

BEFORE ALL HAIL BREAKS LOOSE!

2018 MHEC MPP LOSS CONTROL WORKSHOP

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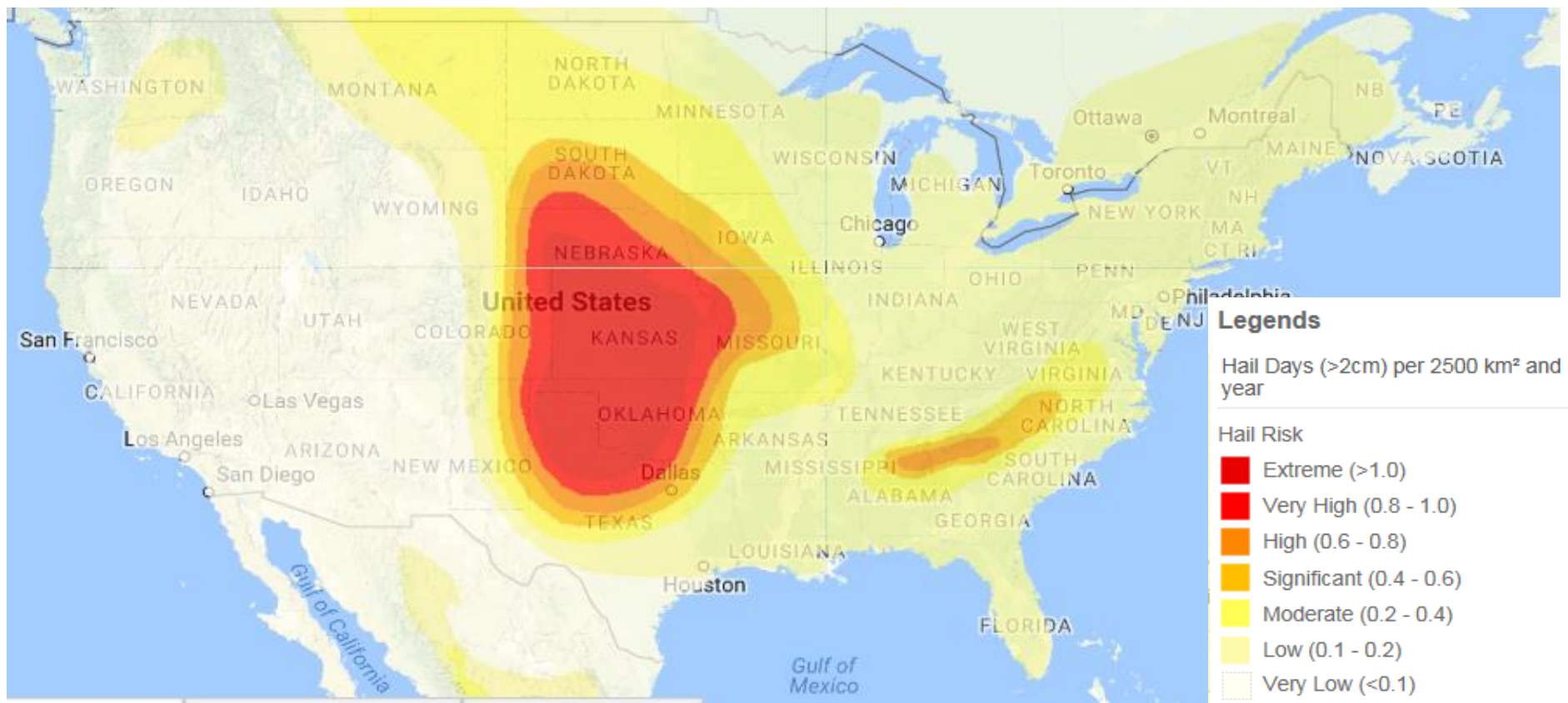
Objectives

- Hail Hazard for MHEC MPP
- Types of Hail Damage to Facilities
- Hail Mitigation
 - New Projects
 - Existing Buildings
- 3 Key Takeaways to follow up on at your Campus



