Storage Stair

An alternative to conventional framing takes advantage of normally wasted space

by Tom Bender

A stairway that my wife Lane and I saw in Japan about 10 years ago etched itself in our memories. Instead of being built on notched stringers, it was made up of finely joined chests and boxes of graduated heights. In stepping from the top of one box to the top of another, you arrived at the second floor. Needless to say, when the time came to build a stair in our own house recently, the Japanese stairway was still in our minds. Our stair (photo, left) contains four different kinds of storage units: drawers, cupboards, a roll-out toybox and a book alcove. There's even a drawer under the lowest tread that pulls out for storing slippers and socks. Considering all the stuff that we're able to store in this normally wasted space, building the storage stair wasn't that much work. It was more work, of course, than for a conventional stairway, but no more than for a storage wall.

Design and layout—Our visions of fine Japanese joinery had to adjust to our own reality. We had an old Sears table saw, a skillsaw, a cheap belt sander, and a random assortment of hand tools. Our cabinet shop was a corner of the living room with the rug rolled up. We couldn't afford good hardwood, and didn't want a house too precious for people to live in. So we had to make do with the pile of construction-grade fir stacked in our living room, some used shiplap, and someone who had never built a stair before.

The structural system I worked out for the stair is a framework supported by four vertical partitions that serve as dividers between drawers or cabinets. These are connected by a grid of 2-in. by 1½-in. face-frame pieces that form a base for treads and act as drawer and cabinet bottoms.

I built all the partitions first. Each one is a different height, but they are all constructed the same way. An identical pair of 2x4 uprights was grooved to accept a ½-in. thick plywood panel and notched at the top for the 2x10 riser that is an integral part of each partition. I drew up a checklist of all the framing members and hung it up by the table saw, then crosscut long stock to rough length with my skillsaw and brought it to the table saw for finish cutting. The 2x4s for each partition were cut in pairs, since they would run clear

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to the floor. I chiseled shallow (⅛-in.) mortises in the 2x4s to accept 1½-in. by 2-in. horizontal face-frame pieces that would connect adjoining partitions and also support the shelves, drawers and treads. These pieces would be joined to the 2x4s with glue and dowels, so I made a cardboard template and stuck a nail through it to mark dowel centers.

Assembly—Putting the whole thing together would have been easy for an octopus with a truckload of clamps. But I was armed with only two bar clamps, a few C-clamps and two hands. Partitions were assembled first. While they dried, I located their positions on the floor, cut all the horizontal pieces to size and checked dowel alignment on each joint. For the final assembly, I put up the tallest partition first, at the high end of the stairs. After gluing and doweling all eight of the horizontal pieces to this partition, I snugged the unit into place with the aid of my faithful bar clamps. After checking for level, I toenailed it to the floor. The remaining three partitions went up in the same way. Each one was clamped to its steady, previously installed neighbor before being nailed to the floor.

We let the glue in the completed framework dry overnight, and began on the stair's ten treads. As all our clamps would be needed to hold a single tread in position until the glue dried, I decided to nail-clamp the joints to hold them while the glue set. I drilled undersized holes, then nailed through the back of the upper riser with 16d box nails, and up through the side frame with 10d finishing nails. Then the bar and C-clamps could be removed and used to set the next tread. After a touch-up sanding, the frame and treads were finished with two coats of boiled linseed oil.

