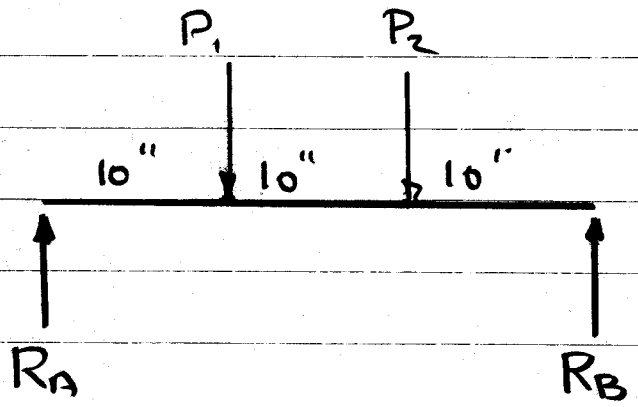
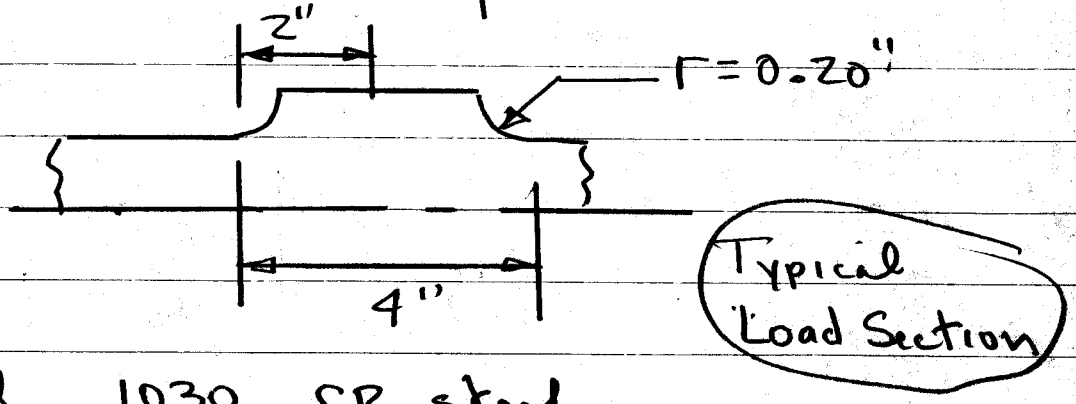
Example 1
Pg 1 of 4

10-7-98



$P_1 = P_2 = 5000$ lb

@ each load point



Typical Load Section

Matl 1030 CR steel

$\sigma_{yp} = 75$ ksi

$\sigma_{ult} = 94$ ksi

Surface: As-forged

$D/d = 1.25$

$r/d = 0.10$

$K_T = 1.75$

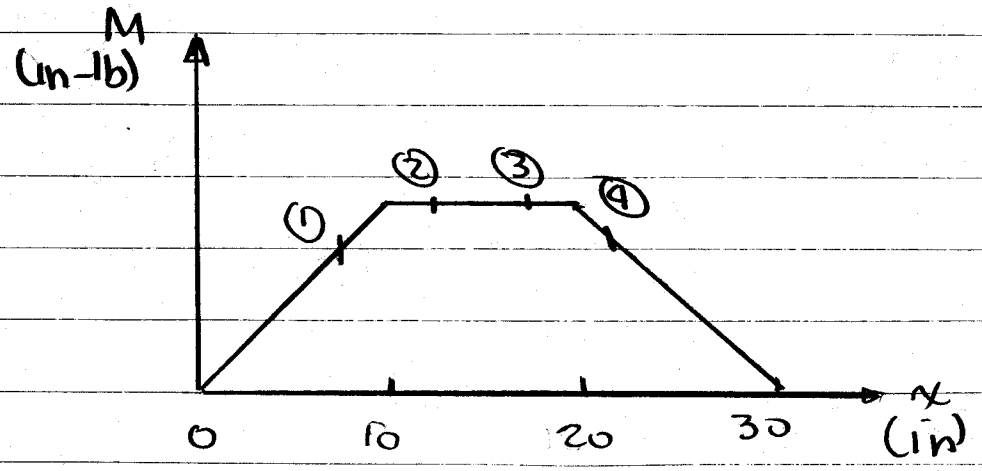
$K_F = 1 + q(K_T - 1)$

$q = 0.88$ $\quad q \sim .92$

$K_F = 1.66$

Example 1
Pg 2-14

$R_A = R_B = 5000$ lb



Need to check 4 places:
2 loads & 2 fillets

$$\sigma = \frac{32M}{\pi d^3}$$

$$S_e = k_a k_b k_c k_d k_e S_e'$$

$$= k_a k_b k_c k_d k_e \frac{\sigma_{ult}}{2}$$

$$= (0.9)\left[(.87)(2)^{-0.09}\right](1)(1)\left(\frac{1}{1.66}\right)(47)$$

$k_a \sim 37$
$k_b \sim 376$

$$S_e = (.20)(47)$$

$$\boxed{S_e = 9.21 \text{ ksi}}$$

$.9\sigma_{ult} = 95$ ksi

$$\sigma = \frac{32 M_{max}}{\pi d^3}$$

$M_{max} = 50{,}000$ in lb @ 2 & 3

$$\sigma = \frac{(32)(50{,}000)}{(\pi)(2)^3}$$

$\sigma = 63.6$ ksi $>> S_e$

Finite Life

Ground surface: $k_a = 0.9$

$S_e = 20.7$ ksi

Need $S_e = 80$ ksi

With ground surface

$S_e = 0.44 S_e'$

$S_{e,req} = 65$ ksi

$S_e' = 149$ ksi

$$S_e' = \frac{\sigma_{ult}}{2}$$

$\sigma_{ult,m} = 295$ ksi $\quad 200$

$S_e' = 100$ ksi

Need to reduce K_F, increase d, or more supports

Example 1
Pg 9 of 9

1030 Steel
Q&T @ 1,000°F

Title _____