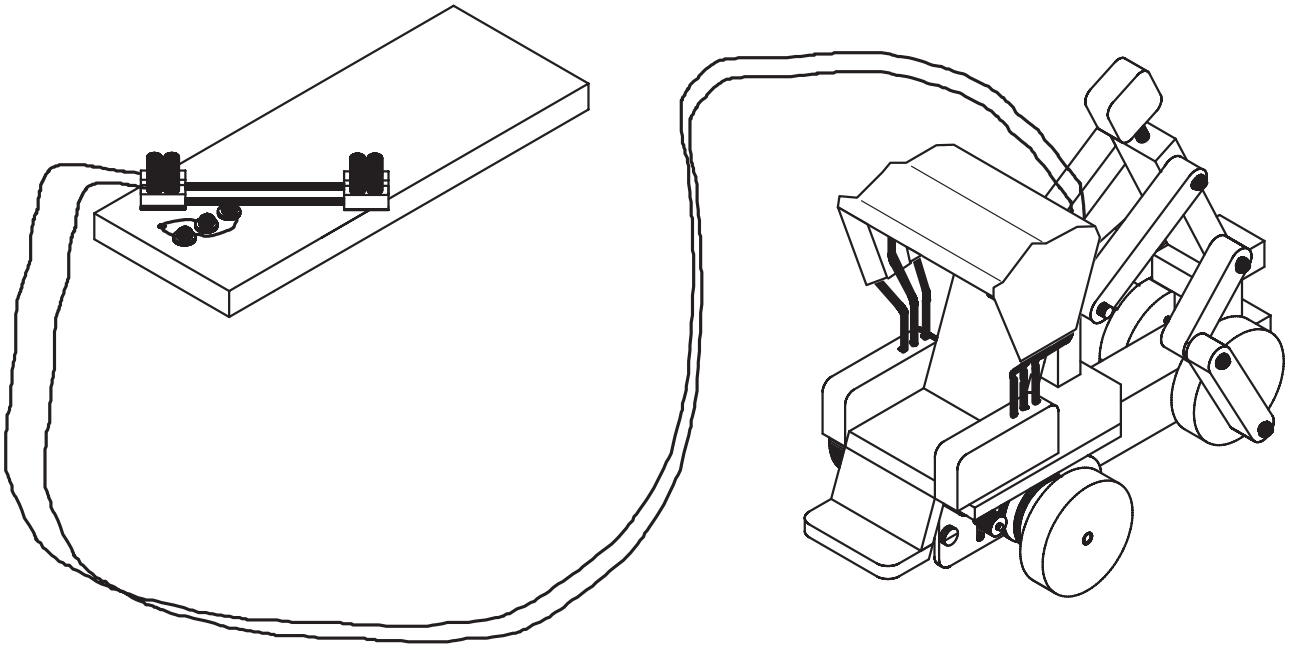
OPITEC

101.887

Rickshaw with cable remote control



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 Technolo- 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: Cable controlled vehicle in project in pack format.

Use: In Design Technology, Key stage 4.

2. Material Information:

2.1 Material: Pine (Coniferous) softwood.
Beech (Deciduous) hardwood.
Wood should be relatively dry before working.

Working: The wood will need to be sawn, drilled, filed and sanded.
It can be marked out by measurement directly from the plans or patterns made.

Joining: PVA white wood glue, screws

Finish: Use wax (Liquid or solid)
Wood varnish (Base coat plus finish coat)
Wood stain (Coloured, water soluable and then coat with varnish)
Linseed oil.

2.2. Material: Welding rod (Copper coated steel)
Strong but relatively easy to bend.

Working: By bending and forming.

Joining: Slotting together.

Finish: No special finish is necessary.

2.3. Material: Brass rod (An alloy of Copper and zinc)
Hard, brittle, and a good conductor of electricity.

Working: The brass must be sawn and filed.

Joining: Soft soldering

Finish: No special finish is necessary.

3. Tools:

Saws: Use a **fine toothed Dovetail saw** or similar on strip wood and dowel.

Note! Hold the work on a bench hook whilst sawing.

Use a **Fret saw** on all round shapes and curves which cannot be sawn with a Dovetail saw.

Note! Fret saw blades are inserted with the teeth facing forward!!!

Use a Fret saw board and work with slow constant strokes, turning the work slowly as you go.

Cutting: Use a pair of wire cutters for cutting the welding rod and brass rod.

Note! This process can leave sharp edges!!
Remove these with file!!!!

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3. Tools:

Wood files / rasps: Choose the correct grade of file or rasp according to the work in hand. Use needle files for small slots and notches

Note! Use a sand paper and block on all flat surfaces and loose sheet on curves.

Sanding: Use a sand paper and block on all flat surfaces and loose sheet on curves;

Drilling: Use a pillar drill

Note! Take care to adhere to the safety rules, tie all long hair back, remove jewellery, wear an apron and safety glasses. Hold the work to be drilled in a machine vice.

Clamping: Hold the work with clamps whilst the glue is drying. Do not over tighten them or they may leave marks.

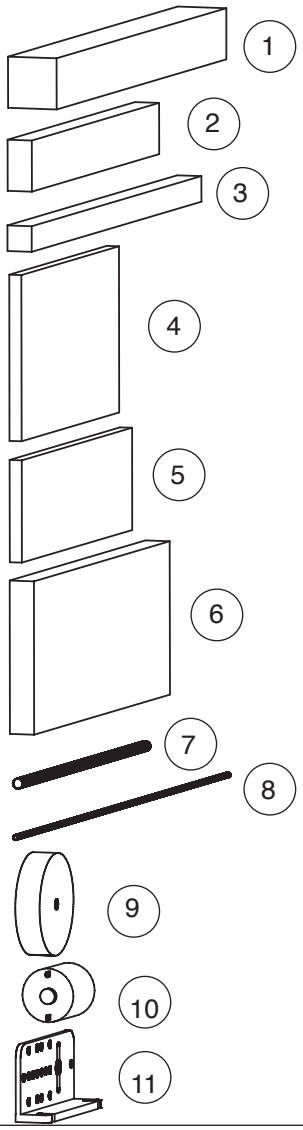
Soldering: Use a 30 Watt soldering iron.
Clean the area to be soldered and use a flux.

Please Note! Soldering iron tips get hot and can cause burns.!

4. Parts List:

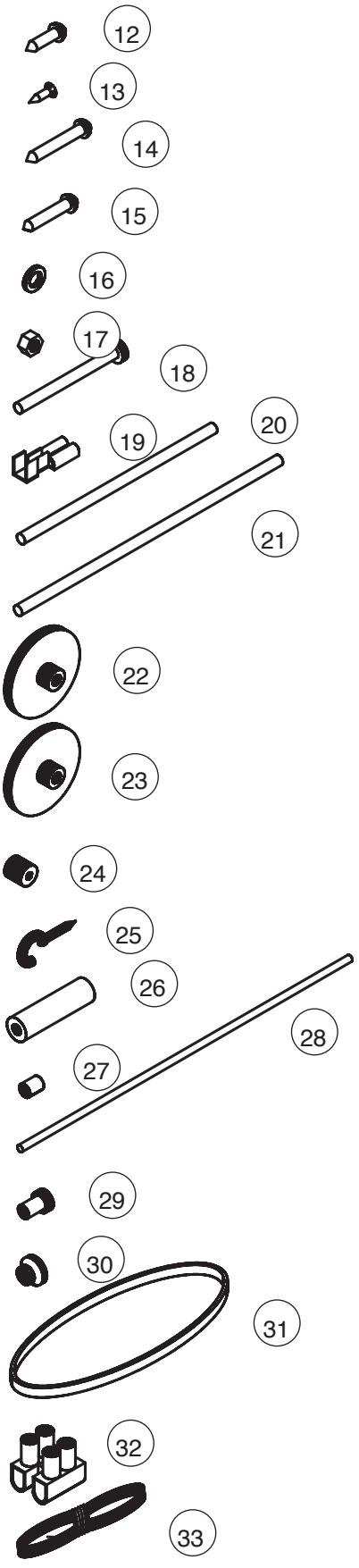
Part	Material	Amount	Size
Chassis	Pine	1	20 x 20 x 200 mm
Seat / Arms/ Body / Head	Pine	2	10 x 20 x 150 mm
Arms /Legs	Pine	2	10 x 10 x 200 mm
Base	Plywood	1	5 x 65 x 115 mm
Seat	Plywood	2	5 x 40 x 130 mm
Controller/ Battery holder	Plywood	1	10 x 60 x 160 mm
Axle/ Neck/ Steering bar	Beech dowel	1	4mm dia x 150mm
Roof supports	Welding rod	3	2 mm dia x 250mm
Wheels	Beech	4	40mm dia
Motor		1	21 dia x 25mm
Angle brackets	Plastic	2	

