I strongly believed that once I graduated, I was not going to need many writing skills because I was going into engineering. I was wrong. I am writing daily. If I knew this back then, I would have taken additional writing courses.

Staff Engineer

My office produces drawings and specifications that are used for construction. The drawings are graphics with text. The text must convey any information the graphics cannot.

Structural Engineer

In the interview process here they have you write a writing sample right when you get to the interview.

Assistant Civil Engineer
Packet Contents

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Workshop Outline

1. Discussion of Effective Engineering Writing and Peer Response/Resources (60 min)—HH

30 Min: Workshop introduction. Students form three groups with each group completing the assigned tasks:

Group 1: Writing Content: Read the Executive Summary section and review the “poor” and “better” executive summary examples. Discuss effective vs. ineffective content.

Group 2: Organization: Review the Guidelines for Lab 1 and the sample Rosette Lab Report. Discuss effective vs. ineffective organization of a report.

Group 3: Formatting: Compare the “poor” and “improved” figures and tables. Discuss effective vs. ineffective visuals in civil engineering writing.

20 Min: Regroup as a class. Develop a list of features of effective content, organization, and formatting in civil engineering writing.

10 Min: Discuss proper techniques for peer response and review the Peer Response Handout. Review resource references including tutors and University Writing Center.

2. 25 Min: Peer Response Exercise—All/EM

Prepare one-page comment sheet with 3 headings: Content, Organization, and Formatting. Exchange Lab 1 Assignment (T/C Strain Gage Report) with a teammate. Review assignment and provide peer response on sheet.

3. 5 Min: Wrap-up—EM

Discuss additional questions as a class. Return papers to teammate and discuss comments. Discuss rewrite of Lab 1 Report, due Week 3.
Section 1. Writing Content—Executive Summaries


Guidelines

The executive summary (ES), often the most influential part of the report, should be written with a busy supervisor or executive (i.e., key decision maker) in mind. It usually aims to influence the executive to take a certain type of action.

The ES should provide a readable, accurate, condensed description of the findings and conclusions that evolved from the project. The ES should contain only information essential to understanding the findings and how they relate to the solution of problems; it is not an abbreviated version of the full report. In short, the ES highlights the purpose of the project and key results so that the conclusions and recommendations may be understood for appropriate action to be considered.

An executive summary should follow a standard format. Generally, an ES is approximately 10% of the length of the final report (excluding appendix). An ES should contain the following items:

- **Introduction.** This section briefly summarizes the background and problem that led to the study, objectives and scope of the project, and the method or approach used. This section should not contain the details of test procedures or calculations (which should be provided in the final report or appendix).
- **Findings.** This section presents what was found and how the resulting findings clarify the problem. Details, tables, figures and other items of use should be in the final report or appendix.
- **Conclusions.** The conclusions discuss what the findings mean beyond the project-specific conditions. Conclusions are based on the results and associated analysis.
- **Recommendations.** The recommendations discuss what should be done on the basis of the findings and conclusions.

An ES is designed to stand on its own—it does not refer to figures, tables, or references contained elsewhere in the full report. Only essential tables may be included in the ES. Define or spell out all uncommon symbols, abbreviations, and acronyms.

Technical writing, including an executive summary, does not typically use first person (I, our, etc.) and the active voice, but rather uses the passive voice. For example, write, “The accuracy of Euler’s equation was examined.” instead of “We examined the accuracy of Euler’s equation.” The main (legitimate) reason for this style is that the passive voice emphasizes results (and objects of actions). The person who conducted the experiment is less important to the reader than the results. If writers use first person with the active voice, it is possible that they may unwittingly emphasize themselves instead of their results!

