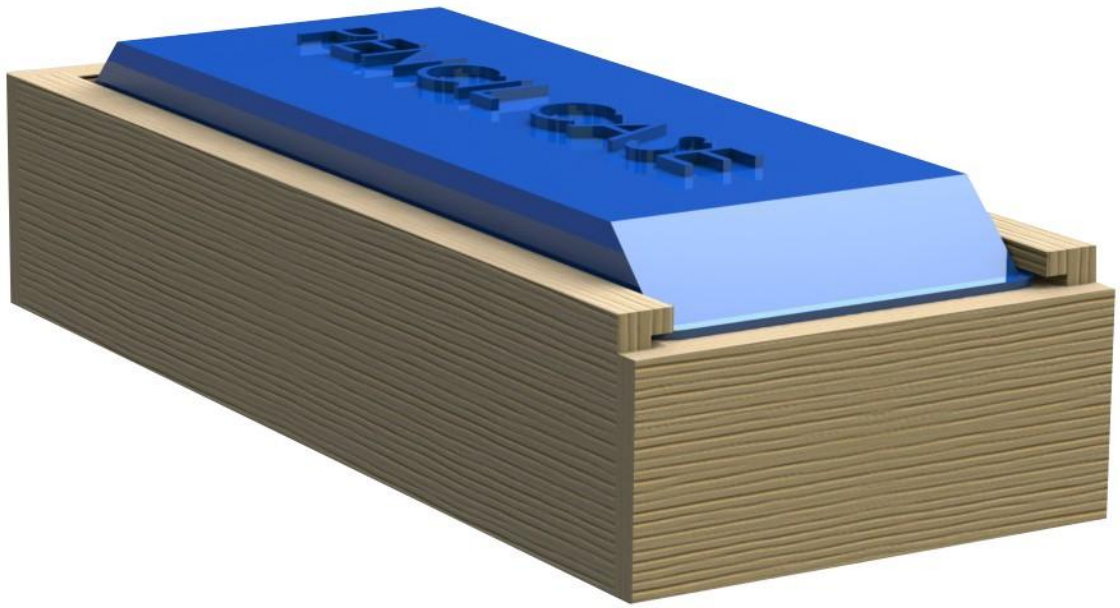
# MANUFACTURING A PENCIL CASE USING THE RJH GERBIL VACUUM FORM TRIMMING AND FINISHING MACHINE



# CONTENTS

# INTRODUCTION

## THE GERBIL

The Gerbil is a unique machine that was originally designed as a safe and easy method of trimming out vacuum formings. Over the years it has evolved and it is now a much more versatile machine that can be used to perform a wide range of tasks. Resource Material G1 gives an overview of the different tasks that can be performed on the Gerbil.

## OBJECTIVE:

The objective of the project is to build a pencil case. The case is made out of both plastic and wooden materials.

## TECHNIQUES:

The project will enable you to learn and practise the following techniques using the Gerbil:

1. Trimming out vacuum formings to give straight and flanged edges
2. Slotting and rebating wooden components
3. Polishing and finishing acrylic components

## MATERIALS:

You will be provided with a set of materials. The pack should contain the following:

1. One vacuum forming, containing the shapes for the pencil case lid, base, and base insert.
2. Two wooden side panels, measuring approx 207mm long x 11mm wide x 44mm high.
3. Two wooden end panels, measuring approx. 91mm long x 11mm wide x 44mm high.

## SAFETY:

Throughout the project, please observe the following safety instructions

1. Wear safety glasses at all times
2. Remove any loose jewellery
3. Tie back long hair

# INSTRUCTIONS

## STAGE 1 – TRIMMING OUT THE VACUUM FORMINGS

1. In total there are 3 acrylic formings to be trimmed, all on one sheet. The lid is the forming which has some writing embossed on it. The base insert has groves to hold the pencils in place.

2. The base insert needs to have a straight edge. This requires using the Tungsten Carbide Disc on the Gerbil o trim out the vacuum forming. For detailed instructions refer to Resource Material G2

3. The lid and base need to have flanged edges, thereby enabling them to slide into the wooden case. This requires using the flange cutter on the Gerbil to trim out the vacuum forming. For detailed instructions refer to Resource Material G3

4. Once all three formings have been trimmed the edges may need to be finished slightly to remove any rough edges. This requires using the mop on the Gerbil. For detailed instructions refer to Resource Material G5. An alternative method would be to use a metal file.

# INSTRUCTIONS - continued

## STAGE 2 – SLOTTING THE PANELS

1. Cutting slots requires using the tungsten carbide disc, combined with the extraction and guide fences. For detailed instructions refer to Resource Material G4

2. **BOTH side panels** need to have two slots along the length of the panels. Both slots will remain as slots right through to the end. Please refer to schematic PC0002 on page 14 for details.

3. **ONE end panel** – the “reduced end panel” – needs two slots along its length. One of these slots will remain as a slot right through to the end. The other will set the line for trimming this panel down to size later on. Please refer to schematic PC0003 on page 16 for details.

4. **ONE end panel** – the standard “end panel” – needs two slots along its length. Both slots will remain as slots right through to the end. Please refer to schematic PC0001 on page 14 for details.

5. For the “bottom” slot, set the height of the disc so that the bottom of it is 14mm above the table. To set the depth of the slot, position the extraction fence so that between 4 and 5mm of the disc protrudes. This is the slot that will hold the base of the case, and it applies to all four panels.

6. Position the panel so that a long edge rests on the table and set the guide fence accordingly and cut the slot as detailed in Resource Material G4.

7. Repeat step 4 for the second side panel and for **BOTH** end panels

8. Check the size of the slots by sliding the trimmed base forming along it. If necessary, raise the height of the disc by ~1mm, and repeat the cut along all of the slots in order to make them wider.

