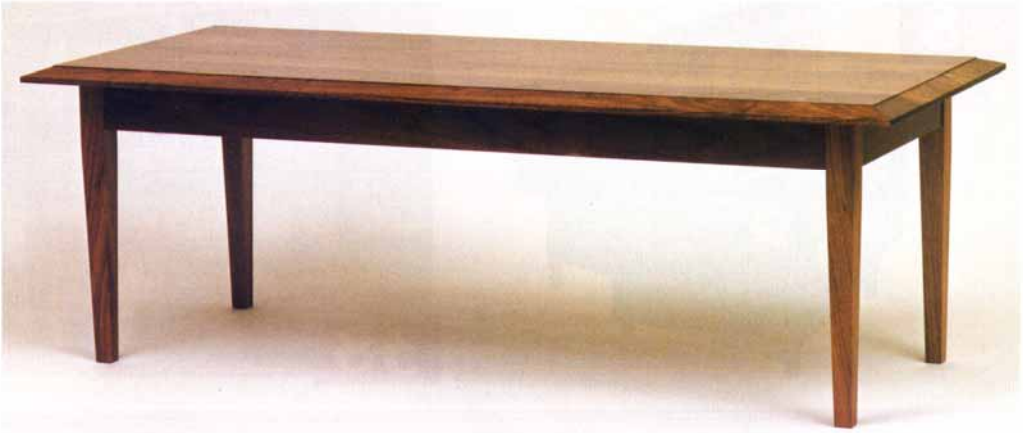
WORKSHOP PROJECT

Coffee table

If you're one of the many woodworkers who believe that elegant simplicity is better than making an ornate fuss, Martin Greshoff's beautifully proportioned coffee table is a project of rare perfection. You'll use hand tools and machines, as you follow a variety of traditional and modern jointing techniques – and its design allows you plenty of scope for making your own choice of timber and finish



The brief for this project was to design and make a coffee table that was simple, light, delicate and elegant in appearance. Its construction is fairly simple, meaning it's a good project for both beginners and those with more experience.

The focus of the table's design is in the proportions of its legs, side rails and top, and their relationship to each other. The legs are tapered and relatively thin in section to create a delicate feel, and the side rails have been kept as narrow as possible to give the impression of lightness. Decoration has been kept to the minimum, with just a simple fielded panel type of moulding on the top to give it the appearance of looking thinner than it actually is.

This project is traditional in both the construction of the frame and choice of materials. The table uses traditional mortice and tenons for joining the rails to the legs, while the top is jointed using the relatively modern technique of flat dowels or 'biscuits.'

The table is made from solid 25mm and 50mm American black walnut. This has a lovely rich chocolate brown colour when it matures, although when freshly cut its colour is more of a purple or brown. Care is needed when selecting the timber to avoid boards with a large number of knots – these tend to be more prevalent in walnut boards than in other species. It is also important that the timber is kiln-dried, and that the boards are of similar colour and are flat and free of bows and winding.

When ordering your timber, allow for at least 25% wastage. This is never a nice thought – but at least, being a temperate hardwood, walnut is an environmentally friendly timber to use.

Preparing the timber

Once you've got your timber back in the workshop, the first thing to do is sort out which board is going to be used for which component; at the same time, you must also decide what part of each board is going to be used. Once this has been established, you need to mark out the very rough sizes. For this, I usually use chalk, as it's easy to see on dark timbers such as walnut (picture 1).

This done, it's time to start cutting out the rough sizes. I used a combination of circular saw and jigsaw here, for ripping and crosscutting respectively (pictures 2-3).

Following this, the components are planed to get them flat on one surface (picture 4). Provided the boards are reasonably flat, a few passes over the planer should be sufficient. One edge of each piece needs to be treated in the same way, to ensure the planed face and edge are square to each other (picture 5).

Once all the boards have been surfaced and edged, they need to be passed through the thicknesser to achieve parallel surfaces and edges (pictures 6-7). It's just initial preparation at this stage, so you only want to take off a minimum amount of material.