An abstract is the name given to a one-paragraph summary of a project, including objectives, test approach, results and conclusions/recommendations. It also includes a descriptive title and author name, position, and affiliation. The abstract allows a reader to quickly understand the thrust of the project. It is intended to be a stand-alone document and is often used to determine if a technical paper will be selected for presentation/publication at a conference and is intended to encourage others to read the paper. In the actual publication of a paper, the abstract is usually placed at the beginning.
Example Executive Summaries

Poor Example

Executive Summary

Buckling is important for us to understand. The purpose of this experiment was to compare the experimental values with the theoretical values by using the buckling equation. I used three different columns with different lengths. The fixed-fixed column was 38.75 inches, fixed-pin was 38 7/8 in and pined-pined was 38/78 in. The testing machine applied a comprehensive load and the data was transferred to the computer including load and displacement. The applied load was recorded in pounds and the displacement was in millimeters. The columns could of buckled in either direction because it was not visible to see if the column was bowed initially. The experiment was stopped after the maximum load was applied. The value for E was 3000,000 psi. and the moment of inertia was found for each column according to the length. In fixed-fixed column the load was 4303 lbs and the difference from theory was 2 percent, for fixed-pined it was 4.3 percent and for pined-pined came out to be exact value.

Better Example

Executive Summary

Design of steel columns to prevent buckling is greatly affected by the assumed fixity at column ends. However, the degree of fixity provided by different types of connections is inadequately understood. Therefore, a series of three experiments was conducted to investigate the influence of end fixity on the buckling load for pinned-pinned, pinned-fixed, and fixed-fixed conditions. In addition, the accuracy of the Euler buckling equation, which is commonly assumed to accurately predict the compressive load required for elastic buckling of a column, was studied. The objectives of the experiment were to measure and compare the theoretical and experimental buckling load and the effective length factor for each end condition.

Euler’s equation of the critical buckling load, \( P_{cr} \), for a column without intermediate bracing is:
\[
P_{cr} = \frac{\pi^2 EI}{(kL)^2},
\]
where \( E \) is the modulus of elasticity of steel, \( I \) is the moment of inertia of the steel bar, and \( kL \) is the effective length. The theoretical effective length factor, \( k \), varies for different support systems (1.0, pinned-pinned; 0.7, pinned-fixed; 0.5, fixed-fixed). By loading three 0.5 in x 1.0 in x 40 in steel bars with different end conditions under compression, the experimental buckling loads and effective length factors were determined.

The ratios of experimental-to-theoretical buckling load for the three test specimens were as follows: 0.95 (pinned-pinned), 0.89 (pinned-fixed), and 1.04 (fixed-fixed). The ratios of experimental-to-theoretical effective length factors were: 1.0 (pinned-pinned), 1.13 (pinned-fixed), and 1.07 (fixed-fixed). Although some inaccuracies were introduced during testing by limiting the maximum load placed on specimens and by taking hand measurements for effective length, differences between experimental and theoretical values were only 11% for buckling load and 13% for effective length.

It is evident that the experimental-to-theoretical ratios indicate a high level accuracy for the Euler buckling equation in determining column buckling load and in use of the theoretical effective length factors for pinned-pinned, pinned-fixed, and fixed-fixed end conditions. Therefore, it is recommended that steel column design for elastic columns be based on the Euler buckling equation.
Section 2. Organization—Sections of a Report

Guidelines for Lab 1 Report (Tension/Compression Lab Assignment), updated 2/1/16

Prepare a report using the following outline and guidelines.
(Note: This report does not include other features used in Formal Reports, such as Acknowledgements, Table of Contents, List of Tables and Figures, Suggested Research, etc.)

Title Page
Include the following: name of institution (California State University, Sacramento); Department (Department of Civil Engineering); Course number and title (CE113, Structural Laboratory); Section number and day of the week; Meaningful title of the experiment (Note: it should give the reader an idea of the purpose of the experiment. E.g., “Verification of the Theoretical K Values in the Euler Buckling Equation Using Compression Tests on Slender Columns); Team number (e.g., Team 1); Your name above Team members’ names; Instructor's name (e.g., Prof. Eric Matsumoto); Day and date of the experiment (e.g., Monday, 9/14/09); Day and date report is due (e.g., Monday, 9/28/09). As appropriate, include a meaningful photo of the experiment (e.g., test setup with specimen under load) from the lab as well for a nice touch.

