5-Stage Cleats

In his new Fundamentals column, restorer and furniture maker John Lloyd explains the five key stages for successful cleating of table tops in the making of a refrectory table

On the face of it, adding a 'cleat' as part of the design of any piece of furniture is not a very smart move! One of the first lessons anyone learns is that wood moves. Or more precisely, wood gets bigger and smaller across its width when it takes on, or loses, moisture, but stays pretty much the same length whatever happens. Armed with this knowledge, no one in their right mind would come up with the idea of a 'cleat', a piece of wood securely fixed across the ends of a top made from several other pieces of wood in a way that restrains their free movement should they want, or need, to shrink. However, cleats have been used in various forms for hundreds of years, presumably with at least some degree of success.

Woodworkers discovered the inconvenient truth about wood movement very early on, and the cunning idea of 'framed and panelled' construction was thought up as a way of coping with this, albeit by some clever Continental chap, and was commonly used in this country in the 16th Century. At exactly the same time cleated ends were being used on table tops, and they're still being used today! So, what is the point of a cleat? Well, the idea is that a large, wide, unsupported lump of timber, maybe a table top made up of 3–4 boards, has a tendency to go out of shape, perhaps by the boards 'cupping' across their width. This is where cleats come in, by securing a reasonably substantial piece of wood across each end of the large unsupported lump, any tendency of the large lump to move is resisted by the cleat because the grain direction of the cleat is running at 90° to the main part of the top and the cleat's stiffness along its length has the effect of keeping the boards in line.

This is not entirely foolproof because the whole assembly, with cleats fitted, can contrive to twist or 'go into wind'! But nevertheless, in general terms, cleats can serve a useful purpose. Not only can they encourage an unrestrained table top to stay flat, they also have a rather pleasing look about them, to me they make the ends of a table top look 'finished'. The trick is to get them to do something useful whilst not at the same time becoming the architect of their own demise.

Creep **Choosing the right glue is critical when it comes to cleating**

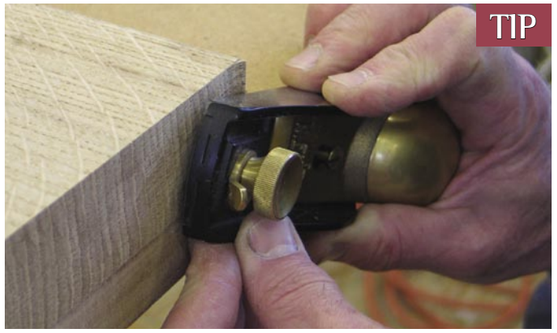
See how John's recently-made refrectory table compares with cleat-end tables of the past on p16

1 Cleaning up

The first part of the cleating process, having created a top of the desired width, is to square the top's ends. I have a large home-made T-square, just a jumbo-sized version of the ones we used to use at school for Technical Drawing, which I use for drawing up full-sized templates and 'rods', but it is also great at squaring lines across any large thing. A pencil line is all that's required to give a guide line for a jigsaw, which can be used to remove the bulk of the waste, but don't get too close to the pencil line as there's the chance of break-out on the top surface because jigsaws cut on their upward stroke. Final trimming is done with a router fitted with a bearing guided trimming cutter, using a straight-edge as a guide for the cutter. It's obviously a prerequisite of any straight-edge, to be straight, and it is also important that it stays straight when pressure is applied to it with a router cutter; so something reasonably substantial is required.

Routing endgrain is as tough for the router as it is for us to plane endgrain by hand, so if there's still a fair bit of wood to remove it's a good plan to take several passes with the router. A nice sharp, manly cutter is essential for this work and cutting speed is also important; listen to the cutter (through your ear-defenders). An anguished squeal with a note that is dramatically and quickly lowering its pitch is telling you that the cutter's having a bit of a struggle, so slow down and/or take off less material; no change in pitch might mean that the cutter's not being given enough to think about, which will often result in burning, especially on endgrain! Stop cutting just before the cutter reaches the end of the top, to prevent break-out, and then carefully trim the last little bit flush with a block plane.