9. The panels now require a “top” slot. This is the slot that will hold the lid of the case. For the reduced end panel this is the slot that will set the line for trimming down later. Note that both slots will be on the same face of the panels.

10. Set the height of the disc so that the bottom of it is 4mm from the table. The depth of the slot is the same so there is no need to adjust the extraction fence position.

11. Rotate one of the side panels. The top slot needs to be on the same face of the panel, and parallel to the bottom slot, but working from the other end.

# INSTRUCTIONS

**STAGE 2 – continued**

12. Set the guide-fence and cut the slot as detailed in Resource Material G4.

13. Repeat step 10 for the second side panel and for the standard end panel.

14. Check the size of the slots by sliding the trimmed lid forming along it. If necessary, raise the height of the disc by ~1mm, and repeat the cut along all of the slots in order to make them wider.

15. Clean off any dust along all of the slots. If necessary use a steel rule or sandpaper to finish off any rough edges and clean inside the slot.

16. The side panels are now ready. Both end panels now require some rebating – move on to STAGE 3

# INSTRUCTIONS

## STAGE 3 – REBATING THE END PANELS

1. Cutting rebates requires using the tungsten carbide disc, combined with the extraction and guide fences. It is carried out in two stages – first of all a slot is cut, then the workpiece is turned by 90˚ and a second slot is cut to create the rebate. For detailed instructions refer to Resource Material G4

2. Both end panels need to be rebated along both ends. Please refer to schematics PC0001 and PC0003 on pages 14 and 16 for details. The rebates need to be on the same side as the slots that have already been cut.

3. Set the height of the disc so that the BOTTOM of it is **10mm** above the table. This needs to match the thickness of the wood. Lay a piece of wood on the table next to the disc, and make sure that the TOP of the disc is at the same height as the piece of wood. To set the depth of the slot, position the extraction fence so that **5mm** of the disc protrudes.

4. Position the end panel so that a short edge rests on the table and the existing slots from stage 2 face toward the disc. Set the guide fence and cut the slot as detailed in Resource Material G4.

5. Rotate the panel and repeat step 4 along the other short edge. Repeat steps 4 and 5 for the reduced end panel.

6. Now the slots need to be turned into rebates. Re-set the height of the disc so that the bottom of it is **6mm** above the table. The depth of the slot also needs to be re-set by re-positioning the extraction fence so that **11mm** of the disc protrudes.

7. Position the end panel so that it lies flat on the outside face, so that the slot cut in step 4 is parallel to the fence, and facing upwards. The slot you are about to cut should be at right angles to this slot.

8. Set the guide fence and cut the slot, thereby removing a small strip of wood to create the rebate. Care needs to be taken to hold the piece of wood steady as it passes through the disc.

9. Repeat steps 9 and 10 for the other end of the end panel, and for both ends of the reduced end panel. Clean off any dust along the rebates. Use sandpaper to finish any rough edges.

10. The end panel is now ready for assembly however the reduced end panel needs one more cut. Move on to stage 4

# INSTRUCTIONS

## STAGE 4 – TRIMMING THE REDUCED END PANEL DOWN TO SIZE

1. The reduced end panel needs to be slightly shorter so that the lid of the pencil case can be slid in and out.

2. Use the slotted reduced end panel as a guide to set the height of the disc. The disc should be at the height of the existing “top” slot. This is the slot that is 4mm from a long edge of the panel. Set the disc so that **7mm** of it protrudes.

3. Position the panel so that the existing slots face AWAY from the disc, with the “top” slot along the bottom. This new cut should line up with the “top” slot, meeting it in the middle and thereby removing a strip of wood to make this panel shorter

4. Set the guide fence accordingly and cut the slot as detailed in Resource Material G4.

5. Clean off any dust along the rebates. If necessary use sandpaper to finish any rough edges.

## STAGE 5 – ASSEMBLY

1. First of all look at the diagram on page 21 to see what the end result should look like. The panels need to be glued together and ideally tacked as well for extra stability.

2. Line up the two side panels against the standard end panel rebates so that the slots are in line along the inside of the case. Refer to the diagram on page 18 for details.

3. Apply some wood glue to the rebated edges on the standard end panel. Slide the base forming in along the bottom slots. Hammer in 4 tacks, one in each corner, as shown in the diagram on page 18.

4. Position the reduced end panel so that it is ready to be glued on to the rest of the case, and apply some glue to the rebated edges. Glue together and hammer in 4 tacks, one in each corner as in step 3. If you are not using tacks, it is necessary to use some tape to hold the case together while the glue dries.

5. Insert the base insert into the case, and slide the lid forming along the top slots. Refer to the diagrams on pages 19 and 20 for details.

6. The pencil case is now complete and just needs to be left until the glue is thoroughly dry. Once the glue is dry, smooth of any edges using the Antelope Bandfacer.

# RESOURCE MATERIALS

# The Gerbil

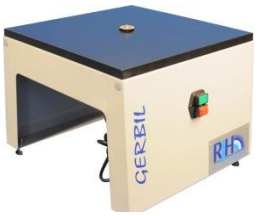
Resource Material G1

Using The Gerbil

## An Introduction to the Gerbil

### 1. The Gerbil

The Gerbil is a versatile work table, for use by students in the classroom, into which can be mounted a variety of tools for working on plastic, wood and metal. There are three models, the basic **2010**, fitted with a trimming disc, the **2020**, which has extra features such as a tilting table, extraction and a range of tools, and the **2030**, which features a 2020 model with a purpose-built trolley.

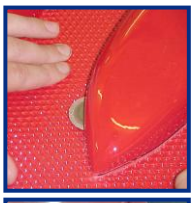



2010


2020


2030

### 2. Trimming out Vacuum Formings



A common application is for trimming out shapes formed by a vacuum from a sheet of plastic. The advantage of the Gerbil over other techniques, such as using a band saw or Stanley knife, is that the process is accurate, controllable, and above all safe.