Executive Summary (~3 paragraphs)
Summarize in several paragraphs the test objectives, applicable theory (e.g., key equations), test approach, specific results using ratios, conclusions, and recommendations. For this relatively short report, the executive summary does not need to be on a separate page. See Writing Workshop discussion of Executive Summary for further guidance.

Introduction (~4 paragraphs)
Summarize relevant background and the experiment, stating clearly the objectives and a brief overview of how the objectives were met using test specimens, equipment, and instrumentation. State relevant theory, including numbered equations (e.g., equations for bending stress, Hooke’s law (stress-strain), and flexural strain) on their own line, centered between margins, and place an equation number such as “Eqn. 2” between the equation and the right margin after each equation. Briefly outline the remainder of the report, identifying what will be found in the following sections. Do not give any test results in the Introduction.

Approach (~2-3 paragraphs plus figure)
Briefly explain the test setup for the experiment and include a very professional/neatly schematic drawn diagram to show the setup, labeled as Figure 1 with a caption (Note: show enough detail such as key dimensions on the cantilever and cross section, as well as locations of strain gages). Then, concisely summarize the test procedure using the imperative voice (e.g., Attach, Load, Record, etc.) Using a numbered list, state the steps one should follow to properly conduct the experiment, but add a few sentences at the end to explain any steps you may have altered and why the experiment was not conducted “ideally”. As much as possible, put procedures in your own words. Where you don’t use the imperative voice, use the passive voice. (Do not simply a cut and paste what is listed on the website.)

Results (Several sentences with 2 tables and 1 figure)
In a short paragraph, briefly introduce Table 1, Table 2 and Figure 2. Then, provide the tables and figure. Place the table caption above the table (e.g., Table 1. Measured Flexural Strain for Wheatstone Bridge Configurations) and place the Figure caption below the figure (e.g., Figure 2. Applied Load vs. Average Flexural Strain). The figure is the most important result and should occupy its own (entire) page, using landscape orientation.

Discussion (~3 paragraphs)
Discuss your results, demonstrating your understanding of the data in the tables and figures, related to the objectives. Mention ratios but not actual strain values. Explain how measured strains varied with load and
how strains differed for the different bridge configurations. Also, compare experimental strains to theoretical
strains, and state assumptions, limitations, and anomalies, as appropriate.

Conclusions and Recommendations (1 paragraph)
Briefly state what you can conclude from experimental results and analysis relative to the test objectives. State
at least one recommendation, based on test objectives and conclusions. Do not include meaningless
statements such as “The experiment was a success.”

References
Provide at least 2 references using guidelines and format found on pages 9-10 of:
http://onlinepubs.trb.org/onlinepubs/shrp2/AuthorGuidelinesSHRP2.pdf

References may include the CE113 website, a reference related to flexure, matweb.com (for E_ALUM), etc. Use
a numbered list for references, and, when using the reference in the report, place brackets around the
number. For example, use [2] within the report to refer to reference 2.

Appendix
Provide a labeled cover sheet with a number list of what the Appendix includes, followed by a copy of the
sample calculations and data sheet. 1) Provide your (neat) calculation for P_max. 2) Show a sample calculation
for theoretical strain in terms of applied load, P, and compare it to the experimental value. For example,
choose an actual load level for P and then, using the bending strain equation, calculate the corresponding
theoretical bending strain. Then, calculate the ratio of Actual/Theoretical bending strain, using 3-4 significant
figures in the ratio (e.g., 1.123 or 0.987). Calculations may be done by hand or typed.

Important Guidelines to Follow in Report
1. Write concisely and accurately. Do not use first person (I, we, our, etc.) in technical report writing. Use
11 point font with 1.5 line spacing and 1-inch margins, and show page numbers centered within the
bottom footer, starting with page 1 for the Executive Summary (not cover page). Use past tense
primarily. Use block format for paragraphs with a space between paragraphs (or else use indentation
without skipping a space). Eliminate all usage of an asterisk (*) to indicate multiplication. Eliminate
contractions, run-on sentences, and fragments. Correctly spell “Hooke’s law”.

