A BRIEF BACKGROUND ON CHINESE SLATE

from John Xue

Although slate has been used for 500 years in China, the modern slate industry is only about 20 years old. The story goes like this: in the early eighties, when China initiated its open-door policy, one former minister from the Urban Construction Ministry saw expensive "stone" being used on top of roofs when he was visiting the United States. When he returned to China, he instructed his associates to find the same stone to export. One of the first places identified was Ziyang in Shaanxi province.

However, it was not until the mid-nineties that China began to distinguish between different qualities of slate—that some slate was fading and some was not, and other issues such as water absorption and acid resistance. This perhaps explains why Chinese slate varied greatly in quality, sometimes even within the same crate. With the introduction of new processing machines from Europe, as well as improved quality control, China is now able to produce good quality slate, although production volume is still rather low.

The color ranges from black to red, yellow, green, grey, blue, purple, etc. Most of the slate is used for decoration or "culture stones" as the local customers call them.

Here are some general descriptions of slate from three provinces:

1. **Beijing**: Slate from Men Tou Gou has been used for roofing for over 500 years. Most of the present production, about 80%, is exported for flooring, walls, roofing, etc. The color varies: black, black grey, purple, green, jade green, etc. The green slate from Fang Shan is very popular, especially for use in billiards tables.

2. **Shaanxi**: The slate vein runs for over 200 km eastwest It averages 50 km wide. Most of the slate was formed from the Ordovician to the Cambrian periods. In this area, they have the beautiful, high quality black slate, which comprises 50% of the national production capacity. People from Germany, France, Belgium, UK, Spain and the United States have come to visit the area for sourcing, purchasing, investment, etc.

3. **Hubei**: Zhu Xi and Zhu Shan areas are supposed to have the largest reserve of Cambrian, Ordovician and Silurian slates. Colors include black, grey, bean green and green. Unfortunately, the overburden is quite large, averaging 50 meters.

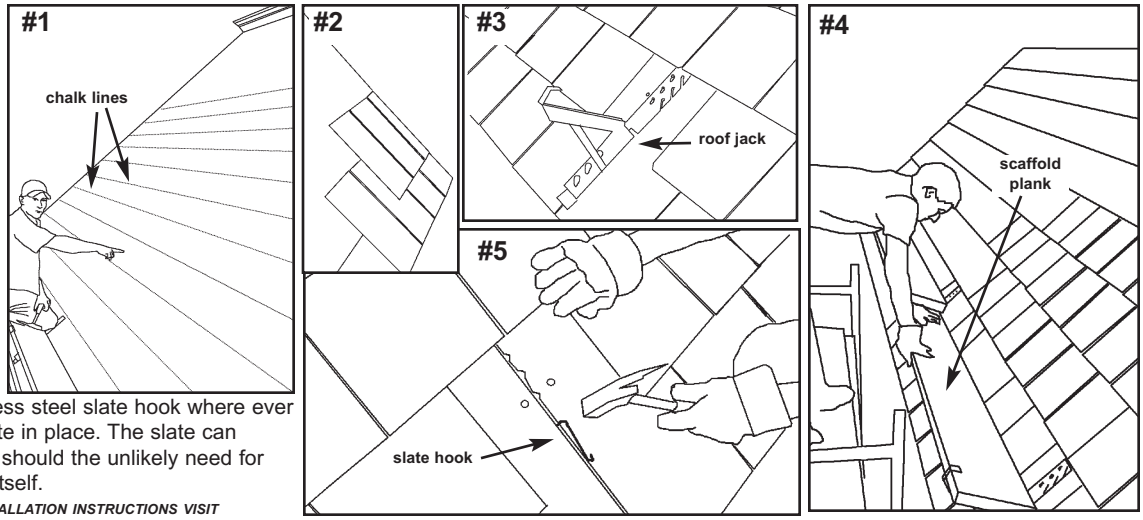
John Xue can be contacted at #38 Shuncheng Road North, Small North Gate, Xian, Shaanxi 710003, P.R. CHINA; johnchina@china.com.

For more information on Chinese slate, contact Jeff Shao of ACK Development, PO Box 48647, Athens, GA 30604; (706) 543-6206; roofslate@aol.com (see add this issue).

SLATE ROOF INSTALLATION HINT

#1) Felt the board roof deck with 30 lb felt, then chalk a line marking the top of each course of slate.
#2) Attach your cant strip, nail your starter row, and begin slating.
#3) Periodically leave a slate out and install a roof jack.
#4) Proceed in this manner until you have staged the roof with adequate roof scaffolding.
#5) When done, install a stainless steel slate hook where ever a slate was left out. Hook a slate in place. The slate can always be removed again later should the unlikely need for future roof scaffolding present itself.

FOR MORE SLATE ROOF INSTALLATION INSTRUCTIONS VISIT WWW.JENKINSSLATE.COM



TRADITIONAL ROOFING

Dedicated to preserving the skills and knowledge of the traditional roofing trades

VOLUME 2:1 SPRING 2002

GRADUATED SLATE ROOFS

TRADITIONAL ROOFS FROM HISTORIC ROOTS

by Joseph Jenkins

Not all slate is created equal. Being a natural stone mined from the Earth, slate comes in many types with many different characteristics.

In the old days, when roofing slate was wrestled from quarry holes and mines using hand tools and beasts of burden, the splitting of roofing shingles from rock was an arduous and exacting art. Many slate deposits contained very hard, rough textured stone that could not be split into uniform, thin sheets. For the sake of efficiency, the stone was split into the largest slate shingles possible, creating a supply of coarse shingles that varied considerably in size—some larger, some smaller. In order to make good use of all these slates, a certain style of roofing was developed—*graduated* slate roofs.

In this style of roofing, the largest slates, sometimes massive, are installed at the bottom of the roof. This allows for the heavier weight of these large stones, perhaps 30 inches long, to be borne by the wall of the building. It also relieves the roofer of having to carry the heaviest slates, which may weigh 200 pounds, to the top of the roof. Furthermore, the bottom of the roof is exposed to more water than any other part of the roof, and heavier slates are more apt to withstand the excess erosion and weathering.

As the roof installer progresses up the roof, smaller and smaller slates are used until the slates near the top may be only 12” long. The result is a roof that “graduates” in size from large at the bottom to small at the top, yielding an architectural style that is both unique and pleasing to the eye. Traditional graduated roofs also utilize *random width* slates. There are still many of these roofs in good condition scattered throughout the United States, yet the art of installing graduated slate roofs is a dwindling one. This issue of *Traditional Roofing* focuses on this art and is intended to preserve and revive knowledge and interest in graduated slate roofs.

