Economical Wood Siding

Knotty grades are a lot less expensive than clear, but they are also less forgiving

By Norman Sievert

One way of lowering construction costs is to use less expensive materials or components. The trick is to find ones that offer a savings while still giving good service. In siding, this means knotty grades.

Most builders are used to clear siding — premium grades that are very stable dimensionally — and they're still the best choice if the budget allows it. But the decreasing availability of large, old growth logs is pushing the price of this material higher, encouraging a long-term trend toward knotty grades.

The amount you or your client can save by using knotty grades of siding varies a lot, but it can run as high as 50% or more. Although your labor shouldn't increase much, you should increase your takeoff slightly to account for extra waste. This brings the price to a little more than hardboard or vinyl, but still gives you the aesthetic appeal and performance of wood.

Pick Your Spot

Knotty grades of siding, however, are less tolerant of climatic changes and mishandling than their premium cousins. There are several reasons for this. First, knotty grades are typically not kiln-dried, and if the excess moisture is lost rapidly or unevenly, the material will cup, split, and check. Second, even with normal seasonal movement — at least 1/8 inch across the width of a 6-inch board — the knots and the compressed grain around them shrink and swell at different rates than the surrounding wood. This *differential shrinkage* can lead to twisting, cupping, and splitting.

Channel rustic is a wise choice in knotty grades because the wide channels readily accept seasonal wood movement.

All photos courtesy of WWPA

As a result, you have to be more selective about where you use knotty grades. Important factors include climate, the site's exposure to sun and prevailing weather, architectural style (the "look" you want), and type of finish. Even under the best conditions, you'll avoid some nasty problems if you stay with narrow widths, and choose one of the patterns that accommodates movement.

A simple rule of thumb is to look around the area and see if existing siding jobs similar to the one you have spec'd are performing well (see Figure 1). I inspected a house in Sun Valley, Idaho, this year whose 8-inch-wide, knotty, tongue-and-groove siding was shrinking badly. In this locale, the moisture content of wood stays down in the single digits year-round. The house, which faced south and west, was up on a mountaintop with constant exposure to sun and drying winds. The siding on the house next door, which was a few years older, was shrinking and cupping so badly you could see the building paper behind it in spots. This isn't an environment where lesser grades of wood siding, particularly in a wide tongue-and-groove pattern, are going to do well. Even premium grades struggle to perform under these conditions.

Installation and finish are also considerations with knotty siding. Although the recommendations for installing knotty grades aren't any different than for premium grades, it is less tolerant if you ignore some of the "rules." In general, a rough or resawn texture with stain is a safer choice for the lower grades of siding than a smooth surface and paint. Stain can accommodate more seasonal wood movement — it's not a continuous film like paint. And a rough texture provides more surface area for the stain to bond with. It also helps hide natural imperfections, and ones that develop with seasonal movement.

Species Selection

Over 90% of all sawn wood siding sold in the U.S. is either western red cedar or redwood. These two species are naturally resistant to decay, and are dimensionally very stable because of their low density. This means less shrinking across the width of the board, which results in less cupping and splitting. They also take and hold finishes very well, which means paint jobs look good longer.

You will, however, have to prime cedar and redwood with oil-base primer to keep water-soluble *extractives* from bleeding through to the surface, and store the siding under cover until the finish coat is applied. Also, in installations where decay resistance is important, such as areas that get wet from lawn sprinklers, use only the darker-colored heartwood of these species.

The majority of redwood siding is used in the West; in particular, its native California. Western red cedar is more widely distributed. It grows throughout the Pacific Northwest and is categorized by where it's grown: on the coast, or inland. The inland variety commands a slight premium because it typically has smaller knots (limbs just don't grow as big in the drier inland areas of Washington, Oregon, and Idaho), and is often sold S-Dry rather than green. Inland cedar is also a little lighter in color.

Other species used locally for siding in small amounts include spruce and eastern white pine (Northeast), southern pine (Southeast), and several other western species — ponderosa pine, western white pines, douglas fir, and hemlock.

Knotty Grades

Visual grades for knotty siding aren't determined by how many knots a board contains, but by how sound they are (see Figure 2).

Grading names are often confusing because there are a number of agencies involved who use different designations. The good news is that grading designations for western red cedar and redwood are fairly straightforward. The bad news is that most mills use proprietary descriptions instead.

