

Asphalt Shingle Wind and Hail Damage

Presented by

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Presenter Bio: Rick Abbott

- Born and raised in Minnesota (Snow, Ice, Lakes)
- BS Civil Engineering – University of MN 1989
- Masters of Engineering (Civil) – Cornell 1990
- 26 years of engineering experience
 - 1 year with construction material testing
 - 1 year masters program
 - 19 years structural design
 - 5 years forensic structural engineer
- Licensed PE in 9 states
- Licensed SE California
- President of Abbott Consulting
- Working 5 state area of MN, IA, WI, ND, SD



Asphalt Shingles - Agenda

8 Examples

Lesson 1 - Introduction

Define the problem
Load and Resistance Design,
Function and Form Discussion

Lesson 2 - HAIL - Resistance of the Shingle

Shingle Anatomy, Threshold Hail, Deterioration

Lesson 3 - HAIL - Variables

Energy, Hail Size, Hail Speed, Cross Winds, Weather Data

Lesson 4 - HAIL - Impact Effect

Hail Damage Defined, Collateral Evidence
Mimicking Effect that are not Hail, Proper Hail Study

Lesson 5 - WIND - Resistance of Shingles

Fastening requirements, High Nailing, Deterioration, Sealed or unsealed shingles

Lesson 6 - WIND - Variables

Weather Data, Wind Speeds, Wind Pressure / Velocity

Lesson 7 - WIND - Effect on a Shingles

Wind Damage Defined



Questions?

