STANDARD SPECIFICATIONS AND DRAWINGS FOR PIPELINES, FACILITIES, AND GENERAL ELECTRICAL WORK

LAS VIRGENES MUNICIPAL WATER DISTRICT
www.lvmwd.com
4232 Las Virgenes Road
Calabasas, CA 91302-1994

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LAS VIRGENES MUNICIPAL WATER DISTRICT

CALABASAS, CALIFORNIA

STANDARD SPECIFICATIONS

FOR PIPELINES, FACILITIES, AND GENERAL ELECTRICAL WORK

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Note: User of this Standard Specification book is responsible for obtaining the most current copy available. Notify Las Virgenes Municipal Water District at the start of a new project and updated material will be sent free of charge.

FOREWORD

The “Las Virgenes Municipal Water District Standard Plans & Specifications” establishes uniform methods and procedures for the design and construction of facilities, pipelines, and general electrical work. This manual is a living document and is meant to capture current preferences, but at any time, the District may consider and approve an as-equal or change to a specified brand or material.

This manual is not a textbook or a substitute for engineering knowledge, experience, or judgment. Neither does it impose a standard of conduct or duty to the public. Instead, the methods and procedures contained in this manual should be reviewed by the engineer using them to determine applicability to the project on which they are working. When methods and procedures are not applicable, the engineer should request guidance from the District.

DEFINITIONS

Whenever the following terms occur in the Standard Specifications, the intent and meaning shall be interpreted as follows:

(a) District: LAS VIRGENES MUNICIPAL WATER DISTRICT, a municipal water district organized under the Municipal Water District Act of 1911, as amended. Headquartered at 4232 Las Virgenes Road, Calabasas, California 91302.

(b) Engineer: The registered civil engineer responsible for the design and whose signature appears on the Plans.

(c) Agreement: The executed form provided in the latest revision of the Las Virgenes Municipal Water District's Administrative Code, Section 11.2, or any proposal that certain works, when constructed to these standards, will be accepted by the District.

(d) District's Representative: The person or engineering firm appointed by the District to represent the District with regard to the Agreement.

(e) Contractor or Subdivider: The person, firm, or corporation entering an Agreement with the District for the performance of work and the construction of facilities to be accepted by the District, or the District's Representative.

(f) Subcontractor: The person, firm, or corporation supplying labor or materials at the site of the work as a part of the Contractor's obligation under the Agreement.

(g) Plans: The official plans, profiles, typical cross-sections, working drawings, detail drawings and supplemental drawings, or exact reproductions thereof, approved by the Engineer, which show the locations, character, dimensions, and details of the work to be done.

(h) Standard Drawings: Las Virgenes Municipal Water District Standard Drawings as provided by the District prior to any work performed.

(i) Specifications: The directions, provisions, requirements, and details pertaining to the method and manner of performing the work, and to the qualities of materials to be furnished for acceptance by the District.

(j) Laboratory: The laboratory designated by the District's representative and/or district to test materials and work involved in the Agreement.

(k) Due Notice: 24 hours

(l) Developer: Any person, firm, corporation, or association having an interest, whether legal or equitable, sole or partial, in any premise or tract, lot or parcel of land which is or may in the future be developed and be responsible for design and construction of facilities to be under the jurisdiction of the District and to become a part of the District's facilities.

(m) Grantor: a person or institution that conveys ownership of a property.

TERMS

Wherever the terms "required", "permitted", "ordered", "designated", "directed", "prescribed", or terms of like import are used, it shall be understood that the requirements, permission, order, designation, direction, or prescription of the Owner's Representative is intended. Similarly, the terms "acceptable", "satisfactory", "or equal", or terms of like import shall mean acceptable to or satisfactory to the District's Representative, unless otherwise expressly stated. The word "provide" shall be understood to mean furnish and install.

ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AC	Asbestos Cement
ACI	American Concrete Institute
AGA	American Gas Association
AGC	Associated General Contractors of America
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron & Steel Institute
ANSI	American National Standards Institute (formerly USASI, USAS, ASA)
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASA	American Standards Association (Now ANSI)
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CCR	California Code of Regulations
CCTV	Closed Circuit Television Video
CLSM	Controlled low strength material
CMLC	Cement Mortar Lining and Coating
CRSI	Concrete Reinforcing Steel Institute
DI	Ductile Iron
DR	Dimension Ratio
EPDM	Ethylene Propylene Diene Monomer
FM	Factory Mutual
Green Book	Standard Specifications for Public Works Construction
HDB	Hydrostatic Design Basis
HDCL	High-Density, Cross- Laminated
HDPE	High Density Polyethylene
HP	Horsepower
HTH	High Test Hypochlorite
IEEE	Institute of Electrical and Electronics Engineers
LLD	Low Level Density
LVMWD	Las Virgenes Municipal Water District
ML&C	Mortar Lining and Coating
NBFU	National Board of Fire Underwriters
NEMA	National Electrical Manufacturers

NESHAP	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollution Discharge Elimination System
NSF	National Salination Foundation
OD	Outside Diameter
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PVC	Polyvinyl Chloride
RW	Recycled Water
State Specifications	California Standard Specifications, State of California, Department of Transportation, Division of Highways
SDR	Standard Dimension Ratio
SSPC	Society for Protective Coatings
SSPWC	Standard Specifications for Public works Construction (Green Book)
UBC	Uniform Building Code, Pacific Coast Building Officials Conference of the International Conference of Building Officials
U/L or UL	Underwriters' Laboratories, Inc.
USASI or USAS	United States of American Standards Institute (Now ANSI)

REFERENCES

General Note: The listings below have been organized into major categories to facilitate their use.

General Codes or Specifications

- Standard Specifications for Public Works Construction, by APWA/AGC, the "Green Book."
- Road Encroachment Regulations, Los Angeles County Road Department.
- Standard Specifications - State of California Business and Transportation Agency, Department of Transportation Standard Specifications (Caltrans).
- State of California Department of Industrial Relations, Division of Industrial Safety, "Construction Safety Orders" (Shoring).
- Uniform Building Code as amended by Building & Safety Department, County of Los Angeles, California.
- Engineering Standard Manual Department of Water and Power, City of Los Angeles, California.
- Procedural Guidelines and General Design Requirements, Irvine Ranch Water District, Orange, California.
- Water Design and Construction Standards, City of Thousand Oaks, California.
- City Standards, City of San Buenaventura, California.
- Ventura County Road Standards, Ventura, California.
- AWWA Manuals
    - M6 Water Meters - Selection, Installation, Testing and Maintenance.
    - M11 Steel Pipe - Design and Installation.
    - M17 Installation, Operation and Maintenance of Fire Hydrants.
    - M22 Sizing - Water Service Lines and Meters.
    - M23 PVC Pipe.

Water System Materials and Construction (Excluding Subjects Listed Separately)

- ASTM Specifications.
    - A185 Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
    - A307 Specification for Bolts and Nuts.
    - A615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement (rebar).
    - A94 Specification for Ready-Mixed Concrete.
    - C150 Specification for Portland Cement.
    - D698 Tests for Moisture-Density Relations of Soils, using 5.516 Rammer and 12-in. drop.
    - D1248 Specification for Polyethylene Plastics Molding and Extrusion Materials (plastic film wrap).

- AWWA Standards
    - C110 American National Standard for Gray Iron and Ductile Iron Fittings, 3-in. through 48-in., for Water and Other Liquids.
    - C111 American National Standard for Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
    - C115 AWWA for Cast Iron and Ductile Iron Flanges Sizes 3" - 48".
    - C153 AWWA for Ductile Iron Compact Fittings Size 3" - 64".
    - C207 AWWA Standard for Steel Pipe Flanges for Water Works Service - Sizes 4-in. through 144-in.
    - C208 AWWA Standard for Dimensions for Steel Water Pipe Fittings.
    - C500 AWWA Standard for Gate Valves - 3-in. through 48-in. NPS-for Water and Sewage Systems.
    - C503 AWWA Standard for Wet-Barrel Fire Hydrants.
    - C504 AWWA Standard for Rubber-Seated Butterfly Valves.
    - C600 AWWA Standard for Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances.
    - C601 AWWA Standard for Disinfecting Water Mains.

PolyVinyl Chloride (PVC) Pipe

- AWWA Standards
    - C900 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-in. through 60-in., for Water.

Steel Pipe

- AWWA Standards
    - C200 AWWA Standard for Steel Water Pipe 6-inches and larger. Note- Steels to be ASTM A283 or A570.
    - C205 AWWA Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe, 4-in. and larger, shop applied. Note - cement to meet ASTM C150.
    - C206 AWWA Standard for Field Welding of Steel Water Pipe. Note - welding electrodes to meet ASTM A233 and welding procedures to meet AWS D10.9.

Ductile Iron Pipe

- AWWA Standards
    - C150 American National Standard for the Thickness Design of Ductile Iron Pipe.
    - C151 American National Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Other Liquids.
    - C104 Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings for Water.
    - C105 Polyethylene Encasement for Gray and Ductile Cast Iron Piping for Water and Other Liquids.

High Density Polyethylene Pipe

- AWWA Standards
    - C906 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings for Pipe 4-in. through 65-in, for Water.

LAS VIRGENES MUNICIPAL WATER DISTRICT
STANDARD SPECIFICATIONS

WATER, RECYCLED WATER, SEWER AND GENERAL ELECTRICAL

Table of Contents – Las Virgenes Standard Specifications

1.0 MATERIALS

1.1 GENERAL REQUIREMENTS

This section discusses the materials involved in systems and associated construction activities.

The materials selected have been chosen for their strength, durability, and ease of maintenance. It should be noted that in some instances the District requirements exceed those of the industry or regional standards. Where applicable, industry or regional standards, such as AWWA or other standards, have been referenced and it shall be the responsibility of the contractor to be familiar with those standards to ensure compliance.

All equipment, materials and supplies to be incorporated in the work shall be new unless otherwise specified.

Contractor is to follow manufacturers' recommendations for storage in order to prevent material damage. Failure to do so will be a cause for the District to reject such improperly stored materials.

In some instances, particular manufacturers and product names have been mentioned as being approved. Other products may also meet the requirements but must be first approved in writing by the District before procurement or delivery is started and before such material is used in the work. One factor for the District in any consideration of other products is the need for some degree of standardization. In the event that the contractor furnishes the material, process, or article better than that specified, the difference in cost of such material, process, or article so furnished shall be at no expense to the District.

1.2 TESTING AND FINAL ACCEPTABILITY OF MATERIAL

The District will require tests and certifications as deemed necessary to show that the specified materials have been employed. Notwithstanding prior factory or yard inspections, the District Representative shall have the right to reject any damaged or defective materials found on the job which will affect the durability or performance of the installation and order its removal from the site.

No materials shall be installed until approved by the District. All installations which are to be backfilled shall be inspected and approved by the District's Representative prior to backfilling. The Contractor shall give 24-hour notice in advance of backfilling to the District's Representative so that proper inspection may be provided.

All materials not conforming to the requirements of these specifications shall be considered as defective and all such materials, whether in place or not, shall be rejected. No rejected material, the defects of which have been subsequently corrected, shall be used until approved in writing by the District's Representative.

The inspection of the work shall not relieve the contractor of any of their obligations to fulfill the specifications as prescribed. Defective work shall be made good, and unsuitable materials may be rejected notwithstanding the fact that such defective work and unsuitable materials have been previously overlooked by the District's Representative and accepted.

All materials for use in the work shall be stored by the contractor in such a manner as to prevent damage from exposure to the elements, admixture of foreign materials, or from any other cause. Materials shall be stored out of direct sunlight until the time of installation. The District will not be responsible for damage or loss of materials by weather or other causes.

1.3 MAIN LINE PIPE MATERIALS

a. PVC Pressure Pipe

1. Pipe. PVC pipe shall conform to the quality and strength requirements of AWWA C900-07.

2. Each standard or random length of pipe shall be clearly marked with the following:
   (1) Nominal size and O.D. base, i.e., OIP size.
   (2) Material code "PVC 1120."
   (3) AWWA pressure class, i.e., PC 235 or 305.
   (4) AWWA designation AWWA C900.
   (5) Manufacturer's trade name and production record code.
   (6) Seal (mark) of testing agency.

3. The standard laying length shall be 20 feet (plus/minus) one inch in all classes and sizes.

4. Class 200 minimum short piece of pipe shall be three feet.

5. For tap sizes of one-inch to two inches, service saddles are required. Refer to Section 1.10 of these Standards for additional information

6. AWWA C900 pipe have the same outside diameter (O.D.) as that of ductile iron pipe in the sizes furnished.

7. Pipe surfaces shall be free from nicks, scratches, and other blemishes. The joining surfaces of pipe spigots and of integral bell and sleeve reinforced bell sockets shall be free from gouges or other imperfections that might cause leakage.

8. Approved PVC pipe is:
   (1) All that meet "A" criteria. Material used to produce the pipe and couplings shall be made from Class 12454-A or B virgin compounds as defined in ASTM D1785, with an established hydrostatic design basis rating of 4,000 psi for water at 73.4°F (23°C).
   (2) Other materials require prior approval.

9. Joint Mechanisms. The joints must meet DR requirements and shall be either of the following:
   (1) Elastomeric gasket couplings.
   (2) PVC solvent cement joints, although allowed by AWWA C900, **are <u>not</u> approved**.

10. Couplings and Fittings. Where couplings are used, they shall meet the requirements of AWWA C900. Couplings shall be as furnished by the manufacturer and shall be

marked with same information as the pipe. Slip couplings shall not be used for mainline installations. Repair couplings to join plain end to plain end pipes shall not be used unless approved by the District. Couplings with no stops shall only be used at closures.

11. Cast iron fittings with grip tight ends shall be used for PVC pipe (refer to Main Line Fittings Section 1.4 of these Standards.)

12. Locating wire. To allow for the location of non-metallic pipes, copper wire shall be provided. Wire shall be coated 12 gauge and shall be continuous between successive valve boxes (including air and vacuum and adjacent valve boxes associated with fire hydrants and blow off assemblies).

13. Hot Tapping. See Hot Tapping section.

b. PVC Gravity Pipe for Sewer

1. Use of PVC for main line sewers on industrial and commercial installations will be permitted only where approved, in advance, by the District.

2. PVC sewer forcemain shall be constructed in accordance with PVC pressure pipe Section 1.3.a.

3. Pipe, fittings, couplings, and joints shall be in conformance with the size, material and performance requirements of ASTM D3034, Standard Dimensional Ratio (SDR) 35, Dimension Ratio (DR) 14 and DR 18 and shall have gasketed joints.

   Pipe and fittings shall be made of PVC plastic having a cell classification of 12454 as defined in ASTM D1784. All pipe shall be of solid wall construction with smooth interior and exterior surfaces.

4. Pipe Marking: All pipe, fittings, and couplings shall be clearly marked at an interval not to exceed 5-feet as follows:
   (1) Nominal Pipe Diameter
   (2) PVC cell classification
   (3) Company, plant, shift, ASTM, SDR and date designation.
   (4) Service designation or legend

5. Pipes which are not installed within 120 days of the latest test shall not be used without prior approval from the District.

6. The socket and spigot configurations for fittings and couplings shall be compatible with those used for the pipe.

c. Steel Pipe

1. All welding shall be done by qualified welders as specified in AWWA C-200, C-205, C-206, C-207, C-208, and the Standards of the American Welding Society. Certification per ASME Section 9 is mandatory for live pipes.

2. Steel pipe shall conform to the quality and strength requirements of AWWA C200 or as specified below. AWWA C200 pertains to electrically butt-welded straight-seam or spiral-seam pipe and to seamless pipe six inches in diameter or larger.

3. The steel shall conform to one of the following:

Specification	Grade	Minimum Yield Points (psi)
ASTM A570	Grade 30	30,000
	Grade 36	36,000
	Grade 40	40,000
	Grade 45	45,000

4. The stress in the steel pipe shall not exceed the higher of 15,000 psi or the stress computed using the stress formula below (1.3.c.5) where P is equal to one-half the design working pressure and the following minimum thicknesses shall be used:

Nominal Inside Diameter (Inches)	Minimum Thickness (Inches)
4'' – 18''	0.1046
20'' and 21''	0.1345
24'' and 27''	0.1495

5. The following formula shall be used to determine the stress in the steel cylinder:

$$s = \frac{PD_i}{2g}$$

Where s = Stress, psi
P = Working Pressure, psi
D_i = Maximum Inside Diameter of Steel Pipe, inches
g = Wall Thickness of Steel Pipe, inches

6. The gauges specified above (1.3.c.4) consider the thicknesses required for welding as well as that required for external loads and a corrosion allowance.

7. The nominal measurement for steel pipe 12 inches and smaller shall conform to the following:

Nominal Inside Diameter (Inches)	Steel Pipe Outside Diameter (Inches)
4	4 ½
6	6-5/8
8	8-5/8
10	10-3/4
12	12-3/4

8. For larger pipes, the steel pipe outside diameter shall be computed using the following formula:

$$D_o = \mathrm{D} + 2(\mathrm{t} + \mathrm{g})$$

Where D_o = Actual Steel Pipe O.D., inches
D = Nominal Inside Diameter, inches
t = Thickness of Cement Mortar Lining, inches
g = Thickness of Steel Pipe, inches

9. AWWA Manual M-11 should be consulted for earth loads in respect to steel lines.

10. The pipe shall be essentially round. The outside circumference shall not vary more than (plus/minus) 1.0 percent from the nominal outside circumference based upon the diameter specified (except for the ends which are discussed below.)

11. The pipe shall not deviate by more than ½ -inch from a 10-foot long straight edge held against the pipe.

12. The pipe lengths, generally 40 feet long, shall be furnished with a tolerance of (plus/minus) two inches.

13. Welded seams in steel cylinders shall be fusion welded, longitudinal, spiral or girth. Longitudinal seams shall be limited to not more than one per plate section. Longitudinal seams must be staggered with longitudinal seams in adjoining plate section. Girth seams shall be limited to one per standard section 16 feet or less in length.

14. Additional girth seams in longer standard sections may be employed but not to exceed one per each additional full 10 feet beyond the first 20 feet. Seams in special sections may be increased as required.

15. Pipe Ends. Various end treatments can be supplied as discussed in AWWA C200 and briefly listed below:

(1) Ends for mechanically coupled field joints. These are either plain or grooved.
(2) Ends for lap joints for field welding. These shall have a bell end pressed or rolled without hammering. The surfaces shall be ground smooth. When assembled, joints must have a minimum 1½ -inch lap with approximately 1/32-inch clearance. The fillet weld minimum (number of passes) shall be 3.
(3) Plain end pipe - these shall have a plain end right angle cut.
(4) Except for butt strap closures, butt welding and field fabricated fittings will not be permitted unless approved by the District.
(5) Deflection of more than three (3) degrees not allowed at joints.
(6) Ends fitted with butt straps for field welding. The butt straps may be made in halves. Wedding bands shall not be used unless approved by the District's Representative.
(7) Plain ends fitted with flanges.
(8) The allowable tolerance at pipe ends is discussed in AWWA C200.

16. Hydrostatic tests. Each pipe shall be tested by the manufacturer to a pressure not less than that determined by:

$$P = \frac{S2g}{D_i}$$

Where S = 0.75 times the minimum yield strength of the steel and the other items are as discussed earlier.

17. Cement Mortar Lining and Coating (CMLC).
(1) Unless otherwise approved or as revised below, all steel pipe shall be cement mortar lined and coated in accordance with AWWA C205 and ASTM C150 which covers shop applied lining and coating. Cement shall be Portland cement Type II or V for lining and Type V for coating.
(2) Cement mortar lining shall be uniform in thickness except at joints or other discontinuities. Ends of lining shall be left square and uniform and the lining holdback shall be as specified for the particular type of joint.
(3) Coating shall be a reinforced coating over all outside surfaces of the pipe and specials. The coating shall be of a uniform thickness except at joints or other discontinuities in the pipe. Ends of coatings shall be left square and uniform and the coating holdback shall be as specified for the particular type of joint.
(4) After inspection of welded joints and electrically bonded connections, the outside joint recess shall be coated.
(5) All Fragment Antigen-Binding (fab) angles shall be made from the same pipe as the straight or standard lengths of pipe and same coil. This allows for the entire special to be fabricated and tracked throughout the process and the installation.
(6) Flanges shall be coated with Sanchem (no-oxide) or equal with wax tape and protected with a polyethylene encasement installed per Painting Section 1.9 and Section 2.18 of these Standards and in accordance with AWWA C205.
(7) The materials and construction methods for field joints shall be as specified in Section 2 of these Standards.

(8) It should be noted that the District requirements for thickness exceed those of the AWWA standard. Also, it should be noted that no wire fabric reinforcement is required for any lining of specials less than 24 inches in diameter.

Cement Mortar Lining Thickness		
Nominal Diameter (Inches)	Lining Thickness (Inches)	Tolerance (Inches)
4-10	1/4	-1/16 +1/8
11-23	5/16	-1/16 +1/8
24-36	3/8	-1/16 +1/8
Above 36	1/2	-1/16 +3/16
Cement Mortar Coating Thickness		
Nominal Diameter (Inches)	Coating Thickness (Inches)	Tolerance (Inches)
4-6	½	-0 + 1/8
8-10	¾	-0 + 1/8
12 and above	1	-0 + 1/8

18. Factory Tests and Inspection. The District Representative shall at all times have the right to inspect the work and materials during the manufacturing process and to make or witness such tests as required in these specifications, or as deemed advisable. The contractor will then perform any and all additional work required to assure the pipeline is electrically continuous. In lieu of the preceding, the contractor shall upon request submit a certificate certifying that the materials meet the requirements of this specification. All testing will be done in recognized testing laboratories within the State of California approved by the District representative.

19. Fabricated Angles. These shall meet the requirements of AWWA C208-83. Except for butt strap closures, field fabricated fittings **will not be permitted unless approved by the District Representative.**

20. Welded Joints. One of each section shall be swaged out to form a female or bell end which shall permit the male or spigot end to enter approximately 12 inches with a minimum clearance of 1/32-inch. The spigot end shall be "sized" to permit it to enter the bell end of the adjacent section and the weld bead shall be ground flush for the distance it is to enter the bell end.

21. Butt Strap Closures. The butt straps shall be the same thickness as the pipe wall but not less than six gauge, at least 10 inches wide with longitudinal seams, rolled

to fit the outside cylinder diameter and shall be centered over the ends of the pipe sections they are to join. A standard five-inch steel coupling shall be welded to the top section of the butt strap to permit access for mortar lining the inside of the joint. The coupling shall be closed with a five-inch solid steel plug welded to the coupling.

22. Welding. Welding electrodes shall comply with the requirements of the Standards of the American Welding Society (AWS). In all hand welding, the metal shall be deposited in successive layers and the minimum number of passes or beads in the completed weld shall be as follows:

Steel Cylinder Thickness (Inches)	Fillet Weld Minimum (Number of Passes)
Smaller than 3/16''	1
3/16'' and ¼''	2
5/16''	3
3/8''	3

23. Shop Drawings. Shop drawings of all pipe and fittings shall be submitted to the District's Representative for approval prior to fabrication of the pipe and fittings. Pipe lay sheets shall be included, consisting of drawings of lay, identification of joints, horizontal and vertical angles, and appurtenances. Stationing and elevation shall be shown on all joints, angles, and appurtenances. Elevation shall consist of top of pipe and finished surface at these points. Fabricated angles shall meet the requirements of AWWA C208-83. Except for butt strap closures, field fabricated fittings **will not be permitted** unless approved by the District. Format for shop drawings and lay sheets may be obtained from the District Representative. Approval of the shop drawings is an additional precaution against errors and is not to be construed as relieving the contractor of the full responsibility for the accuracy of the shop drawings.

24. Marking. Markings shall include a designation mark for each pipe or fitting furnished and "field top" shall also be indicated.

25. Hot Tapping - refer to Section 1.4.m (Tapping Sleeves) of these Standards.

d. Ductile Iron Pipe

1. Pipe: The pipe shall conform to AWWA C151 for both quality and strength. Each pipe shall include the letters "DI" or word "DUCTILE" to indicate the pipe material. The standard nominal laying length shall be 18 or 20 feet. Random and short lengths shall be per AWWA C151. Fully gauged pipe shall be provided for all cut to fit pipes and where requested by the District.

2. Minimum Wall Thickness: The minimum wall thickness for ductile-iron pipe shall be as specified in AWWA C150 for the design pressure class, and thickness Class 53 for flanged spools, unless indicated otherwise on the plans or elsewhere in the

project specifications.

3. Joints: These shall be of the rubber gasket push-on joint type conforming to the requirements of AWWA C111/A-21.11 unless otherwise specified. If required, the manufacturer shall supply a letter of certification attesting to their pipe meeting these specifications. All pipe joints shall be bonded to provide electrical continuity for corrosion monitoring and future cathodic protection.

4. Fittings: Refer to Mainline Fittings Section 1.4.

5. Service Taps: For tap sizes up to two inches, service saddles are required. Tapping of the pipeline is not allowed.

6. Lining and Coating. Unless otherwise approved, the internal surfaces shall be lined with a uniform double thickness of cement mortar and then sealed with a bituminous coating in accordance with AWWA C104. The coating shall be free from blisters and holes and shall adhere to the metal surface at ambient temperatures encountered in the field. Pipes fittings shall be protected with a polyethylene encasement installed in accordance with AWWA C105.

e. HDPE Pipe
   1. Pipe: Pipe and fitting 4 inches through 20 inches shall conform to AWWA C906.

   2. Minimum Wall Thickness: The minimum wall thickness (inches) for pipe 4 inches through 20 inches shall be in accordance with Table 5 of AWWA C906 for the SDR shown on the drawings.

   3. Quality: The pipe shall be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties throughout.

   4. Design Basis: Pipe shall have a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D2837.

   5. Fittings and Joints. Minimum radius of fabricated elbows shall be 2.5 diameters.
      (1) The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe for 50 years of service at 73°F with an included 2:1 safety factor.
      (2) Manufacture the fittings from the same resin type, grade, and cell classification as the pipe.
      (3) Join sections of polyethylene pipe into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method performed in accordance with the pipe manufacturer's recommendations.

(4) The butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer requirements of 500°F, alignment, and 150-psi interfacial fusion pressure.

6. Pipe Marking: All pipe, fittings, and couplings shall be clearly marked at an interval not to exceed 5-feet as follows:
   (1) Nominal Pipe Diameter
   (2) The letters PE followed by the polyethylene grade per the latest version ASTM D1248.
   (3) Hydrostatic design basis in psi.
   (4) Manufacturing, ASTM, SDR and date designation.

1.4 MAIN LINE FITTINGS

All products shall meet NSF/ANSI 61 standards for use in potable and recycled water applications.

a. Gray-Iron and Ductile Iron Fittings

1. Fittings: Shall be cement mortar lined or epoxy lined and shall meet the requirements of AWWA C110, C111, C104 and C200. All fittings shall be rated for 300 psi. This standard covers, but is not limited to, fittings with combinations of ends including mechanical joints, plain end, flange, push on joint.
   (1) The fitting types are as follows:
   90˚ bend, 45˚ bend, 22½˚ bend, 11¼˚ bend.
   (2) Tees & crosses, reducers, caps & plugs, connecting pieces, flanged bends, flanged tees & crosses, flanged reducers.

2. Lining and Coating. Unless otherwise approved, the internal surfaces shall be lined and manufactured to exceed the minimum requirements of American National Standard Institute ANSI A21.51 (AWWA C-151).

3. The outside surface shall be protected with a polyethylene encasement installed per Painting section 1.9 of these Standards and in accordance with ANSI/AWWA C105/A-21.5.

4. All fittings shall meet the AWWA C150 and C153 requirements.

5. Care must be exercised to not mix mechanical and flange joint ends since they will not mate.

b. Flanges

1. Per AWWA C206, C207 and C208, flanges shall be flat-faced and meet the requirements of AWWA C207 and shall be AWWA standard steel hub flanges (these flanges meet ANSI B-16.5.) The flanges shall be marked with the size, name or trademark of manufacturer and with the AWWA class, i.e., "E".

2. The inherent problem with flanges is that they are rigid and do not provide flexibility. When installing flanges, Contractor shall ensure (1) uniform tightening of the bolts; (2) not mating steel raised face flanges with flat face cast iron flanges or vice versa and (3) prevention of bending or torsional strains. Proper anchorage shall be made which is important to meet the latter objective.

3. Flanges shall meet the specifications provided in the following table:

Working Pressure	Specification	Class
0 – 275 (1)	AWWA C207 and ANSI B-16.5	E (flat face)
0 – 300 (1)	AWWA C207 and ANSI B-16.5	F (flat face)

Higher class flanges are allowed when necessary to match valves.

c. Bolts and Nuts

1. Above ground bolts and nuts: Bolts and studs for aboveground installations shall be cadmium plated and shall conform to ASTM A307, Grade B, "Steel Machine Bolts and Nuts and Tap Holes" when a ring gasket is used and shall conform to either ASTM A261 "Heat-Treated Carbon Steel Bolting Material" or ASTM A193 "Alloy-Steel Bolting Material for High Temperature Service" when a full-face gasket is used. Bolts and nuts shall be heavy hexagon series. Nuts shall conform to ASTM A194 "Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service" either in Grade 1, 2 or 2H. The fit shall be ANSI B1.1 "Unified Screw Threads" Class 2, except that Class 3 fit shall be used in holes tapped for studs. Threads may be made either cutting or cold forming. Between 3-threads and 5-threads of the bolt shall project through the nut when drawn tight.

2. Underground bolts and nuts: Bolts for underground installations shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M. Nuts shall be ASTM A194, Grade 8M. All buried bolts shall be completely coated with Sanchem (no-oxide) or appropriate equal, which must be applied in two coats to a minimum thickness of 15 millimeters per coat.

d. Gaskets

1. Shall be of the full face gasket type for flanged joints, 1/16-inch thick where both flanges are flat. Drop-in gasket type 1/16-inch may be used where a raised face flange is present.

2. For Class "E" Flanges: Full face rubber and full face fiber. Gaskets shall be suitable for a pressure of 350 psi at a temperature of 180 degrees F.

3. For Class "F" Flanges: Full face rubber and full face fiber. Gaskets shall be suitable for a water pressure of 740 psi at a temperature of 100 degrees F. Gaskets shall comply with ANSI B16.20.

4. Gaskets for Push-on, mechanical or restrained joints shall be synthetic or natural rubber in accordance with AWWA C111.

e. Flexible Couplings

1. These are designed to connect plain end pipes with a mechanical compression

joint to provide a stress relieving, flexible, leak- proof joint. Their use **must be pre-approved by the District Representative prior to ordering/installing couplings.** They can be ordered in steel or cast iron pipe sizes (note: AWWA C900). The District shall not be responsible for any items ordered prior to approval.

2. Flexible coupling for steel pipe shall have center sleeves made of steel conforming to ASTM A36, A53 or A512 having a minimum yield strength of 30,000 psi.

3. Flexible couplings for ductile iron pipe shall have center sleeves of ASTM A126 class B ductile iron with a minimum yield strength of 30,000 psi.

4. PVC pipe has same outside diameter as cast iron. The couplings shall either be Dresser Style 38 or Rockwell Series 431 or equal.

f. Grooved-End Couplings

Grooved-end couplings shall be of the two-piece style housing, Victaulic Style 77 or equal conforming to AWWA C606. Pipe shall be square cut grooved. Gasket shall be suitable for potable water. This type coupling shall not be used for burial service. Couplings shall be painted the same color as the pipe in accordance with Painting Section 1.9 and Section 2.18 of these Standards.

g. Transition Couplings

These are used to connect pipes of the same nominal size but different materials. AC, steel and PVC pipes can be connected to one another. **Mechanical joint fittings and transition rubber gaskets are not acceptable unless approved the District Representative.**

h. Flanged Coupling Adapters

These are used to connect plain end pipe to flanged valves, pumps, meters, etc. They eliminate the need for both a flanged spool and coupling. Generally, they are available in sizes through 12 inches.

i. Insulated Couplings

These are used to stop the flow of electric current across the joint by means of an insulating boot.

j. Special Steel Pipe Fittings and Fitting Dimensions

1. AWWA C-200, C208 and SS-P-385a covers special fittings, such as elbows, tees, crosses, reducers, etc., and should be consulted for a specific application. Compact fittings **shall not be allowed**. All other fittings shall be submitted to the District Representative for approval. The outside surface shall be protected with a polyethylene encasement furnished and installed per Painting Section 1.9 and Section 2.18 of these Standards and in accordance with AWWA C105.

2. Fitting dimensions shall conform to AWWA Specification C208, except that

reducer shall consist of taper sections between six-inch minimum lengths of adjoining pipe. The taper shall be a minimum of 12 inches in length of each two-inch diameter change and the gauge shall be equal to that of the larger adjoining pipe. The diameter of the six-inch sections shall match the adjoining pipes and the gauge shall be sufficient to maintain a stress of not less than 15,000 psi at the designated working pressure and shall be not less than 10 gauge.

3. All special sections and fittings shall be fabricated in a shop by the manufacturer from District approved shop drawings under the inspection of a District Representative. Field fabricated fittings **will not be permitted unless approved by the District Representative**.

k. Mechanical Restraint Joints

1. Restrained joint fittings shall be provided at all tees, crosses, reducers, bends, caps, plugs and valves such that the pipe is fully restrained in all directions specifically called for on the plans or as approved by the District Representative.

2. Restrained joint fittings shall meet ASTM F1674-11 for PVC and be UL/FM approved through 12" for both ductile iron and PVC. The restraint mechanism shall consist of individually activated gripping surfaces to maximize restraint capability. Twist-off nuts, sized the same as the tee-head bolts, shall be used to ensure proper activating of restraining devices. The gland shall be manufactured of ductile iron conforming to ASTM A536-80. The retainer-gland shall have a pressure rating equal to that of the pipe on which it is used through 14" with a minimum safety factor of 2:1.

l. Push-on Restraint

Push-on joints shall not be utilized unless specifically approved by the District. Therefore, the use of push-on restraints are not allowed unless approved by the District.

m. Tapping Sleeves

1. Edge of sleeve must **not** be closer than 18 inches from a joint.

2. When tapping pipe, no tapping shall be done less than 1-1/2 pipe diameter from a joint.

3. The outside surface of the tapping sleeve and valve shall be protected with a Epoxy coated inside and outside, furnished and installed per Painting Section 1.9 and Section 2.18 of these Standards in accordance with AWWA C105.

4. Hot taps on steel mains must use reinforcement collars when the diameter of the pipe is less than 2 times the main pipe diameter. When the branching pipe does exceed 2 times the pipe diameter, a full wrap saddle shall be used.

5. Hot taps of one-inch through two-inch on steel main must use a 3,000-pound steel coupling.

6. Approved tapping sleeves are as follows:

Main	Sleeve
AC Pipe	Smith Blair 622 or equal
PVC Pipe	Smith Blair 622 or equal

The effective shoulder width (W) of collars or wrappers from the inside surface of the steel riser to the outside edge of the collar or wrapper measured on the surface of the cylinder shall be not less than one-third nor more than one-half the inside diameter of the steel riser. The thickness of the collar or wrapper shall be not less than (T) as determined by:

$$T = \frac{P_w * ID_{cyl} * ID_{riser}}{36{,}000 * W}$$

Where P_w = the design class, psi
All other dimensions, inches

1.5 MAIN LINE VALVES AND COVERS

All products must be verified per NSF/ANSI 61 for potable and recycled water.

a. Butterfly Valves

Butterfly valves per AWWA C504 shall be used for general waterline use when line pressure is less than 250 psi in 10-inch and larger lines or where required by the District.

Identification copper wire used for locating PVC pipe must be installed continuously between successive valve boxes.

1. General.
   (1) Butterfly valves shall be tightly closing, rubber seated valves conforming to AWWA C504 except as herein modified. Valves shall be designed for tight shut-off with no water leaks when subjected to a maximum differential pressure across the disc of 250 psi.
   (2) Valve shafts shall be stainless steel, type 304 or 316 except where completely sealed from water in the valve. Valve disc fasteners shall be stainless steel, type 304. Valve discs shall be of alloy-cast- iron, conforming to ASTM A-436, type 1. The valve disc shall rotate 90˚ from fully open to the fully closed position.
   (3) Shaft seals shall be designed for use with standard split-V type packing or other approved seals and the interior passage shall not have any excessive obstructions or stops. Cartridge-type valve seats, or valve employing snap rings to retain the rubber seats, will not be acceptable. The rubber seat shall be mounted in the valve body. The rubber seat shall be made from peroxide-cured EPDM rubber and shall be fastened integrally within the valve body.

2. Interior Coating. The interior cast iron surfaces of valves, including the disc, shall be coated with 100 percent solids, catalytically setting epoxy which is manufactured for use in the interior of potable water systems and per Painting Section 1.9 and Section 2.18 of these Standards.

3. Exterior Coating. Valve bodies and operator corrosion housings shall be protected with a polyethylene encasement and installed per Painting Section 1.9 and Section 2.18 of these Standards and AWWA C105.

4. Operators.
   (1) All valve operators shall be fully gasketed, weatherproofed, and factory packed with grease. Operators shall be of the size required for opening and closing the valve against its design water pressure and they shall have a torque rating not less than that shown in AWWA C504.
   (2) The operator shall be capable of withstanding an input torque of 450 foot-pounds at extreme operator position without damage.
   (3) Buried operators shall be worm gear or screw type with counter- clockwise opening equipped with standard AWWA two-inch operating nuts. Operators shall be specifically designed and suitable for permanent buried service.
   (4) Operators for valves located above ground shall have disc-position indicators and hand-wheel or as specified.

5. Marking. The manufacturer shall show the manufacturer's name or mark, the year of manufacture valve size and the designation of working pressure.

6. Painting. All exposed metal surfaces of valves installed above ground or in vaults shall be painted per Painting Section 1.9 and Section 2.18 of these Standards and in accordance with AWWA C105.

7. Valve's restraint. Shall be used when installing push-on valves below ground. When placing thrust blocks around a fitting, the concrete must be around the fitting and not the joint.

b. Gate Valves, Wedge and Resilient-Seated Gate Valves

1. Per AWWA C509, this specification pertains to above ground valves, three-inch and smaller and buried valves eight-inches and smaller when line pressure is less than 250 psi or where required by the engineer. When line pressure exceeds 250 psi, high pressure wafer sphere butterfly valve or a plug valve shall be used regardless of main size.

2. Valves shall be tightly closing, rubber seated valves conforming to AWWA C500 and C509 except as herein modified. Valves shall be designed for tight shut-off with no water leaks when subjected to a maximum differential pressure across the disc of 250 psi.

3. Valves shall meet the requirements of AWWA C500, C550 and C509 specifications and shall be of the same size as the main in which they are installed.

4. All valves shall be counter-clockwise opening, non-rising stem type.

5. Buried valves shall be equipped with two-inch square cast iron operating nuts.

6. Valves located above ground or in vaults shall have a hand-wheel unless otherwise specified.

7. Interior coating. The interior cast iron surfaces of valves shall be coated with 100 percent solids, catalytically setting epoxy which is manufactured for use in the interior of potable water systems and per Painting Section 1.9 and Section 2.18 of these Standards.

8. Exterior Coating. Valve bodies shall be protected with a polyethylene encasement and installed per Painting Section 1.9 and Section 2.18 of these Standards and AWWA C105.

9. Marking. The manufacturer shall show the manufacturers name or mark, the year of manufacture valve size and the designation of working pressure.

10. Painting. All exposed metal surfaces of valves installed above ground or in vaults shall be painted per Painting Section 1.9 and Section 2.18 of these Standards and in accordance with AWWA C105.

11. Valve restraints. Shall be used when installing push-on valves below ground. When placing thrust blocks around a fitting, the concrete must be around the fitting and not the joint.

12. Valves, Three-Inch and Smaller, Not Buried. The body and all interior working parts, except stems, shall be constructed of ASTM B-62(85-5-5-5) or ASTM B-61 bronze.

13. Valves, 3-Inches Through 8-Inches. Valve body and bonnet shall be manufactured of cast iron with solid bronze valve with an O-ring stuffing box. All internal working parts, except stems shall be ASTM B-62-70 (85-5-5-5).

c. Plug Valves

1. Plug valves shall only be used where other valves cannot meet appropriate pressures. Any use of plug valves shall be approved by the District Representative.

2. Interior Coating. The interior of the valve except the bronze and working parts shall be coated with 100 percent solids, catalytically setting epoxy which is manufactured for use in the interior of potable water systems and per Painting Section 1.9 and Section 2.18 of these Standards.

3. Exterior Coating. Valve bodies and operator corrosion housings shall be protected with a polyethylene encasement and installed per Painting Section 1.9 and Section 2.18 of these Standards and in accordance with AWWA C105.

4. Installation.
   (1) Valves located below ground shall be spur gear operated with watertight gear housings, lubricant pipe and road box.
   (2) Gear housings shall be complete with the required length of pipe extension and road box set flush with the finished street.
   (3) The extension shall be of such length that a minimum of five inches clearance is provided between the bottom of the road box lid and any portion of the valve stem extension. Exposed nuts and bolts for gear housings shall be stainless steel Type 316.
   (4) Plug valves located above ground or in vaults shall be worm gear operated. Outside locations shall include watertight gear housings and hand-wheel or as specified.
   (5) Plug valves should be submitted for approval.
   (6) The exterior surfaces of ferrous watertight gear housings and pipe extensions shall be coated with factory applied coating.

5. Marking. The manufacturer shall show the manufacturer's name or mark, the year of manufacture, valve size and the designation of working pressure.

6. Painting. All exposed metal surfaces of valves installed above ground or in vaults shall be painted with epoxy per Painting Section 1.9 and Section 2.18 of these Standards.

7. Valve restraints. Shall be used when installing push-on valves below ground. When placing thrust blocks around a fitting, the concrete must be around the fitting and not the joint.

d. Valve Riser and Covers.
   1. Valve riser shall be 8-inch PVC pipe.

   2. Valve box covers shall be cast iron and shall be designed to rest with or without a frame on cast-in-place concrete ring surrounding the valve extension pipe. The lids shape shall be per standard drawing W-116.

1.6 EARTHWORK

Earthwork shall be as listed in the Standard Specifications for Public Works Construction Latest Edition, by APWA/AGC, (*Green Book*) unless otherwise noted.

Within the rights-of-way of the California Department of Transportation, Los Angeles County, and the respective cities within the District service area, earthwork shall be in accordance with requirements and provisions of the permits issued by those agencies. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these Specifications.

a. Pipe Zone

The pipe zone shall include the full width of trench from six inches below the bottom of the pipe or conduit to a horizontal level 12 inches above the top of the pipe per Standard Drawing W-101 or S-101.

b. Sheeting, Shoring & Bracing of Trenches

Trenches shall have sheeting, shoring, and bracing conforming to the latest Cal-OSHA requirements. Shoring plans must be prepared and stamped by a registered civil engineer and submitted to the District Representative.

c. Imported Sand -Pipe Zone and Pipe Bedding

Imported sand used in the pipe zone and for the pipe bedding shall consist of natural or manufactured granular material, or a combination thereof, free of deleterious amounts of organic material, mica, loam, clay, rocks, and other substances not suitable for the purpose intended. Imported sand shall be graded such that 100 percent passes through a 3/8" sieve and 0 – 10 percent passes No. 200 sieve. Sand shall have a sand equivalent of not less than 50 per ASTM D2419.

d. Rock Fill for Foundation Stabilization

Rock refill shall be crushed or natural rock containing less than one percent asbestos by weight or volume.

e. Native Earth Backfill - Trench Zone

In the absence of stricter requirements, the material above the pipe zone may be native material that does not contain rocks larger than three inches and shall be so graded that at least 40 percent of the material passes a No. 4 sieve. The contractor at his option may use imported sand in the trench zone, provided there is no additional cost to the District.

f. Special Slurry Backfill

For pipelines which are laid in an already paved street, it may be required the backfill above the pipe zone with a one-sack slurry mix in lieu of compacted soil backfill. The slurry mix shall have no less than one-sack cement per cubic yard.

1.7 ASPHALT CONCRETE PAVING

a. General

Comply with the applicable sections of the latest version of Standard Specifications for Public Works Construction (*Green Book*). Asphalt concrete thickness and material shall conform to the requirements of the local jurisdiction.

1.8 CONCRETE AND MORTAR WORK

a. General

1. Concrete work shall be in accordance with the Green Book unless otherwise noted.

2. Within the rights-of-way of the California Department of Transportation, Los Angeles County, or the respective cities within the District, concrete and mortar work shall be in accordance with requirements and provisions of the permits issued by those agencies. Such requirements and provisions, where applicable, shall take precedence over the provisions of these Specifications.

b. Design Criteria

1. Concrete for thrust blocks, pipe, and pump can encasement and other unreinforced concrete shall be Portland cement concrete mix 560-C-3250 and attain a strength not less than 3,000 psi at 28 days.

2. Pipe Mortar Lining and Coating (ML&C). Unless otherwise approved or as revised below, all steel pipes shall be mortar lined and coated in accordance with AWWA C205, ASTM C150 which covers shop applied lining and coating, per main line pipe materials.

3. Ends of lining shall be left square and the lining holdback shall be as specified for the particular type of joint.

c. Concrete Admixture

Accelerating water-reducing admixtures or any other type of admixture that contains chlorides or other corrosive elements shall not be used in any concrete. To prevent segregation and improve workability, or to cause an increase in strength, a reduction in mixing water will be permitted when approved in writing by the District's Representative. Only admixtures which reduce shrinkage by at least 10 percent and are not lignin will be permitted. Admixtures will not be permitted in a concrete mixture placed contiguous to steel water line piping and appurtenances.

1. Air-Entraining Admixture: Concrete may contain an air-entraining admixture which shall conform to ASTM C260, except it shall be nontoxic after 30 days and shall contain no chlorides. Admixture shall be Sika Flex or equal.

2. Water-Reducing Admixture: Concrete may contain a water-reducing admixture which shall conform to ASTM C494, Type A or Type D, except it shall contain no chlorides, shall be nontoxic after 30 days, and shall be compatible with the air-

entraining admixture. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations. Admixture shall be Sika Flex or equal.

d. Reinforcing Steel
Where specified, reinforcing bars shall be deformed billet-steel bars for concrete reinforcement Grade #60, ASTM A615 unless otherwise noted.

e. Embedment
The contractor shall furnish all embedment required for proper installation of accessories or equipment specified elsewhere or shown on the drawings.

f. Forms
Forms for exposed interior and exterior concrete shall be plastic coated, edge-sealed plywood. All sharp edges shall be chamfered with 3/4-inch by 3/4-inch triangular fillets.

g. Curing compound
Curing compound shall conform to ASTM C309, Type 2, Class B, and shall be compatible with required finishes and coatings.

h. Cement
Cement shall conform to ASTM C150, Type II or Type V. The content of tricalcium aluminate shall not exceed 6% and the content of alkalies shall not exceed 0.6%.

i. Aggregates
Aggregates shall comply with ASTM C33 and shall be free from any substances that will react with the cement alkalies.

j. Water and Ice
Water and ice that is clean and free from objectionable quantities of organic matter, alkali, salts, and any other impurities which might reduce the strength, durability, and quality of the concrete shall be used in the concrete mix.

k. Color Additive
For exterior electrical duct concrete encasements or buried conduit, a color additive shall be used for identification purposes: Color additive shall be red. Scofield Company, Los Angeles, California or equal. The color additive shall be added while the concrete is being mixed using the quantity per cubic yard of concrete recommended by the manufacturer for the class of concrete indicated.

l. Non-shrink Grout
Non-shrink grout shall conform to the latest edition of the Greenbook and ASTM C1107. For any non-shrink grout in contact with potable or recycled water, the product shall meet ANSI/NSF 61 requirements. Use a non gas-liberating type, cement base, premixed product requiring only the addition of water for the required consistency. All components shall be inorganic.

m. Ordinary Type Grout (Dry-Pack)
Ordinary type grout shall consist of one part portland cement to two parts sand (100 percent passing a No. 8 sieve). Sufficient water shall be added to produce damp formable consistency.

n. Epoxy Bonding Compound
Epoxy bonding compound shall be in accordance with NSF 61. Manufacturer's certifications as to suitability of product to meet job requirements with regard to surface, pot life, set time, vertical or horizontal application, and forming restrictions shall be provided. Bonding compound shall be Concresive 1001 LPL as manufactured by Adhesive Engineering Company, San Carlos, California, or Sikadur Hi-Mod (Sikastix 370) as manufactured by Sika Chemical Corporation or equal.

o. Concrete Mix Design
1. General: Concrete mix design shall conform to ASTM C94 and ACI 318, except as modified by these specifications.

2. Fly Ash: Fly ash shall not be used in the mix as a partial substitute for cement.

3. Air Content: Air content as determined by ASTM C231 shall be 4 percent ±1 percent.

4. Water-Cement Ratio: Maximum water-cement ratio for Class A concrete shall not exceed 0.44 by weight.

5. Classes: Classes of concrete shall be used as described in the following table:

Class	Type of Work	28-Day Compressive Strength (psi)	Minimum Cement Content (lbs per CY)
A	All curbing, sidewalks, manhole bases, thrust blocks, and structures unless specified elsewhere.	3,250	560 = 6 sack
B	Where shown on plans or District Standard drawings	2,500	470 = 5 sack
C	Fill for structure foundations, cradles, supports across pipe trenches, anchors and miscellaneous unreinforced concrete	2,000	376 = 4 sack

6. Slump: Slump shall be measured in accordance with ASTM C 143. Slump shall be as follows:

   Slab on grade or heavy sections..... 3 inches maximum
   wider (in plan view) than 3 feet

   Footings, walls, suspended ..... 4 inches maximum
   slabs, beams, and columns

   Concrete shall be proportioned and produced to have a maximum slump as shown. A tolerance of up to 1-inch above the indicated minimum and 3-inch indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used if approved by the District Representative provided it is properly placed and consolidated.

7. Aggregate Size: Aggregate size shall be 1-inch maximum for slabs and sections 8 inches thick and less. Aggregate size shall be 1 1/2-inch maximum for all larger slabs and sections. Combined aggregate grading shall be as shown in the following table:

Maximum Aggregate Size Percentage Passing by Weight		
Sieve Sizes	1 1/2-inch	1-inch
2”	100	---
1 1/2"	90-100	100
1”	50-86	95-100
3/4"	45-75	77-93
3/8”	38-55	50-70
No. 4	30-45	39-51
No. 8	23-38	31-41
No. 16	17-33	22-32
No. 30	10-22	12-22
No. 50	4-10	3-15
No. 100	1-3	0-5
No. 200	0-2	0-2

8. Pumped Concrete Design Mix: Mix design for pumped concrete shall produce a plastic and workable mix. The percentage of sand in the mix shall be based on the void volume of the coarse aggregate.

p. Workability

1. General: Concrete shall be of such consistency and composition that it can be worked readily into the forms and around the reinforcement without excessive spading and without permitting the materials to segregate or free water to collect on the surface. The proportions shall be adjusted to secure a plastic, cohesive mixture, and one which is within the specified slump range (1-inch to 3-inch).

2. Aggregate: To avoid unnecessary changes in consistency, aggregate shall be obtained from a source with uniform quality, moisture content, and grading. Materials shall be handled in such a manner that variations in moisture content will not interfere with production of concrete of the specified degree of uniformity and slump.

1.9 PAINTING

a. General

1. This section will only cover the paint materials. "Painting" as it relates to construction is discussed in Section 2.18. The painting materials shall comply with SSPC Painting Manual Vol. 2.

2. All buried metal (except bronze) exterior surface to receive two coats of Sanchem (no-oxide) 15 mil. each or equal.

3. In addition to the Sanchem (no-oxide) or equal coating, encapsulate all exposed metal exterior surfaces including nuts and bolts with a 10-millimeter layer of plastic film wrap or as approved by the District.

4. The interior of valves, with the exception of bronze and working parts (see exceptions below), shall be coated with 100 percent solids, catalytically setting epoxy which is manufactured for use in the interior of potable water systems. The fusion method of coating 100 percent solid epoxy is acceptable. The two components shall be of different colors to aid in complete mixing. The epoxy lining shall be factory applied and field applications will not be allowed.

b. Coating Material Requirements for potable water facilities

1. All coating shall be two-part epoxy and NSF 61 approved for potable water or as approved by the District.

Item	Finish Coat
Line Valve Stack Cover	Sherwin Williams (Pallet Tan)
Closed Valve Stack Cover (Zone Valve)	Sherwin Williams (Pallet Tan)
Fire Hydrant Valves Stack Cover and Fire Hydrant Body	Sherwin Williams (Safety Yellow)
Blow-Off Valve Stack Cover	Sherwin Williams (Pallet Tan)
By-Pass Valve Stack Cover	Sherwin Williams (Pallet Tan)
Detector Check Meter Piping and Valves	Sherwin Williams (Pallet Tan)
Master Meter Piping and Valves	Sherwin Williams (Pallet Tan)
Retaining Wall	Color to be approved by District
Galvanized Steel Valve Covers	Sherwin Williams (Safety Yellow)
Guard Post	Sherwin Williams (Safety Yellow)
Protection Fence Assembly	Sherwin Williams (Green)

Item	Finish Coat
(Creek Crossing)	
Bottom and Top of Lid(s)	Tnemec Series 10 modified(Olive Green)
Ladder	Tnemec Service 10 modified (Medium Yellow)
Bolts and Studs	Sanchem (No-oxide)

c. Plastic Film Wrap

1. All bolts shall be completed coated with Sanchem (no-oxide) prior to wrapping all buried valves, bolted flanges, cast iron, steel, and miscellaneous metal. The polyethylene film shall be as produced from DuPont resin or equal and shall meet the requirements of ASTM Designation D 1248 for Type 1, Class A, Grade E-1.

2. The polyethylene film shall be 10 millimeters in thickness. The length shall be sufficient to firmly attach the film to the pipe on either side of the valve, flange or fitting.

3. For pipe tube, tubular material may be purchased and cut with one side to fold out to the required width.

4. Adhesive tape for securing the polyethylene wrap shall be 10 mil. Two-inch-wide adhesive tape Polyken No. 900 (Polyethylene) or equal).

1.10 SERVICE LINE MATERIALS AND FITTINGS

a. General

The materials covered in this section include the service saddle, service line pipe, corporation stop, and angle meter stop inside the meter box. Where specific manufacturers' products are listed, it should be understood that other products which are equivalent may be used if approved in writing. The minimum service line size installed is one-inch diameter.

Water meter types and manufacturers will be selected by the District. A temporary spacer of PVC schedule 80 shall be installed by the contractor, pending installation of the meter by the District crews.

1. Copper Pipe. Copper pipe material shall be used for all service lines from one-inch through two-inches. The pipe shall be Type K soft copper tubing. Solder fittings shall be soldered with solder containing no lead; instead, it shall be a blend of copper, phosphorous, and silver. Service lines are to receive backfill of imported sand within the pipe zone in accordance with Standard Drawing W-101.

2. Service Saddles. Service saddle bodies shall be manufactured of brass, stainless steel, or nylon-coated malleable iron. These shall be of the double strap type made of bronze with bronze nuts. The thread shall be female iron pipe thread. The seal with the outer wall of the pipe shall be installed with either a rubber gasket or an O-ring, except for the stainless steel full-circle style repair clamp connection, which shall have a full-circle rubber gasket.

   For asbestos-cement or ductile iron pipe, service saddles shall be double strap type for all pipe sizes. The straps shall be flat and shall be manufactured of 316 stainless steel.

   For PVC C900 pipes, service saddles shall be manufactured of brass and shall be cast in two sections for pipe up to 8-inches in diameter. Service saddles for use on 10-inch and 12-inch diameter pipe shall have a brass top section and flat 316 stainless steel straps on the bottom of the saddle. Each saddle shall accurately fit the contour of the pipe O.D. without causing distortion of the pipe. The sections shall be securely held in place with type 316 stainless steel hex-head screws or bolts. The casting sections shall be tapped to receive the screws or bolts.

   Service Saddle shall be (McDonald 3826 for AC and 3806 for PVC only and 3826 for ACP only) Jones J-979 for AC and J-969 for PVC only and Ford 202B for ACP only.

3. Corporation Stops. These shall be bronze, solid one piece tee-head and stem with dual EPDM O-rings in the stem. Corporation stops shall conform to AWWA C-800 requirements. Lead material will not be allowed. Corporation stops shall be

Ford, Jones, Mueller, McDonald, or equal. Refer to table below for details.

Service Line	Meter Size	Corp Stop Inlet	Corp Stop Outlet
1''	¾''	MIP Thread	Flared Copper Ford pack joint FB 1100-4 NL
1½"	1½"	MIP Thread	FIP Thread FB – 1100 PJ
2''	2''	MIP Thread	FIP Thread
			FB-1100 PJ NL

4. Angle Meter Stops. These shall be bronze and lead shall not be allowed. Angle meter stops shall conform to AWWA C-800 requirements. Refer to the table below. Corporation stops shall be Ford, Jones, Mueller, McDonald, or equal.

Service Line	Meter Size	Angle Meter Stop	Inlet Side	Outlet Side
1"	3/4" x 1"	1"	Flared Copper Ford Pack Joint	Swivel Meter Coupling
1"	1"	1"	Flared Copper Pack Joint	Swivel Meter Coupling
1½"	1½"	1½"	Female Iron Thread ORPJ Pack Joint + Flange	Flanged
2"	2"	2"	Female Iron Thread Pack Joint + Flange	Flanged

5. Meter Spacers. These shall be PVC Schedule 80 pipe. Refer to the table below.

Meter Size	Pressure (psi)	Length of Spacer
3/4"	150	1¼" x 9"
1"	150	1¼" x 10 ¾"
1 ½"	150	1½" x 13"
2"	150	2" x 17"
¾"	250	1¼" x 17"
1"	250	1¼" x 21 ¾"
1 ½"	250	1½" x 47"
2"	250	2" x 50"

6. Custom Hand Valves. These shall be straight bronze ball valves with a customer handle. The outlets are always female iron pipe threads and shall be no lead. All brass that comes in contact with potable water shall conform to AWWA Standard C800 (ASTM B584, UNS C89833). For recycled water connections, valves shall conform to AWWA Standard C800 (ASTM B62 and ASTM B584, UNS C83600, 85-5-5-5). Valves shall be Jones, Ford, McDonald or equal. Refer to the table below for inlet/outlet sizes.

Meter Size	Inlet	Outlet
¾''	1'' Meter Coupling	1 ¼''
1''	1'' Meter Coupling	1 ¼''
1 ½''	Flanged	1 ½''
2''	Flanged	2''

7. Meter Boxes. For 3/4", 1", 1-1/2" and 2" meters, meter boxes shall be polymer concrete with drop in lid. Meter boxes shall be Armorcast Polymer, J&R Polymer or equal, and sizes shall be according to the following:

Meter Size	Meter Box Size
¾'' or 1''	12" wide x 20" long
5/8'', ¾'' or 1'' Regulated	17" wide x 30" long
1 ½'' or 2''	17" wide x 30" long
1 ½'' or 2''Regulated	17" wide x 30" long

Meter boxes shall be furnished and installed as shown in Standard Drawings W-123.

Location of service to be permanently marked on the top of the curb with a medallion, or per District guidance, "W" for water, and "RW" for recycled water.

The District crews will install the meter. A temporary spacer of PVC schedule 80 pipe shall be installed by the contractor pending the installation of the meter.

8. Detector Check Valves. Double detector check valves shall be FEBCO Model 876V for working pressure up to 150 psi and FEBCO Model LF856 for working pressures above 150 psi per Standard Drawing W-109 and W-110.

b. Fire Hydrant Assemblies

1. Shall be wet barrel type meeting AWWA C503, ductile iron, single body. For hydrants used up to 200 psi static working pressure, rated UL250, etc.

2. Fire hydrants at or near street intersections shall be located inside the intersection valving and located at the curb return. Fire hydrants located between intersections must be located on property lines. For typical installation refer to Standard Drawing W-111.

3. Other hydrant requirements include but are not limited to:
   (1) The outlets shall be protected with plastic type caps attached to the hydrant head with a chain.
   (2) Hydrant flanges shall contain eight equally spaced bolt holes for static pressures under 150 psi and 12 equally spaced bolt holes for static pressures greater than 150 psi.
   (3) All hydrants shall be permanently marked with the manufacturer's name and the year of manufacture.
   (4) Hydrant lateral shall be either PVC or steel pipe for working pressure up to 150 psi and steel pipe for working pressure above 150 psi.
   (5) Hydrant valve shall be a six-inch valve flange by MJ on ends for PVC pipe and flange by flange for steel pipe.
   (6) Painting shall be painted per Painting Section 1.9 and Section 2.17 of these Standards and in accordance with AWWA C105.
   (7) Spool shall be used between the bury/elbow and fire hydrant. Spools generally are available in 30", 36", 42" and 48" lengths.
   (8) Hydrant burys for PVC pipe shall be a six-inch inside diameter and made of cast iron conforming to ASTM A-126. The burys shall be one piece with the top having a flange drilled with holes to receive the extension spool or hydrant. The bottom shall have a 90˚ bend end for meeting the horizontal pipe. In the event the hydrant lateral is PVC then the bury end shall be a push on joint fitting. Burys are generally available in 30", 36", 42" and 48" lengths.

(9) Alloy steel break-off (shear) bolts shall be used to attach the fire hydrant to the extension spool. Buried bolts and nuts shall be stainless steel type 316.

(10) Separate lines used only for fire hydrants shall be a minimum of six inches in diameter. Actual size to be determined by the District representative.

(11) Fire hydrant assemblies for working pressures up to 150 psi shall be 250 psi rating, unibody Jones or equal. Fire hydrant assemblies exceeding a working pressure of 150 psi shall be 350 psi rating, unibody Jones or equal with red plastic cap.

c. Combination Air Release Assemblies

1. The combination air release assembly has the features of an air release valve and an air and vacuum valve. Both units shall be housed in a cast iron body and all internal parts such as the float, bushings, level pins, seat, and baffle shall be either stainless steel or brass as furnished by the manufacturer. All assemblies shall be rated to sufficient working pressure based on the static pressure of the main line.

2. Air and vacuum valves are to be connected to the high point of the main lines. Air and vacuum valves at or near street intersections must be located inside the intersection valving where practical and located at the beginning or end of curb return. Air and vacuum valves located between intersections must be located on property lines. For typical installation refer to combination air release assembly Standard Drawing W-114.

3. Approved Air and Vacuum assemblies are as follows:

VENT-O-MAT Stainless Steel	
Size	Valve No.
1” & 2” flanged	RBX-2521 363psi RBX-4021 580psi ARI D-040-C 250psi
3” & 4” flanged	RBX-1931 276 psi RBX-2531 276 psi

d. Blow-Off Assemblies

1. Blow-offs shall be wet barrel-type meeting AWWA C503 and have a four-inch flanged inlet. Blow-offs shall have one 22-inch valved outlet with National Standard fire hose threads. For typical installation refer to Standard Drawing W-115.

2. Other specific requirements are:

(1) The outlet shall be protected with a plastic cap attached to the hydrant head with a chain.