Diagram

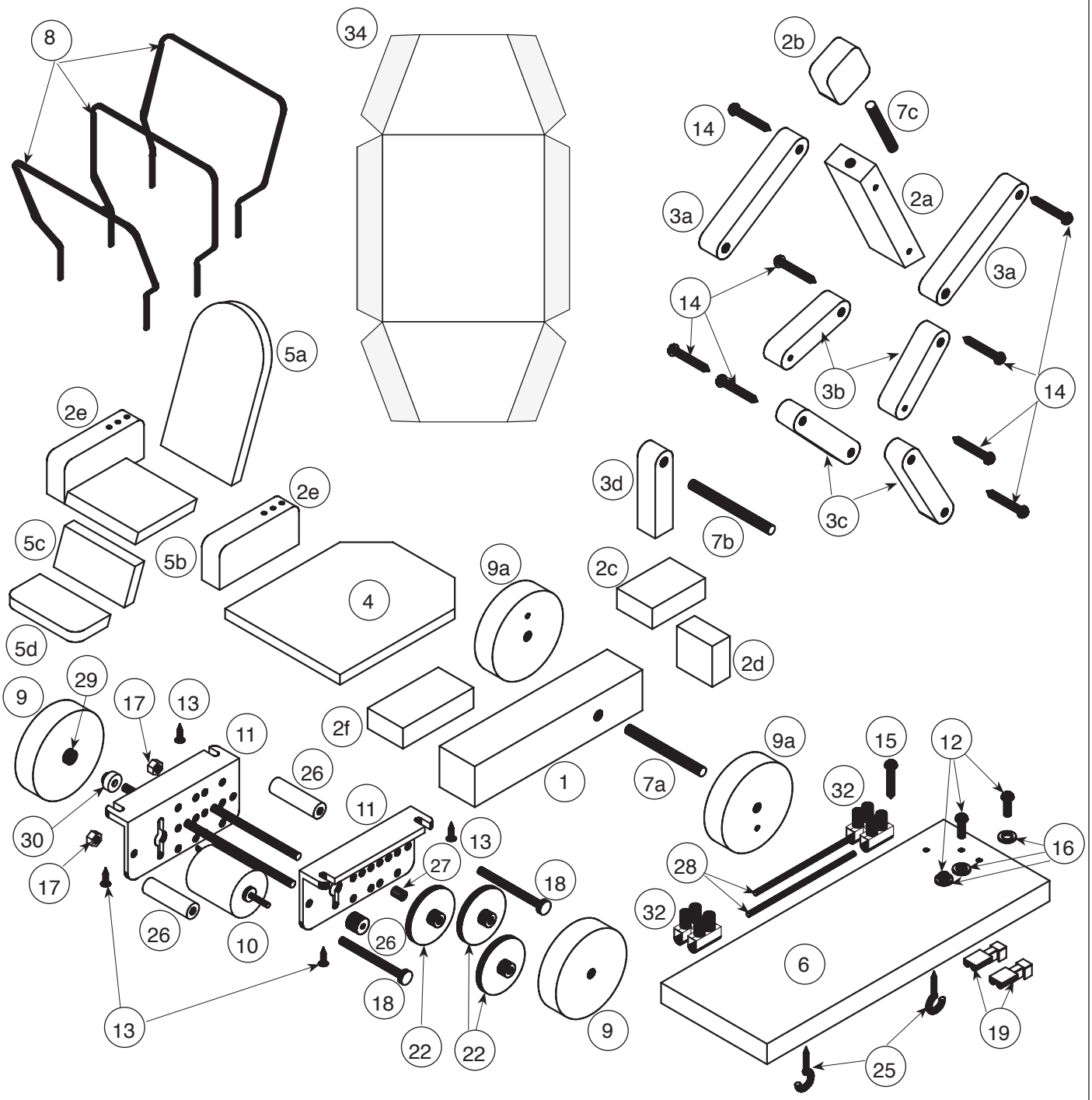


4. Parts list:

Part	Material	Quantity	Size
Screws (Crosshead).	Steel	3	2,9 x 9,5 mm
Screws (Pan head)	Steel	4	2,9 x 6,5 mm
Screws (Roundhead)	Steel	8	3 x 20 mm
Screw (Roundhead)	Steel	1	3 x 16 mm
Washers	Steel	4	3,2 mm
Nuts	Steel	2	M3
Machine screw	Steel	2	M3 x 35 mm
Flat connector	Steel	2	6,3 mm
Metal axle	Zinc plated	1	3dia x 70mm
Metal axle	Zinc plated	1	3dia x 95mm
Double gear, red	Plastic	2	(50/10)Teeth tight fit
Double gear, white	Plastic	1	(50/10)Teeth loose fit
Motor gear	Plastic	1	10 Teeth
Hooks	Steel	2	15 mm
Distance pieces	Plastic	2	25 mm
Brass Tube	Brass	1	4/3 x 5 mm
Brass Rod	Brass	1	2mm dia x 120mm
Reducer	Plastic	2	4/3 mm
Distance piece	Plastic	1	
Elastic Band	Rubber	3	60 dia x 3mm
Connector Block		12 pole	
Wire		1	2000 mm



5. Exploded diagram:

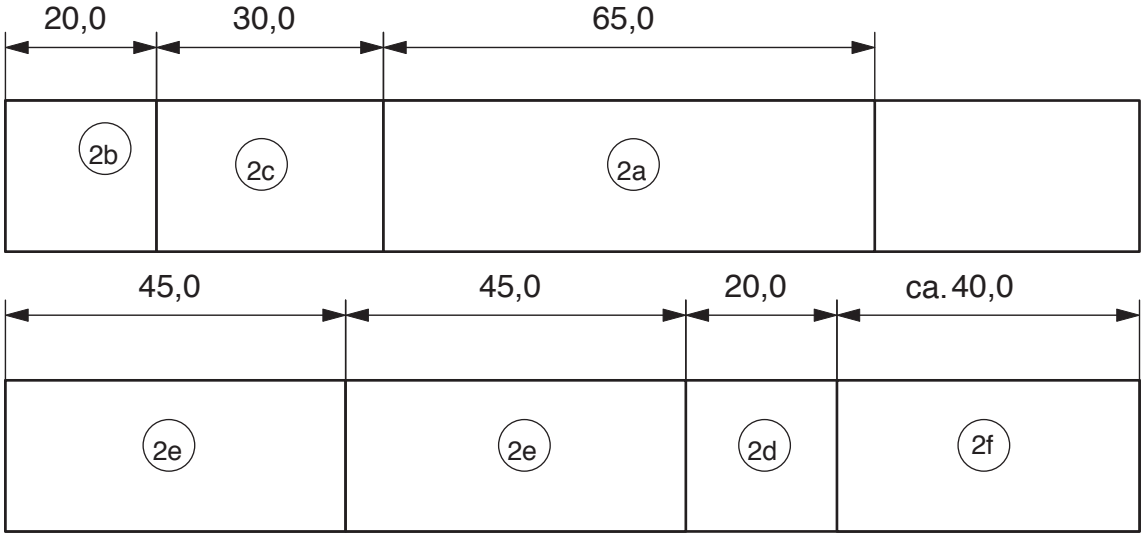


6. Planning overview

6.1 Designing and making the individual parts for the drivers seat, driver and arm supports etc.

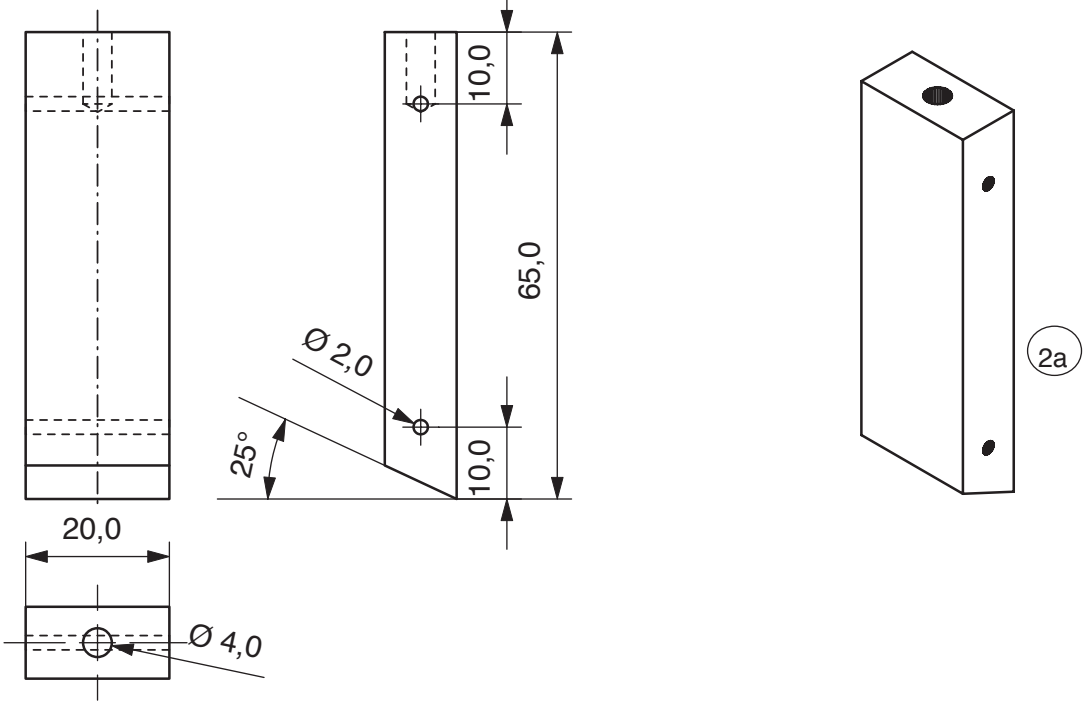
6.1.1 Mark out the pine strip (2) 10 x 20 x 150mm as shown, saw into sections along the lines.

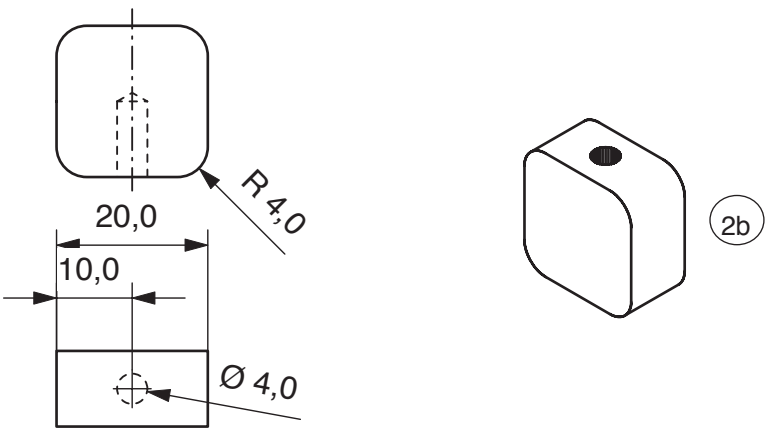
Note: The remaining piece (2f) may be slightly undersize due the thickness of the saw cuts.



