

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

**Construct timber garden furniture
and items of basic construction
equipment as a BCATS project**

Unit Standard – 12932

Level 2, Credit 8

Name: _____





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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 timber projects;
- mark out, cut and machine components for timber projects;
- assemble and finish timber projects; and
- complete work operations.

How you will be assessed

To achieve this unit standard, you need to construct **2** timber projects – an item of garden furniture **and** an item of basic construction equipment (for example, a saw stool, trestle, step ladder or work bench). Your teacher/tutor will tell you which projects to construct.

For each project you need to show your teacher/tutor that you can:

- prepare a cutting list correctly;
- mark out and cut project components correctly;
- finish project component surfaces correctly;
- assemble project components correctly;
- finish projects correctly;
- complete all operations safely;
- clean the work area and dispose of waste; and
- clean and store tools, plant and equipment correctly.



Glossary of terms

Term	Meaning
Bevel	A slanted surface cut at an angle other than a right angle A measuring tool
Cleat	A strip of timber fastened to act as a support or hold another piece of timber
Component	Part or piece
Corrosion	Rust, deterioration of metal
Countersinking	To enlarge the top of a screw hole so that the conical head of a screw is set flush or below the surface of the work
Galvanised	A zinc coating used to protect metal
Mitre-cut	A diagonal joint formed between two pieces of material cut at an angle (usually 45 deg)
Plant	Fixed equipment
Rebating	Cutting a recess along or near the edge of a piece of wood that allows another piece to fit into it to form a joint
Skew	To drive nails into timber at an angle
Template	A pattern or gauge for making a number of objects exactly the same shape
Work operations	How you do a job

Timber garden furniture and construction equipment

To achieve this unit standard, you need to construct **2** timber projects – an item of garden furniture and an item of basic construction equipment. For each project you must:

- prepare a cutting list;
- mark out, cut and finish the project components; and
- assemble and finish the projects.

To produce good workmanship, you should follow any plans and instructions carefully at every stage of the project:

- Preparing a cutting list and marking out – make sure you use enough of the correct materials, and plan any cuts well so you don't waste materials.
- Cutting and finishing components – they need to be accurate with any rough edges smoothed so they fit together well.
- Assembling and finishing – using the correct techniques and materials means the end product will look good, work well and stand up to the conditions it's used in.

For each construction job you carry out, it's also important to:

- choose and use appropriate personal protective equipment (PPE);
- use tools correctly and safely;
- clean the work area and dispose of waste; and
- clean, store and maintain tools, plant and equipment correctly.

For any product or tool you use, make sure you read and understand any manufacturer's instructions that come with it before you start using it.

The construction projects provided as examples in this module are:

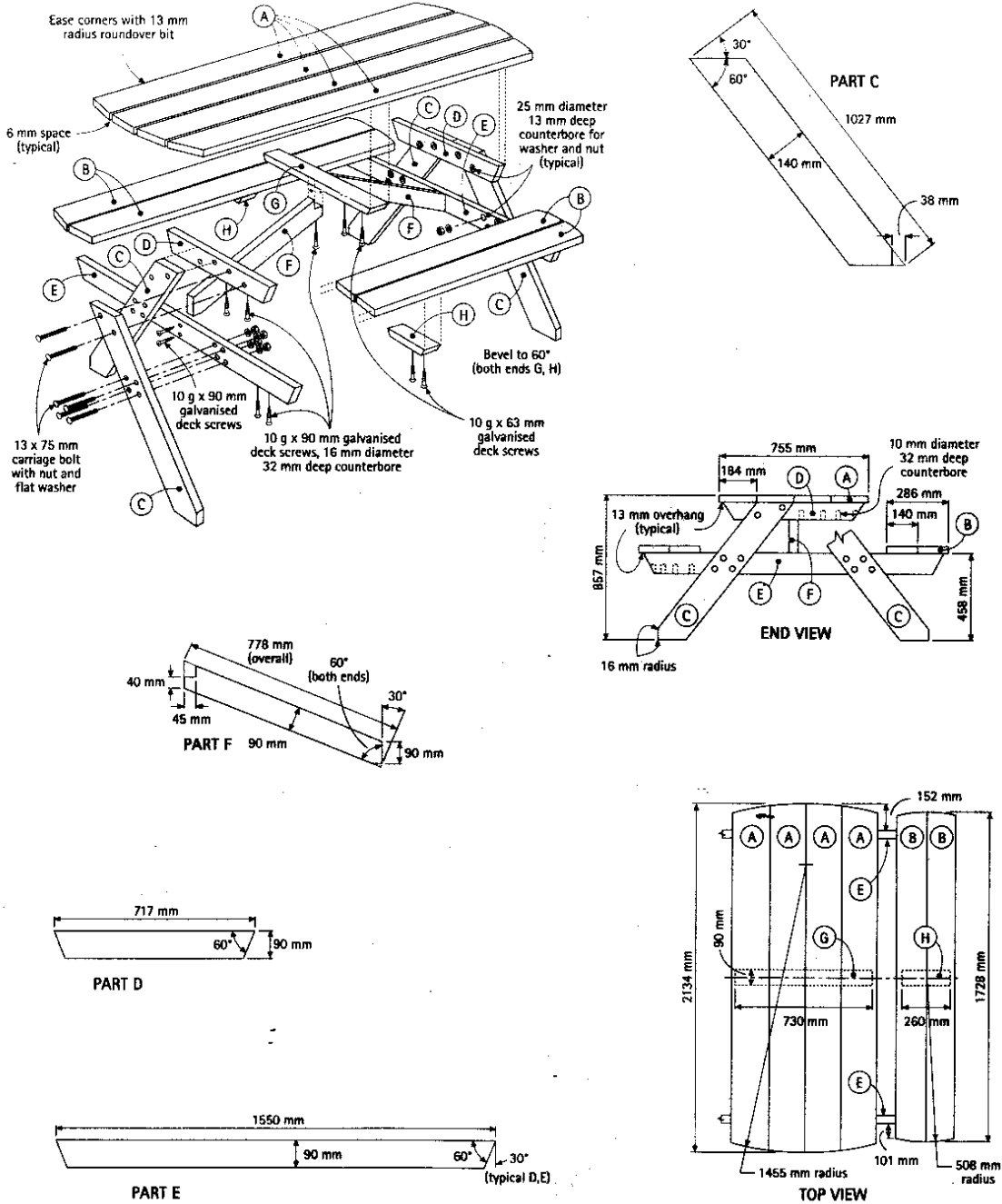
- a picnic table;
- a picnic table and bench; and
- a workbench.

