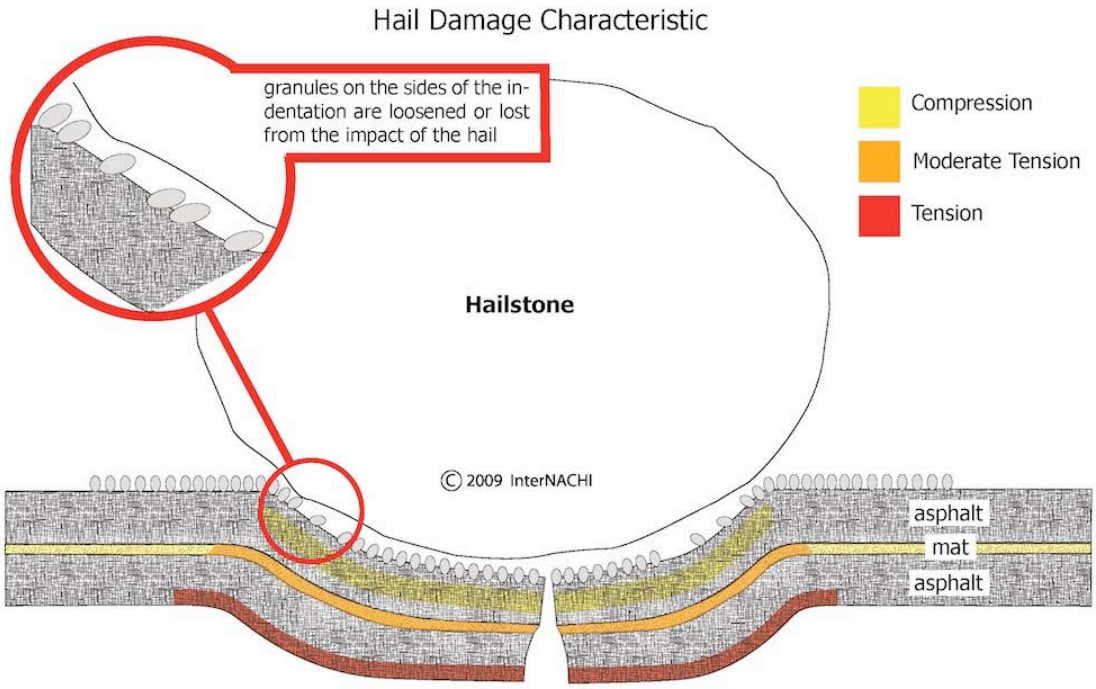


InterNACHI

"Wind and Hail Property Damage Inspection" online training video course

Student Book

www.nachi.org/wind-hail-property-damage-inspection-online-course

Talk Outline

- *Definition of Hail Damage*
- *Asphalt Shingles*
- *Wood Shingles and Shakes*
- *Slate/Tile Roofing*

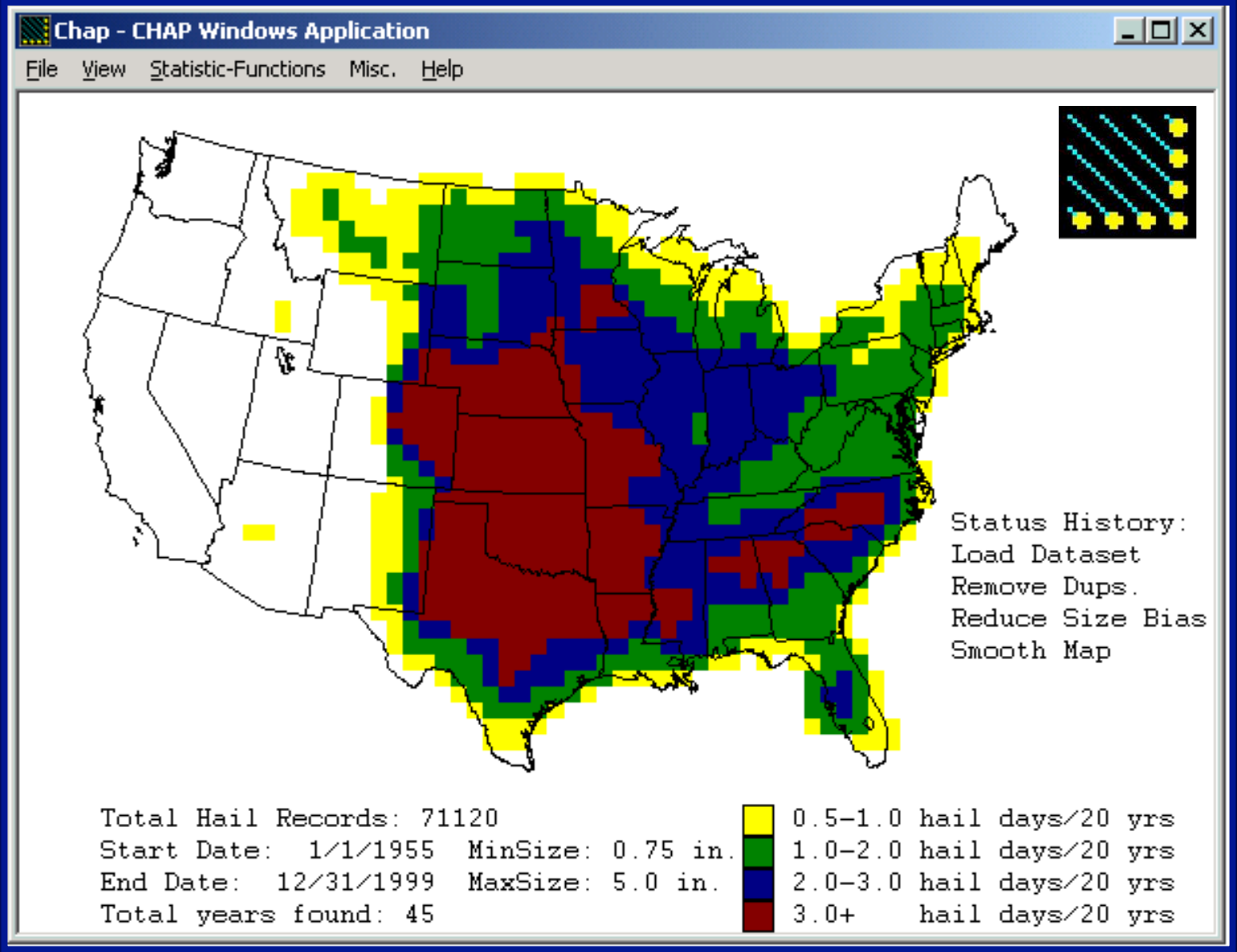
Definition of hail-damage to roofing

FUNCTIONAL DAMAGE

- **Diminution of water shedding ability.**
- **Reduction in expected long term service life.**

COSMETIC ISSUES

- **Appearance change (i.e. color, denting, chipping)**


Chap - CHAP Windows Application
File View Statistic-Functions Misc. Help
Status History:
Load Dataset
Remove Dups.
Reduce Size Bias
Smooth Map
Total Hail Records: 71120
Start Date: 1/1/1955 MinSize: 0.75 in.
End Date: 12/31/1999 MaxSize: 5.0 in.
Total years found: 45
0.5-1.0 hail days/20 yrs
1.0-2.0 hail days/20 yrs
2.0-3.0 hail days/20 yrs
3.0+ hail days/20 yrs

