

Precast Concrete Cleanout and Inlet Sizing Guidelines (July 2008)

Based on Typical Geneva Pipe Cleanout and Inlet Boxes

Use of this guideline (including design & dimensions) should be analyzed and checked by the User's Engineer to make sure that it is adequate for the intended use.



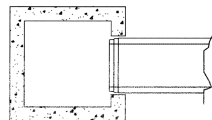
Step 1 - Select pipe size and cleanout/inlet configurations based on project hydraulics.

Step 2 - Find concrete pipe outer diameter (OD) based on Table 1. Adjust the OD based on the skew of the pipe. An example and equation is shown below the table.

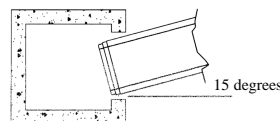
Angle of Pipe Entering Box	0°	5°	10°	15°	20°	30°	45°
Inside Diameter (ID)	Outside Barrel Diameter (OD)						
12.0"	16.5"	17.1"	17.8"	18.7"	19.7"	22.5"	29.3"
15.0"	19.8"	20.4"	21.1"	22.1"	23.2"	26.3"	33.9"
18.0"	23.0"	23.6"	24.4"	25.4"	26.7"	30.0"	38.5"
21.0"	27.0"	27.6"	28.5"	29.6"	30.9"	34.6"	44.2"
24.0"	30.0"	30.6"	31.5"	32.7"	34.1"	38.1"	48.4"
27.0"	35.0"	35.7"	36.6"	37.8"	39.4"	43.9"	55.5"
30.0"	38.3"	38.9"	39.9"	41.2"	42.9"	47.6"	60.1"
36.0"	45.9"	46.6"	47.6"	49.1"	51.0"	56.4"	70.9"
42.0"	52.2"	53.0"	54.1"	55.7"	57.8"	63.8"	79.9"
48.0"	59.4"	60.2"	61.4"	63.1"	65.4"	72.1"	90.0"
54.0"	65.0"	65.8"	67.1"	68.9"	71.4"	78.5"	97.9"
60.0"	72.0"	72.8"	74.2"	76.1"	78.8"	86.6"	107.8"
66.0"	80.5"	81.3"	82.8"	84.9"	87.9"	96.4"	119.8"
72.0"	86.0"	86.9"	88.4"	90.6"	93.7"	102.8"	127.6"
84.0"	101.5"	102.4"	104.1"	106.7"	110.2"	120.7"	149.5"
90.0"	108.5"	109.4"	111.2"	113.9"	117.6"	128.7"	159.4"
96.0"	115.5"	116.5"	118.3"	121.2"	125.1"	136.8"	169.3"

Areas below the dark line indicate pipe sizes and angles that will not fit within a standard 6" wall box. Special box sizes are available for these conditions.

Example:



18" RCP in a Cleanout
OD of 18" RCP = 23.0"



18" RCP in a Cleanout (pipe skew at 15 degrees)
OD of 18" RCP on angle of 15 degrees
 $(OD \times 1/\cos(15^\circ)) + (\tan(15^\circ) \times \text{Wall Thickness})$
 $(23" \times 1.04) + (0.26 \times 6" \text{ wall}) = 25.4"$

Pipes should typically not be designed to go through the corner of a box or inlet. Coordinate any special design with manufacturer.



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Step 3 - Find cleanout box size based on Table 2.

Table 2 Typical Box Sizes					
<p>Sizes shown are for square or rectangular box sides to be configured with the dimensions shown. Box sides larger than 6' are available. Please consult the manufacturer for the most efficient configuration. Boxes shown are for 6" outer walls and meet HS-20 loading. Specifying other wall thicknesses will change box dimensions and should be done with the assistance of the box manufacturer.</p>					
Typical Box Side	2 foot	3 foot	4 foot	5 foot	6 foot
Horizontal Dimension Available for Pipe OD ⁽¹⁾	16"	28"	40"	52"	64"
<p>(1) Assumes maintaining 2" of solid concrete from inside wall and that the core hole diameter will be 4" greater than the pipe OD (2" wider than pipe on each side of OD). Under special conditions, tighter tolerances may be acceptable. Please coordinate with box manufacturer to determine. Boxes with thin wall concrete knock outs may also have a larger area for pipe acceptance (Please check manufacturer drawings if thin wall knock outs are acceptable based on the jurisdictions specifications)</p>					

Step 4 – Once an adequate size has been selected, check box depth as per the following pages.