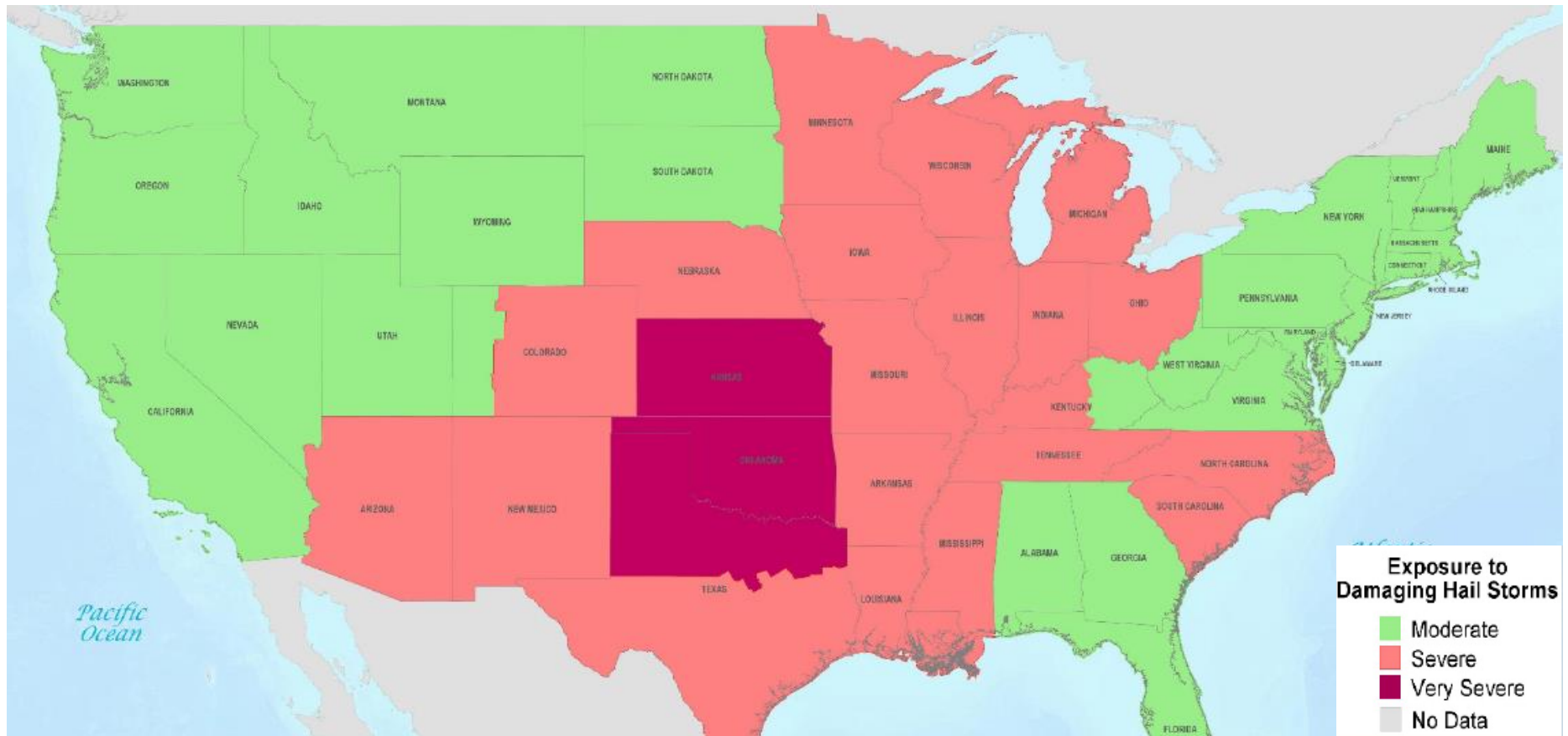
Hail Hazard Map

Swiss Re CatNet ®



Hail Hazard Map

FM Global FMDS 1-34

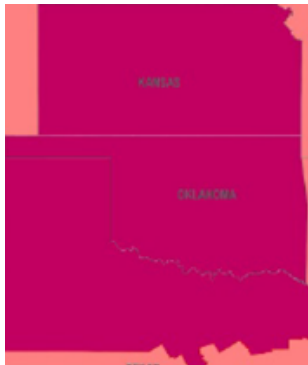


FMDS 1-34 Hailstorm Hazard Map

Hail day: A day where minimum $\frac{3}{4}$ in. (19 mm) diameter hail occurred within 25 mi (40 km) of a location.

