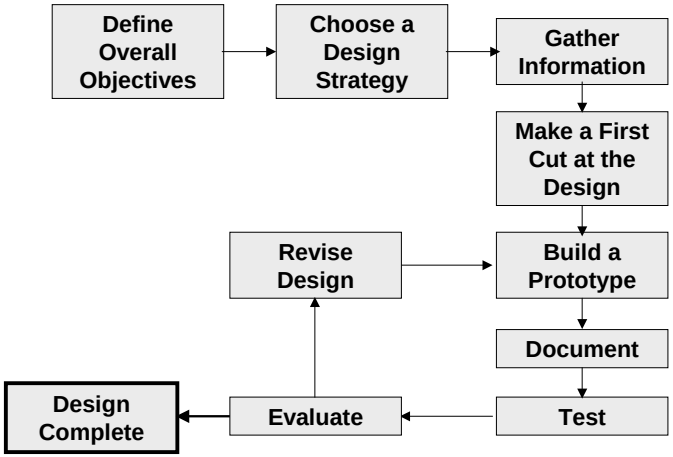
Engineering Design

What is Design?

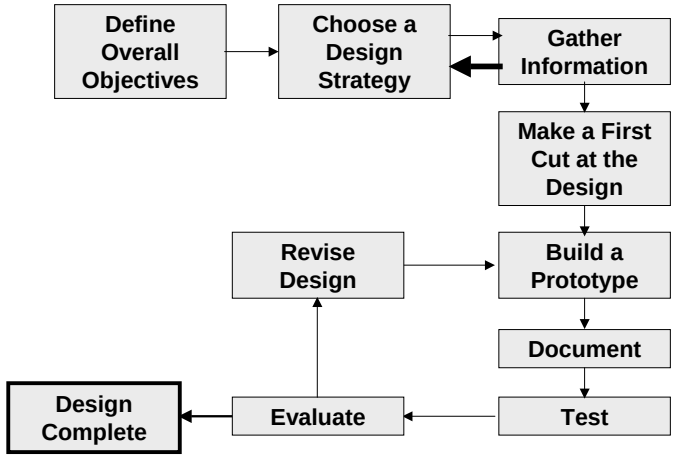
- Design: the arrangement of parts, details, form, color, etc. so as to produce a skillful invention
- Engineers make designs of
  - Devices
  - Structures
  - Systems

…Functional things

Design Cycle



Design Cycle



Define Overall Objectives

What are we trying to accomplish?

- Describe Problem
  - Consider customers' needs
  - Be specific

How will we know if we have achieved our goal?

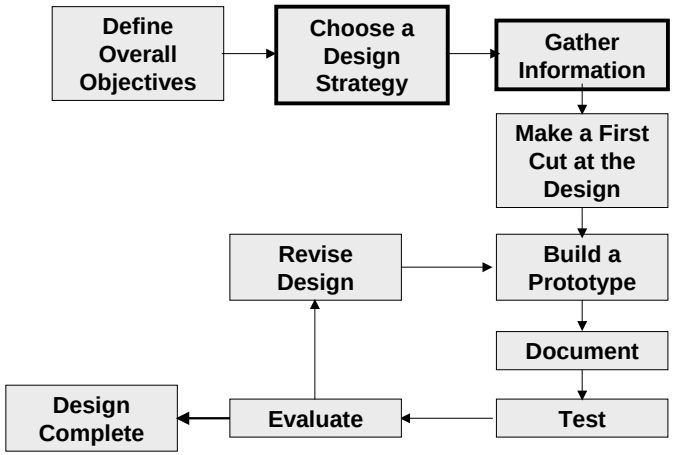
- Performance Measures
  - Quantitative
  - Relevant

General Design Objectives

Completed design should:

- Work reliably
- Meet technical requirements
- Meet cost requirements
- Require minimal maintenance
- Be safe
- Be ethical

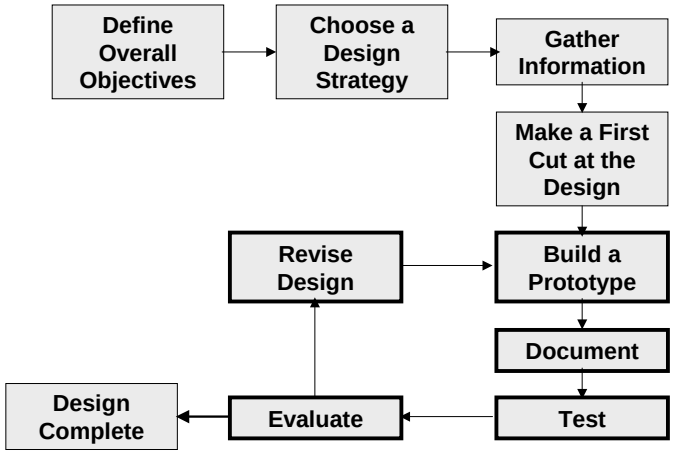
Design Cycle



Preliminary Design

- Choose a Strategy
  - List all possible solutions
    - Brainstorm
    - Quantity of ideas, not quality
  - Decide on best approach
    - Most likely to meet objectives
- Gather Information
  - Options
  - Performance
  - Costs

Design Cycle



Analysis and Testing

- Analysis
  - Application of science, physics, & technology
  - Use formulas to demonstrate design's feasibility
- Build a Prototype
  - Physical Model
  - Computer Model

Design Documentation

- Documents
  - Block Diagrams
  - Specifications
  - Flowcharts
  - Commented Code
  - Testing Procedures
  - Change-Order Log
  - Schematics
  - Bill-of-Materials

Testing and Evaluation

- Testing
  - Operate under actual conditions
  - Record data about performance
- Evaluate
  - Compare to objectives
  - Identify weaknesses

Revising

- Need to eliminate weaknesses
  - Change design
  - New prototype
  - Retest
  - Re-evaluate
- Repeat until design is satisfactory