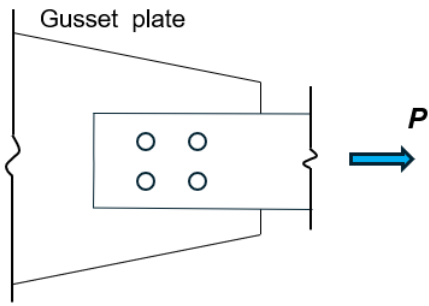
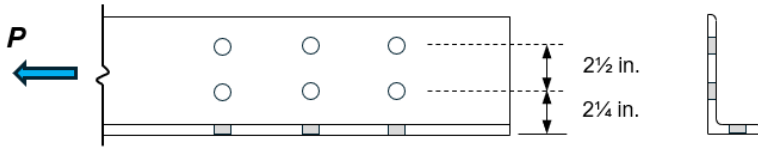


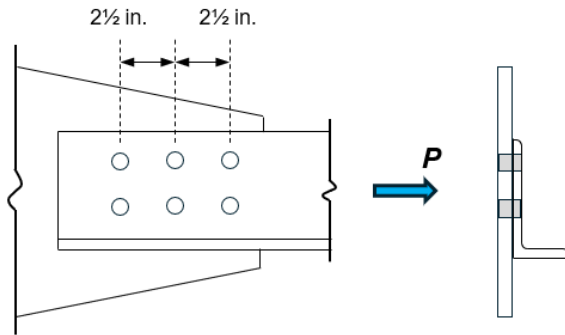
**Classroom Problem 3.2-1:** A tension member consists of a **PL4 x ½** of **A36** steel bolted to an ⅞-in thick gusset plate by four ⅝-in. diameter bolts. What is the design strength for **LRFD**?



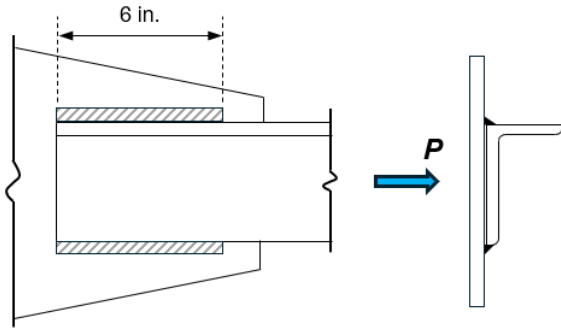
**Classroom Problem 3.2-2:** Compute the maximum acceptable tensile service load on a single angle **L6 x 4 x 3/4** of **A572 Grade 50** steel that is connected along both legs. The 4-in. leg contains a single-gage line of 7/8-in.-diameter bolts, and the 6-in. leg contains a double-gage line of 7/8 in.-diam bolts. The live load is three times the dead load.



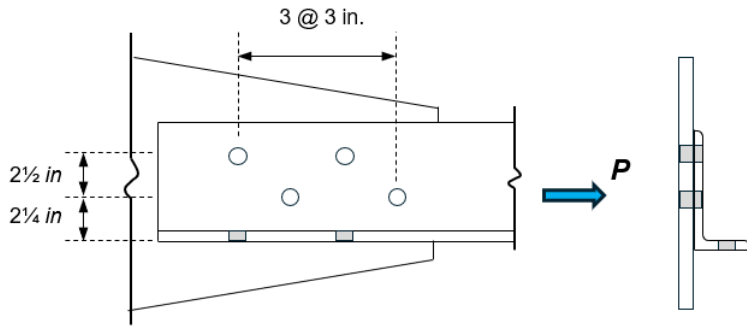
**Classroom Problem 3.3-1:** Compute the maximum acceptable tensile service load on a single angle **L5 x 3½ x ½** of **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) that is connected along both legs. The 5-in. leg contains a double-gage line of ½ in.-diameter bolts. The live load is two times the dead load.



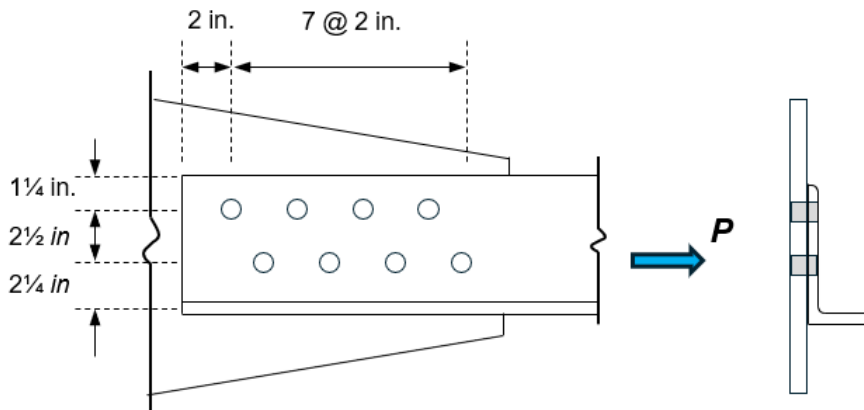
**Classroom Problem 3.3-2:** Compute the maximum acceptable tensile service load on a single angle **L5 x 5 x 3/4** of **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ). The angle is welded to a gusset plate. The live load is two times the dead load.



