



PIMA | TECHNICAL BULLETIN 102

COMPRESSIVE STRENGTH

Compressive Strength is an Important Physical Property

The ability of rigid foam board to resist deformation or maintain shape when a force or load is applied is due to the physical property known as **compressive strength**. Although the force may be applied in any direction, it is most often measured in the direction of insulation thickness. The value is defined as a unit of force applied over an area. In the customary U.S. measurement system, the value would be expressed in the units of pounds per square inch (psi) or pounds per square foot (psf). In the SI system, the units would be Newton per meter squared (N/m²) or Pascal (Pa).

Measuring the Compressive Strength

The American Society for Testing and Materials (ASTM) has two methods which can be used to measure the compressive strength of polyiso foams:

- ASTM D 1621-Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- ASTM C 165-Standard Test Method for Measuring Compressive Properties of Thermal Insulations.

Both methods require the testing of multiple specimens using a precision testing machine to determine an average or mean value. The following procedure is most often used by the majority of the manufacturers of polyiso board.

From the center of randomly selected 4'x8' or 4'x4' (1220mm x 2440mm or 1220mm x 1220mm) insulation boards, a 4" (100mm) strip is cut across the width of the board at its center point; this strip is further cut into 4" (100mm) pieces. Each alternative piece is a test specimen for a total of at least five specimens. Sampling the entire width of the board ensures that the sample is representative and illustrates uniformity of the product. After preparation each specimen is compressed in the testing machine and the force required to deform the piece 10 percent in thickness or until a yield point (which ever occurs first) is recorded. The **compressive strength** for a particular product is defined as the average of at least five test results. Polyiso products are commonly available in the range of 16-25 psi (110-172 kPa).

The published values are nominal or typical values due to the variation of manufacturing processes. Most samples should be within 10 percent of the nominal value. Individual companies should be consulted for specific variations. Manufacturers test production materials to ensure continuing quality and determine values for published specifications.

Importance of Compressive Strength

Common construction applications of polyiso foams require compressive strengths adequate for durability during installation and use. Wall application requires the product to support flexible siding materials. In roofing, it must withstand limited installation traffic, support fastener loads, and sustain the total roofing system. The results of the tests provide information about the behavior of polyiso foams under compressive loads and are important to ensure proper performance.

Using Compressive Strength Values

The specific values needed must be determined by the architect, engineer, or designer of the building. The **compressive strength** value can be used to compare different products or between brands of the same type of product. Polyiso insulation boards are available in a range of compressive strengths. The ASTM Specification for Polyiso Insulations, C 1289, indicates that all polyiso products should have a minimum stated compressive strength of 16 psi (110 kPa). Actual compressive strength may vary above the minimum depending on the manufacturer.

The Polyisocyanurate Insulation Manufacturers Association (PIMA) produces technical bulletins in an effort to address frequently asked questions about polyiso insulation. PIMA's technical bulletins are published to help expand the knowledge of specifiers and contractors and to build consensus on the performance characteristics of polyiso. Individual companies should be consulted for specifics about their respective products.

The Polyisocyanurate Insulation Manufacturers Association (PIMA) is the North American trade association that advances the use of polyisocyanurate (polyiso) insulation. Polyiso is one of the nation's most widely used and cost-effective insulation products available.

PIMA's membership consists of manufacturers of polyiso insulation and suppliers to the industry. Our members account for a majority of all of the polyiso produced in North America.

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