

RETIRE THE ROOF RAKE:

Proven Ice Dam Prevention Strategies

Ice dams can be controlled and eliminated. We can point to results. B|E Retrofit performed an air leakage control (ALC) and insulation project at Garrett and Erin's house in Acton, MA in the sunshine of July 2010. In 2010-2011, the worst season for ice dams in recent memory, Garrett and Erin had none (Photograph 1).

Most homeowners, unfortunately, do not enjoy the same hassle-free winters. Every winter we see incredible icing on roofs – icicles two stories long, ice dams 1 foot tall and icicles blocking the view out of windows (Photographs 2 - 6). Icicles can be pretty, but they are costly, frustrating and time consuming.



Photograph 1: Garrett and Erin's house in Acton, MA. This picture was taken in the middle of the worst season for ice dams in recent memory.

HOW DO ICE DAMS FORM?

Ice dams are a result of excessive heat loss out of a building. Ice dams form when snow melts off of a roof on a day that the exterior temperature is below freezing. What is the source of heat to melt snow on a day when it is 20°F outside? The answer: the 60°F - 70°F temperature in the living spaces of the house that is directly below the roof.

When heat from the house reaches the underside of the roof deck, it melts snow, the water flows down the roof towards the eaves by gravity and then at the eaves (outside of the heat source of the living spaces) the water refreezes. This process continues throughout the winter and the sheets of ice at the eaves grow (The sun, exterior cladding color and overhangs also play a role in icicles at the eaves, but do not produce the severe ice dams seen in Photographs 2 – 6).



Photograph 2



Photograph 3



Photograph 4

CAN WE SOLVE THIS PROBLEM? YES!

Ice dams are not an inevitable evil of a harsh winter. Homeowners can choose from 2 prevention solutions:

1. Turn the heat off. Take a look at the detached garages in your neighborhood in the winter, you won't find any ice dams; or
2. The more comfortable solution, prevent the heat in your house from reaching the roof.

There is not a third option. The traditional New England "solutions" treat the symptoms of ice dams and do not solve the problem. A few common approaches to deal with the ice dams after one has already formed are listed below:

- **Slip-edge, metal eaves** – the thought here is that ice will not build up on the slippery, metal surface. In reality, this strategy creates a dangerous situation around the perimeter of the house as sheets of ice tumble to the ground.
- **Re-roof and install ice and water shield** – a new roof and/or an ice and water shield roof underlayment do not solve ice dam problems. A waterproof roof underlayment is a good idea as an insurance policy against water leaks, but since we now know that heat from the house is the source of the problem, it is intuitive that a layer of rubber won't prevent heat from melting snow.
- **Electric heat cords** – this is the one that we dislike the most. We want to save energy, not use more of it!



Photograph 5



Photograph 6

SOLUTIONS

For homeowners that choose to keep the heat on, the approach to solve ice dams is straightforward: identify the pathways and sources that feed heat to the roof deck and then block 100% of them.

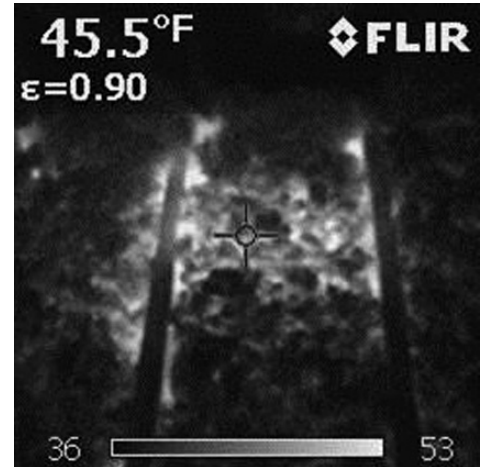
The three most common ways that heat reaches the roof deck are:

1. Air leakage pathways that connect the attic with the warm spaces in the house. Common air leakage pathways are: attic access hatches and pull down stairs, large gaps around the plumbing chases, recessed lighting and cracks above the framing of interior and exterior walls.

WARNING: DO NOT SKIP THIS STEP.

No amount of insulation will solve ice dams without first blocking the air that is leaking into the attic. Air will blow right through fluffy fiberglass insulation like a breeze through window curtains. Air leakage control is done with air-impermeable caulks, foam sealants and rigid materials that block air movement, not fluffy, air-permeable materials like fiberglass.

- Inadequate insulation levels that allow heat loss through the top-story ceiling (Photograph 7). Stopping heat loss through building materials (conduction) is the part where we add insulation. After the air leakage pathways are completely blocked, and only after 100% are blocked – the more insulation the better.
- A heat source in the attic is a sure way to end up with ice damming. The heat sources that we see most in attics are: heating equipment, air handlers, duct work and recessed lights. Heat sources in attics pose a challenge. Approaches that relocate the insulation boundary to the roof surface (insulate the roof rafters) and bring the heating equipment, duct work and other heat sources into the “heated space / below the insulation” is often the best option.



Photograph 7 : An infrared image of pre-retrofit fiberglass insulation illustrates massive heat losses around the original fiberglass (On an infrared camera gray-scale, black is cold and white is hot). This picture is representative of the existing condition of the fiberglass insulation in a majority of New England attics.

A NOTE ON VENTILATION

Adding soffit and ridge or gable end vents to an attic system is not the silver bullet solution that many roofers and builders present it to be. Properly ventilating the underside of the roof surface does help to remove small quantities of heat from the attic, which helps to avoid ice dams. Ventilation will not compensate for large amounts of warm air reaching the roof deck.

Without taking the step to block the heat leaking into the attic (air leakage control and insulation) venting will not solve the problem. In homes with cathedral ceilings, soffit vents can actually pull cold air onto interior surfaces – be careful and understand when it is appropriate to vent and when it is appropriate to build an unvented roof (both will work if they are constructed correctly).

STOP HEAT LOSS AND RETIRE THE ROOF RAKE

There are some limitations, but with careful planning, custom design and high-quality installation you can be sitting inside in a warm house in the winter and not raking your roof and eventually calling the insurance adjustor.

Every style of roof can be retrofitted to prevent heat loss from the house from melting snow and starting the frustrating ice dam and interior damage cycle. Prevention strategies differ widely for different roof and attic designs, but the principles for prevention are the same: stop heat from reaching the underside of the roof and melting snow.

ABOUT

B|E RETROFIT is a specialty building envelope solutions firm serving every style of commercial and residential building. The company's design-build solutions reduce energy consumption, improve occupant comfort and solve common building durability problems.

Is your building or home energy efficient, comfortable and durable? Contact us to learn more about how we can help with your retrofit project.



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