A Fluid SOLUTION

BY PAUL NUTCHER

A new shop-applied thermal break coating gives owners an option for increasing the energy efficiency of their buildings.

THERMAL BRIDGING HAS ALWAYS EXISTED— but it hasn't always received much attention in the U.S.

But that has changed over the past few years—especially with the rise of the green building movement—and designers are increasingly addressing it.

The concept is fairly straightforward: Steel or other metal elements that penetrate a building's facade or bypass the insulated portions of the building envelope can conduct heat or cold into the building, driving up heating and cooling costs. This can also create interior condensation, especially around balconies.

Several strategies—including non-conductive pads and shims or simply letting it occur and dealing with the cost—have been implemented, but a new approach has emerged in the form of fluid-applied thermal break coatings that can reduce or eliminate heat transfer. When applied in the shop or field for new or retrofit projects without impacting the structural design, these coatings can reduce the cost per connection for the fabricator while reducing the building's environmental impact through reduced energy consumption.

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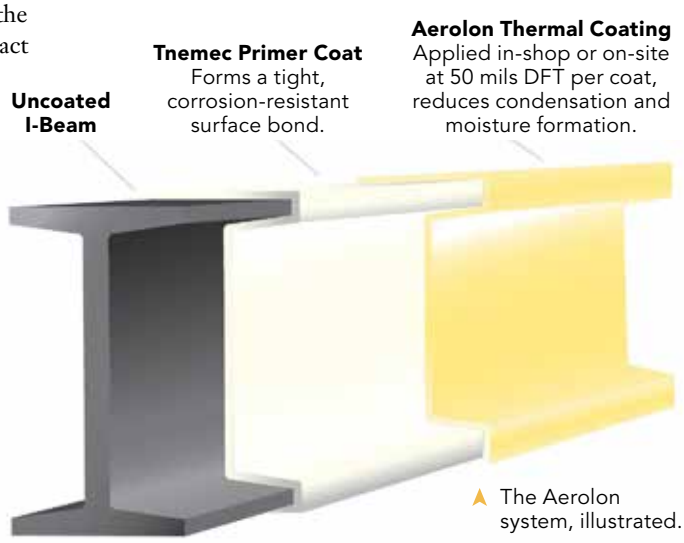
The coatings can provide thermal conductivity levels that are six to eight times more efficient than thermal break pads, as they change the surface temperature enough that moisture does not condense even without a physical break in the beam.

The Right Combination

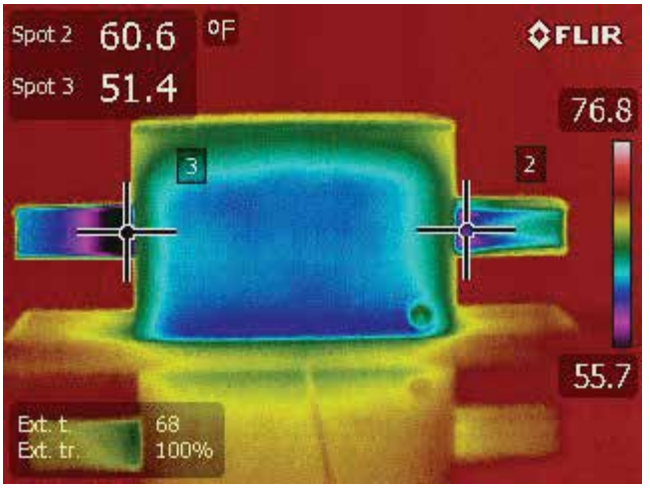
Typical insulation coatings are infused with fillers to produce a low-conductivity material that can be applied in its fluid form. The fillers can be ceramic or glass spheres, which can provide thermal conductivity in the 70 mW/mK to 100 mW/mK range. A new water-based acrylic coating from Tnemec Company, Inc.—Series 971 Aerolon—uses aerogel particles as the filler. Aerogels are solid, porous, low-density materials derived from a gel, with the liquid component being replaced with a gas. Thanks to the aerogel, Aerolon can provide thermal conductivity as low as 35 mW/mK.



The Aerolon system, illustrated.

▲ Coating on a beam that penetrates an exterior wall.

▼ An infrared image of varying temperatures in a coated assembly.



▲ Shop-application of the coating.

▼ Coated steel supporting a balcony.

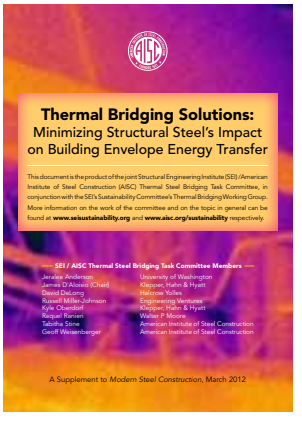
Unlike structural thermal breaks, insulated coatings do not require additional engineering and do not incur additional fabrication and installation costs beyond application. As such, the cost savings of fluid-applied thermal-break coatings compared to thermal-break pads appear to be significant, as reported by a survey of fabricators performed by coatings consultant the Righter Group, Inc. In one analysis, the installed costs for fluid-applied thermal breaks was roughly 25% of the installed costs for thermal-break pads.

Application

In order to use a fluid-applied coating, the steel must first be prepped and then primed with a high-performance coating. The degree of surface prep depends on several factors—existing steel condition, environment, surface temperature, primer chosen, etc.—but will generally meet the requirements of SSPC-SP 6 *Commercial Blast Cleaning*. If it is determined that blasting is not required, then SSPC-SP 3 *Power Tool Cleaning* is sufficient. The primers used most often will be epoxies or zinc-rich coatings, though using zinc-rich primers is not generally recommended when in-service temperatures exceed 120 °F.

The coating should cover 18 in. to 24 in. of the penetrating beams, starting at the interior side of the exterior wall, and should also be applied to the portions of the beams that pass through the wall. If it is not practical to apply the coating through the total wall thickness, then it should be applied as far inside the exterior face as possible.

As with any project, especially one where a new technology is being introduced, communication is key. And in the case of addressing the issue of thermal bridging, communication is especially crucial between the fabricator and structural engineer and the project team members charged with the energy efficiency performance and condensation control of the building. A fluid-applied, thermal insulating coating using aerogel particles can help address these issues by imparting exceptional insulation properties to a building's structural steel components—and in doing so, boost the framing system's profile in contributing to a greener, more economic and more efficient building. ■



For more on thermal bridging, see the AISC publication *Thermal Bridging Solutions: Minimizing Structural Steel's Impact on Building Envelope Energy Transfer,* the product of a joint AISC/SEI committee. Download it for free at **www.aisc.org/sustainability** under "Resources."