Important aspects of hail–

1. Size

Important aspects of hail–

2. Shape

Important aspects of hail–

3. Hardness

Important aspects of hail–

4. Fall pattern

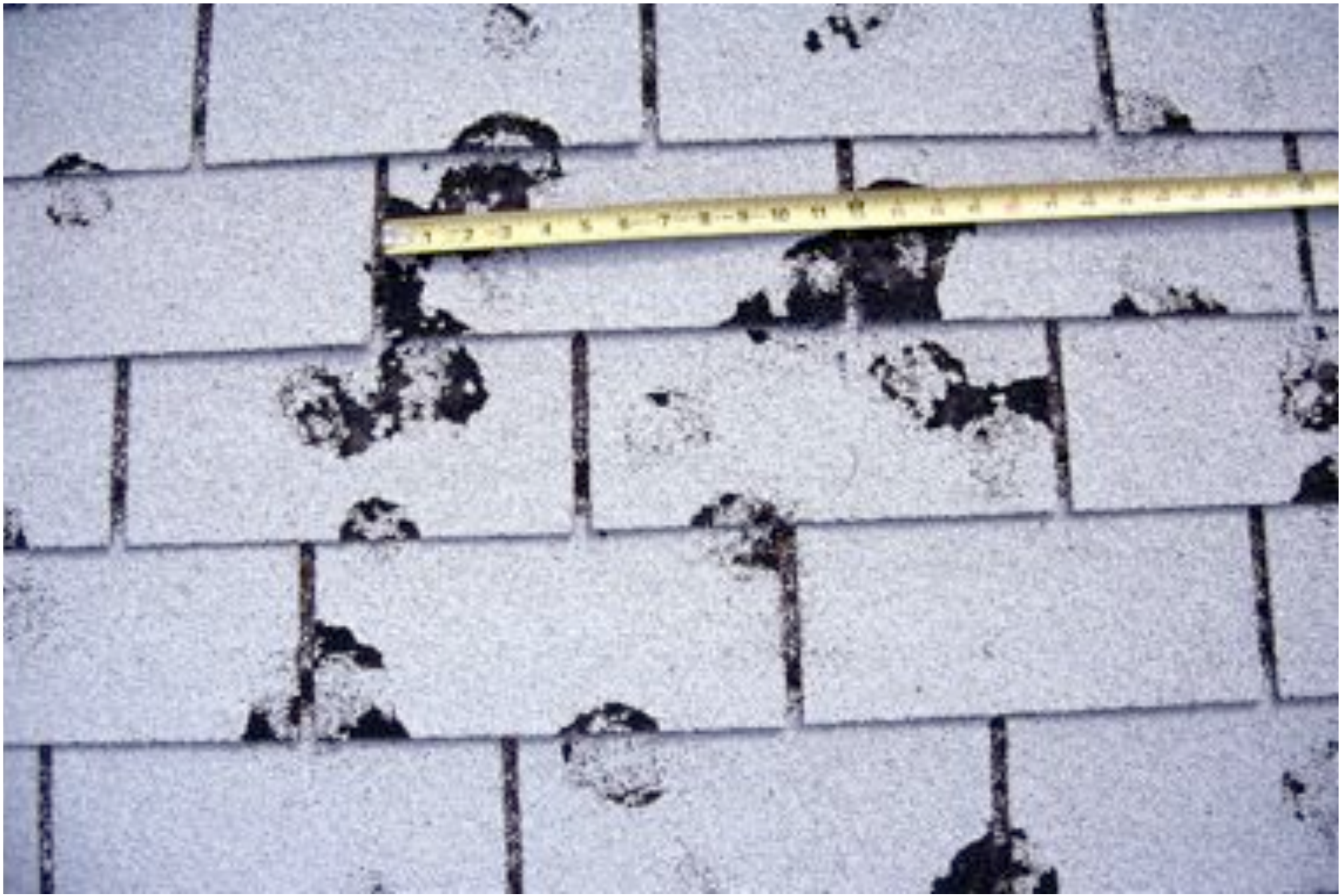
Directionality– spatter marks


Asphalt Shingles

Hail Damage to Asphalt shingles

- A bruise or fracture in the mat that feels soft like that of an apple bruise.
- A puncture in the shingle.
- Breakage of the shingle edge greater than ½ inch extending into the shingle.

Hail Damage



April 5, 2003 DFW Hailstorm Damage

April 5, 2003 DFW Hailstorm Damage

Hail-Caused Bruise

New hail hit on flaking shingles

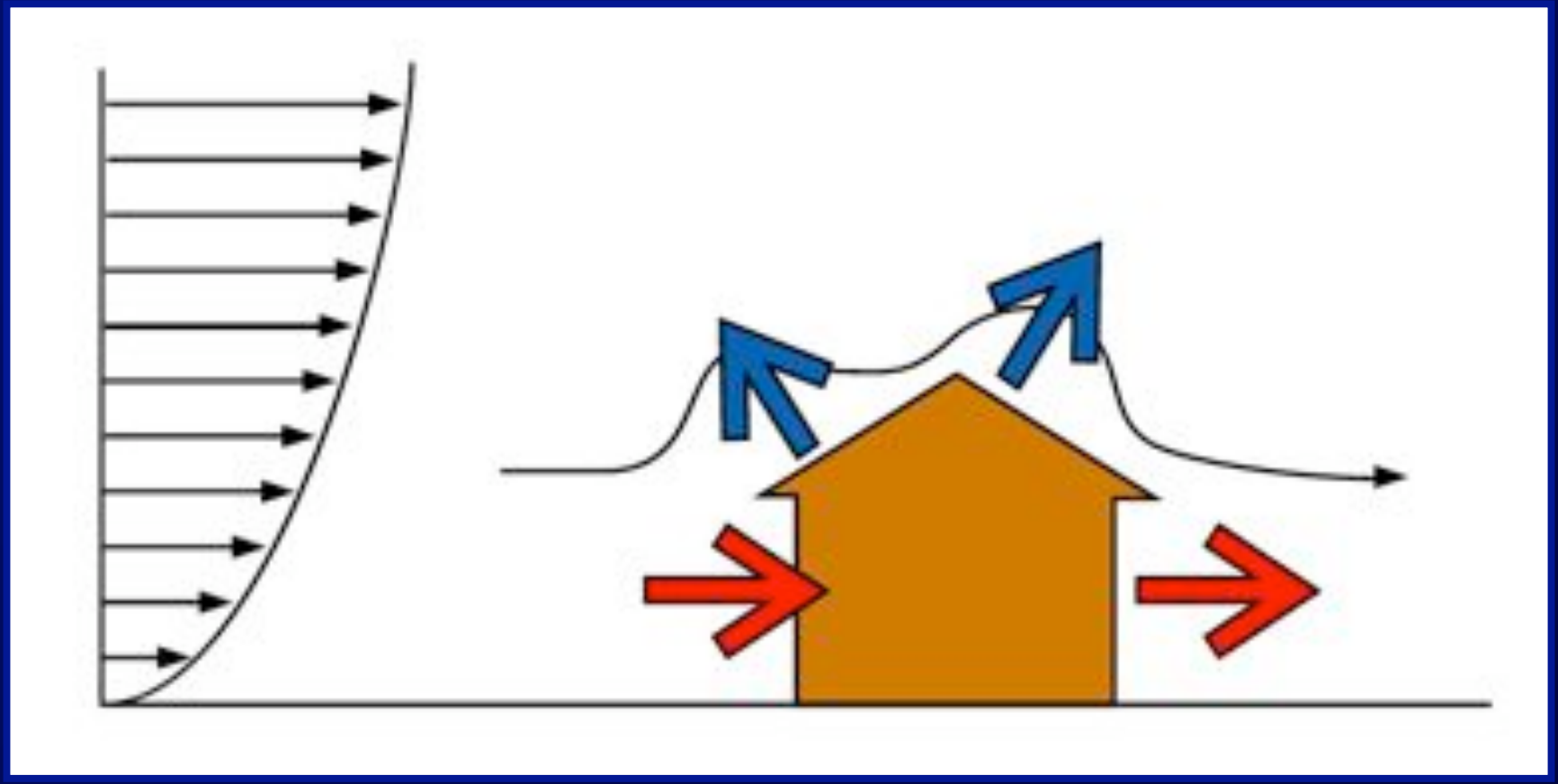
Hail damage to ridge

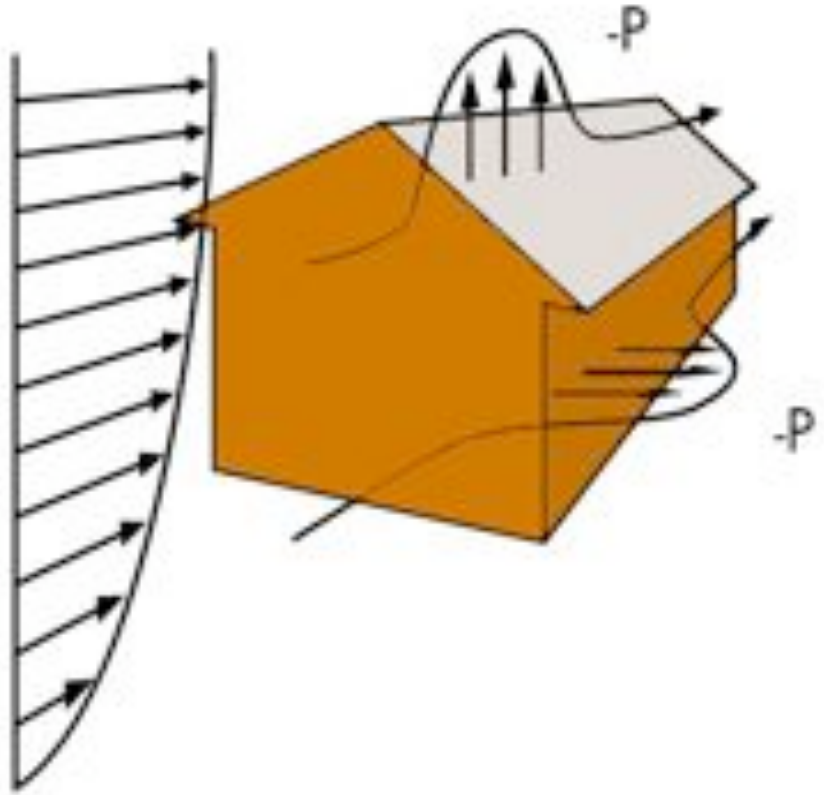
Old hail-caused damage

Wind-caused damage–

- Individual tabs and shingles **torn away**
- Shingle tabs bent upslope and **creased or cracked**
- Impacts by **wind-borne debris**