A BIT OF HISTORY

A good place to look at the history of graduated slate roofs is in Scotland, England and Wales. Scottish slate tends to be a rugged, coarse, and extremely durable rock. Unable to split large, uniformly thick slates from the raw material available in Scotland, the Scots created a distinctive roofing style with a rough texture in keeping with the stone architecture so characteristic of Scotland’s traditional

(CONTINUED ON PAGE 6)

Traditional Scottish Slate Roof, Edinburgh, Scotland

IN THIS ISSUE

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SLATE ROOF INDUSTRY ROUNDTABLE

An event recently occurred that may not have previously taken place in living memory. On January 22, 2002, a slate roofing industry "roundtable gathering" was held in Saratoga Springs, New York. Its intended purpose was to explore reunification of the slate industry, particularly the National Slate Association, an organization not active since, perhaps, the 1930s.

The meeting was "an effort to address the challenges that face the industry as a whole and establish itself as 'the source' for dimension stone slates and slate roofing information," according to Bill Marcum of Martech Associates, primary organizer of the event. The gathering was conducted in an informal setting "in an effort to collect thoughts and gather input into the formation of a formal association that would represent the many needs in the dimension stone slate and slate roofing industry in the new millennium," said Marcum.

The one day event was attended by Bill Marcum; Nancy Turner of US Quarried Slate, Fair Haven, VT; John Conlin of Hilltop Slate, Granville, NY; Jim Gibbs, Pat Rudder, and Jim Constantine, all of Cornell University; Doug Cochran of Durable Slate, Columbus, Ohio; Dave Leeland of Leeland Slate Roofing, Lititz, PA; John Meyer of Vermont Slate and Copper; John Hill of Greenstone Slate, Poultney, VT; Steve Taran of Taran Bros., Inc., Vermont; Pete Tatko of Sheldon Slate Products; Norman Farrell of Pennsylvania; Stuart Matthews of Northern Roof Tile, Blasdell, NY; Matt Millen of Millen Roofing, Milwaukee; Richard Boyle of Evergreen Slate, Granville, NY; Shawn and Dave Camara of Camara Slate, Fair Haven, VT; Craig Markow of Vermont Structural Slate, Fair Haven, VT; Chuck Smid and Clay Heald of New England Slate, Sudbury, VT; Pete Papay of Penn Big Bed Slate, Slatington, PA; Ken Lerch of Structural Slate Co., Pen Argyl, PA; and myself, Joseph Jenkins of Jenkins Slate Roofing Services, Grove City, PA.

The meeting consisted of a presentation by Marcum, punctuated by questions and discussion among the group. Marcum asserted a need for consistent information in the general slate industry—the need for a singular authoritative source of information, explaining that this meeting represented a "wide open opportunity/invitation" and the group was encouraged to tell others about it. Marcum further asserted that he believed a slate association was desperately needed for two basic reasons:

1) To create "standardization" among the industry. This would include, for example, standards regarding hole punching in slate, as well as standardized industry terms to replace or clarify ambiguous ones such as "weathering" and "fading." An association would further aid in the distribution of this standardized information.

2) To establish installation or application methods for roof slate that are universally accepted.

ASTM testing of slate was discussed at some length. Many expressed frustration at the ASTM testing procedures, which were said to be inconsistent and unreliable, or "inaccurate and wrought with errors," as Hill stated, adding that "you can cut four pieces of slate from the same slate, send it to four testing companies, and get four different results." It was suggested that perhaps only three testing labs that are proven to be reliable could be used by all, and that the testing procedures need to be advanced. Again, the assertion was made that an association is needed to change the current testing system. Or, as Marcum put it, "It's time for a change. Let's do it!"

Estimated costs to get such an organization off the ground ranged from a pay-as-you-go approach suggested by Shawn Camara, to $25,000.00 for the first year estimated by Marcum, to $100,000 or more in annual operating costs suggested by Millen, who is affiliated with the National Roofing Contractors Association and aware of its multi-million dollar budget. Marcum also suggested that the publication known as the "Slate Roof Quarterly," now edited by Dave Leeland, could easily become the official magazine of the association.

Although no concrete decisions were made by meeting's end, and no conclusions were arrived at, it seemed to be the general consensus of the group that the formation of a slate industry association should be further considered. No additional meeting dates were set, although several people agreed to meet at a time of their own discretion, in one of three groups, for further discussion.

(CONTINUED ON PAGE 15)

TRADITIONAL ROOFING

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***TR** is a free quarterly newsletter distributed to homeowners, architects, historical and preservation societies and traditional roofing industry professionals across the United States and Canada. Letters and submissions are welcome. Please direct all correspondence to*

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READERS WRITE

(CONTINUED FROM PAGE 13)

Spain, including from the Galicia and Leon regions, and from other foreign sources as well (look for an article on Spanish slate in a future TR). Take your time and shop around — your slate roof should last at least a century if the right slate is used and it's properly installed, so why rush into it? Buyer beware.

ROUNDTABLE

(CONTINUED FROM PAGE 2)

These groups were: 1) manufacturers (quarriers), 2) roofing contractors, and 3) owner/designers. Group one included John Conlin, John Hill, and Shawn Camara. Group two included Doug Cochran, Dave Leeland, Matt Millen, and Joe Jenkins. Group three included Bill Marcum, Pat Rudder, and Jim Constantine.

At the time of this writing, there were no additional developments to report.

CLASSIFIEDS

For Sale:

Tile: 10" Conosera, Red, Smooth, 300sqs + trim; Spanish, Dull Green Smooth, 80 sqs + trim; Lanai, Lava Black, Weathered, 40 sqs + trim; Closed-Shingle, Dull-Green, Smooth, 100 sqs + trim **Slate:** 18xRxStd, SWGG, 60 sqs; 20xRxStd, Virginia Buckingham, 40 sqs; Graduated Vermont, Multi-colored, Intermingled Thickness; large amounts of standard and thick red slate. **The Durable Slate Company, 800-666-7445**

WORLD SLATING AND TILING CHAMPIONSHIPS 2002

The 15th International Federation of Roofing Trades (IFD) World Congress will be held November 5-9 in Dublin, Ireland this year.

Sponsored by the Irish Roofing and Cladding Contractors Association, the Delegate cost will be EUR400 (about $350.00 US) per person attending the Congress. The World Slating and Tiling Championship for Young Roofers coincides with the Congress, and will take place at the same time, also in Dublin, at the Plan Expo 2002.

