National Certificate in Building, Construction, and Allied Trades Skills (BCATS)

Make a cupboard as a BCATS project

Unit Standard – 25921

Level 2, Credit 6

Name: _____

>>B CONSTRUCTIVE

Contents

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What you need to do

By the end of this module, you should be able to:

- Prepare a cutting list for a cupboard.
- Mark out, cut and machine materials for a cupboard.
- Assemble and finish a cupboard.
- Complete work operations.

How you will be assessed

You need to show your teacher/tutor that you can make a cupboard that includes doors (or a door) and drawers (or a draw) as well as:

- preparing a cutting list,
- mark out, cut, finish and
- assemble required components.

Glossary of terms

Term	Meaning
Arris	The sharp edge formed by the intersection of two surfaces.
Carcase (carcass)	The body of a joinery unit.
Cutting list	A list of components, which you need to cut to size.
Flush	Flat, level.
Component	A part of the cabinet.
Hardware	Joinery fittings such as hinges, screws, adjustable feet metal drawer slides.
Hinge mounting plate	A plate that screws to the cabinet carcase and onto which the hinge is clipped. Hinge mounting plates allow cabinet door levels to be easily adjusted and the doors to be quickly removed and reattached.
Jig	A machining aid.
Machinist	A person who specialises in using joinery machinery.
MDF	Medium Density Fibreboard. MDF Manufactured product made by reducing logs into fibre form and combining with resins, compressed to create sheets
Pilot hole	A small hole drilled that makes it easier to drill in screws.
Pre-fabricated metal drawer	Drawer sides that need a front, back and drawer bottom added
Shank	The total diameter of a screw
Shank hole	The hole through which the whole screw passes comfortably.
Specification	A set of written instructions that explains the job requirements.
Template	A pattern that is made to be be used many times so as to ensure accuracy.
Thread or Pilot hole	The hole into which the screw thread bites its way, and must be smaller than the diameter of the shank and at least the full length of the screw.

Introduction

These learning notes bring together your skills and knowledge to make a cupboard as a project. From a drawing, you will understand how to create a cutting list, cut all the components required, assemble the components correctly, and finish the cupboard.

You can use the knowledge you learn as part of this project to make other cupboards to your own, or to others design.

As you create your cupboard, make sure you work methodically. Take the project one step at a time, and in sequence. The order in which you will work is

1. Identify the drawing and job specifications.
2. Make sure you understand the drawings and specifications. If you're not sure, ask your supervisor for help.
3. Create a cutting list.
4. Identify and select the correct materials.
5. Create the components for the cupboard.
6. Sand or finish the components ready for assembly.
7. Assemble the components.
8. Finish the cupboard.
9. Clean up.

If you follow the simple process above, you'll complete your cupboard without any problems. Remember that this project requires you to do certain things before you can do others. Work logically.

You'll need to use a variety of hand tools during the assembly process. Make sure all the hand tools are available and ready for use before you start the assembly process. Use the hand tools correctly and safely.

If at any time you're not sure of what to do next, refer back to the appropriate section of these notes, or ask your supervisor for help.

Most importantly, enjoy what you're doing.

Health and Safety

The Health and Safety in Employment Act is a law that is designed to

- prevent harm to employees at work
- promote good practices in health and safety management.

The Act puts responsibilities on both employers and employees to make sure the aims of the law are achieved.

In the workplace, you must take all practical steps to ensure your own safety, and the safety of others.

You must also wear personal protection equipment (PPE) such as

- hearing protection
- safety boots or shoes
- dust masks
- safety glasses (even if you wear prescription glasses, you must still use safety glasses)
- leather apron
- overalls.

The machinery and other equipment you use must have appropriate guards and safety devices to prevent injury. You **must not** use any machine without the safety guards fitted correctly, and you must receive adequate training in the use of that machine.

Use the machine guards

Set your machines up before beginning work

If you think a machine is not safe to use, don't use it. Ask your supervisor to check it out.

Maintenance

All machines must be maintained so they operate correctly and safely. If you use any machine, you should know the maintenance requirements for that machine.

