Traditional American Slate Roofs

How to Avoid Common Mistakes During Installation

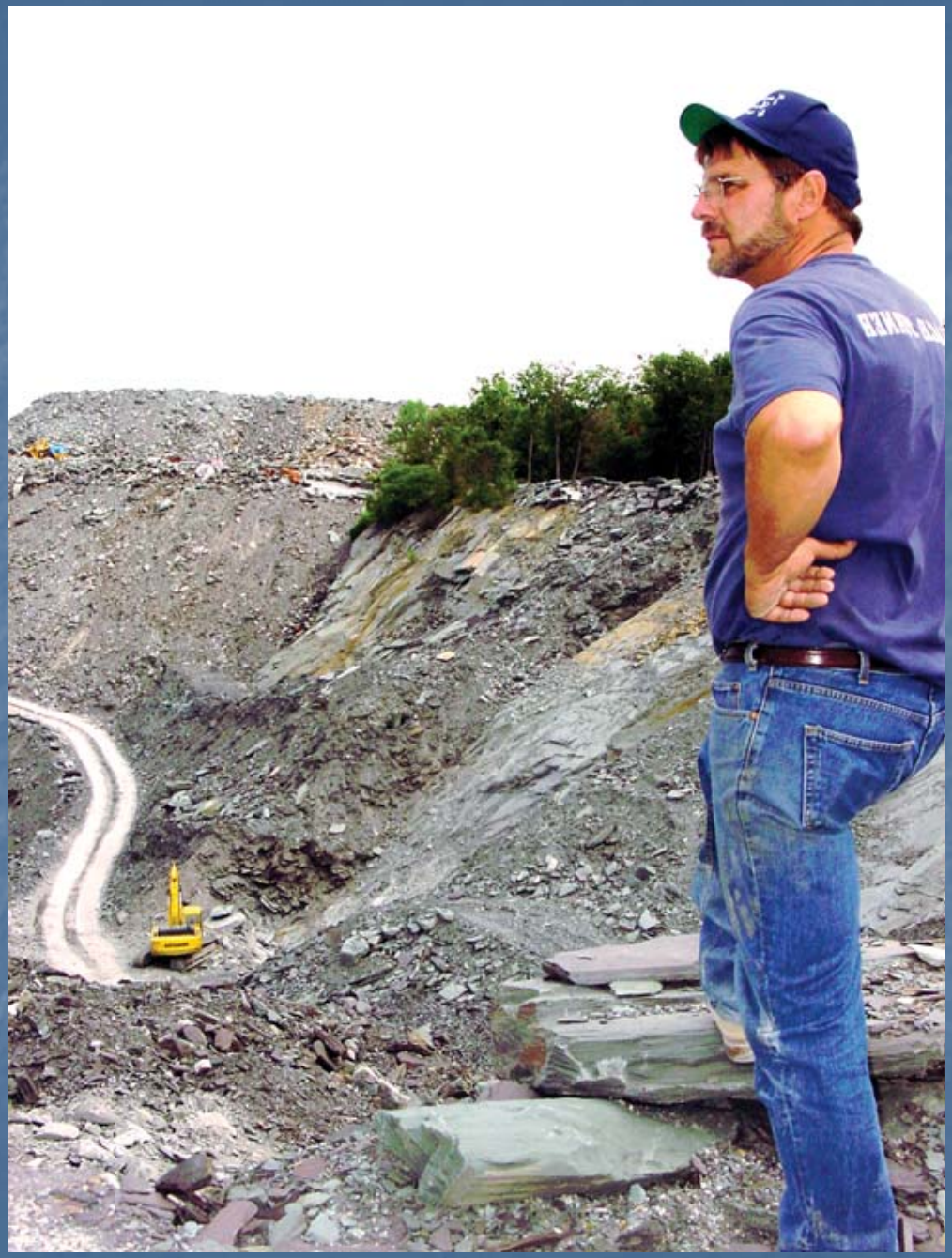
Joe Jenkins
Joseph Jenkins, Inc.
143 Forest Lane,
Grove City, Pennsylvania 16127 USA
814-786-9085

SlateRoofCentral.com
TraditionalRoofing.com
JosephJenkins.com

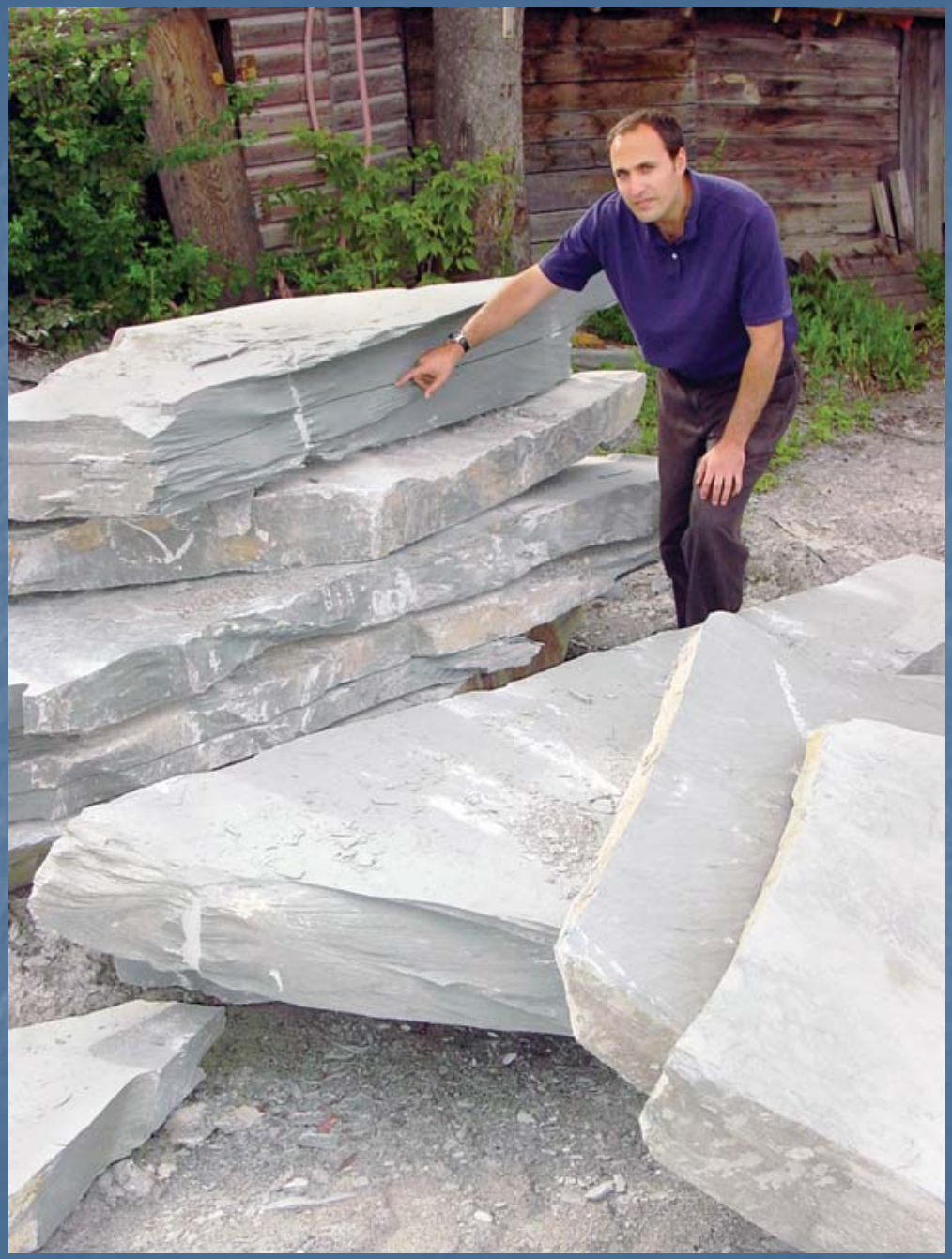
Why install a slate roof?

- Natural material - stone
- Natural Beauty – has no equal
- Fire-proof – will not burn
- Wind-resistant
- Versatile – can be installed in many ways
- Longevity – will last a century or two

Slate is stone from quarries or mines.



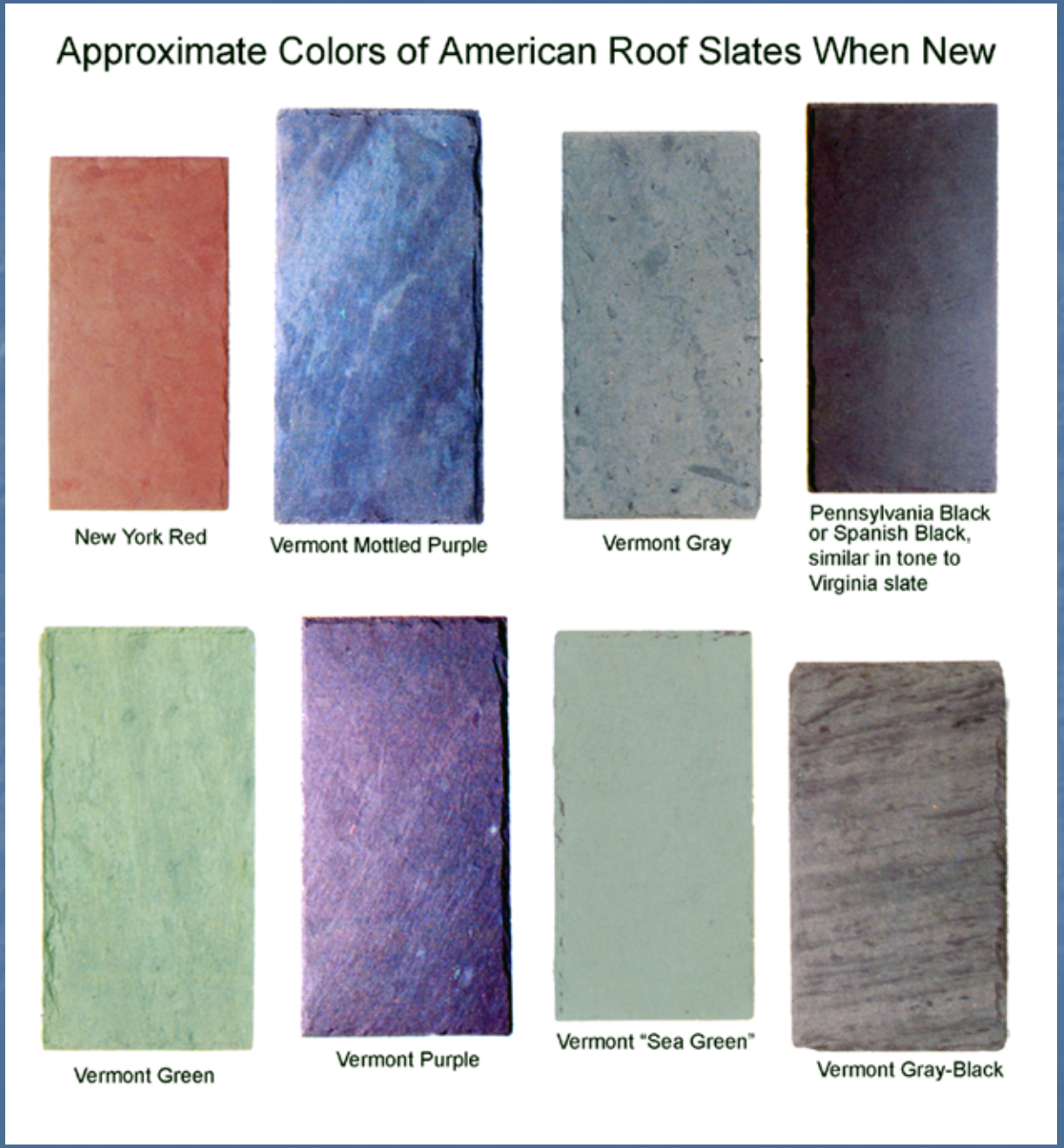
It is a stone that is easily split.



It is worked largely by hand into a roofing material.

The finished slate shingles are available in many sizes and types.

American slate is available in a range of colors.



Roof slate is produced today in the U.S. and around the world. This is Spain.

The beauty of slate roofs is legendary.

Slate can be installed in many ways due to several variables.

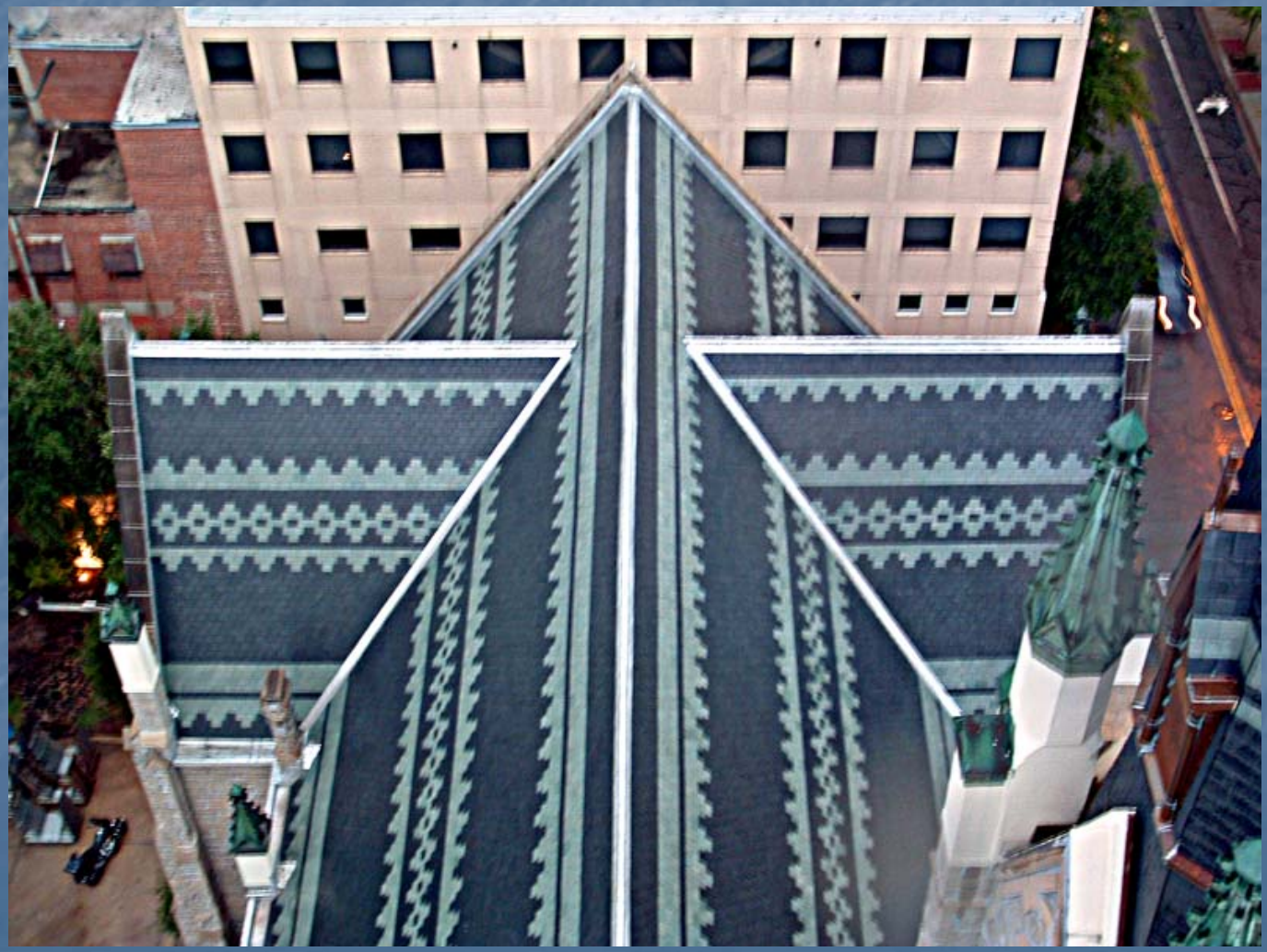
- Widths can be varied.
- Lengths can be varied.
- Thicknesses can be varied.
- Colors or types can be varied.
- Shapes can be varied.
- Recycled (weathered) slates can be used.
- All of the above can be combined on one roof.

