Introduction to Slate Roof Repair, Restoration, and Maintenance

V.2 2025

Slate Roofing Contractors Association of North America, Inc.

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REPAIR & MAINTENANCE



[Name of Instructor]

[State Credentials]

This course qualifies you for 8 Continuing Education Units via the American Institute of Architects.

This course was originally launched in May of 2020 and updated in January of 2025.

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This is an **introductory course only** and is not intended to fully prepare a student to be competent in all aspects of slate roof installation.

Years of practice in the field is the best way to develop competency in the slate roofing trade.

Advanced training courses may also be available. Ask your instructor.



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This is not a safety course.

Refer to OSHA for regulations pertaining to employee and public safety.

U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Ave NW, Washington, DC 20210; 1-800-321-OSHA; 1-800-321-6742; www.osha.gov

PERSONAL FALL ARREST SYSTEM (PFAS)

A PFAS is designed to safely stop a fall before the worker strikes a lower level. It includes three major components:

A. An ***anchorage*** to which the other components of the PFAS are rigged.

B. A full body ***harness*** worn by the worker.

C. A connector, such as a ***lanyard or lifeline***, linking the harness to the anchorage. A rip-stitch lanyard, or deceleration device, is typically a part of the system.

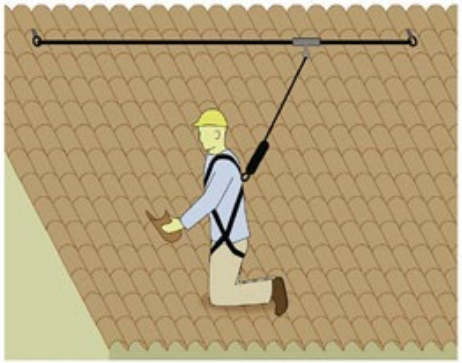


For more information on the requirements for a PFAS, refer to 29 CFR 1926.502(d).

Remember that for fall arrest systems, workers must use full-body harnesses. Body belts can cause serious injury during a fall, so OSHA prohibits their use as part of fall arrest systems.

HORIZONTAL LIFELINE

An engineered horizontal lifeline is another way to increase the area in which a worker is protected. The system should be installed following the manufacturer's instructions or under the supervision of a qualified person.



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WHAT IS THE SRCA?

A 501c6 international non-profit trade association.

Publisher of slate roofing guidelines, both installation and repair.

Developer of hands-on training programs.

American Institute of Architects Continuing Education Provider.

Member of the International Federation for the Roofing Trades.

Affiliate member of the National Roofing Contractors Association.

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Contractors Association

of North America, Inc.

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SRCA

Dedicated to the Preservation of Traditional Roofing Trades and Practices

SLATEROOFERS.ORG

May 2022 course graduates with Certificates of Completion.



REPAIR & MAINTENANCE

2024 course graduates with instructor Chad Brandon.



REPAIR & MAINTENANCE

Slate roofs can have phenomenal longevity. This Vermont roof was 173 years old in 2024.



REPAIR & MAINTENANCE

This is another existing Vermont slate roof.



REPAIR & MAINTENANCE

Slate roofing in the US dates back almost 300 years. (Peach Bottom slate is no longer quarried.)





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Slate was also popular for chalk boards and school tablets.

Slate Roof Survey (Inspection)

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A roof survey can be cursory for small repairs, or comprehensive for major projects.

A slate roof survey should be conducted by someone competent in slate roof repair and *restoration*, not just by a slate roof *installer* or *estimator*.

Estimators should have a working knowledge of slate roof *repair and restoration*.



When checking the underside of the roof, identify the type and dimensions of the lumber. Photograph signs of leakage. You can often view the fasteners from underneath the roof.



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A comprehensive roof survey requires that you document the roof slope, the roof insulation, and roof ventilation. Photographically record everything you can.



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When conducting a comprehensive roof survey:

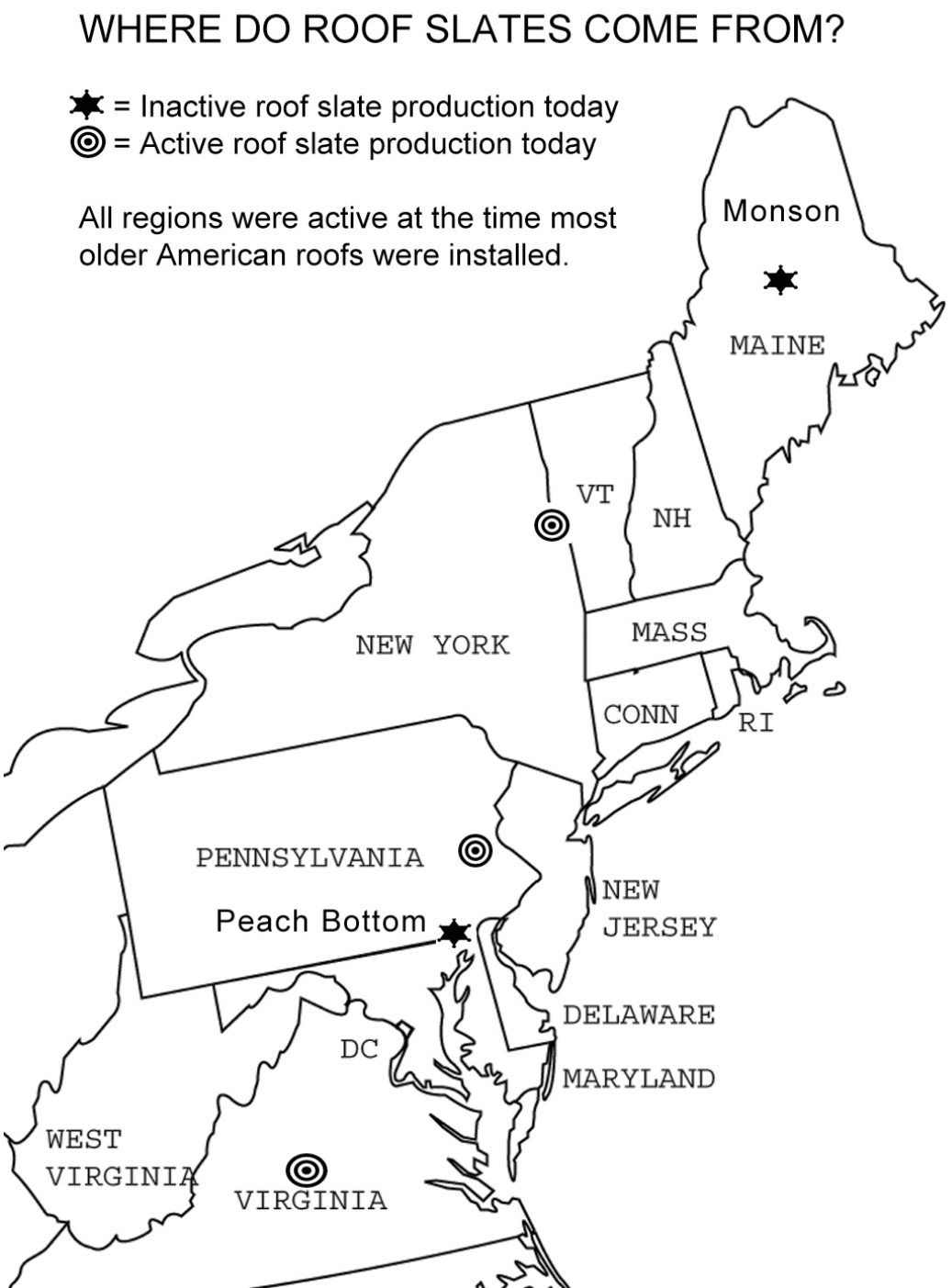
- Identify the slate and estimate the remaining longevity.
- Document the type, size, shape, thickness, color, weathering characteristics, age, and texture of the slate.
- A correctly installed roof with at least fifteen years of remaining life is a candidate for restoration.
- Full replacement of all or only a section of the roof may be part of the restoration process.



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Most existing American roof slates originated from the east coast of the US.

Newer roofs may be covered with imported slates from Spain, Canada, China, Brazil, or elsewhere.



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Examples of new Vermont slate.



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Vermont and NY slate at 100 years of age: purple, red, semi-weathering gray-green.



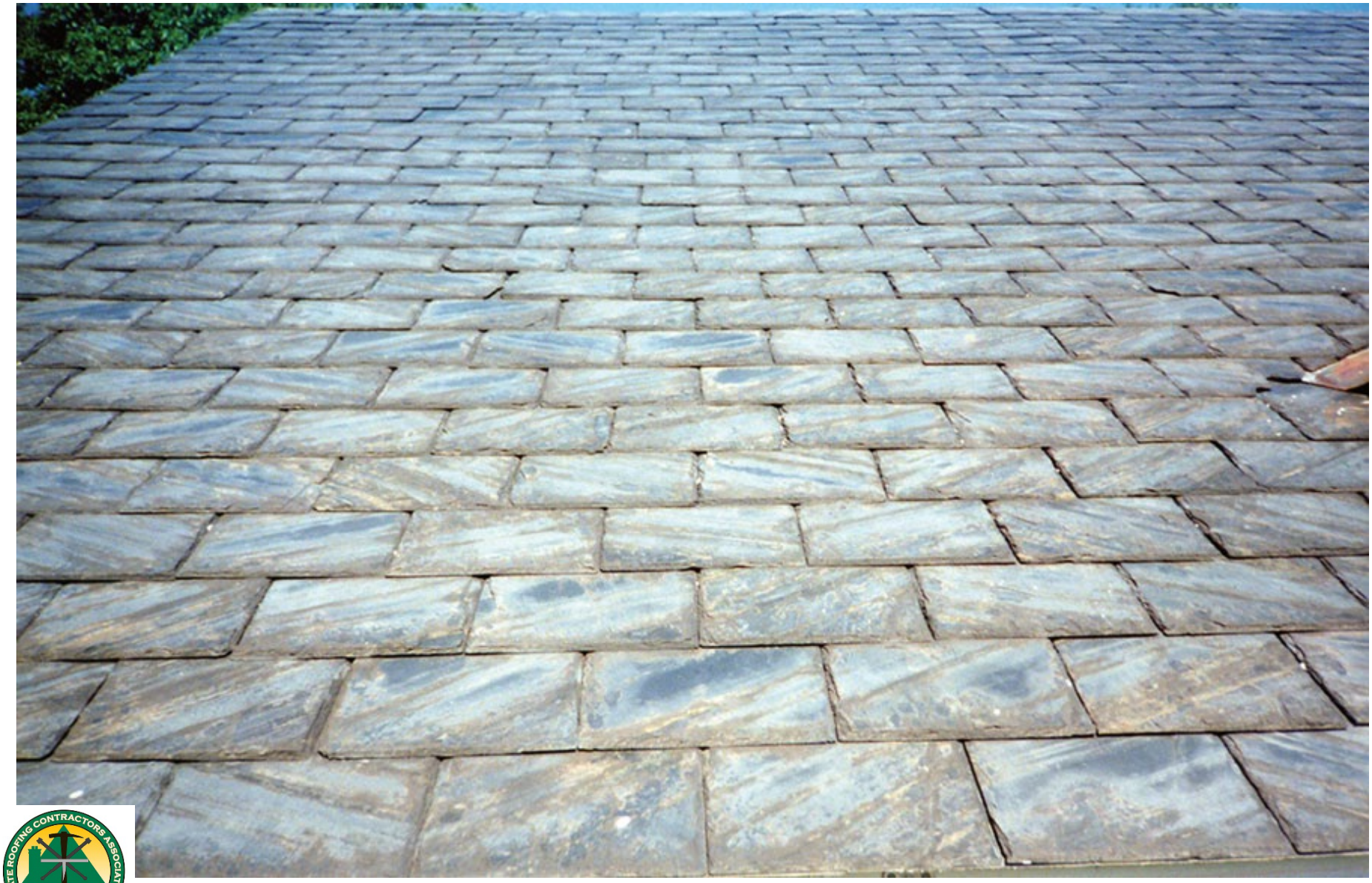
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Many old Pennsylvania black slate roofs are beyond repair and must be replaced.



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PA Chapman slate should last about 125 years.



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PA Bangor slate can last from 75 to over 100 years. It hasn't been quarried since the 1960s



REPAIR & MAINTENANCE

PA Cathedral Gray slate at 100 years shows no wear.



REPAIR & MAINTENANCE

Peach Bottom (PA/MD) slates easily last 100 years.



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Buckingham (Virginia) slates are very long-lasting and sparkle in the sunlight when closely examined.



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Chinese slates are also installed in the US. This is Chinese black roofing slate.



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Black Spanish slates are also popular in the US.



ROOF RESTORATION

The slates on this side of the roof were replaced with salvaged slates of the same size and type as the original 12x22 “sea green” slates.

The salvaged slates that were removed from this side were used to restore the back side.

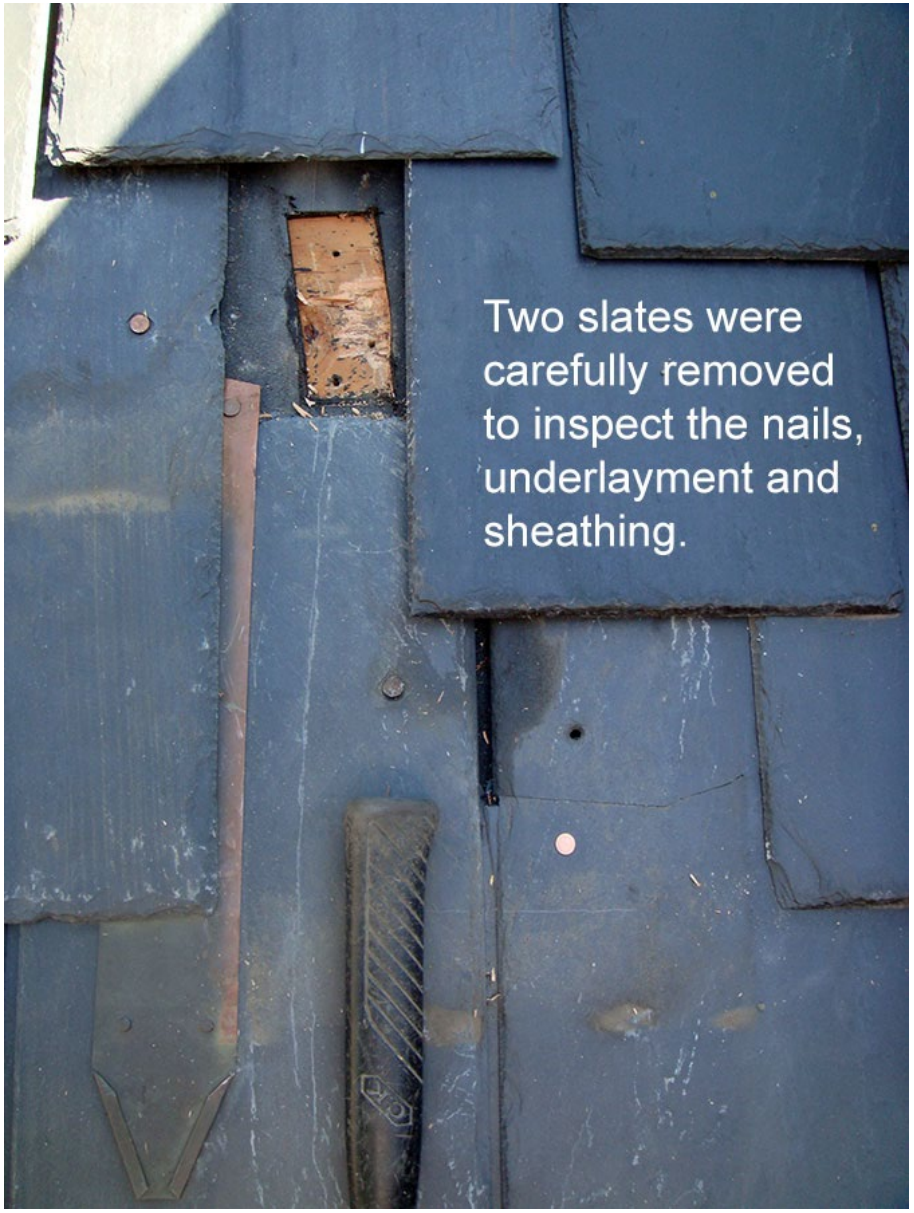




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When conducting a comprehensive roof survey, sometimes you must remove some slates.

- Substrate: wood (laminated?), concrete, gypsum, or metal?
- Nails: what type of metal and what length?
- Determine the headlaps and sidelaps.



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During the roof survey:



- **Examine all slate areas**: field slates, starter slates, ridge and hip slates, valley slates, etc.
- **Examine all flashings**: valleys, chimney flashings, step flashings, cap or counter flashings, ridge and hip metal, pipe vent flashings, parapet wall flashings, turret flashings, etc.

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When conducting a roof survey:

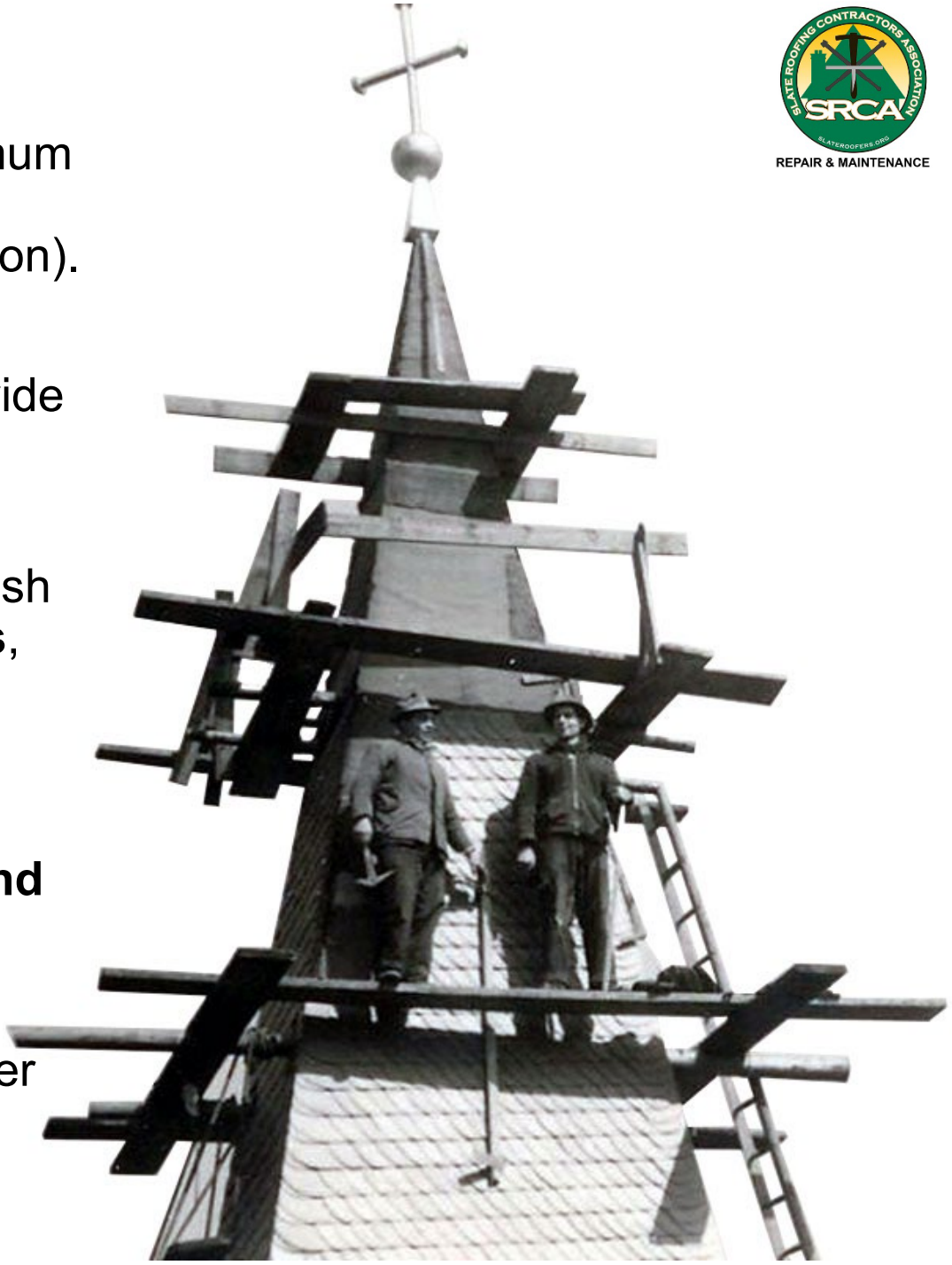
- On a closed valley, some of the lower slates may need to be removed to inspect the flashing metal underneath.
- Determine what other repairs are needed: flat-lock soldered roofs, built-in gutters, exterior gutters, skylights, chimney or masonry rebuilding or pointing, snow retention systems?



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CONTRACTORS

- Contractors should have a minimum of **five years** experience in slate roof *restoration* (not just installation).
- Contractors must be able to provide an acceptable **resume**'.
- Contractors must be able to furnish all necessary insurance, **permits**, labor, materials, and so on.
- Workers must be experienced specifically in slate roof ***repair* and *restoration***.
- Otherwise, workers must be under the full-time supervision of an **experienced supervisor**.



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CONTRACT DOCUMENTS

- Contractors must provide detailed contracts, including contingency fees or unit prices for unforeseen work, when needed. Contracts should include a detailed warranty, when required.

CODES & REGULATIONS

- Contractors should comply with all federal, state, local, and contractual regulations, and abide by applicable building, safety, and health codes.
- Contractors should also comply with Historical Society or similar regulations, when applicable.



PROTECTION OF ROOF SURFACES

- Workers must not damage slates by carelessly walking on them.
- The roof must be properly staged to prevent damage from foot traffic.
- Roof ladders, hook ladders, and other such devices can also be used to protect the roof from foot traffic.



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Roof brackets and scaffold planking allow for safe work surfaces on steep roofs.

Note the “chicken ladders” between the planks.



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Stage the roof for worker safety and to protect the slate.

OSHA now requires two roof brackets per scaffold plank.

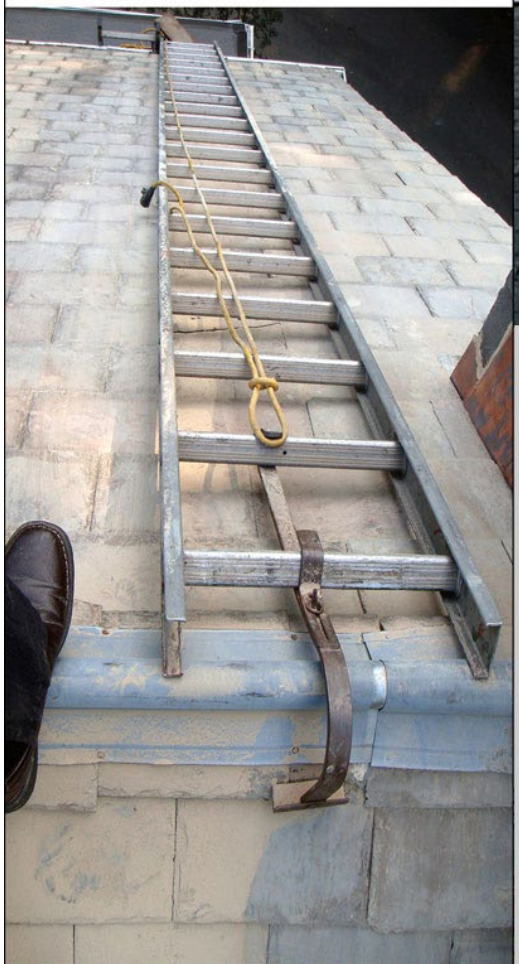


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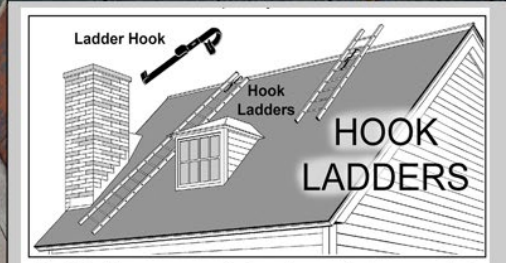
Hook ladders allow safe access to steep roofs while protecting the roof from foot damage.



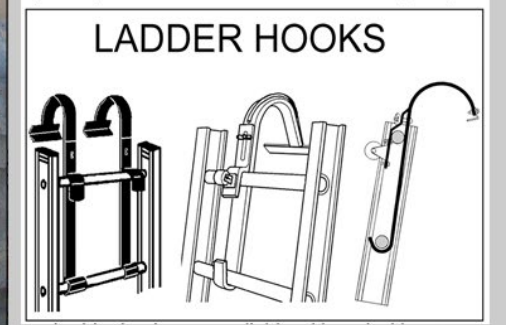








Hook ladders are angled on the roof when needed (above). The hooks can be installed on any rungs.