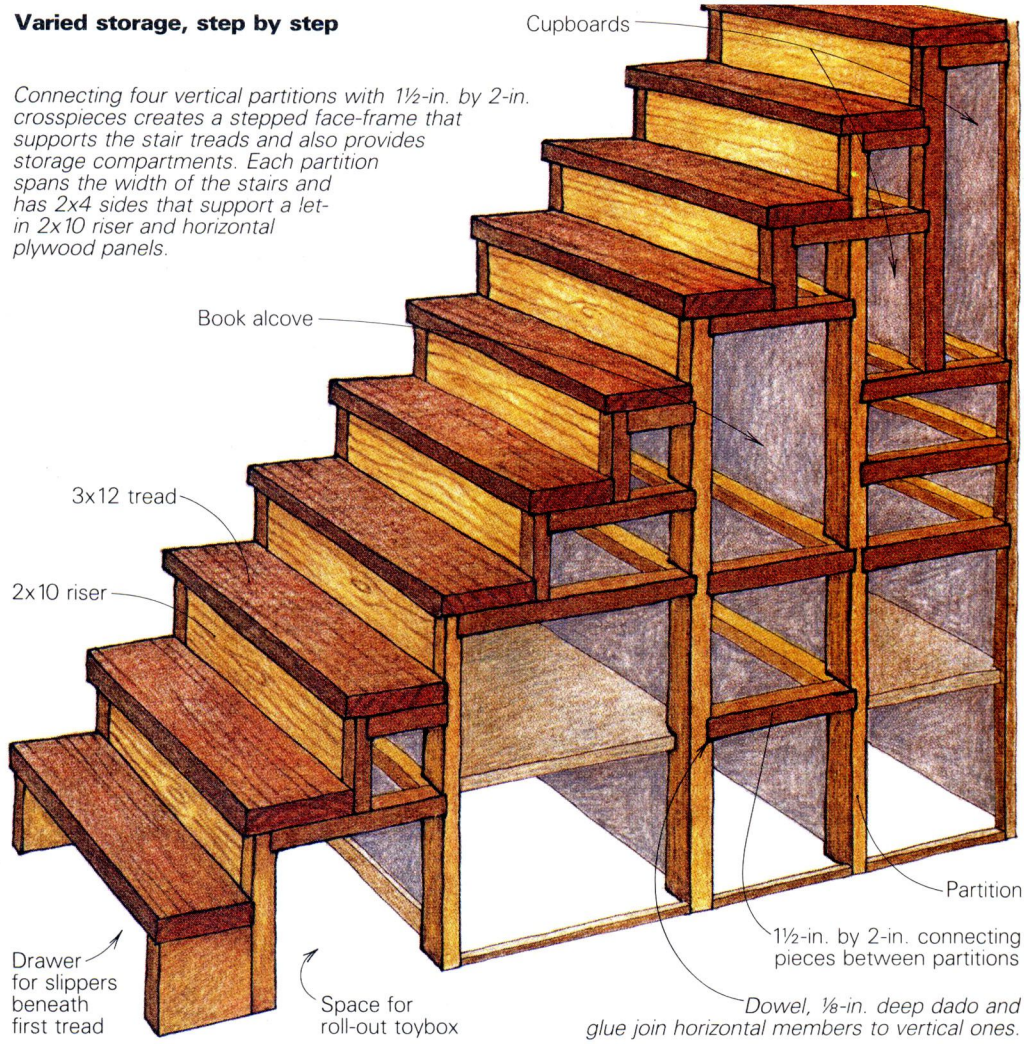
Doors, drawers and shelves—With a usable stairway complete, installing the shelves, drawer glides and stops, and building the doors and drawers could go more slowly. To match the walls of the living room and entry, I made all the doors with the same recycled shiplap, using horizontal battens on the inside face of each door to hold the shiplap boards together. Drawers were made up from ½-in. plywood, with Masonite bottoms. Shiplap was glued up to make each drawer face. For the handrail, I used a long piece of driftwood that we had found on the beach. I cut it to length, then notched it to fit against a 3x3 post that I attached to the stair frame with lag screws.

A translucent screen—Next, we needed to enclose the living-room side of the stairs to make the stairway safe for kids and also to keep heat downstairs. We didn't want the stair and entry to be dark, so a translucent wall seemed like a good idea. Everything pointed toward a Japanese-type screen. The modified *shoji* design we used was easy and inexpensive to build.

A frame for the translucent wall was made from a few 2x4s ripped into strips. I installed ¾-in. by 1½-in. strips vertically, attaching them to the edges of the treads and to the

Varied storage, step by step

Connecting four vertical partitions with 1½-in. by 2-in. crosspieces creates a stepped face-frame that supports the stair treads and also provides storage compartments. Each partition spans the width of the stairs and has 2x4 sides that support a let-in 2x10 riser and horizontal plywood panels.



edge of the floor above, which made them strong enough to prevent anyone from falling through. Smaller ⅜-in. by 1-in. strips were used horizontally, spaced half a riser apart, to stiffen the frame and support the paper covering. I notched all the pieces to a depth of ½ in. at all joints, gang-cutting with a dado blade on my circular saw to ensure correct alignment.

After a trial assembly to make sure everything lined up properly, the notches were then dabbed with glue, and the strips snugged into place with the aid of C-clamps. The inevitable curvature of the long, thin strips of wood caused some concern at first, but any unevenness was pulled back into line as the grid grew. The frame was sealed with a coat of linseed oil, except on the surfaces where the paper would be attached, and allowed to dry well, so that it wouldn't bleed onto the rice paper that would be glued onto it.

To apply the rice paper, I used a paste made of white flour and water. This makes it easy to remove the paper if any sections get damaged. The rice paper, which is commonly used for *sumi* ink drawing, is available in 8½-in. and 11-in. wide rolls from most art or oriental-import stores. We used the larger size, applying it vertically in sheets no longer than about 2½ ft. We found that if we used longer lengths, the glue we painted on the lattice framework would dry before the paper was in place. We worked from one end of the wall to the other, doing one vertical section at a time. A little thumb pressure stretched out any wrinkles or sags, and we were able to keep the paper taut against the frame without much trouble. After waiting a few minutes for the glue to dry, I trimmed off the excess paper with a single-edge razor blade. Then we applied the next strip of paper, lapping the first by the thickness of the wood frame.

A door with rice-paper panels at the stairway finished off the job. Double-swinging spring hinges on the door allow us to go in and out with the ever-present armfuls of children, groceries, laundry or firewood, without losing too much heat or having to stop and close the door behind us. A wide mid-rail on the door acts as a bumper bar, allowing us to open the door even with our arms full.

The finished stair and storage space have met almost all our expectations. The rice paper creates a soft light that accentuates the rich color of the steps. And at night, an almost magic silhouette of the gnarled, curving handrail is cast against the precise and delicate rectangles of the grid.

We had feared that the rice paper wouldn't last long with small children around, but we have all learned to live with its delicacy pretty well. Occasionally holes do get punched through it, but they are easily patched with a rice-paper snowflake or butterfly. The storage works out beautifully, with sweaters, blankets and such available from either the entry or the living-room side of the stair. □

Illustration: Frances Ashforth