

# Design Development

## **Design Development.**

- This section is divided into the following topics :-
- A customer's design brief.
- Producing a design solutions.
- Presenting a design solutions.
- The design project.

## **Customer's design brief.**

## **Customer's design brief.**

The design brief outlines what the customer wants from the product or service they have asked you to design.

In order to begin developing ideas, you must find out the key requirements from the customer's design brief.

**You must be able to identify basic information about:-**

## **Customer's design brief.**

- What the product or service should do.
- What it should look like.
- What materials and technology it should require.
- How much it should cost.
- How many are required.
- When it needs to be completed or available.

## **Customer's design brief.**

Additionally

When developing your ideas you need to consider some wider factors.

## **Customer's design brief.**

- The manufacturing methods suggested by the materials used.
- The scale of production suggested by the quantity required.
- Ergonomics - safety, effectiveness and comfort for human users.
- Quality levels - this will be linked to cost and will have implications for manufacturing methods.
- Cost, and how the materials and manufacturing methods chosen will affect overall cost.



## **Producing design solutions**

## **Producing design solutions.**

- Developing ideas.
- using techniques such as :-
- brainstorming.
- free-hand sketching.
- research - for example into existing products or services.

## **Producing design solutions.**

In order to then develop feasible design solutions, you will need to learn how to obtain and use relevant technical information about materials, processing capability and function.

**You also need to understand and be able to identify production constraints on your design solution, in terms of :-**

## **Producing design solutions.**

- technology - what is available - traditional or computerised systems such as CNC, CAD and CAM.
- materials - the influence of physical and mechanical properties in relation to manufacturing methods.
- availability of resources - labour, materials and equipment.
- environment - consideration of the environment in which the product is used or service performed, to minimise problems such as noise and pollution.

## **Producing design solutions.**

You will also need to be able to test your design solutions out against the requirements of relevant standards and legislation.

Ultimately, you need to be able to evaluate the feasibility of your solutions and select the most appropriately designed solution - that which best meets the original brief.

## **Presenting design solutions**

### **Presenting design solutions.**

In order to be able to communicate your final design solution, you need to be able to produce technical drawings, using appropriate manual and computer-based graphical methods that conform to appropriate industry standards and conventions.

**Depending on your design solution, you need to be able to produce the following types of drawing:-**

### **Presenting design solutions.**

- free-hand sketching.
- general arrangement drawings.
- detail drawings.
- circuit diagrams.
- flow diagrams.
- schematic diagrams.

### **Presenting design solutions.**

- You will also need to be aware of the purpose of different types of scale and different types of projection.
- You must be able to interpret these features where they are relevant to communicating your design information.
- You will also need to be able to interpret technical drawings in order to develop your own drawing skills.

### **Presenting design solutions.**

- You will therefore need to develop a working knowledge of an appropriate sub-set of national standards and conventions, as used in a particular sector of engineering.
- You should be able to identify and quantify information about production methods, quantities and sizes from engineering drawings.



## **The Design Project**

## **The Design Project.**

The design project is designed to provide you with a real experience of producing a design solution that will satisfy a particular need and perform according to a given set of specifications.

**The design project will incorporate a variety of activities including:-**

## **The Design Project.**

- information seeking.
- production of a design brief.
- identifying customer requirements.
- considering relevant standards and legislation.
- identifying constraints.
- preparing a design proposal.
- sketching and drawing.

## **The Design Project.**

- producing a prototype.
- testing the prototype to specification.
- evaluating the design solution.
- preparing detailed costings.
- report writing.
- presenting the design project.

## **The Design Project.**

### What you have to do

You need to produce a design brief and design solution (complete with a prototype, relevant drawings, parts list, etc) for an engineered product.

*You will be working from an outline design brief.*

As a minimum, the design project should involve:-

## **The Design Project.**

- Preparing an action plan.
- Investigating the design brief.
- Clarifying customer requirements (with your tutor in the role of customer).
- Identifying and considering any relevant standards and legislation.
- Identifying any constraints that may impinge on the design.

## **The Design Project.**

- Preparing a design proposal (and have this approved by your tutor).
- Producing a design specification.
- Carrying out a feasibility study.
- Preparing working drawings, documentation and a detailed parts list.
- Procuring or manufacturing parts (as appropriate).



## **The Design Project.**

- Assembling and testing the prototype to specification.
- Documenting your work (including drawings, sketches, etc).
- Preparing a detailed costing for your prototype and for quantity production.
- Presenting your work.