2. Be careful of units (e.g., use labels of Flexural Strain (Microstrain), Flexural Strain (µε), or Flexural Strain
(in/in x 10^-6). Do not show more or less significant figures than are reasonable. For example, measured
strain is not more accurate than 1 µε, so do not list the measured strain is 435.0 µε. However, the real
strain or calculated average strain may be shown as 435.5 µstrain for accuracy from calculation. For the
slope of the line in Figure 2 use 3 or 4 significant figures.

3. Place data from all tests into a table (Table 1) within an Excel spreadsheet and tabulate the data in
columns with the first column being the load, then the following columns: strains for one top gage, one
bottom gage, the 1/2 bridge measured values, and finally full bridge measured strains. Place the actual
measured data into the spreadsheet, directly from your data sheet. Properly label each column and include
units [e.g., Quarter Bridge Strain, Top (Microstrain); note: It is permissible to use the symbol “µε” to
designate units of Microstrain to reduce the number of characters used in the tables.]. This data is the
measured strain for different Wheatstone bridge configurations.

4. Set up a second table (Table 2) with the loads in column 1, then the following columns: strains for each
1/4 bridge in columns 2 and 3, real strains for the 1/2 bridge (i.e., measured values divided by 2) in the
next column, and full bridge real strains (measured values divided by 4) in the next column. Then, add
another column to Table 2 where you average the four values of real strain. But be sure to use the
absolute value for all strains (i.e., change the bottom 1/4 bridge gage to a positive value when averaging
strains). Do all the calculations on the spreadsheet. You should get relatively close to the same values for
real strains values for all tests, if you conducted the experiment properly.
Now, add another column to Table 2 after the Average Strain, with the heading “Theoretical Strain”. Fill this column with your predicted theoretical strains based on the actual loads you used as stated in your table. Use the equations developed in class. Finally, add a column with the ratio of Actual/Theoretical, with significant digits as follows: 1.123 or 0.987.

Thus, Table 2 includes the actual (measured) strain, average strain, theoretical strain, and Actual/Theoretical strain ratio. All strains are “flexural”.

5. Use the spreadsheet to plot Applied Load vs. Average Real Strain and Theoretical Strain, as given in the last two columns of Table 2. This plot, Figure 2, allows a direct comparison of real strains to theoretical strains. Place the load on the y axis and the strains on the x axis. The test data should be shown as data “points”. In contrast, the theoretical strain should be shown as a solid line without data “points” or symbols—even though you have to plot 2 points to get Excel to plot your theoretical line. Make Excel “hide” the symbols for this theoretical line since the theoretical strain is not actual data. Also include a legend, placed within the plot border so the plot size can be maximized.

Place a trend line through the test data and show the associated linear trend line equation. (Note: Because it is expected that zero load produces zero strain, force the trend line through the origin.) Then compare the slope of the trend line to the slope of the theoretical line (from your hand derived equation) for your comparison of theory to experimental data. This is more meaningful than a comparison of select data. Use 3-4 significant figures for the slopes.

6. Show this plot as a full-page plot in Landscape orientation in your report (for clarity). If printed in landscape mode, the top of the graph will be at the binding side of the report. Do not let Excel place a title at the top of the plot (delete it!); rather, give the plot an accurate and meaningful title in the caption (e.g., Figure 7. Applied Load vs. Flexural Strain), at the bottom of the plot. Properly number and label the graph. Label the axes including units. For flexural strain units, use: “(Microstrain)” or “(in/in x 10^-6)”, rather than other variations. For load, use “(lbs)”.
ROSETTE STRAIN GAGE
WORKSHOP

Happy Student #1

CE113 Structural Laboratory
Wednesday, Section 2
CA State University Sacramento

Instructor: Dr. Toughlove
Performed: xx/xx/xx
Due: xx/xx/xx
Wed, Group # 2
  Groupie 1
  Groupie 2
  Groupie 3
  Groupie 4
  Groupie 5
INTRODUCTION

On September 15, 1999 a cantilever test was performed on a 2024 T4 Aluminum bar. The Rosette Strain gage consists of three independent strain gages. Two of the strain gages are oriented 90° to each other and a third is mounted at a predetermined location between the prior two. In this experiment, the third gage is mounted 45° from either primary axis. This data will be then used along with known material properties and established formulas to determine the nature and magnitude of stresses that arises from such an experiment.

