Woodwork 10 – Mitred Box Project

When you designed your box in Fusion we modelled the lid and the bottom separately. We will not be building the box this way. The box is built completely first (lid and base as one), after which the lid will be separated from the base. This will ensure that the finished dimensions of the lid and bottom match perfectly.

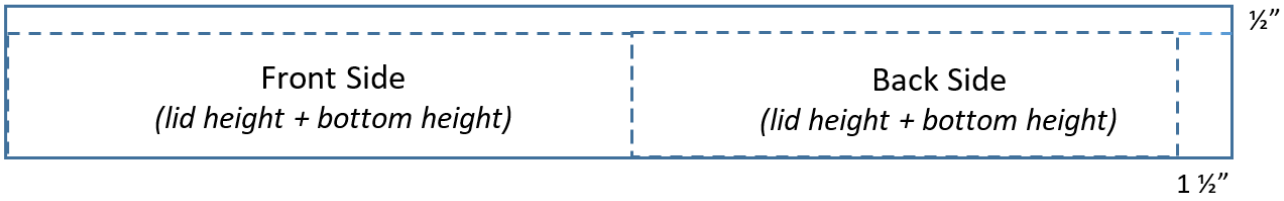
Note: Not all dimensions are included in the procedure below. All dimensions can be found on the project plans, these should be consulted as needed.

OBTAINING MATERIAL

1. You will need two pieces with sizes as noted below:

    - ***'Rough'* length needed** - add the front and back length plus an additional 1 ½"
    - **'Rough' width needed** - add the height of the lid to the height of the base plus ½".

Example: *this would produce one 'full height' front and back side*.



'BREAKING OUT STOCK'…

2. At the **Mitre Saw**, cut your material to 'rough length'

3. At the **Jointer**, machine a face side, then a face edge on each board and mark these.

    a. At the **Table Saw**, rip the boards to the required finished width (*size = base height + lid height (from your plan) + 1/8" to account for saw thickness/kerf)*

4. At the **Thickness Planer**, plane both boards to the finished thickness of 3/8"

MACHINE SLOTS FOR THE INSET BOTTOM…

1. Choose what is to be the inside of the box, mark this.
2. At the **Table Saw** set up the saw to create a slot in both boards 3/16" (5 mm) deep, 3/16" away from the lower edge.
3. Have your teacher check your set up.
4. After receiving the go ahead. Machine a blade width slot in the inside of both boards.

5. Check to see that the inset bottom material will fit your slot. If the slot needs to be widened move the fence slightly to the right and repeat the machining process. Check fit. If necessary adjust and cut again.

SAND & FINISH THE INSIDE OF THE BOX

1. Use an orbital sander
2. Begin sanding with 80 grit. Remove all blemishes/machining marks.
3. Lightly pencil the surface. Use 120 grit until pencil is gone.
4. Again, lightly pencil the surface. Use 180 grit until the pencil is gone.
5. Apply 'Feed & Wax' wood finish to the INSIDE SURFACE ONLY. Apply enough so that the surface is wet when done. Allow a minimum of 20 min to soak in, then rub off excess using paper towel.
6. Repeat Step 5.

CREATE THE MITRED CORNERS…

1. At the Table Saw, use a 'crosscut sled' to machine 45 degree mitres on each end of your two boards. Pay careful attention to miter direction (short side of miters to inside of box).

2. Use the Mitre Saw to crosscut each board in the middle.

3. At the Table Saw, again use the crosscut sled to cut 45 degree mitres on the opposing ends of the boards. This critical step can easily go wrong… ***Pay close attention to the following conditions when setting up for these cuts:***

    - Clamp sacrificial material on the sled's fence and cut this through slightly higher than the thickness of your box sides to clearly indicate the saw's path
    - Use a pencil to mark the correct miter direction on the edge of all boards to be cut
    - Measure carefully and accurately from the existing mitred end (long point) mark and square a line across each board that represents the finished length of the board.
    - Use the Digital Angle finding tool to ensure that the saw is set EXACTLY to 45 degrees
    - Position a board in the crosscut boat/sled such that the blade of the saw is in agreement with the direction indicated by the pencil line on the board to be cut
    - Clamp a stop block to the sled's fence using the mitred end of a board against the blade and the squared line to determine the proper position.

- Double check the positioning of the board. It is a good idea to cut a piece of scrap and measure the result (adjust if necessary)
- Cut the first board, following this with the others (*if they are all to be the same length*)

MAKE THE INSET PLYWOOD BOTTOM FOR THE BOX…

1. Obtain material. This should be made such that it is slightly smaller than width formed by the opposing slots made earlier to allow for movement. Use the slot you created to mark the length/width of the plywood.
2. At the table saw, trim the plywood to its finished length and width.

GLUING UP THE BOX…

1. Using the outside tape method, prepare to assemble the box. **DRY FIT** everything first to ensure that all will go well during glue up. Correct any issues observed.

2. Spread glue one the mitered corners. Take care to consider how much glue would be best. Spread glue on half of the miter from approximately midline to outside edge (dried glue is easier to remove from the outside of the box than the inside).
3. Using the outside tape method as an assembly aid, along with a straight edge to assist with alignment, assemble the box. Ensure that the bottom edges of the box align are pressed down firmly to the table. If out of alignment tap down on the upper edge using a mallet and a block of wood. Use a damp paper towel to remove any and all glue squeeze out from the inside of the box.

