

Rooftop drama

Getting the roof right should be a vital aspect of building design in cold environments

Never underestimate the power of Mother Nature. Falling snow and icicles can cause serious damage, and even injury. Designing snow-country rooftops to address snow and ice should therefore be common sense, yet it is remarkable how few roof designs take these factors into account.

Leaks and roof replacement are costly enough, but there are even bigger liabilities, including snow-damaged decks, ice-crushed transformers and pancaked cars. There are also cases of serious human injury and death. Major resort hotels can spend US\$600,000 shovelling snow every year to avoid liability risks. And how many times have you seen signs in the mountains warning, 'Beware of falling snow'? Such signs keep lawyers dreaming at night.

The physics of snow are real. Old snow, regardless of where it is, comprises 50% water and weighs about 31.25 lb/ft³. Putting these numbers into perspective, a 440 lb California Sierra snow load is equivalent to 16 cars on the roof, stacked one on top of the other.

As a dynamic force of nature, heavy snowfall will always hold the power to awe and delight us. Snow should never hold a building owner hostage however. Expertly designed rooftops can be both attractive and less costly to build and maintain, so it is important to get the design right first time.

Snow-country roof principles

What follows next are the 10 essential planning principles for the successful design of snow-country roofs, which, if followed carefully, can pay dividends.

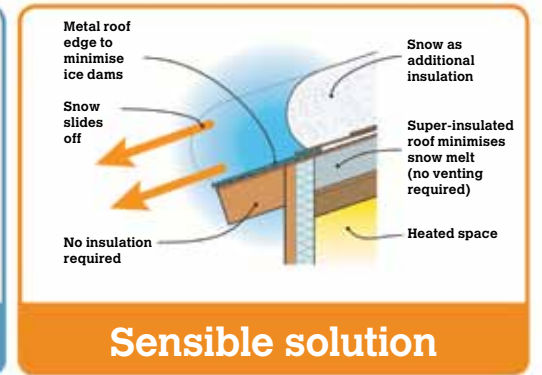
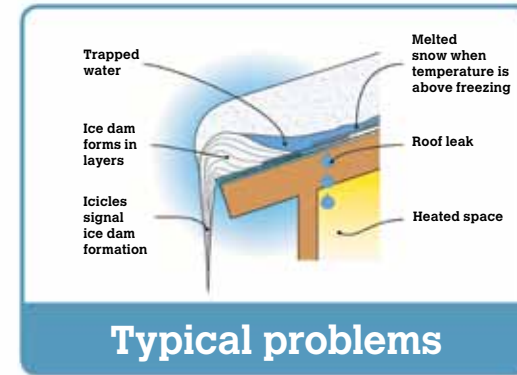
1. Keep it simple: Simple roof forms minimise snow and ice impacts, whereas complex roof forms can be construction and flashing nightmares. Roof penetrations, perpendicular standing seams and rooftop valleys should be avoided due to snow's destructive glacial action, otherwise known as 'snow creep'.

Experience also contests the myth of 'cold roofs' – a sandwich system where two roof assemblies are separated by an air gap. In theory, this ventilates heat from the lower roof and leaves the upper assembly 'cold' to minimise snowmelt and icicle formation. The problem is cold roofs only work with simple roof forms that balance air intake and exhaust at the eaves and ridgeline. For example, rooftop dormers, bends, chimneys and other complications eliminate free airflow and therefore the expected benefits.

2. Hold it! Many people specify expensive metal roofs in the mountains, wrongly believing that they should be designed to shed snow. This solution actually unleashes snow's destructive forces and defies building codes. A high-friction roof – such as composition shingles – keeps snow in place under most weather conditions and is more energy efficient because snow is terrific insulation.

3. Pitch perfect: The natural angle of repose for snow is 6:12; beyond this point, avalanches occur. A pitch of 4:12 is recommended for a sloped roof in snow country to minimise snow creep and the liabilities of sliding snow.

4. Super insulate: Skimping on insulation wastes energy over the long



term and promotes ice dams and icicles. Ideally, a minimum R50 insulation value is required for roof assemblies in cold environments.

5. Use protection: All building entries should be protected from sliding snow and ice, and from annoying drips. Gabled roof forms, arcades or cross-eave configurations address these potential issues.

6. Cover the decks: Cover all decks in snow country to protect railings, minimise maintenance and keep the spaces usable all year round.

7. Damn the ice dams: Ice dams and associated icicles represent a major source of roof leaks and premature damage. The use of a flat-seamed metal panel at the roof eave will minimise ice build-up. Proprietary eave-melt systems can also regulate roof dams and the destruction they can cause.

8. Belt and suspenders: Roof eaves, ridges, valleys and adjacent vertical walls are weak links in roof construction and should be protected by a quality bitumen-based roofing underlayer and properly detailed flashing.

9. On guard! Snow clips and snow guards protect against certain weather conditions and design compromises. Nevertheless, they are often used to fix problems that should never exist. A well-designed roof doesn't require shovelling or retrofit. Clips and guards cost money and have structural and waterproofing implications.

10. Keep it out of the gutter: Snow-country roofs are usually better off without a gutter system. If used, gutters should be installed below the roof's slide line and fully heat traced, including exposed downspouts.

Ultimately, adhering to these 10 principles will help to avoid costly mistakes, reduce liability and maximise operational efficiencies. <<

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