Wind Effects to Steep Roofs





Aerodynamics of wind around a building

Decking removal at gable end

Wind damage at gable end

Wind damage near ridge

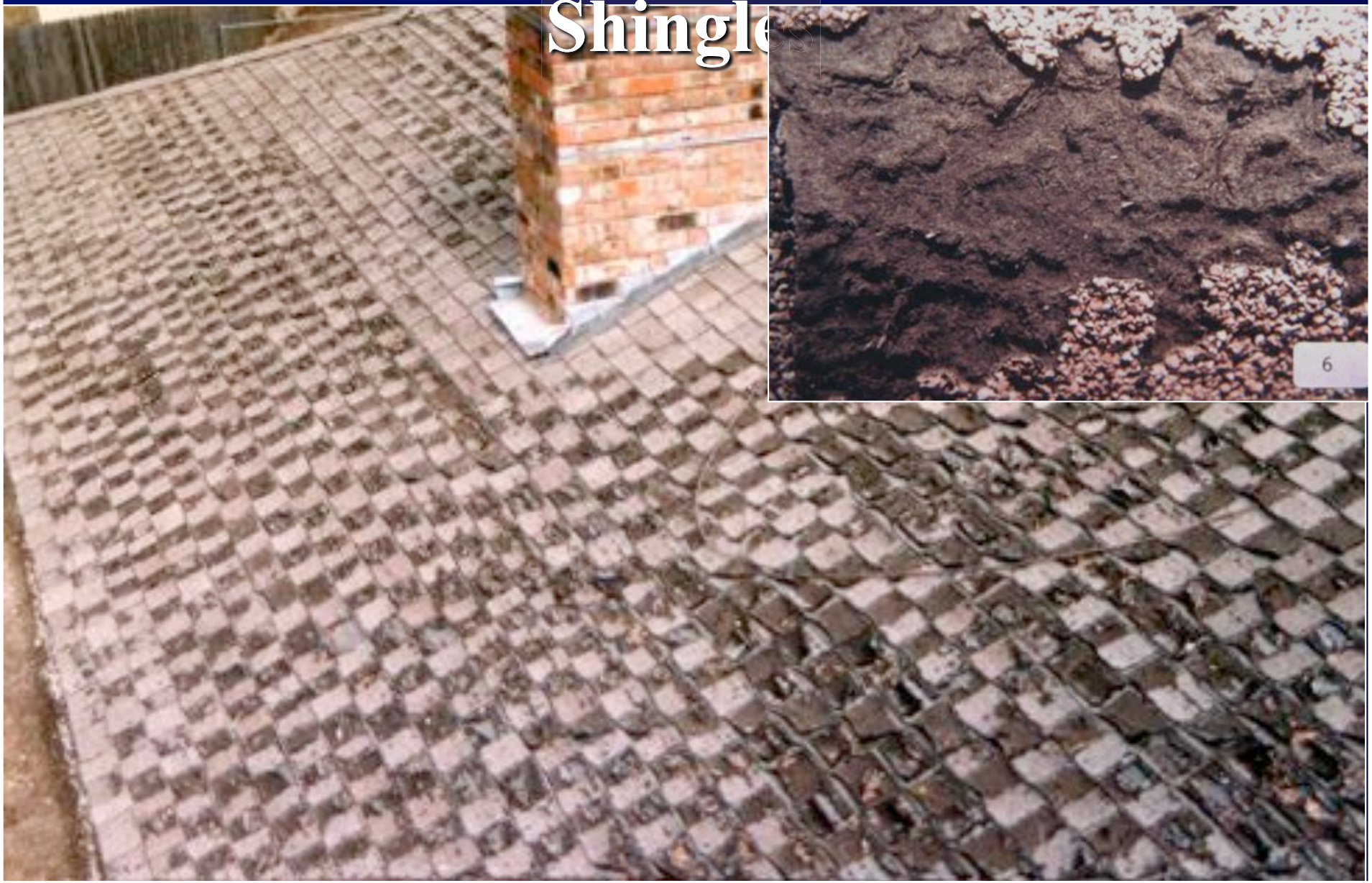
Unbonded tab creased backwards

Leading hail/wind damage myths on asphalt shingle roofs

- Granules lost during the storm shortened the life of the roof.
- Hail/wind caused the shingles to cup or curl.
- Hail/wind loosened or vibrated the fasteners out of the shingles.
- Hail caused or opened the shingles blisters.
- Hail/wind unbonded the shingle adhesive.
- Hail caused algae spots on the shingles.
- Cold hail shocked the shingles.

Shingle Quality Issues

Checker Board on Laminate Shingles



Open blisters – not hail damage

Shingle quality issue

Horizontal cracks from thermal stresses

Diagonal cracks from thermal stresses

Splitting over shingle joints

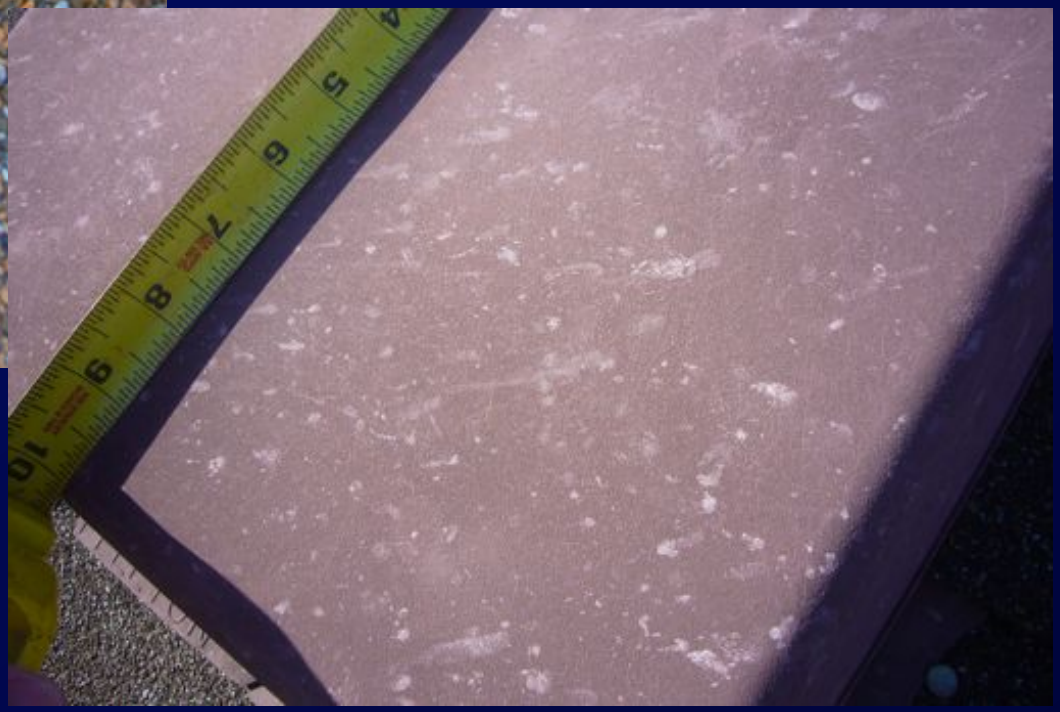
Diagonal split over shingle joint and fractures between sealant

Look at the big picture. Where is the damage?

How do you know this isn't wind?

New Horizon Applique

Does the shingle damage match the collateral damage?



Impacted or never coated?

Classic Horizon - Applique
Look at the big picture

Why not hail?

Is the size of the damage consistent?

Other Non – Wind/Hail Damages

General granule loss – not hail damage

Shingle marring – not hail damage

Shingle marring – foot traffic

Curling

Clawing

Types of Mechanical Damage

- **Intentional – Willful use of tools or objects to inflict damage.**
- **Unintentional- Careless use of tools or objects that inflict damage.**

Intentional Mechanical Damage

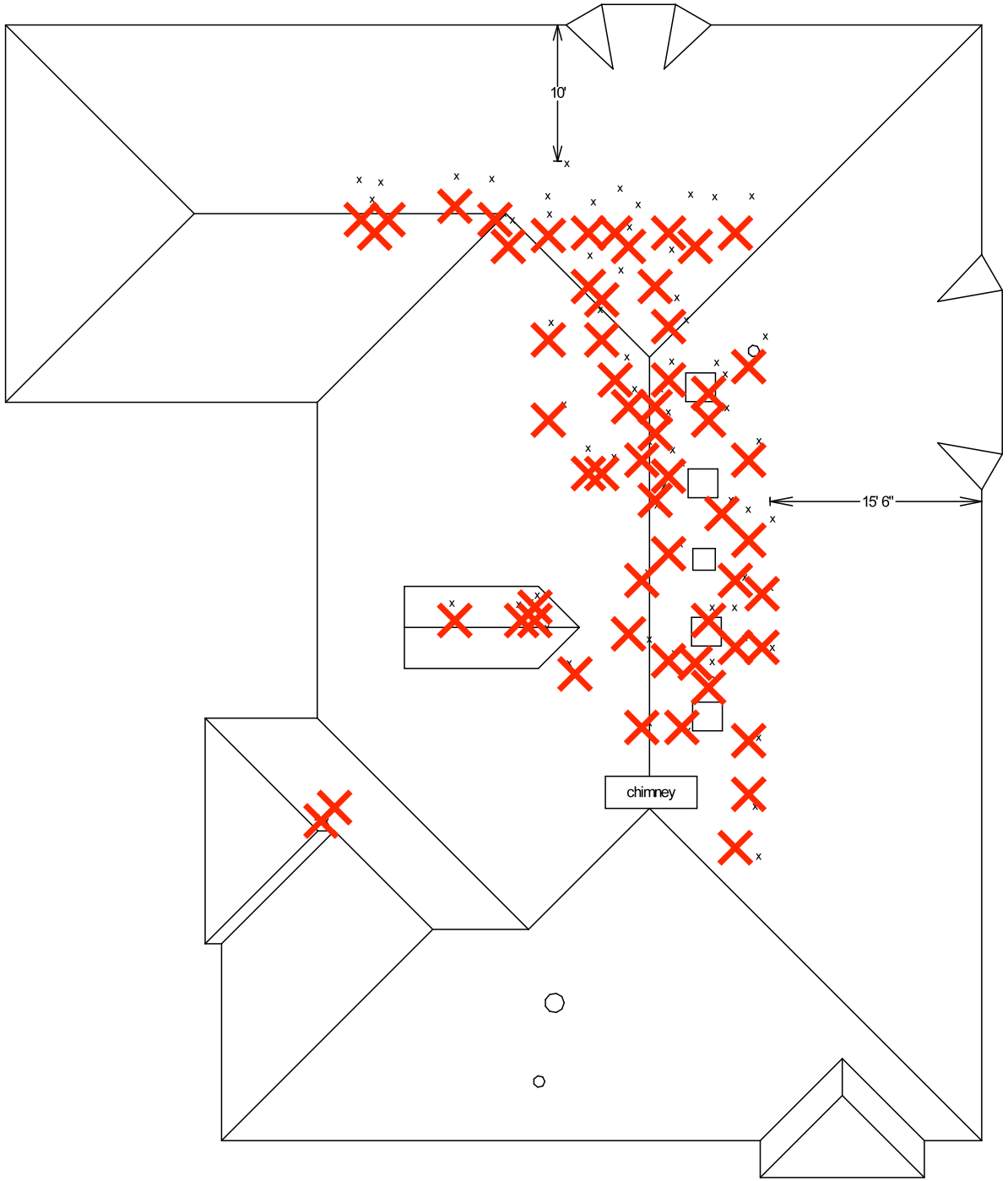
- **Ball peen hammer**
- **Claw or flat peen hammer**
- **Coins**
- **Fingers/thumb – rub or puncture**
- **Screwdriver**
- **Scratch awl**
- **Golfballs or rocks in a sock**

