

$$C \approx 10.67 \approx 10.7$$

L_s = solid length

$$\tau_s = K_s \frac{8F_s D}{\pi d^3} = \frac{8F_s C}{\pi d^2} K_s$$

Assume let spring deflect from whatever its unloaded length is to the solid height. Plus, let the force required to deflect it be one which will cause the spring to "just reach" the yield strength (stress).

$$\tau = \tau_{yp} = 120 \text{ Ksi} = \tau_{\text{solid}}$$

$$120 \times 10^3 \left(\frac{\text{lb}}{\text{in}^2} \right) = \frac{8F}{\pi d^2} C K_s$$

$$K_s = 1 + \frac{0.5}{C} = 1 + \frac{0.5}{10.7} \quad \text{round-off} \sim \text{no appreciable error}$$

$$K_s = 1.05 \quad \sim \text{check chart - what value do you read? (Pg 16 of notes)}$$

$$F = (120 \times 10^3)(\pi)(.105)^2 / (10.7 \times 1.05 \times 8)$$

$$F = F_{\text{solid}} = 46.2 \text{ lb}$$

L_0 = no load length

$$= S_F + L_s$$

L solid height
deflection under force F_s

$$S_F = \frac{F_s}{k}$$

$$k = \frac{d^4 G}{8D^3 N_a} = \frac{d G}{8c^3 N_a}$$

$$G = 11.5 \times 10^6 \sim \text{steel}$$

$$k = \frac{(.105)(11.5 \times 10^6)}{(8)(10.7)^3(11)} \quad (\text{in})(\text{lb/in}^2)$$

$$L \cdot N_a = N_t - 1$$

(text pg 823 / notes pg 20)

$$k = 11.3 \text{ lb/in}$$

Substituting:

$$L_o = \left(\frac{F}{k}\right) + \underbrace{d N_t}_{\text{notes pg 12, note } N_t}$$

$$L_o = \frac{46.2}{11.3} + (.105)(12)$$

$$L_o = 5.35 \text{ inch} \sim \text{no clash considered.}$$

$$S/L_s = \frac{46.2/11.3}{5.35} = 0.8$$

Fig 13-14/ps 828, assuming
non-parallel ends ~ unstable.