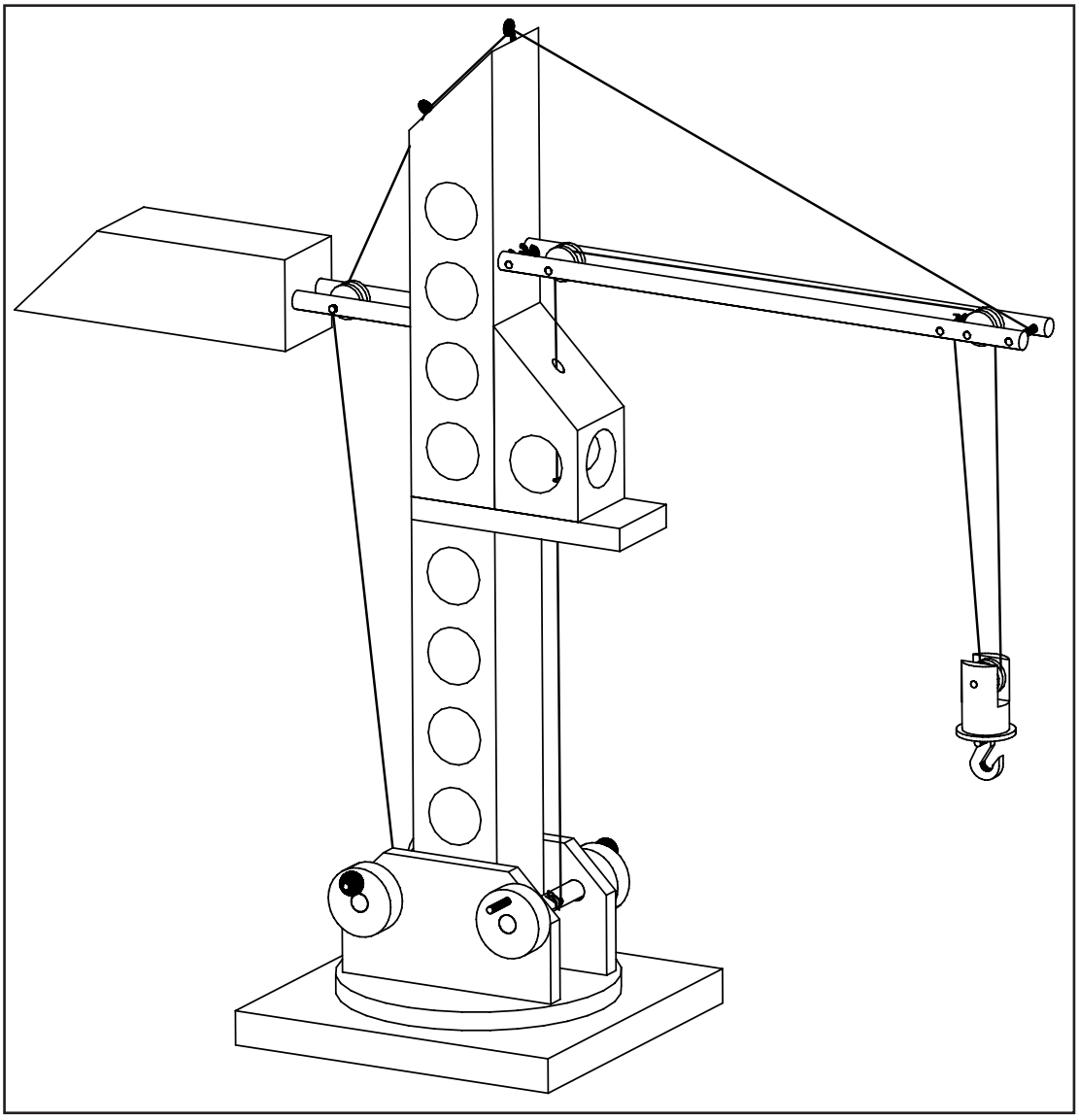
OPITEC

100.490

Tower Crane



Please Note

The OPITEC range of projects is not intended as play toys for young children.They are teaching aids for young people learning the skills of Craft, Design and Techno- lo- gy.These projects should only be undertaken and tested with the guidance of a fully qualified adult. The finished projects are not suitable to give to children under 3 years old. Some parts can be swallowed. Dan- ger of suffocation!

1. Product information:

Article: Working model in construction pack form

Use: In Design Technology, Key stage 3/4

2. Material information:

2.1. Material:
Pine (coniferous), softwood
Beech (deciduous), hardwood
Wood should be relatively dry before working
Plywood sheet (Gabun) multi-layered
Each layer set in different directions

Working:
Wood can be sawn, planed, shaped and drilled.
Mark out to the plan or use patterns

Joining:
Wood glue (PVA white glue)
Dowel joints
Slot joints

Finish:
Wax (liquid or solid)
Wood varnish (base coat/ top coat)
Staining (colour, water based then clear varnish)
Linseed oil

3. Tools

Saws: Use a Fret saw/Coping saw for all curves that cannot be cut with other saws

Note! Fretsaw blades must be insered with the teeth facing down and pointing forward.

Use a special fretsaw board to hold the work.
Use the saw with smooth constant strokes.

Use a fine **backsaw** for all straight cuts in wood strip.

Note Hold the work in a vice or sawing board.

File: Use a suitable grade of wood file / rasp

Note! Files only cut on the forward stroke

Sanding: Use a block and glasspaper for all flat surfaces and loose sheet for curves and individual forms.

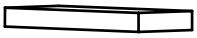
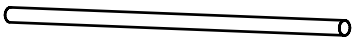
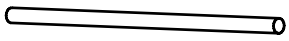
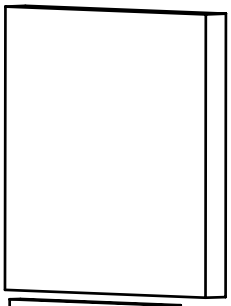
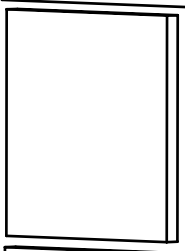
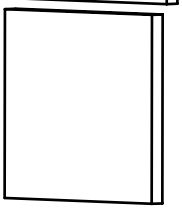
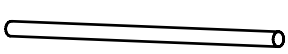
Drilling: Use a handrill or electric pillar drill

Note! Please take care with your safety: wear safety glasses, apron, tie all long hair back and remove all jewellery. Hold the work securely when drilling.

