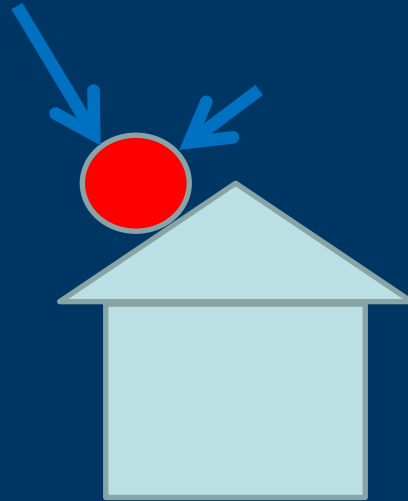


Lesson 4 – The Effect of Hail

Part 3
Load



Part 2
Resistance

Part 4
Effect

- Fractures
- Punctures
- Depressions
- Blemishes (granule loss)
- Splash Marks
- Dents



Flexibility of a Roof Structure

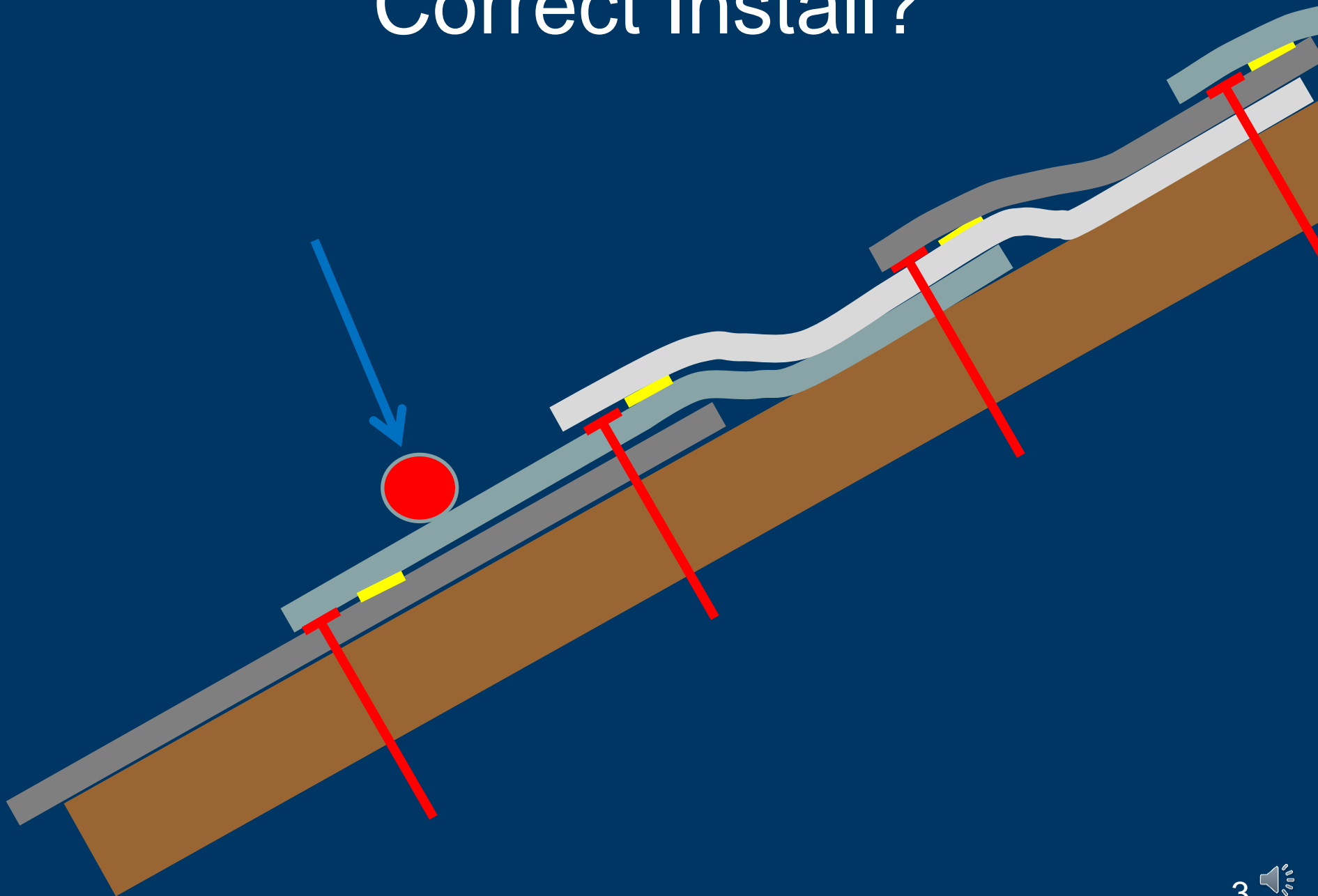
CALL FIREFIGHTERS LIFE NET TRAINING



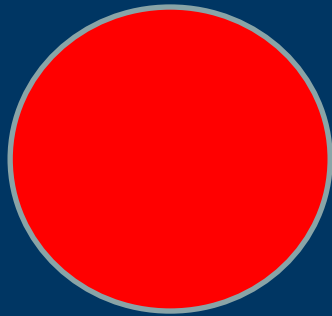
Smash
vs.
Bounce



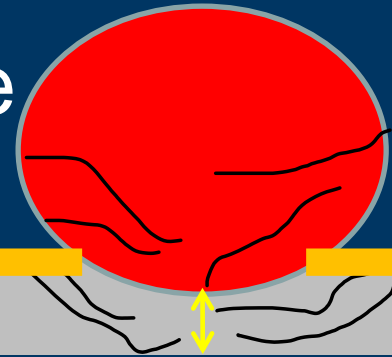
Correct Install?



Kinetic Energy
 $\frac{1}{2} (\text{mass}) (\text{Velocity})^2$



Factures in the Ice
Heat loss of the Ice
Energy absorption
• Shingles
• Deck
• Structure
Sound



Spring Energy
• Shingles
• Deck
• Structure



Shingle Resistance

- The shingles resistance to impact damage is not it's ability to absorb energy
- Absorbing energy would be damage
- The shingles resistance to impact damage is it's ability to transfer compressive stresses through the shingle
- Flexible materials work better than brittle materials in transferring load.



Three **Effects** of Hail Impact

- A **fracture or puncture** of the shingle's fiberglass or organic mat, identified by a deflection (bruise) through the entire thickness of the shingle.
- A **mark of granule displacement**, causing exposure of the asphalt layer of the shingle, but without mat fracture.
- **Both** Fractured mat as well as displaced the granules

Defining Hail **Damage**

- Hail impact that resulted in reduced water shedding capability of the roof.

FUNCTION

- Hail impact that has resulted in a visual undesirable appearance.

FORM - VALUE

- Hail impact that resulted in a reduction in the remaining service life of the roof.

FUNCTION - VALUE



Granule Loss

- Granule loss interpretation is important to consider when assessing roofs suspected of light hail damage.
- Granules are there for a reason. Granules protect the asphalt from UV light.
- **“Hitchhiker Granules”** are granules that are not attached very well from the start. It has been estimated that approximately 20% of total granules on new shingles are hitchhikers.
- **Granules naturally fall** off from a shingle as they age.

Hail Impact **Characteristics**

- **Random (size and location)**
- **Usually directional**
- **Typically leaves markings on various materials (spatter marks)**
- **Generally round**
- **May leave smooth indentations on some metals**