Machines need to be lubricated regularly so they perform efficiently. Cutters and blades must be sharp.

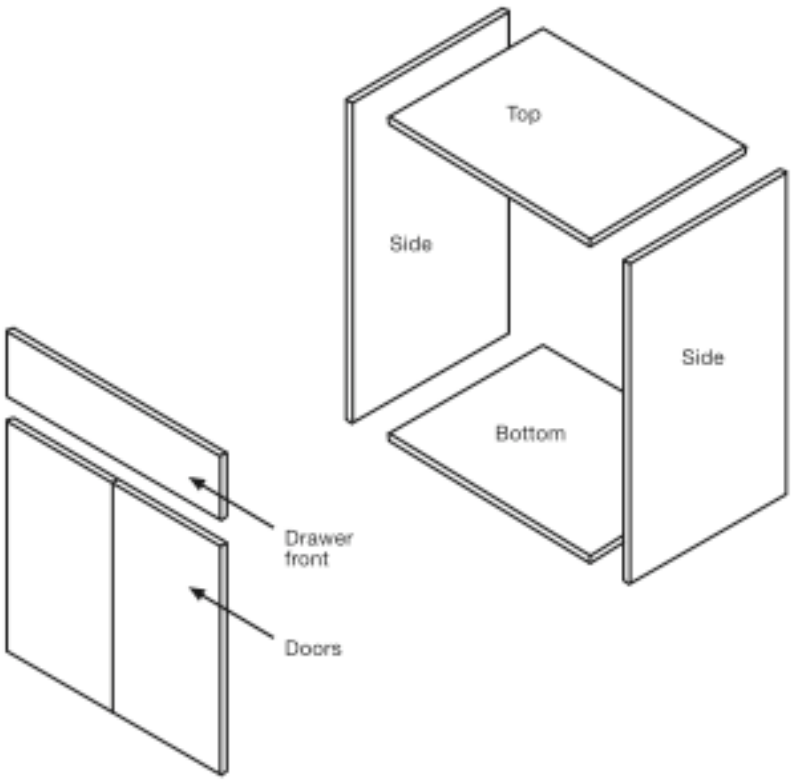
The Project

Below you will be taken through the steps for making a standard cupboard so you understand and can practice the basic processes that need to be followed, before making your own cupboard.

The parts

Our example will have the following parts:

- cupboard carcase
- doors
- drawer guides
- a drawer front that is attached to a metal drawer
- attachments.



Exploded view of the cupboard

The drawer will be at the top of the cupboard (for example a cutlery drawer).

What materials are needed?

For the example cupboard you'll need

- working drawings and specifications
- a cutting list form used in your workplace
- a sheet of 16mm MDF
- hardware (screws, overlay hinges and mounting plates, a metal drawer, drawer runners, drawer bottom, handles, adjustable feet).

What tools will I need?

- hearing protection
- a fine toothed cross-cut saw
- a drill press or borer for the hinge holes
- measuring tape or rule
- pencil
- combination square
- cordless drills
- drill bits
- screw driver or screw driver bit for the cordless drill
- jigs and templates
- sand paper, cork sanding block, orbital (palm held oscillating type) portable sander.

Getting started

Normally the first step in the process is to get the job specifications and a drawing from your supervisor. However for the purposes of this example, we'll use the drawing shown above. The cupboard is to be made from 16mm MDF, and have one drawer, and two doors. It is part of a kitchen that is going to be painted.

Knowing the size the cupboard has to be and from the drawing, we can work out the components and create a cutting list. You will see from the exploded view that we will need the following components.

1. 1 top
2. 2 sides (or ends)
3. 1 bottom
4. 1 drawer front
5. 1 pre-fabricated metal drawer
6. 2 doors
7. 4 self closing hinges
8. 3 handles
9. 4 adjustable legs

You will notice that there are 4 hardware items in the cupboard that are bought from other suppliers (pre-fabricated metal drawer, hinges, handles, and adjustable feet).

The components to be made from MDF are top, sides, bottom, drawer front, and doors. We can now create the cutting list. Most companies have standard form on which they create their cutting lists for the machinist. It can look something like the one shown on the right..

