

ME556 LAB EXPERIMENT #2
 UNSYMMETRIC BEAMS IN PURE BENDING
 Lab report due by Tuesday, October 25

General Description: The experimental arrangement is shown in Figure 1. A "beam" is subjected to four-point loading ($d = 6.75$ in). The beam consists of three pieces which are bolted together. The central region of the beam is a $\frac{3}{16} \times 2 \times 2$ aluminum angle. Properties of this cross-section are shown in Figure 2*. As indicated in Fig 2, the principal centroidal axes are oriented at 45° with respect to the legs of the angle. The total load P will be applied using a table-top Instron located in MEB Rm 123; maximum load P will be 500 lbf. The channel is made of an unknown aluminum alloy; assume $E = 10$ Msi, $\nu = 0.32$.

Strain gages have been bonded on the aluminum channel at the five locations defined in Figure 3. During the lab you will be directed to perform three tests. During each test you will obtain strain measurements from all five gages as the load P is increased. The angular orientation of the channel (angle θ , defined in Figure 4) will vary from one test to the next.

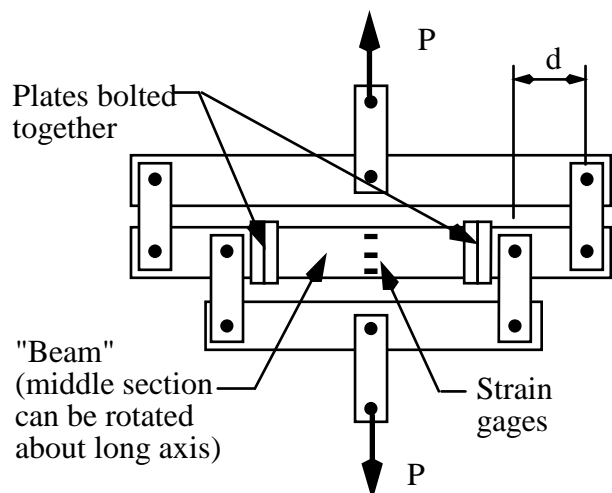


Figure 1: Schematic of Experimental Setup

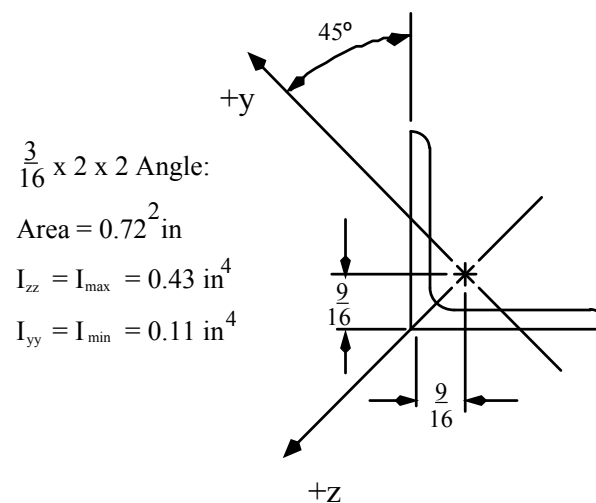


Figure 2: Aluminum Angle Cross-Section Properties

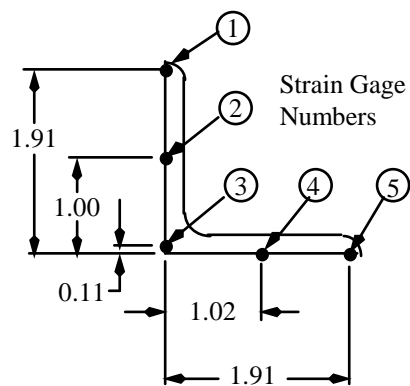


Figure 3: Strain Gage Numbers and Locations (dimensions in inches)

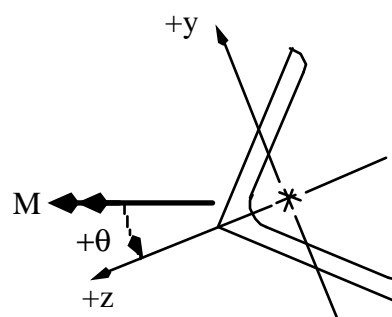


Figure 4: Angular Orientation Angle " θ "

* Cross-sectional properties taken from : *Alcoa Structural Handbook*, The Aluminum Company of America, Pittsburgh, PA.

Performing the Test:

The steps to be followed during the test are described on the DVD labeled "ME 556 Lab #2." Obtain strain measurements for three (3) different beam orientations. One should be $\theta = 0^\circ$, and the other two should be angles of your choice. Simply watch the DVD and follow directions.

Lab Report:

One of the main objectives of this experiment is to compare beam theory with measurement. Submit a brief lab report describing your findings. The report should be organized (roughly) as follows:

- a) Title
- b) Name
- c) Date
- d) Introduction and Objectives
- e) Basis of Analysis (brief summary of theory)
- f) Sample Calculations
- g) Test Procedures
- h) Summary of Results/Conclusions
- i) References (if necessary)

- j) Data
- k) Sketch(es) of experimental set-up
- l) Graphs, plots, etc.
- m) Appendices

Items (d) - (i) *must be limited to three pages.*

Note:

- 1) Laboratory reports must be of professional appearance.
- 2) All text should be written in "third person."
- 3) Plots/graphs must be well-done and computer generated. All axes must be clearly labeled (including units).
- 4) Plots/graphs must be assigned a figure number with an appropriate caption. Similarly, tables must be assigned a table number with an appropriate caption. Refer to figures/tables by number.