Plan Expo is Ireland's premier construction industry event with over 250 trade stands and 7,500 visitors. Delegates to the IFD Congress will be able to view both the championships and the Expo. The Championship is a three day competition between 16 or so countries— a pair of the country's best students, with the help of an older mentor, install slate and tile on roof mock-ups and are judged accordingly. The winners receive gold medals. **The IFD Congress is complete with a welcome reception at the world famous Guinness Brewery and a Gala dinner/entertainment award ceremony evening at a five star hotel in central Dublin**, which will be remembered long after the event is over. A group of Americans will be attending this year. We will provide more information as it becomes available to anyone who is interested. Email us at mail@jenkinsslate.com, call 814-786-9085, or drop a line to Jenkins Slate Roofing Services, PO Box 607, Grove City, PA 16127, or for delegate information, simply email stephan.murtagh@expo-events.com (Expo Exhibitions Limited, 8/9 Sandyford Office Park, Dublin 18, Ireland; Tel: 00353-1-2958181; Fax: 00353-1-2958187).

Every issue of Traditional Roofing features an article on a business in the traditional roofing industry.

THIS ISSUE'S INDUSTRY SPOTLIGHT:

CAMARA AND SONS SLATE COMPANY

The "Slate Valley" of western Vermont is well-known world wide for its high quality, multi-colored roofing slates—some of the best slates in the world come from here. Stretching for 25 miles from north to south, the valley is dotted by numerous quarries of stone that glistens purple, red, green, gray, or black; stone that has been historically proven to withstand the test of time on the roofs of buildings. Many rugged men work these quarries, wrestling from the Earth the massive stone slabs that will be skillfully worked by hand into individual roofing shingles.

Dave Camara is one of those workers. President and founder of Camara Slate, Inc., Dave and four of his sons now operate three working quarries spread throughout the valley. Camara Slate also owns an additional dozen or so area quarries for possible future development.

Dave started in the business in the early 80s by salvaging slates from old buildings, trucking the salvaged slates around the nation, and backhauling steel building components. His slate salvaging business expanded rapidly, allowing, from year to year, the purchase of bigger trucks and more slates, and finally his first slate quarry. Truly a tale of hard work, determination, and ingenuity, Dave Camara, with the help of his family, has risen to the top of the field in the slate roofing manufacturing business. Camara Slate now offers for sale new slates of a rainbow of colors: gray, unfading red, Spanish black, unfading green, unfading mottled purple, "sea green," purple, and Vermont gray black. They also produce slate flooring, flagstones, cladding, sills and copings, treads and risers, countertops, and structural slate in a variety of colors. Pallets of salvaged slates can still be found in the Camara stockyard on Route 22A just outside Fair Haven, although these are now dwarfed by the extensive inventory of new slates that fill the yard.

Dave Camara and a supply of "sea green" roofing slates awaiting shipment at the Camara Slate Co., Inc. stockyard on Rt 22A just outside Fair Haven, Vermont.

Camara and his sons express a strong pride in their products; their attention to detail and concern for quality and reputation is remarkable. Shawn Camara (age 30) runs the Blissville Quarry at the northern end of the valley, working alongside the other men there, splitting slates and keeping an eye on quality control. Here they produce the unfading slates: mottled green and purple, unfading gray and unfading green. Dave Camara, Jr., (age 33) works in the pit at the Blissville quarry—an experienced "rockman," responsible for selecting the high-quality stone that is needed for splitting into roofing shingles.

Shawn Camara, Vermont's most eligible bachelor, splitting a slate block into roofing slates at the Blissville Quarry.

Mike Camara (age 32) runs the West Pawlet quarry at the southern end of the valley, while Danny (age 26) is the rockman there. Here they produce Vermont black slates, semi-weathering gray, and semi-weathering green slates. From their Wells quarry, in the center of the valley, also come sea green and semi-weathering gray slates.

Camara slates are shipped throughout the United States including Hawaii, as well as to Canada. Their roofing slates have the traditional punched nail holes as opposed to non-countersunk drilled holes that are found on lower quality slates. The holes are punched to allow for either a three-inch or four-inch headlap. Camara's slate prices are very competitive; their product quality appears to be quite high; their attention to detail and concern for customer satisfaction are genuine, and they offer information that is no-nonsense and straightforward. As a result, Camara Slate is gaining an impressive reputation among roofing contractors in the United States. They're certainly worth a look when considering the purchase of virtually any slate product.

INSTALLING A GRADUATED SLATE ROOF

By Barry Smith

While visiting Edinburgh, Scotland, in November 2000, I was fascinated to see thousands and thousands of graduated slate roofs. Scottish slate, it was explained, can't be split into smooth and regular pieces, so orders were traditionally filled with different sizes of slate. These would be sorted at the job site and installed with the larger slates at the bottom and gradually smaller slates on up the roof. Fortunately for Scotland, this frugal practice produces a beautiful and distinctive roof that looks appropriate on both mansions and barns.

Graduated roofs are uncommon in North America because we have many types of very fine-grained slate that can be used to produce uniform thickness and sizes of roofing slate. A uniform slate roof requires less labor to install and is therefore less expensive, so this has always been the norm. As a result, the few graduated roofs to be found tend to be on higher-end buildings. These roofs were installed to give the building an elegant European look. I was therefore very interested when contacted by an upscale contractor in Erie, Pennsylvania, to bid on a graduated purple slate roof for a new garage, being built to match the bay-front mansion beside it.

After meeting the contractor and home owner at the building site and discussing their plans, a sampling of measurements was taken from the slate on the house to determine what sizes to order. The slates were about 70 years old and in great shape. They ranged in thickness from 3/8" to 3/4", giving the roof a very textured look.

Matching the roof exactly was going to cost a lot more than an approximate match. So I had several slate companies quote on 3 different options, all involving purple slate. First: 4 different lengths in descending ratios; 40% of 22", 30% of 18", 20% of 16", and10% of 12". Each of these came in 3 to 5 different widths, and ranged in thickness from 3/8"-1/2". Second: The same as above except thinner; 1/4" to 3/8". Third: 20" long slates by random; 1/4"-3/8". The thicker slate was obviously more expensive than the thinner, but the installation labor was the variable that was most affected by each of the options above. Finally, I was able to give them a proposal with the 3 options, with the closest match being the most expensive. They decided on the middle option, thinner slate, but still graduated.

Layout Calculations

The roof was just over 13 squares, but because of valleys and hips, starter slates, capslates (instead of ridge iron), the need to balance all the different sizes, and the need for extras to do some work on the house, I

(CONTINUED ON PAGE 5)

Putting the finishing touches on one side of garage, Erie, PA. Most of the faces had hips on both sides so we started in the middles and worked our way to the edges. Note how the steep roof pitch allowed us to lay ground ladders right on the roof, thereby avoiding the need for any roof planks .

