

ex/ Given: $\frac{5}{16}$ - 18 UNE, Grade 5, 2.5" long

Grip length = 2"

$F_t = 90\%$ Proof

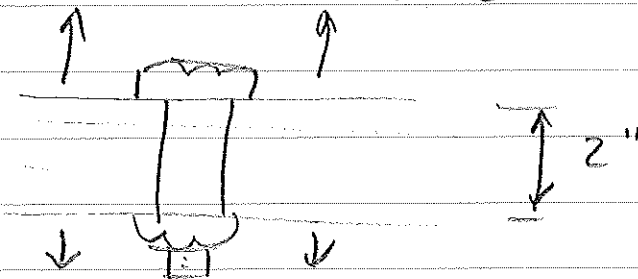
$P = 2000$ lb

the clamped members are all steel.

Find: a) N_s (separation)

b) Yield load factor (FOS w/ P only)

$P = 2000$ lb



SOLN

$$k_b = \frac{A_b E_b}{l_{grip}}$$

$$A_b = \frac{\pi}{4} \left(\frac{5}{16} \text{ in} \right)^2 = 0.0767 \text{ in}^2$$

$$E_b = 30 \text{ Msi}$$

$$l_{grip} = 2 \text{ in}$$

$$k_b = 1.15 \times 10^6 \text{ lb/in}$$

$$k_p R_m = Ed A \exp(Bd/l)$$

15.34

$$A = 0.78715$$

$$B = 0.62783$$

} Table 8.8

$$E = 30 \times 10^6 \text{ lb/in}^2$$

$$d = 5/16 = 0.3125$$

$$l = 2''$$

$$k_m = 8.14 \times 10^6 \text{ lb/in}$$

k

$$C = \frac{k_b}{k_b + k_p} = \frac{1.15}{1.15 + 8.14}$$

0.12

bolt carries

12% of

external load

Preload, $F_i = 90\%$ Proof

$$F_i = (0.9) A_t S_p = (0.9) (0.0524 \text{ in}^2) (85 \text{ ksi})$$

90% Table 8.2 Table 8.9

$$F_i = 4008 \text{ lb}$$

$$F_0 = \text{force to cause separation} = \frac{F_i}{1 - C} = \frac{4008 \text{ lb}}{1 - 0.12} = 4555 \text{ lb}$$

$$n_{\text{sep}} = \frac{F_0}{P} = \frac{4555}{2000 \text{ lb}} = \underline{\underline{2.3}}$$

Load Factor

$$n_L \text{ "A}_{\text{pred}}" = \frac{S_p A_t - F_i}{C P}$$

$$S_p = 85 \text{ ksi} \quad (\text{Table 15.4})$$

$$A_t = 0.0524 \text{ in}^2 \quad \left(\begin{array}{l} 5/16 \text{ NOT in} \\ \text{usual - add to} \\ \text{table 15.1} \end{array} \right)$$

$$F_i = 4008 \text{ lb}$$

$$C = 0.12$$

$$P = 2000 \text{ lb}$$

$$n_L = \underline{\underline{1.9}} \quad - \text{ what does this mean?}$$

A: that the preload is 4000 lb & that the ext force P can be 1.9X P_{design}