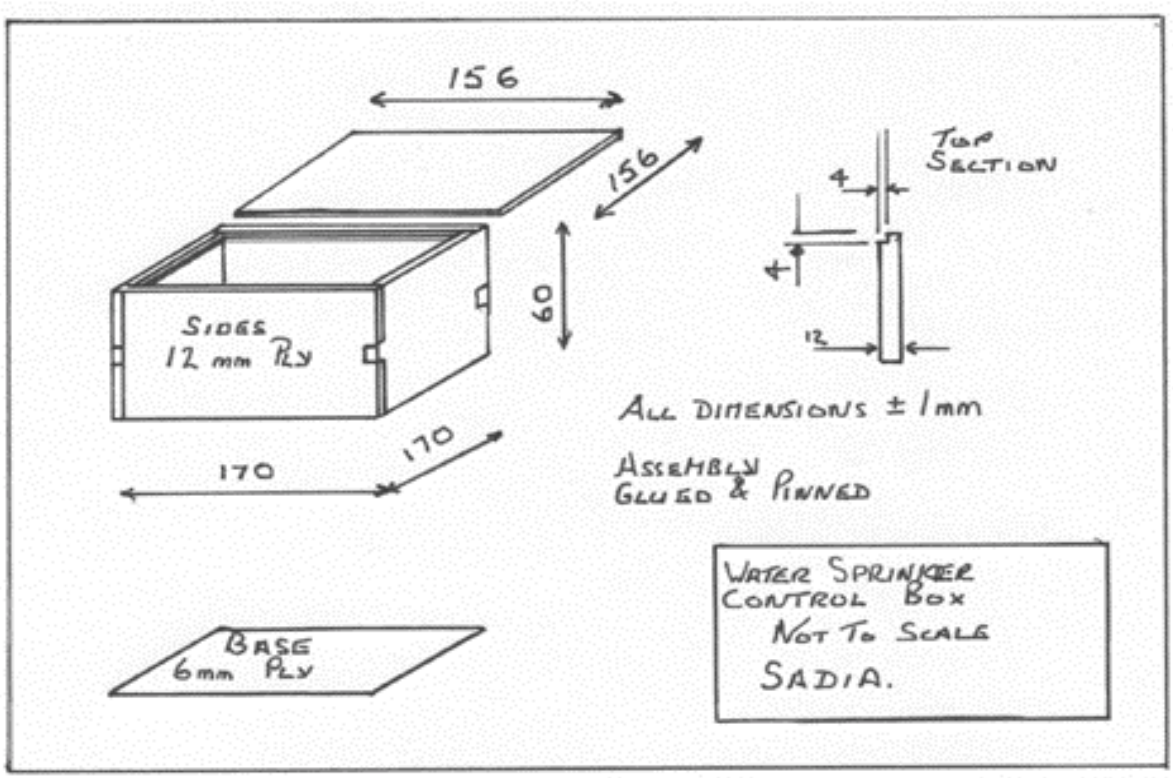
You need to make an engineered product including evidence of:

