



## Verifying the benefits of the Crane SOLID CORE SYSTEM™ through third-party testing

### EXECUTIVE SUMMARY

The Crane SOLID CORE SYSTEM™ is an innovative, patented, solid, insulated siding system specifically designed to outperform all other exterior cladding materials.

The SOLID CORE™ concept, which creates a new category of super premium siding, was pioneered by Crane Performance Siding®. During its sixteen-year development cycle, the modified expanded polystyrene (EPS) material which comprises the Crane SOLID CORE SYSTEM has been independently tested for attributes supporting its performance in exterior wall installations. The Crane SOLID CORE backing\* has also been thoroughly and independently tested both alone and as part of a complete siding system.

This paper summarizes the findings of independent test organizations with regard to SOLID CORE's:

- "R"-value within an exterior wall system
- Water absorption and its effect on structural integrity and "R"-value
- Permeability to water vapor and its impact on the development of mold and "sick home syndrome"
- Effect of SOLID CORE on the drainage plane between the home exterior and SOLID CORE SIDING®

This comprehensive research has proven that the Crane SOLID CORE SYSTEM exceeds the highest standards and specifications set forth by ASTM International and other industry standard organizations. It has been accepted by the majority of the producer members of the Vinyl Siding Institute, and its attributes have also been confirmed in field-testing and installation in homes across the country.

The Crane SOLID CORE SYSTEM is brought to you by Crane Performance Siding.

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## **The purpose of the Crane SOLID CORE SYSTEM**

Before the utility or effectiveness of any product can be evaluated, its purpose must be fully understood. We don't evaluate a chainsaw on the same principles as a hammer or a siding material on the same principles as highway footing.

The Crane SOLID CORE backing was designed to provide enhanced insulation and support behind a maintenance-free vinyl veneer. As such, it must:

- Deliver promised "R"-value for the life of the home
- Shed rather than retain water
- Allow the wall system to breathe, therefore not contributing to mold growth or "sick home syndrome"
- Support the siding profile, therefore maintaining the appearance of premium wood siding for decades
- Resist impact from everyday mishaps and extremes of weather
- Improve the resistance of the siding to wind and water damage
- Be affordable for new home construction and remodeling
- Be easy to install

## **Measuring the "R"-value of contoured materials**

Thermal resistance (the insulating value) of a material is its resistance to heat flow. The higher the "R"-value, the greater the insulation value.

The method for determining the "R"-value of a given material or system depends on its shape.

Flat materials, such as extruded polystyrene insulation, can be tested under ASTM C177 or 518. In these tests, specimens, typically one square foot in size, are placed between two plates in a laboratory apparatus and heat flow through the material is measured. Manufacturers of these materials claim an "R"-value of 2.8 for 1/2" STYROFOAM™; 3.8 for 3/4" STYROFOAM.

Contoured materials, like Crane SOLID CORE backing and some window assemblies, are tested using the "Guarded Hot Box Test" (ASTM C236). This method tests the "R"-value of the entire wall system in real-world conditions.

An 8' x 8' base wall is constructed exactly as it would be on a home, including studs, sheathing, trim details and cedar siding, with laps and seams. The wall system is mounted in an 8' x 8' test fixture. The fixture is closed and sealed. A heat source is located on the input side of the wall and a cooling chamber is located on the output side. The cold side is brought to zero degrees Fahrenheit and a 15 mph wind is blown at the wall.

The warm side is brought to 70 degrees Fahrenheit. These temperatures are stabilized for 24 hours. The energy input is then measured by computer against the time the heat takes to pass through the wall. The process is repeated with the identical base wall covered with SOLID CORE SIDING panels.

A comparison of Crane's SOLID CORE backing, performed by Architectural Testing, Inc. (ATI), revealed that the SOLID CORE backing adds "R"-values from 2.4 to 4.0 to the base wall system. This test takes into consideration the varying thickness of the foam and provides an average accepted by both government agencies and the insulation industry. Because this method most closely resembles real-world conditions, it is the most accurate test for determining "R"-value of the wall system.

**Determining the effect of wet conditions on the insulation value of SOLID CORE**

Expanded polystyrene is well accepted for a variety of applications where it contains or is immersed in liquid for extended periods of time. Think of picnic coolers, boat bumpers and coffee cups. This benefit extends to the SOLID CORE SYSTEM.

ATI tested five samples of Crane’s SOLID CORE backing in accordance with ASTM C272. Each sample was weighed and immersed in water at 74 degrees Fahrenheit for 24 hours. After removal from the water, each sample was weighed again. This test subjects SOLID CORE to conditions far more extreme than would occur naturally. (Can you imagine a situation where your home would be immersed in water for 24 hours?)

Results of this test showed that the average percent absorption by volume was only 2.75%. This minute amount of water does not affect the structural integrity or “R”-value of SOLID CORE. Because very little water is absorbed, freeze/thaw cycles do not affect the integrity of the material, or its “R”-value.

