



# Roofing

One of a series of publications designed to help illustrate the benefits of FM Approved products, including:

- Approval Standard 4435, *Edge Systems Used with Low Slope Roofing Systems*
- Approval Standard 4450, *Class 1 Insulated Steel Deck Roofs*
- Approval Standard 4451, *Profiled Steel Panels for Use as Decking in Class 1 Insulated Roof Construction*
- Approval Standard 4470, *Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction*
- Approval Standard 4471, *Class 1 Panel Roofs*
- Approval Standard 4471, *Class 1 Panel Roofs (Chinese)*
- Approval Standard 4475, *Class 1 Steep Slope Roof Covers*
- Approval Standard 4476, *Flexible Photovoltaic Modules*
- Approval Standard 4477, *Vegetative Roof Systems*
- Approval Standard 4478, *Roof Mounted Rigid Photovoltaic Modules*

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## The Hazards

Roofing systems are the first line of defense in the complete building envelope that includes the roof, walls, windows, doors and flashing. Roofing systems must be able to protect a structure from the natural hazards associated with the local environment, including rain, hail, snow, high winds, temperature extremes—even fire.

Wind rushing over a roof, for instance, produces lift, much like an airplane wing. This lift creates tremendous turbulence and dynamic stresses. Powerful eddies and vortices, which resemble horizontal tornadoes, churn along roof perimeters and corners. These forces can rip at roof covers, flashing, insulation and the underlying roof structure.

The failure of a building's roof and other building envelope elements, including walls, windows and doors, can have a devastating impact from which a business may not be able to recover. When a roof is damaged or destroyed, the building contents can be exposed to flooding and contamination, further compounding the loss.

Loss prevention begins with knowledge. Most property loss, including those involving the roof, can be prevented. FM continues to work hard to help clients in wind-prone areas to improve their roofs and other components of the building envelope. FM Approvals is doing its part to help property owners avoid losses by continually improving Approval standards and by helping to make it easier for designers, architects and contractors to specify and install FM Approved roofing systems.

FM Approvals also works to provide Approval Standards and FM Approved products that support sustainable building practices, including green roofs (e.g., vegetative,

light-colored covering), building-integrated photovoltaics (BIPV), and skylights for day lighting.

## Testing Required for Approval

FM Approvals is a leader in certification and Approval of roof assemblies.

FM Approvals is the only organization in the world that tests complete roof assemblies when subjected to multiple perils such as fire testing above and below the deck, wind-uplift testing, hail-damage testing, accelerated weathering, water leakage, foot traffic and corrosion-resistance testing of metal parts.

A roof assembly is tested to meet:

- The interior fire performance requirements using the FM Approvals Construction Materials Calorimeter Test (the only such test in the world developed after many years of research and testing) adopted by NFPA as NFPA 276. It's a pass/fail test giving the rating of Class 1 if the roof assembly passes.
- The exterior fire performance using the ASTM E 108 test method for an A, B or C rating.
- The wind performance using ANSI/FM 4474 for ratings starting from 60 psf up to 990 psf.
- Hail, corrosion and accelerated weathering performance using FM Approvals test methods for hail, corrosion and accelerated weathering. Ratings for hail are MH (moderate hail) and SH (severe hail).

The combined analysis of fire and natural hazards testing on a roof assembly assures the purchaser and building owner a fire-safe, wind-resistant roof capable of maintaining its integrity for many years.

## BENEFITS OF FM APPROVAL:

- Performance-based testing ensures real-world property loss prevention protection when installed correctly.
- Growing global availability of FM Approved roofing products and adoption or incorporation of FM Approval Standards by local certification agencies.
- Wide range of roofing-related standards supports innovative green building designs, including vegetative roofing and flexible and rigid photovoltaic systems.
- Large-scale, 12 x 24 ft. (3.7 x 7.3 m) wind uplift testing provides a true measure to real-world performance.
- Audits of manufacturing facilities.
- FM Approved roof assemblies are listed in FM Approvals' RoofNav® tool for roofing professionals providing anywhere, anytime access and accuracy.

## SUCCESSES:

- The Packaging Corp. of America's Winter Haven, Fla., USA, manufacturing facility experienced a direct hit from 2004's Hurricane Charley, a Category IV hurricane, and survived with relatively minor damage while many buildings around it had their roofs ripped off. The company's facility was built using FM roofing standards and an FM Approved roof assembly.
- The first FM Approved Building Integrated Photovoltaic (BIPV) roof system was awarded to SOPREMA, Inc. for its Photovoltaic Module Systems in April 2011. The systems were evaluated based on Approval Standard 4476, *Flexible Photovoltaic Modules*.
- In July 2011, LiveRoof, LLC became the first company to qualify a vegetative roof system as FM Approved according to Approval Standard 4477, *Vegetative Roof Systems*. The Approval was granted to the LiveRoof Standard Tray and Deep Tray systems populated with succulent ground covers.
- FM Approvals customers in China can save time and money by having their roof assemblies tested for wind uplift resistance by the China Building Materials Academy, Suzhou Waterproof Research Institute and Xinzhuang Testing Center. China has incorporated the FM Approvals wind uplift standards (ANSI/FM 4474) into its national standards for PVC and TPO membrane roofs

To tailor an FM Approved roof to the needs of the facility owner, designer or contractor, we need to specify the fire and natural hazards ratings. For example, a rating for a roof assembly could be 1-180 A SH, where "1" represents a roof assembly that passed the interior fire test; "180" represents the wind performance rating for the roof in psf; "A" represents the exterior fire rating; and "SH" represents severe hail rating. All this information for all FM Approved roof assemblies is available in RoofNav (RoofNav.com).

## Benefits and Availability

FM Approved roofing products and assemblies are listed in RoofNav, the FM Approvals web-based tool for roofing professionals. RoofNav takes the guesswork out of configuring an FM Approved roofing system by putting all roofing-related information, including a ratings calculator and related installation recommendations from relevant FM Property Loss Prevention Data Sheets, in one place.

Why choose an FM Approved roof assembly versus a non-certified product or design? An FM Approved roof means you get a tested roof assembly, not simply a collection of products and parts that may or may not perform as expected. Through RoofNav and properly installed FM Approved products, you get a roofing system that has been proven in extensive testing to perform as specified, including wind uplift, fire resistance and many other factors.

With an FM Approved roofing system, you are assured that the manufacturers of the components that make up that system have proven quality programs in place. For building owners and architects, when you demand an FM Approved roof assembly for your project, you are more than simply meeting basic code requirements—you are ensuring that the most important building envelope component will be fire-, wind- and hail-safe and protect your structure for many years to come. FM Approved roofing systems are specified and accepted by building owners, designers and code authorities throughout the world.

The FM Approvals certification program is an investment that demonstrates a manufacturer's confidence in its products. While FM Approvals testing is considered among the most rigorous in the world, it is also a true sign of a manufacturer's confidence and a quality indicator that will help differentiate a product from the competition.

## UNDERSTANDING THE BENEFITS

This is one of a series of publications to help you understand how FM Approved products can help prevent losses in your facility. For more information on how to obtain FM Approval of your product, contact the FM Approvals representative below:

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