c information about production details and constraints

SADIA'S WORK

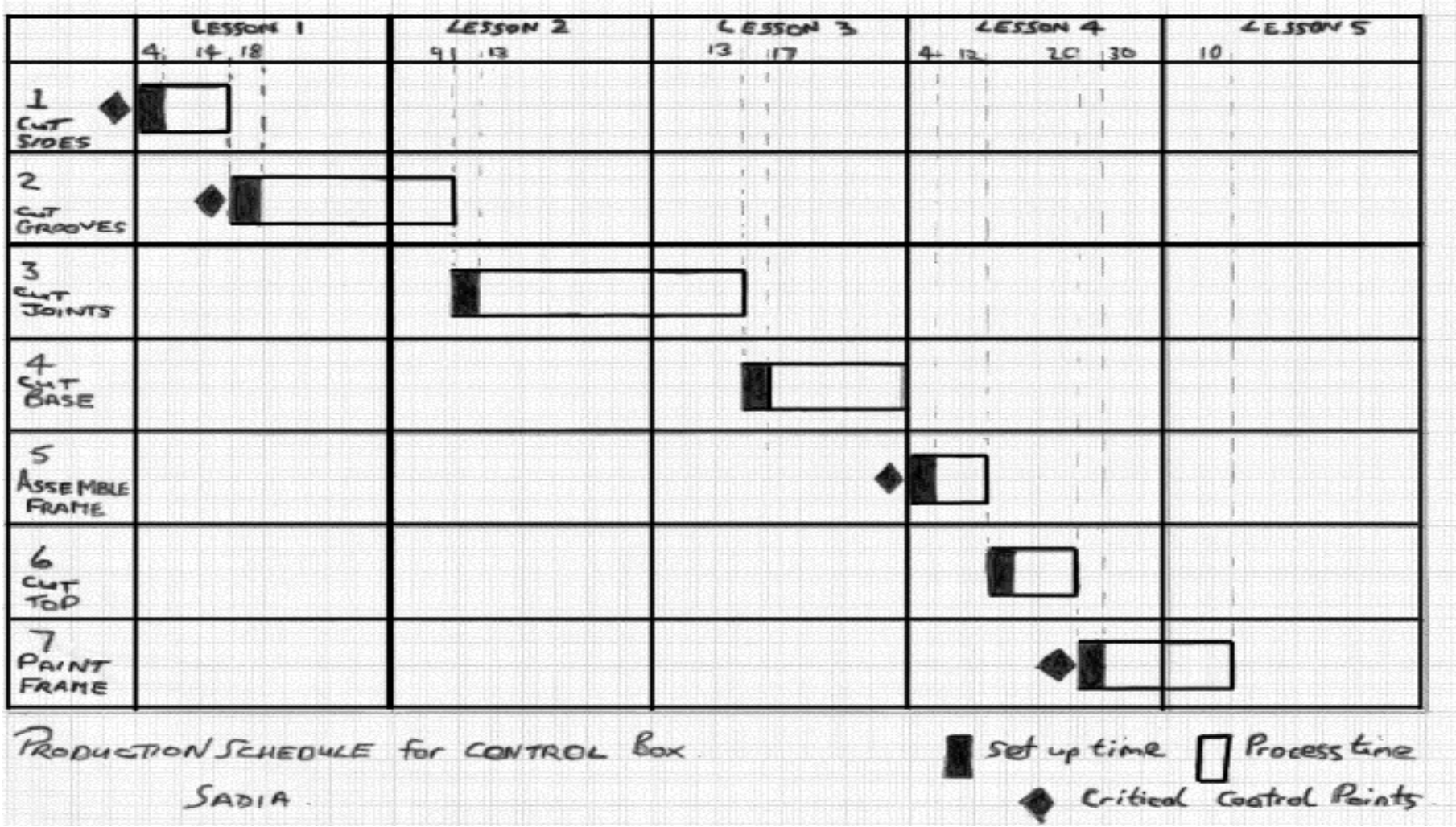


Product Specification	
Product Description	**Control Box**
Materials	Sides: 12 mm birch plywood Base: 6 mm birch plywood Top: Acrylic Glue: Waterproof wood glue Finish: Painted
Measurements	All dimensions ± 1mm
Critical control points	1. Check materials 2. Check sizes after cutting 3. Check sizes after assembly
Finish	Sanded, painted
Quality indicators	Materials: thickness and appearance Dimensions: measured for correct size Finish: appearance

Critical control points

1. Before I start work I will check the thickness of the plywood.
2. I will check each of the four sides to see that they are all the same length and width.
3. I will need to check that the base and the top fit the sides before I glue them together.
4. After assembling the base and sides I will check that the top fits into the slot at the top.
5. I will then make a final inspection to see that everything is right.

Planning Sheet							
Name: Sadia	Date:		Tutor:				
Name of Part: Control Box							
STAGE NO.	PROCESS (What I will do)	MATERIALS	TOOLS & EQUIPMENT	MACHINERY	HEALTH & SAFETY	QUALITY CHECKS	TIME
1	Check plywood sheets	12 mm plywood 6 mm plywood	Ruler			Is wood 12 mm thick?	2 min
2	Cut sides to correct length		Hand saw, square		Watch for loose clothes and keep fingers clear.	Are the ends square Are sides 170 mm long	10 min
3	Cut the groove on the top edge of each side.	4 sides		Router	Guards in place, loose clothes,	Depth of cut.	30 min
4	Cut joints	4 sides	Saw			Keep to lines, keep saw square	40 min
5	Cut base	6mm plywood	Saw, ruler, square			Make sure that it is square,	20 min
6	Assemble sides and base	Glue and pins	Hammer, G-clamps		Don't breath in fumes from glue		8 min
7	Cut top	Acrylic	Saw, ruler square			Is it square, does it fit	10 min
8	Paint sides and base	Paint	Brush		Don't breath in fumes	Are there any bare patches	20min


LESSON 1
LESSON 2
LESSON 3
LESSON 4
LESSON 5
4 14 18
9 13
13 17
4 12 20 30
10
1 CUT SIDES
2 CUT GROOVES
3 CUT JOINTS
4 CUT BASE
5 ASSEMBLE FRAME
6 CUT TOP
7 PAINT FRAME
PRODUCTION SCHEDULE for CONTROL BOX
SADIA
Set up time
Process time
Critical Control Points

You need to make an engineered product including evidence of:

c information about production details and constraints

ASSESSOR'S MARKING GRID

	Mark band 1 At this level work must show:	Mark range	Mark band 2 At this level work must show:	Mark range	Mark band 3 At this level work must show:	Mark range	Mark awarded
(c) **AO1** **AO2** **AO3** **6 marks**	• a production plan that identifies basic details about production requirements and constraints	1 – 2	• a production plan that describes, in some detail, production requirements and constraints	3 – 4	• a production plan that explains the production requirements and constraints	5 – 6	**4**