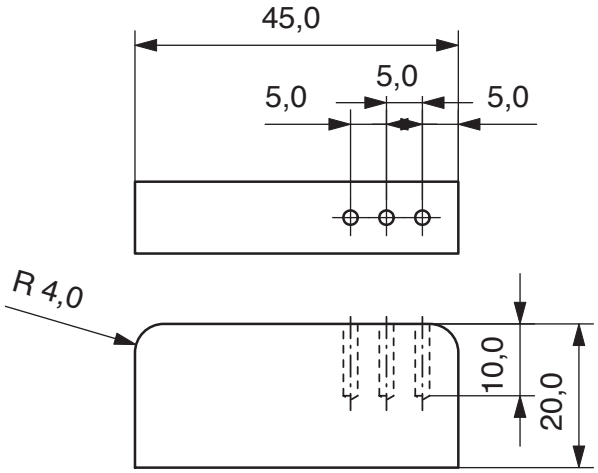
6.1.2 Take the drivers body (2a) and chamfer the bottom to 25 degrees. Mark out and drill the 2 mm holes to fit arms and legs. On the top drill a 10mm deep blind hole for the neck as shown in the diagram.

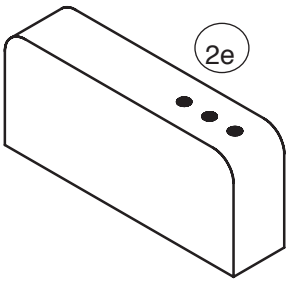
6.1.3 Round off the corners of the drivers head (2b) and drill a 4mm diameter x 10 deep blind hole in the top.





6.1.4 Round off the top corners on the arm supports (2e) as shown in the diagram, mark out and drill the three 2mm diameter x 10mm deep blind holes.

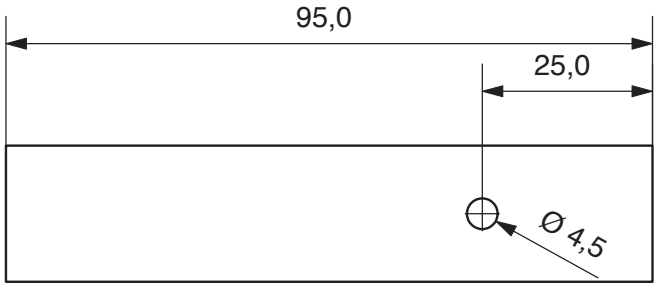


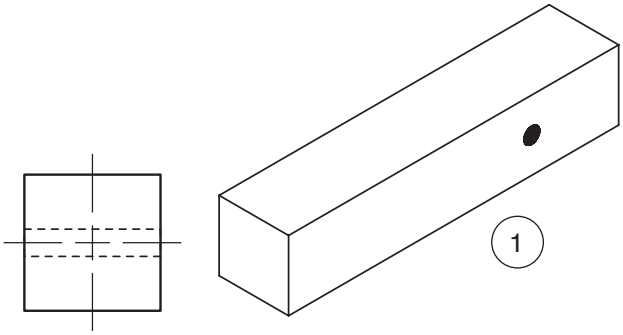


6.1.6 Sand all the parts (2a/2b/2c/2d/2f)

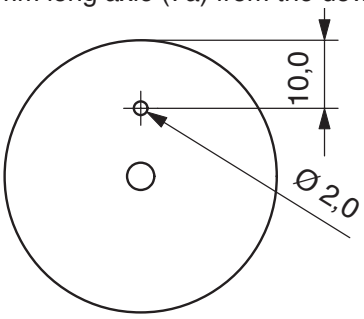
6.2 Making the chassis

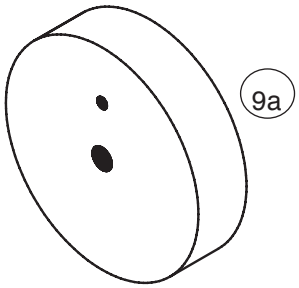
6.2.1 Mark out and saw part (1) from the strip (1) 20 x 20 x 200mm. It should be 95mm long and drilled through at one end, 4.5 mm diameter. Sand the ends.
6.2.2 Mark out and drill a 2mm diameter hole in each of the two wheels (8) as shown.





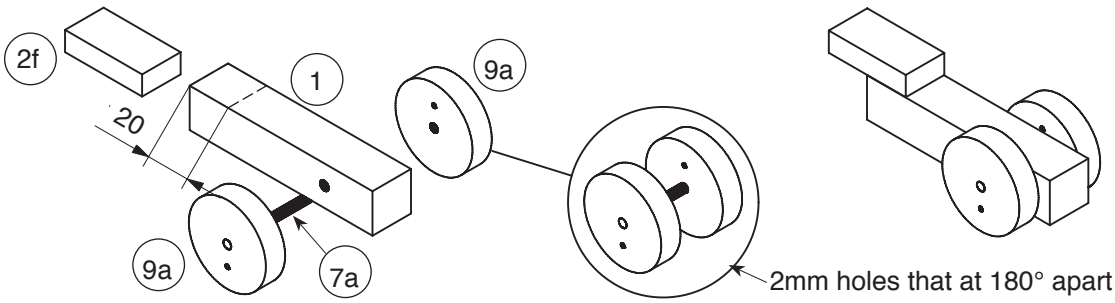
6.2.3 Saw a 42mm long axle (7a) from the dowel (7).





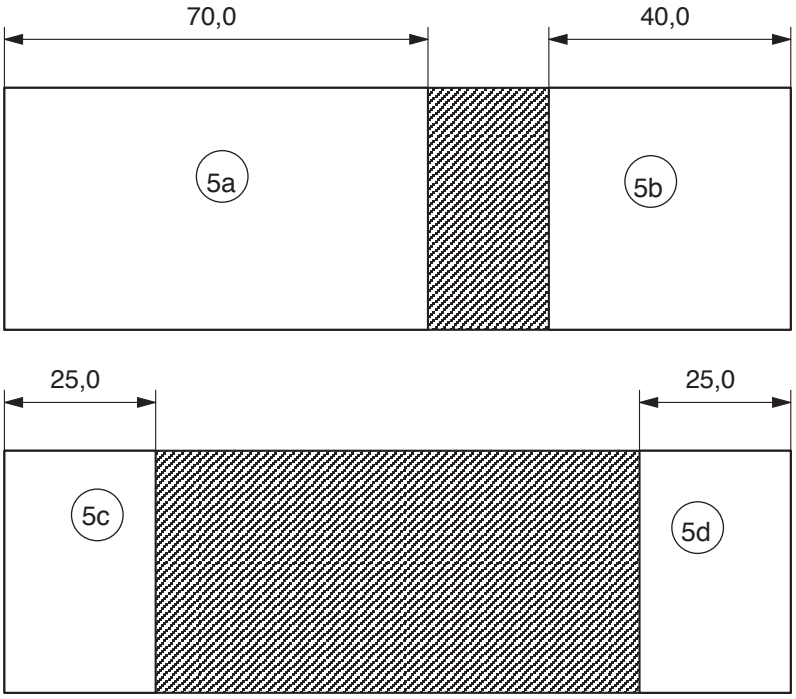
6.2.4 Insert the axle (7a) through the middle holes of the wheels (8),and glue them in position. The wheels must be in such a position, that the 2mm diameter holes are 180 degrees apart from each other (eg: one up the other down see diagram).

Note: Make sure that no glue gets on to the axle itself and causes it to stick in the chassis.

