

SLIDING ICE AND SNOW CAUSE ROOF AND PROPERTY DAMAGE

By Rick Olson



Arrowhead condominiums in Big Sky, Montana.

The power of ice and snow is seldom apparent as individual snowflakes fall to the ground. But when snow accumulates on a roof, the damage that can be caused by sliding ice and snow is a major concern. Tim Ryan, president of the Arrowhead Condominium Association and head of the property management firm for the association, has first-hand experience in dealing with sliding ice and snow.

Located in Big Sky, Montana, the Arrowhead Condominium Association consists of 24 units with metal standing seam roofs on a 12/12 slope. The homes are only 10 to 15 feet apart, and each is a ski-in, ski-out unit on a hillside. During harsh winters, snow, ice dams, and icicles were sliding off the units and damaging neighboring homes. The front door of one unit collapsed three different times from sliding snow. The decks on the buildings had to be closed for the winter, since many rails and decks had been torn off by snow and ice. On lower shed roofs, not only was the metal roofing torn and bent, but the 3/4" plywood sheathing was crushed between the roof's rafters.

On several occasions, Ryan had worked with the association's insurance company assessing the damage. The insurance company said it would not renew the association's policy due to the continuing problems. "Their concern that the ice and snow could potentially cause great personal injury was too great," noted Ryan. "We did not know how to eliminate these problems, so we

contacted a professional in providing solutions to stop the movement of ice and snow."

"The consultant [Terry E. Anderson of Anderson Assoc. Consulting Inc.] recommended an engineered snow retention system," Ryan continued, "and a good ventilation system that, once installed, would stop most of the ice dam and icicle problems. He



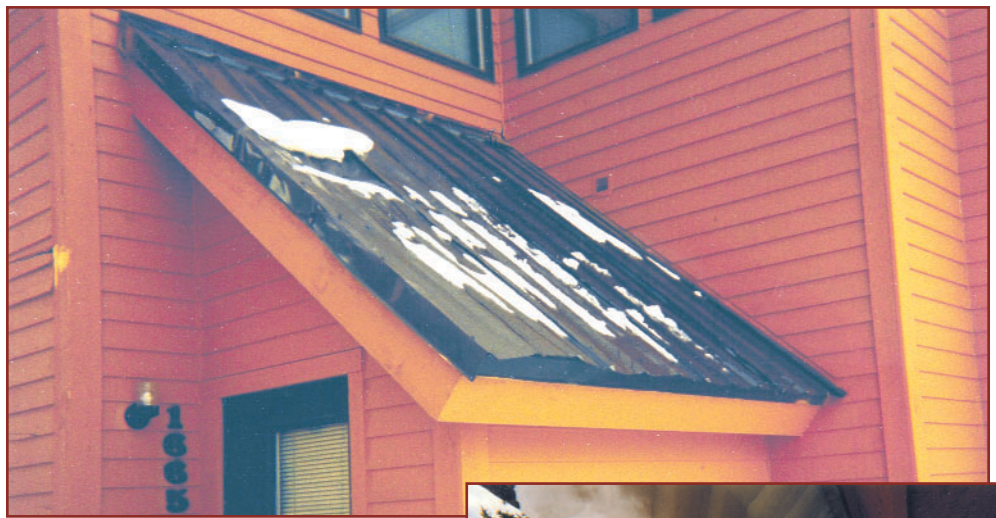
Arrowhead condos from a distance.

visited with the board and gave several options. After reviewing the choices, the Arrowhead Condominium Association chose concrete tiles. The association felt concrete tiles had the longest proven performance record in Europe on cold roof designs, and they also liked the look of the tile."

After the specifications and details were written, the project was bid by qualified roofing companies who were familiar with the specified cold roof system. Trojan Roofing of Salt Lake City, Utah,

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Damage to metal roof and sheathing from snow and ice falling from the roof above.

was selected. The tile chosen was one produced by Westile, Inc. of Littleton, Colorado.

Since the engineered ground snow loads increased after the units were built, a local engineering firm was hired to check the structural integrity of the buildings for retaining snow and ice on the roof. Securing the rafters properly to the top plate and purlins was the only minor change required.

Because it was late in the year and winter was approaching, the Arrowhead Association chose to re-roof 14 of the 24 units immediately. It was difficult for Trojan Roofing to work in the cold and snowy conditions,



Snow and ice sliding off metal roof and curling into window.

but it gave all involved a great opportunity to see the difference between the old and new systems.

Many of the homeowners were concerned that the buildings could not retain snow on a



Above: New cold-roof system framework for concrete tile roof.



Right: New concrete tile roof with snow retention brackets.

12/12 slope. However, with proper engineering of fences and brackets, the system retains the snow and ice on the roof. The system was designed using a fully engineered snow retention system with TRA Snow Brackets and a "Cold Roof System."



The cold roof system stops ice dams and icicles by venting air outside below the roof tile and above the sheathing from the eave to the ridge. The equalized temperature minimizes thawing and refreezing of the snow on the roof by venting away heat from the living space. The system is based on the Roof Tile Institute and Western States Roofing Contractors' Association's *Cold Roof Manual* and air ventilation charts from Europe.

Since adequate ventilation was critical to the success of the roof system, calculating the air openings needed from eave to ridge was essential. The designed air intake system at the eave and the ridge exhaust system at the raised-ridge vent were to work in tandem to achieve the major difference between the old and new systems. This was immediately apparent when icicles were eliminated and snow was retained on the roof.

Homeowners of the first completed re-roofed units were very pleased with the results. The owners commented on how exceptional the tile looked with all the copper flashings and the copper TRA Snow Brackets. The real proof of the improvements between the two roof systems became clear as the snow began to fall; the difference in the two roof systems was obvious. The newly

designed cold roof system allows the snow to compact naturally with ice in the bottom three inches. This ice freezes around the triangular portion of the snow bracket and permits run-off between the ice and the tile when the outside temperature is above freezing.

"The new units have stopped all snow and ice movement as well as icicles," stated Ryan. "The old units still have leaks, icicles, ice dams, damaged decks, and snow and ice hazards. Our association and our homeowners are very happy with the look and design of the units. We are looking forward to having the last ten units completed this spring and summer. Retaining the snow on the roof has also reduced the high snow removal cost."

According to Ryan, "Credit needs to go to Anderson Associates Consulting, Western States Roofing Contractors Association, and the Roof Tile Institute for

Left: Note difference in snow retention. Middle building with new tiling and snow guards is providing safe snow and ice retention. Far building with old metal roof had its deck torn off from sliding snow and ice.

Below: Note the contrasts between the old and new systems. The roofs to the left and the right still have the old system – metal with no snow retention devices, causing ice dams and hazardous conditions. The center slope is a cold-roof system with concrete tiles and a snow retention system at work. It is safe, attractive, and insurable.



the work on *The Cold Roof Manual* that made this system possible, as well as the great work done by Trojan Roofing while working in such bad winter snow and ice conditions. The units look beautiful; they are safe and insurable," concluded Ryan. ■

ABOUT THE AUTHOR

Rick Olson is director of technical services for the Roof Tile Institute (RTI). He has been in the tile industry for over 25 years, first as owner of a small tile company, then president of Marley Rooftiles USA, and subsequently president of RTI. Olson is a member of ASTM (chairman of C15.06), vice chairman of the Roofing Industry Committee on Weather Issues (RICOWI), and a member of the Western States Roofing Contractors Association (WSRCA), National Roofing Contractors Association (NRCA), and the Florida Roofing, Sheet Metal and Air Conditioning Contractors Association (FRSA).



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