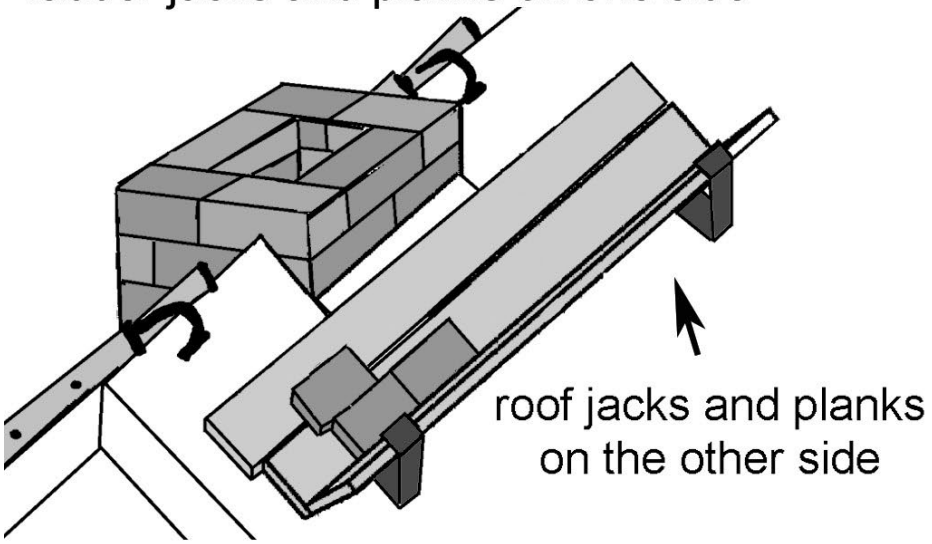


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Hook ladders, roof brackets, and ladder jacks allow for versatility when working on steep slopes.



ladder jacks and planks on one side



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CLEAN UP

- Clean up daily, including gutters and roof areas.
- The property owner should remove or cover valuable items in open attic spaces prior to roofing work.

WARRANTY

- Warranty terms should be clearly detailed in the contract documents.
- The contractor is not responsible for damage caused by other persons, severe weather, or by “acts of God.”
- An extended service maintenance agreement is recommended beyond the warranty period.

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GENERAL MAINTENANCE

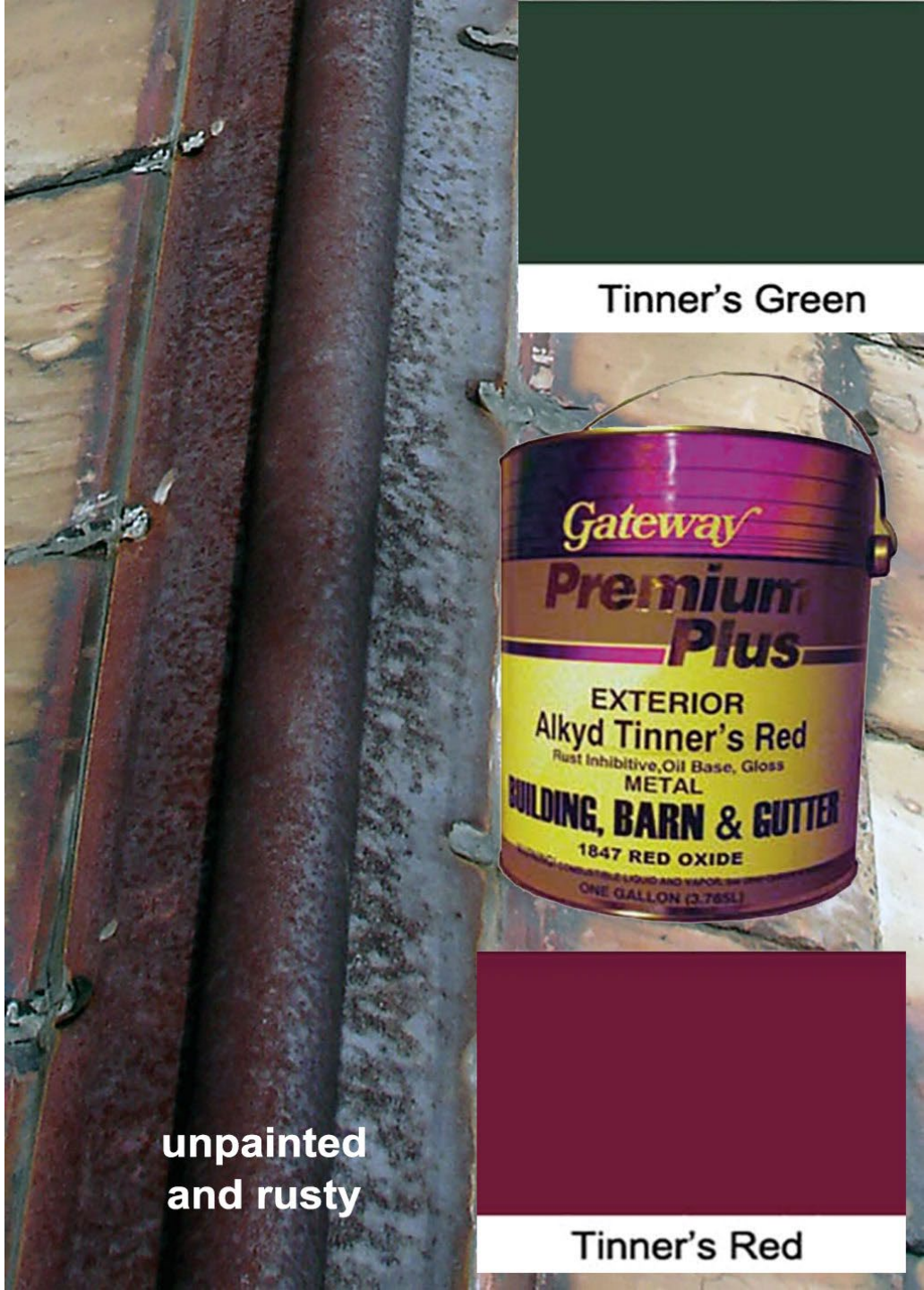
- Replace broken, missing or defective slates.
- Remove and replace old faulty repair work.
- Paint, repair, or replace flashing metal.
- Conduct emergency repairs when needed.



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PAINTING OF FLASHING

- Old metal flashings can be preserved with *Tinner's Red* or *Tinner's Green* paint or other suitable metal paint.
- Painted roof flashing should be repainted about every five years.
- Or replace "tin" flashings with copper and eliminate the need for paint.



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- Note how rusting metal permanently stains the roof.
- Regular painting of “tin” flashings will prevent this from happening.



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REPAIR OF FLASHING

- Existing flashings must be sealed with a high-grade caulk/sealant where needed.
- Loose flashings must be riveted or refastened.
- Missing flashings must be replaced with compatible flashing metal.



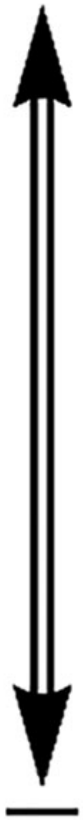
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Understand Metal Compatibility

Metals at the opposite end of the chart are NOT compatible. Do not use zinc coated nails on copper, for example.

Galvanic ActionChart

To minimize the possibility of corrosion, avoid contact between metals at opposite ends of the chart. Terne metal should avoid aluminum and copper.



\+ **MORE ELECTROPOSITIVE (Anodic)**

Zinc
Aluminum***
Galvanized steel *(Avoid copper)*
Cadmium
Mild steel, wrought iron
Cast iron
Stainless steel (Types 304 and 316 active)
Lead-tin solder
Lead
Brass, Bronze
Copper**
Stainless steel (Types 304 and 316 passive)*

— **MORE ELECTRONEGATIVE (Cathodic)**

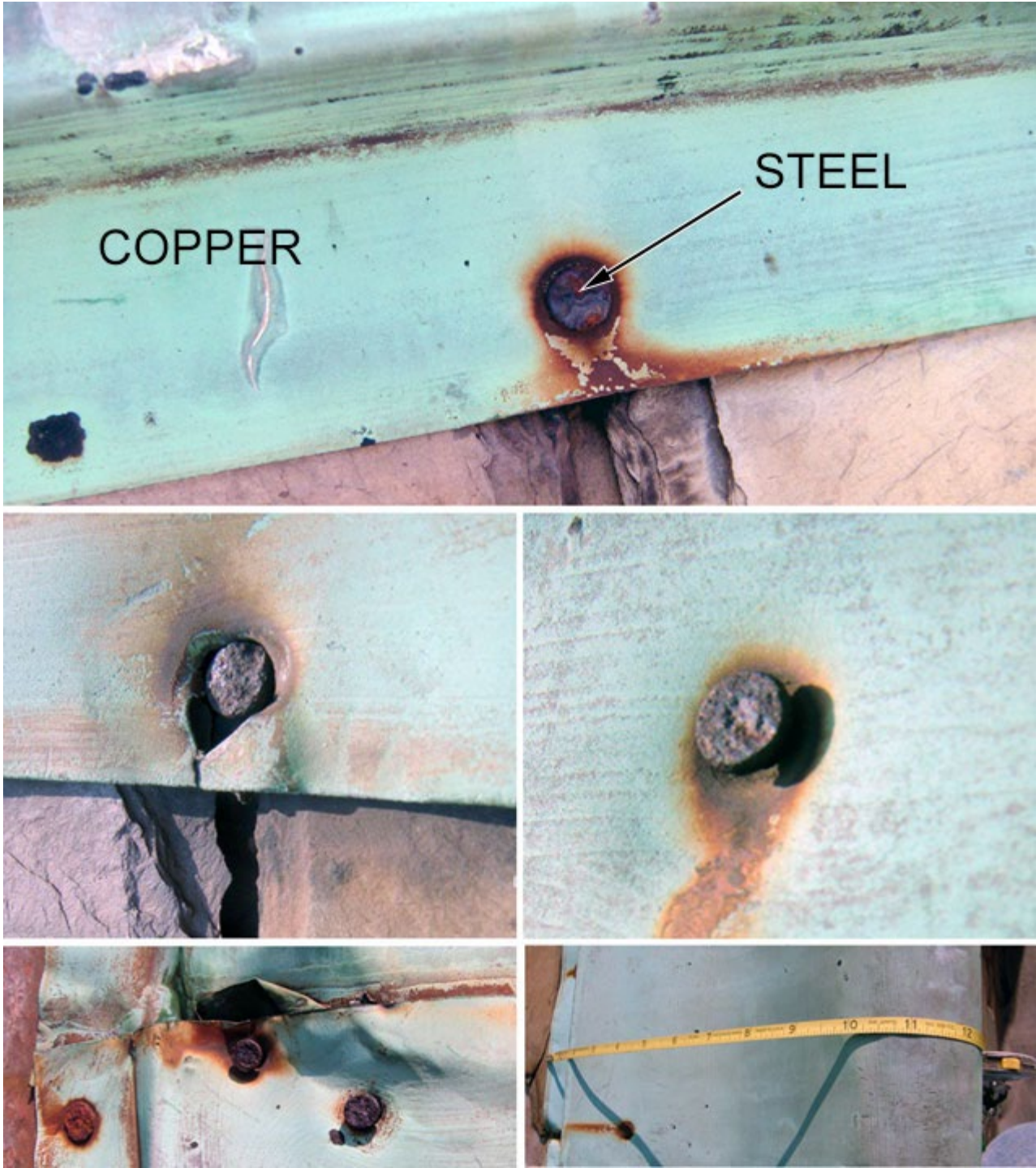
* This stainless steel is chemically treated, usually with an acid solution, to be made passive. ***(Avoid uncoated aluminum, steel, zinc, or galv. steel).* ***Anodized aluminum is considered compatible with all other metals.

Source: *Architectural Sheet Metal Manual - 5th edition*; Sheet Metal and Air Conditioning Contractors National Association; p.9.13.

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Incompatible Metals

Copper will “eat” steel.



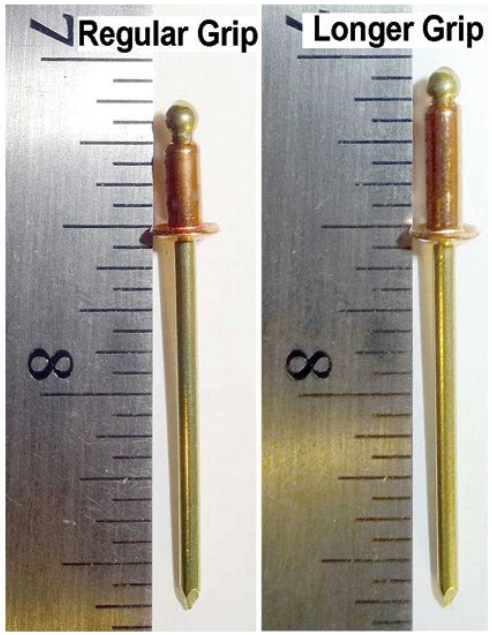
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Use Correct Rivets!

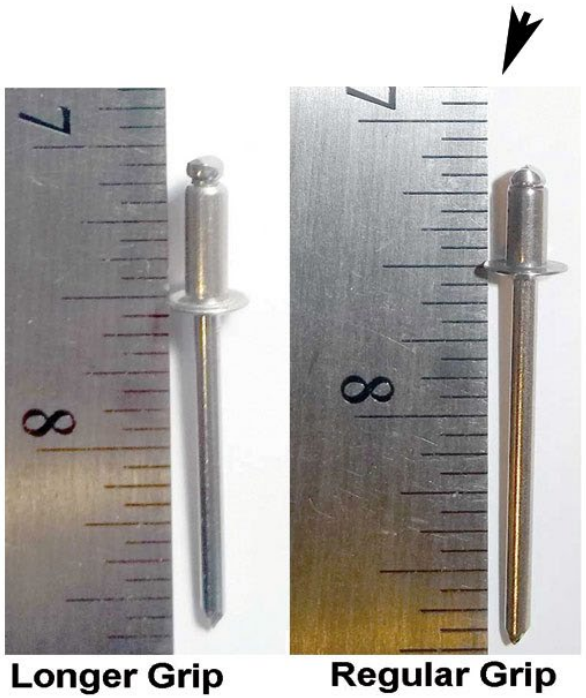
- Copper-plated steel rivets look like copper but have steel mandrels.
- They rust and leave a hole in the rivet.
- The rust also stains the flashing.



Copper Rivets
with Brass Mandrels
for riveting copper flashings



Stainless Steel Rivets
for riveting all sheet metal



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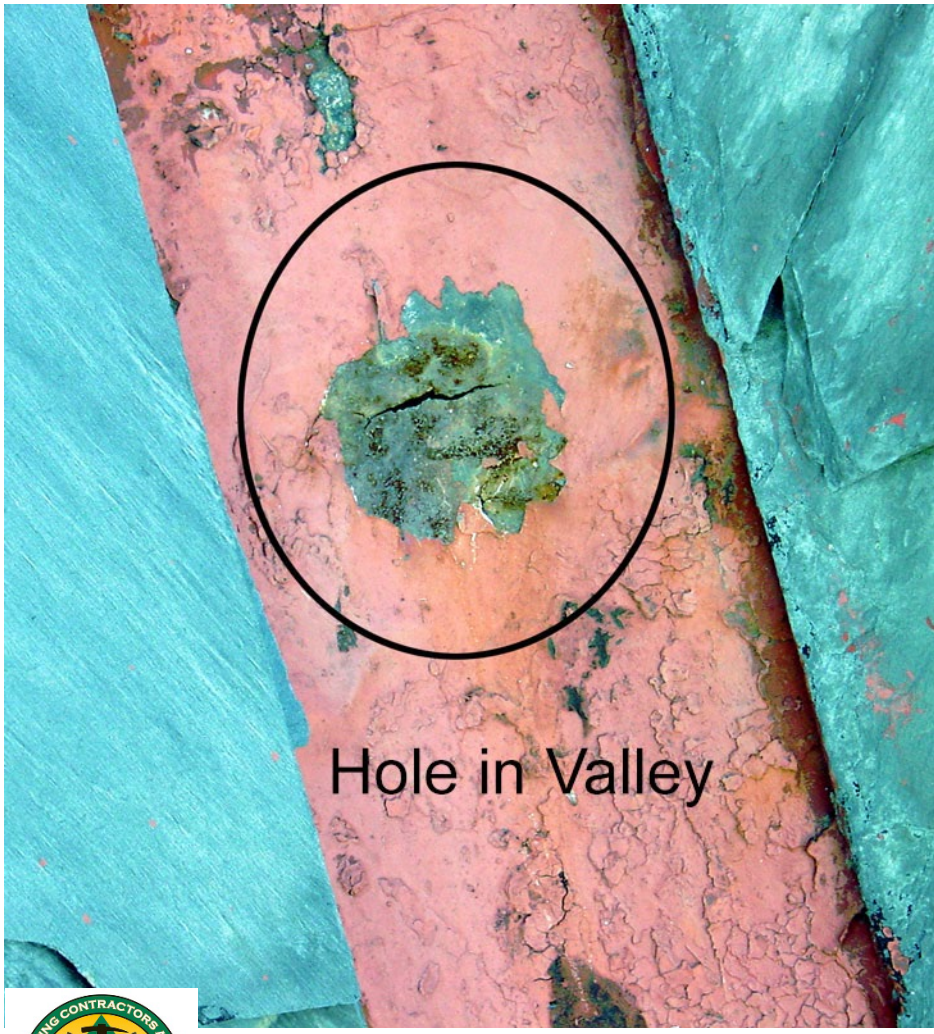
TEMPORARY EMERGENCY REPAIRS

Temporary emergency repairs can be conducted on flashings when:

Painting will no longer preserve the metal.

The property owner can't afford to have the flashings replaced immediately.

Entire roof replacement is neither desired nor needed.



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MASTIC REPAIRS

Flashing can be coated with a trowel-grade roof cement, brush grade mastic, or other sealant (a warranty may not be included).

Reinforcing membrane, such as fiberglass mesh, is recommended to be used in all mastic repairs.

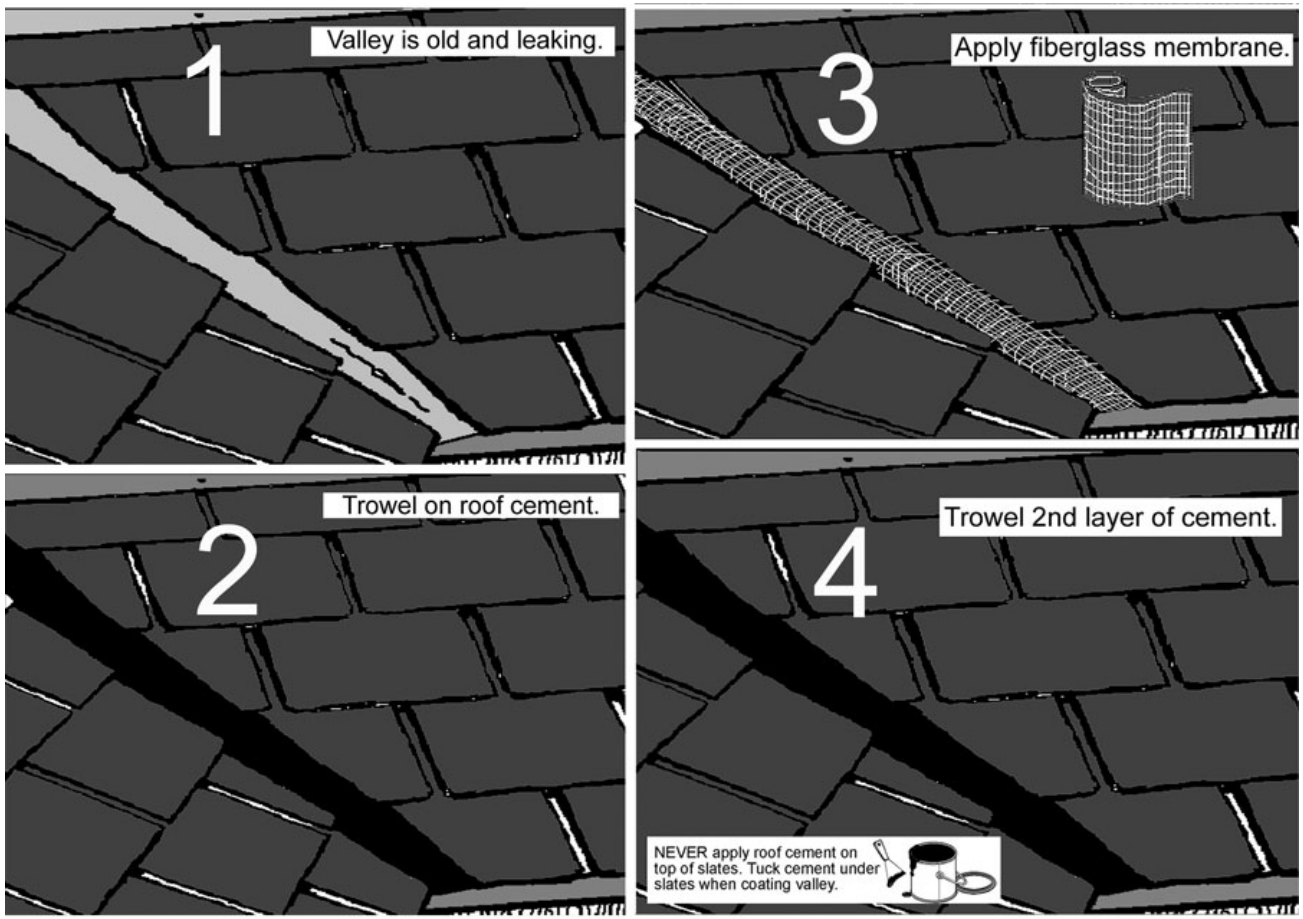
Avoid applying mastic or sealant over the exposed surface of slates, bricks, or other surfaces to be preserved.



EMERGENCY REPAIR OF VALLEY FLASHING

Use trowel grade roof cement and fiberglass mesh reinforcement.

Do not apply roof cement on top of the slates! Tuck cement under the valley slates using a pointed trowel.

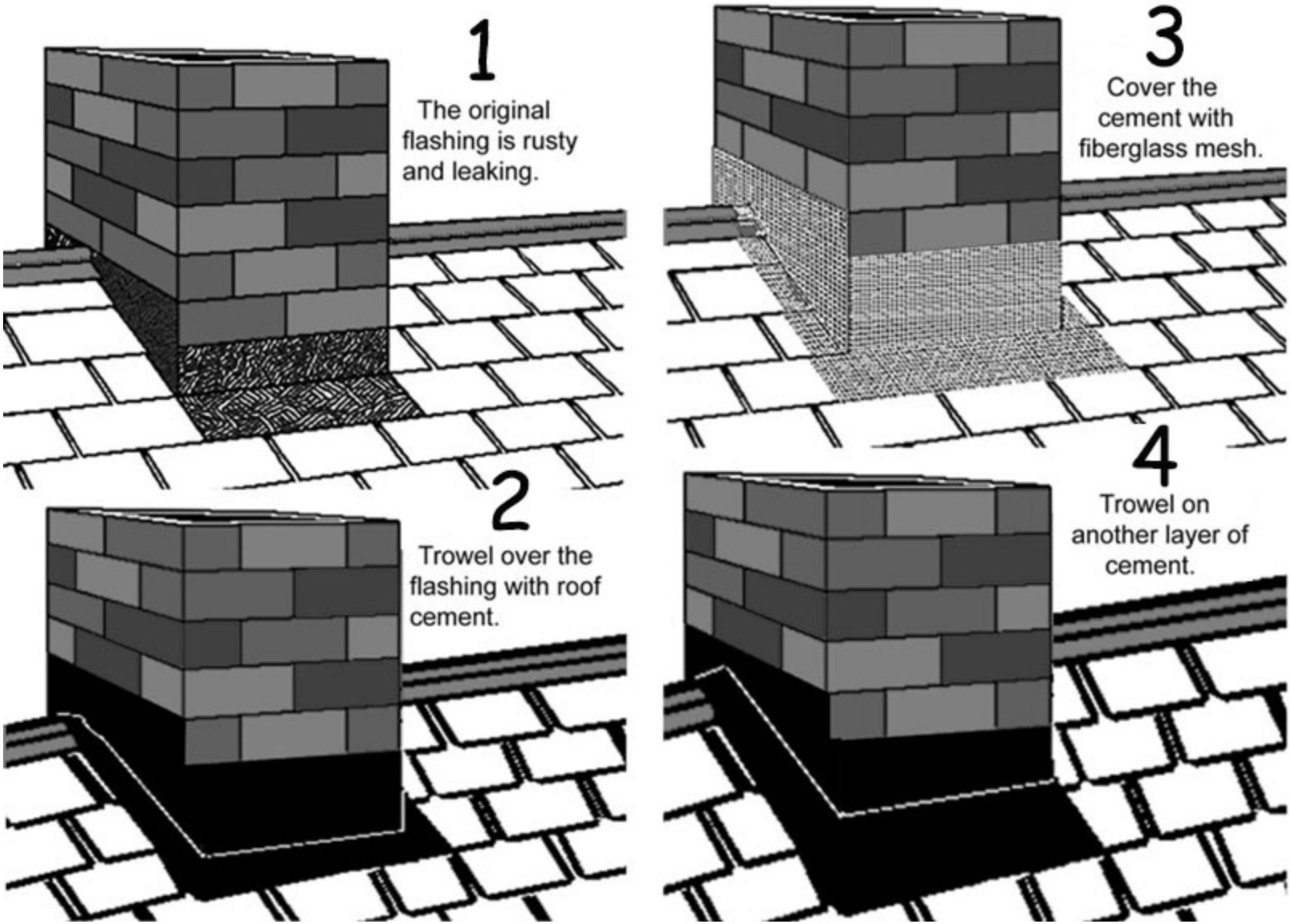


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Emergency Chimney Flashing Repair

Use trowel-grade roof cement and a fiberglass mesh backing.

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A TEMPORARY MASTIC REPAIR:

The roof cement (mastic) and fiberglass repair on the left chimney was painted for aesthetic purposes.

The repair prevented the chimney from leaking until it was rebuilt and reflashed the following year (as shown in the photo on the right).





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Examples of unacceptable mastic repairs on chimneys.





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TEMPORARY REPAIR OF BUILT-IN GUTTER LININGS

Built-in gutters can be temporarily preserved with a brush-grade roofing compound layered with a reinforcing mesh membrane.

