

Hardwood Plywood

Modern 'glued-up stuff' saves work, money and wood

by Tage Frid

There is great confusion about how to buy hardwood plywood, about the different grades and qualities, and about its advantages and disadvantages against solid wood. Having a good knowledge of these things makes it easy to decide when to use plywood and when to use solid stock.

The advantage of plywood is that it's more stable and won't change its dimensions, except in thickness. It's easier to make machine joints using veneer-core plywood because the alternating direction of the plies makes for about 50% long-grain to long-grain gluing surfaces. It would be impossible to make much modern furniture without plywood.

The advantage of solid wood is that it can be shaped and carved. Its color is usually darker and its figure more pronounced because it's not cooked and steamed like veneer. The joints in solid-wood constructions can be exposed, making an attractive addition to the design. Solid-wood surfaces are also easier to repair, something to consider when making a piece that will receive lots of wear and possible abuse.

The greatest disadvantages of solid wood are that it doesn't have much strength across its width, and its dimensions never stabilize—it's always moving in width and thickness. The disadvantages of plywood are that it's difficult to repair, its joints usually have to be hidden and its edges have to be faced with either veneer or strips of solid wood.

Many people talk about plywood and veneer as "that modern glued-up stuff." Actually there's nothing modern about it, except the glues used today. Veneering, the basis for plywood construction, was known to the Egyptians 3,500 years ago. The ancient Greeks and Romans used the technique also, but during the Middle Ages the technology was lost, and solid-wood furniture was joined with pegs rather than glue. In the 15th century the Italians rediscovered the technique of veneering and the art spread throughout Europe, reaching its climax of skill and artistry in 18th-century England and France. With the introduction of machinery and the decline in craftsmanship during the 19th century, the art of veneering again suffered. After World War I, the first fumbling experiments were made to use plywood in furniture construction, and since then it has become indispensable.

The flush corners and edges of modern furniture and the development of panel constructions into plain unbroken surfaces would have been impossible without the dimensional stability of plywood. Architecture has been revolutionized by the availability of standard-size sheets of wood that are stronger than ordinary lumber. Exterior-grade plywood made with weather-resistant glue and used for decking and siding has changed our conception of house framing. And with the shortage of wood today, manufacturing veneer for plywood, unlike sawing boards from logs, produces little waste. Almost 100% of the log is made into plywood, except for its center, which is put to other uses.

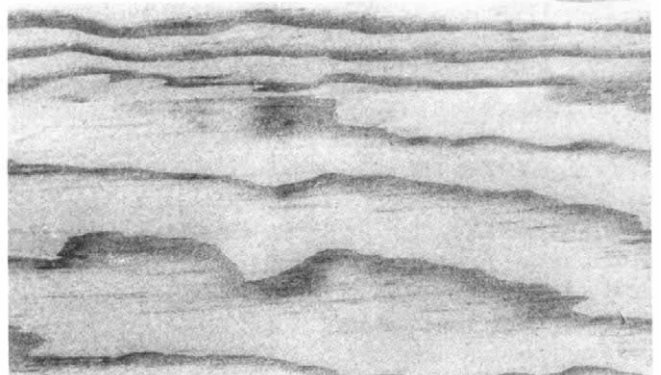
Plywood means less waste for the craftsman too—there are

no knots, checks or other natural defects that must be cut out. Also, more expensive species of woods, such as rosewood and teak, can be purchased in plywood form for about half the cost of an equal amount of solid stock. Generally though, the cost of one square foot of good quality $\frac{3}{4}$ -in. hardwood plywood is about the same as one board foot of solid stock of the same species. Using plywood saves labor as well as material because it's not necessary to glue up large panels from narrow boards or to construct frames to hold the panels. Woodworkers should not rule out using plywood because they think it costs too much.

Plywood veneers are cut in one of four ways, depending on the species of the lumber and the use to which the veneer will be put. Most veneer is rotary cut. This method requires first cooking the log and removing its bark. Then it's placed between centers in a big lathe and revolved into a knife. As the log turns, the knife automatically advances into the stock at a controlled rate, which determines the thickness of the veneer. A cylinder six or seven inches in diameter is left over. Rotary-cut veneer (*FWW* #12, Sept. '78, pp. 83-85) doesn't have the fine figure of sliced veneer, because when rotary cut, the veneer is peeled off the log like a sheet of wrapping paper being pulled from a roll. Because the cuts are always parallel to the annual rings, the grain of the veneer looks unnaturally stretched and doesn't have much character.

