2016 Suite

OCR
Oxford Cambridge and RSA

Cambridge **TECHNICALS LEVEL 2**

Cambridge TECHNICALS 2016

ENGINEERING

Unit 7

Product manufacture and fabrication Model assignment

D/615/2137

Version 1 October 2017

ocr.org.uk/engineering

Contents

Please note:

You can use this assignment to provide evidence for summative assessment, which is when the learner has completed their learning for this unit and is ready to be assessed against the grading criteria.

You can use this assignment as it is, or you can modify it or write your own; we give more information in this document under Guidance for tutors.

Guidance for tutors on using this assignment

General

OCR Cambridge Technical model assignments are available to download from our website: www.ocr.org.uk.

The purpose of this assignment is to provide a scenario and set of tasks that are typical of how production engineers devise and implement product manufacturing processes to enable you to assess your learner against the requirements specified in the grading criteria. The scenario and its tasks are intended to give a work-relevant reason for applying the skills, knowledge and understanding needed to achieve the unit.

This assignment will not instruct learners how to meet the highest grade. Whether learners achieve a pass, merit or distinction will depend on what evidence they produce.

You can modify the scenario we provide in this assignment to make it more relevant to your local or regional needs. Please refer to the information under 'Modifying the model assignment' later in this section.

You don't have to use this assignment. You can use it as a guide to help you to design your own assignment, and we provide an assignment checking service. You'll find more information on these matters in section 8 of the qualification handbook.

In the tasks, we'll refer to the format of evidence. Learners are **not** required to follow that format **unless** we tell them otherwise.

It's essential that the work every learner produces is their own. Please make sure you read through the information we give on authenticity in section 8 of the qualification handbook and make sure that your learners and any staff involved in assessment understand how important authenticity is.

We provide this assignment to be used for summative assessment. You must not use it for practice or for formative assessment.

Before using this assignment to carry out assessment

Learners will need to take part in a planned learning programme that covers the knowledge, understanding and skills of the unit.

When your learners are ready to be assessed, they must be provided with a copy of the following sections of this assignment:

- General information for learners
- Assignment for learners
- Evidence Checklist

They may carry out preparation prior to undertaking the tasks and there is no time limit for this.

When completing the assignment

You should use this assignment in conjunction with the unit specification and qualification handbook.

Resources to complete the tasks

There are resource requirements for this assignment. Every learner will need access to the following resources:

- Relevant Health and Safety regulations, standards and codes of practice appropriate to product assembly and manufacture
- Personal Protective Equipment (PPE) as appropriate to the given task
- Detailed engineering drawings, see appendix
- Materials and components to make the toolbox
- Appropriate tools and equipment to make and quality assure the toolbox
- Data for Statistical Process Control (SPC) analysis – see tutor information below.

Tutor information to support the tasks

You may want to give a general introduction to the function of the toolbox chosen for this assignment.

Observation and witness statements can be a useful way of providing additional support and corroboration of learner-generated evidence and skills which are not easily represented in the portfolio of evidence (see the section on Internal Assessment in the Qualification handbook, and in particular the section on the use of witness statements.

In task 3 learners will be expected to draw on learning from Unit 3 Learning Outcome 3 to interpret the engineering drawings provided in this assignment.

In task 4 you will need to provide learners with data so they can use SPS analysis to check the quality of their toolbox (P10) and evaluate the quality of their toolbox (D1). The data you supply must be sufficient to satisfy the grading criteria. You could generate your own statistics for this purpose or collate the data from other learners in the class (if you have a group all working to this model assignment). Although the data supplied could be from the group you should ensure learners perform their own analysis.

Health and Safety and the use of resources

Health and safety will need to be considered should any of the tasks, or parts of the tasks be undertaken as practical activities. This should include appropriate risk assessments, safe working methods statements and the use of appropriate personal protective equipment (PPE). Learners should be encouraged to take part in assessing risk before conducting any practical activity.

Time

You should plan for learners to have 14–19 hours to complete this assignment.

Learners must be allowed sufficient time to complete all the tasks. The amount of time may vary depending on the nature of the tasks and the ability of individual learners. To help with your planning, against each of the tasks we've given an indication of how long it should take.

Learners can produce evidence in several sessions.

Format of evidence

Learners have to produce evidence that demonstrates how they have met the grading criteria. At the very least they must produce evidence that meets **all** of the pass criteria.

