

What Home Inspectors Need to Know About

Slate Roofs

Part 1

Fabrication and Installation

By Joe Jenkins

SlateExperts.com

SlateRoofCentral.com

TraditionalRoofing.com

SlateRoofWarehouse.com

Phone toll free: 1-866-641-7141

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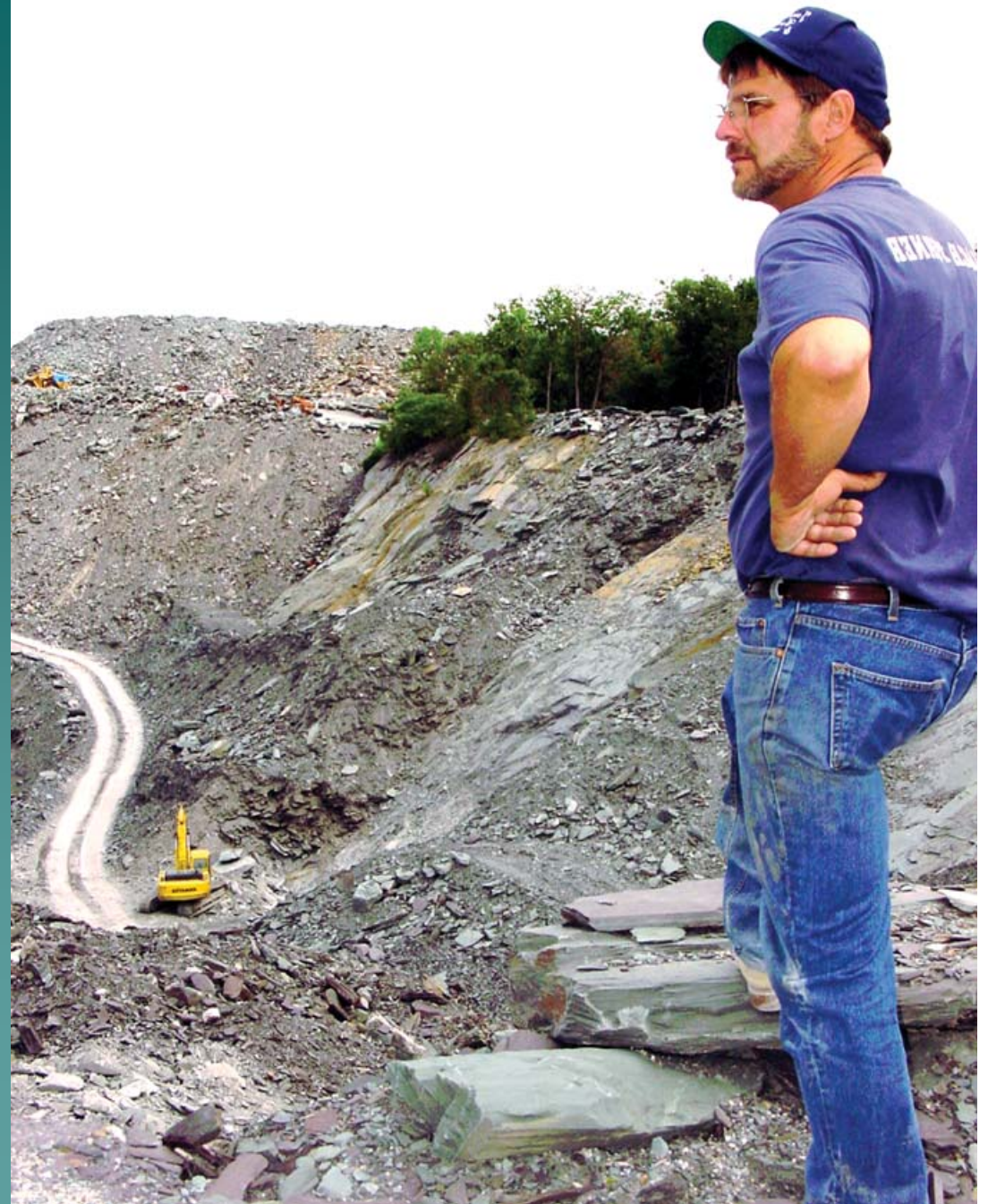
FABRICATION
Slate roofs are made of rock. The rock is mined or quarried from the earth. This is a “quarry” at Camara Slate Co., Fair Haven, VT.



This is a slate mine in Germany.
“Mines” are underground tunnels.



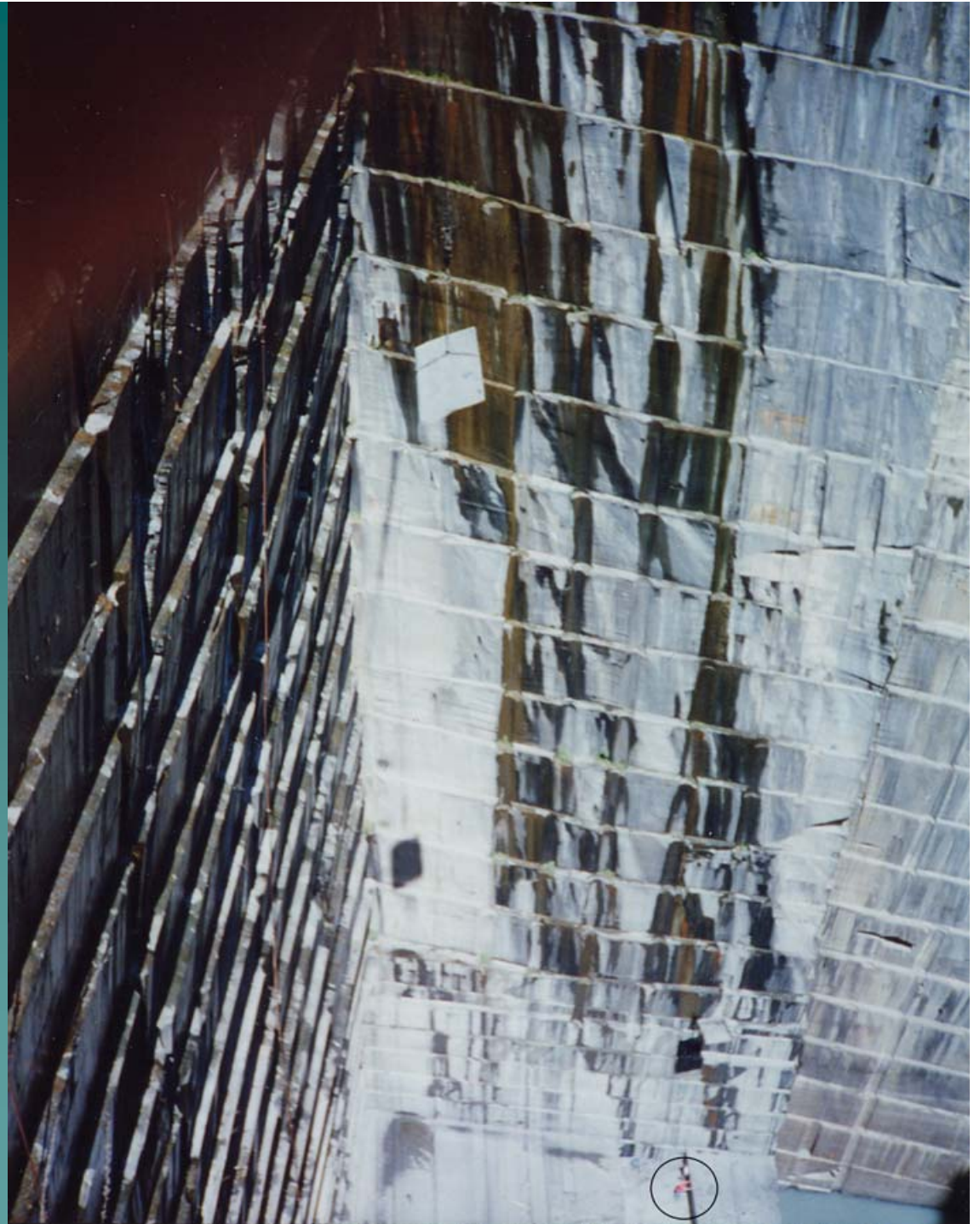
Here, slate is being extracted from a quarry by the U.S. Quarried Slate Company in Vermont.



This is a Chinese slate quarry.



This is an old, still operating Pennsylvania slate quarry carved into solid slate rock. The circle shows a worker. The rectangle is a large piece of slate being removed by a chain hoist.



Slate is still quarried in VT, PA, VA, NY

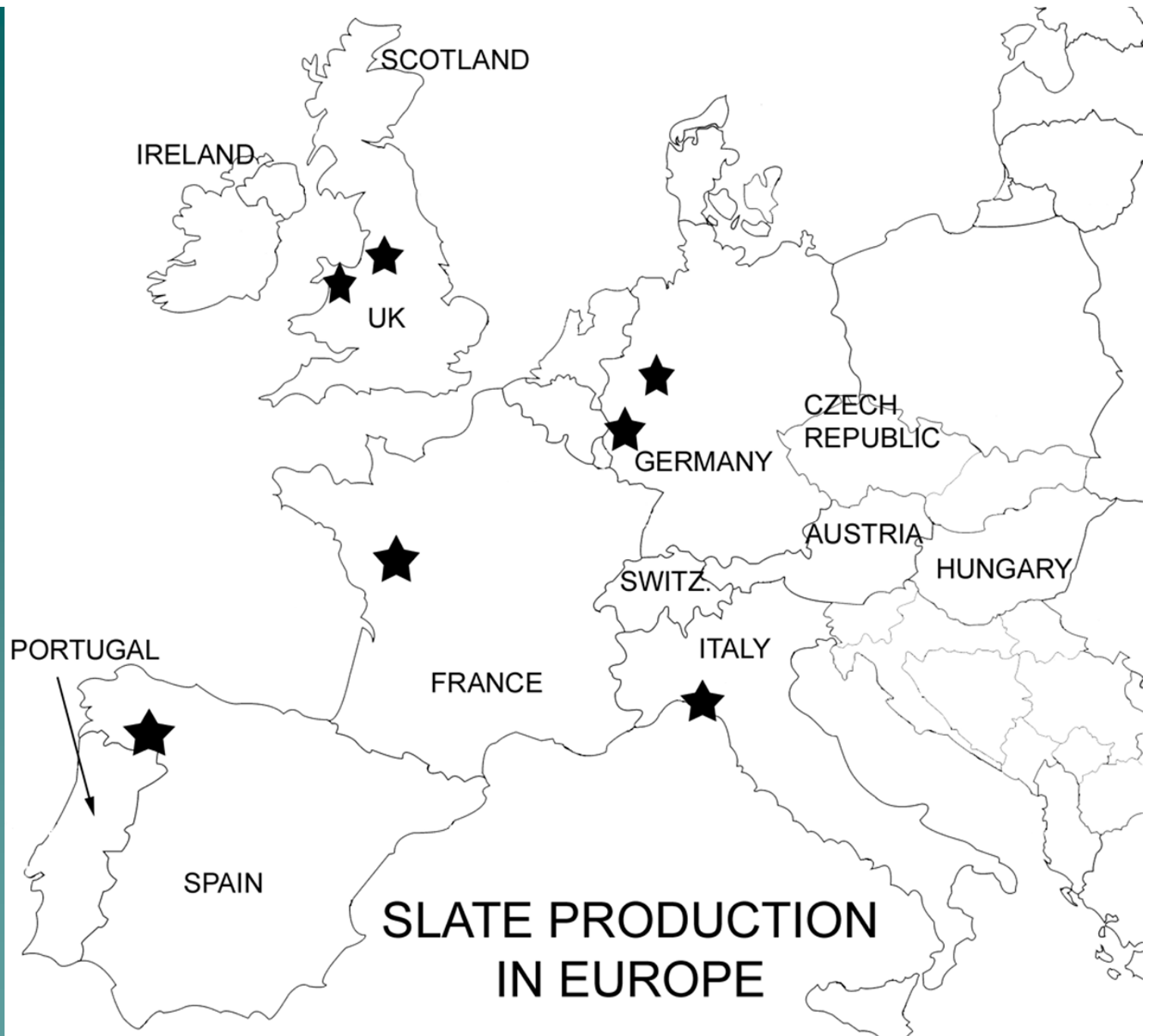


Figure 3.5

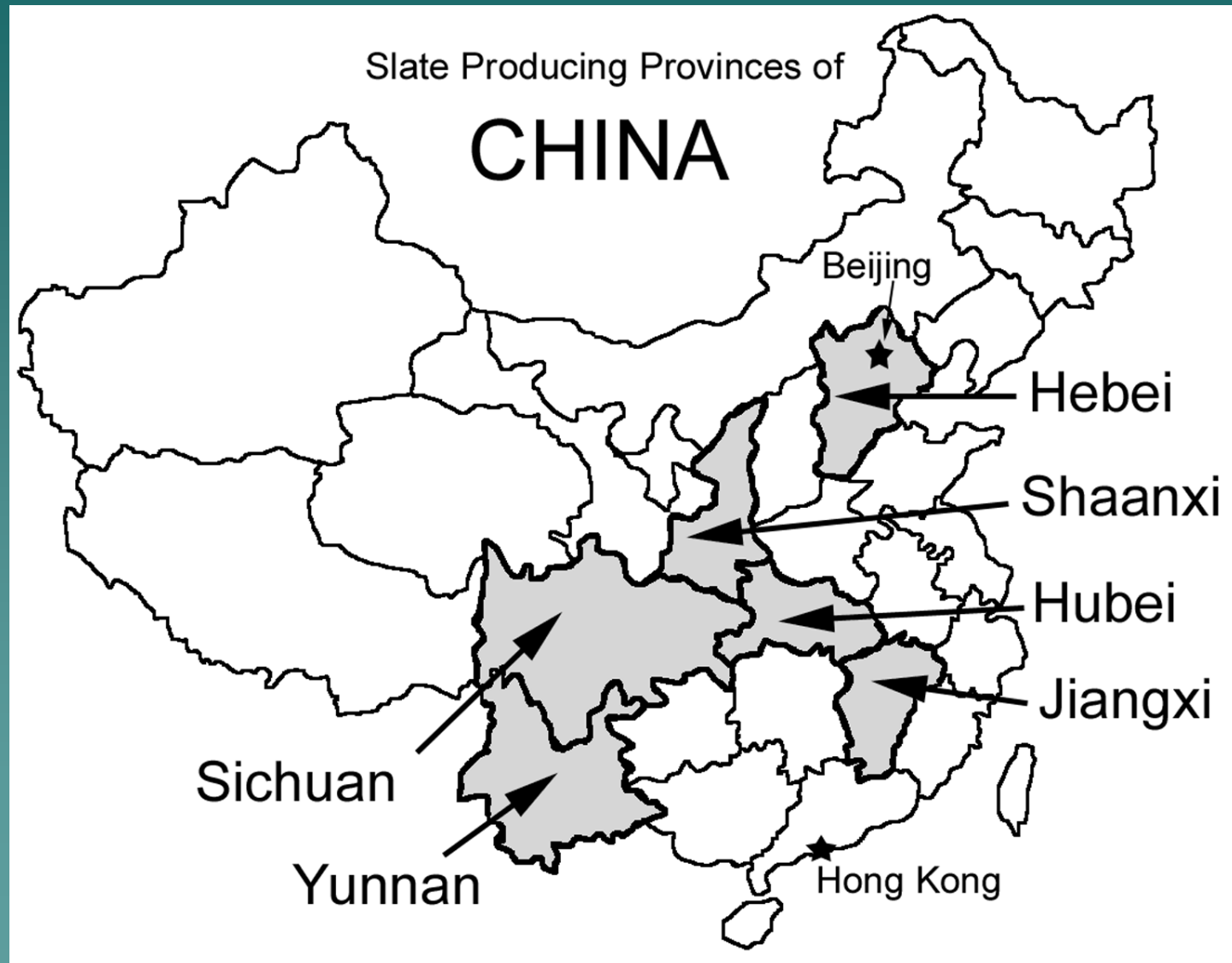
LOCATION OF KNOWN SLATE DEPOSITS IN THE UNITED STATES

Solid marks are (or were) productive districts, hollow marks are prospective districts. The five commercially important U.S. roofing slate districts are: 1) Monson District, Maine; 2) New York/Vermont border; 3) eastern Pennsylvania; 4) Peach Bottom (PA/MD border); 5) Buckingham District, Virginia, although only #2, #3, and #5 are still productive.

