

JUST THE FACTS



PIPE INSTALLATION

Just The Facts - Pipe Installation

- Fact** Concrete pipe is a rigid pipe, self-contained pipe system. It arrives on site as both a structure and a conduit. Due to the inherent strength of the concrete, it is much less dependent upon support from the embedment material.
- Fact** Flexible pipe arrives on site as a conduit only and not as a pipe system. Flexible pipe has very little inherent strength and depend upon a properly installed embedment material for their load-carrying capacity. The soil/pipe structure has to be built on site by the installer by appropriately placing and compacting the embedment material in 200 mm layers. Disturbing this material after proper placement and compaction destroys the integrity of the pipe structure.
- Fact** Specifications make deflection testing mandatory for flexible pipe. The testing shall not be performed until 30 days after completion of installation with a limit of 5 percent deflection.
- Fact** Ontario Provincial Standard Specification 410 - OPSS 410.07.15.05 – Construction Specification for Pipe Sewer Installation in Open Cut: Section 410.07.15.05, states that:
- *“Ring deflection testing shall be performed on all pipe sewers constructed using plastic pipe”*
 - *“The device shall be pulled manually through the pipe not sooner than 30 days after the completion of backfilling and installation of service connections”*
 - *“Any sections of the pipe that fail the deflection test shall be repaired and retested.”*
- Fact** Recently, the AASHTO Bridge Committee approved an amendment to Section 30.5.6.2 of the LRFD Bridge Construction Specifications – Installation Deflection 2005-*“For locations where pipe deflection exceeds 5 percent of the inside diameter, an evaluation shall be conducted by the Contractor and submitted to the Engineer for review and approval considering the severity of the deflection, structural integrity, environmental conditions, and the design service life of the pipe. Pipe remediation or replacement shall be required for locations where the evaluation finds that the deflection could be problematic. For locations where pipe deflection exceeds 7.5 percent of the inside diameter, remediation or replacement of the pipe is required.”*
- Fact** OPSS 514 - Construction Specification for Trenching, Backfilling and Compacting is the construction specification most commonly used in Ontario for the installation of underground infrastructure. This specification references the Occupational Health and Safety Act, R.S.O. 1990 and requires bedding materials to be placed in 200 mm lifts simultaneously (i.e. both sides of the pipe) compacted to 95% maximum dry density before a subsequent layer is placed.
- Fact** Closed profile HDPE pipe manufacturers usually reference ASTM F894 in the literature they distribute. This reference states that: “Pipe produced to this specification should be installed in accordance with Practice ASTM D2321 and with the manufacturer’s recommendations”. ASTM D2321 6.4.2 –Specification for Movable Trench Wall Supports states: “Do not disturb the installed pipe and its embedment when using movable trench boxes and shields. Movable supports should not be used below the top of the pipe zone unless approved methods are used for maintaining the integrity of embedment material.” Ontario Regulations, specifically OPSD 802.010, indicates that “where trench wall support is used; the support is to extend 150mm below the bottom of the pipe.” There is an obvious contradiction between this Regulation and ASTM D2321 6.4.2.

Fact Based on ASTM D2321, there could be as little as 8” of clear space between the pipe and the trench wall. These trench dimensions are inconsistent with OPSD 802.010 in that the minimum clearance between the trench wall and the pipe is 300mm for pipe 900mm or less and 500mm for pipe over 900mm. At the same time the dimensions are inconsistent with the Occupational Health and Safety Act, R.S.O. 1990 that governs all construction activities in Ontario, as it states that: “a worker shall have a clear work space of at least 450 mm between the wall of the excavation and any formwork or masonry or similar wall.”

Fact The Occupational Safety and Health Administration (OSHA) in the US, Regulation 1926.652(g) (2) states: “Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.”