Very Severe Hail Hazards

Areas in the United States shown as Very Severe in Figure 8, *Hail Storm hazard map for the United States*.



Severe Hail Hazard

Areas that have experienced on average at least three hail days per year.

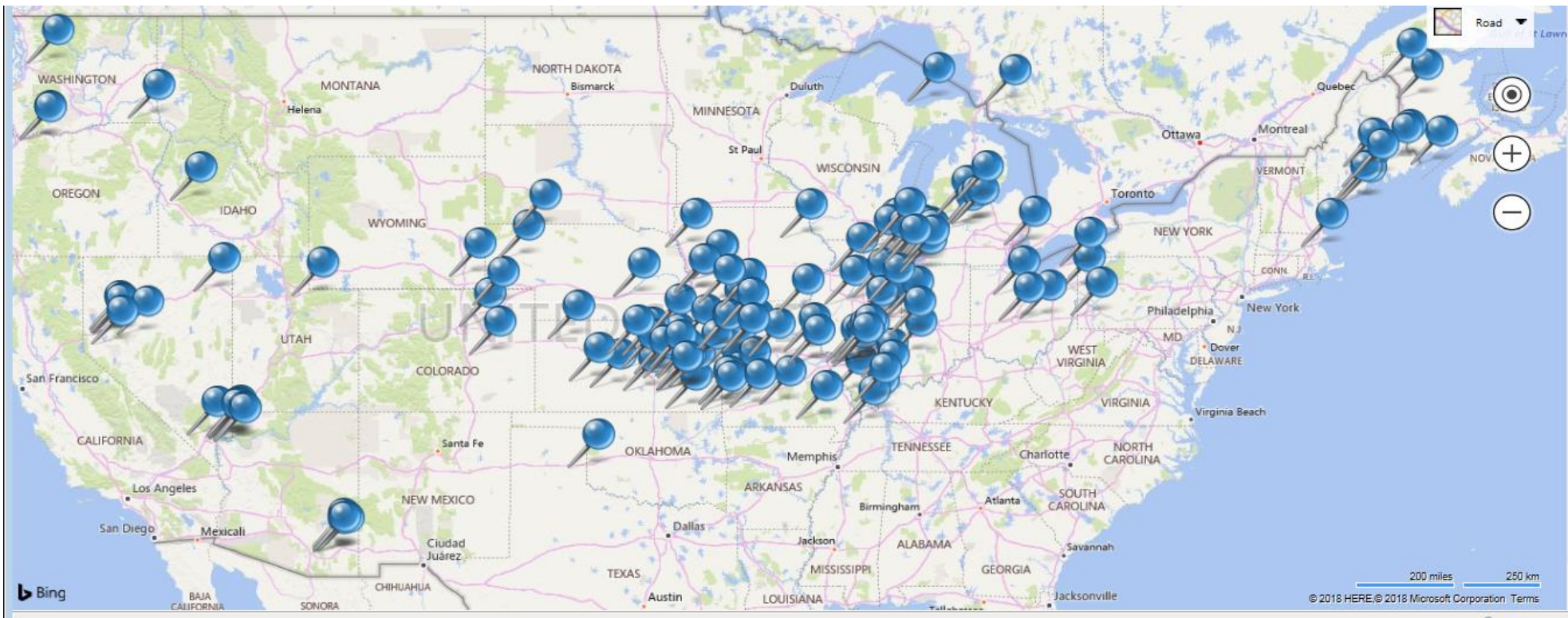


Moderate Hail Hazard

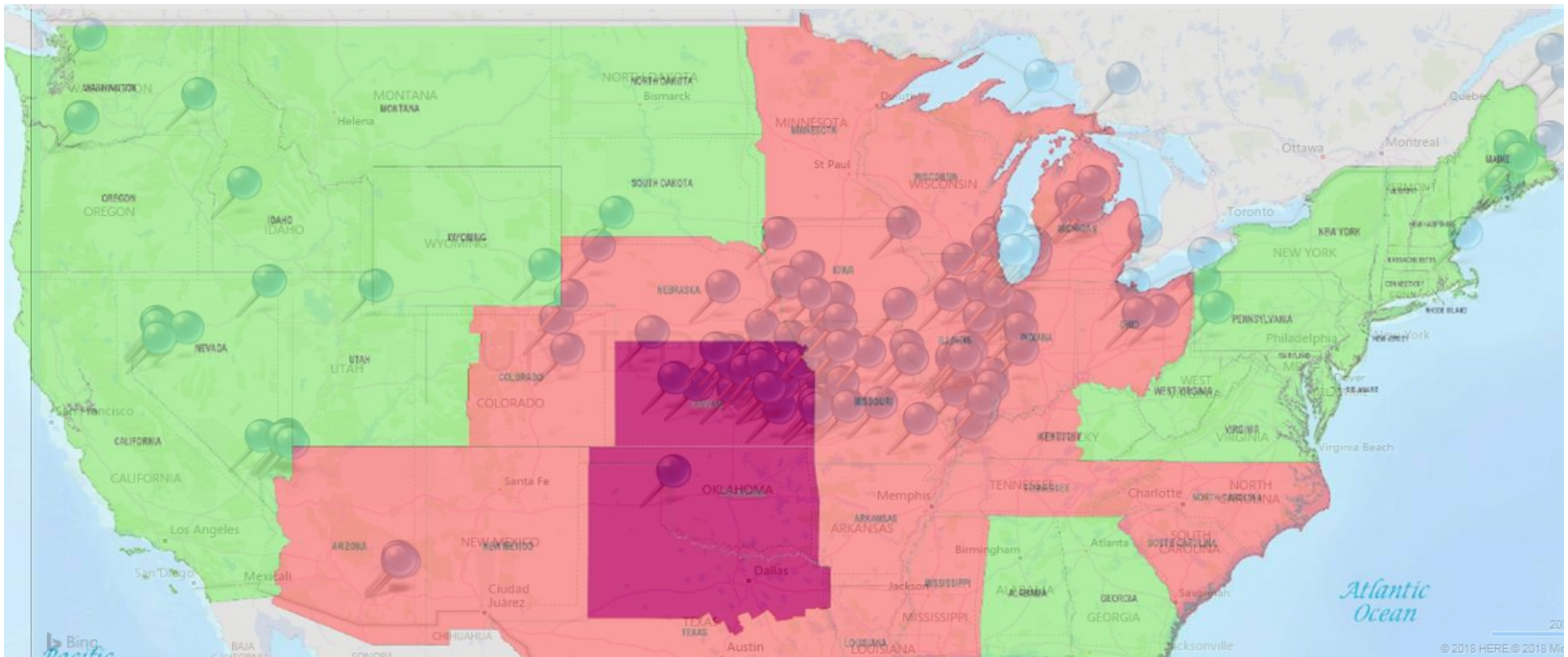