Got a friend or friends who would like to receive ***TR***? Send us the address(es), and we'll add them to our mailing list!

READERS WRITE

(CONTINUED FROM PAGE 9)

Do I think it's wrong to put ice and water shield along the eaves of a slate roof? I think it's unnecessary in western PA, even though almost the entire state is categorized as benefiting from ice and water shield according to the NRCA. It may be a design improvement in Maine or other area of more severe weather. It may also simply be a way to extract more dollars from a roof owner. Some roofing contractors here in western PA advise homeowners to take off the slates along their eaves and install IWS and then re-install the slates. This is a costly approach compared to just finding a leak and fixing it.

Obviously, the IWS industry's marketing efforts are paying off.

* * *

"I had 3000 sq.ft. of spanish slate [from Galicia region of Spain] shipped to my home in NJ. It is roughly 3/16" in thickness. When it arrived, I was surprised to see no holes in the tiles." G.M.

* * *

Jenkins replies: They don't typically "hole" the slate in Spain during quarrying like they do here, as much of the Spanish slate is shipped to Europe where they tend to install the slate with hooks rather than nails, so no nail holes are needed. When slates are produced for the American market, they are holed before shipping (usually). Looks like you got a shipment that wasn't holed. You'll probably have to hole them by hand with a slate hammer.

Buying slates from a foreign source can be a huge gamble unless you're familiar with the quarry, the slate mill, and the work ethic of the people who produce the slate. I have recently heard quite a few horror stories about large, new, slate roofs that are failing after only 10 years (or less) due to "bad" slates coming from foreign sources. Some of these failing jobs have become a huge liability for the installer or for the company that provided the slate — nightmare scenarios that you do not want to experience and don't need to if you educate yourself.

Not only are slates that are destined for a European market usually not holed, but they can also be very thin, maybe 1/8" thick. American slates are always holed and are usually 3/16" to 1/4" standard minimal thickness. Furthermore, all nail holes in roofing slate must be punched to allow for a counter-sinking effect on the front of the slate so the nail head can sit down into the slate. If the slate is drilled, the drilled holes must also be counter sunk. Many foreign slates are being shipped to the US without the counter sinking, and some domestic slates may also be lacking in the same manner. Slates that have nail holes without counter sinking will allow the nail heads to rub against the overlying slates eventually resulting in leaking holes popping up all over the roof — a disaster.

So anytime you're buying slates, make sure you're getting a) slates with nail holes; b) nail holes that are counter sunk; c) 3/16" to 1/4" minimum thickness; d) slates that are high quality with a proven longevity. Color should never be the first consideration when buying roofing slates; quality of the rock should be the first consideration. You can acquire good quality slates in many colors, but do your homework first. It will be either your money, your home, or your reputation at stake.

I have to add that some excellent slate comes from

(CONTINUED ON PAGE 15)

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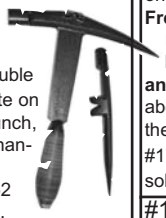
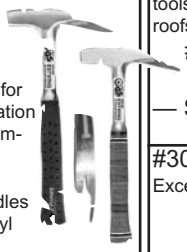
#5 — **FREUND ROOFER'S HAMMER $45.00** ($56.00 list) Punches holes in slate, Great for all aspects of slate roof restoration work. No need to carry two hammers! 28.6 ounces (811 grams), 12.5" long, 6.75" head. Made in Germany.



#19 — **G&B SLATER'S HAMMER — $99.00** Classic hammer — double edged shank for cutting roof slate on site, right or left handed. End punch, side claw, pear-shaped leather handle, heat treated, precision balanced. 11.5" long, 9.5" head; 852 grams (30 ounces). Made in US.

#7. **STORTZ RIGHT HAND SLATER'S HAMMER $99.00** ($136.00 list). Traditional slate hammer with beveled shank for cutting roof slate on site. Tool steel, heat treated, leather handle, side claw, slate punch end. 25.4 oz (720 gms), 12.75" long, 8.5" head. Made in



ESTWING ROOFER'S HAMMERS $35.00 Punches holes in slate. Great for all aspects of slate roof restoration work. No need to carry two hammers! 34+ oz (974 gm leather, 985 gm nylon), 13" long, 6.75" (21 oz.) head. Solid steel handles with either leather or nylon/vinyl grip. Made in US.

#28: **Leather Grip Handle**

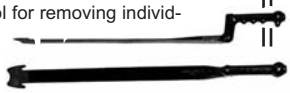
#11. **1.5" COPPER NAILS** (11 ga.) **$5/pound**

12 — **2.5" COPPER**

#20. **ALUMINUM BIB FLASHINGS $17.00/50 pcs** 4"X7" fits in nail pouch. Brown/white, painted 2 coats to prevent galvanic reactions. Make slate repairs easy, permanent, and invisible.

#14. **5 PIECE TOOL SET WITH FREE BOOK — $232.00** ($267.00 sold separately). Tool set includes one US made **Stortz Slate Ripper**; one US made **Pearson Slate Cutter;** one German made **Freund Roofing Hammer**; two US made **Fulton Ladder Hooks, and** a free copy of the **Slate Roof Bible** as a bonus! More about these tools on this page. Instructions are included in the Slate Roof Bible.

#17 — **3 PIECE TOOL SET — $180.00** ($215.00 sold separately). Same as above: **ripper**, **cutter**, and **ham-**

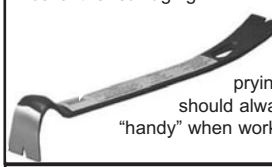


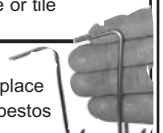
#10 — **STORTZ SLATE RIPPER $70.00** ($84.00 list) Indispensable tool for removing individual slates or tiles from roof. You cannot work on a slate roof without a ripper and the Stortz ripper is the profes-

#15 — **STORTZ 3 PIECE TOOL SET** Ripper, Hammer, Stake — **$200.00** ($224.00 sold separately; $282.00 list). Basic tools used when installing and repairing slate roofs.

#16 — **STORTZ HAMMER AND STAKE SET — $150.00** ($198.00 list). Same as

#30 — **HANDY BAR — $15.00** Excellent for salvaging slates, removing face nails, replacing ridge iron or copper, chipping old tar off roofs, prying off old flashings. You should always have one of these tools "handy" when working on slate or tile





#18 — **STAINLESS STEEL SLATE HOOKS $9.50/lb** Used to replace slates during repairs. Great for repairing asbestos roofs. 65 count/lb. Made in USA.

