

AS LEVEL Section A

FACT FILES

Technology & Design

For first teaching from September 2011

For first award in Summer 2012

Material Choice
and Selection Part 1

FACT FILE

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design

1.1 Material Choice and Selection Part 1



Learning Outcomes

Students should be able to consider the following when selecting a material:

- Functional requirements (properties and characteristics);
- Manufacturing demands (scale of production and suitability of manufacturing process);
- Environment (corrosion resistance and stability);
- Availability (common form and sizes);
- Cost;

- Flexibility
- Buoyancy
- Flexibility
- Colour or texture
- Environment
- Stability

Economic requirements

Correct costing and forecasting is fundamental in the manufacture of any product, not only in the initial cost, but also in the working and processing of them. i.e., machining, joining and finishing. Any wastage must be considered in the original costing.

Other costs incurred in the production of a product include time, labour costs (if industrial), repair and servicing of machinery and electricity. In industry, if new parts or components are to be produced, the workforce might require additional training.

The choice of material can determine the quality of the final outcome. Quite often expensive materials can be justified, due to the fact that they are easier to machine, process or work with.

If we look at the area of seating we can see how a range of materials can be used depending on the target consumer and the purpose of the seat, whether it be for public use or as a high quality decorative piece of furniture.

The photograph shows public seating that has been



designed for people to sit for short periods. The mild steel has been painted with a corrosive resistant red paint to prevent rusting. The arm rest and slight curve suggest

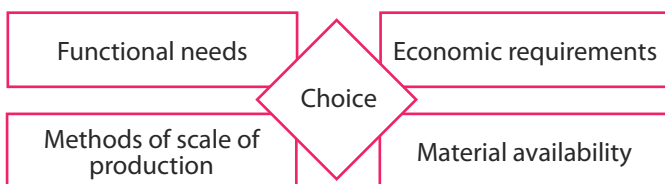
that ergonomics have been considered.



Course Content

Selecting the correct material can often be the most important decision to be made. Materials provide the aesthetic quality and properties of a product. The three main considerations when selecting a material are:

1. Will they meet the performance requirements?
2. Will they be easy to process?
3. Do they have the correct aesthetic properties?



Functional Requirements

Choosing materials has become problematic due to the extensive range of materials that are available. Many materials can be adapted to possess properties that make them more versatile.

Ideally, materials used in products should be perfectly suited to the function of the final product. The following properties or requirements might be taken into account when choosing a material:

- Hardness
- Rigidity
- Weight



The wooden seating for five people have been designed for indoor use. It possesses a modern and functional design and incorporates materials that will guarantee lasting aesthetic appeal. The stainless feet and legs would be expensive to produce and it is apparent that ergonomic comfort has been sacrificed.



Whilst the three forms of seating above are very different, they have all been designed and produced for the same purpose, aesthetic appeal. The materials have been selected because of the quality of finish and working properties. The carver chair includes intricate woodworking and finished with a high gloss protective varnish, whilst maintaining a correct posture for the consumer, reflecting ergonomic design.

The egg-shaped seat is a car seat for a child. The orange lining is soft, providing comfort, whereas the exterior is a tougher plastic, ABS, to guarantee durability and toughness. The recliner seat is designed for an exclusive target consumer group and manufactured using high quality materials and textiles.

The recliner and carver seats would be made in batches and the car seat would be mass produced.

Material availability

Most types of materials are available from suppliers in standard forms, shapes and sizes. Standardisation has affected the size and materials quality.

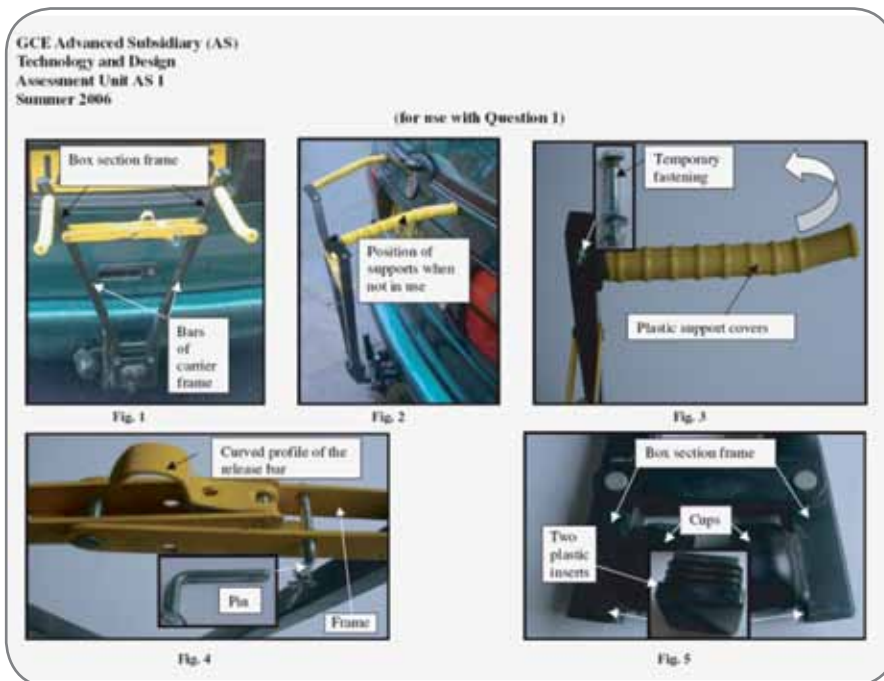
Use of non-standard materials or sizes of materials is likely to increase the cost of raw materials.

- Wood tends to be supplied in standard sizes of sheet, plank or rod (dowel) form.
- Metals are supplied in standard sizes of sheet, plate, box section, tube, rod etc. (The metals factsheet supplies more information on this)
- Plastics are supplied in sheet form, rod, tube etc.



Revision questions

1. With the aid of detailed sketches, suggest appropriate improvements for the following:
 - (i) design an adjustable pad or block that can be quickly positioned and secured to the bars of the carrier frame (Fig. 1) to suit different sizes of bicycles and to prevent paint from both the carrier frame and the bicycle being chipped off.
 - (ii) a quickly released hand operated design that can be secured to the frame and will prevent the pin from vibrating out, (Fig. 4).



2. Metals are supplied and used in a range of forms. State **four** different forms in which metal is available.