(2) All angle fire hydrant valves shall be permanently marked with the manufacturer's name and the year of manufacturer.
(3) Mains to Blow-offs: Separate lines used only for blow-offs shall be a minimum for four inches in diameter. Actual size to be determined by the District Representative.
(4) Blow-off Valve: Shall be a four-inch flange or as otherwise approved by the District

1.11 SEWER MANHOLES AND MANHOLE COVER

a. General Requirements

Manhole frames and covers shall be made of ductile iron conforming to ASTM A536, Class 400, or cast iron conforming to ASTM A48, Class 30 minimum. Casting shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Frames and covers shall be of the traffic type, designed for H-20 loading.

b. Fit and Matchmarking

Each manhole cover shall be ground or otherwise finished so that it will fit in its frame without rocking. Manhole covers shall include hinges and be self-locking. Frames and covers shall be matchmarked in sets before shipping to the site.

c. Cover Inscription

Covers shall have the words "LVMWD" and "SEWER" cast thereon as shown in Standard Drawing S-103. No other lettering on the top side shall be permitted.

d. Cast letters

Cast letters shall be 3-inches and the relief depth shall be at least 3/16-inch. Top surface of the letters and diamond tread pattern shall be flush with the outer ring edge and the frame top surfaces.

e. Inspection and Coating

Before leaving the foundry, castings shall be cleaned and subjected to a hammer inspection. Castings shall then be dipped twice in a preparation of asphalt and oil applied at a temperature of not less than 290°F, not more than 310°F, and in such a manner as to form a firm and tenacious coating.

f. Manufacturers

Manhole frames and covers shall be manufactured by Alhambra Foundry, National Casting, Neenah Foundry, or South Bay Foundry.

g. Manhole Liners

Concrete manholes shall be lined with 100% solid polyurethane lining. Total dry fill thickness shall not be less than 125 mils.

2.0 CONSTRUCTION

2.1 GENERAL REQUIREMENTS

This section describes the use of materials and workmanship to be employed in construction of the water system. The Engineer shall prepare such general and special specifications as are necessary to define the nature and location of the work, contractual arrangements, payment for work, and any other matters concerning the Owner or his Contractor; these items are not discussed within the standards presented here.

In accordance with the provisions of California Business and Professions Code Section 7059, the District requires that (a) Contractor be licensed in the State of California (b) possess the following classification: Class A or C-34 license.

a. Use of This Section

1. The construction section is intended to highlight the features of construction which are deemed to be most significant. In any construction activity, the recommendations of the manufacturer of a product, especially where more stringent, should apply. Construction to be per District's Standard Plans and Specifications.

2. There are a number of construction activities which pertain to all pipe types and these will be presented first. Specialized activities unique to a particular pipe type will be covered thereafter.

3. Specific references which are incorporated into this section include:
   (1) AWWA C206 "Field Welding of Steel Pipes."
   (2) AWWA C900-16 "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings 4 in. Through 60 in. (100 mm Through 1,500 mm)"
   (3) AWWA Manual M11 "Steel Pipe - Design and Installation."
   (4) AWWA Manual M23 "PVC Pipe - Design and Installation."
   (5) AWWA Manual M17 "Installation, Operation and Maintenance of Fire Hydrants."

4. Section 1 of these Standards contains material descriptions. The Engineer/Contractor should use that section along with this section and the respective Standard Drawings as a reference.

b. Protection/Operation of Existing Water System

1. A primary concern of the District is the protection and operation of the existing water system. No Developer or Contractor will be allowed to operate any existing water valves or to cause a shutdown of any portion of the District's water system without prior approval from District.

2. Any operation of valves in a planned shutdown shall be done by the District. Any planned shutdown shall have two weeks' notice prior to shut down. Contractor must have all parts on site prior to the notice of shutdown. Shutdowns will only be allowed if no other reasonable alternative exists, such as the use of a hot-tap connection in lieu of a cut-in tee. When shutdowns are required in a part of the District system, the District will evaluate whether the shutdown should be done during the day or during the night. Any shutdown shall involve a thorough notification plan for existing customers as well as the provision of bottled water, water tanks, etc. where appropriate at no expense to the District.

c. Quality of Materials
    1. Materials and equipment to be incorporated into the work shall be new and unused unless otherwise approved. In case a reference is not clear as to which of several available grades is desired, the highest quality material shall be used.

    2. The Contractor's attention is called to the time required for obtaining certain materials and equipment to be furnished. It shall be the responsibility of the contractor to promptly place orders for items of extended delivery times.

d. Construction of Water, Sewer, and Recycled Water
    1. All water used for construction shall be metered. Recycled water shall be used when available for compaction.

    2. The Contractor shall sign up at the District's headquarters office for one or more construction meters. After receipt of a deposit amount, the District will install the meter at the fire hydrant selected by the Contractor. Upon request, the District will move the hydrant meter to another location. The Contractor is not to move the construction meter(s). Charges for construction water are covered by District's Administrative Code. The contractor is put on notice that unpaid invoices will result in removal of the construction meter.

e. Substitutions
    Where articles or materials are specified by brand or trade name, alternate materials or articles equal to those specified may be approved provided the request for approval is in writing accompanied by supporting data and received in ample time to permit investigations without delaying the work. Unless substitutions have received prior approval, no deviation from the Standards will be allowed.

f. Quality of Workmanship
    All work will be done by persons experienced in the specific work, under competent supervision and in a workman like manner to the District's complete satisfaction.

g. Supervision and Superintendence

1. The Contractor shall designate and furnish a competent superintendent, who shall not be replaced without written notice to the District's Representative, at all times during its progress. The superintendent will be the contractor's representative at the site and shall have authority to act on behalf of the contractor. All communications given to the superintendent shall be as binding as if given to the contractor. During periods when the work is suspended, the contractor shall make appropriate arrangements for any emergency work which may be required.

2. In the case of the designated superintendent's absence, the District's Representative may relay information to the foreman or another worker in charge. Information so given shall be as binding as if given to the superintendent.

h. Defective Work

Any defective materials or workmanship which shall become evident within one year after acceptance of completed work shall be replaced or repaired without cost to the District. The District has the right to bring legal action to correct the deficiencies as well as to withhold exoneration of performance bonds.

i. District Inspection, Field Acceptance, and Guarantee Period

1. Whether expressly indicated on the drawings or not, all contractors shall call the Underground Service Alert prior to any excavation. Failure to do so shall not relieve the contractor of any liability associated with disturbance/breakage of existing utilities. The District will inspect all pipe installation including appurtenant structures, trench backfill within the pipe zone. It will be the contractor's responsibility to provide a five (5) working day notice to the District Representative prior to the start of any work. Such notification will allow for scheduling a preconstruction meeting between interested parties. Failure to provide proper notification may delay the starting date since the District Representative may not be able to inspect the work and cannot accept any work for which inspection has not been arranged.

2. The District's Representative shall at all times have access to the work to inspect the progress, workmanship and materials used in the work.

3. Whenever the Contractor varies the daily working hours, they shall give timely notice to the District's Representative so that the representative may be present to observe the work in progress. If the Contractor fails to give such timely notice, any work done in the absence of the District's Representative will be subject to rejection.

4. The Contractor shall give timely notice to the District's Representative in advance of backfilling or otherwise covering any part of the work so that the District's Representative may observe such part of the work before it is concealed.

5. The observation, if any, by the District's Representative of the work shall not relieve the contractor of any of his obligations; **the primary responsibility for compliance with all District requirements and standards rests with the Developer and/or Contractor.**

6. Defective work shall be corrected by the Contractor. Materials and equipment furnished and work performed which is not in accordance with the contract documents may be rejected. Correction of defective work and work not in conformance with the contract documents shall be made at no cost to the District.

7. Field acceptance is made by the inspector and will not coincide with the date of the District Board of Director's acceptance of the work. However, the one- year guarantee period for all work shall begin as of District Board of Director's acceptance. As previously mentioned in this section, any defective work discovered during this period shall be repaired or replaced. A new one-year period will begin for that corrected work.

j. Public Relations

1. The contractor shall conduct its affairs in a manner which will lessen the disturbance to residents in the vicinity of the work. In this regard, formal working period shall be 7:30 A.M. to 5:00 P.M., Monday through Thursday and Friday from 8:00 A.M. to 4:30 P.M., excluding holidays. (For updated schedule of holidays contact the District's inspector.) Inspections requested by or made necessary as a result of the actions of the contractor outside the normal working period or on Saturdays, Sundays or holidays must be scheduled and approved by the District. All costs for the required inspections outside the normal working period shall be the responsibility of the contractor with payment agreed to by the contractor in advance of the inspection at the rate established by the District.

2. The contractor shall provide a minimum 48-hour written advance notice to the District's Representative and inspector for all work anticipated outside the normal working period with payment agreed to by the contractor in advance.

3. These Standards utilize the term "due notice." The term "due notice" is hereby defined to be 24 hours.

k. Sanitation

The contractor shall provide and maintain enclosed toilets for the use of employees engaged in the work. These accommodations shall be maintained in a neat and sanitary condition.

l. Cleanup and Dust Control

1. Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the work site clean and free from rubbish and debris. The Contractor shall also abate dust nuisance by cleaning, sweeping and sprinkling with water, or other means as necessary. The use of water resulting in mud on public streets or District grounds will not be permitted as a substitute for sweeping or other methods. Clean up and dust control shall be done at no extra expense to the District and shall be accounted for within applicable bid schedule items in the Contractor's bid.

2. Materials and equipment shall be removed from the site as soon as they are no longer necessary; and upon completion of the work and before final inspection, the entire work site shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory, clean, and neat appearance.

3. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately, and the area cleaned.

m. Observation of Work by Public Agencies

The Contractor shall be responsible for procuring, scheduling and coordinating all observations/inspections by Public Agencies as required by their respective permits and governing codes. The District's Representative shall be notified in writing, 48 hours in advance, of such scheduled inspection, and shall have the opportunity to be present during the inspection.

n. Safety

1. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the work, and the contractor shall fully comply with all state, federal and other laws, rules regulations and orders relating to safety of the public and workers.

2. The right of the Engineer/Architect or the District's Representative to conduct construction review or observation of the Contractors performance will not include review or observation of the adequacy of the contractors safety measures in, on or near the construction site. Safety is the sole responsibility of the Contractor.

o. Traffic Control Devices and Signs

1. Where construction will be within the rights-of-way of the California Department of Transportation, Los Angeles County and the respective cities within the District, construction shall be in accordance with requirements and provisions of the permits issued by those agencies. Such requirements and provisions, where

applicable, shall take precedence and supersede the provisions of these Specifications.

2. Construction signing, striping, barricades, and other traffic control devices used for handling traffic and public convenience shall conform to the latest edition of the State of California, Department of Transportation, "Manual of Traffic Controls for Construction and Maintenance Work Zones" at no expense to the District. Signs shall be illuminated or reflectorized when they are used during hours of darkness. Provide cones, pylons, barricades, or posts used in the diversion of traffic with flashers or other illumination if in place during hours of darkness at no expense to the District.

3. Maintain a 24-hour emergency service to remove, install, relocate, and maintain warning devices. Furnish to the authority having jurisdiction the names and telephone numbers of three persons responsible for the emergency service. In the event these persons do not promptly respond or the authority having jurisdiction deems it necessary to call out other forces to accomplish emergency service, the contractor will be held responsible for the cost of such emergency service.

2.2 PERMITS

The following may be required of the contract:

a. Encroachment

Where construction will be within the rights-of way of the California Department of Transportation, Los Angeles County, and the respective cities within the District, encroachment shall be in accordance with requirements and provisions of the permits issued by those agencies. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these Specifications.

b. Other Permits

Unless otherwise noted by the District or the District Representative, the developer and/or contractor shall be responsible for obtaining required permits by agencies having jurisdiction for the project. The developer and/or contractor shall comply with all requirements within the permits.

2.3 EASEMENTS

1. It is the District's intent that all water and sewer facilities will be located within the dedicated public street right of way, unless specifically approved by the District for construction within easements.
2. A Detector Check will be installed on a private property within dedicated easements to the District.
3. The District shall have all-weather drivable access to perform inspections, operation and maintenance, rehabilitate, repair, and reconstruct its facilities.
4. The Grantor shall not allow any obstruction which may impede or interfere with the District's use of or access to said easement.
5. No buildings, structures, walls, fences, or trees, including the extents of a tree drip line, shall be placed upon, over or under said parcel of land within the easement for the duration of the easement. No exceptions shall be made unless details are provided on approved improvement plans that have been reviewed and approved by the District
   (1) The only exceptions that the District will consider include improvements used for street, road or driveway purposes, trail, path parking lot, non-vehicular public access, or shallow root landscaping purposes and for other utilities, so long as such use does not interfere with the District's use of and access to the easement for the purposes for which it is granted. Any proposed exceptions shall be shown on improvement plans and submitted to the District for review and approval.
6. The District shall not be liable for any damage to any of the Grantors(s) improvements placed upon said parcel due to the District's operations using reasonable care.
7. Should any of the District facilities within said easement be required to be relocated or repaired as a result of changes in grade or other construction within the easement, the Grantor's or its successors and assigns shall bear the full cost of such relocation

or repair, unless changes in grade or other construction are done with the prior written consent of the District.

8. The District shall have the right, but not the obligation to cut, trim, remove trees, brush, and/or remove other unauthorized obstructions which may impede or interfere with the District's use.
9. The District accepts no responsibility for or liability to Grantor or any other party for any damages arising out of the installation, use, maintenance, ownership or operation of other utilities or any other improvements within District's easement and right of way.
10. All provisions of an easement, including the benefits and burdens, run with the land, and are binding upon and inure to the Grantor(s), District, and their heirs, assigns, successors, tenants, and personal representatives.
11. The Signatory for Grantor(s) shall warrant that it has the legal authority to bind the party hereto and Grantor(s) warrant that it may legally grant the rights described herein.
12. Easement widths provided for distribution mains shall be based on the existing conditions and are subject to approval by the District. The minimum easement width for a distribution main is 10 feet. The normal location of the distribution main shall be in the center of the easement.

a. Approvals
   All approvals must be obtained from local agencies prior to mobilizing/beginning of work, e.g.: approved traffic control permit.

2.4 UTILITIES AND EXISTING FACILITIES

a. Utilities and Exiting Facilities

1. Whether expressly indicated on the drawings or not, all contractors shall call the Underground Service Alert (811) prior to any construction of pipelines. Failure to do so shall not relieve the contractor of any liability associated with disturbance/breakage of existing utilities.

2. In case it shall be necessary to remove and or relocate any such utilities, facilities or any portions thereof, the contractor shall notify the District and authorized agent of the owner of the utility and/or facility so affected. The contractor shall not interfere with said utility and/or facility structures until disposition of the obstruction to the work has been determined and/or notice to relocate or remove has been given by the District and/or authorized agent of the owner of the utility and/or facility so affected.

3. Any existing utility or facility, shown or not shown on the drawings, inadvertently damaged during excavation shall be repaired by the contractor at no expense to the District.

4. It shall be the contractor's responsibility to ascertain, prior to commencing work, the existence of any underground utilities or facilities which may be subject to damage by reason of his operations.

b. Separation Requirements

1. Separation requirements must abide by California Waterworks Standards (California Code of Regulations (CCR), Title 22, Division 4, Chapter 16, Section 64572).

2. In instances where certain conditions may call for the installation of pipelines with less separation distance, the contractor must discuss options with the District and the Owner of the existing utility. An alternate pursuant to CCR, Title 22 Section 64551.100 can be proposed with District and existing utility Owner approval.

2.5 EARTHWORK

a. General

1. Earthwork defined. Earthwork shall include all necessary clearing, grubbing, grading, excavation, backfilling, compaction, and cleaning up debris.

2. Other items relating to Earthwork. Included is controlling water, bracing excavations, stabilizing subgrade, protecting existing structures and facilities, and such supplementary operations as are necessary to properly complete the entire work indicated or specified.

3. Easements. Within water pipeline easements or rights-of-way, trees, shrubs, fences, and all other improvements that have to be removed to allow construction and which are intended for replacement shall be replaced in kind or size or with approved substitutes unless permission to exclude such replacement is obtained from the owner/agency or granted by the District.

4. Safety Precautions. All excavations shall be performed, protected and supported as required for safety and in the manner set forth in accordance to the latest rules, orders and regulations prescribed by the State of California Department of Industrial Relations, Division of Industrial Safety "Construction Safety Orders."

   Shoring plans must be prepared and stamped by a registered Civil Engineer, whose license is currently in effect.

5. Obstructions. The Contractor's attention is directed to the possible existence of pipe and other underground improvements which may or may not be shown on the Plans. The Contractor shall preserve and protect any such improvements whether shown on the Plans or not. Where it is necessary to remove and replace or to relocate such improvements in order to prosecute the work, they shall be removed, maintained and permanently replaced by the Contractor with appropriate approval.

6. Oak Tree Ordinance. The developer and/or contractor must be aware of local oak tree ordinance which govern the protection, trimming and removal of oak trees, as well as the limits of construction around the oak trees. It is the responsibility of the contractor to coordinate and obtain proper approvals from all relevant agencies regarding oak trees and their protection. In general, any work under or within the protected zone of an oak tree may be subject to special requirements.

7. Grading and Stockpiling. The contractor shall control grading in a manner to prevent water running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can flow uninterrupted in existing gutters, other surface drains or temporary drains. Material for backfill or for protection of excavation in public roads from surface drainage shall be neatly placed and kept shaped so as to cause the least possible interference with public travel. Free access must be provided to all fire hydrants,

water valves, meters, and private drives.

8. Imported Backfill Material. Whenever the excavated material is not suitable for backfill the contractor shall furnish suitable imported backfill material.

9. Working Area. Except for specified off-site construction, all earthwork shall be confined strictly within site property lines.

10. Compaction Tests. Compaction tests will be made at no cost to the District by an approved laboratory in accordance with ASTM D1557 or better. The number of tests and their location and depth shall be determined by the District's representative. The contractor shall make all necessary excavations for compaction tests as directed by the District's representative and shall refill and re-compact these excavations to the densities as specified herein.

11. Relative Compaction. A percentage of the maximum density at optimum moisture content is determined by AASHTO Test No. T180-57 Modified. Unless otherwise specified, the relative compaction for earthwork in open fields shall be 90%. In populated areas and in public and private roads and driveways the relative compaction shall be minimum 90%.

12. Dewatering. The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavation or other parts of the work.

    To ensure a firm, unyielding excavation and preservation of the final line and grade of the bottom of excavation, dewatering shall be continuous until such times as water can be allowed to rise.

    The Contractor shall dispose of the water from the work in a suitable manner without damage to adjacent property. No water shall be drained into work built or under construction without prior consent of the District's Representative. Water shall be disposed in such a manner as not to be a menace to public health and shall comply NPDES requirements.

13. Correction of Faulty Grades. Where excavation is inadvertently carried below subgrade and/or foundation elevations, it shall be rectified by backfilling with approved sand, compacted to structural standards and/or one sack slurry as directed by the District's Representative, all at the expense of the contractor.

14. Clearing & Grubbing. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish, and other unsuitable material within the area of the work shall be stripped or otherwise removed prior to starting excavation and backfill.

15. Final Clean-up. After backfill has been completed, the site shall be cleaned and left in a neat and presentable condition, free of all cleared vegetation, rubbish and other construction wastes.

16. Seeding. The Contractor is required to scarify and seed the ground at locations along the pipeline where the native vegetation has been destroyed by construction operations and at other areas where seeding is determined to be necessary by the District's Representative. The areas shall be seeded with a District approved mixture.

17. Removal and Disposal of Material. All brush, stumps, roots, vegetation, debris and pavement shall be removed from the site and disposed of in a manner acceptable to agencies having jurisdiction over the work, the soils consultant, and the District.

    After approval by the District, recycled water shall be disposed of into the sewage collection system. Unless noted otherwise in the Contract Documents, or directed by the District Representative, chlorinated water from potable or untreated water pipelines shall be disposed of into the sewage collection system. Prevent the disposal of any rinsed or washed waters or materials on impervious or pervious site surfaces into the storm drain system. The District must be notified and approve any discharge.

    If hazardous substances or petroleum products are encountered, the Contractor shall immediately notify the District for proper disposal method.

2.6 EXCAVATION AND TRENCHING

a. Safety Precautions

All excavations shall be performed, protected and supported as required for safety and in the manner set forth in accordance to the latest rules, orders and regulations prescribed by the State of California Department of Industrial Relations, Division of Industrial Safety "Construction Safety Orders." Shoring plans must be prepared and stamped by a registered Civil Engineer, whose license is currently in effect.

b. Alignment and Grades

1. Trench depth shall be adequate to accommodate the pipe and its foundation at the profile shown on the Plans. In the absence of such profile grade, the top of pipe grade shall be located three (3) feet below the existing street grade or existing ground for potable, three and half (3.5) feet for recycled water and seven (7) feet for sewer pipelines. The measurement of the depth shall be at the trench centerline.

2. When the natural ground adjacent to the accepted pipeline trench extent has been over excavated and/or the pipeline is to be placed in new excavation, excavation material shall be placed and compacted to an elevation of not less than three feet above the top of pipe prior to trench excavation.

c. Foundation in Poor Soil

1. Where rock excavation is required, the rock shall be excavated to a minimum over depth of six (6) inches below the trench depths indicated on the drawings or specified. Over depths in the rock excavation and unauthorized overdepths shall be backfilled with the same material as the bedding zone. Whenever wet or otherwise unstable soil incapable of properly supporting the pipe as determined by the District's inspector is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with an appropriate material between a course sand and a crushed rock to provide a stable foundation.

2. The necessity of replacing unsuitable material at depths of more than two (2) feet below bottom of pipe grade will be determined by the District's Representative. If the necessity for such additional removal and replacement has been occasioned by an act or failure to act on the part of the contractor, it shall be rectified by backfilling with approved sand, compacted to structural standards, and/or one sack slurry as directed by the District's Representative.

d. Trench Width

1. The width of the trench within the pipe zone shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed the amount detailed in the Standard Drawing W-101 or S-101. In general, the following shall be adhered to:

Nominal Diameter (Inches)	Trench Width	
	Minimum	Maximum
6-12	O.D. + 6”	O.D. + 9”
14-30	O.D. + 9”	O.D. + 12”

2. Trench widths in excess of those shown may be as wide as necessary if for the explicit purpose of installing sheeting and bracing in the performance of the work.

e. Pipe Subgrade
   1. The trench bottom shall have a flat or semi-circular cross section. The bottom of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of each joint except for required "bell holes" at joints.

   2. Foundations in poor soil where rock and soft spongy and deleterious material exists, the unfavorable material shall be removed.

f. Over Excavation
   Over depth excavations shall be corrected by backfilling with crushed rock or concrete as directed by the District Representative. No native earth backfill will be permitted to correct over depth excavation beneath structures.

g. Jacking and Tunneling
   1. All jacking and tunneling shall be in accordance with OSHA mines and safety rules, and all applicable local, state, and federal requirements.

h. Horizontal Directional Drilling
   1. All horizontal directional drilling shall be in accordance with OSHA mines and safety rules, and all applicable local, state, and federal requirements. Caltrans Guidelines and Specifications for Trenchless Technology Projects?

2.7 PIPE BEDDING AND LAYING

a. General

1. This portion of the work includes the furnishing of all materials and their proper assembly to result in a first-class pipeline installation true to line and grade and free from leaks, cracks and obstructions.

2. Do not lay pipe without giving the District's Representative due notice to inspect the bedding.

3. All pipe 24 inches or greater in diameter shall be braced and stulled to prevent damage during shipment. Any damaged pipe or fittings delivered and unloaded at trench side shall be removed by the contractor from the work site.

4. With steel Mortar Lining and Coating (CMLC) and DI Pipe, the off-loading of the pipe as well as placement in the trench shall be handled with straps. Chains or bare cinch or choker type cables shall not be used. The slings shall be sufficient width to prevent damage to the lining or coating. For 20- foot length of pipe or longer, two straps must be used.

5. The Contractor is warned that the approved pipeline design is based upon a proper combination of pipe strength and pipe support. No acceptance will be given unless the work of trenching, bedding, laying, backfilling and compaction is conscientiously done in accordance with the procedures outlined in these Standards.

6. Grades shall be transferred from surveyor's set reference points based on approved construction plan and grade. Each length of pipe shall be laid on bedding as specified and shall have full bearing for its entire length between bell holes excavated in said bedding material to allow for unobstructed assembly of all joints. No wedging or blocking with wood or soil to support the pipe will be permitted. Under no circumstances will a contractor be allowed to dump backfill materials on top of a pipe which is not continuously supported in its final grade position.

7. Pipe shall not be laid when the District's inspector determines that the condition of the trench is unsuitable. As the work progresses, the interior of the pipeline shall be cleared of all dirt and superfluous materials of every description. Trenches shall be kept free from water until sufficient backfill has been applied to keep the pipe in place. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the District inspector so that no trench water, earth or other substance will enter the pipe or fittings. Pipe or fittings damaged during assembly shall be removed and replaced.

b. Pipe Laying for PVC Pipe C900

1. Because it is a plastic product, the pipe should be covered with an opaque material if it is to be stored outside for a prolonged period of time (45 days). Gasket lubricants shall be non-toxic and water soluble specially prepared for use in potable water

systems.

2. In obtaining a square end cut, a PVC pipe cutter is recommended, but conventional fine-tooth hand or power saws may be used.

3. Field beveling of pipe ends after cutting must be done with special beveling tools or with such items as rasps.

4. The minimum short length of pipe shall be three feet and must meet the requirements of DR18 and DR14. The use of short pieces must be approved by the District representative.

5. Prior to laying pipe, trench grade sheets must be submitted to the District's Representative with identification of horizontal and vertical angles and appurtenances. Stationing and elevation shall be at 25- foot intervals and on all angles and appurtenances. Elevation shall consist of top of pipe and finished surface at these points.

6. Pipe shall not be lowered into the trench until the pipe bedding has been brought to design grade.

7. When pipe laying is not in progress, the open ends of installed pipe shall be closed.

8. The pipe joint shall not be deflected either vertically or horizontally beyond the limits recommended by the manufacturer.

c. Pipe Layout for Curved Alignment

C900 Pipe Diameter (Inches)	Minimum Curve Radius (Feet)
4	100
6	150
8	200
10	250
12	300
14-36	764

Special design required for short curve radius.

1. **Pipe deflection by the use of staking or any mechanical means is not permitted under any circumstances.**

2. To allow for the location of non-metallic pipes, copper wire shall be provided in the pipe zone directly on top of the pipe centerline. Copper wire shall be coated 12 gauge and shall be periodically wrapped or taped to the pipe at intervals of five (5) feet apart

along the barrel by means of short strips of adhesive tape, Polyken No. 900 (polyethylene) or Scotchrap No. 50 (polyvinyl.) Wire shall be continuous between successive valve boxes (including air and vacuum and adjacent valve boxes associated with fire hydrants and blow off assemblies.)

3. The contractor will perform all required tests to assure the continuity of the copper wire.

d. Pipe Laying for Steel Pipe

1. Shop Drawings. Shop drawings of all pipe and fittings shall be submitted to the District's Representative for approval prior to fabrication of the pipe and fittings. Pipe lay sheets shall be included, consisting of drawings of lay, identification of joints, horizontal and vertical angles and appurtenances. Stationing and elevation shall be shown on all joints, angles and appurtenances. Elevation shall consist of top of pipe and finished surface at these points. Fabricated angles shall meet the requirements of AWWA C208. Except for butt strap closures, field fabricated fittings **will not be permitted** unless approved by the District. Format for shop drawings and lay sheets may be obtained from the District representative. Such approval is an additional precaution against errors and is not to be construed as relieving the contractor of the full responsibility for the accuracy of the shop drawings.

2. Trench Grade Sheets. Prior to laying pipe, trench grade sheets must be submitted to the District's Representative with identification of horizontal and vertical angles and appurtenances. Stationing and elevation shall be shown on all joints, angles and appurtenances. Elevation shall consist of top of pipe and finished surface at these points.

3. Plastic Film Wrap. To protect the pipe from corrosion, cement mortar lined and coated pipe and fittings buried underground shall be protected with a polyethylene encasement wrap per Painting Section 1.9 and Section 2.18 of these Standards. The wrapping shall be applied to the pipe in the field shall follow the steps outlined in Section 2.8f Wrapping Pipe with Polyethylene Encasement.

4. Rubber Ring Joints. Joining the pipe is similar to that for PVC and DI pipe with exceptions noted under field joints (Section 1.3c) and electrically bonded connections.

5. Flanged Joints. All flanges, bolts and nuts (Section 1.4) must be covered with Sanchem (no-oxide) and the outside surface shall be protected with a polyethylene encasement furnished and installed per Painting section of these Standards.

6. Flexible Coupling Joints. Joints shall be completed in the trench after the pipe has been laid to the alignment and grade shown on the plans. Each pipe, for a distance of six (6) to eight (8) inches back from the end, shall be thoroughly cleaned to remove oil, dirt, loose scale, rust, and other foreign matter. Flanges, gaskets, and sleeves shall then be assembled on the pipe ends in accordance with the manufacturer's

recommendations. Coupling sleeves shall be accurately centered over the pipe ends and one pipe and shall touch the coupling sleeve centering stop if the coupling sleeve is so equipped. Bolts and nuts must be covered with Sanchem (no-oxide) or equal and the outside surface shall be protected with a polyethylene encasement furnished and installed per Painting Section 1.9 and Section 2.18 of these Standards.

7. Lowering of pipe and accessories into trench. Pipe shall not be lowered into the trench until the pipe bed has been brought to grade. The sealing surfaces of all materials shall be kept clean during installation.

   (1) When pipe laying is not in progress, the open ends of installed pipe shall be closed to prevent entrance of trench water into the line.

   (2) The pipe joint shall not be deflected either vertically or horizontally beyond the limits recommended by the manufacturer.

8. Mortar Lining of the Interior Joints. When the section has been laid in place, the joint shall be finished by pulling a rubber ball or the equivalent through the joint to finish it off smooth with the inside surface of the lining (swabbing.)

   (1) The contractor must obtain a confined space permit prior to mortar lining the interior joints when the pipe is 24-inches or larger.

   (2) No pipe shall be filled with water until at least 24 hours after the joints have been mortared.

9. Welded Joints. Field welding of joints shall be in accordance with AWWA C206.

   (1) No welded joint shall be backfilled until it has been inspected by the District representative. Sufficient trench space shall be left open in the vicinity of each joint to permit visual inspection around the entire joint.

   (2) All welding shall be done by experienced welders qualified in accordance with the standards of the American Welding Society and be certified per ASME Section 9. Welding electrodes shall comply with the requirements of ASTM Specification A233. Welding procedures shall meet qualifications of AWS Standard D10.9 "Qualification of Welding Procedures and Welders for Piping and Tubing."

   (3) Welds shall be applied by means of continuous stringer beads. Each bead shall be thoroughly cleaned and descaled before the succeeding bead is applied. The metal shall be deposited in successive layers and the minimum number of passes or beads in the completed weld shall be as follows:

Steel Cylinder Thickness (Inches)	Fillet Weld (Minimum Number of Passes)
> 3/16''	1
3/16'' and ¼''	2
5/16''	3
3/8''	3

(4) In all welding, undercutting of the base metal adjoining the weld is a defect and shall be repaired. Overlapping or burning back the inside or outside corner during the application of a fillet weld will not be permitted. The finished fillet weld must be free of grooves, deep valleys or ridges and contain no abrupt changes in section at the toe.

(5) Lap or fillet welds shall have legs of equal size except when specified otherwise and they shall have a throat profile that is straight to slightly convex. In no case will a throat with a concave surface be acceptable.

(6) After the joints have been welded, each joint shall be grouted with cement mortar in the same manner as specified for mortar lining of interior joints.

10. Butt Strap Closure Joints. Butt strap closure joints shall be completed in the trench after the pipe has been laid to the alignment and grade shown on the plans.

(1) They shall be field welded to the outside of the pipe along both edges by full circumferential fillet welds. The interior of butt strap joints shall be grouted with cement mortar as specified for mortar lining of interior joints.

(2) For all pipe sizes smaller than OSHA approved confined space entry, a butt strap with integrated handhold shall be provided.

(3) The exterior of butt strap joints shall be wrapped with mesh wire and completely covered with mortar equal to the thickness of the existing coating.

(4) Except for butt strap closures field fabricated fittings and butt joints will not be permitted, unless approved by the District representative.

11. Mortar Coating of Exterior. Grout composed of one part, Type II cement to not more than two parts sand thoroughly mixed with water to the consistency of thick cream. Sand gradation shall conform to the requirements of ASTM C33 except that 100 percent shall pass the No. 16 sieve. The joints shall be coated with cement-mortar,

retained by suitable bands or diapers so as to bridge the joint and retain the grout without leakage. The diaper shall be made of heavy duty sail cloth of sufficiently close weave to prevent cement loss from the mortar. The diapers shall be Mar-Mac fabric diapers or approved equal. The fabric shall be hemmed on each edge and shall contain a metal strap within each hem sufficiently longer than the circumference of the pipe to allow a secure attachment of the diaper to the pipe. The diaper width will depend on pipe size and design and shall be the width recommended by the manufacturer. The grout space, prior to filling, shall be flushed with water so that the surface of the joint to be in contact with the grout will be thoroughly moistened when the grout is poured. The joint shall be filled with grout by pouring from one side only, and shall be rodded with a wire or other flexible rod or vibrated so that the grout completely fills the joint recess by moving down one side of the pipe, around the bottom of the pipe, and up the opposite side. Pouring and rodding the grout shall be continued to allow completion of the filling of the entire joint recess in one operation. Care shall be taken to leave no unfilled space. The exposed portion of the grout at the top of the pipe shall be coated with a sealing compound or covered with burlap or moist earth.

e. Pipe Laying for Ductile Iron Pipe

1. Ductile-iron pipe and ductile iron fittings shall be installed in accordance with the applicable sections of AWWA C600.

2. For restrained joints, deflection of the joint shall not exceed the manufacturer's recommended maximum deflection.

3. The pipe shall be laid true to the line and grade shown on the plans within acceptable tolerances. The tolerance on grade is 1-inch. The tolerance on line is 2-inches.

4. All exposed flanges and other metal surfaces and all damaged coatings shall be coated after assembly per Section 1.9.

5. Unless otherwise specified or shown on the plans, the pipe base and pipe zone (a.k.a., pipe bedding zone) backfill material shall be imported sand of a gradation and composition as specified herein.

f. Pipe Laying for HDPE Pipe

1. Installation procedures shall be in accordance with the pipe manufacturer’s guidelines. Upon commencement of the pipe splitting process, pipe insertion shall be continuous from the insertion pit to the pull pit. Protect the new HDPE pipe from damage during the installation process.

2. Review buried utilities adjacent to the pipe operation, and where necessary, excavate to relieve transient loading during the insertion operation. If any utilities are within 24 inches of the pipe to be split, excavate a pit at the location to check

clearance. If adequate clearance does not exist between the existing waterline and the subject utility, use substitute means to rehabilitate the existing pipeline.

3. For utilities crossing within 6 inches of the existing waterline to be split, excavate and remove soil to relieve loading during the splitting operation.

4. Remove any section of the new HDPE pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than 10% of the wall thickness from the site. However, a defective area of the pipe may be cut out and the joint fused. In addition, discard any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness, or any other defect of manufacturing or handling as determined by the Owner's Representative.

5. Pipe bedding material shall be coarse grained soil, such as gravel or sand, or a coarse-grained soil containing fines, such as a silty sand or clayey sand. The particle size should not exceed one-half inch for 2 to 4-inch pipe, three-quarter inch for 6 to 8-inch pipe and one inch for all other sizes. The embedment should be placed in layers, or lifts, not exceeding 6 inches in thickness, followed by mechanical tamping to a level of at least 85% percent Standard Proctor Density, with a level of 95% under streets and roads (Refer to ASTM D698).

6. Insert the new HDPE pipe immediately behind the splitting head in accordance with the manufacturer's recommended procedures. The insertion tool shall be specifically designed and manufactured for the type of insertion process being used and utilized to guide and assist the splitting head during the operation.

7. After the new polyethylene pipe has been installed and tested, connect each service to the new pipe in accordance with manufacturer's recommendations for sidewall fusion.

2.8 BACKFILL AND COMPACTION FOR PVC, DI, STEEL and HDPE PIPE

a. General

1. Backfill and compaction will be as listed in the Standard Specification for Public Works Construction Latest Edition, by APWA/AGC, the "Green Book unless otherwise noted."

2. Within the rights-of-way of the California Department of Transportation, Los Angeles County, and respective cities within the District, backfill and compaction shall be in accordance with requirements and provisions of the permits issued by those agencies. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of the Specifications.

3. There are several distinct zones to be considered in the backfilling procedure (refer to Standard Drawing W-101.) In all cases, the filling of trenches shall be subject to approval by the District representative and/or City or County Public Works Inspector who shall have full authority to order compaction tests to demonstrate the actual backfill density.

b. Backfilling Pipe Zone

Sand as specified in Earthwork Section 2.5 of these Standards must be used and shall be placed in the pipe zone with particular attention to getting material to the underside of the pipe and fittings to provide a firm support along the full length of the pipe. Care shall be exercised in backfilling to prevent damage to the pipe or coating, as applicable. CLSM shall be used for bedding and backfilling when HDPE pipe is installed in paved areas or where pipe crosses utility easement.

The minimum depth of cover over pipelines, sleeves and conduits shall be as follows:

Pipeline	**Depth of Cover (inch)**
Water Main (10” or smaller)	42”
Water Main (12” or larger)	48”
Recycled Water Main (4” or greater)	60”
Sewer Main (any size)	84”

c. Jetting Method in the Pipe Zone

Jetting with water to consolidate the sand in the pipe zone is acceptable when foundation soil provides adequate drainage and jetting is approved by District representative.

d. Backfilling Above Pipe Zone

1. Testing for pipe and joint leakage will be done after consolidation of the backfill to the top of the base zone and after service lines have been installed to the property lines.

2. Contractor shall assume the responsibility of removal and replacement of backfill necessary for correction of defective conditions revealed by testing at no expense to

the District.

3. In traffic areas within public rights-of-way where pavement is to be replaced, the City or County requirements may call for a cement sand slurry mixture to be used for trench backfill at no expense to the District.

4. Standard Drawings W-101 and S-101 presents the District's trench requirements within the paved right-of-way.

e. Compaction Tests
   1. All required excavations and tests will be performed at no expense to the District.

   2. Tests shall be performed in accordance to ASTM D1557 by an approved geology laboratory.

   3. The contractor shall make all necessary excavations for compaction tests. The number of tests and their location and depth shall be determined by the District's representative and/or a representative of those agencies where construction is within their rights-of-way.

   4. Compaction test results shall be submitted in writing to the District inspector prior to testing for pipe and joint leakage.

f. Wrapping Pipe with Polyethylene Encasement
   All ductile-iron pipe and fittings buried underground shall be protected with a polyethylene encasement wrap in accordance with AWWA C105. Wrap shall be a loose 8-mil thick LLD polyethylene tube or a 4-mil thick HDCL polyethylene tube. All joints between plastic tubes shall be wrapped with 2-inch wide, 10-mil thick, polyethylene adhesive tape, Polyken 900, or Scotchwrap 50. Installation of plastic film shall conform to the following.

   1. Placement of Polyethylene Encasement: Using a sling, the pipe shall be picked up with a crane at the side of the trench and raised about 3 feet off the ground. The polyethylene tube, cut approximately 2 feet longer than the length of pipe, shall be slipped over the spigot end of the pipe and bunched up, accordion fashion, between end of the pipe and the sling.

   2. Placement of Pipe into Trench: The pipe shall be lowered into the trench after the pipe is wrapped. The spigot shall be seated into the bell of the adjacent installed pipe, and the pipe lowered into the trench bottom. A shallow bell hole shall be provided in the trench bottom to facilitate the wrapping of the joint.

   3. Joint Assembly: The pipe joint shall then be made up as described herein.

   4. Adjustment of Polyethylene Encasement: The sling shall be removed from the center of the pipe and hooked into the bell cavity. The bell shall be raised approximately 12 inches and the tube of polyethylene film slipped along the full length of the pipe barrel. Enough of the film shall be left bunched up, accordion

fashion, at each end of the pipe to overlap the adjoining pipe about 1 foot. Care shall be taken to ensure that soil that adheres to the pipe is removed as the 2.7polyethylene film is placed around the pipe.

5. Overlapped Joints: To make the overlapped joint wrap, the film shall be pulled over the bell of the pipe, folded around the adjacent spigot, and wrapped with about three circumferential turns of the plastic adhesive tape in order to seal the tube of film to the pipe. The tube on the adjacent pipe shall be then pulled over the first wrap on the pipe bell and sealed in place behind the bell, using about three circumferential turns of the polyethylene adhesive tape.

6. Attachment of Encasement: The resulting loose wrap on the barrel of the pipe shall be pulled snugly around the barrel of pipe, the excess material folded over the top and the fold held in place by means of short strips of the 2-inch wide, 10-mil thick adhesive tape at intervals 5 feet apart along the pipe barrel.

2.9 THRUST BLOCKS AND ANCHOR BLOCKS

a. General

Do not place concrete without giving the District's Representative 24-hours' notice. Failure to give proper notice will result in removal and replacement of encasement at the contractor's expense.

b. Concrete Thrust, Anchor Blocks

1. Thrust Blocks shall be placed as required and shall consist of Portland cement concrete containing not less than five sacks of cement per cubic yard and shall conform to the applicable provisions of the Standard Specifications for Portland Cement Concrete. Concrete thrust and anchor blocks shall be placed between the undisturbed ground and the fittings to be anchored. The concrete shall be placed so that the pipe joints and fittings will be accessible for repair. All concrete supports shall be allowed to cure for at least five days prior to filling the supported pipe with water or per special design provisions.

2. Quantity of concrete and the area of bearings on the pipe and undisturbed soil shall be as shown on the Plans or per Standard Drawing W-127.

2.10 RESURFACING AND RESTORATION

a. General

1. Resurfacing and restoration will be as listed in the Standard Specifications for Public Works Construction Latest Edition by APWA/AGC, the "Green Book" unless otherwise noted.

2. Within the rights-of-way of the California Department of Transportation, Los Angeles County, and the respective cities within the District, resurfacing and restoration shall be in accordance with requirements and provisions of the permits issued by those agencies. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of the Specifications.

3. Substructures removed or damaged on public or private property shall be restored or replaced unless such structures are designated on plans "to be abandoned." Such structures include but are not limited to trees, bushes, plantings, ground cover, mailboxes, fences and sprinkler systems.

4. Any temporary paving, barricades or special provisions required by public agencies shall be furnished at no expense to the District.

5. Survey Monuments: The casing and cover for survey monuments shall be adjusted to the finish grade in accordance with LVMWD settlement and horizontal monument records.

2.11 HOT TAPPING

a. General

1. No tapping shall be performed on steel pipe where the horizontal or spiral weld of the pipe will be in contact with any part of the nozzle or collar per Standard Drawing G-105.

2. Hot tapping shall only be done in the presence of the District Representative. The tapping mechanism shall be as recommended by the tapping manufacturer.

3. Tapping shall be performed only with use of tap saddles or sleeves.

4. Hot taps on steel mains must use reinforcement collars when the diameter of the pipe is less than 2 of the main pipe diameter. When the branching pipe does exceed 2 of the pipe diameter, a full wrap saddle shall be used.

5. Hot taps of one-inch through two-inch must use a reinforcement collar and a 3,000 pound steel coupling.

2.12 SERVICE CONNECTIONS AND SERVICE LINES

a. General

1. As shown on Standard Drawings, service connections to the main where copper tubing is used for the service line shall be made at 15-inches above horizontal (spring line.)

2. Water service laterals at intersections shall be located outside of the intersection valves whenever possible.

3. Service lines shall be one continuous length "snaked" within the trench to allow for expansion or contraction.

4. Service Taps. In no case shall a service tap be made in a main closer than two feet from a joint or fitting. Service taps shall not be less than three feet apart on PVC main, and no less than 18 inches apart on steel pipe mains. Service taps shall be located opposite the meter locations so that the service laterals will be perpendicular to the water main and street centerline. Service tap locations varying more than five feet from the perpendicular must be approved by the District's representative prior to installation. Unless otherwise noted on the Plans, service taps shall be located so that the water service lateral is parallel to and 10 feet from the sewer lateral serving the same property.

5. Dielectric Connections. Shall be provided where dissimilar metals are joined and shall conform to Standard Drawing W-118.

6. Earthwork. Shall conform to Standard Drawing W-101 and Specification Section 2.5.

2.13 INSTALLATION OF VALVES AND FITTINGS

a. General

1. Valves and fittings shall be installed at the locations and grades shown on the Plans. The following items comprise a partial check list.
   (1) All line valves at intersections shall be located as close as possible to the beginning of curb return and/or end of curb return.
   (2) Water distribution main shall have valves spaced no greater than 1,000 feet apart.
   (3) All valves and appurtenances at depths greater than eight (8) feet require special design and District approval.
   (4) Flanged joints. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Flanges shall be cleaned by wire brushing before installing flanged valves. Flange bolts and nuts shall be cleaned by wire brushing, threads shall be lubricated with anti-seize compound, and nuts shall be tightened uniformly and progressively.
   (5) Buried valves shall be wrapped with two layers of 8-mil polyethylene wrap per AWWA C105.

2.14 INSTALLATION OF FIRE HYDRANT ASSEMBLIES

a. General

Fire hydrant assemblies are to be installed in accordance with the general instructions contained in Standard Drawing W-111.

1. The setback from the curb face must be per Standard Drawing W-111, whether the fire hydrant is on public street or within a private street .

2. Fire hydrants at or near street intersections shall be located inside the intersection valving and located at the beginning of curb return or end of curb return. Fire hydrants located between intersections must be located on property lines.

3. The fire hydrant shall be positioned so that the bolts between the extension piece and the hydrant are accessible, as shown on Standard Drawing.

4. Painting shall be per Painting Section 1.9 and Section 2.18 of these Standards with all metal surfaces above ground being painted.

2.15 INSTALLATION OF METER BOXES

a. General

Standard Drawing No.	Size
W-102 and W-103	¾'' and 1'' meter
W-104 and W-105	1 ½'' and 2'' meter
W-106	3" to 10" meter

The District will select the meter type and install the meter after proper arrangements have been made.

b. Meter Boxes

1. These shall be set as shown in Standard Drawing W-123.

2. Spacers are to be placed within the meter box until the District installs the meter.

3. Care must be taken to avoid placing a strain on the spacer through misalignment of the house or service line.

2.16 INSTALLATION OF SEWER PIPES

Inspect the sewer pipe immediately after the pipe installation. Prior to pipeline CCTV inspection, perform sewer cleaning. Locate and expose sewer lateral connections prior to pipe installation. Reconnections shall be performed immediately after mainline installation.

a. Trench Width and Concrete Cradles

1. When the maximum allowable trench width has been exceeded and a cradle is required by the earthwork section of Standard Specification Section 2.5, the pipe shall be cradled with Type 1 or Type 2 if the trench is firm ground, or Type 1A or Type 2A if the trench is yielding ground (typically at river/stream crossing. The areas of high likelihood of inflow and infiltration as determined by the District). See Standard Drawing S-102 for complete details.

2. If the trench width is less than one and one half times the maximum allowed by the specifications without cradle or if the cover on the pipe is less than ten feet, Type 1 or 1A shall be used. If the trench width is more than one and one half times the maximum allowed by the Specifications without cradle and the cover is ten feet or more, Type 2 or 2 A shall be used. See Standard Drawing S-102 for complete details.

2.17 INSTALLATION OF PRECAST SEWER MANHOLES

a. General

1. Precast reinforced concrete manholes shall comply with ASTM C478, with a minimum wall thickness of 6-inches. The ASTM standard and manufacturer shall be stamped on the interior and exterior of all manhole shafting and cone.

2. Manhole components shall be designed for H-20 highway loads and site soil conditions.

3. Precast reinforced concrete manhole risers and tops shall be constructed of Class A concrete with Type II or Type V cement.

4. Where connections to existing manholes are required, the manholes shall be broken out as necessary to accommodate the new sewer pipe and the base shall be rechanneled, as required, to allow a smooth transition between the inlet and outlet pipe. The manhole reinforcing steel shall be cut only as required to allow the connection of the new pipe.

5. The existing concrete surface shall be cleaned and prepared with an approved concrete epoxy adhesive prior to the connection of the new pipe and placement of concrete dry pack.

6. Street rehabilitation and/or asphalt overlay projects shall not interrupt the service function of any sewer manholes and emergency access shall be maintained at all times. Manholes that are paved over during construction shall be raised to grade no later than three days after they were paved over.

2.18 PAINTING

a. General

1. Paints shall be delivered to the jobsite in original cans or packages bearing the brand name and the manufacturer's name.

2. Paints specified shall be used unless specific written approval is obtained in advance to use other products.

3. Manufacturer's recommended time between coats will be adhered to.

4. The Contractor shall notify the District inspector after surface preparation and after the application of each successive coat of paint.

5. Surfaces to be painted shall first be thoroughly cleaned to remove dirt, loose scale, rust, oil, grease, and/or other foreign matter immediately prior to painting.

6. After cleaning, metal surfaces shall receive two primer coats of a minimum film thickness of 15 millimeters each or equivalent conditioning or seal coats and two finish coats of two-millimeter thickness each.

7. Unless noted otherwise, the following surfaces shall not be painted and shall be fully protected when adjacent areas are painted.
   (1) Mortar-coated pipe and fittings
   (2) Stainless Steel surfaces (excluding stainless steel bolts, nuts, and washers which shall be painted)
   (3) Aluminum guardrails and handrails
   (4) Galvanized pipe supports and ladders
   (5) Nameplates and grease fittings
   (6) Aluminum grating
   (7) Brass and copper pipe

2.19 RECYCLED WATER SERVICE INSTALLATION

a. Recycled Water Service Requirements

All recycled water installations shall adhere to local, regional, state and federal requirements governing the use and distribution of recycled water, including but not limited to Title 17 and Title 22 of the California Code of Regulations and "Guidelines for the Pipeline Construction and Installation-For the Safe Use of Recycled/Reclaimed Wastewater" from the Los Angeles County Department of Health-Environmental Health.

b. System Construction

1. The Las Virgenes Municipal Water District shall be notified 48 hours prior to the start of construction or pipeline installation by calling (818) 251-2100, to schedule an inspection.

2. Hose bibs are not permitted on the recycled water irrigation system. Quick couplers shall be used if hose connections are necessary.

3. A currently approved reduced pressure principle backflow prevention assembly shall be installed on the potable water service(s) to any recycled water use site.

c. System Identification

1. All newly constructed, buried recycled water distribution piping, including main and lateral lines, valves and other appurtenances should be color extruded purple, Pantone 512, and embossed or integrally stamped/marked by the manufacturer every 24 inches on two (2) sides: "CAUTION: RECYCLED WATER- DO NOT DRINK".

2. All above ground recycled water facilities (controllers, valves, risers, heads, quick couplers, etc.) must have identifying colors and labels for recycled water.

3. Signs shall be posted at the entrances to the site and at other locations on the site as required, noting that recycled water is being used for irrigation purposes.

d. Recycled Water Service General Notes

1. Pipe materials:

All on-site potable water lines must be copper, and identified with a warning tape with a blue background and the words: "**CAUTION: POTABLE WATER LINE**".

All newly constructed, buried recycled water distribution piping, including main and lateral lines, valves and other appurtenances should be color extruded purple, Pantone 512, and embossed or integrally stamped/marked by the manufacturer every 24 inches on two (2) sides: "**CAUTION: RECYCLED WATER-DO NOT DRINK**".

When, due to pre-existing conditions, recycled and potable water lines are of the same material and color, as in the case of sites where the irrigation system was

converted to recycled water use, when the potable system is expanded, copper will be used.

2. All above ground recycled water facilities (controllers, valves, risers, heads, quick couplers, etc.) must have identifying colors and labels for recycled water.

3. Hose bibs are not permitted on the recycled water irrigation system. Quick couplers shall be used if hose connections are necessary.

4. Backflow prevention devices shall not be included in newly constructed recycled water systems unless requested by the District.

5. Backflow prevention devices on pre-existing potable irrigation systems being converted to use recycled water shall be removed, unless required by the District.

6. A reduced pressure principle backflow assembly is required on any and all potable water services to a property where recycled water is being or will be used for irrigation.

2.20 ABANDONMENT

a. General

1. The Contractor shall remove and dispose of/or abandon in place existing pipelines, structures or appurtenances as shown on the plans.

2. Abandonment of all water mains and appurtenances shall be approved by the District Representative prior to any such work.

3. Water lines to be abandoned shall be pumped full with a two-sack sand slurry mix. Each end shall be encased with a minimum of six inches of concrete per Concrete and Mortar Work Section 1.8. Said concrete shall thoroughly cover all exposed metal.

4. Structures and appurtenances associated with lines to be abandoned shall be removed by the contractor.

5 . All materials and appurtenances determined by the District Representative to be salvageable are District property and shall be delivered by the Contractor/Developer to the District warehouse at no cost to the District.

b. Asbestos Cement (AC) Pipe

AC pipes shall be cut, removed, and disposed of in a proper manner. The Contractor shall be responsible for developing and implementing an asbestos removal work plan in accordance with NESHAP, OSHA, these specifications, and State requirements. The Contractor must have a licensed Asbestos Consultant to provide detailed asbestos specific safety and work plans for ensuring worker and community protection. The contractor shall be responsible for the proper manifesting of any and all asbestos cement pipe at authorized disposal site. The Contractor shall confine operations at the site to the area requiring disturbance of AC pipe and the general site area associated with the proximity of the project. Coordination with the District is required in order to abandon AC pipe.

2.21 HYDROSTATIC TESTING WATER MAINS

All completed waterlines, as well as the service lines and appurtenant structures, will be tested by and at the expense of the contractor in the District's representative's presence prior to field acceptance of the work per AWWA C600. The contractor must correct all defects in workmanship or materials which become evident by inspection or testing at any time during the work. Testing will be done after the complete installation and compaction of all underground utilities, except as modified below.

a. General

1. Pipe and all appurtenances shall be subjected to a four-hour hydrostatic pressure test per AWWA C600. This test shall consist of applying to the pipeline a pressure of 50 psi in excess of the design working pressure of the pipe, or up to the pressure rating of the pipe in cases where adding 50psi is greater than the pressure rating of the pipe. Pressure tests shall not be performed until backfill and compaction is completed to subgrade per the Standard Specification on Earthwork. Re-tests shall be conducted following "disturbances" of the pipe zone pipeline or appurtenances at the discretion of the District Representative.

2. The maximum length of pipe to be included in any one test shall be no more than 2,500 feet or the distance between valves, whichever is greater. The contractor shall provide suitable test bulkheads, blocking and fittings to permit such sectionalizing.

b. Preparation

The test shall be applied at an approved outlet. The contractor shall provide and later securely plug such fittings. The line shall be flushed, filled and maintained at operating pressure for a period of at least 72 hours prior to testing to satisfy any system water absorption. Seventy two hour soak period not required for PVC pipe. While filling and immediately prior to testing, all air shall be expelled from the pipeline.

1. Conduct pressure tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.

2. Provide any temporary piping needed to carry the test fluid to the piping that is to be tested. After the test has been completed and demonstrated to comply with the specifications, disconnect and remove temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Plug taps or connections to the existing piping from which the test fluid was obtained.

3. Provide temporary drain lines needed to carry testing fluid away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing. Drain the pipes after they have been tested.

4. After the 72 hour soak period the pressure in the pipeline shall be pumped up to the specified test pressure. When the test pressure has been reached, the pumping shall be

discontinued until the pressure in the line has dropped 10 psi, at which time the pressure shall again be pumped up to the specified test pressure. This procedure shall be repeated until four hours have elapsed from the time the specified test pressure was first applied. At the end of this period, the pressure shall be pumped up to the test pressure for the last time.

5. Perform required disinfection after hydrostatic testing, except when pipeline being tested is connected to a potable waterline.

6. Locate and install test bulkheads, valves, connections to existing pipelines, and other appurtenances in a manner to provide an air gap separation between existing potable water pipelines and the pipeline being tested. Disinfect water and pipeline being tested before hydrostatic testing when connected to a potable waterline.

c. Leakage

Shall be considered as the total amount of water pumped into the pipeline during the four hour period, including the amount required in reaching the test pressure for the final time.

If leakage exceeds the allowable leakage, the leak points shall be located and stopped, and all defective pipe, fittings, valves and other accessories discovered shall be removed and replaced.

Allowable leakage shall be computed as below:

$$L = \frac{CND/P}{1850}$$

Where L = Maximum allowable leakage for the section of pipeline being treated, gallons per hour
N = Number of joints in length tested
Welded pipe = 1 joint
D = Diameter of pipe, inches
P = Test Pressure, psi
C = 0.25 for PVC pipe with rubber gasket joints
0.50 for cast iron pipe with rubber gasket joints
0.125 for flanged joints
0 for welded steel pipe with welded joints

When the pipeline being tested contains more than one type of joint or pipe type allowable, leakage shall be computed for each, then summed for a total allowable leakage. The District representative will provide the contractor a temporary water meter to measure leakage.

d. Role of Flushing

All mains shall be flushed with potable water after completion of construction and prior to disinfection. The primary purpose of this function is to remove the sediments and miscellaneous products of construction.

Minimum Flushing Flow	
Pipe Size (Inches)	Flow Rate to Produce 2.5 fps (gpm)
6	220
8	390
10	610
12	880
14	1,200
16	1,565
18	1,980

Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 2.5 fps for water testing. Flush pipes for time period as given by the formula

$$T = \frac{2L}{2.5}$$

Where T = Flushing time, sec
L = Pipe length, ft

For pipelines 24 inches or larger in diameter, acceptable alternatives to flushing are use of high-pressure water jet, sweeping, or scrubbing. Water, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the pipe.

2.22 DISINFECTING WATER MAINS

a. General

1. Disinfection is the last step necessary before connection to the existing water mains. After pressure testing and prior to acceptance of the work, the entire pipeline including all valves, fittings, hydrants, service laterals and other accessories shall be disinfected in accordance with the current AWWA Specification C651 which provides detail specifications for:

   (1) Limiting contaminating materials from entering the water mains during construction or repair.

   (2) Removing by flushing contaminating materials that may have entered the water main during construction or repair.

   (3) Disinfecting any residual contamination that may remain after cleaning.

   (4) Determining the bacteriologic quality of fresh water in the water main after disinfecting the main.

b. Procedure

1. All mains shall be flushed with potable water after completion of construction and prior to disinfection. Drainage facilities shall be constructed such that the water lines cannot be contaminated through the flushing outlet. After flushing, a licensed chlorination contractor shall disinfect the line. Chlorine solution shall not exceed 100 ppm and chlorine residual shall be a minimum of 25 ppm in all parts of the line and appurtenances attached thereto.

2. The placing of high-test hypochlorite (HTH) capsules or powder in pipe sections during the laying process shall not be considered adequate sterilization. The contractor shall keep adequate chlorine residual testing and indicating apparatus available on the site during the entire sterilization period.

c. Final Flushing

If residual is less than 25 ppm after 24 hours have elapsed, disinfection shall be repeated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. The flushing fittings shall be plugged with devices intended for this purpose at the pressure class of the pipe. Where water main is coated, plugs and outlets shall be similarly coated. Do not discharge chlorinated water with chlorine content greater than 0.2 - 0.5 mg/L to natural water course or storm drain. De-chlorinate water and discharge only in a manner permitted by Regional Water Quality Control Board.

d. Bacteriologic Tests

One sample of water for the specified bacteriologic test shall be taken by the District representative from each end of the sterilized main (located downstream of the point of

introduction of chlorine disinfectant.) For mains over 2,500 feet in length, additional samples shall be taken at intermediate points in such a manner that at least one sample is taken for each 2,500 feet of main.

e. Repetition of Procedure
If the disinfection fails, then the procedure shall be repeated.

f. Procedure After Cutting Into or Repairing Mains
Two procedures are recommended as follows:
1. Swabbing with hypochlorite where all pipe and fittings are swabbed on the interior with five percent hypochlorite solution before they are installed. This should be followed by flushing, preferably from both directions.

2. Slug method whereby a section of line is isolated and then fed a slug dosage of chlorine up to 500 mg/L for a minimum of *2* hours. Then the line is flushed.

2.23 WORK AREA CLEANUP

a. Cleaning During Construction

1. During execution of work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

2. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

3. Provide containers for collection and disposal of waste materials, debris, and rubbish.

4. Cover or wet excavated material leaving and arriving at the site to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.

b. Final Cleaning

1. At the completion of work and immediately prior to final inspection, clean the entire project site as follows:

(1) Clean, sweep, wash, and polish all work and equipment including finishes.

(2) Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces.

(3) Repair, patch, and touch up marred surfaces to match adjacent surfaces.

(4) Broom clean paved surfaces; rake clean landscaped areas.

(5) Remove from the site temporary structures and materials, equipment, and appurtenances not required as a part of, or appurtenant to, the completed work.

c. AC Pipe Removal/ Disposal

1. Submit the following information to the Engineer immediately following the removal and disposal of AC Pipe:
   (1) Copies of all waste shipment records
   (2) Copies of all air monitoring results taken during the removal in compliance with OSHA. Air sample results shall be submitted to the Engineer within 24 hours.

3.0 GENERAL ELECTRICAL AND ELECTRICAL WORK

3.1 GENERAL REQUIREMENTS

a. SCOPE

The Contractor shall install the complete electrical systems as shown on the plans and specifications. The Contractor shall verify any existing control circuitry and modify controls, conduit, and cable as required to support modified control schemes for the project. The Contractor shall demolish all items indicated as to be removed in accordance with the Drawings and Specifications.

The Contractor shall provide all materials, tools, equipment, labor, and services necessary to furnish and install complete working electrical systems as shown on the Drawings and described within these Specifications. The Contractor shall furnish all power supplies, disconnects, controls, and any other work, as well as all electrical and electrical-related work as called for in all sections of the Specification and Drawings. All systems, at project completion and before final acceptance, shall be demonstrated to have complete and working functional operations. The work includes, but is not specifically limited to, the items indicated below.

1. Obtain permits.
2. Electrical main service if shown.
3. Furnish and install all new electrical equipment as shown on the Drawings.
4. Trenching, conduits, feeders, and cables for electric power and controls.
5. Controls, wiring, and misc. materials as shown and/or specified.
6. New instrumentation and controls as shown on the Drawings.
7. Demolition as required by the Drawings.

b. RELATED DOCUMENTS

Contract requirements of the foregoing General Conditions, supplements thereto and all requirements of all sections of these Specifications shall form a part of this Section with the same force and effect as though repeated herein. Where two or more codes conflict, the most restrictive shall apply. Nothing in the Drawings and Specifications shall be construed to permit work not conforming to applicable codes.

1. Codes and Regulations: All electrical equipment and material and its installation shall conform to the current requirements of the following authorities:
   (1) California Electrical Code, Title 24
   (2) California Occupational Safety and Health Act (CalOSHA).

(3) California Administrative Code (CAC), (latest edition). Title 8, California Electrical Code (CEC) Title 19, Fire and Panic Safety Standards.

(4) Uniform Building Code, (latest edition).

(5) Uniform Mechanical Code, (latest edition).

(6) Uniform Plumbing Code, (latest edition).

(7) National Fire Code, (latest edition).

2. Tests and Standards: The tests, standards, or recommended procedures of the following agencies shall relate to all parts of these Specifications and shall be considered a minimum:

(1) American National Standards Institute (ANSI)

(2) Underwriters Laboratories, Inc. (UL)

(3) National Electric Manufacturers Association (NEMA)

(4) Electrical Testing Laboratories (ETL)

(5) National Fire Protection Association (NFPA)

(6) Insulated Power Cable Engineers Association (IPCEA)

(7) Institute of Electrical and Electronic Engineers (IEEE)

(8) Illumination Engineering Society (IES)

(9) National Electrical Testing Association, Inc. (NETA)

(10) International Conference of Building Officials (ICBO)

c. PROJECT DESCRIPTION

The electrical drawings are diagrammatic and do not necessarily show all raceway, wiring, number or types of fittings, offsets, bends or exact locations of items required by the electrical systems. Items not shown or indicated, which are clearly necessary for proper operation or installation of systems shown, shall be provided at no increase in contract price.

The exact routing of systems and location of devices and equipment shall be governed by coordination with other trades, structural, and architectural conditions. The local agency Inspector reserves the right, at no increase in contract price, to make reasonable changes in location of electrical equipment or wiring system so as to coordinate with other systems, to group them into orderly relationships, or to increase their utility. Contractor shall verify requirements in this regard prior to roughing-in.