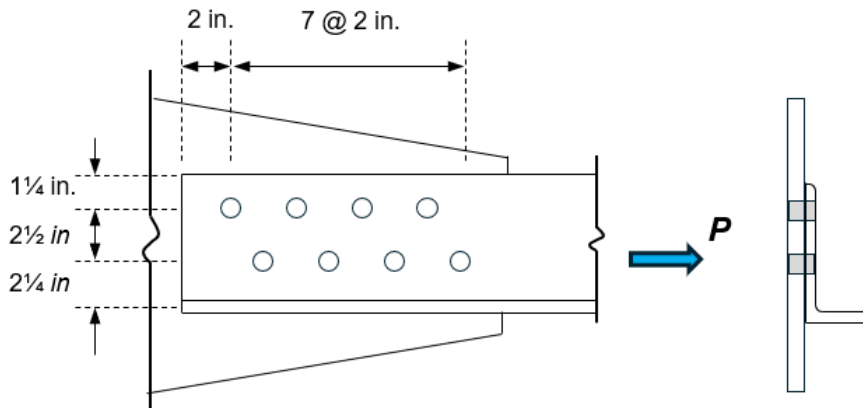
**Classroom Problem 3.4-1:** Compute the maximum acceptable tensile service load on a single angle **L6 x 4 x 1/2** of **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ). The 6-in. leg contains a double-gage line of staggered  $7/8 \text{ in.}$  diameter bolts. The live load is three times the dead load. Neglect of the effects of block shear.



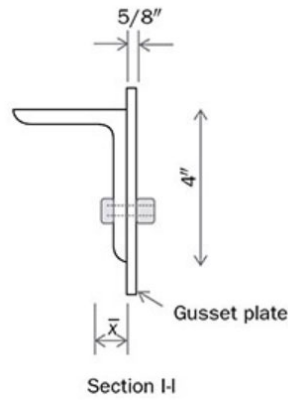
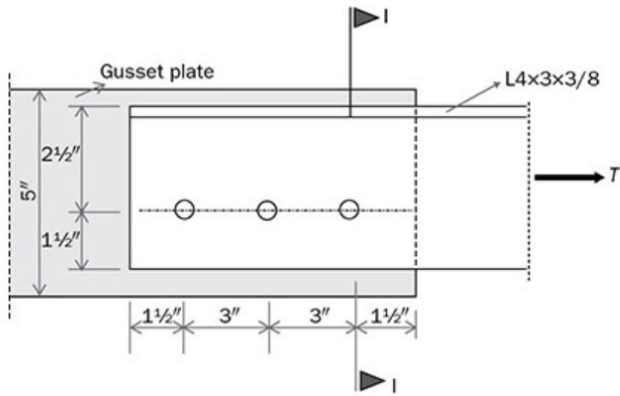
**Classroom Problem 3.4-2:** Compute the maximum acceptable tensile service load on a single angle **L6 x 4 x 1/2** of **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ). The 6-in. leg contains a double-gage line of staggered 7/8 in.-diameter bolts. The live load is three times the dead load. Neglect of the effects of block shear.



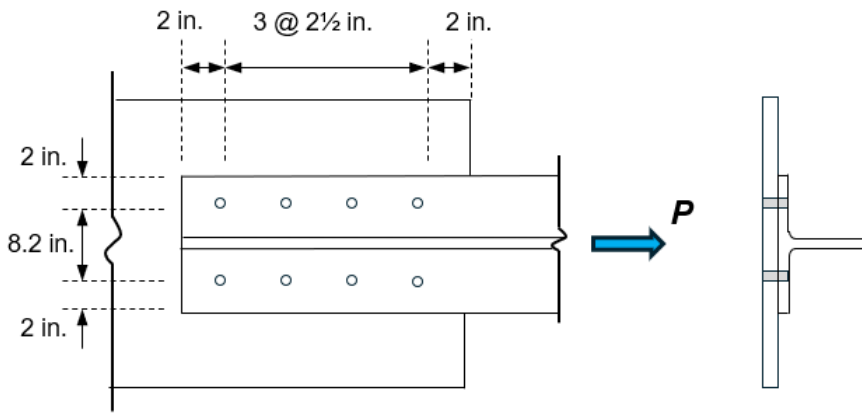
**Classroom Problem 3.5-1:** Compute the maximum acceptable tensile service load on a single angle **L6 x 4 x 1/2** of **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ). The 6-in. leg contains a double-gage line of staggered 7/8-in.-diameter bolts. The live load is three times the dead load.