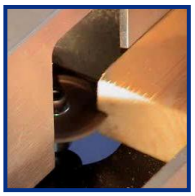
The formings can be cut out using either a trimming disc or a flange cutter. The disc works from *inside* the forming and produces a straight edge. The flange cutter works from *outside* the forming and leaves a flanged edge. The flange may be appropriate, for example, if two pieces are to be joined together. Instructions for disc and flange trimming. See Resource Materials G2 and G3.

### 3. Sanding and Finishing

A drum sander or flap wheel can be fitted in place of a trimming tool. This can be used for finishing any rough edges left by the trimmer, for shaping profiles in the forming, or for working on the mould itself. When used with the adjustable tilting table, for example, you can produce a slanted or chamfered edge on the mould (often known as the “Draft Angle”) which makes it easier to withdraw the mould from the forming. See Resource Material G4.

Similarly, a mini mop can be fitted for the polishing or finishing of pieces of acrylic. This is particularly useful for the finishing of small components, as this can be hazardous on a full size polisher.

### 4. Cutting Slots and Rebates



With the addition of the guide fences, the Gerbil’s disc can be used to make slots and rebates in soft wood. This is ideal, for example, for making a lid for a box, or slots to divide a box into compartments. See Resource Material G5.

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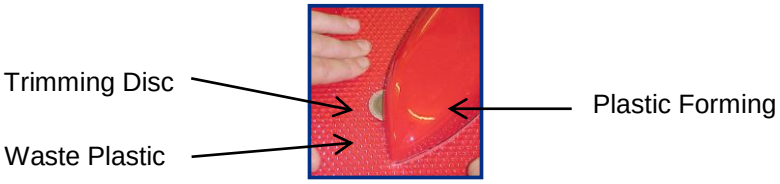
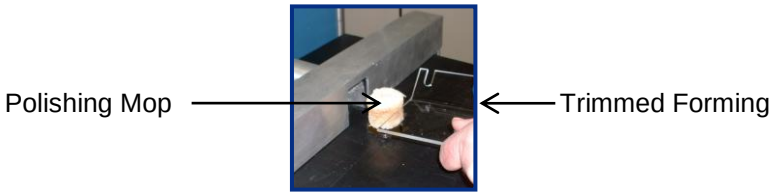
## Trimming a Vacuum Forming to Give a Straight Edge


Both the **2010** and **2020** Gerbils can be used with the tungsten carbide abrasive disc to trim out vacuum formings leaving a straight edge.

1. The following safety instructions must be observed at all times: wear safety goggles, tie back long hair and remove any loose jewellery.
2. Fit the abrasive disc as described in the instruction manual. Set the cutting height as required.
3. Place the vacuum forming over the top of the disc and make sure that it is seated flat on the table. You should not be able to see the disc as it will be hidden beneath the vacuum forming.
4. You can hold the vacuum forming in place however best suits you, but be careful not to apply too much pressure or the forming may distort. It is best to apply pressure to the waste plastic around the edge, and, if you need to, simply rest a hand on the forming to guide it as you trim.
5. Switch on the machine. Holding the vacuum forming as instructed in (4) push the vacuum forming against the rotating disc so that it trims through the wall of the forming (see figure below); about half of the disc will now be visible. If you have the 2020, you can use the table top cross hairs to give an estimated position of the disc.




6. Gradually move the abrasive around the vacuum forming, clockwise or anticlockwise, at a slow, steady rate. If you rush or push too quickly you will leave a rough finish which will need more sanding later. When the disc is within 20mm of the starting point, reduce the rate at which you are moving the forming and gradually complete the operation.
7. Switch off the Gerbil, remove the vacuum forming and clear the waste plastic from the table.
8. Allow the forming to cool.
9. The base of the vacuum forming may now need a small amount of finishing work. This should be done in two stages:
   a) Break off any large pieces of plastic swarf with your fingers.
   b) Use the mini mop to finish any rough edges (see Resource Material G5). If you do not have this tool you can use the edge of a steel rule, or a piece of abrasive paper. Be careful when sanding not to dwell too long on one spot, for fear of rubbing away too much material.
10. You should now ask your teacher if any more finishing is needed.

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Resource Material G3

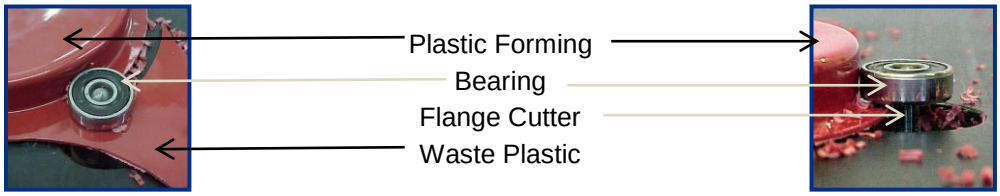
Using The Gerbil

## Trimming a Vacuum Forming to Give a Flanged Edge


The **2020** Gerbil is supplied with a flange cutter to cut out vacuum formings so as to leave a flanged base. A flange may be necessary, for example, to provide a surface for sticking two formings together. The cutter can also be supplied separately and fitted to the **2010** model.

The flange tool consists of a cutter shielded by bearings above and below the table. The bearings serve both to hide the blade for safety and to act as a spacer controlling the width of the flange.

1. The following safety instructions must be observed at all times: wear safety goggles, tie back long hair and remove any loose jewellery.
2. Fit the flange cutter as described in the instruction manual.
3. Place the vacuum forming to be trimmed alongside the cutter and make sure that it is seated flat on the table top of the Gerbil.
4. You can hold the vacuum forming in place however best suits you, but note that you do not need to apply as much pressure with the flange cutter as you do with the cutting disc; simply guide the forming in the right direction.
5. Switch on the machine. Holding the vacuum forming as instructed in (4) guide the forming towards the cutter, allowing the tool to cut a path through the waste plastic to the edge of the vacuum forming. The bearing should be visible all of the time, moving over the top of the plastic.
6. When the cutter reaches the forming, so that the bearing is resting against it, you can start cutting around the forming. Do this by keeping the cutter moving at a steady rate clockwise around the forming (see pictures below).