Install electrical work in cooperation with other trades, make proper provisions to avoid interferences, and coordinate with structural and architectural features in a manner approved

by the local agency Inspector. All changes caused by neglect to make such provisions shall be at Contractor's expense. Provide offsets and special fittings, as required to facilitate installation of the work.

When a particular product or type of product is specified with a manufacturer's designation, the latest published specifications, installation, and construction information of the manufacturer shall constitute the minimum acceptable standard. Any substitutions shall be made in accordance with subsection "Submittals."

d. QUALITY CONTROL

1. Workmanship: The work shall be performed by competent trained workmen, skilled in the particular phase of the work entailed. The work shall be first class throughout, neat, accurate and in full accordance with the intent of these Specifications, and to the satisfaction of the Engineer. All electrical work will be performed by a State licensed Contractor having a C-10 license.

2. Safety: All standard safety procedures as set forth by OSHA, CAC, and California Division of Industrial Safety shall be strictly adhered to.

3. Coordination: Before rough-in of any utility lines, services, and feeders, or of any equipment, the Contractor must coordinate the work with that of other crafts and trades so that these services shall be installed in their proper locations and without interference to the equipment or building structure. This will require cooperation among all crafts and trades, the Engineer, and Contractor, along with study of shop drawings and the building plans. The Contractor shall be familiar with the work of, other power utility company work so as to be able to provide electrical service of correct size, voltage, and other requirements to any equipment to be installed. The installation shall be coordinated as to location and time, and interference causing delays and non-acceptable construction shall be avoided.

4. Exact equipment rough-in locations shall be verified by the Contractor from the shop drawings describing the equipment being installed.

5. Cutting and Repairing: The Contractor shall do all cutting necessary for the proper installation of the work, repair any damage done by the Contractor or the Contractor's workers and coordinate the work with that of others.

6. Cleaning and Painting: All exposed work shall be thoroughly cleaned upon completion of work. Panel board enclosures, fixtures, and equipment, where finish has been marred in shipment or installation, shall be completely refinished. Minor damage shall be rectified as indicated by the Engineer. Contractor shall remove from the site all waste and rubbish resulting from his work.

7. Permits and Fees: For work on this section, Contractor shall secure necessary permits and licenses, pay fees and deposits, and arrange for inspection, as required by applicable governmental rules, regulations, codes, utilities, and ordinances.

8. Utility Work Approval: The Contractor shall give required notice and obtain approval from the utility prior to commencing work and shall coordinate utility inspections of work being done for the utility.

9. Supervision: The Contractor shall personally, or through a competent representative, constantly supervise the work from beginning to completion and final acceptance. The Contractor shall cooperate fully with the inspection authorities in providing information and access to the work. The Contractor, as best as possible, shall maintain the same job foreman throughout the life of the project unless a replacement is requested or authorized by the Engineer.

10. Inspection and Tests: The Contractor shall furnish all labor and test equipment required to fully test and adjust the equipment installed under the Specifications and demonstrate its proper operation. The Contractor shall provide factory start up and training on all electrical and instrumentation equipment or devices.

11. The contractor shall provide factory calibration and testing of all instruments so that they will match the Districts SCADA system setpoint and range or new programming.

    (1) Arrange for all tests and inspections and provide minimum 48 hours prior notice to the Engineer.
    (2) A test must demonstrate that each piece of equipment, outlet, fixture, device, and appurtenance is in sound operating condition and in proper cooperative relation to associated equipment.
    (3) All tests shall be conducted under supervision of the District or the District's Representative, and any defects of any nature which are apparent as a result of such test shall be made correct to the satisfaction of the Engineer before final acceptance is made.
    (4) No equipment shall be tested, or operated for any other purpose, such as checking motor rotation, until it has been fully checked in accordance with the manufacturer's instructions.
    (5) Check and tighten nuts, bolts, lugs, and similar elements of equipment: switchboards, motor control centers, bus ways, panels, etc.
    (6) Submit complete test reports with the maintenance manual submission.

e. SUBMITTALS

Make submittals for all material to be used on the project, whether as specified or substitutions, as specified in the General Conditions.

1. All submittals shall be neat and bound in a suitable folder or binder.

2. Identify each item by manufacturer, brand, trade name, number, size, ratings, and whatever data is necessary to properly identify and check materials and equipment. Words "as specified" are not sufficient identification.

3. Identify each submittal item by reference to Specifications section in which item is specified, or Drawings and detail number.

4. Submittals shall be submitted in coherent groups, e.g., all light fixtures at one time. No partial, or incomplete submittals will be accepted.

5. Organize submittals in same sequence as they appear in Specification sections, articles, or paragraphs.

6. Submittals shall be made and approved before any material is ordered.

7. Product Data: Submit seven (7) copies, in groups, as follows:
   (1) Conduits and raceway types required, including fittings.
   (2) Electric wire, cable and connectors.
   (3) Electric boxes. and fittings.
   (4) Wiring devices.
   (5) Splice kits.
   (6) Signal system devices and equipment.
   (7) Instrumentation.
   (8) Transfer switches, services, power equipment.
   (9) Starters.
   (10) Lighting fixtures.
   (11) Signal system devices.

8. Shop Drawings: After receiving satisfactory product review, submit shop drawings showing physical arrangement, wiring diagrams, construction details, finishes, materials used in fabrication, provisions and conduit entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, weight, power sources, circuit numbers, and compatibility with the Drawings and Specifications.
   Show wiring as actually installed, connected, and identified for the specific project. Include identification of cables and cable conductors. Include control schematic and elementary diagrams.

Shop and instruction drawings shall cover the specific equipment or device to be installed and not merely the general class of such equipment or device.

Submit seven (7) prints and one reproducible as follows:

(1) Switchboards and Switchboard Equipment.
(2) Control schematic and elementary diagrams.
(3) Generation and related equipment and piping.

f. DOCUMENTATION

1. Construction Record Drawings

The Contractor shall furnish to the Engineer, in accordance with the General Conditions, a complete set of "as constructed" drawings which clearly indicate all deviations from the basic contract Drawings, including exact dimensioned locations and depths for all stubbed conduits, location and size of spare conduits, and conductors, all new and uncovered existing work outside the buildings, power feeder runs, and communications "primary" conduit runs. Corrections and changes shall be kept up to date at all times.

All submittals and shop drawings will be resubmitted, in the number required above with record drawings showing all revisions and changes made, clearly marked with field termination wire so as to reflect actual construction record conditions. Revisions and changes will be noted and new dates of drawings shown. Final submittal of shop drawings shall include revised control schematic & elementary diagrams. Submit with final submittals all switch board & mechanical drawings, one-line diagrams, and control schematics & elementary diagrams on Computer Aided Drawing (CAD) AutoCAD Files.

g. OPERATION AND SERVICE MANUALS

1. General:

Contractor shall prepare manuals describing the operations, servicing, maintenance requirements of, and complete parts lists for all electrical equipment. Submit seven (7) copies.

2. Equipment:

Equipment described in the manual shall include all equipment listed under "Submittals," and all other auxiliary miscellaneous systems.

Information contained in the manual shall consist of 8 1/2-inch x 11-inch size catalog data on each item, together with parts lists, description of operation, maintenance information, shop drawings, wiring and riser diagrams, and test reports as installed. Catalogs and data in the manuals shall be neat, clean copies. Drawings shall be accordion folded to letter size and installed in an envelope within the manual. An index shall be provided, which shall list all contents in an orderly manner with the provided, respective equipment supplier's name,

address and telephone number, and the manufacturer's recommended servicing instructions. Diagrams shall be complete for each system installed. Provide divider sheets with identifying tabs between each category. The Contractor will include in the manuals a complete description and documentation of any programming done for any device or system-and include a list of all variable set points, their access address and the value as left.

A reproducible copy of the final manufacturers control drawings is required. Control plans are to be CAD compatible with ACAD generated and the drawing file submitted as a part of the operations manual.

After completion of work a factory representative shall be present for a training course for the Owner's maintenance crews on the electrical controls and equipment. The training course shall be at least one eight-hour session.

h. SEISMIC RESTRAINT AND ANCHORAGE

Provide complete engineered seismic anchorage and bracing for the lateral and vertical support of electrical equipment and conduit systems per CCR Title 24 Part 2code. District projects are located within a high seismic region. Utilize site-specific seismic design parameters or values as required per current governing codes.

All equipment mounted on concrete shall be secured with steel stud expansion anchors requiring a drilled hole. Powder driven anchors are not acceptable. Minimum concrete embedment shall be as required by ICSO report. Minimum spacing shall be 10 diameters center to center and 5 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80 percent of the ICSO test report values (Hilti, Phillips).

i. EXISTING SUB-SURFACE STRUCTURES

It shall be the Contractor's responsibility to locate and protect all underground systems and structures while excavating and installing the electrical distribution system. Any damage done to the existing systems during the course of the electrical work shall be repaired to the satisfaction of the Owner and the utility or agency involved, at the expense of the Contractor. Before any digging, boring, or probing is started the Contractor will notify "U.S.A. Underground" and the "Owner" and request an underground facilities investigation.

j. PORTABLE OR DETACHABLE PARTS

The Contractor shall retain in his possession, and shall be responsible for, all portable and detachable parts of portions of the installation, such as fuses, keys, locks, adapters, locking clips, and inserts, until final completion of the work. These parts shall be itemized and delivered to the Owner at Final Acceptance.

k. GROUNDING

The conduit system supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded by means of an approved ground clamp, in accordance with the California Electrical Code of the Department of Industrial Relations of the State of California, and the National Electrical Code. All main services will have a minimum of two grounding sources with a 25' UFER ground being one.

The Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc. Where it is not possible to obtain good contacts, the conduit shall be bonded around the boxes with a No. 6, B&S gauge, rubber covered, double braided wire with ground clamps.

Equipment and raceway bonding procedures shall be rigidly maintained and meet all jurisdictional requirements of all codes and regulations. A grounding conductor shall be included in every raceway.

3.2 MATERIALS

a. CONDUIT MATERIALS AND COMPONENTS

All conduits installed outdoors, under roads, driveways, etc. are to have a minimum of 36 inches (see 3.01) cover to finish grade

1. Threaded Metal; Rigid Steel

   All locations as follows, excepting those specifically indicated for PVC Coated GRC, PVC Schedule 40 or 80. All exterior locations above grade, in concrete walls and slabs, in concrete block walls, or elsewhere as shown on the Drawings. Runs within, passing through, or above hazardous areas shall be rigid conduit exiting the duct bank or underground stub ups. Rigid steel conduit shall be new galvanized threaded, conforming to UL 6. All coupling and connectors shall be threaded. Note: IMC is not allowed.

2. Flexible Liquid Tight Metallic Conduit

   Connections to machinery. Conduit shall be flexible interlocking single strip steel conduit with liquid tight exterior cover, with all connections made with plastic bushed compression fittings and with copper ground wire. Maximum length is 36 inches. American Brass Seal tight or equal, conforming to UL 1.

3. Plastic PVC, Schedule 40

   Underground locations and below vapor barrier of slabs, in duct bank, and in solid grouted masonry walls where wall entry and exit points are made with rigid galvanized steel. PVC conduit shall be Type 40 thick wall polyvinyl chloride conduit, Underwriters' Laboratories tested, furnished in 10 foot lengths. Note: DB and EB duct bank is not allowed.

4. Plastic PVC, Schedule 80

   Use in locations above grade in chemical rooms and corrosive atmosphere locations. PVC conduit shall be Type 80 heavy thick wall polyvinyl chloride conduit, Underwriters' Laboratories tested, furnished in 10 foot lengths.

5. PVC Coated Galvanized Rigid Conduit

   All metallic conduits installed in contact with concrete in contact with earth, shall be coated with a minimum 40 Mil PVC coating on all conduit lengths and fittings. The coating shall correspond to ASTM D638-68, D140-64, and D746-64T specifications and Federal Test Standard 141, Method 61 5z. Coating shall be continuous without flaws showing exposed metal. Coating shall extend to the

device where the conduit is terminated in exposed locations and 12 inches above grade in unexposed locations. Field applied PVC tape is not an acceptable substitute for PVC coated rigid conduit.

Conduits which start up through floor shall be installed so that none of the curved portion of the elbow is exposed.

b. WIRING DEVICES

1. Receptacles:

(1) Standard Duplex Receptacles: Full gang size, polarized duplex, parallel blade, U-grounding slot, specification grade, rated at 20 amperes, 1 25 volts, designed for split feed service. Hubbell, GE, or Bryant 5362 with S.S. Plates.

All switches are to be mounted at plus 48 inches to center line of handle from finish grade or floor.

(2) Duplex Receptacle - Ground Fault Interrupting: Hubbell, GE, or Bryant No. GF-5362 with S.S. Plates. All receptacles are to be mounted no lower than 15" from finished grade or floor to center of receptacle.

(3) Nameplates: Provide engraved cover plates for receptacles and/or switches other than standard duplex receptacles or switches, indicating voltage, phase and amperes, or function of switch or plug.

(4) Color: Normal Power Circuits: Provide ivory receptacles in areas with light wall finish, and brown receptacles in areas with wood or dark wall finish. Receptacles on Emergency Power Circuits are to be red.

c. WIRE

1. Low Voltage - (Under 600 Volts):

(1) Wire Type and Sizes

Conductors shall be flexible stranded tinned copper, UL listed Type XHHW-2 or THWN-2 at the owner's discretion and shall be rated 600V. Wires for instrument signal circuits shall be No. 16 AWG minimum. Control and alarm input circuits shall be #14 AWG. Wires supplying 120 VAC power on the line side of a fused disconnect shall be #12 AWG (minimum). All 20/1 home runs over 180 feet from panel for 277 volt circuits, and 100 feet from panel for 120 volt circuits shall be increased to next larger size.

Twisted single pair aluminum polyester shielded signal cable shall be Belden No. 8760, #18 AWG tinned copper, 300V polyethylene insulated, copper drain wire or equal.

Twisted single triad aluminum polyester shielded signal cable shall be Belden , #18 AWG tinned copper, 600V polyethylene insulated, copper drain wire or equal.

Ethernet CAT-6.

(2) Wire Insulation Colors

Conductors shall be identified by color-coded insulation. The color of the insulation of the conductors shall be as follows, except as indicated otherwise in the Contract Documents.

Power Wire Colors

Service Wire Color	
120 VAC	Black
Neutral	White
Ground	Green

Control Panel Wire Colors

Service Wire Color	
120 VAC	Black
Neutral	White
Ground	Green
Control	Red
24 VDC	Blue
12 VDC	Purple
DC Common	Blue or Purple with White Stripe

Field Wire Colors

Service Wire Color	
120 VAC	Black
Neutral	White
Ground	Green
Control	Red
24 VDC	Blue
12 VDC	Purple
24 DC Common	Blue with White Stripe
12 V DC Common	Purple with White Stripe

(3) Instrument Wiring

Instrument wiring shall use 1 pair shielded cable with 18 AWG conductors. The shield shall be an overall with a drain wire. The overall jacket shall meet 600 VAC

insulation requirements. The wire pairs shall not be less than 18 AWG. The wire shall be stranded no solid wires will be accepted. The color of the wire shall be as follows:

Instrument Wire Service	Color
Signal Positive	White or Red
Signal Negative	Black
Signal Shield	Drain Wire

(4) Ethernet Cable

Ethernet cabling inside the control panel shall be Cat 6 with type TIA/EIA-568-B connections. Ethernet cabling going to the radios shall be Cat 6 outdoor rated cable TIA/EIA-568-B connections. Each ethernet cable shall be labeled as shown on the Drawings.

(5) Wire Labels

Each wire shall be labeled as shown on the drawings. The wire label shall be heat shrink type appropriately sized for wire size and type. The wires shall have the wire labels at both ends of the wire label. Wire labels shall be installed on all field equipment for power listing the circuit breaker number or the device input/output wiring.

(6) Wire Ferrules

Wire ferrules will be used on all wires in the control panel and field wiring except wires larger than 14 AWG. The ferrules shall be crimped with appropriate crimping tools.

(7) Wire Duct

Wire duct shall be used in the control console as a means of organizing, maintain control, and power wiring. The duct shall be sized at 40% fill. The duct shall be having wiring access slits at ½'' increments or less. The wire ducts shall have a cover. The wire duct size shall be as shown on the drawings.

(8) Conductor Identification

Wire marking shall be as follows: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique wire number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every termination.

The letters and numbers that identify each wire shall be machine printed on sleeves with permanent black ink. The figures shall be 1/8-inch high. Sleeves shall be yellow or white tubing and sized to fit the conductor insulation. Hot air shall be used to shrink the sleeves to fit the conductor after installation. The sleeves shall be TMS Thermofit Marker System by Raychem Co., sleeve style wire marking system by W. H. Brady Co. or equal. Adhesive strips are not acceptable.

d. LIGHT FIXTURE SCHEDULE

See fixture schedule on drawings

e. CONCRETE WORK

1. Equipment Bases: 2,500 psi concrete in 28 days and reinforcing in accordance with Civil Specification.
2. Pole Fixture Bases: 3,000 psi concrete in 28 days and reinforcing in accordance with Civil Specification.

3.3 EXECUTION

a. EXCAVATING FOR ELECTRICAL WORK

1. General

   Do not excavate for electrical work until work is ready to proceed without delay, so that total elapsed time from excavation to completion of backfilling will be minimal.

   Excavate with vertical-sided excavations to greatest extent possible, except where otherwise indicated. Where necessary, provide sheeting and cross-bracing to sustain sides of excavations. Remove sheeting and cross-bracing during backfilling wherever such removal would not endanger the work or other property. Where not removed, cut sheeting off at sufficient distance below finished grade to not interfere with other work.

2. Width and Cover

   Unless otherwise noted, minimum earth cover above conduit shall be 36-inches. Excavate for conduit with 6-inch to 9-inch clearance at both sides of conduit, except where otherwise shown or required for proper installation of joints and fittings. Excavate for other electrical work to provide minimum practical but adequate working clearances.

   Excavate near large trees (within drip line) by hand and protect the root system from damage or dry out to greatest extent possible. Verify trench locations with Engineer prior to trenching. Maintain moist conditions for root system and cover exposed roots with burlap.

   Store excavated material (temporarily) near excavation, in manner which will not interfere with or damage excavation or other work. Do not store under trees (within drip line).

   (1) Retain excavated material which complies with requirements for backfill material.
   (2) Dispose of excavated material which is either in excess of quantity needed for backfilling or does not comply with requirements for backfill material. Remove unused material from project site and dispose of in a lawful manner.

b. DEWATERING

Maintain dry excavations for electrical work by removing water. Protect excavations from inflow of surface water. Pump minor inflow of ground water from excavations.

c. BACKFILLING

Conduit trenches or duct banks shall be inspected by District electrical department prior to any backfill, slurry, or concrete encasement. Proper separation of all control and power conduits shall be maintained.

Coordinate backfill with piping contractor to prevent pipe damage. Except as otherwise indicated, backfill with Class 2 aggregate base compacted to a 95 percent relative density free from boulders, trash, and rubble. Pavement replacement shall be as shown on the Drawings.

Condition backfill material by either drying or adding water uniformly, to whatever extent may be necessary to facilitate compaction to required densities. Do not backfill with frozen soil materials. No jetting will be permitted.

Backfill simultaneously on opposite sides of electrical work, and compact simultaneously.

Backfill excavations in 6-inch high courses of backfill material, uniformly compacted to the following densities (percent of maximum density, ASTM D 1 557), using power-driven hand operated compaction equipment. Minimum acceptable compaction shall be 95%.

Backfill to elevations matching adjacent grades.

Install marker >WARNING= tape 12 inches below finish grade for all conduit installations, or as per detail.

Compaction Test: Demonstrate proper compaction by testing at one-half of the trench depth. Perform three tests per 100 feet of trench (Contractor pays fees).

d. BORING AND CUTTING

Where trench crosses concrete walks or paved areas, bore or saw cut and patch as required for conduit installation. Boring shall be by screw auger or dry ramming. Where soil conditions warrant, (water boring may be allowed on a case by case basis upon approval of the Engineer). No water jetting shall be allowed.

Bore and saw cut as indicated on the Drawings, or where not indicated; bore under walls, paved or concrete surfaces 30'-0" wide or less, saw cut walls, paved or concrete surfaces wider than 30'-0".

e. INSTALLATION OF CONDUIT RACEWAYS

1. General: Install conduits in a neat manner, concealed except as noted. Mount conduits to building structure with strut system. Secure straps with cadmium-plated wood screws into wood, machine screws into metal or inserts preset in concrete. Where impractical to secure directly to structure, suspend on conduit

hangers. Wherever possible, group and rack multiple conduit runs. All conduits shall have a Meyers hub type connection to panels, j-box, terminal box etc.

2. Installation And Cleaning

   Install free from dents, kinks and bruises. Plug ends at time of installation to prevent entry of dirt or moisture. Thoroughly clean out conduits before installing conductors. Thoroughly clean all exposed conduit exteriors.

   Provide tagged pull wire in all empty conduits. Pull wire shall be 3/16-inch stranded nylon with a minimum breaking strength of 800 pounds. Leave 36 inches free coiled each end and tag as to where other end is.

   Plastic conduit shall be installed in accordance with manufacturer's recommendations and accepted trade practice. Where plastic conduit runs rise above ground in exposed locations, and for all conduit runs larger than 1-inch diameter, the riser bend and riser shall be of galvanized rigid metal conduit installed according to rigid metal portion and requirements of electrical specification sections.

   All plastic, flexible, feeder and receptacle branch conduits shall carry a grounding bond wire with the size as shown, or where not shown, as determined by applicable codes for the capacity of the circuit being carried.

3. Protective Coating

   All metallic conduits installed in contact with earth, or in concrete in contact with earth, shall be coated with a minimum 40 Mil PVC coating on all conduit lengths and fittings. The coating shall correspond to ASTM D638-68, D140-64, and D746-64T specifications and Federal Test Standard 141, Method 61 5z. Coating shall be continuous without flaws showing exposed metal. Coating shall extend to the device where the conduit is terminated in exposed locations and 12 inches above grade in unexposed locations. Field applied PVC tape is not an acceptable substitute for PVC coated rigid conduit.

   Conduits which start up through floor shall be installed so that none of the curved portion of the elbow is exposed.

4. Concrete Encased Conduits: All conduits for circuits over 600 Volts indicated on the Drawings shall be concrete encased to a minimum of 3 inches beyond the outside wall of the conduit, all around. Use 2,000 psi red concrete.

5. Conduits Penetrating Floors and Walls: Provide link seal grouting around raceways where penetrating floor slabs, concrete or masonry walls. At fire separation walls or floors use Engineer approved expanding type foam, 3M or equal, to maintain the fire rating of the surface penetrated. Seal all conduit entrances into switch gear of

motor starter. All conduits are to be installed inside walls and under floor where possible. Only overhead lighting conduits are to be installed in ceilings and will exit walls in attic.

f. INSTALLATION OF EXTERIOR PULL BOXES

Where pull boxes are used without bottoms, they shall be set on 3/4-inch crushed rock of a volume equal to that of the pull box used. Bottoms and joints will be grouted over for paper layer, made watertight, and sloped toward middle with a 1/2 inch drain hole.

Where pre-cast units are used, all joints are to be tongue and groove, sealed with a suitable sealer.

Where conduits enter horizontally, they shall be bushed with belled ends and terminated flush with the inside of window. All cracks and openings shall be grouted smooth.

Where conduits enter, other than from horizontal runs, they shall be properly bushed and extended a minimum 2-inch from inside of wall or bottom into pull box. They shall be at no more than a 45 degree rise from the horizontal runs.

All conduits entering pull boxes and manholes shall be sealed watertight with suitable duct sealing compound.

g. INSTALLATION OF WIRE

1. Scope

Provide all wiring for complete electrical work, installed in code conforming raceway.

Color coding shall be strictly adhered to and shall be as follows:

(1) Color coding for 277/480-volt system shall be:

A Phase - Brown	B Phase - Orange	C Phase - Yellow
Neutral - Gray	Ground - Green	Travelers - Lavender

(2) Color coding utilized shall be noted on electrical "as constructed" drawings and shop drawings.

(3) Wires shall be of solid colors in all sizes.

(4) The color coding for control circuit wires will be as noted on the Drawings or as agreed upon with the Engineer and will be of a color other than that designated for the phase wires. Where control wires are installed and various colors are used, they shall be noted on the "as constructed" drawings and shop drawings turned in at the completion of the job.

(5) Where modifying or renovating existing systems, color coding shall match existing. Where existing color coding is different than that indicated in No. 1 and No. 2 above, Contractor shall notify the Engineer prior to ordering wire so that a logical system can be agreed upon.

2. Pulling: Use approved wire pulling lubricant for pulling No. 4 AWG and larger wire. Oil, grease, or wax hardening compound is prohibited as a conductor pulling lubricant. All conductors No. 8 and smaller shall only be pulled by hand. Pulling lubricant for conductors over 600 V shall be approved by the conductor manufacturer and the Engineer.

3. Splices

   Join the conductors securely, both mechanically and electrically using crimp connectors, except that screw-on spring-type compression connectors may be used for No. 10 AWG wires or smaller. The splice area shall be taped to provide equal or greater insulation than the original. Tape run-back over the original insulation shall extend 3 to 5 overall diameters of the insulated wire. All wet location and below grade splices shall utilize 3M Scotchcast resin splicing kits or equal.

   Splice only in accessible junction or outlet boxes.

   Wiring in panel boards, switchboards, and cabinets shall be neatly installed. Wiring shall be grouped, laced or clipped, and fanned out to wiring terminals.

4. Identification and Markings: In addition to all other requirements for identification and marking of wires, panelboards, and junction boxes the following shall be strictly adhered to:
   (1) The identification of individual wires terminating in either junction boxes, circuit breakers, terminal strips, or on control devices shall be done by means of waterproof ink on a linen tag or approved equal.

   (2) Each end of particular feeder or sub distribution class circuits shall be marked as to its phase and point of origination of destination and either voltage line to line in distribution class circuits or voltage to ground in sub distribution class circuit.

   (3) Where distribution wires are terminated in distribution panels, they shall be marked by a minimum 1-1/2 inch square tag, or approved equal, as to either the point of supply or the point of destination, phase and line voltage.

(4) Where sub-distribution wires terminate, they shall be marked with the point of origination or point of destination, phase, and voltage to ground. This will include all sub-distribution circuits originating from 480/277 volt or 208/120 volt distribution panel serving lighting circuits, receptacle circuits, smaller power equipment, and small mechanical equipment.

(5) All control circuits will be marked at each control panel as to their function and where they terminate. Where control wires terminate into relays, enclosures or terminal cans remote from the main point of control, the wires will be marked as to their function and where they originate.

(6) All associated wiring integral within a control cabinet may be marked with the printed circular wire wrapping at each end.

5. Testing

All wires under 600 volt potential shall be tested with a 600 volt megohm prior to energization and the readings shall be recorded and handed in with the record drawings at the completion of the project. The tests shall be conducted from phase to phase and from each phase to ground.

h. INSTALLATION OF CONCRETE WORK

Install concrete for electrical work in accordance with the Drawings

i. PERFORMANCE AND MAINTENANCE, EXCAVATION WORK

Where subsidence is measurable or observable at electrical work excavations during general project warranty period, remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality and condition of the surface or finish to match adjacent work and eliminate evidence of restoration to greatest extent possible.

3.4 MEASUREMENT AND PAYMENT

No separate payment will be made for Electrical Related Work. Payment for work in this section shall be included as part of the applicable Lump Sum or unit prices stated in other sections

LAS VIRGENES MUNICIPAL WATER DISTRICT

STANDARD DRAWINGS

Table of Contents

General, Water, and Recycled Water Standard Drawings

W-128	Anchor Block Details (16" Pipe Max.)
W-129	Special Anchor Block Detail
W-130	Joint Restraint and Anchor Box Assembly for Mechanical Coupling Sizes 6" to 12"
W-131	Pipe Protection Slab and Concrete Encasement
W-132	Test plate / Bulkhead
W-133	Sacrificial Anode Installation at Leak Repair Site for Non-Traffic Condition
W-134	Sacrificial Anode Installation at Leak Repair Site for Traffic Condition
RW-101	Recycled Water Backflow Prevention Installation

Sewer Standard Drawings

S-101	Sewer Trench
S-102	Standard Concrete Cradles and Encasements
S-103	Sewer Manhole and Cover (1 of 5)
S-103	Sewer Manhole and Cover (2 of 5)
S-103	Sewer Manhole and Cover (3 of 5)
S-103	Sewer Manhole and Cover (4 of 5)
S-103	Sewer Manhole and Cover (4 of 5)
S-104	Polymer Concrete Manhole and Concrete Base (1 of 2)
S-104	Polymer Concrete Manhole and Concrete Base (2 of 2)
S-105	Cut-In Wye Connection (1 of 2)
S-105	Cut-In Wye Connection (2 of 2)
S-106	Existing Manhole Abandonment (Abandoned Sewer Line) (1 of 2)
S-106	Existing Manhole Abandonment (Sewer Line in Service) (2 of 2)
S-107	Sampling Well
S-108	Cleanout Sewer Forcemain
S-109	Sand Trap

Electrical Standard Drawings

E-101	Electrical Construction Notes
E-102	Electrical Commissioning Notes
E-103	Instrument / Sensor Commissioning Notes
E-104	Typical Pullbox with Extension
E-105	Field Sensor Device with Sunshield
E-106	Trench Section
E-107	Motor and Device Labeling
E-108	Instrument / PLC Device Enclosure
E-109	Conduit Mounting Support on Steel Tanks

ABBREVIATIONS:

'	FOOT
"	INCHES
AC	ASPHALT CONCRETE
ACP	ASBESTOS CEMENT PIPE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWWA	AMERICAN WATER WORK ASSOCIATION
CML	CEMENT MORTAR LINED
CL	CLASS
CMC	CERAMIC MATRIX COMPOSITES
DI	DUCTILE IRON
DIP	DUCTILE IRON PIPE
DIA	DIAMETER
FIP	FEMALE IRON PIPE
FLG	FLANGED
FRP	FIBERGLASS
GA	GAUGE
GE	GROOVED END
I.D.	INSIDE DIAMETER
LB / LBS	POUNDS
LVMWD	LAS VIRGENES MUNICIPAL WATER DISTRICT
MAX	MAXIMUM
MFR	MANUFACTURER
MH	MANHOLE
MILS	MILIMETER
MIN	MINIMUM
MJ	MECHANICAL JOINT
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
PO	PUSH ON
PSI	POUND PER SQUARE INCH
PSF	POUND PER SQUARE FOOT
PVC	POLYVINYL CHLORIDE PIPE
RH	RIGHT HAND
RW	RECYCLED WATER / RECLAIMED WATER
VCP	VERTIFIED CLAY PIPE
SHT	SHEET
SPEC	SPECIFICATIONS
TYP	TYPICAL
UNC	UNIFIED COARSE THREADS
W	WATER
W.W.F.	WELDED WIRE FABRIC

SYMBOLS:

Ø	DIAMETER
||	FLANGE
	VALVE
	TEE
	WELDING DIRECTIONS

TYPICAL ABBREVIATIONS AND LEGEND

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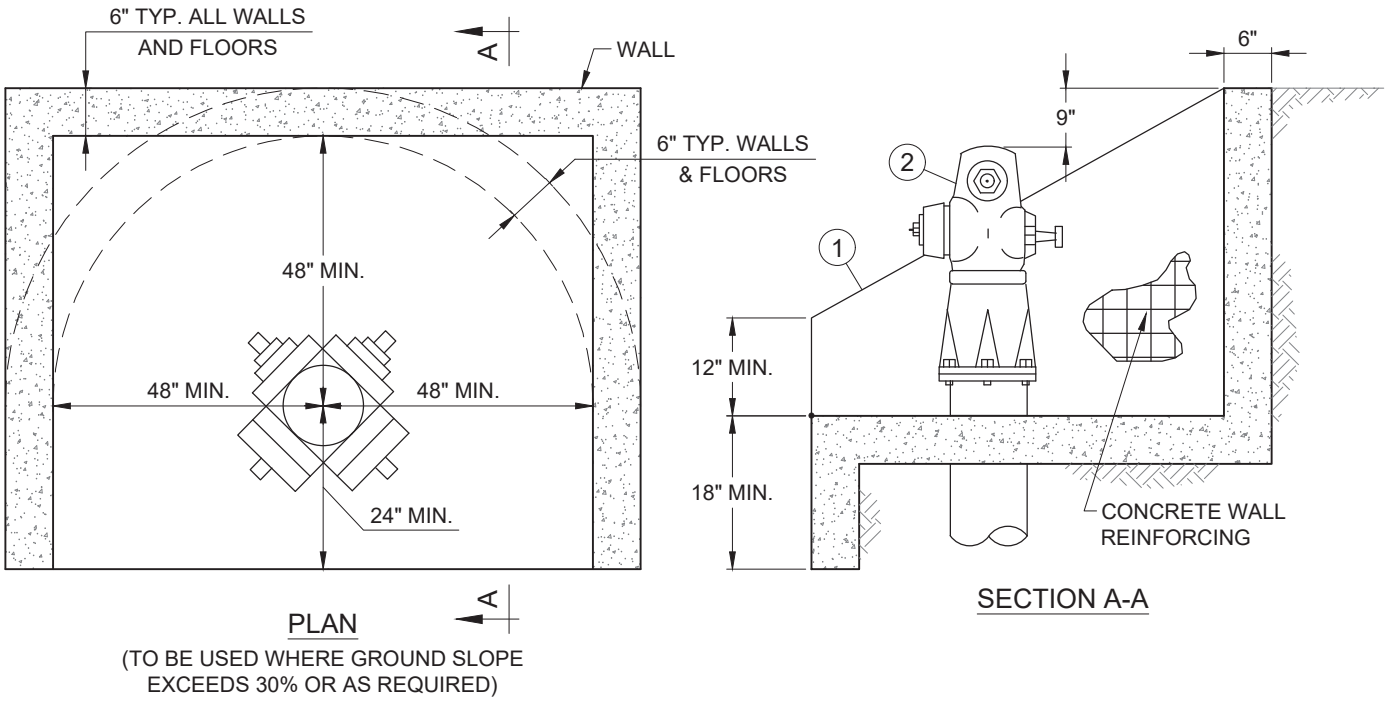
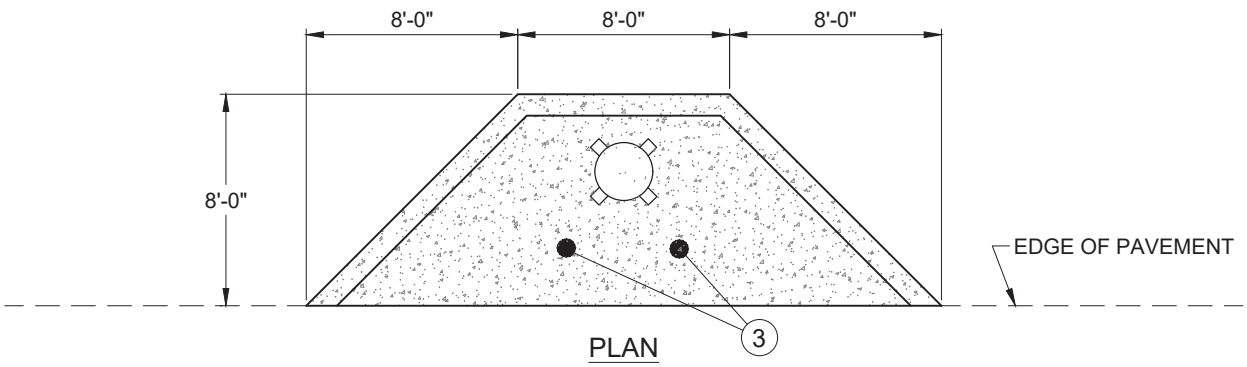
G-100



PLAN

(TO BE USED WHERE GROUND SLOPE EXCEEDS 30% OR AS REQUIRED)

SECTION A-A



PLAN

(TO BE USED IN STREET SHOULDER WHEN GROUND SLOPE EXCEEDS 30% OR AS REQUIRED)

1. RETAINING WALL
2. ABOVE GROUND WATER APPURTENANCES (REFER TO STANDARD DRAWINGS W-111 AND W-124 FOR SPECIFICS)
3. GUARD POST (REFER TO STANDARD DRAWING G-102 FOR SPECIFICS)

NOTES:

1. ALL WALLS REQUIRE BUILDING PERMIT. CONCRETE BLOCK MAY BE SUBSTITUTED FOR WALL SECTIONS IF APPROVED BY BUILDING DEPARTMENT.
2. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
3. HORSESHOE SHAPE MAY BE SUBSTITUTED IN PLACE OF SQUARE WALLS.

CONCRETE OR BLOCK RETAINING WALL

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12/22/2021
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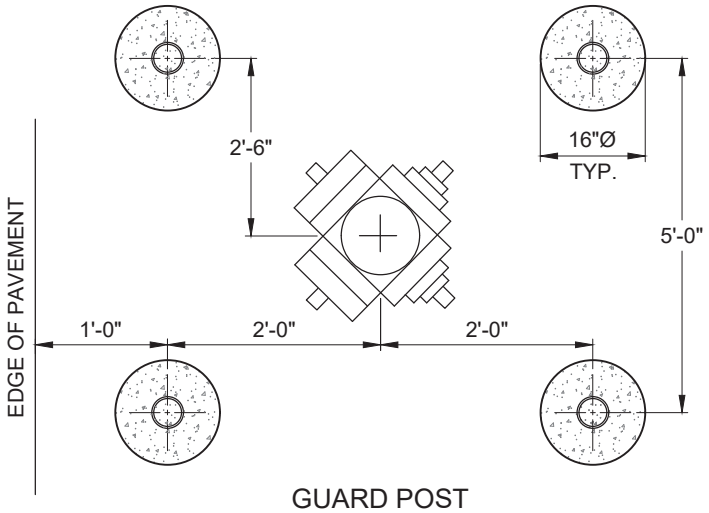
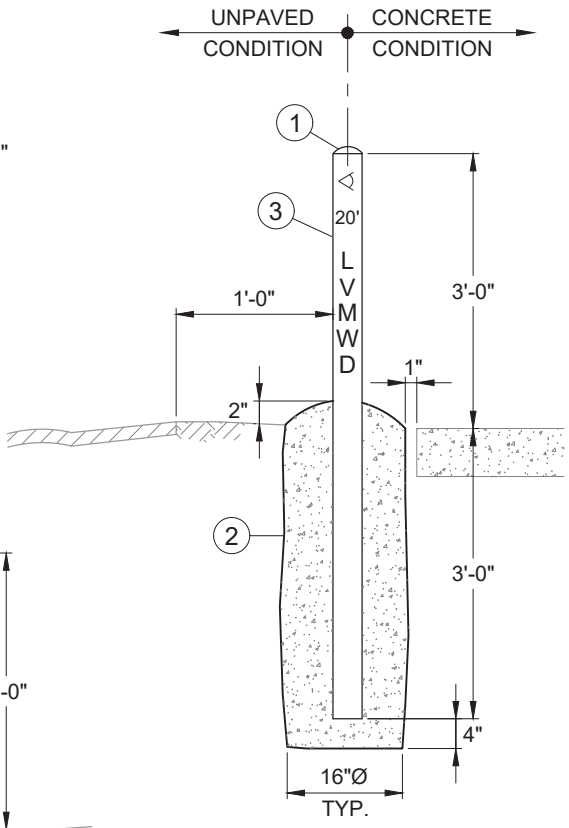
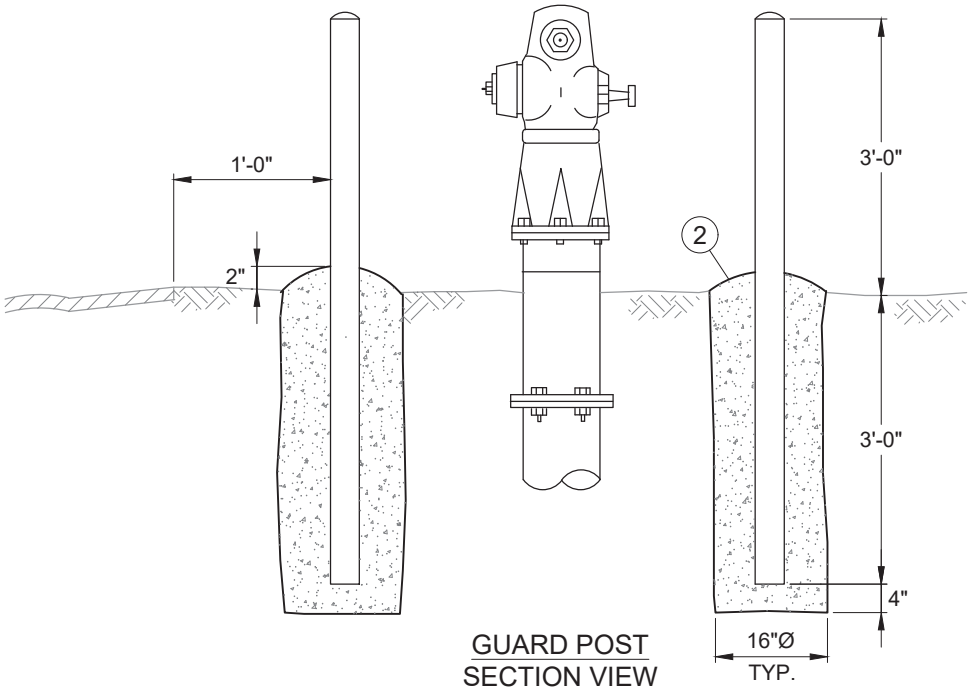
G-101



GUARD POST
PLAN VIEW



MARKER POST



GUARD POST
SECTION VIEW

(1) PIPE (4"Ø SCHEDULE 40 STEEL; SEE NOTE 1.)

(2) CONCRETE BASE (SEE NOTE 1.)

(3) POST MARKING (SEE NOTES 2. AND 3.)

NOTES:
1. FILL WITH CONCRETE AND CROWN CONCRETE AT TOP TO SHED WATER.
2. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
3. STENCIL IN BLACK LETTERS 2" HIGH ("LVMWD", ANGLE IF ANY, AND DISTANCE FROM POST TO VALVE OR UTILITY).

GUARD AND MARKER POST DETAIL

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4232 LAS VIRGENES RD.
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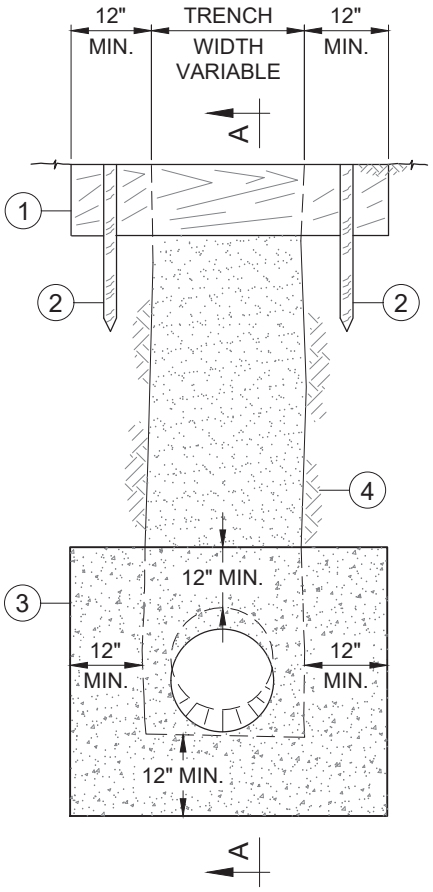
REVISIONS			
NO.	BY	DATE	APRVD.

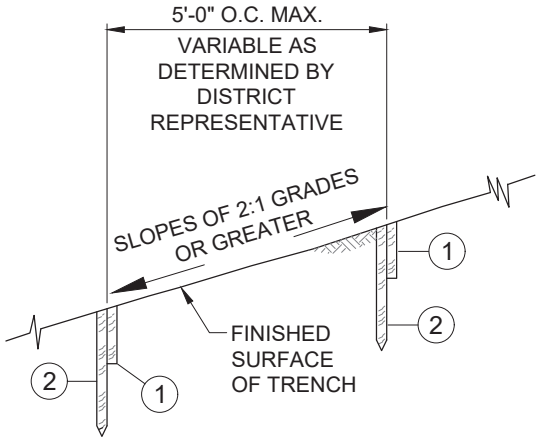
PRINCIPAL ENGINEER

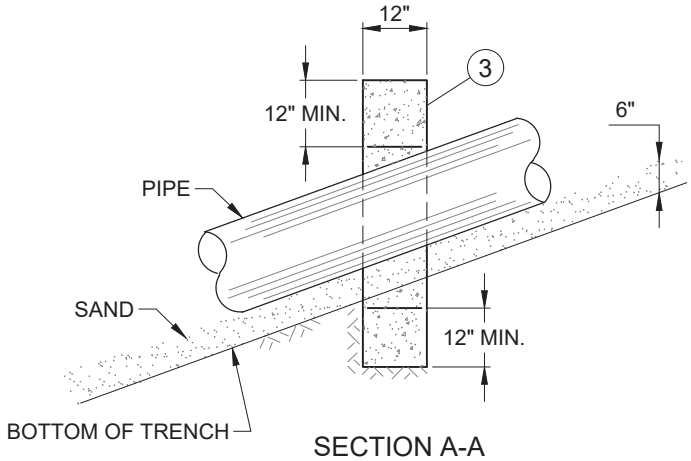
12/22/2021
DATE

G-102



ELEVATION





SECTION A-A

(1) BAFFLE (SEE NOTE 1.)

(2) STAKE (SEE NOTE 1.)

(3) CONCRETE COLLAR (CLASS 560-C-3250)

(4) BACK FILL (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS)

NOTES:
1. 2" x 12" PRESSURE TREATED BAFFLES. 2" x 4" x 24" PRESSURE TREATED STAKES AT 3'-0" ON CENTER.
2. CONCRETE COLLARS SHALL BE PLACED ON WATER LINE PIPES AT 20'-0" ON CENTER MAXIMUM, WHERE DESIGNATED ON PROJECT PLANS.

PRESSURE TREATED WOOD BAFFLES AND CONCRETE COLLARS

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4232 LAS VIRGENES RD.
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REVISIONS			
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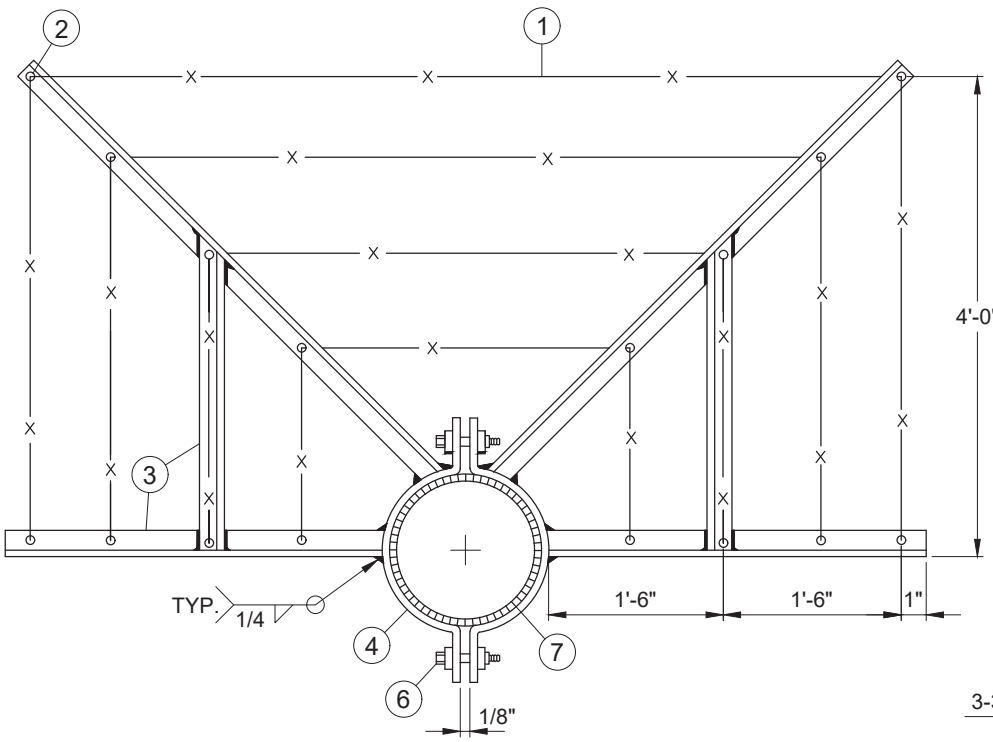
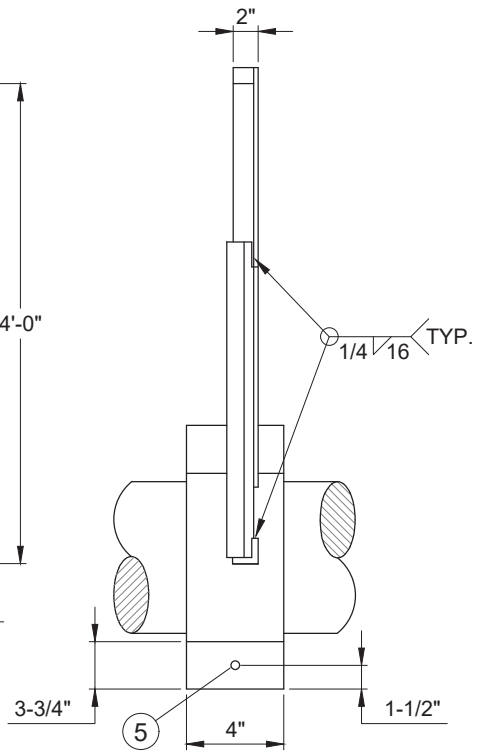
12/22/2021
DATE

G-103



FRONT ELEVATION



SIDE ELEVATION

1. WIRE (BARBED WIRE 9" ON CENTER)
2. HOLE (3/8"Ø HOLES - TYP.)
3. ANGLE (2" x 2" x 1/4" "L" - TYP.)
4. STRAP (4" x 1/4" STEEL - TYP.)
5. BOLT HOLE (5/8" BOLT HOLE - TYP.)
6. BOLT (1/2" BOLT, NUT AND WASHER - TYP.)
7. FELT PAPER (NO. 15 BUILDING FELT)

NOTES:
1. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.

PIPE PROTECTION FENCE ASSEMBLY

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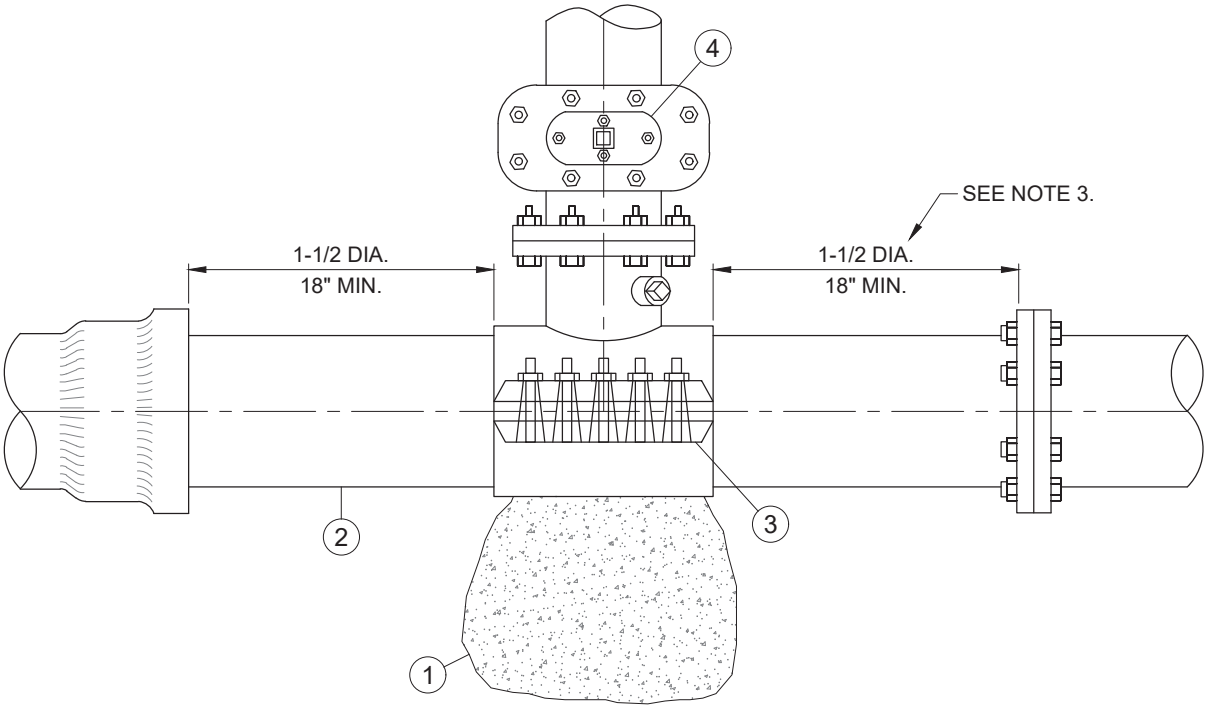
12/22/2021
DATE

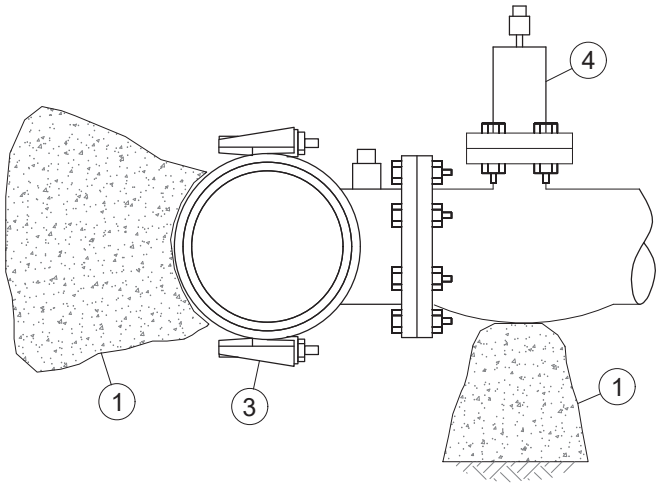
G-104



HOT TAP PLAN VIEW

NOTES:

1. PRIOR TO TAPPING THE WATER MAIN, THE TAPPING SLEEVE AND VALVE SHALL BE ATTACHED TO THE WATER MAIN AND PRESSURE TESTED FOR FIVE MINUTES AT 150 PSI.
2. NEW LINE AND TAPPING SLEEVE MUST BE AT LEAST ONE SIZE SMALLER THAN THE EXISTING MAIN.
3. TAPPING SLEEVE SHALL BE SEPARATED FROM NEAREST BELL, FLANGE, SERVICE CLAMP, CORP STOP, OR OTHER FITTING BY A DISTANCE NO LESS THAN 1-1/2 PIPE DIAMETERS, WITH A MINIMUM OF 18".



ELEVATION

(1) THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)

(2) EXISTING PIPE

(3) TAPPING SLEEVE (EPOXY COATED OR STAINLESS STEEL WITH DI FLANGE, ROMAC, MUELLER, SMITH-BLAIR OR EQUAL) REFER TO SPEC. SECTION 1.4)

(4) GATE VALVE, RESILIENT SEATED WITH FULLY ENCAPSULATED GATE, EPOXY COATED INSIDE AND OUTSIDE, FULL SIZE WATERWAY, 200 PSI MIN. WORKING PRESSURE AWWA C-509

MECHANICAL JOINT TAPPING SLEEVE

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REVISIONS			
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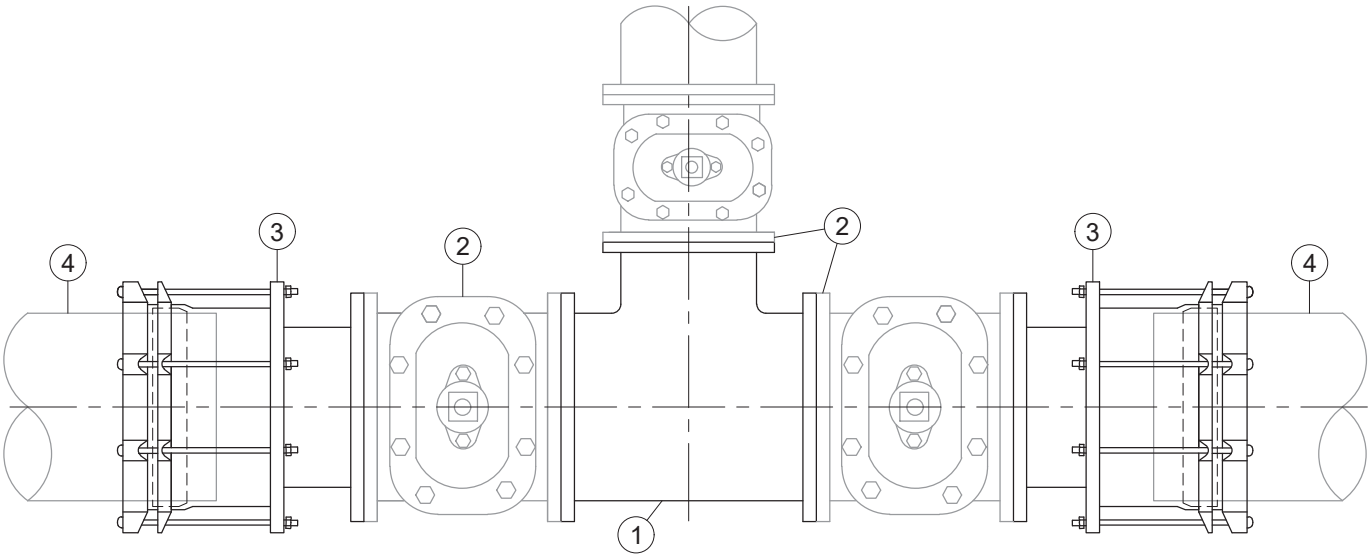
12/22/2021
DATE

G-105



1. D.I. TEE, FLG x FLG
2. RESILIENT WEDGE GATE VALVE OR BUTTERFLY VALVE FLG x FLG, WHERE REQUIRED ON PLANS
3. D.I. FLANGED COUPLING ADAPTER WITH 316 STAINLESS STEEL NUTS, BOLTS AND WASHERS
4. EXISTING PVC PIPE

NOTE:
1. WRAP ALL METALLIC PARTS WITH 8 MIL POLYETHYLENE ENCASEMENT - REFER TO SPEC. SECTION 1.3.

CUT-IN TEE FOR PVC

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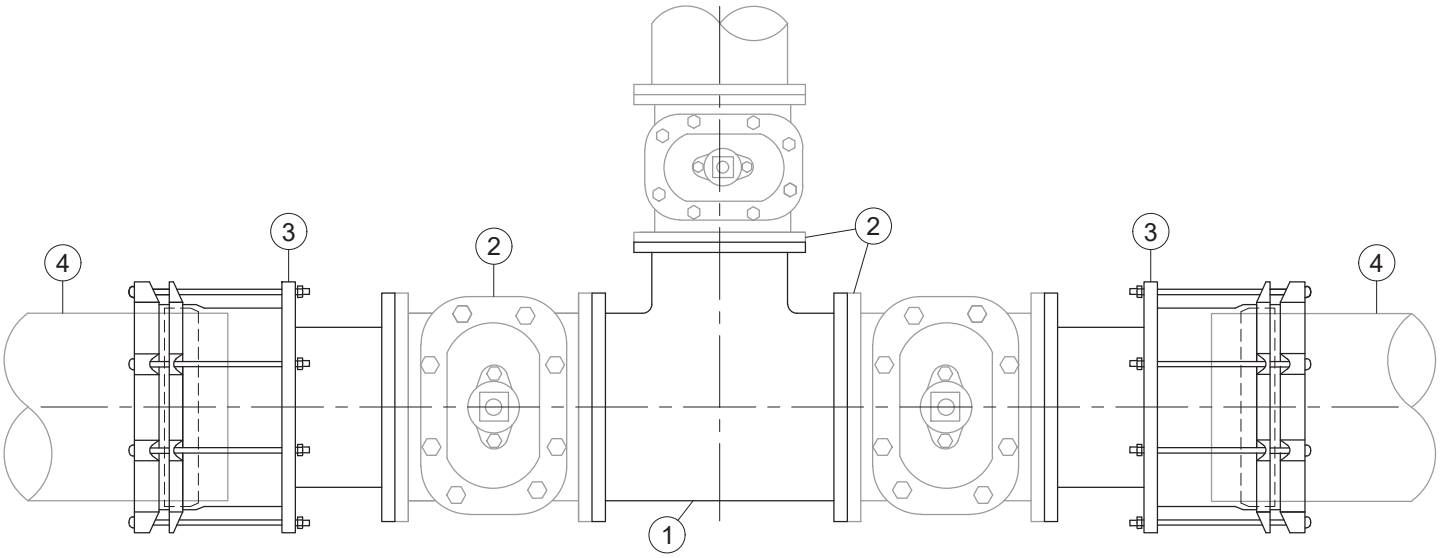
12/22/2021
DATE

G-106



1. D.I. TEE, FLG x FLG
2. RESILIENT WEDGE GATE VALVE OR BUTTERFLY VALVE FLG x FLG
3. D.I. FLANGED COUPLING ADAPTER WITH 316 STAINLESS STEEL NUTS, BOLTS AND WASHERS
4. EXISTING DIP

NOTE:
1. WRAP ALL METALLIC PARTS WITH 8 MIL POLYETHYLENE ENCASEMENT - REFER TO SPEC. SECTION 1.3.

CUT-IN TEE FOR DIP

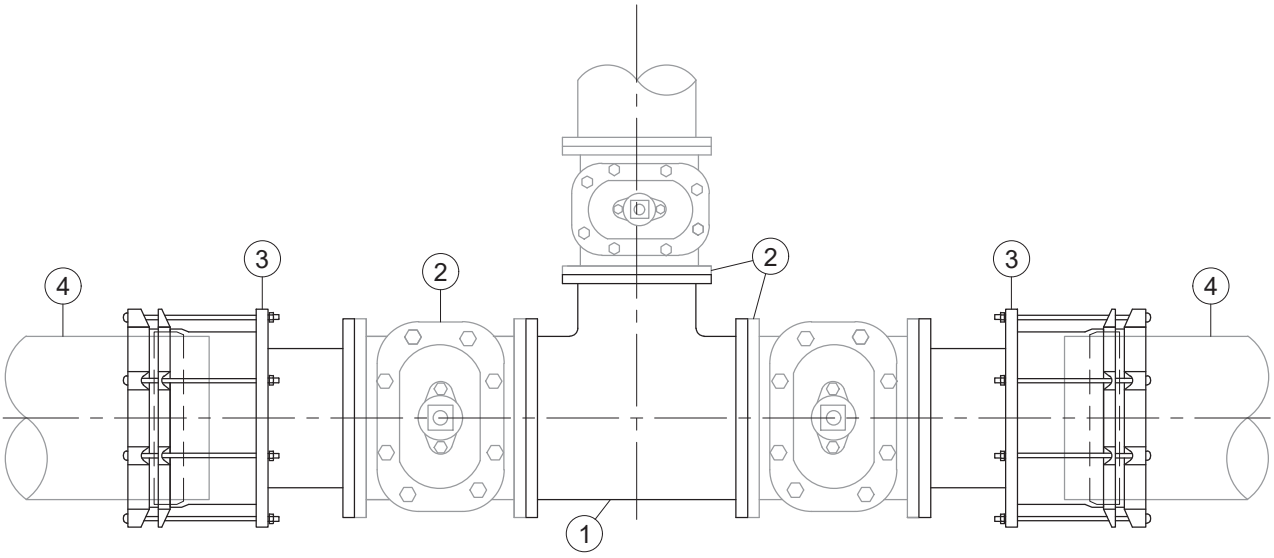
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

G-106



1. D.I. TEE, FLG x FLG
2. RESILIENT WEDGE GATE VALVE OR BUTTERFLY VALVE FLG x FLG, WHERE REQUIRED ON PLANS
3. D.I. FLANGED COUPLING ADAPTER WITH 316 STAINLESS STEEL NUTS, BOLTS AND WASHERS
4. EXISTING ACP

NOTE:
1. CUT ANY MACHINE-END OFF ACP TO EXISTING ROUGH BARREL.
2. WRAP ALL METALLIC PARTS WITH 8 MIL POLYETHYLENE ENCASEMENT - REFER TO SPEC. SECTION 1.3.