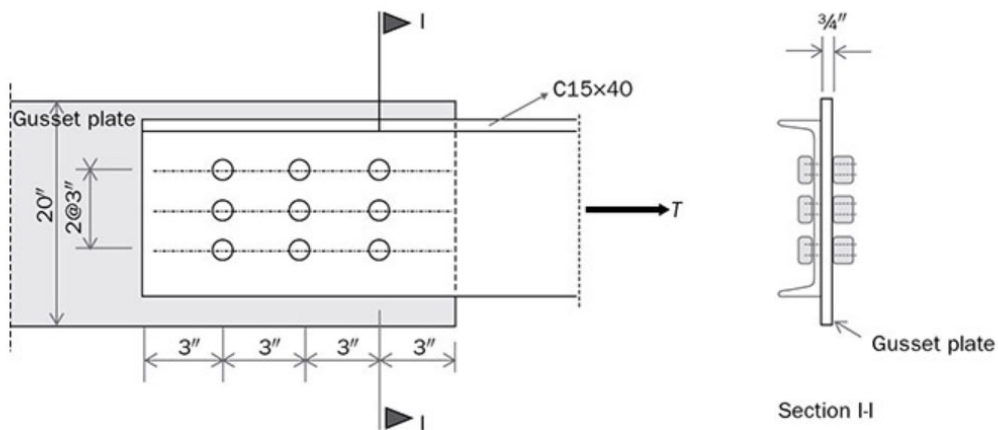
**Classroom Problem 3.5-2:** An angle  $L4 \times 3 \times \frac{3}{8}$  tension member is connected to a gusset plate by three  $\frac{7}{8}$ -in.-diameter bolts in the standard holes. **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) is used. Compute the design strength.



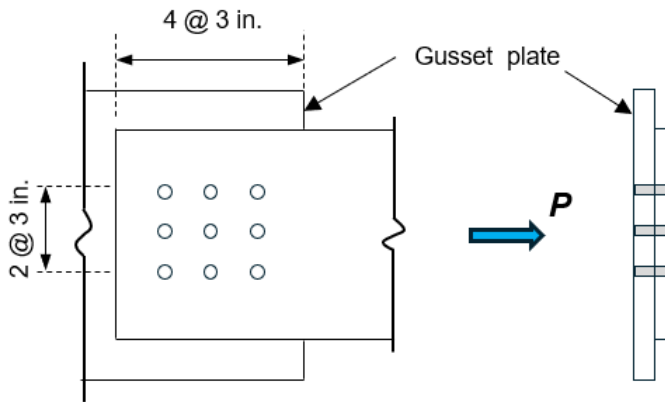
**Classroom Problem 3.5-3:** Compute the design strength for **WT6 x 53** bolted to a **PL24 x 3/4** gusset plate with eight 7/8-in. diameter bolts. **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) is used for the WT shape.



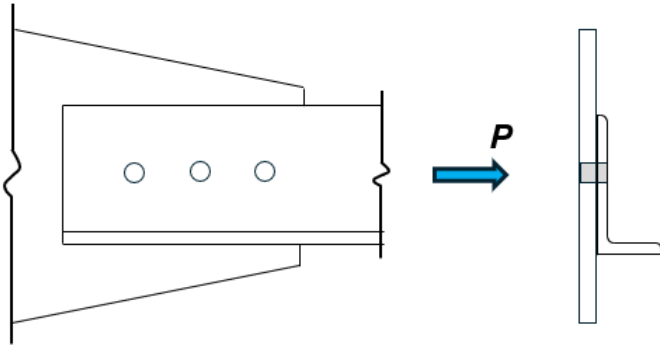
**Classroom Problem 3.5-4:** The structural member consists of channel **C15 × 40** and a plate with 20 in. width and  $\frac{3}{4}$  in. thickness. All three limit states in both the channel and the gusset plate need to be considered. The  $\frac{3}{4}$ -in.-diameter bolts are installed in standard holes, and **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) is used for both the channel and the plate. The tension force  $T$  is due to 70% dead load and 30% live load. Assume  $A_e = 0.85A_n$ . Determine the maximum tension force on the tension member/connection.