SETUP and PROCEDURE

The 2024 T4 sample specimen in this procedure was previously outfitted with a 350-Ohm, 2.14-gage factor, Rosette strain gage. The test bar was unlabeled, however, sketches within the laboratory identified this sample as Bar #1. The dimension of this bar is 20”x3/8”x3/4”. A 2”portion of the rod was clamped to a stationary object and a weight receptacle was hung from the opposite, unsupported bar end, for the progressive load increases.

The Rosette strain gage was located near the support, on the topside of the sample. Each of the three gages that comprise the Rosette were attached to a Switch and Balance Unit in a ¼ bridge circuit, which was then connected to a P-3500 Strain Indicator. The Switch and Balance Unit allowed personnel to determine strain in each gage without disrupting the test apparatus.

Gage orientation was initially determined with tape measurements and trigonometric calculations. Using these results, the gage closest in orientation to the axis of the bar was calculated have an orientation of 12.4° to the bar axis. The gage was titled Xg. The gage, oriented 45° from Xg is X45. The final gage, rotated 90° from Xg is Yg. Figure 1, on the following page, gives a visual representation of the test setup and gage orientation.

Proper gage factor and resistance was set on the strain indicator and the wiring configuration, which followed device instructions, was checked. This consisted of loading the sample and observing strain in Xg. Positive readings correctly indicated tension. Following this, sufficient 1 lb and ½ lb weights were added to produce approximate strains of 600 in⁻⁶/in for gage Xg. One 1lb and three ½ lb weights were found to provide this level of strain.

Following the initial setup and equipment check, the test procedure begins. To eliminate test apparatus loads from results, strain was monitored and recorded for all three circuits at a zero load. Taking care not to disturb wiring, the initial load is applied and readings were taken from each gage of the Rosette. A reading was taken following application of each of the five loads. In order, these loads are ½ lb, ½ lb, 1 lb, ½ lb and ½ lb. Total combined load is 3 lbs. To help ensure integrity of the test setup, throughout the experiment, a final reading in each circuit is taken at zero load.
RESULTS

The recorded results for the four experiments are listed below in Figure 2. The position of the gage \( X_g \) and \( X_{45} \) suggested that strain along each gage axis would yield positive results. Initial speculation by members of Team 2 was mixed in regard to the nature of strain along gage \( Y_g \). Results from the procedure support the initial predictions for gage \( X_g \) and \( X_{45} \). Both yield positive results, showing the member to be in tension. \( X_g \) is closest to the axial line of the sample and demonstrated the highest tensile strain. \( Y_g \) yielded negative results and is in tension. The magnitude increased with loading along each gage.

The strain vs. load data is also displayed within Figure 2, on the following page. This chart includes all three data groups with a regression trendline plotted through each population. Each trendline is linear and includes a corresponding line equation.
Table 1
Measured Strains for Rosette Strain Gage

<table>
<thead>
<tr>
<th>Load (Lbs)</th>
<th>Measured Strain ε (ue or in(^6)/in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X(_1)</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>0.5</td>
<td>98</td>
</tr>
<tr>
<td>1.0</td>
<td>194</td>
</tr>
<tr>
<td>2.0</td>
<td>384</td>
</tr>
<tr>
<td>2.5</td>
<td>478</td>
</tr>
<tr>
<td>3.0</td>
<td>573</td>
</tr>
</tbody>
</table>

![Strain vs. Load for Rosette Strain Gage](image)