Built-in gutters can also be temporarily preserved with a self-adhering membrane (such as EPDM).

Larger holes in gutter linings may first need to be patched with trowel-grade roof cement and fiberglass reinforcing membrane.



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This is a temporary repair of a built-in gutter using EPDM. This can last about 10 years.



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REPLACEMENT OF A BUILT-IN GUTTER LINING

This shows an EPDM-patched built-in gutter correctly relined with 20-ounce soldered copper.



TEMPORARY PATCH



PERMANENT REPAIR

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SLATE REPAIR





The repair of a missing or damaged slate can be accomplished by sliding a bib flashing *underneath* the defective slate.

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Keep caulk and tar off the slates!

Broken or missing slates are not to be repaired with mastic or caulk applied on the exposed slate surface.



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Never apply mastic (tar) on the surface of roof slates!



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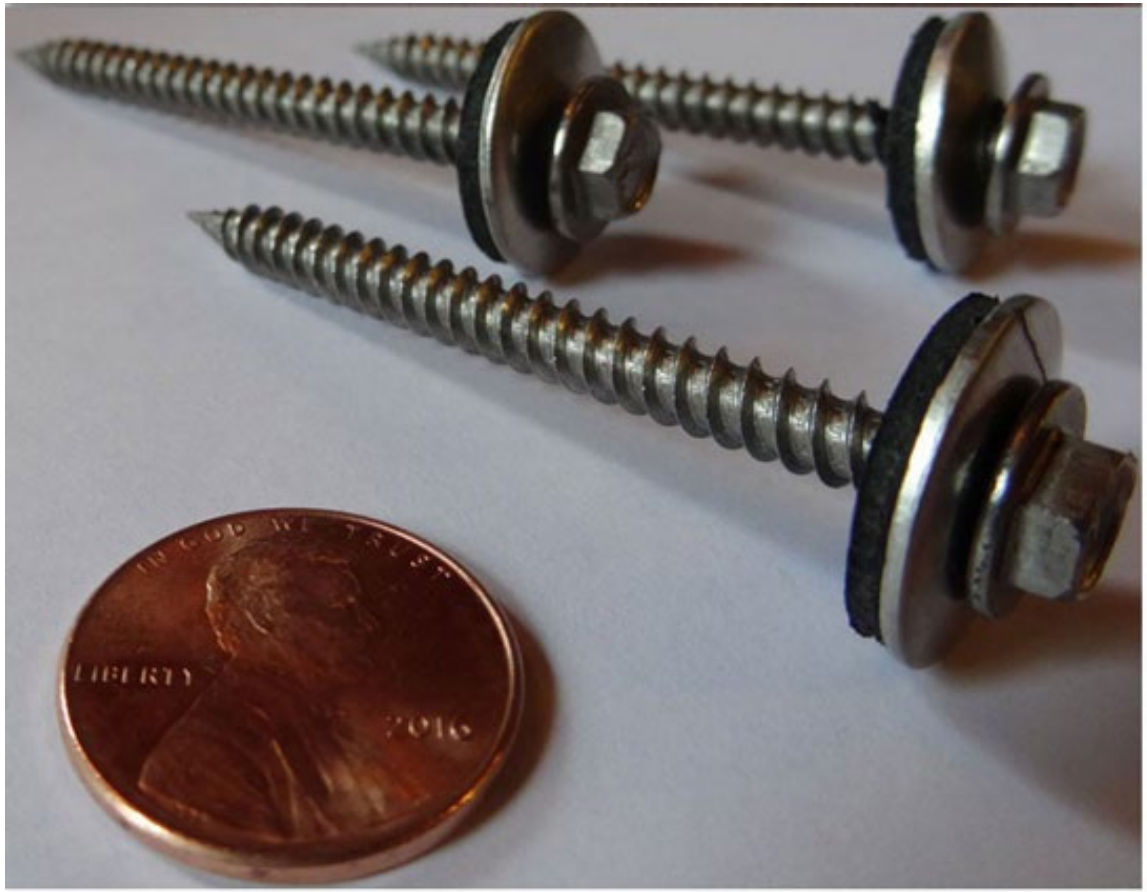
REPAIRING EXPOSED FASTENERS

This is an example of a poorly installed apron flashing with exposed nail heads. The installers should have used cleats or clips, or gasketed fasteners.



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Remove nails with exposed heads and replace them with gasketed fasteners. This is better than just caulking over them.





Metal-Panel Screw with EPDM Washer



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“Cleats” or “clips” can fasten flashings without leaving any exposed nail heads.





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This is an example of an exposed nail head that can be pulled out and the hole soldered over. Also, the nail could be replaced with a gasketed stainless steel screw or nail.



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SLATE REPAIR

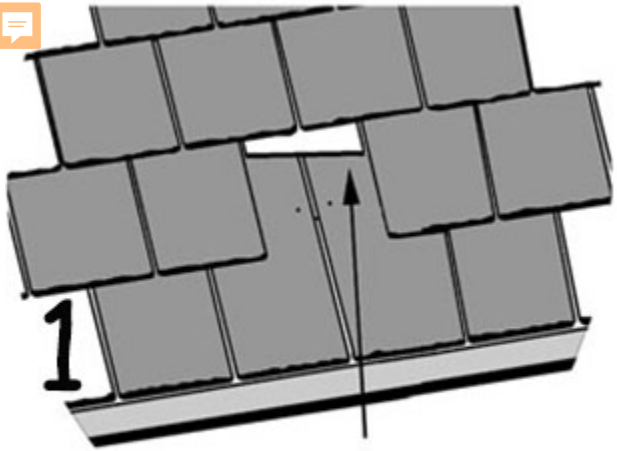
Defective slates should be removed using a slate ripper. Slide the ripper underneath the slate you want to remove and hook its nails. Then beat the ripper and pull on it at the same time to pull out the nails, one at a time.

Keep the handle of the ripper down against the roof surface when hammering on it.

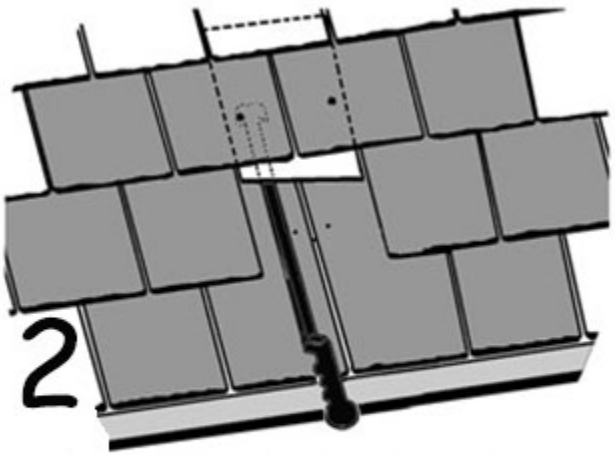
If the handle is lifted during use, it can break overlying slates.

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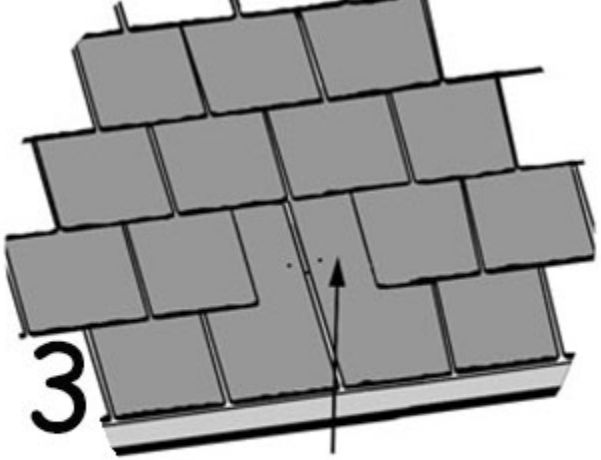




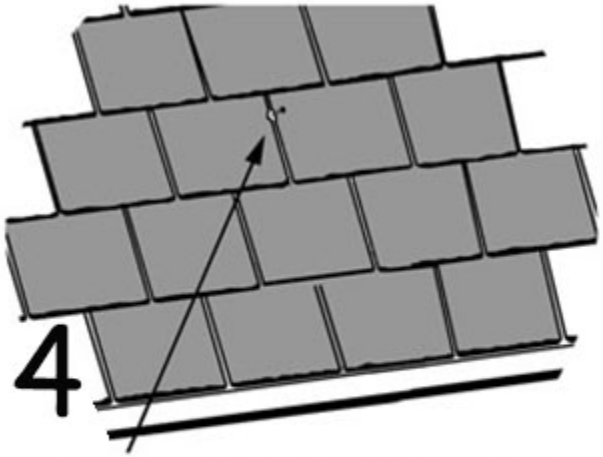
Broken slate needs to be replaced.



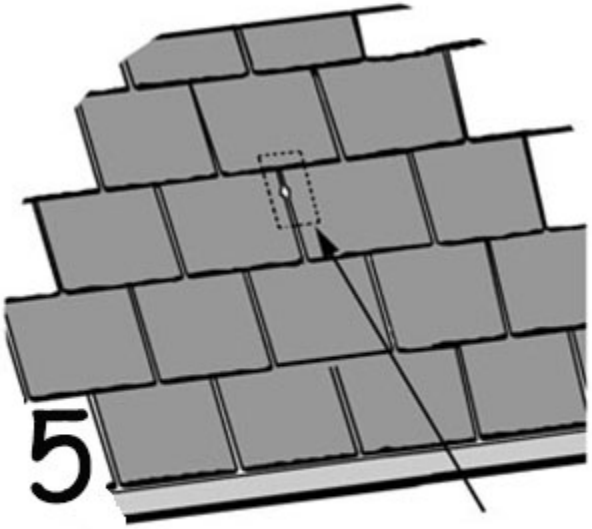
Slate ripper hooks slate nails and pulls them out, removing slate.



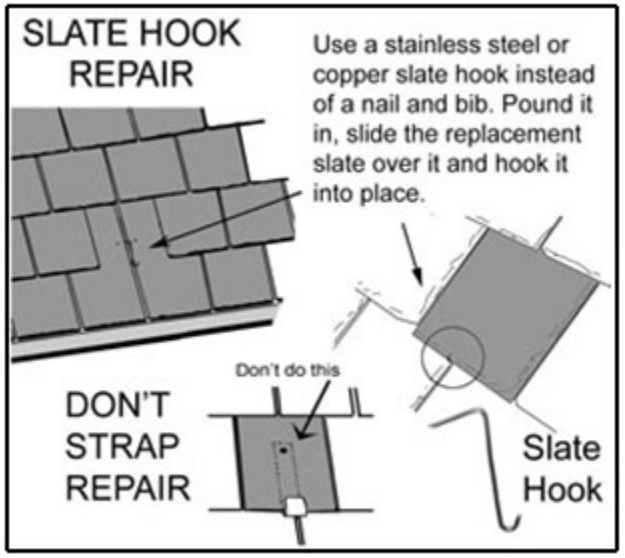
The slate has been removed and the roof is now ready for a replacement.



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.



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BASIC REPAIR SEQUENCE

USE MATCHING REPLACEMENT SLATES!

Replacement slates must match in type, length, width, thickness, shape, color and, if necessary, age. Refer to the SRCA website for a list of salvaged roofing slate sources.



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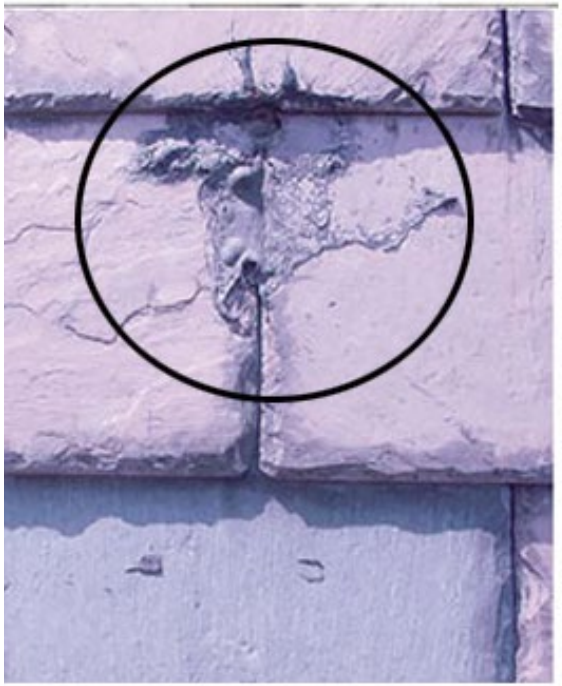
https://slateroofers.org/sources_salvaged_slate.html

Here are examples of bad repairs.

Don’t use exposed roof cement.

Don’t nail in a slot without inserting a bib flashing.

Don’t “face nail” the slates!











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FACE-NAILING

Replacement slates must not be “face-nailed.”

No exposed nails or screw heads, including gasketed or sealed heads, should be visible on any repaired or replaced slate.







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THE “NAIL AND BIB” REPAIR TECHNIQUE

The bottom of the bib flashing should extend a minimum of 3” below the covered nail head. The top should extend underneath the overlying slate a minimum of 3”.

The bib can be bent slightly lengthwise to allow for a friction fit. Barbs may be cut into the sides of the bib to improve retention.



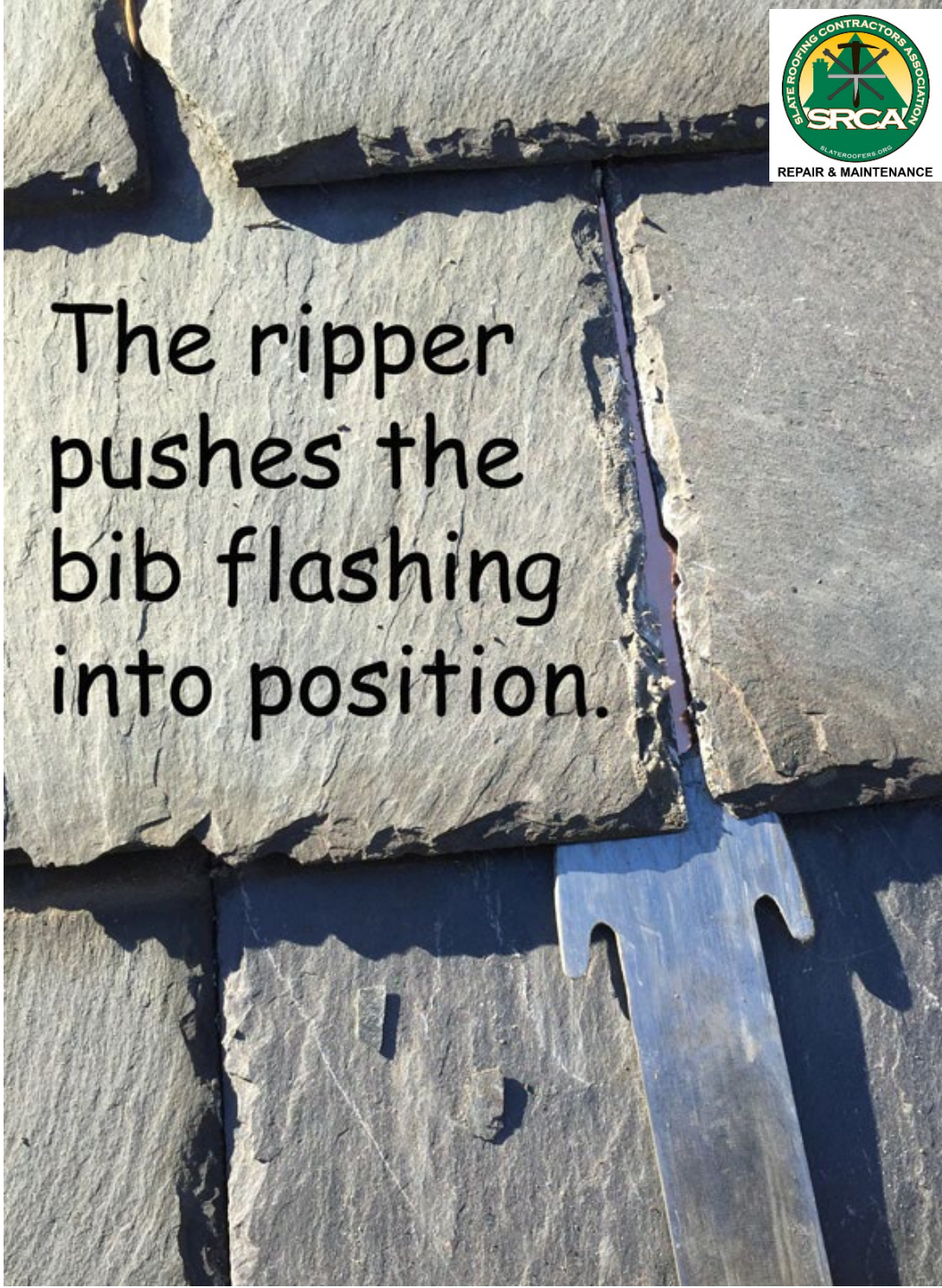
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USING BIB FLASHINGS FOR SLATE REPAIR

When a slate is split lengthwise or has a small hole in it, it can be repaired without replacing it by using a bib flashing slid *underneath* the defective slate.

A slate with a vertical crack can be repaired by slipping an oversized bib flashing *underneath* the slate.

A slight lengthwise bend in the bib, or else barbing the sides, will help to friction fit the bib into place. A bent bib flashing will ride over the replacement nail easier than a flat piece of metal.



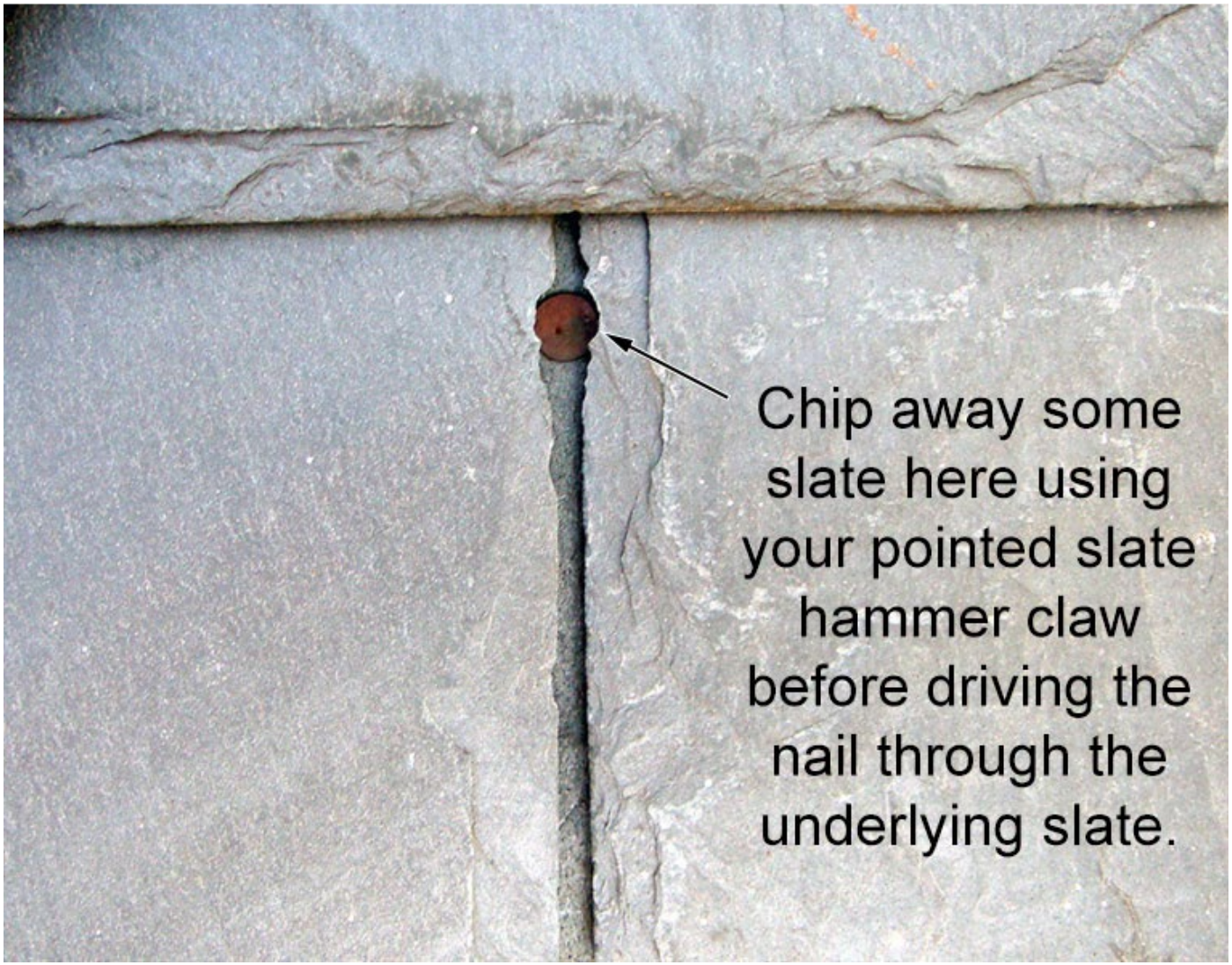
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Bib Flashings for Slate Repair



Bib flashings should be copper (minimum 16-ounce), painted aluminum (minimum .019”), or stainless steel, a minimum 4” wide by 6” long (4”x7” are shown). They are slid underneath the slates over replacement nail heads.

Replacement slates can be fastened with one smooth-shank roofing nail (copper, HD, or stainless) installed at the top of the slot between the two overlying slates.



Bib Flashings

The same type of slating nail on the existing roof can be used to fasten the replacement slates. Hot-dipped (HD) galvanized nails are common on older slate roofs, so the same nail type can be used when repairing the slates. You could also use copper or stainless nails.

Painted aluminum bib flashings (dark side facing out), are suitable for slate repair when the roof only has approximately 50 or so years of life remaining (such as on old buildings and barns).

Use copper bibs or slate hooks on new roofs.



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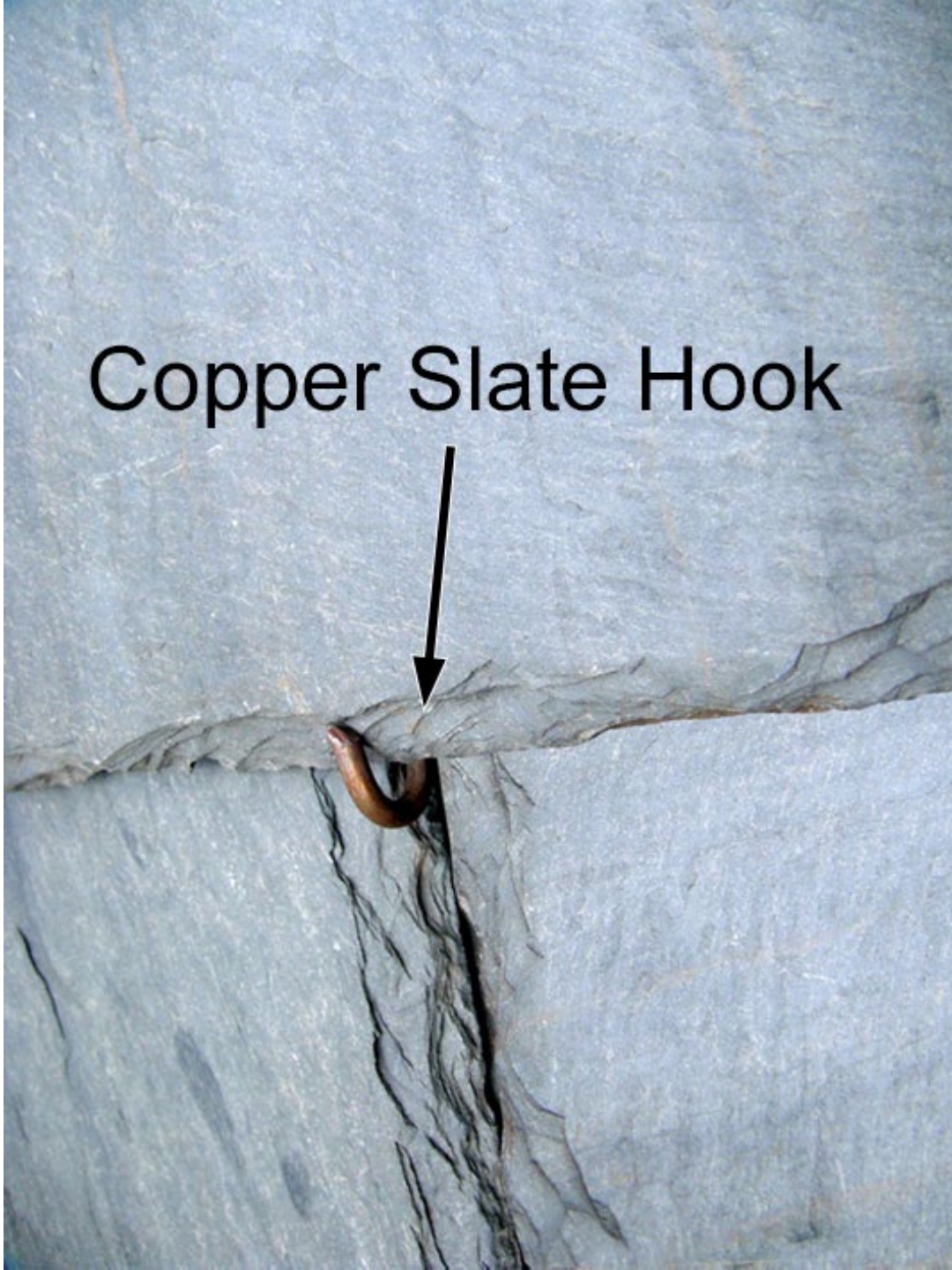
Here’s an old steel nail repair that never had a bib flashing covering it. It probably leaked for years, and no one could find the leak. This is what you would call a “hidden leak.” It can be easily repaired with a new nail and a bib.



