

SLATE ROOFS

AVOID THESE 21 CONTRACTOR ERRORS

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Figure 1: These photos of existing slate roofs attest to the durability, beauty, and longevity of this natural roofing system.

A small leak will sink a great ship — little mistakes can create huge problems. Since my area of expertise is specifically in slate roofing, I have observed and documented many mistakes that contractors make when installing slate roofs. By documenting and illustrating some of the mistakes I have seen in the field, I hope to help others avoid making the same mistakes. Slate roofs are a wonderful architectural roof assembly, but poor installations are hurting the reputation of this excellent roofing system.

Most American slate shingles should have an expected longevity of somewhere between 75

and 150+ years, depending on the type of slate. The best slate roofs use a good quality slate of known origin and proven performance, fastened with corrosive-resistant fasteners such as copper, stainless steel or hot-dipped galvanized nails, attached to decks of solid wood at least 3/4" thick. Pretty simple. So what goes wrong? Well, here are some examples, in no particular order:

1) SIZE OF SLATE: The smaller the slate shingle, the more that are required to cover one hundred square feet of roof — a "square." For example, the largest standard size, 14" X 24", requires 98 shingles per square. The smallest standard size, 6" X 12", requires 533 shingles per square. Since each shingle is attached to the roof deck with two nails, obviously the smaller slate will require much more labor during installation. If a contractor is not aware of this fact, he may choose to purchase small slates simply because they may be less expensive. In one case, this proved to be a dire error — the contractor bought 6" X 12" slates for a re-roof on a 12 story building in Kansas, probably trying to save money on materials, then he went bankrupt halfway through the job, no doubt because his labor costs were sky-high.

2) TYPE OF SLATE: Ideally, the slate selected for a project is a tried-and-proven material with many decades of outstanding performance in the field, manufactured by a company that takes pride in its product. Most American and Canadian slates fall into that category. However, there are many foreign slates entering the American market these days with little or no history of performance. In one recent case, a very large two-year-old roof installed with Chinese black slates faded, or changed color dramatically to create a splotchy, unpleasant black/white appearance. The entire roof had to be removed and reslated at great cost. This is not to suggest that all Chinese black slates will do this, but obviously some will. Selecting the correct slates can be very tricky when the slates come from an-

other continent and you can't trace their origin back to any particular hole in the ground.

Some Spanish black slates are known for their pyrite content, which will bleed red rust stains down the roof. Figure 2 shows such a slate taken off a residence in Florida after only one year on the roof. This large residential roof had to be completely reslated, again at great expense. The owner of the residence selected this slate because he liked the shade of black, not understanding that some slates can change in appearance with exposure to weather. When selecting Spanish slates, it is important to know whether those being considered are pyrite-bearing, a condition that may or may not be obvious by visual inspection. In a recent case on the east coast, an entire church roof had to be reslated because the new Spanish black slates were bleeding rust down the roof and the church people did not like the way it looked. Again, this is not to be construed as a condemnation of all Spanish black slates, as some are quite good.

In another case, Spanish black slates were ordered for a large roof, but they were not all from the same origin. Although they looked the same sitting in the pallets on the ground, once they were installed on the roof, they created a slightly mottled look that was unacceptable to the property owner. It's hard to say who to blame this mistake on — the supplier, who should have known they were not sending the same material to the job site, or the contractor for not rejecting the slates due to obviously different pallet markings suggesting slates of different origins. The contractor could also have prevented the unsightly, patchy mottling of the roof by thoroughly blending or shuffling the slates before installing them. This would have allowed for a uniformly mottled effect that is pleasing to the eye.

3) OPENING PALLET: Even if the slate is all from the same source, different pallets can contain different shades of

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Figure 2: This Spanish black slate leached rust stains down the new slate roof after only one year.

