

SECTION 9 STORM DRAINAGE

9-01 GENERAL

This work shall consist of furnishing and installing storm drain pipes, structures, underdrains, fittings and all other materials and appurtenances in accordance with the Plans and these Standard Specifications.

9-02 MATERIALS

9-02.01 Reinforced Concrete Pipe

Reinforced concrete pipe shall conform to the requirements of ASTM C76, as amended to date. The wall design shall be at the option of the manufacturer. The manufacturer shall furnish to the City certificates showing that the pipe conforms to the specified ASTM designation. All pipe shall be Class III unless otherwise shown on the Plans. Nonreinforced concrete pipe meeting all requirements of reinforced concrete pipe may be substituted for all sizes twenty-four inches (24") in diameter and smaller.

Pipe designated by D-Load shall be marked as described in the ASTM Specifications except that the D-Load shall be marked on the pipe. The D-Load shall be determined during tests as described in the ASTM Specifications.

9-02.02 Reinforced Concrete Pipe Joints

Concrete pipe joints shall be bell and spigot type with rubber gaskets. Upon request from the Engineer, the Contractor shall supply a test sample of the type of gasket.

9-02.03 Polyvinylchloride Pipe (PVC)

Polyvinylchloride pipe and fittings shall be bell and spigot, conforming to ASTM D3034 (SDR 26) for diameters from four inches (4") through fifteen inches (15") and ASTM F679 (PS 115) for diameters from eighteen inches (18") through thirty inches (30"), as amended to date.

9-02.04 Polyvinylchloride Pipe Joints

Polyvinylchloride pipe joints shall be bell gasketed joints. Gaskets shall meet the requirements of ASTM F477. The joints shall meet the requirements of ASTM D3212.

9-02.05 High Density Polyethelene Pipe (HDPE)

High density polyethelene pipe and fittings shall conform to AASHTO M252, Type S; AASHTO M294, Type S; and AASHTO MP7 requirements.

9-02.06 High Density Polyethelene Pipe Joints

High density polyethelene pipe joints shall be bell and spigot type and conform to Section 64-1.04, "Joints," of the Caltrans Specifications.

9-02.07 Precast Manhole Sections

Precast manhole sections shall conform to size, shape and details shown on the Plans and Standard Plans. Precast reinforced concrete manhole risers, cones and grade rings shall conform to ASTM Designation C478 as amended to date.

9-02.08 Castings

Castings for manhole rings, cover and other purposes shall conform accurately to the form and dimensions shown on the Plans and Standard Plans. The surface of casting shall be reasonably smooth, free from defects of any kind and the castings shall conform to the requirements of ASTM A48, Class 30B as amended to date. Bottom rim of cover and seat of frames shall be machined to form a close fit free from wobble. The combined weight of cover and frame shall exceed two hundred sixty-five (415) pounds.

Before leaving the foundry, all castings shall be thoroughly cleaned and coated by dipping in asphalt applied at a temperature of three hundred degrees Fahrenheit (300° F) in such a manner as to provide a firm, durable, tenacious coating.

9-02.09 Inlets

All inlets shall conform to size, shape and details as shown on the Plans and Standard Plans. The type of inlet shall be as specified on the Plans or in the Special Provisions or Technical Provisions.

9-02.10 Inlet Grates and Grate Frames

Inlet grates and grate frames shall conform to size, shape and details as shown on the Plans and Standard Plans. Rectangular frames shall be fabricated from structural steel conforming to the requirements of ASTM A36. The bar portion of the frames may be fabricated from special quality, hot rolled steel bars conforming to the American Iron and Steel Institute Designation No. C1021. Frames and grates shall be match marked in pairs before delivery to the job site and the grates shall fit into their frames without rocking.

9-02.11 Reinforcing Bars

Reinforcing bars shall be deformed billet steel bars conforming to the specifications of ASTM A615, Grade 60, including Supplementary Requirement S1 and shall be of the size shown on the Plans and Standard Plans. Bars shall be of the round deformed type; free from injurious seams, flaws or cracks; and shall be cleaned of all rust, dirt, grease, loose scale and any other coating of any character that would destroy or reduce the bond.

