Photo courtesy Green Bay Packers. Photo© Steve Ryan.

by Deniz Carroll

EPS Scores Big for Wall Project

Wisconsin's Lambeau Field is home to the Green Bay Packers and carries the distinction of being the National Football League's (NFL's) longest continuously occupied stadium. With a staunch fan base, the facility has been sold out on a season-ticket basis since 1960. In 2002, a major two-year expansion and remodeling project was undertaken to expand the bowl stadium by 11,711 seats. For a variety of reasons, expanded polystyrene (EPS) rigid foam insulation was chosen as the primary insulation for the interior side of the exterior walls.

The EPS sheathing was specially designed with galvanized steel furring strips embedded directly into the foam insulation with a polymeric laminate applied to each panel face. H.J. Martin, the lead contractor in charge of gypsum wallboard on the Lambeau project, selected EPS over the original product specification that called for a traditional three-step, on-site process of Z-furring, standard insulation panel installation and vapor barrier application.

"We were looking for something faster than the typical Z-furring process," said Joel Johnson, project manager on the Lambeau project. "You also eliminate the extra step of having to add a vapor barrier, and you end up with a better R-value than you'd get with the standard process. I bet we saved 35 percent of our usual installation time."[1]

It is estimated this design provides an overall project cost savings of approximately 20 percent and it delivers increased thermal performance because the embedded metal furrings never make contact with the masonry, virtually eliminating the thermal bridging usually experienced by traditional systems. Independent studies have shown EPS sheathing outperforms competitive insulation systems by as much as 14 percent, partly due to its stable R-value.[2] The polymeric laminate provides a vapor perm rating of 0.07.

Sheathing is one of the most basic and widely used applications for rigid insulation in residential and commercial construction. It helps create an envelope around the structure, covering wall cavities and studs to increase resistance to heat transfer and moisture penetration. Even though rigid foam insulation was introduced into the construction market back in the 1950s, it was not used as sheathing with any prevalence until the energy crisis of the 1970s.

EPS sheathing is non-structural and is used as both an exterior and interior insulator, below and above grade, although it can be employed throughout the structure in roof, floors, and ceilings. Manufacturers can also provide the builder with insulation that varies in density, possibly translating into a structure that meets—or exceeds—energy code standards without the added expense of increased stud width. When higher R-value is required, EPS can be fabricated to a higher density, rather than adding layers and layers of more rigid insulation materials.

Photos courtesy Plymouth Foam

Thanks to the ease of its installation, EPS sheathing fulfilled the specifications for the Lambeau project on time. As a mainstay product in building and construction applications, expanded polystyrene manufacturers provide a variety of sheathing products to satisfy many building requirements.

Expanded polystyrene sheathing is compatible with framing made of traditional materials, along with masonry applications. The boards are installed vertically over the exterior sides of the studs, with the vapor retarder facing the heated side of the structure. EPS sheathing can be fastened with nails, screws, and/or staples, depending upon the framing surface. For example, spot adhesive is the norm for masonry substrates. However, it is important to note some adhesives contain petroleum-based solvents that will dissolve EPS on contact.

The joints of EPS sheathing should be close and flush. Seams are taped for added tightness and corner braces are installed to increase structural stability. In some cases, air-barrier house-wrap may not be needed when the sheathing is properly installed and seam tape is used. A variety of sidings and finishes are easily affixed through the exterior sheathing to create the possibility of an aesthetically pleasing building.

EPS insulated sheathing board is manufactured with an array of facers. Aluminum foil, polyethylene, and kraft paper are all used to enhance performance properties and protect it from rough handling and ultraviolet (UV) degradation. EPS manufacturers use reflective aluminum foil to increase the resistance of radiant heat absorption. When a radiant barrier is combined with dead air space, it can actually add to the wall assembly's insulation value.

Various EPS sheathing products are available depending on the intended application. One of the primary functions of sheathing is to help control moisture by acting as a vapor retarder. A perforated foil can increase breathability when used above-grade, thus assisting in the avoidance of any type of condensation build-up between the structure's interior and exterior.

In addition to acting as a vapor retarder, polyethylene facers improve the surface adhesion of the board for taping and adhesives. The tape used to seal the seams of the foam adheres better to the polyethylene-faced board rather than unfaced products. Kraft paper is bonded between the facer and foam sheathing, increasing its strength and durability to provide additional protection during transportation and handling.

EPS has been used successfully for many years in areas where moisture is a concern, specifically below-grade. There had been some concern moisture would permeate voids existing between the foam insulation and the wall cavity, causing damage. However, this theory was conclusively rejected after results were released from a study conducted by the National Research Council Canada (NRC).[3] Below-grade EPS insulation performed consistently throughout the two-year study without signs of water damage to the structure or the EPS insulation.

Notes

[1] As insulation formulation may vary from manufacturer to manufacturer, design professionals should consult the suppliers' specification sheets to understand the exact properties over time, including the actual R-values. Factors affecting the R-value include thickness of application (*i.e.* the thicker the foam, the better the R-value), the substrate, and the covering systems used (*i.e.* the lower the perm-rated covering and substrate, the higher the R-value).

[2] See the 2000 Construction Technologies Laboratories report, *Thermal Resistance Comparison of Gold-wall Versus Comparable Z-Furring Systems,* by John Gajda (see footnote 1).

[3] See the 1999 NRC report, *In-situ Performance Evaluation of Exterior Insulation Basement Systems (EIBS)—EPS Specimens*, by N. Normandin et al.

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