Areas that have not experienced on average at least three hail days per year.



MHEC MPP Campus Location Map

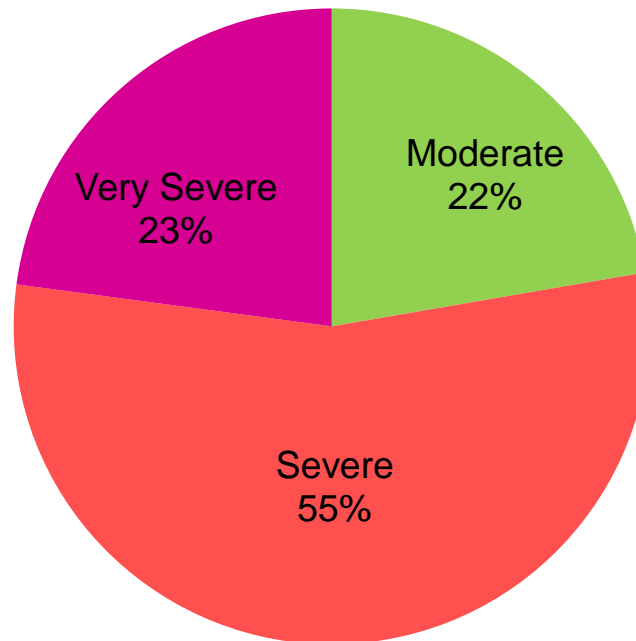


MHEC MPP Campus Location Map



MHEC MPP Campus Locations

Hail Ratings by Location (FMDS 1-34)



MHEC MPP Losses 2013-2017

- 14 reported hail losses
- Total \$20,714,281
- Average \$1,479,592
- Median \$605,969

