

TECH TALK *from* Georgia-Pacific Gypsum

Technical Insight from the Roof Board Experts

Durability: How Cover Boards Contribute

The proper choice of a cover board can help resist the forces that threaten roof-system durability. Here's how.

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A roof is a big investment—and it protects an even bigger investment in the building and its contents. That's why durability in any roofing system translates directly into lower total cost of ownership. Durability is more than just toughness. It's also the ability to protect contents and occupants from fire, water and noise.

Several forces challenge roof-system durability:

- Fire
- Water intrusion and mold growth
- Sound intrusion
- Wind uplift
- Impact from hail and foot traffic

Properly chosen cover boards can help reduce the effects of all these forces.

Fire resistance is the sum of the components

Fire resistance in a roofing system comes from all roof components working together—and the choice of cover board can either enhance or detract from fire resistance. Where the decking, insulation or membrane is combustible, a non-combustible cover board can contribute to a lower-risk fire rating.

Lower-risk fire ratings can both ensure code compliance, and help reduce insurance premiums. For example, roofing systems that qualify for a Class 1 rating from Factory Mutual Research (FM) will qualify for the lowest insurance rates from FM affiliated insurance companies. A UL Class A rating (for external fire exposure) can also help qualify for lower premiums. Those lower premiums are a direct payback for enhanced fire durability.

(For more details on fire ratings of roof assemblies with cover boards, refer to the January, 2002 TechTalk.)

Wind uplift is a durability factor

In extreme wind situations, wind-generated forces trying to lift the roofing off a building can be hundreds of pounds per square foot (psf). For even moderate wind conditions, roofing systems must withstand at least 60 psf before failure, and 90 psf ratings are becoming a default in many applications that use Construction Specifications Institute (CSI) or American Institute of Architecture (AIA) master specifications. As with fire ratings, higher wind-uplift ratings may qualify for lower insurance premiums, and cover boards can contribute to wind-uplift durability. Here's how:

Where the membrane is held down by a continuous coating of adhesive, wind performance relies on the strength of the substrate. If the membrane is bonded directly to a fragile, low-density insulation layer, uplift forces can literally pull the insulation apart. A cover board with good tensile strength, installed between the membrane and the insulation, can prevent this. Mechanical fasteners penetrate the insulation and transfer uplift forces directly to the rigid deck.

Cover boards can also enhance durability in roof systems using mechanical fasteners rather than adhesives. In these systems, wind forces may try to rock the fasteners sideways, and the fasteners can lose compression or even back out of the decking. A suitable cover board under the membrane can keep the fasteners from rocking and protect the roof.

Impact resistance withstands hail and foot traffic

The third force that tests roof system durability is impact from hail or foot traffic. Without a protective cover board, impact damages both the insulation and the membrane. The rigid cells of low-density insulation foam don't recover from impact compression, so crushing reduces the R-value and damages the bond with the insulation board's facing layer. Insulation compression also forces the membrane to stretch, which makes it more vulnerable to puncture.

Insulation damage from hail impact is obvious. The impact damage caused by foot traffic is less immediately noticeable, but more pervasive. Foot traffic, wheel barrows and equipment carts all generate loads that compress unprotected insulation and threaten the membrane with stretching and punctures.

Traffic damage comes first during installation of the roof itself, then from installation of HVAC, antenna systems, and other roof-top equipment. After construction, routine building maintenance continues the stress. This is why some roofing system warranties place a limit on the amount of roof-top traffic that can be tolerated.

Cover boards can protect against both hail and foot traffic damage. Installed between the membrane and the insulation, a rigid cover board with good compressive strength distributes impact to prevent insulation compression. Cover boards also improve puncture resistance by supporting the membrane.

(For more details on cover board strength in roof assemblies—including wind-uplift resistance and impact resistance—refer to the November, 2001 TechTalk.)

Water intrusion can be external or internal

Water is another force that tests roof-system durability. Moisture can come from leaks or from internal condensation caused by the daily and seasonal temperature cycles of the building.

When moisture is retained in a roofing system, it can initiate a vicious cycle; the retained moisture reduces the R-value of the roof assembly. The reduced R-value accelerates the rate of condensation within the roof, which generates even more moisture and lowers the R-value even further. In the worst case, the roof system can become completely saturated. A wet roofing system can deteriorate and collapse if the cover board does not provide wet strength.

Where a cover board is part of a roofing system, there are two key moisture issues:

- What are the moisture absorption characteristics of the board?
- Does absorbed moisture damage the integrity or mechanical strength of the board?

Many cover board materials, including wood and perlite, will absorb and retain a high percentage of water by weight. Further, the moisture causes swelling and permanent loss of strength in the material. Other materials—such as DensDeck® Roof Board—absorb much less water to begin with and retain their physical properties through a wet-dry cycle.

(For more details on the importance of moisture resistance in roof assembly cover boards, refer to the February, 2002 TechTalk.)

Mold needs organic material to grow

Mold requires four factors for growth: spores, proper temperature, moisture and an organic food source. The first two, spores and proper temperatures, are universally present in roof systems. The third, moisture, can be partly controlled through proper building design. Adequate roof ventilation and vapor retarders can help reduce condensation and moisture retention in the roof system, but can't eliminate it entirely. One element that we can practically limit is the organic food source. A cover board which contains primarily inorganic elements, such as gypsum board with fiberglass facings, can help to reduce mold growth

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when compared to other roof board substrates with high organic materials.

