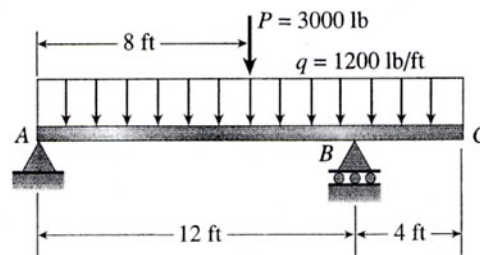


**Strength of Materials  
Spring 2009  
Project Assignment**

A simple beam with an overhang supports a uniform load with intensity  $w = 1200$  lb/ft and a concentrated load  $P = 3000$  lb. The uniform load includes an allowance for the weight of the beam. The allowable stresses in bending and shear are 18 ksi and 11 ksi, respectively.

Select the lightest American Standard (S) beam shape that will support the loads and not exceed either of the allowable stress.

Note that this beam will support a floor on which many members of the general public will be. This fact will need to be carefully considered in terms of factor of safety in your design.



To solve this problem do the following:

1. Find someone in class to work with (2 people per group). Let Dr. Lemley know who you are working with via e-mail by April 10, 2009 at 5:00 p.m.
2. Solve the problem using hand calculations and techniques such as drawing shear and bending moment diagrams and calculation of maximum normal and shearing stresses in beams.
3. Solve the problem using SolidWorks to draw the beam and COSMOS to compute the shearing and bending stress at all points in the beam. Also the beam deflection at all points should be obtained.

Note that your report of your work should follow the standard ASME format:

[http://www.asme.org/Publications/ConfProceedings/Author/Formatting\\_Paper.cfm](http://www.asme.org/Publications/ConfProceedings/Author/Formatting_Paper.cfm)

The report is due on May 5, 2009 by 11:59 p.m.

There is a template for this report on the course web-site:

[http://evan.lemley.org/courses/engr2143\\_spring\\_2009/report\\_template.doc](http://evan.lemley.org/courses/engr2143_spring_2009/report_template.doc)

**The reports should be e-mailed as a single "pdf" file to Dr. Lemley.** If you do not have Adobe Acrobat to make pdf's then you may use either of the following software to create one:

1. Primopdf (<http://www.primopdf.com/>)
2. OpenOffice.org (<http://www.openoffice.org/>)

If you wish to include some hand calculations, they should go into an Appendix, and they will have to be scanned as images, then imported into the document (an alternative is to reproducing the hand calcs. with an equation editor).

**Documentation** – Each two person group will need to submit a group report. The report is due on Dec. 11, 2008 by 11:59 p.m. The report will need to be turned into a pdf and submitted by each group to Dr. Lemley via email by the deadline.

[http://www.asme.org/Publications/ConfProceedings/Author/Formatting\\_Paper.cfm](http://www.asme.org/Publications/ConfProceedings/Author/Formatting_Paper.cfm) for paper formatting)

1. Introduction – the basics of the design problem and your basic objectives.

2. Background –

1. This section should include relevant background theory.

2. In this case this includes governing equations from strength of materials or other disciplines. These equations should be properly formatted. Use of an equation editor is required to make things appear properly.

3. Other background information is needed to, such as general beam design issues – public safety (including the use of factor of safety) must be addressed here.

3. Problem Description – What problem are you tasked with solving (graphics are nice). You may be tempted to reuse the handout that describes the project, but that would be plagiarism, so you will need to rework the description. Also you need to research the problem and lay the groundwork for your choice of beam.

4. Analysis / Calculation Results

1. Hand Calcs. -- Need some sample calculations here – the details of these can go in the appendix. Results of your hand calculations should be shown (use an equation editor to summarize these). A plot of the shear and moment diagrams should be shown (this should be made in Excel, MATLAB, or some other graphing software).

2. Software Analysis (COSMOS) – Drawings of the chosen beam cross section, how you set things up (graphics may be useful for this), shear and normal stress plots, beam deflection plots.

3. Comparison of Hand Calcs and Software results for max shear stress and max normal stress.

4. Conclusions

5. References – see the links above for the correct format.

6. Appendices