

ICE DAM FAIRY-TALE

Why are roof ice dams worse this year? Are you at risk?

Icicles adorn the edges of a roof piled thick with fluffy snow. You are completely relaxed in a comfy chair by a wood fire, reading a great book while secluded in a cabin deep in the woods.

Like all images from a good fairy-tale, just enough is real that you can let go and just enjoy. But if you have ever had an ice dam, you would erase the image "icicles adorning the edges of a roof..." from your relaxation fairy-tale!

December 2010 in St. Paul, Mn



Water/ice flowing out of siding/windows



How much bigger until this one causes damage?

Ice-Dams In a Nut-Shell:

- Heavy snow on a roof can be beautiful, but it is not desirable
- You can go years/decades without a dam and then.....WHAM
- Heavy snow followed by very cold temps are key ingredients
- You cannot tell when dams are big enough to cause damage
- Insulation & air sealing is an important step to reducing dams
- Roof ventilation is next step to reducing dams
- If you see dams, it is safest to have the snow removed

Our goal is not to scare you into investing lots of money to reduce all ice dams. Not everyone needs to go down that road. Still, I do want you to become more aware of what damage ice dams can do and be better able to judge for yourself what to do if you notice ice dams. When an ice dam gets big enough, water can go places it should not; like wall cavities, roofs, and onto ceilings. The hard part is that once you see the water entering your home, the damage is already done.

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What are Your Risks of Ice Dams?

Even before weather conditions are ripe for ice dam formation, how do you assess the risk to your house? The following guidelines can be used:

HIGHER RISK:

- Have had ice dams in the past
- Poorly insulated & air sealed attic (energy audit can determine this)
- Cathedralized ceilings (ie. 1.5 story house with finished attic)
- Roof has valleys and/or low slope
- Poor roof venting, especially at the soffits

Why Do Ice Dams Not Appear for Years?

Deep Snow + Cold Temps

Weather patterns can converge to suddenly create very severe conditions for ice dams. Deep snow followed by very cold is the formula to watch for. From the late 1980's through 2008, Mpls/StP had mild winter conditions for ice dams. If we had heavy snow, warmer than average temperatures followed. In fact, 15 of the last 22 years, we had average or above average winter temps. And for many years, we did not have heavy snow on our roofs even when cold temps did settle in. But last year we had moderate ice dam conditions and this year serious snow and cold conditions hit in December.

Weather conditions alone don't cause ice dams. To help you sort thru your risks of ice dams, let's continue unraveling the mystery of what causes ice dams.

What Causes an Ice Dam?

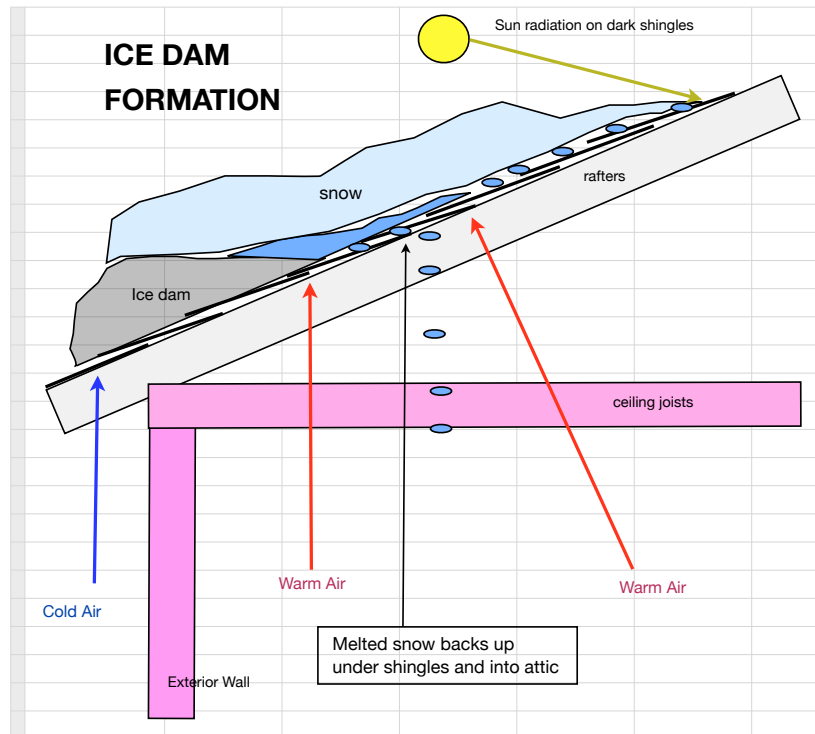
1. *Deep Snow + Cold Temps*
2. *Heat from inside the house Warms the Roof Deck*
3. *Solar Radiation on Shingles*
4. *Roof Design (can magnify the effects)*

If only the causes were simple! This is the point where you need to hunker down and digest a bit of building science or call an expert if you are worried about getting indigestion from all of this.

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We already know that deeper snow plus colder temps are “Ingredient #1”. But without a source of heat to melt the snow, there would be no ice dam or water to leak into your home. Here is a picture showing an ice dam forming on a roof:



You can see that the warm air from inside the house and from the sun's radiation causes some melting of snow that then runs down the shingles until it hits the cold part of the roof just past the exterior wall. The water then freezes into a block of ice so that when more melt-water runs down, it hits the ice dam and pools up. The down-hill side of water tends to freeze and increase the size of the dam while the up-hill side tries to flow under shingles and into the house.