The most common one for western red cedar is "STK,"

Knotty Siding Sins

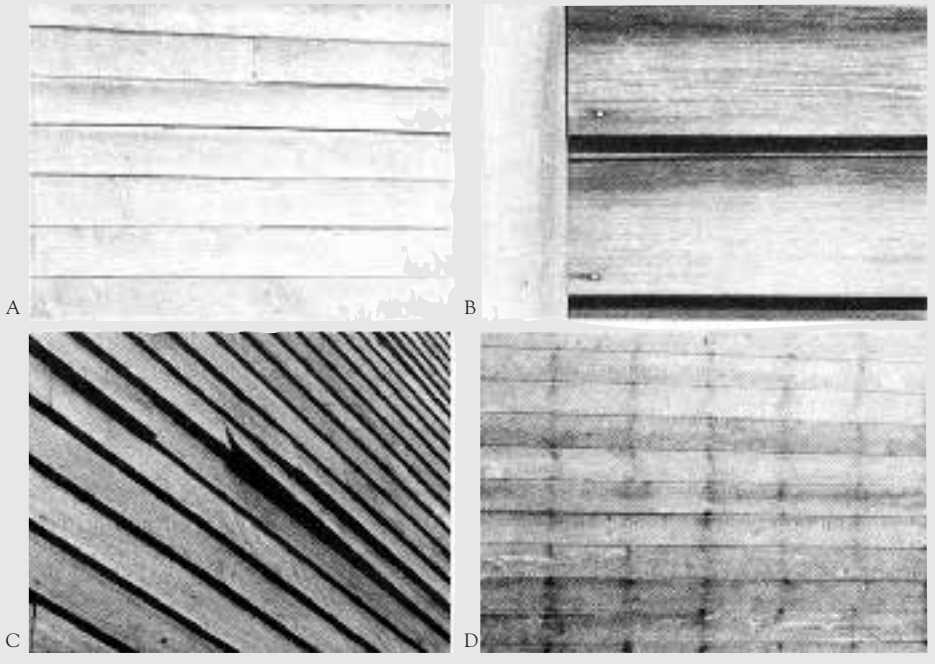


Figure 1. *Knotty Siding Sins.* *Knotty siding is not forgiving of errors. Picking the wrong pattern or installing it incorrectly will lead to problems:*

The 8-inch, knotty T&G siding is shrinking and cupping on this commercial façade in the dry Southwest (A). In such a dry, sunny climate, the contractor should have used a narrower pattern and one that allows room for seasonal movement.

Knotty clapboards (bevel siding) should have one nail only at each stud and no nails that penetrate both courses at once. Double nailing, as was done here (B), and nailing too close to the end, lead to splitting.

Nailing should bite 1 1/2 inches into sheathing and framing lumber. Nailing into sheathing only (C) will eventually result in the nails pulling out.

Nails aren't the place to save money on a siding job since they have to last as long as the material itself. In this case (D), electro-galvanized nails were used for the bottom half of this structure. Although the staining can be bleached out, the problem will begin to reappear the next day. High-strength aluminum or hot-dipped galvanized are good choices with knotty siding.

which stands for "sound, tight knot" or "select, tight knot." This means that all knots are intergrown — what lumber people often refer to as "red knots." However, because STK isn't an actual agency grade, the quality varies from mill to mill.

High-quality STK is generally equal to a *No. 2 Common* grade from the Western Wood Products Association (WWPA) or *Select Knotty* grade from the West Coast Lumber Inspection Bureau (WCLIB) or Canada's National Lumber Grades Authority (NLGA). These grades will look good and perform well over time if installed properly.

A lower quality knotty grade is equivalent to a *No. 3 Common* (WWPA) or *Quality Knotty* (WCLIB and NLGA). Quality knotty allows an occasional encased or "black knot" that may fall out after the siding dries. Some suppliers sell a mix of Select and Quality (No. 2 and No. 3) for their STK. You may want to purchase extra material with No. 3 and lower grades, and cut around any encased knots that could fall out later on.

Redwood grades are similar, and are sold under the descriptive term "Rustic Siding." As with cedar, the top grade is called *Select Knotty*, with the lower grade called *Rustic Knotty*. Rustic Knotty allows a much larger number of unsound knots than Quality Knotty, but most Rustic Knotty exceeds the grade minimum by quite a bit.