CUT-IN TEE FOR ACP

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
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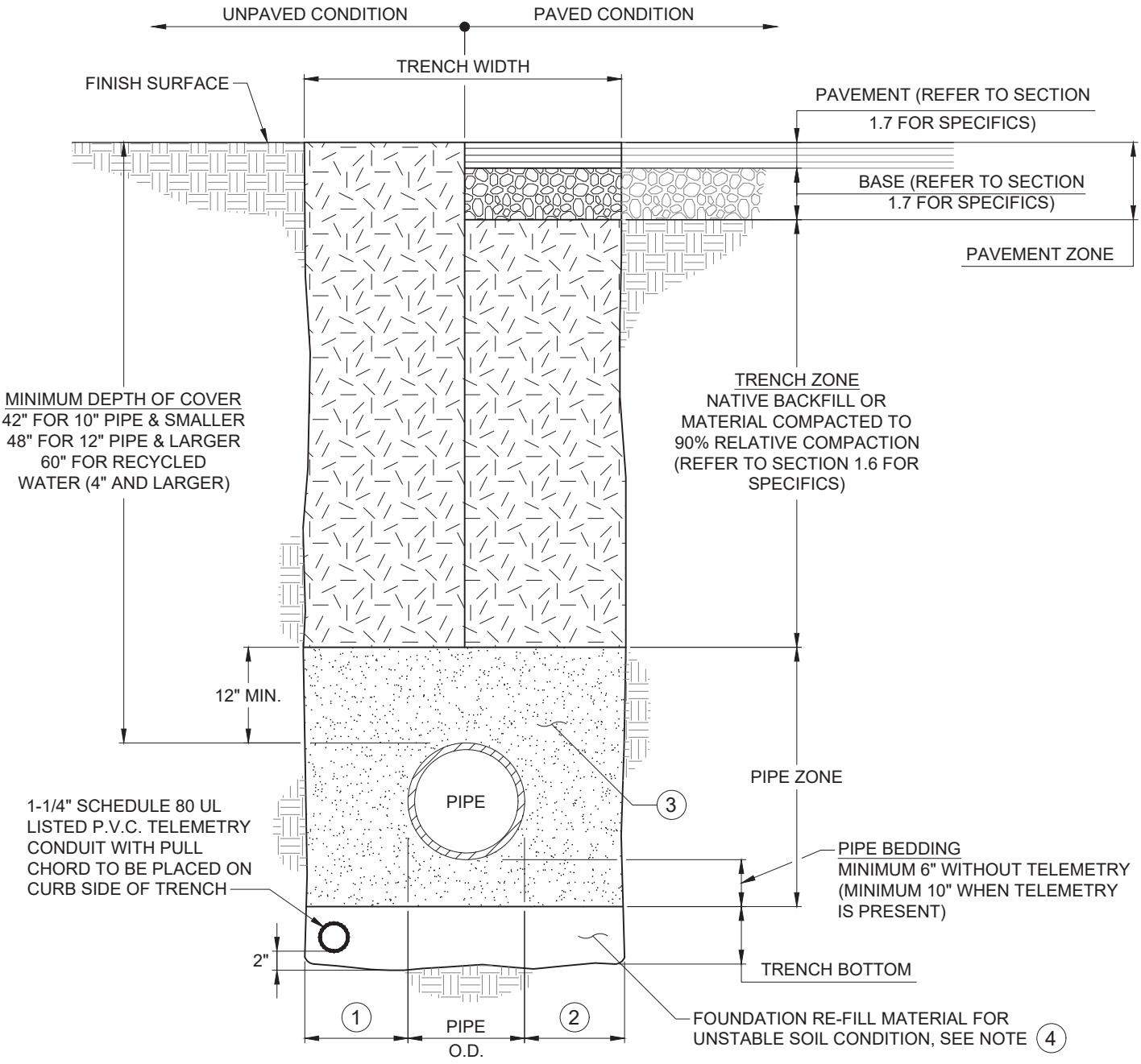
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

G-106



1. FOR PIPE 12"Ø AND SMALLER, TRENCH WIDTH AT SIDE OF PIPE SHALL BE 6" TO 9" (TYPICAL BOTH SIDES)
2. FOR PIPE 14"Ø TO 30"Ø, TRENCH WIDTH AT SIDE OF PIPE SHALL BE 9" TO 12" (TYPICAL BOTH SIDES)
3. SAND MATERIAL PER SPECIFICATIONS COMPACTED TO 90% RELATIVE COMPACTION (REFER TO SECTION 1.6 FOR SPECIFICS)
4. IF UNSTABLE SOIL IS ENCOUNTERED, THE DISTRICT REPRESENTATIVE SHALL DETERMINE OVER EXCAVATION DEPTH AND FOUNDATION RE-FILL MATERIAL PER LVMWD STANDARD SPECIFICATION SECTION 2.5.

TRENCH TERMINOLOGY AND STANDARD DIMENSIONS

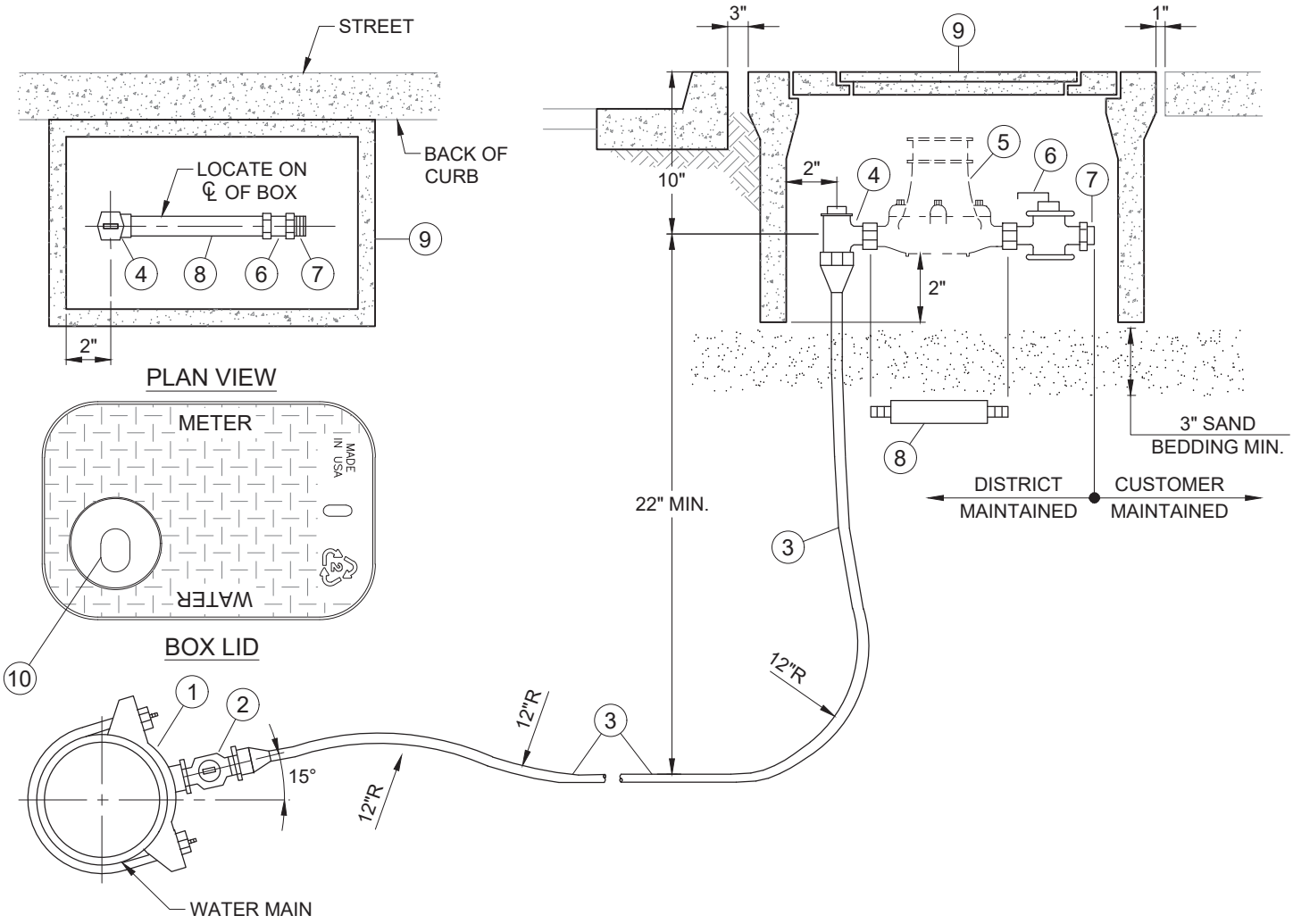
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-101



1. SERVICE SADDLE (REFER TO STANDARD DRAWING W-118 FOR CONNECTION TO STEEL MAIN)
2. CORPORATION STOP FOR PVC MAINS (FOR STEEL MAINS, SEE W-118). (INSTALL WITH KEY ON SIDE AND OPEN POSITION, UNLESS OTHERWISE DIRECTED)
3. COPPER - SOFT K COPPER (SEE NOTE 2.)
4. ANGLE METER STOP
5. METER (INSTALLED BY LVMWD)
6. CUSTOMER HANDLE VALVE
7. NYLON BUSHING
8. PIPE SPACER PVC SCHEDULE 80 (SEE NOTE 3. FOR SPACER LENGTH)
9. 12" x 20"HEAVY DUTY POLYMER METER BOX WITH FLARED WALLS, SLIP RESISTANT COVER WITH STAINLESS STEEL BOLT, WASHER, AND FLOATING NUT. OLDCASTLE FIBRELYTE, DFW OR EQUAL (REFER TO STANDARD DRAWING W-123 FOR LOCATIONS)
10. 4" Ø 5/8" x 1/2" DEEP RECESS WITH 1.88"Ø x 2.50" TOUCH READ HOLE FOR ENDPOINT

NOTES:

1. REFER TO SPEC. SECTION 1.10 FOR MATERIALS SPECIFICATIONS.
2. NO INTERMEDIATE JOINTS PERMITTED WITHOUT APPROVAL OF LVMWD. SERVICE LINES TO RECEIVE BACKFILL OF IMPORTED SAND WITHIN PIPE ZONE (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS).
3. REFER TO SPEC. SECTION 1.10 FOR SPACER LENGTH.
4. POTABLE WATER CONNECTION TO BE CONSTRUCTED PARALLEL TO THE CURB AND RECYCLED WATER CONNECTION PERPENDICULAR TO THE CURB.

3/4" OR 1" METER SERVICE INSTALLATION (MAXIMUM WORKING PRESSURE 150 PSI)

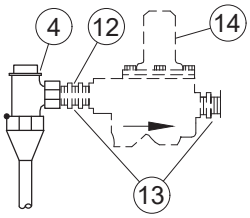
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

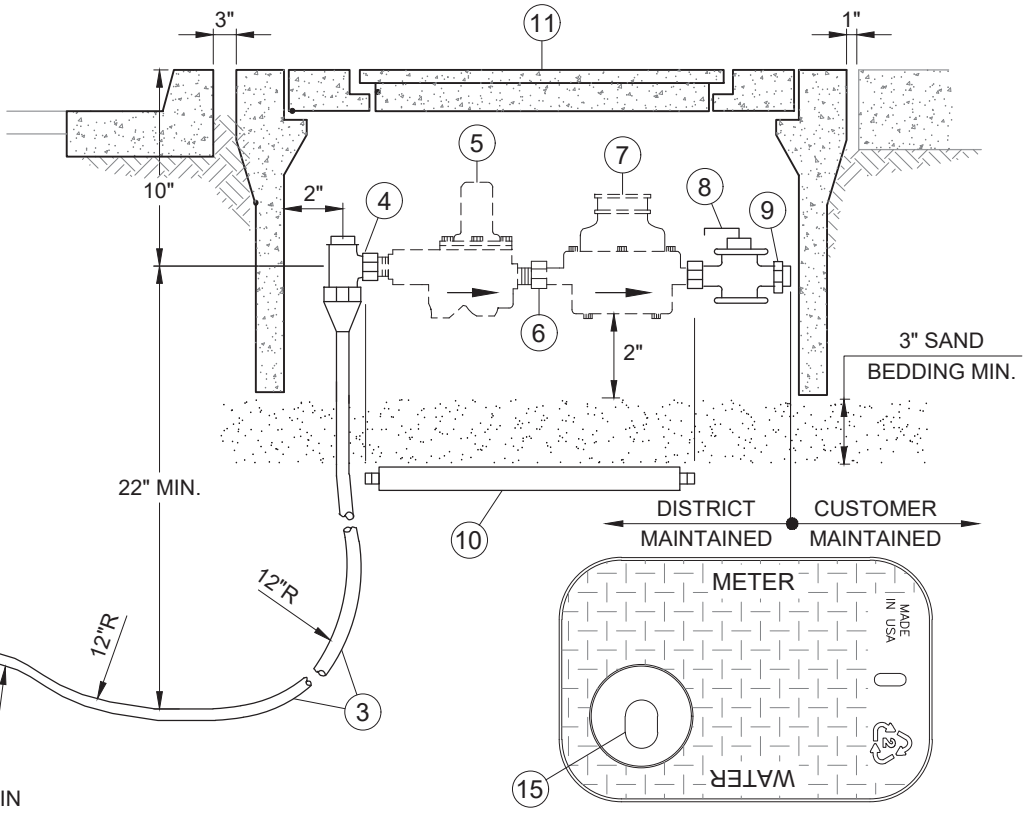
PRINCIPAL ENGINEER

12/22/2021
DATE

W-102



1" METER SERVICE



BOX LID

(1) SERVICE SADDLE (REFER TO STANDARD DRAWING W-118 FOR CONNECTION TO STEEL MAIN)

(2) CORPORATION STOP (INSTALL WITH KEY ON SIDE AND OPEN POSITION, UNLESS OTHERWISE DIRECTED)

(3) COPPER TUBING PIPE (SEE NOTE 2.)

(4) ANGLE METER STOP VALVE

(5) PRESSURE REGULATING VALVE FOR 3/4" METER (WILL BE INSTALLED BY LVMWD)

(6) METER COUPLING (WILL BE INSTALLED BY LVMWD)

(7) METER (WILL BE INSTALLED BY LVMWD)

(8) CUSTOMER HANDLE VALVE

(9) NYLON BUSING

(10) METER SPACER (PVC SCHEDULE 80 WILL BE INSTALLED BY CONTRACTOR, SEE NOTE 3.)

(11) 18" x 30" HEAVY DUTY POLYMER METER BOX WITH FLARED WALLS, SLIP RESISTANT COVER WITH STAINLESS STEEL BOLT, WASHER, AND FLOATING NUT. OLDCASTLE FIBRELYTE, DFW OR EQUAL (REFER TO STANDARD DRAWING W-123 FOR LOCATIONS)

(12) METER ADAPTER (WILL BE INSTALLED BY LVMWD)

(13) BUSHING (WILL BE INSTALLED BY LVMWD)

(14) PRESSURE REGULATING VALVE FOR 1" METER (WILL BE INSTALLED BY LVMWD)

(15) 4" Ø 5/8" X 1/2" DEEP RECESS WITH 1.88"Ø X 2.50" TOUCH READ HOLE FOR ENDPOINT

NOTES:

1. REFER TO SPEC. SECTION 1.10 FOR MATERIALS SPECIFICATIONS.
2. NO INTERMEDIATE JOINTS PERMITTED WITHOUT APPROVAL OF LVMWD. SERVICE LINES TO RECEIVE BACKFILL OF IMPORTED SAND WITHIN PIPE ZONE (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS).
3. REFER TO SPEC. SECTION 1.10 FOR SPACER LENGTH.
4. POTABLE WATER CONNECTION TO BE CONSTRUCTED PARALLEL TO THE CURB AND RECYCLED WATER CONNECTION PERPENDICULAR TO THE CURB.
5. PRESSURE REDUCING VALVE SHOULD BE CLA-VAL 90G SERIES OR EQUAL (S.S. TRIM, WITH BRONZE DISC RETAINER AND DIAPHRAGM WASHER, 250 PSI)

3/4" OR 1" METER SERVICE INSTALLATION (MAXIMUM WORKING PRESSURE 151 - 250 PSI)

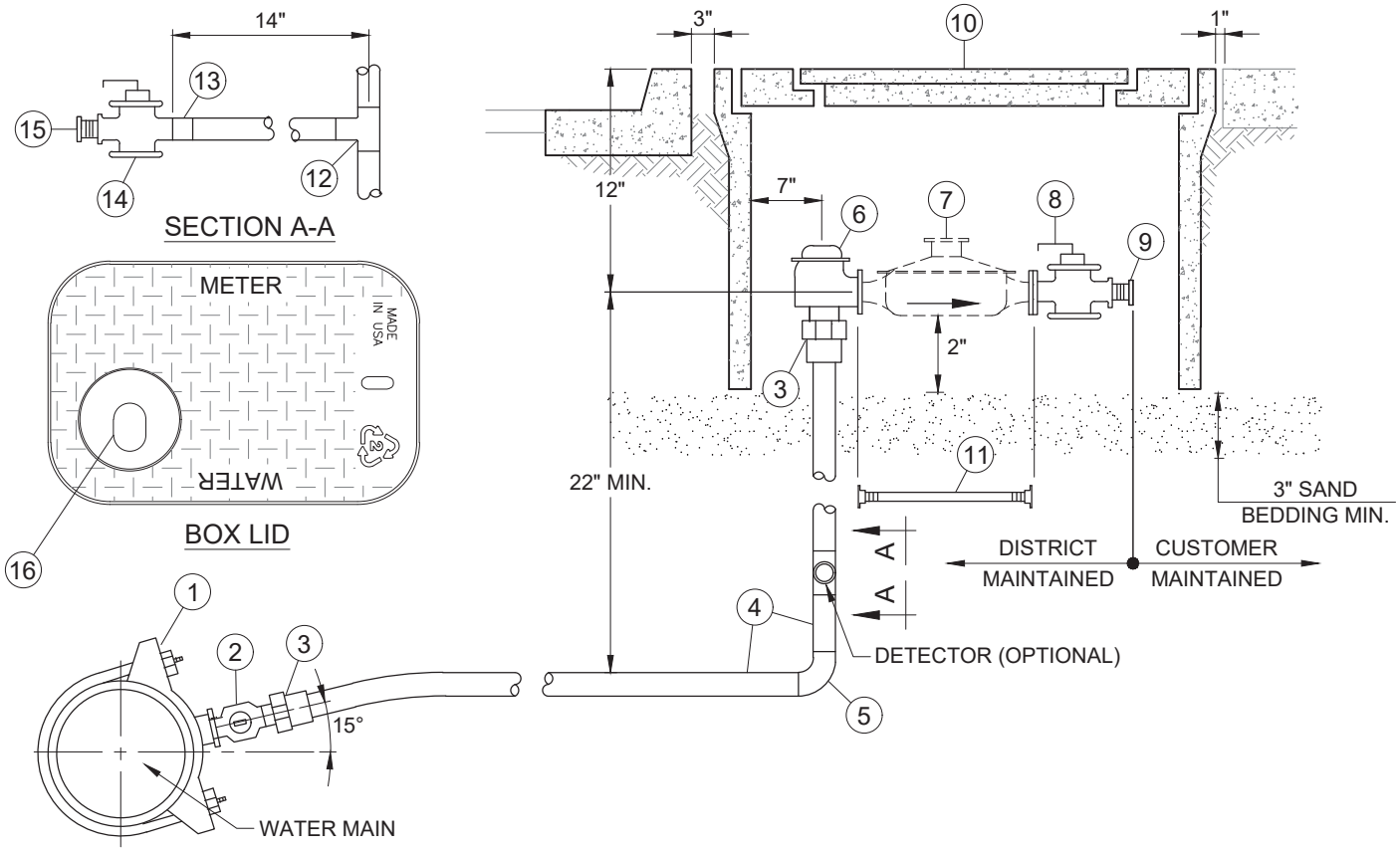
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-103



1. SERVICE SADDLE (REFER TO STANDARD DRAWING W-118 FOR CONNECTION TO STEEL MAIN)
2. CORPORATION STOP (INSTALL WITH KEY ON SIDE AND OPEN POSITION, UNLESS OTHERWISE DIRECTED)
3. COPPER ADAPTER
4. COPPER SERVICE TUBING (SEE NOTE 2.)
5. 90° ELBOW (SOLDERED)
6. ANGLE METER STOP VALVE
7. METER (WILL BE INSTALLED BY LVMWD)
8. CUSTOMER HANDLE VALVE
9. NYLON BUSING
10. 18" x 30" HEAVY DUTY POLYMER METER BOX WITH FLARED WALLS, SLIP RESISTANT COVER WITH STAINLESS STEEL BOLT, WASHER, AND FLOATING NUT. OLDCASTLE FIBRELYTE, DFW OR EQUAL (REFER TO STANDARD DRAWING W-123 FOR LOCATIONS)
11. METER SPACER (PVC SCHEDULE 80 WILL BE INSTALLED BY CONTRACTOR, SEE NOTE 3.)
12. COPPER TEE (2" x 2" x 2")
13. COPPER MIP (2")
14. 2" BALL VALVE, FIP x FIP TEE HEAD WITH LOCKWING
15. 2" BRASS PLUG (SEE NOTE NO. 4)
16. 4" Ø 5/8" X 1/2" DEEP RECESS WITH 1.88"Ø X 2.50" TOUCH READ HOLE FOR ENDPOINT

NOTES:
1. REFER TO SPEC. SECTION 1.10 FOR MATERIALS SPECIFICATIONS.
2. NO INTERMEDIATE JOINTS PERMITTED WITHOUT APPROVAL OF LVMWD. SERVICE LINES TO RECEIVE BACKFILL OF IMPORTED SAND WITHIN PIPE ZONE (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS).
3. REFER TO SPEC. SECTION 1.10 FOR SPACER LENGTH.
4. INSTALL OPTIONAL DETECTOR CHECK PER STANDARD DRAWING W-110.

1-1/2" TO 2" METER SERVICE INSTALLATION (MAXIMUM WORKING PRESSURE 150 PSI)

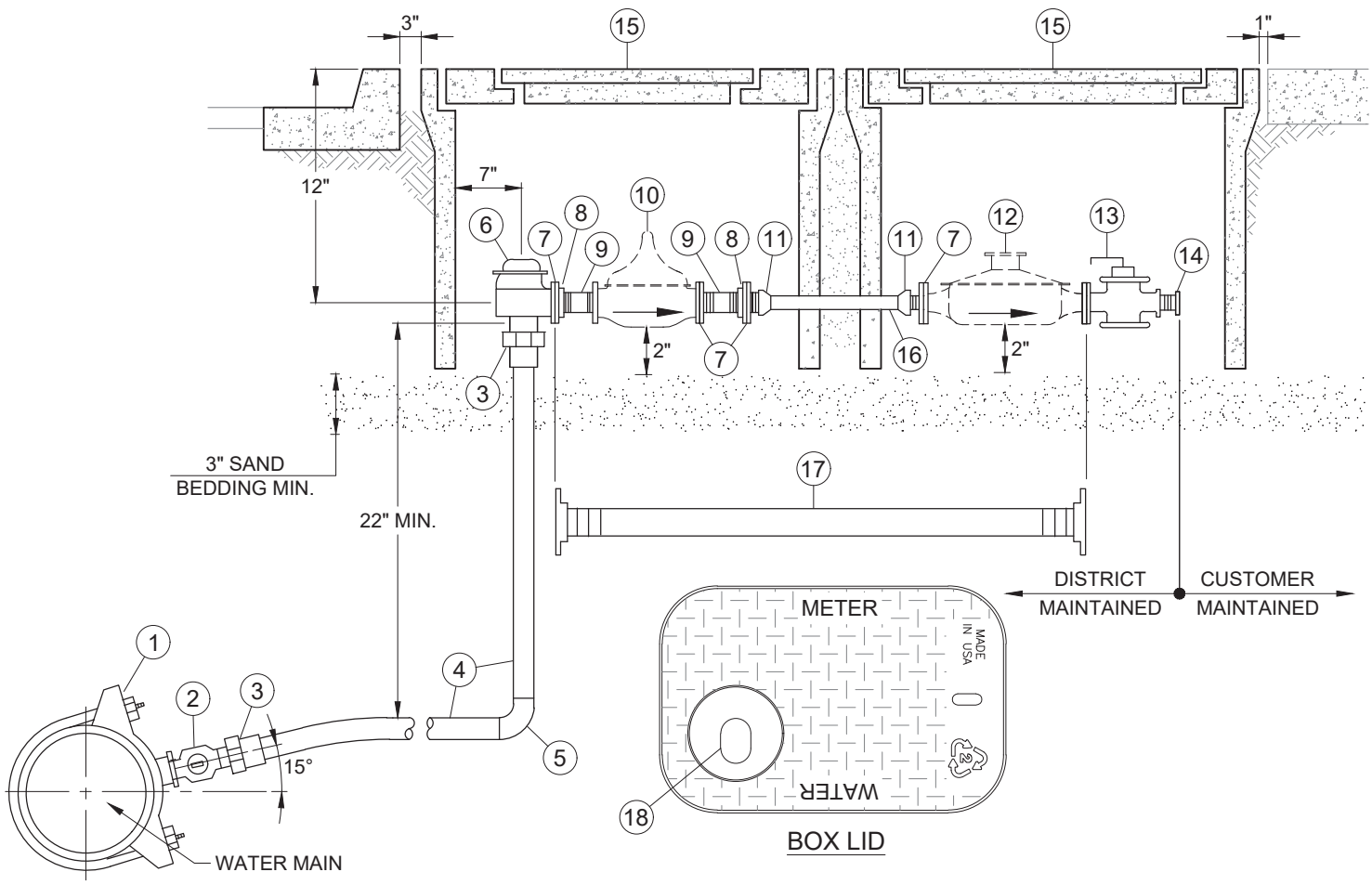
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-104



1. SERVICE SADDLE (REFER TO STANDARD DRAWING W-118 FOR CONNECTION TO STEEL MAIN)
2. CORPORATION STOP (INSTALL WITH KEY ON SIDE AND OPEN POSITION, UNLESS OTHERWISE DIRECTED)
3. COPPER ADAPTER
4. COPPER SERVICE TUBING (SEE NOTE 2.)
5. 90° ELBOW (SOLDERED)
6. ANGLE METER STOP VALVE
7. METER FLANGE (WILL BE INSTALLED BY LVMWD)
8. BUSHING (WILL BE INSTALLED BY LVMWD)
9. NIPPLE (WILL BE INSTALLED BY LVMWD)
10. PRESSURE REGULATOR (WILL BE INSTALLED BY LVMWD)
11. ADAPTER (WILL BE INSTALLED BY LVMWD)
12. METER (WILL BE INSTALLED BY LVMWD)
13. CUSTOMER HANDLE VALVE
14. NYLON BUSHING
15. 12" x 20" HEAVY DUTY POLYMER METER BOX WITH FLARED WALLS, SLIP RESISTANT COVER WITH STAINLESS STEEL BOLT, WASHER, AND FLOATING NUT. OLDCASTLE FIBRELYTE, DFW OR EQUAL (REFER TO STANDARD DRAWING W-123 FOR LOCATIONS)
16. SERVICE TUBING
17. METER SPACER (PVC SCHEDULE 80 WILL BE INSTALLED BY CONTRACTOR; SEE NOTE 3.
18. 4" Ø 5/8" X 1/2" DEEP RECESS WITH 1.88"Ø X 2.50" TOUCH READ HOLE FOR ENDPOINT

NOTES:

1. REFER TO SPEC. SECTION 1.10 FOR MATERIALS SPECIFICATIONS.
2. NO INTERMEDIATE JOINTS PERMITTED WITHOUT APPROVAL OF LVMWD. SERVICE LINES TO RECEIVE BACKFILL OF IMPORTED SAND WITHIN PIPE ZONE (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS).
3. REFER TO SPEC. SECTION 1.10 FOR SPACER LENGTH.
4. PRESSURE REDUCING VALVE SHOULD BE CLA-VAL 90G SERIES OR EQUAL (S.S. TRIM, WITH BRONZE DISC RETAINER AND DIAPHRAGM WASHER, 250 PSI).

1-1/2" OR 2" METER SERVICE INSTALLATION (MAXIMUM WORKING PRESSURE 151 - 250 PSI)

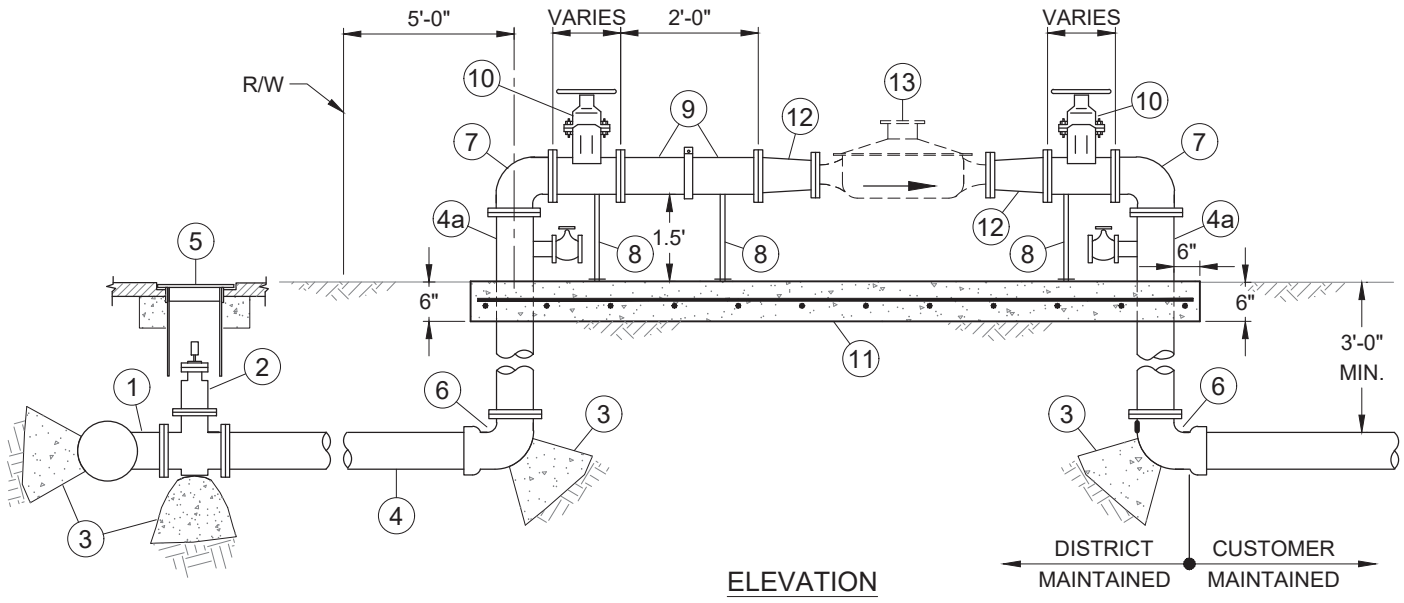
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-105



ELEVATION

(1) FLANGED OUTLET (INSTALL TEE OR REFER TO STANDARD DRAWING W-125 AND G-105 FOR SPECIFICS)

(2) VALVE FLG x FLG CL 250 (REFER TO SECTION 1.5 FOR SPECIFICS)

(3) THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)

(4) PIPE PVC C-900 Cl. 200 OR DI OR STEEL CML (REFER TO SPEC. SECTION 1.3 FOR THICKNESS) ABOVE 200 PSI

(4a) PIPE STEEL CML WITH 2" 3000# HALF COUPLING AND 2" MALLEABLE IRON G.V. OR DI SADDLE x 2" FIP CORP

(5) VALVE BOX AND COVER (REFER TO STANDARD DRAWING W-116 FOR SPECIFICS)

(6) 90° ELBOW (CL) FLG x GE OR FLG x FLG ABOVE 200 PSI

(7) 90° ELBOW (STEEL CML) FLG x FLG

(8) ADJUSTABLE PIPE SUPPORT

(9) PIPE DI FLG x GE COUPLING (SEE NOTE NO. 1)

(10) GATE VALVE AND HAND WHEELS (METER SIZE) FLG x FLG

(11) SUPPORT PAD (WITH #4 REBAR AT 8" ON CENTER)

(12) PIPELINE SIZE x METER SIZE REDUCERS (CI, DI OR STEEL CML) FLG x FLG

(13) METER (WILL BE INSTALLED BY LVMWD)

NOTES:
1. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
2. SPACER TO BE INSTALLED BY CONTRACTOR. VERIFY SPACER DIMENSIONS WITH LVMWD REPRESENTATIVE PRIOR TO FABRICATION.

NOTE: TYPICAL DISTRICT FACILITIES TO HAVE RECORDED EASEMENT. VERIFY EXACT EASEMENT LOCATION AND DIMENSION WITH THE DISTRICT.

3" TO 10" METER SERVICE INSTALLATION (ABOVE GROUND) (MAXIMUM WORKING PRESSURE 150 PSI)

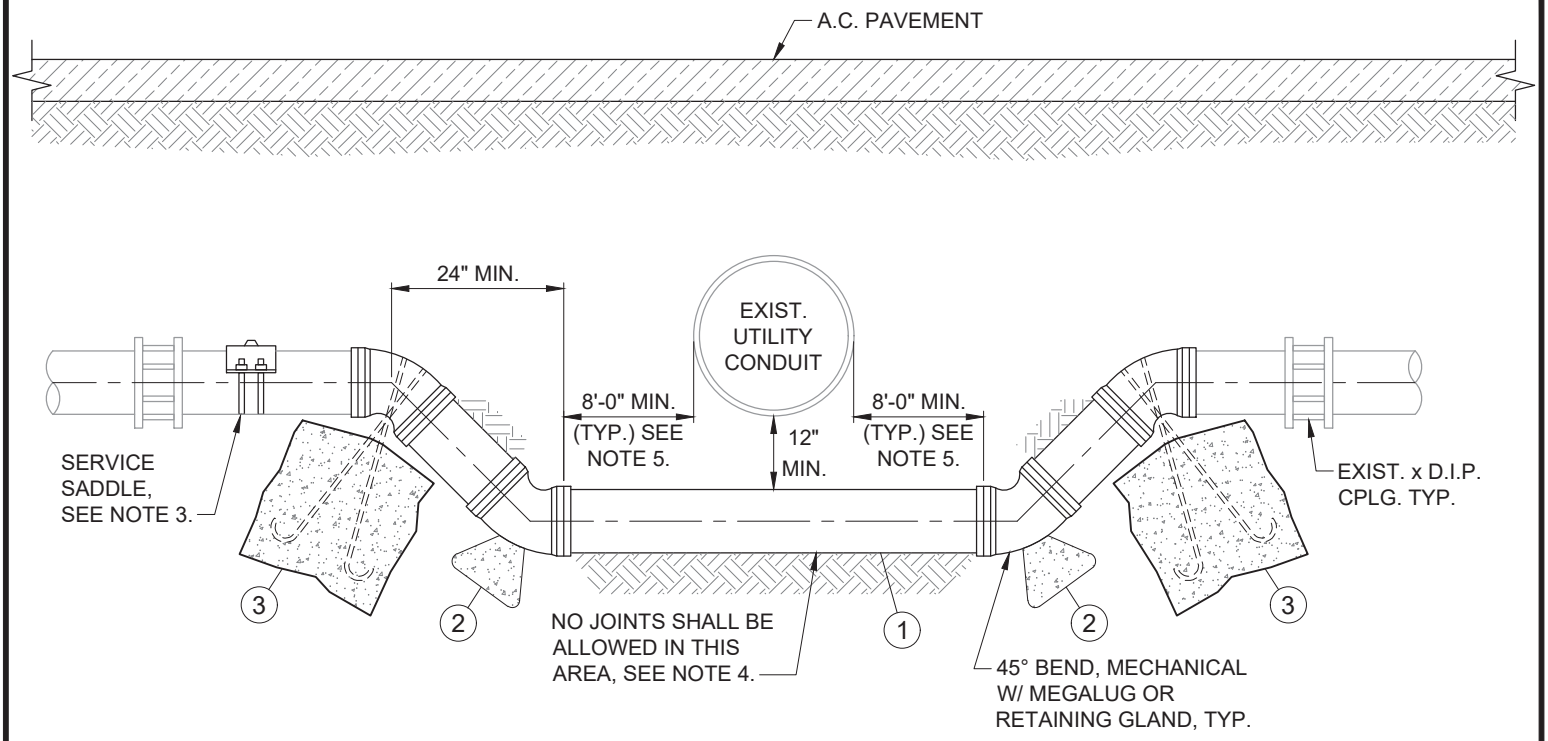
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-106



(1) MAIN PIPELINE

(2) THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)

(3) ANCHOR BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)

NOTES:

1. ALL PIPE JOINTS AT 45° BENDS SHALL BE MECHANICAL JOINT WITH MEGALUG OR RETAINING GLAND. FLANGED JOINTS MAY BE USED WHERE CONDITIONS WARRANT AND SUBJECT TO DISTRICT APPROVAL.
2. INSTALLATION SHALL BE ENCASED IN POLYETHYLENE PER AWWA STANDARD C105.
3. SERVICE SADDLE AND COMBINATION AIR RELEASE VACUUM RELIEF VALVE SHALL BE INSTALLED ON THE HIGH POINTS OF THE OFFSET AS SHOWN ON THE PLANS. SERVICE SADDLE SHALL BE 1" ON 8" AND SMALLER EXISTING MAINS AND 2" ON LARGER EXISTING MAINS.
4. IF BOTTOM SPOOL PIECE EXCEEDS 18'-0", CONNECT PIPE SECTIONS WITH DISTRICT APPROVED JOINT RESTRAINTS.
5. IF UTILITY CONDUIT IS NON-POTABLE, MINIMUM DIMENSION SHALL COMPLY WITH THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES AND DIVISION OF DRINKING WATER REQUIREMENTS.
6. BEDDING SHALL BE AS SHOWN ON STANDARD DRAWING W-101 AND TRENCH BACKFILL ABOVE PIPE ZONE AS REQUIRED BY THE DISTRICT.
7. WHERE RECYCLED AND POTABLE WATER LINE CROSSES, THE RECYCLED WATER LINE SHALL BE INSTALLED BELOW THE POTABLE WATER LINE AND SHALL BE INSTALLED IN A PVC CLASS 200 PIPE SLEEVE THAT EXTENDS A MINIMUM OF FIVE (5) FEET ON EITHER SIDE OF POTABLE WATER PIPING.

PIPELINE LOWERING

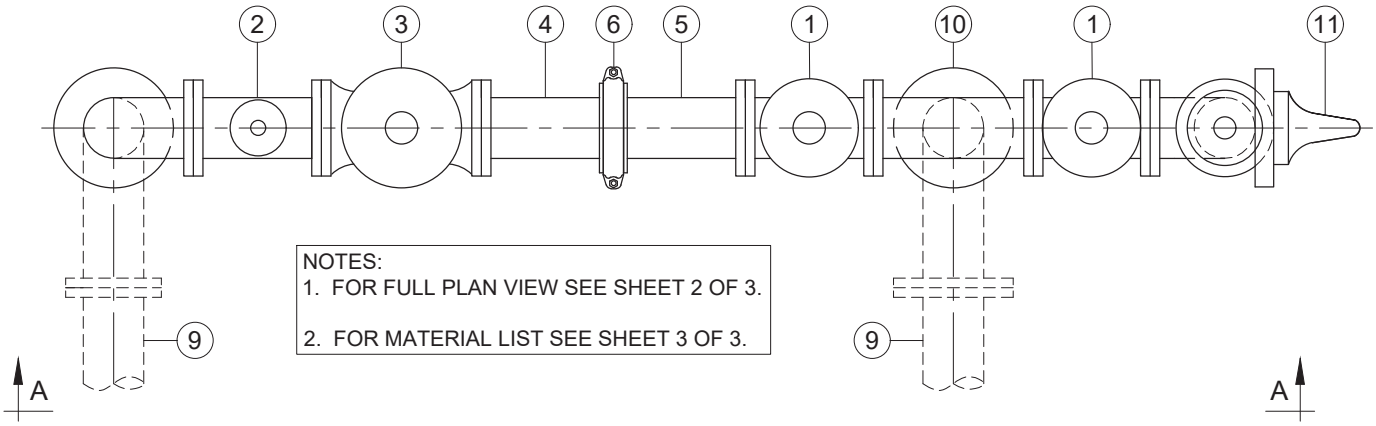
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

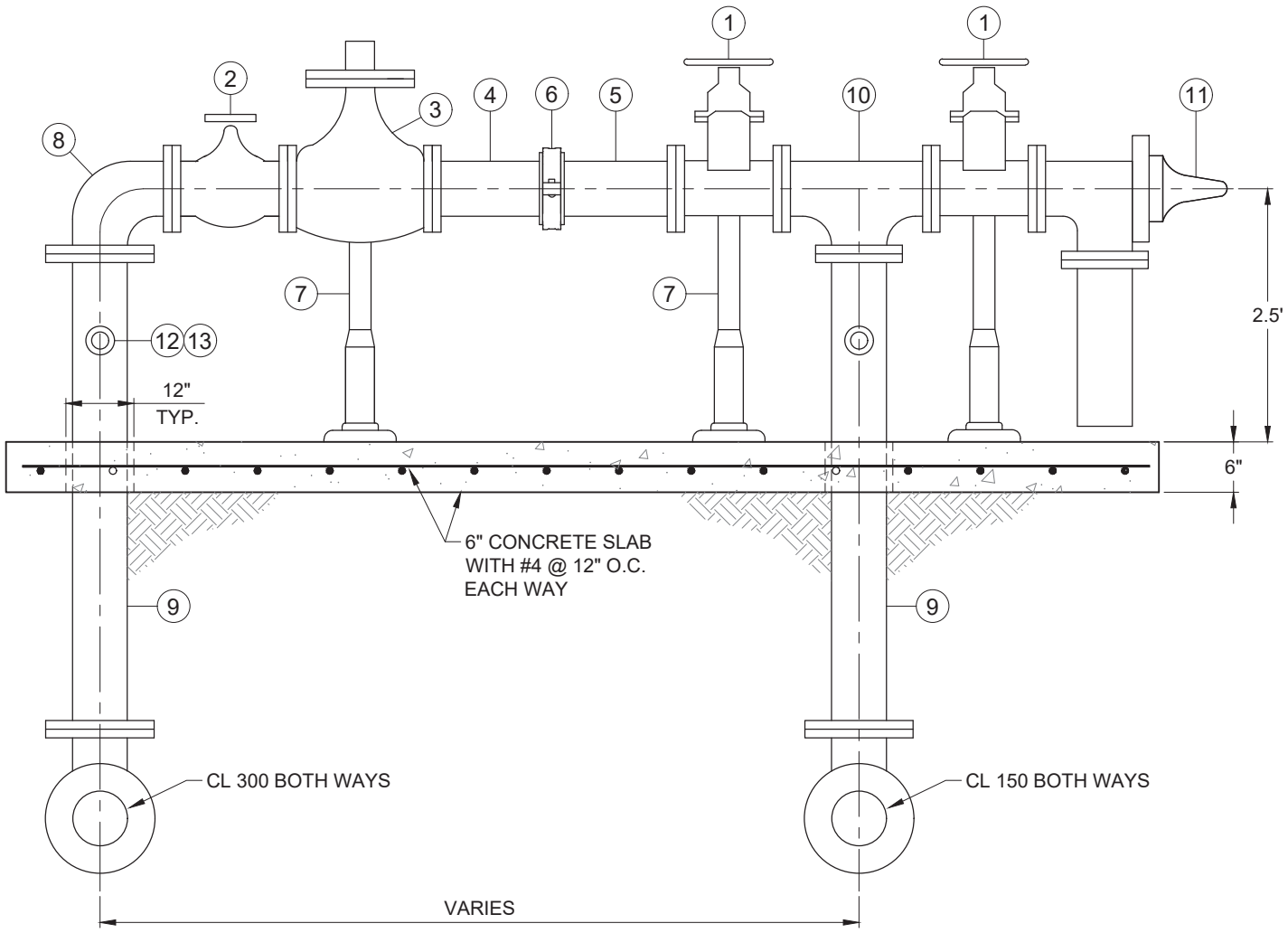
12/22/2021
DATE

W-107



NOTES:
1. FOR FULL PLAN VIEW SEE SHEET 2 OF 3.
2. FOR MATERIAL LIST SEE SHEET 3 OF 3.

PLAN VIEW



SECTION A-A

SINGLE STAGE PRESSURE REGULATION STATION

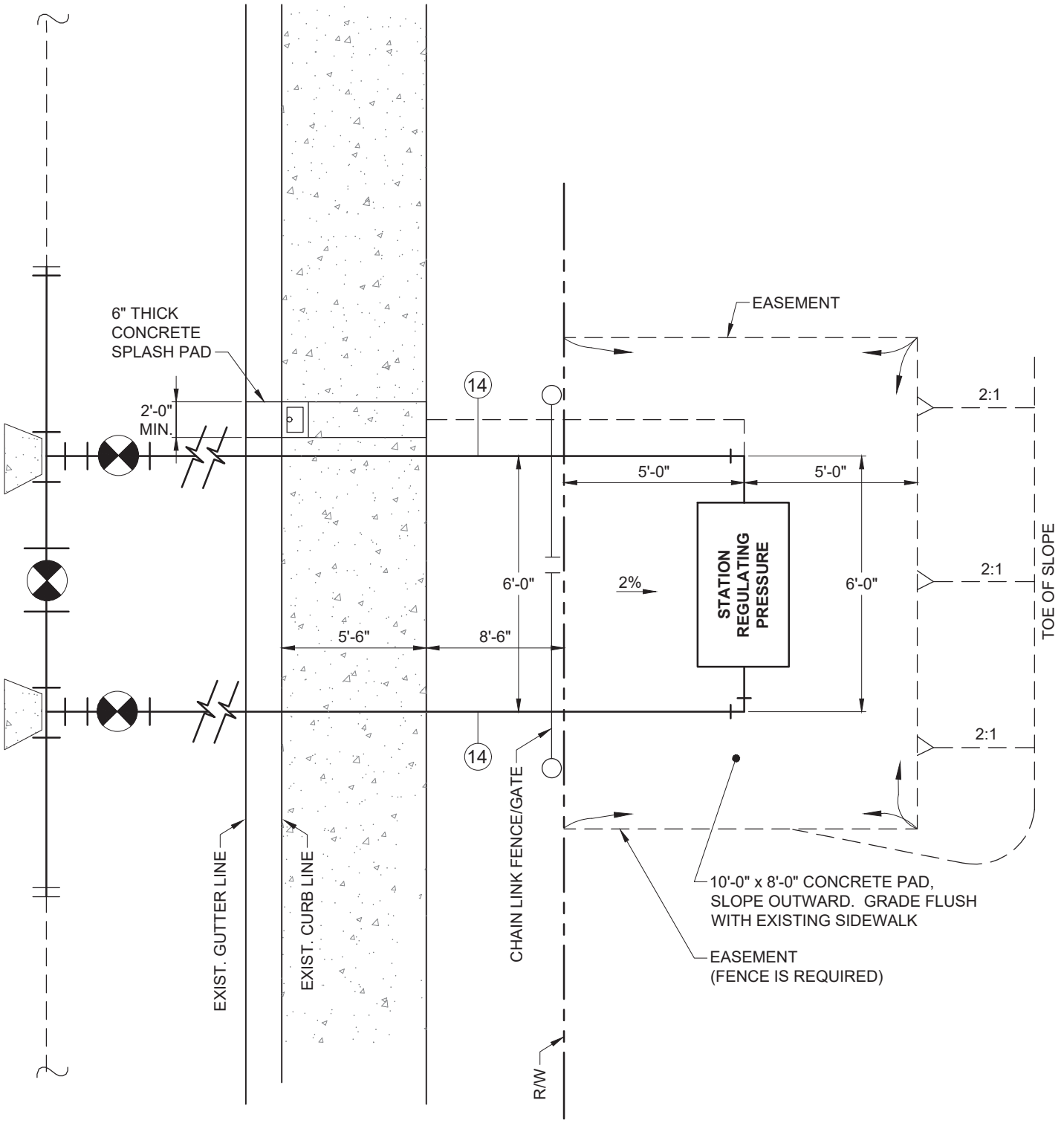
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-108



N.T.S.

SINGLE STAGE PRESSURE REGULATION STATION PLAN

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-108

1. GATE VALVE PER L.V.M.W.D. STD. SPECS. (150 p.s.i.) (FLAT FACE, HAND WHEEL) FLG x FLG
2. PLUG VALVE (400 p.s.i.) (WITH HAND WHEEL) FLG x FLG
3. PRESSURE REDUCING VALVE, CLA VAL 90G SERIES OR EQUAL, (S.S. TRIM), (WITH BRONZE DISC RETAINER AND DIAPHRAGM WASHER, 250 p.s.i.)
4. SCHEDULE 40 STEEL PIPE (CML) WITH FLANGE TO MATCH VALVE ON ONE END AND MILLED FOR GROOVED END COUPLING ON OTHER END
5. SCHEDULE 40 STEEL PIPE (CML) WITH FLANGE TO MATCH VALVE ON ONE END AND GROOVED END COUPLING ON OTHER END. THIS PIECE CAN BE WELDED IN FIELD AND FIELD COATED (REFER TO SPEC. SECTION 1.3 FOR SPECIFICS)
6. GROOVED END STANDARD COUPLINGS
7. ADJUSTABLE PIPE SUPPORT
8. 90° ELBOW FLG'D CML/CMC, OR CAST IRON 250 CL
9. STEEL PIPE CMLC (REFER TO SPEC. SECTION 1.3 FOR THICKNESS)
10. FLANGED STEEL TEE OR D.I. CL. 250
11. PRESSURE RELIEF VALVE CLA VAL 50A SERIES OR EQUAL (S.S. TRIM ANGLE VALVE) WITH BRONZE DISC RETAINER AND DIAPHRAGM WASHER
12. 2" WELD-ON COUPLING (HALF COUPLINGS, HEAVY DUTY). VARIES WITH DIFFERENT SIZE OF BY-PASS
13. (2) 2" STEEL PLUGS. VARIES WITH DIFFERENT SIZE OF BY-PASS
14. PVC PIPE

DIM	GENERIC PART NAME	PART DESCRIPTION	PRESSURE RATING (PSI)	LENGTH OF THE PARTS (INCHES)				
				4"	6"	8"	10"	12"
A	90° ELBOW	CENTERLINE OF PIPE (HIGH PRESSURE SIDE) TO EDGE OF FLANGE	250	6.50	8	9.00	11.00	12.00
B	PLUG VALVE	ROCKWELL FIG. 1489 OR EQUAL (WORM GEAR OPERATED)	400	-	13.00	14.25	16.75	17.50
C	PRESSURE REDUCING VALVE	CLA VAL MODEL 90G OR EQUAL	250	15.62	21.00	26.38	31.12	35.50
D	GATE VALVE	RESILIENT SEAT, PER LVMWD SPECS	200	9.00	10.50	11.50	13.00	14.00
E	TREE	OUTSIDE EDGE OF FLANGE TO CENTER LINE HALF OF MAIN RUN DIMENSION	250	6.50	8.00	9.00	11.00	12.00
F	-	THEORETICAL LENGTH OF SPOOL (SHIPPED PLAN END, CUT TO FIT)	250	23.88	23.50	25.87	25.13	29.00
		TOTAL LENGTH (INCHES)		61.500	84.00	96.00	108.00	120.00
		TOTAL LENGTH (FEET)		5.125	7.000	8.000	9.000	10.000

NOTE: P.R. STATION/SIZING/STAGING IS THE SUBJECT TO DISTRICT REVIEW. MULTIPLE STAGE DESIGN TO BE COORDINATED WITH THE DISTRICT.

SINGLE STAGE PRESSURE REGULATION STATION

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

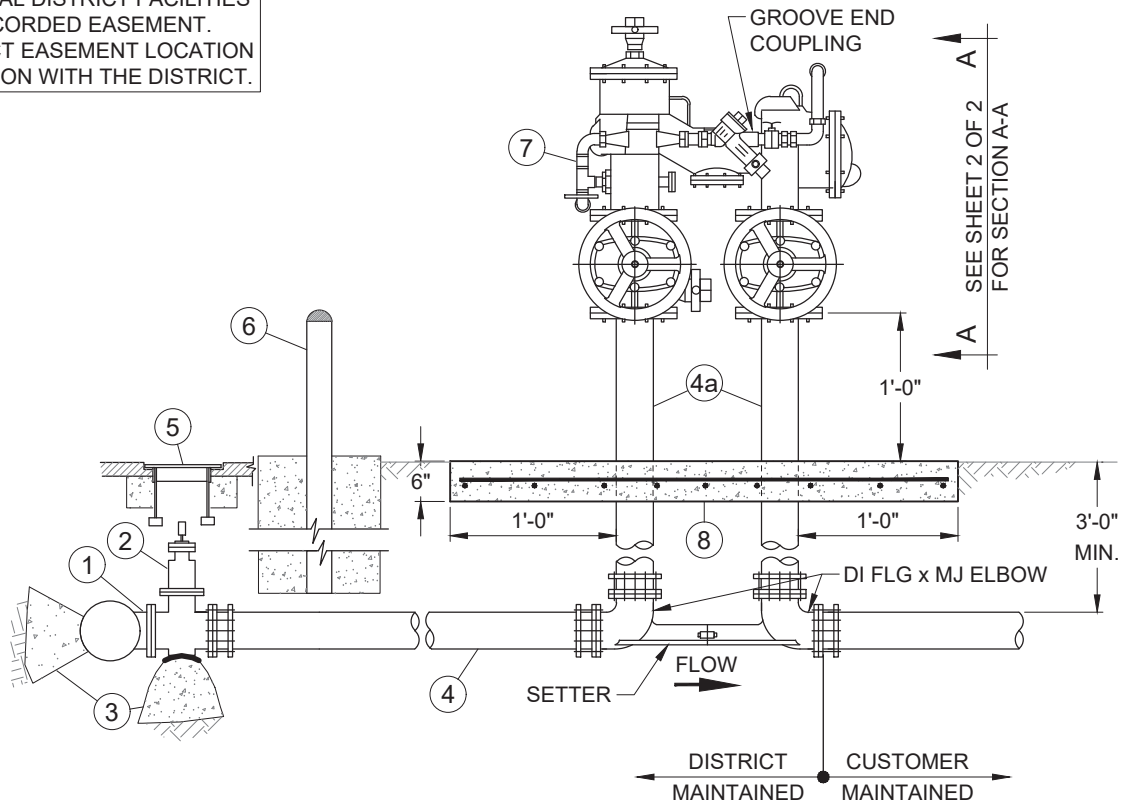
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-108

NOTE: TYPICAL DISTRICT FACILITIES TO HAVE RECORDED EASEMENT. VERIFY EXACT EASEMENT LOCATION AND DIMENSION WITH THE DISTRICT.



ELEVATION

1. FLANGED OUTLET CL 250 (INSTALL TEE OR REFER TO STANDARD DRAWING W-125 AND G-105 FOR SPECIFICS)
2. GATE VALVE FLG x MJ CLASS 250 (REFER TO SECTION 1.5 FOR SPECIFICS) (4" MINIMUM)
3. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)
4. PIPE PVC C-900 OR D.I. - AWWA C151 (PIPING TO BE 4" MINIMUM)
4a. DI SPOOL FLG x FLG
5. VALVE BOX AND COVER (REFER TO STANDARD DRAWING W-116 FOR SPECIFICS)
6. GUARD POST (REFER TO STANDARD DRAWING G-102 FOR SPECIFICS)
7. FEBCO BACKFLOW PREVENTION MODEL 876V DOUBLE CHECK VALVE DETECTOR
8. SUPPORT PAD (WITH #4 REBAR AT 8" ON CENTER)

NOTE:
1. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
2. SETTER TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED BY LVMWD STAFF.
3. FIRE DEPARTMENT CONNECTION SHOULD BE OUTSIDE OF LVMWD EASEMENT.

4" TO 10" DETECTOR CHECK INSTALLATION (ABOVE GROUND) WORKING PRESSURE UP TO 150 PSI

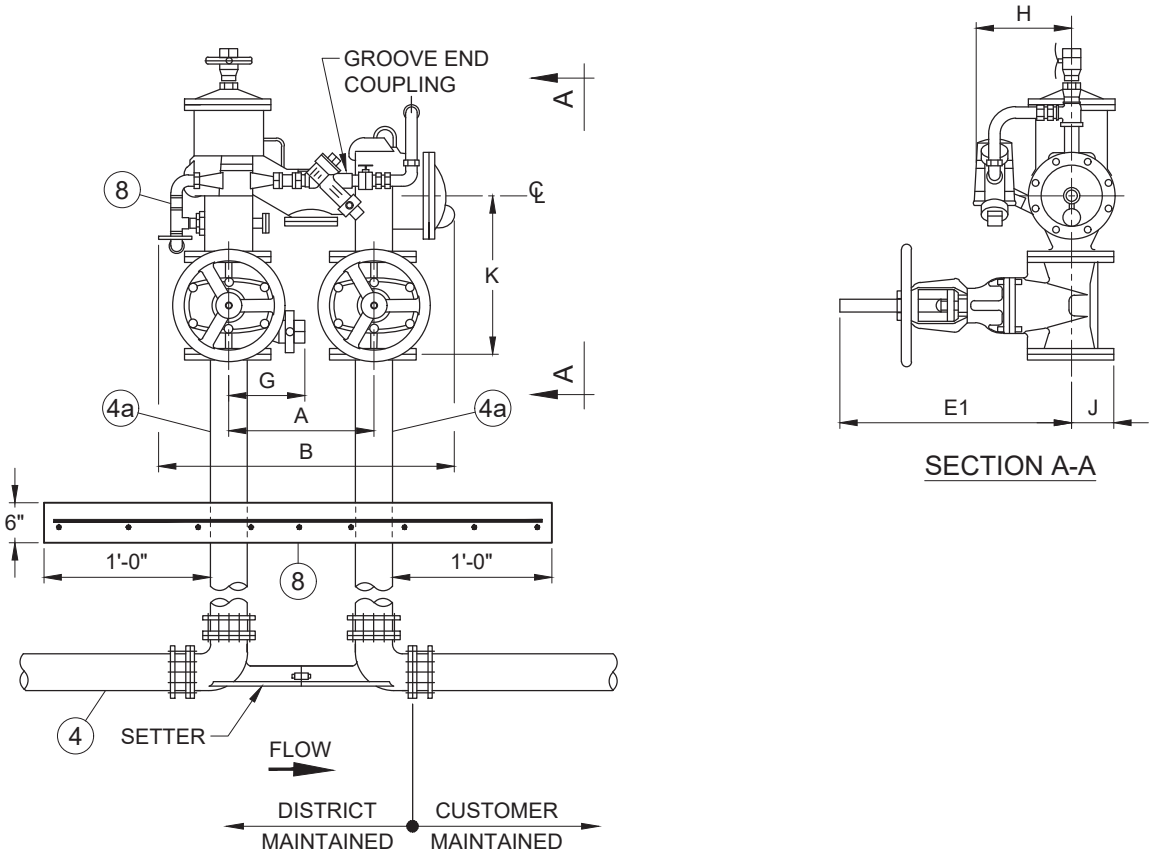
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-109



FEBCO MODEL 876V
DIMENSIONS

DATA PER MANUFACTURE CATALOG CONFIRM WITH MANUFACTURER FOR FINAL DIMENSIONS FOR INSTALLATION											
SIZE (INCHES)	A (INCHES)	B (INCHES)	C (INCHES)	E1 OS&Y OPEN (INCHES)	F (INCHES)	G (INCHES)	H (INCHES)	J (INCHES)	K (INCHES)	M (INCHES)	NET. OS&Y (LBS)
4	14	27-7/8	26-3/4	23-1/4	17-3/4	7	13	4-1/2	15-1/2	31	330
6	16	32-1/4	32-1/4	30-1/8	21-5/8	8	13	5-1/2	18-5/8	37-1/4	520
8	18-1/2	37-1/2	36-3/8	37-3/4	24-3/4	9-1/4	14-1/2	6-3/4	20-3/4	41-1/2	860
10	21	42-1/2	40-3/4	48	27-1/2	10	15	8	24	48	1460

4" TO 10" DETECTOR CHECK INSTALLATION (ABOVE GROUND) WORKING PRESSURE UP TO 150 PSI

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

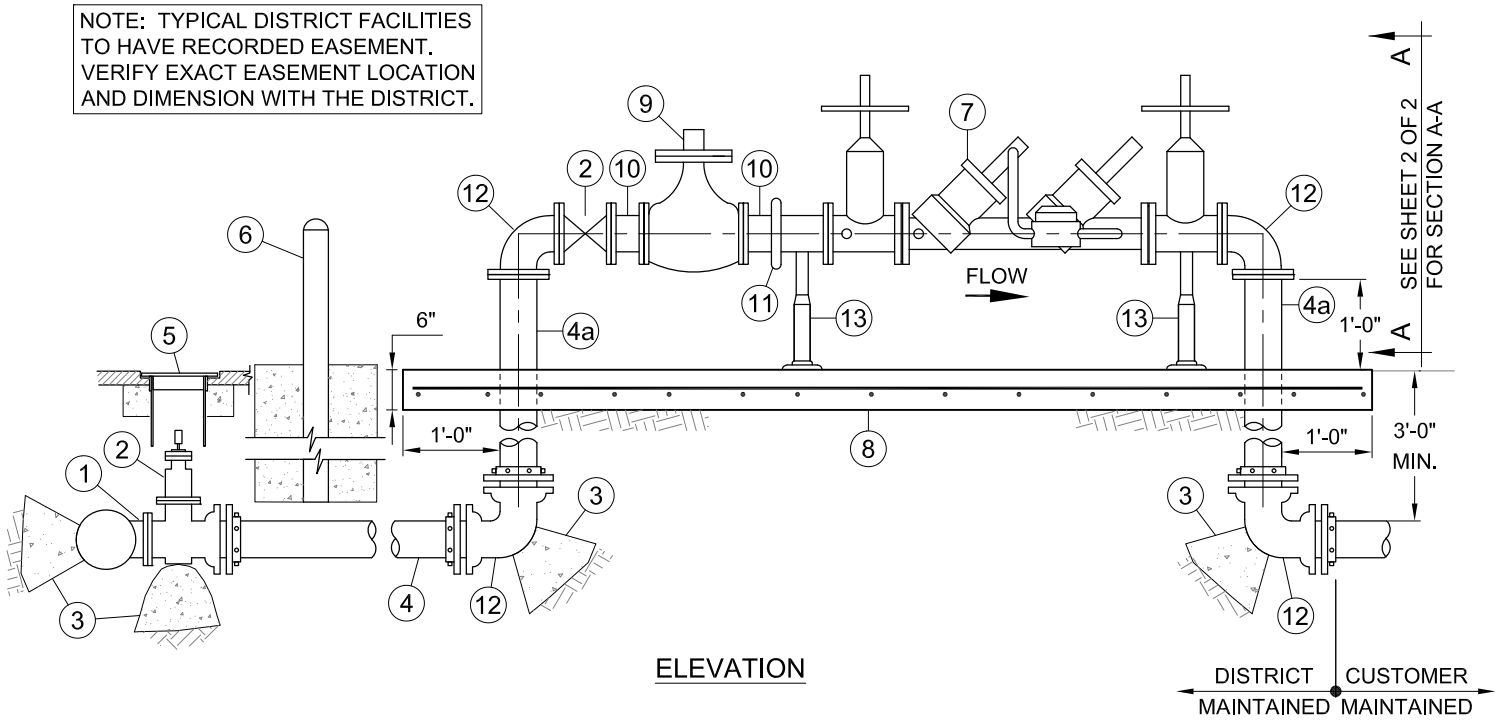
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-109

NOTE: TYPICAL DISTRICT FACILITIES TO HAVE RECORDED EASEMENT. VERIFY EXACT EASEMENT LOCATION AND DIMENSION WITH THE DISTRICT.



