

Making a Dovetail Box.



By Neils Andersen

Introduction

The size of a box is usually determined by what it going to be used for, however a box does look more aesthetically appealing when the sizes follow the "Golden Rectangle" proportions. These being the length is 1.62 times the width and the height 0.62 times the width. An example of this would be a box measuring 240mm long, 150mm wide and 90mm high.

The thickness of the wood must also be considered. Most boxes are made from wood either 10mm or 12mm thick. The smaller the box the thinner the wood and the larger the box the thicker the wood. The thickness could range from 6mm for a very small box to 19mm for a very large box. If the circumference around the box is less than 750mm you would use 10mm thick wood, if it is greater than 750mm you would use 12mm thick wood.

Timber for Box Making.

A timber that cuts and shapes cleanly with minimal tear-out without dulling blades and router bits is the best option. A medium density timber is usually the best option for making boxes. Timbers I would recommend are New Guinea Rosewood, Silky Oak, Queensland Maple, Camphor Laurel, Jacaranda, Huon Pine, Sassafras and White Cedar. Red Cedar is ok, but you do need to be careful as it does bruise easily. Some Australian Pines are all ok as well, but you do need to careful of chip-out from router bits.

Making a Dovetail Box.

The easiest and most accurate way to make a dovetail box is by using the "Gifkin's Dovetail Jig. There here are 3 templates that can be used to cut dovetail joints. These are shown below. The one we will use on this box is the A10.

STANDARD TEMPLATE SPECIFICATIONS			
Joint type	Through dovetails		
Template profile	H10	A10	B10
Dovetail cutter	TGHD 12 ¼	TGAD 12 ¼	TGBD 16 ½
Straight cutter	TGHS 12 ¼	TGAS 12 ¼	TGBS 16 ½
Pin size	6	10	17
Pin spacing	18	20	38
Min thickness	2	5	14
Max thickness	10	13	22
Max width	290	310	

Timber Width

The width of the timber to be used in a box is in direct relation to the distance between the slots on the template. The A10 as shown above has a pin spacing of 20mm. The smallest timber width I use the A10 template is 30mm, then I use timber widths in increments of 20mm, these being 30mm, 50mm, 70mm, 90mm, 110mm and so on. These sizes allow suitable tail and pin placements.

Timber Thickness

Each set of router bits has a minimum to maximum thickness of timber that can be used with a specific plate. The maximum thickness is related to the maximum cutting height of the router bits.

The size of the box we are about to make will follow the sizes stated in the cutting list shown below. You can vary the sizes if you wish but make sure the timber thickness does not exceed 12mm and the timber width is consistent with one of the timber widths **stated earlier.**

Part List		
Item	Quantity	Sizes (in millimetres)
Front & Back	2	280 x 70 x 12
Ends	2	180 x 70 x 12
Plywood Base	1	268 x 168 x 6
Lid Frame	2	500 x 38 x14
Lid Panel	1	230 x 130 x 14
Brass Butt Hinges	2	38mm x 20
C/S Brass Screws	12	10mm x 2.6

It is recommended that the plywood base and the lid panel not be cut to final size until the box carcass and lid frames are ready for dry fitting.

PROCEDURE

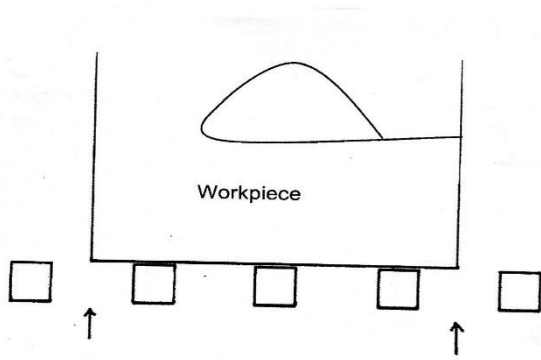
Step 1. Preparing the timber.

Mill down a piece of timber long enough for the front, back and ends. To ensure the grain on your box runs consistently along the box cut each piece as it will be joined to the next piece. Number the ends of each piece when you cut them so you know how it should be joined together. Also mark face & edge marks on each piece. This face will be on the outside of your box.



Step 2. Set the dovetail jig up to suit your timber.