Client: _____ Job Number: _____

Date required: _____ Finish: _____

Description: _____

Component	No.	Length	Width	Th	Notes

Making a cutting list

Let's take this style of cutting list and insert our own information.

Client: A. Trollop Job Number: 0909/065

Date required: 30 September, 2009 Finish: Paint or polyurethane

Description: Cupboard with single drawer and 2 doors.
Manufacture from 16mm MDF
Hardware: 120mm metal drawer, satin chrome 'D' handles, overlay hinges
Standard adjustable feet

Component	No.	Length	Width	Th	Notes
Top	1	568	575	16	MDF
Bottom	1	568	575	16	MDF
Sides	2	740	575	16	MDF
Drawer front	1	598	150	16	MDF
Doors	2	590	300	16	MDF
Metal drawer	1	560	400		120mm deep
Hinges	4				Full overlay, self closing
Handles	3	100			Satin chrome
Adjustable feet	4				Standard

You can see from this cutting list that the next step is simple. You need only to be able to identify MDF.

If you don't know what MDF looks like, ask you supervisor to show you. You'll need to identify the other materials later, before you start the assembly process.

Having identified the MDF, select a sheet that is the correct thickness. Remember the specification states the need to use 16mm MDF. A quick check on the cutting list confirms this.

Note: If you change the thickness of the sheet, for example to 18mm, you will have to write up another cutting list so everything fits together, and work out the most economic way to cut the parts.

Choose a full sheet of MDF for the cutting out

Remember to wear hearing protection when you're using machines.

Get help with lifting full sheets of material. Don't struggle on your own.

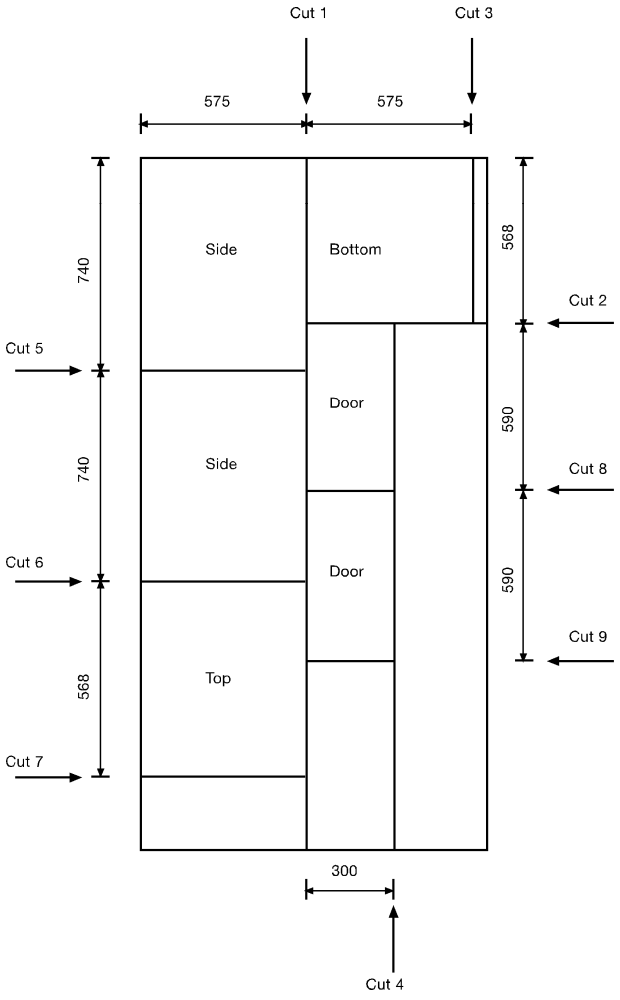
One of the things you will become better at over time is how to work out the most economical way to cut a sheet. It can become a confusing and more expensive when you try to cut out components singly from a lot of different sheets.

The standard sheet size of MDF is 2400mm long by 1200mm wide. We can cut the sheet for this example project so it is economic and efficient. Below are the directions how to do that.