Unintentional Mechanical Damage - Roofs

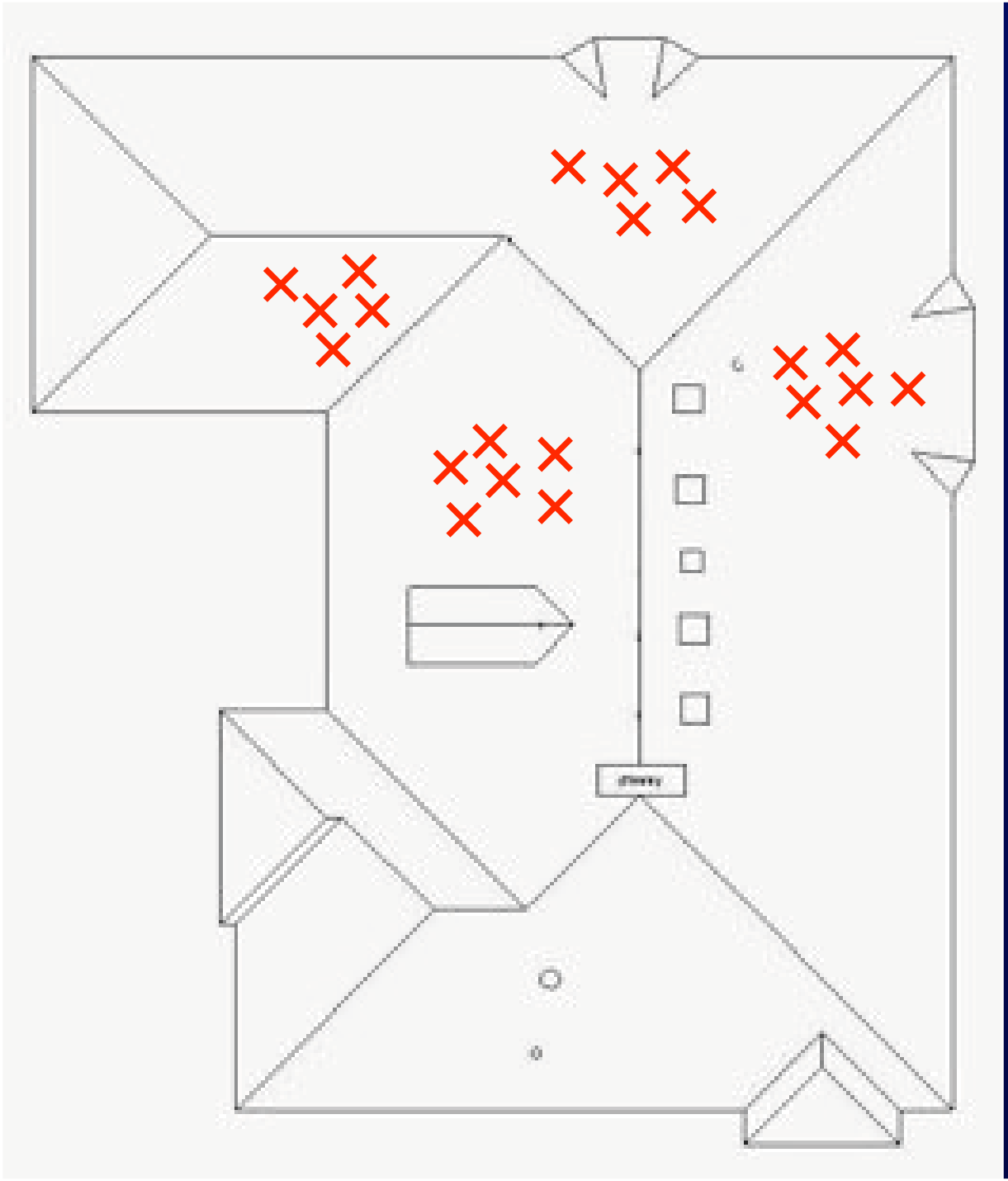
- **Foot traffic – (i.e. Shingle marring)**
- **Knife cuts**
- **Nail holes from toe-boards**
- **Dragging equipment – compressors, carts, shingles, tools, etc.**
- **Errant golfballs (next to golf course)**
- **Shipping/handling**

Intentional Mechanical Damage Characteristics

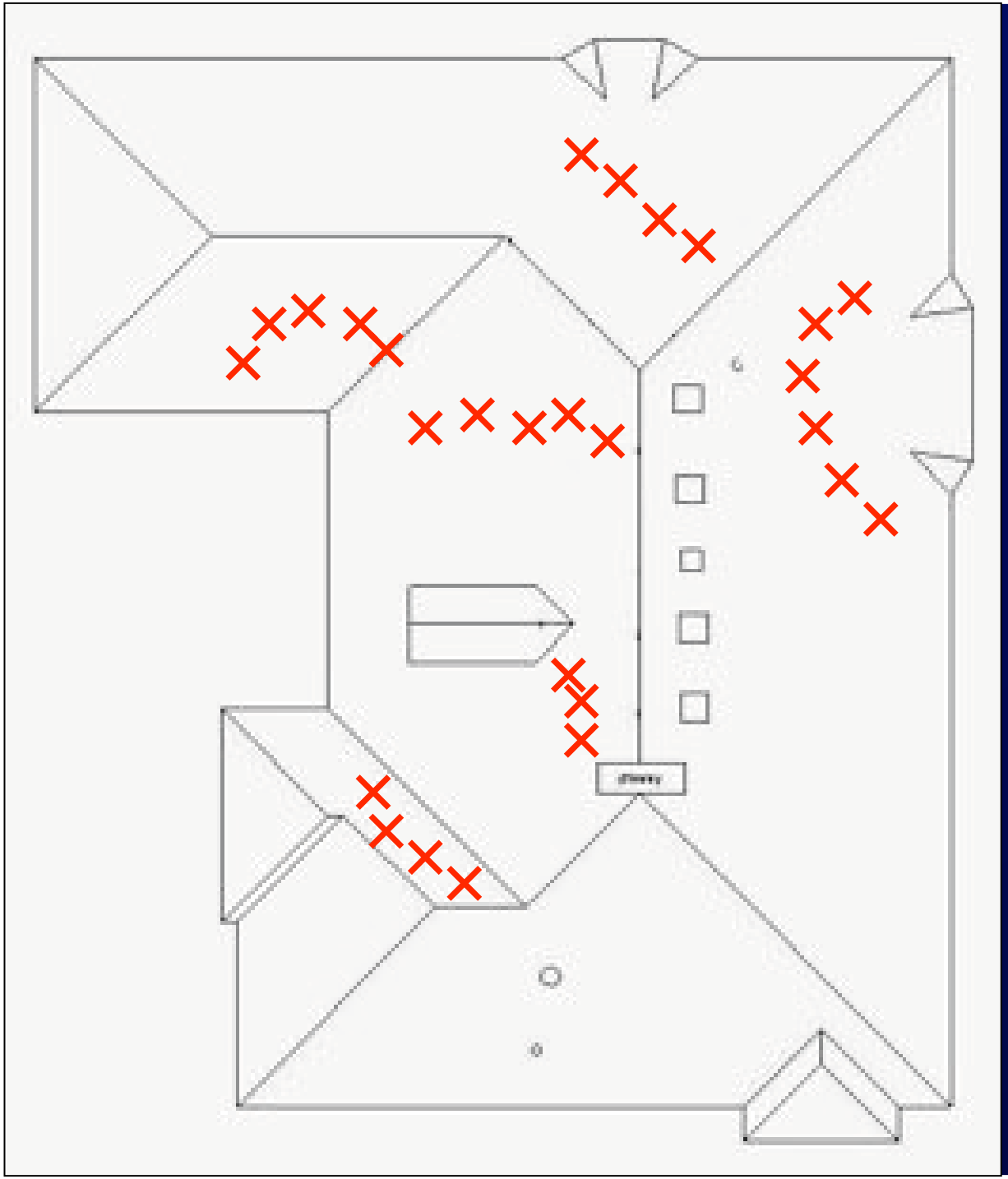
- **Not randomly distributed on the roof (i.e. oriented in lines or groups).**
- **Not randomly distributed on the shingles. (i.e. center of tab preference)**
- **Impacts are similar in size and shape.**
- **Impact marks are limited to areas of easy access.**
- **Impact marks have same impact angles on each slope.**