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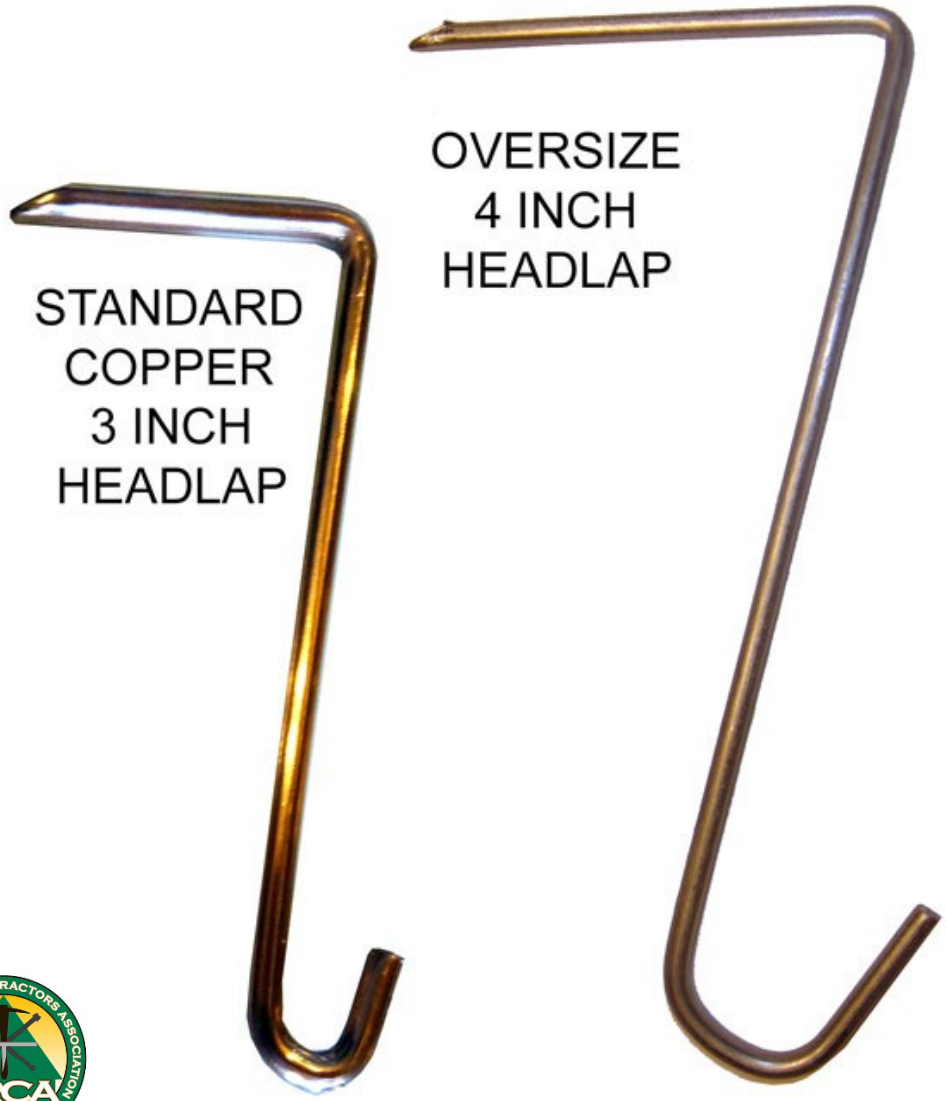
SLATE HOOKS

Replacement slates may also be installed using either copper or stainless-steel slate hooks.



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Slate Hooks





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The slate hook is pounded in like a nail.

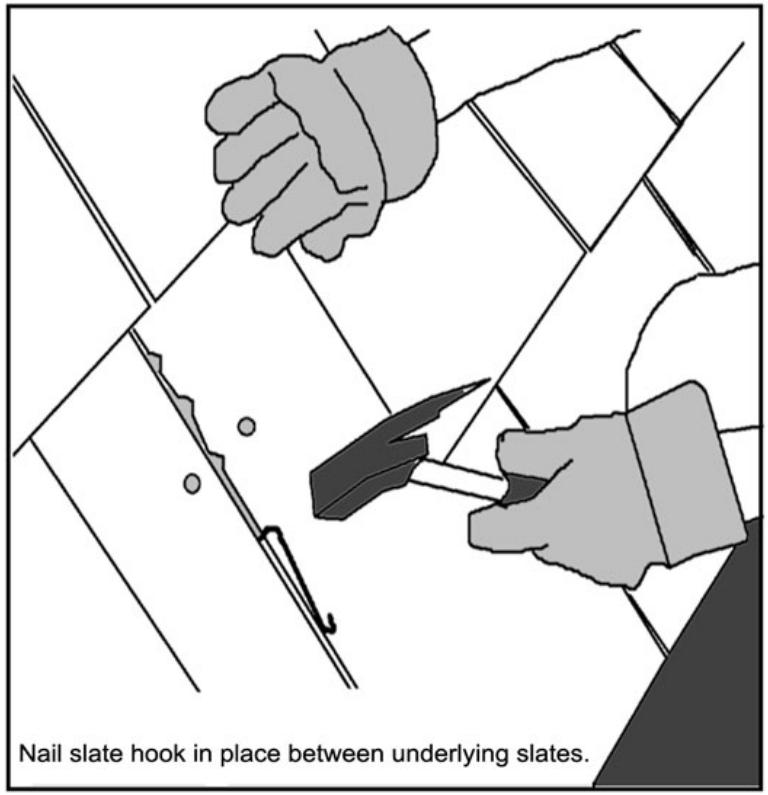


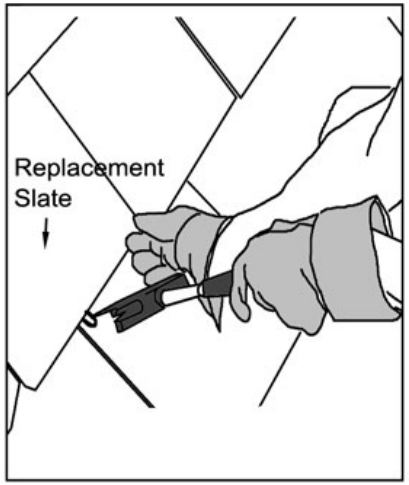
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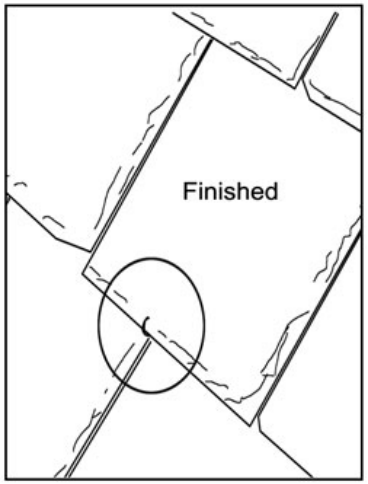
1) The faulty slate is removed using a slate ripper.

2) A slate hook is pounded in like a nail.

3) The replacement slate is slid into place.







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STRAP HANGERS

should not be used for replacing slates.



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Strap hangers can open up and the slates can slide out. Note the poor practice of using non-matching slates.



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ADHESIVES

Adhesives are not to be used to fasten slates without additional mechanical fasteners.

Adhesives may be used to help fasten slates in limited circumstances.

Adhesives are to be applied only *underneath* slates.



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SIDE LAP REPAIR

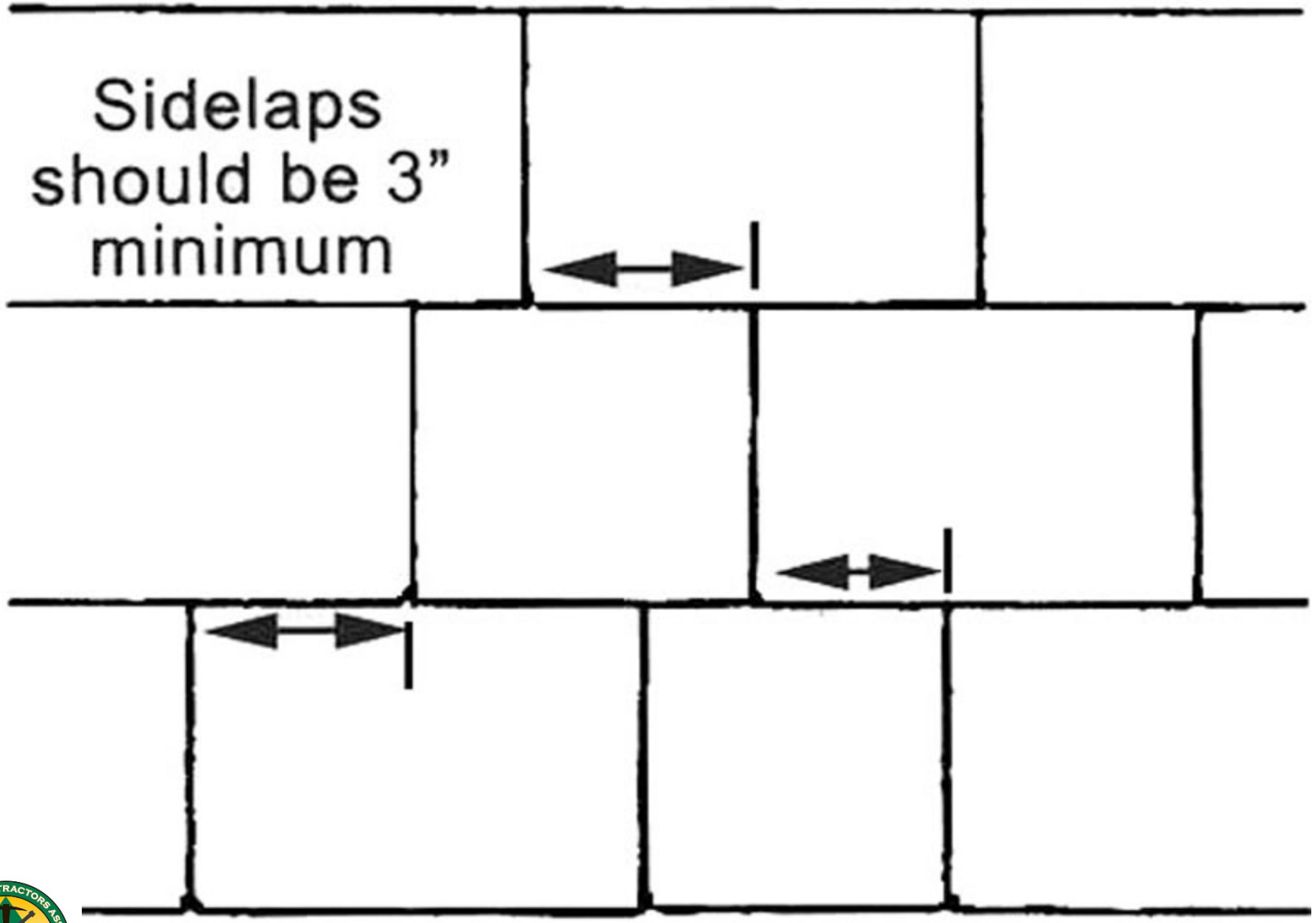
Insufficient side lap can be repaired by sliding an oversized bib flashing underneath the defective joint, thereby extending the lap.

The bib should be a minimum of 6 inches in width and approximately the length of the slate exposure plus three inches.

A slight lengthwise bend, or else barbing the sides, will help to friction fit the bib into place.

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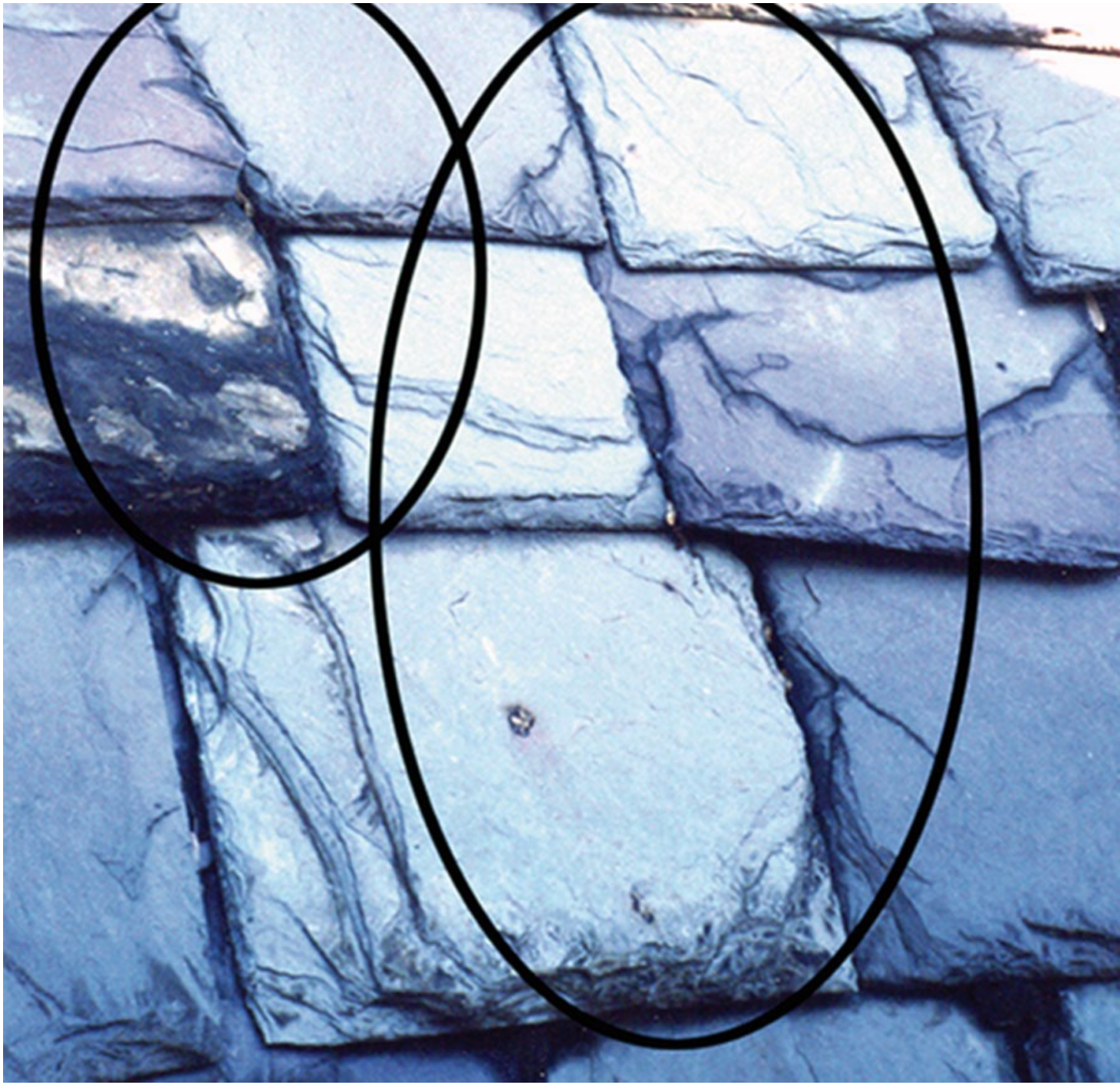




Inadequate sidelaps must be corrected.

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Slide the bib flashings underneath defective sidelap joints to prevent leakage.



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This roof has sidelap issues.

Can you spot any?



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These can be repaired using bib flashings underneath the slates.

What other mistakes do you see?



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Use oversized slate hooks on heavy slates, not straps. Thin slates can be installed back-to-back to mimic a heavy slate.



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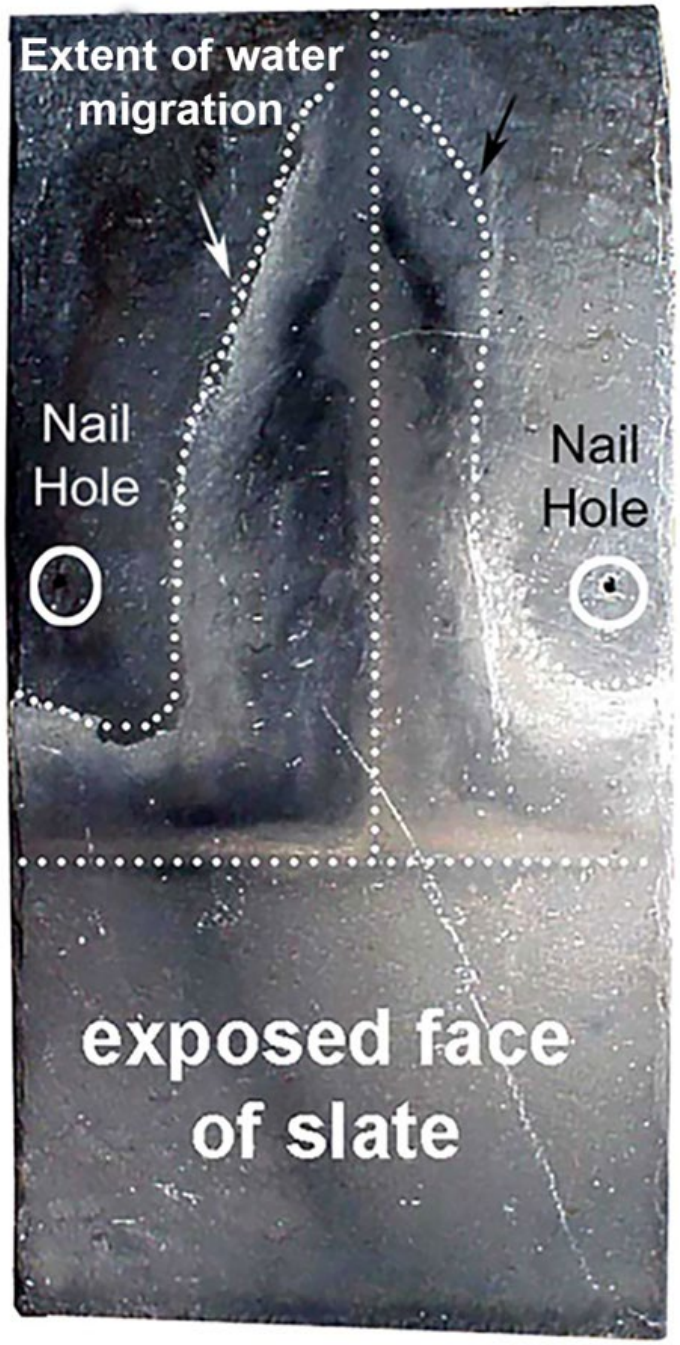
Capillary attraction can draw water upward underneath the slates.

Therefore, the overlying slates should be butted as close to the center of the underlying slates as possible.

The nail holes should be positioned close to the outer edges of the slates.

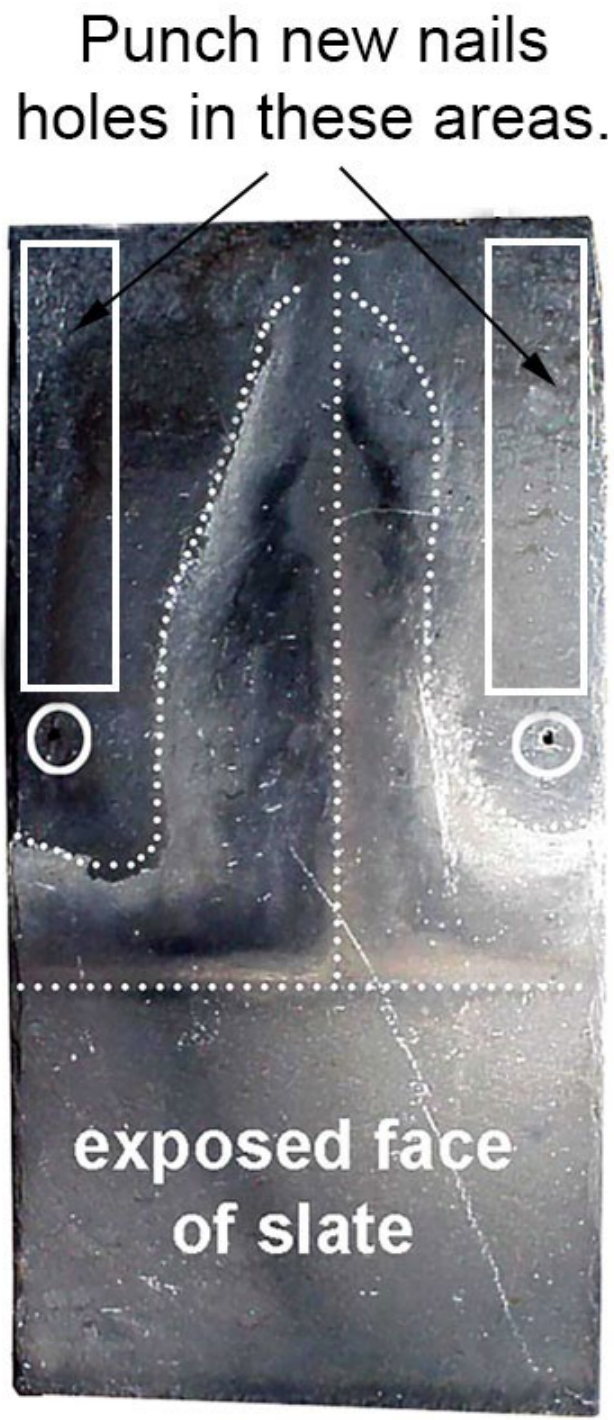
Melting ice and snow on the roof can exacerbate the water migration issue.

This is why correct sidelaps are important.



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If you must punch new nail holes in an existing slate, punch them <u>above</u> the existing nail holes, not closer to the center of the slate. Remember to punch the nail holes on the back side of the slate.



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ROOF “CANNIBALIZATION”

When matching replacement slates cannot be obtained, identify a section of the existing roof that is least visible from the ground (rear dormer?).

Remove the slates from the identified area and use them for restoring the remaining roof.

The “cannibalized” roof section can then be slated with either new or salvaged tiles that match the original roof as closely as possible.



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This PA “Cathedral Gray” slate roof was nearly ruined by roofers who installed asphalt shingles along the eaves.



The shingles were removed and replaced with a standing seam copper ice apron. Matching slates were not available.

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The original 3 rows of square slates along the bottom were reduced to 2 rows. The third row was “cannibalized” and used to repair and restore the remaining roof with perfectly matching slates.