**The importance of “breathability”**

The average family of four produces six gallons of water vapor a day in their home. If this vapor does not escape, it can condense on and between wall studs, causing structural and health-related problems. Damp dry wall and lumber provide a perfect growth medium for molds, fungi and bacteria that can promote respiratory illnesses. To say nothing of the mushroom-like odor they emit.

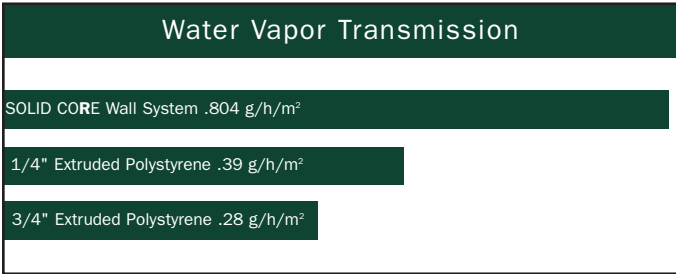
Industry experts agree that sealing up a home like a Tupperware® container to reduce energy usage can contribute to mold growth and “sick home syndrome.” New building science recommends that no vapor barrier be installed on either the inside or the outside of a wall.

In order to ensure that Crane’s SOLID CORE backing does not create a vapor barrier or contribute to these problems, we asked RADCO, an independent testing laboratory, to determine the permeability (perm rating) of Crane’s SOLID CORE backing and compare it to that of extruded flat stock products.

A material with a vapor-transmission rate of one perm or less is considered a vapor barrier; two or less is a vapor retarder. The higher the perm rating, the more vapor is allowed to escape.

Architectural Testing, Inc. (ATI) was contracted to conduct comparison testing for moisture absorption of a SOLID CORE composite wall system versus hollow backed vinyl siding after being subjected to specified and accurately controlled environmental conditions.

After collecting the data and reviewing the results, it is the opinion of ATI that the use of Crane Performance Siding’s SOLID CORE SYSTEM has no negative effect on the performance of the wall panels in relationship to moisture absorption.



*Although the SOLID CORE SYSTEM absorbs very little water, it does permit water vapor to exit the home. With a perm rating of 5.0 perms per inch, it is not a vapor barrier and will not trap harmful water vapor in the wall. SOLID CORE significantly enhances the insulation value of the wall system without contributing to mold growth or “sick home syndrome.”*

## Maintaining a drainage plane

An adequate drainage plane between home sheathing material and the siding is important in keeping the walls of the home from absorbing and retaining moisture. SOLID CORE SIDING maintains this drainage plane and allows less water to penetrate the siding envelope, protecting the sheathing material from absorbing and retaining moisture.

This benefit has been demonstrated by a wind-driven rain test performed by ATI. ATI exposed a Dutchlap vinyl wall panel without backing and an identical Dutchlap SOLID CORE panel to one hour of wind driven rain at a velocity of 25 mph at a water application rate comparable to 8 inches of rainfall per hour.

The siding material was attached to Oriented Strand Board (OSB), a typical home sheathing material. The dimensions of the test frame measured 48" wide by 96" high. They were constructed of 2" x 4" lumber and one seamless sheet of one-half-inch-thick OSB sheathing. The amount of water absorbed by the OSB was measured.

Without SOLID CORE, the wall system had retained 15.0 ounces of water 30 minutes after the "rain" stopped. It retained 4.5 ounces after an hour. Within 24 hours, all the moisture had evaporated. The identical wall sided with Dutchlap SOLID CORE SIDING had retained just 5.3 ounces of water 30 minutes after exposure, 0.3 ounces after 1 hour. Within 24 hours, all moisture had evaporated from the wall panel. **The presence of the SOLID CORE backing behind the vinyl actually inhibits the retention of moisture by the wall system.**

## Additional benefits

In addition to these benefits, SOLID CORE offers:

- Superior impact resistance. Independent tests prove that the Crane SOLID CORE SYSTEM stands up to 300% more impact than typical vinyl siding.
- Protection against hurricane-force winds. SOLID CORE reduces the likelihood that high winds can peel siding off the wall.
- Long-term good looks. SOLID CORE SIDING looks and feels like premium wood siding for decades.
- Resistance to termites and carpenter ants. PerformGuard®, a patented material added to the SOLID CORE backing during the manufacturing process, deters insects from nesting in the foam insulation.
- SOLID CORE SIDING installs just like vinyl siding, yet it's stiffer and easier to handle.
- The cost of SOLID CORE backing is highly competitive with STYROFOAM and other materials.

## CONCLUSION

The Crane SOLID CORE SYSTEM is an ideal insulating and support material for vinyl cladding veneers. For detailed descriptions of the independent testing procedures, call our toll-free number 1-800-366-8472.

\* Quality core backing supplied by PROGRESSIVE FOAM TECHNOLOGIES, INC.



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