However, your teacher/tutor could ask you to construct other timber projects to achieve this unit standard, for example, other garden furniture such as chairs or loungers, or other basic construction equipment such as stools, trestles, saw stools, or step ladders.



Picnic table

This garden table and bench unit can be made from treated radiata pine or Western red cedar.



Preparing a cutting list

Study the plans your teacher gives you carefully so you can prepare a cutting list for timber and work out what other materials you need.

Project components required for this plan (finished sizes):

- Table slats 184 x 38mm – 4 x 2134mm
- Bench slats 140 x 38mm – 4 x 1728mm
- Table legs 140 x 38mm – 4 x 1027mm
- End supports 90 x 38mm – 2 x 717mm
- Bench supports 90 x 38mm – 2 x 1550mm
- Braces 90 x 38mm – 2 x 778mm
- Middle support 90 x 38mm – 1 x 730mm
- Bench cleats 90 x 38mm – 2 x 260mm
- Galvanised deck screws 63mm, 90mm
- Carriage bolts with nuts and washers 75 x 13mm
- Wood plugs 10
- Water-resistant adhesive
- Paint or stain

Galvanised fixings resist corrosion, but if the furniture will be used near the sea, you should use stainless steel fixings.

Tools required

- Orbital or belt sander
- Portable electric drill
- Bench saw
- Drill bits – 10mm, 13mm, 10mm spade
- Jigsaw
- 10mm plug cutter
- Long bar cramps, pipe cramps or sash cramps
- Framing square
- Pencil
- Screwdriver
- Hammer

Building the table top

Cut the table slats (A) and lay them face down and side by side on a flat work surface, with the ends carefully aligned.

Cut 6mm spacers of scrap timber to help you set up even spaces between the slats. Insert the spacers and attach a bar cramp across each end of the tabletop to hold the slats in place.

Set the mitre fence on the table saw to an angle of 30 degrees. Mitre cut both ends of the end supports (D) to a 60 degree angle.

Lay the end supports across the slats, 190mm in from the ends.

Using a 10mm bit fitted into a portable drill, counter bore two 32mm deep holes in the end support above each table slat. Attach the end supports by driving 90mm galvanised deck screws through the holes and firmly into the undersides of the slats.

Bevel cut both ends of the middle support (G) to a 60 degree angle. Lay the middle support across the centre of the tabletop, then attach it to the slats.

Using a portable electric drill fitted with a 10mm bit, drill holes through the middle support into the undersides of the slats. Secure the middle support by driving two 63mm deck screws into each slat.

Attaching the legs and the benchtops

Mitre cut the ends of the four table legs (C) to a 60 degree angle.

Trim 38mm from the bottom outside corner of each leg. Make sure the cuts are at a 90 degree angle from the mitre-cut end.

Clamp the legs to the outside face of the end support, with the ends flush to the underside of the tabletop and centred between the sides.

Using a 10mm spade bit in a portable drill, drill two holes through each leg and the end support.

Use 75mm coach bolts to attach the legs to the end support, securing them with nuts and washers.