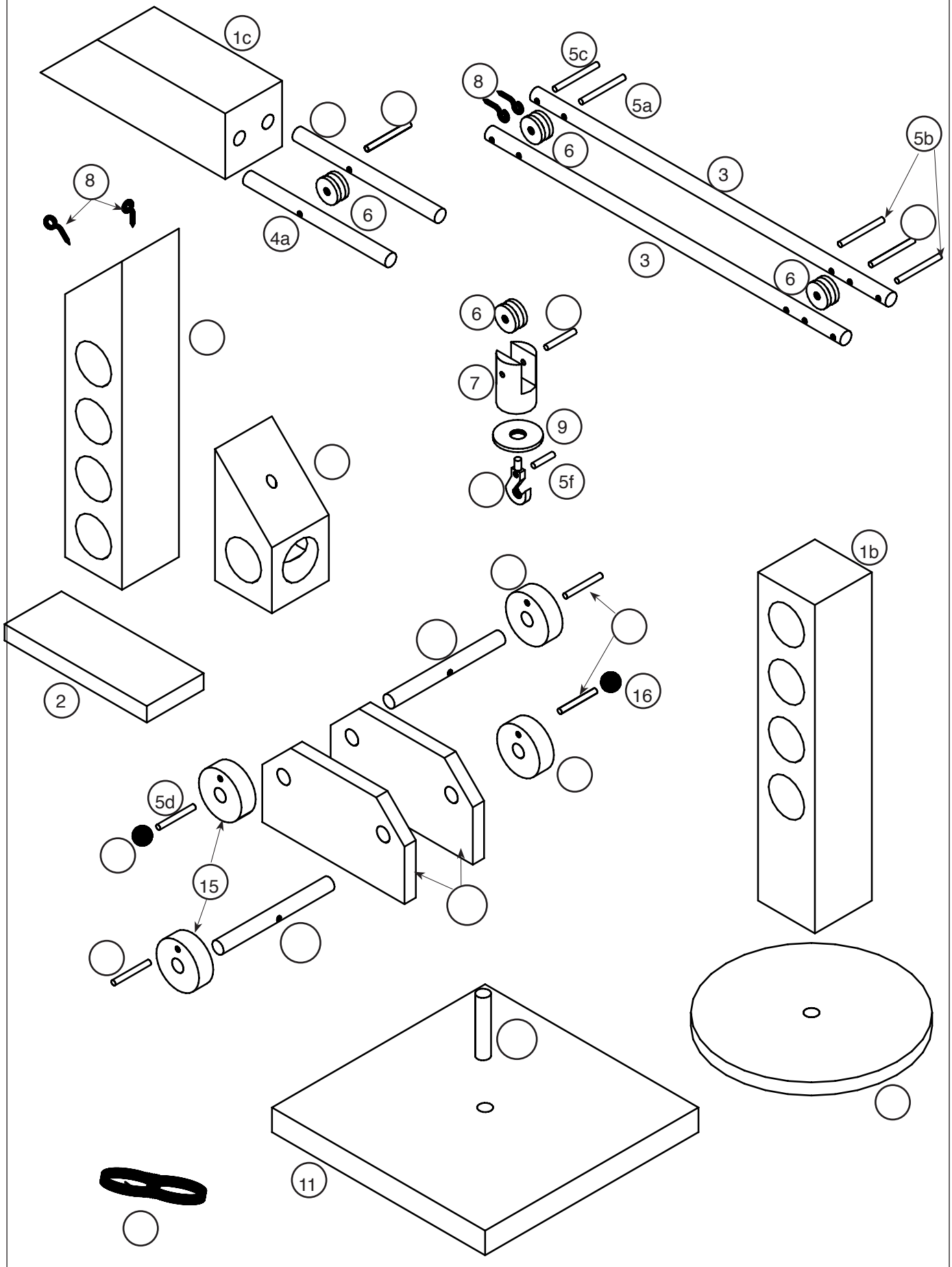
Clamping: Use a good quality clamps. Do not screw them too tight as they will leave marks.

Fit protective jaws when using a machine vice for drilling.

4. Parts list

Part	Material	Quantity	Size	Diagram
Tower/ balance	Pine	3	40 x 40 x 200 mm	 1
	Pine	1	10 x 40 x 100 mm	 2
Arm / weight hook	Pine dowel	2	8 diax 250 mm	 3
	Pine dowel	1	8 dia x 200 mm	 4
	Beech dowel	3	3 dia x 150 mm	 5
	Pulley	4	15 mm dia	 6
	Pine dowel	1	20 dia x 50 mm	 7
	Screw hook	4	12 mm	 8
	Washer	1	25/8,4 mm dia	 9
	Hook	1	(Plastic or Metal)	 10
Base/ turntable handle	Pine	1	15 x 150 x 150 mm	 11
	Plywood	1	8 x 120 x 120 mm	 12
	Plywood	1	8 x 100 x 110 mm	 13
	Pine dowel	1	8 dia x 200 mm	 14
	Pine disc	4	30 mm dia	 15
	Beech ball	2	10 mm dia	
	Thread	1	0.1 x 3000 mm	 17

5. Exploded diagram

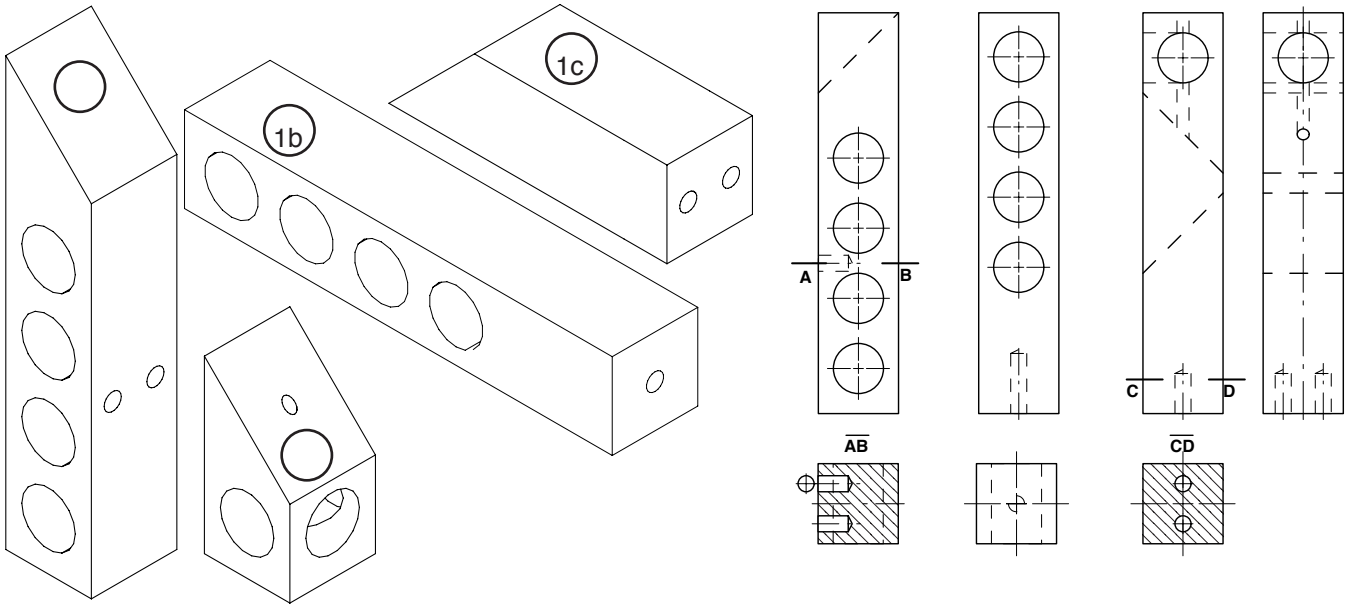


6. Planning overview

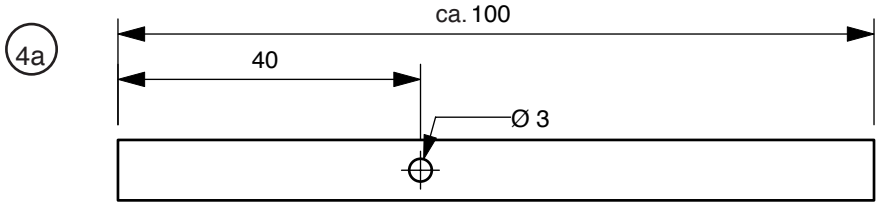
6.1 Planning and making the tower and balance weight