Common Hail Damage to Facilities

- Damage to Roofing Components
 - Roof Covers & Substrates
 - Skylights
 - Vents
 - Flashing
- Damage to Walls/Wall Panels
- Damage to equipment
 - Rooftop Units
 - HVAC
 - Solar
 - and other equipment
- Water damage to interior of building
 - Restoration cost
 - Replacement of furnishings or equipment

Damage to Roofing Components

- Many types of roof covers for both flat and sloped roofs
- Factors that influence susceptibility to hail damage to all types of roofs is
 - Age
 - Weathering
 - Degradation
 - Temperature
 - Listed/Approved Components
- According to FM Global, the most damageable roofs are asbestos-cement, cementitious fiber and any roof in poor condition.

Damage to Roofing Components



Damage to Roofing Components



Damage to Roofing Wall Panels

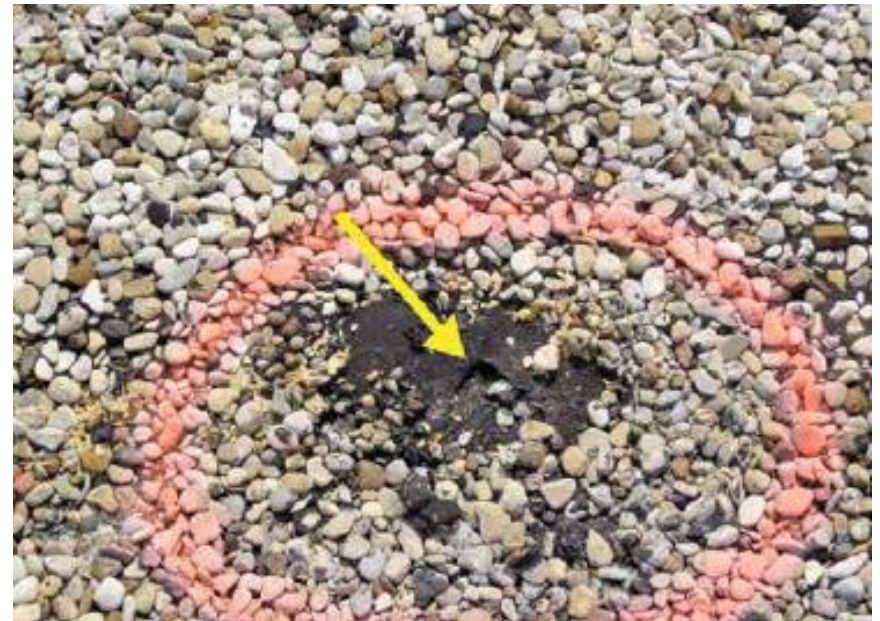


Damage to Roofing Components



Source: <http://rci-online.org/>

Damage to Roofing Components



Source: <http://rci-online.org/>

Damage to Roofing Components



**Hole in TPO Wall Flashing
(temporary repair applied)**

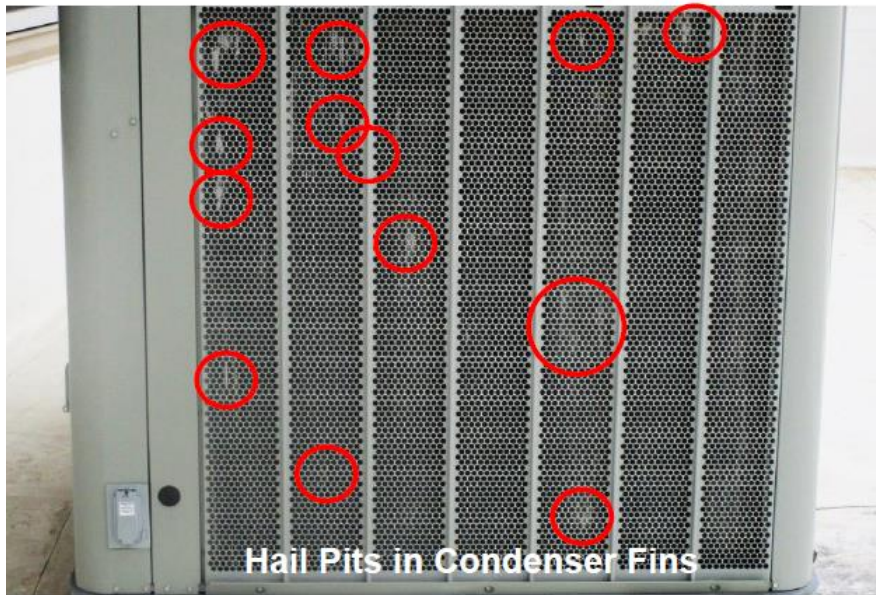
Damage to Equipment



Fig. 3. Hail damaged HVAC unit

Source: *FMDS 1-34*

Damage to Equipment



Hail Mitigation

New Installations:

