

## **08002 Construction Materials – Sewage Mains**

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**08002-1     Scope**

This Section describes materials which have been approved for use in the construction of gravity, sanitary and storm sewage mains in the City of Saskatoon. Sewage force mains shall be constructed using pressure pipe, as described in Section 08001, Construction Materials - Water Mains.

**08002-2     Concrete**

Notwithstanding the provisions of any other specification, Type HS/HSb sulphate resistant cement shall be used in the manufacture of concrete sewer pipe, manhole barrels and other concrete products described herein.

**08002-3     Sewer Pipe**

The minimum size of pipe which shall be used for the construction of sanitary sewage mains, catch basin lead and storm sewage mains shall be 200 mm, 250 mm and 300 mm respectively.

The minimum size of pipe for roadway subdrainage piping shall be 100 mm diameter.

**3.1           Polyvinyl Chloride (PVC)****3.1.1         (Type PSM) PVC Pipe**

Smooth wall PVC pipe shall conform to ASTM D3034 and CSA B182.2. The SDR shall not be greater than 35. The pipe shall be supplied with factory installed elastomeric gaskets. Applications include sanitary and storm sewage mains and catch basin leads.

**3.1.2         Profile PVC Pipe**

Profile PVC pipe shall conform to ASTM F794 and CSA B182.4. The pipe shall be open profile (OP) or dual wall corrugated profile (DWCP). The pipe shall be supplied with factory installed elastomeric gaskets. Applications include storm sewage mains only.

**3.1.3         (PR 80) PVC DR51 Pipe**

Smooth wall PVC DR51 CIOD 80psi gasketed pressure pipe shall conform to AWWA C900, ASTM D1784, and be certified to CSA B137.3. The pipe shall be supplied with factory installed elastomeric gaskets. Applications include large diameter storm sewage

mains only (600mm to 1200mm) with up to 6m of ground cover or unless otherwise specified by the Engineer.

### **3.2            Reinforced Concrete**

Reinforced concrete pipe shall be manufactured according to the 5 classes in ASTM C76M-08a or for a specific D-load in ASTM C655M-09.

Pipe larger than 1200 mm shall have a tapered lift hole. A tapered plug shall be supplied to seal the hole. No portion of the plug shall extend into the pipe.

The laying length of standard pipe sections shall not be less than 1.8 m. Bevelled pipe for laying on curves shall be either standard length or one-half standard length. The tolerance on the bevel shall not exceed  $\pm 0.001$  of the pipe diameter.

#### **3.2.1           Joints**

Joints shall be the rubber gasket type.

For all pipe installed the joints shall conform to either ASTM C443M-07 or ASTM C361M-08.

#### **3.2.2           Basis of Acceptance**

Unless otherwise specified acceptance shall be based on tests described in either ASTM C76M-08a or ASTM C655M-09.

All tests shall be certified by an independent testing firm.

### **3.3            Polyethylene Pipe**

Polyethylene pipe may be used in special cases when approved by the Director of Construction & Design.

Polyethylene pipe shall conform to the current Canadian Government Specification No. 41-GP-25m. Joints shall be butt fused in accordance with the manufacturer's recommendations.

### **3.4            Perforated Pipe**

Perforated drainage pipe shall be corrugated HDPE pipe with geotextile sock suitable for fine grained soils. The HDPE pipe shall conform to ASTM F405 or ASTM F667 and shall have a minimum stiffness of 200 kPa at 5% deflections according to ASTM D2412. Connection to the catch basin shall be made with a 100 mm diameter SDR35 PVC pipe.

#### **3.4.1           Joints**

Couplings shall be silt tight joints and conform to the specifications of ASTM F405 or ASTM F667.

### **08002-4       Standard Manholes**

Precast reinforced concrete manhole barrels, top sections, bases and grade rings shall be manufactured in accordance with the requirements of ASTM Specification C478M-09 and all current revisions.

Twenty (20) mm diameter ribbed, extruded aluminium step rungs, equal to Model 350 Climbing Step as manufactured by MSU Mississauga or an equivalent as approved by the Director of Construction & Design, shall be installed in all manhole barrels.

Step rungs shall be uniformly spaced with centres not more than 305 mm apart.

A minimum clearance of 150mm shall be maintained between the rungs and the manhole barrel.

Notwithstanding the provisions of ASTM C478M-09, the barrels, bases, top slabs and grade rings shall be manufactured in accordance with the dimensions and details shown on current City of Saskatoon Standard Drawings as posted on the City's Internet web site.

Lifting inserts shall be installed in all manhole barrels and cone tops (eccentric and concentric) for the purpose of lifting and installation. Catch basins shall NOT be equipped with lift holes.

Further to the requirements of article 17 of ASTM C478M-09, the specification designation, the name or trade mark of the manufacturer and the date of manufacture shall be clearly marked, with waterproof paint, on the inside surface of each manhole and catch basin section.

Manhole Safety Platforms, where required, shall be manufactured in accordance with the detailed drawing supplied with these specifications.

#### **4.1 1050 mm Manholes**

Notwithstanding the provisions of ASTM Specification C478M-09, all 1050 mm diameter manhole barrel sections shall be manufactured with a minimum wall thickness of 89 mm (ASTM Class "A" Wall). The top section shall be concentric reducing from 1050 mm to 600 mm. Steps shall be spaced at 406 mm and staggered on opposite sides of the barrel.