6.1.1 Measure (see page 13) and saw out the parts for the crane tower (1a) and the balance weight 9 (1c) and the cabin (1d) from the 3 pine strips (1) 40 x 40 x 200mm.(Parts 1c/1d are made from a single piece)

Note: Measure and drill the holes first and then saw to length,finally sand the ends square

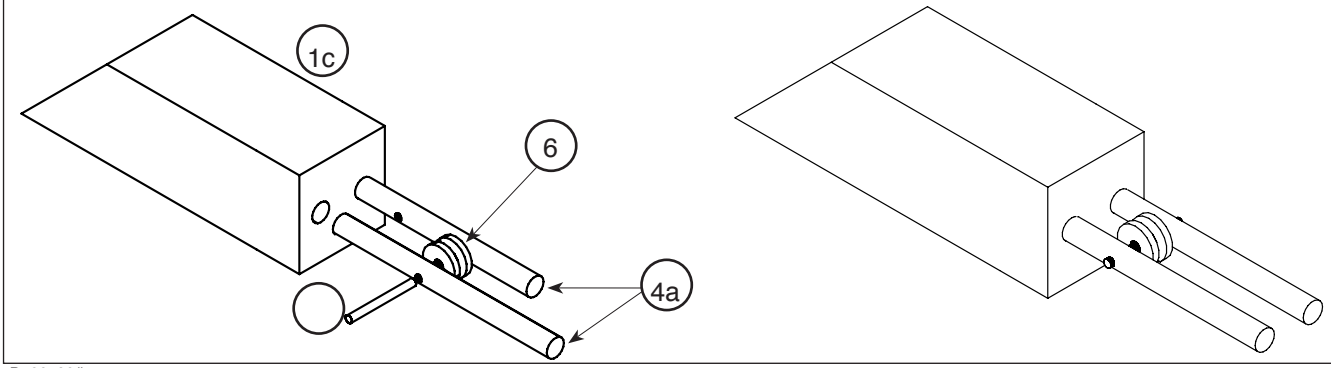


6.1.2 Saw the pine dowel (4) 4mm dia x 200mm in half and drill a 3mm diameter hole as shown (4a)

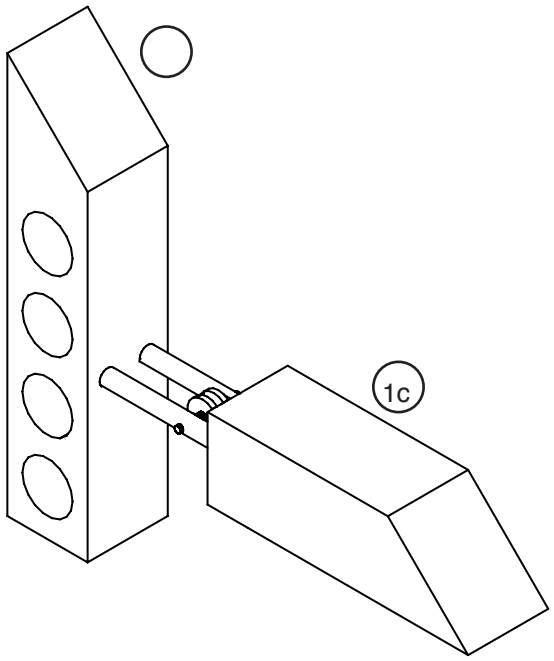


6.1.3 Saw a piece 30mm (5a) from the 30mm long beech dowel (5) and clean up the ends.

Note: Insert the parts (4a) into the block and mount the pulley (6) on the beech dowel (5a) glue the parts in position ensuring that the pulley (6) runs freely, do not glue the pulley!

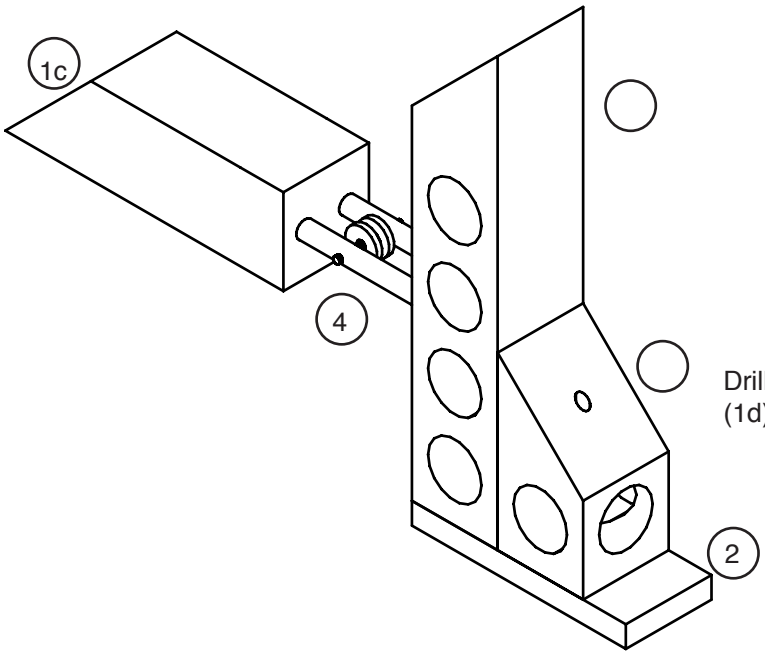


6.1.4 Insert and glue the weight in the tower (1a)



6.1.5 Glue the following (1a) (1d) parts in position on the base (2)

Note: Once the glue is dry drill the holes in the cabin (1d) and in the pine strip (2) using a flat bottom bit

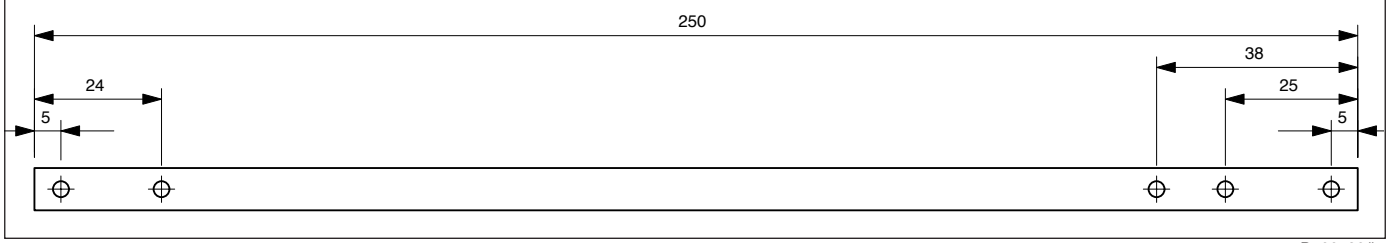


Drill a 8mm dia hole through (1d) to the cabin base (2)

