Vertical Grain Proves Worthy

by John Leeke

I'm sure we've all felt a connection with the carpenter who built the house we're renovating. A chalked date or tool marks are the most evident signs. When I'm looking over a house, I often catch myself wondering what that carpenter had in mind when he cut a board a certain way or selected one piece of wood over another. I've noticed that carpenters on these houses often put "vertical-grain" wood on surfaces that take a beating.

Vertical Grain vs. Flat-Sawn

Most common lumber is "flat-sawn" from the log. On the end grain you see the characteristic curving annual rings roughly parallel to the face of the board. "Vertical-grain" wood (sometimes called "edge-grain") is "riff-cut," or "quarter-sawn," from the log. This type of cut leaves the annual rings running roughly perpendicular to the face; the rings cross from one face of the board to the other (see Figure 1). In many applications,

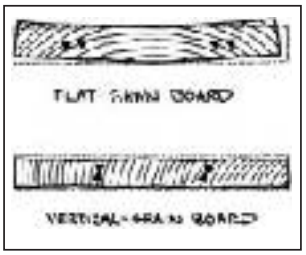

Figure 1. *"Flat-sawn" boards' annual rings run roughly parallel to the face of the board; they tend to shrink across the width, and cup. "Vertical-grain" boards' rings cross from one face of the board to the other; they tend to shrink across the thickness and stay flat.*

vertical-grain wood performs better than flat-sawn wood.

In the past, vertical-grain boards were used in flooring, shingles, and clapboards. Builders knew that the severe exposure of these parts of the building demanded the special characteristics of vertical grain for good performance.

Radial-cut clapboards have vertical grain. They were commonly used in the past and are still available today. They are well known for their strength, stability, and their ability to hold paint. These advantages extend to other building parts as well. For example, face trim and rake boards benefit from the qualities that vertical-grain wood offers.

The Advantages of Vertical-Grain Wood

Generally, wood shrinks and expands with changes in moisture content. Moisture drops the most during initial drying, but then fluctuates a little during seasonal changes.

A 12-inch-wide, flat-sawn board might shrink 1/2 inch during its initial drying, and then change width by almost 1/4 inch from season to season. These radical changes in width take place because the growth rings run across the width of the board, and most of the movement is along the growth rings. In a vertical-grain board the rings run through the thickness of the board. So most change takes place across the thickness, a relatively small dimension. Initial shrinkage is limited and seasonal movement is minimal.

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Where to Use Vertical-Grain Boards

- ***For porch decks:*** Figure 2 shows what can happen if you use flat-sawn boards for a porch deck. These boards have expanded in width and buckled due to excessive moisture. Vertical-grain boards would not have buckled.
- ***For better paint finishes:*** Vertical-grain wood holds paint better than flat-grain for two reasons. First, the paint film is stressed less since the wood underneath moves less. Second, the wood's annual growth rings are composed of soft porous wood that grows in the early spring, and relatively harder, dense wood that grows in late summer. It's the late wood we usually count as "the ring." Paint soaks in and adheres well to the porous early wood, but bridges over the dense, late wood where adhesion is poor (see Figure 3). On painted vertical-grain wood, the bridge is much shorter, hence stronger, than on flat-grained.
- ***For clapboards:*** Figure 4 shows two western-cedar clapboards. The one on the right is flat-sawn. Notice that paint has fallen off the harder, dense late wood. The paint shows the characteristic flame pattern of flat-sawn boards. The clapboard buckles out when it rains, stressing the paint film. Water soaks in where the paint has failed causing more paint failure. The vertical-grain clapboard on the left is flat and the paint film is still protecting it from excessive moisture.

Vertical-grain wood lasts longer, painted or not. When it is left exposed without paint, vertical-grain wood deteriorates more evenly than flat-sawn wood. Flat-sawn wood left exposed to the weather will develop "weather checks," natural weaknesses in the wood that split open as the wood expands and shrinks. Once open they let moisture and destructive rays from the sun deep into the wood. Flame-patterned late wood can delaminate, catch rain water, and funnel it deep into the board. But vertical-grain wood has neither of these problems. Even if you paint the wood, you can't guarantee the paint will be maintained three or four decades from now. Vertical grain weathers well even when the paint has worn away. Just take a close look at the weathered boards of the next old barn you drive by. You'll see examples of these problems.