Cutting the MDF sheet for the carcase

First, we can split the sheet along its length, giving us a strip at 575mm wide. That strip will give us two sides and a top.

There will be an off-cut around 350mm long by 575mm wide, and we still need to cut piece for the bottom, and the two doors out of that.



Cutting order

If we cut across the width at 568mm, then at 740mm, we'll now have the top and bottom from the first piece, and the two sides and the top from the second piece. There are two off-cuts and a lot less waste.

The next cut will be across the sheet at 300mm. This gives us the 2 doors.

The last component we need to rip up is the drawer front at 150mm high by 568mmm wide. Most workshops have an off-cut area. Look in there, you will probably find an off-cut you can use for the drawer front.

Having cut the components to size in one direction, we need to cut them to size the other way.

Now, set the rip fence to 575mm. Trim one edge of the 568mm strip using the squaring off fence. This makes sure that the component will be square. Then cut the component using the rip fence. Run the remaining piece though at the same size. We now have a top and a bottom

Next, get the 740mm strip. Do the same as before – trim one edge on the saw using the squaring off fence, and cut the two sides.

Cut the doors to length next. Set up to stop on the squaring off fence. Checking the cutting list, we can see that the finished length of the doors is 590mm.

Then trim one end of the drawer front strip. Turn it around, and measure and mark 590mm. Cut exactly on the mark to create the drawer front.

Note: as you are assembling the carcase you most likely will have to trim the doors and drawers so they have clearance and do not rub against any other part of the cupboard.

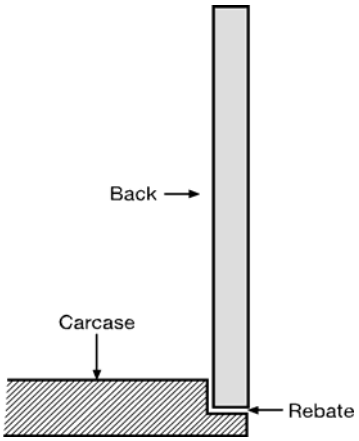
Now find an offcut that will be suitable for the cupboard back and trim it to approximately 650mm x 800mm. It can be the same thickness as the carcase MDF (16mm) but would be best made out of thinner material. You will trim and fit this back panel to an accurate size once the carcase is assembled.

Make a final check of the cutting list to make sure all the components required for the cupboard are cut out.

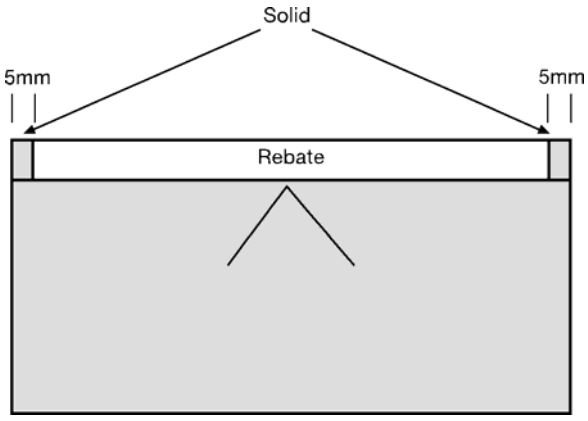
What other machining do we need to do before assembly starts?

The back panel rebate

Start by cutting the rebate for the back panel.



The rebate for the back



The solid overlap area to be left at the ends of the top and bottom

Lay the cupboard top, bottom and sides flat on your work bench and with a pencil, make a light arrow head mark on the inside of each panel that points to what will be the rear of the cupboard. This arrow marks the interior and rear of the cupboard so you do not get confused.

Now draw a line the same distance in from the rear as the thickness of your cupboard back.

Note: On the top and bottom you will not router right to the end of the panel. You need to leave a solid piece of carcase 6mm from each end. To do this measure in 6mm from each end and draw a line square across the rebate as shown in the diagram below. This shows you the solid that you do not want to router into.

Important: *Routers work at high speed and are very dangerous machines if incorrectly used. If you have not used a router before, or are unsure about any part of its operation, ask your supervisor to demonstrate to you how to set up and use the router correctly and safely.*

Choose a 10mm straight router bit. Do not plug the router in yet. Insert and tighten the router bit, set the router depth stop so the router will cut a groove 11 mm deep.