This is the common standard pattern – all slates are the same size – same width, length, shape and type.

Another standard pattern, but different shapes have been used.

This has been developed into an art form by the Germans.

This is also a standard pattern, but the colors have been varied.



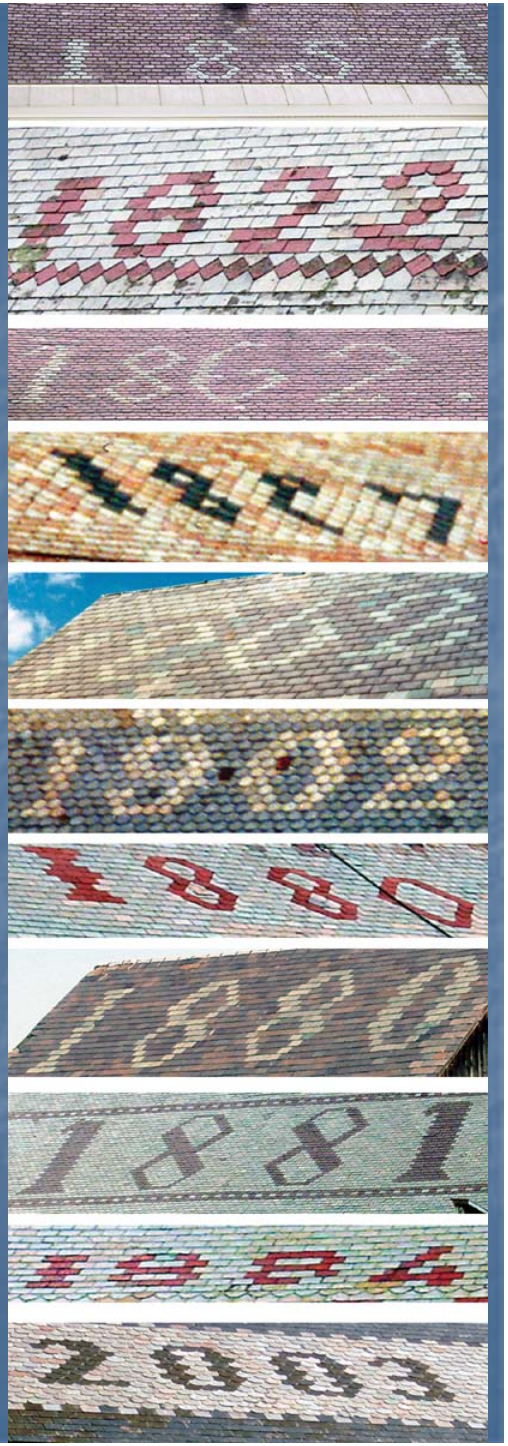
This slate roof blends thicknesses, widths, lengths, colors and shapes. It is a variation of the standard pattern.

Another variation of the standard pattern; this roof blends colors, widths and lengths with both new and recycled slates.

“Graduated” slate roofs typically have varied lengths, widths and thicknesses of the slate.

Traditional German slating utilizes an entirely different installation style.

The longevity of a properly installed slate roof is phenomenal. A century or two can be expected, depending on the type of slate. We have been installing slate roofs in the U.S. for over 150 years with a great degree of success.



This roof was installed in September, 1887. It was 115 years old when restoration work was done. The roofer who installed it had scratched his name and the installation date on the back of a valley slate.

No one knows how much longer this 1887 Vermont “sea green” slate roof will last.

This Scottish slate roof was installed in 1785 and still has the original slate on the original 1” board roof decking.

- This roof was 215 years old when photographed.
- Roofs of this nature can be replicated today.
- Correct materials and installation methods must be utilized.
- Roof decking materials are critically important.
- Underlayments are not.
- Long-term maintenance needs must be factored into the roof design.

Roof Decking

- Must provide a suitable, proven, long-term nailing surface for slate.
- Must have a proven longevity of at least a century, preferably two.
- Should allow for air transpiration (be able to breathe).
- Traditional, proven decking materials include 1” boards, ¾” boards, or 1.5” boards.
- For best results, avoid laminated woods and other glued decking materials.

For example, this bank roof decking was specified by the architect to be 5/8” plywood, which is unsuitable for slate. We changed it to ¾” yellow pine boards, an excellent material for slate roofs.

Radical departures from traditional methodologies are unproven, unnecessary, and not recommended.

The original 1” board roof deck was still solid and could have been used for reslating.

Instead, the original deck was covered with 5/8” plywood, then peel and stick, then 30 lb felt. This deck cannot breathe. The long-term performance of this decking system is unknown.

- The excessive use of underlayments hinders long-term maintenance because old, cracked underlayment interferes with the use of the slate ripper, the common tool used for removing broken slates or flashings.

The slate roof on this $25 million house was installed on plywood.

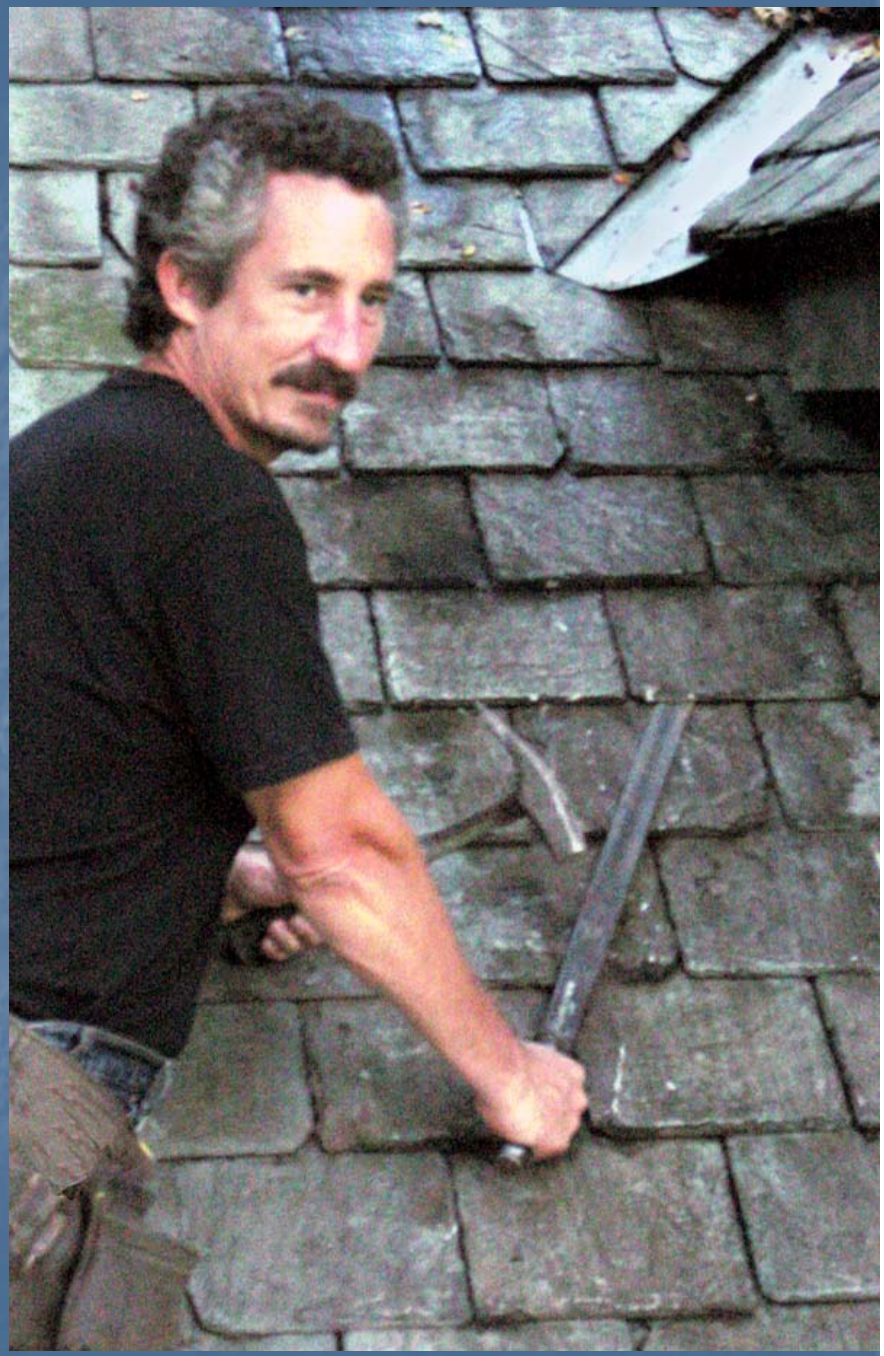
The plywood was covered with a hot mop underlayment, then 30 lb. felt before slating. This is a radical deviation from traditional, tried and proven methods. If traditional methods and materials had been used, success would have been guaranteed.

Underlayments

- The purpose of underlayment is to keep water out of the building until the roof is installed.
- Underlayments provide no long-term waterproofing benefits for slate roofs.
- Excessive underlayments inhibit long-term maintenance of slate roofs.
- Slate roofs do not need any underlayment at all to function properly for their entire long lifetime.

Most of these existing slate roofs were installed with no underlayment whatsoever and are still functioning well today.

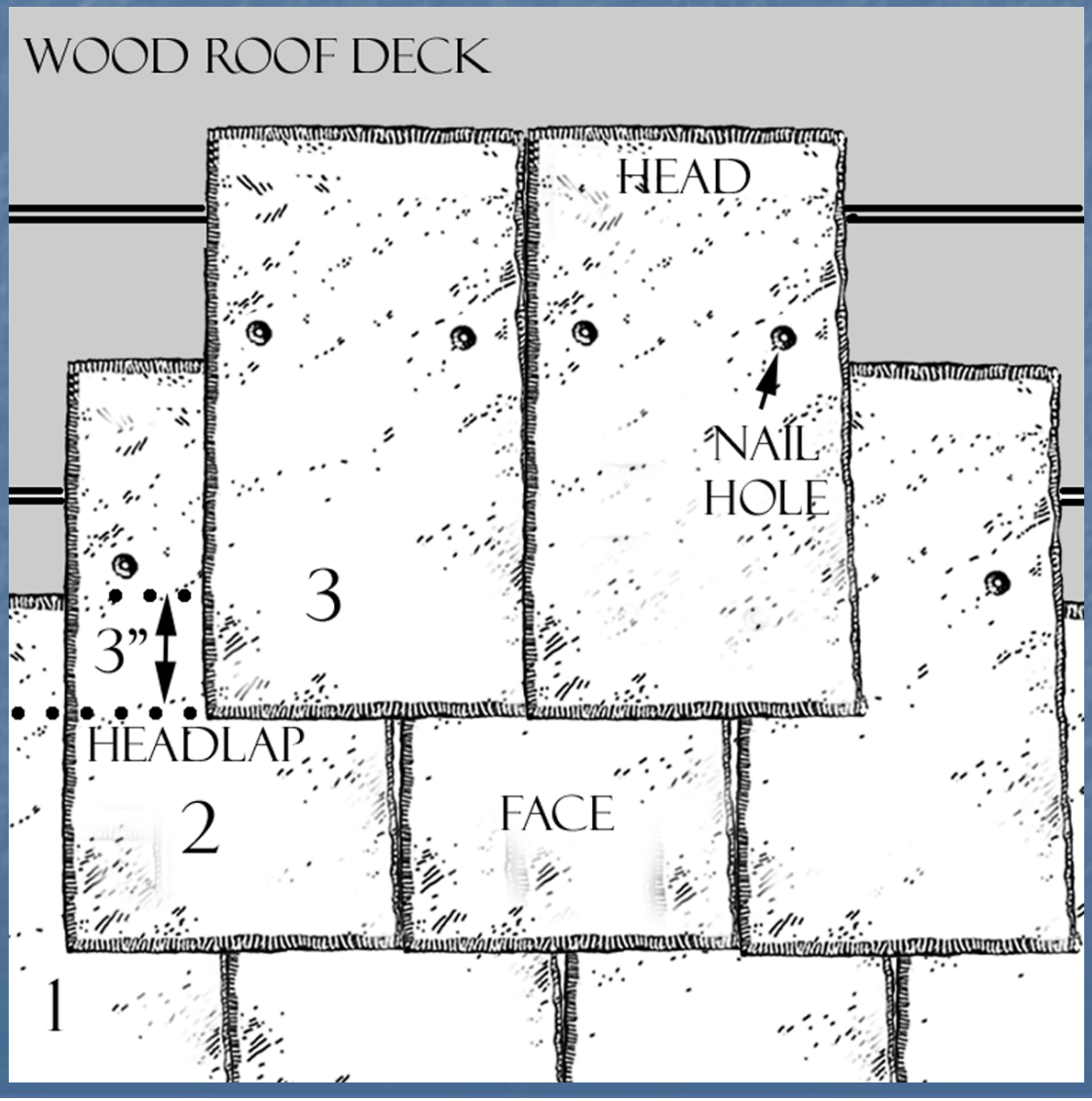
The long term maintenance of a slate roof requires free access underneath the slates by a slate ripper, the tool most often used by the slate roof restoration professional. Unnecessary underlayments can severely inhibit the use of this tool.