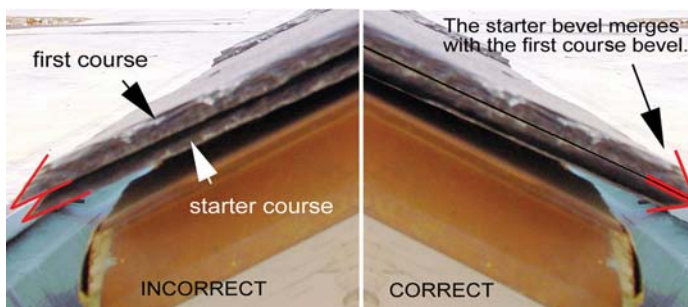


Figure 3: Even domestic slates can rust. These Vermont slates on a high-rise apartment were poor in quality and should have been screened for pyrite inclusions.



Figure 4: Traditional slate roofing systems, despite their incredibly successful performance, are being largely abandoned in favor of plywood roofs with peel and stick underlayment.

Figure 5 (right): The starter course should be flipped over and laid upside-down as shown on the right in this illustration. This creates a clean drip edge and allows for correct nail counter-sinking.



slates due to the location of the rock strata or other factors related to the quarrying of the material. Therefore, when the slate is delivered to the site, all of the pallets should be opened from the outset and slates taken simultaneously from each pallet in order to blend the entire inventory and create a pleasant appearance on the roof. It is a mistake to start with one pallet, install those slates, then open another pallet, install those slates, etc.

4) CULL OUT BAD SLATES: Poor quality slates can originate from any quarry. This may be due to the manufacturer not culling out rejects, for example. Shoddy quality control can lead to rusting pyrites on even the best American slates. Figure 3 shows Vermont slates badly rusting down an apartment building roof. This is unusual and indicates a commercial source of roofing slate that should have been avoided, or a bargain slate that wasn't worth the money, and/or a contractor who should have culled the defective slates out, but didn't know what a bad slate looked like.

5) BUY FROM A CONSCIENTIOUS SOURCE: There are other nuances related to the manufacture of roofing slates that can affect quality and longevity. Direction of grain and nail hole placement are two examples. A good manufacturer will be aware of these nuances and strive to produce top-quality slate. It pays to buy from such a slate source.

6) DON'T REINVENT THE WHEEL: Styles and methods of slate installation can vary greatly, but one important point needs to be emphasized: if it's *longevity* that's desired, then the installation system should be based upon known methods and materials that have proven themselves. A solid, not laminated, wood roof deck, with the emphasis on correct slate and flashing installation and not on underlayment, has proven to provide exceptional longevity. Such traditional methods and materials can easily be replicated today, yielding the same degree of success. Figure 1 shows a number of existing slate roofs that have stood the test of time despite being made only of slate, wood and fasteners.

Figure 4 shows a 150-year-old slate roof being replaced in Boston. Although the roof was still functioning at the time of replacement, and the existing roof system, made of slate, 1" boards, 30 lb. felt, and nails, had demonstrated a 150 year performance, the contractors who replaced the roof completely abandoned the existing system and replaced it with one that had no proven longevity, emphasizing underlayment and completely eliminating any chance of air transpiration. The original 1" roof board deck, still sound, was covered with 1/2" plywood, then peel and stick, then 30 lb. felt, then slate. Will this new roof system last 150 years? Time will tell, but why reinvent the wheel? A chain is only as strong as its weakest link. Traditional slate roofing systems have already proven themselves, are less expensive, are more environmentally friendly, and take less time to install. If one wants to guarantee that a slate roof will last a century or two, traditional methodologies should be followed.

7) GET THE STARTER COURSE RIGHT: The starter course is the very first row of slates to be installed. Starter slates are invisible once the roof is completed because they're hidden underneath the



Figure 6 (above): No slate lies flat on a slate roof. Every slate is angled, which is why they should not be walked upon and why the starter course requires a cant.

first course of slate. The starter course slate should be installed face down, unlike all the other slates on the roof, which are installed face-up. This is the traditional installation method as it allows for a clean drip edge where the starter slate meets the first course (Figure 5). Inexperienced installers often put the starter course face-up.

Often, the cant or shim strip is missing underneath the starter course. Starter slates must be angled on the roof in order to match the angle of all the other slates in the field of the roof (Figure 6). Typically, this was done by installing a wood strip (Figure 7), but it can also be achieved by using a metal drip edge with a cant formed into the metal, or even by raising the fascia.