Please make sure your learners realise that missing just one pass criterion means they will not pass the unit, even if they have successfully met the merit and distinction criteria.

We don't have specific requirements for the format of evidence in this assignment. We've said what format the evidence could take for each task. For example, if we say 'You could include a report on …', the evidence doesn't have to follow any specific reporting conventions. You can modify the format of the evidence, but you must make sure the format doesn't prevent the learner from accessing the grading criteria.

It's possible that certain formats for evidence can naturally cover several grading criteria and avoid the need for excessive amounts of evidence. For example, a report can be a good way to pull together evidence to meet several grading criteria.

For more guidance on generation and collection of evidence, please refer to the section 8 'Internal Assessment', in the qualification handbook.

Group work

This assignment hasn't been written to include group work. If you plan to ask learners to work in a team to complete work for assessment, you need to determine at which point in an assessment task learners can work together.

You must be sure that each learner can produce evidence of their own contribution to each grading criterion. You can give constructive feedback to learners about working as a group and direct them on team working skills because evidence of team working skills is not required by the unit. See our information on authentication, including group work and feedback to learners, in section 8 of the qualification handbook.

If witness statements are used to support learners' evidence, you'll need to complete an individual statement for each learner.

After completing the assignment

Once the learner has submitted their work to you to be assessed, you must judge or 'mark' the work against the grading criteria for the unit and identify one grade for the unit. For further information about assessment, please refer to section 8 of the qualification handbook.

Your assessment decisions must be quality assured across the cohort of learners in your centre who are being entered for the same unit. This must be done through an internal standardisation process. We give information on internal assessment and standardisation in the qualification handbook.

Reworking the assignment

If you and the learner feel they've not performed at their best during the assessment, the learner can, at your discretion, improve their work and resubmit it to you for assessment. If a learner is working on improving their work before it is resubmitted, you and the learner must continue to make sure the work is the learner's own.

Any feedback you give to the learner must not direct them on how to improve their work. You can identify what area of the work could be improved but you cannot give the learner any details about how they could improve it. You must follow the guidelines given in section 8 of the qualification handbook under 'Authenticity of learner work'.

Modifying the model assignment

The tasks in this assignment allow learners access to the full range of grades detailed in the grading criteria of this unit.

If you modify this assignment you must **not** change the grading criteria provided in the tasks for the learner or in the evidence checklist. These grading criteria are taken from the unit.

You can modify the scenario to suit your local or regional needs and the tasks may be contextualised to match any changes you have made to the scenario. If you supply your own drawings to support a different scenario, these must be sufficiently detailed for learners to complete the tasks.

You can modify the type of evidence and the format it takes, unless we expressly state that evidence must take a specific format.

You must also make sure that you avoid discrimination, bias and stereotyping and support equality and diversity. For more information, please see the section 'Designing your own assignments for internally assessed units' in section 8 of the qualification handbook.

If modifications are made to the model assignment, whether to the scenario alone, or to both the scenario and individual tasks, it's your responsibility to make sure that all grading criteria can still be met and that learners can access the full range of grades.

If you're using this model assignment and delivering the Foundation Diploma, Diploma or Extended Diploma you have an opportunity to secure meaningful employer involvement by working with an employer to modify it.

General information for learners

Q ***What do I need to do to pass this assignment?***

A You need to produce evidence to meet the requirements of **all** the pass criteria for the unit this assignment relates to. If you miss just one pass criterion, you will not achieve this unit and will receive an unclassified result.

Q ***What do I need to do if I want to get a merit or distinction for this assignment?***

A For a merit, you need to produce evidence to meet the requirements of **all** the pass criteria for the unit this assignment relates to **and** you need to produce evidence to meet **all** the merit criteria.

For a distinction, in addition to the above, you also need to meet **all** the distinction criteria for this unit.

Q ***What help will I get?***

A Your tutor will support you when completing this assignment and will make sure that you know what resources or facilities you need and are allowed to use. We've given your tutor information about how much support they can give you.

Q ***What if I don't understand something?***

A It's your responsibility to read the assignment carefully and make sure you understand what you need to do and what you should hand in. If you are not sure, check with your tutor.

Q ***I've been told I must not plagiarise. What does this mean?***

A Plagiarism is when you take someone else's work and pass this off as your own, or if you fail to acknowledge sources properly. This includes information taken from the internet.