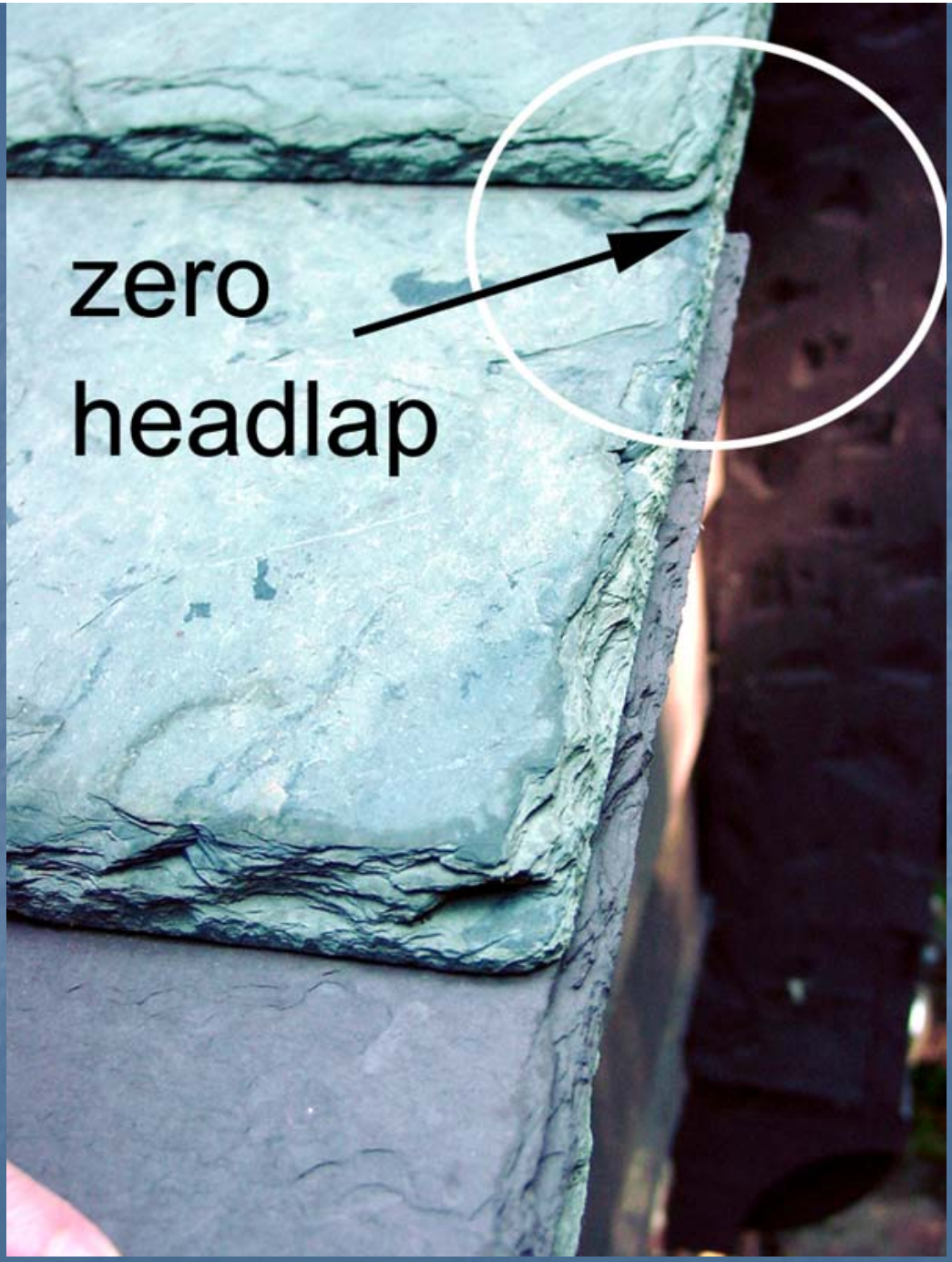
Headlap

- Headlap is the overlap each slate course has on the slates two courses below.
- Typical headlap is 3”, but varies (2” headlap, with adequate slope, has worked well).
- Understanding headlap is critical to installing any type of overlapping shingle roofing.
- Slate roofs with improper headlap can be disastrous.
- Read an article about headlap at traditionalroofing.com (Issue #6).

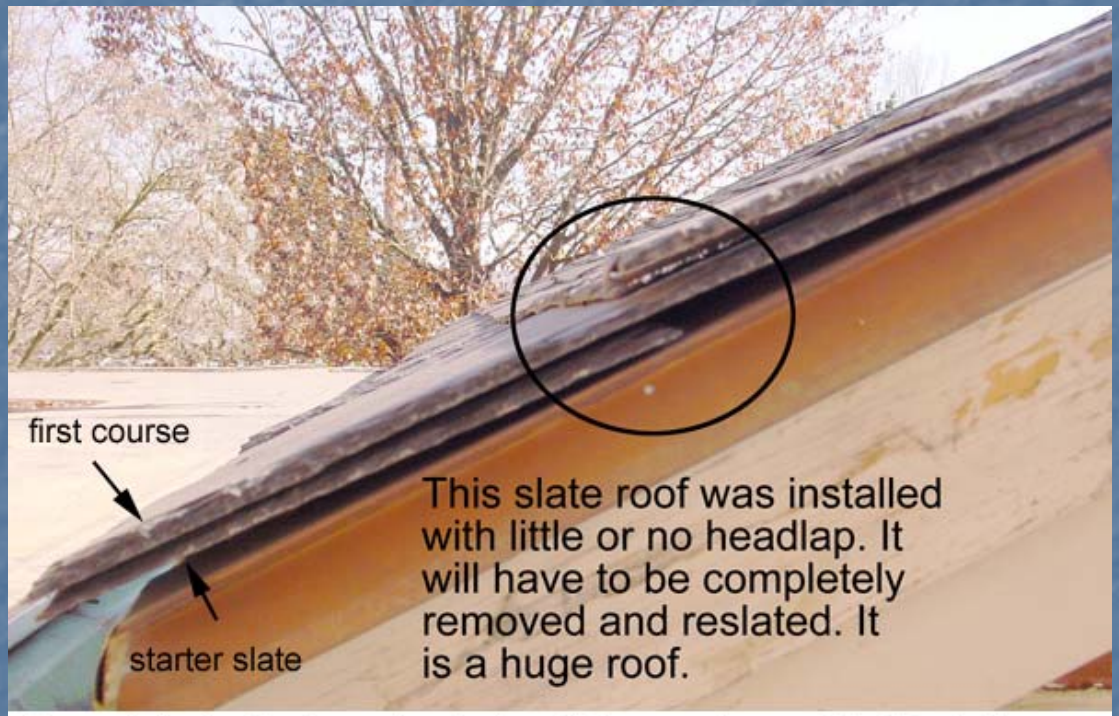
Proper headlap is what keeps the water out.



This slate roof was installed with no headlap and had to be completely reslated at a cost of about $450,000.

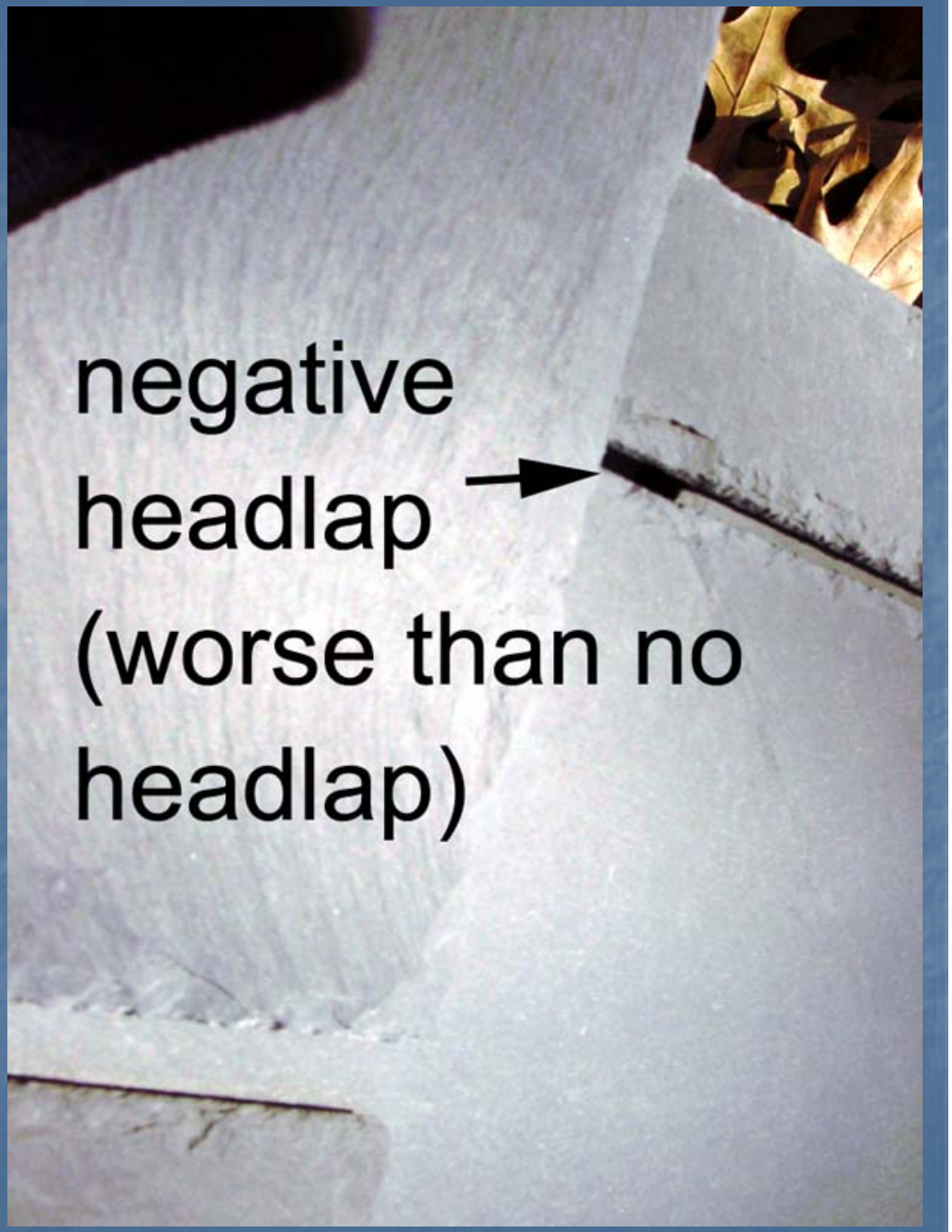


This very expensive college dormitory slate roof was installed without correct headlap.

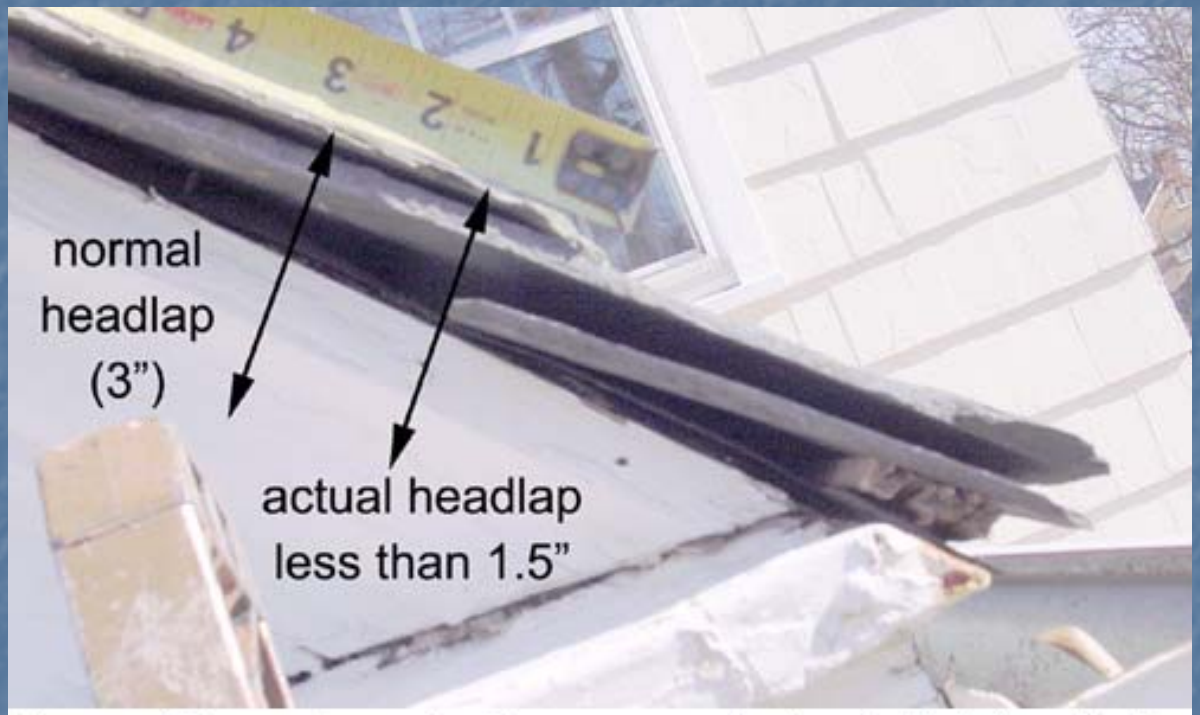


One quick sign that a contractor has little experience with slate is the starter slate installed upside down. The starter slate is normally installed with the back side facing up in order for the beveled edge to merge flush with the beveled edge on the first course. The starter slate is the only slate on the roof with the back side facing up. In the photo above, the starter slate has been incorrectly laid with the back side facing down. Although this will not adversely affect the functioning of the roof system, it does indicate whether the contractor has much experience installing slate roofs.

The same dormitory showed areas of negative headlap (i.e. direct water entry).



Insufficient headlap on the starter course is a common problem.



Every slate must overlap two courses below it. This is called "headlap" because the top of the slate is called the "head" and it is being overlapped by the slate two courses above. The standard headlap is 3". Lower slopes require 4" or more. Two inch headlap was once also common. The photo above is showing a 1.25" headlap on the starter course, when it should be 3" or 4".

Headlap can be increased at the eaves to prevent ice-dam problems. Do not rely on underlay-ment to prevent ice-dam water infiltration.

FOR ICE-DAM PROTECTION, INCREASE THE HEADLAP ALONG THE EAVES -- DON'T RELY ON UNDERLAYMENT!

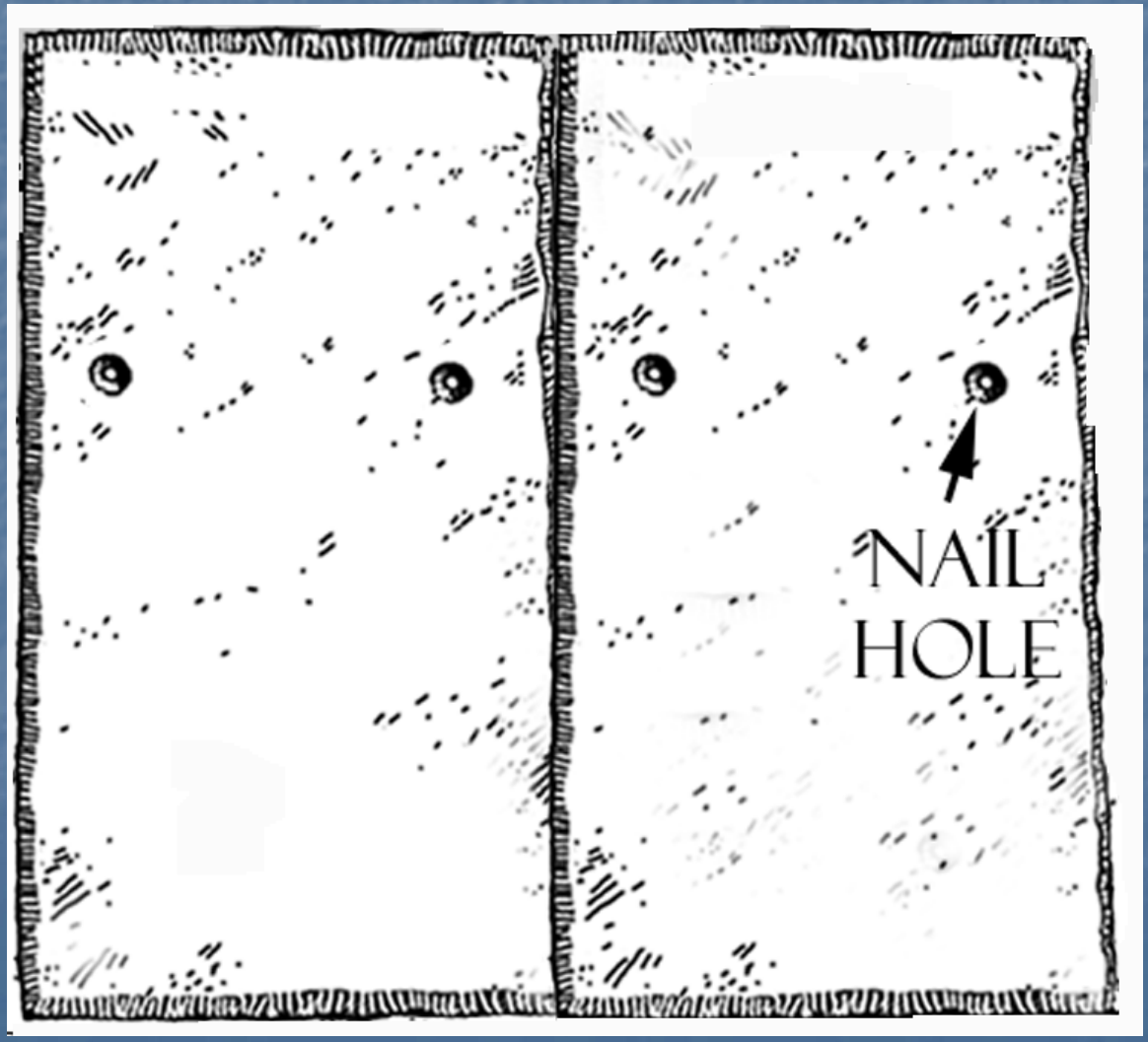
This roof is installed with 20" long Vermont "sea green" slates from Camara Slate Company in Vermont. The snowguards are Mullane. The roof was installed with a standard 3" headlap in the field of the roof. However, the bottom 36" of eaves has a 4" headlap. This means that the exposure on the field of the roof is 8.5" whereas the exposure at the eaves is 8". The difference in overlap is invisible to the naked eye. This method of tightening up the eaves on a slate roof to prevent ice-damming and other problems that *may* occur along the eaves provides a permanent solution, unlike relying on underlayments which only provide a temporary solution.

