



Asphalt Shingles, Roofs, Ice Dam

*Pillar To Post® Presentation
Randall Patterson*



Outline

- Asphalt Shingle Construction
- How to Shingle a Roof
- Reliability and Failure
- Ice Dam


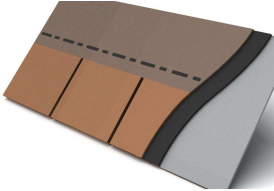


Asphalt Shingle Construction




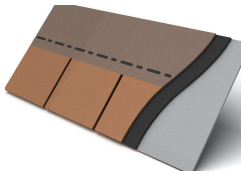
Shingle Construction

- Three layers
 - Base
 - Asphalt
 - Granular




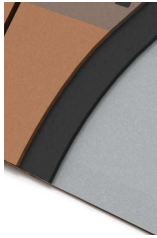
1) Base Layer

- Gives the shingle strength and shape
- A surface for the asphalt
- Made of either
 - Thick paper saturated in asphalt (called roofing felt)
 - Fiberglass mat



2) Asphalt Layer

- Liquid gold layer (asphalt is expensive).
- Longer lasting shingles have more asphalt.
- Sheds water and is a surface to embed the granular material.



3) Granular Surface

- Ceramic particles embedded in asphalt
- Reflects ultraviolet
 - Asphalt degraded by UV
 - Without this material, the shingle would not last long
- Color and texture



Fiberglass Vs. Organic

- Confusion on this point
 - What are fiberglass shingles?
 - Usually referring to asphalt shingles with fiberglass base layer
- Base layer may be –
 - **Organic** – means base layer is paper saturated with asphalt
 - **Fiberglass** – means base layer is a matrix of fiberglass



Organic Vs. Fiberglass

- | | |
|--|--|
| <ul style="list-style-type: none">• Organic base<ul style="list-style-type: none">– paper saturated with asphalt– more asphalt (40%)– Heavier and thicker– Excellent durability | <ul style="list-style-type: none">• Fiberglass base<ul style="list-style-type: none">– matrix or mat of fiberglass– Less asphalt required– Lighter |
|--|--|



Organic Vs. Fiberglass

- Which one is better?
 - No clear winner. Both are excellent
 - Organic may be marginally better for impact resistance (hail) and durability
 - Fiberglass base may have better tear resistance in a wind storm



Organic Vs. Fiberglass

- Fiberglass base asphalt shingles are becoming more common than organic.
 - Uses less asphalt (\$\$) to do the same job
 - Lighter for equivalent warranted life
 - Fiberglass base architectural laminated shingles are becoming more and more popular



Self Sealing Tabs

- Integrated into shingle design in the 70's
- Spots of asphalt
- Upper shingle seals to the lower shingle
- Reduces the possibility of wind damage
- Requires heat to seal after installation



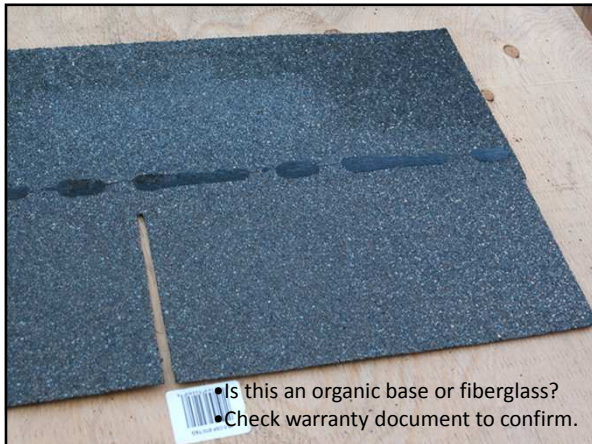
Warranty

- Confusing???
- 20 year shingles versus 30 year shingles, etc.
- **NOTE & REMEMBER!**
It's a warranty concerning defects NOT a guarantee of roof life
- This number is loosely related to the expected life of the roof in an ideal installation and typical weather conditions for area



Three Tab Shingle Vs. Architectural









Many Types Available

- Huge variety of shapes and styles now available
 - Architectural
 - Laminated
 - Shadow
- 50 year shingles (remember - ideal conditions, does not guarantee age in wearable years)



Summary

- Three layers – base, asphalt, granular
- Base may be organic, paper saturated with asphalt, or fiberglass
- Asphalt layer waterproofs, thickness determines life
- Granular surface reflects UV and creates texture and color



Summary

- Shingles today are self sealing
- Shingle warranty refers to defects of the shingles under ideal installation and weather.
- Three tab versus architectural choice of home owner. Both are warranty under ideal conditions and does not cover damages.