4. After the glue has dried, un-tape and sand/scrape off any external glue squeeze out before proceeding.

MAKING THE LID…

MACHINING

1. Prepare a lid for the box. See attached diagram/details to select and prepare a ‘blank’ that will be re-sawn to produce two ‘book matched’ pieces.
2. Re-saw the blank down its middle (mark a line on the edge opposite the face edge using a marking gauge, then highlight this line using a pencil)
3. Thickness plane (good faces down) both top pieces to achieve a thickness of ¼”

EDGE GLUEING

1. Arrange the two pieces edge to edge in consideration of grain/book match and inspect edge mating. Correct any mating issues by jointing edges as necessary. Take care to remove minimal material when doing so.
2. Glue the two top piece edge to edge. Spread glue evenly on both edges. Use three strips of painters stretched across the two pieces on both sides to secure the glue up while it dries. Weight the top such that it will help it to dry flat (do not allow it to stick to anything during the drying process). Leave to dry until next class.
3. Remove tape and scrape/sand off excess glue. Sand what will be the inside of the box lid to finished quality, moving through 80, 120 then 180 grits of sand paper.

FITTING

1. Lightly pencil center marks on two opposing sides (outside) at the top edge of the box. Turn the box upside down and place on the finished side of the top. Align the middle marks on the box with the glue seam of the top. Create marks/lines on the top that are offset from the box approximately 1/16”.
2. Use the Table Saw (rip) and the crosscut sled to trim the box top to the pencil lines create in the previous step.

ATTACHING THE TOP TO THE BOX

1. Glue the top onto your box. make sure to align the tops center seam with the center of your box (pencil marks).
    - Make sure that the top overhangs slightly on all sides. Clamp the top to the box, using appropriate clamps and ‘strong back’ so distribute clamping load.
    - Use a flush cut bit mounted in a router table to trim the lid such that it is flush to the box.
    - Use a chamfering bit to create a 1/8” chamfer on all edges

MAKING THE SLOTS FOR THE CORNER SPLINES…

1. On one corner of the box, use a pencil to layout the center position for the splines, two for the bottom portion of the box and one for the top portion of the box. These marks should be evenly spaced to achieve a pleasing to the eye result. You will first need to identify and mark the location that will become the separation point for when the lid is cut from the bottom as determining and measuring from this point is the only way to ensure that the splines will be evenly spaced.
2. **** Have your teacher check your setup before performing this procedure **** Use the splining jig to create slots for the box corner splines.

3. Ask your teacher for spline material (you will need to determine the species of wood you would like to make these from, ie dark or light). If not on hand, your teacher will either cut this for you, or assist you in doing so.
4. At the Band Saw, cut your spline material to lengths slightly longer than the length of the slot they will be fit into. Pro tip: once one length has been determine and cut, use this as a template to mark for subsequent lengths.
5. Glue the spline material into the box. Use masking tape to protect the box from glue that will squeeze out from the joints.
6. Carefully, using thoughtful technique to prevent grain tear out and a flush cut hand saw, cut off the excess spline material. Aggressive cutting can lead to wood tear out resulting in the need to repair.
7. Sand the splines flush to the face of the box (sand with the grain direction!). No need for finish sanding at this point.

CHAMFERING THE BOX TOP

1. At the router table, using a 45 degree cutter, machine a chamfer on all the top edges of the box.
    a. This procedure is to be done in at least two passes (cutting depths) to minimize the chance of tear out.
    b. A test cut to confirm setup prior is highly recommended – use a scrap piece.

SEPERATING THE LID FROM THE BOTTOM

Have your setup for this procedure checked by your teacher BEFORE performing this operation!

1. Move the rip fence to the left side of the blade and attach an auxiliary fence using clamps.
2. Ensure that the fence is square to the table, shim if necessary.
3. Adjust blade height to just cut through the box (slightly higher than 3/8”)
4. Standing on the left side of the saw, facing the fence, hold the base of the box against the fence with hands positioned at the top of the box well clear of the blade.
5. Have an assistant, standing in the normal operator position, hold the base of the box against the fence using a push stick. During the procedure the push stick must always stay behind the blade.
6. After your setup has been approved, perform the operation cutting all four sides. On the final cut, DO NOT reach for the lid as it separates from the base. Stop the saw. Only reach for the lid AFTER the blade has stopped rotating!
7. With a pencil, create alignment marks to indicate the orientation of the lid to the base
8. If necessary, use a sanding board to sand the mating edges flat

DRILLING FOR HINGES

1. Identify what is to be the back of the box and mark the edges of the wood (both top and base) with a 'B' to indicate that these edges will receive hinges.
2. Obtain a drilling jig and the appropriate drill bit with a stop installed.
3. Use the drilling jig to drill holes in the edges identified in step 1
    a. The jig must clamp securely on the wood. If loose, use spacer (of equal thickness) on each side of the jig.

MACHINING CHAMFERS FOR HINGING

1. At the router table, using a 45 degree cutter, machine a chamfer on the hinge edges of the box, both lid and base.
    a. The goal is to machine the chamfer so that its edge is aligned half way through the hinge hole
    b. This procedure is to be done in at least two passes (cutting depths) to minimize the chance of tear out.
    c. A test cut to confirm setup prior is highly recommended – use a scrap piece.

FINAL FINISHING

1. Sand the entire outer surface of the box (all surfaces!)
    a. Remove any machining marks using 80 grit (much of this was done earlier)
    b. Remove scratches left from 80 grit using 120 grit (pencil technique)
    c. Remove 120 grit scratches using 180 grit (pencil technique)
2. Have your sanding approved by your teacher BEFORE proceeding
3. Apply wood finish (two coats), buffing in between and after

HINGE INSTALL

1. Obtain two barrel hinges.
2. Examine the hinges so as to install each in the same manner
3. Press each hinge into its hole in the base. GENTLY tap with a wooden mallet as needed.
4. With the hinges held vertical, align the hinges with lid hinge holes, then press down on the lid to insert the hinges.

GRADING

1. Obtain a Self-Assessment grading sheet and complete it.
2. Turn in both the assessment sheet and your project. Your name needs to be clearly written on both!