Carlisle's Very Severe Hail (VSH) Approved Systems

As the industry leader in warranted commercial roofing systems, Carlisle SynTec Systems takes pride in its tradition of providing unique solutions for rooftop challenges. Carlisle continues to shape the evolution of the commercial roofing industry by offering world-class system solutions that are Very Severe Hail (VSH) approved.
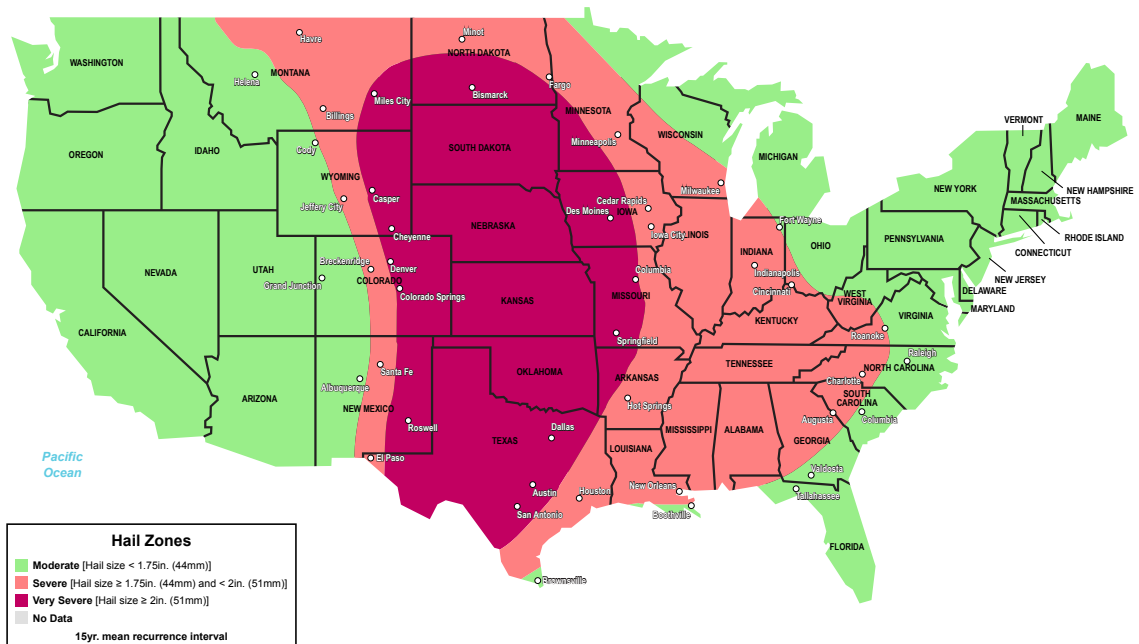
SEVERE HAIL (SH) VS. VERY SEVERE HAIL (VSH)

Historically, the Factory Mutual (FM) Severe Hail (SH) designation has been the most stringent hail approval in roofing. The test consists of a 2-inch steel ball dropped almost 18 feet, with virtually any rigid insulation board with a single-ply membrane resulting in an approval. In 2017, Factory Mutual introduced the Very Severe Hail (VSH) approval, consisting of a 2-inch diameter ice ball shot out of a pressurized air cannon. The ice ball impacts the membrane and substrate at approximately 110 miles per hour, resulting in four times the energy impact as SH testing.

Hail Rating	Impact Medium	Method	Impact Energy
SH Severe Hail	2"-Diameter Steel Ball	17' 9 ½" Height Gravity Drop	14 ft-lb (19 J)
VSH Very Severe Hail	2"-Diameter Ice Ball	160 Feet/Second Shot Velocity	58 ft-lb (79 J)

FACTORY MUTUAL'S HAIL ZONE MAP

VSH requirements now include parts of 14 states as designated by Factory Mutual. VSH requirements can also appear in specifications outside of these 14 states.

Hail Zones

- Moderate [Hail size < 1.75in. (44mm)]
- Severe [Hail size ≥ 1.75in. (44mm) and < 2in. (51mm)]
- Very Severe [Hail size ≥ 2in. (51mm)]
- No Data

15yr. mean recurrence interval

UNDERSTANDING VSH APPROVED SYSTEMS

The cover board is an essential part of a VSH single-ply system. Carlisle's commitment to innovation has recently allowed common rooftop cover boards such as gypsum and HD polyiso to gain approval under these extreme testing standards. Carlisle now offers a wide variety of VSH solutions. SecurShield® HD Composite is the easiest to use and most cost effective as the industry's first all polyiso solution. EcoStorm VSH™ offers a solution sourced from post-industrial and post-consumer waste streams with a compressive strength of nearly 4,000 psi. DensDeck® StormX™ is the first gypsum-based solution providing best in class fire performance. StormBase® provides an easy-to-use composite combining the traditional strength and performance of OSB factory bonded to polyiso insulation.