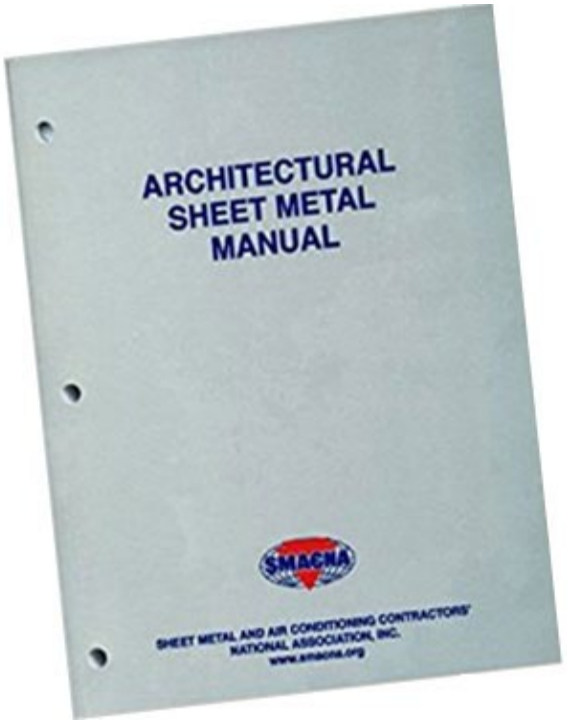
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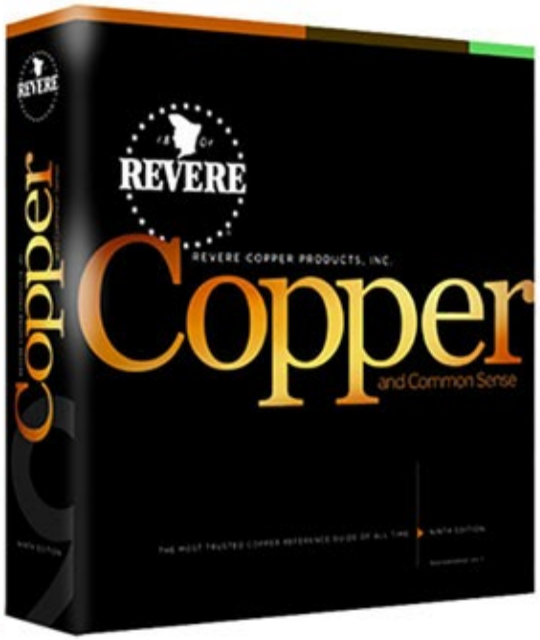
For flashing guidelines, refer to:

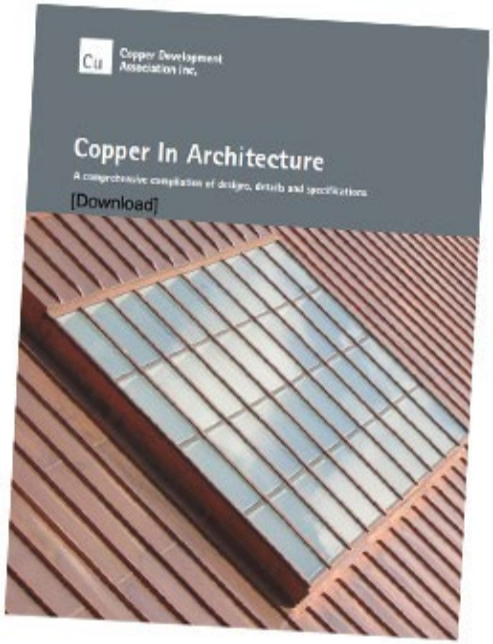
Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) "***Architectural Sheet Metal Manual.***"

Copper Development Association's "***Copper in Architecture.***"

Revere's "***Copper and Common Sense.***"

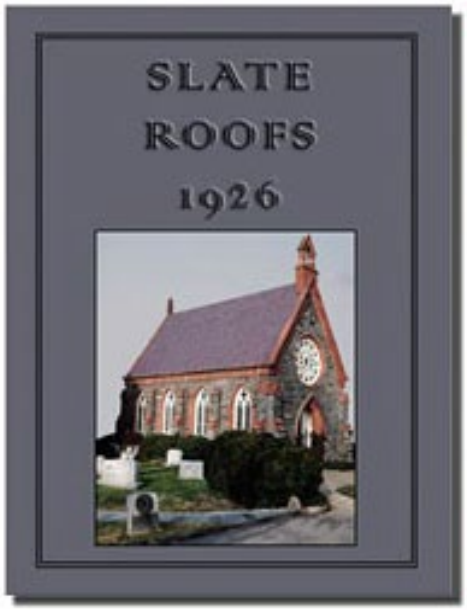




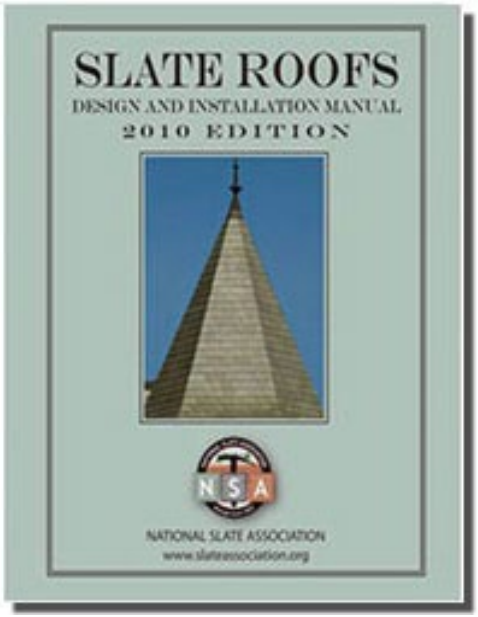


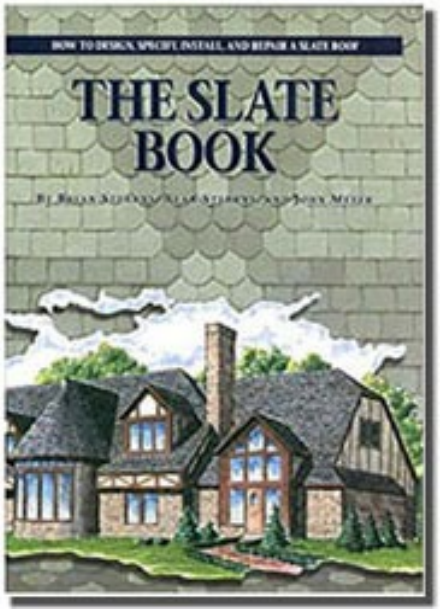
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Additional References:









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FLASHING INSPECTION

All flashings are to be inspected for cracks, holes, splits, deterioration, exposed nail heads, and looseness.

Flashing metal that is perforated and leaking must be removed and replaced.

Valley and gutter metal are more likely to be eroded over time than other flashings.

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SOLDER JOINTS

Solder joints should be inspected and resoldered, or repaired as needed, when possible.

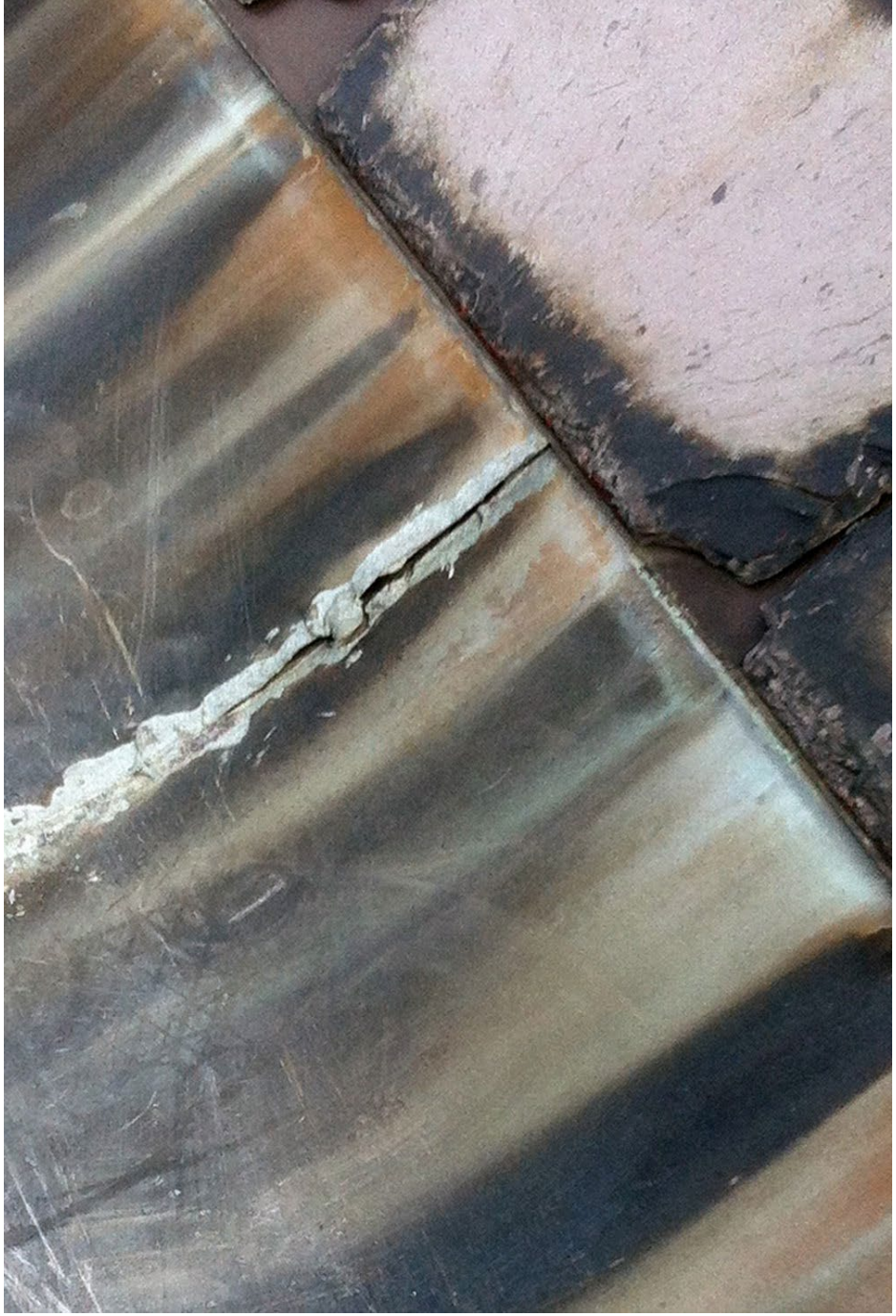
If solder joint failure is evident, the entire assembly should be examined for thermal expansion and contraction design issues.

Refer to SMACNA, CDA, and Revere publications for sheet metal expansion and contraction design recommendations.



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This solder joint could be repaired by wire brushing it clean, riveting it, fluxing it, resoldering it, or soldering a copper strip over it.



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This bad solder section could possibly be covered with a copper patch that is riveted and soldered to the copper roof.



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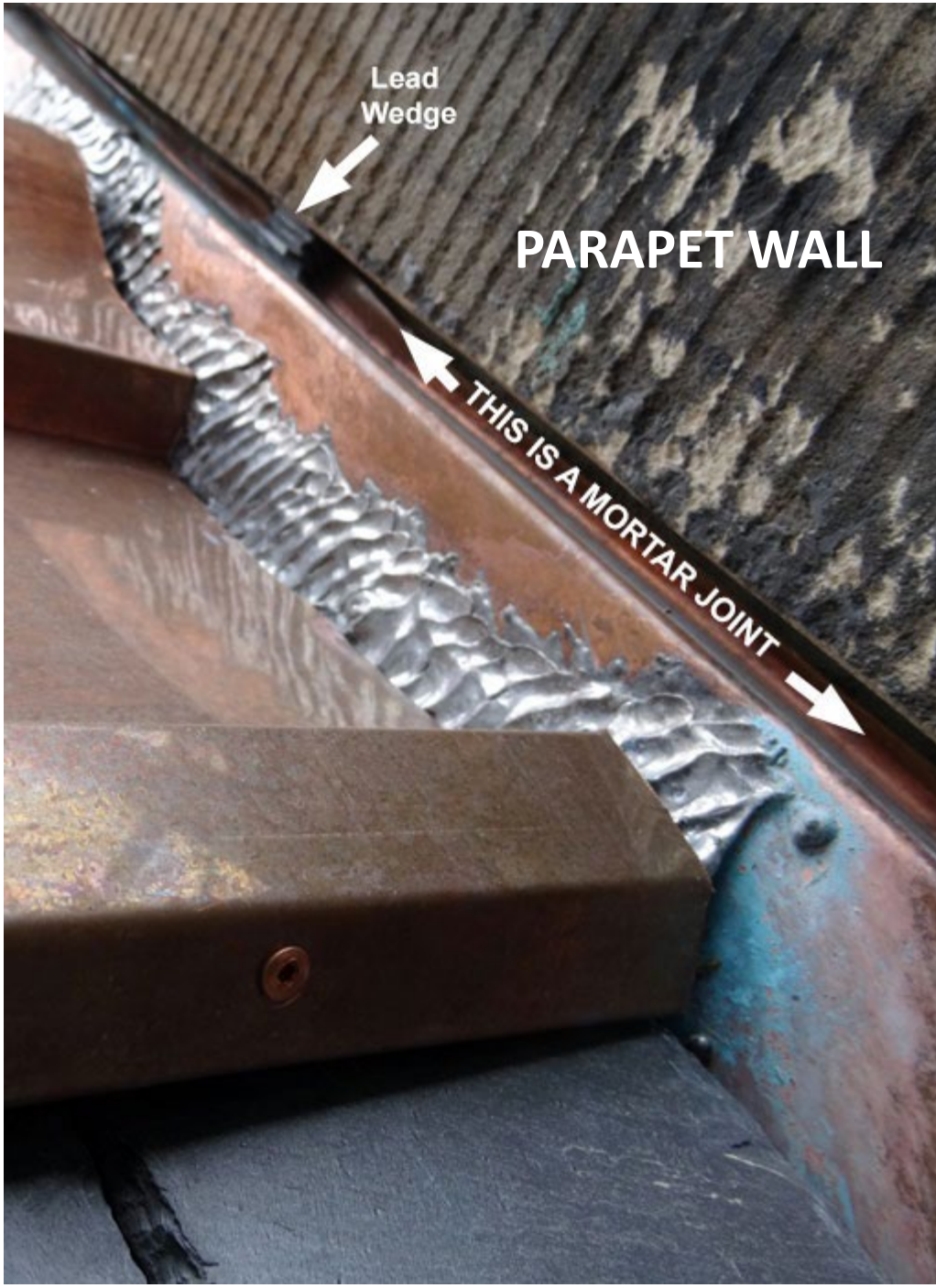
MORTAR JOINTS

Mortar joints that have been cut out to allow for the insertion of new flashing may be sealed using a high-grade caulk/sealant.

Fully cut out mortar joints may be repointed with mortar.

Refer to National Parks Service (NPS) Preservation Brief "*Repointing Mortar Joints in Historic Masonry Buildings.*"

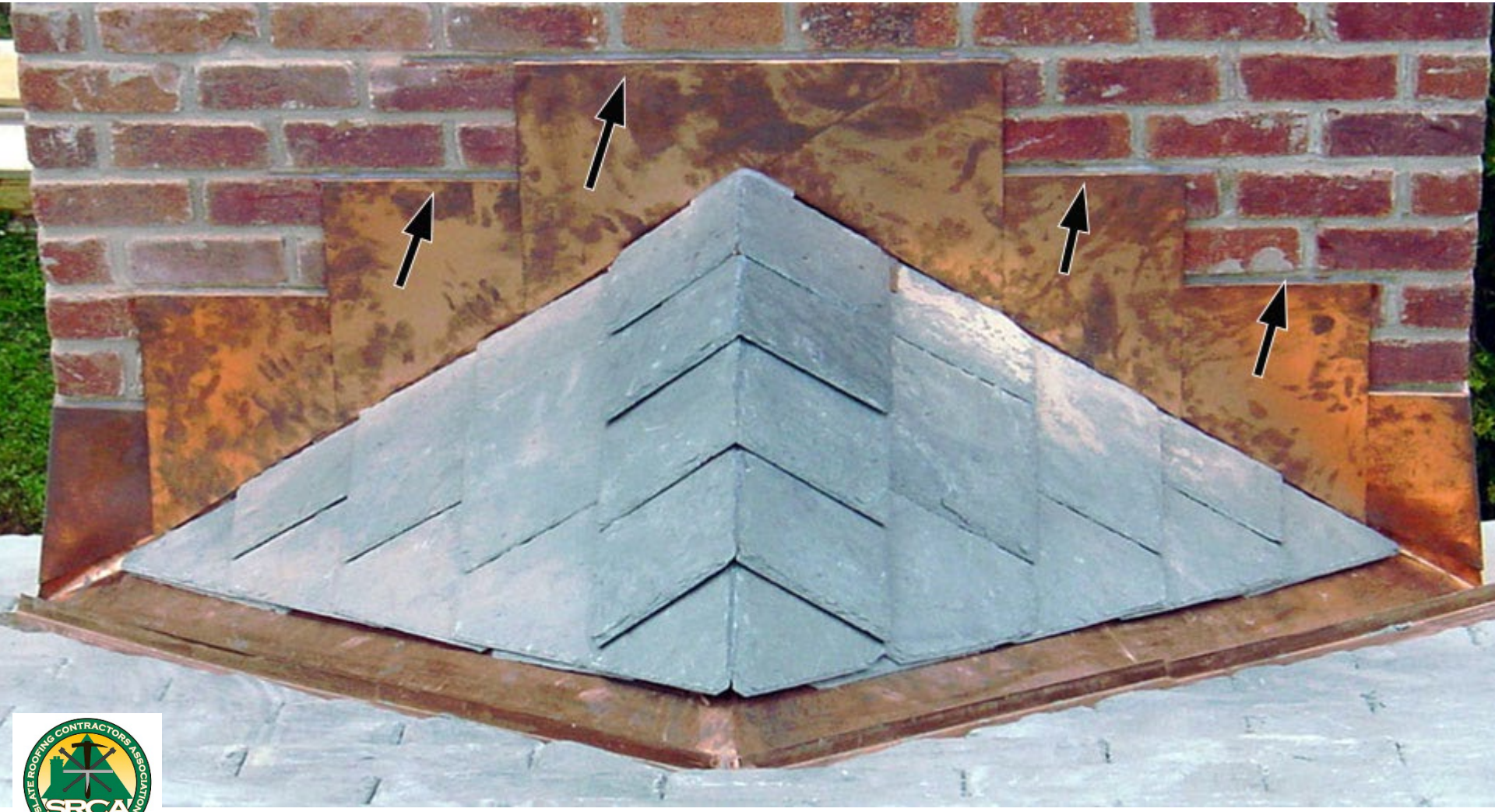
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These mortar joints have been fully cut out. They can either be repointed with masonry cement or caulked.



These mortar joints have been cut out, flashed, then filled with matching-color caulk.



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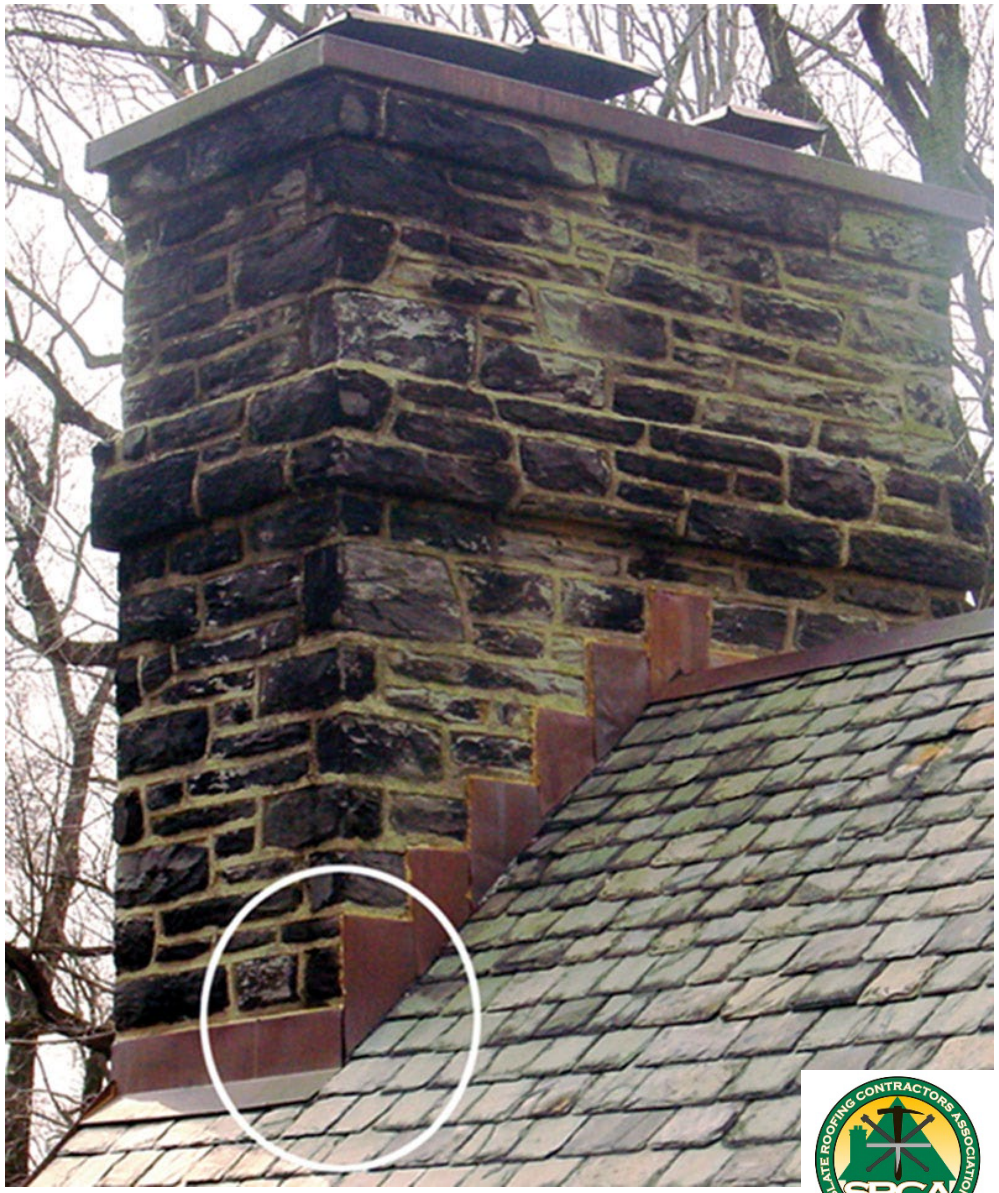
CHIMNEY FLASHING

Defective chimney flashings should be replaced in their entirety.

Flashing material should be minimum 16-ounce copper or 4-pound sheet lead.

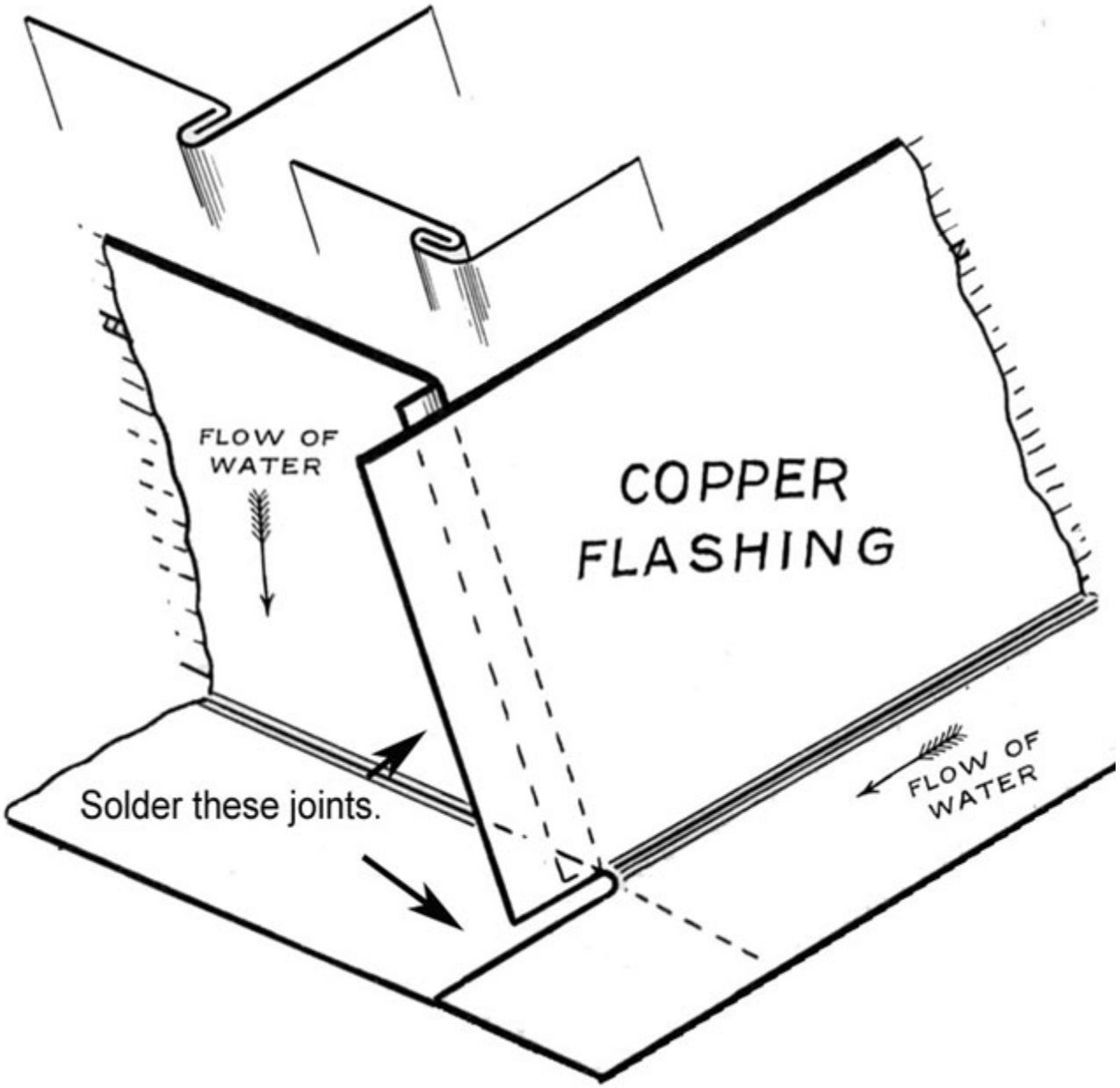
All corner flashings should be installed to be watertight without sealant.

Chimney corners will leak if not soldered, seamed, or folded correctly.



