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Rosen Shingle Creek Resort
Orlando, Florida
March 14 - 19, 2013

How to Survey a Slate Roof

Joseph Jenkins

Joseph Jenkins, Inc., SlateExperts.com

Joseph Jenkins, Introduction:

1. Joe began working on slate roofs in PA in 1968.
2. He published the Slate Roof Bible, 1st edition, in 1997.
3. He started slate roof consulting services in 1998 at Ford's Theater, Washington DC.

Ford's Theater: built in 1863.

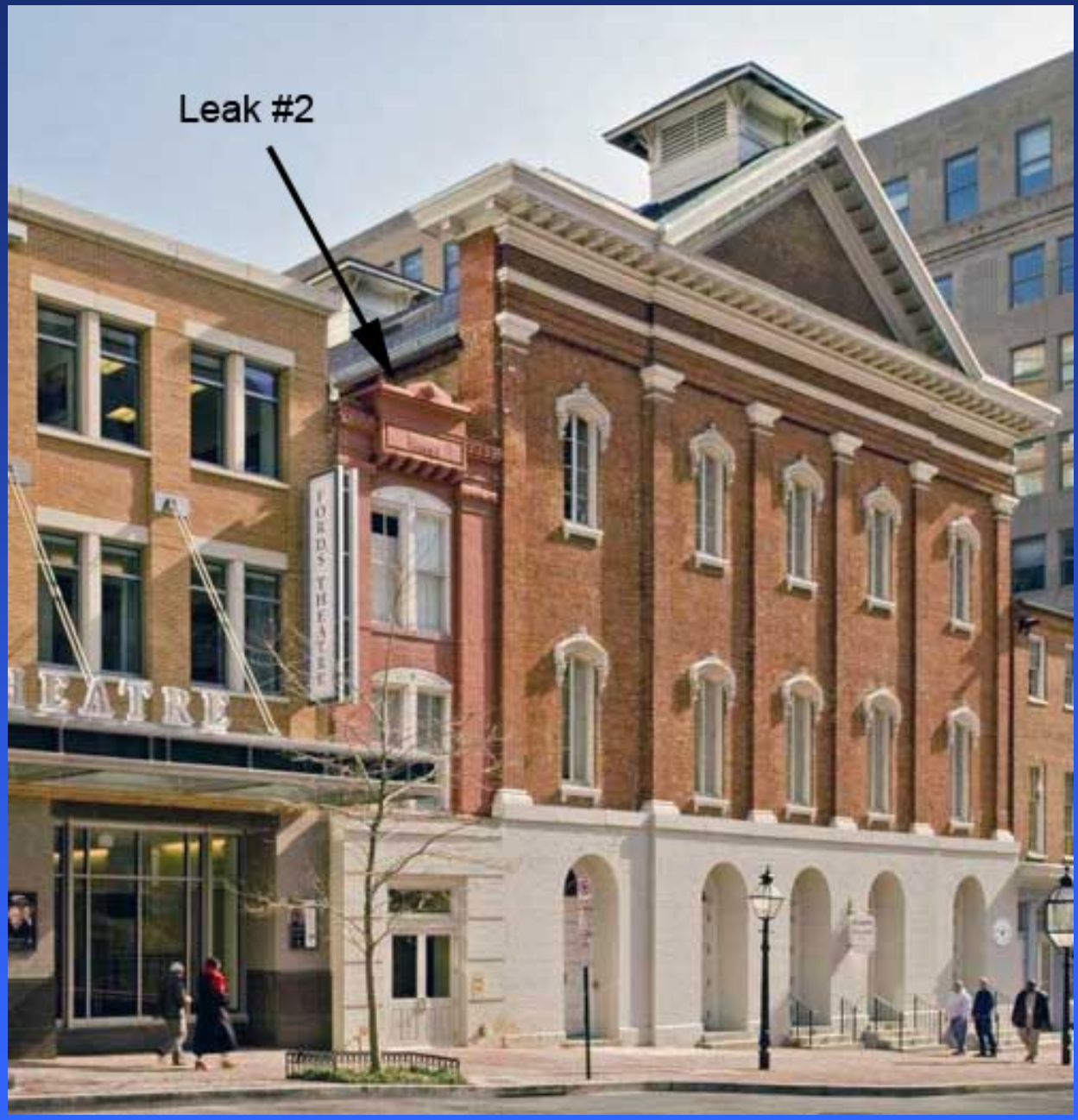
Abraham Lincoln assassinated there in 1865.

1. Buckingham slate roof
2. Two leaks in roof
3. Roof was being considered for replacement after 135 years.
4. US Park Service needed a professional opinion.

My findings: the roof itself was not leaking and was only 30 years old.

The main leak was in the copper parapet coping joint where a soldered seam had popped open.

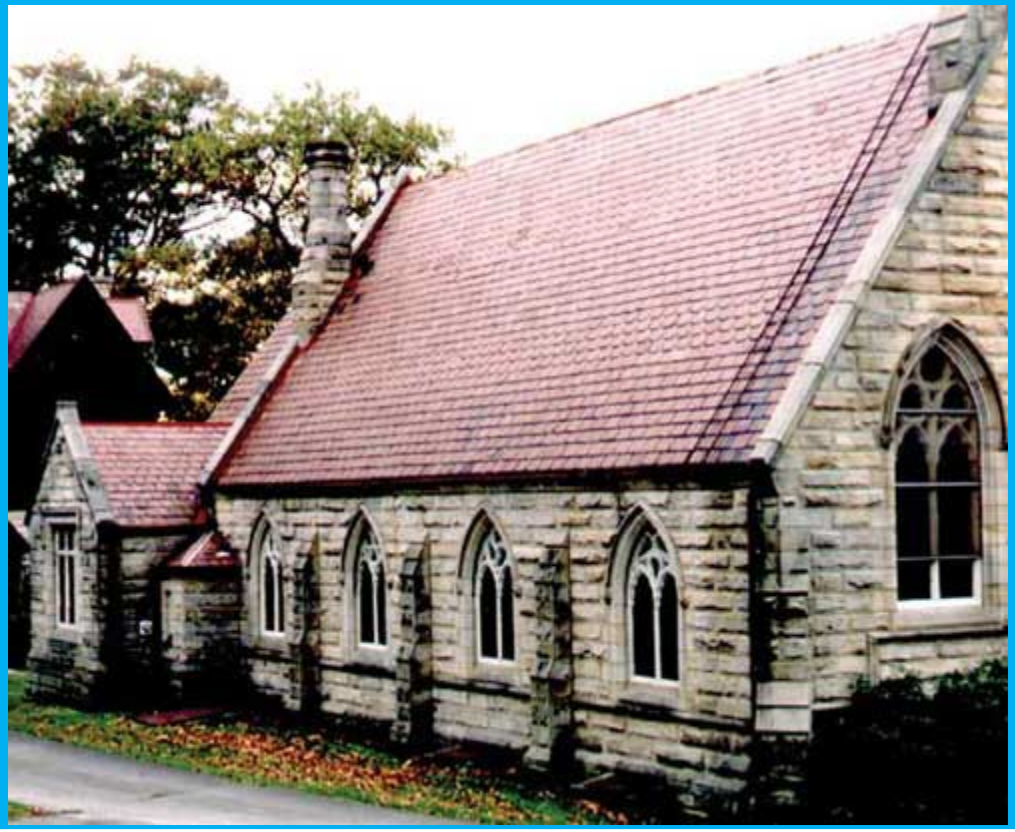
The second leak was in a wall flashing on the adjacent building.



Taxpayer savings due to professional consultation services: at least $400,000.00

Fifteen years later, what have I learned about slate roof surveys that I can share with you in 90 minutes?

Part 1) Slate Basics

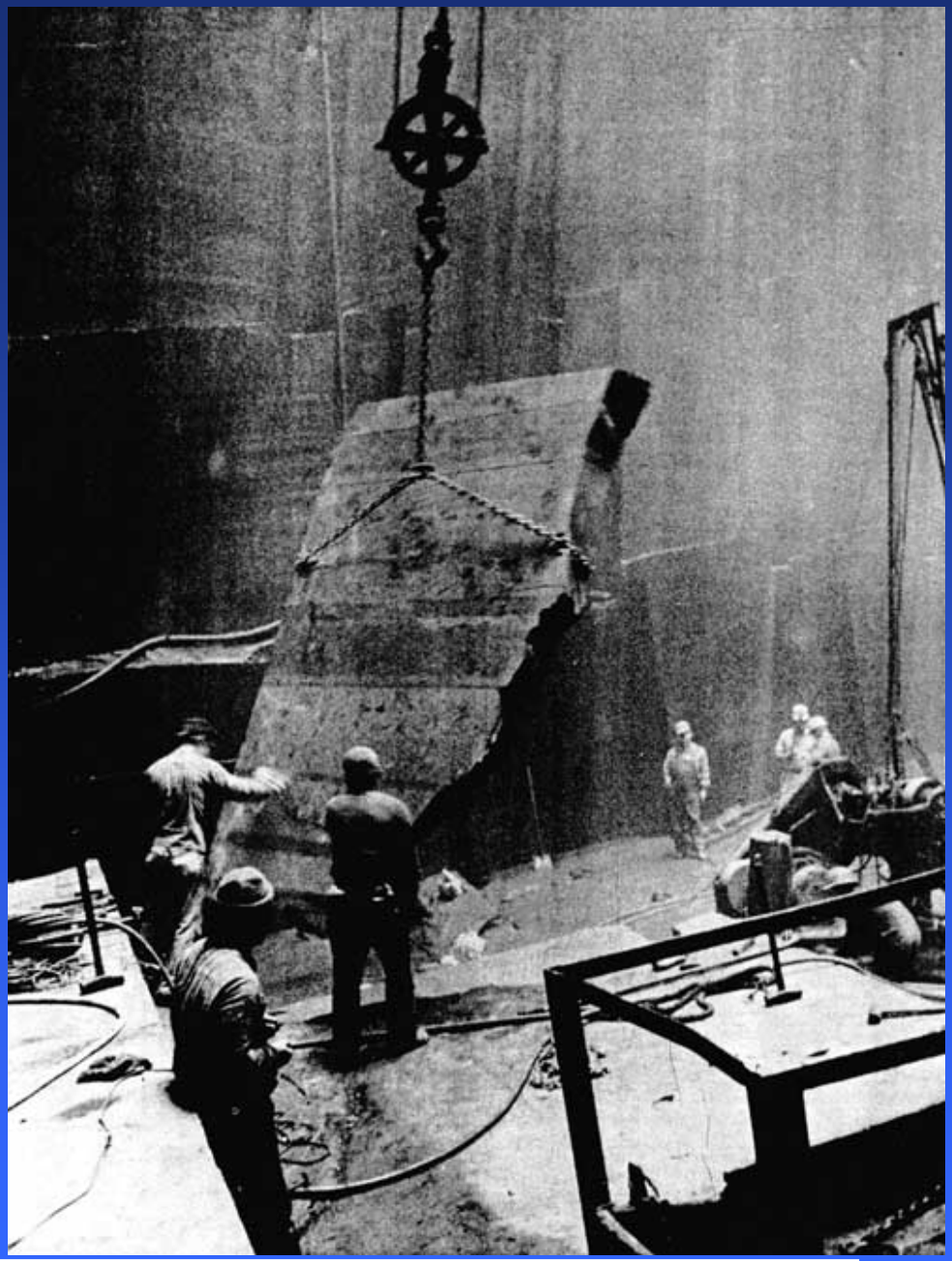


A typical American slate roof:

1. Stone shingles
2. Attached with nails
3. Onto wood decking
4. Has metal flashings

Stone shingles are quarried:

The stone is brought to the surface.



Slate has natural cleavage planes.

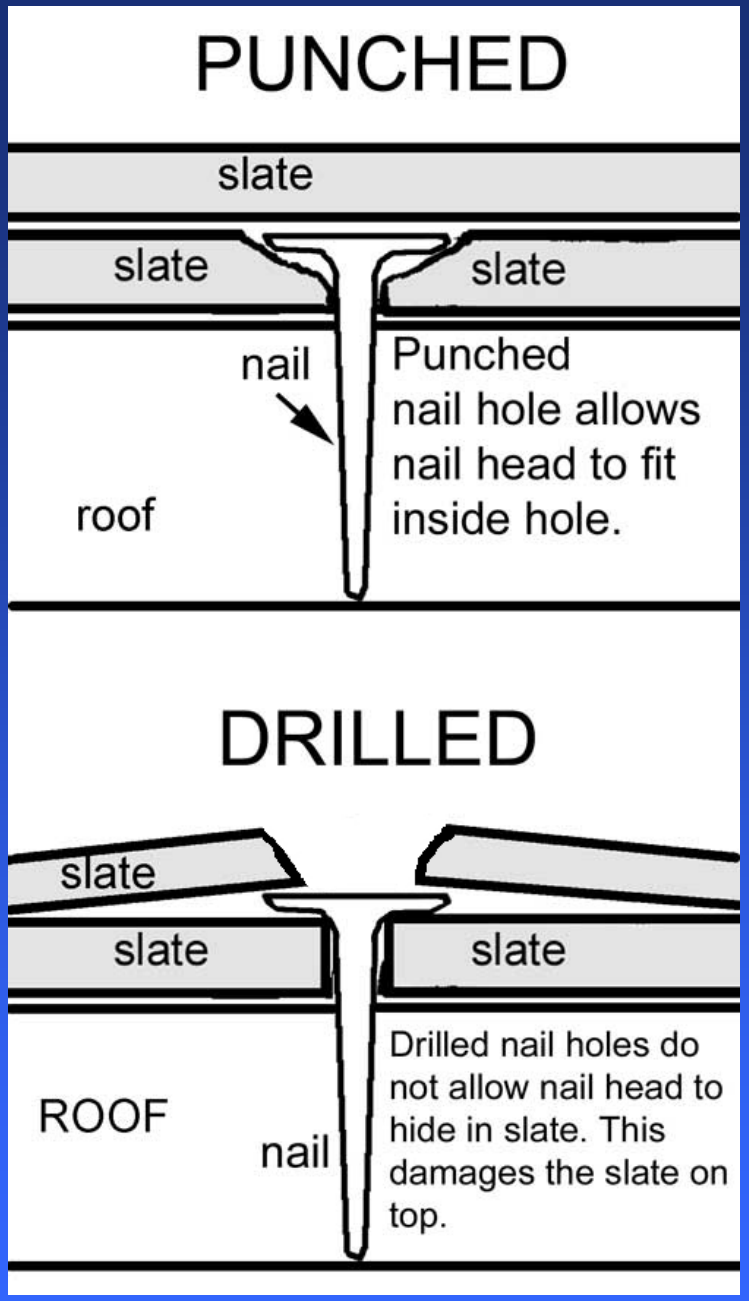
Split slabs are sawn into blocks.