Because proprietary descriptions are used so widely, it's important to look at the material to make sure it meets your expectations. If your supplier stocks the pattern and size you want, ask him to break open a bundle so you can look through it. If you're having to order, ask to see samples and find out if your supplier uses a regular source. Many mills have built reputations for supplying knotty siding material that can be counted on for its consistency.

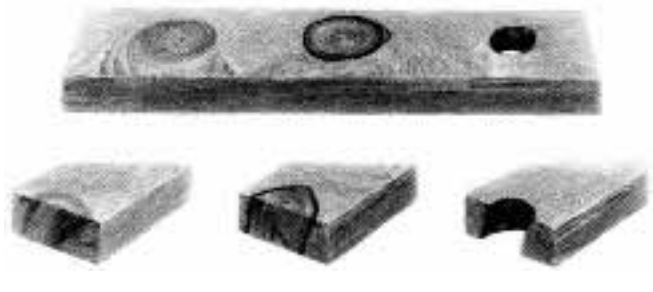


Figure 2. *In the grading process, knots are judged either sound or unsound. Sound or "tight" knots, at left, are intergrown and will not fall out. "Encased" knots, center, are allowed in lower grades, but cannot be counted on to stay put, right.*

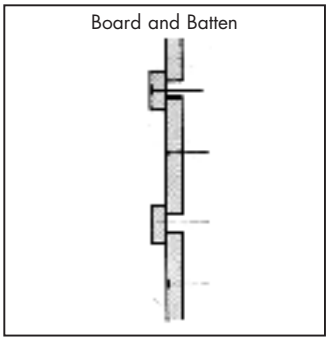
Patterns

Architects and homeowners typically choose a pattern based on appearance. That leaves the contractor as the only one considering performance. In knotty grades, this factor is crucial, so you'll have to consider the harshness of the local climate and the location of the siding on the building.

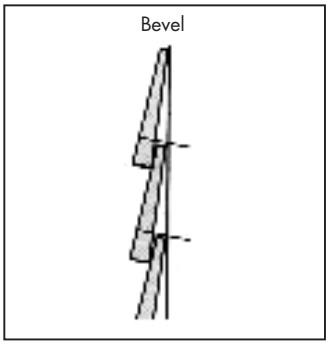
The first performance rule is that the wider the siding, the more shrinkage it will suffer. Narrower patterns shrink less, cup less, and are less likely to split or develop seasoning checks. Another rule is that thicker patterns also cup and split less than thin patterns. Some patterns such as *bevel* (*clapboard*) and *Dolly Varden* are offered in a variety of butt thicknesses.

But each pattern has its own characteristics and peculiarities that you should keep in mind when specifying knotty grades. The patterns illustrated below show nailing for boards 6 inches and under. Some patterns require a second nail in 8 inch and wider (see the section "Nails and Nailing," below). The main patterns are:

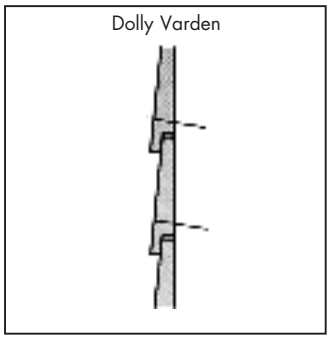
Board-and-Batten. The most forgiving pattern. Even at 12 inches, splitting is minimized because of its consistent thickness and the way it's nailed; and cupping isn't easily seen because of the shadow line created by the batten. It is produced in 4/4 and 5/4 stock in smooth, rough, or resawn at every width up to 12 inches. However, it can only be installed vertically, and has a very rustic look.



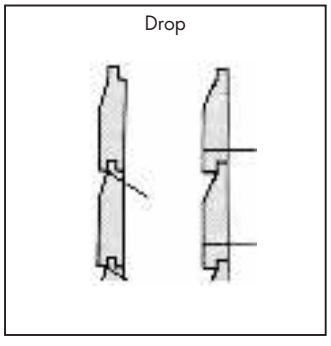
Bevel (Bungalow or Clapboard). Bevel siding in knotty grades works well at 6 inches and even 8 inches. But because there is a void behind this pattern just above the overlap, it's very easy to cup wide bevel siding by giving nails an extra blow or two. This is called *overnailing*. Price and quality are based in part on butt thickness; the range is 1/2 inch to 7/8 inch. The thicker the butt the better. The top of the pattern should never measure less than 3/16 inch.