This roof was installed on 1” rough-sawn lumber over 30 lb. felt, with unfading-gray slate and copper nails. We expect it to last 150 years. Headlap at the eaves is 4” – in the field of the roof it is 3”.

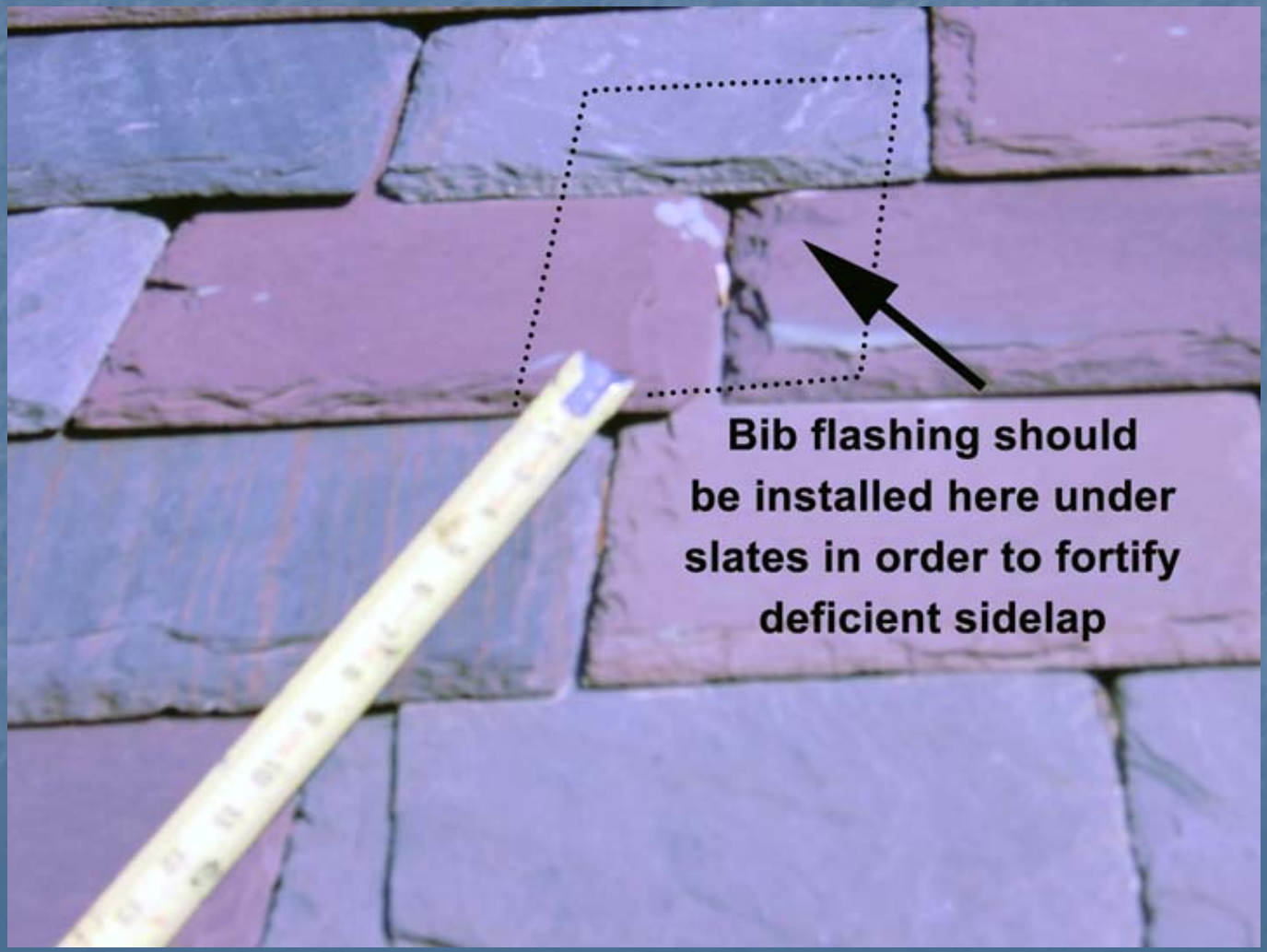
Sidelaps

- The lateral spacing of slate butt-joints should be approximately 3” minimum to keep the joints away from the nails.
- Slates must be manufactured correctly with correct nail hole placement.
- Nail holes should be 1.25” to 1.5” from the outer edge of the slate.
- Read an article about nail holes on roofing slates at traditionalroofing.com (Issue #5).

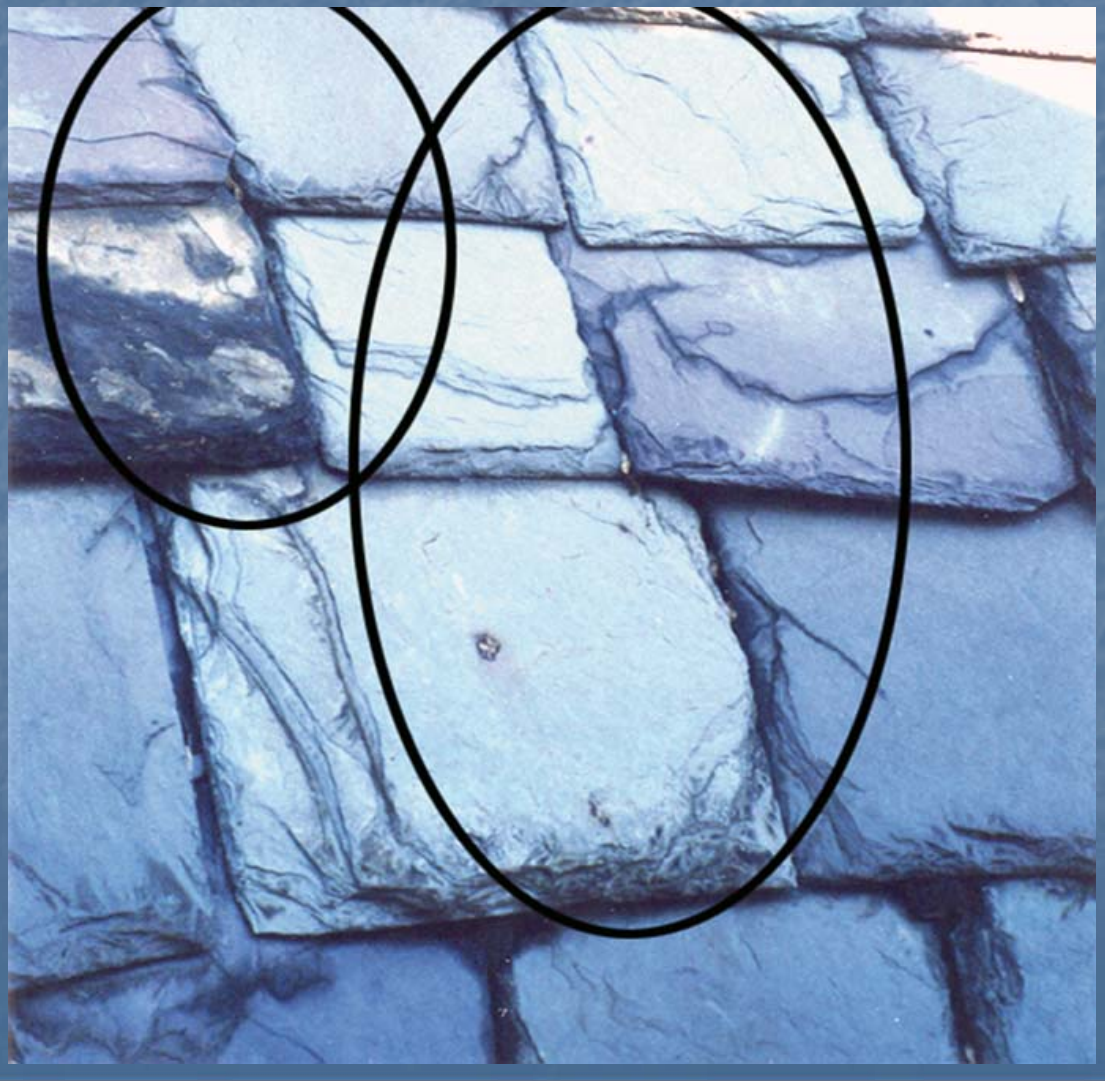
Remember where the nail holes are located.



If the butt-joint is too close to the edge of the underlying slate, it will allow water into the nail hole or into the underlying butt joint.



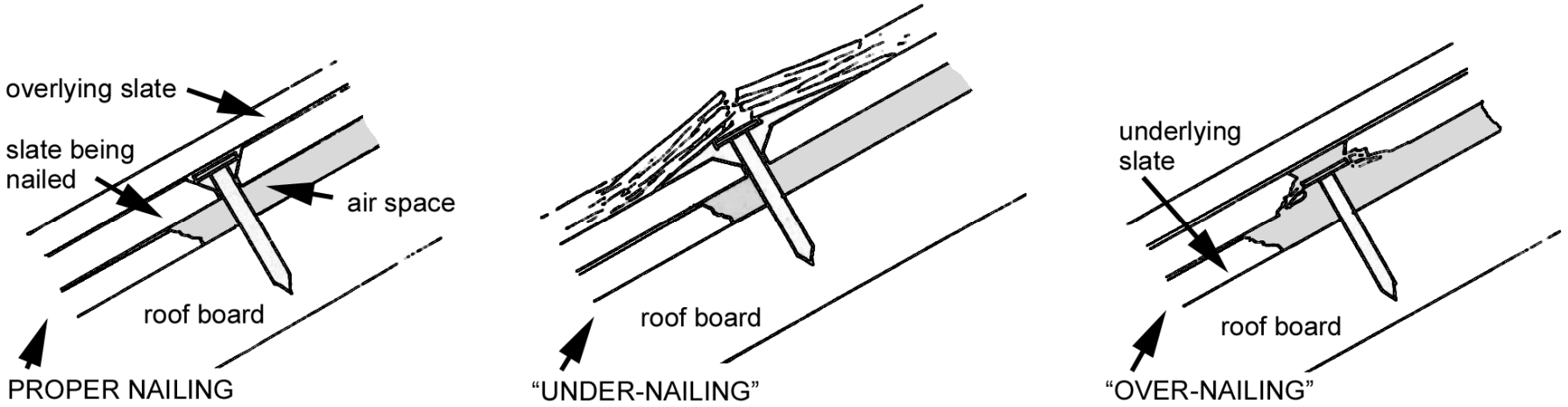
This lack of sidelaps is inexcusable.



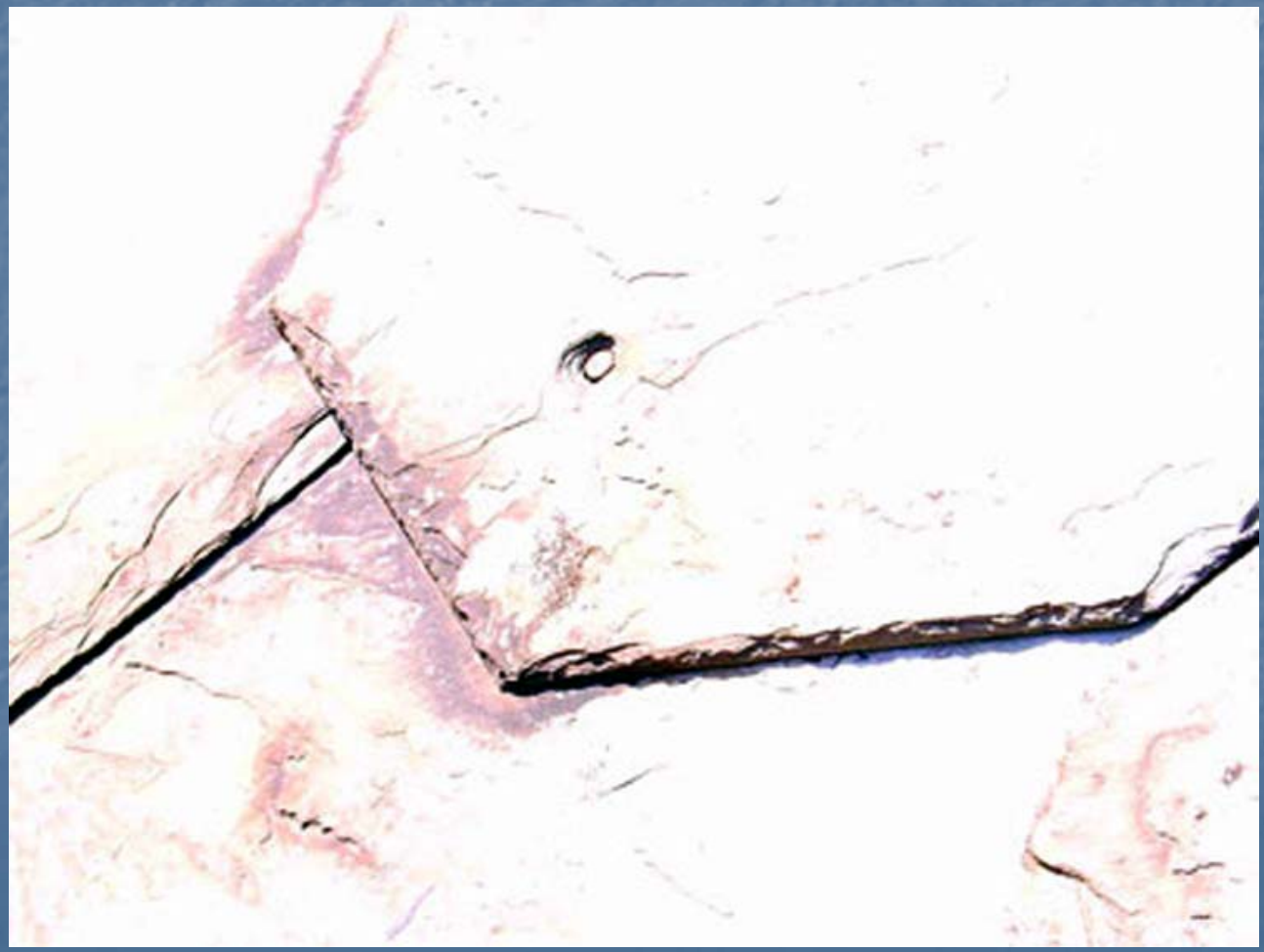
Another example of bad workmanship.

These slates were installed on an historic building with incorrect side-laps. The butt joints lie right over top of the underlying nail heads.