Blocks are hand-split into shingles.

The shingles are trimmed to standard sizes.

Nail holes are punched into the shingles.

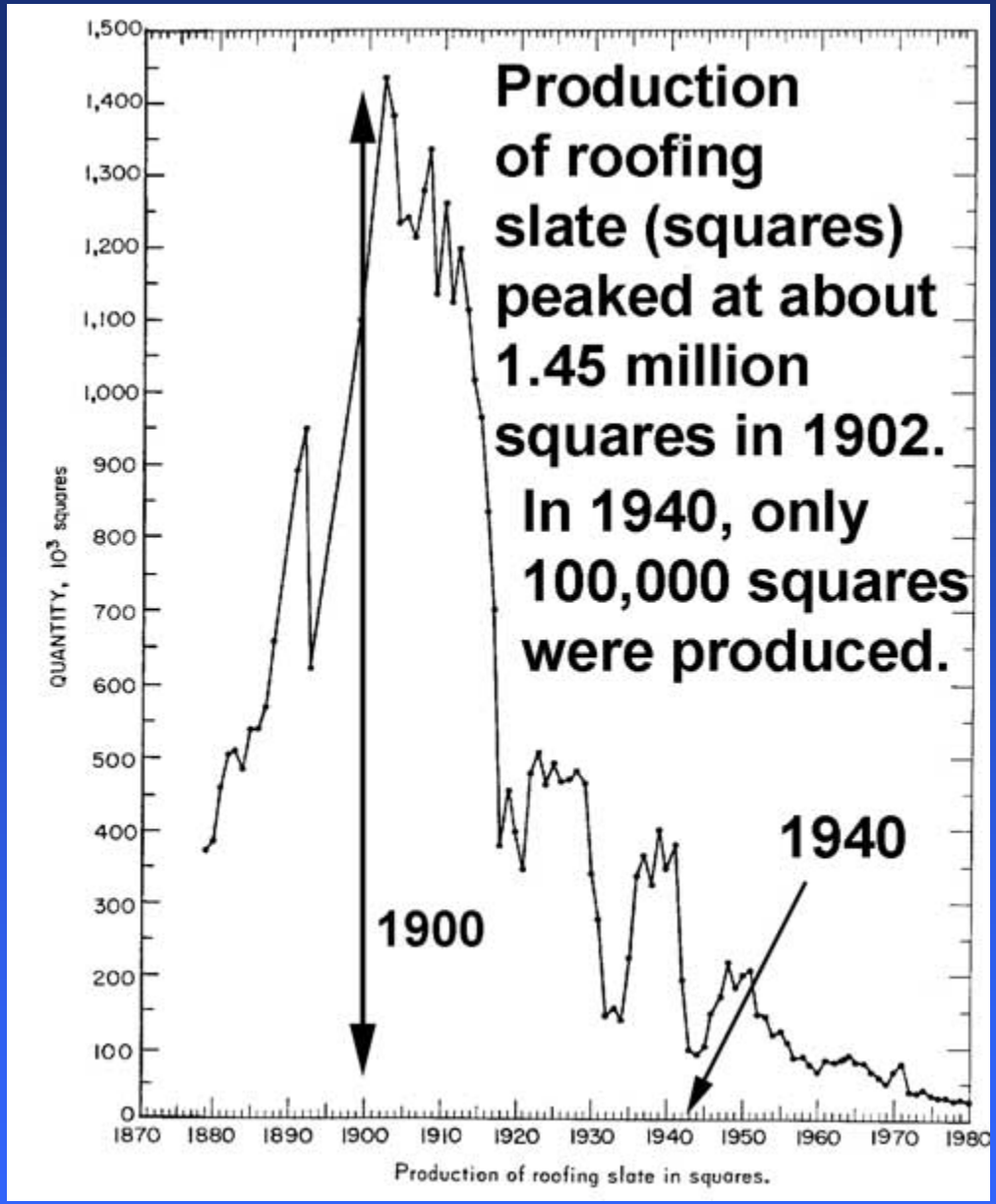
Punched holes allow for the slating nail head to be countersunk into the slate. Thicker slates may need to be drilled.



This is what it will look like after a nail head rubs on an overlying slate for too long. This is also the result of “undernailing.”

Slate is still quarried in North America.

US production peaked between 1890 and 1920. Most existing slate roofs are old.



Roofing slate is rated according to ASTM standards (S1, S2, or S3).

Rating the Quality of Roofing Slate

Grade	Service Life (yrs)	Breaking Load min lbf (or N)	Absorption max, %	Depth of Softening, max. in. (mm)
S1	over 75	575 (2558)	0.25	0.002 (0.05)
S2	40 to 75	575 (2558)	0.36	0.008 (0.20)
S3	20 to 40	575 (2558)	0.45	0.014 (0.36)

S1 slates can last 200 years. The ages of these roofs are shown in the margins.

There are many types of slate.

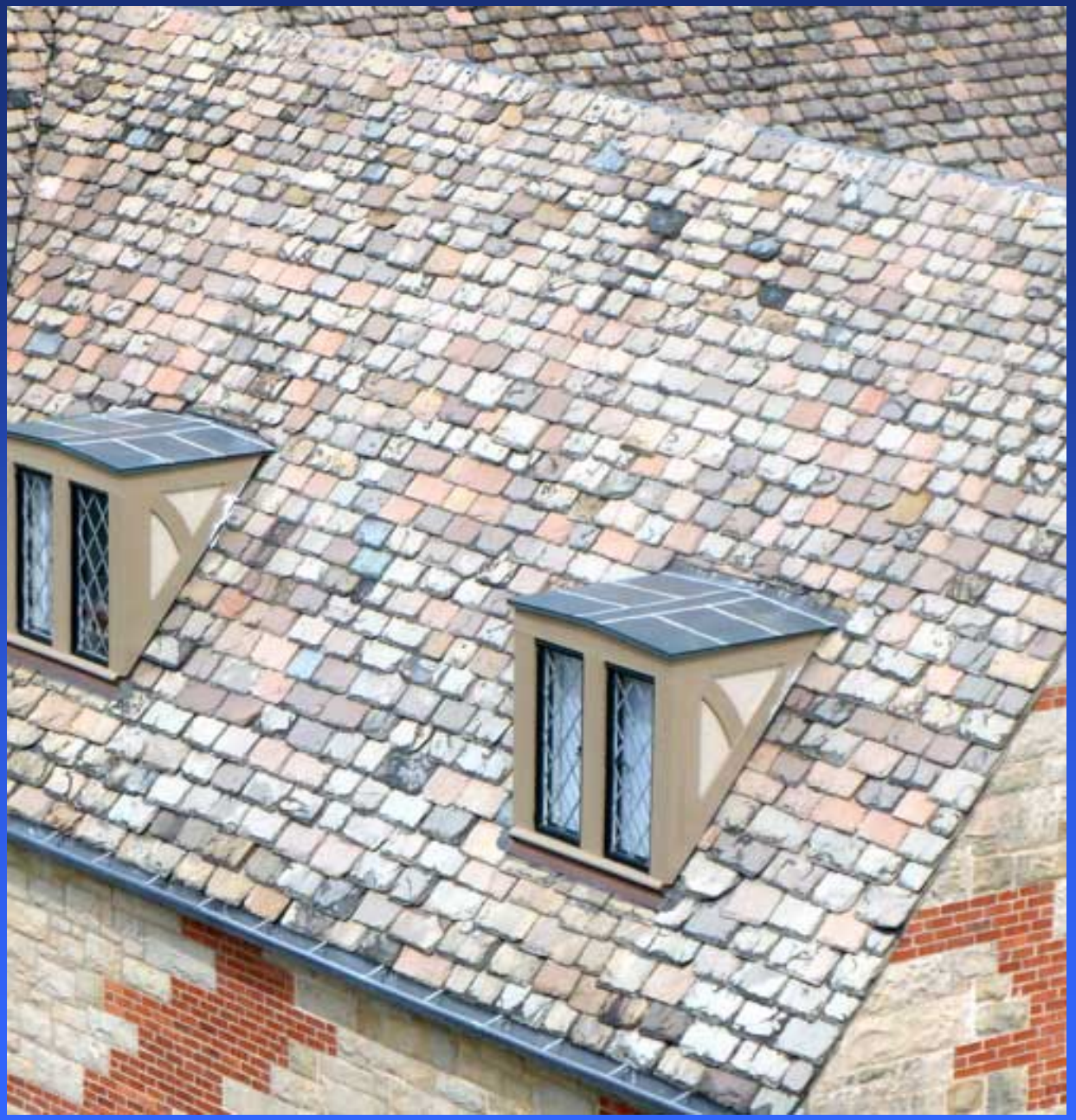
This is Vermont purple slate.

This is a blend of types and sizes.

This is slate from India.

Mixed Vermont types:

Mixed Vermont slates:



Bangor PA slates. Note the typical white edges.

Bangor slates again:

Vermont unfading-green slates.

Buckingham, VA slates, 1879 (134 Years old, with repairs):

The original slating nails (134 years old, no deterioration).

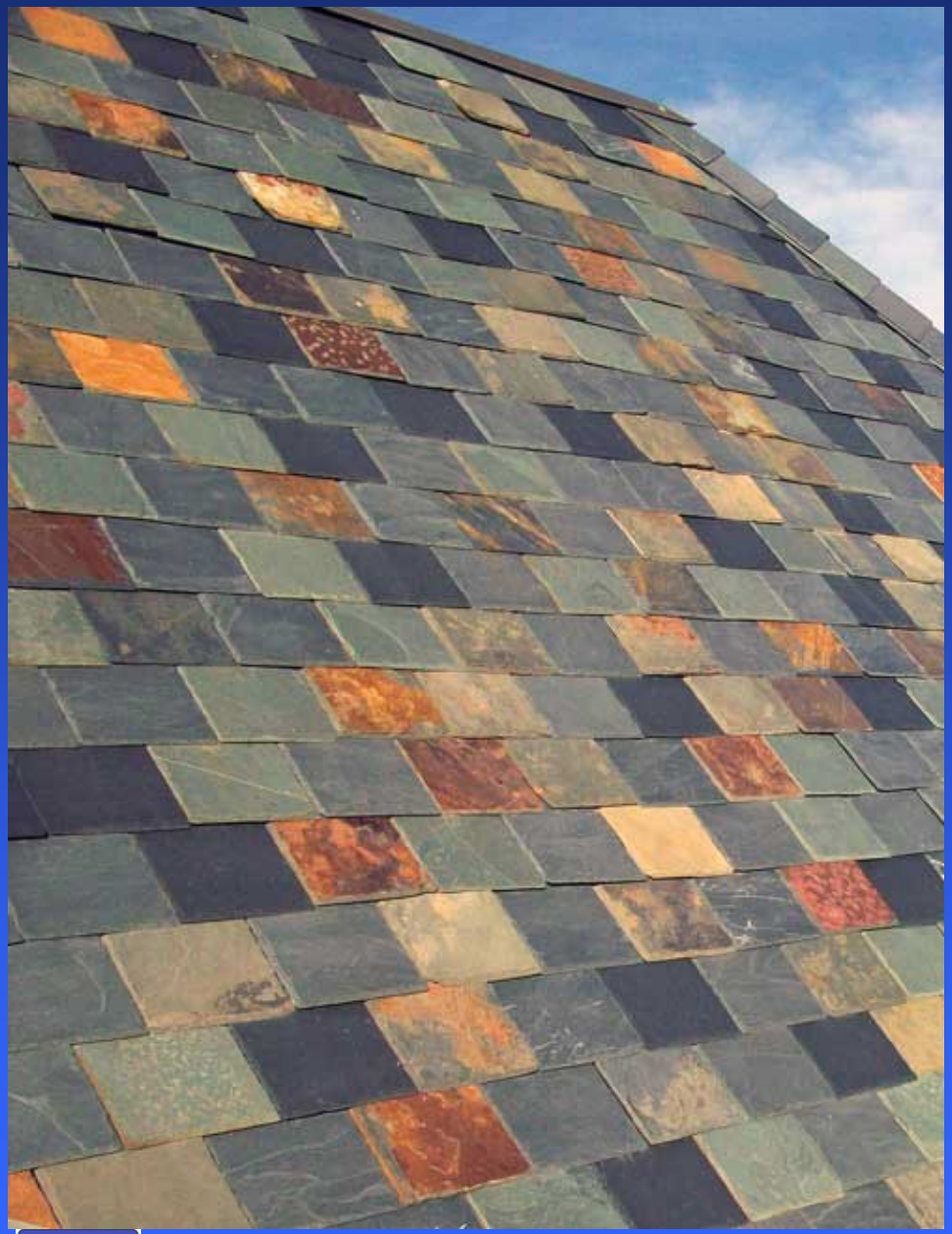
Spanish slates:

Spanish slates can have rust problems.

American slates can also have rust problems, but it's much less likely.

Chinese green slates:

Defective Chinese black slates:



Chinese multi-color slates:

Defective Chinese multi-color:

Asbestos shingles: NOT slate!

Part 2) Installation Basics

Get a free download of the SRCA Slate Roof Installation or Repair/Restoration Guidelines at SlateRoofers.org (Word or PDF files).

Slate Roofing Contractors Association

of North America, Inc.