To mark the position of the bench support (E) on the legs, hold a framing square along the bottom of the tabletop. Measure 343mm up along the vertical arm, then hold a straight edge across the framing square and mark the legs with a builder's pencil.

Mitre cut the bench supports (E) to a 60 degree angle.

Clamp the bench supports to the inside face of the legs, centred across the table's width.

Drill four 13mm holes on the outside face of each leg and attach the bench supports with 75mm coach bolts secured with nuts and washers.

Mitre cut the ends of the diagonal braces (F) to a 60 degree angle. Cut a 45 x 40mm rectangular notch in one end of each brace.

Centre the notched end of the diagonal brace on the middle tabletop support. Drive two 63mm galvanised deck screws through the diagonal brace into the middle support of the tabletop.

Centre the diagonal braces on the bench supports. Use a 10mm bit to drill counter bore holes, then drive two 90mm deck screws through the outside face of the bench supports and into the angled braces.

Cut the bench slats (B) and clamp them into pairs, as described for the tabletop slats.

Bevel cut the ends of the bench cleats (H) to a 60 degree angle.

Centre the cleats across the bench slats and drive two 63mm galvanised deck screws through the cleats into each benchtop slat.

Centre the benchtops on the supports so the inside edges extend 13mm past the ends of the supports.

Clamp the benchtops firmly in place.

Use a 10mm bit to drill two 32mm deep counter bore holes into the bench supports over each slat.

Attach the benchtops to the supports by driving a 90mm deck screw in each hole.

Finishing

Cut or purchase 13mm timber plugs for the holes. Using water-resistant glue, fix a plug in each counter bored screw hole.

Lay out and cut the curved ends of the tabletop and benches with a sabre saw or jigsaw.

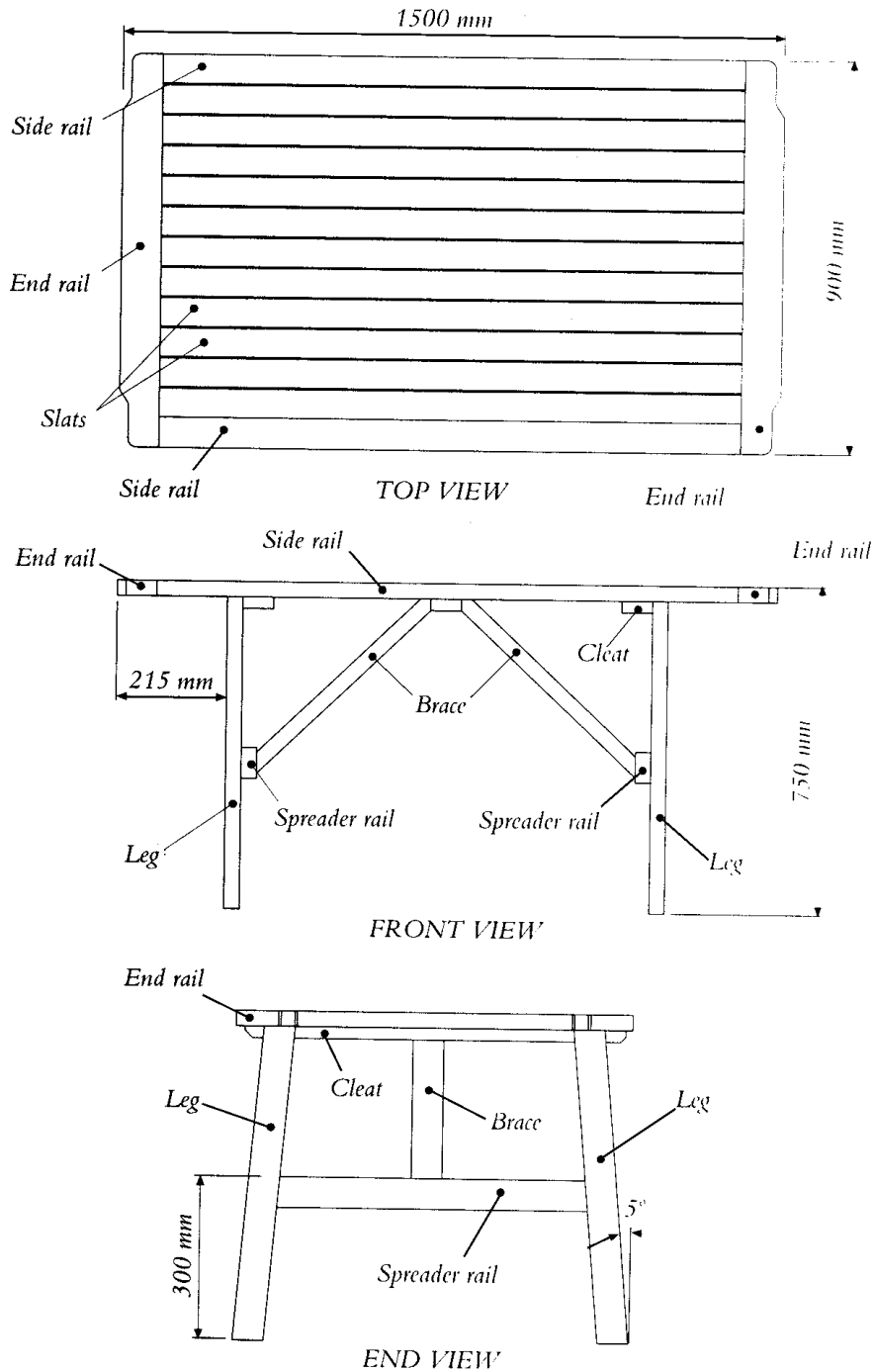
Sand all rough edges and apply the preferred waterproof stain or varnish.