For face veneer the finest hardwood logs are used, and the veneer is sliced instead of rotary cut. Whether cut tangentially or quarter-cut, there are several ways to slice veneer. Usually the log is rammed into a fixed knife and automatically advanced between cuts so each slice is the exact same thickness, usually $\frac{1}{2}$ in. The pieces are kept in order as they come from the machine so they can be matched. Sliced veneers are sold in flitches, bundles containing all the stock from one log or from a section of a large log. This makes it possible to panel a whole room with face veneer from the same tree.

Somewhat similar to sliced veneer, but cut instead on a



Rotary-cut veneers often lack natural-looking figure because they're cut parallel to the growth rings.

lathe, is half-round veneer. The log is bolted to a stay and mounted to the lathe in eccentric chucks. As the log revolves, it presents only a small arc of its circumference to the knife. Another method of getting veneer is by sawing on a band saw with a thin blade, which makes a narrow kerf. Even so, as much wood is wasted as is saved. Because this way produces so much waste, it is little used.

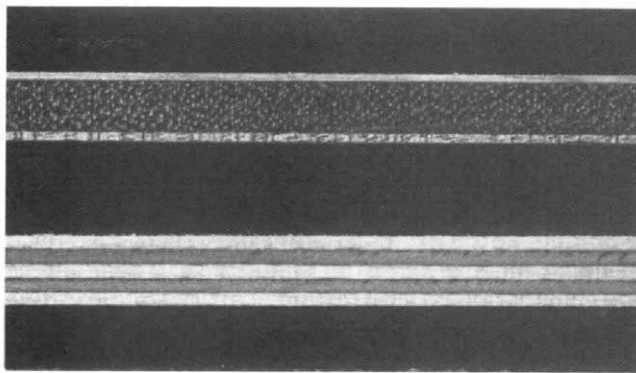
Though most plywood is made for the building industry, there are several good products available to the craftsman, who can buy them with the face veneer already glued on or with no face veneer at all (so he can veneer it himself). The plywoods commonly used by the craftsman are veneer core, lumber core, particle-board core and fiber-board core. All plywood is built up of an uneven number of plies of various thicknesses, depending on the finished thickness of the sheet itself. But whatever the thickness and the species of lumber used, the grain direction of any ply must be at right angles to that of the adjacent plies. This crossing of the grains gives plywood its great strength and dimensional stability.

The most used and best-known plywood is veneer core. The thinner the veneer used to build up the core, the greater the strength of the plywood. I would never use, for example, three-ply $\frac{1}{4}$ -in. plywood. In most cases such plywood is made of cheap materials, especially the core, so any imperfection in the core telegraphs right through the face veneer. Assuming that the face veneers are $\frac{1}{28}$ in. thick, this makes the core about $\frac{1}{3}$ in. thick, and because the grain of the core must cross the grain of the face veneers at right angles, the plywood is weak along its length and easy to break. If $\frac{1}{4}$ -in. plywood is made out of five plies, the center ply and the face veneers run in the same direction, and with the two crossbands, it's stronger and more stable.

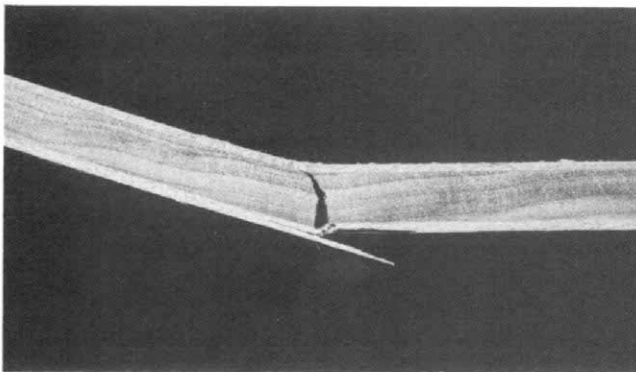
The quality of veneer-core plywood varies greatly. Cheaper plywood contains voids and unsound knots in its inner plies. Voids in the crossband, the plies directly below the face plies, make the face veneers weak in those places because there's nothing to back them up, and they can break through. A better veneer-core plywood is a Russian product called Baltic birch. The quality of the wood is good, but the plywood itself tends to twist, and lately I've found that the layers sometimes separate. Most Baltic birch plywood is made to metric dimensions—standard sheets are 150 cm by 150 cm (roughly 5 ft. square) and the thickness also is in millimeters. Another very good veneer core is made in the Philippines and is sold under the general commercial name lauan. It is very stable and the core is good. Its color is close to mahogany.