It's not just about presenting a whole copied assignment as your own; you will also be plagiarising if you use the ideas or words of others without acknowledgement, and this is why it's important to reference your work correctly (see Q&A below for more information on referencing).

Plagiarism has serious consequences; you could lose the grade for this unit or you may not be allowed to achieve the whole qualification.

Always remember that the work you produce must be your own work. You will be asked to sign a declaration to say that it is.

Q ***What is referencing and where can I find out more information about it?***

A Referencing is the process of acknowledging the work of others. If you use someone else's words and ideas in your assignment, you must acknowledge it, and this is done through referencing.

You should think about why you want to use and reference other people's work. If you need to show your own knowledge or understanding about an aspect of subject content in your assignment, then just quoting and referencing someone else's work will not show that **you** know or understand it. Make sure it's clear in your work how you are using the material you have referenced **to inform** your thoughts, ideas or conclusions.

You can find more information about how to reference in *The OCR Guide to Referencing* available on our website: http://www.ocr.org.uk/Images/168840-the-ocr-guide-to-referencing.

Q ***Can I work in a group?***

A Yes. However, if you work in a group at any stage, you must still produce work that shows your individual contribution. Your tutor can advise you how to do this.

Q ***Does my work for each task need to be in a particular format?***

A You can present your work in a variety of ways – it can be handwritten, word-processed, on video or in digital media. What you choose should be appropriate to the task(s) and your tutor can advise you. There may be times when you need proof that you have completed the work yourself: for example, if you do something during work placement that you want to use as evidence, the tutor might ask the employer to provide a witness statement.

Make sure you check the wording in each task carefully. For each task, we'll tell you if your evidence has to be in a specific format:

- If we say use the word '**must**', for example 'You must produce a report' or 'Your evidence/work must include a diagram', then you must produce the work in the stated format.
- If we use the word '**could**', for example 'You could include sketches of your ideas' or 'You could do this by annotating your diagram', this means that you are not required to follow the format we have given, but you must make sure that the work you do produce allows you to demonstrate the requirements of the grading criteria.

If you are unsure about what evidence you need, please ask your tutor.

Q ***Can I ask my tutor for feedback on my work?***

A Yes, but they can't give you detailed feedback.

We have given your tutor instructions on what kind of feedback they can give you. For example, they are **not** allowed to tell you exactly what to do to make your work better, but they **can** remind you about what they've taught you and you can use this additional learning to try and improve your work independently. They can say what they've noticed might be wrong with your work, for example if your work is descriptive where an evaluation is required, but your tutor can't tell you specifically what you need to do to change it from a description to an evaluation – you will need to work out what you need to do and then do it for yourself.

Q ***When I have finished, what do I need to do?***

A If you have included the personal details (such as name, address or date of birth) of someone other than yourself in your work, this must be blanked out (anonymised) – your tutor will tell you how to do this. You don't need to do this for information contained in references.

You can complete the evidence checklist to show your tutor where they can find the evidence for each grading criterion in your work.

You should make sure your work is labelled, titled and in the correct order for assessing.

Hand in the work that you've completed for each task to your tutor. They might ask to see your draft work, so please keep your draft work in a safe place.

Q ***How will my work be assessed?***

A Your work will be marked by someone in your centre who has been authorised to do so. They will use the information in the grading criteria to decide which grade your work meets. The grading criteria are detailed in each unit and are also given in the tasks within this assignment. Please ask your tutor if you are unsure what the grading criteria are for this assignment.

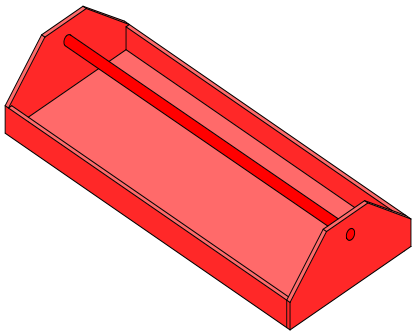
Assignment for learners

Unit 7: Product manufacture and fabrication

Scenario

A toolbox as shown in the picture below is to be fabricated from sheet metal and assembled using a range of mechanical fastenings and hot joining techniques. The toolbox has a hinged lid, with handle and draw latch.

Inside the toolbox is a removable thermoplastic tray that has been manufactured and assembled using adhesives.