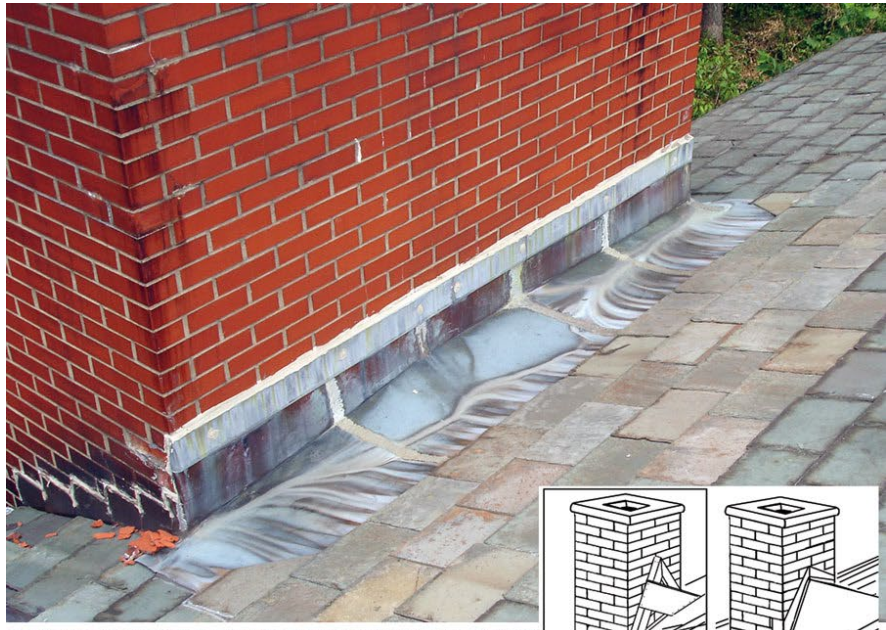
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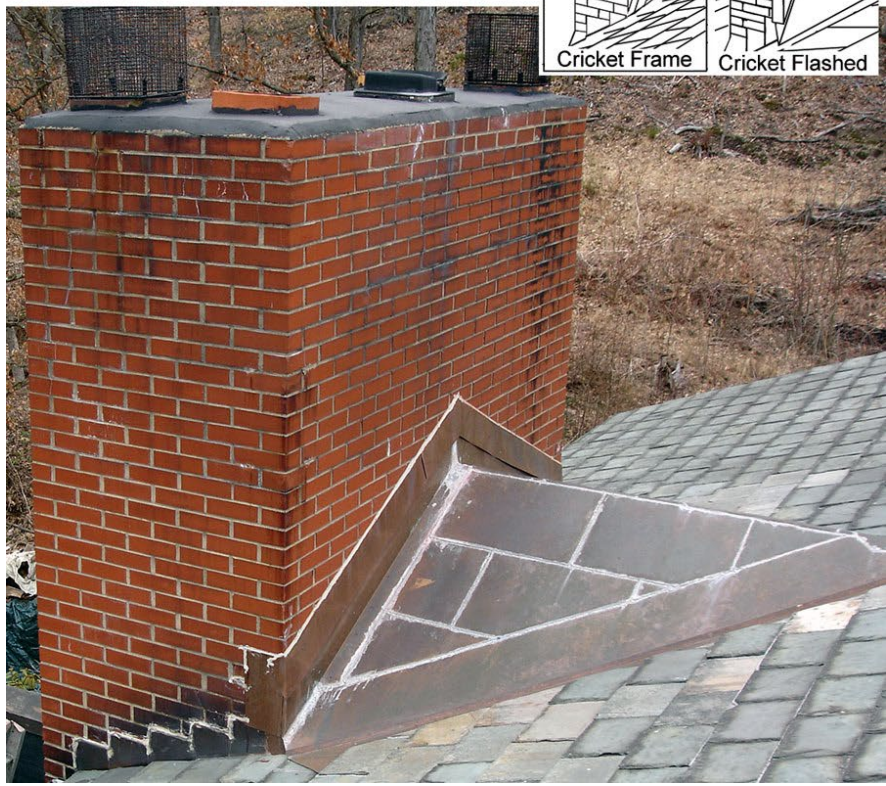
One way to prepare a chimney corner for soldering.



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This chimney had to have a “cricket,” or “saddle,” installed behind it to stop it from leaking. Chimneys wider than 30 inches need to have such a diverter.

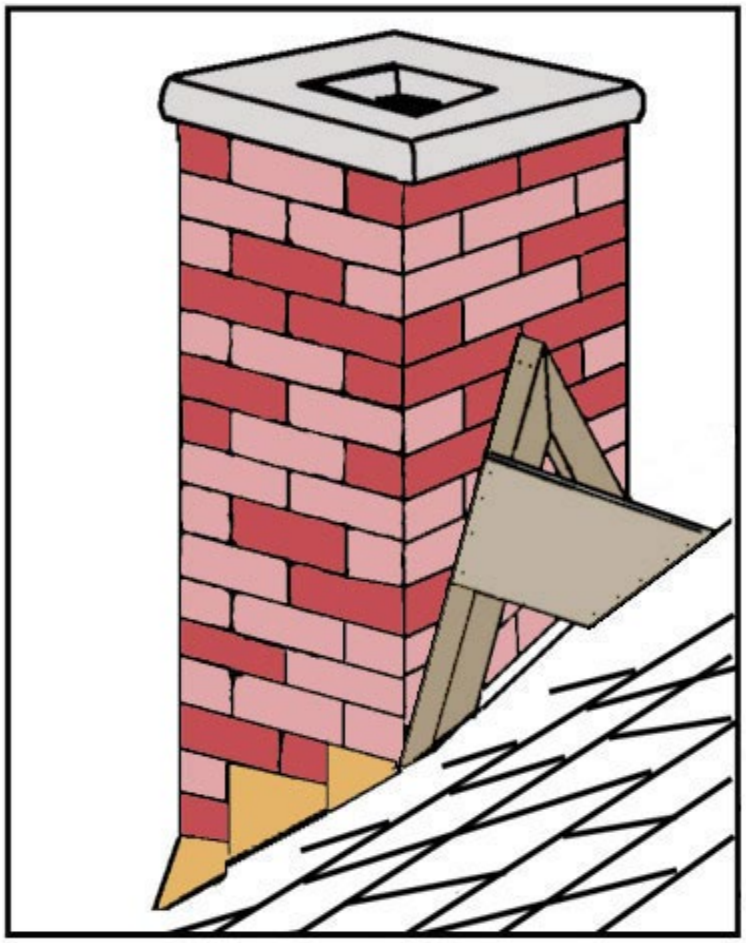


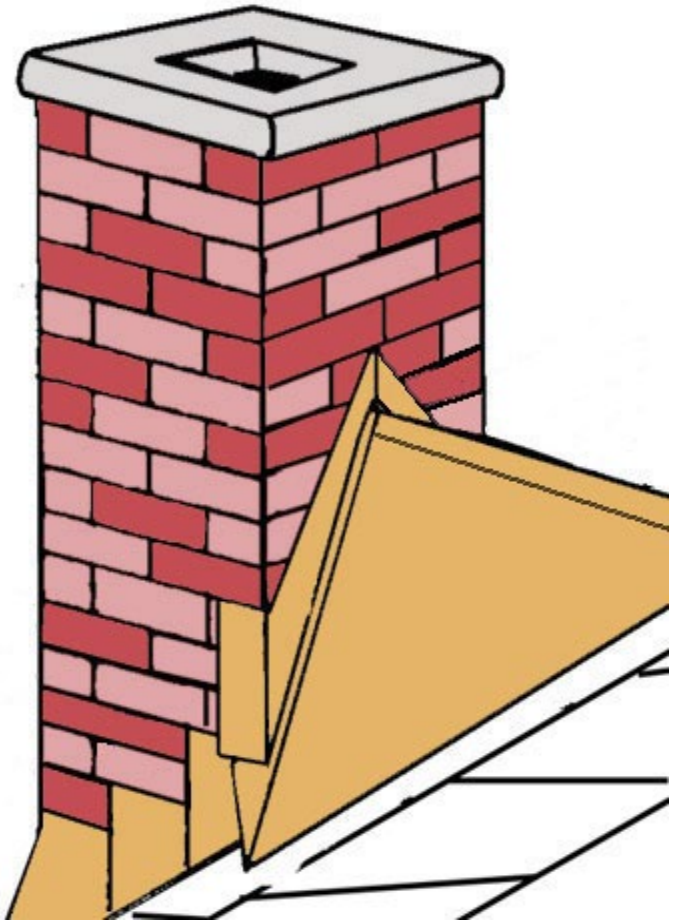


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Chimney Crickets

are often necessary when chimneys are 30” wide or wider





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Removing Existing Chimney Tops

Chimneys that are no longer in use can be removed to below the roofline.

Ensure they are not in use for any reason (such as gas water heaters).

First obtain written authorization and a release from liability.

Close the roof with matching sheathing, then slate to match the existing roof.





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This is another example of chimney top removal, before and after.



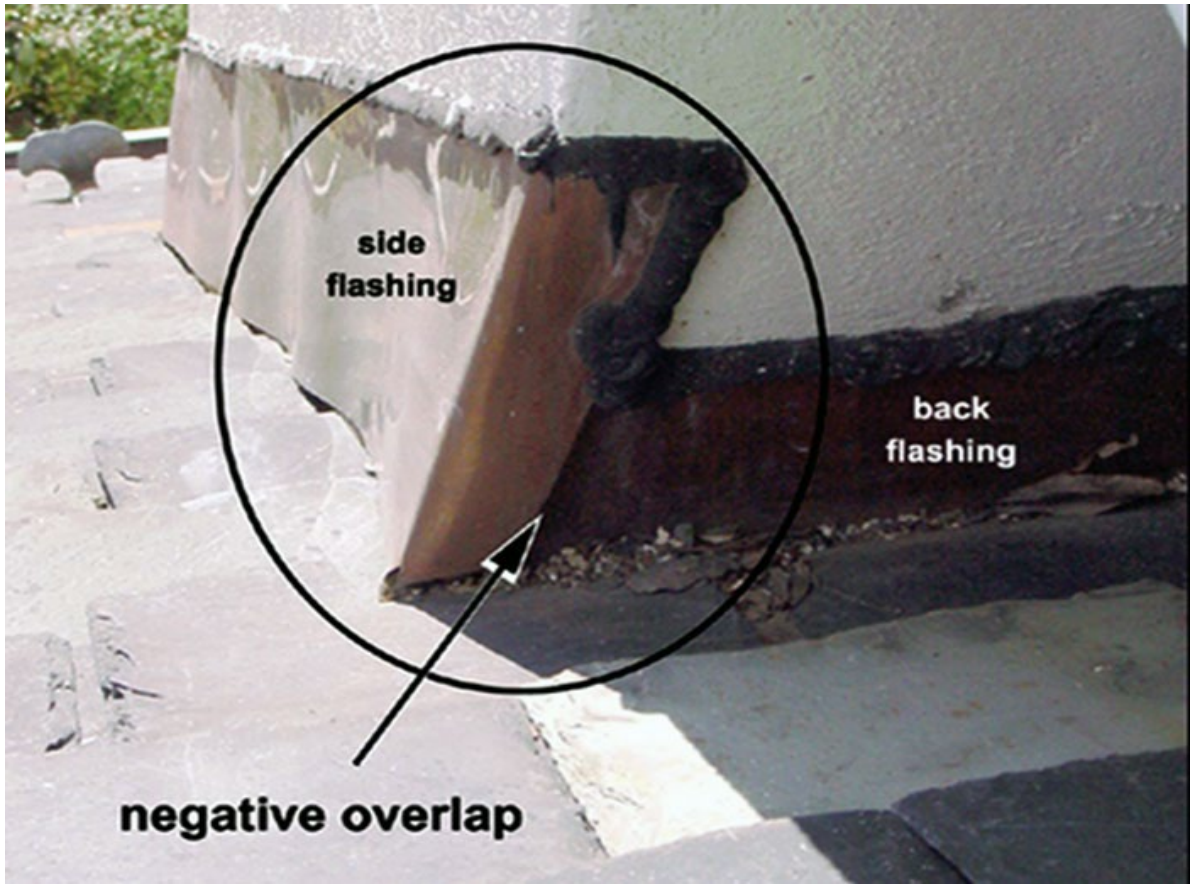


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POSITIVE FLASHING OVERLAP

This is an example of incorrect “negative overlap.”

The side flashing should be underneath the back flashing, not on top of it.



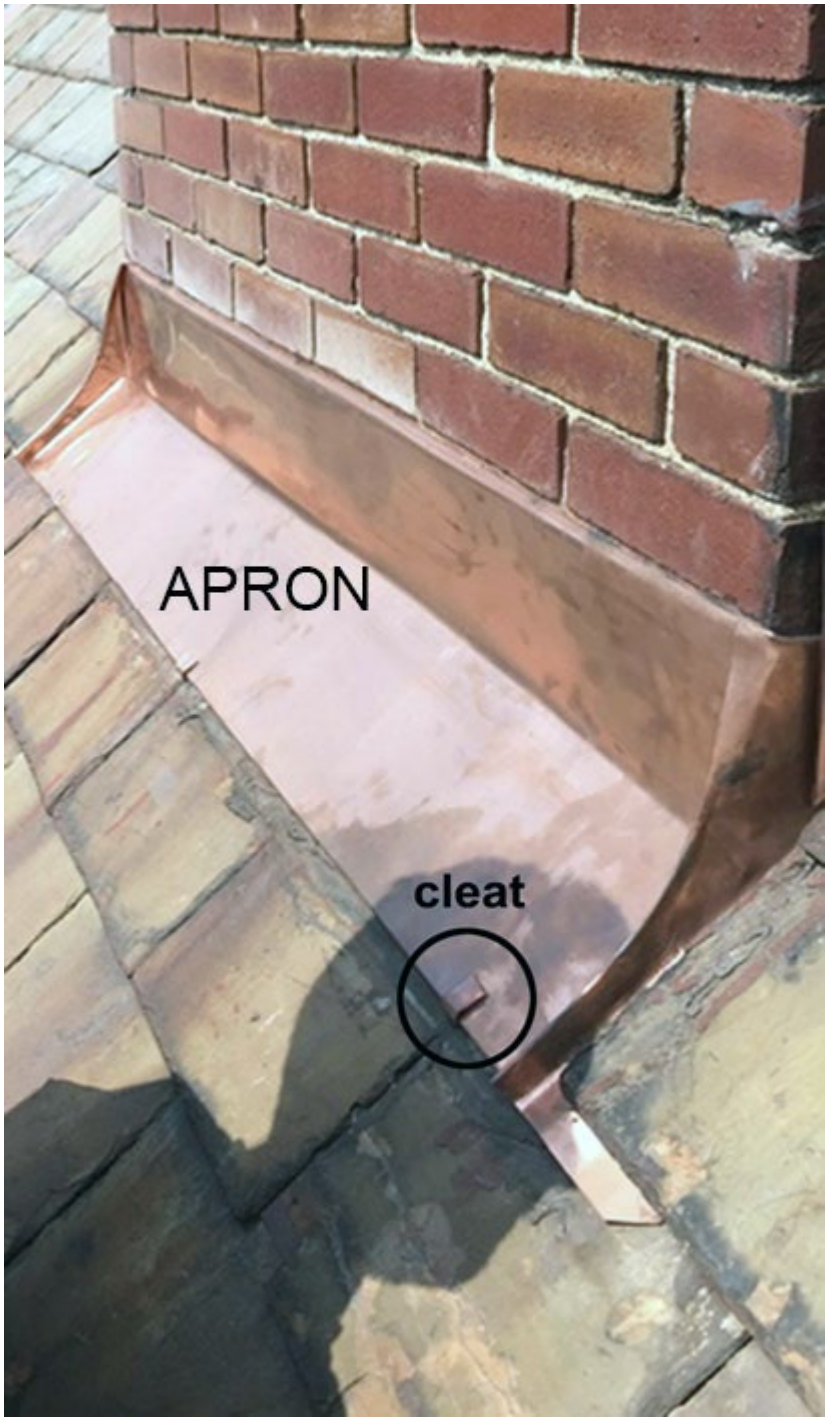
All flashings are to be installed to have “positive overlap,” such that higher flashings overlap on top of lower flashings, not underneath them.

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APRON FLASHINGS

It is recommended that lower, exposed edges of apron flashings be fastened with cleats or clips.

Otherwise, exposed fasteners must be gasketed or sealed.



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REUSE OF EXISTING SLATES

Slates overlying flashings should be carefully removed and reused whenever possible!

The original slates on this roof could have been reused when the flashings were replaced. Instead, the appearance of the roof was ruined.



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There was no reason to use new slates on this older roof when replacing the valley. The original slates were still in good condition and could have easily been reused.



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VALLEY REPLACEMENT

Defective valley metal must be entirely replaced.

Slates must be carefully removed and reused whenever possible. Number the slate courses before removal.

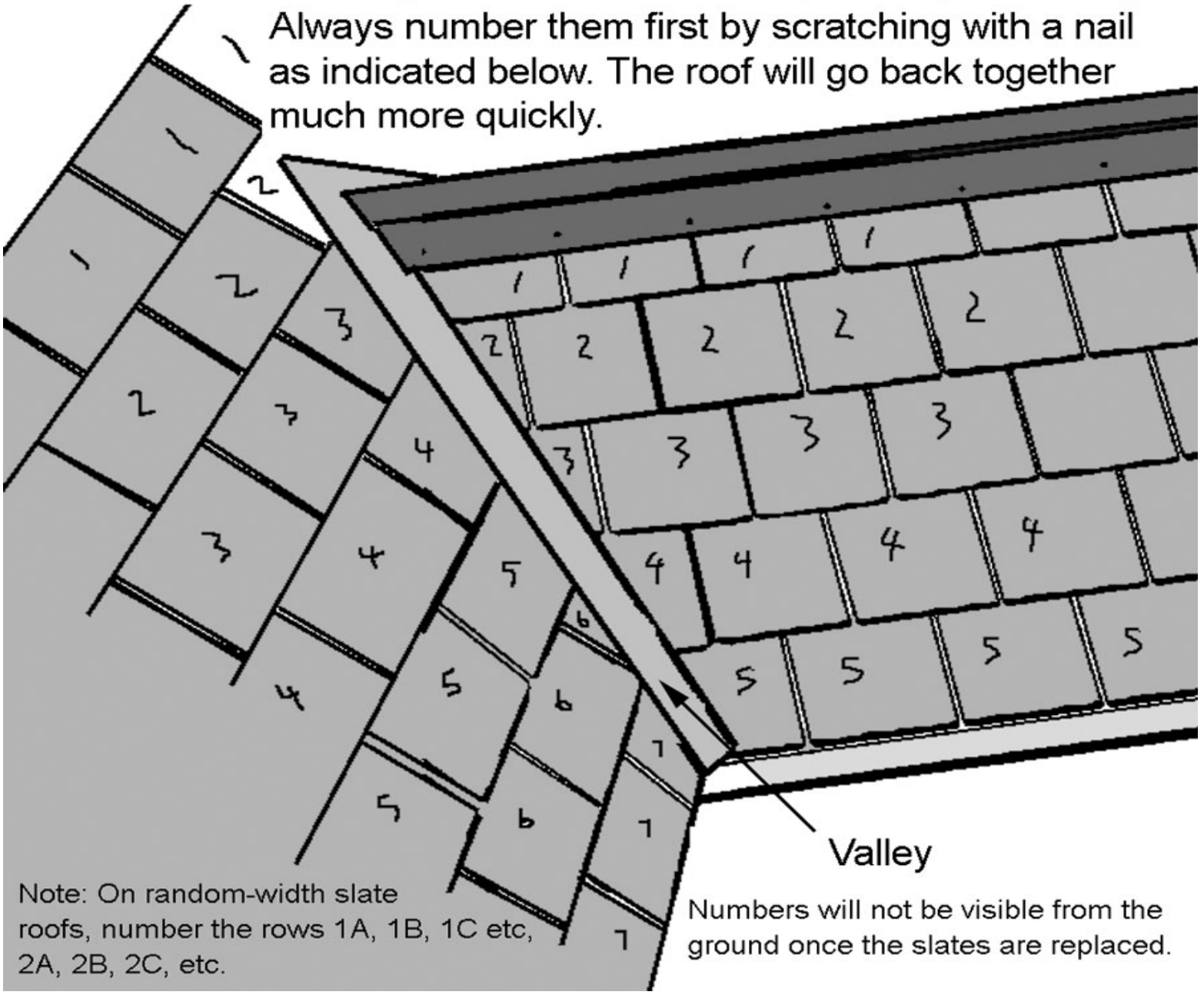
Sweep the roof deck and check for nail heads or other obstacles after valley removal. Re-nail the roof deck as needed.

Install minimum 30 lb. felt over the roof deck when required.

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Before Removing Slates When Replacing a Valley

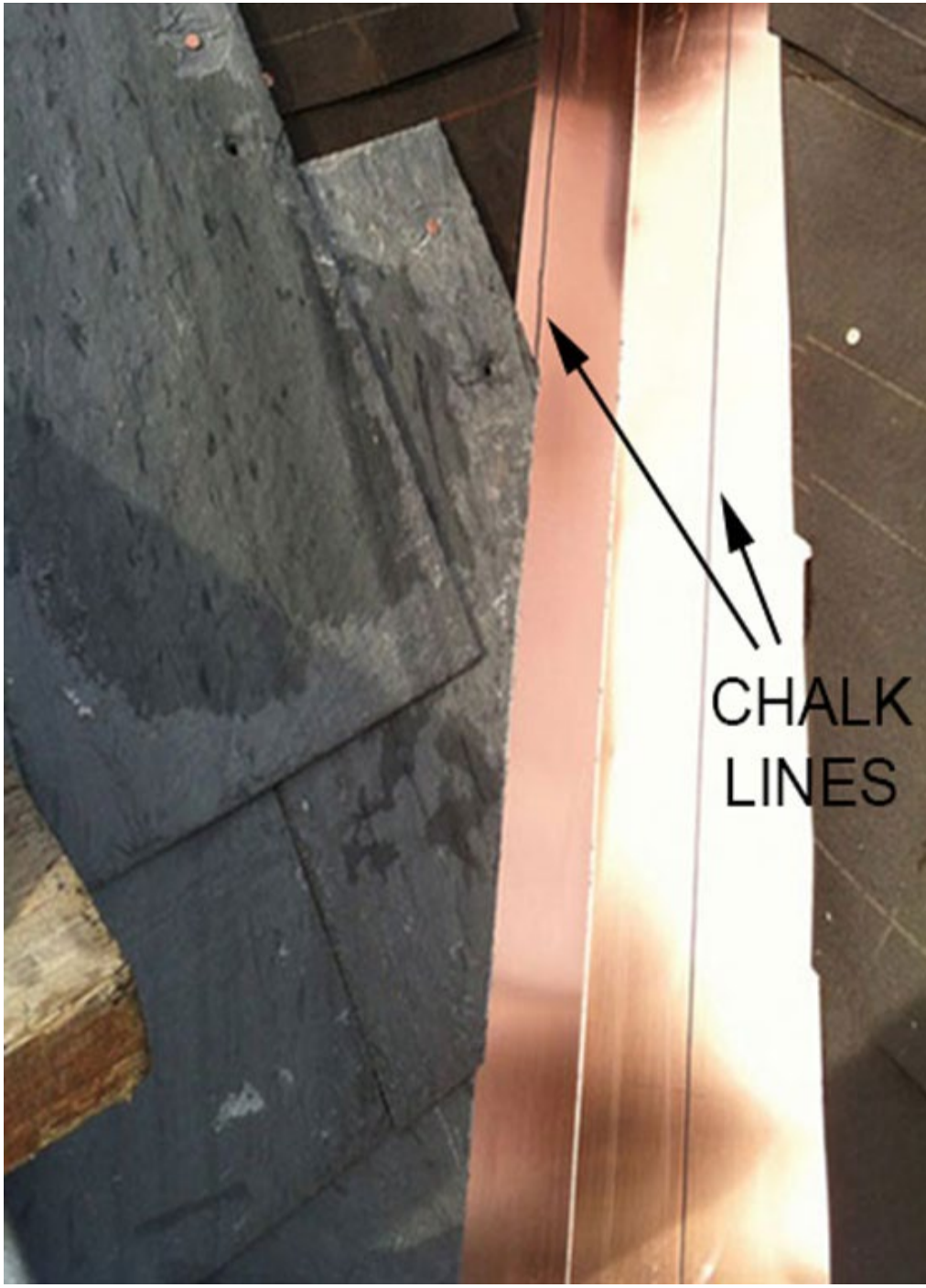


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When reslating a valley, the numbered slates will be renailed into the same place where they were removed.

Chalk lines on the valley metal and align the slates with the lines. Draw over the chalk lines with a permanent marker or they'll rub off.

Defective slates should always be replaced with sound, matching slates.



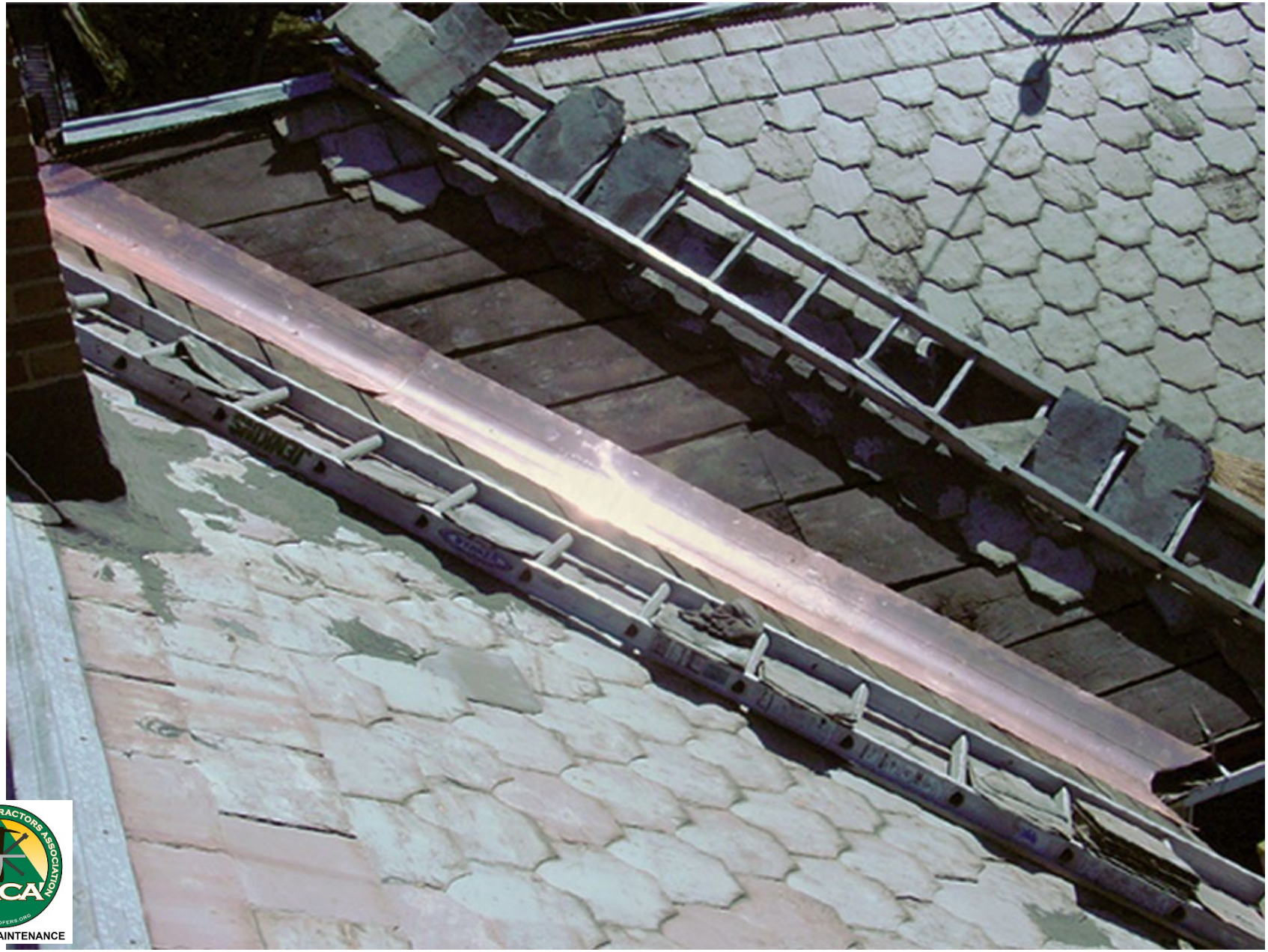
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This tarred valley makes the roof look hopeless.



