

What You Need to Know to

# Keep a Slate Roof Alive for Centuries

by Joseph Jenkins

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Traditional slate roofs are fabulously successful roofing systems that can easily function as a waterproof covering on a building for a century, and, if properly constructed, for 150 years, or even 200 years. Some slate roofs in Europe are still in good functioning condition after 400 years.

Their longevity, however, is not their only quality. Slate roofs are made of natural materials — primarily stone (slate) with wood boards or battens and metal fasteners (nails). They are simple, low-tech roofing systems that are beautiful to look at. When they do need to be replaced, the slates can be discarded as clean fill as opposed to the toxic waste of petrochemical roofs. As such, slate roofs are sought after by those who are ecologically minded.

Despite their reputation as the finest of roofs, slate roofs are arguably the least expensive roof money can buy when the entire life of the roof is taken into consideration. I recently looked at a beautiful slate roof on a cathedral in Arkansas that is 120 years old. The cost to install this ornate 11,700 square foot roof, with a 220 foot spire, was \$765.00 for the labor and \$1,166.50 for the materials in 1881. Even adjusted for inflation, it should be obvious that this was money well spent.

## FOUR MAIN REASONS WHY OLDER SLATE ROOFS FAIL

### 1) TYPE OF SLATE

One reason many older slate roofs fail is because of the type of slate — some types wear out sooner than others and once they wear out they can't be saved. There are many types of roofing slate and they each have their own particular qualities and idiosyncrasies. On the 120 year old cathedral roof mentioned above, the slate was installed with an ornate pattern of black and green slate. The green slate originated in Vermont, while the black slate originated in Pennsylvania. The black slate had a life expectancy of about 120 years, an age that had been reached, and it was showing a lot of delamination, softening, and crumbling. The slates had served their useful life and were now failing. The green slates, on the other hand, remained hard and showed no deterioration after 120 years — it's anyone's guess how much longer they would last. If the entire roof had been installed with the green slate, the roof would not have needed replaced at this time. Yet, because half of the slates were a softer black variety that had reached the end of its life, the roof was not repairable; it had to be replaced (with new slate, of course).

It is imperative that people who own or work on slate roofs know of the different types of roofing slate, their origins, longevities, characteristics, and qualities, and be able to identify the slate on the roof in question. If sight identification is not possible, then they must be able to send a slate sample or photo to someone who knows slate in order to have it identified. Presently, in the US, roofing slate is still being quarried in Virginia, Pennsylvania, New York, and Vermont. However, a century ago there were hundreds more American slate quarries than there are today, including in Maine and Georgia. The differences between the slates from the various quarries were sometimes striking, so a knowledge of the history of slate quarries is also important for people who work with traditional slate roofs.

### 2) FLASHING FAILURES

Even if a slate roof is composed of very long lasting slate, the metal flashings can wear out and leak before the slate wears out. These flashings are sheet metal joints that are installed between the various planes of the roof in order to prevent water entry, such as in the valleys, along dormer walls, and around roof penetrations such as chimneys. The most common older flashings were made from terne coated steel, which is steel coated

with a lead/tin combination, also erroneously (but commonly) called "tin." Terne coated steel must be painted regularly to avoid corrosion. Copper flashings (either plain copper or lead coated) were used primarily in association with institutions and upper-scale residences, and often sheet lead flashings were used on older buildings, especially around plumbing vent pipes. The terne flashings could last 90 years or longer if they were kept painted. Copper flashings, ironically, because they are typically not painted, will begin to corrode, pit, and leak in about 60 to 70 years in areas of high wear, such as valleys. For this reason, older copper flashings should be painted in order to extend their effective lives.

When flashings begin to fail on a slate roof that is made of sound slates, only the flashings should be replaced, not the entire roof. This is routine work for slate roof restoration professionals. One of the extraordinary characteristics of slate roofs is that they are designed to be taken apart and put back together. Broken slates, worn flashings, rotted sheathing boards, or any element of the roof can be removed and replaced without the need to replace the entire roof. Because of this unusual maintenance characteristic, slate roofs can be made to last as long as the slate itself will last, which could be hundreds of years.

When repairing or restoring a slate roof, individual slates are removed from the roof in order to expose the existing flashings, which can then be removed and replaced. The removed slates are then put back into their original positions and the repaired roof will look much the same as it did before the repair, except with new flashings. The sign of a good repair is one that is invisible to the layperson.