You are to manufacture and assemble a toolbox and removable tray using a range of mechanical fastenings, adhesives, and hot joining techniques.

Outline drawings can be found in appendix.

Task 1: Assembly and manufacturing planning

(This task should take between 3 and 4 hours.)

Learning Outcome 1: 'Be able to prepare and plan for product assembly and manufacture' is assessed in this task.

You must investigate factors that could affect product assembly and manufacture of products such as the toolbox for:

- a single (one off) production
- a batch production and
- continuous flow.

You could also investigate the principles of lean manufacture and its impact on:

- scale of production
- unit cost
- tools and equipment
- human/physical resources
- operating processes and procedures
- quality procedures.

To prepare for making the toolbox as a one off production (see task 3) you must produce a product assembly and manufacturing plan.

You must also modify your product assembly and manufacturing plan so that it can be used as a plan for batch and continuous flow production, you may want to do this after you have assembled and manufactured your toolbox and tray as a one off production which you will do in task 3.

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td>P1: Identify factors that affect product assembly for single, batch and continuous flow production.</td><td rowspan="3">M1: Explain how the principles of lean manufacture in product assembly and manufacture can impact on:
scale of production
unit cost
tools and equipment
human/physical resources
operating processes and procedures
quality procedures.</td><td rowspan="3"></td></tr>
<tr><td>P2: Produce a product assembly and manufacturing plan for a one off component.</td></tr>
<tr><td>P3: Modify a product assembly and manufacturing plan to use for batch and continuous flow production.</td></tr>
<tr><td colspan="3">Evidence</td></tr>
<tr><td colspan="3">You must identify factors that affect product assembly for single, batch and continuous flow production this could be a report or presentation (including detailed speaker notes) and you could include an explanation of the principles of lean manufacture in product assembly and manufacture and its impacts.

You must produce a product assembly and manufacturing plan for a one off production of your toolbox and then produce a modified version for batch and continuous flow production.</td></tr>
</table>

Task 2: Following procedures that are efficient and safe

(This task should take between 2 and 3 hours.)

Learning Outcome 2: 'Be able to follow efficient and safe working procedures for product assembly and manufacture' is assessed in this task.

You need to follow efficient and safe working procedures when manufacturing and assembling your toolbox and tray in task 3.

You must investigate:

- cost and environmental efficiencies and
- safe working procedures.

The results of your investigation should be included in your product assembly and manufacturing plan.

Pass	**Merit**	**Distinction**
P4: Perform cost effective, environmentally efficient and safe working procedures for product assembly and manufacture.		
Evidence		
You should record cost and environmental efficiencies and safe working procedures in your product assembly and manufacturing plan. When you make your toolbox in task 3 you must show how you have followed these procedures this could be through photographs or video footage with accompanying annotations and must be supported by witness statements.		

Task 3: Fabrication and assembly

(This task should take between 7 and 9 hours.)

Learning Outcome 3: 'Be able to produce an engineering product using product assembly and manufacturing techniques' is assessed in this task.

Your task is to manufacture the toolbox and tray.

During manufacture and assembly you must use:

- mechanical fastenings
- adhesives and
- hot joining techniques.

Pass	**Merit**	**Distinction**
P5: Produce an engineering product using mechanical fastenings for product assembly and manufacture.		
P6: Produce an engineering product using adhesive(s) for product assembly and manufacture.		
P7: Produce an engineering product using hot joining technique(s) for product assembly and manufacture.		
Evidence		
When you manufacture your toolbox you must evidence how you have used mechanical fastening adhesives and hot joining techniques this could be through photographs or video footage with accompanying annotations and must be supported by witness statements. You must include evidence of your final assembled toolbox which could be in the form of annotated photographs.		

Task 4: Quality assessment

(This task should take between 2 and 3 hours.)

Learning Outcome 4: 'Be able to apply quality control checks to product assembly and manufacture' is assessed in this task.

You must perform checks to confirm the accuracy of your toolbox against the dimensions and tolerances specified in the engineering drawings. You must then select and use techniques for evaluating quality control in the product assembly and manufacture of your toolbox. You should consider:

- comparison of dimensions and tolerances
- appearance
- fitness for purpose.

You must also use Statistical Process Control (SPC) analysis to check the quality of your toolbox against other toolboxes. Your tutor will provide you with the necessary data.