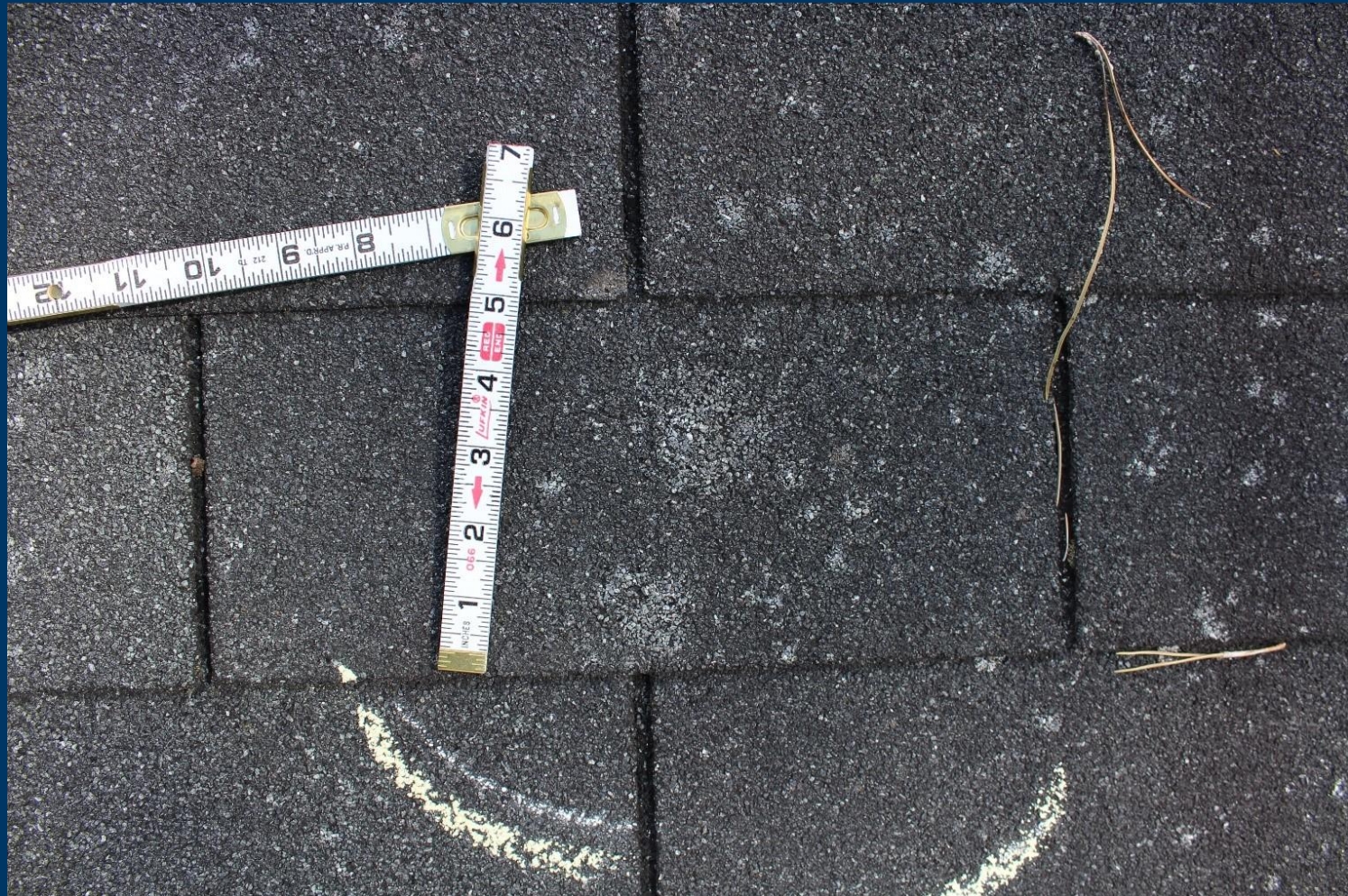
Example 5: Hail Damage – Is it from hail?

- ✓ **Random in size**
- ✓ **Random in location**



Example 5: Hail Damage – Is it from hail?

✓ **Generally round**



Example 5: Hail Damage – Is it from hail?

- ✓ **Directional – more pronounce on certain slopes**
- ✓ **Spatter marks on other materials**
- ✓ **Indentations on soft metals**
- ✓ **Weather Data**

From Hail

Example 5: Hail Damage – Is it hail damage?

✓ Hail impact that has resulted in a visual undesirable appearance.

Hail Damage

Collateral Indicators



Collateral Indicators



Look for damage to soft metal surfaces – vents, ridge caps, etc.





Look for damage to soft
metal surfaces
vents, downspouts



Counterfeit Hail Damage



Organic Mat Deterioration



Counterfeit Hail Damage

Animal Damage:

occurs along the edges of the shingles
animals look for food
jagged edges

Man-made defects: scuffs, gouges, scrapes.

Moss and Lichen

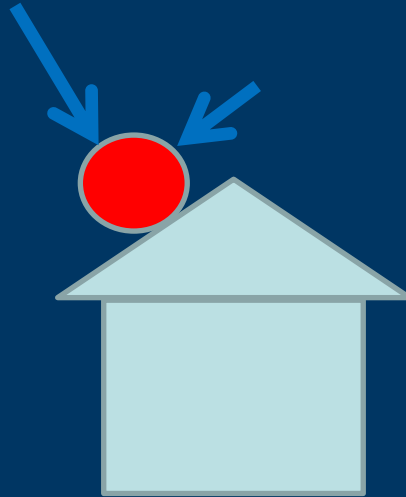
Proper Hail Study

1. Review weather data to estimate size of hail.
2. Interview eye witnesses.
3. Look for hail impact effects to gutters, windows, downspouts, air conditioning equipment, siding, garage doors, exterior lighting etc....
4. Study the roof for its ability to resist hail; evaluate its condition, age, and identify all defects or other sources of damage that is present.
5. Inspect the roof surfaces for blemishes. Evaluate if they are consistent with hail. Rule out other forms of damage and deterioration.