Marks avoiding roof edges



Marks in a test square pattern



Marks in lines or arcs

Line of marks along ridge

Circular arrangement of marks

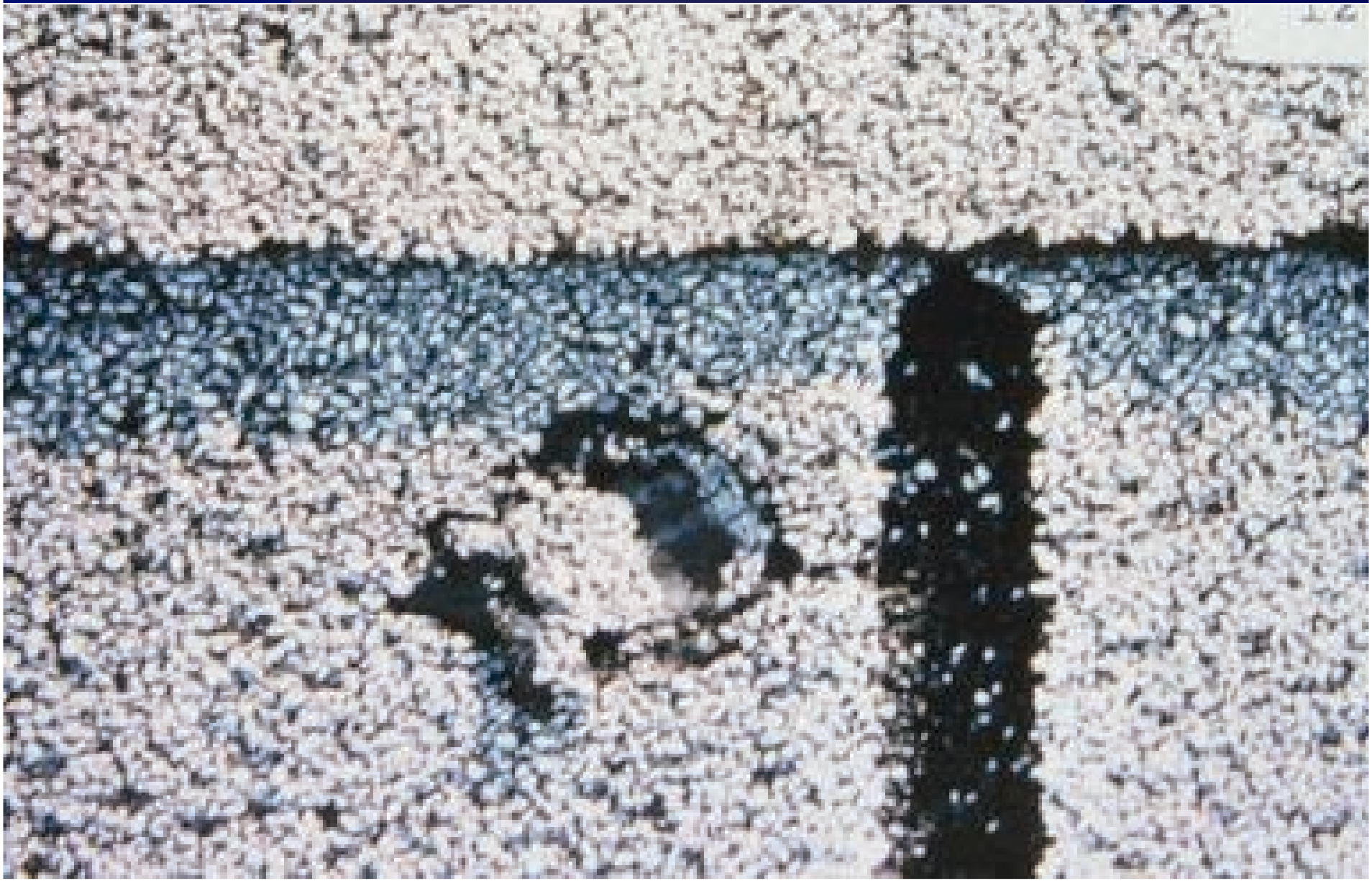
Question mark pattern of marks

The little dipper?

Flat peen hammer impacts

The “frowny” face impact

Claw hammer impact

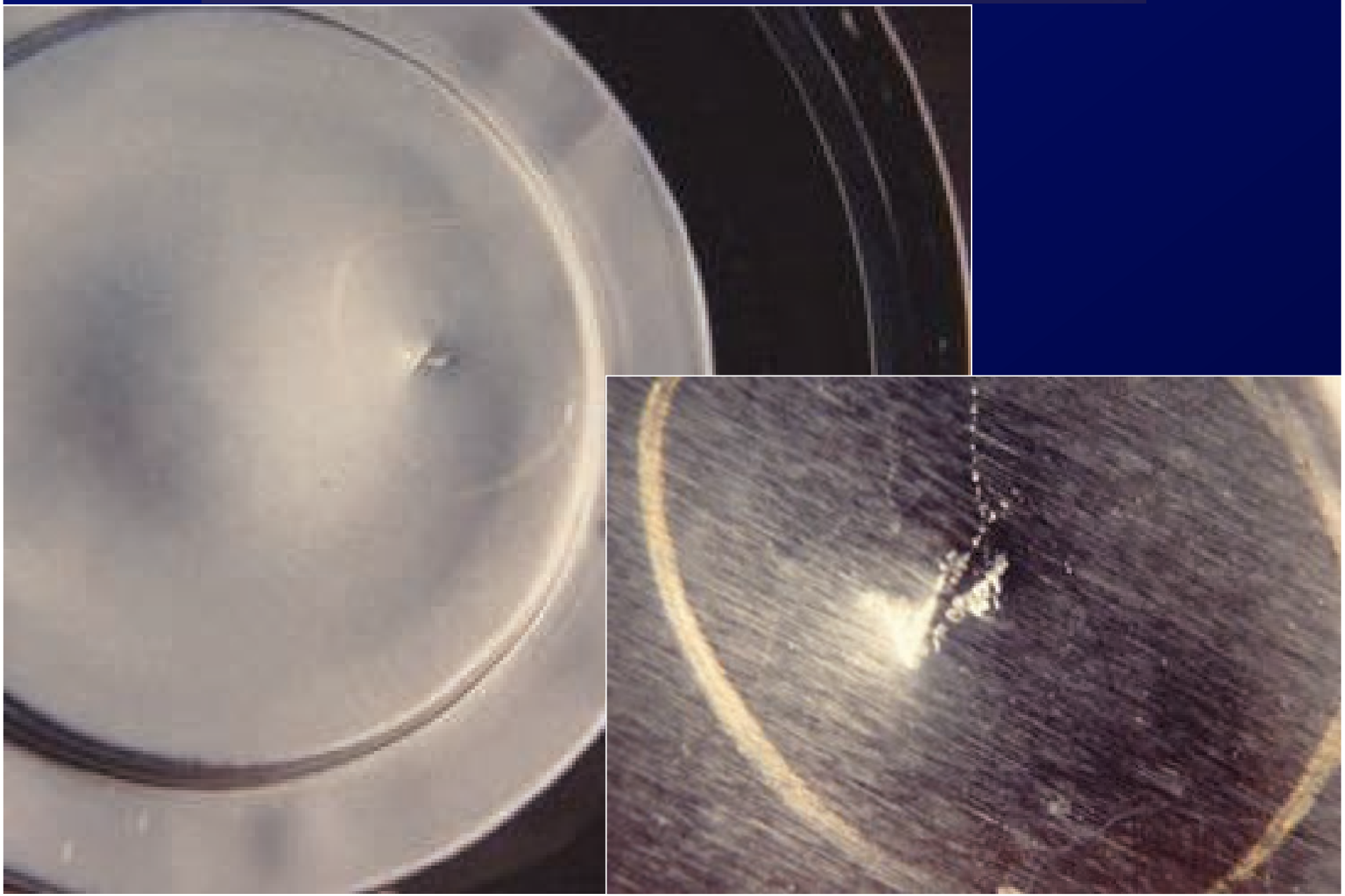


Crushed granules – smeared asphalt

Coin Marks

Key scratching

Screwdriver impact on vent cap



Scalloped edge to vermin tear

Squirrel damage near eave

Wood Shingles and Shakes

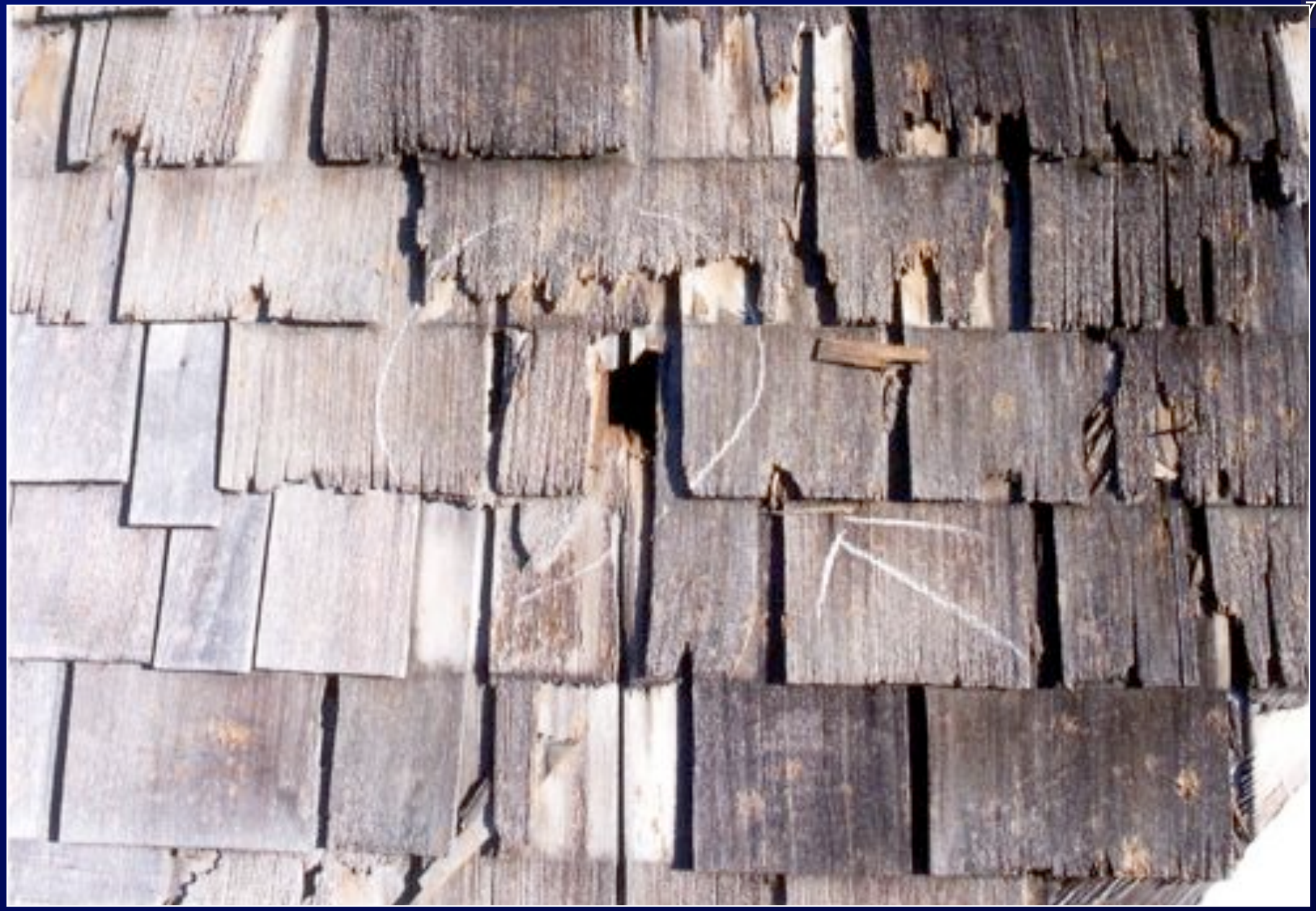
Hail Damage to Wood shingles and Shakes

- An impact-caused fresh split or puncture.
- Breakage of the wood that exposes a fastener.
- Breakage of the wood that shortens the joint sidelaps below 1.5 inches.