Another common mistake on starter courses is a lack of headlap, especially when the field slates are turned sideways and used for starter slates. An example of a starter course lacking headlap is shown in Figure 8. Read more about starter courses in TR 5 (traditionalroofing.com).

8) GET THE HEADLAP RIGHT: If the headlap is missing or inadequate, the roof is probably going to be condemned. Headlap is the overlap on each course of slate by the second course above it (Figure 9). This overlap is what prevents the roof from leaking. Three inches is standard, but headlap can vary according to the slope of the roof. Figure 10 shows a shopping center roof in Louisiana, newly installed, with about an inch of headlap on the field slates. The overlap should be 3". There is no fix for this inadequacy other than to rip off the entire roof and start over.



Figure 7 (above): Note that the starter slate is laid back-side-up and is propped up by a cant strip.

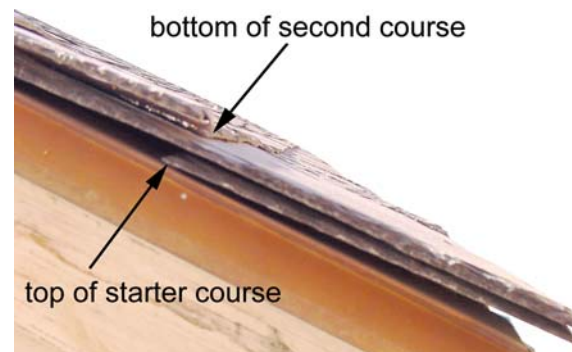


Figure 8 (above): The starter course should be overlapped by the second course by at least three inches. In this case, it is not overlapped at all. This is a serious, but common mistake. Note also that the starter slate is incorrectly laid back-side-down. This is an indication that the installer was inexperienced in laying slate.

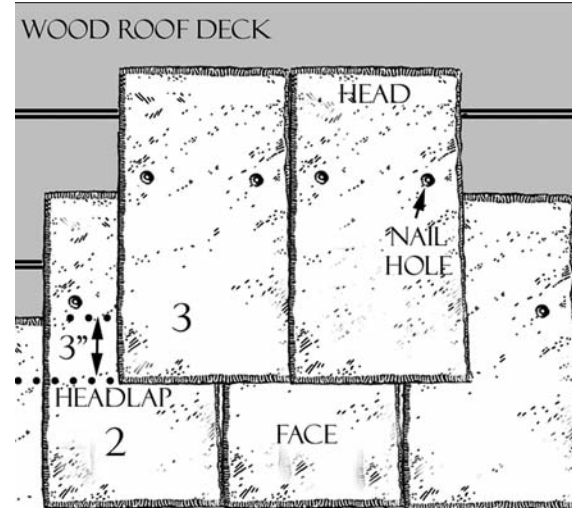


Figure 9 (above): Headlap is a critical detail on a slate roof. Lack of headlap will cause an entire roof to be condemned. Read more about headlap in TR6.



Figure 10 (right): This is an example of inadequate headlap (about 1") on a shopping center in Louisiana. There is no solution for this poorly installed new slate roof other than to remove it and start over.

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Figure 11: When the slate courses are spread too far apart vertically, negative headlap can result, creating holes all through the roof.

Negative Headlap



Figure 11 shows a university building with a new slate roof — and, incredibly, *negative* headlap. This is the same as having holes all through the roof. It's hard to believe that roofing contractors can make such drastic mistakes, especially on institutional buildings, but seeing is believing. Read more about headlap in TR 6 (traditional-roofing.com).

9) WATCH YOUR LATERAL OVERLAPS: Lateral overlaps, or sidelaps, should also be 3" minimum. However, don't be surprised to see slates with no lateral overlap at all, as shown on an historic building in Georgia (Figure 12). Incorrectly placed sidelaps can leave the butt-joint directly over the slating nails, as shown on an historic Pennsylvania State Park building in Figure 13. This will allow direct water entry through the nail holes.