Lumber-core plywood is made up of two face veneers, two crossbands and a solid-wood core. Because the core is much thicker than the crossbands and its grain runs in the same direction as the face veneers, it has great strength lengthwise. Most lumber-core plywood is made up of edge-joined strips in its center; poplar and basswood are common, though mahogany is better. These strips vary in width, but 3 in. is usually the maximum. The strips are glued together and then dressed to the necessary thickness. Next the crossbands and face veneers are glued on. Lumber-core plywood can twist because the glued-up core acts like one piece of wood.

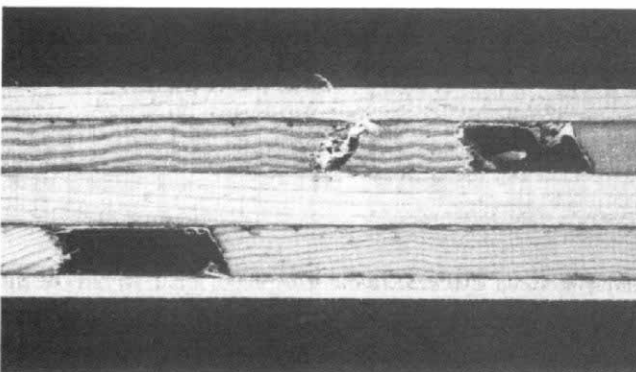
Imported lauan plywood is also available in lumber core. The difference between the lauan lumber core and the ordinary commercial kind is that the core strips in the lauan are not glued up into one solid sheet. They're held together by the crossband plies with small spaces between the strips. This



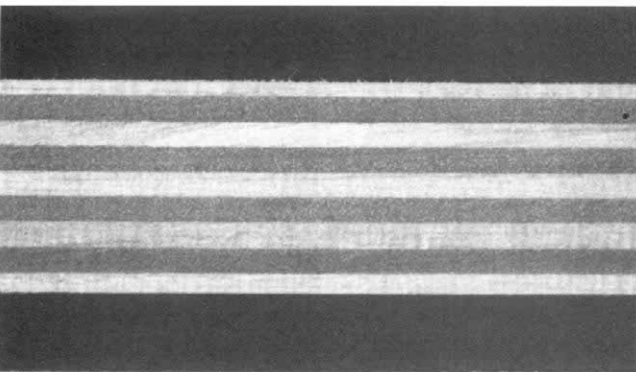
The three-ply material, top, is weaker than the more expensive five-ply material, bottom. Defects in the three-ply core will telegraph through the face veneer.



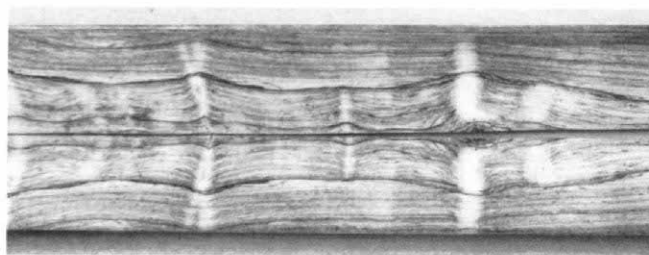
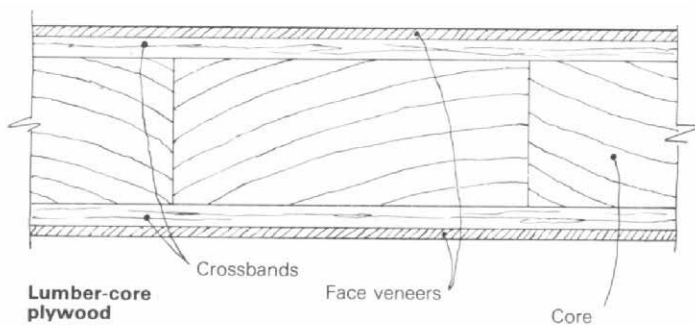
Three-ply $\frac{1}{4}$ -in. plywood breaks easily, especially if it is used in narrow strips.



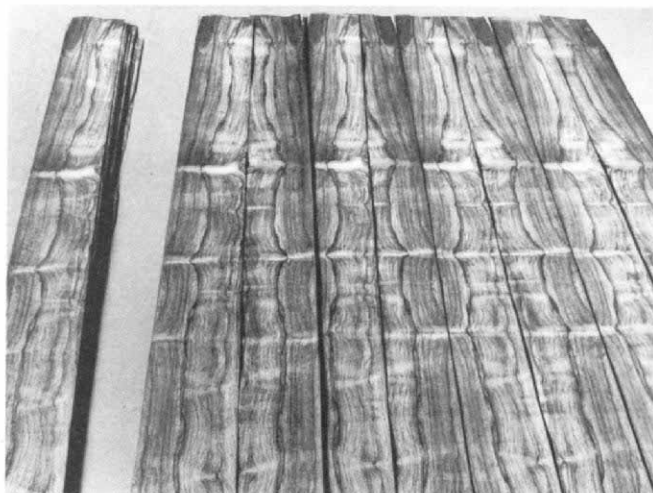
Voids in cheap plywood weaken the entire sheet and make the face veneers vulnerable because there's nothing to back them up.