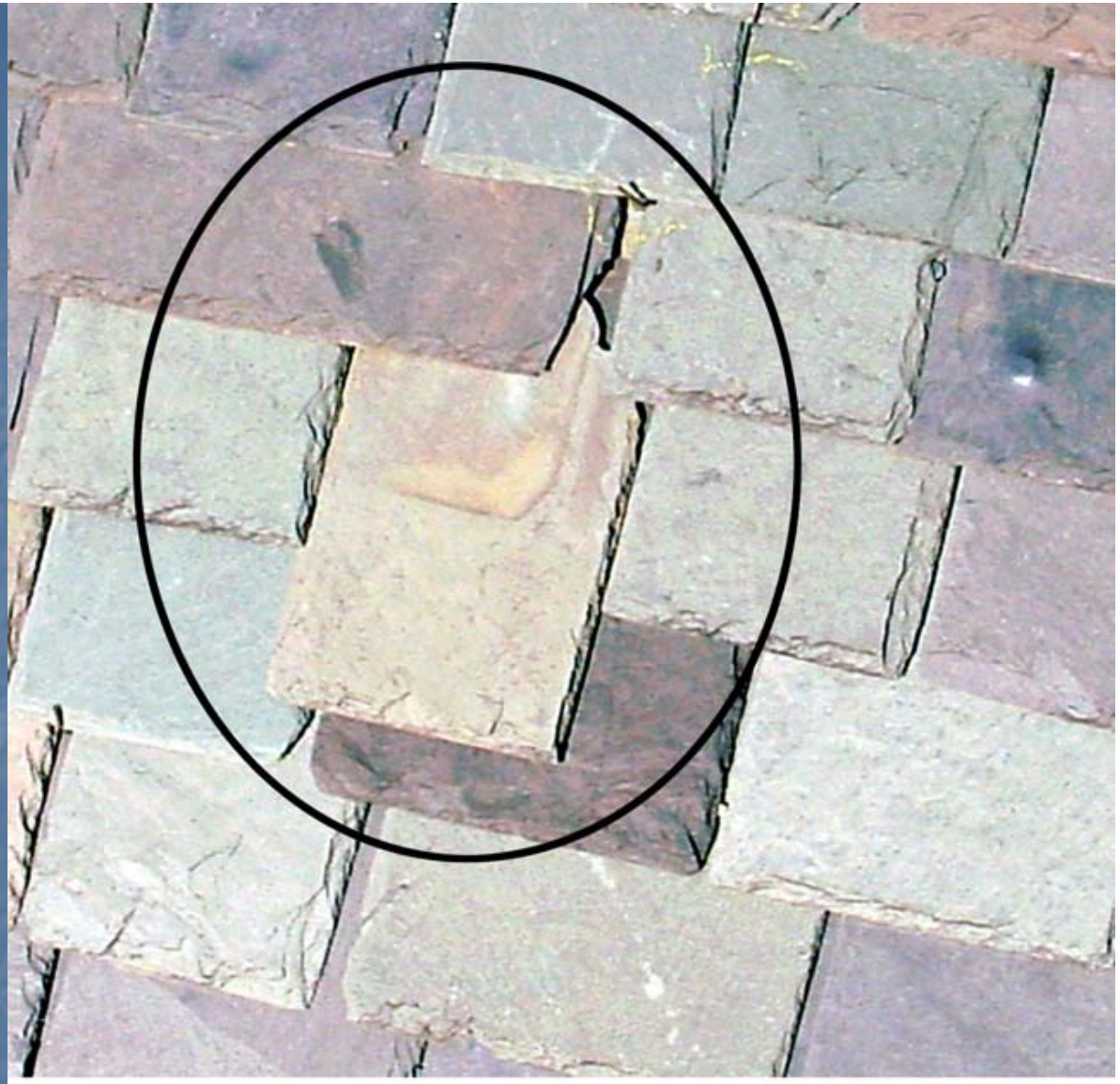
Nailing Slate:
The nails should not be over-driven or under-driven.



Under-nailing:
The nail head will work a hole in the overlying slate over time.



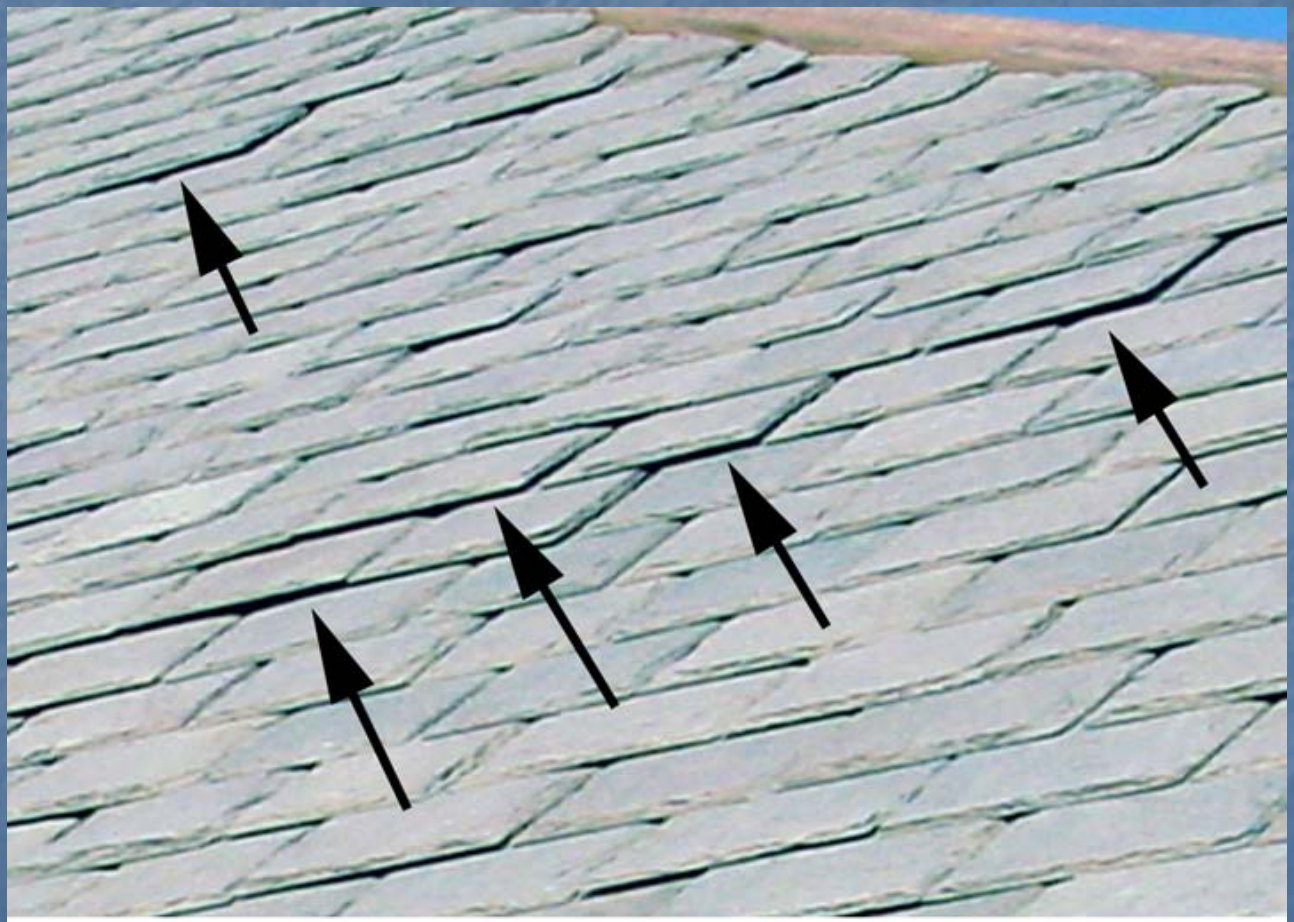
Over-nailing will result in slates sliding off the roof.



Slipping slate probably caused by "overnailing" during installation. Note broken-out nail hole.

Another example of over-nailing.

The bottom of the slate should be held down when the slate is nailed, not the top, in order for the slate to lie flat on the roof.



Slates on east-facing main roof slope are not lying flatly on the roof deck, probably due to overnailing.

The slating nails should not be too long. Nail length should be twice the thickness of the slate plus 1” when using a 1” roof deck.

Roof decking suffers from nails that are too long. Broken out decking reduces the nail grip on the wood deck.

A properly nailed roof deck does not break out the back of the wood. Here is a deck made with correct materials.

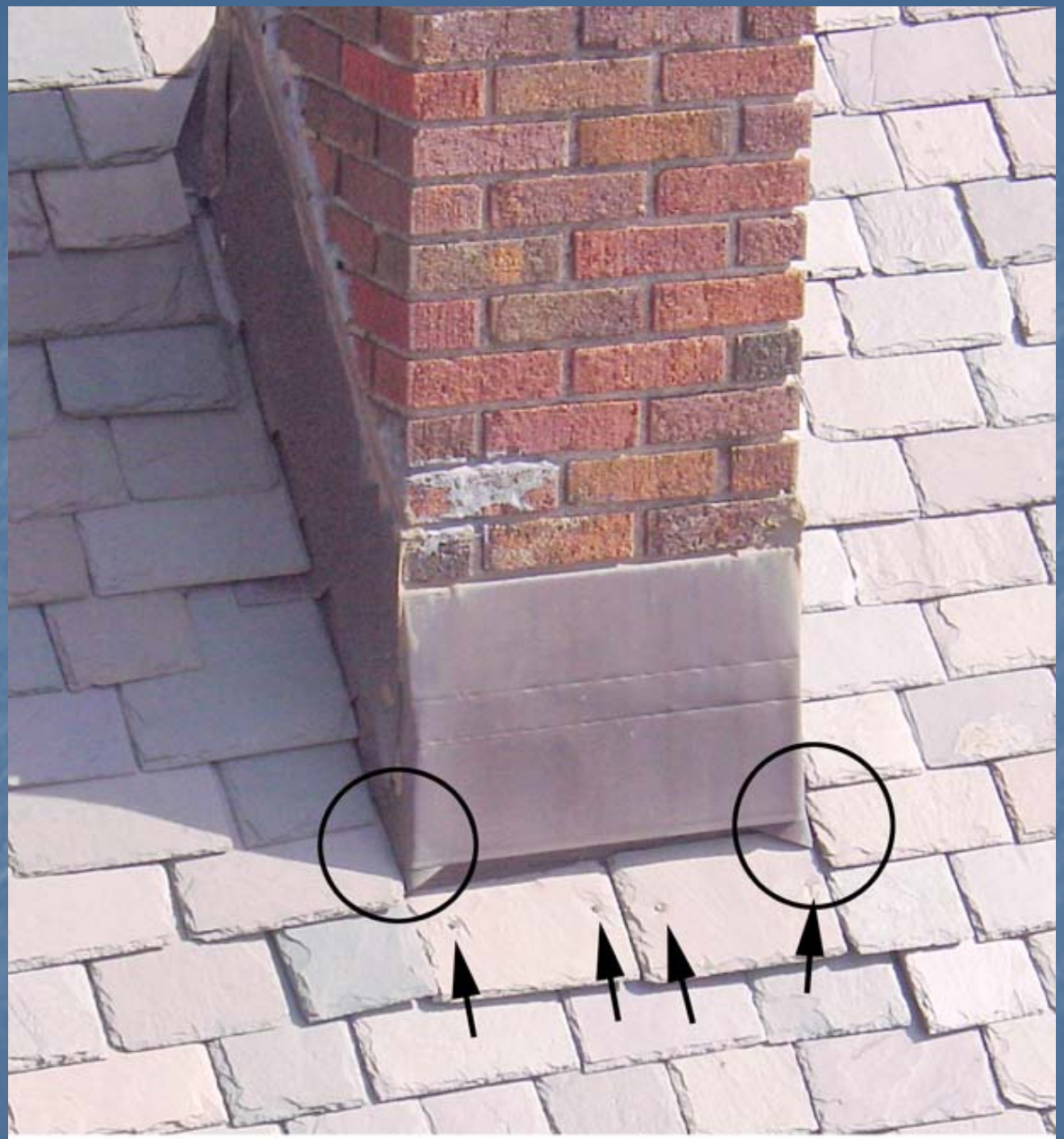
Another properly constructed and nailed roof deck. In this case, there is no nail penetration at all.

Common Flashing Mistakes

- Negative overlapping
- Lack of expansion joints on built-in gutters
- Failure to either fold or solder external corner joints
- Wrong rivets or fasteners
- Soldering with open flame torches

Negative overlapping means the flashing is overlapped incorrectly.

Lower flashings should always be underneath upper flashings.

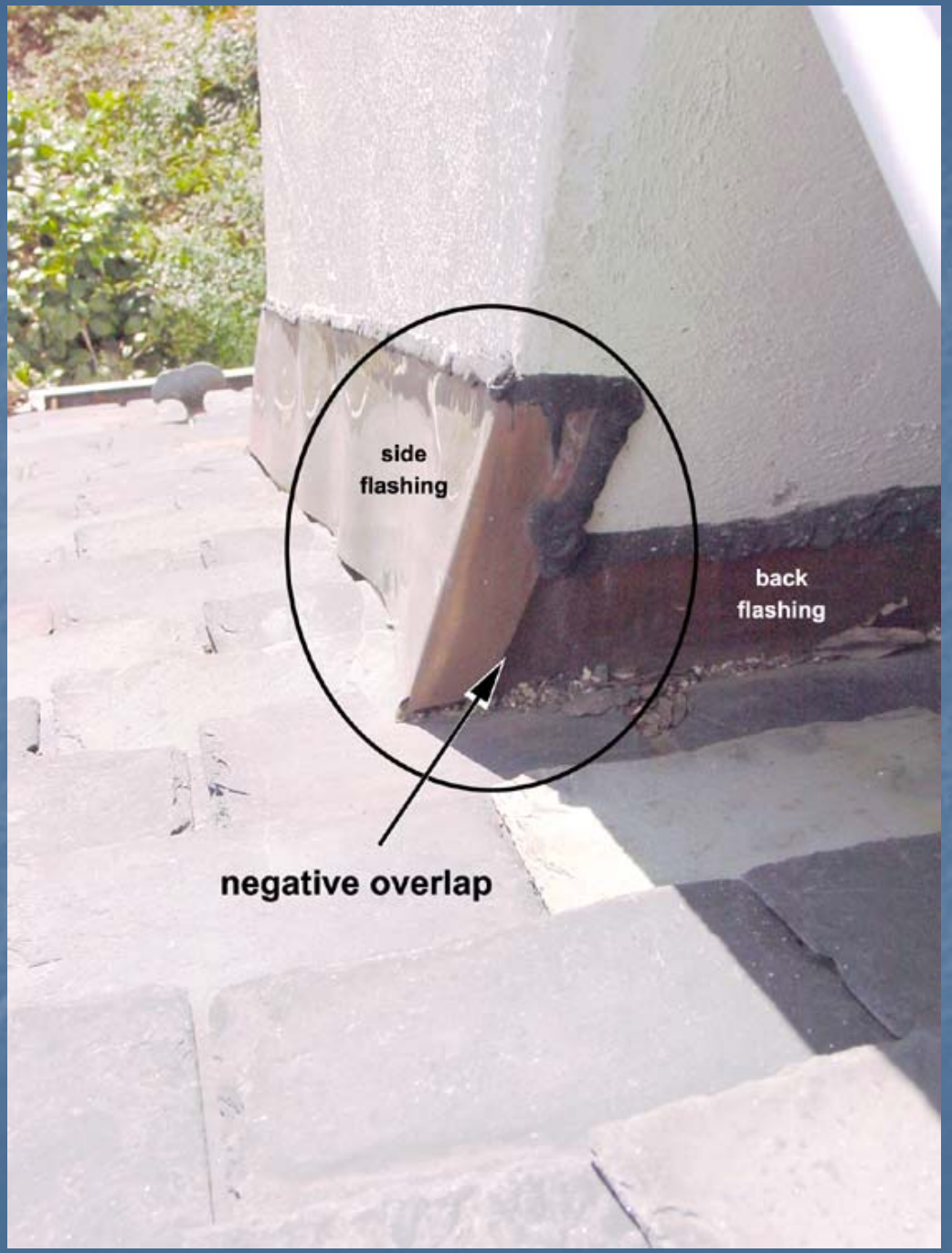


Reverse overlap on chimney corner flashing (circled).
Exposed, uncaulked nail heads (arrows).

