

LET IT HAIL,  
LET IT HAIL,  
LET IT HAIL



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### Video Conference Courtesies:

- ✧ Thank you for being on-time we will close attendance after 20 minutes today and after 15 minutes next week.
- ✧ PLEASE STAY MUTED!
- ✧ Use the Q&A at the bottom your screen to send your questions to Debbie. She can then relay them to me.
- ✧ Due to the number of participants, a few questions may be handled today, others we will address next week.
- ✧ Next week's questions will be handled as an attachment to the program after it is completed.

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### Your Instructor:

- ✧ Richard Boon, P.E.
  - ✧ 40 years in roofing
  - ✧ Former Director: The Roofing Industry Educational Institute
  - ✧ Walked almost 200 million sq. ft. of roofing in career
  - ✧ 50%/50% for and against for hail claims
  - ✧ Umpire for roofing-related disputes over \$1 million

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### Program Objectives

- ✧ Was the property struck?
  - ✧ How large was the hail?
  - ✧ What damage was done?
  - ✧ How is the damage quantified?
- ✧ What is a contractor to do?
  - ✧ Develop a Scope of Work, based on observed damages
- ✧ Don't forget SB38
- ✧ What does the future hold?

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### Part One's Goals:

- ✧ To understand hail damage on roofs
- ✧ To remind the audience about SB 38
- ✧ To become familiar with the terminology and site specific elements.
- ✧ To examine sample hail strikes on roofs

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## Part Two's Goals:

- ✧ Hail Damage "Scope of Work" Repairs
  - ✧ SB-38 Items
- ✧ Code Upgrades
- ✧ Code based Controversy
- ✧ Drone surveys
  - ✧ Pros and Cons

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## Denver Climatologist:

- ✧ "It is well documented that due to climate changes, our hail storms are more frequent and with larger hail than in the past."

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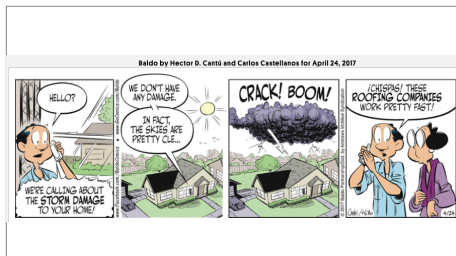
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## Hail response times are short



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## Hail Damage on Roofs



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## SB-38: Residential Roofing Bill of Rights

- ✧ Work over \$1,000
- ✧ Written contract
  - ✧ Scope includes materials
  - ✧ Cost based on damages known at time of contract
  - ✧ Dates of Service
  - ✧ Contractor contact info
- ✧ Etc.

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## Hail Strikes: Was it Hit?

### ★ Site Survey

- ★ Look at hard surfaces for splatter
- ★ Leaf Tears
- ★ Metal Dents: Ground (downspouts, gutters, HVAC etc)
- ★ Other damages that would be created by other impacts.

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## Was it Hit? Other Sources

### ★ Weather Maps

### ★ Witness Testimony

**The value these sources can be questionable.**

**On-site physical evidence is the best source for hail size information**

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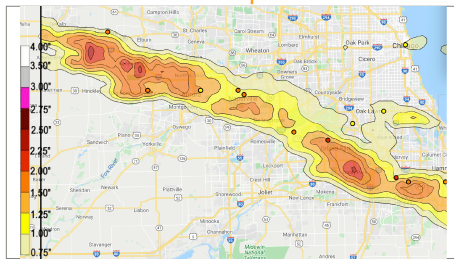
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## Commercial Reports



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## Eye witness accounts sometimes wrong



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## Best source of sizing information Actual Samples



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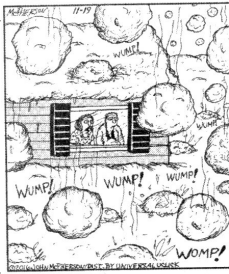
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"Whew! They weren't kidding when they said La Niña would bring some extreme weather!"

