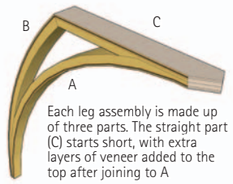
Elliptical Maple Dining Table

Having finished the most complicated project of his short career, **Stephen Prescott** highlights the routing jigs he used to construct his maple dining table, and the importance of working in order

Leaving a well-paid career to start out creating your own business generates a number of responses in the people around you. Some are shocked that you would leave the security of a salaried environment, while others have admiration for your decision to bail out of the cycle of commuting, performance reviews and doing stuff that really doesn't excite you. All are helpful, all have valuable opinions to offer. The streets aren't paved with gold, and cautionary advice should be considered carefully.

On the flipside, when you do plunge in, the less cautious, more encouraging people really get things moving. None more so than those friends who, upon hearing what you plan to produce, say: "Ooh, can I get one of those please?" Eddie and Sarah fall into this exclusive group; people trusting me to produce something special.

Fig.1 Leg assembly



Each leg assembly is made up of three parts. The straight part (C) starts short, with extra layers of veneer added to the top after joining to A

Eddie and Sarah got married last year and decided that one of their wedding presents would be to commission me to make them a new dining table. So, after securing the agreement of various family members whose combined wedding gifts would pay for the table we got down to designing. The design brief was quite simple which can work both ways. Early on it was decided that the top should be elliptical, the height to match their existing table and the overall appearance would be 'contemporary'. A brief meeting involving a sheet of plywood, a long piece of string and a jigsaw had the top mocked up in full size. Then, after many hours of questioning and sketching and crawling around under tables in pubs, shops, cafes and the like, we finally arrived at Version 19 for the legs and underframe.

Routing jigs

This project is a great demonstration of the versatility of the router in a small workshop. The first stage is to laminate up the major components for the legs. I'm not going to go into much detail about this here because the laminating is an article in itself (Pic.1). In essence you create templates with which to produce the two formers that shape the legs from constructional veneer.

There are two curved parts to each leg assembly, the inner (A) and outer (B), and one straight part at the top (C). Both these are tapered from top to bottom for appearance (see box, p14). They are each 30mm thick at the top, and need a combined thickness of no more than 20mm at the foot, where they join. After tapering I applied the final layers of 3mm bandsawn American black walnut and maple to hide the glue lines that are exposed by the

Pic.1 **The four leg assemblies comprise two curved components each, which were laminated in separate formers (left)**

Tapering the legs

Pic.2 **Skiing the inside face of the inner leg component to taper the thickness from the top down to the foot**

Tapering the thickness of the legs is done by using a technique known as skiing, which involves running the router attached to a ski which bears on a pair of templates attached to the former.

The workpiece can be screwed to the former (which was made overlong for this purpose). The ski templates are made using the trammel with the radius offset from the desired finishing radius of the workpiece. The offset accounts for the depth to which the cutter is plunged below the ski at its deepest cut.

My components started out at 24mm and ended up at 2mm at their thinnest point, therefore, the offset needed to be at least 22mm. In addition to the ski templates my setup also included a pair of templates cut to the finished radius of the piece sandwiched between the former and ski template on each side. These act as a reference to gauge when the final depth of cut is reached as it was not possible to view and measure this from the side without removing the ski template.

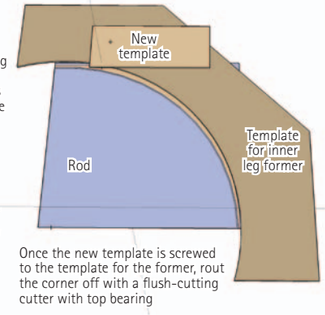
They also give clearance between the workpiece edge and the ski template to avoid the cutter damaging the template. Damage can be avoided by mounting a guide bush to the ski which gives sufficient clearance for the cutter to pass through but is close enough to the cutter radius to allow the cutter to reach right to the edges of the workpiece.

I used a straight two-flute bit to do my cutting but since discovering Wealden's surface trimmers I would recommend using these instead as the straight bit has a tendency to tear the wood, and the rounded corners of the surface trimmer are much less violent to the wood.

Pic.3 **The extended base on the router bridges the two templates for tapering the thickness of the leg components. The guide bush is fitted only to stop you cutting into either of the templates**

Fig.2 Making the jig for routing curve on straight part

To replicate the short length of curve where the straight part (C) meets the inner leg (A) you screw the template that was made to create the former for laminating the inner leg on the rod, lining it up accurately. Then you screw a piece of MDF on top for the new template, lining it up with the line for the straight part on the rod



Once the new template is screwed to the template for the former, rout the corner off with a flush-cutting cutter with top bearing

tapering, using the original formers for gluing up.

