AVALANCHE!

FALLING ICE FROM STEEP ROOFS IS A PREVENTABLE HAZARD!

BY JOSEPH JENKINS

Death by icicle is not fun. Reports from such snowbound locations as St. Petersburg, Russia, bear this out, where falling ice killed five people and injured 150 more, including babies and children, in one recent winter. In 2001, 74 Moscow residents were victims of falling ice. In Chicago last winter, falling ice caused the closure of several streets and forced at least one bus route to be changed after people were injured and cars were damaged by ice and snow avalanching off downtown roofs. Perhaps the most famous incident took place at the Cowboys Stadium in Texas during Super Bowl week last year when several workers were injured by falling ice and snow. What's a property owner to do?

Water weighs over 62 pounds per cubic foot (about 8 pounds per gallon), and ice is about 92% the weight of water. A cubic foot of solid ice would plummet to the ground like a 57-pound rock; which begs the question, does one have a snow management system for the roof, or a potential liability nightmare? Property owners can be liable for damage or injury from avalanching snow if it could have been prevented by proper maintenance. This is a fact one does not want brought to one's attention by a lawyer after it's too late.

Snow retention systems are designed to hold the ice and snow on a roof so that they won't come suddenly crashing to the ground. Such systems help prevent damage to people, cars, shrubbery, and other property that may be in the fall zone below, not to mention the gutters that may be on the building, which are often ripped off or bent by suddenly sliding ice. Snow guards, snow dogs, snow birds, snow stops, snow pipes, snow rails, and snow fence are all names for snow retention systems. Such devices have been manufactured for over a century in the U.S. and are designed for slates, cedar shakes, asphalt shingles, ceramic tiles, standing-seam, and flat metal roof systems. They're available in stainless steel, copper, bronze, cast iron, galvanized steel, cast aluminum, painted steel, and polycarbonate. Some are mechanically fastened, some require an adhesive, some are soldered, and others hook onto existing nails or shingles.

Perhaps due to the great variety of snow guard types and styles, building codes do not govern these products or their density, placement, or spacing on roofs. Instead, a consumer must review the wide selection of snow retention devices and systems and decide which type to use and how to install them. Most snow guard manufacturers and distributors provide technical support and will develop a plan for an individual situation, including how many snow guards to install, how far apart in each course, and how many courses are needed. These details are determined by such factors as roof slope, rafter length, climate, roofing material, holding capacity of the snow guard, building orientation, and location. Other considerations include dormers, valleys, upper roofs, and historical climate data such as maximum snowfall, drifting, and freeze/thaw cycling.

According to the M.J. Mullane Company, Inc., one would calculate the density requirements of snow guards thus:

In order to determine the minimum density required (Q), one would first determine the average mechanical force failure point of the snow guard (F). Then the climatic data relative to the greatest anticipated weight (W) of the accumulated snow is analyzed to determine the design load (pounds per square foot of roof area), taking into account drifting and snow moving from upper roofs and valleys. The area of the subject roof is then calculated (A) and multiplied by the sine of the angle of the roof to determine the resultant vector force (V) [that] will be applied to the snow guard. This calculation assumes that the coefficient of friction on the roof surface is zero. So (A)rea x (W)eight of snow x (S)ine of the roof angle, divided by the (F)ailure point of the guard, would

determine the minimum (Q)uantity of guards required for a particular roof area. As in most engineering calculations, the use of a safety factor is recommended for a secure installation.

It should now be obvious why one would want to have technical support when designing a snow retention system for one's roof. Engineers love this stuff, but the rest of us develop glazed eyes when talking about sines, vector forces, and failure points. We just want the snow to stay on the