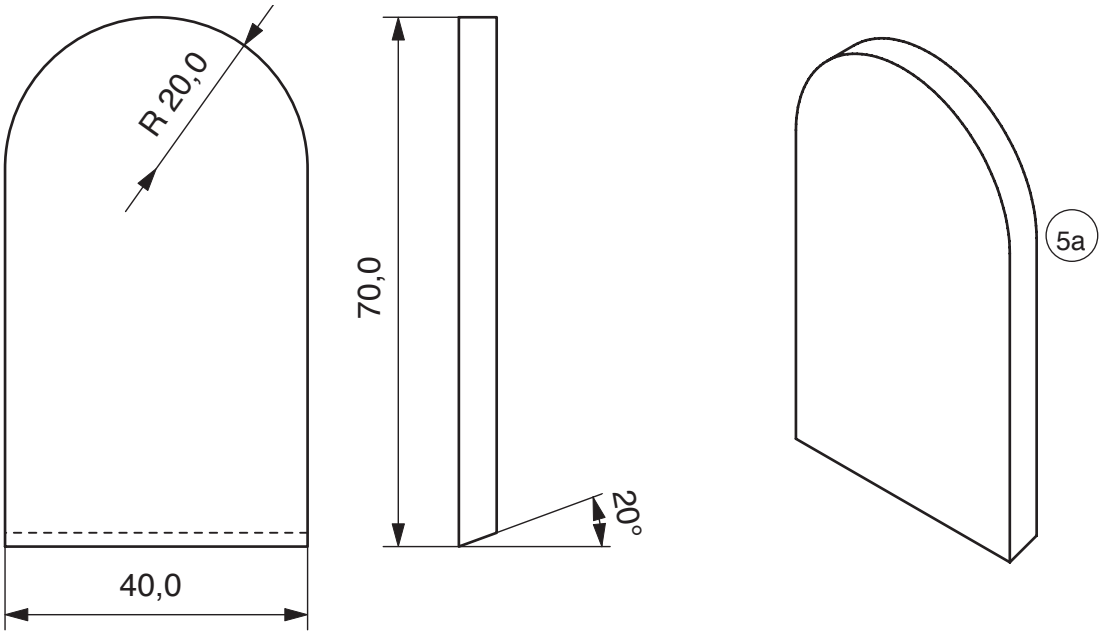


6.3 Making and mounting the rickshaw seat

6.3.1 Mark out the plans as shown on the plywood sheets (5) 5 x 40 x 130mm and saw them out.

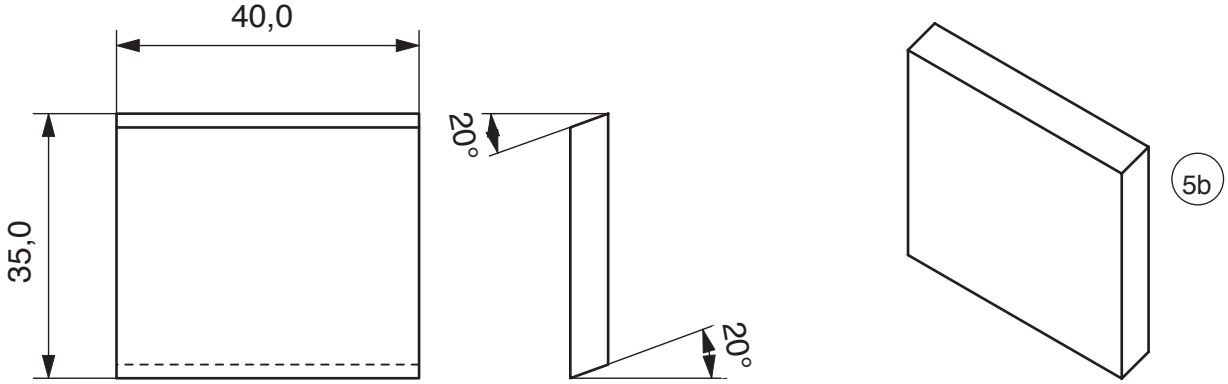


6.3.2 Curve the top of the seat back (5a) and then chamfer the base shown.



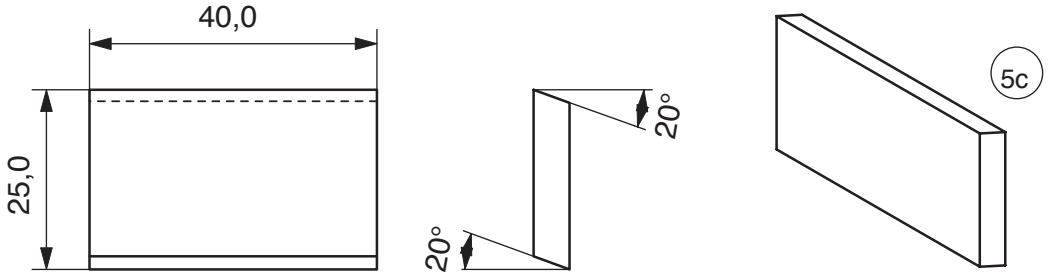
6.3.3 On part (5b) chamfer both ends to slope at an angle of approx 20 degrees as shown in the diagram.

Note: Each angle is chamfered in the opposite direction.

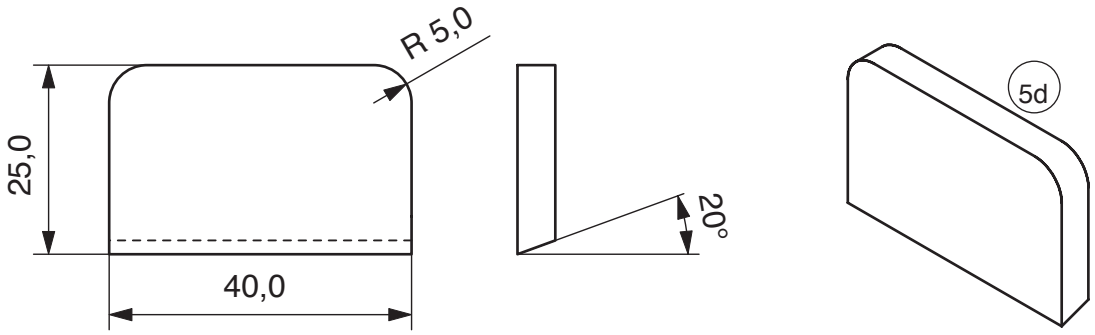


6.3.4 Chamfer both parts of (5c) on the ends at 20 degrees..

Note: Make sure that the ends are chamfered in the correct direction!

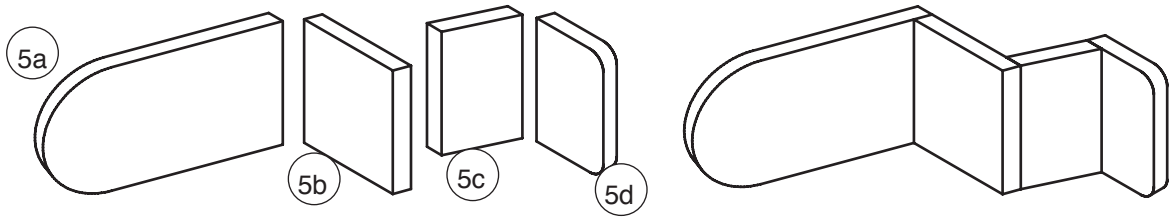


6.3.5 Angle (5d) on the bottom at 20 degrees and round the top corners as shown.



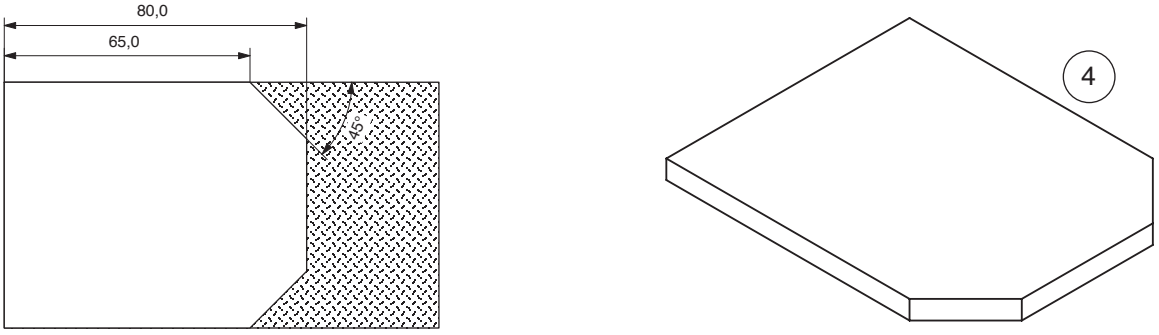
6.3.6 Now assemble and glue all the parts (5a / 5b/ 5c/ 5d) together to make up the seat as shown in the isometric drawing.

Note: We recommend that the seat parts are left to glue on a flat surface as shown!



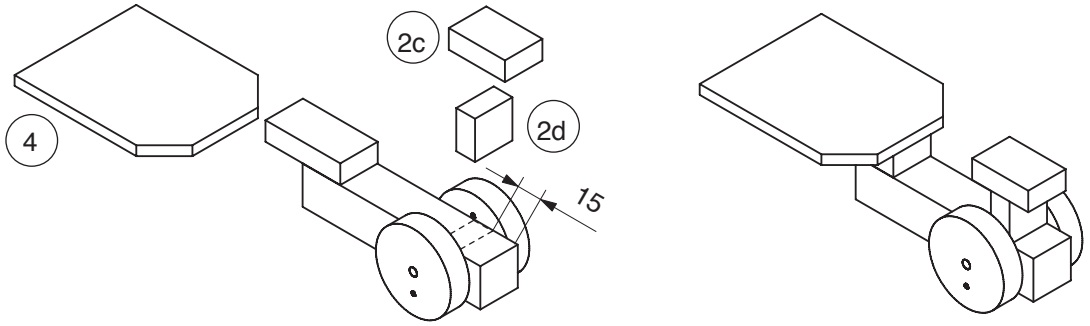
6.4 Making the chassis floor and drivers seat.

6.4.1 Measure out the floor pattern (see page 17) on the plywood sheet (4) 5 x 65 x 1155mm and saw it out. Sand all the edges



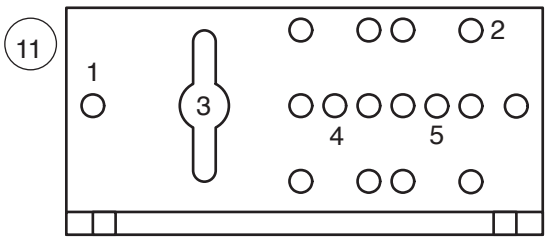
6.4.2 The floor (4) can now be glued centrally on the basic chassis (2f.) so that it is level on end.

6.4.3 Place the pine strip (2c) 10 x 20 x 30mm and glue it centrally on part (2d) 10 x 20 x 20mm to make up the drivers seat. This seat is located approx 15mm in from the end of the chassis. (See diagram).



6.5 Assembling the gearbox

6.5.1 The marked holes in the side angle brackets (11) are used as follows:
- Insert a machine screw (18) M3 x 35mm in each of the holes marked 1 / 2:
- The motor is clamped between the slotted holes marked 3
- The axle (21) 3dia x 95mm is inserted in the hole marked 4
- The axle (5) 3 x 70mm is inserted in hole 5