Another example of negative overlap.

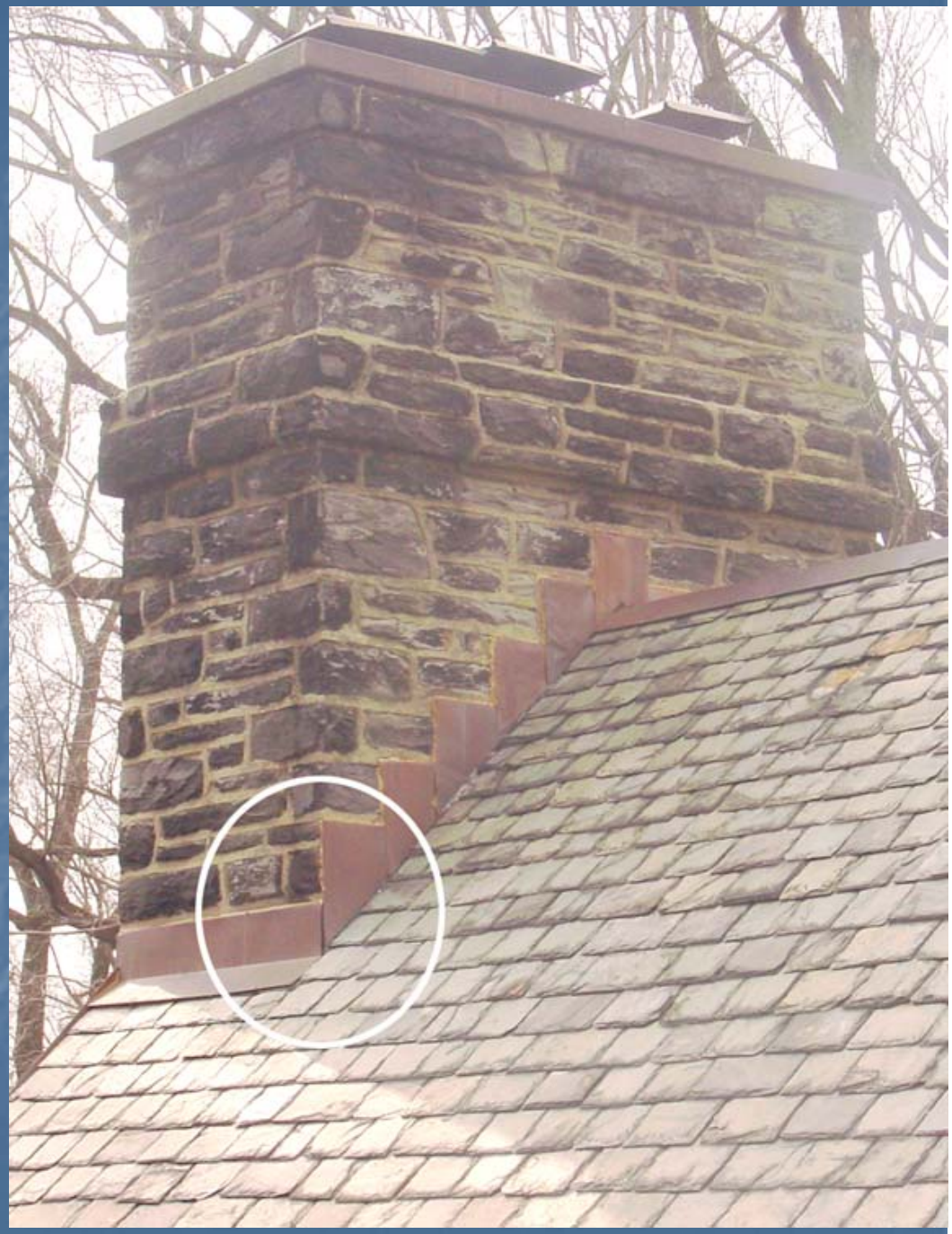
reverse overlapping on chimney flashing
(very poor workmanship)

Yet another example of negative overlap.



Corner joints must be either properly folded or soldered to prevent leakage.

Corner flashings that aren't either folded or soldered are almost certain to leak.

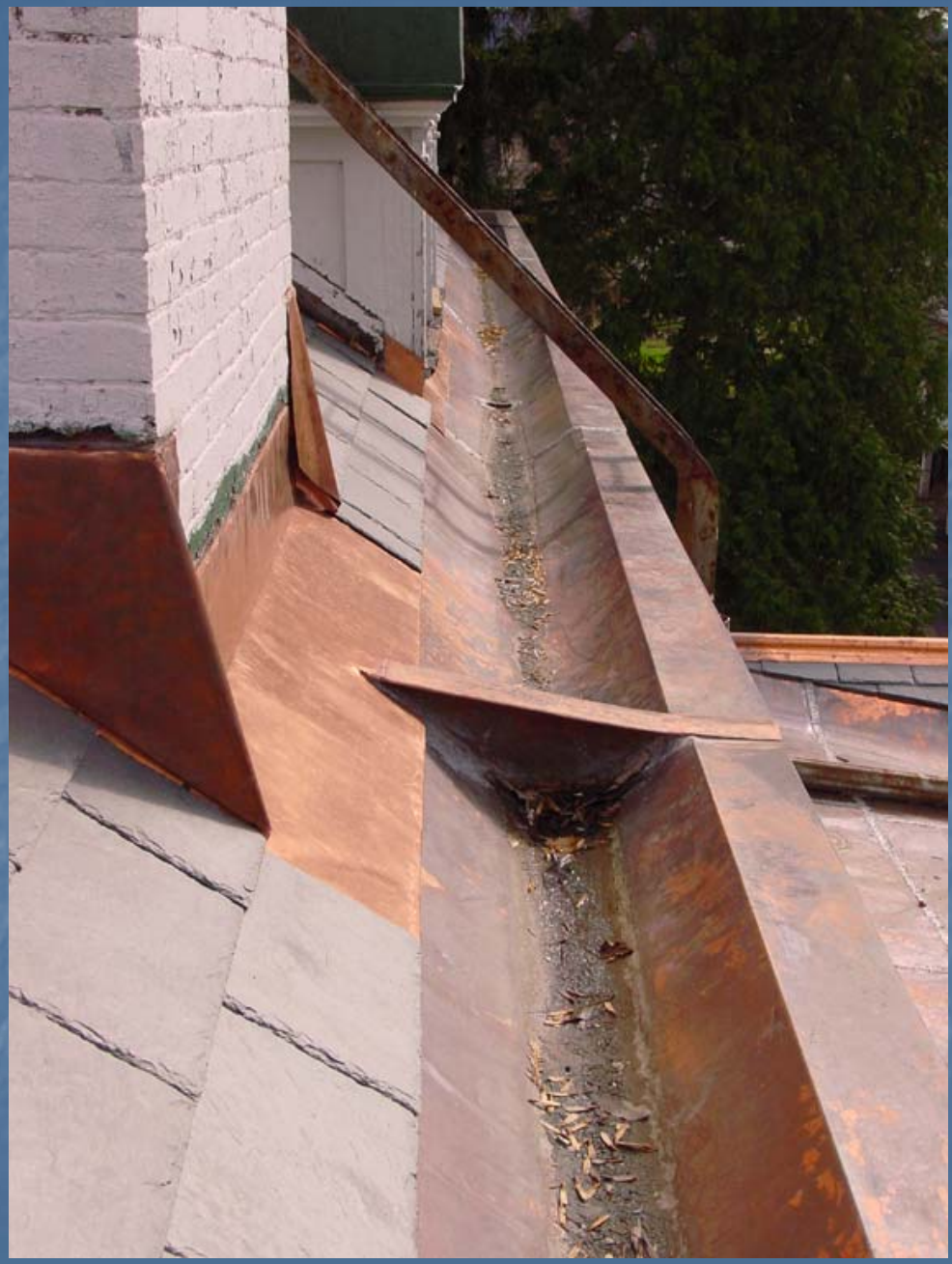


Lack of expansion joints in built-in gutters cause the solder joints to fail prematurely. Follow SMACNA guidelines.

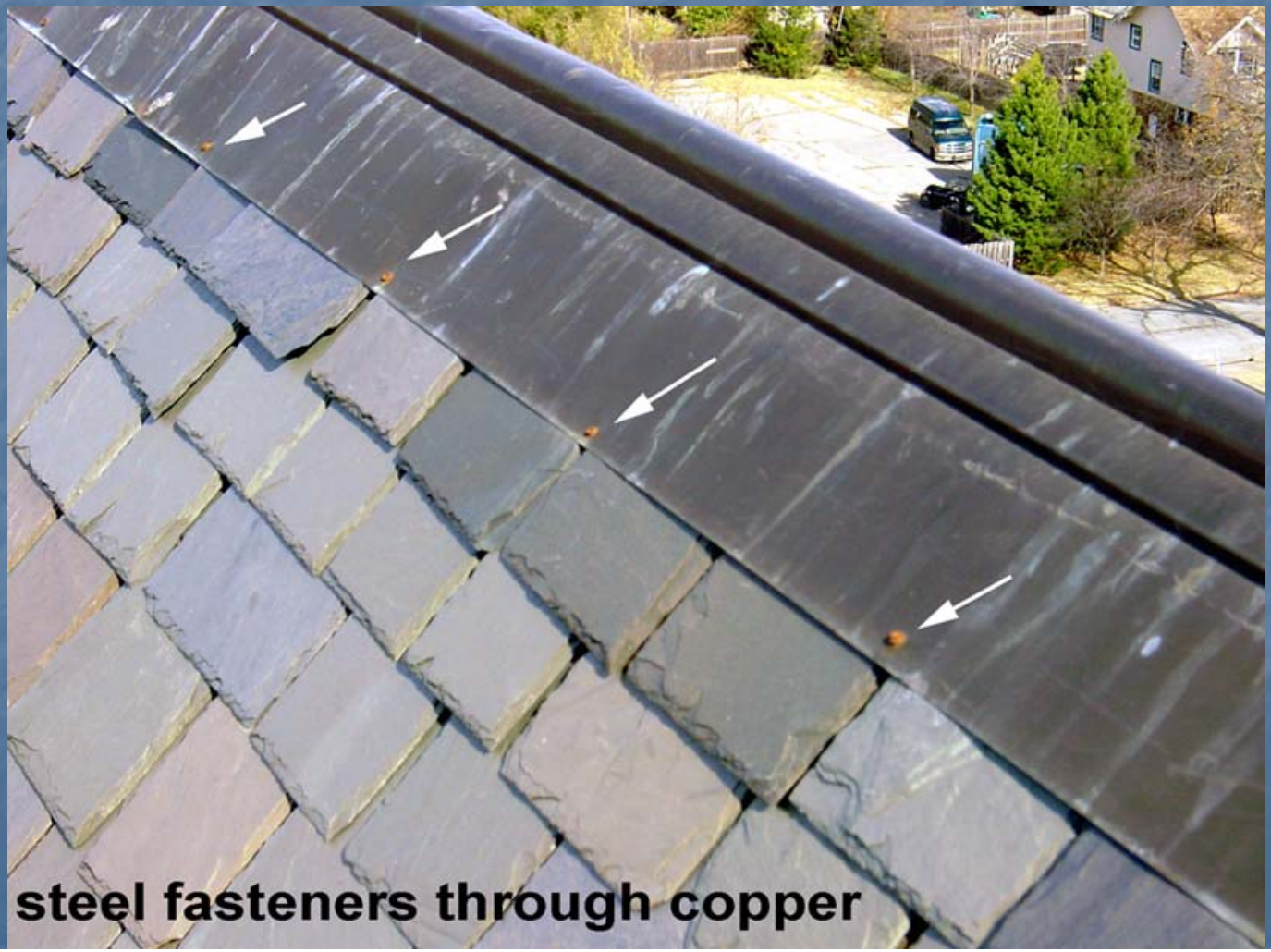
Expansion joint under construction.

Expansion joint completed.

Expansion joint at chimney apron.

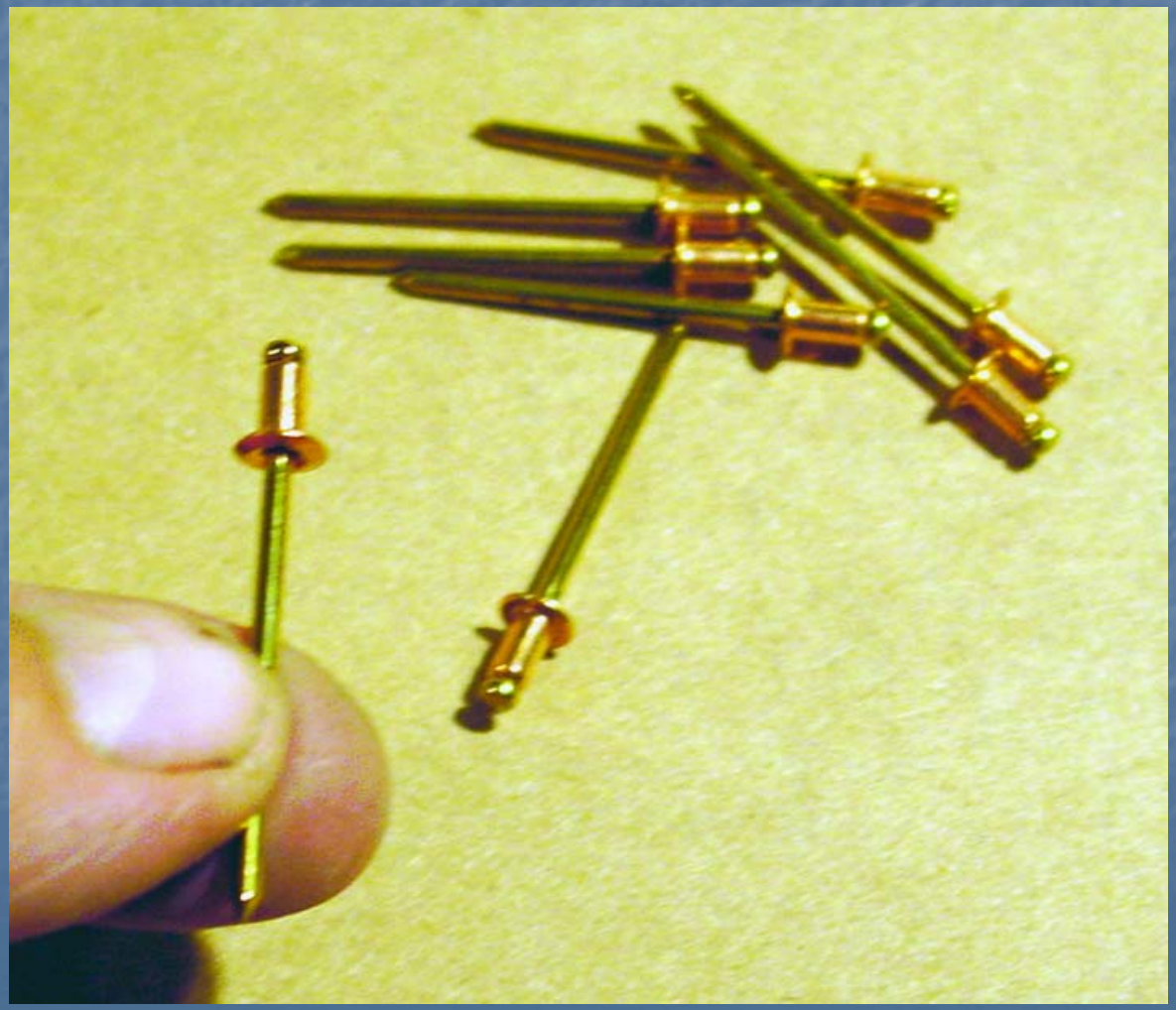


Incompatible metal fasteners: steel screws with copper flashing. The copper will “eat” the steel.



