



THE ARROWHEAD CONDOMINIUMS
IN BIG SKY, MONTANA.



Power of Ice

Sliding Ice & Snow Causes Roof & Property Damage

by John Del Grosso, TRA Snow Brackets

The power of ice and snow is seldom apparent as each unique snowflake falls to the ground. Yet, when snow accumulates on the roof, the damage that can be caused by sliding ice and snow is a major concern. Tim Ryan, president of the Arrowhead Condominium Association, a Private Unit Development, 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 consisted of 24 units with metal roofs and a 12:12 slope. These homes are only 10' to 15' apart, and each is a ski-in/ski-out unit on a hill-

side. During harsh winter weather, the snow, ice dams, and icicles were sliding off the units and damaging neighboring homes. The front door of one unit even collapsed three different times. The decks on the buildings had to be closed for the winter, since many rails and decks had been torn off. On lower shed roofs, not only was the metal roofing torn and bent, but the $\frac{3}{4}$ " 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 com-



pany said it would not renew its policy due to the continuing problems. "Their concern of the ice and snow killing someone was too great," noted Ryan. "We did not know how to eliminate these problems, so we called Locati Architectures of Bozeman, Montana. They referred us to Terry Anderson of Anderson Associates Consulting, Inc."

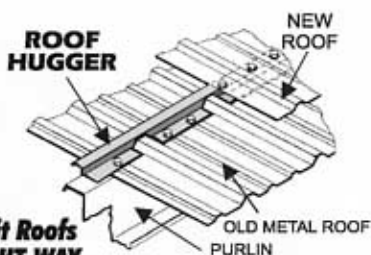
Anderson, who is the co-author of *The Cold Roof Manual*, published by the Western States Roofing Contractors Association and the Roof Tile Institute (RTI), visited the project to review all the damage and concerns. He concluded that the only way to solve the problem was to stop the movement of ice and snow.

"Anderson recommended an engineered snow-retention system," Ryan continued.

(Continued on Page 26)

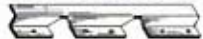
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Power of Ice

(Continued from Page 24)

"He also recommended a good ventilation system that, once installed, would stop most of their ice dam and icicle problems. He visited with the board and gave them several roof options. After reviewing the choices, the Arrowhead Condominium Assoc-



iation chose concrete roof tiles. The association felt the concrete tiles had the longest record of use in Europe using a cold-roof design. They also liked the look of the tile."

After Anderson Associates wrote the specifications and details, the project was bid out to qualified roofing companies who were familiar with the specified cold-roof system. Trojan Roofing, from Salt Lake City, Utah, was selected. The choice of all parties was concrete tile produced by Westile, Inc. of Denver, Colorado.

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

Because it was late in the year and winter was approaching, the Arrowhead Association chose 14 of the 24 units to be reroofed immediately. It was difficult for Trojan Roofing to work in the cold and snowy conditions, 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 12:12 slope. Anderson worked with the homeowners, assuring them that with proper engineering of snow fences and snow brackets, the roof system would retain the snow and ice on the roof. The system was designed using a fully engineered snow-retention system with TRA Snow Brackets.

"Neither the homeowners nor the association understood what a cold-roof system was and how it would stop ice dams and icicles" stated Anderson. "We worked very closely with them, explaining that venting air below the roof tile and above the sheathing would make melting and freezing equal from eave to ridge. We used the

(Continued on Page 28)



Power of Ice

(Continued from Page 26)

RTI and WSRCA *Cold Roof Manual* and air ventilation charts from Europe.”

Since adequate ventilation was critical to the success of the roof system, Anderson calculated the air-duct size needed from eave to ridge. He then designed an air-intake system from the eave and a ridge exhaust system in a raised-ridge vent. Everyone involved was pleased to see the major difference from the old to the new system, which was immediately apparent when icicles were eliminated and snow was retained on the roof.

Homeowners of the first reroofed 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 3". This ice freezes around the triangular portion of the TRA Snow Bracket. This permits the natural run-off of water to shed between the ice and the roof tile when the outside temperature was above freezing. Photos were taken to show the other property owners, who are all over the U.S., the improvements.

“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 heavy 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 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. 