7. Make sure that the bearing maintains contact with the side of the vacuum forming so that the flange width is constant.
8. When the cutter is within 20mm of the starting position, slow down and very carefully complete the cut.
9. Switch off the Gerbil, remove the vacuum forming and clear the waste plastic from the table.
10. Note that you can use the flange cutter to work in more than one plane of the forming. For example, if cutting out a vacuum formed car, you can use the tool to form the wheel arches, after you have cut out the car body from the plastic sheet.
11. Allow the forming to cool.
12. The base of the vacuum forming may now need a small amount of finishing. Please refer to step 9 of Resource Material G2.

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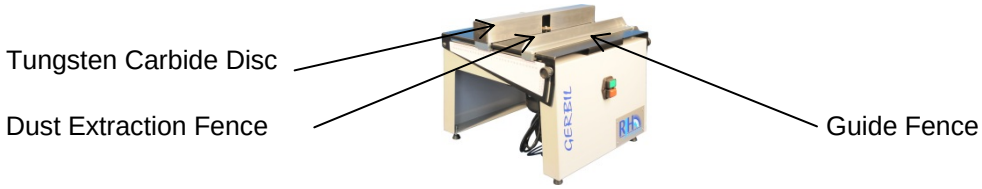
Resource Material G4

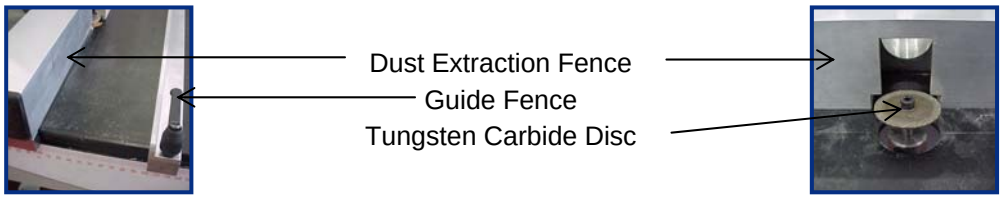
Using The Gerbil

## Using the Gerbil to Cut Slots and Rebates




By using the tungsten carbide abrasive disc and the guide and extraction fences on the Gerbil **2020**, it is possible to cut slots and rebates in softwood. This is very useful for making wooden boxes or enclosures.

1. The following safety instructions must be observed at all times: wear safety goggles, tie back long hair and remove any loose jewellery.
2. Fit the abrasive disc as described in the instruction manual and adjust the height of the disc to set the position of the slot above the base of the wooden item.
3. Install the guide fence and dust extraction fence as outlined in the manual. The distance between the front of the dust extraction fence and the front edge of the tungsten carbide disc sets the depth of the slot.




4. Place the wooden workpiece against the dust extraction fence. Then push the guide fence against the workpiece. Secure by tightening the Kip lock. Make sure that the workpiece is free to travel all the way along the fences without becoming stuck.
5. Attach the vacuum cleaner hose to the extraction fence dust outlet.
6. Switch on the Gerbil and turn on the vacuum cleaner.
7. Push the workpiece towards the disc at a slow, steady rate, as shown in the picture below. Work from right to left, so that the wood is pushing against the rotation of the disc.
8. Use another piece of wood to push the workpiece along - do not use your fingers to push. However you may need to use your left hand to hold the top of the workpiece steady as it moves along.

9. Switch off the Gerbil.
10. Clean off the dust. You can use a steel rule to clean inside the slot. Your slot is now finished.
11. To make a rebate, you can make it by turning the workpiece by 90° and repeating steps (4) to (9). Your rebate is now finished.
12. To deepen the slot, move the dust extraction fence further back and repeat the cut.
13. Similarly, you can widen the slot by raising the height of the tool and repeating the cut.

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# The Gerbil

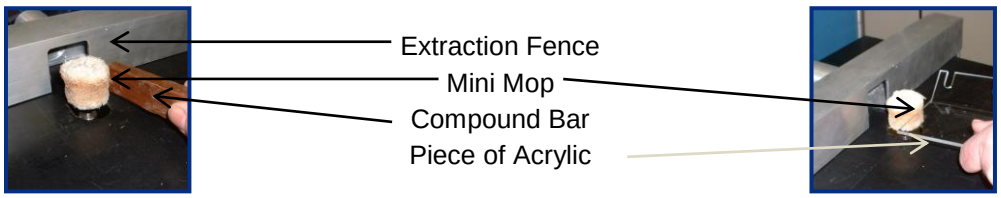


## Using the Gerbil to Polish and Finish Plastic Components

Gerbil 2020

By using the mini mops and compound bars on the Gerbil **2020** it is possible to finish the edges of plastic components. This is particularly useful for the finishing of small pieces, as this can be hazardous on a full size polisher. The mops and compound bars can also be supplied separately and fitted to the **2010** model.

1. The following safety instructions must be observed at all times: wear safety goggles, tie back long hair and remove any loose jewellery.
2. Select your preferred mop and compound bar – there are two to choose from; the polishing mop and bar and the finishing mop and bar.
3. Fit the mop as described in the instruction manual.
4. Switch on the Gerbil, and apply compound by gently holding it against the rotating mop. See image below.
5. To finish the plastic edge, gently press the workpiece against the mop. Steadily move the component up and down and at different angles so as to finish the entire edge.
6. Be sure to hold onto the component firmly so that it is not pulled away by the moving mop. Please note however that the slow running speed of the mop means that even if this were to happen there would be no danger to the operator, it would simply disrupt the finishing process.
7. Periodically lift the component away from the mop and feel the edge to check the finish. If necessary apply more compound.
8. When you are happy that the edge is smooth enough then switch of the Gerbil.

