



Not quite measuring up

Polyisocyanurate insulation thicknesses seem to vary

by Mark S. Graham

NRCA has received a limited number of reports of faced, rigid board polyisocyanurate insulation with thicknesses less than what was specified and indicated on the insulation's package labeling being delivered from manufacturers to distributors and job sites. Following is information about these reports, as well as information about recognized allowable thickness tolerances and NRCA's recommendations to roofing contractors for monitoring this situation.

Reports

NRCA has received reports of new, uninstalled polyisocyanurate insulation being received directly from polyisocyanurate insulation manufacturers with thicknesses notably less than nominal dimensions. Reports have been received from the East Coast to the Rocky Mountains and as far north as Wisconsin and south to Texas.

Reports have been received about various specified nominal thicknesses of polyisocyanurate insulation; however, the problems appear to be more common with thicker polyisocyanurate insulation products than thinner ones. For example, NRCA has received multiple reports of 3½-inch nominal thickness polyisocyanurate insulation measuring



less than 3¼ inches thick at board edges.

Although most reports relate specifically to one polyisocyanurate insulation manufacturer and have been traced to multiple manufacturing plants from that manufacturer, the problems are not unique to that manufacturer.

Allowable tolerances

When assessing nominal length, width and thickness dimensions of polyisocyanurate insulation, it is important to realize reasonable manufacturing tolerances apply.

The U.S. product standard for polyisocyanurate insulation is ASTM C1289,

“Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.” ASTM C1289, Types I and II are referenced in the *International Building Code*® as minimum requirements for polyisocyanurate insulation used in roof systems.

ASTM C1289’s Section 8—Dimensions provides specific dimensional tolerance criteria, namely length and width tolerances shall not exceed ±¼ of an inch, thickness tolerance shall not exceed ⅛ of an inch and the thickness of any two boards shall not differ more than ⅛ of an inch.

ASTM C303, “Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation,” provides the specific procedure for board measurement. For measuring a board’s thickness,

ASTM C303 prescribes measurements be made not along the board’s edges but about 1 to 3 inches in from the board’s corners. Two additional thickness measurements shall be taken near the center of the long dimension direction of the board between the corner measurement locations.

Also, boards shall not depart from absolute flatness by more than ⅛ of an inch per foot of length and width. Boards shall have no crushed or depressed areas on any surface exceeding ⅛ of an inch in depth on more than 10 percent of the board’s total surface area.

Discussion

Similar to there being recognized, reasonable tolerances for the application of roofing products and roof systems, NRCA recognizes the necessity for reasonable tolerances, including minimal thickness tolerances, in the manufacture of roofing products, including polyisocyanurate insulation.

Some minimal thickness variability is inherent in polyisocyanurate insulation’s manufacturing process. In the U.S., faced, rigid board polyisocyanurate insulation typically is manufactured using a restrained rise process where the board’s top and bottom surfaces (facer sheets) are set at established distances (thicknesses) in a laminator within the manufacturing line. Once the board leaves the laminator and during its curing, the board may slightly grow (rise) in thickness as a result of the chemical reaction of the product’s raw materials and heat generated during manufacturing. Manufacturers may account for this additional rise by setting the thickness in the laminator slightly less than the board’s desired nominal thickness.

Also, it generally is recognized the center of a polyisocyanurate insulation board may be slightly thicker than its manufactured edges because of this rise. Some in the industry also theorize manufacturers’ weatherproof packaging, which is applied at the end of the manufacturing line but before the product fully cures, may restrict additional rise during curing, resulting in board edges being slightly thinner than a board’s center.

When considering polyisocyanurate insulation’s allowable thickness tolerances and the reports of thicknesses being less than specified, it is important to realize thickness variations can affect overall roof system performance. For example, if insulation boards’ thicknesses are not as nominally specified, insulation thickness likely will not match established thicknesses of perimeter wood blocking and nailers, resulting in uneven surfaces to which to adhere roof membranes. This particularly is a concern when using multiple insulation layers.

Also, some of polyisocyanurate insulation’s physical properties are affected by board thickness. Polyisocyanurate insulation’s R-value, for example, is thickness-sensitive. Assuming an R-value (or LTTR value) of 5.6 per inch thickness of polyisocyanurate insulation, a board’s thickness being ⅛ of an inch less than nominal can result in a reduction in the board’s R-value of about 0.7.

Moving forward

NRCA has met with polyisocyanurate insulation manufacturers identified in the reports. The meetings have been constructive, and the manufacturers have committed to making the changes necessary to properly address this situation.

In the meantime, NRCA suggests distributors and roofing contractors measure polyisocyanurate insulation board edge thicknesses upon delivery, preferably while the insulation still is on the truck. If the measured thicknesses are less (or more) than the specified and labeled thickness, taking into consideration applicable tolerances, you should contact the manufacturer or distributor immediately. You also can contact NRCA’s Technical Services Section at (800) 323-9545 to report the situation and the manufacturer’s or distributor’s response. 🌱🌱

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