### 3) SLATES ARE BROKEN OR MISSING

It is not uncommon for a century old slate roof to have 50 or more slates fail from simple attrition. Slate is a natural stone with faults and hairline cracks and a slate will eventually break here and there on the roof. A typical 20 square roof (2,000 square feet), with a typical 10"X20" slate, will have about 3400 slates. If fifty of them fail after a century, then the failure rate of the roof is 1.5% per 100 years — phenomenally small. Yet, one missing slate is all it takes to create a leak, which in turn may cause someone to shout, "tear it off and replace it!" More often than not, many people unknowingly lose their good, repairable, slate roof when they could easily have repaired or restored it.

Faulty slates should simply be removed and replaced. Replacement slates matching in size, shape, and color must be used whenever possible. Replacement slates must never be fastened in place with visible straps or face (exposed) nails. Instead, there are two generally accepted methods of fastening replacement slates into place: the *nail and bib method*, and the *slate hook*.

The nail and bib method is perhaps the most widely used. This involves nailing the replacement slate with a nail in the slot between the overlying slates (see illustration) and then sliding a "bib" flashing under the overlying slates and over the nail head. The bib is often bent slightly in order to friction fit it into place. It can be composed of aluminum, copper, or other non-corrodible metal. The bib should not be shiny and reflective like stainless steel as it may then be visible from the ground on a sunny day. Instead, copper or brown painted aluminum (coilstock) are preferred. A common size bib is 4 inches by 7 inches.

A slate hook is a hard wire hook made of galvanized steel, copper, or stainless steel, approximately three inches long. A small exposed loop hooks the replacement slate in place. This is one instance when an exposed repair device is acceptable as the tiny hook is almost invisible from the ground. Stainless steel hooks are stronger than copper. Slate hooks are preferable to the nail and bib on particularly hard slates and on new slate roofs, especially for repairs in the field of the roof.

The tool required for removing slates from a roof is the *slate ripper* — a sword-like object that slides up under the slate and pulls out the two nails that hold it in place. A *slate hammer*, another important slate roofing tool, has a hole punch at one end used to punch holes in slates for nailing. Some slate hammers also have shanks designed to cut slates, which is done by a chopping motion against a straight edge, typically a *slater's stake*. Salvaged slates readily punch without breaking, leaving a clean hole with a "countersunk" characteristic into which the nail head sits. New slates can be hard and brittle and require some practice for easy punching with a slate hammer. Standard thickness slates (3/16 inches thick) are readily cut with a simple hand-held device, a *slate cutter*.

Contractors should work on slate roofs using *hook ladders*, which keep their weight off the slate while giving them a safe work platform to cling to. It is not proper to work on slate roofs by walking on them using ropes, as

walking on slate roofs breaks the slates — this is the primary reason low-slope slate roofs fail prematurely. Slate roofs *can*, in some circumstances, be carefully walked on by a qualified slate roofer, and that means a slate roofer who will repair any slates he breaks during his moving about.

It is improper to tar or coat the surfaces of slate roofs, or to use surface tar for repairs. Not only is this unsightly, but it doesn't stop leaks permanently and it ruins the slates.

#### **4) ABUSE, BAD REPAIRS, AMATEUR WORK, NEGLECT**

One of the biggest problems facing older slate roofs today, and a cause of many leaks, is not natural attrition, flashing failures, broken slates, or global slate failures. It is, put plainly, bad work. There are many unqualified persons attempting to repair slate roofs who don't know what they're doing. In my own slate roof restoration business, fully half of the work we do is the removal and replacement of faulty repairwork. Slate roof owners pay good money to have their roofs abused, then they have to pay good money again to have it repaired correctly. Abused roofs include the ones that are walked on by "bigfoot," the ones that are face-nailed, tarred, repaired with non-matching slates, coated, or reflashed incorrectly.

Furthermore, roofing contractors who have little or no expertise in slate roofs will advise a roof owner to replace a slate roof which may have many decades of life remaining. A roof owner will listen to bad advice when it is the only advice that can be found. All these factors combined can make a roof owner, in frustration, want to forever remove his slate roof no matter how much longer it will last if properly repaired.

