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Home Building Mistakes & Fixes

Practical Fixes for Real World Home Building & Repair Problems

by

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Craftsman

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Also, thanks to Danny Quindoy for his input on carpet installation.

To my wife Dee, who for many years sat alone at night while I worked on this book up in my computer room. She thought it might never get done, but still would go down to buy me supplies to help finish it.

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INTRODUCTION

When I started out as a builder/remodeler, I read up on any literature that would help me do a better job, in less time and at less cost. But whenever I went out on a job, those instructions that I'd read didn't seem to help much, as the real things didn't go the way the books said. To change out a range hood, for example, you just unscrew the old one, slide in the new one, connect up the flue, and screw it on tight. Quick and easy. Right? But when I went out on the job, the screws were rusted and broke off when I tried to unscrew them. When I finally wrestled the thing out, I saw that the flue was crushed and leaking. So I had to replace that. Then when I tried to put the new hood in, I found that the opening was narrower in the back than it was in the front, so it wouldn't go in. I made some "adjustments" with my saw and a rasp, and got it in, but discovered that not only was the flue opening in the new hood in a different place than it was in the old one (I wish I'd checked that before I worked on fixing the flue), but the screwholes in the front went into air! The new hood was for standard cabinets, and the cabinets in that old kitchen were non-standard and about 2 inches shallower.

What was my other mistake on this job? I'd already named my price and hadn't included any provision for surprises. Lesson learned.

And this is how it usually went. Practically nothing ever just fit right in and hooked up just right. Maybe the people who wrote those books got all the easy jobs and left me with the battles.

But I was young (and maybe a little foolish) and I was just a bit smarter than the average Joe, and I made it my rule that I could always fix what others couldn't. No challenge was too big for me. And it worked. Pretty soon I was known as the guy to call when there was a problem.

I lived in rural North Michigan, where we got some real weather. On top of that, we had many buildings and alterations done by either builders or do-it-yourselfers who didn't know what they were doing, or who didn't like to waste time thinking – there were some unbelievable mistakes. Combined, these made for lots of problems, and since it was a far-from-affluent area, I had to figure out fixes my customers could afford. And this I did, and I made a decent living at it too.

It took being creative. Sometimes I couldn't come up with a way on the spot, but overnight I generally figured something out. True, a modern building inspector would likely cringe at some of my fixes, and I expect current building codes wouldn't allow some of the things I did. Yet everything I did worked and held up. If it hadn't, my wife would have heard about it in the market or at the hairdresser, and my kid would have come home from school crying because the other kids were teasing her that her daddy didn't know how to build. And you thought having the inspector fail your job is hard to take?

What I'm describing in this manual is *what I did*. I'm not promoting my tips as what you should do. I'm certainly not promising the methods are in accordance with what the code you work under will allow, nor that the work will pass inspection. I'm just telling you what I did, and how I did it. I can tell you that they worked, but you'll have to judge for yourself if you should use any of these methods on *your* jobs. Maybe, if you're working under strict code enforcement and my method wouldn't pass, you can spinoff your own approved method, using mine as a base. At worst, as a builder, you may just enjoy reading my tales of the horrific building mistakes and problems I was called on to fix. And I'm pretty sure that at least one of my tales is going to come in handy for you sooner or later, either showing you how you might solve a problem, or showing you what *not* to do so you don't *create* a problem.

Buck Nemeth

1

SELECTING THE SITE

None of us in the building trade can say we haven't made a mistake here and there. Some we can correct. Some we can re-do. But no mistake is as permanent or expensive as miscalculating a building site's location. You can fix a door hung the wrong way, or a window that's been framed 12 inches from where it was supposed to be . . . but how do you fix a room addition you've built that encroaches onto a neighboring lot?

Who's Going to Pay for This?

We've all heard war stories about contractors building on what turns out to be the neighbor's property. It's not that hard to do, and it doesn't even have to be the contractor's mistake. He could simply have been following the customer's instructions. But no matter whose fault it is, the contractor's going to take the heat. He's the professional and he's supposed to know what to check and how to check it. If he builds on the wrong land, over the setback line, or into the view corridor — even by an inch — what are the chances that the customer's going to pay him the full amount he's owed? Not good. The customer's mistake becomes the contractor's headache and expense.

When you contract to build an extension, or even just a wall, make absolutely certain you're building it where you're supposed to. And don't just go on the owner's say-so. Making assumptions about property line locations can get you in big trouble.

Confirm Property Lines

You can hedge your bets by confirming property lines with your local building or planning department. In most areas, there are fees charged for various required permits. Each jurisdiction has specific rules, and I encourage you to make the most of your building officials' knowledge. By following their directions to the letter, you'll find the building process easier, while building a reputation with the officials for being a straight-up contractor.

> ***THE TIDE IS TURNING*** *more in favor of rules and regulations in the building industry. It's good practice to become familiar with not only the process of building, but the permit process that precedes it.*

Let's look at a few cases where making assumptions about property lines caused problems for both the unsuspecting contractor and the naïve homeowner. You'll see it can happen quite easily.

The Importance of Boundaries

The job was to add a room on the back of the house. The customer showed the contractor the property line. He knew exactly where it was, because that's where the nicely-mowed grass ended and an untended area began. When the customer bought the property, he and the seller had walked the lot. The seller had told him the edge of his neat green lawn was the property line, and that the neighbor never took good care of his grass.

Like the customer, the contractor hadn't doubted that was the property line — it was obvious to him. But the real boundary was actually 20 feet closer. The grass wasn't any indication of the property line at all — it just looked right. The customer had been mowing a 20-foot strip of his neighbor's yard.

The footings were dug and the cement truck was there for the pour when the neighbor showed up and said, "Hey, you're building over the lot line!"

"No," said the owner, "I was told my lot goes way over here."

"Well, you better look it up. You're trenching on my property."

That's where the cement contractor came in. Working with a transit, he confirmed the true property lines. Sure enough, the neighbor was right.

This is one of those nick-of-time saves reserved for the lucky. If the neighbor hadn't shown up, the cement would have been poured, the framing started, and possibly the whole addition would have been built extending several feet onto the adjoining lot.

Build on the Right Lot

Here are a couple of cases where the building wasn't just a little bit over the property line — it was on a whole different lot.

Whose Land is This, Anyway?

In this case, the owner had bought the land for hunting many years before. He thought he knew his property well. He'd go hunting and dream of exactly where he'd build a cabin or little lodge someday, secluded on a favorite hill. The owners of the surrounding heavily-wooded land also just used it for hunting. There were no fences or other boundary marks. Each owner kept track of his land by remembering landmarks.

> *"There were no fences or other boundary marks. Each owner kept track of his land by remembering landmarks."*

Our owner never met any of the other landowners in the area, and went ahead with his plans. He hired a contractor, who drew up the plans based on what the "owner" told him about the property location, and built the lodge. It had been finished for several months before the neighbor returned for hunting season, saw the building, and said, "Who's been building on *my* land?"

It wasn't just on the edge or butting up to it. It was smack dab inside the other man's property. The neighbor had bought the land primarily for investment, and quickly saw he was in a pretty good position — he had a buyer who couldn't dicker over price! He could have just said, "Thanks, neighbor."

Fortunately for the contractor, this customer took responsibility for his mistake and paid the price. This doesn't always happen. Too often, when building deals go south, the "injured party" looks for someone to blame. Here, he could have claimed it was the contractor's responsibility to make sure of property lines, and sued him for whatever he had to pay for the land. Sadly, the courts seem to favor the poor customer over the conniving contractor. Keep that in mind and *always* check property lines yourself before you build.

Don't Assume!

Mistakes can happen in the city, too. Here's a case where a city official, no less, made an assumption that could have had disastrous results.

This error began simply enough, from the fact that city blocks in this town didn't always have the same number of lots. The majority of blocks were 12 lots long, while a few were 16 lots long.

"Since most of the blocks in the city were 12 lots long, the city worker assumed that the man had bought the two end lots."

The city had two empty lots for sale, lots 11 and 12. Two other lots, 15 and 16, at the end of the block, were for sale privately. The buyer of the city lots was taken to see his purchase by a city representative. Since most of the blocks in the city were 12 lots long, the city worker assumed that the man had bought the two end lots. He showed him the property and said, "Here they are!" The man immediately began planning to build, enlisting the help of a local contractor. Priding himself on being methodical, and trusting the city's representative, our contractor assembled his crew and got to work.

Lots 15 and 16 had belonged to a local lumberyard whose owner had just sold the property. The new owner was *also* prepared to build. The lumberyard owner drove down this street daily, on his way to work. He saw the crew cleaning up the lot and getting ready to grade. Since he had just sold it, he assumed the new owner had hired them to clean up for the buyer. Then the real new owner drove by and saw the cleanup. But *he* knew that no one should be there.

He stopped to ask what was going on, and was told, "We're going to build two spec houses for our client on these lots he bought from the city." A call to the building department resulted in a visit from an inspector who sorted out the situation. It was decided that since both new owners intended to start their projects immediately, the solution was to clean up the other two lots. When both owners were satisfied that their properties were equally "prepared," each began his project. But don't assume your error will have such happy ending. Be prepared with the proper documents that leave no room for doubt that the property you see is what you should be building on.

Setbacks and View Corridors

Building on the wrong property isn't your only worry. A far more frequent problem is building over the setback line, or blocking someone's established view.

Setbacks

I don't think there's any jurisdiction that doesn't have setback requirements. Generally, you can't build right on the property line. What if the next-door neighbor did too? You'd be a little too close for comfort. Setbacks are different from community to community. There are also varying requirements for the side, back and front setbacks for a property.

Measuring setbacks from the wrong spot is a common occurrence. There's a difference between measuring from the house wall to the property line and measuring from the completed eave line. Check *beforehand* with the building department on where to measure from and what the rules are.

The Fence is the Lot Line ... or is It?

Lot lines can be unmarked or in the wrong place. Many landowners don't know exactly where their property lines are. They assume it's where the fence is.

Most of the time, the fence is only "somewhere near" the property line. The exception is perhaps in new housing tracts, where the developer calculates and stakes out the lots down to a fraction of an inch to maximize the number of homes he can build on the property he bought. For less strictly defined lots, the fence is often located where the trees and the rocks don't get in the way of a straight line.

THE JOB WALK *Before you begin any work, do a job walk. Look for surveyor stakes in the ground at each corner. Request a legal description of the property from your customer. Explain that you need confirmation of the boundaries. If you can't find any markers, have the customer hire a surveyor to check the plot lines. Remember, you must know the exact boundaries of the property. You'll end up saving time and money for both the owner and yourself.*

If you're hired to build where there's a 10-foot setback on the sides, don't think you can measure 10 feet in from the fence and start building there. If, by some oversight, the plans are approved by the building department, when an inspector comes to check the foundation work, he'll no doubt get out his tape measure. If you've built right to the setback line, leaving no leeway, you'll probably be required to hire a surveyor — at your expense, of course — to determine where you're actually allowed to build.

This just reinforces what I've been trying to stress — make it your motto *never* to start building until you're satisfied that you know exactly what you're doing. That includes having a plot plan of the property and its dimensions, *as well as* a copy of the local building guidelines, including setbacks.

Remember also that in measuring for setback, the foundation edge isn't necessarily where you measure from. A roof edge can extend as much as 2 feet beyond the foundation. So if your building will have 2-foot eaves, and the setback on the property is 10 feet, you may need to have the edge of the foundation 12 feet from the property line. Some jurisdictions allow a little leeway if it's only the eaves that extend over the setback, but you'd better make *absolutely certain* of that, and of exactly how far eaves may extend, before you pour any cement or start any building. A lot of contractors have been caught by this — and it's by no means an easy or cheap fix.

View Corridors

View corridors are similar to setbacks. What if you put up a building or addition that blocks the neighbors' view? If the neighborhood has rules against that, you may have to tear it down. Expect to have some problems collecting your construction fee, in that case. Your customer won't be thinking about his neighbors' view — he just wants a room addition over the garage, and you weren't able to give it to him.

As property gets more expensive, a mountain or ocean view can add thousands of dollars to a house's value. Block that view and you've brought grief to your customer and a big financial blow to your company. It's your responsibility to find out the rules and advise the homeowner accordingly.

Do Your Homework

A prospective homeowner may know exactly where he wants his house to be built. But it's up to you to make sure it's built in the correct location and oriented properly. There are also countless other issues to be addressed. There's more at stake than just how the entry will look or how the land slopes. Researching the job is your best insurance against the unexpected.

Living on (or in) a Lake

Living on the water — doesn't that sound perfect? What an ideal place to call home. But don't build your customer's dream house without knowing the project area. He could find himself living *in* the water instead of *near* the water.

It's the homeowner's responsibility to provide you with the property's legal description and dimensions. If you think I repeat this too often — and I know it can be a pain in the neck to always put into practice — forget about it just once. If you do, I guarantee you'll be kicking yourself. Believe me, it's essential to verify the legal boundaries and check for easements on *every* job. Keep in mind that if anything involving your construction goes wrong for any reason, you'll be the one paying for it.

For instance, in some parts of the country — like the East and Midwest — houses are built with basements or cellars. Deciding to locate in a wetlands or waterfront area brings a whole new set of challenges and choices to the customer. Some people opt out of the basement idea. But it can be done, if you're prepared for the potential problems.

All the mistakes we're discussing are costly ones. As the contractor, you're expected to know not only how to build, but where. While it's true that the most effective way to learn is by experience, I don't recommend you learn any of *these* lessons that way. Other builders have already paid the price. Learn from *their* experience.

2

EXCAVATING & LEVELING

You get to your jobsite ready to begin grading. You're confident that all the measuring and leveling has been done. But before you begin, here's some advice: *Always confirm every part of the project that involves you.* The extra time you spend up front could make the difference between getting paid or not. Let's face it. If your customer's unhappy with the job, for whatever reason, you're not going to have an easy time getting payment.

Underground Utilities

Contracting isn't as easy as some people think. Unforeseen problems pop up. The only way to stay on top of them is to check and recheck your data. Which brings me to the first of my recommendations in this chapter. Examine the site for any subterranean utilities before you begin excavation. You don't want to break any lines. If you're working in the city, you could encounter utility, sewer or cable T.V. lines. You can't start digging until you find out for sure what lies beneath the surface — and where.

Learn all you can about the jobsite. There are agencies to help you find any obstacles. Utility companies have numbers to call if you plan to dig underground. Cable companies also send out representatives to assist you. These agencies have maps showing underground piping, wires, etc. They'll come out and mark the surface above water pipes, sewer lines, gas pipes, electrical lines and cable T.V. lines, using flags and spray paint.

Planning Ahead

An ounce of prevention can save contractors a bundle. Here's a story involving one of my clients that shows the importance of planning ahead. The main element missing in this story is common sense. Find out exactly what's under the surface and where it is before you start work. Read on and you'll see what I mean.

I'd been putting up some drywall for my client and had stopped work for the weekend. On Sunday, he noticed water leaking from under the ground outside his house. It was coming from somewhere between the city water line at the street and the meter in the home's basement. You might think that the city would have to repair the leak because it was between the meter and the home. But no, they said they were only legally responsible if the leak was on city property.

The anxious homeowner called a local plumber to fix the pipe. The plumber hired a fellow with a backhoe to come out and dig up the pipe so he could make the repair. Believe it or not, they both came out that same day. What service! But it may have dawned on you: How was the plumber going to get the water shut off by the city on a Sunday? You wouldn't think he could do anything as long as the water was on and the pipes pressurized.

But that didn't stop him. The backhoe started working. The operator had dug a trench from the sidewalk to the house, almost level with the basement floor, when the backhoe hit the city water line and broke it. If you've never seen water spewing under full pressure, you can't imagine what a spectacular sight it can be. A spectacular sight, but with unfortunate consequences.

Within minutes, the trench filled with water, and then flooded the basement through a gaping hole. If the workers had used their heads, they could have wadded up plastic bags or even newspapers and crammed them into the hole. But, let's face it, anyone who digs up a pressurized water line on a Sunday wouldn't be that smart. The water was running full-blast from the broken pipe through the trench and into the hole in the basement foundation wall.

Because it was a weekend, there was an additional glitch — there were no public works employees on the job to shut off the water at the main. They were off until Monday. By the time the excavators found someone to shut off the water, the basement was mired in muck. It took two days for the basement sump pump to get rid of the water, and a week for the mud to be completely scraped up.

Those of you in the Sun Belt might ask, “Why didn’t the operator just dash out to the curb stop on the street and shut off the water at the main?” Well, I live out in the Snow Belt, where it can be 30 degrees warmer in your freezer than it is in your yard. Here, a shutoff placed just below the surface would be frozen solid in winter. So shutoffs are placed about 4 feet underground, inside a pipe. You need a special tool to reach and operate it, and only city workers have this tool. In addition, there may be 2 feet of snow and ice on top, and they have to use metal detectors to even find them.

This damage could have been prevented if either the plumber or the backhoe operator had called the local utility companies. It would’ve been better to wait until the city sent someone out to identify the location of the pipeline (and turn off the water), than work blindly. Digging around any utility line is risky — and digging without knowing its location is just plain foolish.

When I came back to finish my work on Monday, I found my wooden tool boxes had been drenched with water. I’d left them on the bottom step to the basement for the weekend. It took weeks for the boxes and all my tools to dry out! Luckily, my power tools had been higher up on the stairs, and they stayed dry. Here’s another lesson I learned from this: Always take your tools home — just in case something like this happens on your jobsite.

Water Levels

Lake and bay water levels can vary considerably, depending on the amount of winter snowfall or spring rains. Just because your customer has seen the lake’s water at a seasonal high doesn’t mean that’s as high as it gets. After an enormous amount of precipitation in a record-breaking year, water level can substantially exceed its previous seasonal high level. It may only happen once in 50 years, but who wants to take a chance? It’s not advisable to build a full-height basement below the average water level.

Even if the client’s home is set back from the water’s edge, he’ll have leakage if the basement is below the mean water level. This is why it’s mandatory to consult the building department to obtain charts of the high and low rain and water activity along the waterfront. You need to know that your client’s basement won’t flood, come, well, hell or high water. A sump pump can control excess water for a few days during heavy rains; but if the basement is built *below* the average water level, sooner or later it’ll get wet.

If your customer insists on a basement, there are some things you need to discuss with him first. A poured cement basement, as long as it's properly and fully sealed, will withstand water, but a block basement definitely won't. Mortar joints aren't meant to hold up against constant water contact. If the soil outside the basement is wet, eventually there will be water running across the basement floor to the sump pit.

If your client is willing to put up with a periodically-wet basement floor rather than have no basement at all, get a signed and notarized document saying that you, the builder, are absolved from any responsibility should that basement flood. But be sure to tell him the disadvantages of his decision, and note that on the document as well. I sure don't endorse this kind of decision, but the sump pump will keep the floor from actually flooding (as long as it's installed correctly and in the right location). I'll talk more about sump pumps in another section.

The Stakeout

Before the dozer starts digging, you have to stake out the area to be excavated for the crew. Remember to place the stakes so there'll be at least 5 extra feet on all sides. To make his job as easy as possible, ask the bulldozer operator how far out to offset the stakes. You don't want the stakes right on the excavation line, or the bulldozer could knock a corner stake out. If that happens, your basement boundary line is lost and you'll have to remeasure. If the operator knows they're offset a specified distance from the actual excavation, he'll stay within the stakes.

You can take the string lines down at both ends of the excavation, so the bulldozer can push the ground right through and out the other end in a pile. This is a lot less trouble than digging the ground out from the end with a backhoe (which has to be done if you leave the string lines up across the ends). Of course, this leaves more ground to fill in again when the project is finished. But if you have access to a bulldozer, it's the cheapest way to go. You and the bulldozer operator need to discuss the job in advance so he knows exactly what you want him to do, and how. Don't assume he'll know how you want things done.

The Importance of Leveling

Here's the easiest to make — and most common — mistake in this book. Ironically, it only takes a minute to prevent. But not taking that minute can easily cost thousands of dollars to fix, if it can be fixed at all. I'm talking about being out of level. You may have gotten used to carrying your level and relying on it for the information you need. But a 4-foot carpenters level has its limitations. It just doesn't have enough length to show you where there are fluctuations in a building site, except within that distance. If you need to level anything over 15 feet, use a builders level. You'll be inaccurate if you use a level to check long forms or walls, so make sure you have the right tool for the measurement.

Check for Level, Often

It's pretty obvious that everything built, from the basement up, has to be level. The footings must be level to keep the block walls aligned. The drainage pipes and sump pump pit must be level if the floor is to stay dry. It may surprise you that the drain tiles outside the basement must be level, too, but I'll explain that in Chapter 3, "Slabs & Basements."

> *"The structural integrity of a house depends on proper leveling in the initial construction phases."*

Pouring a level basement floor depends on checking true — religiously. The structural integrity of a house depends on proper leveling in the initial construction phases. Over the years, I've seen innumerable oversights in this department. The result, however, is always the same: a nightmare for the contractor.

Most people in construction set up a level at the start of the day. But checking during the workday is just as important as the morning setup. Just someone accidentally brushing it as they walk past can cause one of the legs to move slightly; or it can be bumped, and that way go out of level. It doesn't take much, and the result can be catastrophic. So it must be checked for level whenever it's been left for any length of time, and any time something significant is to be done. The day could be over, but the work would need to be redone if the level had been bumped or somehow moved out of alignment.

What does this tell you? Before critical readings are taken with the level, check and check again. Checking for level is so short and simple a process that you'd be foolish not to do it.

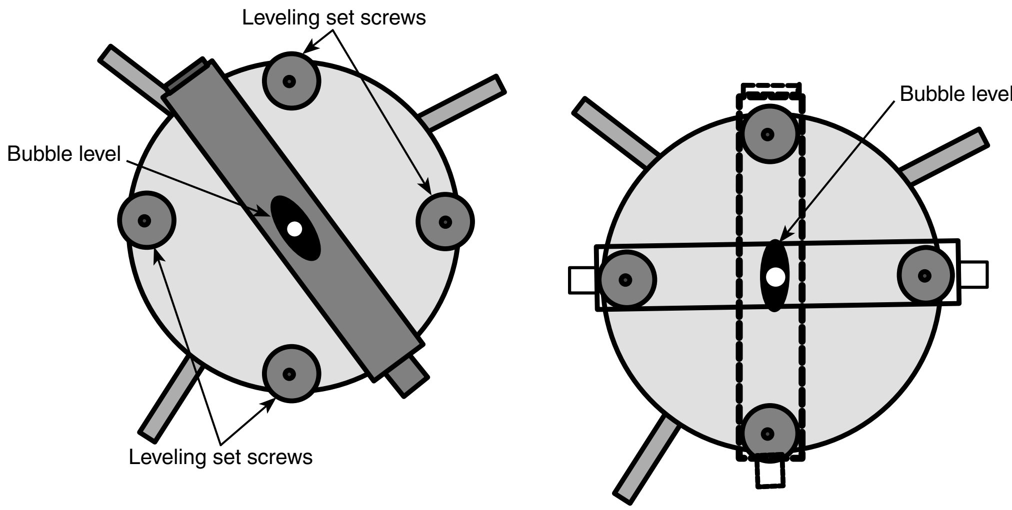


Figure 2-1
Top view of builders level

Using a Builders Level

Here's a quick course on using a builders level. It has its own set of levels built in. Four set screws allow it to be leveled exactly — north to south and east to west. It also has a compass with north and south alignments. In Figure 2-1, you're looking down on the leveling screws. Here's how to level the builders level:

- Make sure the legs are planted firmly on the ground.
- Use the set screws to level in each direction, over each pair of set screws, 90 degrees from each other.
- Adjust the north/south screws by turning them slightly until the bubble level in the middle indicates they're set at level.
- Repeat the process for the east/west set of screws.
- You have level when the bubble indicates level in each direction over each pair of set screws.

Understanding and Operating a Laser Level

A laser level is a big step up from the builders level. It takes two people to take a reading with a builders level. One person looks through the eyepiece on the level, while another person holds up the story pole (a pole with measurements on it like a yardstick). The person looking through the eyepiece on the level would tell the second person just where the crosshair appears on the marked story pole.

But with a laser level, one person can do both parts of the operation! You just set up the laser light to continuously rotate in a circle at the required height. Then you walk over to the desired checking point and hold up the story pole to see where the laser is hitting it.

For the most part, the setup for a laser level is the same as for a builders level, just covered. So read the previous instructions for setting up the builders level first. Here's a summary of the steps: Fasten the laser level onto a tripod, and then set it up where you intend to take a reading. The laser level has two knurled wheels or knobs for leveling it. Yes, the builders level might have had four leveling set screws, but when you think about it, just two set 90 degrees apart are all you need to level any object. Like the builders level, leveling is done easily by turning the leveling wheels as you watch the two built-in bubble levels.

Some laser level lights can be set to continuously rotate in a complete 360 degree circle, or they can be set to just rotate back and forth in specified degrees of an arc. In other words, the laser light beam can be set to scan just one wall, or the end of a hallway, etc. Figure 2-2 should help make this all clear. The final thing I should mention is that some laser levels can be set so that the laser beeps when the light hits the story pole at some specified mark. This feature can be very useful sometimes.

You wouldn't think of turning a regular builders level on its side, but you can lay a laser level on its side on a table, or on a tripod, so the laser light projects a vertical beam of light. This can be really handy for aligning a row of fence posts outside, or for determining where tile should be aligned on a floor or ceiling, etc. This is better than snapping a chalk line — and you don't have to wipe the laser line off later. One more thing I should mention is that some laser levels come with a set of enhancement glasses that help you view the laser light better under some adverse situations, such as where there isn't much light, or if you're outdoors on a misty morning.

It's essential, when taking any reading with the level, to verify that the unit itself is level. This is especially important when doing concrete work. Some of the most serious mistakes you'll be reading about in this book involve concrete work that wasn't properly leveled. Most mistakes with wood can be redone if something turns out wrong. But concrete work that's set and out of level can be very difficult to fix. Let me give you an example of what can happen when someone doesn't check their level for level before using it.

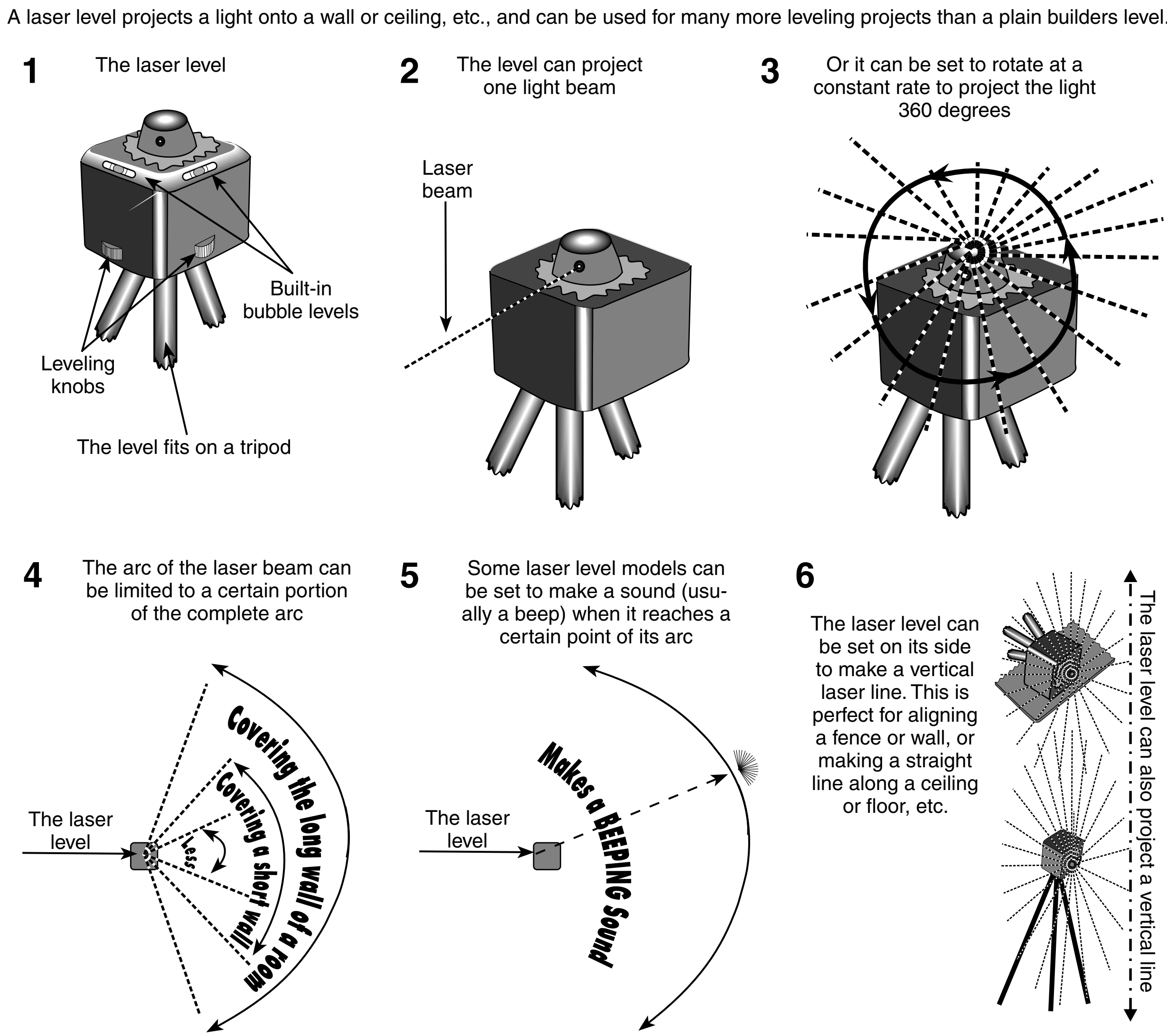


Figure 2-2
Understanding and operating a laser level

Out-of-Level Problems

I was helping to install the siding on a very expensive house in an exclusive bayside area of new homes. House construction was more than half finished when we began the siding; the basement, framing, sheeting and roof were complete. The listing real estate agent stopped by to see the home's progress. She went in the front door, and proceeded down the basement stairs to check the house from the bottom up.

The house was right on the bay, so it was uncommon to even *have* a basement. With the bay's water level a few feet above the basement floor level, there was clearly a possibility of seepage. However, the sump pump should have been able to get rid of any water that might leak in. As the agent reached the bottom of the basement stairs, she suddenly stopped. *"Oh, no! This can't be!"* There were 4 inches of water in the basement.

The basement floor was designed to drain to one end, with the sump pump at the low end. Unfortunately, the pump couldn't handle the water because it was mistakenly located at the *higher* end of the basement floor instead of the low end. The entire floor was poured out of level. How could that have happened?

Apparently, the level was out of level when the basement was under construction, giving a reading 6 inches high. The workers poured the entire floor sloping in the wrong direction. To make matters worse, the sump pump pit, now at the high end, and the drain lines — buried in the cement — were also off level. Even if the other end of the floor could somehow be raised, the water still might not drain correctly.

This didn't just affect the basement. Since the level wasn't level when the footing forms were set up, the basement walls weren't level. That carried through to the walls, floors and roof of the house. *Nothing* was level. The mistakes that made this basement out of level or out of square could happen to your slab, too. Forgetting to level your level can have dire consequences. And a level can get knocked out of level very easily. Keep this in mind. Just a few seconds taken to recheck the level before taking a reading would have prevented this disaster.

Don't Use a Hand Level

Remember, a hand level is only good for close quarters or when measuring short distances. You can also use it with a string line in some cases. If you run a string between two pins, stretch it tight, and then put the level on it, it'll give you a fairly good level reading over a short distance. But for dependable leveling over a longer distance, always use a builders level or a laser level. A hand level is accurate only to about 15 to 20 feet, or the length of a piece of lumber.

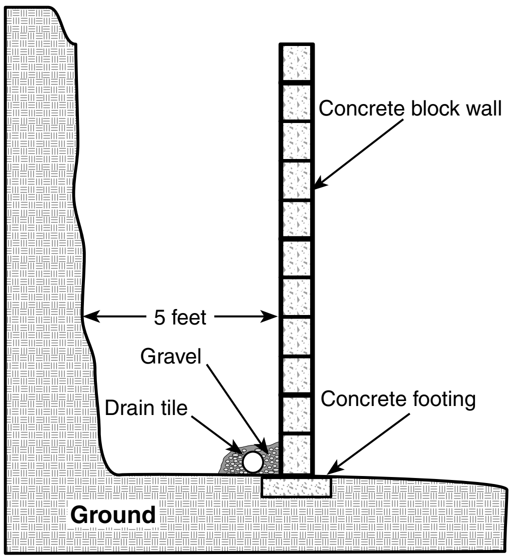


Figure 2-3
Trenching outside cement forms

Preparation for Excavating

If things are going according to plan and all your dimensions and property lines have been verified, your bulldozer operator can begin. It's important that he does all the digging necessary while he's dozing. Remember, what he doesn't dig, you'll have to shovel by hand. Time is money, especially if you have to pay someone else to do by hand what could've been done by dozer.

Extra Work Room

Always add at least 5 feet of extra trenching *outside* the cement forms when digging begins, as shown in Figure 2-3. You need this extra space for installing drain tile. And the block workers need room to work and a place for their supplies. That means digging the excavation 5 feet wider than the footings *on all sides* for working space. Make sure your operator digs the entire hole. It won't make your crew happy if the bulldozer leaves and the excavation is too narrow. Have you ever tried to shovel gravel in or out of a trench while working in only 2 feet of space? If you have, you know why you need at least 5 extra feet on all sides. So, pay attention. Then you won't have to pay someone else to dig all over again.

Here are some other reasons why you need extra work room:

1. to lay block, tuck-point the block, tar or stucco the block wall, apply styrofoam insulation, etc.
2. to lay corrugated drain tile and shovel gravel over it
3. to allow for debris from cave-ins (resulting from a combination of loose soil, runoff, and vibration from normal work)

Obviously, it's easier for a bulldozer or backhoe to dig out enough ground initially than to bring them back later (or do it yourself with a shovel). Be sure to be onsite when the excavation crew arrives to discuss the issues of workspace and dig dimensions. You want to ensure you have the proper length, width and depth of the excavation. If the dig is too shallow, half of the finished basement could end up sticking out of the ground.

3

SLABS & BASEMENTS

Whether you're constructing a basement or a simple slab, your objective is the same: to produce a good foundation for building. What you initially build has to be level and square, or nothing you build on it will be. The stakes you put in show the corners of the basement floor or slab. A small miscalculation when building your forms can cause a big problem. Following are some mistakes you want to avoid — at all cost. And if you don't, it will cost *you*.

Square Your Forms

The owner of a ready-mix concrete company wanted his office building — walls and all — poured out of concrete. Not only would it be cost-effective and durable, it would be great advertising. Only one problem: the cardinal rule of building was somehow forgotten. *The forms weren't squared before the concrete was poured.* This big mistake was especially embarrassing, since the structure was meant to market the company's construction skill.

The Out-of-Square Building

The whole crew was called out bright and early on Day 1 to get this project going. Ready-mix concrete, the mixers, trucks — everything was right at hand.

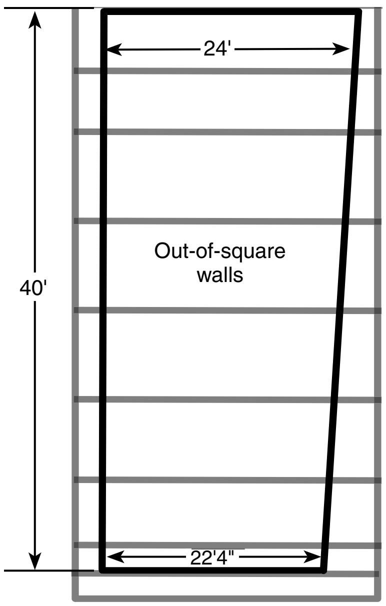


Figure 3-1
Out-of-square wall fix

After the cement was poured, the carpenters constructed the roof and put up the eaves. When the pour was set and the forms removed, the carpenters got ready to put up the trusses. It didn't take long for them to see something was seriously wrong. After they lined up a few trusses, it was obvious that the eaves were getting wider and wider.

Of course, the eaves weren't getting wider; the building was getting *narrower*. In fact, the back of this 40-foot building was 20 inches narrower than the front. Since it was made of poured concrete, there wasn't a thing they could do about it.

I know you're thinking, "What does this have to do with me?" Well, this could also have happened with a poured basement. The only difference is that the mistake would have been underground. Concrete walls are concrete walls. Once they're poured, it's all over. But this story isn't quite over yet.

You can see how this was remedied in Figure 3-1. The carpenters came up with an ingenious idea. They made the trusses on each eave at the back of the building extend 10 inches more than the trusses on the eaves in the front. Customers only saw the front of the building, so the discrepancy wasn't obvious.

But what if this had been a house seen from all sides? It would have looked awful. See what can happen if you forget to check that the forms are square before pouring? Buildings may be out of square by a half-inch or so, because somebody bumped the form boards. To be off 20 inches is unbelievable. But it happened.

This mistake could have been avoided if someone had simply measured the diagonal corners to make sure they were the same. That's it. Nothing complicated. The difference in those two measurements would have shown the problem.

The 3-4-5 Method to Check for Square

Here's a tried-and-true technique to check for square: It's called "Taking a 3-4-5," and is a common method. Figure 3-2 shows this procedure. Measure 3 feet from the corner, down one side; then measure 4 feet from the same corner — but down the other side. If what you're measuring is square, the distance between the two marks should equal 5 feet. If it doesn't come out to 5, check your angles. One of them isn't 90 degrees.

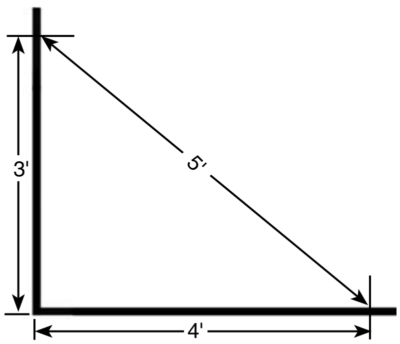


Figure 3-2
3-4-5 measuring technique

The Differences in Dirt

Now I'm going to give you a little refresher course on dirt. It's not your garden-variety dirt anymore; it's a complicated mixture of mineral and organic materials plus air and water. The contents vary in different locations and are constantly changing. There are many different kinds and types; each has certain characteristics, including a specific color and composition. We know how every little speck is formed, which kind we like and which kind we hate. Different dirt is good for different things. Why is dirt important? Well it isn't usually the concrete you have to worry about when planning a pour. It's what comes *before* the concrete that can cause the problems.

Composition

What kind of fill do you have? The ground's composition determines how the concrete will hold up. If the subsoil is sandy, you're in luck. Sand is very consistent by nature, and makes excellent fill. But regular soil is a different thing entirely.

Think about the ground that grass grows in. It seems balanced, but it isn't. The first few inches of topsoil change constantly. Topsoil compacts more each year as the grass and tree roots eat up its organic content. Topsoil is a living thing. So is most of the soil in the first few feet below ground level. It's filled with tree roots, leaves, decaying grass cuttings, etc. You wouldn't want to pour a concrete slab or build a block wall on anything that unstable.

In other words, it's just dirt. It'll be changing for the next 20 or 30 years. It's certainly not a good base for concrete. So what do you want for fill under your concrete floor? You guessed it — sand. Sand is fine bits of rock, ground up by the effects of wind, waves, and nature in general. Gravel is also a good choice for fill, but not as good as sand.

Saving the Topsoil

When your bulldozer dug out the basement, you probably removed all the topsoil and rubble. The unstable soil is gone, and the ground you're going to put the forms on should be fine — unless it's black dirt. You don't want to pour concrete over black dirt. Its consistency is too clay-like, and it doesn't make good fill.

As a contractor, you have to know your dirt. While going through the building process from the ground up, I'll remind you of some things you may already know. If you don't, it's time to put them into your bag of tricks. Here's a starter.

Topsoil should be set aside so it can be reused, maybe as part of the customer's new landscaping. Keeping topsoil is important, because the deeper ground you bulldoze up is poor quality, with no organic enrichment. While this can be good to build on, it's the opposite of what you need for growing a nice lawn.

For a healthy yard, you need topsoil full of old grass clippings, leaves, etc., to supply nutrients and allow roots to spread. And that's exactly the reason not to have it under the footings or concrete slab: you don't want any ground movement. So remember to put the topsoil aside. Also, keep in mind that replacing it is costly for the client.

> ***MOST OF TODAY'S ROCK** was formed millions of years ago. That reminds me of a lady who wanted us to build her a stone fireplace. She told us before we went to get the rocks that she wanted only new rocks in her fireplace. Nothing old would do. Since most rock has been around for a long time (unless you live by a volcano), we found this demand quite amusing. Needless to say, we didn't find any new rocks, but we told her we picked the newest ones we could find. And she was happy with that.*

You need stable ground under footings and concrete floors. It's a big mistake to build basement walls or pour a concrete floor on unstable ground. When that type of soil shifts, it causes continual problems. Concrete or block could settle, crack or move. This affects not only how it looks (terrible), but makes it structurally unstable. If you're not sure of the ground's stability, scrape off the top level of soil and have sand trucked in. With clay, this is mandatory. Clay is useless as fill, and not any good for topsoil, either.

Forms and Footings

Now let's talk about building the forms for your footings. As advertised, this isn't a book about standard building. Instead, it relates dozens of mistakes that can occur during the process.

Most of us like to build footing forms a couple of days before the concrete is poured; say, on Friday to be filled on Monday. Those empty forms can be quite a temptation for kids (or anyone) to play on. Kids think building sites are playgrounds, and jump from board to board. That's all it would take to push the forms down or out of line. Ideally, you want to fill the forms as soon as they're finished. If you need to change your schedule, it will be well worth it.

Now, let's say the forms are just slightly out of whack. If push comes to shove, block workers can fill in low spots with mortar. But remember, when constructing forms you want them level from the very start.

With a little preparation, you can avoid structural snafus. Here are some problems you can steer clear of when building your forms.

Basement Walls

There are lots of reasons basement walls buckle in the middle after they're built. But let's face it: it doesn't matter how it happens — the result is the same. Do you want to know how to prevent it? Read on.

Most people with basements wish they had more headroom. With hot air ducts and other utilities installed in a basement ceiling, height is limited. To make any noticeable difference, you need about three extra courses of blocks when you're building. The potential problem starts here, because the extra height reduces the ability of the walls to hold back the earth outside. They develop cracks about halfway up, where the pressure is greatest.

You need to add reinforcement to prevent cracking. Concrete blocks are very strong vertically and can easily support a two-story house. Individual blocks, though, are only held together by mortar. They have very little horizontal strength, so frost or ground compression can move the block walls inward. That causes cracking at the mortar joints, which aren't meant to hold back any horizontal pressure. Any wall built even a little higher than normal can crack, and if there's enough pressure against it, buckle.

Nailing Made Easy

If you've ever tried to fasten screws in a concrete block wall, you know that it takes a lot of fooling around with screws and anchors.

Here's a trick I thought up that's made my life easier when working with concrete block. Since it's probably not an "approved" method, you may want to use it only for short-term holds.

This simpler method works with nails; is quicker than using screws, and you don't need plastic anchors. Instead, you use short pieces of insulated wire.

1. Drill a 1/8-inch hole in the block with a masonry bit.
2. Cut a piece of insulated copper wire about 2 inches long.
3. Bend the end over about ½ inch; this keeps the wire from falling into the hole in the concrete block.
4. Insert the wire into the hole.
5. Drive an 8-penny or roofing nail into the hole alongside the insulated wire; the insulation-covered copper wire holds the nail in tightly.

This method isn't appropriate in all situations, especially long-term, as eventually the insulation will decay and then the nail will be loose. But during my career, I've found it a real time- and aggravation-saver in a lot of situations.

Reinforcement

Now let's talk about the beginning stages of construction. I'll start with basements and their potential problems. A basement is the bottom rung of the ladder, and supports all the other elements. Here are some situations you may have seen for yourself — or read about.

This example involved a local YMCA gymnasium. The walls had to be built unusually high. In fact, they were the height of two ordinary basement walls, for auditorium seating. The builder made sure that no machinery came near the foundation trench, which was a good move. No heavy machinery should ever come near a newly-filled basement wall; there's a risk of compaction that could jeopardize the wall's integrity. Even a small tractor can cause a problem. But compaction wasn't what caused this problem. It was the lack of reinforcement in the block walls.

"The builder made sure that no machinery came near the foundation trench, which was a good move."

Within a year, before the gym was even finished, one of the walls started to buckle. Ironically, what prevented its complete collapse was that the structure was still under construction — lumber leaning against that wall actually propped it up. How lucky was that?

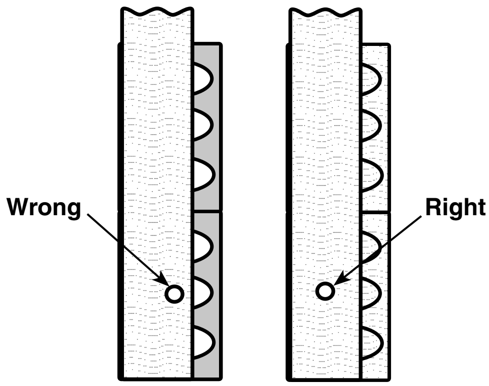


Figure 3-3
Anchor bolt placement

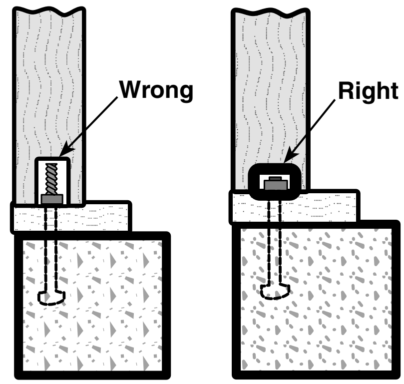


Figure 3-4
Anchor bolts, washers and nuts

Obviously, this story goes back a few years, before code enforcement actually made it to our area. Nowadays, there aren't many places where you'd be able to get away with an unreinforced block wall — certainly not a foundation wall. But even if you could, there are *no* places where a buckled wall is accepted. Wherever you're building, whether you have to worry about passing an inspection or not, *all* higher block walls must be reinforced with steel rods or they *will* buckle.

Another thing to keep in mind is having the concrete truck pour from only one location. You may need several wheelbarrows to spread the concrete from the truck, but it's worth the trouble. A loaded concrete truck is extremely heavy. You don't want it anywhere near the basement's perimeter.

Anchor Bolts

As soon as the basement walls are finished, it's time to install anchor bolts in the top row of blocks. Remember not to fix the bolts into the center of the block cores, although that may seem logical. The center of the block is nowhere near the center of the 2 x 6 top plate, where you'll install the floor joists and box frame. Look at Figure 3-3. The blocks are 8 inches wide, so putting the bolts in the block center puts them 4 inches from the outside edge. They'd be way off on the plates — *their* centers are only 2¾ inches in.

Plates are about 1½ inches thick. Sink the bolts only far enough into the concrete that they stick up about 2 inches. That's just enough to attach a washer and nut. If a bolt lines up over a stud, notch the stud to make room for the bolt. Don't be tempted to put the bolts up any higher than necessary, as pictured in Figure 3-4.

DO YOU KNOW THE LOGIC BEHIND DRAIN TILE? *Drain tile around the outside of the basement walls, leading to the sump pump, keeps water from building up. This helps retard seepage through the basement walls and floor. The water is drained into the sump pump pit before it can put pressure against the walls or floor.*

Drain Tiles and Basement Sump Pumps

A final word on basements: You frequently see a sump pump pit in the basement, without drain tile. Will this work? It can. The pump will get the water out of the basement sooner or later. But why let it get into the basement in the first place? Think about installing drain tile, even if the basement is already built. Nowadays, this material is made of flexible perforated tubing and is simple to install.

Basements without drain tiles are consistently damp, especially on the lower rows of block. Water seeps in from around the perimeter of the basement during wet weather. Eventually the water finds its way over the floor to the sump pump pit. Mortar joints aren't meant to contain the water, but simply to keep the concrete blocks in place. Excess water has nowhere to go but across the floor. This adds up to a lot of moisture in the basement.

You *can* dig up the ground around basement walls if your clients decide to install drain tile. But that's costly. If the original contractor had installed drain tile during initial basement construction, he'd have saved a lot of money for the homeowner. There's more to drain tiles than meets the eye.

Channel Drain

If your job involves a house without outside perimeter drain tile to protect the basement, there's a solution that doesn't even involve digging. That's right; you can now guarantee perfectly dry basement floors even if there are no exterior drain tiles.

There's a great product that takes the place of underground drain tile. It's called "Channel Drain." It looks like vinyl baseboard, and is made out of a hard, rubbery material similar to vinyl baseboard, but rigid. It comes with a special epoxy to glue the channels down on basement floors. Just like vinyl baseboard, it comes in lengths of 4 and 10 feet. It has a base on the bottom that holds it upright after you glue it down, and comes with corners that fit any shape.

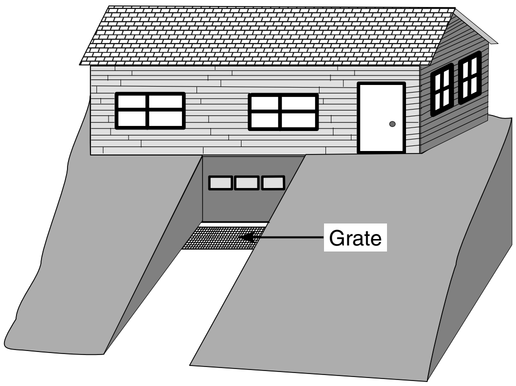


Figure 3-5
Drain grate to divert water

Glue this drain to the basement floor about 1½ inches from the wall, around the perimeter of the basement, making a wide channel to catch any water around the basement walls.

Now you'll have the same water drainage inside the basement that drain tile provides on the outside. The channel is routed to the sump pump pit. Any water entering around the basement walls is caught by the channel before it can spread onto the basement floor. So the floors never get wet. The water is directed around the perimeter of the basement. The sump pump carries the water outside and … problem solved. Ask your building supply store for a brochure.

Diverting Water Flow

Here's a mistake that a builder couldn't fix. Almost anyone planning a ramp descending to a basement garage can have this problem. The basement is usually well below grade, unless the house is built into a hill. It's difficult to stop rain from running down the driveway during a storm and going into the basement. Rainwater has no other place to go on a lower driveway except into the basement.

That's just what happened here. The garage/basement was below driveway level. It wasn't long before the problem became obvious. When it rained, there was no way to stop the water from flooding the area. Both builder and homeowner tried putting in curbing, etc. to divert the water, but their efforts were in vain.

The only solution I could think of was to put a grate across the entire driveway, close to the garage door. The water still ran down the driveway from the surrounding area, but it ran into the grate before it got to the garage. The water could then be diverted into a drainage system running underground to the sewer or into the sump pump pit. Figure 3-5 illustrates my project.

If the garage/basement hadn't been built at the bottom of a slope, the water wouldn't run down into it to begin with. But changing the grade all around the house after the fact would be pretty extreme. Installing a drain and drain line wouldn't cost nearly as much.

When to Pour the Cement

Your first instinct may be to pour the concrete floor for the basement as soon as the basement walls are up. Seems reasonable, doesn't it? But the sump pump isn't in yet, so if you pour, rainwater will pool on the new concrete. The sump pump needs electricity to work, and the wiring for it hasn't been installed.

Worse yet, the house can't be heated either, so the water on the floor could freeze and crack the concrete. Finally, if it rains before the roof is built, raindrops on fresh concrete could make pockmarks, or standing water could compromise the integrity of the concrete.

This recommendation might seem strange to you if you're new to the contracting business. The time to pour the basement floor is after the walls are up and the roof is on the house. You're probably thinking — how can the floor be poured then? Easy: It's poured through a basement window.

All concrete trucks have chutes which attach to the truck for situations just like this. Wheelbarrows are put below the chute in the basement. The concrete is dumped through the window into the waiting wheelbarrows, which distribute the concrete to all parts of the basement. Having several wheelbarrows and men on hand makes the job quick and easy.

If you have no choice but to pour concrete in cold weather, always cover it with plastic sheeting and a few inches of hay or straw after the concrete is set up stiff. Get straw or hay in bales, break it up and sprinkle the pieces, a few inches deep, over the plastic covering. This is very good insulation — so good, in fact, that it will protect the ground from freezing if you have to pour concrete there later in the winter. This technique is covered in more detail in Chapter 4.

You can also get ready-mix concrete pre-mixed with *hot* water instead of cold. This is a helpful if you have to pour in the middle of winter. But be aware that concrete mixed with hot water costs more.

Septic Lines and Tanks

Be careful around septic lines near the house, especially in the country. These lines aren't nearly as deep as city sewer lines, and they're a lot more fragile. It doesn't take much pressure to compress them. *Never* let the concrete truck — or, for that matter, any vehicle —

***SO WHY NOT** chute the concrete through several windows and avoid wheeling it across the whole basement? Remember, when a heavy concrete truck drives around the basement perimeter, it puts a lot of pressure on the ground. This could compromise the integrity of the wall. That's why it's best to chute through just one window.*

drive over a septic drain line. The weight of the truck will crush it. Let me tell you about something I saw involving a concrete truck. It was ugly.

The block walls for the basement of a new house were finished, and the house was framed and covered, including the roof. It was time to pour the basement floor. The concrete truck had arrived, and was backing toward the basement.

No one realized that there was an old septic tank left from the previous house. Yes, you guessed it: The concrete truck backed over the old tank, crushing it. All at once, the truck dropped into the septic tank. Being fully loaded, it just sat there, stuck. The concrete company had to send an empty concrete truck to pull this one out after the concrete in it was unloaded. And guess who was liable for the wasted concrete? Two guesses. I'll give you a hint. "The owner" isn't the right answer.

I hope I've encouraged you to ask the landowner if there is anything underground that you should be aware of. But don't just take his word for it. All cities have maps of sewer lines, water lines, gas lines, etc. You can also get information from the telephone and power companies. Be sure to check with them before doing any digging. Remember, it may not be your property, but as the contractor, the blame sits squarely on your shoulders if there are any problems.

4

CONCRETE

This chapter addresses foundation work from the *ground* up, including footings and forms. The importance of good concrete work can't be overemphasized, and even a seasoned builder may learn new things.

What Makes a Good Base?

Footings support a structure's foundation, so it's imperative that they rest in good, stable ground. The problem is that "ground" really isn't good and stable. It's organic — made of grass clippings, disintegrating leaves, pieces of plants, etc. — in other words, things that decompose. And ground compacts as it decomposes. That's the last thing you want under concrete, which needs a firm base. Sand, on the other hand, is already in its permanent form, and it will be in that same state forever: compact and stable.

Compacting

It's not always possible to dig out all the ground and replace it with sand when you're preparing to pour concrete, but you can compact the ground to give you the base you want. It's important to compact the surface thoroughly before pouring concrete. Even tamping it with a simple square of plywood nailed to a 6-foot 4 x 4 makes a world of difference, though I'm not suggesting this be your method for compacting for a house foundation. The footings for a concrete block wall built

FIGURING CUBIC YARDS OF CONCRETE

Multiply the length of the slab by the width (in feet) to get the square-foot figure. For a 4-inch-thick slab, divide this number by 81 for the cubic yards of concrete you'll need for the pour. If the slab is to be 6 inches thick, divide the square-foot figure by 54.

on uncompacted soil will settle and shift. And when the footings settle, you can bet the wall will, too. You'll begin to see vertical cracks between the blocks, and soon the concrete slab over the footings will crack, too.

How Concrete Hardens

Most people think that concrete hardens as it *dries*. Not so. Think of bridge footings. If concrete hardens by drying out, what happens to it under water? Well, it still hardens — a testament to concrete's strength.

In reality, concrete must not be allowed to dry out before it hardens. Have you seen sidewalks with pebbles showing through the concrete? You know, the ones with very rough surfaces? That's caused by the concrete surface drying out before the pour can cure sufficiently, which is a process that takes several days.

Concrete hardens by chemical reaction, and keeping the surface wet is part of this process. The concrete ¼ inch or so below the surface gets its moisture from the wet concrete beneath it, and hardens as it should. But the surface of the concrete will never harden if it's not protected from drying out before this action takes place. That's why you must keep the surface moist for at least two days.

You can spray the slab with water every few hours to keep it damp, or you can cover the surface of the concrete with plastic to keep the moisture in. I've even seen people spread layers of newspaper or cardboard on top of the slab and wet them down for those two days, but I'm not sure I'd recommend that. Just don't spray water directly on the concrete until it's set up firmly.

If it starts to rain, cover fresh concrete with plastic. This is especially important for any walkway next to a structure. Without the plastic covering, water running off the eaves could mark the concrete below in a dotted-line pattern.

Forms

Make sure you build your formwork with enough support to hold the concrete. You don't have to use expensive plywood, though. Chipboard works fine and costs a lot less. It's made of wood chips, compressed and glued together under pressure. Just remember that concrete is extremely heavy, so you need sturdy forms.

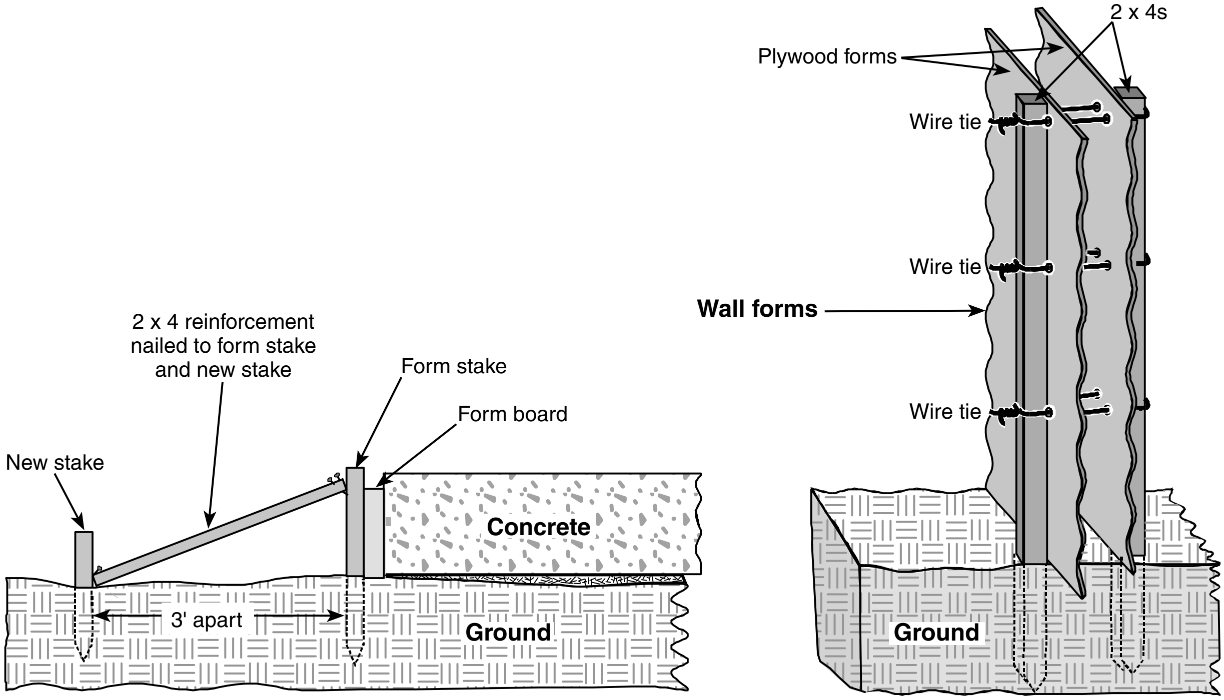


Figure 4-1
Always wire wall forms at corners to add reinforcement against concrete pressure

As Figure 4-1 shows, use wire ties between the sides of wall forms. Even a 4-foot concrete wall exerts substantial pressure, and the forms need to be firmly supported.

Reinforcement

When forming up a slab, pound stakes every 2 feet along the perimeter of the forms. If the ground is too soft to hold the stakes, place them a few feet out from the forms. Put short 2 x 4s between the stakes and the form. It's better to have too many stakes than not enough. If the forms pull loose at some point, you're heading for disaster. Just what are you supposed to do once the concrete has popped the forms and gushed out? Well, my friend, you're out of luck. It's too late to try reinforcing the forms then.

Wire Mesh

Some concrete slabs develop cracks wide enough to stick your finger into. Maybe you've seen a few. But it's not time or age that causes this. In the cases I'm talking about, someone forgot to add the reinforcement — rebar, wire mesh, or more recently, fiberglass. If reinforcement wasn't embedded in the slab when it was poured, there's no support. The only remedy is to tear down and re-pour, this time with the right materials. If wire mesh is used in your jurisdiction, pick some up yourself, instead of waiting for the truck to deliver it with the concrete. You'll save time and, better yet, money.

Installation

1. Unroll the wire on a hard surface, and flatten it. Work on any curved spots to get the kinks out. Remember, you don't want any wire pushing through the surface of the concrete. Any bends in the wire could eventually cause the mesh to move upward, and show rust spots on the surface.

2. You can cut the mesh with pliers, but it's a lot easier with large nippers or bolt cutters. Cut the wire so the pieces can overlap each other by about a foot. Cutting and laying wire takes time. Here's a tip: *Don't call for a cement truck until all the wire mesh is fully and firmly in place*. With all the prep work done, the cement truck can just pour the concrete and be gone. That's another savings.

3. Support the mesh on concrete or plastic "chairs" so it's all a couple of inches above the ground. It should be approximately centered in the slab. Then pour the concrete over it all. I never used chairs — I'm not even sure they had them. I just laid the mesh on the ground, then, when the concrete was poured, I'd use a hooked piece of rebar to pull the wire up to the approximate middle of the slab, as shown in Figure 4-2. As long as I'd done a good job of vibrating the material, the mesh would stay where I'd pulled it. I never had a problem. But there must have been problems, as now, at least in most places, you can't do it; you have to use chairs. Don't use my method unless you know for sure it's allowed in your jurisdiction.

***WHENEVER CEMENT** is poured into forms, air pockets invariably develop against the plywood form. Always lightly tap the outside of the plywood with a hammer after the cement has been poured. Pebbles drop down and fill open spots. Tap lightly every couple of inches along the form. Don't tap too hard; that can cause the cement to slump down, putting a strain on the forms. If you overdo the tapping, cement tends to sag and push outward against the forms. You can literally make the forms bow out by being too aggressive. As you're tapping on the forms, keep your eye on the top and sides. If they start to bow out, stop tapping immediately.*

Reinforcing Rods

Concrete companies will gladly provide reinforcing bar, but you can save money by buying it yourself. It comes in all sizes, but you want bars that are about ½ inch in diameter.

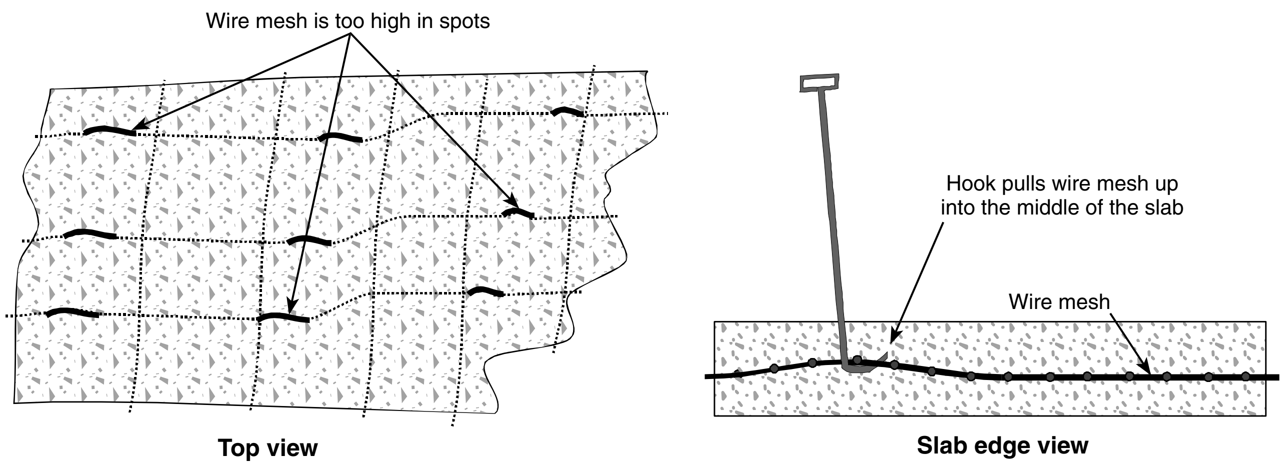


Figure 4-2
After pouring concrete over the wire mesh, use a hooked piece of rod to pull the mesh up

That's large enough for most concrete jobs around a house, but check your code requirements first. When you're placing the rebar, code requires you *bend* it to fit around corners; you don't cut it. But there *are* occasions where you need a shorter piece than you have. So what's the best way to cut rebar? You could use bolt cutters or hacksaw it into the length you need, but you'd be so tired when you're done that you'd have to save installation for the next day. Do you really want to wait? I didn't think so.

The easiest way to cut rebar is by using a metal-cutting blade in a circular saw. Make sure you use a metal-cutting blade. Masonry blades look very similar and, if you're not careful, you could end up with the wrong one. These blades cost just a little but save you a whole lot of trouble. Wear safety glasses when you work, and be careful not to tilt the saw while you're cutting. The blades are pretty brittle; you don't want one to shatter in your face.

Placement of Reinforcing Bar

In areas of severe weather and frost, wire mesh alone can't keep cracks from migrating inward from the edges of a slab. Frost can tear the wire mesh apart at the edges, where concrete is the weakest. Without reinforcing bar, there would be no protection; frost causes concrete to move up and down, eventually cracking it. But that doesn't have to happen.

The solution is to embed overlapping reinforcing bar around the perimeters, as shown in Figure 4-3. This is extremely important, especially at garage door openings and door frames. Put the bar where you need it, and, if your code requires it, where the code requires it, and you won't have any trouble.

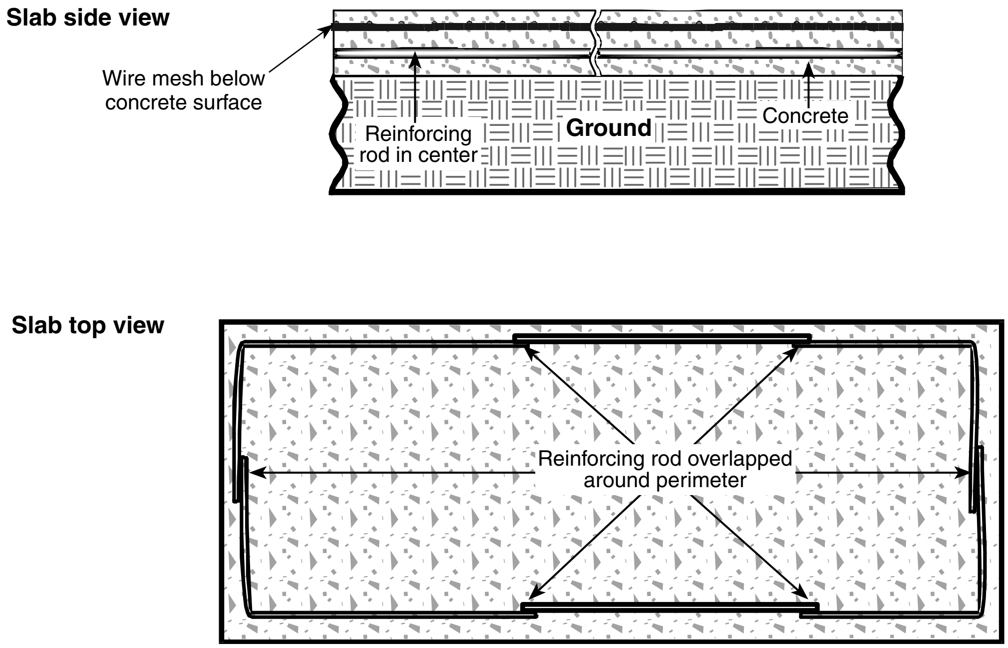


Figure 4-3
Reinforcing rods are embedded around a slab perimeter to help maintain its structural integrity

Reinforcement like this isn't just for the home-building market. Highways and dams, for example, have incredibly heavy bar every foot or so, in all directions. If you want your concrete to wear like a super highway, take your cue from the big boys and add that support.

Hand Tamping

Concrete is made of sand, gravel, water, and portland cement. Cement and sand, being such fine-grained materials, provide a fairly even surface. The gravel mixes with the cement to create strength. Since you don't want those pebbles showing through the mix, you need to trowel the pour continuously to produce a truly smooth surface.

Watch a concrete contractor troweling. He taps downward with the trowel before he smoothes it back and forth. This action pushes the pebbles under the surface of the concrete. Otherwise, they'd show through on the surface.

It's time-consuming to tamp with the trowel alone. So use a hand tamper, illustrated in Figure 4-4. It's a simple metal frame with ½-inch mesh stretched tightly across it. The tamper makes your job easy, by helping you cover a large area very quickly.

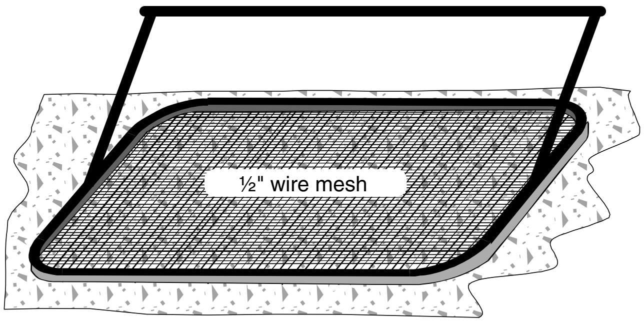


Figure 4-4
A hand tamper forces pebbles down below the concrete surface

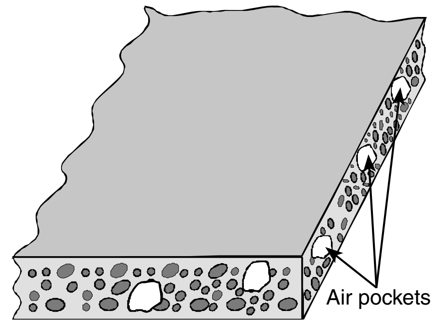


Figure 4-5
Hollow spots formed at the edge of the concrete by the wood forms

The hand tamper pushes through the concrete, catches the pebbles and pushes them down. You end up with a mushy surface free of pebbles. Smooth the concrete surface with a trowel, and there won't be any pebbles to mar the finish.

Air Pockets

It's common for voids to form whenever pebbles position themselves up against wood forms; see Figure 4-5. To release these air pockets, the method I use is to tap the sides of the form with a hammer to vibrate the concrete around the pebbles. I've found this causes the pebbles to slump and drop down, filling any air pockets.

If you've seen unvibrated concrete (where the forms weren't tapped sufficiently before the concrete set up), you know how terrible it looks. There are cavities all over the face of the concrete. Some are big enough to stick your fist into.

Leveling a Large Concrete Slab

You can easily screed (level) any concrete slab up to 18 feet wide by utilizing a 20-foot plank. The ends of the plank rest on 2 x 6s along the perimeter of the form. But lumber only comes in lengths up to 20 feet. So how do you level larger slabs? Every basement or garage floor is well over 20 feet wide, so if you're building a house you need to be able to screed an area that size.

It takes careful figuring and planning to do a large concrete pour. You can't eyeball the concrete as you level it. Believe me, that doesn't work, and you'll make a mess of the job. The method I suggest is simple, as you can see in Figures 4-6 and 4-7.

Screeding a slab too wide for a plank to rest on both sides of the formwork

An 8-foot steel pipe set on supports on a line of rebar stakes will serve to support the other end of a screed plank on a large pour, where the width is greater than the length of a plank. After screeding, the pipe is removed; the rebar stakes and pipe supports are left buried in the concrete.

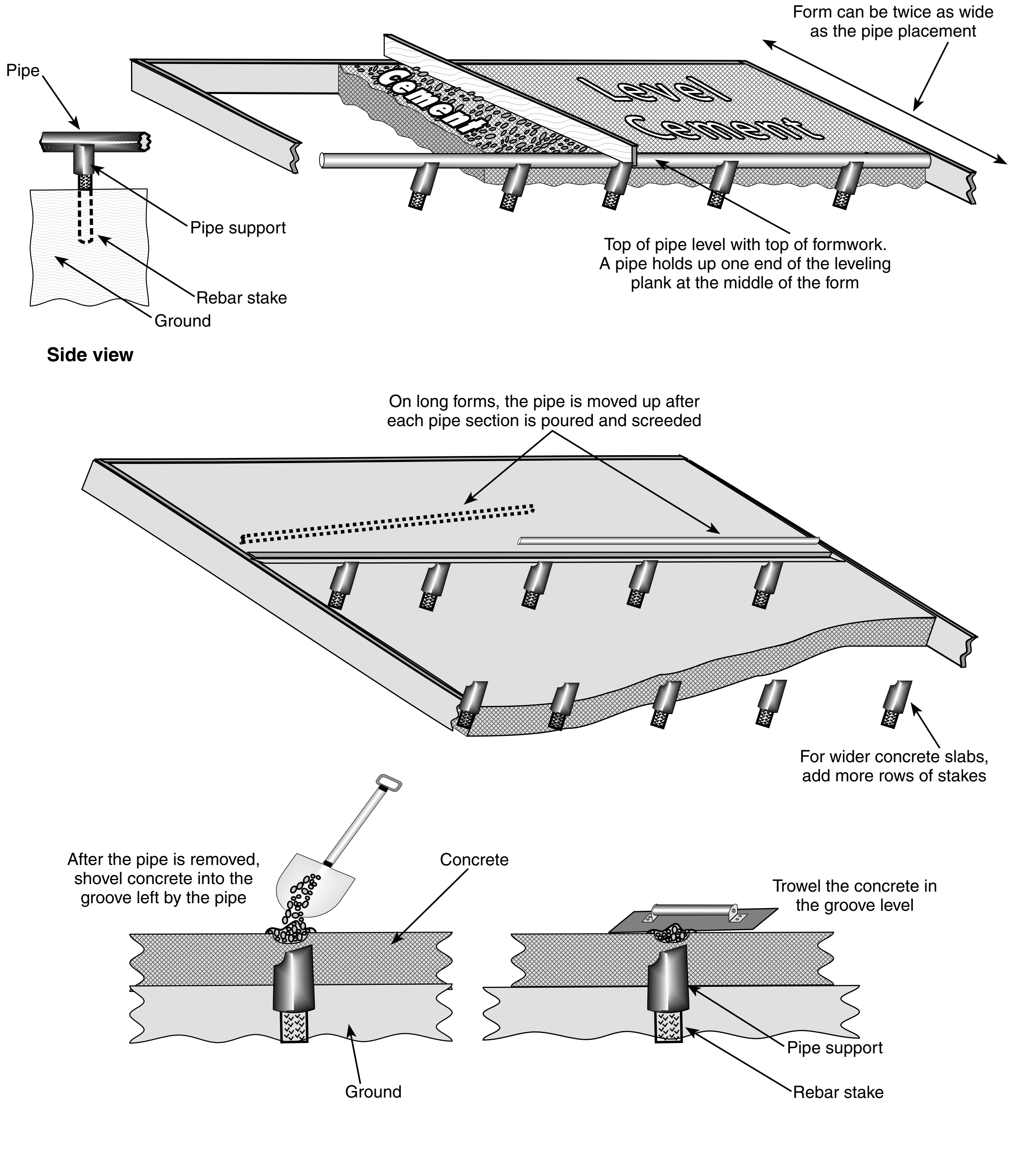
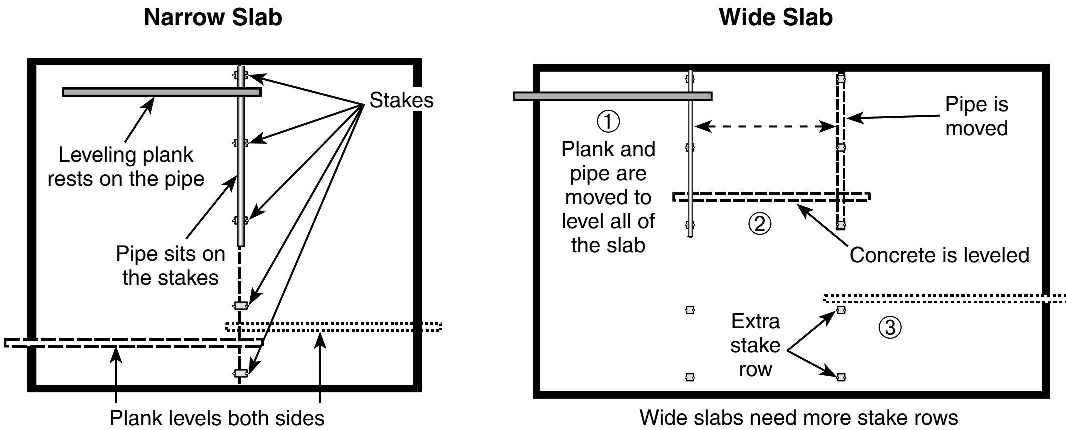
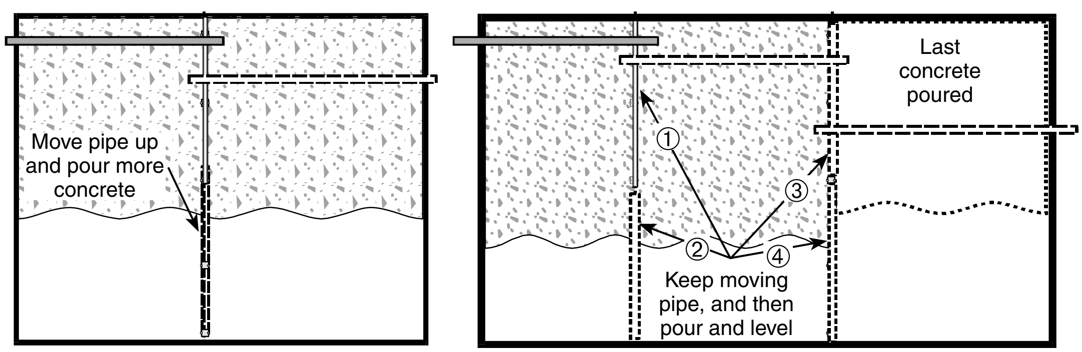


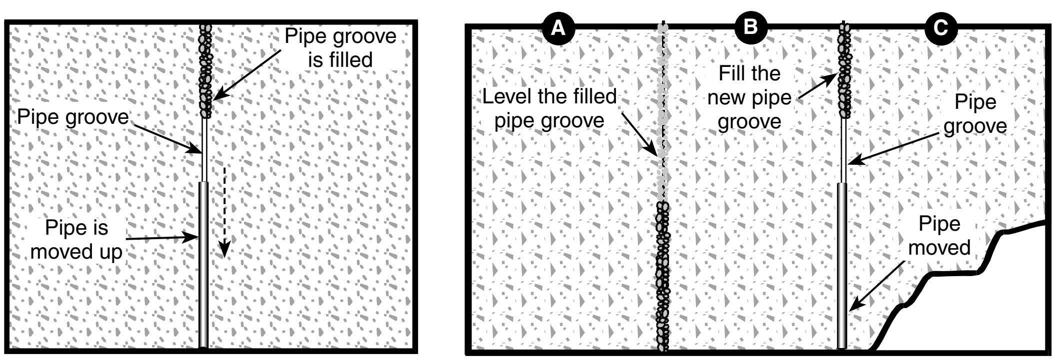
Figure 4-6
Leveling a wide concrete slab with stakes and pipe



1. Set the rows of stakes for the pipe to rest on



2. Pour the concrete on both sides of the pipe and level



3. Move the pipe up, fill and level the old pipe groove

4. Repeat these steps until the slab area is filled

Figure 4-7
Level a slab with plank and pipe

1. Start by stretching a string line between the tops of the form boards about where you'll need an additional support for the screed plank. Drive a stake made of an 8-inch piece of ½-inch rebar into the ground, along the string line and close to the form board, and another 7 feet along the line. Continue driving stakes, about every 7 feet, all along the line, including one at the form board on the other side. Slip a pipe support (available at your cement supplier) over the top of each stake. Set an 8-foot length of ¾-inch pipe onto the supports, as in Figure 4-6. The top of the pipe, along its entire length, should be exactly where the surface of the concrete will be, so you'll use a level to see where to make adjustments to the height of the stakes. You'll rest one end of the screed plank on this pipe, and the other on the form edge, or on another such row of supports if you're in the middle of a very large slab.

2. Pour concrete into the forms, burying the stakes and pipe supports, exactly level with the top of the pipe.

3. The pipe holds up one end of the plank. Level the concrete as usual between the pipe and the edge of the form. If the slab is less than 36 feet wide, a single row of stakes (with one pipe) is all you'll need for center support. The stakes and pipe are in the middle of the form and the concrete can be poured and screeded on both sides of the pipe.

4. Pour and level the area on one side of the pipe, then pour and level the other side.

5. If the slab is extremely wide, simply set up another row of stakes and use the same pipe. You can continue pouring and leveling between the stake rows.

6. When you remove the pipe each time, you'll leave a trough, or groove, in the concrete where the pipe sat. Shovel in a little concrete to fill the trough before you trowel. Make sure these areas don't end up higher than the rest of the surface. For a basement floor, put a row of stakes and a pipe 12 inches in from the facing block walls to support the leveling plank at the wall.

7. Pour the concrete between the pipe stakes and the edge of the form. Allow the concrete to flow a little past the row of stakes; you'll level these few inches with the plank.

8. Once the area is filled with concrete to the end of the pipe, move the pipe up the row of stakes, and continue pouring.

9. Follow the same procedure to fill in the rest of the form, pouring the concrete and moving the pipe on the stakes.

10. Now you'll do some preliminary smoothing before the final finishing. Although the concrete has been leveled, the surface isn't the smooth finish you need for the final floor. While the concrete is still wet, use a bull-float to smooth it, pulling the bull-float back and forth over the concrete. By lowering the handle when you push the bull-float away from you and raising it when you're pulling it towards you, the edge of the float can't dig into the concrete. Overlap your strokes until the surface is uniformly smooth. This isn't your finished surface yet, but you've made the concrete much smoother in preparation for the final trowel finish, which you'll do once the concrete has set up properly.

11. Adequate curing is very important. You'll know the concrete is ready to trowel when you can push a piece of plywood down on the concrete and it doesn't sink in. But it also needs to be soft enough for you to trowel the surface smoother. Timing is something that you can only learn by experience. Until you become more adept at judging, don't hesitate to ask a seasoned concrete man how to recognize when the time is right to begin finishing.

12. To finish, kneel on one of two pieces of plywood, with your feet on the other. One piece will hold you up while you move the other to work on the concrete.

You can rent finishing machines that do a great job. They're called *power trowels*, and look very much like a large ceiling fan with long handles. The blades rotate, quickly smoothing the concrete. But if you're on a smaller job, you wouldn't even need a finishing machine; it's just a convenience.

__PLASTIC SHEETING__ will protect the ground from freezing throughout the winter. If you're skeptical, test it yourself. Spread a piece of plastic on your lawn late in the fall (you won't need hay or straw for this). When snow has covered the plastic for several months, lift up a corner. You'll see green where the grass is still alive and growing.

Cold-Weather Pours

Here in Michigan, we live in frigid temperatures half the year, so contractors can end up working with concrete in freezing weather. The following suggestions can help you work under these conditions:

- Order the concrete mixed with *hot* water instead of cold. This helps with the initial forming. It buys you some time to pour the concrete and level it before the temperature drops down to freezing.

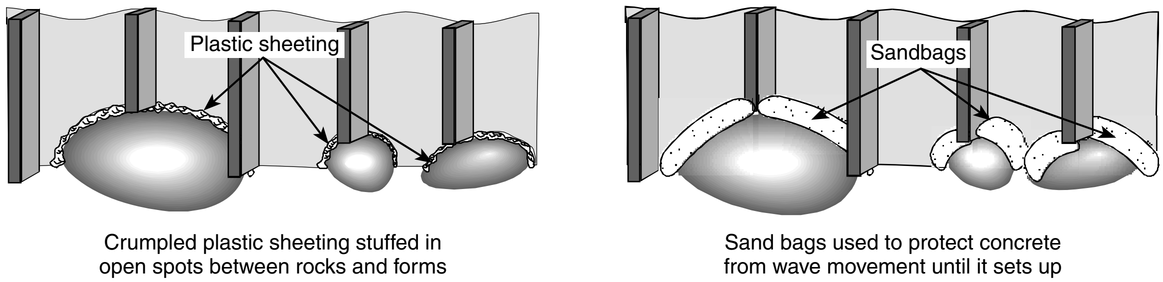


Figure 4-8
Pouring concrete in moving water

- Protect the new pour from the cold when you're finished. Cover the concrete with plastic as soon as it's screeded. The plastic holds the heat in, allowing the concrete to set up. In an hour or so, the surface can be troweled or broomed, then recovered with plastic.
- Spread a foot or so of hay or straw over the plastic. This is the best and cheapest insulation. In Michigan, we can get hay and straw by the bale at local farms. Break the bales apart and throw the straw over the plastic-covered slab. To provide optimum insulation, you want a 12-inch layer, loosely-packed, covering the surface.

Remember: plastic covering also protects the uncured concrete surface from pits caused by rain. Keep plastic on hand, and don't hesitate to use it when there's even a hint of rain.

Building a Concrete Dock

When I built a concrete dock at the edge of Green Bay, I got a real eye-opener. Constantly-moving water makes setting forms a real challenge. So throw out the rule book, and read on.

This dock was for small boats, and was in shallow water about 4 feet deep; bigger boats used a local marina downstream. I carefully cut the edges of my plywood forms to fit closely around the many rocks under the water in the vicinity of the dock I was building. Well, wind-swept waves never stop in Green Bay, so there's no such thing as a good day for pouring concrete. As soon as I had the forms secured, it was obvious I had to do something to keep the wave action from washing the concrete out of the forms.

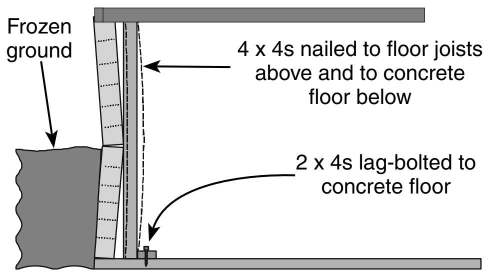


Figure 4-9
Temporary reinforcement for buckling basement block wall

Under water, concrete takes hours to set up enough so that it won't wash away. By that time, major portions of the concrete I poured could have disappeared. My solution was so simple, it still makes me laugh. Take a look at the illustration in Figure 4-8. I crumpled up pieces of plastic sheeting and stuffed bits of it into all the gaps between the rocks and the forms. An alternative is to lay sand bags around any open areas to protect the concrete from wave movement until it sets up.

The plastic worked perfectly. After I poured the concrete, only a few wisps escaped from around the rocks. I was pretty lucky to solve this problem the first time around, and I've used that technique ever since.

Fixing a Cracked Basement Wall

Here's a job I did recently to save a customer's basement wall, located alongside his neighbor's driveway. The house next door was a day-care facility, so traffic in and out was heavier than normal. This compacted the ground under the driveway, causing it to freeze to a greater depth in the winter than it would have otherwise.

As I mentioned before, freezing exerts pressure — in this case causing my client's concrete block wall to crack. Within a couple of years, the wall had buckled inward 3 inches at ground level. A horizontal crack, about halfway down along the wall, was soon big enough to drive a truck through. Well, maybe I'm exaggerating a little.

In order to fix this sorry situation, I poured a new concrete wall parallel to the old block wall to reinforce it. This took some doing.

1. My first concern was to stop the wall from caving in. I stood treated 4 x 4s along the wall, spaced every 16 inches, so I could nail the tops to the floor joists above. This step (and the one directly below) is illustrated in Figure 4-9.
2. Against the post bottoms, I lag-bolted 2 x 4s to the concrete basement floor. This was a temporary fix to keep the wall from buckling — the pressure on the middle of the posts was tremendous. I left these supports in place until I was ready to install the forms for my new wall.

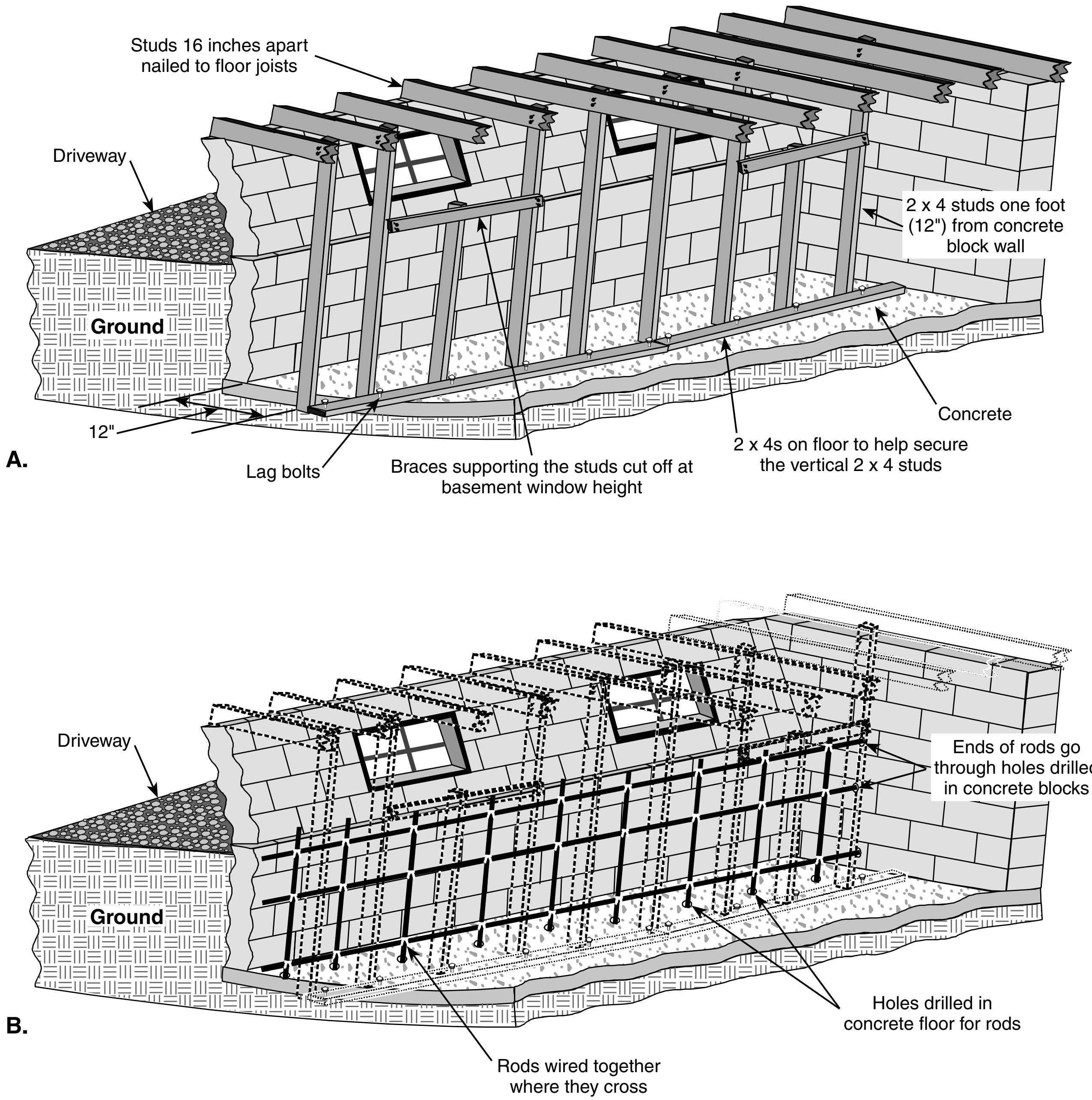


Figure 4-10
Forms for new concrete reinforcing wall built against existing basement wall

3. I built my concrete forms from 2 x 4s, 1 foot out from the old block wall, and spaced 16 inches apart so that they could be supported by the floor joists above, as I had with the temporary 4 x 4s. (See Figure 4-10 A.) But, in order to be able to pour the concrete through the window openings, I had to space the 2 x 4s 24 inches apart in front of the windows. (Remember this spacing; it comes into play later.) The new wall only needed to be as high as the basement

windows, which were above the exterior ground level, and safe from the freeze push. I decided that a 1-foot-thick slab wall, reinforced with both vertical and horizontal rebar, would do the job as long as I also added some concrete buttresses to hold the wall in place.

4. I put horizontal 2 x 4s on the basement floor behind those on the form, and drilled $^{3}/_{8}$-inch holes into the floor through the horizontal 2 x 4s, every 2 feet. When you drill for lag bolts, start with a $^{1}/_{8}$-inch masonry bit. Drill through the 2 x 4 and into the concrete floor. This makes a little dimple in the concrete to mark the location where you'll be drilling.

5. I moved the 2 x 4s and finished drilling, enlarging the holes a bit for the bolts. Then I temporarily fastened the 2 x 4s down with $^{3}/_{8}$-inch lag bolts. They were only needed until the concrete set up.

6. Next, I built a support web of $^{3}/_{8}$-inch reinforcing rods to strengthen the new concrete wall (see Figure 4-10 B). I drilled holes in the concrete blocks at each end of the basement side walls, 6 inches out from the old wall, to support the horizontal rods. Then I drilled holes in the concrete floor, also 6 inches out from the wall, to support the vertical rods. I cut the reinforcing bars and installed them, overlapping the horizontal rods by about 1 foot and securing them together with wire. I also wired the horizontal and vertical pieces together where they crossed each other. The bars stretched from wall to wall, stopping just below window level. When the reinforcing was completed, I attached plywood to my forms, leaving cut-outs in the plywood for the buttresses (Step 7).

7. Because the new wall was only going up to ground level, it could still be forced inward, since that was where the driveway push was coming from. There was nothing to hold the new wall in place at the top. My reinforcement went up to the floor joists, but I couldn't leave plywood forms and 2 x 4s there forever. It would have looked horrible. But the buckling could eventually push down the basement wall on that side — along with the house. My solution was to build three forms for buttresses, each in the shape of a triangle, along the inside of the new wall (see Figure 4-11). These 90-degree triangles would extend out every 8 feet from the wall, inside the basement.

8. At the bottom of each triangular form, I drilled ½-inch-diameter holes for anchor bolts, extending into the concrete floor. They were 2 inches deep, centered in the bottom of the form.

THE "WALKING" MASONRY DRILL

Here's something I've learned: If the masonry drill tries to "take a walk" as you're drilling, get your center punch, place it in the spot you want a hole, and give the punch a whack with your hammer. You'll get an indentation in the concrete for the drill to follow.

If you need holes about 2 inches deep and started with a 3/8-inch bit, it would take you forever to get 2-inch holes in the concrete. By starting smaller and drilling the holes 1/8 inch larger each time, you'll drill much faster. You'll go through several smaller-sized bits before you're finished. If you can, use a hammer drill. Rent one if you don't own one.

9. Before pounding the bolts into the floor, I turned the nuts so they were even with the top of the threads. It's important to pound on the nut when you drive the bolt down. The shafts of the bolts and nuts were several inches above the floor, so that when I poured the concrete, the bolt heads were securely bonded inside the concrete, which kept the buttresses from moving.

10. I had the concrete poured through each basement window using a chute, and placed it into the forms from above.

11. I had cut two pieces of plywood for the top of each triangle form. I nailed the first piece at the lower end of the triangle before pouring the concrete (see A on Figure 4-11), then I nailed on the second piece after pushing the concrete down into that lower section of the triangle form (see B on Figure 4-11). Now the concrete buttresses were anchored to the floor and would keep the new wall from bending under the push of frost.

12. As I poured and placed, suddenly the 24-inch-wide areas of plywood under the windows started to bulge out. I learned that day not to space 2 x 4 forms any farther than 16 inches apart. I know now to nail short horizontal 2 x 4s near the top of those already placed under each window. This keeps the concrete from pushing the plywood outward under the windows as you're working it down into the forms.

13. To get rid of any air pockets in the pour, I used a hammer to tap lightly on the outside of the forms. I kept the forms up for about three days to ensure a good cure.

This was one of those jobs where there's no accepted-normal solution; you have to just think up a way that seems like it'll work, and then give it a try. Usually, after I've made a few adjustments along the way, I get it to work. And then I know how to deal with this situation if it, or something like it, ever comes up again. Note that I say "usually." Sometimes I strike out and I've put in a lot of work and I'm back to square 1. My preference is to use a trick that someone else has paid to discover and perfect, and that's what I offer here.

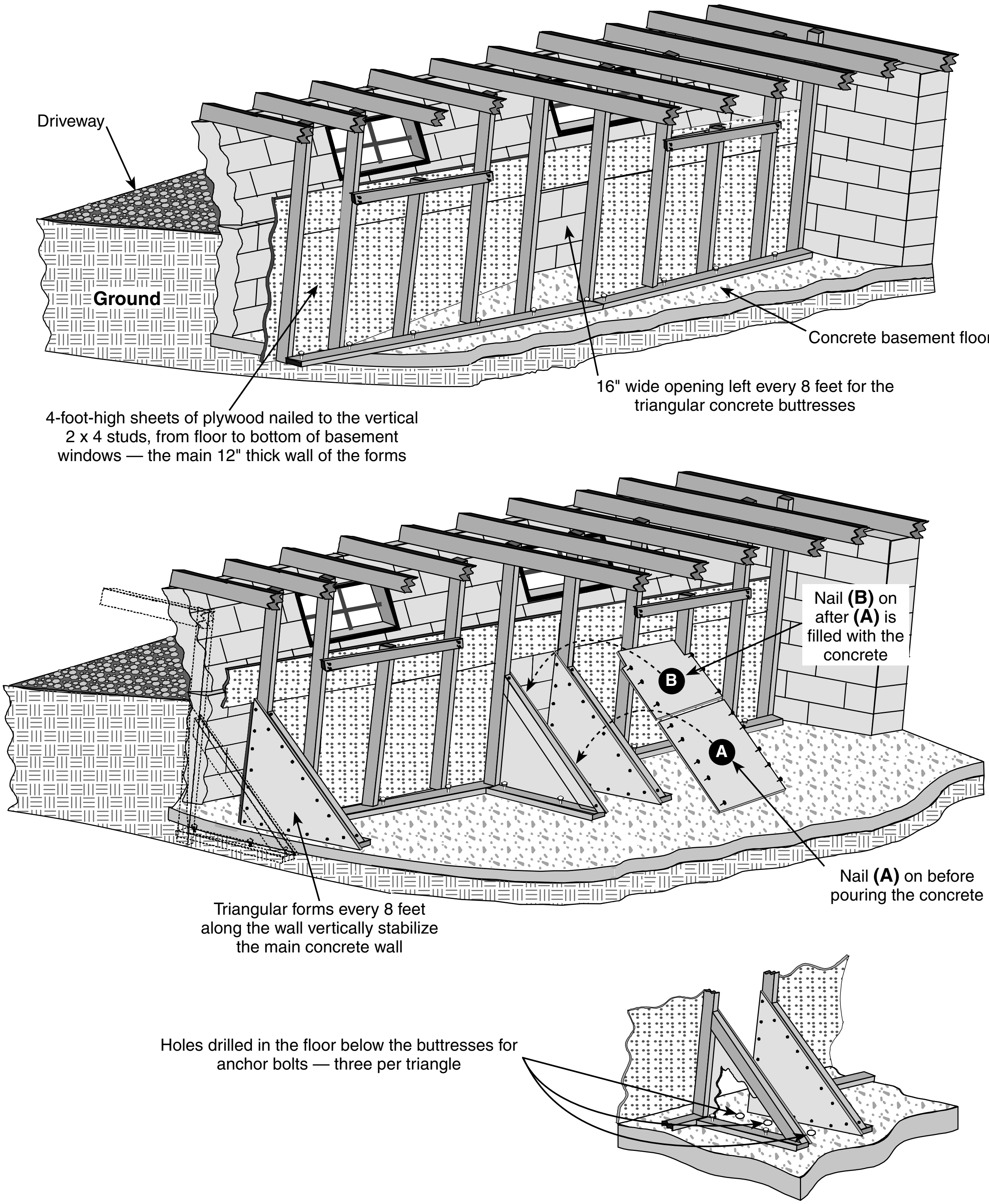


Figure 4-11
Triangular buttresses provide stability

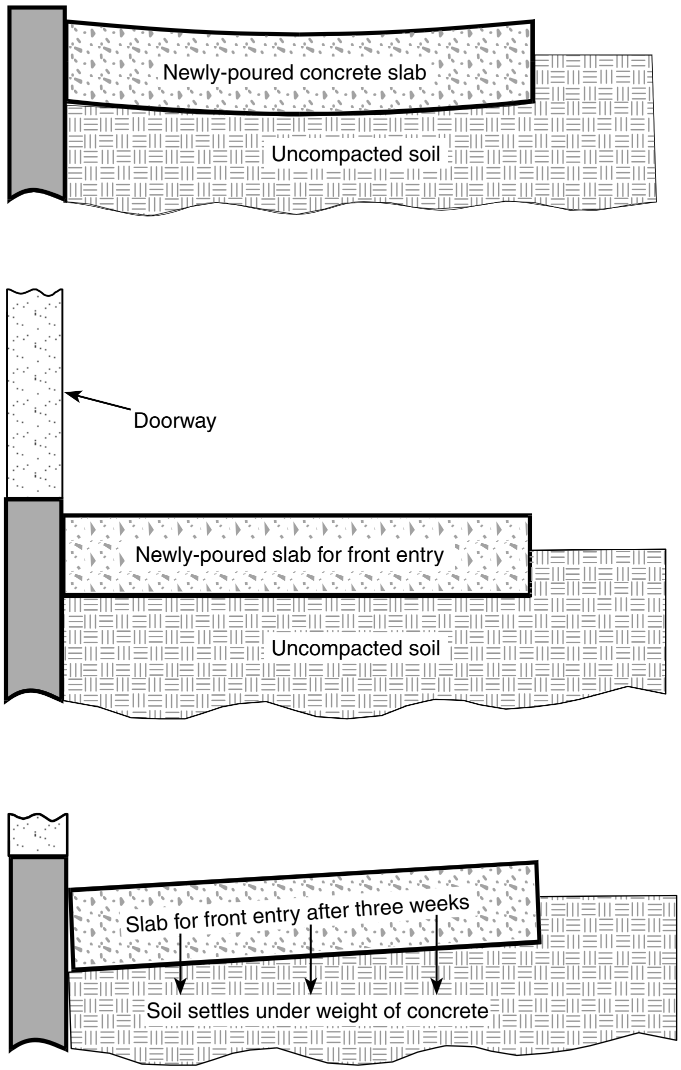


Figure 4-12
The dangers of uncompacted soil

Slab Problems

The slab challenge I had to deal with was the back porch at the house my daughter and her husband bought. It sagged about 3 inches along its length. Why? My suspicion was that the ground hadn't been compacted sufficiently. Concrete hardens in a matter of hours, and the ground had self-compressed 3 inches within that short period of time.

Well, I didn't replace the porch; I built a deck over it and was able to hide the problem. Of course, that didn't fix the slab, but now nobody can see it. You may be thinking — a contractor should have talked his daughter out of buying that house. But if you have a daughter, you know that's impossible.

This isn't meant to help you avoid the issue. Anyone at any time could be faced with cracking or sagging concrete caused by uncompacted soil. Figure 4-12 gives you some examples of problems you might run into. If the soil is very loose, the weight of the cement will settle it before the cement has a chance to set up. Your client may end up with a slab like the first one in the figure. The next slab looked fine in the beginning — but since the soil under it was either never compacted or insufficiently compacted, after a few weeks, the fill settled, and the slab resembled the third one in the figure.

An entry slab that slants sharply to one side can usually be attributed to poorly-prepared fill. This is commonly found next to basement walls.

The settling of uncompacted soil under concrete is more pronounced where an entry abuts the slab, since that's a prime location for any framed opening to move away from the slab. If the entry tilts, water collects on the slab and runs down toward the basement wall, intensifying the problem.

There's no way to correct this situation. You'll need to break up the concrete, compact the soil sufficiently, and start all over again. There *are* companies that specialize in jacking up sunken concrete slabs, if your customer wants to go that route. But he'd better be prepared to pay the price.

Sidewalks

Those lines scored across sidewalks every few feet aren't to make the sidewalk look more attractive, though they end up doing just that. These are control joints, and their purpose is, strangely, to crack. Any long narrow ribbon of poured concrete, even if on well-compacted soil, will eventually develop cracks across it. Keep this in mind if you're pouring a pathway along somebody's house, or from the street to the house. Even if you make it an extra-thick pour, temperature changes, drying shrinkage, swelling and shrinking of the base, and other factors, will combine and you're going to have cracks. What you need to do is control in advance exactly where those future cracks are going to happen. A control joint is a weak spot, a little like a fuse in an electrical circuit. If something goes wrong in the circuit, the fuse pops instead of the house going up in flames. When the concrete cracks, it'll crack along its weak spots – the control joints you put in. These are perfectly straight, and below the surface, where they can't even be seen. Instead of an ugly jagged crack diagonally across the sidewalk you built, all that will be visible is the nice clean row of inset lines you spaced evenly along its length.

A control joint is a cut, going down a minimum of a quarter the depth of the pour, made with a grooving tool when the concrete is still soft, or with a saw when the concrete is set up but not so hard the edges of the cut will chip.

Spacing

Space control joints no farther than double in feet the number of inches the pour is thick. So in a 4-inch-thick sidewalk, the very maximum I'd put one is every 8 feet; in a 6-inch-thick sidewalk, you could technically put them 12 feet apart, but I wouldn't. I'd still go with the 8-foot distance. This formula gives you the maximums, but closer is better. And if you're in an area with expansive soil or extremes of temperature, closer spacing is a must. Your jurisdiction may impose some rules, so check beforehand. Also take appearance into consideration. A walkway will look odd if the control joints aren't evenly spaced. If a walkway is, say 26 feet long, you don't want to have a joint at 8 feet, 16 feet, and 24 feet, and have a 2-foot-long piece at the end. I'd put them each 6½ feet apart.

5

WORKING WITH LUMBER

Let's say that it's time for some serious carpentry to begin. You already have the plates for the floor joists and box frame to rest on, and you've made sure everything is square. You've done your job, and from now on, construction will be a breeze. What can possibly go wrong? I'm glad you asked.

Here's a big mistake many builders make — and pay for: They let somebody else check the quality of the lumber that's delivered. Don't do this. Check it yourself.

How and Where to Buy Lumber

Many businesses sell lumber, including some hardware stores and discount marts. You know who they are — we all shop there. Lumber isn't their main business though, so stock is limited. They sell decent lumber, but don't usually carry siding or material for finish construction. Since they don't have the volume to order large quantities, there's no reason for them to carry an extensive range of building lumber. They know a little about the kinds of lumber they do carry, but their expertise is limited. If your customer needs a serious amount of wood, my recommendation is to stick with the big boys — at the local lumberyard.

Lumberyards happen to be the top tier on the lumber totem pole. They have a huge selection of lumber and the hardware to go with it. Because of their volume sales, the lumber quality is excellent. They sell to people in the building trade, so they can't afford to carry inferior materials. Their livelihood depends on maintaining a good reputation, so they usually deal fairly. They'll get you decent lumber, since they want to maintain good working relationships with experienced builders. And lumber wholesalers know better than to send them poor lumber. One hint of unscrupulous dealings could ruin a wholesaler's standing in the construction community.

Checking Lumber Quality

Now that you've found your wood source, let's see what to look for in the way of quality. First, check for any warped lumber. You want as little of that as possible. If the curve is 3/8 inch or less, the lumber is still usable on a 16-foot joist, so don't discard the pieces that are a little off. Slightly warped pieces have no adverse effect on floor joists.

Warp

If the warp in your wood is up and down along its edge, it's a *crook*. So when that particular joist is positioned, the center could sit either higher or lower.

You want to put the bow *up*, to make the joist a little higher in the center, because the weight of furniture tends to push it down. Just remember to put all the warped pieces together.

"If the warp in your wood is up and down along its edge, it's a crook."

If the warp is really bad — ¾ inch or more — don't use it for a floor joist. But don't get rid of it. You can always use the poorer grade pieces elsewhere. For instance, the floor frame can have short pieces on the ends. To be ahead of the game, look at the lumber before you lay it and cut any warped joists into pieces you can use there. Chances are, the warp won't be noticeable once the lumber's cut. Warped 2 x 4s can be cut into short headers for above the door and window frames. Some twisted joists can be used too, by nailing the joist ends and straightening

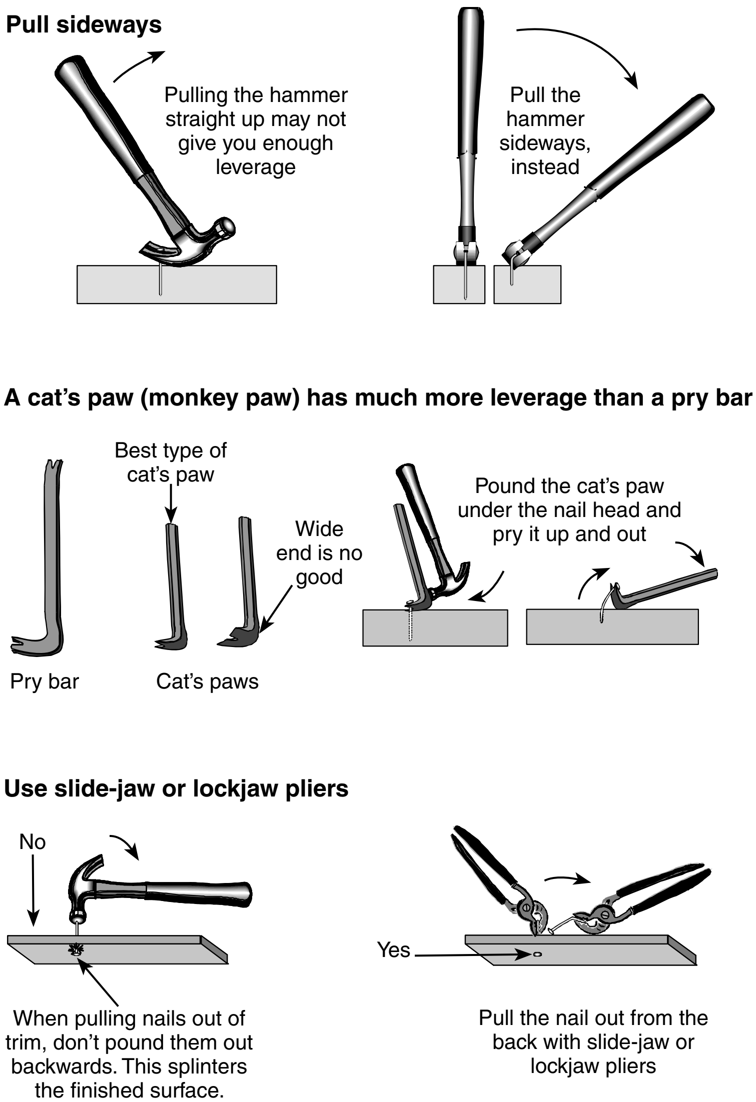


Figure 5-1
Nail-pulling tips

the twists. You'll find ways to use almost every piece of lumber.

Ripping Warped Lumber

Sometimes you need to rip a board to a narrower width. Say the board is a 1 x 6 (which is really 5½ inches wide), and you need a 4-inch-wide board. Stretch a chalkline on the edge of the board. There's warp in the lumber if the chalkline doesn't touch the board near the center. If there *is* warp, make a mark in the center of the board. You want it to be ripped to 4 inches at all points along this length, so marking it in the center for your chalkline will remove the warp when sawing. Well, not really *remove* the warp, but you'll be able to see it when snapping the chalkline.