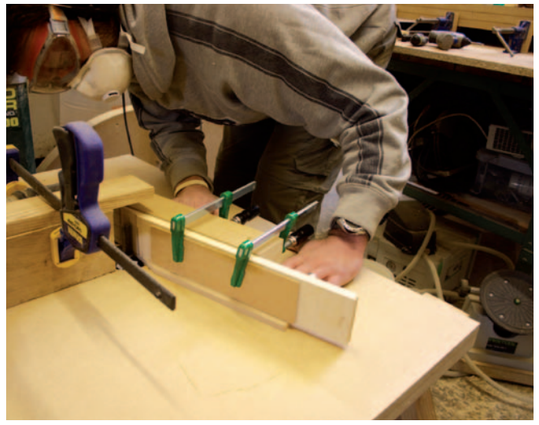
With the basic leg components glued up you can embark on the joinery. The first step is to clean up the edges which are rough from misalignment of the veneers plus dollops of squeezed out glue. This was done by holding the components in the formers. With a couple of spacer blocks applied to the base of the router a surface trimmer can be run over the edge of the component removing just enough material to create a flat edge (Pic.4). The process can either be repeated on the other face or the components can then be ripped to width with either tablesaw or bandsaw. Cleaning up the edges makes it easier to hold the components in jigs for cutting the joint faces.

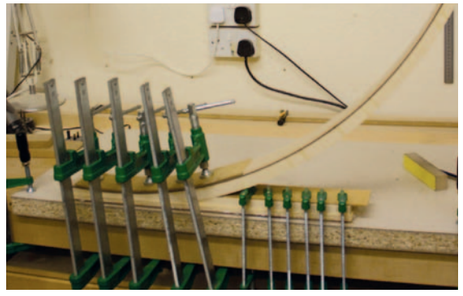
Joinery

The first joinery task is to create a curve on the end of the straight piece (which at this stage was still only half of its finished thickness) to match the outer curve of the inner leg.

To do this I made a jig to hold the straight component (C) on edge while it was cut using a long cutter in the router table. A spindle moulder would have been better as the cutter I had was not long enough to cut the full width of the component.

Pic.4 **This is a great way of levelling the edges of laminated components, returning them to the former, but lifted a little on blocks. You then run a router over the top, with triangular section runners fitted to a sub-base. Steve used a two-flute straight cutter, but subsequently discovered the Wealden six-wing surface cutters, which would have produced a much smoother finish for this job**





Pic.5 **The straight component (C) needs to be rounded at the end to meet the inner (A) curved part of the leg assembly (above, left). These two parts can then be glued and screwed together (above). Once that is done extra laminations are glued to the top of the joint between the straight part (C) and the inner part (A) to cover the joint. The end of the straight part is then mitred (right) to join the outer leg (B)**

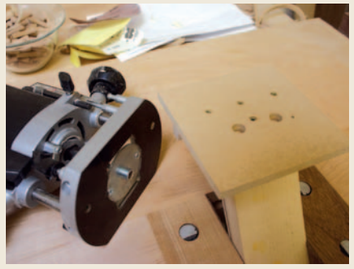
The jig I made has a shaped base/template that runs against a bearing on the cutter shank. Having made the initial cut satisfactorily, you have to replace the cutter with a top-bearing flush trimmer, and run that against the routed, curved surface. This second stage has to be taken very slowly as the trimmer is now working against the grain.

When making the jig it is critical to get the angle between the straight and curved surfaces right so that the inner leg (A) and straight part (C) line up accurately. This was achieved using the rod (Fig.2). First the curved template that was used to make the female inner leg former is cramped to the rod. On top screw the MDF for the new jig, covering the area where the straight part of the underframe sits. The original curved template is then used to cut the required curve onto the jig base. With a large block screwed to the jig base the components can be clamped on while they are cut.

Cramp the straight component to the inner leg using the rod for alignment, and drill dowel holes through the

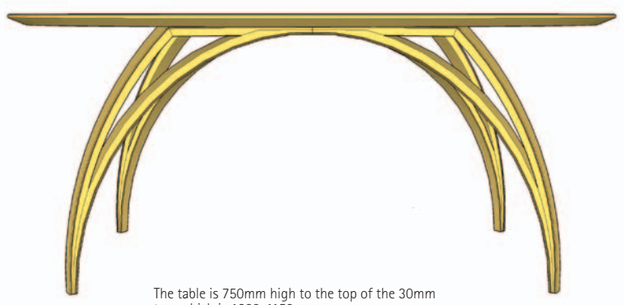
Dowelling with a router

The joint between the straight component (C) and the outer leg part (B) is a mitre, strengthened with dowels. The dowel holes are drilled using a simple jig which consisted of a plate with two through holes drilled to accept a router guide bush. There is a block on the underside of the plate to act as a reference, aligned with the outer edge of the mitre. The jig is screwed to the joint face, and with the appropriate guide bush fitted, I drill the holes with one of Wealden's dowel cutters to create perfectly aligned, parallel holes.



