

## **Deadlines**

### **Monday 6<sup>th</sup> March**

- Developed prototype page
- 3<sup>rd</sup> angle orthographic drawing

#### 4.4.4.4 Section D: Developing design ideas (20 marks)

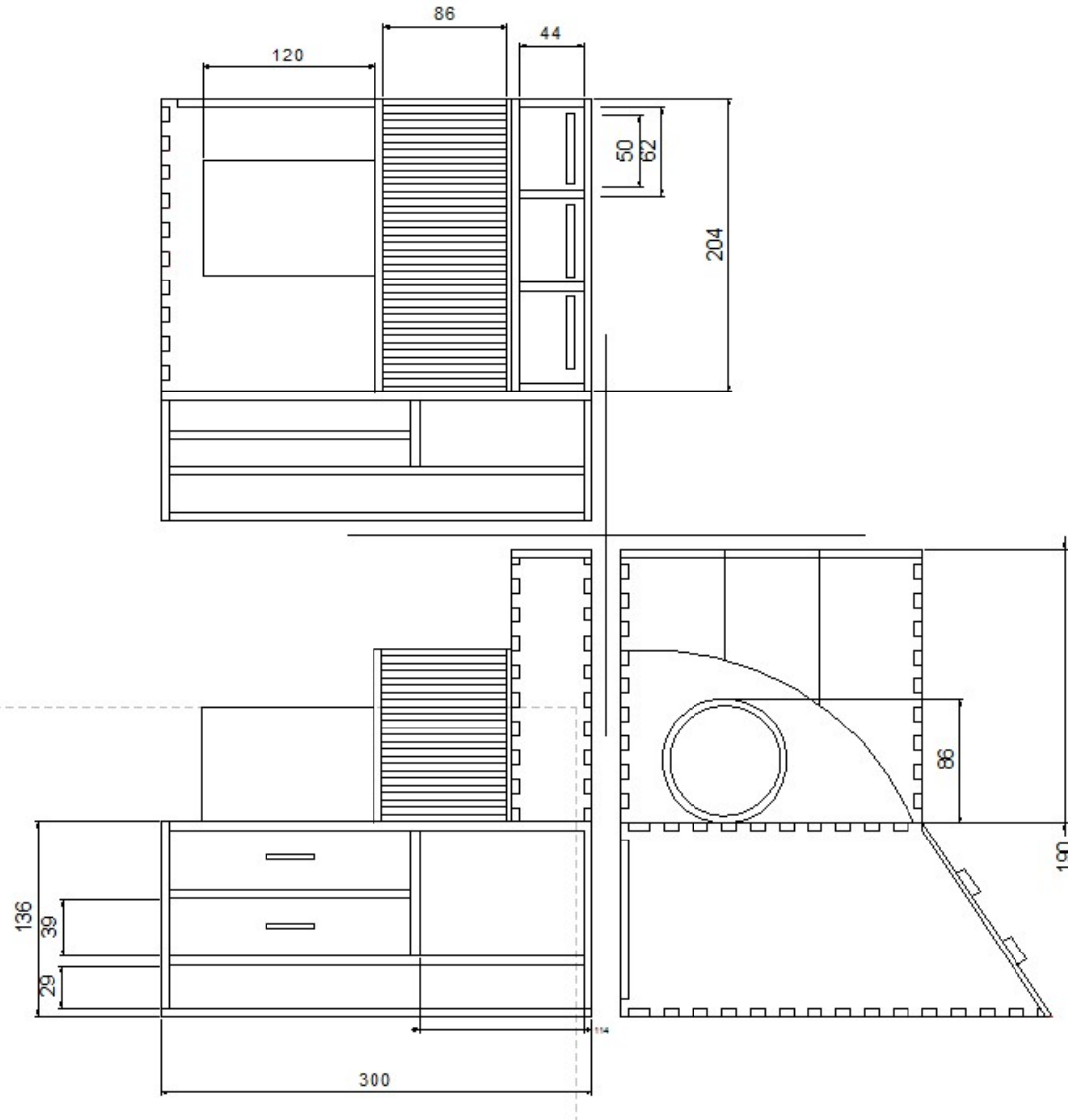
Students will develop and refine design ideas. This may include, formal and informal 2D/3D drawing including CAD, systems and schematic diagrams, models and schedules. Students will develop at least one model, however marks will be awarded for the suitability of the model(s) and not the quantity produced.