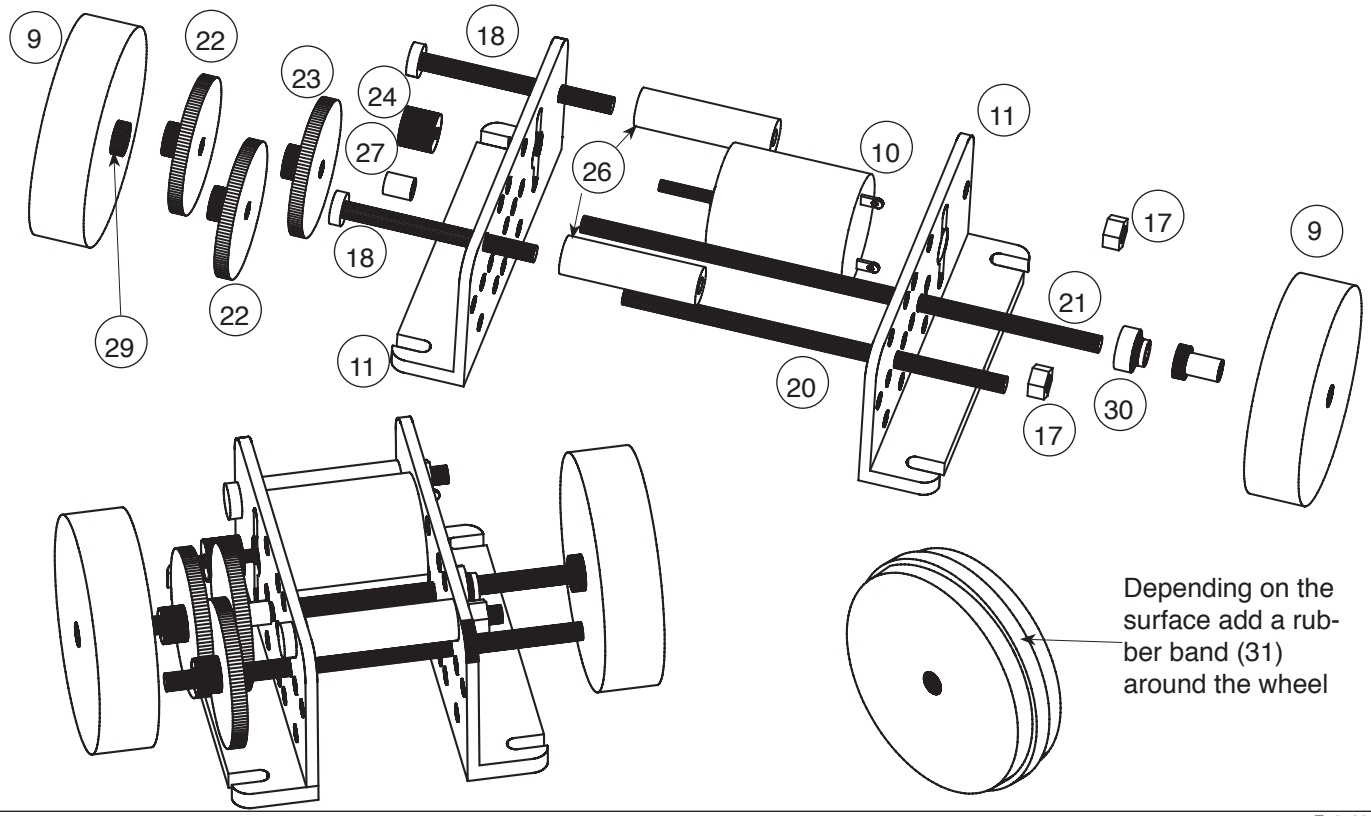
6.5.2 Place the angle brackets (11) so that the right angled parts face outwards.
Insert the motor in between the holes (3) place the two set screws in the holes 1 & 2, at the same time add the plastic distance pieces (26) . Place the nuts (17) on the ends of the set screws and tighten the whole assembly so that the motor is clamped between the brackets

6.5.3 Insert the axle (21) in hole 4 and the axle (20) in the hole marked 5. Centralise both axles.

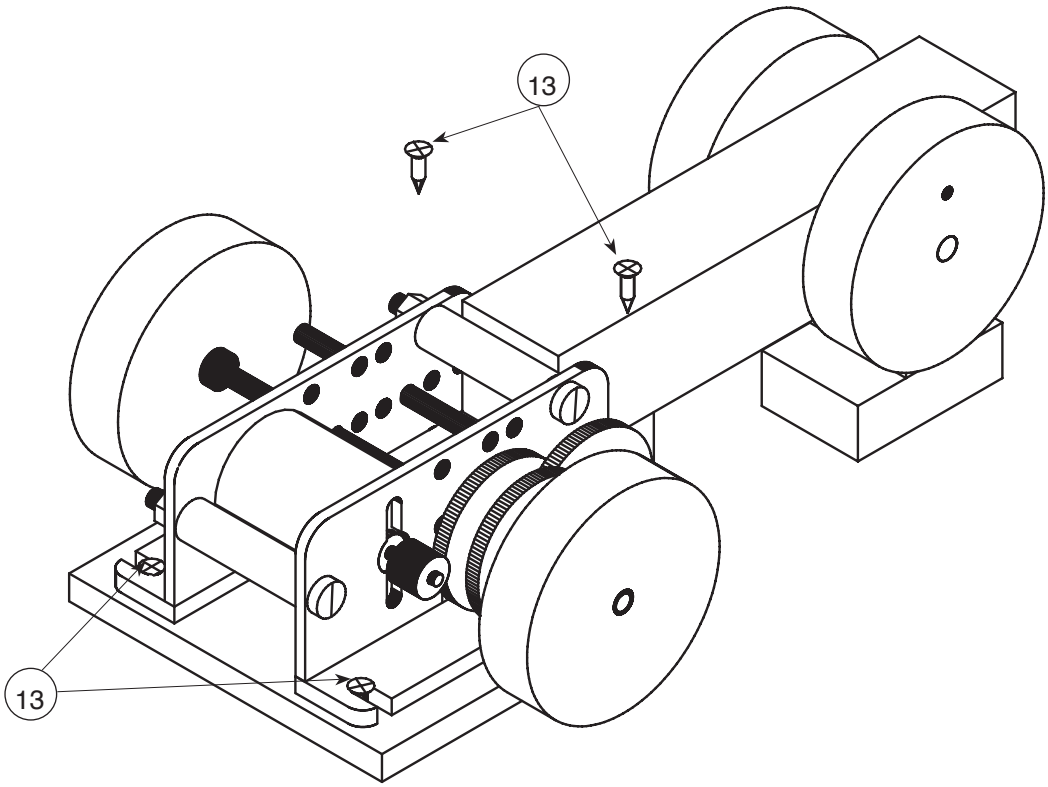
6.5.4 Slide the motor pinion gear (24) on to the motor shaft.
Slide the brass tube spacer (27) on the first axle (21) and then the white gear (23 loose fit). Place it such a position that it engages cleanly with the motor pinion.
The double gear (22, tight fit) is pushed on the axle (20) until it engages with the white gear (23)
The second double gear (22 tight fit) is now placed on the axle (21) until it engages with the red gear (22) arrange the gears as necessary, so that they engage correctly.
On the opposite side of axle (21), add a distance piece (30). Slide this on until it reaches the angle bracket and there is only a little bit of play.

6.5.5 Insert a reducer (29) into the centre each wheel (9b) and press the wheels left and right on the axle shaft (21).

Note: Due to the tolerance in the individual parts, you may find that you have to glue the reducers into the wheel centres. To stop the finished rickshaw from slipping on smooth surfaces glue a rubber band (31) around each of the wheels

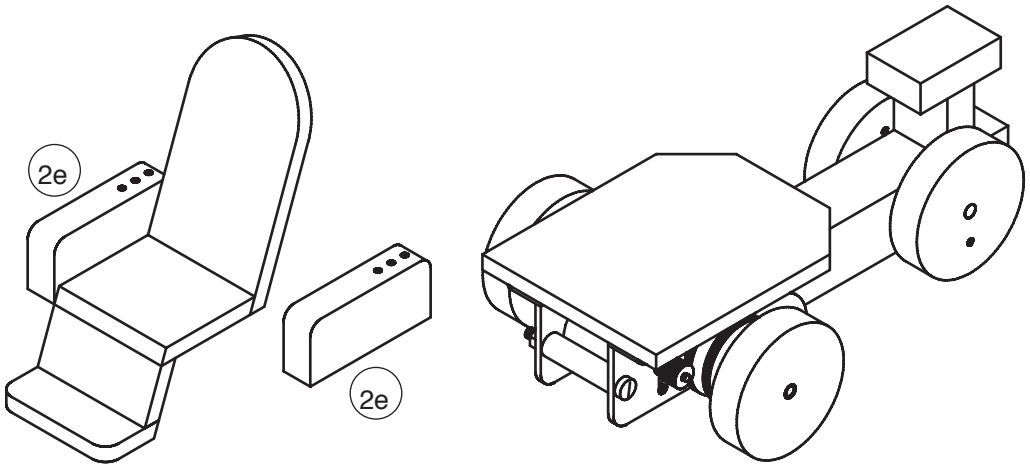


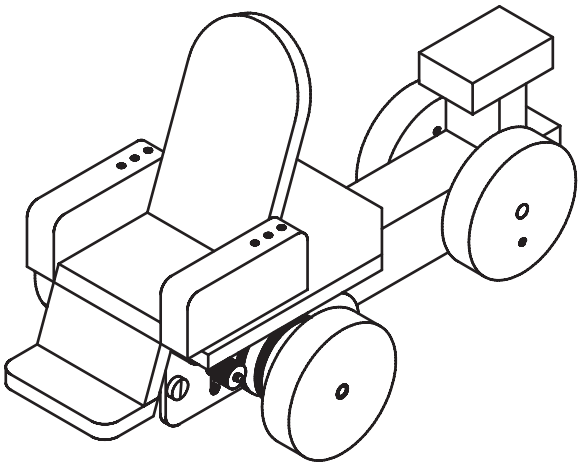
6.5.6 Turn the chassis over and fit the gear box in position using 4 screws (13) so that it lies centrally under the chassis floor (see diagram)



