

CHAPTER 9- THE DESIGN METHOD

Drafting and Engineering

Dossin

What is Design?



What is Design?

- Design is a process, a series of linked steps with stated objectives.
- A way of conceiving and creating new ideas and then communicating those ideas to others in a way that can be easily understood
- Accomplished most efficiently through the use of graphics
- *It can be aesthetic design or functional design or both, like what is used for this car shown.*

What is Design?

- **There are 2 types of design: empirical** which is sometimes referred to as “conceptual design” and **scientific** design.
- In **scientific design** use is made of the principles of physics, math, chemistry, mechanics and other sciences.
- In **empirical design** much use is made from the info in handbooks, which in turn has been learned by experience.

“Engineering Design” Defined

- Engineering Design is a process
- Two Key elements to any successful design plan is gaining the **Proper Motivation** and stating the **Objectives**.
- Your “**motivation**” should be to create the most efficient solution to a problem.
- The “**objective**” **statement** will provide a framework within which any engineering design problem can be addressed in a methodical manner.
- Proper planning and scheduling are also key to successful design plans.

Design Concepts- Sources for New Ideas

- **1) A patent** is issued by the US government granting the holder the “right to exclude others from making, using or selling” a specific product.
- **2) Examine Manufactured Products:** Dismantle them, evaluate them and study how their parts are designed to work together. This is referred to a **reverse engineering**.***
A Coordinate measuring machine (CMM)
 - Studying a product that no longer performs to the manufacturer’s existing or upgraded standards, referred to as **functional decomposition**

Design Concepts- Sources for New Ideas

- A *Coordinate Measuring Machine (CMM)*



Design Concepts- Sources for New Ideas

- 3) **Studying the Natural World:** Noting how other creatures' interact with their surroundings can provide a wealth of information and creativity.



Design Concepts- Sources for New Ideas

- The 2 most common used group creativity techniques are **brainstorming** and **storyboarding**.
- **Brainstorming:** occurs when a group of individuals come together to discuss new ideas.
- **Storyboarding:** used to graphically illustrate the progression of their designs, as well as the manufacturing process required to create a final product. Story boards are rough sketches, created freehand by the designer.

Design Concepts- Sources for New Ideas

- **Reintegration of ideas** generated during the brainstorming is very important, once the team has settled on a specific design it is imperative that the designer incorporates this input into his/her design.



The Design Process

The 5 stages of the Design Process are as follows:

1. Identification of problem, need or "customer".
2. Concepts and Ideas.
3. Comprise Solutions
4. Models and/ or Prototypes.
5. Production and or working drawings.

Stage 1- Identification of the Problem and the Customer

- Recognition of a problem and or the determination of a need
- Determine the customer
- Codes or standards?
- Prioritize the design requirements.
- At this point no solution.
- Other questions such as... What is the design expected to do? What is the market potential?, What is the estimated cost limit? What can it be sold for? When will prototypes be ready for testing? When can products be put on the market? Etc etc.

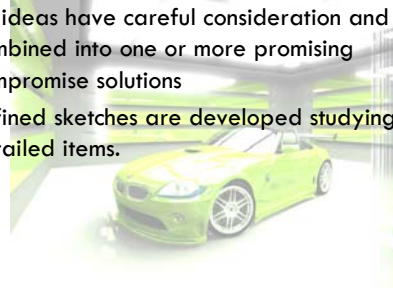
Stage 2- Concepts and Ideas

- Many ideas are collected, reasonable and otherwise, for possible solutions to the problem.
- No attempt to evaluate the ideas at this stage, once again all notes and sketches are dated and signed and saved for later use and record and proof.



Stage 3- Compromise Solutions

- All ideas have careful consideration and combined into one or more promising compromise solutions
- Refined sketches are developed studying more detailed items.



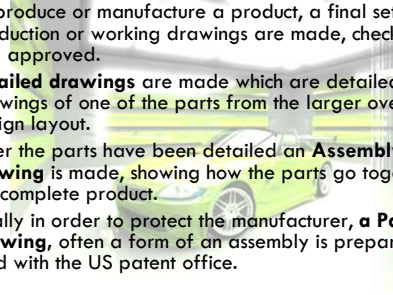
Stage 4- Models and Prototypes

- A model to scale is often constructed to study, analyze, and refine a design.
- A full sized working model is called a "**prototype**".
- 3D CAD Models



Stage 5- Production of Working Drawings

- To produce or manufacture a product, a final set of production or working drawings are made, checked and approved.
- **Detailed drawings** are made which are detailed drawings of one of the parts from the larger overall design layout.
- After the parts have been detailed an **Assembly drawing** is made, showing how the parts go together in the complete product.
- Finally in order to protect the manufacturer, a **Patent Drawing**, often a form of an assembly is prepared and filed with the US patent office.



Mousetrap Racing!!!