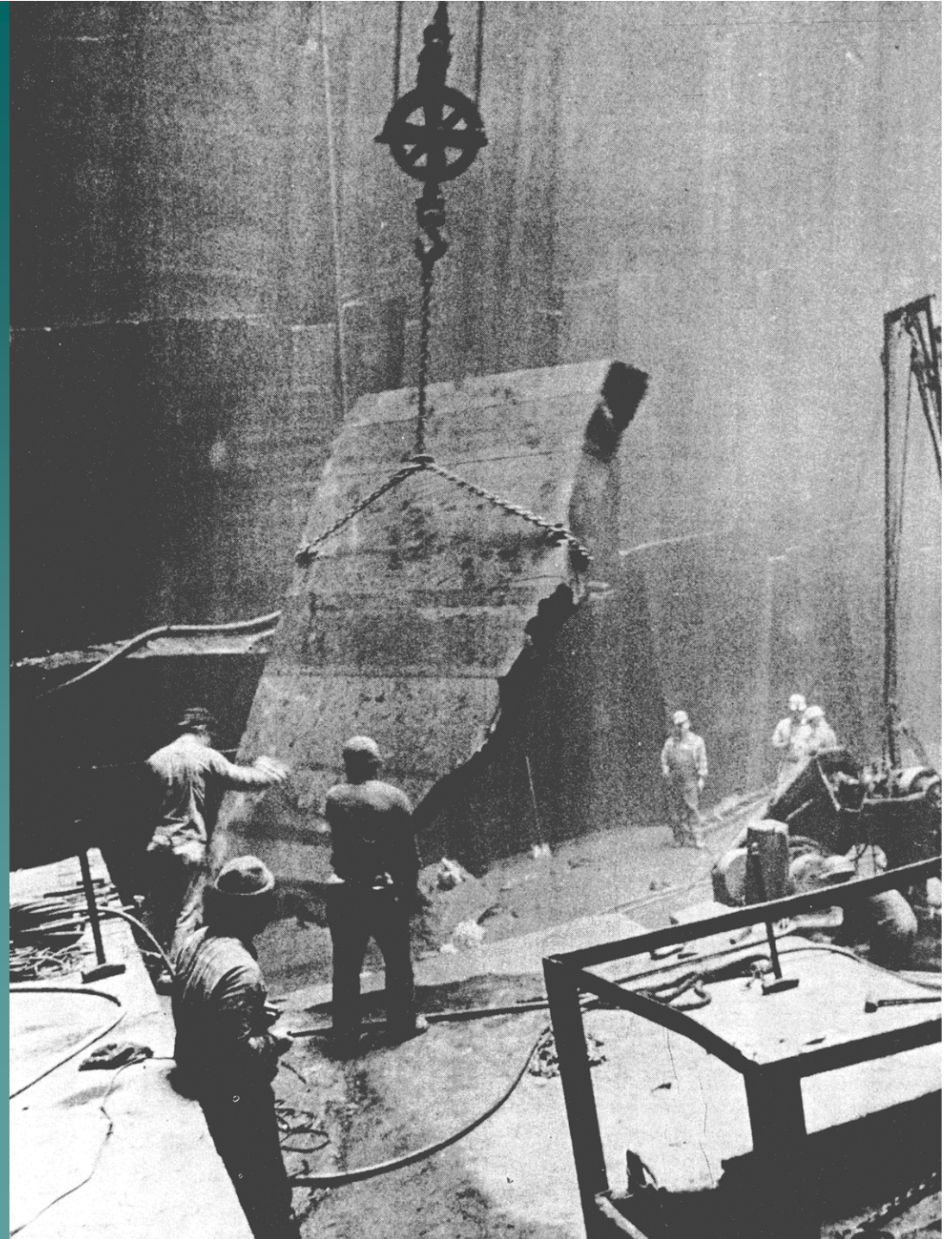
Roofing slate is also produced in Italy, Germany, France, Spain, the UK, and elsewhere in Europe.



Roofing slate is now produced in China and throughout the world (South Africa, Brazil, Argentina, etc.)



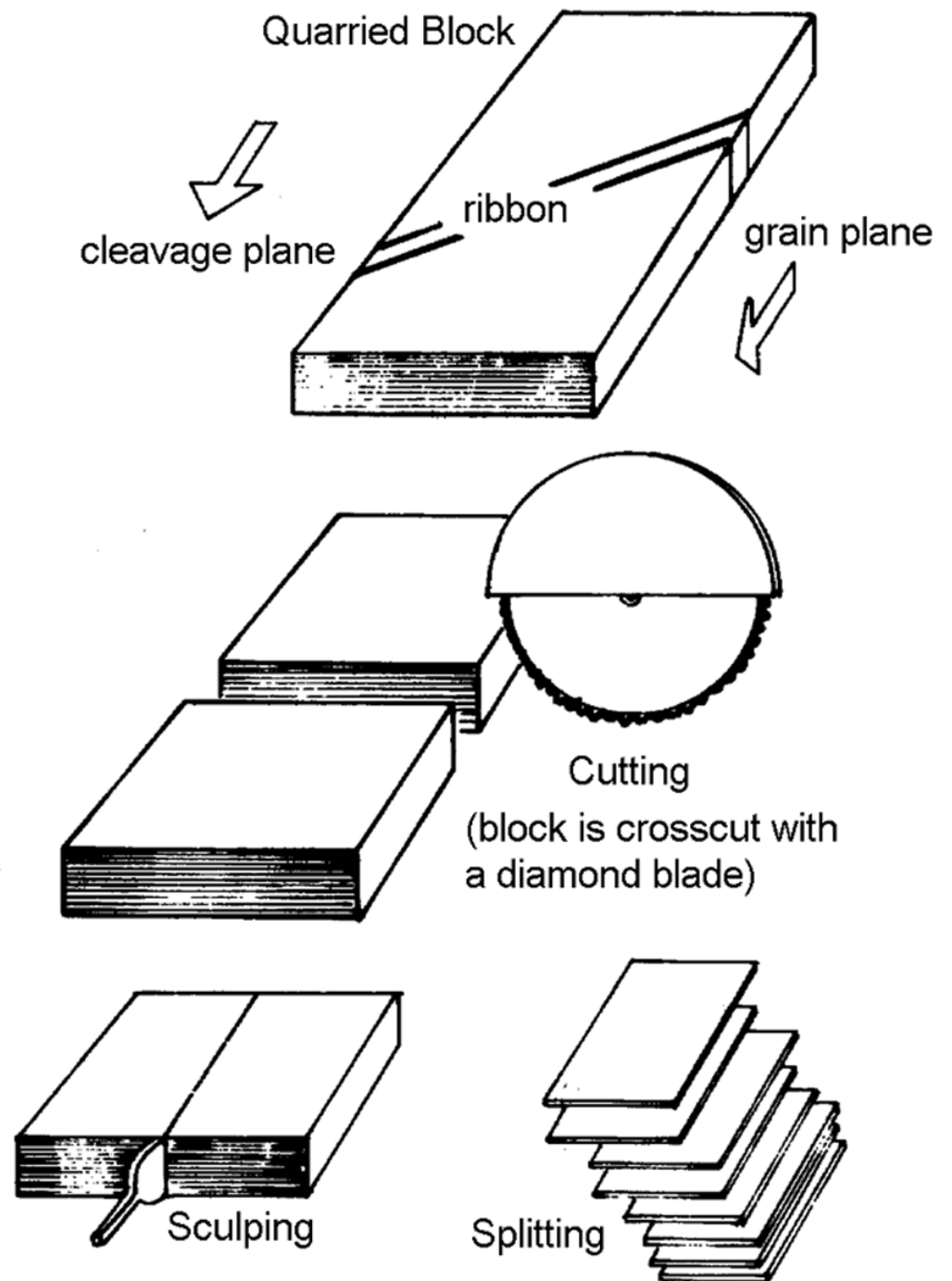
First, large blocks of stone are removed from the quarry or mine.



The blocks are split according to their “grain” and “cleavage.” This photo is at Vermont Structural Slate Co. The man is pointing to the “cleavage plane.”



Smaller blocks are cut using a diamond saw.



These blocks are ready to be split into shingles. This photo is at the Greenstone Slate Co. in Vermont.



The slate is split into roofing shingles with hammers and chisels. This photo was taken at the Camara Slate Co. in Vermont.



A splitter at Hilltop
Slate Company in
Vermont.



The edges
are trimmed
square
using a
trimming
machine.



Nail holes are then punched into the slates individually. Here a traditional foot-powered nail punch is being used. Some companies drill the slates instead of punching them. On standard thickness slates, it is better to punch the holes because the nail heads fit better into punched holes.



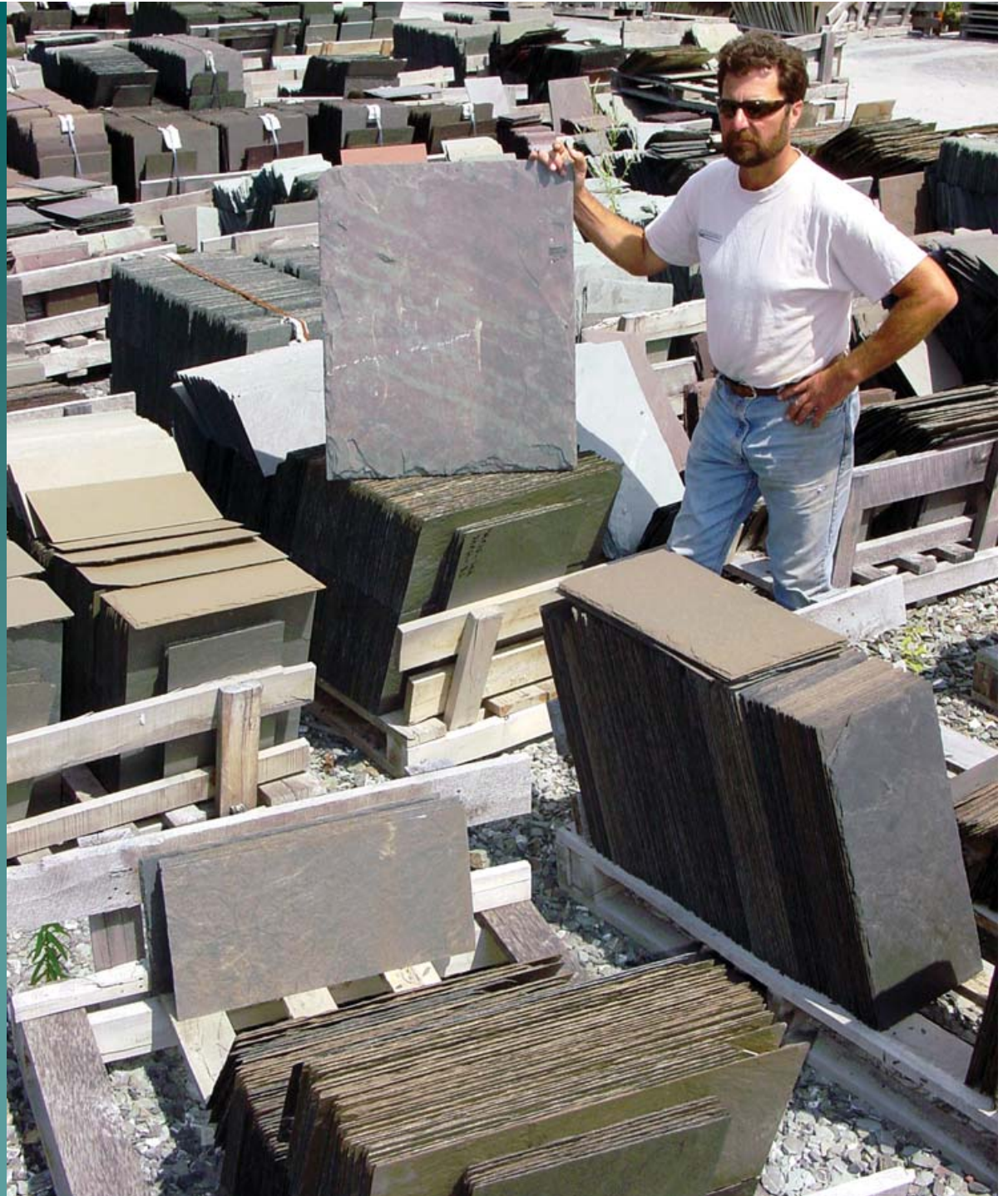
The finished shingles are then sorted, palletted and shipped. These Vermont “mottled green and purple slates” are “heavies,” i.e. thicker and heavier than usual.



These slates are being shipped to the U.S. from China.



New roofing slates of all sizes, thicknesses and colors are produced in the USA today. This photo is at Taran Slate Co., Vermont.



Sources of new (and used) roofing slates and ceramic tiles are listed on the web at:

SlateRoofCentral.com

or in the back of the Slate Roof Bible, 2nd edition, available at SlateRoofWarehouse.com, Amazon.com or by calling toll free 866-641-7141.

The finished shingles are fastened to the roof deck with nails, preferably by experienced slaters.

NEXT: INSTALLATION
TECHNIQUES



Installation techniques vary according to culture. This is traditional German slating.



This is a traditional German installation.



The traditional German slating style is called “Altdeutsche.”
Here it is being practiced at a German roofing school.



In England and Wales, stone roofs were once hung with wooden pegs on thin lath.



Today in the UK, slate is nailed to battens that are nailed on top of felt underlayment.



A fully battened UK roof, slates sorted by thickness, is ready for slating.



This is what's left of a very old UK pegged slate roof showing the lath. No felt underlayment was used at that time.



Distances between battens must be carefully measured when installing slate the UK style.



Note the diminishing spaces between the slating battens.



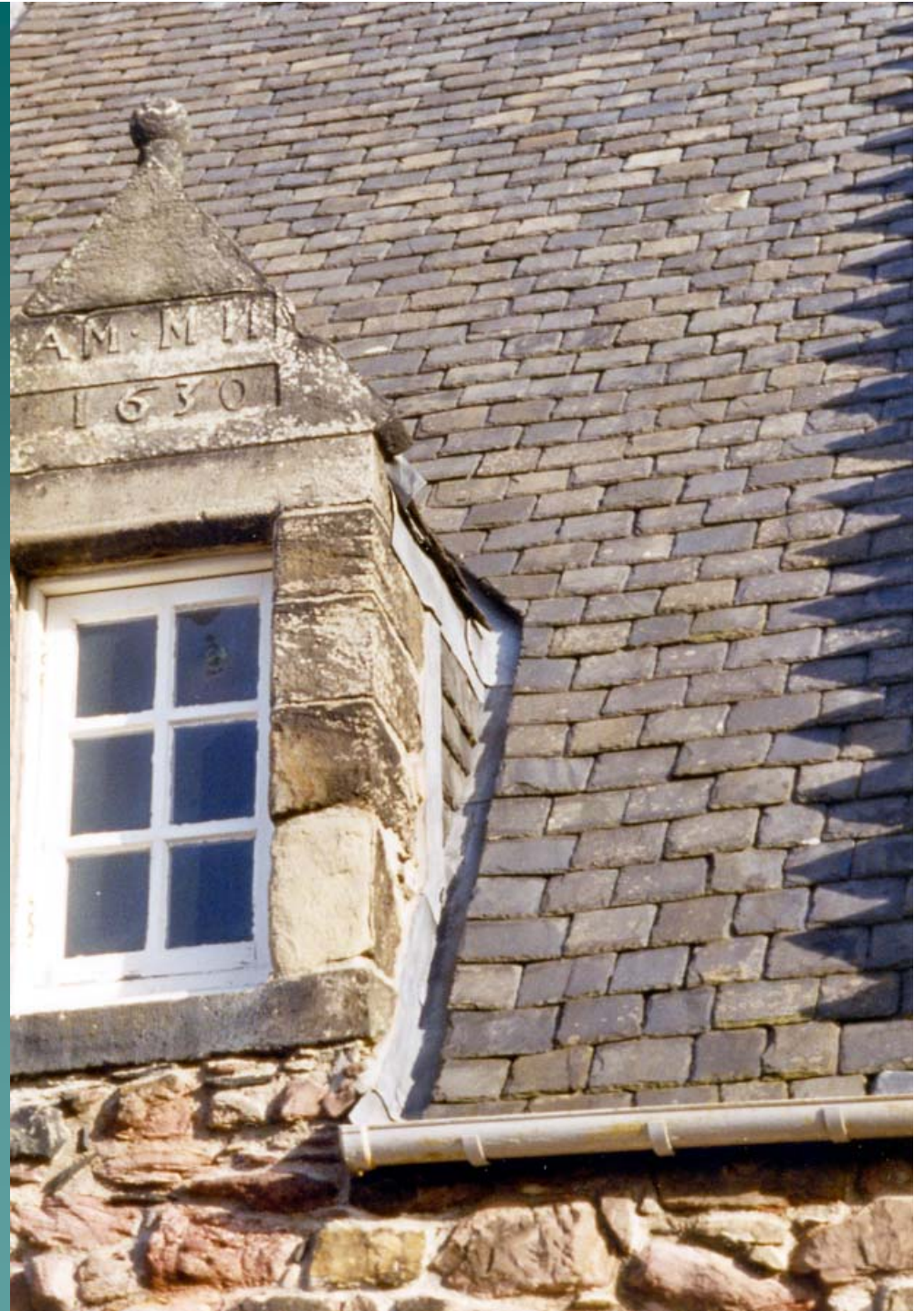
The same style of slate roofs were installed in France.



This is an old, graduated slate barn roof on battens in the UK.



In Scotland they traditionally use solid roof decking boards (not lath) called “sarking,”
The slates are “head nailed” with a single nail in the top center of the slate.



In Spain they may also use a modified lath system.



This is a traditional Spanish slating style.



Another traditional Spanish slate roof.



This is the underside of a traditional Spanish slate roof.
Note the vertical, rather than horizontal, nailers.



In Italy, heavier slates with more overlap can be seen.



This is a traditional Italian slate roof.



This is the underside of the same Italian slate roof.



In the U.S., solid board roof decks under slate are similar to the Scottish system.



In the U.S., it's not uncommon to find slating lath and the original wood shakes under the slate.



Solid board roof decks provide the best decking system for slate roofs, due to proven longevity.



