Concrete Tile Excels in Snow Country; Europe Shows How

By Terry Anderson

Ruined penetration pipes, torn-off gutters, broken tiles, damage to property below roofs and various other snow- and ice-related problems on concrete tile roofs are just a few of the complaints I have repeatedly received since I began roof consulting in the western United States. After researching the problems in the U.S. and discovering that there were few effective solutions, I determined to look beyond our borders. The solutions to all of these problems were found across the Atlantic Ocean in Europe, where concrete tile is both popular and performs well in snow and ice areas.

Snow-covered Oslo sports a predominance of pitched-tile roofs.

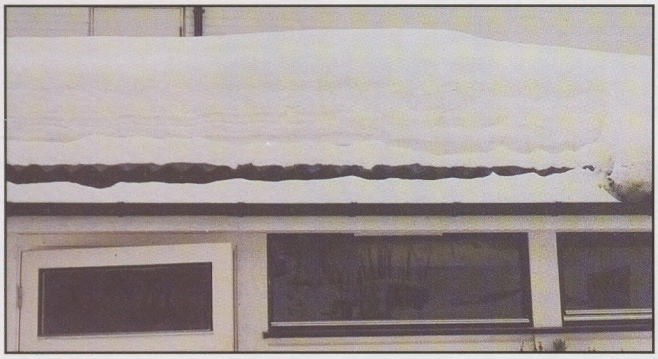
Monier Inc., the largest U.S. manufacturer of concrete roof tile, referred me to their parent company, Redland PLC, headquartered in England. I studied tile roofs in various parts of Europe, including England, Germany and Norway. In the vicinity of Oslo, Norway, where winters are long and severe, tile roofs were inspected in the heaviest snow areas.

In Norway, tile manufacturers from Zanda arranged a meeting for me with the head of the information division of the Norwegian Building Research Institute (the equivalent of ICBO or BOCA) where they were queried regarding the overwhelming choice for concrete roof tile in their country. They opined that Norwegians are more concerned about life cycle cost, energy efficiency and fire ratings than Americans appear to be. Concrete roof tile has fit their stringent requirements best. Asphalt shingles were used to a small degree after World War II because of their low cost, but were replaced by tile again when the population could afford a longer lasting product.

Research in Germany indicated that most pitched roofs utilize concrete tile. The pitches ranged from 10:12 in the lower land of Frankfurt but changed to 5:12 in the Austrian Alps, a practice opposite what I generally see in the U.S. The standard practice in America is to increase pitch as you travel upward in elevation, as evidenced by A-frame cabins and steeper pitched roofs. Why do pitches of roof drop from 10:12 in low snow areas to 5:12 in high snow areas in Europe? It was discovered that the Germans and Norwegians actually want a "snow blanket" on their roofs.

I was familiar with the idea of using snow as an insulator. Years ago, as a Scoutmaster, I would take my troop to the Klondike Derby (a winter campout held in February). Some of the scouts would build snow caves to sleep in. Others brought tents. The ones who slept in the caves were warm. The boys in tents often slept little because of how cold they were. Obviously, the snow and ice of the caves acted as an insulator and the temperature was therefore much warmer than that in the tents. The effort to use the insulative properties of snow on roofs in rural areas of Norway and Germany was astounding. I saw centuries-old stone and slate buildings with low pitched roofs that actually had boulders placed on the roof to help hold the snow in place!

Snow and ice damage is almost non-existent in Norway



This is an example of a double-vented system and brackets functioning to hold snow on a roof in Norway.

and Germany. Designers and roofers use a double-vented cold roof system to keep the temperature just below the tile at 32 degrees. This creates compacted snow and stops icicles and ice dams caused by heat loss from the building which melts the snow. Working like a fireplace flue, cold roof systems draw cold air from outside through the roof soffit. This air mixes with warm air in the attic and is vented out through a continuous ridge vent. This mixed air in the attic is about 50 degrees on average during the winter.

To get the air under the tile close to 32 degrees, it is again vented under the roof tiles using 2 x 2 vertical battens. This draws air from eave to ridge, venting it out. When spans from eave to ridge are very long, vents are also placed midpoint. Metal snow brackets are slipped over the tiles, interlocking between courses. Some tile manufacturers form snow stops into the tiles themselves. These hold the snow in place, prevent it from sliding and thereby avoiding damage to the tile, penetrations, property and people.

Underlayments used in Germany were limited generally to one layer of 30-pound felt over the roof sheathing and 2 x 2 vertical battens below. Many roofs in Norway had underlayment unfamiliar to me. The decks were a tempered hardboard with an asphalt coating applied, acting as decking and underlayment. Neither of the two roofing systems included a bitumen or ice-and-water shield product.

While studying in Germany I discovered that Braas (which is part of the Redland Braas Building Group) provides roofers with hardbound roof application books which include details like how many snow brackets to use and provides layout charts based on snow load and degrees of pitch. Because of this support and the demand for tile, the majority of cold climate roofers in Europe are well educated about tile and know how to install it.

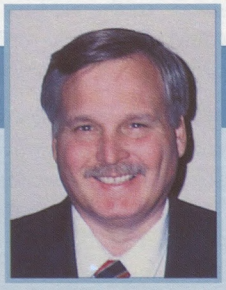
Metal snow brackets on a tile roof in the German Alps.

Today in these areas, architects specify concrete tile made with built-in snow stops or requiring metal snow brackets placed throughout the roof from ridge to eave. In some cases, snow fences are also used. The purpose of these fences is to prevent the avalanching that sometimes occurs with layered snow. I also found that because of the double vented cold roof system, ice was greatly reduced. Copper gutters were widely used without any concern for them being torn off. I found no evidence of bent penetration pipes or broken tile in valleys, nor of any damage from snow and ice slippage. All of these conditions have been pervasive on tile roofs in the mountains of the western United States.

These tiles have affixed concrete snow stops. Note the vented system between deck and tile, at right.

(Photos by Terry Anderson)

Much of this "old world knowledge" was brought back to Utah and has been used successfully for the past two winters. Europeans obviously worked through their snow and ice concerns centuries ago and have developed a tile roof system that will perform for centuries more. Since their combination of low slope roofs, cold, vented attics and engineered placement of snow brackets performs so effectively, the construction industry in the United States should take careful note.



About The Author

Author Terry Anderson has been involved in the roofing industry for 20 years and is the owner of Anderson Associates Consulting in Highland, Utah. He is a member of RCI and NRCA. Mr. Anderson also serves on the committee for tile roof applications in snow and ice areas for the National Tile Manufacturers Association and Western States Roofing Contractors Association. He conducted research in Europe and has reported some of his findings in this article. For more information, please contact Terry Anderson at 4544 West Killarney, Highland, Utah, 84003; phone (801) 756-9811; fax (801) 756-7891.