

Tech Bulletin: Control #1005 (Rev 00)  
Title: Testing Requirements for Insulated Panels  
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Source: Laminators Inc Technical Group

### Overview

Many manufacturers produce thermally insulated panels using foam cores, polymer stabilizers, and aluminum skins that are often used as infill panels in curtain wall or window systems. This tech bulletin serves to inform the design community of the code-required testing associated with insulated panels and the requirements for reporting R-values as a measure of thermal performance per today's energy codes.

### Following the Code Path

Current building and energy codes have very specific guidelines as to how R-values are to be defined if a product is being presented to the marketplace for its ability to insulate. Although the instruction for testing R-values is well defined, the code path to get to this information is not straightforward.

Energy efficiency is covered in Chapter 13 of the 2009 International Building Code (IBC), where section 1301.1.1 specifically directs users toward the IECC stating "Buildings shall be designed and constructed in accordance with the *International Energy Conservation Code*." The 2009 International Energy Conservation Code (IECC) specifically states in chapter 5, section 501.1, that "The requirements contained in this chapter are applicable to commercial buildings, or portions of commercial buildings. These commercial buildings shall meet either the requirements of ASHRAE/IESNA Standard 90.1, *Energy Standard for Buildings Except for Low-Rise Residential Buildings*, or the requirements contained in this chapter." The same language exists in IBC 2012 and IECC 2012.

IECC does not specify insulation testing therefore the requirements of ANSI/ASHRAE/IESNA Standard 90.1 (ASHRAE 90.1) are to be followed. Per ASHRAE 90.1, section A9.3.1, "If building material R-values or thermal conductivities are determined by testing, one of the following test procedures shall be used: a. ASTM C177, b. ASTM C518, c. ASTM C1363." ASTM C1363 is used to test thermal performance of full wall assemblies; therefore, either ASTM C177 or C518 used to measure the R-value of discrete materials.

### Understanding the Upper Limits

When reviewing published R-values for various thermally insulated panels in the current marketplace, it is important that the design community understands the upper limit of what a foam core product is capable of providing. The R-value of any thermally insulated panel is directly correlated to the thickness of the foam core and any airspace provided in the stabilizers (i.e., open-core stabilizers such as a fluted core).

For example, a 1" overall thickness thermal infill panel with 4mm open-core stabilizers and 0.020" thick face and backer aluminum skins will correlate to a foam core thickness of 0.645". Assuming an expanded polystyrene (EPS) foam core with a typical R-value per inch of thickness equal to 4.0, the R-value provided by the 0.645" of foam core would be 2.58. The air inside of (2) 4mm open-core stabilizers has an equivalent R-value of 0.5, therefore the theoretical maximum R-value for any panel with this type of configuration is R-3.08 (R-2.58 + R-0.5). Any value higher than R-3.08 needs to be substantiated by testing per ASHRAE 90.1 (ASTM C177 or ASTM C518). Note that solid-core stabilizers have a lower R-value than open-core stabilizers.

Following the same logic, the theoretical maximum R-values for a 1" panel with extruded polystyrene (XPS) or polyisocyanurate (ISO) foam cores would be as follows:

- 1" XPS core w/ 4mm open-core stabilizers: R-3.72 (typical XPS foam R-value = 5.0/in of thickness)
- 1" ISO core w/ 4mm open-core stabilizers: R-4.37 (typical ISO foam R-value = 6.0/in of thickness)

#### Substantiating the Claim

It is not realistic for a manufacturer to publish an R-value higher than the theoretical maximums for a thermally insulated panel (as explained above) without providing testing to validate the claim. The design community should require ASTM C177 or C518 testing reports be provided along with any thermally insulated panels currently in the marketplace to verify any published R-values. If a manufacturer is unwilling to supply the code-required testing reports, it is a likely possibility that the testing was not performed in accordance with the requirements of ASHRAE 90.1 and therefore the panel product in question may not be code compliant.