When working with solid timber, always bear in mind the fact that it will move with a change in humidity. It is therefore a good idea at this stage to store the roughly prepared boards indoors for a three or four weeks, taking care to keep it away from radiators as these will make the timber too dry. Place uniform spacers between the boards, to allow air to circulate around them – offcuts of 18mm MDF, about 30mm wide, work well for this (picture 8). Doing this will allow the components to achieve a similar moisture content to the environment in which the finished table will live, thereby reducing the amount of movement that will occur after the table is finished.

After the timber has 'rested,' it can be machined to its final widths and thickness. Do not cut the pieces of timber to length at this stage.

Jointing the frame

The side and rails can now be cut to length – allowing, of course, for the tenons. At this stage, leave the tenons longer than their finished length.

I cut my tenons using a combination of dimension saw

STEP-BY-STEP GUIDE

Rough sizes are marked out using chalk, showing which parts of the boards are going to be used for which components

Rough cross-cutting can be done using a jigsaw

Rough ripping is done on a circular saw bench, if you have one. Note that the guard has been removed for clarity

The boards are planed, first to their surfaces and then their edges

Planed boards are then passed through the thicknesser to produce parallel surfaces and edges

Having been cut oversize, the timber is left for three or four weeks to acclimatise. Spacers should be used to allow air to circulate

Simple tenons are cut on the end and side rails...

...before mitres are cut on their ends

Here, a machine is used to cut the mortices on the legs, though you can do is just as well the old way. Final cleaning-up cuts must of course be taken by hand

A jig is used for cutting the tapers on the legs. Here, the fence on the saw table is being set up

There are two notches on the jig. These are used to cut the first and second taper on the legs

Having cut the tapers, plane the legs by hand to give them a smooth finish

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STEP-BY-STEP GUIDE

16

With the legs and rails prepared, the corner mortice and tenon joints are ready to go together. Use as many dry runs as you need to ensure you have a perfect fit

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Slots are cut on the inside side rails to accommodate the buttons for fixing the top

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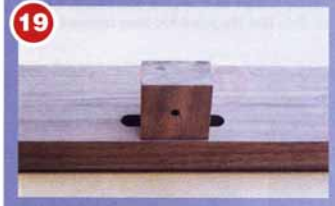

With a button in place, the small step from the edge of the top rail can be clearly seen

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The secret to pain-free gluing-up is to have everything you need prepared and to hand before you start

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Starting with the end assemblies, glue the components and cramp them up. Be sure to remove any excess adhesive, either from the outside surfaces or the inside of the exposed mortices

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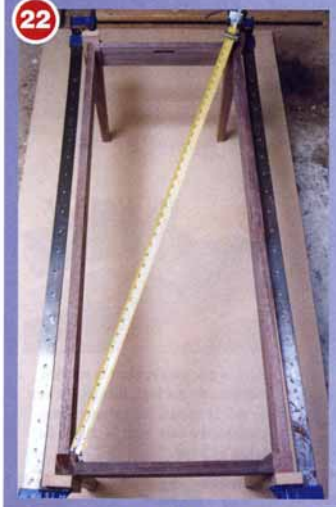

Having glued up the frame assembly, check its diagonal dimensions. If it's out of square, adjust it using a cramp across the longer diagonal

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Lay out the boards for the top with their annular rings oriented in alternating directions. This is to prevent the finished component from bowing

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Marking the boards with a triangle means that once you've put them in order, you'll keep them that way

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Mark out the positions for the biscuit joints – for boards of this length, five will be about right