★Hail always sounds louder than it really is to occupants

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### Hail sizes are crucial to damage

- ★The larger the hail the more the damage
- ★Exponential relationship
- ★Energy of impact
- ★Hardness of hail
- ★Shape of hail

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### Lots of little hail

Lots of small hail does not necessarily mean there is damage



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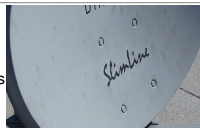
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### How Do We Determine Hail Size?

- ★ "Splash" Marks
- ★ Dents
- ★ Holes
- ★ Screens



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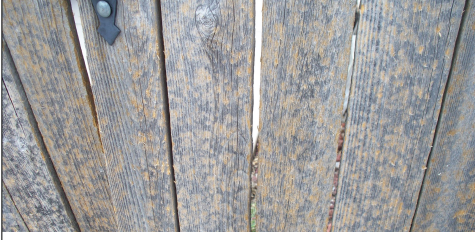
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## Fences:



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## HVAC Fins

One of these was hit by hail, which one?



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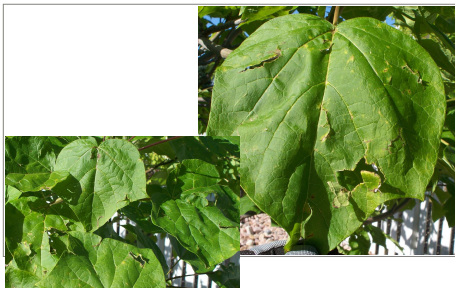
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## Leaves:



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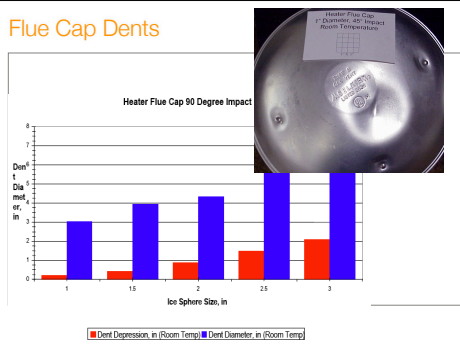
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## Flue Cap Dents



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Dents:  
The type and thickness of the metal matters



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Hail sizes are often compared to everyday known objects.  
Table 1.

**Hail Sizing**

Hail Size	Description	Hail Size	Description
0.25 inch	Pine Size	1.75 inch	Golf Ball Size
0.50 inch	Mothball Size	2.00 inch	Hen Egg Size
0.75 inch (Severe Criteria)	Dime/Penny Size	2.50 inch	Tennis Ball Size
0.88 inch	Nickel Size	2.75 inch	Baseball Size
1.00 inch	Quarter Size	3.00 inch	Tennis Size
1.25 inch	Half Dollar Size	4.00 inch	Grapefruit Size
1.50 inch	Walnut or Ping Pong Ball Size	4.50 inch	Softball Size

Table 1. – Hail Size Chart, NWS Tampa Bay, Florida

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**Velocity and Energy**

Diameter		Terminal Velocity			Approximate Impact Energy	
inches	cm	ft/s	m/hr	(m/sec)	ft lbs	Joules
1	(2.5)	73	50	(22.3)	<1	(<1.36)
1-1/4	(3.2)	82	56	(25.0)	4	(5.42)
1-1/2	(3.8)	90	61	(27.4)	8	(10.85)
1-3/4	(4.5)	97	66	(29.6)	14	(18.96)
2	(5.1)	105	72	(32.0)	22	(29.80)
2-1/2	(6.4)	117	80	(35.7)	53	(71.9)
2-3/4	(7.0)	124	85	(37.8)	81	(108.8)
3	(7.6)	130	88	(39.6)	120	(162.7)

Table 2. Terminal velocities and energies of hailstones

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**What do hail strikes look like?**

\*TPO: May not be visible from the top side.