6.6 Mounting the rickshaw passenger seat, and arm supports

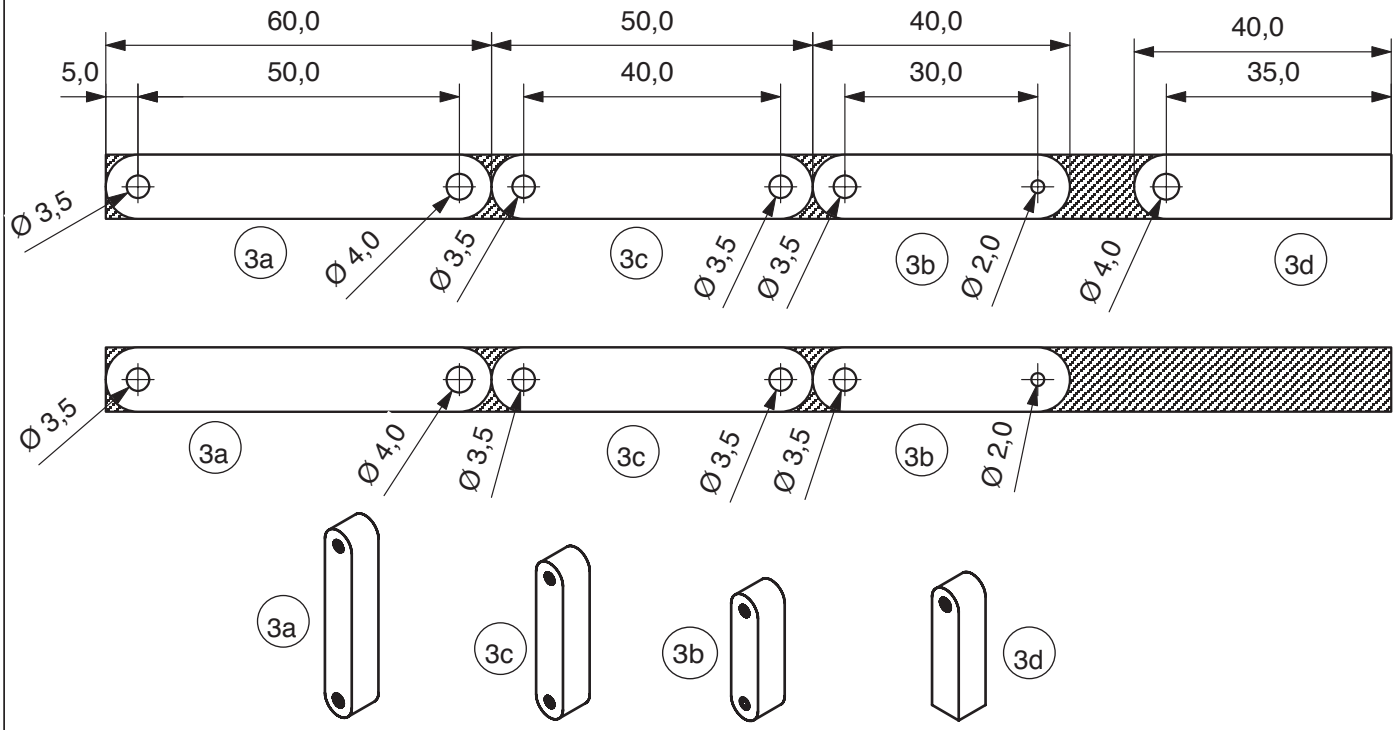
Glue the seat directly onto the front of the chassis (4) and add the side arms (2e) so that the holes in the arms are at the rear.





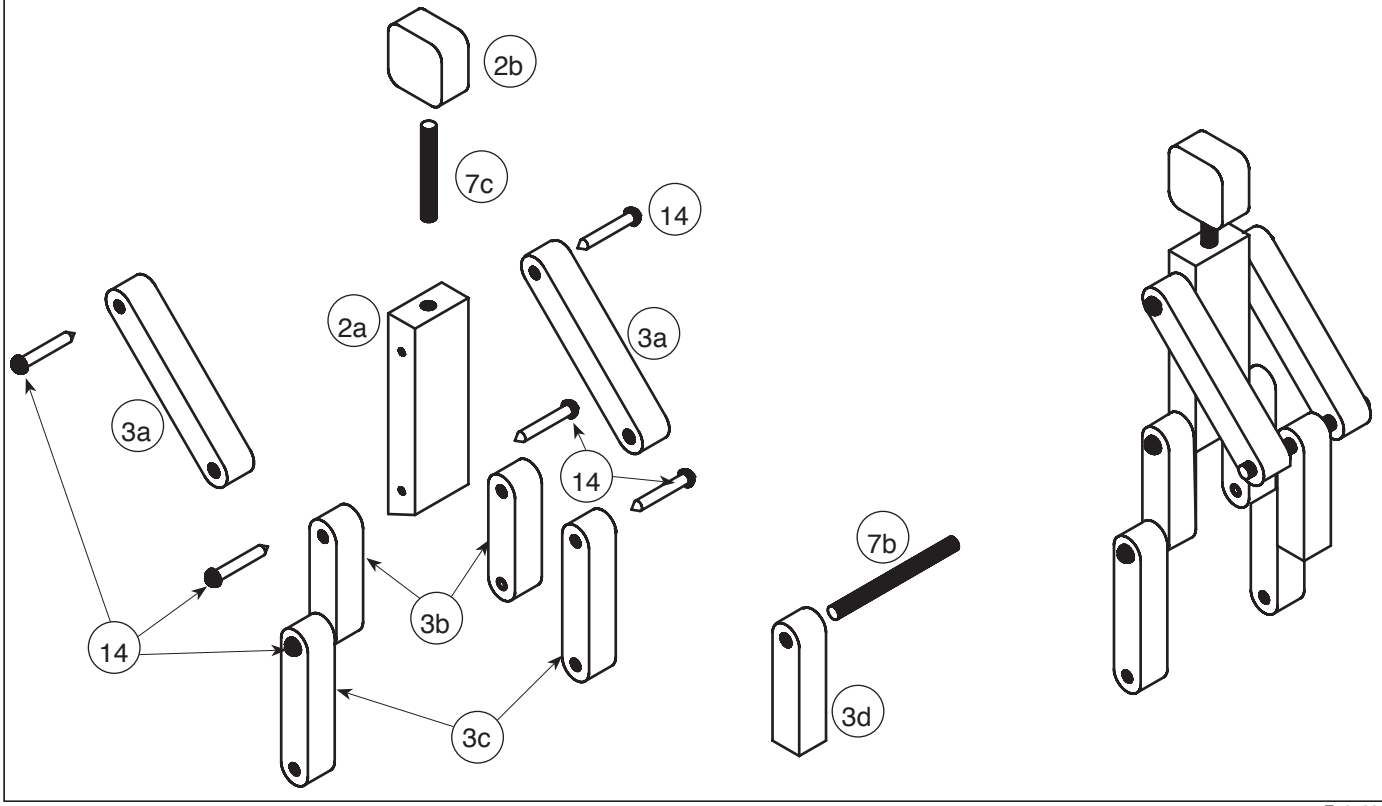
6.7 Making and assembling the rickshaw driver

6.7.1 Measure and saw out the pieces from a pine strip (3) sand all the ends and drill as shown in the diagram. Sand all the parts.



6.7.2 From the dowel (6) cut a length for the steering bar (6b) and piece for the neck 25mm long. Sand all the ends.

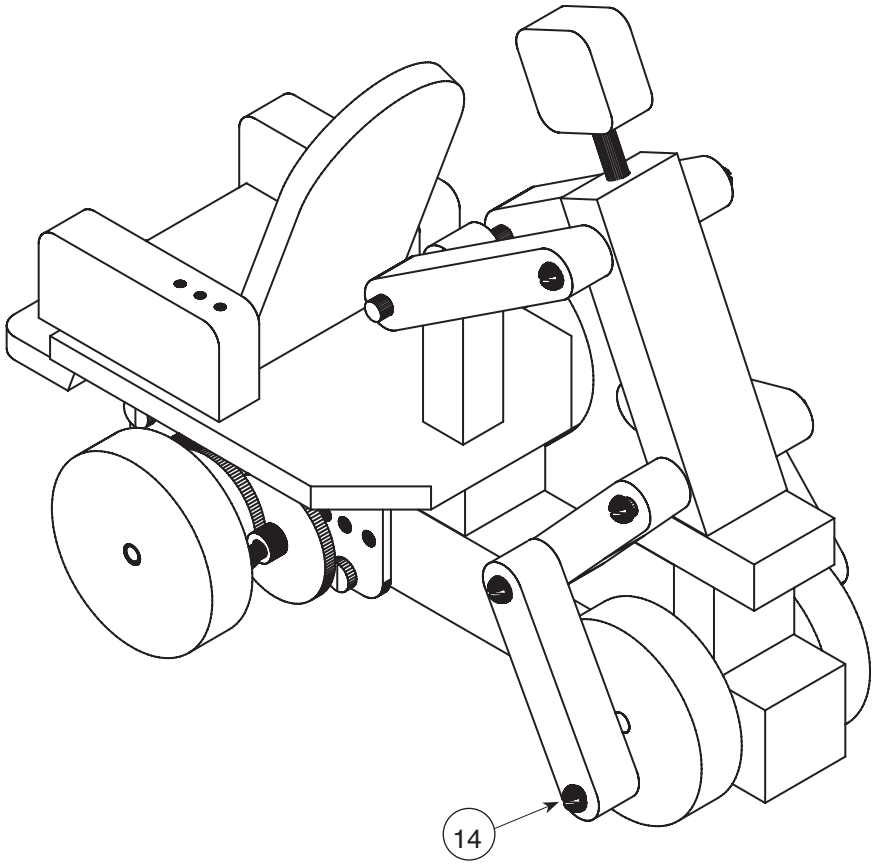
6.7.3 Insert the neck dowel (6c) in the head and then in the body (2a), glue in position
Glue the steering bar into the centre holder (3d)
Insert a screw (14) through the 3.5 mm hole in the arms (3a) and into the 2mm hole in the top of the body, so that it cannot move easily. At the same time place the hands on the steering bar, but do NOT glue them in position.
Insert a screw (10) through the 3.5 mm hole in the top of the lower leg (3c)
Into the thigh to make a moving knee joint.
Then insert a screw (14) through the top of the thigh to make the hip joint, again ensuring that all the joints move easily.



6.8 Mounting the driver on the rickshaw

6.8.1 Insert a screw (14) through the 3.5mm hole in the ankle (3c), place the figure on the seat and insert the screw into the 2mm hole in the wheel (8a) Tighten it so that the legs can still move freely.