Steel screws through copper

Most copper rivets have copper-plated steel shanks and should be avoided. Only use copper rivets with brass shanks (available at josephjenkins.com).



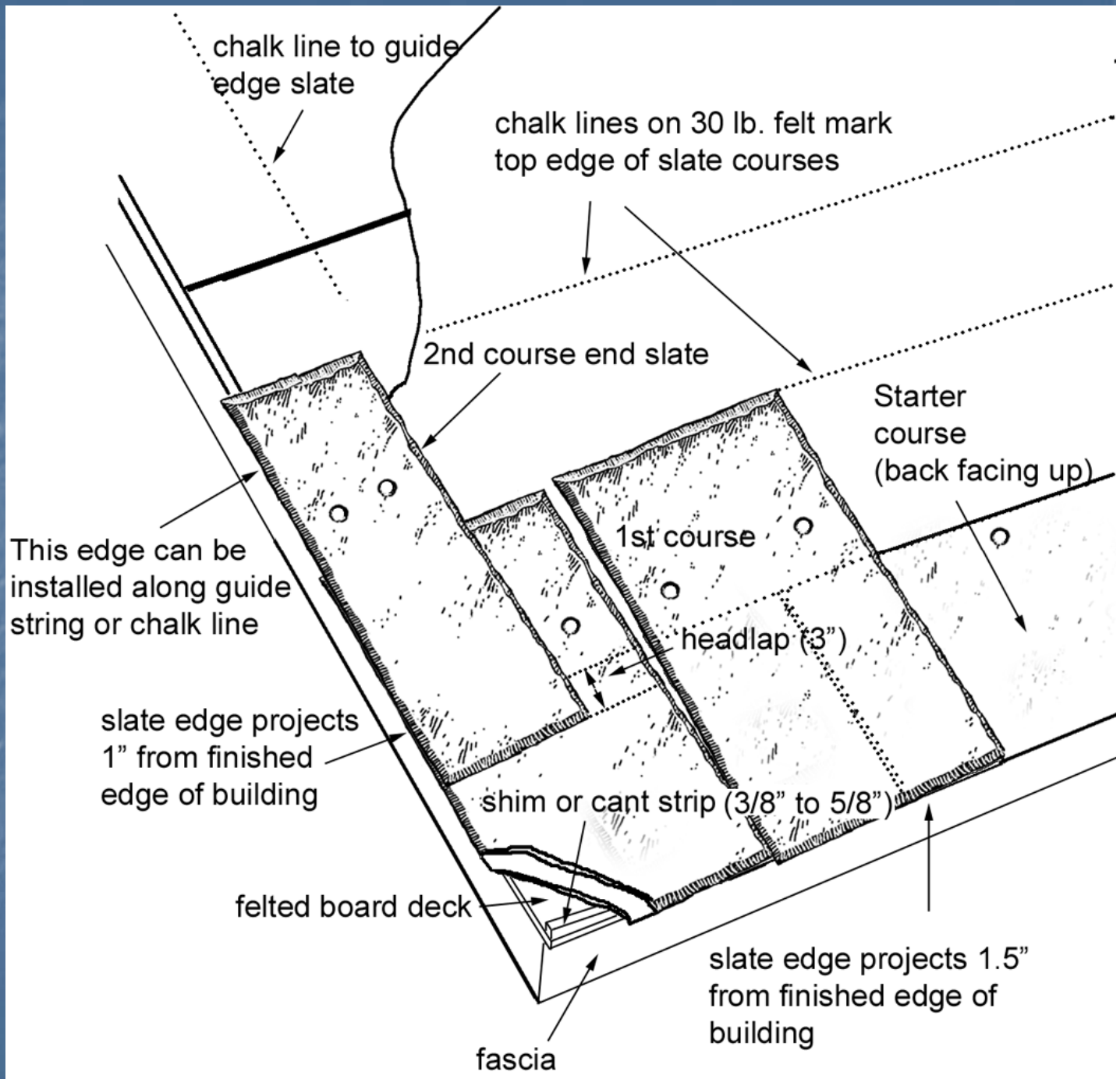
Open flame torches used on roof flashings are a quick way to start a building on fire. Use closed-flame soldering devices (available at josephjenkins.com).

More Areas of Concern

- Cant strips
- Gutters
- Snowguards
- Read an article about cant strips and starter courses at traditionalroofing.com (Issue #5).

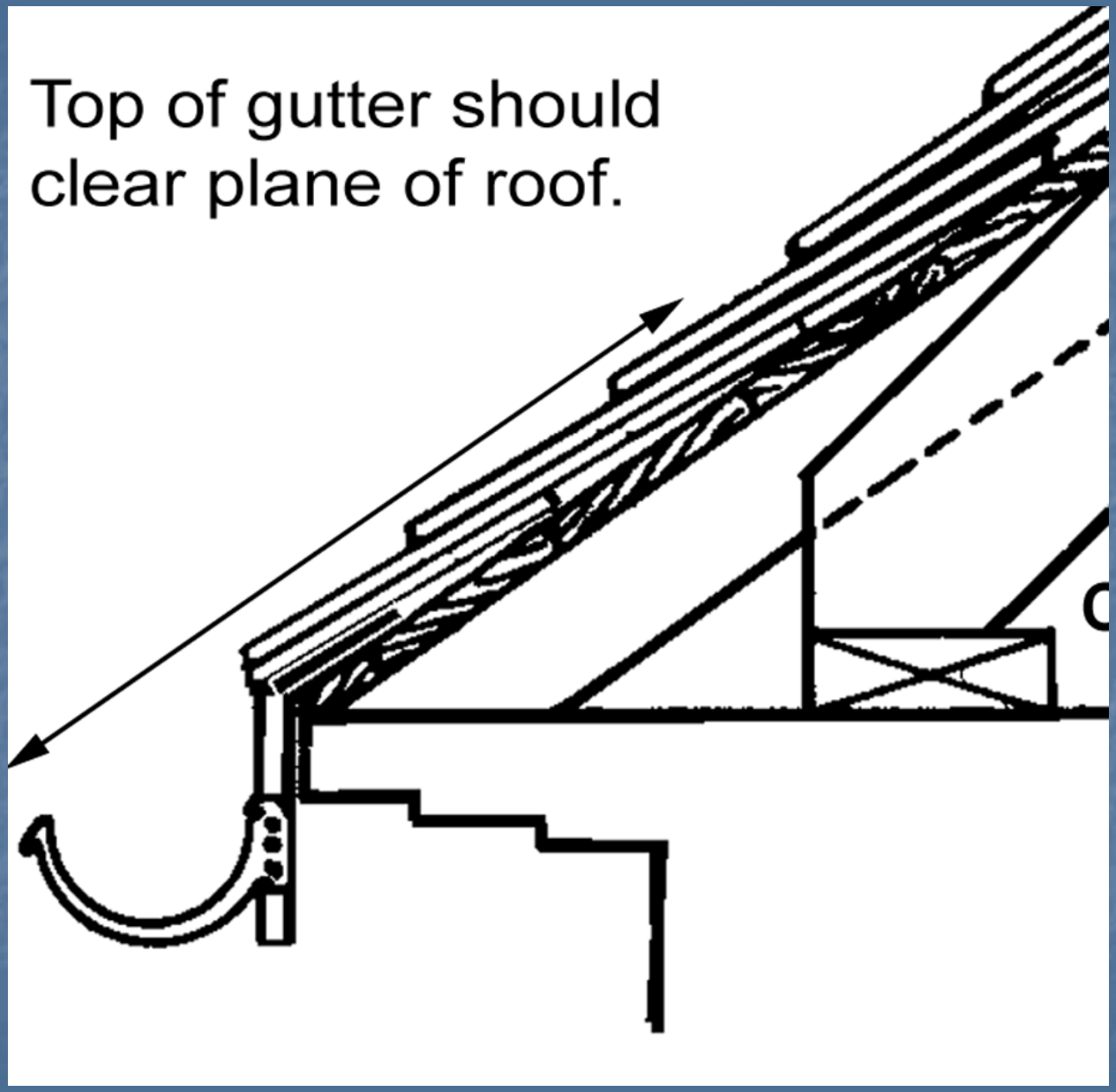
Lack of cant strip.

The cant strip raises the bottom edge of the starter slate to the correct angle.



Wooden cant strips work well. Starter slate should be back side up. Metal drip edges are not needed on most slate roofs.

Gutters hung too high against a roof will be damaged by sliding ice and snow.


Top of gutter should
clear plane of roof.

Snowguards must be installed in adequate numbers.

Inadequate quantities of snowguards will not hold the snow and will pull out and take the slates with them.

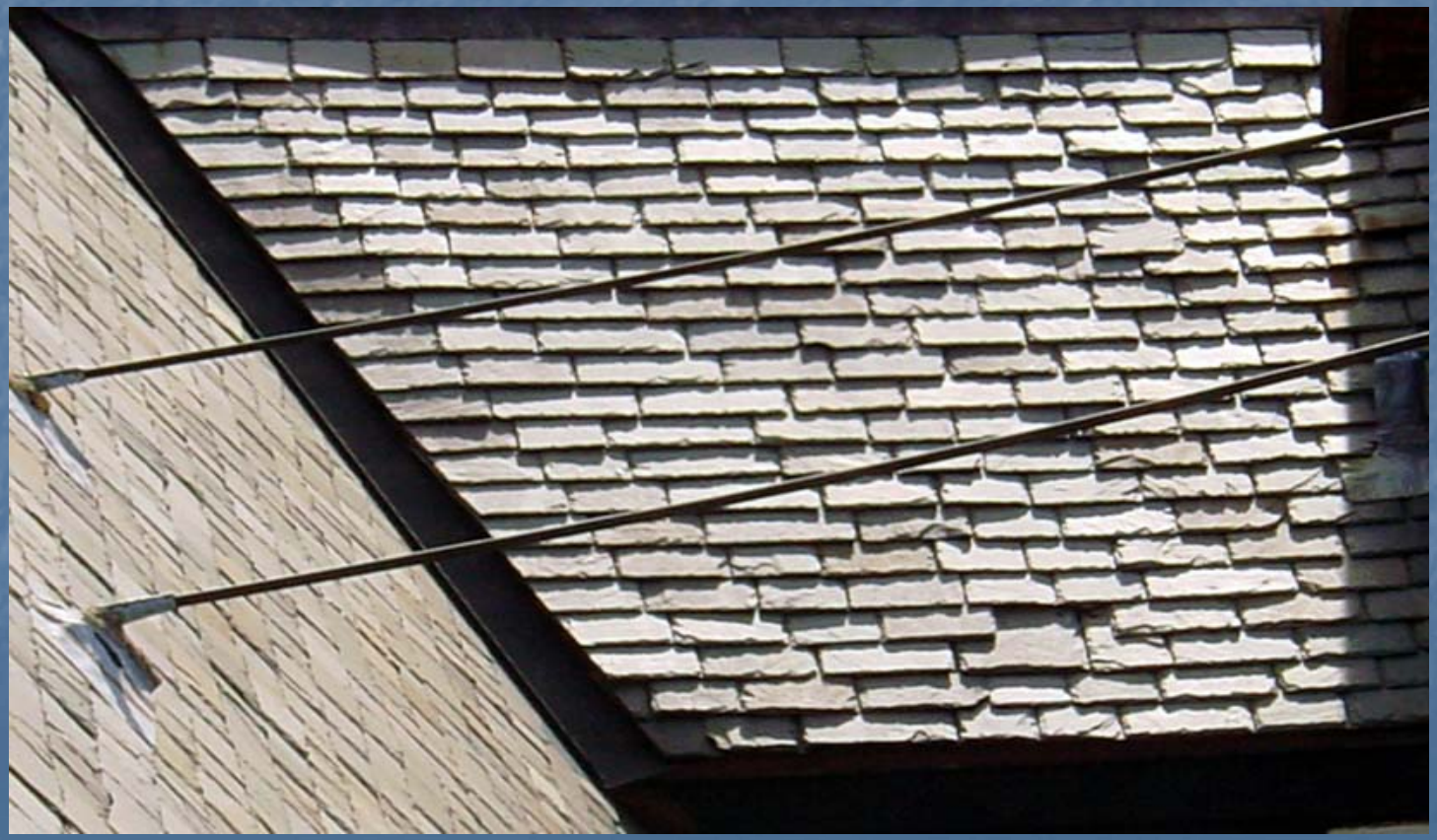
Choose the Correct Slates

- Know the origin of the slate.
- Make sure they're manufactured correctly.
- Use the correct size.
- Get a quality guarantee.
- Include detailed slate specifications in the contract documents (type, size, origin, thickness, etc.).

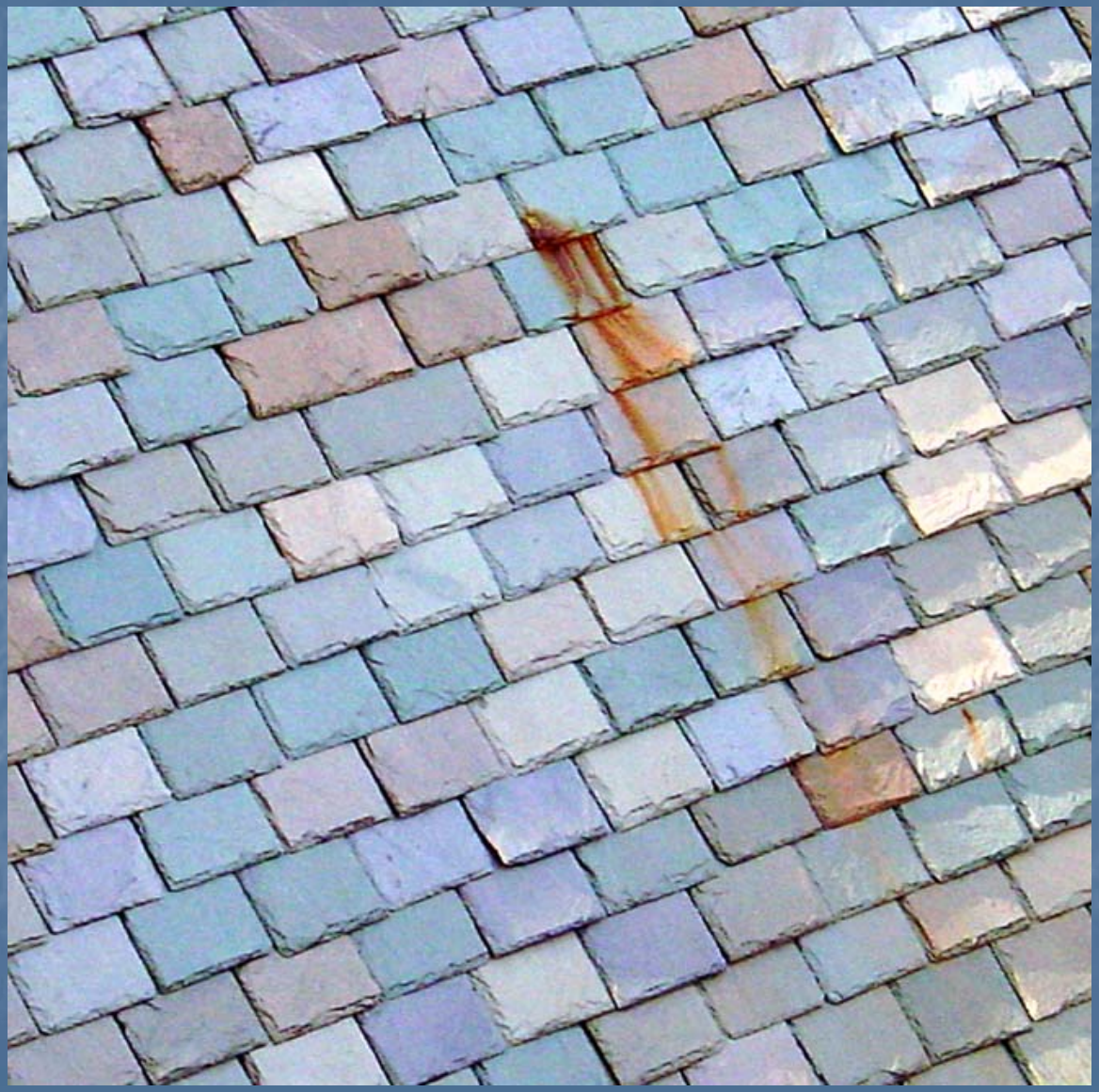
Mixed origins can create a nightmare. These are two types of black Spanish slates which didn't mix well on the roof. This project was headed for litigation.