ELEVATION

1. FLANGED OUTLET CL 250 (INSTALL TEE OR REFER TO STANDARD DRAWING W-125 AND G-105 FOR SPECIFICS)
2. GATE VALVE FLG x FLG ABOVE CLASS 350 (REFER TO SECTION 1.5 FOR SPECIFICS) (4" MINIMUM)
3. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)
4. PIPE CMLC, REFER TO SPEC. SECTION 1.3 FOR THICKNESS (PIPING TO BE 4" MIN.)
4a. DI SPOOL FLG x PE
5. VALVE BOX AND COVER (REFER TO STANDARD DRAWING W-116 FOR SPECIFICS)
6. GUARD POST (REFER TO STANDARD DRAWING G-102 FOR SPECIFICS)
7. FEBCO BACKFLOW PREVENTION MODEL LF856 DOUBLE CHECK VALVE DETECTOR
8. SUPPORT PAD (WITH #4 REBAR AT 8" ON CENTER)
9. PRESSURE REDUCING VALVE, CLA-VAL MODEL 90 - 01 OR EQUAL (S.S. TRIM, WITH BRONZE DISC RETAINER AND DIAPHRAGM WASHER)
10. DI SPOOL, FLG x GE, OR DI SPOOL FLG x FLG
11. GROOVED END COUPLING
12. 90° ELBOW DI MJ CL 350
13. ADJUSTABLE PIPE SUPPORT

NOTE:
1. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
2. SETTER TO REMAIN IN PLACE UNLESS OTHERWISE DIRECTED BY LVMWD STAFF.
3. FIRE DEPARTMENT CONNECTION SHOULD BE OUTSIDE OF LVMWD EASEMENT.

4" TO 10" DETECTOR CHECK INSTALLATION (ABOVE GROUND) WORKING PRESSURE 151 PSI AND ABOVE

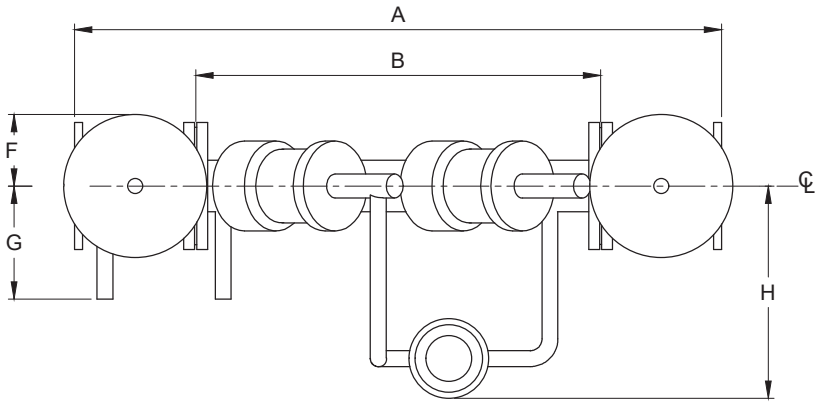
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

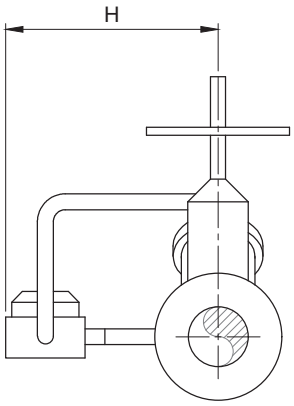
PRINCIPAL ENGINEER

12/22/2021
DATE

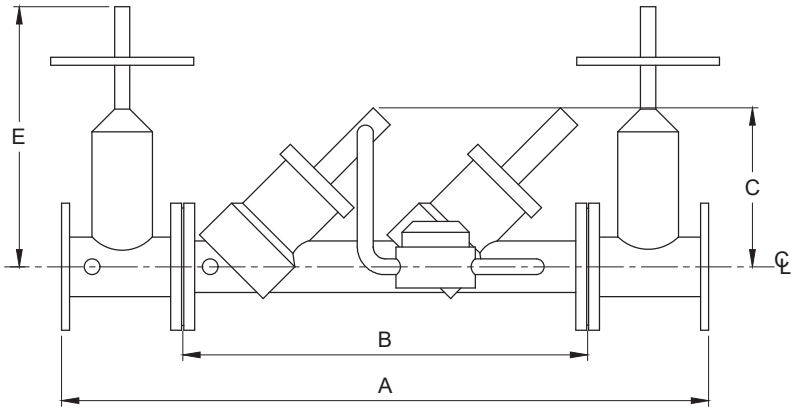
W-110



PLAN VIEW



END VIEW A-A



ELEVATION VIEW

FEBCO MODEL LF856 DIMENSIONS

DATA PER MANUFACTURE CATALOG CONFIRM WITH MANUFACTURER FOR FINAL DIMENSIONS FOR INSTALLATION								
SIZE (INCHES)	A (INCHES)	B (INCHES)	C (INCHES)	E (INCHES)	F (INCHES)	G (INCHES)	H (INCHES)	WEIGHT OSY (LBS)
4	46-1/4	28	10-1/8	23-1/4	5-1/2	8-1/8	14	338
6	56	34-3/4	12-3/4	30-1/8	6-1/2	9-7/8	15	515
8	65	41-3/4	15-5/8	37-3/4	7	11-1/8	15-3/4	826
10	72-5/8	46-3/8	15-5/8	48	9	12-3/8	15-3/4	1234

4" TO 10" DETECTOR CHECK INSTALLATION (ABOVE GROUND) WORKING PRESSURE 151 PSI AND ABOVE

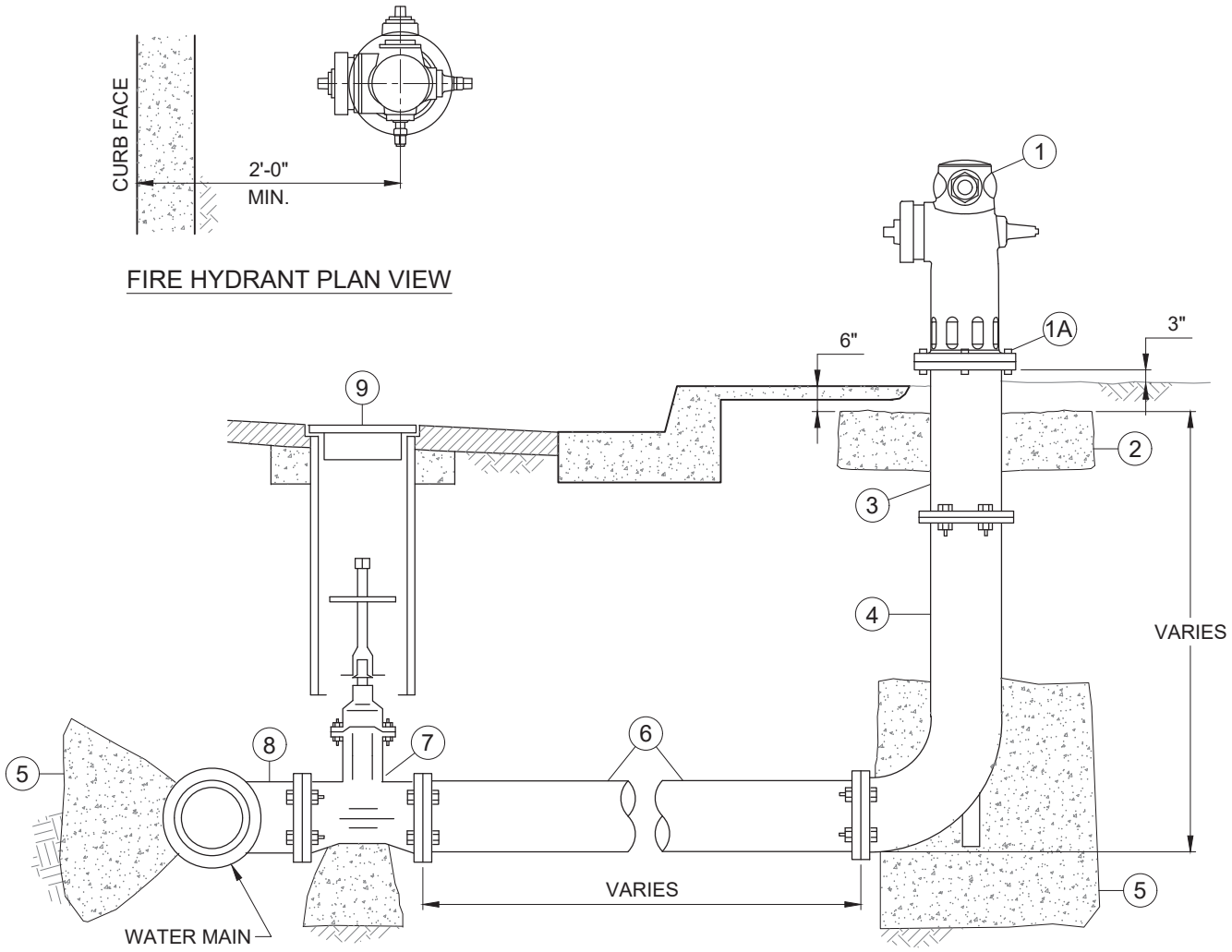
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-110



1. FIRE HYDRANT ASSEMBLY (250 PSI RATING UNIBODY JONES OR EQUAL, REFER TO SPEC. SECTION 1.10 AND STANDARD DRAWING W-123 FOR LOCATION SPECIFICS)
1A. SHEAR BOLTS AND 6" SLIP-ON WELD FLANGE, CL 300. WELD NUTS TO BOTTOM FLANGE
2. CONCRETE SUPPORT BLOCK (6" x 24" x 24")
3. 6" HYDRANT EXTENSION
4. 6" FIRE HYDRANT BURY
5. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)
6. PIPE (SEE NOTE 1.)
7. 6" GATE VALVE 250 PSI MIN. (REFER TO SPEC. SECTION 1.5) FLG x FLG
8. FLANGE OUTLET (SEE NOTE 1. AND STANDARD DRAWINGS W-125 AND G-105)
9. VALVE BOX AND COVER (REFER TO STANDARD DRAWING W-116 FOR SPECIFICS)
10. HYDRANT GUARD, STAINLESS STEEL DUAL PLATE CHECK VALVE FOR WET BARREL HYDRANTS (PRESSURE RATED FOR 350 PSI)

NOTES:
1. FOR STATIC PRESSURE BELOW 150 PSI, DI OR STEEL CML/CMC FITTINGS SHALL BE USED. REFER TO SPEC. SECTION 1.3 FOR THICKNESS.
2. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
3. HYDRANT GUARD TO BE INSTALLED IN HIGH RISK AREAS AS DIRECTED BY THE DISTRICT.

FIRE HYDRANT INSTALLATION
WORKING PRESSURE UP TO 150 PSI

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

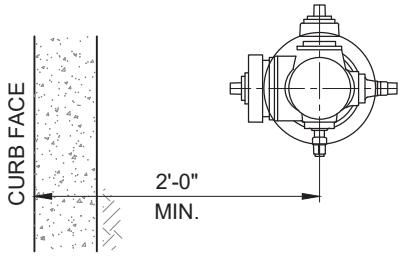
REVISIONS

NO.	BY	DATE	APRVD.

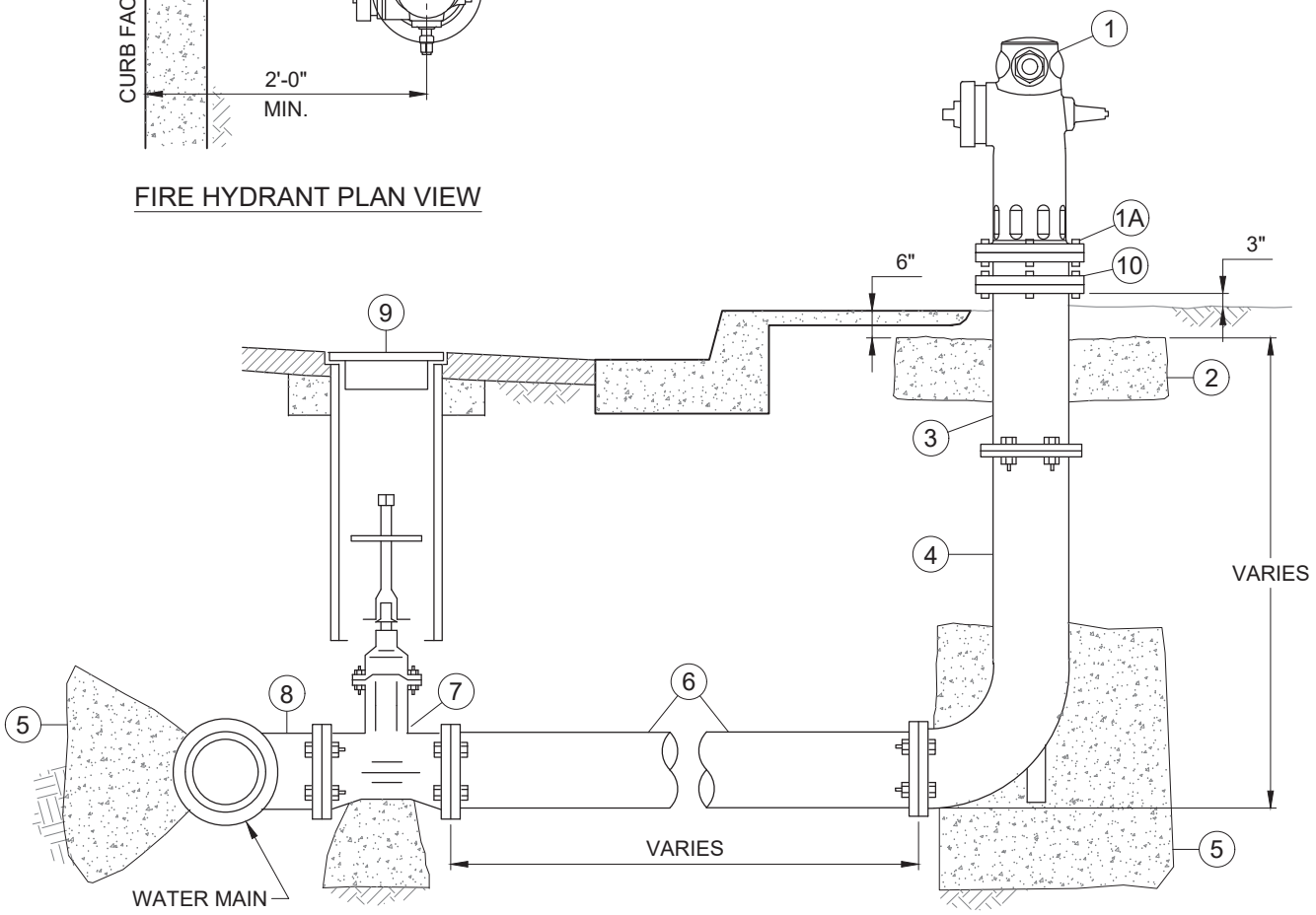
PRINCIPAL ENGINEER

12/22/2021
DATE

W-111



FIRE HYDRANT PLAN VIEW



1. FIRE HYDRANT ASSEMBLY (350 PSI RATING UNIBODY JONES OR EQUAL, WITH RED PLASTIC CAP, REFER TO SPEC. SECTION 1.10 AND STANDARD DRAWING W-123 FOR LOCATION SPECIFICS)
1A. SHEAR BOLTS AND 6" SLIP-ON WELD FLANGE, CL 350. WELD NUTS TO BOTTOM FLANGE
2. CONCRETE SUPPORT BLOCK (6" x 24" x 24")
3. 6" HYDRANT EXTENSION
4. 6" FIRE HYDRANT BURY
5. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)
6. PIPE (SEE NOTE 1.)
7. 6" GATE VALVE 350 PSI MIN. (REFER TO SPEC. SECTION 1.5)
8. FLANGE OUTLET (SEE NOTE 1. AND STANDARD DRAWINGS W-125 AND G-105)
9. VALVE BOX AND COVER (REFER TO STANDARD DRAWING W-116 FOR SPECIFICS)
10. HYDRANT GUARD, STAINLESS STEEL DUAL PLATE CHECK VALVE FOR WET BARREL HYDRANTS (350 PSI PRESSURE RATED)

NOTES:
1. FOR STATIC PRESSURES EXCEEDING 150 PSI, STEEL PIPE AND FITTINGS CML/CMC SHALL BE USED. REFER TO SPEC. SECTION 1.3 FOR THICKNESS.
2. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.

FIRE HYDRANT INSTALLATION
WORKING PRESSURE ABOVE 150 PSI

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

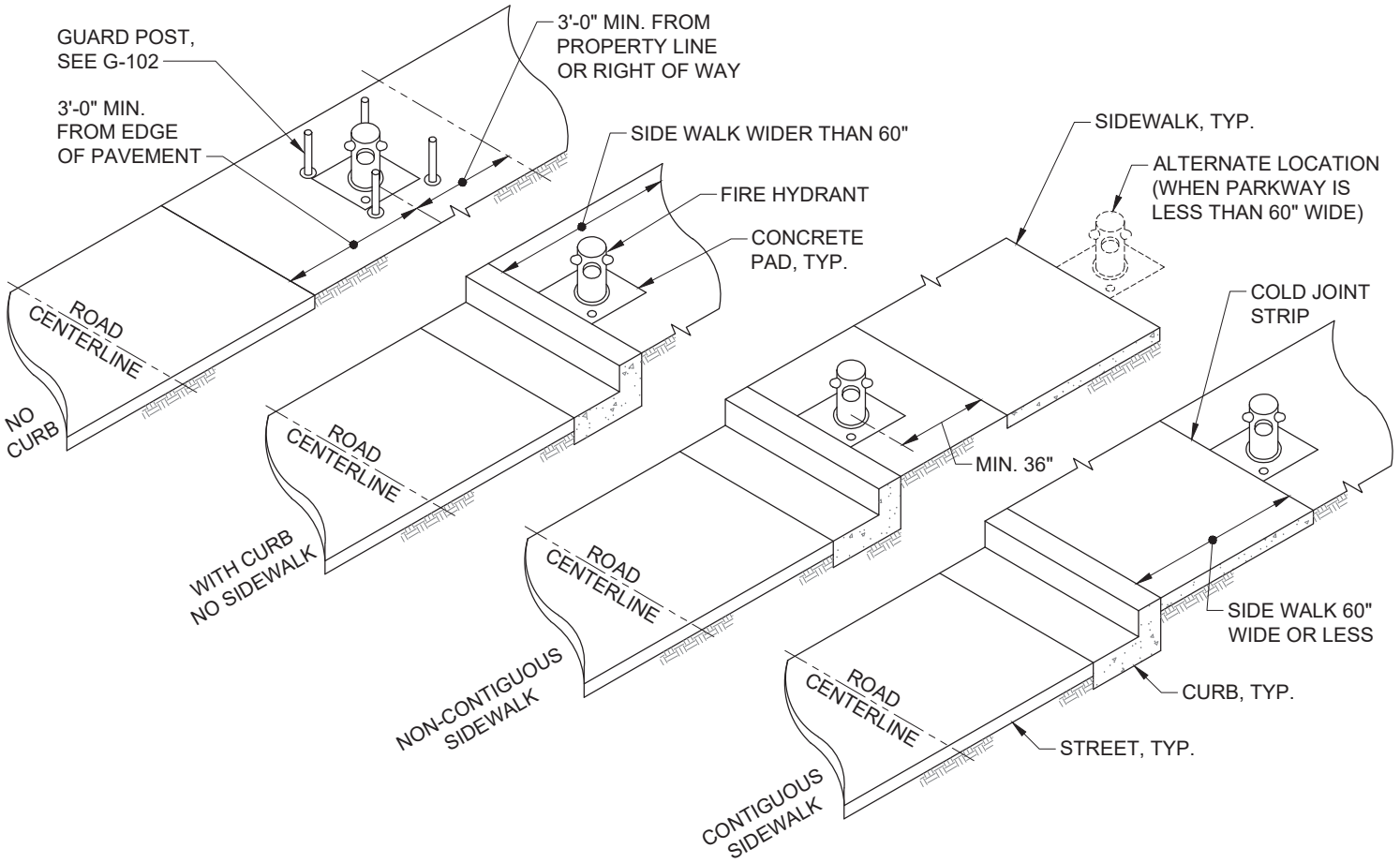
REVISIONS

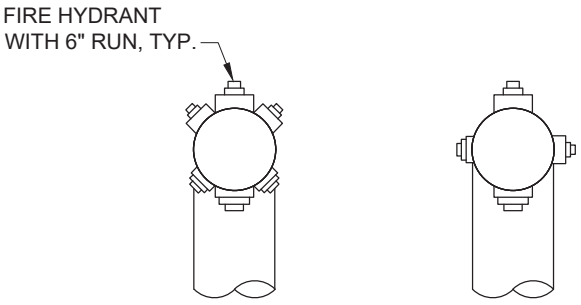
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-111





NOTE:

1. FIRE HYDRANT SHALL BE INSTALLED WITH THE LARGEST PORT PERPENDICULAR TO THE STREET.
2. THE DISTANCE FROM THE FACE OF CURB TO THE CENTERLINE OF THE FIRE HYDRANT SHALL BE 2'-0" MINIMUM.
3. CONSTRUCT CONCRETE OR BLOCK RETAINING WALL IF THE HYDRANT IS INSTALLED IN AN UNPAVED OR LANDSCAPED LOCATION. (REFER TO STANDARD DRAWING G-101).
4. WHEN REQUIRED, NUMBER OF POSTS AND LOCATION TO BE SHOWN ON THE PLANS.

FIRE HYDRANT LOCATION AND PORT ORIENTATION

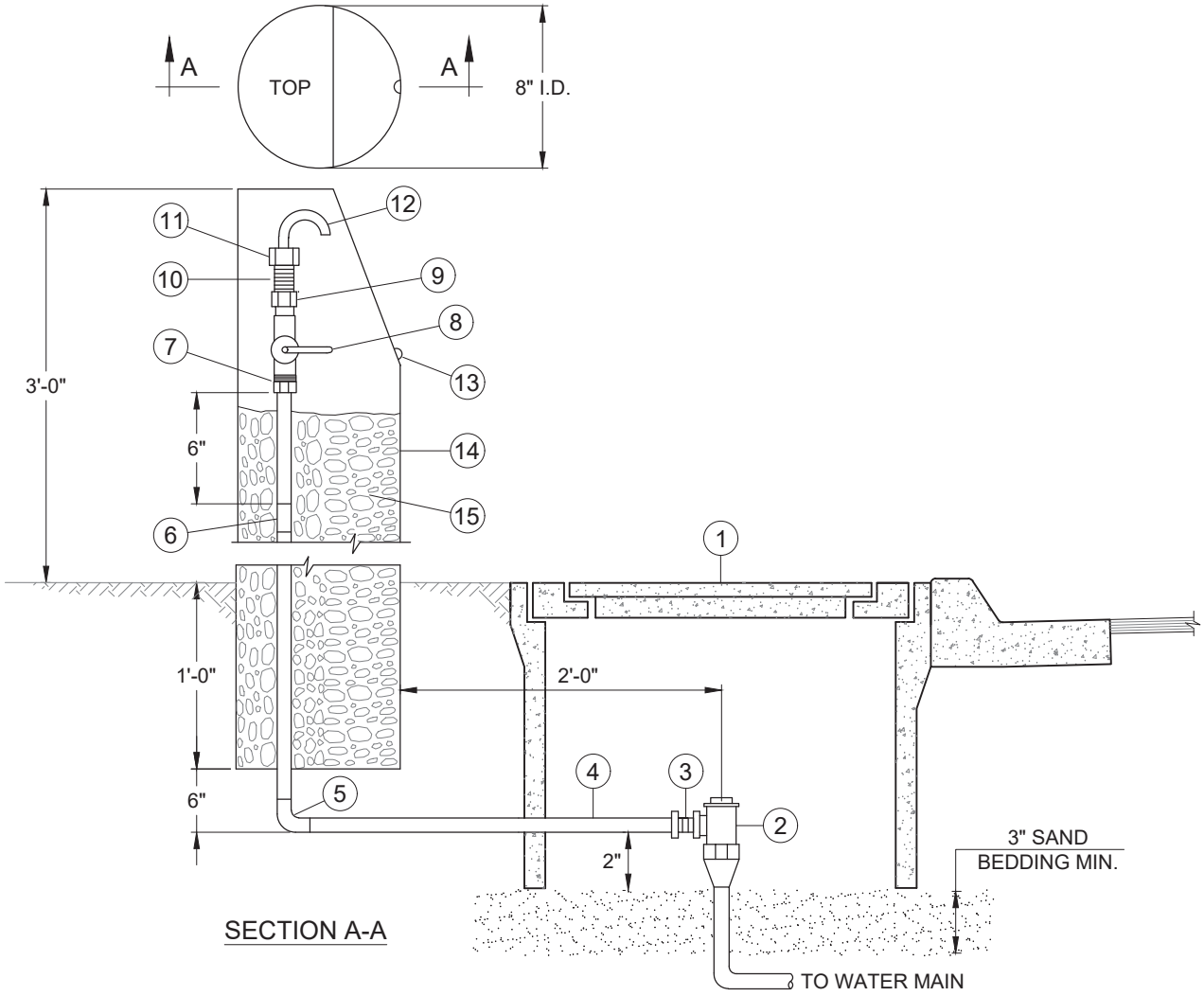
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-111



1. METER BOX (REFER TO STANDARD DRAWING W-123 FOR SPECIFICS)
2. ANGLE METER STOP VALVE
3. ADAPTER (1" x 1")
4. STAINLESS STEEL TUBING (SEE NOTE NO. 1)
5. 90° STAINLESS STEEL ELBOW
6. REDUCER (1" x 1/2")
7. STAINLESS STEEL ADAPTER (1/2")
8. BALL VALVE (1/2")
9. BUSHING (1/2")
10. STAINLESS STEEL NIPPLE (3/8")
11. STAINLESS STEEL FLARE NIPPLE (3/8")
12. STAINLESS STEEL TUBING (3/8" x 6")
13. LOCK (STANDARD KEY)
14. SAMPLE STATION COVER (STAINLESS STEEL, 12"Ø, 36" HEIGHT - SEE NOTE NO. 2)
15. 3/4" CRUSHED ROCK

NOTES:
1. REFER TO SPEC SECTION 1.10 FOR MATERIALS SPECIFICATIONS.
2. REFER TO STANDARD DRAWING W-123 FOR LOCATION SPECIFICS.

1" WATER SAMPLING STATION

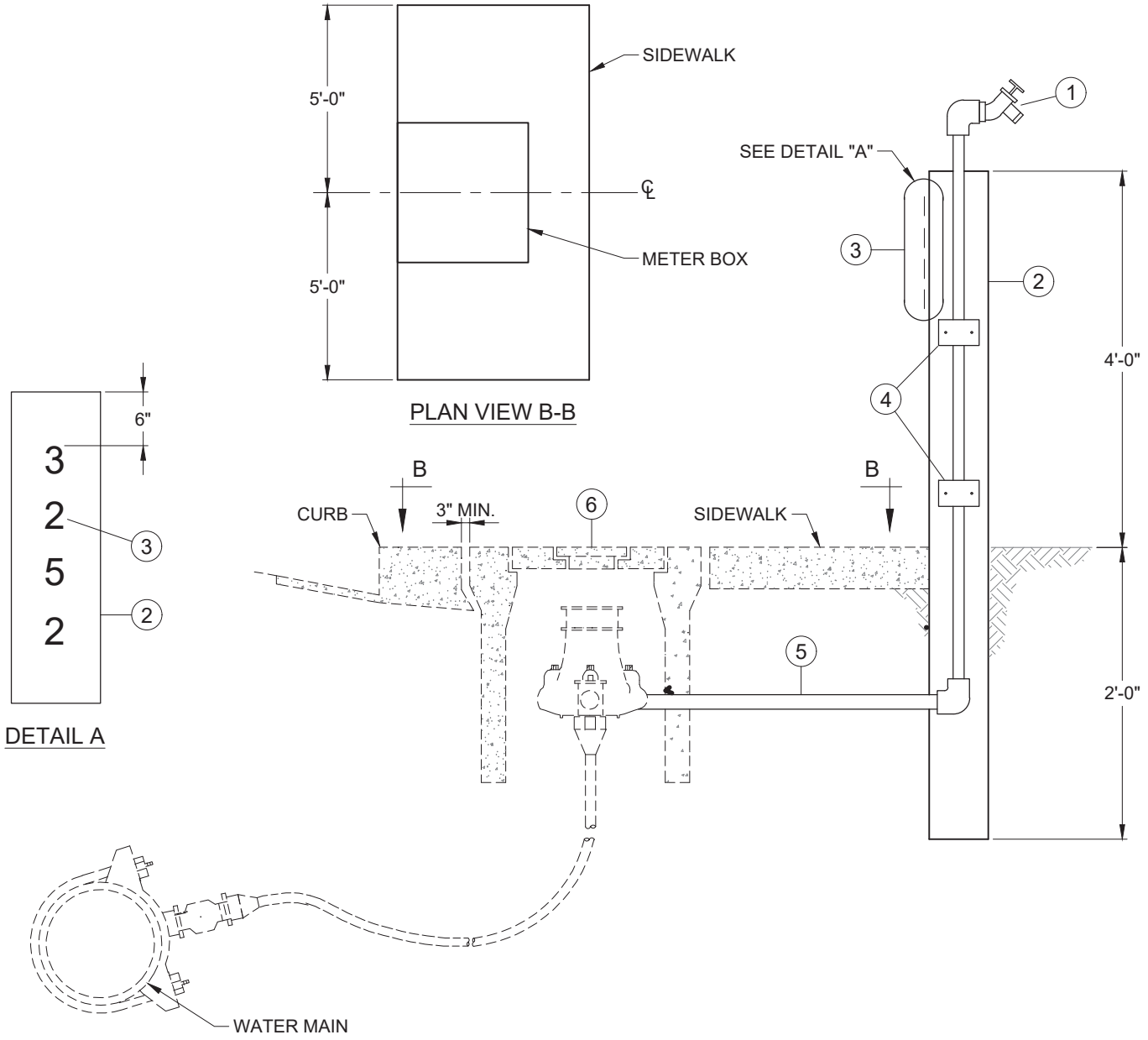
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-112



1. HOSE BIB WITH ANTI-SIPHON ON OUTLET
2. REDWOOD POST (4" x 4" x 6")
3. LOT NUMBER / ADDRESS 2" HIGH METAL NUMBERS (SEE DETAIL "A" ABOVE)
4. PIPE STRAP
5. CUSTOMER SERVICE LINE COPPER TUBING
6. VALVE BOX AND COVER PER STANDARD DRAWING W-116.

NOTES:
1. FOR CONNECTION TO METER, REFER TO STANDARD DRAWINGS W-102 THROUGH W-105 FOR SPECIFICS.

TEMPORARY RISER AND HOSE BIB

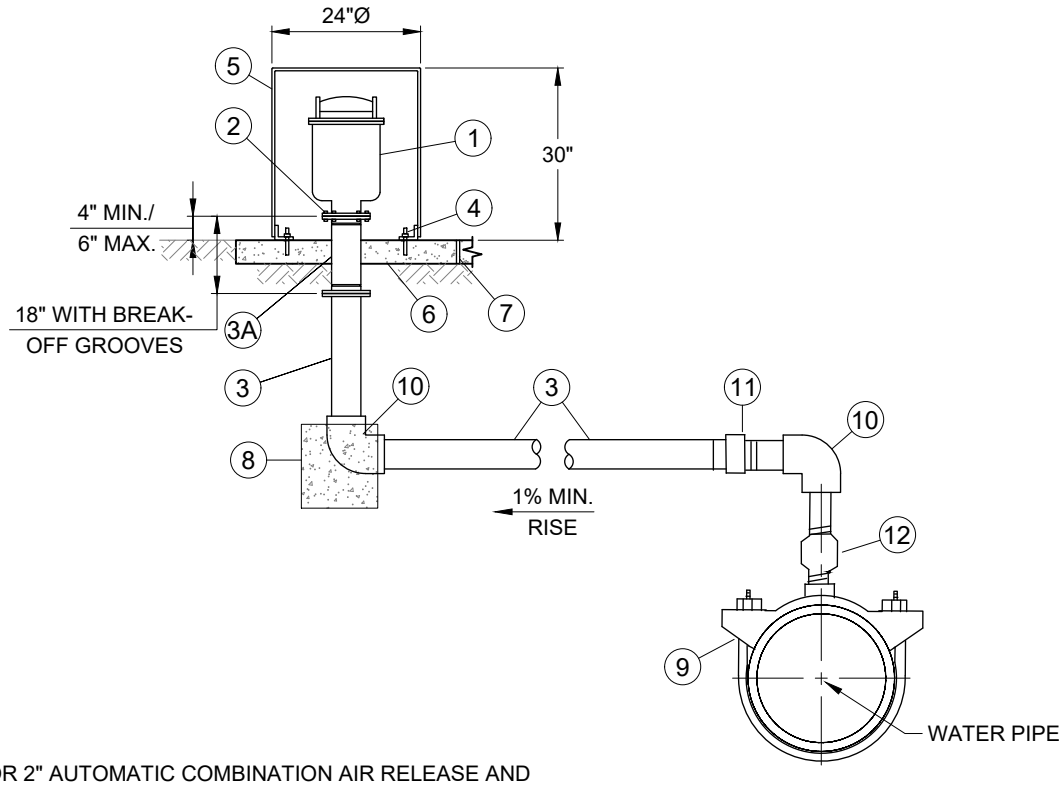
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-113



1. 1" OR 2" AUTOMATIC COMBINATION AIR RELEASE AND AIR/VACUUM VALVE ASSEMBLY VENT-O-MAT OR EQUAL
2. BALL VALVE, SEE NOTE 2.
3. 1" OR 2" COPPER PIPE, RIGID
3A. 1" OR 2" BRASS PIPE
4. 5/8" x 3" STAINLESS STEEL DROP-IN ANCHORS (3 EACH AT 12" APART)
5. POLYETHYLENE VENTED VALVE ENCLOSURE, SEE NOTE 1.
6. 42" x 42" x 6" THICK CONCRETE SLAB
7. COLD JOINT STRIP
8. CONCRETE THRUST/ANCHOR BLOCK (REFER TO STANDARD DRAWING W-127)
9. SERVICE SADDLE (REFER TO STANDARD DRAWING W-118 FOR CONNECTION TO STEEL MAIN)
10. 1" OR 2" COPPER 90° BEND, SOLDERED
11. ADAPTER
12. 1" OR 2" CORPORATION STOP (SEE NOTE 4.)

NOTES:

1. FOR AREAS PRONE TO FIRE, USE GALVANIZED STEEL COVER. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
2. FIP X FIP BALL VALVE.
3. AIR AND VACUUM VALVES INSTALLED FOR THE USE OF POTABLE/RECYCLED WATER SHALL BE IDENTIFIED AS DESCRIBED IN PLANS.
4. FOR STEEL AND DI MAINS, AIR RELEASE PIPE MATERIAL AND COATINGS SHALL BE OF THE SAME MATERIALS AS THE MAIN LINE.
5. FOR PVC MAINS, DI PIPE SHALL BE COATED PER SPECIFICATIONS.
6. FOR WORKING PRESSURE ABOVE 150 PSI, USE CLASS 350 VALVES AND FITTINGS.
7. NO INTERMEDIATE JOINTS PERMITTED WITHOUT APROVAL OF LVMWD. SERVICE LINES TO RECEIVE BACKFILL OF IMPORTED SAND WITHIN PIPE ZONE (REFER TO STANDARD DRAWING W-101).

1" AND 2" AIR AND VACUUM VALVE FOR 6" TO 18" MAINS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

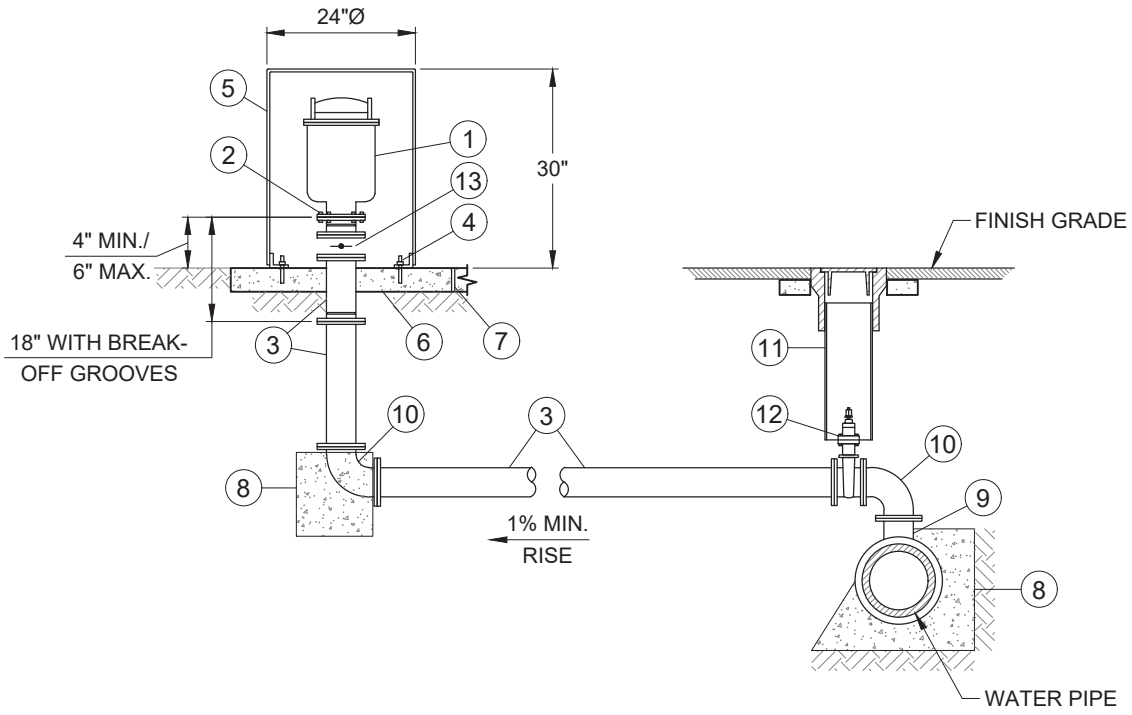
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-114



1. 4" OR 6" AUTOMATIC COMBINATION AIR RELEASE AND AIR/VACUUM VALVE ASSEMBLY VENT-O-MAT RBX SERIES OR EQUAL
2. BREAK-AWAY BOLTS, SEE NOTE 2.
3. 4" OR 6" FLANGED DUCTILE IRON PIPE x REQUIRED LENGTH
4. 5/8" x 3" STAINLESS STEEL DROP-IN ANCHORS (3 EACH AT 12" APART)
5. POLYETHYLENE VENTED VALVE ENCLOSURE, SEE NOTE 1.
6. 42" x 42" x 6" THICK CONCRETE SLAB
7. COLD JOINT STRIP
8. CONCRETE THRUST/ANCHOR BLOCK (REFER TO STANDARD DRAWING W-127)
9. MAIN PIPE SIZE x 4" OR 6" MJ/FLG x FLG TEE
10. 4" OR 6" FLANGE 90° BEND
11. VALVE BOX AND COVER PER STANDARD DRAWING W-116
12. 4" OR 6" GATE VALVE
13. 4" OR 6" BUTTERFLY VALVE, FLG x FLG

NOTES:

1. FOR AREAS PRONE TO FIRE, USE GALVANIZED STEEL COVER. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
2. BREAK-AWAY BOLTS SHALL BE 5/8" x 3" WITH 3/8" HOLE DRILLED IN THE SHAFT OF THE BOLT. INSTALL WITH HEX HEAD ON TOP OF FLANGE.
3. AIR AND VACUUM VALVES INSTALLED FOR THE USE OF POTABLE/RECYCLED WATER SHALL BE IDENTIFIED AS DESCRIBED IN PLANS.
4. FOR STEEL AND DI MAINS, AIR RELEASE PIPE MATERIAL AND COATINGS SHALL BE OF THE SAME MATERIALS AS THE MAIN LINE.
5. FOR PVC MAINS, DI PIPE SHALL BE COATED PER SPECIFICATIONS.
6. FOR WORKING PRESSURE ABOVE 150 PSI, USE CLASS 350 VALVES AND FITTINGS.
7. NO INTERMEDIATE JOINTS PERMITTED WITHOUT APROVAL OF LVMWD. SERVICE LINES TO RECEIVE BACKFILL OF IMPORTED SAND WITHIN PIPE ZONE (REFER TO STANDARD DRAWING W-101).

4" AND 6" AIR AND VACUUM VALVE FOR 18" AND LARGER MAINS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

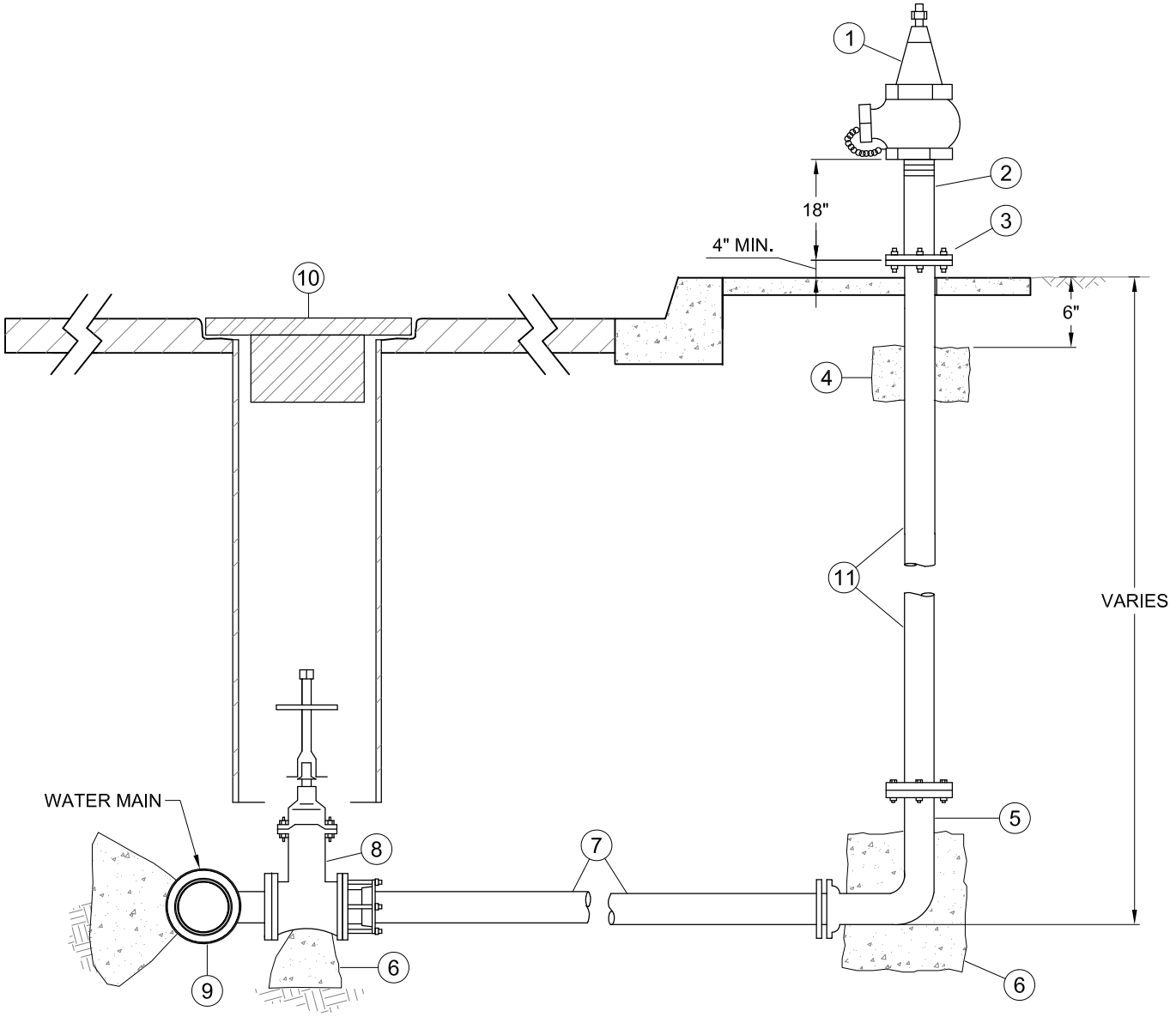
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-114



1. 4" ANGLE FIRE HYDRANT (SEE NOTE 1.; REFER TO SPEC. SECTION 1.10 AND STANDARD DRAWING W-123 FOR LOCATION SPECIFICS)
2. 4" NIPPLE (STEEL CML) OR DI SPOOL FLG x THREAD
3. SHEAR BOLTS AND COMPANION ADAPTOR FLG
4. CONCRETE SUPPORT BLOCK (6" x 24" x 24")
5. 90° ELBOW DI, FLG x MJ
6. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)
7. 4" PVC PIPE (SEE NOTE 4.)
8. 4" VALVE FLG x FLG (REFER TO SECTION 1.5 FOR SPECIFICS)
9. FLANGE OUTLET (INSTALL TEE OR REFER TO STANDARD DRAWINGS W-125 OR G-105 FOR SPECIFICS)
10. VALVE BOX AND COVER (REFER TO STANDARD DRAWING W-116 FOR SPECIFICS)
11. 4" DI PIPE

NOTES:
1. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
2. 10 GA STEEL PIPE AND FITTINGS CML/CMC OR DI. REFER TO SPEC. SECTION 1.10 FOR SPECIFICS.
3. REFER TO SECTION 1.10 FOR MATERIAL SPECIFICATIONS.
4. BLOW OFF ASSEMBLY PIPING MATERIAL SHALL MATCH THE TYPE OF MAIN LINE PIPING MATERIAL. IF MAIN LINE IS PVC USE EITHER STEEL OR DI.

4" CLASS 200 OR 400 BLOW-OFF INSTALLATION

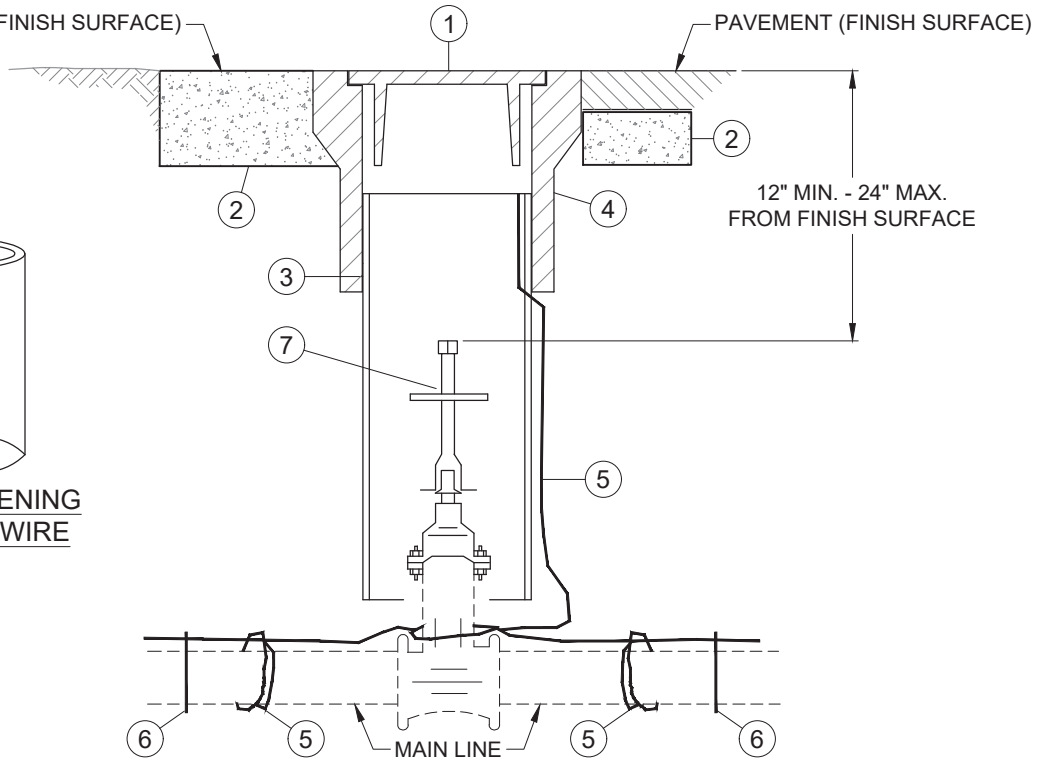
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

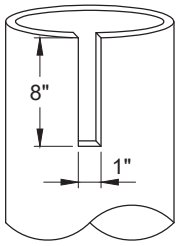
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

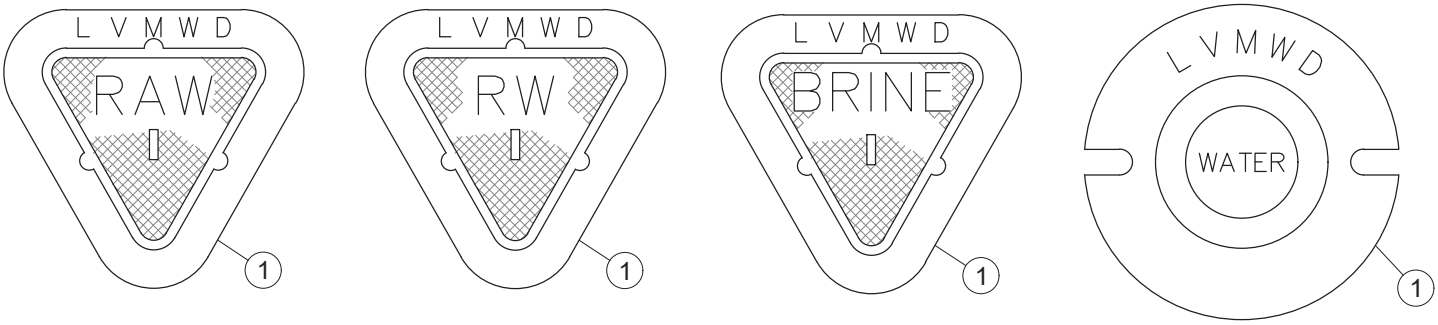
12/22/2021
DATE

W-115





RISER PIPE OPENING
FOR TRACER WIRE



TYPICAL IDENTIFICATION

1. VALVE BOX FRAME AND COVER (ALHAMBRA FOUNDRY OR EQUAL, REFER TO SPEC. SECTION 1.5, SEE NOTE 1.)
2. CLASS B CONCRETE COLLAR (20"Ø, 6" HIGH) REINFORCED WITH W.W.F. 1.6 x 1.6 IN TURF BLOCK AND UNPAVED CONDITIONS). DO NOT USE CONCRETE COLLAR FOR WATER VALVES
3. PVC RISER PIPE (8" O.D.)
4. VALVE CAN
5. COPPER WIRE (REFER TO SPEC. SECTION 1.3 FOR SPECIFICS)
6. ADHESIVE TAPE (10 MIL. 2" WIDE)
7. VALVE EXTENSION (REFER TO STANDARD DRAWING W-117 FOR SPECIFICS)

NOTES:
1. VALVE COVER TO BE IRON WITH LETTERS "LVMWD" CAST THEREON.
2. FOR DOMESTIC WATER LINES ADD "WATER".
3. FOR RECYCLED WATER LINES ADD "RW".
4. FOR RAW WATER SUPPLY LINES ADD "RAW".
5. FOR BRINE WASTE LINES ADD "BRINE".
6. REFER TO SECTION 1.5 FOR SPECIFICATIONS.

VALVE BOX AND COVER IDENTIFICATION

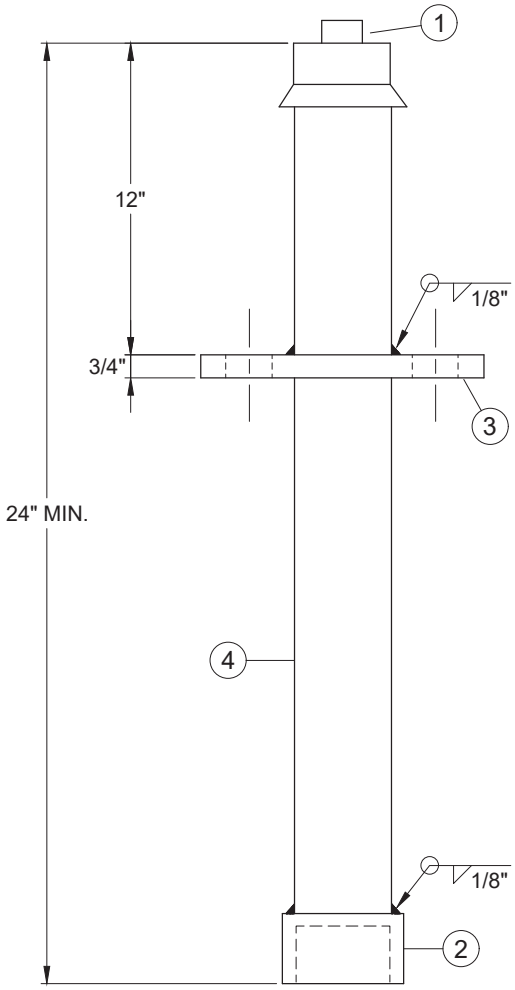
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

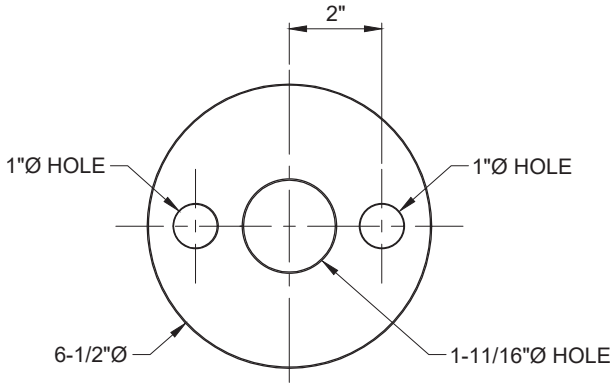
PRINCIPAL ENGINEER

12/22/2021
DATE

W-116



EXTENSION STEM



SPACER PLATE

1. A.W.W.A. - 2" SQUARE OPERATING NUT
2. SOCKET - 2" SQUARE OPERATING NUT
3. SPACER PLATE (SEE NOTE 3.)
4. EXTENSION STEM (1-1/4" SOLID, ROUND OR SQUARE STEEL BAR STOCK; PINNED COUPLERS ARE UNACCEPTABLE, HOLLOW TUBE OR PIPE ARE NOT ALLOWED)

NOTES:
1. PROVIDE VALVE STEM EXTENSION WHEN DEPTH TO OPERATING NUT EXCEED 48" (FABRICATE EXTENSION TO FIELD MEASUREMENT).
2. NO VALVE STEM EXTENSION SHALL BE LESS THAN 2" IN LENGTH. TERMINATE EXTENSION 12" TO 24" FROM FINISHED GRADE.
3. PROVIDE ADDITIONAL SPACER PLATE WHEN DISTANCE TO BOTTOM SOCKET EXCEEDS 5'-0".
4. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.

VALVE STEM EXTENSION

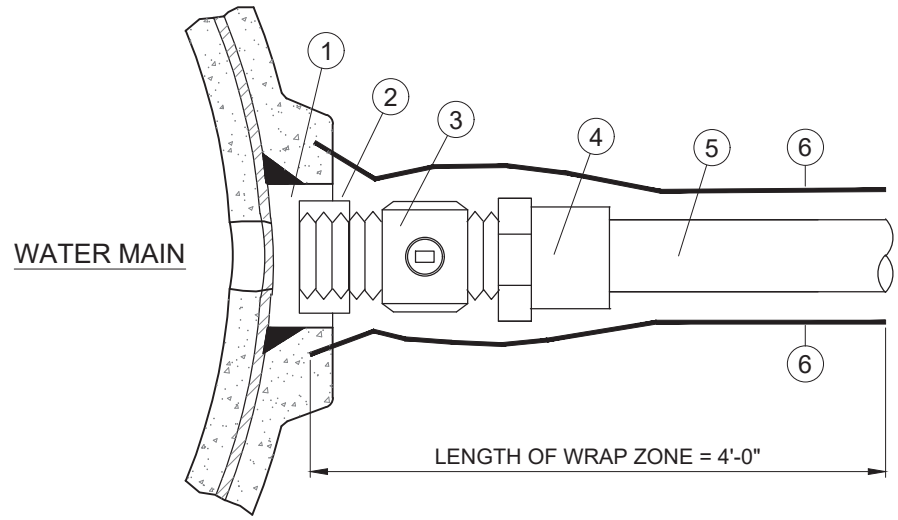
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-117



1. COUPLING (EXTRA HEAVY CARBON STEEL 3,000 LBS. RATING)
2. INSULATING BUSHING (RED NYLON, SEE NOTE 2.)
3. CORPORATION STOP (SEE NOTE 1. AND 2.)
4. ADAPTER (WHEN REQUIRED, SEE NOTE 1.)
5. SERVICE TUBING (SEE NOTE 3.) (REFER TO SPEC. SECTION 1.3 FOR PIPE MATERIAL)
6. ADHESIVE TAPE (SEE NOTE 3.)

NOTES:

1. REFER TO SPEC. SECTION 1.10 FOR MATERIALS SPECIFICATIONS.
2. DIELECTRIC CONNECTIONS SHALL BE REQUIRED ON ALL AIR AND VACUUM VALVE ASSEMBLIES, MANUAL AIR RELEASE ASSEMBLIES AND WATER SERVICE ASSEMBLIES WHERE COPPER OR BRASS PIPE CONNECTIONS ARE MADE TO STEEL MAINS.
3. TYPICAL WRAP - USE DOUBLE WRAP OF 10 MIL 2" WIDE ADHESIVE TAPE. WRAP CORPORATION STOP OR VALVE IN OPEN POSITION, UNLESS OTHERWISE DIRECTED.

DIELECTRIC CONNECTION TO STEEL MAIN

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

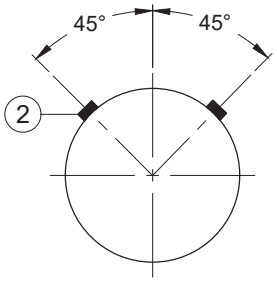
REVISIONS

NO.	BY	DATE	APRVD.

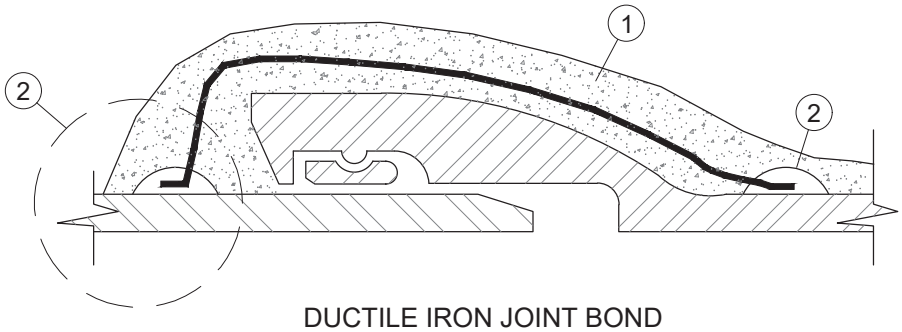
PRINCIPAL ENGINEER

12/22/2021
DATE

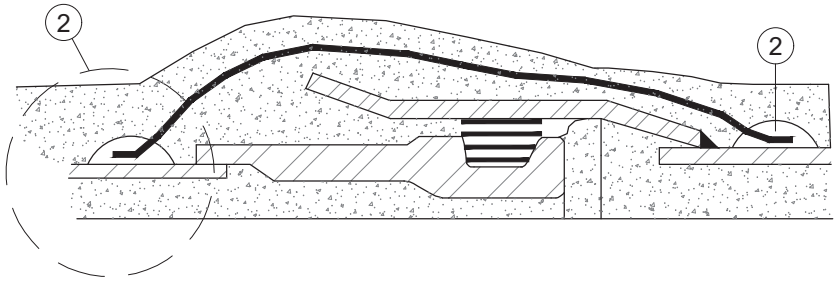
W-118



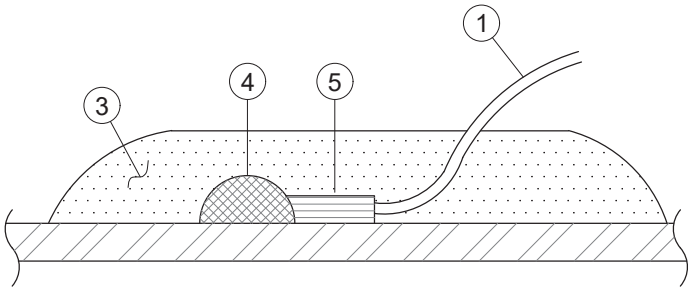
PLACEMENT DIAGRAM



DUCTILE IRON JOINT BOND



STEEL JOINT BOND



BOND WIRE CONNECTION DETAIL

1. WIRE (SEE NOTE 2.)
2. BOND WIRE CONNECTION (2 TYP.)
3. EPOXY PUTTY, MOISTURE TOLERANT, HIGH STRENGTH, SIKADUR 32 OR EQUAL
4. EXOTHERMIC WELD
5. COPPER SLEEVE

NOTES:
1. PIPE SURFACE AROUND WELD MUST BE CLEANED TO PROVIDE A SOUND, CLEAN DRY METAL SURFACE. RECOAT ALL EXPOSED METAL.
2.