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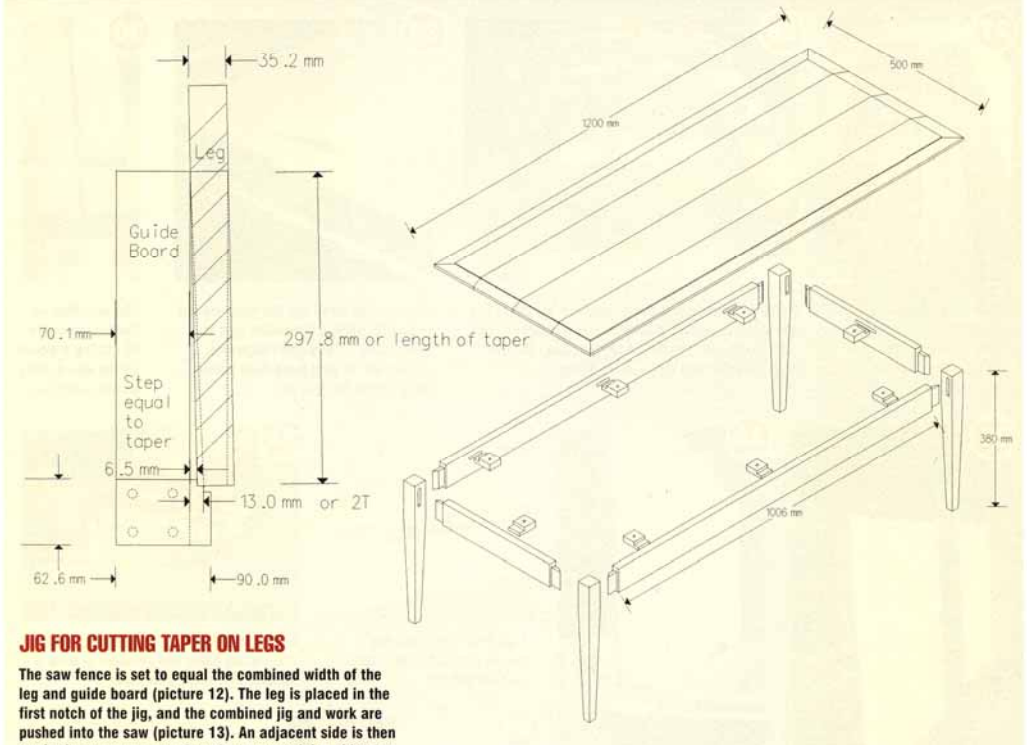
Slots for the joints are cut with a biscuit jointer. You could of course use a more traditional technique instead, but edge-jointing boards like this is probably where biscuits are at their most effective



JIG FOR CUTTING TAPER ON LEGS

The saw fence is set to equal the combined width of the leg and guide board (picture 12). The leg is placed in the first notch of the jig, and the combined jig and work are pushed into the saw (picture 13). An adjacent side is then cut in the same manner, then the two remaining sides are cut in the second notch (picture 14). No change is made to the fence setting.

and bandsaw, but there is of course no reason why they can't be cut by hand using a tenon saw. However you're working, it's always advisable to cut a test joint to make sure the set-up is correct before cutting the final tenons on the rails.

The tenons are fairly narrow and rely on a perfect fit for strength. Once your tests are complete and you are satisfied that the set-up is right, cut the tenons on the ends of all the rails (picture 9). Once this is done, cut the 45-degree angles on the ends of the tenons (picture 10) – make sure these are just slightly shorter than the space they will fit into, to allow for surplus glue in joints.

After the tenons have been cut, the square section timber for the legs is cut to length and the positions of the mortices are marked. These can now be cut (picture 11) – I used a mortising machine with a 9mm hollow chisel, but again there's no reason why you couldn't chop them out by hand. As with the tenon, it's advisable to make a test mortice before working on the actual components. It's very important that the tenons fit perfectly into the mortices – not too tight, but not too loose.

The moulding around the table top is clearly seen here. It's cut using a circular saw table and tidied up with hand-planes

Once the mortices have been cut, the legs can be tapered. I did this on my circular saw table, using a jig (pictures 12-14, plus diagram and caption). Allow for a little material to be planed by hand (picture 15), so as to achieve the sort of finished surface even the finest saw blade won't give you.

Before you go any further, it's time for as many dry runs as it takes to satisfy you that all the joints are perfect. Mark up and fit each in turn, making sure they all fit snugly (pictures 16-17). Another option may be to dry-assemble the whole frame, but it may be difficult to take it apart afterwards without causing damage.

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STEP-BY-STEP GUIDE

Place a No.20 biscuit in each slot and check the assembly for fit. The glue will make the biscuits expand and lock the joints

Placing the cramps alternately when gluing up the top will help ensure it doesn't end up cupped. The paper is to stop the glue from reacting with the metal cramps and staining the timber

With the top glued up, the ends are cut to length. Here, a dimension saw is being used – if you don't have one, careful use of your hand-held power tools will do the job, too

The moulding on the top is started by cutting a groove all the way around its upper surface

To help your saw accommodate the size of the top, it may be helpful to fix a flat board to the saw fence. Make absolutely sure that it's square to the saw table

The saw blade is set to an angle of 17 degrees and height of 30mm...