The mid-length slates on this graduated roof were unusually thick. The slate thicknesses were probably not checked by the contractor prior to installation. This led to litigation, initiated by the homeowner.

These 12” long slates were too small for the 200 square roof. There were about 356 slates per square. A larger slate would have only required about 120 per square. The labor cost installing small slates is great. The roofer went bankrupt before finishing this job.



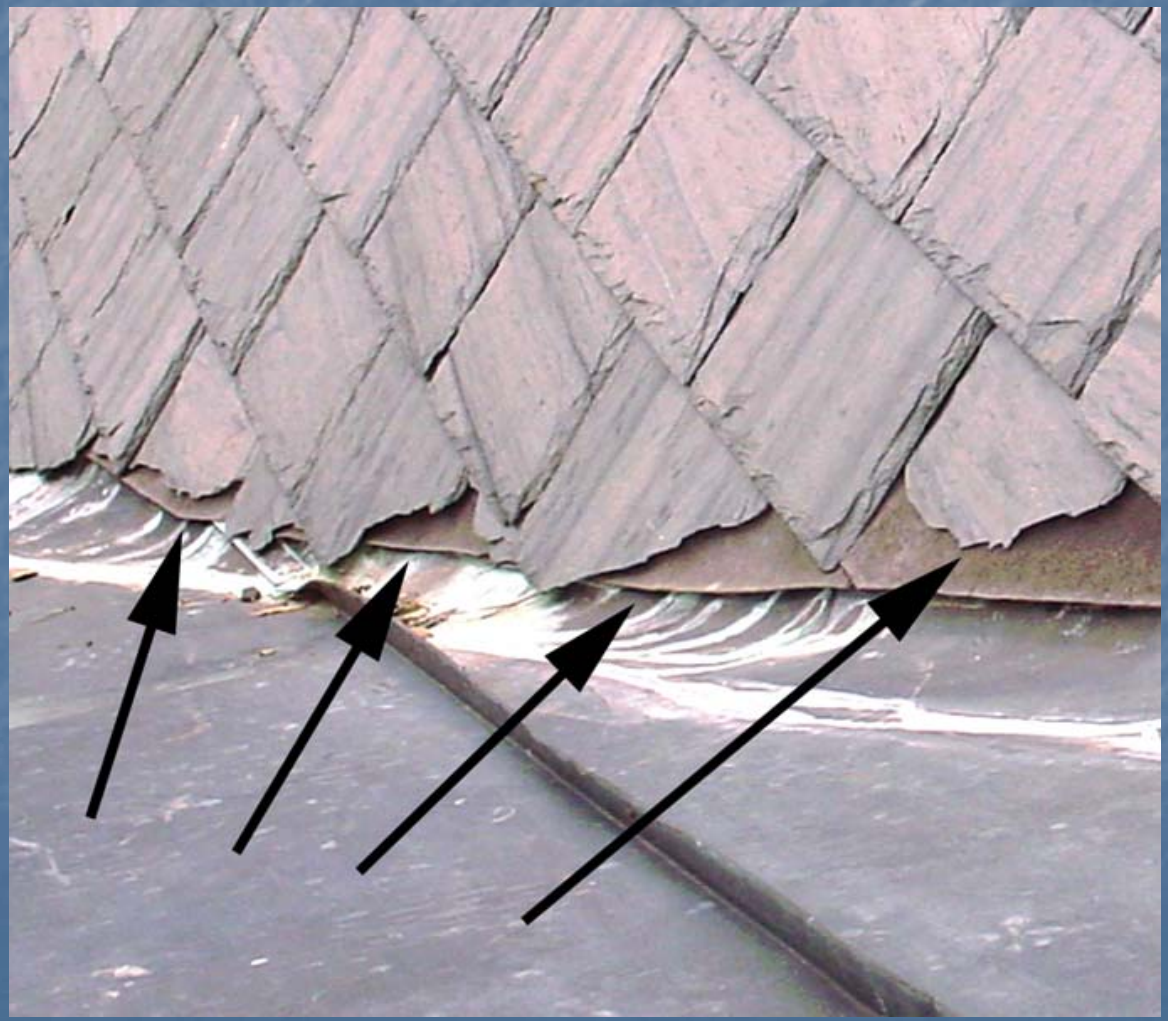
These faulty slates had iron inclusions that defaced the roof. Make sure you buy slates guaranteed to be free from iron leaching inclusions.



Use the Proper Tools

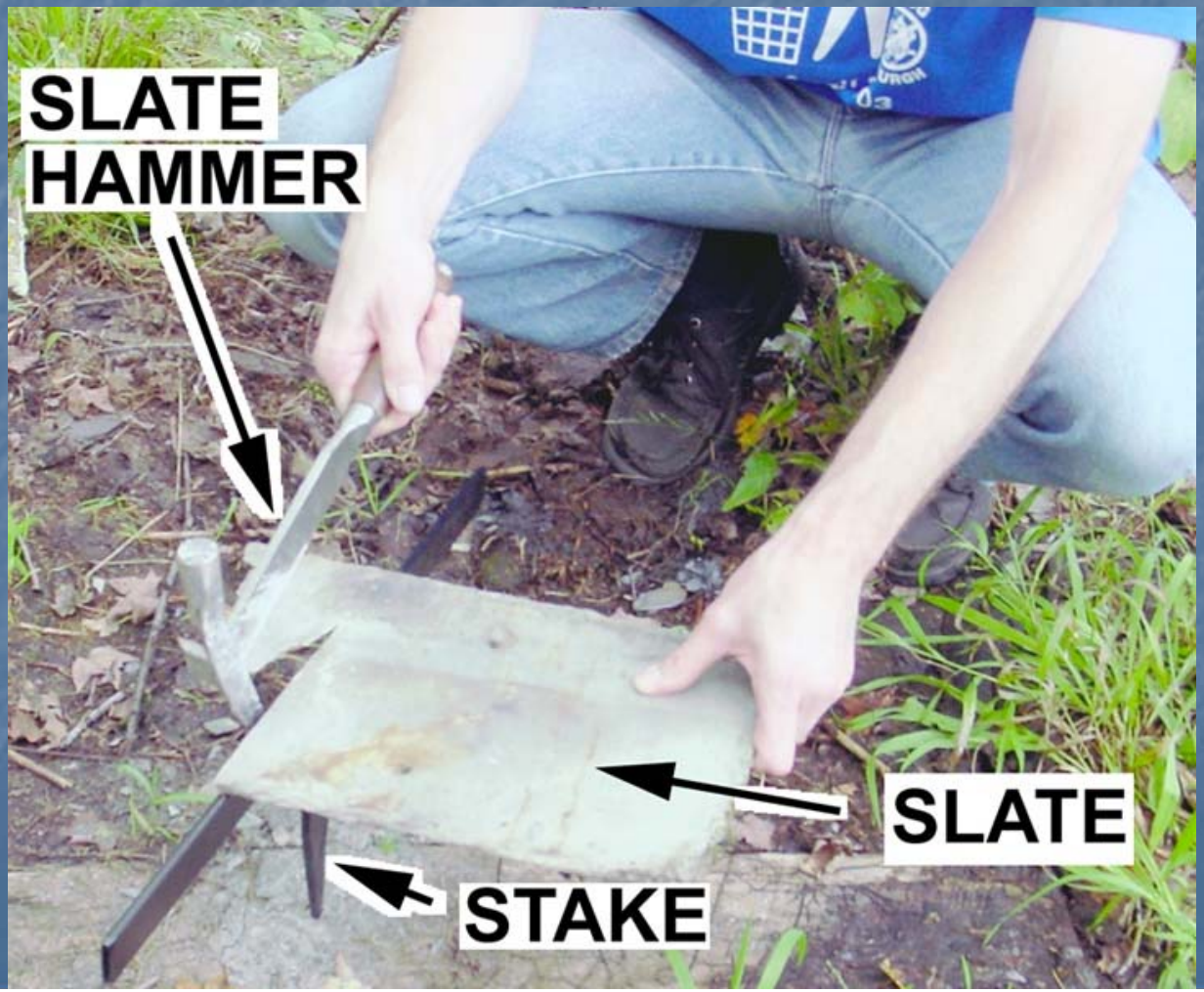
- Cut slates with either a slate cutter or hammer and stake. Cut on the back side only. (See a video demonstration of these tools at the josephjenkins.com online store.)
- Punch slates with a slate hammer or cutter. Punch on the back side only.
- Remove slates with a slate ripper.
- Access roofs with hook ladders or roof brackets.

Roof slates should be cut with slate cutters or stakes. These were cut with improper tools.



Slate cutters are readily available on the internet at josephjenkins.com.

A stake and hammer can be used for cutting thicker slates (available, and demonstrated, at josephjenkins.com).

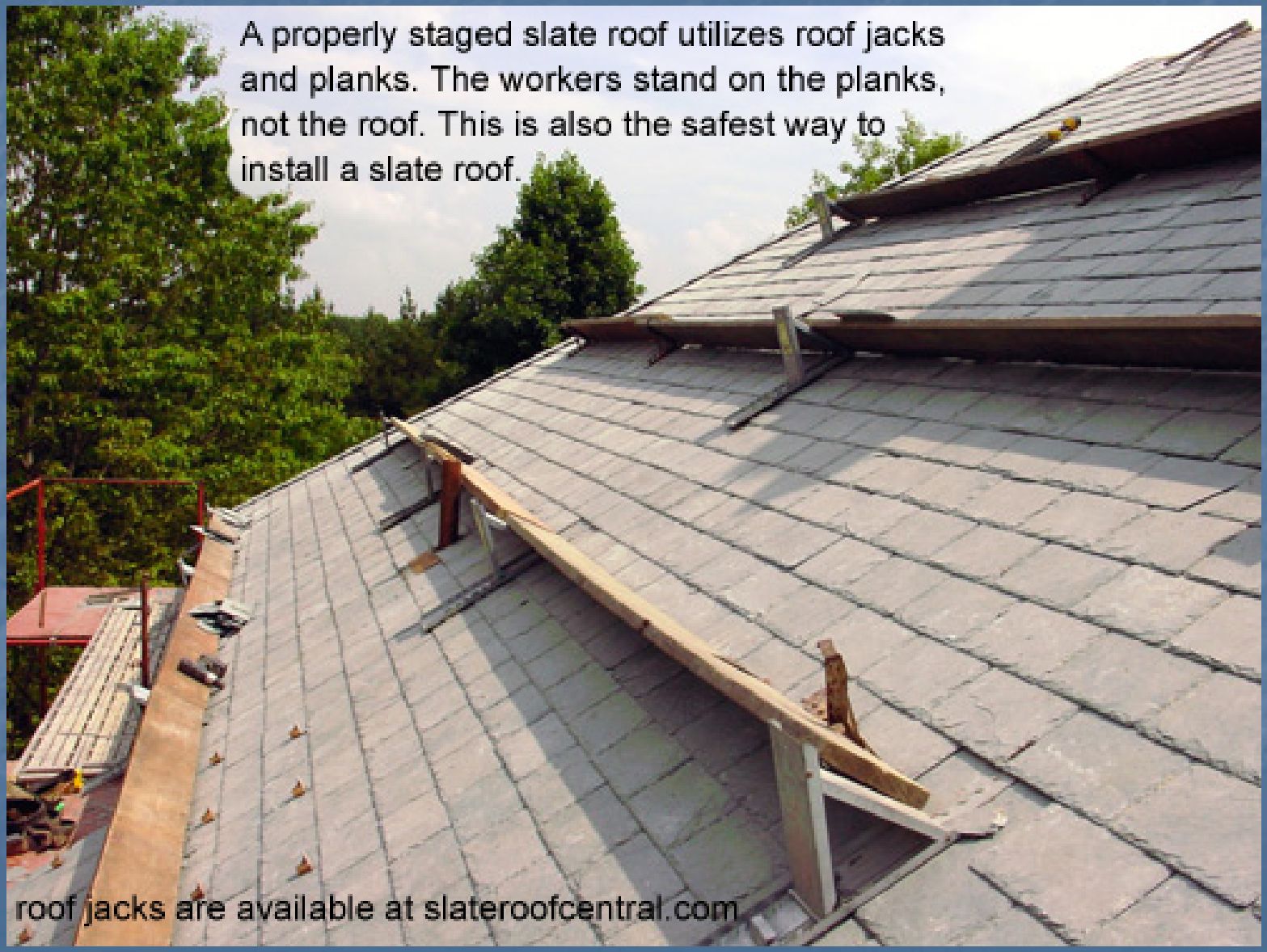


Slates that are diamond sawn lose their beveled edge and look bad.

Slate roofs should not be walked on during installation or at any time.

The roof should be properly staged in order to minimize or eliminate the need to walk on the slates. Routine walking on a slate roof during installation is a mistake which will cause slates to crack and possibly break off later.

A properly staged slate roof utilizes roof jacks (available at josephjenkins.com) and planks.



Unlike slate flooring, roof slate does not lie flat on the roof surface and can easily break if walked upon. Note the lack of headlap in the example below – an improperly installed roof.

Valley slates should not be hung on wires. This is a tile technique, not a slate technique. Wire will cut the slate.

Summary

- Contractors unconcerned about roof longevity should not be installing slate roofs.
- Roof decking is important, underlayment not so much.
- The contractor should educate himself before installing slate roofs.
- A good roof slate source is imperative.
- Proper tools and materials are required and can be bought on the internet.
- Detailed contract documents are important.
- Radical deviations from long-established installation standards are not recommended.

For more information:

- The Slate Roof Bible, 2nd edition
- SlateRoofCentral.com (source of info, etc.)
- SlateRoofers.org (source of contractors)
- TraditionalRoofing.com (source of articles)
- Josephjenkins.com (source of slate roofing tools, snowguards, flashings, materials, etc.)
- Call us toll free at 866-641-7141
- Questions? Go to our message board at slateroofcentral.com/messages

More information:

- Sample slate roof installation proposal at SlateRoofCentral.com
- Contractor lists at SlateRoofers.org
- Slate Roof Bible, 2nd edition, available at JosephJenkins.com or via Amazon.com or any bookstore
- Tools, flashings, nails, etc., available at SlateRoofWarehouse.com
- Source Lists for new and salvaged slates and tiles available at SlateRoofers.org