

Insulation factors

General information

Exterior doors are often used to block the transmission of temperature from one side to the other. Energy lost through a door opening is the result of both:

- **Thermal transmission**, through the door assembly, is stated as either the U-Factor or the R-Factor. These factors are covered on this page.
- **Air infiltration**, around the perimeter of the door, is stated as air leakage in CFM. This rating is covered on Page 2 of this sheet.

Thermal tests

Doors are tested in accordance with ASTM C1363 and SDI 113. The door assembly (or door only) is subjected to heat with the amount of loss measured.

Honeycomb core doors provide insulation through the small air pockets created by the hexagonal cells. The insulation of the honeycomb core is far better than a solid core wood door, insulated glass and concrete block walls. Polystyrene and polyurethane core doors are recommended where extreme temperature variations are prevalent.

Thermal factors

The following terms are used to describe thermal transmission through building products:

- **U-Factor:** Overall co-efficient of heat transmission passage through a built-up panel section. Technically, it is heat transmission in BTU per hour per square foot per degree Fahrenheit of temperature difference from air to air for a complete panel sectional (the lower the U-factor, the better the insulation).
- **R-Factor:** Thermal resistance is a measure of ability to retard heat flow. **R** is an expression of the total resistance to heat flow through a complete panel section or construction assembly. **R** represents a value of the thermal resistance, per hour per square foot of a typical panel section. **R** is the numerical reciprocal of the **U-factor** (the higher the **R**, the higher the insulating value).
- **K-Thermal:** Conductivity (**K**) is the amount of heat that passes through a homogenous material one inch thick and one square foot in area per hour. Values of **K** are expressed in BTU per hour (the lower the **K**, the higher the insulating value). The **K** unit is for a single component material one inch thick and one square foot in area. Therefore, it does not apply to a 1-3/4" thick door panel consisting of several materials. (Conductivity is not a method of measuring heat transmission through built up panels.)

Thermal performance test results per SDI 113-01			
Door series	Core	Tests per ASTM C1363 U-Factor	Tests per ASTM C1363 R-Factor
B18 Series	Steel Stiffeners	0.50	2.01
B16 Series	Steel Stiffeners	0.53	1.89
L18 Series	Honeycomb	0.56	1.80
L18 Series	Polystyrene	0.38	2.64
L18 Series	Polyurethane	0.36	2.81
L16 Series	Honeycomb	0.57	1.74
L16 Series	Polystyrene	0.39	2.54
L16 Series	Polyurethane	0.38	2.67
CE18 Series	Polystyrene	0.41	2.44
H16 Series	Honeycomb	0.60	1.67
H16 Series	Polystyrene	0.42	2.36
A14 Series	Honeycomb	0.78	1.28

Note: Corrected to ASHRAE winter design with 15 mph wind outside, still air inside.

Historical statement

Historically, SDI 113 required thermal transmission testing in accordance with ASTM C236-89(1993) "Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box". In 2001 ASTM C236-89(1993) was withdrawn as an ASTM standard. SDI 113-01 was subsequently revised to require testing in accordance with ASTM C1363-05 "Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus". This change in test methods results in significant changes in performance values which are not comparable between the current standard ASTM C1363 and the old standard ASTM C236. Architectural specifications must be carefully reviewed for compliance with the appropriate standard.