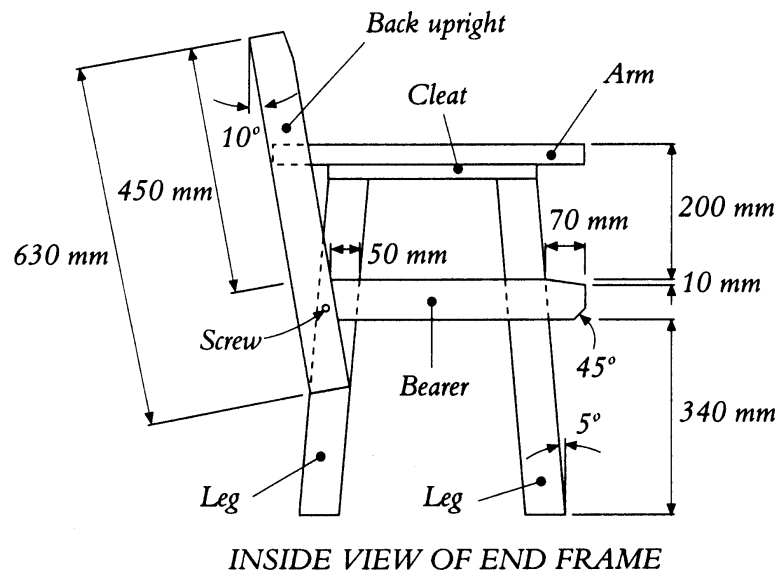
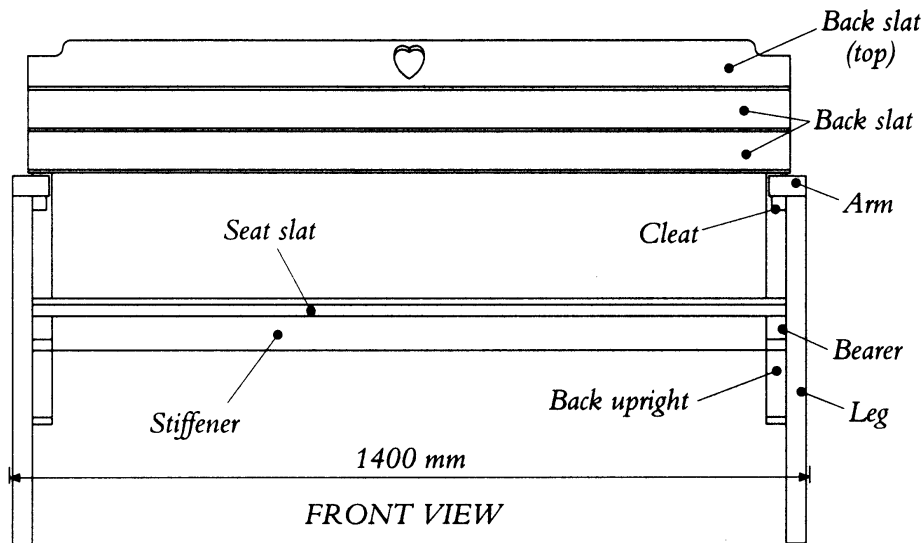
Picnic table and bench seat

This picnic table and bench seat can be made from treated radiata pine. The finished table measures 1500 x 900 x 750mm. The finished bench seat measures 1400 x 600 x 840mm.

Table



Seat



Preparing a cutting list

Study the plans carefully so you can prepare a cutting list for timber and work out what other materials you need.