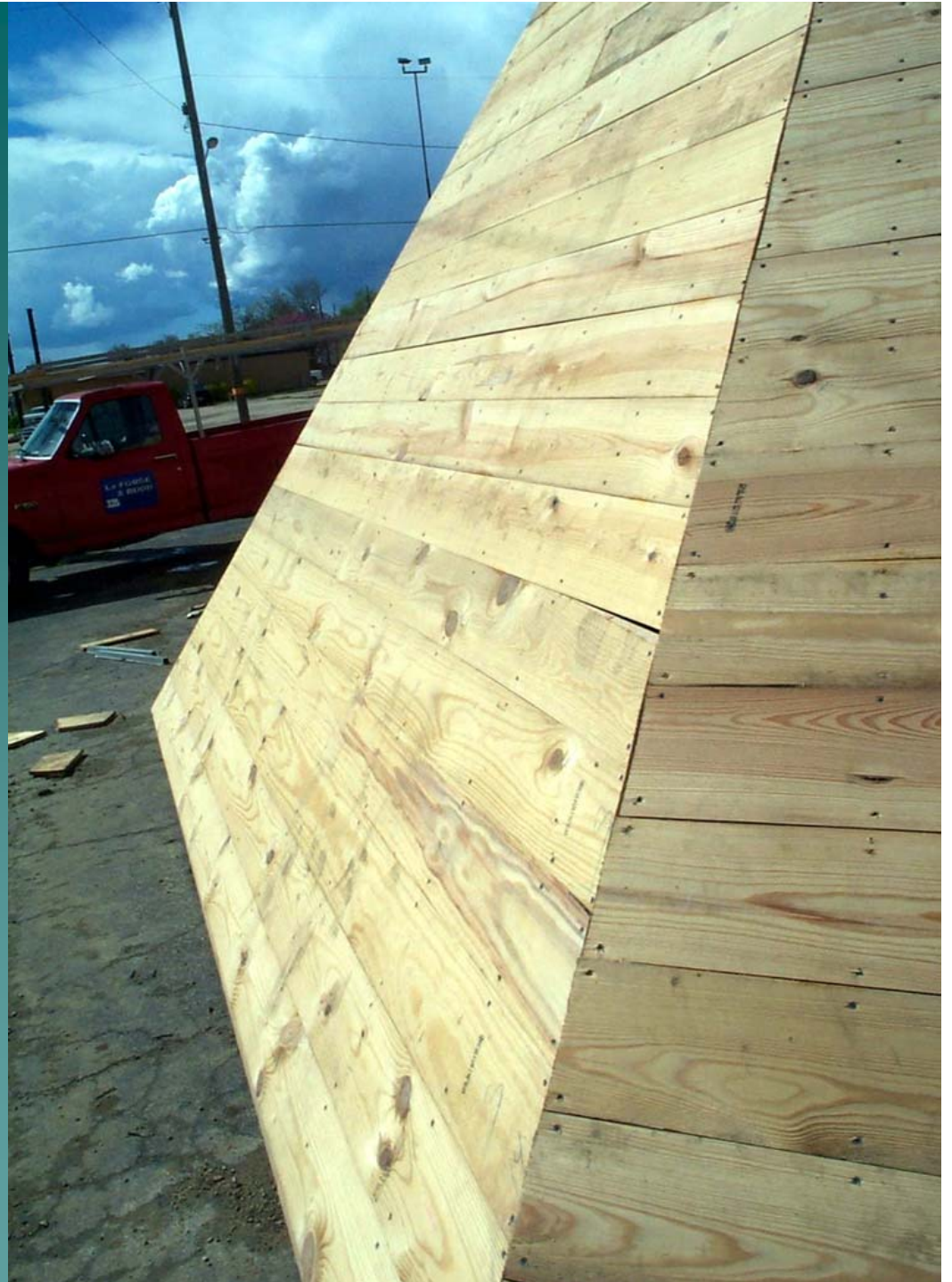
For example, this is a “green” mixed hardwood roof deck on an outbuilding, prior to slating.



This is a new bank building in Kansas about to be slated over $\frac{3}{4}$ " yellow pine board roof decking.



A close-up of the yellow pine roof decking on the bank tower, waiting to be slated on the ground. This roof was installed over a metal frame.



In the U.S., board decking under slate roofs is a traditional, tried and proven system.



This simple roofing system can easily be duplicated today, with similar results.



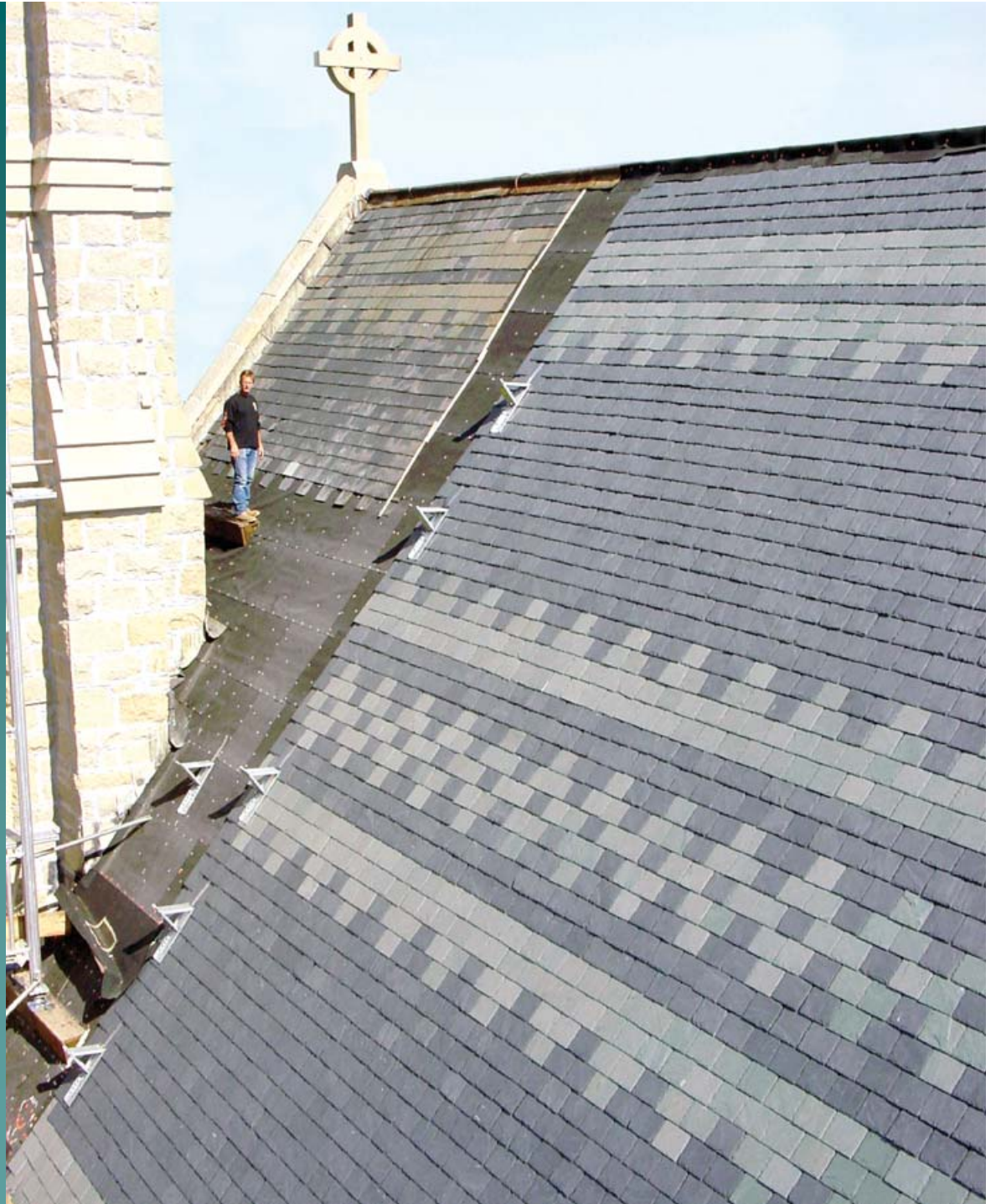
Underlayment, such as felt paper, is not necessary on slate roofs. Barns, for example, traditionally don't use underlayments.



This is a 100-year-old residential slate roof, on hardwood lath, with no underlayment and no leaks. The slate is being removed for recycling (salvage).



When this 120 year old cathedral roof was reslated, it was found to have no underlayment under the original slates.



An oak lath barn is being reslated by adding hemlock 1x4s between the lath.



Felt underlayment keeps the rain out until the slate is installed.
After the roof is installed, the felt serves little purpose.
No water penetrates the slate.



The slate and the flashings permanently keep the water out, not the underlayment, which is expected to deteriorate over time.



Scaffolding is handy when installing slate roofs. For more details of installation procedures see the Slate Roof Bible, TraditionalRoofing.com or SlateRoofCentral.com.

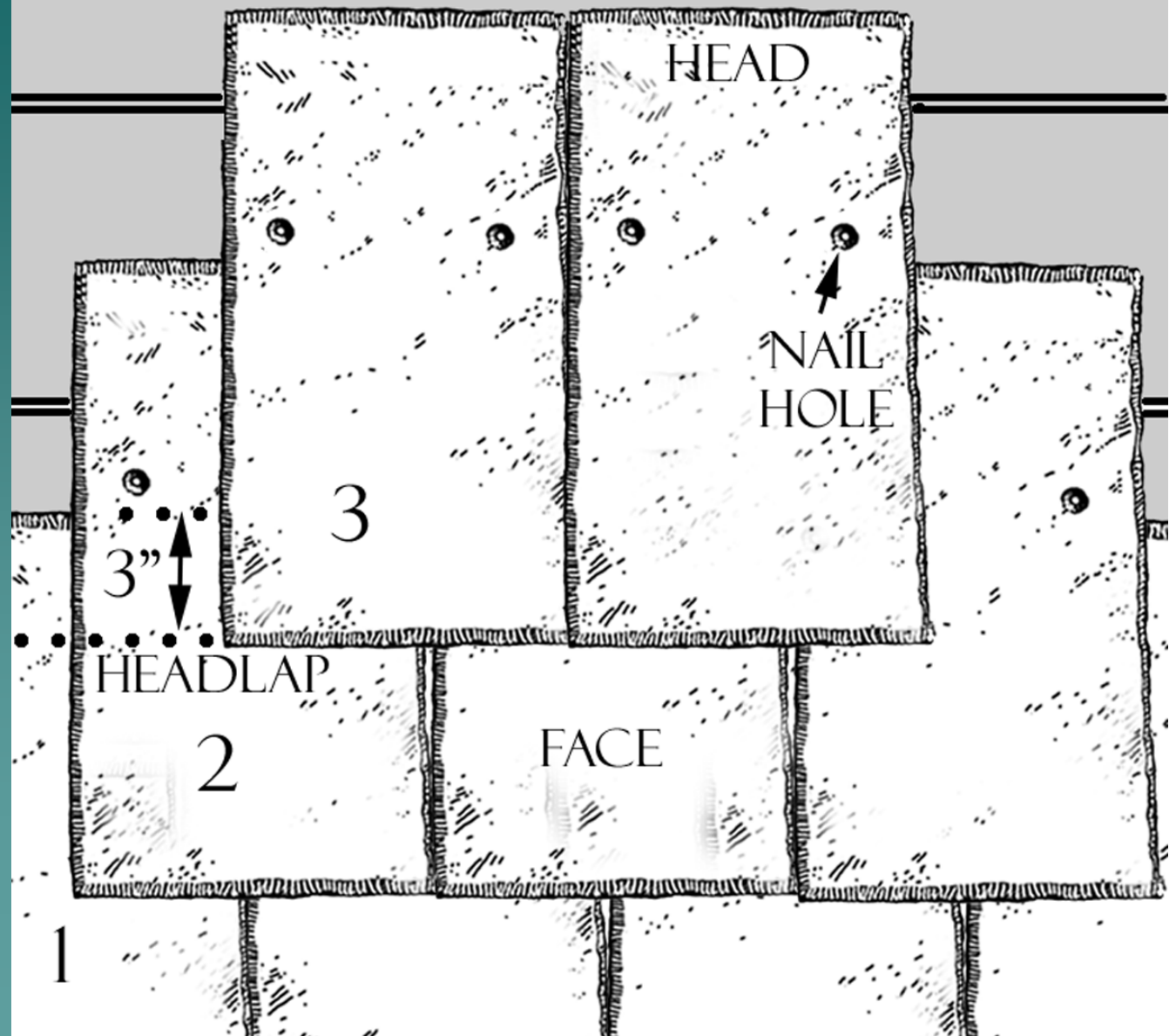


Proper HEADLAP is critical. This new slate roof at a university was installed incorrectly, with little or no headlap.

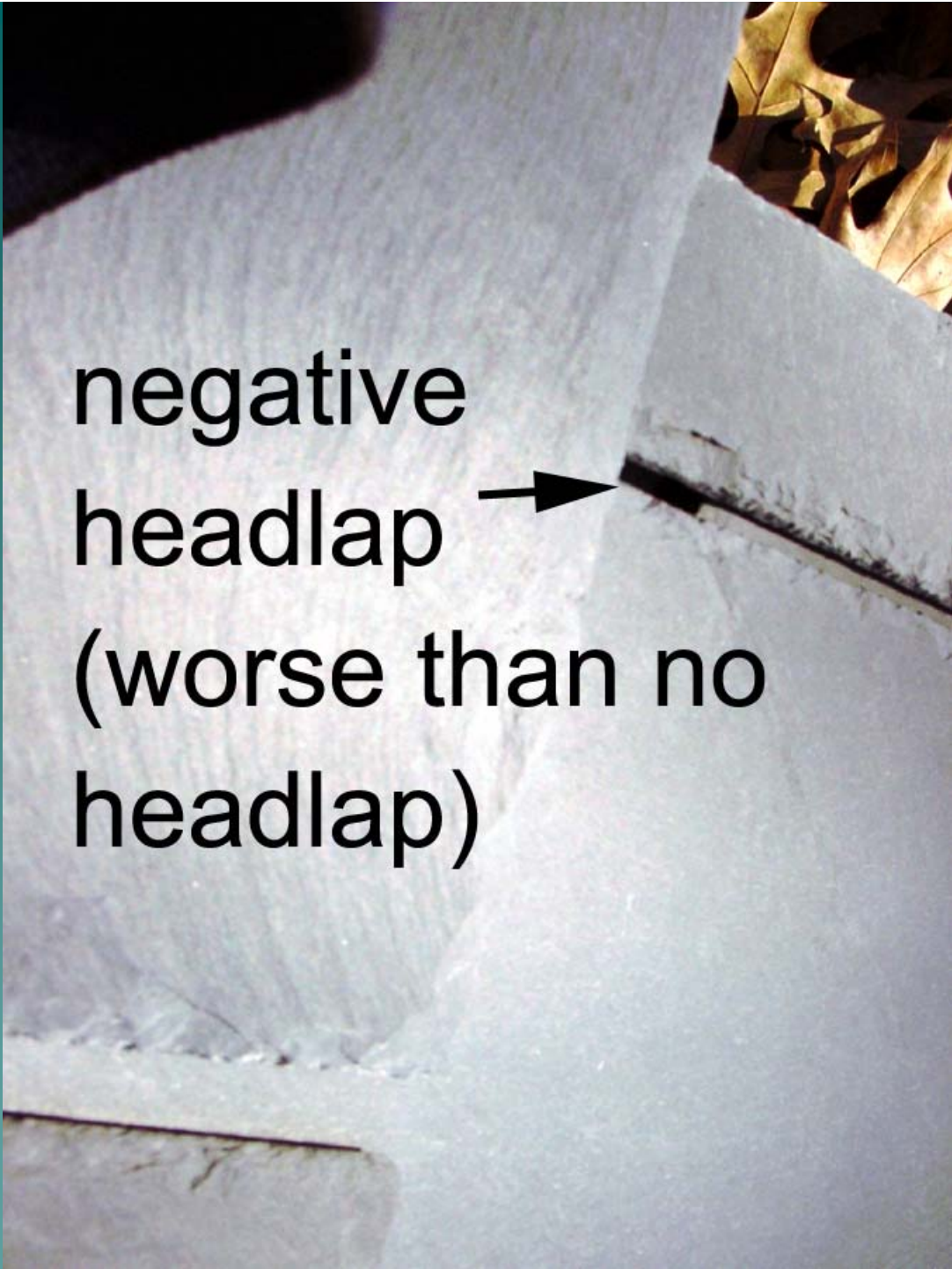


Each slate must overlap the slates two courses below it. This is called the headlap.