143 Forest Lane, Grove City, PA 16127 USA; Ph: 814-786-7015

GENERAL INSTALLATION GUIDELINES FOR NATURAL QUARRIED ROOFING SLATE

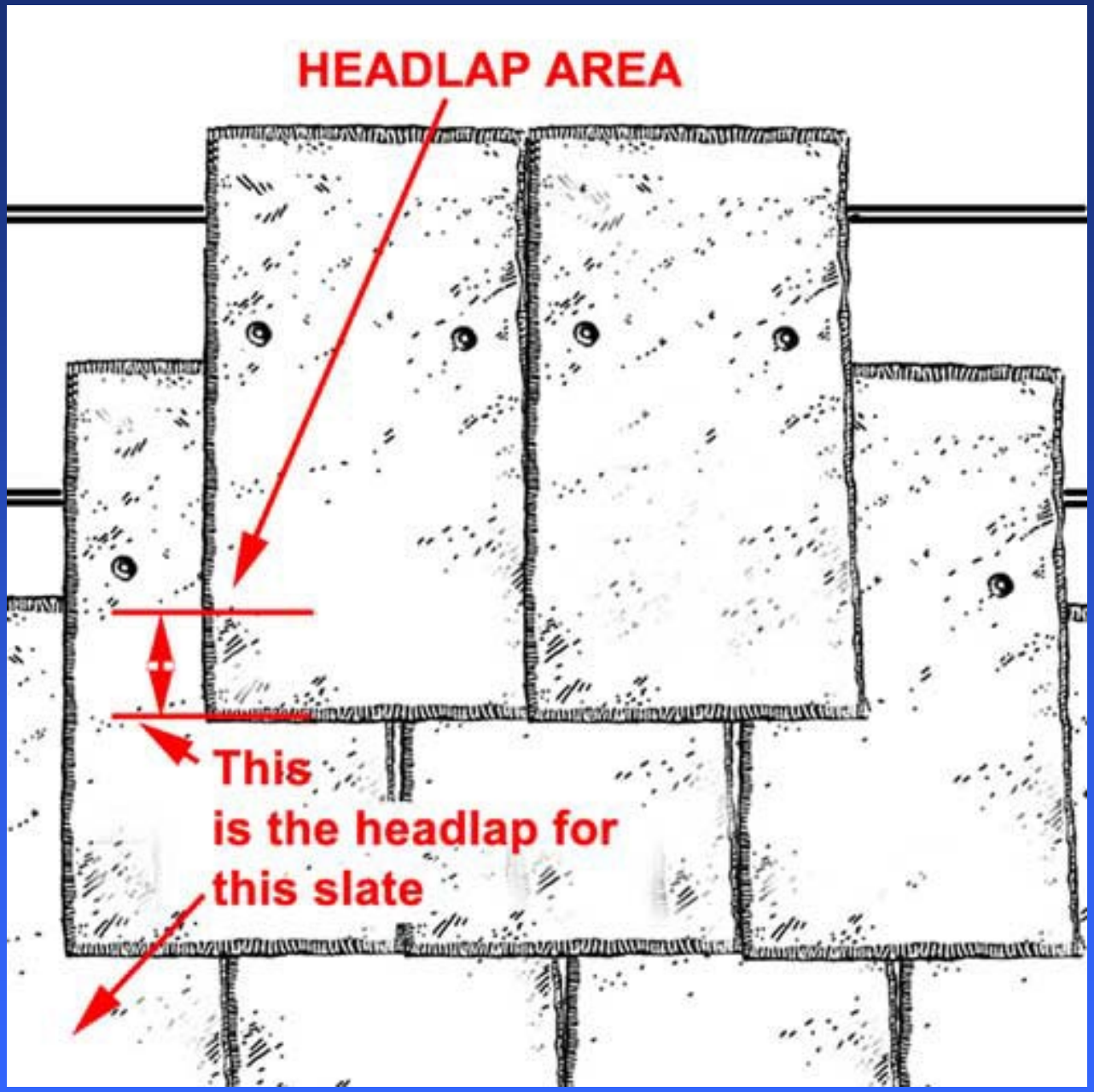
Version 1.2, Published by unanimous vote of the SRCA Board of Directors, 6/23/2012

Download a Word version of these guidelines.

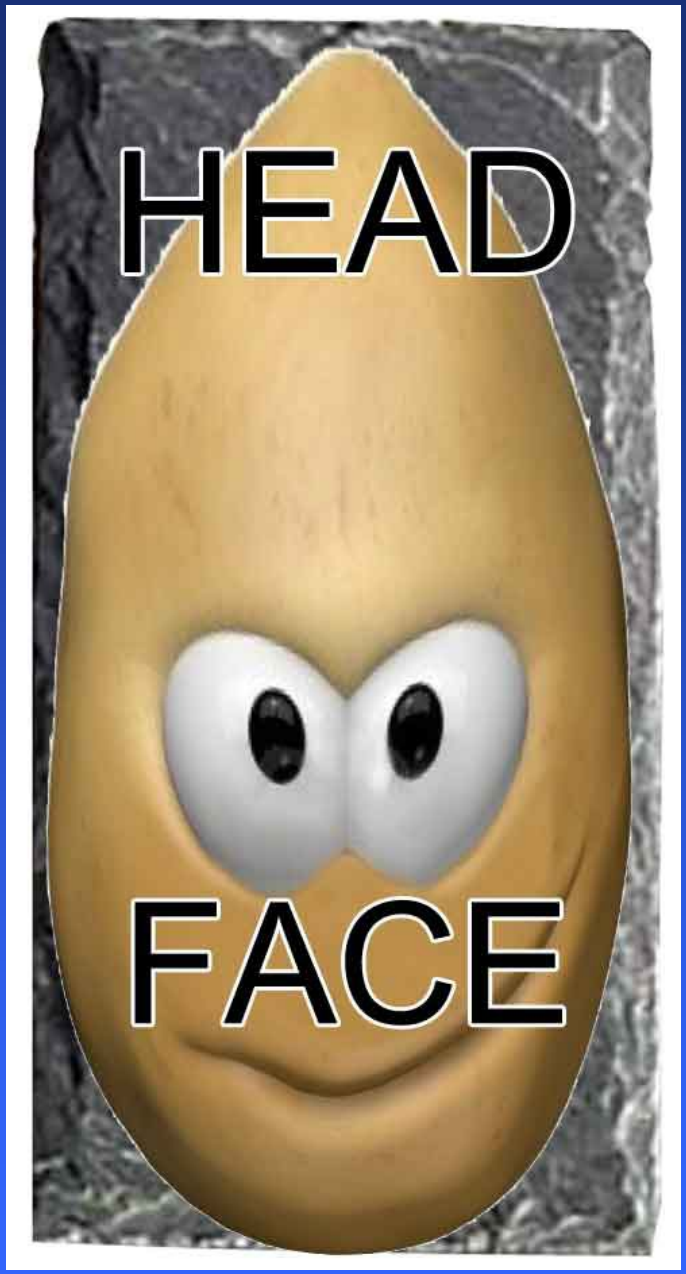
Installation Guidelines are available in English or Spanish!

Correct overlap is critical.

Lack of headlap will condemn a new roof.



Imagine that slates had heads and faces. The top of the slate is the “head” and the bottom (what you see on the roof) is the “face.” Headlap overlaps the head.



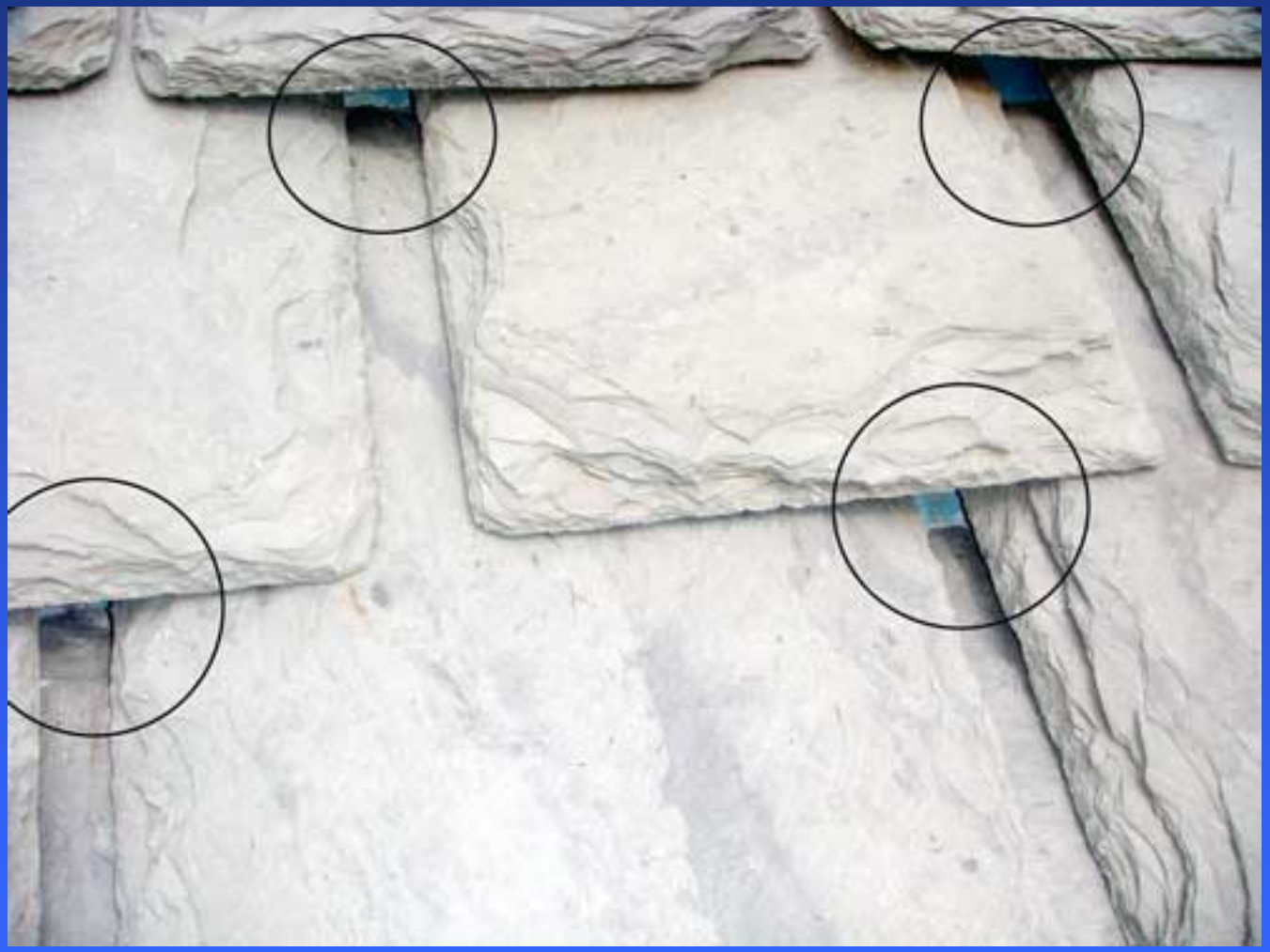
Headlap is generally 3 inches. Here you see one inch of headlap. This new slate roof had to be removed and replaced.

This was the building – a shopping center in Louisiana.

Here is stark evidence of negative headlap. This roof also had to be completely removed and reslated.

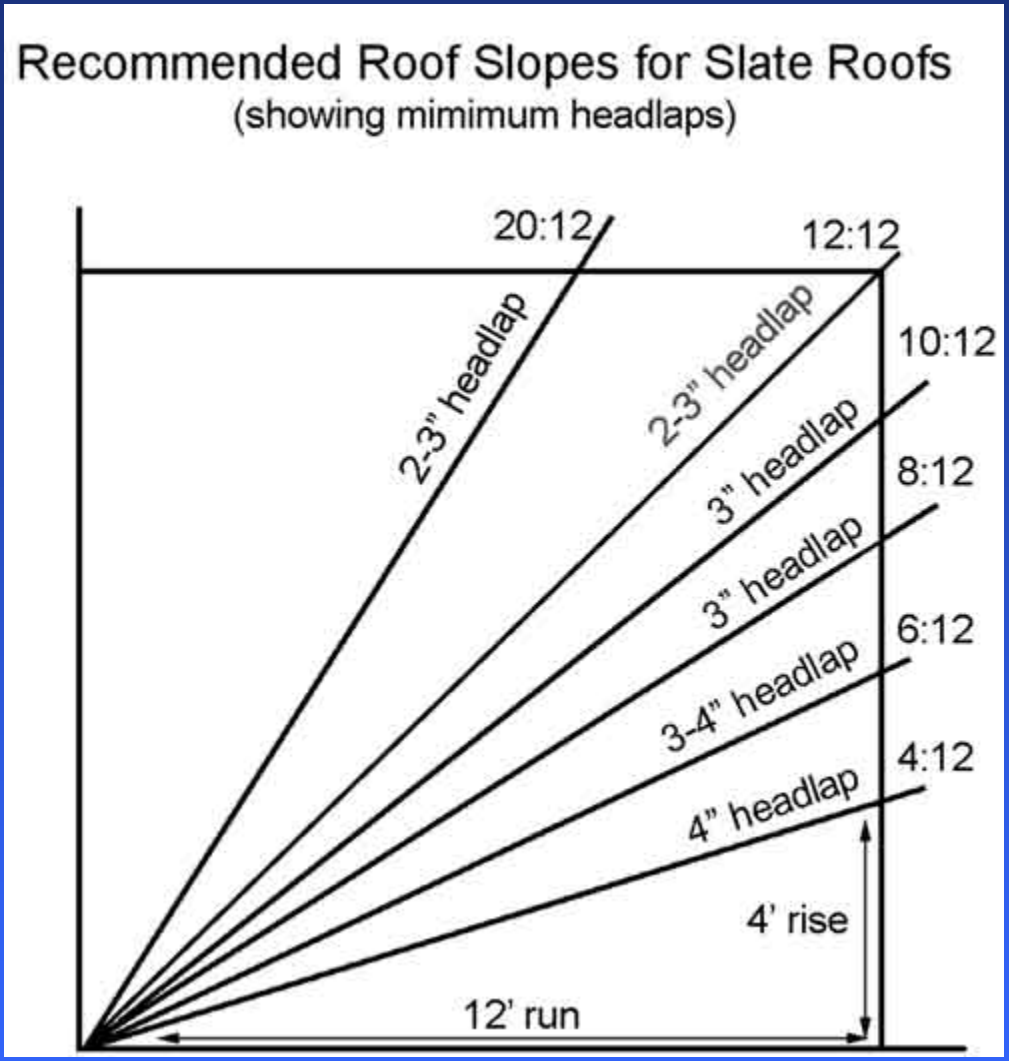
This is what that roof looked like. You cannot see the headlap deficiency without close inspection.

Another look at zero headlap (same roof).

