

## Ice Dams

### Introduction

When snow lingers on a roof, ice dams can become a problem. This paper summarizes:

- What are ice dams?
- How are ice dams formed?
- Why are ice dams a problem?
- How to spot ice dams?
- How to stop ice dams?

### 1. What are Ice Dams

Ice dams are ice formations on a roof that prevent the free flow of melt water from exiting a roof.

When the ice forms at the low area of a roof, it can create a condition where water can become trapped above the ice formation. The trapped water becomes a water puddle on a sloped roof or in a valley.



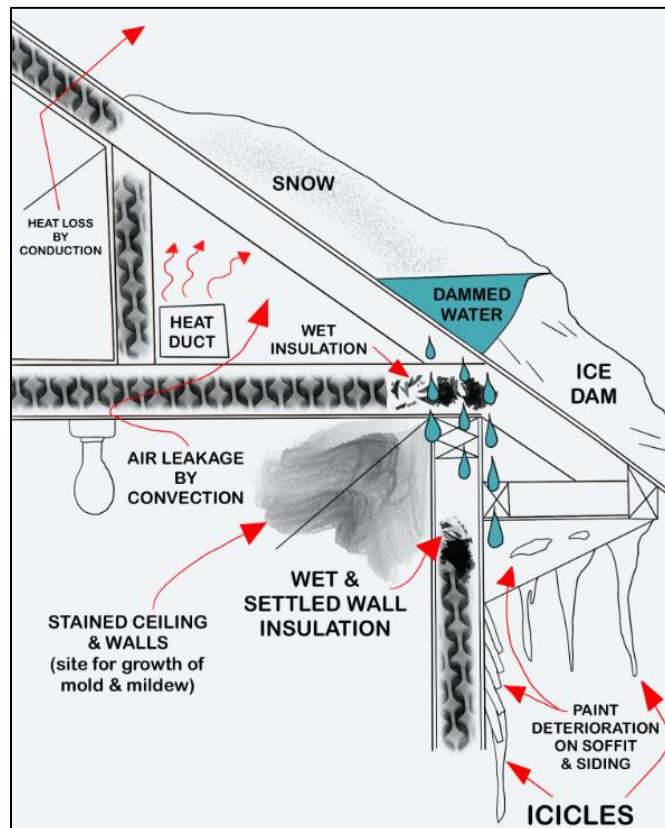
### 2. Problem Identification

In order to stop any type of damage it is vitally important to understand the reason for the damage. What caused the ice dam in the first place?

A problem cannot be corrected if it is not correctly identified. Problem identification is necessary if a solution is to be found.

### 3. How are Ice Dams Formed

The image below shows a typical formation of an ice dam.



Ice dams are formed by uneven melting. The snow melts at a higher elevation. The sun can melt the snow at the higher elevation, or there may be an uneven heating of the roof due to a heat source from the interior or a combination of both. Ice dams are usually more prevalent on west, south, or east slopes due to sun exposure. Rarely are ice dams found on north-facing slopes.

Whatever the cause of the uneven temperatures on the top surface of the roof, the melt water flows down to a lower elevation that is colder. If the colder area is below freezing temperature, the water turns to ice.

If conditions are right, the process continues. The ice formation grows in size and can become large enough to stop water from flowing off a roof.

#### 4. Why are Ice Dams a Problem

The problem is not the ice. The problem is the melt water.

Ice dams do not rip and tear at roof materials as some have suggested. The water simply freezes and the ice thaws in a gentle manner causing no change in the materials. The very small amount of expansion and contraction of ice causes no damage to roof materials. The claim of ice tearing roof shingles is not a mode of damage. If tearing is present, it is normally due to careless removal of the ice.

The problem with ice dams is 100% water intrusion. Roofs are designed to shed water, not hold water.

If there is a puddle on a roof, water can flow back and around the roofing material and find its way past a roof system at a small hole such as a simple nail location.

A roof that was adequate for shedding rainwater, may not be able to resist water penetration from standing water.