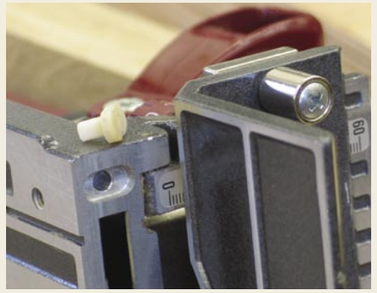
Trimming **John Lloyd uses a trimming cutter with bottom bearing to trim the end of the table top straight before grooving it for a loose tongue. Stop just short of the end of the top with the router to reduce the risk of breakout, and clean this up with a block plane (right)**



2 Attaching the cleat

I like to use a loose tongue to attach the cleat to the top. Forming a tongue on the end of a large table top, and an accurately matching groove on the cleat is a challenge I don't need in my life! Forming two grooves of exactly the same width, and exactly the same distance from the top surface of

2 Grooving for the tongue



The router option might seem to be the obvious choice for grooving for a tongue if fitted with a bearing-guided slotting cutter. This is the sort of cutter that looks like a mini circular saw blade, and this will certainly work, but I find that a biscuit jointer, with its larger diameter blade, will make much less fuss when making the cut, is nice and stable, and adjusting the depth of cut is easier than fiddling around with different diameter bearings, oh, and the dust extraction is probably more effective than a router. A biscuit jointer is, however, designed not to move when the blade is making its cut. In my case, with a Lamello, that means removing two little grippy lugs either side of the blade opening. The standard cutter in a biscuit jointer is only 4mm wide, so two or three passes will be required to achieve the right width of the tongue, and remember to work against the direction of the cutter, which in this case means moving from left to right. Don't make life difficult here though, go for a standard ply thickness that's around 1/3rd of the thickness of the table top. In this case the table top was 32mm so a 9mm or 12 mm tongue will be fine. Stop the groove about 25mm from each end and remember to put a curve onto the ends of the tongues, perhaps with a disc sander, to match the shape left by the jointer blade.

Biscuits **John chooses the biscuit jointer for grooving endgrain because it has a larger blade than a slotting cutter (right) on a router. Not all biscuit jointers are as well suited as routers for moving along an edge like this, and the plastic lugs on John's Lamello have to be removed for it to move smoothly**

Glues **John favours the 'weakest' PVA for cleating in the hope its ability to creep helps the joint**

the table is easy, well it is if there's a router or a biscuit jointer to hand (see panel left).

3 Choosing a glue

All that remains is to glue the cleats into place, and getting this bit right is vital if the cleat is not going to be the top's downfall. Historically, the only glue that was available was animal glue. There's no 'creep' in animal glue, in fact it sets like rock, but when it fails, it tends to fail along the glueline. This makes it relatively easy to dismantle a failed joint and re-glue it with a little more animal glue.

These days we have a plethora of different glues to choose from and they all have different things that they are good at. Cascamite, or whatever it's called these days, is a waterproof glue that has a strong glueline and sets like rock, so no creep, but unlike animal glue, it doesn't let go in a neat and tidy way, and failure with Cascamite tends to result in a nasty, jagged mess.

PVAs are basically plastic, but there are many different types of PVA, some are waterproof and some do clever things like cross-linking, which reduces creep, but in this case, when gluing cleats, creep is just what we do want. The PVA with the most creep is the one with the poorest performance, the one that should only be used for internal joinery; its technical classification will be 'D1'. The creep that this glue allows will often mean that the main part of a table top can shrink quite happily without even breaking the glueline.

4 Attaching the cleat

Having picked a glue, some cramps need to be organised. For a long table, standard sash cramps can be extended by bolting pairs of them together, and MDF spacers can be added to the bars to keep them clear of the wood. This will prevent the wood from being damaged, make it easier to clean up the glue and prevent any iron staining from the bars being in contact with the wood when it's wet. Don't hold back on the number of cramps and remember to alternate the cramps over and under the top to prevent the cleat from being twisted out of level with the surface of the top. Apply the glue with a brush, knock the cleats into place with a rubber mallet, one of life's must-have tools, and apply plenty of pressure with the sash cramps. Just remember that a sash cramp will tend to pull parts into a concave shape on the side the cramp is fitted, so check for the cleat twisting with a straight-edge and adjust the cramping pressure on individual cramps to get everything into line as necessary.