#13 — **STORTZ STRAIGHT SLATER'S STAKE $55.00** ($62 list). Traditional slater's stake used with the Stortz or GB hammer for trimming slates on site. 20" long blade length. Made in

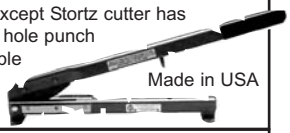
#1. **SLATE ROOF BIBLE $35.00 —** 287 pages, 370 illustrations. Presented the NRCA Gold Circle Award for Service to the Roofing Industry in 2001. An Amazon.com bestseller. Essential resource for anyone who owns, works on, or is interested in slate roofs. Includes industry resource guide, instructional "how-to" manual, historical information, and trade secrets. Written and published by Joseph Jenkins.

#31. **FLASHING CHISEL $9.00 —** Hard to find handy tool for flashing work, wedging and cleaning mortar joints, removing old flashing, etc. 10" long, 2" wide, extra thin

#9 — **PEARSON SLATE CUTTER $65.00 —** Cuts standard thickness slate (3/16" to 1/4"). (For thicker slates use a Stortz or G&B hammer and slater's stake). Replaceable hole punch on handle; cutting blade never wears out. Cuts straight, convex or concave curves to match slate shapes. Lasts a lifetime. Cuts and punch-

Made in USA

#24 — **STORTZ SLATE CUTTER $85.00** ($96.00 list) 25" long, 5 lbs, 4" blade. Similar to Pearson Cutter (above) except Stortz cutter has a heavy duty replaceable hole punch on the handle more suitable for punching thicker or harder slates. Also cuts



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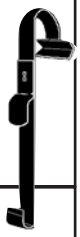

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INSTALLING A GRADUATED ROOF

(CONTINUED FROM PAGE 4)

decided to order on the heavy side. In the spring of 2001, we took delivery of 19 squares of slate, consisting of 17 different sizes, from Evergreen Slate Co. For the remainder of this article, I will assume that the reader has read ***The Slate Roof Bible***, especially Chapter 12, or already has a working knowledge of basic slate installation.

When we arrived at the job site, my employees, Mark and Mildred (don't ask), were ready to pound some nails. However, I knew that this was going to be a bit trickier to get started than the normal job. I scrambled to get the calculations done to keep ahead of them. I counted all of the different sizes and verified that the above ratios were delivered and then determined the ratios of the various widths within each length.

With the above numbers, the chalk-line layout could be determined. I calculated the area that the 22" long slates would cover (40%) and determined the number of courses of this size. The chalk-line interval for these courses would be 9 ½", assuming a 3" headlap. ((22"- 3" headlap) divided by 2 = exposure). There were 5 different widths of 22" long slates that broke down accordingly: 11" (9%), 12" (29%), 14" (59%), 16" (1%), and 18" (2%). We used these percentages to guide us when carrying up the slate so that we wouldn't run short on any of the widths before the roof was completed.

After determining the starter course chalk-line and the required number of courses of 22" long slates, it was time to graduate down to 18" slate chalk-lines (7 ½", which were to cover the next 30% of the roof. The key to doing this involves a transitional row of 20" long slates, the length being arrived at by averaging 18" and 22". **The top of the transitional slate is treated like an 18" slate**, because it uses the same chalk-line interval as the 18" long courses (18"- 3"headlap divided by 2 = 7 ½"exposure); **however the bottom of the transitional slate acts like a 22" slate**, because it has a 9 ½" exposure.

Between the 18" long slates and the 16" slates, the transitional row is 17" long with a chalk-line interval of 6 ½", which is the same for the rest of the 16" courses (20% of the roof).

The last transitional row is 14" long, with the chalk-line interval stepping down to 4 ½". This, as before, is the interval for the rest of the 12" long slates (10% of the roof). As you might imagine, this took several attempts before all of the numbers were worked out. We went through this process on the roof itself, and once we were satisfied that we had the right measurements, we each drew up a "key" on an index card that told us everything we needed to know about each of the 23 courses: chalk-line measurement, slate length, and the percentage of each width within each length (see below).

At last we could start nailing! As each slate was installed, care was taken to maintain at least a 3" lateral lap

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GRADUATED ROOFS

(CONTINUED FROM PAGE 1)

buildings. This graduated slating style was also popular in England and Wales for the same reason—it allowed for the efficient use of the stone.

Each country had its own peculiarities, however. Scottish slate, for example, was "head nailed," with a single nail hole at the top center of the shingle, nailed into solid wood decking referred to as "sarking" (as opposed to slating lath). Although slating lath was popular in Wales and England, Scottish slates could often be so coarse and random in lengths, widths and thicknesses that a solid wood deck was needed in order to facilitate the nailing of the shingles. Scottish slates are also "shouldered"—their top corners are knocked off, a practice still in use today in much of Europe. [When a newly split shingle has a broken corner in the US, it's rejected. In Europe the other corner is simply chipped off and the slate is used. The top corners are never visible anyway and it doesn't matter functionally whether they're cut off or not.] Because the Scottish slates were nailed at their top, there was the risk of gale winds lifting the bottom of the slates and blowing them off the roof. The Scots, however, utilized rather thick slates, the weight of which more than compensated for the weakening effect of head nailing. An interesting characteristic of Scottish slate roofs is that the slates can be swiveled on the single nail, to one side or another, in order to clear the way for replacing a slate underneath. This is aided by the shouldering of the slate. Slate rippers are rarely needed.

The English and Welsh also utilized a head nailing technique involving the use of a wooden dowel instead of an iron nail. A dowel was driven through a hole in the top center of the slate, which was then hung over a thin hardwood lath strip hand split from a log. This practice eventually gave way to what is called "center nailing," a nailing style used in the US today in which the slates are nailed with two nails, one on each side, situated about 1/3 of the way down from the top of the shingle. The center nailed slates were then nailed to sawn lath strips, perhaps an inch thick. This method of fastening slates is still prevalent in the UK today, and only differs from standard US techniques in that a solid Scottish style board deck is preferred in the US rather than lath strips. Incidentally, graduated slate roofs are known as "diminishing course" roofs in the UK, while uniform slate roofing is known there as "tally" roofing.