Step 5 – Select frame and grate configuration, floor configuration and appurtenances

Top Section Configuration

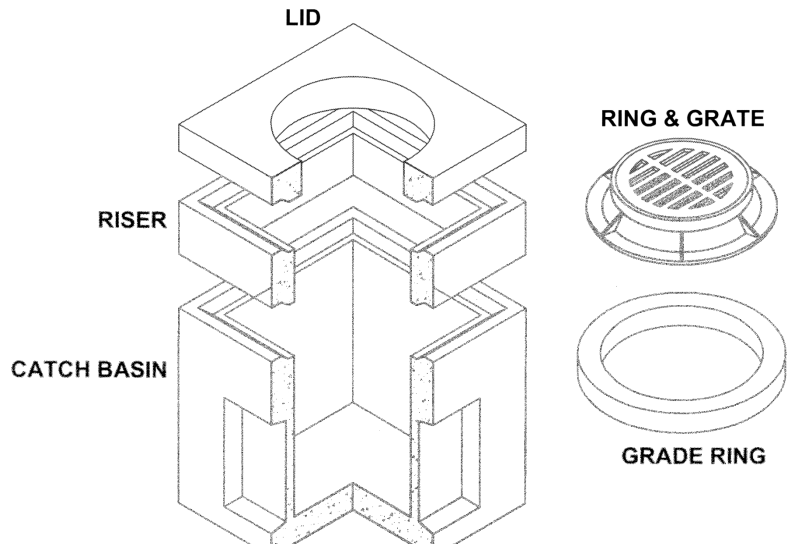
- Riser Height
- Unfinished Top with Exposed Rebar for Monolithic Pour
- Frame and Grate Type

Floor Configuration

- Flush
- Poured Invert
- Sump

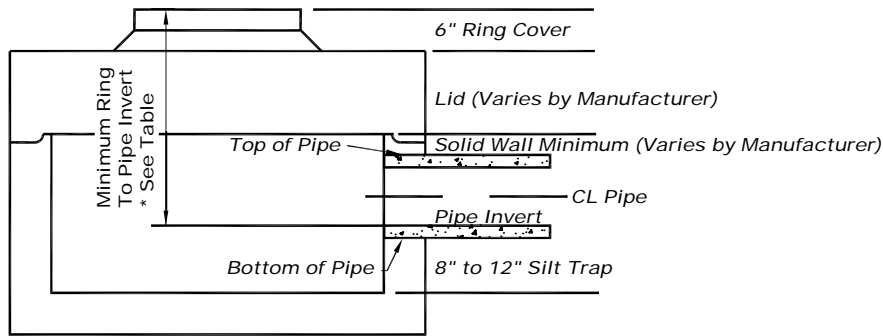
Appurtenances

- Steps



Drawings in this handout are shown for illustrative purposes only. Different manufacturers will have different type joints, risers, lids, grade rings, knockouts, etc. For the manufacturers detailed most current drawings, please contact the manufacturer.





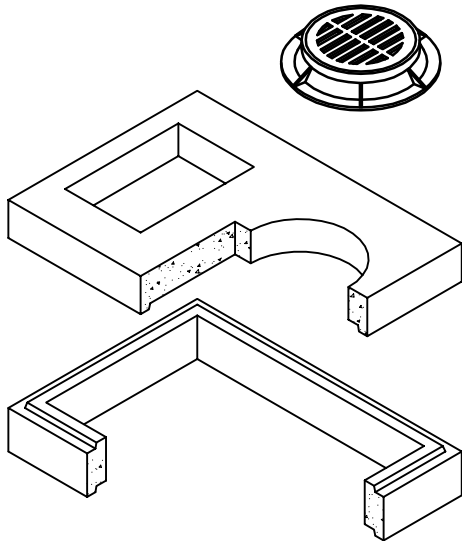
Storm Drain Manhole/Combo Box Typical

* Assume RCP for Pipe Diameters and Wall Thickness

Pipe Diameter (In.)	Wall Thickness (In.)	Hole Diameter (In.)	Minimum Difference Ring-to-Pipe Invert (In.)	Minimum Difference Ring-to-Pipe Invert (Feet)
12	2.25	20.50	37.25	3.10
15	2.25	23.75	40.25	3.35
18	2.5	27.00	43.50	3.63
21	3.0	31.00	47.00	3.92
24	3.0	34.00	50.00	4.17
27	4.0	39.00	54.00	4.50
30	4.125	42.26	57.13	4.76
36	4.94	49.88	63.94	5.33
42	5.12	56.24	70.12	5.84
48	5.71	63.42	76.71	6.39

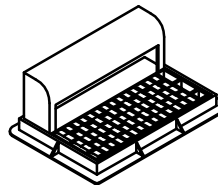
The above minimum guidelines may not be sufficient for instances where the number of pipes in a manhole or box requires a larger structure. Larger structures may require deeper minimum depths for structural considerations.

Configuration in Table

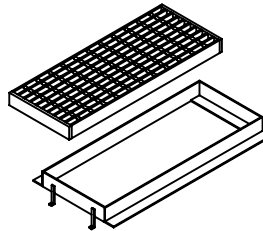


Manholes and Combo Boxes with Ring and Cover
Suggested Cover over top of Pipe - 23"
Depth to Invert Shown in Table.