6.2. Planning and making the crane arms

6.2.1 Mark out and drill the dowels (3) as shown in the diagram

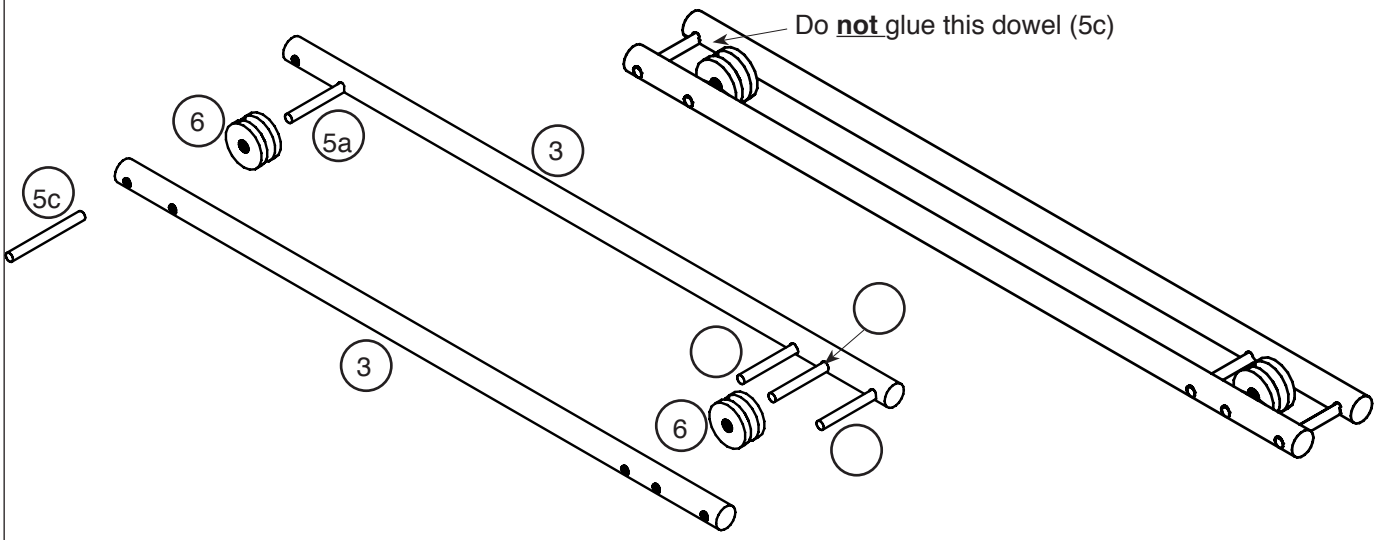
Note: Try to drill both dowels at the same time!
After you have drilled the first hole the dowels can be pinned together with cross pieces



6.2.2 Saw off 5 pieces each 30mm long from the beech dowel (5) and clean up the ends. Insert these cross dowels (5a/5b) in one of the crane arms and glue them in position.

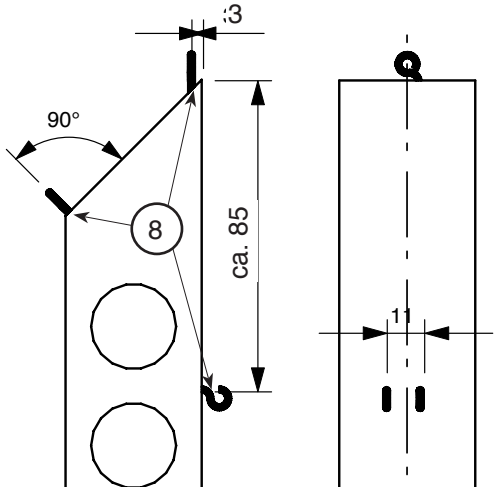
6.2.3 Mount the pulleys (6) on the cross dowels (5a) and then add the other arm. Glue in position. Finally add and the insert cross dowel 5c at the end of the arm but do not glue it in position yet.

Note: Do **not** glue that last dowel (5c) !!!



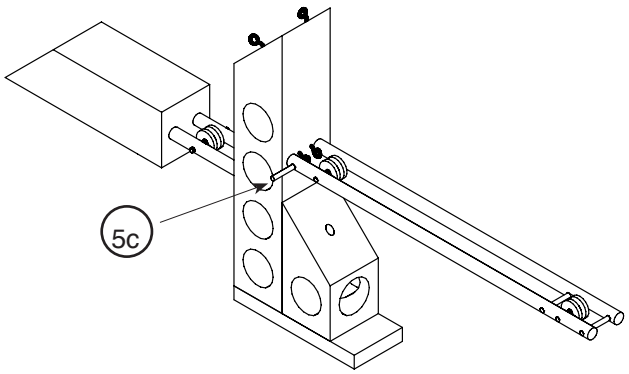
6.2.4 Insert two screw eyes (8) in the top of the tower. They should be approx 11mm apart and parallel. Insert another two in line on the side of the tower approximately 85mm from the top (see diagram)

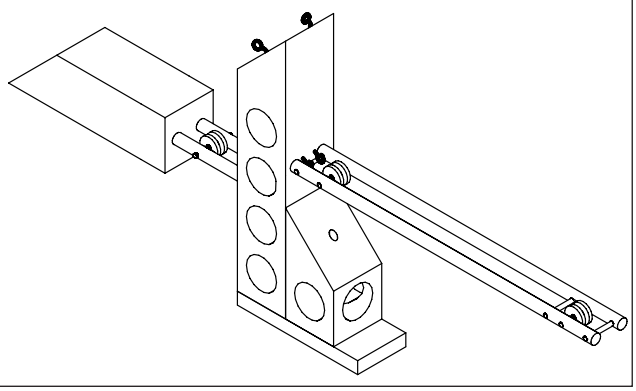
Note! Use a sharpened bradawl to make the holes before inserting the screw eyes, making sure that they line up.



6.2.5 Insert the other two screw hooks (8) in the angled part of the tower (See diagram)

6.2.6 Once the crane arm dowels are set, remove the loose dowel 5C. Eventually this will be used to fix the arm in the bearing (screw eyes). Insert the arms between the screw eyes holes in the block, once in position the dowel 5c can be glued in position.