FIGURE 2: STRAIN VS. LOAD for ROSETTE STRAIN GAGE

\[ y = -59.240x - 2.120 \]
\[ y = 90.984x + 0.592 \]
\[ y = 190.336x + 2.568 \]
CALCULATIONS

Reference Load:
The reference load (R.L) for all calculations is derived from the following equation.

\[
R.L = [0.8 + \text{Group} \# \times 0.05] \times \text{Max Load}
\]

Group\# = 2
Max Load = 3 lb

\[
R.L = [0.8 + 2 \times 0.05] \times 3 = 2.7 \text{ lbs}
\]

Reference Strains:
Using the load, R.L in conjunction with the linear equations that represent the strain, produces

\[
\varepsilon_{X_g} = 190.336 \times R.L + 2.568 = 516.475 \text{ in}^{-6} / \text{in strain}
\]

\[
\varepsilon_{X_{45}} = 90.984 \times R.L + 0.592 = 246.249 \text{ in}^{-6} / \text{in strain}
\]

\[
\varepsilon_{Y_g} = -59.240 \times R.L - 2.120 = -162.068 \text{ in}^{-6} / \text{in strain}
\]

Shear strain along gage axis:
Using the relationship \( \varepsilon'_{X} = \varepsilon_{X} \cos^2(\beta) + \varepsilon_{Y} \sin^2(\beta) + \gamma_{xy} \cos(\beta) \sin(\beta) \)

\[
\varepsilon_{X_{45}} = \varepsilon_{X_g} \cos^2(45) + \varepsilon_{Y_g} \sin^2(45) + \gamma_{xy} \cos(45) \sin(45)
\]

\[
\cos(45) = \sin(45) = \frac{1}{\sqrt{2}}
\]

\[
\varepsilon_{X_{45}} = \frac{\varepsilon_{X_g}}{2} + \frac{\varepsilon_{Y_g}}{2} + \gamma_{xy}/2
\]

\[
2\varepsilon_{X_{45}} = \varepsilon_{X_g} + \varepsilon_{Y_g} + \gamma_{xy}
\]

\[
\gamma_{xy} = 2(246.249 \text{ in}^{-6} / \text{in}) - (516.475 \text{ in}^{-6} / \text{in}) - 162.068 \text{ in}^{-6} / \text{in}
\]

\[
\gamma_{xy} = 138.09 \text{ in}^{-6} / \text{in strain}
\]

\[
\gamma_{xy} = 138 \text{ in}^{-6} / \text{in strain}
\]
Normal and Shear Stress in the Gage Axis

\[
\sigma_{x_1} = \sigma_{x_g} \cos^2(\beta) + \sigma_{y_g} \sin^2(\beta) + 2 \tau \sin(\beta) \cos(\beta)
\]

\[
\tau_{xy} = (\sigma_{x_g} - \sigma_{y_g}) \sin(\beta) \cos(\beta) + \tau \cos^2(\beta) - \sin(\beta)
\]

\[
\sigma = \frac{E(\varepsilon + \nu \varepsilon)}{1 - \nu^2}
\]

\[
\tau = G \gamma
\]

Where

E=Modulus of Elasticity\(^1\)=10501 ksi

\(\nu\)=Poisson’s ration\(^2\)=.33

\[
G = \frac{E}{2(1 + \nu)} = 3947 \text{ ksi}
\]

For \(X_g\), the normal stress along the gage axis is

\[
\sigma = \frac{10.501(516.475 + .33(-162.068))}{1 - .33^2} = 5.456E3 \text{ psi}
\]

For \(Y_g\) the normal stress along the gage axis is;

\[
\sigma = \frac{10.501(-162.068 + .33(516.475))}{1 - .33^2} = 98.619 \text{ psi}
\]

The Shear stress of \(X_{xy}\) is calculated by

\[
\tau = G \gamma
\]

\[
\tau = 3947744 \text{ psi} \times 1.384 \times 10^{-4} = 545.183 \text{ psi}
\]

Orientation of the Rosette Strain Gage;

Initial, rough measurements suggested that the \(X_g\) gage was oriented 12.4\(^\circ\) from the axis of the sample bar. Strain gage measurements and calculation have determined this difference to be 5.75\(^\circ\). Error in measurement equals 6.6\(^\circ\). The error in initial angle calculations is understandable. Measurements were made relative to the backing of the gage, not the gage itself and measuring technique was rough. Greater attention to measurement location and greater precision in equipment could remove much of this error.