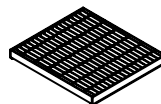
Alternate Configurations



- Curb Back Grate (add 6" for TBC)
- Suggested Cover over top of Pipe - 23"
- Pavement to Invert Depth Shown in Table minus 0"



- 4" Frame and Grate
- Suggested Cover over top of Pipe - 21"
- Pavement to Invert Depth Shown in Table minus 2"



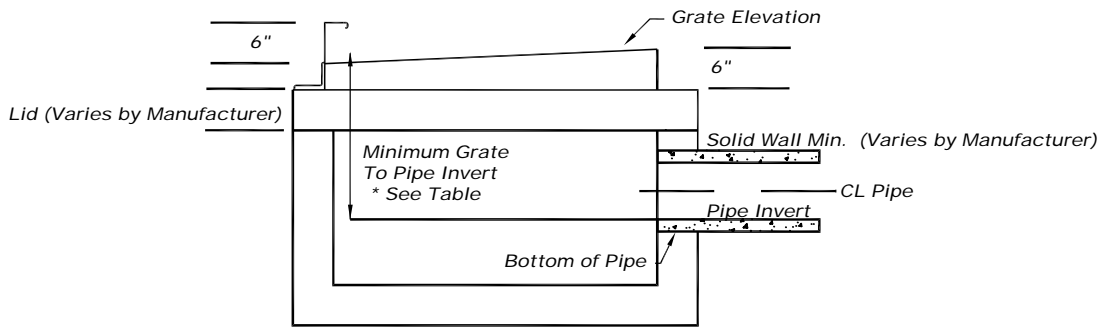
- Recessed Grate
- Suggested Cover over top of Pipe - 17"
- Pavement to Invert Depth Shown in Table minus 6"

The above shown configurations are meant to be design guidelines only. More shallow configurations may be available by contacting the manufacturer.

THESE DRAWINGS ARE FURNISHED FOR INFORMATION ONLY.
ALL DIMENSIONS SHOWN ARE SHEET SPECIFIC.
USE OF THESE DRAWINGS (INCLUDING DESIGN AND DIMENSIONS)
MUST BE CHECKED BY THE USER'S ENGINEER ENSURING ADEQUACY
FOR THE INTENDED USE.

THE SIZE OF PIPE WILL DETERMINE WHAT SIZE OF BOX IS NEEDED,
AND THEREFORE, IF A LID IS NEEDED ON THE BOX. IF A LID IS NOT
NEEDED THEN MINIMUM CLEARANCE MAY BE REDUCED. IT IS UP TO
THE DESIGNER TO DETERMINE WHAT SIZE OF BOX IS NEEDED AND IF
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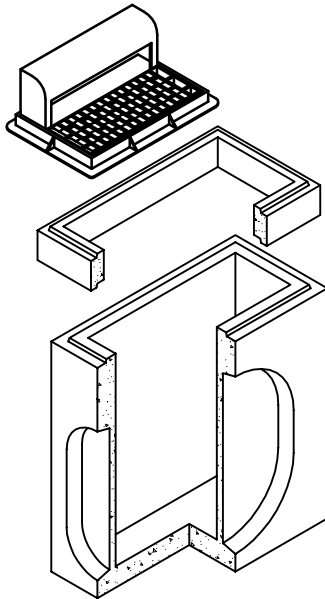
Storm Drain Curb Inlet Box Typical

* Assume RCP for Pipe Diameters and Wall Thickness

Pipe Diameter (In.)	Wall Thickness (In.)	Hole Diameter (In.)	Min. Difference Grate-to-Pipe Invert (in.)	Min. Difference Grate-to-Pipe Invert (ft.)
12	2.25	20.50	33.25	2.77
15	2.25	23.75	36.25	3.02
18	2.5	27.00	39.50	3.29
21	3.0	31.00	43.00	3.58
24	3.0	34.00	46.00	3.83
27	4.0	39.00	50.00	4.17
30	4.125	42.26	53.13	4.43
36	4.94	49.88	59.94	5.00
42	5.12	56.24	66.12	5.51
48	5.71	63.42	72.71	6.06

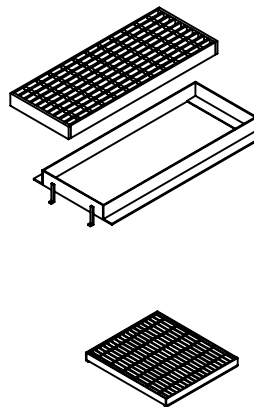
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Configuration in Table



Inlet Box with Curb Back Inlet and Lid - Add 6" for TBC
Suggested Cover over top of Pipe - 19"
Depth to Invert Shown in Table.