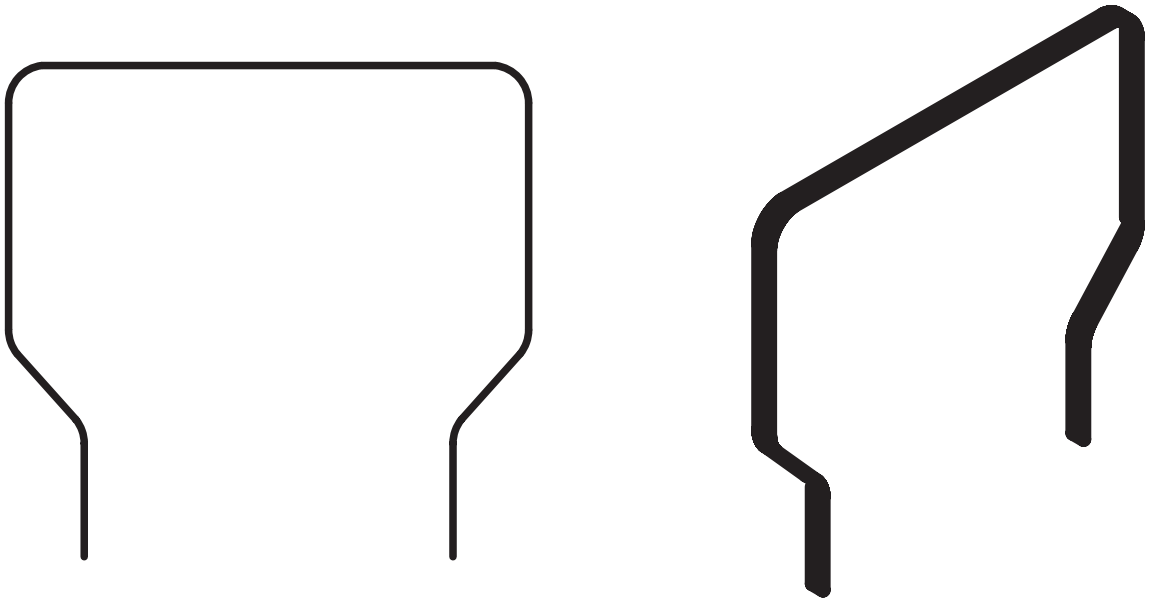
6.8.2 Now centralise the figure on the steering bar so that the mounting post (3d) is in the middle of the chassis and the body is leaning forward. Before gluing him in position check that all the parts can move freely. Check by rotating the rear wheels.
Once you are satisfied the driver can be glued on to the seat and the mounting post glued on to the chassis.



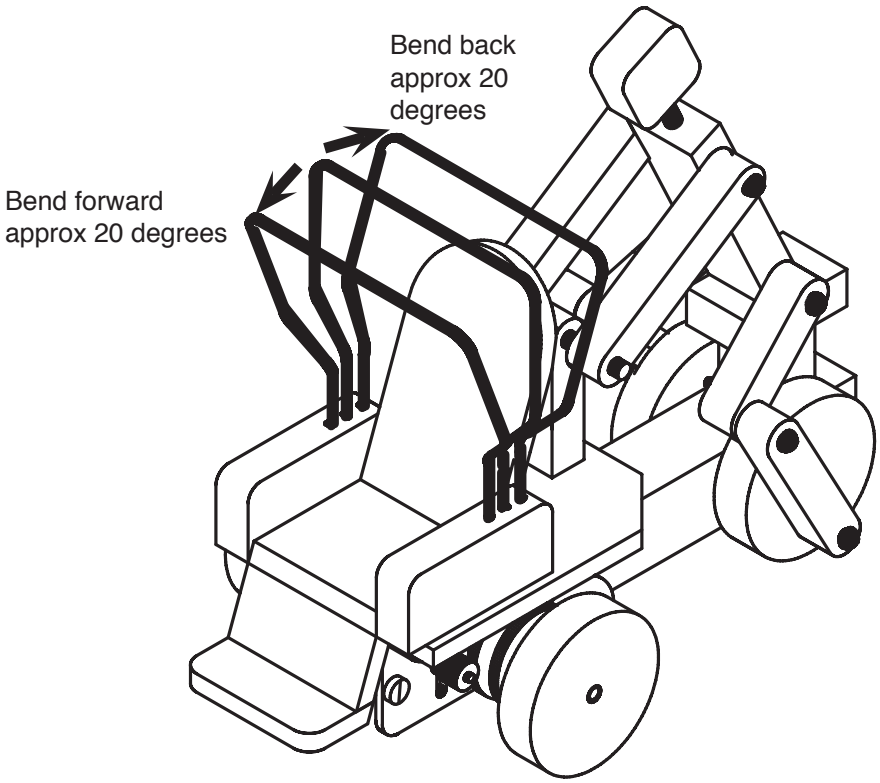
6.9 Making and assembling the roof frame and cover

6.9.1 Bend the three welding rods (7) as shown and remove any sharp edges with a file.

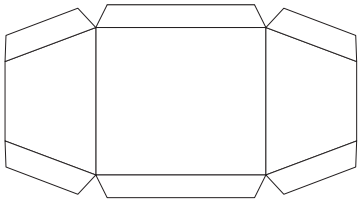
Scale 1 : 1



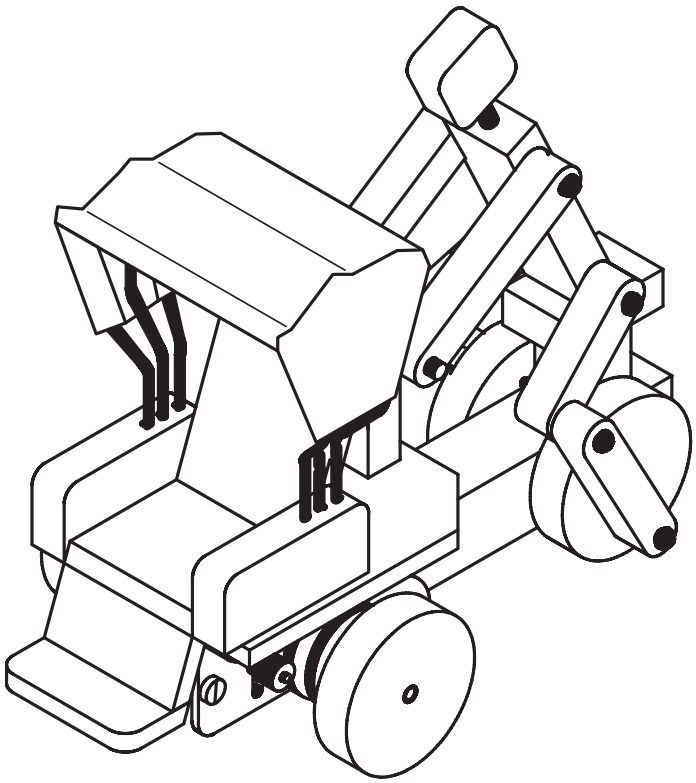
6.9.2 Insert the ends of the roof frame (7) in the 2mm holes in the arms of the seat. Bend and adjust them so that they are about 20 degrees apart from each other.



6.9.3 Cut out the shape of the roof using the pattern (12 / page 13) fold the tabs inward



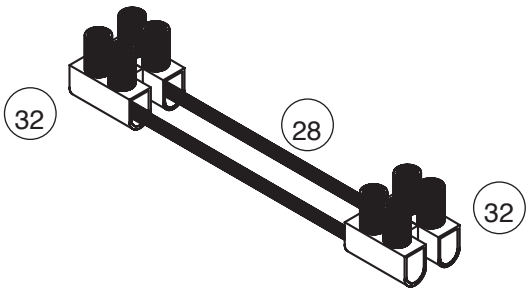
6.9.4 Lay the roof over the frames and fold / glue the front and rear tabs over the frame
Open the roof and glue the side tabs to the frame.



6.10 Making the remote control unit (switch)

6.10.1 Cut the brass rod (28) in half and file the burr from the end.

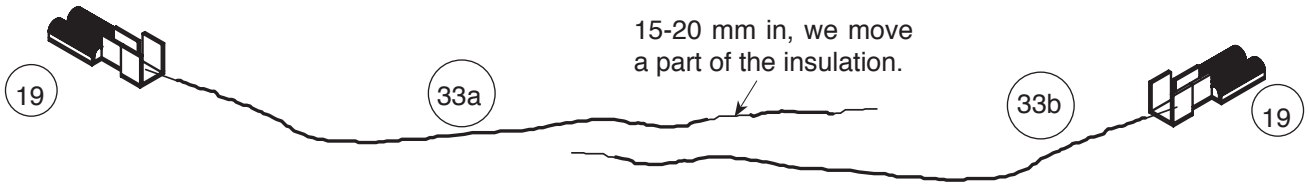
6.10.2 Two double sections form the 12 section connector block and join them together by using the brass rods. (See diagram)



6.10.3 Cut two lengths one (33a) and the other (33b) from the insulated wire (33). One length is 80mm (33b) and the other 100mm (33a). Remove (bare) the insulation 5mm from the ends.

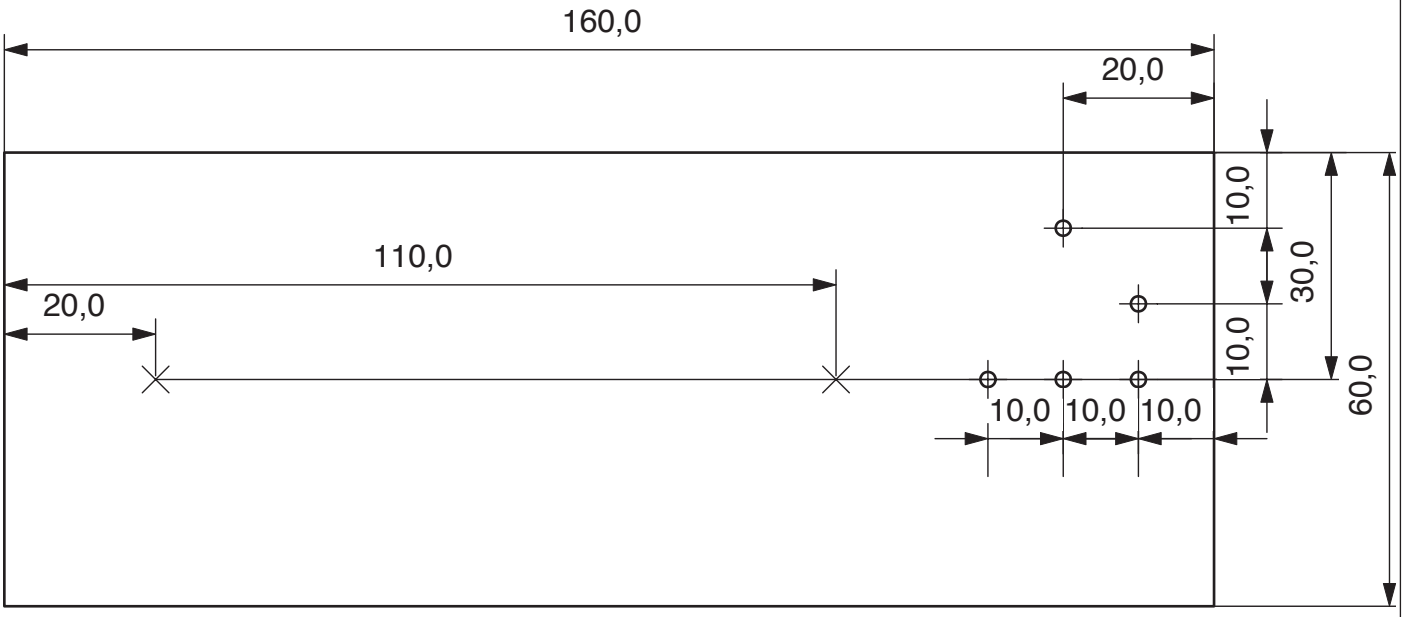
6.10.4 Bare (Remove the insulation, about 5mm long) 15-20mm in from the end of the wire (33a)

