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Manhole Invert Elevations

How pipe inverts on drawings differ from pipe inverts on precast manhole bases

How are manholes displayed on drawings?

Most engineering drawings will show the profile of a manhole as a vertical line. The vertical line signifies the centre point of where the manhole is to be located. Pipe invert elevations are typically written on engineering drawings directly below their associated manhole. Much like the manhole itself, the location of a pipe invert elevation is given at the *centre point* of the manhole.

How are manholes produced?

Manholes are typically produced with premade pipe connections built into the manhole wall. The location of a pipe connection is based on the pipe invert elevation at the *outside face* of the manhole.

What does this mean to me?

As shown in Figure 1 below, depending on the diameter of the manhole and the grade of the pipe, the pipe invert elevation at the outside wall of the manhole can differ significantly from the pipe invert elevation at the centre point of the manhole. It is important for producers, designers, installers, and inspectors to be aware of this difference and account for the change during the manufacturing and installation processes.

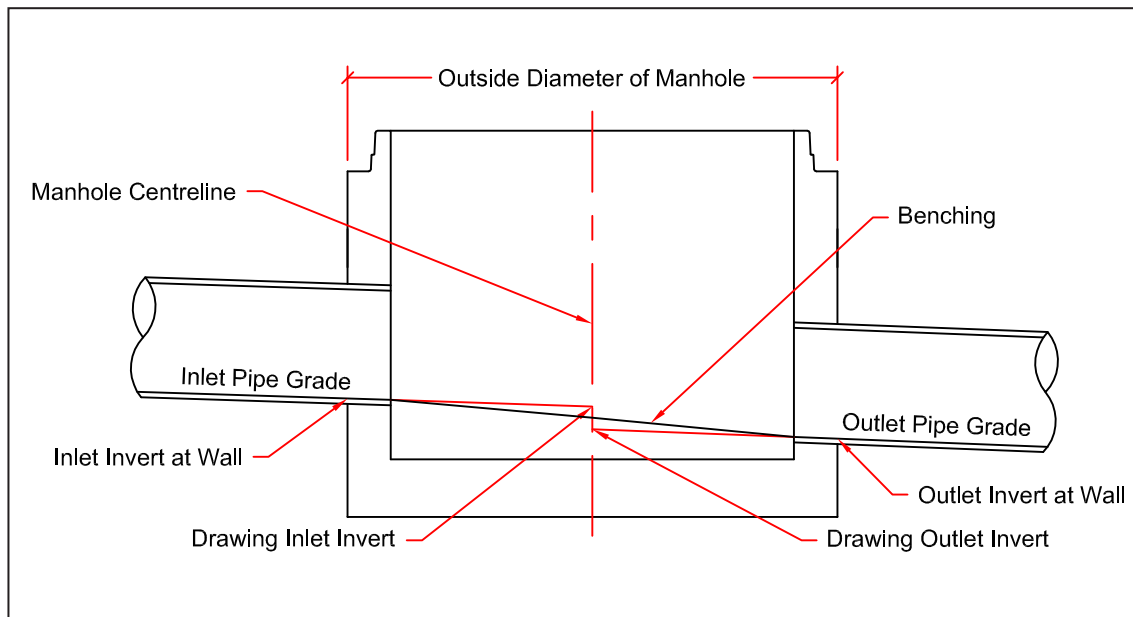


Figure 1: Typical Manhole Base with Adjusted Invert Elevations

How can you calculate the wall invert elevation?

You can calculate the pipe invert elevations at the wall of a manhole using the following formulas:

For Outlet Pipes:

$$\text{Outlet Invert at Wall} = \text{Drawing Invert} - \text{Grade of Pipe} \times \frac{\text{Manhole Outside Diameter}}{2}$$

For Inlet Pipes:

$$\text{Inlet Invert at Wall} = \text{Drawing Invert} + \text{Grade of Pipe} \times \frac{\text{Manhole Outside Diameter}}{2}$$

The *Drawing Invert* and *Grade of Pipe* are both typically provided on the engineering drawings. The *Manhole Outside Diameter* can be obtained from the manhole supplier. Ocean Pipe's standard *Manhole Outside Diameters* are shown in Table 1 below.

Manhole Nominal Diameter (mm)	Manhole Outside Diameter (m)
1050	1.295
1200	1.473
1350	1.689
1500	1.867
1800	2.223
2400	2.896

Table 1: Ocean Pipe Standard Manhole Outside Diameters

How does Ocean Pipe account for the elevation difference?

Ocean Pipe's in-house design software automatically calculates the required wall invert elevations using the information provided on the engineering drawings. Therefore, all manholes produced by Ocean Pipe will arrive onsite with the correct, adjusted, wall invert elevations.

How does the elevation difference effect installation?

It is extremely difficult to accurately measure the elevation of a pipeline at the centre point of a manhole. Therefore, most installers will rely on measuring the pipe invert elevation at the outside face of the manhole. In order to be accurate, installers must carry out the above calculations to find the required invert elevation at the manhole wall.

How do I learn more?

For additional product information or design assistance, contact Ocean Pipe's technical staff:

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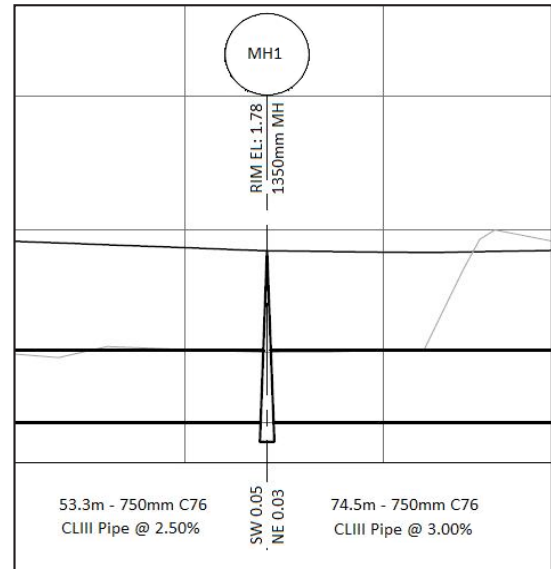
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Example Problem

Question:

Find the pipe invert elevations at the manhole wall for the manhole shown on the drawing.
Note that the outlet pipe is on the right side of the page (the northeast direction).



Solution:

$$\text{Outlet Invert at Wall} = 0.03\text{m} - \frac{3.00}{100} \times \frac{1.689\text{m}}{2} = 0.005\text{m}$$

$$\text{Inlet Invert at Wall} = 0.05\text{m} + \frac{2.50}{100} \times \frac{1.689\text{m}}{2} = 0.071\text{m}$$

