



# DENVER

## THE MILE HIGH CITY

CITY AND COUNTY OF DENVER  
DEPARTMENT OF PUBLIC WORKS | ENGINEERING DIVISION

## Storm Drainage and Sanitary Sewer Construction Detail and Technical Specifications

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### 10.6 Polyvinyl Chloride (PVC) Sewer Pipe

#### 10.6.1 General

This section covers material requirements, inspection and testing, marking and delivery, installation, and field performance and acceptance tests of Polyvinyl Chloride (PVC) Sewer Pipe and Fittings for use in gravity, non-pressure, storm or sanitary sewer installations.

#### 10.6.2 Referenced Standards

This section references American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), and American Water Works Association (AWWA), UNI-Bell PVC Pipe Association (UNI), which are made part hereof by such references, and shall be the latest edition and revision thereof. All material, manufacturing, operations, testing, inspection and production of Poly (Vinyl Chloride) (PVC) sewer pipe shall conform to the following referenced standards:

ASTM C33	Standard Specification for Concrete Aggregates
ASTM D448	Standard Classification for Sizes of Aggregate for Road & Bridge Construction.
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

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ASTM F679	Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
ASTM F789	Standard Specification for Type PS-46 and Type PS-115 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings.
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
UNI-B-6	Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe.

### **10.6.3 PVC Sewer Materials**

The following described materials are approved for use in PVC pipe sewer construction.

#### **10.6.3.1 Pipe and Fittings**

Sanitary sewer pipes shall be PVC and conform to: ASTM D3034 SDR 35 for sizes 8 inches to 15 inches in diameter; ASTM F789 for sizes 8 inches to 18 inches (Solid Wall); ASTM F679 for sizes 18 inches to 36 inches (Solid Wall); ASTM F949 for sizes 8 inches to 36 inches (Profile Wall); ASTM F749 for sizes 8 inches to 48 inches (Profile Wall); ASTM F1803 for sizes 18 inches to 60 inches (Profile Wall).

#### **10.6.3.2 Gaskets**

Gaskets shall comply with ASTM F477. It shall consist of a properly vulcanized high grade elastomeric compound. The basic polymer shall be natural rubber, synthetic elastomer, or a blend of both. The gasket shall be the only element depended upon to make the joint flexible and water-tight.

#### **10.6.3.3 Lubricant**

The lubricant used for assembly shall have no detrimental effect on the gasket or on the pipe. Lubricants shall be in accordance with the manufacturer's recommendations.

### **10.6.4 Acceptance**

Acceptance of the pipe, fittings, and other associated sewer material shall be based on full compliance with these Detail and Technical Specifications.

#### **10.6.4.1 Certification**

A manufacturer's certification that the material was manufactured and tested in accordance with these Detail and Technical Specifications together with a report of all test results shall be furnished at the time of shipment.

### **10.6.5 Receiving, Storage and Handling**

The Contractor shall follow the procedures and recommendation for receiving, storage, and handling contained in the Uni-Bell Plastic Pipe Association, “Handbook of PVC Pipe”, and as recommended by the manufacturer.

#### **10.6.5.1 Receiving**

Pipes not conforming to the requirements of these Detail and Technical Specifications and pipes damaged in transit shall be rejected by the Project Construction Engineer. Acceptance of pipes at the time of delivery does not preclude rejection of the installed sewer pipe which do not conform to these Detail and Technical Specifications.

#### **10.6.5.2 Storage**

Pipe shall be stored in unit packages provided by the manufacturer. The unit packages shall be supported by racks to prevent damage to the underside of the pipe. Supports shall be spaced to prevent pipe bending. Stored pipe shall be covered with an opaque material to prevent exposure to direct sunlight while permitting adequate circulation of the air above and around the pipe to prevent excessive heat accumulation. Pipe determined to have been damaged in storage shall be rejected.

#### **10.6.5.3 Handling**

Construction equipment shall be operated in a safe and cautious manner so as to prevent damage to the pipe. Blows to the pipe causing impact damage shall be prevented. Pipe and fittings shall not be thrown, dropped, or dragged.

### **10.6.6 Installation**

Installation of PVC pipe shall be in conformance with ASTM D2321, except where modified by these Detail and Technical Specifications.