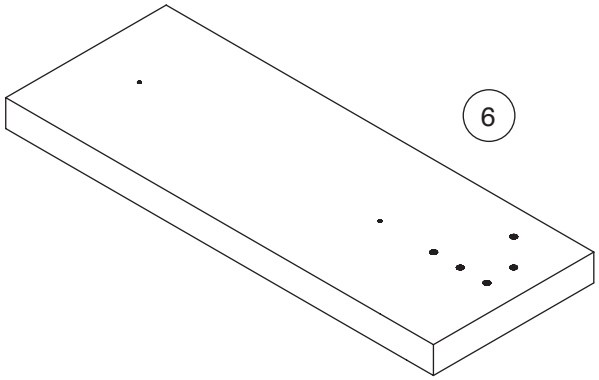
6.10.5 Solder a flat connector (19) to each end of the insulated wires as shown.



6.10.6 Mark out and drill the 2mm holes in the plywood strip (6) 10 x 60 160mm.

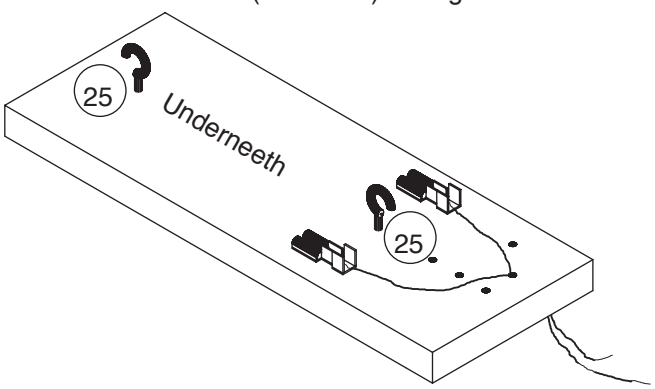
Note: The points marked X should be made with a pointed hole maker (They are for the screw eyes.)

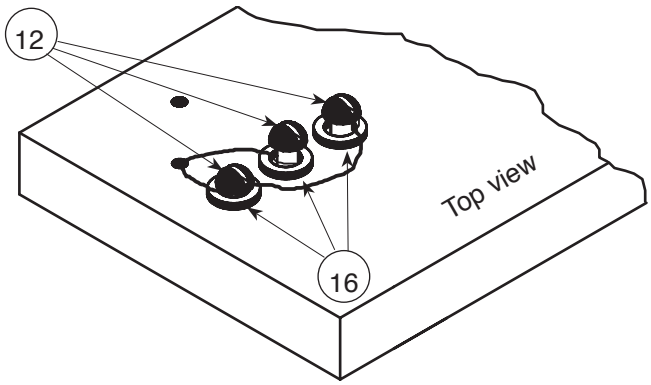




6.10.7 Screw in the eyes (25) so that they are positioned as shown in the diagram.

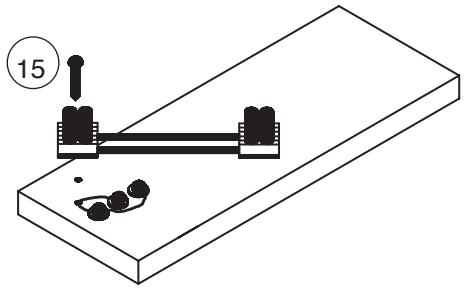
6.10.8 Insert the wires (33a / 33b) through the holes as shown.

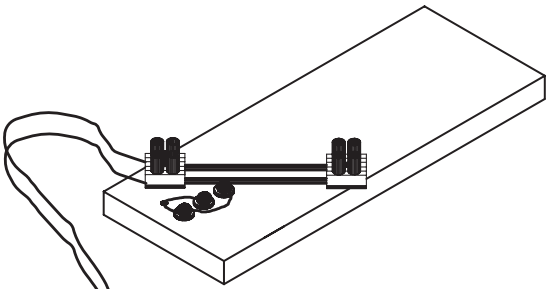




6.10.9 Turn the plywood base (6) over .Place 3 washers (16) over the 3 holes in a row and hold them in place with screws (12). Before the final tightening, take the length of wire (33b) with the single stripped end, and trap it under the middle screw. The remaining wire (33a), with insulation stripped in two places (At the end and 15mm in) is secured under the first and last screw (See diagram).

6.10.10 Insert the screw (15) in the switch arm and fasten it into the remaining hole. Make sure that the arm can turn easily.



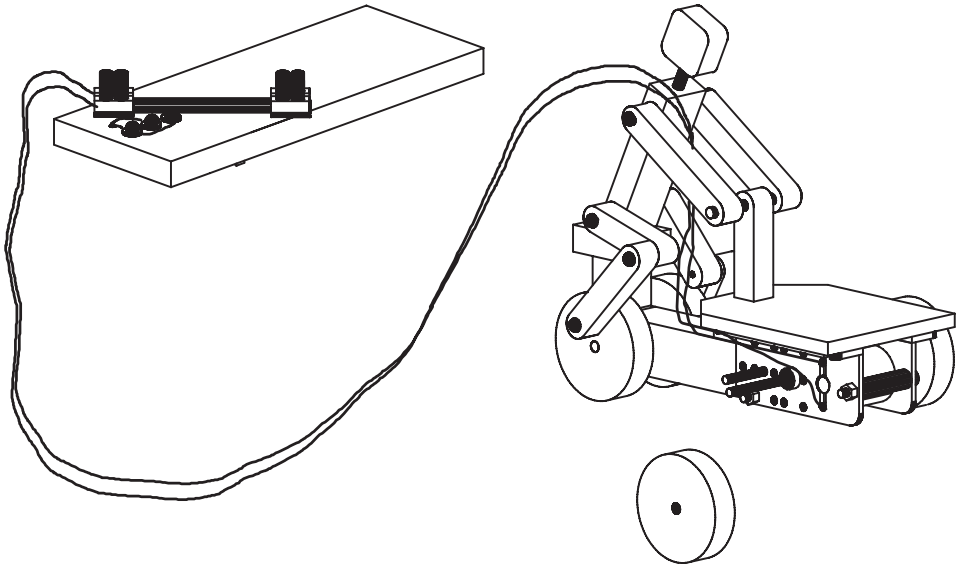


6.11 Wiring and testing

6.11.1 Cut the remainder of the insulated wire (33) in half and tin the ends.

6.11.2 Solder an end from each of the wires on to the motor. To make this easier, remove the wheels

6.11.3 Guide the wires up through the arms to the switch and clamp the ends into one of the connecting blocks.



Note: Note when wiring , care must be taken with the polarity!

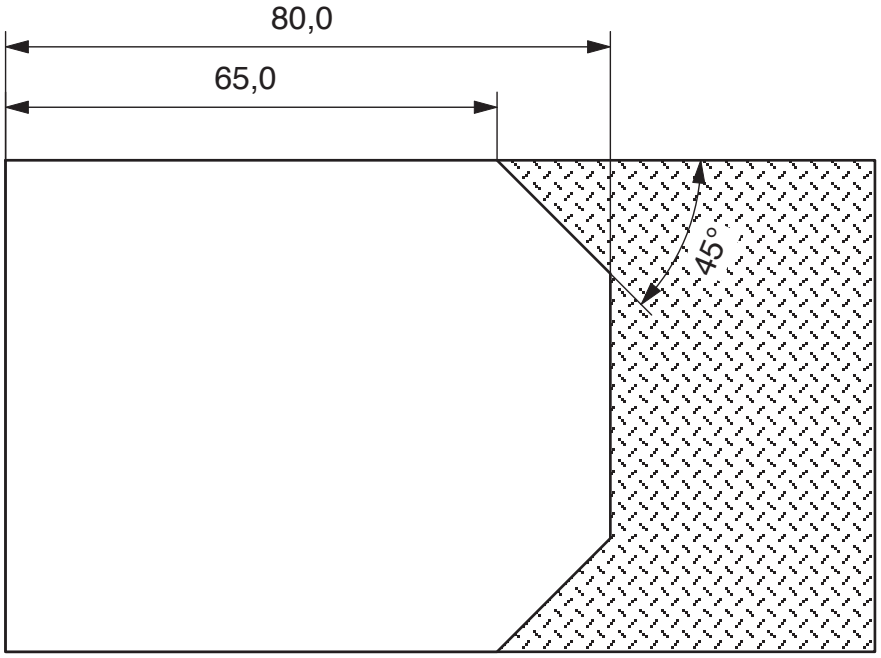
6.11.4 **Testing:**

Place a flat shaped 4.5 Volt battery under the plywood base of the switch (6), hold it in place with rubber bands so that it connects with the contacts. (Flat connectors) Turn the switch so that the brass rod makes a connection with the head of the first screw. The rickshaw should now move forwards until the switch is moved to make contact with the next screw, then it should move in reverse.

7. Patterns

Scale 1 : 1

Base (4)



Roof