#### 5. How to Spot Ice Dams

Ice dams are formed on a roof under a snow layer. The actual ice dam formation can be hidden by snow; however, excessive amounts of icicles at an eave is a telltale sign that the mechanism is at work. The photo below shows a warm spot on the roof. The snow melted at the center of the roof and formed large icicles at the eave. Looking closer at the roof eave a thick layer of ice can be seen on the roof overhang under the snow.



#### 6. How to Stop Uneven Melt

Whatever caused the roof to have uneven temperatures needs to be stopped if possible.

The problem may be inadequate ventilation or inadequate insulation. An attic space that is not vented adequately may only need additional ventilation. However, space may have a heat source within a roof structure and may not be able to be vented. It may be a heated living space.

The problem can be an isolated problem due to air leaks. If there are too many air leaks from the warm interior, the attic becomes warmer than the eaves. The problem may be as easy as sealing all air leaks from the interior to the attic space.

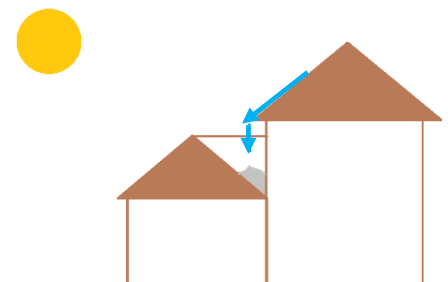
Stopping the source of uneven melting can stop the problem with ice dam formation.

#### 7. Identifying the Actual Location of Ice

Sometimes the problem of uneven roof temperatures cannot be avoided. If this is the case, stopping the formation of the ice may be the only route to solve the problem. The actual location of the ice dam needs to be identified. Common areas where ice dams can form are:

1. Unheated areas of a roof that intersect with heated areas.
2. A roof eave.
3. An attached unheated porch.
4. An attached unheated garage.

Ice dams can be entirely related to roof configurations that have uneven sun exposure. The image below shows a typical condition that creates uneven melting. The snow on the upper south-facing roof slope melts. The water drains off the upper roof and falls into the shaded area that may be much colder and never sees the winter sun. The water freezes in the valley area.



## 8. Heat Cable

When there is no means of avoiding the uneven melt and freeze conditions at a low area, the location of the ice dam can be heated to allow the water to fully leave the roof without refreezing.

The image below shows typical heat cables installed along the entire roof edge.



## 9. Factors Affecting the Presence of Ice Damage

The factors that promote ice dams and the intrusion of water into a structure include:

1. The amount of ice present.
2. The amount of snow.
3. The period of time when the exterior temperatures are slightly above or below freezing.
4. The amount of insulation.
5. The amount of ventilation.
6. The presence or lack of a vapor barrier above the ceiling.
7. Air leaks or poor sealing around penetrations.
8. Complicated roof configurations.
9. The orientation of intersecting slopes of different exposures to the sun's radiation.

The causes of a certain ice dam may be one cause or a combination of several causes.

## 10. Typical Repair Recommendations

The following are typical techniques that are used to combat ice dams. Depending on the severity of the problem, one technique or a combination of techniques might be needed to stop the formation of ice dams:

1. Clearing the snow off the roof and breaking up the ice will prevent water infiltration into the house. This should only be done by a properly insured and qualified contractor who can safely remove the snow and ice without damaging the roof.
2. Hosing the roof with tap water on a warm day to remove ice and create channel flow through the ice.
3. Applying a waterproof membrane along the eaves and in the valleys, or in the area of the ice formation.
4. Changing the roofing material to a metal roof that promotes snow and ice to slide off the roof.
5. Increasing the amount of insulation.
6. Increasing the ventilation. The soffits and peaks of a sloped roof should be vented to remove excess heat that gets into the attic before it has a chance to warm the roof deck.
7. Adding a vapor barrier or better sealing the barrier that is present. The amount of warm moist air entering the attic from the interior should be reduced.
8. Adding heat cables to the roof to melt the ice.
9. Changing the roof configuration.

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