Pic.6 **The dowel drilling (or dowel routing) jig is screwed to the mitred end of the straight part of the leg assembly, and then to the mitred end of the outer leg part (B). Steve makes lots of these 'instant' jigs in his work**

Fig.3 Front elevation of dining table



TIP

Pic.8 Using 'donkey's ears' to pull the mitred joint between the straight and outer curved components together. At this stage the two curved parts are not joined at the feet, and are flapping around. An extra layer of veneer is glued between the two curved parts so there isn't a fine dust trap

joint for reinforcement. These dowel holes would eventually be lost inside the finished frame because there are still two laminations to be stuck to the top face of the straight part. The two components were glued and screwed together with dowels providing alignment.

Next the crowned part of the inner leg which curves up above the straight part needs to removed on the bandsaw. The resulting surface, to which you will soon be gluing extra straight laminations, needs to be cleaned up using a surface trimmer with the router sitting on a simple jig made from a piece of 18mm MDF with a hole jigsawn into it. The jig is screwed to the straight part of the assembly (C) and the whole lot supported in the bench vice taking care to ensure the MDF jig is supported all round.

The final layers of laminate, including the walnut highlight are then glued on to the straight part of the assemblies (Pic.5, back a page). Once dry 6mm diameter fixing holes are drilled for the fixing bolts to the top. Later these holes will need to be elongated to allow for movement of the top but for now it is important to keep them a snug fit for the bolts as they are used for fixing the frames to more yet more jigs for trimming the legs to length and for tapering the legs down to a point at the foot (see box, p17).

Cutting the mitre

Next the mitre cut is made using the tablesaw and a jig used to hold the curved outer leg at the correct angle for the cut and also, by bolting on the inner leg assembly to the jig using the same mounting bolts and sockets as would be used for the table top the length of the flat top to each of the four subframes could be made equal. The mitre joint is reinforced using dowels, drilled with a router and jig (see boxout, pxx). The joints were glued and cramped together.

This leaves one open joint at the floor end of each subframe, glued and cramped together with an extra leaf of veneer in between. This helps to prevent that part of the leg assembly becoming a dust trap when the table is in use (Pic.13, overleaf).

Pic.7 Paring back the dowels after trying to use screws to pull up the mitre between the outer leg (B) and the straight part (C). The leg assemblies are joined at the centre in pairs first (above right)

Final assembly

All the internal edges of the frame were given a small chamfer. For stability I extended the router base with a workshop-made plywood base. The internal corners of the chamfered pieces were finished with mason's mitres pared using a sharp chisel.

I reinforced the centre joint using a Festool Domino but it can just as effectively be done with dowels using the same jig used for the mitre joints.

A jig was also made to cut a housing in the end of each leg for a leather foot so as to avoid scratching the wooden floor. The jig simply consists of a hole in a plate shaped to accept a guide bush and straight two-flute cutter. Below this are two arms to be cramped around the table leg.

The final step was to open out the mounting holes in the frame to 9mm but this was only done after the positions had been marked in the underside of the top to allow it to be drilled to accept the mounting sockets. To drill neatly enlarged holes I again opted for the router and simply using a straight bit the router was held in position using a guide bush located in a hole in a sheet of MDF which was cramped in place on the frame, effectively using the router as a mobile drill press.

The top

Making the top has its own set of challenges, not least making it elliptical. I decided the most sensible way was to make an elliptical template with which to shape the top, which first meant making an ellipse trammel.

The principle is very simple, the trammel bar has two pivot points with one at half the major axis and one at half the minor axis. These two pivot points are then attached to sliders which run in orthogonal tracks on a base which is

Tapering width

With the basic shape of each of the four subframes now assembled it was time to taper them across their width. This requires the creation of a jig comprising a box with the top inclined to match the taper of the legs. The top of the box has a hole jigsawn in it which corresponds to the outline of the subframe. Finally the subframe is bolted to the wall of the box, once again using mounting bolts and sockets.

A surface trimmer can then be used to create a smooth, tapered surface on one side of each subframe by taking off 1.5mm at a time (1.5mm is the depth the Trend T11 I use plunges by for one full turn of its adjuster screw). I used a Wealden six-wing surface trimmer and the results were excellent by comparison with previous projects where I just used straight two-flute cutters.