In New England, some small specialty mills produce clear, vertical-grain clapboards in relatively narrow widths that are very dimensionally stable, but these are pricey.



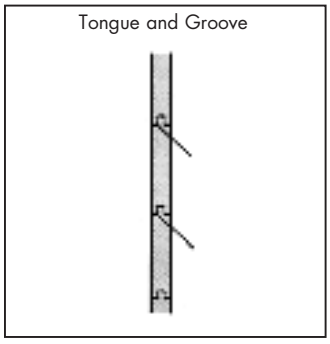
Dolly Varden. Not widely produced, but attractive and effective in knotty grades. Basically, it combines the benefits of shiplap with the look of bevel siding. Unlike a bevel pattern, it is less susceptible to overnailing since it lays flat on sheathing or studs. It is measured by butt thickness — up to 7/8 or even 1 inch in 6-, 8-, and 10-inch widths.



Drop. Drop siding can either be tongue-and-groove or shiplap. Used a lot in the South in premium grades and painted, it's not the best choice in knotty because it's typically produced in wider widths (6, 8, and 10 inches).

The shiplap version is superior to tongue-and-groove if there is a lot of seasonal movement, because each course moves independently. The tongue-and-groove version also has a greater tendency to show voids between courses with extreme shrinkage — the tongue is cut shorter than the groove it sits in — and the front edge of the groove is susceptible to breaking off with cupping.

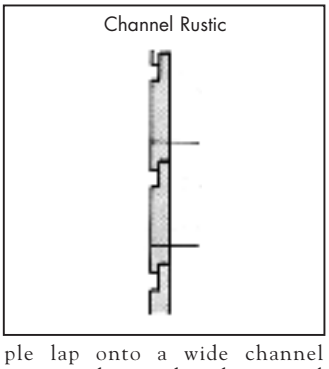
Double drops and other restoration patterns are premium products seldom made in knotty grades because they are typically painted.

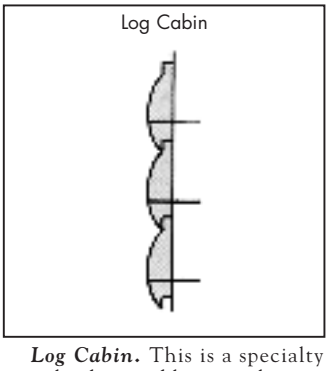


Tongue-and-Groove. Although it's very popular, the most unforgiving pattern is tongue-and-groove. Even slight seasonal shrinkage or cupping shows at joints. Unfortunately, it's a favorite with architects who specify it hoping to create a seamless, painted "skin" on the building exterior. To make matters worse, this look seldom includes rakes and eaves.

Milled in 4-, 6-, 8-, and 10-inch widths, it's best left to interior use in knotty grades in most climates.

Channel Rustic. A good choice even in wider widths because its simple lap onto a wide channel accommodates and masks seasonal wood movement. It's typically sawn 6, 8, or 10 inches wide with a thickness of 3/4 inch. Siding courses overlap 1/2 inch, leaving a 1- to 1 1/4-inch channel. It can also be used vertically.





Log Cabin. This is a specialty item, but has good longevity because it's thick and has a "counter cup" built into it. It's typically cut 1 1/2 inches thick at widths from 6 to 12 inches in ponderosa pine. Like most yellow pines, this species is dense, and checking is a danger if the siding isn't kiln-dried. It is also a resinous species, which means you have to seal off knots and pitch pockets that would otherwise bleed through the finish. It is always produced smooth.

Moisture Content

The moisture content is the amount of water in a piece of wood expressed as a percentage of the wood's weight (not volume). As wood loses or gains moisture, it will shrink or swell until it reaches equilibrium with the surrounding air. When it has to do this very rapidly or unevenly, the result is cupping, twisting, warping, splitting, and checking.

To keep this movement from creating havoc, the moisture content of the siding should match its final environment before it is installed. For instance, if the yearly range in an area is 10% to 14%, the siding should be at or near this *equilibrium moisture content* (emc) before it is installed. In most of the U.S., the emc gets as low as 7% to 8% in the dry season on the south or west exposure of a building. During the wet times of the year, the emc runs closer to 13% or 14%. However, some areas of the desert Southwest don't get much beyond the 3% to 5% range.