\(^1\) http://www.Matweb.com
\(^2\) http://www.Matweb.com
Figure 2. Applied Load vs. Flexural Strain

\[ y = 0.0108x \]
\[ R^2 = 1.000 \]
Trendline

1/4 Bridge
1/2 Bridge
Full Bridge

350 OHM, 2.15 Gage Factor, Strain Gage
Figure 1. Applied Load vs. Midspan Deflection
### EXTRAPOLATED DATA FROM DIAGRAMS

<table>
<thead>
<tr>
<th></th>
<th>Moment at left end bolts (lbin)</th>
<th>Moment at right end bolts (lbin)</th>
<th>Moment at center of beam (lbin)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental</strong></td>
<td>-79874</td>
<td>-140487</td>
<td>6.84E+05</td>
</tr>
<tr>
<td><strong>Theoretical</strong></td>
<td>0</td>
<td>0</td>
<td>6.95E+05</td>
</tr>
<tr>
<td><strong>% difference left</strong></td>
<td>11.49</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>% difference right</strong></td>
<td>20.20</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Left Support</th>
<th>Right Support</th>
<th>Midspan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolted (kip-in)</td>
<td>-79.9</td>
<td>-140.5</td>
<td>684.0</td>
</tr>
<tr>
<td>Simply Supported (kip-in)</td>
<td>0.0</td>
<td>0.0</td>
<td>695.4</td>
</tr>
<tr>
<td>Simply Supported/Bolted Midspan</td>
<td>-</td>
<td>-</td>
<td>1.02</td>
</tr>
<tr>
<td>Bolted/Bolted Midspan</td>
<td>-0.12</td>
<td>-0.21</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 1. Comparison of Bending Moments for Bolted and Simply Supported Beam
Section 4. Guidelines for Peer Response

- Balance praise and constructive criticism. Point out what the writer does well and give suggestions for improvement that the writer can use for thinking about revision.

- Comment on content, format, and visuals. Don’t bother editing sentences that may not even be there in the final draft.

- Comment on three or four of the most important areas for revision. Don’t overwhelm the writer with twenty different comments.

- Be specific about what is working and what needs revision. Don’t just write “good” or “unclear.” Say why something is good or why it’s not clear.

- Refer back to the assignment description and the features of effective writing when you comment.
Section 5. Resources for Writing in Engineering*

Campus Writing Resources

University Reading and Writing Center, 128 CLV. See website for hours and contact information: www.csus.edu/writingcenter.

Writing across the Curriculum Resources for Students. Follow link to Student Resources at www.csus.edu/writingcenter.

Engineering Online Writing Guides

http://www.ecf.toronto.edu/~writing/handbook.html

http://writing.colostate.edu/guides/documents/ee-com/

http://classweb.gmu.edu/WAC/iteguide/

http://www.writing.eng.vt.edu/index.html

http://www.grammarbook.com/numbers/numbers.asp

http://onlinepubs.trb.org/onlinepubs/shrp2/AuthorGuidelinesSHRP2.pdf (references)

Writing in Engineering Books

*Introduction to Engineering Communication*, Hillary Hart

*Handbook of Technical Writing*, Gerald Alred et al.

*Technical Communication: A Reader-Centered Approach*, Paul V. Anderson

*Technical Writing A-Z*, Trevor Young

*Note: These are not presented in complete “Reference format” (for details, see http://onlinepubs.trb.org/onlinepubs/shrp2/AuthorGuidelinesSHRP2.pdf).