Note: When using the Gifkin's Dovetail Jig your face marks must always face outwards. Set up the Gifkin's Dovetail Jig on the side of the jig marked "Dovetail". Align the ends of your first piece of timber so the ends are evenly spaced on the jig. Clamp both stops against the edges of your workpiece. Clamp your timber to the jig.



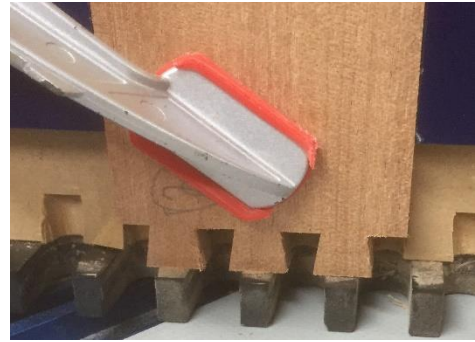
Step 3. Set the router bit at the correct height.

Fit the dovetail router bit in the router table. The height of your router bit **MUST** be the height of the jig plate plus the thickness of your timber plus 1/2mm as shown. This must be set long before you turn on the router.



Step 4. Cutting the Dovetails

Cut the dovetail slots on your first two pieces. The dovetails look better on the front sides of a box. Make sure the bearing on the router bit comes into contact with both sides of the template.



Step 5. Cutting the Pins



Turn the Jig around to the side marked **"Straight"**. Place your other two pieces usually the two short pieces, in between the stops which were set when you did the long pieces. Clamp your timber to the jig.

Fit the straight router bit in the router table. Again, the height of your router bit **MUST** be the height of the jig

plate plus the thickness of your timber plus 1/2mm.

Cut the pins on your other pieces as shown again making sure the bearing on the router bit comes into contact with both sides of the template. Now check the fit on the first piece into the corresponding long pieces. If the fit is ok cut the remaining pins. If the fit is not ok, you will need to adjust the shims to obtain a good fit.



Step 6. Dry Fit Joints



Note: -By adding a shim, you will get a looser fit, by taking a shim out you will get a tighter fit.



Assembled Box Carcass

Step 7. Levelling the top and bottom faces

Made sure the top and bottom face of the box carcass are all even. They can be made level by using a block plane, a wide sanding board or done on belt sander. Now lay the box carcass on a perfectly flat surface such as the top of a table saw and check that the top and bottom surfaces are flat.

Step 8. Cutting the grooves for the plywood base

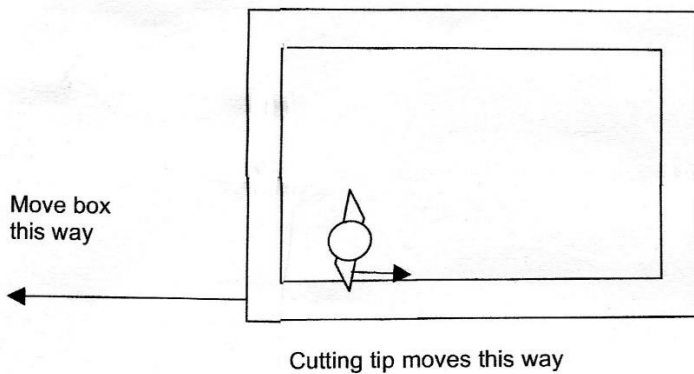


Fit the rebate cutter to the router at a height 4mm from the bottom of the cutter to the top of the router table. Use the cutter with the **large bearing first**.

Wrap some good quality masking tape around the box to hold the joints together when routing the grooves with the rebate cutter.

When cutting the grooves for the plywood base, the box must be moved along the inside of the box in the direction shown.

Now remove the large bearing and replace it with the **small bearing** then do another cut which will now be the required depth of 5mm.



Now the cutter must be moved up to do a final cut to obtain a groove that is the right size to fit the 6mm plywood for the base. A small piece of the same plywood used for the base can be used to test the fit of the plywood.



Step 9 Fitting the plywood base.



Before taking the box apart, measure the inside length and width of the box, and add 9mm. This will be the sizes for the plywood base. The reason for adding 9mm, is that the depth of the groove is 5mm all the way around which adds up to 10mm. Take away 1mm for clearance will then become 9mm.