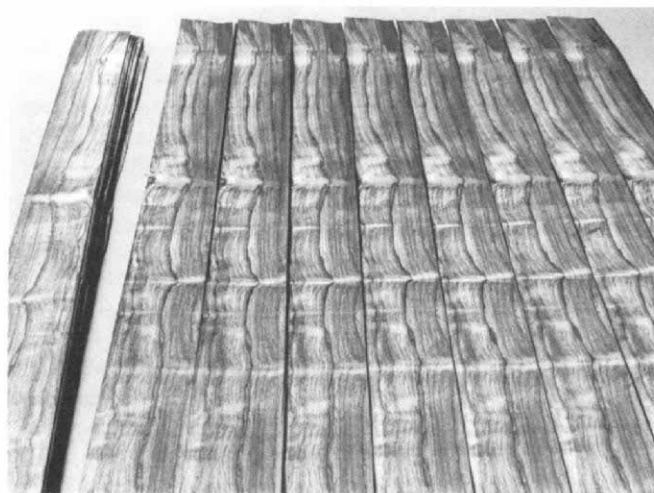
Baltic birch plywood, a Russian import, contains no voids and has exceptional strength and good working properties. Though it sometimes twists and delaminates, it's generally a superior product.



Two bookmatched veneers. When taken from the flitch, one piece is flipped over, as you would open a book.



An entire panel can be made up of bookmatched veneers by flipping every other piece as it comes from the flitch.



Slip-matched veneers have a different look because there's no mirror-image effect.

allows each core strip to move independently, making the plywood more stable and more suitable for cabinetmaking. This lumber-core plywood is available without face veneers in 4x8 sheets that the craftsman himself can veneer.

When veneering plywood yourself, take the pieces of veneer from either the top of the flitch or the bottom. Don't pull them out of the center or any other place in the bundle because that splits up the flitch and makes it impossible to match the figure later on. There are two ways to match veneer on a panel. One is called bookmatching, because the piece on top is flipped over, as though you were opening the cover of a book. Bookmatching can be done with more than two pieces of veneer, and this is usually how good-quality sheets of plywood are faced. The other way of matching is to use veneers in the order they come from the flitch, only without flipping them. This is called slipmatching.

When working plywood of any type, the cardinal rule is that what you do to one side you must do to the other. Whether you veneer your own plywood blanks or buy them with the face veneers already glued on, make sure that the face ply and the back ply are the same species. If two different face veneers are used, for example, walnut on the front and poplar on the back, the two will expand and contract at different rates. There are plywoods available with plies of the same species on the front and back, though usually the quality of the front veneer is better and allows for fewer defects.

There are other materials that can be veneered or that come already faced with veneer. These are sold under the commercial names of particle board and fiber board and are usually less expensive but not nearly as strong as plywood. The greatest advantage in using these materials is that because they're

made out of sawdust or fibers they don't have any grain direction, so the veneer can be applied with its grain going in any direction. The greatest disadvantage of this type of material is that it doesn't have much strength and that it's not easy to join together, because the joints must be reinforced with splines made of some other material. Another disadvantage of particle board is that it will bow if it's used to make doors that slide in a track on the bottom. This is because there's no grain direction to support the weight. To prevent this from happening, either put a wide facing on the edges of the doors or hang them from a frame at the top.

The U.S. Department of Commerce has established voluntary product standards for grading hardwood plywood. This grading system is different from the one used to grade softwood plywood, and the two should not be confused. Premium-grade veneers are given the symbol *A*, while other quality veneers are designated by a number: good grade—1, sound grade—2, utility grade—3, backing grade—4, and a specialty grade—*SP*. Any combination is possible, the first symbol representing the quality of the face veneer and the second the quality of the back veneer. Plywood grade *A-3*, for example, has a premium-quality face veneer and a utility-grade back veneer. The absolute best would be *A-A*. Often the back veneer is a different species from the front veneer, so it's a good idea to ask about this when ordering because the grading system doesn't take this into account. For more information, write the Hardwood Plywood Manufacturers Association, Box 2789, Reston, Va. 22090. □

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