Measure from one end of the board along the mark and stretch the line to the center mark. When you snap the line, it'll be 4 inches at all points along half of the board. Now go to the other end of the board and repeat the process. The board will still be warped in the center, but your chalklines will be 4 inches wide.

After you've ripped the board, begin by nailing one end, and then proceed along the board, pulling it straight as you nail it. This simple method allows you to use the warped board. Once it's nailed down, no one will know it wasn't straight in the first place.

Nail Pulling Made Easy

Since you'll be working with wood so much, Figure 5-1 shows a few different ways to pull nails easily. These methods work, and can be real time-savers.

LAYING PLYWOOD SHEETS

Now let's talk about laying ½-inch plywood 4 x 8 sheets. This is usually the first layer nailed to the floor joists. If the room is a rectangle, the joists run across the short walls. Lay the sheets with the 8-foot length running parallel to the long wall. That way, you'll have half as many seams as you would if you ran the plywood along the shorter wall.

You may want to start laying the plywood in one corner and continue, row after row of plywood sheets. Suppress the urge. You have to stagger the sheets. If all the sheets meet on the same joists, your floor won't be as solid as it needs to be. If you start out with a full 4 x 8 sheet, the next sheet should be a 4 x 4. The ends of the two plywood sheets will then be staggered, and won't end on the same joist. In other words, alternate your 4-foot pieces with 8-foot lengths at one end of the room.

After the first end row, the other sheets will be full 4 x 8s. Of course, when you're finishing at the last row, the sheets have to be cut to fit the wall. But each sheet will still be staggered. It may take a little time to cut the sheets, but not as much time as it would to come back and re-tile or do repair on a sagging floor. Remember, the sheets still wouldn't be staggered, so the floor would be a continual problem. And it wouldn't be long before everybody in the community was informed that your work gives the homeowner nothing but trouble.

Plywood

In most cases, you'll be positioning floor joists and roof trusses, etc. on 16-inch centers and, although some joists will be bowed in spots, now you know how to straighten them out. By marking plywood sheets beforehand, those marks can be used for reference when the plywood is nailed down later. You'll be marking the plywood on the two 8-foot-long sides.

Make marks 16 inches apart on the two edges of plywood that will lay across the joists. Your tape measure has a handy red or black "V" every 16 inches just for this purpose. Mark the plywood as you take each sheet off the pile. Marking the sheets and aligning the joists to the marks as you nail helps enormously in laying out your plywood.

If the plywood sheet has been ripped to fit against a wall, measure for your 16-inch marks from the *opposite* (uncut) side of the plywood. Always measure on the factory-cut edge of the sheet, since you know that side is square.

Nailing Plywood

Once you've marked it all, start nailing the sheets at the wall where the sheets haven't been trimmed. If the first sheet has been trimmed, its *uncut* end should fit up to the middle of the joist its edge rests on. Nail the corner first, then the other end to its joist at the wall. Nail at each pencil mark along the wall. You should hit a joist with every nail if the joists are on 16-inch centers. Now, line up the joists with the pencil marks on the other side of the plywood. If some aren't centered on a mark, pull them until they are. Do you see the reason for the pencil marks? Some pieces will be warped or bowed, so moving each joist to the mark puts them all in line as they're nailed.

Moisture

If you have a wooden boat that you store in winter, you know its joints open as the wood dries out. Once the boat goes back in the water in spring, the boards swell up and the joints are tight again. Good for a boat. Bad for a house.

Will your customer be a victim of moisture invasion, thanks to your installation of plywood? Well, it depends on two things:

1. where the plywood was kept before installation
2. how damp its environment is once it's in place

If it was kept dry before you nailed it to a first story floor or a roof, it'll swell enough from basement or roof humidity to move each sheet a fraction of an inch. Sooner or later, moisture will creep into the plywood itself, causing each sheet to swell slightly and increasing its size by as much as 1/8 inch. It doesn't take much moisture to cause plywood to swell.

Considering how many sheets would be pushing against each other if every sheet grows, that adds up to a lot of movement. If each sheet increases in size just 1/16 inch, after a few sheets the plywood moves ¼ inch or more. Where does that ¼ inch go? It can't expand outward. The result is inevitable: the sheets start buckling.

It takes time for enough moisture to accumulate inside plywood to cause swelling, so the sheets could have been nailed down and the final floor or roof on for a long time before the movement becomes evident. You may be long gone, but I guarantee you'll be hearing from an irate homeowner. If the sheets are on the first floor and carpeting is installed, the swelling may go unnoticed. If parquet or tile floors are laid, the joints will open and tiles will move up or down. In this case, it can't be hidden, so what can be done? Nothing short of complete replacement. But read on, and see how you could have easily avoided this fiasco.

Plywood sheets for the floor and roof must *never* be butted tightly against each other. You need spacing. Temporarily tack two 8-penny nails along the side, and two more along the end of each sheet before the next sheet is nailed down. As soon as the succeeding sheet is tacked in place, remove the nails and re-tack along the side and end of the new sheet before the next sheet is put down. The same technique is used when putting down the next layer of flooring, which is usually ¾-inch particleboard. This slight spacing won't show once the finished floor is down.

Most of us build where a building code is enforced. The inspector won't pass your job if you haven't left the required spacing between the plywood sheets. But waiting till the inspector requires you fix it is the expensive way to go.

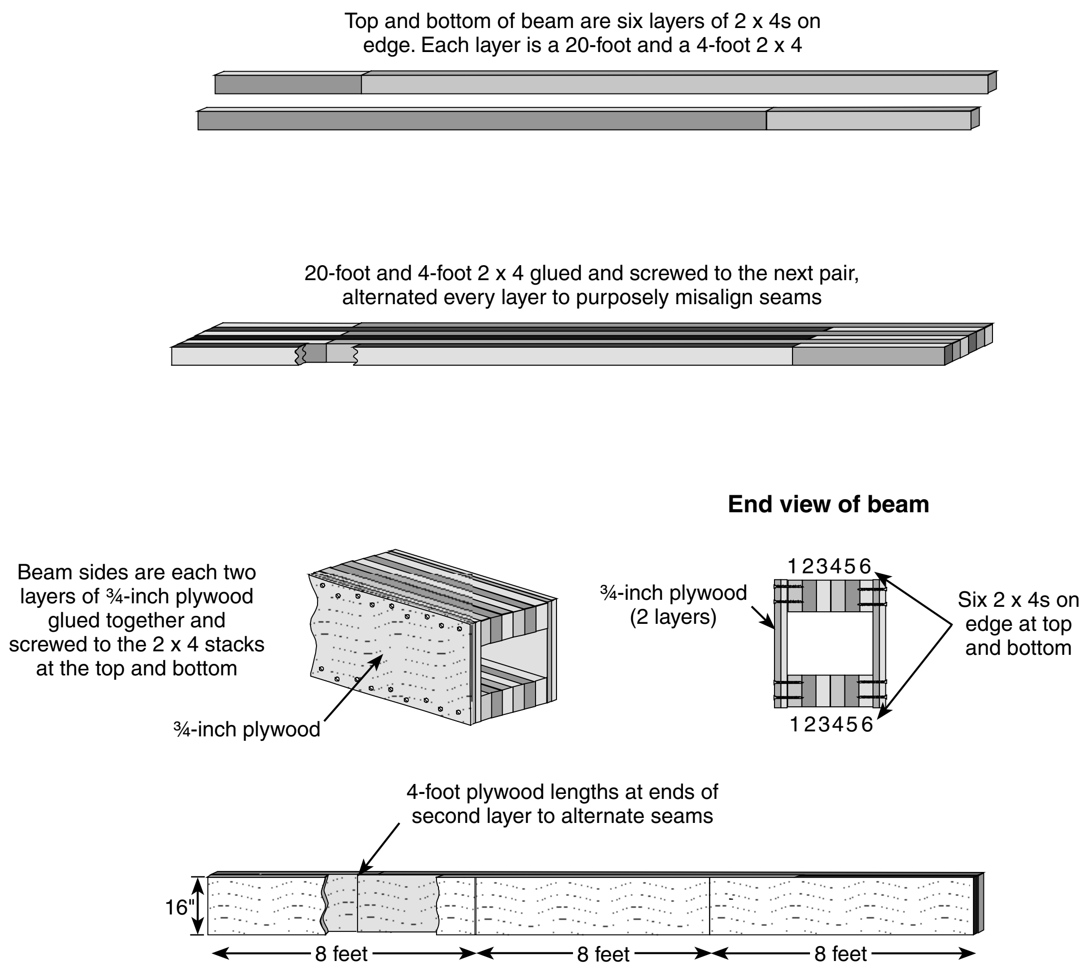


Figure 5-2
A laminated wood supporting beam

Making a Long Laminated Beam

A long time ago I had a client who wanted living space above his garage, but didn't want any posts in the way of his cars or limiting his workspace. The two rooms he wanted above the garage would have to be supported by a 24-foot beam. A specialty company *could* fashion a laminated beam or install a steel I-beam, but these are expensive solutions. I solved the problem by using 2 x 4s and ¾-inch plywood to construct a very strong supporting beam; see Figure 5-2.

I glued and nailed six 2 x 4s together, side by side, standing on end. The longest lumber available is 20 feet, so I used 4-foot 2 x 4s at each end. I alternated the joints in the lumber, putting the seams at opposite ends. I made two stacks of six 2 x 4s.

Then I ripped 16-inch-wide strips of ¾-inch plywood for the sides, cutting four of them 8 feet long. After that, I cut four 4-foot lengths of 16-inch plywood strips for the alternate seams when I attached each layer of plywood. I screwed and glued two layers of these ¾-inch strips on each side of the stacks of 2 x 4s. Then I placed them flush with the top and bottom of the 16-inch plywood strips.

This made a hollow box beam, with 2 x 4 strips at top and bottom when installed. It would take a tremendous amount of pressure to cause any flexing of *this* beam.

There aren't many places these days where you're allowed to construct your own laminated support beam. Nowadays, code requires they be designed by an engineer — I suspect because there were failures of beams designed and constructed by contractors whose sole concern was to save money. I'm sure the beam I constructed was *at least* as strong as any an engineer could have designed, but that doesn't matter. If the job you're working on is one that falls under the governance of a building code, a laminated beam needs an engineer's stamp.

Bridging Between Floor Joists

If you don't address this problem, it'll eventually push your homeowner over the edge. A few years after you're gone, the tile floors start to develop cracks every 8 feet. They go all the way across the floors, wall to wall. At first they're barely noticeable, but they open up wider and wider. What's happening? The customer calls you when he loses two dogs and a favorite watch in a hole … well, maybe the cracks aren't *that* deep. But they seem that way to the homeowner. Although your floor joists were strong enough to support people and furniture, one more thing should've been done to stabilize the floors. You neglected to bridge between the floor joists.

Bridging is achieved by using short pieces of 1 x 3s nailed diagonally between each joist. They allow the joist to be stiffly joined (in the middle of the joist) to joists on either side of it, effectively distributing weight between them. Then even if a leg of heavy furniture is resting on a single joist, three joists are really holding up the total weight.

You can buy bridging in bundles, or you can cut your own. It's quick and easy. All you need is a radial saw. Cut the ends of each piece of bridging at a 45-degree angle. You may only need to do a little alteration on the end joists.

Bridging must be installed in pairs, one in each direction, like an "X". Bridging keeps the floor from flexing as people walk across it. This slight bending may seem minor, but it can eventually cause floor tiles to crack. X-shaped braces bridge the middle of the floor — where it needs more strength.

It may take some time for your customer to see cracks at the joists, but believe me — when he does, you'll be hearing from him. Cracking is compounded if the underlying plywood sheets aren't offset, as mentioned before. If they butt together on the same joists, the floor is weakened every 8 feet. And if you didn't bridge below the floor, cracks will show up even sooner. At first, the fractures appear to be tiny, but soon open wider as the sheets beneath the floor spread.

The solution is to be proactive: *stagger your sheeting* when you build the floor and install bridging or blocking to strengthen it. Most building codes now recommend blocking rather than bridging. You'll find the requirements for it in your code. It's possible to install bridging after the fact, but only in one specific situation: if the problem's on the first floor and you have access to the basement. Then you can go down and place bridges. Unfortunately, that's the only scenario where you can easily repair a sagging floor.

6

WALLS & INSULATION

The plywood flooring is down. Now you can start building the walls. You probably have a good handle on framing, so I won't go into great detail, but I will give you some building tips that'll save you time and money.

Building House Walls on the Ground

The old method of constructing walls was to build the frame on the floor, stand it up, then nail the framed section to the outside edge of the floor. The workers then stood the sheeting up and nailed it on the outside of the house walls. Next, they cut out the windows and doors. Finally, they unrolled the tar paper and tacked it up. Do you see some wasted steps? Some extra work?

My method is more practical: Complete all the above steps while the walls are still laying down. It's a lot easier to nail plywood onto a wall when that wall is flat on the ground. You aren't fighting gravity — you're letting gravity help you. The only part in this method where gravity *isn't* on your side is at the end, when you have to lift the finished wall upright. For that, you'll need either lifting equipment or a lot of extra help. If you don't have either, you can't take advantage of this particular time-saving trick.

Plywood sheets have right-angle corners. You can square the walls as you attach the sheets. You'll be able to see immediately if the wall framing is out of square because one end of the plywood sheet will be further up on the wall than the other. Of course, you checked the framing for square before you ever nailed on a sheet of plywood. Right?

- ➢ To get each wall square, snap two chalklines on the floor where the framing is nailed together. Follow those lines as a pattern while you build the wall. Snap the line longer than the wall you're going to build. This is where you'll lay out the bottom of the wall, so leave room for the framing above the chalkline.
- ➢ Draw a 90-degree, 2-foot line with your square near the end of the chalkline where the wall's edge will start. Tack a nail on the end mark and hook your chalkline to it. Follow the line you drew with the square. Snap the chalkline a little longer than the height of the wall.
- ➢ Nail the wall together as usual, complete with bottom plate, studs, and top plates. Then slide the wall up to the chalklines. Once you've lined up the bottom wall plate and the end wall studs, the wall will be lying on the floor, squared. Angle a few toe nails into the outside edges of the 2 x 4s to hold them in place. You don't want them moving out of alignment.
- ➢ Sheet the wall, cut out the doors and windows, and cover the wall with tar paper while the wall is still lying down. Don't cut out the doorframe bottom 2 x 4 yet.

There are a few things I want to stress:

1. Plywood on exterior walls should extend ½ inch down below the floor. When you stand the wall up, the plywood will extend *downward* past the floor — which is what you want. Rain won't be able to seep in under it, and it also forms a good seal to prevent winter drafts.
2. Don't cover one end with plywood on some of the walls. Why? When the first wall is up and temporarily braced, you need to slide the next wall up to it. You won't be able to align them if both walls have plywood sheeting at the corners. Leave the last few inches of plywood off the new wall, so you can reach through and hold the corners together. That makes it much easier to align the walls.
3. It's a good idea to snap a line 3½ inches in from the outside edge of the floor before standing up an outside wall. This positions the wall properly before you nail it, making it square and vertical. Another reason to use the chalkline is to see if the wall is bowed or the plywood sheeting is warped. You don't want to find that out when it's too late to fix it. Draw V-shaped lines out from the chalkline every few

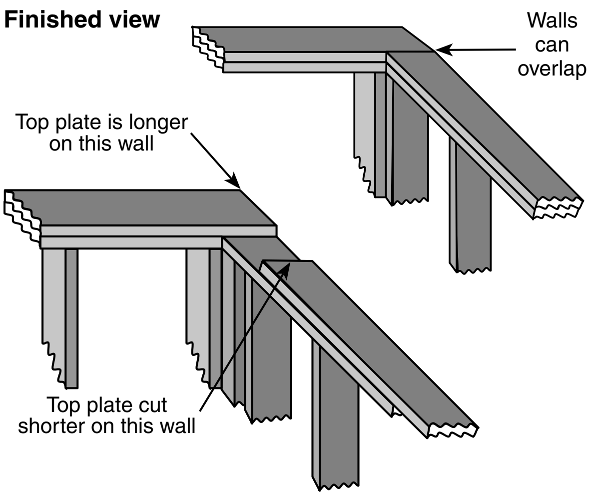


Figure 6-1
Cutting a double plate

feet. That lets you know ahead of time that the wall is getting close to the chalkline.

4. Remember to space the plywood differently where the sheeting overlaps the next wall. Some of the plywood will just be flush with the edge of the last plywood sheet. But on the abutting walls at the outside corner, the plywood should be 4 inches longer than the framing. That allows the plywood to cover the end 2 x 4 stud of the adjoining wall and its plywood edge. The sheeting on the adjoining wall has to cover the 3½-inch stud and the ½-inch plywood — a total of 4 inches.

Cutting Top Wall Plates for Length

A common mistake is cutting all the top plates the same length as the framed wall. All walls have a double plate on top. As well as the plate nailed to the wall studs, there's a 2 x 4 plate above it. These double plates help support the roof trusses that rest on them. The trusses and roof load exert a lot of pressure, so top plates are always doubled to handle the weight.

There's a good example of what I'm describing in Figure 6-1. The top plates extend over the adjoining wall where they meet at the corner. Half the top plates will be 3½ inches shorter at the end. The other half will extend 3½ inches to make up the difference. That's where you nail the tops of the walls together. Remember, no section of top wall plate can be less than 24 inches in length.

Mark Wall Studs on the Floor Before You Drywall

Can you name the mistake made by nearly every drywaller early in his career — maybe even you? Putting the first sheets of drywall up, not knowing where the studs are because you've covered them. Here's what I recommend: Before you start nailing up drywall, mark the middle of

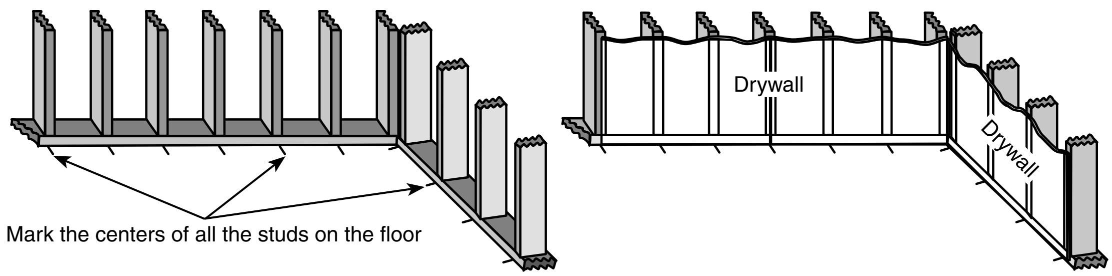


Figure 6-2
Marking wall stud locations

each wall stud on the floor. In Figure 6-2, you can see how easy this makes drywalling. Extend the line from the stud outward and mark the spot. Use a felt-tip marker. This way you can keep track of the wall studs even though they're behind the drywall.

Insulation

There's one more phase to getting the walls up and ready. After the house walls are framed and sheeted on the outside, install the insulation. Don't start the inside drywalling until this is done. But first, here's a question about insulation: How can you insulate corners after the walls are framed?

Two types of framing meet at every corner. One wall has the normal stud at the end of the wall. The abutting wall has double studs that are 3½ inches apart. These studs are spaced to create an inside corner. This is where you nail the drywall.

But once the two walls are nailed together, how can the corner be insulated, since the space between the two studs is enclosed? You're going to stuff 3½-inch-wide strips of insulation between these two studs before nailing them together. Even if you forget, you can still drill holes every foot or so down the corner and squirt in spray foam insulation. It's a relatively easy fix. Start at the bottom hole and go upward. The foam spreads and sets up quickly and is quite durable.

Ceiling Insulation

What's one of the most important aspects that can literally "make or break" your customer's heating and cooling costs? Insulation! So one of the things I'm going to show you is how to super-insulate cathedral ceilings in houses without attics. If ceiling beams are exposed as a decorative feature, or have drywall or paneling over them, there's no place to put the insulation. So, what can you do? Well, I'm glad you asked … I'm going to share a few ideas with you.

Following are two ways you can help your customer to achieve the means to a lower fuel bill … something he will thank you for!

Method #1 — Insulation Below the Ceiling

The cheapest way to insulate a room is to put the insulation below the existing ceiling, using insulation board. Measure the area you're going to cover and buy enough sheets of dense foam insulation board to cover the ceiling, along with paneling glue made specifically for this purpose. You'll also need a hammer and a ladder.

- ➢ Remove any corner molding or ceiling trim strips. If you're careful and don't bend or break them, you can reuse them when you're finished installing the insulation.
- ➢ Find at least one joist by using your stud finder, or just by tapping the ceiling with a hammer. When you think you've found a stud, hammer in a small nail to see if it hits something hard. You need to locate the center of the stud for good attachment, so once you've hit a stud, move your nail over about ¾ inch and tap the nail in again. If you hit a stud once more, move over ¾ inch the opposite way and try again. When the nail pounds in easily, you've found the edge of the joist.
- ➢ Once you've found the first joist, measure at 16-inch intervals to find the rest. Pound a nail into the center of each joist, to be sure the locations are accurate. Remember to mark the location of all ceilings joist centers *on the wall* with a pencil or masking tape, to keep track of where the joist centers are after the insulation is up.
- ➢ Attach the insulation board to the ceiling joists. Apply lines of paneling glue to the back of the insulation board so the pieces will stay in place as you secure them. Incidentally, lath and plaster is springy, so you might find that using screws to secure them is easier than trying to nail the boards on. I actually prefer this method.
- ➢ If you're using 1-inch insulation board, use 1½-inch roofing nails so they won't go all the way through the roof boards. Begin installing the board at the edges, where you'll be able to hit joists. Make sure the edge of the first sheet falls on the middle of the joist. Then all the other

sheets will fall into place. Once you have enough nails in to hold the board up, find all the ceiling joists behind the first sheet.

- Snap a chalkline on the insulation board at the center of each joist. The marks you made will guide you when snapping these lines. With the chalklines snapped, nail and glue the sheets onto the stud lines. Use as few nails as possible. Keep the heads of the nails flush with the surface of the insulation board; you don't want dimples.

"Remember, plaster can crack along joint lines, so be careful."

- My practice is to use joint compound on the insulation board joints, making a smooth line. Apply with a narrow putty knife, then smooth with a wider knife. Try to feather out the edges, so you don't have any lumps or lines on the surface. Remember, plaster can crack along joint lines, so be careful.
- If there are blemishes in the surface, use a forming plane to smooth it. Cover with joint compound. Sandpaper (or jitterbug sand) the joint smooth the next day. Don't worry about getting the surface perfectly smooth. You're going to cover the board anyway (as explained below).

Your next step is to conceal any blemishes. This is critical. First and foremost, use the correct material; *don't* make the mistake of using paint. Paint isn't thick enough to cover irregularities. The methods described below for covering and concealing are equally effective.

There are two standard ways to finish plaster ceilings. The first one involves a texture brush, found in any paint store, to make the pattern on the ceiling. The bristle surface is 3 inches in diameter, with a round, knobbed handle to hold onto at the top.

Texture Brush

The real secret to successful texture brushing is the choice of ingredients and their proportions: I use 50:50 latex paint and drywall joint compound. The thickness of the mixture is what makes for good texture; the consistency should be like whipped cream. Always try your mixture first on a scrap of insulation board.

Dip your brush into the mixture, then apply pressure to the brush against the ceiling, which causes the bristles to splay out. They come together again as the brush is removed. If your paint and plaster mix is the right consistency, you'll get a nice pattern. Cover the whole ceiling with overlapped strokes. You won't have to paint afterwards, because the paint and plaster mix is also the finish coat.

Texture Roller

In this alternate method, you'll apply texture paint with a texture roller. Like the name implies, the roller leaves an embossed pattern on the surface. It's used like a regular paint roller, except you don't go back over the area you just covered. Since the pattern repeats, you simply overlap your strokes. These rollers come in many different patterns. The paint is premixed to the right consistency, and comes in large plastic buckets. This thick mix will cover everything, so surface blemishes seem to disappear.

Method #2 — Insulation Above the Roof

This insulating method works well in houses made of pre-built materials. You know the kind of houses I mean — sections are factory-built and delivered to the building site on trailers. There, they get set up on a new foundation and fastened together. Pre-fabs are very reasonably priced, but share one drawback: The ceilings are built of 2 x 8 ceiling joists and are cathedral-type, but with no attics for insulation. And there's only 7½ inches of insulation in the roof instead of the usual 12.

How can you add more insulation when there's no room for it? Unfortunately, these pre-fab houses have low ceilings to begin with, so there's no room to go down. What did I do when I faced this problem? I saw that while there was no room to go down, there *was* room to go up. I put the insulation *above* the roof. See Figure 6-3.

First, I put up 2-inch dense foam insulation board and sheet over it with ½-inch plywood. Adding 1 x 4s around the perimeter of the roof will cover the edges of the insulation board. Then I nailed the bottoms of the 1 x 4s onto the house eave boards. They extended above the original eave boards as high as the thickness of the insulation board.

If you want to try it, there's a four-step process for this project:

1. Get a roll of aluminum roof flashing to help tie the plywood sheets together. Although the plywood is nailed to the 1 x 4s on the edge of the roof, you'll need to stabilize the edges of the sheets. Cut the aluminum into strips about 4 inches wide. Nail them over the joints where the plywood sheets meet. Then use 1-inch roofing nails to hold the aluminum strips down.

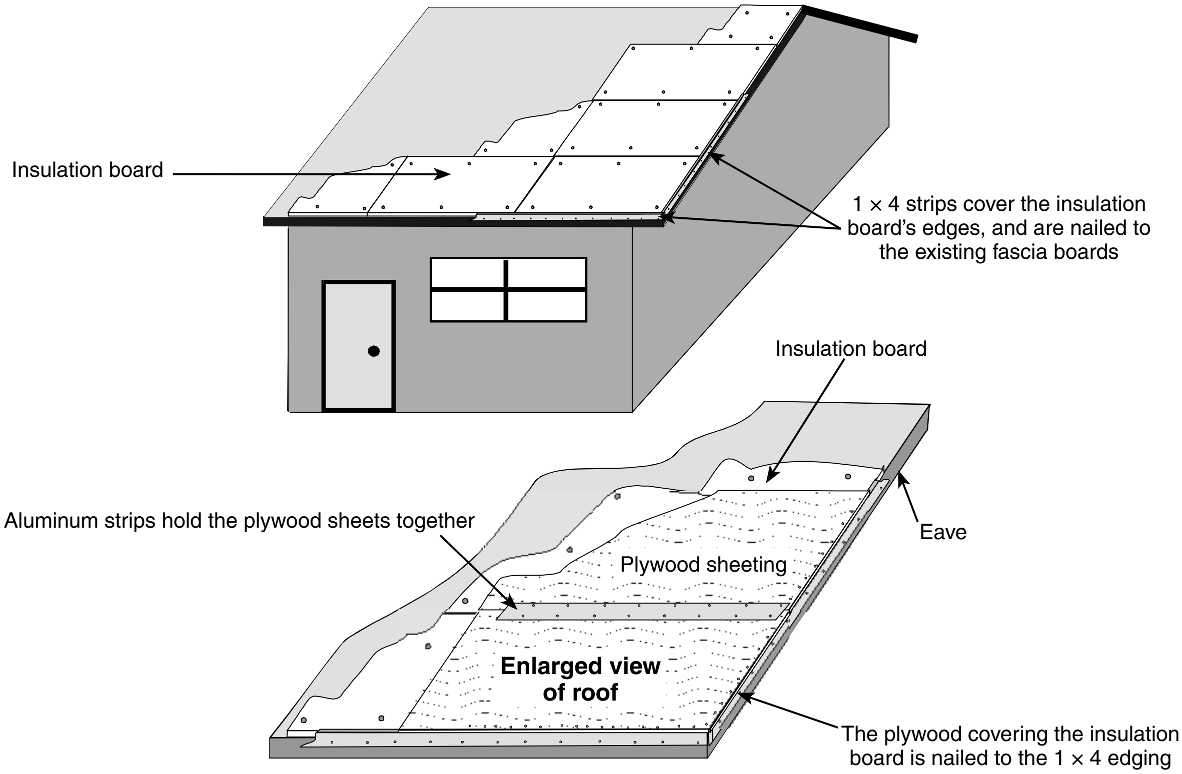


Figure 6-3
Insulating a cathedral ceiling above the existing roof

2. You don't want the plywood edges to be uneven where the sheets meet; that would make a ridge under the shingles. So be precise. Don't just drive long nails through the insulation board into the old roof itself. You'd most likely force the plywood down lower, causing an unsightly roofline.

3. Nail the plywood onto the top edges of the 1 x 4s. Don't let the edges of the plywood stick out past the sides of the 1 x 4s. If you wanted to wrap the eave boards with aluminum, protruding plywood would make it difficult for you to push the metal fascia up under the roof edging.

4. After the 1 x 4 trim is nailed around the edges of the roof and the plywood is nailed to the 1 x 4s, the new roof can be shingled normally. You can paint the 1 x 4 edge to match the eaves.

Insulating Hard-to-Get-at Spots

There's another method of insulation for those out-of-the-way places — spray-foam applied from a can through a length of plastic tubing. It expands once it's exposed to air, and fills just about any space. It's great for cracks in the foundation and around pipes, or inside walls around drafty receptacle boxes. If your customer has had trouble with mice carrying away his fiberglass insulation, this is a great alternative; the mice leave it alone. Watch out for using it around windows. It puts quite a bit of pressure on the window frame and could void the warranty.

Now I'm going to tell you a couple of "strange but true" stories. Have you ever been daydreaming and come back into the present, thinking: "Wow, I'm glad I wasn't doing anything important just then; I sure would've screwed up!" Well, in some of these cases, that's just what happened — the brain was out to lunch.

Supporting Walls

It was time for some big changes. Bill's two tiny rooms downstairs were so small they were pretty much useless. What could be a better idea than making them into one Great Room? Not only would it be fashionable, Bill even knew who could do the work. His buddy, Arthur, a retired contractor, assured Bill that this was a piece of cake.

"What was Arthur's solution? Simply tear out the middle wall between the two rooms."

What was Arthur's solution? Simply tear out the middle wall between the two rooms. That would certainly open things up. So he arrived with his crowbar and sledgehammer, and in just a few hours the wall was gone. There was nothing left for Bill to do except sweep up plaster dust in his really big Great Room.

Funny, though. The kids' upstairs bedroom floors suddenly became very springy. They were delighted, and loved to watch the floors rebound like a trampoline when they jumped on them. Bill, however, didn't think it was so funny. He suspected the floors shouldn't be that bouncy. Bill called Arthur, but his buddy was out of town in Las Vegas. So Bill sent the kids to his mother's, just to be safe, and then hurried down to the local lumberyard to get some advice. He told the man at the lumberyard his story, and asked him to come out to the house.

The lumberyard workman got a big surprise. The missing wall had been a *supporting* wall. It was meant to hold up the floors of the second story. All that was left for support now were the crosswise floorboards and the downstairs ceiling drywall. Luckily, Bill had sent the children away. The floors could have come crashing down any minute.

The workman went back to the lumberyard and returned with some supporting 4 x 4s. He pushed them into place to hold the upstairs floors so they wouldn't collapse. Then he brought in jacks with 4 x 4s on top, to hold up the ceiling.

> *"Removing a supporting wall without adding reinforcement is pretty crazy, but that's nothing compared with this next mistake."*

Bill certainly got his Great (big) Room. But not until a great big laminated beam was put across the middle of the room to hold up the ceiling. It didn't look that bad, once the beam was drywalled and painted. Bill had said he was dying for a bigger living room. That came closer to happening than he likes to think!

You may laugh and tell yourself you'd never do anything that dumb. People do, though, because they're focusing on the goal. It could happen to you, too.

The Sideways House

Removing a supporting wall without adding reinforcement is pretty crazy, but that's nothing compared with this next mistake. It's so crazy that I thought nobody would believe it. But it actually happened, and it's too amazing to keep to myself. So, here's an incredible mistake.

One day, my wife noticed a most unusual sight. A workman was tearing off all the siding on the ground floor of a house. Now, that isn't unusual. It happens all the time when siding is being replaced. But my wife thought this was a little odd — the workman was tearing off the boards that held the siding, too.

Odd but not weird, until I tell you that he was removing all this only from the first floor of this two-story house. Hmmm. Why would anybody do that? By the third week, as hard as it is to believe, he was tearing off the drywall from the walls on the first story. Apparently he was only remodeling the first floor.

This put him in serious jeopardy. The only things holding the house up — the sheeting on the outside and the plaster walls on the inside — were being removed. Sure, the 2 x 4 wall studs could keep the second story and roof from falling down, but they couldn't keep the house from moving sideways. Taking all the support down at once without putting anything up in its place is some serious lunacy.

Later that week, while the owner was away, a light breeze pushed the house over sideways. I wish I had pictures of the disaster, step by step. How in the world did he get his insurance to consider a claim? Imagine trying to defend yourself. Is stupidity an acceptable plea?

Well, I'll bet *you* know how to keep a disaster like this from happening. Brace it! I'll explain two methods to support your walls, with some examples. I prefer the first way, since it provides more stability. But if you can't brace it that way, I'll give you an alternative that also adds extra strength to your structure.

Bracing Methods for Supporting Walls

The first bracing method holds gable end walls in position after they're put up. The second method is used on houses having no plywood exterior wall sheeting to keep the house stable.

Gable End Walls

When the gable end walls are built and stood up, they must be supported temporarily until framing is complete. Braces are meant to support vertically until the roof rafters (or trusses) are placed, as shown in Figure 6-4, and sheeted with plywood. This bracing is essential. During that time, there's nothing else to hold the gable end walls upright and level.

When the roof is sheeted, the gable end walls can't move laterally, but there's nothing to hold them steady up until then. That's where jack rafter 2 x 4s come in. They're installed diagonally between the wall and ceiling joists at both gable ends of the house. A 1 x 4 strip is nailed above the ceiling joists at each end of the house, to hold the joists on 16-inch centers and keep them from moving when the jack rafters are installed.

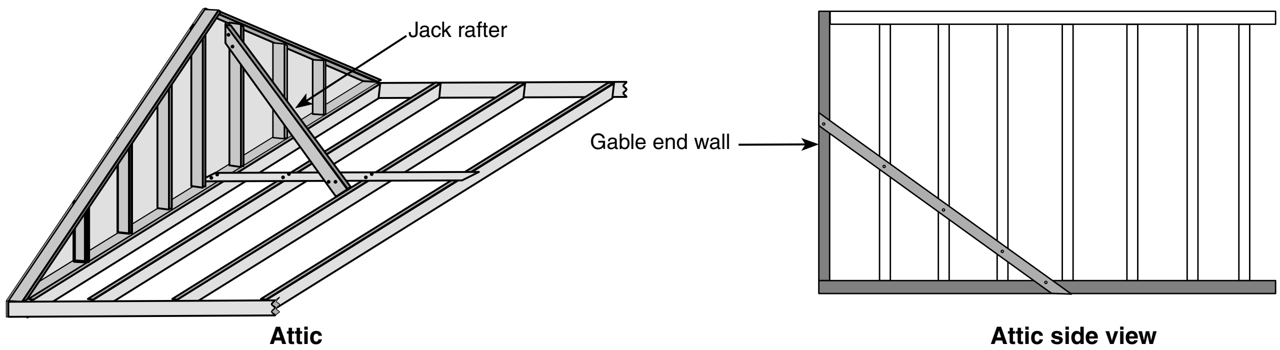


Figure 6-4
Temporary bracing at gable end walls

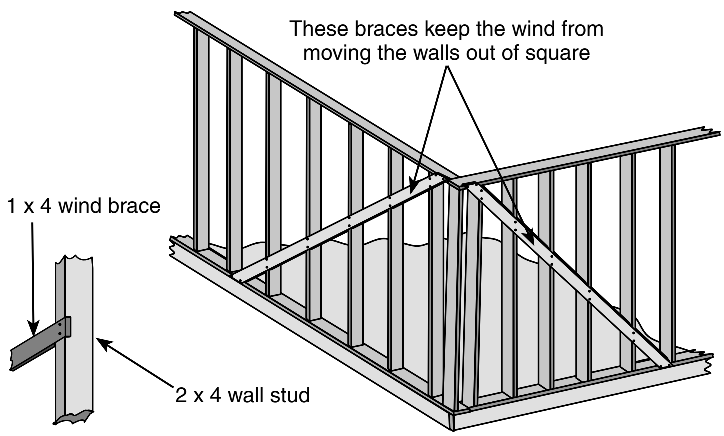


Figure 6-5
Diagonal wind bracing

1 x 4 Wind Braces

Surprising to me, most building codes permit houses to be framed without plywood on exterior walls. The siding is nailed right onto the 2 x 4 framing to cover the exterior of the house. Sometimes a layer of foam insulation board is put between the framing and siding, but that offers no added strength to the structure.

In construction like this, wind braces, such as 1 x 4s, must be installed, diagonally. I generally put them by each corner, as shown in Figure 6-5, but corners aren't the only place they can go. It depends on the size and configuration of the structure. These braces are set into the wall studs, so they're flush with the surface. Diagonal bracing is quite strong and holds the house solid at the corners. It also keeps strong winds from damaging the house.

7

ROOFING

Ever since man began to build structures to protect himself from the elements, the roof has been one of his greatest achievements. Since it's a difficult and hazardous area to work on, do as much preparation as you can before actually going up onto the roof.

Measuring a Roof from the Ground

Did you know that you can find the area of a roof and never leave the ground? To calculate the width of the roof, measure the width of the house and add to that the width of the eaves that extend from each end; see Figure 7-1. To get measurements at the gable ends, hook a tape measure at the low end of the corner wall of the gable. Keep raising the tape as you walk toward the roof peak. This won't give you the exact roof angle, but it'll be close enough. Add the distance the eave extends past the house to get the final measurement (illustrated in Figure 7-2).

Measure the width of the front of the gable dormer from the ground also, seen in Figure 7-3. Once you have that measurement, estimate the length of each side of the gable roof. If the roof of the gable is pitched steeply at about 45 degrees, half the roof will be approximately three-quarters of the width of the front of the dormer. How do I know that? Draw a square on a piece of paper. Now draw a diagonal 45-degree line from the bottom corner to the opposite top corner; the line will be about 150 percent longer than the sides of the square. So, if the gable's front

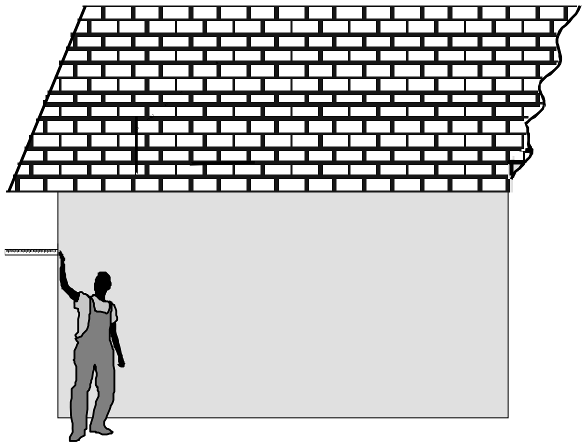


Figure 7-1
Finding the eave overhang measurement

angle is 45 degrees, each *half* of the gable roof will be 75 percent of the gable width. Even if the roof pitch isn't as steep as 45 degrees, this figure will still be close. Keep in mind that you only need rough measurements; you can always buy more shingles or take back any unopened bundles.

How far does each eave extend beyond the gable wall? Again, estimate. Eyeball the eave. Is the overhang 1 foot, or closer to 2? Take a guess. If you're uncomfortable with your ability to estimate, add a little to each measurement. You'll be fine. The last thing to determine is the depth of the dormer roof, which is illustrated in Figure 7-4. Is the front of the dormer about the same as the side? Is the side of the dormer 1½ times as long as the front? These are the kinds of questions that help you get a feel for estimating. With the width of the front of the dormer, you can figure the depth of the dormer sides. Don't forget to add in the length of the eave, too.

There's one more area to estimate on the dormer: the triangular areas of roofing, where the back of the dormer joins the main roof. Measure this as one rectangle (two triangles stacked, with one reversed). Estimate the

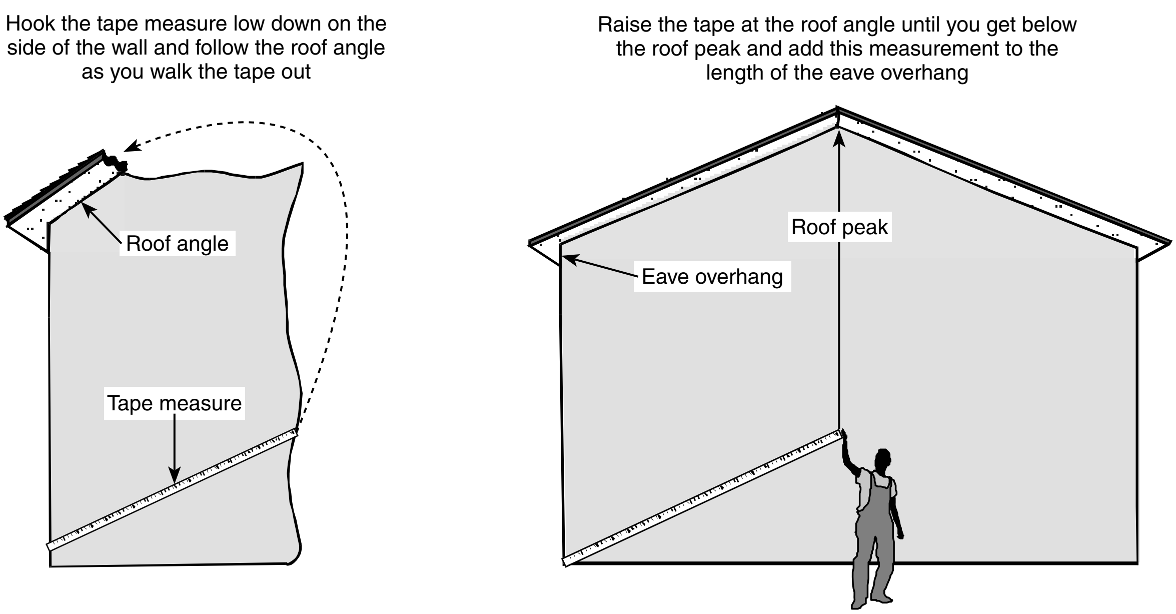


Figure 7-2
Measuring the length of a slanted gable eave

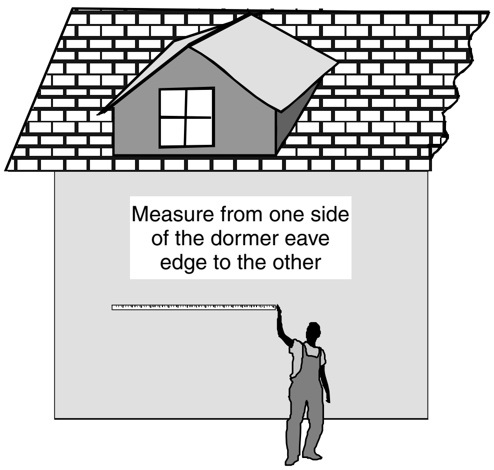


Figure 7-3
Estimating the width of a dormer roof

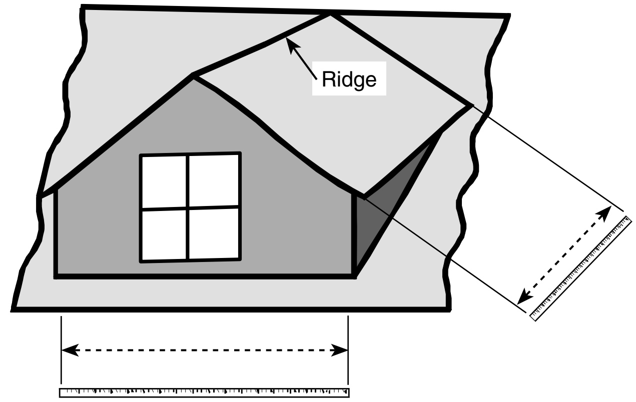


Figure 7-4
Visually comparing the width
of the front to the length of the side

length of the gable's ridge that extends to meet the main roof. Two feet? Four feet? Take a guess, and multiply that measurement by the width of the dormer front. By treating the two triangles like a rectangle, it's easy to calculate area — just multiply length times width. Dormers are usually small, so even a ballpark estimate won't be off by much.

Some dormers have flat roofs that extend from the main roof out to the front of the dormer. If the flat roof has shingles, estimate the area by counting the shingle rows. Multiply by 6 to get the dormer length (shingle rows are 6 inches deep). If the dormer has a rolled roof, count the rows of shingles on the main roof alongside the dormer. If it looks like the dormer starts 6 or 8 feet from the front eave, subtract that amount from the main roof measurement.

Roof Jacks

There are precautions to observe when you get up on a roof. It's safe enough to walk around on a low-pitched roof. But if your hands are full of materials, it's a totally different story. Unless the roof you're working on has a 4-12 pitch (pitching 4 inches every foot), put something behind you to catch any dropped materials … or you, if you lose your grip. This is where roof jacks come to the rescue.

Position a roof jack under a shingle near the middle of a tab; see Figure 7-5. Then you won't have to make nail holes near an exposed loop in the shingle. Always use four roofing nails in every roof jack — the first two in a loop close to the top of the jack and the second set of two a few loops

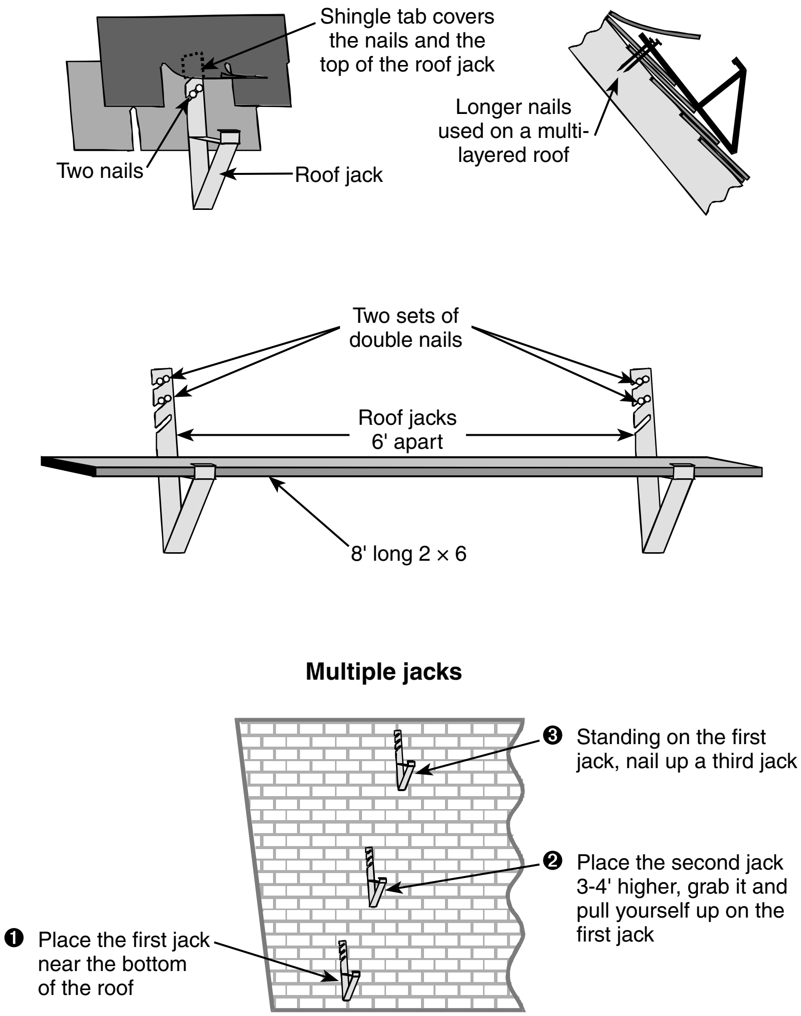


Figure 7-5
Using roof jacks to work safely

down. This spacing keeps the jack from turning sideways or twisting when you put pressure on it. It's common for heads to pop off roofing nails . . . which is why I recommend putting two sets of two nails each for extra security. Nails are cheap, especially when you compare them to your life and your tools.

Make sure each nail hits something solid; the problem is that you can't see the roof boards through the shingles. If you're not positive you've placed the nail properly, try a different location. Be sure the nails are gripping well. If the roof you're working on has several layers of shingles, you'll need longer 16-penny nails instead of roofing nails, to insure good attachment.

Place one 8-foot 2 x 6 across two roof jacks. That's where you'll lay your materials while you work. Position the jacks and plank near the bottom of the roof. Don't put yourself between your materials and the edge of the roof. That's a bad spot to be in if things start to fall. By letting a foot of plank overhang the jacks on either side, you can reach out 2 feet to the left and right, shingling 12 feet of roof from one 8-foot 2 x 6.

If you need to work on a really steep roof, like an A-frame, you'll need three jacks. Nail one jack near the bottom of the roof, above the eave, and the second jack about 3 feet above that. Use the second jack as a hand-hold to pull yourself up onto the first one. Then, while standing on the bottom jack, reach up and put in the third jack a few feet above the second, and repeat your climb. You can reach the top of a high-angled roof using this method. It's good to know, if you don't have a long ladder handy.

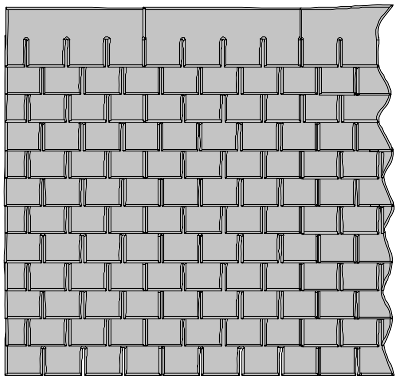


Figure 7-6
Alternate full- and half-tab shingles on each row

Shingles

Think of each shingle as a brick. You generally stagger rows of bricks, and shingles are laid like bricks — never lining up with the ones on the row above or below. The difference is that shingles have tabs. Each shingle has three tabs, and you can think of each tab as one brick. If you start the first row with a full shingle (a full tab at the starting end), start the row above it with a half tab. Begin the next row above the half tab again with a full shingle. Each row is staggered, which gives the pleasing pattern we're accustomed to. You can see the finished product in Figure 7-6.

But looks aren't the only reason for staggering shingles. If the shingles in each row matched up with those in the rows above and below it, rain would run unchecked between the shingles. That could cause all kinds of problems, including premature rotting of the shingles. Staggering the shingles in each row helps protect the joints in the rows below. The roof actually ends up being covered with two layers of shingles, because half of each shingle is lapped under the shingle above it. This has the added advantage of making the roofing stronger than it would be otherwise.

When you start a row with a half-tab shingle, you may think of cutting a tab off the shingle and using that piece to start the next row that needs a half tab. Let me tell you right now that this doesn't work. The half tab is the right width, but the side you cut is straight, so the loop remaining is narrower than it is on an uncut shingle. You'll see what I mean when you look at the drawing in Figure 7-7. Using the leftover pieces is a matter of where you *should* put them, not where you *want* to put them.

If you're shingling the left side of a roof, the half tabs you cut off work fine to start rows beginning on the right. And vice versa. You can use these leftovers when you need to start a row from the opposite direction. Again, the picture shows more clearly what I'm talking about.

Shingle Placement

You typically gauge shingle placement by lining up the new shingle with the top of the loops on the row that you just nailed down. This only takes a few seconds per shingle. And usually, you won't even need that much time, unless the old shingles rise and fall noticeably. You don't want your new shingle lines to be wavy too, so in this case you'll need to line up each row the traditional way.

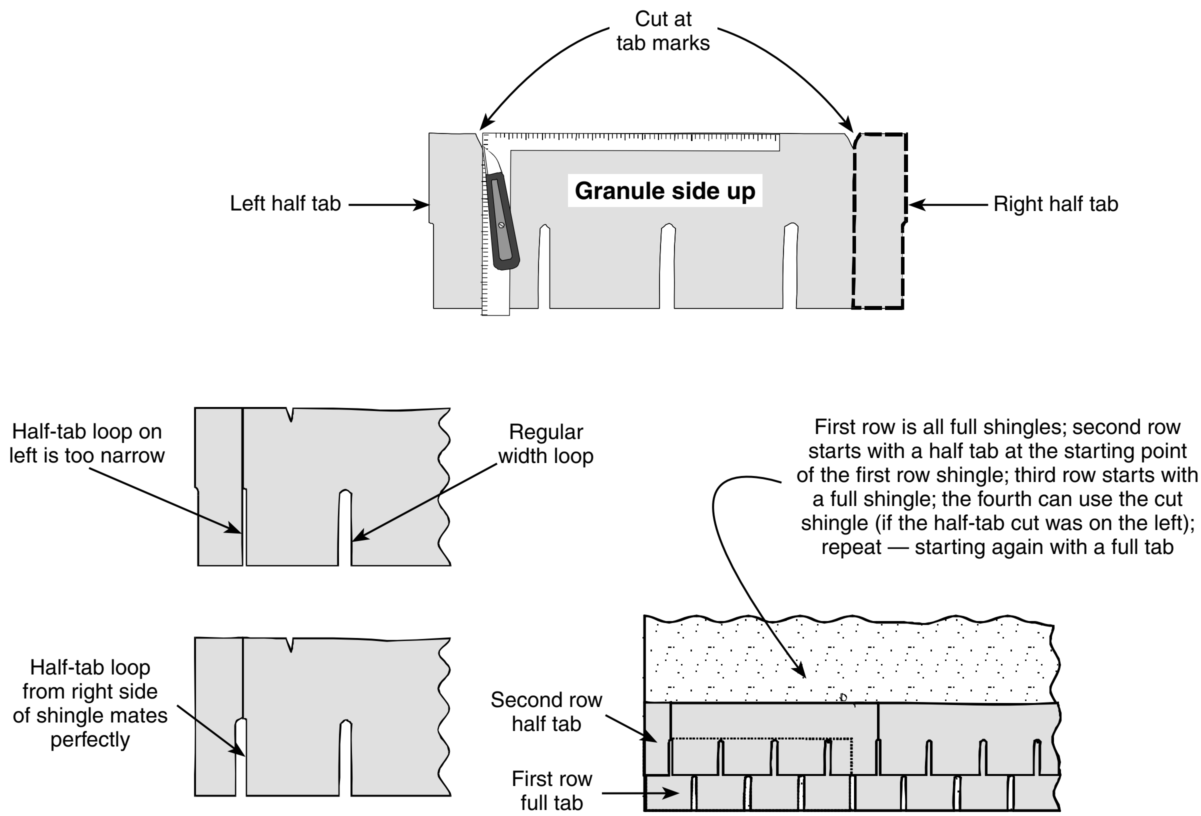


Figure 7-7
Cutting and placing half-tab shingles

Look at Figure 7-8. When you're putting a new layer of shingles over the old one, save time by running the new up against the bottom of the old. By following the old shingles, you eliminate the need for lining up. Your first row starts even with the bottom edge of the old shingles, as usual. Then, in the second row, butt the tops of the new shingles up to the bottom of the next exposed row of old shingles.

If this puts the bottom of the second row too low, snap a line and put the row up a little higher. With the third row of new shingles, start putting their tops against the bottoms of the next row of old shingles. All the rest of the new shingle rows are done the same way — butting the tops of the new shingles up to the bottoms of the old.

You can move at a fast clip when you line up new shingles this way — just slap them down and nail them. In my younger days, I worked with a professional roofer. We mostly re-roofed older houses. He loved any job where we put new shingles over straight original shingle rows. We could finish the job in one day. This alignment method is something to remember if you want your work to be fast and precise.

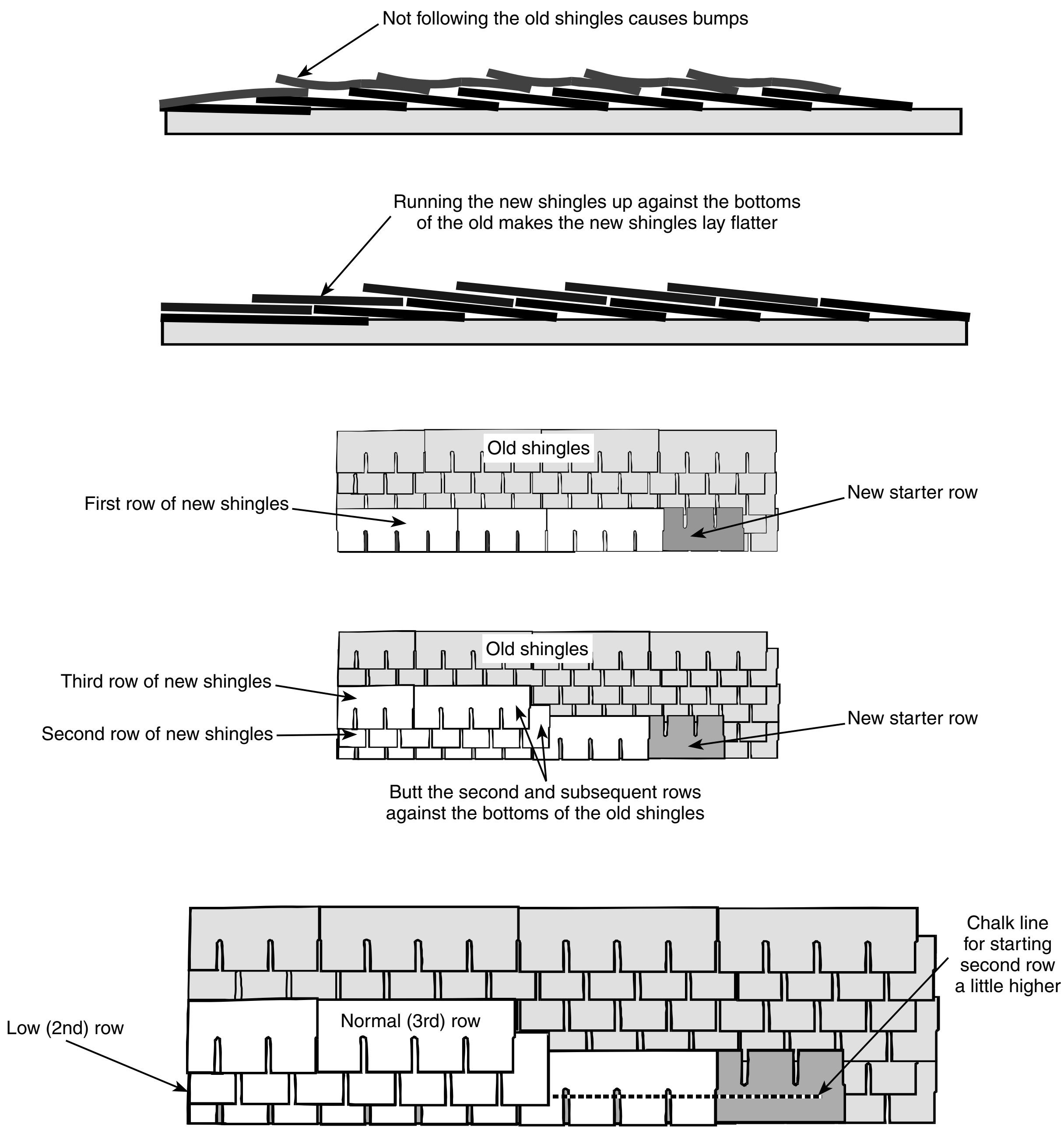


Figure 7-8
How to lay new shingles over old

Fixing Uneven Shingle Rows

If you've been in the business for very long, here's something you've probably experienced: You're on the ground looking up at a roof and see that some shingle rows don't line up with others. That happens when the loops aren't lined up correctly, and the finished product looks terrible. Hopefully, it's not a job *you* did.

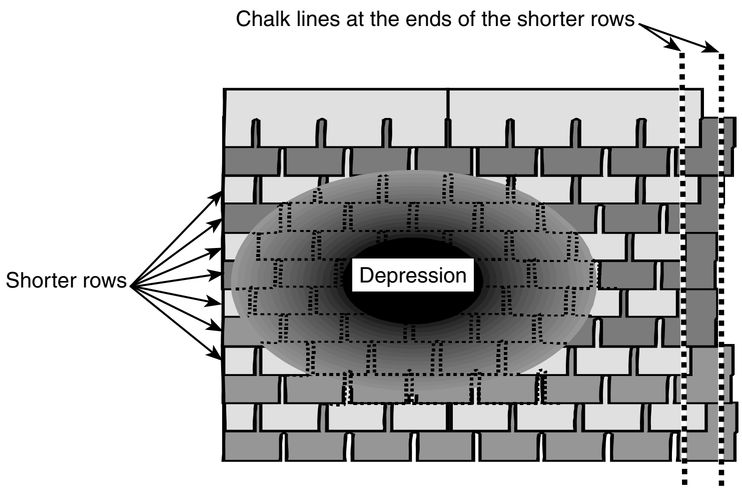


Figure 7-9
Fixing uneven shingle rows

Let's say the roof has five rows out of line in one area. You probably know what the problem is, but I'll tell you anyway: There's a low spot on the roof surface. Rotten roof boards, sagging rafters in the attic, or even warped roof boards could be the cause.

Here's why and how the sagging occurs: Shingles go down in a low area, then come back up. The low spot could be as much as ½ inch deep, meaning the shingle will lose one inch of its length in the dip (½ inch down and ½ inch up). That makes the row uneven enough to be seen from the ground. Of course, these rows will be out of line for the rest of the roof, too. You need to even up all the uneven rows. You can't stretch the short rows, so you'll be cutting the rest of the shingles to match them. Take a look at Figure 7-9 before reading the following instructions:

1. Snap two chalklines to find the rows that are the shortest. These short rows will be in the middle of the sunken area, of course. Be sure that each chalkline is on the same shingle tab, both up and down.

2. Put in a temporary nail at the top and bottom of both chalklines.

3. Measure from the edge of the roof to each of the nails. Be careful laying out the chalklines. They have to be vertical from top to bottom.

You have two choices. The obvious solution is to fill the depression and level the roof in that area. It would solve the problem, but it's a complicated job. And if you're in the middle of shingling a roof, you're not prepared for this. The second solution is a much better one, because it solves the problem quickly and easily.

What you'll do is cut off all the rows on the roof to match the two uneven rows. If there are rows further down past the depression, you'll have to cut them too. Even if a roof has no depressions, it can still have some rows that are longer or shorter than others. So cut all the rows to exactly the same length. Then you can resume shingling, and your rows will line up once again.

I like to shingle 8 or 10 feet of roof at a time. Start at the eave and shingle the row all the way up to the roof's peak. Now move your jacks and plank over and shingle another section. After you've shingled 20 feet or so up to the peak, go down to the ground and look up at your work. Is everything lined up vertically on all rows?

You may find that some rows are noticeably out of line with the rest. That's when you stop, snap a chalkline, and cut off the longer rows before shingling any further. Make a habit of checking your progress hourly. This way, you'll quickly catch any out-of-line rows. You don't want to shingle the whole side of a roof only to find that some rows are crooked. While we're on the subject of alignment, I'll tell you how to avoid another common mistake when lining up shingles.

Lining Up Shingle Loops

The bottom end of each new shingle is lined up with two things: the end of the shingle just nailed down, and the top of the loops on the previous row of shingles. That's how to judge the vertical alignment of each shingle. Any time you have more than one person shingling the same side of a roof, there's a potential for problems. And this one occurs frequently.

The top of the loop on the previous row of shingles is where the bottom of the new shingle goes. Well, some workmen have their own idea of where the new shingle should go. They start their line-up with the bottom of the arc of the loop, for instance. This is about 1/8 inch shy of the correct location. After roughly seven rows of shingles, this workman's eighth row will be 1 inch lower than everyone else's. If he gets all the way to the peak of the roof, this difference is considerable. So before any work begins, meet with your crew and explain that shingles are to be lined up with the top of the loop. Not almost the top. Not down where the loop curve starts. But *exactly* at the top of the loop.

Laying Two Shingles at a Time

This tip helps stop shingle looping errors. It may be simple, but it's very effective — lay two shingles at a time; see Figure 7-10.

Line up the first shingle with the end of the shingle just nailed down. Then, put one nail at the starting end of this new shingle and line up another shingle against the end of this one. Move them both together when lining up the shingles with the loop. Line up the far end of the second shingle with the loop top of the previous row. Keep the illustration handy for reference.

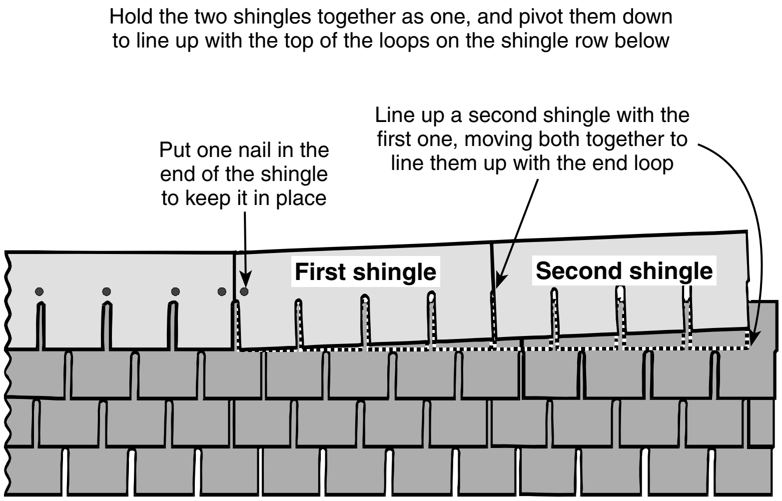


Figure 7-10
Laying two shingles at a time

Why is this method so much better? By lining up two shingles at once, you lessen the chances of height and alignment problems. By lining up one shingle at a time, you could be off ⅛ inch every shingle. With two at a time, you'd only be off ⅛ inch every *two* shingles, at the most.

Share this method in the initial meeting with your crew, to make sure they're all on the same page. It doesn't take long to get the hang of holding two shingles while you line up the end of the second one with the loop. The first shingle needs to be attached with a roofing nail before starting at the other end, so remind the workers of that, too.

Checking Alignment

While we're on the subject of shingles, here's another situation that can make a shingled roof look bad. The height of the rows begins to change so that, by the ridge of the roof, there's a difference of several inches along the last row. This can be especially unsightly if that top row disappears under the roof caps at one end of the roof. The building itself could be the culprit. It isn't unusual for an old roof to sag at its ridge, so even if the shingle rows were perfectly straight, the top row wouldn't follow a sagging ridge. I'll tell you how to get around this problem. You'll have that roof looking perfect in no time.

Checking the rows and preemptively straightening shingles as you get near the peak minimizes this unsightly problem. As Figure 7-11 shows, check the rows for uniform height every 10 feet or so as you progress up the roof. Measure a row that goes across the whole length of the roof at the top of the new shingles. Hook a tape measure on the bottom eave and measure up to this row at both ends and in the middle. If it's an exceptionally steep roof, check at a few more spots. You want the measurement to be consistent at each location. Let's say that by the time you're halfway up the roof, your shingle rows vary as much as an inch or more.

Snap a chalkline to straighten out the next row. Where do you snap the chalkline? Where the height of the bad row is the *lowest*. Since the

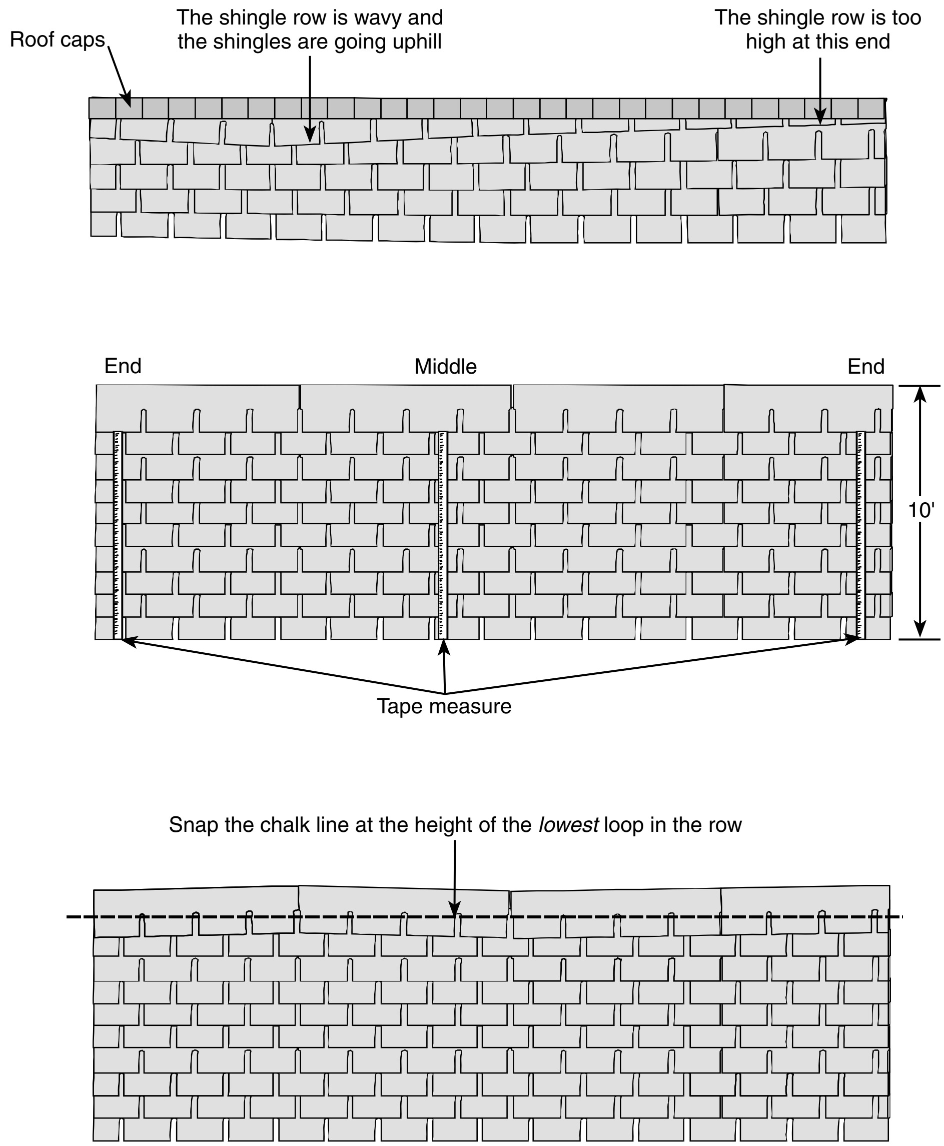


Figure 7-11
Check shingle rows every 10 feet to ensure uniform height

next row of shingles must cover all the shingle tops it overlaps, find the lowest loop on the row in question. Pound in a nail at each end of the roof, and stretch your chalkline across the roof between both end nails. Is the line even with the top of all loops on the shingles? If it is, snap the line. If it isn't, move the line down until you reach that point (move both end nails down the same amount). Make these checks every 10 feet up the roof, until you're within 6 feet of the ridge.

Figure 7-12 shows you why you'll now measure from the ridge down. You need to know that the last shingle row is a uniform distance from the ridge … *before* you put the ridge caps on. If you start checking about

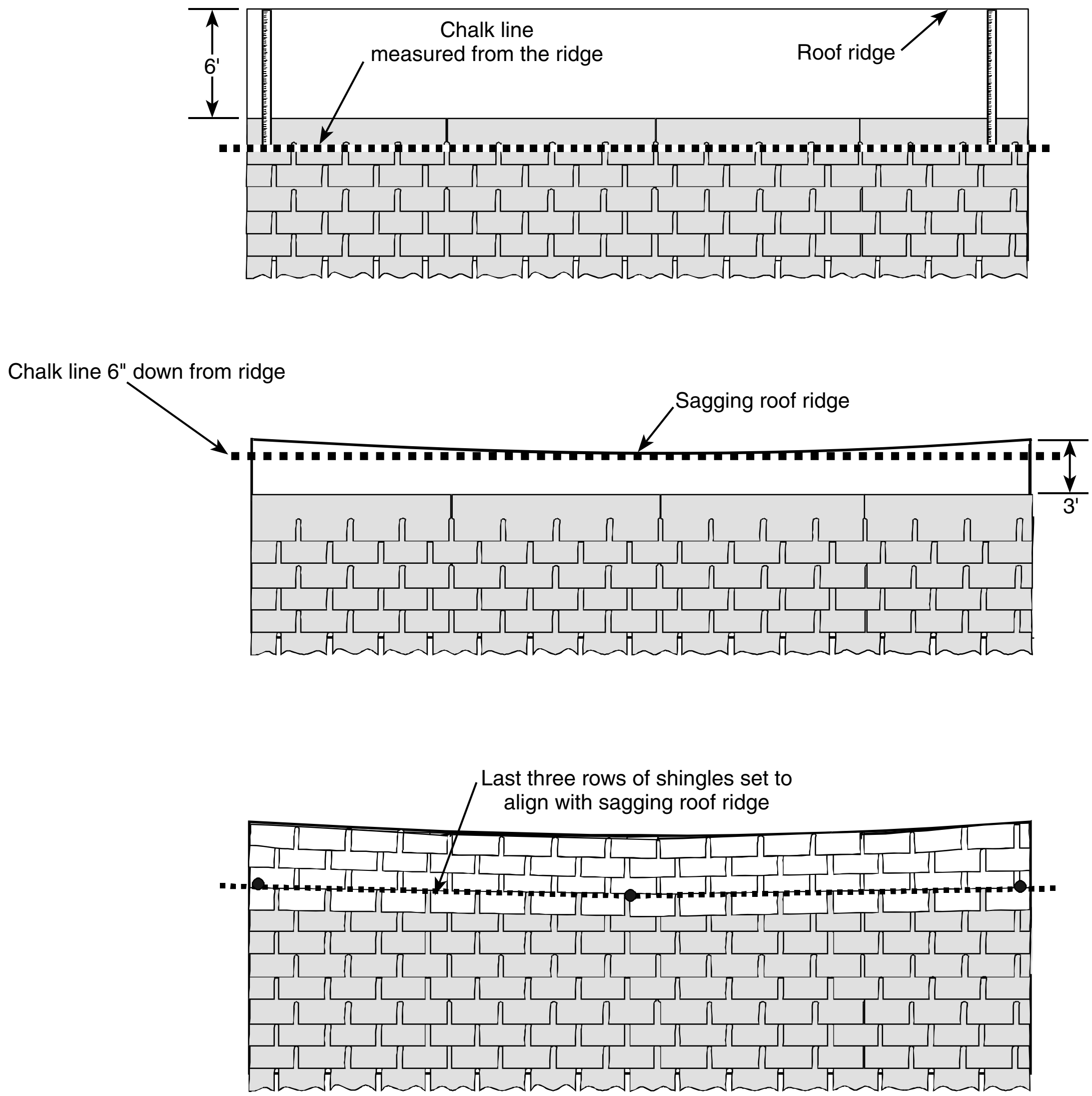


Figure 7-12
When the roof ridge sags, adjust the last rows to match the ridge

6 feet from the ridge, you'll have time to realign, if necessary, to get a nice even top row.

When you get within a few feet of the ridge, you may find one end higher or lower than the other. If a spot in the top row is an inch or less off, snap a chalkline again and adjust the next row to the chalkline. This again puts the shingles in line with the ridge. What if the row is off by 2 inches or more? You shouldn't alter a row more than 1 inch at a time. To get a 2-inch change, for instance, you'd lower two rows. Snap a chalkline 6 inches down from the roof ridge to check it for sag, from one end of the roof to the other. You'll see then if it's possible to raise or lower the top rows enough to make the alteration, or if you need to adjust more rows to fit the bowed roof ridge.

Whenever you're taking measurements down from the ridge to the last (top) row of shingles, be sure to measure from the middle of the roof ridge too. Then you'll know if you're looking at a sagging roof ridge. Remember, if the ridge is bowed and the shingle rows are straight, the shingles will still look awful at the ridge. You may decide to make the top rows follow the ridge bow too, so they match it. Be flexible, and you'll find the answer to your particular problem.

If the ridge is bowed in the middle, snap a chalkline 1 inch down in the middle of each of the three last rows of shingles, as shown in Figure 7-12. They'll match the bowed eave. This is preferable to making the rows straight and having the top row disappear under the roof caps. Just remember to check the height of the rows, starting about 6 feet from the ridge. Then you'll still have time to make changes.

Notice that I haven't talked about raising a row of shingles. That's because you can't do it. There'd be a space between the top of the loops on the last row and the bottom of the shingles on the new row, and that's unacceptable. You can always lower a row an inch or so and it won't be noticed. But space above the loops is very noticeable, since that's where the tar lines begin to show. Once in a while you may have to raise the top row a little bit when you're at the roof ridge. If the gap is small, it'll be okay.

The tar lines may show if ridge caps don't quite cover the top row of shingles. Hopefully, the roof is high enough that it can't be seen clearly; then you can get away with a little space showing. As a last resort, remove about three rows, drop each row an inch, then re-lay the shingles. But only do this if you have to — it's a lot of work.

Shingling at the House Wall

Some roofs, like those over porches, end at the house wall. So the end of each row of shingles is cut to fit against that wall. Those unfamiliar with shingling may decide to use a tape measure for length, then mark the shingle to be cut. That's pretty time-consuming. Here's the method used by pros, and you don't even need a tape measure.

You've nailed a new row of shingles up to the wall. Now you need to cut a shingle that will fit between the end of the wall and the last shingle on this row. Forget about measuring. These quickly-cut shingles will fit perfectly every time. Just take a new shingle and turn it over. Push it against the wall and slide it up to the top of the loop on the end shingle in the last row.

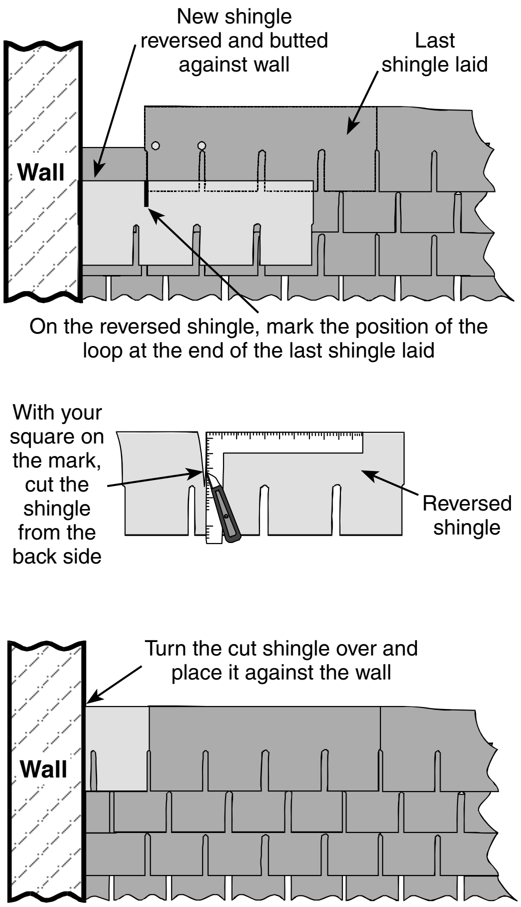


Figure 7-13
Cutting shingles to fit against a house wall

Mark on the back of the shingle where that last shingle comes. Make sure to mark where the actual end of the shingle is above the loop. Your cut will be about $1/8$ inch over from the loop end at the bottom of the shingle. Then reverse the shingle so that it's right-side up, and you're ready to attach it. Repeat this method to fit the rest of the shingles along the wall. Figure 7-13 provides an illustration. Try this method of marking at the end of rows. I've used it for years because it works great.

Tar Paper

Generally, when a roof suddenly begins to leak, the client calls his insurance carrier first, and then someone to do the repair, in that order. Imagine the poor owner's shock, not to mention rage, when the insurance agent says, "So sorry. This insurance policy doesn't cover your roof." How can that be? This next tip can save your customer a bundle, and make you look like his guardian angel.

If tar paper wasn't placed before the shingles were nailed down, that's enough to void the insurance coverage. Tar paper really provides no protection after the roof is completed. It's only installed to protect the roof before the shingles are put on. But insurance companies look for any excuse not to pay on a claim. I'm mentioning this unfortunate scenario so it doesn't happen to you and your clients.

Always replace the tar paper when you're re-shingling a roof. It's inexpensive and installation time is minimal. There's one situation where you may not need tar paper, but only one: If you're re-shingling over old shingles, the original shingles should have tar paper underneath. But always confirm this by looking under the old shingles yourself. That protects your customer's investment and your good reputation.

Nailing Tar Paper

There are times when a client has to bite the bullet and allow you to rip off his home's entire roof. Fortunately, a complete re-roofing job isn't necessary very often. This next mistake, ironically, involves putting *on* tar paper. As you'll see, there's a right and a wrong way.

A few years ago we had a terrific hailstorm. Hundreds of roofs were damaged and had to be replaced. Damage was so extensive that we were estimating 100 roofs a week. To keep up with the workload, we hired a crew to go in front of us and tear the old shingles off, then cover each roof with tar paper. That way we always had a house ready for roofing as we proceeded street by street. But it takes more time to tear off roofing than it takes to re-shingle. So the demo guys got a little careless in their attempt to stay ahead of us. What happened in this story wasn't funny.

The crew tore through the roofing and tar papered the roof boards, as usual. That night, a high wind came up, bringing rain that lasted for hours. The following day I received an angry phone call. This man's roof leaked so badly into his bedroom that he had to go out and sleep on the couch. His was the last roof to have been stripped and tar papered before the storm.

The poor guy had to put pots on his bed to catch the water coming through the plaster on the bedroom ceiling. But why in the world did that one spot get all the water? The tar paper hadn't been nailed down properly. No wood strips were nailed down the middle of each row of tar paper — only the top and bottom. Nailing in the middle is crucial.

The correct placement can be seen in Figure 7-14. Without this row of lath, wind can pull the edges of the tar paper out. When I got on the roof, I found at least half the tar paper gone. No wonder there was a leak. Fortunately, the plaster didn't fall down from the bedroom ceiling; it eventually dried out, *un*fortunately leaving some unsightly brown stains. Luckily, the homeowner was planning to repaint the room and had already purchased the paint. All we had to do was paint the room for him and we were off the hot seat.

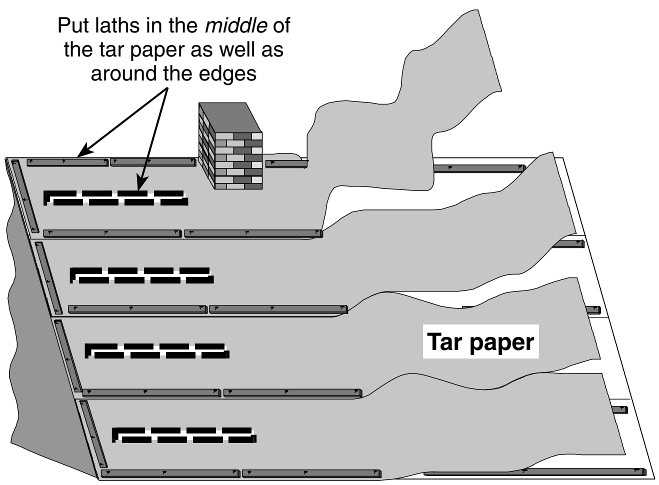


Figure 7-14
Proper lath placement to secure tar paper

Cutting Your Own Lath

You probably know that you can't simply staple tar paper down on a roof. Any little breeze will pick the edges up and … goodbye tar paper. Lath is the only thing to use. You can get it at any building supply store. But even though it's scrap wood, you'll pay through the nose. I don't do that. As you might suspect, I have an alternative.

It's cheaper to cut your own lath out of ½-inch plywood. And I recommend saving lath any time you tear out an old plaster wall. It's worth keeping. I use the same lath over and over, on every job. This saves me and my customers a few dollars.

Use three 8-penny nails in each lath. Let the nail heads stick up about an inch, because you'll be pulling them out later. Don't forget — put a row of lath down the middle and at each end, within ½ inch of the tar paper's edge.

Tear-Off

Generally speaking, you aren't allowed to put a third layer of roofing on a house today. Four layers of shingles used to be common, but can you imagine the weight that put on a roof? Now, the old roofing material is usually torn off before the new is put on.

As with everything else, there's a right way and a wrong way to remove shingles. Half the time, it's not done properly. Crews can get overly-aggressive and tear off the shingles on half the roof, then begin shingling. They can't re-roof in one day, so they cover up the exposed roof boards with tarps until the job is finished. This makes no sense. You only need to tear off and shingle about 8 feet or so at a time. You can easily reach that far from an 8-foot plank held up by roof jacks, as previously mentioned.

Here's how to do it right:

1. Tear off a strip of shingles about 8 feet wide, right up to the peak of the roof.
2. As soon as the strip is removed, cover the area with tar paper. To protect the edge of the shingles not yet torn off, let the ends of the tar paper overlap them a couple of feet and temporarily tack it down.
3. After you've shingled 8 feet or so, remove the lath and roll the tar paper back over the new shingles. Then tear off the next 8 feet of old roofing and continue until you're done.

This procedure will cut your shingling time in half.

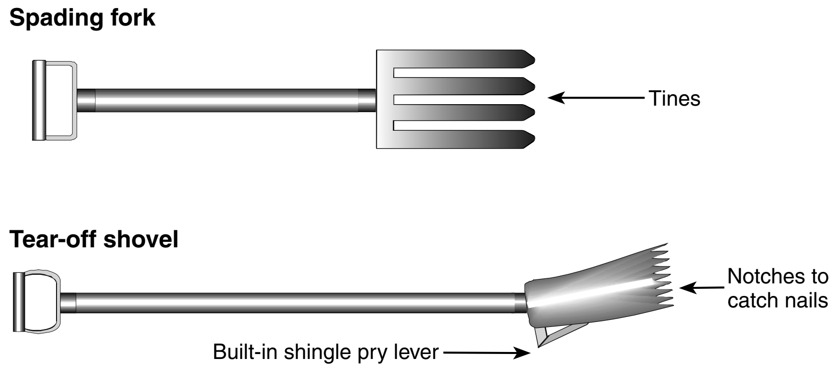


Figure 7-15
Shingle tear-off tools

Tear-Off Tools

I've already mentioned that roof removal takes more time than shingling, but if you use the right tools, it speeds up the process considerably. Have you ever tried using a regular shovel to do tear-off? Well, it works, but the curve of the shovel makes it difficult to get under the nail heads. So then you try a shovel that's got a flat front. That doesn't do a good job either, because when it hits the first nail, it stops dead. And it's hard to pull nails up with it, so some nails pull away from the shingles and stay in the roof.

A spading fork is a good tool for tearing off shingles. Look at Figure 7-15. A spading fork has four straight, flat prongs, called *tines*. Each tine comes to a rounded-off point. When you push the spade under the shingles, the tines slide around the nails and keep going. The entire length of the tines goes under the shingles; when you raise the handle, you'll pull up a large quantity of them, nails and all.

You can buy a special tool — a tear-off shovel — made specifically for pulling up shingles, also shown in Figure 7-15. It has a triangular strip of heavy metal welded near the front and a built-in pry lever. The row of V-points at the front of the shovel goes around nails and pulls them up when you push the handle down. With this tool, you also pull up shingles and nails.

When I started out, money was tight. Why buy a tool when you can make one? I made a shingle puller quite inexpensively. I went to a liquidation store where they sell hardware bought at bankruptcies, etc., and got a narrow flat shovel for a couple of bucks. The end of the shovel was almost flat, and about 6 inches wide. All I had to do was grind a row of Vs in the shovel blade. I saved maybe $20 by making my own shingle puller, and it worked great.

Filling Between Widely-Spaced Roof Boards

If you have cedar shingles as the bottom layer on your re-shingle job, the roof boards they're attached to are spaced ¾ inch to 1½ inches apart. Why? Cedar shingles are longer and thicker than other materials, so the roof boards are spaced farther apart than those for other shingles. That translates into saving a lot of money on roof lumber.

But you can't put asphalt shingles over these widely-spaced roof boards. Asphalt shingles become very limp in hot weather. After a few warm summer days, they literally sink down into any recesses between roof boards. It looks bad but, more importantly, the roof could start leaking because the surface is no longer flat. The spaces between roof boards must be filled.

I can't tell you how often I've seen crews nail ½-inch plywood over an entire roof just to cover these spaces between the roof boards. Not only is that ridiculously expensive, it also takes time to cut the plywood and nail the sheets down. You don't need to build a whole new roof. You just want to fill the spaces. Here's a simple and cheap solution.

When cedar shingles were first introduced, most lumber was rough-cut and came directly from a saw mill. Roof boards for cedar shingles were made of inch-thick rough lumber. Rough lumber is a lot cheaper than planed lumber, because cutting wood into rough lumber is quick and easy. Cutting the wood into specific sizes and planing the surfaces is what costs money.

I live near a sawmill and can pretty much fill my van with rough lumber for about $35. The same amount of planed board at a lumberyard would cost five times that. Rough lumber is still 1 inch thick, like the old roof boards on the house. Be sure to ask if the rough wood you buy has been seasoned; otherwise it will twist and warp. If you're lucky enough to live near a sawmill, also, this can save you a lot of money.

Rip the boards into strips, in a variety of widths. Make the narrowest strip ¾″ wide, then cut strips 1″, 1¼″, and 1½″ wide. Don't worry about small gaps between the roof boards, the shingles will cover them. I take an assortment of strips up on the roof with me, then pick out what I need as I go along. If the strips aren't the right length, the straight claw of your hammer can get them to the size you need.

Roof Caps

You can move ridge caps left or right to overlap more on one side of the roof. Ridge caps don't have to be centered on the peak. They aren't

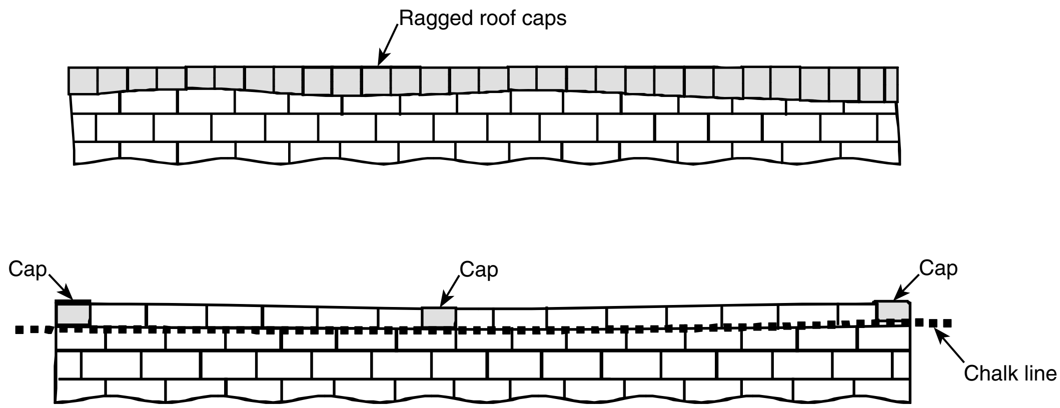


Figure 7-16
How to get a straight line of roof caps

easily seen from the ground; you can't see both sides of the roof at the same time. If you fudge a bit with ridge caps, it won't be noticed. And it could be necessary.

Do you fold your roof caps in half and nail them to the roof ridge? Since each cap is creased in the middle, it may seem logical that you just slap them onto the ridge. But this doesn't work. You'll soon find your cap line wandering up and down. It's caused by caps laying at a slight angle because you didn't keep the edge of the capping row straight.

Do you want waves along the capping? After all the work that you put into the roofing, I doubt it. All you need to do is snap a chalkline to prevent it. Snap the line on only one side of the ridge; if the measurement of one side is straight, the other side will be, too.

As you'll see in Figure 7-16, the only way to assure that the row of caps will be straight is to lay three caps on the roof ridge, one at each end and one in the middle. Next, snap a line from each of the end caps to the center cap. You'll follow this line to lay each side of the caps. The reason you snap a line from each end is to follow the ridge if it sags. A cap at the center of the ridge lets you mark the chalklines that follow a sag in the ridge.

You'll need to make a couple of modifications to assure a smooth and evenly-aligned ridge cap. Trim each side of the caps at an angle, from the bottom of the loop toward the middle of the roof cap. That makes the piece fit where it overlaps the previous cap, without any of the lower cap edges showing. If you didn't give these sides a slight angle, the result would look ragged. You can see how to avoid a ragged ridge cap in Figure 7-17. Basically, when you angle-cut, there aren't any exposed edges left to show. Don't worry about making an exact cut; just slant each one a little, and you'll be fine.

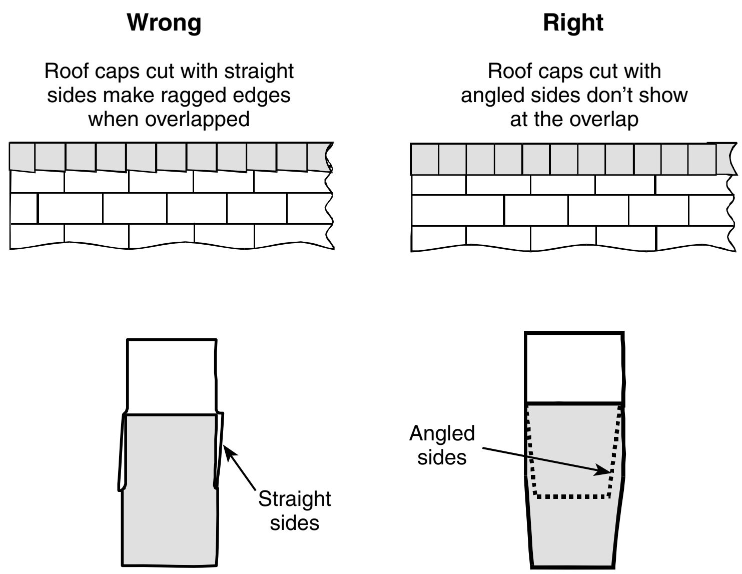


Figure 7-17
Cut cap sides at an angle to avoid ragged edges

Valleys

Here's another problem you'll see on house roofs, and it happens at the valley, where shingles on two adjoining roofs meet. You can probably guess what the problem is. If you say "water," you're on the right track.

The mistake occurs when shingles are cut at the valley; see Figure 7-18. Yes, there's metal flashing under the shingles in the valley, and this flashing *should* drain roof water down to the ground. But do you want to rely on a mere probability?

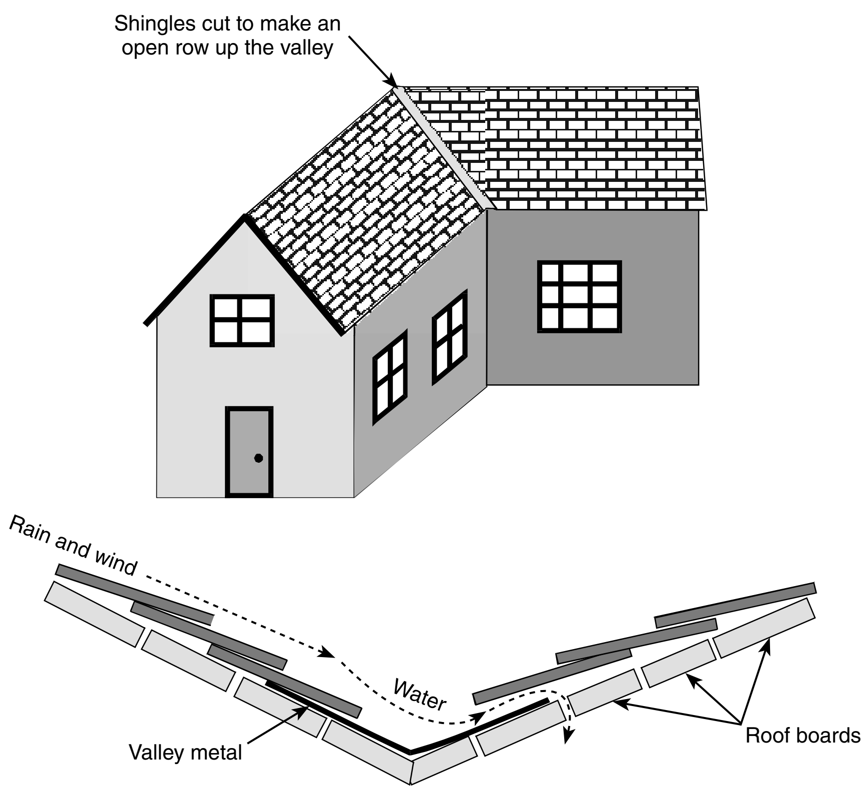


Figure 7-18
An open valley roof — how rain can be forced under the roof boards

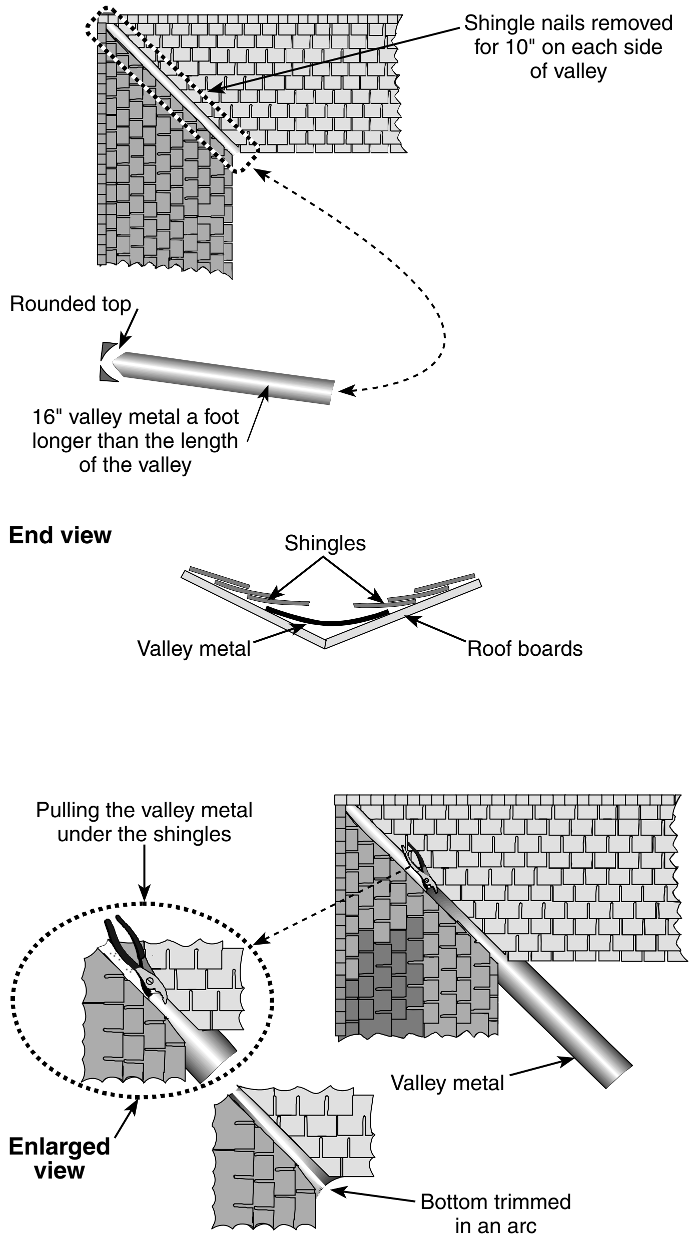


Figure 7-19
Replacing a metal valley without removing shingles

I know why other contractors cut the shingles at the valley. It looks neat, and it's the easiest thing to do. Unfortunately, open valleys leak. Think about it. If the wind blows during a rainstorm, the water won't run down the valley, because the wind forces it sideways, under the open shingle ends. And there it sits.

Once the water gets under the shingles, it doesn't have far to go before it's behind and beneath the narrow flashing. From there, it can run down into the attic. Maybe there's tar paper under the valley metal, but remember how tar paper's attached? With nails. And what comes with nails? Holes.

Replacing a Metal Valley Without Removing the Shingles

Here's a little background on roof valleys and how they've been treated in the past. Years ago, galvanized metal was used for the valleys (because aluminum flashing didn't exist). It was supposed to be rustproof, but after a few years, it rusted anyway. To make things worse, open valleys were the norm years ago. People didn't clear out leaves and debris that settled there, and before long, the metal rusted.

It's pretty expensive to replace the metal in valleys. First, all the shingles have to be removed in the valley area. Then the new metal is nailed down and all the shingles are nailed back on. You're talking at least a day's labor. Would you believe it can be done in about two hours?

Figure 7-19 shows this simple technique. The secret is that the shingles aren't removed. Use a pry-bar to take out all the shingle nails for 10 inches on each side of the valley, along with the capping shingles. Pull the nails from the valley side and raise that side of the caps up. Cut a strip of 16-inch-wide metal flashing a foot longer than the valley — you want a little extra for trimming later.

Cut the corners off the metal strip at the top to make a rounded lip. You'll be cutting the bottom of the metal to fit after you run the valley metal under the shingles. I recommend using 18-inch valley aluminum, but 16-inch valley will also work. Both come in rolls. Some hardware stores will cut the length you need; others require you to buy the entire roll. If you have a lot of valley repair work, you may as well get the whole roll. That gives you enough material for two or three valleys.

Here's where you save your time and your customer's money, which is the whole idea, isn't it? From a ladder at the bottom of the valley, feed the top of the strip under the loose shingles in the middle of the valley. It should push up easily for a few feet. Don't be surprised if the metal suddenly stops moving. You've simply hit a nail sticking out of the roof boards. Get up on the roof and poke a pry bar under the shingles near the end of the metal strip. Keep fishing and poking and you'll eventually locate the nail with the end of the pry bar. Fish a little more, and you'll be able to get the nail out.

"I recommend using 18-inch valley aluminum, but 16-inch valley will also work."

After you've pushed the metal up as far as you can by hand, get on the roof. With a pair of vise-type pliers, clamp onto the top metal strip at the middle. As you pull the metal farther up the valley, lift the shingles up every so often to make sure none of the shingle ends have gotten caught under the metal. This'll happen frequently, so watch for it as you pull the metal up. If the shingles are torn or split, these ragged ends can slide partly under the metal. Look out for this, too.

Be sure to check your progress frequently. Any bent or partially-stuck shingles can make the valley leak if you don't correct the situation. You may have to adjust your pliers for a tighter grip if they keep pulling off the metal. When you get to the top, you'll do some fancy footwork to get the metal up the final few inches. Once the metal slides up enough for the caps to cover the end, you're in good shape. Put one temporary roofing nail at the top to hold it in place. You don't want the metal strip to move out of position.

Once the metal is pulled up and tacked down, go to the bottom of the valley and center the metal piece. You'll be able to move it left or right, since it's only nailed at the top. Watch that you don't get any kinks in the metal somewhere up the valley. If you should somehow kink the metal, go back onto the roof and gently move the metal at the kink until you've straightened it out. Shingles caught under the metal can cause kinks too.

Now you'll trim the bottom. Cut it in a curve — an arc, not a square. The metal should extend past the corner's edge so it can drain water away from the area. Start replacing the nails in the shingles at the bottom and work your way up, one shingle at a time on each side, putting new nails in the old nail holes. After you've nailed all the shingles, do the same with the roof caps, again using the old nail holes.

Some contractors recommend tarring the edges of the shingles where they meet the metal. It's a good idea, because heavy rain can make open valleys leak. But tarring looks so bad, especially if the shingles are a light color. You can buy roofing cement or caulking that will blend in with the shingle color. Whichever material you choose, apply it correctly.

Never apply tar with a stick from a tar bucket. Use a caulking gun with a tar tube. Don't make the end of the tube too small. You need a fairly wide ribbon to cover the double edges of exposed shingles. Smooth the tar, caulk, or roofing cement with your finger to make a neat, smooth joint at the edges.

Shingling Valleys

I've been in this business for many years, and have come up with some time savers that are second nature to me now. You can tell by this chapter that I do more than my share of shingling, so — not surprisingly — I have a few tricks up my sleeve to share with you.

In this first method, you shingle one side of the roof up and over the valley about a foot. As you see in Figure 7-20, the first roof shingles overlap the valley about a foot. Shingle the adjoining side of the roof that meets the one you've just completed. Let the shingles from the adjoining side *also* overlap the valley for about a foot. They'll cover the shingles that already overlap the valley.

Lay a shingle under the top overlapping shingles to protect the lower layer. Now you're going to cut the top layer of shingles. Snap a chalkline up the center of the valley from bottom to top. This line gives you a center guide for cutting the top layer of shingles.

Next, cut the top layer (from the second overlapping side) on the chalkline. Remember, you don't want to cut into the bottom layer. Once you cut the top layer, you have a nice neat line of shingles ending in the center of the valley.

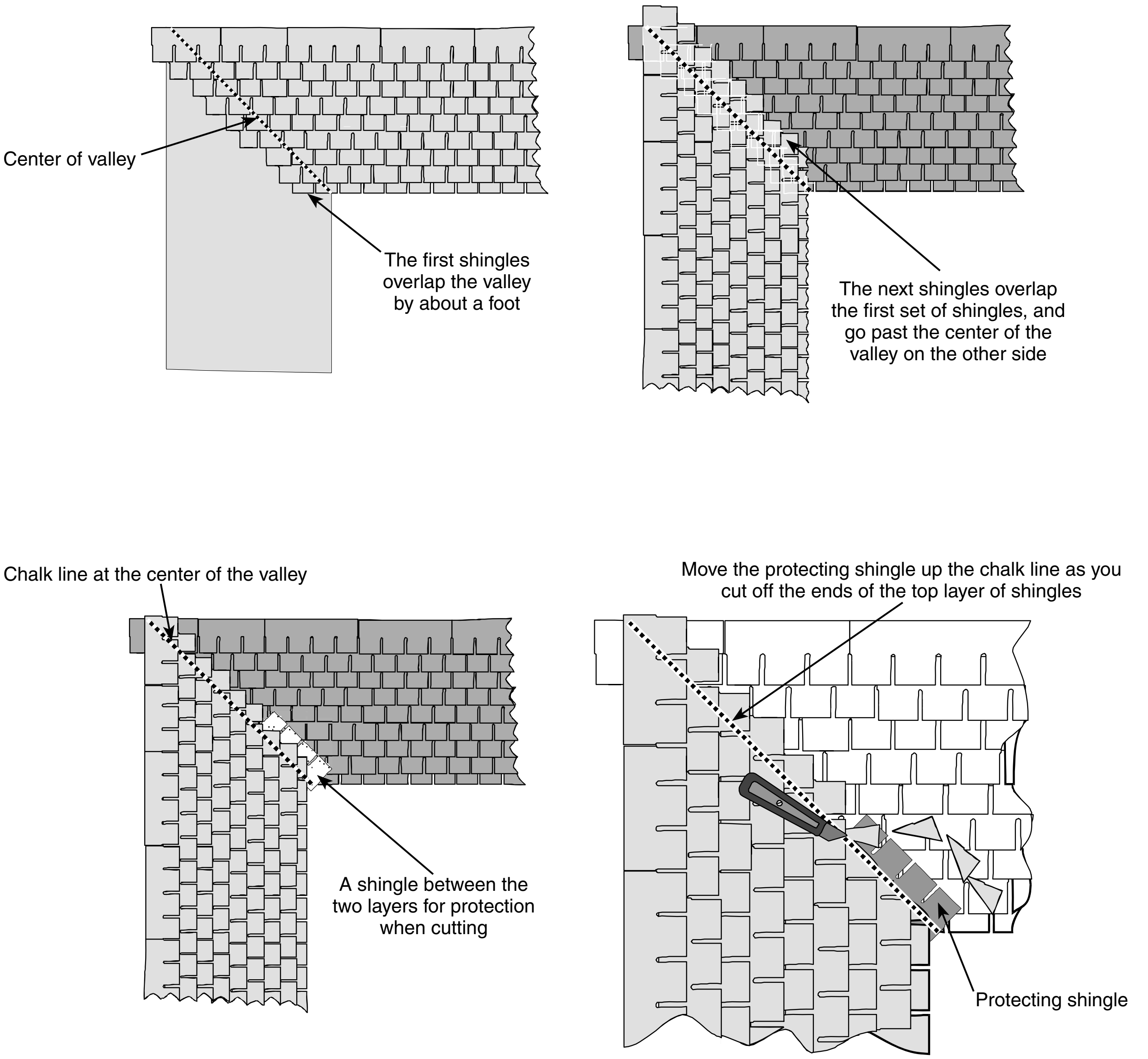


Figure 7-20
Standard method for shingling a valley

Now water can blow under the shingles from only one side. Since the shingles underneath overlap the first layer, the water can't get past this second layer either. Any water that might seep under the first layer of shingles can't go far, because it would run back down and out of the valley. If you find this confusing, refer to the illustration and it should be clear.

Weaving a Watertight Valley

In the next method of shingling valleys, you end up with no exposed cut shingles at all. This is the perfect method for making any roof valley

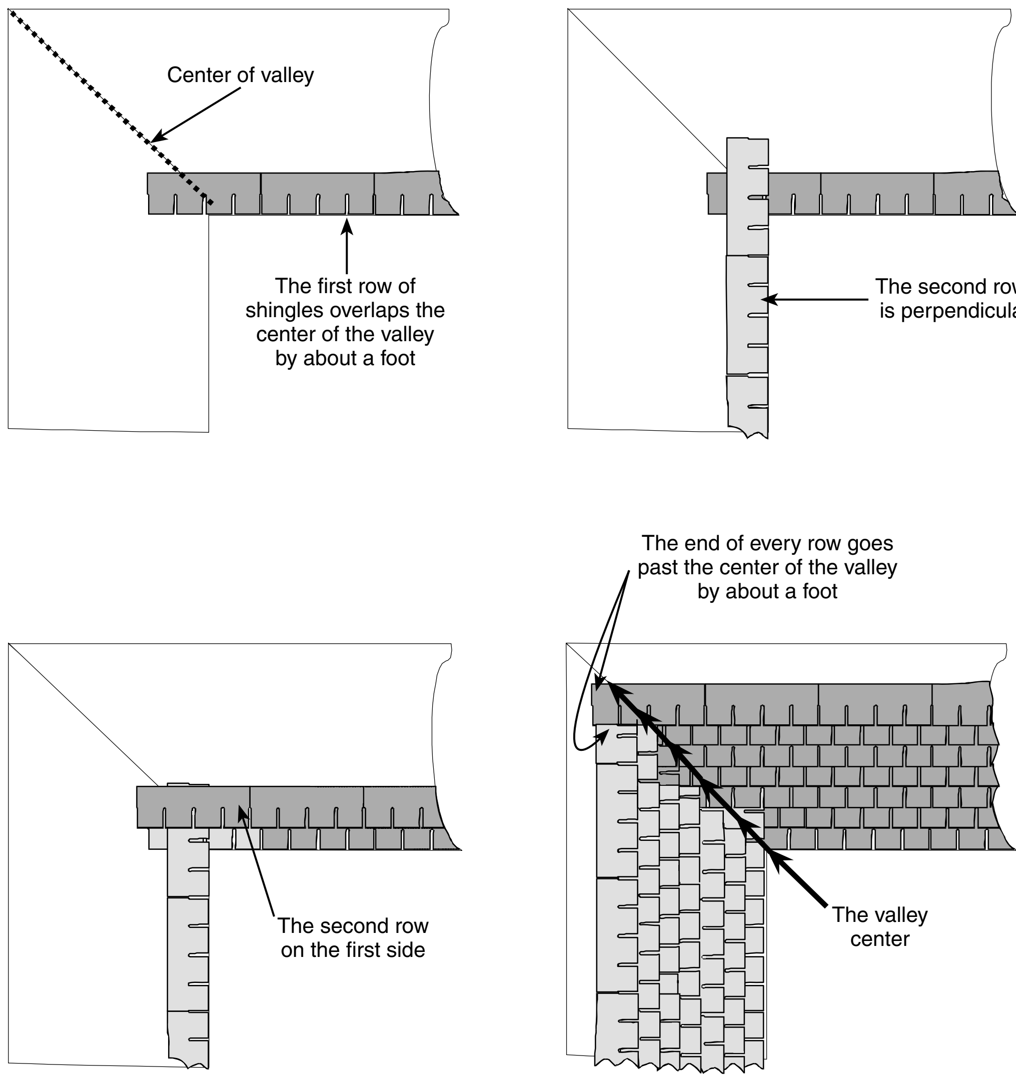


Figure 7-21
The weaving method of shingling a valley

watertight. It's called *weaving*. The shingles are actually woven, one shingle over another, in the middle of the valley. As Figure 7-21 shows, with weaving, there's no seam in the middle of the valley. Both sides of shingles go past the center of the valley, then uphill to the other side. Follow the drawing to really understand my description.

