APPENDIX E
ACCESS STRUCTURES

1.0 Introduction

Access structures are utilized to provide entry to continuous underground storm drains for inspection and cleanout. A manhole or grate inlet may be used for access. Typical locations where access structures should be specified are:

- where two or more storm drains converge,
- where pipe size changes,
- where an abrupt change in alignment occurs, and
- where an abrupt change of the grade occurs.

2.0 Spacing

Spacing of access structures on small lines up to and including 36 inches shall not exceed 400 feet. Spacing of access structures on lines larger than 36 inches shall not exceed 900 feet. The spacing shall not exceed 400 feet when inlets are used in lieu of manholes.

3.0 Types

A listing of standard ODOT access structures and their associated drawing numbers is presented in Table A.

Table A ODOT Access Structures

I.D.	Configuration (Max Pipe Diameter; Max Depth)	ODOT Standard Drawing No.
Standard MH	Precast Manhole with cone top (24 inch; N/A)	RD336
Shallow MH	Shallow Precast Manhole with flat top and manhole cover. (24 inch; N/A)	RD342
Drop Manhole	Outside drop to manholes added when pipes enter the structure at significantly different elevations.	RD352
Large Precast Manhole	Manhole Base for large pipes (8 feet; N/A). Large manholes are required for pipes from 2.5 feet through 8 feet.	RD346
B	Precast inlet box with flat top and concrete slab cover (24 inch; 4 feet)	RD368
B-SL	Precast inlet box with inclined flat top and concrete slab cover (24 inch; 4 feet)	RD368

4.0 Sizing

When determining the minimum access hole size required for various pipe sizes and locations, two general criteria must be met.

- The manhole or inlet structure must be large enough to accept the maximum pipe as shown in Table B.
- A 12-inch minimum distance between each pipe should be maintained (measured from the outside of the pipe).

Figure 1 displays a typical layout for a manhole with inflow and outflow pipes.