SOME SPECIFICS

On one of my trips to Wales researching slate, I happened to meet a young slater who was installing a slate roof (photo on page 212 of the *Slate Roof Bible*). I found it interesting that there were several steps involved in the slate installation that we here in the US almost never encounter. For one, the roofer was obligated to "hole" each slate, as no nail holes are punched in the slate at the quarry as is typically done in the US. This is a carry-over of the days when graduated slate roofs were the norm, and nail holes had to be punched on site after the proper lap had been determined for each course. The position of the holes in the slate was particularly critical as the British prefer to install the slates on lath, or 1x2 strips spaced to allow for the nailing of each course, leaving little room for error. Sawn lath strips developed from the practice of using hand split lath, as mentioned earlier, and continues to this day as much from tradition as from a lack of lumber resources in England and Wales. But another practice that surprised me was the sorting of the slate by thickness prior to installation. This was a roof of uniform sized slates—not a graduated slate roof. Yet, the roofer, according to custom, sorted the slates before carrying them up onto the roof, the thicknesses being termed "very heavies," "heavies," "mediums," and "lights." The very heavies were installed at the bottom of the roof, and so on until the lights finished off the top. I found the variance in thicknesses to be minimal, yet the roofer carried on a custom that began with the graduated roofs of old: sorting prior to installing.

Today, the sorting of the slate prior to and during installation is critical to the creation of a graduated slate roof. It requires careful advance planning for the job to be well done. The number of courses required on the roof must be determined beforehand, and the number and degree of graduations, both in thickness and length, must also be part of the planning of the roof installation. There is no one correct formula for this. Diminishing lengths can occur with each course, or they can occur only with every several courses. In any case, once the particular formula for your particular roof job has been determined, then the correctly sized slates can be ordered from the quarry. For illustration, I measured the graduations of three separate old roofs chosen at random, and have listed the data in this article.

It must be strongly emphasized that graduated slate roofs typically utilize slates of varying lengths, varying thicknesses, and random *widths*. The installation of slates with random widths is an art in itself, as adequate *sidelaps* must be carefully maintained. That is to say that the side-butts of each slate should be spaced a minimum of three inches laterally from any side-butt above or below. If the side-butts are spaced too closely to each other, the roof could leak. A sloppy roofer will install random width slates with close side-butts. A master roofer will not.

Furthermore, when a slate course graduates from one length to a shorter one, a transitional row may be necessary in order to maintain a standard three-inch headlap. Otherwise, when a two inch length decrease occurs from one course to the next, a five inch headlap may occur. This is not necessarily a problem as long as the slates with the excess headlap lay well on the roof, but it can be a problem with the roof scaffold staging and the use of standard three inch slate hooks to replace slates left out to accommodate the staging (see *Slate Roof Installation Hint* on the back page).

Finally, a graduated slate roof can be made a work of art by mixing in a variety of slate colors. A common color scheme involve a variety of Vermont slates, including purples, unfading greens, sea greens, grays, and perhaps

(CONTINUED ON PAGE 7)

TOOL REVIEW

ESTWING EUROPEAN ROOFING HAMMERS

Like all good slate roofing tools, slate hammers are hard to find if you don't know where to look. Estwing's European roofing hammers, which they call "Latthammers," are patterned after the German style roofing hammers and are sold primarily to the European market. These hammers would do well in the United States within slate roof restoration circles if they were more readily available on the American market. Now here's the good news: Estwing slate hammers are now being sold in the US by Jenkins Slate Roofing Services along with an extensive line of other high-quality slate roofing tools and supplies.

Estwing tools have been known in the United States since 1923 for quality and craftsmanship. Their hammers are unique in that they're made of solid steel rather than tubular steel and are offered in two styles—extremely durable leather handle grip as well as shock reduction nylon/vinyl grip. Another unique feature of these slate hammers is the weight—a whopping 34+ ounces per hammer with a 21 ounce (600 gm) head. Overall length is a standard 13" (330mm).

The weight of these well-balanced hammers makes them ideally suited for beating a slate ripper into submission. The hammer does the work of removing the slate nails and saves your arms, wrists, and joints from yanking on the ripper. These hammers not only feel good in the hand, but also have a slate punch end and a nail pulling claw. Many slaters have been known to carry two hammers on the job, a lighter weight slate hammer and a heavier regular hammer for beating on the ripper. The Estwing hammer eliminates the need for two hammers, plus it can be used for framing, nailing, salvage work, sheathing, and general restoration work. And it does the job.

Another big bonus with the Estwing slate hammer is the price—they're made in the US and therefore no import fee is attached—so they're priced at $35 per hammer, a full $10 less than the Freund or CK slate hammers made in Germany. Jenkins has a special introductory deal going on right now with the Estwing slate hammer line: purchase either a leather grip or vinyl/nylon grip $35 hammer and receive free Estwing safety goggles with your order!

This is an awesome hammer that every slate roofing professional should have in the tool box—one leather for show and one nylon/vinyl for go! Call 814-786-9085 to order hammers by phone, or order online at jenkinsslate.com. Or send $35 (plus $7.25 shipping and handling for one hammer or $9.25 for two) to Jenkins Slate Roofing Services, 324 Old Beech Road, Grove City, PA 16127. All hammers have a cross hatch face. Specify leather or nylon/vinyl handle—both are the same price. Order form in this issue!

INSTALLING A GRADUATED ROOF

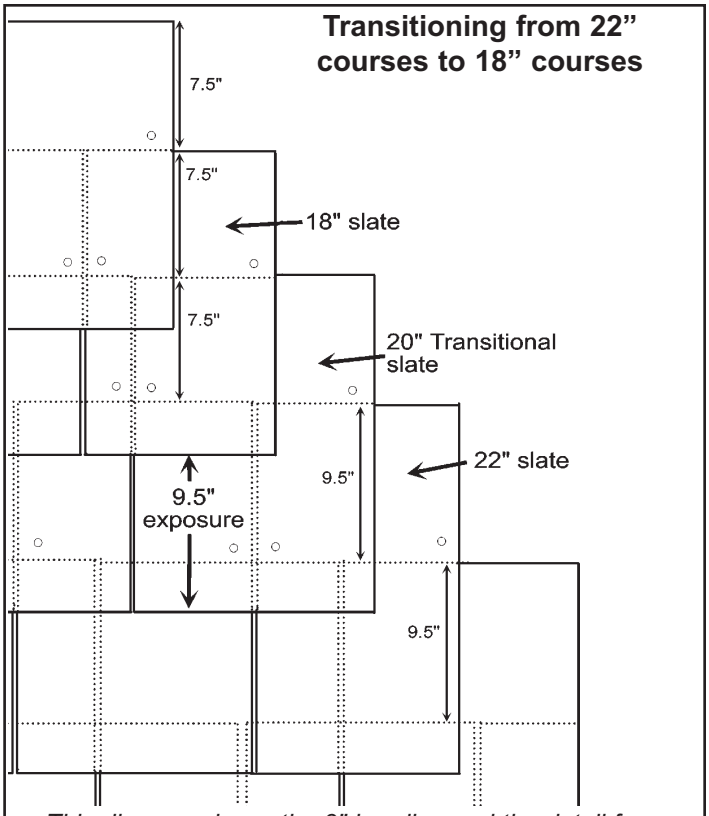
(CONTINUED FROM PAGE 5)

relative to the slates being covered below. This slows the process considerably, compared to installing uniform width slates. Referring to our keys frequently slowed the process further. As each side was completed, the remaining slates would be recounted to make any needed adjustments to the percentages of widths within each length. The final product was a very good match, both in color and style, and the difference in slate thickness on the house and the new garage was hardly noticeable, making that compromise seem like a reasonable one. With the addition of copper half-round gutter and spouting, the new garage was beautiful, and will remain so for many, many years.