Hail impact with fresh split

Hail punctured thin area in shake.

April 5, 2003 DFW Hailstorm



April 5, 2003 DFW Hailstorm

Leading hail damage myths on wood roofs

- Hail-caused dents will cause future damage.
- Hail loosened the fasteners.
- Hail caused internal damage that structurally weakened the wood (fatigue).
- Hail caused eroded openings in wood.
- Hail can split the wood without leaving an impact mark.

Hail-caused dents – not functional damage

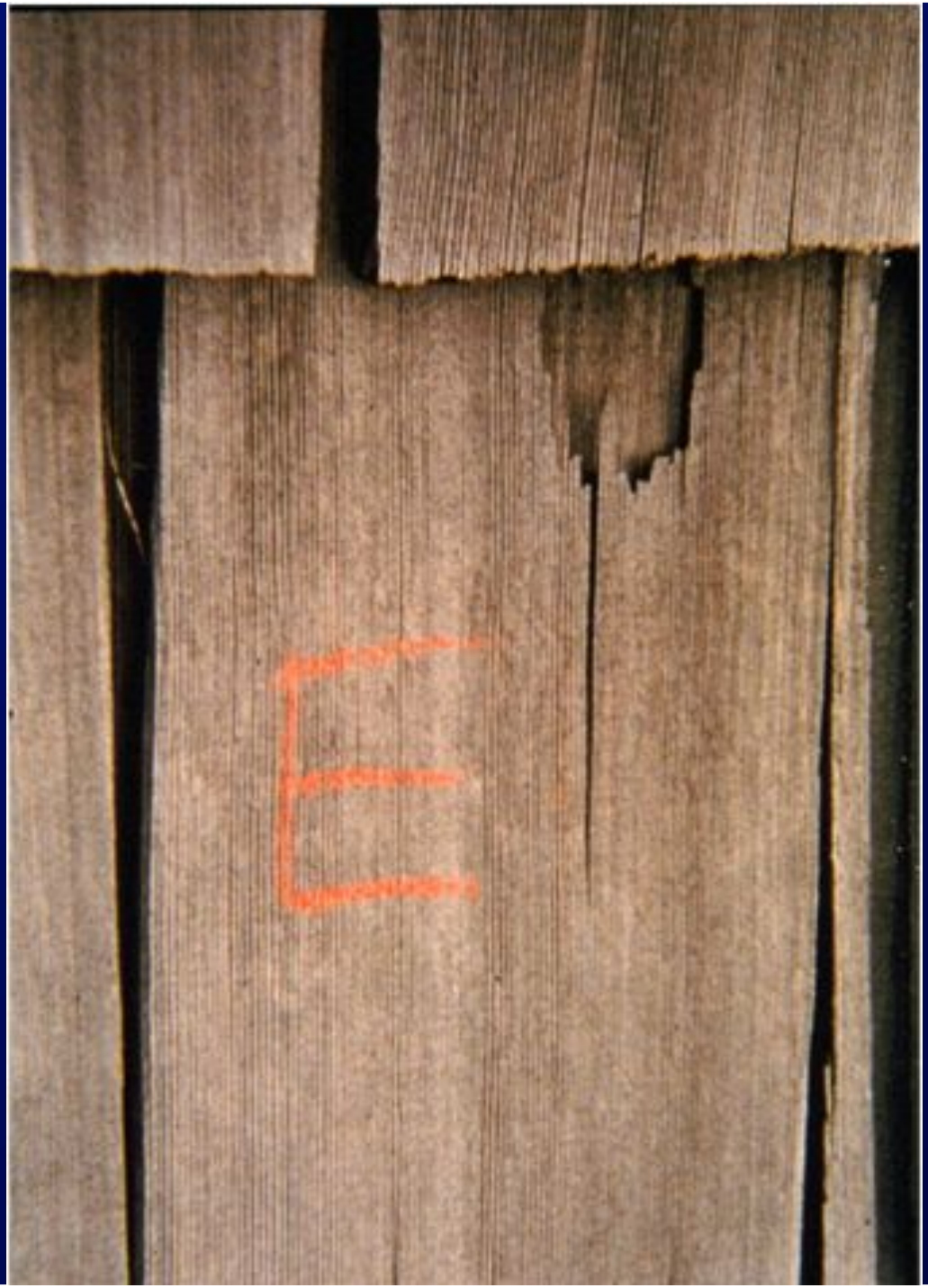
Cupped/curled shakes – not hail/wind.

Knot holes in wood – not hail.

Weathered splits in flatgrain-cut wood.

Weathering-caused split in cedar shake.

Foot-broken shake.

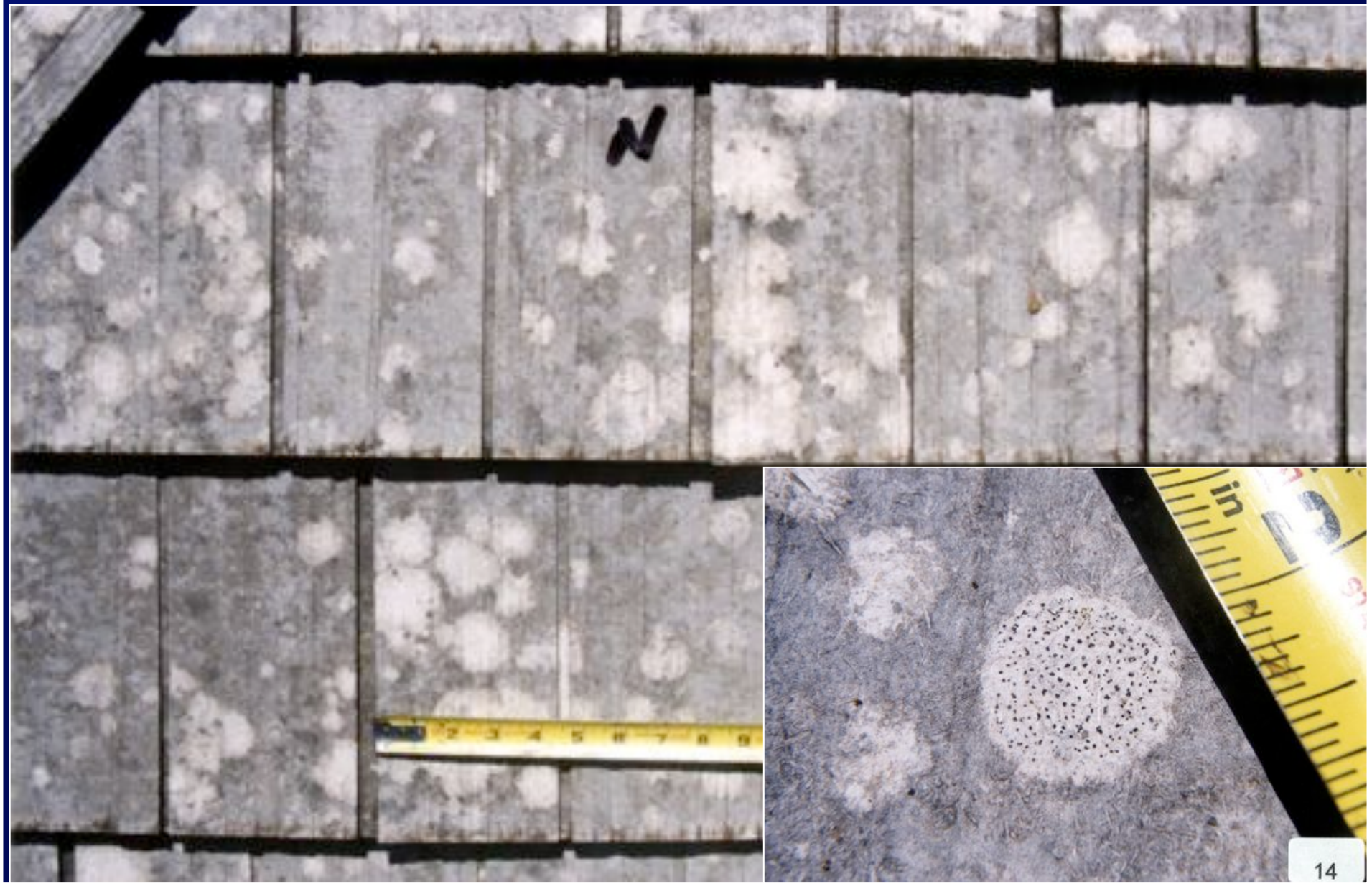


Eroded opening in wood – not hail.

Shoe spike marks in shake surface.

Ball peen impacts on cedar shakes.

Fungus spots on wood-fiber panels - not hail.




Slate and Tile
Roofing

Hail Damage to Slate and Tile Roofs

- Shattering of tile (multiple irregular fractures).
- Star-shaped fracture in tile surface.
- Half-moon shaped fracture in overlap.
- Pitting or puncturing – old slates.

