EME 3123 – Fluid Mechanics – Design Project

Wilderness Resort Lodge

Spring 2014, Section 1, Dr. Gerhart

Assigned: Monday, March 17
Preliminary Reply: Monday, March 24
Interim Design Due: Thursday, April 10
Final Design Due: Thursday, April 24

Instructions:

You must work in a team of three of your choosing. Submit one report for your team. I will carefully inspect your preliminary reply and interim design report and make comments to improve your design and process. Then you will have time to work-out any problems or issues, fix mistakes, or alter your design. This should allow you the chance to develop a very good and practical design (assuming that you have substantial work attempted for the preliminary report). The interim design report does not need to be typed and formal, but have it very neat so that I can clearly inspect your work. Your final design report will be typed with the format indicated below. Sample calculations can be done by hand in the appendix, but your calculation/design steps with some equations should be in the main body of the report. I also want your design explained well and readable (i.e., pay attention to presentation and grammar). Since a design report is not the same as a homework assignment, don't just do some calculations with a few numbers in boxes. Explain your steps and show all of your work neatly. A good design with sloppiness and poor explanation will appear like a bad design.

Format:

Abstract – This section is one paragraph or two short paragraphs that briefly describes the main components of your design. It should be a stand-alone section.

Introduction – Describe the problem to be solved, objectives/goals, assumptions.

Description – Include a comprehensive schematic(s) of your final design near the beginning of this section. Then go through the design process with important calculated results and/or graphs, tables, etc. and include additional sketches and drawings if necessary. Be logical in your sequence of this section. Always title (caption) and label any figures. As common practice, any figure in the report must be discussed somewhere in the text.

Conclusion – Summarize the features of your design, the estimated cost to produce it, and the operational cost.

References – Use a standard format for references (e.g., APA, MLA, Chicago)

Appendix – Include hand calculations, lengthy computer print-outs, or anything else that supports your design but is not necessary in the main report. Everything in the Appendix should be noted in the report. For example, "Appendix A shows the detailed calculations of the previous result." Otherwise, the material does not belong in the Appendix and hence the report.

Wilderness Water System

Your rich uncle, Mortimer, has recently purchased a large tract of land in the Upper Peninsula of Michigan. He did not become wealthy by purchasing worthless things, yet the land he bought has no valuable minerals, nor any profit from lumber. It does have a magnificent wilderness resort lodge, but it was abandoned years ago and fell into a dilapidated state. The lodge is known as the Overlook Hotel. (No, not *that* Overlook Hotel from *The Shining*; that place makes people go crazy and is located in the mountains of Colorado.) Before Uncle Mortimer can begin restoration of the Hotel, he needs a modest cottage for multi-day stays while he begins planning. Besides a living room and bedroom, the cottage will have a kitchen with a sink and a bathroom with a shower, sink, and toilet. He also wants a spigot on

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the outside of the cottage for a hose to rinse the dust from his 2014 Ford F-150 SVT Raptor (yes, the plush one with a 6.2L V8 engine). The land has access to electricity. His cottage (and Hotel) will be on a rocky hillside 300 vertical feet above the lake (which is what the hotel will "overlook") and 2200 feet from the lake's edge. A water well cannot be drilled through the rocky hill. After learning of your vast new knowledge of fluid mechanics, he has asked you to design a water system for his cottage. Eventually that same water system will be upgraded to supply the hotel. Your focus should be on the cottage's water system, while keeping in mind that the system will be enlarged in the future. You will need to consider a water delivery system, filter(s), heater(s), a piping system, and other components for this cottage. You must keep in mind that Uncle Mortimer is miserly with his expenses; he did not get rich by wasting money. But Uncle Mortimer is very generous with his family. Therefore if you can design an efficient and cost effective system, you will not only be paid well, you will likely inherit the land and hotel in Uncle Mortimer's will!

Preliminary Reply Investigation: some (not all) considerations during the first week:

- How should water be removed from the lake?
- How much water is needed?
- What are some needs and consequences for Uncle Mort and his customers?
- What major components are needed for approximated water capacity.

Some considerations:

- Ensure that the cottage has typical/sufficient water flow and pressure.
- Be careful with pipe selection (sizing) and material, ensuring that the water is fairly equally distributed throughout the cottage.
- The layout of the water system will determine the layout of the cottage.
- Be cautious that the components and design are not too costly. You should keep track of approximate expenses for components. You do not need to consider installation costs.
- Consider operational expenses for Uncle Mortimer. In other words, choose your water delivery system and heater(s) wisely.
- The hillside continues above the cottage/hotel another 400 vertical feet to the summit in 600 ground feet.
- Consider Upper Peninsula weather conditions.
- You do not need to be concerned with sewage (i.e., sinks, shower, and toilet drains).
- Remember that this system will be upgraded for the entire resort lodge.