MODERATOR COMMENTS

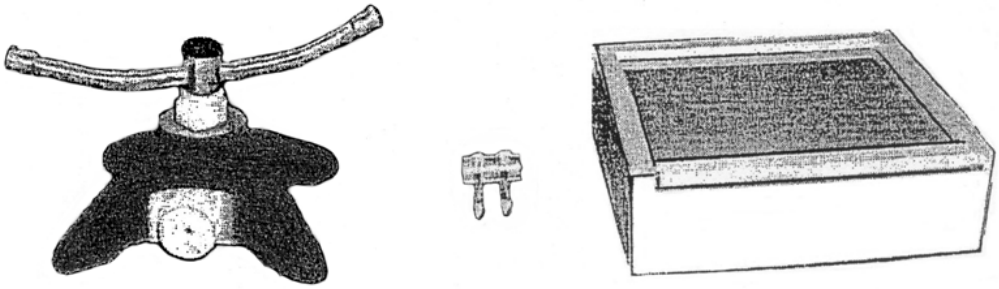
Sadia has produced a production plan that includes the details required to enable the control box to be manufactured. The schedule illustrates the proposed sequence of operations, although there is no evidence of how the processing times were determined. Sadia has considered the availability of suitable materials, available technology (the use of a router to cut the grooves), health and safety, and the main areas of quality control. In this instance it may be inappropriate to consider the availability of skilled labour.

Sadia should be awarded 4 marks for this work.

You need to make an engineered product including evidence of:
d how you selected and used materials to safely make your product
e how you selected and used parts and components to safely make your product
f how you selected and used processes, tools and equipment to safely make your product

ROBERT'S WORK

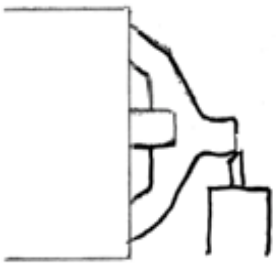
The Automatic Water Sprinkler Project



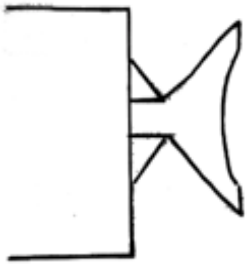
By Robert

Machining of Sand Casting

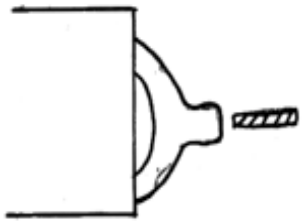
• Once you have got the mould out of the sand, you now have to take it to the lathe. From now on most of the work will be done using the lathe. The first thing I need to do is to change the 3 jaw chuck to a 4 jaw chuck, this is so my mould can fit in the lathe more easier. Once then 4 jaw chuck is in place I just make a final safety check to make sure the chuck is on safely. Now I place my mould into the chuck and tighten it, with help from a TDI to make sure it is also in straight. Once this is in place I make sure I have the left hand facing tool in place. The first thing to do next is to cut the top of the spigot to level it off. Once that is done you now just take off a small amount around the side of the spigot all the way down leaving 13 mm at the bottom.



• Once you have cut the spigot, we now need the 3 jaw chuck. When the 3 jaw chuck is in place you can now place the spigot into the chuck. Set the lathe at the correct speed and the facing tool in the correct position. Now everything should be set to start cutting away the excess material on the bottom of the casting. You just keep cutting the bottom taking off a few millimeters every time, until the bottom of your mould is flat and ok to use. Once you have finished this, your mould should not have any excess material about and should now start looking towards a finished item.



• After all that I placed the mould back into the 4 jaw chuck ready to drill a hole into the spigot. Once in correctly I now drill into the spigot using an M18 drill piece. I drill down to the required depth leaving 10mm from the bottom. Once all the drilling is done to the spigot it is time to tap and die that hole all the way down to the bottom. Making sure that I tap and die the hole straight and that it doesn't go in at an angle.



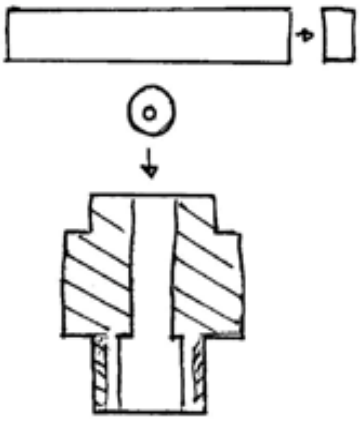
• Now I have to cut off the end of the spigot which is not required. To do this I leave it in the lathe and cut off what I do not need with a left hand facing tool. When cutting off the spigot I leave 13mm of the spigot at the bottom and cut off the rest leaving a spigot of 13mm high.