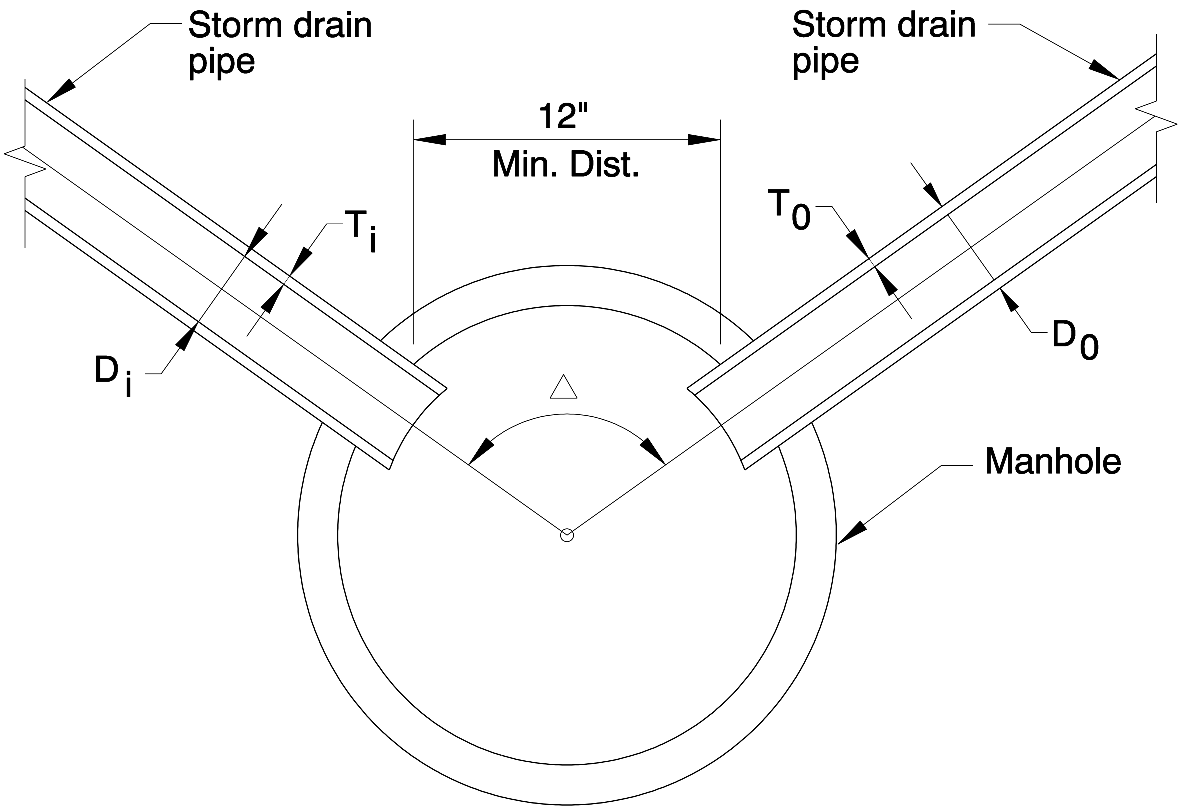


Figure 1 Manhole Sizing

Equation 1 is used for determining the proper manhole diameter based on incoming pipe diameters, pipe wall thickness, and the angle between the pipes in degrees.

$$K = \frac{\frac{D_i}{2} + T_i + \frac{D_o}{2} + T_o + 12}{\Delta} \qquad \text{(Equation 1)}$$

Where:

D_i and T_i are interior diameter and wall thickness of inlet Pipe, inches
D_o and T_o are interior diameter and wall thickness of outlet Pipe, inches
Δ = angle between the pipes (measured from the centerline of each pipe), degrees

Table B Manhole Sizing

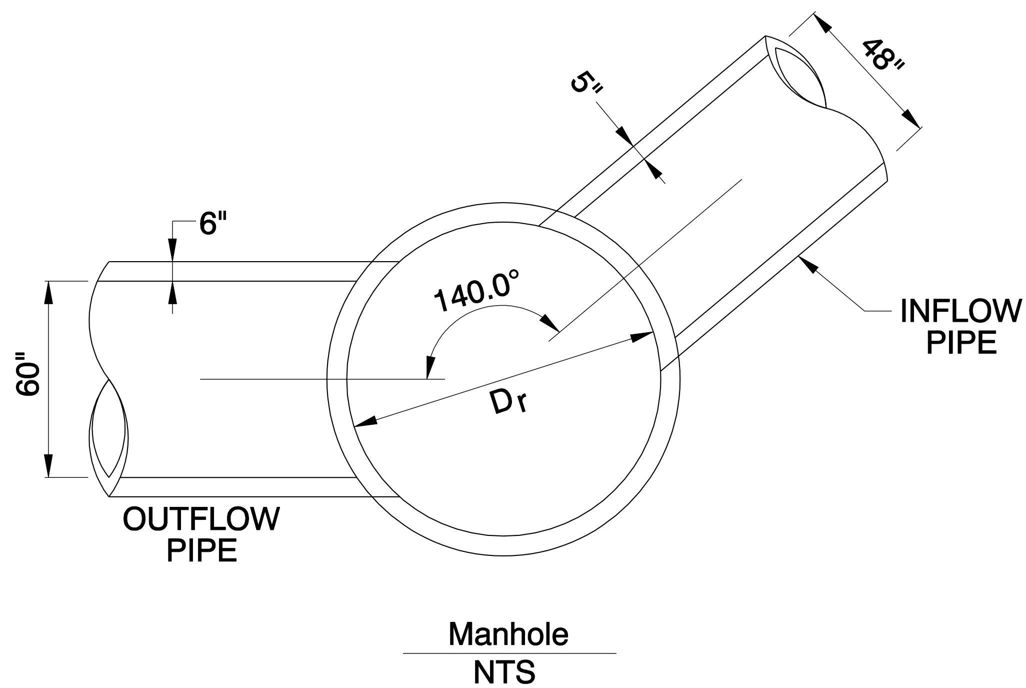
Manhole Diameter inches	**K inches/degree**	**Maximum Pipe Size inches**	**Maximum Pipe Size inches**
		AASHTO	ODOT
42	0.37	28	24
48	0.42	30	24
60	0.52	42	30
72	0.63	48	42
84	0.73	60	54
96	0.84	72	66
108	0.94	84	78
120	1.05	0	90
126	1.10	0	96

4.1 Manhole Sizing Example Problem

The following example illustrates using Table B to determine the minimum access hole size required.