You could investigate and explain the importance of quality checks for product assembly and manufacture, with reference to both quality control and quality assurance. You could evaluate the quality of a product, such as your toolbox, using Statistical Process Control (SPC) analysis.

<table>
<tr><th>Pass</th><th>Merit</th><th>Distinction</th></tr>
<tr><td>P8: Perform checks for accuracy and tolerance using quality standards for product assembly and manufacture.</td><td rowspan="3">M2: Explain the importance of quality checks for product assembly and manufacture, with reference to:
quality control
quality assurance.</td><td rowspan="3">D1: Evaluate the quality of a product using Statistical Process Control (SPC) analysis to include:
comparison of variables
appearance
recognised quality standard(s)
fitness for purpose.</td></tr>
<tr><td>P9: Select and use techniques for evaluating quality control in product assembly and manufacture.</td></tr>
<tr><td>P10: Use Statistical Process Control (SPC) analysis to check quality standards in product assembly and manufacture.</td></tr>
<tr><td colspan="3">Evidence</td></tr>
<tr><td colspan="3">You must demonstrate how you have carried out checks for accuracy and tolerance using quality standards this could through annotated photographs supported by a witness statement from your tutor.

You must provide evidence of how you selected and used techniques for evaluating quality control in product assembly and manufacture, and used Statistical Process Control (SPC) analysis to check quality standards in product assembly and manufacture. Your evidence could be in the form of a presentation that contains charts, graphs, data sheets, spread sheets and statistical analysis which should be accompanied by detailed speaker notes.

You could produce a report or presentation (including detailed speaker notes) to explain the importance of quality checks for product assembly and manufacture and show how you have used Statistical Process Control (SPC) analysis to evaluate the quality of the toolbox.</td></tr>
</table>

Evidence Checklist

OCR Level 2 Cambridge Technicals in Engineering
Unit 7: Product manufacture and fabrication

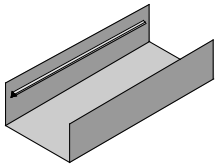
LEARNER NAME:

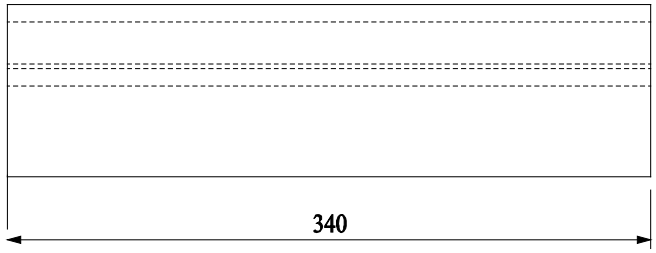
For Pass have you: **(as a minimum you have to show you can meet every pass criterion to complete the unit)**	**Where can your tutor find the evidence? Give page no(s)/digital timings, etc.**
P1: Identified factors that affect product assembly for single, batch and continuous flow production?	
P2: Produced a product assembly and manufacturing plan for a one off component?	
P3: Modified a product assembly and manufacturing plan to use for batch and continuous flow production?	
P4: Performed cost effective, environmentally efficient and safe working procedures for product assembly and manufacture?	
P5: Produced an engineering product using mechanical fastenings for product assembly and manufacture?	
P6: Produced an engineering product using adhesive(s) for product assembly and manufacture?	
P7: Produced an engineering product using hot joining technique(s) for product assembly and manufacture?	
P8: Performed checks for accuracy and tolerance using quality standards for product assembly and manufacture?	
P9: Selected and use techniques for evaluating quality control in product assembly and manufacture?	
P10: Used Statistical Process Control (SPC) analysis to check quality standards in product assembly and manufacture?	

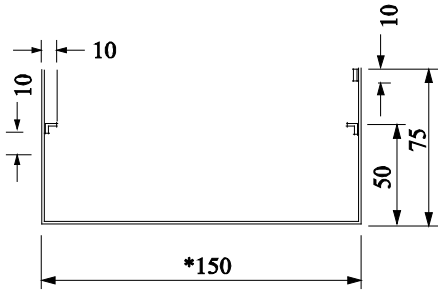
For Merit have you:	**Where can your tutor find the evidence? Give page no(s)/digital timings, etc.**
M1: Explained how the principles of lean manufacture in product assembly and manufacture can impact on: • scale of production • unit cost • tools and equipment • human/physical resources • operating processes and procedures • quality procedures?	
M2: Explained the importance of quality checks for product assembly and manufacture, with reference to: • quality control • quality assurance?	