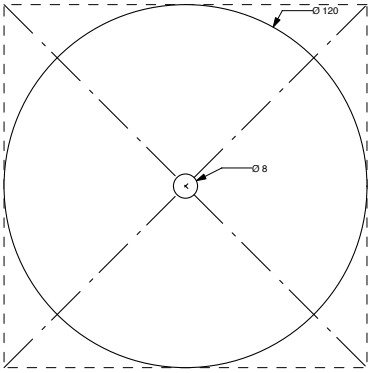


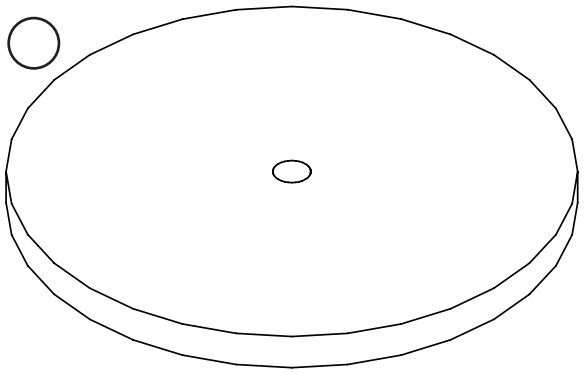


6.3 Making and assembling the crank handle and turntable

6.3.1 Draw out the plan (page 15) for the turntable on the plywood sheet (12) Saw out and drill the holes.

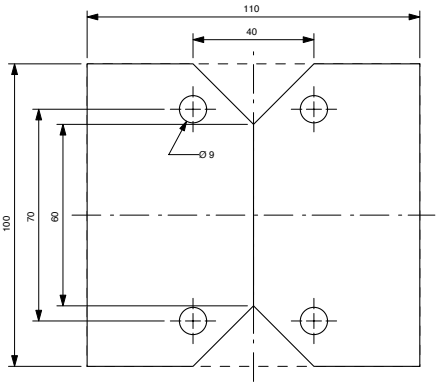
Note: Drill out the hole first and then saw out the shape.

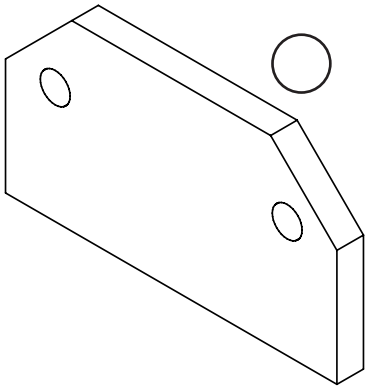




6.3.2 Mark out and drill, saw the sides (13a) of the crank mechanism housing.

Note! Firstly mark out the sides, saw them in half,then place them on top of each other and drill both of them together.



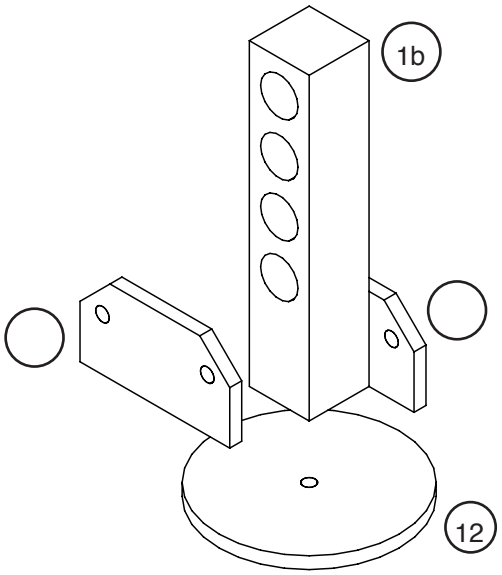


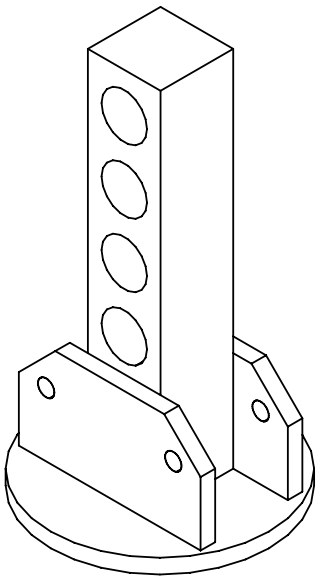
6.3.3 Glue the tower (1b) in the middle of the turntable (12)

Note: To ensure that the 8mm holes in the tower and turntable line up properly,insert the dowel (14) through from underneath the turnatable (12) into the tower (1b) (DO NOT GLUE THIS DOWEL).

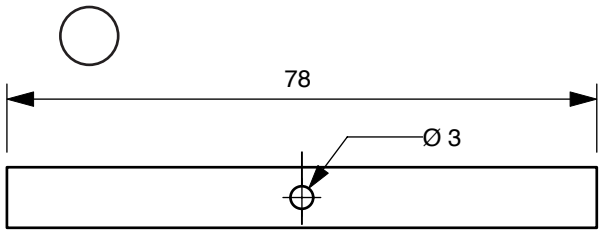
Place the side parts (13 a) on the turntable (12) making sure that they are evenly spaced either side of the tower (1 b) and glue them in position.

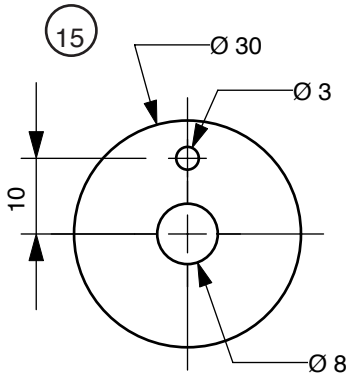
Note: Glue the sides (13a) of the winding mechanism either side of the tower as shown, ensure that the holes are in line. Use the dowel (14) for this purpose (DO NOT GLUE THE





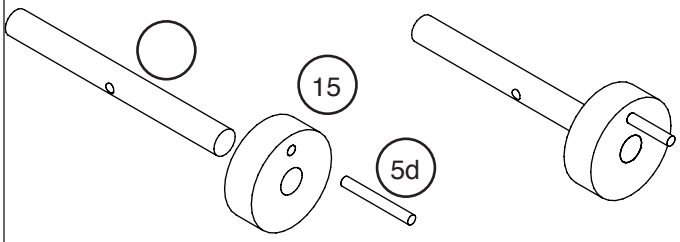
6.3.4 Drill all the pine discs (15) as shown in the diagram.

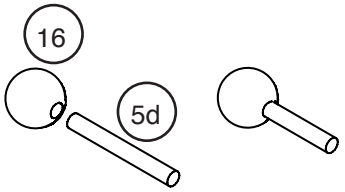




6.3.5 Saw off 2 lengths (14a) from the pine dowel (14) each 78mm long and sand the ends.
Drill the 3mm diameter hole in the top as shown. (see above diagram)
Sand the remainder of the dowel (14b) as this will be used for the base plate bearing.

6.3.6 Saw 4 x 25mm pieces (5d) from the third length of dowel.
Study the diagram and assemble the two parts (5d/14a/15) to make up the handles and two parts (5d/16) to

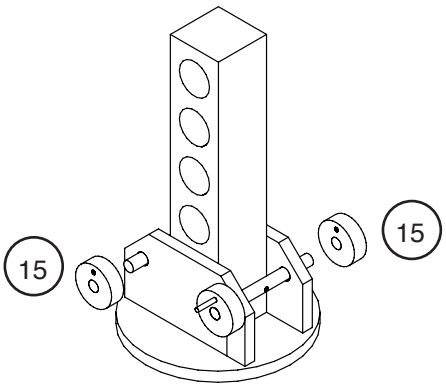


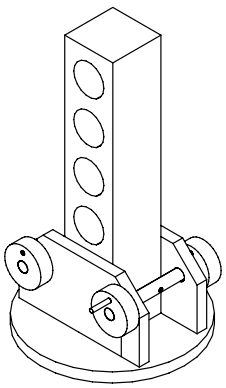


make the stop mechanism. Glue them together.