- Specify proper Hail Approval/Listing
 - Roofing Systems
 - Wall Panels
 - Skylights
- Hail Guards
 - Condensor Fins
 - Equipment

Existing Installations:

- Roof Inspection Program
- Qualified Contractors
- Hail Guards for Equipment
- Age matters

New Roof Installations

- Stone or paver ballasted roofs are acceptable for all hail ratings (some limitations)
- ANSI FM 4473: *Test Standard for Impact Resistance Testing of Rigid Roofing Materials by Impacting with Freezer Ice balls.*

Hail Hazard Area (FMDS 1-34)	Roof Hail Rating	
	single-ply, multi-ply or panel roofs	Shingle Roofs
Very severe (VSH)	VSH	FM Class 4
Severe (SH)	VSH, SH	FM Class 3 or 4
Moderate (MH)	VSH, SH, MH	FM Class 2, 3, or 4

ANSI FM 4473

- Ice balls are used in this test method to simulate hailstones.
- The test specimen shall show no evidence of visible cracking or breakage or any damage such as punctures, fractures, disengagement of lap elements or exposure of materials not so intended.



Other Standards

- UL 2218 Standard for Impact Resistance of Prepared Roof Covering Materials
- ASTM D3746 Standard Test Method for Impact Resistance of Bituminous Roofing Systems



Roof Inspection Program

Why?

- Age and condition matter!
- ANSI FM 4473: “Exposure of roof coverings to the elements over an extended period of time has a potential to significantly lower the hail resistance of the roof materials..... “

How Often?

- Scheduled roof inspections at least 2 times per year (spring and fall)
- Additional inspections after major storms
- Document the age and condition of all roofs for important buildings
- GRC property surveys for all MHEC MPP members will include audits of the roof inspection programs

Roof Inspection Program

Conditions that make certain roofs prone to hail damage.

Built-up and modified bitumen:

- Original surface coating, such as granules or gravel missing
- blisters, deteriorating felts (scrim is showing) and alligator surfaces

Single-ply membranes:

- crazing (very fine cracks in the membrane surface)
- stretching at the edges and seams, indicating probable embrittlement.

Liquid applied roof covers:

- crazing, cracking, peeling, flaking or erosion.