Knotty siding is classified as either *dry* or *green*; most is sold green. In knotty grades, "dry" indicates maximum 19% moisture and is often grade stamped *S-Dry*. Green or unseasoned siding is *at least* 19% moisture. *Air-Dried*, however, doesn't indicate a specific moisture level, although it's likely to be drier than the typical green siding.

If bought dry, you only need to allow a week or so for the siding to reach local emc. Green siding requires as much as four weeks. If you rush the process and install it too soon, you may end up having to start over because of resulting problems.

Stickering. To acclimate either dry or green siding, you have to break down the bundles and sticker each individual board with 1x2s. This practice is sometimes ignored with premium material (which is sold dry), but it's mandatory with knotty material to avoid problems later. The siding needs to acclimate where it's out of the weather — an open garage is ideal. If stacked over concrete, use 2x4s on edge to elevate the first course, and put plastic down as a vapor barrier on top of newly poured slabs before stacking the lumber. Do not surround the lumber with plastic or you'll just be keeping the moisture in.

If you can't accommodate the drying time of four weeks for green siding in your building schedule, don't be tempted to cheat. Just look for dry siding and pay the upcharge.

Backpriming. After the wood is dry, the next step in preventing moisture problems is *backpriming* — actually, applying a prefinish to *all* faces, ends, and edges to minimize moisture gain after it's installed. Priming the exterior faces of the boards before installation cuts down the moisture that's gained while the siding is waiting for the painting contractor.

Excess moisture gain on the back of the siding — either precipitation that has found its way beneath the siding and become trapped or interior moisture that has migrated outward through the wall — is a prime cause of cupping. Backpriming will help with this problem, and extend the life of the finish on the exterior. It also means you won't get a callback when the siding shrinks during the dry season and exposes areas that were hidden when the painter did his work. For this reason, it makes sense to use your finish coat material — clear water repellent, stain, bleaching oil, or paint — for your prefinish.

Backpriming doesn't need to take a lot of time. Lay several pieces back side up across two sawhorses, butting the edges together so you can roll or brush efficiently. Hit the edges next with a brush or small roller, and then quickly flip the boards over so you can deal with the "show" face of each one before any drips or runs have a chance to dry.

Installation

Whatever pattern, species, or grade of the siding you choose, make sure it's installed correctly. In knotty grades, this can make a pronounced difference.

Underneath. Wood siding should always be installed over 15-pound felt or house wrap so there's an effective water barrier behind the siding to keep moisture that does find its way through from damaging the structure. Take some care to install it properly at openings, and provide an extra layer at corners. You should also install a vapor barrier on the warm side of the insulation to slow moisture diffusion from the inside of the structure.

Application. While board-and-batten siding can only be installed vertically, bevel and Dolly Varden should only be applied horizontally. Tongue-and-groove, channel rustic, drop/shiplap, and log cabin can go either way.

Theoretically, some patterns can be installed on the diagonal. Although this application works fine on open expanses of wall, it channels water directly into door and window jambs and casings, causing nothing but problems. I know there are a lot of these installations around, but I sure don't recommend the method.

Detailing at corners/openings. There are several ways to detail inside and outside corners (see Figure 3).

Although installing corner boards and butting the siding is traditional in some areas, a gap can develop as the trim shrinks seasonally, leaving the caulk as your first line of defense. An alternative, where aesthetically acceptable, is to overlay the trim. This method is better at holding out weather and doesn't require fitting each board. It also keeps board ends, which are susceptible to splitting and soaking up moisture, covered. But you do need to fill the voids in the pattern behind the trim with caulk. One corner detail not shown is mitering — it should be saved for interiors.

Door and window openings should be flashed at their heads to make sure rain doesn't get past the siding and reach the sheathing and wall studs. Clear grade window and door casing will also cut down on the shrinkage that can open up gaps between head and jamb pieces and let water in.

Joints. Although common wisdom is that boards don't shrink along their length, a 16-footer — particularly if it's juvenile wood — can shrink or expand about 1/8 inch. This will show at joints, and can even cause some buckling in extreme cases if the boards are square cut and butted. Using a lap joint and prefinishing the cut ends of boards will help minimize this problem. So will stickering your siding so it can acclimate, and avoid-

ing the very driest season when installing.