WOOD ROOF DECK



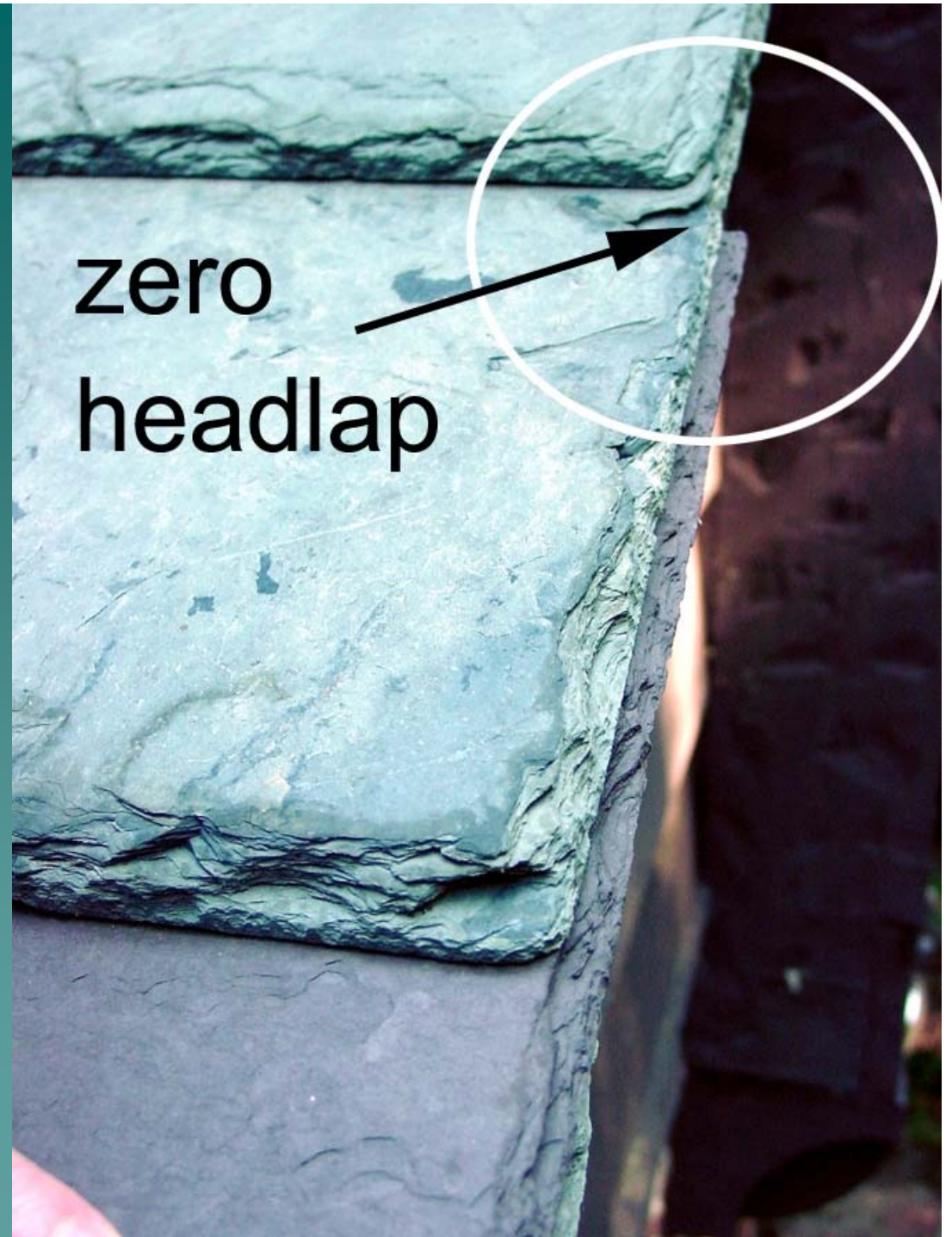
This is the same Pennsylvania university roof showing areas of negative headlap. This slate roof was incorrectly installed and will have to be completely removed and reslated.



negative
headlap →
(worse than no
headlap)

The photograph shows a close-up of a slate roof joint. The slate on the right is positioned lower than the slate on the left, creating a gap where water can penetrate. A black arrow points to this gap. The text 'negative headlap' is written in large black font, with '(worse than no headlap)' written below it. The background shows some dry leaves in the upper right corner.

This is an example of zero headlap on a historic building in Georgia. The entire roof was installed incorrectly and had to be removed and reslated.



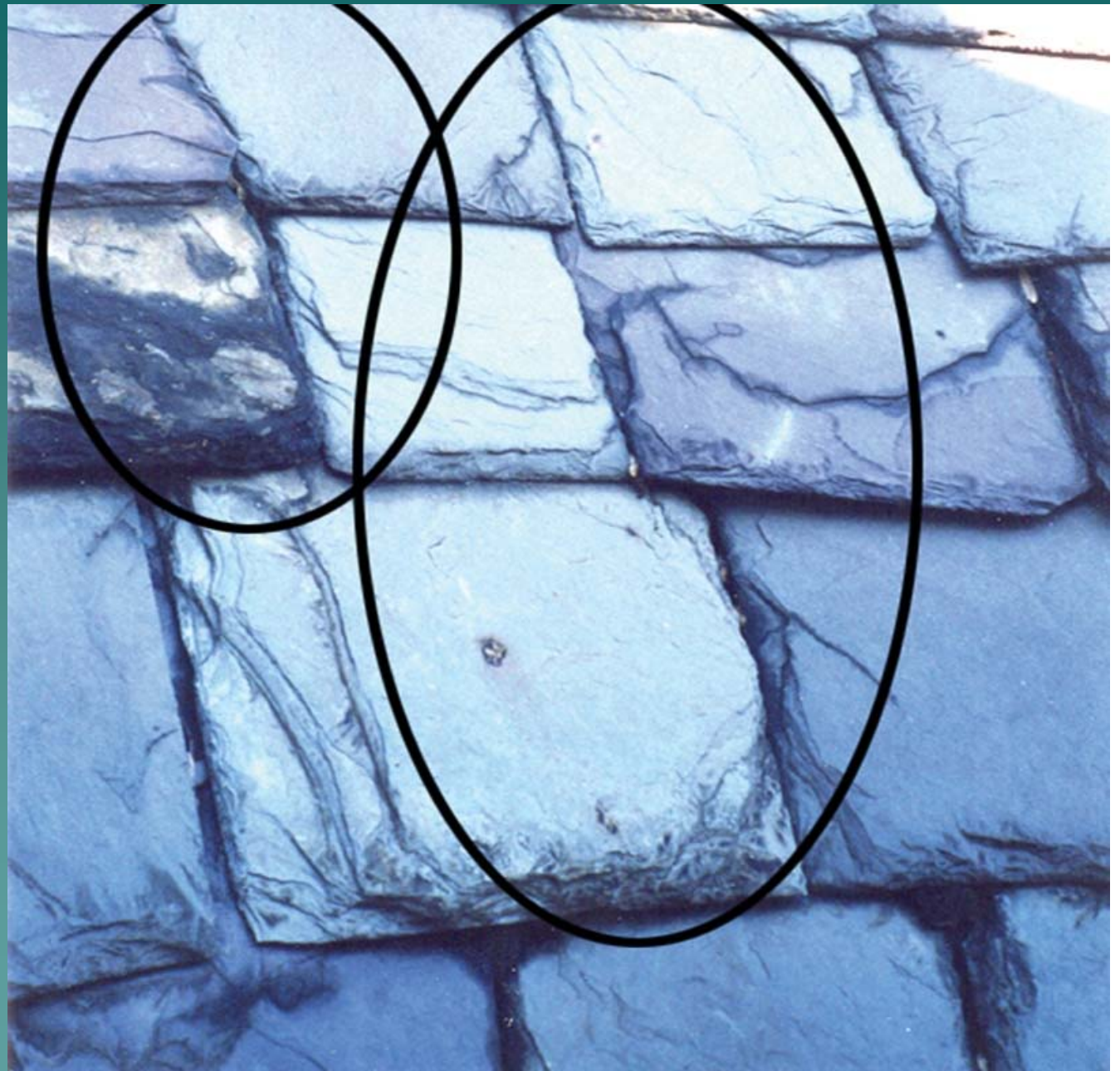
This was a huge, complicated and expensive undertaking.
It pays to do it right the first time.



This re-roofing job was successfully completed.



Lateral overlaps or “sidelaps” are also important. These shown here are inadequate or nonexistent.



Slate is versatile and can be installed in many styles, as long as proper headlaps and sidelaps are maintained. This is a “ragged butt” style.



This ragged butt roof was condemned by 3 roofing contractors, although little was wrong with it. It was eventually repaired.



Another ragged butt slate roof.



A staggered butt, rough textured, mixed color slate roof.



Staggered butt,
mixed colors,
using both new
and salvaged
slates.



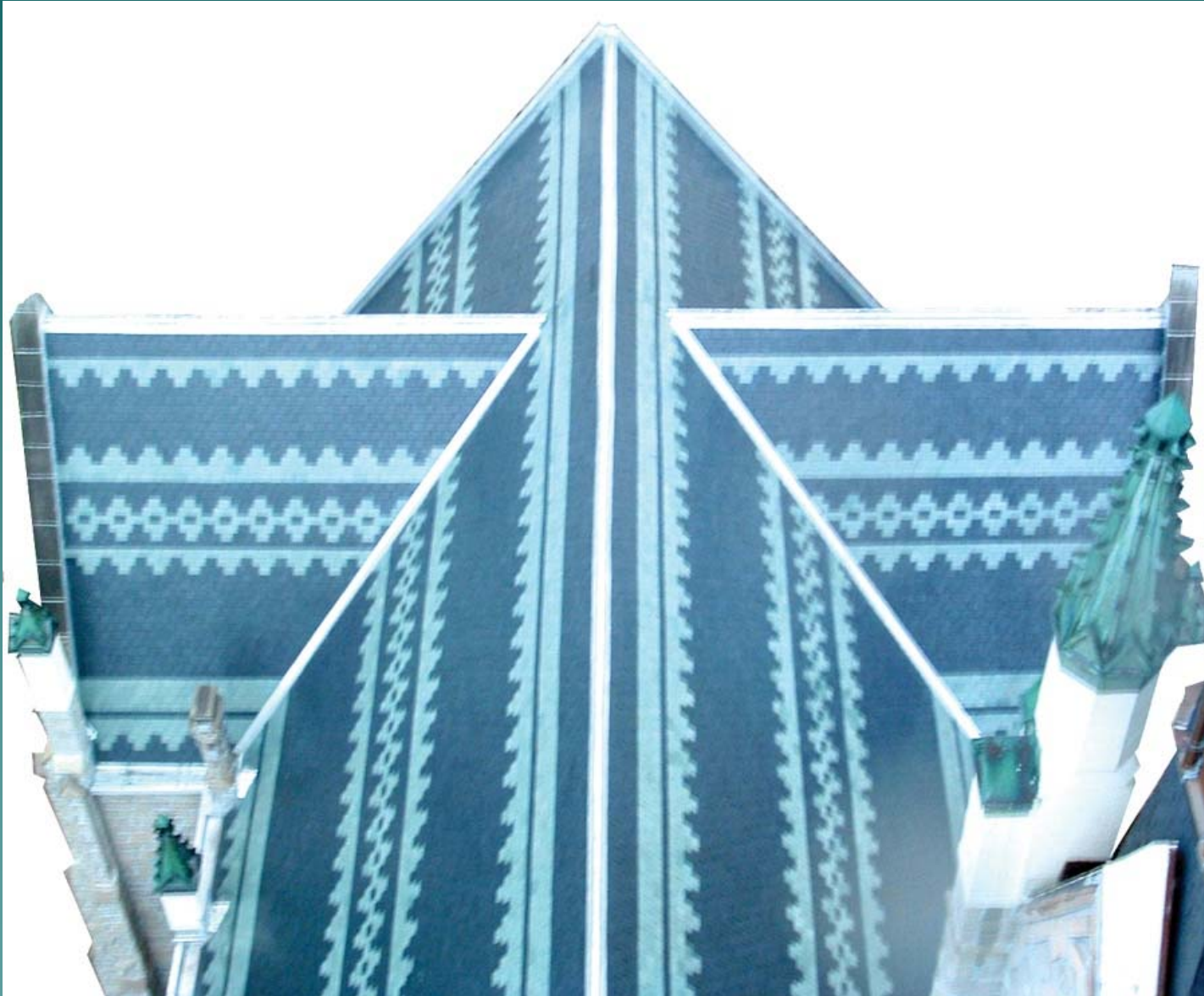
Another staggered butt slate roof style. All slates are the same length, but are staggered 1". The roof is chalked for a 4" headlap (rather than 3") to allow for the 1" stagger.



This is a one-color, rough textured slate roof of Pennsylvania black slate.



Slate can easily be installed in patterns and designs. This roof slate has two colors, one size and one shape.



It's easy to create a landmark roof with slate. This is two types of slate, two shapes, mostly recycled, on a university building.



NEXT: Evaluating slate roofs.

[Note: for more information about headlap, starter courses, soldering copper, weather damage, etc., please read the articles at TraditionalRoofing.com.]

What Home Inspectors Should Know About
Slate Roofs

Part II: Evaluating Slate Roofs

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There are many types of roof slates, with different longevities, primarily identified by the quarry from where they originated.

Approximate Colors of American Roof Slates When New



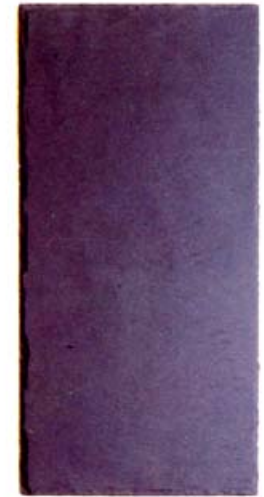
New York Red



Vermont Mottled Purple



Vermont Gray



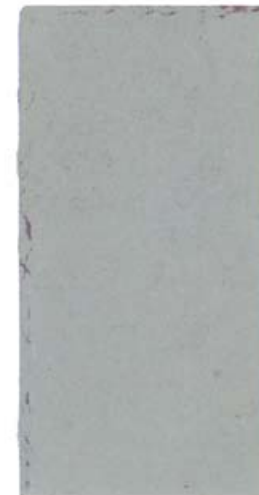
Pennsylvania Black or Spanish Black, similar in tone to Virginia slate



Vermont Green



Vermont Purple



Vermont "Sea Green"



Vermont Gray-Black

Some have lesser longevities.
Slates that are worn out can't be restored.



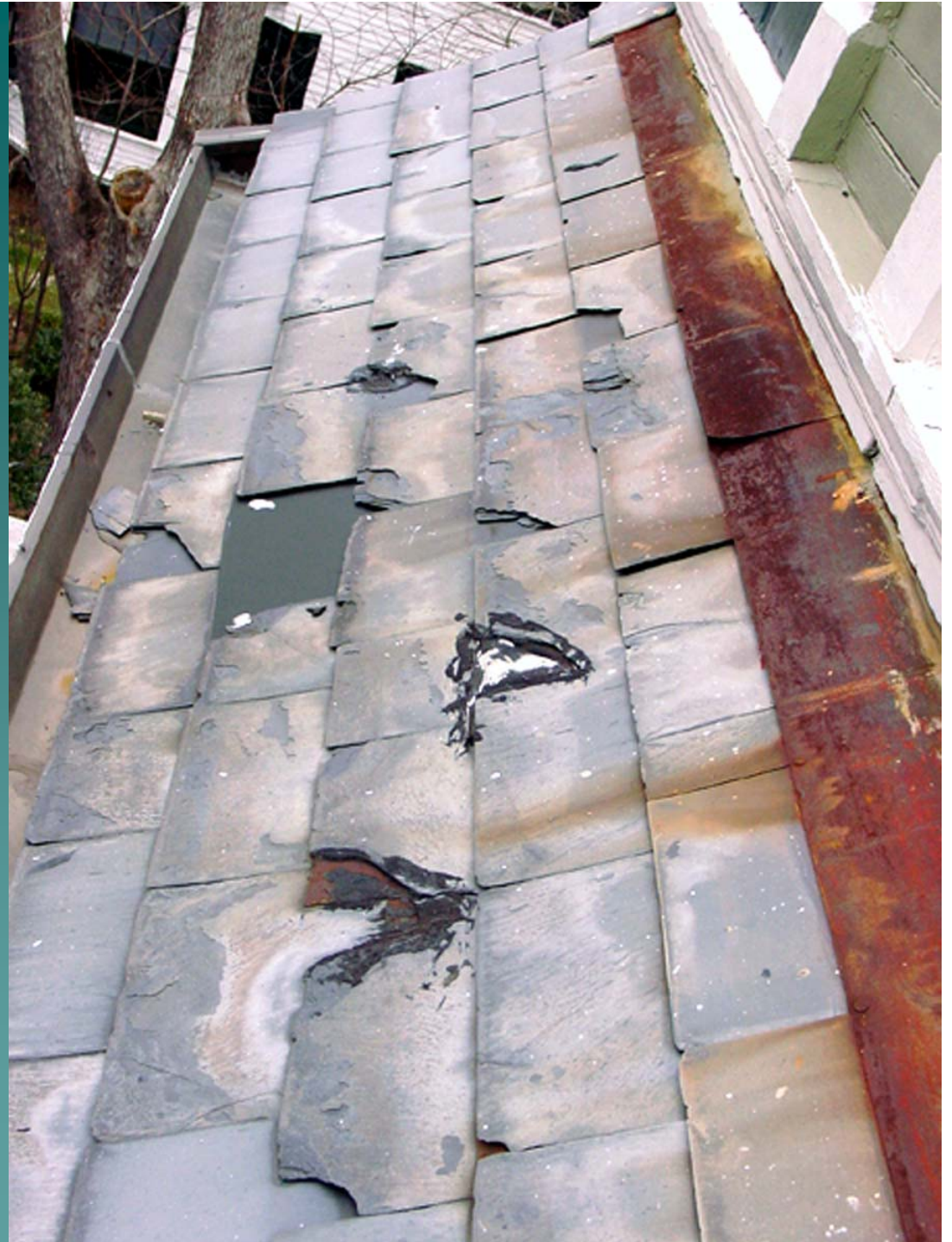
This Pennsylvania black slate roof is near the end of its life at about 90 years of age.



Softer slates will flake, crumble and fall apart, in time. These tend to be mainly PA black slates, but others can deteriorate prematurely as well.



Another example of a PA black slate roof in disrepair and beyond hope. It should be reslated.



When slate has reached the end of its life, this is what it looks like. This is Vermont “sea green” slate at 115 years. Most VT sea green slate lasts much longer.



This 100 year old roof is still good, although it had been wrongly condemned by a home inspector solely because of its age and color (black). This is Buckingham slate with many years of life left.