PIPE SIZE (INCHES)	WIRE SIZE (AWG NO.)
4-10	#6
12-16	#4
20-24	#2
30-42	#1

BOND JOINT INSTALLATION (STEEL PIPE)

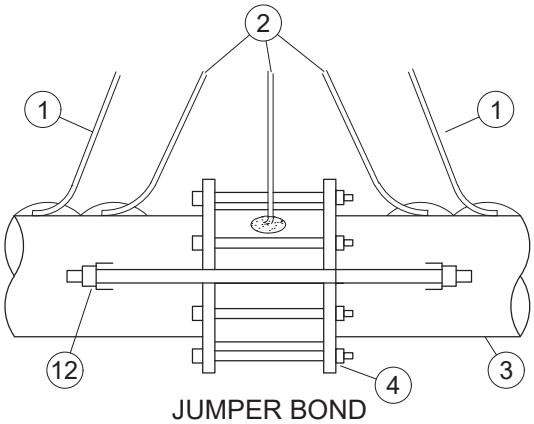
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

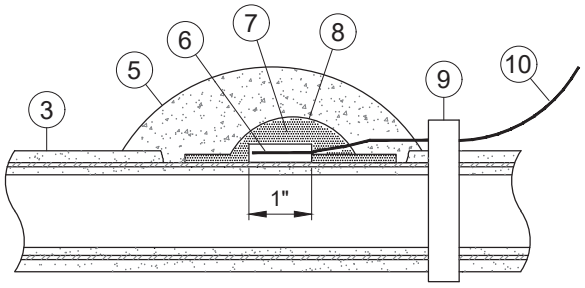
PRINCIPAL ENGINEER

12/22/2021
DATE

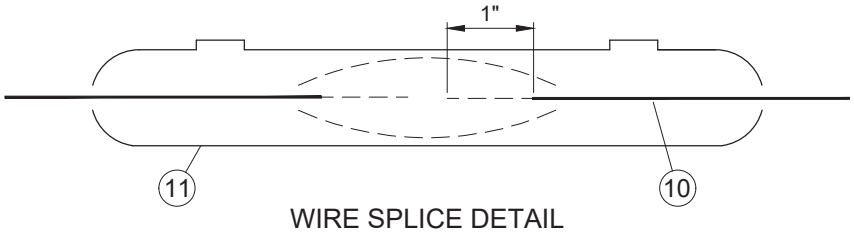
W-119



JUMPER BOND



PIPE CONNECTION DETAIL



WIRE SPLICE DETAIL

1. WIRE 10 GA (SEE NOTES 2. AND 6.)
2. CABLE 4 GA (SEE NOTES 5. AND 6.)
3. METALLIC PIPE
4. INSULATOR PIPE COUPLING
5. CEMENT COATING (SEE NOTE 3.)
6. CAD WELD (SEE NOTE 3.)
7. COPPER SLEEVE (SEE NOTE 2.)
8. ROYSTON HANDY CAP (SEE NOTE 3.)
9. ADHESIVE TAPE (10 MIL 2" WIDE POLYKEN NO. 900)
10. TEST WIRE (SEE NOTE 2.)
11. CABLE SPLICE KIT (SEE NOTE 4.)
12. PIPE JOINT RESTRAINT (REFER TO STANDARD DRAWING W-130 FOR SPECIFICS)

NOTES:

1. PIPE SURFACE AROUND WELD MUST BE CLEANED TO PROVIDE A SOUND CLEAN DRY METAL SURFACE. RECOAT ALL EXPOSED METAL.
2. NO. 12 GA WIRE RED STRANDED THW REQUIRES AN ADAPTER SLEEVE.
3. CAD WELD SHOULD BE COATED WITH "3M" ELECTRICAL COATING AND SEALED WITH PLASTIC HANDY CAP BEFORE THE CEMENT COATING IS REPLACED ON THE PIPE.
4. INLINE RESIN POWER CABLE SPLICE KIT DESIGNED FOR DIRECT BURIAL LOCATIONS.
5. NO. 4 GA CABLE BLACK STRANDED THW; REQUIRES A 1" ADAPTER SLEEVE.
6. COPPER WIRE SHALL BE WITH HIGH-MOLECULAR WEIGHT POLYETHYLENE (HMW/PE) INSULATION SUITABLE FOR DIRECT BURIAL USE. HMW/PE INSULATION SHALL CONFORM TO ASTM D1248, TYPE 1, CLASS "C", CATEGORY 5, GRADES E4 AND E5 WITH TENSILE STRENGTHS J1, J3.

CATHODIC PROTECTION TEST LEADS AND WIRE SPLICE DETAILS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

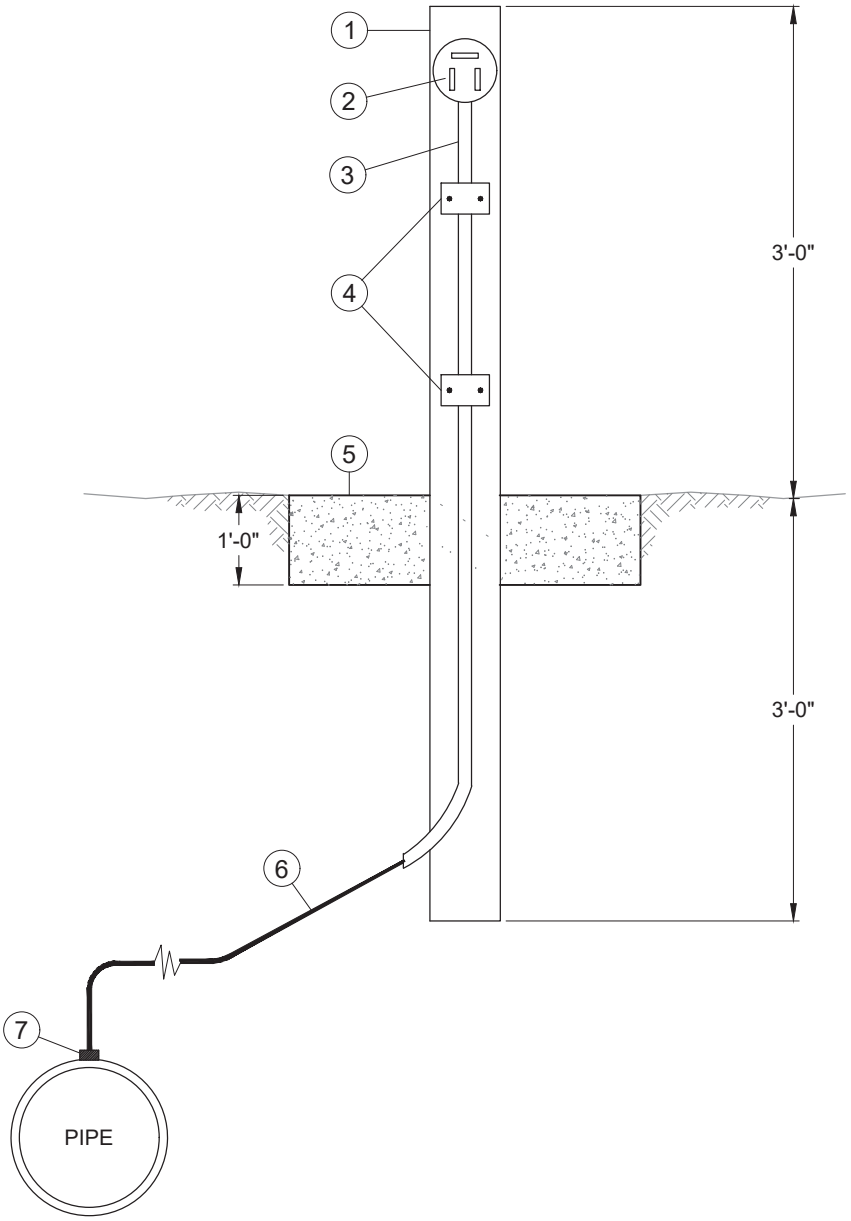
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-120



1. REDWOOD POST (4" x 4" x 6'-0", SEE NOTES 2. AND 3.)
2. EXPLOSION PROOF OUTLET BOX (4")
3. CONDUIT (1" GALVANIZED) SCH 40, ASTM A 53
4. U-CLAMP (2 REQUIRED; SEE NOTE 2.)
5. CONCRETE PAD (24" x 24" x 6")
6. TEST WIRE (SEE NOTE 1. AND REFER TO STANDARD DRAWINGS W-119 AND W-120 FOR SPECIFICS)
7. CONNECTION (REFER TO STANDARD DRAWING W-120 FOR SPECIFICS)

NOTES:
1. TEST WIRE TO RECEIVE BACKFILL OF IMPORTED SAND. REFER TO STANDARD DRAWING W-101 FOR SPECIFICS.
2. SEE SPEC. SECTION 1.9 FOR PAINTING REQUIREMENTS.
3. WHEN GUARD POSTS ARE NECESSARY, REFER TO STANDARD DRAWING G-102 FOR SPECIFICS.

CATHODIC PROTECTION TEST POINT STATION FOR NON-TRAFFIC CONDITIONS

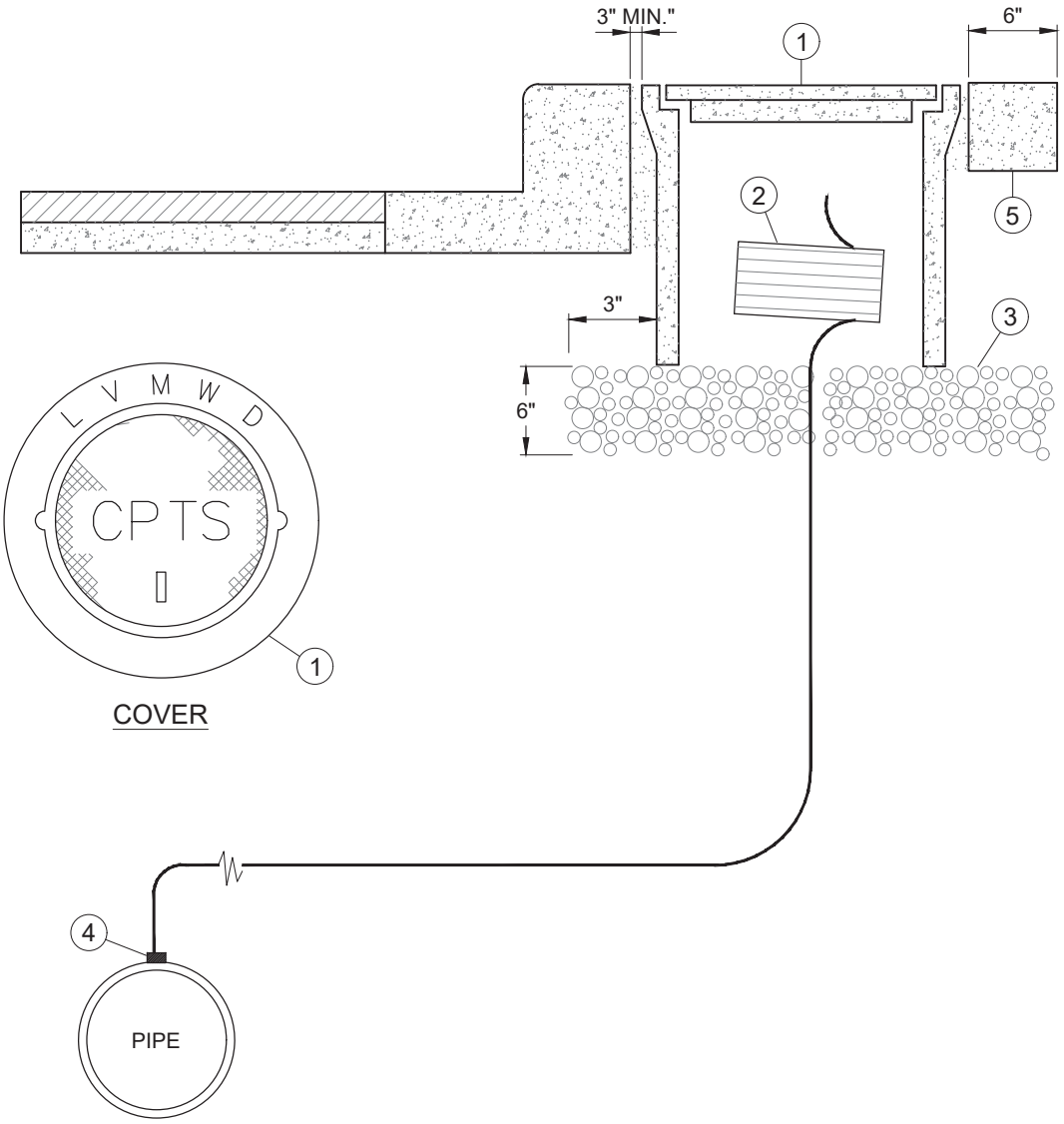
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-121



1. TEST BOX (REFER TO STANDARD DRAWING W-123 FOR SPECIFICS)
2. TEST WIRE (REFER TO STANDARD DRAWINGS W-119 AND W-120 FOR SPECIFICS)
3. 3/4" CRUSHED ROCK
4. CONNECTION (REFER TO STANDARD DRAWINGS W-119 AND W-120 FOR SPECIFICS)
5. CLASS B CONCRETE. REINFORCED WITH W.W.F. 1.6 x 1.6 IN UNPAVED AND TURF CONDITIONS.

NOTES:
1. PROVIDE MINIMUM 2'-0" EXTRA WIRE INSIDE THE BOX.
2. BACKFILL PER STANDARD DRAWING W-101.

CATHODIC PROTECTION TEST POINT STATION FOR TRAFFIC CONDITIONS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

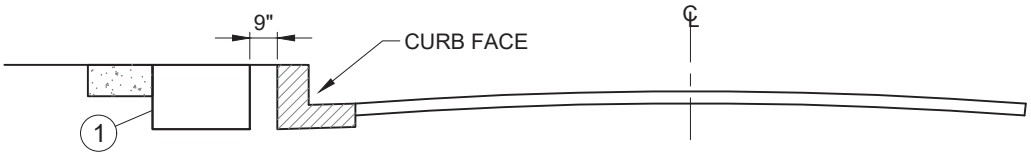
REVISIONS

NO.	BY	DATE	APRVD.

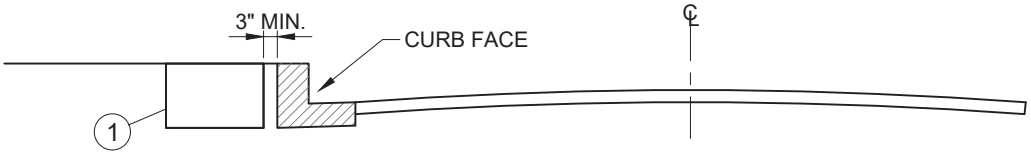
PRINCIPAL ENGINEER

12/22/2021
DATE

W-122



WITH CURB AND SIDEWALK



WITH CURB, NO SIDEWALK

NO CURB

(1) METER BOX

NOTES:
1. METER BOXES TO BE SET LONGITUDINAL AXIS PARALLEL TO AND 1" FROM BEHIND CURB. LOCATION OF SERVICE TO BE PERMANENTLY MARKED ON TOP OF THE CURB WITH A "W" FOR WATER AND "RW" FOR RECYCLED WATER. THE OWNER SHALL BE RESPONSIBLE FOR THE LOCATION AND CONDITION OF ALL SERVICES UNTIL SUCH TIME AS LVMWD HAS ACCEPTED THE WATER SYSTEM. METER BOXES TO BE SET WITH LONGITUDINAL AXIS PARALLEL TO AND 1'-0" BACK OF PAVEMENT EDGE, AND 1" HIGHER THAN FINISH GRADE WITH STEEL LID

LOCATION OF METERS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

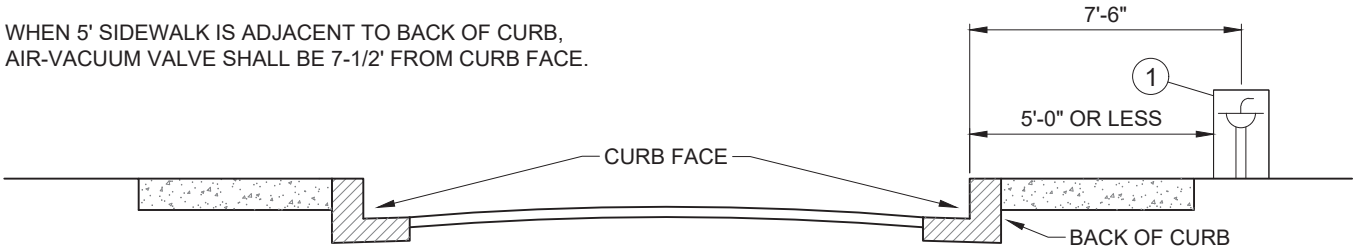
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

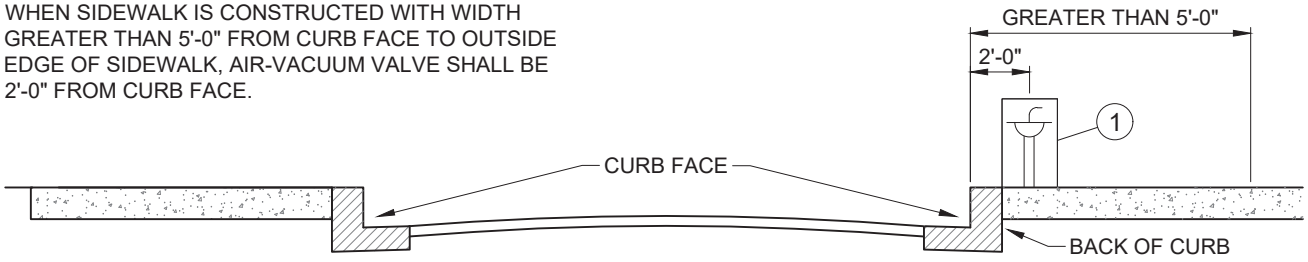
12/22/2021
DATE

W-123

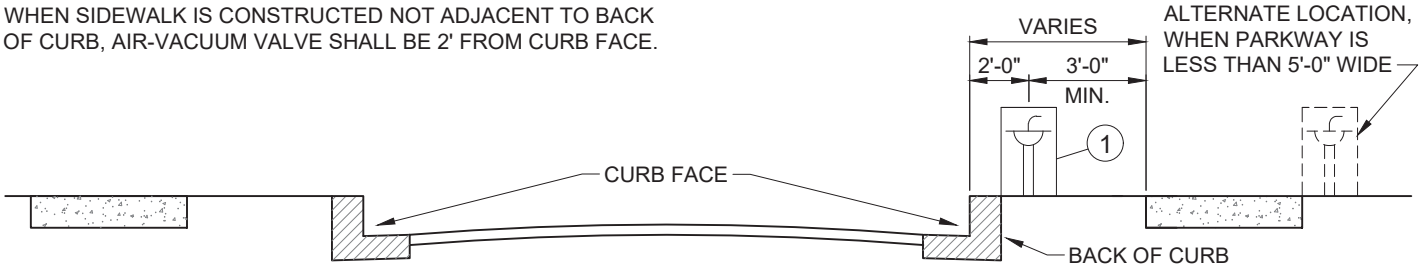
WHEN 5' SIDEWALK IS ADJACENT TO BACK OF CURB, AIR-VACUUM VALVE SHALL BE 7-1/2' FROM CURB FACE.



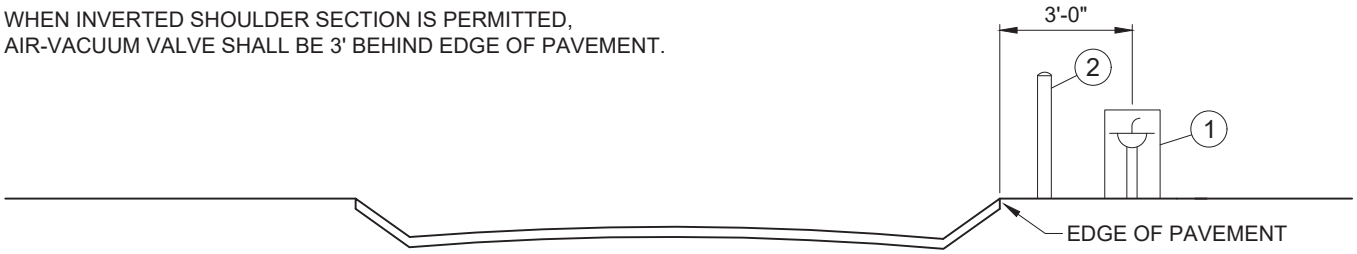
WHEN SIDEWALK IS CONSTRUCTED WITH WIDTH GREATER THAN 5'-0" FROM CURB FACE TO OUTSIDE EDGE OF SIDEWALK, AIR-VACUUM VALVE SHALL BE 2'-0" FROM CURB FACE.



WHEN SIDEWALK IS CONSTRUCTED NOT ADJACENT TO BACK OF CURB, AIR-VACUUM VALVE SHALL BE 2' FROM CURB FACE.



WHEN INVERTED SHOULDER SECTION IS PERMITTED, AIR-VACUUM VALVE SHALL BE 3' BEHIND EDGE OF PAVEMENT.



(1) AIR-VACUUM VALVE

(2) GUARD POST

NOTES:

1. AIR-VACUUM VALVES AT OR NEAR STREET INTERSECTIONS SHALL BE LOCATED INSIDE THE INTERSECTION VALVING AND LOCATED AT THE BEGINNING OF CURB RETURN AND END OF CURB RETURN. AIR-VACUUM VALVES BETWEEN INTERSECTIONS SHALL BE LOCATED ON PROPERTY LINES. REFER TO STANDARD DRAWINGS G-101 AND G-102.

2. GUARD POSTS ARE REQUIRED EXCEPT AT BACK OF CURB LOCATIONS. REFER TO STANDARD DRAWING G-102.

LOCATION OF ABOVE GROUND UTILITIES (AIR AND VACUUM VALVES)

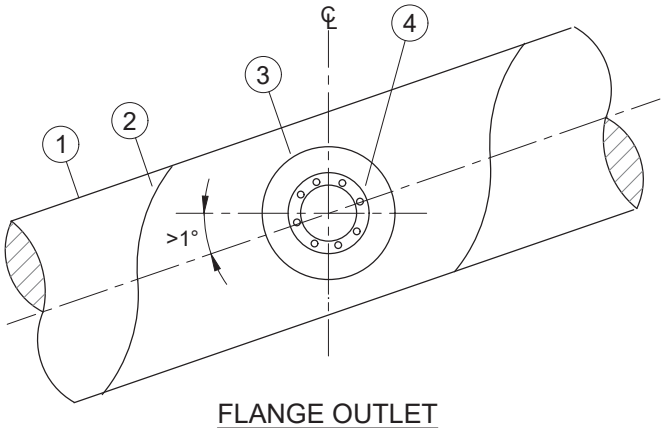
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

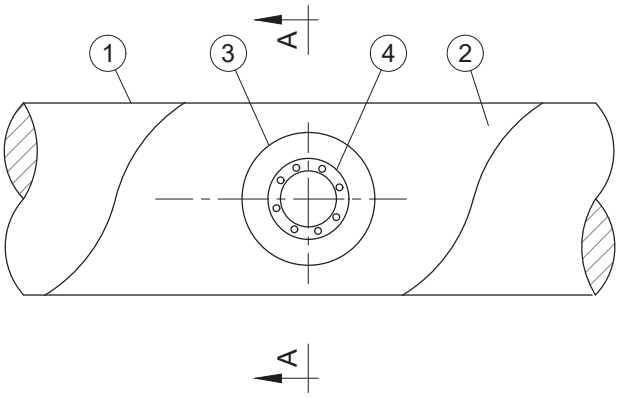
PRINCIPAL ENGINEER

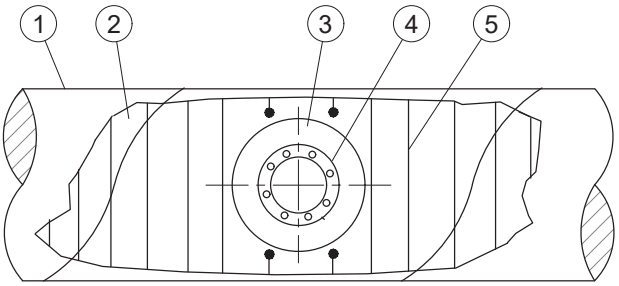
12/22/2021
DATE

W-124

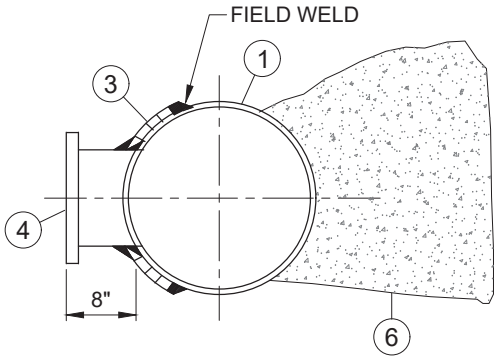


FLANGE OUTLET
LONGITUDINAL ELEVATIONS STEEL PIPE PER AWWA C200

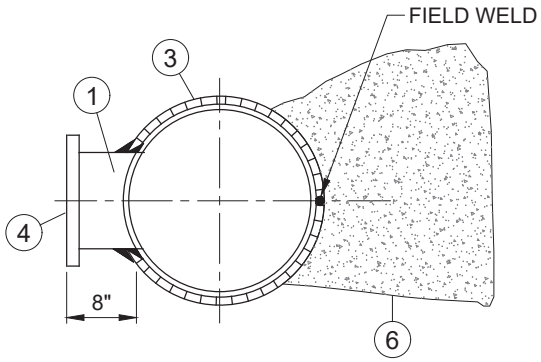




FLANGE OUTLET DETAIL
STEEL PIPE PER AWWA C303



SECTION A-A
USING REINFORCEMENT COLLAR



SECTION A-A
USING FULL WRAP SADDLE

1. STEEL PIPE
2. LONGITUDINAL OR HELICAL SEAM (NO WELDING OR CUTTING OF SEAM)
3. COLLAR
4. STEEL NOZZLE CML/CMC AND FLANGE (PIPE CUT TO FIT, SEE NOTE 1.)
5. CIRCUMFERENTIAL REINFORCEMENT WIRE (MUST BE SPOT WELDED TO PIPE PRIOR TO CUTTING)
6. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)

NOTE:
1. WHERE SLOPE OF WATER MAIN EXCEEDS 1%, INSTALL FLANGES WITH BOLT HOLES STRADDLING THE VERTICAL CENTERLINE AS SHOWN.

FLANGE OUTLET AND END ASSEMBLY DETAILS

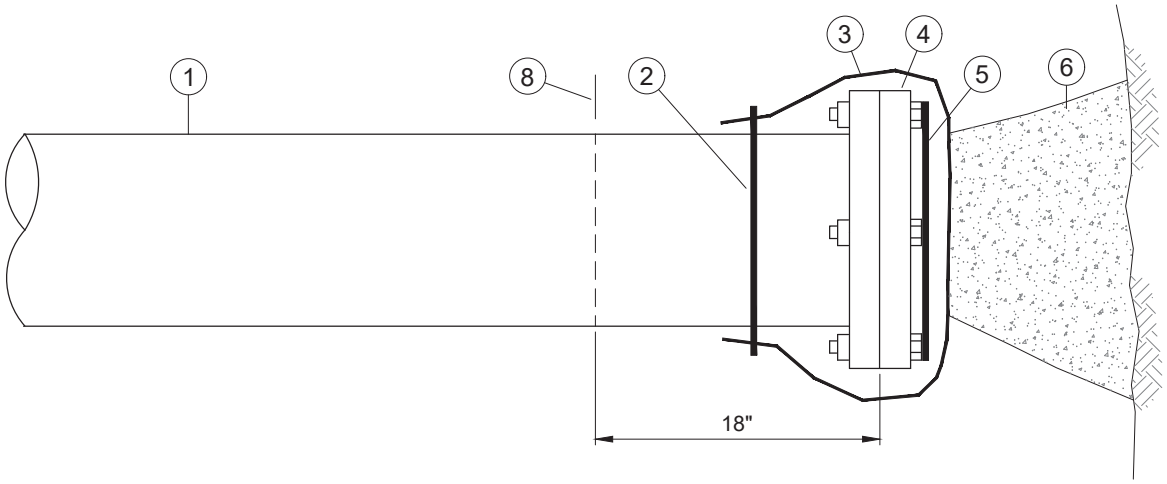
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

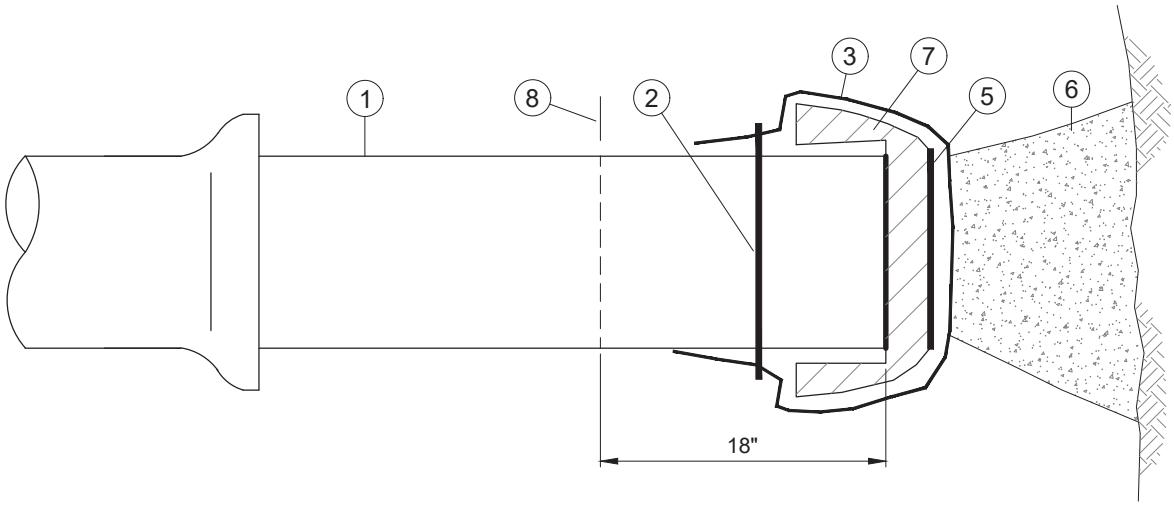
PRINCIPAL ENGINEER

12/22/2021
DATE

W-125



STEEL PIPE END ASSEMBLY



PVC AND DUCTILE IRON PIPE END ASSEMBLY

1. PIPE
2. ADHESIVE TAPE (10 MIL 2" WIDE)
3. PLASTIC WRAP
4. FLANGE
5. FELT PAPER (NO. 15 BUILDING FELT)
6. THRUST BLOCK (REFER TO STANDARD DRAWING W-127 FOR SPECIFICS)
7. DI CAP
8. POINT OF CONNECTION OF AIR RELEASE ASSEMBLIES

FLANGE OUTLET AND END ASSEMBLY DETAILS

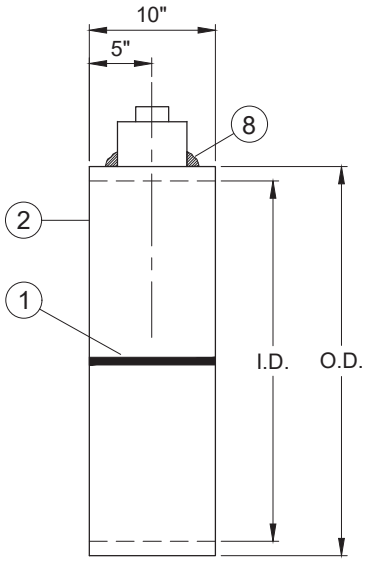
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

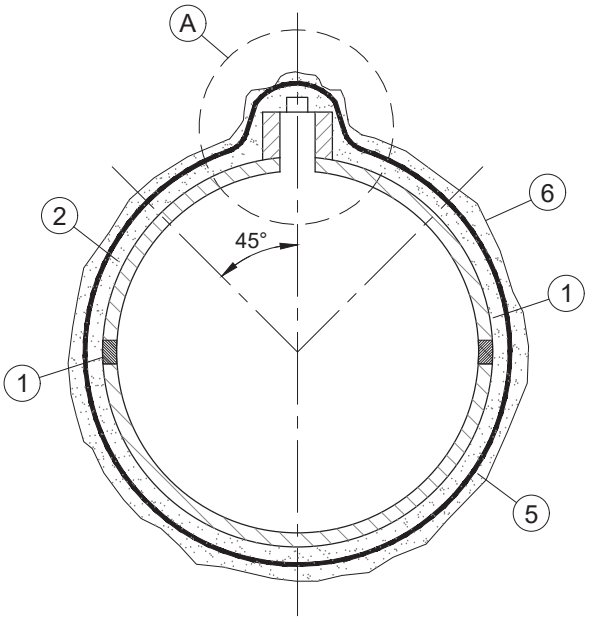
REVISIONS			
NO.	BY	DATE	APRVD.

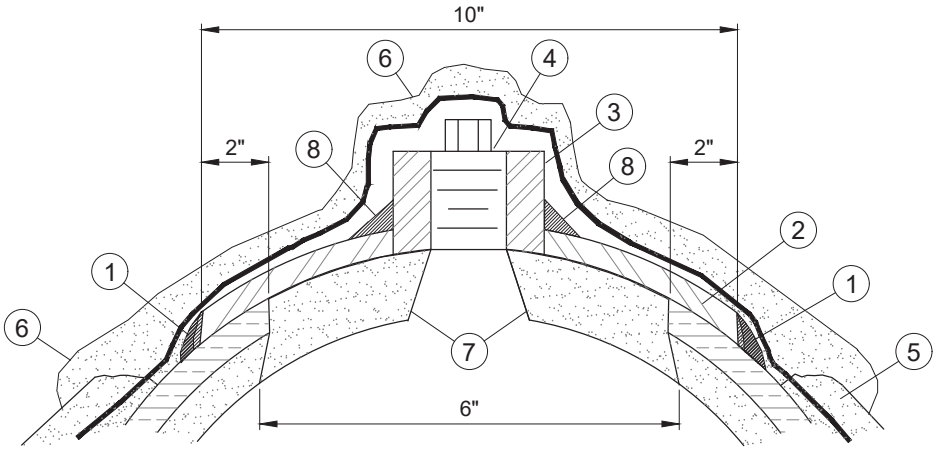
PRINCIPAL ENGINEER

12/22/2021
DATE

W-125







DETAIL A

1. WELD (FIELD WELD WITH THREE PASSES)
2. BUTT STRAP (10" MINIMUM WIDTH, ROLLED STEEL)
3. PIPE COUPLING (1/2 STD. 5" 3,000 LB.)
4. PLUG (SOLID STEEL PLUG) WELD TO SEAL
5. WIRE
6. COATING
7. LINING FIELD POINT
8. WELD IN SHOP

NOTES:

1. BUTT STRAP TO BE SHIPPED IN HALVES AND WELDED IN THE FIELD. PLATE THICKNESS SHALL BE EQUAL TO ADJOINING STEEL PIPE OR MINIMUM 6 GA MILD STEEL. WHEN PIPE I.D. EXCEEDS 12", PROVIDE TWO HANDHOLES AT 45° FROM VERTICAL.
2. PIPE SURFACE AROUND WELDS MUST BE CLEANED TO PROVIDE A DRY METAL SURFACE. RECOAT ALL EXPOSED METAL WITH MORTAR.

BUTT STRAP CLOSURE DETAIL

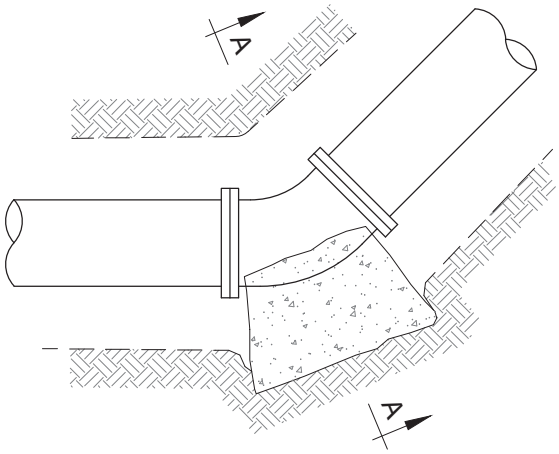
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

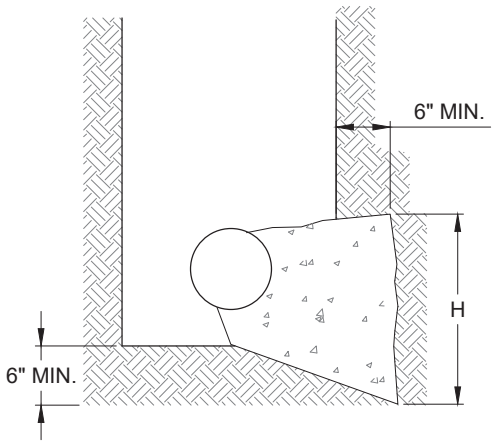
PRINCIPAL ENGINEER

12/22/2021
DATE

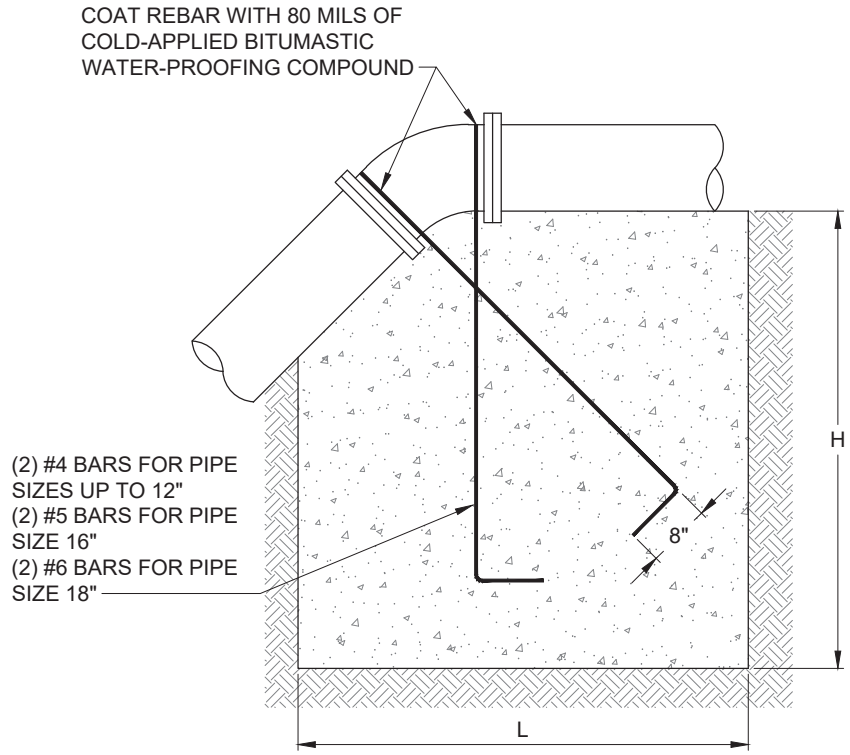
W-126



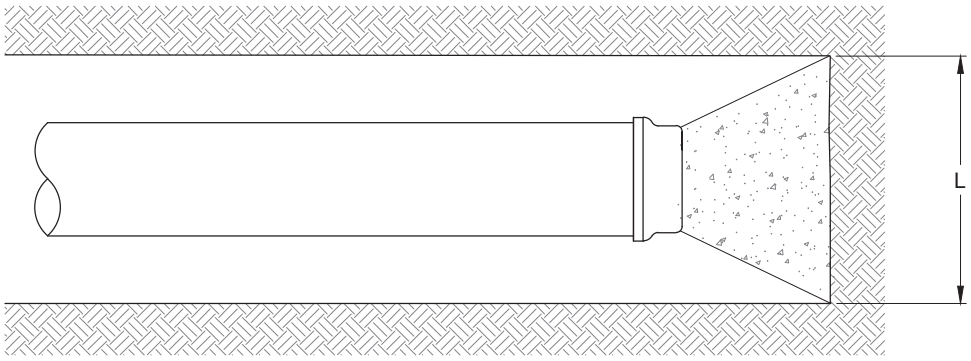
PLAN



SECTION A-A



SECTION
VERTICAL BEND ANCHOR



END OF LINE

THRUST BLOCK DETAILS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-127

HORIZONTAL BEND THRUST BLOCK								
PIPE SIZE (IN)	11-1/4° BEND				22-1/2° BEND			
	L (IN)	H (IN)	AREA (IN^2)	THRUST (LBS)	L (IN)	H (IN)	AREA (IN^2)	THRUST (LBS)
4	12	6	72	554	16	8	128	1,104
6	17	9	153	1,248	24	12	288	2,483
8	23	12	276	2,218	32	16	512	4,414
10	29	15	435	3,465	40	20	800	6,897
12	34	17	578	4,990	48	24	1,152	9,932

HORIZONTAL BEND THRUST BLOCK								
PIPE SIZE (IN)	45° BEND				90° BEND			
	L (IN)	H (IN)	AREA (IN^2)	THRUST (LBS)	L (IN)	H (IN)	AREA (IN^2)	THRUST (LBS)
4	23	12	276	2,165	31	16	496	4,000
6	34	17	578	4,871	46	23	1,058	9,000
8	45	23	1,035	8,659	61	31	1,891	15,999
10	56	28	1,568	13,529	76	38	2,888	24,999
12	67	34	2,278	19,482	92	46	4,232	35,999

HORIZONTAL BEND THRUST BLOCK				
PIPE SIZE (IN)	END OF LINE			
	L (IN)	H (IN)	AREA (IN^2)	THRUST (LBS)
4	26	13	338	2,828
6	39	20	780	6,364
8	52	26	1,352	11,313
10	64	32	2,048	17,677
12	77	39	3,003	25,455

VERTICAL BEND ANCHOR BLOCK *						
PIPE SIZE (IN)	22-1/2° BEND L, H, W (IN)	VOLUME (YD^3)	THRUST (LBS)	45° BEND L, H, W (IN)	VOLUME (YD^3)	THRUST (LBS)
4	26	0.4	1,104	32	0.7	2,165
6	34	0.8	2,483	42	1.6	4,871
8	41	1.5	4,414	51	2.8	8,659
10	47	2.2	6,897	59	4.4	13,529
12	53	3.2	9,932	67	6.4	19,482

* FOR DUCTILE IRON PIPE, ALL VERTICAL BENDS SHALL BE MECHANICALLY RESTRAINED. SEE NOTE 14 ON SHEET 5 OF 5.

THRUST BLOCK DETAILS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

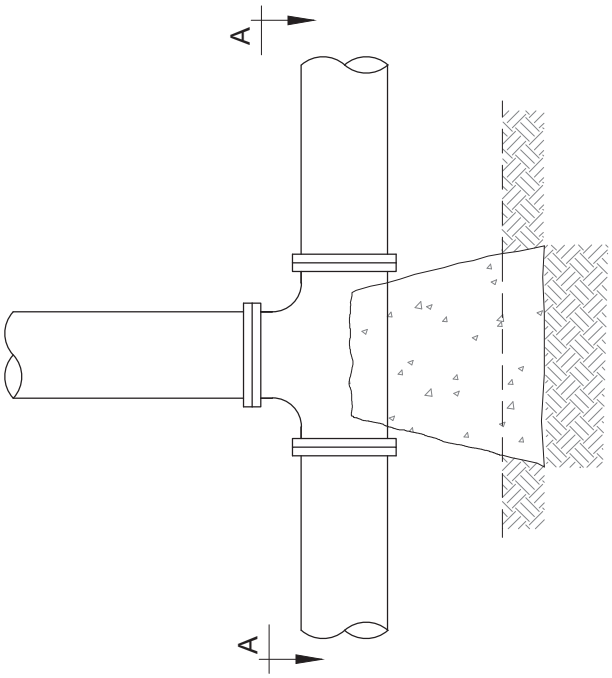
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

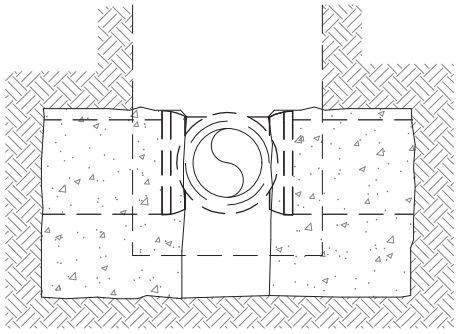
12/22/2021
DATE

W-127



PLAN

PIPE SIZE (IN)	TEE			
	L (IN)	H (IN)	AREA (IN^2)	THRUST (LBS)
4	26	13	338	2,828
6	39	20	780	6,364
8	52	26	1,352	11,313
10	64	32	2,048	17,677
12	77	39	3,003	25,455



SECTION A-A

TEE

THRUST BLOCK DETAILS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

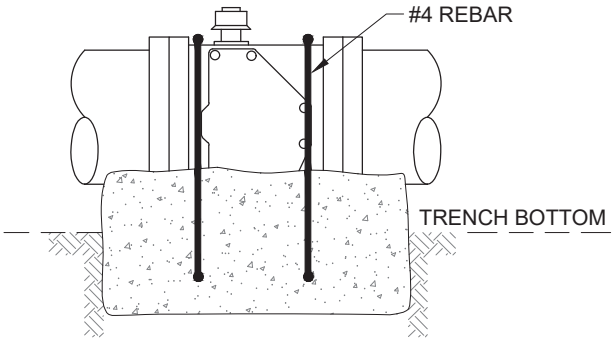
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

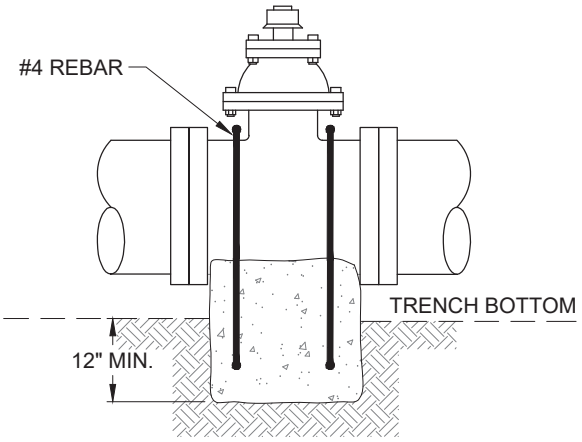
W-127

BUTTERFLY VALVES

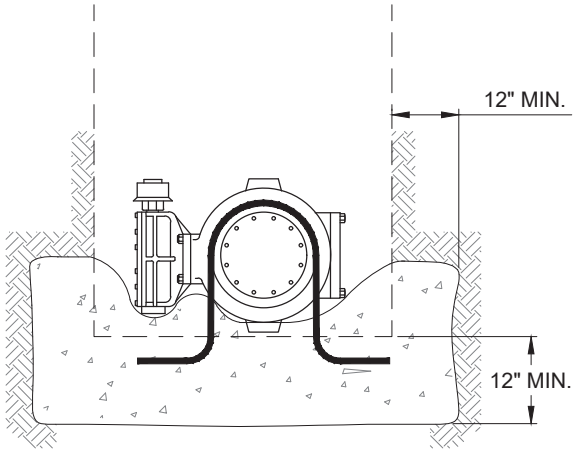


ELEVATION

GATE VALVES



ELEVATION



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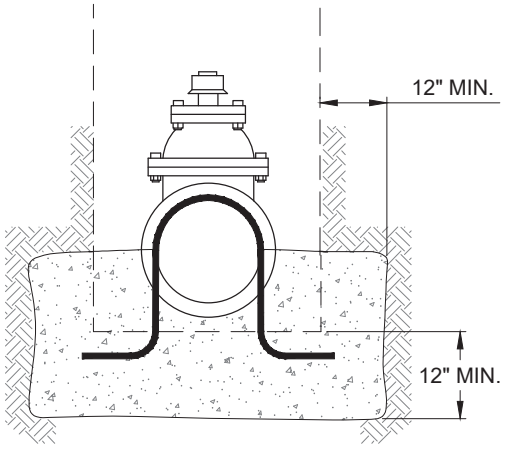

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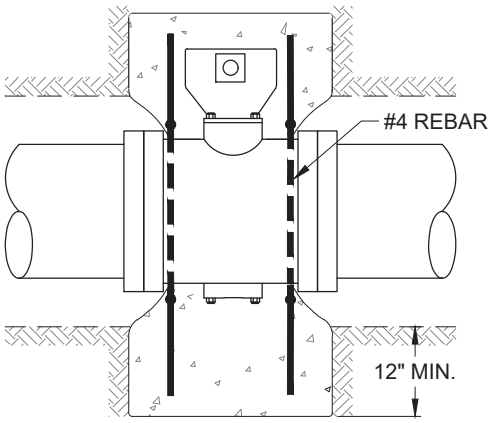
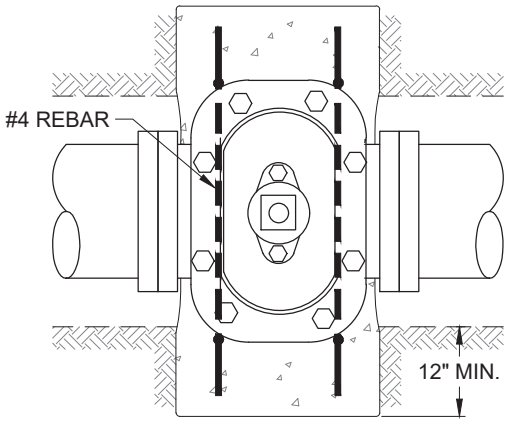


PLAN



PLAN

THRUST BLOCK DETAILS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-127

NOTES:

1. THRUST BLOCK BEARING AREA BASED ON ALLOWABLE SOIL BEARING VALUE OF 1500 PSF PRESSURE, 225 PSI LINE PRESSURE WITH 3'-0" COVER MIN., AND A MIN. SAFETY FACTOR OF 1.2.
   FOR BEARING = 1000 PSF, 1.5 X AREA SHOWN
   FOR BEARING = 500 PSF, 3.0 X AREA SHOWN

2. ALL THRUST BLOCKS SHALL BE PORTLAND CEMENT CONCRETE MIX 560-C-3250 AND PLACED AGAINST UNDISTURBED SOIL.

3. CONCRETE SHALL NOT EXTEND ONTO FLANGES OF VALVES AND APPURTENANCES OR ADJOINING PIPE AND FITTINGS.

4. WHEN VALVES ARE FLANGED TO FITTINGS, AVOID PLACING CONCRETE ON ANY PART OF THE VALVE BONNET OR VALVE OPERATOR.

5. COAT REBAR WITH 80 MILS OF COLD-APPLIED BITUMASTIC WATER-PROOFING COMPOUND. WRAP EXTERIOR OF VALVE, ACTUATOR AND REBAR WITH 8 MIL POLYETHYLENE SHEETING AND TAPE.

6. MIN. CONCRETE COVER OVER REBAR SHALL BE 3".

7. NO CONCRETE SHALL BE POURED ON VALVE OR PIPE JOINT.

8. YIELD STRENGTH OF STEEL BARS SHALL BE 36 KSI.

9. FOR PIPELINES LARGER THAN 12" IN DIA., THE ENGINEER SHALL CALCULATE THRUST BLOCK SIZE BASED ON PROJECT SPECIFIC SOIL CONDITIONS AND SHALL SUBMIT THE CALCULATIONS TO THE DISTRICT FOR APPROVAL.

10. MECHANICAL THRUST RESTRAINTS SHALL BE PROVIDED IN LIEU OF THRUST OR ANCHOR BLOCKS IF THE BEARING FACE OF THE THRUST OR ANCHOR BLOCK MAY BE DISTURBED AT ANY POINT AFTER CONSTRUCTION OR DURING CONSTRUCTION OF OTHER FACILITIES.

11. WHERE MECHANICAL THRUST RESTRAINTS ARE PROVIDED, THE ENGINEER SHALL CALCULATE THE REQUIRED LENGTH OF THRUST RESTRAINT ALONG THE PIPELINE ALIGNMENT AND SHALL SUBMIT THE CALCULATIONS TO THE DISTRICT FOR APPROVAL.

12. DUCTILE IRON PIPE JOINT FITTINGS SHALL BE MECHANICALLY RESTRAINED AT ALL VERTICAL BENDS. VERTICAL BEND ANCHOR BLOCKS SHALL ONLY BE PROVIDED WHERE APPROVED BY DISTRICT.

13. CONCRETE SHALL BE MIXED THROUGH A READY-MIX OR A BATCH TYPE MIXER. REFER TO SPEC. SECTION 1.8 FOR ADDITIONAL REQUIREMENTS.

THRUST BLOCK DETAILS

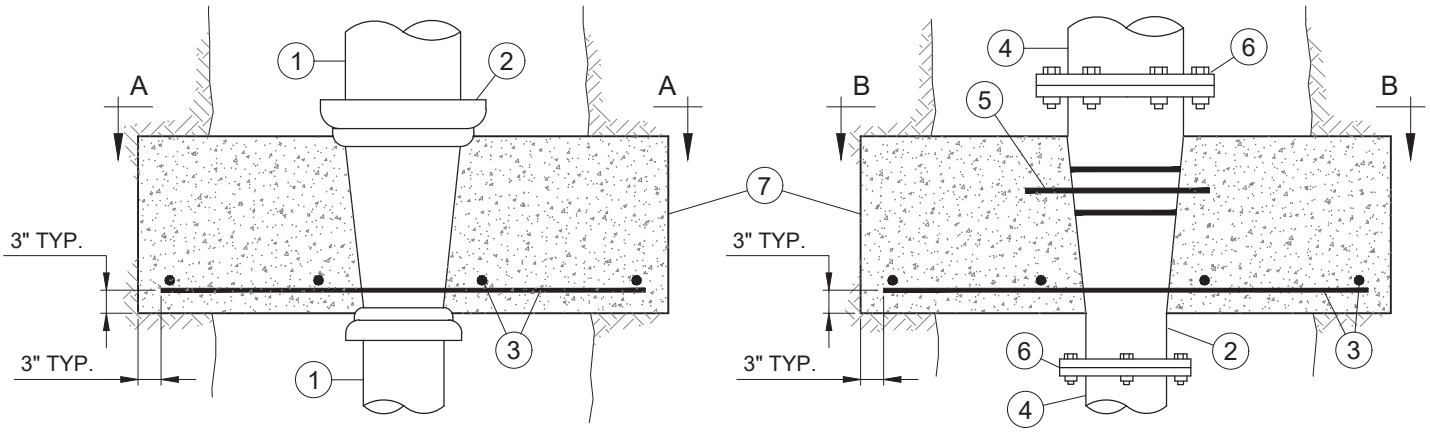
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

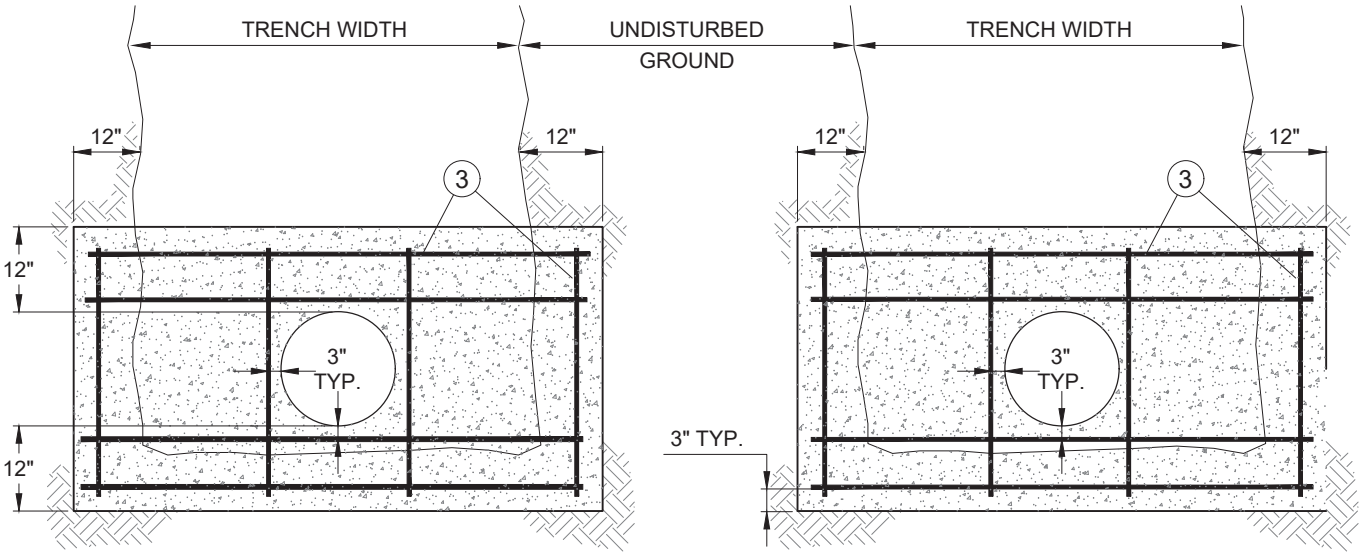
12/22/2021
DATE

W-127



PVC AND DI PIPE
PLAN

STEEL PIPE
PLAN



SECTION A-A

SECTION B-B

1. PVC AND DI PIPE
2. REDUCER (SEE NOTE 1.)
3. #4 BARS
4. STEEL PIPE
5. COLLAR (SEE NOTES 1. AND 2.)
6. FLANGE
7. CONCRETE (SEE NOTE 3.)

NOTES:
1. REFER TO STANDARD DRAWING W-129 WHEN USING STEEL REDUCER OR FOR SPECIAL ANCHOR BLOCK DETAIL.
2. 9" x 3/8" PLATE COLLAR AND 3" x 1/2" RING. SHIP IN HALVES, WELD IN FIELD WITH 3/8" FILLET WELD.
3. CONCRETE THICKNESS = REDUCER LENGTH (3'-0" MAX.)

ANCHOR BLOCK DETAILS (16" PIPE MAX.)

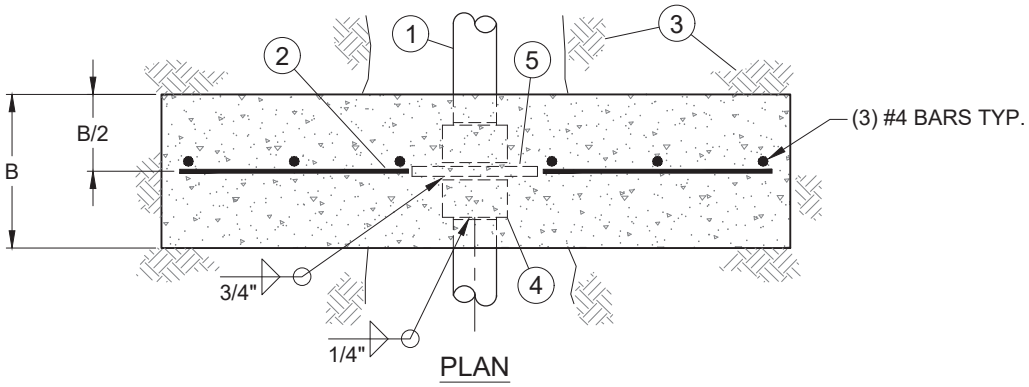
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-128



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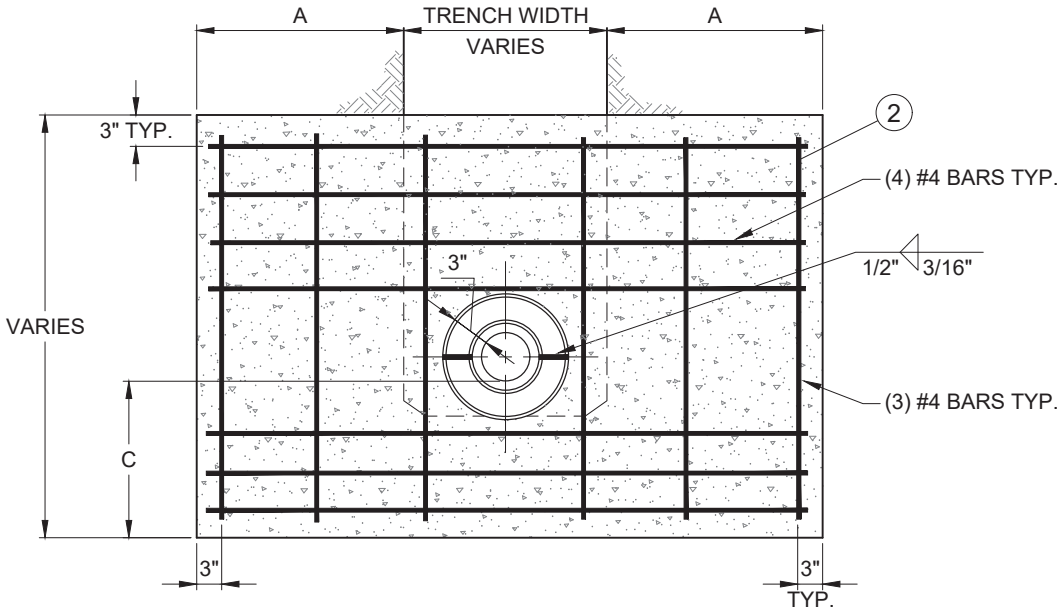


SIZE OF PIPE	CLASS 150			CLASS 200			ABOVE CLASS 200		
	A	B	C	A	B	C	A	B	C
8"	12"	12"	6"	12"	12"	12"	SPECIAL DESIGN REQUIRED		
10"	12"	12"	12"	15"	12"	12"			
12"	15"	12"	15"	24"	12"	15"			
14"	24"	12"	15"	30"	15"	15"			

1. STEEL PIPE
2. BARS (NO. 6 BARS)
3. UNDISTURBED GROUND
4. COLLAR (SEE NOTE 2.)
5. RING (SEE NOTE 3.)

NOTES:
1. TABLE DENOTES MINIMUM DESIGN STANDARDS FOR ANCHOR BLOCK INSTALLATION. SPECIAL DESIGN IN FIELD SHALL BE REQUIRED WHEN DETERMINED THAT THE SOIL BEARING LOAD AREA IS BELOW 1,500 LB./SQ. FT. OR PIPE BURIED LESS THAN 3'-0".
2. 9" x 3/8" PLATE WRAPPER - SHIP IN HALVES AND WELD IN FIELD.
3. 3" x 1/2" - SHIP IN HALVES AND WELD IN FIELD.

SPECIAL ANCHOR BLOCK DETAIL

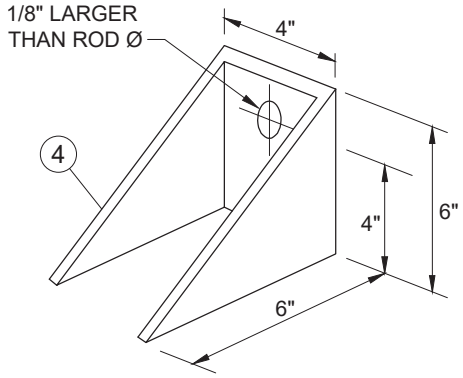
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

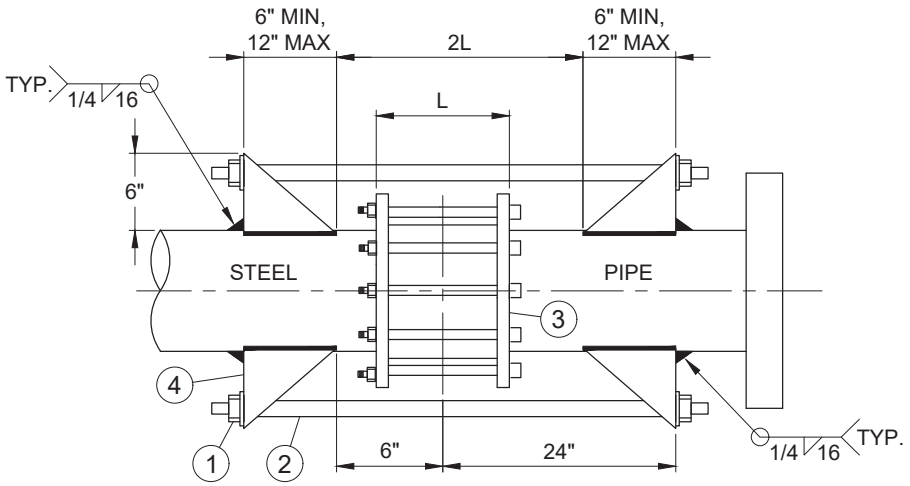
PRINCIPAL ENGINEER

12/22/2021
DATE

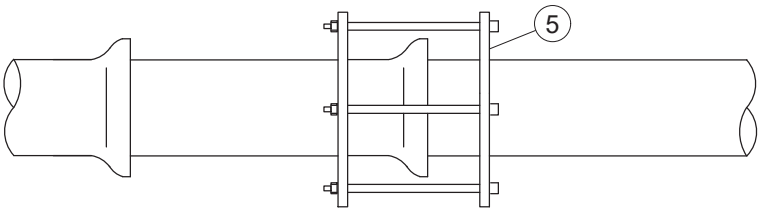
W-129



ANCHOR



ANCHOR BOX ASSEMBLY



JOINT RESTRAINT FOR PVC AND DI PIPE

1. NUT - HEAVY STEEL NUT AND WASHER (8) REQUIRED
2. ROD (SEE NOTE 1.)
3. PIPE JOINT MECHANICAL COUPLING (STAINLESS STEEL DRESSER STYLE)
4. ANCHOR (SEE NOTE 2.)
5. MECHANICAL PIPE JOINT RESTRAINT (SEE NOTE 3.)