In order to prevent the router falling in to the large hole in the jig I fitted a base extension made from plywood. Another consideration is the direction of cut. As much as possible I try to make a climb cut around the edges of the component, this helps to ensure a clean edge. It is essential to support the 'floor' end of the subframe to prevent it from flexing in the jig during cutting.

With one face on each subframe cut the jig was dismantled and re-assembled the other way up so that the other face can be cut. It is critical when making the jig that the mounting sockets in the jig which accept the mounting bolts are located centrally to the wall of the jig so that when the two faces were cut the mounting holes would be left central to the subframe.

The jig was then adapted to allow the floor end of the subframes to be cut to length on the tablesaw. The joint faces for the main central joint of the frame were cut using the tablesaw with the subframes mounted to a board which served as a jig. It was essential at this point to remember to cut two subframes and then flip the board to mount and cut the other two so as to get the 'left and right' versions of the subframes.

Pic.9 Once the leg frames are glued up, Steve built a box for tapering them to width down to a fine foot. The frames are bolted to the box through the mounting holes that will be used to fix them to the tabletop eventually

Pic.10 Having tapered the legs, the same box can be used on a tablesaw for cutting the legs to identical length

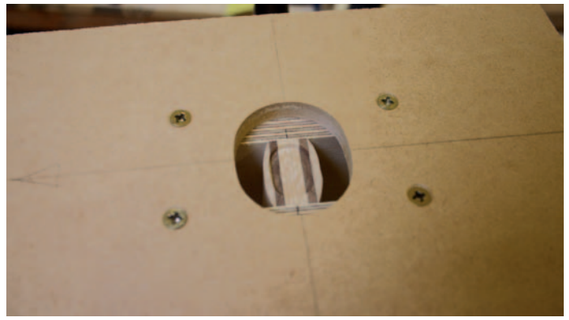
Pic.11 **Cutting out the MDF template for the elliptical top. To keep the sheet stable for as long as possible, Steve routs most of the way through the MDF like this, then cuts away the waste with a jigsaw, running along the centre of the groove. This leaves a little waste left at the bottom of the 'groove'. He then uses a laminate trimming cutter, with a bearing, against the routed edge to clean it up**

attached to the template material. As the trammel is pulled round the constant repositioning of the two pivot points result in a constantly changing radius, so the router describes an elliptical path. To someone from an engineering background like me it is a joy to behold. I made the sliders and tracks with a dovetail cutter to ensure they would remain located while the jig was in use. The router was mounted using a simple workshop-made clamp to accept the fence mounting rods and under the outer edge of the router a block of the same material used to make the base helped to keep the trammel from sagging thereby keeping the router cutter perpendicular to the template.

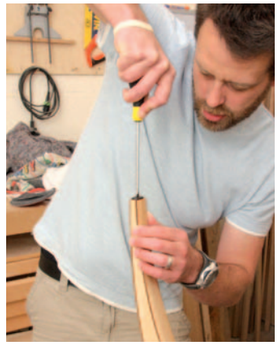
Top template

As before, the template is cut part way through, jigsawn and then cleaned up using a template trimmer. I took care to ensure the centre point from the trammel base was transferred through to the template so that it could later be transferred to the table top. This would aid positioning of the frame for marking the mounting holes. Similarly the other template mounting screw holes were aligned so as to be obscured by the underframe in the final assembly. With the template cut and the top jointed, cut roughly to shape and surfaced on the wide belt sander of a local factory, I screwed the template to the underside and using a template trimmer gradually trimmed the top to shape. This is a process of four quarters:

Pic.13 **There is an extra layer of veneer in the joint between the curved parts to avoid a dust trap**



Pic.12 **The little jig Steve has made for the depression in the bottom of the foot for the leather insert. Steve makes loads of these quick jigs**



two with the grain and two very slow ones against the grain.

I wrote last issue about using a Wealden six-wing cutter and jig to bevel the underside of the top. Once that was done I set a thin line of veneer into the top, which was a challenge I'll explain at a later date.

The whole lot was sanded through various grades from 150 up to 2000 grit and finished with Danish oil. The top was finished in two stages with the underside finished first and then with the mounting bolts partially screwed in the top was flipped over, the bolts held the freshly oiled surface clear of the bench while the upper surface was finished.

Lots of challenges presented themselves while making this table but the ever present solution was the router and the excellent cutters supplied by Wealden. I hope it will give you a some inspiration to get a little more from your router on the next project.

Thanks to Wealden www.wealdentool.com *0800 328 4183) for suppying Steve with the cutters.*