Roof Inspection Program

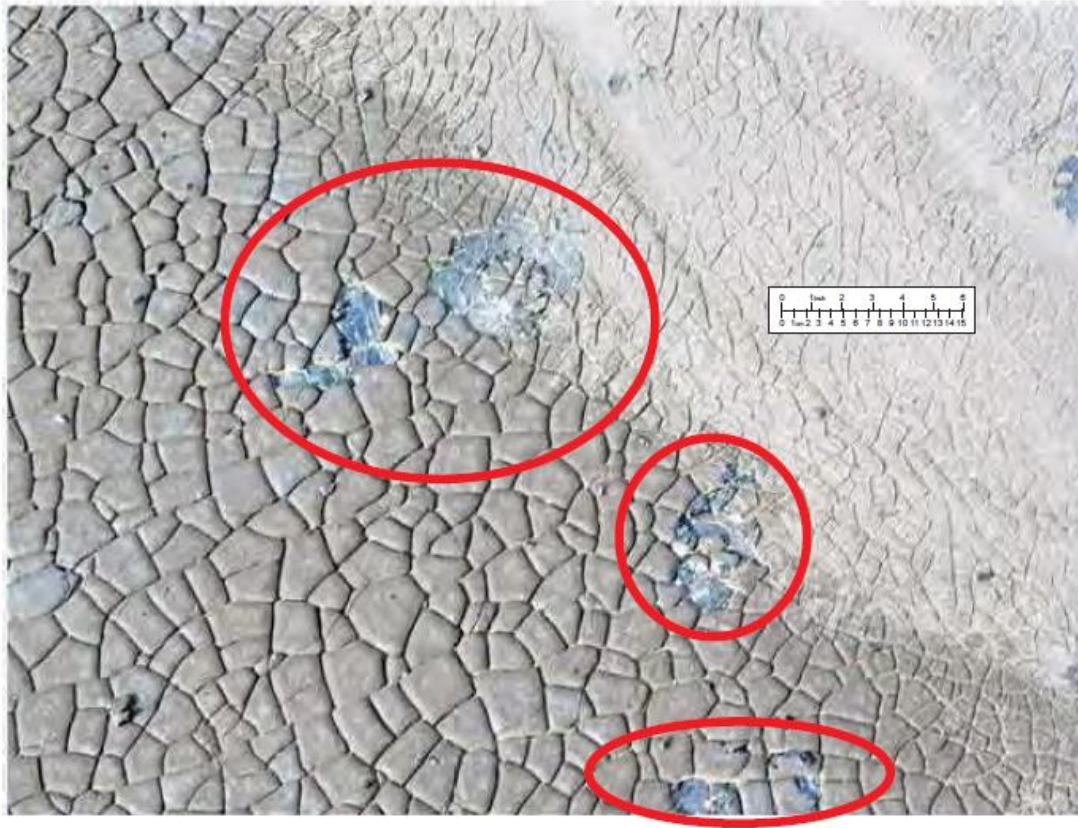


Fig. 5. Hail damage to severely "alligatored" roof (built-up roof)

Source: FMDS 1-34

Roof Inspection Program



Figure 1 – Severe deterioration of TPO membrane with embrittled/loss of top coating and exposed scrim.

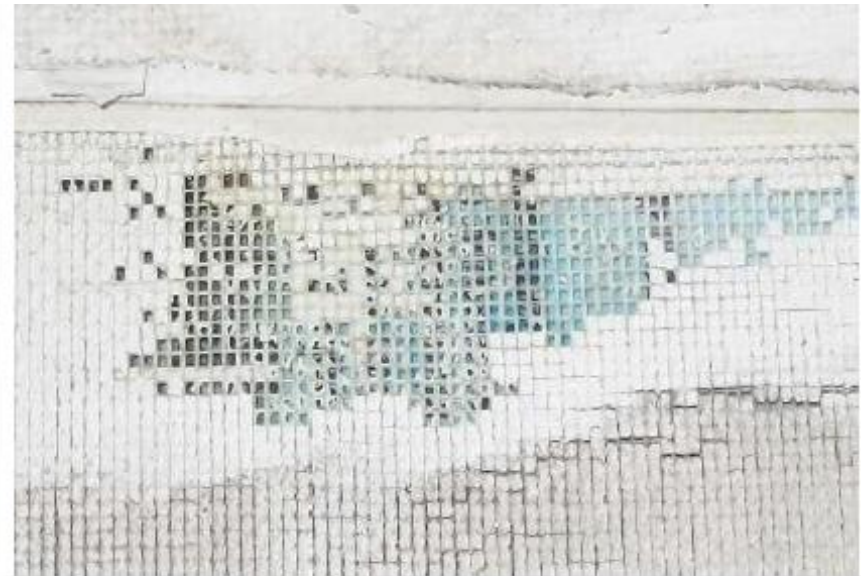


Figure 2 – Close-up view of deteriorated TPO membrane with embrittled/loss of top coating and exposed scrim.