9-02.12 Portland Cement Concrete

Portland cement concrete for manhole bases, inlets and other concrete structures shall conform to the requirements of Section 90, "Portland Cement Concrete," of the Caltrans Specifications and specified herein.

The concrete shall be Class "A" containing six (6) sacks of Portland cement per cubic yard of concrete. The grading of the combined aggregate shall conform to the requirements of one and one-half inch (1-1/2") maximum. The consistency of the fresh concrete shall be such that the slump does not exceed four inches (4") as determined by Test Method No. California 520. The concrete shall have a minimum compressive strength of 3,300 PSI after twenty-eight (28) days.

9-02.13 Mortar

Mortar shall conform to the requirements of Section 65, "Reinforced Concrete Pipe," of the Caltrans Specifications.

9-03 CONSTRUCTION

9-03.01 Trenching

Trench excavation, shoring, grade control, backfill and resurfacing shall conform to the requirements of Section 8, "Trench Excavation, Backfill and Resurfacing," of these Standard Specifications.

9-03.02 Handling of Material

Storm drain pipe, precast concrete manhole sections, inlet frames, grates and fittings must be carefully handled at all times. Only suitable and proper equipment and appliances shall be used for the safe loading, hauling, unloading, handling and placing of materials. Any material which is checked, spalled, out of round or damaged shall not be installed and such material must be permanently removed from the job site within twenty-four (24) hours after notification.

9-03.03 Pipe Laying

No pipe shall be laid until the Engineer inspects and approves the condition of the bottom of the trench. Pipe laying shall proceed upgrade with the tongue section of tongue-and-groove pipe pointed in the direction of flow.

Split pipe shall be used through a manhole except for changes in pipe grade, size, type or direction.

Each section of pipe shall be laid true to line and grade and in such a manner as to form a close, concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line. As the work progresses, the interior of the storm drain shall be cleaned of all dirt and debris. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and pulled forward past every joint immediately after jointing has been

completed. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.

Concrete pipe with elliptical reinforcement shall be laid with the minor axis of the reinforcement cage in a vertical position.

9-03.04 Grade Control

All storm drains shall be accurately laid to grade. An offset string line (or other acceptable method) should be stretched between accurately surveyed grade stakes set at intervals not to exceed twenty-five feet (25'). The Contractor shall make available to the inspector adequate equipment to check both the grade of the string line prior to excavation and the grade of the pipe prior to backfilling. Any deviation from the proposed grade shall be approved by the Engineer and the Contractor shall make the necessary corrections before any pipe is laid.

9-03.05 Concrete Joints

The joints shall be completely filled and compacted with mortar so as to make a strong joint. No mortar will be required in the outside joint recesses of self-centering pipe. Unless otherwise approved by the Engineer, all joints shall be finished smooth on the inside of pipe.

In concrete pipe sizes twenty-one inches (21") and larger, inside joint recesses shall be hand-pointed. In concrete pipe sizes eighteen inches (18") and smaller, inside joint recesses shall be buttered prior to closure. After the closure is made, the joint shall be pointed inside the pipe and excess mortar removed by means of a long-handled brush, an inflated swab or squeegee.

9-03.06 Structures

Structures and appurtenances shall be located as shown on the Plans and installed in accordance with the Standard Plans.

Structures shall be constructed and/or installed in conformance with applicable requirements of Section 51, "Concrete Structures," of the Caltrans Specifications. All the inside and exposed surfaces of concrete shall be smooth and uniform when finished and the concrete shall be thoroughly compacted around all reinforcing bars. Frames for manholes and tops of inlets and other structures in paved areas shall be accurately placed flush with and in the plane of the finish pavement. Inlets installed in curb returns shall have angle anchors curved to conform to the curb return radius. Precast inlets will be permitted when meeting the above requirements and when approved by the Engineer.

9-03.07 Television Inspection

After completion of the pipe installation and cleaning, the storm drain line shall be televised with a color closed-circuit television with tilt-head camera recorded in the latest electronic format approved by the Engineer. The original DVD and log sheets shall be provided to the Engineer.