

Technical Terms

ASTM

ASTM stands for American Society for Testing and Materials. The non-profit organization develops codes and test standards for use in industry. The plastic industry has many different test standards used such as ASTM D6109. These standards can be found on the ASTM web site at ASTM.org.

Live Load

Live load is defined as a load temporarily applied to a structure, examples include; snow load, wind load, rain, objects and people.

Dead Load

Dead load is defined as a load permanently applied to a structure.

Span

Distance between supports. This is different than Center to Center. True span is distance from inside of one support to inside of other support.

On center

Center distance between supports. Example is 16" on center joist made of 2 x 10 would be 16" from center of one board to 16" to the next board. This is different than span because span would be the distance between the edges of the boards. For the example of 2 x 10 joists 16" on center the true span would be $16" - 1.5" \text{ board width} = 14.5"$

Strain

Strain is the ratio of total deformation to the initial dimension of the material body in which the forces are being applied. This is measured at the point of most extension. For a flex test it is measured at the bottom of the board when being flexed down. For a 3% strain the board on the bottom when flexed down is 3% longer than before being flexed down.

Stress

Flexural Stress is a calculated number based on force applied, shape of beam, and span. English units are pounds / Foot².

Flex strength

Flexural strength is the amount of stress the part can handle when being flexed. Plastic lumber uses ASTM standard is D6109 to test the boards. The strength reported is at break or a maximum of 3% strain. Many plastic boards may not break before reaching the 3% strain so the value is reported at 3% strain. ASTM D6109 states reporting of Flex Strength at break or 3% strain. The



maximum 3% strain is used in plastics because they do not have a traditional Yield point like steel where it flexes and will not recover. Flex Strength can be called MOR (Modulus of rupture)

Compression Strength

Compressive strength is the amount of stress the part can handle when being compressed. Plastic lumber uses ASTM standard is D6108 to test the boards to. The strength reported is at break or a maximum of 3% strain. Many plastic boards may not break before reaching the 3% stain number. ASTM D6108 states reporting of compressive strength at break or 3% strain. The maximum 3% strain is used in plastics because they do not have a traditional Yield point like steel where it flexes and will not recover.

Modulus of Elasticity

Modulus of elasticity is the measurement of the stiffness of a product. The higher the Modulus the more force it takes to flex or compress a product the same distance. It can be reported for both Flex and Compression. It can be calculated using different points on the stress strain curve. The following is a list of some of those methods.

Secant modulus: On the Stress strain curve this is measured from the start of the curve to a specific point of the curve. ASTM D6109 for Flex and D6108 for Compression uses 1% strain at the point to calculate the Secant Modulus. 1% strain is used to provide the modulus in the most representative portion of the stress strain curve.

Tangent modulus: Tangent modulus is the slope of a line tangent to the initial linear portion of the Stress strain curve. This value is normally higher than the Secant modulus on the same test.

Cord modulus: Cord modulus is the slop of a line between two stress values on the stress strain curve. ASTM D6109 calls for the value to be from 10% to 40% of the maximum stress or 3% stress witch ever is lower.

It is important to note that the flexibility of plastic lumber increases as the temperature rises. Therefore a temperature correction factor is needed to correct the standard beam deflection formula. Normal test are reported at 74 Deg F. A table for other temperatures can be provided.

Specific Gravity

The ratio of the density to fresh water. A product that has a specific gravity grater then 1 will sink in water. A specific gravity less than 1 will float. It is sometimes has units of g/cm³ because fresh water is very close to 1.0 g/cm³. Note seawater is around 1.022.

Bulk density



A measurement of weight of a product for a specific volume. Can be supplied in different units such as English pounds / feet³ or metric of g/cm³. Example water at 50 deg F would be 62.4 pounds / Feet³ or 0.999 g/cm³

Flash point

Lowest temperature at which the material will ignite, when given an ignition source.

Spontaneous Ignition

The lowest temperature at which a substance will ignite itself without the presence of a spark or flame.

Flame spread

Flame spread value measures flame growth on the underside of a horizontal test specimen using ASTM E84. It is used to relate products to each other and provide building codes classes. Class A has a flame spread of 0-25, Class B has a flame spread of 26-75, and Class C has a flame spread of 76-200. Asbestos-cement has a value of 0 and red Oak has a value of 100.

Smoke Developed

Smoke Developed value concentration of smoke a material emits as it burns. It also it tested using ASTM E84. Value of 0 to 450 is required for building code class A, B or C. Asbestos-cement has a value of 0 and red Oak has a value of 100.

Thermal Expansion

Thermal expansion is a measurement of how a product expands and contract based on temperature change. It is measured using ASTM D 6341 using a temperature range of -30 and 140 Degrees F. As an example FIBERFORCE® plastic lumber expands and contracts along its length based on temperature. A calculation of change in length in inches (cm) can be done by using 0.000034 IN/IN/deg F (0.000061 cm/cm/deg C) multiplied by its length in inches (cm) and the temperate change of the board.

