

## SECTION 13 STORM DRAINAGE

### 13.01 DESCRIPTION

This work shall include the furnishing of all labor, materials, tools, equipment and incidentals to construct and complete in an efficient and workmanlike manner the installation of the storm drainage system in accordance with the approved plans, these specifications and the City Standard Details.

### 13.02 MATERIALS

#### A. Pipe

1. Reinforced Concrete Pipe (RCP) shall conform to the specifications of A.S.T.M. Designation C76 and shall be Class III, IV or V rubber gasket type, unless otherwise specified on the plans. Reinforcing shall be the minimum requirements for circular reinforcing wire mesh cages as specified in A.S.T.M. Designation C76. Portland Cement used in the manufacture of reinforced concrete pipe shall conform to the requirements of the specifications for Type II Portland Cement, A.S.T.M. Designation C150. All joints and gaskets shall conform to A.S.T.M. Designation C443.

The minimum allowable class of RCP shall be class III for depths from 2' feet to 28' feet defined as the distance from the inside top of pipe to the top of finished grade. RCP which lies wholly or partially within the structural section of a street shall be Class V.

Tests on reinforced concrete pipe shall be required to determine conformance with "D" load and reinforcing requirements of these specifications.

Pipe samples for testing shall be furnished, without charge, by the Contractor one week in advance of construction. The cost of testing the pipe shall be borne by the Contractor. One section of pipe from each lot to be used shall be tested in accordance with the procedures outlined in A.S.T.M. C76. Lots tested shall be marked with the date made as well as by lot number for shipment to the specific project for which that lot has been tested. Any pipe arriving on the job without the appropriate markings shall be rejected and sent back to the supplier until such lot or lots can be tested and accepted for use.

In lieu of the above testing of reinforced concrete pipe, the Contractor may submit to the City Engineer the manufacturer's "Certificate of Compliance" guaranteeing the requirements of A.S.T.M. C76.

2. Polyvinyl Chloride (PVC) Pipe and Fittings shall at a minimum, conform to one of the following specifications:

<u>Diameter</u>	<u>Specifications:</u>
8 inches thru 15 inches	ASTM Designation: D 3034, SDR 35
18 inches thru 27 inches	ASTM Design: F794 or F2241, SDR 51
30 inches thru 48 inches	ASTM Designation: F794

Polyvinyl Chloride joints shall be bell and spigot using an elastomeric gasket, which meets the requirements of A.S.T.M. Designation F477. The pipe shall have a stop indicated on the barrel or other approved means to accurately position the pipe end in the joint. No solvent weld joints will be allowed.

Connections to manholes drop inlets or other concrete structures shall be made by utilizing manhole adapters or elastomeric seal rings embedded in the concrete.

A written guarantee, warranting ASTM Designation F794 pipe against failure until such time as the pipe may be accepted by the California Department of Transportation shall be furnished to the City by the pipe manufacturer. The guarantee shall include all costs of removing and replacing any failed pipe. Damage caused by construction or maintenance operations may be excluded from the guarantee.

Maximum allowable deflection (reduction in vertical inside diameter) of the installed pipe shall be 5%. On pipes 21 inches in diameter and smaller, the City Engineer may require the Contractor to furnish a properly sized “go, no-go” mandrel, sewer ball, deflectometer, or other approved devices, to check the pipe for maximum allowable deflection. For pipes larger than 21 inches in diameter, deflection may be determined by other means. At any location where the deflection is determined to be excessive, the City Engineer may require the Contractor to remove, re-bed, and if required, replace the pipe. The City Engineer may require certification by the manufacturer that the test results comply with specification requirements. The pipe shall have a home mark to indicate full penetration of the spigot when a joint is made. The date of manufacture shall be marked on the pipe. Pipe being installed shall have been manufactured within 12 months of the date of installation.

3. Acrylonitrile-Butadiene-Styrene (ABS) composite pipe and fittings shall conform to and meet the requirements of ASTM Designation D2680, Standard Specification for ABS composite sewer pipe in sizes 6-inch through 15-inch. Each lot of pipe and fittings shall be inspected for defects and tested in accordance with ASTM D2680. The City Engineer may require certification by the manufacturer that the test results comply with specification requirements. The pipe shall have a home mark to indicate full penetration of the spigot when a joint is made. The date of manufacture shall be marked on the pipe. Pipe being installed shall have been manufactured within 12 months of the date of installation.

Trench width for ABS composite pipe shall be pipe O.D. plus 24 inches, as measured at the top of the pipe.

Joints for ABS composite pipe shall be Type SC, solvent cemented per ASTM D2680. Prior to assemblage of the pipe joints, the exposed cross sectional ends of composite pipe shall be coated with the same solvent cement used for jointing the pipe. Manhole connections shall incorporate an approved steel band and rubber gasket waterstop, or steel bands and rubber boot, which allows the pipe to deflect while maintaining a watertight connection between pipe and manhole. Alternative methods of providing a flexible watertight connection will be considered but must be submitted to the City Engineer for prior approval.