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Rip everything out and install new valley metal.



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Then reslate with matching slates.



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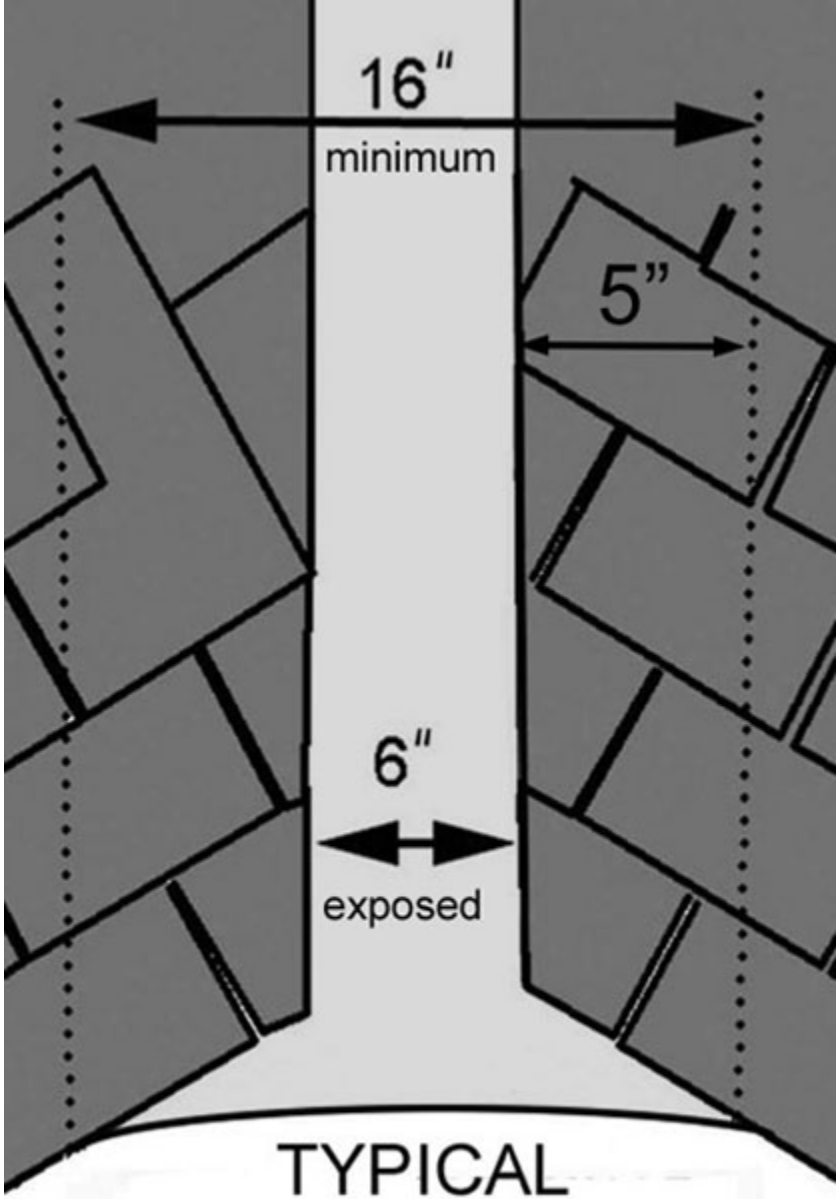
Residential Valleys

Valley metal should be minimum 16-ounce copper (20-ounce is better).

The valley metal must extend under the slates on either side of the valley by a minimum of 5 inches.

Lower slopes (6:12 or less) may require increased overlapping.

Nails should not penetrate more than one inch from the outer edges of the valley metal. Or hem the valley edges and use cleats.



TYPICAL RESIDENTIAL OPEN VALLEY

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A hopeless-looking 34-foot barn valley can be replaced in one day by two experienced slaters.



The original terne-metal valley flashing was sagging between the slating lath.

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Open Valleys

Do not make valley sections longer than ten feet.

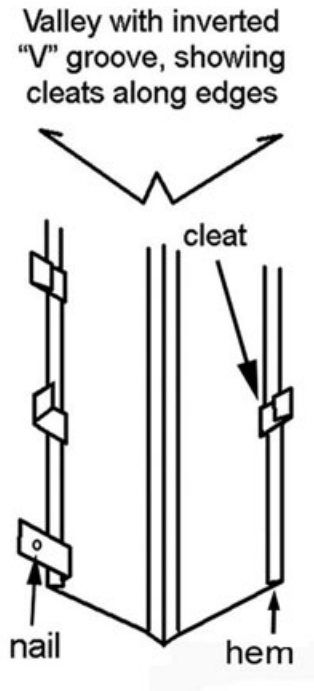
Overlap valley sections 6 inches in most cases.

As much as 12” may be needed on lower slopes.

Valley sections may instead be soldered, using cleats to attach them to the roof deck.

Where two valleys meet at a top juncture, they can be folded, soldered, or double locked in a sweep seam.





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This is an example of a sweep-seam valley connection prior to the installation of the ridge.



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OTHER CONSIDERATIONS

On asymmetrical roof slopes, form the valley with an inverted “V” groove.

Between two steep symmetrical slopes, a straight-line bend down the center is often required.

Valley metal may be simply forced into the valley using a knee, creating a traditional rounded metal valley configuration.

Valleys can be parallel or tapered. Shown is a typical, open, tapered “W-valley.”



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A W-valley soldered top joint. Note the extra piece of copper flashing covering the overlapped joint.



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CLOSED VALLEY

Closed valleys are typically flashed with step flashing.

Replace the flashings when the metal becomes pitted and leaking.

The valley slates are again numbered before removal to make reinstallation easier and faster.



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Closed Valleys

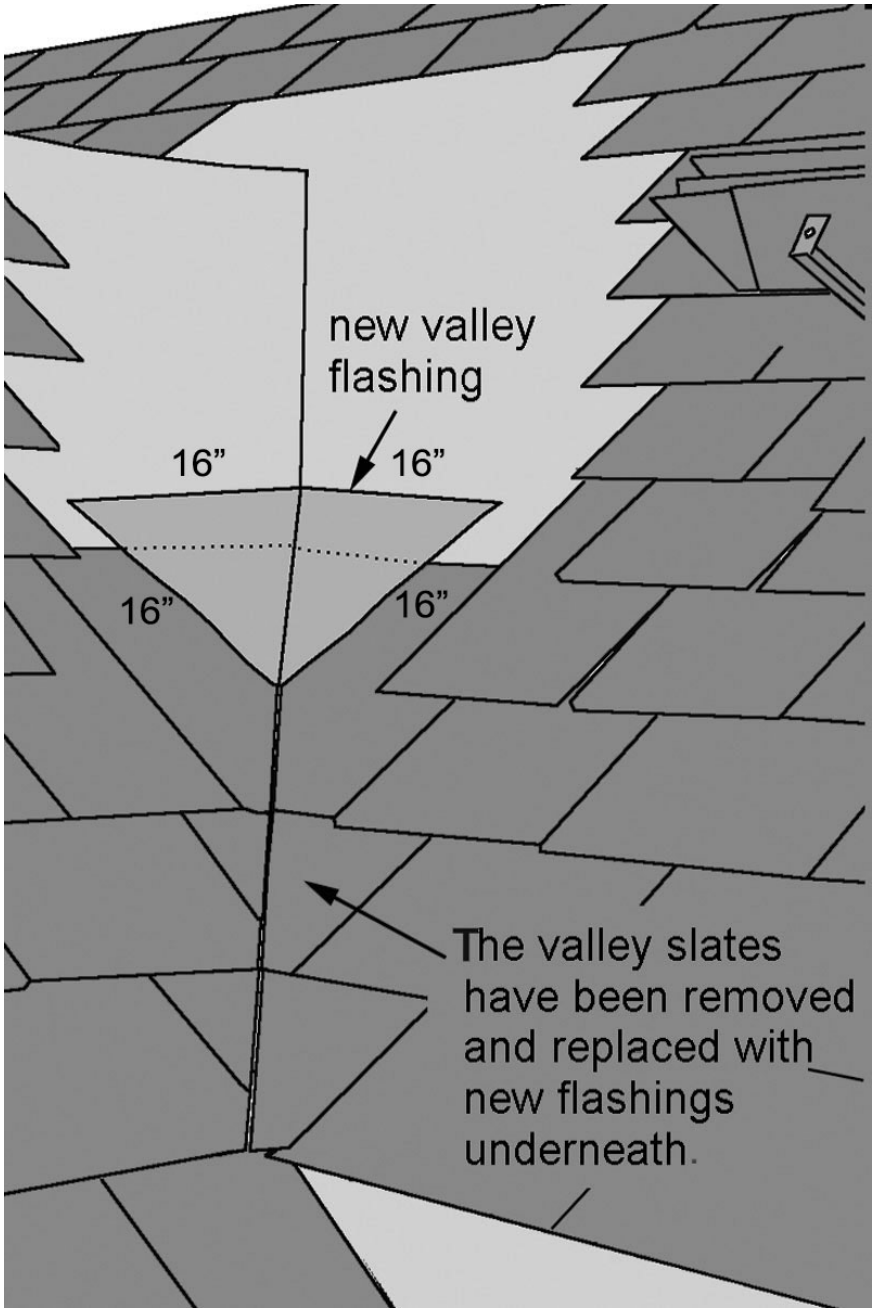
Closed valleys are typically step-flashed. Square pieces of flashing 16”x16” can be used in many situations.

Sections should overlap each other by a minimum of 6 inches and extend out from the centerline of the closed valley a minimum of 5 inches.

The flashing should extend above the slates far enough to allow for nailing without penetrating the slates.

Slating nails should not penetrate the flashings.

Flashing sizes vary according to slate size and roof slope.



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Closed Valleys

Reinstalled valley slates should be butted in the center.

For a closer fit, cut the valley slates on the front face of the slate to reverse the chamfer.

Defective slates must be replaced with good quality matching slates.



PIPE FLASHINGS

Defective pipe flashings should be completely replaced.

Slates surrounding the flashing must be carefully removed and reused, when possible.

The flashing baseplate must maintain a minimum 3” headlap with underlying and overlying slates, and a minimum 3” sidelap with adjacent slates.

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Rubber sleeves only last about 15 years. This was a bell-shaped sewer pipe. The bell was cut off with a high-speed grinder and a metal blade so the flashing could fit over the top.



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These old pipe flashings have been replaced with 20-ounce shop-fabricated soldered copper.

Step and Counter Flashing

Step flashings in acceptable condition may remain original when other roof flashings are replaced.

When step flashings lower on a roof wear out sooner than the upper ones, it may be necessary to only replace the lower flashings.

Slates overlying step flashings shall be carefully removed and reused whenever possible.

Defective flashings are removed in their entirety and replaced with minimum 16-ounce copper.



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Step and Counter Flashing

Step flashings are installed underneath the overlying slates.

The bottom edge of the step flashing should be approximately flush with the bottom edge of the overlying slate.

Step flashings must extend underneath the 2nd course of overlying slates a minimum of 3 inches, or whatever the headlap measurement is.

The step flashing length is the length of the slate exposure plus the headlap measurement (usually plus 3 inches).





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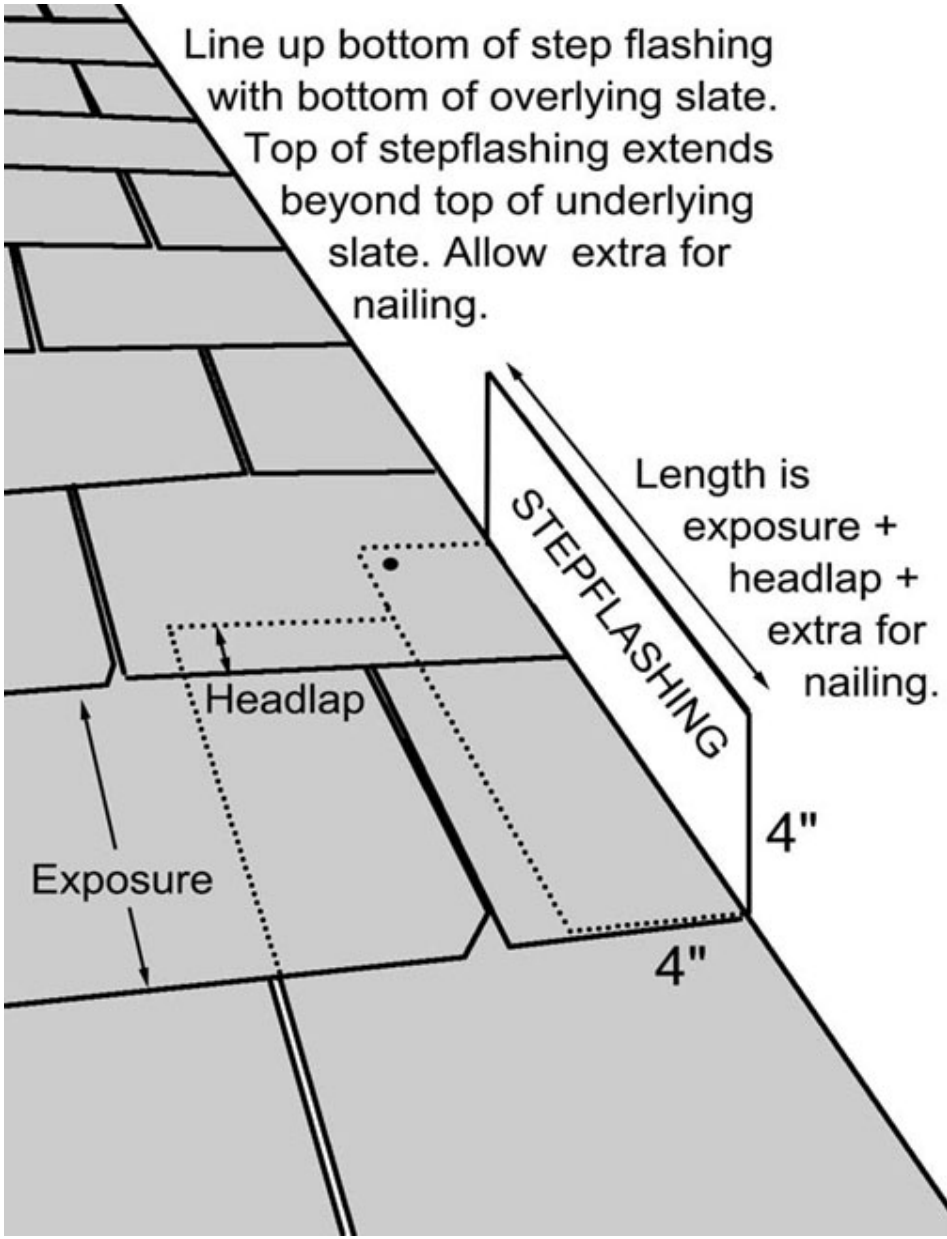
Step Flashing

Step flashings extend 4” onto the roof and 4” vertically, if possible.

The slating nails should not penetrate the step flashing.

Replace counter flashings as needed using minimum 16-ounce copper or 4-lb. sheet lead.

Wedge counter flashings into mortar joints ¾” deep, when possible, using galvanically compatible wedges, such as lead or copper.



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Wedging flashing using lead wool. You can also use rolled copper or sheet lead for wedging flashing.



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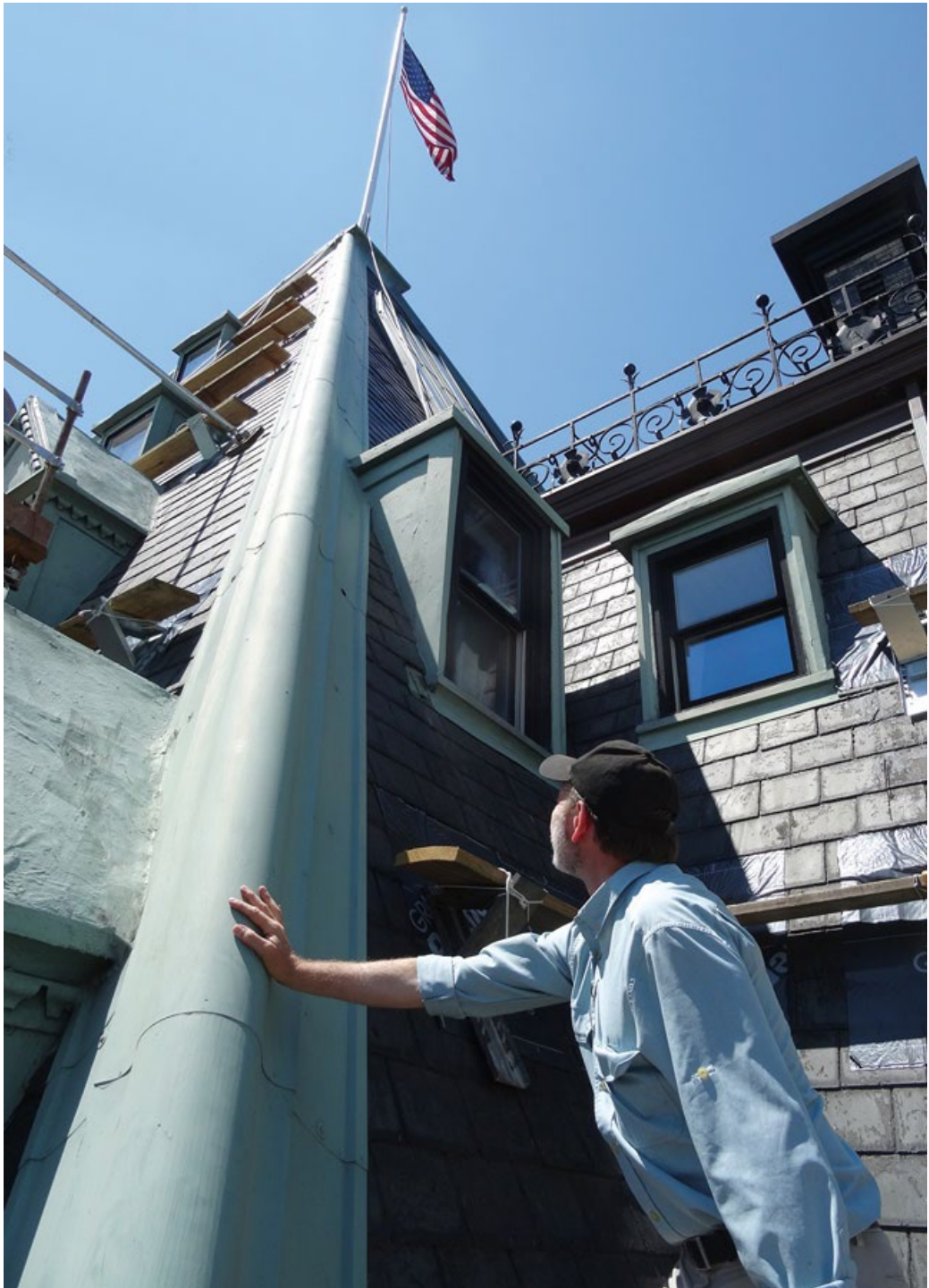
RIDGES AND HIPS

Slate ridges and hips are repaired by removing and replacing the defective slates.

Saddle slate ridges may need to be disassembled and reassembled to avoid face-nailing.

Worn metal ridges and hips are to be completely removed and replaced in their entirety.

When replacing metal ridges and hips, repair any defective slates underneath them.



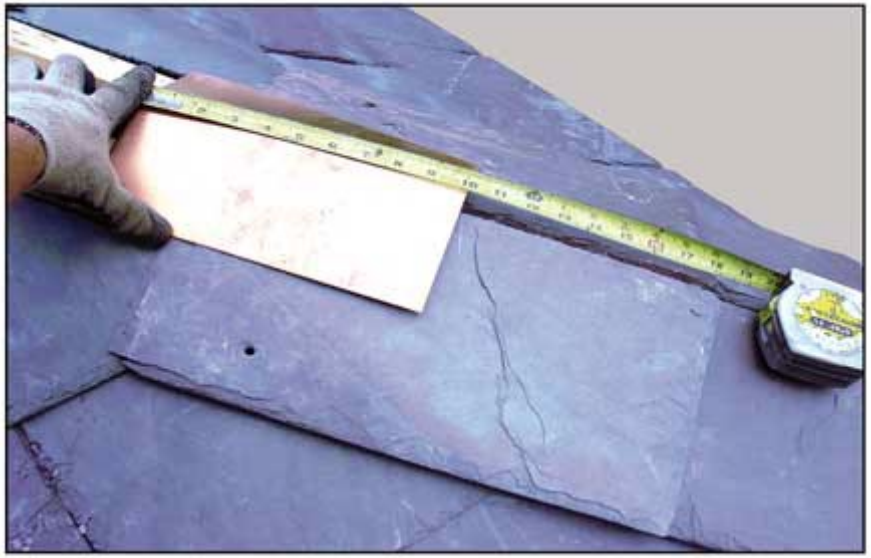
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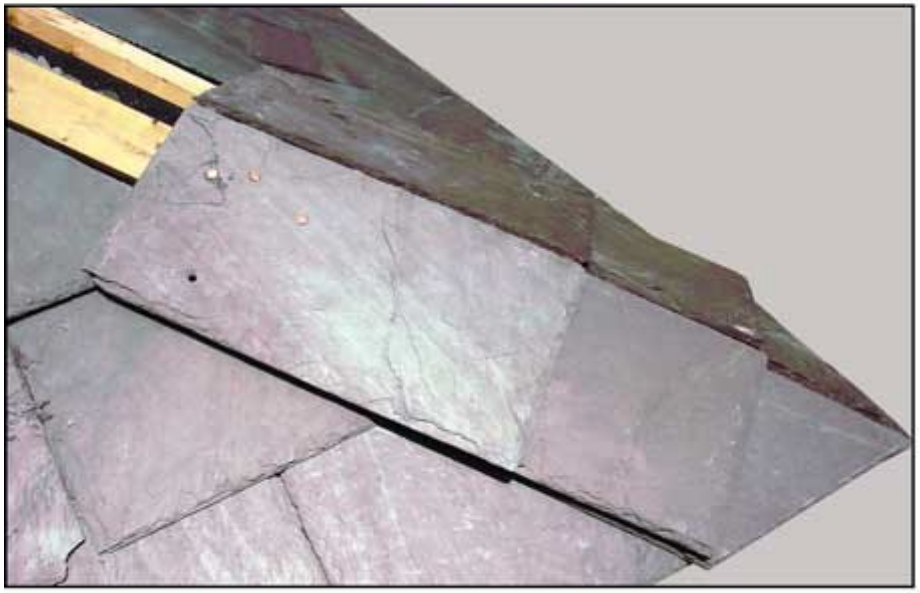
Slate saddle ridges without flashing can spread open and leak over time. This ridge was caulked.

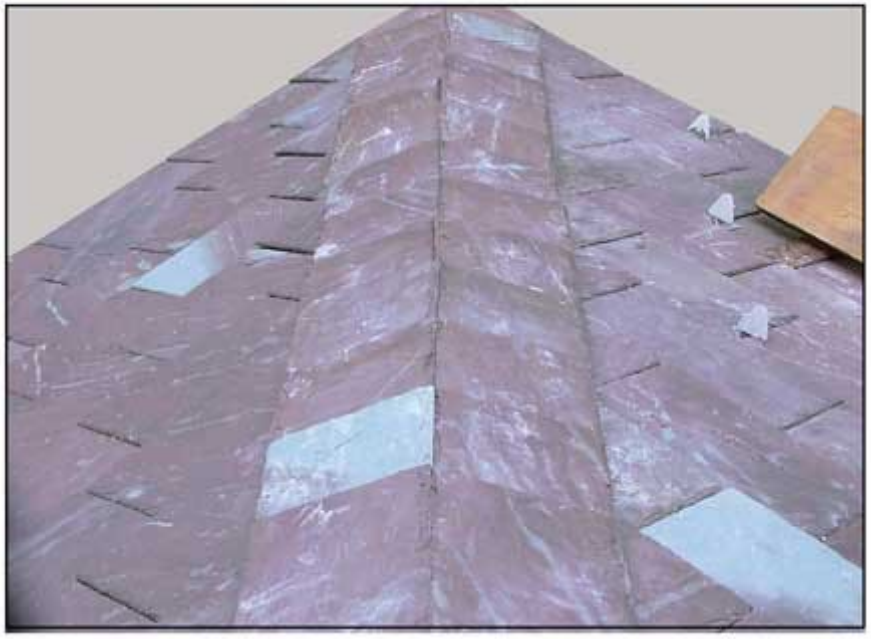


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Step flashing installed in a saddle ridge or hip creates a more water-tight roof.