A smooth surface indicates a good slate and a good roof, no matter how old.



Weathering VT slate, or “sea green” slate, can last 150 years or longer. This slate has turned brown.



This is a more typical example of a VT “sea green” slate roof, after restoration, at about 100 years of age.



Chapman (PA) slate (striated black) may last 125 years. VT unfading green slate (light gray) may last 200 years.



A graduated, mixed Vermont slate roof is highly restorable. Restoration primarily involves replacing the flashing metal.



VT unfading green and VT purple slate roofs are excellent, long-lasting and very restorable.

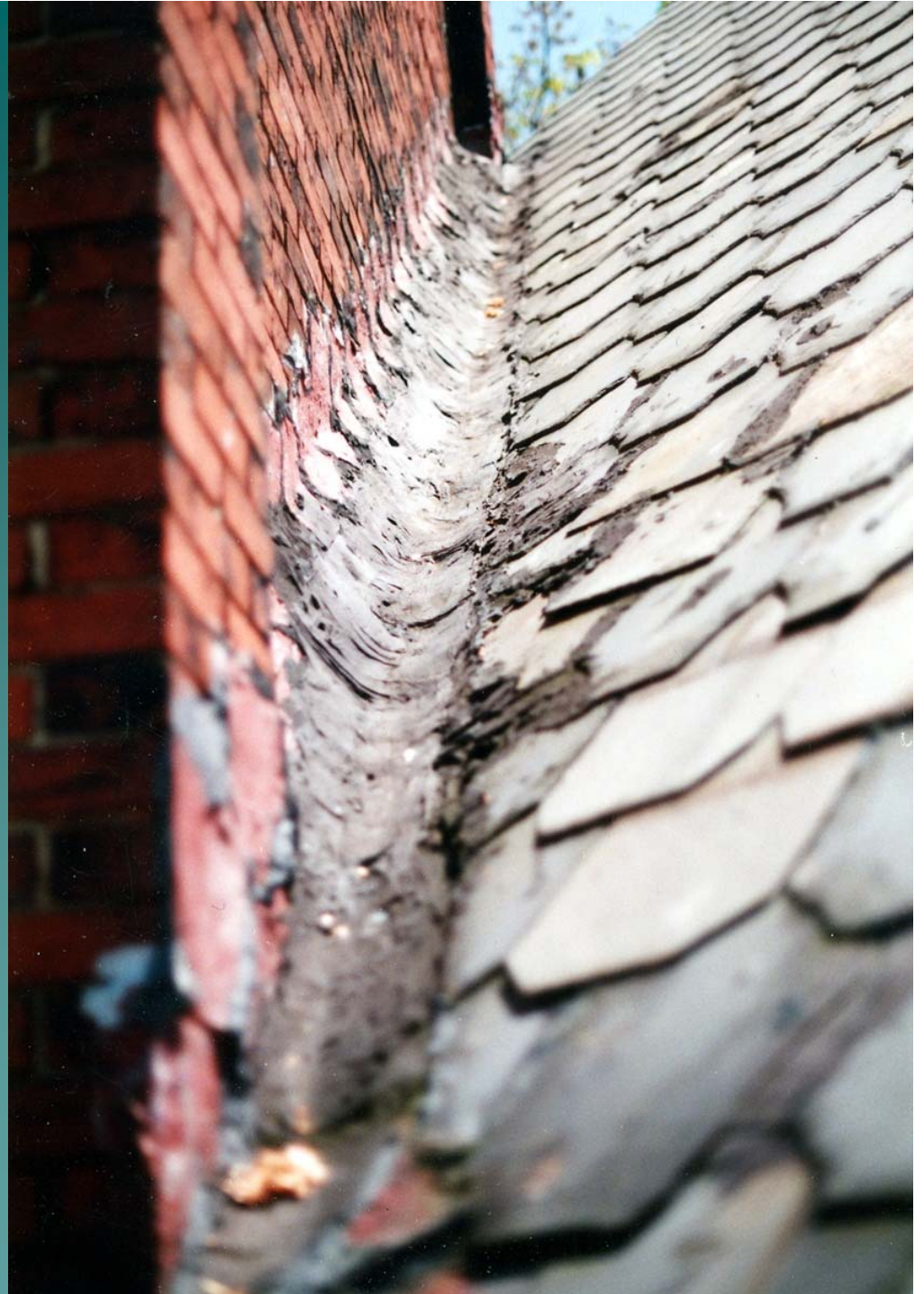


There is a
“How to Identify Your Slate Roof”
page on the web at

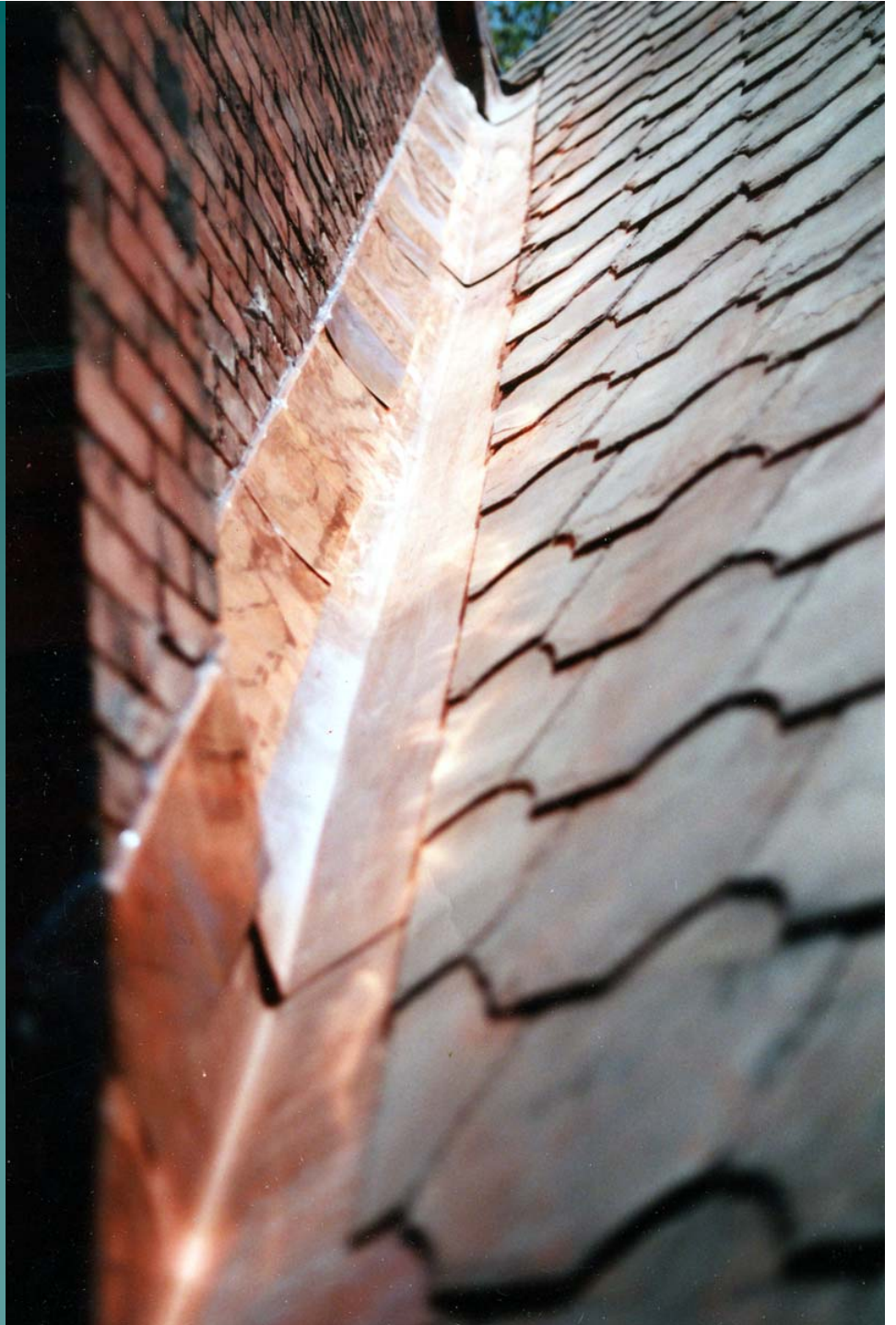
SlateRoofCentral.com

Go to the top navigation bar under “how-to.”

This is a “soft” PA black slate roof on a church at 104 years of age. Looks pretty bad – surely this roof must need to be torn off and replaced.



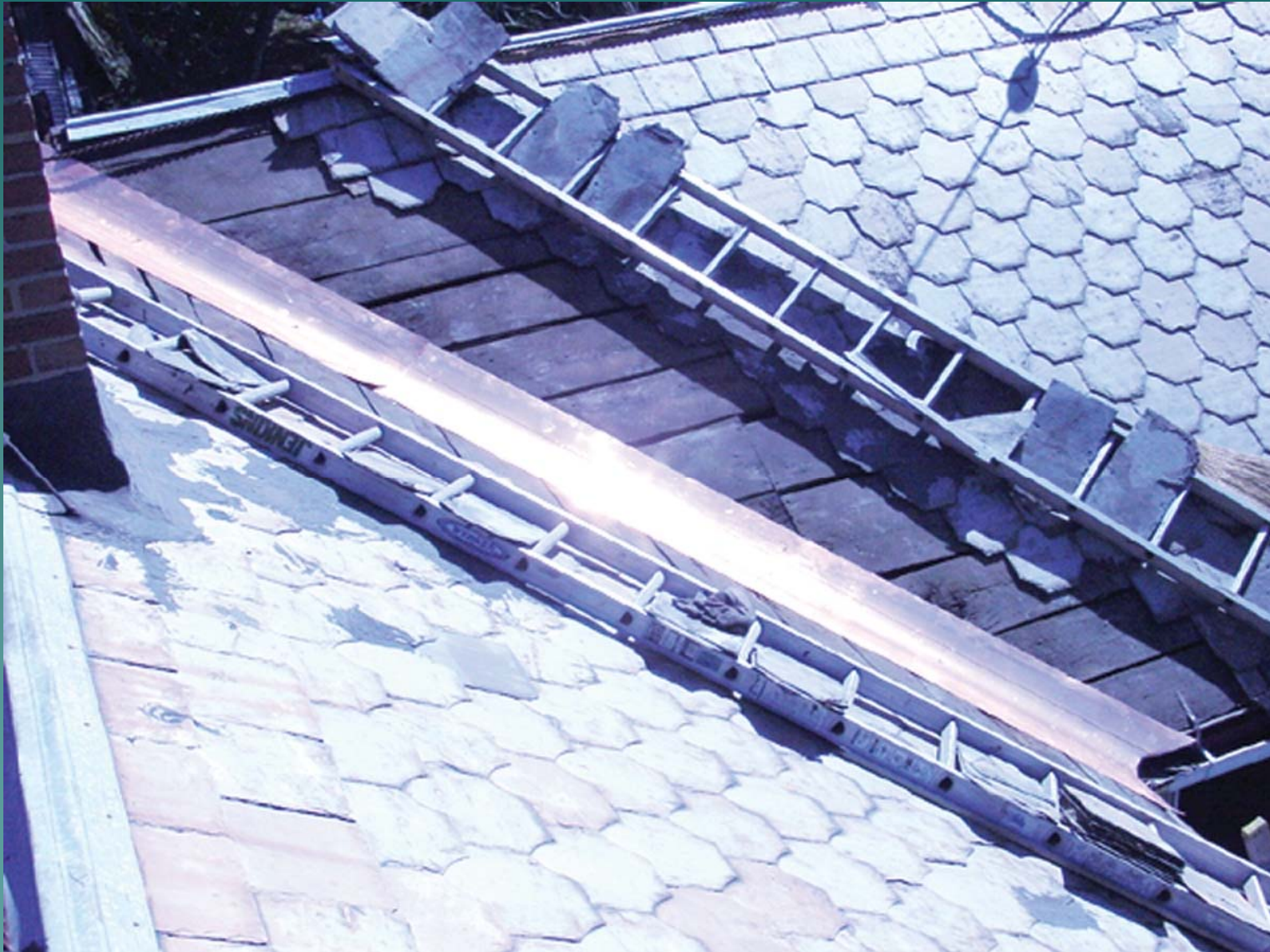
Yet, one day's work for a
slate roof restoration
professional, with a helper,
puts the roof back in shape.



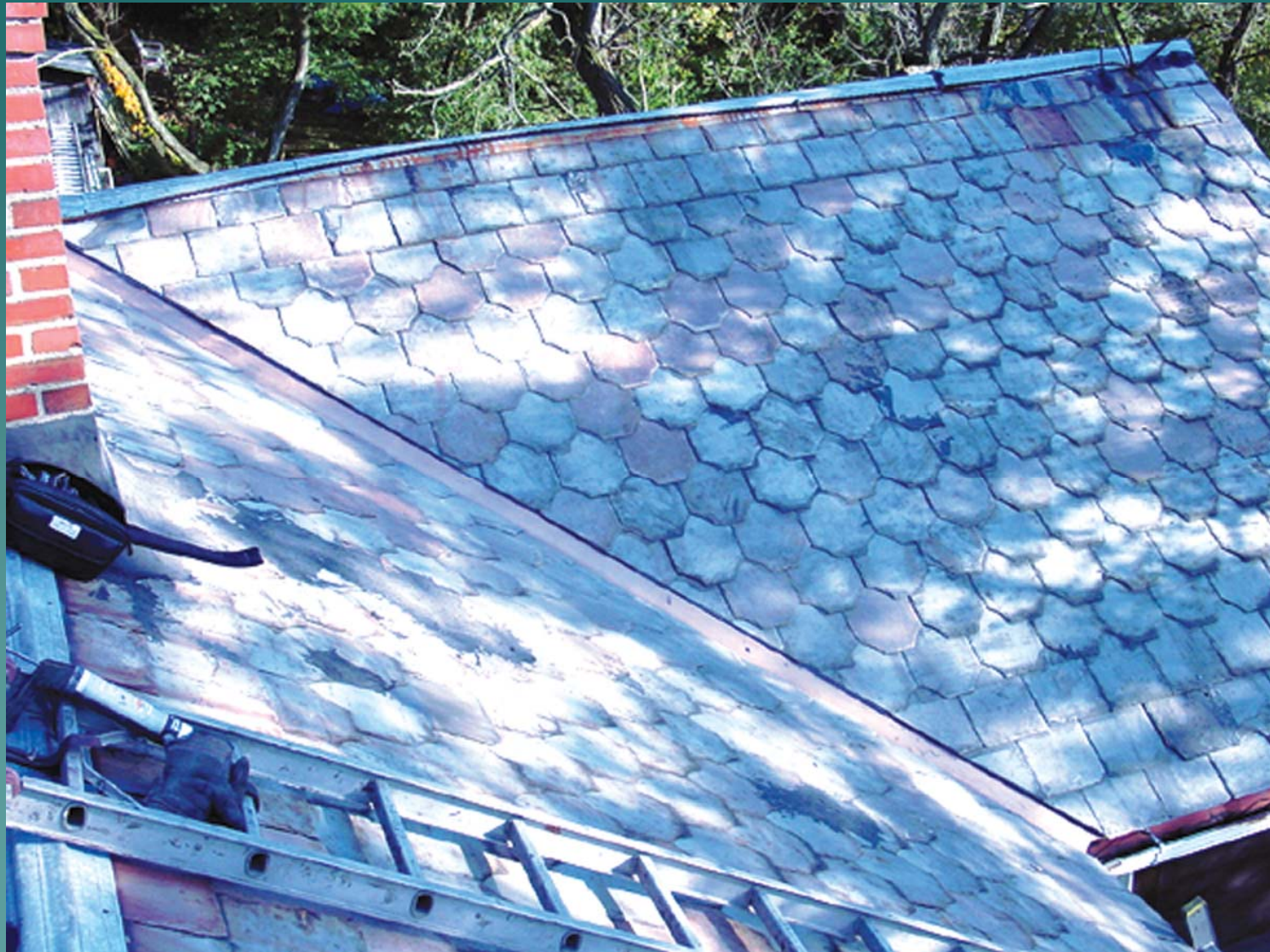
This is a VT “sea green” slate roof that has been heavily damaged by roofing contractors. At first sight, it looks like it needs replaced.



Instead, all flashing and tarred slates are removed and new copper flashing is installed.



This is routine restoration work on a century-old slate roof. A day's work for one man.



Typical “Neanderthal” roof repair makes a slate roof look terrible. Should this roof be condemned and replaced?



This is the same chimney
after five hours of
professional slate roof
restoration work.



This VT “unfading green” slate roof is in good condition, but with severe leakage.



The leakage was caused by poor workmanship by the copper contractor (he screwed up the slate). The slate itself is excellent.



Here is a sign of severe leakage on a church – does the slate roof need replaced? Many would say yes.