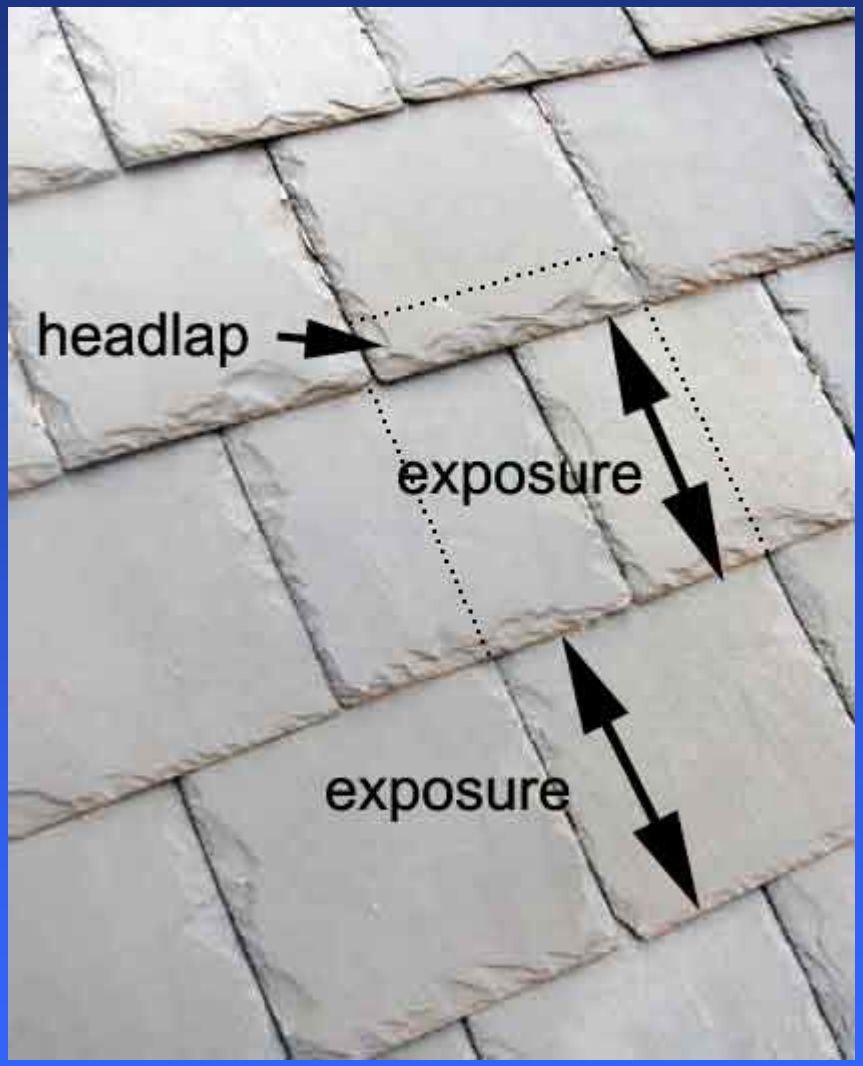


Headlap will vary with slope. The steeper the roof, the less headlap needed (2” min.).

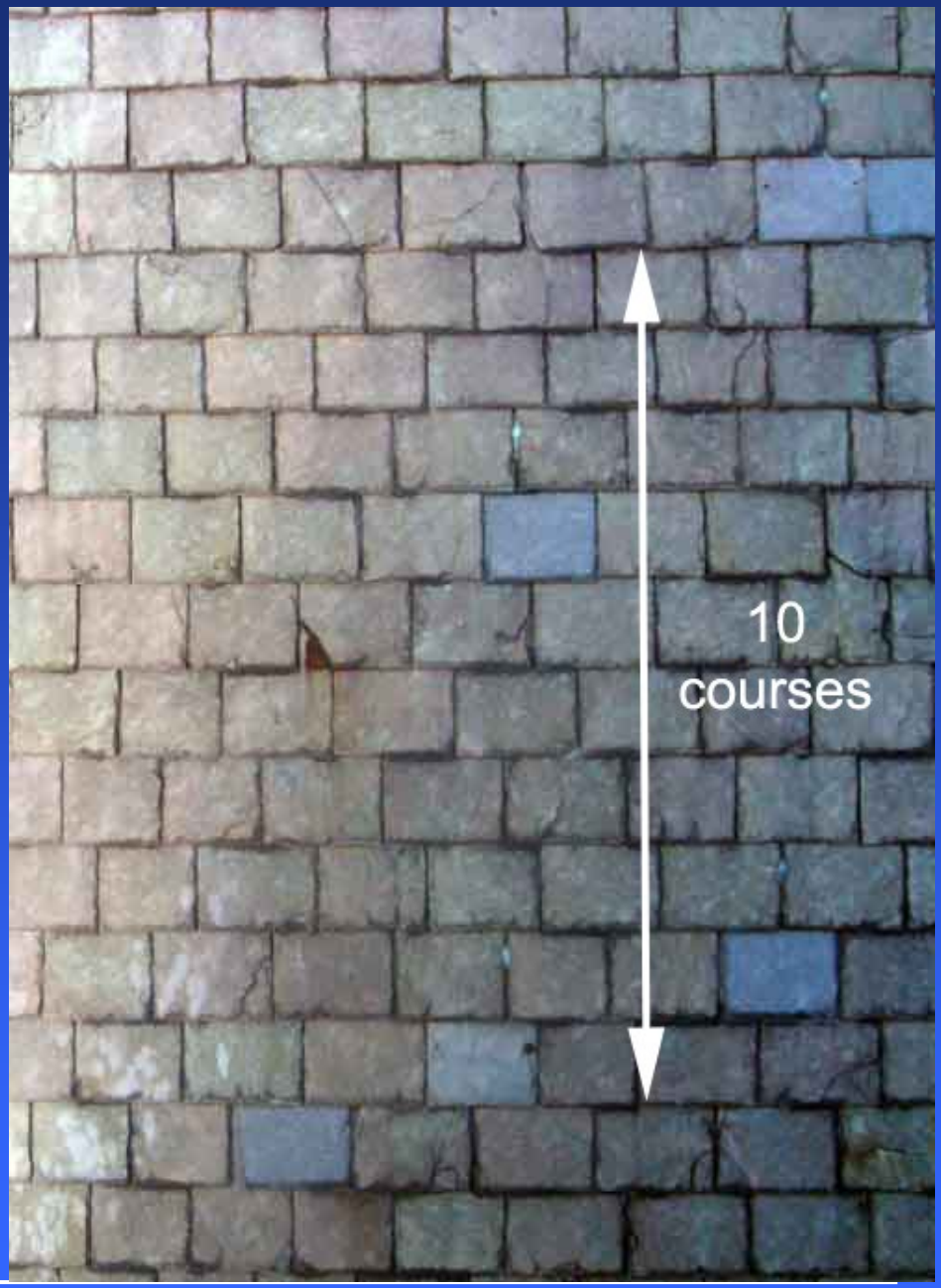
Note that slate roofs are not to be installed on slopes less than 4:12.



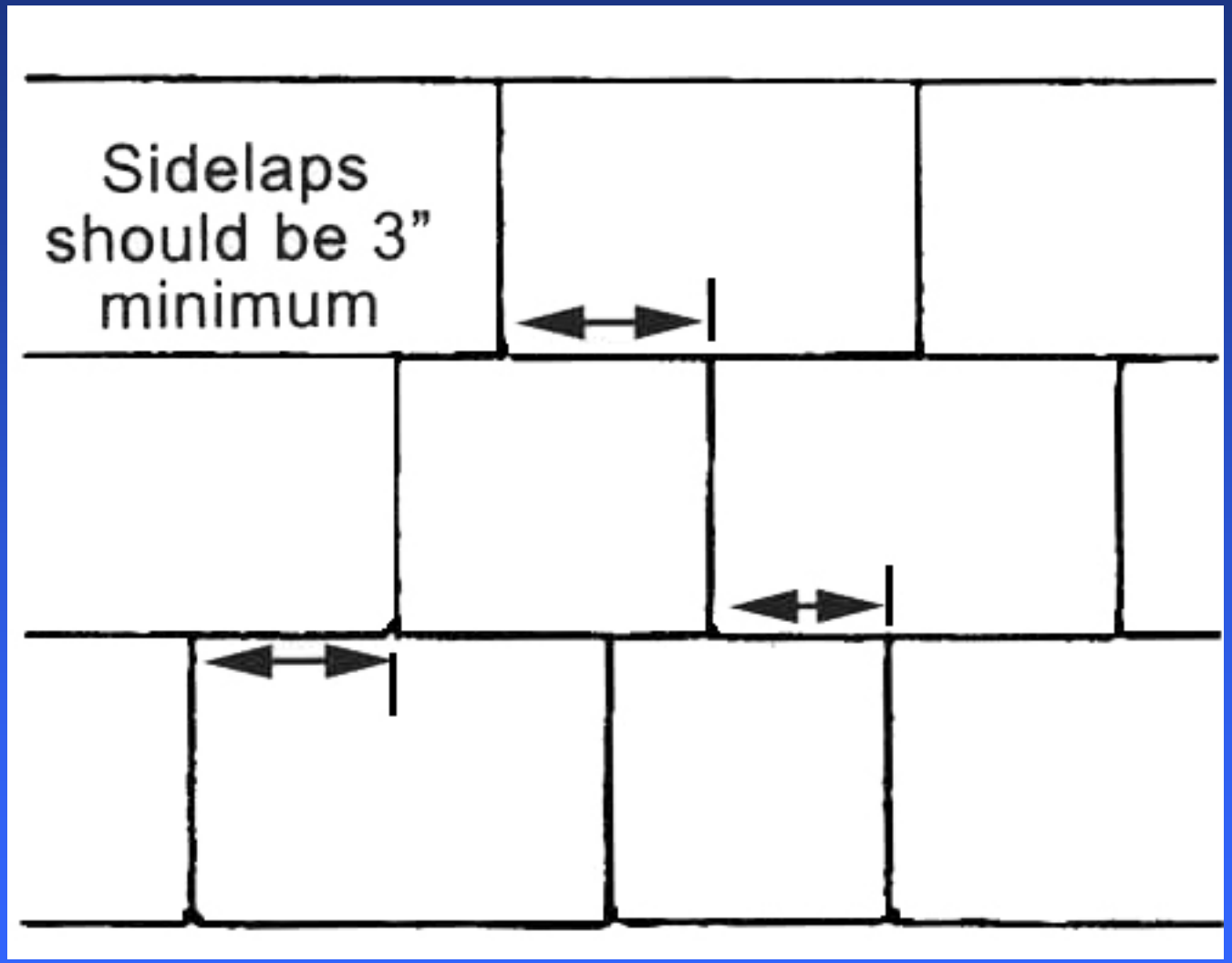
Headlap = slate length minus 2X exposure



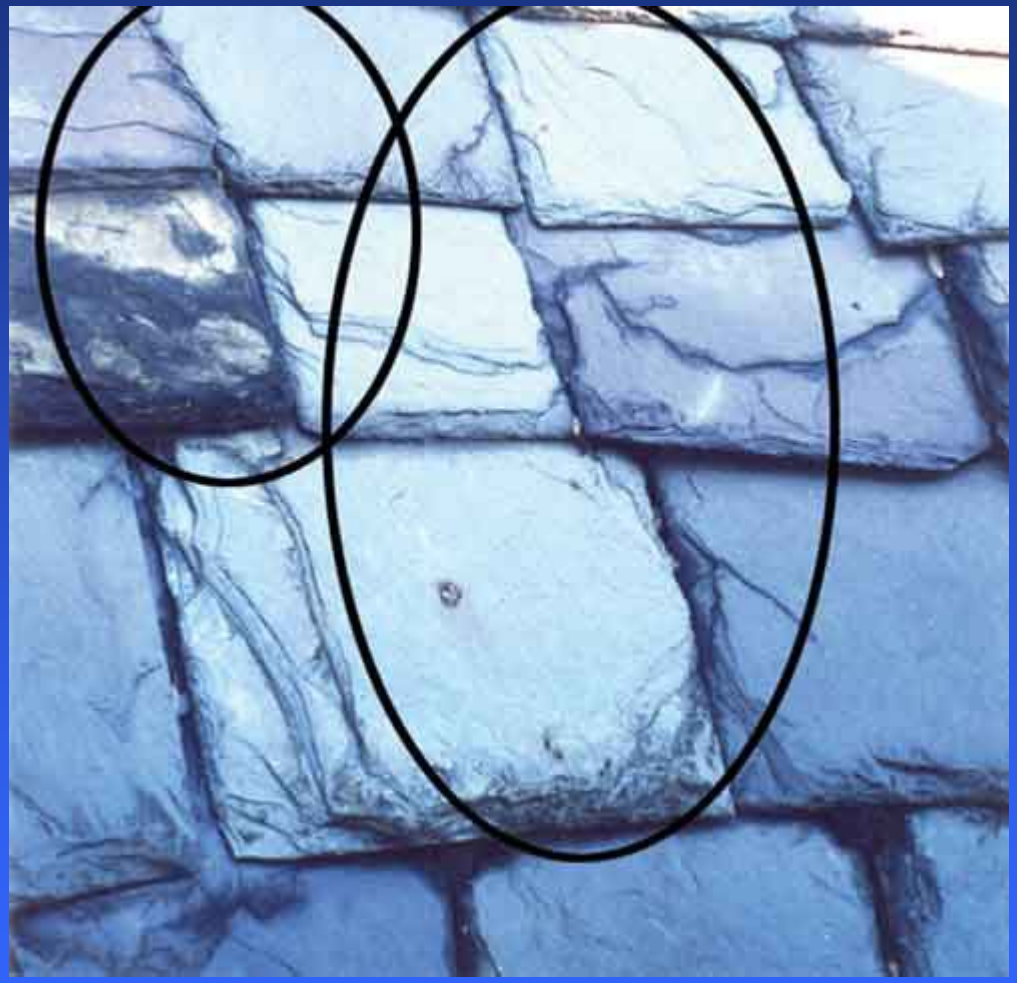
Measure 10 courses vertically, divide by 10 for an average exposure. If you know the slate length, this will also give you an average headlap for that portion of roof. Repeat on other roof surfaces.



SIDELAPS: should be 3 inches minimum.