With the glue set and the cramps removed, the cleats need to have their ends trimmed flush; a pencil line squared around two faces of the cleat will give a guide for initial trimming with a saw, and final trimming of the tough endgrain can be tackled with a low angle plane. A block plane would certainly get the job done, but it might complain a bit. A better option, if you have such a thing, would be a low-angle jack. The far greater heft of this much bigger plane will slice through these big chunks of endgrain with comparative ease. Remember to attack the cleat from the end of the table to avoid break-out!

5 Finishing the top

With the table top now finished it just needs a final ingredient to ensure the top a has a long, uneventful, split-free life. Whatever polish or lacquer that has been chosen for the table, and its top, it must be applied to the underside of the top in the same quantitiy that it is on the top surface. It's very tempting not to bother with this, but find the time, it will be worth it. Apart from making wood look more lovely, polish reduces the rate at which moisture moves in and out of the wood and therefore restricts the amount that the wood is likely to move. There will of course be some movement in the top and after a while the cleats will seem to have grown a little, standing a little proud of the edges of the table top, but I wouldn't want to trim them flush again, I rather like this slight difference in levels; at least if this happens, and there are no accompanying splits in the surface of the top, it shows that the theory is working!

John Lloyd runs short and long courses at his workshops in West Sussex. Find out more at johnlloydfinefurniture.co.uk or call 01444 480388.

TIP

Cramping **Spacers under the sash cramps stop them staining the oak and keep them flat**

Must-have **John considers the rubber mallet one of the must-have tools in any workshop for assembly and knocking things apart**

Fundamentals Fact File

No.1 Trimming Cutters

John Lloyd explains how to make the most of a router and a simple trimming cutter

Quite why router cutter companies feel the need to produce their cutters in so many sizes and varieties, I'm not quite sure. Trimming cutters come in the obvious two options of 1/4in and 1/2in shank, but they are also available in a myriad of different lengths and diameters, and with the bearing fitted above or below the blades. Apart from this there are various other options like 'replaceable tip', 'negative shear' and 'milling', but these are for fairly specific applications like trimming laminates.

So which one to buy? Shank size might just be dictated by the size of router. Smaller routers will only take 1/4in cutters, but obviously when removing a lot of material from the end of a large table top, a large 1/2in cutter is going to be preferable and will give a much cleaner cut because there will be less vibration, or chatter, in the cutter!

Generally speaking, for trimming to a template, a cutter with the bearing above the blade is appropriate because more often than not it's easiest to fix the template to the top of the workpiece. Bearings below the cutter tend to be used for trimming laminates flush with an edge. But for trimming a wide edge to a template or straight-edge I would choose a long, 1/2in cutter with the bearing below the cutter. This means that a slightly deeper cut might be possible, especially if the template being used is quite thick and would otherwise affect the depth of cut.

With the template above the cutter you can fit a shorter cutter, using the template as a reference to start with, and then work your way down the finished edge, using the bearing against the workpiece itself. This can save you money on not needing a long cutter.

Sharpening a trimming cutter is possible, using a credit-card type diamond stone, but bear in mind that every time the blade is sharpened, its diameter reduces slightly, and ultimately the cut will not be quite flush with the bearing.

Variety **Trimming cutters are supplied with bearings above or below the cutter, and in various different diameters**

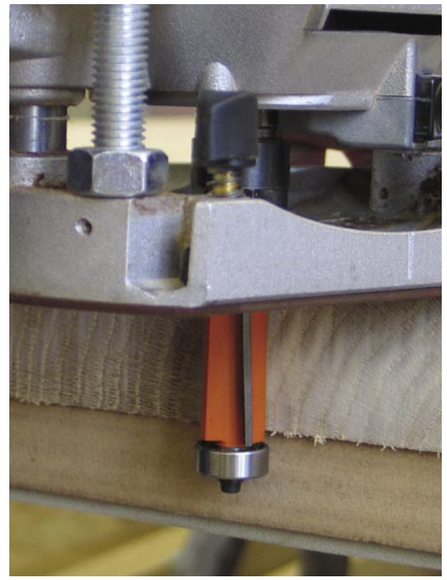
Using trimming cutters with a straight-edge