#### **10.6.6.1 Trenching and Excavation**

Trenching and excavation shall be performed in accordance with Section 4.0 of these Detail and Technical Specifications.

#### **10.6.6.2 Bedding and Haunching**

The bedding shall be Class B as defined in Section 4.0 of these Detail and Technical Specifications. The bedding material shall conform to ASTM C33 or ASTM D448 gradation No. 67 as modified and shall be brought to proper grade and elevation prior to installation of pipe and assembly of joints. Depressions for pipe bell shall be provided. Additional bedding material shall then be placed according to Standard Detail S-301, “Standard Detail for Trenching and Bedding”.

#### **10.6.6.3 Jointing Pipe**

Assembly of all joints shall be in accordance with the recommendations of the manufacturer. Proper jointing may be verified by rotation of the spigot or with a strap wrench. If unusual

joining resistance is encountered or if the insertion mark does not reach the flush position, the joint shall be disassembled, inspected for damage, the joint components re-cleaned and the assembly steps repeated.

#### **10.6.6.4 Cutting and Beveling Pipe**

For shorter than standard pipe lengths, field cuts may be made with plastic pipe cutters. Ends shall be cut square and perpendicular to the pipe axis. Spigots shall have burrs removed and ends smoothly beveled by a mechanical beveler or by hand with a rasp or file. Field spigots shall be stop-marked with felt tip marker or wax crayon for the proper length of assembly insertion. The angle and depth of field bevels and length to stop-mark shall be comparable to factory pipe spigots.

#### **10.6.6.5 Sanitary Sewer Connections**

On all new PVC sewer construction, connections shall be made with Wye's or Tee's conforming to ASTM D3034 or F679 whichever is applicable. Only gasketed fittings will be used. Saddle Wye's and Tee's with gaskets for the saddle and joints are approved for sanitary sewer service connection to existing PVC sanitary sewers only. Stainless steel straps shall be used to secure the saddle fittings to the main pipe.

#### **10.6.6.6 Water Stops**

Whenever the PVC sewer pipe joints a manhole and is encased by the concrete manhole base or a cutout in precast manhole base, waterstops or seals shall be used. See City and County of Denver, Engineering Division Standard Detail No. S-550.

#### **10.6.6.7 Trench Backfill**

Backfilling of the trench shall as specified in Section 5.0 of these Detail and Technical Specifications except that no wheeled vehicles shall be used for compaction or other purpose over the installed pipe until the backfill is at least 30 inches thick measured from the top of the pipe to the backfill surface. Mechanical tampers shall not be used until the backfill is at least 48 inches thick. Direct dumping of material over the top of uncovered pipe will not be allowed.

### **10.6.7 Field Performance and Acceptance Tests**

#### **10.6.7.1 Television Inspection**

The City will perform a television inspection to verify accuracy of alignment, freedom from debris or obstructions, displacement of gaskets or joints and leaks at joint and service connections. Any of the above discrepancies observed shall be rectified by the Contractor at no cost to the City.

The cost of the initial inspection and the first re-inspection to confirm correction of previously identified deficiencies will be borne by the City. In the event additional inspections are necessary due to inadequate or otherwise unacceptable repairs, the costs for such inspection shall be charged to the Contractor.

**10.6.7.2 Air Pressure Test**

An air pressure test using the most recent version of UNI-Bell's UNI-B-6 shall be made. The air pressure test outlined in paragraph 9.2.3 of Section 9.0 of these Detail and Technical Specifications will not apply to PVC sewer air testing. The Contractor shall secure adequate copies of UNI-B-6, as published by the Uni-Bell Plastic Pipe Association, and provide at least one copy to the Project Construction Engineer.

**10.6.7.3 Infiltration Test**

If the ground water level is above the top of the pipe throughout the length being tested, an infiltration test shall be performed. See paragraph 9.2.2 of Section 9.0 of these Detail and Technical Specifications.

**10.6.7.4 Deflection Test**

A deflection test shall be performed according to paragraph 9.2.5 of Section 9.0 of these Detail and Technical Specifications. The allowable deflection limits shall be a maximum of 5% after construction and 6% at the end of the guarantee period. The allowable deflection shall be based on the base inside diameter of the PVC pipe.

**10.6.7.5 Reports**

Copies of all certified reports and logs of all tests and inspections conducted shall be submitted to the Project Construction Engineer.