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NRCA has received a significant number of reports of problems associated with the use of polyisocyanurate roof insulation, although it is important to note that the vast majority of roof assemblies that include polyisocyanurate insulation have performed successfully. However, the reported problems often involve large roof areas, where remedies can be quite expensive. The majority of the reported problems have occurred in low-slope membrane roof assemblies where a cover board layer of insulation was not included in the design.

According to the Polyisocyanurate Insulation Manufacturers Association (PIMA), more than 4.5 billion board feet of polyisocyanurate foam insulation were produced in the United States in 1999. A reasonable estimate is that at least 2.5 billion board feet were installed in low-slope membrane roof assemblies, which represents, according to NRCA market survey data, about 55 percent of the market for insulation used in low-slope membrane roof systems.

Polyisocyanurate roof insulation can exhibit problems in several different ways. These include:

- Facer-sheet delamination
- Edge cavitation
- Cupping or bowing
- Shrinkage
- Crushing or powdering

These characteristics are discussed more fully in an attachment to this bulletin.

NRCA has previously recommended the use of cover boards over polyisocyanurate insulation where hot-applied bituminous membranes are installed. This recommendation is included in *The NRCA Roofing and Waterproofing Manual, Fourth Edition*, and was the subject of NRCA Technical Bulletin 9, "NRCA Statement on Polyisocyanurate, Polyurethane and Phenolic Foam Roof Insulations," dated September 1988. NRCA is now expanding its recommendation for the use of cover boards to include all other low-slope membrane roof assemblies, including thermoset and thermoplastic single-ply roof assemblies in ballasted, mechanically attached and fully adhered configurations.

In addition, NRCA has separately reported (in a report issued May 24, 1999) concerns with the U.S. material standard for polyisocyanurate roof insulation, ASTM C 1289, "Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board." For example, the standard does not establish a requirement for curing time prior to shipment, and NRCA believes that improperly cured polyisocyanurate insulation is more prone to experience problems. Similarly, NRCA has recommended changes in the standard's values for compressive strength, dimensional stability and R-value determination.

NRCA has had a number of discussions with polyisocyanurate insulation manufacturers and PIMA addressing these issues. NRCA has also been actively working to improve ASTM C 1289, and intends to continue to do so, by working, where appropriate, in cooperation with individual polyisocyanurate insulation manufacturers and with PIMA.

Given NRCA's concerns with shortcomings in ASTM C 1289 and reported problems experienced in the field, NRCA recommends that designers specify a suitable cover board over polyisocyanurate insulation in all low-slope membrane roof systems. The use of a cover board should help to reduce problems whether directly related to the manufacturing process or due to other causes.

Further, polyisocyanurate roof insulation is often specified because of its fire-resistance properties. There are occasions, however, when the use of a cover board may be required to achieve a fire-resistance classification for a roof assembly, and the use of certain types of cover boards can generally improve the fire-resistance properties of roof assemblies that include polyisocyanurate insulation.

Insulation cover boards should be a minimum 1/2" (13 mm) thick and be composed of any of the following:

- glass-faced siliconized gypsum board
- perlite board
- wood-fiber board
- glass-fiber board
- mineral-fiber board

When selecting a specific suitable cover board, designers should consider the characteristics of the specific roof assembly, and take into account the cover board's compatibility with the assembly.

Using a suitable cover board over polyisocyanurate insulation in low-slope membrane roof assemblies provides the following attributes:

- It separates the membrane from the polyisocyanurate insulation, reducing the possible effects of facer-sheet delamination, edge cavitation, cupping or bowing, shrinkage and crushing or powdering of the polyisocyanurate insulation.
- It allows for installation of the insulation board layers with staggered board joints, a practice known to reduce stresses on the membrane and improve a roof assembly's overall thermal performance.
- It may be required to achieve a fire-resistance classification for a roof assembly.