Layout Key Below (see also illustration at right)

23	**Caps**			11	94		
22	155.5	x 8" (28%)		10	86.5	x 9"(26%)	
21	151	**12"**x 9" (37%)		9	79	**18"**x10"(45%)	
20	146.5	x10" (35%)		8	71.5	x11"(29%)	
19	142			7	64		
18	137.5	**14" Transition**		6	56.5	**20" Transition**	
17	133			5	49	x11" (9%)	
16	126.5	x 8" (13%)		4	39.5	x12" (29%)	
15	120	**16"**x 9" (31%)		3	30	**22"**x14" (59%)	
14	113.5	x10" (45%)		2	20.5	x16" & 18" (3%)	
13	107	x11" (25%)		1	10.5*	**22"x12" Starters**	
12	100.5	**17" Transition**					

**Note that the headlap on the starter course is only 2 1/2" since a 12 1/2" wide slate would be a special order and is unnecessary.*



This diagram shows the 3" headlap and the detail for a "transitional" slate, which is necessary when laying out a graduated roof.

INTERNATIONAL PRESERVATION TRADES WORKSHOPS 2002

The Preservation Trades Network and the Vandalia Heritage Foundation will hold the 6th Annual International Preservation Trades Workshop in Fairmont, West Virginia, August 2-4, 2002. The IPTW features demonstrations, exhibits, and seminars in many areas of the historic preservation trades. PTN has been instrumental in building a worldwide community of preservationists who share a hands-on knowledge of the process of historic preservation. Cost is $330 for members and $370 for non-members (after June 14 it's $355 for members and $395 for non-members). Membership fee for PTN is $45 individual, $25 apprentice or student, $300 business or institution. Membership payment can be sent to PTN, 731 Hebron Ave., Glastonbury, CT 06033. To register or for additional information visit www.ptn.org or call 860-633-2854.

GRADUATED ROOFS

(CONTINUED FROM PAGE 6)

Vermont black and/or New York red. The percentage of each color must be determined before the slate is ordered, and with a variety of lengths and widths to also consider, careful pre-planning is a necessity in order to ensure a successful job. Some suggested color combinations by Rising and Nelson Slate Co. (Middle Granville, NY; Ph: 518-642-3333) include: #1) 70% semi-weathering gray green with 30% variegated purple; 2) 50% semi-weathering gray green and 50% variegated purple; 3) 60% unfading mottled green and gray with 40% unfading green; #4) 50% semi weathering gray green with 20% variegated purple, 20% unfading green, and 10% Vermont gray black; 5) 70% unfading green and 30% unfading mottled green and purple.

For a first-hand account of one slater's experience with a graduated roof installation, read the article by Barry Smith on page 4 of this issue of *Traditional Roofing*.

THREE EXAMPLES OF GRADUATED SLATE ROOFS

It's obvious that the sizes of slates and number of graduations is entirely a matter of style and/or personal taste.

Beau and Liz Heath Residence; Grove City, PA; 30' rafter, 3" headlaps; VT slates. Unusual graduated slate roof with uniform standard thickness slate.

# courses	length of slate
[Top of Roof]	
13	16"
11	18"
9	20"
6	22"
5	24"
[Bottom of roof]	

This 90 year old roof has five slate lengths which graduate in 2" increments according to an apparently random scheme. The slates on this roof are nearly uniform in thickness (1/4")

Ketler House; Grove City, PA; 3" headlaps; VT slates

# courses	length of slate
[Top of Roof]	
etc.	
1	27"
1	28"
1	29"
1	30"
[Bottom of roof]	

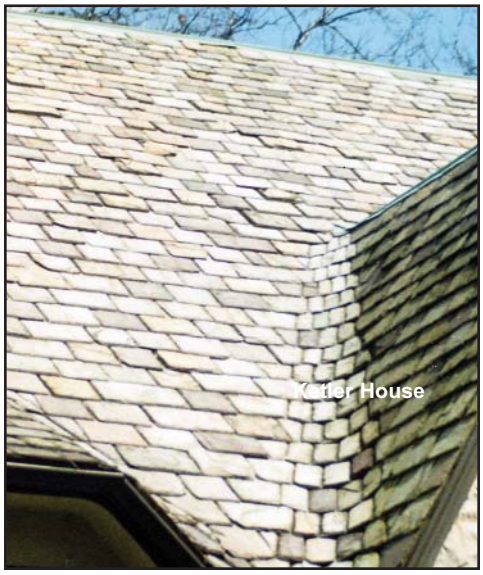
This century roof graduates one inch per course from bottom to top. The bottom slates are 1" thick, the top slates are 3/16" thick.

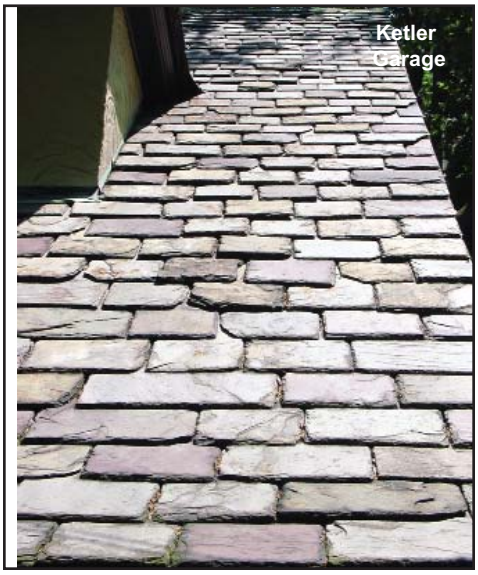
Ketler Garage, 25' 8" from drip edge to ridge; 39 courses; 3" headlaps; VT slates

# courses	length of slate
[Top of Roof]	
9	13"
1	14"
6	18"
3	17"
5	16"
3	19"
3	20"
3	21"
3	22"
3	24"
[Bottom of roof]	

This century roof graduates randomly from bottom to top. The bottom slates are 1" thick, the top slates are 3/16" thick.