NOTES:

1. PIPE SIZES 6" AND 8": USE (2) RODS 7/8"Ø x 32" LONG, 7/8"-9 UNC 2A RH;
   PIPE SIZE 12" PIPE: USE (2) RODS 1-1/8"Ø x 32" LONG, 1-1/8"-4 UNC 2A RH.
2. ANCHORS TO BE FABRICATED FROM 6" x 4" x 3/8" STRUCTURAL TUBE SECTION (4 REQUIRED). DRILL ALL HOLES IN THE SHOP. TORCH CUT PIPE RADIUS AT INSTALLATION SITE.
3. PIPE JOINT RESTRAINT SHALL BE CONSTRUCTED OF ASTM A536 DUCTILE IRON FOR USE ON WATER PIPELINES, HYDROSTATIC PRESSURE AND TESTED IN ACCORDANCE WITH EITHER AWWA C600 OR ASTM D2774. IT SHALL HAVE A WORKING PRESSURE RATING OF 350 PSI FOR 3-16 INCH, 250 PSI FOR 18-48 INCH. REFER TO AWWA M11 FOR NUMBER OF STEEL BARS AND DIMENSION OF ANCHORS.

JOINT RESTRAINT AND ANCHOR BOX ASSEMBLY FOR MECHANICAL COUPLING SIZES 6" THRU 12"

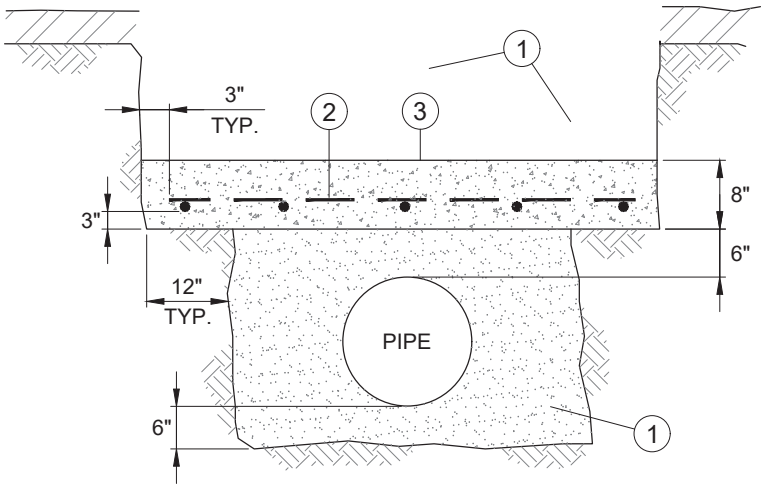
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

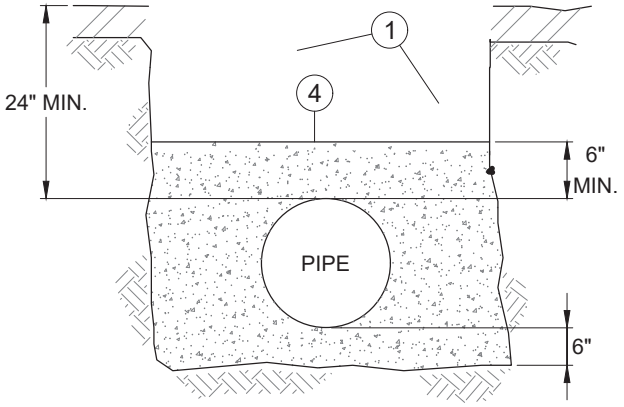
PRINCIPAL ENGINEER

12/22/2021
DATE

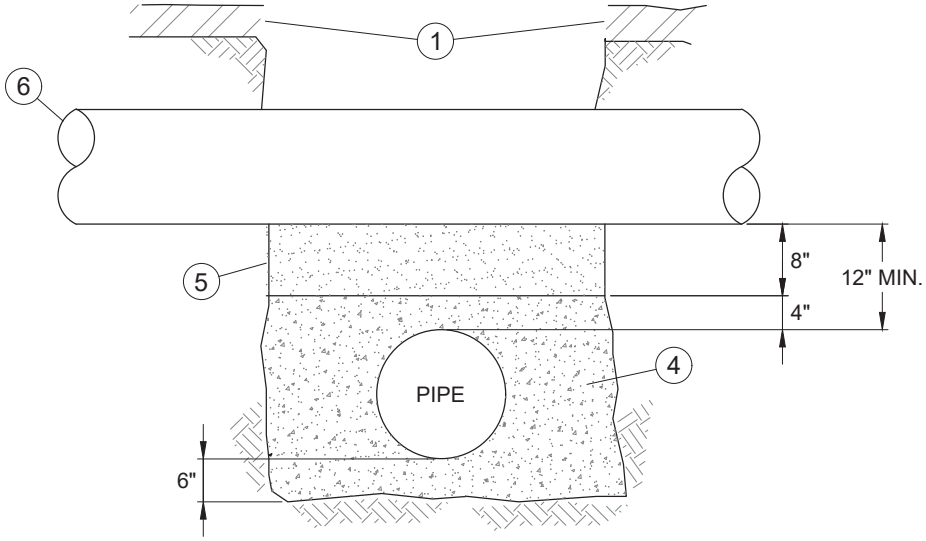
W-130



PIPE PROTECTION SLAB FOR
LESS THAN 3'-0" OF COVER



CONCRETE ENCASEMENT DETAIL
FOR LESS THAN 3'-0" OF COVER



CONCRETE ENCASEMENT DETAIL
UNDER STRUCTURES

(1) BACKFILL (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS)

(2) REBAR (#5 BARS AT 12" ON CENTER EACH WAY OR SPECIAL DESIGN)

(3) CONCRETE SLAB (CLASS "B" CONCRETE)

(4) CONCRETE ENCASEMENT (CLASS "B" CONCRETE)

(5) IMPORTED SAND, MINIMUM SAND EQUIVALENT SHALL BE 30 FOR NATURAL IMPORTED AND 40 FOR SCREENED RECYCLED MATERIAL PER ASTM D2419

(6) STRUCTURE (REFER TO STANDARD DRAWING W-101 FOR SPECIFICS)

NOTES:
1. CLASS "B" CONCRETE. LENGTH OF CONCRETE PAD TO EXTEND AT A LEVEL GRADE TO 1'-0" BEYOND POINT AT WHICH PIPE COVER EXCEEDS 3'-0".
2. EXISTING PVC PIPE SHALL BE COVERED WITH TAR PAPER, POLYURETHANE BAGGIE OR RUBBER MAT PRIOR TO POURING CONCRETE.

PIPE PROTECTION SLAB AND CONCRETE ENCASEMENT DETAIL

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

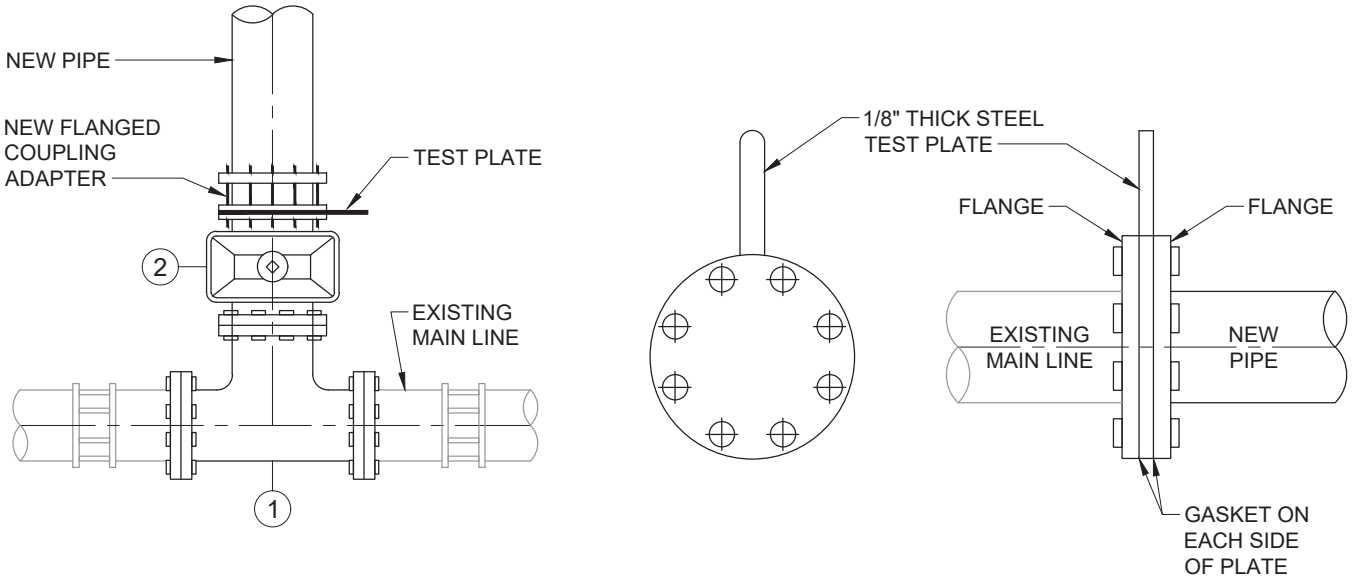
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-131



TEST PLATE DETAIL

1. CUT-IN TEE OR HOT TAP (REFER TO STANDARDS DRAWINGS G-105 AND G-106)
2. GATE VALVE, FLG x FLG (REFER TO STANDARD DRAWING W-116 FOR VALVE BOX AND COVER)

NOTES:
1. DIRECT CONNECTION TO THE EXISTING WATER SYSTEM SHALL NOT BE PERMITTED UNTIL THE NEW INSTALLATION HAS PASSED BACTERIA TESTING AND PHYSICAL CHECK BY THE DISTRICT. SEE STANDARD SPECIFICATIONS FOR TESTING AND DISINFECTION OF WATER PIPE.

TEST PLATE / BULKHEAD

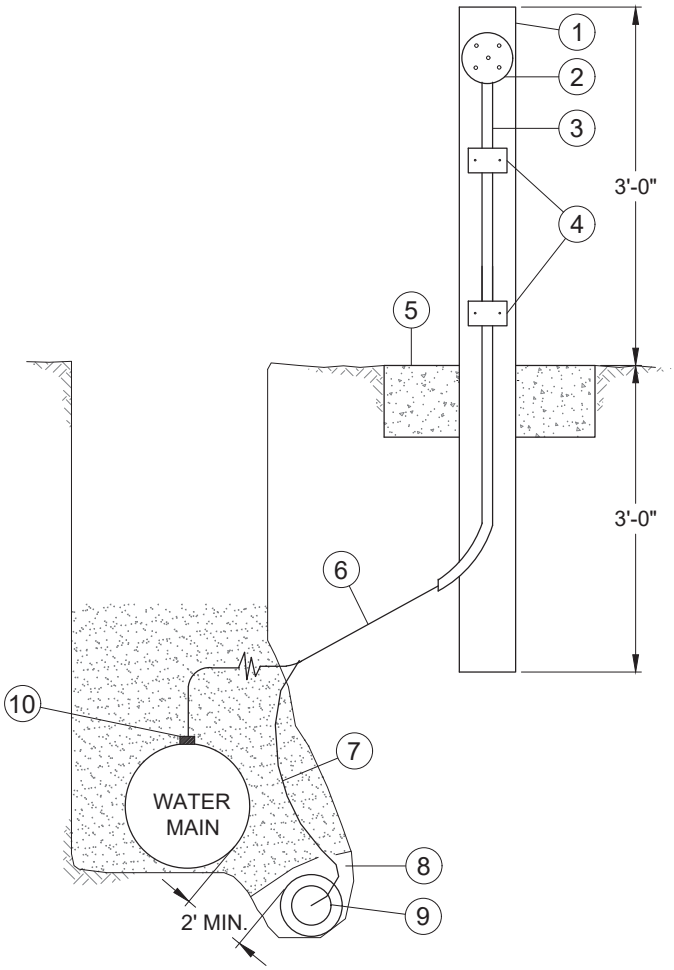
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-132



1. REDWOOD POST (4" X 4" X 6', SEE NOTE NOS. 2 & 3)
2. EXPLOSION PROOF OUTLET BOX (4")
3. CONDUIT (3/4" GALVANIZED)
4. U - CLAMP (2 REQUIRED; SEE NOTE NO. 2).
5. CONCRETE PAD (24" X 24" X 6")
6. TEST WIRE (SEE NOTE NO. 1 AND REFER TO STANDARD DRAWINGS W-119 & W-120 FOR SPECIFICS).
7. #10 ANODE LEAD
8. BACKFILL (SEE NOTE NO. 4).
9. 32 LB. PACKAGED MAGNESIUM ANODE (SEE NOTE NO.5).
10. CONNECTION (REFER TO STANDARD DRAWINGS W-119 & W-120 FOR SPECIFICS).

NOTES:

1. TEST WIRE TO RECEIVE BACKFILL OF IMPORTED SAND. REFER TO STANDARD DRAWING W-101 FOR SPECIFICS.
2. SEE SPEC SECTION 1.9 FOR PAINTING REQUIREMENTS.
3. WHEN GUARD POSTS ARE NECESSARY REFER TO STANDARD DRAWING G-102 FOR SPECIFICS.
4. REMOVE EXTERNAL SHIPPING BAG AND SOAK ANODE WITH WATER BEFORE BACK FILLING. BACKFILL 12" MINIMUM AROUND ANODE WITH NATIVE SOIL. DO NOT ALLOW ANODE TO COME INTO CONTACT WITH SAND BACKFILL.
5.

PIPE SIZE;	ANODES REQUIRED;
12" AND UNDER	2
14"-20"	4
21" AND LARGER	4 TO 6

6. MINIMUM SPACING REQUIREMENTS, AS NOTED ON THE SKETCH, SHOULD BE OBSERVED IN PREFERENCE TO MINIMUM NUMBER OF ANODES. (ANODES MAY BE PLACED VERTICAL, WHEN NECESSARY, TO ACHIEVE MINIMUM SPACING REQUIREMENTS).

SACRIFICIAL ANODE INSTALLATION AT LEAK REPAIR SITE FOR NON-TRAFFIC CONDITIONS

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

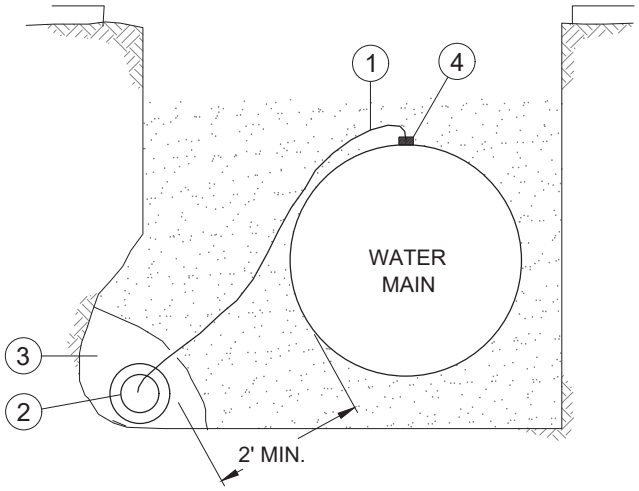
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-133



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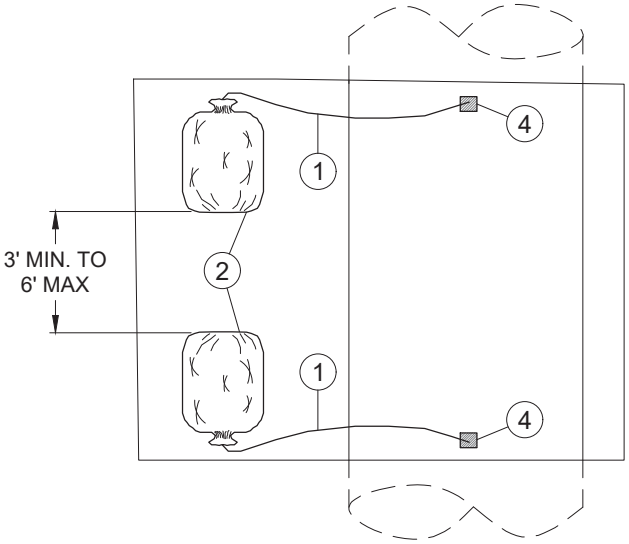


PLAN

(1) #10 ANODE LEAD

(2) 32 LB. PACKAGED MAGNESIUM ANODE (SEE NOTE NO. 2).

(3) BACKFILL (SEE NOTE NO. 1).

(4) REFER TO STANDARD W-119 FOR JOINT BOND SPECIFICS.

NOTES:

1. REMOVE EXTERNAL SHIPPING BAG AND SOAK ANODE WITH WATER BEFORE BACK FILLING. BACKFILL 12" MINIMUM AROUND ANODE WITH WITH NATIVE SOIL. DO NOT ALLOW ANODE TO COME INTO CONTACT WITH SAND BACKFILL.

2.

PIPE SIZE;	ANODES REQUIRED;
12" AND UNDER	2
14"-20"	4
21" AND LARGER	4 TO 6

3. MINIMUM SPACING REQUIREMENTS, AS NOTED ON THE SKETCH, SHOULD BE OBSERVED IN PREFERENCE TO MINIMUM NUMBER OF ANODES. (ANODES MAY BE PLACED VERTICAL, WHEN NECESSARY, TO ACHIEVE MINIMUM SPACING REQUIREMENTS).

SACRIFICIAL ANODE INSTALLATION AT LEAK REPAIR SITE FOR TRAFFIC CONDITIONS

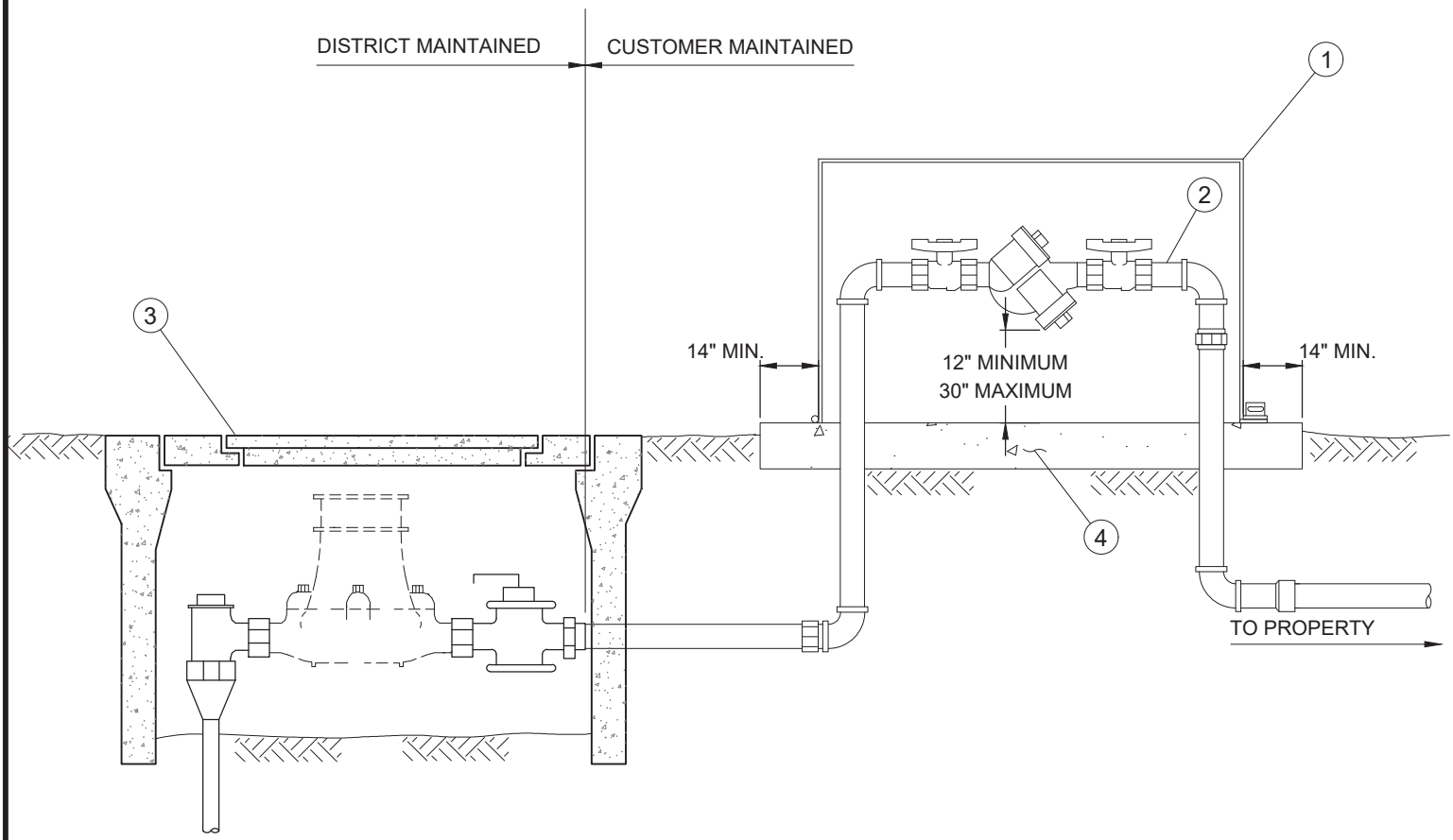
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

W-134



1. ALUMINUM LOCKABLE ENCLOSURE
2. REFER TO STANDARD DRAWINGS W-109 AND W-110 FOR DETECTOR CHECK DETAILS
3. REFER TO STANDARD DRAWINGS W-102 TO W-105 FOR METER SERVICE DETAILS
4. 6" THICK CONCRETE PAD

NOTES:

1. THE ASSEMBLY MUST BE INSTALLED IMMEDIATELY DOWNSTREAM OF DISTRICT'S WATER METER.
2. AS INDICATED IN THE GENERAL DIAGRAM ABOVE, THE OPENING OF THE RELIEF PORT SHALL BE AT LEAST TWELVE (12) INCHES, AND LESS THAT THIRTY (30) INCHES ABOVE THE FINAL GRADE OF THE PROPERTY.
3. THIS ASSEMBLY MUST BE INSTALLED IN A ALUMINUM LOCKABLE ENCLOSURE. ENCLOSURE SHALL BE MOUNTED ON CONCRETE PAD IN ACCORDANCE TO MANUFACTURER'S INSTRUCTIONS.
4. THIS ASSEMBLY MUST BE ACCESSIBLE FOR MAINTENANCE AND ANNUAL TESTING TO INSURE PROPER OPERATION.

RECYCLED WATER BACKFLOW PREVENTION INSTALLATION

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

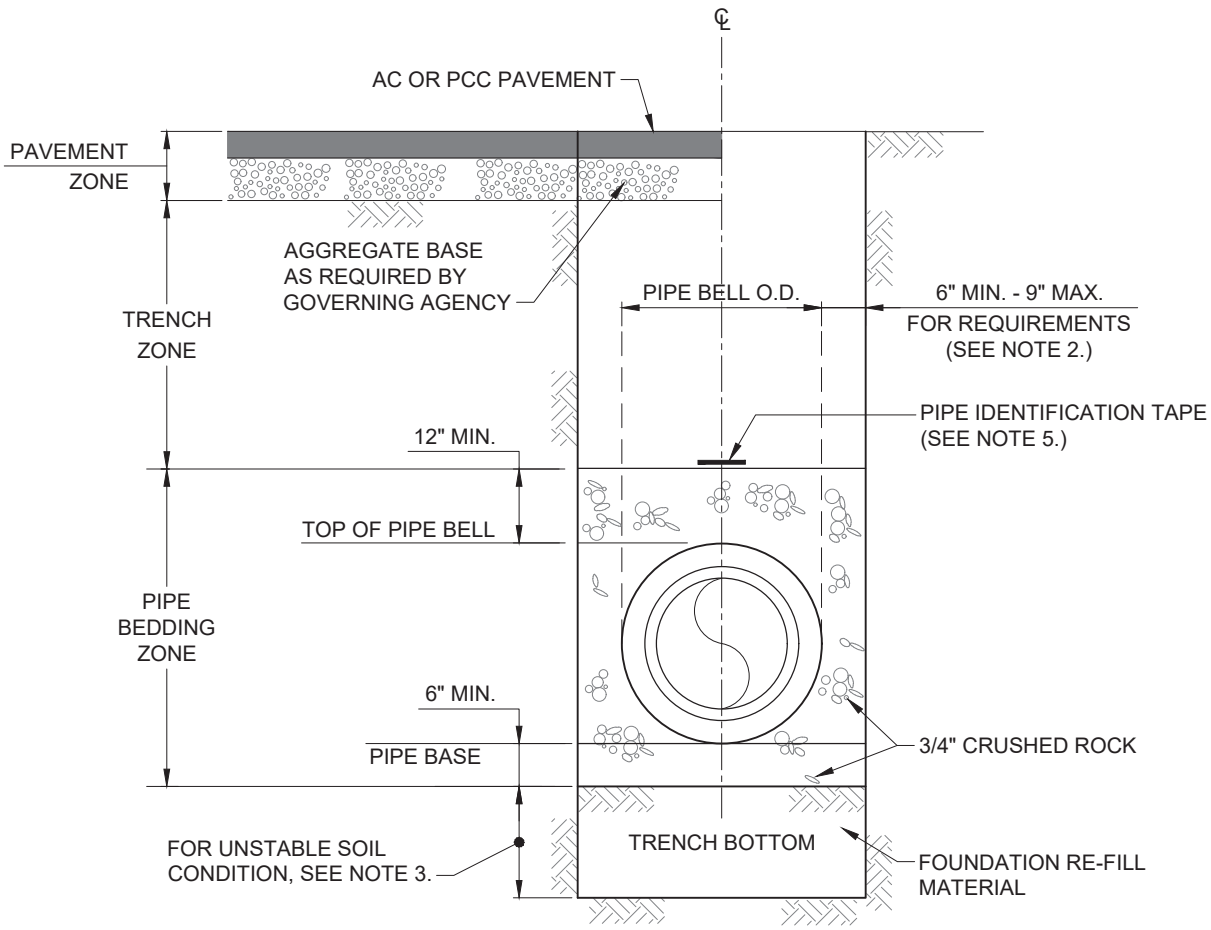
PRINCIPAL ENGINEER

12/22/2021
DATE

RW-101

PAVED CONDITION

UNPAVED CONDITION



NOTES:

1. ALL WORK SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 2.5.
2. WHERE CONTRACTOR FAILS TO MAINTAIN PROPER TRENCH WIDTH LIMITS, SPECIAL BACKFILL (SUCH AS ONE-SACK SLURRY) AND BEDDING SHALL BE REQUIRED AS DETERMINED IN THE FIELD BY THE DISTRICT REPRESENTATIVE.
3. IF UNSTABLE SOIL IS ENCOUNTERED, THE DISTRICT REPRESENTATIVE SHALL DETERMINE OVER-EXCAVATION DEPTH AND FOUNDATION RE-FILL MATERIAL PER SPECIFICATION SECTION 2.5.
4. CONTRACTOR SHALL PROVIDE HAND EXCAVATED "BELL HOLE" FOR EACH PIPE JOINT SO THAT THE WEIGHT OF PIPE DOES NOT BEAR ON THE BELL. CONTRACTOR SHALL RE-FILL AND HAND-TAMP EACH "BELL HOLE" PRIOR TO COMPLETING THE PLACEMENT OF PIPE BEDDING.
5. GREEN ID TAPE WITH BLACK LETTERING IDENTIFYING THE SEWER LINE SHALL BE USED ON ALL PIPES 1" AND LARGER. THE ID TAPE WORDING SHALL READ: "CAUTION: SEWER LINE BURIED BELOW". TAPE SHALL BE PLACED AT 5'-0" INTERVALS.
6. THE MIN. DEPTH OF COVER FROM FINISH GRADE TO THE TOP OF THE SEWER MAIN SHALL BE 7' UNLESS OTHERWISE APPROVED BY THE DISTRICT.

SEWER TRENCH

LAS VIRGENES MUNICIPAL WATER DISTRICT
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CALABASAS, CA 91302

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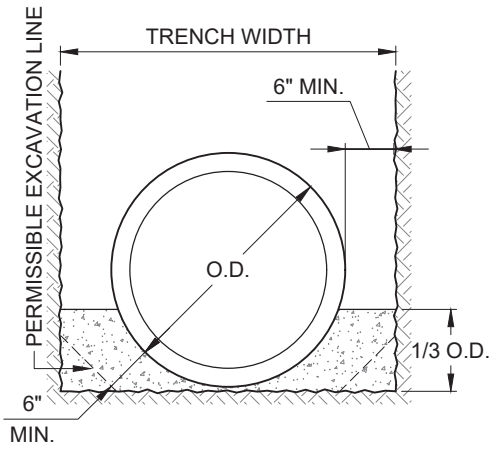
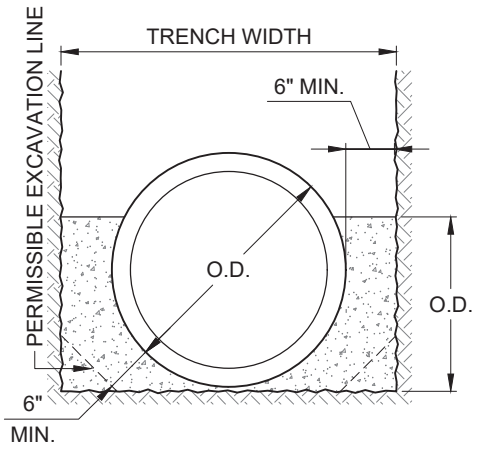
12/22/2021
DATE

S-101



CRADLE TYPE 1



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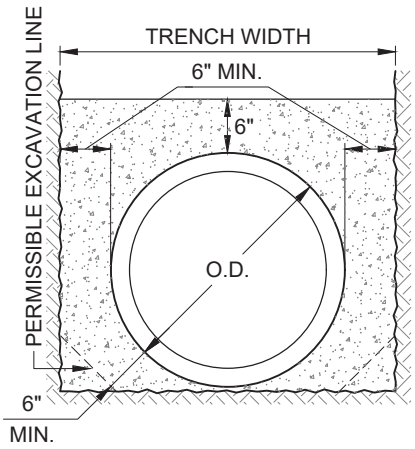
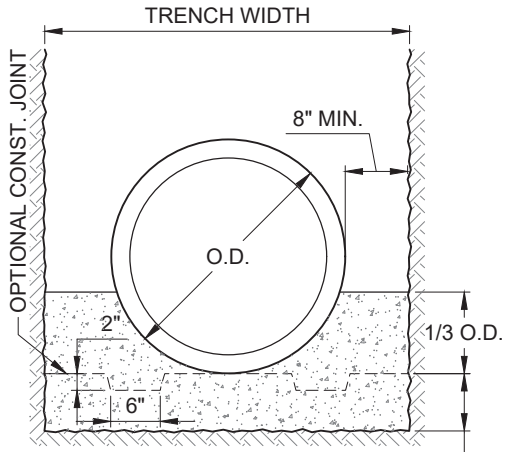
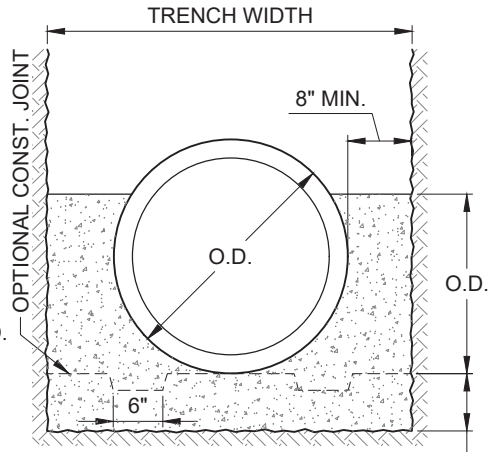


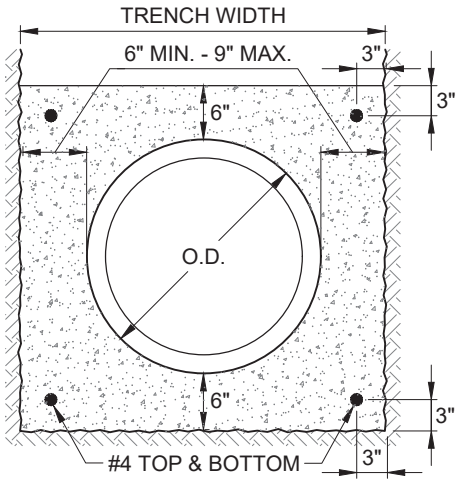
ENCASEMENT TYPE 1



CRADLE TYPE 1A



CRADLE TYPE 2A



ENCASEMENT TYPE 1A

NOTES:

1. ALL CONCRETE FOR CRADLES AND ENCASEMENTS SHALL BE CLASS "B".

2. THE CONCRETE FOR CRADLES TYPE 1 AND 2 AND ENCASEMENT TYPE 1 SHALL NOT BE POURED AGAINST TRENCH SHEETING OR FORMS OR ON LOOSE MATERIAL IN THE TRENCH BOTTOM BUT SHALL BE POURED AGAINST AND ON THE UNDISTURBED TRENCH WALLS AND BOTTOM.

3. THE CONCRETE FOR CRADLES TYPE 1A AND 2A AND ENCASEMENT TYPE 1A MAY BE POURED AGAINST TRENCH SHEETING OR FORMS OR AGAINST THE TRENCH WALLS BUT SHALL NOT BE POURED ON LOOSE MATERIAL IN THE TRENCH BOTTOM.

4. WHEN THE MAXIMUM ALLOWABLE TRENCH WIDTH HAS BEEN EXCEEDED AND A CRADLE IS REQUIRED BY THE EARTHWORK SECTION OF STANDARD SPECIFICATIONS SECTION 2.5, THE PIPE SHALL BE CRADLED WITH TYPE 1 OR TYPE 2 IF THE TRENCH IS FIRM GROUND, OR TYPE 1A OR TYPE 2A IF THE TRENCH IS IN YIELDING GROUND (TYPICALLY AT RIVER/STREAM CROSSING. THE AREAS OF HIGH LIKELIHOOD OF INFLOW AND INFILTRATION AS DETERMINED BY THE DISTRICT). IF THE TRENCH WIDTH IS LESS THAN ONE AND ONE HALF TIMES THE MAXIMUM ALLOWED BY THE SPECIFICATIONS WITHOUT CRADLE OR IF THE COVER ON THE PIPE IS LESS THAN TEN FEET, TYPE 1 OR 1A SHALL BE USED. IF THE TRENCH WIDTH IS MORE THAN ONE AND ONE HALF TIMES THE MAXIMUM ALLOWED BY THE SPECIFICATIONS WITHOUT CRADLE AND THE COVER IS TEN FEET OR MORE, TYPE 2 OR 2A SHALL BE USED.

5. ENCASE PIPE TO THE NEAREST FLEXIBLE JOINT.

6. PIPE IDENTIFICATION TAPE SHALL BE INSTALLED ABOVE THE PIPE ENCASEMENT, 4" BELOW PAVEMENT SECTION.

STANDARD CONCRETE CRADLES AND ENCASEMENTS

LAS VIRGENES MUNICIPAL WATER DISTRICT
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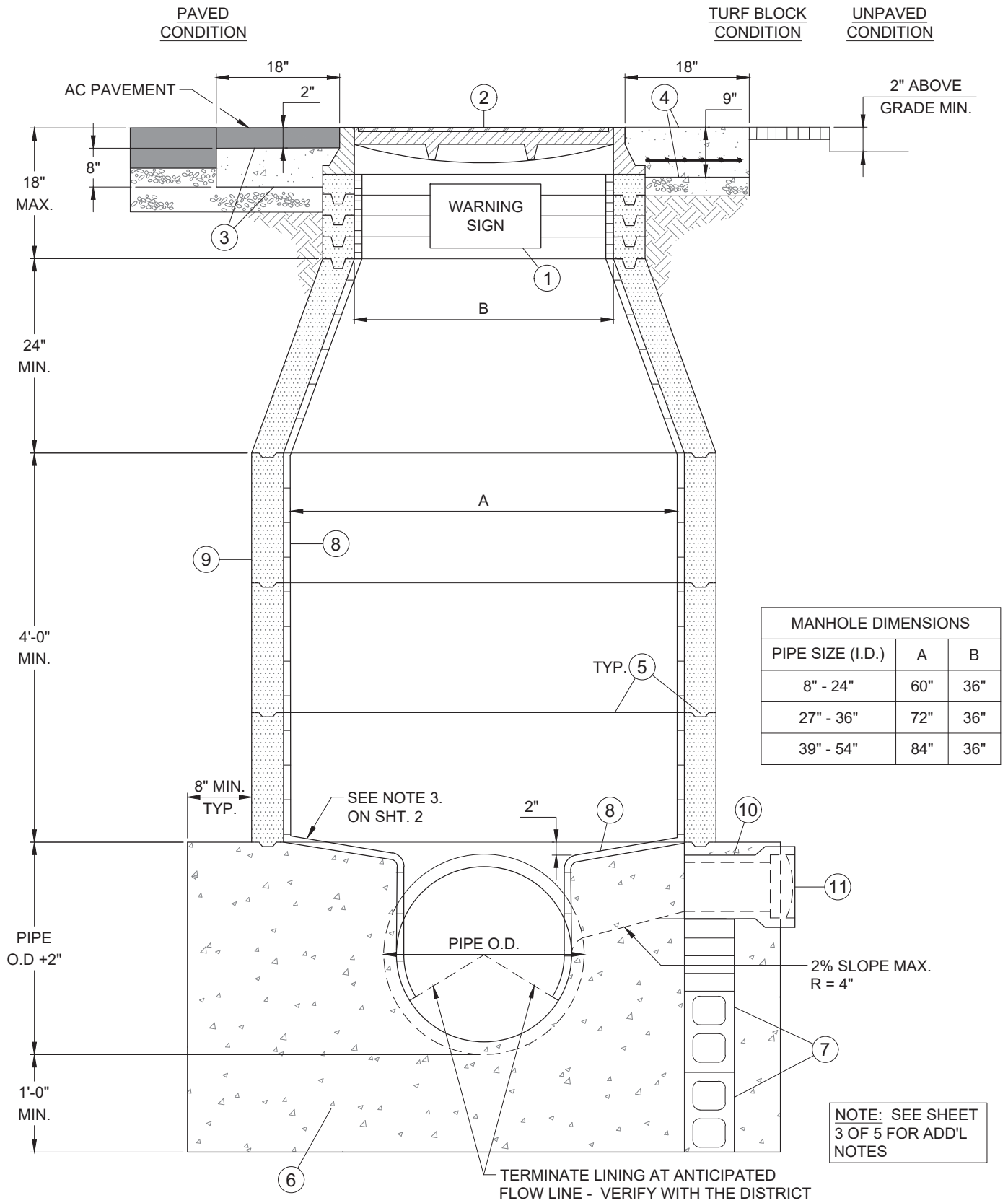
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-102



MANHOLE DIMENSIONS		
PIPE SIZE (I.D.)	A	B
8" - 24"	60"	36"
27" - 36"	72"	36"
39" - 54"	84"	36"

NOTE: SEE SHEET 3 OF 5 FOR ADD'L NOTES

SEWER MANHOLE AND COVER

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
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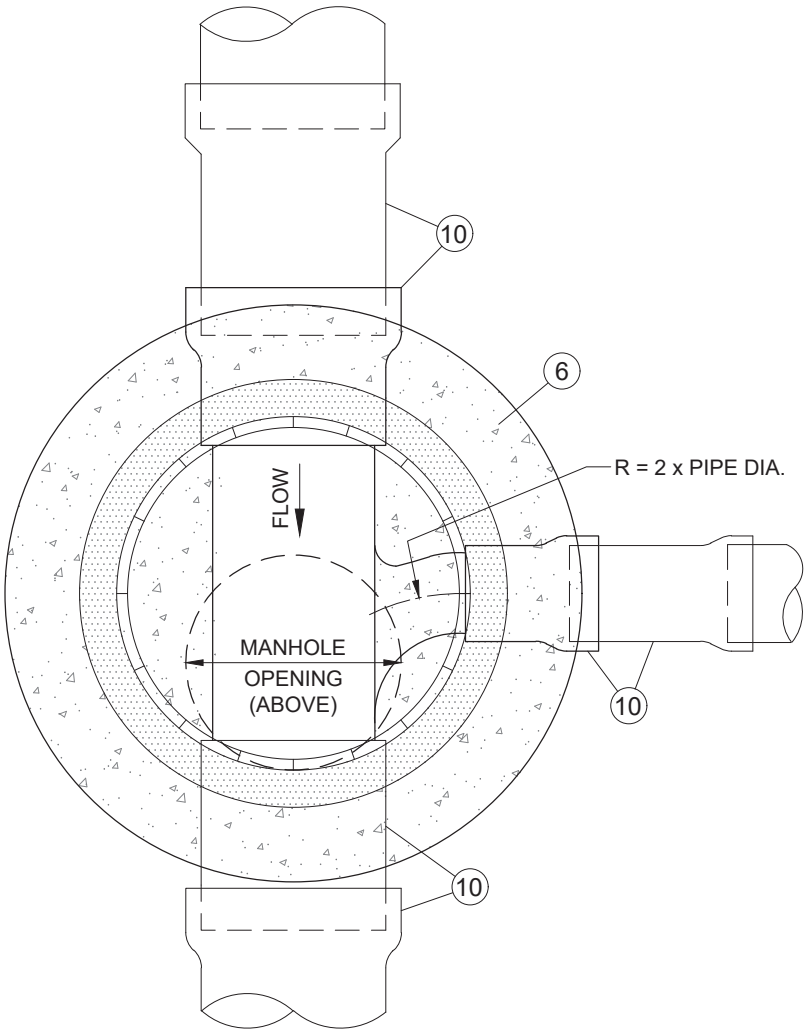
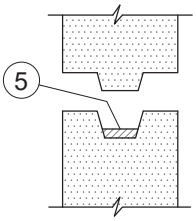
PRINCIPAL ENGINEER

12/22/2021
DATE

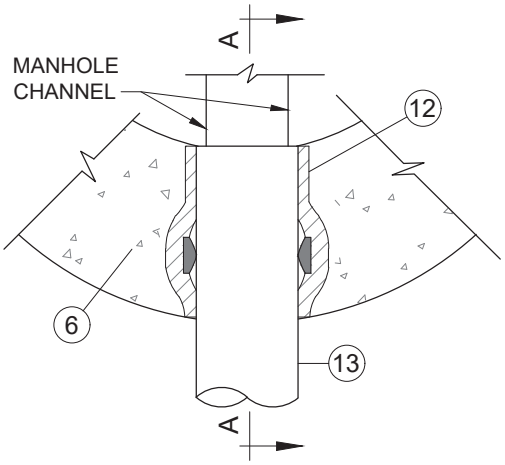
S-103



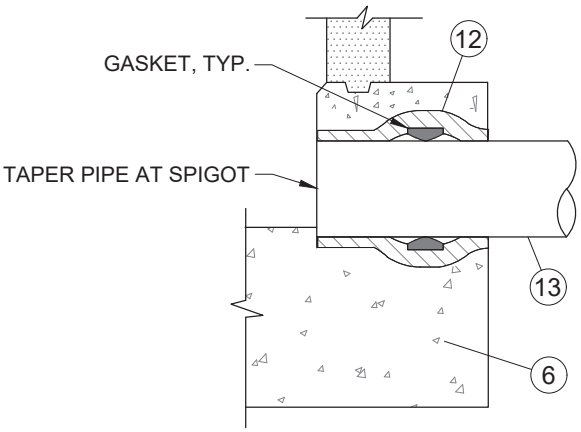
MANHOLE BASE WITH
VCP CONNECTION



SHAFT JOINT



PLAN



SECTION A-A

PVC PIPE CONNECTION

SEWER MANHOLE AND COVER

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
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REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-103

1. STENCILED WARNING SIGN WITH WHITE BACKING. SEE DETAIL ON SHEET 5
2. FRAME AND COVER PER SPEC. SECTION 1.11. SEE DETAIL ON SHEET 4
3. ROUND CLASS "B" CONCRETE COLLAR AND AC PAVEMENT
4. SQUARE CLASS "B" CONCRETE PAD WITH 6" x 6" STEEL CENTERED IN CONCRETE
5. SHAFT JOINT WITH JOINT SEALING COMPOUND. SEE NOTE 8. BELOW
6. CONCRETE MANHOLE BASE, CAST IN PLACE. SEE NOTES 6. AND 8. BELOW
7. CONCRETE BLOCK AND/OR BRICK SUPPORT. SEE NOTE 4. BELOW
8. MANHOLE LINER PER SPEC. SECTION 1.11. APPLY NON-SKID SURFACE ON TOTAL SHELF AREA
9. PRECAST CONCRETE MANHOLE SHAFT, MIN. WALL THICKNESS AS NOTED BELOW:
   60"Ø MANHOLE: 6" WALL THICKNESS | 72"Ø. MANHOLE: 7" WALL THICKNESS | 84"Ø. MANHOLE: 8" WALL THICKNESS
10. FOR INSTALLATION OF NEW M ANHOLES OVER EXISTING SEWER LINES, INSTALL 16" LONG VCP THROUGH MANHOLE BASE FOLLOWED BY A 12" LONG VCP, AS SHOWN, FOR FLEXIBILITY. FOR PVC PIPE, REFER TO "PVC PIPE CONNECTION" DETAILS ON SHEET 2 OF 5
11. INSTALL TEMPORARY PLYWOOD PLUG IN PIPE BELL JOINT
12. FOR SDR-35 PVC PIPE: GASKETED SDR-35 (SDR-26 FOR 15" THRU 18") PVC MANHOLE COUPLING WITH EPOXY RESIN SAND COATING ON EXTERIOR SURFACE. FOR C900 PVC DR 14 PIPE: GASKETED C900 PVC DR 14 MANHOLE COUPLING WITH EPOXY RESIN SAND COATING ON EXTERIOR SURFACE
13. SDR-35 PVC PIPE OR C900 PVC DR 14 PIPE

NOTES:

1. ALL MANHOLES SHALL HAVE 36" COVERS.
2. COAT FRAME AND COVER PER SPEC. SECTION 1.11.
3. PLACE TWO HALF MOON SHAPED PLYWOOD COVERS (5/8" THICK MIN.) ON BOTTOM OF MANHOLE AFTER SHAFTS HAVE BEEN SET TO KEEP DEBRIS FROM ENTERING SEWER. REMOVE PLYWOOD PRIOR TO FINAL ACCEPTANCE.
4. ALL INLETS AND OUTLETS SHALL BE SUPPORTED WITH CONCRETE BLOCK AND/OR BRICK SUPPORTS, PRIOR TO POURING MANHOLE BASE TO PREVENT PIPE MOVEMENT DURING CONSTRUCTION OF MANHOLE BASE
5. ALL PRECAST CONCRETE MANHOLE SHAFTS SHALL BE MANUFACTURED PER SPEC. SECTION 1.11.
6. BASE SHALL BE POURED AGAINST UNDISTURBED SOIL. IF SOIL IS DISTURBED, OR IF GROUND WATER EXISTS, CRUSHED ROCK SHALL BE INSTALLED BENEATH BASE.
7. CLASS "A" CONCRETE BASE, CAST IN PLACE MONOLITHICALLY.
8. PREFORMED COLD-APPLIED READY-TO-USE PLASTIC JOINT SEALING COMPOUND SHALL BE USED FOR ALL MANHOLE JOINTS. REMOVE EXCESS FROM SURFACES INSIDE MANHOLE.
9. RETAINING WALLS SHALL BE INSTALLED AROUND MANHOLE WHEN THERE IS AN ADJACENT SLOPE. CONSTRUCT RETAINING WALL PER STANDARD DRAWING G-101.
10. MANHOLES SHALL NOT BE PLACED IN SIDEWALKS OR IN CONCRETE DRIVEWAY APRONS.
11. MANHOLES DEEPER THAN 20'-0" TO TOP OF PIPE SHALL BE DESIGNED BY A REGISTERED CIVIL ENGINEER.
12. TIE DOWN ALL MANHOLES ON THE NEAREST CURB FACE BY MEANS OF A 4-INCH WHEEL GRINDER, SEE DETAIL ON SHEET 5 OF 5.
13. PAINTED WARNING SIGN SHALL HAVE WHITE BACKGROUND AND BLACK LETTERS.
14. MANHOLE MUST BE CONSTRUCTED AS SHOWN HEREON REGARDLESS OF CONSTRUCTION PHASE. NO INTERIM CONDITIONS WILL BE ACCEPTED.
15. STREET REHABILITATION AND/OR ASPHALT OVERLAY PROJECTS SHALL NOT INTERRUPT THE SERVICE FUNCTION OF ANY SEWER MANHOLES AND EMERGENCY ACCESS SHALL BE MAINTAINED AT ALL TIMES. MANHOLES THAT ARE PAVED OVER DURING CONSTRUCTION SHALL BE RAISED TO GRADE NO LATER THAN THREE DAYS AFTER THEY WERE PAVED OVER.

SEWER MANHOLE AND COVER

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

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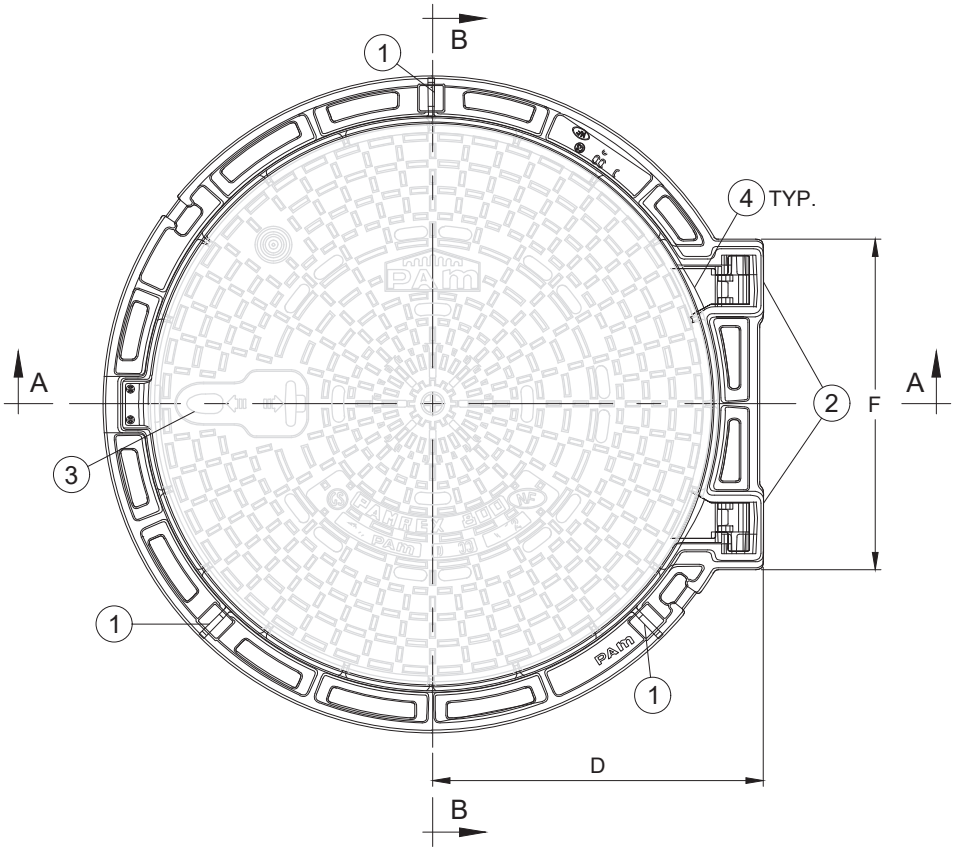
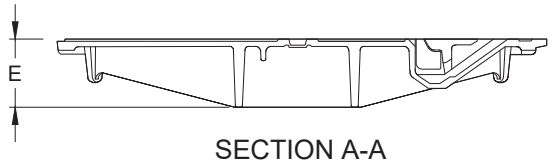
12/22/2021
DATE

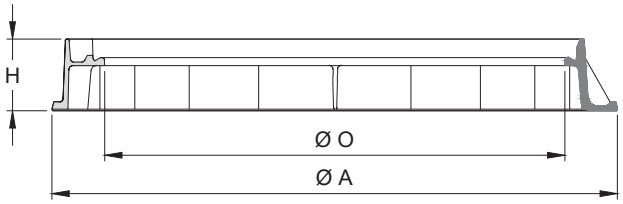
S-103



FRAME AND COVER



SECTION A-A



SECTION B-B

MASS (LBS.)		DIMENSIONS (IN.)					
COVER	TOTAL	A	D	E	F	H	O
205	392	48	22	5.67	23	6	36

1. LIFTING EYES
2. HINGE
3. LOCKING SYSTEM
4. FRAME SLOTS
5. INFILTRATION PLUG

SEWER MANHOLE AND COVER

LAS VIRGENES MUNICIPAL WATER DISTRICT
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CALABASAS, CA 91302

REVISIONS			
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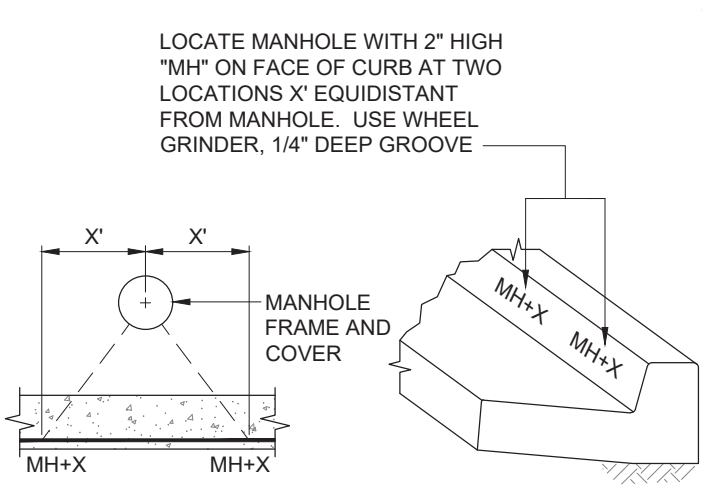
PRINCIPAL ENGINEER

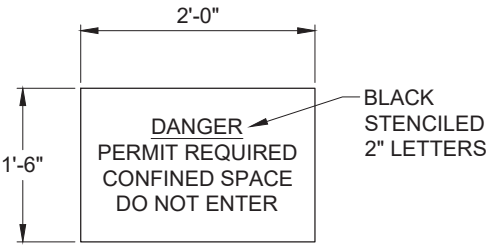
12/22/2021
DATE

S-103

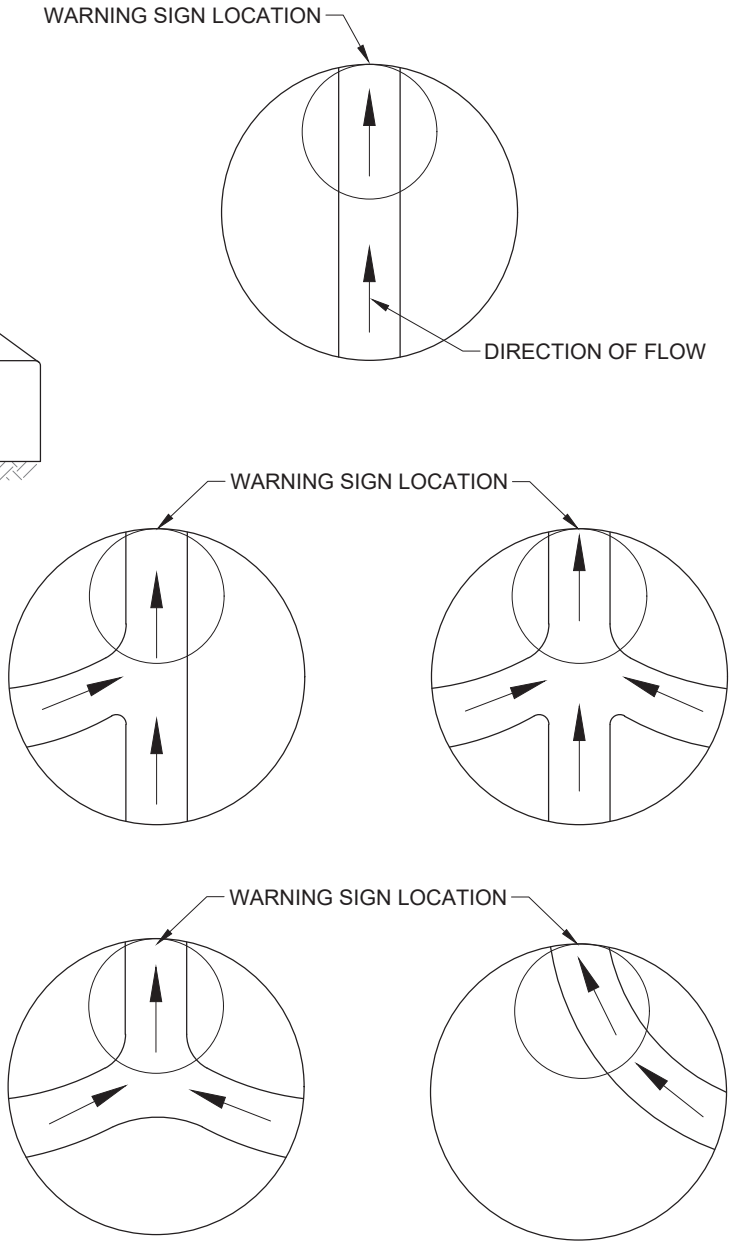


PLAN VIEW

MANHOLE TIE-DOWN



WARNING SIGN WITH WHITE BACKING



ORIENTATION OF MANHOLE COVER TO MANHOLE BASE

SEWER MANHOLE AND COVER

LAS VIRGENES MUNICIPAL WATER DISTRICT
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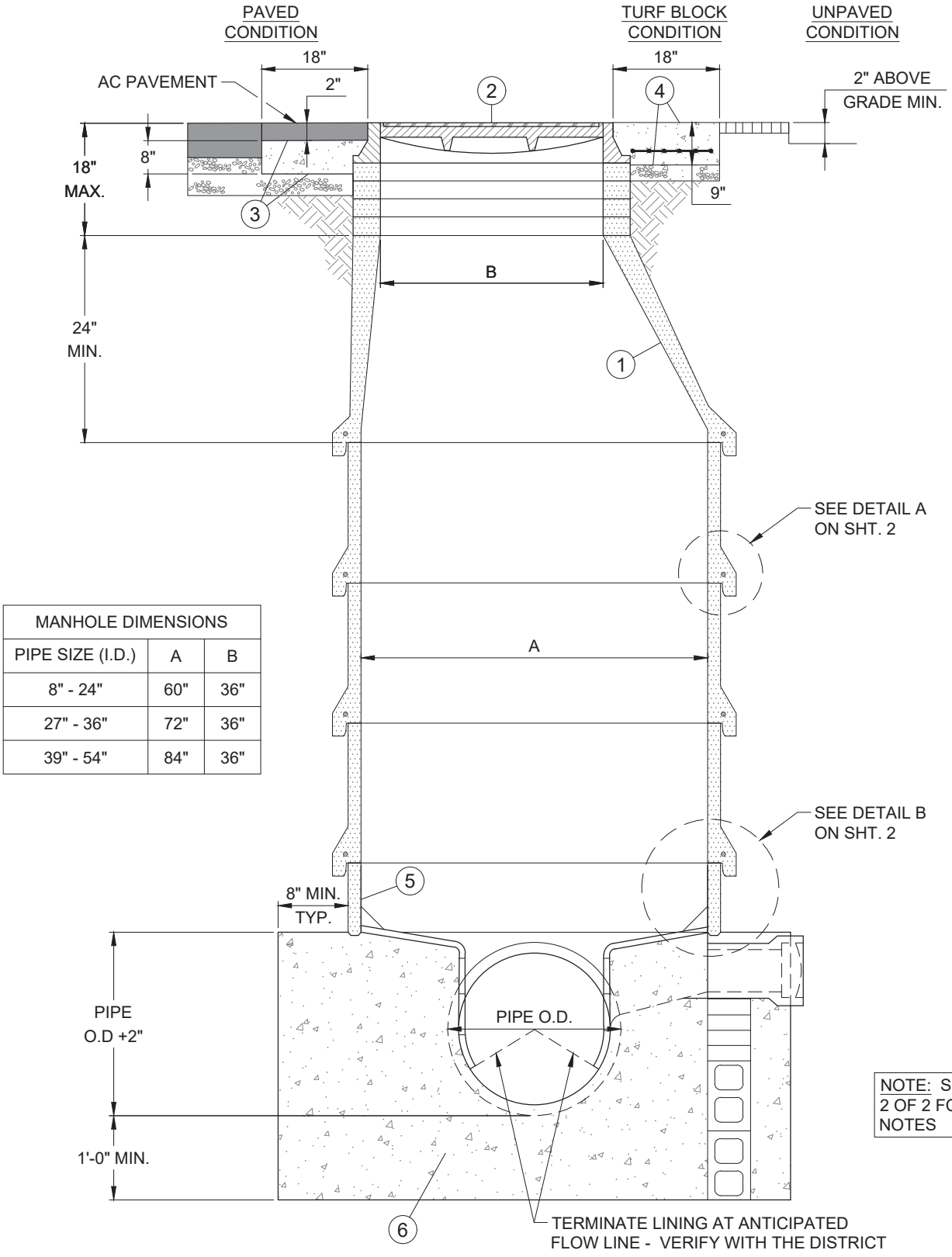
12/22/2021
DATE

S-103



MANHOLE DIMENSIONS		
PIPE SIZE (I.D.)	A	B
8" - 24"	60"	36"
27" - 36"	72"	36"
39" - 54"	84"	36"

NOTE: SEE SHEET 2 OF 2 FOR ADD'L NOTES

POLYMER CONCRETE MANHOLE AND CONCRETE BASE

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
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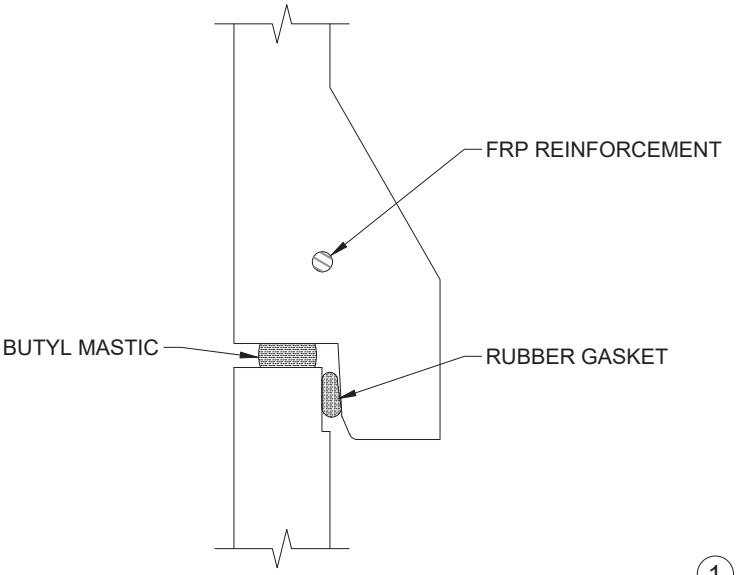
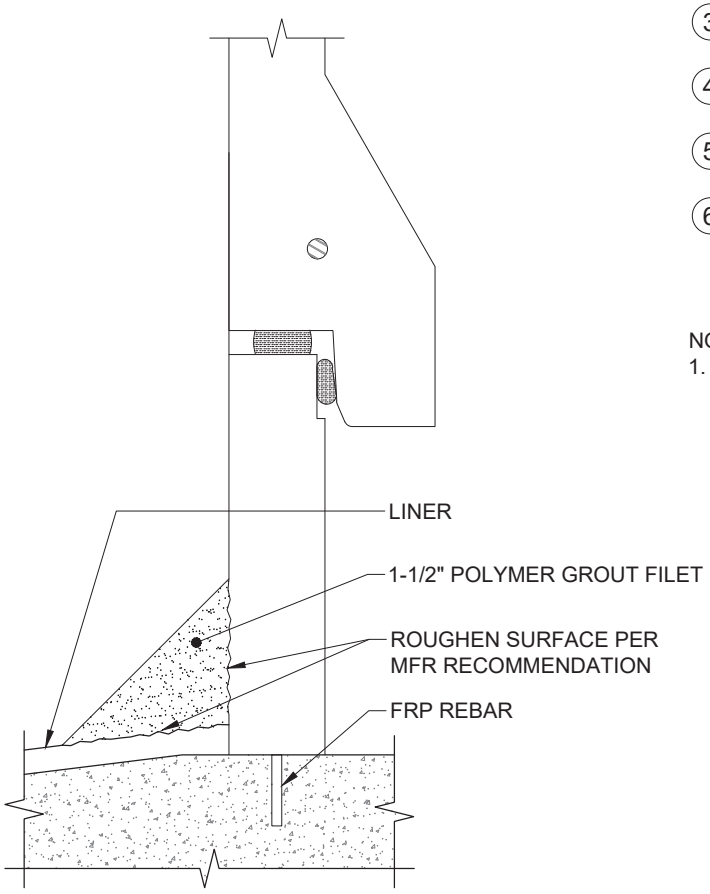
PRINCIPAL ENGINEER

12/22/2021
DATE

S-104



DETAIL A



DETAIL B

1. POLYMER CONCRETE GRADE RINGS, CONE, AND BARREL SECTIONS
2. FRAME AND COVER PER SPEC. SECTION 1.11
3. ROUND CLASS "B" CONCRETE COLLAR AND AC PAVEMENT
4. SQUARE CLASS "B" CONCRETE PAD WITH 6" x 6" STEEL CENTERED IN CONCRETE
5. 2" RISER WITH 5" FRP REBAR @ 45° OC, WET SET INTO CONCRETE BASE
6. CAST-IN-PLACE CONCRETE BASE - SEE STANDARD DRAWING S-103 FOR DETAILS

NOTE:
1. REFER TO STANDARD DRAWING S-103 FOR MANHOLE BASE, FRAME, AND COVER.