Shingle the first row as usual, letting it go past the center of the valley about a foot. Now shingle a row on the *other* side of the roof meeting the valley. Extend this row for about a foot also, but lay the last shingle on top of the first *end* shingle. That's why it's called weaving — you go back to the first side and shingle another row, the same as the first, finishing above the end shingle on the adjoining side. Get the idea? You could even shingle one side completely, stopping when close to the valley, then do the other.

The end shingles on both sides overlap the previous row on the other side, in the middle of the valley. No cuts are necessary. The rows on both sides go past the center of the valley and then go up again after the center. Each new row of shingles covers the previous row's exposed ends. Water can't get past the shingles on either side of the valley. Again, refer to Figure 7-21 for more detail.

Valley weaving can be tricky, because if the two sides of the roof aren't the same pitch, the weaving will move left or right of center as you shingle further up the valley. The two sides won't meet. The row on one side starts gaining on the other as you go up the valley. Luckily, there's an easy fix. Simply lap two rows of shingles on the *low* side, and only one on the other. Repeat this until the low side equals the high side and they meet in the middle of the valley again.

You'll need to continue adjusting rows as you shingle up the valley, so expect to repeat these steps. The weaving method gives you the best possible roof valley, so it's worth the effort. Once you understand the basics, give it a try. It's easy.

Cleaning Valleys Will Double Shingle Life

Almost every home has landscaping. If there are any trees surrounding the property, you can count on falling leaves. They clog the drainage areas on a roof, and roof valleys are especially vulnerable. Roofs should be cleared twice a year of any leaves or fallen branches, etc. Remind your clients to sweep or rake the debris out every six months, and they'll extend the life of the shingles considerably. When leaves get wet, they stay wet. That's why they really don't belong anywhere on a roof. A shaded area on the roof is even worse. Then the leaves never dry out. And dampness is a death sentence for shingles.

Shady spots and areas with standing leaf piles will rot long before the rest of the roof. If the moisture problem is really bad and isn't addressed, the roof boards themselves rot. Then not only do the shingles have to be replaced, but the boards or plywood underneath, too. If homeowners wait too long to get the roof fixed, the joists underneath will also need to be replaced.

Correcting Roof Pitch

The roof in Figure 7-22 was in dire straits. It leaked so badly that the owner put washtubs in the attic to catch the water. The worst part

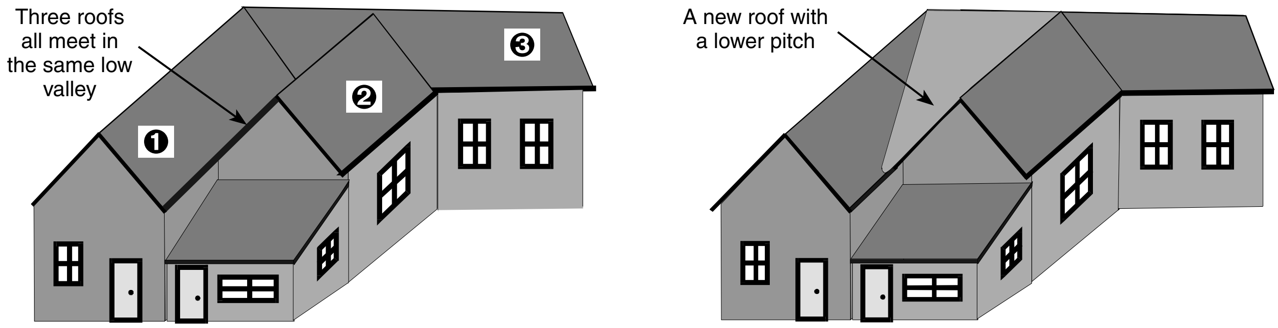


Figure 7-22
Correcting roof pitch can mean installing a new roof

of this story is that the house had just been re-roofed to stop the leaks. So what happened?

Take a look at the figure: You won't see it often, but two side-by-side gable roofs join the main roof. The problem occurred where the gable roofs meet at their bottom eaves. Any water running off these facing gables collected at this point, and had to run the entire length of the gable eaves before it could drain off. Of course, snow collected there in the winter, and became ice. On sunny days, the ice melted and water went to the only place it could — under the shingles and into the attic.

As you see, the solution required a whole new roof, with corrected roof pitches. The new roof has a gradual pitch, eliminating the deep valley between the gables. None of the roofs meet at a steep angle now, and the water drains off in an acceptable amount of time. There's no ice buildup anymore, because there's no low spot to catch the snow. The valleys where the roofs meet were woven, as previously described, so the valleys are watertight too. The contractor before me knew the roof was leaking badly where the gables joined, but was either too lazy or too inexperienced to fix it. So he ignored it. You can bet his reputation has been tarnished. He happened to mess with the wrong customer — our local newspaper publisher!

This problem can occur any time multiple roofs drain onto a low-pitched roof. Water collecting in the rain gutter from just one roof can be considerable during a storm. When two roofs meet and drain in one location, water hits the shingles on the low-pitched roof from the side. The water's power is strong enough to force its way under the shingles. The longer it rains, the more water accumulates under the shingles. It spreads out and soon gets under enough shingles to seep into the roof underneath. And if you add high winds to the rain, you have even more problems. Wind-driven rain is one of a roof's worst enemies.

Half-Lap Roll Roofing

After a severe rainy season, we had to tear the shingles off a low-pitched roof, because they were disintegrating from constant moisture. Once water gets under shingles, they don't dry out. These shingles were laid on wafer board. Below that was a layer of old shingles, with the original roof boards below them. Everything was rotted through to the original roof boards, which were the only things that kept the roof from caving in.

I had to think fast for a solution — there was no time to wait. Adding wafer board and more shingles hadn't done any good. Besides, shingles are effective only when water can run down them. If water is rushing horizontally, like in a rainstorm, the roof will leak. Shingles should never be used on a low-pitched roof, anyway, let alone when another roof drains onto it. The only solution was to use half-lap roll roofing.

Half-lap roofing is actually two layers of roofing material with tar between them. Consequently, roofing is nailed through three layers of material at the top of each section. The only roof that's more effective than this is a hot-tar roof, which is much more expensive.

Roll roofing is solid 90-pound asphalt roofing with a granular coating. It's called "90-pound" because one square of this roofing weighs 90 pounds. Each roll covers 100 square feet. Half-lap roofing only has texture on its bottom half. That's because the top half of the piece is covered by the next layer of half-lap. A coat of liquid tar is applied before the next layer is put down over it.

The only half visible is the granular portion. It's this tarred double layer that makes half-lap roofing waterproof. It's the only sensible thing to use on a low-pitched roof. The tar between layers stops water from seeping under the roofing.

You can install half-lap roofing yourself, without any hot-tar equipment, which can be quite expensive to rent. There are two types of tar, both sold in 5-gallon buckets. You want *liquid tar*, which pours easily on warm days. In the winter it thickens, so if you plan to use it then, keep it in the garage or shed until you need it. The second type of tar, the one *not* to use for this particular job, is called *plastic roof cement* or *fibered roof cement*. It's quite thick, and is applied with a putty knife or trowel. It's great for sealing around chimneys and roof vents, but too thick to spread easily on half-lap roofing.

To roof with half-lap, start at the front eave, the lowest point on your roof. It's important to know that you'll use a half-width strip for your first piece. The top section is all you'll be using here. Roll out the roofing along the eave to the end of the roof. Cut this section off the roll. Then cut off the top section, right above the granules. Nail the upper portion to the roof, apply liquid tar to it, then install the first full-width section of roofing on top of it. When you get to the top of the roof, you can use the leftover bottom granular strip to finish.

An Out-of-Square Roof

It seems so simple to shingle a roof. You just lay one shingle after another and nail them down. What can go wrong? I'm glad you asked. This is a mistake that sneaks up on you unexpectedly and, before you know it, you have a problem. It can easily happen to any roofer.

If the roof area you're going to shingle isn't square, a *lot* can go wrong. If it's even 2 or 3 inches out of square from top to bottom, a shingle tab line can disappear or a new tab line can appear about the time you get to the top of the roof. Not the best situation. Needless to say, it looks pretty bad, and can only be corrected by tearing off all the shingles on that side of the roof. Then … you start over.

You can shingle an out-of-square roof to make it look much better. First, and most importantly, *always* check the roof for square before you start working. Without knowing your dimensions, it's impossible to accurately begin the first row of shingles. Discovering that a roof unpredictably widens as it goes up can ruin your day. You're thinking, "Well, *I'd* just start a new row of shingles."

Don't bother — it's been tried many times and only succeeds in making the job look amateurish. Besides, you end up with nothing to nail the shingles to. So then you think, "Well, I'd just follow the roof edge, and move each row over." Unfortunately, the shingle lines would move too, so the pattern would *still* look awful. See why making things square makes sense? I've already mentioned squaring up, but I'm going to explain it again.

The 3-4-5 (or 6-8-10) Squaring Method

Taking a 3-4-5 is the most common way to check any area for square. First, measure 3 feet down from one corner and make a mark. Measure 4 feet from the same corner, up the adjoining side, and mark the spot. If the roof is square, the measurement between the two marks should be 5 feet, and a 90-degree corner.

If you're checking for square on a large roof, use 12-16-20 for the measurements. Most roofs, at least, in my part of the country, are at least 16 feet high, so you can use the longer measurements to get a more accurate result. If, when using the longer measurements, you find that the diagonal measurement is more than 20 feet, the roof edge is widening toward the top. But since you checked the roof for square before you started (didn't you?), you know that you'd start the first shingle so it was sticking out past the roof edge *the same amount that the roof is out of square at the top*.

> *"Hopefully, the roof isn't more than 6 inches out of square, because that's the width of half a tab."*

Cut off the end of the first shingle as much as the roof is out of square at the top edge. Then cut less and less from the edges of the shingles as you go up the roof. By the time you get to the top, the shingles will fit perfectly at the edge of the roof.

I just showed you how to adjust for a roof with a dimension that's more than the length that you want. But what if the diagonal measurement is *less* than 20 feet? That means the roof is getting narrower towards the top. Hopefully, the roof isn't more than 6 inches out of square, because that's the width of half a tab. Why is that important?

Well, every shingle row is staggered half a tab over from the row below it. So you can't move any row left or right more than 6 inches without affecting the tab on the row above. The most you can do in this situation is start with a full shingle. But if the roof is off more than 6 inches, you're out of luck. You'll lose a tab at the roof edge before you reach the top, which means you'll have a very crooked last row or so.

Figure 7-23 shows just how easy it is to keep your rows parallel to the roof edge. Measure a shingle. Snap the first chalkline a shingle-width in from the eave, at top and bottom. You'll need another chalkline snapped in a half tab *less* from the eave edge. This is the line for the alternate rows of shingles to follow. Every shingle has the half-tab marks cut into its top, so measure one to find your half-tab chalkline. When you begin each row, keep the end of each starting shingle on its chalkline, and the shingles will follow the roof edge.

It's possible that a roof edge could bow in or out. If you stretch a chalkline down the edge of the eave, you'll know for sure. If the eave bows in, no problem. Just keep the shingles on the chalklines and cut the shingle ends off so they stay even with the metal edge at the eave's inward bow. If the eave bows *out*, you'll need to do a little extra figuring.

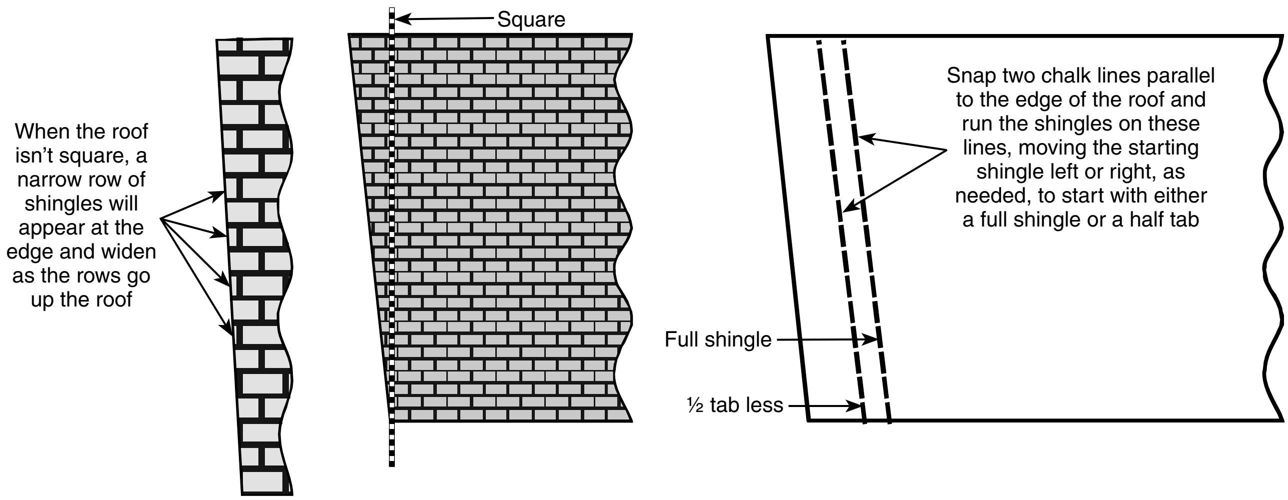


Figure 7-23
Shingling an out-of-square roof

To find how far the eave bows out, measure for square at the starting and ending roof edges. For our purposes, let's say it bows out 1½ inches. Also measure the total length of the bottom eave to the other end of the roof. You don't want to be left with a sliver of a tab at the far end.

Your length measurement might influence where you place the first shingle. Again, Figure 7-23 illustrates how to proceed. Move the starting shingle 1½ inches past the metal edge, so when you get the shingles up to the bow, they still cover the metal edge. Otherwise, you'd have to add narrow strips of shingle to the edge to make it even. The initial shingle should align the rest of the row correctly, so you can simply follow the tab marks when shingling each new row.

Shingling Around Vent Pipes and Other Obstructions

How do you neatly cut and fit shingles around pipes or other roof obstructions? I'll use a toilet vent pipe in this example, because every house has at least one. Shingle up as close to the pipe as you can. The last row should be within about 6 inches of the vent. The illustration in Figure 7-24 shows the correct placement. The last row is on the left of the vent pipe, but if you're shingling your roof from the opposite side, just reverse these directions.

Slide a new shingle up to the vent pipe, pushing it against the last shingle by the side of the vent pipe, as shown in Figure 7-24. Put your

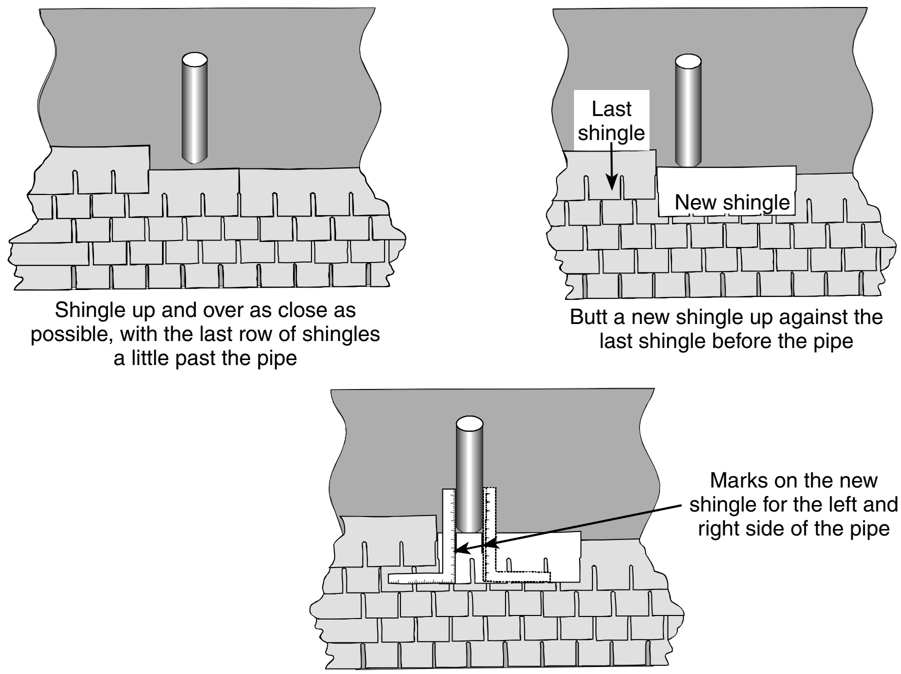


Figure 7-24
How to mark, cut and lap shingles around a pipe

square up against the side of the pipe, making it parallel with the shingle under the vent pipe. Hold the square vertically against the side of the pipe. Mark at the top of the new shingle where this side of the pipe will be. Mark the same on the new shingle for the other side of the pipe.

Before you begin the next steps, look at Figure 7-25. Mark the bottom of the vent pipe on the new shingle. Align it with the top and bottom edges of the last shingle at the side of the pipe. Put your square against the bottom of the vent pipe and on top of the new shingle. Making sure your square is horizontal, mark the bottom of the vent pipe between the two marks. Extend the side marks down to the vent pipe bottom mark. This gives you a U-shape for three sides of the vent pipe.

Now draw an approximate opening on the shingle. The top of the vent pipe hole will be a little higher, because the roof is slanted where the vent pipe comes through the shingles, which is why vent pipe holes are always oval instead of circular. Make a duplicate hole in the overlapping shingle on the following row. The next shingle will be a half tab over from the first. Lay the next shingle at the top of the loop on the first shingle, and over a half tab before you make a cutout.

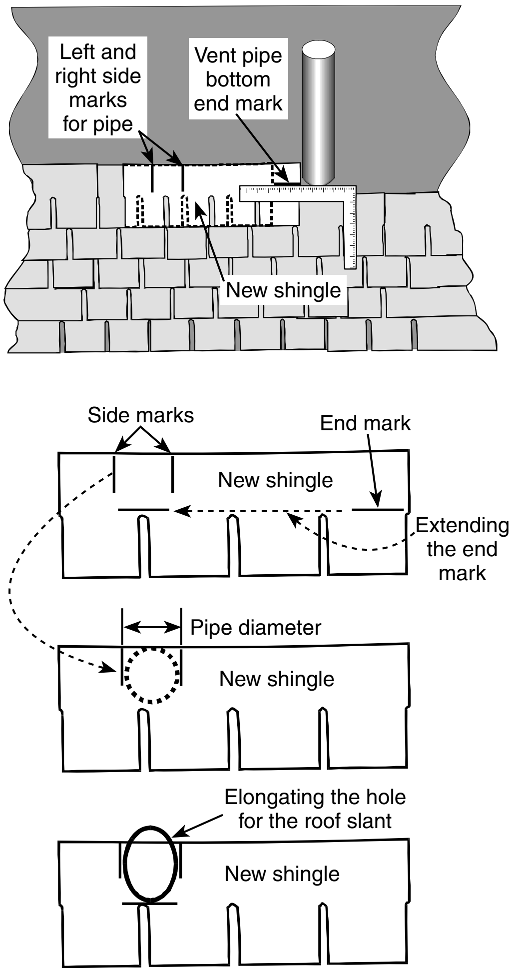


Figure 7-25
How to mark, cut and lap shingles around a pipe

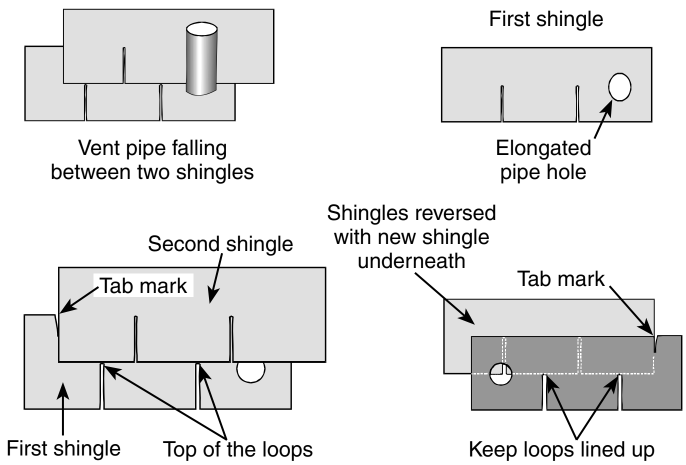


Figure 7-26
How to mark, cut and lap shingles around a pipe when the pipe falls between two shingles

How to Shingle Around a Vent Pipe Between Two Rows

In my experience, 90 percent of the time, a vent pipe falls between two rows of shingles. You always cut two shingles anyway, because they overlap. But when the vent pipe is partially on the exposed top of a shingle on one row and the exposed bottom of a shingle on the next row up, the cutout will be on two exposed shingles. Figure 7-26 should make this clear.

Make the cutout on the first shingle as usual. The toughest part is lining up the two shingles at the right spot on the second shingle. Lay it on another shingle and cut it out the same way. So, where will the new shingle be placed when the roofing is put on?

Take one step at a time. You know the shingle in the row above the cutout shingle will be either a half tab to the left or a half tab to the right of the cutout shingle, because shingle rows alternate a half tab every row. The end of the new shingle will be at either the tab mark at the far left or the tab mark at the far right on the cutout shingle. The only other thing to determine is how far the new shingle extends over the cutout shingle. So let's position the new shingle on top of the cutout shingle.

With the shingles positioned, hold them together and carefully turn them upside down so you can make the duplicate cutout on the new shingle. You should have the roof shingled up to the last shingle below and the last shingle on one side of the vent pipe. There'll probably be a metal or rubber boot where the vent pipe meets the roof. Pry it off. Drop the cutout shingle over the pipe to see how it fits. By putting the cutout shingle over the vent pipe, you'll see where the new shingle must go.

Now take the cutout shingle off the pipe and place the new shingle on top of it. Line the bottom of the new shingle up with the top of the loops on the cutout shingle. Keeping the new shingle level with the loops, slide it to the side it will overlap. Bend the last tab at the top end of the cutout shingle a little, to fit the new shingle against it. Keep the new shingle at the height of the loops and slide it up to the bent tab. Now the two shingles align perfectly. Hold them together, carefully turn them over, and duplicate the cutout on the new shingle.

Estimate the rest of the shape to cut. Then check the fit of both shingles over the vent pipe. The trial shingle gives a ballpark measurement. Using this method of aligning shingles, you can make a pretty accurate cutout for nearly anything coming through a roof surface.

Installing Roof Vents

This is the best way I've found to install roof vents. Just resist the temptation to tear off all the shingles in the area before you cut the roof vent hole. Don't sweat it — it's easy.

First, measure the base of the vent for the size hole you need. The vent above the neck covers the base almost down to the base plate itself. Hook a tape measure on one side of the tube extending from the base, so you can measure the width. Or lay your square against one side of the base and your carpenter's pencil against the other, then measure the distance between them. Add about ¼ inch to each measurement before you cut the hole. If you make the cutout a little too small, the shingles won't lie down. Having a larger hole and shingle cutout is fine, because you'll be tarring the vent base later.

Next, make sure the roof vent cutout doesn't fall over a joist. With a ⅛-inch drill bit, drill through the roof where you want to put the vent. Be sure you drill completely through the roof boards. If your roof has three layers of shingles and the roof boards are an inch thick, you'll have to drill a hole nearly 2 inches deep. So set the drill bit out 3 inches and drill a hole where you'd like one of the vent corners to be.

Drop a large nail, or spike into this hole, so the shaft hangs down inside the roof. Then go up in the attic and find it. Is it near a roof joist? If you can't find the nail, that probably means you've drilled into a joist. Maybe the nail stopped part way in. In any event, if you can't find the nail, go back on the roof and drill another hole 3 inches left or right of the first hole.

If a roof joist is 2 inches thick and you move the drill 3 inches, the drill will miss the joist. Makes sense, right? Go back to the attic and look again. You'll find the nail, and the hole is away from a joist. Now you can plan your roof vent cut.

Put the vent 6 inches down from the roof ridge. Tap a roofing nail in at each corner of the neck location. Let those nails stick up a little, because you'll pull them out later. Hook your line on one of the nails and snap a line on every side. Now get your saw. I recommend a circular saw, with a carbide blade.

Tilt the back of the saw up, and set your saw table on the roof with the blade up a little. Move the saw down on the chalkline, so the blade starts cutting about 4 inches from a corner. Slowly lower the blade to cut, without moving the front of the saw table. Lower the saw until the table is flush with the roof. Don't cut past the corner as you lower the blade. This is called making a *plunge cut*.

If your initial cut wasn't right up to the first corner, turn the saw around. Put it back in the cut near the beginning, and move it ahead as you saw up to the first corner. Why turn the saw around? Because *you never want to saw towards yourself with a circular saw*. The rotation of the blade can make the saw jump out of the cut, and you don't want that momentum directed your way.

Cut the other sides. Some cuts may extend a little past the corner, but that doesn't matter. They'll be hidden when you attach the bottom plate on the vent.

Now you have a nice hole in the roof (and through the roofing material) the size of the vent tube neck at the base plate. Remove all the shingle nails around the vent base. You're going to fold the shingles back just enough to put the vent in place. You may end up removing a few shingles if you have trouble getting the vent in, but certainly not all of them.

Once your vent base is down on the roof boards, slide it up under the top row of shingles. Figure 7-27 shows how. Put the vent over the cutout and fold a few shingles down against the base neck. Then you'll see if you've placed the vent so the shingles can clear the neck. Don't worry about bending the shingles. They're quite flexible.

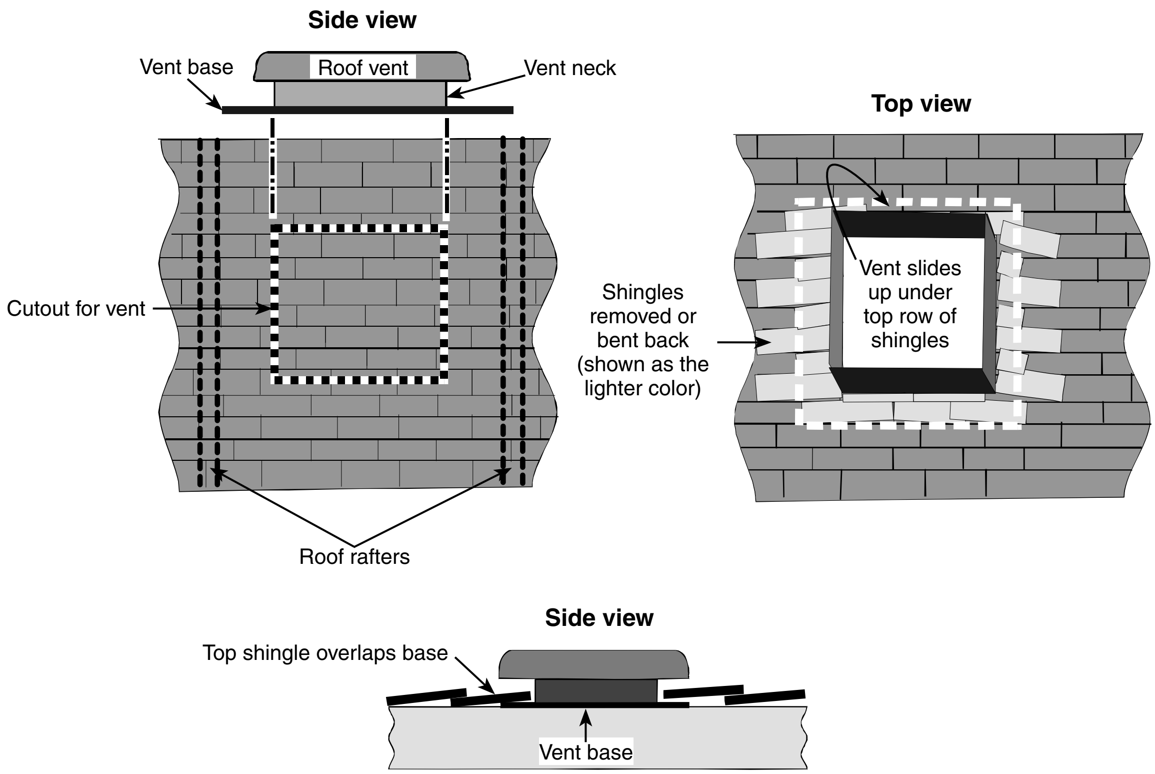


Figure 7-27
Installing a roof vent

Nail the base to the roof boards with a nail on each side. The vent will get nailed down well when you replace the roofing nails that you pulled out. Re-nail the shingles, and you're ready to tar the vent.

Put a tube of tar in your caulking gun and squirt a generous amount of it around the neck of the vent, where the shingle ends meet. With a narrow stick, spread and smooth the tar up to the vent neck. This makes the shingles watertight. A handy tip: If you buy a foot of plastic tubing, you can slip it over the tip of the tar tube. Then you'll be able to reach under the vent edges to tar where you couldn't with the regular tip. When you're through, slip a doubled length of wire into the tube to pull the hardened tar out so you can use the tubing another time.

Roof Leaks Around a Chimney

One of the most common places for a roof to leak is around the chimney. But a leak around a chimney could show up a good distance away. Water that gets under the roofing by a chimney runs down the roof under the shingles until it escapes further down the line. But let's address leaks that are obvious.

There are various ways to repair these leaks. This first method only works if the chimney is at the middle of the ridge: Simply tar the shingles around the chimney. However, if the chimney is down from the ridge, there's a low spot behind it where the shingles meet the chimney. Water accumulates there after it rains, and can leak into the attic. Simple tarring won't be enough.

A better idea is to reverse a shingle so its top is toward the chimney. Then bend the top up about 2 inches. Put this side against the chimney. If one shingle isn't long enough, bend a second and lap it over the first. Tar them to the chimney, between these bent shingles, and the other shingles, too.

Don't nail any shingles down behind the chimney. Instead, spread lines of tar on the back of each shingle and stick them down in place. Tar holds them in place as well as or better than nails, and there won't be any punctures in the shingles for water to seep in.

Once the tar sets up, the shingles won't move. You may end up using several tubes of tar, but it's better than punching nail holes and making the leak worse. Tar the loops shut on all the shingles behind the chimney. This also helps keep water out.

A strip of 90-pound granulated roofing can be used instead of shingles. It does an even better job. Or lay a piece of bent galvanized metal or aluminum under the shingles and behind the chimney; then bend it up the back of the chimney about 2 inches. Bend the top edge of the metal and mortar it into the brick or stone joints. Then tar the metal to the shingles and chimney. This makes it impossible for water to get through the shingles. Here also, don't nail the shingles down behind the chimney. Use lines of tar on the back of each shingle as you lay them in place. There's no sense in putting metal behind a chimney to stop leaks and then pounding holes in it.

Preventing Leaks with a Cricket

By far the best method of all to prevent leaks is to build a miniature roof behind the chimney. This is called a *cricket*. A cricket diverts water and drains it off to each side of the chimney, and it's easy to build. Nail two small triangles of plywood together, as you can see in Figure 7-28. Then shingle, just like it was a tiny roof. The only snag in building a cricket is figuring the pitch. The sides of the cricket roof should have at least a 4-12 pitch, but check with your inspector for the requirements in your location. So how do we figure it?

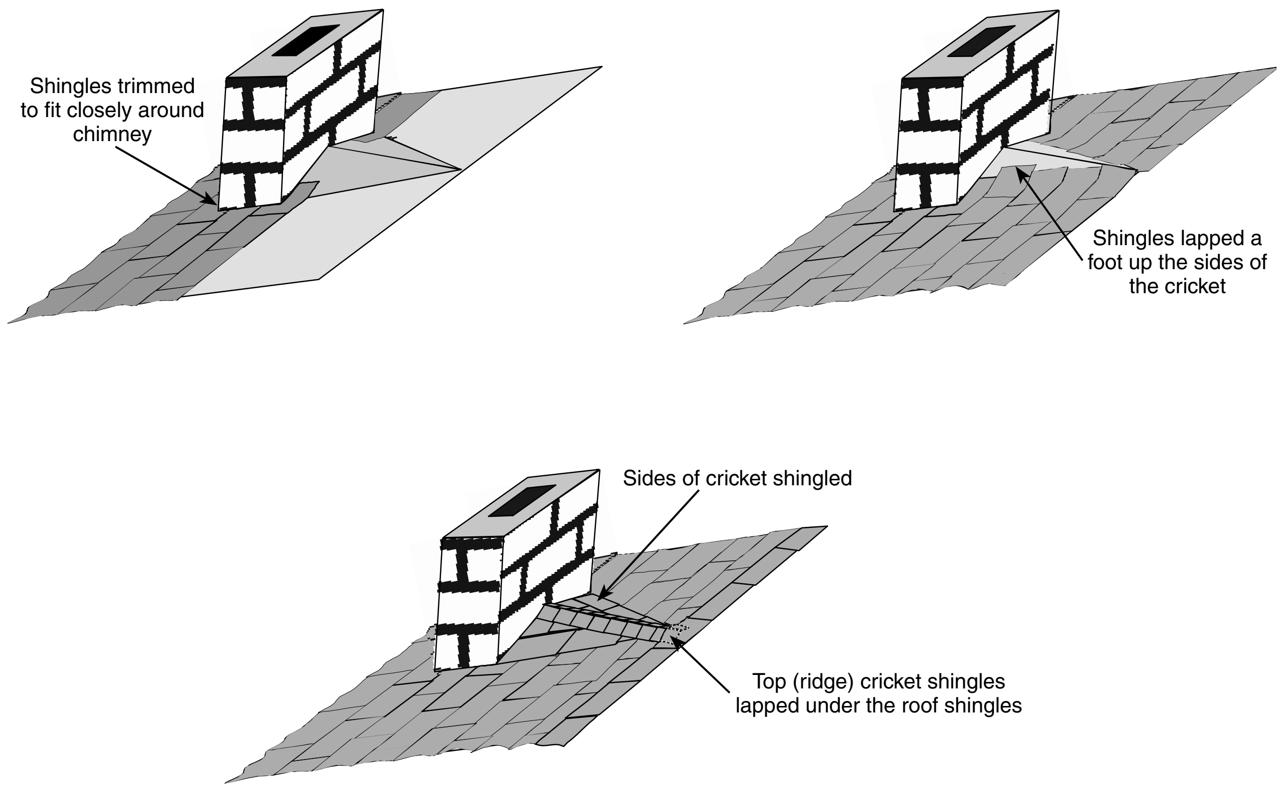


Figure 7-28
Shingle and tar a chimney cricket to prevent leaks

A 4-12 pitch roof drops 4 inches in 1 foot, 16 inches in 4 feet. If a chimney is 4 feet wide, the cricket's roof would have to drop 8 inches between the middle of the chimney and the edge. The cricket ridge would be in the chimney's middle, 2 feet from each edge. When the ridge has moved horizontally 2 feet, it moves down 8 inches (4 inches down for every 12 inches horizontally). So the ridge wood is 8 inches high by the chimney.

Measure the width of the chimney and divide it in half. Now you can figure how high the cricket ridge will have to be. In this example, the chimney is 4 feet wide and each side of the little roof behind it is slightly over 2 feet wide (because the ridge is in the middle of the chimney and pitches down). Each 2-foot side must have a rise of 8 inches. If the cricket roof is ½-inch plywood, you can use a 2 x 8 for the ridge. A 2 x 8 is 7½ inches high; adding the ½-inch plywood roof makes the ridge 8 inches high — just what you want.

Now you need to find the length. Draw a vertical line in the middle of the chimney at the back. Use your tape and measure up from the roof. Make a mark as high as your ridge will be. Next, put the bottom of your level on this mark. Keep the level angled 90 degrees from the chimney

— the angle the cricket ridge will be. Next, hold your tape on the bottom of the level, with the tape end against the chimney. Measure how far it is from the chimney out to the roof.

Mark this distance on the edge of your 2 x 8, on the end of the wood at the height of the ridge. Extend a line from the ridge length mark down to the ridge height mark. You'll see why a low-pitch roof will have a longer cricket ridge than a high-pitch roof. If the roof pitch is low, a level measurement from the ridge mark on the chimney will travel much further out before meeting the roof. When the pitch is steeper, the level tape meets the roof much sooner (a shorter ridge distance).

Cut out the triangle for the ridge. Lay it against the mark you made on the back of the chimney. Use your square to align the ridge triangle 90 degrees out from the center of the chimney back. Tack the ridge triangle down on the roof, leaving the nail heads up for now.

Next, you need the measurements for the plywood triangles for the cricket's roof. The length of the top of the ridge will be the measurement for the top of the plywood triangle. Measure the distance from the end of the ridge strip where it meets the chimney to a back corner of the chimney. Do this on both sides of the chimney to check that your ridge triangle really is in the center of the back of the chimney.

If you don't get the same measurement on both sides, move the end of the triangle right or left where it meets the chimney, until the side measurements are the same. Cut a sample triangle out of a big piece of corrugated cardboard to save yourself time. You can trim it with your utility knife until it fits. Then cut two plywood triangles and nail them to the ridge and roof.

Now it's time to do the shingling. Shingle the roof up to the row that overlaps the chimney. Trim the shingles on this row to fit closely against the chimney. Continue fitting the shingle rows until you get up to the back of the chimney where the cricket starts.

At the back corner of the chimney, cut the shingles so they lap about a foot up each side of the cricket. Make sure they fit closely at the back of the chimney, too. Continue the shingle rows, lapping them up the sides of the cricket, until you get to the cricket top.

For now, leave the nails out of the shingles near the cricket peak. When you shingle the cricket itself, lap the last shingles at the cricket top *under* the row of roof shingles going across the cricket top. This underlap at the top keeps water from getting under the cricket shingles.

After the cricket is shingled, put in the nails you left out on the overlapping row. Cap the cricket roof as usual. To finish, tar all the shingle edges that meet the chimney. Use a thick coat of tar where the cricket shingles meet the back and corners of the chimney. Those areas are prone to leaks. Tar shrinks a bit, so be sure to put on plenty. You can use tar tubes, but in this case, a bucket of thick fiber or plastic roof cement (smoothed with a paint stick) does a much better job.

Shingling Around Dormers

This is an area where lack of experience can get you into a lot of trouble. One of the hardest things to do when shingling a house roof is shingling up and around a dormer. The shingle rows must match up when they meet again above the dormer. If the dormer is very small, you might get lucky and the rows just might match up at the top. But with a large dormer, the chances of the shingles matching up again above the dormer are almost impossible — without some planning.

What are the two things you don't want to see after shingling a roof with a dormer?

1. different row heights at the dormer peak
2. a big gap between the ends of the two top shingle rows

As you shingle upwards, the rows on each side of the dormer must stay at the same height. But more important is keeping the ends of both rows exactly in line with each other vertically. How do you do this when you shingle each side separately? I'm going to show you two different ways. The first is the standard method, and the second is quicker and easier ... and is the method I use.

Back-Laying Shingles

The standard method, used for many years, is laying shingles backwards from the top down. With this system, you put each new row of shingles *under* the last row of shingles. Why would anyone use such a crazy method? Because it works.

Shingle around a dormer up to the top row above the dormer. Run that top row of shingles back down the other side of the dormer, tabbing each shingle with the last. The shingles meet at the top perfectly because the shingling was continuous. There never were two separate groups of shingles. Do you see the advantage of back-laying shingles? It's extra work, but the best way to shingle around a large dormer.

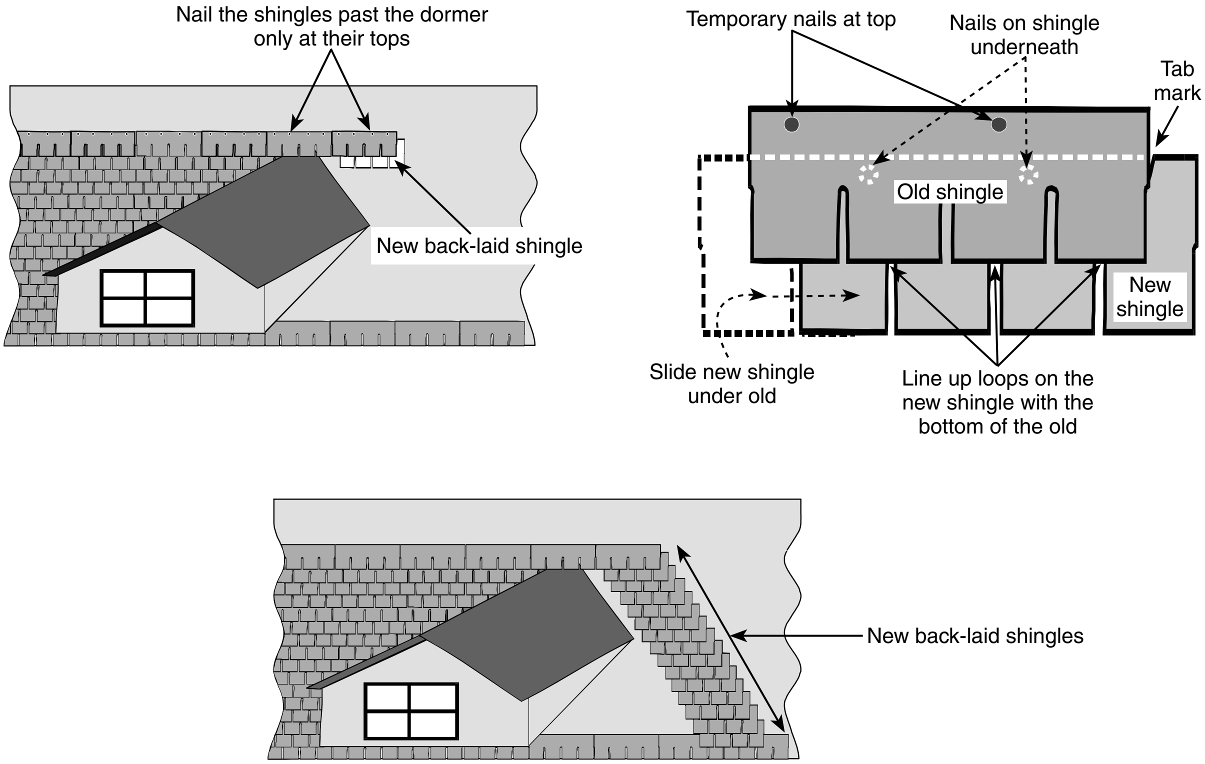


Figure 7-29
Back-laying shingles by a dormer

As shown in Figure 7-29, shingle the roof normally on one side of the dormer until you get to the top row that passes over the ridge. If the dormer has a flat roof instead of a peak, shingle the side of the dormer until you get to the last row — the one that finally runs over the top of the dormer roof. As shown, you shingle this top row horizontally until you're two shingles past the ridge (or edge) of the dormer.

Now, start back-laying the shingles:

- To begin, slide the first new shingle under the last shingle in the top row you just finished. Slide it up until the top of the loops in the new shingle are even with the bottom of the one you're sliding it under. This is basically the same way you've been looping shingles before. The only difference is that you're now looping the shingles by sliding one up underneath, instead of laying it on top.
- Slide the end of the new shingle over until the tab mark meets the end of the shingle above it. Bend the new shingle up a little at the tab mark. Then it will stop there when you're sliding it sideways under the other shingle.

- Once you have loops and end tab lined up, temporarily nail the new shingle in place. Nail it at the top only, with two nails. Leave room to push the next new shingle up under this one. After all the shingles are back-laid, go back and nail them as usual above the loops.
- Each back-laid shingle is a half tab over from the one above it. You can back-lay either a half tab to the right or the left. If you alternate left and right shingle tabs, you can back-lay straight down. Continue laying shingles in this manner until you get down to the row below the dormer. If you haven't continued the last row of shingles below the dormer and across the roof to the eave on the other side, do it now.
- The back-laid shingles will move over a half tab at a time. The last row, on the bottom, might be far to the left or right of the dormer. That's why you extend the last row of shingles under the dormer — so the back-laid shingles can match up with the row below the dormer.

After you've completed the line of back-laid shingles down to the shingle row below the dormer, take a look at it. Is the last back-laid shingle at the right height above the original shingle row extending from below the dormer? It will be if you've done this right.

Matching up tab lines is also important. Does the last back-laid shingle end where it should vertically against the matching shingle on the extended dormer row right below it? If everything went well, the back-laid shingle will be right on a tab mark on the shingle in the row extending from under the dormer.

You need these back-laid shingles to mate with the original shingles below the dormer to be able to align the rest of the new shingles. If the back-laid shingles align at the top of the dormer, then the rest of the rows will align with them as you shingle up this side. They'll also line up at the top of the dormer. Back-laying guarantees that shingle rows will line up even if they start in different locations.

Figure 7-29 shows the back-laid shingles moving to the right with each new shingle. You can also tab the shingles to the left. If you don't want the shingles to keep moving in one direction, reverse the direction. And if you alternate between left tabbing and right tabbing, you can back-lay straight down if you want.

What if the last back-laid shingle doesn't line up with a tab on the original shingle row below? (By the way, I've never had this happen, but I suppose it could.) You can resort to a little cheating. Are the tab and shingle end on the two shingles at the bottom very far from matching? Let's say that the tab mark is ¼ inch off. If you moved two of the back-laid shingles over ⅛ inch each, the last two shingles would match up. Get the idea?

Move more shingles if you have to. But don't move any shingle more than ⅛ inch. Perhaps the last back-laid shingle is a little too high or low. If it's too low, you don't have a problem. People can't tell if a row is dropped ½ inch (or even ¾ inch).

- Snap a chalkline ½ inch or so down from the loops on the bottom row and run the new row of shingles on this line. If you're a perfectionist, you can drop two rows ¼ inch each, instead. This isn't as easy as it sounds, because you'll have to raise the bottom back-laid shingle ¼ inch (to get rid of the ½-inch drop).
- Snap a chalkline at the new height of the back-laid shingle (which is now only ¼ inch down from the bottom row's loops) and shingle this new row.
- You won't have to raise the next back-laid shingle. It'll now be ¼ inch down, because you just raised the back-laid shingle under it.
- Snap a chalkline ¼ inch down from the loops on the new row you just shingled. This chalkline should be right at the bottom of the second back-laid shingle.
- What if the last back-laid shingle is too high? This *can* be a problem. Hopefully, it's only about ¼ inch too high. Raise the first two new rows of shingles ⅛ inch; even a small space showing above the loops is obvious.
- Snap a chalkline ⅛ inch above the loops on the original long row of shingles and nail the new row of shingles on this line. There's still a small space between the top of the loops and the next row, but it's not going to be noticeable.
- Move the bottom back-laid shingle down ⅛ inch to this chalkline. The second back-laid shingle should be just ⅛ inch too high.
- Snap another chalkline ⅛ inch above the loops on this new row and nail the shingles on. You shouldn't have to move the second back-laid shingle down because the chalkline should be right at its bottom.
- You could just shingle the new rows and let them be ½ inch too low. You'd have to lower each back-laid shingle to the height of each new row. But don't move the shingle down until after you have that row shingled around it. You don't want to lose the vertical alignment each back-laid shingle gives you. When you get to the previously laid shingles above the dormer, drop the original row of shingles above the dormer down ½ inch.

Dropping a row of shingles ½ inch is a lot better than trying to raise them. I've tried to mention every problem that can come up when you're back-laying shingles. Believe me, it can ruin your day if you go to the trouble of shingling a roof around a dormer only to find that the shingle lines don't match up. Next, an alternative to back-laying that *really* simplifies things.

An Easy Alternative for Shingling Dormers

When you shingle around a dormer, you have to keep the shingles aligned so they match up when they merge above the dormer. If they don't match up when they meet, you'll have a big headache. If the row heights don't match up, you can drop one or more rows on the side that's too high until they do match. Removing a row or so of shingles and lowering them isn't a big deal.

If you end up with a space between the ends where the two groups meet, it's a little more complicated. You can't move shingles left or right. Their loops would be out of line with the shingles below. See how much vertical alignment matters when you're shingling? You can lower or raise rows slightly, but you can't stretch them to fill a gap between the ends of the rows where the two sides meet. And if the ends overlap, you also have a problem.

You're probably ready for an alternative to all the work I just mentioned. You could trim the ends of the shingles on one side to mate with the shingles on the other. This works fine unless the overlap is extreme. But you can avoid all of these problems by using the simple method I'll explain next. Take a look at the illustration in Figure 7-30.

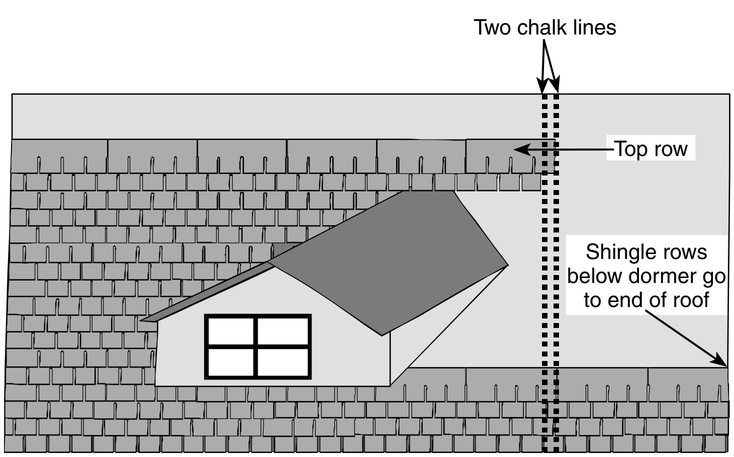


Figure 7-30
An alternative method of shingling around a dormer

- Shingle the lower area of the roof as usual up to the bottom of the dormer (run these rows to the other end of the roof). Don't let the bottom of any shingles extend past the top of the previous row's loops when you shingle each new row. If you shingle too high, you're heading for trouble.
- Shingle the roof on one side of the dormer, up to the first row that goes across the top of the dormer. The last shingle of this row

must be a full shingle. If necessary, run another row above it, starting with a full shingle so you can end up with a full shingle at the end of the row.

- Measure the top row of shingles, from the eave to the last shingle. In the first row that starts with a full shingle under the dormer, find the shingle that matches the measurement of that last shingle in the top row. Once you've found the right shingle, put a temporary nail at the end of it and hook your chalkline on it.
- Go back up to the end shingle on the top row above the dormer and snap a chalkline down the roof between the two shingle ends. Put a temporary nail at the top of the shingle at this mark and hook your chalkline on the nail. Stretch the chalkline up to the same tab mark on the higher chalk-lined shingle, and snap a second chalkline between the two shingles. All the critical work is done.
- You now have the two chalked guidelines for running the rest of the shingles. Don't tab the shingles — line up the ends of each new row against the chalklines. All your rows up to the top will be aligned, since every new row will begin at those lines.
- Since you snapped two lines, one for full tab and one for half, you won't have any vertical alignment problems. Remember to use the correct chalkline for each new row. It doesn't matter which side of the chalkline you start each row on. But it's easiest to run each new row on the side of the line going away from the dormer. Then come back and butt a shingle against the starting shingle and finish the row going in the opposite direction (up to the edge of the dormer).

Your shingles will meet and match up perfectly above the dormer. The only way you could go wrong is by starting against the wrong chalkline. Make sure that the loops on every second row alternate with the loops on the row above and below. Keep checking your placement and you'll avoid having to tear off half the roof.

Cutting and Fitting Metal Edge

A lot of people know how to shingle, but don't know how to properly cut and fit a metal edge. Where two pieces of metal meet, it would be logical to just lap one over the other for an inch or so. Logical? Maybe. But it doesn't work. The top piece bulges out noticeably at the joining; see Figure 7-31.

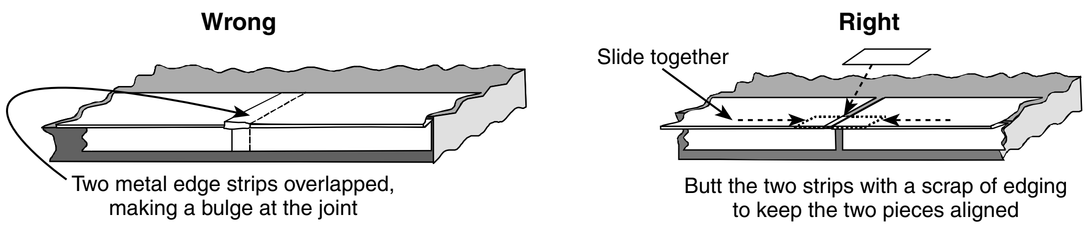


Figure 7-31
Cutting and fitting metal roof edging

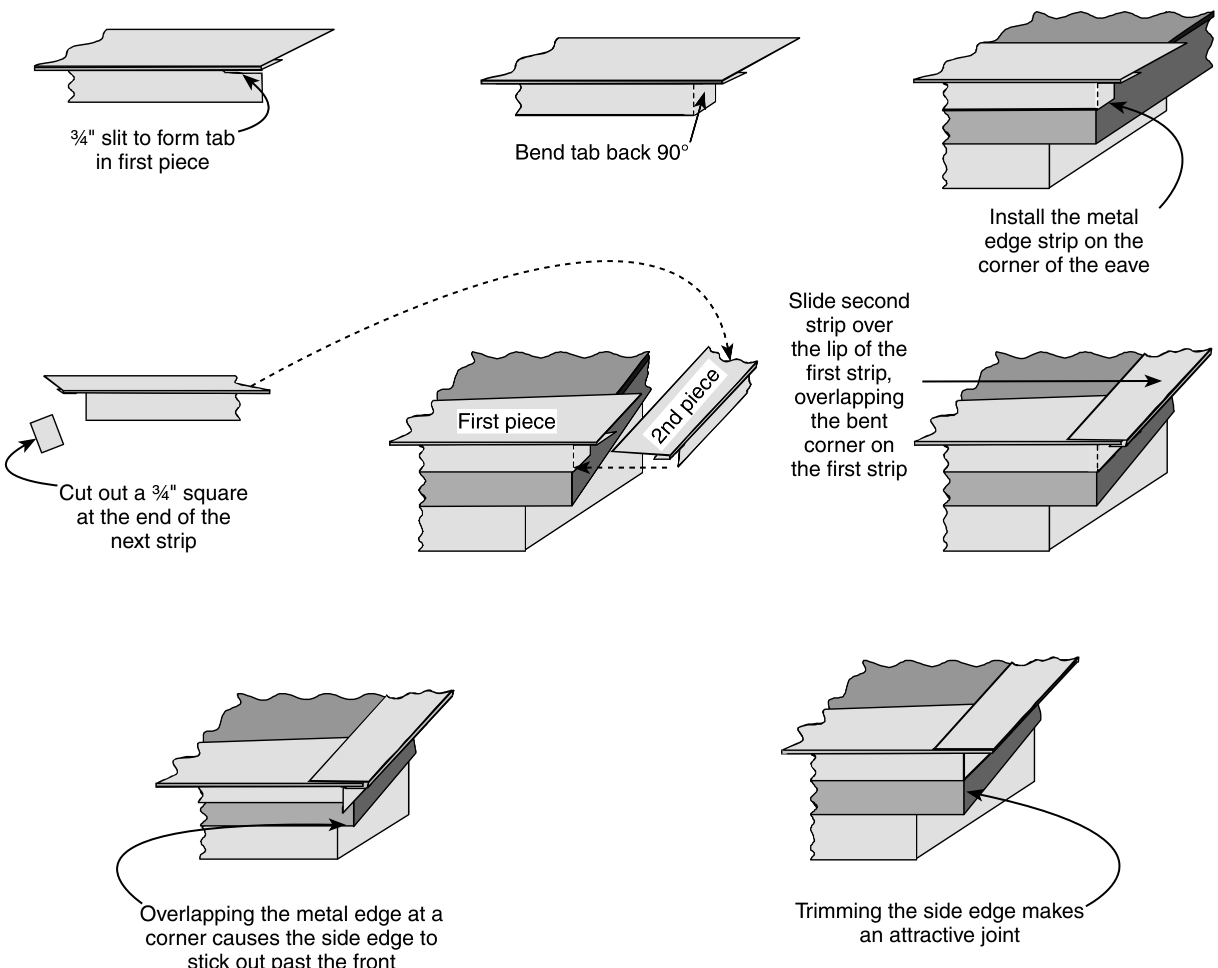


Figure 7-32
Making leakproof outside corner joints

To make leakproof outside corner joints, take a look at Figure 7-32 and follow the instructions below:

1. Cut a metal edge scrap into a narrow flat strip.
2. Slip it inside the doubled lip at the front of one piece, leaving half of the scrap piece sticking out.

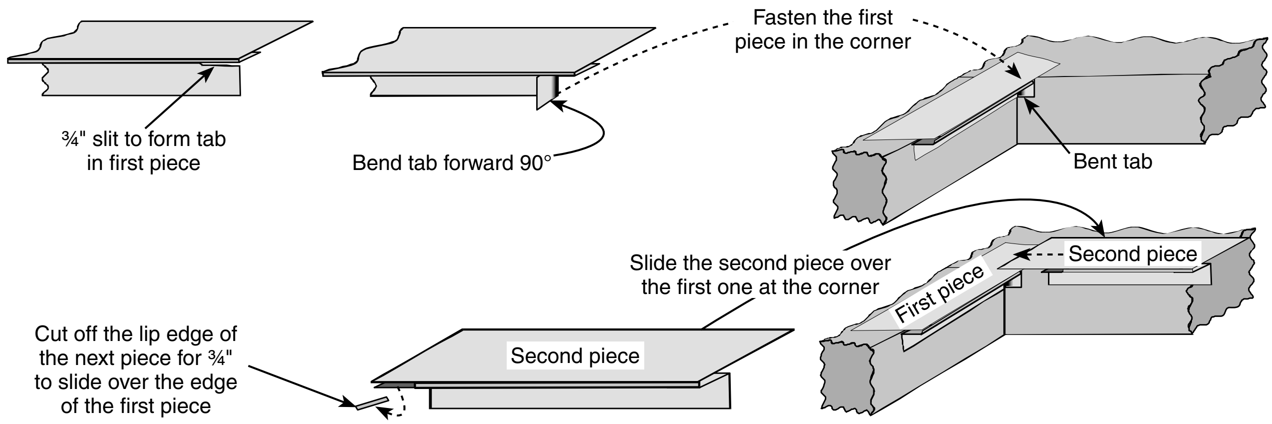


Figure 7-33
Making leakproof inside corner joints

3. Slide the other piece of metal edge over that, and push the pieces together. The metal between them holds the two pieces in line.
4. For the corner on a horizontal eave, cut a ¾-inch tab at the end of one metal edge.
5. Bend this ¾-inch tab around the eave corner. The end of the second metal edge overlaps this tab. The piece that comes down the gable eave at the corner overlaps that.
6. To shape the corner, cut a small ¾-inch square out of the downward lip at the corner. Then the downward lip isn't exposed when you slide the two pieces together over each other. The little square that would have been exposed has been cut off.

Cutting inside corners is a bit more complicated, because the end of one metal edge fits into the other's front edge. Look at Figure 7-33, and you'll see what I'm talking about.

1. Cut a ¾-inch slit at the end of the first piece.
2. Bend the resting tab 90-degrees forward, so it fits tightly in the eave's inside corner.
3. Put this bent corner on the end of the metal edge at the inside corner of the eave.
4. Now you're going to cut the second piece of metal edge. You've got to be able to slide its lip over the edge of the first piece. Cut ¾ inch out of the edge at the end.
5. Slip this piece of metal edge over the rim of the first piece of metal edge, and you have a watertight joint.

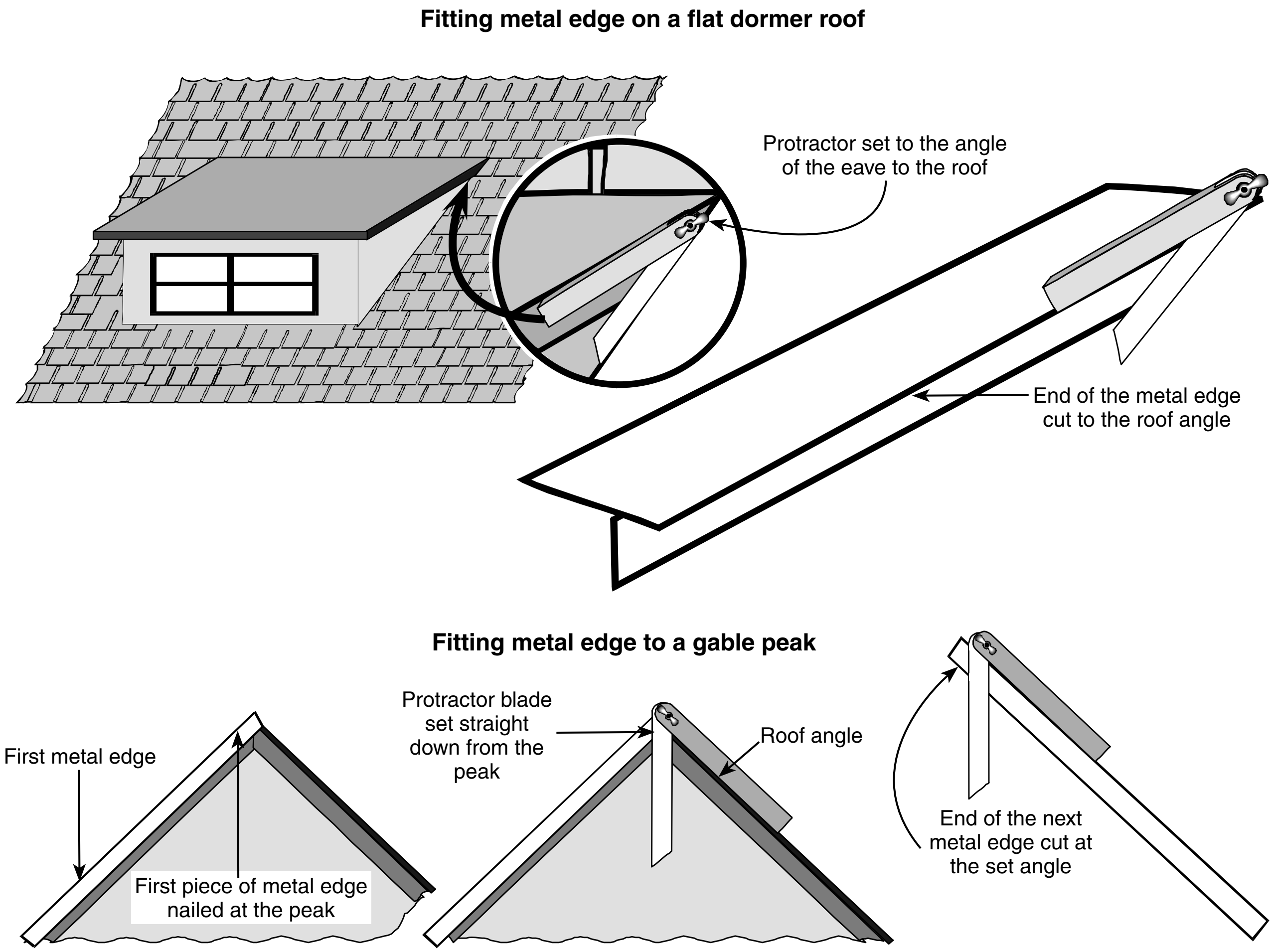


Figure 7-34
Fitting metal edges

When a dormer with a flat roof meets a gable roof, trim the upper end of the metal edge to fit the roof angle, using a protractor. The protractor also helps determine the angle you'll cut the top metal edge at the gable; see Figure 7-34.

The protractor is held against the eave edge and moved up until the blade meets the roofing. Tightening the thumb-nut holds that angle.

Slide the protractor up the ridge of the roof and set the protractor blade so it's pointing straight down. That's the angle to cut the top piece of metal that overlaps and will be visible.

The cut for the peak piece can be guesstimated; you'll cover it with the second piece of metal edging.

The Hook-Blade Knife

Everyone has a regular utility knife. But there's another blade that's also useful. It's called a hook blade, because of its hooked tip. When you cut roll roofing with a hook blade, the roofing is caught with the hook and cut by the hook's V-shape. A hook-blade knife doesn't dull; granules on the roofing simply grind the V-shape deeper, sharpening the blade.

Here's the best method to cut duplicate lengths of roll roofing. Roll out the roofing on the ground and make a slash where you want to cut it. Roll the roofing up tightly to the slash cut and, using the roll as a guide, cut the length, keeping your knife against the rolled up roofing. You'll get a near-perfect 90-degree cut. With the first piece rolled out on the ground, roll the second piece on top of it. Make a slash on the new piece of roofing where the first piece ends. Roll the roofing up tightly again, and then make the next cut.

Metal Edge and Fascia Installation

Don't install the metal edge tightly against the fascia board. The roof plywood could keep the fascia from being placed correctly if the fascia trim bumps into the edge of the plywood. To prevent this, leave at least 1⁄8 inch between the roof edging and the edge of the plywood sheeting or roof boards. Who knows? You may decide to wrap the eaves with metal in the future.

An Old, Leaky Shingled Roof

I was called out to fix an old leaky roof by an old couple in an old house.

The roof was in terrible shape. The shingles on one side were cracked and damaged. When you looked at the loops of the shingles between the tabs, you could see the roof boards. Water was soaking the drywall ceiling and dripping down the walls.

Shingles get very fragile when they get old; I couldn't even raise them enough to put roof jacks in place, because the shingles just fell apart. A new roof was the only solution, but the couple couldn't afford it right then. I can understand that, because I've been there. And the house was sustaining more damage from the leak.

Most contractors would have walked away. But when I told the couple that I'd come over and take a look and see if I could figure something out, I meant it.

My solution was unorthodox, and I'm not sure what an inspector might have said. But it saved the house until the owners could spring for a proper roof job — and it still put a little money in my pocket.

I ended up nailing the roof jacks on top of the shingles and tarred the nail holes later. Then I filled all the shingle loops with tar, squirting it between the shingle tabs and rubbing it down between them. This took a lot of tar. I ran tar along the obvious cracks in the shingles. This looked very strange, but luckily it was on the backside of the house. I succeeded in temporarily stopping the leaks. However, I let the couple know that, in a year or two, the shingles would have to be replaced. Nothing on Earth would hold them together longer than that.

Help for Sagging House & Garage Roofs

If you've done much remodeling, you've probably seen your share of sagging roofs. Garage roofs are especially vulnerable because, years ago, garages were built with roof rafters but no trusses. The roofs on these structures barely hold up against age in general, let alone winter snowfalls. Here are two solutions to this kind of problem.

Jack Rafters

If your customer's house or garage doesn't have a trussed roof, by all means install jack rafters. Jack rafters are horizontal 2 x 4s nailed across the middle of each pair of rafters. In some areas they're called rafter ties or cross ties. They strengthen the rafters by distributing weight evenly on them both. Figure 7-35 shows roof rafters after the jack rafters are installed. Simply jack up the sagging roof rafters and install jack rafters to relieve the sag. But I advise using the next method at the same time, especially if the sag is in the house's roof.

Adding 2 x 4s

This solution adds two diagonal 2 x 4s running from the ends of the jack rafter down to the central wall in the house. You can see in Figure 7-36 that these add substantial strength to the rafters. They make a triangle at each pair of roof rafters and permanently remove any roof sag. Every house has a dividing wall (or hallway) running down its center. This wall provides a solid base for these diagonal legs to rest on.

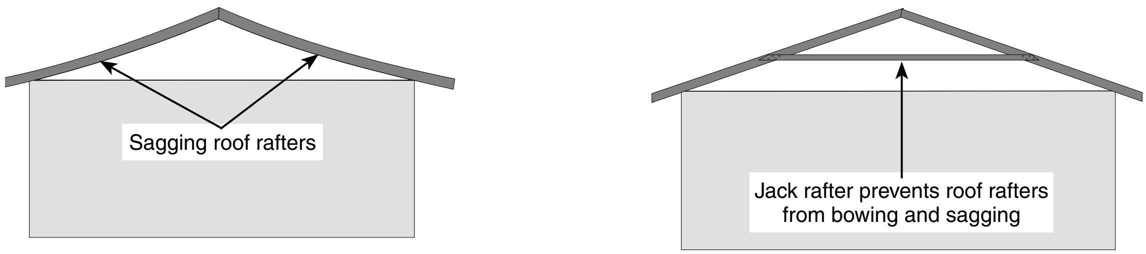


Figure 7-35
Jack rafter supports sagging roof

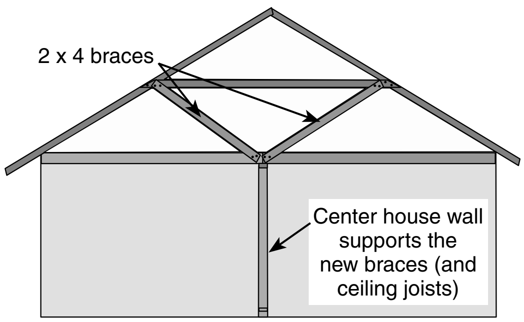


Figure 7-36
Diagonal 2 x 4s for extra bracing

- Locate a wall plate in the attic by pulling aside any insulation near the area of that downstairs wall.
- Expose the top of the wall plate; the diagonal legs will rest on this.
- Jack up the roof joists on both sides of the roof before installing the horizontal jack rafters. Put the base of the hydraulic jacks against the edges of the wall plate in the attic. Then extend a temporary 2 x 4 leg up to the roof joist on each side.
- Work goes a lot quicker if you put a 4-foot (or longer) 4 x 4 between each jacking leg and the ceiling joists. This can span between three or more roof rafters, so you're able to jack up several at a time. Of course, you have to jack the rafters up on both sides at the same time. And be careful using hydraulic jacks — as you apply pressure, they try to kick out.
- Put slanted blocks at the base of the jacks to stabilize them. The positioning for each jack and the block below it takes some figuring. To help hold the short 2 x 4 blocks in place on the top wall plate, drill two holes in each block for 16-penny nails or 2½-inch screws. Then you can screw or nail the block to the edge of the top wall plate.
- The 4 x 4s on each jack have to be above or below where the horizontal jack rafter will be installed, so they won't be in the way when the jack rafter is nailed in place.
- Don't jack directly upward at the middle of the downstairs room ceilings. You'll crack the plaster in the ceiling. Do all your jacking above the top plate of the downstairs wall.

8

ELECTRICAL

"Electricity is magic." That's what one old electrician told me a few years back. Electrical power is one of the biggest advances in human technology … ever. But due to the potential for immense damage, make sure you know what you're doing before doing any electrical work.

Temporary Power

For heavy-duty tools like an air compressor, you need a heavy-duty cord. For the size compressor I have, I use one rated at 30 amps and about 6 feet long. That's plenty long enough to reach from an outlet to the air compressor. It's better to use a longer air hose than a longer extension cord. A heavy cord solves the current problem in the wire. But don't try this in an older house with poor wiring — a compressor exerts a heavy load in order to build up air pressure.

Soldering

Although it's unnecessary to solder the connections when doing most regular residential wiring, sooner or later you'll have to solder a wire on some piece of equipment. The most common soldering irons for residential construction use are pistol grip and pencil type; and now there are even battery-operated or gas soldering irons.

Contrary to popular belief, a soldering iron doesn't heat up solder to melt it. It heats up the *work* (wire, metal, tubing, etc.), so it's hot enough to melt the solder. If the wire isn't hot enough, the solder won't stick, resulting in a *cold solder joint*. Solder is part tin and part lead, and can't form a real bond unless the wire or metal is hot enough to actually melt the solder.

Never use solid roll solder to solder electrical wiring. That particular solder is for plumbing, and comes in heavy wire form. Acid flux is brushed on the work before soldering. If you use this type of solder and flux on electrical wire, it will turn green and corrode. Solder for electrical wires is much finer and has rosin flux inside the solder, which doesn't corrode electrical wires.

You must keep the tip of the soldering iron clean at all times. When you see it turning black, it's time to clean the iron. How? If you wipe it on synthetic cloth, the cloth will melt and stick to the soldering iron. The best thing I've found for this job is a cellulose kitchen sponge (but *not* the kind that has the scrubber on one side). Cut a little circle from a sponge and place it in a jar lid. Wet the sponge and wipe the iron on it. The lid holds the sponge securely. After you wipe the dirty solder on the sponge, immediately *tin the iron* — melt fresh solder on the tip of the soldering iron.

Repairing a Pistol-Grip Soldering Iron

A common problem with pistol-grip soldering irons is that the tip stops getting hot enough to do a good job. The constant heating and cooling causes it to expand and contract, loosening the nuts holding the tip. The nuts must be tight to make a good electrical connection between the end of the tip and the barrel of the soldering iron.

To solve this problem, loosen the nuts about a quarter-turn with pliers and then tighten them up again. This not only clamps the tip in place, but the rotation of the nuts also wipes away any oxidation between the tip and the nut's surface. Check the nuts every few days to make sure they're tight.

Wiring

Electrical wiring codes have changed substantially over the years. In the early days of electricity, house wiring consisted of only two power wires — ground wires didn't appear for many years. Eventually, it was discovered that a ground wire, run along with the power wires, protected appliances and made everything safer. Today, it's mandatory that all houses have two wires with a ground. Old houses that have two wires and no ground should have their wiring updated, though it's a big job.

Pulling (Replacement) Wire through a Wall

It's sad but true: When putting in replacement wire through the wall, you can't simply fasten the new wire onto the end of the old and pull it through. The bulge where they're connected won't fit through the original holes drilled in the studs.

Using Figure 8-1 as a guide, fasten a single strand of bare wire (12 or 14 gauge) to the end of the old wire. You'll be able to pull this easily through the wall from outlet to outlet. Cut the outside sheathing off the last few inches of old wire, making it narrower where it joins the single wire. Cut one of the two wires 3 inches shorter than the other. Make the joint as small as possible to match the circumference of the original house wire when you bend and tape them together.

Once you've pulled the single wire through, fasten it to the end of the new wire and pull it through. Again, cut the sheathing off the end of the wire and cut one of the two wires shorter. Bend and crimp the new wire and the thin wire around each other, then tape the new electrical wire securely to the single wire. This wrap keeps the wire joint intact as you pull it through the holes in the studs.

Pull both old and new wires through the wall. Why bother with the old wire? Because, if by some chance the new wire gets hung up somewhere in the wall or pulls loose, you still have the old single wire running through the wall. You'd be able to reattach the new wire and pull it through.

Adding an Outlet

Old houses had very few outlets. In fact, it was unheard of to have more than one ceiling light and two wall outlets. Ironically, with all the electrical devices we use now, even modern homes don't have enough outlets for all our gadgets. But it's easy to add an outlet in a room if the adjoining room has an outlet nearby:

- Shut off the power to the outlet first. Remove the cover plate and pull the outlet out of the box. There's usually extra wire attached, so you shouldn't have any trouble.

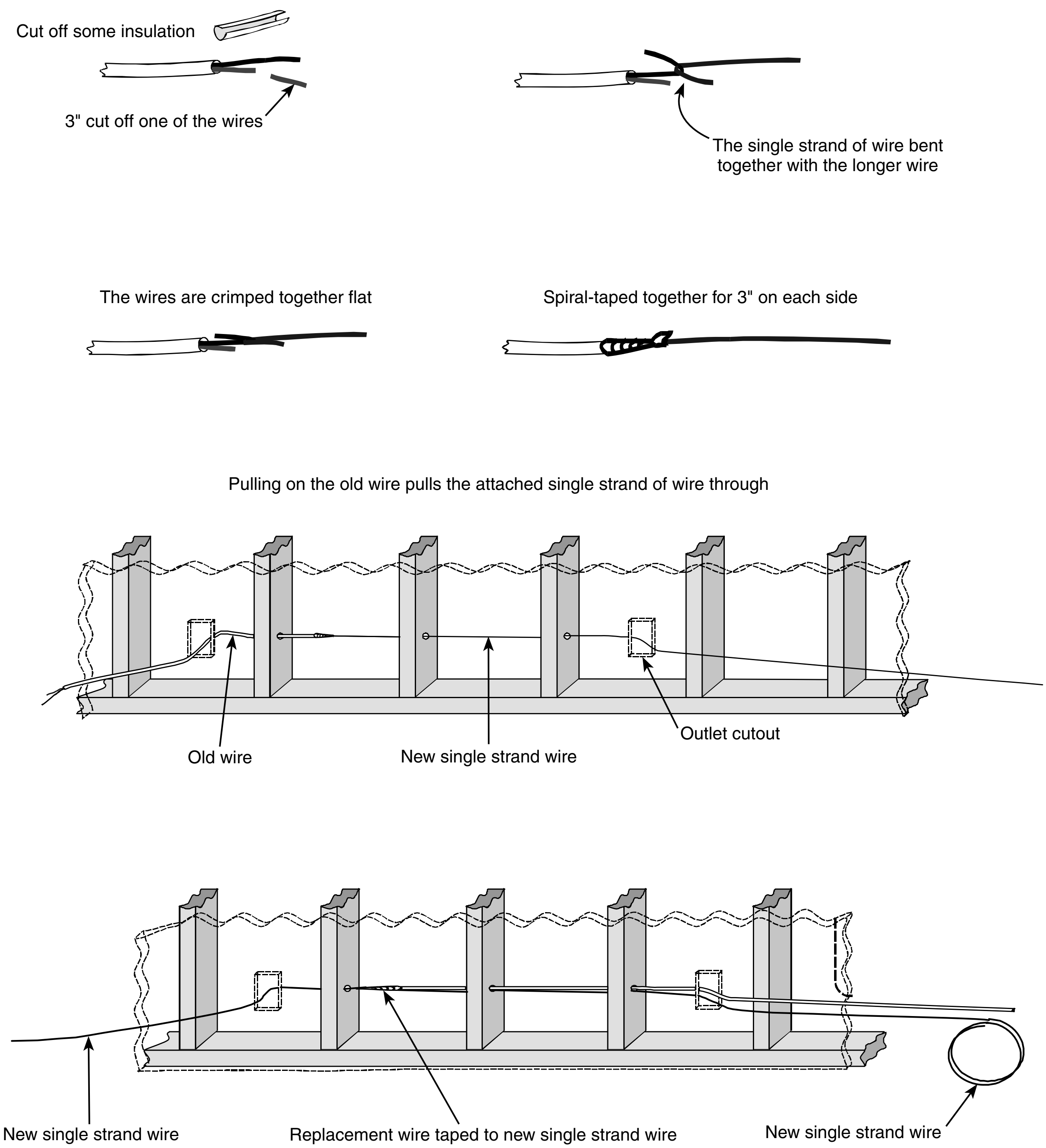


Figure 8-1
Running replacement wires

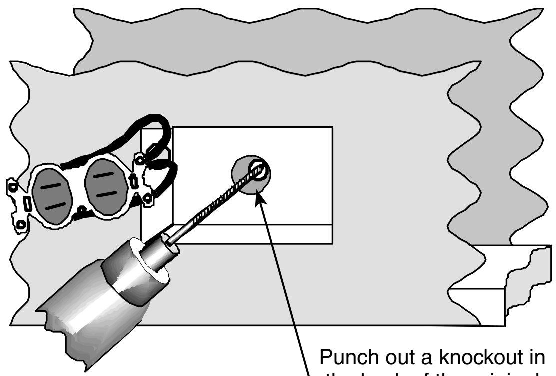


Figure 8-2
Adding a new outlet in an adjoining room

➢ Check the location of the outlet on the wall. Is one corner of that wall parallel to the wall where you want to add an outlet in the next room? Determine how the walls align by measuring them. If the end walls on the two rooms aren't parallel, drill through the adjoining wall to find a good location for a new outlet.

➢ Measure how far the outlet box is from the corner and how high it is from the floor. In the next room, mark that spot on the wall at the same height and distance from the corner.

➢ Drill a 1-inch hole with a spade bit directly across from where the outlet is in the adjoining room. Don't drill too deeply — only deep enough to get through the drywall or lath and plaster. You should be able to see the old outlet box by shining a flashlight through the hole.

➢ If that doesn't work, there's another way to find the outlet box. Pull the outlet down enough to punch out one of the knockouts on the back; see Figure 8-2.

➢ Use a ¼-inch bit and drill through the knockout to make a hole in the wall of the next room; as shown in Figure 8-3. Go into the room and drill a 1-inch hole where the bit just came through.

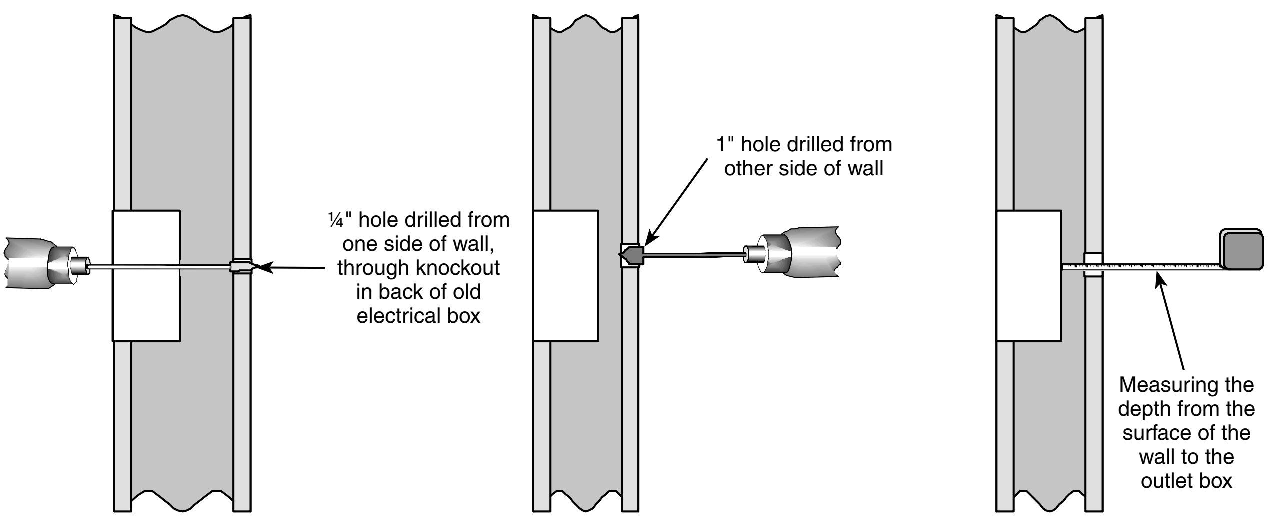


Figure 8-3
Preliminary drilling and measurement for a new outlet box

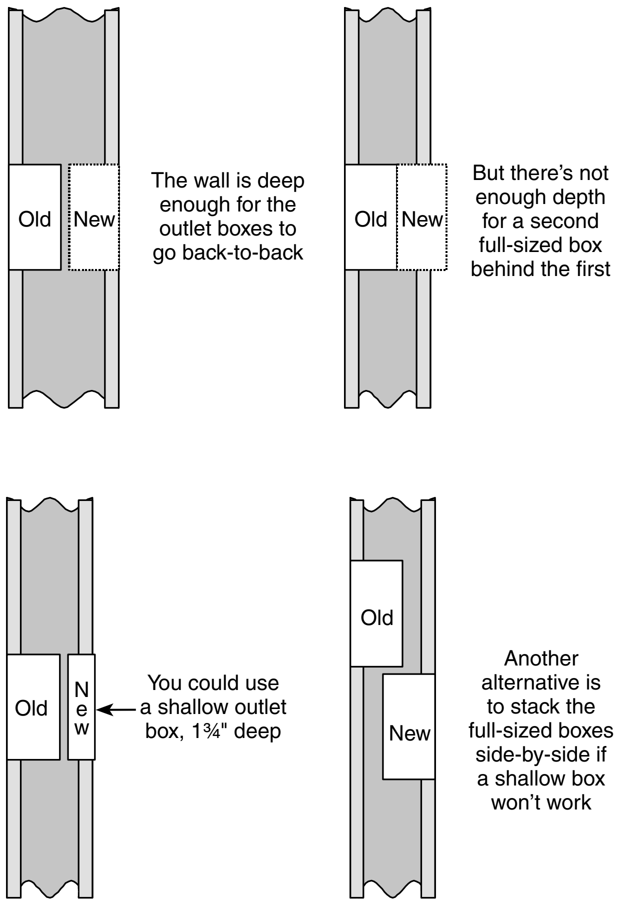


Figure 8-4
Different ways to arrange a new outlet box

- Measure in the hole how far away the back of the outlet box is from the surface where you want the new outlet. Is it at least 2¾ inches? That's the depth of a standard outlet box. You *can* get shallower outlet boxes that are 1¼ inches deep for situations like this. If there isn't enough room for the outlet boxes back-to-back, you can put them off to the side a little; see Figure 8-4.
- Now you have enough information to make a cutout in the wall for the new outlet box. You can get plastic outlet boxes with flaps that clamp the new box in place without nailing. Simply slide the new outlet box into the hole and tighten the screw on each side. The flaps turn out and tighten up, clamping the box to the wall.
- Measure the outside dimensions of the new outlet box. If you don't see at least two edges of the existing box through the 1-inch hole, drill another hole overlapping the first, so you can see the edges of the old box through the wall.
- Mark the new outlet box cutout on the wall.
- Cut out the hole with a saber saw. You just want a hole big enough to push the outlet box into the wall. The lips at the ends must rest on top of the wall because they keep the box from falling inside. (For these next few steps, see Figure 8-5.)
- Punch out the knockout in the back of the new outlet box, lining it up with the knockout in the back of the other box, if possible.
- Cut a length of No. 12 or 14 wire, 16 inches long. Strip the wires at both ends about ¾ inch, and cut about 3 inches off the outer sheathing. Run this wire out of the old outlet box into the new outlet box not yet in the wall.
- Connect the new wires to the old outlet. There will only be one ground screw. Either loosen the ground screw and add the new ground wire, or twist the new ground wire around the old one. Run this wire into the new outlet box, through the knockout.

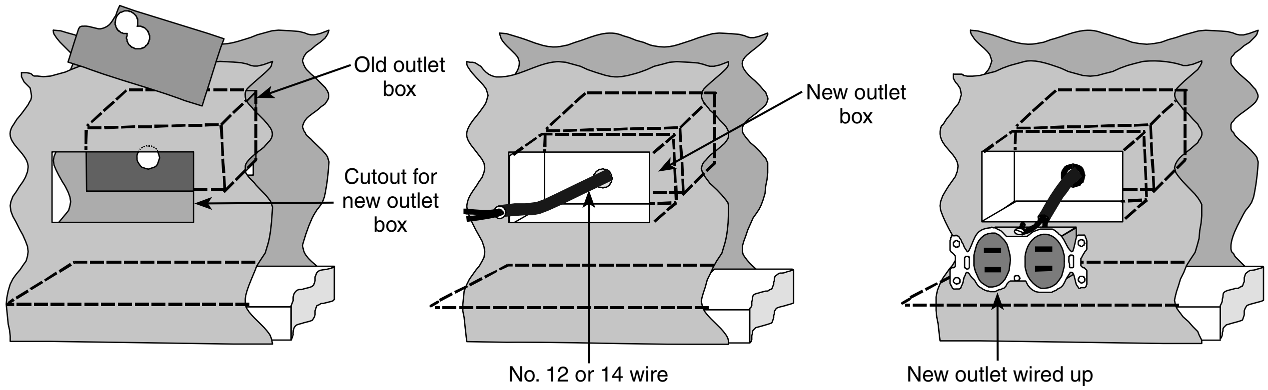


Figure 8-5
Final steps for installing a new outlet box

- Fasten the new box in the hole you made, tightening the screws to clamp the box in place. (If the wall is lath and plaster, you may have to reach inside the hole with a chisel and scrape away some of the plaster. You need to be able to install the clamps and operate them.)
- Connect the wires to the new outlet and fasten it in the box. Install the cover plate, and you're finished.

Ceiling Fans

Your customer wants a ceiling fan, but there's no wiring. Many old houses have no ceiling light fixtures. In the old days, if you wanted a light, you plugged a lamp into an outlet down by the baseboard and sat the lamp on a table. But your customer wants to modernize. Before you install his new ceiling fan, you'll need to install a receptacle box, wired in the center of the ceiling.

Installing a receptacle for a ceiling fan is a pretty straightforward job:

1. Find two adjoining ceiling joists near the center of the ceiling.
2. Cut a square out of the ceiling up to the center of these joists.
3. Run new electrical wire up to this cutout.
4. Install a reinforced receptacle box on one of the joists.

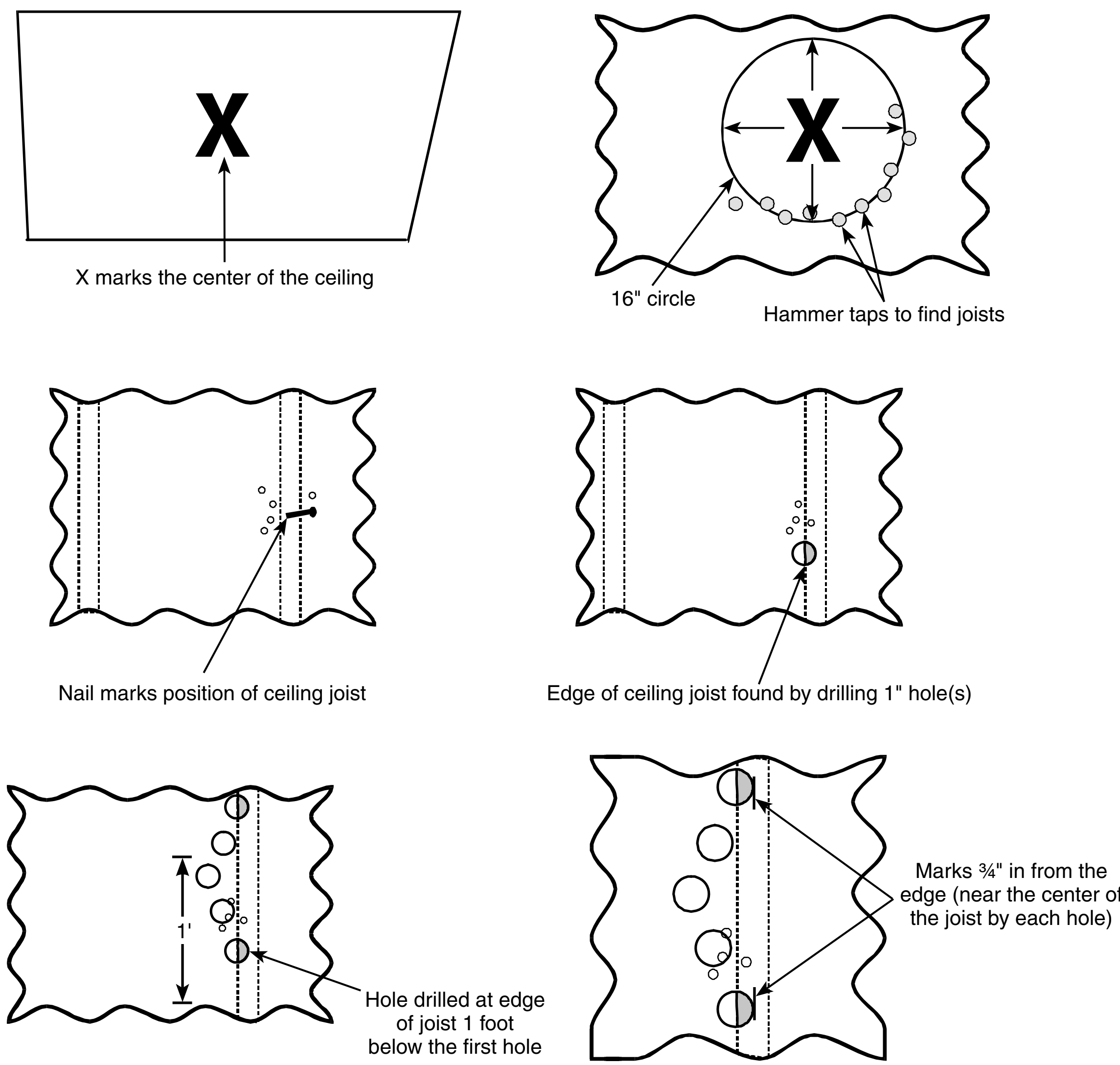


Figure 8-6
Ceiling joist location

5. Wire up the receptacle box.
6. Nail a new piece of drywall around the receptacle box and plaster and sand its seams.

Not hard, is it? That's how to install a fan in a first-floor room. If there's wiring above that you can use (such as attic wiring), you don't even have to run new wires.

Finding Joists

You may not be able to install a ceiling fan exactly in the center of the ceiling, since its location is determined by ceiling joists. But you should be able to get fairly close to the center of the ceiling without too much trouble. All you need to do is find a joist, either with a hammer or a stud finder. I generally used a hammer, not because I have anything against stud finders, but mine was always out in the truck when I needed it; whereas my hammer was always at my side. Figure 8-6 shows how to do this, using a hammer. First tap lightly at the center of the ceiling. When you hit a joist, drive a nail into the ceiling. Make a mark by the nail hole.

To find the joist adjacent to the first one, first determine which direction the joists run. Move 16 inches either along the length of the room from the marked nail hole or 90 degrees from it; see Figure 8-7. Tap and find the second joist. Once you've found it, you'll know the direction the joists run. That makes it a lot easier to find the edges of the joist, which helps you find the centers.

You'll need to expose about ¾ inch of the joist for lapping the new drywall and nailing it securely onto the joists. Drill a hole with a 1-inch spade bit close to where you've found a joist. Reach through the hole to feel for a joist. Locate the edges of the two joists so you can draw a square up to the center of them.

Draw a square about 17½ inches on each side. Drill more 1-inch holes to find the edge of the joists. This square should also be close to the center of the ceiling between the joists.

Now that you've found the joists and drawn the square on the ceiling, cut it out with a circular saw, using a carbide blade. Wear safety glasses and a mask, since you'll kick up some dust. Set the saw blade to cut ¾ inch deep. This will cut through ½-inch drywall and probably be deep enough to cut through lath and plaster, if necessary. As mentioned before, when cutting through drywall or plaster, sawing gets pretty dusty, so leave the room as soon as you finish.

Running New Wires

The location of the closest power wire determines how much trouble it is to route electrical wire up to the ceiling. Wires going to a wall switch usually aren't complete power wires. (All rooms *must* have a wall switch.) Here's how to add wiring to a wall switch or to outlets by the baseboard.

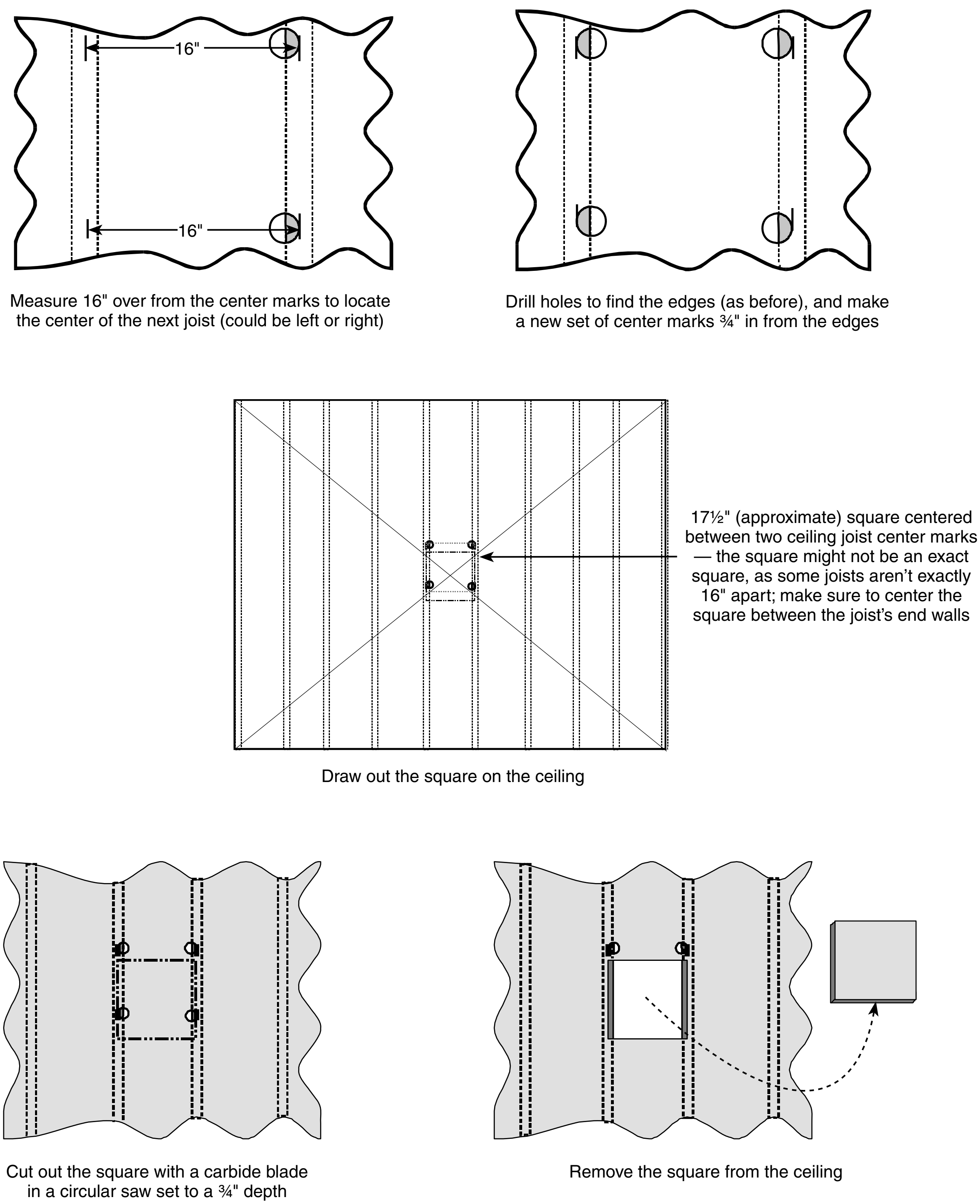


Figure 8-7
Marking and sawing the correct size square in the ceiling between two joists

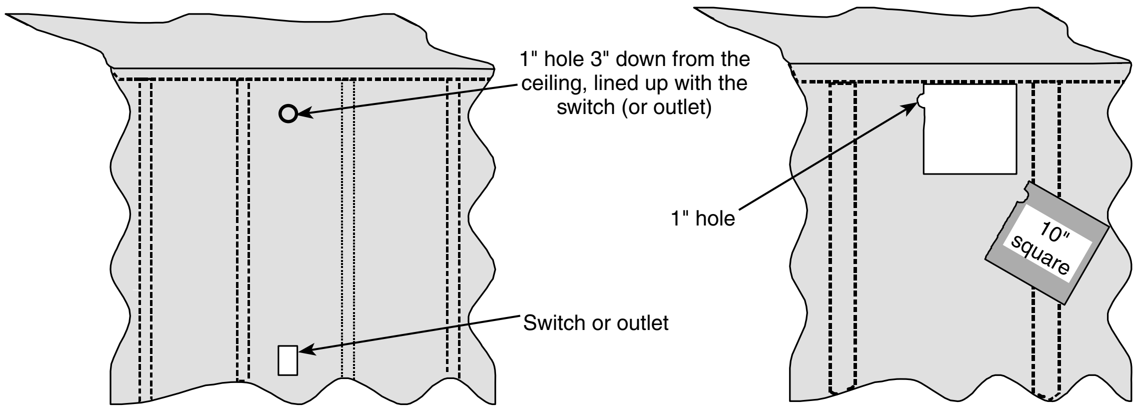


Figure 8-8
Making a cutout in the wall to run new power wires

Turn off the main power to the area. Remove the cover and the screws holding the switch in the switchbox. Straighten the wires inside so you can work on them. Are there two wires? Is one of them clipped with the two ends fastened to switch screws? If so, you probably have power running to the switch. But you want to know for sure before running new wires for the ceiling fan. So be sure to test for power before starting work.

Run wiring from the switch to the fan:

➢ First, run the new wiring up to the ceiling cutout to power the fan. Start routing the new wires by drilling a 1-inch hole through the wall, 3 inches down from the ceiling and directly above the wall switch. Figure 8-8 illustrates this process.

➢ Make a cutout about 10 inches square, starting at the drilled hole, with a saber saw. Cut the top of this hole as close to the ceiling as you can. The hole will expose the top wall plate so you can drill a hole through it. Save the drywall to replace after you finish running the wiring.

➢ Drill a 1-inch hole (as shown in Figure 8-9) through the exposed top wall plate to run the wiring up into the ceiling, and another 1-inch hole in the ceiling above where you drilled in the wall.

➢ Cut out another 10-inch square of drywall in the ceiling, to enable you to reach the wire when you push it through the hole in the wall plate.

➢ Take the switch and its switchbox from the wall and let it hang out a few inches. Using stiff wire (12 or 14 gauge), bend the end over itself about 2 inches. That gives a rounded end to push through the wall.

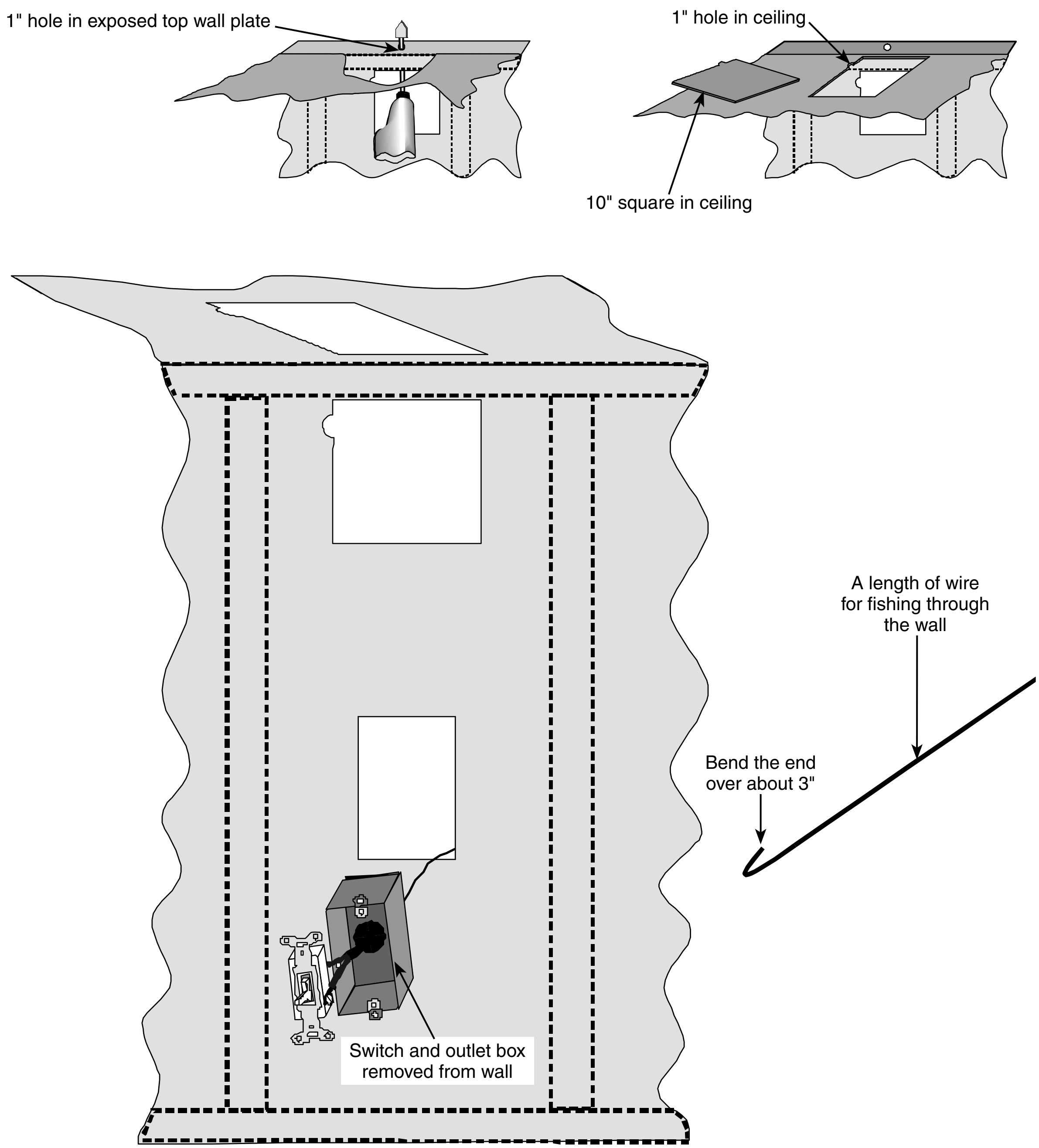


Figure 8-9
Making cutouts to run new wiring

- Measure from the ceiling to the switch, and put a piece of tape on the wire a little further up than that, to show you when you've pushed enough wire into the wall to get down to the switch. Figure 8-10 illustrates this step.

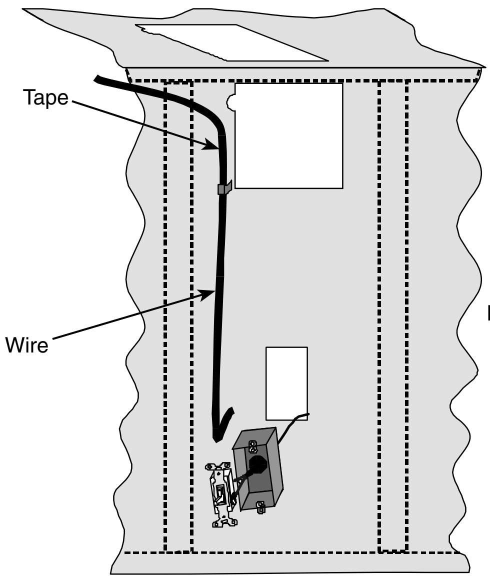


Figure 8-10
Fish the wire through the wall, from the ceiling, down and out through the cutout

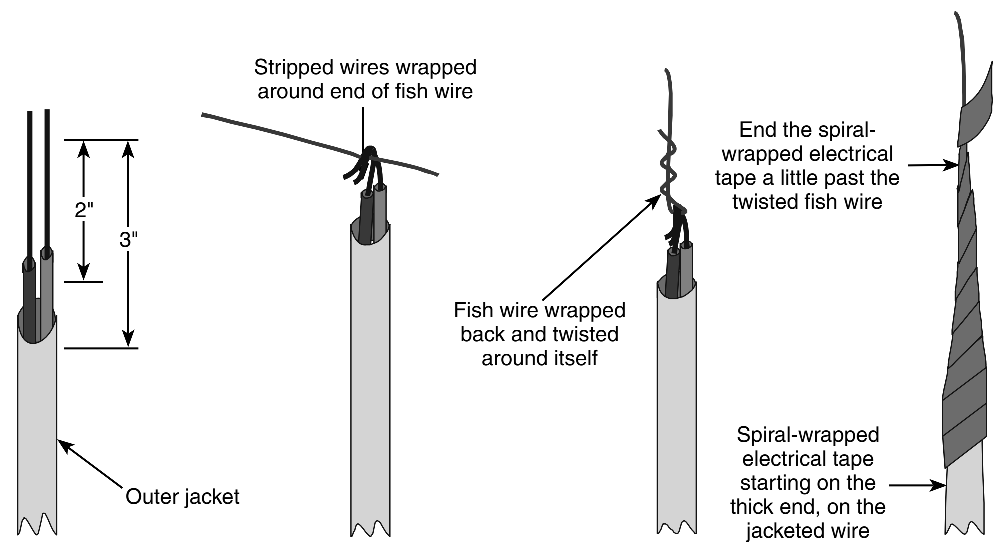


Figure 8-11
Stripping and wrapping the wire for an easy pull

- Push the wire down through the hole by the ceiling until you see the end at the switch (or outlet) cutout.
- Once it's there and pulled out of the cutout, strip 3 inches of the outer insulation from the electrical wire, and 2 inches of insulation from the two insulated wire ends. See Figure 8-11.

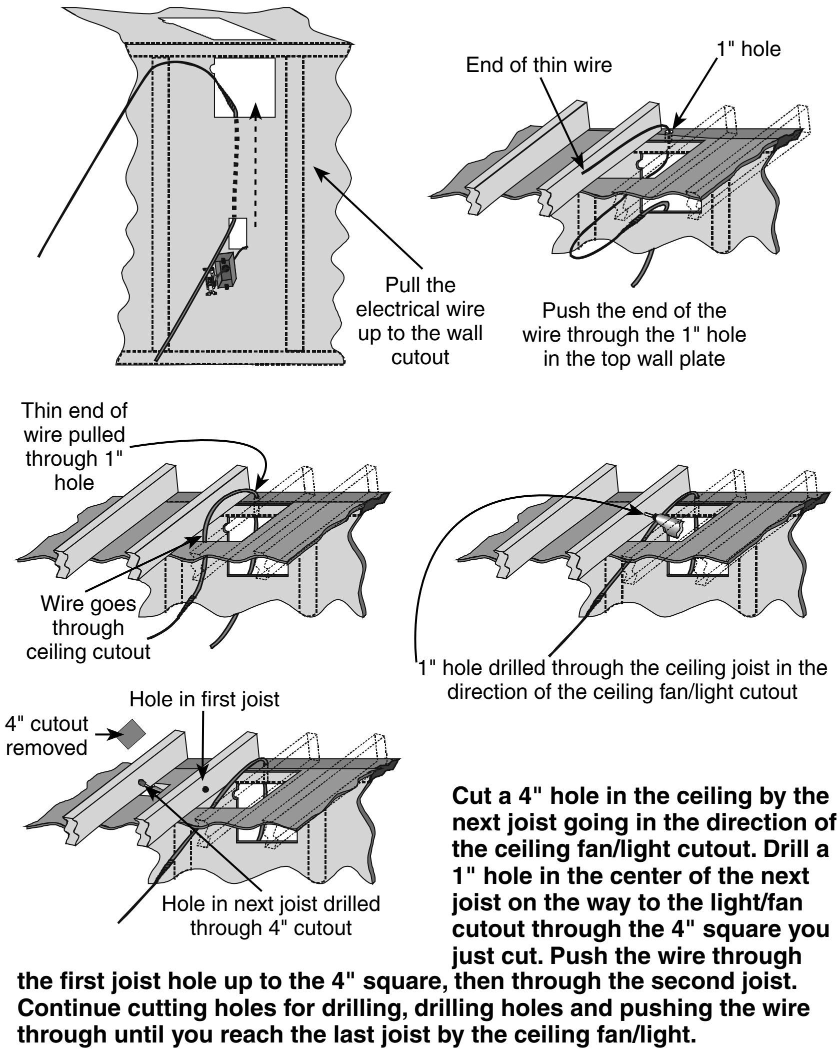


Figure 8-12
Finishing up the wiring if you have to go through multiple joists

- Bend the ends of the electrical wire over the thin wire, 3 inches from the end, and twist the end around itself a few times. The wires are now fastened together.
- Tape the wires to prevent them from coming apart: Wrap the tape over and over the bent ends and the twisted thin wire. Wrap past the end of the wire, then cut the tape and press the end down tight.
- Pull the wires upward, through the 10-inch hole by the ceiling. Push them through the hole in the top wall plate and pull the wire and attached electrical wire up and out the ceiling hole.

To get the wire over to the ceiling fan, you'll need to drill holes through any joists between the hole in the top wall plate and the fan cutout. See Figure 8-12. This is a tedious procedure, and you need to be careful; the edge of any hole shouldn't be within 1¼ inches of the edge of the lumber. On 2 x 4 joists, you may want to drill only ¾-inch holes to allow some room for error. Installing a protective metal plate on the bottom of the joist under the hole will make sure the wire doesn't get pierced by a nail when the ceiling is drywalled.

3-Way Switches

Wiring up 3-way switches can be frustrating. It confused me years ago when I first tried it. But the convenience of being able to turn on a light from both ends of a long stairway or hallway is worth the hassle. Once you understand how a 3-way switch works, it's easy to install one. Take a look at Figure 8-13.