Students will also select suitable materials and components communicating their decisions throughout the development process. Students are encouraged to reflect on their developed ideas by looking at their requirements; including how their designs meet the design specification. Part of this work will then feed into the development of a manufacturing specification providing sufficient accurate information for third party manufacture, using a range of appropriate methods, such as measured drawings, control programs, circuit diagrams, patterns, cutting or parts lists.

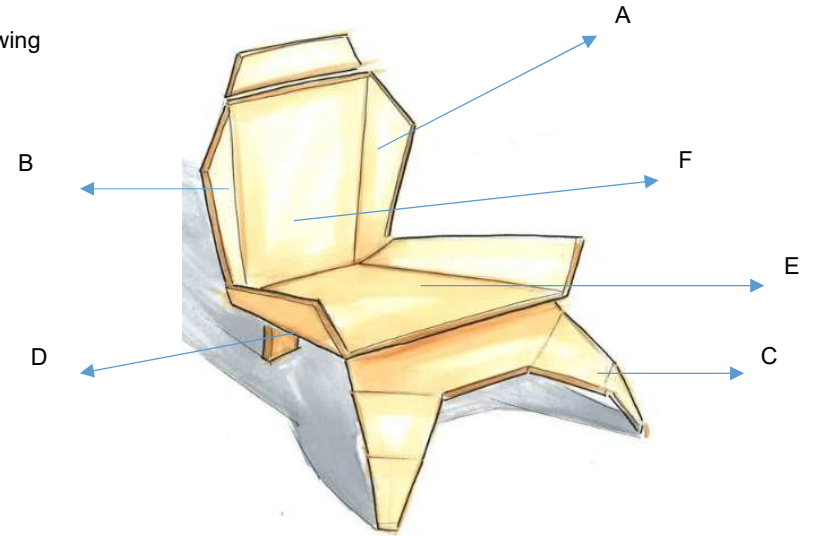
Mark band	Description
16–20	<p>Very detailed development work is evident, using a wide range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.</p> <p>Excellent modelling, using a wide variety of methods to test their design ideas, fully meeting all requirements.</p> <p>Fully appropriate materials/components selected with extensive research into their working properties and availability.</p> <p>Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture.</p>

# Manufacturing Specification

3<sup>rd</sup> Angle Orthographic Projection



3D Drawing



Material and Process Choices For Prototype

Material / Process	Part(s)	Justification
3mm Acrylic	A, B	Ability to be laser cut and engraved with decorative design. Good strength to weight ratio. Available in a variety of colours.
4mm Laser Plywood	C, D	
Styrofoam	E, F	
Laser Cutting	A, B, C, D	Laser cutter is able to cut acrylic and plywood very accurately using a 2D Design file.
Laser Engraving	A, B	
File Forming	E, F	

# Manufacturing Specification

## Cutting list

Material	Part(s)	Dimensions	Costings
3mm Acrylic	A, B	300 x 100mm	£2
4mm Laser Plywood	C	300 x 400mm	75p
4mm laser plywood	D	200 x 400mm	75p
Styrofoam	E,F	400 x 500 x 10mm	£9.60
PVA glue (for PVA wash)	E,F	100ml	30p
Spray paint	E,F	N/A	£8.59

- You will need to explain how the cost will reduce if you were making multiple prototypes.
- Discuss where you would source your materials from (e.g. timber merchants, online retailers, specialist modelling stores) and the use of stock forms e.g. sheet polymers, dowels etc.
- Your overall cost will seem very high, however this is because you are making a one off and do not benefit from economies of scale.

## Costings

Use the information in the following table to help calculate the cost of your final prototype. If you know you will use an equal part of a sheet e.g. one half, you could consider this in your calculations, but don't make it overly complicated.

In addition to the materials and adhesives listed below, you may have requested unique materials/ components/ finishes e.g. vintage hinges, you will need to find the cost of these items yourself and add them to your costings.

Material	Stock Dimensions / size	Cost
4mm laser plywood	500mm x 350mm	75p
3mm laser MDF	500mm x 350mm	35p
6mm birch plywood	1220mm x 2440mm	£21
9mm birch plywood	1220mm x 2440mm	£27
Styrofoam	600mm x 600mm x 50mm	£24
HDPE foam	150mm x 150mm 75mm	£11
Foam board	420mm x 297mm x 3mm	£1.10
3mm Acrylic	600mm x 400mm	£8
3mm dowel	2400mm length	£1.20
6mm dowel	2400mm length	£1.95
9mm dowel	2400mm length	£3.50
12mm dowel	2400mm length	£4.90
0.7mm Aluminium	250mm x 250mm	£6
PVA glue	500ml Bottle	£1.50
Contact adhesive	500ml bottle	£6.50
Tensol cement	20ml bottle	£7.99

# Student Guide – Manufacturing Specification

## Introduction- Have you:

Explained why you will need to complete a final 3D drawing, material and process choices and a cutting list with costings before starting the manufacture of your final prototype.

