STAIRCASE

Barrie Scott is back with another home project. This time it's the risers and treads of making your own staircase

What about the red tape?

Building regulations are strict. The angle, in private stairways, is no greater than 42 degrees. Twice the 'rise' plus the 'going' should equal 60 - 62mm. Or, the rise times the going should equal approximately 450mm. An acceptable standard size is: risers - 180mm and treads -250mm.
This will vary slightly according to equal divisions of the finished floor to finished floor height and the total available 'going', or horizontal distance. Calculations need to include vertically measured headroom of at least two metres from the tread nosings; the stairs need situating so no-one bangs their head. This all gets very interesting in some existing stairwells, where joists cannot be moved.

The construction and strength of the familiar 'box' staircase is a triumph in joinery design. The basic components: strings, treads and risers, when jointed together, build up to a girder-like strength far greater than they possess individually, but often a staircase can be lifted into position by one man. No nails or screws are needed in assembly. The secret is basic technology: the wedge.

Making a straight flight involves housing treads and risers housed into a big zig-zag cut into the strings (see fig 1 for terminology) and secured with wedges. The criteria for the size of steps are, however, where the staircase becomes interesting. All steps must be the same size and based on a ratio formula that allows for an average length of stride. This is, amongst other things, crucial to fire regulations. A fireman may need to descend rapidly, carrying someone. If one step is uneven he will stumble, the stride being an unconscious action. On standardised stairs the feet will know exactly where to go. Architects normally give only broad outlines on layout and maybe appearance, but generally leave the details to those who know: the joiners.

This model demonstrates the jointing methods. It is slightly scaled down to make use of off-the-peg softwood. The rise is 180mm and going 197mm. Having only three treads, it will not meet the building inspector being unlikely to ever carry anyone up to bed. Wider boards become costly, being commonly available normally in parana or yellow pine, hence the increasing use of MDF for treads. Treads normally finish at 25mm thick. Twelve millimetre ply is now often used for risers and is screwed into the back edge of the tread instead of, like this one, being tongued and grooved.

Step-By-Step

1

Having established stair sizes the first stage of setting out is making templates. The main information is on the pitch board. Note that the 'going' is from riser face to riser face, excluding the nosing. Cut precisely to size, the pitch board will reflect the exact angle of the staircase. The margin template (see photo) positions the pitch board and the nosing's distance from the edge of the string. When the precise distance between steps is established it should be stepped out along the string, using large dividers, to double check uniformity. The right angle where tread and riser meet is a useful point for this. In pic 1, this point is squared across between the strings.

The tread and riser sticks are then used to mark the exact shape of the housing, allowing for the wedges. Note that the tops of the sticks are offered to the line marked by the pitch board. Wedge proportions must be an exact fit otherwise the stairs will creak.

2

A router template is then prepared using the same method as for marking out the strings. It should then be marked and cut out suitably oversized to allow a margin for the router guide bush to be used. In this case 9mm, which is marked off the tread and riser lines to position the template. It can be pinned in position under the step where pin holes will not show.

3

The housing should be 10 - 12mm deep. When routing, after preparing a template, it is not essential to mark all the housings with tread and riser sticks. The template can be positioned merely from the pitch board lines. The housing is cut right to the back edge of the string to allow for insertion of the wedges.

4

Blank treads and risers are cut wider than the going and rise to allow for the nosing and also for the tongues and grooves. These can be routed on the bench using a straight flute cutter and rebater set. An adequate groove depth is 9mm; here I've used a width of 12mm to suit the available cutter. The exact position of the grooves can be found using the pitch board.

5

I obtained the nosing shape with two passes over the router table using an ovolo cutter. It is worth establishing the exact nosing shape on a test piece before the setting-out procedure, so that templates are created with the precise shape that you can make with your cutters.

6

Dry fitting, and numbering of all joints is essential, to check for errors. Tongues and grooves should line up precisely with the housings, ready to receive adjacent components. Methodical setting out should ensure accuracy. If any hiccups have occurred, the dry run is the time to find and correct them. It pays to check, assembling a staircase is a major operation and mistakes can be costly.

7

The tread and riser are fitted together into individual steps prior to final assembly using the stair assembly jig (fig 3). It can be made from sawn timber, large enough to fit most sizes and robust enough to stay square. The tongue and groove are glued together and held square by clamps. Glue blocks are stuck in position as shown. They can be pinned to free up the jig more quickly for the next step. Glue blocks should not be fitted to the top tread and riser because they will hook over the joist when installed.

8 Stack the shapes as shown. It is economical on space and helps ensure that they remain straight while awaiting assembly.

9 The lower end of the strings can now be cut to match the floor. If any shaping is required it is easier now than when the stairs are assembled. Using the pitch board, the rise distance is marked from the top of the first tread. The floor angle is marked using the 'going' face of the board. How much of the string is left on in front of the bottom riser will be dictated by factors like the position of the staircase and skirting board sizes. The bottom riser will be narrower than the others by the thickness of a tread.

10 For a full-sized staircase around 50 - 60 wedges are required and, as mentioned before, they need to be accurate. To produce them swiftly and precisely on a table saw, I use what I term the 'Burns Method' (fig 4). John Burns told me about this, several years ago. I tried it, liked it and shamelessly adopted it.

Having prepared a pattern wedge and tested it for fit, pieces of 20mm board should be cut to the length of the wedges. Offcuts from tread and riser board are usually enough. The pattern wedge is pinned to the edge of the stock, keep an eye on the length of the pin in relation to the sawblade. The saw guide is set at the combined thickness of the thin end and the thick end of the wedge, in this case 30mm. Note in the photo the use of both a notched push-stick and a batten, chopstick style, to keep hands away from the blade when sawing such short stock. The pattern is then removed from the wedge and re-fixed to the stock as shown in fig 4. The second wedge is then cut from the opposite direction

to the first, i.e. thick to thin rather than vice versa. It will be identical to the first. Cuts 1 and 2 are then repeated for however many wedges are needed.

11 Glue all the tongues and grooves and in all the housings, using a paintbrush for speed. There is a lot of work to be done within its setting time so be quick. The clamping of the staircase during assembly is done using an assembly bench, if available. Compression is achieved from above with a system of threaded rod and adjuster wheels. In the absence of this, I clamp a stout enough length of timber to my workshop ceiling members, nail on uprights as shown and achieve compression using folding wedges; crude and fiddly, but effective. A length of timber is placed on the string to protect it and even out the pressure.

12 Constant checks must be made to make sure all is square using both try square and a squaring rod.

13 Having tapped everything as far into position as possible, it is wedging time. The wedges must be glued on the face to come into contact with tread or riser.

14 I find it most effective to begin with the risers. This pulls the nosings into place, squeezes the tongues and grooves tight and, at the same time pushes up the treads. Wedges are all pushed in hand tight and then tapped in a little each at a time, constantly checking for square and that all is tightening in the right places.

15 As the wedges are hammered home, the face of the risers is pushed tight against the housing. A satisfying fine line of glue squelch should indicate that all is working effectively.

16 I usually leave the wedges over-length to allow for hammering room and maybe slight adjustment where the thin end can be cut off a little, for greater compression if required. The protruding thick ends are then sawn off, back-cutting a little, to allow for the insertion of the tread wedges. The same procedure is then followed to pull the treads tightly into position.