A single power wire goes to the first 3-way switch. The other wire goes directly to the lightbulb. Thus, the 3-way switch can only turn this single wire going to the lightbulb on or off. There are two wires passing between the two 3-way switches. One of these is always on. Which wire is hot is determined by which wire the first switch is turned toward.

A 3-way switch has three terminals. The first one is connected to either the second or the third, depending on whether the switch is up or down. If you flip either of the two switches controlling the light, it goes on or off.

3-way switches don't show *on* when the switch is up or *off* when it's down. If the switch with the power is coming in down (putting the power on the bottom wire), the second switch can only turn the light on if it also is pushed down, to connect with the bottom wire. Only one wire can have power. If both switches aren't switched to the power wire, the light can't turn on.

There are three wire connection screws on each switch. Two screws are for the wires that connect between the two switches, and the other screw is for the second wire going to the lightbulb or in from the power wire. So there are six connections on these two switches. If any of the wires are on the wrong screw, the switches won't work.

A 3-way switch has two contacts at one end of the switch across from each other, and one contact at the other end. The single contact, alone at one end, is for the main wire. So this wire is either the house power wire that comes into the first 3-way switch or the wire that goes out of the second 3-way switch to the light.

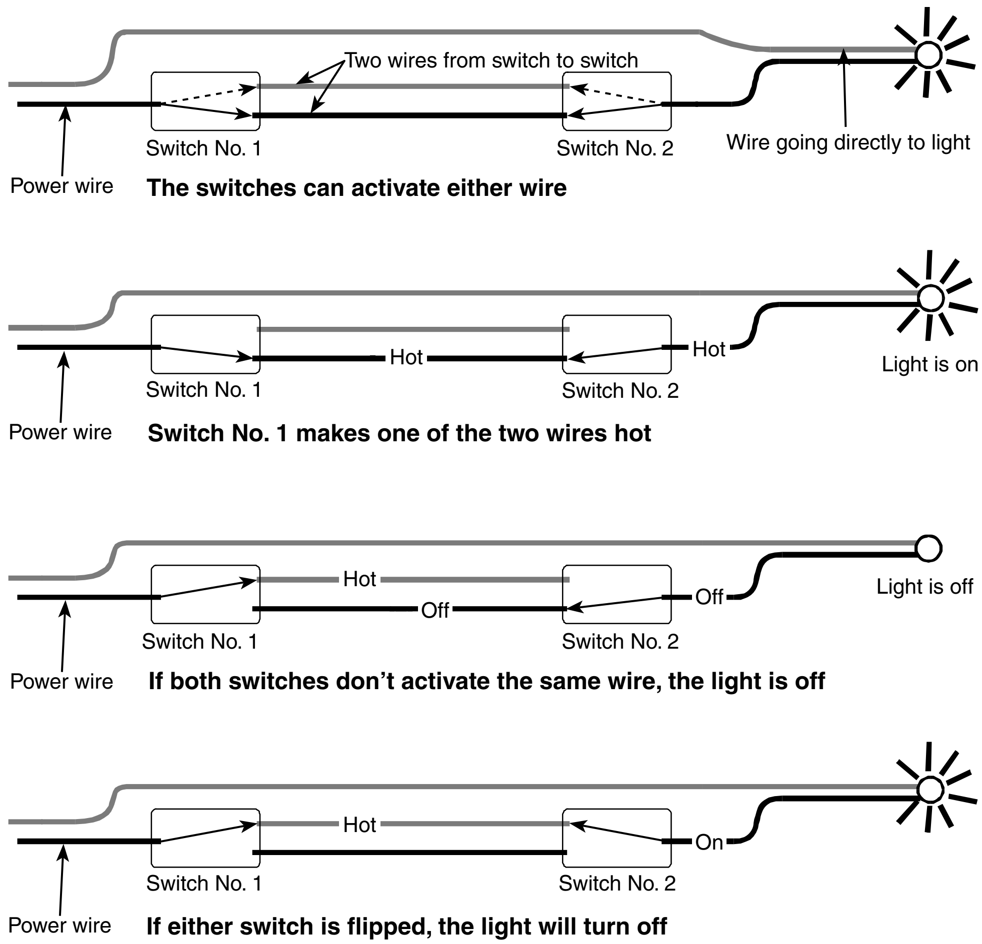


Figure 8-13
The inner workings of a 3-way switch

The contacts at the other end are for the two wires that go between the switches. These are the contacts that each switch can select and switch between. If the switches don't work, one or both of the switches is using the single contact for one of the wires going between them. The light will turn on only when both switches are pushed a certain way. If the wires are connected to the two contacts across from each other at one end of the switch, either switch will be able to switch the light on or off.

Repairing a 3-Way Switch

3-way switches aren't hard to work on. If your client has one that's not operating correctly, check to see if it's wired the right way.

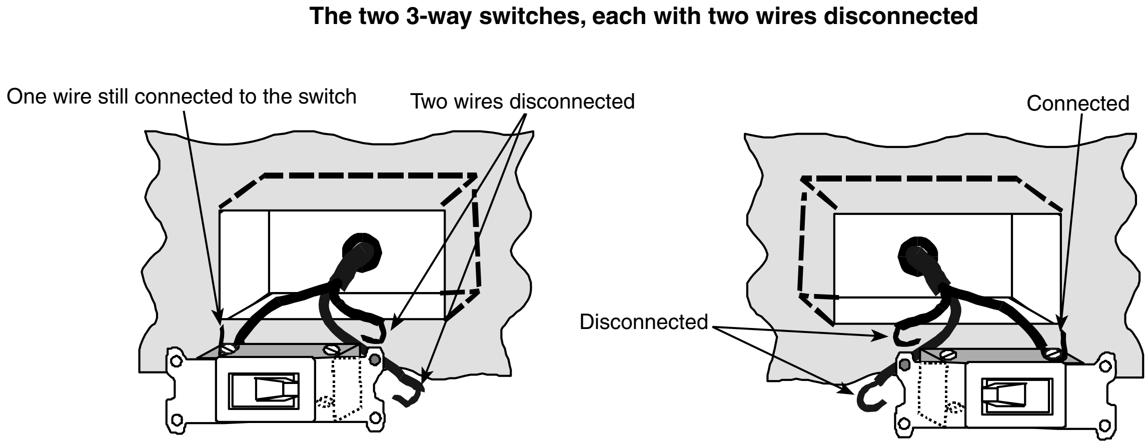


Figure 8-14
Finding the wire that powers the 3-way switches and light

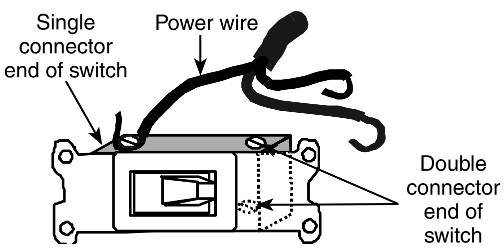


Figure 8-15
First 3-way switch: the power wire is connected to the single connector end of the switch

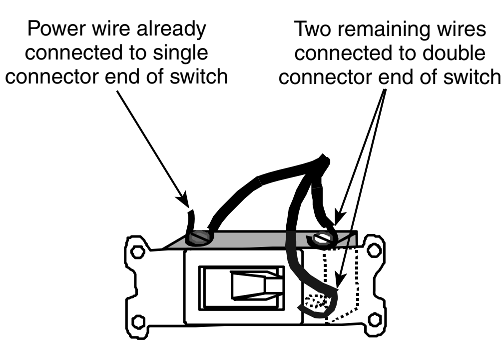


Figure 8-16
Two remaining wires connected on other end of first 3-way switch

1. Find the switch connected to the house power wire.
2. Turn off the power and pull both of the 3-way switches out of their outlet boxes.
3. Disconnect any two of the three wires attached to each switch. By leaving only one wire attached, you'll be able to find which switch is connected to the house power wire.
4. Turn the power back on and check each wire on both switches with your circuit tester to find out which one of the six has power; see Figure 8-14.
5. Once you've found it, shut off the power again.
6. Connect that power wire to the single contact at one end of the switch. Figure 8-15 illustrates this step. If that contact had the original single wire on it, take it off, unless it's the power wire.
7. Connect the two remaining wires to the two contacts at the other end of the switch. It doesn't matter which goes where; see Figure 8-16. You now have this switch wired correctly.
8. Turn the power back on.

Once you've turned the power back on, go to the second switch, where one of the three wires will have 110 volts — that's the one to connect to one of the two screws at the double connector end.

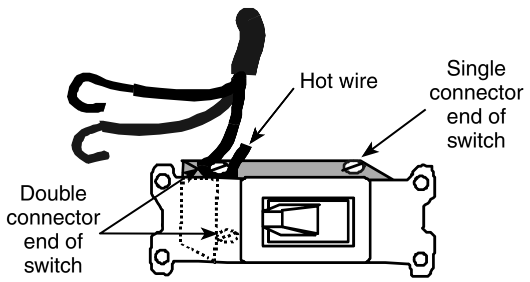


Figure 8-17
Second 3-way switch: the power wire goes on the double connector end of the switch

Flipping the first switch in the opposite direction shows which wire is the new hot wire powering the second switch — connect it to the second screw at the double connector end of the switch.

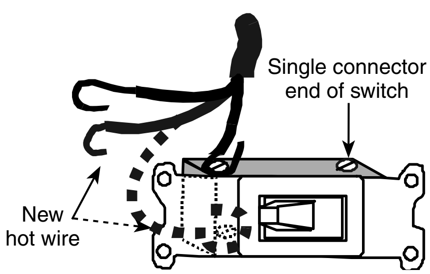


Figure 8-18
Hooking up the second wire on the second 3-way switch

Connect the last wire to the single screw at the other end of the second switch

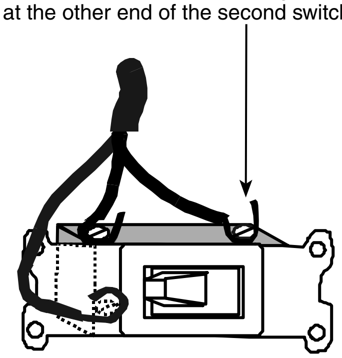


Figure 8-19
Attaching the last wire

9. Find the power wire in the second switch.

10. Turn the power off and connect it to either of the contacts at the end of the switch that has two contacts — the double-connector end (see Figure 8-17). Don't connect it to the end of the switch that has only one contact.

11. Turn the power on and flip the first 3-way switch once, to the opposite direction.

12. See which wire on the other switch has power now.

13. Connect that wire to the second contact on the double contact end of the switch, as shown in Figure 8-18.

14. Connect the last unused wire to the single screw at the other end of the switch. Look at Figure 8-19. The light should work properly from both switches now.

Reusing an Outlet Box

In all my years of remodeling, I never reused an old-style outlet box when I drywalled. I just put in a new box. But this next customer was trying to save some money. The cutouts in the new drywall were right in front of the old outlets, so it was just a matter of pulling the outlet boxes through the cutouts in the new drywall and fastening them in place. Sounds pretty simple, doesn't it?

Well, I'd never worked with old outlet boxes that had sheet metal fasteners. Maybe you're not familiar with them either. I couldn't figure out just what held everything in place. There were no nails or screw clamps.

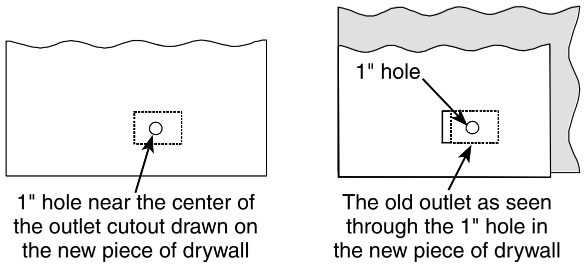


Figure 8-20
Checking the line-up for a cutout

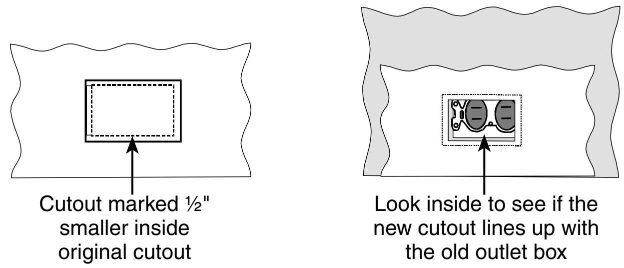


Figure 8-21
Making the final adjustments to the cutout

If you haven't seen one, they're similar to plastic boxes: There's a lip at the top and bottom in front to keep the box from falling into the cutout. What's different are the fasteners. Sheet metal T-fasteners slide into the cutout on each side of the box. When the sheet metal legs are inside the cutout, the Ts pull tightly against the back of the drywall. Then the two flaps in the front are bent around inside. The two tabs keep the box from falling in, and the sheet metal Ts keep the box from falling out.

- Make an outlet cutout in a new sheet of drywall that matches the old outlet cutout as closely as possible. Measure carefully on the new drywall and mark for the new cutout.
- Drill a 1-inch hole with a spade bit in the center of the new drywall where you marked for the outlet.
- Stand the new drywall sheet in front of the old outlet and check the line-up through the 1-inch hole; see Figure 8-20. Does the cutout for the new outlet line up fairly well with the position of the old outlet?
- Draw another cutout ½ inch smaller inside the first drawing. Cut the smaller rectangle out of the drywall sheet. Stand the new drywall sheet up to the old one for comparison. Remember, you're trying to get a good line-up before cutting. Figure 8-21 illustrates this step.
- Make any needed changes to the final cutout.
- Turn off the power to the outlet, take out the outlet screws and move the outlet out of the box. For these next few steps, look at the illustration in Figure 8-22.
- Bend the tabs on the Ts and remove them. One of the legs on each T is shorter, so that's the end that comes free first.
- Pull the outlet box out of the wall, hopefully several inches … it depends on how much wire was initially installed; see Figure 8-23.

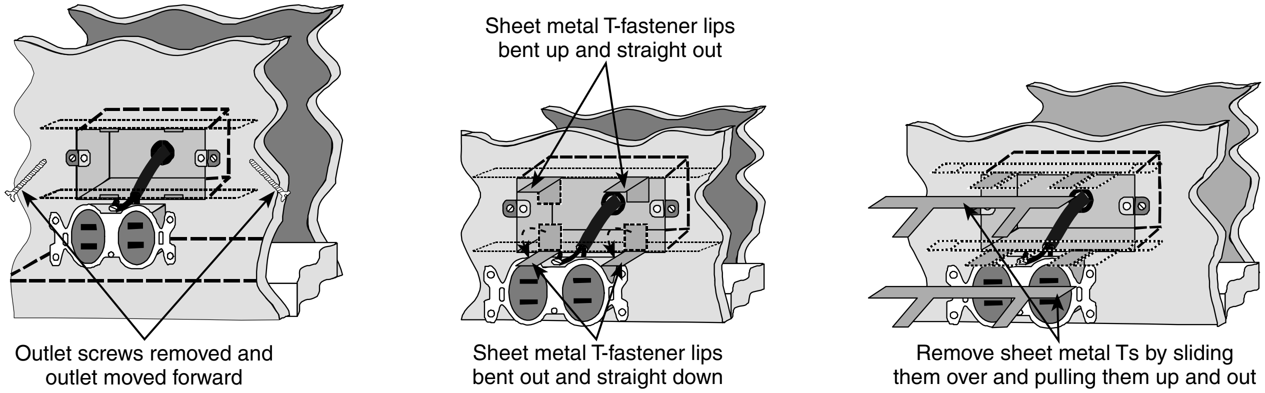


Figure 8-22
Preparing an outlet box for removal

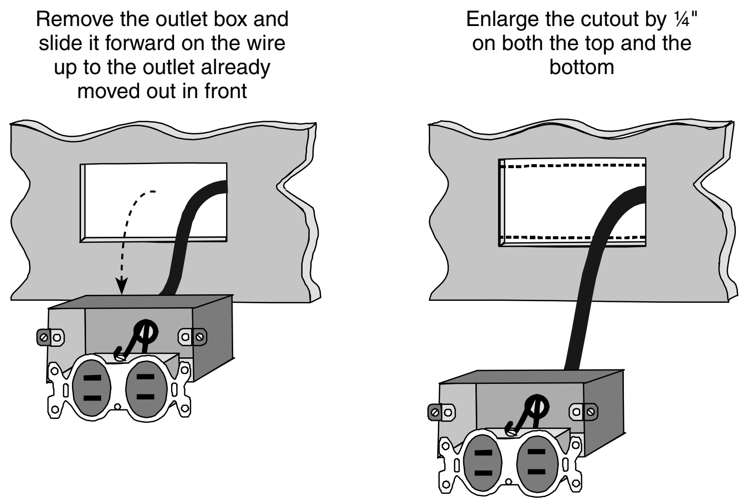


Figure 8-23
Removing the outlet box and enlarging the cutout for ease of installation

- The edges of the old cutout will be in the way when you insert the metal Ts, so cut the wall ¼ inch on both the top and bottom with a utility knife. Don't worry about how the hole looks; the new drywall will hide it. If you use a saber or reciprocating saw, be careful of the wires inside.
- Put the new drywall sheet in front of the old cutout.
- With the new sheet of drywall in front of the outlet and box, reach through the new cutout and pull the outlet and its box through.

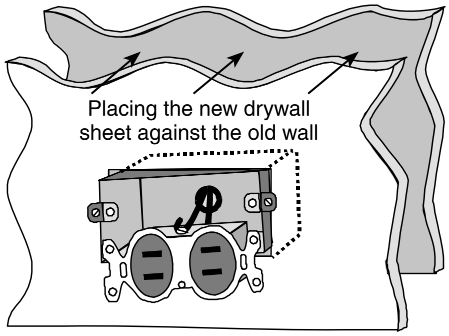


Figure 8-24
Fitting the new drywall sheet in place

- Push the drywall sheet tightly up against the wall (see Figure 8-24).
- Temporarily tack the drywall in place with two nails. Let the nail heads stick out a bit.
- Push the outlet box in until the two tabs in the front of the box are flush with the surface.
- Work the sheet metal Ts into place on each side of the box.
- After the legs are in, pull them up tight on the back of the wall, and bend the T ends inside the box to hold it securely in place.
- Replace the outlet back and the cover plate.

A Happy Ending

In this next example, the owner hired me to install a fan and light in the middle of his family room ceiling. The power for the new fan would come via the existing circuitry connected to an overhead light, near the room's entry. The old light was to be removed, the bracket covered up, and the wiring extended to the new fan and light. I could run new wire from the wall switch, but that would mean running wire inside the wall from the switch all the way over to his new ceiling fan location.

Here's my solution: I ran new wires out of the old electrical box in the ceiling to power the fan. They went from the old box to the attic, then over to the new electrical box I'd centered on the ceiling. In effect, the electrical box became a junction box for the new wires. That meant the box had to be moved above ceiling height, so new tiles could cover its old location, and that presented a problem.

The old electrical box was ¾-inch thick and screwed flush to the ceiling boards above the tile. The box stuck out a little below the ceiling tile, but the light fixture had covered it. Now, however, the box had to be moved up flush with the ceiling boards. The ceiling tiles were stapled directly to the ceiling boards; there were no furring strips. In order to raise the electrical box, I had to cut out the boards around it.

I went into the attic and removed the poured insulation around the box, to see what I had to work with up there. There were four wires in the attic going into the box, so I wouldn't be able to cut the boards from up in the attic, because by the time the wires got to the side of the electrical box up in the attic, they were only about 2 inches above the floorboards. This wasn't enough space to cut the ceiling boards from below using a saber saw — not enough safe clearance by the wires.

Before I did any cutting of the ceiling board, I had to carefully cut out the old tiles around the electrical box. I used a square to cut against, and put the edge of the square right on the joint between the tiles. I ended up removing four tiles, exposing the ceiling boards around the electrical box.

Then I drilled a line of four or five holes on each side of the box, using a ¾-inch spade bit. I had to proceed carefully, and stop the drill as soon as it broke through the ¾-inch board, or the drill could have poked through the board and hit one of the wires.

Once I got the first hole drilled, I could see the wires up in the attic, so I could keep the bit from hitting them. After that, it was simply a matter of chiseling out the square.

First I drilled two lines of holes against the grain of the board. I didn't have to drill all around the box, because the two rows of holes made it easy to remove this small section with a few strokes of the chisel. I pushed the box up above the ceiling boards, and connected the new wires to the old, then installed the cover plate.

All that was left now was to re-tile the ceiling. Ceiling tiles are quite fragile, so they can easily be dented or scratched. Sometimes you can remedy this by patching. But usually you have to bite the bullet and replace the damaged tiles. You install new tiles by locking them into grooves in the existing tiles. Slide the first tile or two into place, and cut off a few of the tongues on the succeeding tiles — otherwise they'll overlap the old tile. If you end up with a slight gap at some joints, cut a bit of the new tongue off to get the joint to fit together tightly. If any old tiles are loose, squirt some paneling glue under their edges before putting up the new ones.

When fitting the final tile, you'll need to cut off at least three of the edge lips, so you can push the tile up into place. If necessary, use paneling nails to hold the tiles up until the glue dries. A dab of caulk will cover the nail heads. See Figure 8-25 for some pointers on the entire ceiling tile replacement process.

> ***DON'T FORGET*** *to buy a cover plate for an open electrical box. Building code states that all junction boxes must be enclosed and accessible. Remember: if a house you worked on should ever catch fire, the first thing inspectors would look for would be faulty electrical work. It's enough ammunition for an insurance company to shoot down a homeowner's policy.*

In most cases, you'll have to repaint the ceiling. Ceiling tiles are usually white, but there are many different shades of white, as you may have already found out the hard way. If you get an exact match, you've beat the odds.

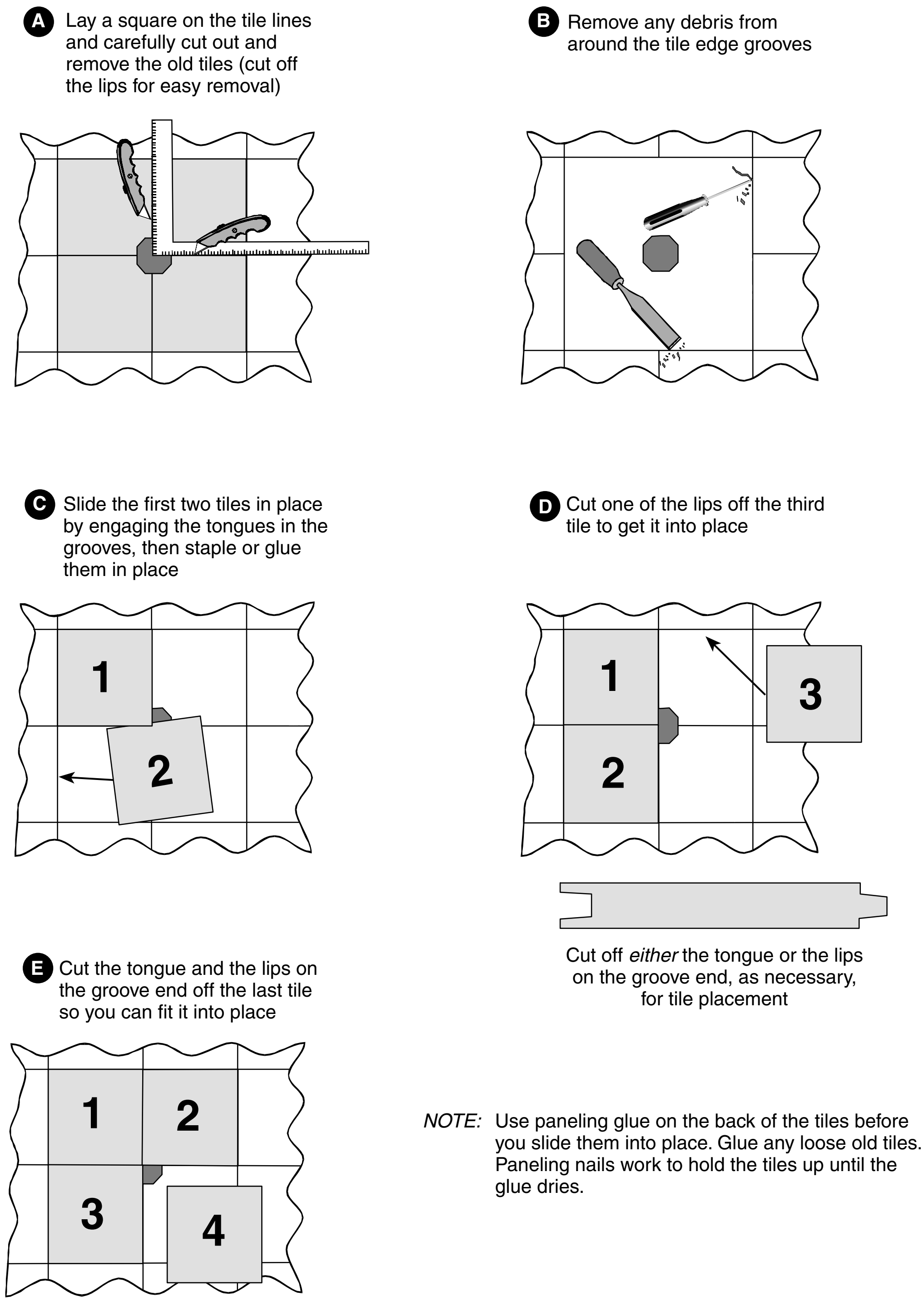


Figure 8-25
Replacing damaged ceiling tiles

Extension Cords

One of the most frustrating things about electrical work is tangled extension cords. Unfortunately, it's a universal experience: When you wind up your cord, the thing immediately starts to kink. Every coil you make puts in another twist. In no time at all, your extension cord is hopelessly knotted.

Tangle-Free Cords

There's an easy solution to those snarled extension cords, and I'll share it with you: Make a backward twist when you feel the cord try to go its own way — this immediately takes the tension off. In other words, put the ending turn of the new coil behind the coil being formed. Do this reverse move every four or five turns. Look at Figure 8-26 to see what I mean.

Continuing on with Figure 8-26, wrap and secure the extension cord as I've shown. If you do, it won't knot when you unwind it, either. I don't know about you, but when I see my cords in a wad of knots, my first thought is to throw the whole mess away and just buy replacements. This foolproof way of winding and storing extension cords saves you money, and sure lowers your blood pressure.

Cold Weather Tips

While we're on the subject of extension cords that seem to have minds of their own, here's some advice for those of you who live in cold parts of the country. Instead of using regular extension cords that become hard and inflexible in cold conditions, get the cold weather type. You'll see *"No Cold Weather Stiffening"* marked clearly on the label. They cost a little more, but are well worth it; the coils stay nice and limber.

Have you ever cut off the cord on your circular saw because it was stiffened from the cold and "hiding" under the saw? Me, neither. But speaking of these particular cold weather cords, I cut about 10 feet off the end of one of them and put it on my circular saw, replacing the cord that was on it before. Although this voids any warranty, it makes using the saw much easier in cold weather. So for me, it was worth it. If you do this, get an extension cord rated for 15 amps.

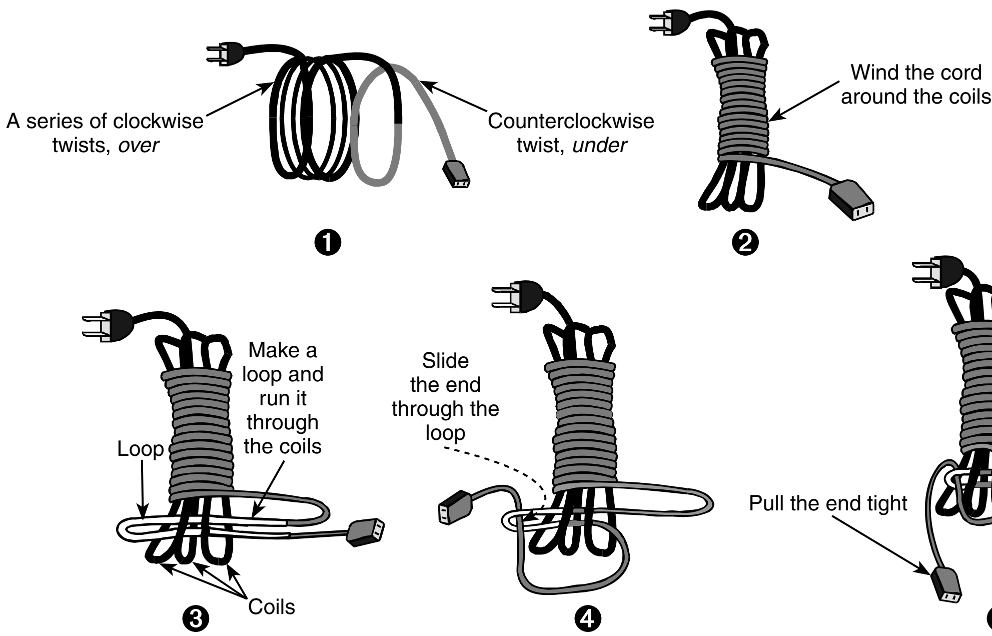


Figure 8-26
Five simple steps to avoid tangled extension cords

9

PLUMBING

There's no better way to be a hero to your customer than solving his plumbing problems. Plumbing is the sort of thing that always needs to be in good working order … and if it's not, it's imperative that it be fixed *immediately*. No other single part of the house is more critical to your customer's well-being. The old days when there was a handy outhouse for a back-up are many years in the past.

Toilets

Everyone has a toilet, so that's where I'm starting this chapter. Chances are, you've run into most of the situations I'm describing here. If not, I'll help you with them, and we'll save your customer some money.

Constantly Running Water

A persistent trickling of water is a common problem in old toilet tanks. Listen closely at the top of the toilet tank. If you hear a slow drip inside, take off the tank cover. If the water is up to the top of the overflow pipe, the fill valve (also called a tank valve) probably isn't closing completely.

Parts of a toilet

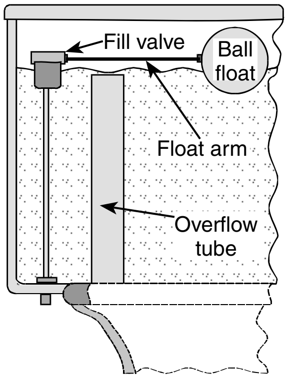


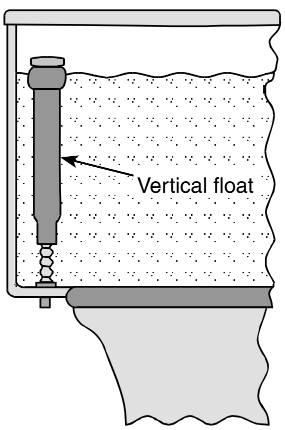
Figure 9-1
A simple cleaning may fix a leaky toilet

Valve Mechanisms

If water keeps leaking, the cause could simply be dirt or rust in the valve mechanism. The shutoff is designed to stop water from reaching the top of the overflow tube — which keeps the tank from overflowing onto the floor.

Try cleaning the old component first; see Figure 9-1. Shut off the water, then flush the toilet to drain most of the water out of the tank. After removing the tank cover, you'll see the round top of the fill valve, with two or three screws holding it in place. Remove these screws and lift out the top, along with the ball float and arm.

Turn it upside down and rinse it out inside, being sure to put a stopper in the sink first. (There shouldn't be any loose parts to fall out, but you don't want to chance losing something important.) Wipe it with a damp paper towel, and clean out the inside of the tank, too, as well as the chain-pull stopper at the bottom. Put everything back together and see if you've stopped the drip. If cleaning doesn't fix it, your client will need a new flush valve kit, which costs around $15.



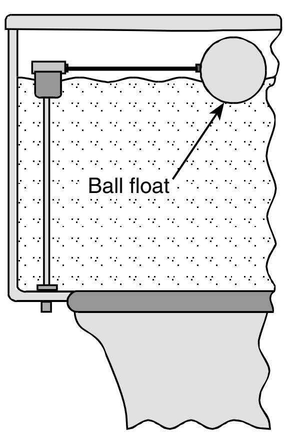


Figure 9-2
Two types of toilet floats

Float Mechanisms

There are two types of float mechanisms, as seen in Figure 9-2. Older toilets have a ball float mechanism, while newer floats are an inverted plastic cup that slides up and down along the supply tube. There's always a chance that you could twist something out of shape when you loosen the fittings, so do this early enough in the day that the hardware store is still open in case you need a part. Better still, have a flush valve kit in your truck already. They're cheap and are universal fit, and you're bound to need one sooner or later. If you damage the solid copper tubing, use flexible tubing as a replacement. The tubes come in several lengths. Get one a little longer than you need. It will curve to fit in place.

You can always replace an old unit with a newer plastic unit, which fits into any tank. But you may find that a valve kit would stop the drip. Simply put a new seal washer in place of the old one. Don't forget to wipe everything off before you put the new washer unit in. Simply press down on the top of the unit and turn — the cap lifts right off.

Flush Stoppers

A flush stopper that slowly leaks water into the toilet bowl could be the problem. The flush stopper, also called a flush valve seat, or flapper, is at the bottom of the tank, in the middle, with a chain attached to it. Pushing the handle down to flush the toilet raises the rubber stopper, which can become deformed as the rubber ages.

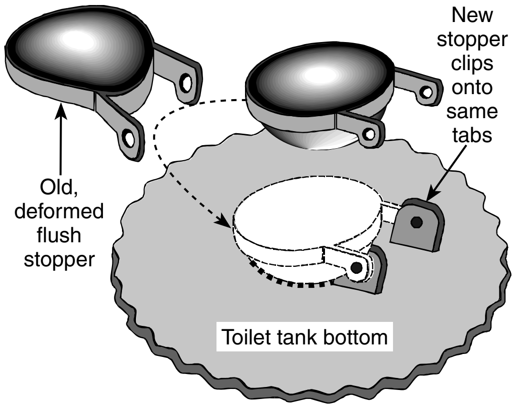


Figure 9-3
Replacing a flush stopper

What would you look for in the case of a malfunctioning flush stopper? One symptom is that water slowly trickles into the toilet bowl. A lower water level in the tank causes the float to go down, triggering the valve to open, letting more water in. In this case, there's no fixing involved — you'll have to put in a new stopper; see Figure 9-3.

Shut off the water and flush the tank to drain it. Then slip each of the stopper ears off the hard rubber base at the bottom of the tank. Wipe any gunk off the opening, then, to put the new rubber stopper on, slip the two little ears over the tips on each side of the base unit.

A Leak at the Toilet Base

A floor that's visibly — and continuously — wet around the toilet base could indicate deterioration of the wax seal ring between the toilet floor flange and the toilet bottom. These rings eventually break down. You don't have to take out the old wax ring; in fact, it's better not to. Adding a wax ring to the one already there helps seal the joint tightly.

Most wax rings come with a plastic insert to help shape the wax so it seals better. But when you're putting a new ring on top of an old one, the plastic insert would prevent the two rings from sealing well, so you won't be using it. Buy just a plain wax ring.

Here are the steps to fixing a leak caused by a faulty ring, illustrated in Figure 9-4:

1. Shut off the water supply and flush the toilet. There'll be a little water trapped in the gooseneck at the bottom of the toilet. Scoop out as much of that water as you can, then soak up the rest of it with a sponge. Since you'll be tipping the toilet when you move it, you don't want to leave any water inside.

2. Disconnect the supply line at the shutoff. Unscrew either the nut that holds the supply tube to the bottom of the tank or the one that holds it to the shutoff.

3. Remove the rounded caps over the bolts holding the toilet to the floor. The brass nuts should unscrew easily. However, sometimes the bolts break off below the floor flange, which you may have to remove. Toilet bolts have screw threads, so you can screw new bolts into the floor, if all else fails.

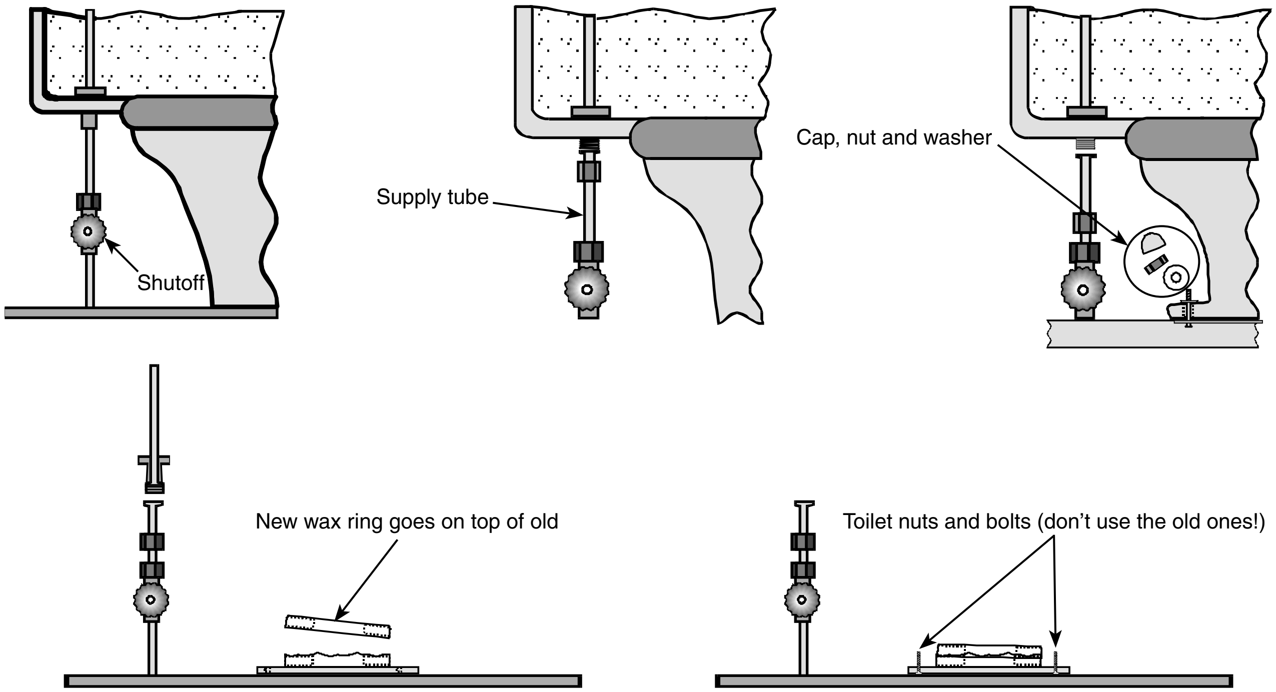


Figure 9-4
Fixing a leak caused by a defective wax ring on a toilet base

4. Temporarily thread two of the nuts onto the bolt. Screw the sharp threaded end into the floor with a wrench. It tightens the top nut against the nut under it, so you can screw the bolt in.

5. Once you've fastened the new bolt, remove the nuts and do the same thing with the second bolt. If the floor flange is rusted out completely, there's a PVC floor flange that you can screw directly to the floor. This means you can replace the flange without having to replace the rest of the original collar.

6. Remove the toilet. Don't set it down in the bathtub or on the shower floor without putting some protective material under it; there may be jagged edges that will scratch the enamel or polished finish. If the old wax ring is pulled up a little, push it back into place with a chisel or putty knife, as you'll be putting the new ring on top of it.

7. Put the new ring down, and the toilet over it. This squeezes the two rings together.

8. Rock the toilet back and forth to compress the rings even more.

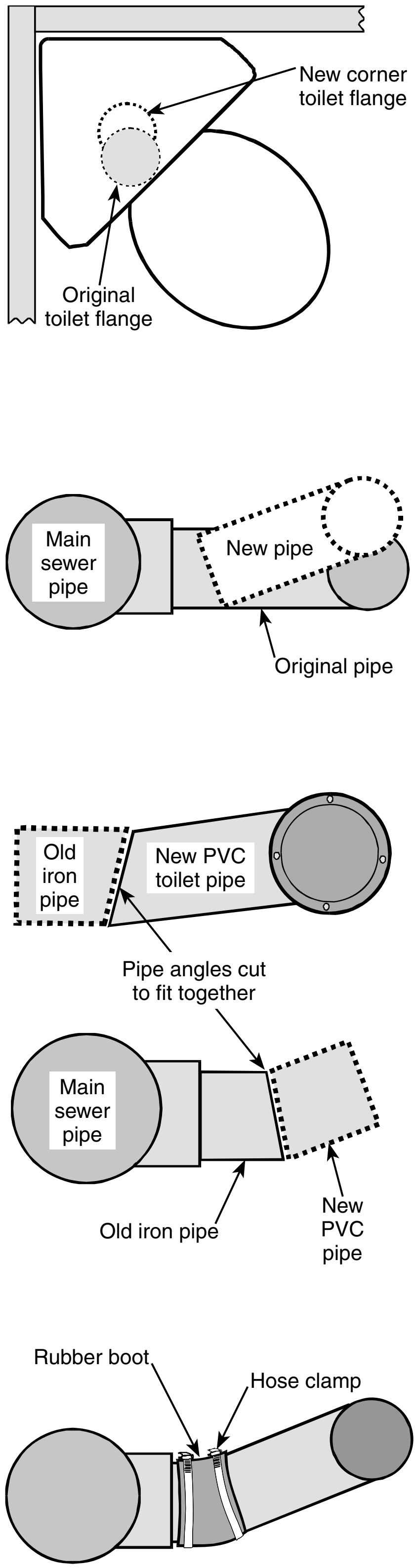


Figure 9-5
How to fit the pipes for a corner toilet

9. When it feels secure, put the new washer and nut on each new bolt, and tighten them. Be careful not to crack the porcelain by over-tightening. Don't try to reuse the old washers, nuts and bolts.

10. Replace the plastic caps, reconnect the water line to the toilet tank, and you're in business.

As a final note, new toilet installations use PVC pipe and rubber ring kits instead of wax rings. They provide a good seal, and never need replacing. The kit is easy to install, and costs only a few dollars.

Replacing a Standard Toilet with a Corner Unit

I recently installed a corner toilet in place of a standard one. The homeowner wanted a toilet that would take up less space in the bathroom. I found out, the usual way, of course, that this kind of installation demands a lot of work on the floor and plumbing.

A standard toilet has a large flange for the sewer pipe, 12 inches out from the wall. Figure 9-5 illustrates this setup. A corner toilet is at a 45-degree angle from the wall, so the original opening for the sewer pipe is several inches from where the new sewer pipe will be. The angle of the new sewer pipe is different from the original, so no new sewer drainpipe can make a connection to the main large sewer pipe going into the basement floor. You can change the position for the new floor cutout, and cover the old one, but rigging a connection for the new angled toilet drainpipe to the main sewer pipe is tricky. Here's how to solve the problem:

- Cut out the floor in the new location and fill in the old cutout.
- If the floor is to be covered with thin vinyl floor covering, smooth the surface with a putty-type material like Durabond 90.
- The old cast-iron plumbing has to stay where it enters the main, going down and out through the basement floor.

> ***CAST-IRON PIPE*** *never breaks evenly. You might think that you could cut through it with a hacksaw. Forget it. You could saw for an hour with a hacksaw and hardly make a mark on the pipe. Put a metal-cutting blade in your power saw and (literally) grind through the old sewer pipe to cut it off.*
>
> *There are two types of blades: One cuts metal and one cuts concrete (masonry). Get the metal-cutting blade if you want to guarantee cutting through cast-iron pipe. These blades are only about ¼ inch thick, so be careful not to exert sideways pressure on the saw or blade. I've never had one of these blades break and shatter, and I don't want you to, either. Always wear safety glasses when cutting; the small bits of metal could do a lot of damage to your eyes.*

- ➢ If you're using PVC, splice it onto the cast-iron pipe near the old main. Make sure the main is clear of buildup. Now is a great time to clean it out, while you have access.
- ➢ In this particular job, moving the floor flange over a few inches for the corner toilet made it impossible to use standard pipefitting to join with the original drainpipe. The angle was unworkable. I had to angle cut the end of the iron pipe (with a metal-cutting blade in a power saw), and match that angle on the new PVC. Then I used a rubber boot to seal the angle-cut joint, and put hose clamps on each pipe.
- ➢ Stuff wadded-up plastic into the end of any open sewer pipe to keep gas from entering your work area.
- ➢ Once you've cut the pipes and they're ready to fit in place, use a rubber boot to join them. Heavy rubber boots go around just about every diameter pipe. They also have rubber boots that go from one size pipe to another. Be sure the boot is listed for this specific use. Use two hose connectors on each side of the joint to be safe.

Repairing a Broken Toilet Tank Lid

Here's a repair I made that most contractors would laugh at. An old widow near where I live had somehow broken the lid on the top of her toilet tank. It was an old type, much larger than they are now, and baby blue, as were the sink and the tub. I guess this must have been fashionable back when the house was built. But there was no way I'd be able to find a match for any of the fixtures — and she wouldn't have been able to afford them even if I could. And I couldn't just leave it, as one of the halves might fall off and land on her foot.

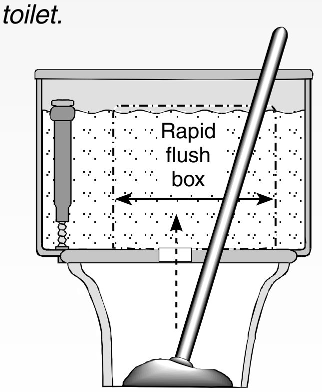
This was one of those occasions where I had to figure out something that would work — and it wasn't a case where I had to worry about the code or an inspector. Here's what I did.

HOW TO PLUNGE A CLOGGED POWER FLUSH TOILET

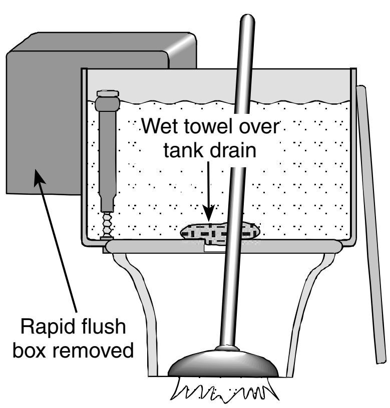
Power flush toilets have more pressure emptying the toilet bowl, but you can't plunge them the ordinary way when the pipe gets clogged. A plunger can actually push the clog up into the toilet tank instead of pushing it out the drain trap.

So, here's how to get rid of a clog:

1. *Remove the inverted plastic box in the toilet tank.*
2. *Hold a folded wet towel over the water outlet at the bottom of the toilet tank, preventing the water from going up into the toilet tank.*
3. *Plunge away … your plunging now pushes the clog out of the toilet.*



The water goes up into the tank, and the clog in the trap isn't pushed out



Toilet now plunges like it should

I started by cutting a piece of heavy galvanized sheet metal to fit loosely inside the lid. Then I opened up my can of trusty Bondo (I love this stuff, because it *works*). Then I filled the cracked edges with Bondo and pushed the two sides together tightly for a few minutes until the Bondo began to set up. Then, using a grater-type plane, I got the Bondo down until it was fairly flush with the porcelain tank top. Porcelain is pretty tough, so unless you're really careless, you won't scratch it. Remember to use the grater as soon as the Bondo sets up enough. Test it with your fingernail.

Next, I turned the tank cover upside down and scraped the lumps of Bondo off the seam inside. I wanted to get the inside surface fairly smooth, so I could Bondo the sheet metal to the inside of the tank cover. Then I cleaned the inside of the cover with rough steel wool, so the Bondo would stick. I spread Bondo on the metal and centered it inside the tank cover. Finally, I glued the metal inside to keep the porcelain and Bondo from cracking again later.

Now, how did I paint the surface of the tank cover to match the old baby blue? First, I sanded the outer surface with my jitterbug sander. I found gloss spray paint that matched the toilet's color. However, getting a good spray paint job on the tank cover took some practice and patience. As always, I tested my technique on a scrap piece of porcelain. Don't think you can simply give the tank cover a thick coat of spray paint. For the best result, apply at least three light coats. As you spray each coat, overlap the passes. Never stop the can when you're spraying; make slow, even passes. A coat that just about covers with each pass is plenty. You want a beautiful silky finish — no runs and no drips. When I finished, you couldn't tell I had made the repair.

Did I get well paid for my time and my skill? Well, not exactly. Probably about the same rate as the plumber who installed those awful blue fixtures in the first place. But I didn't have any other work at the time, and I liked being able to accomplish an almost-perfect fix on a job that most contractors wouldn't have even tackled. I felt good about it, and sometimes that's enough.

Replacing Rotted Floorboards Under a Toilet

Because toilets are prone to leaking at the base, it's inevitable that the floorboards underneath them rot. Rather than replacing the whole bathroom floor, just cut out the rotted area and replace it up to the middle of the closest floor joists. This repair is possible only if there's a basement or another floor below the toilet in question.

- First, locate the floor joists. Use a bit the size of a 16-penny nail in your drill. Drill a hole in front of the toilet. Drop a nail into the hole, then go down into the basement (or downstairs) to see where the nail came out. You'll be able to see how far the nail is from a floor joist. If you can't find the nail, you could have drilled into a floor joist.
- From upstairs, stick a piece of wire down through the hole. If it stops, you've hit a joist. All you have to do then is drill another hole 1½ inches over from it to miss the joist. Of course, if you drill the new hole in the direction the floor joist is running, you'll keep drilling into it the whole length. But that's completely avoidable by looking in the basement to see the direction the joists are running.
- After measuring for joists in the basement, go back up to the bathroom and mark the location of the joists closest to the rotted floor.
- Drill through the floorboards where you've located the edge of a joist.
- Drop another nail in the hole and go down to see if it's near the edge of a joist.
- Drill a hole in the floor with a ¾-inch spade bit, on the edge of the joist you found.
- Take the toilet out and mark for the floor cutout. Knowing where the edge of one floor joist is, you should be able to mark where to drill more holes to find the

edge of the second joist. The edges of the floor cutout must be in the middle of each joist, so that the ends of the new boards can rest on the joists. Once you've found the edges of the joists, you can accurately mark ¾ inch in for the cutout.

- Set your circular saw blade down a little deeper than the thickness of the floor. The saw blade won't cut right to the corner, so chisel out the uncut bits of wood. You want clean corners when you lay down the new flooring in that area. Once you have the boards cut out, mark their shape on the new boards.

- Use paneling, thin plywood, etc. to bring the thickness of the new floor up to the height of the old floor. You can raise the new floor section with shims in a small area, if needed.

When using plywood as a base, cut it in half in the middle of the toilet pipe cutout. That gives you two halves to slide under the toilet flange, making it easier to get them in place. If you need more bracing, nail 2 x 4 strips under the floor beside the old floor joists.

Toilet Seat Fasteners

Toilet seats are fastened on with nylon wing nuts. The reason they're nylon and not metal is because nylon nuts don't rust. But they do corrode, which can make them very hard to remove. The next paragraph describes a common problem, the solution to which may have eluded you.

Ideally, you're able to loosen the nylon toilet seat nuts with your fingers. On this particular job, I needed pliers. But all they did was crush the ears on the nuts. I tried slip-jaw pliers, because of their longer handles and better leverage. Well, the nuts wouldn't turn, and by now there were no lips left to grip. I got my vise-jaw pliers and clamped them as tight as I could. Guess what? The nuts *still* wouldn't turn and, by now, they were completely mashed out of shape.

Well, I did get the nuts off. But it wasn't pretty. What did I do? Got out my propane torch and, with cardboard on the floor under each nut, melted them right off the bolts. Sure, they flamed and smelled to high heaven as they melted, but they came off. The porcelain toilet wasn't harmed, and the floor wasn't damaged. This took me about five minutes. But what causes nuts to freeze up if they're made of nylon? Even though *they* couldn't rust, the bolts could. The rust built up within the nylon threads, making it impossible to turn the nuts.

QUICK PIPE REPAIR WITH RUBBER PADS AND CLAMPS

You can buy clamps that hold rubber pads in place against pipe leaks. They come in several sizes for different pipe diameters — usually in a kit — and are available at most plumbing supply stores. Sand the pipe area before putting the clamps and pads on the pipe. You don't want scale or rust to impair the seal.

Repairing a Leaky Galvanized Pipe

Fixing a slow drip in rusty galvanized pipe can be a real problem. A drip invariably means that the old pipe is rusting out from the inside. You can bet that if it's leaking at one spot, it will soon be leaking everywhere. If you cut this section of pipe and try to unthread it, the rusty threaded section could break off inside the next fitting. That would mean replacing that fitting also. And so on and so on. Worse, if the fitting is a T, you'd also have to cut one of the other legs going to the T to rotate and unthread it. And guess what you'd have to do then? Right — replace that section too.

You can't replace a single section of threaded pipe if it's connected to other sections of pipe that can't be rotated. It's that simple. It's impossible. You have to use two sections of pipe, joined by a pipe union (see Figure 9-6), to replace the original single pipe. The union joint can be tightened without moving either attached section of pipe.

You can try cutting galvanized pipe with a hacksaw, but it's a real hard job. If you go this route, use a metal-cutting blade in a circular saw. However, the best way to fix this is to replace the original iron pipe with PVC. Cut out the bad section of pipe and screw in a galvanized-to-PVC connector where each end of the old pipe used to be. Wrap Teflon tape around the threads about three times. Then glue in the section of PVC. You can also use push-fit connectors.

The Basin Wrench

Here's something you may only think about when you're under a sink and have the wrong tool: Faucets installed for sinks on countertops don't leave enough room for you to tighten the faucet nuts under the countertop — there isn't room to swing a standard wrench. To do the job, you'll need a basin wrench. Figure 9-7 illustrates some of the advantages of this specialized tool.

This wrench has a spring-loaded jaw to hold tight around the nut. The jaw can swing to the right or left for either tightening or loosening. The handle is held vertically when tightening horizontal faucet nuts. The tightening bar sits below the bottom of the sink when the jaws are on the nut, so there's no problem turning the handle.

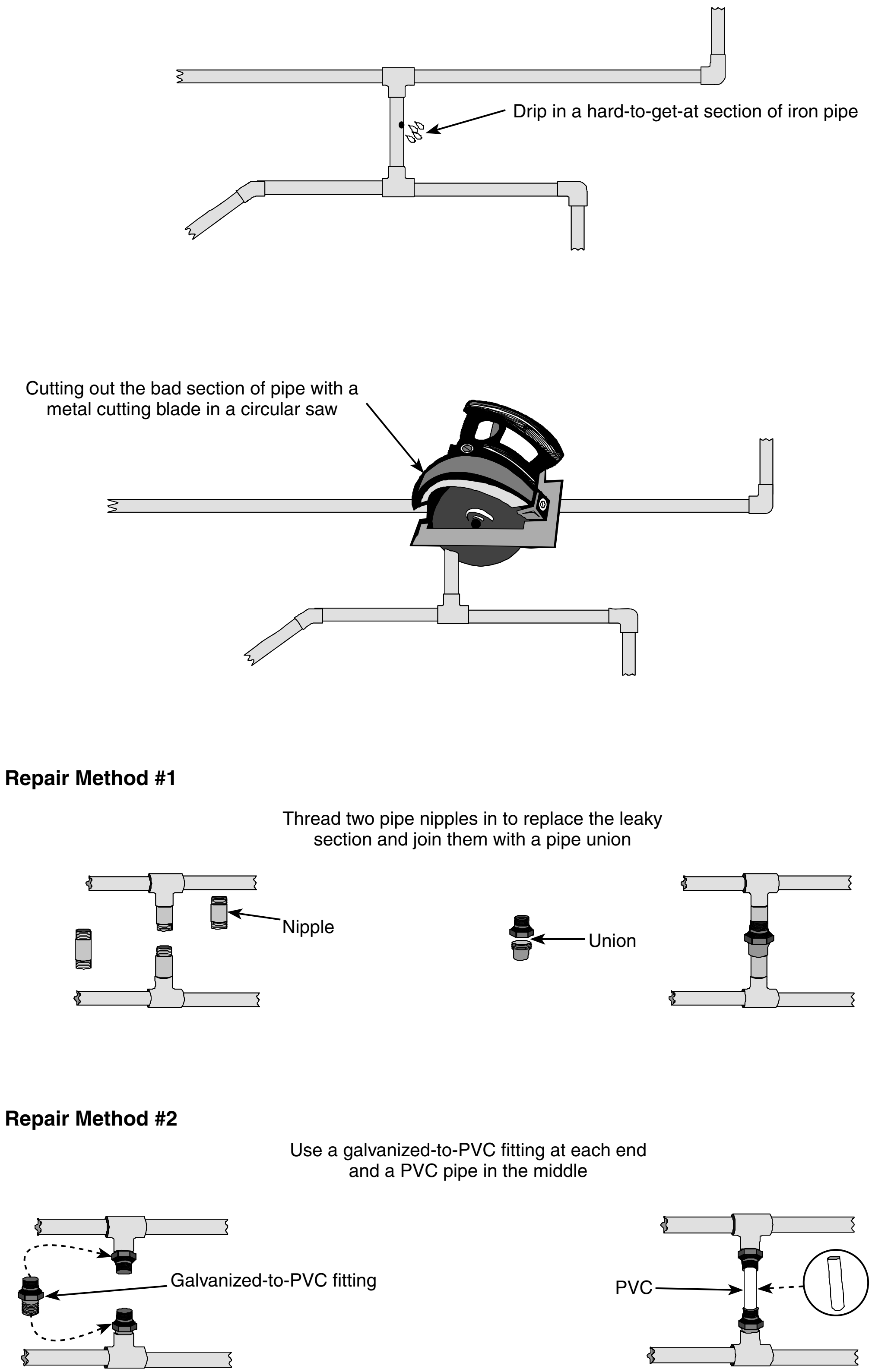


Figure 9-6
Replacing a section of old iron pipe

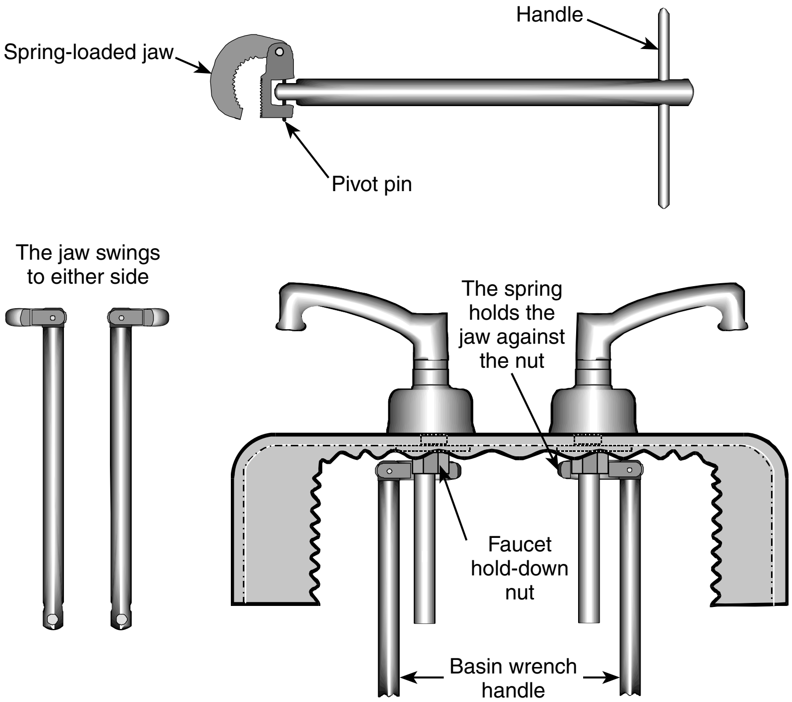


Figure 9-7
Basin wrench

Replacing Copper Tubing

This problem came up in a nearby summer rental. Since it was only occupied part of the year, the water pipes had to be drained every fall to keep them from freezing. Unfortunately, the previous fall someone had forgotten to open the tub water control handle. What was so bad about that? Well, water stood in the pipe, and later in the winter it froze, expanding and exploding the copper pipe. The water didn't flood out because the pump had been shut off.

Well, come the next spring, the house was occupied, and when the water was turned back on, the pump started running and only shut off for a matter of seconds before turning back on again. In the bathroom, where the tub control had been forgotten, water was oozing out of the wall behind the tub. The renters could hear water running inside the wall, and when they went down to the basement, the problem was obvious. Water was running down in sheets from the bathroom into the basement. Well, the burst section of copper tubing obviously had to be replaced, and that's where the problem came in.

The bad piece of copper tubing was inside the wall, so I cut out a rectangle of drywall to gain access to the section of bad tubing. With little room to swing a tubing cutter inside the wall, I used my Handisaw®, a short saw with a hacksaw-type blade. So far, so good.

The problem manifested when I tried to solder in the new piece. Both ends of tubing were soldered fast to fixtures, so they were unmovable. Figure 9-8 lays this out so it's easy to understand. I couldn't push the pieces of pipe up or down to get that last joint over the new section of tubing.

Getting the first joint on was easy. I slipped it over the end and put the new piece of copper tubing into the joint. It was easy because I could move the new piece sideways enough to slide it in place.

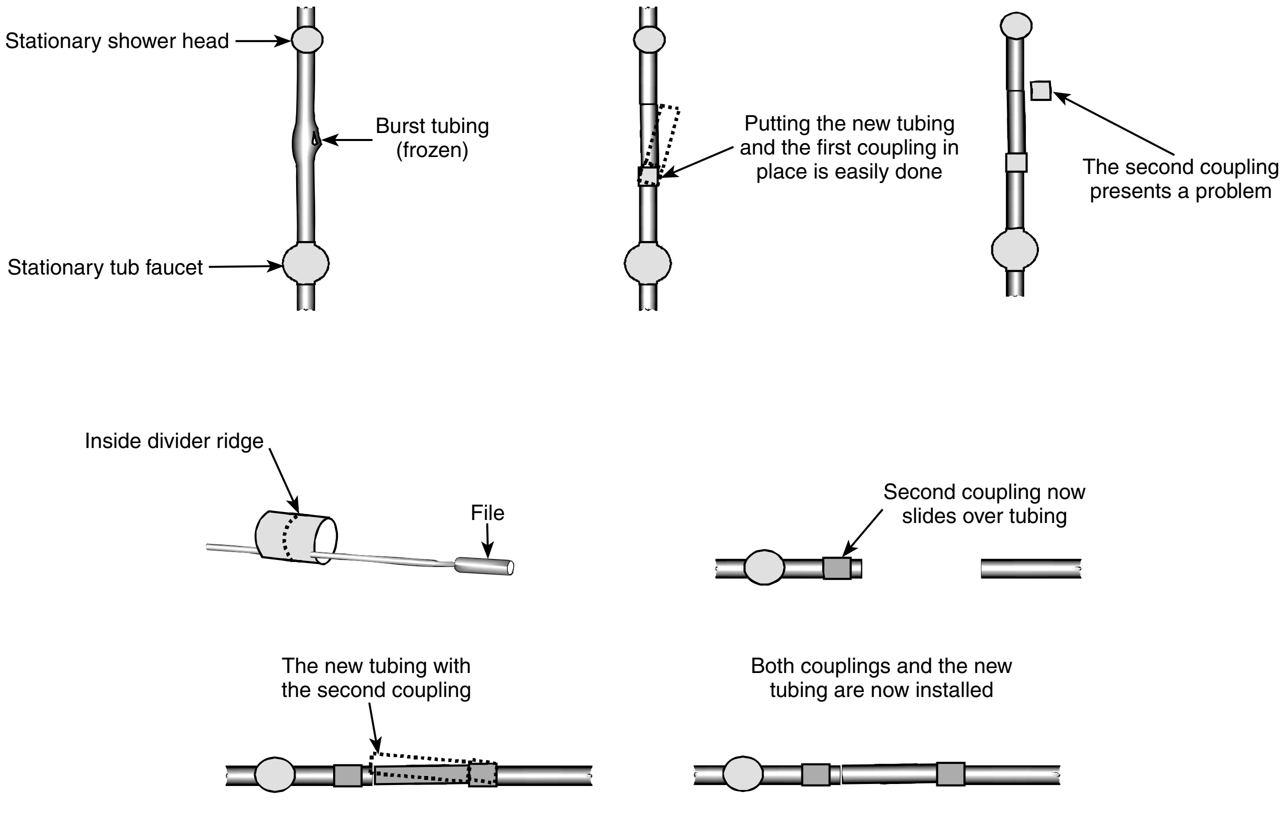


Figure 9-8
Solving a tubing repair problem

But the *other* cut end was a bear. It wouldn't go into place unless the ends of the two pieces of tubing could be spread apart enough to get the joint on. And they weren't budging.

My solution was to file the little ridge down inside the copper tubing connector joint. You can see it inside, going around the copper pipe joint. It stops the joint from sliding more than halfway over the tubing. The ridge centers the joint automatically between the two pieces necessary for normal joint soldering.

But this ridge was a troublemaker. I couldn't slide the joint past it to make enough room to line up the pieces. Once I filed it down, I could slide the joint up out of the way on the cut tubing. I used a ½-inch round metal file because of its larger arc. You could even take down the ridge with some rough sandpaper on a dowel. It might be slow work, but since copper is soft, and the ridge is narrow, it wouldn't be hard work.

Tips for Fixing Leaky or Clogged Faucets

Older faucets had packing inside to seal the screw mechanism responsible for water shut-off. New faucets rarely have packing because their seals are so much more efficient. But you'll still run into old faucets — at outside hose bibs, for instance. The best solution is to simply replace the old faucet with a new one. But sometimes you don't have that option — you're stuck with having to fix what's there. In that case, you need to know how.

Replacing Faucet Packing

If your customer has been complaining about a drippy old faucet, try replacing the packing. When the faucet packing starts to wear, a drip appears around the faucet handle where it enters the body of the faucet. The drip gets worse when the handle is rotated to turn the faucet on or off. (See Figure 9-9 for the inner workings of an older faucet.)

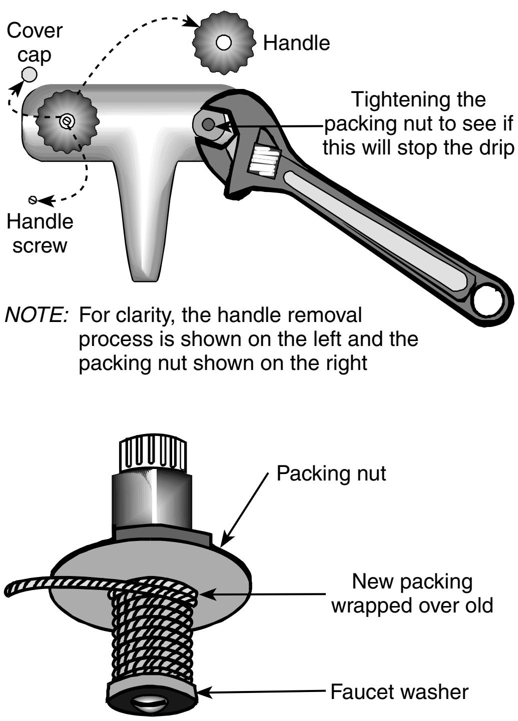


Figure 9-9
Fix a drippy faucet by tightening the packing nut or adding new packing

Tighten the hex nut around the faucet handle where the post goes into the faucet body. If the packing is worn, the nut will do a half-turn clockwise before tightening up. If you can't see the packing nut, pry off the center cover cap, take out the screw that holds the handle on, and remove the handle.

"If your customer has been complaining about a drippy old faucet, try replacing the packing."

This should expose the packing nut, which looks like a thick metal washer with two flat spots on it for a wrench. No matter what the nut looks like, turn it clockwise with a wrench. Does it do a partial turn before tightening up? With the handle back on, try the faucet. Does it still drip around the handle? If it still leaks, you'll need more packing inside the faucet. Packing is sold in hardware stores and plumbing shops. It comes in a small package and looks like heavy black twine.

Remove the faucet handle and loosen the packing nut until you can lift out the faucet mechanism. You'll see packing wrapped around the shaft below the nut. It won't look like twine anymore because it's been packed into a mush around the faucet handle shaft. You won't need much new packing. Just put about three turns of the new packing around the old, then break it off. Don't wind too much twine around the shaft or you won't be able to put it back together. The packing will compress because it's designed to make a seal. If you stuff the packing in and can thread the packing nut on, it should be about right. Put the faucet back together and tighten the packing nut. If you still have a drip, wind a little more packing around the shaft.

Faucet Repair Kits

If a single-handle faucet leaks around the sleeves connecting the handle and spout above the faucet base, the rubber o-rings, gaskets and tiny rubber cups inside need to be replaced. When they age, these pieces shrink and deform, so water that should stay inside leaks out around the handle and spout edges. Luckily, most single-handle faucet replacement mechanisms are universal, no matter what the brand. Consequently, they're called "Universal Repair Kits for Single-Handle Faucets." Catchy, huh?

Go to a plumbing supply shop to get your parts. They have everything for every type of faucet, shower controller, pump, spray head, etc. Tell them the brand name of the faucet that you're going to repair. Even though most faucets have universal parts, your client could possibly have one that doesn't fit that bill. The salesman will know what parts you'll need for any particular brand of faucet.

1. The first step in repairing the leak is to remove the water-control handle. It's held on by an Allen screw either at the front or back of the control handle base. Once you loosen the screw, you can lift the handle off. The spout will come off too, because it was secured by the handle. You'll see a dome-shaped metal semi-circle with a knurled ring around it, as shown in Figure 9-10. This dome covers the o-rings, springs, etc. and holds them in place.

2. Put a damp towel over the drain so you don't lose any small parts when you remove the handle. Although you'll most likely replace the parts, you still want to have them so you know what to look for at the hardware store.

3. Remember the order of the cups and springs when you take them out. If you replace things in the wrong order, the faucet will leak worse than ever or maybe

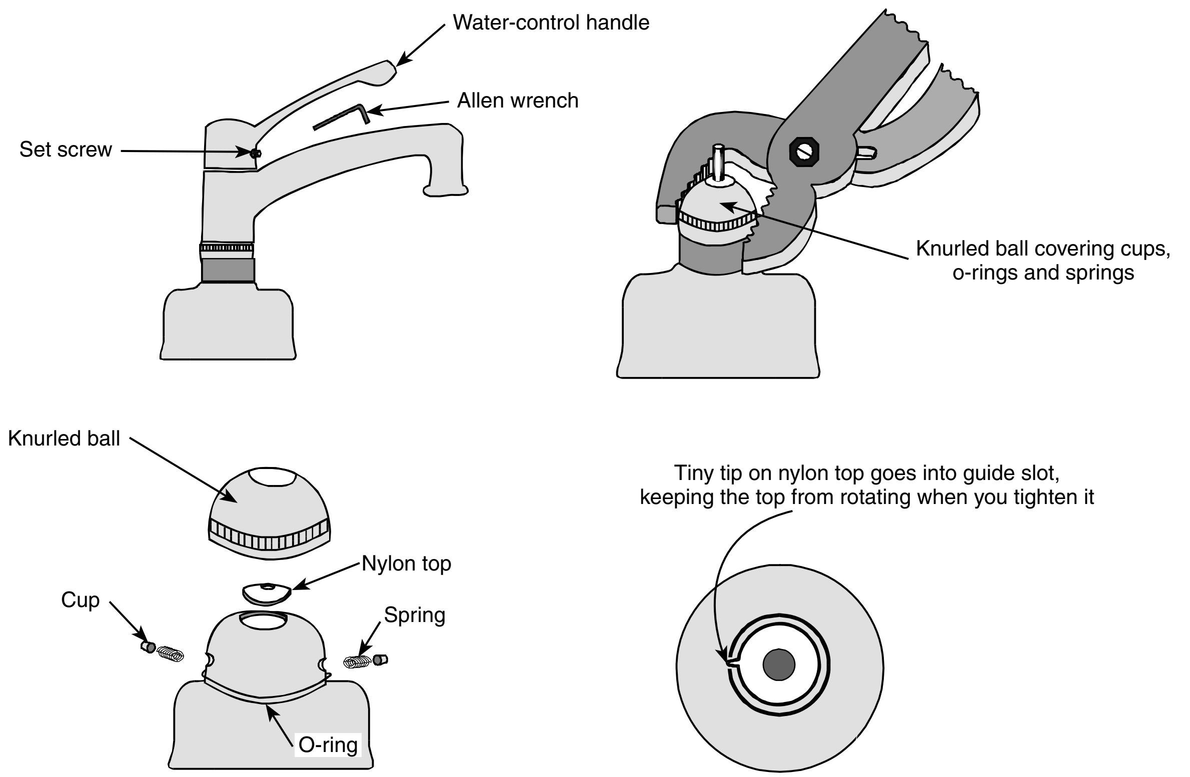


Figure 9-10
Fixing a leaky single-handle faucet

> not work at all. Make yourself a simple sketch of how you took everything apart. You'll be glad you did. It's really important to have the parts in the right position before you put the knurled nut back on. For instance, the round nylon fitting at the top under the dome has a little tip on it which drops into a groove in the metal. This keeps the nylon piece from rotating when the faucet handle is turned. If it isn't in its groove when you screw the knurled dome back on, it will get mashed out of shape.

So, keep your eyes open as you're taking things apart and putting them back together. And don't force anything. If something doesn't go in easily, stop and think for a minute. Are you putting it back together in the wrong order? Is something rotated in the wrong direction?

Faucets and Sink Sprayers

Rust or mineral particles often cause faucets and sink sprayers to clog. It's especially common in the country, when your client is using well water. But it can happen in the city, too. These particles clog faucets and sprayers that have perforated strainers. The holes in the strainers are so tiny that they often get blocked.

> *"Rust or mineral particles often cause faucets and sink sprayers to clog."*

Remove the threaded ring at the end of the faucet or sprayer and check the perforated nylon washer or fine screen inside. Do particles fall out when the washer and/or screen is removed? And does the water flow faster after you've cleaned the piece? Hopefully, that's the only repair you need to make. But there's something else that could completely stop a faucet.

When you push the handle on the sprayer, does water just dribble out? It should come out at full flow, with significant pressure behind it. Conversely, when you turn off the water, flow should cease immediately. If you're diverting from faucet to sprayer, all the water should be diverted, not just part of it. If a little dribble comes out of the faucet while the sprayer is running, that's normal. But if the faucet still releases water when the sprayer is being used, you can fix this problem easily.

When sprayer pressure is low, it usually means that the small valve at the bottom of the faucet, the *diverter*, isn't doing its job. It's a one-piece unit with a spring and valve attached, and it's supposed to stop the water to the faucet whenever the handle or lever is pushed on the sprayer. These valves can wear out, but luckily they're inexpensive to replace and easy to install. Get the parts you need, then look at Figure 9-11. Cover the sink drain before you start taking things apart.

1. Use an Allen wrench to remove the set screw that holds the faucet handle on. It should be easy to spot.
2. After removing the set screw, lift the faucet handle up and off, followed by the faucet spout. You might have to rotate the spout as you remove it.
3. You'll see the little shutoff valve inset in the front at the base of the faucet. Remove the old valve and slip

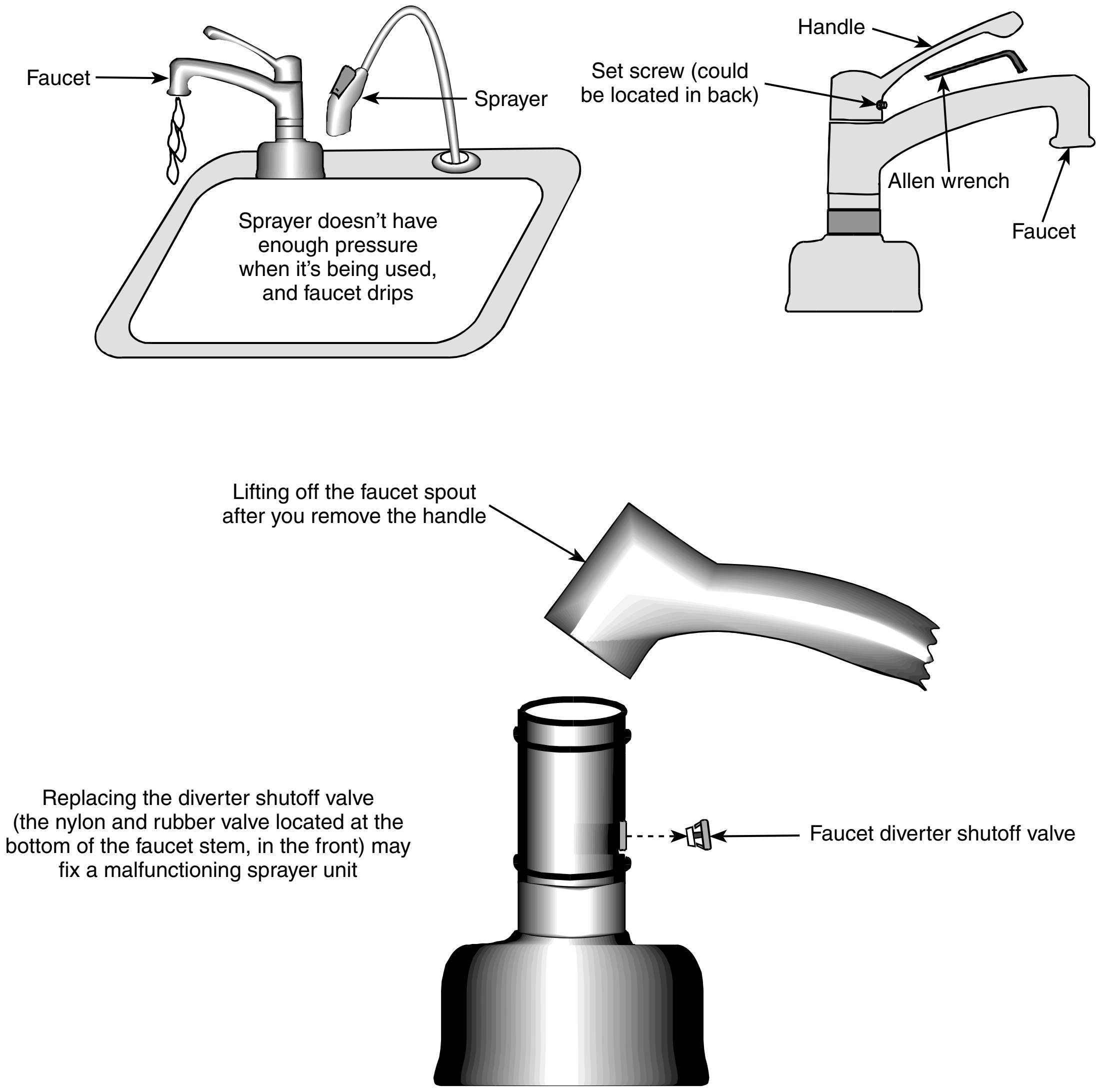


Figure 9-11
Replacing the faucet diverter shutoff valve

the new one in. The open cone-shaped section goes inside. When it's seated in place, the faucet body slides over it. If you paid attention to where the parts came from, you should have no trouble putting everything back together again.

Showerheads

Showerheads have small holes to give a fine spray, which are prone to clogging from mineral deposits in the water. There are several products for removing lime and mineral deposits. Pouring them on a hard

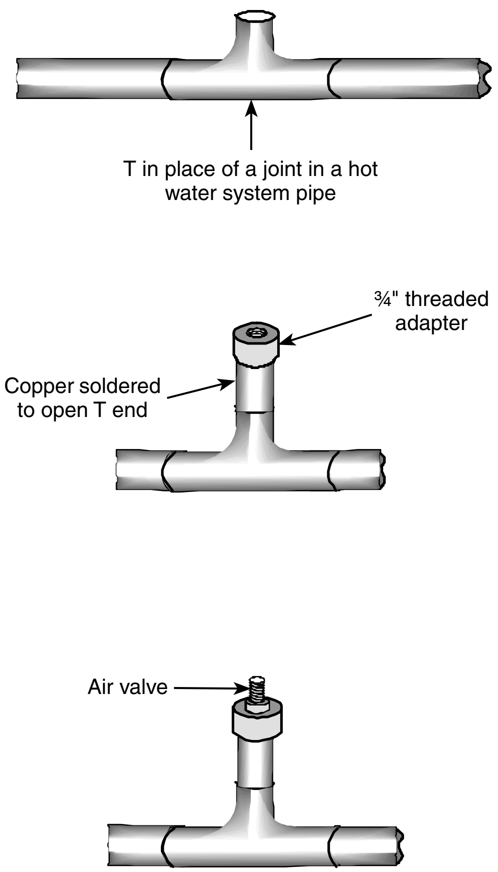


Figure 9-12
Testing for leaks in a hot water system

water deposit dissolves the minerals away completely. But it can also dissolve your skin, so wear rubber gloves. You don't even have to remove the showerhead to use the product. Just attach a bowl to the showerhead with duct tape, and pour the solution of choice in the bowl, making sure it's in the proper position to immerse the showerhead. If your client is concerned about the environment and doesn't want you to use harsh chemicals, you can use vinegar.

Water Heating Systems

What's your primary rule for water heating systems? *Don't fill them with water until you've tested for leaks.* If you find a leak after a water system is filled, you'd have to drain water out of the whole system before you could do repair soldering. There are a lot of solder joints in water heating systems, so don't be surprised if you have a solder joint leak somewhere sometime.

Testing for Leaks

How can you test for water leaks without water in the system? By using an air compressor or a tire pump; see Figure 9-12. First, find a place on the line to operate the air compressor (or tire pump) and your pressure gauge. Change one joint, installing a T instead, to give you an unused end. On this open T-end, solder a copper line to a ¾-inch threaded adapter fitting.

Once you have a fitting with pipe threads on the water line, you're ready for the air valve fitting. It's a common fitting, because water systems are usually checked with air when they're first built. It looks like what you'd attach to a car tire valve. Describe what you want at the plumbing shop. One end will be threaded the same as a small pipe. Get an adapter fitting that brings your ¾-inch threaded fitting down to the size that fits the smaller threads on the air compressor/pump fitting.

After you have the fitting installed, simply screw a common tire air valve into it, and you're set. You don't need a lot of pressure for the test, only about 10 pounds. Keep air in the water lines for about three hours. Then recheck for pressure with the tire gauge. Even a small leak reduces air pressure to almost nothing in three hours. If the pressure is still 10 pounds, you know that the system is watertight.

Testing for a leak is easy. Finding it is even easier. Inflate the system again with 10 pounds of air pressure. Dilute liquid dish soap with water. Swab every joint with the soapy water. A leak will cause the soap to bubble in the joint area. But don't stop when you find one leak. Test every joint, in case you have other bad solder joints. If you find any, make sure you release the air completely before soldering. After you're done, put air back in the system and retest. When you're finished, and leak-free, install a pipe plug in place of the air valve.

Replacing Heating Elements

Water heater elements are only good for a few years. They twist out of shape from the constant heating and cooling, then they burn out. You probably know that water heaters have two heater elements. Ordinarily, only the top one heats the water, but if a lot of hot water is used, both elements engage to supply hot water more quickly. These two elements have different wattage ratings. That's important to know if you need to replace them.

Although I always drain the water from the tank just to be on the safe side, heating and plumbing men don't bother if it's the top element. They just unscrew the old element and immediately install the new one. As soon as the new element goes in, they thread it into place. In that second or two, very little water leaks out. It sure saves a lot of labor when changing a heater element, assuming you've mastered this technique.

If your customer lives where there's a lot of limestone, he'll get lime leaching into the water. Lime hardens onto the water heater elements each time they heat up. After a while, this sediment breaks off and falls to the bottom of the tank.

These pieces can be about ½ inch long, and if there's an accumulation on the bottom of the water heater, they could cover the heater element. This causes it to function inefficiently, as the flakes keep heat from circulating to the water near the element.

This is easy to fix. Let the water run out of the tank for a few seconds. Stick your finger through the element hole to feel for flakes. If you find them, you have to get rid of them. Hook up a garden hose to the drain at the bottom of the tank, and remove the water. Then scoop out the flakes: Stick a U-shaped piece of strap banding metal, the kind you use to secure a water heater to the wall, into the tank through the element hole. Tilt the U-end down to extract the flakes. Be gentle here, or you'll damage the element.

Wells

If your customer lives in the country and has a water supply problem, there aren't any public officials he can call for help. Being without water for a day is worse than being without phones or lights. But it will happen sooner or later. If you have many clients with their own wells and pumps, you know the problems they can have. So you should know the solutions, too.

Cutting Off a Well Pipe

Today, Michigan regulations require the top of a well to be kept above ground, with the supply pipe running through a hole in the side of the well pipe, about 4 feet down. Years ago, the code said that the well pipe had to be cut off below frost level and capped with a special seal plate. The well water supply pipe came up out of the center of this special seal plate and then went to the house.

If you have to work on a well, pay close attention. This happened to me on a job years ago. Well pipe, driven down when a well is drilled, is about 6 inches in diameter, and heavy. What happens when the drilling is finished and the well pipe has reached an ample water supply? You're left with this big pipe sticking up out of the ground.

It doesn't matter if the pipe is intended to be above the ground or below, you still have to dig a huge hole around the well pipe. It has to be below the frost line and big enough to stand in. You'll either have to cut the pipe off below the frost line or torch a hole through the well pipe and attach the water supply pipe down below the frost line.

On this particular job, the well had been drilled and the drillers were gone. I was called to cut the well pipe off below frost level. I was 4 feet down in the hole dug around the well pipe and had a huge pipe cutter ready to use. In a few minutes, I'd cut the pipe almost completely through. Water was spurting out at the sections that were already cut through. Apparently, this was a good well, because the water level had risen in the pipe all by itself.

I finished cutting through the pipe, and the top piece of pipe fell over. As soon as the pipe was cut off, a huge blast of water rushed out. I had to pull myself up out of the hole. By the time I got out, it was nearly filled with water. An amazing amount of water came out of the pipe from the artesian well.

I still had to install the pipe cap and tighten up the four bolts that clamped it to the top of the pipe. But as water continued to fill the hole,

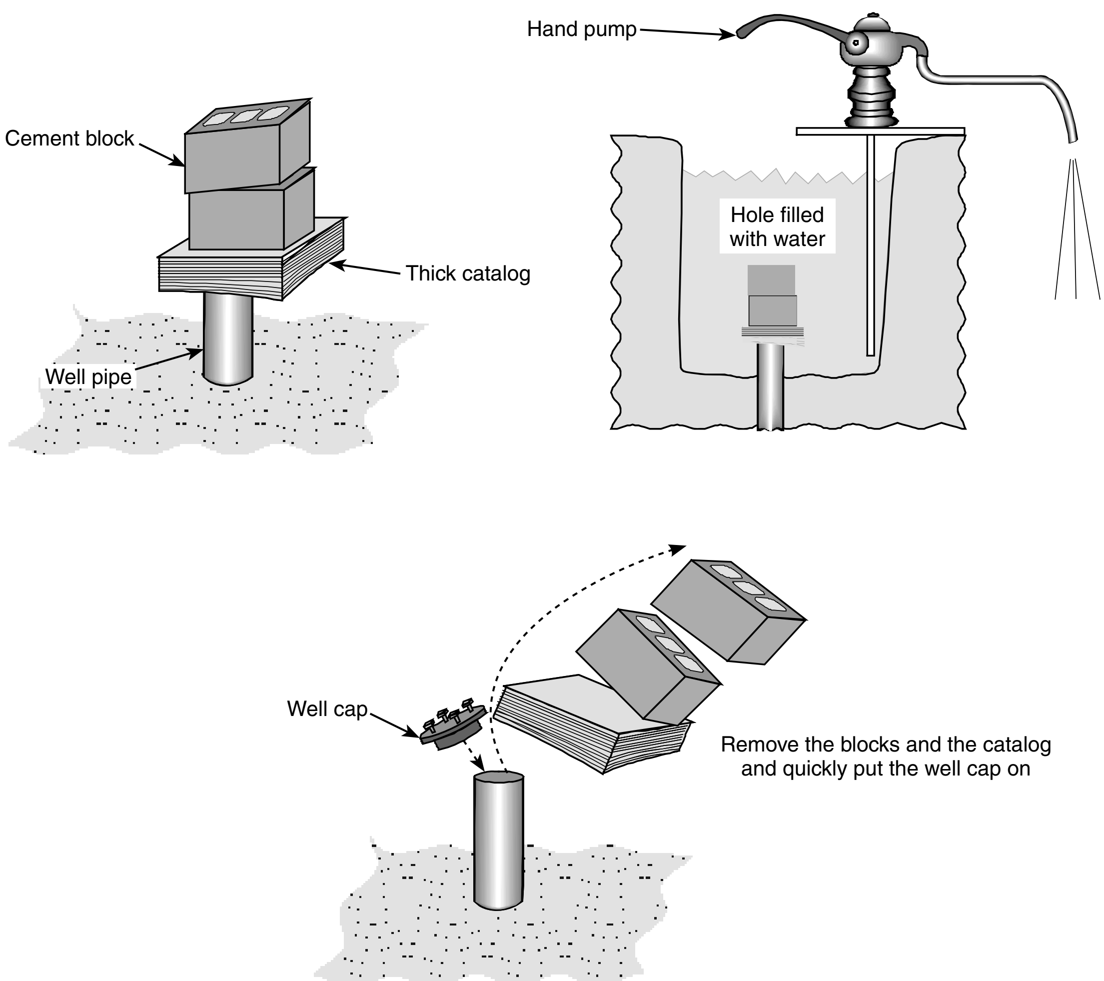


Figure 9-13
Getting the water out of the hole after cutting a well pipe

I knew that I sure couldn't tighten those bolts under water. Pumping the water out of the hole wasn't an option, because it was rushing out of the pipe so fast, and, besides, it couldn't be pumped out of the hole with the top of the well pipe open.

Here was my simple solution, thanks to the Sears catalog I'd left in the truck (see Figure 9-13). It was just the right size to cover the pipe, and I used two concrete blocks to hold it there. I pumped the water out of the hole with a little hand pump I carry. An artesian well doesn't have much pressure, so very little water came out around the catalog. The tricky part was when I had to put the well seal into the top of the pipe. As soon as I pushed the blocks and catalog off the pipe, I jammed the well seal in. Water spurted, then stopped as I tightened up the seal nuts.

A Slow-Pumping Well

If your customer's well is pumping slower and slower, something's stopping the water from reaching the well. You may have to dig up and take out the long pipe that went down into the well. If you intend to install galvanized pipe in the well, put a union on the pipe about a foot from the well pipe, after it starts its horizontal run toward the house.

If there's a union near the well, disconnect it so you can unthread the pipe going into the well. If there isn't, you're in trouble if you ever have to take the small pipe out of the large well pipe (as I had to do here). Without a union on the line near the well, you'd have to dig up and unscrew all of the piping up to the house just to take out the well pipe. Of course, if you're working with plastic pipe, all you'd have to do is unscrew the stainless steel hose clamps to take the pipe apart.

What was the problem? Well, at the end of the pipe at the bottom of the well, a tapered metal strainer was threaded on. This was meant to stop any large pebbles from entering the pipe when the pump was on. Think about it. A metal strainer in the water. What's wrong here?

Even though there were 1⁄8-inch holes in this strainer, they'd rusted and fused completely shut. Actually, a water pipe shouldn't be placed near the bottom of the well. Water in a well pipe flows in and up several feet, so install the water pipe at least a foot up from the bottom of the well.

The last thing I'll say about a strainer is this: You don't even need one. Well drillers go down to bedrock when digging a well. When they begin digging the well, the pump picks up any sand or ground rock debris. The 1⁄8-inch holes in a strainer wouldn't have stopped these smaller particles from being pumped up anyway.

Dowsing for Water

You may doubt this story, but I swear it's absolutely true. These fellows came out to dig a well, and used the dowsing method to find the water.

One man took a wishbone-shaped willow stick in his two hands, and started walking back and forth in front of the house. Suddenly, the stick started to point downward and vibrate. "Dig here," he said.

They set up the well driller right on that spot and, after about 20 feet, they hit water. It had to be pumped out of the pipe continuously for a long time, but still kept coming faster and faster. It was an artesian well, and the water came right up to the top of the ground all by itself. I became a believer. Dowsing could really come in handy.

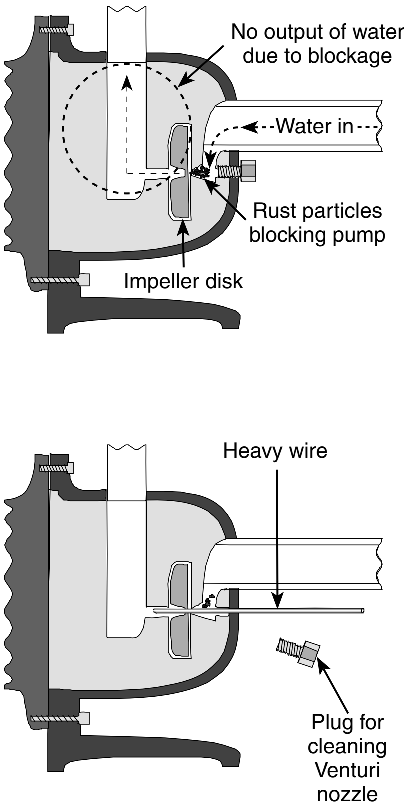


Figure 9-14
Cleaning a water pump Venturi nozzle

When I had to dig my own well, I found a fellow who could dowse. I didn't have to look far: He happened to be my father-in-law. It all began when I forgot just where the well pipe was. I dug here and there, but found nothing. I even dug a 5-foot trench toward our fireplace, thinking it had to be somewhere around there. After four days of digging, I still hadn't found it. And this ground was *hard*. At around 4 feet, I had to switch to a pick — which didn't make it easy to dig a deep hole. This did absolutely nothing for my temper.

Then my father-in-law came over and said he could dowse to find the water. He said that since the water was in a galvanized pipe, it would be better to look for metal than water. So instead of using a willow stick, he took two pieces of coat hanger, bent into two L-shapes … metal to find metal.

He held the shorter ends of the Ls in each hand, with the longer ends sticking straight out, parallel to each other, and the damndest thing happened — the two longer arms of the Ls suddenly moved toward each other and crossed. He said, "Your well pipe's right here." Of course, I didn't believe him, but to be polite, I dug down at the spot where the coat hangers had crossed. *And there was the well pipe!* Go figure.

Pump Repair

This is the perfect time to discuss water pump problems. Electric water pumps create suction for pumping with a *Venturi nozzle* (see Figure 9-14). In the narrow junction where water enters the pump, there's a spinning disk that looks a lot like a submarine propeller. But instead of having open propeller blades, these Venturi blades are curved and attached to a nylon disk. There's a small hole in the center where the blades converge, called an orifice.

This orifice is in front of the small opening, where it begins to narrow. The motor spins this disk and its blades, forcing water inward toward the center hole. This happens because the curve on all of the blades narrows toward the center, by the small opening, so water is directed to this area.

Water in front of the orifice is pulled towards it, which makes the pump work. The orifice is purposely made very small; it's no bigger than the diameter of a coat hanger. Being so small, it doesn't take much to plug the hole and inhibit pump operation.

Any rust or mineral particles in the water will easily clog the Venturi nozzle. When your customer's pump stops because it's plugged, how do you clean it out? Easy. There's a small plug behind the Venturi nozzle. When the pump begins to labor while trying to get enough pressure to shut itself off, it's clogged. The homeowner will know he's got a problem when he notices water pressure at the faucets dropping, or the pump taking too long to shut off.

Here's my remedy:

1. Remove the plug at the back of the pump, and push a length of wire into the opening to clean any debris out of the nozzle. The nozzle opening is only a few inches inside the pump, so a 10- or 12-inch length of wire $1/8$ inch in diameter will do the job. A small-diameter welding rod is just the right size. When the rod pushes in easier and a further distance, you'll know that it's clear.

2. Put the plug back in and turn the pump on. Although this fixes the problem temporarily, it might very well happen again in a day or two, especially if there's constant rust or corrosion coming off the well piping. If that's the case, the only solution is to replace the iron pipe with plastic pipe.

Foot Valve Placement

Most people put the foot valve at the very end of the water supply pipe down inside the well. This seems reasonable, because the foot valve is there to stop the water from falling back down the well pipe each time the pump shuts off.

But if something goes wrong with your customer's foot valve, you'll have to dig up the well and pipe to get at that foot valve. You know the foot pump has failed if the pump runs and runs but won't pump water until it's primed. The foot valve isn't closing tightly, and water runs back into the well when the pump shuts off. It's designed to hold the water in the pipe behind the pump, so it can't flow back down into the well.

The correct location for the foot valve is shown in the illustration in Figure 9-15. This allows the foot valve to keep the water from falling back down the pipe, while still being easily accessible. Always install a union fitting close to the foot valve. If the foot valve breaks, you can loosen the union and take the valve out to work on or replace.

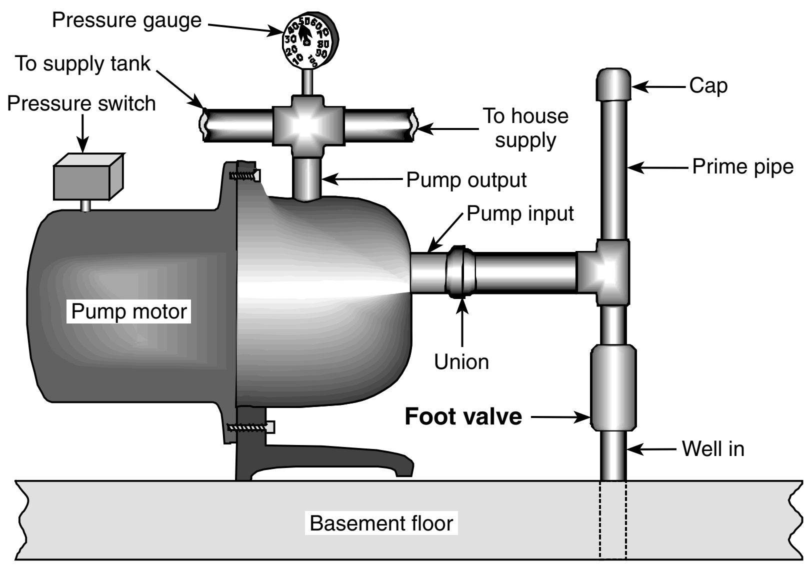


Figure 9-15
Where to put a foot valve

Have a short vertical pipe, about 1 foot long, on the water line right before the foot valve. Use it for priming the line if the foot valve should lose the prime in the pipe. You can put a pipe cap on the top to keep it clean. If you need to prime, pour water down the well pipe through this pipe. A funnel helps direct the water into the pipe, but you need to see inside the pipe as you're pouring the water.

Why? Because when the water starts rising up this piece of pipe, you immediately have to slap the pipe cap on and secure it to keep the pressure in and the water from flowing back down. If you can turn the pump on before the water drops, the pump will soon fill the pressure tank and shut itself off. You only have to get water in the pipe close to the pump, so it can form a suction. Remember, the well pipe doesn't have to be full of water right down to the well. You just need to get the pump started.

Unclogging a Foot Valve

How do you easily unclog a foot valve without taking it off the water line? If you have the foot valve off the pipe, you could just rinse out the particles that are clogging it. But this takes a lot of time and effort. Instead, tap gently on the outside of the foot valve with a hammer while the pump is running. Go all the way around the valve. It jars the particles loose. They'll be immediately sucked through the pump and gone. The pump shuts off and stays off — no particles are left to hold the foot valve open.

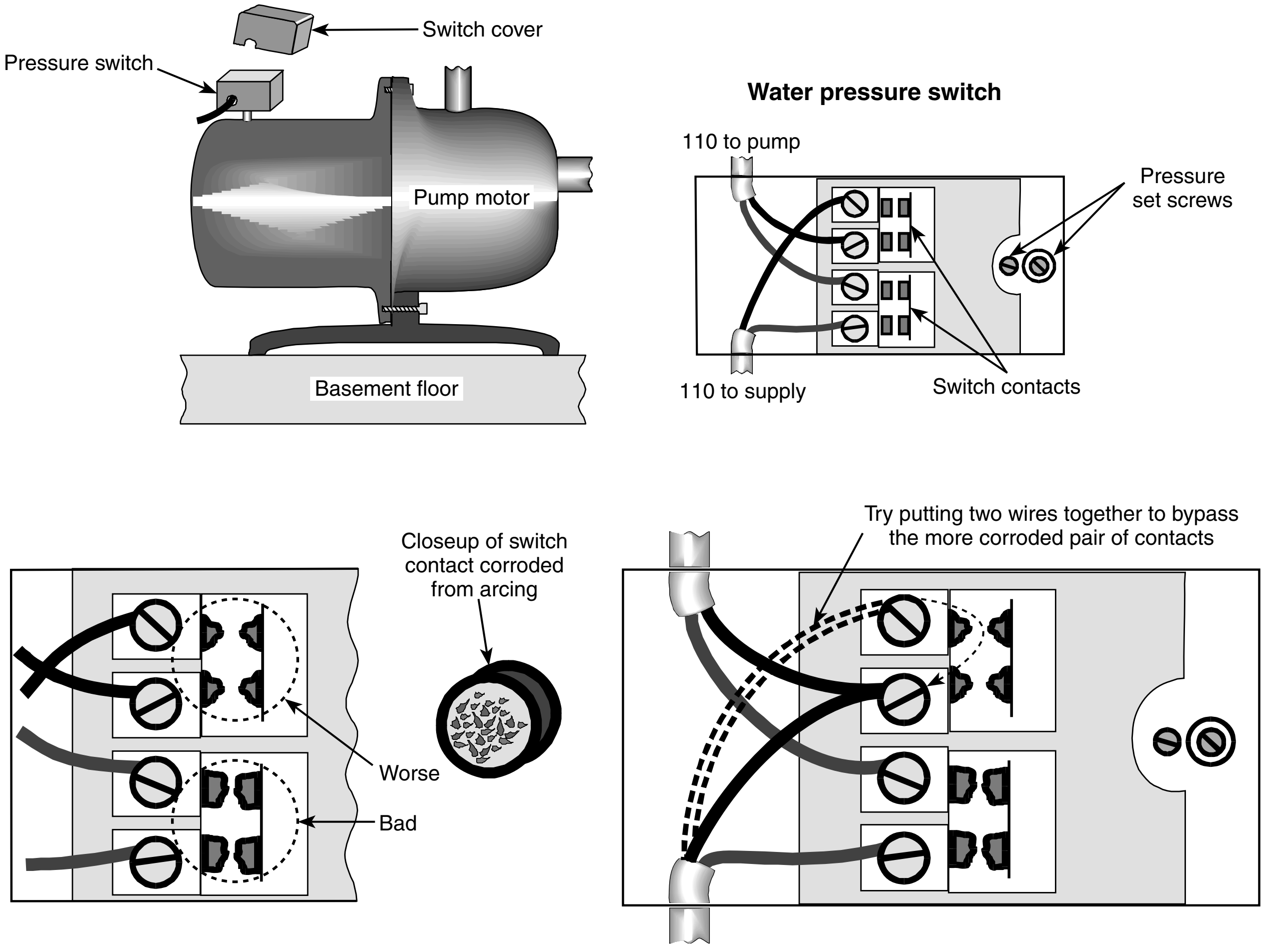


Figure 9-16
Temporary fix for a faulty pressure switch in a water pump

Pressure Switches and Gauges

Every water pump has a pressure switch and a pressure gauge. The gauge shows how much pressure the pump is maintaining. The switch turns the pump on when the pressure goes below its preset level, and shuts the pump off when the correct pressure level has been reached. The main cause of switch failure is the contact points. They become corroded from the constant arcing caused when the switch turns on and off.

The two wires going to the pump have contact points that make or break the circuit to turn the pump on and off. Just before the contact points touch, they arc, making a spark. Eventually, the points pit and burn out. The pressure switch will then need to be replaced. If replacement parts aren't immediately available, see Figure 9-16 for how I accomplished a temporary fix. Looking at it now, it seems somewhat risky, so I'm not recommending it. Back then, I think I was immune to electricity.

- Before doing anything drastic, check the breakers, or see if a fuse blew. There's either a fuse by the pump itself or a fuse or breaker for the pump circuit that you can disable.
- If the breakers and fuses are okay, shut off the power to the pump.
- Check the pressure switch by sliding the metal cover up and off. Inside you'll see the two pairs of contacts. If they're bad, the surfaces will be pitted, and could be burned completely off.
- Since there are two separate sets of contacts, you can temporarily bypass the bad ones, and let the good ones start and stop the pump until you can get a new pressure switch. Bypass the set of contacts that are in the worst shape. Two screws hold the electrical wires at each pair of contacts. If you put both of these wires together on the same screw, you bypass the bad contacts. But this is just for a day or two so the customers can have water till you can get to the supplier and get a new switch. You can't leave it this way.
- Turn the power back on and see if the pump works. You'll see the spark across the other set of contacts when the power comes on. That means the pump is getting power and there isn't a broken wire. The pump should run now, unless the other contacts are bad, too.
- If you bypass both sets of contacts, the pump will turn on, but there'll be no pressure switch to shut it off. If you decide to do this, watch the pressure gauge and pull the plug or trip the breaker when the pressure gets up to 30 or 40 pounds. Most home water pumps are set no higher than 40 pounds of pressure. A good one can maintain 50 pounds of pressure; but even if you can only get 30 pounds, the system will be usable.

THE HIGHER THE PRESSURE, *the more the faucets will drip, so you probably don't want to put your customer's water pressure up too high. Make sure his system has a pressure tank to hold water in reserve when the pump is off. Most modern tanks have an inflatable air bag inside the tank to maintain water pressure. There's an air valve that allows more air to be added if necessary.*

Your customer may end up needing a new pressure tank. The tanks come with instructions for the correct pressure needed in the air bag. A water pump can be operated without a reserve tank, but the pump will run every time a faucet is turned on — and it will keep running as long as water is coming out of a faucet.

You can also change the water pressure. Two set screws allow you to set the pressure you want to turn the pump off and how low it will be when the pump comes back on. You'll see instructions for operating the set screws under the switch cover.

The pressure switch has two set screws at one end. The outer set screw has a pretty heavy spring and washer under it. This is the main screw — for water pressure. When you tighten it, it increases the tension on the spring, so the pump has to work harder to shut off, making the water pressure go up. You don't have to turn the set screw very much to change the pressure. Try a half turn at a time, and then run some water so the pump starts, and see where it shuts off on the pressure gauge.

The second set screw (the smaller one) is a timer, used to set the length of time the pump runs between on and off. It also determines when the pump will turn on to start pumping. Leave this set screw alone, since it's preset by the manufacturer.

Loosening Old Hex Nuts

When you replace an old kitchen sink in an old house, it's sometimes necessary that you keep the old plumbing. It's not the best idea, but once you start changing the plumbing, unless you're going to replumb the entire house, where do you stop? Somewhere, you're going to have to connect old with new, and that may not be so easy. Plus, once you expose plumbing that's not code-compliant, you're required to replace it. Who's going to pay for that? Not all customers can; they just want a new sink. So here's how it's done: Just remove the sink basin drain so you can use it on the new sink. But this is easier said than done. A large flat nut fastens the basin in place under the sink, squeezing the sealer ring against the sink bottom to prevent leaking. If it's been in place for 10 or more years, turning that nut to unscrew it can be very challenging. Added to that, the nut flange is thin and difficult to grip. If you don't want to impress your client with the extent of your vocabulary, you'll need some help. Removing this nut is a two-man operation. When you rotate the nut below the sink, it causes the basin rim above, inside the sink, to rotate also. Therefore, you need one person to hold the sink while the other turns the nut.

Use needlenose pliers around the X in the sink drain, and put a wrench handle through the pliers' handles to keep them from turning. If your nut still won't turn, here's a solution. Get a large punch, and put the end of it against the hex nut under the sink. Rap it hard with a hammer. After about three or four raps the hex nut should move slightly. Four more hard hits on the punch will get it rotating noticeably and start loosening. You only have to force the nut to rotate about an inch and it frees up.

I've tried to cover the most common situations in this plumbing chapter that you would probably run into on a regular basis, and hope that I've succeeded. Just keep in mind: if your customers enjoy good, reliable plumbing systems, and you're the one to thank, your customer base can't help but increase.

10

FIREPLACES & CHIMNEYS

Sitting in front of a fireplace and watching the flames jump and crackle is a warm and cozy experience. But if your customer's fireplace doesn't have glass fireplace doors, he's watching his heat go "up in smoke." A fireplace has a large flue, which draws air up the chimney when a hot fire is burning. Without any fireplace doors to stop the airflow, all the warm air from inside the house goes up the chimney. Encourage your client to purchase some fireplace doors if he doesn't already have them.

Fireplace Doors

Fireplace doors stop the airflow from the room into the fireplace — which is just what you want. But a fireplace still needs air, which it will have to get from somewhere else. Here's the perfect solution: an ash-pit door in the floor of the fireplace that's vented to the outside. If your homeowner keeps the ash-pit passageway open and the fireplace doors closed, his fireplace can get all the air it needs from the ash-pit instead of the living room — air from the outside instead of from inside his house.

Building a Good Fireplace

Let's talk a little about the structure of an efficient fireplace. Of course, the floor must be firebrick to withstand the intense heat of a fire. The best fireplaces are built out of concrete blocks around a double wall liner. And imitation stones can be mortared to the concrete blocks, if desired, prior to installation.

Liners

The liner takes the main heat from the fire. When you're building your client a fireplace, there are two types of double-walled metal liners to consider. One has the chimney flue on top, so rain coming down the chimney falls on the fireplace liner. Tell him he doesn't want this kind. The second type of liner has the hot air damper positioned vertically, facing the back of the liner. It allows you to build a concrete smoke shelf against the back wall, toward the top. Hot air from the fireplace flows out the damper and into the smoke shelf area. Rain falls onto this shelf instead of onto the metal liner.

Your local concrete supply company probably stocks fireplace liners and firebrick, etc. Don't forget they also have white sand, white cement, and bags of cement coloring, to help you get just the right color around brick or stones. Don't use portland cement; it's grey, which can "muddy" the color you're after.

FIREPLACE HINTS

- *Solid brick or stone fireplaces are terribly inefficient. Masonry fireplaces are much better.*
- *Metal liners fit inside most masonry fireplaces, and come with glass doors and double walls.*
- *Air-intake grilles at the top and a hot air vent with a blower at the bottom greatly increase fireplace performance. Built-in fans pull the room air in at the bottom and push heated air out the top and back into the room. These units are as good as a furnace.*

Stone Fireplaces

I'm going to give you a few tips on how to build a beautiful fireplace. If you've never tackled this job, don't be shy — jump right in. I'll tell you how to avoid the pitfalls.

Imitation Stone

There are many types of imitation stone on the market now that look real. They're made out of a light plaster-like material. Imitation stone is easy to use, mainly because it's less likely to fall down as you place it, like natural stone does. Imitation stone comes with matching corner stones, notched to fit on the fireplace corners. Best of all, you can cut it easily with a masonry blade in your circular saw.