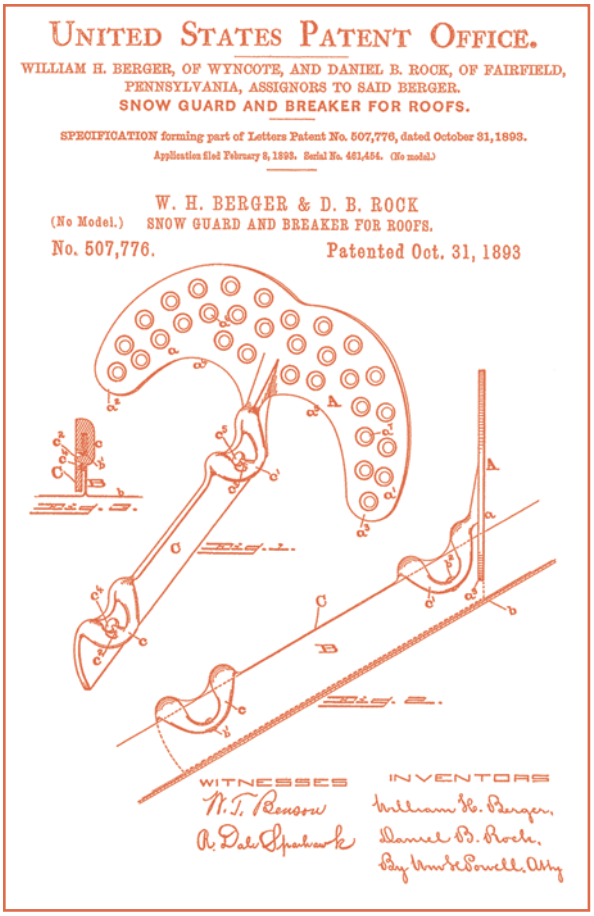
Figure 1 – Mullane's classic 100 and 200 series of snow guards are made from cast bronze and copper. They're available in both standard and retrofit models.

Figure 2 – Mullane's heavy-duty eagle, oak leaf, and fleur-de-lis cast-bronze snow guards add elegance to a roof while providing effective snow retention. They are not available in retrofit models but must be installed when the roofing is installed.

roof. So let's take a look at some commercially available snow retention devices available today. Manufacturers include Mullane, Berger, Sieger, Jalco, Gough, S&S Copper, Short Slate, and many others.

The aforementioned Mullane company, owned by Berger since 2006, offers a popular Bronze Guard® line in cast bronze (*Figure 1*). Some of these snow guards are also available in a retro hook style for installing on existing slate roofs. Styles include cast eagles (hence the term "snow birds"), oak leaves, and fleurs-de-lis designs (*Figure 2*). Most of Mullane's snow retention products are designed for slate or asphalt shingle roofs. Their most heavy-duty snow retention system is the Mullane 500 brass, three-pipe snow rail, shown in *Figure 3* (also called

Figure 3 – The Mullane 500 brass and cast-bronze three-pipe snow rail system is one of the strongest snow retention systems available. It can be backed with expanded stainless steel, as shown in the lower portion of this illustration, to catch even small items that may slide off a roof, such as a falling shingle.



UNITED STATES PATENT OFFICE.

WILLIAM H. BERGER, OF WYNCOTE, AND DANIEL B. ROCK, OF FAIRFIELD, PENNSYLVANIA, ASSIGNORS TO SAID BERGER.

SNOW GUARD AND BREAKER FOR ROOFS.

SPECIFICATION forming part of Letters Patent No. 507,776, dated October 31, 1893.

Application filed February 8, 1893. Serial No. 461,454. (No model.)

W. H. BERGER & D. B. ROCK

(No Model.) SNOW GUARD AND BREAKER FOR ROOFS.

No. 507,776. Patented Oct. 31, 1893

WITNESSES INVENTORS

Figure 4 – William H. Berger's device, patented in 1893, is still sold today as the Berger SGBR1 snow guard.

"snow fence" or "snow pipes"). These are institutional-grade devices that are frequently spotted on churches, cathedrals, and other large buildings. Mullane snow rail products come in two-pipe and three-pipe, brass, galvanized, and cast-bronze systems.

Berger Building Products Company, a leader in snow retention products since 1874, offers a comprehensive

Figure 5 – Copper "loop-the-loop" snow guards are perhaps the least expensive of all snow retention systems. They're easy to install and effective when used in sufficient quantities.