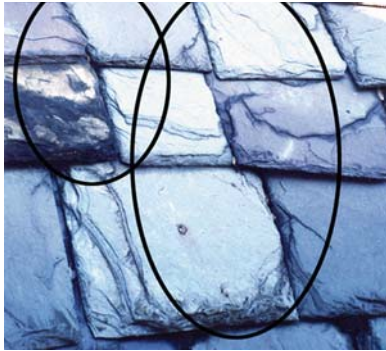


Figure 12 (above): "Sidelap," or lateral overlap, should be 3" minimum. Here we see no lateral overlap at all. This roof had to be removed and reslated as it also had no headlap.



Figure 13 (above): Each course of slates should have been staggered so as to break the course below down the center. Instead, these slates were butted directly over the underlying slating nails, ensuring leakage.

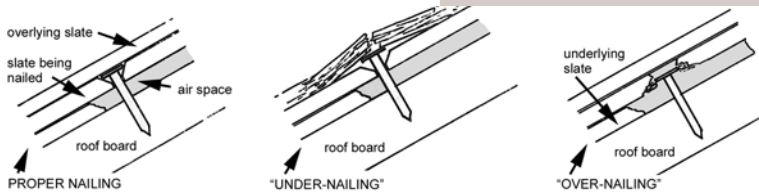


Figure 14 (above): A good slater has no problem nailing slates correctly. When properly nailed, the nail head just sits down inside the slate. When undernailed, the protruding nail head can damage the overlying slate over time. When overnailed, the slate being nailed will crack, break, or cock awkwardly on the roof.



Figure 15: A protruding nail head eventually wears a hole in the overlying slate.

new slate roof installations is what I call the Bigfoot Syndrome — roofers walking on the slates during installation, as shown in Figure 18 on a new bank building in Kansas. An experienced slating crew will make every effort to keep off the slates during installation by staging the roof correctly (Figure 19). When Bigfoot walks all over the slates, the shingles

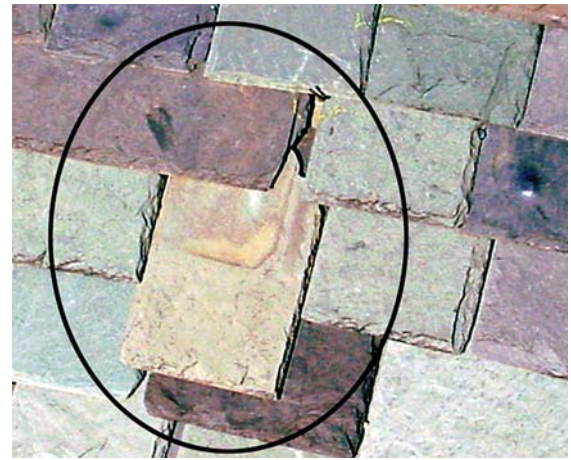


Figure 16: This slate was nailed so tightly that the nails broke through the slate and the slate is sliding out.



Figure 17: When the slating nails are too long, the back of the roof decking breaks out. This reduces the effective holding power of the nail. A longer nail, therefore, does not mean more holding power. The best nail length just barely penetrates the roof deck, if it penetrates at all.



Figure 18: It is a mistake to walk on a slate roof during installation.

12) STAGE THE ROOF CORRECTLY: A very common error with



Figure 19: A correctly-staged slate roof will enable the roofers to install the slate without the need to walk on the shingles.

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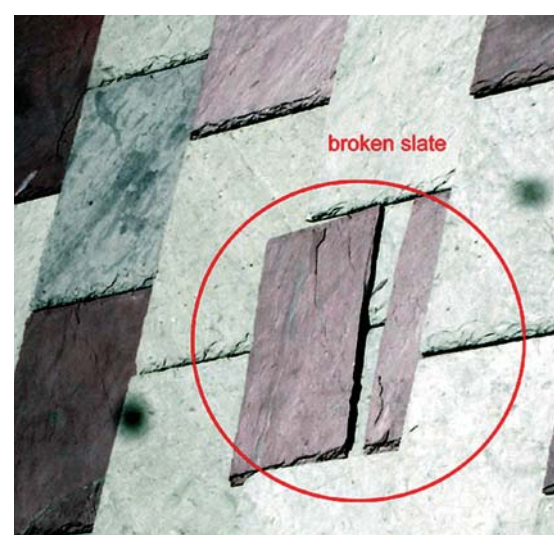


Figure 20 (above): Slate roofs that are walked on during installation will shed slates after the roof has been installed, perhaps for years.