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# SCHEMATICS

| DWG NO. PC0001 | PROJECTION: | IF IN DOUBT ASK | DO NOT SCALE DRAWING | DEBUR AND BREAK SHARP EDGES |
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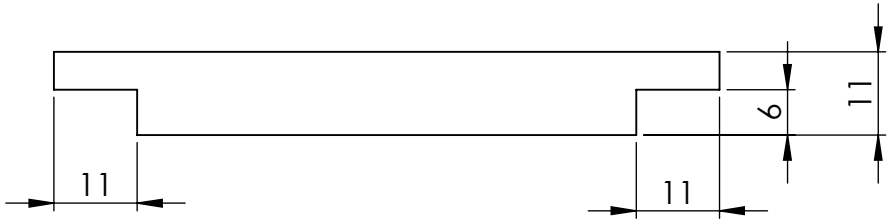


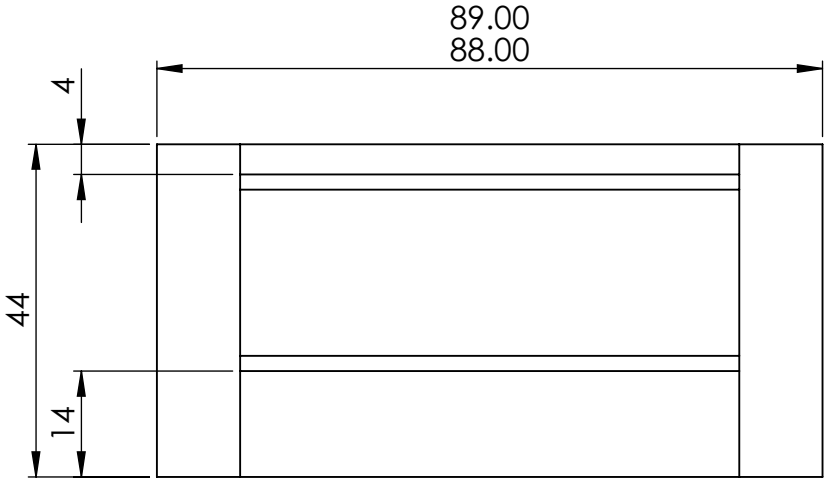


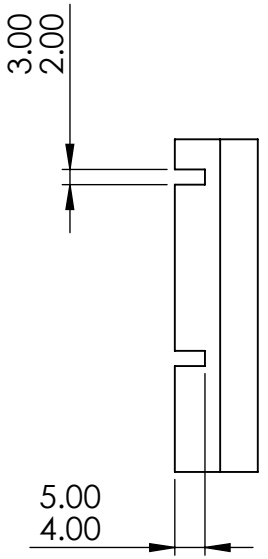


| ISSUE | DATE | INITIALS | NOTE N° |
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| C | 16.10.12 | MS | ALT. DIM POS |
| B | 10.10.12 | MS | ALT. DIM POS |
| A | 19.09.12 | MS | ALT. DIM POS |

MODIFICATIONS

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Tel: (01924) 402490
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MATERIAL: softwood

FINISH: natural

QTY: 1 OFF

TITLE: End Panel



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS (mm)
GENERAL SURFACE FINISH: 1.6RA
TOLERANCES: LINEAR: ±0.5
ANGULAR: WHOLE DEGREES ±0.5°,
CONCENTRICITY: WITHIN 0.05

| | | |
|---|---|---|
| DRAWN | MS | |
| DATE | 28.08.12 | |
| CHK'D | | |
| DATE | | |

SCALE: 1:1

SHEET: 1 OF 1

SHEET: A4

DWG NO. PC0001

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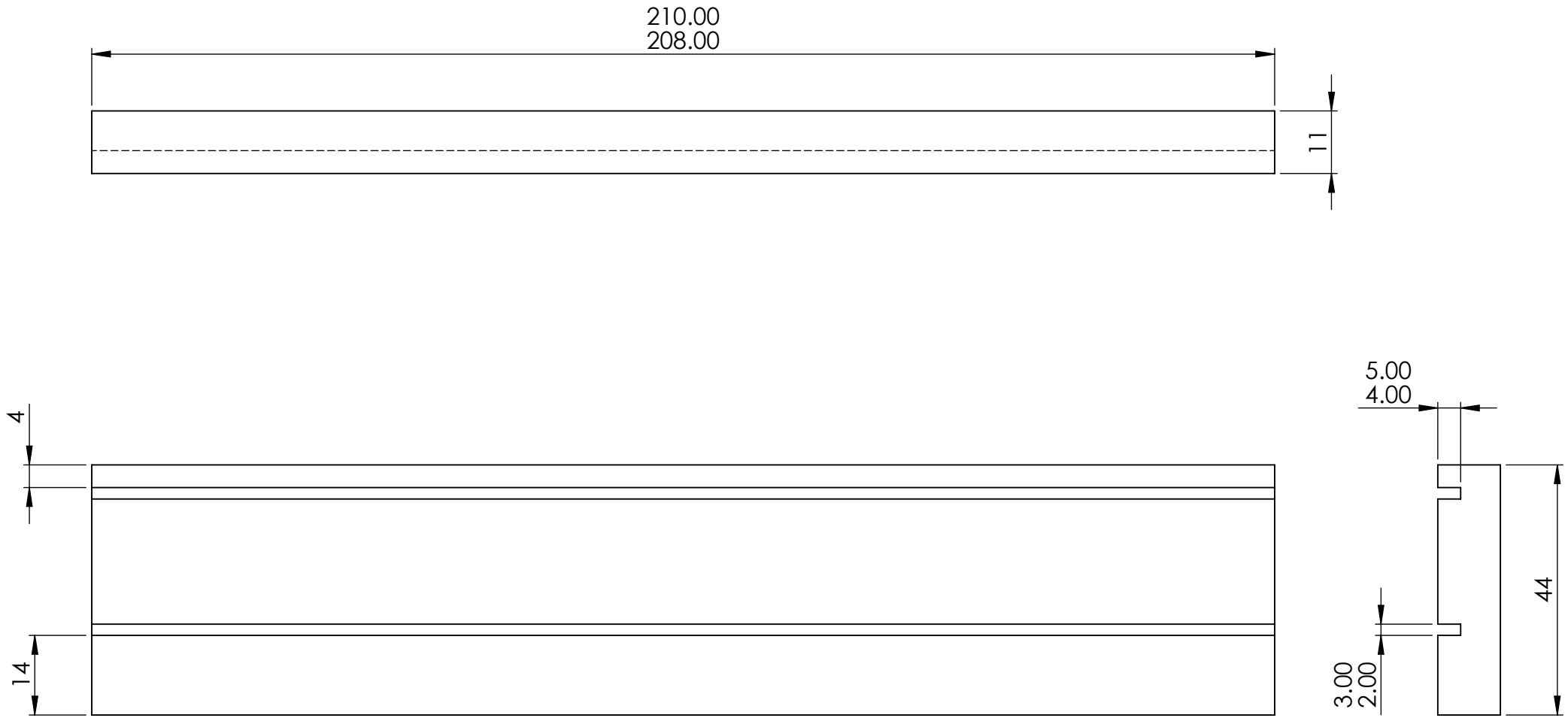