• Once the spigot is cut off to the correct size, the main body of the sprinkler is not needed for a while and now I start on making the brass pieces. The first of these I made was the

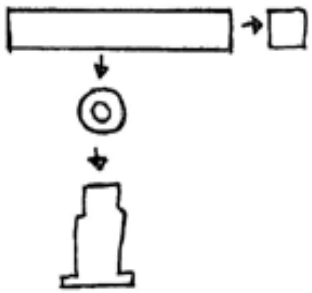
Robert

head, this started off as just a solid piece of brass which I had to cut to the correct length. Once this was done I then had to drill a 7.5 diameter hole which went in 5mm. I then used a file to curve the end of the head to the correct shape. Once this is done I find the middle of the head and drill a hole all the way through it.

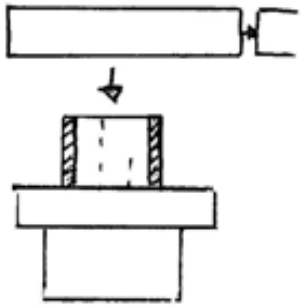
• Now I have finished my first brass piece I then went on to make my first piece made of nylon, this was the bearing. I was given the piece of nylon in just a long stick and my job was to cut it all to shape. This was done using the lathe. I placed the nylon in the 3 jaw chuck and the first thing I done was to cut the 8 diameter hole all the way through then I proceeded to cut it to the correct dimensions using the left hand facing tool. These dimensions are that one end is 5 mm long with a diameter of 20, the middle length is 10 mm long and has a diameter of 25 mm and the other end is 10 mm long with a diameter. Once the hole is drilled and the nylon is cut to all of the correct sizes, I then have to tap and die the longer end so it can then fit into the hole in the top of the metal mould. Once the hole is tap and died I then need to cut a 12 diameter hole into the end which I tap and died making room for the shaft to slot into its place, this hole should be 10mm deep.



• The next piece I made was the shaft which is what holds the head in place and helps the arms spin. This is made by getting a piece of brass at which you cut it off at a reasonable length and then put this in the 3 jaw chuck. Once in the 3 jaw chuck I got the drill and drilled a 6 diameter hole right through the middle. The next thing to do is to cut all the dimensions, these dimensions are one end is 2 mm long with a diameter of 11, the middle part is 16 mm long with a diameter of 8 and the other end is 5 mm long with a diameter of 7.5.

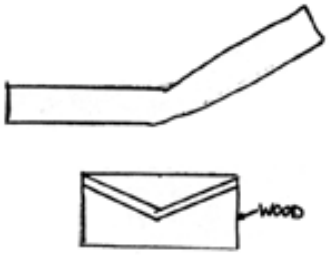


• I now need to make the adaptor which is made of nylon. The first thing I done was to cut the nylon so that it had a diameter of 30. The next thing I done was to drill a hole with a 6 diameter through the piece of nylon or you can just drill it through the length you want which is 23mm. The next thing I had to do was to cut all the sizes to the correct length. One end of this piece of nylon was to be cut to the size of a diameter of M26.4 which was 10 mm long. The middle size is left as 30 and cut to a length of 5 mm and the other end is 8 mm long and has a diameter of M12. This end is to be tie and died as well to allow it to screw into the side of the mould.



Robert

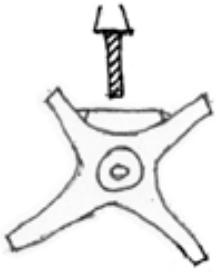
• After this the next part I had to make were the arms which go into the head and spins around by the force of the water. I got a two tubes of brass both with the length of 82 mm and a diameter of 3/8inch. I then soften the brass using a brazing torch. Once this is cooled down I then put them in between two pieces of wood both cut to get the correct angle of 30 degrees. I then put these in a vice and squeeze them together so the brass gets an angle of 30 degrees in it.



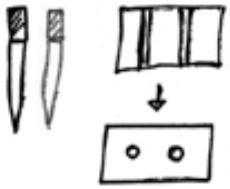
• The last parts I have to add to my water sprinkler are the end sleeves. These are made by getting a piece of brass with the diameter of 13mm and 12mm long and drill a hole of 3/8 inch 10 mm into it. I then drilled 5 1mm holes in the top of these making way for the water to get through. Make two of these.

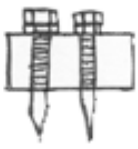
• Once all the small brass parts were made I had to soft solder them together, the arms to go into the head and the end sleeves to go onto the end of the arms. Once this was all soldered together it was left to cool and then the head was placed onto shaft with a water tight fit.

• When I have done all of this the next stage is to make the hole in the side of the mould in which the adaptor goes. This is done by using the milling machine. The mould is placed in a clamp to hold it in place and then I used the milling machine to first smooth off the face and then to drill a M12 hole right in the middle and all the way through until I reached the entrance to the other hole I made earlier. The end of this hole is then to be tie and died so allow the adaptor to screw in.