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**Insulation facers: Note condensation on back-side of membrane**

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**AI Surfaced APP: Top Side Circles**

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Bottom side damage



Star fractures can be found without a corresponding top side mark

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Granule surfaced backside



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3-Photo Story



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Reinforced PVC



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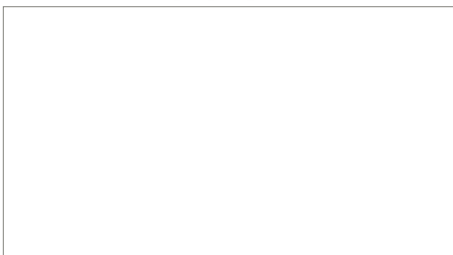
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Hail strikes on a properly installed SBS



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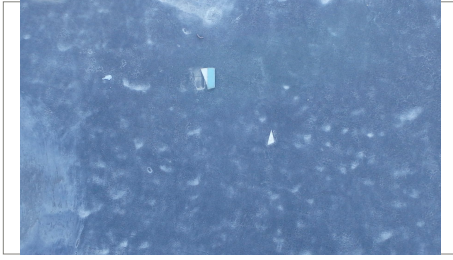
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EPDM ☆NOT HAIL STRIKES!



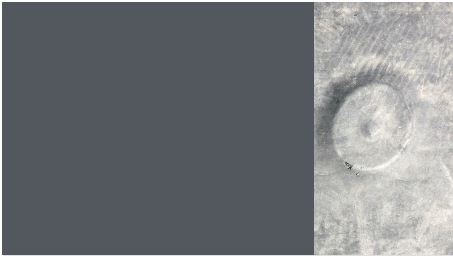
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EPDM ☆Effects of shovels, Not hail!



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EPDM ☆Effects of shovels, Not hail!



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PVC: Arc Shaped marks



Star fractures on the backside

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BUR Flashing punches are easy



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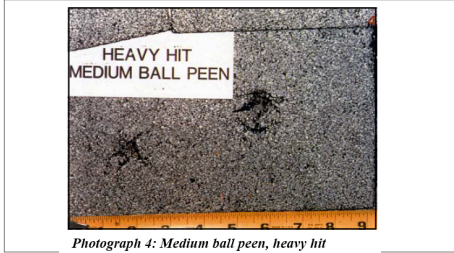
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## But not on asphalt shingles



Photograph 4: Medium ball peen, heavy hit  
Haag Engineering, Ball Peen Hammer Test, by Tim Marshall, P.E. revised 2003

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## Accessing the roof

- ✧ Know what you will be walking on: Don't do more damage
  - ✧ Light weight tile easily fractured
  - ✧ Old Shakes may be cupped or curled
  - ✧ Clay tiles may be fragile
- ✧ Be Cautious
  - ✧ Loose material: sliding hazard

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## Hail strikes: Asphalt Shingles



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Bruising:  
White  
Glass  
means  
old strike



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## Old hail strikes: White glass showing



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## Old Hail Hits



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## Cedar Dents

- ✧ Weathered grain is like knife edges
- ✧ Stones flatten the grain in a localized area
- ✧ The flattened grain is always much less than the stone diameter
- ✧ The flattened grain and color change persist for up to 18 months

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## Lots of little hail



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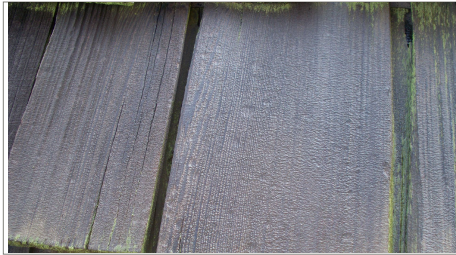
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## Look for crushed grain, and a split



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## Look for crushed grain, and a split



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## Old Clay Tile



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## Molding Flaws in Clay



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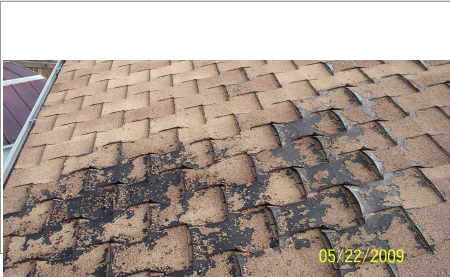
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## What is not Hail damage