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| B | 10.10.12 | MS | ALT. DIM POS |
| A | 19.09.12 | MS | ALT. DIM POS |
| ISSUE | DATE | INITIALS | NOTE N° |

MODIFICATIONS

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Tel: (01924) 402490
Fax: (01924) 404635

MATERIAL: softwood

FINISH: natural

QTY: 2 OFF

TITLE: SIDE PANEL



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS (mm)
GENERAL SURFACE FINISH: 1.6RA
TOLERANCES: LINEAR: ±0.5
ANGULAR: WHOLE DEGREES ±0.5°,
CONCENTRICITY: WITHIN 0.05

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| DATE | 29.08.12 | | SHEET: A4 |
| CHK'D | | DWG NO. | PC0002 |
| DATE | | | |

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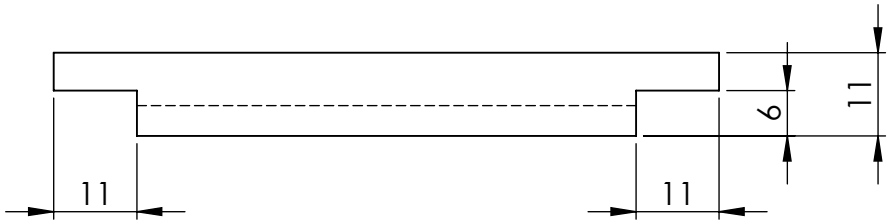
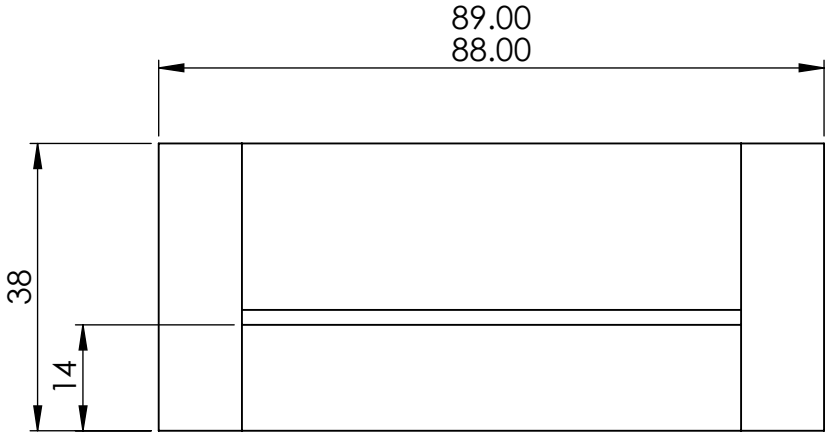
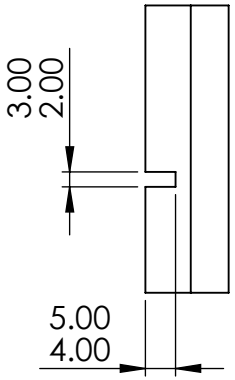



| ISSUE | DATE | INITIALS | NOTE N° |
|---|---|---|---|
| B | 16.10.12 | MS | ALT. DIM |
| A | 10.10.12 | MS | ALT. DIM |

MODIFICATIONS


RJH Finishing Systems Ltd.
Artillery Street,
Heckmondwike,
West Yorkshire,
WF16 0NR.
Tel: (01924) 402490
Fax: (01924) 404635




