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Role of high-density polyiso cover boards in low-slope roofs
High-density Polyiso COVER BOARDS

Enhancing the durability of low-slope roofs

By Justin Koscher

When planning for a roof on a new building or reroofing an existing structure, finding the right products to balance cost and performance is a tall order. Whether it is replacement on an older building or new construction, the right roof system can reduce installation costs and improve building performance.

Many architects, specifiers, and contractors include cover boards in conventional low-slope roof assemblies (with a roof membrane as the outermost component) to enhance overall system durability and lower long-term maintenance costs. A cover board is a thin substrate to which a roof membrane is secured. It can help extend the life of a roof assembly by providing a tough, resilient layer for improved wind uplift resistance, increased impact resistance from construction/service traffic, and high compressive strength.

In a conventional roof system, the cover board is installed on top of insulation (below the membrane). Many product types are available, ranging from traditional gypsum board, cement board, perlite board, asphalt/glass board, glass-based board, mineral wool, oriented strand board (OSB), polyurethane-based board, and wood fibre board to highly engineered, high-density (HD) polyisocyanurate (polyiso) cover boards.

Specifying polyiso cover boards

All HD polyiso cover boards are developed and tested to be part of a roofing system. Most HD polyiso cover boards are compatible with mechanically attached and fully adhered single-ply roof systems (e.g. thermoplastic polyolefin [TPO] or ethylene propylene diene monomer [EPDM]) and cold-applied modified bitumen (mod-bit) and built-up roof (BUR) applications.

When specifying cover boards, several factors should be considered, including roof-covering type and installation method, project/building location (which may govern wind uplift requirements), as well as anticipated service conditions (i.e. traffic or additional rooftop equipment such as photovoltaic [PV] panels). The designer, specifier, or contractor is encouraged to consult roof system manufacturers for guidance and assistance in specifying the system that best meets the needs of the project, design team, and/or building owner.

In Canada, HD polyiso cover boards may be designated as Type 4, 5, or 6 (depending on physical properties, including compressive, tensile, and flexural strength) in accordance with the Underwriters Laboratories of Canada (CAN/ULC) S704.1:2017, Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced. Type 4, 5, and 6 products have significantly higher requirements for
physical properties as indicated in Figure 1 (page 48). Type 1, 2, and 3 products are typically designated for roof insulation (installed above the roof deck and below the cover board).

The use of cover boards, although not required by the National Building Code (NBC), is a best building science practice as it offers added resiliency and durability to the roof system. An ongoing research consortium at the National Research Council Canada (NRC) is focusing on evaluating the available cover board product types. The outcome of this research will pave the way for developing a Canadian standard for cover board products.

**Benefits of HD polyiso cover boards**

High-density polyiso cover boards are increasingly being used as they offer many benefits.

**Lightweight**

HD polyiso cover boards, on average, weigh 66 to 80 per cent less than gypsum and cement products with the same thickness.

Individual boards are light enough to be carried by a single worker, thereby reducing manpower requirements.

**Water resistance**

The water absorption by volume of HD polyiso cover boards is about four per cent, lower than traditional options such as gypsum cover boards. Polyiso boards do not rot or dissolve and can maintain their integrity under adverse weather conditions.

**Fewer truckloads**

HD polyiso cover boards can be shipped with about three times more square foot per truckload requiring fewer trucks/hauls, leading to fuel and transportation savings as well as reduced traffic congestion on jobsites.

**Reduced product staging time**

These cover boards require less crane time with lower hoisting, loading, and staging costs. They are easier to carry and move around the roof. Pallets do not require breaking or redistribution as needed with the heavier cover board product types.
The design team for dairy co-operative Agropur's headquarters in Longueuil, Qué., employed high-density (HD) polyiso cover boards to ensure the roof assembly is not damaged by heavy equipment or workers.

### Table: Physical Property Requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
<th>Type 5</th>
<th>Type 6</th>
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<tr>
<td>Compressive Strength, min., kPa</td>
<td>110</td>
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<td>550</td>
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<tr>
<td>Tensile Strength, min., kPa</td>
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<td>35</td>
<td>35</td>
<td>95</td>
<td>95</td>
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</tr>
</tbody>
</table>

According to the Underwriters Laboratories of Canada (CUL) 5704.1:2017, Thermal Insulation, Polyurethane and Polysiocyanurate, Boards, Faced, HD polyiso cover boards are categorized into different types.

**Dust free**

HD polyiso cover boards are made of the same polyisocyanurate found in many insulation products and do not generate the dust produced by gypsum or cement products during cutting. The use of HD polyiso cover boards decreases jobsite dust and debris as well as potential for seam contamination during installation of the roof covering. Less mess equals better productivity for installers while the absence of silica particles in the air enhances worker safety.

**Mould**

These cover boards resist mould growth when tested in accordance with industry standards such as ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

**Resiliency**

Higher compressive strength and flexibility in HD polyiso cover boards with coated glass mat facers (CGF) improve a roof’s resistance to wind uplift and imparts greater resistance to impact from hail, as well as various construction and service activities (i.e. damage from foot traffic, heavily loaded carts, and construction tools).

