CALGARY HAILSTORM
EXPOSING OUR VULNERABILITY TO HAIL
WHERE DO WE GO FROM HERE?

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Hailstorms now routinely expose that we do not build with this hazard in mind.
Spectrum of hail damage

CoCoRaHS Data 1999-2018

0 - No visible damage
1 - Vegetation damage only
2 - Car dents and vegetation damage
3 - Vegetation, shingle, and/or car window damage
4 - Vegetation, shingle, car window, and house window damage
Ingredients for a Catastrophic Hailstorm

**Big Hail**
Damage to structures begins often at hail sizes above 1.5 inches (3.8 cm)

**Lots of Hail + Wind**
High concentrations of hail embedded in strong winds make even small hailstones damaging

**Major metro**
Our suburban environment is growing quickly. We build larger and closer together than ever before

**Vulnerable Roof Covers**
U.S. & Canada only countries that the dominant roof cover is asphalt shingles
Most building materials are not designed to resist large hail
IBHS Closed Claims Study 2012: Dallas-Fort Worth Hail Event

Residential Structure Claims by Attribute

- **Roof damage**: 92%
- **Other building components**: 5%
- **Walls**: 1%
- **Windows**: 2%

Adapted from Brown et al. (2015)
IBHS Closed Claims Study 2012: Dallas-Fort Worth Hail Event

Roof Cover Claims

- **Asphalt-Comp. Shingles**: 79%
  - 3-Tab
  - Architectural
- **Metal**: 0.65%
- **Tile**: 0.93%
- **Slate**: 0.2%
- **Other**: 2%
- **Unknown Roof Cover**: 18%

Adapted from Brown et al. (2015)
Do we really understand product performance?
IMPACT RATED ASPHALT SHINGLES

Underwriters Laboratory testing program (UL 2218)
Pass or Fail
Multiple classes
Brand new products
Steel ball bearing
UL 2218 Impact Location Passing Rates:
Architectural, IR Architectural and Premium Architectural Shingles

<table>
<thead>
<tr>
<th>Shingle Type</th>
<th>Class 1 Impacts</th>
<th>Class 2 Impacts</th>
<th>Class 3 Impacts</th>
<th>Class 4 Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>architectural</td>
<td>55%</td>
<td>42%</td>
<td>41%</td>
<td>35%</td>
</tr>
<tr>
<td>IR architectural</td>
<td>71%</td>
<td>77%</td>
<td>60%</td>
<td>35%</td>
</tr>
<tr>
<td>premium architectural</td>
<td>60%</td>
<td>43%</td>
<td>38%</td>
<td>35%</td>
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</table>
## UL 2218

<table>
<thead>
<tr>
<th><strong>PROS</strong></th>
<th><strong>CONS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeatable</td>
<td>Physics is wrong = wrong damage mode</td>
</tr>
<tr>
<td>Simple setup</td>
<td>Kinetic energies too high</td>
</tr>
<tr>
<td>Fast execution</td>
<td>Evaluation of back of shingle</td>
</tr>
<tr>
<td></td>
<td>Pass/fail</td>
</tr>
<tr>
<td></td>
<td>Product differentiation?</td>
</tr>
</tbody>
</table>

*“Epic fail”*

*“Not so bad”*
Most impact testing standards trace their roots to work from the 1930’s

Standards and old science...
Road to the IBHS Hail Impact Test Standard

Foundational Research to Operational Testing to Product Development to Changing the Marketplace

Evaluate existing test standards
UL 2218
FM 4473
Damage assessment

Field measurements
Determine what properties of hail must be replicated in the lab.

Manufacturing laboratory hail
R&D to develop lab hail system, matching properties of real hail measured in the field

New testing protocol
New testing standard
Machine-vision, objective damage assessment
Product scorecard
Most current science
Objective damage classification
2 inch manufactured hailstones
IR SHINGLE COST SURVEY

GOOD & EXCELLENT PERFORMERS OKLAHOMA CITY COST PER ROOFING SQUARE

Average Non-IR cost per square $93
HOW CAN WE REDUCE ROOF DAMAGE?

- Better performing shingles both new & aged
- IBHS Good & Excellent performers all polymer modified asphalt products
- Alternative roof covers
- Emerging technologies
Composite Shingle Impact Test
Other building attributes
Shake siding
(could be concrete fiber board, wood, composite)

Vinyl siding
Mission Critical Steps to Bend Down the Hail Loss Curve

**Knowledge**
Understanding characteristics of Hailstorms, regional variances, climate change

**Improving Building Material Testing**
Testing **MUST** be representative of the hazard, evolve as science improves, and have real-world predictive performance.

**Awareness & Socio-Economic Factors**
Provide cost-effective solutions and choices. Reduce fraud. What are the nudges to get people to act and protect their home?

**Can building codes lean in?**
Fort Collins, Colorado recently codified a requirement that all new roofs use impact-rated products.

**Right materials, right place, at the right price!**
Ultimately we must build to deal with the hazards that we face. This is the only way to avoid the damage, disruption, & financial loss that comes with severe weather.