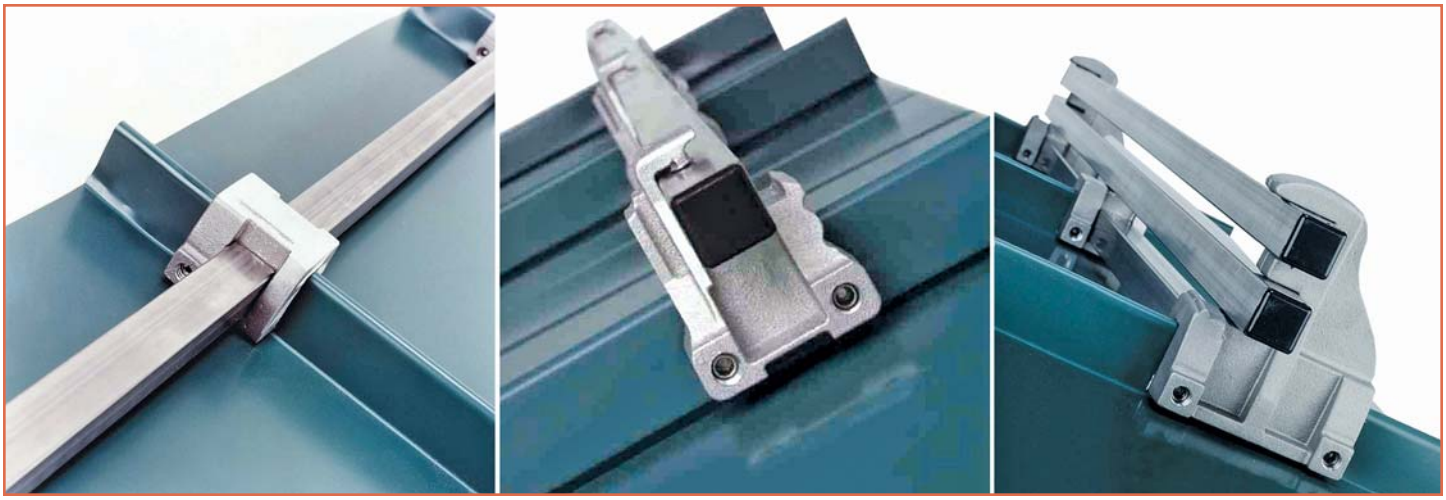


Figure 8 – Berger's aluminum snow rails for standing-seam roofs include, from left to right: the S-Rail, the E-Rail, and the F-Rail systems. Their installation requires no roof penetrations.

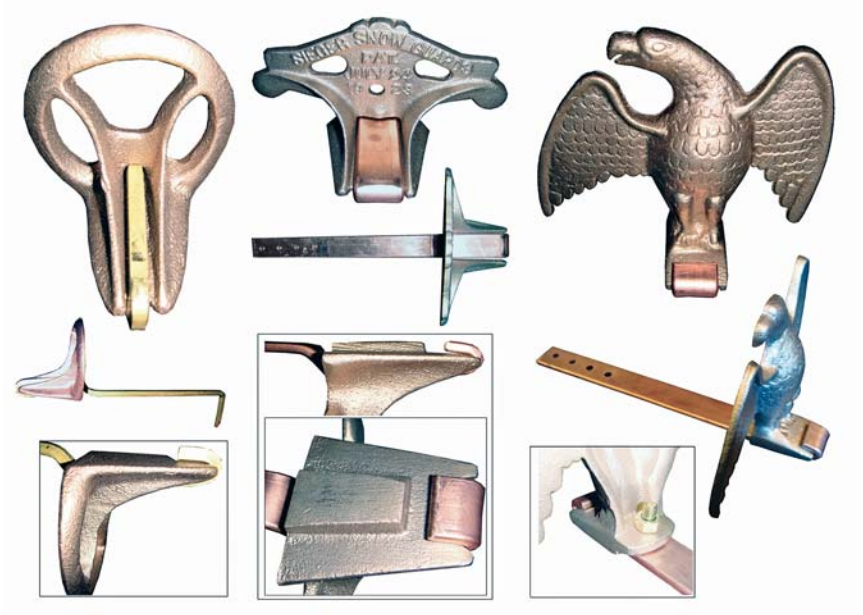
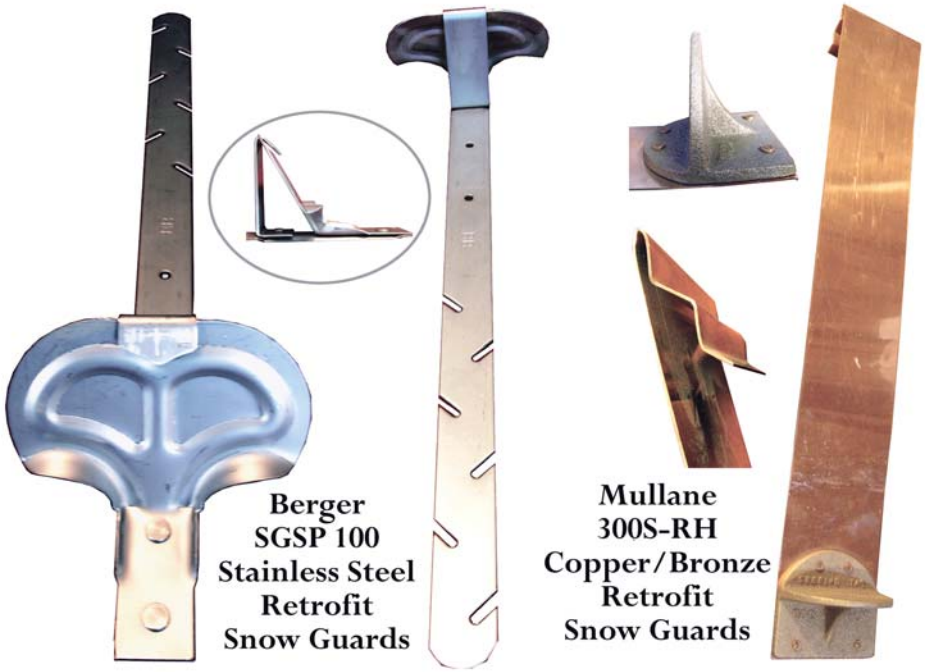