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What is a Shingle Roof?

A Water Shedding System



The Starter Strip

- The starter strip is to span the gap between shingles
- Often achieved with a row of shingles installed upside down
- Another way is to cut off the tabs and install right side up



The First Row

- Directly on top of starter strip
- Shifted half a tab



Working Up The Roof

- Start at bottom and work up the roof line.
- Alternate between starting a row of shingles with a full tab and half a tab







Two Shingles Thick

- The top row covers a little more than 50% of the row beneath
- Two shingles thick




Head-Lap

- This shows three rows of shingles



Why Shingles ?

- Accommodates movement (structure)
- Thermal expansion and contraction
- Minimizes stresses in the material (long life)



Not a Water-Proof System

- Shingles are a shedding system
- Not a water-proof system
- Relies on two layers plus head-lap
- Water backing up on the roof will get past the shingles (i.e. ice damming)



Flashing

- Shingles are great for flat open space
- How do you seal around openings and at intersections?
- Flashing makes these areas shed water



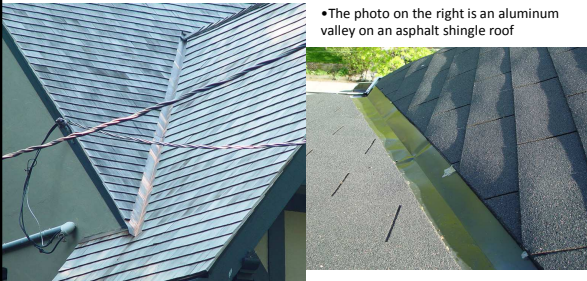
Roof Wall Flashing

- This is an example of a flashing
- Without this detail, water would leak past the roof surface
- This shows a roof to sidewall flashing
- In this case, the flashing is made of lead
- The lead flashing goes up under the stucco and over top of the tile roof




Roof Intersection

•The photo on the left is a copper valley flashing on a cedar shingle roof



•The photo on the right is an aluminum valley on an asphalt shingle roof



•You can see the step counter-flashing




the metal flashing goes up and under the aluminum siding and then sits over top of the shingles below




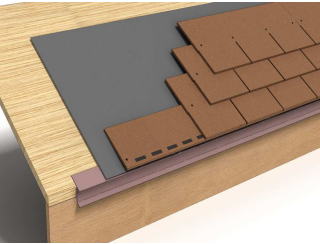
Poor Flashing

The house on the left has a fake metal flashing. A piece of metal is nailed in place but of course will do nothing. If in doubt, remember that flashing should shed from one surface to the next.




Under the Shingles

- Underlayment
 - Commonly asphalt saturated paper (called roofing felt) is used
 - Protects the roof deck
 - Wind driven rain
 - Ice dams
 - Secondary line of defense




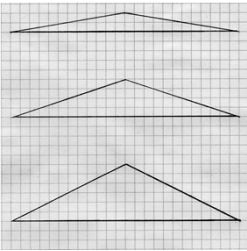
Roof Slope

- Shingles rely on gravity to shed water
- Roof must be sloped
- Roof slope is stated as “x in 12”
 - For example 6 in 12
 - Rise of 6 with a run of 12



Roof Slope

- Standard minimum slope for asphalt shingles is 4 in 12
- Absolute minimum is 2 in 12
 - Special shingle application required
- 4 in 12 or greater is called conventional
- 2 in 12 to 4 in 12 is called low slope



Low Slope

- What if the slope is less than 4 in 12?
- From 2:12 up to 4:12 it's called a low slope roof
- Special procedures US vs. Canada
 - Double underlayment - USA
 - Reduced shingle exposure and shingles cemented in place - Canada



Summary

- Starter strip is an extra layer of shingle at the bottom edge of the roof
- Shingles are placed in a staggered pattern so there are no gaps
- The roof surface is two shingles thick in all most areas
- At the head-lap, the roof surface is three shingles thick



Summary

- Flashing protects roof intersections and roof penetrations
 - Creates a shedding system at these areas
- Underlayment under the shingles
 - Secondary line of defense
- Conventional slope is 4 in 12 or steeper
- 2 in 12 to 4 in 12 is a low slope roof and requires special installation procedures.