...so that it cuts into the groove you made previously (see picture 30)

Having cut the bevels on the top, clean them using block and shoulder planes, a scraper and some sandpaper

Seal the top and, using the buttons you've made, fix it to the frame in preparation for finishing

Once you're happy, you can go on to make the buttons for fixing the top. I did these using the dimension saw, and again I suggest you start off with a test run. Having made the buttons, drill and countersink a fixing hole in each.

The slots to accommodate the fixings now need to be cut on the inside faces of the rails. I used a 9mm, two-flute straight cutter for this, mounted in a hand-held router (picture 18). The slots should be in a position such that when the button is fitted, its top face is a millimetre or two below the top edge of the rails. This is so the fixing screws have something to pull against. The slots will also need to be longer than the buttons that will fit into them, so that the top is free to move slightly in response to changes in room temperature and so on (picture 19). This is particularly important on the end rails, as the top will move across its width rather than its length.

Before commencing with assembly, sand all the components, taking care not to get over-zealous and damage the faces of the mortices. Use first a 120-grit aluminium oxide paper and then a 150-grit. Any sharp edges can at this stage be removed with a block and abrasive paper.

Assembling the frame

The secrets to successful gluing are to do as much preparation work as possible before applying any glue, and to work in a methodical manner. Get all your cramps set up, prepare suitable glue blocks, have some scrap paper to hand to put between the work and the cramps, keep some warm water and a cloth handy to remove any surplus glue... and don't forget the glue itself, and a brush for applying it (picture 20). Any PVA-type adhesive is recommended, as this allows for slight movements in the timber – so that if the rails do decide to move slightly across their width, the glue joints won't respond by cracking.

Find a flat surface on which to carry out the gluing-up process, which is best done in two stages. First, glue up the short end rails: once the adhesive has cured, these can be joined by the side rails.

Apply the adhesive to both the mortice and tenon of each joint, but take care not to flood the mortice with glue. Start with the tenons on the two short end rails and corresponding mortices. Push the joints together by hand and apply the cramps with glue blocks (picture 21), using a damp cloth to remove any surplus adhesive

CUTTING LIST

All dimensions in millimetres

Rough sizes

Component	Qty	Length	Width	Thickness	Material
Legs	4	500	45	45	Black walnut
Side rails	2	1200	75	23	Black walnut
End rails	2	550	75	23	Black walnut
Top (to make)	4	1350	140	23	Black walnut
Buttons	8	55	45	23	Black walnut
Leg jig 1	1	400	85	18	MDF
Leg jig 2	1	120	80	6	MDF

Finished sizes

Component	Qty	Length	Width	Thickness	Material
Legs	4	380	35	35	Black walnut
Side rails	2	1060	65	29	Black walnut
End rails	2	394	65	20	Black walnut
Top (to make)	4	1200	140	20	Black walnut
Buttons	8	44	35	20	Black walnut
Leg jig 1	1	360	70	18	MDF
Leg jig 2	1	90	63	6	MDF

that is squeezed out. Take care to remove any surplus adhesive from the remaining four mortices, too; an old 6mm bevelled chisel and damp narrow brush works well for this purpose.

Allow enough time for the adhesive to cure, then remove the cramps. Finally, apply adhesive to the tenons on the long side rails and remaining four mortises, push the frame together and cramp it up. Once again, remember to remove any surplus adhesive.

Before leaving the frame to set, you must checked it for squareness. The easiest way of doing this is to measure across the diagonals (picture 22) – the measurement must be the same for both. If there is any discrepancy, a cramp will have to be applied across the diagonal with the longer dimension and tightened gently until the dimensions are the same. Once the adhesive has set, remove the cramps and give the frame another sanding.

Jointing the top

The four pieces of timber for the top now need to be joined up. These should still be over-length at this stage, and should remain so until they have been glued up. To safeguard against the table top bowing after it has been glued up, it is advisable to alternate the orientation of the annular rings on the ends of the boards (picture 23). Once you are satisfied with the arrangement of the boards, mark them with a large triangle (picture 24) – this will ensure that the chosen order is maintained, as the triangle won't match up if the boards are out of order.

