The Design Report Format

General Requirements

General (10%). A design report should be of high quality (clear, neat, correct grammar and spelling with adequate margins) and follow in order the numbered sections 1-10 below. It should be terse, well illustrated and not crowded. Text should be typed in 12 pt. Times font. Calculations should not be typed; do them with a pencil. Use one side of 8.5 x 11 in paper only.

The report should be assembled in the order of the sections given below, pages numbered and bound by a medium-sized metal binder clip (an inexpensive clamp). **Do not use report covers** and **do not staple** reports. Submit the **original** of the report, not a Xerox copy, on or before the deadline.

This general grade also includes any grievous deductions made on design submittals throughout the semester for incomplete or late work.

Report Organization

Cover sheet. It is recommended that the project assignment sheet(s) be used as a cover. The report must include in order the following ten sections; some sections include subsections.

1. **Project Drawings, Parts List and Bill of Materials (15%).** These summarize and communicate your design and must be sufficient to fabricate the design. Drawings must be roughly to scale and must include (1) a *rendering* of your design, (2) an *isometric assembly* with components 'called-out' and correlated by number or part name with the parts list, (3) *details* to clarify component connections and joints and (4) other *details* as necessary. Use professional conventions. Include all dimensions. Do not draw details of standard 'off-the-shelf' hardware like nuts, bolts, washers, castors, etc., just specify them in the bill of materials and call them out in the drawings. The bill of materials lists (1) structural products and their details (materials, sizes and amounts) necessary to fabricate parts and (2) off-the-shelf hardware. It may include weights and costs. The parts list and bill of materials may be combined.

Table 1: Short Sample of Bill of Materials [with weight and cost added][a]

No.	Part	Quantity	Description	Wt, lbs	Unit Cost, $	Cost, $
1	Leg	8 ft	3" nom. Sch 40 pipe 0.216" wall, wrought steel, seamless	60.60	0.69 lb	41.81
2	Pin	4 ea	0.25" dia. x 2" long 303 stainless steel, cold drawn	0.04	1.09 ea	4.36
3	Bed	1 ea	18" x 24" x 0.032" aluminum 1100 sheet	1.38	2.10 lb	2.90
			Totals	62.02		49.07

a. Note: Quantity usually includes the total quantity (amount, length, etc.) of product used in the entire design. For item No. or Part names in call-outs, length for each is determined from the drawing, not the total value given here. Also note that Sch 40 means item 1 is pipe, not tube, but you may include the word pipe. Weight is the total for the quantity specified. Costs given here are examples and may be inaccurate.

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2. **Methods (15%).** This section summarizes in narrative form your design process: your plan or strategy, approach to solving problems or overcoming obstacles, considerations to achieve function as well as form, technical research done, engineering methods used, and in particular, creative ideas and significant ideas discarded. It addresses key design issues such as safety, standards, material selection, and environmental impact. Keep it less than a page and tie it to other sections, Section 1 in particular.
3. **Assumptions (5% w/ Warnings).** This section is a numbered list of assumptions necessary to enable the design. Justify each one. Cite them where used by number. Assumptions raise warning flags and should be used sparingly and only when absolutely necessary for the design to proceed. AN ASSUMPTION IS ONLY NECESSARY IF THE DESIGN CANNOT PROCEED WITHOUT IT. (For guidelines, read the Design Notes section under Tutorials on the website and discuss this subtle issue in class.)
4. **Warnings.** This covers known deficiencies in the design that are beyond the scope of the project. Warnings serve to alert other engineers and management associated with the project, not the consumer, hence restrict them to technical deficiencies. Do NOT use warnings to avoid doing design that you are capable of doing.
5. **References (5%).** This section is a bibliography of paper, internet and human sources. Cite each where used in the body of the report and list its details in this section. Web Example: AlloyTech, Inc. Pipe Size Chart, http://www.suppliersonline.com (viewed 17 Aug 2007). Other examples can be found in your project assignment sheets, in the Introduction section of the Design Notes on the website.
6. **Data sections (10%).** Data sections establish one place to put basic data which is applicable throughout the design report.

   (1) **Materials Data Table.** Displays property and allowable values and their source. Below the table, provide sample calculations for allowable values. Note: Allowables for metals, plastics, wood and concrete follow different treatments, hence require different sample calculations. Assumptions should also be noted here and listed in Section 3.

   (2) **Loads Data.** Present live loads that the structure must bear. If applicable, calculate dynamic load factors. Dead loads do not appear here, but may be included during design.

   (3) **Other data.** Anthropometric data, codes, i.e., snow loads, standards, i.e., trailer hitch tongue and draw loads.
7. **Calculations (30%).** For each component, show its location within the structure and consider possible loading scenarios. Construct a *Model* for each loading scenario. For each model, draw a *Free-Body Diagram* and do *Analysis*. Then make a *Decision*. Two team members must sign off for each *Decision*. The *Model* displays either the component removed from the structure or the structure itself, with boundary supports. *Free-Body Diagrams* must be drawn even in simple circumstances. *Analysis* is used to determine dimensions or check critical stresses and deformations. The *Decision* sets final nominal dimensions and other conclusions; if it is not obvious, give reasons for it. Title each calculation set by *Component Name*. Sets of calculations should follow a logical sequence. Avoid over-design. Seek a "tight" design near the feasibility limit. Design formulas transformed from conventional analysis formulas should be developed; spreadsheet analysis should be clearly described and a sample hand calculation shown.

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8. **Peer Reviews (5%).** The peer review of your design that was done by another team must be included in the design report. Also include the peer review that your team did for another team. Only the latter peer review will be graded.
9. **Response to Peer Review (5%).** This is your response to the peer review of your design. It outlines suggested revisions you accepted and gives reasons why you rejected the others. Do NOT accept flawed suggestions, but consider all thoughtfully.
10. **Appendix.** If you believe you have information important enough to append, place it after the Response Section (Section 9). Keep it brief or exclude it. You do not get credit for this section, but it may be a convenient way to establish a fact or support an argument in the graded sections of the report.

Report grading

Report grading may vary slightly from section to section from the percent values given above. However, in addition to a general quality grade, one should expect point subtractions for low quality work and errors, and additions for exceptional quality work and creativity.

Grading of calculations. Most instructors will not grade all calculations. Rather, one or more components will be selected for grading. Students may suggest two components which received exceptional effort for grading and the instructor may select one or both of these plus other components at her/his discretion.

Questions on grading details should be discussed with your instructor.