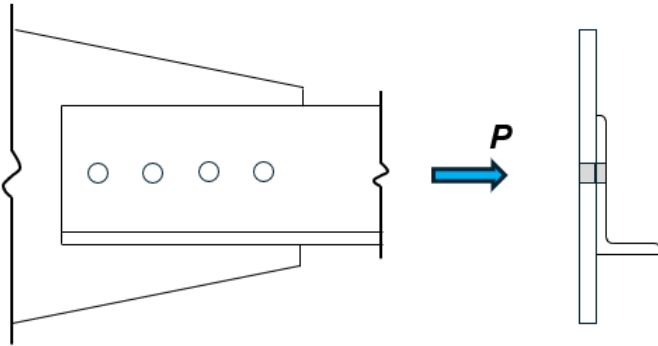
**Classroom Problem 3.5-5:** Compute the design strength for **PL12 x 3/4** plate connected to a 1-in. thick gusset plate with nine 7/8-in. diameter bolts. **A572 Grade 50** steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) is used for both plates. Assume  $U = 1.0$ . The tension force is 40% dead load and 60% live load.



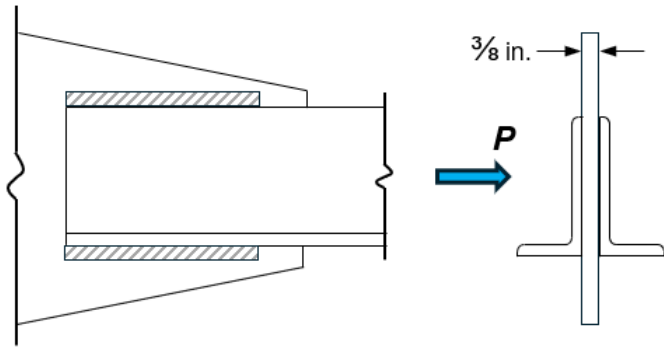
**Classroom Problem 3.6-1:** Use *LRFD* to select a tension member for a roof truss of **A572** Grade 50 steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ). The axial dead load is 60 k, the live load is 6 k, and the member is 12 ft. long. Assume  $\frac{7}{8}$ -in.-diameter bolts located on a single gage line.



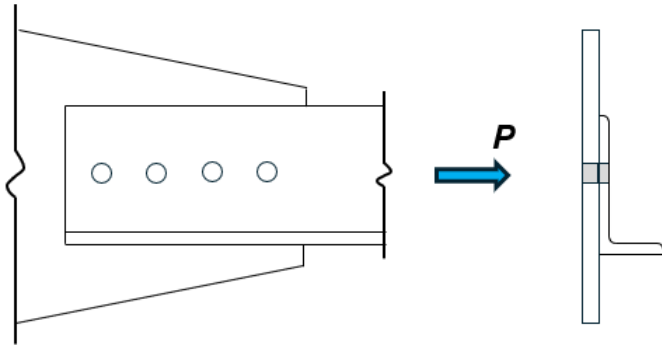
**Classroom Problem 3.6-2:** Use *LRFD* to select a single angle of **A572** Grade 50 steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) to support a dead load of 15 k and the live load is 40 k. The tension member is 15 ft. long. Assume  $\frac{3}{4}$ -in.-diameter bolts located on a single gage line of at least four bolts.



**Classroom Problem 3.6-3:** Use *LRFD* to select a pair of angles of **A572** Grade 50 steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) to support a dead load of 50 k and the live load is 30 k. The tension member is 22 ft. long. Assume the angles are back-to-back, separated by a  $\frac{3}{8}$ -in. gusset plate, and that the connection is welded, and that  $U = 0.85$ .



**Classroom Problem 3.6-4:** Use *LRFD* to select a single angle of **A572** Grade 50 steel ( $F_y = 50 \text{ ksi}$ ,  $F_u = 65 \text{ ksi}$ ) to support a dead load of 15 k and the live load is 40 k. The tension member is 15 ft. long. Assume  $\frac{3}{4}$ -in.-diameter bolts located on a single gage line of at least four bolts. Use **Table 5-2** in Part 5 of the *Manual*.



**Classroom Problem 3.8-1:** A steel truss is loaded with service load  $P$  at points B, C, and D.  $P = 70$  kips, including 60% dead load and 40% live load. Member BC consists of two angles ( $2L 6 \times 4 \times \frac{1}{2}$ ) bolted to a  $\frac{5}{8}$ -in.-thick gusset plate by six  $\frac{3}{4}$ -in.-diameter bolts in standard holes. Check whether member BC is safe based on all three limit states of the angles and the gusset plate block shear. Assume  $A_e = 0.90A_n$ . **A572 Grade 50** steel ( $F_y = 50$  ksi,  $F_u = 65$  ksi) is used for all components.