• The last part I was to make in this project was the probe, this is the part which is connected to the wires on the circuit board and then has metal probe which go into the ground and recognise whether it is wet or dry etc. The first thing I had to do here was to get a round 3 cm long piece of clear acrylic. I then drilled 2 M5 holes each 7 mm in from each side, and then I tie and died these holes. I then got 2 pieces of brass the same size of the hole, one end was to be tie and died to screw into the acrylic and the other end was to be cut at an angle to get a point at the end to allow it to go into the ground easier. Once they are both in place to finish it off I just had to put and waster and a nut on the end of this to allow for a connection with the wire.





• To finish off the project I then used red enamel paint and painted over the casting to add some colour to the project.

Robert

Safety in the workshop

The main thing you must make sure of when working in the workshop is that you and the other people around you are safe from injury.
When working on the lathe things you must do and look out for are:

- Wear eye protection
- Make sure the work is always in the chuck correctly.
- Make sure the chuck key I not still in the chuck when turnt on.
- Make sure all tools are neatly put away so they can't get caught up.
- Make sure all loose clothing is taken off or tucked away.

When working on the milling machine things you must do and look out for are:

- Always wear eye protection.
- Make sure the work in the vice is in tight.
- Make sure all loose clothing is taken off or tucked away.
- Make sure the drill piece is in correctly.

When doing the sand casting things you must do and look out for are:

- Make sure all the sand goes where you want it to go.
- Make sure it can't get flicked up and into peoples eyes.
- Be careful when compacting the sand.
- Make sure the casting is cool before taking it out of the sand.

When silver soldering things you must do and look out for are:

- Be very careful when lighting the torch.
- Make sure you do not burn yourself when soldering.
- Make sure other people are of a safe distance.
- Make sure you use tongs when cooling.

When drilling things you must do and look out for are:

- Make sure the drill piece is in correctly.
- Wear eye protection.
- Make sure all the work is tight in the vice.

Robert

Observation Record

Candidate name: *Robert Hall*	
Unit title: *Unit 2 Engineered Products*	Candidate number: *5012*

Activity context:
This may be provided by the assessor or candidate

Making an engineered product
Producing the bearing for the 'Water Sprinkler'.

Assessment evidence:
Refer to the assessment grids reproduced from the specification.

d) selection & use of materials
e) selection and use of parts and components
f) selection & use of processes, tools and equipment

Observation notes:
Specific comments on candidate performance that demonstrates achievement of the assessment evidence.

Robert produced a simple list of materials and processes he could use for the relevant parts of the 'Water Sprinkler'. He used relevant text books and discussed various options with me before selecting nylon for the bearing.
Robert successfully selected the nylon in bar form from the stores.
He used the lathe to turn the bearing. Whilst he was able to select appropriate speeds and feeds, referencing appropriate engineering data handbooks, he needed reassurance before using the machine.
Robert ensured that the chuck key was out and all components etc were secured. The guard was used effectively and protective glasses were used. He was careful that swarf did not 'land' on his skin as he knew that this could burn.

Robert used the nylon and lathe to make the bearing in a safe and reasonably skilled manner that meets the requirements of mark band 2.

Assessor name: *John Smith*	Assessor signature: *J SMITH*
	Date: *17 – 5 – 0X*

You need to make an engineered product including evidence of:

d how you selected and used materials to safely make your product
e how you selected and used parts and components to safely make your product
f how you selected and used processes, tools and equipment to safely make your product

ASSESSOR'S MARKING GRID

	Mark band 1 At this level work must show:	Mark range	Mark band 2 At this level work must show:	Mark range	Mark band 3 At this level work must show:	Mark range	Mark awarded
(d) **AO1** **AO2** **6 marks**	• a selection, with guidance, of some appropriate materials, using them safely with some skill to make a product	1 – 2	• a selection, with limited guidance, of appropriate materials, using them safely with skill to make a product	3 – 4	• an independent selection of appropriate materials, using them safely with skill and accuracy to make a product	5 – 6	**4**

MODERATOR COMMENTS

Robert's other work shows evidence of the materials he selected to cover the project. This commentary relates to the selection of materials whilst making the bearing. The observation record suggests some alternatives were considered and also records some assistance being provided. Material selection is appropriate but there is no evidence to suggest suitability of characteristics and properties. This restricts his achievement to the criterion in mark band 2 for this aspect of his work.
The Observation Record produced by the assessor clearly indicates achievement at mark band 2 for safety use. Had Robert's 'Safety in the Workshop' sheet discussed aspects of material safety in greater detail, he could have gained more than 4 marks.