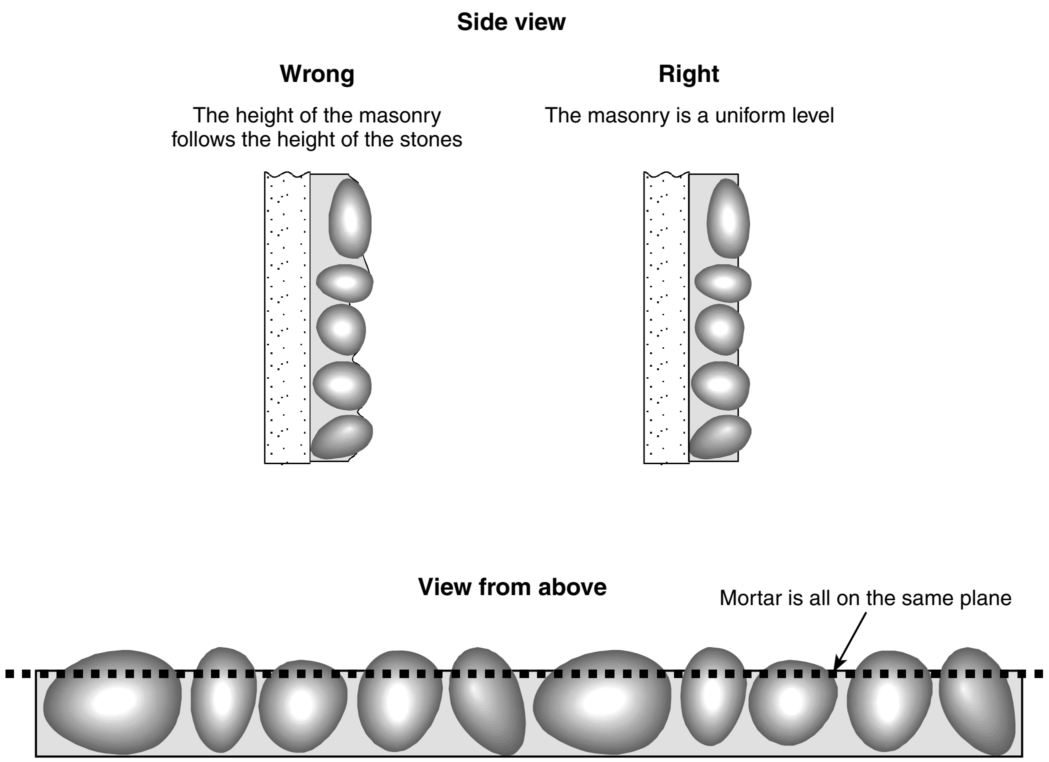


Figure 10-1
The correct way to place mortar around stones in a fireplace

When I built my own fireplace, many years ago, I decided I wanted a real rock face. Here in the Midwest, farmers used to plow their fields to get them ready for planting every year. The rocks that turned up on the surface were removed, so every farm had a rock pile. My property also had rocks, but they were dull, gray things that wouldn't do at all. A fireplace should be faced with nicely-grained and colored rocks. I found some really beautiful ones in my neighbor's rock pile.

Another resource for finding unique rock is the local gravel pit. Gravel pits supply material for road building, and are usually abandoned when the small gravel runs out, so they're a great place to look for nice rocks. Or you can go to a business that specializes in rock for home building — but their prices are usually pretty high.

When you're laying real stone, you need stiff mortar to hold it in place. Standard mortar, with sand mixed in, doesn't have the body to support stone. I mix half portland cement and half regular mortar to get the mortar thick enough not to slump when I set the heavy stones.

Think of the mortar as being on one uniform plane, as you can see in Figure 10-1. I figured that out the hard way when I put the stone on the front of my fireplace. I wasn't at all satisfied with how it was coming out.

The first foot or so looked amateurish, so I stopped. I couldn't figure out what I was doing wrong. Then it dawned on me: these first mortar joints were at different depths because natural stones are never flat, so *they* lay at different depths. In other words, I had spread the mortar thinly when I put in smaller stones and thicker around the larger stones.

I realized that I had to keep the mortar thickness the same everywhere. I'd been putting the mortar close around the face of each stone with no regard to the thickness of the mortar around adjoining rocks. Luckily, I caught my mistake, took the stones out, and reset them correctly.

To support the heavier stone until the mortar set, I propped 1 x 2 sticks against the rocks to brace them. Since my house was under construction, I was able to put a nail behind each stick to keep it from sliding on the floor. I'd do a row of stones, let the mortar harden overnight, and then do another row the next day.

Seasoned Wood

While we're talking about fireplaces, here's some information about the dangers of burning green wood. Firewood should dry, or cure, for at least a year before it's burned. Burning green wood produces creosote. Think about what would happen if your client burned a telephone pole in his fireplace.

Creosote is unburned residue that goes up the chimney. Chimneys are cooler inside further up, so the creosote in the smoke forms deposits on the sides of the chimney. It becomes very thick, and the heat of the chimney dries it out. This becomes a highly-combustible substance, easily ignited, that burns like a blowtorch inside the chimney. Many houses have burned to the ground because of creosote buildup in their chimneys. You can be a hero if you pass this information on to your clients.

People new to country living want to get out their new chainsaws and cut firewood. They burn it as soon as they cut it. A little green wood doesn't hurt, but if burned all winter long, it can be a huge fire hazard. The pitch in unseasoned wood doesn't burn completely. Some of it is carried away with the smoke; but much of this unburned residue never makes it out of the chimney. Firefighters have told me tales about arriving at house fires that started in the chimney. When they tried to clear the debris inside the burning chimney, some of them were so plugged with creosote that the firemen couldn't even get a 3-inch ram down inside.

Think of it this way: since a house chimney is at least 8 inches or more wide, the creosote had to be at least 3 inches thick. That's a huge

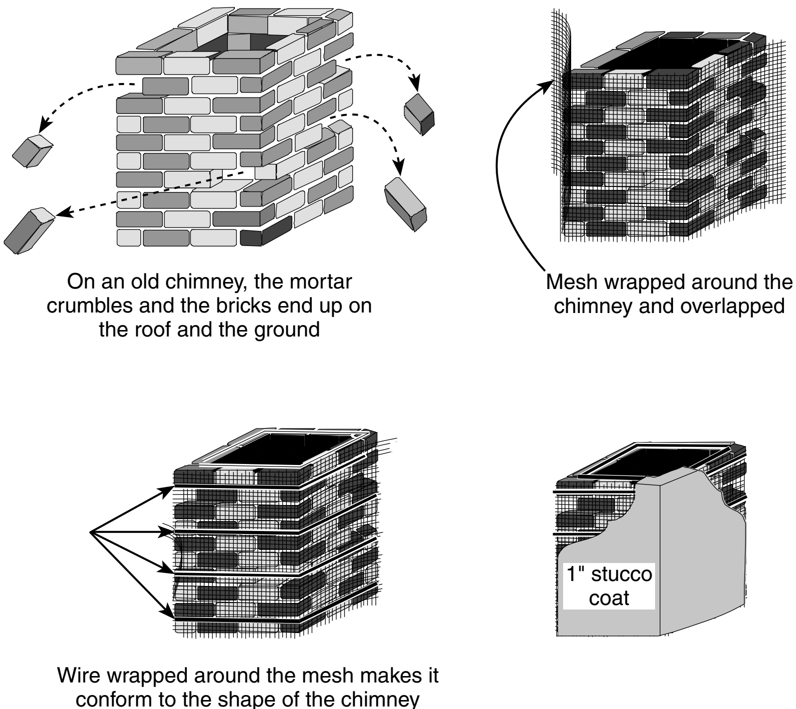


Figure 10-2
Fixing a crumbling chimney

amount of combustible material. So warn your customers about burning green wood.

Repairing an Old Chimney

Old chimneys are notorious for having disintegrating mortar and loose bricks. It's common to find bits and pieces scattered on the ground below, a long way from the chimney. Fortunately, the place with the worst damage is usually the exposed section above the roofline. You can rebuild that area and the chimney will look (and work) fine.

Of course, if you see a lot of loose bricks on the outside of the chimney, by all means look down inside it to make sure that the bricks inside aren't in bad shape. If they are, your client has a fire hazard on his hands. However, there isn't the same danger now that there was when people burned wood or coal. Most remaining old chimneys are just for show these days, and aren't functional.

It's not difficult to repair a chimney — see Figure 10-2:

- Measure the chimney above the roofline and get enough expanded metal mesh to cover it, with a little left over.
- Wrap a rectangular piece of mesh around the chimney. Be sure to overlap the mesh where the pieces meet.
- Wire the mesh into place against the chimney. Cut the wire to go around the chimney once every foot, up and down. After you've twisted several wires around the mesh, the mesh will begin to conform to the shape of the chimney. You want the wire and mesh to lie as close to the chimney as possible, so none of it protrudes through the cement when you apply it.
- By wrapping more wire around the chimney, the first wires tend to slacken, so twist those ends tighter.

- Keep adding wires and tightening until the mesh is held firmly against the chimney.
- After cutting a hole for the flue, put a small piece of mesh across the top of the chimney, and hold it down with a rod that you've bent into a square.
- Don't worry about the wire rusting — you'll be encasing it in the concrete. However, the concrete will be only about an inch thick, so make sure the mesh is as close as possible to the chimney, to ensure satisfactory coverage.
- The concrete will bond to the old mortar in the joints between bricks. I use regular mortar for the base mixture, which, by itself, isn't very strong. But adding portland cement in a 1:3 proportion (even a half-and-half mix is fine) before adding water gives you a good strong mix. It's easy to combine the portland cement with the mortar mix. Just be sure to mix it enough so that it's uniform in color when it's dry.
- Add just enough water to hold the mix together. As you're mixing, intermittently scoop a trowelfull of the mix. If the mix stands up decently on the trowel and doesn't slump, you have a good mix, and are ready to begin the concrete work.
- Start at the base of the chimney and work your way up. If you've mixed the proportions correctly, the concrete will stick just fine as you push it onto and into the mesh.

When you're done, hose down the roof to get rid of any bits of concrete around the chimney. If you want to go all out, get powder coloring to tint the cement. Sometimes this attention to detail makes all the difference in the appearance of a refurbished chimney.

Chimney Settling

Here is a condition common to old two-story houses. The tremendous weight of a two-story chimney makes it settle several inches. Since the chimney is attached to floor joists, they settle, too. This can pull down the floor along with it, several feet from the chimney. Needless to say, this looks bad. But living in such a house could also be dangerous. Settling can be severe. I've seen houses where the second-story floors were pulled down as much as 6 inches within 8 feet of the chimney. Think of the loss of stability that can cause.

There's no easy fix. Most of the time, the old chimney has to be removed and a new one built, with proper footing. In one really bad case, the chimney was situated next to a hallway. You had to be careful not to fall over when you stepped on the low area. There was no way to fix it without rebuilding the whole second floor. And even that might not fix the problem, because the brick chimney would keep on settling for years to come. Here's what I came up with.

I installed a suspended ceiling with 2- x 4-foot tile inserts on the downstairs ceiling. The suspended ceiling hid the sagging ceiling above it. First, I shimmed the sagging floor of the second-story hallway with tapered wood shims laid on 16-inch centers. Then I laid ¾-inch plywood sheeting over the shims, to make a new level floor. Next, I filled in where the ¾-inch sheeting ended at the old floor with ½-inch plywood or ⅛-inch paneling, to taper it out. Then, to make the floor almost-perfectly flat, I spread *Durabond* along the edges and screeded it level with the rest of the floor.

This didn't repair the settling, but bought time enough for the homeowner to eventually address the problem. Once he decided to do the long-term fix, I pulled up the plywood upstairs floor and re-shimmed the supporting beams. When I was done, I successfully repaired the problem that I initially camouflaged.

11

DRYWALL & PLASTERING

You may encounter a few problems working with drywall and drywall compound. Drywall compound shrinks a lot when it dries. You patch over seams and nails, and the next day the compound has shrunk so much you have to re-do everything to make the surface level.

Drywall Compound

Drywall compound comes in 5-gallon buckets already mixed and ready for spreading. It also comes in smaller containers. This compound isn't nearly as hard as real plaster, but it's not meant to be.

Countersink all of the nail heads a little. If they're close to the surface, the plaster falls off the nail heads when you sand. Drywall sheets have indented strips along each side. They leave room for seam tape and plaster.

Drywall professionals use wide, curved blades to cover joints. This type of blade puts the compound on a little thicker in the middle of the joint, so you don't have to cover each joint twice. When I put compound over nails, I purposely put it on a little thick, so that when it shrinks, it's still above the nail heads. Sometimes, though, even two coats of compound aren't enough on drywall joints, so monitor shrinkage.

Covering the Seams

When you're ready to cover the seams, use nylon mesh seam tape. It works better than gummed paper tape. The mesh strengthens the plaster and keeps it from cracking at the joints. Remember to push the mesh well into the corners. If it's too close to the surface of the plaster, it comes through when you sand.

> *"Drywall is ½ inch thick, which is often wider than the top of the old baseboard."*

Don't allow the mesh to overlap at the joints. The seam would be too thick. When one strip meets the previous one, cut it with a sharp utility knife and start again on the other side of the mesh strip. That way, there's not double thickness at the corner.

Some people think they can drywall over cracked walls. Don't be one of them. It's just a temporary, cosmetic fix. New cracks will soon appear unless you cover the existing cracks. Drywalling over plastered walls creates problems too. Drywall is ½ inch thick, which is often wider than the top of the old baseboard. And if the baseboard rises or falls a little, cracks can appear between the drywall and the baseboard. This is where patching material like *Durabond 90* comes to the rescue. Put it on, and hold a metal strip against the top of the baseboard until it sets.

Pro Plastering Techniques

Professional plasterers know how to plaster smoothly so they don't have to sand later. Real plaster is tough stuff, and very hard to sand after it sets. For just those reasons, it isn't used very often for patching.

If you've been plastering for years, you don't need the following information. But if you're new to this kind of work, these steps are essential. Few books explain applying plaster correctly in terms that make it easy to understand. Without some advice, plastering can be a real headache. So here are a few helpful hints, starting with supplies.

You need something to hold the joint compound (plaster) while you're working. Hardware stores sell long plastic troughs for holding plaster that come with a strip of metal on one side. They're inexpensive and are

> ***BLADE CHOICES***
>
> *You can get inexpensive plastic blades at any hardware store. But since you'll probably be installing full 4 x 8 sheets of drywall, I recommend two metal blades. Get a 12-inch metal blade for the seams between the sheets and an 8-inch metal blade for the first coat of plaster on drywall joints. It covers the main inset strips on the seams, and then the 12-inch blade applies a second coat of plaster wide enough for feathering out the final seam coat.*

real lifesavers. They're worth the investment. For small jobs, use a putty knife. But if you've got a big job, you'll need at least a 4-inch-wide blade.

Getting Plaster Out of the Trough

Here's the best technique for getting plaster out of the trough. Trying to plaster directly out of the 5-gallon bucket won't work; you'll get too big a blob of plaster. Fill the trough you've purchased with the plaster, and use your trowel from there. The hardest thing for beginners to remember is that they must pick up a blade-sized amount of plaster. That's very important. Here's how to do that.

Push all the plaster against the side of the trough that has the metal edge. Always work from this one side — the metal strip cuts the plaster neatly when you move the trowel against it. Every so often, push the plaster against that side to keep your trowel evenly filled.

Push the trowel into the plaster, a little down from the metal edge. Cut off a nice strip of plaster as long as the trowel and about 2 inches thick. That's exactly what you want. Then spread that strip of plaster evenly onto the wall or ceiling. Once you're comfortable with this technique, you can easily cut off plaster onto the edge of the trowel to fill corners. Remember, a big blob of plaster applied in a corner would cause extra plaster to squeeze out around the blade. If you keep the trough full on the metal-edged side and cut off only what you need, you shouldn't have any problems.

Filling Joints Between Drywall Sheets

The most time-consuming part of plastering is filling joints between drywall sheets. Tape the joints with nylon mesh — don't overlap. Then apply the first layer of plaster, filling the indented area at the sides of each sheet.

When this layer dries, it shrinks and will end up lower than the surface of the drywall. Apply a second coat of plaster with your 12-inch blade. This layer, too, will shrink and be lower than the drywall where the two sheets meet, mainly because of the sunken edges on the drywall. You can minimize the shrinkage by how you handle the blade. Press the edge of the blade against the drywall at the far edge of the plaster where the strip ends. Apply it a little thicker over the drywall seam. You may need to sand a bit more to make your seam flush with the drywall, but it's more efficient than applying more plaster.

Inside Corners

Plastering inside corners can be a real challenge. But not when I explain these simple steps. First, run nylon mesh tape along every corner. Don't overlap it. You don't simply trowel plaster into the inner corners until they're filled, then trowel along each wall to smooth the plaster. That's only part of it. This is when knowing how to cut off an inch-wide line of plaster from the trough onto the trowel comes in handy.

Smooth the plaster to the metal-edge side of the trough. Cut off an inch of plaster onto your wide blade. Push this plaster into the corner joint, along the whole length of the corner. Do the same the length of the other side of the joint, on the opposite wall.

Now, you'll need a corner trowel. Plastic ones work fine, and only cost a few dollars. Start at one of the corners and pull the trowel along the joint to the opposite end. Trowel back over the lumps that may remain. You'll get a relatively smooth line that you can sand later, but the main corner length will be neatly rounded and smoothed.

MAKING INVISIBLE SEAMS

What's the best way to seam on a wall or ceiling where drywall sheets meet? The ends don't have indented strips like the sides, so you'll need a thicker, wider strip of plaster to cover the mesh tape that lies on the surface of the drywall. You can't sand the plaster flush with the surface — the tape would show through.

On end seams, cover the seam with plaster, tapering it out gradually. Then the seam isn't obvious. Plaster a strip about twice as wide as the ones you put over the indented seams. Feather the plaster down to the drywall level. If you do this gradually and with patience, it won't be noticeable that the plaster is a little higher at the seam.

Make-It-Yourself Drywall Jack

If you have a lot of drywall to attach over your head, believe me, the information in this section is for you. Drywall gets pretty heavy when you have to hold it up and nail it to the ceiling. You could rent a drywall jack to support it, but that means spending money. As you may know by now, that's rarely an option in my book. You can easily make a "T" for holding up a sheet of drywall while you nail it. Simply use a 3-foot 1 x 4 nailed on the end of a 1 x 4 that's a little longer than the floor-to-ceiling height. This job will take two people.

One person holds the sheet up against the ceiling, and the other centers the T on the drywall sheet, pushing the bottom of the T-leg until it's wedged on the floor. The drywall is secure against the ceiling. Nail it in place, and remove the T to use for the next drywall section. You could do this alone, too, if you have to. Put the T close by and hold the drywall up with one hand. Put the T in place with your other hand.

You could also use a simple scaffold to hold the drywall close to the ceiling. Lift the drywall up and slide it on top of the scaffold frame. When the drywall is about ½ inch from the ceiling, raise one edge and start nailing the sheet to the ceiling. Since the frame is open, you can reach in and nail up the rest of the sheet.

Wall and Ceiling Repair

This next story shows just how expensive a mistake can be when planning repairs. This particular job involved a house that had fine cracks, common in older houses, in the walls and ceilings. Years of freezing and thawing can cause a house to develop a few cracks, and this home had seen a lot of winters.

This owner had already hired a plasterer to stucco the garage walls, so she naturally turned to him for advice. He said all he'd have to do would be nail new drywall sheets over the cracked walls, and plaster over them. In other words, put drywall over the existing walls. Well, that only succeeded in making the walls thicker, which caused the bottom of the drywall sheets to stick out above the top of the baseboard. Even though he'd covered the cracks, the walls looked ridiculous. More than that, the job cost a small fortune.

A better and cheaper solution would have been to plaster the cracks. It would have cost just a few hundred dollars in labor and material instead of thousands. The only precaution is to sand first with rough grit sandpaper (40, or even 30). That encourages the patching to adhere to the walls.

Here's how to perform this repair:

1. First, open up the cracks a little with your utility knife to enable the plaster to grip inside the cracks. You'll have to do this several times.

2. On the first pass, hold the knife at a 90-degree angle from the wall.

3. On the next pass, tilt it about 45 degrees as you run the knife along the crack.
4. Finally, hold your knife 45 degrees in the opposite direction. The crack should now be wide enough.
5. Vacuum the debris and dust out thoroughly; the plaster's adhesion could be hampered by plaster dust.
6. If the plaster isn't sticking, push your putty knife into it and stir. The dust will soon dissolve into the plaster, picking up the fine plaster dust. Your mixture will begin to stick to the surface instead of falling away.

Another option that'll give a stronger job than plaster is to use a commercial plaster-type material like *Evercoat HomeFix Universal Repair Filler* or *Durabond 90*. They cost more, and are harder to sand, but they'll take more abuse. They'll stay in place inside the crack, and resist damage from stress or building movement. And although they cost more than plaster, compared to drywalling and plastering the whole house, that's nothing. Be sure and read the MSDS for these products before using them.

Fixing Holes

It isn't unusual to find a house with holes in the plaster. The roof could have leaked, soaking the ceilings and walls, and causing the plaster to come loose from the lath in spots. In most cases, it's not necessary to replace the whole ceiling or wall. It can be repaired.

"Don't expect new plaster to stick the old plaster back in place. It won't work."

If only a few feet are damaged or the plaster is loose, you can cut out those sections and replace them. First, find the ceiling joists or wall studs. Cut out to the middle of the joist or stud on each side of the damage. Cut a piece of drywall to fill that area. If you're working in an old house and the ceiling or wall is lath and plaster, it will be thicker than ½-inch drywall. In that case, cut narrow shims to make the drywall even with the old lath and plaster. Since the edge of the new drywall ends on the middle of a stud or joist, you can easily nail it into place.

Don't expect new plaster to stick the old plaster back in place. It won't work. If there's the slightest chance that any old plaster is loose, get rid of it. Loose plaster will cause you problems, for reasons I hope are obvious to you!

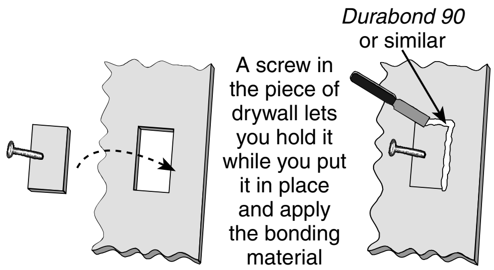


Figure 11-1
Screw holds patch while bonding material is applied

Now if your ceiling/wall is lath and plaster, you have lath behind the plaster, so you're in good shape. You don't even need the new piece to come out on a joist.

If there's no stud behind the edges, or the drywall springs and you can't pound in a nail — just screw the drywall on instead. Use drywall screws to attach the new drywall to the old laths. A good thing about drywall screws is that they can actually pull the pieces together. When a piece springs, it's almost impossible to drive a nail home. But you *can* use a screw.

You'll frequently find your contracting skills revolving around a hole in the wall. Teenagers see it as a rite of passage to punch or kick holes in the wall when they get upset. *Durabond 90* or a similar product can help you do this job in minutes. Since you're not using plaster, the patch can be sanded and painted almost immediately.

Figure 11-1 shows a small rectangular hole. Notice the drywall screw used in the drywall patch to steady it. Holding the piece with the screw, use your putty knife to apply the product to each corner of the patch. You don't have to do the entire perimeter at first; each corner is enough. When it sets up, you can let go of the screw. Mix another small batch to seal up the rest of the cracks around the patch. Don't wait too long before planing; remember, you want it cheesy, not rock-hard.

Making Drywall Patterns

You may have to fill an oddly-shaped hole in drywall. What should you do? Sure, you could enlarge the hole and make it square to fit a piece of drywall, but it's a lot quicker to use drywall cut to that odd shape.

How do you do that without a lot of measuring? Just trace the shape on a piece of paper bag. Lay the paper over the broken section of drywall, tape it in place, and trace the hole with a pencil. Cut the shape out and trace it onto a piece of drywall. It'll be nearly the shape you need, and will require only minor trimming to make it a perfect patch. Try this — it's easy and works great!

12

WINDOWS & DOORS

There are probably as many types of windows as there are days of the year, but they all have basically the same function: to let in light and provide a view to the outside, while keeping in cooled or heated air, and keeping out the elements. Modern windows, if they're installed correctly and properly maintained, will do just that.

No matter where your customer lives, good, solid windows and doors are essential to his well-being. Houses in cold climates need to have openings that keep the winter weather out, and insulate the people inside. And houses in hot parts of the country must have openings that seal well enough to protect the people from the discomfort of the high temperature days of summer. Energy-efficient doors and windows are a *huge* factor in lowering heating and cooling bills, and with the cost of gas and electricity on the rise, that's very important.

Installing a Larger Window

Is it possible to frame for a new, larger window *without* taking the whole wall apart? Absolutely. You can cut out all of the following without even taking the drywall off the wall:

- the existing end stud
- 2 x 4 cripples on the bottom of the window
- wall studs, as needed

You can also install the new header and bottom 2 x 4 without taking off the drywall. Of course, you'll still have to cut the drywall to accommodate the size of the new window, but not having to deconstruct an entire wall will save you a lot of time and effort.

To begin with, remove the old window and trim. Once you've done that, determine which side of the 2 x 4 window framing to cut out to enlarge the opening. Unless the window fits exactly between standard wall studs, you'll have to install a new stud or filler strips on one side for the new window.

Find the location of the wall studs in the window area. With the old window removed, you'll easily see the nails on the bottom 2 x 4, which will tell you the exact position of those wall studs. Since wall studs are spaced at 16 inches, you can immediately find the next stud or two inside the wall on each end.

Window Cutout

It's easy to find the dimensions for the new window opening — simply measure the new window frame height and width, and add ½ inch to both of those measurements. You don't want the window to be tight in the new framing; you'll need room to level it, if necessary.

"If at all possible, place the new window close to an existing wall stud — it makes your job easier."

To get the measurements for the new window, figure the spacing for the width of the window first. With a tape measure, check from each side of the window and determine which side of the old frame to keep and which side to cut out.

How do you decide? The extra size of the new window could go on either side of the old opening. It really depends on where your customer wants it and where it would look best. If at all possible, place the new window close to an existing wall stud — it makes your job easier.

You also need to consider whether the new window should be higher or lower than the old one. If the top of the old window is already pretty close to the ceiling, you'll know that it will have to be lower.

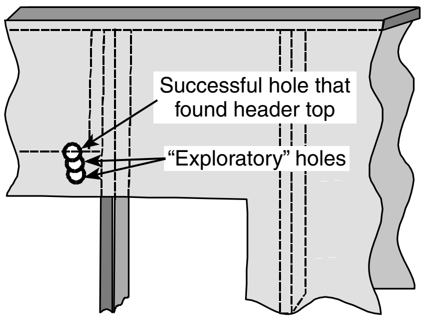


Figure 12-1
Drilling 1-inch holes through the drywall to find the top of the header

Once you've taken all these location aspects into consideration and determined the height and width placement on the wall itself, draw the cutout on the inside wall of the house. Now you're ready to cut the opening:

1. Cover everything in the room before you start sawing. Use a circular saw with a carbide blade set to cut just a little thicker than the drywall or lath and plaster. It will be very dusty, so you'll probably have to leave the room for 15 minutes or so until the dust settles. If you have a helper, have him hold a shop vac close to where you're cutting. This will reduce the dust you'll have to clean up by about half.
2. With some careful measuring, transfer the same cutout measurements to the outside of the house and cut through the siding and sheeting or wallboards.

Cutting Off the Old 2 x 4s

You now have your basic window cutout; however, the old wall studs and window framing are still in place. Here is where my method is a real timesaver. Snap a chalkline on the wall where you'll place the top of the header and the bottom of the lower 2 x 4. This shows you where to cut off the 2 x 4s inside the wall to make room for the new framing installation.

You probably can use the top of the old header as the height for the top of the new, longer header. To find the top, drill a hole 1 inch deep where you think the old header is located. Keep drilling 1-inch holes until you find it, as illustrated in Figure 12-1. You can estimate by looking inside the wall at the exposed end stud. Where are the header nails located?

If the window is only about 2 or 3 feet wide, the header is probably a 2 x 4 with two nails. If the window is 6 feet wide, the header is probably a 2 x 6 with three nails. The spacing of the nails will give you a pretty good idea of where to drill to find the top of the old window header.

Remember to drill the trial hole a few inches in from the end stud. If you hit solid wood when you drill, the top of the header must be higher (unless you're drilling into a stud or a cripple). If the drill goes right inside the wall and doesn't hit anything, stick your finger inside the hole and wiggle it around to find the header.

When you find the very top of the header, mark it on the inside wall. Drill a hole at that height next to the edge of the last full-length stud. Using

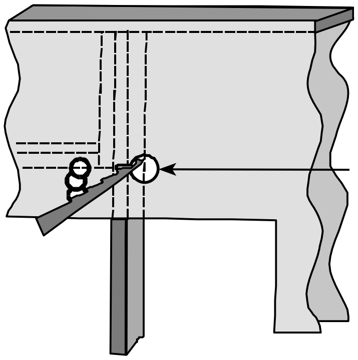


Figure 12-2
Sawing off the end stud at the height of the header through another drilled hole

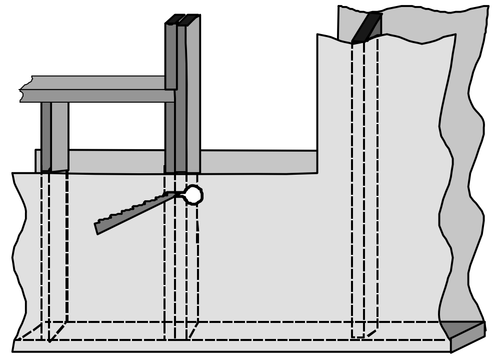


Figure 12-3
Sawing the 2 x 4 through the 1-inch hole with an angled reciprocating saw

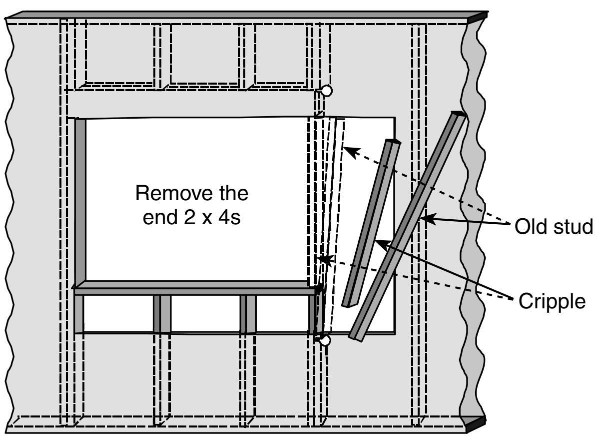


Figure 12-4
Prying out the 2 x 4 section and the section of cripple next to it

a reciprocating saw, cut off the full-length end stud at header height; see Figure 12-2.

Next, cut off this old end stud and the cripples to make room for the new, longer 2 x 4 underneath the window. Cut these pieces off 1½ inches below the new window cutout. This will give you room to install the new horizontal bottom 2 x 4.

Snap or draw a line 1½ inches below the bottom of the new window cutout. Drill 1-inch holes with a spade bit alongside the end stud and all of the lower cripples below the window cutout. Again, with a reciprocating saw, cut off the end stud and all the cripples that you don't need 1½ inches below the new window cutout. You'll have to angle the saw blade quite a bit to make the cuts (see Figure 12-3). Be careful not to saw off the full-length stud at the other end of the window.

Once you've cut the old end cripples above the header and below the window, you'll be able to pry out this middle piece and the short cutoffs above and below the new window cutout. Figure 12-4 shows you this process.

If the new window is a lot wider than the existing window, you'll have to use a bigger header. On a window up to 4 feet wide, you can use 2 x 4s on edge for a header; but you'll need 2 x 6 headers for a window 6 feet wide. And there's some additional work for you if the new header is higher. You'll either have to drywall the open spots at the bottom of

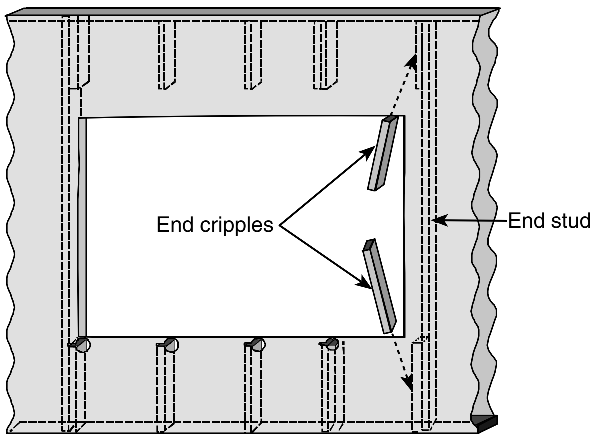


Figure 12-5
Cutting and gluing in two cripples against the end stud at the top and bottom

the header, or cut off all the cripples above the window inside the wall to fit the new, bigger header into place.

Remove the existing header above the window and the horizontal 2 x 4 below the window so you can replace them with the new, longer pieces. First, pull out the nails in the horizontal 2 x 4 below the window. There will be two nails in this 2 x 4 at the top of each cripple. You probably won't be able to get at all of them.

If you have trouble prying out the header or bottom 2 x 4, cut them down the middle with the reciprocating saw — then you'll be able to pry out each half. After you have the header and the 2 x 4 below out, you'll be able to see the ends of the shorter cripples inside the wall below the window.

Adding Cripples

If the new window is much longer than the old one, you may have to add one or more cripples inside the wall at the top and bottom of the new window cutout. Simply cut the new cripple as high as the existing short studs above and below the window. Put some paneling glue on the two edges of the cripple and on the top and bottom. Then place it in the wall. See the example in Figure 12-5.

If the wall is lath and plaster, you'll undoubtedly have to scrape off the plaster on the inside of the lath in order to get the new 2 x 4 cripple inside the wall. You now have a resting place for the new, longer 2 x 4 that will frame the bottom of the window opening.

Installing the New Stud

There should still be an old stud left on one side of the new window cutout. So your next step is installing a new full-length stud on the opposite side of the rough opening for the new window.

See if there's an existing wall stud close to the side of the new window opening. If the last stud inside the wall is within even 3 inches of your new window cutout, you're all set: You can cut the new window header and bottom 2 x 4 a little longer, so they go up to the old stud.

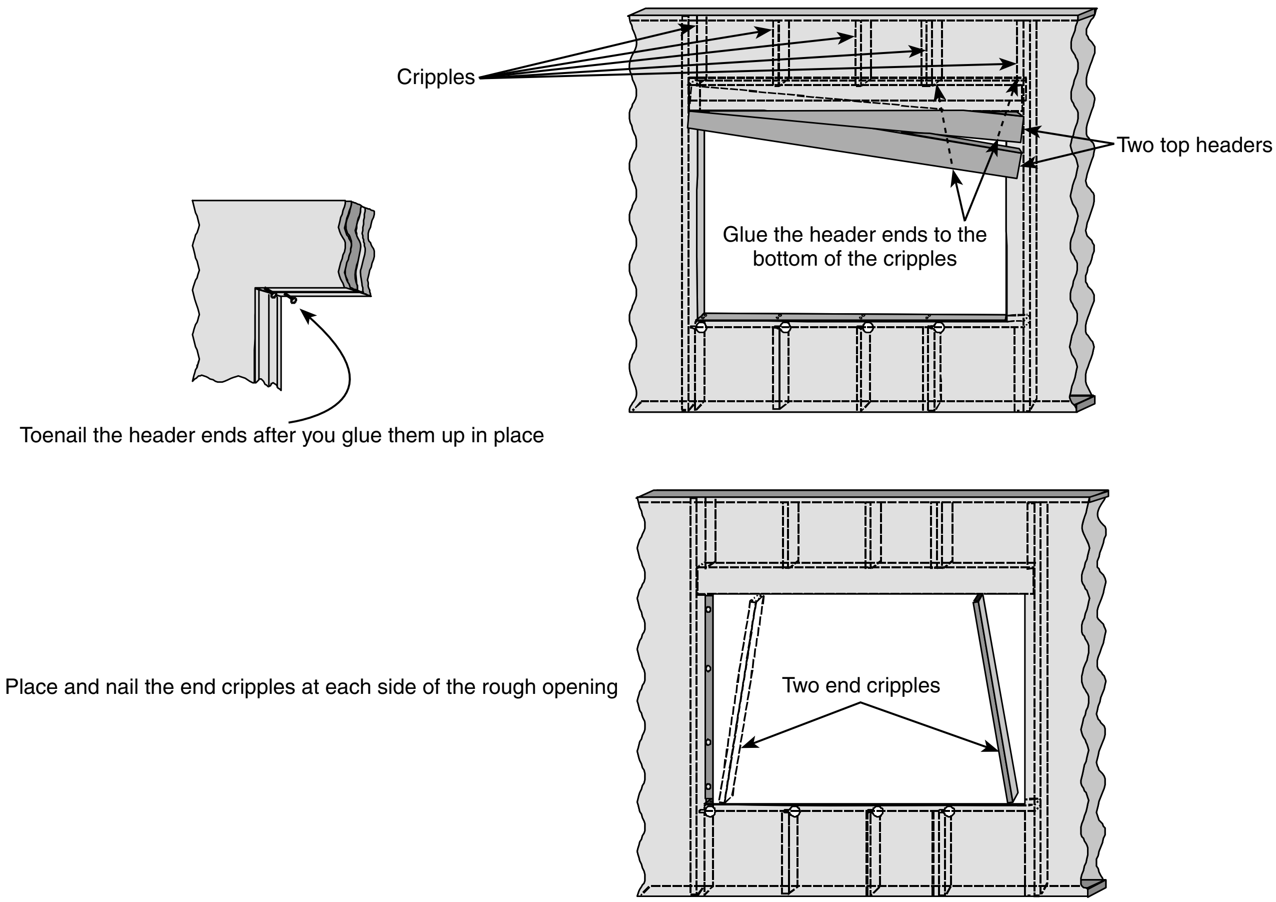


Figure 12-6
Gluing top headers to cripples and nailing end cripples

Sure, they'll be a little longer than the window cutout, but later you can put another 2 x 4 (or 1 x 4) against the new end stud to fill the open space at the end of the window cutout, as shown in Figure 12-6.

Although you could simply nail the ends of the new header and bottom 2 x 4 to the end stud inside the wall, it would be better to cut duplicates of the cripples already above and below the window.

Place them inside the wall against the existing end 2 x 4 before putting in the new header and lower 2 x 4. If you drill slanted nail holes in them beforehand, you can nail them to the existing end stud. If this is too difficult, squirt paneling glue on the edges and push them into place inside the wall against the end stud. Cut the bottom 2 x 4 to go between the two existing wall studs on each end.

Slip this new 2 x 4 into the wall and nail it to the top of the new cripples and the studs at each end. Toe nail each end of the bottom 2 x 4 to the studs, using 16d finishing nails. Congratulations! You have now completed the rough framing for the bottom of the new window.

Cutting the Top Header

Now you're going to cut the header for the top of the window frame. This too must be cut long enough to go between the first two existing studs — just as you cut the length for the bottom 2 x 4. You won't be able to nail the header at the top because it will be inside the wall, but you can reach in and squirt paneling glue on the existing studs, where the ends of the headers will be going.

Drill two diagonal starter holes at the bottom on each end of the header. Use 16d finishing nails and pound them in flush after you push the header up into position. You might have to cut out the drywall or lath and plaster to get the end of the header up.

Cut 2 x 4s to fit vertically between the header and the lower horizontal 2 x 4 at the ends of the window. You'll be nailing them in place against the end studs of the rough opening. These 2 x 4s will hold up the header on each side.

What if a 2 x 4 is too thick to allow you to get the window in? If that's the case, use a 1 x 4, or even a strip of ½-inch plywood. The purpose of having wood between the header and bottom 2 x 4 is to hold the header up. If you end up using a strip of plywood, nail or glue it to the stud, and it will prevent the header from being pushed down.

Finishing the New Window

If the end of your window cutout is a foot away from the next old stud inside the wall, you'll have to remove some drywall or lath and plaster. (From now on, I'll just refer to drywall instead of drywall or lath and plaster. It's more common.) Cut out the drywall between the last cripples and the end stud inside the wall.

Be sure to cut the drywall only up to the middle of each end stud and the cripples adjoining them. This leaves you some exposed wood to nail or screw the new drywall onto later. Once you have the drywall removed, you'll be able to nail in a full-length stud at the distance needed for the new window. See Figure 12-7 for the steps to take.

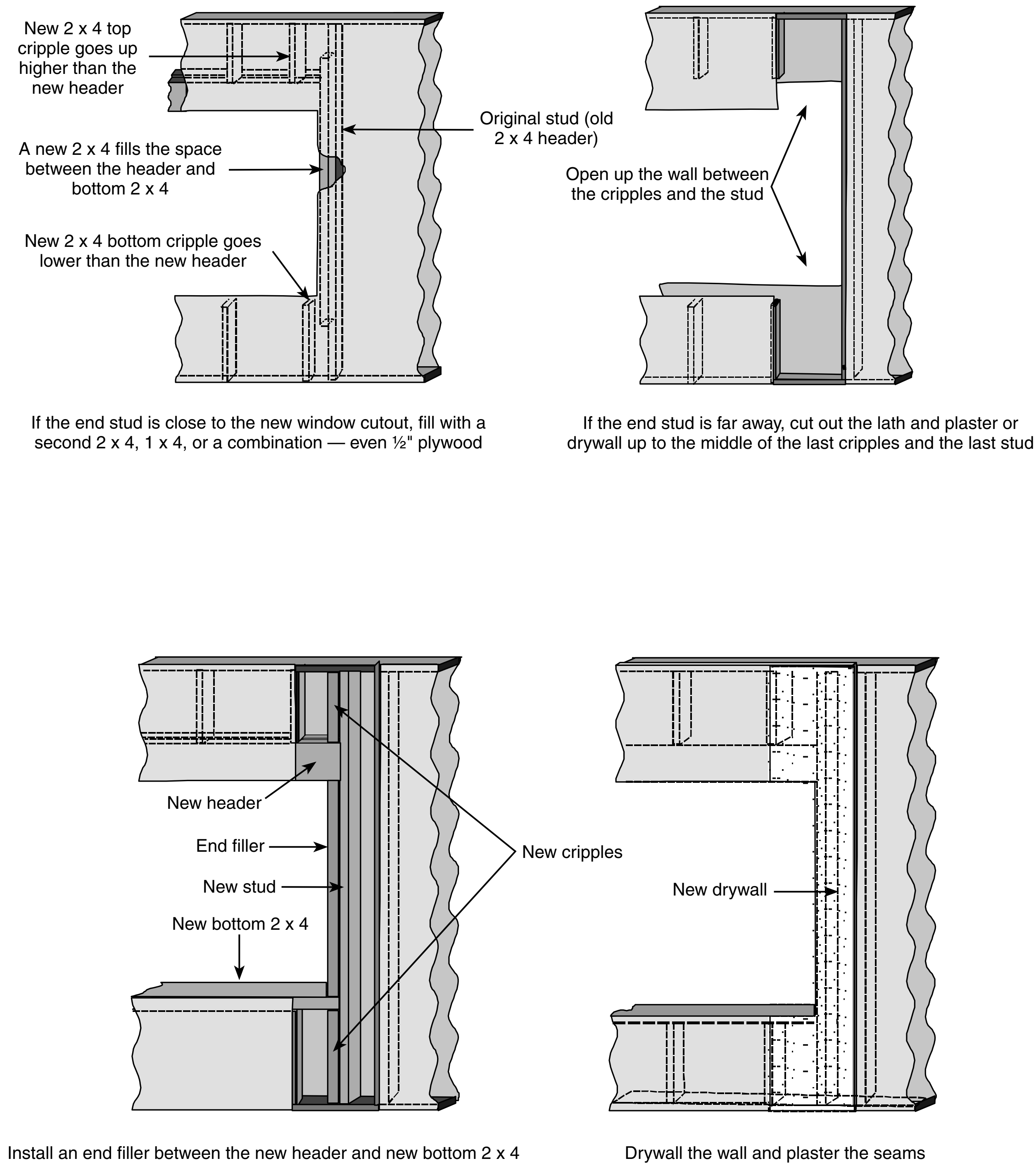


Figure 12-7
Finishing up new window installation

If the wall *does* happen to be lath and plaster, don't try to lath and plaster the newly-opened part of the wall. Just shim out regular drywall so it's flush with the old wall surface. You'll probably have to rip strips of wood to bring the drywall out the proper distance to match the old wall surface. Remember: you can rip strips of masonite, plywood, or paneling to shim out the drywall.

For the exterior, after the window is in, just put on the exterior trim and apply caulk around the window frame.

Renew — Don't Replace Windows

If you want to save your customer money when updating his windows, don't replace old window sashes just because he wants dual-pane glass. Instead, modernize his existing windows, and give him all the convenience of vinyl without the exorbitant cost. Why spend time taking out old windows and installing new ones? You'd bill as much as the windows cost themselves — not a bad profit for you, but if you intend to be in business for the long run, saving your customer money will put you high up on his "good guy" list.

There's an inexpensive alternative to those new vinyl thermal-pane windows: inserts that fit inside the old frames. They're made of thermal-pane glass and have vinyl slides, and even open inward so the outside glass can be cleaned from inside. So why are these inserts such a great deal? Because you only have to replace the glass, not the trim and sash.

This makes a tremendous difference, and at a reasonable price. You can install them by yourself, without having to pay a helper. The vinyl inserts can be adjusted about ½ inch up in size, so you have some leeway in fitting — but only if the inserts are *smaller* than the existing window frames. There are adjustment screws that can increase the size of the insert, but there's no way to decrease it.

- When you calculate the width of the window frames, be sure to measure from one side of the window frame to the other. This gives you an accurate measurement.
- Getting the top-to-bottom measurement can be tricky. The bottom of the windowsill angles downward toward the outside, to direct rainwater off the windowsill. Measure the height of the window frame where the window rests inside it. That's the maximum height you want.

***REMEMBER, VINYL WINDOWS** and slides can adjust to be a little bigger, but not smaller. If the new window is too short, you can use adjustment screws or the vinyl strip provided for fill at the bottom. But if it's wider or higher than the old frame, you're out of luck.*

Before ordering the new windows, confirm with the dealer just how to measure. It doesn't hurt to get his input. And don't forget that windowsills tilt downward. As part of the package, you'll get angled vinyl pieces to fill any gaps. Always caulk around the new inserts and fill any cracks between the new windows and old frames.

Repairing Window Frames

This next tip can really save your customer money, and it's easy. Is he thinking about buying a new window and frame because the sill is rotten or the wood on the bottom has gaps or cracks? Tell him that, for a few bucks, you can make that old window frame as good as new.

In all but the most severe cases, you can fill in surface cracks or gaps with *Durabond* or a similar product, using a putty knife. A piece of aluminum or cardboard taped against the window frame edge keeps the material from slumping when you fill in large sections. Have your grater plane handy to smooth the surface. Remember, timing is critical — too soon, too soft; too late, too hard.

Installing Windows in Thick Log Cabin Walls

Log cabins still exist, but sometimes you can't tell from outside — or inside — the house. That's because the logs have been covered with boards or plywood, and then sided over. The inside log walls have been shimmed and drywalled, making them about 14 inches thick.

Installing new windows in these extra-thick walls presents some unique challenges. Modern window frames are built to new house standards and are 4½ inches thick. Framing is done with 2 x 4s 3½ inches thick, which, along with ½-inch drywall and ½-inch plywood outside the walls, total the 4½-inch window depth. Well, these modern windows aren't going to fill the 14-inch wall depth without a fight.

But it can be done. First, let's address the mortar between the logs, called *chinking*. You'll be using a reciprocating saw to remove it, and the instant you hit one of those mortar joints, you'll dull the blade, not to mention pelting yourself with debris. So your first chore is to knock out all the chinking along the window frame. That will give you a clean work area.

Drill through each corner with a large spade bit attached to your drill. You'll need an extender, which you can buy at any hardware store, to get through all 14 inches. You'll then be able to insert a long reciprocating saw blade to start the cuts. By choosing a new window that only needs to fit into the old rough dimensions, you can eliminate having to saw through more than the window frame.

You need a new window frame that has the extra depth to fit the opening. Make a frame about 10 inches thick, then tack it to the outside of the opening and make sure it's level. Use shims to make the frame fit the opening, then glue the 10-inch frame inside the opening, getting a good fit without making it too tight.

Fill the extra space with spray foam insulation that expands as it sets up. Be careful not to over-apply. Expansion could push the window frame out too far, causing it to bind when the window is opened or closed. Then just install the trim and caulk and you're done.

Cutting Glass from Salvaged Window Panes

Many homes have old windows left over when new storm windows were put on the house. I take the glass panes out of these old windows and store them in the corner of my garage for future use. Sure enough, every now and then, this stack of old glass comes in handy to fix someone's cracked window.

Why don't I just drive over to the hardware store and have them cut a piece the size I need? Well, in the first place, that's a 20-minute drive from where I do most of my work, then there's another 10 minutes while I wait for the glass cutter to get to it (and if I go to one of the big box stores, I have to wait for them to find someone who can cut glass because the person who usually does it is on his lunch break). Then the 20-minute drive back. And a couple of times the glass broke when I was putting it in — so another hour and couple gallons of gas. How much can I charge a customer for replacing a 10- x 14-inch piece of glass and not have them think I'm robbing them?

This way, I'm independent. I just grab a piece, and a spare piece, out of my garage and go. And the glass cost me nothing but a few minutes of my time.

So, I'm going to explain how to cut old window glass so you can reuse it for repairing other windows.

Hardware stores sell glass cutters very cheaply. They aren't diamond tipped, but they do the job for occasional glass cutting. Laying out the lines for cutting and doing the actual cutting stumps most people, but you can learn how to do it right the first time. Getting the glass out of an old frame isn't hard when you know a few secrets.

The first problem you'll run into is that old window putty is as hard as a rock. If the putty is in really bad shape — cracking and partially falling out — you might be able to scrape it out with a sharp chisel. But don't push too hard with the chisel or you'll end up cracking the glass.

If you have a heat gun, you can get the putty out easily. Use a low setting and slowly play it over the window putty for 3 or 4 inches. Try to keep the heat on the putty and not on the glass, because the heat can easily cause the glass to expand in that spot and crack. You'll find that the old, hard putty becomes soft again, and you can easily scrape it out with a putty knife. If you have a lot of window panes to change out, use a reciprocating tool like a Fein MultiMaster. They're great timesavers.

Once you have all the putty scraped out of the frame, run your chisel down the edge of the glass near the frame and push out the little metal tabs that hold the glass in. These are called glazier points, and there will be one of these pushed into the frame every few inches along the edges of the glass. These points are what really hold the glass in place. The putty is there mainly to water seal the glass edges by the frame. Once the putty and glazier points have been removed, you should be able to lift the glass right out of the frame.

Steps for Cutting Glass

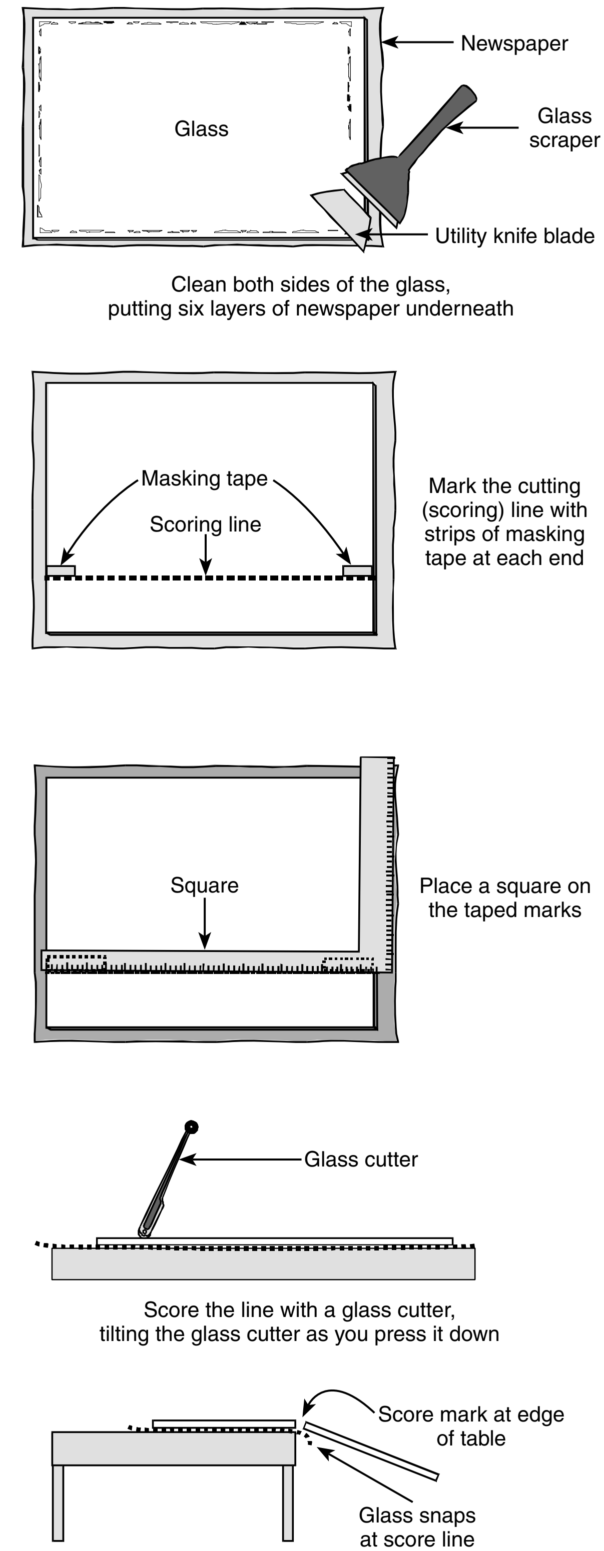
Follow these simple steps for successful glass cutting.

Step 1. Prepare Your Work Area & Clean the Glass Surface

You'll need a flat surface for glass cutting, so lay at least six layers of newspaper over the table or bench where you'll be working. Put the newspaper right up to the edge of the table. Because you're going to snap the scored glass over the edge of the table later, you want it well cushioned. The layers of newspaper keep the glass from breaking accidentally in case your table or bench has some high or low spots.

When a pane of glass has been removed from a frame, there are always bits of window putty and paint on the edges of the glass. Remove these before cutting the glass. For the glass cutter to operate correctly and scribe the glass, the surface must be perfectly smooth and clean; see Figure 12-8.

Use a glass cleaner and paper towels to clean the worst of the dirt off the glass. Old glass will usually have large deposits of gunk and dirt on



Clean both sides of the glass, putting six layers of newspaper underneath

Mark the cutting (scoring) line with strips of masking tape at each end

Place a square on the taped marks

Score the line with a glass cutter, tilting the glass cutter as you press it down

Press down quickly to break the glass

Figure 12-8
Reusing glass from old windows

at least one side of the glass. After this basic cleaning, there will still be many patches of old paint and putty near the edges of the glass. But at least now you can clearly see where the bad spots are on the glass. This is a big help in the next step.

Spray some WD-40 or paint thinner on the glass and scrape it with a scraper made for window cleaning. The best tool to use holds a utility knife blade tightly at its front edge. You'll find it in the tool section by utility knives and scrapers. Scrape the glass clean; if there are a few stubborn spots, spray them once more with WD-40 and scrape again. Once the glass surface is clean, you're ready for the glass cutting.

Step 2. Mark the Position of the Cutting Line

At each end of the glass, put down a short strip of masking tape next to where you're going to cut the glass. Place these pieces of tape on the edges so they'll line up the square that will guide the glass cutter as you pull it across the glass surface. The reason for using masking tape to mark for the cutting is that you can't draw a line on the glass to lay the square against. If the glass is wider than the 24-inch edge of the square, put a third short strip of masking tape in the middle of the glass so that the square has something to follow at the middle, also. When you cut glass for a frame, it's a good idea to cut the glass pane about 1⁄8 inch smaller than the frame — better a little too small than too large.

Step 3. Score

If you've placed the masking tape and square correctly, you should now be ready to score a line for the glass cutting. Notice the scoring wheel on the glass cutter is set in a fraction of an inch from each side of the glass cutter. Thus, the glass cutting score line will be slightly away from the edge of the square that you're using for a guide. Now is the time to measure and see if this will put the score line a little too far over. Remember: it's better to cut the glass a little smaller than you need rather than have it too big. The new window putty you'll be applying will cover a lot of the space between the frame and glass. But if you cut the glass piece a little too big, you've made a real mistake. It's just about impossible to cut ¼ or ⅛ inch off a pane of glass.

Pour a little kerosene or paint thinner along the line before scoring. Hold the glass cutter at about a 45-degree angle from the glass and pull it towards you. Keep constant pressure on the cutter as you pull it. Listen for a crackling sound as you pull the cutter towards you. It sounds like crumpling cellophane. If you only hear a crackle now and then as you press down and pull the cutter towards you, it means the score wasn't good at some spots. Score the glass again, listening for that constant crackle. It isn't a good idea to score the glass more than once, but if the cutter didn't crackle constantly, the glass won't break cleanly, and the pane will probably be ruined when you crack it off.

Step 4. Crack the Glass on the Score Line

It's important to crack the glass shortly after you score it. Experts say that glass "heals" itself within a few seconds of being scored; so make the snap-off quickly. Put the score line right over the edge of the table. Hold the square down firmly with one hand, and with the other hand (the gloved hand), snap the glass extending over the table downward firmly in a quick motion. If you do this right, the glass will snap neatly on the score line.

Doors

If you go door shopping at a building supply store, one of the first things you'll be asked is, "Do you want a right- or left-hand doorknob?" or, "Do you want an innie or an outie?" If you don't know the answer, you could end up buying the wrong door.

What's the difference between an in-swing and out-swing door? Entry doors come pre-hinged to either swing in or swing out. Every door intended to be installed on an exterior wall of a house will have trim (called brick molding) on one side of its frame, as shown in Figure 12-9. The brick molding goes outside the house. It's thicker than the molding on interior doors, because it covers the edges of the exterior side that butts against the doorframe. That makes it easy to tell if the door is in-swing or out-swing. If the hinge pins are on the brick molding side of the door, it will be an out-swing door.

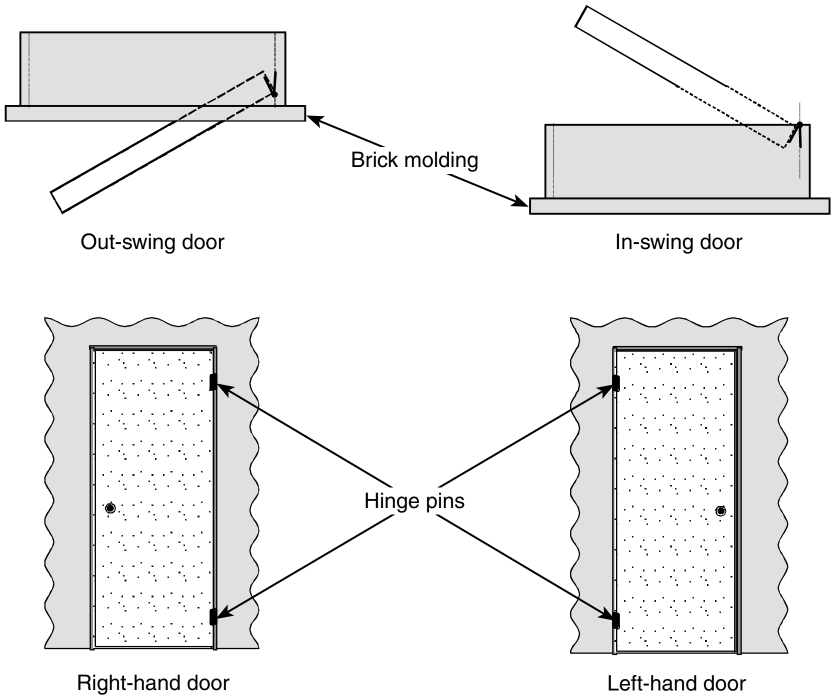
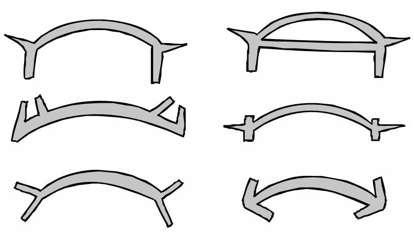


Figure 12-9
Out-swing and in-swing, right-hand and left-hand doors

REPLACING A DOOR'S RUBBER INSERT

When the rubber weather seal on the door threshold wears out, it's easy to replace. Just pull it up, take it out of the aluminum threshold, and take it along to the hardware store. Why? Because even though all weather seals are 36 inches long, there are a lot of shapes available. Get the insert that's the same width as the one you're replacing and closest to the shape of the threshold. There are many variations, and you want the fit to be perfect the first time.

Different styles of threshold inserts



Brick molding for outside doors has been used successfully for many years, and it works just fine. Interior doorframes usually have no molding. If the doorframe comes without trim, you're able to turn it around and face it either way you want.

The main thing you need to know is whether the door has a right-hand knob or left-hand knob, which is determined by how the door swings when you're facing its hinged side. Are you with me? All doors have door hinge-pins. You can only open the door toward the hinge-pins. So choosing the inward/outward swing and right/left handle all boils down to hinge-pins and brick molding. Look again at Figure 12-9.

Weatherstripping

Weatherstripping a doorframe is simple, but I'm amazed at how many people don't get it right. If you think the door presses the weatherstripping *inward* toward the doorframe when the door is closed, you're wrong. The hinge-side stripping will peel off the frame if you apply it like other weatherstripping. That hinge-side piece goes on the doorframe itself. The edge of the door will then compress it.

Easy Weatherstripping for an Out-of-Square Doorframe

If you have gaps between the door and the frame, it could be that the frame is out of square — it could be *wider* than the weatherstripping. All you have to do is add extra layers of weatherstripping to fill the opening. Most foam weatherstripping has an adhesive backing, so it's easy to layer the extra material you need.

It's sure a lot simpler than putting shims in the doorframe to fill the gap, but if the gap is ¾ inch or more, you might have to resort to shims. Simply rip wood strips with your circular saw to tack to the doorframe before you install the weatherstripping.

Solving Fit Problems

Here's a situation I've never seen on one of those T.V. fix-it shows: fitting a door into a warped, out-of-line doorframe. I don't mean that the doorframe is out of square. I mean that the metal frame is installed correctly, but when the door is shut, there's a space at the top or bottom — which can be a real problem when windy weather sets in.

Your customers don't want warmth leaking out in the winter and icy, below-zero air taking its place; and the same goes for hot air seeping in during the summer time, fighting against the air conditioning. How do you fix this problem? Cut wood shims to compensate for the warped doorframe. Taper them from ½ inch on down and put them behind the metal storm doorframe. The amount of warp determines what and how much you'll need to do, so play it by ear.

Another possibility is that the doorframe was installed incorrectly. Check to see if the trim and brick molding on the outside door are equidistant from the wall at all points. If you see a space, the door installation is the problem and not the actual walls.

In cold climates, this is usually caused by frost pushing up one side of a storm porch. It generally affects the side of the porch farthest from the house, if the footings weren't properly installed. Frost can't raise

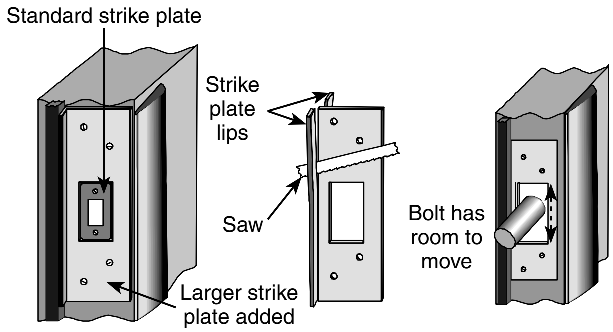


Figure 12-10
How to modify a strike plate

the actual house footings and foundation because they extend below the frost line. You'll know your customer has a frost problem if he lives where it freezes and his door shuts tightly in summer but not in winter. That subject is coming up next.

Modifying a Strike Plate

Frost can warp a door or doorframe by pushing the ground up during the winter. The frame and door are compressed from the frost, and then released when it thaws.

A client asked me to enclose her back step so it could be used as a protected porch in the winter. I attached wood framing to the concrete step unit, and built the enclosure. But by March, the door and storm door no longer latched when the door shut. The winter frost had lifted the ground ¾ inch, raising the concrete along with it. Since concrete footings below the frost line aren't required under concrete steps, everything lifted.

The bolt on the door didn't fit into the strike plate anymore, because the two didn't line up. To fix the problem, I could have moved the strike plate, but then every spring and fall, when the ground rose and settled, I'd need to modify it again.

I had a permanent solution to this problem: A special, longer strike plate surround that was originally developed to deter burglars. I used it by itself to make a new strike plate that was very deep. No matter how much the frost moved the latch bolt up or down, it engaged all year long. One last suggestion: Saw off the latch plate lips and you'll make sure the plate lays flush on the door edge, as illustrated in Figure 12-10.

Squaring Up a Doorframe

When you frame a house, rough openings for doors are framed about ½ inch wider than actual finish doorframes. Sometimes these openings end up out of square, so the finish doorframes won't fit. Follow along by looking at Figure 12-11 to see how to fix that.

1. Mark on the problem area of the 2 x 4 the distance needed to widen the frame.

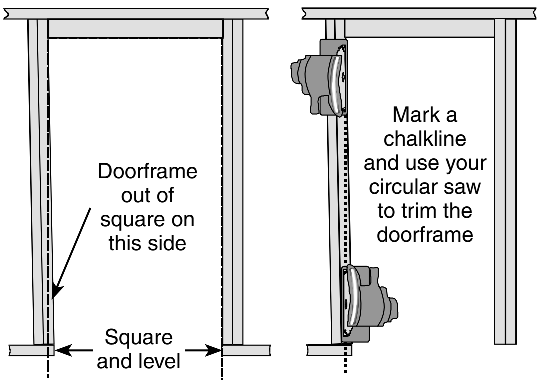


Figure 12-11
Squaring up a doorframe

2. Snap a chalkline at the required distance on both sides of the 2 x 4.

3. Rip from both sides by using a circular saw, set 3½ inches deep. Usually, the rough opening is wide enough at one end, so you'll be cutting out a long tapered section.

4. Since the circular saw table doesn't allow you to rip all the way to the top and bottom, you'll have to cut the last few inches with a reciprocating or hand saw. Make your cut every inch on the face of the 2 x 4, down the chalkline. Fortunately, you only have to do this the few inches your circular saw can't reach.

5. Use a chisel to remove the 1-inch sections you've cut. This may seem time-consuming, but it's much worse to catch the irregularity after the drywall is up. Then you *really* find out the meaning of time-consuming.

Widening Rough Openings

My next client had done some of his own framing, quite professionally, for the most part. He bought 32-inch doors for all the rooms in the house. He'd carefully framed all the 2 x 4 door openings 32 inches wide. Problem? Well, there are a few of them.

1. A 32-inch door has a ¾-inch board on each side for the finish doorframe;
2. There must be ⅛ inch between the frame and door on each side to allow the door to open and shut;
3. You need at least ¼ inch on each side between the 2 x 4 framed rough opening and the actual finished doorframe in case shimming is necessary, which would be the case if the rough opening isn't completely square.

Unfortunately, my guy discovered the hard way that the rough opening for a 32-inch door should be 34 inches. He called me in to make those 32-inch rough openings 2 inches wider.

In Figure 12-12, you'll see that removing one of the vertical 2 x 4s is an option. If the rough openings are only 1½ inches too narrow, that

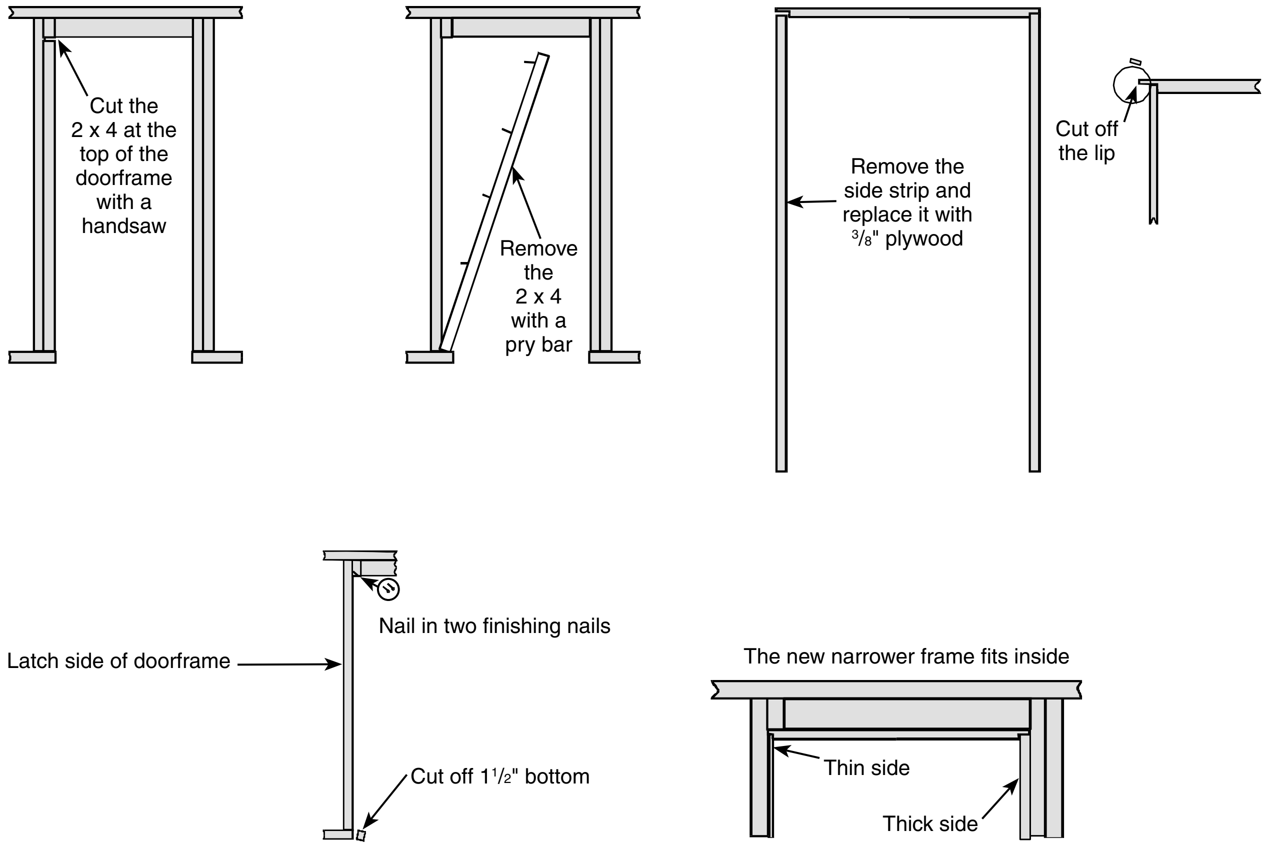


Figure 12-12
Enlarging a rough door opening

would work. But be sure to keep the double 2 x 4 on the hinge side of the door, where the stress is greatest.

- Before removing the 2 x 4, saw it off at the header, keeping the short piece of 2 x 4 alongside the header for a spacer.
- Next, toe nail this short piece of 2 x 4 in place with several medium-sized finishing nails. (It may not seem like the best idea to take out half of the framing, but tearing out the drywall to replace the 2 x 4 is a much bigger project.)
- If that still doesn't give you enough width for the finish doorframe, you do have a problem. It's one thing to remove a 2 x 4 from the latch side of the frame, but quite another to mess with the hinge side.
- Try to gain a little space by again modifying the latch side of the frame. Finish doorframes have ¾-inch-wide boards on each side. You could replace one of those with

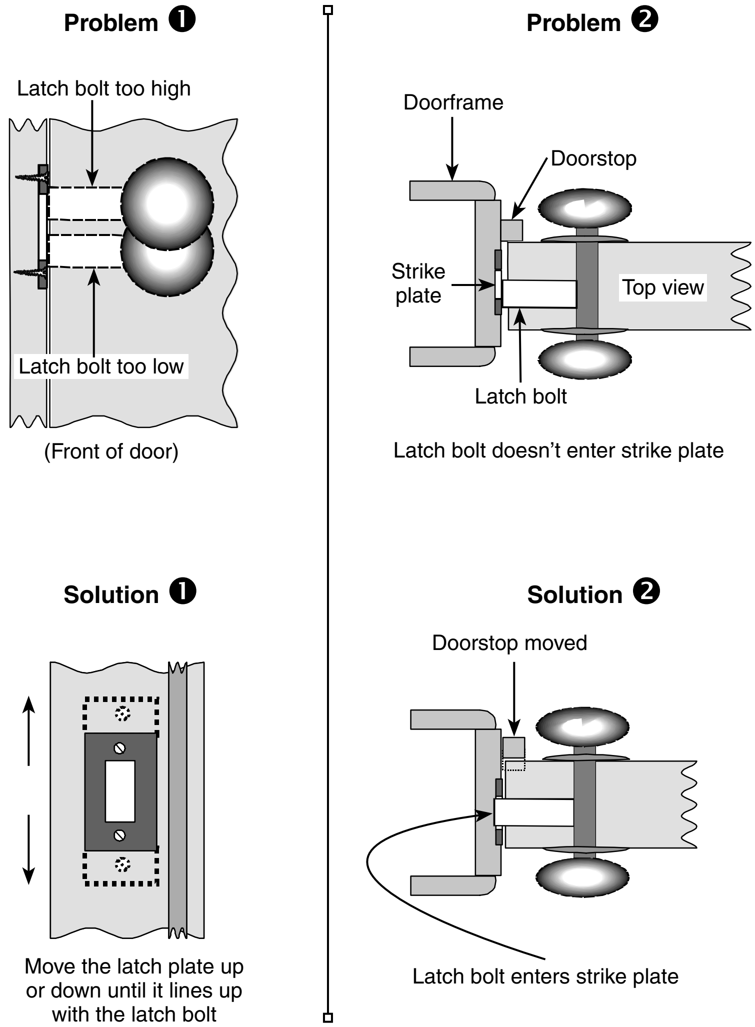


Figure 12-13
Two easily-fixed latch problems

a piece of ½-inch plywood ripped to the original frame size. Fortunately, the latch side doesn't take much stress, except at the latch plate.

Fixing Doors That Won't Latch

Here are two of the most common and easily-remedied latch problems. See Figure 12-13 as a guideline.

1. *The bolt is too high or low, so it doesn't meet the strike plate.* The solution is an easy one. Move the strike plate on the doorframe either up or down so that it matches the bolt.

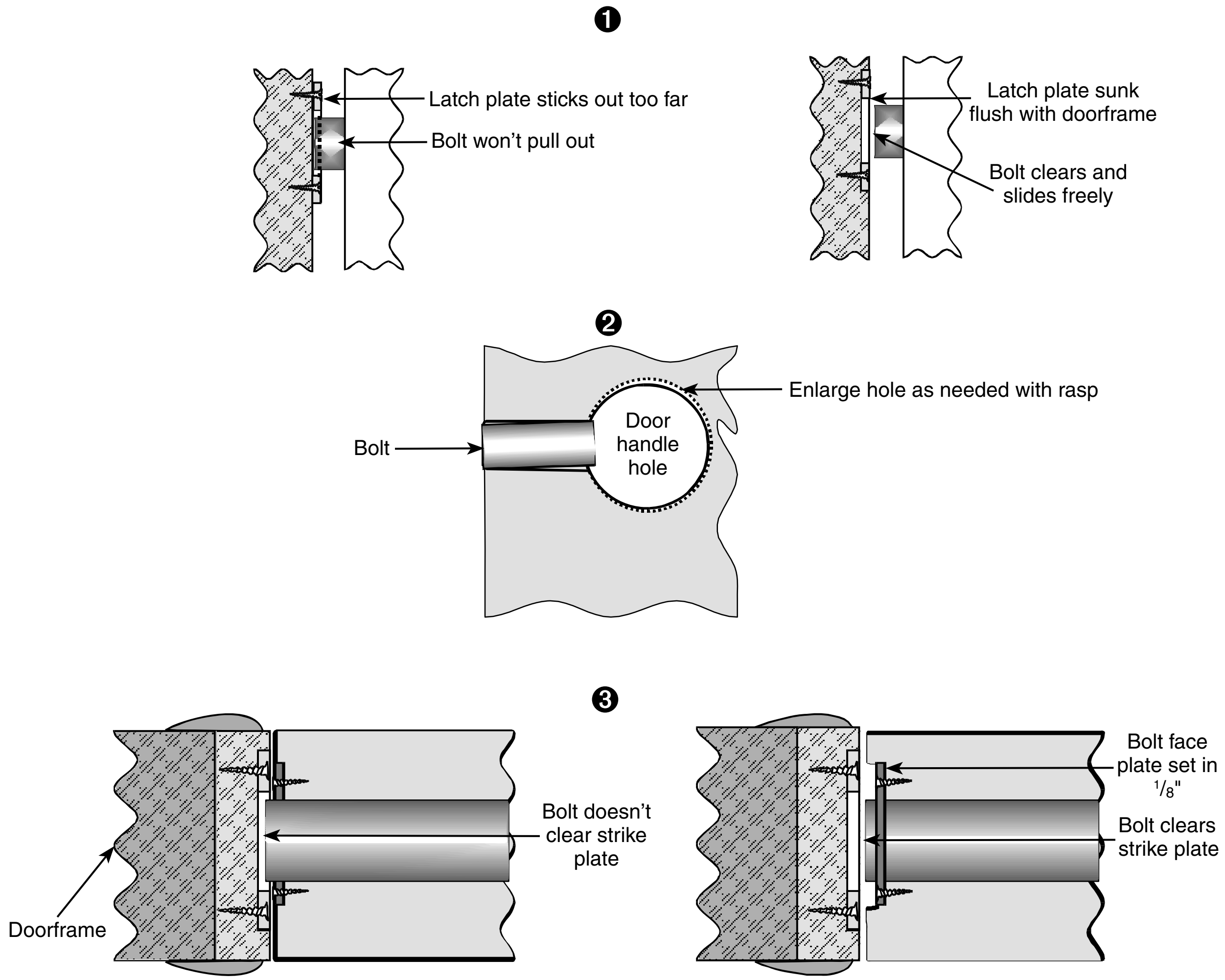


Figure 12-14
Door latch solutions

2. *The bolt sticks out too far when the door is shut, so it can't enter the recessed area in the strike plate.* Move the doorstop trim strips so that the bolt lines up with the plate when the door is closed against the doorstop.

These next three problems involve the bolts themselves. Have any of your clients ever been faced with these scenarios? I'm sure a lot of them have, because these situations crop up every day, so know your options. Figure 12-14 gives you some examples.

The Bolt Doesn't Clear the Strike Plate

The bolt recedes into the door as far as it will go, but doesn't clear the strike plate when the handle is turned. The cause could be that the strike plate isn't flush with the surface of the frame.

If that's the case, use a utility knife and chisel to shave the frame until the plate is flush with it. That should solve the problem.

The Bolt Doesn't Slide into the Strike Plate Hole

The bolt can't slide into the strike plate hole, or the hole for the door handle is slightly off. First, loosen the handle bolts a little so you can move the mechanism. Close the door and see if moving the handle frees the bolt so it moves easily. If that works, tighten up the bolts while holding the mechanism in position.

The Bolt Doesn't Operate When the Handle is in Position

If the bolt operates when the handle is loosened, but not when the mechanism is tightened into position, either the bolt hole or the hole for the handle has been drilled incorrectly. The hole for the bolt can be enlarged with a wood rasp. If the problem is the hole for the handle mechanism, you'll have no trouble filing it down with a rasp. There's plenty of room. You could even use a saber saw to enlarge the hole.

If the door bolt doesn't pull out far enough to disengage, your customer could have a recurring nightmare that just happens to come true — locking himself out of his house.

The door at one particular home was tight against the frame, and the bolt didn't disengage from the plate. There should be about ⅛ inch between the door edge and the frame. Here, even when the handle was turned all the way, the bolt stuck in the strike plate. The door, for all intents and purposes, would lock automatically.

To recess the strike plate was useless, since the bolt still hit the frame. I tried indenting the plate about ⅛ inch in from the edge of the door. The bolt hit the edge of the handle cutout, so obviously it still wasn't retracting completely. I ended up cutting a notch in the handle hole so the bolt could move and seat properly.

Quick Repairs

To fill nicks and marks on old doorframes, turn to filler like Durabond or Evercoat HomeFix. Use steel wool to rough up the surface area, then spread the material. When it's firm, shape with your grater plane and sand for a smooth finish.

If a metal threshold is loose, it could be that the nails meant to secure it don't hit anything, because they're in the crack between two rooms.

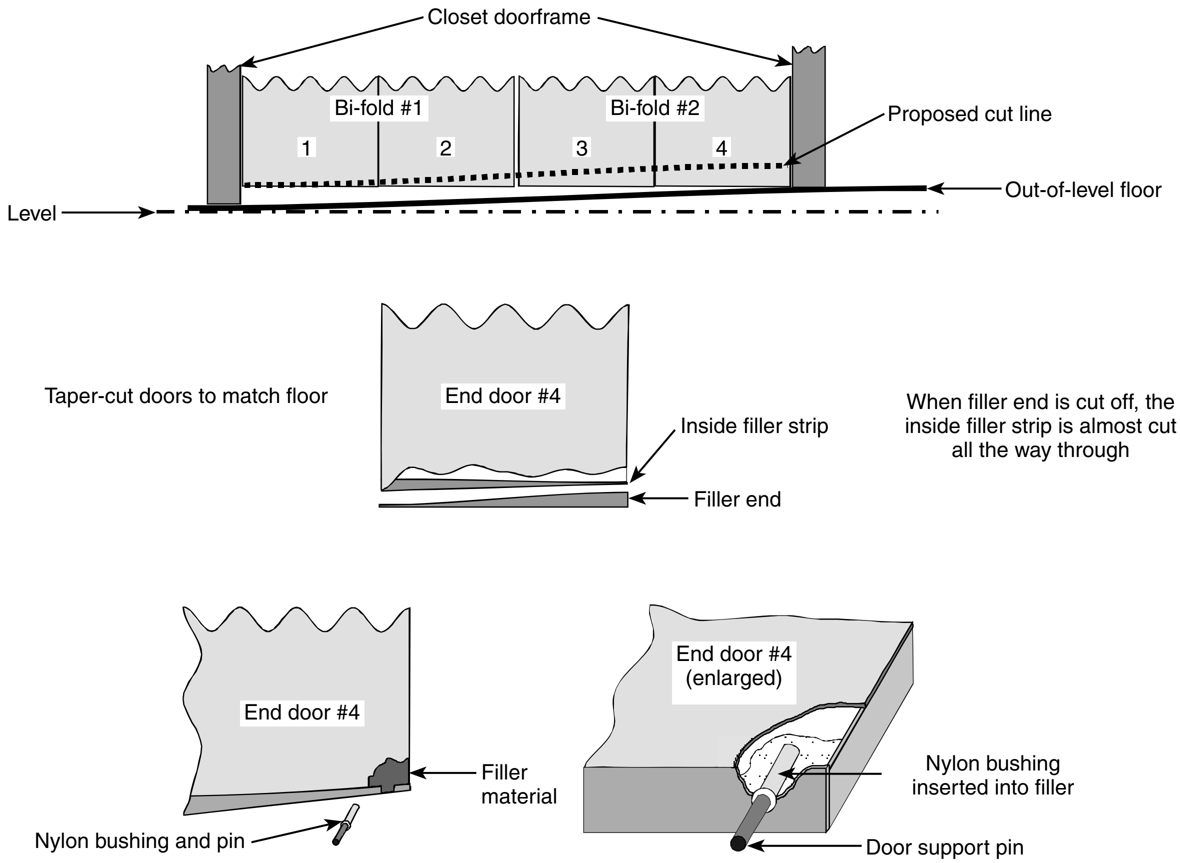


Figure 12-15
Shortening bi-fold closet doors

Pack filler, such as *Liquid Nails* adhesive, in where the nails go, and immediately lay the threshold down, pushing the nails into the filler. Within minutes, the nails will be held firmly in place.

Closet Doors

In this next example, I was hired to install bi-fold closet doors on the second floor of an old house. The floors upstairs had settled, and were way out of level in many spots. The closet doorway was 8 feet wide, and was the biggest problem. In that 8 feet, the floor sloped 1¼ inches. It takes two bi-fold doors to cover an opening this wide, so the doors had to be cut to accommodate the slanted floor. In a situation like this, lay the doors down together, and snap a chalkline across them to cut the long taper at the bottom of the doors. See Figure 12-15.

This may seem pretty simple, until you consider this: Bi-fold doors have hollow cores. They have narrow strips of wood only along the edges, and the middle is cardboard material similar to an egg crate. All hollow doors have a filler strip at the top and bottom to allow for the door to be cut off if the situation requires.

Unfortunately, most bi-fold doors have only 1-inch-thick filler. Generally, a door doesn't need more adjustment than that. But most of the bottom wood filler would have to be cut out in this particular situation. There would be no wood left to hold the nylon bushing supporting the metal pivot pin that holds the door up. Without bushings and pins, the doors couldn't swing out when they open.

After shortening the bi-fold doors, there was almost no wood left at the bottom of the door where the pivot was supposed to go. There was still a sliver of wood at the bottom of the door, but it wasn't nearly thick enough to hold the nylon bushing in place.

So what did I do? I suppose I could have gotten into some clever finish carpentry work and rebuilt the bottom of the door to accommodate the bushing. But the cost of my labor would probably have been more than the cost of the door, and the customer wouldn't have gone along with that. And there's a limit to how much work I'll do for free. So I used *Liquid Nails*. The original hole for the nylon bushing was still in the thin strip of wood left on the bottom of the door. I mixed a little *Liquid Nails* and pushed as much as I could inside the hole with a narrow putty knife, so it would spread inside the door near the hole. Then I pushed the bushing up into the hole.

I had to work fast to get the nylon bushing up inside the hole before the *Liquid Nails* started to set up. That gave me just a few minutes. Fortunately, my makeshift idea worked like a charm. The moral of the story is to be resourceful.

Old Door Handles

When remodeling old houses, another common problem you'll encounter is caused by doors with mortise-type door hardware. The mechanisms for these door handles are set deeply inside the door; modern handles are installed in a 2-inch hole. To replace the hardware in an older door, simply fill in the deep hollow opening before drilling the correct sized hole for the new handle.

- ➢ Cut two squares of ½-inch plywood to fit inside the deep mortise. If your fillers are too thick or too thin, cut shims to fill the space. By using paneling glue, you can fill slight gaps completely. Don't use wood glue; it's thin and doesn't fill gaps as well.

- Once you have the blocks and shims glued in, fill the old holes on the door faces. The edge of the door will probably need some filler, too, around the shims.
- After the filler has set up enough, plane and sand the surfaces smooth. I suggest you only try this when the door is to be painted, not stained. The repaired area won't take stain the way the rest of the door will.
- If you do intend to match a stained and varnished finish, you'll also have to take into account the edge of the door. Don't worry about the filler material on the face; it'll be gone when you drill the $2\frac{1}{8}$-inch hole for the handle. Since the edge is only visible when the door is open, get craft paint that matches the color of the stain. Paint over the filled edge. Your repair work should be virtually invisible.

13

EAVES & VENTS

In this chapter we're going to deal with framing and wrapping house eaves. Since almost all eaves are wrapped with aluminum these days, I'll use that material for my examples. I'm including attic ventilation in this chapter too, because air intake vents are located in the eaves, so that's where ventilation begins.

Fascia

So, you've decided to wrap the eaves on your customer's house with aluminum, but there's a stumbling block: The fascia has a 1 x 2 strip at the top, or possibly a thick molding on the top half of the fascia (see Figure 13-1) , so you can't use standard aluminum fascia. Any idea what to do?

Well, you *can* put up regular flat fascia. Eaves with 1 x 2s at the top are common. The solution is to put 1 x 2 strips at the bottom of the fascia boards, too. Then put aluminum fascia on the front of the eaves.

- ➢ Using white or brown aluminum nails, tack the aluminum fascia to the edge of the 1 x 2 every few inches, to secure it.
- ➢ Nail the 1 x 2s flat against the bottom of the old fascia board. Whenever you edge-nail something that wide, drill tight starting holes for each nail, so the nail heads can't slide in easily. Use finishing nails, because the heads aren't so big that they'll dimple the aluminum.

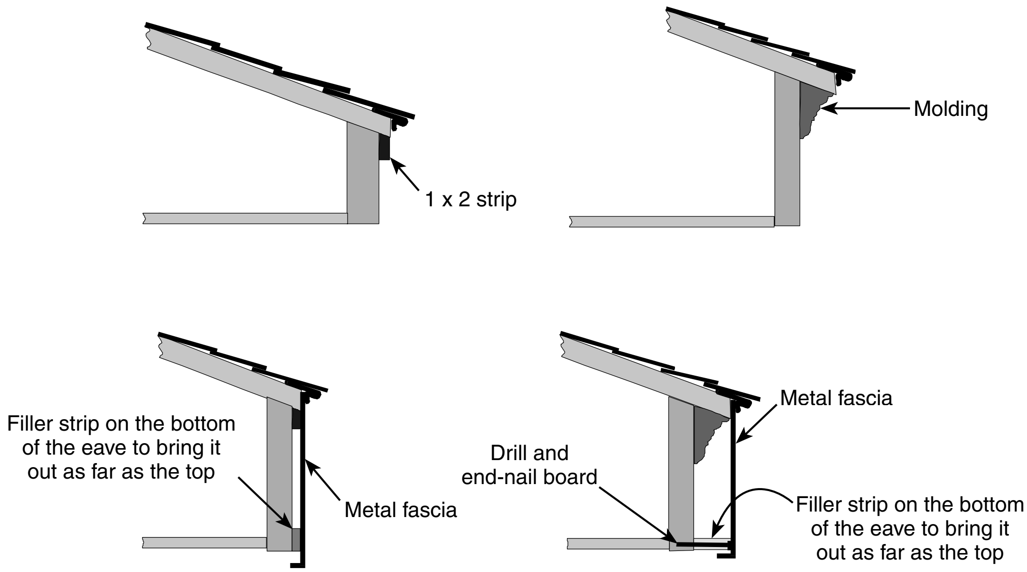


Figure 13-1
Wrapping unusual eave shapes

> **HELPFUL HINT**
>
> *There I was, wrapping the eaves on a very old two-story house. I had to extend my 40-foot ladder out just about all the way to get at the eaves on this house, which were really wide. It was all I could do to reach out and hold the fascia up to position it under the metal edge. At this height on a 40-foot ladder, your opportunity for a fall is high. In this case, rent scaffolding. Once on the scaffolding, if you have problems holding the fascia metal and positioning nails, I have four words for you —* heavy aluminum sticky tape*. In this situation, I just tore off a little square of sticky tape and put it around the nail I needed to drive in. I put the nail in place and pushed the tape around it onto the surface of the fascia. The tape held the nail straight out so I had no trouble pounding it straight in.*

- Space these nails every 10 inches to hold the boards firmly. Aluminum fascia must be positioned ½ inch down from the fascia boards it covers, so the soffit covering the bottom of the eaves can slide in between the fascia board and the bottom of the metal fascia strip.

When you're wrapping eaves that have ornamental molding at the top of the fascia, follow the instructions below:

- First, measure the distance from the flat fascia board below the molding to the metal edge on the roof. The new metal fascia goes behind that edge. Let's say the distance is 3 inches from the front of the fascia board to the back of the metal edge. If you nail 3-inch filler strips at the bottom of the fascia boards, you can attach aluminum fascia to the strips. The top of the metal is behind the edge, wedged between it and the front of the roof boards.

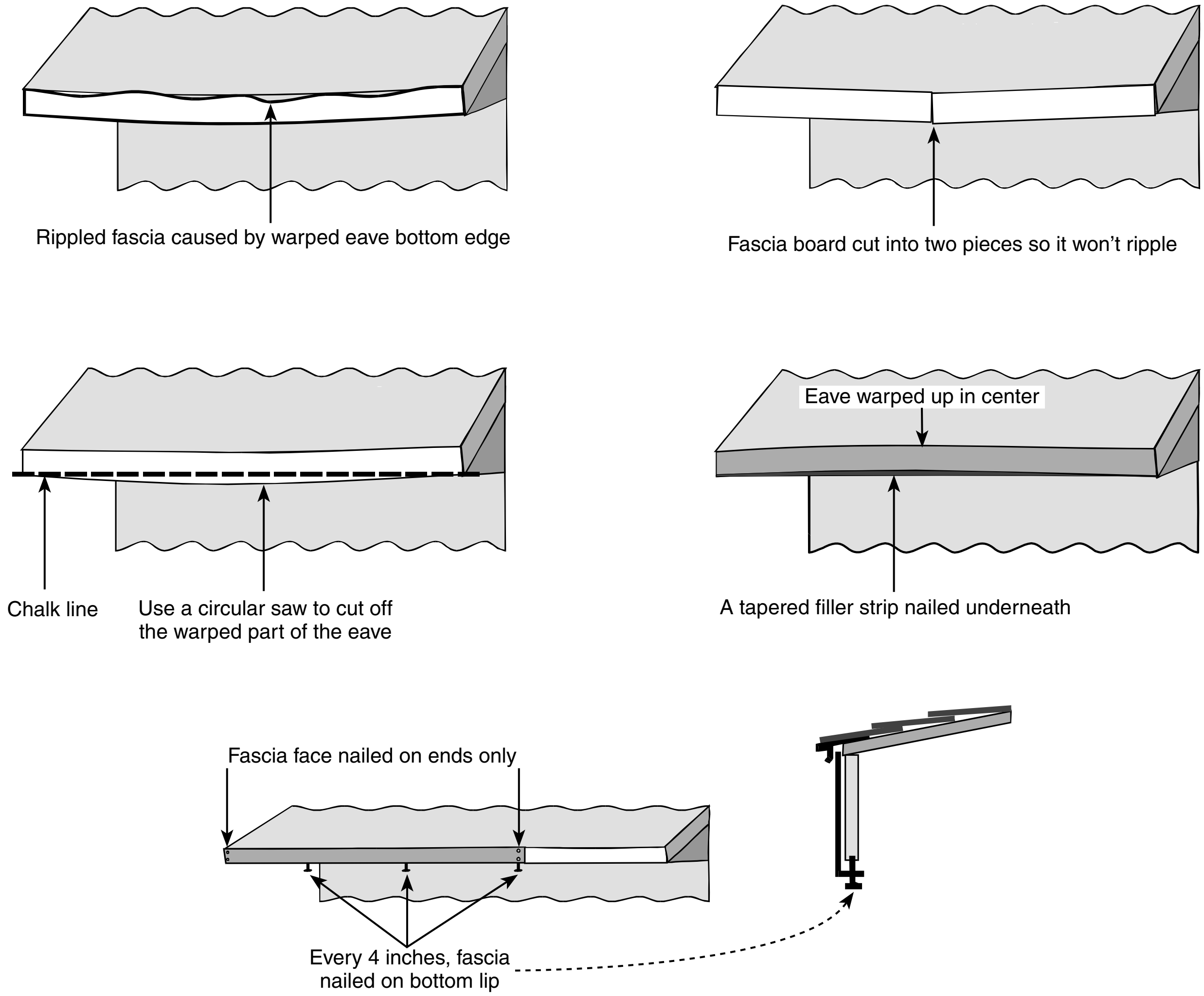


Figure 13-2
Eave wrapping and nailing techniques

Warped Eave Boards

A warped eave is the last thing you need if you're wrapping it with aluminum fascia. Fascia strips for eaves are 10 feet long, and must be installed on straight boards. If you try to install the metal fascia on a warped eave, it'll be wavy from the get-go. And that will be quite obvious from the ground, as illustrated in Figure 13-2.

Cut off the warp in the eave board as follows: Snap a chalkline between the bottom ends, and saw on the line to produce a "straightened" eave. If you end up having to cut past the lip of the fascia, cut the metal fascia into two lengths instead. Stretch a chalkline across the bottom of the board to find the lowest spot, and join the two pieces of fascia there. Now there's no bow in the metal. You'll have another joint, but that's better than having waves along your fascia.

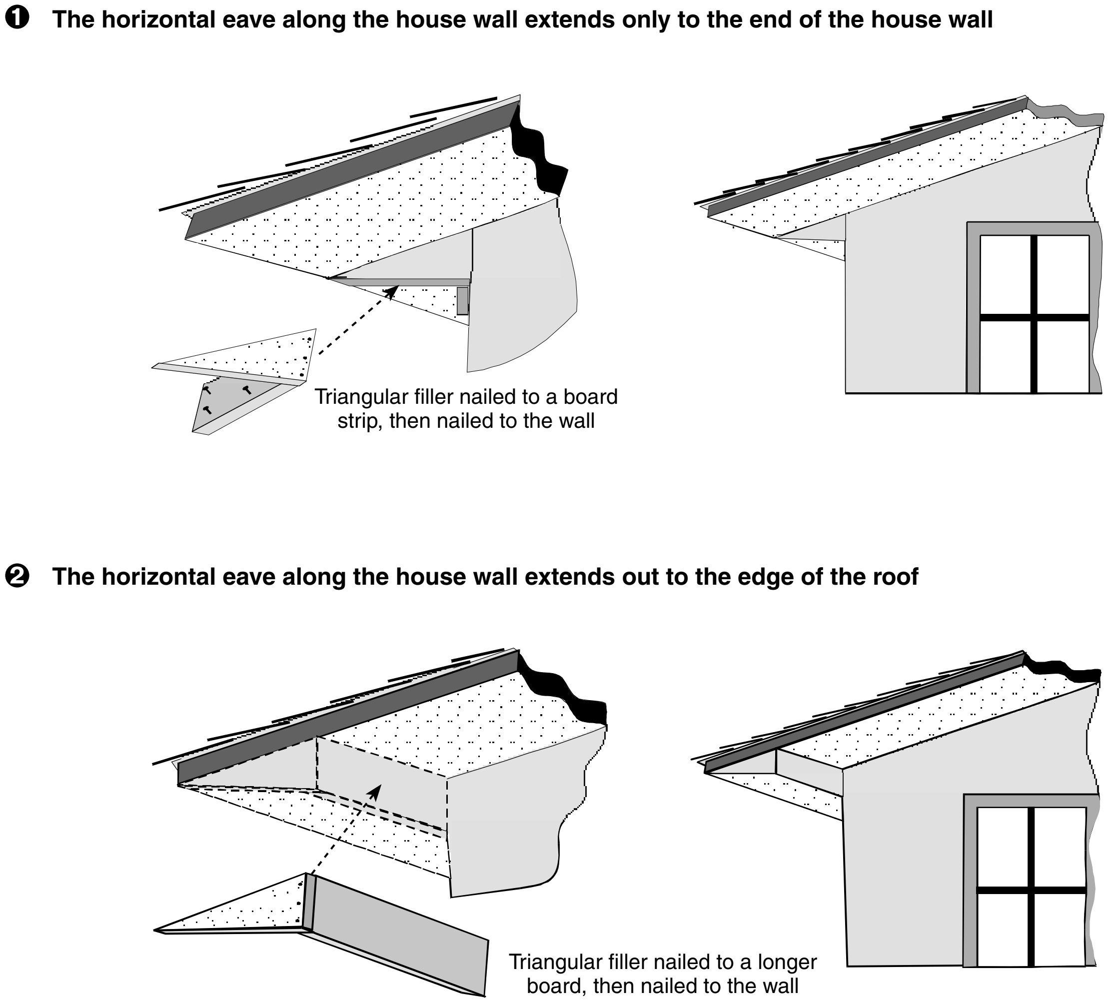


Figure 13-3
Two basic eave corner shapes

Eave Corners

There are two types of eave corners, which I'll explain. Look at Figure 13-3 to understand the difference between roof angle and eave angle. Roofs meet a house at an angle. The eaves on a house are horizontal. Occasionally, eaves slant up where they meet the house wall, following the slanted roofline. You can't wrap this type of eave with metal unless you alter it.

There are two places where the horizontal wall eaves meet the slanted eaves. The first place is where eaves on the front and back of the house continue past the house corner, and meet the angled roof at its corner. The other place they meet is where the angled roof joins the eave at the corner of the house wall.

Your customer may want the eaves to run past the house wall, extending to the roof edge on each side. This gives the roof edge a stronger profile. Or your customer could prefer the change at the end of the house wall. Whichever profile he chooses, you'll be doing a lot of cutting and fitting.

Supporting Frames for Attaching Corner Soffit & Fascia

If you're working on an older house with slanted eaves, build a wooden frame to use when attaching the aluminum fascia and soffit at each corner. You can't wrap the bottom of the eaves because they won't meet the soffits extending from the house wall. So your solution is to build supporting frames for the aluminum at each end of the house eave using wooden triangles between the house wall and the eaves. When you wrap the front and back eaves, you'll join the horizontal eaves with the roof eaves. Then you effectively go from a horizontal eave to a slanted eave that extends past the wall.

"If you're working on an older house with slanted eaves, build a wooden frame to use when attaching the aluminum fascia and soffit at each corner."

First, mark the bottom of the eave on the house wall by sliding your square up until it meets the bottom of the slanted eave; see Figure 13-4. Mark this measurement on both corners.

Next, mark the wall for the F-channel you'll be installing. The channel is ½ inch deep, and the bottom of the channel is another ½ inch below that, so put a chalkline there, too.

Plywood Triangles

Now, measure for the plywood triangles. Figure 13-5 illustrates the procedure. Slide a square up to meet the bottom of the eave at one corner. Then measure from the bottom of the eave to the top chalkline. You'll be cutting the shape out of ½-inch plywood. Once you have two of the three measurements for your triangle, simply connect those two lines and you've got your first triangle. So — does it fit? Cut out the

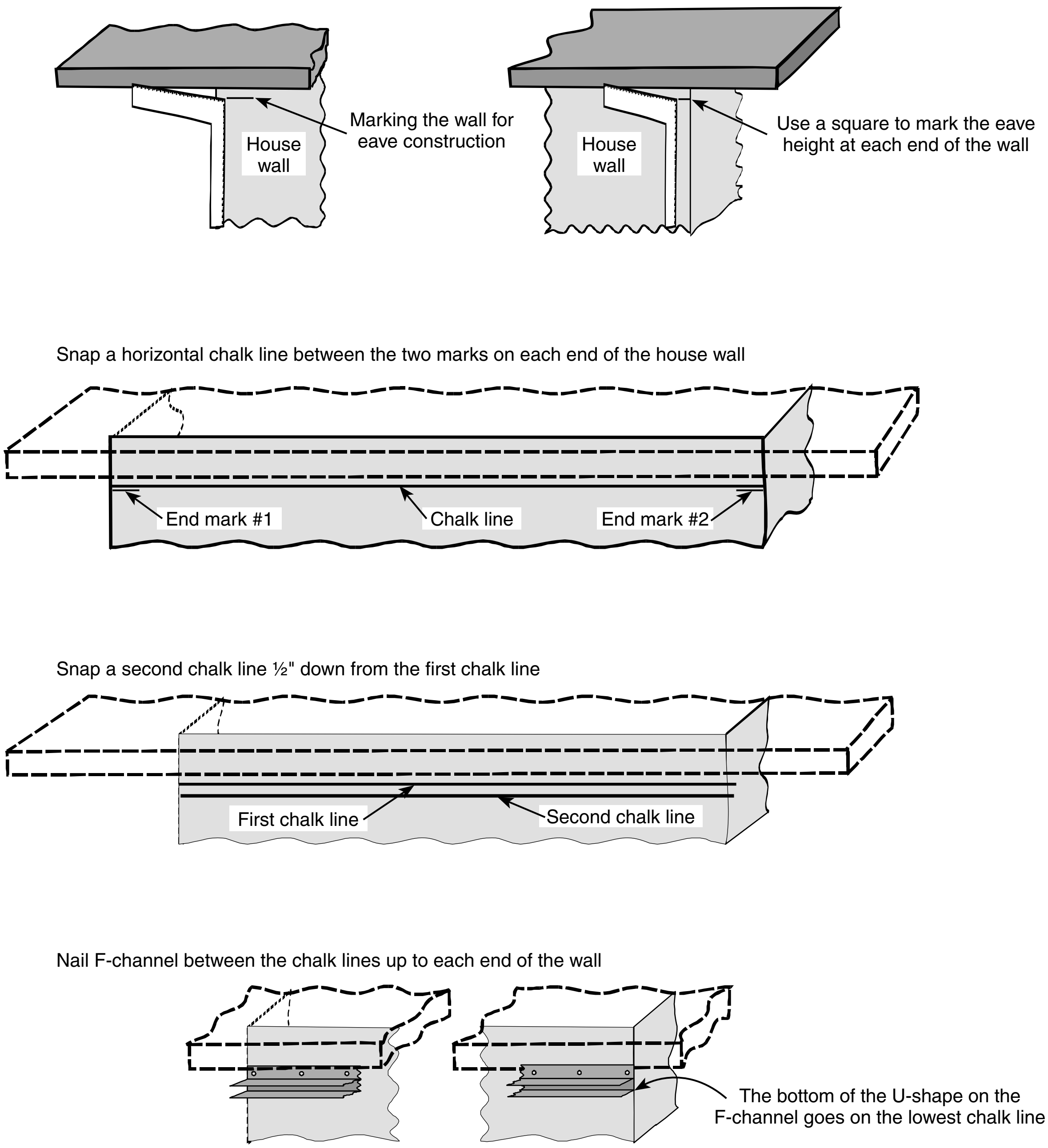


Figure 13-4
Corner eave wrapping, Part I

shape and hold it up to the wall. The board goes against the wall and the bottom of the eave. The triangle is at the end of the eave, the sharpest corner meeting the outside of the eave. If the shape is accurate, make three more triangles for the other corners.

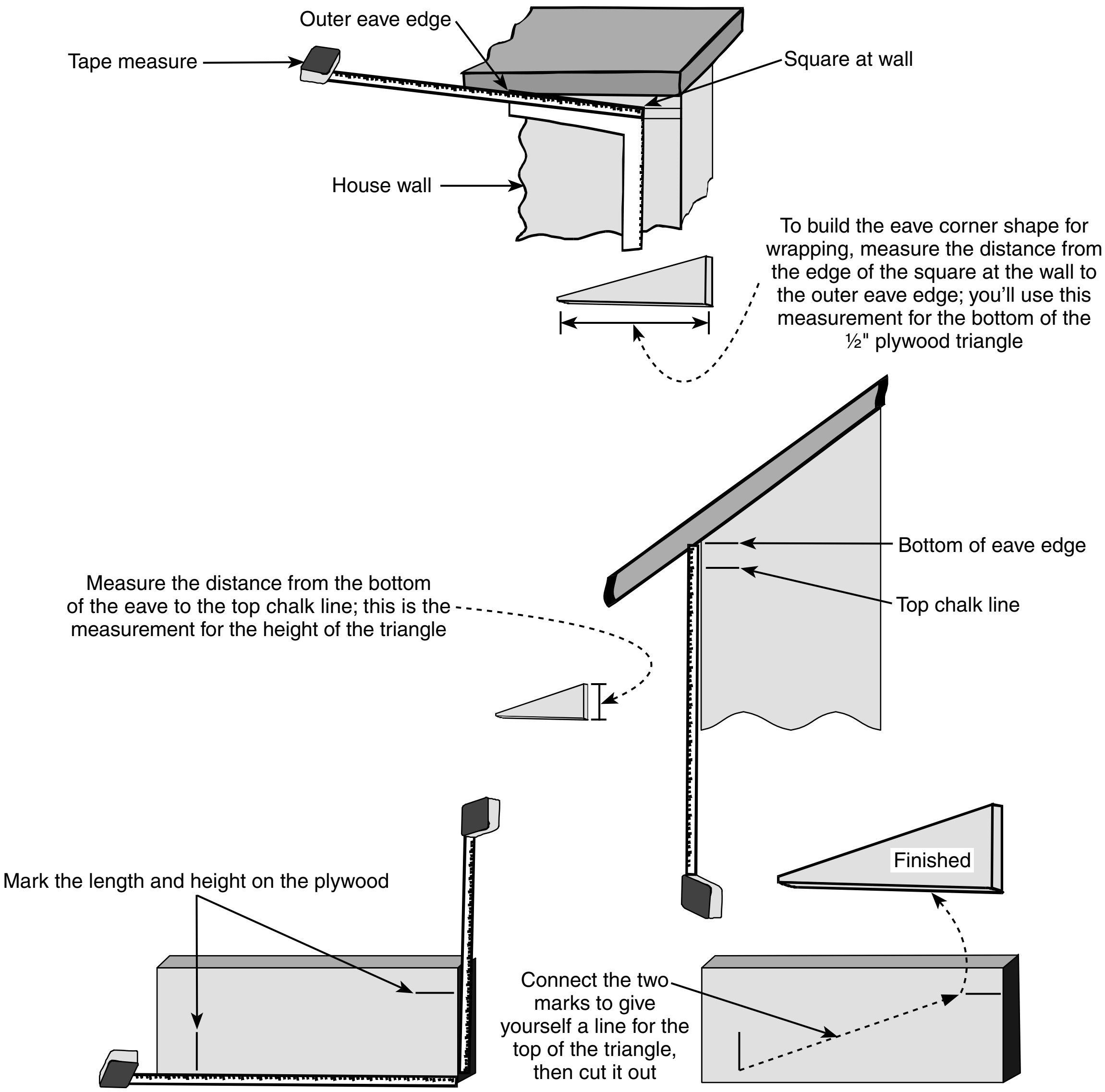


Figure 13-5
Corner eave wrapping, Part II

Find the distance between the house wall and outside edge of the eave (see Figure 13-6), and mark it on the board where you'll attach the triangle. Add about a foot to that length, because you'll need space to nail the board to the wall.

Rip the length of board to the width of the narrow end of the triangle, to match the angle. Nail the triangle to the end of the board, being careful not to split the wood. Now, see if it fits.

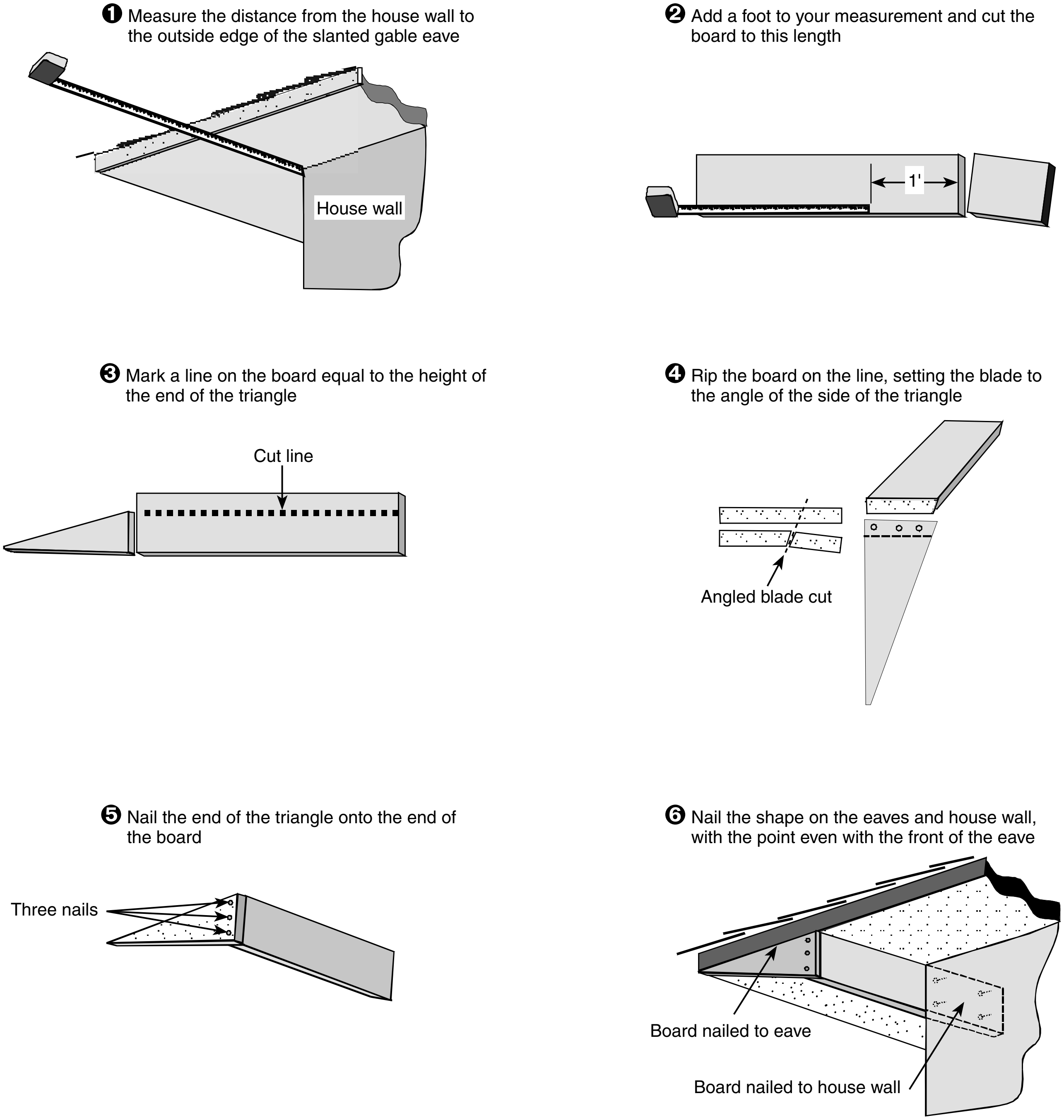


Figure 13-6
Corner eave wrapping, Part III

Nail one end of the board against the eave and the triangle on the extended eave. The point of the triangle is under the eave's outside corner. Use 1½-inch finishing nails or long paneling nails. Don't use nails with big heads.