Heath House


Ketler House


Ketler Garage

READERS WRITE:

"Apart from the additional cost, are there technical reasons why slate should not be installed over IWS? I understand about the role of felt for temporary covering during installation, but in chronic ice damming climate (where I work) where the usual design solutions cannot be used on old construction, we apply IWS. We do not use it as a "prophylactic" for bad craftsmanship!" *Grand Rapids, Michigan*

* * *

"Regarding your article in Fall 2001 "Traditional Roofing," titled "Why Slate Roofs Don't Need Ice and Water Membrane", may I respectfully object? I lived for many years, until the mid-1980s, under a slate roof on a house in Philadelphia built in about 1901... it leaked in several places. We were able to trace the problems to some of the valleys. We had good slate roofers look at the roof, and they were of the opinion that the only way to completely stop the leaks would be to remove most of the roof slating, widening the flashing. This proved too costly, and we lived with the leaks.

I have always been concerned that the nature of the slate material creates relatively large open channels between the slates, with the potential to allow water to be driven up under windy storm conditions.

There is also the whole concern about ice damming at eaves, with which I am sure you're familiar. Over the years, use of such membranes has virtually eliminated leakage problems with roofs on buildings I've been involved with.

You seem to be in denial about people's experience with slate roofs. Unfortunately, I have heard too many people object to my proposal to use a slate roof on their house because their experience of slate roofs is that they leak! If I want to put slate roofs on my buildings, I need to be able to assure my clients that they will not leak, because modern materials, like the membranes to which you object, will make such a thing possible." M.W.

* * *

"My family has been in the slate roofing business since my great grandfather immigrated here from Ireland in the early 1880's. He was trained in England first as an apprentice and then a roofer. My grandfather started our slate roofing company in the 1920's, and we have been in operation ever since.

Ice and water shield under slate as well as other roofing material becomes brittle and can crack. We assume this happens due to the high temperatures slate roofs achieve or the expansion of different materials. Slate as well as roofing shingles stick to the ice and water and can be difficult to replace without breakage. Ask any of your asphalt shinglers what it is like to strip a roof totally covered with ice and water with the shingles installed directly to the ice and water. The same happens to slate and the slate can be destroyed or become unsalvagable.

Some of the places we have observed ice and water shield failures are at dormer/roof deck intersections and chimney/roof deck intersections. The materials expand and contract differently and can cause cracking of the ice & water at these areas. We install ice and water to our felt underlayments on shingle installations and not to the roof deck. So beware!

We only use two solutions when it comes to ice damming on a slate roof. First one is a copper ice belt. The second involves installing two layers of 30 pound felt with a layer of slaters mastic in between. We have never had a failure." *K.S.*

* * *

Jenkins replies: *We also have heavy ice damming at times. When I investigate a leak caused by that ice damming, I have invariably found it to be caused by a hole or crack in the slate, not by penetration of water through the slate in general (if the slate's installed properly). I have actually never used a square inch of ice and water shield in 33 years of slate roofing and probably never will. Nor have I ever seen it on a slate roof, except those installed in the past decade or two by asphalt shingle roofers. My primary aversion to IWS is simply that the industry is trying to make it a required component of every roof, when, in fact, in many cases, if not most, it serves no useful purpose at all. It's main purpose is to protect plywood from delamination, and non-plywood roofs don't need it.*

Although I do use 30 lb. felt when installing new roofs or flashings in case of rain during installation, I don't use IWS, or, for that matter, any *underlayment under valleys or around chimneys when I'm installing or replacing the flashings. I know my work will not leak—and that's 100% guaranteed. If it leaks a drop, something was done wrong and it needs to be redone. If it isn't going to leak a drop, then what's the point of an underlayment—just in case it leaks? If it leaks I want to know it immediately and find the prob-*

lem and fix it. I've had a couple of instances over the years when a chimney flashing job leaked. It took me a while to figure out the flashing (not underlayment) problem, but I did, and once I figured it out, repair was simple. A heavy underlayment would have hidden the problem. I'm very grateful when I can learn from my mistakes and I don't need to obscure my work with the false security of a temporary underlayment. ***It's the slates and flashings that permanently keep out the water, not the underlayment.***

When a slate roof is installed properly, or flashed properly, not a single drop of water will penetrate the roof. This is a fact of roofing life that is taken for granted among experienced professionals. Knowing that, I marvel at the insistence that ice and water shield should be considered an essential part of any roof system.

As far as ice build-up along eaves causing roof leaks is concerned, think of it this way: If *the leak is being caused by water penetration through the slates due to ice back-up,* then *the water penetration should occur* along the entire length of the eaves. *If that happens, more headlap may likely solve the problem (unless the problem is due to insufficient slope or other design flaw). In any case, water penetrating a slate roof anywhere, for any reason, means the roof was not installed properly.*

What I have found during times of heavy ice build-up and leakage along eaves is the leakage does not *occur along the length of the eaves at all. It occurs in one spot or two along the eaves, showing up inside the building in pin-pointed places. When I have examined the roof closely, I have found holes, nails, or cracks at those points on the roof. These minor roof flaws only leak under severe ice damming situations and once these points are repaired, the problem is solved.*

Here's an ice dam tip: the roof is leaking at the eaves during ice damming, but you can't find where the water is penetrating. Simply cut copper bib flashings about 6" wide and long enough so that when you slide them under the slots (where the roof slates abut at their sides) the top of the bibs hit the slate nails on the next row up. Curve the bibs slightly so they friction fit under the slates. Use a drop of lifetime clear silicon under the bibs if you feel the need for extra adhesion. Install the bibs along the affected area of the eaves. You can do this in a very short time and it will likely stop the leaking. It has never failed for me and is a lot easier and more permanent than removing the slates and installing new temporary underlayment.

The writer who mentioned leaking valleys that could not be effectively repaired was suffering from either roofing contractors who did not know what they were doing, or a faulty roof design (or both). Having replaced literally miles of valleys on slate roofs under all sorts of circumstances and never having a leak, using no underlayment ever, I know that the assertion that valleys will leak without ice and water shield is totally incorrect.

I was originally attracted to slate roofing systems because they're natural roofs — roofs of stone and wood, biodegradable roofs, recyclable roofs, ecological roofs, environmentally friendly roofs. They're simple, low-tech roofing systems that are fabulously successful when properly installed. Adding unnecessary asphalt materials to these roofing systems steers them away from the ecologically friendly roof systems that they now are and forces them toward the petrochemical toxic waste roofing systems so popular in America today. There's no excuse for that. Architectural and construction planners would do well to place a high priority on choosing building materials and methods that are environmentally friendly.

(CONTINUED ON PAGE 13)