



Clarifying HDPE Standards in Canada

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Ontario Concrete Pipe Association has three professional engineers on staff with almost sixty years experience in the gravity pipe and precast industries. Throughout the course of the year we are busy interacting with design professionals and conduct Lunch and Learn presentations and seminars.

In our presentations we address standards for all types of gravity pipes used in Ontario including reinforced concrete (RCP) pipe, Polyvinyl Chloride (PVC) pipe and High Density Polyethylene (HDPE) pipe. Concrete pipe produced in Ontario in accordance with *CSA A257 Series-09 Standards for Concrete Pipe and Manhole Sections* can be used in both storm and sanitary applications. Similarly, PVC pipes produced in accordance with Canadian Standards *CSA B182.2-06* can be used in storm and sanitary applications. This is not the case with HDPE pipe. *Our experience has shown that many of the attendees at these presentations have been confused by the number and diversity of HDPE standards that have been promoted to them. They do not always understand the differences between these standards at the beginning of our lectures.* However, we feel we are successful in explaining HDPE standards and have brought clarity to those in attendance. In this article we will attempt to inform the reader on the key aspects and



HDPE pipes available in Canada have many variations

differences of HDPE pipe standards for products that are being promoted in Ontario and indeed across Canada.

CSA HDPE Standards: There are two HDPE standards for gravity pipes that were developed by the Canadian Standards Association, namely:

- *CSA B182.6-06-Profile Polyethylene Sewer Pipe and Fittings for Leak- Proof Sewer Applications*
- *CSA B182.8-06-Profile Polyethylene Storm Sewer and Drainage Pipe and Fittings*

CSA B182.6-06-Profile Polyethylene Sewer Pipe and Fittings for Leak Proof Sewer Applications only allows virgin resins and the joints are comprised of bells and gaskets. The requirement for these joints is as follows “*Elastomeric gasket joints made with pipe and fittings or with bell-end pipe shall comply with the requirements of ASTM D 3212, except that the internal hydrostatic pressure shall be 100 kPa*”. **This is the same requirement for PVC pipe - SDR 35 and ribbed or profile PVC pipe - produced in accordance with Canadian Standards CSA B182.2-06 and CSA B182.4-06.**

CSA B182.8-06-Profile Polyethylene Storm Sewer and Drainage Pipe and Fittings allows recycled resins and has a number of options for the joints.

The joints may be comprised of bells and gaskets but the requirement for the internal hydrostatic pressure decreases to **74 kPa** for Type 1 gasket joints. **Type 2 silt-tight gasket joints** shall not leak when tested in accordance with ASTM D 3212, except that the internal hydrostatic pressure used for the test decreases to **13.8 kPa**. **Type 3 soil-tight non-gasketed coupling joints:** Joint tightness testing for elastomeric gasket joints does not apply to Type 3 coupling joints.

Pipe Stiffness: The above referenced CSA standards also allow two pipe stiffnesses, namely 320kPa and 210kPa. Pipe stiffness for flexible pipe is the inherent strength measured in accordance with *ASTM Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading* measured at an industry standard of five per cent.



210kPa is the pipe stiffness normally associated with agricultural drainage tile. 320kPa (46psi) is the pipe stiffness adopted by the PVC industry for both SDR 35 and Class V ribbed PVC pipe produced in accordance with Canadian Standards CSA B182.2-06 and CSA B182.4-06 respectively.

Certified versus Conformance: The words “certified” and “conform to” are regularly used by HDPE salespeople in the promotion of their products. What do these terms mean and how are they different?

Certified is also known as Third Party Certification. In such a process the first party is the product’s manufacturer.



Proper use of a trench box

The second party is the owner of the infrastructure into which the products are incorporated, e.g. a municipality. The third party is an independent outside agency that examines and inspects the producer’s manufacturing process and finished products and certifies that the manufacturer is producing product in accordance with a given standard. Third party certification usually includes:

- Plant visits;
- Finished product testing;
- Testing and evaluation of raw materials;
- Monitoring of quality control records;
- Calibration of testing equipment.

CSA International is the most commonly known testing agency in Canada that is used to certify plastic pipes.

Conformance to a standard means the manufacturer is producing a product in accordance with a particular standard but **there is no outside agency verifying quality or performance.**

United States HDPE Standards: There are also a number of American standards for HDPE pipe including

AASHTO M 294 Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500mm Diameter and ASTM F894-07 Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe. These products are manufactured with different resins than those used in Canadian HDPE products. Furthermore both standards have a declining pipe stiffness as the diameter of the pipe increases. For example, a 1,500mm HDPE pipe produced in accordance with AASHTO M294 has a pipe stiffness of 95kPa. ASTM F894 refers to Ring Stiffness Constant (RSC) instead of pipe stiffness but RSC can be easily converted to pipe stiffness. An HDPE pipe with an RSC of 160 and a diameter of 1,500mm has an equivalent pipe stiffness of 110kPa.

Conclusions and recommendations: All of the above leads to a large and confusing number of combinations for the specifier.

- Two Canadian specifications
 - CSA B182.6-06
 - CSA B182.8-06
- Two Pipe Stiffnesses-320kPa and 210kPa
- Certified or Non-Certified (Conforming to)
- CSA B182.8 joint options:
 - 74kPa
 - 13.8kPa
 - “Soil Tight”
- AASHTO M294
- ASTM F894

The Ontario Building Code requirements for HDPE pipe used for a drainage system only allow HDPE produced in accordance with CSA B182.6-06 with a minimum pipe stiffness of 320kPa and certified by an accredited testing agency with the Standards Council of Canada. The National Building Code also requires HDPE produced in accordance with CSA B182.6-06 and with a minimum pipe stiffness of 320kPa.

It makes little sense to have a lower standard for HDPE underneath city streets, municipal roads or provincial highways than the standard for the drainage system underneath the parking lot at a big box store or shopping mall. The diversity of HDPE standards has more to do with industry competitiveness than with engineering principles and life cycle costing.

As a professional engineer with almost 30 years pipe industry experience I always recommend the specification of HDPE produced in accordance with CSA B182.6-06 with a pipe stiffness of 320kPa and certified by CSA International but only where HDPE is considered to be a viable option. 