(e) **AO1** **AO2** **6 marks**	• a selection, with guidance, of some appropriate parts and components, using them safely with some skill to make a product	1 – 2	• a selection, with limited guidance, of appropriate parts and components, using them safely with skill to make a product	3 – 4	• an independent selection of appropriate parts and components, using them safely with skill and accuracy to make a product	5 – 6	**3**

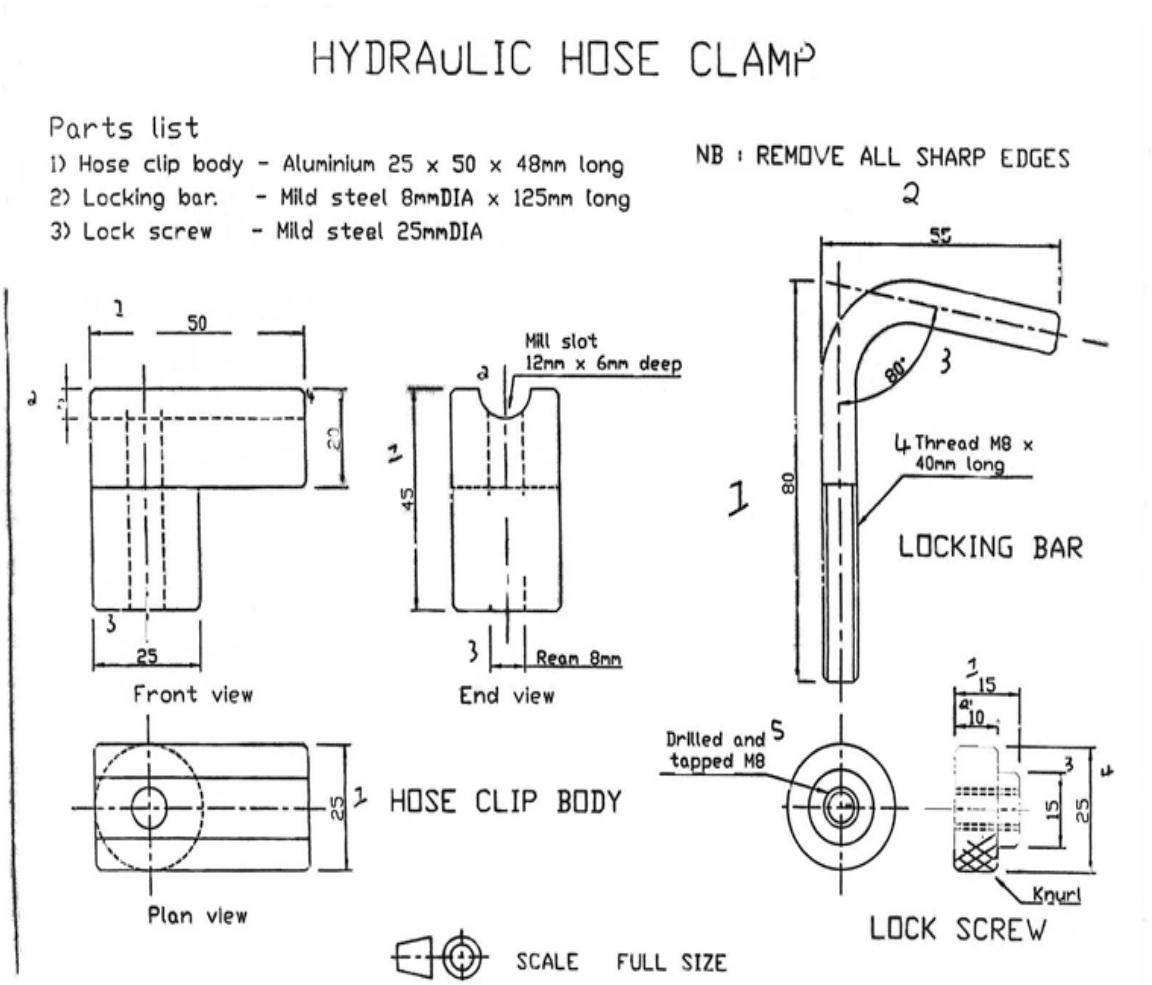
MODERATOR COMMENTS

The comments for this evidence are similar to those for (d). However there is less evidence in Robert's portfolio about the safe and skilful use of parts and components.
His work should therefore be awarded 3 marks. Further evidence is required on both selection and use of parts and components before more marks can be awarded.

ASSESSOR'S MARKING GRID							
	Mark band 1 **At this level work must show:**	**Mark range**	**Mark band 2** **At this level work must show:**	**Mark range**	**Mark band 3** **At this level work must show:**	**Mark range**	**Mark awarded**
(f) **AO1** **AO2** **6 marks**	• a selection, with guidance, of some appropriate processes, tools and equipment, using them safely with some skill to make a product	1 – 2	• a selection, with limited guidance, of appropriate processes, tools and equipment, using them safely with skill to make a product	3 – 4	• an independent selection of appropriate processes, tools and equipment, using them safely with skill and accuracy to make a product	5 – 6	**4**
MODERATOR COMMENTS							
Again, the comments for this evidence are similar to those for (d). The Observation Record shows that Robert is achieving at mark band 2. Robert's work throughout the project shows selection and use of a wide range of processes. However there is evidence to indicate that his level of accuracy is not always high. Robert's work should therefore be awarded 4 marks.							