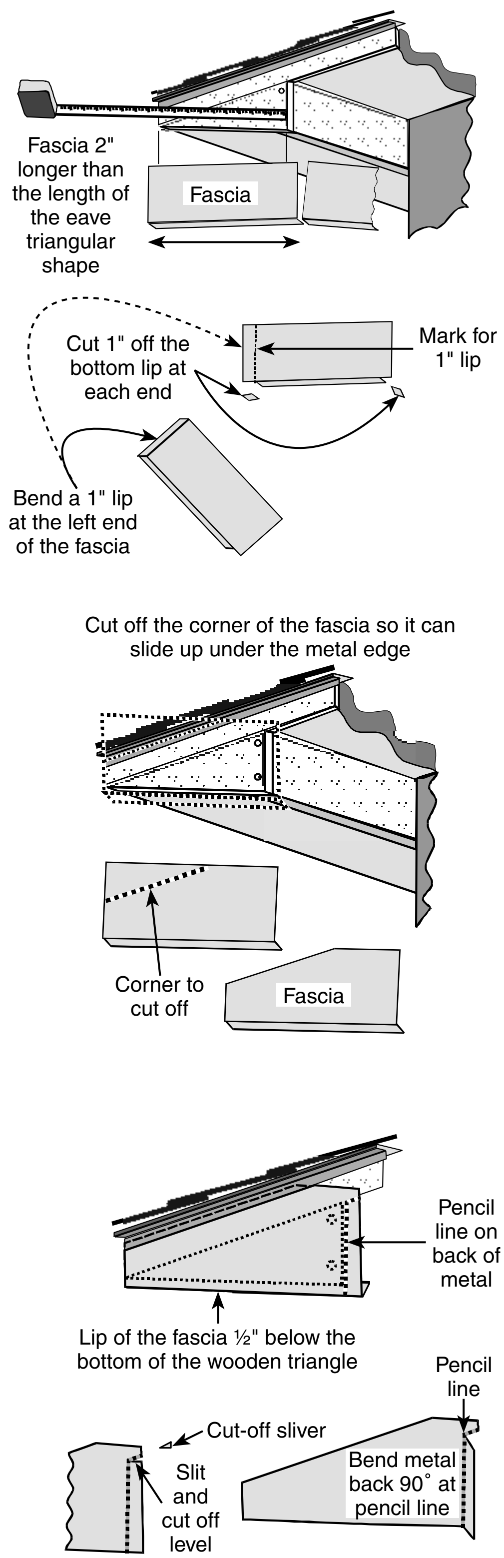


Figure 13-7
Corner eave wrapping, Part IV

Make a duplicate of this shape and nail it at the other corner, adjusting if necessary.

Wrap the triangular shapes with strips of aluminum fascia, as shown in Figure 13-7. Fascia comes in widths of 4, 6, 8, and 10 inches, to suit all eave depths. It has a ¾-inch lip at the bottom. The front of the fascia covers the side of the eaves, and the lower lip holds the edge covering the eave bottom.

Begin at the right eave. (Since left and right are mirror images of each other, you'll know how to bend the left — just reverse my instructions.) The plywood triangle shapes are already in place on the outside corners of the eaves. The depth of the eaves dictates the width of the fascia, which goes under the shingle's metal edge lip. It doesn't have to go right up to the top, since the lip comes down ¾ inch. The edges of the roof boards stop the fascia from going up all the way, and the metal edge holds it in place. Ideally, you want to insert the fascia about ½ inch under the metal edge.

If you have 4-inch wood fascia, 4-inch metal fascia won't be deep enough to cover the edge. The bottom lip of the fascia must be ½ inch below the bottom of the eave, because the soffit metal strips slide between the wood eave and bottom lip of the fascia. You need 6-inch metal fascia, trimmed down to 4½ inches. To be sure of the dimensions, cut a 12-inch piece at 4½ inches and push it up under the edge at several spots along the eave to see how it fits. If it's wide enough to cover most, but not all, spots, you may only need to trim one or two special pieces for those locations.

Cut a piece of fascia the length of the bottom of the wooden triangle, adding 2 inches for overlap. Next, bend a 1-inch lip over at one end. To do this, hold the fascia with the ¾-inch bent lip down and away from you. Make a 1-inch bend on the left side. Using your square, draw a line 1 inch from the left on the inside of the fascia. Cut the bottom lip up to this line. Lay the strip on the end of a board and bend the 1-inch strip downward to a 90-degree angle, using the end of the board to help shape it. This bent lip will go against the front corner of the eave.

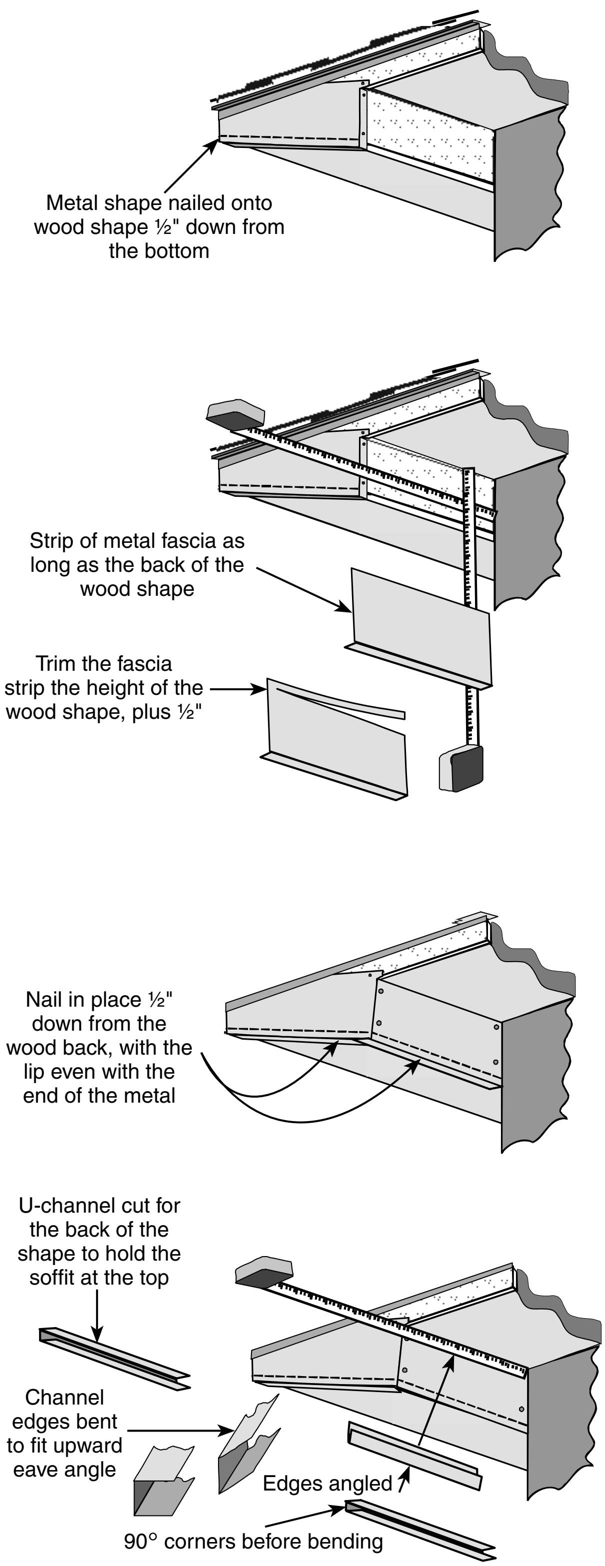


Figure 13-8
Corner eave wrapping, Part V

Put the bent lip against the end of the wood triangle, with the new bend against the front corner of the triangle and eave. Slide it up until the bottom lip is ½ inch below the bottom of the triangle. One side of the metal strip will overlap the metal edge.

You may have to cut the top of the fascia off at an angle to slide it up to within ½ inch of the wood triangle. You should be able to insert your metal shape under the edge, and line up the metal strip and the triangle.

Be sure that the corner with the bent lip is pushed snugly against the front corner of the wood triangle. Mark where the back of the triangle meets the metal shape. Mark on the metal where the bottom of the slanted eave meets the metal. The line will be at an angle.

Cut the metal up to the vertical mark. Your next bend ends at the top. Snipping the metal here allows you to bend the end over in the next step.

Put the piece of metal back on the face of the wood triangle. Butt the front edge of the metal against the front corner of the wood shape. Slip the corner under the metal edge. The lip at the bottom should be ½ inch down from the bottom of the triangle.

Now, bend over the lip that extends past the back of the triangle on the right. Don't worry about the part that can't be bent; it'll be hidden.

Keep the bottom lip ½ inch below the bottom of the triangle and nail it in place. Then nail the top of the fascia where it overlaps the eave board (these nails will be covered later by the eave fascia). This should hold the triangle in place. (See Figure 13-8.)

Only the back of the triangle and its attached board have yet to be covered. Measure from the wall to the outside edge of the plywood triangle. Cut a piece of fascia that length. It should cover the back of the shape.

Next, cut it to the right height. Measure the height from the bottom of the eave to the bottom of the board. Add ½ inch for the soffit metal. This piece of fascia fits the back of the triangular shape. The lip on the bottom should match the lip on the metal triangle already nailed on.

Attach this strip with two nails at each end. If the nails are visible, make sure they're the colored-aluminum variety.

Cut a piece of U-channel as long as the rectangular back. Slide it into the top of the back rectangle.

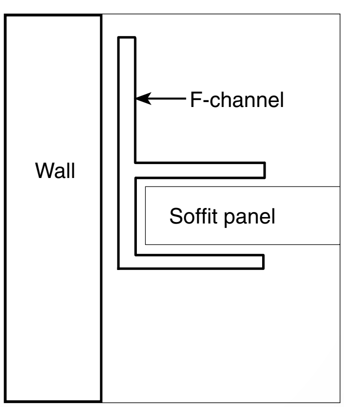
Because the eave slants upward and the rectangle is vertical, bend the sides of this strip at an angle. Nail it to the top of the rectangle. You may have to nail it through the inside U in some spots, if you don't have anything else solid to nail it to. Keep the U-channel level when you nail it up.

The old fascia may show below the wooden eave. You have to watch that the U-channel resting on the bottom of this fascia is at that same level. To be sure this strip is at the proper height, lay your square on the wall behind the triangle. Slide the long side up until it rests on the bottom of the eave fascia. Mark where the top of the square meets the wall. The bottom of the U-channel should be ½ inch down from this mark.

You can nail up the short U-channel after you snap the chalklines for the F-channel in the next step. In fact, you could wait until you have the F-channel up on the gable wall to be sure that the short piece is at the right height.

F-CHANNEL AND J-CHANNEL

F-channel is used on a vertical surface (such as a house wall) to support a horizontal panel, as shown in the illustration below. J-channel is used on a horizontal nailing surface (such as the bottom edge of a 2 x 4) that can support the J-channel. It's also used to finish off the ends of vinyl siding, and as trim around doors and windows.



F-Channel on a House Wall

Now you're going to install the F-channel on the gable wall for the aluminum soffit attachment. To get the correct height, place your square against the wall and slide it up to the bottom of the eave. The top of the square blade will meet the wall at the eave height. The bottom of the F-channel will be ½ inch below this, because of the soffit thickness.

Put the wide lip on the F-channel face up, to hide it. Run the end of each F-channel up to the corner on the house wall at each end. The metal fascia covers the exposed board between the triangle and the wall, and comes up to the edge of the F-channel. Some houses already have plywood soffits that come down to within about ½ inch from the bottom eave height, so they're in the way.

If there's no room for the lip on the F-channel, use J-Channel, which has no lip. It's a little harder to nail to the wall, though, since you can only nail it inside the U-shape. Regular 8-penny nails are long enough to use without hitting the J-channel lips. Once the head is in as far as the lips, pound the nail in with the head of a nail-set.

Wrapping Deep Eaves

A steep pitch can pose a problem when you're wrapping eaves, especially if the eaves extend more than a foot from the house. It's not uncommon for eaves to extend 18 inches or more, but the widest fascia you can get is 10 inches wide. What do you do?

Overlap fascia to get the needed height, as shown in Figure 13-9. Fascia is ribbed horizontally on the surface. These ribs give the fascia a pleasing appearance, while providing extra strength. Most importantly, they effectively hide any joinings you make. Overlap one piece at one of the ribs. The overlap is invisible. Add any number of strips of fascia to get the height you need. Cut the ¾-inch lip off the overlapping pieces. And remember to always use colored aluminum nails.

Soffits

You can easily cut soffit metal with a radial-arm saw. Tap a nail into the saw table at the cut distance, and butt the metal against the nail each time you cut. Use a fine-toothed blade in the saw to keep shavings from catching in the teeth. You can also use a circular saw, with a fine-toothed blade put in backwards — again, so the metal can't catch in the teeth.

If you prefer carbide blades, use the narrowest blade you can find. Don't allow the saw table to scratch your pieces. If your table has nicks and marks on it, you'll inevitably mark the white aluminum trim. So always saw aluminum from the back, or cover the whole table with masking tape if the surface is really bad.

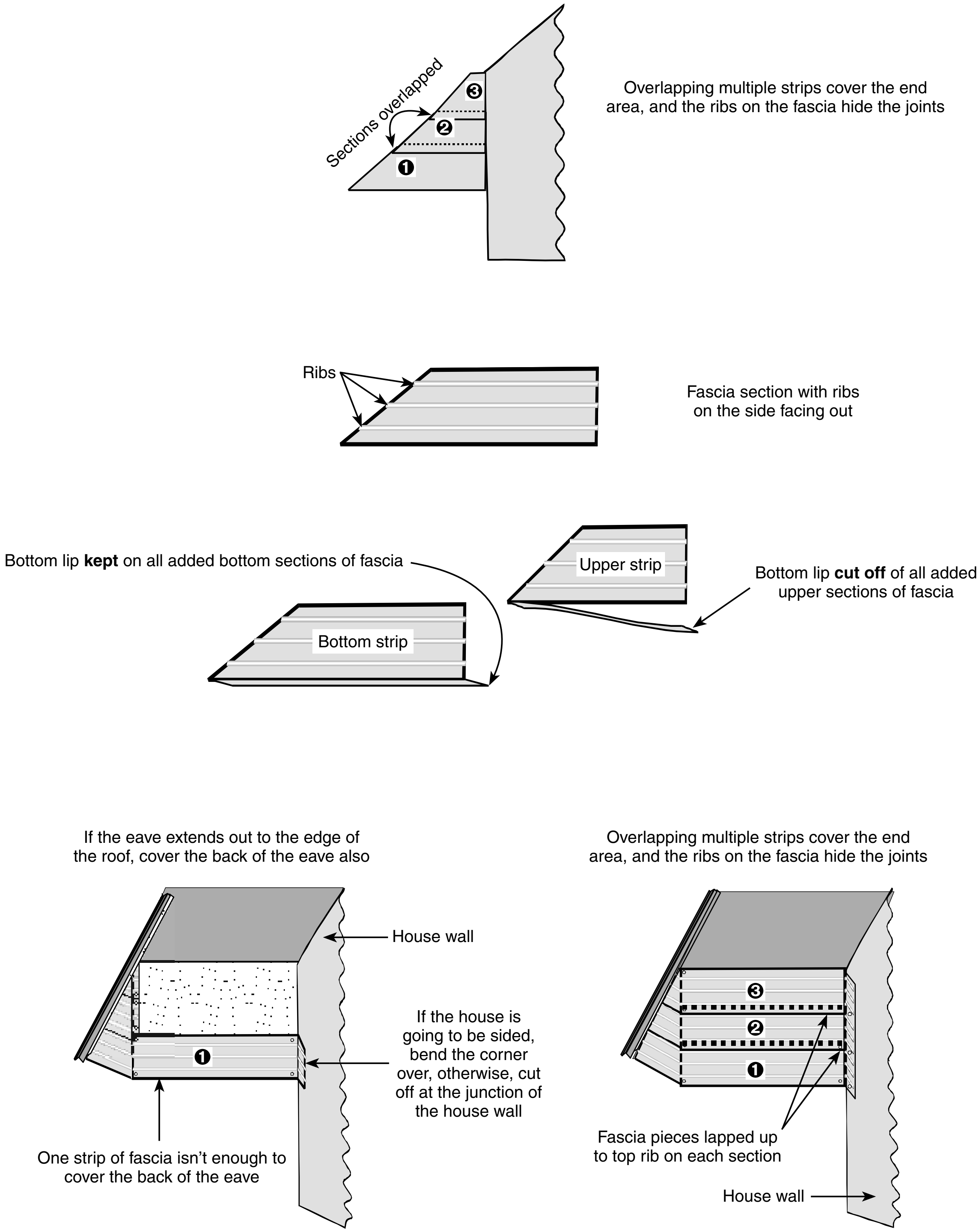


Figure 13-9
Layering fascia strips

After you cut one piece to length, draw a duplicate. Soffit width can change noticeably in just 5 or 6 feet. If that happens and you've cut all your pieces, what can you do with them? Cut them about $\frac{1}{8}$ inch shorter than the measurement, so they aren't a tight fit.

This next tip will save you a whole lot of trouble when installing the pieces. First, slide each soffit piece into the F-channel on the wall and push it into the lip on the previous piece. Then, put a wide staple at the corner resting on the eave board. This will temporarily hold each piece up. After you have about 10 feet stapled, put up a length of fascia strip. The lip on the fascia holds all the strips in place for good. This is a lot quicker than nailing each strip.

Snipping Soffits: Three Easy Steps

Snips have a habit of squashing tin as they snip. They flatten soffit ridges, stretching the cut end noticeably. You can avoid this by simply cutting in stages, and with a good, full-sized pair of tin snips.

1. Cut up to a bend and reposition the snips.
2. Cut up to the next bend and reposition.
3. Cut up *only* to the next bend.

You'll find your cuts will no longer squash the metal out of shape. It's the little things that make a big difference.

Low-Pitched Porch Roofs

Some small porch roofs have a low pitch, giving scant slant to the eaves. Simply cover the eaves on all sides. A special channel can be used at each corner, that looks like two J-channels joined back to back.

"Some small porch roofs have a low pitch, giving scant slant to the eaves."

Figure 13-10 illustrates the process, using a double F-channel. It's installed diagonally, at each corner, from the corner of the wall to the corner of the eave. Since it's U-shaped at each side, the metal soffit is simply run into it from two adjoining eaves. Even if they aren't the same distance out from the wall, the channel still works. You just cut the pieces of soffit at whatever angle you need to fit into the corner channel. In a pinch, you could even use two pieces of J-channel, back to back.

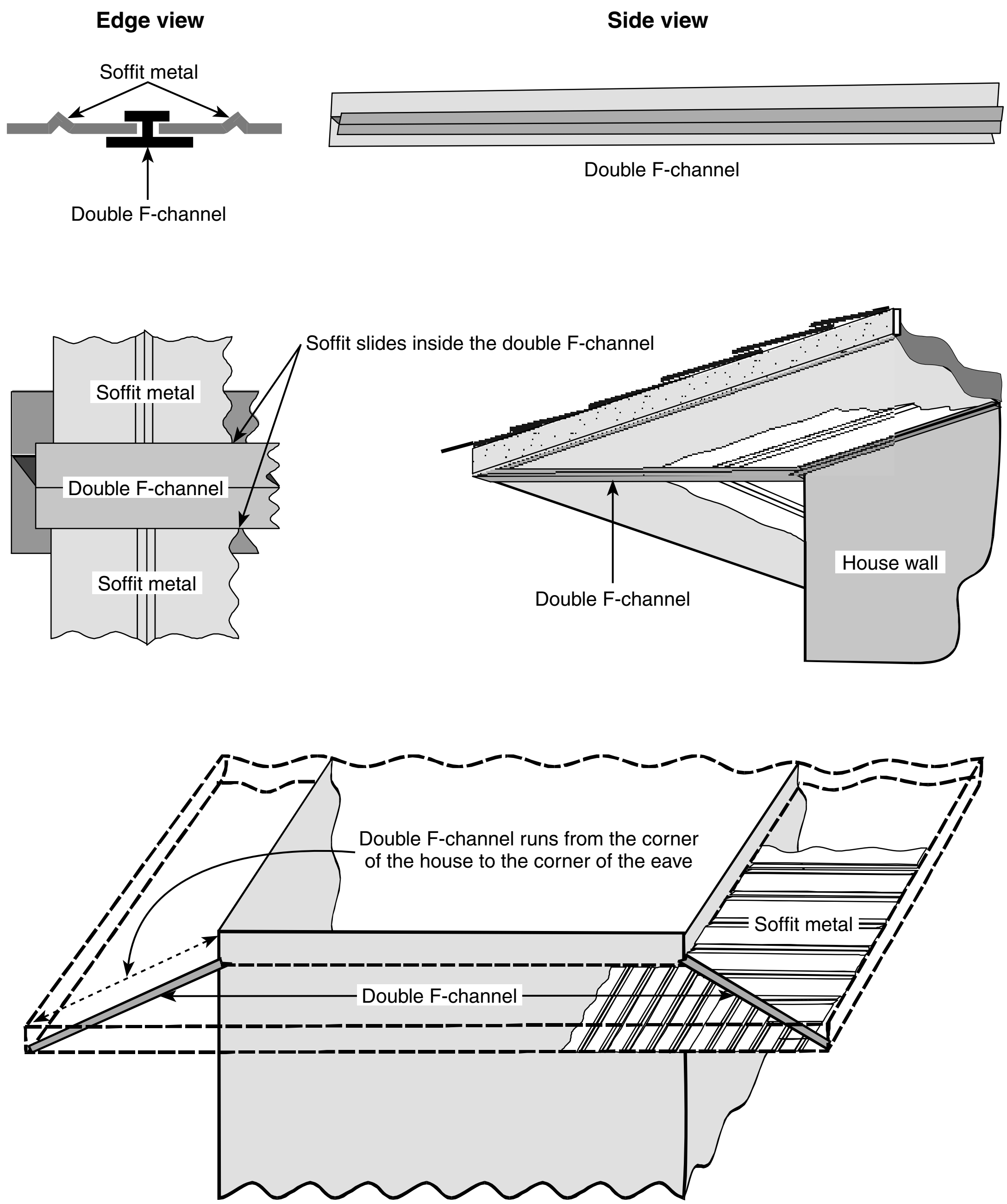
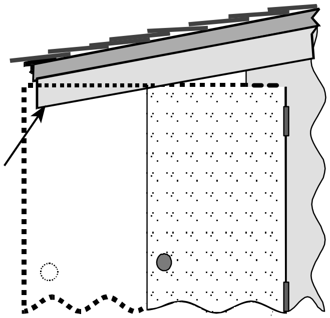


Figure 13-10
Installing double F-channel

Eave Clearance for a Door

Some back porches have low roofs, so the doors into the house must swing inward. (They'd hit the eave if they swung outward.) What if you had to install a door that swung outward because that's what your customer wanted?



My solution was simple (see Figure 13-11). New metal soffits had to be cut for the porch anyway, so I notched out the fascia and trimmed the rafter tails to allow clearance for the door when it opened. This took a little work, but really solved the problem.

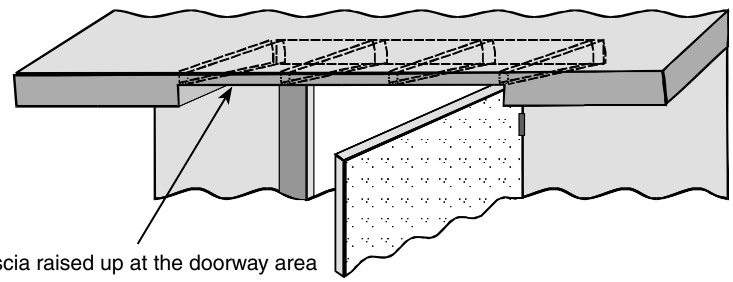


Figure 13-11
Eave clearance for an out-swing door

Moving Power Wires

Every house has an electrical power supply wire entering the house at some location. It's usually on a side wall or the fascia board. When a house is sided or the eaves wrapped, the insulator holding this power wire on the house is in the way.

When I faced this on a siding job, I never gave it a second thought. There usually isn't much tension on the wire because the pole is close to the house, so I just unscrewed the insulator a little to make a space between the insulator base and the house wall or eave. Then I slid the piece of siding up in place around the insulator's mounting screw. The screw end fastens the insulator onto the house.

Sometimes it was easier to unscrew the insulator completely and hang it on a wire wrapped around a bent nail. As long as I was careful to hold only the insulator in my hand, and kept it well away from the power wire itself, I was fine.

But today, there's no way I'd do that. There's just too much liability and risk, neither of which crossed my mind back then. Now, I'd have the power company send someone out to deal with it. I'd put the siding up to the house wire, then, when the power company person had unfastened the wire, slip the next piece of siding up and snap it in place. Then he, or she, can refasten the wire hanger on top of the new piece of siding, and go on their way, leaving me to nail it on and finish work on the rest of the house. Why risk a problem by handling something that's a potential danger when it's really not your responsibility? Make sure, in advance, that the homeowner knows that if the power company imposes a charge for this, it's his. You don't want to pay the power company out of your profit on the job.

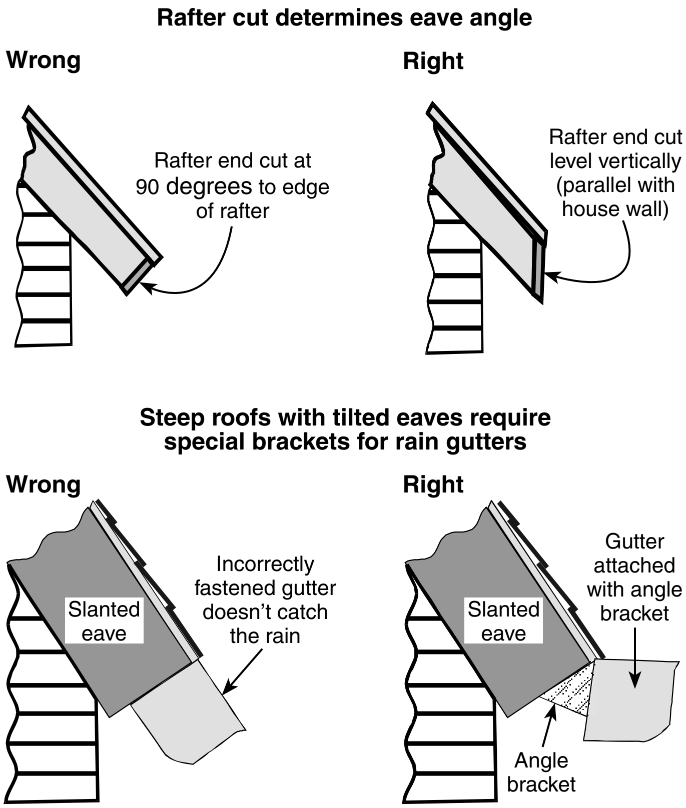


Figure 13-12
Eave construction

Gutter Installation

Most modern roofs have a 4-12 pitch; but older houses can have a 6-12 pitch, which means the roof is at a 45-degree angle. If the eave boards are tilted on these houses, rainwater can go up and over the top of the gutters. V-shaped vinyl inserts correct this problem. They're installed behind the gutter and can tilt it into a fairly upright position. The screws that fasten the gutter to the fascia board also hold these inserts in place.

Whether or not the roof pitch will give you a problem also depends on how the eaves were constructed. The correct way is to cut the ends parallel with the house wall, with the rafter ends vertical to the house wall. That pretty much guarantees you won't have a problem installing rain gutters that work efficiently. But some carpenters cut the eave rafters off at a 90-degree angle. That's a problem waiting to happen, as shown in Figure 13-12.

Problems

Here's a recurring problem I've encountered when installing rain gutters. Old house foundations sag in spots, which makes the eaves sag, too. When you try to put gutters on these eaves, you can have some real headaches. Gutters have to slope downwards to let water drain out, so the downspout has to be lower than the starting end. However, the system can still work adequately as long as the gutter is level along its length. But if the starting end is lower than the downspout, water stands permanently at the lowest spot. First and foremost, don't install rain gutters on eaves that are out of level. It's a foregone conclusion that those gutters won't work.

If eaves are slanted in the wrong direction, granted, you can't change them. But you *can* change how you install the rain gutters. One way is to drop the end of the rain gutter to the lowest point possible and still have it attached to the fascia board. Unfortunately, the strange appearance of the gutter drooping toward one end of the eave is what the eye is immediately drawn to. It doesn't matter that the rain gutter isn't really drooping and it's the eave that's rising.

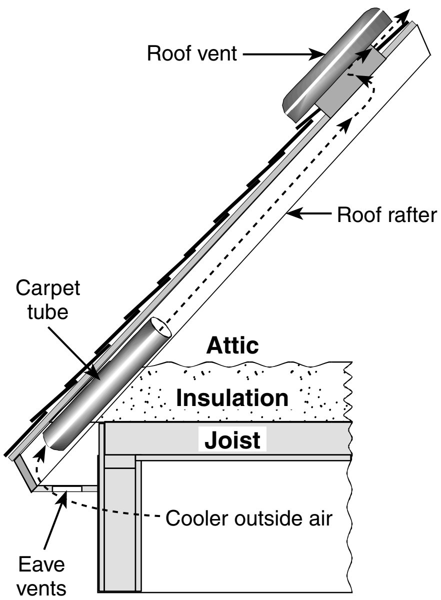


Figure 13-13
Increasing air circulation in an attic

The top of a rain gutter could almost reach the bottom of the eave by the time it got to the downspout. The sure fix would be to put the downspout elsewhere. But what if it had to be in that particular spot? What if the owner didn't want the downspout by the front entry or in the middle of his flowerbeds? Well, then, he'd be stuck with an eyesore of a slanting rain gutter — but a functional one.

Vents

Attic air gets unbelievably hot in the summer but, fortunately, most houses have some means of ventilation. The simplest way is through triangular vents at the peak of the gable on each end of the house. Builders now install foam inserts shaped to fit between each roof rafter, to prevent insulation from blocking airflow.

Ridge vents, which run the length of the roof ridge, are often found in older homes. But these vents don't do much good if air can't flow in near the bottom of the roof. The hot air has to have a way to get out to make room for the cool air. Install vents in the eaves to let the air in. Cooler air then flows up between the roof rafters and forces the hotter air out the vents near the top of the roof.

If you're wrapping eaves with aluminum, don't block the intake vents. Aluminum soffit comes in both vented and non-vented types. Be sure you buy the vented. And don't be surprised if the older home you're called to work on has no vents. It isn't unusual, but it is easy to fix. If there are no vents, you can make them. It's not much of a job if you're working on an older house with plywood soffits — circular, square, and even continuous vent strips are available.

Simply install four roof vents low on each side of the roof, and four more near the peak on each side. The vents near the peak should be placed as high as possible, since hot air rises. This placement will move the air the same as any new house's roof vents. The cool air enters through the low vents and pushes the warmer air out the top.

When attics are insulated with fiberglass, space by the eaves between the rafters can get blocked, limiting the air flow. Here's a solution to that, and it's free. Use carpet roll tubes. Every carpet dealer has them, and will give them to you — with thanks for taking them off his hands. Cut the tubes into short pieces, and slide them past the attic insulation into the eave area by every other rafter, along both sides of the roof. This instantly clears the congestion. Figure 13-13 shows the correct placement.

Eave Ice

Homes built in areas that experience below-freezing temperatures get patches of ice here and there, including the eaves. Ice buildup is caused by the roof heating and cooling. Even in the dead of winter, the sun warms a house, so snow on the roof begins to melt. By late afternoon, the roof cools down and the water freezes again at the eaves.

The main section of the roof, over the area of the heated house, stays warm longer, so the snow continues to melt there. Then the dripping water from the warm part of the roof freezes when it hits the colder eaves. This trickle never gets to the edge of the roof, but starts forming ice on the eaves. Once there's a little ice buildup, water dams up behind it and quickly freezes.

No water gets off the roof because the ice has no time to thaw before the temperature drops again. When the ice gets to be about 4 inches thick, the trouble starts. Shingled roofs usually have a 4-12 pitch, which means that the water now has to get up and over 4 inches of ice before it can roll off the roof. And that's almost impossible.

Water trapped behind the ice finally runs under the back of the shingles and, from there, under the eaves and into the attic. For an immediate stop-gap fix, do what I do: Take a kettle full of boiling water up to the eaves. Let the hot water trickle onto the ice in one location, until it melts a narrow channel in the ice, allowing the trapped water to flow down the eaves. Melt a channel like this every 6 feet along the length of the eave. The water will take the path you've made and spill to the ground.

Three Permanent Solutions for Eave Ice Buildup

Eave areas are the coldest spots on a roof because there's no house underneath to warm them. As we've seen, ice buildup on the eaves can lead to a leaking roof. If your customer gets ice buildup every winter, use one of the following methods for a permanent fix. Figure 13-14 illustrates these methods.

1. Standard heating tape will keep ice from accumulating on eaves. It's sold in a kit with everything you need for installation. Hook the tape to the roof under the shingle tabs, and fasten with the clips. Install the tape in a zigzag pattern along the eave. When the electrical cord attached to it is plugged into an outlet, the tape heats up and can melt sizeable grooves in the ice, releasing any accumulated water. A thermostat is attached, and only allows the tape to heat if the temperature is below freezing.

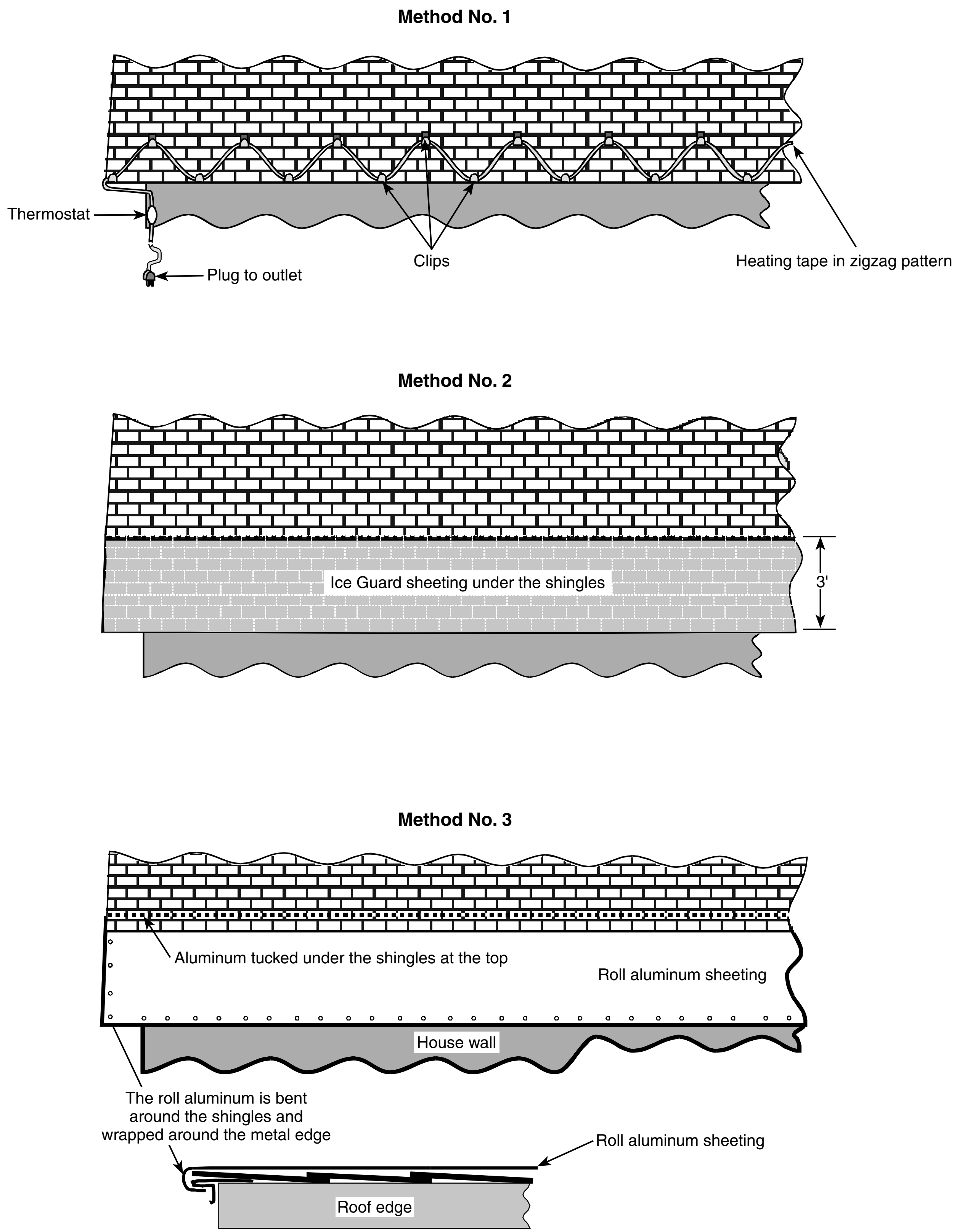


Figure 13-14
Three methods for stopping eave ice buildup

2. The next method involves using Ice Guard® 36-inch-wide rubber sheeting. Put it just under the first 3 feet of shingles at the eaves when you build or re-roof a house. It isn't cheap, so shop around for the best price.

   (a) Ice Guard, being rubber, seals around the nails so there can be no leaks. A word of caution, though. The glue that attaches it can be a real headache. As soon as it touches something, it won't budge. So don't let two sections of it touch — you're not going to get them apart again. Leave the adhesive covered until you have the sheeting where you want it.

   (b) Unroll the sheeting along the eave, lining it up with the metal edge. (Remember to leave the paper on the sticky side.) Tack it in place with three or four nails, but don't pound them in all the way. Now peel the paper off the adhesive. Carefully lay the sticky side down on the roof. Take it slow — remember, once it sticks, it's there to stay. Now attach the other half. Finally, nail shingles down on the sheeting.

3. This is the same idea as the method above, except the aluminum strip goes over the top of the shingles instead of under them. This method is a great one for your customer: it relies on the sun (instead of electricity) to heat the aluminum so the ice will fall off.

   (a) Measure up the roof to where you want to position the top edge of the aluminum strip. After choosing which row of shingles to slip it under, remove the nails on that row temporarily so you can insert the strip. If the eaves on the house extend less than 12 inches past the house wall, 24-inch aluminum will be adequate. If you need wider, you may have to visit a sheet metal shop where they can cut the length you need.

   (b) Put the nails in the aluminum 3 inches in from the edges. Nail every 6 inches along the eaves.

   (c) Let the strip extend past the metal edge about an inch. Bend this strip over the metal edge and the end of the shingles on top of it. Bend it under the metal edge about ¾ inch, to keep the wind from getting under the strip.

(d) When the aluminum is in place and nailed, raise the shingle tabs and nail in the same old holes with roofing nails a little longer than the ones you removed, to hold down both the metal and the shingles.

14

SIDING

This chapter is dedicated to remodeling with siding. Vinyl siding isn't just for your grandma's house anymore. The industry has made a lot of advances, and now vinyl siding competes successfully with real wood. In fact, vinyl siding is now the third most popular choice of exterior cladding in the United States. Where else can your client get a choice of almost 700 colors for the outside of his house? While paint and stucco require regular touch-ups, vinyl siding has a 30-year lifespan and doesn't crack or rot. Modern techniques have even made it possible to mimic the look of cedar shake.

Siding Increases a House's Value

I once was hired to side a house the owner wanted to sell. It had a few problems and the old man who owned it didn't want to deal with it any more. He just wanted out, but hoped to get a good price. The problem was, it looked awful, because the siding on it was a total mess. It needed some major cosmetic work. When my crew came to install new vinyl siding, we discovered that the surface of the old siding was rippled as much as 3 inches in spots.

The old siding was made out of a cellulose-type material covered with roofing granules for texture. It was meant to look like brick. This siding is actually quite durable because it's so tough. But if it cracks or opens at the joints, water gets behind the siding pieces. The water can't run out easily, so the inside gets damp and stays that way. Eventually,

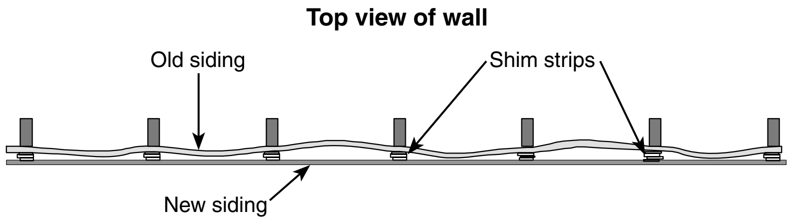


Figure 14-1
Shims even out old siding in low spots

the dampness causes the cellulose material to swell, which causes it to thicken. Pretty soon the siding ripples, and then buckles.

What did I do to make this house look good again? Well, first I had to realign the siding by pounding the panels back into shape. Of course, this broke the sections of siding that were pounded in, but since I was going to cover them with new vinyl siding anyway, it didn't matter. What did matter, though, was getting the outer wall surface nice and even again before I put on the new siding.

Knocking it in was easy, but how did I punch out the sections that were sunk in? Well, I shimmed the walls out at each wall stud in the sunken areas. Have shim stock ready (¼, ½, or ¾ inch thick). You can rip some old pieces of paneling into strips to make these shims.

As you can see in Figure 14-1, you may have to stack the shims to bring the wall out the necessary distance. Siding only needs to be nailed every 16 inches, so place the shims at each wall stud. If there are boards on the outside of the house under the old siding, you can nail the shims anywhere. This method helps you smooth the wall.

The house ended up looking so good when I finished that my client was able to sell it for $30,000 more than the price he'd figured originally.

TRIM FIRST, THEN SIDING

I could hardly believe this when I saw it. I went across the river into Wisconsin to give a consultation on a siding job. Seems that this man's nephew said he could side the house, and had already begun covering the exterior with vinyl siding. Three sides of the house were completed, but something seemed strange. That was when the owner called me in. What had happened was that the nephew had sided the house without any window or door trim.

Vinyl corners and trim have wide strips on each side for nailing to the house. It's imperative to install trim before siding, because once the siding has been nailed on, there's nowhere to nail the edge-trim strips. The trim is nailed through these strips, and then the siding goes on and covers them. Since the walls had been sided first, without the corners or trim, we had to remove the siding and start all over again. Let me tell you, that customer wasn't too happy with his nephew!

Allowing for Expansion and Contraction

There are mistakes that professional builders don't make, especially when it comes to siding. The most common mistake a novice makes is not realizing that a piece of 12-foot siding expands and contracts with temperature changes. For instance, on a 90-degree day, each piece of siding is at least $1/8$ inch longer than it would be on a freezing cold day. This is true for both masonite and vinyl siding.

When masonite siding is nailed tightly in place, something's got to give — and it will, if there's no room for expansion and contraction. Although in this particular example I'm talking about color-lock masonite siding, you'd have the same problem with regular masonite siding, too.

Color-lock siding has plastic joint strips on the end of every piece to cover the joints. Not only do they cover the joints, they also allow the siding pieces to move with temperature changes. However, if the siding is butted too close during installation, the joint has no room to move.

"For instance, on a 90-degree day, each piece of siding is at least $1/8$ inch longer than it would be on a freezing cold day."

In this scenario, the siding was installed in below-zero weather by workmen who left inadequate space between the pieces of siding. When the 90-degree summer days came, the siding buckled on the entire west wall. We had to pull off the siding and reinstall it, this time leaving the necessary $1/8$ inch between each piece. Luckily, it was just a small section of the wall that had been sided that day. Here's a lesson for you: If you're siding on an unusually cold day, be sure to adjust for the expansion that will come on a day in mid-August.

Nailing

Start with the proper nails. Use corrosion-resistant (aluminum, stainless or galvanized) roofing nails with a $3/8^{th}$-inch diameter head. The nails should be long enough to nail into the base at least $3/4$ inch.

There are a lot of wrong ways to nail vinyl siding. The number one "don't" is to nail the siding as tightly to the wall as you would when installing cedar siding. Never drive the nails all the way into the vinyl siding. Keep them loose to allow for expansion and contraction. Vinyl siding actually hangs from the nails. This loose nailing allows the pieces to slide past each other when swelling and shrinking.

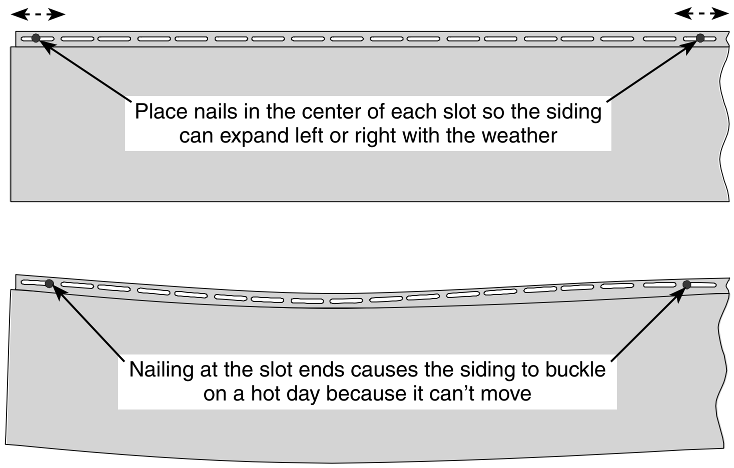


Figure 14-2
Right vs. wrong nailing of siding

Where you put the nails in the siding slots can make the siding too tight, even if you nail them correctly. That sounds crazy, so I'll explain. People unfamiliar with vinyl siding tend to put the nails anywhere in the nailing loops punched at the top of the siding. Even though they don't nail too tightly, the siding buckles anyway. Why? Nails must go in the *middle* of each loop. Look at Figure 14-2 to see what I mean. If the nails are put at either end of the loop, the siding can't expand or contract in one direction or the other. You get that wavy siding again on hot days.

Fixing Joint Problems

Here's another mistake — and it looks just as bad as a wavy piece of siding. If you look at a piece of vinyl siding, you'll see that each end has a 1-inch jog in it. This allows each end to overlap the next, and slide a little to the left or right with temperature changes. I've seen joints open up when an overlap of only about ½ inch was allowed. Believe me, it doesn't look good. The gap makes the siding appear uneven. There are a couple of ways to fix this problem. You can either replace the short piece with a longer one, or slide adjoining pieces over to lie on top of it. But you have to know what you're doing.

Let's say you install some siding and you're long gone before the weather changes. What happens when the homeowner notices a bad joint? You get a call. All you can do is change the spacing in that row of siding to give more overlap at the bad joint. Of course, the piece you move leaves a space where it was, so you may end up re-spacing more than a few pieces.

Lapping Joints

"It's all in the way you look at it." That saying is a lead-in for my next piece of advice. In fact, how you look at a house affects how the joints should be lapped. The laps on vinyl siding aren't perfect. If you look at a joint from the overlapped side, you can hardly see it. But if you look at it from the other side, you'll see that some of the laps are slightly open. You want the house to be seen from the overlapped side if at all possible.

People get their first view of a house as they approach it from the street or the sidewalk. You want the open end of the laps to face away from their view. They shouldn't see the slightly open ends of the laps as they walk up to the house. You always have a choice of which piece overlaps the next, so remember to lap the joints to look their best.

Row Line-Up

While on the subject of joints, here's another mistake you don't want to make. You may think that starting off with a new piece of siding for every row is the correct application method, leaving the shorter pieces for later use. You'd be wrong. Using a full piece of siding for each new row makes the joints line up, one above the other. And that looks really bad.

The cardinal rule of siding is to never, *ever* allow joints to line up vertically more often than every four rows. Think of how bricks look when they're correctly positioned. It's the same idea here. How do you achieve this spacing? It's really simple. When you finish a row of siding, you usually have a short piece left over. Simply start the next row with this piece. But if the piece is less than a foot long, put it aside and use a longer one.

You'll usually find a row that will need that short piece of siding you saved. Once you start using the cut-off pieces to start a new row, you'll see each row ending with a piece of siding longer than the last. That's just what you want. If you keep changing the length of the starting pieces so the joints are never uniform, you'll end up with nice random joints.

"Using a full piece of siding for each new row makes the joints line up, one above the other. And that looks really bad."

If you always get the same length pieces at the end of your rows, all you have to do is cut a different length of siding to finish that row. Then, when you begin the next row, it doesn't start with a half or full length. You now have another random length to start a row where the problem of alignment occurs. It may sound crazy to cut up a perfectly good piece of siding to start or end a row, but it's better than having the same spacing over and over, all the way up.

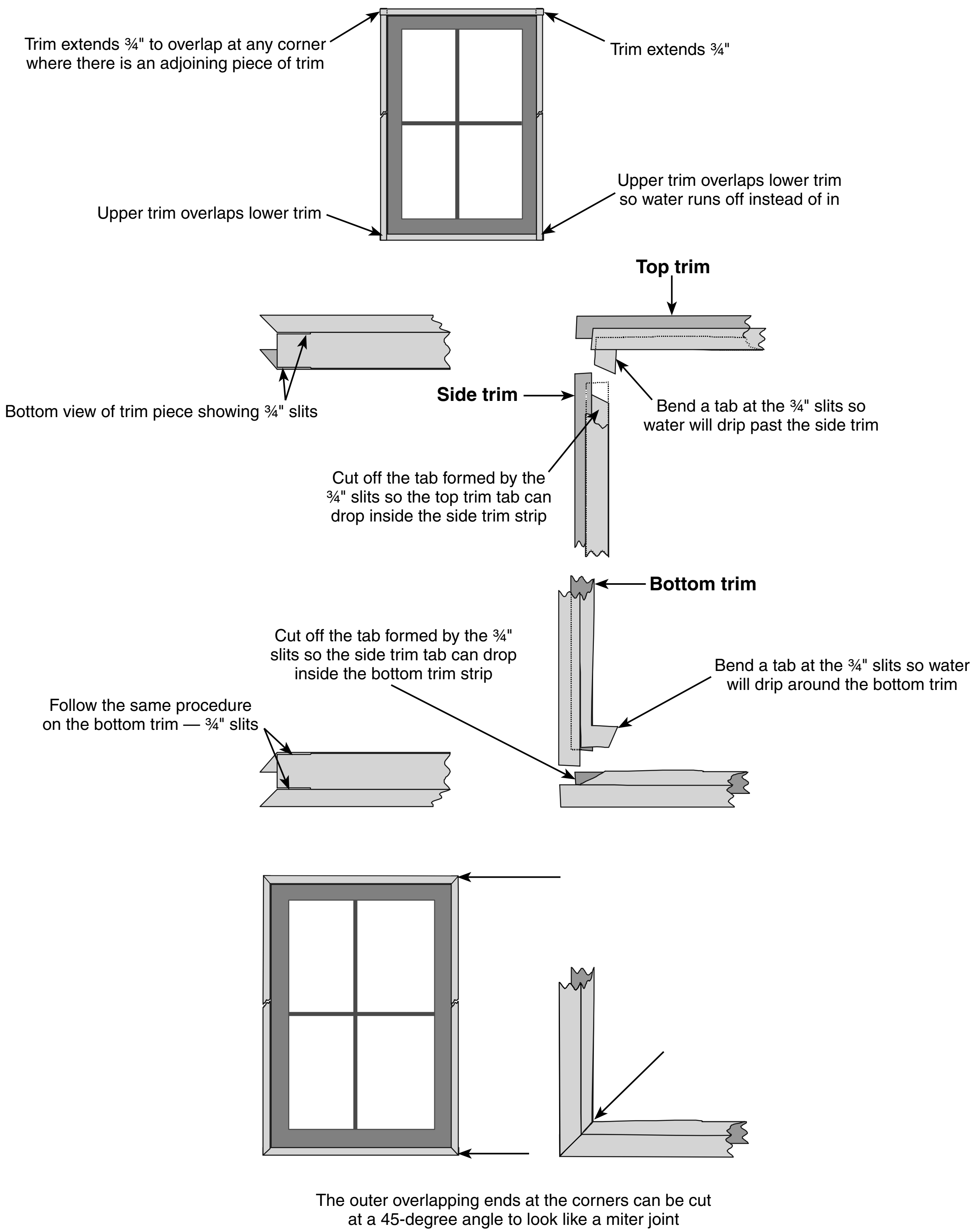


Figure 14-3
Making waterproof joints

Making Waterproof Joints on Vinyl Trim

Some builders aren't comfortable cutting and bending vinyl trim for windows and doors. There's a lot more to it than simply cutting the pieces so the trim looks good when it's in place. When making joints, appearance is second in importance to keeping water from getting under the siding. Look at Figure 14-3 to really understand each step in the process I'm about to describe.

Once you learn to cut and bend vinyl trim for a window, you'll be comfortable trimming doors, too. Let's start with the trim at the top and bottom of a window. The pieces must overlap each side of the frame ¾ inch. If your window frame is 28 inches wide, the trim for top and bottom will be 29½ inches. Vinyl trim is usually ¾ inch wide, so every corner that has trim on the adjoining side must extend ¾ inch.

1. Referring to the illustration, make a ¾-inch slash at each end of the top and bottom trim pieces.
2. On the top piece, bend the lips downward to overlap the vinyl trim on the side of the window or door. Bend them a little less than ¾ inch to allow for the added thickness of the side trim piece.
3. At the ends of the trim at the bottom of the window, remove the ¾-inch piece you just cut. The ¾-inch tabs on each piece of side vinyl trim extend past and are bent around the bottom trim. The bottom tabs are cut off because they'd be in the way when the side window trim was bent. See why the top and bottom pieces are cut this way? Notice that the side window trims are slashed ¾ inch at each overhanging end. Simply cut the ¾-inch flap off at the top of the trim and bend it over at the bottom.

Once the pieces are nailed on, it will be apparent to you why the joints are cut and fit in this manner. Any water getting on the top trim strip is directed over and around the side trim strips. Water running down the sides of the trim can't run under the bottom trim strip, because the bent tabs on the side strips cover the bottom trim.

If you cut the outer overlapped corner at a 45-degree angle, it'll give the appearance of a mitered joint. Overlapping the upper strips at each corner prevents water from seeping inside the frame. The top window trim, then, is the outermost strip.

Insulation at Window Frames

Most builders who do vinyl siding apply ½-inch insulation board outside the house first. This dense foam insulation takes a huge bite out of heating bills in winter months. It can be unsightly, though, if it shows around window edges. If the windows extend ½ inch or more, the insulation board edges are hidden by the edge of the window frame. If you can see the full ½ inch of insulation edges, though, you'll have to cover them.

Rip filler strips out of ¾-inch pine boards to cover the insulation edges. A ¾-inch by ¾-inch strip will usually be enough to cover them. Remember to paint the strips before you nail them around the window frame. You may have to caulk where they don't fit perfectly, and you'll always caulk the bottom strip. Caulking prevents water from seeping inside the vinyl trim. It doesn't hurt to caulk all around the window edges, anyway, to be safe.

If you're really ambitious, try making custom vinyl strips for the windows. Using the same siding that you used on the house, form these strips with a heat gun to cover the edges of the insulation board, instead of using wood strips. Since they're made of vinyl, these strips match the house siding perfectly.

New Siding Over Old

There may already be old siding on a house where you're installing vinyl siding, but you don't have to remove it. Simply put the new siding on right over the old. Besides being practical, the thicker the walls, the easier it will be to heat and cool the house.

New siding over old can create some problems, though. For one thing, it can cause dimpling where the new siding is nailed, under the bottom of the old siding. It may be driven in so far that the next new piece of siding nailed above it will bow out in the middle. The wider bottom of the old siding pushes out the thinner new siding. This may only happen where the new siding meets the widest part of an old piece.

How do I eliminate this problem? I nail the piece a little looser — loose enough to be able to pull the top of the new piece of siding even with the bottom of the old piece. Figure 14-4 shows the nail head on the new piece of siding is out a little, to avoid bowing the next row of siding. Nailing one piece a little looser than the others won't be noticed, but

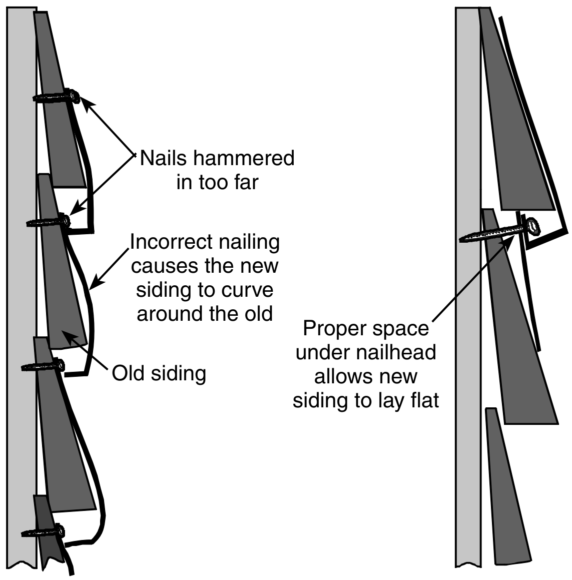


Figure 14-4
Nailing new siding over old

a whole bowed row of siding sure will. This won't happen over masonite because that siding isn't very thick. It only happens with older types of thick wood siding.

So what do you do when you get to a questionable area? Keep your eyes peeled to catch the problem quickly. The first time it happened to me, I didn't notice it until my crew had sided a whole wall. Well, there's a tool for unclipping vinyl siding. It's really handy and makes fixing the bad rows much easier. It slips behind the siding bottom and unhooks it as you slide the tool along underneath the clipped edge. Luckily, on our job, we were able to unclip just one row of siding and pull the nails out a little to fix it. With this handy tool, we didn't have to remove all the siding just to do the fix. Believe me, you'd go nuts trying to unclip vinyl siding without it.

Window and Door Replacement

I should mention another problem that happens now and then when you put new siding over old — the walls end up thicker than they were before. It isn't unusual to end up with walls that are 7½ inches thick. Your customers will often choose to replace doors and windows when they re-side their houses. In order to accomplish this replacement, you may have to shim the new door and window frames out 3 inches or more.

This can be tough, because, ideally, you should use finishing nails with small heads, and the longest ones are only 3½ inches (16-penny). Obviously, this doesn't give you much holding power. You have to drill nail holes first anyway, so make a larger hole, about ½ inch deep, for the nail head to sink into. The set-in nail can then be inserted deeper into the window or doorframe. I recommend you glue the frame edges before you nail them together. You don't want any warping when the seasons change, and the glue is just another ounce of prevention.

Thicker doorframes are a challenge. When you install a new door on the thicker inner frame, the latch bolt can scrape along the frame. There's a solution: Deepen the frame by adding extension strips. Temporarily remove the brick molding from the outside doorframe. Nail the frame's extension strips on the outside of the doorframe and replace the molding over the extra strips. By putting the new, wider strip on the brick molding exterior side, the door hinges are still in place. The latch bolt also remains in its original position.

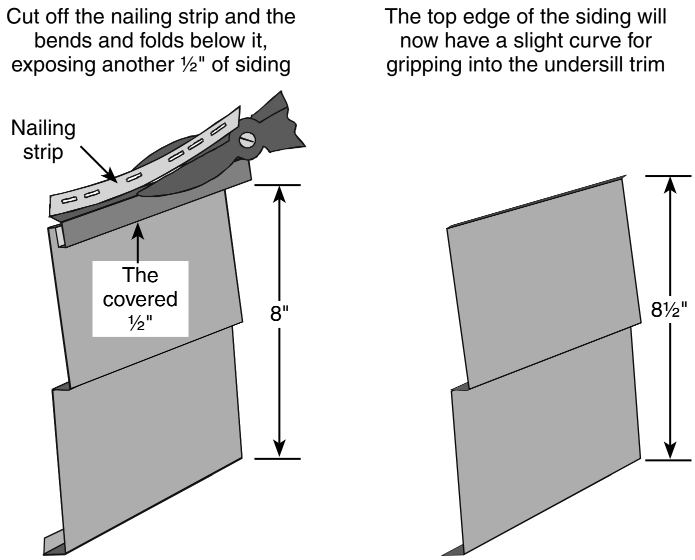


Figure 14-5
Extending siding height by ½"

Double 4 Vinyl Siding

Since we're discussing vinyl siding in depth, you may be wondering if I have a preference. Well, I use double 4 vinyl siding. *Double* means that a single piece of vinyl is shaped to look like two pieces; *4* means 4-inch siding. The vinyl piece is "stepped" in the middle to give that appearance. You nail up one 8-inch piece of siding instead of two 4-inch pieces — a big time saver. Siding comes in double 3, 4, or 5 inch. You can buy 8-inch vinyl siding that is simply one continuous flat piece of vinyl. But without bends in the center, it's limp and unmanageable. It invariably bows in or out in the middle, making a wavy profile.

Fitting and Forming Techniques

Sometimes standard vinyl siding and trim must be modified to fit. Ninety-nine percent of the time it turns out perfect. But what about that other 1 percent? To help you out, I'll give you a crash course in vinyl forming techniques. These solutions show how to make vinyl siding and trim fit in unusual situations. All you'll need is a heat gun.

You go to work on your siding and find you're just a fraction short of what you need for height. You can't clip the piece into the under-sill trim strip. So what do you do? This is one of the easiest of all the techniques I'll share with you. Simply modify part of the upper factory-formed siding to make the piece ½ inch higher than the original size. You'll see what I'm talking about by looking at Figure 14-5. How can cutting off something make it bigger? Because an extra ½ inch is hidden by the folds near the top of the siding.

Using my method, the last row of siding is raised up enough to fit and clip into the trim strip. You can't cut a ½-inch strip of siding for the top row. Even if you could, the job would look amateurish. So, get your heat gun. You're going to attack the bend, armed with only a heat gun and carpenter's square. For reference, look at Figure 14-6.

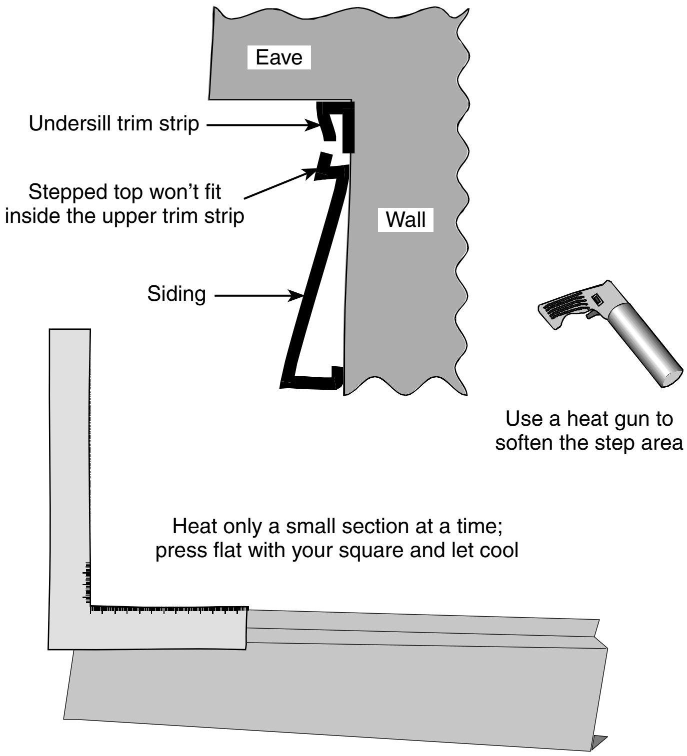


Figure 14-6
Heating vinyl siding to flatten for top section insert

- Always do a trial run with a scrap piece of vinyl. Wear gloves to protect your hands from sharp edges and the heat from your heat gun. Begin by inserting a utility knife and cutting along the fold. This exposes the hidden width you need to extend the final piece of siding to 8½ inches.
- With the heat gun, heat 10 or 12 inches of the bend at one end of the siding. When the vinyl begins to soften, press the wide edge of your square down on the warmed area. The square flattens out the siding, and its surface will immediately be cooled by the square and harden again. When you raise the square you'll see you've literally ironed the bend flat.
- Heat up the next few inches and press with the square. Repeat this the length of the siding. You'll end up with a nice flat strip. If some areas aren't completely flat, reheat them and press down again with the square.
- After you've flattened the bend in your scrap piece, cut it for height. Punch clip indents with a siding tool for a few inches. Space your indents a few inches apart.
- Try the test piece at several locations to be sure it will snap up into place inside the under-sill trim. It should be a tight fit, but not so tight that you can't push it into the trim strip. Don't be surprised if it fits fine in some spots but not in others. It's common for eaves to be a little irregular along the length of a house. By using scrap vinyl you know exactly how high or low to cut the final piece of siding.
- When you're satisfied with your sample, get the real piece. After flattening it, cut it to fit inside the under-sill trim strip. Don't forget that you need enough space at the top of the siding to punch the indents. The siding should go into the trim at least ½ inch, but no more than ¾ inch.

How to “Stretch” Vinyl Siding

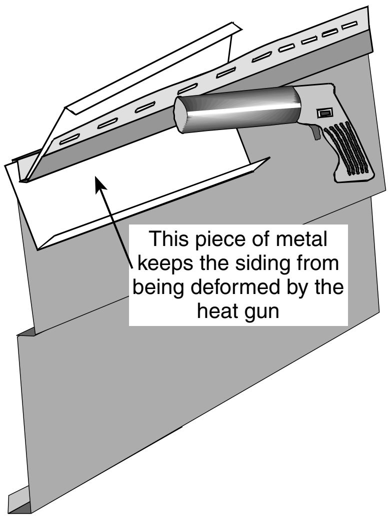


Figure 14-7
Heating vinyl siding to hide a bow in the eave

As Figure 14-7 shows, the eave is bowed up 1¼ inches for a few feet. This is a little too high for the last row to cover. If you cut and inserted a little strip of siding to fill this space, it would look strange. But you can solve this problem by making the top piece of siding about 1¼ inches higher at that spot. Use the heat gun to unfold the fold at the top of the siding, which adds more than 1¼ inches.

1. Beginning at one end of the siding, insert a piece of sheet metal into the fold at the top. Use any scrap of sheet metal. I use a strip of aluminum fascia about a foot long.
2. Before you heat the vinyl, slip your gloves on and put a second piece of metal under the folds you're heating. This keeps the heat gun from deforming the other part of the siding. Move this piece along with the first metal strip, to keep from accidentally heating the rest of the vinyl.
3. When the section is sufficiently heated, you'll be able to raise the metal strip to a 90-degree angle, unfolding the vinyl along with it.
4. Slide the two strips down another length and repeat the process.
5. Continue to the end of the siding. Even though you eventually want this piece unfolded completely, only bend it 90 degrees at a time. And don't try to heat and unfold a long section; part of it will cool off before you can unfold it.
6. Go back and heat the vinyl at the first end, but this time use the 16-inch end of your square. Heat 16 inches at a time, and press the vinyl down flat with the square. Do this the whole length of the siding. Now you only have to straighten the last fold of vinyl.
7. Slip your strip of metal into the last fold at the top of the siding. Heat and unfold the vinyl 90 degrees as far as the metal strip. Continue to the end, as you did before.
8. Using your square, heat and fold this strip flat, to the end. You now have completely flat siding, but it will be wavy in spots.

9. Heat the top 12 inches of the newly unfolded siding and press the wide edge of the square down on it to iron it flat. Do this the length of the siding. With a little effort, it'll look like part of the original piece. Once you finish, the siding will be 2 inches wider.
10. Since we're still talking about covering a bowed eave section with the vinyl siding, make an end seam just short of where the eave starts to go south.
11. Cut the bad section out, and insert the new piece of siding.
12. Carefully measure and cut the top of the siding to fit inside of the under-sill trim. It should slide inside the under-sill trim about ½ inch, leaving enough material at the top to punch for fastening the siding.

Fitting Round-Top Windows

How can you make a piece of straight vinyl J-channel fit a round window top? Some builders snip the front and back of the trim at about 1-inch intervals so it bends around the window top, but that looks terrible. Forget about trying to make round trim with snipped cuts. Put on your gloves and use your heat gun instead.

1. Use drywall to make a form for the J-channel trim to bend around. Drywall is inexpensive and easy to cut with a saber saw, so that's what I use. You could use a utility knife, but that's more time-consuming. As shown in Figure 14-8, cut two pieces of ½-inch drywall the shape of the round top and glue them together.
2. You now have a shaped form, 1 inch thick. Since vinyl trim is ¾ inch wide, use a ¾-inch stick, 18 inches long, to press the heated vinyl around the form.
3. Next, cut your J-channel a little longer than the round top dimensions. Set the heat gun on low and start heating the J-channel at one end, playing the gun back and forth over about a foot at a time. Keep the gun moving, so you don't overheat any one area.
4. Try bending the strip around the form. As soon as the J-channel bends around the form, press the heated part down on the form with your square. The square will quickly cool the J-channel, so you can remove it from the form.
5. Heat the next sections of J-channel until you have the whole shape formed.

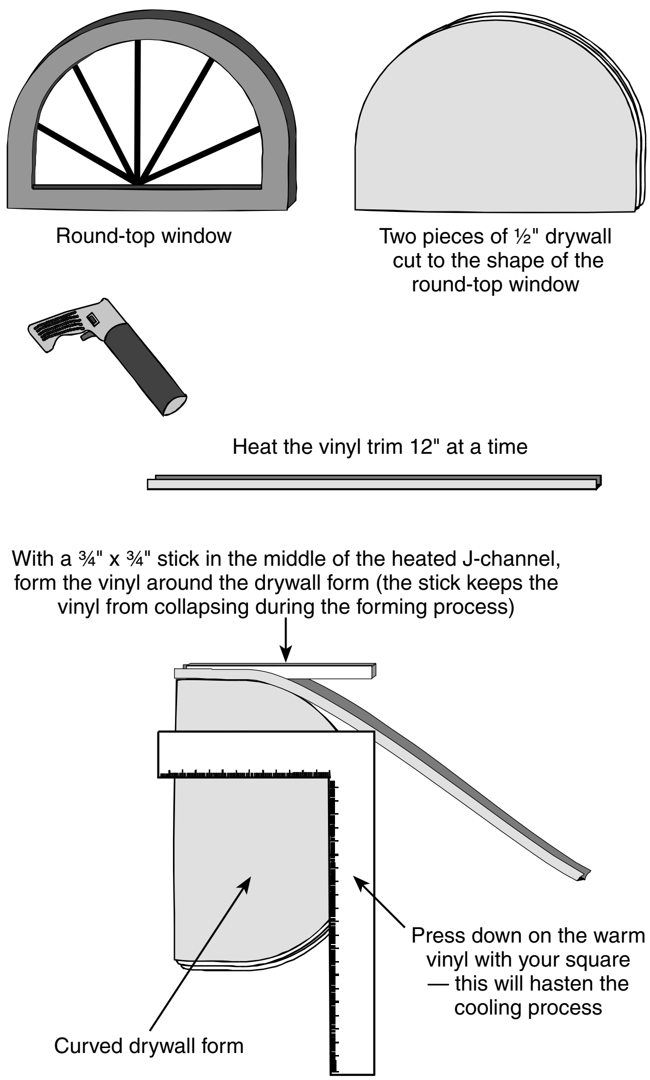


Figure 14-8
Curving a straight vinyl strip to fit a round-top window

It's really pretty easy. Making the form is the hardest part. But think of all the time you'll save if there are several windows with the same top curve. You only need to make one form for a template.

Customizing Window Strips

While you could use painted wood strips to cover the exposed edges of foam insulation board around windows, vinyl siding is better. Not only does it match the siding exactly, but you can make several narrow cover strips from just one piece of siding. This is a quicker, less-expensive technique than cutting, painting, and installing wooden strips.

Before forming, you have to know the thickness of the foam insulation being used under the siding. Some builders still install ½-inch insulation board, but using 1-inch-thick board offers greater protection. As long as you're going through all the trouble of cutting and nailing the foam insulation, you may as well use the thicker board. Dense cell insulation board is better than beadboard-type styrofoam insulation. But for this example, the insulation board is ½ inch, so we'll make strips ½ inch wide on one side.

- Cut strips 1¼ inches wide from a piece of vinyl siding. Part of this will cover the edge of the ½-inch insulation board, and the rest will go between the insulation board and the J-channel window trim, to hold the strip in place. In a section of double 4 siding, there are two areas with ½-inch steps. Halfway up the siding, there's a step very close to ½ inch, and at the bottom is another bend that's perfect for making your new strips. By carefully cutting strips from these areas, you'll already have the 90-degree ½-inch lip you need.

- Draw a line on the back of a strip, ½ inch from the edge. This is your guide for bending the strip to 90 degrees. Lay it line side up, on a surface that can't be damaged by your heat gun.

- Put a board on top of the strip, against the line you've drawn. This holds the strip in place while giving a good edge for bending. Make sure the board isn't warped, and that it's perfectly aligned.
- If all's well, put on your gloves and start heating the strip. Have your square ready. As before, play the heat gun on the exposed end of the vinyl strip about a foot at a time.
- When the vinyl is pliable, slide the square under the heated section and lever it up against the ¾-inch board holding it down. The cold square cools the vinyl, and the lip will remain at a 90-degree angle.
- Continue every 12 inches to the end. If the square gets warm, use the other end until it cools down. Keep the upper board stationary, or the fold could end up with a jog in it.
- Bend the angle all the way to the end of the strip. Later, you'll cut these strips to fit around the windows and cover the exposed edges of the insulation board.
- After the strips are in place, caulk between them and the window.
- Finally, caulk the strip along the bottom of the opening.

Vinyl Corner Modification

Vinyl corners are made to fit the average wall height of a common house. If the walls are higher than 10 feet, standard vinyl corners will be too short. Inserting a short length of corner into the bottom of an existing corner won't make the corner higher. The added piece is the same outside dimension as the full-length corner, so it would get squeezed inside the other piece and curve inward. You succeed only in deforming the short piece. You have to relieve the tension so the inserted piece doesn't get misshapen.

Carefully cut about an inch off the top corners of the short piece. You'll only be cutting ⅛ inch on each side — just enough from each corner to keep the piece from distorting. Carefully mark each corner an inch down from the top, and cut only to that line. If you do this carefully, you'll hardly notice where the smaller piece joins the first. See Figure 14-9.

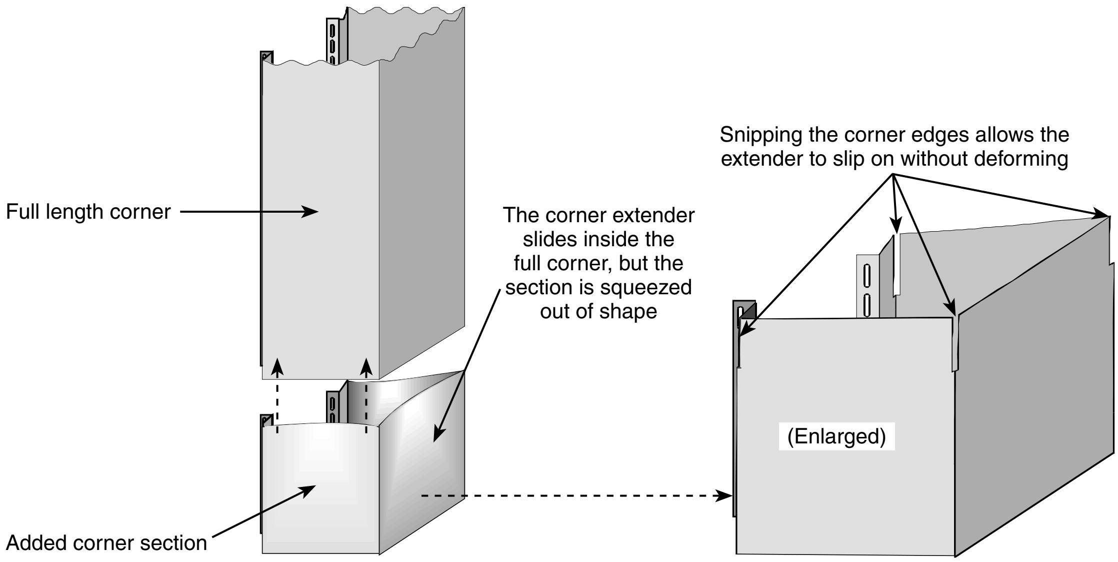


Figure 14-9
Extending vinyl siding corner posts

FASTENING GABLE TOP TRIANGLES

Here's another solution I came up with: The peak of a gable was so high that I could barely reach from the top rung of my ladder to nail the vinyl trim. If you've ever installed vinyl siding, you know that gable ends have no under-sill trim to hold the top of the siding. You always have to finish with a little triangle of siding a few inches high. All of the pieces are held with nails, except the last triangular piece — it has no nailing loops.

Now, I could have nailed that small piece with a galvanized finishing nail, but that would have been too noticeable. Worse yet, the nail could push the triangular piece inward at the top. So I squirted caulk in the bottom channel of the triangle, and simply pushed it up into place. When the caulk set up, it was just as good as glue. Best of all, nothing showed on the outside afterward.

Siding Solo

Imagine that you're siding all alone at the top of a 40-foot ladder, in the wind. Each time you start nailing at one end, the wind unclips the piece at the other end, and tries to blow the whole thing out of your hands. Believe me, experience this once and you come up with a whole new way of doing things.

Here's how I solved this problem: I attached a 2-foot length of wire through a nailing loop at one end of the siding. I took this piece of siding up the ladder, put a nail in the wall about 2 feet up from where the siding would end, and wrapped the end of the wire around the nail.

Then I got down, moved the ladder, and climbed up where I wanted to start the piece. I was able to grab the siding and pull the unwired end over into place, clip it, and nail it on. Position your ladder between where the siding is hanging and your starting end, and reach out to clip the end at arm's length. Keep some slack in the wire so you can raise or lower the piece to clip it. This tip is like having four hands.

LADDER SAFETY *Falls from portable ladders (step, straight, combination and extension) are one of the leading causes of occupational fatalities and injuries. Here are some safety tips:*

1. *Inspect the ladder before using it. If it's damaged, don't use it.*
2. *Only use ladders for their designed purpose.*
3. *Always maintain a three-point contact (two hands and one foot, two feet and one hand) with the ladder when climbing. Also, keep your body near the middle of the step and face the ladder.*
4. *Only use a ladder on a stable, level surface. Don't place a ladder on any unstable surface (boxes, barrels, etc.) to obtain additional height.*
5. *Don't stand on the three top rungs of a straight, single or extension ladder. An extension ladder used to access an elevated surface must extend 3 feet above the point of support.*
6. *The proper angle for setting up a ladder is to place its base a quarter of the working length of the ladder from the wall or vertical surface.*
7. *Make sure the ladder is free of any slippery material on the rungs, steps or feet.*
8. *Avoid electrical hazards. Look overhead for power lines before setting up the ladder. Don't use a metal ladder near energized or exposed power lines or electrical equipment.*

For more information on workplace safety, check with your local OSHA office.

An Alternative to a Punch Tool

I'd just finished siding, and was ready to install the top piece. The wall was rectangular, and had under-sill trim at the top. The top row of siding is always cut for height to fit the house wall. This works great because no nails are needed to hold the last top piece of siding in place. The only extra piece of equipment you need is a punch tool to mark the siding pieces. Well, guess who forgot his tool?

Then it dawned on me: I could make tiny punch marks with my narrow ¼-inch chisel. Perfect — it made marks just about the right size. I made some trial punches on a piece of scrap siding, until I found an angle where the punch pushed outward on the face of the siding. That's what I needed for gripping inside the under-sill trim strip.

But you don't really need a narrow chisel. Angling your regular wood chisel when you punch does the job almost as well. Experiment first on scrap siding. Make sure the punch marks are the right distance from the top edge. Too close to the top and the punch is pushed right out; too far down, the punch won't clip up into the under-sill trim.

Warning: Do not attempt this in extremely cold weather. Rather than working out nicely, as described, the vinyl will shatter when you try to punch it. The temperature must be at least 50 degrees to punch and form vinyl successfully.

Solutions for Window Edging Problems

You're putting new vinyl siding over wooden siding, and suddenly you encounter a problem — a bad problem. What are your options when the ends of the window frames stick out an inch or two? Not only does it look bad, but the window frames are impossible to side around. There's no

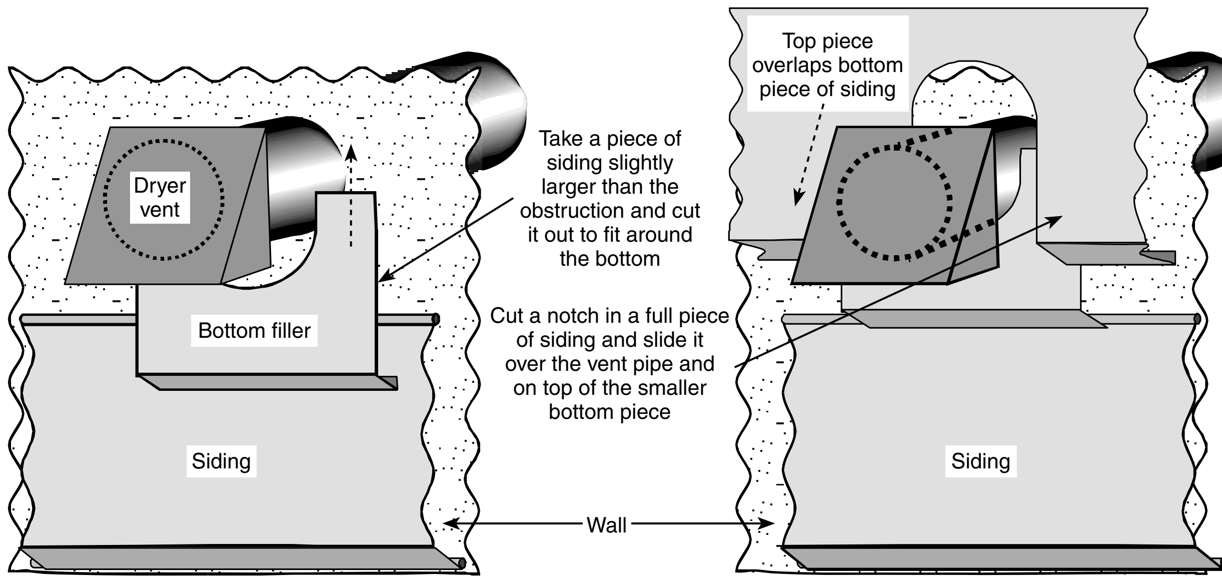


Figure 14-10
Cutting siding to fit around dryer vent

functional reason to keep these ends, so cut them off with a circular saw before installing your siding. Use a carbide blade in case you hit a nail somewhere before you're finished cutting.

Wrapping Windows with Metal Over Stucco

In the past, white or brown aluminum was wrapped over window frames to protect them. The material wouldn't deteriorate and never needed painting. Aluminum pieces were cut to fit over the old window frames. After installation, all the edges were caulked.

But stucco surfaces present problems if you need to install aluminum channels. Some of the particles in stucco remain exposed on the surface. This gives the house exterior a unique look, but also makes the walls very rough. When you try to slide bent aluminum channels over a wood window frame on a stuccoed house, the metal edges hit pebbles and, since stucco has an uneven texture, the metal can also stick out from the wall in spots. Something has be done to achieve a smooth surface so the windows fit flush with the walls. The solution is simple but a little messy:

- ➢ With a circular saw, cut into the stucco around each window frame. Get a blade made specifically for masonry cutting. It can grind both masonry and concrete, and says so on the label. *Always* wear safety glasses. Set the blade deep enough to cut into the stucco about ½ inch.

The blade grinds through pebbles and concrete really well, but expect a little smoke when it comes in contact with wood.

- Keep your blade set at the correct depth. You want it cutting deep enough to get past most of the roughness, but not so deep that it actually cuts through the stucco. You simply want to reduce the roughness.
- Pebbles wear down the blades pretty fast. You'll keep resetting the saw table to have enough blade left to cut down deeply enough. This may seem like a pain in the neck if you aren't used to fine-tuning your blade and table height. It'll take a little getting used to, but the job is otherwise pretty painless.

Siding Around Obstacles

There are times when you'll have to side around something sticking out from the house wall. Let's look at how to side around a dryer vent in the middle of a wall.

1. First, measure and mark the hole you need. Your cutout should be a little bigger to accommodate the large flange on the dryer vent where it fastens to the wall.
2. You don't even have to remove the vent because you can cut a rectangle of siding to fit around the vent at the bottom. The rectangle should be about an inch wider than the vent pipe on either side.
3. At the middle of the pipe, cut the siding straight up on each side, as shown in Figure 14-10 (this piece of siding only covers the bottom half of the vent pipe).
4. Slide this piece up around the vent pipe and clip it in place. Cut out a full piece of siding to slide down over the first piece. The benefit of this installation is that the obstruction, in this case, the dryer vent, doesn't have to be removed for you to side around it.

In this next example, the obstruction is a simple wire. If the wire is close to the top, bottom, or end of the piece of siding, just make a notch in the siding for the wire to pass through. If the wire is at the middle of the siding, make a slit up or down from where the wire is located, and cut a hole big enough for the wire to pass through. Open the slit and slide the wire into place. Sometimes the obstruction is at the end of different pieces

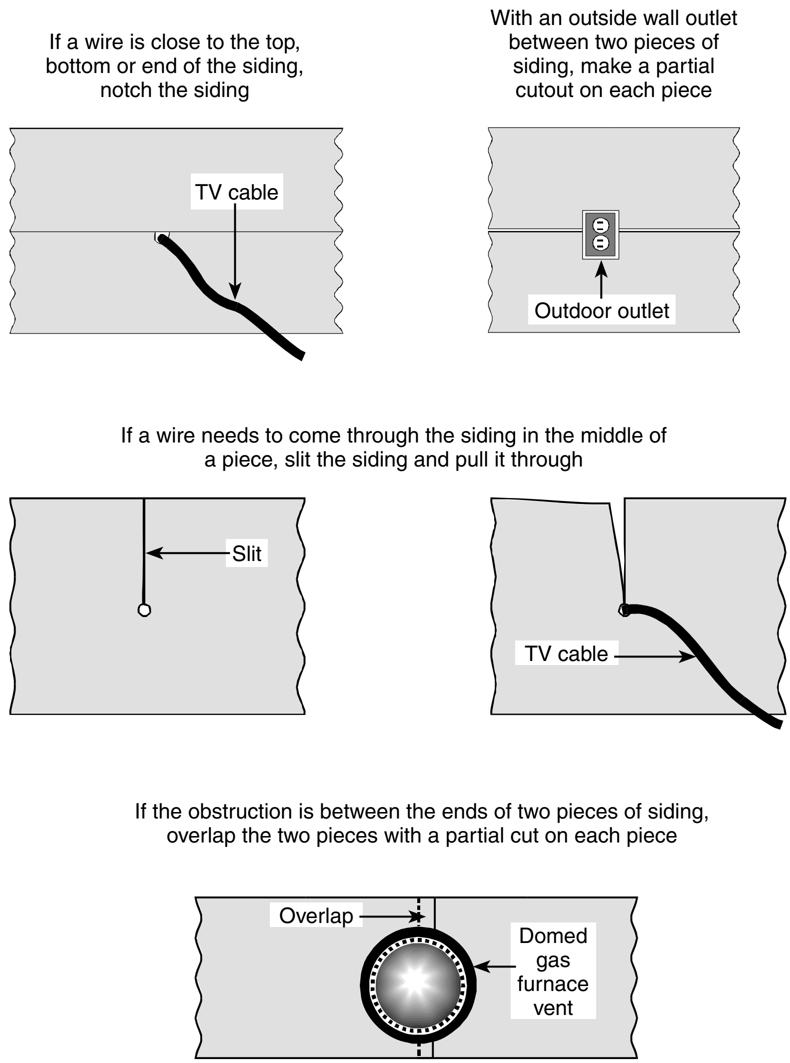


Figure 14-11
Openings for various obstructions

of siding. In Figure 14-11, there's an outside wall outlet in one example, and a domed gas furnace vent in the other. In cases like these, make cuts on both pieces of siding that will match up around the outlet or vent.

High and Low Siding Rows

Because vinyl siding is flexible, rows can end up being too high or low. The most common siding problem is when the rows on one side of a window or doorframe are higher than the rows on the other side. This generally occurs between a window and a door when they're in close proximity. The pieces of siding in those spots are narrow, so they tend to flex easily, while the regular pieces of siding are much longer, and not as likely to stretch.

Narrower pieces of siding stretch a little when you push them into place. This won't seem to be a problem until you've reached the top of the window or door, and have to put up the piece that goes across the frame. Guess what? That inch or so between the rows on each side is now very noticeable. The long pieces of siding above the opening are way below the short rows on the other side. And, to make matters worse, the long piece of siding can't clip into place because of the height difference.

"Guess what? That inch or so between the rows on each side is now very noticeable."

The moral of the story is this: Be very careful when you're handling short pieces of vinyl siding. *Never* push them up when you're nailing. You'll have all kinds of problems. But vinyl's flexibility also allows you leeway to make revisions that would be impossible to fix with stiff hardboard or thick wood siding.

Leveling Rows

You may find that the row on one side of an opening is higher than the one on the other side. Sometimes there's no apparent reason. You check to see if any short pieces of siding are involved, but they're not. Puzzling. It rarely happens, but when it does, here's what I do.

I remove the siding down to the bottom of the window, because I have to get the rows on each side to meet at the top. As I put each piece back up, I push it down slightly before nailing. The little "give" when it clips in place saves the day. By the time all the siding is back up to the top of the window, both sides are level.

Sometimes the rows of siding around large windows are too low. Once again, use vinyl siding's flexibility to your advantage. If the rows are low, push the siding up and press it firmly as you nail it. You'll be pleased with the results.

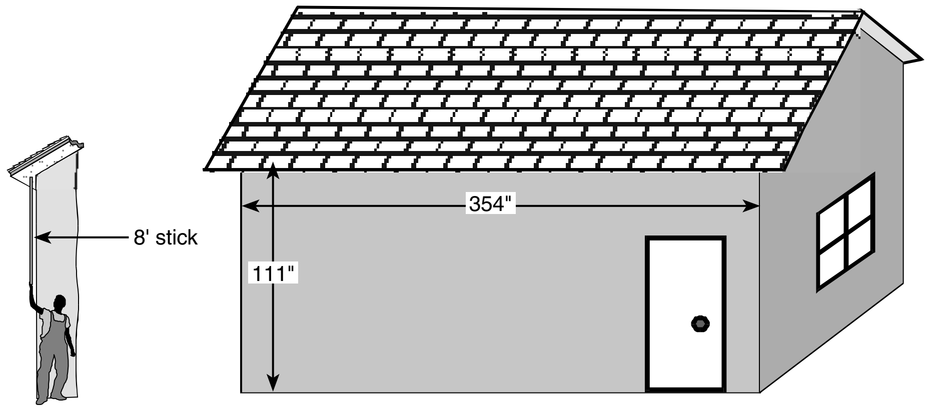


Figure 14-12
Measuring for siding without a ladder

Measuring Without a Ladder

This next technique might seem impossible, but it can be done. When you estimate for siding on a house, you don't need exact measurements. If you're within a foot or so of the actual measurements, you'll be fine. I add about 10 percent more to the total area for waste. And don't worry — if you somehow misjudge the measurements and get too much, you can always return unopened boxes. But believe me, this procedure is amazingly accurate. Decide for yourself.

Don't try to extend a tape measure up to the eaves to measure the height of side walls; it doesn't work. The tape keeps falling back towards you. All you need is a stick about 8 feet long.

As Figure 14-12 shows, you can hold the stick up and touch the eave. Now just measure how far it is from the bottom of the stick to the bottom of the siding on that wall. Add the length of the stick to that measurement. When measuring the area of the wall, ignore the doors and windows. Act as if the walls have no openings.

To determine the area of a wall, multiply length times width. I multiply the height and width in inches and divide those measurements by 12, converting inches into feet. Why? Because it's easier. When I divide by 12, I find that the wall is 9¼ feet high (9.25 feet) and 29½ feet long (29.50 feet).

Now you need the area of the gable end walls, at the peak of the roof. Getting the area of the gable ends takes a little more figuring, as you'll see in Figure 14-13. You're going to split this into two separate measurements.

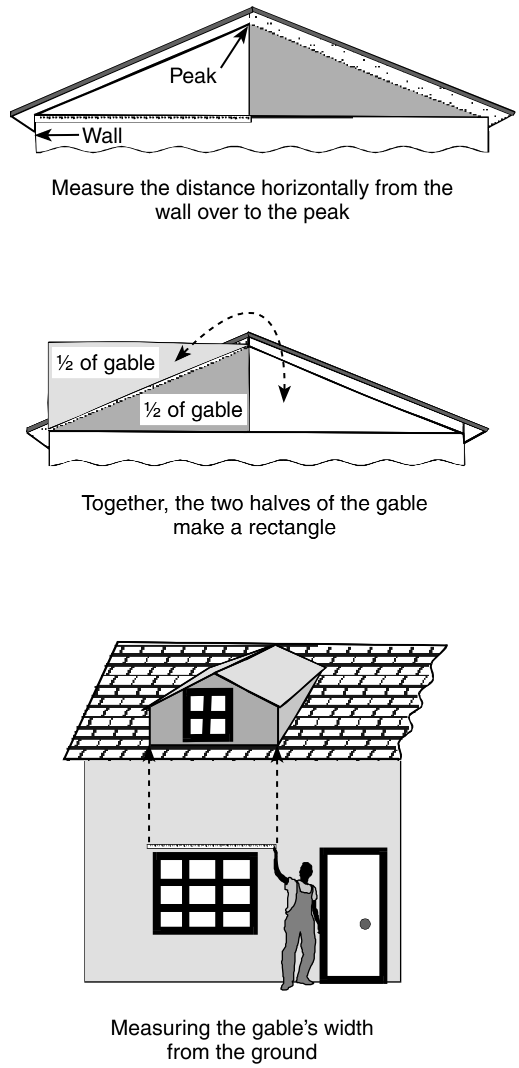


Figure 14-13
Figuring the area of a gable end wall

1. First, find the height of the end wall up to the eave, and multiply it by the width of the wall. This is usually a rectangle.
2. Then, find the area of the end wall from the eaves to the peak. Looking at the illustration, think of the area as two triangles facing each other. They meet below the peak of the roof, where they form one rectangle or square.
3. How far out on the wall is the peak located? Simply walk along the wall until you're right below the peak. How far out is the peak from the corner of the house? Mark the spot. Measure the distance from the other corner of the house to the peak.
4. Sometimes the peak isn't in the middle of the house wall. But for our purposes, let's say it is. You know the length for the triangle. How high is it from the eave to the peak (the second part of the triangle measurement)? To figure this, simply count how many rows of siding there are from the eave to the peak. You can eyeball this from the ground. Follow the bottom of the piece of siding at the start of the eave to the middle of the wall, below the peak. Count how many pieces of siding there are from there up to the peak.
5. Measure the height of a piece of siding on the house wall. Multiply that by the number of pieces there are from eave to peak. The gable end of the wall from the eave to the peak is just two triangles facing each other. If you stack these triangles over each other, reversing one, they would make a rectangle. You need the *area of the rectangle* that the two triangles make up. The height to the peak multiplied by the width of half of the wall gives you the total area of the end of the wall, from the eave to the peak.
6. Some second stories have gables extending onto the main roof. Use the same technique for estimating the width and height of the sections on the gable. You can estimate the width of the front of the gable by using the windows and doors below as reference. Hold your tape on the wall below the gable to get its width.
7. Now we'll determine the length of the gable's side walls. Simply count the rows of shingles from the front of the gable to the back, where it meets the roof. Shingle rows are about 6 inches high; multiply the number of shingle rows times 6 to get the width of the

gable side. Since these areas are so small, add a little to your measurement to be sure you get enough siding. The two triangles again make a rectangle when put together, so you only need a height and width measurement for one side of the gable to figure the total area for both.

Laying Out and Cutting Corners

The biggest headache when siding a house is trying to fit a vinyl corner. The top has to fit the roof angle and the soffit shape at the bottom of the eave. Since vinyl corners are the most costly siding accessories, you need to be precise the first time. To begin, look at Figure 14-14. I think you'll be more confident after I walk you through the process.

- Make a pattern out of corrugated cardboard. Bend it into a square the same size as the vinyl corner.
- Cut a 1-inch lip and bend inward at each edge. These lips hold the cardboard shape an inch out from the house wall — the same distance the vinyl corner will extend — so the cardboard template is in exactly the same position as the vinyl corner.
- Cut a notch where the vinyl corner is inset into the soffit. Begin by finding the height of the notch. Put the template up against the soffit bottom, with the 1-inch lips holding the pattern out from the wall. Measure from the top of the cardboard at the back to the bottom of the eave. Measure down from the top of the template, and make a mark.
- The measurement you made at the back of the pattern is the distance you'll cut the notch at the front, so you'll extend your mark to the front on that side. Refer to the figure if this is unclear.
- Determine how far in the notch will be. With your template back on the corner, mark the position of the back of the soffit on the top of your pattern. That's how deep the notch must be.
- Draw a line from here down the side of the corner to your first mark. You now have the basic shape to cut the front of your template.
- Now you need the angle of the gable eave. Using a protractor against the back of the soffit where it goes up to the eave, set the blade of the protractor to that angle. Tighten the thumbscrew to save the angle.

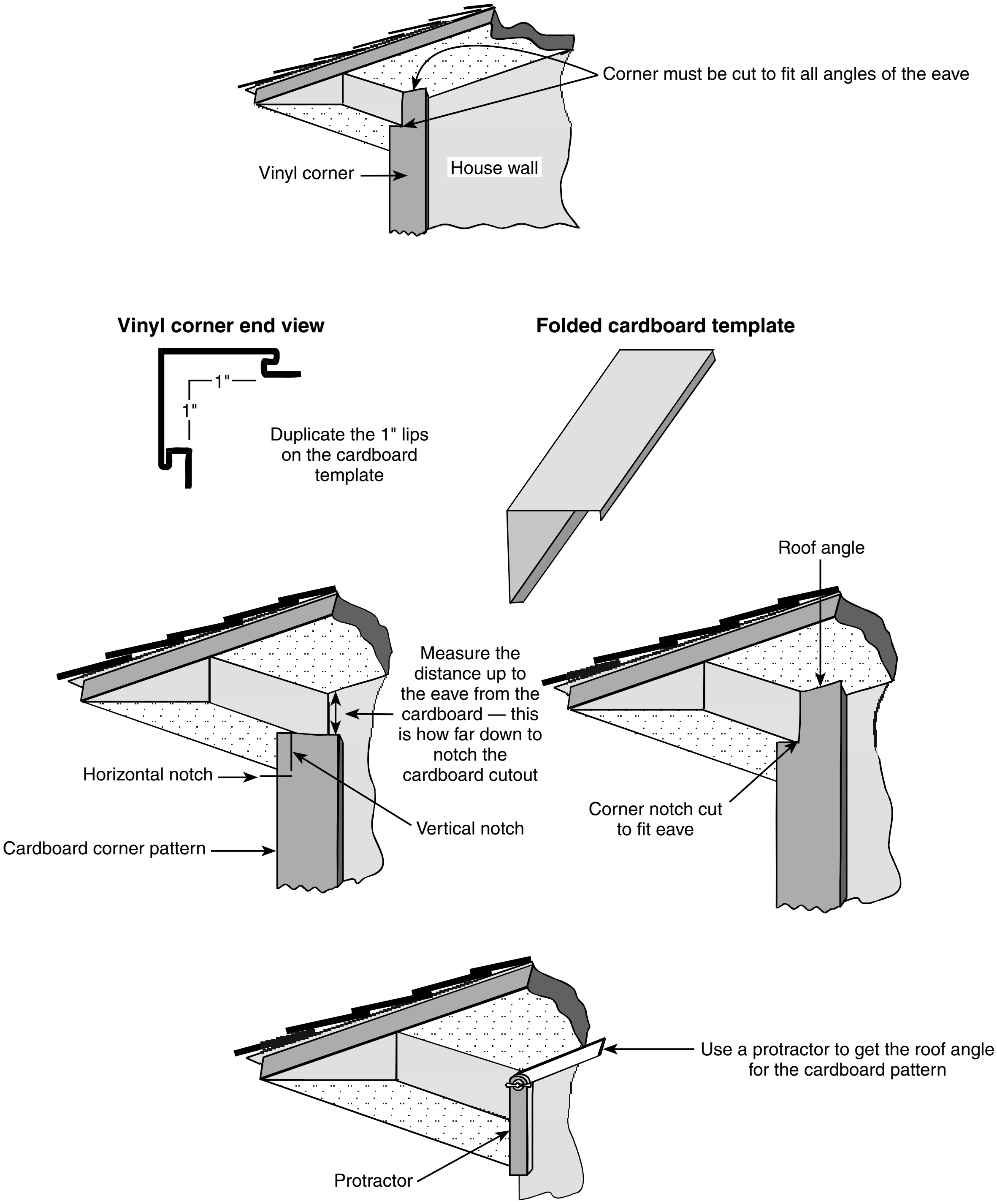


Figure 14-14
Making a cardboard pattern for a vinyl corner

- With the protractor blade on the side of your template, line up the top of the blade with the top back corner of the template. This is the angle you'll cut the top of the template. Draw a line on the pattern.
- You've completed your template. Hold it up to make sure it fits all the way up to the eave. You may need to trim it a little in spots. Remember to hold the pattern perfectly vertical against the corner. You may have to make small cutouts if fascia or trim is holding the template away from the eave. Better to correct your template than botch the real thing.
- Make a final pattern out of vinyl, making absolutely sure everything fits. Do you have some corners that don't need a whole length vinyl post? If so, cut a short section from one of those posts. The good thing about doing this is that you can use this stiff vinyl pattern to trace the shape on your other vinyl post tops. And if you carefully cut this template apart at each corner, you can reverse it for post tops that have opposite corners.
- There's only one more thing to know to finish a corner post: How long each post has to be. Put your pattern in position and mark the bottom of the template on the siding.
- Measure from this mark to the bottom of the siding. By adding the height of the template to this measurement, you get the overall post height. Add ¼ inch to this total, since each post should be down about ¼ inch from the bottom of the siding.
- A note of caution: Don't assume one pattern will fit multiple locations. Always test your pattern at every corner to confirm that you don't need to make a custom pattern for that corner.

Remember, if you're using vinyl siding, you can also cut strips from it to cover the exposed wood by the doors and windows, as I discussed earlier. Before nailing the 2 x 2s to the house, drill starter holes for the nails. Use 16-penny spikes and a drill bit close to the size of the nail. By following my tips on siding in this chapter, you'll have a completed project that makes your customer's house a warm and cozy home.

15

FLOORING & FLOOR REPAIR

If you're in the remodeling business, you need to be flexible. And if you can complete a job by yourself — or with only one helper — there's more profit for you. Most remodeling and renovation jobs are likely to involve flooring: vinyl tile, ceramic or porcelain tile, sheet vinyl, carpeting or wood. There's no reason you can't do these installations. Finish work like flooring isn't that difficult, especially if it's for an easy square or rectangular area. And you make money on the materials as well as the labor. So give it a try. You may be surprised.

There are a lot of steps involved in laying floors, and until you've had a lot of practice, each step holds the possibility of an expensive mistake. So, rather than list all the mistakes you might make, I'll tell you how to do it right the first time. Follow my instructions and you should be able to avoid most, though probably not all, of the mistakes. There are some things you just have to learn the hard way.

Obviously, if your customer wants some high-priced flooring in a room that's an unusual shape, with a lot of projections, this isn't the place for you to begin practicing your skills. Start with a simple job: a nice square or rectangular room that involves lower-cost materials. If you totally mess up and have to replace material you damaged, it won't be a disaster. Consider it a tuition fee: You're learning. Once you have a few basic jobs under your belt, you can tackle some of the more complicated jobs.

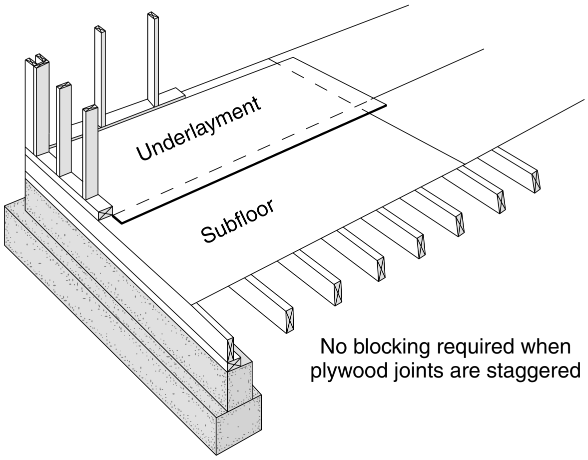


Figure 15-1
Plywood subfloor and
underlayment with staggered edge joints

Underlayment

What comes under the finish flooring can make the difference between a fantastic and functional floor and a squeaky, uneven mess. It's important to start with the correct subfloor and underlayment if you want a happy customer who'll be singing your praises.

Sheet Vinyl or Tile

If you're installing sheet vinyl or ceramic or vinyl tile, you may want to place a layer of ¼-inch Lauan over the particleboard before laying the final surface material. Butt the edges of the Lauan, since gaps might show under the tile, and will *definitely* show under vinyl floors. Use the correct nail spacing techniques for the plywood and particleboard, stagger the nails to keep the wood from splitting, and make sure you get the right size nails for each application.

Consider coating the floor after a subfloor is installed to ensure no nailheads telegraph through the sheet goods or tile. Skim coat the floor with a general purpose gypsum-based floor leveler, then do any needed patching.

Carpet or Resilient Vinyl

Use particleboard under carpet and resilient vinyl, unless you're working in a bathroom, where you'd use exterior plywood. The rule of thumb is ⅝-inch particleboard over ½-inch plywood subfloor. (Check your local code — sometimes it calls for ⅝-inch plywood for the subfloor, rather than ½ inch.)

Proper Offsets

If plywood is laid at a *right angle* to the joists, the underlayment panel joints and plywood panel joints must be offset by at least 2 inches. If plywood is laid *parallel* to the joists, the underlayment panel joints and plywood panel joints must be offset by at least one joist. Figure 15-1 gives an example of staggered edge joints.

Nailing

Using ring-grooved underlayment nails, start nailing in the center of each plywood panel and work toward the edges. Nails should be perpendicular to the panel surface, and set flush; edge nails should be between ½ and ¾ inch from the panel edges. Nail each panel completely before moving on to the next, leaving a $\frac{1}{16}$-inch gap between the panels.

Working Around Radiant Heating

If your client has a radiant-heated slab, use the correct flooring adhesive — one that holds up to the temperature generated in a heated slab. And check the manufacturer's recommendations to be sure that the flooring your client wants is approved for installation over a radiant-heated slab.

General Room Preparation

After the floor area is prepared and dry, remove the baseboard, then the quarter-round molding, shoe molding, or vinyl wall base. If tiling a bathroom, also remove the toilet and pedestal sink, if there is one. Cut the bottoms of doorway moldings so the flooring material can easily slip underneath them, using a handsaw held flat on a cardboard scrap that's the same thickness as the new flooring material. Then sweep or vacuum the floor, and drive down any protruding nail heads in the underlayment.

Vinyl Tile

If you're installing resilient flooring over an existing resilient floor, make sure the surface is flat, smooth, and completely bonded to the subfloor. Generally, flooring won't bond to asphalt tile, resilient flooring installed below grade, cushioned sheet vinyl, or urethane-coated floors. You may want to remove the old tiles and, if so, the following information comes in handy.

Heating Vinyl and Asphalt Tiles for Removal

This solution only works for asphalt-type mastic (as most tile mastics are). These mastics are usually either light brown or black and look

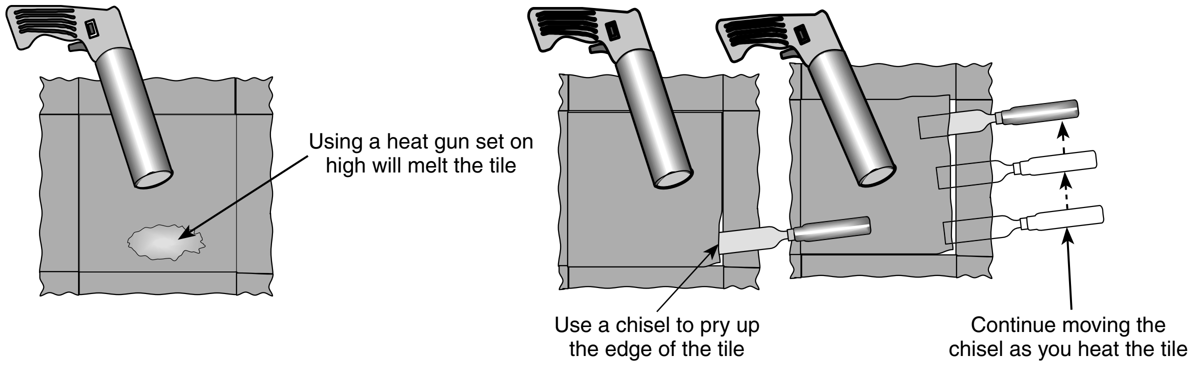


Figure 15-2
Heating vinyl and asphalt tiles to remove them

like regular roofing tar. A heat gun will soften either type so that the tiles can be easily lifted up. *Note:* This method of tile removal *doesn't* work on a cement-based substance like mortar.

Take extra precautions when you use this method. Heating asphalt mastic creates noxious fumes. Before starting work, open doors and windows to bring in outside air, and position a fan to create a positive air exchange.

Think of a heat gun as a super-hot hair dryer. Even on low heat, heat guns are unbelievably hot. I've never had to use any higher setting than low on my heat gun. Higher settings will easily burn and melt the tile.

With the heat gun set on low, hold it about 4 inches above the tile you want to remove, and play the heat gun over the surface of the tile. Never stop moving the heat gun, or it will quickly melt right through the tile; see Figure 15-2. Keep playing the heat gun on the tile, and when you see the tile start to lift and curl up slightly around the edge, push the end of a chisel under the tile at that spot. As the mastic is heated it soon becomes liquid again — just as it was in the can originally. As you continue heating the tile, you'll soon be able to slide the length of the chisel under the tile. Then you'll be able to lift the whole tile up and off the floor. Quickly scrape off any small spots of mastic still left under the tile. If necessary, reheat any spots still left, and scrape them off.

A Clean Surface

Vinyl tile requires a smooth and clean underlayment or slab, free from moisture, dust, solvent, paint, wax, oil, grease, or sealing

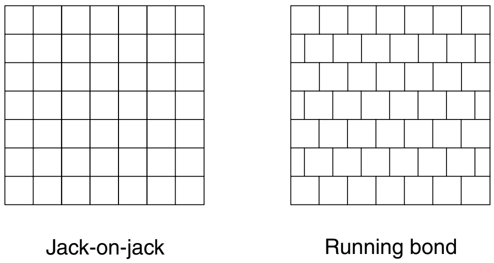


Figure 15-3
Tile patterns

compounds. In order to get the surface you need, remove any paint by sanding the floor. If you're installing on top of concrete, put down a moisture barrier. If you're tiling over a wood subfloor, it must be dry and smooth, have no movement or expansion, and again, be free of moisture, dust, solvent, etc.

I would also recommend rolling the floor with latex floor primer to create a better bond with the finish goods. Use a paint roller and roll over the entire area, then wait for the latex to dry to the touch. Then cover the floor with a good skim of gypsum-based floor leveler to fill cracks and holes.