6.3.7 Insert the winder through the hole in the housing sides and add a wooden disc (15) on the other end of the shaft DO NOT GLUE this disc on.

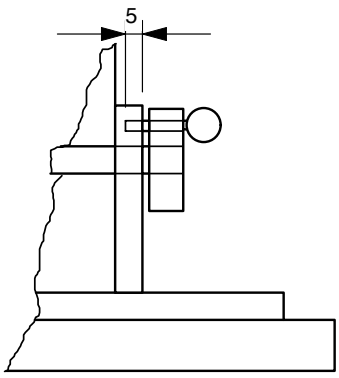
Note: Check that the handle turns easily

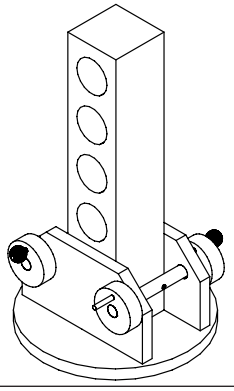




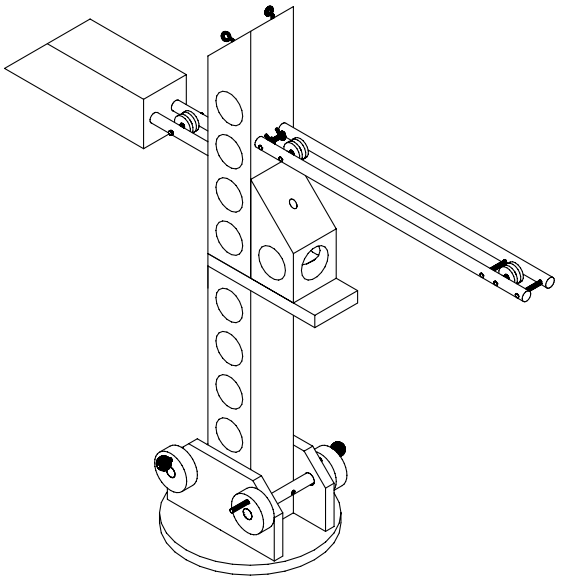
If not, modify the fault

6.3.8 Now arrange the other discs (15) so that the 3mm diameter hole is at the top (uppermost) insert a drill and continue the holes into the side parts of the housing for a depth of 5mm. Remove the disc and clean out the hole. Replace the disc and dowel to ensure that itwill act as a stop by sliding easily into the hole in the housing. Once you have checked everything and are satisfied with the action glue the disc (15) on to the end o f the dowel (14a)





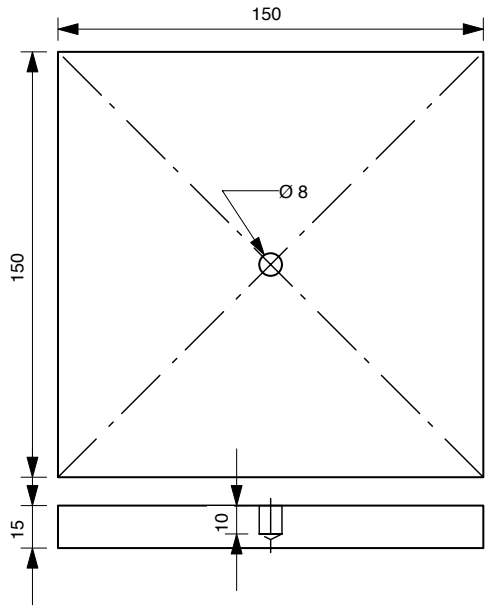
6.3.9 Assemble and glue all the parts of the crane together as shown in the diagram..

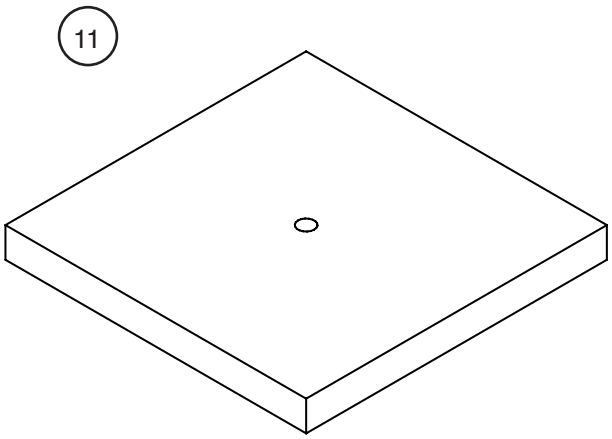


6.4 Making the base

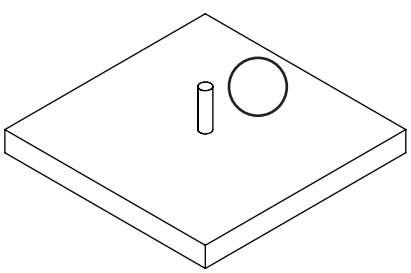
6.4.1 Mark out the hole in the middle of the base (11) This is a blind hole and should only be drilled to a depth of 10mm.

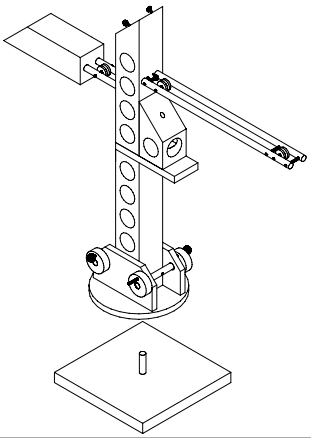
Note: Draw two diagonals to find the centre of the base!





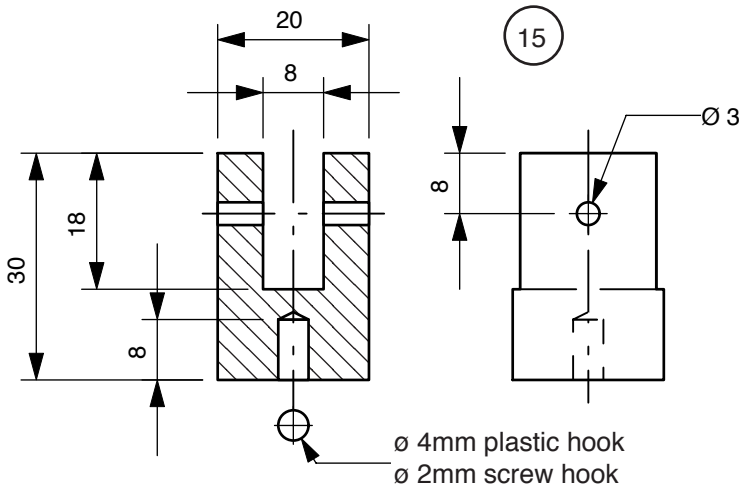
6.4.2 Glue the dowel (14b) from step 6.3.5 in the blind hole in the base (11) and leave to dry. Once set assemble the crane on its base.