#### **ADDITIONAL CONSIDERATIONS**

Low slope slate roofs will fail prematurely because people will walk on them over the years and break the slates. The resultant leaks are often repaired by non-professionals because the roofs are low in slope and therefore accessible. These repairs tend to be done poorly; the roof will still leak, resulting in more traffic on the roof, and a downward spiral of deterioration begins, ending with the demise of the slate roof. The lowest slope advisable for a slate roof is 4:12. However, the slope should be too steep to walk on in order for the roof to last a long time. That would bring the slope up to about 8:12 or steeper.

Nails are often said to be the cause of slate roof failure, however, this is often not the case at all. It is true that nails will corrode on an older slate roof, but this is most likely under two general conditions: (1) the nails were of poor quality when initially installed, and/or (2) the slate has reached the end of its life and moisture is now penetrating the roof, thereby corroding the nails. Originally, in Wales, slate roofs were installed with wooden pegs driven through a hole in the top center of the slate. The slate/peg combination was then hung over a horizontal lath on the roof — no nails were used. The weight of the slates overlapping each other held the roofing in place. In the US, slates are nailed in place with two nails situated about a third of the way down the slate, along the outside edges. The slates are nailed into boards (roof sheathing — usually one inch thick) or into horizontal wooden strips (slating lath or battens, usually one by twos or threes), depending on the predilection of the installer. Lath roofs are common in Wales, England and Europe, so immigrants from those countries often copied their traditional styles of slate installation once they arrived here in the US at the turn of the last century. Traditional Scottish roofs use solid boarding, as is more common in the US. Most of the older slate roofs in the US are nailed with hot-dipped galvanized roofing nails, although most institutional and upper-scale residential roofs are nailed with copper nails. Some older slate roofs are nailed with square-cut iron nails. I have seen many a hot-dipped or cut-steel nail that has been on a slate roof for 100 years and still in quite serviceable condition. The exceptions are as mentioned above: poor nails to begin with (not hot-dipped), or a roof on it's last legs due to slate deterioration.

The need for felt underlayment on slate roofs is another exaggerated "urban myth," so to speak. The most common underlayment on older slate roofs is 30 pound felt. It is used in order to prevent leaking during installation. After about 75 years, the felt deteriorates almost to a powder under the slates. This is not a cause for concern. Many slate roofs in the US have been installed with no felt underlayment whatsoever and they do not leak, even after a century. This is true for virtually all barn roofs, where leaking during installation was not a

concern so no felt was used when the roof was installed. These roofs do not leak — felt or no felt. The felt underlayment is only essential during installation on a structure where rain water can damage the interior. It is very bad advice to tell someone that they must replace their slate roof because the felt has worn out, although this sort of advice is often given by roofing contractors or consultants who don't know what they're talking about.

Nowadays, the trend is to install slate roofs as if they are simply asphalt roofs with slate on them, which they are not. This means that traditional tried and proven methods of slate roofing are being abandoned and replaced by methods that cater to the convenience of the contractor and/or architect. Consequently, architects are now specifying new slate roofs with plywood roof decks and ice and water shield (to preserve the plywood), as they do for asphalt roofs. Although slate can be installed on plywood, you cannot expect a plywood roof deck to last as long as a natural wood deck, which will easily endure 150 years, maybe much longer. I stayed in a house in Scotland last year with a 215 year old original 1 inch board roof deck, and, of course, a slate roof in excellent condition. Natural roof decks do not need ice and water shield, a fact that has been proven by millions of century old slate roofs with natural wood decks and no ice and water shield. There is no acceptable reason to downgrade proven, simple, natural, and fabulously successful traditional slate roofing methods, and the trend toward membrane-covered plywood decks under slate is a trend that will create a whole new set of problems for the slate roofs of the future. When smart roofers and architects stick with traditional roofing methods they create for our future generations one of America's most overlooked treasures — a beautiful, long-lasting slate roof.

## **BIO**

Joseph Jenkins has an international reputation in the slate roofing industry, having been involved in the trade since 1968 and personally working on over 1,500 slate roofs. He authored the Slate Roof Bible, 3rd edition, which received 10 national and international book awards in 2017. Jenkins also published the Traditional Roofing Magazine and has provided nationwide slate roof consulting services since 1998. A former board member of the National Slate Association, Jenkins founded the Slate Roofing Contractors Association of North America, Inc. (SlateRoofers.org) in 2005, an international, non-profit, 501c6 trade association, of which he is currently Executive Director.