For Distinction have you:	Where can your tutor find the evidence? Give page no(s)/digital timings, etc.
D1: Evaluated the quality of a product using Statistical Process Control (SPC) analysis to include: • comparison of variables • appearance • recognised quality standard(s) • fitness for purpose?	

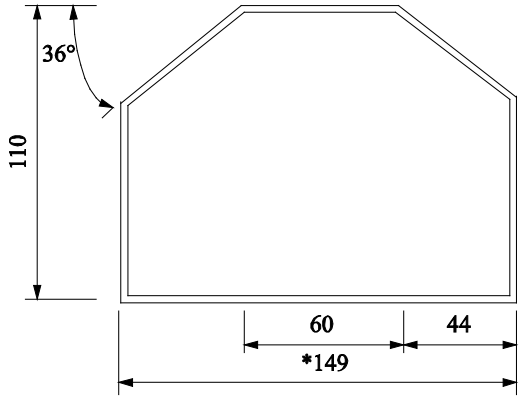
Part 1: Sides and base

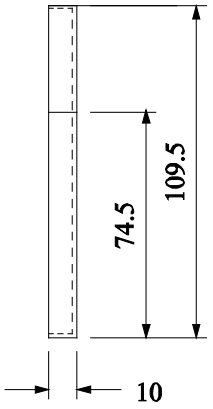






Part 2 & 3: End plates





OCR Oxford Cambridge and RSA

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS
TOLERANCE: +/- 1mm on linear dimensions
LINEAR: ± 1
ANGULAR: ± 1

SURFACE FINISH: DEBURR AND BREAK SHARP EDGES

DO NOT SCALE | REVISION

ALL DIMENSIONS IN MILLIMETERS

	NAME	SIGNATURE	DATE
DRN			
CHKD			
APPVD			
MFG			
QA			

NOTE
*Close running clearance fit between Part 1 and Parts 2 and 3

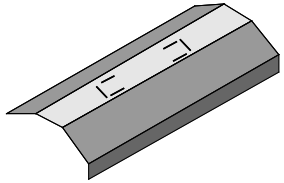
TITLE
TOOLBOX PARTS 1, 2 AND 3

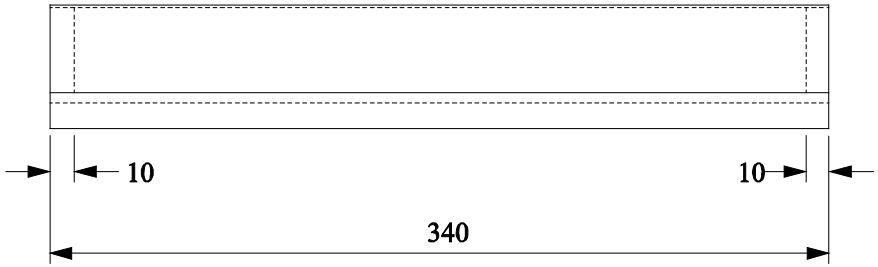
PROJECTION

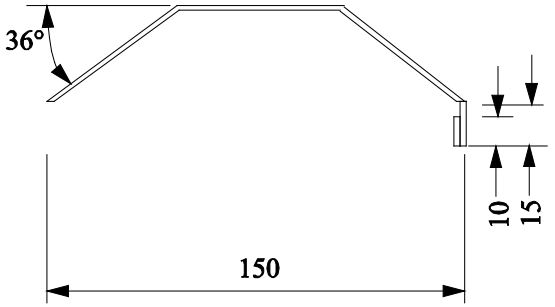
DWG-N°
OCR- U7_001

WEIGHT | SCALE | SHEET 1 OF

Part 4: Hinged Lid





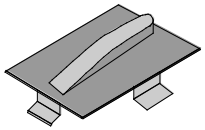


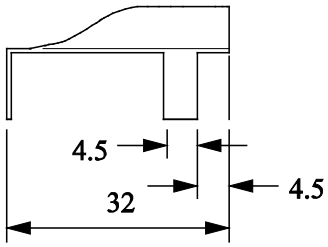
OCR Oxford Cambridge and RSA	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS TOLERANCE: +/- 1mm on linear dimensions LINEAR: ± 1 ANGULAR: ± 1		SURFACE FINISH: DEBURR AND BREAK SHARP EDGES	DO NOT SCALE	REVISION
				ALL DIMENSIONS IN MILLIMETERS	
	NAME	SIGNATURE	DATE	NOTE	TITLE: TOOLBOX PART 4
DRN					
CHKD					
APPVD				PROJECTION	DWG-N°: OCR- U7_002
MFG					
QA					
				WEIGHT	SCALE / SHEET 1 OF