Timber for table:

- Side rail 70 x 35mm – 2 x 1360mm
- End rail 90 x 35mm – 2 x 900mm
- Slat 70 x 20 mm – 11 x 1360mm
- Cleat 70 x 35mm – 3 x 760mm
- Spreader rail 70 x 35mm – 2 x 600mm
- Brace 70 x 35mm – 2 x 600mm
- Leg 70 x 35mm – 4 x 730mm

Timber for seat:

- Leg 70 x 35mm – 4 x 580mm
- Bearer 70 x 35mm – 2 x 450mm
- Back upright 70 x 35mm – 2 x 630mm
- Arm 70 x 35mm – 2 x 550mm
- Back slat (top) 90 x 20mm – 1 x 1350mm
- Back slat 70 x 20mm – 2 x 1350mm
- Seat slat 70 x 20mm – 1 x 1350mm
- Seat slat (front) 70 x 20mm – 5 x 1350mm
- Stiffener 70 x 35mm – 1 x 1330mm
- Rail 40 x 20mm – 1 x 1260mm
- Cleat 25 x 25mm – 2 x 450mm

Additional materials:

- Epoxy adhesive
- Abrasive paper – two sheets of 120 grit
- Timber dowels – 8 x 50 x 10mm
- Screws (galvanised, countersunk) – 30mm x 8 gauge, 40mm x 8 gauge, 50mm x 8 gauge, 65mm x 8 gauge
- Nails (galvanised, decking) – 50 x 2.5mm
- Preservative
- Finish of choice

Tools required

- Rule or tape
- Pencil
- Jigsaw
- Tenon saw
- Power mitre saw
- Router with 20mm straight bit
- Marking gauge
- Electric drill
- Drill bits – 3mm, 4.5mm twist bit, 10mm dowelling bit

- 10mm dowel centres
- Sash cramps
- Screwdriver
- Sliding bevel
- Combination square
- Builder's square
- Hammer
- Chisel – 25mm

Making the table top

Cut two side rails and two end rails to length, using a power mitre saw.

Cut a 20 x 20mm rebate along one edge of each end rail using a router.

Measure in 70mm from each end and square a line across the rebated side and edge.

Set a marking gauge to 20mm (the width of the rebate), turn over the rail and, working from the rebated edge, mark a line from the end to the 70mm line. This part will be removed to create a flat section for the dowelled joint.

Use a tenon saw to cut across the rebate and then a jigsaw to cut along the line. Round over the edge with abrasive paper.

Mark the dowel set-out on each end of the side rails.

Use a 10mm dowelling bit in an electric drill and bore the holes 26mm deep.

Place dowel centres in the holes and position the end rails at right angles to the side rails to mark the corresponding holes. Drill these holes 26mm deep.

Place adhesive in the holes and on the end of the rails.

Insert the dowels and place the frame in sash cramps. Use scrap timber between cramps and frame to protect the surface.

Tighten the cramps and remove excess adhesive. Measure the diagonals for square. Leave to dry.

Cut eleven 1360mm long slats and round over the ends and edges on the top surface with 120 grit abrasive paper.

Lay the slats out upside down and fit the frame over the slats, allowing a gap of 3 to 5mm between each board. (A nail placed between the boards makes a useful spacer.)

For each slat, drill one or two 4.5mm clearance holes through the end rail, then 3mm pilot holes into the underside of the slats.

Hold each slat in position and fix from beneath with 30mm x 8 gauge countersunk screws.

Make a cardboard template to shape each end rail. Draw the shape onto the rails in pencil.

Cut the shape with a jigsaw.

Clean the edge and round over with 120 grit abrasive paper.

Turn the top upside down and measure in 250mm from each end. Square this mark across the bottom of the slats.

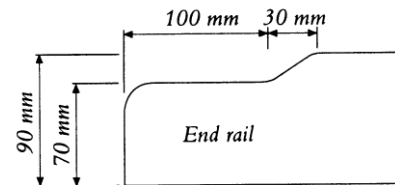
Cut two 70 x 35mm cleats to fit between the side rails. Bevel cut the ends to 15mm thick and round the edges over.

Position the cleats on the inside of the marked lines and drill a 4.5mm clearance hole followed by a 3mm pilot hole into each slat.

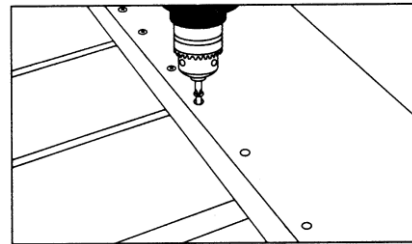
Screw the cleats to each slat with a 40mm x 8 gauge countersunk screw.

Fix a third cleat across the centre of the slats.

Skew a 50mm galvanised screw into the side rails from each side of the cleats.



END RAIL SET-OUT



Adding the table legs

The legs are cut with a 5 degree parallel bevel on each end. Set the angle on a mitre saw, or you can set a sliding bevel or create a pitch board. To minimise waste, cut the legs from one length of timber. Bevel cut one end at 5 degrees.

Measure 730mm, mark and cut parallel to the first cut. Mark and cut the other legs. The angle on the waste side is the same angle required for the next leg.