Source: <http://rci-online.org/>

Roof Inspection Program

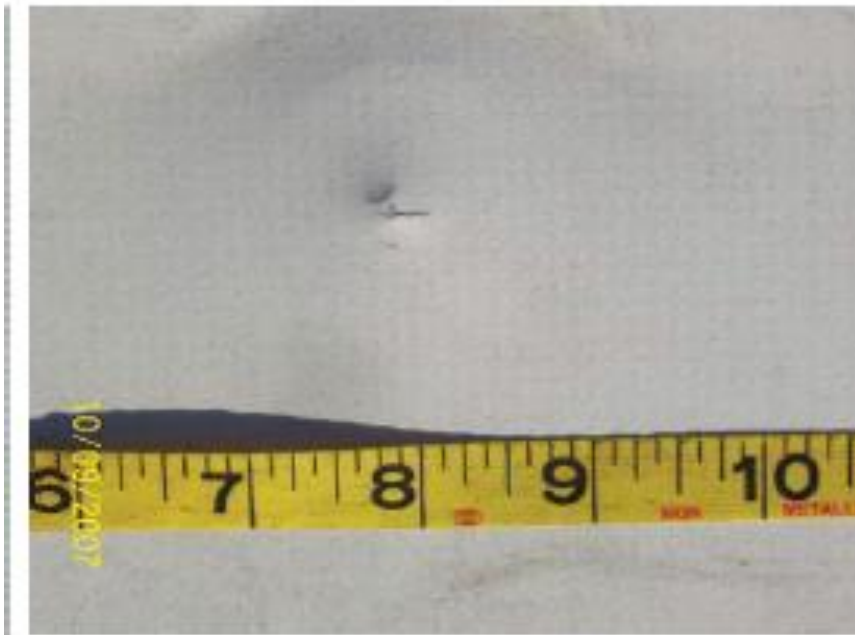


Figure 14 – Cracking in top surface of TPO membrane at fastener head protruding up on membrane.



Figure 16 – View of underside of membrane at crack revealing corrosion on fastener head.

Source: <http://rci-online.org/>

Roof Inspection Program



Roof Inspection Program

- Routine inspections can be done by a competent person
- When issues or concerns are found contact your roofing consultant
- Registered roof consultant (RRC) is a designation made by RCI, Incorporated; which is an international association of professional consultants, architects, and engineer who specialize in the specification and design of roofing, waterproofing, and exterior wall systems.

<http://rci-online.org/>

- Reference MHEC Property Risk Control Standards section 8: Roof Maintenance

Roof survey

Company name: _____
Building(s): _____

Instructions:

1. Complete a form for each major building. Connected groups of smaller buildings may be included on one form.
2. Any "yes" answer signifies a condition that needs to be repaired or examined by a qualified professional.
3. Schedule repairs promptly. Roofs that require repair are more susceptible to windstorm damage.
4. Complete this form twice a year and after severe storms.

Overall condition:

☐ Satisfactory
☐ Needs repair Action planned _____

Item	Yes	No	Actions/Comments
1. Are there any cracks, splits or loose seams in the roof covering?	<input type="checkbox"/>	<input type="checkbox"/>	
2. Is there any blistering (may resemble bubbles) of the roof covering?	<input type="checkbox"/>	<input type="checkbox"/>	
3. Is there any ponding or other evidence of water accumulation?	<input type="checkbox"/>	<input type="checkbox"/>	
4. Are drains plugged or potentially blocked by debris or other material?	<input type="checkbox"/>	<input type="checkbox"/>	
5. Are there any bare spots in the gravel or stone covering?	<input type="checkbox"/>	<input type="checkbox"/>	
6. Is there any evidence of damage from hail?	<input type="checkbox"/>	<input type="checkbox"/>	
7. Are rafters and trusses clear	<input type="checkbox"/>	<input type="checkbox"/>	

Master Property Program
Property Risk Control Standards
October 2017



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Walls, Panels & Skylights

Walls:

- Select wall systems that are inherently fire and hail resistant such as brick or concrete block.
- Select wall panels with Approved/Listed hail rating

Skylights:

- Select Approved/Listed hail rating
- Skylights can also be protected with minimum No. 11 gauge diameter steel wire mesh with maximum mesh opening size of 1.0 in.

Equipment

Cooling Fins for HVAC Units:

- Provide hail guards or steel wire mesh
- Min No. 11 gauge diameter steel wire mesh with maximum mesh opening size of 1.0 in. and supported on a steel framework

Roof Vents:

- Steel Wire Mesh



Fig. 4. HVAC unit with hail guard over cooling fins at same location as hail damaged unit in Figure 3

3 Takeaways

1. Specifications for New Projects

- ✓ Do specifications for new construction and renovations include proper hail ratings for roofs, skylights, wall panels?

2. Inspection Program

- ✓ Is there a formalized/documented roof inspection program?
- ✓ At least 2 scheduled inspections per year and after major storms?
- ✓ Repairs being performed by qualified personnel (RRC)?
- ✓ Do we have hail guards on condensor fins or other rooftop equipment?

3. Age and Condition

- ✓ Do we document the age and condition of all our roofs on campus?

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