John describes the features of a good straight edge, and how to make a vacuum-powered version

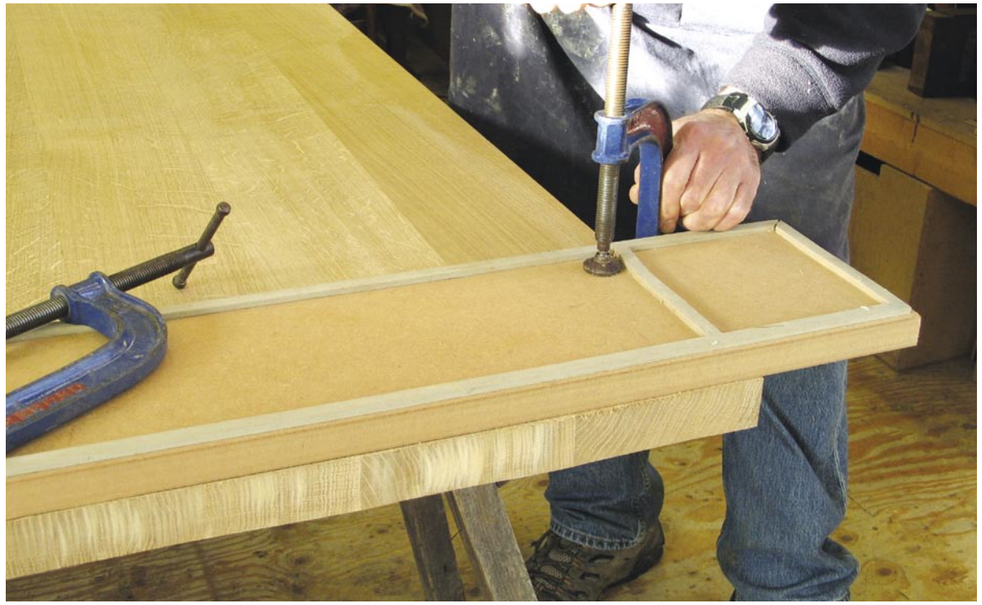
My preference is for a piece of MDF because it has nice smooth edges and stays flat; it doesn't have to be hugely thick, 3/4-1in is fine, but it does have to be relatively wide. It is this width which gives the straight-edge its stiffness. The one I'm using here is 1in thick, 200mm wide and 1200mm long, which seems to be adequate for most things. You might notice in the photos that it looks like it is covered in strips of something that looks slightly reminiscent of draught sealer, this is because it is covered in strips of draught sealer, and the eagle-eyed amongst you might also notice that there's a Bagpress fitting screwed into one end.

This straight-edge can be plugged into a vacuum pump and turned into a 'vacuum straight-edge', but in this instance, when it was to be hung on the underside of my table top and routed with a fairly hefty router and cutter, I felt the need for the security of some G-cramps. There is also the possibility, when it's vacuum powered, that the squidgy strips allow a tiny bit of sideways give in the straight-edge, which is not what's needed here.

TIP When attaching the straight-edge with cramps I use that old trick of putting a piece of garnet paper, folded into three, at the cramping points, sandwiched between the MDF and the table top, and of course a softening pad under the cramps on the other face. The abrasive bites into itself, the table top and the straight-edge, ensuring that nothing has a chance of slipping during routing. It's a good idea to position the straight-edge with about 4in protruding at the 'lead-in' end, so that the bearing on the router cutter can pick up the straight-edge before it starts cutting, which makes the process less exciting but more



Heavy **John favours MDF for straight-edges because it is smooth. He's made his own vacuum edge (below)**