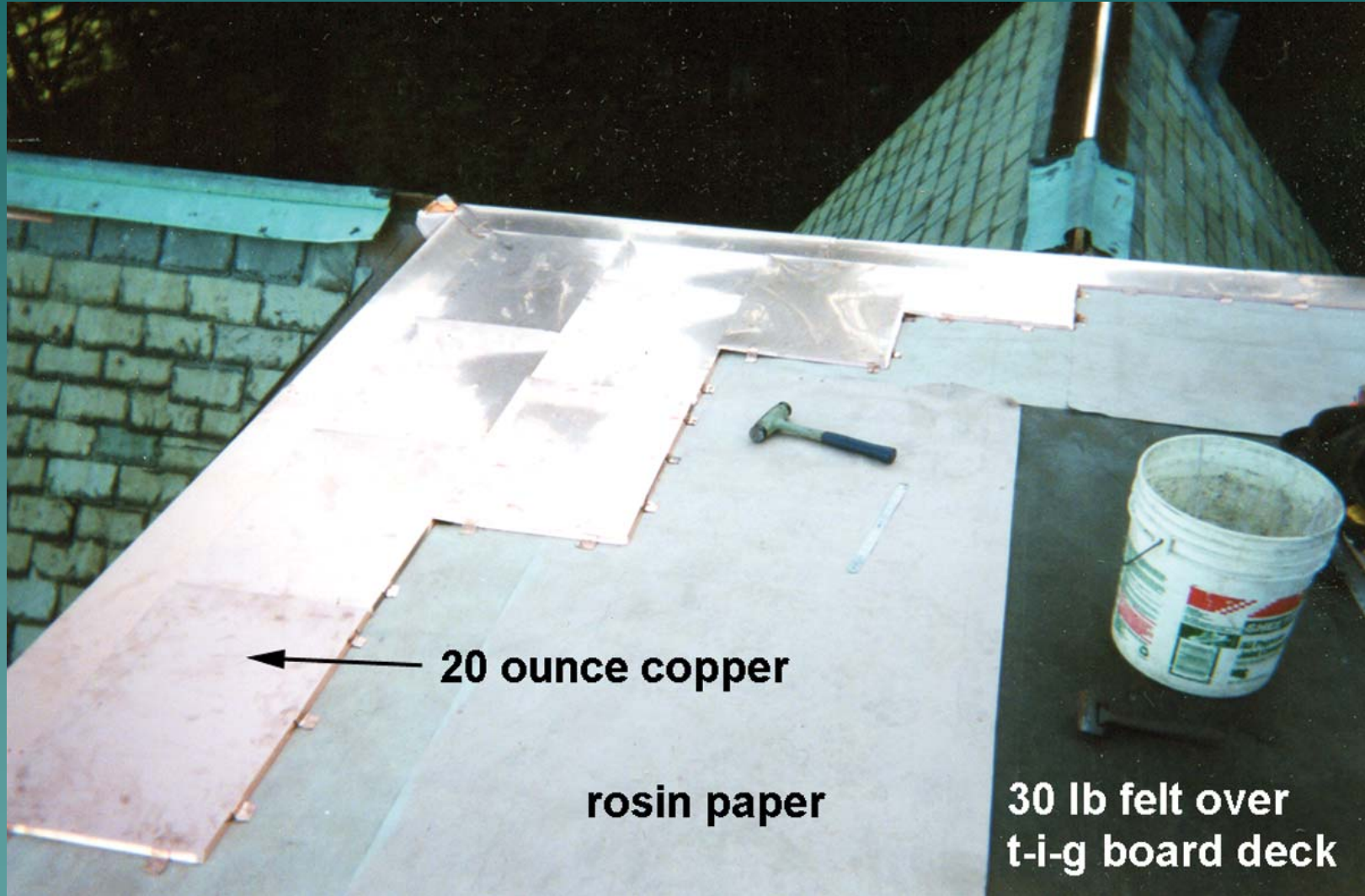
No. The leakage was not in the slate roof, but in an adjoining low-slope built-up roof. The Vermont slate itself was excellent.



Leaking low-slope areas can be re-roofed with soldered metal roofing.



In this case, 20 ounce copper is being used.



← 20 ounce copper

rosin paper

30 lb felt over
t-i-g board deck

The pans are soldered together to create a durable roof.



Ford's Theater: This is another roof condemned because of a leak on an adjacent non-slate roof.



The coping was leaking on a parapet wall at a spot indicated by the arrow. The slate roof had already been completely replaced.



Ford's Theater

This 10-year-old slate roof was also condemned by roofing contractors.



However, the minimal ice damage at the snow guards was covered by home-owner's insurance.



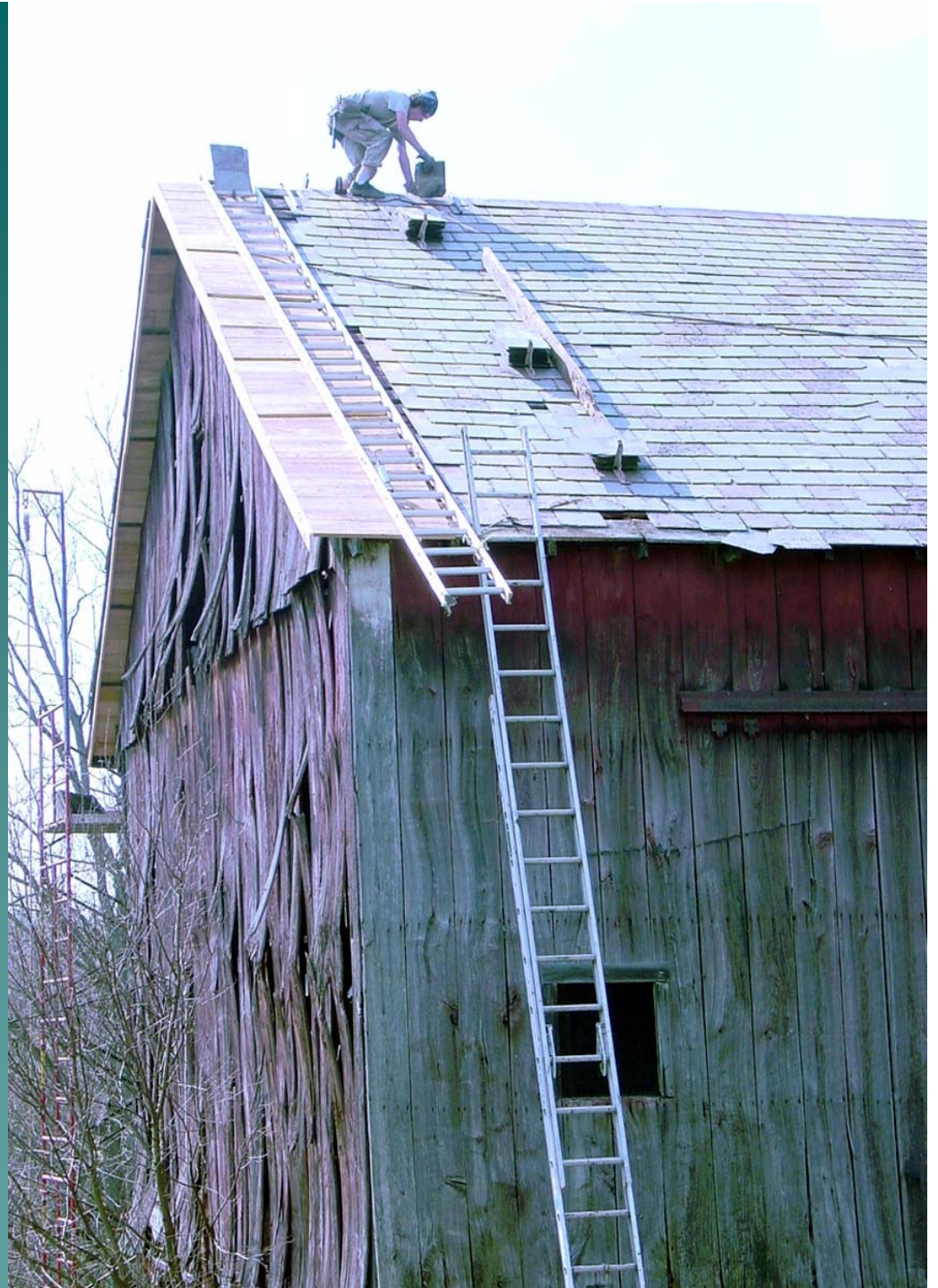
Neglected slate roofs can be saved *if* the slate is still good.



Weather damage
can cause a home
inspector
“condemn” a slate
roof.



But no matter how bad it looks, if the slate is good, the roof can be restored.



A properly restored slate roof appears original,
with no visible repairs.



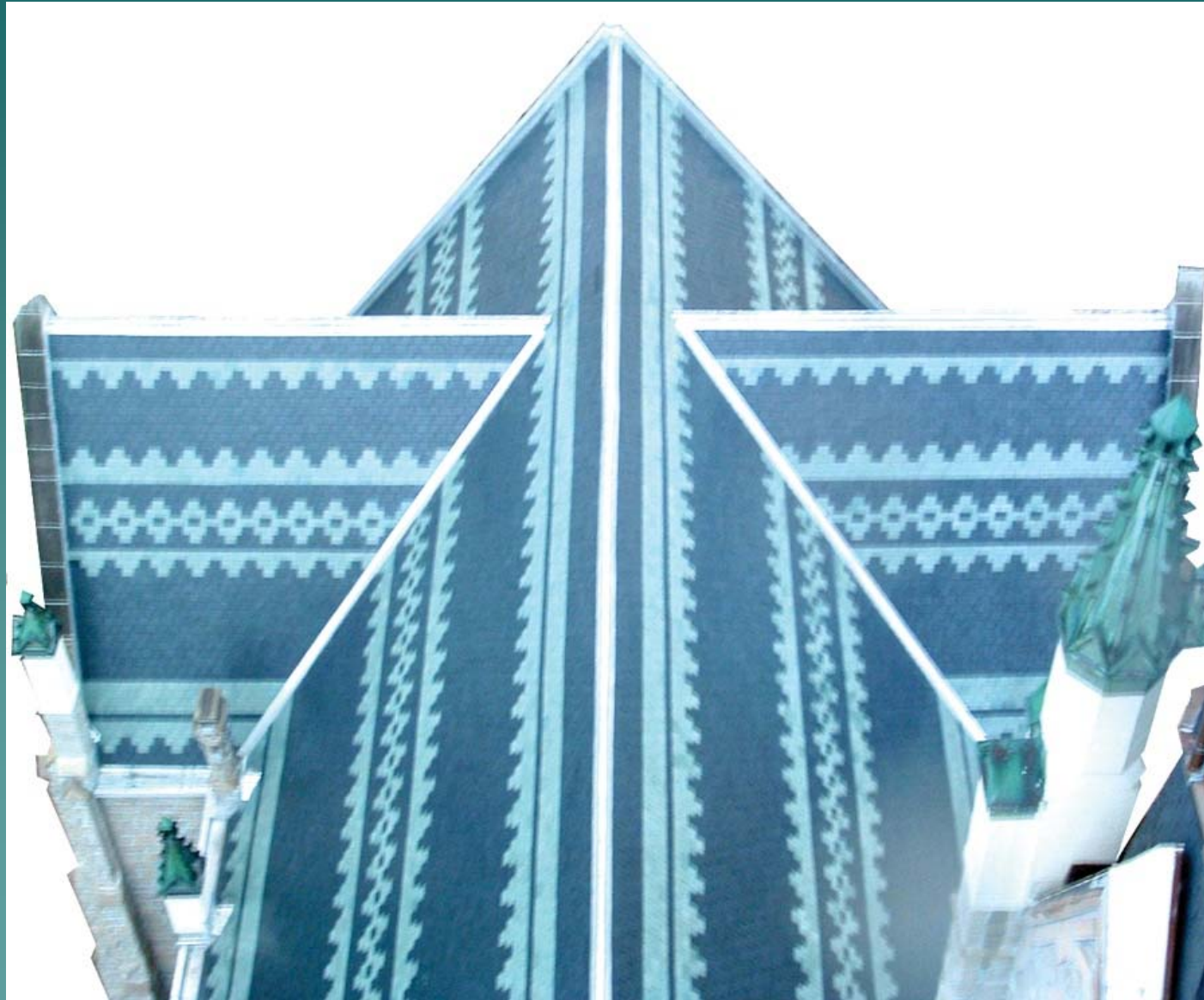
This cathedral roof could not be restored without total replacement.



The black PA slates had worn out, although the green VT slates were still good after 120 years.



New Welsh black and VT unfading green slates and stainless steel flashings have added 150 years to this building.



Our consulting services help identify and solve slate roof problems (see SlateExperts.com).



Next:

Part III - Repair and Restoration of Slate and Tile Roofs

Note: for more information about headlap, starter courses, soldering copper, weather damage, flat-lock soldered copper, etc., please read the articles at TraditionalRoofing.com. Have questions? Visit the message board at SlateRoofCentral.com.

What Home Inspectors Should Know About

Slate Roofs

Part III: Repair and Restoration

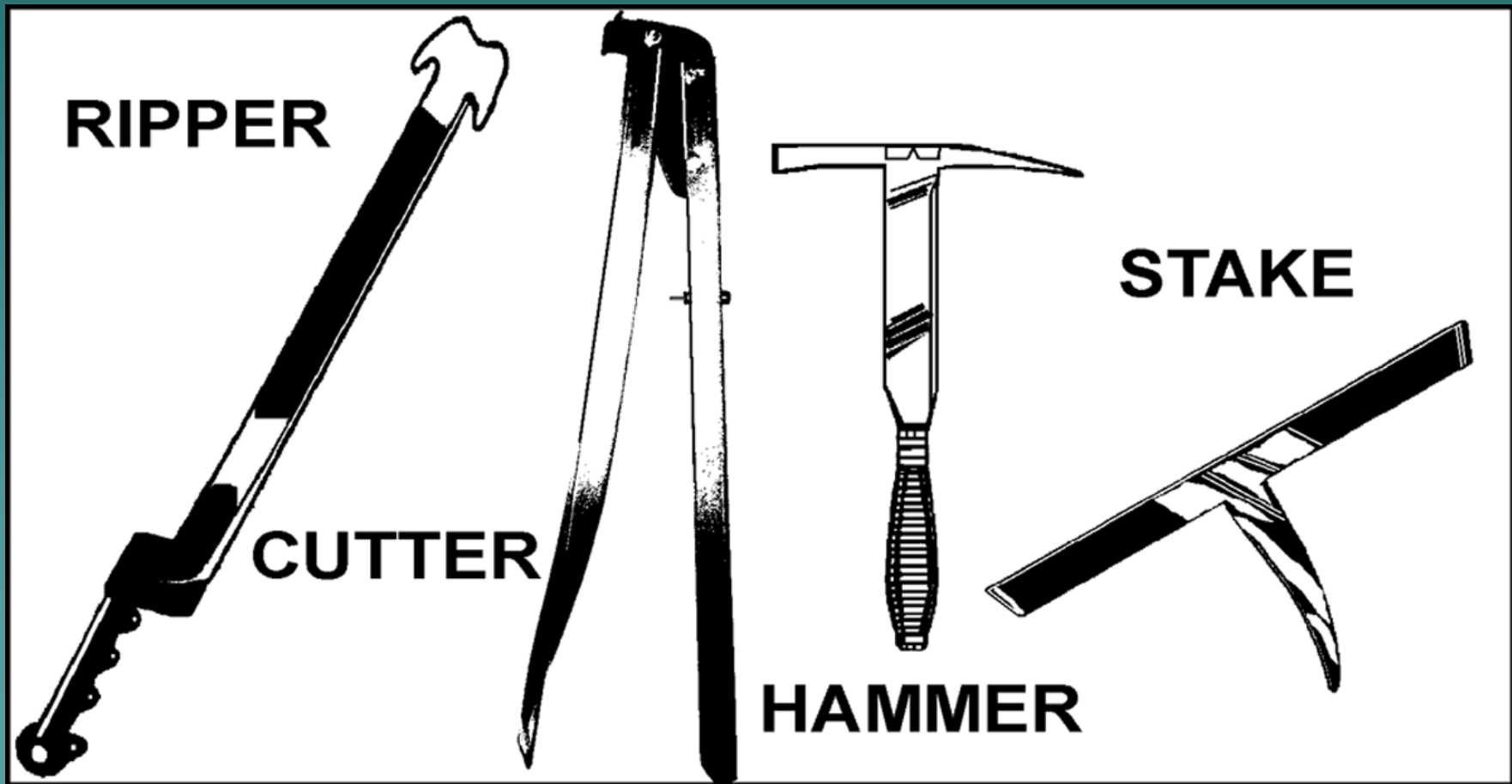
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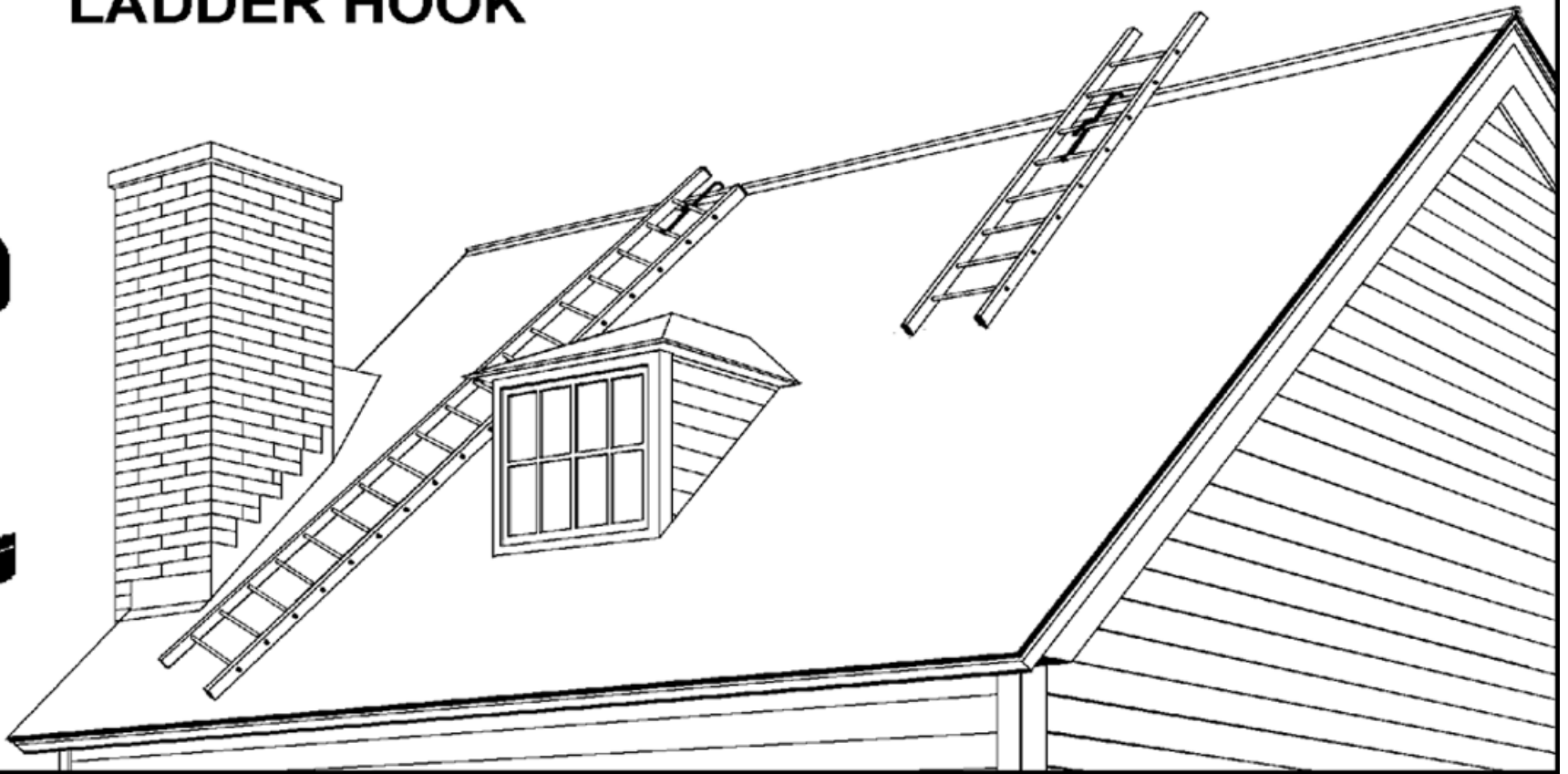
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Specialty tools are required when working on slate roofs.
All are available at SlateRoofWarehouse.com.