INGREDIENT #2: Heat from inside the house warms the roof deck

Heat rises so a larger percentage of heat loss in your home is generally through the “lid” (top floor). This heat then hits the wooden roof deck, warms the shingles and melts the snow. You can probably see where this is heading.... better insulated/ sealed houses not only save energy and money but also reduce heat flow to your roof and therefore reduce ice dams. Beyond insulation/sealing a home, simple physics help explain how our own habits and the weather can influence the amount of heat that transfers to your roof. The larger the difference between outdoor and indoor temps, the more heat loss will occur.

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Therefore:

- The warmer you keep your house, the more heat loss
- The colder it is outside, the more heat loss

And the deeper the snow, the more roof heat is retained near the roof deck due to the insulating qualities of snow. The result is greater snow melt and larger ice dams!

INGREDIENT #3: Sun's radiant heat warms the shingles

Yes, even on Minnesota's coldest days, the sun has enough energy to affect melting of snow on your roof. This radiant energy gets absorbed readily by dark colored shingles that can become exposed (initially) toward the top of your roof. Combining this solar energy with heat from inside the home contributes to melting of snow which can add to ice dams.

INGREDIENT #4: Roof Design can magnify the effects

- *Cathedralized Ceilings*
- *Poor Roof Venting*
- *Valleys or Low Slope*

Cathedralized ceilings are often found in 1.5 story homes that have finished attics. The result is that the 2nd floor ceiling is directly attached to rafters which has the roof directly attached on the opposite side. This is a perfect path for conducting heat from inside to the roof; thus contributing to ice dams. Ever see a roof with "stripes" of frost or snow? These often have cathedralized ceilings. There are stripes of melt right where the rafters are transferring indoor heat to the shingles.

Roof venting is one feature that reduces ice dams in Winter and keeps attics cooler in the Summer. Generally, this venting brings in cool air from the soffits which then travels under the roof deck toward the peak of the roof where it is vented out. This can whisk away much of the heat that might otherwise hit the roof deck and contribute to ice dam formation. Unfortunately, many homes have substandard roof venting. Proper venting techniques are specific to your your roof design and would take many pages to address so we will not go deeper here.

Valleys on roofs tend to magnify ice dam formation. Valleys are the intersection of two different roof planes where water/snow tends to accumulate in greater quantity. Lower sloped roofs also tend to accumulate more snow thus creating more insulation above the shingles which retains more heat for melting. And a lower slope means that the same volume of water will travel further under the shingles than on a steep pitch roof.

Not all Dams Create Damage.... At What Size Should you be concerned?

You cannot look at an ice dam and know when it will be big enough to cause damage. So if you are not a risk taker, it is best to remove the snow from your roof once ice dams are forming. If you want help, there are outfits that can remove the snow and then remove the ice portion with a steam-jet.

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Many folks feel immune from ice dams since they remember their roofer proudly pointing out the installation of “ice & water shield” at the roof edge. This MIGHT prevent damage, but in 2009, at least one St . Paul homeowner found this was not true. They received a new higher-quality re-roofing job from a reputable outfit just last year which included code required two rows of ice/water shield. They felt safe. However, in 2009, ice dams grew and water leaked into the homeowner’s kitchen. The water leaked between the seams of the 2 layers of ice/water shield. Now the homeowner has invested in ice dam prevention instead of relying on an imperfect membrane that is the proverbial “finger in the dam”.

Can Ice Dams be Prevented?

It is a fairy-tale to think that anything can provide 100% assurance against ice dams... except for the unrealistic immediate removal of snow every time it falls. Below are investments that might help, but please realize that assessing costs/benefits are very specific to your home.

Prevention Options	Install Cost	Considerations
Roof Venting	Low to High (\$300 - \$3000)	<ul style="list-style-type: none"> • Venting at peak without vents at soffits is generally sub-standard • 1.5 story homes: often need more vents at spaces behind kneewalls • Expert generally needed to assess options
AirSeal & Insulate	Low to High (\$300 - \$3000)	<ul style="list-style-type: none"> • Do venting first, then air seal, then insulate • Air seal often more important than insulating • Ex: weatherstrip access door to attic, foam around plumbing vents in attic floor, etc.. • Often pays for itself thru saved energy
When Re-roofing Decide: * Insulated/vented decking * Added ice/water shield * Non-granular Ice/water * Reflective roofing material	Moderate to High	Rare opportunity to consider all options just before re-roofing. Roofers normally do not think this way so get expert advice about these options prior to bringing the roofers in.
Heat Cables aka “De-Icing Cables”	Low to Moderate	<ul style="list-style-type: none"> • Band-Aid that does not address causes • Electric costs of \$25-\$100/Winter • Can burn out without knowing it
Remove Gutters	na	<ul style="list-style-type: none"> • Gutters rarely contribute materially to ice dams • Gutters can be damaged by ice dams

Bob Alf, Owner of Bob Alf Construction, LLC

a St. Paul based builder/remodeler who specializes in sustainable solutions for residential homeowners

visit www.bobalfconstruction.com or email bobalfconstruction@gmail.com