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## Not a strike



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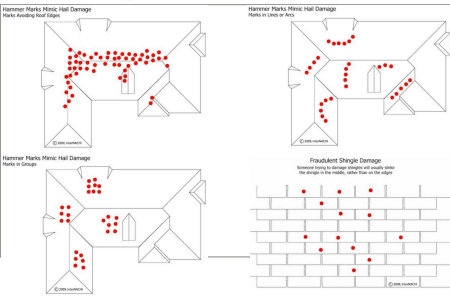
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## Look for patterns



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## Wood Erosion Holes



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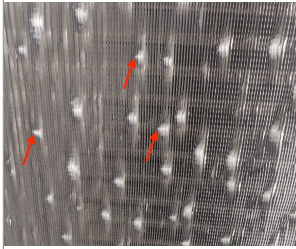
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## Not Hail Damage



Strike angle horizontal

Pointy bends of fins

Too small diameter to bend the fins

Fin on right side vertical then next fin laid down

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## Quantifying Hail Damage

- ✧ Strike energy does the damage
- ✧ No Set Industry Standard
- ✧ Random 100 square foot area (10x10)
- ✧ Identify all the strikes in the selected area
- ✧ Count and document each strike
- ✧ Insurance company then says yes or no to replacement based on count

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## How to mark

- ✧ Colored Sidewalk Chalk
  - ✧ Washes off with rain, generally the preferred method
- ✧ Marking Crayon
  - ✧ More permanent use color similar to granules
- ✧ Paint
  - ✧ Stays "forever" for litigation it may be best as the mark remains for all to see

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## Marking Technique

- ✧ Decide your method between parties:
- ✧ "O" Suspect strikes
- ✧ "X" mechanical marks
- ✧ "Slash" for loose shingles
- ✧ Decide on any other special marks based on the roof

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## Typical Square



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## Do your counts

- ✧ Simultaneous work is fastest.
- ✧ Use different color chalk
- ✧ Work opposite sides of the ridge then switch.

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## How it sometimes appears to work

- ✧ The PA marks the roof and then lays out the square where the most marks are located.
- ✧ The Insurance rep looks for the fewest marks and then centers the square there.
- ✧ The PA is on hands and knees with his nose to thereof looking for anything that is a black mark
- ✧ The Insurance rep walks quickly over the roof and if the hail dent doesn't trip him it is something else.

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## Location, Location, Location



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## Truly Random Location?

- ✧ For low slope roofs:
  - ✧ 4 pennies and a dime
  - ✧ Throw the coins
  - ✧ Find the dime and that is the cut or count location
- ✧ Steep Slopes:
  - ✧ One person select vertical location
  - ✧ Other person selects horizontal location

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## Count entire roof:

ROOF SLOPES					
WIREFRAMES					
Surface Area (sq ft)	Horizontal (sq ft)	Area (sq ft)	Area (sq ft)	Area (sq ft)	Area (sq ft)
1,017	205	121	121	63	63
sq ft	sq ft	Volume (cu ft)	Roofing (sq ft)	Sheathing (sq ft)	
61				115	
DIMENSIONS					
Shape	Area (sq ft)	Perimeter (ft)	Pitch	Squares	Vol (cu ft)
A	21.3	63.2	4/12	2.5	66
B	130.3	167.4	4/12	13.7	130
C	146.4	199.9	4/12	14.8	136
Total	277.9	429.8		30.7	332

\*This was computer counted

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## Document and Record

- ✧ Satellite photos from Google Earth
- ✧ Draw in where test square located
- ✧ Note North on photo
- ✧ Note storm direction, if applicable
- ✧ Include hit counts by area

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## What do you do with the info?

✧ Come back next week.

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