POLYMER CONCRETE MANHOLE AND CONCRETE BASE

LAS VIRGENES MUNICIPAL WATER DISTRICT
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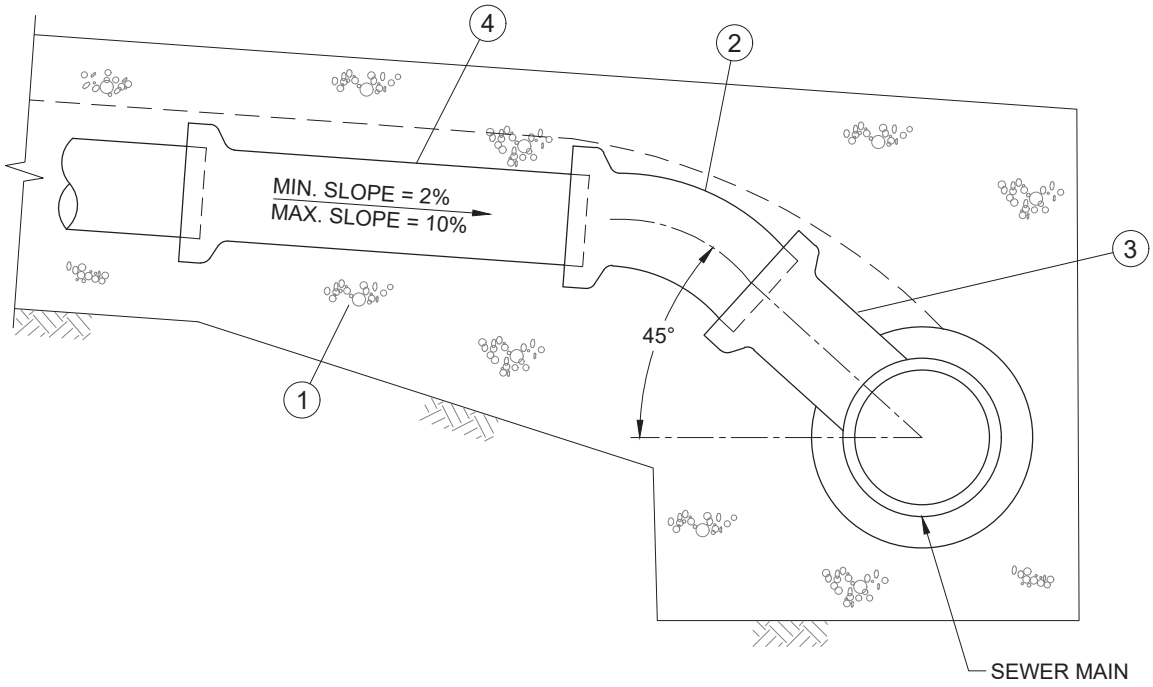
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-104



1. 3/4" CRUSHED ROCK BEDDING, MINIMUM 6" THICKNESS
2. BEND OR OTHER FITTING TO ADJUST TO PROPER GRADE
3. VCP OR PVC WYE BRANCH FITTING. SEE SHEET 2 FOR DETAILS
4. VCP OR PVC PIPE LATERAL. MATERIAL SHALL MATCH THE MAIN SEWER LATERAL UNLESS ALLOWED BY THE DISTRICT

CUT-IN WYE CONNECTION

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
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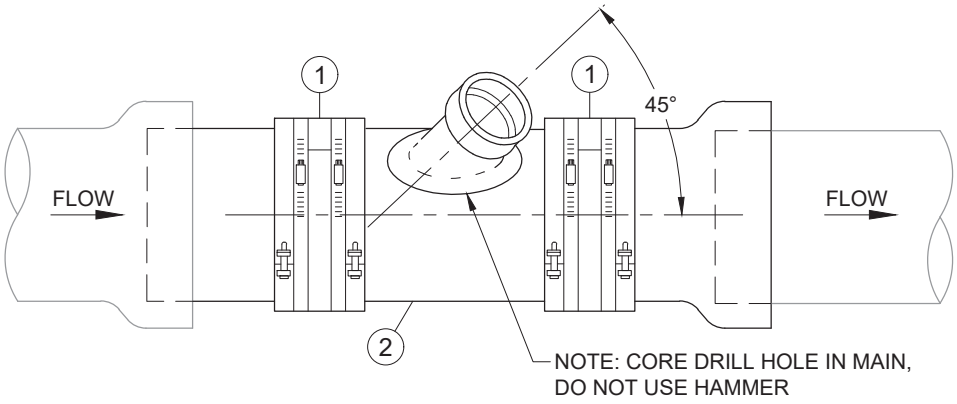
REVISIONS			
NO.	BY	DATE	APRVD.

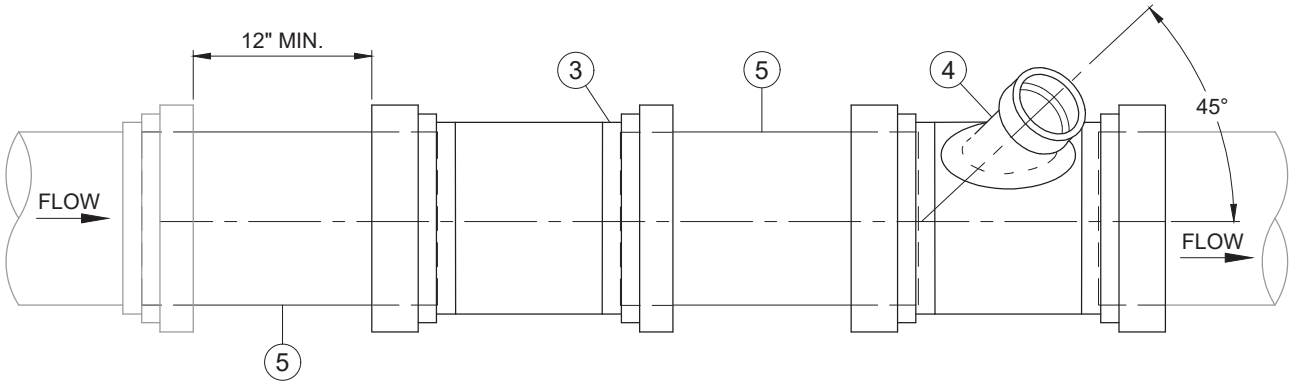
PRINCIPAL ENGINEER

12/22/2021
DATE

S-105



VCP SEWER LATERAL



PVC SEWER LATERAL

1. BANDED RUBBER COUPLING WITH OUTSIDE TYPE 316 STAINLESS STEEL SHEAR RING.
2. VCP WYE FITTING.
3. GASKETED PVC PIPE COUPLING, REPAIR STYLE.
4. GASKETED PVC WYE FITTING.
5. SDR-35 PVC PIPE (PUP), MIN. LENGTH: 12".

NOTES:

1. WHEN 12" MIN. SPACE BETWEEN EDGE OF COUPLING AND BELL CANNOT BE PROVIDED, CUT-OUT NEAREST BELL JOINT AND INSERT PLAIN-END PIPE.
2. ALL DEBRIS SHALL BE KEPT OUT OF THE SEWER. THE PIPE REACH CUT-INTO SHALL BE CLEANED AND BALLED, IF NECESSARY, AS DIRECTED BY THE DISTRICT REPRESENTATIVE.
3. DAMAGED PIPE SHALL BE REPLACED AS DIRECTED BY THE DISTRICT REPRESENTATIVE
4. SADDLE-TYPE CONNECTIONS SHALL ONLY BE USED FOR SPECIAL SITUATIONS, AND SHALL NOT BE CONSTRUCTED WITHOUT PRIOR DISTRICT APPROVAL.
5. 8" AND LARGER DIA. LATERALS SHALL BE CONNECTED TO MAIN LINE VIA MANHOLE ONLY

CUT-IN WYE CONNECTION

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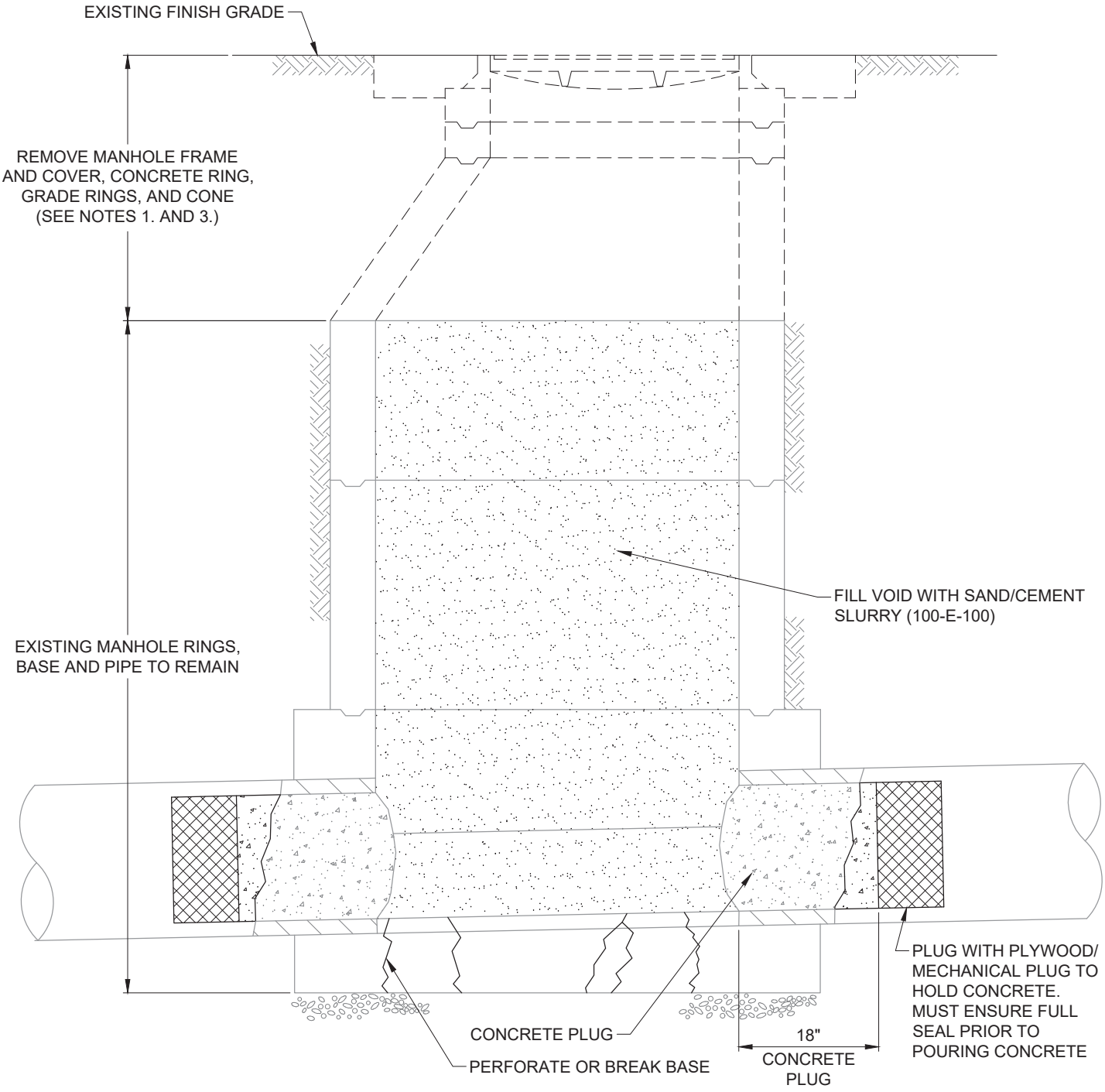
DATE

S-105



NOTES:

1. ALL SALVAGED MATERIAL BECOMES THE PROPERTY OF LVMWD.
2. FILL 18" OF ABANDONED SEWER MAIN WITH CONCRETE OR PRESSURE GROUTING.
3. BACKFILL TRENCH ZONE WITH NATIVE EARTH MATERIAL. (SEE SPEC. SECTION 1.6 FOR SPECIFICS). BACKFILL SHALL BE COMPACTED TO MINIMUM 90% RELATIVE COMPACTION

EXISTING MANHOLE ABANDONMENT (ABANDONED SEWER LINE)

LAS VIRGENES MUNICIPAL WATER DISTRICT
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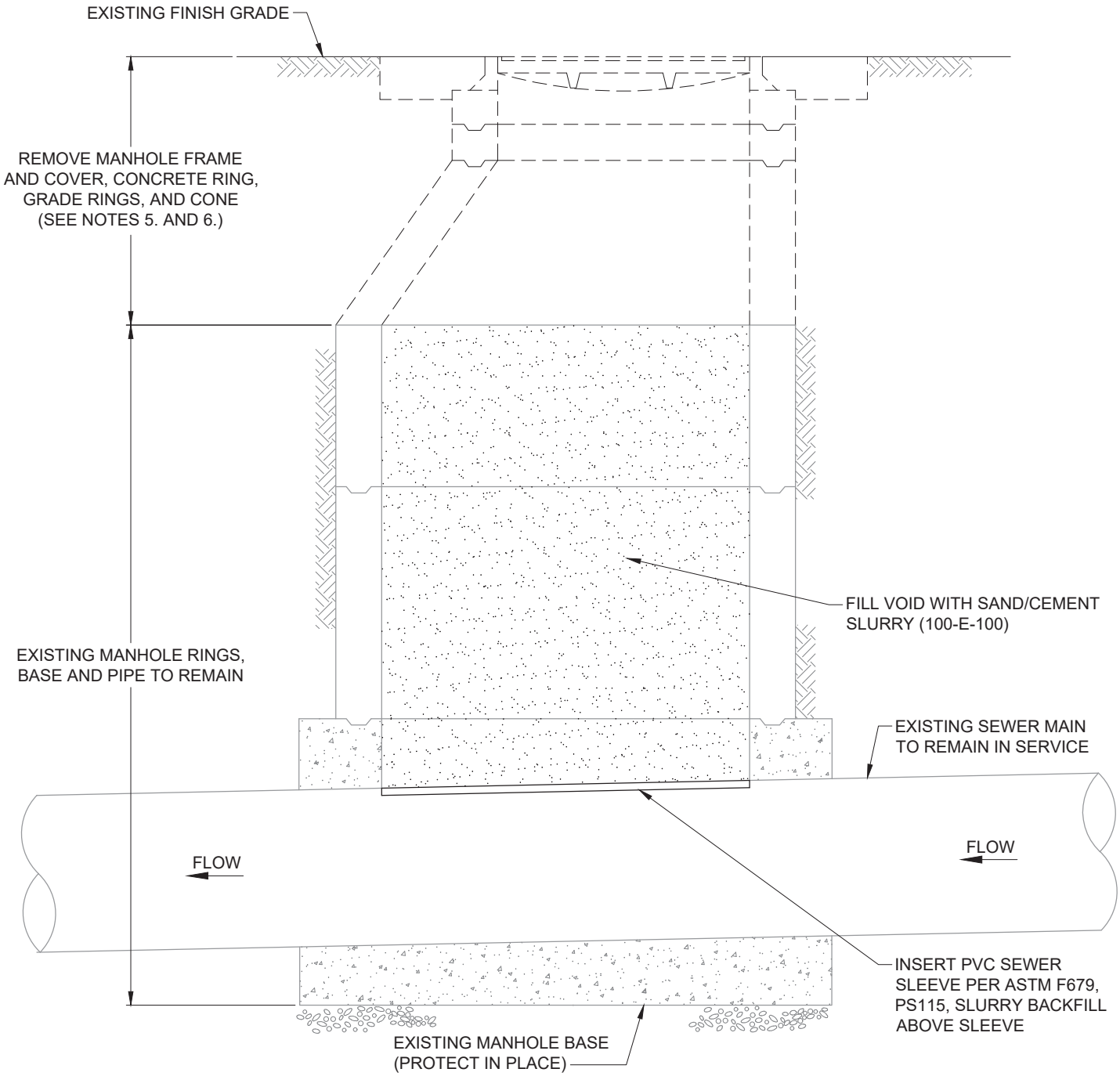
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-106



NOTES:

1. FIELD MEASURE MANHOLE CHANNEL AND DETERMINE NEEDED SLEEVE DIMENSIONS PRIOR TO INSTALLATION.
2. INSTALL SLEEVE INSIDE FLOW CHANNEL, ALIGN INVERTS OF SLEEVE AND EXISTING SEWER PIPE INSIDE MANHOLE FOR A CONTINUOUS GRADE.
3. AVOID VERTICAL AND HORIZONTAL DISPLACEMENT OF SLEEVE DURING BACKFILLING.
4. DO NOT ALLOW SLURRY TO ENTER INSIDE OF SEWER PIPE.
5. ALL SALVAGE MATERIAL BECOMES PROPERTY OF LVMWD.
6. BACKFILL TRENCH ZONE WITH NATIVE EARTH MATERIAL. (SEE SPEC. SECTION 1.6 FOR SPECIFICS). BACKFILL SHALL BE COMPACTED TO MINIMUM 90% RELATIVE COMPACTION.

EXISTING MANHOLE ABANDONMENT (SEWER LINE IN SERVICE)

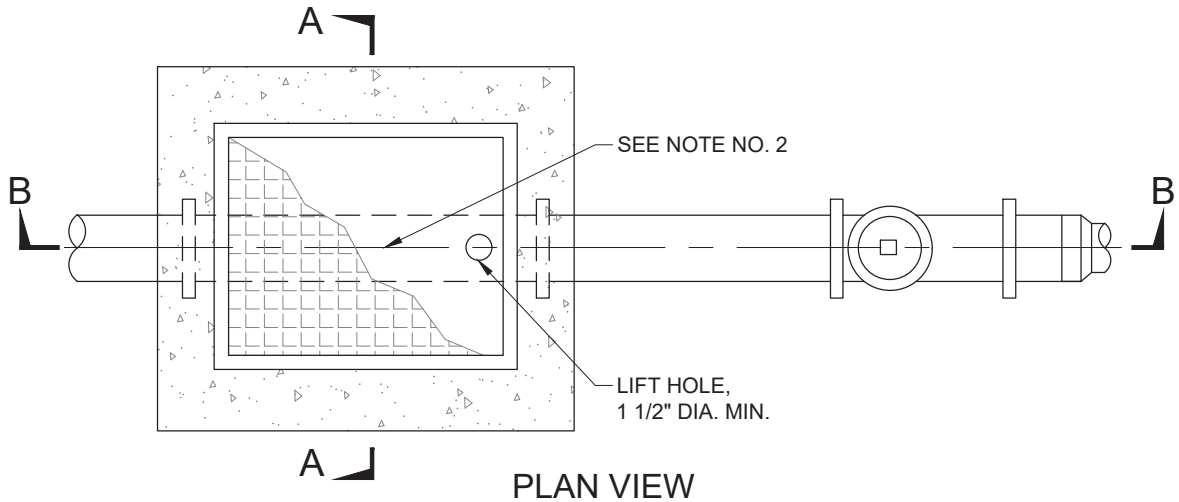
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

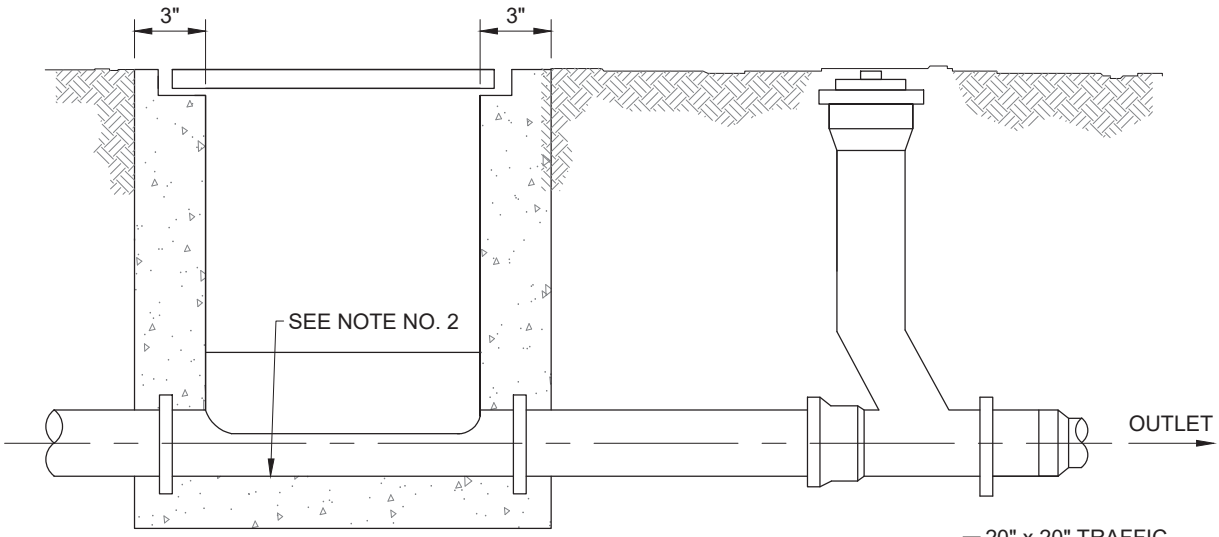
PRINCIPAL ENGINEER

12/22/2021
DATE

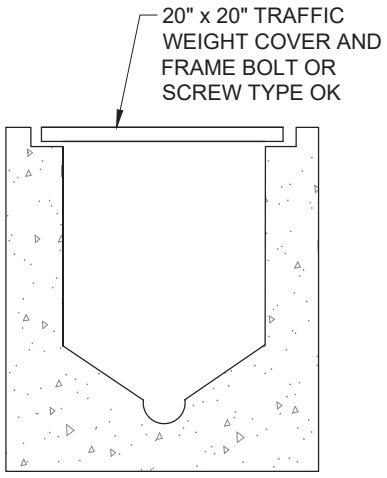
S-106



PLAN VIEW



SECTION B-B



SECTION A-A

NOTES:
1. APPROVAL FOR THE LOCATION OF THE SAMPLING WELL SHALL BE OBTAINED FROM THE LVMWD PRIOR TO INSTALLATION.
2. WHEN INSTALLING THE SAMPLING WELL, BE SURE THAT THE INVERT OF THE SAMPLING WELL IS LEVEL WITH THE INVERT OF THE INLET AND OUTLET PIPES.
3. FOR PLASTIC SEWER PIPE, PLACE TIGHT FITTING RUBBER RING OVER PIPE AT MIDPOINT WHERE IT PASSES THROUGH CONCRETE WALL.

SAMPLING WELL

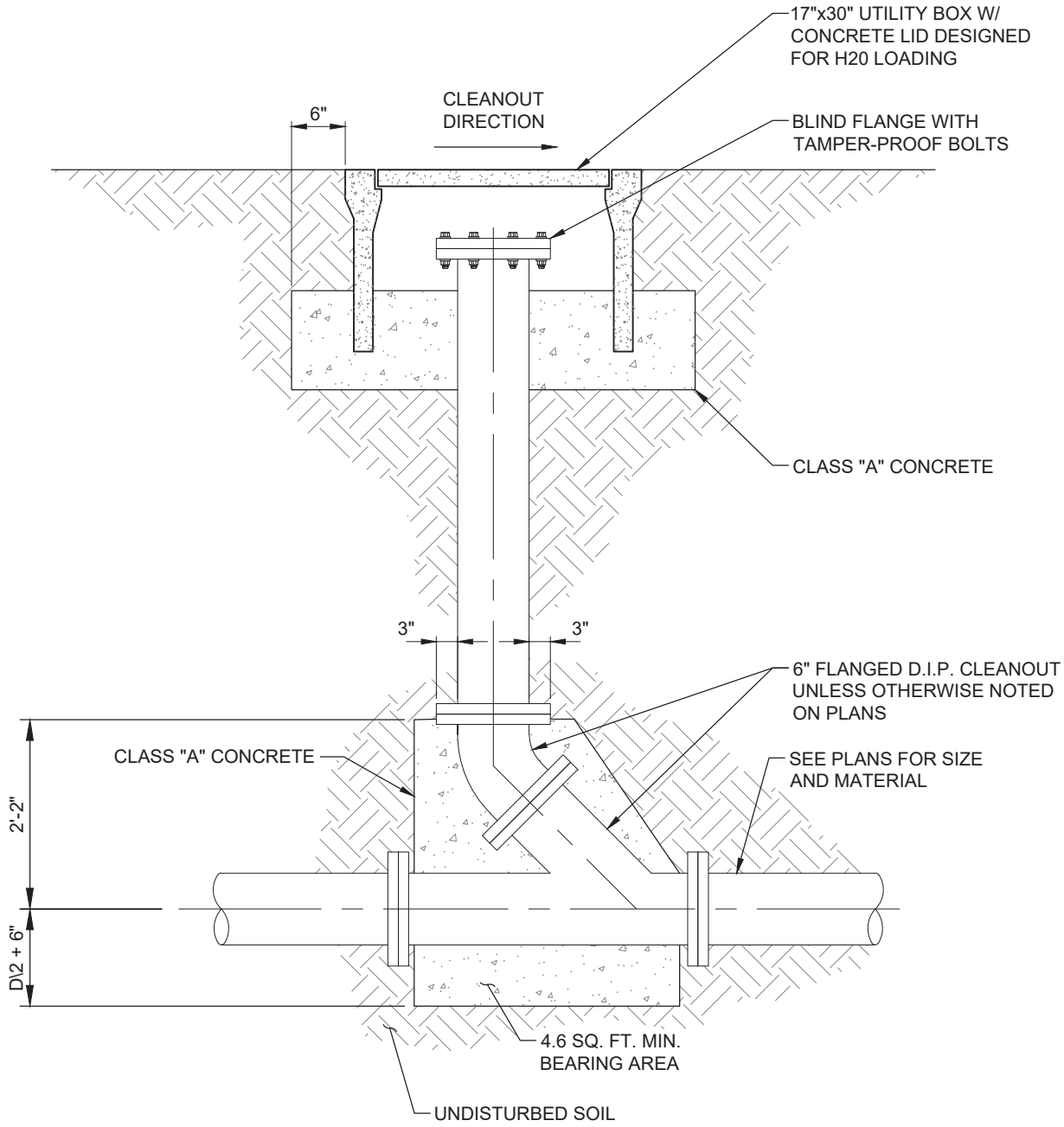
LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-107



ELEVATION

NOTES:

1. SIMILAR POLY VINYL CHLORIDE COMPONENETS MAY BE USED IN ACCORDANCE WITH ASTM STANDARD SPECIFICATION D-3033.
2. CONCRETE SLAB TO BE 560-C-3250 PSI.
3. REFER TO STANDARD DRAWING S-103 FOR MANHOLE FRAME AND COVER SPECIFICS. USE TRAFFIC RATED MANHOLE FRAME AND COVER FOR TRAFFIC IN AREAS SUBJECT TO VEHICULAR TRAFFIC.

SEWER FORCE MAIN CLEANOUT

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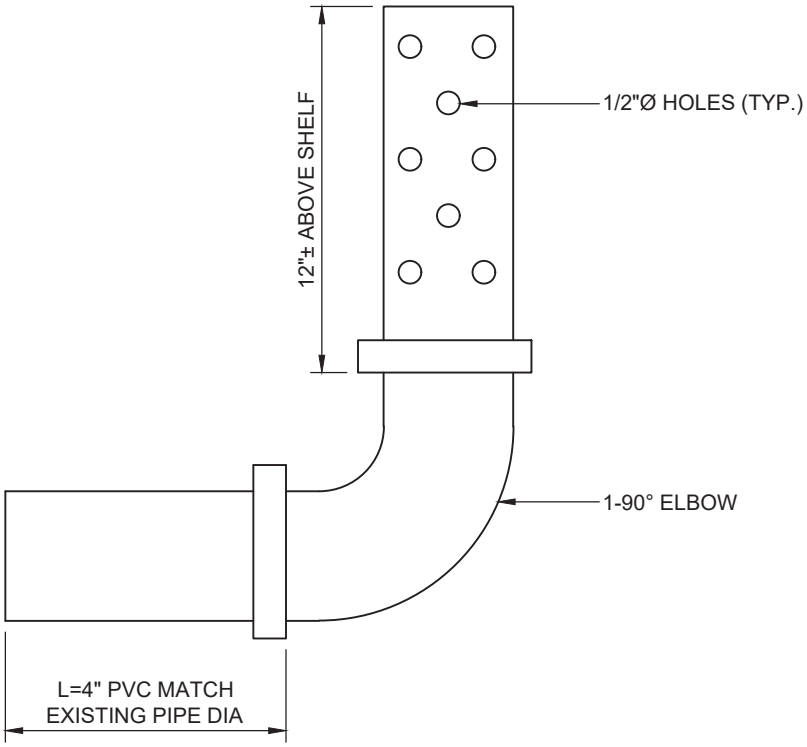
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-108



NOTE:
CONTRACTOR SHALL BE REQUIRED TO INSTALL AND MAINTAIN SAND TRAPS IN MANHOLES AT THE DOWN STREAM END OF PROJECT. PRIOR TO REMOVAL OF THE SAND TRAPS, THE LINES AND MANHOLES SHALL BE CLEANED OF ALL DEBRIS. THE SAND TRAPS SHALL BNOT BE REMOVED UNLESS AUTHORIZED BY THE DISTRICT AND IN THE PRESENCE OF THE PROJECT'S INSPECTOR.

SAND TRAP

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CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

S-109

PER CEC 110.12 ELECTRICAL INSTALLATION TO BE NEAT AND WORKMANLIKE. SEE NECA 1 STANDARD FOR GOOD WORKMANSHIP AND NECA 101 STANDARD FOR INSTALLING STEEL CONDUIT FOR REQUIREMENTS.

ABOVE GRADE - HOT DIPPED GALVANIZED RIGID STEEL CONDUIT TO BE USED FOR ALL EXTERIOR AND INTERIOR LOCATIONS ABOVE GRADE OR ELSEWHERE SHOWN ON PLANS. ALL RIGID CONDUIT AND FITTINGS TO BE THREADED. USE OF SET SCREW OR COMPRESSION TYPE CONNECTOR IS PROHIBITED. MEYERS HUBS TO BE USED ON ALL EXTERIOR PANEL CONNECTIONS.

BELOW GRADE - RIGID PVC NONMETALLIC CONDUIT SCHEDULE 40 TO BE USED FOR ALL UNDERGROUND LOCATIONS AND BELOW VAPOR BARRIER OF SLAB. NO CONDUITS SHALL BE INSTALLED TO REDUCE THE STRUCTURAL INTEGRITY OF FOOTINGS. MANDREL ALL CONDUITS PRIOR TO PULLING WIRE

CHEMICAL BUILDINGS AND CORROSIVE ATMOSPHERES - RIGID PVC NONMETALLIC CONDUIT SCHEDULE 80 TO BE USED FOR ALL INTERIOR LOCATIONS ABOVE GRADE IN CHEMICAL BUILDINGS AND CORROSIVE ENVIRONMENTS.

THROUGH CONCRETE SLABS AND EXTERIOR CORROSIVE ATMOSPHERES - PVC COATED GALVANIZED RIGID STEEL CONDUIT MINIMUM 40 MIL FACTORY COATING TO BE USED FOR ALL EXPOSED CONDUITS THROUGH CONCRETE SLABS (MINIMUM 12'' ABOVE AND BELOW SLAB) AND ALL EXTERIOR LOCATION CORROSIVE ATMOSPHERES. USE MANUFACTURERS' SPECIFIED TOOLS AND PROCEDURES FOR INSTALLATION.

MOTORS AND SENSOR CONNECTIONS - LIQUID TIGHT FLEXIBLE METAL CONDUIT (UV RESISTANT) TO ONLY BE USED ON CONNECTIONS TO MOTORS AND SENSORS OR TO ISOLATE VIBRATION. MAXIMUM LENGTH TO BE 30''.

JUNCTION BOXES - MINIMUM SIZE PER NEC. EXPOSED LOCATION, 1 AND 2 GANG TO BE CAST IRON DEVICE BOXES TYPE FS/FD SUITABLE FOR WET LOCATIONS. EXPOSED LOCATION EXTERIOR LARGER SIZES CONTINUOUS HINGE TYPE 4, CORROSIVE LOCATIONS CONTINUOUS HINGE TYPE 4X STAINLESS STEEL.

GROUND CONNECTIONS - GROUND CONNECTIONS TO BE EXOTHERMIC CADWELD (ALL 600 AMP OR LARGER SERVICE) OR BURNDY HYDRAULIC COMPRESSION CONNECTORS. GROUND BUS CONNECTIONS TO BE CRIMP LUG TYPE WITH BOLTED CONNECTION TO GROUND BUS.

480 VOLT AND BELOW POWER WIRING TO BE XHHW-2, THWN-2 600 VOLT PER OWNER'S DIRECTION, ALL POWER CONNECTIONS TO BE TREATED WITH ANTIOXIDANT COMPOUND. ALL VFD MOTOR CABLE TO BE SHIELDED, INVERTER DUTY. SHIELD GROUNDED AT BOTH ENDS.

CLASS 1, DIVISION 1 WIRING PER CEC 501.10A - PVC COATED THREADED RIGID METAL CONDUIT, RIGID METAL CONDUIT OR ALUMINUM CONDUIT PER OWNER'S DIRECTION IS REQUIRED. RIGID PVC CONDUIT ENCASED IN MINIMUM 2" CONCRETE AND MINIMUM 36" BELOW GRADE IS ALLOWED PER PRIOR APPROVAL. ALL CONNECTIONS TO BE WRENCH TIGHT MINIMUM 5 THREADS ENGAGED. FLEXIBLE FITTINGS TO BE EXPLOSION PROOF PER UL 1203. INTRINSICALLY SAFE (INCAPABLE OF CAUSING IGNITION) IS ALLOWED FOR SENSORS IF ISOLATED FROM NON-INTRINSICALLY SAFE WIRING.

CONTACT OWNER'S ELECTRICAL REPRESENTATIVE TO SCHEDULE AN

ELECTRICAL PRECONSTRUCTION MEETING PRIOR

TO COMMENCING CONSTRUCTION

ELECTRICAL CONSTRUCTION NOTES

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES RD.
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REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-101

SITE:_____ **DATE:**_____

WARNING: FOLLOWING ALL REQUIRED SAFE WORK PRACTICES AND PPE IS THE RESPONSIBILITY OF THE CONTRACTOR. ALL WORK TO BE PERFORMED BY A TRAINED/CERTIFIED TECHNICIAN.

PDP AND MAIN COMMISSIONING

WITH ALL POWER SOURCES LOCKED OUT VERIFY ALL BUS CONNECTIONS ARE TIGHT
TORQUE SETTINGS

VERIFY ALL GROUND CONNECTIONS ARE COMPLETE AND SOLID
MEASURE VOLTAGE AT MAIN
_____ A-B PHASE VOLTS
_____ B-C PHASE VOLTS
_____ A-C PHASE VOLTS

VERIFY MOTOR CONDITION AND CONTROL CIRCUIT REQUIRED FOR EACH MOTOR
MOTOR TAG AND DESCRIPTION:_____

__ LOCKOUT MOTOR DISCONNECT

__ WITH T-LEADS DISCONNECTED MEGGER MOTOR AND LEADS. DOCUMENT READINGS (1 MEGOHM/VOLT + 1000 MEGOHM) (MIN. 1500 MEGOHM FOR 480 VOLTS.)
MEGOHMS A-B _____
MEGOHMS B-C _____
MEGOHMS A-C _____
MEGOHMS A-G _____
MEGOHMS B-G _____
MEGOHMS C-G _____

SETUP PROTECTION
__ VERIFY FLA ON MOTOR NAMEPLATE
__ SET HMCP (EQ. RECOMMENDATION10 TIMES FLA), VERIFY OL SETTING.
__ SET MOTOR PROTECTION RELAY PARAMETERS IF APPLICABLE
__ SET SOLID STATE AND VFD STARTER PARAMETERS IF APPLICABLE. DOCUMENT ALL PARAMETERS

WITH T-LEADS DISCONNECTED AND CONTROL POWER ON VERIFY START/STOP CONTROL WILL START AND STOP STARTER.
__ DOCUMENTATION: VERIFY STARTER CONTROL SCHEMATIC IS CORRECT INCLUDING MOTOR PROTECTOR AND ALL SOFT START AND VFD PARAMETERS ARE DOCUMENTED.

IF ALL TESTS PASSED RECONNECT T-LEADS

ROTATION CHECK (VERIFY EQUIPMENT REPRESENTATIVE HAS CHECKED ALL MECHANICAL ITEMS, LUBRICATION, MOUNTING, AND OKAYS TEST BEFORE RUNNING MOTOR)

__ WITH MOTOR UNCOUPLED BUMP (IF DAMAGE CAN OCCUR) CHECK FOR ROTATION

IF APPROVED RE-COUPLE MOTOR

LOAD TEST RUNNING AMPS KVA=VXAX1.732/1000 KW= P.F.XVXAX1.732/1000
A-B RUNNING AMPS_____@RPM_____
B-C RUNNING AMPS_____@RPM_____
A-C RUNNING AMPS_____@RPM_____

ELECTRICAL COMMISSIONNING NOTES

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4232 LAS VIRGENES RD.
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REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-102

SITE:_____ _____ **DATE:**_____

WARNING: FOLLOWING ALL REQUIRED SAFE WORK PRACTICES AND PPE IS THE RESPONSIBILITY OF THE CONTRACTOR.
ALL WORK TO BE PERFORMED BY A TRAINED/CERTIFIED TECHNICIAN.

INSTRUMENT DATA:

SENSOR DESCRIPTION:_____
SENSOR TAG/LOOP NO.: _____EX. XXX-XXX-XXX
INSTRUMENT TYPE:_____
INSTRUMENT MANUFACTURER:_____

PROCESS DATA:

PROCESS RANGE: _____ EX. PSIG, FEET OF WATER, GPM, PPM
INSTRUMENT RANGE: _____
INSTRUMENT SPAN: _____

TRANSMITTER DATA

MODEL NO.:_____
CALIBRATION RANGE VERIFIED:_____
SENSOR OUTPUT VERIFIED:_____ EX. 4-20 MA, OPEN/CLOSED, RTD
DISPLAY RANGE VERIFIED:_____

FIELD TEST

LOOP CHECK: SENSOR:_____
TUNING:_____
OUTPUT:_____

INSTRUMENT/SENSOR COMMISIONNING NOTES

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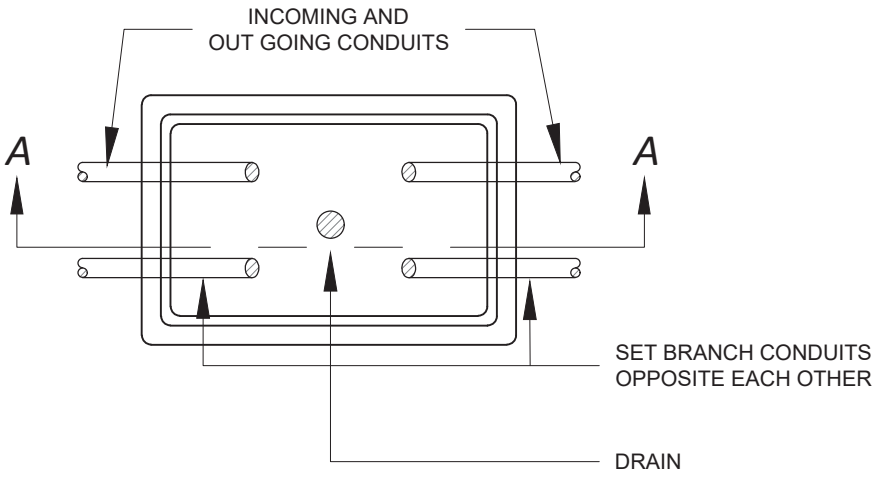
REVISIONS			
NO.	BY	DATE	APRVD.

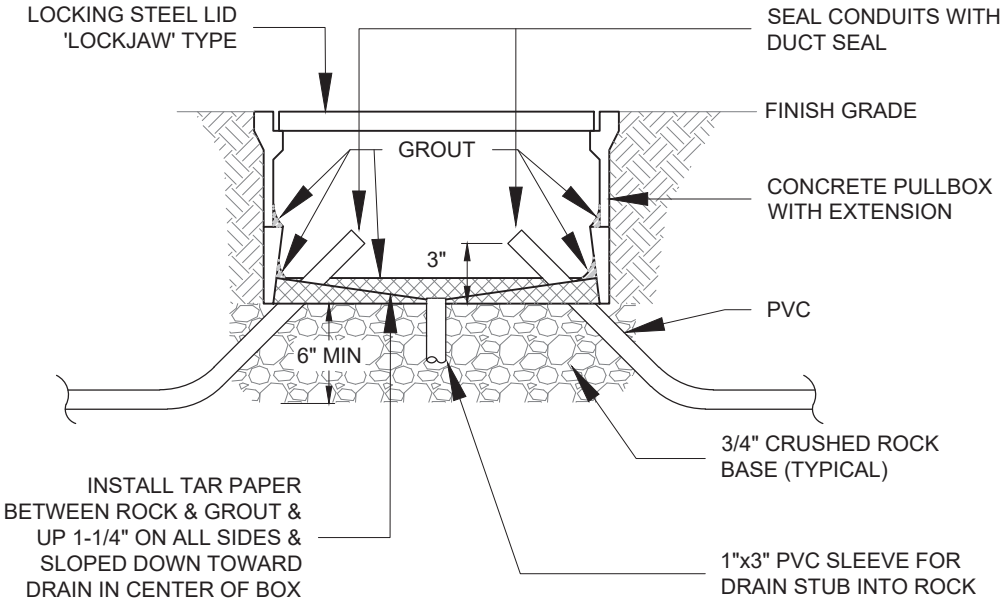
PRINCIPAL ENGINEER

12/22/2021
DATE

E-103



PLAN VIEW



SIDE VIEW A-A

CHRISTY N9 OR LARGER PULLBOXES SIMILAR

ELECTRICAL DETAILS
TYPICAL PULLBOX WITH EXTENSION

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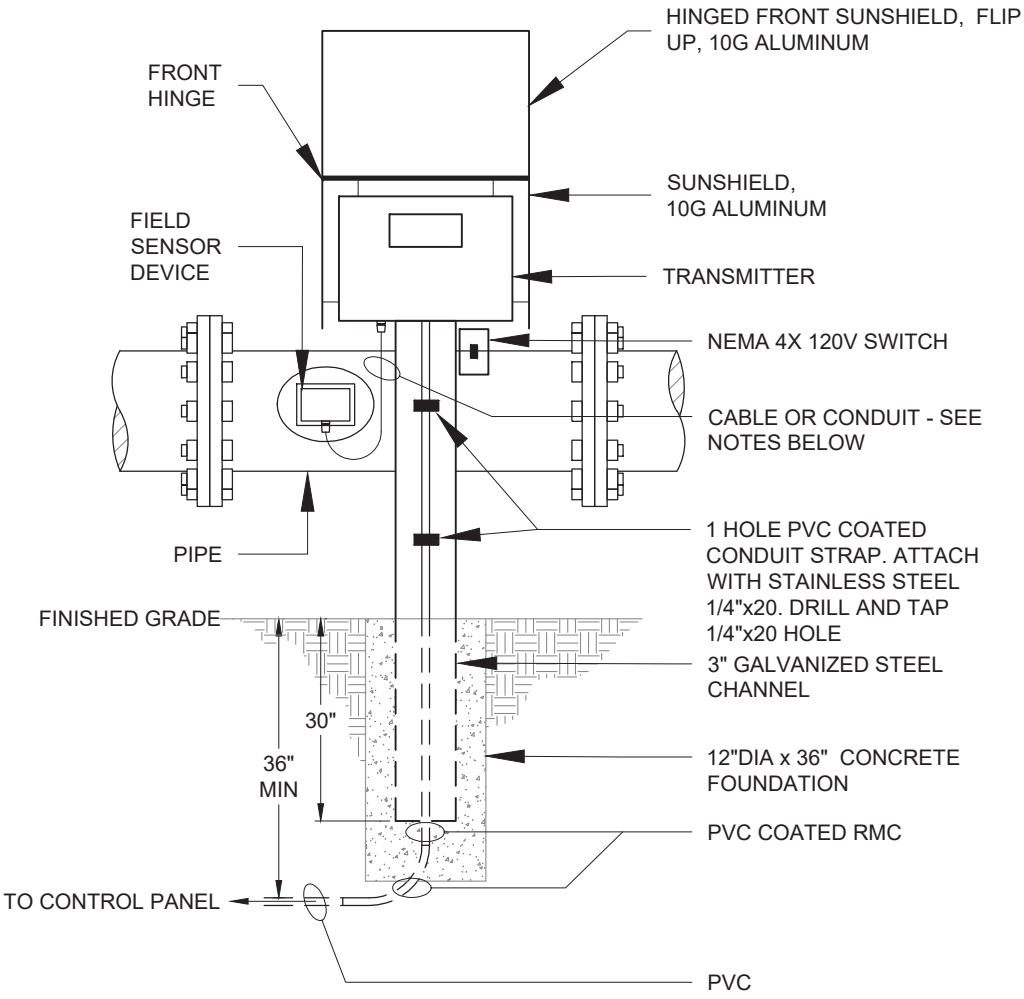
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-104



NOTES:

1) IF FIELD SENSOR DEVICE IS FURNISHED WITH CONDUIT CONNECTION PROVISIONS, CONNECT WITH LIQUID TIGHT FLEXIBLE METAL CONDUIT.

2) IF FIELD SENSOR DEVICE IS EQUIPPED ONLY WITH LIQUID TIGHT CABLE, USE LIQUID TIGHT CABLE CONNECTOR. PROTECT CABLE WITH SPIRAL WRAP FLEX.

ELECTRICAL DETAILS
FIELD SENSOR DEVICE WITH SUNSHIELD

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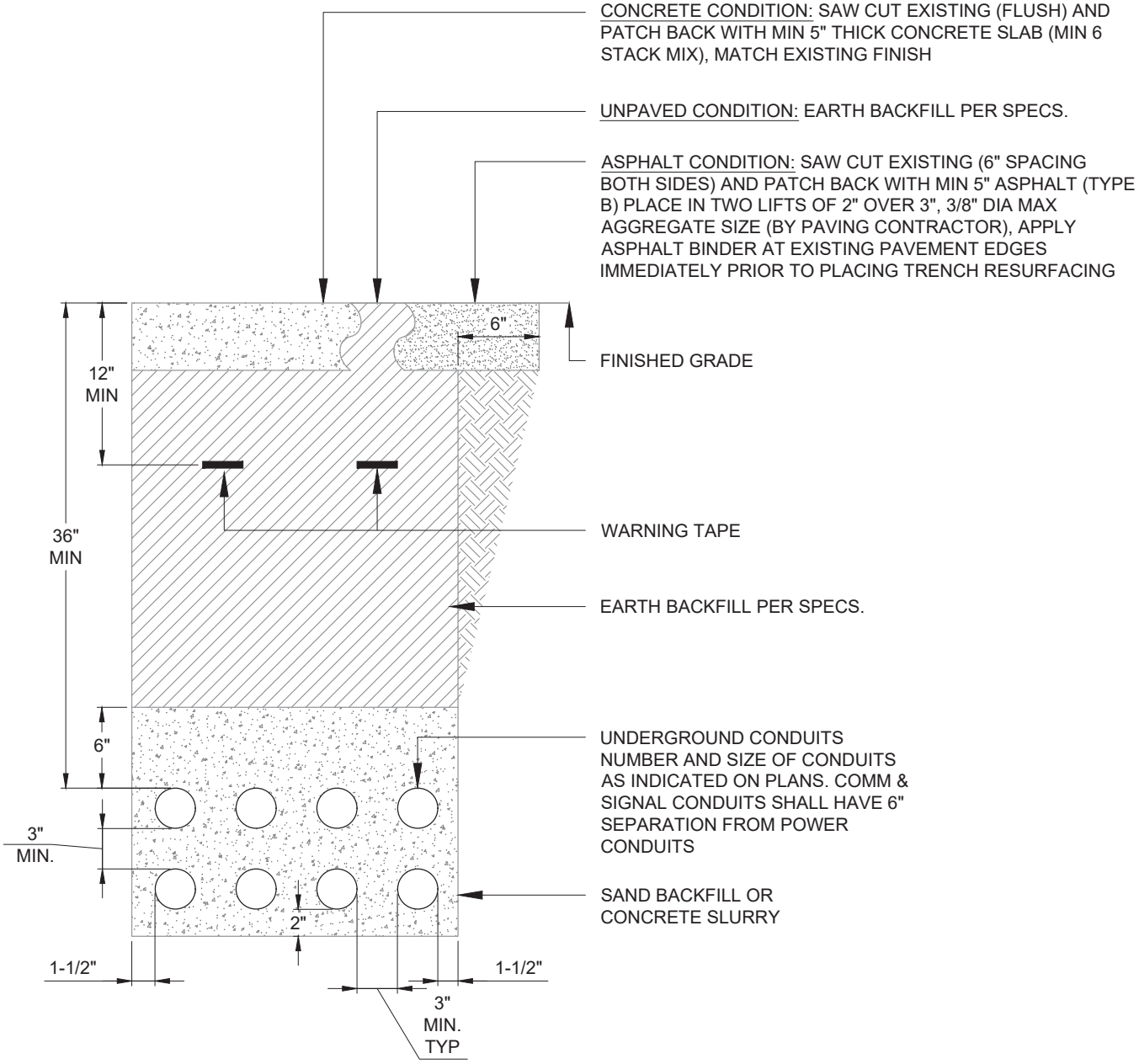
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-105



ELECTRICAL DETAILS
TRENCH SECTION

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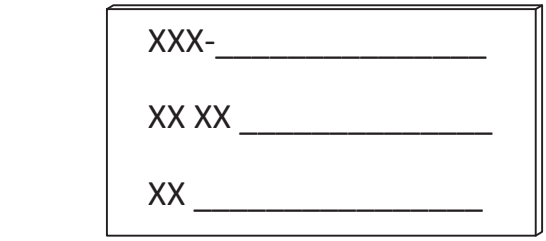
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-106



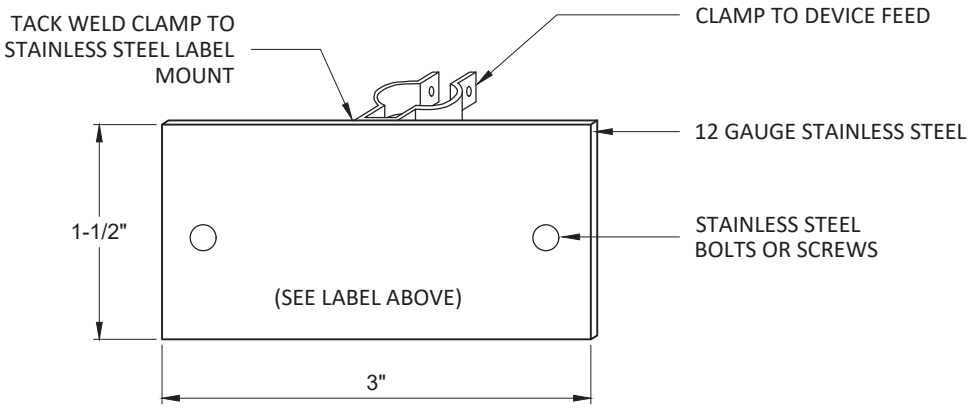
(DEVICE TAG - I.E. FIT-1)
OR (MOTOR DESCRIPTION)

(DEVICE DESCRIPTION - I.E. WELL FLOW)
OR (MOTOR HORSE POWER)

(DEVICE UNITS - I.E. GPM)
OR (MCC)

WHITE LAMICOID WITH BLACK LETTERS OR
STAMPED STAINLESS STEEL

AT DEVICE/MOTOR



AT DEVICE/MOTOR

ELECTRICAL DETAILS
MOTOR & DEVICE LABELING

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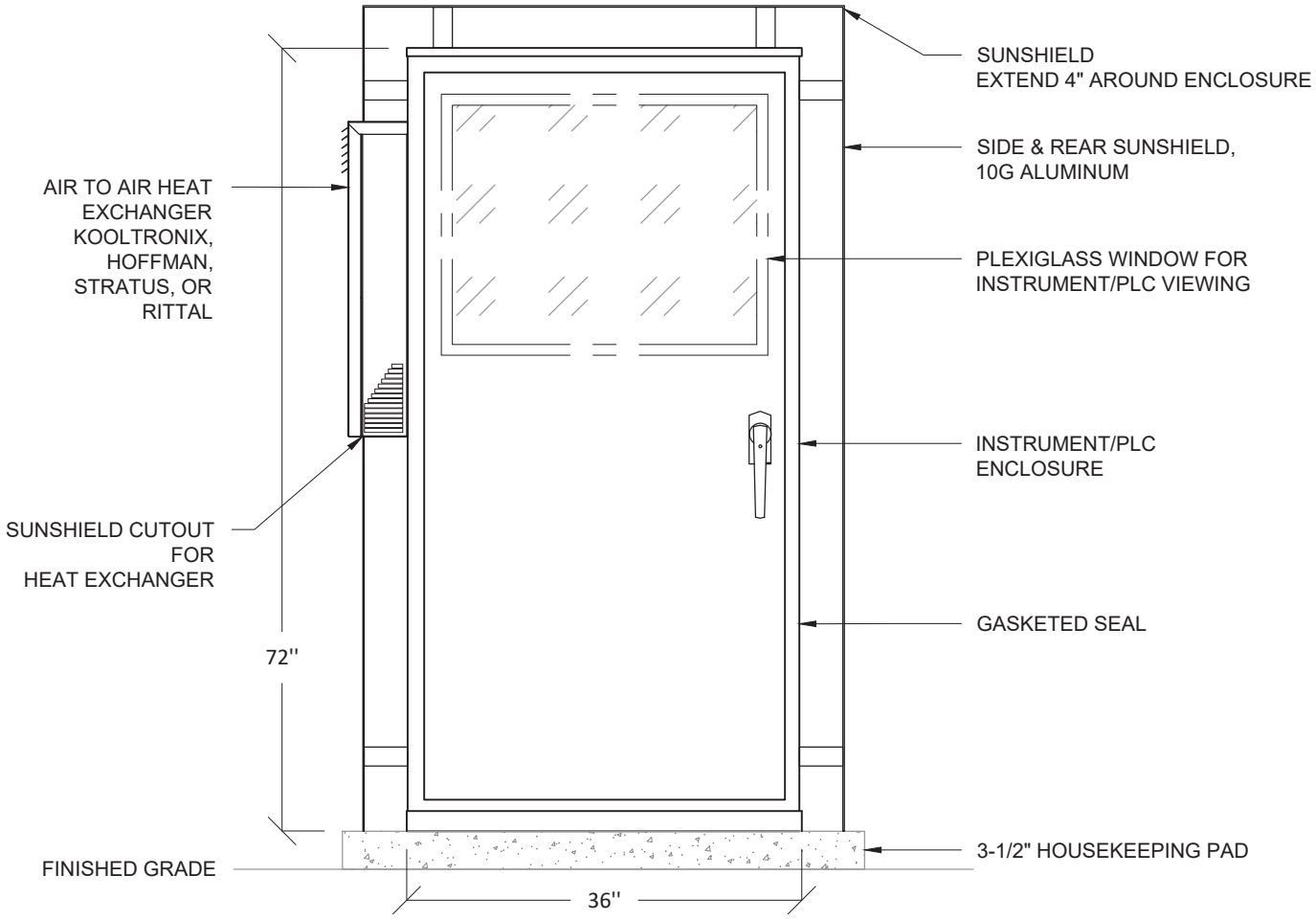
REVISIONS

NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-107



FACE NORTH

OUTDOOR PANEL NOTES:

1. ALL PANELS EXPOSED TO WEATHER SHALL BE MINIMUM NEMA 3R RATED.
2. PANEL FINISH TO MEET UL 1332 CODE FOR COATING OF STEEL ENCLOSURES FOR OUTDOOR EQUIPMENT AND ASTM B117 FOR CORROSION RESISTANCE. STAINLESS STEEL PANELS DO NOT REQUIRE ADDITIONAL FINISH.
3. FINAL FINISH PAINT COAT TO BE WHITE.
4. ALL SECTIONS TO INCLUDE THERMOSTATICALLY CONTROLLED SPACE HEATER TO PREVENT CONDENSATION.
5. ALL SECTIONS TO INCLUDE A LED STRIP LIGHT FOR MAINTENANCE LIGHTING CONTROLLED BY DOOR SWITCH.
6. AIR TO AIR HEAT EXCHANGER TO BE PROVIDED FOR COOLING TO HAVE 150% REQUIRED COOLING CAPACITY.
7. INSTALLATION TO INCLUDE STUD MOUNTED ALUMINUM SUNSHIELD ON TOP AND ALL SIDES WITH DIRECT EXPOSURE TO THE SUN FOR ANY PANELS WITH ELECTRONIC COMPONENTS.
8. ENCLOSURES TO INCLUDE DUST GASKETING.
9. DOORS TO BE 3 POINT LATCHING EXTERIOR WITH NO EXPOSED CONTROLS ON THE OUTER DOOR AND PROVISIONS FOR PAD LOCK.
10. ALL CB, PANELS, VFD, SSRV COMPARTMENTS TO BE LABELED WITH LAMICOID TAGS WITH TWO STAINLESS STEEL. SCREWS.

ELECTRICAL DETAILS
INSTRUMENT/PLC DEVICE ENCLOSURE

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4232 LAS VIRGENES RD.
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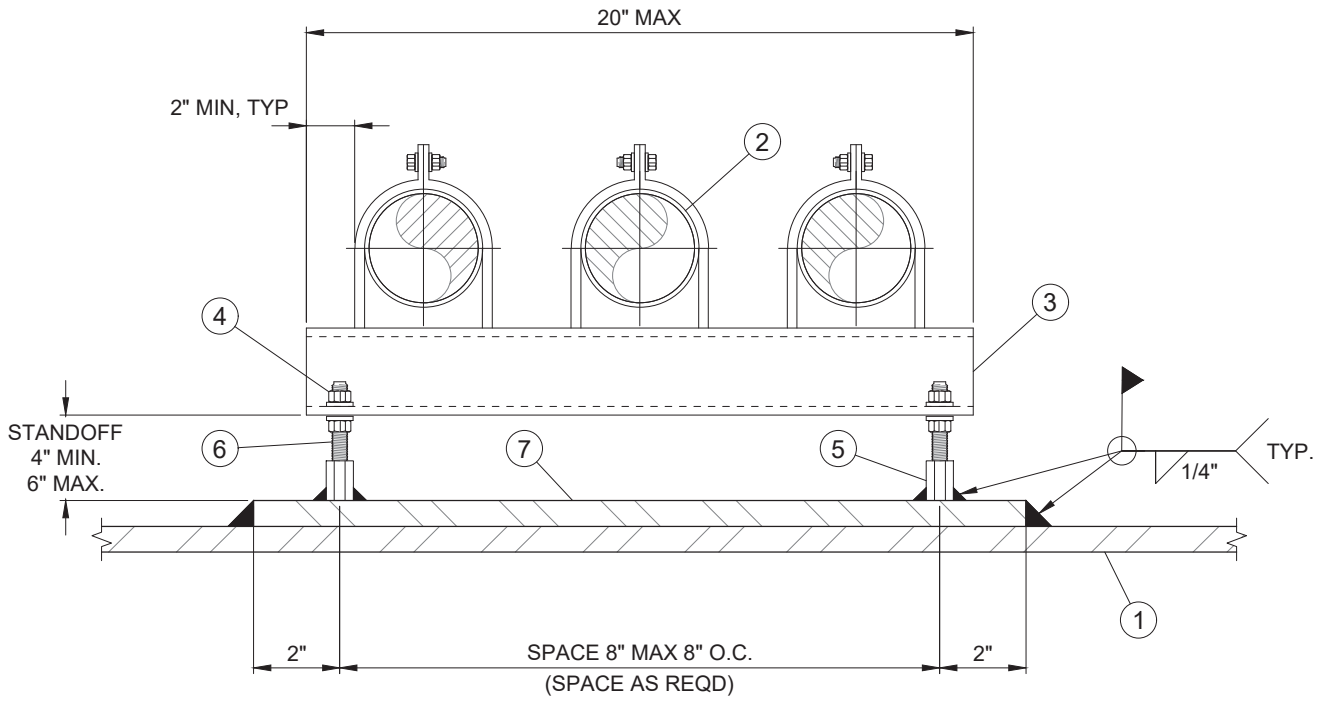
REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-108



1. TANK SHELL OR ROOF
2. PIPE TUBING OR CONDUIT,SEE PLANS
3. MOUNTING CHANNEL S.S.
4. 1/2" S.S. NUT TYP
5. 1/2" MIN S.S COUPLING NUT (TYP)
6. 1/2" MIN S.S THREADED ROD (TYP)
7. 1/4" MOUNTING PLATE

NOTES:

1. COUPLING NUT SHALL BE COATED WITH TANK. INSTALL MOUNTING CHANNEL ASSEMBLY AFTER TANK IS COATED; DO NOT COAT MOUNTING CHANNEL
2. USE SIMILAR DETAIL FOR SUPPORTS MOUNTED ALONG THE TANK'S RINGWALL FOUNDATION, EXCEPT THE STANDOFF IS NOT REQUIRED. BOLT SUPPORTS ALONG THE SIDE OF THE CONCRETE RINGWALL NOT THE TOP
3. PLAN VIEW FOR SUPPORTS ON THE TANK SHELL. ELEVATION VIEW FOR SUPPORTS ON TANK ROOF.

CONDUIT MOUNTING SUPPORT ON STEEL TANKS

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4232 LAS VIRGENES RD.
CALABASAS, CA 91302

REVISIONS			
NO.	BY	DATE	APRVD.

PRINCIPAL ENGINEER

12/22/2021
DATE

E-109