4.1.1 Determine the minimum access hole size required for the following conditions:

Sketch:



Given:

D_i = 48 inches (inflow pipe diameter)
T_i = 5 inches (inflow pipe wall thickness)
D_o = 60 inches (outflow pipe diameter)
T_o = 6 inches (outflow pipe wall thickness)
Δ = 140^o (pipe deflection at manhole)
D_r = required manhole diameter in inches

Solution:

Step 1- Solve for (K):

K = access hole (manhole) sizing coefficient

$$K = \frac{\frac{D_i}{2} + T_i + \frac{D_o}{2} + T_o + 12}{\Delta} \qquad \text{(Equation 1)}$$

$$K = \frac{\frac{48}{2} + 5 + \frac{60}{2} + 6 + 12}{140}$$

K = 0.55 inch/degree

Step 2- Determine (D_r):

D_r = Required Manhole Diameter in inches

Use Table B to obtain appropriate manhole diameter. For K = 0.55 minimum manhole diameter is 72 inches (6 feet). However, the largest pipe has a diameter of 60 inches, and ODOT requires a minimum diameter manhole of 96 inches for this size of pipe. Therefore, a 96-inch manhole should be selected.

For this example, spacing is not critical and the pipe size governs. Had the Δ angle been 115 degrees or less, the following sizing coefficient would be calculated.

$$K(115) = \frac{\frac{48}{2} + 5 + \frac{60}{2} + 6 + 12}{115}$$

K (115) = 0.70

Therefore, from Table B, a minimum access hole diameter of 84-inches (7 feet) would be required based on spacing. However, similar to the example discussed above, the pipe size of 60 inches would have required the use of a 96 inch access hole.

Had the Δ angle been 90 degrees or less, the following sizing coefficient would be calculated:

$$K(90) = \frac{\frac{48}{2} + 5 + \frac{60}{2} + 6 + 12}{90}$$

K (90) = 0.86

Therefore, from Table B, a minimum access hole diameter of 108 inches (9 feet) would be required based on spacing. In this case, spacing is the limiting factor (instead of the pipe diameters used in the previous calculations) and a 9-foot diameter access hole would be required and would not need to be sized further to accommodate larger pipes.

5.0 Blind Connections

Design of completely new storm sewers should not include blind connections. Single inlets may be blind-connected to 18-inch diameter or larger storm drains without constructing a manhole in projects involving retrofitting existing systems. The maximum diameter of intersecting storm drain shall be 6 inches less than the trunk storm drain. When blind connections are used, they should not constrict or obstruct the trunk line.

6.0 Drop Manhole

Drop manholes shall be used where the difference in flowline elevations between intersecting storm drains, except inlet runs, exceeds 4 feet. The purpose of a drop manhole is to prevent splashing which might interfere with work in the manhole. They also prevent water from dropping on the workers in the manhole. Drop manholes are only effective during low flows.

7.0 Special Manholes

Special manholes shall be designed when conditions prevent the use of standard manholes. For example, a special manhole is needed for pipes larger than 8 feet in diameter, and for splitter manholes to water quality facilities. As discussed above, larger diameter manholes are required for systems with pipe diameters exceeding 2.5 feet.

8.0 Other Considerations

- Access structures should not be located in traffic lanes; however, when it is impossible to avoid locating an access hole in a traffic lane, care should be taken to insure it is not in the normal vehicle wheel path.
- Access structures over 20 feet in depth should be avoided due to the limitations of ODOT vactor trucks. Adjacent access to the structure is needed for the vactor to operate to this maximum depth.
- The Oregon Occupational Safety and Health Administration have requirements for manhole rest platforms for structures deeper than 20 feet, and the design should satisfy these requirements. These requirements can be obtained from the Oregon Occupational Safety and Health Administration website at http://www.orosha.org/

- Other applicable confined space design guidelines can be obtained from the Oregon Occupational Safety and Health Administration website noted above.

9.0 Utility Issues

Utility conflicts are presented in Appendix F of this chapter.