Figure 9 – The Sieger snow guard line includes cast-aluminum and cast-bronze snow guards and rails.

Figure 10 – Two types of retrofit snow guards that can be attached to existing roofs are shown. The Berger 100 series, shown in stainless steel at left, simply slips underneath the shingles and hooks onto an existing nail. The Mullane 300 copper/bronze retrofit snow guard, shown at right, slides underneath slates or tiles and hooks over the head of the underlying shingle.

and safest snow retention lines on the market today (*Figure 9*). Three original snow guards were offered in the early 1900s by founder Henry Sieger of Slatington, PA, in the heart of Pennsylvania's slate quarrying country; and now more than 12 different styles are available, including bronze and cast-aluminum snow rail systems. The company is based out of Leesport, PA, and is run by the Reiger family. Tim Reiger, the CEO, is a hands-on guy, while Kathy Reiger manages the office, working closely with distributors and customers.

John Kleckner got tired of looking at rust stains running down roofs from steel snow guards, so in 1958, he came out with what some say was the first aluminum snow guard. Today, Jalco snow guards of Laureldale, PA, are made with at least 50% recycled aluminum. Their products, de-



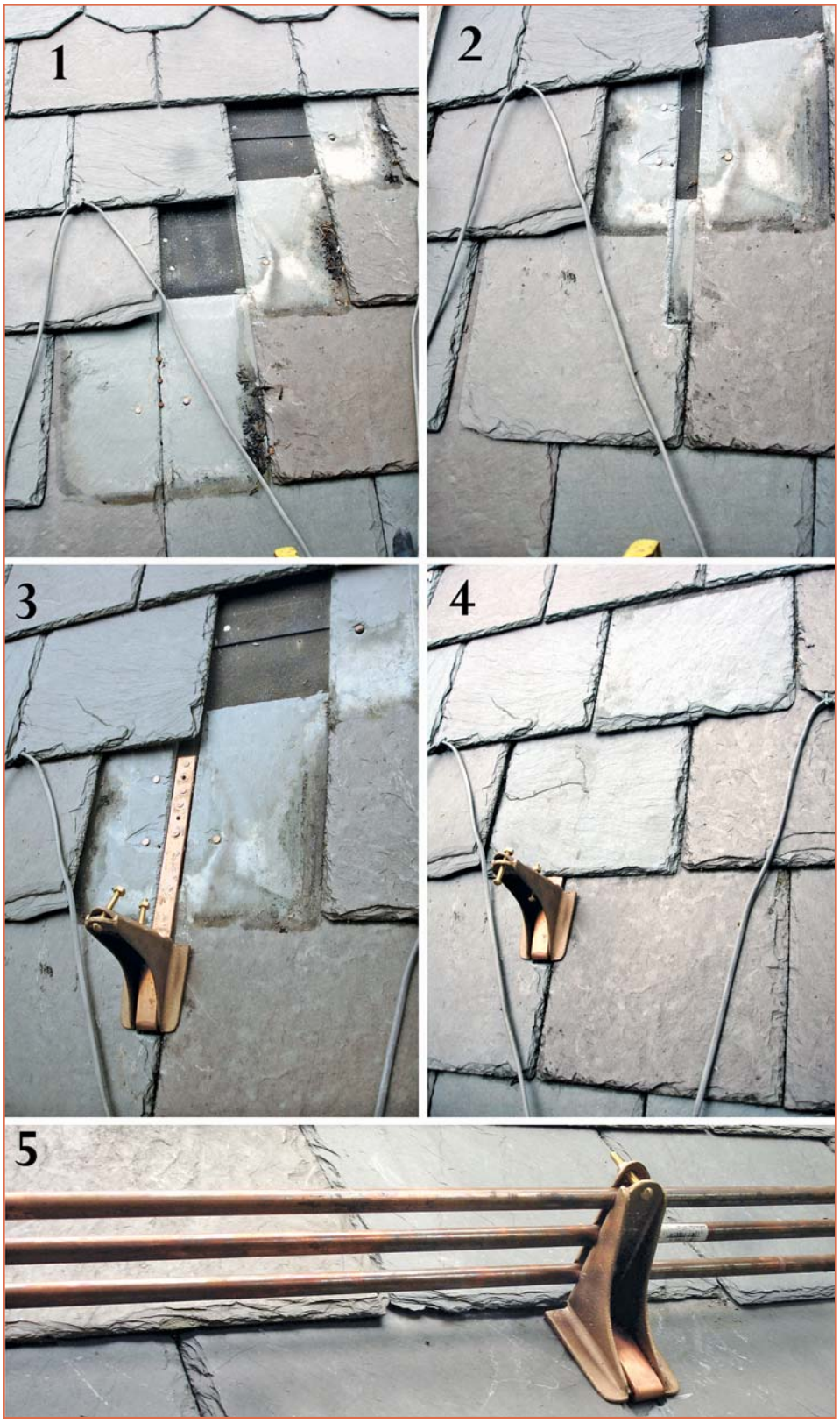


Figure 11 – Snow guards with shafts can be added to existing slate roofs if some of the slates are removed, as illustrated in this series of photos: 1) Remove three diagonal slates, the lowest of which will be the slate underneath and to the left of the snow guard. 2) Notch the lowest slate and reinstall it using two nails on the right side, one above the other. 3) Insert the snow guard shaft into the notch and fasten it to the roof deck using nails or screws. 