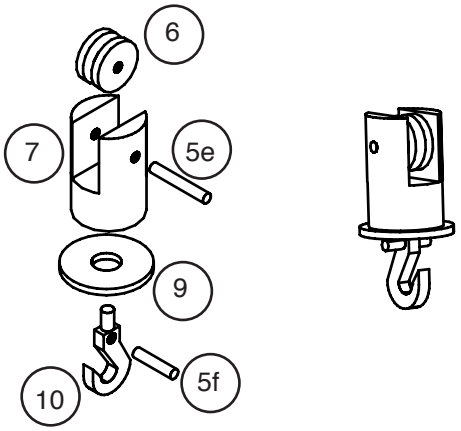




6.5 Making and assembling the hook mechanism

6.5.1 Shorten the pine strip (7) to a length of 30mm. Drill the hole as shown. After drilling the hole cut out the slot.





6.5.2 Saw piece 20mm (5e) and 15mm (5f) long from the beech dowel (5)) and clean up the ends.

6.5.3 Assemble all the parts (5e/5f/6/7/9/10) according to the diagram.

Note: When gluing the pulley (6) to the dowel shaft, ensure that you do not get glue on the pulley.
Glue all parts (5f/9/10) with a multi purpose glue

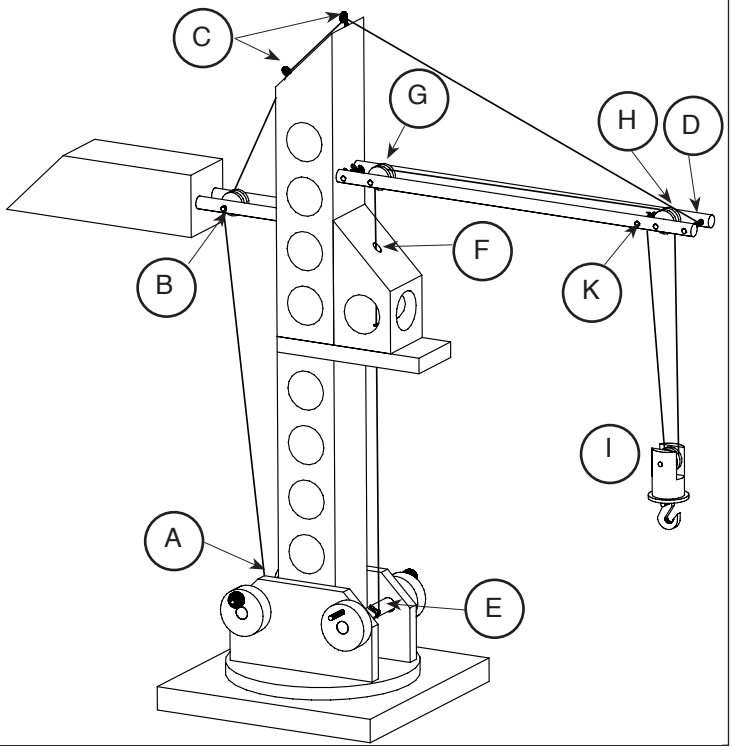
6.6 Testing and evaluating the design

6.6.1 Threading the cord

- Cut a length of 900mm from the cord (17) thread one end through the middle hole in the rear stop dowel (A) (directly under the weight)and tie a knot. Thread the cord over the pulley (B) through the two screw eyes (C) to the end of the first cross member on the arm (D/5b) and then tie a knot (the knot should be underneath the arm).
- Cut a length of 1500mm from the cord (17) thread the end through the hole in the front winder shaft (E) and tie a knot. Thread the cord through the 8mm hole in the cabin (F) over the two pulleys (G/D) on the arm, through the pulley on the crane hook (hook faces forward) back to the third cross member (K/5b) on the arm and tie with knot.

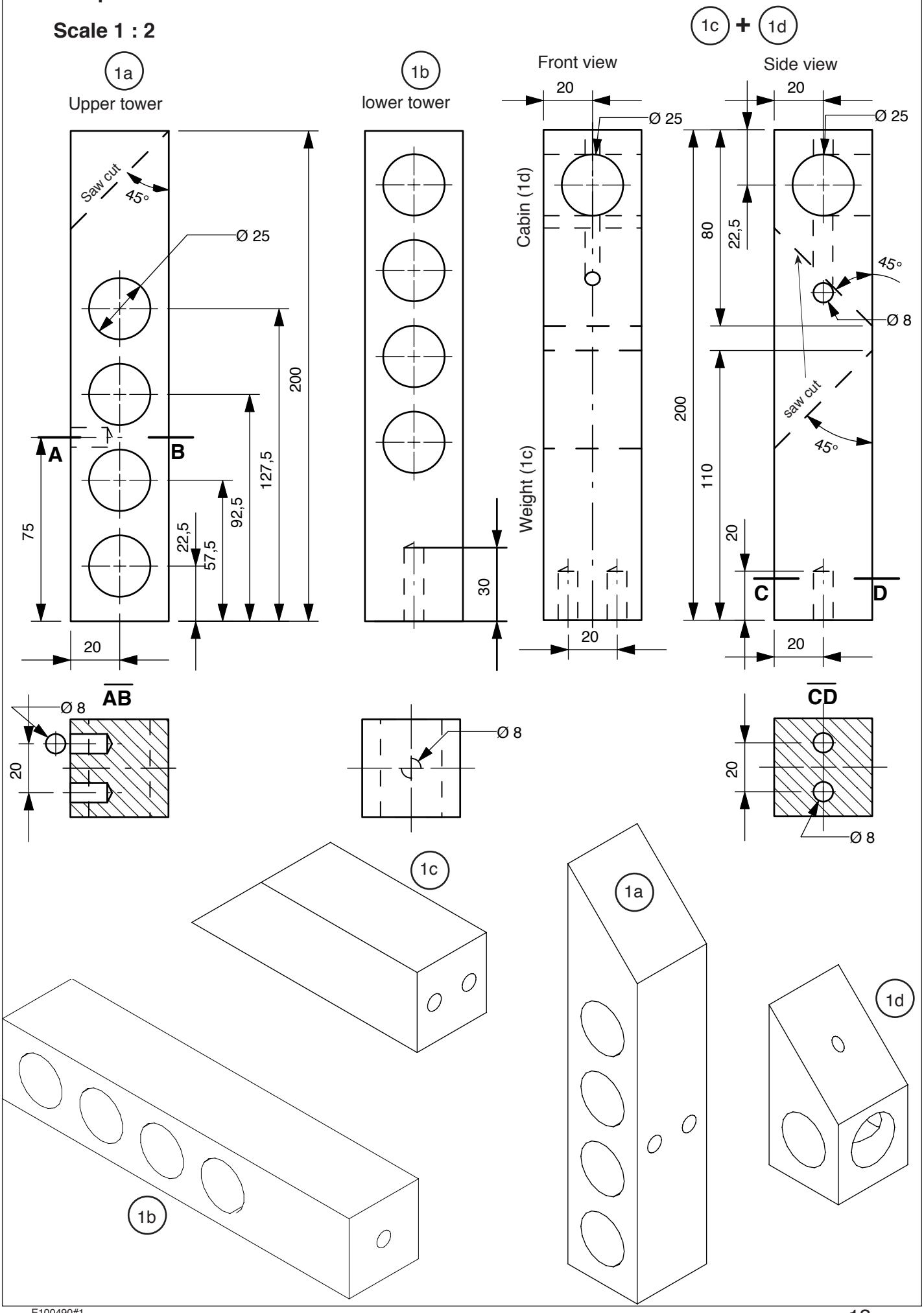
6.6.2 Testing the system

- Turn both of the crank handled wheels and check to see if arm and hook move up and down if there are problems check the system and correct the fault.