As we go



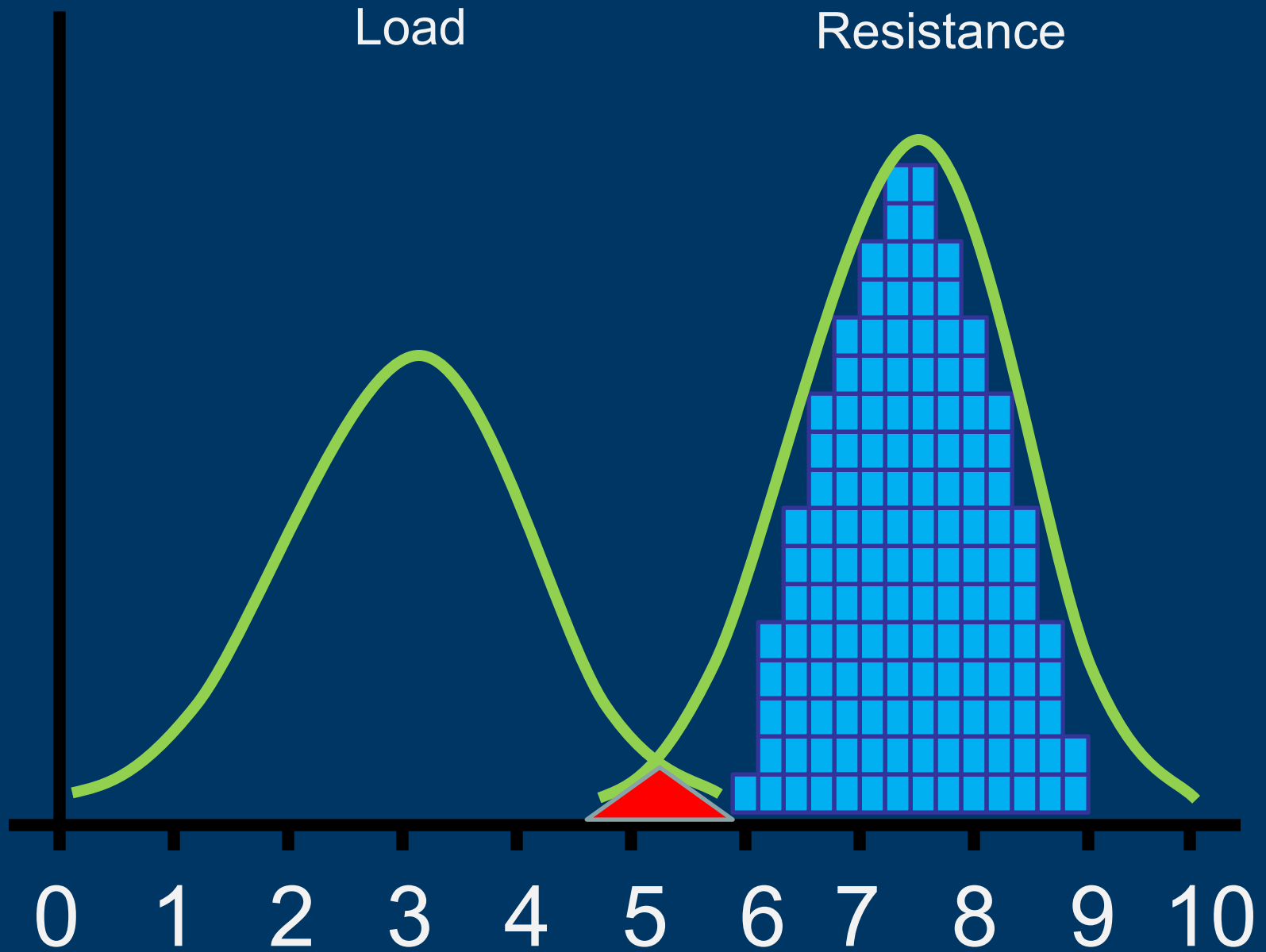
Lesson 1 – Defining the Problem

- Hail causes nearly one billion dollars (U.S.) in damage to property and crops each year.
- The costliest hail storm was in 2001 in U.S. history causing \$2 billion in damage.
- The largest hailstone ever recovered in the United States was a 8-inch diameter chunk of ice. (2010)
- There were 5,411 major hail storms in 2015

National Oceanic Atmospheric Administration (NOAA)



Lesson 1 - Define the Problem



Load

Resistance

Hail Event

Roof Shingles

Physics of Hail
&
Hail at the site

Function
(Was it working)
Form
(How did it look)

What was the Effect?
Was it damage?



What is the Life Expectancy of a Shingle

Shingle Warranty Average Life Expectancy

20 years

25 years

30 years

40 years

Example 1 – Granule Loss



Example 1 – New Roof



Example 2 – Mild Deterioration



Example 3 – Advanced Deterioration



Example 4 – Dead Roof



Function (Was it working)



Form (How did it look)

New Aged Old Dead



Small

1.0

1.68

Big



New Aged Old Dead



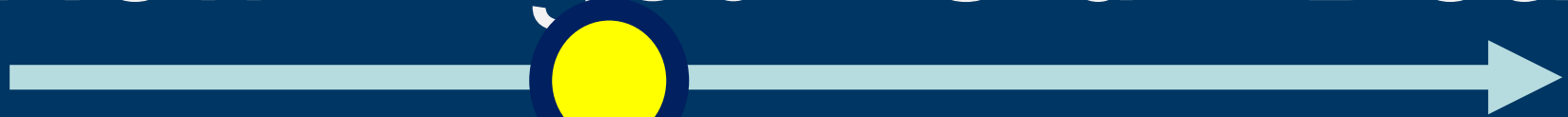
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New Aged Old Dead



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1.68

Big

Damage

What is damage?

Do I get to define what damage is?

Damage should not be some
mysterious definition?

Is the roof damaged or
not?

Is the roof damaged by
wind or hail?



dam·age

/'damij/

noun

1. physical harm caused to something in such a way as to impair (lessen, weaken, reduce, diminish) its value, usefulness, or normal function.

What's my Point?

- Both Function and Form need to be evaluated (pre-existing conditions must be considered when evaluating systems that deteriorate over time)
- A roof has a gradient from new to DEAD.
- A storm event has a gradient from mild to severe.
- There is a Load Side & Resistance Side to the problem of evaluating roofs for damage.

Lesson 2: Resistance of a Shingle



Lesson 3: Load Side – Impact Force of Hail



Lesson 4: The Effect