MATERIAL: softwood

FINISH: natural

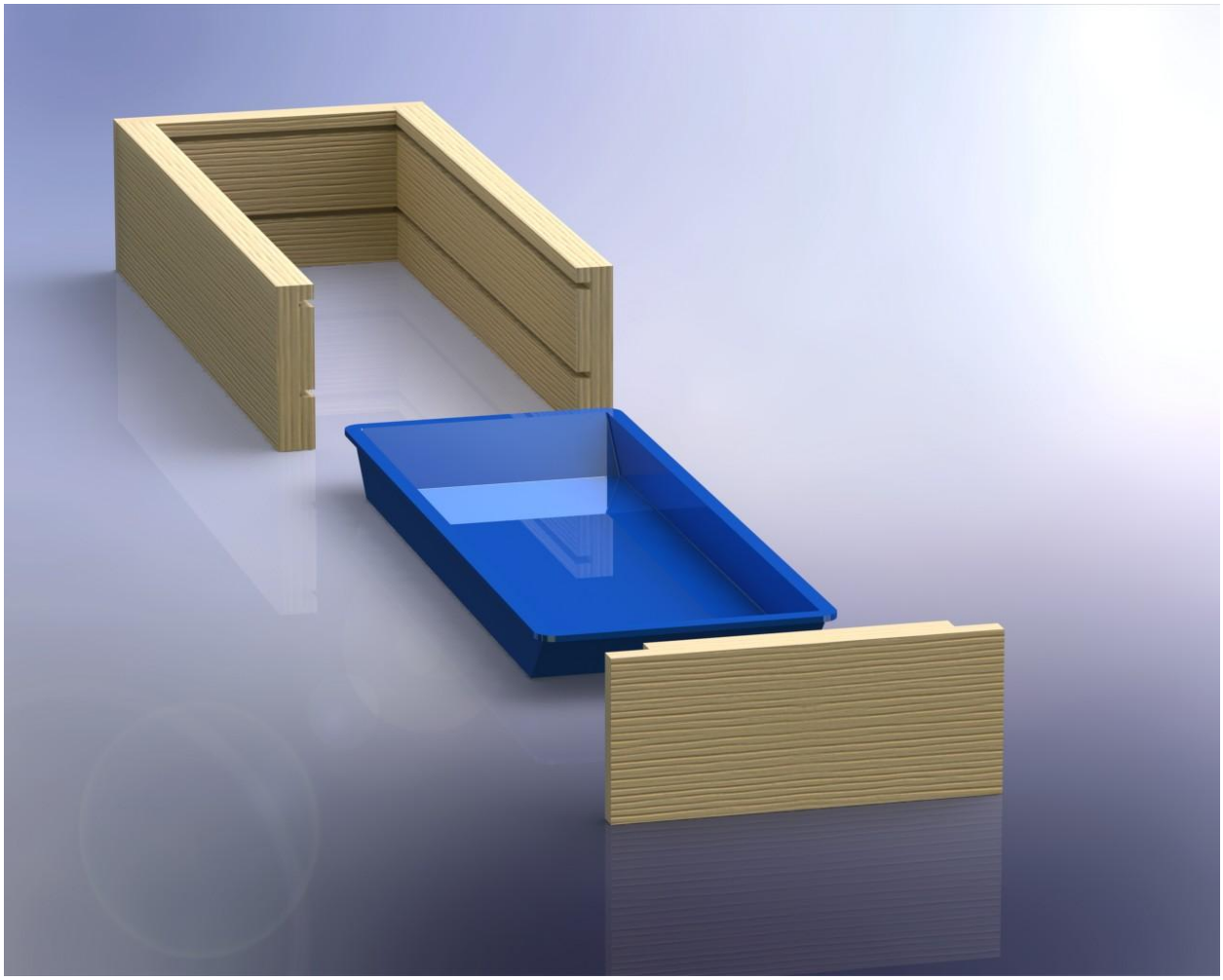
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS (mm)
GENERAL SURFACE FINISH: 1.6RA
TOLERANCES: LINEAR: ±0.5
ANGULAR: WHOLE DEGREES ±0.5°,
CONCENTRICITY: WITHIN 0.05



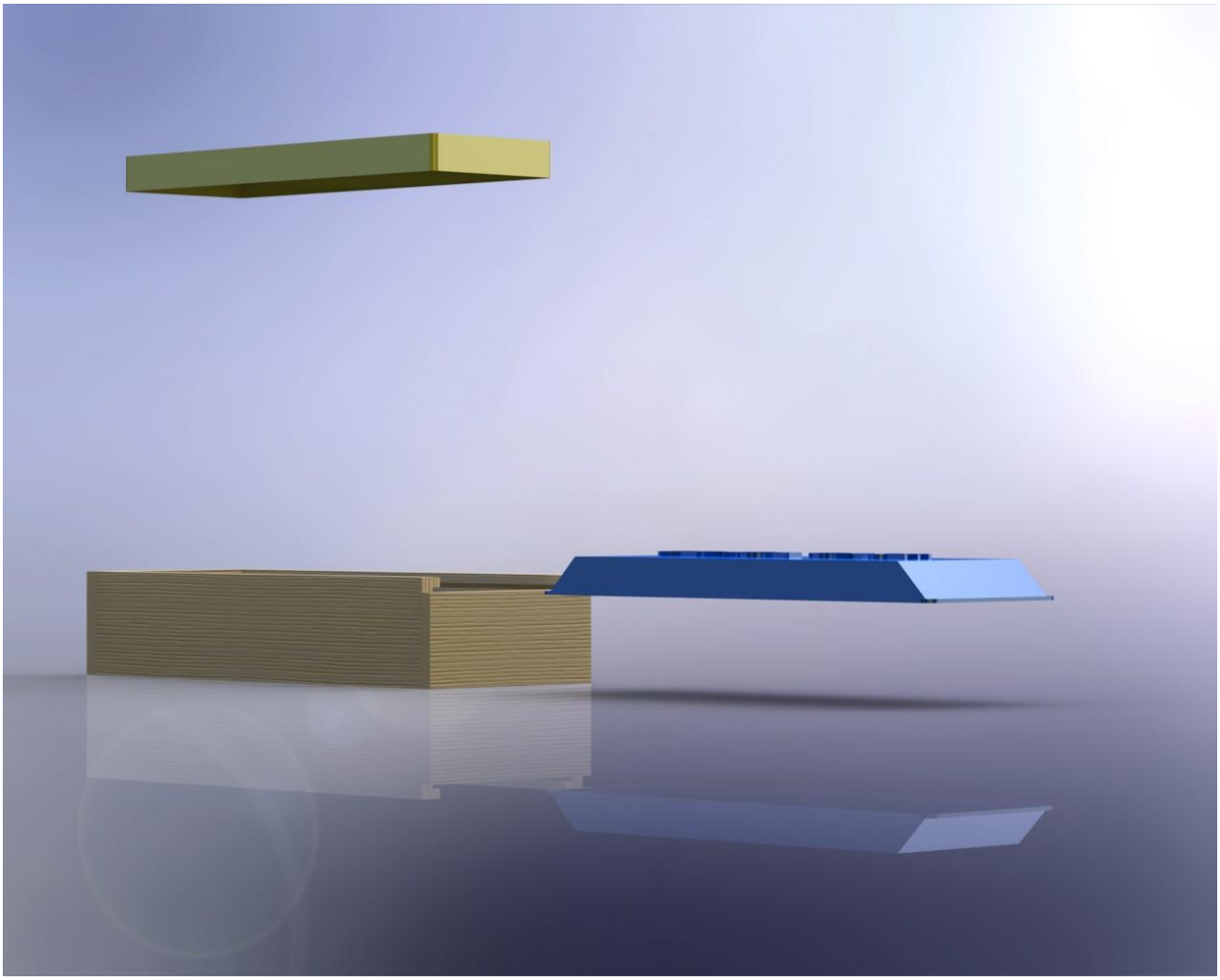
| QTY: 1 OFF | | TITLE: Reduced End Panel | | |
|---|---|---|---|---|
| DRAWN | MS | | | |
| DATE | 29.08.12 | SCALE: 1:1 | SHEET: 1 OF 1 | SHEET: A4 |
| CHK'D | | DWG NO. PC0003 | | |
| DATE | | | | |