Now plane the edges that are going to be joined up. It's best to use a sharp, finely set jack plane for this, as you have much more control than you would using the surface planer. The butting edges need to be perfectly flat and square. A good way to check this is to hold the two pieces of timber up to a light source; there should be no light visible along the joint.

Once all the edges have been planed, lay the boards on a flat surface and mark out the finished length along the flat surfaces as well as the edges. The positions of the biscuit slots can now be marked out. Five No.20 flat dowels per joint should be sufficient, two positioned about 80mm from the marked-out ends and the other three spaced evenly in between (picture 25). Cut the slots using a biscuit jointer (pictures 26-27), then dry-assemble the top and cramp it together to double-check that there are no gaps along any of the joints.

If you're satisfied the top is perfect, you can go on to glue it up. For table tops, I prefer to use a resin adhesive like Cascamite which, if mixed to the correct proportions, is extremely strong. It is comparatively brittle – but, as there is not going to be any timber movement along the joints, is still an excellent adhesive to use for this kind of application.

Again, have everything ready before you start work. Apply adhesive to both faces to be joined, as well as to the biscuits and slots. Double-check that the boards are in the correct order. Fit the cramps so that they alternate, with one to either side of the work (picture 28) – the idea here is that this prevents pressure from the cramps cupping the top. It is also advisable to put pieces of paper between the cramp and the work, to prevent the adhesive reacting with the metal of the cramps and staining the timber. As you go along, be sure to remove any excess adhesive with a damp cloth.

When the adhesive has cured (this will take at least six hours, depending on local conditions), the cramps can be removed and sanding can begin, followed by scraping. For the initial sanding, use a belt sander fitted with a 100grit belt; follow this up with an orbital sander, going through the grades from 120 to 240grit.

Using the markings you made on the long edges when you marked out the finished size of the top, re-mark the finished length on the surface. The top can now be cut to the correct length, using the dimension saw (picture 29) – if you don't have one, a circular saw and guide rail will provide an alternative, but do be sure to get your marking-out absolutely spot on before starting the cut.

Having trimmed the top to length, the sawn edges can be planed smooth and square using a block plane. To avoid splitting the ends, plane in towards the centre from each side.

Making the top moulding

As before, it is best to do a test first when preparing to make the moulding. First, cut a 2mm deep groove around the top, 33mm from the edges (picture 30), then set your circular saw to an angle of 17 degrees. Due to the size of the top, a piece of 18mm MDF about 400mm wide could be attached to the fence to provide additional support, making sure that it is at right angles to the saw table (pictures 31-32). The fence should be set to about 9mm from the blade at the table level, and the blade height should be set to about 30mm so the saw cuts into the groove (picture 33).

Carefully cut the bevels, taking care to keep the work against the fence and vertical at all times. You may well find that the guard has to be removed before you can cut these bevels; I'm certainly not about to recommend that you ever use a machine unguarded, so really you should look for another way. Some people will insist on removing the guard and pressing on; if you do this, on your own head be it – but do at least let us counsel you to take extreme care.

The bevels now need to be cleaned up using a sharp block plane and shoulder plane, scraper and finally sandpaper (picture 34). Both the top and the frame can then be scraped to their final finish, using a cabinet scraper.

Attaching the top

The end is almost in sight. Prior to fixing the top to the frame, I sealed both the underside of the top and frame with a coat of Danish oil.

Lay the top upside down and place the inverted frame on to it, then mark out the position of the frame on the underside of the top. Fit the buttons into the grooves and mark out the screw holes, then drill the pilot holes and fit the screws (picture 35). These buttons must not be glued in position.

Finishing

All that remains to be done now is the application of the finish. This, in some ways, is a matter of personal taste.

I wanted a natural appearance for this table, so I applied six coats of Danish oil to finish it – this is inexpensive and easy to apply, and while it's not as hard-wearing as lacquers, unlike them it can be rejuvenated. In order to make the finish more durable, I added satin polyurethane varnish to the Danish oil in a ratio of about 1:10 for the final couple of coats ■