Prof. Kurtz’s

Homework Standards for Engineering Courses

Lafayette College Engineering Division

Grading System

All homeworks, unless noted otherwise, are graded out of 10 points consisting of:

- 8 points for technical content (correct logic, computations, conclusions).
- 2 points for presentation
- Up to 1 bonus point for exceptional presentation
- One bonus point awarded to the most exceptional homework, designated at the homework solution.
- Occasionally, a homework will simply be marked with a “check.” This means that the student received credit, but no corrections are marked on the assignment. Students are strongly encouraged to check the posted solution.

Why is presentation highly valued?

- Engineers are technical communicators. Strictly speaking, engineers are not paid to produce solutions to problems. Engineers are paid to communicate solutions to problems. Poorly presented calculations are of low value and cost organizations money because of the wasted effort necessary to interpret them. Well-presented calculations save money because of the rapid speed with which they can be checked and used.
- Hand-drawn graphics are important. In some disciplines, the final drafting of design documents is not a part of the engineer’s job description; this is not true for all disciplines, but it is true for some. Instead, final drafting is completed by a professional draftsperson. For these cases, the engineer’s most important form of graphical communication is done by hand: providing sketches to the drafting room, to clients, or to fellow engineers. These graphical skills must be practiced.

Anatomy of Homework Presentation

Good Presentation includes:

- Written on Lafayette College Engineering Paper with pages stapled together.
- Sharp sketches, dimensioned and labeled
- Accurate, brief problem statement (do not copy the professor’s words from the assignment; at least paraphrase them).
- Explicit computations (stating assumptions and logic, while justifying the procedure)
- Penmanship
- Correct units and equations, including appropriate subscripts, where needed.
- Boxed or ballooned major steps, final answers, or important conclusions
- Spelling and grammar
- Label each page: Your name, course name, date, lesson number, page numbering

Examples

See attached.
**EXAMPLES**

The following four pages contain three versions of the same engineering calculation:

- **Version 1.** A well-presented assignment. This assignment would receive 10 points out of 10.
- **Version 2.** A poorly-presented assignment. This assignment would receive 8 points out of 10, or zero points for presentation.
- **Version 3.** An exceptionally well-presented assignment. This assignment would receive a 0.5-point bonus or 10.5 points out of 10.

**Version 1 (grade: 10 out of 10) –** A good, standard homework assignment with the following strong points:

- A sharp, dimensioned and labeled sketch
- Accurate, brief problem statement
- Explicit computations: sufficient description makes it easy to follow. Book is cited, when necessary. Author’s name, the assignment number, date, and page numbers are included.
- Penmanship is good
- Correct units and equations.
- Ballooned major steps and final answers
- Each page labeled with student’s name, date, course, page numbers, and a description of the assignment.

Version 1 is a solid assignment but it will not receive a bonus because its presentation is still somewhat awkward:

- The sketch is not sufficient for an unfamiliar reader to fully understand the problem.
- The layout is not clearly sequential; it jumps around, somewhat.
- Clear distinctions between the problem statement, the given information, and the solution are not made.
- An inconsistent number of significant digits are used.

**Version 2 (grade: 8 out of 10) –** A technically correct, but poorly presented homework assignment:

- A very poor, free-handed sketch
- No problem statement
- Cryptic computations: often difficult to discern what the author is doing (where did numbers come from?). No name, assignment number, page numbers, or date on the sheet
- Penmanship is fair
- Missing units and incomplete equations.
- Ballooned final answer, but intermediate steps are muddy.
- No name, course name, date, page numbering on each page.

**Version 3 (grade: 10.5 out of 10) –** An exceptionally well-presented assignment:

- Writing is extremely clear and neat
- The 3-D view is quite useful
- The solution is chronological in every way
- Every cited table is noted
- There is an obvious hierarchy with consistent indenting so that the reader understands precedence
Design Strength of Member:

\[
\Phi_T = \frac{F_y A_g}{A} = 0.90 \times 6.09 = 274 \text{ kips (Yielding)}
\]

\[
U = 1 - \frac{3}{L} = 1 - \frac{0.698}{L} \leq 0.90
\]

\[
\text{or, could use } U = 0.85 \text{ per LRFD Commentary-83}
\]

\[
\Phi_T' = 0.75 \times 6.09 = 252 \text{ kips (Fracture)}
\]

Max. Weld Size \( a = \frac{t_n}{2} - \frac{z}{16} = 0.28 \times -0.09 = 0.22" \)

Nom. Weld Size \( a = 3/16" \) (LRFD Table 3.2.4 P.16.1-54)

Use 3/16" E70 electrodes

\[\Phi R_{aw} = \Phi t_n (0.6 F_{exx}) = 0.75 \times 0.707 \times 0.6 (7) = 0.48 \text{ kips/m} \]

Strength from Fillet W/o Slot:

\[\Phi T_n = \Phi R_{aw} \left( \frac{2}{16} + 1.2 \right) = 4.18 \text{ kips} \]