Ridges and Hips

When replacing metal ridges, use wider ridge replacement metal to cover the old nail holes, if possible.

It is recommended that new ridge or hip metal be installed with concealed, not exposed, fasteners.

If ridge/hip metal is nailed or screwed, the nail or screw heads should be gasketed.

New ridge/hip metal must be sized to maintain correct headlap with the underlying slate (it must be wide enough to not leak).

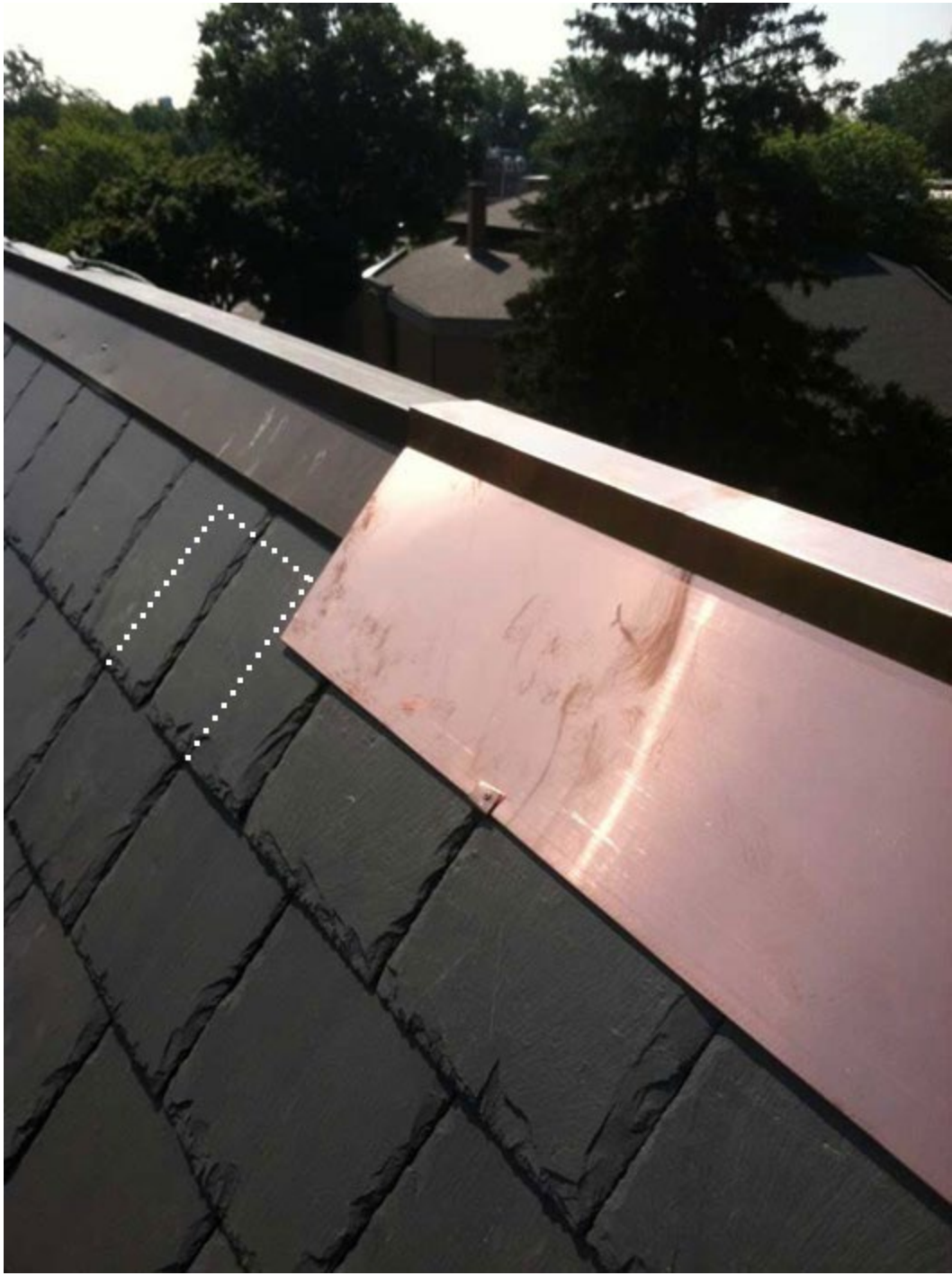


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An oversized ridge is being installed to cover the existing ridge due to a lack of overlap.

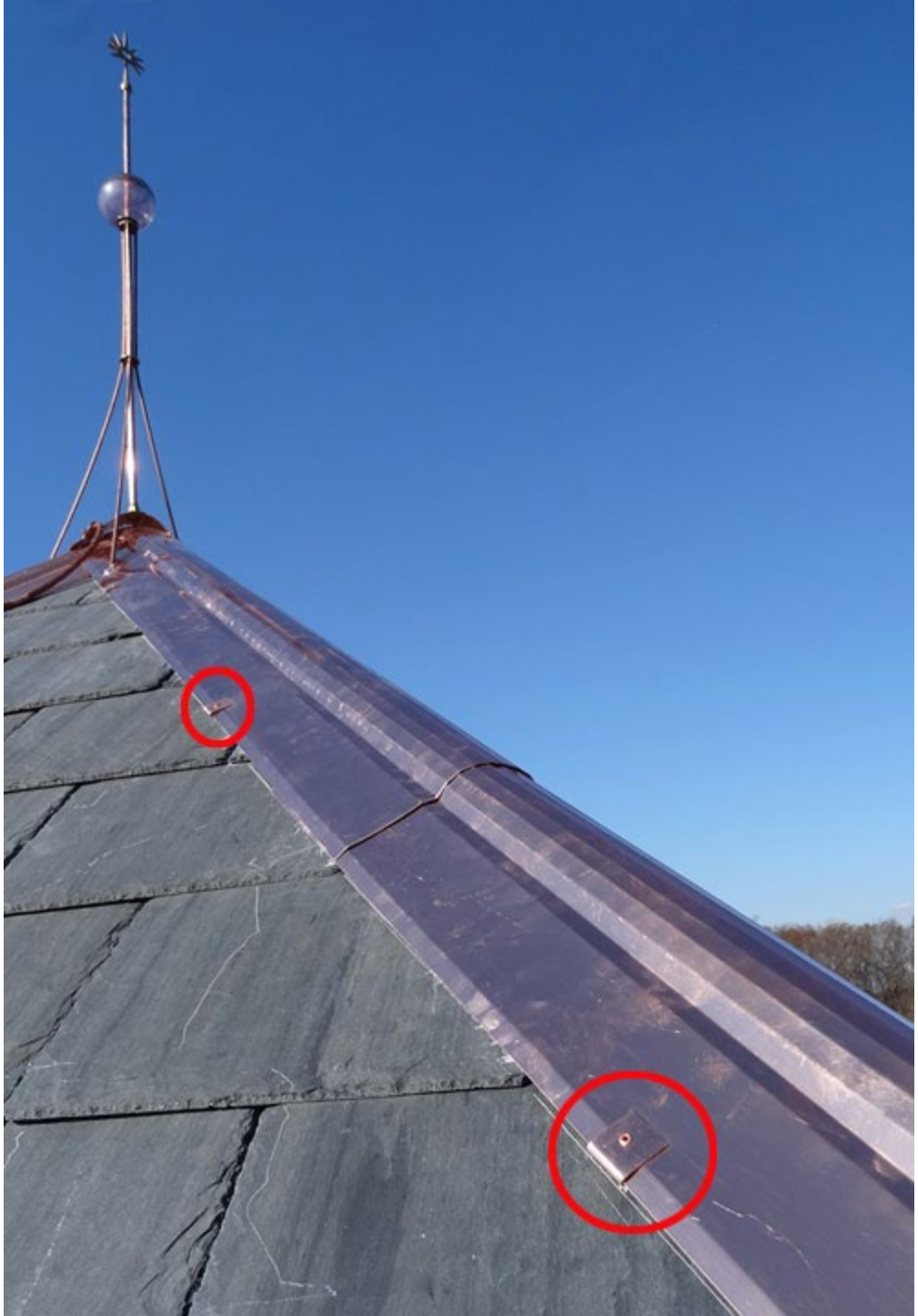
The original ridge metal was not wide enough to provide correct overlap on the head of the slates.

The dotted line shows where the slate is positioned. Note the lack of headlap under the ridge.



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It is recommended that copper hips and ridges be installed with concealed fasteners (in this case, riveted copper cleats). Otherwise, exposed fasteners should be gasketed.



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GENERAL ROOF PENETRATIONS

Other roof penetrations that have not been addressed here may also need flashing replacement. These include such things as air vents, skylights, and cupolas.

Generally, these can be reflashed in the same manner as chimneys or the other flashing systems discussed in this course.

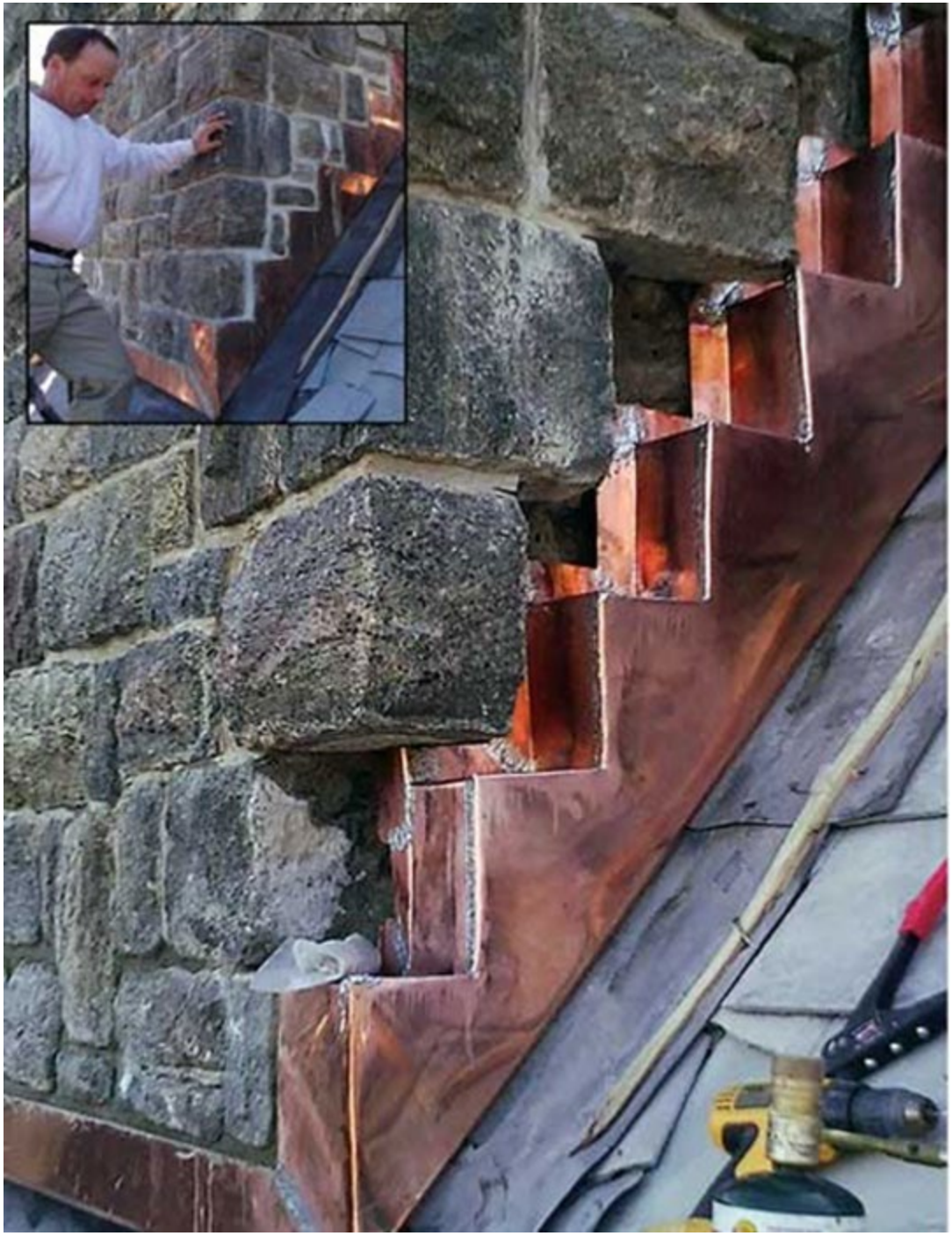
We intend to develop flashing training courses in the future.

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THROUGH-WALL FLASHINGS

If non-ferrous metal (e.g., copper) through-wall flashings are found properly installed and in good condition, they may be reused when underlying flashings are replaced.



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RECYCLING METAL FLASHINGS

Old flashing metal, when removed for replacement, should be taken to a scrap yard or otherwise recycled, whenever possible.



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BUILT-IN GUTTERS

Built-in gutters are built into and below the roof plane, or on the plane of the roof, usually at or near the eaves.

When they wear out, the metal linings must be removed and replaced in their entirety.

Built-in gutter liner replacement can be delayed with temporary or emergency patching.



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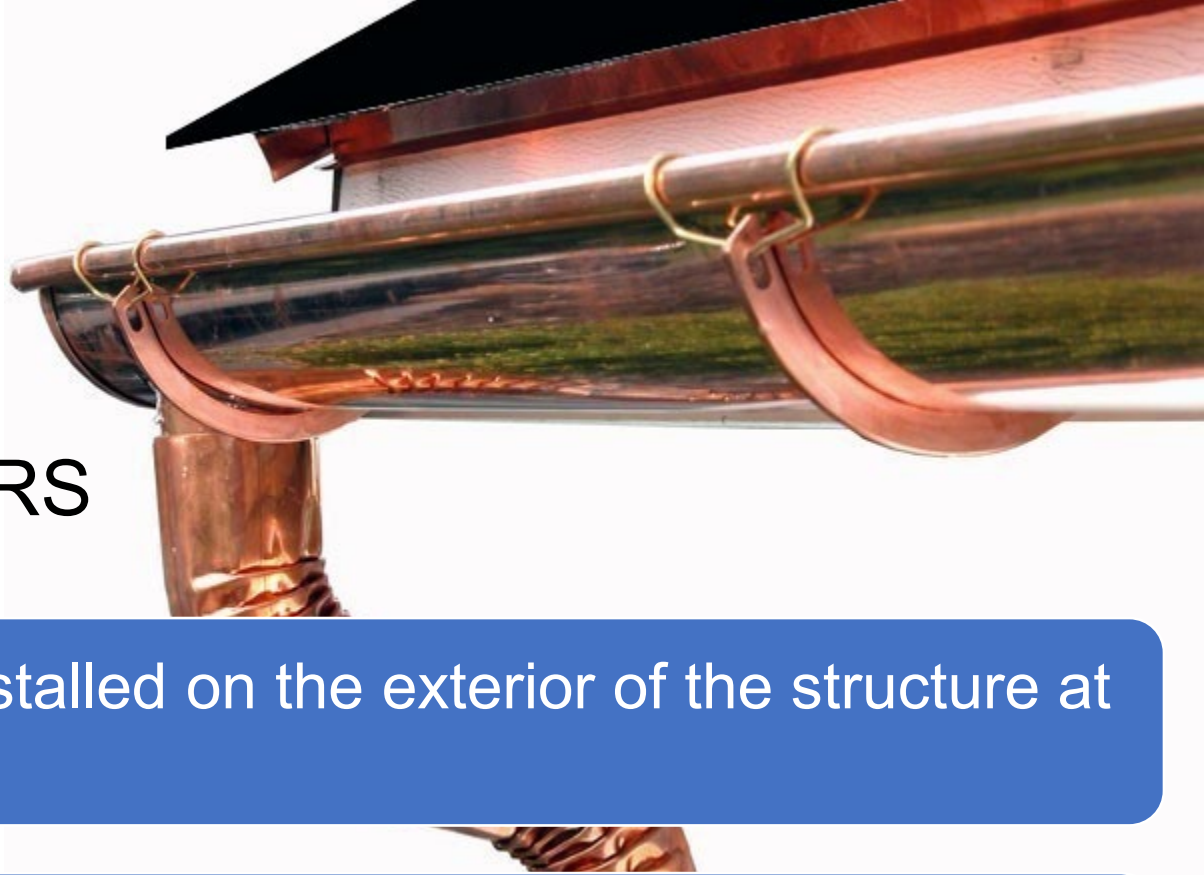
Old built-in gutter replaced with new 20-ounce copper.





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HANGING GUTTERS

Hanging gutters are installed on the exterior of the structure at the eaves.

When they wear out and leak, are damaged, or installed incorrectly, they may need to be removed and replaced in their entirety.

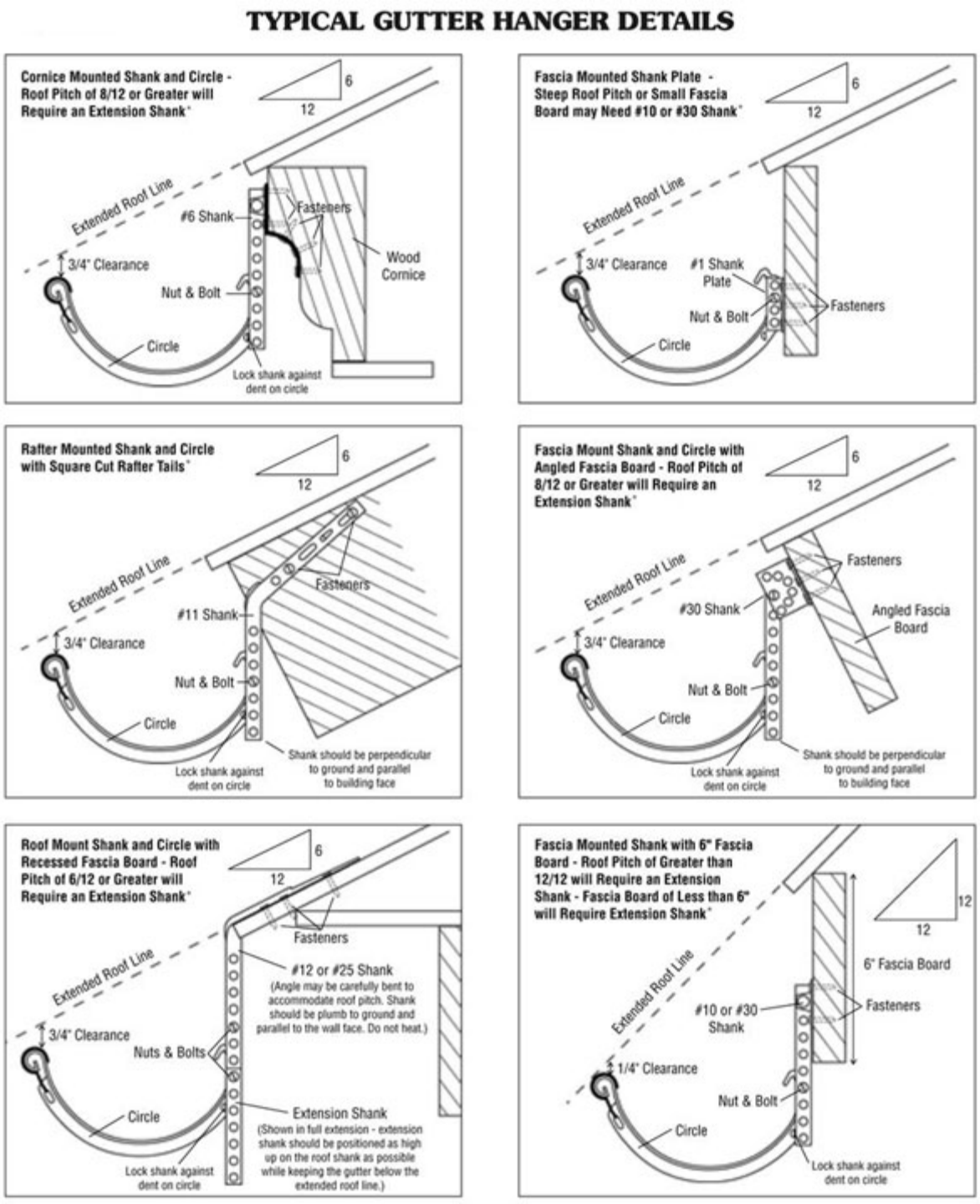
Gutter hangers must not be attached through the slate but should be installed directly onto the roof deck underneath the slates, or to the fascia.

When replacing exterior gutters, remember that the outside edge of the gutter should be below the roof plane.

Otherwise, use snow guards to protect the gutters from ice and snow avalanches.

Image source: Berger Building Products, Inc.

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Strap Hangers on Gutters

Gutter hangers on top of slates can ruin the roof. The hangers must be removed and re-installed underneath the slates. The damaged slates must be repaired or replaced.

It is recommended that the gutter's metal type be galvanically compatible with roof valleys and other roof flashings (i.e., copper gutters with copper valleys).



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SNOW RETENTION SYSTEMS

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Snow guard or snow rail layouts should be designed by a qualified design professional. Quantities and spacing should be based on conditions specific to the geographic area, roof slope, rafter length, and so on.

Refer to manufacturer's installation recommendations.

Snow guards can be installed during the roof installation, or after the roof has been installed (retrofit snow guards).



These retrofit snow guards simply slide underneath the slate and hook on a slating nail. A typical installation requires 3 horizontal rows installed on every other slate. No caulk or roof cement is required.



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Galvanized snow guards can stain the roof with rust.

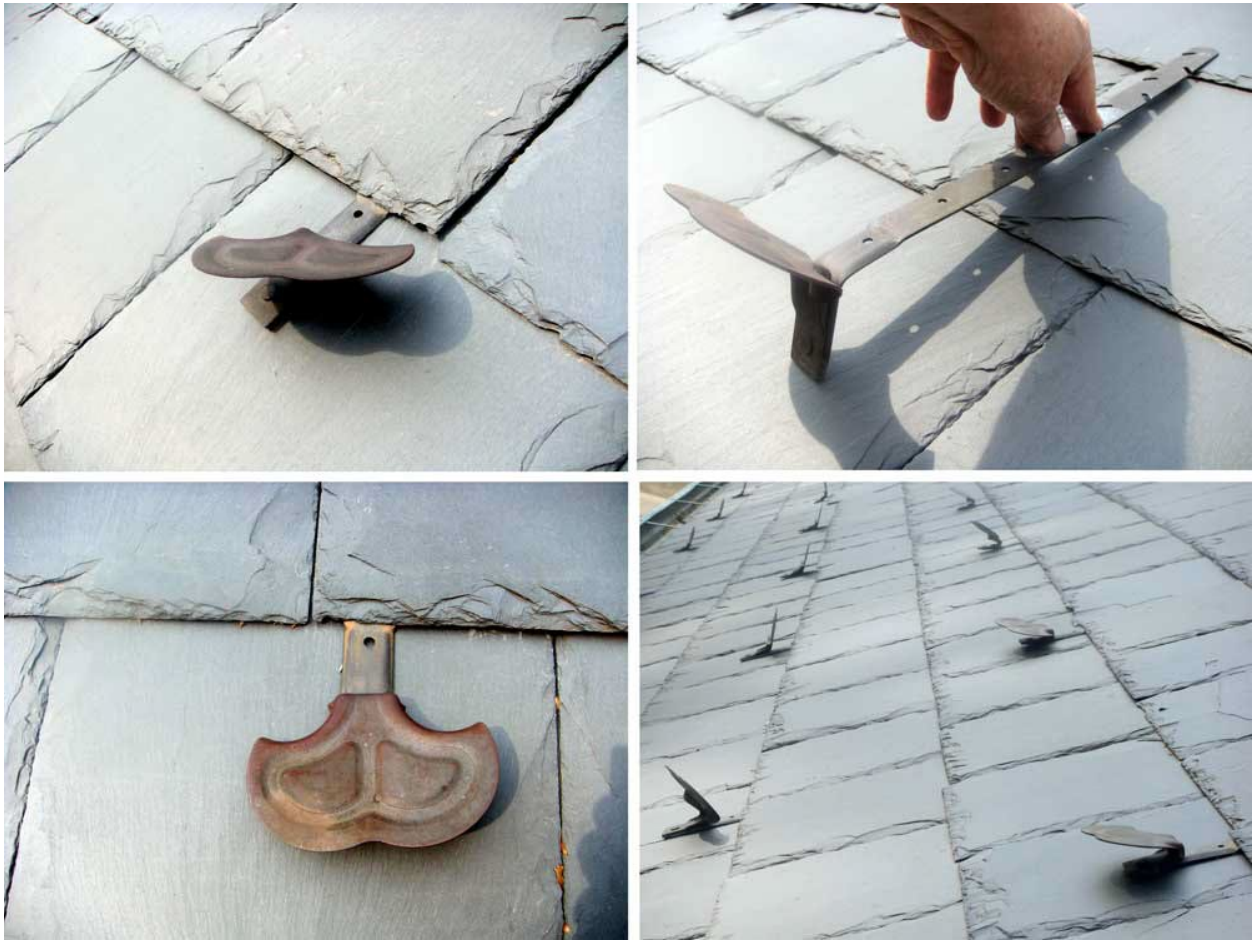


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Snow Guard Failure and Replacement

Snow retention systems may fail with age, or when incorrectly designed, or when the snow guards are installed in insufficient quantities.

Inadequate snow retention systems can be removed and replaced in their entirety or supplemented with additional snow guards or snow rails.



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This snow rail failed due to insufficient snow rails being installed. They must be spaced no more than 25 feet apart vertically.

Extra snow guards were also needed above this snow rail to prevent avalanches from an upper roof.



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Questions?

Thank you for attending!

This slide presentation was created by the Slate Roofing Contractors Association of North America, Inc. The following SRCA Directors voluntarily contributed to this project:

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