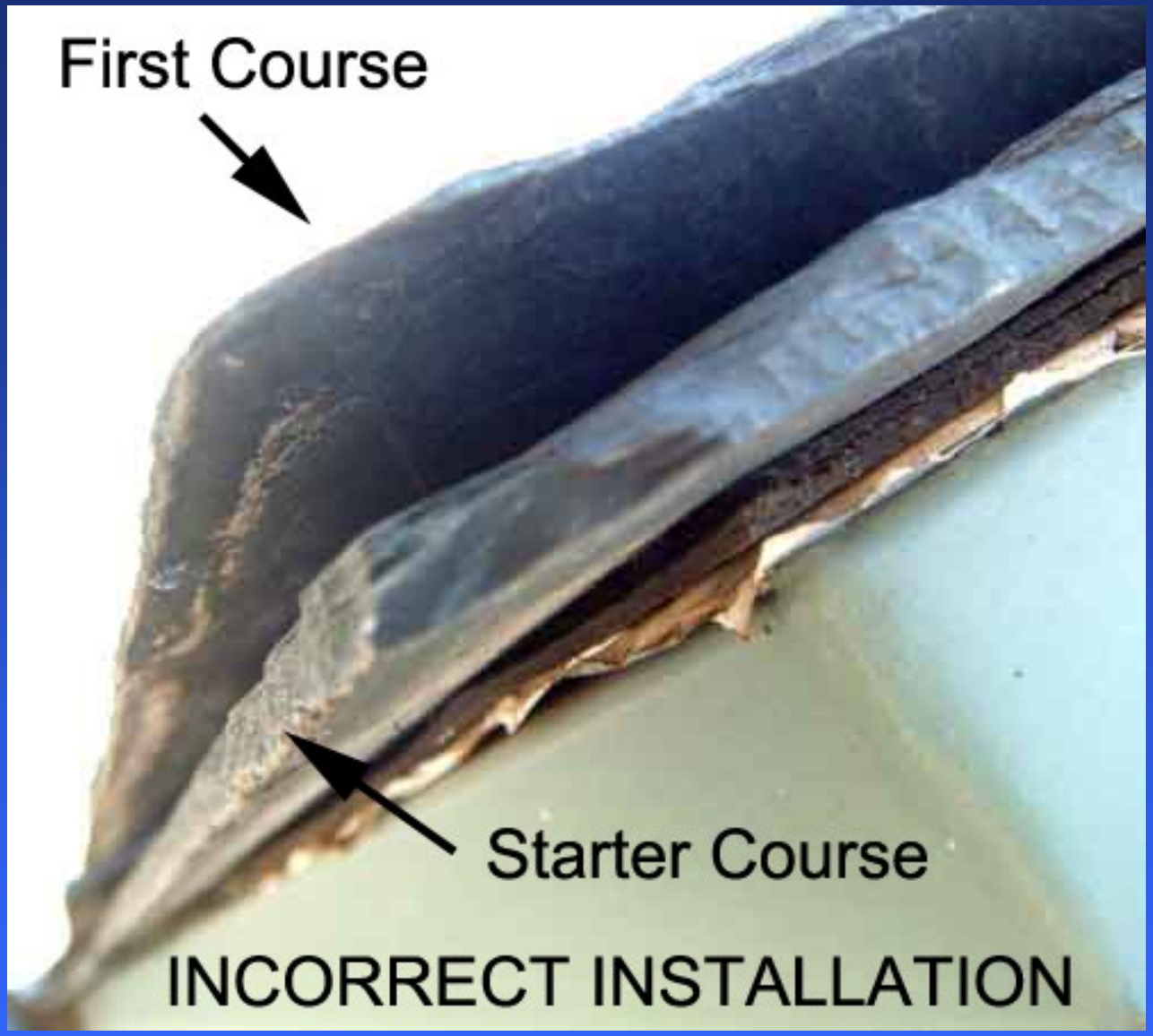
Incorrect slate installation (bad sidelaps):



Common Starter Course Errors:

1. Lack of headlap
2. Lack of sidelap
3. Starter laid face up
4. No cant

The starter slate and first course should be back-to-back. There should be a cant under the starter.



Correct: back-to-back starter slate and first course.

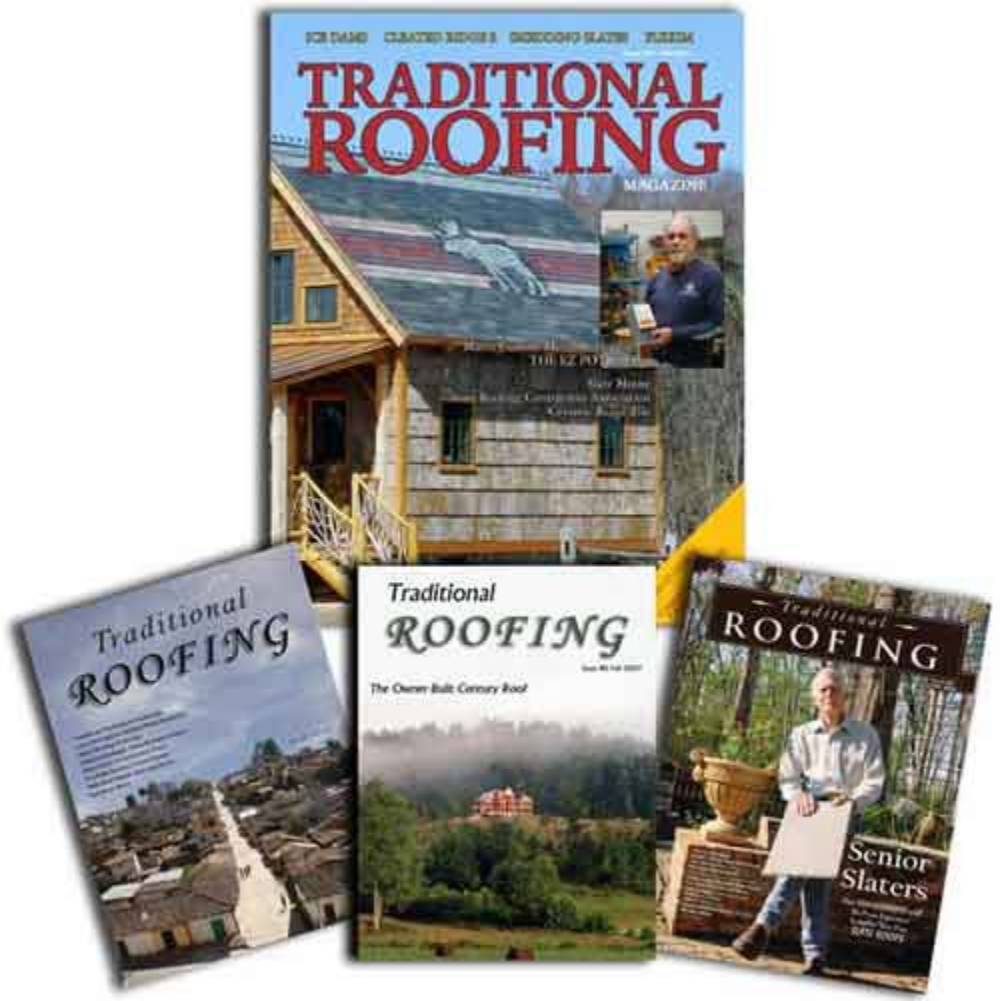
Incorrect starter, not enough sidelap:

Cants for the starter course can be a wood strip or can be built into a metal drip edge. The cant tilts the starter course to match the field slates.

Correctly installed starter with copper cant:

Articles about headlap, starters, installation, nailing, etc:

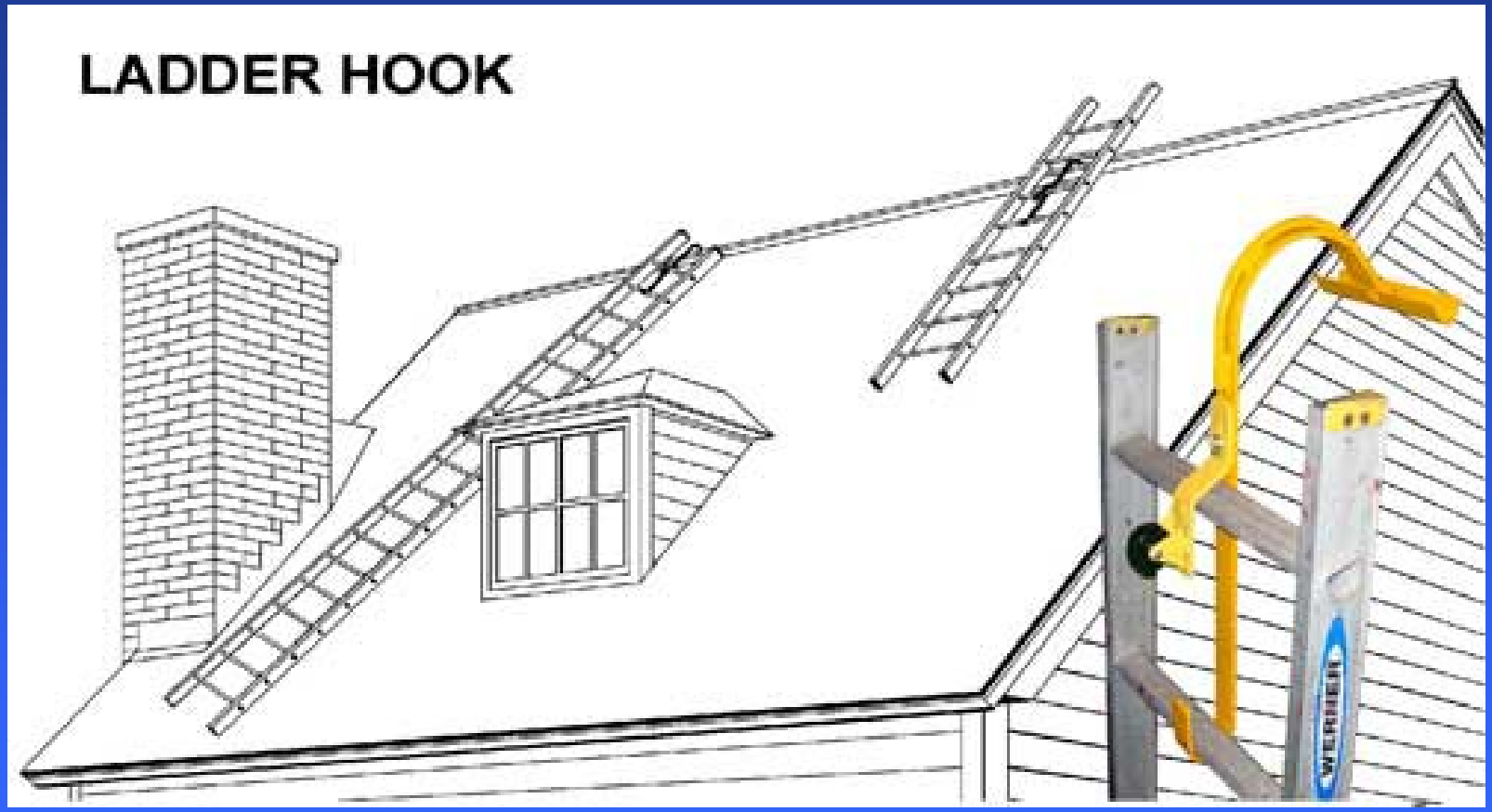
TraditionalRoofing.com



Part 3: Accessing Slate Roofs

Slate roofs tend to be high and steep. Gaining access often requires experience as well as creativity.

Ladder hooks are often used for access.



A combination of ladder hooks, roof jacks, and planks can get you almost anywhere on a slate roof, providing you can reach the roof with a ground ladder. This is a church in New Jersey.

The view from the church roof looking down from the 2nd set of roof jacks.

The hook ladder is hooked on the ridge of the church. This new roof was leaking at the ridge in two places, so access to the ridge was important.

Ridges, hips and valleys can usually be carefully walked or crawled on but wear soft-soled shoes. Avoid walking on the field of the roof. This is the Smithsonian “Castle.”

The ridge can be crept along if the roof is too steep to walk on.

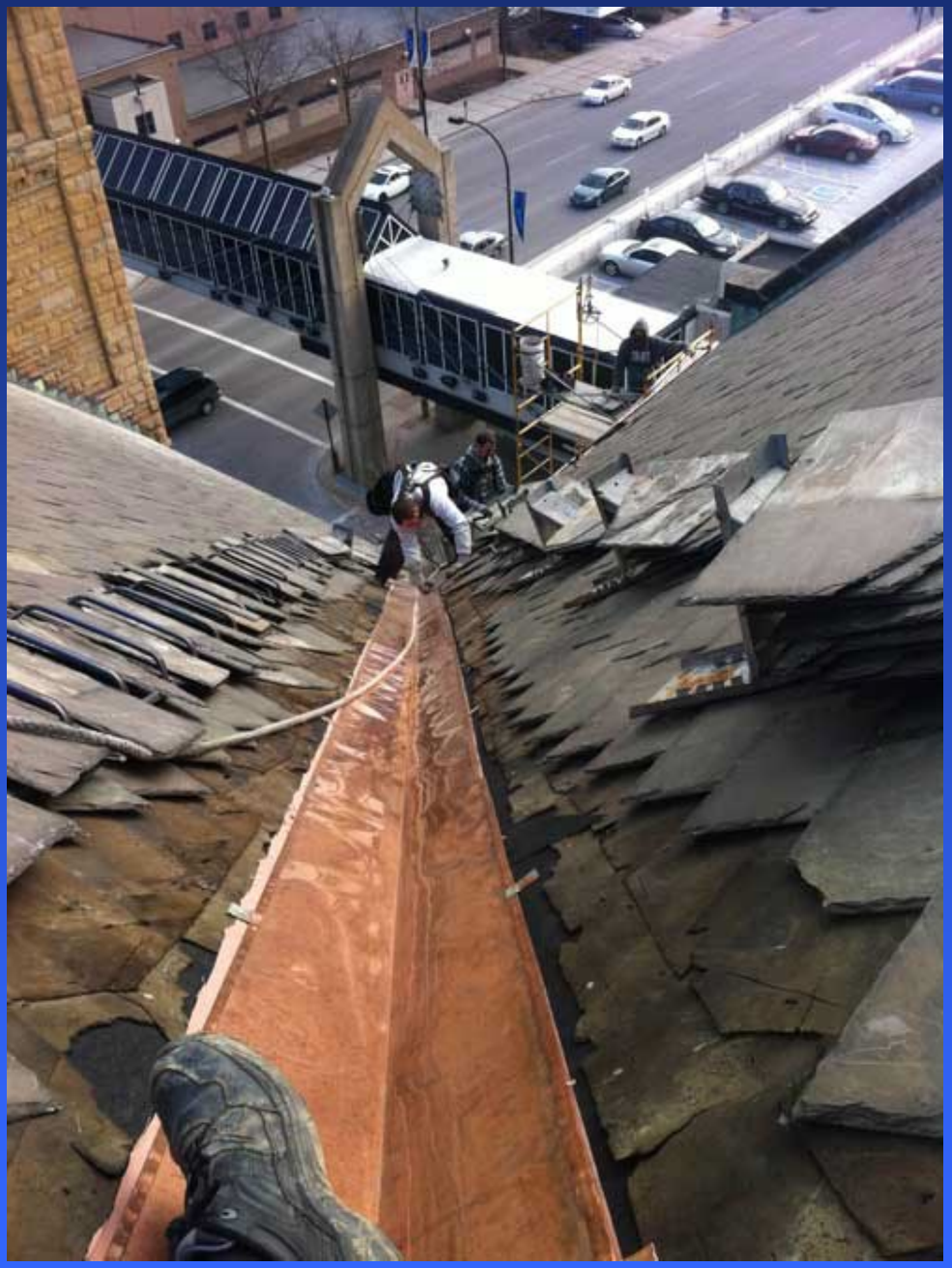
Hip roofs are relatively easy to access because hips can be carefully climbed up and down.