Cleat-End Table Tops

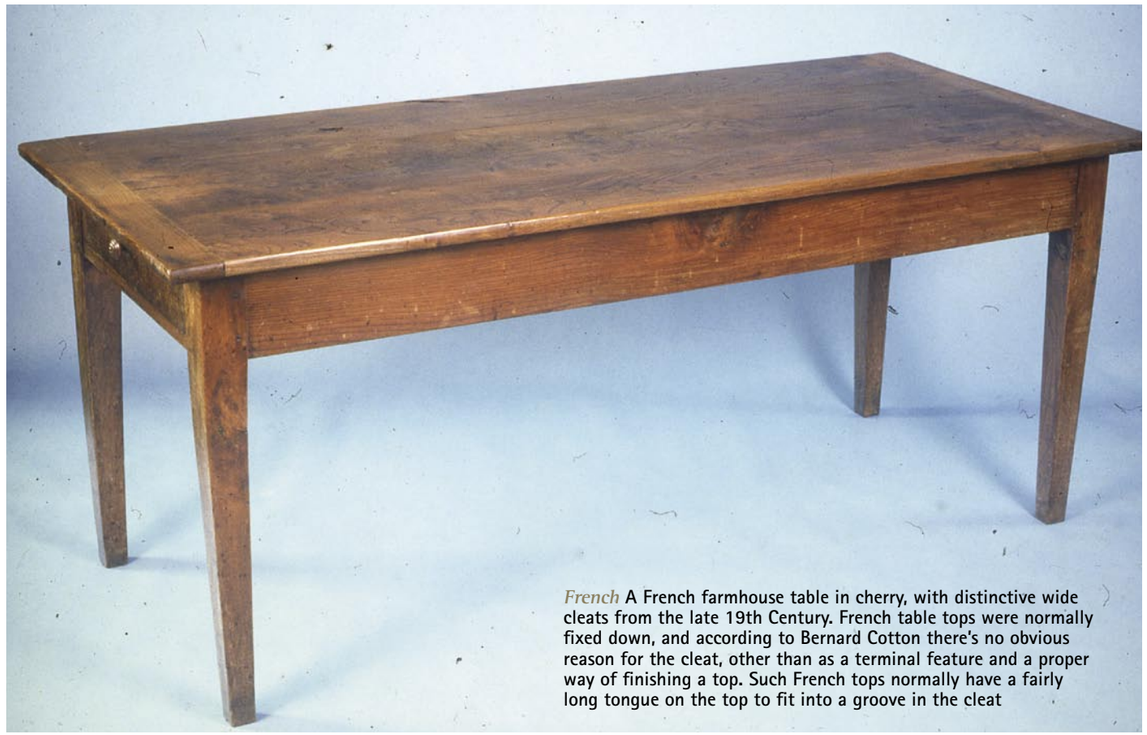
Furniture historian Bernard Cotton finds us some examples of cleat-end tables through the ages to put John Lloyd's piece in context

Newlyn Ralph Todd's painting shows a typical West Country table, with drawers along the sides and a pine top. Bernard Cotton, author of *The English Regional Chair,* says that people would often sit on benches obliquely at the table because they couldn't get their knees under the drawers, perhaps facing a fire. The chair was probably made by William Lavers who had a workshop in Plymouth from 1873–1900

Reversible This table with ash or elm base (and a pine top) would have been made for a West Country farmhouse in the 19th Century. The brackets at the ends are typical of the region. The top was cleated because it was detachable and reversible and so needed to be kept flat. The best side would have been painted with red lead paint, and might only have been used on Sundays and for celebrations, while the working side was plain wood and scrubbed, sometimes with fine sand

Portable Cleats were often used because the top was detachable and the table 'knock-down', perhaps for storage, or to be moved from house to house

High These two tables, both late 17th or early 18th Century, are taller at 32in than we would expect now, tables being usually 30in high now. Benches or joint stools would have been used. The sledge feet are similar to those used for John Lloyd's table (top left)



French A French farmhouse table in cherry, with distinctive wide cleats from the late 19th Century. French table tops were normally fixed down, and according to Bernard Cotton there's no obvious reason for the cleat, other than as a terminal feature and a proper way of finishing a top. Such French tops normally have a fairly long tongue on the top to fit into a groove in the cleat