Cut the plywood base to the sizes calculated. Rip the plywood to the correct width first on the table saw then cut it length using the sled on the table saw, making sure that the ends are square.

The corners of the grooves are curved because of the cutter blade. The diameter of the cutter is about the same as a 10-cent coin. This can be used to mark the curves on the plywood base. Use a sharp pencil to do this, then carefully sand the corners to these marked lines on a disk sander.

Now dry fit the plywood to the box and check that all the parts fit correctly.

Pull the box apart and sand the sharp edges of the grooves and plywood. Also sand the inside of the pieces with 120 to 400 grit sandpaper.

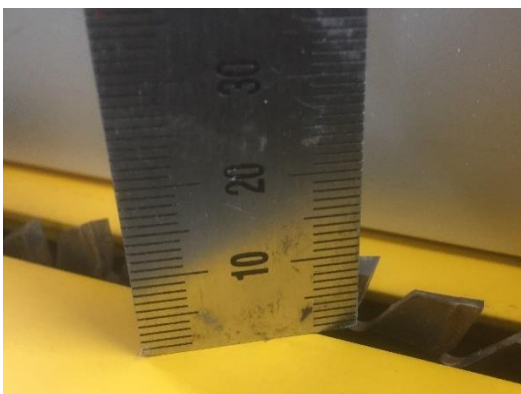
Step 10 Gluing the box together.



The box can now be glued up. Lay the pieces down how that need to be fitted. Apply glue with a small brush on all the joints and a small amount into the centre of the grooves. Assemble the box, tapping the parts together with a small hammer and waste piece of wood. Using a clamp and two small pieces of wood to prevent any bruising to the box, clamp the pieces together until the joints fit together.

Leave till the glue dries. The outside of the box can now be sanded on the linisher belt to remove any excess material on the corners.

Step 11 Making the frame for the lid.



Cut two pieces of timber for the lid frame to the sizes given. Each piece will make one long and one short side. It is safer to work with pieces this size.

Set the blade on the table saw to a height of 8mm. This will be the depth of the groove on the frame.



Set the fence so that when a cut is taken with each side up against the fence you will be left with a groove 5-6mm wide and 8mm deep.



Set the mitre sled on the table saw and cut the frame pieces to a length of 3-4 mm longer than the length and width of the box.

Now trim the ends using the Mitre Trimmer. They should now be 2mm longer than the length and width of the box.



Step 12 Making the panel for the lid.

Fit the frame in the frame clamp and tighten up the bolts to ensure the frame is square.

Now measure the inside length and width of the box and add 15mm. This will be the size for the panel. The reason for adding 15mm, the depth of the groove is 8mm all the way around which adds up to 16mm. Take away 1mm for clearance which then becomes 15mm.



Fit the panel bit in the router to a height so that the panel when the panel is done on the top and bottom the edge will fit in the grooves of the frame.



Now move the fence over so that the distance from the outside of the panel bit is 12mm Router the panel, both top and bottom so that the panel fits in the grooves of the frame. This is best done in a series of cuts to get the correct fit.

Step 13 Assembling the frame.



Fit the panel in the frame and check the fit. If it looks good put it in the frame clamp and check everything fits when clamped up again.

Note how it was assembled, then remove it from the frame clamp. Now apply glue to the mitre joints and a small amount in the grooves then reassemble and re-clamp.

Leave over night for the glue to dry. Remove from the frame clamp. Run it through the drum sander on both sides to ensure it is flat then sand with the Flea sander or orbital sander with 180 grit paper.

Step 14 Trimming the lid to the same size and shape as the box.



Attach the lid to the top of the box with some double-sided tape. Ensure the corners of the box line up with the mitres on the lid. There should be about 1mm overlap around the box.

