Design Documentation in ME 2110

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What you will do in ME 2110

• Design and evaluate devices.

• Document these designs using drawings.
  – Drawings should be computer-prepared
  – All design illustrations should represent your work

• Describe and explain the designs in written reports.
Technical Communication—I
Figures

• Drawings display designs
• Flowcharts display sequences of events
• Tables display data
• Graphs show comparisons
• Matrices display decision criteria
• Specification Sheets display evaluation criteria
Technical Communication—II
Describing Figures

• What is shown?
• What is important in the figure or table?
• What does this system do?
• What does this matrix help you to do?
Reports present accomplishments

Accomplishments are tangible:

- A device (shown in a drawing)
- A plan for solving a problem
  (shown in flowcharts and tables)
Reports do not present administration

- Team meetings
- Brainstorming sessions
- Concepts that were discussed but not drawn
Reports require teamwork

Team members must take charge of:

• Text
• Drawing
• Quality
  – Coordinate figure numbers with citations
  – Proofread the document
  – Verify that page design is appropriate
  – Verify that the document is complete
Typical Report Sections

• Abstract

• Introduction

• Overview
  – As appropriate

• Discussion
  – As appropriate

• Conclusions
Abstract

• State Objective.
• State Result.
  (Use numbers when available)
• State Evaluation / Recommendation
  (such as lessons learned)
• List Report Contents.

Do not use figures in the Abstract
Introduction

• State the assigned task.
  – Customer Needs
  – Overall Product Function

• Define the design challenges.

• State what is presented in the report.
Overview

(for Introductory project)

Design Overview
• Display and describe drawings of the device you designed

(for reports on large project)

Planning Presentation
• Display and describe Planning Tools

Concept / Evaluation Presentation
• Display and describe alternatives and evaluation tools
Discussion

**Justification:** How was the design selected?
- Present and describe alternatives and evaluation.
- Present and describe planning tools.

**OR**

**Analysis:** Did the design perform as expected?
- Report system performance.
- Account for failures and for successes.
Conclusions

• Restate the project task.

• Restate the result and evaluation.
Displaying Illustrations

• Make your own drawings
  *If an illustration is not original, you will be in trouble*
• Label the drawings
• Number the figures
• Provide captions
• Cite and describe figures:
  "Figure 3 shows....."
How to display information in drawings
Figure 1. Overview of Leatherman SuperTool

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Subsystem Drawings

How to Use Pliers

To Open: Grip each handle at the blade end and swing them open. You will notice greater resistance as the handles swing fully open. This resistance keeps the handles in place while using the pliers.

To Close: Simply reverse above procedure. It is not necessary to grasp pliers jaw with hands.

Figure 2. Pliers Operation
Detail drawings isolate components

Using the Wirecutters

The regular and hard wirecutters are located in the plier jaws. The hard wire cutter is the small notch at the base of the wire cutting area. The regular wire cutters should be used for softer grades of wire. To prevent damage, hardened wire such as fish hooks should be cut only with the hard wire cutters.
Formal Figure Description

See also section 10.1.3 of the book
Describing Figures

*Description Statements*
1) Citation
2) Objective
3) Listing of labeled features
4) Explanation of operation
5) Discussion (as needed)

*State potential challenges or actual results*
A fully labeled drawing is shown

Figure 9.3 An Air Catapult

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Figure 9.3 is a concept drawing of an air powered catapult. It is used to hurl tennis balls to the scoring zone of the design tournament field. The tennis balls are initially placed on a launch plate, which is connected to a hinge by two lever arms. Two pneumatic actuators are attached to these arms and are anchored to a base plate. Hoses connect these actuators to a T-Valve, which is connected to an air reservoir through a solenoid valve. The solenoid valve is connected to a controller box, which is not shown. To fire this catapult, the controller sends a signal to the solenoid valve. The valve opens to allow a burst of pressurized air to flow from the reservoir to the pneumatic actuators. The actuators extend, thereby forcing the lower arms and platform upward. This motion hurls the tennis ball towards the target.
Labels coordinate with text discussion
Figure 9.3 is a concept drawing of an air powered catapult. It is used to hurl tennis balls to the scoring zone of the design tournament field. The tennis balls are initially placed on a launch plate, which is connected to a hinge by two lever arms. Two pneumatic actuators are attached to these arms and are anchored to a base plate. Hoses connect these actuators to a T-Valve, which is connected to an air reservoir through a solenoid valve. The solenoid valve is connected to a controller box, which is not shown. To fire this catapult, the controller sends a signal to the solenoid valve. The valve opens to allow a burst of pressurized air to flow from the reservoir to the pneumatic actuators. The actuators extend, thereby forcing the lever arms and platform upward. This motion hurls the tennis ball towards the target.

Figure 9.3 An Air Catapult

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Description of Planning Tools

See also section 2.2 of the book
Planning Tool Description

1) Cite the tool
2) State what the tool demonstrates about your work
3) Call out significant entries
   (Cust Needs at left, Eng Char at top, Importance on the side, Strong relationship between…..)
4) State how it impacts your work
HOQ from the book
House of Quality for Personal Transporter

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| Column Σ                       | 22         | 18              | 17             | 15            | 12           | 18            | 30            | 27              | 37                 | 34               |
| Σ(Importance*Relationship)     | 164        | 143             | 143            | 105           | 163          | 242           | 205           | 308             | 28                 |
| Relative Value (Σ/TotalΣ)       | 0.09       | 0.08            | 0.08           | 0.06          | 0.06         | 0.09          | 0.13          | 0.11            | 0.17               | 0.15             |

Target Values
- $<2000
- <25 kg
- 40 kg - 100 kg
- 2 Hrs. Charge
- 4 Hrs.
- 5 min.
- Jogger
- Wheelchair
- <Wheelchair
- <15 deg. stable
- 10 cm
In order to thoroughly define the problems that a personal human transporter must address, the House of Quality shown in Figure 1 was developed. The column on the left lists the customer needs, which are ranked on an importance scale of 1 to 10. The top row displays the engineering requirements that have been identified at this point in the project. The most important customer needs are “Safe Operation,” “Ease of Use,” “Reliability,” and “Terrain Robustness,” which are ranked 10 and 9 in importance.
In order to thoroughly define the problems that a personal human transporter must address, the House of Quality shown in Figure 1 was developed. The column on the left lists the customer needs, which are ranked on an importance scale of 1 to 10. The top row displays the engineering requirements that have been identified at this point in the project. The most important customer needs are “Safe Operation,” “Ease of Use,” “Reliability,” and “Terrain Robustness,” which are ranked 10 and 9 in importance.
Based on this analysis of the problem, the design presented here addresses community acceptance in the requirement of “Sidewalk Compatibility,” and it addresses safety in the requirements of “Terrain Stability” and “Ground Clearance.”