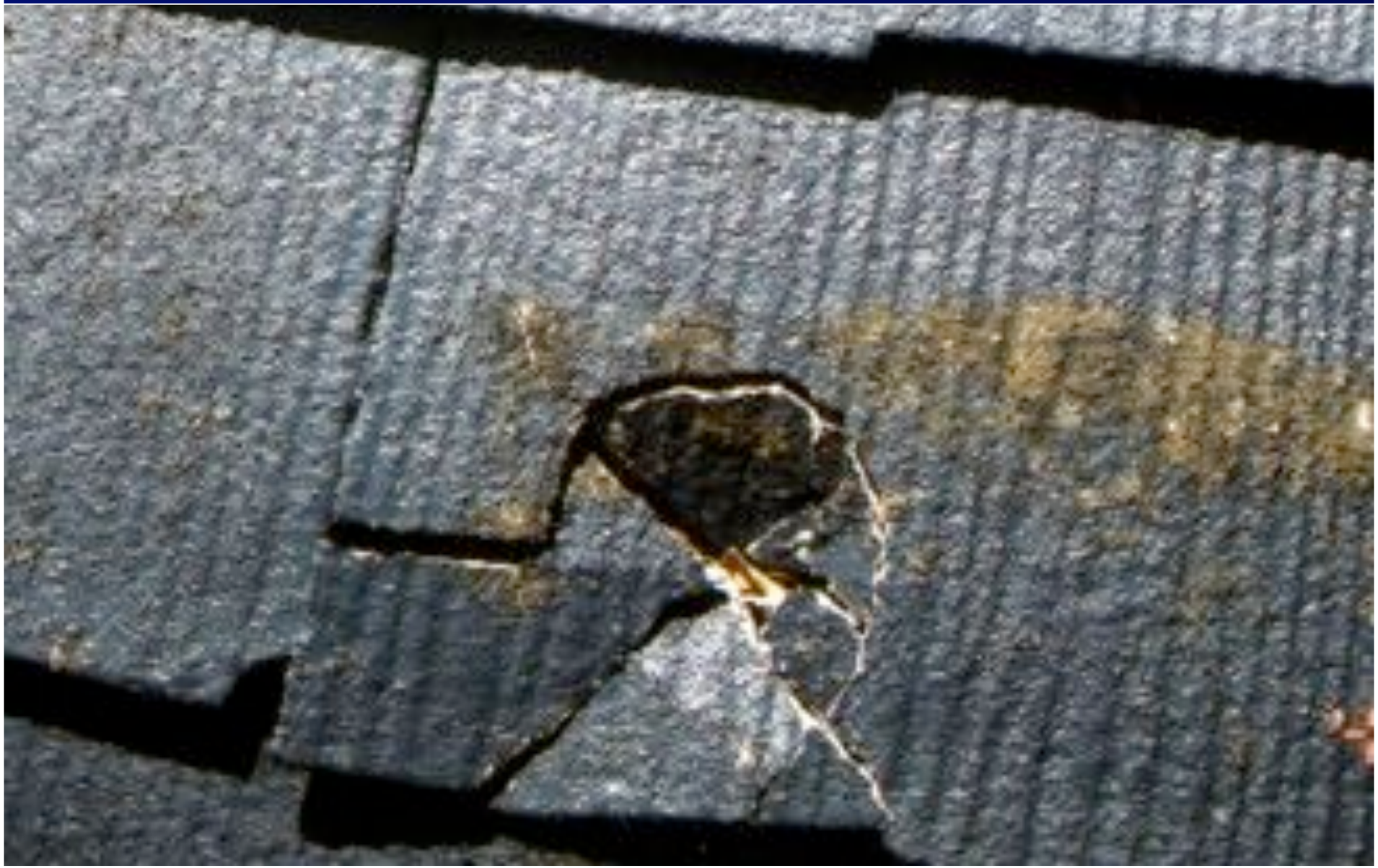
Hail damage to slate roofing

Broken & punctured slates

Hail damage to clay tile.

Hail damage to fiber-cement tile

Hail damage to asbestos-cement tile



Hail damage to concrete tile

Concrete tile broken by large hailstone

Leading hail damage myths on tile roofs

- Hail pressed down on the tiles causing the mortar patties to press into and crack the asphalt underlayment.
- Hail caused micro-fractures in the tile.
- Hail chipped or pitted the tile (freeze-thaw).
- Hail roughened the surfaces of the tile.
- Hail caused the single, curved right corner cracks.
- Hail serrated the tile edges or chamfered corners.

Foot traffic damage – not hail

Right corner cracks – concrete tile – not hail

Single, right corner cracks in concrete tiles – not hail.

Hairline crack in corner piece visible when wetted

Repair Cost Calculations for Wind/Hail Damage

Test Areas (Squares)

- One per directional slope (100 sq. ft.)
- Away from overhanging trees
- Away from foot traffic zones

Estimating Cost of Hail-Damage Repairs

Repair Cost = D x U x R x A

- **D**= Damage (hail-caused damage/square)
- **U**= Unit repair cost (typically $5-10/shingle reflecting local costs, roof slope, stories)
- **R**= Repair factor, a measure of how difficult it would be to repair the roof

  1.0=good condition

  1.5=fair condition

  2.0=poor condition

- **A**= Area (squares)

Possible additional costs:

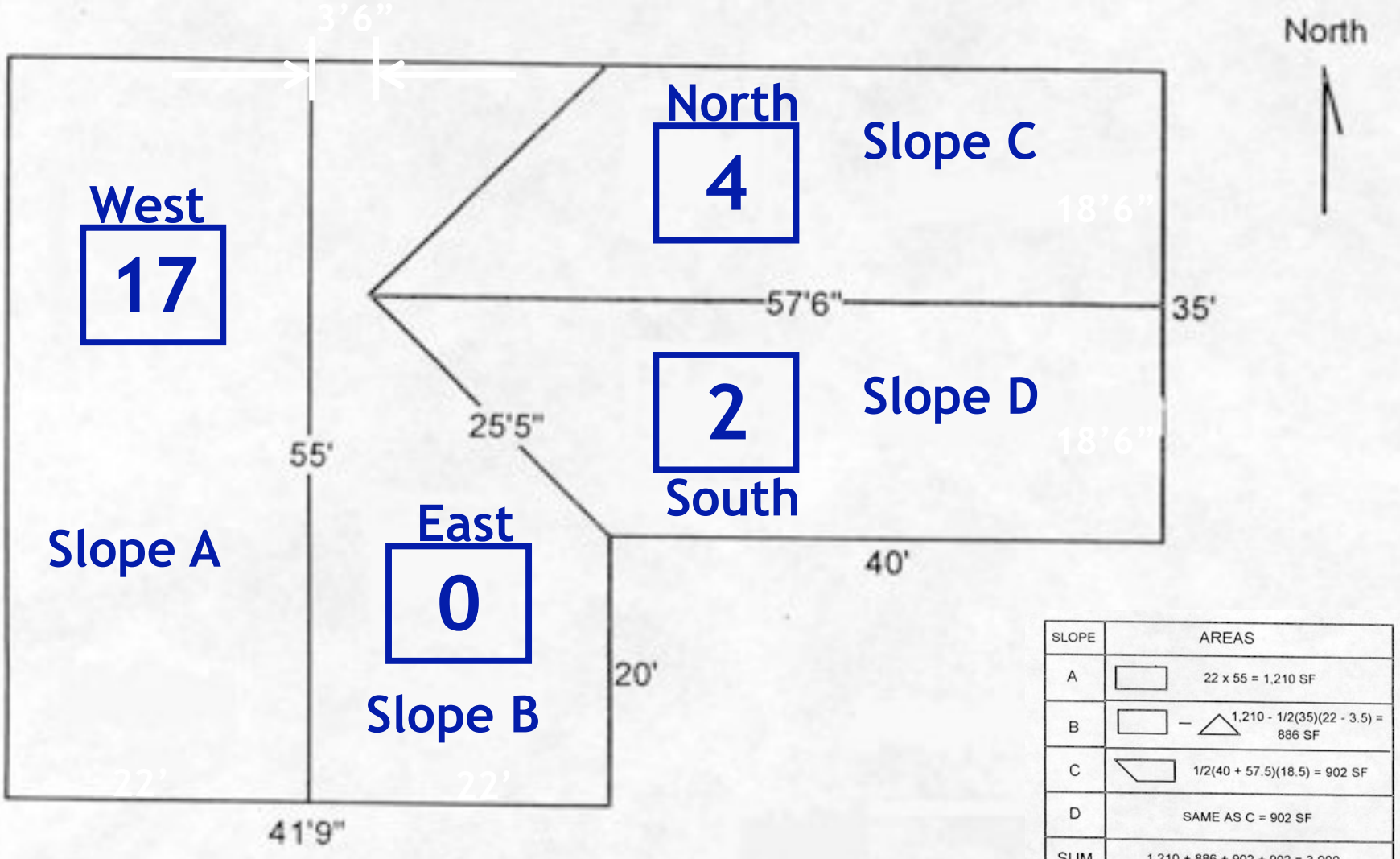
1. Ridge/valley damage
2. Steep charge
3. Two-story charge
4. Appurtenances
5. Slope replacement tie-ins
6. Wind-caused damage
7. Foot-caused damage???

The Bottom Line:

- Compare the cost of repair with the cost of replacement on a ***slope by slope basis.***

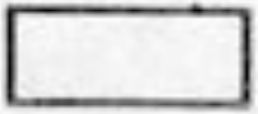
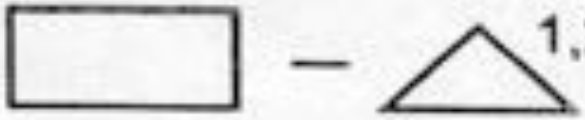
Repair Methods

Example Problem



SLOPE	AREAS
A	22 x 55 = 1,210 SF
B	1,210 - 1/2(35)(22 - 3.5) = 886 SF
C	1/2(40 + 57.5)(18.5) = 902 SF
D	SAME AS C = 902 SF
SUM	1,210 + 886 + 902 + 902 = 3,900

Example Problem (cont.)

SLOPE	AREAS
A	 22 x 55 = 1,210 SF
B	 1,210 - 1/2(35)(22 - 3.5) = 886 SF
C	 1/2(40 + 57.5)(18.5) = 902 SF
D	SAME AS C = 902 SF
SUM	1,210 + 886 + 902 + 902 = 3,900

Example Problem (cont.)