4) Insert the slate immediately above the snow guard and fasten it with two nails on the right side. Then insert the third slate and fasten it with a slate hook. 5) In this case, the snow guard is a rail bracket. Such brackets only need to be installed in a single row and are spaced approximately every three slates.

signed for slate and asphalt shingle roofs, include eagle and other classic designs.

Snow guard installation procedures obviously depend on the type of roof on which the snow retention system is being installed. Retrofit snow guards for slate roofs may have a shaft that can simply slide underneath the existing slates and hook onto the slating nails. Other retrofit designs slide underneath the slates and hook over the top edge or the "head" of the slate (*Figure 10*). When installing new hard shingle roofs, standard snow guards simply nail in place as the shingles are installed. The shingles may need to be notched when installing snow guards with brass or cast-aluminum shafts (*Figure 11*). Snow guards for standing-seam metal roofs simply slip over the seam and are anchored to it, usually by stainless steel set screws (*Figure 12*). Snow guards for flat metal roofs (*Figure 13*) can be soldered into place when made of copper, brass, or bronze, or mechanically attached and fortified with an adhesive when the guard is aluminum or polycarbonate. Some snow rail systems require the removal of a slate shingle or ceramic tile, which is then replaced by an identical brass, bronze, or cast-aluminum shingle or

Figure 12 – Snow guards for standing-seam roofs come in a variety of sizes and shapes. Shown at right are Berger and Sieger snow guards and rails made of cast and polished aluminum and cast bronze.