**Versatility**

High-density polyiso cover boards can be used in new construction, reroofing, and recovery applications. They are suitable in mechanically attached, adhered, and ballasted roof assemblies. HD polyiso cover boards are manufactured using the same process as polyiso board insulation. However, cover boards are produced to have a higher density, thus, higher physical properties such as compressive, flexural, and tensile strength. The product is typically produced in 13-mm (1/2-in.) thick boards using a continuous manufacturing process. The final product can then be cut and delivered to the jobsite in either 1.2 x 1.2 m (4 x 4 ft) or 1.2 x 2.4 m (4 x 8 ft) board sizes.

**Ease of cutting**

Unlike gypsum or cement cover boards that require heavy-duty saws or cutters to resize, HD polyiso product types can be easily scored and cut using a utility knife. A single worker can measure and cut boards to size, increasing the roofing team’s overall productivity.

**Greater resistance to heat flow**

Certain cover board products can enhance building energy efficiency by increasing the overall performance of roof assemblies. For example, HD polyiso cover boards contribute additional thermal resistance to the roof assembly and can provide as much as five times greater R-value than gypsum-based products of the same thickness. A 13-mm (1/2-in.) HD polyiso cover board typically has an RSI value of 0.44 (2.5 R-value), whereas the RSI value of a gypsum cover board with the same thickness is about 0.11 and a cement cover board has an RSI value of about 0.07.

**Additional considerations when selecting a cover board**

Prior to installation, roofing contractors should protect HD polyiso cover boards from exposure to moisture and keep them safe from other hazards like open flames. The product is typically delivered to the jobsite in manufacturer wrapped bundles. Like all roofing materials stored on the jobsite or roof, care should be taken to ensure cover boards are properly protected and stored to prevent materials from blowing...
off the roof. For additional information on recommended storage and handling procedures, it is advisable to consult the Polyisocyanurate Insulation Manufacturers Association’s (PIMAs) Technical Bulletin 109, Storage and Handling Recommendations for Polyiso Roof Insulation. Additionally, it is best to install the quantity of roofing material (insulation and cover board) that can be covered the same day by a roof-covering material. HD cover boards are tested to meet the applicable product and roof assembly standards for fire performance. For information on evaluated assemblies including HD cover boards, interested parties are encouraged to review the third-party roof assembly listings from accredited testing agencies such as Underwriters Laboratory (UL) and Factory Mutual (FM).

Finally, like polyiso insulation products, HD cover boards are manufactured using a blowing agent with low global warming and zero ozone depleting potential. Products sold with a thermal resistance value (R-value) should be tested in accordance with industry standards. R-values for closed-cell foam products are reported as aged-values to reflect the loss of any blowing agent.

Case study
In 2016, the dairy co-operative Agropur opened its new, two-storey office building in Longueuil, Qué., that earned a Leadership in Energy and Environmental Design (LEED) certification from the Canada Green Building Council (CaGBC) in 2017. The project allowed Agropur to consolidate four existing offices into a single, unified 23,226-m² (250,000-sf) campus in a heavily wooded environment. The new campus is adjacent to its existing distribution centre and quality assurance (QA) labs.

The campus offers a state-of-the-art office environment, underground parking for 700 cars, as well as amenity areas, such as a cafeteria, gymnasiums, and relaxation and conference rooms. The building was designed in a series of narrow wings, with many windows to allow natural light and continuous views of the surrounding forest.

The building was designed by Le Groupe Architex, and the roof was installed by Truchon Roofing. Since the exterior of Agropur’s building is glass, regular window washing is a must. The roof needed solid bases to protect it from the heavy equipment and accompanying workers who would launch from the roof.

The architect chose HD polyiso cover boards to ensure the roof materials installed below the board are not damaged by additional loads. Unlike other types of cover board, HD polyiso offers the added thermal resistance, which contributes to improved energy efficiency.

Commercial low-slope roof systems are expected to perform during the service life of a building, so understanding and utilizing products to help enhance the roof’s performance and longevity is advisable when planning for one. Selecting products offering performance benefits as well as ease of installation is a win for both the contractor and building owner. With proper installation, HD polyiso cover boards provide versatile and resilient low-slope roof system solutions. Whether it is exposed to severe weather or maintenance personnel servicing rooftop equipment, a long-lasting roof system means satisfied building owners.

Note
1 For more information, visit www.buildgp.com/product/densdeck-prime.

Justin Koscher is president of the Polyisocyanurate Insulation Manufacturers Association (PIMA). Prior to joining PIMA, Koscher was the director of polyurethanes markets at the American Chemistry Council’s (ACC’s) Center for the Polyurethanes Industry (CPI) for three years, and spent four years as vice-president of public policy and staff counsel for the Center for Environmental Innovation in Roofing. He also holds a law degree from DePaul University College of Law in Chicago, Ill. Koscher can be reached at koscher@pima.org.