Coefficient of Friction

Coefficient of Friction is the ratio between the force necessary to move one surface horizontally over another and the pressure between the two surfaces. A value of 0.5 would mean that it takes .5 lbs of force to move an object across the surface if the object weighs 1 lbs. Note: Friction is not area dependent only weight. When reporting values test are set up with many different surfaces. A test using a rubber sole of a shoe against plastic is not going to be the same as a shoe leather against plastic. Other terms used with friction are:

Static: The ratio taken to get the object moving.

Dynamic: The ratio taken when the object is moving.

Dry: The ratio using a dry surface.

Wet: The ratio when the surface is Wet with water.



Creep

Creep is defined as, the deformation of a product, due to the weight of the board plus any load placed upon it, for an extended length of time. Recycled plastic lumber, when loaded properly within the design limits, will deform slightly at the onset and minimally thereafter. Note the creep deformation is drastically reduced in Bedford FiberForce® and BarForce® products. Also creep increases as temperature increases, refer to temperature correction factor tables.

L/360

When referring to an L/360, L/240, L/180 the reference is related to deflection calculated. The L is referring to the span and the 360 is the limit. Example would be if you have a 10' or 120" span the limit of deflection would be $120"/360 = .333"$. This limit or calculated amount can apply to Creep or Live load applications. As in the example above a calculation for L/180 would be $120"/180 = .667"$ of deflection allowed. For decking applications and other similar applications the L/360 will feel firmer when walked on than when L/180 is used. Also, you will have a more visible deflection in the boards with an L/180 verses an L/360.

Moisture absorption

Moisture absorption is the % of water absorbed over time of Bedford SelectForce lumber is 0.06% by weight Bedford plastic lumber absorbs very minimal amounts of moisture.

Shear Strength

Shear strength is the force required to cut or shear the product. Its units are lbs / Square inch. For plastic lumber there is not a good ASTM test for a true shear strength. We use ASTM D2344 that is a short beam test that provides a shear strength number.

Abrasion Resistance

Abrasion resistance is a test to determine the ability to resist wear or abrasion. The test used for plastic lumber has been ASTM D4060. This test uses a machine that will abrade or wear the surface and report how much material has been removed from the sample for a given number of cycles.

Impact resistance

The ability of the product to resist a force or shock applied over a short time period. Impact resistance is used to study toughness of a material. A test for reporting the value is ASTM D256. It uses an Izod machine that has a swinging arm trying to break a specimen that has a notch cut into it with specific geometry. The energy is calculated by the height of the arm swinging and is reported as Feet Lbs / Inch. The notch cut is used to determine notch sensitivity.

Screw pull out.

The force it takes to pull a screw out of a product. Plastic lumber manufactures use D6117. The test procedure describes a standard screw, pilot hole diameter to be used and depth for screw to



be used in the test. Then it is placed in a tester to determine the amount of force needed to pull the screw out of the sample. Other screw diameters and depths can be tested but they must be reported if not the standard screw. The value is reported in Lbs of force.

Chemical resistance.

The ability of a product to withstand exposure to liquids? The test used on Plastic lumber is ASTM D543. Values reported is percent weight gain for the absorption of the liquid. Often the results are shown with strength test such as tensile strength before and after the product has been soaked or submerged in the testing liquid. Standard time for the product to be in the test liquid is 7 days. Values can be reported for different liquids such as Gasoline, Diesel Fuel, Salt Water and others.

Stiffness.

See modulus of Elasticity.

Deflection

Deflection is the amount a beam or member moves under a load. The amount it moves is directly related to the shape and properties of the beam or member. Modulus of Elasticity is the measurement along with shape of the member that is used in calculating the amount of deflection that will occur with a specific load. A standard deflection formula for a simple beam with a load at the center would be $\text{Deflection} = (\text{Force applied} * \text{Length}^3) / (4 * \text{modules of elasticity} * \text{width of beam} * \text{Height of beam}^3)$.

Porosity

Porosity when referring to plastic lumber is the voids between the plastic. In plastic it can also be called foaming. All of Bedford Technology's plastic lumber has Porosity or foaming added for weight and shape control. The size of the porosity can vary between different products. For example a CE (continuous extruded) product can weigh less per foot than a HT (Hard Tool product). The CE product has more porosity but you can't see it because they void areas are so small. HT product tend to have larger Porosity in its core and less Porosity closer to its skin. Strength and stiffness mainly comes from the outer part of the product and because HT has less porosity in the outer surface HT can be stronger and stiffer than a CE product.

Fire Rating

Fire rating is a building code guideline for fire resistance. It is rated in different classes and those classes are determined though testing Flame spread and Smoke developed. See definitions for Flame spread and Smoke developed for more info.





BEDFORD
TECHNOLOGY
SMARTER LUMBER

2424 Armour Rd | PO Box 609
Worthington, MN 56187

800-721-9037 | 507-372-5558
Fax 507-372-5726
www.plasticboards.com

Experience the Bedford Difference

