



Washington State Department of Transportation



American Public Works Association  
Washington State Chapter

# Technical Commentary for Standard Plan B-15.20 Manhole Type 1

## General Information

**Background:** Manholes primarily serve as junctions for storm or sanitary sewer systems when a change in horizontal or vertical alignment must occur. Manholes can also serve as access points to the pipe system for maintenance purposes. Manholes differ from catch basins in that the overall maximum depth is greater and there is no sump provided below the outlet pipe invert.

**Manhole Depth:** A maximum depth of 20 feet is specified in order to comply with Department of Labor and Industry ladder safety regulations. Manholes that exceed this depth must be designed with an appropriate safety feature, such as a landing platform or ladder safety device. Ladder safety requirements are outlined in WAC 296-56-60209 and WAC 296-876-60065.

The structural design of the bottom slab was developed using a manhole depth of 25 feet. If this depth is exceeded, the designer should investigate the need for increasing the thickness of the slab or increasing the amount of steel reinforcement in the slab.

The minimum depth of a Type 1 manhole is specified as 8 feet. This is a result of the typical dimensions of a base section (4 ft), an eccentric cone (3 ft) and any adjustment sections ( $\pm 1$  ft). If the 8 foot depth cannot be achieved, a Type 3 manhole should be specified.

**Maximum Pipe Size:** The maximum pipe inside diameter (I.D.) that can be placed in a Type 1 manhole is shown on Std. Plan B-10.20. The maximum I.D. is dependent on the diameter of the manhole, the maximum knockout size, and the outside diameter of the pipe entering the manhole. The relationship between the inside diameter of the pipe and outside diameter of the pipe varies, depending on the pipe material used. If the inside diameter of the pipe to be used is larger than that shown in Std. Plan B-10.20, a larger manhole such as those shown on Standard Plan B-15.40 (72", 84", 96", 120", 144"), must be provided. Manholes are available in diameters up to 144 inches and knockout sizes up to 108 inches.

It is recommended that a gap of approximately 2 to 2 1/2 inches be provided between the knockout wall and the outside of the pipe. The gap facilitates pipe installation into the manhole. Once the pipe is installed, the gap is filled with concrete grout (joint mortar).

**Pipe Alternates:** Most contracts allow a number of pipe alternates to be used. The designer must insure that the Type 1 manhole diameter specified for a location is large enough to accept all of the pipe alternates for that location.

**Minimum Distance Between Knockouts:** The minimum distance between knockouts provides enough wall area to keep the manhole intact during transit, installation, and backfilling. Manholes are particularly susceptible to damage when the knockouts are being removed in the field. Once the pipes have been installed and grouted into the manhole, much of the structural integrity is restored. If it is not possible to maintain the minimum distance between knockouts, a larger manhole diameter should be specified.

**Base Sections:** There are two different base sections that can be provided for a Type 1 manhole. The most common type is the precast base with integral riser walls. With this base section, the walls and base are formed and poured together, resulting in a monolithic section, typically 2 to 5 feet tall. Depending on the height, the base section may or may not contain the knockouts. Additional riser sections are placed on top of the base section to develop the full height of the catch basin.

The second type of base section is a precast base slab. The base slab is set in place and fit with an o-ring gasket. The o-ring gasket provides a watertight seal around the base to prevent leakage. A 2-foot riser section is typically placed first to form the sump. A 4 to 5-foot riser section containing the knockouts is placed next, followed by additional risers to develop the full height of the manhole basin.

### **Updates / Comments**

For revision history see <http://www.wsdot.wa.gov/Design/Standards/ManualArchive.htm>

### **Applicable Specifications**

6-02.3	Construction Requirements for Concrete Structures
7-05	Manholes, Inlets, Catch Basins, and Drywells
9-04.3	Joint Mortar
9-04.4	Pipe Joint Gaskets
9-05.15(1)	Manhole Ring and Cover
9-05.50	Precast Concrete Drainage Structures

### **Referenced Standard Plans**

B-30.70	Circular Frame (Ring) and Cover
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B-30.90      Miscellaneous Details for Drainage Structures

**Other Information**

This commentary sheet is maintained by Headquarter's Hydraulics Office. Please send any suggestions for additions or modifications to :

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Last Updated:      September 29, 2017