You need to make an engineered product including evidence of:
g how you tested your product and how it complied to the standards required.

ABDUL'S WORK



Production Quality Checks		
Hose Clip Body		
Critical control point	**Quality Indicator**	**Comment**
Block dimensions	Aluminium 25 X 50 X 48 mm Tolerance ± 0.2 mm All surfaces to be square	Use a micrometer to determine measurements. Use an engineers square
Spigot diam	25 mm ± 0.2 mm	Use external micrometer
Bore diam	8 mm ± 0.2 mm	Use plug gauge

I will check measurement regularly to make sure that I make body correctly and do not cause any faults.

Final Inspection of Hose clamp Body

Front View				
Side number	Specified Dimension	Allowed Tolerance	Actual measurement	Comments
Front View				
1	50 mm	± 0.2 mm	50.1 mm	This is within tolerance
2	6 mm	± 0.2 mm	6 mm	I set the depth of cut when milling the slot. It was difficult to measure the depth along its length.
3	25 mm	± 0.2mm	49.8 mm	I took a bit too much off with my last cut. But it was still in tolerance.
4	20 mm	± 0.2 mm	20 mm	I measured this with a height gauge and it was spot on.
Plan View				
1	25 mm	± 0.2 mm	25 mm	I used a 25mm block of aluminium
End View				
1	45 mm	± 0.2 mm	49.7 mm	This was out of tolerance, but I was told that it would be OK.
2	12 mm x 6 mm	± 0.2 mm	12 mm x 6 mm	I used a special milling cutter to get the shape.
3	8 mm	± 0.2mm	8 mm ream	I checked the reamer before reaming the hole and then used a go-not go gauge to check the diameter. Then I checked that the bar fitted correctly.

I used a Dial Test Indicator to check that the spigot was at right angle to the main body. There was a variation of 0.6 mm in a length of 45 mm. This was acceptable.

Therefore all dimensions were in tolerance.

The drawing did not specify surface finishes, but I checked all surfaces to make sure that they were smooth and that all corners were rounded off.

Witness Statement

Candidate name: *Abdul Ali*

Unit title: *Unit 2 Engineered Products*	Candidate number: *0003*

Activity context:
Outline of the activity and its purpose. This may be written by the candidate prior to the observation.

Machining and Final inspection of Hose Clip body.

Assessment evidence:
Refer to the assessment grids reproduced from the specification.

(g) how you tested your product and how it complied to the standards required.

Observation notes:
Specific comments on candidate performance that demonstrates achievement of the assessment evidence.

Abdul worked slowly to ensure that he machined the clip body to within the required standards.

At one stage he took too much off the base of the block, but I told him that this measurement was not critical and that he should proceed.

Abdul chose the main measuring instruments himself, but needed help to measure the depth of the milled slot.

Abdul was able to check the surface finish and was satisfied that it met the requirements of the brief.

Witness name: *Bill Green*	Witness signature: *B GREEN*
Job role: *Workshop Technician*	Date: *12/7/0X*
Assessor name: *Mary Harp*	Assessor signature: *M HARP*
	Date: *13/7/0X*

You need to make an engineered product including evidence of:

g how you tested your product and how it complied to the standards required.

ASSESSOR'S MARKING GRID							
	Mark band 1 **At this level work must show:**	**Mark range**	**Mark band 2** **At this level work must show:**	**Mark range**	**Mark band 3** **At this level work must show:**	**Mark range**	**Mark awarded**
(g) **AO3** **6 marks**	• basic testing against the product specification and limited compliance to the standards required	1 – 2	• a range of testing against the product specification and compliance to the main standards required	3 – 4	• objective testing against the product specification and consistent compliance to the main standards required	5 – 6	**4**
MODERATOR COMMENTS							
Abdul has produced some evidence of the range of tests and measurements he carried out. These are not complete, but the 'Witness Statement' helps to ensure that Abdul has met the mark band 2 criterion. Abdul has not modified his production plan and also he lacks confidence. Therefore he should be awarded 4 marks.							

Appendices

Appendix 1 – Observation Record

Candidate name:	
Unit title:	Candidate number:

Activity context:
This may be provided by the assessor or candidate.

Assessment evidence:
Refer to the assessment grids reproduced from the specification.

Observation notes:
Specific comments on candidate performance that demonstrates achievement of the assessment evidence.

Assessor name:	Assessor signature:
	Date:

Appendix 2 – Observation Records

What is an observation record?

An Observation Record is a document which records statements of learner performance. It directly relates to the criteria contained within the Assessment Evidence grid included in each Unit Specification. It may confirm achievement or provide specific feedback on candidate performance against national standards.

Guidance on completing an observation record

Since an Observation Record will provide primary evidence, it is essential that the recording of performance is sufficiently detailed to enable others to make a judgement as to the quality and sufficiency of candidate performance and confirm that national standards have been achieved.