Lay the sides down so you can see the arrow and rebate line you marked earlier. Put on your personal protective equipment, and using the router fence or a guide template, router out the rebate to the line you drew.

Router more slowly as you come to each rebate end on the sides, so the rebate finishes without accidentally going around to the next panel side.

Now select the top and bottom and router out the rebate on those. Note that on the top and bottom you **do not** router right to the end of the panel. You don't want to cut into the piece of

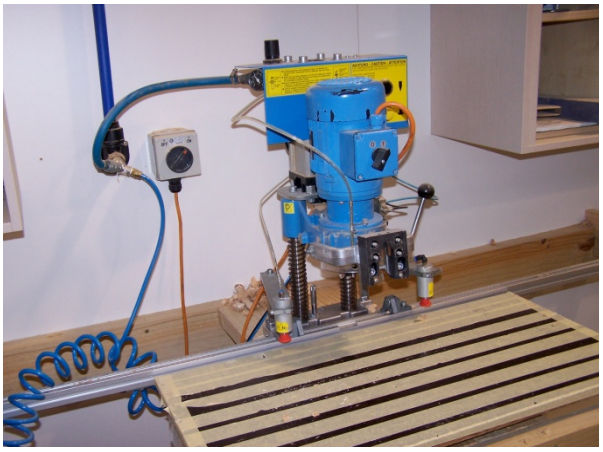
carcase 6mm from each end that you left as an overlap. Router close to the square line you marked across the rebate, without cutting into it. Then take a chisel and by hand square off the rebate right up to the line.

Hinges

You next need to bore the holes for the overlay hinges. Many workshops have a specialised drill that is set up all the time for boring these holes.

If your workplace has a specialist borer, get you supervisor to show you how to use it. At this stage, you are not expected to be able to set it up.

If your workplace doesn't have one of these specialist machines, you'll need to use the drill press. Set up the drill press. There may be a jig you can use to give you the correct positions of the holes. If your workplace doesn't have a jig, you can use a combination square to pencil gauge the correct position of the holes off the edge of the doors. Then measure the correct distance from each end and mark the centre of the holes.



Overlay hinge drill

Carefully use that mark to bore the holes. When the holes for the hinges have been bored, we're ready for assembly.

The carcase of the cupboard is going to be screwed together. Work through the steps below to put the carcase together.

Cupboard Assembly Steps

Step 1. Lay out the two sides on your bench. Pencil gauge a line 8mm off each end of the sides.

Step 2. Mark off positions for 4 screws. The screws at each edge need to be *at least 50mm from the edge,* so the top and bottom don't split and to avoid the rebate for the cupboard back.

Step 3. Place a drill bit in your cordless drill. Make sure it is large enough for the screw to pass through the hole. Drill shallow pilot holes for the screws to go into on these marks.

Step 4. Attach the drawer runners to the inside of the sides. Your workplace may have a template with the correct hole positions.

Step 5. Now, get one of the sides and the top, and place them together with the end of the top flush with the end of the side.

Flush side and top

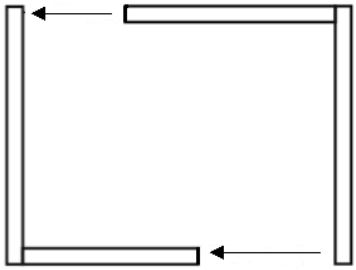
Step 6. Now get a smaller drill bit and place it in your drill ready to make the pilot holes for the screws. Remember that the pilot hole should be slightly smaller than the diameter of the screw shaft.
At this stage, you'll need a screw driver or a second cordless drill set up with a screw driver bit.

Step 7. It's time to work with the remaining top and side. Get one the other side and the top, place them on edge, and put together with the end of the top against the face of the side. Make sure the top is flush with the end of the side. Holding the two components together, drill the first pilot hole.

Step 8. Using your screw driver (or cordless drill) on a slow speed put a screw into the first hole. Tighten the screw until the head is just below the surface. The screws you're likely to be using will have self countersinking heads so you should not need to countersink a hole for the heads.