Figure 13 – Snow guards for flat metal roofs (below) can come in a variety of sizes, shapes, colors, and materials, including aluminum, copper, bronze, and polycarbonate; they can be mechanically fastened, adhered with an adhesive, or soldered.

Figure 14 – Mullane's Fitrite series of aluminum alloy and bronze snow fence brackets for tile roofs allow consumers to install heavy-duty snow retention systems on a variety of tile types.

tile on which a snow rail bracket is permanently mounted (*Figure 14*). Brass, stainless steel, galvanized, or copper pipes slip through the brackets to create a snow rail, a very effective barrier against ice and snow avalanches.

The number one reason snow guards fail is because not enough of them are installed. Contractors sometimes want to cut corners and get away with skimping on snow guards because most property owners aren't the wiser. When the number of snow guards is insufficient, a bad ice year can bend them or even pull them out (*Figure 15*), allowing an avalanche to occur and damage to be done. Also, contractors sometimes don't do their homework before installing snow guards, and they install them incorrectly, face-nailing them to the surface of the roof as shown in

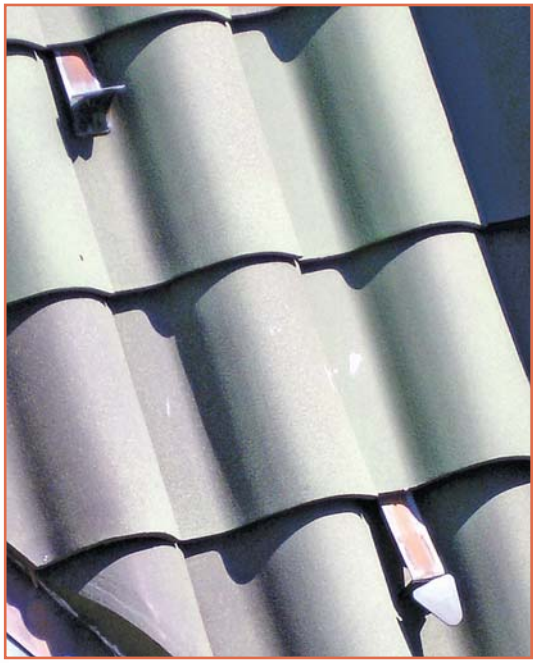


Figure 15 – This is an example of an overloaded snow guard that simply got flattened (bottom of photo). One snow guard by itself is a bad idea. The number one reason why snow guards fail is because not enough are installed.

Figure 16. This creates leaks and makes a mess. It is imperative that snow guards be installed in sufficient quantities and according to manufacturers' recommendations for best results.

Snow retention systems may not be "silver bullets" that will prevent all ice and snow from falling off a roof. They will, however, go a long way toward alleviating the dangers and liabilities of roof avalanches. Snow guards and snow rails are effective devices that should be in the arsenal of all roofing contractors, whether installing new roofs or retrofitting older ones.

Figure 16 – This photo shows an example of a very bad snow guard installation. This type of guard has a notched shaft that simply slides underneath the slates and hooks on an existing slating nail. However, the installer slid the snow guard shafts up the slot between the slates and nailed them there instead, then covered the exposed nail heads with roof cement. Of course, they leaked and looked ugly from the outset. These snow guards are made of galvanized steel, the cheapest type available. Note the rust stains running down the roof from each snow guard. Stainless steel snow guards are only slightly more expensive and will never rust.

Joseph Jenkins

Joseph Jenkins has been a member of RCI since 1999, during which time he has been an RCI conference speaker and contributed several articles to *Interface*. He has received multiple awards for his book, the *Slate Roof Bible*, including the 2001 NRCA Gold Circle Award in 2001. Jenkins also publishes the *Traditional Roofing Magazine*, is executive director of the nonprofit Slate Roofing Contractors' Association of North America, Inc., and is a former board member of the National Slate Association. His company, Joseph Jenkins, Inc. (SlateExperts.com), also operates online supply centers at SlateRoofWarehouse.com, SolderWarehouse.com, and SnowGuardWarehouse.com.