I was able to access this entire courthouse slate roof with only one short folding ladder carried inside a Prius.

The back side of the courthouse was against a hill. A short ladder allowed access to a hip. Once on the hip, the rest of the roof was accessed via ridges, valleys and built-in gutters.

On this church roof, workers already on the job site had scaffolding set up and a rope to hold on to.

It can be risky using other contractor's roof access equipment, but sometimes it's necessary.



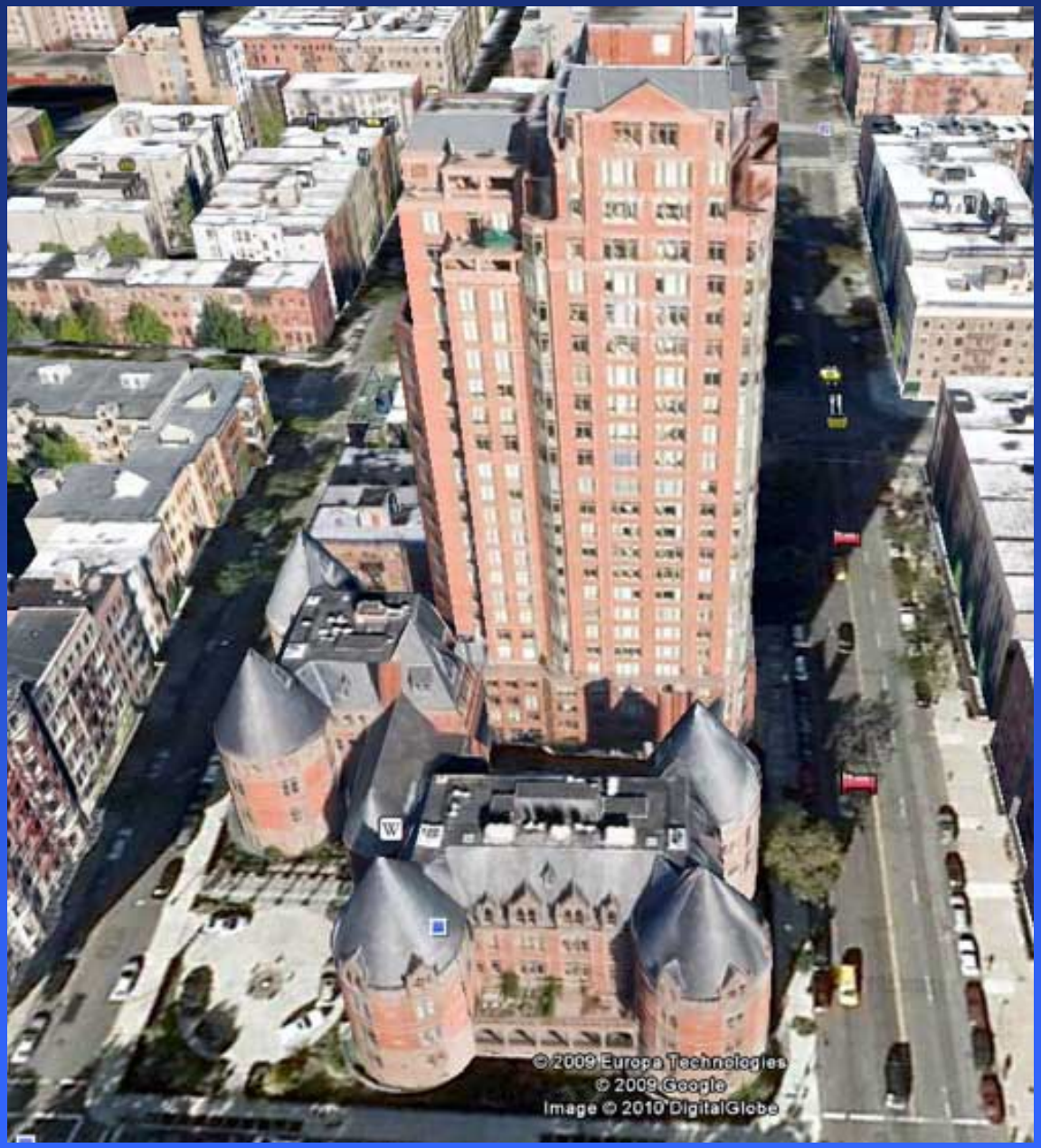
If you're really lucky, scaffolding will be set up around the building. This is in Manhattan, NY.

Articulating lifts require operators, access, and maybe permits. They are necessary on higher roofs.

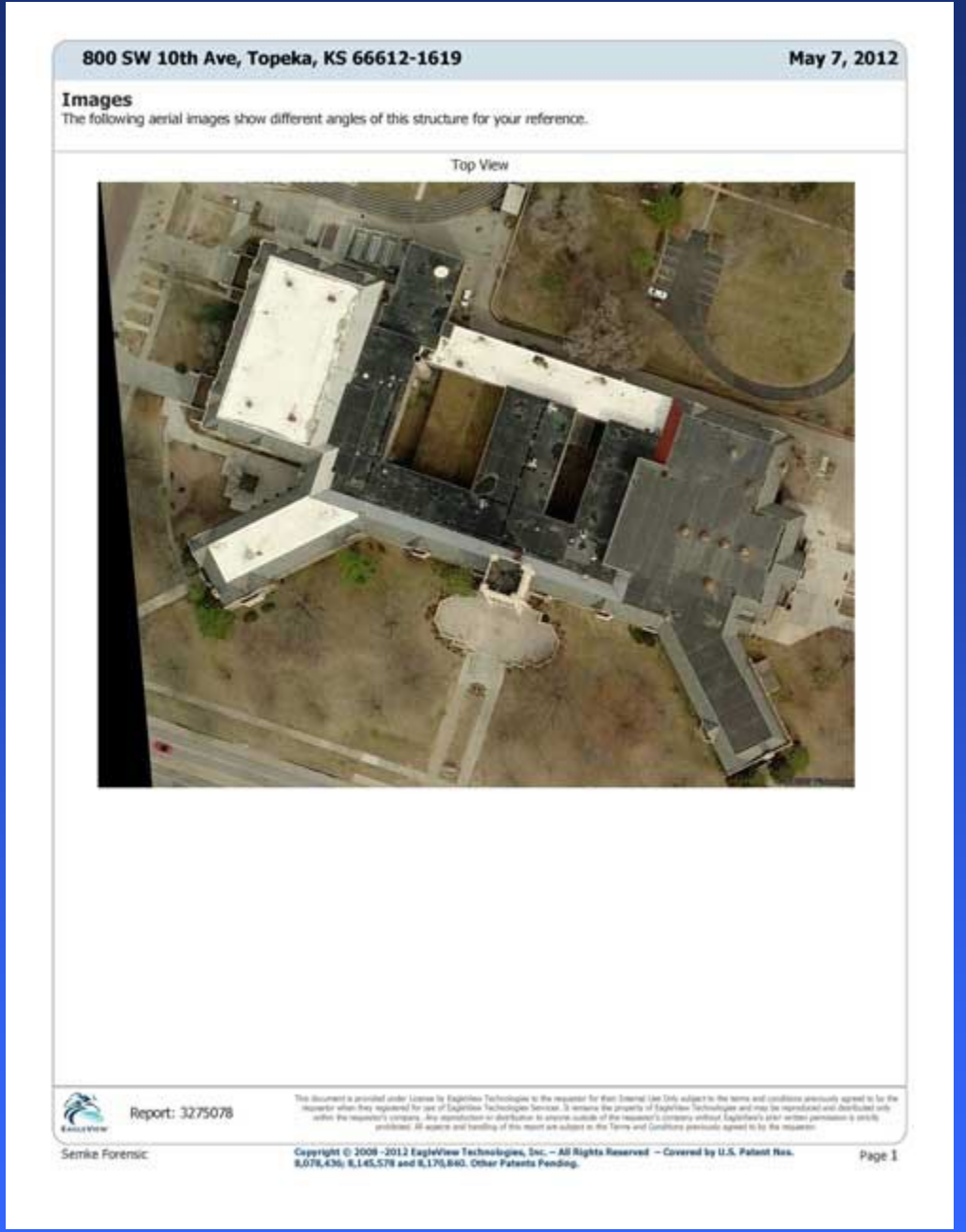
Get access to an adjacent building so you can get an overview, if possible. This is on Central Park West in Manhattan, NY.

This view is from a public parking garage next door to the site. This is in the Boston area.

Of course, don’t forget Google Earth, and Google Maps. You can gain amazing views of some buildings.



And make good use of “Eagle View,” “SkyTek,” and other online roof report services.



800 SW 10th Ave, Topeka, KS 66612-1619 May 7, 2012

Images

The following aerial images show different angles of this structure for your reference.

Top View

Report: 3275078

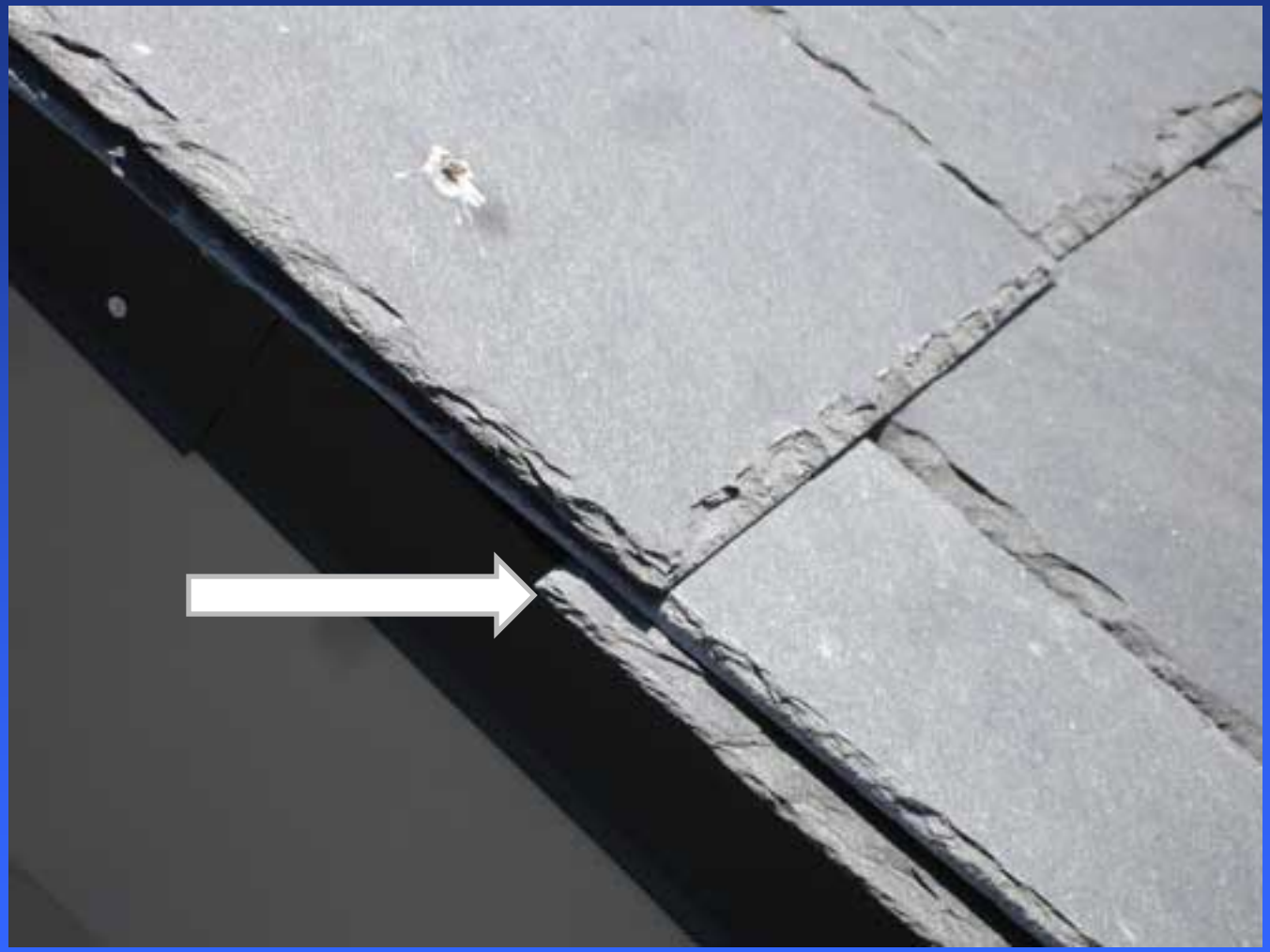
Semke Forensic

Part 4: INSPECTING THE ROOF

What to look for:

1. Anything broken
2. Headlap issues
3. Sidelap issues
4. Holes in slates
5. Flashing issues
6. Leaking areas
7. Metal incompatibilities
8. Photograph all surfaces!