(For more details on mold in roof assembly cover boards, refer to the May, 2002 TechTalk.)

Sound intrusion affects quality of life

The sound transmission properties of a roofing system are not part of the direct protection the roof offers, but sound transmission affects the quality of life inside the building. In general, people like it quiet inside occupied buildings and studies have shown that students perform better in a quiet environment. Keeping out noise from aircraft, traffic and equipment is one of the tasks of a roof system. Adding one or more layers of high-density material, such as a gypsum cover board, can help attenuate outside noise and significantly raise the Sound Transmission Class (STC) of the roof assembly.

(For more details on STC ratings of roof assemblies with and without cover boards, refer to the February, 2004 TechTalk.)

Cover board selection—look at all the forces together

If the proper cover board can improve durability in many roof systems, how do you select a cover board material? Consider these factors:

- Fire resistance
- Strength to resist both wind uplift and impact
- Water intrusion characteristics
- Sound transmission qualities

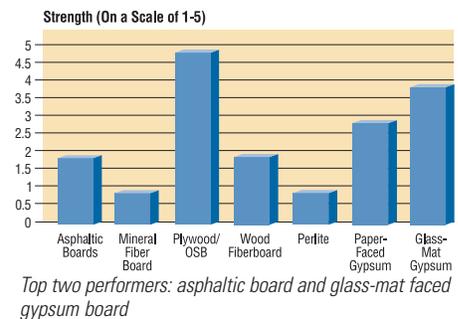
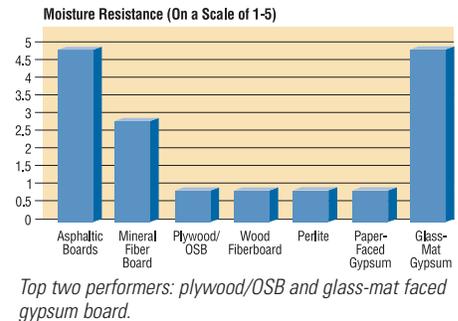
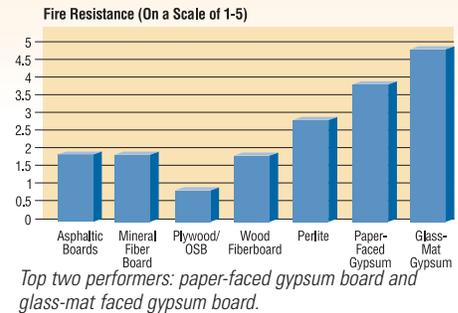
The seven most common cover board materials are:

- Asphaltic board. Fiberglass-faced asphalt board in a variety of thicknesses
- Mineral fiberboard. Lightweight, semi-rigid rock wool or fiberglass board
- Plywood or Oriented Strand Board (OSB). Plywood, thin sheets of veneer in layers. OSB, cross-laminated layers of oriented, resin-bonded wood strands
- Wood fiberboard. Organic fibers bonded with resins, lightweight
- Perlite. Mineral aggregate board with cellulose binders and sizing agents, lightweight
- Paper-faced gypsum. Gypsum core with paper facers on both sides
- Glass-mat faced gypsum board. (DensDeck® Roof Board) Treated, high-density gypsum board with fiberglass mats embedded on both sides

How do you compare the performance of these different materials? The charts to the right summarize the key dimensions of fire resistance, strength and moisture resistance on a standardized scale of one to five.

Consider glass-mat faced gypsum board for all-around performance

Only asphaltic board exceeds glass-mat faced gypsum board in moisture resistance, and only plywood/OSB materials exceed its strength. In resisting the forces that challenge roof-system durability, no other common cover board material delivers the all-around performance of gypsum board finished with fiberglass mat. It is the clear choice in almost any roofing application.



SALES INFORMATION AND ORDER PLACEMENT

U.S.A. Midwest: 1-800-876-4746 West: 1-800-824-7503
South: 1-800-327-2344 Northeast: 1-800-947-4497

CANADA Canada Toll Free: 1-800-387-6823
Quebec Toll Free: 1-800-361-0486

TECHNICAL INFORMATION

Georgia-Pacific Gypsum Technical Hotline
U.S.A. and Canada: 1-800-225-6119
www.gpgypsum.com

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Unless otherwise stated in our written warranty for these products, our sole liability for any product claim shall be limited to reimbursement of the cost of repair or replacement of the affected product, up to a maximum amount of two times the original purchase price for the affected product. We shall not be responsible under any circumstances for lost profits, damage to a structure or its

contents, or indirect, incidental, special or consequential damages. Claims shall be deemed waived if they are not submitted to us in writing within ten (10) days after discovery of a product defect/circumstance giving rise to a claim.

CAUTION: For product fire, safety and use information, go to gp.com/safetyinfo.

HANDLING AND USE

CAUTION: This product contains fiberglass facings which may cause skin irritation. Dust and fibers produced during the handling and installation of the product may cause skin, eye and respiratory tract irritation. Avoid breathing dust and minimize contact with skin and eyes. Wear long sleeve shirts, long pants and eye protection. Always maintain adequate ventilation. Use a dust mask or NIOSH/MSHA approved respirator as appropriate in dusty or poorly ventilated areas.

For additional product fire, safety and use information go to www.gp.com/safetyinfo or call 1-800-225-6119.

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