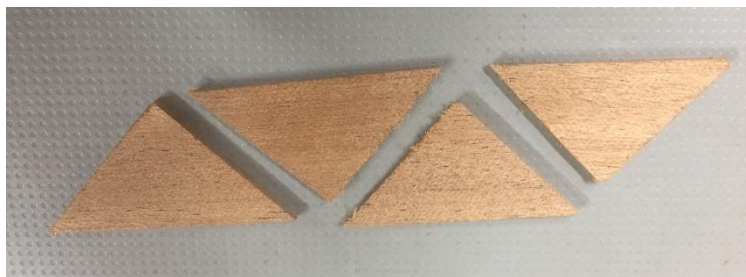
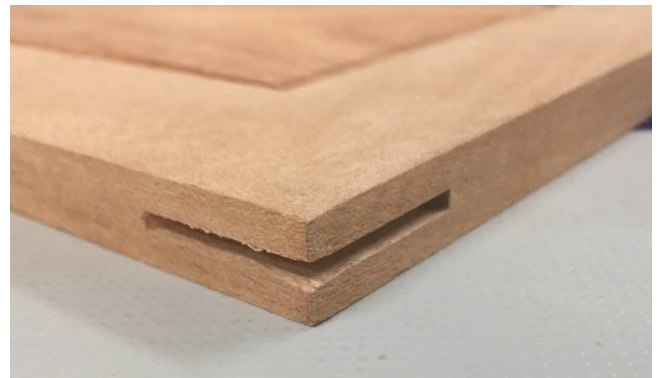
Now fit a flush trim bit to the router so that the bearing is just above the lid. Now run the router around the box (*Make sure you are going against the rotation of the cutter*).

The lid should now be the same size as the box. A light sanding on the finisher may be necessary.

Step 15 Fitting splines to the corners of the lid

Fitting splines in the corners will strengthen the mitre joints.

Using the spline cutting jig on the table saw, cut the grooves for the splines on the corners. You need to ensure that the groove is located in the centre of the panel. The depth of the groove is approximately 20mm.



To make the splines dress some timber to 30mm x 4mm. The timber can be the same as the lid or a contrasting timber.

Now run the timber through the drum sander until it fits into the grooves for the splines. It should slide in easily but not be too loose. If the fit is too firm the spline will not fit and the timber swells when glue is applied. Cut the timber into small pieces that are slightly larger in length than required.



Glue the mitres in the grooves making sure they are seated all the way to the bottom of the groove.

After the glue has dried trim the excess off the splines then sand flush to the outside of the lid.

Step 16 Cutting the rebates for the hinges.

Measure the length of the box. Then cut a piece of timber approximately 40mm x 6mm x the length of the box. This board used to set up the router for rebates for hinges is called a "Story Board". **Note** the length of this Story Board needs to be exactly the length of the box.



The length of the cut in the Story Board needs to be the length of the hinge. The depth of the cut needs to be the distance from the outside of the hinge to the centre of the barrel of the hinge. The distance from the end of the Story Board to cut needs to be how far the hinge will be placed from the outside of the box.



Set up a 6mm straight router bit in the router at a height half the barrel diameter of the hinge. Using the Story Board set the distance from the fence. Now set the stops on both ends. The travel between the stops will be the length of the hinge.

Now mark on the box and the lid where the back is. This is where the hinges will go. Carefully router one end of the lid and the box. Turn the Story Board around and set the stops up again and repeat the process until all rebates are cut.

The corners in the rebates are squared up with a chisel.



Step 17 Fitting the hinges.

The hinges are placed up against the shoulders of the rebates and secured with countersink brass screws. If done correctly, the lid will fit perfectly on the box. Some slight adjustment may be necessary.

Step 18 Catch or finger pull.

A piece of contrasting timber is shaped and glued onto the front of the lid. Also, a small magnet can be fitted to keep the lid closed, however, a brass catch can be fitted instead of the finger pull.

Optional extras

The inside of the box can be either fitted with dividers or a tray. This can be designed to suit the items that will be placed in the box.

If the box is for storing jewelry or other precious items, it is recommended that the base be lined with felt or a similar material.

Step 19 Finishing the box.

The box can be finished with any of the traditional or modern coatings. Regardless of the chosen finish it is recommended that the box and lid are sanded to at least 400 grit. Taking the trouble to sand through the grades from 120 grit will give the best results.

Step 20 Assembling the box.

After you are happy with the finish, reassemble the box and ensure everything fits correctly. A stay or chain can also be fitted to keep the lid at the correct angle when opened.

Well done. I hope you enjoyed making your box!