Summary

Load

- Size
- Speed
- Wind Direction
- Density of Ice
- Temperature of Air
- Angle with Roof
- Weather Data



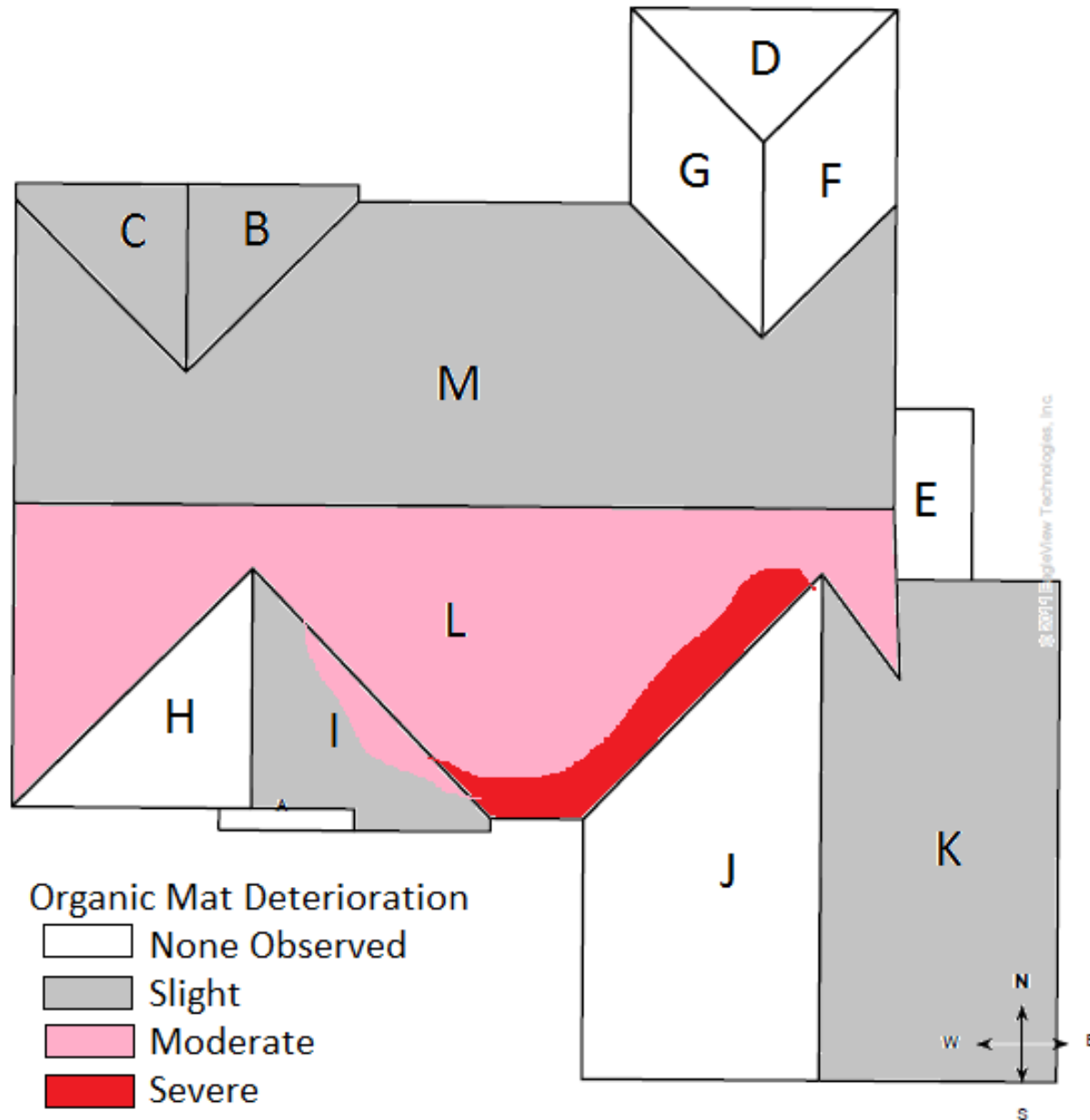
Resistance

- Condition of Roof
- Type of Roof
- Age of Roof
- Structure Behind
- Are there 2 layers?
- Flexibility of Str.

Effect

- Fractures
- Punctures
- Depressions
- Blemishes
- Splash Marks
- Dents
- Loud Sound

Hail Damage Study on a Deteriorated Roof





Early Stage
(Slight Deterioration)

Middle Stage
(Moderate Deterioration)

Advanced Stage
(Severe Deterioration)

Integrity to resist hail impacts

Some, but the top layer is delaminating making it easier to flake. The shingle is more brittle.

Little to no resistance to impact. Granules easily flake off with the slightest effort.

None

Criteria used for "Hail Damage

Treat similar to a new roof.

Depression of the mat, along with mat fracture.

None. Hail cannot damage a shingle that has no integrity