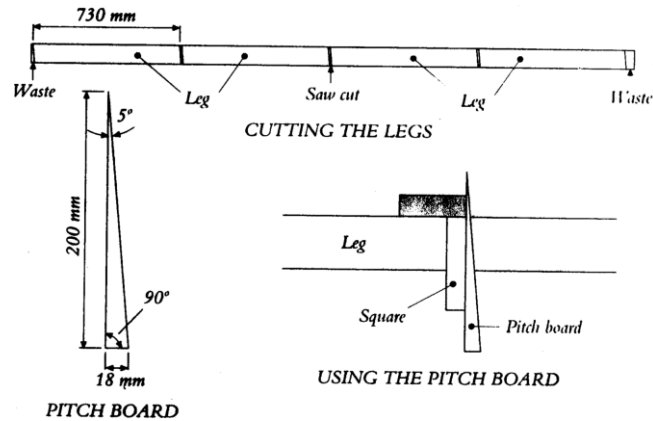
Cut two spreader rails 600mm long with 5 degree bevels (angled in opposite directions, not parallel as for the legs) at each end.

Measure up 300mm from the bottom of each leg and square a line across the outside edge.

Place the legs flat with the spreader rail on top. Line up the top edge of the rail with the squared lines. Keep the ends flush with the outside edge of the legs. Fix in position with two 50mm x 8 gauge countersunk screws on each leg. Use the pitch board or sliding bevel to ensure the rail is at the correct angle.

Stand the assembled leg frame upside down against the outside edge of an end cleat. Centre it against the cleat. Fix each leg with two 65mm x 8 gauge screws into the edge of the cleat. Repeat at the other end for the other leg frame.

To stabilise the table, cut a brace for each leg. Measure from the lower edge of the spreader rail to the centre cleat. Cut two braces to this length. Fix them with two 50mm x 8 gauge screws into the centre of the cleat and to the spreader.



Turn the table right side up and lightly sand with 120 grit abrasive paper.

Cutting the bench pieces

Cut the four legs 580mm long. Bevel both ends of each leg at 5 degrees.

Cut two bearers 450mm long.

Cut an 80 degree angle on one end of each bearer. Measure and mark 70mm in from the opposite end of the bearer and square a line across the top edge. Square a second line across the same end 10mm down from the top. Join these points on the face and cut the bevel. On the lower edge, cut a 45 degree bevel.

Cut two 630mm back uprights, bevelling the top of each as for the bearers.

The arms fit around the back uprights and sit on top of the legs. Square cut one end of an arm. Measure 70mm from the end and use a square and pencil to mark a line from the inside edge across the face.

Place a bearer on the edge of the arm and use it as a template to mark an 80 degree angle. Square the bevelled mark across the bottom of the arm. Use a gauge to mark 35mm from the line to the squared end on each face. Remove this corner with a saw by cutting on the waste side of the line. Make the second arm in the same way so you have one left and one right arm.

Round the ends of the arms with abrasive paper.

Cut the back slats. Shape the ends of the top slat with a jigsaw to match the tabletop. Round the edges with abrasive paper.

Cut a design in the centre of the top slat.

Assembling the bench

Square a line 10mm in from both ends across the back of the back slats. Position the top slat on the bevelled end of one back upright. Line up the squared line with the outside face of the upright and fix with adhesive and two decking nails.

Check for square with a builder's square.

Fix the other end of the slat to the other upright.

Nail the other two back slats in place with a 10mm overhang and a 4mm gap between each.

Cut two cleats from off-cuts, turn the frame over and fix them across the back of the slats, 10mm from the top.

Cut the seat slats. The long slat goes at the front and overhangs the bearers by 10mm at each end; the others sit flush on the bearers. Fix them in place as for the back slats.

Turn the seat over and cut the stiffener. It fits between the bearers, in line with the second slat. Fix it through the bearers with two 65mm x 8 gauge screws at each end.

Fix a 40 x 20mm rail across the centre of the slats.

Measure up 340mm from the bottom of each leg on the inside face and mark a line across the face of the leg, parallel to the end. Position each leg against the bearer, lining up the set-out with the bottom edge. The front legs sit against the edge of the front slat. The back legs are fixed 50mm in from the bevelled end and secured with two 50mm x 8 gauge screws.

The back is positioned so its top is 450mm above the top of the bearer. Hold the upright against the end of the bearer and fix it in place with two 50mm screws into the leg.

Cut two 450mm cleats to fit against the inside of the legs at the top. Cut the ends at a 5 degree angle to match the outside of the legs. Fix in place, flush on the top and ends, with two 50mm screws into each leg.

