

PVC PIPE ASSOCIATION TECHNICAL BRIEF

PVC PIPE AND FITTINGS MATERIALS: TESTING REQUIREMENTS

The PVC pipe industry follows a specified set of testing requirements to ensure that its PVC materials meet the requirements of product standards. Before a PVC material can be used for pipe or fittings, it must pass a series of qualification tests. Additional tests are required to qualify materials for pressure usage and for drinking-water applications.

CELL CLASS - ASTM STANDARD D1784

For qualification of PVC pipe and fittings materials, ASTM Standard D1784 is typically specified. The standard's cell classification system is discussed in Uni-Bell Tech Brief "PVC Pipe Materials: Cell-Class Explained." ([Click here](#) for the Tech Brief.)

The standard provides a table of minimum cell values for each of four material properties. The properties and their associated test methods are as follows:

1. Impact strength (Izod) per ASTM D256
2. Tensile strength per ASTM D638
3. Tensile modulus of elasticity per ASTM D638
4. Deflection temperature under load per ASTM D648

All test samples must be prepared per ASTM D618 and tested in a controlled environment. In addition, all materials must pass a flammability test conducted per ASTM D635.

ADDITIONAL REQUIREMENTS - PRESSURE APPLICATIONS

Long-Term Pressure Capacity

To be rated for pressure usage, a PVC compound must obtain a Hydrostatic Design Basis (HDB). The process is as follows:

- Testing of pipe samples made from the compound is conducted per ASTM D1598. This sustained pressure-testing program usually runs in excess of eighteen months for a full evaluation.
- The resulting test data are analyzed per ASTM D2837. If the results fall outside of specified statistical limits, the data are classified as unsuitable for analysis.
- Pertinent test information is then submitted to the Plastics Pipe Institute's Hydrostatic Stress Board (HSB). If testing meets the requirements of D2837 and PPI TR-3, the HSB grants a listing for the compound at the experimentally determined HDB.

This HDB is then used to determine pressure ratings per the applicable product standard.

Drinking Water Potability

Specifications for potable water projects typically include requirements for pipeline components in contact with drinking water. Although tests are not run on the PVC materials themselves, analysis is done to determine:

- What possible contaminants could leach into drinking water
- What type of chemical extraction testing is necessary for the finished products

Certification

Certifying agencies typically conduct the tests for cell class and long-term pressure capacity and also perform the analyses of materials to plan for subsequent potability testing. This use of third-party test agencies provides additional assurance for designers and users of PVC pipe products.

PROCESS ASSURES MATERIAL QUALITY

Qualification of PVC materials for pipe usage is a complicated process:

1. A series of tests must be conducted under carefully controlled conditions.
2. These tests are typically conducted by third-party testing agencies.
3. Ongoing material certification is maintained through certifying agencies.

This testing procedure helps assure that PVC pipe materials are suitable for their intended usage.

References: ASTM D256 "Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics" (2010); ASTM D618 "Standard Practice for Conditioning of Plastics for Testing" (2013); ASTM D635 "Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position" (2014); ASTM D638 "Standard Test Method for Tensile Properties of Plastics" (2014); ASTM D648 "Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position" (2016); ASTM D1784 "Standard Specification for Rigid Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC) Compounds" (2011); ASTM D1598 "Standard Test Method for Time-to-Failure of Plastic Pipe under Constant Internal Pressure" (2015); ASTM D2837 "Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products" (2013); NSF Standard 61 "Drinking Water System Components – Health Effects" (2013); Uni-Bell Tech Brief "PVC Pipe Materials: Cell-Class Explained" (2014)