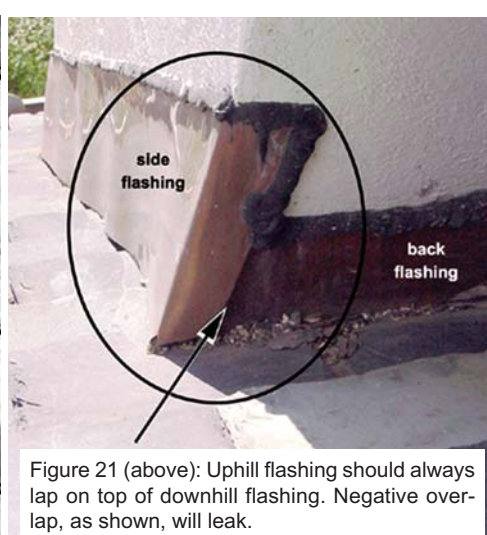
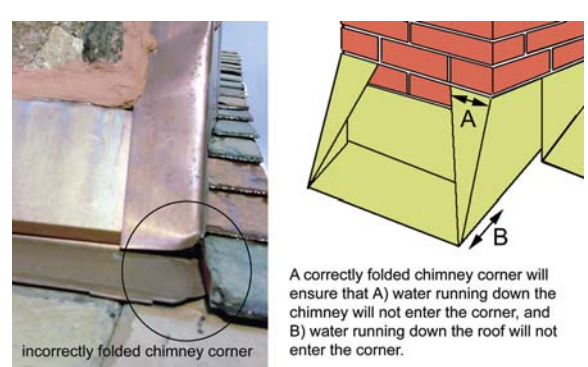


Figure 21 (above): Uphill flashing should always lap on top of downhill flashing. Negative overlap, as shown, will leak.



A correctly folded chimney corner will ensure that A) water running down the chimney will not enter the corner, and B) water running down the roof will not enter the corner.

Figure 23 (above): This chimney corner flashing (left), although folded, was installed incorrectly and will surely leak. A properly folded corner flashing must account for the water that runs down the chimney as well as the water that runs down the roof. In effect, the flashing should create a mini-roof over each corner.



Figure 24 (above): This is a case where the corner flashing is neither folded nor soldered, leaving a large hole in the roof.

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crack and break (Figure 20). They may not fall apart immediately, but I have seen a hundred slates fall off a new slate roof within five years after installation due to the Bigfoot Syndrome.



Figure 25 (above): Box gutters require expansion joints, otherwise the solder joints will crack under pressure. This is evident by solder joints that have been covered by roof cement, a common sight on box gutters, new and old.



Figure 22 (above): Chimney corners flashings should either be folded or soldered. If neither is evident, then the corner is either sealed with sealant, or with nothing. In either case, this is a leak waiting to happen.

13) INSTALL FLASHING CORRECTLY: Flashings provide all sorts of opportunities for error. Negative overlap, for example, is sure to leak. Figure 21 provides an example of negative flashing overlap. Uphill flashing should always lap on top of downhill flashing. When lower flashings lap on top of higher flashings, water can enter the roof. Corner joints on roof penetrations are also commonly flashed incorrectly — chimneys provide a perfect example. The corner flashings must either be correctly folded, or else soldered in order to prevent leakage there. If a corner isn't folded or soldered, as shown in Figure 22, then the only thing keeping it from leaking would be caulk or sealant, which does not have adequate longevity. An incorrectly folded chimney corner is illustrated in Figure 23. This is a leak waiting to happen. Dormers also often have corners that need to be flashed. Without the knowledge of folding corners or soldering, a dormer corner can be left wide open and waiting for the first good rainstorm (Figure 24).