Fact There is an obvious conflict between ASTM D2321 and OSHA Regulation 1926.652(g) (2) for pipe diameters greater than 18” in diameter since OSHA only allows “excavation of material to a level no greater than 2 feet (.61m) below the bottom of the members of a support system” and ASTM D 2321 states that “movable supports should not be used below the top of the pipe zone unless approved methods are used for maintaining the integrity of embedment material.” In response to this dilemma, one major manufacturer of HDPE pipe has published a trench detail on its website that details the use of a trench with a width equal to three times the pipe diameter when using a trench box. According to this design, for a 36 inch diameter pipe, a 109 inch wide trench is required; and for a 48 inch diameter pipe, a 142 inch wide trench diameter will be required.

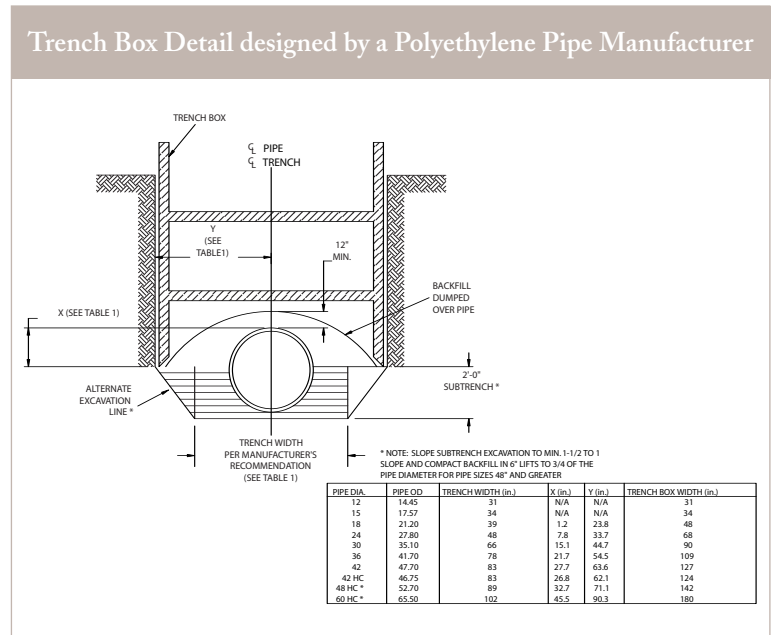


Table X1.1 as per ASTM F894 shows the relation between RSC and Pipe Stiffness

Pipe Diameter	RSC 40	RSC 63	RSC 100	RSC 160
18	12.9	20.2	32.2	51.6
21	11.0	17.4	27.8	44.4
24	9.8	15.3	24.4	39.0
27	8.6	13.7	21.7	34.7
30	7.8	12.3	19.5	31.2
33	7.1	11.2	17.8	28.4
36	6.6	10.2	16.2	25.8
42	5.6	8.8	14.1	22.6
48	4.9	7.7	12.3	19.7
54	4.3	6.9	11.0	17.7
60	3.9	6.2	9.8	15.8
66	3.6	5.6	9.0	14.3
72	3.3	5.2	8.3	13.3
78	3.0	4.8	7.7	12.3
84	2.8	4.4	7.0	11.3
90	2.6	4.2	6.6	10.6
96	2.5	3.8	6.2	9.8
108	2.2	3.4	5.5	8.8
120	2.0	3.1	5.0	7.9

Fact CSA B182.6/B182.8 require a pipe stiffness value of 320 KPa for flexible pipe. According to ASTM F894, Table X1.1; only an 18” diameter pipe with an RSC of 160 has a pipe stiffness greater than 46 psi or 320 KPa.

Fact ASTM D2321, Section 7.10 refers to connection of flexible pipe to manholes and it specifies: “Use flexible water stops, resilient connectors, or other flexible systems approved by the engineer to make watertight connections to manholes and other structures.” Connection of concrete pipe to manholes doesn’t require flexible water stops.

Fact HDPE pipe is installation sensitive, and engineers and contractors have to be educated with regards to proper installation of these products.

Excessive deflection can be a result of improper installation and/or product quality and pipe profile geometry. Excessive deflection can lead to bad joints, grade problems, poor hydraulic performance, stress related problems, and surface (ground or pavement) irregularities. More importantly, though, is the fact that most of these problems are an indicator of future failure. Specify an engineered and time proven product with verified installation methods: Concrete Pipe.



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