Fleece-backed and bareback membranes can achieve VSH approvals; however, cover board attachment is critical. With fleece-backed membranes, the cover board can be mechanically attached using plates and fasteners or adhered using a two-part polyurethane adhesive. With bareback membranes, the cover board can only be adhered using a two-part polyurethane adhesive. See the chart and schematics below for clarification.

VSH Approvals	80-mil Sure-Weld® TPO				115- and 135-mil FleeceBACK® TPO			
Membrane Attachment	Roller or Spray Applied Bonding Adhesive				Full Spray/4" Beads			
Cover Board	SecurShield HD Composite	StormBase Composite	EcoStorm VSH	DensDeck StormX	SecurShield HD Composite	StormBase Composite	EcoStorm VSH	DensDeck StormX
Cover Board Attachment	Flexible FAST™				Flexible FAST	Flexible FAST or Plates and Fasteners	Flexible FAST or Plates and Fasteners	Flexible FAST

VSH Approvals	115-mil and 145-mil FleeceBACK EPDM				145-mil Sure-White® FleeceBACK EPDM			
Membrane Attachment	Full Spray/4" Beads				Full Spray/4" Beads			
Cover Board	SecurShield HD Composite	StormBase Composite	EcoStorm VSH	DensDeck StormX	SecurShield HD Composite	StormBase Composite	EcoStorm VSH	DensDeck StormX
Cover Board Attachment	Flexible FAST	Flexible FAST or Plates and Fasteners	Flexible FAST or Plates and Fasteners	Flexible FAST	Flexible FAST	Flexible FAST or Plates and Fasteners	Flexible FAST or Plates and Fasteners	Flexible FAST

80-MIL SURE-WELD TPO
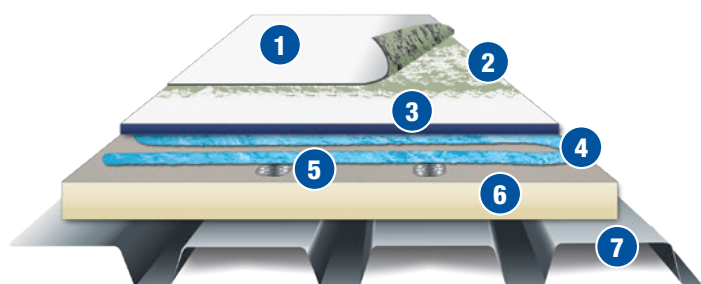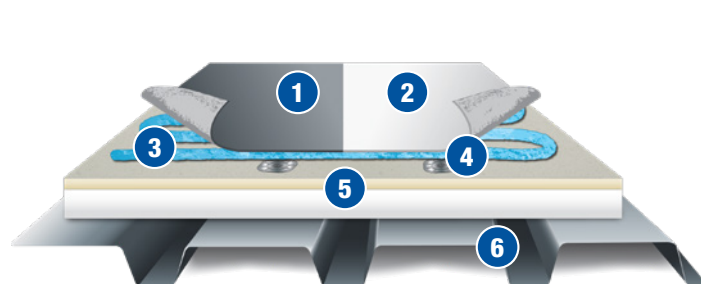
1. Sure-Weld 80-mil Reinforced TPO Membrane
2. CAV-GRIP® III Adhesive/Primer
3. EcoStorm VSH Cover Board
4. Flexible FAST Adhesive in 4" beads
5. Insulation Fasteners and Plates
6. Polyiso Insulation
7. Steel Deck

FLEECEBACK MEMBRANE

1. 115-mil FleeceBACK EPDM or 145-mil Sure-White FleeceBACK EPDM
2. 115-and 135-mil FleeceBACK TPO
3. Flexible FAST Adhesive in 4" beads
4. Insulation Fasteners and Plates
5. SecurShield HD Composite
6. Steel Deck

For help designing a Carlisle VSH approved assembly, contact your local Carlisle Manufacturer's Representative.