Strength Required from 2L = 252 kips

\[T_2 = 184 \text{ kips} = T_2 \frac{9}{4} \text{ kips} \]

Required \( L = \frac{T_2}{\Phi R_{aw}} = \frac{0.68}{4.18} = 8.2" \)

Use \( L = 8 \frac{1}{2} " \) inches

\[T_0 = 1.2 (0.35 T) + 1.6 (0.65 T) = 1.46 T \]

Service Load Capacity \( T = 252 / 1.46 = 173 \text{ kips} \)

Presentation Grade = 2 out of 2.
Total Grade = 10 out of 10
Version 2 (grade:  8 out of 10) – A technically correct, but poorly presented homework assignment

\[ \phi_T = 0.90 \left( \frac{50}{6} \right) \times 2.01 = 274 \]
\[ U = 0.85 \]
\[ \phi_T = 0.75 \left( \frac{65}{0.85} \right) 6.09 = 252 \]

MAX  \[ q = 0.202 - \frac{9}{16} = 0.22" \]  USE \[ q = \frac{3}{16}" \]

MIN.  \[ q = \frac{3}{16}" \]
USE \[ q = \frac{3}{16}" \]  \( \leq 70 \) ELECTRODES

\[ \phi_R = 0.75 \left( \frac{0.70}{0.6} \right) \frac{3}{16} \left( \frac{0.6}{0.70} \right) = 4.18 \]

SIX IN 5 FT WITHOUT SL-7 = 4,13 (44) = 1837 kips

\[ 252 - 184 = 68 \]

2 LESS  \( \left( \frac{68}{2} \right) / u. = 8.2" \]

USE \[ L = 8\frac{1}{2}" \]

\[ \phi_T = 252 - 1.2 \left( \frac{0.357}{0.65} \right) + 1.0 \left( \frac{0.65}{0.357} \right) = 1.46 \]

\[ T = 252 / 46 = 173 \text{ kips} \]

Presentation Grade = 0 out of 2.
Total Grade = 8 out of 10
Problem: Determine the minimum length of slot, L, in order to develop the full strength of a C12 x 20.7 welded to a 3/8" plate. Also, compute the service load capacity.

Given: Service load = 35% dead load + 65% live load
Steel grade is A992 Grade 50.

Solution:

Mode 1: Yielding
\[ \Phi_T = \Phi_t \cdot F_y \cdot A_y = 0.40 \times (50) \times (6.09) = 274 \text{ kips} \text{ (yield)} \]

Mode 2: Fracture

Shear lag factor \[ U = 1 - \frac{x}{L} \leq 0.90 \quad \text{where} \quad x = 0.648 \quad \text{(Table 1)} \]
\[ U = 0.96 \]

Alternatively, one may use \[ U = 0.85 \text{ per LRFD Commentary B3} \]
\[ \Rightarrow \Phi_T = \Phi_t \cdot F_y \cdot A_e \quad \text{where} \quad F_y = 65 \text{ ksi} \]
\[ A_e = U \cdot A_n = 0.85 \times (6.09 \text{ in}^2) \]
\[ (0.75)(65)(0.85)(6.09) = \frac{252 \text{ kips}}{} \text{ (fracture)} \]

Weld Sizing - Max. Weld Size \[ a = t_w = \frac{1}{16} = 0.0625 \times 0.22" \]

Say Max. \[ a = \frac{3}{16}" \]

- Min. Weld Size \[ a = \frac{3}{16}" \text{ per LRFD Table J2.11 (p. 161-56)} \]
  (based on flange thick \[ t_f = 0.50" \])

Weld Capacity Per Inch:
\[ \Phi R_{aw} = \Phi f_e (0.6 F_{exx}) = 0.75 \times (0.701)(3/16)(0.6)(70 \text{ ksi}) = 4.18 \text{ kips/"} \]

(cont’d)
Version 3 (grade: 10.5 out of 10) – An exceptionally well-presented assignment (continued)

**Steel Structures**

2/30/09

**Beautiful Homework Assignment**

**Welded Connections - HW #11**

**Strength From Fillet W/o Slot:**

\[ \Phi T_n = \Phi R_{uw} \left( \frac{2(16)}{2(16)} + \frac{1}{2} \right) \approx 4.18 \times 44 = 184 \text{ kips} \]

**Strength Required From 2L:**

\[ 2L = 252 \times 184 \times 68 \text{ kips} = T_{slo} \]

**Required 2L:**

\[ 2L = \frac{T_{slo}}{\Phi R_{uw}} \]

\[ \Rightarrow L = \frac{(68/2 \text{ sides})}{4.18} = 8.2'' \]

*: Use \( L = 8\frac{1}{2}'' \)

**Factored Load:**

\[ \left[ T_o = 252 \right] = [1.2 (0.35T) + 1.6 (0.65T) = 146T] \]

**Service Load Capacity:**

\[ T = 252 - 173 \text{ kips} \]

Presentation Grade = 2 out of 2
Presentation Bonus = \( \frac{1}{2} \) point
Total Grade = 10.5 out of 10