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Reliability and Failure



The Consumable Roof

- An asphalt shingle surface will wear out
 - Sun (UV radiation) degrades the surface
 - Surface wear and heat also degrade the surface
 - Excessive heat in the attic will cause shingles to crack and curl and claw. (Poor Ventilation in attic)
- Imagine the asphalt roof as a consumable like the brake pads for your car



Reliability

- As a roof ages it becomes less reliable
- Older roofs at end of its life cycle, it is not reliable



Very Old Surface

- Missing granular
- Indicates surface is far beyond reliable life



Old Surface - New Surface



Vulnerable Roof



Could It Last Two More Years?

- With maintenance, almost any roof can be made to last two more years
 - In many cases the maintenance and repair required would not be worth it \$\$\$
- Can the roof last two more years with the same reliability as a new surface?
 - Probably not
 - In the pictures we just saw, definitely not
 - Don't waste money on repairs. It will cost more in the long run with damages that may occur from failed roof.



How Many Layers

- Counting layers can be deceiving
 - Each layer has two thicknesses of shingle
 - Each layer has three thicknesses at the head-lap
 - There is an extra thickness at the starter strip








Multiple Layers

- It's better to strip the roof surface every time
 - Flashings get done better
 - Surface sits flatter
- Most areas allow two layers before you are required to strip the roof.

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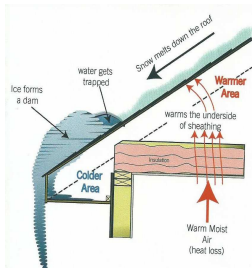
Summary

- A roof surface should be considered a consumable
- An old roof becomes unreliable
- Poor flashings make a roof unreliable
- Many old roofs could last another year or two with maintenance and repairs
 - May not be reliable
 - May not be worth spending money on an old roof
- How many layers do you have? Repairs to old shingles may not be reliable.



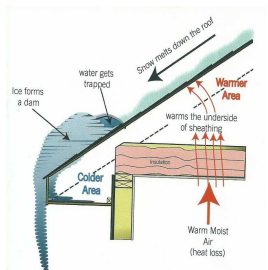
Ice Damming

- Ice dams are large build-ups of ice found at the bottom edge of the roof. A small amount of ice may not cause an immediate problem, but if the ice continues to build up, it will block the water flow down the roof, causing water to back up under the shingles and leak into the soffit area, or into your house.
- Here's How it Happens
- ☑ Ice dams form when there is a blanket of snow on the roof.
- ☑ Heat from the attic melts snow above.



Ice Damming

- ☑ Water then runs down the roof between the shingles and the blanket of snow.
- ☑ When the water reaches the roof overhang (bottom edge of the roof), it encounters an area of the roof that is not getting any heat from the attic so the water freezes.
- ☑ As this condition progresses, the ice at the bottom edge of the roof becomes thicker until it blocks water flow.
- ☑ Water backs up and starts to leak into the soffit area and eventually into the home.

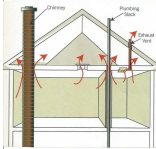


The root cause of ice damming is heat from the attic. When you control the heat, you control the ice dam. Here are three ways you can control the heat in the attic:

Air seal the attic from the house: recent research indicates that air sealing is paramount. Air leakage from the house heats up the attic. Not only will this attic heat contribute to ice damming but air leakage will cause condensation on roof decking and framing, leading to rot. Bathroom vents, recessed light fixtures and plumbing stacks are all potential air leakage spots.

Insulate the attic: if the attic insulation is insufficient, upgrade it to reduce the conductive heat transfer into the attic.

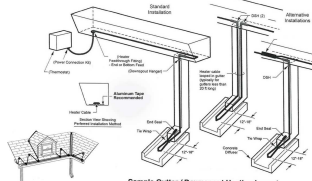
Ventilate the attic: proper ventilation and air flow through the attic will help control the attic temperature. Make sure insulation is not blocking vents. Also make sure vents are evenly distributed, with some high on the roof, such as roof-top vents and some lower, such as soffit vents. **Do not try to improve attic ventilation by adding more roof top vents without adding corresponding lower vents** such as soffit vents. **Unbalanced venting can actually create negative pressure in the attic,** drawing more air leakage from the house into the attic.



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Heat Cables in gutters and downspouts

- In some cases, the roof configuration may not be conducive to preventing ice dams, leaving only one option: heating cables, often called heat trace. The heating cables prevent ice from building up in the first place, or, at the very least, the cables will melt channels in the ice to allow water to flow off the edge of the roof. The heating cables use a significant amount of electricity and should be considered only if there is no other solution.
- If your home has heating cables, you have to turn them on before you have a huge ice dam. Most heating cables do not have enough power to melt and ice dam once it is formed.



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Thank You

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