14) ALLOW FOR METAL EXPANSION: Common on many slate roofs are built-in gutter systems. "Box gutters" require expansion joints, but they're often installed without any allowance for expansion whatsoever. This becomes evident by the failure of the solder joints (Figure 27), which are often roof-cemented after they start leaking in order to alleviate water penetration (Figure 25). Expansion joints (Figure 26) can be added after the gutters are installed, but it's a lot easier to install them correctly in the first place. Read more about expansion joints in TR 6 (traditional-roofing.com).

15) USE COMPATIBLE METALS: A common sight on new slate roof installations is metal incompatibility, often steel and copper used together (Figure 28). The copper will "eat" the steel, causing steel fasteners to degrade at an accelerated rate.

16) THROW OUT MAGNETIC RIVETS: Many roofing supply outlets sell copper rivets with copper-plated steel mandrels. When

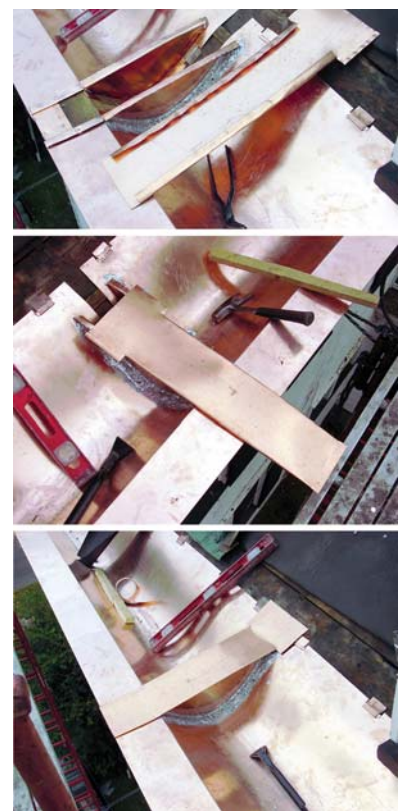


Figure 26 (above): Expansion joints allow built-in-gutters to move when expanding and contracting, thereby relieving the stress on the solder joints and prolonging the life of the gutter.



Figure 27: This is a perfect example of a new built-in gutter showing failed solder joints because not a single expansion joint was installed in the gutter system.

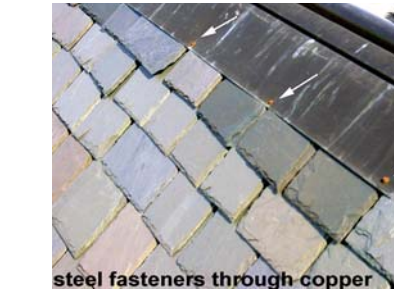


Figure 28: Steel fasteners on copper, as shown, will deteriorate.

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NEW RIVET RUSTING

Figure 29: Copper rivets with steel mandrels will rust almost immediately, even through a solder joint.

RUSTING THROUGH SOLDER

Top of gutter should clear plane of roof.

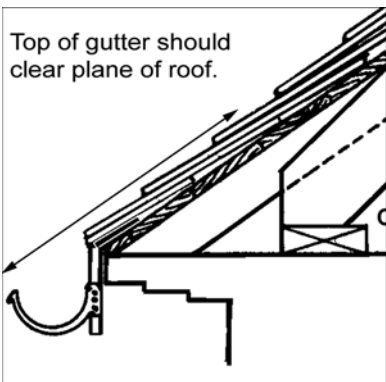


Figure 30: Ideally, the outer edge of external rain gutters should be hung below the plane of the roof to prevent damage to the gutters from sliding ice and snow.



Figure 31: This gutter is just waiting for a snow avalanche to knock it off.

take it apart for later repair or restoration. It isn't gonna happen.