# ASSEMBLY DIAGRAMS

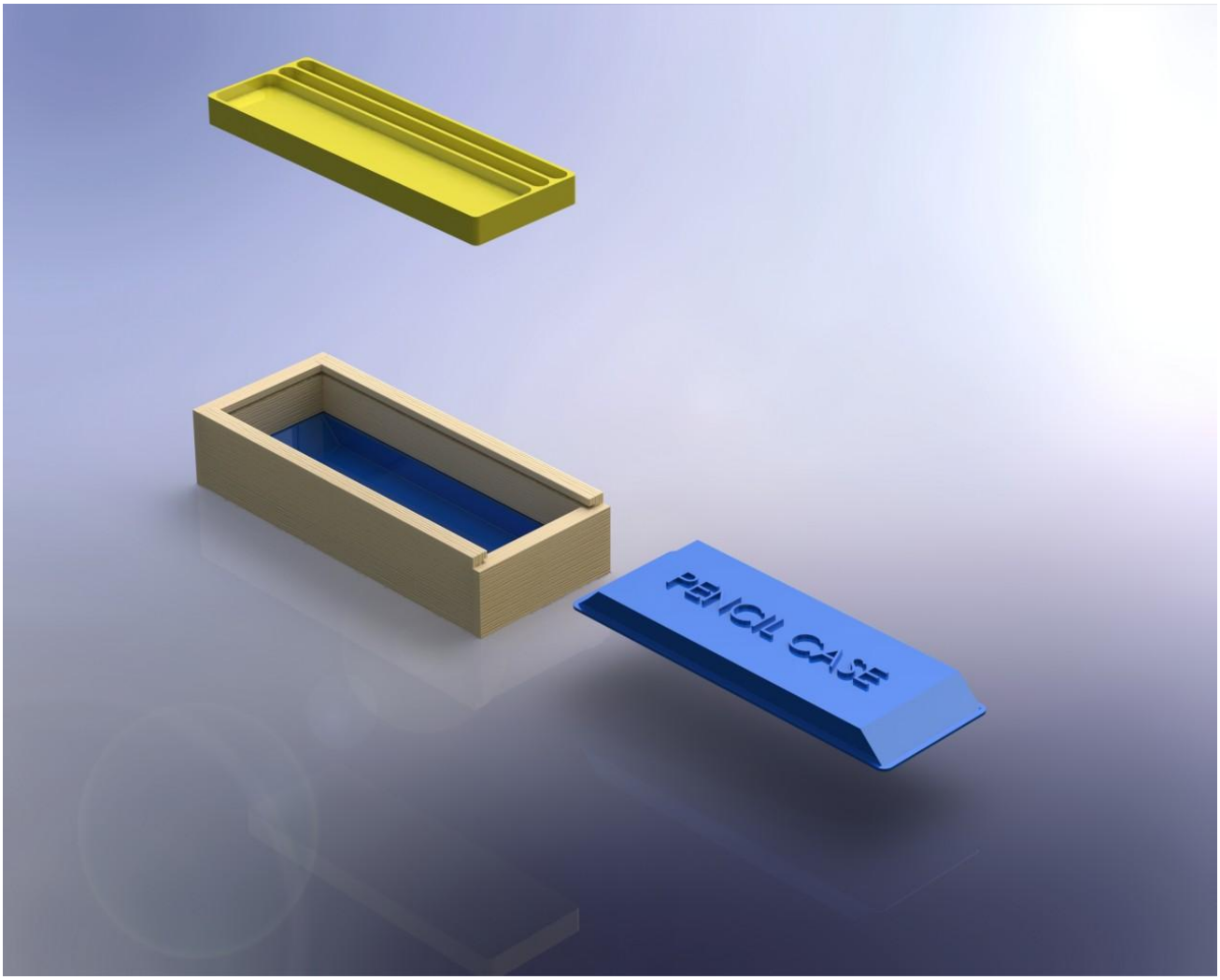
# ASSEMBLY STEP 1



# ASSEMBLY STEP 2 – IMAGE 1



# ASSEMBLY STEP 2 – IMAGE 2



# THE COMPLETED PENCIL CASE