Known information:

- Pitch 5:12
- Good condition (R=1.0)
- 30 yr. Laminated shingles*
  - -Unit repair cost= U= $10/shingle
  - -remove shingles: $20/sq.
  - -replace shingles/felt: $120/sq.
  - -Total roof area: A= 3,900sf= 39.0 sq.

**Example only, verify local costs*

Example Problem (cont.)

West slope

Repair cost: D x U x R x A

- RC: 17 sh/sq x $10/sh x 1.0 x 12.1sq= $2,057

Slope replacement cost:

- Removal: 12.1sq x $20/sq= $242
- Replacement:

  12.1sq x 1.1(waste) x $120/sq = $1,597.20

  $1,839.20

Slope replacement is economic choice

Example Problem (cont.)

North slope

- RC= 4 sh/sq x $10/sh x 1.0 x 9.0sq= **$360**

South slope

- RC= 2 sh/sq x $10/sh x 1.0 x 9.0sq= **$180**

East slope

- No damage= **$0**

Example Problem (cont.)

Total cost to replace west slope and repair north and south slopes:

- $1,839.20 + $360 + $180 = $2,379.20

Total replacement cost

- Removal: 39.0sq x $20/sq= $780
- Replacement:

  39.0sq x 1.1(waste) x $120/sq= $5,148

  $5,928

Compare Repair vs. Replacement

Repair Methods

Repair Issues:

- Color match
- Size (metric vs. standard)
- Slope replacement

Weathering/Anomalies

Mismatch or art?

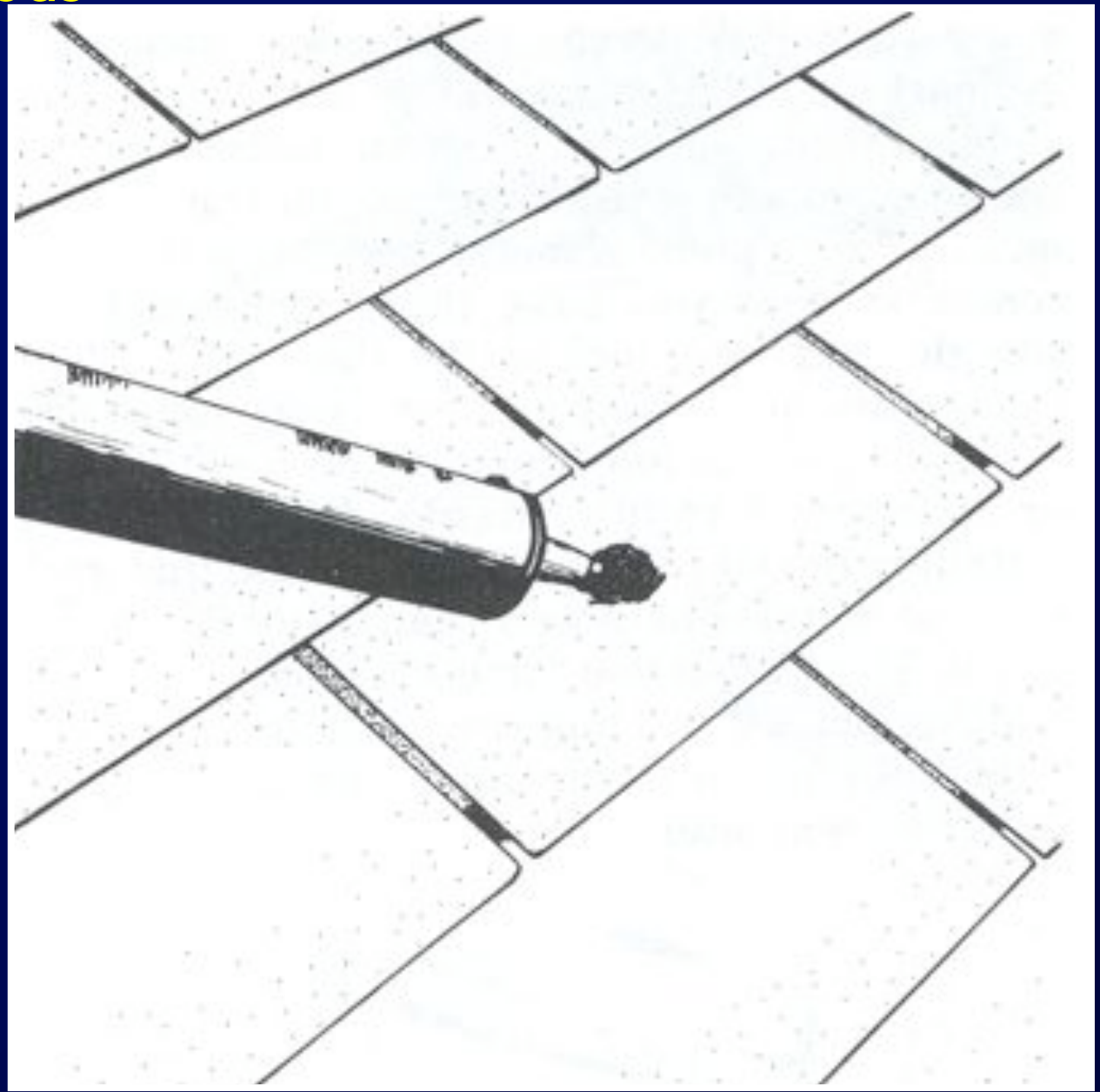
Repair Methods

Spot repairs

- Roof First Aid (repair kit)
- Clear silicone
- Mastic and granules

Repair Methods

Repairing a small spot with plastic cement.



Source: Roofer's Handbook by William Johnson

Repair Methods

Applying granules from a chalk container.

Source: Roofer's Handbook by William Johnson

Repair Methods

Insert shingle repairs:

- Unbond shingle and one above it
- Remove fasteners in shingle and one above it
- Insert new shingle
- Fasten new shingle and one above it
- Apply adhesive dollops to seal shingle

Repair Methods

Repair Methods

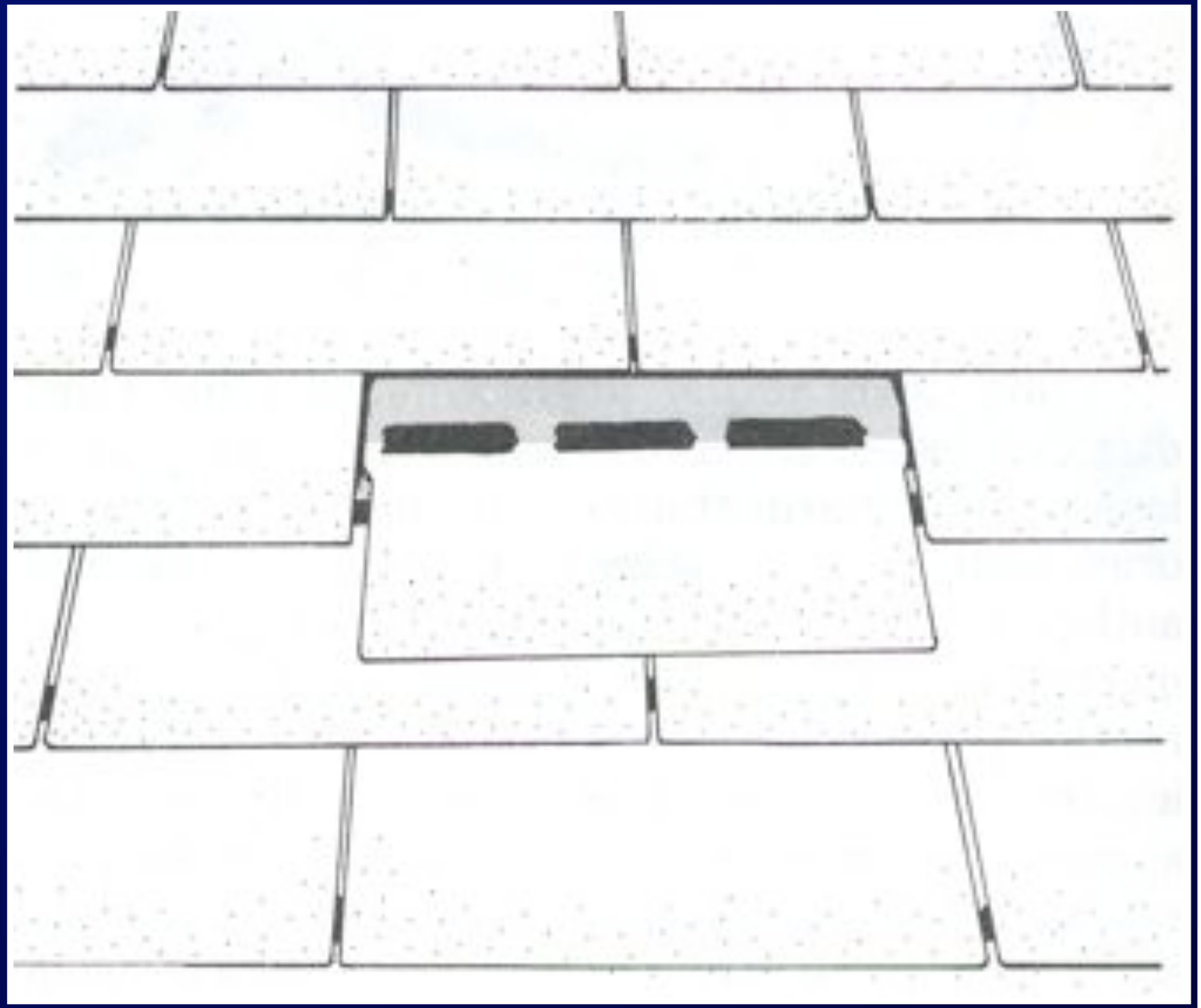
Repair Methods

Repair Methods

Repair Methods

Repair Methods

Replacing a tab



Source: Roofer's Handbook by William Johnson

Repair Methods

Improper repair

Repair Methods

Improper repairs

Repair methods

Aggressive preventative maintenance

The End

Special Thanks to Brian Peterson who wrote this slide presentation for us.