Step 9. Repeat the process with the other holes in this joint, keeping the top flush with the end of the side. The top and the side will stand up on edge without you having to hold them. Do the same with the other side and the bottom.

Step 10. Finally, we can screw the two angled parts together to create the carcase as in the diagram below.



The two carcass parts come together.

Check that the carcase is square, using a square. Get your supervisor to help you do that if you need to.

Step 11. Now lay the carcase face down on your workbench and measure the height and width of the back from rebate to rebate. Take the back you had earlier cut out to an approximate size, and cut the back to fit the rebate snugly.

Test fit the back, if it is too tight and sticking, place the back in a vice and trim the edge lightly with a hand plane until the back sits in the rebate with a small neat gap between the back and the cupboard carcase.

Now put the back aside for the moment. You will not attach it until you have the hardware installed.

Installing the hardware

Now we have the basic carcase, we can start putting in the hardware we need. Identify and select the correct hinges (including mounting plates), metal drawer and runners, adjustable feet, and handles.

We suggest you ask your supervisor to work with you and guide you through these stages below so you can use their knowledge and better understand the fitting.

- First, attach the hinge mounting plates in position. Again, your workplace may have a template for this.
- Insert the drawer bottom and attach the drawer front to the metal drawer,
- Insert the hinges into the back to the doors.
- Place the carcase upside down on your bench and attach the brackets that hold the adjustable feet in place. The brackets at the front of the carcase need to be positioned at least 60mm back from the front edge of the bottom.
- Position them at least 50mm in from the edges of the sides and at the back. Here, you can your combination square as a guide to get the correct position.
- Tap the adjustable feet into the brackets and turn the carcase over to sit on its front so you can fit the back.
- Sit the back into its rebate to check the fitting. If it is the correct fit, you can fix the back in place using an air gun that fires small nails or staples, or alternatively apply a small trickle of glue gently into the lip of the rebate and drop the back into position.
- Stand the carcase on its feet. If you have glued the back, check for any glue runs inside the cabinet, turn the cupboard face down again and let the glue dry.
- Stand the cupboard up, put the drawer into the carcase on the runners, and clip the hinges on to the mounting plates. Adjust the hinges so they sit square on the carcase. Get your supervisor to show you how to do this.
- The doors should have a small gap in the centre between them, and another small gap between the bottom of the drawer front and the top edge of the doors. If needed, use a hand plane, or sandpaper with a cork block, to create the gap.
- Now, we can attach the handles to the doors and drawer front. Your workplace may have templates for this. Drill the holes and screw in the handles.

We now have a complete cupboard unit.

Finishing off

The final part of the assembly process is to sand any edges of the unit that will be seen ready for painting.

Remove the doors and drawer from the carcase, and remove all the hardware (hinges, mounting plates, handles, and drawer front), except for the adjustable feet. The adjustable feet will be covered by the toe board when the cupboard is installed.

Place the doors and drawer front in the vice on your bench. Sand each edge of these components until it is smooth. Hand sanding with a cork block gives you the most control and is best, but you may use an orbital sander for this. Get your supervisor to show you how to correctly set up and use the orbital sander.

Next, lay the carcase on its back and repeat the sanding process on the front edges of the carcase.

When you have finished sanding all the components and the carcase, remove all the arris edges with sandpaper and cork block and give them a final check.

When you're happy that the cupboard unit is complete, get your supervisor to check it over and confirm that it meets the job specifications.

Remember to clean up after yourself.

The cupboard unit is now ready to be finished with your choice of polyurethane or paint.

Alternatives

We have explained to you how to make a basic cupboard for your workplace experience. There are other means of constructing the cupboard. You could join the carcase parts using dowels, biscuits or cams, all of which would mean you do not require the screws. Alternatively you can add to your cupboard design for example by cutting a wooden base with mitred corners (and not using the feet) or adding a decorative top of solid wood.

Your supervisor will know of even more construction methods – when you are finished ask them how else you could have done the job so you have alternatives you can use in the future.