Always break joints over a stud; sheathing just doesn't provide enough meat for solid nailing. A simple 45-degree lap joint looks and works best. However, even if you just butt your boards, never caulk these joints; it just gets pushed out by seasonal movement and looks bad.

Splitting is a common problem, particularly at board ends. It's easily solved by predrilling; a small, low-torque cordless drill is all it takes.

Over foam. There have been problems reported over the years with installing wood siding over rigid foam insulation. The problems include peeling paint, cupping, cracking, and loose siding. The primary causes were a buildup of heat and moisture; some thin, less dense foams also compressed slightly with seasonal expansion.

A joint study between the two industries concluded that these problems could be largely avoided by using building paper or house wrap over the foam, and backpriming the siding very carefully. Also, you'll have to increase the length of your nails to still get proper penetration into sheathing and studs, and you may need to predrill for nails since their shank size will increase with their length.

Contractors looking for an extra degree of insurance install furring strips over the foam and nail the siding to these. It's extra work and can cause some problems with sills and jambs at openings, but this separation allows air to reach the back of the siding so heat and moisture don't build up. If the furring strips are at least 1/2 inch thick, it also creates a capillary break that prevents wind driven rain from penetrating the building shell any further.

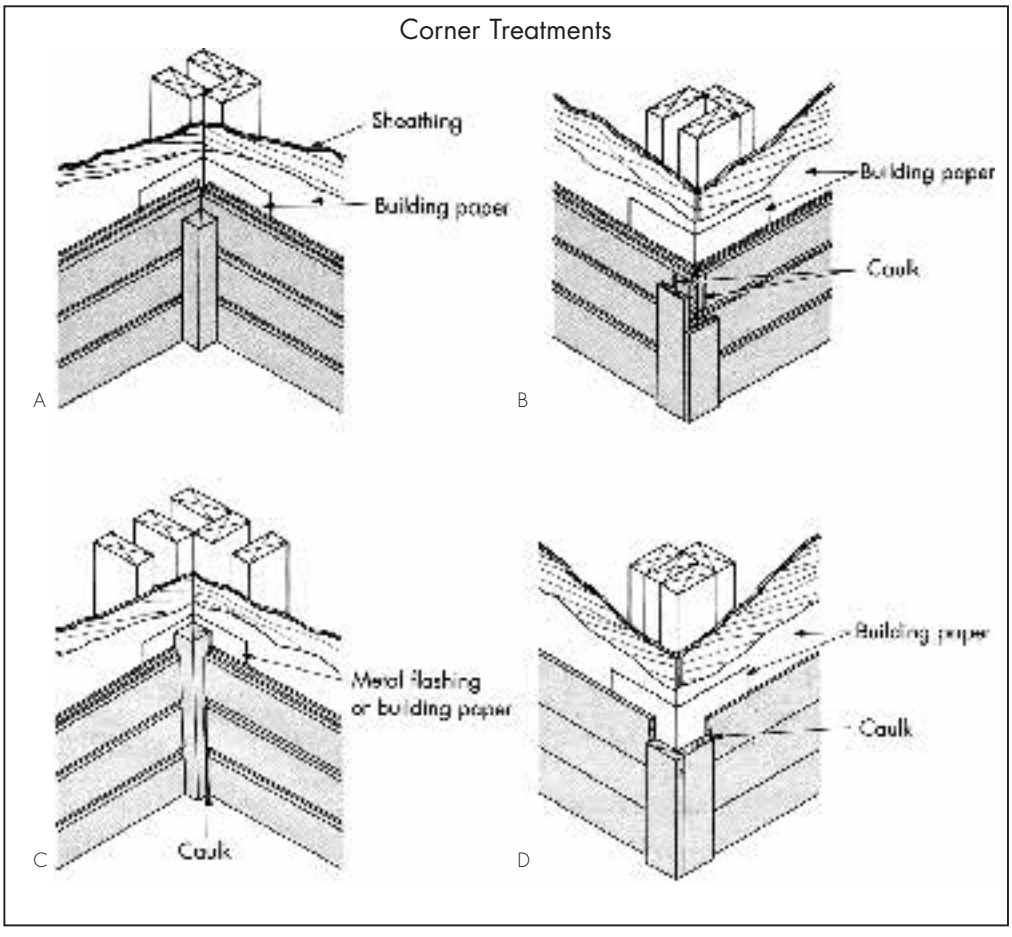


Figure 3. ***Interior and exterior corner treatments.*** *Overlaid corner boards, shown here on channel rustic (A & B), keep endgrain from soaking up moisture, and hide splits that can develop from nailing. With flush corner boards (C & D), preferred by many builders on beveled profiles, the caulking strip can open up when the wood shrinks.*

Nails and Nailing

The key to installation is to use non-corrosive nails that are long enough to resist withdrawal, and to place them so they don't restrict the siding as it moves seasonally. It sounds simple, but the problems I see most often as a field rep are caused by failing to follow these recommendations.

