EGG 102: Introduction to Engineering Design
Spring 2002

Design Project

Objective

A new resort "Le Reve," is proposed to be built on the old site of the Desert Inn. Steve Wynn (developer of the Bellagio and Mirage) has proposed that the 1.63 billion dollar project have a water-theme with a constructed lake. Near surface non-potable groundwater will be treated and serve as the water supply (you do not have to worry about the extraction or treatment of this water). Mr. Wynn is looking for ideas for the water feature that will be the centerpiece of the resort. **It is the objective of your design team to design the water feature and build a scale model that meet the following design guidelines.**

Ground Rules and Constraints

1. The sole source of energy for the system is a water spigot (hose bib) that has an operating pressure in the range 30-40 lbs/in^2 (psi)
2. The exhibit must have at least 20 water features (fountains)
3. The fountains must shoot water at least 10 cm (4 inches) high
4. The area of the model should be should fit inside a 0.61 m by 1.22 m (2 ft x 4 ft) area. You are allowed to make it smaller and irregularly shaped.
5. The area of the model should be at least 80% of the rectangular area specified above.
6. The fountain must spray the water inside the exhibit
7. The following materials will available to you at no cost; however, you will need to keep track of what you use and include the material costs in your final budget. ie. If you used 15 tee connections (item f below), your project cost in that category is $1.50.
    a. 0.61 meter x 1.22 meter pegboard that can be used as a base ($10.00)
    b. Two Y-connections for mounting a garden hose ($1.00 each)
    c. Pressure gauge ($5.00)
    d. Adapters from garden hose connection to 1/4 " tubing ($1.50)
    e. Barb connections ($0.10 each)
    f. Elbow connections ($0.10 each)
    g. Tee connections ($0.10 each)
    h. ¼" clear tubing ($0.15 per foot)
8. No team may spend more than an extra $20.00 on the exhibit (costs other than that shown above in #7). Recycled material is permitted and does not count against the $20.00. A record of the extra project expenses, with supporting receipts, must be submitted in your final report. You will be reimbursed for the cost of materials up to $20.00.

Evaluation Criteria

- Height of highest fountain
- Creativity of layout (site layout and plumbing need to be built)
- Creativity of water feature design
- Cost of items 7e-h (need to try to optimize the plumbing costs)
- Demonstration of model (does it function properly?)
- Engineering analysis that supports the design. Remember, someone is going to have to build the full-size version and you have to communicate your vision, rationale and design details to the constructor. Engineering analysis will include general layout and detail drawings, summary of materials, water use and pressure considerations (i.e. could get 2 foot high fountain with 30 psi with total consumption of 1.5 gallons / minute, but needed 40 psi to get 3 feet and a consumption of 2.0 gallons/minute)

Timeline

- **Phase 1: Problem Definition – Thursday of Week 4,** (Report Sections 1.0)
- **Phase 2: Identification of Alternatives – Thursday of Week 6** (Report Sections 1.0, 2.0)
- **Phase 3: Selection of Design Alternatives – Thursday of Week 8** (Report Sections 1.0, 2.0, 3.0)
- **Phase 4: Design Analysis for Preferred Alternative – Thursday of Week 11** (Report Sections 1.0, 2.0, 3.0, 4.0)
- **Phase 5: Presentation and Competition – Thursday of Week 14**
- **Final Report Due – Thursday of Week 14**

Report Format

Title Page
Cover Letter
Table of Contents
List of Figures and Tables
Executive Summary

1.0 **Introduction and Problem Definition** (Formal problem statement, relevant background information, discuss examples and provide photos, etc..)

2.0 **Identification of Design Alternatives** (discuss the various alternatives that are available and feasible, what type of preliminary analysis do you have to perform)

3.0 **Selection of Alternatives** (discuss the methods you will use to select between the alternatives)

4.0 **Description/Design of Preferred** Alternative (discuss the final design alternative, any relevant calculations should be provided, detailed drawings of site and piping network, cost estimate, other design considerations such as government regulations)

5.0 **Conclusions and Recommendations** (include your final recommendations, what additional work should be done, how long will the project take to build, post project monitoring, etc…)

6.0 **References**

7.0 **Appendices**

Responsibility of Team Members
Each team will consist of four or five people. The overall responsibility of the project will rotate among the team members. For instance, one team member will be Lead Engineer, and will responsible for compiling all the information for Phase 1. All team members are to contribute; however, it is the Lead Engineers responsibility to prepare that Phase. Responsibilities will be changed each Phase so all team members are the Lead Engineer at sometime. Other roles that team members will play throughout the project are:

- **Developer** (Steve Wynn) to make sure it is what they want
- **Financer** to make sure it does not cost too much
- **Lead Engineer** to make sure that it works and is safe
- **Government Agency** to make sure it complies with all regulations
- **Contractor** organization that has to build it.

Review of Report
You will be responsible for having the UNLV Engineering Writing Center (TBE B175) review your draft reports before you hand in the different phases. **This is required** and you will not receive full credit if the writing center has not reviewed the report prior submitting it to me. You need to schedule appointments with the writing center and they will have a no show policy where you have to cancel your appointment in person at least one hour prior.