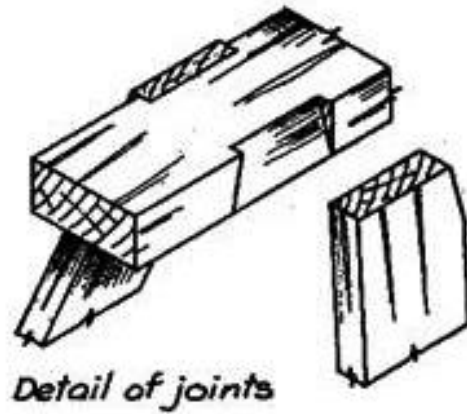
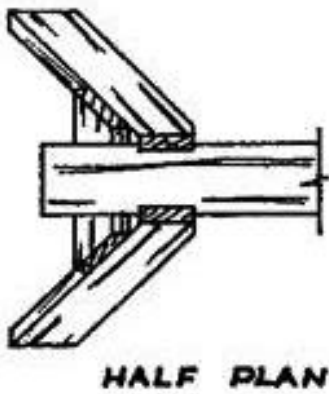
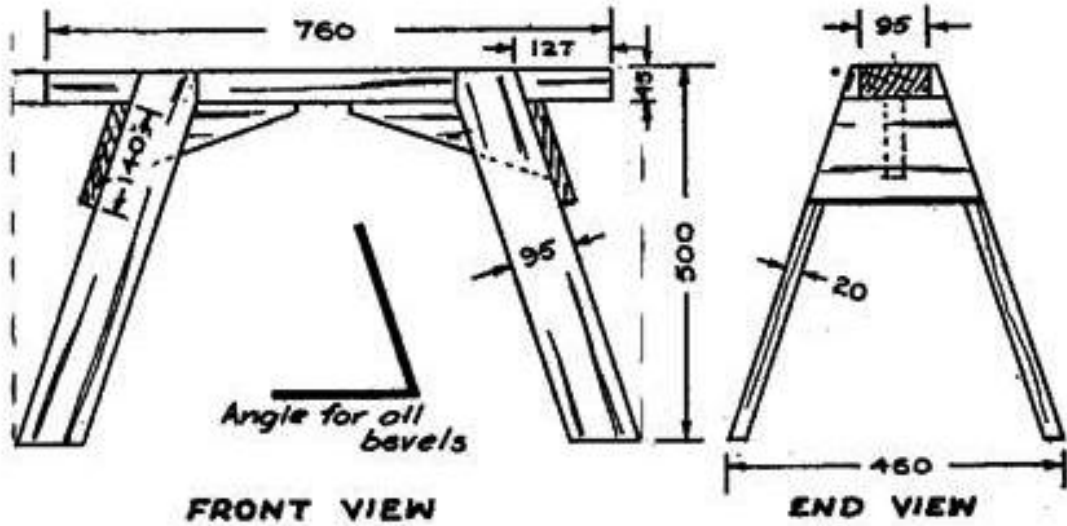
Place the arm on top of the legs, against the back. Fix with 50mm screws through the upright and cleat.

Sand the bench with 120 grit abrasive paper, and apply a finish to match the table.



Saw Stool

All measurements in millimetres



Cutting list (over)

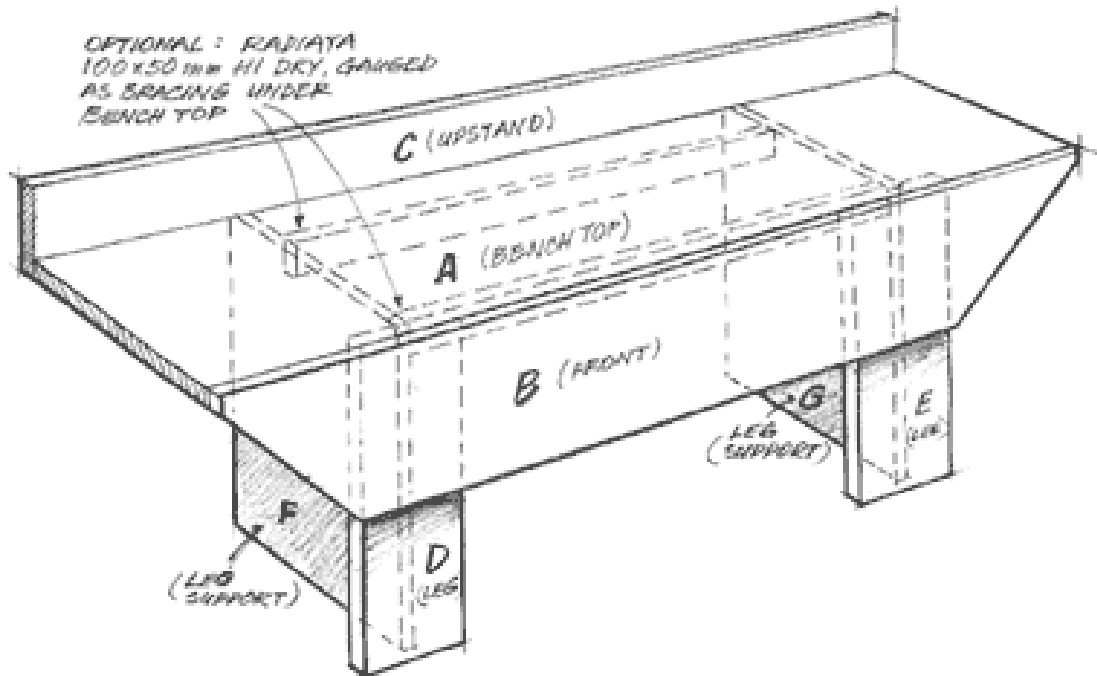
Cutting list for saw stool

All units in millimeters

Part	Length	Width	Thickness
Top	760	95	45
Legs	600	95	20
Ends	250	40	20
Braces	250	127	20



Workbench



This workbench unit can be made from radiata pine.