Felt Paper

Some types of vinyl tile need a special lining felt underlayment, so don't forget to check the manufacturer's recommendations. If that's what the manufacturer suggests, lay the 15-pound asphalt-saturated felt paper across the boards with butted (not overlapped) edges, then roll with a 150 lb. roller from the center to the edges.

Layout

Don't let your tile joints fall over the underlayment joints. Plan ahead for this by making a layout on paper before you begin. There are two basic patterns in floor tile layout: jack-on-jack (the most common), and running bond. Take a look at Figure 15-3 to see the difference. The jack-on-jack is easier to install and less time-consuming, which is one reason it's more common.

Installation

Once your layout is ready, follow these easy steps:

1. Find the midpoints of all four walls.
2. Pull a chalkline to the midpoint of the opposite wall and snap a straight line on the subfloor. Do this on both walls. Your lines should meet in the middle of the room.
3. Put a row of dry tiles (don't set them!) along the chalkline from the center point to one side wall and one end wall, making an L shape.

4. Measure the distance between the wall and the last full tile. If this space is less than half a tile wide, snap a new chalkline and move half a width of tile closer to the opposite wall.
5. Check to make sure you have right angles.
6. Repeat these steps with the perpendicular row — the other leg of the L. (This eliminates fitting small pieces of tile next to the walls.)
7. If you're using adhesive-backed tile, just peel and stick. If you're using mastic, apply a thin layer with a roller, brush, or trowel.
8. Lay one quarter-section of the room at a time, starting at the center point marked with the chalkline, and moving toward the walls. Set each tile down firmly and tightly against each adjoining tile.
9. To cut and fit vinyl tile against the wall, place a new tile on top of the last full tile closest to the wall. On top of this tile, place a third tile and slide it until it butts against the wall. Using the edge of the top tile as a guide, mark the tile under it (the second one) with a pencil. Cut that tile with a pair of household shears along the pencil line.
10. To get a clean fit around any room protrusions, make a pattern on paper by tracing the outline of the obstruction onto a vinyl tile, then cut the tile with shears. Lay the tile with the rough edge against the wall.
11. Roll the finished floor with a 100-lb. roller. This helps bond the finished floor and eliminate any air pockets.

Ceramic and Porcelain Tile

The term "ceramic" technically covers all types of tile made from fired clay – which is what the word means. However, there are many types of ceramic tile, including the currently-popular porcelain. Porcelain ceramic has more glass in the mix and is fired at a higher temperature, making it denser and more water-resistant than non-porcelain ceramic. Because it's generally more resistant to wear and damage from abrasion and impact than non-porcelain, porcelain tile is used most often on floors. Retailers used to charge a lot more for porcelain, but now there's not much difference.

So should you recommend porcelain? If your concern is wear-resistance, which is more a function of the glaze than of the material in the tile. Study the wear rating – the PEI wear test. Group I tile is too soft for floors and should only be used on walls. Group II is also risky on floors, unless it's in a room that has little traffic. For most floors, stick with Group III or higher. If the box doesn't show a wear rating, choose another tile.

If you want porcelain ceramic, for its strength and water-resistance, if it's not made in the U.S., don't simply trust the words on the box. Asia, Europe and South America define porcelain differently, often involving the color as well as the tile's composition and firing temperature. A simple test is the weight; the heavier the tile, the denser it is. Pick up a box and compare it with the weight of a box labeled "Ceramic." Assuming the same square footage and thickness, if it's much heavier, it's probably porcelain.

In my discussion here, I'm including porcelain and non-porcelain tile. Where I'm referring specifically to porcelain ceramic, I call it porcelain.

Ceramic and porcelain tile is durable but more expensive than vinyl, and comes in a variety of shapes: hexagons, octagons, rectangles, and squares. It's great to use in high-moisture areas like bathrooms and kitchens, and is frequently used in entryways. Since all ceramic tile needs good support to prevent cracking or breaking, make sure you have a good, solid base. Check the manufacturer's recommendations first, but there should be at least ¾-inch plywood under the cement board.

Smaller tiles save you a lot of cutting, and have the added advantage of not breaking as easily. But today, large floor tiles, 20 by 20 or even larger, are popular, so be prepared to cut. A wet-saw tile cutter is by far the best tool, and they're cheap enough to be worth having even if you do ceramic work only occasionally. But you *can* cut tile with a circular saw with a masonry blade. In a pinch, you can even cut tile by hand, but you'd only take this option on a very small, simple area such as an entryway. To cut tile by hand, cut with the glazed side up. Score the tile with a glass cutter using a straightedge, then break the tile over a finishing nail.

Cutting Ceramic Tile with a Circular Saw

There are times when you've got to cut a section out of a piece of ceramic tile, such as when fitting around a doorframe or a floor register; see Figure 15-4. You can buy or rent tile-cutting saws, but sometimes you just want to finish the job without having to go to the hardware store. If you had thought ahead and bought masonry cutting blades to

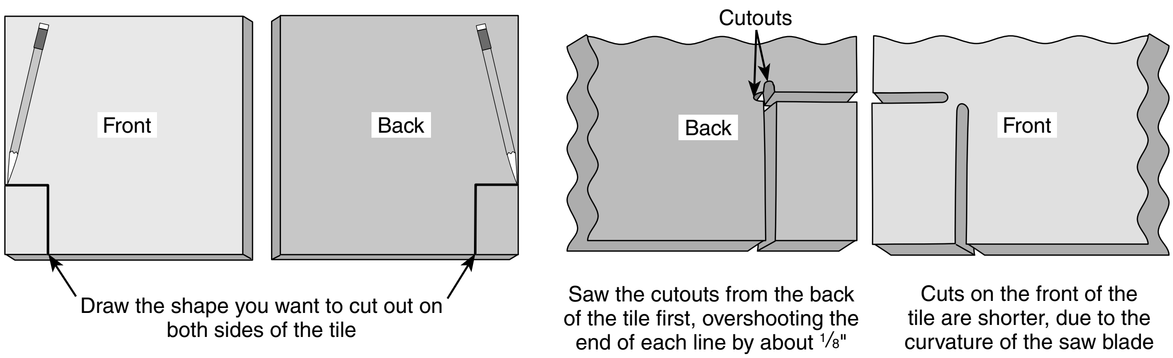


Figure 15-4
Cutting ceramic tile with a circular saw

put in your circular saw, you'd be in luck. Although the blades are called "masonry blades," they cut ceramic tile just fine. Be sure you wear safety glasses when cutting with these saw blades.

Draw the shape you want to cut out on both sides of the piece of tile. Next, set the masonry blade to cut at about twice the thickness of the tile flooring. Do the cutting on the *back* of the tile, and saw up to the end of each line. Now turn the tile over and look at the saw cuts on the front.

The cuts on the front will always be about 1/8 inch shorter than the same ones on the back, because of the curvature of the saw blade. If not sawn enough on the face of the tile, turn the tile over and saw a little more on the back. Repeat until the cuts are good on the front of the tile. If necessary, break out any small bits of tile left in the corner with a pair of pliers.

Using a Wet-Saw Tile Cutter

You can get an adequate wet-saw tile cutter like mine for around $100. You'll recoup the cost after the first job or two. Tile nippers and biters are great, too. You can't beat them for cutting shapes and curves, and to get more precise fits.

Drilling Holes with a Ceramic Tile Bit

At times you'll need to drill holes in ceramic tile, such as when you're laying it around a floor register. The floor register will have one or more screw holes on each side. You'll have to drill matching holes in

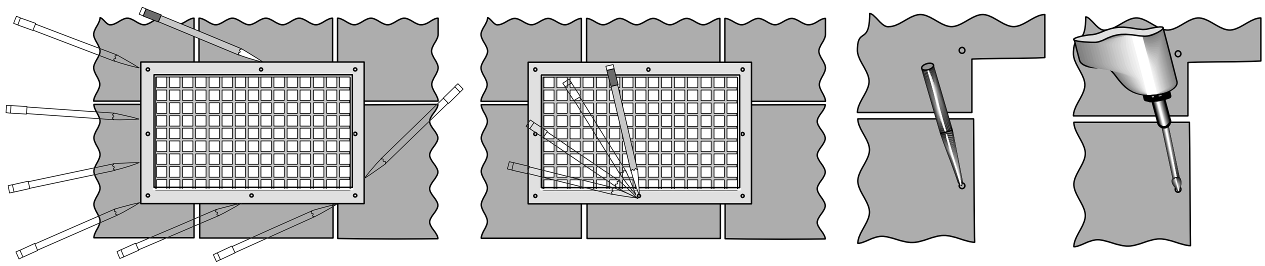


Figure 15-5
Drilling holes in ceramic tile with a drill bit for glass and ceramic

the ceramic tiles under these holes. Hardware stores come to the rescue again, because they sell special bits for drilling holes in glass or ceramic. Don't confuse these bits with masonry drill bits.

These glass and ceramic bits usually drill a hole about 1⁄8 inch in diameter, which serves the purpose in most circumstances. You can get other size ceramic bits by special order, but a 1⁄8-inch hole will probably do the job. Position the floor register (threshold strip, etc.) on the tile floor where it will be fastened down; follow along in Figure 15-5.

Use a pencil to trace the screw holes onto the tiles underneath. Remove the register and use a sharp center punch to make a mark in the center of each traced hole. Don't hit on the punch too hard when making the marks or you'll crack the tile. If the center punch tip doesn't feel sharp, sharpen it … the extra time you take will be worth it. You need these marks to keep the drill from wandering and keep it centered when you drill each hole. Don't press down too hard when drilling, just hold the drill in place.

The rapid rotation of the drill bit will soon start working, pushing out tiny granules around the bit. Lift up the bit as soon as you feel the bit tip going through the tile. You don't want to drill a hole in the floor underneath, because then the screws wouldn't hold. If you should drill into the wood floor, fill the hole with Durabond 60 or Plastic Wood® before putting the screws in.

Slip Sheets

A slip sheet can make a big difference in the life of a ceramic tile floor, especially in areas prone to earthquakes and shifting ground. Even just the normal movement as a building settles can adversely affect ceramic tiles. As an extra precaution against cracking from movement of the subfloor, talk to your customer about installing a slip sheet before you put down his ceramic tile.

There's a product approved by the tile industry that combines a load-bearing anti-fracture membrane with a slip sheet, so that would be your best bet. You can also use a slip sheet with a wire-reinforced mortar bed — it depends on your client's budget.

A slip sheet, also called a cleavage membrane, minimizes the chance of cracks in the cement slab travelling up through the tile floor and mortar joints. There's some degree of crack transference in any tile assembly, and since the two surfaces rarely move in the same direction, hairline cracks can appear in the tile. If you install the tile over a cleavage membrane, you can stop most of the cracks before they spread to the ceramic tile. The tiles float over the concrete and are isolated from the cracks.

If you're installing ceramic tile over a plywood subfloor, the order of application is as follows:

1. membrane (slip sheet)
2. wire reinforcement
3. mortar bed
4. cement backerboard
5. thinset or mastic
6. ceramic tile

If you're installing the ceramic tile over a concrete slab, make sure it's fully cured and prepared. The membrane goes on top of the slab, then the rest of the material goes on in the order of application listed directly above.

Slip sheets don't prevent the cracking entirely, but they do help. Another element that adds to the stability of tile floors is the higher-quality concrete now used for residential construction. Better concrete makes a better foundation, and a good foundation under a slip sheet keeps shrinkage and cracking to a minimum.

Cement Backerboard (CBU)

I need to warn you that many ceramic tile manufacturers won't guarantee their floor tiles unless cement board goes down first. Cement board really *is* made out of cement, and doesn't expand with moisture like wood or particleboard.

Cement board comes in 4 x 8 sheets and is about ¾ inch thick. You install it using waterproof tape and joint compound. While quite heavy, cement board isn't hard to nail through, since it's not as dense as concrete. Fiberglass mesh is embedded in the middle to prevent cracking. Cement board may seem like overkill, but you need to use it when putting down a ceramic tile floor. You don't want your customer to end up with a voided warranty because you forgot or ignored that step.

Layout

Most of your customers will prefer floor tiles centered at a doorway. It just looks better that way, whether in a larger room like a kitchen or in a small bathroom space (where most of the odd pieces of tile are hidden under the toilet, tub, or moldings).

"Most of your customers will prefer floor tiles centered at a doorway."

Trying to lay floor tiles so that the borders at each wall are equal can intimidate even a seasoned contractor. A narrow row of tiles along one wall can be unsightly, so you have to plan for the correct spacing long before you lay the first tile.

Unlike vinyl tile, ceramic tile is sized by its nominal dimension; that is, a 12 x 12 ceramic tile is actually a little bit less than 12 x 12, to allow for the grout joint. So the total space the tile-and-grout unit will occupy is 12 x 12 inches. This helps when you're figuring layout.

- Find the center of two walls that face each other. If the room is rectangular, start on the shorter wall.
- On the floor, mark the centerpoint of each wall.
- Snap a chalkline across the floor on these marks.
- Measure the distance from centerline to both walls. In a square room, the distance to both walls will be similar, if not identical.
- If the walls are out of square or bowed in or out, mark a plus (+) or minus (−) on the wall to identify those spots. Write how much plus or minus it is at each location.

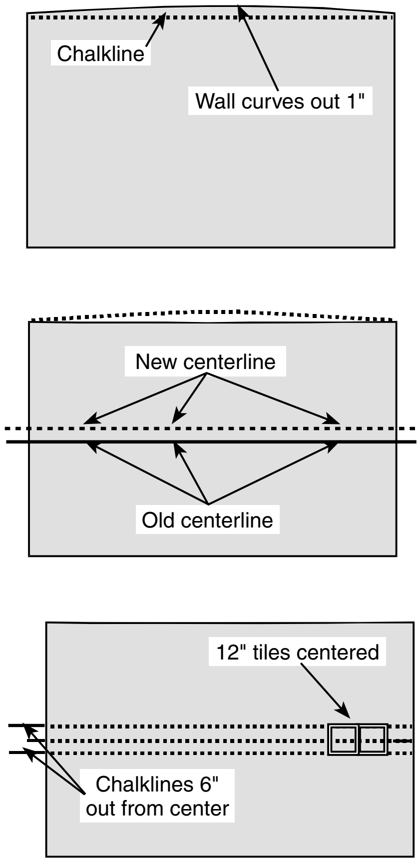
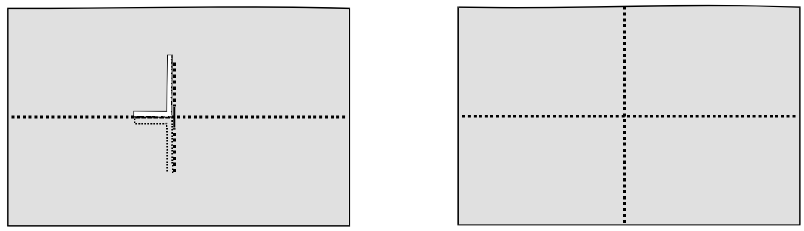


Figure 15-6
Tile layout

- Let's say the distance is an inch longer on one of the sides because of a bow-out on that side, as Figure 15-6 shows. If you hadn't identified the uneven wall before you started, you'd find a new row of tiles appearing along the bowed part of the wall. Eliminate the problem ahead of time by moving the starting tile row out an inch. Cut the tiles narrower little by little, until you get to the bowed section.
- Now snap a chalkline for the starting edge of the tiles.
- You have two choices when starting the first row of tiles along the chalkline: Space the tiles evenly along each wall, with either the *edge* of each tile on the chalkline, or the *center* of each tile on the chalkline.
- Let's say you're laying 12-inch tiles on the floor. Snap two more chalklines, 6 inches away from the original line, one on either side.
- Measure the distance to each of the two walls from these new lines. For example, if you have a 3-inch difference from one side to the other, you'll need to use the widest part of the wall as the room's dimension.
- Move your chalkline out 3 inches, toward the wall. You'll be able to evenly space your tiles using this new "center" line.
- Now even up the borders on the other side. Measure for and mark the center on the chalkline that you're using for reference.
- Next, as shown in Figure 15-7, lay a square on the chalkline center mark, with the 24-inch side extending outward. Draw a line along the square.
- Reverse the square and draw another 24-inch line on the other side of the chalkline. You now have 4 feet marked, starting at the center of the chalkline.
- Extend these 4-foot lines to the wall on each side. You have now created a new centerline.
- Repeat this procedure to get your tiles even along the final two walls.



Lay the square on the center and draw 90-degree marks

Extend the centerlines out to each wall

Figure 15-7
Finding centerline to position tiles

Measuring a room that isn't a simple square or rectangle is a bit more difficult. Jogs in the floor can cause uneven borders. Eliminate those problems by changing your original chalklines in one direction or another, as I just showed you. This may seem like a lot of trouble, but considering how long your customer will probably be living with his new tile floor, the effort is well worth it.

Laying the Floor Tile

Today, most ceramic tile is laid in thinset, whereas adhesive was more common in my day, and is still used in some situations and locations. But I use thinset now; it's not only easier to work with — it gives a better result. Thinset is actually a cement product. It's tough and waterproof like cement, and comes in bags like cement. You mix it with water, and possibly some additives if they're not already in the mix, and you only mix as much as you're going to use in a short period of time. The instructions on the bag give the square feet of floor (or wall) that bag can cover, so you have an idea how much thinset you'll need for any given area. But allow extra, especially if you're using large tiles and you suspect the floor may be slightly uneven. A word of caution here: If the floor has some major unevenness – high spots and low spots, it needs to be properly leveled. You can't fill in the lows to match the highs with thinset. If you try, you'll use tons of thinset until you get to a doorway and see that you've got yourself into a pickle there's no way out of.

You can get an epoxy-based thinset that's even stronger, but it sets up very fast. I wouldn't recommend it. It's just for the experts, working where speed is crucial, such as in a business where they can't close shop for 24 hours. It also costs considerably more.

With non-porcelain ceramic tile, you generally need only butter the surface on which you're laying the tile. It's more porous, and when you press the tile into the thinset, it'll adhere. But porcelain tile is much denser, and hardly absorbs moisture at all. You need to butter both the back side of the tile and the surface you're laying it on. Otherwise, some tiles may pop up later! So estimate more thinset and more labor if you're laying porcelain tile.

Installation

1. Use a 5-gallon bucket for mixing the thinset. You need the bucket large enough to get your trowel in and out easily so you can quickly scoop the mix out. Thinset hardens quickly, so don't mix too much at a time. If you do, the last half will be too hard to spread.

2. Use a propeller or mix-master type rod clamped in a drill to do the mixing. You can do it by hand, but by the end of the day, your wrist will be telling you loud and clear that you should have used a drill.

3. Trowel the thinset on quickly. Don't try to install more than 3 or 4 square feet at a time. With today's larger tiles, just one tile may be almost 3 square feet, so this means one tile at a time.

4. Be careful setting the first tile — make sure you put it down square to your guidelines. If you make even a little mistake with the first tile, all the tiles you put down after it will compound into a huge mistake.

5. Tile doesn't come with spacers, so get spacers. Experts may just "eyeball" spacing, and think spacers are only for amateurs. Maybe when you're an expert, you can eyeball spacing, too. But until then, your customers would rather have an honest novice who produces straight and even grout lines than a "wannabe" expert who screws up.

6. Don't slide the tiles down into the thinset. Twist each tile slightly as you lay it, lining it up to the spacer (or the edge of the previous tile, moving it over slightly for the grout line, if you're an expert). Press the tile down firmly. As you finish each area, you can remove the spacers.

7. Set the border tiles last. After you cut them to fit, smooth the cut edges on a brick or concrete surface.

Use tile nippers to shape the tiles around obstructions. Take little bites, not big ones, or you'll end up breaking the tile.

8. Once you've gotten all the tiles set, clean any overflow of thinset from between the joints, making a groove for the grout. Let the tiles set at least 48 hours.

9. After 48 hours, you can start grouting. Latex grout strengthener helps make the grout more elastic and easier to apply, so I recommend its use as an additive. Completely fill the spaces between the tiles, forcing out the air. Wipe the tiles often with a sponge rinsed in clean water to keep grout haze to a minimum. Let the surface set for 24 hours, then wipe the surface thoroughly with grout haze remover.

10. Wait at least two days and apply a quality grout sealer; don't skimp here. Apply at least two coats.

Sheet Vinyl

Sheet vinyl — durable, affordable, and easily cleaned — is still a popular choice for flooring. Since it comes in large rolls that are 6-12 feet wide, these sheet vinyl flooring jobs go more smoothly if you have a helper. Be careful when you start to make your cuts. A mistake this early in the job can ruin a whole piece of flooring material.

- First, remove all the baseboards and, if applicable, the ¾-inch trim on the baseboard.

- Put the roll of vinyl flooring in the room where you're going to lay it. If the room is smaller than the width of the flooring, put the roll in diagonally. Because of expansion and contraction, let it come to room temperature before installation; this takes at least 24 hours.

- Raise one end of the roll so you can get it parallel to one of the walls. (You're probably going to need a helper for this.) If there's a pattern to your material, be sure to position the roll so the pattern goes the way you want it to.

- While your helper holds the roll up against the wall opposite where you want to start, unroll it toward the other side of the room. Be careful with vinyl flooring. If it's bent sharply, it can kink or tear, so handle it gently until it's flat on the floor.

➢ Fit the flooring close to two of the room's walls. Which two walls? That depends on the shape of the room. If it's a simple square or rectangle, fit it against any two adjoining walls. If the room has closets or rooms adjacent to it, start at two walls that have no projections. If the room is longer than it is wide, know the direction you want the flooring to run before unrolling it.

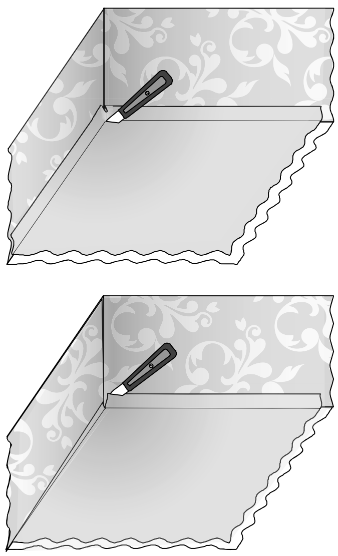


Figure 15-8
How to slash flooring corners

Cutting and Fitting

I've got one thing to warn you about before you cut your material to fit: *Start out conservatively.* You can always make longer slashes if necessary. You don't want to risk cutting into flooring that you'll need later.

Don't make any slashes at doorways just yet. You need some experience seeing how cuts can affect your installation. Also, don't be overly aggressive slicing into flooring that has to be used in an adjoining hallway. Always think ahead before you make a long upward slash. And don't make a slash any longer than the depth of the wall if the flooring continues into another room. In other words, until you have the flooring fitted at the doorway leading into the adjoining room, don't make *any* slash that might be going into that room.

The flooring should now be lying on the floor against two walls. Before cutting, make sure that the flooring is close enough to the walls that it will completely cover the edges once the baseboard is reinstalled. The flooring should fit snugly against the two walls. If walls aren't straight, there can be gaps between the flooring and walls. Don't worry about small gaps. But if any of your gaps are wider than ¾ inch against the first two walls, you need a closer fit.

Cut against the long edge of your square. You only need about 2 inches extra up against the other walls. Don't be afraid to trim the flooring if it's in your way, but remember not to cut by any doorway until later.

Slit the flooring in the corner where it's rolled up against the two walls. Feel through the flooring to find the exact location of the corner. Starting there, make an upward slash, as shown in Figure 15-8. It doesn't matter if the cut isn't perfectly straight, because you'll discard any flooring that goes past the edge of the room. But make your slash as straight as you can. Once you make it, the flooring will immediately lie flat.

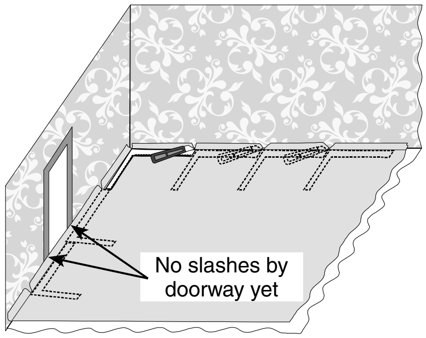


Figure 15-9
Make small slashes to reduce tension

To start the next area, make an upward slash at the corner of the doorframe going into that room. Now you'll see if your initial cut was exactly in the corner. If it wasn't quite right, make another slash as close as you can to the actual corner. Then you can start fitting the flooring against the other two walls.

You're not finished cutting until your flooring lies flat throughout the whole room. To accomplish that, you have to reduce the tension along the last two walls. Start making cuts at the first wall to relieve the stress. Lay your square against the flooring at the corner. Pushing it along the floor against the wall, make one slash upward near the end of the square, being careful not to gouge the wall. Look at Figure 15-9 to see what I mean.

Move the square down another length and repeat. Do this along the entire wall, except at doorways. By making these slashes, the flooring lies flatter and fits better against the wall. Repeat this along the wall that the roll is lying against. Finally, with the tension on the flooring released, do some close trimming to fit the edges. Speaking of fit, next, we need to talk about cutting corners . . . literally.

Corners

If a corner needs closer fitting, lay the square flat on the flooring while pushing into the corner. Cut the material with your utility knife along the edge of the square. Each time you cut the length of the square, look at your work. Is the sheet vinyl trimmed neatly to the edge of the floor? If not, keep trimming.

You may have to adjust your placement of the square now and then. You want to leave a slight gap between the flooring and the wall, because vinyl flooring tends to spread out after it's walked on. This isn't the case at doorways, though, where it must fit tightly. And now I'll tell you how to cut at doorways.

Doorways

Accurate cutting by a doorframe is critical, so proceed slowly and carefully. There's no extra flooring to hide mistakes here. Start by making upward slashes by the *outside* of the doorframe (where it meets the wall). See this technique in Figure 15-10.

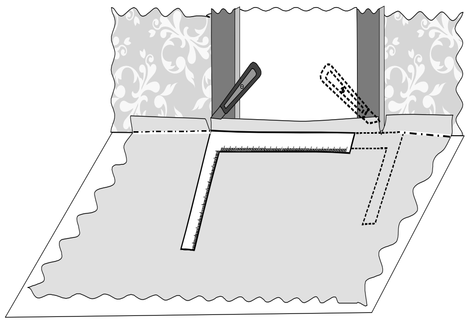


Figure 15-10
Upward slashes at doorframe

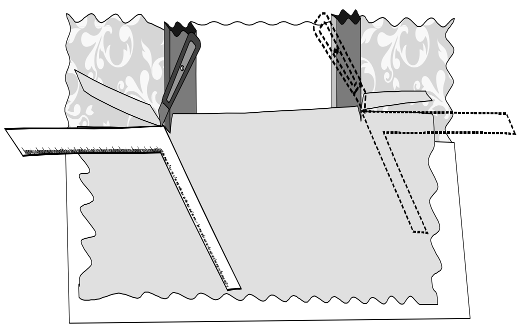


Figure 15-11
Removing excess material at doorframe

After you're finished on each side, put your square against the wall up to the doorframe. Trim the flooring along the wall up to the slashes you just made, as shown in Figure 15-11. You should now have the flooring fitted along all the walls up to the outside of the doorframe.

Trim the flooring to fit precisely inside the doorframe. This can get tricky, because there's no molding to cover any gaps between flooring and doorframe. So read this section carefully before you start! *Take your time.* I've said it before: be very deliberate when making these slashes. I've illustrated this process in Figure 15-12.

Follow even the slightest jog in the door trim and frame. Each jog must be cut closely. Move the square in whatever direction is necessary to get a good angle for cutting. Wherever the trim curves, cut just ¼ to ½ inch at a time. This is the most exact cutting you'll do, so don't rush it. The flooring should now be lying snugly around the doorframe.

One more thing: If you put flooring down in only one room, it has to terminate within the doorframe. Since most frames have a hinged door inside the frame, the best spot to end the flooring is in the middle of the frame. Generally, a metal strip is installed at that junction. It not only covers the seam, but also protects the end of the flooring.

Another reason for the metal stripping is to separate the floor covering from one room to the next when the door is shut. You don't want to see a strip of the hall flooring from inside a room when the door is closed.

Some rooms can be tricky to work in. Rooms with closets, for instance, present unexpected problems. It's more difficult to lay out your flooring before cutting, too. The next section is devoted to rooms that aren't the usual squares or rectangles.

Odd-Shaped Rooms

Home building and remodeling books and TV shows make all flooring jobs look like a piece of cake. But that's not real life. They'll show you perfectly square, uncomplicated installations in perfectly square, uncomplicated rooms. Problems are minimized, if discussed at all.

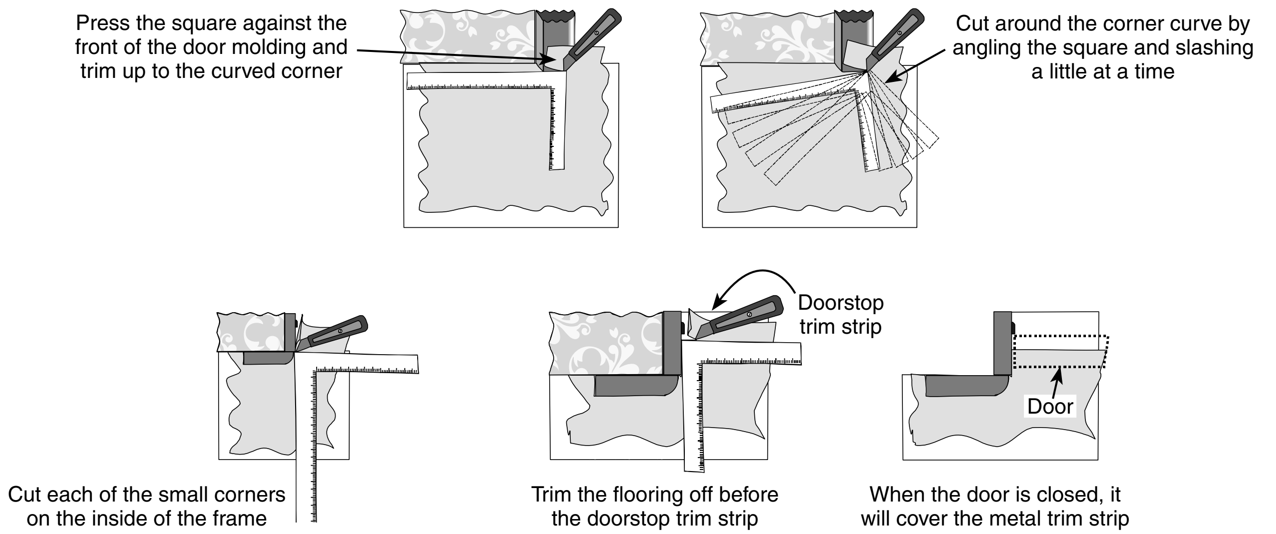


Figure 15-12
Using a square when trimming gives you the correct angles

Well, a jog in the wall means you'll have to cut before you can roll the flooring out all the way. But first you have to get the unrolled flooring out of the way so you can *start* cutting. And that's not always easy. Here's how to handle this situation:

1. Remove the baseboard along all the walls.

2. Lay the new roll of flooring down at the widest end of the room. You may only be able to roll out about 10 feet, depending on where the jog is. In some houses, even the widest part of the room could be narrower than a 12-foot roll of flooring.

3. Have your helper hold up the opposite end of the roll as you lay the flooring down along the wall. He'll have to raise the roll higher as the room gets narrower. By standing on the flooring you've rolled out, your helper can assist in unrolling most of it to the other side of the room. Then you can begin fitting, starting at the first two walls.

4. Standing on the bare floor, you and your helper will pull the flooring up to the edges of two walls. The best starting point is where the flooring lines up well with at least two walls — then it won't be too far off when you cut it. Remember, when you're fitting a room with jogs and protrusions, don't do any more cutting than you have to.

5. The flooring should be snug up against the jogged wall, running the length of the room. The excess will be rolled up along the side of the wall. Move the flooring whatever way you need to, so it lies flat in the middle of the room. Make sure that it stays in place. You'll need it as a point of reference.
6. Now you're ready to make your first cut at the jogged corner. After you've made this cut, the flooring should lie flat against the wall up to the jog. But before you cut, check the placement at all the walls. Is there enough flooring to cover the surface completely? Is it laid out straight? Carefully check along the two walls that have the flooring up against them. Are there any open spots along the walls wider than the baseboard will cover? If there are, close the gap by pushing the flooring closer to the walls.
7. Find the corner at the jog in the room. Feeling through the flooring, start your cut right at the corner. If the room is narrower where you're cutting, start your cut in the corner and then angle it toward the narrower length of the room. You'll be cutting away from the wider area. This is the secret: Always cut *toward* where the flooring will be removed. Whenever you make a slash to start fitting, be sure to slash *away* from the section of good flooring that you might still use, and *toward* the flooring that you'll be discarding.
8. Your first slash was the trickiest. The flooring is now lying down on the widest part of the surface, and you can unroll the rest of it. Don't worry about areas where the flooring isn't lying flat. At this point, it only needs to cover the basic area. Remember: If you cut before the flooring is lying flat and you have to re-fit, your cut is already made, and you'll have to live with it. So again, be careful and take your time.

When a room's floor dimensions exceed 12 feet in both directions, you need to add another section of material. Don't be afraid of that. Piecing flooring together isn't difficult.

Making Strong Seams

Seaming vinyl flooring must be exact. The slightest variation in floor surface can become glaringly obvious. The cut must be precise and the joining must be accurate at the seam, or the floor will be ruined. Seaming carpet is *much* simpler than seaming vinyl flooring.

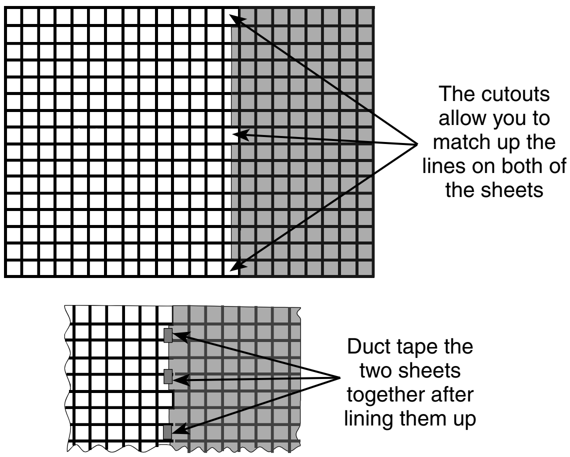


Figure 15-13
Cutouts to match flooring pieces

The bottom side of carpeting is all one piece, but the top is composed of many adjoining fibers, giving you some leeway.

I'm going to spend a little time here on things you should know when seaming a vinyl floor.

Vinyl Flooring Patterns

If there's a pattern on the vinyl flooring, there are arrows printed on the back indicating which way is "up." When seaming, make sure that the arrows on the backs of all pieces go the same way.

Some patterns can be obvious and easy to match up. But others have no squares or lines of any kind. Some simply have light-colored swirls or small dots in a tiny pattern. On flooring like this, it's hard to tell how two pieces should be oriented to match up. The arrows on the back are a lifesaver. It isn't funny to start laying flooring only to discover after cutting that the two pieces don't match.

Let's say that the flooring has a mosaic pattern repeated over the surface. The pattern has to be matched up perfectly where the two pieces butt together. You have to lay and fit the first piece of flooring before you can match up the second. By "fit," I mean you need to fit the first sheet at the doorframe, and keep it in place while you match the second sheet. Spread mastic around the perimeter of the first sheet to make sure it won't move. But *don't* put any mastic on the edge where you're going to seam it, because that would interfere with the next fitting and cutting steps.

Matching up a Pattern with Cutouts

It will take some maneuvering to perfectly line up the second piece of vinyl flooring with the one you've already fit. To butt them together exactly, make cutouts about 6 feet apart at each end and in the middle of the second section of flooring. *Don't forget this step*. Without the cutouts, you can't align the patterns on the pieces. If this seems unclear, see Figure 15-13.

Cut the already-laid flooring on the embossed "tile line" where you want to make a seam. If there's a factory-edge on the laid flooring, that will be where you join the two pieces. Otherwise, the first full tile line that runs from wall to wall will be your seam location.

Once you know where you want your joint, make cutouts in the second sheet of flooring about ½ inch wide at each end by the walls and every 6 feet along the edge. You'll be able to see this better when the new piece of vinyl is lined up with the other section. Be sure they're lined up perfectly everywhere along the line before you cut.

Make cutouts to the center of the line; later, you'll cut through two layers at once in that spot. That gives you the best joint appearance. Keeping your cut in the middle of the line allows you a little wiggle room. Next, lay the second section of vinyl on top of the first so you can match the second line to the line on the first piece. Start at the edge by the wall. When that edge is lined up perfectly, duct tape the corner. Go to the next cutout, match, and tape. Continue until you get to the end of the sheet.

The two sheets should line up perfectly, and be taped down so they can't move while you're cutting. Tape down the second section of flooring in several spots along the wall so it won't move after the first tape is removed and you're gluing the seam. If you've already spread adhesive along the edges of the first section, it will stay in place while you complete the next steps.

WHAT DO YOU DO WITH AN AIR BUBBLE IN A VINYL FLOOR?

Let's say that after you've glued down the vinyl floor, you notice an air bubble trapped under it. This noticeably-raised spot needs attention. What can you do? Simple: prick the bubble with a needle and slowly push down until the trapped air is vented out. The tiny hole in the flooring won't be noticeable. Whatever you do, don't try to flatten it out without making the pin hole. Instead of flattening the trapped air bubble, the bubble will blow open that spot on the flooring.

Cutting

With a new blade in your utility knife, you're ready for action. You don't have to cut through both sheets in one stroke, but you *do* need a sharp knife. You only have one chance to do this right.

Start cutting along the seam's edge, by a wall. Hold the long edge of your square tightly in the middle of the line. With constant pressure, use your blade to cut almost to the end of the square. Move the square (not the knife) and continue cutting, until you cut through both layers.

Remove the duct tape and the top section of vinyl at each cutout as you go along. You've cut through the top layer of vinyl, but maybe not the lower piece. If you have to re-cut, hopefully it's only an inch or two.

Don't use the square for this part of the job. You need to see both pieces clearly, and cut the second piece exactly in line with the first. Even the slightest variation will be noticeable along the seam later, so — you guessed it — take your time.

Attaching the Seam Edges

Now you have to get the seam area ready for its final attachment. You can't just lift the vinyl at the seam and spread mastic to glue it down. Why not? Well, if you lay the two sections back down, the mastic will ooze up through the seam and keep the seam sealer from adhering to the joint.

So what *do* you do? Lift the edge of one of the sheets and draw a line with a pencil along the edge of the other sheet on the floor. That gives you a reference line exactly where you want the seam.

Striping Tape and Mastic

Next, attach ¼-inch striping tape to the center of the line you drew. You can get striping tape at an auto parts store — it's used to pinstripe cars. Once the tape is applied, spread a 4-inch strip of mastic down the center of the seam, 2 inches on each side of the seam. You'll remove the tape later, so don't worry about getting mastic on it. Let the mastic dry until it's tacky — usually 20 minutes or so.

If the mastic sticks to your finger when you touch it, that means it's set up enough so it won't creep up through the seam when you press the sections down. Pull up the striping tape and discard it. The mastic may spread a bit, but it won't come up through the seam. Press the edges of the vinyl down on the mastic, all along the seam. The edges need to be even with each other before you apply seam glue. Once you start gluing, you won't be able to move the seam edges again, so make sure they're right.

Seam Glue

Seam glue comes in matte, semi-gloss, and glossy finishes. Find out which type to use for your project. In most cases, you'll use semi-gloss. Buy it where you get flooring. It's not cheap, but it's the best adhesive when it comes to vinyl flooring.

Preparing seam glue is a two-part process; mix it just before you use it. Total application per unit is shown on the label. Follow the directions carefully. One thing to remember is not to use more than you need. You should have only about a ⅛-inch-wide strip of glue showing above the joint seam. Test the glue first on a cut you've made in a piece of scrap vinyl, to get the hang of spreading the glue evenly. Allow the seams to dry thoroughly before you walk on the floor. Then use a 100-lb. roller to bond the sheet goods and eliminate air pockets. And that's all there is to it.

Carpet

Carpet is one of the best (and least expensive) ways to perk up the looks of a home. Since you'll probably be getting a lot of carpet installation work, follow these instructions and you'll get it done right the first time. Remember that carpet pile should always face in the same direction, and away from any window or other source of light. Take this into consideration before cutting the new carpet.

1. Take out the old carpet, padding and tack strips. You can remove the old carpet easily if you cut it into strips first.
2. Clean the surface and do any repair work you may need — you may have to do some leveling, pound in nailheads, or apply a seal.
3. Take off the baseboard moldings (and the door, if there is one).
4. Measure the length and width of the room.
5. Put down new tack strips, leaving a space of approximately ½ inch between the wall and the strips. Be sure to place the strips with the pins facing the wall — if you don't, the carpet won't attach when you stretch it across the room.
6. Put down the pad, installing it right up to the edge of the tack strip. Roll it out and cut it at the wall. Repeat and slide the next piece of pad to the edge of the other side. This will leave you with the pad up against the walls. Trim the pad with a sharp case knife around the tack strip. Your blade should fit along the edge of the tack strip, which you'll use as a guide to cut off the excess pad. Apply pad cement to the perimeter of the pad, as well as to the joint between the two pieces of the pad. Be sure to cut away any of the pad that's on the tack strip, as the carpet won't attach to the strip if there's pad riding on it.
7. Now it's time to bring in the carpet. Roll the carpet out flat outside the room and cut it to the size of the room, adding 2 inches extra all around. So, if the room is 15 x 12 feet, your first length would be 15 feet 4 inches.
8. Fold the carpet in half by the width. This should give you a 15 foot 4 inch x 6 foot 2 inch piece of carpet. Roll this up and carry your cut into the

room, being careful to distribute the weight onto your legs and back.

9. Starting from the far wall, roll the cut out and flap it over once it's rolled out. Adjust the piece so each wall has at least 2 inches going up the wall. If you have more than 2 inches on any wall, cut off any excess.

10. Now you're going to set the wall for a proper stretch. Set 2 inches of the length wall with a kicker. Press down to ensure the carpet is attached. Place the foot of the stretcher on the set wall and the head of the stretch on the opposite wall. Take a stretcher and set the head by pressing the carpet on the strip.

11. Now that you have a proper stretch, set the carpet on the length wall that you just stretched.

12. Repeat this process for the width.

13. After you've set the width, return the stretcher to the length and stretch into the corner. Then stretch the width side into the corner. This will flatten the carpet and bring any air pockets into the corner.

14. Carpet areas wider than 12 feet will need to be seamed. If you have to seam two pieces, position the seam away from high traffic areas and run it perpendicular to the light source. Make sure the pile is running in the same direction on the two pieces. If you think of carpet in 6 foot increments, it's easier to figure the amount of carpet you'll need. For example, a room that is 20 x 18 would require a piece of carpet that is 29 x 12 (20 feet for the main sheet and a 9 x 12 split for the fill). When you're seaming carpet, be sure to trim both sides of the carpet before putting it together. Using hot melt tape and an iron, place the tape under the seam and use the iron to heat the tape where the two edges fall. Be sure to bring both carpet edges together nicely without having any of the tape fall into the seam.

15. Once the room is stretched in, cut all carpet rolled up the wall. This can be done by hand. Be careful to cut the carpet so that it fits under the baseboard (which you'll be reinstalling), pushing the carpet down between the tack strips and the wall. Cut any "stringers" you see — those nylon threads poking out of the carpet.

16. Put the baseboards back on, trim the carpet by the doorway to center it under the closed door, and install a door edge strip.

17. Re-hang the door, and check to see that it clears the new carpet and closes easily (you may have to trim the bottom of the door down a bit).

Carpeting Stairways

When carpeting a stairway, the cardinal rule is *not* to attach it by stapling down one long piece of carpet. That may seem the easiest way, but it will cause the carpet to start angling almost immediately. It's nearly impossible to keep a narrow piece of carpeting parallel to the edges of the stairway when you have a lot of steps to cover.

How do professionals carpet stairs? One step at a time:

- Cut a strip of carpeting just long enough to cover the riser, tread, and nose of the step. Staple this in place.
- Start a new piece of carpeting under the nose of the step, butting into the previous piece. You'll be working with short pieces of carpeting, so they'll be easy to position and staple down. The seams are hidden under the nose of the step where the two pieces meet, so your seam is all but invisible.
- It might take a few tries to get just the right size of carpeting to cover one step. Once you get a piece cut just right, mark *"pattern"* on the back and cut duplicates of it. Stairs are normally all the same size, so each piece of carpet will fit. The only odd piece will be the last one covering the bottom riser at floor level. This piece only goes from the floor up to the nose of the first step.

Carpeting (staple) guns are available at hardware stores; you can buy them or rent them. You must use these specific staplers — carpet staples are much narrower than regular ones — to minimize compression of the carpet's nap.

Carpeting Staircase Landings

Staircase landings should be carpeted in much the same way as steps. Wrap the carpeting around the landing nose just like you did the steps, and staple the carpet underneath the nose. Make a pattern first out of a large piece of paper for fitting purposes if you feel a little unsure of yourself. You can buy an unprinted newspaper endroll from your local newspaper for very little money, and it's perfect for this purpose.

Carpeting Spiral Staircases

When cutting carpet for steps on a spiral staircase, make a pattern for the step out of the newspaper endroll. Cut a shape that's roughly the size of the step. Lay it on and around the step, and mark and recut the shape until the paper shape fits. The same shape can probably be used for a pattern for the next step. If you need to make a few small modifications, at least you won't have to start from scratch.

Wood Floors

Wood flooring has a well-deserved reputation for warmth, beauty and value. It's affordable, easy to maintain, and comes in a wide variety of styles. If you only know the basics of wood flooring, follow along in the next few pages for a quick education.

Wood Laminate Flooring (Floating Floors)

This type of flooring comes in planks, usually 12 inches x 48 inches, and is installed without glue or nails. Pergo is one of the most common brand names. Floating floors connect to each other, but not to the surface underneath. A thin foam underlayment bonded to the planks provides cushioning and prevents sticking to the subfloor. Since the image on the surface is a *photograph* of flooring material, there are endless possibilities for different looks. If you're installing laminate flooring, let's look at some tips to help you get it right:

- Plan ahead. Start at the longest wall in the room and measure to the opposite side. If you're going to be left with a thin piece (hard to cut and install), cut down the width of the planks in the first row instead.
- Place spacers along the wall and lay out the boards, joining the pieces at an angle so the tongue and groove lock together easily when you flatten them out. The planks lock on all edges, and it takes some trying before you figure out the best way to connect them.

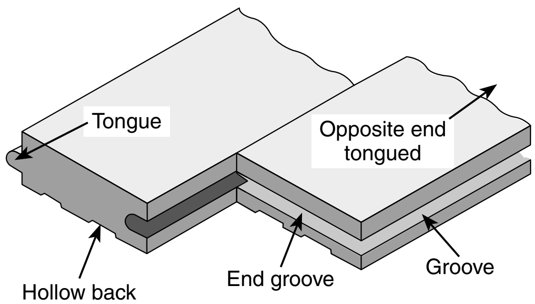


Figure 15-14
Side- and end-matched flooring strips

WOOD TILE FLOOR INSTALLATION

1. *Find the center point of the room by measuring across the room in both directions and mark the center with a chalkline.*
2. *Do a dry run; lay out the tiles starting at the center, following both chalklines.*
3. *Use a notched trowel to apply the manufacturer-recommended adhesive to the floor, and lay the center tile.*
4. *Press the tile in place while lightly twisting it back and forth to secure it.*
5. *Using the center tile as a reference point, install the remaining tiles along straight lines. Install only a few tiles at a time.*

- Once you've locked the new piece along the short edge, kneel on the flooring that's already been installed and lift up the new piece along the outside long edge. Pull it towards you and push down to lock the piece to the previous row. You'll find that some of the previously-installed pieces in the newest row will also lift up a little. The challenge is keeping those pieces from coming loose. It helps to weigh them down … use a box of the flooring you happen to have right there.
- Laminate flooring planks are like laminate countertops: they chip easily if you aren't careful when you cut them. Follow the manufacturer's instructions for the right tool to use. Usually, if you're cutting the plank face-side up, use a hand saw; from the back, use a power saw.

Wood Tile Flooring

Wood tiles are basically installed the same way as other tiles. Low cost and ease of installation make this tile a good choice. If the tiles you're using aren't self-adhesive, apply them with adhesive to a smooth base (underlayment or finished concrete floor with a vapor barrier), following the manufacturer's recommendations for adhesive application.

Wood Strip Flooring

Wood strip flooring is made out of either softwood or hardwood and comes in two different kinds (side- and end-matched or square-edged). Softwood costs less than hardwood, but is rarely used any more — it's not as resistant to wear. However, it is acceptable for bedrooms, closets, and light traffic areas. You'll most likely be using tongue-and-groove end-matched strip flooring — the tongue-and-groove edges make for easy installation. See Figure 15-14 for an illustration of the side- and end-matched wood strip flooring.

Make sure to break the bundles of flooring apart and store the pieces indoors near the area of installation, so the strips adapt to the ambient moisture. As far as the best installation tool — use a flooring hammer.

Diagonal boards or plywood provide the best subfloor for strip flooring. Lay the strips along the length of the room and at right angles to floor joists, unless you're laying over old strip flooring. In that case, lay them crosswise to the existing flooring.

The following nailing requirements are standard in the industry, but always check the flooring manufacturer's recommendations:

25/32-inch flooring	—	8d flooring nails
½-inch flooring	—	6d flooring nails
3/8-inch flooring	—	4d casing nails

A Problem When Laying Tongue-and-Groove Flooring

You may have seen this one with your own eyes: a homeowner laid his tongue-and-groove flooring himself — what he thought would be an easy do-it-yourself project. After all, the actual fitting together of the flooring is pretty obvious! Unfortunately, he forgot to check the starting end of each new row. What he ended up with was something that looked like the top diagram in Figure 15-15.

This looks bad because it breaks a flooring rule that says: "No row's seams should repeat until three or four rows later." In such cases it's necessary to purposely cut a short length (about 2 feet) to start a new row. This breaks the repeating starting lengths. Also, never start a row with a length of flooring any shorter than about 6 inches. Save such short lengths for where a short piece of flooring must be used, such as next to a floor register, or at the end of a later row. Take a look at the bottom drawing in Figure 15-15 — that's what the floor *should* look like.

Side- and End-Matched

1. Place the first strip ½ to 5/8 inch from the wall to allow for expansion.
2. Nail straight through the board near the grooved edge. Drive the nail in close enough to the wall so it will be covered by the base or shoe molding (which you've removed).

Breaking the cardinal rule of flooring: *"No row's seams should repeat until at least three or four rows later"*

Once a shorter length is used to begin a row, each of the following rows is no longer a multiple of the same length

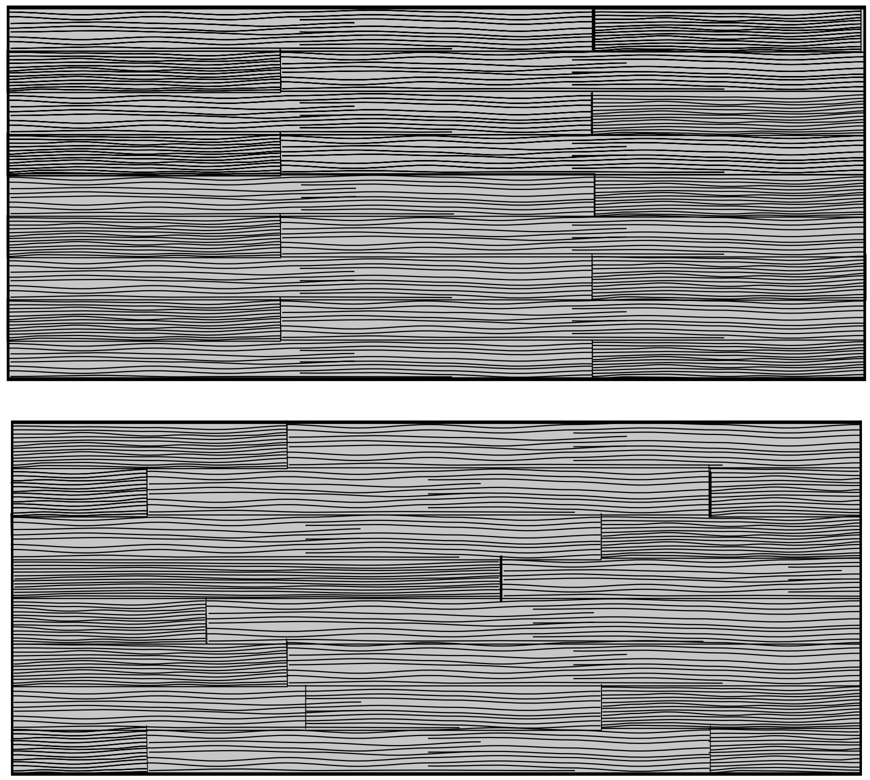


Figure 15-15
Properly laying tongue-and-groove strip flooring

3. When the flooring is laid crosswise to the joists, drive the nails into a joist.
4. Nail the tongue down.
5. On consecutive flooring strips, nail through the tongue only, at a 45-50 degree angle, and not quite flush.
6. Set the nail with the end of a large nail set.
7. Select random lengths carefully so that butts are well-separated in adjacent courses.
8. Install each board tightly against the previous one.
9. If you have crooked boards in the batch, don't throw them away. You can probably use them later. If they're not too warped, you can force them into alignment, or cut them off to use at the end of a course, or in closets.
10. Leave the last course $\frac{1}{2}$ to $\frac{5}{8}$ inch from the wall, just like you did with the first course. Face-nail it near the edge, where the base or shoe molding will cover the nail.

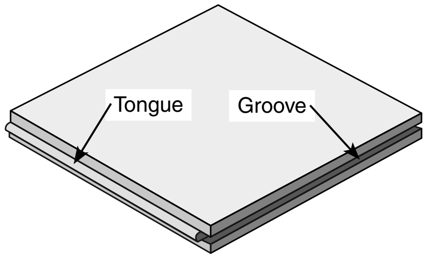


Figure 15-16
Tongue-and-groove wood block flooring

Square-Edged

There are two reasons why the thinner square-edged strip flooring isn't a popular flooring choice: it can only be installed over a substantial subfloor (costing more time and money), and it will probably squeak anyway (very annoying).

This flooring must be face-nailed, but all other installation procedures are the same as for the end-matched flooring.

Wood-Block Flooring

Wood-block flooring comes in many patterns and sizes: from 4 x 4 to 9 x 9 and sometimes even larger. It's usually prefinished, meaning you just need to wax it after installation.

Install this flooring, which is almost always tongue and groove (see Figure 15-16), by nailing through the tongue and into the wood subfloor. You can also attach it to concrete with adhesive. Alternate the grain direction of blocks to reduce the effects of shrinkage and swelling.

Finishing a Wood Floor

Your customer may have an old wood floor that he wants you to restore and finish. It's not hard. You'll have to sand three times, using coarse, then medium, then fine sandpaper. If you're using a drum sander, make sure you know how to operate it: It's easy to oversand and dig holes into the flooring. Sand the baseboard with an edger or disc sander (or by hand), and vacuum between each sanding.

Apply the first coat of stain the same day you finish sanding. Start with the grain, then go against the grain, wiping up the excess. Let it dry completely.

There are two ways to finish the floor, and each has its advocates:

1. *Penetrating Seal:* Apply along the grain, wipe up excess, let dry 8-12 hours and buff out.

2. *Surface Finish:* Brush the sealer on against, then with the grain. Dry according to the manufacturer's recommendation. Buff. Apply a second coat, and buff only if applying a third coat. If you need to apply a third coat, go ahead. Just don't buff out the final coat.

And there you have it — information on just about every flooring choice available. If you know how to install the types mentioned in this chapter, you'll have a pretty widespread knowledge of flooring. Now I'm going to move on to some fix-it situations.

Warped Floors

Floors in old houses tend to settle in some areas of the house and not in others. If the areas are small and not more than ¼ inch deep, use floor leveler compound to fix the problem. It's sold in bags at hardware and building supply stores. The powder mixes with water and hardens when it dries. But it isn't nearly as hard as cement or plaster. And it doesn't stick well to asphalt tile floors, so don't use it on that material.

To start, rough up the area with rough grit sandpaper in a jitterbug sander before applying the compound. I prefer No. 40 grit sandpaper. Mix the compound until it's soupy enough that it almost levels itself when you pour it on the floor. Smooth with an oblong trowel. If you mix the compound too thick and trowel it on, you might not get it level, so be sure to add enough water for the proper consistency.

Durabond 60® is made especially for filling floors (though I use it in all kinds of places). It sets up completely in 60 minutes — hence its name. Take your time and put it on as smoothly as possible, because it's hard to sand down. Durabond also comes in a version that sets up in only 30 minutes. Be prepared to use a lot of sandpaper — this stuff is *hard*.

If the surface variations are really bad, cut shims to fill the low spots. You'll do this in layers. For depressions ⅜ inch or deeper, start with a piece of paneling for the lowest area of the depression. Add bigger pieces of the filler extending further outward with each layer.

By using different thicknesses of filler, you'll get very close to floor level. When the last layer is nailed down, finish leveling by filling in any low spots with Durabond. Apply sparingly with a wide plastic or metal trowel, then smooth with a grater-type plane once it's set up. If you use my technique, you'll have the floor leveled and so smooth that it will require little or no sanding.

Resurrecting Antique Baseboards

Years ago, I was asked to help restore a beautiful old house. The doorway in one room had been replaced before I began my work, leaving a 4-inch gap between the old baseboard and doorframe. The baseboard was impossible to replace, since 100 years had passed since it was first installed in the home.

I cut and fit some wood filler strips between the baseboard and frame to imitate the molding's general shape. Of course, they didn't come anywhere near the lovely shape of the old baseboard. Next, I applied layers of Durabond until I matched the original shape as closely as possible.

If you try this, use a wide putty knife, resting half the blade on the old baseboard as you shape the Durabond over the filler strips. You'll have to apply several coats before it starts to resemble the old workmanship.

Don't rush it. By the time you mix each new batch of Durabond, the layer you just applied will be set up enough to apply the new coat. Don't try to put a large amount of Durabond on all at once. It'll sag and set up into an out-of-shape blob. Apply thin coats until you've built up to the necessary thickness. If you work slowly, your shape will eventually match the original baseboard.

Matching the Finish on Old Baseboards

If the baseboard is stained or varnished wood, use brown craft paint to duplicate the original wood grain. You'll need several different shades of brown paint and a very fine brush for the process. Before you attempt to paint the real baseboard, practice on scrap wood, and allow the paint to dry. Then you'll know exactly what hues to expect from each bottle of paint.

I've matched wood patches to existing stained and varnished surfaces, but be forewarned that it's time-consuming. Apply the closest background color you can find, then add other browns to match the original grain appearance. People who do wood graining professionally use a fine comb for the second darker color, or a special brush with splayed bristles to apply the wood-grain finish.

Replacing Rotted Floor Joists

As most people know, clothes dryers are meant to vent out through a wall of the house. In this instance, it was vented into the crawlspace below the floor. And a dryer vents a lot of moist air as the clothes are drying.

The homeowners noticed a dark spot on their floor, and called me to take a look. When I went down into the crawlspace, I couldn't believe my eyes. All of the floor joists were covered with a thick layer of lint from the clothes dryer. That was a given. But the joists were so rotted that sections came off in my hands. It's a miracle the floor hadn't caved in.

First thing first: I vented the dryer out the side wall of the house. Then I went into the crawlspace again, to tackle installing new floor joists in place of the rotten ones.

This wasn't the easiest thing to do. The new joists were longer than the space between the block walls, so I couldn't just lay them alongside the old joists. I did come up with a solution, though. I laid each joist flat, diagonally, and then pushed each one up flush with the block walls. I tapped them with a sledgehammer until they were in place next to the rotted joists. Once I was able to position each new joist against the old, I fastened them tightly together with a dozen spikes or so. Look at Figure 15-17 to see how I accomplished this.

Fixing Floors from Below

One thing that I see, and am often called on to repair, is a floor that has begun to sag. It's really common in a home with a basement or wooden foundation, since the floor is wood and wood is known to flex. If it wasn't adequately braced when built, or an unsuitable wood was used for framing, you'll inevitably need to give your customer's floor a lift.

Jack Posts in the Basement

Working in a basement is much easier than working in a crawlspace. There's plenty of room, and you can use standard steel jack posts instead of improvising; see Figure 15-18.

- Stretch two string lines across the floor upstairs. In the basement, cut a 4 x 4 to stand vertically on the hydraulic jack to reach the floor joists. You'll need another 4 x 4 laid horizontally to hold up the floor joists as they're being jacked. This piece remains permanently, held by the steel jack posts. How long should the horizontal 4 x 4 be? Take a look at your string lines upstairs to see the extent of the sag and use the appropriate length beam.
- Install two steel jack posts about 3 feet from each end of the horizontal 4 x 4, which is centered across the floor joists. Don't put pressure on them yet. They're in place to hold up the 4 x 4, so you can set up the hydraulic jack in the center.

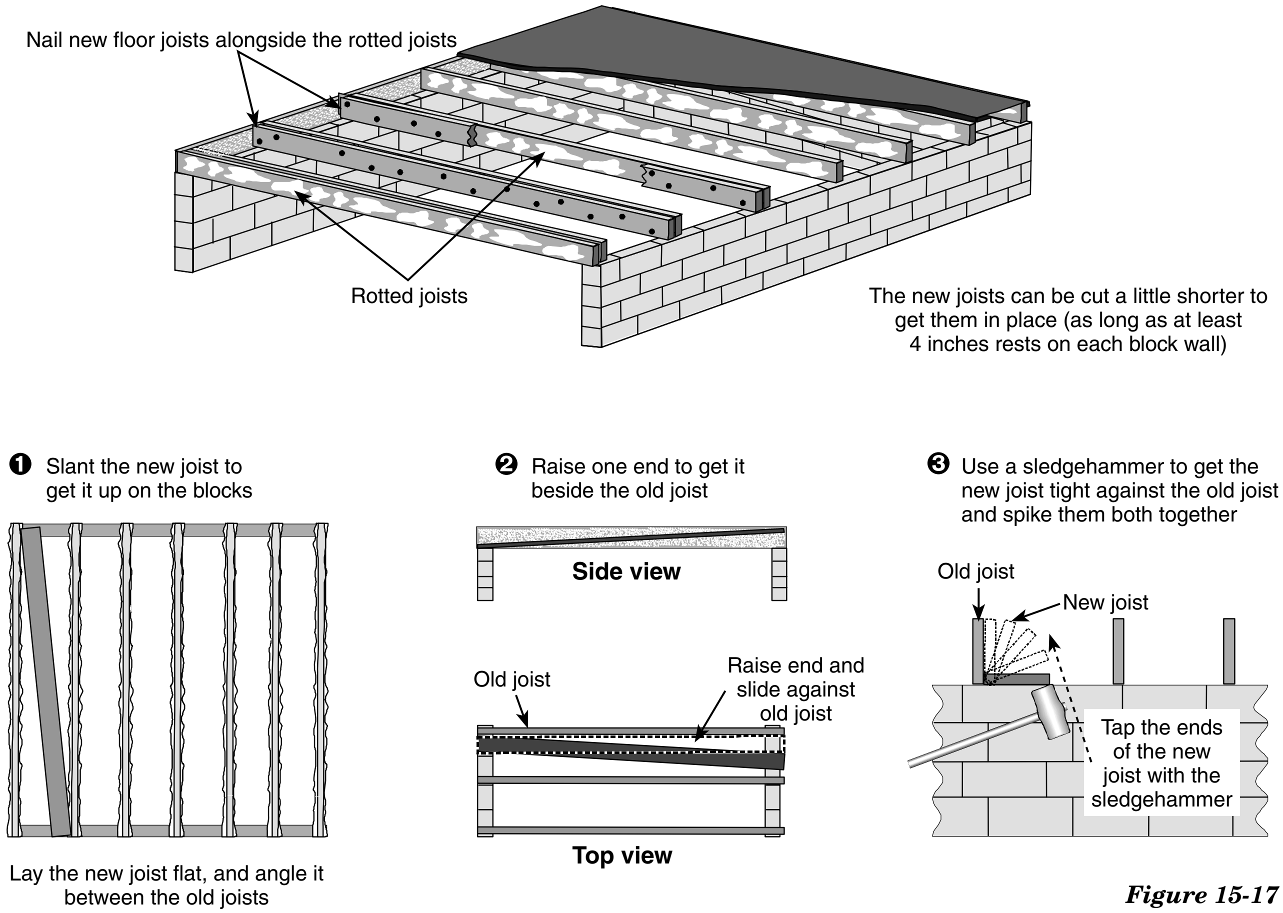


Figure 15-17
Adding new joists to support a floor

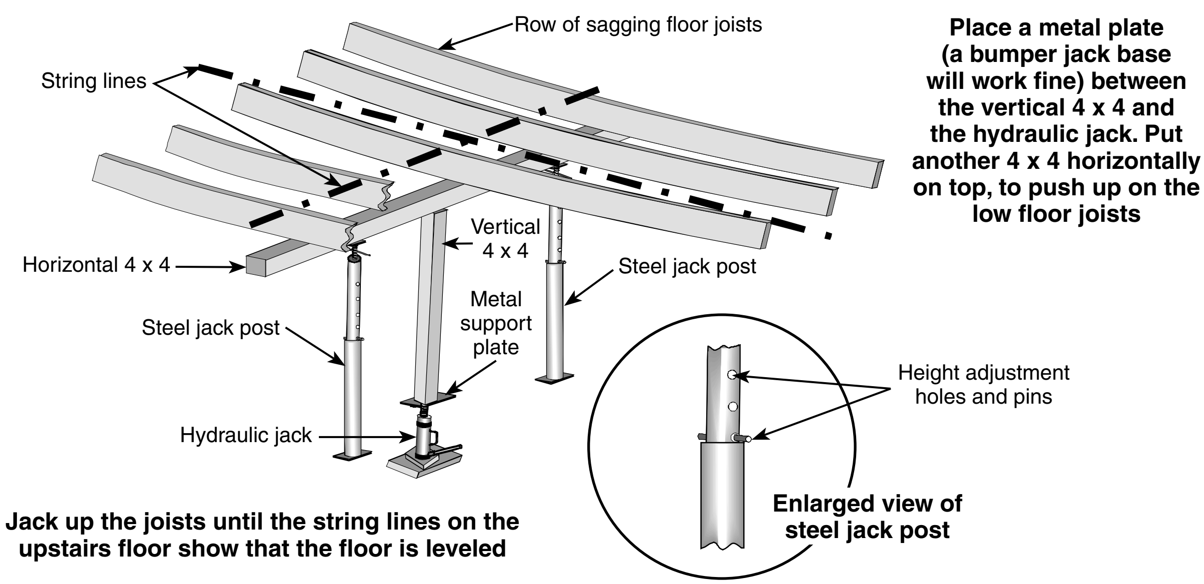


Figure 15-18
Jacking up sagging first floor joists from the basement

__OSHA__ considers a crawlspace a confined space. They've written General Industry standards to follow when work is required in a confined space. These haven't been applied to residential situations, but it's a good idea to review OSHA Standard 29 CFR 1910.126 for the do's and don't of entering a crawlspace to work.

Here's a quick overview of working condition concerns:

- *Is the crawlspace readily accessible?*
- *Is there standing water?*
- *Is there evidence of asbestos?*
- *Is there mold contamination?*
- *Is there evidence of pests, snakes or rodents?*
- *Is there risk of structural collapse?*
- *Do you need crawlspace personal protective equipment (PPE) – eye protection, protective clothing, a respirator, knee pads, head protection, etc.?*
- *Do you need an assistant or backup?*
- *Do you need a cell phone or two-way radio for emergency assistance?*

- If you're working on a dirt floor, put a concrete block under the base of the jack. Without the block, the jack could push into the ground instead of jacking up the 4 x 4. Screw the top of the jack all the way down. Then raise it enough to hold the vertical 4 x 4 post in place. Be sure the 4 x 4 on the jack is plumb while you're screwing it. If it isn't, pressure could cause the jack to kick out. Jacking up the floor joists doesn't put a lot of pressure on the jack, but keep your eye on the 4 x 4. If it starts to bow, you'll need to replace it with a 6 x 6.
- When the jack has raised the vertical post a little, turn the rods on the jack posts to keep tension constant. Keep alternating between jacking and tightening up the jack posts. If you run out of length with the jack, tighten up the posts to hold up the horizontal 4 x 4, then add more blocking below the jack to get the height you need. Repeat these steps until the floor is level with your string lines. Add jack posts where necessary before you remove the hydraulic jack.

Working in a Crawlspace

I've seen crawlspaces so cramped that it's impossible to move around, let alone work. There's barely room to breathe. On one job where I had to jack up a sagging floor, when I opened the door to the crawlspace, I found wiring and plumbing, probably installed before the floor was built. There was not one spare inch for me to worm my way in.

The biggest challenge here was to get to the area where I needed to work, and then to make room to get the job done. My solution here was to dig a trench through the subfloor so I could crawl in. But there wasn't even enough space to raise my shovel. Lying on my stomach, I used a small shovel and threw the dirt under the floor joists as I went along. With little room for the dirt, I had to fling it as far as I could. I didn't want it to fall back into the trench.

I finally reached the area of the sagging floor I wanted to jack up, after trenching 25 feet. On my stomach. I was just happy to have a trench big enough to crawl through. I jacked up the floor with no further complications, and was glad to emerge from my hole into the fresh air and sunshine.

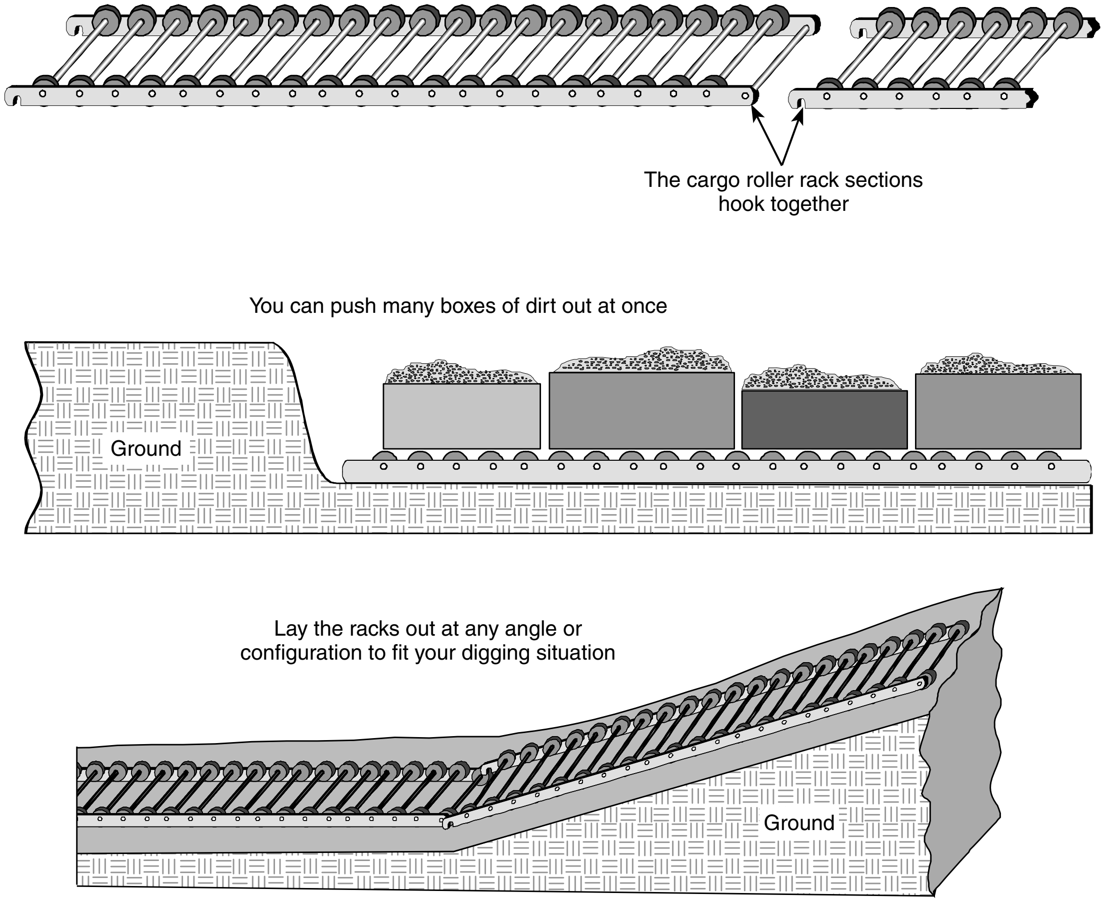


Figure 15-19
Removing dirt from a crawlspace

Enlarging a Crawlspace

On another such job, the homeowner was prepared. His home had a small crawlspace, but he wanted it big enough to get at the plumbing and wiring under the house. I was there to accommodate. Now this is where it becomes ingenious. And I can't take the credit.

A friend of my client owned a small grocery store that used cargo carrier roller-racks for unloading goods — like trams going into and out of a gold mine. He thought they'd be perfect for getting dirt out of the crawlspace. As you can see in Figure 15-19, you can lay out the racks to suit your situation. I lined up wooden boxes from his garage onto the rollers, connected them to each other, and easily removed the dirt and dumped it outside.

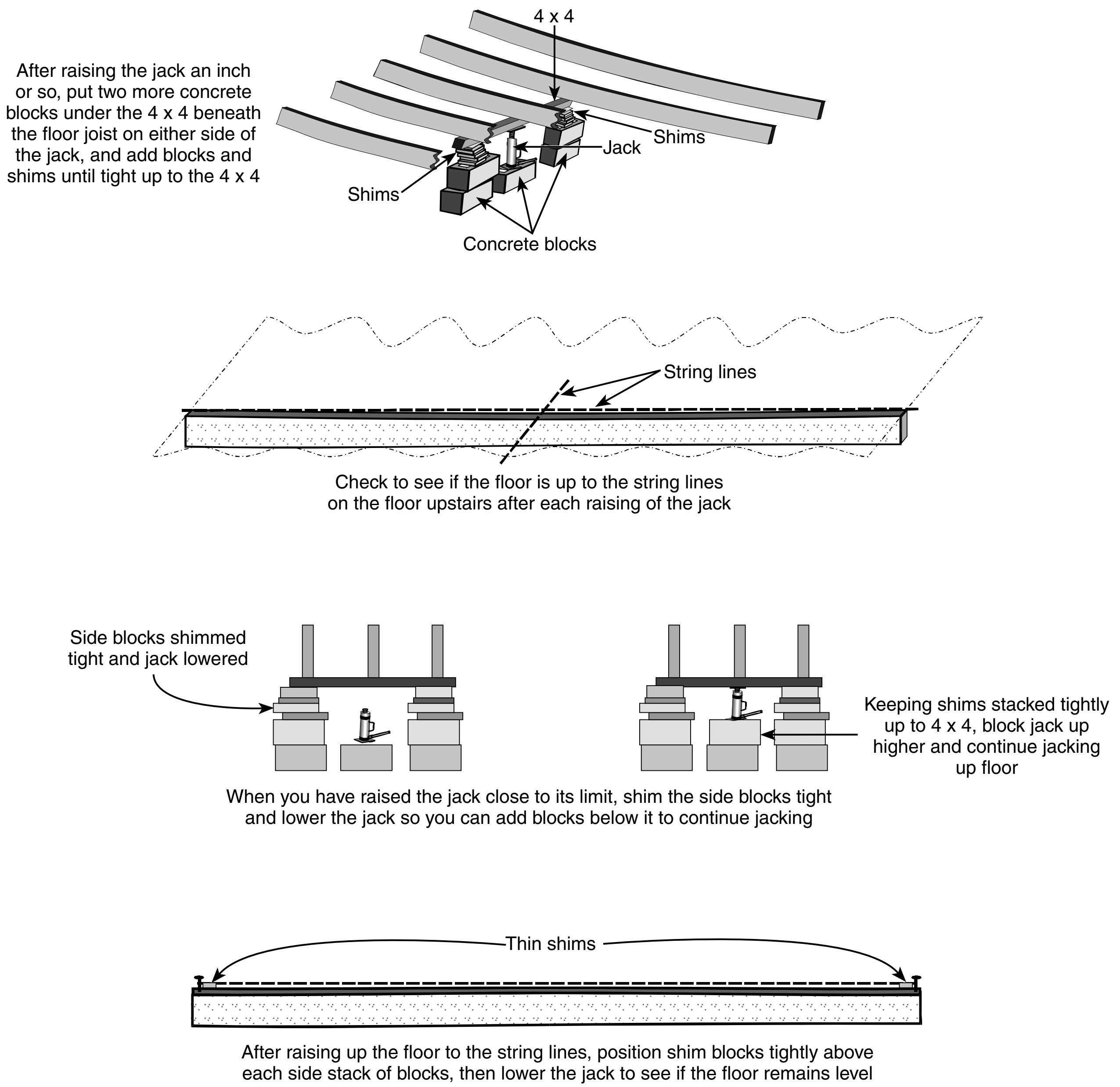


Figure 15-20
Jacking up a floor from a crawlspace

Floor Reinforcement from a Crawlspace

When you need to reinforce a floor from under the house, start by getting these things together: cement blocks, some patio blocks, and short pieces of 2 x 4s (2 x 6s or 2 x 8s are even better because they provide more surface area). You'll also need ¾-inch boards and a package of shims. Figure 15-20 gives you a visual of the instructions that follow.

1. To get the floor joists just right, insert tapered shims to get the final height. When installed from both directions, they can be pounded in toward each other. Small oblong pieces of ½-inch plywood are also helpful to get the exact height required. Keep an assortment of shims nearby. You don't want to have to leave the crawlspace once you've started because you forgot something outside. It's not quite as convenient to enter and leave as a normal work area.

2. You first need to locate the sag. If you (mistakenly) chose to mark the spot underneath the floor joists, the string lines would be in your way. Instead, stretch them on the floor above the area in question. You need these strings to let you know when the floor has reached level, and to keep from jacking it up too far.

3. Where the floor sags most is where you want to place the jack. A hydraulic jack exerts a lot of pressure, so to distribute the weight evenly, I use a 4 x 4 at least 4 feet long. That way, I can jack up three joists at a time, relieving the pressure I'd have on a single joist if I tried lifting one at a time. When you decide where the jack should go, place a concrete block on the ground, and center the jack on it. Be sure it's centered, as concrete block can crumble easily if too much weight is put on the outside corners.

4. Place the 4 x 4 between the top of the jack and the floor joists. If space is really limited, use a flat patio block (like a stepping stone) below the jack instead of the concrete block. While jacking up the floor, you'll be using two blocks: one for under the jack, and the other to hold stacks of wood blocks or shims.

5. The hydraulic jack rod exerts tremendous pressure on the bottom of the 4 x 4. Without extra support, the jack rod would push up into the wood. So put the jack's metal plate between the top of the jack and the 4 x 4. The plate that comes with a bumper jack is perfect.

6. Open the valve on the jack and push the center of the jack rod down all the way before starting. Make sure you close the valve. With the jack down all the way, you can raise it as much as possible each time. Use pieces of 2 x 6, patio blocks, or ¾-inch board, etc., to get the jack up as far as possible, initially. You'll be adding concrete block or shims under the 4 x 4 each time you jack the joist up.

7. To prevent pressure from forcing the concrete block down into the ground, add blocks from the stack nearby to hold the 4 x 4 when the jack is released. Keep adding blocks and shims from your second pile. They'll support the 4 x 4 when the jack is let down. You may need a third block and shim pile to help with support when the jack is released each time. Having a block pile on each side of the 4 x 4 makes the area a lot safer while you work, too.

8. Every so often, go upstairs and look at the center of the string lines to see how close they are to level with the string ends. When the sag has been raised up to the string lines, you've just about got it. Put spacers (wooden match sticks are fine) under the string line ends by each nail.

Why use spacers for a final check? To let you know if you jacked the floor up too much. If you jacked the floor up to the original string lines, you wouldn't know if you'd gone too far without these spacers. Shim the remaining block tightly up to the 4 x 4. Put tapered shims on opposite sides of the pile and drive them toward each other. Now you can release the jack and check the string lines again. Does the floor stay up? If so, you're in business.

16

STAIRWAYS

Stairways add a dramatic statement to your client's house. Because they can be fancy or plain, straight or curved, they can completely change the appearance of a room.

Updating a Stairway

If you're rebuilding a stairway that has, for example, 8-inch risers, you have to build it to conform to the code-approved height, which is currently 7³⁄₄-inches maximum (minimum is 4 inches). I build them 7 inches, to be safe. But when you change the riser height, you're going to have headroom problems. You'd think that with the lower steps there'd be *more* headroom, but that's just not so. When 7-inch steps are put in place of taller ones, the stairway's total height (the rise) is about 14 inches lower.

Since so much rise is lost, two or more steps have to be added to bring the stairway up to the height of the second floor. This reduces headroom near the middle of the stairway by 8 or 9 inches. In other words, depending on the original clearance, you may hit your head on the edge of the second story stairwell opening. And even if you don't hit your head, the building code requires more headroom — currently a minimum of 6 feet 8 inches between the tread surface of any step and the ceiling above.

There are two alternatives — either move the top step back about 16 inches (the width between floor joists), or move out the stairwell header cutout 16 inches. In some cases, you may need to do both. You're then two steps down at the stairwell header, giving you 14 inches (two step heights) more headroom. The header joists that you'll be cutting for the longer stairwell are supported by 4 x 4 posts on the basement floor.

An Uneven Floor

On one particular job of mine, the first floor ceiling was 10 feet high, which meant a very long stairway. But the ground floor was very wavy and out-of-level. How do you figure the height from the first floor to the second when the ground floor is as much as 3 inches higher and lower over 12 feet? Stairs extend more than 12 feet of floor length, so how can you figure the true stair height? You must have the exact distance between first and second floors before you can build a stairway.

The solution is so simple that it's easy to overlook. Snap a level line on the wall of the stairway about halfway up. Measure up from that line to where the stairs will end — at the second floor top — and down from the chalkline to where the stairway will start, on the first floor. Add the two figures together to get the total height for the stairway.

It doesn't matter what the floor does between the start and end of the stairway. But if the total height puts the stair's run (its total length) away from where you originally measured in the first place, you'll need to measure again.

"How do you figure the height from the first floor to the second when the ground floor is as much as 3 inches higher and lower over 12 feet?"

Measure the distance from the chalkline to the first floor at the new run. Because of the out-of-level floor, you may get a new height for the stairs when you measure up from the new location. Keep measuring length and measuring up at this new location until you get the length that reaches precisely the distance you want.

The Secret of Strong Newels

Fastening newels solidly between the spindles on a stairway can be a problem for inexperienced builders. It's easy to fasten the spindles solidly, because (in a well-built stairway) they're set in holes bored in the railing and floor, or bored in a lower horizontal rail. The ends of each spindle are glued in place in these bored holes, making them pretty solid. In fact, it's common to find that the spindles are solid, but the end newels are weak and wobbly.

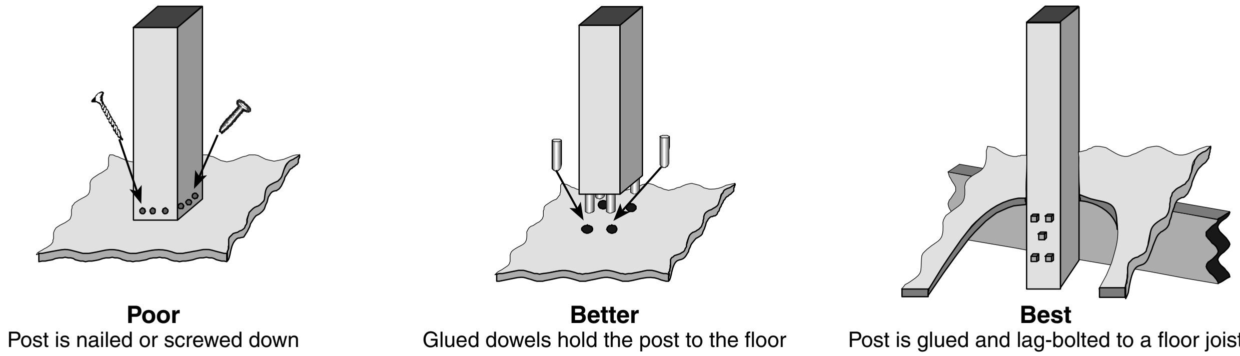


Figure 16-1
Stair and railing posts are often mounted poorly and fail to hold up

If there's a wall at the upper and lower end of the stairway, you can fasten the newels securely to the wall. Inexperienced people often try to attach the newel ends to the floor. But this provides no stability. They may place four dowels near the newel's corners, and glue them in place. The newel can't fall over, but it still wobbles when you push on it. The only failsafe method for fastening a newel in this situation is to run its bottom end down into the floor and secure it to the side of one of the floor joists below.

If the newel is next to a floor joist, you don't have a problem. Simply glue and lag bolt the newel to the side of the floor joist. The odds of being near a joist may seem astronomical, but if you plan ahead when laying out the stair newels and railings, it can be done. For instance, if the railing is on the edge of a balcony in a loft, plan the railing so the newels will line up with the joist or stringer in the floor. So, before you lay out any of the newels or railing, check inside the floor to see where they'd get the best support.

Even if the newel is an inch or more from the side of the joist, you still can screw and glue blocks there to meet the edge of the newel. When you glue and lag bolt the newel to this blocking, you've made a solidly-supported newel. (See Figure 16-1.)

But what if the newel is mid-way between floor joists? The solution is to fasten blocking between the joists against the newel. Do this in two directions to really stabilize it. If the newel is on the first floor and your client has a basement, do the blocking from the basement, where you can work easily. But, for instance, at the top of a stairway between the first and second story, you'll have to cut out a section of flooring between the joists for room to nail and glue the blocking.

Be sure you cut out the floor up to the middle of the joists, so you have a good nailing surface when you re-nail the floor section to the joists. Mark on the floor where the newel is to go. Draw centerlines and find the center, then drill a ¾-inch hole at the center of the newel with a spade bit.

Before cutting out the floor, be sure that the newel isn't resting over a floor joist. If your drill bit goes in 2 inches or more and is still hitting wood, you're over a floor joist. If the bit goes through the floor without hitting a joist, stick your finger in the hole and feel around. If you didn't hit a joist, you can install the newel. And even if you did, you still might be able to put the newel there. But how?

Cut a notch in the newel to go over the joist. Find exactly where the edge of the joist is by drilling another hole or two on each side of the first one. Can you see the edge of the joist now? Since your newel is at least 3½ inches square, you could notch it up half way (1¾ inches) to fit it around the joist. Once you know where the edge of the joist is, you'll know if you can put the newel there or if you need to move it over a little.

Next, cut out the square in the floor for the newel. You could actually slide the glued pieces of blocking down through the hole and push them into place without making the larger cutout. Glue will hold everything in place later without nailing. Don't skip the gluing — and use plenty of it.

Also, glue the sides of the newel that will butt against the blocking. There is a way to save all the trouble of cutting open the floor. Here's how: After you cut the hole for the newel, temporarily cut out a square of flooring to give you room to install the blocking between the newel and joist. Find the edges of the two joists near the hole in the floor. Reach into the hole with your tape measure to find how far the two joists are from each edge of the cutout. The illustrations in Figure 16-2 will guide you through this process.

Mark above on the floor the location of the joist edges. Lay your square on each of the joist marks, and draw a line parallel to the joists. Drill four holes with your ¾-inch spade bit at the end of each of the lines you just drew. If some of the holes show the edge of the joists, or the hole is right over the joist, move your drill a little and try again. Feel with your finger in the hole for the edges of the joists.

You now have marks on the floor for the edges of both joists. The cutout must be centered between the joists so that the edges of the square of floor you cut out will rest ¾ inch over each joist later. Mark a square about 17½ inches wide. Before sawing, set your saw blade to cut just a little deeper than the actual flooring. When you saw out the square, saw

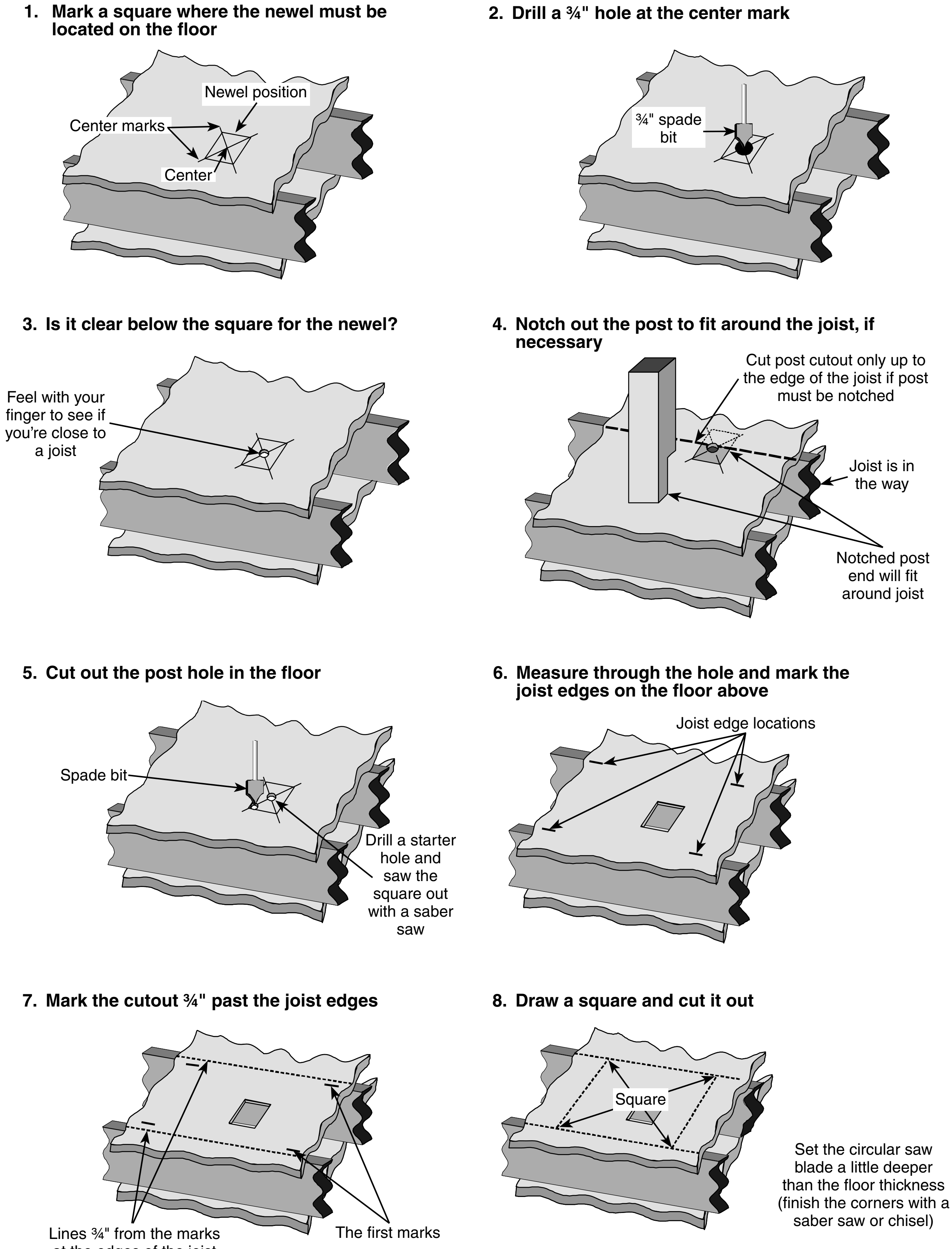


Figure 16-2
Correctly installing a newel

a little past at each corner, so the wood is cut at the bottom of the flooring, too. You also might have to use a chisel in the corners to free the cutout. Here is where a cat's-paw nail puller works great. You'll have at least two layers of flooring to take out. There are several ways that you can place blocking to hold the newel in place. Once the blocking and the newel are glued in place, simply slide the square of flooring down over the newel and nail it back in place over the joists. Your customer will now have a sturdy newel that isn't going to move … ever. Apply paneling glue all around the newel to hold it to the floor, and you're done.

Modernizing Steep Stairs

THE PROBLEM WITH *many old stairways is that there's just no room to make the stringer longer. If two steps are added, the stair stringer moves out 20 inches longer than before. This is called the "run." Many old stairs end with a short landing and then a door, so there's not enough room to extend the stairway out 20 inches.*

The stairs in old houses are often quite steep. It's common to find stairs with risers 8, or even 9, inches high. Seven inches is the norm now, so these old stairs can be a real pain to climb. In fact they're dangerous, in some cases, because people are used to 7-inch steps nowadays. It's so easy to stumble up or down an unexpected high step.

In a lot of old houses, the stairs are as close to the door as you can get and still have room for the first step. How in the world do you add two more steps when there's no room? It sounds impossible, but it's not. One way to get an extra step is to make the top landing into a winder. What's a winder? A winder is two or more diagonal steps. Picture a spiral staircase. The steps are the regular width at the outside, but come down to nothing at the inside. That winder is the kind we'll use.

Learning a Lesson from Spiral Staircases

The steps in a spiral staircase are often wrapped around an iron pole. The stairs have no run, meaning there's no length to the stairway. A winder is an added step at the landing, which converts the length of the landing into two steps. That way you can add a step without using any more run.

But how can you add a second step without taking up any of the regular stair length? Things get a little more difficult to understand here, because you literally build the step into the floor of the house. That's right; you can add a step by cutting out a space for it in the floor. A step is 7 inches high, and the tread another inch perhaps, so you have room between the floor joists. Depending on the direction your floor joists run in relation to the stairway, it can either be easy or a big problem. For instance, you may have to cut out a joist to install the new inset step.

Think Before You Cut

You can't simply cut out a portion of a floor joist and leave it like that. The end of the joist must be supported. You can install a new short header between the next joist and a wall, to hold up the cut-off joist. You don't want a stairway that's too steep, or a set of basement stairs that has you bumping your head every time you go down them.

What this boils down to is whether or not you can do anything at all. You'll have to take out the old stair stringers and steps and rebuild them. That calls for careful measuring and figuring. You want to be very sure that everything will fit, and know that the final solution will work before tearing out the old steps.

Handrails

Trying to figure uniform height for a stairway handrail is something that stumps almost everyone at first. Even if you get the handrail close to even, the two ends still aren't level. How do you get it right the first time? Actually, it's not hard at all, once you understand the basics.

- Measure the railing height from the very front of the step, which is called the *nose*. The minimum height for handrails is 34 inches (maximum is 38). This means the top of the handrail should be at least 34 inches from the *front edge* of the treads. You'll get the best measurements by marking 34 inches above the nose at the bottom step, and 34 inches above the nose at the top step. Be sure to make the marks in those exact locations. Use a 4-foot level to measure and mark. I recommend putting a piece of masking tape at 34 inches on the level and marking it. Then you don't have to juggle the tape and level at the same time.
- Stand the level up and put the edge of it at the nose of the step. If you don't have a 4-foot level, use a yardstick against a small level and draw your line.

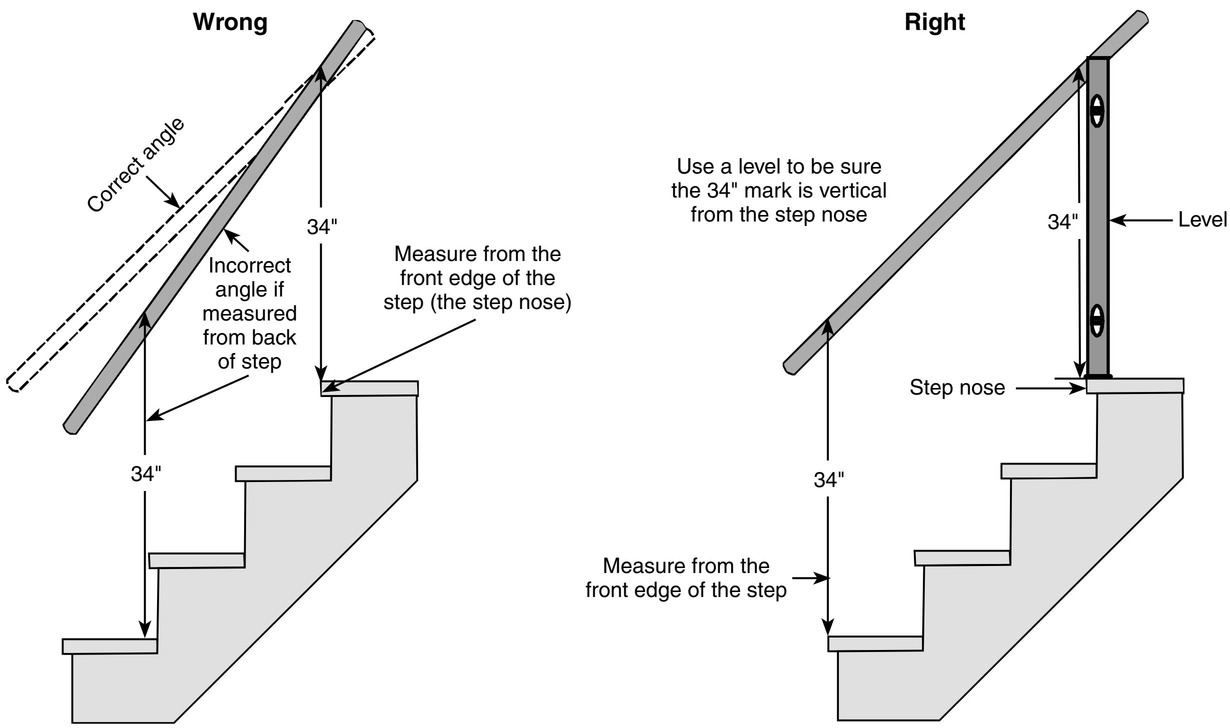


Figure 16-3
Measuring railing height

- Stretch your tape along the level, keeping the level straight. Mark on the wall 34 inches from the bottom of the level which, again, should be at the front edge of the step. Look at Figure 16-3 for a visual. Incidentally, whenever I have to make a temporary mark, I stick masking tape on the wall and mark on that. Then I don't mark up the wall itself.
- When you have your two 34-inch marks, snap a line between them and locate the wall studs. Remember, your tape measure has marks every 16 inches to locate the vicinity of the studs. You need their location to attach the handrail brackets. By putting your test nails in below the handrail height, the handrail will hide these holes. With this in mind, pound a small nail into the area until you hit a stud. If you miss, try again. After a few tries, you'll stumble on one, and the rest will be easy to find.
- Once you have a nail at the stud location, hook your tape measure onto it and reel the tape out toward the other end of the stairway. Of course, the horizontal

tape will only show where the stud is. You'll need your level to get the stud location at the actual railing height. When you're done, you'll have a bracket every 4 to 6 feet along the handrail. But for now, just fasten a bracket near each end.

- These two brackets will hold the railing in place at the right height. After you have the end brackets in place, measure between them and decide if you want to put a bracket at every other stud or every third stud. Space the distance evenly. Then simply hold the brackets against the bottom of the handrail and screw them into the studs.
- After the brackets are installed, shape the handrail ends. I do this by using my circular saw at a 45-degree angle, and making small triangular slices around the end. Then I trim, little by little. By rotating the handrail slightly between each slice, I can get the curve almost perfect. A wood rasp or grater-type plane rounds it even better, followed by a jitterbug sander with 40 grit sandpaper to finish smoothing.

Evenly-Spaced Spindles

Here's a problem that can drive you crazy: spacing spindles evenly. Building codes require that the gap between spindles be no greater than 4 inches. With this spacing, little kids can't squeeze their head between the spindles and get stuck.

"Building codes require that the gap between spindles be no greater than 4 inches. With this spacing, little kids can't squeeze their head between the spindles and get stuck."

Let's say you start to nail the spindles in place at one end, keeping them the necessary 4 inches apart. You get to the last spindle to find only 2 inches of space remaining from the last post. Should you take all the spindles out and space them a little closer together? How much closer? You know you can't put them further apart because of the building code.

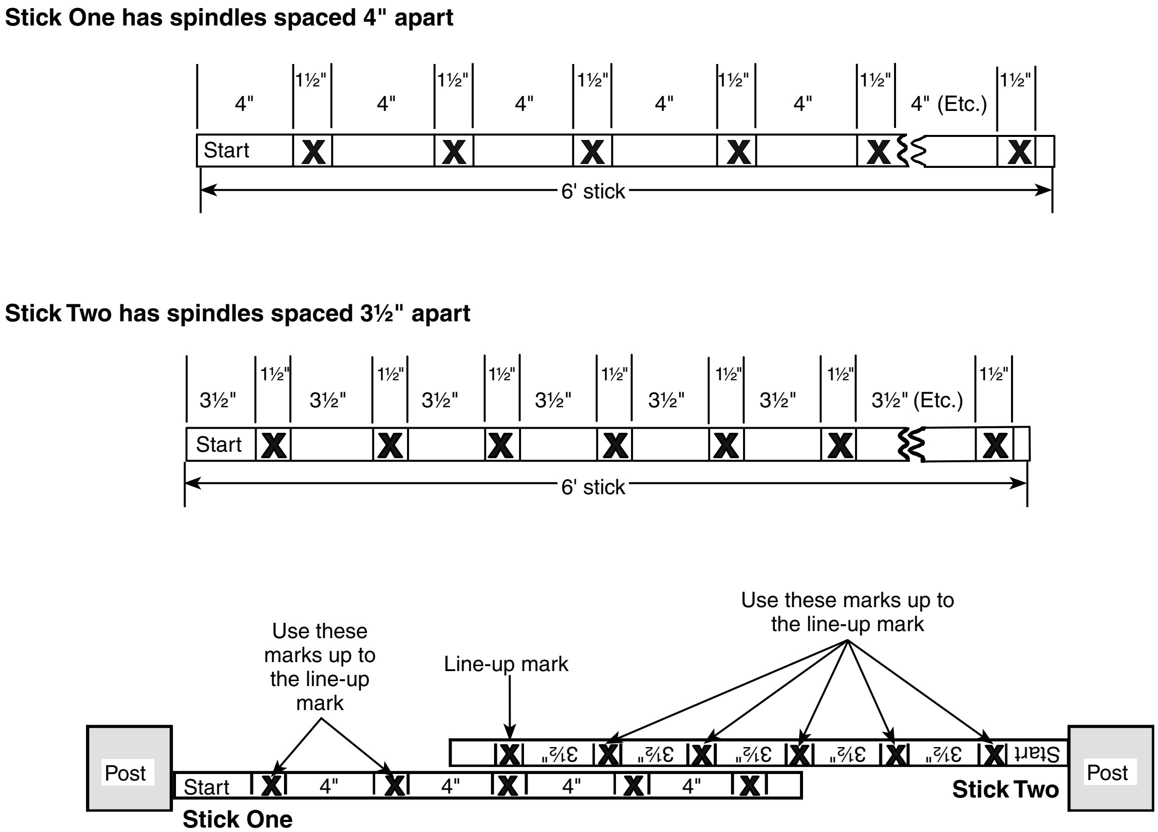


Figure 16-4
How to measure spindle distance

The first time this happened to me, I did what most people do — I fudged. I took out the last six or so spindles and put them back in, closer together. But that wasn't the way to solve this problem. Figuring out how far apart to space spindles can make you crazy, so I came up with the perfect solution, and it's quick, to boot.

1. I chose two 6-foot-long sticks from some scrap pieces of wood. At one end of each, I wrote the word "Start." I marked for spindle spacing every 4 inches (standard spacing). Then I marked for spindles on the other stick at 3½ inches. I laid the "Start" end of each of these sticks, writing side up, against the two posts the spindles would go between. The ends of these two sticks were side by side, as you can see in Figure 16-4.

2. I compared the spindle marks on each stick. Since the marks on one stick were spaced ½ inch closer than on the other, I looked for the measurement that both had in common. Then all I had to do was mark for spindles from each post inward, at 3½ and 4 inches, respectively. When I got to the spindle that was duplicated on both sticks, I was finished. There was no strange spacing at the post ends of the railing, and the ½-inch difference wasn't noticeable.

From that day on, I've used these two sticks for spacing spindles. Incidentally, the reason I made the sticks 6 feet long is that end posts are never more than 8 feet apart. So two 6-foot sticks laid down as described would overlap enough to be accurate between the posts. If you opted to move individual spindles to get uniform spacing, you could spend hours and still not get it right. This method has been so successful that I've even applied for a patent.

Stairway Stringers

Have you ever built a stairway and the steps didn't all turn out to be the same height? You cut stairway stringers for each step exactly the same height (the rise). So how could you be wrong? I have an answer to this common problem. Read on, look at Figure 16-5, and you'll learn how to avoid this mistake.

Stringers are the supports that hold up the steps in a stairway. They're usually long 2 x 12s, and run diagonally upwards under the sides of the steps. They're the exact shape of the stairway's steps, and are the first part of the stairs to be installed. Steps are nailed on afterwards. It's the stringers that determine the total height and shape of the stairway. The stairway can be no better than the stringers supporting it.

Suppose that when you put two stringers up side by side and attach the treads, the bottom step is *higher* than all the others. How can that be, when all the cutouts were identical? The thickness of the tread must be subtracted from the bottom step on the stringer. Every step has a tread, both on its bottom and its top, except the bottom step. The floor is the bottom part of that step, so subtract the bottom thickness of that first step. Does that make sense? I think you'll be fine once this sinks in and you refer to the figure. I'd write another sentence or two to describe it better, but I can't improve on what the drawing shows you.

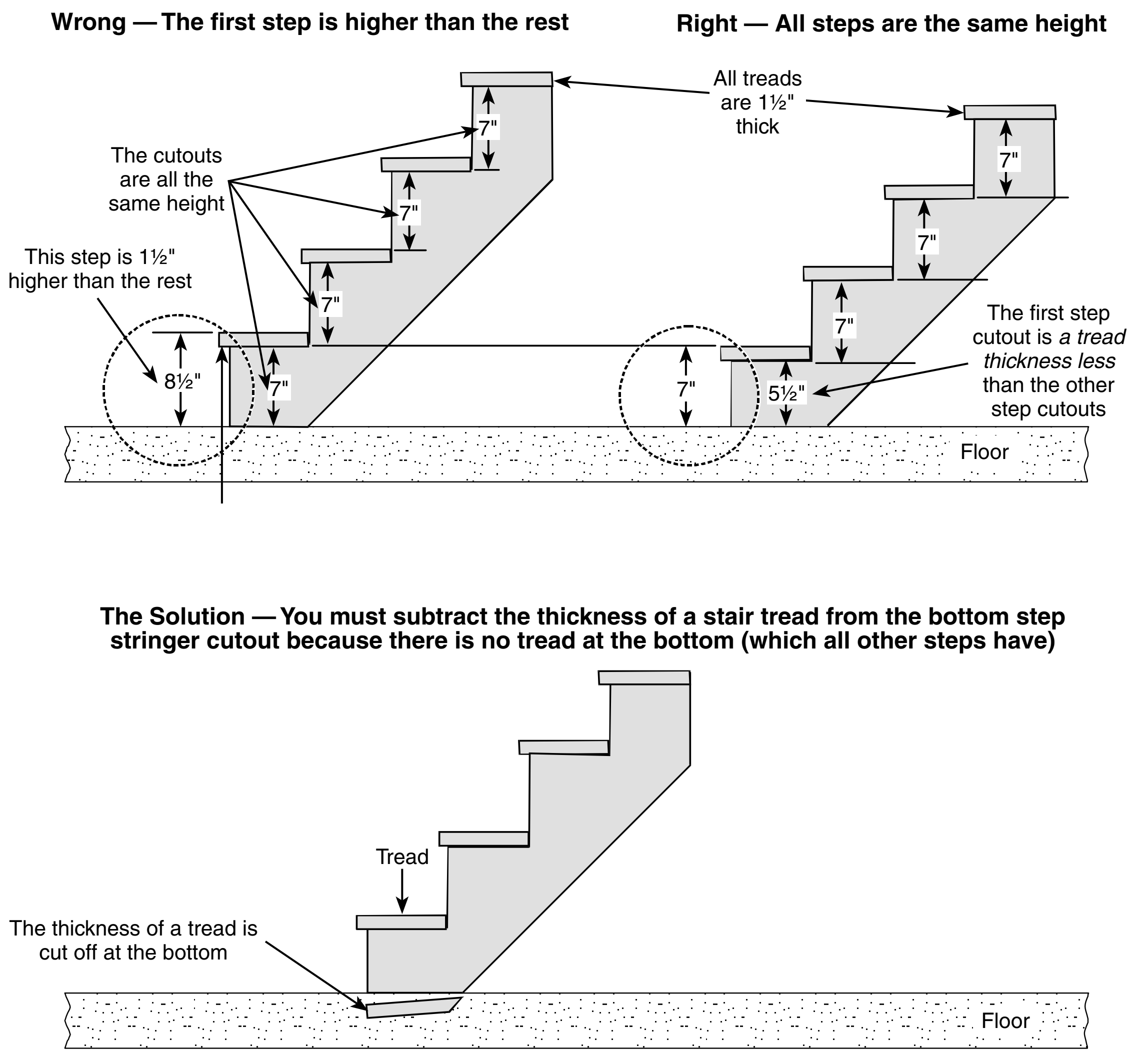


Figure 16-5
The stringer cutout for the bottom step must be a tread thickness less than the rest of the step cutouts

Every step on a stairway must be almost exactly the same height. The highest riser can't be more than $\frac{3}{8}$-inch higher than the shortest one. So if you're building a stairway with 7-inch risers, and one of them is a little bit short, and is only $6\frac{3}{4}$ inches, that's OK as long as none of the others is more than $7\frac{1}{8}$ inches. The code gives you a $\frac{3}{8}$-inch leeway. But if one is $7\frac{1}{4}$ inches, you're in trouble, as now you have a ½-inch variation.

Stringer Height

This section addresses properly laying out stair stringer height. For novices, this is very difficult. A lot of builders can frame and build a basic

1. Total stairway height needed is 35"; four $7\frac{3}{4}$" steps are 31" (you have 4" left over).

2. If the height needed is a few inches over any multiple of $7\frac{3}{4}$", you have to add one step to the total. The height of the steps can be lower than $7\frac{3}{4}$", but it can't be higher. You need five steps now (not four).

3. Needed stair height = 35". Thus, you must make the five steps total 35".

4. Divide the height by the number of steps:

Five steps into 35" = 7" per step

5 × 7" = 35"

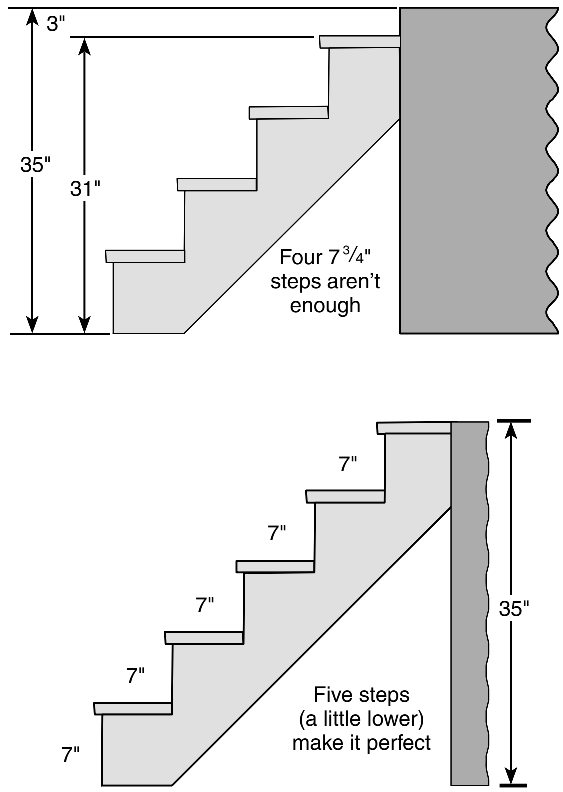


Figure 16-6
Figuring stair count to accommodate stairwell height

house. But if you want to find out if they really understand carpentry, ask them to build a stairway. The last section showed if you overlook the height of the first step on a stair stringer, it can throw the whole stairway off. But that's minor compared to laying out all the steps wrong. That's what I'll cover next.

