

Design Exercise #2. Design of Controller Box

Assigned: 9/30/13, Due Date: 10/14/13 (rough draft)

Grading:

- 15 points (style, grammar, organization),
- 10 points (quality of drawings),
- 10 points (summary of calculations)
- 5 points (Design Content: Functional Requirement-Design Feature Mapping),
- 5 points (Design Content: Cost Estimates)
- 55 points (Design Content: Design Quality, Completeness, Buildability)

The second level functional requirements for your design will be

- A) a container to hold the electronic control components (Vex microcontroller, Radio Shack circuit boards, electrical connectors, panel switches) allowing access to the components & viewing of the lights and protecting the components from environmental conditions (such as water, shock & vibration, and impact).
- B) A frame to provide stiffness for the steering wheels, drive wheels, and to hold the controller box (A). Front and rear steering wheels must mount to either end of the frame. Pivots to attach drive wheels & suspension must be provided in the frame design.**

This design exercise is to develop a design to fulfill functional requirement B.

Constraints:

- A) **Buildable out of in-the-lab materials, components, and a limited amount of purchased structural material**
- B) **Provide controller box mounting detail.**
- C) **Total dimension of the frame + wheels should be 4 feet by 4 feet**
- D) **Each wheel will experience a 200 lbf design load. Frame deflection (to be determined) should not exceed 0.01” Use a design factor of 2 for all load calculations.**

Identify the third level functional requirements for FR B (call them B1, B2, ...).

Design Output:

Produce a report that includes the mapping of Functional Requirements to Design Features.

Discuss special features or design decisions so as to facilitate the selection of your device for the group's build.

Provide a summary of all calculations used to justify your design. You may append (hand-written) detailed calculations; however, you should use the results of your calculations in the body of your report. E.g., 4 10-32 bolts were chosen to affix the wings to the frame. Under 200 lbf load, the maximum shear in each bolt was 20 kip which is comfortably below the 40 kip shear failure strength of the bolt. See Appendix A for detailed calculations.)

Provide assembly drawings to illustrate your design concept. Detailed design drawings are not necessary at this point as it is a rough draft.

Provide an inventory of parts that need to be purchased, along with part numbers and suppliers and cost (put it in a table please).

Parts to be Contained

- Controller Box (FR A)
- Wings for Drive Motors
- Front & Rear Steerable Motors