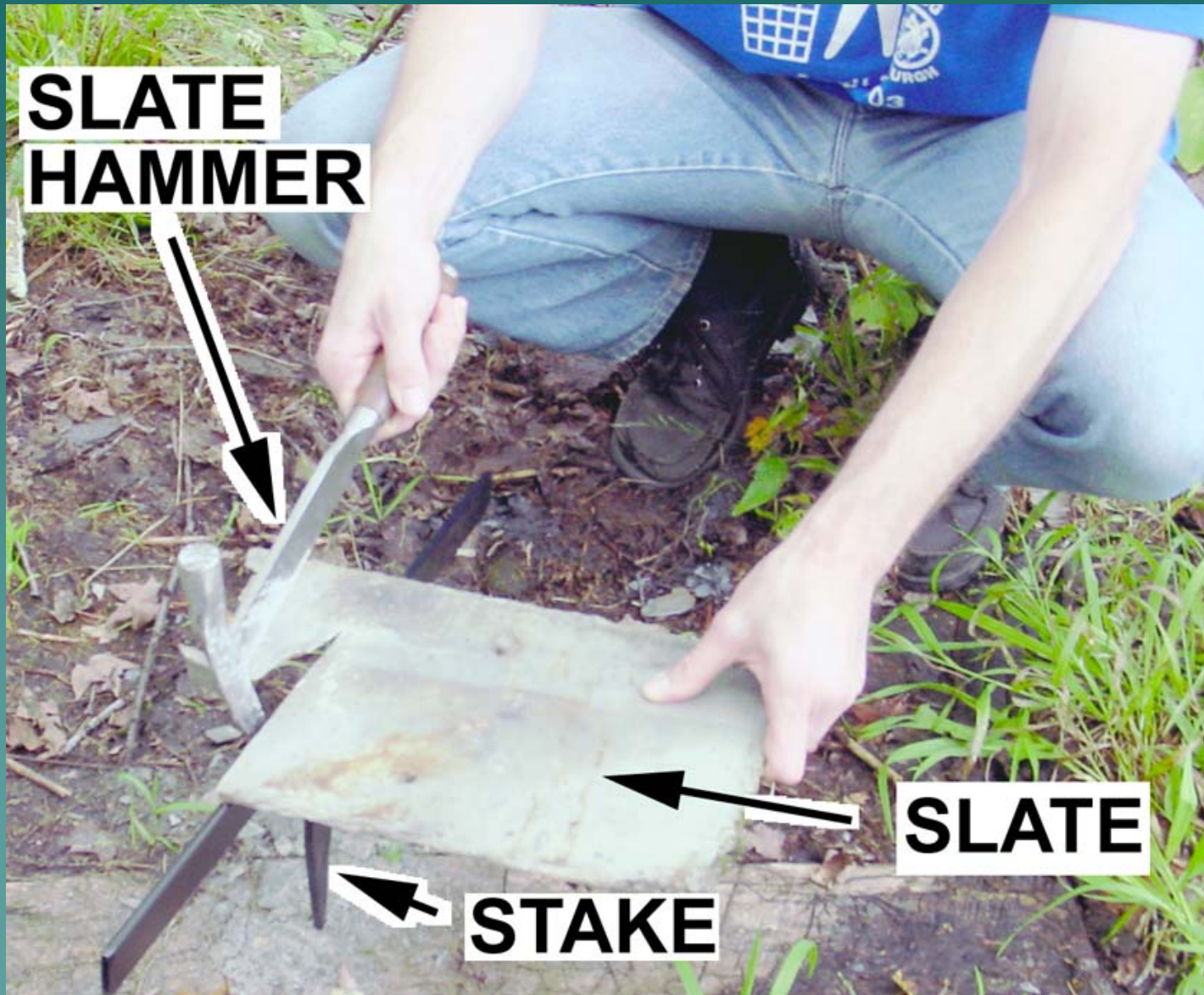
Hook ladders allow access to the roof without walking on the slates. Slate roofs should not be walked upon.

LADDER HOOK



Slates can be cut by hand with a standard slate cutter or with a hammer and a stake.

This is demonstrated at SlateRoofWarehouse.com.



Most leaks in slate roofs are caused by:

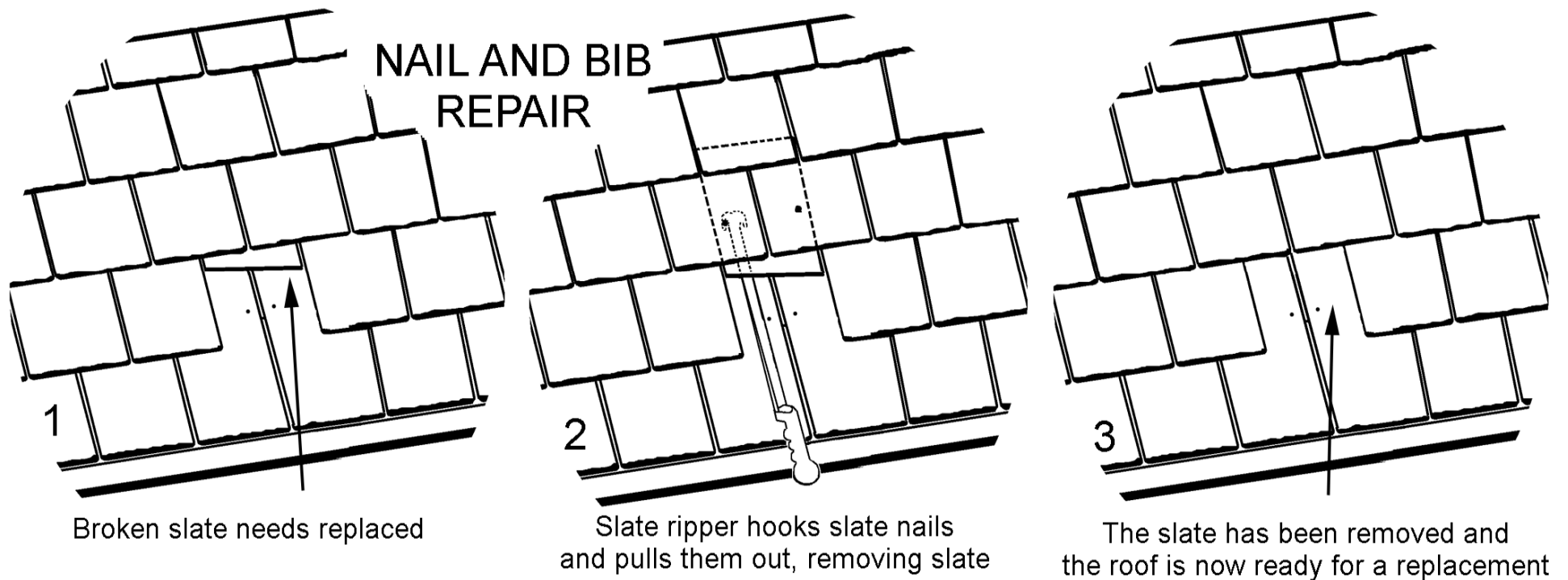
- 1) faulty slates**
- 2) faulty flashings**
- 3) bad repairs**

In many cases these can be repaired or restored.
Some can not.

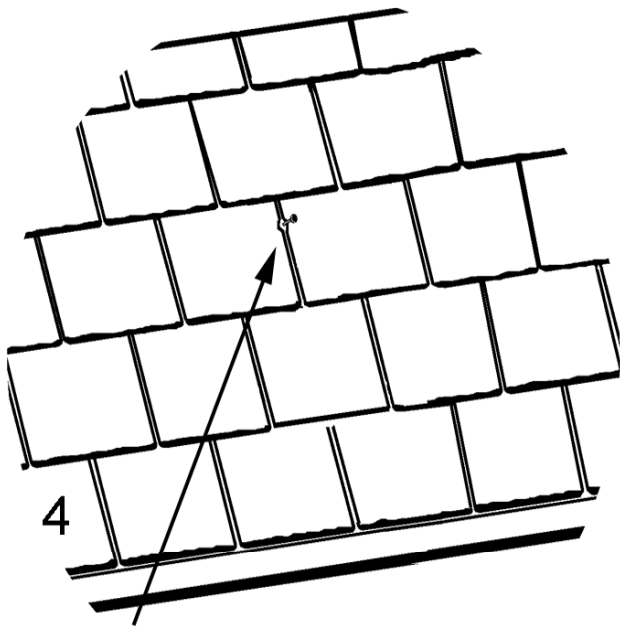
Missing slates are easy to repair.



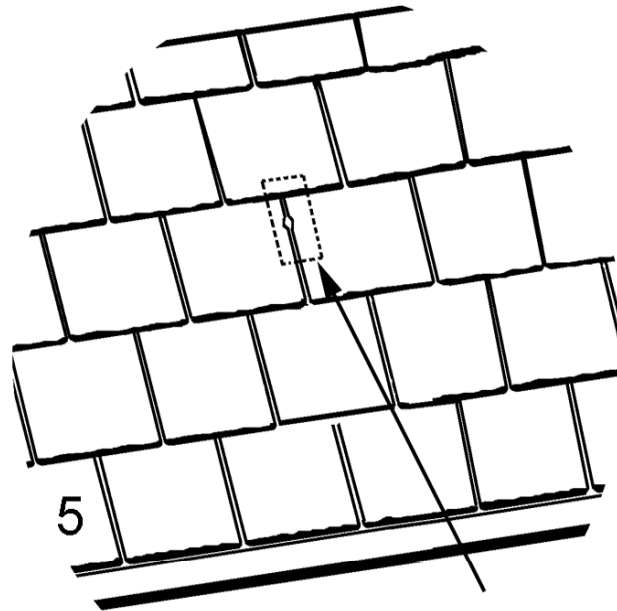
Any part of a slate roof can be removed and replaced. An individual slate can be removed and replaced, as can any flashings. This allows for long-term maintenance and repair.



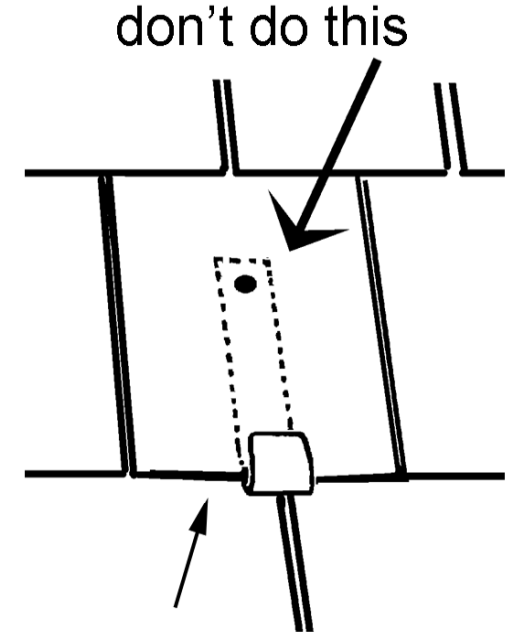
The “nail and bib” repair is common and acceptable.
Exposed strap hangers are not acceptable.



Replacement slate is slid into place and fastened with a nail in the slot



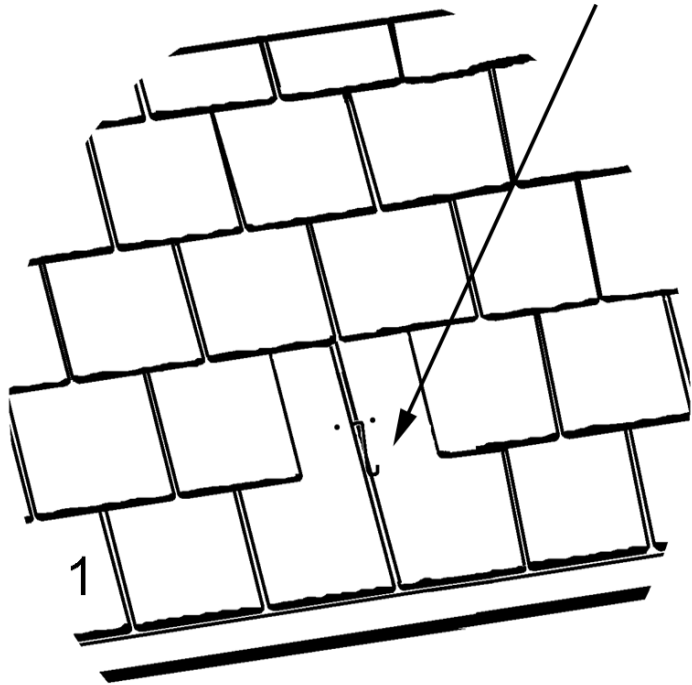
The roofing nail is tapped down and a bib flashing is slid under the slate but over the nail head



The above strap technique is undesirable for two basic reasons: it looks bad and the straps are easily bent open by sliding ice and snow

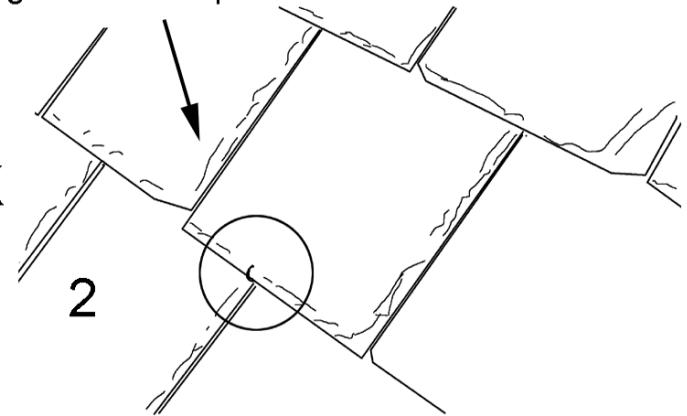
Slate hook repairs are also acceptable.

