WIND & SEISMIC FORCES

APPLICABLE TO THERMALSTAR STRUCTURAL WALL INSULATION (SWI)

Wind and seismic events impose forces that must be accounted for when designing the structural elements of a building. The requirement for lumber to resist vertical loads from the roof and floors down to a foundation is one of the obvious structural elements. Likewise, OSB or plywood sheathing to resist snow and other dead loads on roofs is easily understandable. However, the design of walls is often not fully understood. Walls must be designed to resist not only vertical loads, but also the racking of a building against wind or seismic events, as shown in Figures 1 and 2. The vertical lumber elements of walls alone have little racking resistance.

FIGURE 1

Walls must be strong enough to resist the wind forces that push against the structure.

FIGURE 2

In an earthquake, the seismic ground motion acts on the foundation, while inertia attempts to keep the roof from moving with the foundation, exerting lateral forces on the walls.

The structural element used to resist the racking of a building is called wall bracing. Wall bracing consists of adding a structural sheathing over the framed wall. Wall bracing can be a complex subject and is described in great detail within the International Building Code (IBC) and the International Residential Code (IRC). In fact, there are 16 different bracing methods described in the IRC. Wall bracing often consists of OSB or plywood but structural fiberboard sheathing, gypsum board, particle board sheathing, Portland cement plaster, and hardboard siding are all recognized bracing methods. In addition, there are a number of engineered products which are available as alternative bracing products.

Atlas Molded Products has developed ThermalStar® Structural Wall Insulation (SWI) to provide a next generation wall bracing composite product that provides the benefits of wall bracing, continuous insulation, air barrier, and weather resistive barrier all in a single product.

- The bracing component of ThermalStar SWI consists of a proprietary wall fibrous sheathing board. The sheathing board is a high density fibrous product which has advanced performance when compared to other sheathing products recognized in the IBC and IRC.
- The insulation component of ThermalStar SWI consists of graphite enhanced ThermalStar® molded polystyrene insulation. ThermalStar GPS rigid insulation provides unmatched quality, with a stable long term R-value that will last the lifetime of your structure.
- ThermalStar SWI has an integrated film facer, which serves as a code compliant water resistive barrier (WRB) when properly flashed and taped.

ThermalStar SWI has been thoroughly tested by accredited laboratories to evaluate performance to the following industry standards:

- Lateral wall testing in accordance with ASTM E564.
- Transverse wind pressure resistance testing in accordance with ASTM E330.
- Insulation physical property testing in accordance with ASTM C578.
- Water resistive barrier testing in accordance with ASTM E331.
- Water vapor transmission testing in accordance with ASTM E96.
- Air barrier testing in accordance with ASTM E2178.
- Surface burning characteristics testing in accordance with ASTM E84.

The compliance of ThermalStar SWI to the IBC and IRC can be determined by an evaluation of the complete collection of test results compared to IBC and IRC requirements. The IBC and IRC specifically provides a path for the approval of ThermalStar SWI as an alternative material where a building official has the authority to require tests as evidence of compliance. The review of all the ThermalStar SWI test reports would be burdensome to a building official, but fortunately there are agencies that review test results and provide evaluation reports. It is important that evaluation reports are from an agency that is accredited to ISO/IEC 17065, "Conformity assessment – Requirements for bodies certifying products, processes and services." Examples of ISO/IEC 17065 accredited agencies include Dr J Engineering, IAPMO ES, ICC-ES, Intertek, and UL.

ThermalStar SWI has been evaluated by Dr J Engineering and the results of their evaluation are published in evaluation report TER 1905-02. The use and installation of ThermalStar SWI as a wall bracing product in compliance with the IBC and IRC is described in great detail within TER 1905-02. Key requirements for compliance of ThermalStar SWI with TER 1905-02 include specified fasteners and fastening pattern, panel blocking, interior gypsum fastening, stud spacing, exposure category, seismic design category, and wind speed. TER 1905-02 includes numerous simplified tables for use of ThermalStar SWI in compliance with the IBC and IRC and only to be used by a registered design professional (RDP).

Table 1: Simplified Bracing – Foam In Orientation

Table 2: Simplified Bracing – Foam Out Orientation

Tables 3/4: Wind Bracing Requirements – Foam In Orientation

Table 5: Wind Bracing Requirements – Foam Out Orientation

Numerous tables are also available for Portal Frame with Hold Downs (PFH), braced wall line equivalency factor, allowable stress design (ASD) for wind, transverse wind resistance, and various ThermalStar SWI properties.

ThermalStar SWI must be installed in accordance with the detailed requirements of TER 1905-02 to obtain the benefits of wall bracing, continuous insulation, air barrier, and weather resistive barrier all in a single product.

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