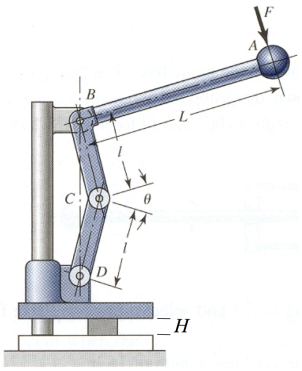
Design Project
ME 4140 Mechanical Design I
Spring, 2015

Due in 280 JC by 5:00 PM on Friday, April 24

Problem Statement: Consider the hand-operated toggle press shown below. Come up with a *single* practical application for such a press, which requires a given press force P for specified values of H and F. In so doing, assume that the overall dimensions are chosen such that θ=10° when H=0, with a maximum operating angle of θ=100°.



Based on a design factor of n=5 against a static failure, determine two *substantially different*, physically reasonable configurations which satisfy the requirements of your chosen application. Restrict your attention to yielding in bending of bar AB and buckling of link CD, which based on past experience are the primary modes of failure. Using preferred sizes, fully specify the dimensions of bar AB (circular cross section) and link CD (rectangular cross section) for each configuration. Assume that all parts are to be machined from commercially available metallic bar stock, and select your materials for optimal strength and weight at a reasonable cost. Compare and contrast your two configurations, and provide recommendations for obtaining a truly optimal design.

Grading: The project grade is based on the submission of a final report, which is worth 20% of the final course grade. The exact same grade will be recorded for each team member (teams of 2). Per the Syllabus, completion of the project is required for a passing course grade. Late projects will be accepted with a penalty of 20%.

Report Format: The report should be prepared using standard word processing software and must contain the following sections:

- Title (10 pts): Include a descriptive title at the top of the first page, with name(s) and date below. Do not include a separate title page.
- Abstract (20 pts): Single-paragraph summary of your ENTIRE project, but no more than 250 words. Your abstract should summarize each of the subsequent sections in one or two sentences.
- Problem Description (10 pts): Fully describe the project specifications and design requirements, assuming the reader has no prior knowledge of the project assignment or your chosen application.
- Analysis and Results (50 pts): Detailed description of analysis procedures and resulting design configurations. Include relevant equations and figures *within the body of the report*, and number them in the order in which they appear. Reference the Appendix for further details and hand calculations. Clearly compare both designs in a table.
- Conclusions (10 pts): Brief summary of what was done, the conclusions drawn from the analysis, as well as final recommendations.
- Appendix: Include all relevant hand-written calculations and/or appropriate computer listings.