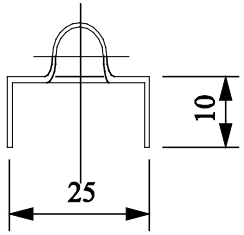
Parts 5, 6 and 7: Handle and handle hinge

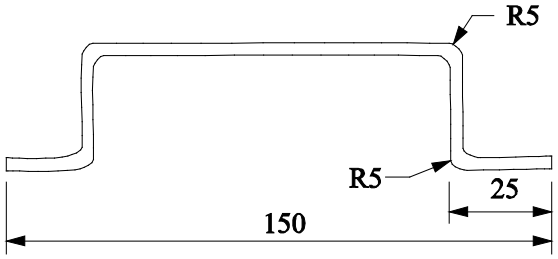
Part 5: The handle is to be fabricated from low carbon steel, round bar of a suitable diameter

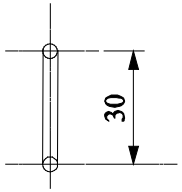
Parts 6 and 7 are a design for a pressed steel fabricated handle hinge: less elaborate alternative hinges could be developed for use by the centre





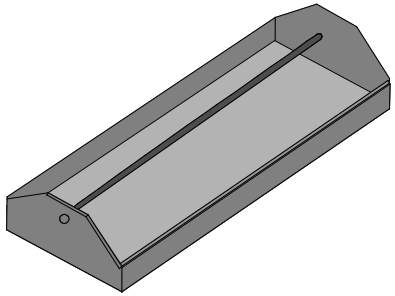


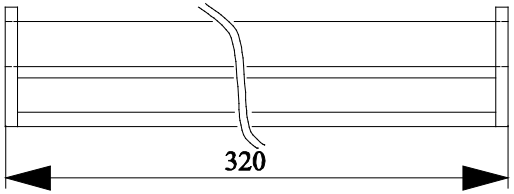


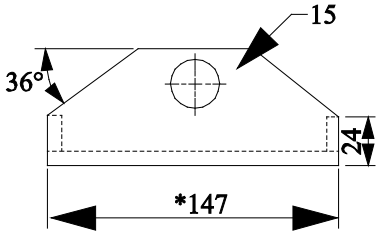


OCR Oxford Cambridge and RSA	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS TOLERANCE: +/- 1mm on linear dimensions except measurements below 10mm +/- 0.5mm		SURFACE FINISH: DEBURR AND BREAK SHARP EDGES	DO NOT SCALE	REVISION
				ALL DIMENSIONS IN MILLIMETERS	
	NAME	SIGNATURE	DATE	NOTE	TITLE: TOOLBOX PARTS 5, 6 AND 7
DRN					
CHKD					
APPVD				PROJECTION	DWG-N°: OCR- U7_003
MFG					
QA					
				WEIGHT	SCALE / SHEET 1 OF

Part 8: Thermoplastic tray with handle







OCR Oxford Cambridge and RSA	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS TOLERANCE: +/- 1mm on linear dimensions LINEAR: ± 1 ANGULAR: ±1	SURFACE FINISH: DEBURR AND BREAK SHARP EDGES	DO NOT SCALE / REVISION
			ALL DIMENSIONS IN MILLIMETERS

	NAME	SIGNATURE	DATE
DRN			
CHKD			
APPVD			
MFG			
QA			

NOTE
*Easy running clearance fit between Part 8 tray and Part 1 side and base

TITLE
TOOLBOX PART 8

PROJECTION

DWG-N°
OCR- U7_004

WEIGHT | SCALE | SHEET 1 OF

To find out more
ocr.org.uk/engineering
or call our Customer Contact Centre on **02476 851509**

Alternatively, you can email us on **vocational.qualifications@ocr.org.uk**

OCR
Oxford Cambridge and RSA