Preparing a cutting list

Study the plans carefully so you can prepare a cutting list for timber and work out what other materials you need.

Project components required for this plan:

- Board – two sheets of 18mm MDF
- Bracing – 100 x 50mm
- Screws
- Adhesive
- Sandpaper – 80 grit, 180 grit

If you want to use wood filler to fill the countersunk screws, the countersunk holes will need to be deeper.

Tools required

- Rule or tape
- Pencil
- Jigsaw

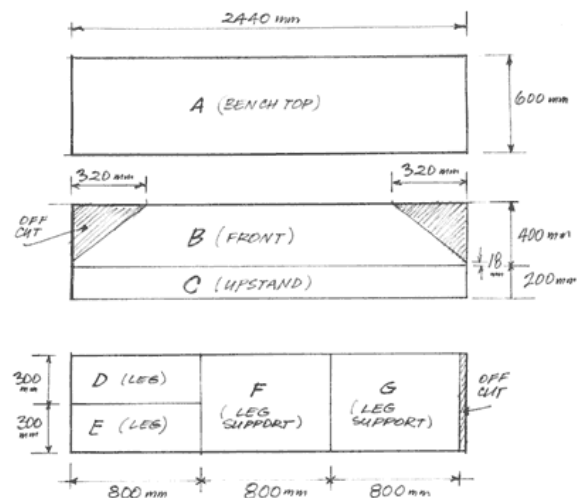
- Tenon saw
- Power mitre saw
- Router with 20mm straight bit
- Marking gauge
- Electric drill
- Drill bits – 3mm, 4.5mm twist bit, 10mm dowelling bit
- 10mm dowel centres
- Sash cramps
- Screwdriver
- Sliding bevel
- Combination square
- Builder's square
- Hammer
- Chisel – 25mm

Setting out and cutting the components

Lay out the three sheets and mark out the measurements as per the cutting plans.

Cut out the panels.

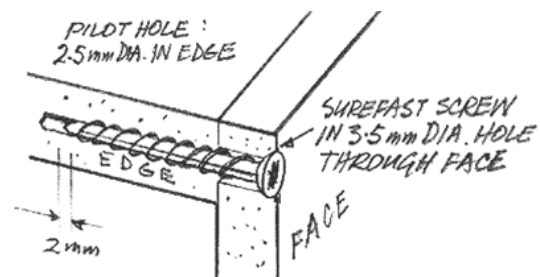
Clean up the cut edges with sandpaper, first with 80 grit then 180 grit.



Assembling the work bench

Drill pilot holes at 400mm centres and screw pieces B and C to A. Both B and C must be screwed through their face and into the edges of A. This forms the top of your workbench.

Drill pilot holes at 200mm centres and screw pieces D and E to F and G to form the legs. Both D and E must be screwed through their face and into the edge of F and G (the leg supports).



Adding bracing

Two pieces of radiata 100 x 50mm gauged dry framing can be attached under the bench top between the assembled legs at the top so that the bench top A can be screwed into the bracing.

Also screw F and G leg supports into the ends of the 100 x 50mm bracing.

The legs should be positioned 600mm in from each end of the bench top. Drill pilot holes at 200mm centres and screw the bench top into the leg supports F and G.

Using 30mm x 8 gauge twinfast screws, fix the legs into B from the back of D and E. Use four (4) screws for each leg.

Finishing

Fill the countersunk screw holes with particleboard-coloured filler. Sand and smooth when dry.

Use a wood sealer or polyurethane to finish the workbench.

The workbench can be positioned and fixed against a wall through the upstand to provide extra support for any large, heavy projects.



Activity

1. Why is it important to study the plans carefully before you start a construction project?

2. What is the purpose of a cutting list?

3. What do you need to consider when you're setting out and cutting components?

4. Why is it important to produce a good surface finish to the completed project?

5. What personal protective equipment (PPE) should you wear when using portable electric tools?

6. Where could you find information on the safe use of hand or power tools?

7. What protection of fixings is required for outdoor furniture construction and why?

8. What processes should be used to finish the surface of outdoor furniture components?

9. What steps have to be taken before storing tools and equipment after use?
