Design Specifications

Engineering Design and Development
Lesson 3.1 Select a Solution Path

Design Criteria and Constraints

• Design Criteria
  – Performance
  – Product Size and Shape
  – Aesthetics
  – Materials
  – Safety and legal issues
  – Ergonomics
  – Environment
  – Life Cycle
  – Durability and Maintenance

• Design Constraints
• Measurable Values

Example Design Specification

Design a pet restraint system to keep a dog safe.

Criteria and Constraints

• Specific, concise written information about the requirements that must be met in order to attain the intended outcome
• Must be specific and unambiguous
• Client must be involved
Design Criteria

- The explicit requirements that a product must meet in order to be successful
- Used to evaluate a product’s potential to be successful
- Used to create testing procedures
- May address:
  - Performance
  - Product Size and Shape
  - Aesthetics
  - Materials
  - Safety and Legal Issues
  - Ergonomics
  - Environment
  - Life Cycle

Performance

- Specify the function of the product
  - What will the product need to do?
- Example: When designing a special fork lift for a warehouse,
  - How will the vehicle be powered?
  - What is the maximum speed?
  - On what surfaces must the vehicle operate?
  - What turning radius is required?
  - What are the dimensions of the cargo to be lifted?
  - What is the maximum load to be lifted?
  - How high must the cargo be lifted and stored?

Product Size and Shape

- Form
- Dimensions
- Weight

Aesthetics

The way that a product looks will affect marketability, especially for a consumer item.
- Color
- Surface Treatment
- Shape
- Material
Materials

Often chosen by the design team to meet criteria, but sometimes dictated based on special needs or availability.

Safety and Legal Issues

- Human health and safety
- Product liability laws expose manufacturers to lawsuits if their products fail

Ergonomics

- The science of designing according to human needs
- Products should be designed for human comfort, efficiency, safety, and ease of use

Environment

Operating Environment

- Product will encounter a wide range of environments from manufacture to operation by the customer
  - Temperature range
  - Corrosive environments
  - Dust or dirt
  - Pressure and humidity
  - Vibration and noise
  - Degree of abuse
Environment

Global Environment

- What affect will the product have on the Earth’s environment?
- How will the product be disposed of?

Life Cycle

- **Service Life:** The length of time a product is expected to operate properly without need for repair
- **Product Life:** The length of time a product will undergo production before being replaced with a newer version
- **Planned Obsolescence:** A manufacturing decision by a company to make consumer products in such a way that they become out-of-date or useless within a known period.

Durability and Maintenance

- Product should not need major repairs within the service life
- Routine maintenance should be planned
- Routine maintenance should be easy
  - Plan for access
  - Necessary tools
  - Replacement parts

Design Constraints

The limits on the design and production of a product
- Resources (people, equipment, etc.)
- Budget
- Time
- Energy
- Materials
- Manufacturing Process
- Others
Measurable Values

Each criteria and constraint should be expressed with specific or measurable value(s).
- Evaluation of Conceptual Designs
- Testing Criteria

Image Resources