## **Aspects in Detail**

## **Aspects in Detail.**

### **The Design Brief.**

- a statement to the designer that describes a customer requirement. Design briefs can vary considerably in both content and form.
- usually about improving an existing product rather than something completely new ( e.g. reducing size, weight, or cost)
- does NOT specify the design solution

## **Aspects in Detail.**

### **The Design Brief.**

- identifies constraints stated by the customer as well as legal constraints such as the product safety
- .there is no way of proceeding from the stated 'brief' to a proposed solution without designing
- equally applicable to engineering services (they also require designing)

## **Aspects in Detail.**

### **Customer Requirements.**

- functional considerations (technical specification)
- ergonomic considerations (including ease of use and adaptability to suit different users )
- aesthetic considerations (details on styling, general appeal, range of colour options, etc.)
- quality (type of materials, reliability and expected life )

## **Aspects in Detail.**

### **Customer Requirements.**

- cost (initial purchase price )
- whole life cost ( ease and cost of repair, the need for routine maintenance and the cost of spare parts and consumable items, as well as purchase price )
- quantity (prototypes and production costs can be directly related to the quantities involved)

## **Aspects in Detail.**

### **Customer Requirements.**

- size and weight (this is often of prime importance to the customer)
- time-scale (involves creating a realistic planning and development schedule to meet customer requirements)
- tolerance.

## **Aspects in Detail.**

### **Standards and Legislation.**

- functional considerations (technical specification)
- ergonomic considerations (including ease of use and adaptability to suit different users )
- Health and Safety legislation
- Environmental legislation
- codes of practice

## **Aspects in Detail.**

### **Standards and Legislation.**

- conventions
- British Standards (BSI)
- European Union directives.
- Relevant International Standards

## **Aspects in Detail.**

### **Design Constraints.**

Design constraints impinge on the design brief and may include factors such as :-

- available technology
- resources (labour, materials, plant)
- environmental considerations
- cost

## **Aspects in Detail.**

### **Feasibility study.**

- an in-depth study of the brief to establish whether a feasible design is able to satisfy all of the customer requirements sometimes a compromised solution might be agreed between the designer and the customer.
- many ideas and solutions may be explored at this stage but very little real design work will have taken place.

## **Aspects in Detail.**

### **Feasibility study.**

- problems most generally encountered at this stage relate to cost, weight, size, etc.
- some designs can become outdated before they can be realised.
- following a satisfactory feasibility study, the next stage is to submit a full design proposal.

## **Aspects in Detail.**

### **Design Proposals.**

The design proposal sent to the customer basically consists of :-

- a provisional design specification.
- proposed overall contract costs.
- delivery dates.
- servicing and maintenance.
- any legal requirements.

## **Aspects in Detail.**

### **Design Specification.**

- produced after the design proposal has been finally agreed by the customer (further agreement may be necessary relating to the specifications for the product ).
- contains a comprehensive list of parameters with values and tolerances.
- specifies the physical dimensions, weight, surface finish and colour of the product.

## **Aspects in Detail.**

### **Design Specification.**

- specifies how the product or service will operate.
- identifies compliance with relevant legislation.
- may include definitions of terminology and description of standards.

## **Aspects in Detail.**

### **Design Strategy.**

A Design strategy or Design method consists of two things :-

- A framework of intended actions within which to work
- A management control function that will deal with changes as the problem unfolds

## **Aspects in Detail.**

### **Design Process.**

There are six basic stages in the design process:

1. Clarifying objectives.
2. Establishing functions.
3. Setting requirements.
4. Generating alternatives.
5. Evaluating alternatives.
6. Improving details.

## **Aspects in Detail.**

### **Drawing Types.**

The following types of drawing are used in the design development process :-

1. **Layout drawings** The original sketches and drawings required to show your design proposals.
2. **Detail drawings** Dimensioned drawings of any manufactured parts.
3. **Assembly drawings** Showing how the project should be assembled.
4. **Item lists** Listing all drawn and 'bought out' parts required to make the final assembly.

## **Aspects in Detail.**

### **Cost Reduction.**

The following checklist can be used for cost reduction:-

1. **Standardise** Can parts be standard rather than special?
2. **Modify** Is there a satisfactory cheaper material?
3. **Reduce** Can the number of components be reduced? Can several components be combined into one?
4. **Simplify** Is there a simpler alternative? Is there an easier assembly sequence? Is there a simpler shape?
5. **Eliminate** Can any function and therefore its components, be eliminated altogether? Are any components redundant?

## **Aspects in Detail.**

### **Controlling the Design Strategy.**

In order to keep the design strategy under control :-

- Be sure to keep all objectives in mind; in designing it is impossible to have only one set of completely fixed objectives.
- A creative resolution of a design problem often means changing some of the earlier objectives.

## **Aspects in Detail.**

### **Controlling the Design Strategy.**

In order to keep the design strategy under control :-

- The design strategy should be kept under continuous review, the aim is to solve the design problem in a creative and competent way and not follow a path leading to nowhere. If no progress is being made, review the strategy.

## **Aspects in Detail.**

### **Controlling the Design Strategy.**

In order to keep the design strategy under control :-

- Involve others in the team, they may see the problem in different ways, and may be able to suggest a different path and change the way of thinking of a solution to the problem.

## **Aspects in Detail.**

### **Controlling the Design Strategy.**

In order to keep the design strategy under control :-

- Keep all files and sketches throughout the project design stages, jot down any ideas that come to mind to be possibly used at a later stage, even when working on different aspects of the project.
- Never throwaway any sketch or layout drawings until well after the design is finished and proven.

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## **Revision Page**

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