Observation Records are often accompanied by supporting/additional evidence. This may take the form of visual aids, handouts, preparation notes, cue cards, diaries, logbooks, and peer assessment records. It is essential that where present, these are included in the learner evidence. Where visual aids and handouts are used, notes should be made on the Observation Record as to how these were used and their effectiveness.

The assessor of the qualification being undertaken by the candidate completes the Observation Record, therefore must have direct knowledge of the specification to enable an accurate assessment decision to be made.

An Observation Record has greater validity than a Witness Statement since it is capable of recording an assessment decision.

All Observation Records must be signed and dated by the assessor.

Appendix 3 – Witness Statement

Candidate name:	
Unit title:	Candidate number:

Activity context:
Outline of the activity and its purpose. This may be written by the candidate prior to the observation.

Assessment evidence:
Refer to the assessment grids reproduced from the specification.

Observation notes:
Specific comments on candidate performance that demonstrates achievement of the assessment evidence.

Witness name:	Witness signature:
Job role:	Date:
Assessor name:	Assessor signature:
	Date:

Appendix 4 – Witness Statements

What is a Witness Statement?

A Witness Statement is a document which records statements of learner performance. It is completed by someone other than the Assessor of the qualification. This may be someone who does not have direct knowledge of the assessment evidence, but who is able to make a professional judgement about the performance of the candidate (for example, a work placement supervisor, technician, librarian).

Guidance on completing a Witness Statement

The quality of a Witness Statement can be greatly improved if the 'witness' is provided with the assessment evidence from the specification so that accurate reference can be made to this in relation to the success of learner performance. When recording details on the Witness Statement the candidate may provide a statement of context on the Witness Statement.

A Witness Statement does not confer an assessment decision. When making an assessment decision, the assessor must consider the validity of the information contained within the Witness Statement, noting the relevant professional skills of the 'witness', along with any other supporting evidence, before making a final judgement.

As Witness Statements are often used to record practical performance, especially in the workplace, it is important that the person responsible for the completion of the document is identified by the Assessor at the outset.

All Witness Statements should be signed and dated by the 'witness' together with clear details of their job role.

It is the assessor's responsibility to ensure the authenticity of Witness Statements. It may be helpful to collect specimen signatures. A telephone call to thank the witness for providing evidence may also provide evidence of the authenticity of the Witness Statement.

Witness Statements which are to be taken into consideration for assessment purposes must also be signed and dated by the assessor.

Opportunities for the submission of additional Witness Statements should be encouraged as this provides further evidence of learner performance, for example where candidates have taken part in more than one work placement.

Appendix 5 – Edexcel GCSE in Engineering (Double Award) Unit 1 Mark Record Sheet

Centre no:	Centre name:	Internal moderator name:
Candidate no:	Candidate name:	**Resubmission of work**
Series number		

All/mostly amended	
Some amendments	
No amendments	

Unit 1: Design and Graphical Communication							
Assessment evidence	Annotation and page number	**Mark Band**			**Centre mark**	**Edexcel use only**
		1	2	3		
a an analysis of the brief with key features of the product or service		1 – 2	3 – 4	5 – 6		
b details of the product criteria and production constraints		1 – 2	3 – 4	5 – 6		
c a range of ideas and design solutions		1 – 2	3 – 4	5 – 6		
d evidence of how you tested and selected the final solution		1 – 2	3 – 4	5 – 6		
e evidence of how you selected and used engineering drawing techniques		1 – 2	3 – 4	5 – 6		
f engineering drawings and technical details		1 – 2	3 – 4	5 – 6		
g evidence of how the solution meets the criteria with suggested modifications to improve its fitness for purpose		1 – 2	3 – 4	5 – 6		
		Final total				

Edexcel moderator use only		
Number:	Name:	Signature:

Appendix 6 – Edexcel GCSE in Engineering (Double Award) Unit 2 Mark Record Sheet

Centre no:	Centre name:	Internal moderator name:		
Candidate no:	Candidate name:	**Resubmission of work**	All/mostly amended	
			Some amendments	
Series number			No amendments	

Unit 2: Engineered Products						
Assessment evidence	Annotation and page number	Mark Band			Centre mark	Edexcel use only
		1	2	3		
a how you used a product specification and interpreted engineering drawings		1 – 2	3 – 4	5 – 6		
b information about details of resources and processing requirements		1 – 2	3 – 4	5 – 6		
c information about production details and constraints		1 – 2	3 – 4	5 – 6		
d how you selected and used materials to safely make your product		1 – 2	3 – 4	5 – 6		
e how you selected and used parts and components to safely make your product		1 – 2	3 – 4	5 – 6		
f how you selected and used processes, tools and equipment to safely make your product		1 – 2	3 – 4	5 – 6		
g how you tested your product and how it complied to the standards required		1 – 2	3 – 4	5 – 6		
		Final total				

Edexcel moderator use only		
Number:	Name:	Signature:

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