Nails. I'm amazed at how many builders and remodelers try to save $30 or $40 on nails only to end up with a project that is ruined by streaking within weeks. And the only way you can correct the problem permanently at that point is to pull the siding.

My first choice is stainless-steel nails, but they are very expensive. To match the economy of using knotty siding, you might consider high-tensile strength aluminum nails. Both are available with color coating to help hide them.

Hot-dipped galvanized (HDG) are okay with a heavy body stain or paint. The zinc on HDG nails isn't as vulnerable as electrogalvanized (EG) coatings, which chip when you're driving the nails, and wear off quickly. However, you might consider stainless-steel or aluminum nails if you're using a clear preservative — a few problems have been reported in the field when galvanized nails were used with some of these finishes.

For knotty siding where there is likely to be greater wood movement, consider using spiral or ringshank nails. These are required to penetrate 1 1/4 inches into solid wood (for smooth-shank nails it's 1 1/2 inches). "Solid wood" means any combination of framing lumber and sheathing. But don't just nail into the sheathing.

Nails should be box or siding nails (see Figure 4) with *blunt* rather than *needle* points to cut down on splitting problems. It's tempting to use casing nails because of their low head profile, but these lead to problems with "pull through" when the siding cups. They are recommended for blind nailing tongue-and-groove siding, but that's not something you should be doing in knotty grades on the exterior.

Nailing. Although it takes longer, hand nailing has real quality advantages over pneumatic nailing. You aren't as likely to "overnail" clapboards or drive the head of the nail below the surface of the wood, and it's a lot more accurate in putting nails just where you want them. If you have to use a nail gun, make sure you keep the air pressure adjusted so you're not overnailing, and *never* use staples.

Vertical siding should be nailed at a maximum of 36 inches on-center when face nailed, and 32 inches when blind nailed. (However, some building codes now require a 24-inch maximum spacing.) Horizontal siding can be nailed at a maximum of 24 inches on-center over sheathing, and 16 inches on-center without it.

But maybe the most critical rule is *never* nail through two courses of siding with a single nail, sometimes called "double nailing." On patterns 8 inches and up (except clapboards and Dolly Varden) you will need to drive two nails, spaced 3 to 4 inches apart, into each stud. But still, each piece is nailed independently of its neighbor.

Nailing two courses together may have gotten started in New England several centuries ago where the lower edges of clapboards were nailed through the one below to help keep the wind out. Unfortunately, the practice is still common. Because of the void that is created when bevel siding is lapped, it's tempting to nail down toward the bottom edge where the lap makes it feel more solid. Although you may get away with this if you're using narrow, clear, vertical-grain siding in a climate that doesn't have a long drying season, you can end up with problems with knotty material.

All patterns should be fitted together without any gap or expansion space except board-and-batten, which calls for a 1/2-inch space between boards. Bevel siding (clapboards) should lap the previous course by only 1 inch so your nails don't end up going through the top of the course below. This means you'll get a 4 1/2-inch exposure from a 6-inch clapboard; if you want a narrower exposure, you'll need to rip the material down. ■

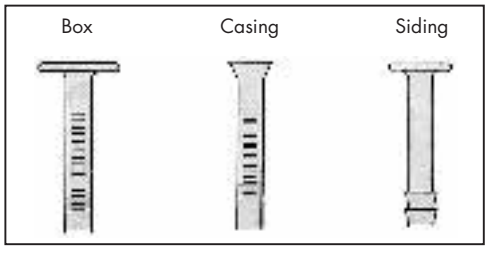


Figure 4. *Box nails, far left, and siding nails, right, will discourage the "pull through" common with casing nails, center, particularly with the wood movement common to knotty siding.*

Norm Sievert is the Northwest field representative for the Western Wood Products Association.