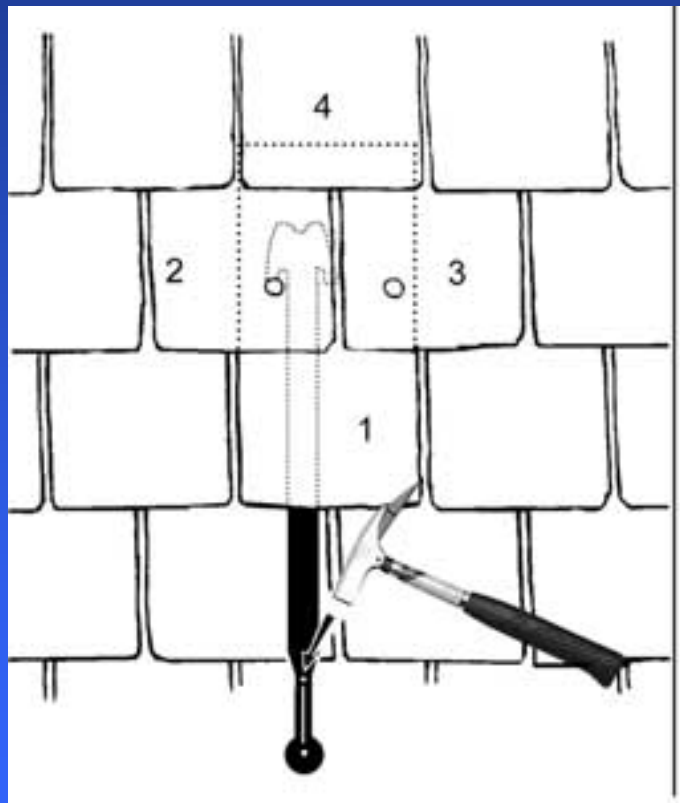
Headlap can often be observed at the gable ends.

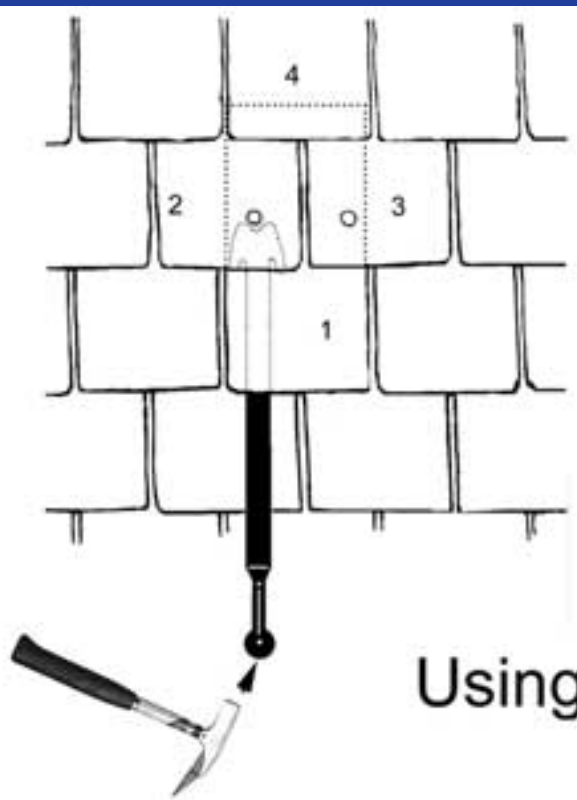


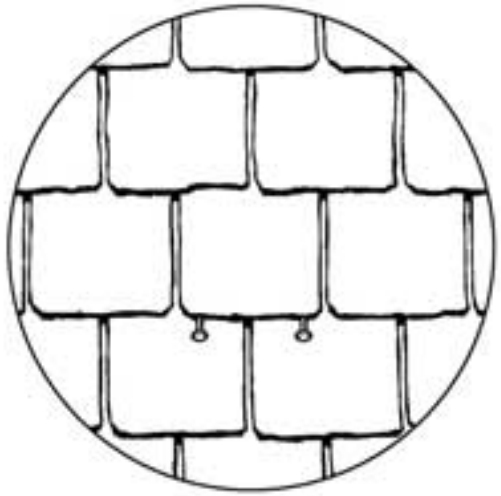
You may have to remove slates to inspect the roof deck or check the nails, underlayment, or headlap. You will need slater's tools for this purpose.

The basic tools are unique to the trade.

The slate ripper pulls out the nails so you can remove slates. It does not cut them.







Using the Slate Ripper

A slate can be re-installed using a “slate hook.”

An angle locator is helpful. It's necessary to know what the slopes are in order to determine the correct headlap.

A good digital camera that clips on to your belt is essential. You can't take too many photos! Also take video when needed. Video voice notes taken on site can be very helpful.

Broken Slates

Most of the fractures shown here are defects in the original Spanish slate rock. This is unusual.

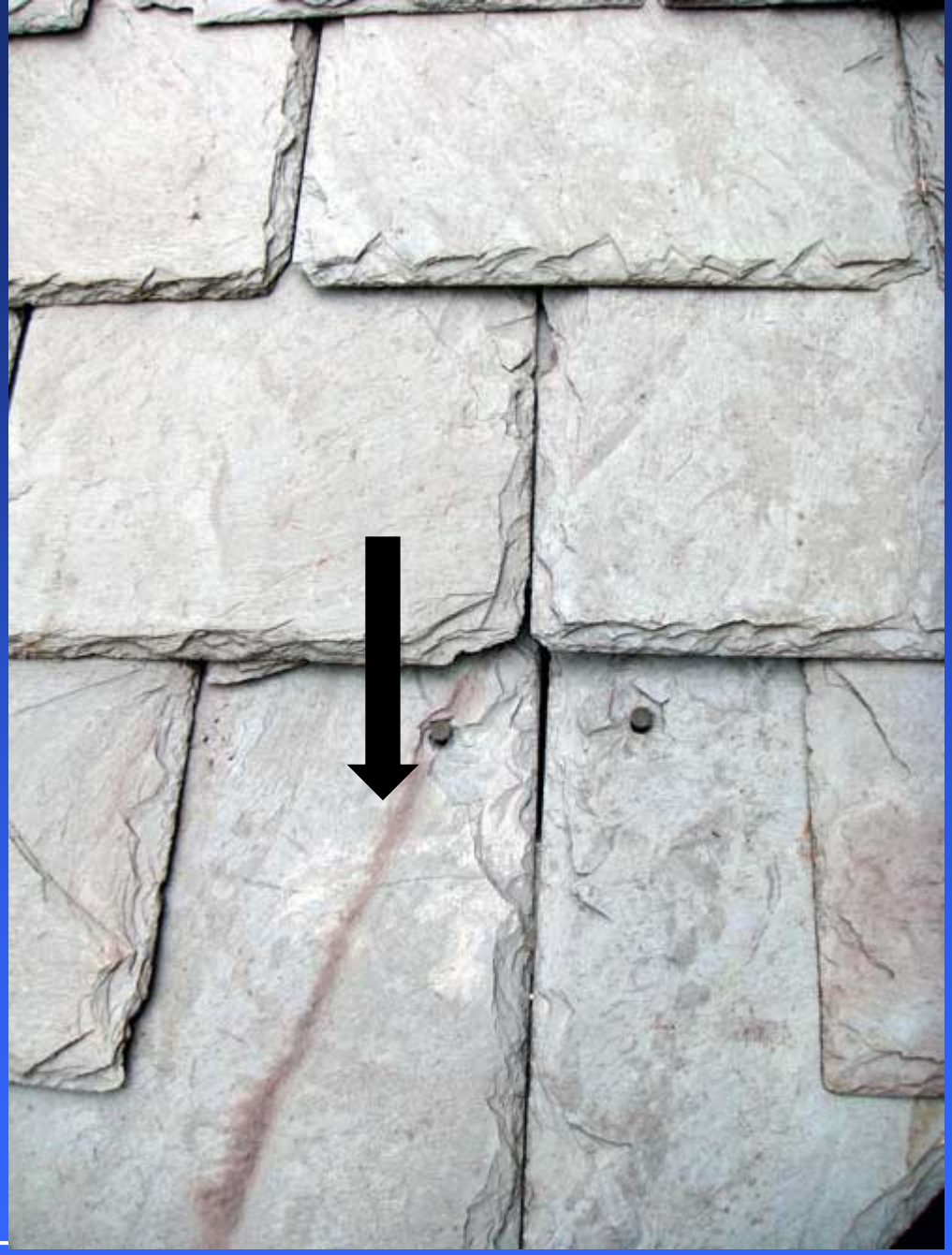
Classic foot-traffic damage:

Probable foot-traffic damage (the bottom half of the slate is broken off):

The wrong way to install a slate roof is by walking all over the slates!

Planks on roof brackets allow for a safer and better installation.

Probable foot traffic damage. Again, the bottom half of the slate is broken off.



Foot-traffic damage fallen off a hospital roof:

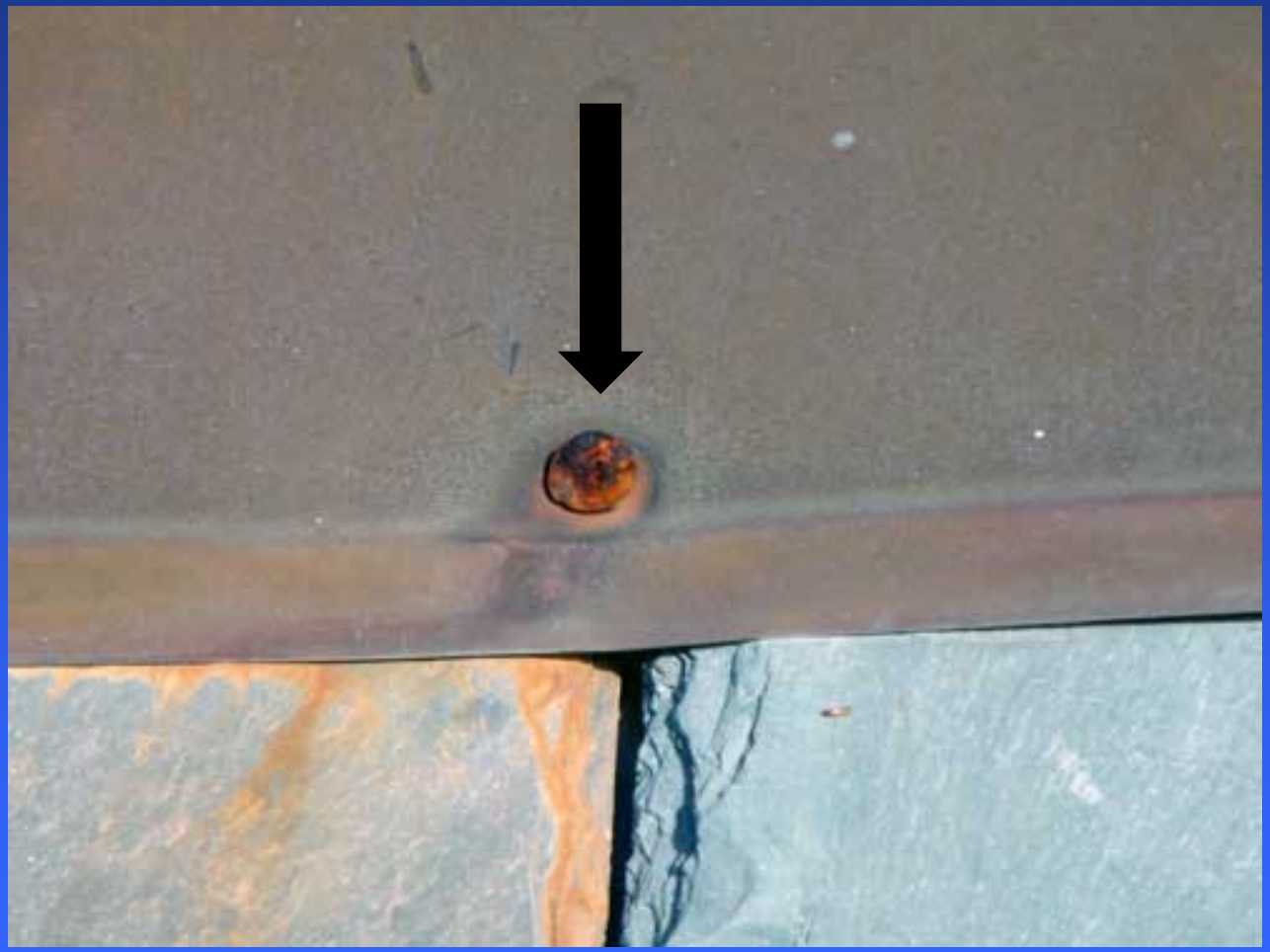
Look for accuracy of layout. Good layout indicates experienced roof workers.

A poor layout will have headlap issues. This installation was condemned, and the roof had to be replaced in its entirety.

