



Ice Dams: Recognition and Prevention

Ice dams are caused by the interaction of three factors:

- Ice and snow melt at 35°F. Liquid water freezes at 32°F. Minor temperature differentials can lead to major problems.
- Layered roof systems such as shakes or shingles do not keep out standing water. They require a continuous, uninterrupted slope to shed water.
- Attics are warmer than the outside air because heat leaks from the heated portion of the structure up into the attic. Heavy snow cover effectively insulates the attic from cold outside air, allowing the temperature to rise even higher.

Eventually, the temperature of the roof under the snow pack, usually near the ridge, (A) rises above the melting point. Meltwater runs down the roof, refreezing when it reaches the edge of the insulating snow blanket at the eaves (B). They are still far below the freezing point since they are unheated by air from the structure interior. An ice dam forms (C). As layer after layer of meltwater refreezes, the ice dam grows, with liquid water pooling (D) behind it under the snow. Soon, this water is deep enough to seep between shingles and into the attic or wall cavities (E). Ice dams are sometimes one to two feet thick. Secondary ice dams often form around vents and skylights.

Prevention: The Cold Roof

The best protection against ice dams is a properly designed "cold roof." Minimizing heat gain in the attic while maximizing attic ventilation with outside air is the best way to reach this goal.

Attics gain heat in two main ways: conduction due to inadequate insulation; and convection caused by warm air leaking through gaps, usually around plumbing, wiring, ducts and vents.

Reduce conductive heat gain by increasing the insulation levels. Convective heat gain can be minimized by meticulously caulking and sealing even the smallest penetrations through the ceiling, as well as carefully gasketing around attic entrances. Although some heat gain is inevitable, when the attic ventilation is adequate the temperature will not reach levels that cause extensive melting. A cold roof is easy to achieve with properly designed new construction. Reaching the same goal in older homes may be both difficult and expensive.



Other preventive methods have been tried:

Method	How It Works	Comments
Metal roofing	Shed snow	Expensive Hazardous snowslides Requires re-roofing
Aluminum "ice belts"	Shed snow	Unattractive Often ineffective
Heat tape on roof	Melt ice as it forms	Potential fire hazard at eaves Wastes energy Often ineffective
Self-sealing rubberized membrane installed under shingles	Additional line of defense against water penetration	Effective backup to a cold roof approach Requires re-roofing

Correction

Once an ice dam forms, the only relief is to remove the ice and snow from the roof. This extremely dangerous work should be left to qualified professionals with the right tools and insurance. Improperly done, the roof can be severely damaged.

Damage: Obvious & Hidden

Ice dams cause millions of dollars of damage every year. Obvious, visible damage may include:

- sagging, ice-filled gutters
- delaminated or rotted roof decking
- stained, sagging wall or ceiling drywall
- damaged and/or dislodged shingles or shakes
- wet insulation (both temporary and permanent problems)

This damage is usually repaired when weather or funds permit.

Unfortunately, obvious damage may be just the tip of the iceberg. The worst effects of ice dams are often hidden, caused by moisture trapped inside walls or floors. This damage is seldom discovered until months after all the snow has melted. The insured seldom makes the connection between the damage found and their ice dam of the previous winter.



Besides the cost of restoration, hidden damage can make future ice damming more severe, waste energy, and even create serious health risks for building occupants.

Hidden damage is entirely preventable. With proper instruments, equipment and training, trapped moisture in building materials can be detected and removed before it causes severe damage.