Alternatively, a copper or stainless steel slate hook can be nailed into place after the old broken slate has been removed

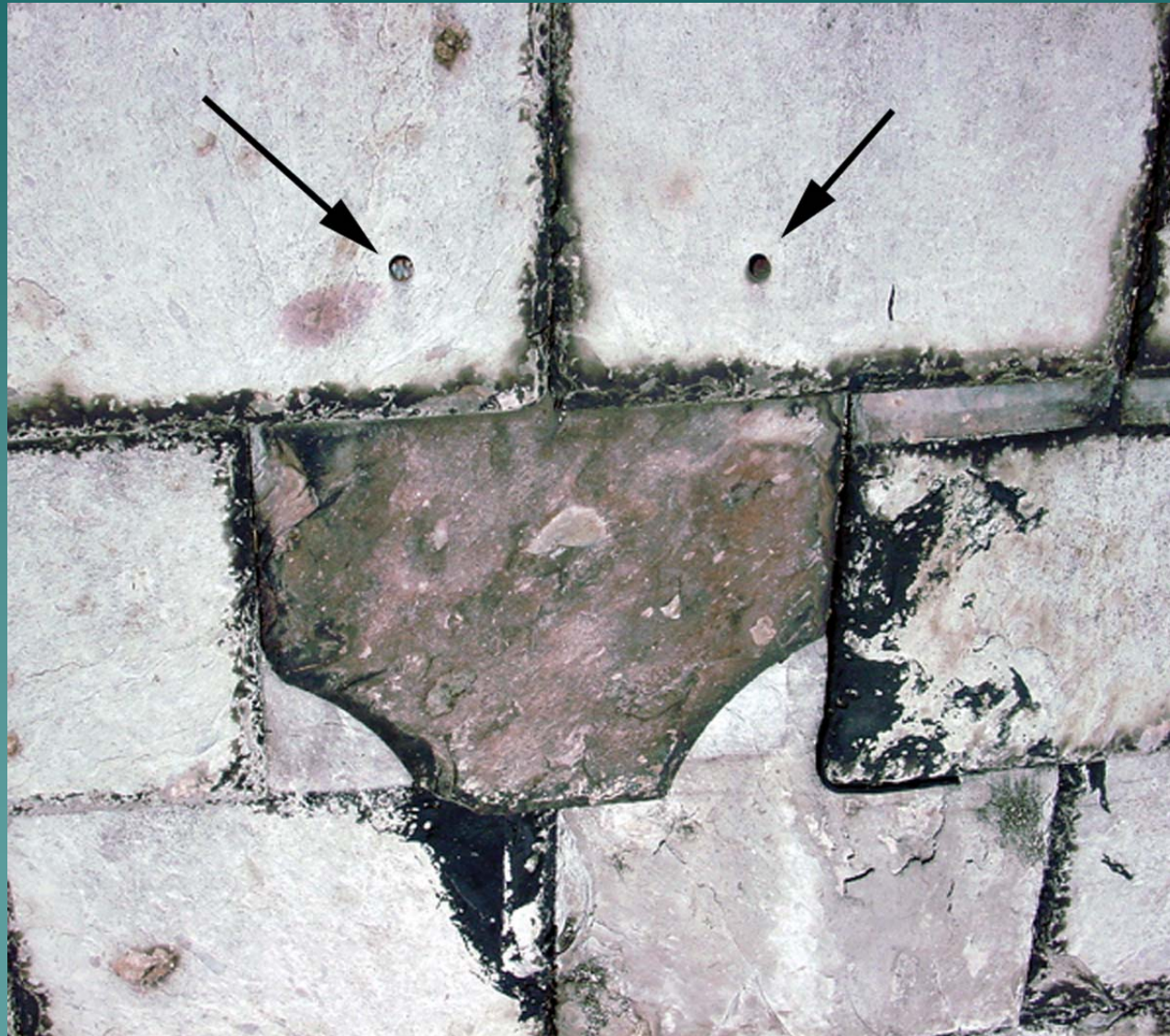


The replacement slate is then slid in place where it is permanently held by the slate hook. The hook can be pushed down between the underlying slates, if needed, in order to make more room for sliding the slate in place.

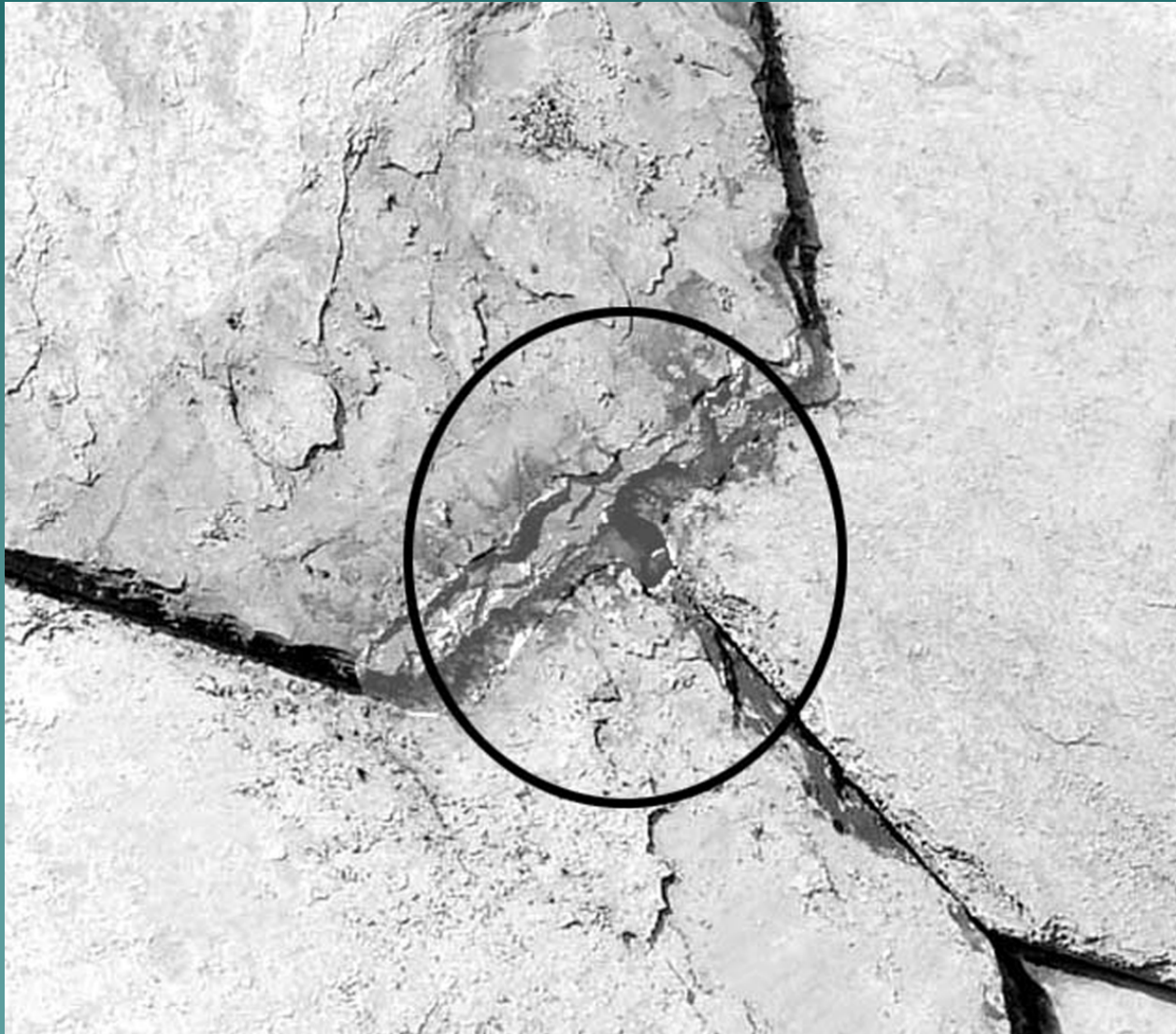
SLATE HOOK REPAIR



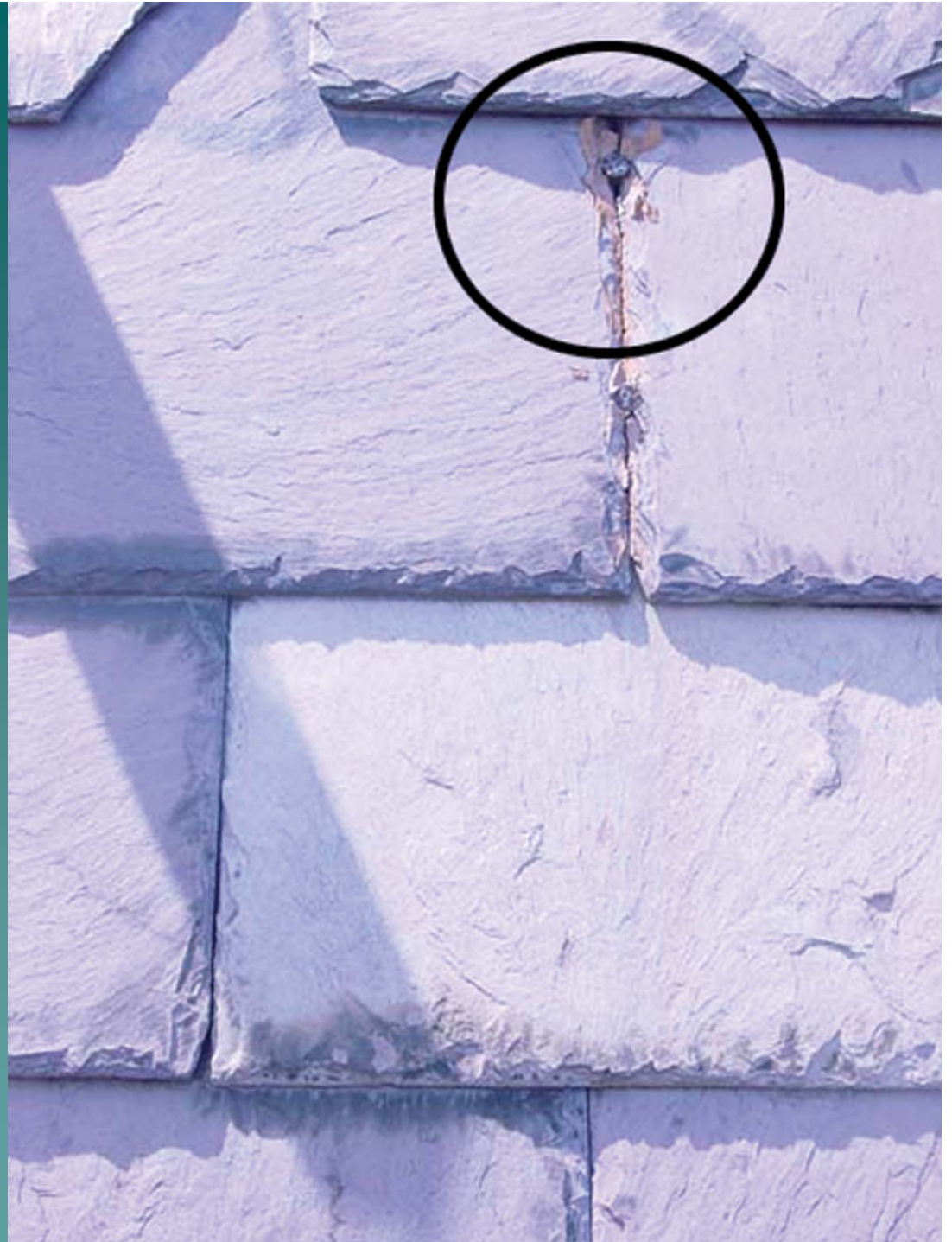
Bad repairs are a plague on many existing slate roofs. This repair slate is the wrong shape, wrong type, probably wrong length, and face-nailed.



A hidden “repair” nail, without a bib covering it, creates a persistent leak that is difficult to see or find.



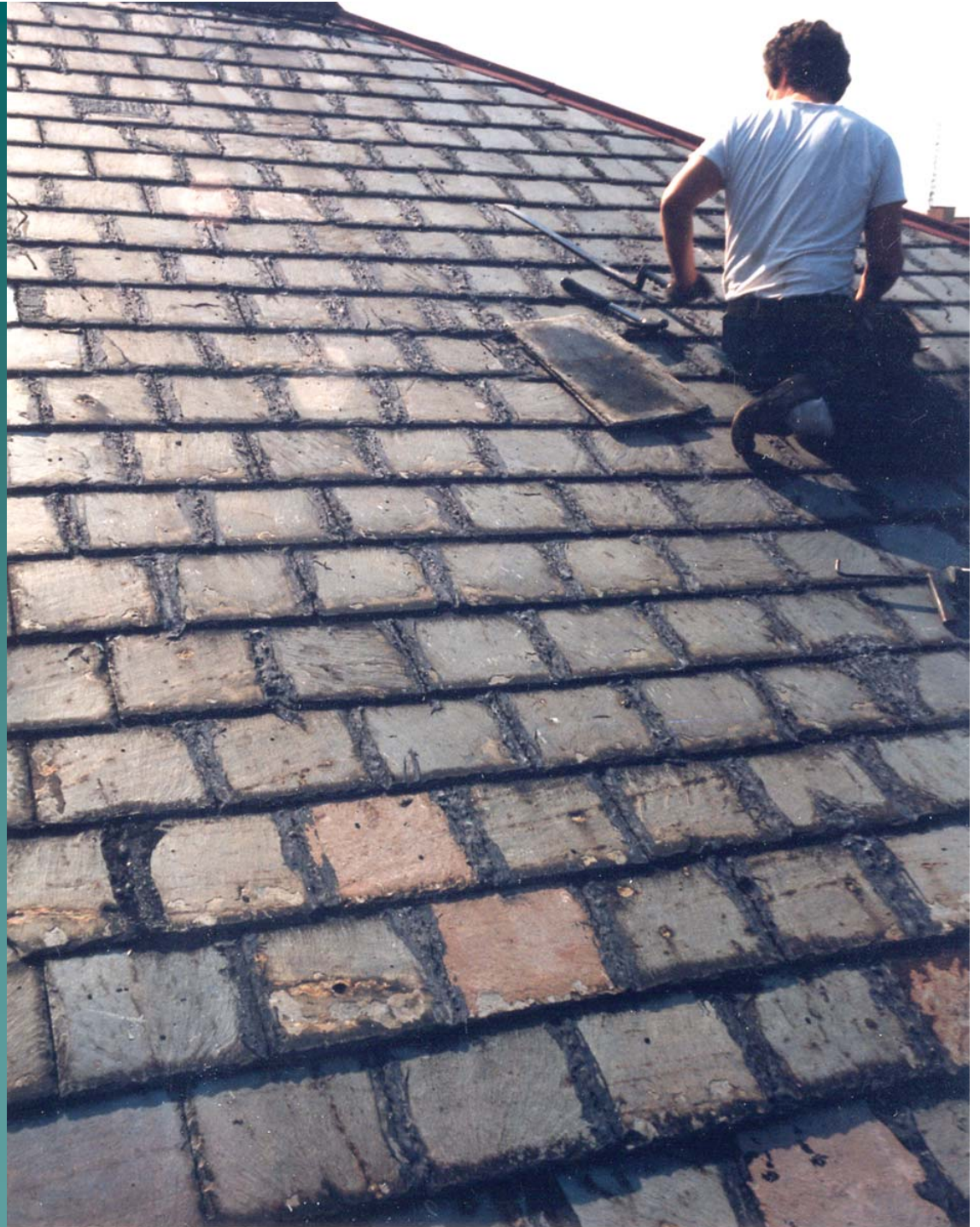
Here's another example of a repair nail without the necessary bib flashing. This is a notorious source of leakage and is difficult to spot from the ground.



Strap hangers are a mistake. They are unsightly and unnecessary. They will flatten out under the pressure of ice and snow and will allow the slate to slide out.



Roof cement (or “mastic”) applied to the surface of a slate roof is a mistake. It is very unsightly and does not permanently stop leaks. It makes the roof much more difficult to repair properly.



During restoration, old rusty tin flashings, such as the ridge metal on this church, should be replaced. Often, just a coat of paint will be enough if the metal is still sound.



This is a valley replacement on a church with a 104 year-old PA black slate roof. Note that no underlayment (felt paper) whatsoever is being used - it's not necessary. There is no functional underlayment on old slate roofs anyway.

When replacing valleys, the old valley metal must first be completely removed.



Flat roofs can also be restored.



New copper is soldered in place.



When completed, the restoration work has added 50 years of new life, or more, to this roof.



This is the sort of faulty chimney “repair” seen all too often on slate roofs.



First, all of the offending material is removed down to bare wood.



Then it is properly replaced.



Another example of a chimney in poor condition.



The same procedure is followed – clean it down to the bare wood and get rid of all tar, bad flashings and bad slates.

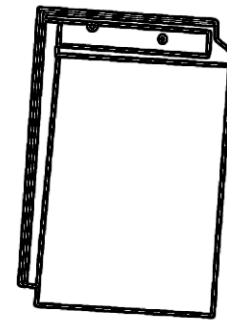


Replace the old metal with new copper and replace all faulty slates with good matching slates. Now the roof is as good as new.

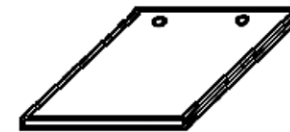


Ceramic Tile:

There are many different types of roof tiles.



interlocking shingle tile



flat shingle tile



mission tile



broad pan tile



Spanish tile



pan tile

Tile roofs are repaired in much the same way as slate roofs.



When flashings wear out on tile roofs, they are simply replaced.




Replacement tiles must be hung on “tile hangers” attached to the back of the tile. This hanger is 20 ounce copper attached with caulk and a copper wire.



Unlike slates, replacement tiles are sometimes hung on wires.



In Summary

- ◆ There are many types of slate roofs.
 - ◆ Many can last 150 to 200 years.
 - ◆ Slate roofs are readily repairable.
 - ◆ Slate roofs are often completely restorable.
 - ◆ Slate roofs should not be condemned without good reason.
 - ◆ People evaluating slate roofs should educate themselves prior to issuing opinions.
 - ◆ We should preserve these national treasures, if possible.
 - ◆ If replacement is called for, the roofs should be replaced with slate.
- 
- A decorative graphic at the bottom of the slide showing a silhouette of a mountain range in shades of teal, extending from the right side towards the center.

For More Information:

- ◆ SlateRoofCentral.com
- ◆ TraditionalRoofing.com
- ◆ SlateExperts.com
- ◆ SlateRoofWarehouse.com
- ◆ **The Slate Roof Bible**
- ◆ (available on the web in paper or e-book form at SlateRoofWarehouse.com, Amazon.com, or via your local bookstore)
- ◆ Call us toll free at 1-866-641-7141
- ◆ Joseph Jenkins, Inc., 143 Forest Lane, Grove City, PA 16127