1050mm manhole barrels and concentric cone to be used exclusively for rehabilitation work on existing 1050mm manhole bases. 1050mm manholes are not permitted for new construction or reconstruction.

#### **4.2 1200 mm Manholes**

Notwithstanding the provisions of ASTM Specification C478M-09, all 1200 mm diameter manhole barrel sections shall be manufactured with a minimum wall thickness of 127 mm (ASTM Class "B" Wall). The top section shall be eccentric reducing from 1200 mm to 600 mm. Steps shall be spaced at 305 mm, in line, along one side of the barrel.

All 1200 mm manhole barrel sections shall have single offset or grooved O-ring rubber gasket joints manufactured in accordance with the provisions of ASTM Specification C443M-07 and all current revisions. The offset or O-ring rubber gasket shall be approved by the Director of Construction & Design prior to manufacture and acceptance of the manhole barrels. A rubber gasket shall be provided with each manhole section which is supplied.

#### **4.3 Cast Iron Frame and Cover/Grate**

Castings shall be grey cast iron and shall be clean, sound and coated with asphaltic varnish.

##### **4.3.1 Manhole Frame and Cover**

1. The manhole frame and cover shall be manufactured in accordance with the dimensions shown on current City of Saskatoon Standard Drawings as posted on the City's Internet web site.

2. Castings shall conform to all requirements of ASTM designation A48M-00 class 20B.
3. Castings shall be produced to the dimensions and within the tolerances noted.
4. Castings shall be marked with the proper identification markings which will include:
  - Foundry identification markings and year of casting
  - Markings shall be so located in such a manner and of such size that they are easily identifiable after installation
5. All castings shall be free of defects, be true to pattern and be free from cracks, gas holes, flaws and excessive shrinkage. Surfaces of castings shall be free from burnt- on sand and shall be reasonably smooth.
6. Castings shall not rock when installed. The manufacturer shall trial fit the castings against a standard frame.

**08002-5      Pipe to Manhole and Concrete Structures Connectors**

Watertight resilient flexible connections between pipe to manhole and concrete structures shall meet or exceed the requirements of ASTM Specification C923, including physical properties of materials and performance testing.

Connectors shall be installed in accordance to manufacture's specifications. Specialty installation tools shall be acquired from the manufacturer prior to installation.

For precast manhole bases and concrete structures, flexible clamp-type connectors shall be installed by an approved manhole manufacturer.

**5.1              Cored Hole Compression-Type Connector**

The compression-type flexible connector shall be installed in a precast or cast-in-place manhole or concrete structure with a precision cast or cored hole of specific diameter.

The hole shall be free of imperfections and intruding rebar or wire mesh reinforcement.

**Table 1: Cored Hole Compression-Type Connector**

<b>Manufacturer</b>	<b>Connector</b>	<b>Pipe Type</b>	<b>Pipe Size (mm)</b>
Press-Seal Corporation	Kwik Seal	*PVC	100–600 I.D.
		**CP	300-600 I.D.
Hamilton Kent	HKT-CS	*PVC	100-375 I.D.

\*(Type PSM) smooth wall pipe. Contact the pipe manufacturer for profile to smooth wall pipe adapters.

\*\*Storm sewer applications only.

## **5.2 Cored Hole Clamp-Type Connector**

The clamp-type flexible connector shall be installed in a precast or cast-in-place manhole or concrete structure with a precision cast or cored hole of specific diameter.

**Table 2: Cored Hole Clamp-Type Connector**

<b>Manufacturer</b>	<b>Connector</b>	<b>Pipe Type</b>	<b>Pipe Size (mm)</b>
Press-Seal Corporation	PSX: Direct Drive & 8QRS	*PVC, CP	43–1130 O.D.

\*(Type PSM) smooth wall pipe. Contact the pipe manufacturer for profile to smooth wall pipe adapters.

## **5.3 Cast-In Compression-Type Connector**

The cast-in compression-type flexible connector shall be integrally cast into a concrete structure by an approved manhole manufacturer.

**Table 3: Cast-in Compression-Type Connector**

<b>Manufacturer</b>	<b>Connector</b>	<b>Pipe Type</b>	<b>Pipe Size (mm)</b>
Press-Seal Corporation	Econoseal	*PVC	107-389 O.D.
		*PVC	475-813 O.D.

\*(Type PSM) smooth wall pipe. Contact the pipe manufacturer for profile to smooth wall pipe adapters.

#### **5.4 Grouted-In Connector**

The grouted-in rigid connector shall be used in cast-in-place structures and manhole doghouse field poured collars when flexible connectors are not an option. All other applications require approval by the City of Saskatoon.

Where required, a structural epoxy-based bonding adhesive and non-shrink Type HS sulphate resistant, cementitious grout shall be used to fill the annular space between the pipe and concrete structure. The concrete structure opening shall be 100-150mm larger than the pipe outside diameter. The pipe and connector shall be centred in the concrete structure opening to permit proper consolidation of the non-shrink grout.

The bonding adhesive and grout shall be specified by an approved manhole manufacturer.

Table 4: Grouted in Connector

<b>Manufacturer</b>	<b>Connector</b>	<b>Pipe Type</b>	<b>Pipe Size (mm)</b>
Press-Seal Corporation	WS-25	*PVC, CP	100-150 O.D.
	WS-30	*PVC, CP	200-3658 O.D.

\*(Type PSM) smooth wall pipe. Contact the pipe manufacturer for profile to smooth wall pipe adapters.

**End of Specification 08002**