Alternate Configurations



- 4" Frame and Grate
- Suggested Cover over top of Pipe - 17"
- Pavement to Invert Depth Shown in Table minus 2"

- Recessed Grate
- Suggested Cover over top of Pipe - 13"
- Pavement to Invert Depth Shown in Table minus 6"

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Geneva Pipe

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Clearance Tables for RCP in
Inlet/Cleanout Boxes

July 2008

Sizing Manholes Multiple Holes at Same Elevation

Formula

$M \times \text{Angle} = Y$ $M = \text{Circumference}/360 \text{ degrees}$ (see table to right)
 $Y = \text{Arc Distance between the center line of pipes}$

$a = Y - (\text{Pipe \#1 Arc Size} / 2) - (\text{Pipe \#2 Arc Size} / 2)$
 $a = \text{Distance between openings}$

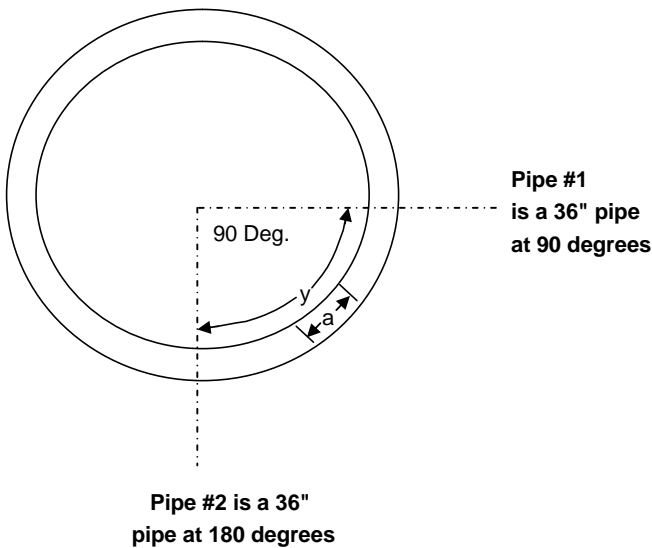
Manhole Diameter	M in/deg
48 in.	0.419
60 in.	0.524
72 in.	0.628
84 in.	0.733
96 in.	0.838

*Suggested "a" distance is 6" or greater for 48" thru 72" Diameter Manholes.
 For greater than 72" Diameter Manholes suggested "a" is 8" or greater.*

Pipe Diam. (in.)	Pipe OD (in.)*	Core Hole (in.)	Arc Size per MH Diameter				
			48" Diam.	60" Diam.	72" Diam.	84" Diam.	96" Diam.
12	16.5	20.5	21.2	20.9	20.8	20.7	20.7
15	19.8	23.8	24.8	24.4	24.2	24.1	24.0
18	23.0	27.0	28.7	28.0	27.7	27.5	27.4
21	27.0	31.0	33.7	32.6	32.0	31.8	31.6
24	30.0	34.0	37.8	36.1	35.4	35.0	34.8
27	35.0	39.0		42.5	41.2	40.6	40.2
30	38.3	42.3		46.9	45.2	44.3	43.8
36	45.9	49.9			55.1	53.4	52.5
42	52.2	56.2			64.5	61.6	60.1
48	59.4	63.4			77.6	71.9	69.3
54	65.0	69.0				81.0	77.0
60	72.0	76.0					87.7

*Pipe OD is for "B" Wall Pipe. Other pipe OD's can not use this table.
 The table assumes that for pipe sizes up to 30" in diameter a "boot" will be installed.

Example: Two 36" pipes at an angle of 90 degrees



Manhole Check

Try a 72" Diameter Manhole
 $Y = M \times \text{Angle} = 0.628 \times 90 = 56.52$

$a = Y - (\text{Pipe \#1 Arc Size}/2) - (\text{Pipe \#2 Arc Size}/2)$
 $a = 56.52 - (55.1 / 2) - (55.1 / 2)$
 $= 56.52 - 27.55 - 27.55 = 1.42$

a = 1.42" is less than the 6" suggested minimum, so try a larger manhole diameter

Try a 84" Diameter Manhole
 $Y = M \times \text{Angle} = 0.733 \times 90 = 65.97$

$a = Y - (\text{Pipe \#1 Arc Size}/2) - (\text{Pipe \#2 Arc Size}/2)$
 $a = 65.97 - (53.4 / 2) - (53.4 / 2)$
 $= 65.97 - 26.7 - 26.7 = 12.57$

a = 12.57" is more than the 8" suggested minimum, so manhole size is sufficient

These dimensions are furnished for information only. All dimensions shown are sheet specific. Use of these dimensions or example calculations must be checked by the user's Engineer ensuring adequacy for the intended use.

Revisions or additions to the above may be issued periodically and it shall be the responsibility of the receiver of these files to keep them current with any updates.