4. High-density Polyethylene Pipe (HDPE) and Fittings (up to and including 36 inches) shall conform to the specifications of ASTM D3350 minimum cell classification 335420C; or ASTM D1248 Type III, Class C, Category 4, Grade P33.

All joints shall be bell and spigot meeting AASHTO M294 and MP6-95. The bell and spigot joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall be made of polyisoprene meeting the

requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72 hour exposure to 50 PPHM ozone at 104° Fahrenheit.

Fittings shall conform to AASHTO M294 and MP6-95. Fabricated fittings shall be welded on the interior and exterior at all junctions. Pipe deflection shall conform to the manufacturers recommendations. At any location where the deflection is determined to be excessive, the City Engineer may require the Contractor to remove, re-bed, and if required, replace the pipe.

Installation shall be in accordance with ASTM D2321 and in conformance with the manufacturer's requirements. Connections to manholes, drop inlets or other concrete structures shall be watertight. The openings around the pipe shall be sealed with a stiff mix of concrete mortar thoroughly compacted. The mortar shall be composed of one part Type II Portland Cement and three parts clean sand.

5. Other pipe materials that will provide a storm drain system with a minimal leakage rate and maximum durability may be allowed with prior approval by the City Engineer.
6. The use of Non-Reinforced Concrete pipe will be considered on a case-by-case basis with special approval required by the City Engineer.

#### B. Manholes and Junction Boxes

1. Storm drain manhole bases may be cast-in-place or precast conforming to the Standard Details. Barrel, cone and grade rings shall conform to A.S.T.M. C478. Precast barrel sections shall be 48-inch diameter unless otherwise directed by the City Engineer.

2. Frame and Cover

The country of origin shall be clearly and permanently shown on the top surface of the frame and cover in accordance with the Trade and Tariff Act of 1984.

Date of manufacture shall be clearly and permanently indicated on the cover and the top of the frame.

Seating surface shall be closely machined to nominal dimensions with tolerances not to exceed +/- 1/64 inch.

The weight of the frame shall be 140 lbs. +/- 10 lbs. The weight of the cover shall be 130 lbs. +/- 5 lbs.

3. The storm drain manhole (Standard Detail #302) shall not be used on storm drain conduit greater than 36 inches in diameter. Saddle manholes (Standard Detail #304) shall only be allowed on storm drain conduits greater than 36 inches in diameter, provided that no junction exists with any other storm drain conduit at the manhole.

#### C. Catch Basins

1. Storm drain catch basins shall be cast-in-place or Santa Rosa precast base section for Model 4-A conforming to the Standard Details. Concrete shall be Class A.
2. Curb inlets shall be precast, equal to Santa Rosa Model 4-A or Phoenix Model P2448C with fiberglass throat form attached or cast-in-place using the Pelican

series form liner with fiberglass throat form attached. Frame and cover shall be South Bay Foundry No. 1934 marked "Storm Drain", or approved equal.

**D. Headwalls, Wingwalls, Endwalls, and Railings**

All headwalls, wingwalls, and endwalls shall be of Class A reinforced Portland Cement Concrete constructed in accordance with the plans and Section 51 of the State Standard Specifications. Temporary bank protection may be provided by sack concrete rip-rap in accordance with Section 72 of the State Standard Specifications.

**E. Drainage Pump Stations**

Drainage pump stations shall be allowed on an individual basis with the specific approval of the City Engineer.

**13.03 VISUAL INSPECTION**

A. Allowable deviation of drainage pipe from design grade shall be no more than 0.05 feet. In addition, allowable deviation in slope shall be 0.05 feet in any 25-foot length of pipeline.

B. There will be a final visual inspection of the completed system to ensure there is no ground water intrusion. If ground water intrusion is discovered, corrective work shall be done. The cost for this work shall be borne by the contractor.

**13.04 MEASUREMENT AND PAYMENT**

**A. Pipe**

Payment for storm drain pipe complete in place shall be per linear foot measured from center of manhole to center of manhole or catch basin, or from center of manhole to wall of outlet structure as the case may be. Measurement shall be along a line parallel to the grade of the storm drain.

Payment shall include the furnishing of all labor, materials, water, tools, and equipment required to construct and complete in an efficient and workmanlike manner the installation of storm drain pipe in accordance with the plans and these specifications. Full compensation for all incidentals arising from this work shall be considered as included in the price paid per linear foot measured and no further compensation shall be allowed.

**B. Structures, Manholes, Catch Basins and Curb Inlets**

The unit of measure for payment shall be per each unit. Payment shall be made at the bid price per item for each structure complete in place and shall include the cost of excavation, backfill, frames, covers, plates or reinforcing steel where required.

Full compensation for all incidentals, arising from this work shall be considered as included in the price paid per each unit and no further compensation shall be allowed.