

The Peril of Hail: Improving Your Odds in the Single Ply Roofing Market

According to the National Weather Service, hail causes over \$1 billion in property and crop damage in the U.S. each year. Traveling at velocities that can exceed 100 mph and in sizes that reach up to seven inches in diameter, it is no surprise that hail can reduce a questionable roof to nothing at all in a heartbeat's time.

Hail makes many roofing manufacturers run for cover. While catastrophic hail will always involve a gamble, moderate hail up to one inch in diameter is a predictable and naturally occurring event. Roofing systems should be designed with this in mind. Roofing manufacturers, building owners, specifiers and consultants can improve their odds with hail by following some basic steps before considering a product, especially in hail prone regions.

1. Understand hail.

Hail forms when rain, before falling to the ground, meets an updraft of warm air which launches the droplets high into the sky to a level much colder where they gather additional atmospheric moisture and freeze. These frozen droplets then start to fall and often face the warm updraft again and again, and thus repeat the cycle and increase in size. When the ice droplets become heavy enough to overcome the force of the updraft, or if the updraft decreases, the droplets fall to the ground as hail.

Size, density and velocity are factors that affect the impact energy of hail. Studies have shown that hail-producing thunderstorms occurring during colder temperatures generate smaller, less dense hail and those occurring during warmer temperatures generate larger, denser hail. It is this heavy, dense hail traveling at higher velocities that often causes the most damage. However, small hailstones can act like bullets when aided by downdrafts or horizontal winds.

Springtime and summer are the most hail prolific seasons. The central U.S. region including Texas, Oklahoma, Colorado, Kansas, Nebraska and Wyoming (also known as hail alley) is home to most hail-bearing storms. Here, the warm air from the Gulf of Mexico meets the cool air from Canada. No region in the U.S., however, is free from the occasional hailstorm.

2. Request results from industry approved test methods that simulate the impact of hail.

Testing organizations, such as the American Society for Testing and Materials (ASTM), Underwriters Laboratories (UL), Factory Mutual (FM) and other independent organizations have developed different methods of simulating hail events and measuring the impact resistance of different roofing products. Roofing manufacturers should be able to provide performance test data on their system as it is new, and also after the product has

aged. If an aged system performs poorly against hail, the manufacturer should disclose this and recommend a time period for replacing the roof. Be aware that some test methods fail to account for how temperature variations can affect product performance at the time of impact.



3. Research weather patterns at the site of the roofing project.

Check local historical records of hail fall. Consider frequency of storms, velocity, size and density of hailstones, as well as general weatherability characteristics of the roofing product. Be aware of local conditions that could accelerate a product's aging process, such as high heat and intense UV ray exposure. Correlate your findings with the impact tests to be sure the tests simulated conditions similar to those revealed by local weather records.

4. Understand the potential causes of hail related roof failures.

Depending on the roofing product, there are many factors that can affect performance during a hail storm. In the single-ply, thermoplastic segment of the commercial roofing market, test results have demonstrated that the following are factors to consider:

- The geographic location of the building will impact the aging of its roof. Heat and UV rays accelerate aging.
- Liquid plasticized PVC products are more susceptible to hail damage than KEE membranes that meet the ASTM D6754 specification.
- Plasticizer migration with aging weakens the membrane's impact resistance to hail.
- All membranes are unique. Distinct differences exist in plasticizer stability between products by different manufacturers.
- Harder substrates beneath the product have achieved better performance results; softer substrates reduce the product's

impact resistance to hail.

- The age of the substrate and the membrane affects performance. The newer the better both will be at absorbing hail's impact energy.
- The mass of the sheet tends to improve the product's performance when facing hail. A thicker membrane also tends to age less rapidly.
- The temperature at the time of impact has been proven to affect the hail resistance performance qualities of the product.

Yes, hail storms can be perilous to roofs. But often they are moderate and somewhat predictable weather events. Staying informed and asking the right questions will help you navigate your way to making better choices about roofing products that can weather these storms.

Seaman Corporation acknowledges the following resources for providing information that supports this article:

1. Vickie Crenshaw and Jim D. Koontz, P.E., "Simulated Hail Damage and Impact Resistance Test Procedures for Roof Coverings and Membranes", October 27, 2000, p. 1-4.
2. Frank J. Foley, Jim D. Koontz & Joseph K. Valaitis, "Aging and Hail Research of PVC Membranes"
3. Blue Print for Safety, <http://www.blueprintforsafety.org/hail/hail00.html>.
4. National Geographic News, http://news.nationalgeographic.com/news/2003/08/0804_030804_largest-hailstone.html.
5. National Weather Service, <http://www.erh.noaa.gov/er/cae/svrwx/hail.htm>.

FiberTite News is a marketing publication by Seaman Corporation, editor Kim Seaman, kseaman@seamancorp.com.

FiberTite File: The Georgia Aquarium, Atlanta, GA

Owner: The Georgia Aquarium, Inc., Atlanta

Program manager: Heery International, Inc., Atlanta

Architect: Thompson, Ventulett, Stainback & Associates, Atlanta

General contractor: Brasfield & Gorrie, LLC

Installation date: May 2005

Total square feet: 160,000 sq. ft.

Roofing system: FiberTite 45 mil Fleece Back over two ply BUR, installed in hot steep asphalt over a lightweight concrete roof deck. Color: Grey.

Why FiberTite? FiberTite was selected to be installed as a cap sheet, applied with hot asphalt over a BUR system and on top of a lightweight concrete deck. Using FiberTite as a cap sheet allows for the building project to be carried out in phases. The BUR roof was installed quickly and acted as a temporary roof, speeding construction schedules and facilitating roof traffic from all other trades during the project. The FiberTite Fleece Back membrane was installed to finish the project and will endure the normal abuse a membrane experiences during new construction. FiberTite was also selected for aesthetic reasons: our grey membrane suits the design requirements of the building project.

One of the world's largest aquariums — 55,000 animals from 500 different species in over 5 million gallons of water!