Hopefully, you've gained some knowledge from this little sampling of slate roof mistakes. Yes, there are others, but there are only so many pages in this magazine. Slate roofing is not rocket science, and any reasonably intelligent person who takes the time to become informed about the topic will be able to successfully install a roof sure to last for generations. There are plenty of slate roof resource materials available both in print form and on the internet. A couple hours of research can save a roof installer a lot of headaches, prevent high blood pressure and ulcers, and keep him out of litigation. I long for the day when every slate roof I survey is free of major defects. In the meantime, I won't be holding my breath waiting. ❏

the rivet is installed, the steel mandrel breaks off inside the rivet, lurking there to eventually rust and create a hole in the flashing (Figure 29). These rivets *look* like they're made of copper, but they aren't. Check them with a magnet to be sure. Copper is not magnetic, but steel will stick to a magnet like glue. Copper rivets should have brass mandrels, not steel. If they're magnetic, pitch them.

17) DON'T SOLDER WITH AN OPEN FLAME: Open-flame torches should never be used to solder flashings, so if you see a worker on a slate roof soldering a box gutter, for example, with an open flame plumber's torch, *say something*. The flame is too hot and will ignite the substrate, be it felt paper or rosin sheet, which will then smolder underneath the metal, perhaps unnoticed until it's too late. If the smoldering is noticed, panic will ensue because there is no way to get to the fire without first ripping out the flashing. The correct tool for a soldering job is a closed-flame soldering device, or a heavy-duty electric soldering iron. Open flame devices can be used on external copper gutters, however, because the metal is not in contact with the roof.

18) HANG GUTTERS BELOW PLANE OF ROOF: Speaking of gutters, they're often hung too high. The outer edge of external gutters should be below the plane of the roof (Figure 30) in locations where snow or ice could slide down the roof and knock them off. The gutter in Figure 31, for example, will not last long.

19) USE ENOUGH SNOW GUARDS: Snow retention systems are another source of problems when they're installed incorrectly. One of the tricks for a proper snowguard installation is to use enough of them. Otherwise, they won't be able to hold the weight of the ice and snow and will rip out, taking slates with them. A poor snowguard installation is shown in Figure 32. The lack of snowguards on this large roof caused many to rip out during an icy winter. Follow the manufacturer's guidelines when installing these popular slate roof elements.

20) USE THE CORRECT TOOLS: Incorrect tools can be the downfall of many a would-be slater. Slate roofing has its own unique set of tools and equipment. For example, slates should be cut with, you guessed it — "slate cutters." A slate cutter will leave a beveled edge on the shingle, allowing it to match all the other shingles on the roof, all of which have beveled edges. If a diamond blade is used to cut the slates, a square edge remains, which can stick out like a sore thumb and get a roofer into trouble if the property owner doesn't like the look of it. Figure 33 is a perfect example of square edges exposed at the wrong place on a slate roof. These square edges could be dressed with a slate hammer and stake to give them the proper appearance, but one has to first have these tools in the tool box. When the proper cutter is not on hand, a roofer will resort to drastic measures to try to cut slates, as shown in Figure 34, where it looks like the slates were chewed off by Bigfoot himself. This brand new roof, by the way, also had to be completely removed and reslated, causing the property owner much expense and grief.

21: INSTALL UNDERLAYMENT UNDER SLATES: I looked at a new slate roof where a first-story section had been installed with self-adhering underlayment (ice membrane) pasted over top of each course of slates before the next course was laid. You couldn't see the underlayment because it was covered. That winter was a bad ice year and an avalanche fell on the first-story roof, damaging the slate. I was asked how to repair it. "Rip it all off and reslate it," was my advice. There is no way to repair a slate roof that has been glued together like that. The beauty of traditional slate roofs is that they are like cars, you can remove any part and replace it, and in so doing, you can keep such a roof alive for centuries. Glue the roof together, then try to



Figure 32: Snowguards must be installed in adequate quantities, or else they will get knocked off in the first bad ice storm and will damage the roof in the process.



Figure 33: Diamond blades cut a square edge on slates, making them stick out like a sore thumb.



Figure 34: Slate roofing requires the correct tools to do the job right. There is no excuse for the sort of work shown above.