Before you layout steps on a stringer, you need to approximate the basic step height so that the total number of steps will reach the height needed.

1. To begin figuring for a stair stringer, first decide the height the stairway must be to reach the upper floor. Measure the distance from the downstairs floor surface to the upstairs floor surface where the steps will end. If the stairs are for a porch or deck, the ground becomes the lower step, so measure up from there.

2. As Figure 16-6 illustrates, divide the finished floor height by $7\frac{3}{4}$, the height of your stair step. Basically, you're answering the question: How close will a stairway of $7\frac{3}{4}$-inch steps come to the uppermost floor height? What multiple of $7\frac{3}{4}$ will be close to the height needed?

3. In most situations, you end up with more height than you need. If the height is a little short, you have to add a step, still giving you more height than you need. To get the final step height, divide the height needed by the new number of steps you must use. Since steps can't be higher than 7¾ inches, you can temporarily add the height of one more step (7¾ inches) to your total step height. How high does that make each step? Since you've added one more step, you have to make each step a little lower to get them to the correct height. Let's assume the total height was 4 inches more after adding a step. Reduce the height of each step equally to lower total height by 4 inches. Again, you'll see what I mean by referring to the figure.

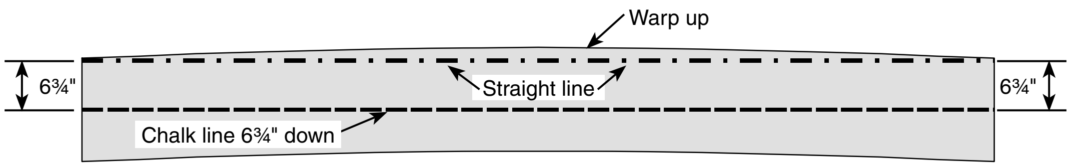
4. The height needed in my illustration is 35 inches. Since four steps equal 31 inches, add a fifth step. Thirty-five divided by 5 equals 7 inches for each step. And you're done.

Laying Out Stair Stringer Shape

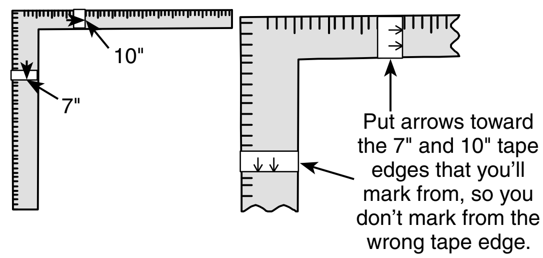
Here's another project that often stumps people, but it's really not that hard. Following are the step-by-step instructions for calculating and cutting stringers.

- Lay out the stair stringer shape on a 2 x 12. You'll need two 2 x 12s per stairway. On wide stairways, you may need three. How long should the stringers be? To figure this out, you must know how many steps there will be in the stairway. That method was explained previously. Standard step stringer cutouts are 7 inches high (the rise) and 10 inches deep (the run). Looking at Figure 16-7, you'll see that each 7- x 10-inch step is laid out horizontally on the 2 x 12 (so each one really forms a triangle). Thus, each step laid down on the chalkline takes up a little over 13½ inches of length on the 2 x 12. Once you know how many steps you need, multiply the number of steps by 13⅝ inches to get the total length of each 2 x 12 needed for the stringers.
- When these step triangles are sketched onto the 2 x 12s, they are each a hair over 6¾ inches up to the peak of the triangle. That means this line of steps

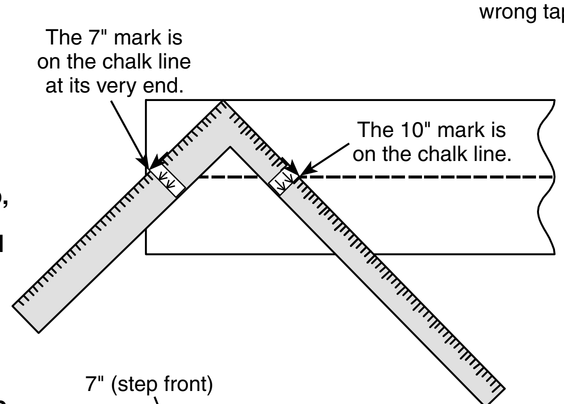
1. **Snap a chalk line on the 2 × 12, 6¾" down from the edge (at both ends). If the 2 × 12 is warped, put the warp up before measuring.**



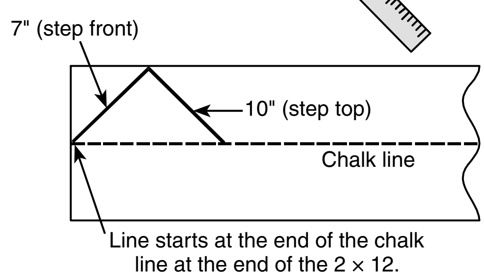
2. **Put masking tape on your square at 7 inches and 10 inches for drawing out 7" × 10" steps.**



3. **A. Lay the square on the left end of the 2 × 12, with the 7" width on the left and the 10" width on the right (above the chalk line). Line up the 7" and 10" marks with the chalk line. Since this will be the first step, the 7" mark should be right at the end of the chalk line and at the end of the 2 × 12.**



B. Draw a triangle above the chalk line for the first step. The 7" line on the left should be angled up from the chalk line for the front of the first step. Extending down from that line to the chalk line should be a 10" line for the top of the first step.



4. **Slide the square down to the end of the first step, and again draw out a step. Repeat for all the steps.**

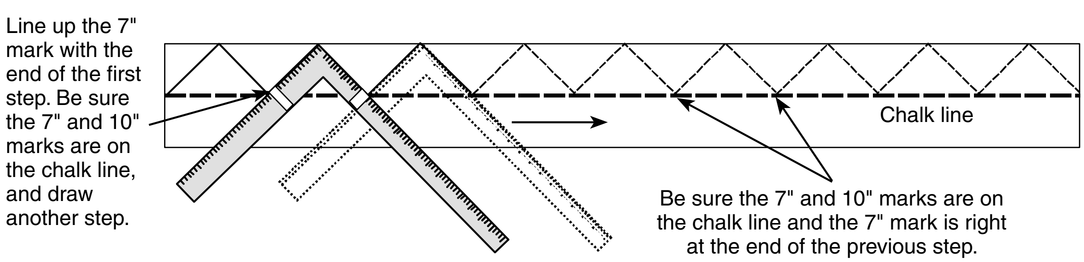


Figure 16-7
Laying out a 7" stringer

that you'll be drawing on the 2 x 12 will take up 6¾ inches of height on the 2 x 12's width. So if you snap a chalkline 6¾ inches in from one edge on the 2 x 12, you'll have a line for drawing out the steps. This might all seem confusing when you read it, but the figure should make it clear.

- A word of warning when buying the 2 x 12s: get the straightest ones you can find. To check, lay two of them edge to edge to see if they're really straight. Try to get a pair that isn't warped more than ¼ inch. If one of the 2 x 12s is warped, put the warp up when snapping the chalkline. In other words, measure the 6¾-inch marks from each end of the up-warp side of the 2 x 12.
- Measure from the top of the up-warp edge at each end. By doing that, you'll have a little lumber left over in the middle (over the height of the steps in the middle). If you put the warp going down when measuring and snapping the chalkline, there wouldn't be quite enough wood at the top of the step triangles at the middle of the 2 x 12.
- Laying out the triangles is quite simple. You know that each step will be 7 x 10 inches. Put pieces of masking tape on your square, and mark them at 7 inches on one leg of the square and 10 inches on the other. That saves you from having to keep looking for the tiny lines on the square, once you get going. Now, starting at one end of the 2 x 12, line up the masking tape marks on the square with the chalkline. Look back at Figure 16-7 to see clearly where and how to start this step layout.

"A little careless marking can add up to a lot by the end of a stringer layout."

- After you've drawn the two lines for the first step, simply slide the square down the chalkline and start the second step outline right where the first ended. Be careful not to overlap where each new step starts or leave a space between step outlines. A little careless marking can add up to a lot by the end of a stringer layout.

- When marking out the individual steps, you can easily get what carpenters call a *pile-up*. If you're a little off when drawing out each step, you can end up with a ¼-inch (or more) difference along the length of the stringer. That isn't funny. Watch also that you're not up or down on the chalkline when you're lining up each masking tape mark. Take your time. It's very easy to do a lousy job when laying out a stringer.
- Remember, if you messed up drawing steps on the stringer, you can always lay out the steps all over again on the other side of the 2 x 12. Or else use a different color pen or pencil for the re-draw so you don't mix lines up when sawing. I've sometimes had to draw out the lineup of steps a third time. When you have to re-draw the steps on a previously-drawn side, switch ends (or edges), so the newly-drawn lines aren't right next to the first set of lines.
- Once the step outlines are drawn, you're over the hump. Now, simply saw out the triangles with a power saw. You won't be able to saw all the way through each step, so use a handsaw to finish. You also need an angle-cut by the bottom step, where it rests on the floor. Remember, this step will have to be a tread thickness less than 7 inches high. Once you have one stringer cut out, simply lay it on the next 2 x 12 and trace it. You can also use the triangles you cut off to make the second stringer, as I'll explain next.

Save Time & Material When Making Stringers

This simple trick saves sawing a second stringer for a stairway. Use the triangles cut off the first stringer to make the second. Each triangle is attached with glue and two screws on each corner along a 2 x 6 to make the stair stringer for the other side of the stairway. Look at Figure 16-8, following.

To keep the triangles from being smaller than the original stringer, try to saw each step on the first piece right in the middle of the pencil lines. Notice that a 2 x 6 is used for this stringer bottom. A 2 x 6 is 5½ inches wide — an inch wider than the 4½-inch-wide strip left when you sawed the step triangles out of a 2 x 12. Be sure to align the new stringer on top of the original stringer so the cutout steps are nailed on in the same place as the originals. In other words, match the top triangles to each other, since the stringer bottoms are now different.

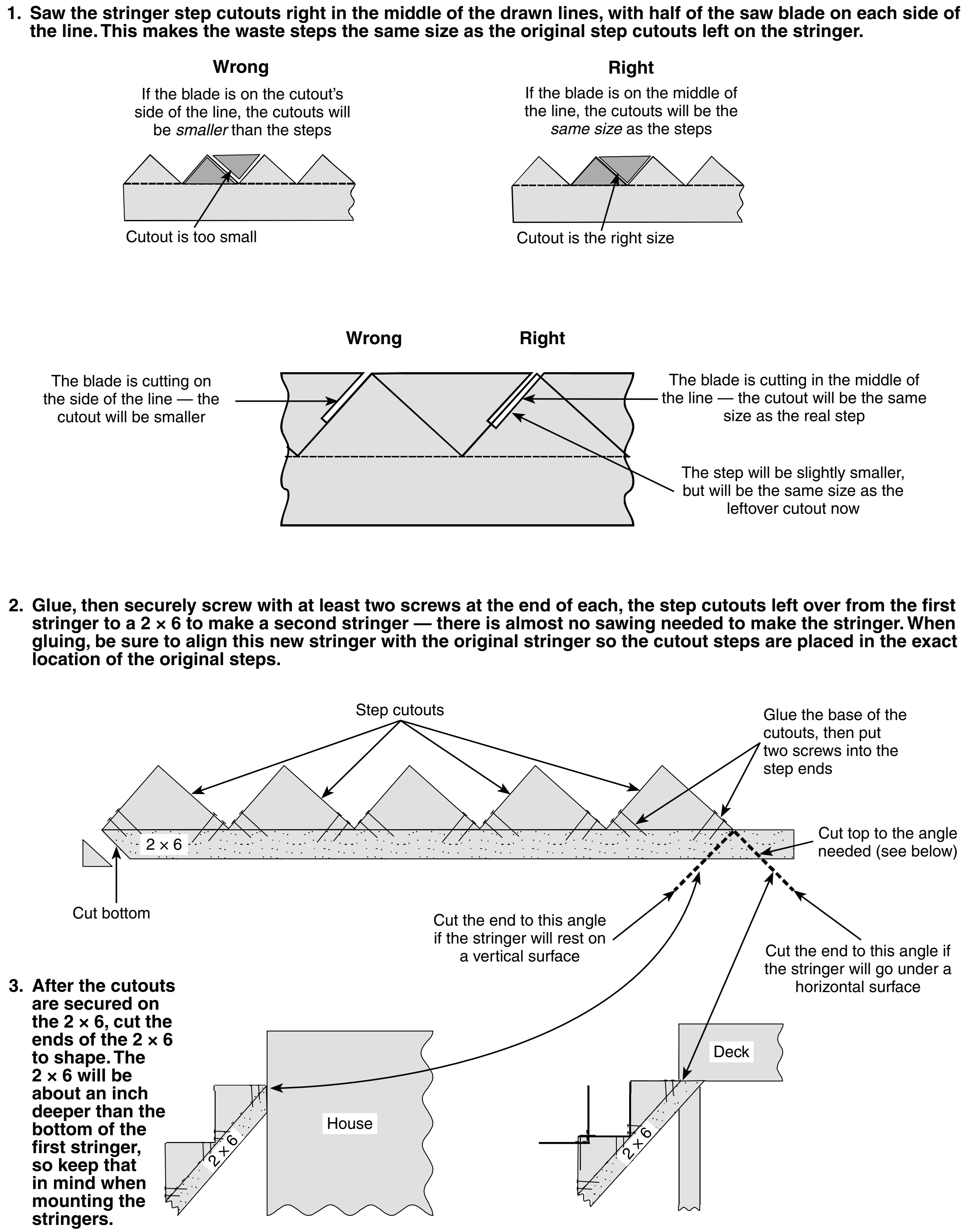


Figure 16-8
Making a second stringer by reusing step cutouts

17

COUNTERTOPS & CABINETRY

The kitchen has always been the heart and soul of a home. It's the social center — a favorite place to meet, eat, and entertain — in almost every household. The kitchen also sells the house; it's the room that can make the difference between a homeowner getting his asking price when selling his home or settling for substantially less. That's why I'm going to spend some time here on kitchen remodeling and fix-it projects.

Get your client's kitchen in good order by giving him a perfect match for his lifestyle and budget. By doing so, you'll add significantly to both his home's value and his personal satisfaction.

It's always best to have a starting point in mind to anchor the kitchen. I like to begin with what I consider the most prominent area in that room — the countertops. First, let's discuss materials.

Countertop Materials

Some kitchens are being remodeled with exotic horizontal surfaces like granite, marble, and natural and engineered stone. But their high cost puts these materials out of reach for many people, especially in today's economy. Stainless steel, solid surface, and tile have also found favor over the years, and concrete is a real up-and-comer. The possibilities are endless. But there are two important criteria in selecting kitchen countertops: The material must be durable, and it must be non-porous. That narrows the field considerably.

When helping your customer select the most compatible material for his needs, take into consideration the home's personality — not only at present, but also in the future. Countertop materials can be reasonably priced, fairly expensive, or outrageously exorbitant. The cost will definitely be a deciding factor in your customer's decision-making process.

To find the ideal countertop material for your client, determine how the kitchen will be used and how much they want to spend. Also, your customer may be interested in mixing styles: a tile or stainless steel backsplash, granite for the baking area, tile around the sink, etc. Definitely mention this option.

Laminate countertops have been popular for many years: they're inexpensive, sturdy, colorful, and easy to install. These surfaces are quite popular because they stand up to the beating a family can dish out and provide long-lasting service in almost any situation. And, as a bonus, they're also reasonably priced. If they get damaged, replacing them isn't that big a deal. You can probably replace a laminate countertop a dozen times for the cost of a single granite one.

New products seem to come on the market weekly, so by the time you read this, there could be a new miracle material. I mostly install laminate, because the majority of my work is remodeling family and vacation homes. Since granite and engineered stone are almost always installed by specialists who have the required equipment, I'm going to tell you how to measure for and install a laminate countertop.

Laminate Countertops

In most cases, you'd simply remove the old countertop, exposing the inside of the cabinets. (This is the ideal time to make any repairs or alterations to those cabinets.) Then you just place a new, preformed countertop on top and secure it. Preformed countertops usually include a rolled edge and a backsplash, and normally come in 6-, 8- and 10-foot lengths. You can buy corner pieces cut at a 45-degree angle to make perfect L- and U-shaped counters. You can even order them with sink and cooktop cutouts already done. Installation is simple.

But preformed countertops don't come in every color and pattern, and they're not made to fit every kitchen. In these cases, you have to make your own, and it's not that difficult.

Building a Laminate Countertop

First, figure out how much material you'll need. Laminate and other sheet material comes in different-sized pieces. The key is to pick the right size the first time, so carefully measure the area you're going to cover.

Lay out the countertop by cutting pieces of butcher paper for a template. Position them in different ways to see what size sheets to buy, keeping in mind where you'll be putting the factory edges.

If this is uncharted territory for you, take the measurements to your supplier, and ask for help in choosing the sheet sizes you need. If you're covering a 4 x 4 top with 1-inch-thick edges, for instance, a 4'1" x 4'6" sheet is the right size. This gives you a little extra for cutting the top and edges. Save the factory edges for those hard-to-reach places where you can't fit a router. Clean the counter, the edge, and the back of the laminate before application with contact cement.

Store the laminate in your customer's kitchen for at least 48 hours prior to installation, so it has time to adjust to the ambient temperature and humidity.

You'll be applying the edge strips first. Why? Since the countertop is the work surface, it goes on last; otherwise, it can easily peel up; *not* something your customer would want.

CONTACT CEMENT *is unlike any other glue you've ever used — you cover both the material and the area where it's to be installed with the cement. The difference between contact cement and other adhesives is that you don't put the two surfaces together until the cement is dry to the touch. Believe me, it's called contact cement for a reason. If you jump the gun and the surfaces aren't quite dry, you'll never get the pieces apart again if you need to realign them.*

Caution: *Contact cement gives off toxic fumes that can knock you out and do some real damage to your lungs. Keep windows and doors open, and place a fan to keep the air moving. If you're using a lot of it, you may want to wear a respirator. Each product comes with an MSDS (Material Safety Data Sheet) which is available at the store where you purchased the product. It provides information you should know prior to use.*

Applying the Counter Edge

1. Cut the counter edge pieces.
2. Spread contact cement onto the counter edge and the back of the edge strip, and let the cement set for about 15 to 20 minutes.
3. Drape butcher paper over the edge of the counter so the two glue-covered surfaces won't come in contact with each other.
4. If one end of the edge strip meets an inside corner, start there. Pull out the paper as you press the strip onto the edge.
5. When you have the entire strip in the correct position, firmly press it into place. Use a rolling pin to help it stick.
6. Trim the edge strip with a router fitted with a carbide-tipped flush-cutting bit; see Figure 17-1. Trim flush with the countertop in a counter-clockwise motion.
7. After applying all the counter edges and trimming with the router, smooth with 80-grit sandpaper and dust off thoroughly.

Now you're ready to install the countertop itself.

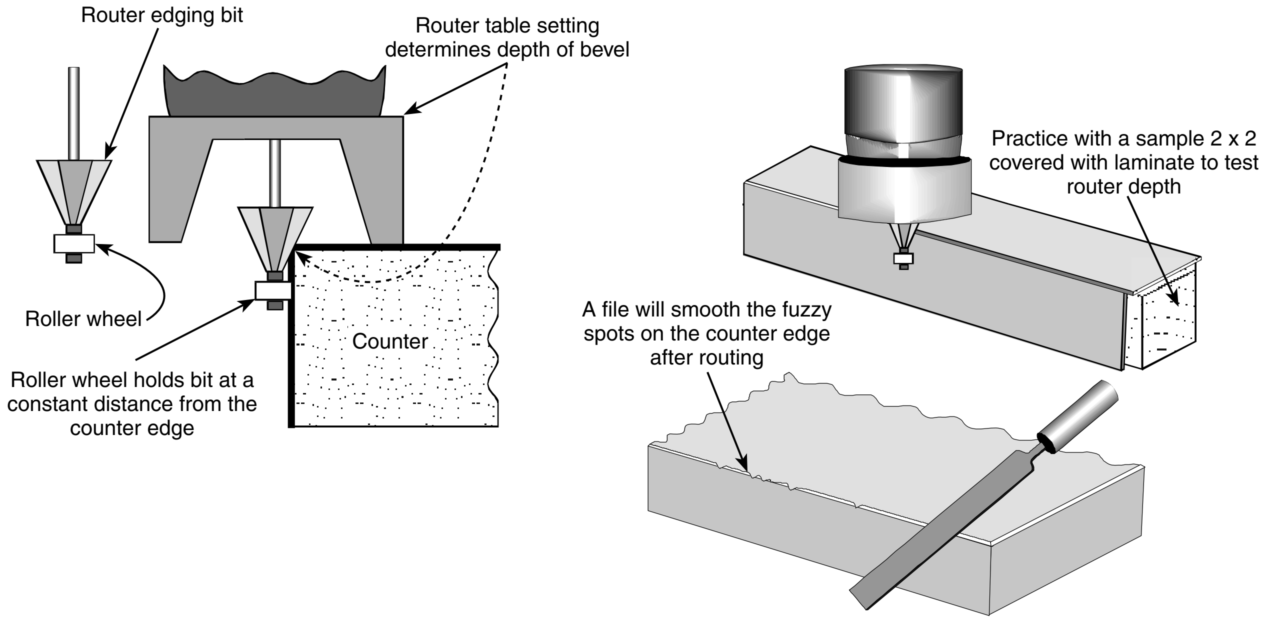


Figure 17-1
Routing finished countertop edges

Applying the Countertop

1. Apply glue to the countertop and the laminate and cover the countertop with butcher paper.
2. Carefully lay the glued sheet on the countertop over the paper. Don't bump any of the paper out of position. When you place the countertop material on the surface, make sure you have surface and countertop material lined up with each other. The sheet of laminate should extend slightly past the edge of the countertop.
3. Let the glue set up before aligning the surfaces as carefully as you can. Don't worry about the glue setting too long. The surfaces bond well, even after 30 minutes. Ideally, wait about 15 to 20 minutes for the glue to set — it's ready when it no longer sticks to your finger.
4. Starting in the middle, remove the paper. Don't try to press the sheet onto the countertop until you've pulled up a foot or two of the paper.
5. When the covering begins to stick to the counter, make sure it's still extending past the counter edge on all sides. Keep pulling the paper out, working from the middle.

6. Once the material is stuck securely in the middle and the edges are lined up, press the laminate down, again starting in the middle. Press evenly outward to prevent air from getting trapped between the surface and the material. This is your only chance to get the material to adhere just right. A word of warning: If air is trapped and the edges of the laminate are securely attached, you'll have a bump in the countertop that will be there forever. It's no use trying to use a needle to prick the air bubble; the hole will show.
7. Put masking tape on the newly-laminated edges, then router off the excess laminate from the countertop.

Finishing the Countertops

There's a lot involved when you're finishing up laminate countertops. I'll address some of the most important aspects below.

Seaming

If a countertop is L- or U-shaped, you'll need to do some seaming. This is when factory edges become important. Only factory edges can butt together at a joint to make a perfect fit. You think you can saw edges? Forget it. You absolutely, *positively*, can't get the precise edge you need with a saw. Use hand-sawn pieces only as a last resort, and where the seam is least noticeable.

Countertop Posts

Some countertops have posts at one end, and some have them at both ends. This makes it difficult to neatly rout the counter edge, because the router table gets in the way. Here's how to get around it: when you get to where you can't get any closer, carefully trim the material edge with a fine-toothed saw. You can also reverse the blade, which comes in handy for sawing in tight spaces. Once the edge has been rough-cut to the shape you want, finish with a metal file.

Rounded Corners

Here's a little shortcut I use if I'm replacing countertops that have rounded corners. Laminate is relatively flexible, and can be bent to follow gradual curves; but it tends to spring back to its original straight shape while you're installing it. This is common when you're using a long, narrow strip to wrap around a corner. The fix? Heat the laminate so it holds the shape you want.

A heat gun is perfect for forming laminate. When you heat it, it becomes flexible and you can easily bend it. As it cools, it retains its shape. I use a heat gun because, set on low, it won't burn the material.

Read the next couple of paragraphs carefully before you get your heat gun fired up. Wear gloves, because the laminate will get pretty hot, and you're going to press it into shape with your hands. Practice on an extra strip of material until you get the knack of heating and forming. You need a relatively long piece of scrap material so you can try your hand at shaping it, too.

1. Heat *only* the back of the laminate. If you keep the heat gun's setting on low, and move it in a circular motion along the back side, the material won't burn. Make sure there's no contact cement on the laminate when you do this.
2. When you're confident in your ability to form and shape, get the good piece that you want to use. Bend it around the corner to get the length measured correctly. Mark where the bent corners end at each side. It's that length that you're going to heat.
3. Run the heat gun back and forth on the area between your marks, like you did on the practice piece. Remember — use low heat. When the strip starts to bend, put it against the corner of the counter. If it bends but doesn't wrap around easily, heat it a little more.
4. When the strip gets limp, press it against the corner again. If it forms easily, hold it there until it sets up and stiffens. Heating the material is tricky, so take your time. If you overheat it, you'll blister your material, ruining it and, possibly, your day.

The Backsplash

You were nearly finished with the kitchen countertops … or so you thought. Then you run into the following scenario — deep windowsills butting into the counter make it impossible to rout the backsplash below. Only 2 inches to go, but they're between the bottom of the sills and the top of the backsplash. Getting the saw into that space is impossible. So near to being finished and yet so far. So, what do you do?

There *is* a way. A Dremel tool can cut and shape in small, hard-to-reach areas. Take your time and don't gouge into the material with your sanding blade. Do your final shaping with a sanding block held at an angle after you're done trimming the laminate close to the backsplash edge.

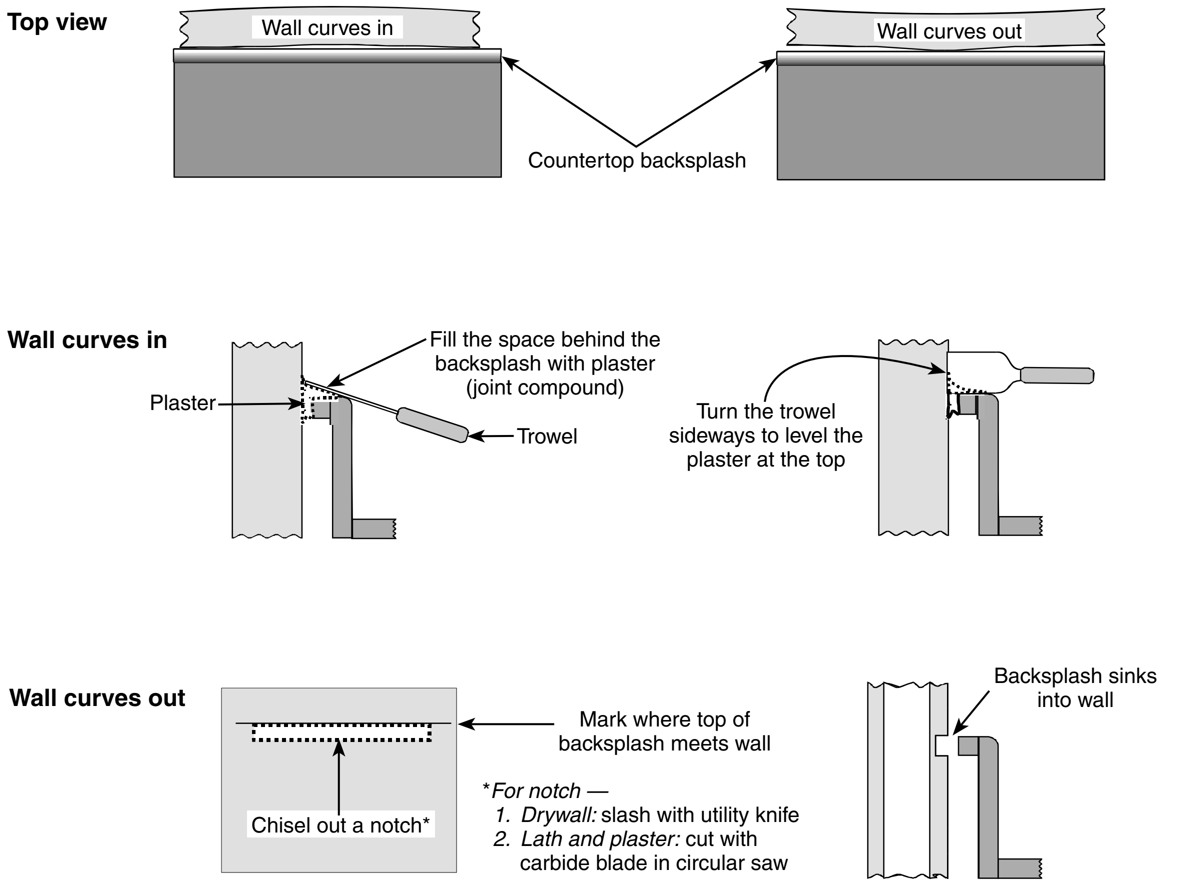


Figure 17-2
Fitting a countertop's backsplash to uneven walls

Aging can cause walls to move places they weren't before. Some areas sag and go south. Some places bend under the force of gravity. Sound familiar? It's that older house you're working on. A common problem in aging houses is uneven walls. Settling of the foundation — caused by gravity — increases the likelihood of uneven, out-of-square walls. But you can fix it.

When you're installing a long kitchen countertop, the backsplash must meet the wall evenly. But if you're working on a kitchen in an older home, one with some miles on it, you could have ¼- or even ½-inch gaps between the backsplash and the wall. Walls in some old houses wave in and out more than ½ inch. What caused that waviness doesn't matter. What *does* matter is that you've been hired to make the kitchen look as good as new, and that's just what you're going to do.

There are two solutions to the problem of "wavy" walls: When the wall curves in, fill the gaps; when it curves out, cut small grooves in the wall so the backsplash lip can fit. This may sound drastic and labor-intensive, but it's surprisingly easy. So, assess your situation, read on, and follow the diagram in Figure 17-2.

Filling the Void

This first solution might seem a little unorthodox, but if you've read the previous chapters, you shouldn't be expecting some run-of-the-mill remedy.

- If you don't have to do much filling, get a small container of pre-mixed drywall compound. With a wide-bladed trowel, pack it behind the backsplash. It will sink down initially, but soon fills the gap.
- After it's filled, smooth the compound along the wall where it meets the backsplash. Amazingly, even a ½-inch gap can be disguised. And once you paint this section to match the rest of the wall, it's hardly noticeable. Be prepared to paint the whole wall, though; new paint usually looks different from the old paint in the rest of the room. All in all, you'll be pleasantly surprised at just how easy this is.

Recessing the Backsplash

Here's another solution that takes the opposite approach. When the wall curves outward, there are gaps where the backsplash doesn't match the curve. So you're going to make recesses in the wall for the backsplash fill strip to sink into.

Let's look at the easiest-to-fix situation first — when walls are made of drywall. You can cut grooves in the wall to correct protruding (convex) spots, allowing the backsplash to "melt" into the wall.

- Mark with a pencil where the backsplash meets the wall, then pull the countertop out. With the counter removed, draw another line about an inch down from the first one. The backsplash fill strip is ¾ inch thick, so a 1-inch-deep groove is enough for the piece to recede into. Put a new blade in your utility knife because you're going to use it to cut that drywall notch.
- Make ¼-inch-deep slashes between the two pencil lines. By angling the blade with every cut, you'll be able to go deeper than if you try to use the same angle each time. Be careful not to get your knife stuck in one of the earlier slashes.
- Next, slash between the lines you've made, at right angles, so you end up with little squares.

- With a wood chisel, pry out the wall material, square by square, to a depth of roughly ¼ inch to start. You don't want to be overly-aggressive right off the bat. Try the backsplash in the groove every so often to see how it fits. You'll see pretty quickly where you need to direct more effort.

Now let's discuss the worst-case scenario — lath and plaster walls. This is an entirely different situation. Real plaster is tough stuff. You can't cut it with a utility knife; you'll have to use a circular saw with a carbide blade.

Warn your customer that the dust will settle everywhere, including inside the cupboards and drawers.

This is one of the messiest jobs in carpentry. Cover everything with a drop cloth before you start and be sure the area is well-ventilated. Close doors to the rest of the house. Warn your customer that the dust will settle everywhere, including inside the cupboards and drawers. Set the blade to cut ½ inch deep, the usual thickness of plaster. Put on your safety glasses and a dust mask, and saw along the lines. You may have to leave the room every few minutes to let the dust settle.

Mitering Corners

When you're replacing or installing a countertop, sometimes you'll need to miter long corners. These miters are held together underneath the counter with special bolts that have a short bar at each end. You'll rout out the countertops underneath to accommodate these bolts and bars, which go in at the front, back, and middle of each of the corner sections. After you align the countertops in the corner, you'll insert the bolts into these cutouts. Then you'll tighten the bolts with a box-end wrench, and butt the sections together.

This works very well, except in one situation: If there's a Lazy Susan under the counter, you can't just reach up to place and tighten the bolts. You may be thinking — just bolt the countertops together on the floor and then install them. That takes two people, which is fine if you're paying someone to do what you could do alone. Here's how to do it by yourself, as illustrated in Figure 17-3.

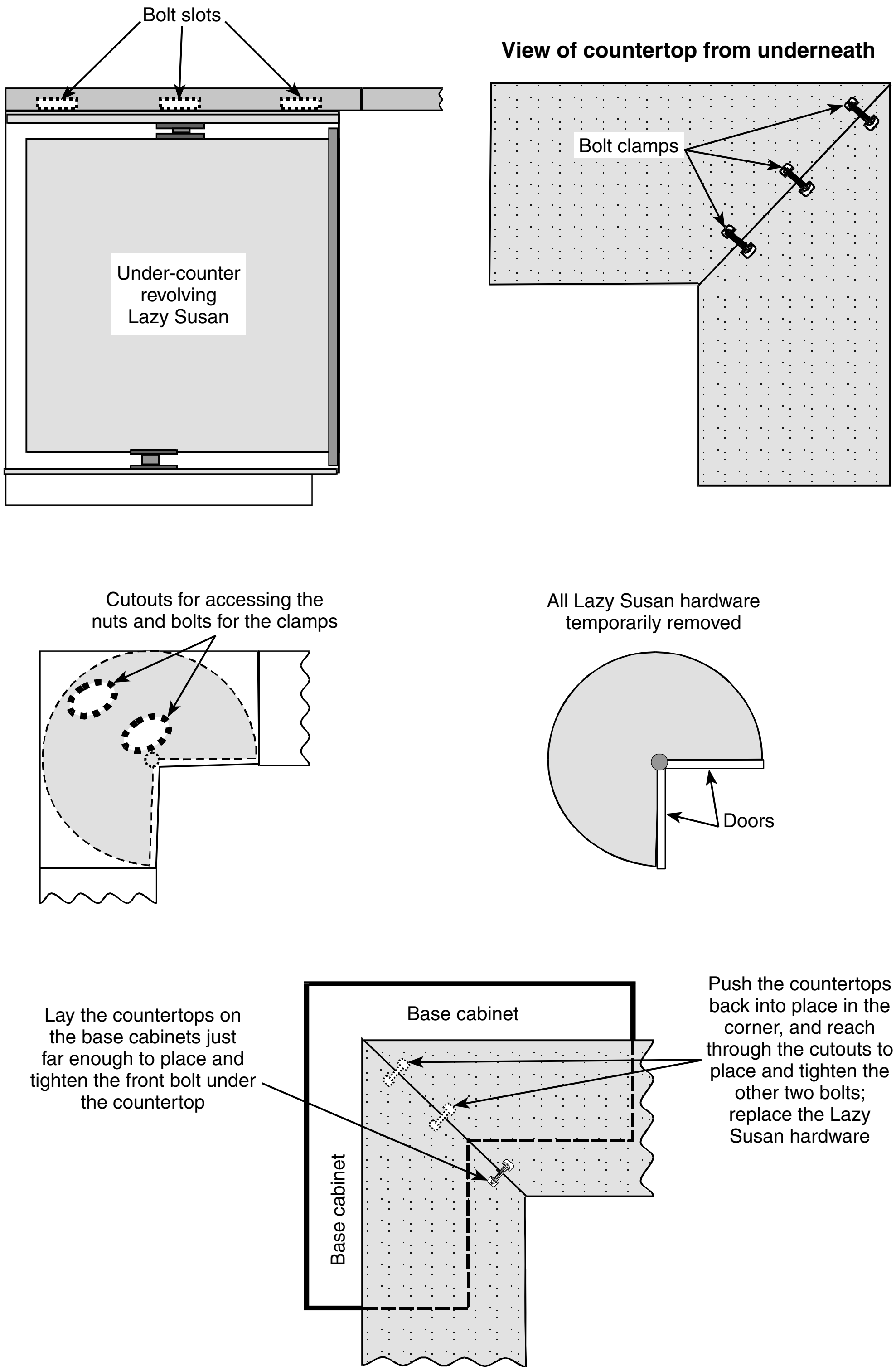


Figure 17-3

Bolting a countertop's mitered corners together when there's a Lazy Susan in the cabinet

Working Around an Under-Counter Lazy Susan

1. Take the Lazy Susan and its mechanism out of the cabinet.
2. With your saber saw, cut two oval holes in the top of the Lazy Susan where the bolts will go. Don't cut a hole for the bolt nearest the front of the countertops. The problem is getting at the middle and back bolts covered by the Lazy Susan. The oval holes solve that problem.
3. Before pushing the butted countertops into place, tighten the front bolt. You need to do that before the counter is in place, since you didn't make a hole for that bolt.
4. When you butt the countertops together in position, reach through each oval hole from underneath with a wrench, and tighten the bolts.

Dropping in a Sink

If you do it wrong, the cutout for a sink in a new countertop can cost you plenty. By making a bad cut, you'll ruin the countertop. And you can be sure that the replacement cost will come out of your pocket, not your customer's. You can't just drop a sink into a countertop. Because of the size and depth of modern sinks, there's little room between the edge of the sink and the edge of the supporting cabinet. If your cutout is even ½ inch off, the sink won't drop down into the cutout — it will hit an edge of the cabinetry underneath.

Cutouts

Sink manufacturers are making sinks very large these days … some barely fit inside a standard cabinet frame. So laying out the cutout for the sink is critical. Making it the right size is the least of your problems. If you cut in or out a little too much from the backsplash, the whole job is ruined.

You do have a little leeway in the cutout on the left or right sides. Partitions in most base cabinets are wider than the edges of the sink that will be dropped inside. But there's hardly ½ inch of space between the edges of the sink and the backsplash and front frame of the base cabinet. Modern sinks come with a cardboard template and instructions for making the sink cutout, so it's easy to make the cutout the right size. You just have to put the cutout in the correct location.

1. Figure out where to place your pattern on the countertop. If it's wrong left or right, the sink could hit one of the divider partitions. If the sink is too far in or out, the edge could rub the backsplash or hit the front frame of the cabinet.
2. If you have the old countertop off, you can see the top of the base cabinet frame. Measure from the inside edges of the partitions by the sink to the end of the base cabinet. If the countertop will stick out past one end of the cabinet, measure from the end that will be flush with the countertop.
3. If the ends of the countertop and base cabinet are against a wall, do your measuring from that end. If the countertop will extend past both ends of the base cabinet, add that overhang to your partition location measurements.
4. Put some masking tape on the countertop near your measurements, and mark the location of these partition measurements on the tape.
5. Use a square held against the backsplash to make your lines square.
6. Center the cardboard sink pattern between these two lines. Make sure that the pattern edges are parallel with the lines, and center the pattern between the backsplash and the front edge of the countertop.
7. Draw the edges of the pattern on the masking tape, but stop before the corners start to round.
8. The new sink will come with instructions for placing the template front to back, so follow them.
9. Cut out as far as you can on the top of the counter, and then finish from underneath.

The table on your circular saw or saber saw prevents a close cut to the backsplash at the back of the sink cutout. Here are the steps for finishing with power tools:

- Saw as far as you can from the top of the counter, coming within 2 inches of the backsplash.
- Transfer the cutout lines onto the back of the countertop and make the final cuts from the back (the bottom) of the countertop.

- Drill two 1/8-inch holes through the countertop at each end of the line you drew at the back of the sink cutout. You simply want to mark on the back of the counter where this back line should be drawn. Be sure to keep the drill 90 degrees from the counter as you drill.
- Flip the counter over and, using a level, draw a line for the back of the cutout.
- Line up the template on the cutouts made for the front and sides and the line for the back, and trace the corners.
- Finish the cutout from the back.
- When you're three-quarters of the way finished, put two 2 x 4s (standing up on edge) under the countertop and cutout, so it can't break off as you finish the cutting. If it should fall, it could tear the laminate, ruining it.

Reusing a Sink

If the sink is stainless steel, the rim will be caulked to the countertop. There are probably also sink clips holding the sink in place, either screwed or bolted to the underside of the countertop. If there are, the first thing you have to do is get them off. Get under the sink, and with a screwdriver or open-end wrench, gradually loosen them so you can turn the clamp part off to the side, releasing the sink. It's not necessary to remove the entire clamp, but you can.

Then you can start dealing with the caulk so you can lift the sink up and out. This can be tough — if you're not careful, it's easy to bend the lip of the sink, and since you're going to reinstall it after you've put in the new countertop, you don't want that. Figure 17-4 provides a good illustration.

Carefully push a metal-blade putty knife under the lip of the sink. You can use a chisel, but start out with a putty knife, as it's thinner and wider and you're less likely to put a dent in the rim. Do this in several spots to begin loosening the lip. Don't be in a hurry here — easy and gentle is the game. Pry too hard and you'll deform the rim.

If the sink lifts up a little, start prying at that spot and, once it's up a little more, slide a chisel under the edge. Continue prying, and when it's up a little more, slide the tip of a screwdriver under the rim to hold it up. Pry some more, and when the rim lifts a little further on down, slide the screwdriver down next to the chisel. It will take a while to free the sink, but as long as you do it slowly and carefully, you won't ruin the rim's appearance.

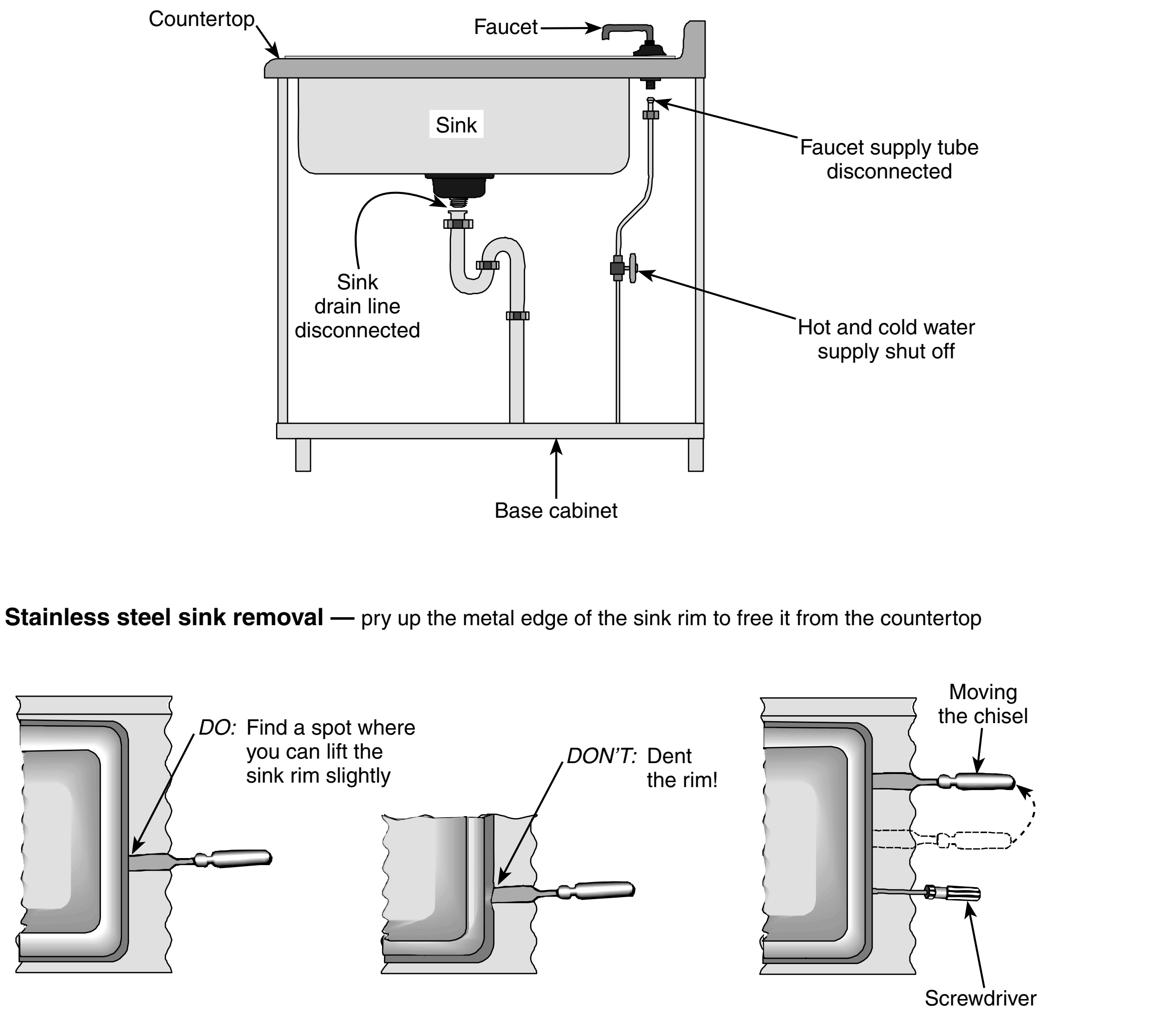


Figure 17-4
Removing a stainless steel sink to reuse with a new countertop

Wiring Up a Sink

If the old sink is enameled cast iron, there should be a metal rim around the sink, with clamps underneath holding the sink up in place. Before you remove these clamps, wire the sink up so it can't fall down inside the base cabinet. Here's how to wire the sink up:

1. Lay a short piece of 2 x 4 on the countertop, across the length of the sink, and run wires up through the sink drains, twisting them around the 2 x 4; see Figure 17-5.
2. To keep the wires from damaging the drain bottoms, put sticks between the wire loops and the drains.

Removing a cast iron sink with a metal rim — suspending the sink from a 2 x 4 to remove the sink rim clamps

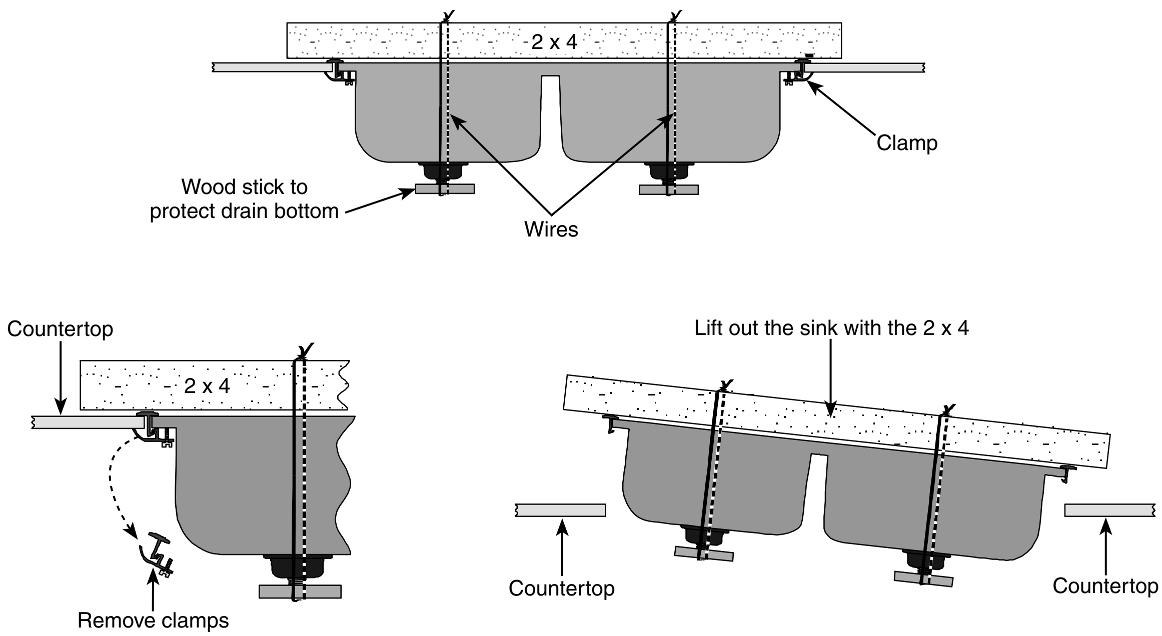


Figure 17-5
Removing an enameled cast iron sink to reuse with a new countertop

3. With sticks in place, twist the wires tight around the 2 x 4. The sink is held firmly in place against the 2 x 4, and you can remove the clamps. Save these clamps to reuse later.
4. Once you've removed the clamps, you can pry up the rim of the sink. If it's caulked down, follow the directions for loosening the caulking around a stainless steel sink.
5. Lift the sink out with the 2 x 4 and remove it to use with the new countertop later.
6. Put a piece of corrugated cardboard a few inches larger than the sink cutout on the old countertop against the backsplash, to use as a pattern.
7. Trace the cutout on the cardboard from underneath.
8. Cut out this shape with a utility knife.
9. Measure where the old sink was, and position the cardboard cutout at that location on the new countertop, tracing its position.
10. Measure the old countertop and mark that length on the new. Now you can cut the opening in the new countertop.

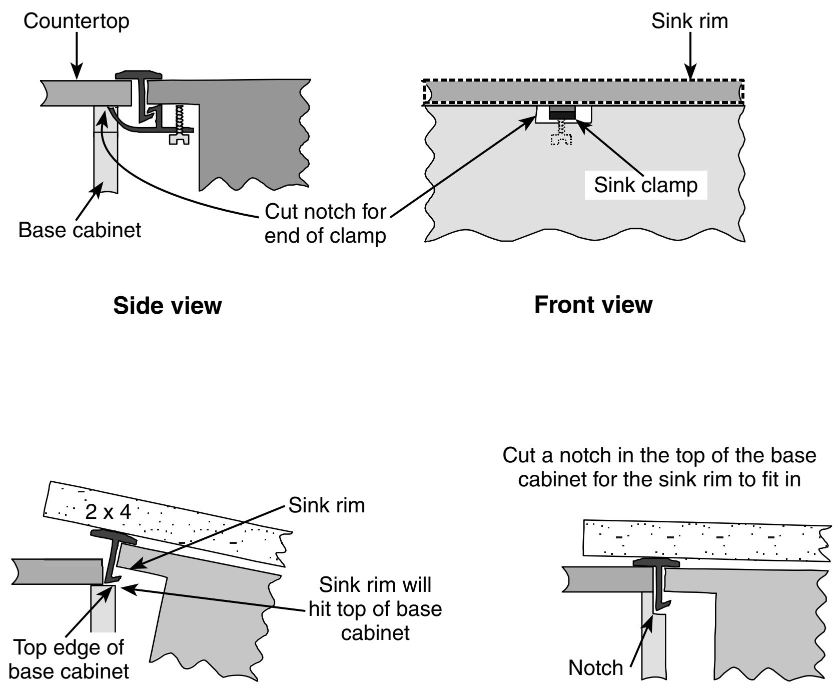


Figure 17-6
Reinstalling a sink

11. Once you have the old countertop out and the new one in place, reinstall the sink. The 2 x 4 wired to the sink makes it easy to pick it up and put it inside the new cutout. Just reverse the process and clamp the sink to the new countertop. If you have alignment problems, don't worry. Read on.

It's not unusual to find that all the clamps won't go back up in place. They could be hitting the edge of the sink partitions or the front lip of the cabinet. If this happens, cut notches in the top edge of the partition or cabinet frame so you can insert the clips. Another problem occurs when the sink won't drop down in place because the rim is hitting the front edge of the base cabinet. Figure 17-6 shows the solution.

If you can see the edge of the cabinet through the sink cutout, that part of the edge has to go so the sink can drop down in place. Mark the cabinet frame where the cutout overlaps it. Move the countertop and trim along this line with a circular saw, with the blade down about ¾ inch. Don't saw too deeply; you don't want to saw through the base cabinet. After you saw this piece of wood, use your utility knife and a chisel to remove it.

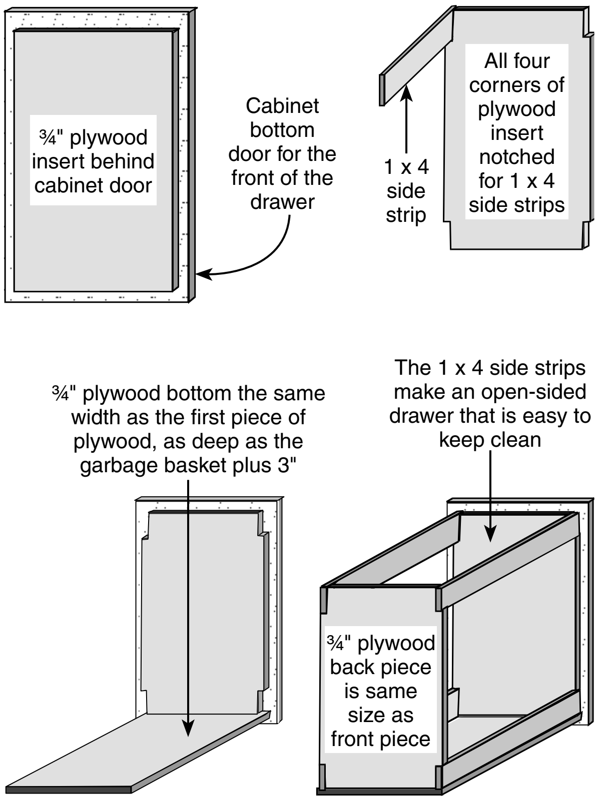


Figure 17-7
Making a pullout drawer behind a cabinet door

Hiding the Kitchen Wastebasket

Everyone has a trash basket in the kitchen, but that doesn't mean your client has to look at it all the time. If he wants to hide it, here's how: Change a cupboard door into the front of a deep drawer to hold the garbage container. Take a look at Figure 17-7.

The drawer should have open sides to make it easy to clean. You only need a basic bare-bones shape to hold the garbage container. Simply cut a back and front for the drawer from ¾-inch plywood, and a solid plywood bottom. The sides are 1 x 4 slats, to hold it together. Drawer slide kits come with a middle track for underneath the countertop, and a wheel attachment that's screwed on the back of the drawer to hold it up. This wheel rides in the track; see Figure 17-8.

Two nylon wheels are attached to the cabinet frame below the drawer, or inserted into the floor of the cabinet. They allow the drawer to pull out easily. Don't bother with the wheels intended for the top of the drawer. The weight of a wastebasket tends to move those wheels off the track. You don't even need the entire drawer kit. Buy just the two nylon wheels with brackets at any hardware store. And it's easy to find a plastic wastebasket the right size to fit inside the drawer frame.

Installing a Bathroom Vanity

If you're remodeling the kitchen, there's a good chance you'll also do some work in the bathroom. You might think it's a simple task to install a bathroom vanity. It's not. It has to fit around the hot and cold water pipes and the drainpipe. If the pipes come through the wall behind the vanity, there's no problem. A vanity usually doesn't have a back, so simply push it against the wall and attach the plumbing fittings.

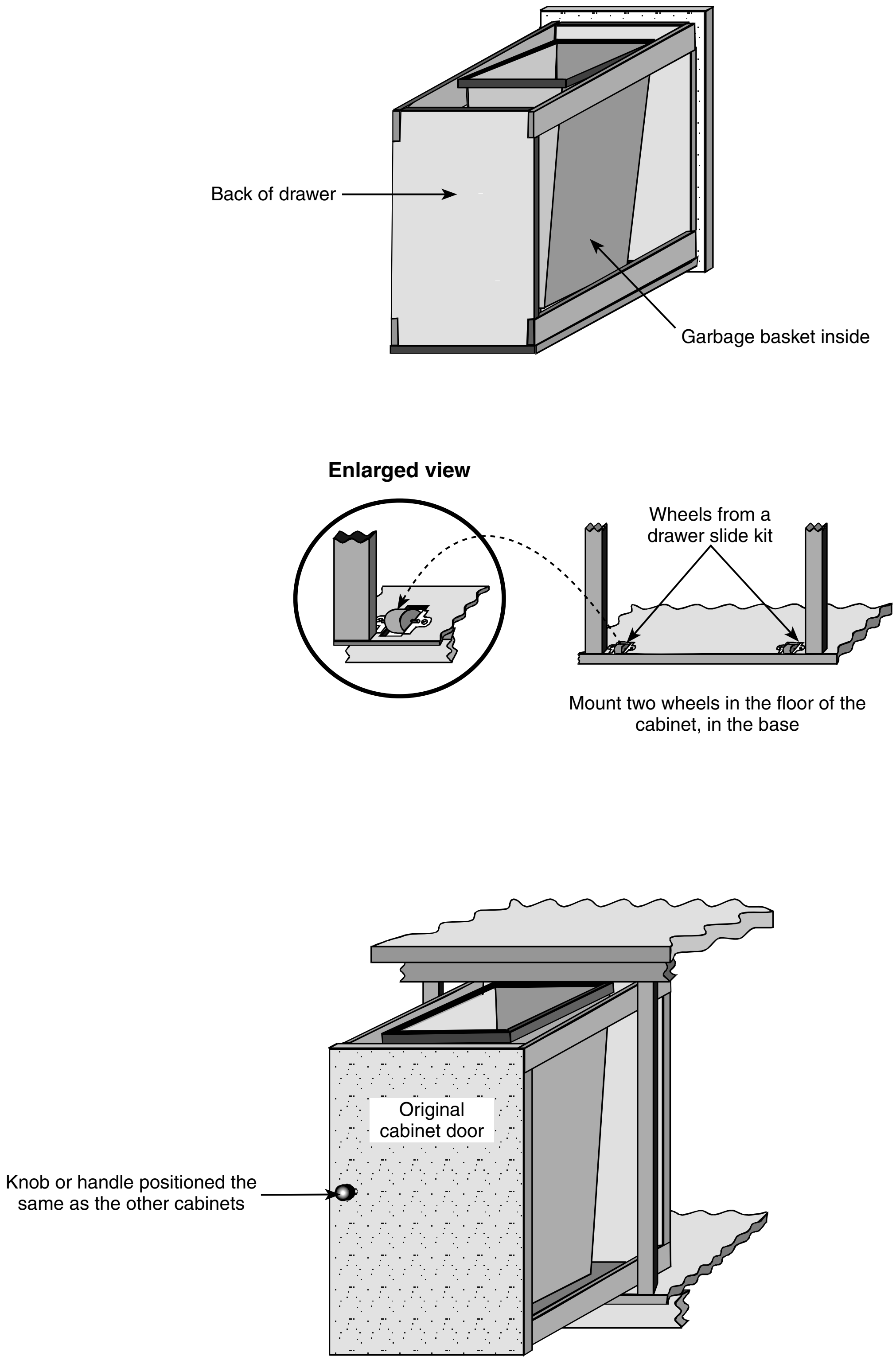


Figure 17-8
Putting on the wheels

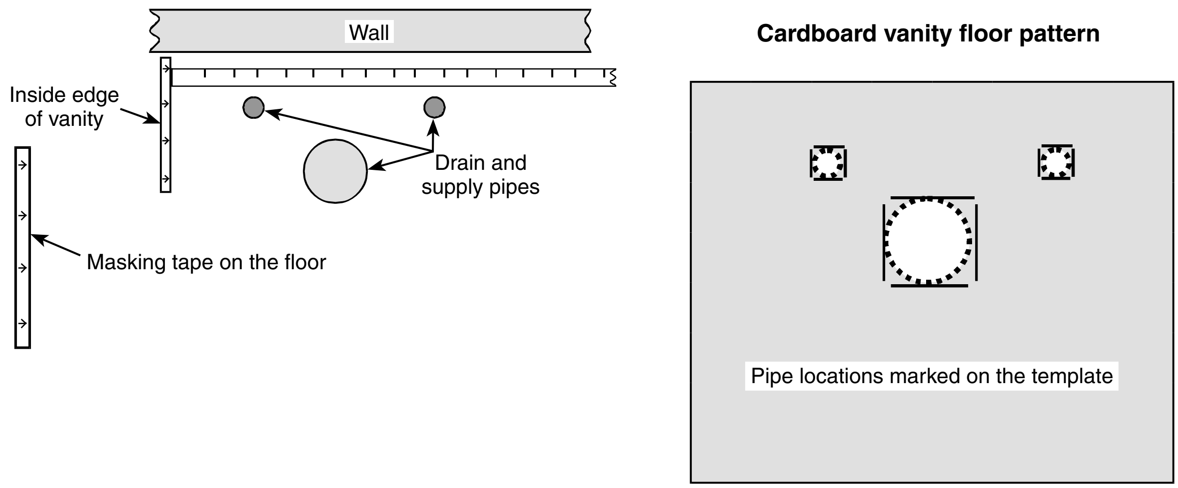


Figure 17-9
Fitting a vanity around piping

But plumbing usually comes up through the floor, which makes it more difficult to install a vanity. Here's my solution: Cut out the floor of the vanity to fit around the pipes. Make cutouts for the size and location of the pipes, and remove that part of the vanity floor so you can slide the vanity into place around the pipes. Once it's in place against the wall, you can replace the section you removed around the pipes.

Refer to Figure 17-9 as you follow these next steps:

- Cut a cardboard pattern the size of the inside vanity floor and measure the width of the inside.
- Put a strip of masking tape about a foot long on the bathroom floor where the left inside edge of the vanity should go. All measurements will be taken from this inside edge.
- Use a square from this spot and measure 90 degrees out from the wall. Note where the vanity should go to fit around the pipes.
- Mark arrows on the tape indicating the inside vanity edge.
- Measure for the pipe cutouts in the vanity floor and mark each location on the cardboard pattern. There are two methods for making these cutouts. Choose the one that works best for you from Figure 17-10.
- Measure from the wall to the edge of the pipe in back and the distance from the marked edge of the masking tape to the edge of the pipe. Mark this on the cardboard pattern, too.

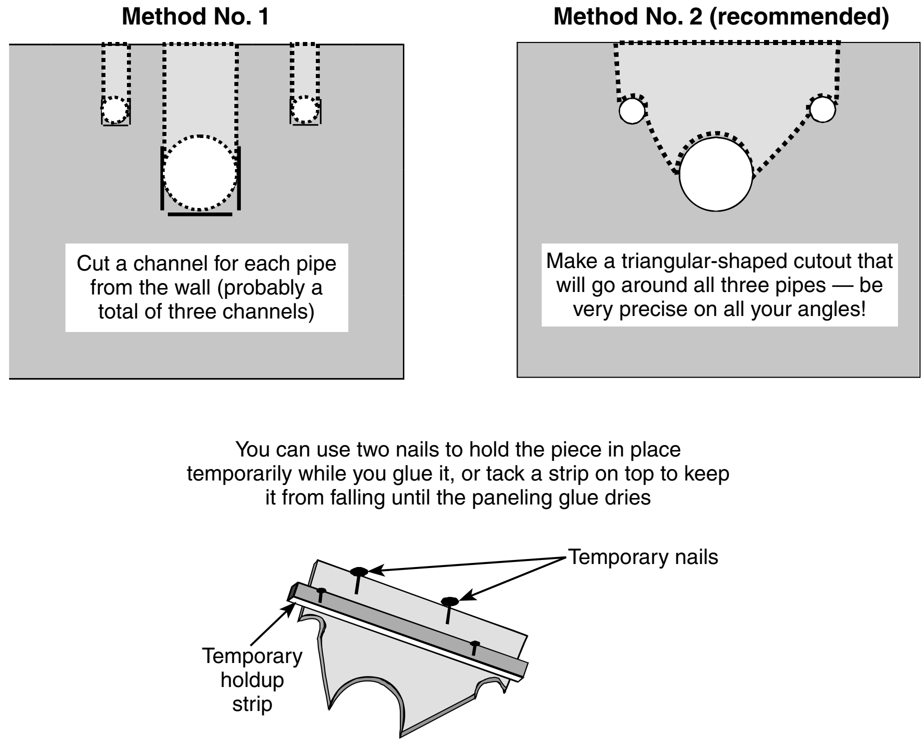


Figure 17-10
Two methods of making a cutout in the vanity floor for pipes

- Measure the diameter of the pipes and make U-shaped cutouts a little larger than that width on a small piece of cardboard, for easier installation. See if these cutouts fit around each of the pipes.
- Cut out the pipe holes in the cardboard pattern. There are two ways to do this. You can cut out behind each of the pipes so that the vanity fits over the pipes up to the wall; or you can cut a triangular shape out of the vanity floor. You'll glue the cutout strips or triangular shape back in place once you've got the vanity in position.

Painting Cabinets (a Cautionary Tale)

If you use masking tape when painting, read on. I was painting the ceiling in a kitchen and, since the cabinets went up to the ceiling, I ran masking tape along the top of the cabinets. After I painted the ceiling, I left to work on another job while the paint was drying. Unfortunately, I didn't return to take the tape off the kitchen cabinets until about a week later. That's when I learned my lesson.

When I peeled away the masking tape, the imitation wood on the cabinets came off with it. When masking tape is left for a week or so, the sticky stuff dries out. Then it hardens and stays on whatever surface it's been stuck to.

Did I have to buy new cabinets to replace the ones I'd ruined, or did I somehow repair the damage? I was actually able to fix the problem with several bottles of craft paint close to the wood-grain color. By mixing them, I was able to match the original wood pattern. I got lucky — it could have been an expensive lesson.

18

OUTDOOR WORK

In the course of my contracting career, I've repaired several decks and porches over and over — the same ones. In case you're wondering, I did the repair work correctly; the homeowners simply had done bad finishing jobs on the decks or porch surfaces. So, in this chapter, I'll share my secrets for decks and porches that *don't* have to be fixed on a yearly basis. I'm also including solutions to problems caused by aging — which eventually will affect every exterior wood surface.

The Long-Lasting Deck

Using regular paint on a deck or porch is one of the worst things you can do. Yes, exterior paint works fine for siding, windows, doorframes, etc. But it breaks down when applied to horizontal deck or porch surfaces. These areas are subject to constant abrasion. Walking around and moving deck furniture causes substantial wear and, inevitably, the paint begins to peel off. "But," you say, "there's paint made especially for porch surfaces. It says *PORCH & DECK* right on the label." Well, even this might not stand up on deck surfaces. Here's why.

Bacteria can only survive in a moist environment. It slowly eats away the interior of the wood. That condition is known as *wood rot* or *dry rot*. In order to prevent this, lumber for decks is treated … impregnated with chemicals to stop any organisms from growing inside it. But surface coating can't be applied immediately to freshly-treated wood — it's important to follow the directions when painting or staining treated wood. The chemicals protecting the wood temporarily moisten it. If you try to apply the surface coating too soon, it won't stick. Which leads me back to why I get repeat business.

> *"Lumberyards sometimes suggest waiting many months before painting a new deck, to allow the chemicals to dry completely."*

When paint begins to peel off wooden decks, I'm called in to do repairs. Nine times out of 10, the wood surface was painted too soon. Lumberyards sometimes suggest waiting many months before painting a new deck, to allow the chemicals to dry completely. This waiting period depends on the type of wood as well as the local humidity. Once the chemicals are out of the treated lumber, the grain opens up and the new finish will penetrate better. This could take up to a year!

There are alternatives to deck and porch paint that give better and longer-lasting coverage, and they are just as attractive. Stain does an excellent job of coloring and protecting deck surfaces. It penetrates the surface of the wood, so it doesn't wear off like paint. You can get either transparent or opaque formulas. There are a number of well-known manufacturers that make durable products for deck protection, though you still have to wait for the wood to dry out completely. Do your research on what products will best suit your customer's needs.

Wood Surface Protection

A local doctor called one day and asked me to help him solve a problem. He'd gotten his deck stained the year before but, after one winter, the stain had peeled off in many spots and looked terrible. I went to the local paint store where the stain had been purchased.

If you're a newcomer to deck repair, you'll be amazed at how much there is to correctly preparing the surface and applying the various products. The premature peeling the doctor experienced wasn't the product's fault. The workmen who applied it evidently skipped some of the steps required to make the protectant effective. As a result, the deck surface had virtually no defense against normal wear and tear.

The product they used is applied in a three-step process, which makes it very durable. Two of the coats are primers. Apply one coat, wait a day, then apply the second. You may have to wait a couple of months before applying the final stain. This gives the first coats a chance to cure on the surface so the final coat adheres well. In this case, the original workmen made mistakes: they didn't apply one of the first two coats of primer, or they didn't wait long enough before applying the stain coat, or perhaps they didn't clean the deck well before applying the coatings. At any rate, the original coats of product had to come off before I could start the new process.

Pressure Washing

How do you remove all that treatment down to the bare wood? Sanding or scraping would take forever. But with a pressure washer, I could blast the stain off in no time. I rented the pressure washer and soon found out it comes by its name legitimately.

I hooked up to the hose bib. The pressure washer came pre-set at 250 pounds of pressure (I was cautioned not to go any higher than 400). I held the spray nozzle about a foot away from the deck surface, and let 'er rip.

The stain literally peeled off in strips as I played the sprayer over the deck surface. The pressurized water blasted the coating right off. No wonder I'd been told not to go any higher than 400 pounds. I'll bet that much pressure could blow the wood itself away.

Next, I washed the deck thoroughly with TSP, which you can find in any hardware store. Start by reading the product Material Safety Data Sheet (MSDS). It's available from the manufacturer online or provided wherever you buy the TSP. Put on eye protection and your rubber gloves, and mix it with water in a well-ventilated space. Why wear protective gloves? Because, used full strength, TSP dissolves paint or varnish right off of wood. It's definitely not good for your skin. Apply with a scrub brush. Dissolving the stain completely off isn't what you want to do, though; you just want to rough up the surface enough to get good adhesion for the wood protector.

PRESSURE WASHER SAFETY

Follow all the safety instructions and caution stickers on the washer.

- *Wear safety goggles and closed-toe shoes.*
- *Protect yourself from any possibility of direct spray, and never point the gun at another person or animal.*
- *Never allow children to play near a pressure washer when it's in use.*
- *Use the proper high-pressure nozzle so you don't damage the wood surface.*
- *Before you begin, test wash a small hidden area.*
- *When using an electric pressure washer, be sure you plug it into a properly grounded GFCI outlet.*
- *Hold the gun assembly firmly and properly when spraying.*
- *When not spraying, engage the safety latches to prevent accidental spraying.*
- *After turning off the pressure washer, always release any pressure by squeezing the trigger – before you disconnect the hoses and nozzles.*
- *Use caution when moving the washer. The engine and motor can get very hot after an extended use.*

After power washing, you *must* allow at least three days for the surface to dry before applying the first protective coat — longer if it's cold or humid. Pressure spraying gets water much deeper into the wood, so it takes longer to dry out. You want the wood completely dry before you apply the coating. A few days later, I applied the first coat of primer. The next day, another coat. Finally, when the time was right, I applied the finish coat.

If you're going to repaint, and need to remove old coating, I highly recommend using a pressure washer. If the old paint is peeling and loose in spots, you can blast it right off. But remember to set the pressure way down. You don't have to blast all the old paint off — only where it's peeling. Be especially careful when spraying next to any trim. You don't want to damage the finish with a high-power spray. You could also tear the screens right off the windows if you're not careful. Experiment a little. Find out how much pressure you need. Pressure washers can be a valuable time-saver when used properly.

Repairing Worn Deck Surfaces

Keep your customer from having to replace his decking or deck stair planking. It's common to see badly scarred lumber on the surfaces of a deck and stairs. Grain runs the length of the lumber and, in time, the grain opens along the lines where the wood isn't as dense. As wood ages and dries out, the surface opens along the entire length of the cracks. Once the grain opens, the situation gets worse very quickly. The cracks hold water after it rains. As the lumber swells, the cracks widen. In the winter, the water in the cracks freezes and expands, widening the cracks even more. Obviously, something has to be done to stop the constant deterioration of the wood.

The obvious and ideal solution is to replace the decking and stain it properly. But most of the customers I seem to get aren't up for that. They want me to fix what's there. I get called because I'm Mr. Fixit, not Mr. Replaceit.

I used *Durabond 60* or *Evercoat HomeFix Universal Strength Repair* to fill the cracks and restore the decking. I spread the material on each plank with a wide putty knife, forcing it deep into the cracks. If you do a clean job when you're spreading, it will need very little sanding. Yes, it's going to take a lot of the material to fill all the cracks in the deck grain. But spending money on this is still a lot cheaper than replacing all your client's deck and stairs. To finish, use opaque stain to match the wood, or simply paint it instead.

Deck Postholes and Underground Utilities

When you build a deck, you usually place its supporting posts about 4 feet apart. That means there's a post 4 feet in every direction under the deck. So, what does that tell you? There's a pretty good chance that one (or more) of the posts will be directly over a buried utility line. Most cities have utilities underground, such as cable TV, water, sewer, and electrical.

I recently constructed a 30-foot deck, larger than I normally build. I'd never had the problem of running into anything, so I didn't think to contact any agencies about underground obstacles. Well, this time my luck ran out. Generally, cable TV, gas, and electrical lines are required to be about 2 feet underground. Postholes here in Michigan — and other frost-prone areas — have to be down 4 feet. Maybe your digging requirements are similar.

I was at the bottom of the sixth posthole when the owner's wife opened the door and said the TV had suddenly gone out. She called the cable company while I used my cell phone to call the local underground utility hotline (every area has its own name for this — in my neck of the woods, it's "Mrs. Dig"). I was told that a representative would arrive shortly to mark the location of any hidden utility lines.

The fellow came out with a special device, similar to a metal detector, and walked the site where I'd been digging. He marked the ground with spray paint and flags wherever there was something underground. Of course, I already knew that post #6 was over a cable TV line. Then he marked another location where I'd intended to put a posthole. It was directly over a power line. So, before using the posthole digger, I dug down by hand until I uncovered the electrical cable. Once I knew the location of the wire, I dug the posthole alongside it.

Concreting Deck Posts Quickly and Easily

When you need only a little concrete for a project, use Quikrete®. It's a dry mixture of sand, gravel and cement, sealed in small bags. All hardware and building supply stores have it, or something similar. It's reasonably priced and eliminates the waste you'd have buying from a concrete company. And you won't have to shovel the mix out of a truck, into a wheelbarrow, and place it where you want it.

To Quikrete deck posts, all you need is a sheet of plastic about 6 feet square, water and a bag of Quikrete. Lay the plastic alongside the posthole. Pour the Quikrete onto the plastic. Make a small depression in the middle of the mix with a shovel. Pour water into the depression and start mixing the concrete. Watch that the water doesn't trickle out of the depression as you mix it. If you're careful, you can mix up all of the Quikrete without losing any water. Don't let the mix get too thin. You want it fairly stiff, like bread dough.

If you simply pour the concrete into the narrow posthole, it won't provide support for the post. I use a narrow shovel to widen the hole at the bottom. An additional inch in diameter is enough extra space to give a good foundation at the bottom of the hole.

Now, lift the plastic and dump 3 inches of the Quikrete into the posthole. By enlarging the posthole at the bottom, you've made a much wider pad. Carry the concrete on the plastic to the next hole and repeat the process. Do this at all the postholes. Then let the concrete set up for a few hours. You want it to be stiff before you set the posts, to make a solid pad for them to rest on.

If you had put the posts in right after you poured the concrete, they would have sunk down to the bottom of the hole, and had no extra support whatsoever. After putting the posts on the firm concrete pads, you can completely concrete them into the ground. The concrete footings are important elements that support these posts and the deck you're about to build.

Posts for Railings

This will save you a lot of time when you're making a straight line of posts for a deck railing. The biggest mistake you can make is to try and get each post level with the others as you put it in the ground. Don't even bother. Here's a foolproof way you can save some time.

1. Corner posts always go in first. To make sure you have the tops of all four corner posts level, when you've put in the first one at about the height you want, put in the other three all a little bit higher. Then stretch string lines tightly from the top of the first corner post to the tops of each of the others, and hang a level on each line. Gradually lower the end of the string line on the second, third and fourth posts until the bubble on the level is centered, and mark the spot. Use your square to draw a line all around the post, then saw it off. Now the tops of all your posts will be exactly level.

2. Stretch stringlines across the top of each post to use as a guide to dig the postholes for the posts in between. Then set each of the in-between posts so the tops are a little higher than the stringline. Of course, you need to use

your level to make sure all the posts are exactly vertical — don't trust just your eyes.

3. Once the posts are firmly set, snap a chalkline from the tops of the corner posts to mark where to cut off the in-between posts. Use your square to mark all around each post. Be very meticulous in this entire process — check and recheck. If one ends up a little short, you'll either have to patch an extra piece onto the short one, or cut down the others to match. Neither option is good.

4. With a circular saw, cut all the posts off at the line. Although you have to be careful, this is a lot easier and quicker than trying to get them in the ground at exactly the same height, don't you think?

Cutting True Corner Posts for a New Deck

If you've never built a deck, this next bit of information may seem elementary to you. What's the big deal about making deck corner posts? Well, two posts are commonly used at a corner. 4 x 4 deck posts are always notched out 1¾ inches, or halfway, so the posts rest on the surface of the deck, halfway in. This is fairly easy to do if only one cut is needed on the side of the post. But if it's a corner post, it seems almost impossible to make a 1¾-inch notch in both directions. It *is* possible, though, and can be done in a few easy steps:

- Start by drawing two lines 1¾ inches in on a corner of the post. These lines are right in the middle of the post. They will go up as high as the top of the notch you're going to cut. How far up do you draw these lines for the cutout? It depends on the height of the deck framing sides. If the sides of the deck are 2 x 10s (9½ inches high) and the deck planking is made from 2 x 4s (1½ inches thick), the cutouts would be 11 inches high (9½ plus 1½). The height depends on your framing and decking material. Square off these lines at the top as far as the post corner.

- Next, set a circular saw for a 1¾-inch-deep cut. Do this by placing the saw blade against the edge of the 4 x 4 corner post and adjusting the blade height so it comes down to the 1¾-inch pencil line. When you make the cuts on the two sides and at the back, the cut will be exactly the depth you need. But since the blade can't get all the way down at the end of each cut — because of the curve of the blade — how do you get rid of the uncut corner wood?

- Start by drilling two holes in the corner alongside each other with a 1-inch spade bit. Get the holes as close as you can to each other. When you drill the first hole, try to position the spade bit so that it drills right up to the pencil lines by the corner. Do this again in the corner on the other side of the 4 x 4. If you've done this correctly, there'll be very little wood left in the corner. You can easily remove the remaining wood with a sharp chisel. A little extra attention will give you a nice inside corner. You'll be surprised at how easy it is to make a perfect corner notch inside the post.

Straightening Warped Deck Planks

Straightening warp as you nail isn't easy, but the solution is simple. All you need are a broom handle or large dowel and spade bit.

Attach the bit to the end of the broom handle or dowel. Pound the tip of the bit into the joist beside the warped edge of the plank, and pry the warped board over while you nail it. The same hand that holds the tool in place can hold the nail. Then just pound the nail in. You could even use a large screwdriver, chisel, or pry bar. But if you're building a deck of any size, it's to your advantage to put this simple tool together.

A Redwood Deck and Privacy Fence

This solution applies to any type of wood, even though I'm talking about redwood in this example. Although lumber is no longer cut from redwood trees, you might still be able to buy it at some lumberyards. Redwood isn't only hard to get, it's also very expensive. In this next job, we had to track it down from lumberyards in several different states to get enough to build a deck and privacy fence. Because of its scarcity, we needed to make use of every foot. So when we finished the deck, we moved on to the privacy fence, where we used not only the wood purchased specifically for the fence, but also the leftover scraps from the deck.

We used up the short pieces of redwood by alternating them up and down with longer fence boards. If the whole fence had been made of short pieces, or if the short pieces had all been in one location, it would have looked awful. But by alternating the short strips, the fence looked great.

Batten boards behind the ¾-inch redwood face boards provided something to screw the board ends into. Almost all the scrap boards were

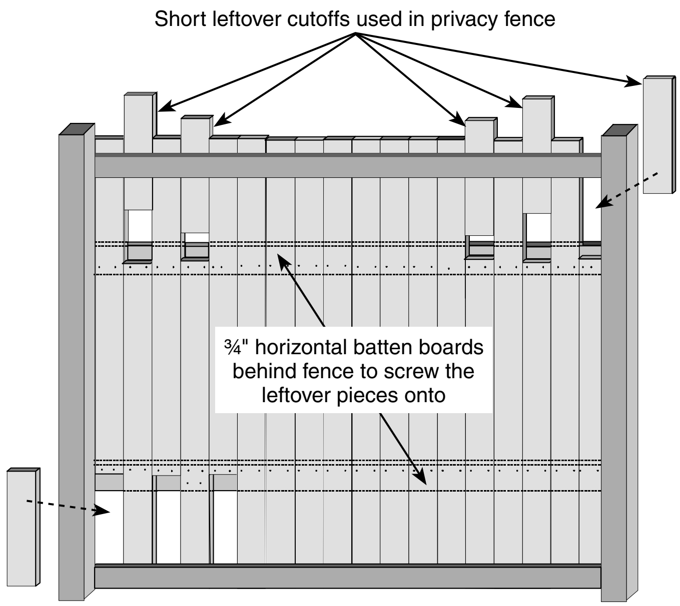


Figure 18-1
Alternate short pieces of fencing, and attach to batten boards

the same length, so two batten boards (one up and one down) were all I needed to use. All the joints fell in the same locations, but from the front, the board lengths always alternated, giving a pleasing effect. Figure 18-1 illustrates what I mean. Not only did I use all the redwood I bought, I was able to hold the amount needed to a minimum.

Built-in Deck Seating

This next idea gives your customer convenient seating outside his deck area. It increases the usable space and actually makes the deck feel bigger all around. As Figure 18-2 shows, the seating is slanted outward, and the framing for the seat planks is screwed to the deck's outside frame.

These seats take the place of the regular railing. Why bother cluttering up the deck with chairs? Built-in seating is so much more convenient. First, make a sample back-brace shape from corrugated cardboard. The back braces can be tricky, so modify the pattern until you've got it right. The angle for the back slant of the brace is critical. Don't slant it back too far.

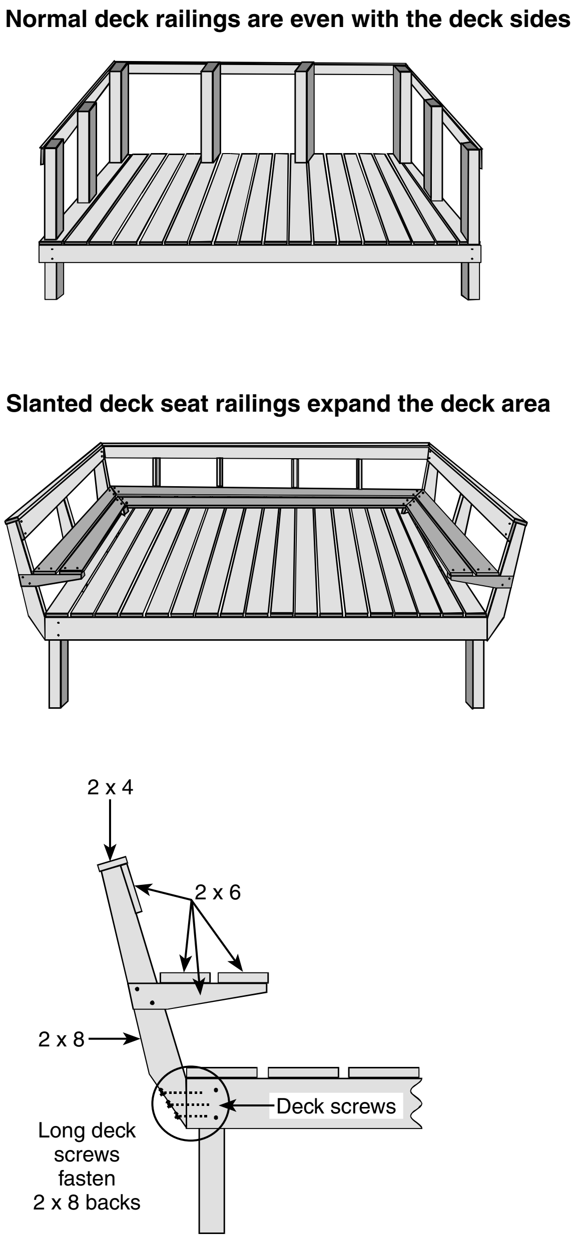


Figure 18-2
Converting deck railings into a seating area

Cut only two of the slant back braces first. Attach them to the outside of the deck, and screw on the gussets that hold up the seat. Drill a starter hole with a drill bit that's just a little smaller than the screw shank diameter. You need these holes to put the screws in at the right angle. Fasten the seat braces to the outside of the deck. Now have your client sit on this temporary seat to try out the angle before you make the rest of them.

It takes ingenuity to make an angle brace for seats that continue around the corners of the deck. This brace will be completely different from the rest. It has to be notched near the bottom to meet the corner of the deck. If your client opts to have seating on all sides, here are some hints to help you get the corner brace right.

1. First, install the slant braces on adjacent deck sides, including the last regular brace near each corner.
2. Temporarily tack the top 2 x 4s (the railing tops) to the braces, so they meet at the corner.
3. These corner miters will take some altering too, because the 45-degree miters will *also* be angled. Make these cuts now. They'll probably be compound miters, so you'll have to find the right angle setting on your circular saw. Not only will you have the regular 45-degree corner miter at the top of each 2 x 4, but the side of each 45-degree miter will have to be angled, too. This means you'll be cutting and re-cutting the end of each 2 x 4 until it fits at the corner. Having the bench backs tilt right to the outer corners looks great, and is worth this extra time and trouble.
4. Fit the 2 x 4s into the corner first. That gives the basic shape for fitting the angled corner braces. It helps to cut and temporarily tack one of the angle braces close to each corner. When figuring the corners, you'll save yourself a mountain of trouble by making up a cardboard pattern. You know the basic shape of the pattern will be the same as the other back braces, except the corner brace is longer.

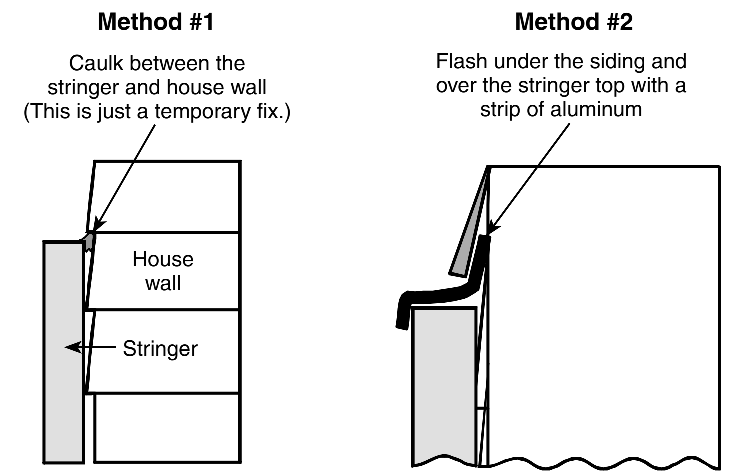


Figure 18-3
Two methods for sealing the joint where the deck meets the house

So, make the cardboard pattern a few inches longer, and fold the ends over.

5. Experiment until you find the correct angles at top and bottom. You only have to make one corner pattern — all the other corner braces will be the same. You may screw up the first corner brace before all the trial angles are cut, but don't feel bad. Nobody gets something like this to fit perfectly the first time. But the first piece you cut will show you what to change on the second try.

Flashing Joints

Remember to seal the joint where the deck meets the house. Decking is made of treated lumber, which is rot-resistant, but the deck stringer bolted to the house wall isn't. Water is bound to pool at that joint after every rain, and moisture will get trapped somewhere between the house and the stringer. Sure, the treated wood won't rot, but sooner or later the constant dampness between the stringer and house wall will cause major headaches.

As shown in Figure 18-3, there are a couple of ways to handle this. The simplest, but temporary, solution is to caulk the joint between the house and the stringer. But the proper fix is to flash over the stringer top with a strip of aluminum. Install the aluminum flashing before you put on the decking boards. The aluminum goes up behind the last piece of siding above the stringer. Then the flashing covers the top of the stringer along the wall and bends down over it.

If the bottom of the last row of siding ends just above the stringer, the aluminum strip will be out of sight behind the decking. If the next siding row is a few inches above the decking, the aluminum will show a bit. Remind your customer that you can always paint the flashing to match the siding or the house.

A good job of caulking will take care of the problem temporarily, until the aluminum drip channel can be installed. Just remind your client to check the caulk joint regularly until then. Caulking eventually shrinks, and if the caulk is very wide, it'll probably open up in the middle of the caulk line.

Reinforcing a Hot Tub Platform

On another job, the owner wanted the lip of his hot tub to rest on top of his deck. Without reinforcement, the weight of the water-filled tub would pull the whole unit through the deck. But I had a solution — I built a concrete footing for it to rest on, so the weight of the filled hot tub was on the footing and not the deck. This allowed the hot tub to look like it was suspended, while still providing the proper support.

You can get around this weight problem another way. To support a hot tub on the deck planking itself, you've got to reinforce the deck frame around the tub to handle the extra weight. Needless to say, a full hot tub is pretty heavy. Beneath the hot tub, put extra 2 x 10 joists under the regular deck joists. Space 4 x 4 legs every 4 feet alongside the 2 x 10s. These legs support the weight of the hot tub. (See Figure 18-4.) If you're in a frost-prone area, put the legs the required depth beneath the surface; in Michigan, it's 4 feet. You can see clearly in the illustration how this reinforcement allows the deck planking to support the weight of the hot tub.

Building a Deer Fence

Here in upper Michigan, we have a deer problem. They're everywhere, even in the city limits of small towns. Installing a deer fence will keep them out.

How high should a deer fence be? Believe it or not, at least 8 feet. That may surprise you if you live where deer are scarce. But any hunter can tell you that adult deer can jump nearly that high if they feel like it. If a fence is any shorter, it won't keep them out for long. But building a fence 8 feet high can be a problem.

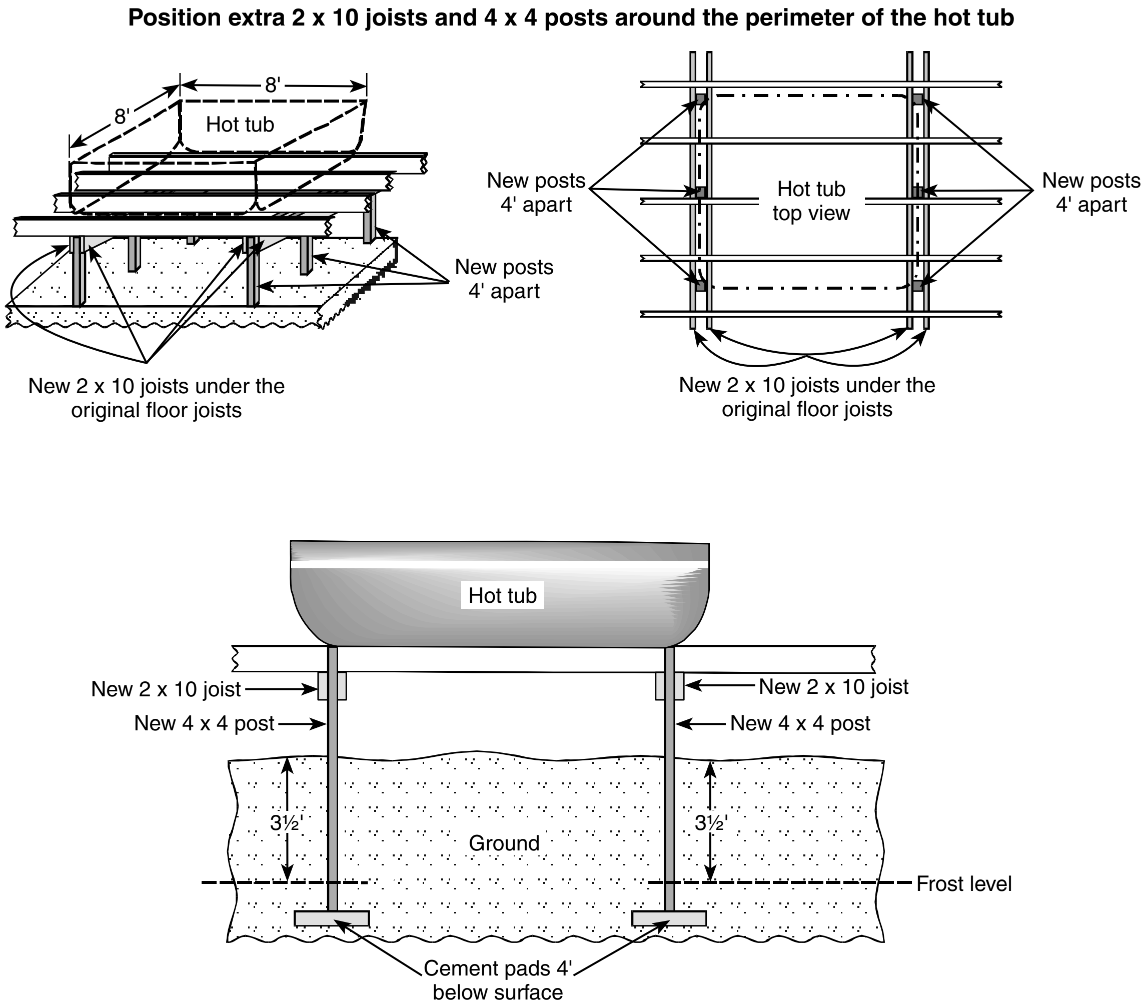


Figure 18-4
Reinforcing a deck to support a hot tub's weight

The best type of fencing to use for deer is commonly called *pig wire*. It's heavy, galvanized wire that's formed into 4-inch squares, and comes in rolls. Before installing the wire, unroll it and straighten it out. Walk on it to flatten it. It'll take a lot of flattening to make the fencing look decent.

Stretching the wire up in place puts a lot of strain on the corner posts. With two rows of this fencing, one piece above the other, there's double the strain between the corner posts by the time you've stretched it and stapled it on the posts. The strain literally pulls the corner posts inward at the top. So you can't simply put the posts in vertically — instead, you have to install the corner posts slanting outward at the top. I can't say how much the posts should slant on your job, because that depends on many factors. But, for instance, if you're putting in a 20-foot deer fence, a good rule of thumb is to slant the posts outward about 6 inches from vertical.

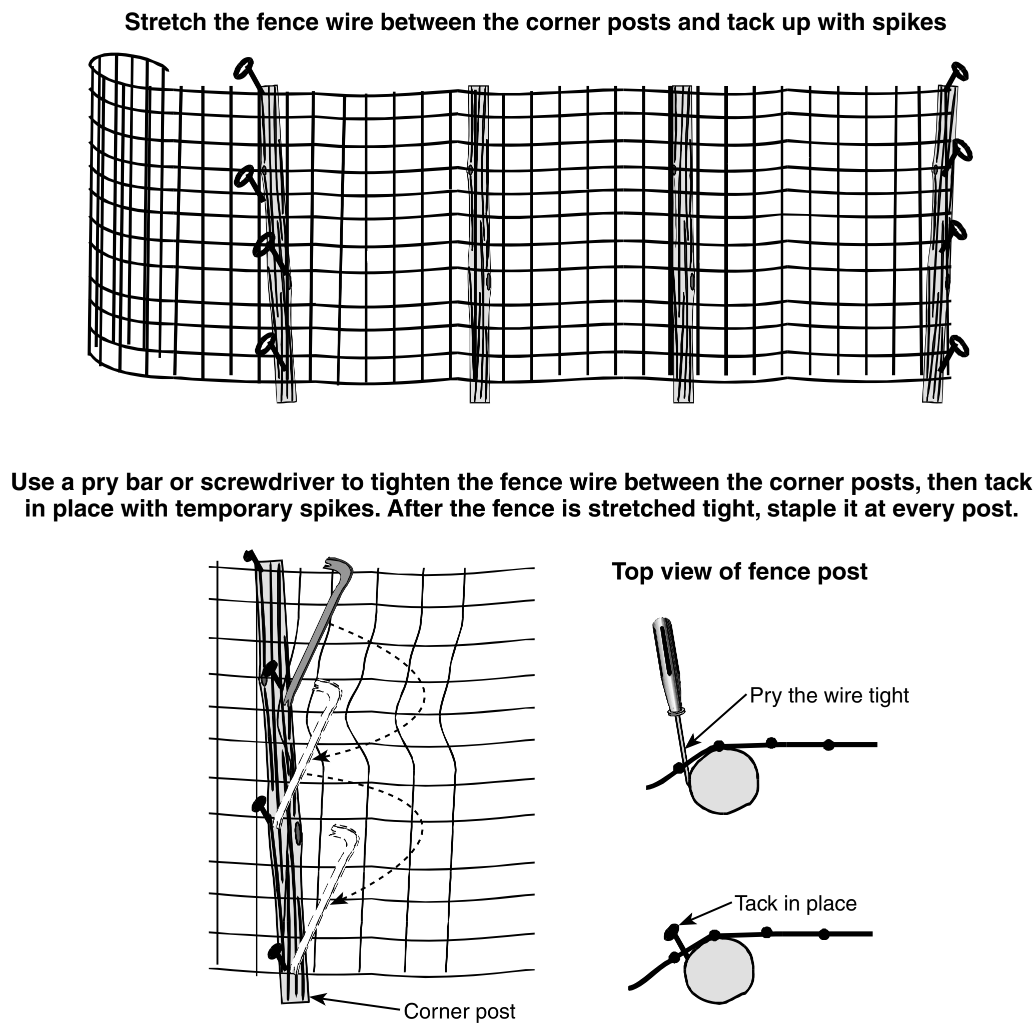


Figure 18-5
Building a high fence

You could staple the wire from post to post. But it's a lot easier to start with a few nails to tack the wire up from the starting post to the corner post; see Figure 18-5. The nails hold up the wire in the general area where you want it. The fence will probably have two gateposts (one for each side of the opening), so it's best to start there. You can put all the staples in permanently at the first gatepost.

Go down to the first corner post where you tacked the wire up temporarily. The proper tool, of course, is a come-along. If you find you're doing a lot of wire fences, it's worth it to buy yourself a good one. Don't buy a cheapie — they're not worth the money. But if a good come-along isn't in the cards for you, as it wasn't for me, you can manage just fine using the tools you have. Here's how: With an awl or screwdriver behind the wire at the top, drive your tool into the post, making sure it's secure. Pry the wire as tight as you can. Then put an angled nail behind the wire to hold it. Move down the post a few inches and repeat, tacking the wire in place with another nail. Continue to the bottom of the post. The fencing should now be fairly tight between the gatepost and corner.

By the time you get to the bottom of the post, you might find the wire pulled so tight that it's loose again at the top. Don't be discouraged … that's what you want. You're successfully tightening the wire. Go back to the top of the post and repeat, tacking at each location. You might have to do this a couple of times before putting the staples in. When the fence is close to being tight in most places, put a second staple in before starting, so the wire won't pull the first one out as you tighten. Now you can use a little trick of mine.

Tighten the fence more where it needs it, with slip-jaw pliers. (Regular pliers work, but not as well.) Grab the wire with the pliers, right next to the staple. Twist the wire up horizontally about an inch. This puts a crimp in the wire that tightens it even more. Do this at all the staples where the wire is still loose. This does a great job of tightening, and you don't need to remove any staples to do the work. When you've tightened the wire enough, you'll know it — any sagging will be gone. If the wire is curved badly in spots, straighten it out with your hands. Now do you see why it was necessary to tilt the corner posts outward a few inches? The tightness of the wire pulls the posts in, so they're straight.

Fence Reinforcement

Since we're talking about how to make fences stronger, here's a tip for you. I built an 8-foot privacy fence onto the back of a client's deck to shield his hot tub from view. But after the fence was up, I suspected it might not withstand high winds. Here's why.

I had extended the 4 x 4 posts at the back of the deck so that they were 8 feet above the deck. They were sunk into the ground and nailed to the deck sides, and extended up to support the back deck fence. These posts were spaced every 8 feet. That was fine for the deck, but the 8-foot-high solid board fence would blow away like a huge kite in the wind. High winds exert terrific force on a solid fence. I had to do something to strengthen the fence.

Since the owners wanted complete privacy, there was no spacing between the boards. I ended up reinforcing this fence every 4 feet, between the 4 x 4s. I used 2 x 4s, on edge. They might spring a little in high winds, but would keep the ¾-inch boards from blowing off. Actually, the kind of wind we get here on the lake in Michigan isn't what your customer might get where he lives. So always get advice from someone locally. I'd hate for you to reinforce your customer's fence inadequately.

Facelifts for Antique Porch Posts

Older houses can have beautiful woodwork. If you want to see an excellent example of fine craftsmanship, look at the porch of an old house that has turned posts and spindles. As a house gets older, though, these exposed porch posts are the first things to deteriorate.

This section will show you how to repair them, since finding new posts to match the old ones is almost impossible. You know the kind I'm talking about — those huge turned posts. Even 4-inch turned posts cost a lot, and the price of 6-inch posts would shock you. Well, many old houses have porch posts that are 10 inches or more in diameter. Obviously, there's no cost-effective way to replace them. You probably couldn't come anywhere near matching the woodwork, size and shape. So you couldn't replace one or two — you'd have to replace them all, for the sake of consistency.

Rot begins at the bottom of the porch posts. Sometimes only one of the posts is in really bad shape, but it generally turns up at the front of the porch. Unfortunately, since the post could have been made 80 years ago, the cost of making a duplicate would be astronomical.

I've come across this problem more than once. The best solutions I've found are shown in Figures 18-6 and 18-7. The materials didn't cost much, and the fix-its just took a little carpentry skill.

1. Before posts can be repaired, they have to be taken down. That involves jacking up the porch roof next to the bad posts to support the weight of the roof when you take down the posts. Put a solid platform under your jack before you start, or you could find it sinking into the ground. Pull out any nails from the top and bottom of the post before you begin lifting the roof. Don't jack along the roof edge; use the long beam at the front of the porch. Again, avoid putting your jack on grass, where it will sink.

2. Once the post begins to pull free, tap it from side to side with a sledgehammer. It will wiggle at the top or bottom, so you'll find the location of the nails that you need to pull. Before you remove the post, be sure to tighten the jack, or place a 4 x 4 post under the porch roof beam, in case the jack should move.

3. As Figure 18-6 shows, 10 inches had rotted badly at the bottom of the post I was repairing, which happened to be about 6 inches square. I had a short piece of treated

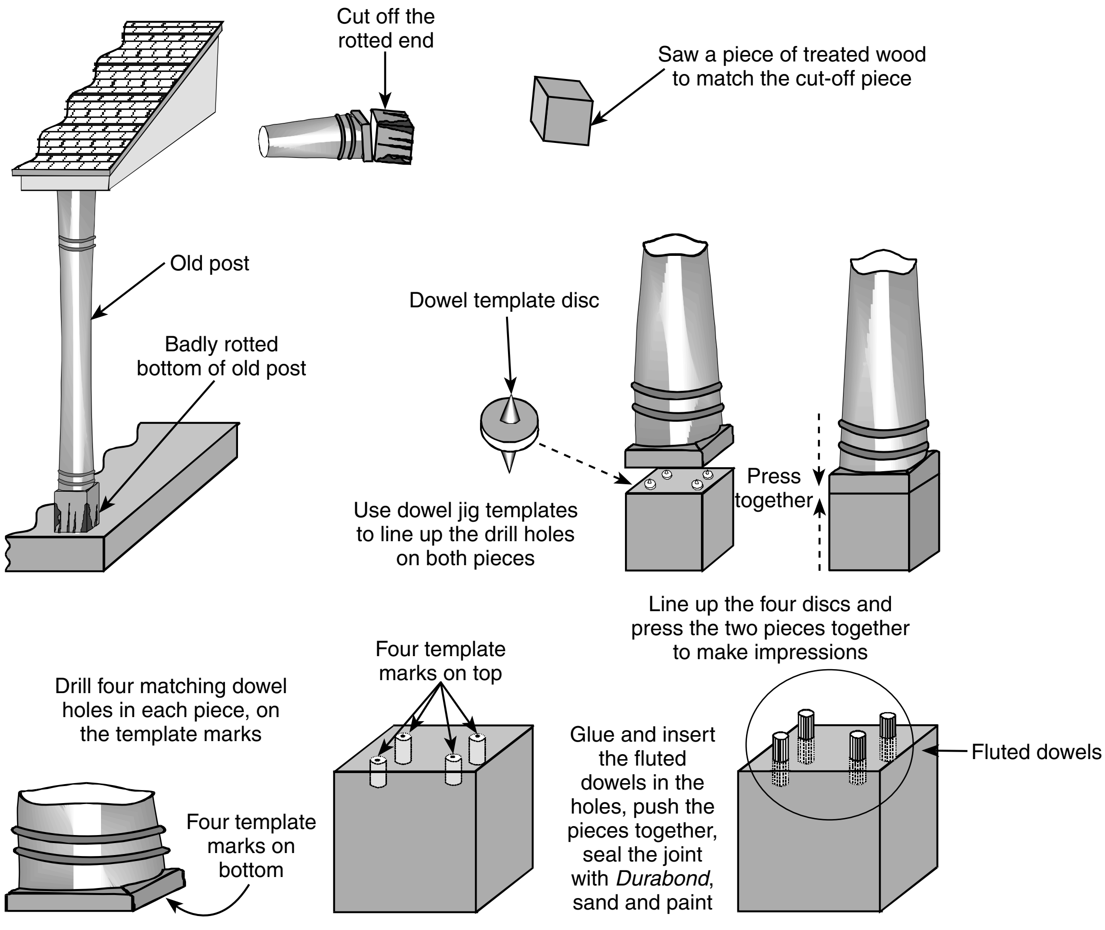


Figure 18-6
Replacing rotted porch post ends

6 x 6 left over from another job. I cut a little off two sides to make it match up with the size of the original post bottom. Next, I marked just above the rotted part and sawed it off.

4. You'll need a set of dowel jig templates. The templates are disks, each about the size of a dime, with a pointed projection in the middle at top and bottom. They come in packages of four. You'll need the same number of fluted dowels as dowel jig templates.

5. You've probably guessed the purpose of the dowel jig templates. You'll use them to make marks to drill holes for dowels in the post and end block you just cut. As Figure 18-6 also shows, these four metal templates go on the top of the block. Lower the end of the post onto the top of the block, carefully lining up the end of the post with the end of the block.

6. On a stepladder, lift the top of the post and whack it down hard on the bottom block. This presses the jig templates between the post and block, and marks the spots where the dowels should go. Before you take the post off the block, it's a good idea to mark an "X" on the block and post so that you know which side matches up after you drill the holes.

7. The four indentations you've made in the end of the post and block are where you'll drill the holes. I recommend using spade bits because their sharp narrow tips are easy to set into each indentation. Using a ½-inch spade bit, drill the holes a little deeper than half the dowel length. Don't drill too deeply, because some dowels push easily into one hole but not in the matching hole on the other piece. You want the dowel to be equally embedded in both pieces when you're fitting them.

8. Apply glue to all the holes, set the dowels in place, and carefully force the post down over the dowels, lining up as you go. Believe me, this type of doweling is very strong, and once the glue dries, nothing is going to force those two pieces apart.

9. After the sections are joined tightly, apply *Durabond 60* or similar to the seams. Have your grater plane ready, and plane the filler material smooth as soon as it sets up sufficiently.

Filling Broken Sections on Turned Porch Posts

Sometimes the turned post is also rotting on the turnings. When the bottom of porch posts are rotted, you can bet there'll be sections of the fancy turned posts that are rotted, too. These can be re-formed into their original shapes by using filler material. As I mentioned previously, replacing old turned columns is nearly impossible. Even if a duplicate could be made, the cost would be prohibitive. But my method does the job quickly and easily.

Figure 18-7 illustrates how to shape a piece of wood to fill the section that's bad. This filler wood doesn't have to be the exact shape of the rotted section; it just provides the insides. Cut the shape from a piece of ¾-inch board with a saber saw. Don't make it any larger than necessary, you can fill in the gaps later with filler.

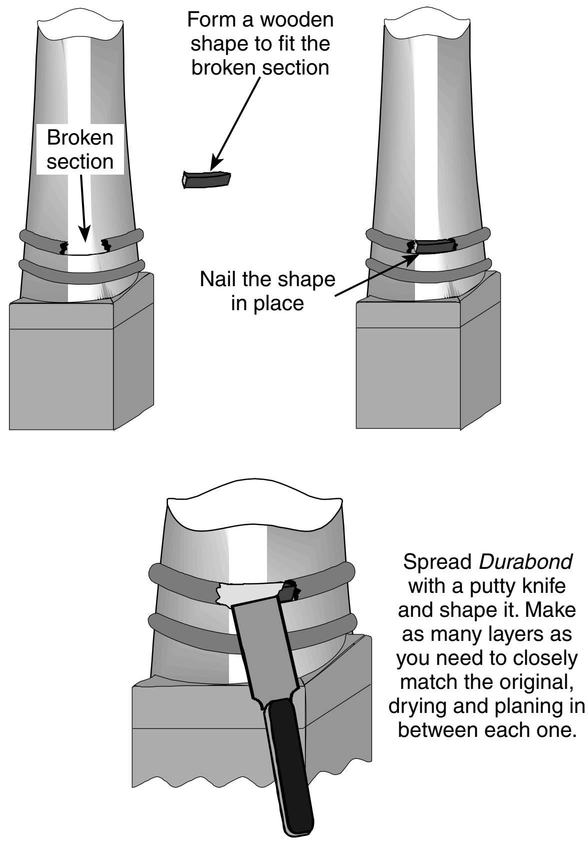


Figure 18-7
Repairing turned posts with *Durabond* or similar material

Next, nail the new piece into place. With a wide putty knife, spread filler material over the missing section. Don't overfill the area. Remember, filler tends to sag after it's spread — so make your layers as thin as possible. Keep your grater plane handy, and if the filler is too high in spots, plane it down. Just be sure it's set up enough before you start planing.

After the third or fourth layer, you should be close to the original shape. Your putty knife can follow the original shape on each side of the new insert, if the knife is resting against the original molding. Look again at Figure 18-7. *Durabond 60* conforms to the original turned shape in no time.

The Porcupine Porch Ceiling

The ceilings above small porches are usually nothing more than bare roof boards. When shingles are nailed to the boards, those nails show through the ceiling. Of course, if it's *you* nailing those shingles, you can avoid that by using shorter roofing nails. But what if your client's house was the victim of a haphazard contractor and has a "porcupine" porch ceiling?

I've seen old porches with as much as an inch of nail showing through. Obviously, that wasn't the look the customer was going for. "Take the shingles off," you say, "and use shorter nails to replace them." You'll agree that's too expensive when I tell you my easy fix.

Put 1-inch-thick foam insulation board on the ceiling side, using short roofing nails. The board covers any nails that are sticking through. Join the edges of the insulation board with a thin layer of *Durabond 60*. When it dries, you can paint the ceiling just like any drywalled ceiling.

Happy Endings

Now that you've reached the end of my book, I hope you've learned a few things. The methods in this book aren't a secret … so share them with your friends and don't be stingy. There will always be plenty of mistakes to fix!

I hope my book will be very helpful to new builders and repair people — so they can build and repair things and do them right the first time around. My teachers were not only the people who did repairs and new construction the correct way, but also the ones who made some of the mistakes. And I'm sure the mistakes weren't done on purpose!

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