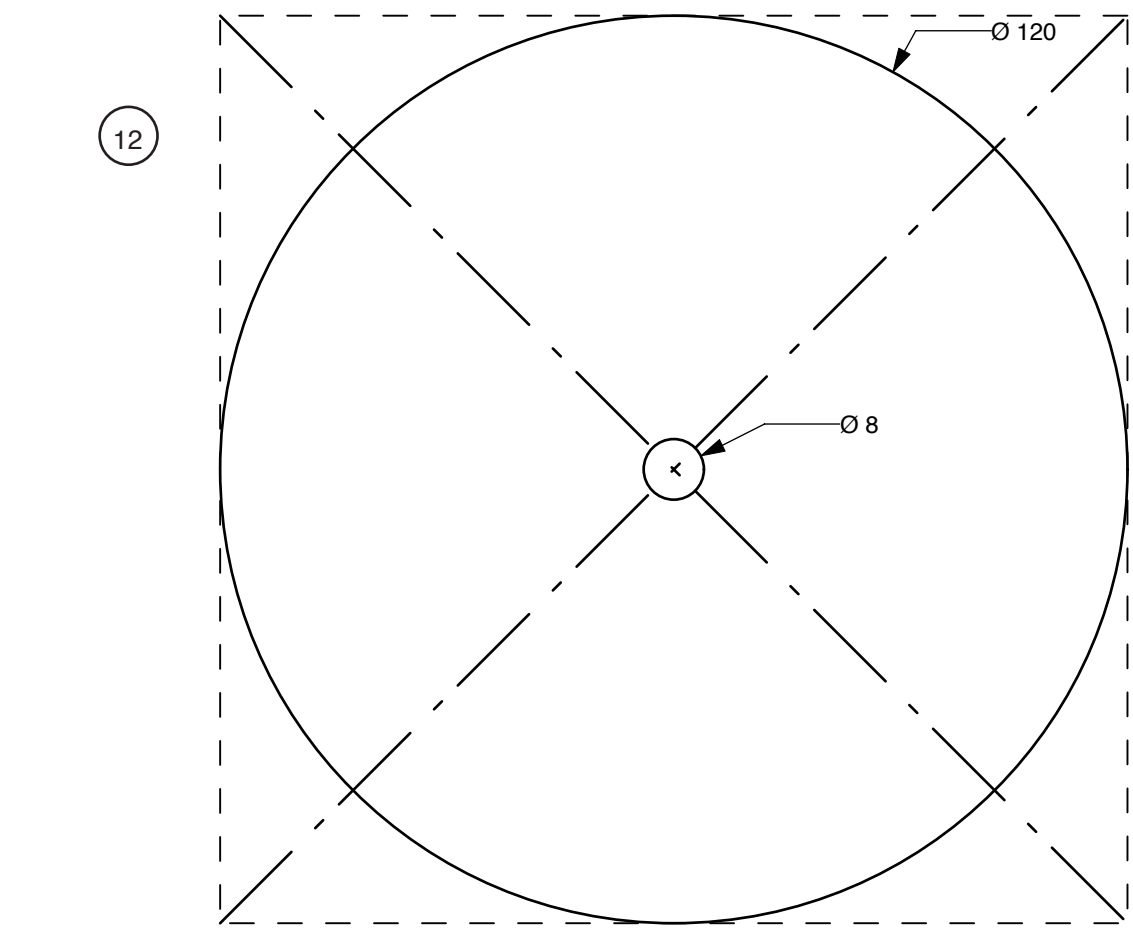
7. Tower parts 1a/1b/1c/1d

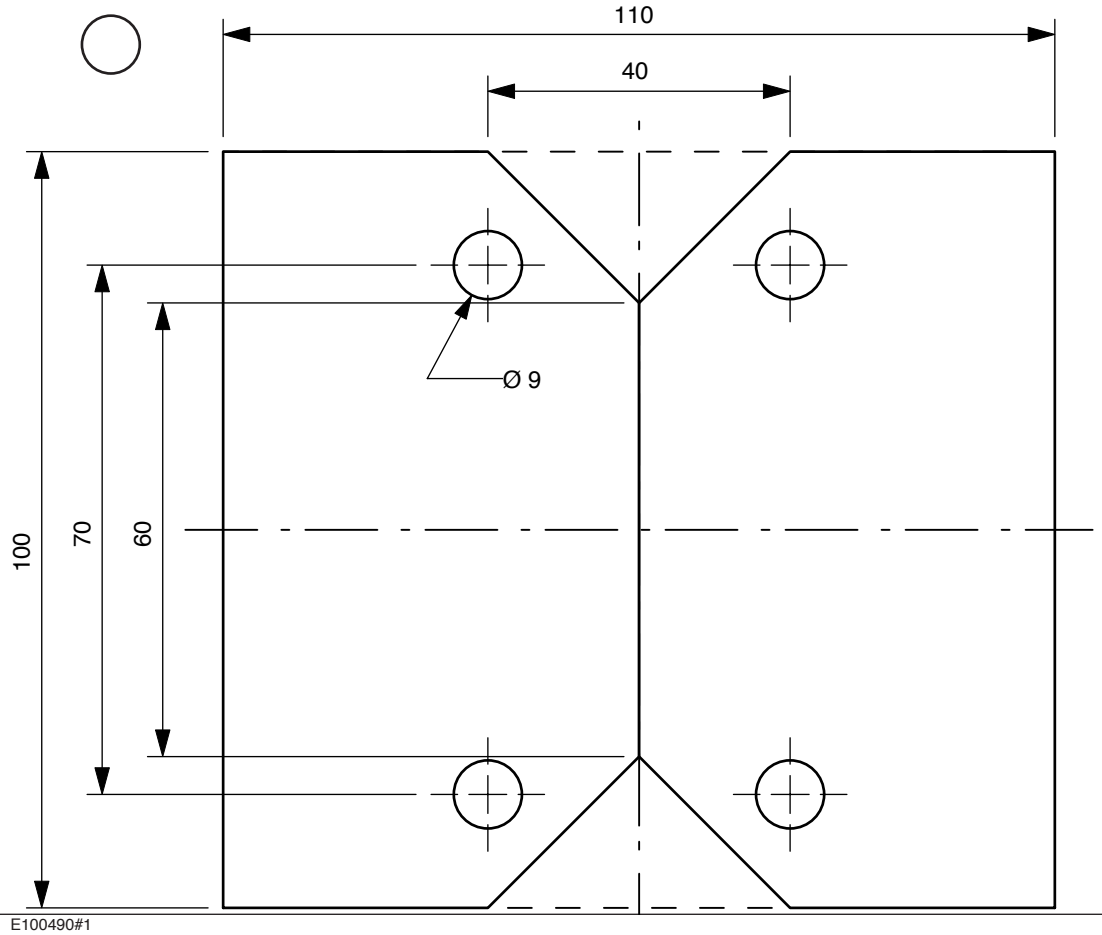
Scale 1 : 2



7. Turntable (12): Side parts (13a)

Scale 1 : 2





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