## Manufacturing Specification – have you:

- Created a rendered 3D drawing of your final design concept (by hand or using CAD).
- Added labels to identify each part of your final product (as shown in the example).
- Created a table identifying your final material and process choices for each part.
- Fully justified why you have chosen each material and process using subject specific vocabulary.
- Created a cutting list identifying specific materials and sizes you will need (providing 3 dimensions in mm). *Have you considered all aspects of your product in your cutting list, including finishes and components etc.*
- Used the information provided and your own research to calculate the cost of manufacturing your prototype.
- Fully explained your intended place of purchase for each of the materials identified and why you are required to order using pre-determined stock forms.

- Fully explained how the cost would reduce if you were to make multiple prototypes of your final design.

## Possible extra ideas for inclusion:

- Add in additional smaller drawings to show finer details that may not be captured in a final 3D drawing.
- Include information on tools, equipment and machinery required at each stage of manufacture.
- Add in information about tolerances and the required tolerances for your prototype.
- Discuss quality control and how you can ensure your product is manufactured to the highest standard.

## Summary - Have you:

- Explained what you plan to do next (*create a plan of manufacture – this is a step by step flowchart showing how to make your prototype*).

**Manufacturing Specification**  
3rd Angle Orthographic Projection

**3D Drawing**

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**Material and Process Choices For Prototype**

Material	Process	Part(s)	Justification
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4mm Laser Plywood		C, D	
Styrofoam		E, F	
Laser Cutting		A, B, C, D	Laser cutter is able to cut acrylic and plywood very accurately using a 2D design file.
Laser Engraving		A, B	
File Forming		E, F	

**Notes:**

- You may have requested unique materials e.g. vintage hinges, you will need to find the cost of these items yourself and add them to your costings.
- You will need to consider how the cost will reduce if you were making multiple prototypes.
- Discuss where you would source your materials from (e.g. timber merchants, online retailers, specialist modelling stores) and the use of stock forms (e.g. sheet plywood, sheets etc).
- Your overall cost will seem very high, however this is because you are making a one off and do not benefit from economies of scale.

## Parent guide – Manufacturing specification

### Introduction to this page

Students have already completed their third angle orthographic drawing, which is one aspect of their Manufacturing Specification. However a drawing alone would not be enough information to manufacture a prototype and so students need to use this page to identify and justify their final material and process choices, and also create a cutting list of materials and components they will need (this is the materials they will need to have to begin manufacture). They should also calculate the cost of manufacture.

This page is much more informative rather than evaluative like previous pages in their NEA and gives all of the final decisions for their product such as what they will make their product from or how they will make it.

Manufacturing Specification  
3rd Angle Orthographic Projection

3D Drawing

Material and Process Choices For Prototype

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Cutting list

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- You may have requested unique materials e.g. vintage hinges, you will need to find the cost of these items yourself and add them to your costing.
- You will need to explain how the cost will reduce if you were making multiple prototypes.
- Discuss where you would source your materials from (e.g. online merchants, online retailers, specialist modelling stores) and the use of stock forms e.g. sheet polymers, dowels etc.
- Your overall cost will seem very high, however this is because you are making a one off and do not benefit from economies of scale.

## How can you support your child at home?

Look over your child's page:

- Have they included a 3D sketch of their final design which includes labels to identify the different parts (as shown in the example)?
- Have they included material and process choices for all of their final prototype design which has been fully justified using subject specific vocabulary?
- Have they create a cutting list (which includes 3 dimensions (l x w x h) for all materials listed) and also considers any additional components etc. they may need, and included costing for each piece?
- Have they fully explained where they will purchase materials and why materials must be ordered in stock forms from merchants or retailers. Have they shown understanding of the high estimated cost being due to one-off manufacture and the impact manufacturing multiples of their product would have on this?

Could you ask your child to talk through their prototype, what will each piece be made from, how will parts be shaped and fit together? They should be able to talk about this in detail and the same level of detail should be mirrored in their work for this page.

Could you encourage them to add in the extra ideas for inclusion (in green) to help them gain more marks.