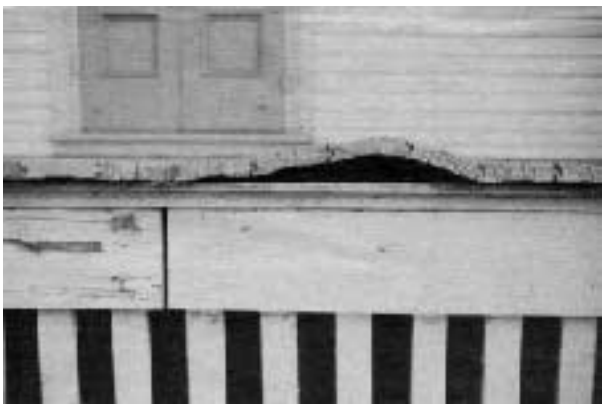


Figure 2. *These flat-sawn boards have expanded in width and buckled due to moisture.*

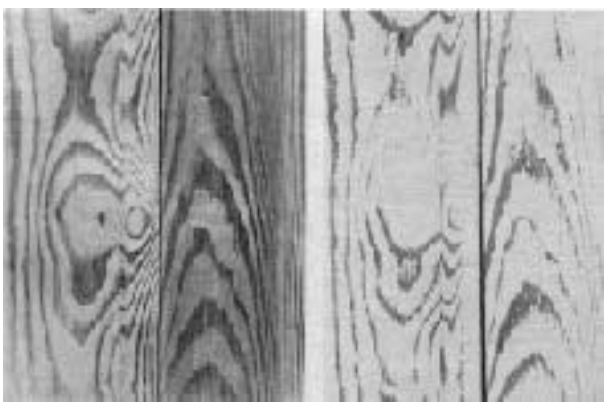


Figure 3. *In the flat-sawn boards (left), the hard dense late-growth wood appears as the "rings." The porous early wood forms the lighter sections. After painting and weathering (right), notice how the paint soaks in and bonds to the early wood, but has worn off the late wood.*

Disadvantages of Vertical-Grain Wood

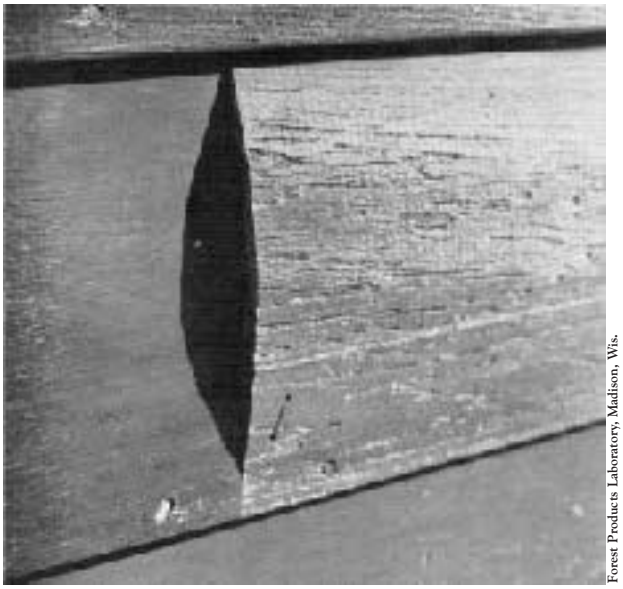
Nails tend to work loose over time in vertical-grain wood due to seasonal movement through the thickness of the board. The solution is to drive longer nails through the sheathing into the studs. I prefer cut nails since they provide greater initial holding power than standard round-shank nails.

Vertical-grain lumber costs two to three times more than flat-sawn wood of the same grade and species. The additional cost can be justified two ways: In renovation work (and particularly on historic projects) materials may only be 25 to 30 percent of total project costs. The extra costs for vertical-grain will be a very small part of the total project costs.