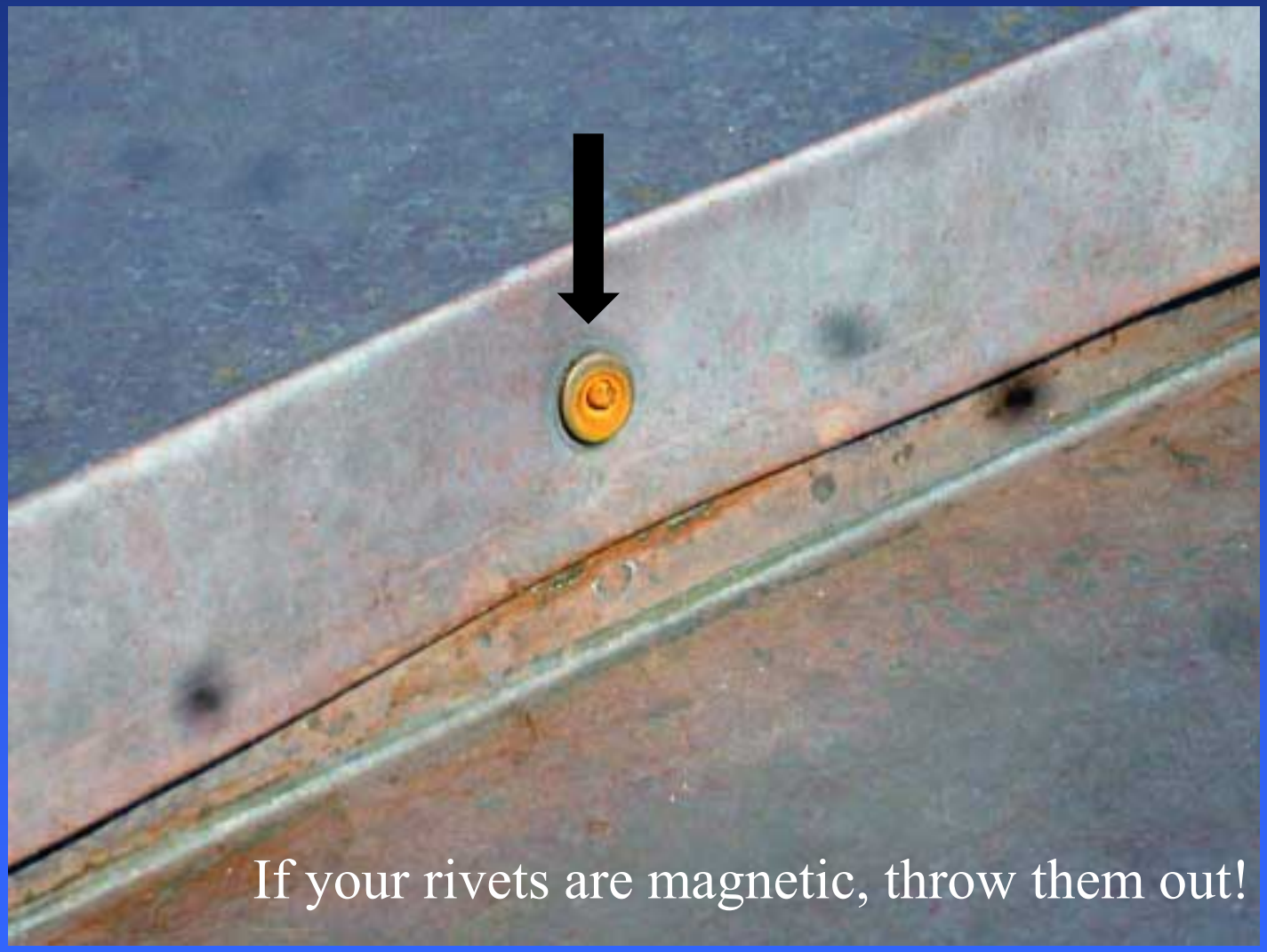
Any loose nail will create a leak:

Incompatible metals:

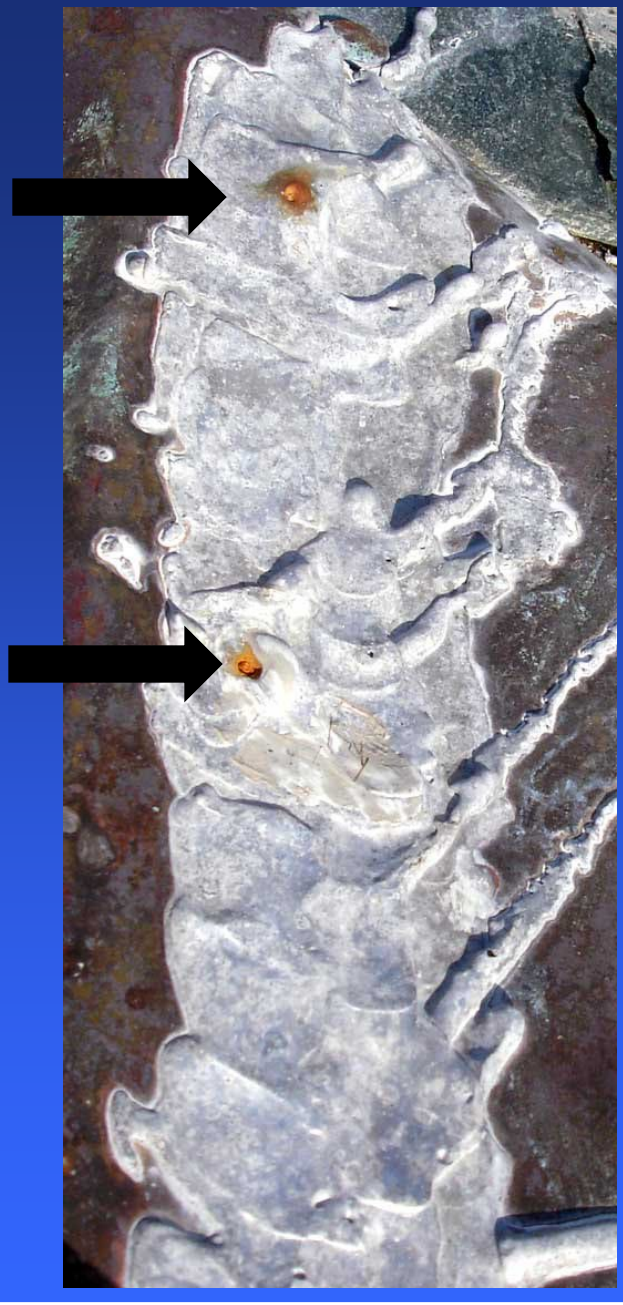
Copper flashing and steel nails don’t mix!



Steel-mandrel copper rivets are not compatible with copper flashing.

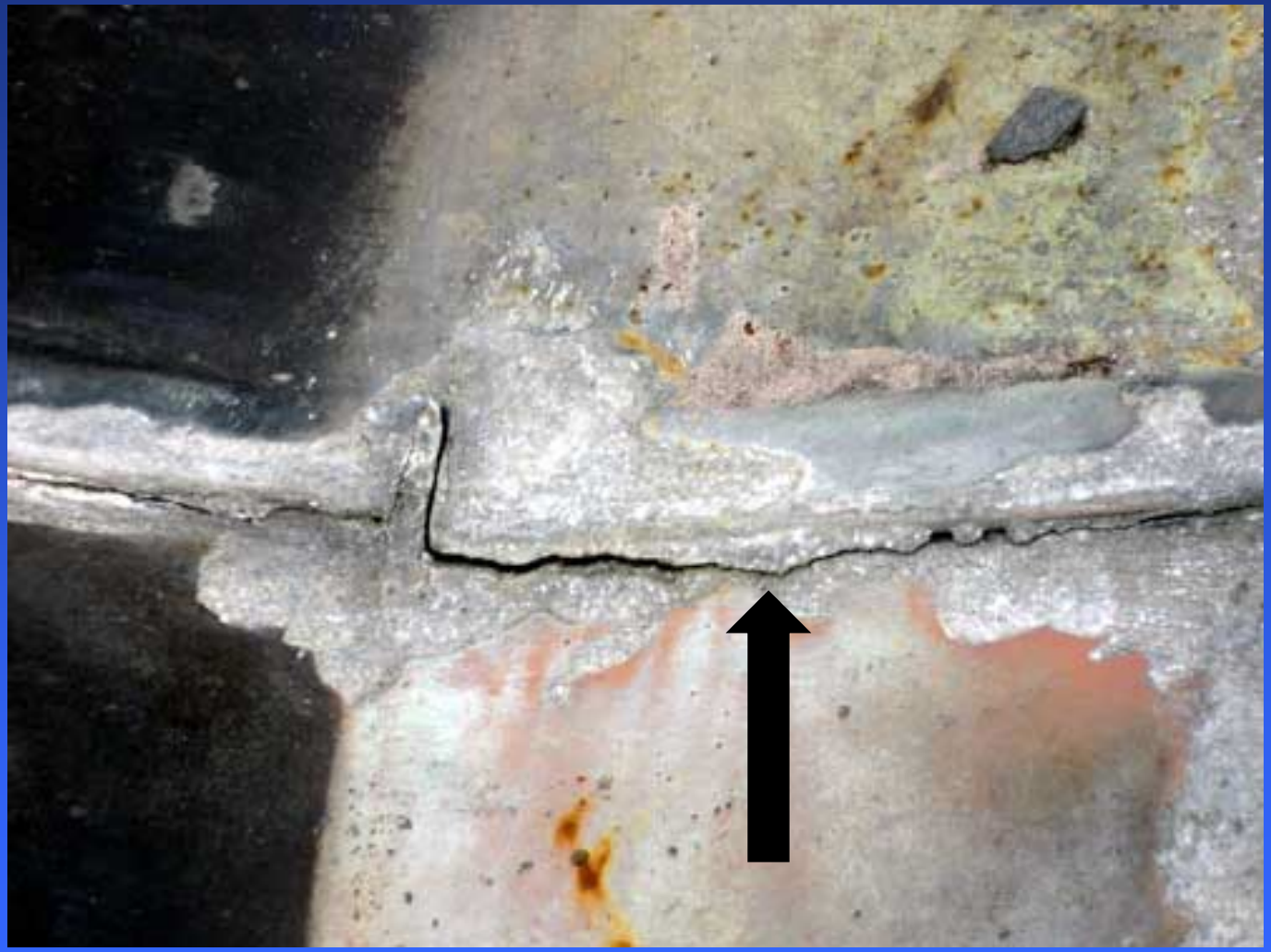


Steel-shank rivets will rust through tin-lead solder, leaving holes in the solder joint.



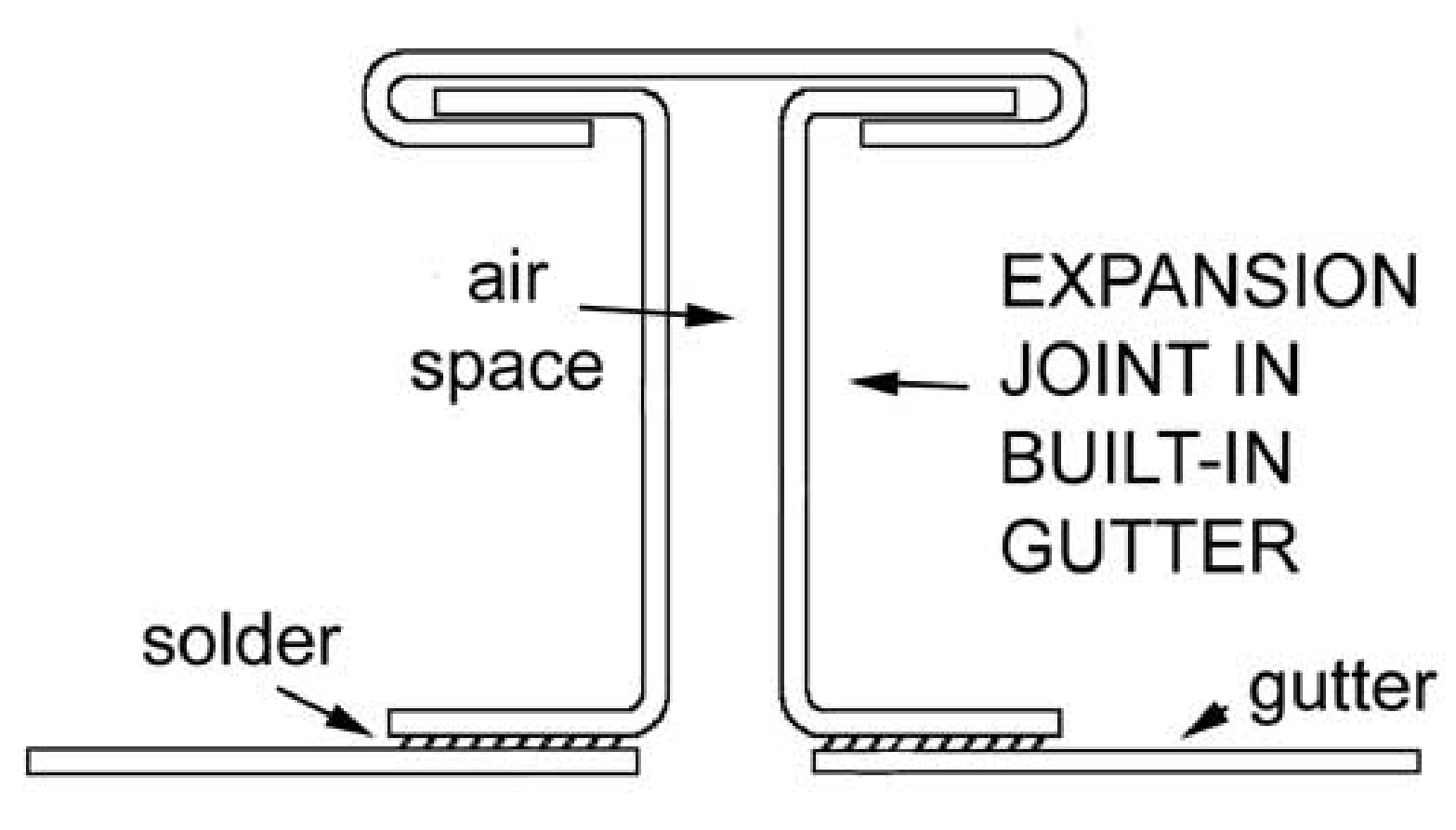
Built-in gutters often have problems at the solder joints, due to thermal expansion.

Solder joints will break from the pressures of expansion and contraction.



Expansion joints are needed in built-in gutter systems to prevent the solder joints from breaking.

The expansion joints take the strain off the solder joints.



Here is an expansion joint under construction. The joint can be added retroactively but it's much better if it's part of the initial installation.

Part 5: CASES

New roof, Indian slate, had to be completely removed and reslated.

Bad flashings, bad headlap, bad sidelaps, numerous installation errors.

New roof, Vermont slate, had to be completely removed and reslated.

Bad headlap, numerous installation errors. Residence, Pittsburgh.

New roof, Chinese slate, had to be completely removed and reslated.

Poor quality slate. Museum of the City of New York.

New roof, Chinese slate, had to be completely removed and reslated.

Bad flashings, bad headlap, bad sidelaps, numerous installation errors. Scottsdale, Arizona.

New roof, Chinese slate, had to be completely removed and reslated.

Bad slate quality, poor installation. “Red House” in Trinidad.

QUESTIONS?

Thank you for attending!