Second, vertical-grain wood has a longer life and lower maintenance costs, so the additional costs can be considered an investment with a definite payback period. Generally that payback is measured in decades, but it is there. Using vertical-grain wood makes sense when your customers have a long-term commitment to their building.

Where to Get Vertical-Grain Wood

You can make your own vertical-grain wood from standard flat-sawn lumber (see Figure 5). At the lumber yard, select wide boards that have vertical-grain along the edges. You may even find a few boards that are mostly vertical grain. Starting with 10- to 12-inch-wide boards, rip off 2-



Forest Products Laboratory, Madison, Wis.

Figure 4. *The vertical-grain clapboard on the left is flat and paint film is still protecting it from excessive moisture. The paint of the flat-sawn western-cedar clapboard on the right has fallen off the harder, denser late wood allowing moisture to enter and warp the board.*

to 4-inch-wide pieces for exterior face trim. Wide pine from 12 to 21 inches wide is available in the restoration market. Wide flat-sawn boards can yield vertical-grain boards 4 to 8 inches wide. Use the leftover flat-grain wood from the center of the boards for other, less critical work. Your local building supplier can order select grade vertical-grain douglas fir or redwood at $2.50 to $3 per board foot for 1x6, surfaced four sides. Allow an order time of a few days to two weeks.

A special order at a local sawmill will take longer, perhaps two to three months. The may custom saw your order or select it from their regular production run. The cost will be $4 to $6 per board foot for 4x4, surfaced two sides, air-dried.

Why Bother?

I'm often asked why it's so important to preserve and study historic buildings. One lesson I've learned from doing this is that vertical-grain wood outperforms flat-sawn wood. I apply that knowledge to the preservation of historic buildings, as well as to ordinary renovations and new construction. I know I can count on vertical-grain to eliminate certain problems before they happen. There are many other lessons—of both good and bad practices—to learn from these old buildings and the workers who built them. If we study preserved buildings, we can repeat their success, but without these buildings to learn from, we are condemned to repeat their failures.

New-England Suppliers

For exterior pine or spruce clapboards, radial sawn: Donnell's Clapboard Mill, Mayra Donnell, County Road, RR Box 1560, Sedgwick, ME 04676; 207/359-2036.

For vertical-grain lumber, wide pine, wide oak, ship-lapped pine, pine clapboards: Carlisle Restoration Lumber, Dale Carlisle, HCR 32, Box 679, Stoddard, NH 03464-9712; 603/446-3937. ■

John Leeke, of Sanford, Maine, restores and maintains historic buildings. He also consults with contractors, architects, and owners working on older buildings.

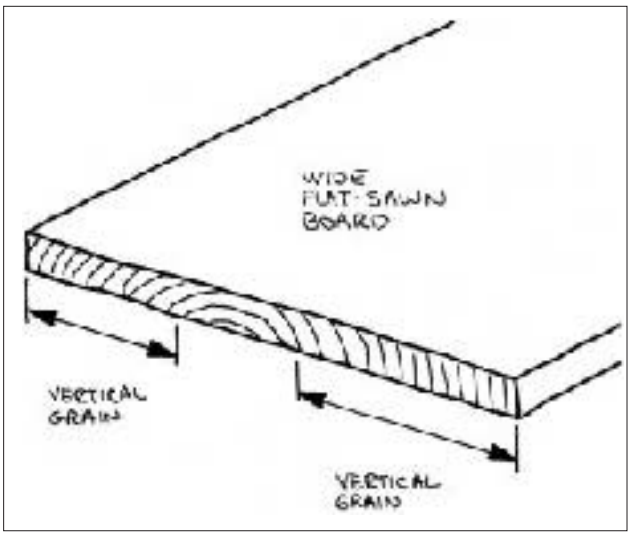


Figure 5. *Make your own vertical-grain wood from standard flat-sawn lumber by ripping 2- to 4-inch-wide pieces off wider boards.*