PROB #7.6

$\psi_t = \psi_e = \psi_s = \lambda = 1.0$

c_b = side cover = 3.00 in.

or

$c_b = \frac{4}{2} = 2.00$ in. ←

(a) Assuming $k_{tr} = 0$

$$\frac{c_b + k_{tr}}{d_b} = \frac{2.00 + 0}{1.27} = 1.575 < 2.50$$

$$\frac{\ell_d}{d_b} = \left(\frac{3}{40}\right)\left(\frac{f_y}{\lambda\sqrt{f'_c}}\right)\frac{\psi_t \psi_e \psi_s}{\frac{c + k_{tr}}{d_b}}$$

$$= \left(\frac{3}{40}\right)\left(\frac{60{,}000}{(1.0)\sqrt{4000}}\right)\left(\frac{1.0 \times 1.0 \times 1.0}{1.575}\right)$$

$$= 45.18 \text{ diameters}$$

$$\frac{\ell_d}{d_b}\frac{A_s\,reqd}{A_s\,furn} = (45.18)\left(\frac{3.44}{3.79}\right) = 41.0 \text{ diam.}$$

$$\ell_d = (41.0)(1.27) = \boxed{52.1 \text{ in.}}$$

(b) using calculated value of k_{tr}

$$k_{tr} = \frac{A_{tr} f_{yt}}{1500 s n} = \frac{(2)(0.11)(60{,}000)}{(1500)(8)(3)} = 0.367$$

$$\frac{c_b + k_{tr}}{d_b} = \frac{2.00 + 0.367}{1.27} = 1.864 < 2.50$$

$$\frac{\ell_d}{d_b} = \left(\frac{3}{40}\right)\left(\frac{60{,}000}{(1.0)\sqrt{4000}}\right)\left(\frac{1.0 \times 1.0 \times 1.0}{1.864}\right)$$

$$= 38.17 \text{ diameters}$$

$$\frac{\ell_d}{d_b}\frac{A_s\,reqd}{A_s\,furn} = (38.17)\left(\frac{3.44}{3.79}\right)$$

$$\ell_d = 34.65 \text{ diameters} = \boxed{44.0 \text{ in.}}$$

√gcmc

PROB # 7.10

$\psi_t = \psi_t = \lambda = 1.0$

c_b = side cover = 3.00 in.

or

$c_b = \frac{4}{2} = 2.00$ in. ← $\psi_e = 1.5$ since $c_b < 3''$

(a) Assuming $k_{tr} = 0$

$$\frac{c_b + k_{tr}}{d_b} = \frac{2.00 + 0}{1.27} = 1.575 < 2.50$$

$$\frac{\ell_d}{d_b} = \left(\frac{3}{40}\right)\left(\frac{f_y}{\lambda\sqrt{f'_c}}\right)\frac{\psi_t \psi_e \psi_s}{\frac{c + k_{tr}}{d_b}}$$

$$= \left(\frac{3}{40}\right)\left(\frac{60{,}000}{(1.0)\sqrt{4000}}\right)\left(\frac{1.0 \times 1.3 \times 1.0}{1.575}\right)$$

$$= 58.73 \text{ diameters}$$

$$\frac{\ell_d}{d_b}\frac{A_s\,reqd}{A_s\,furn} = (58.73)\left(\frac{3.44}{3.79}\right) = 53.30 \text{ diam.}$$

$\ell_d = (53.30)(1.27) =$ **67.7 in.** Say 68 in.

(b) using calculated value of k_{tr}

$$k_{tr} = \frac{A_{tr} f_{yt}}{1500 s n} = \frac{(2)(0.11)(60{,}000)}{(1500)(8)(3)} = 0.367$$

$$\frac{c_b + k_{tr}}{d_b} = \frac{2.00 + 0.367}{1.27} = 1.864 < 2.50$$

$$\frac{\ell_d}{d_b} = \left(\frac{3}{40}\right)\left(\frac{60{,}000}{(1.0)\sqrt{4000}}\right)\left(\frac{1.0 \times 1.3 \times 1.0}{1.864}\right)$$

$$= 49.62 \text{ diameters}$$

$$\frac{\ell_d}{d_b}\frac{A_s\,reqd}{A_s\,furn} = (49.62)\left(\frac{3.44}{3.79}\right)$$

$\ell_d = 45.04$ diameters = **57.2 in.**

Say 58 in.

√gcmc

PROB# 7.18

with reference to Table 7.1 in Chapter 7 of text

$\psi_t = \psi_e = \psi_s = \lambda = 1.0$

c_b = cover = 3 in. or

$c_b = \frac{1}{2}$ c. to c. spacing of bars $= \frac{4}{2} = 2$ in. ←

Using ACI Equation 12-1 with $k_{tr} = 0$

$$\frac{c_b + k_{tr}}{d_b} = \frac{2+0}{0.875} = 2.286 < 2.50 \quad \text{ok}$$

$$\frac{\ell_d}{d_b} = \frac{3}{40}\frac{f_y}{\sqrt{f'_c}}\frac{\psi_t\psi_e\psi_s}{\frac{c_b+k_{tr}}{d_b}} = \frac{3}{40}\frac{60{,}000}{(1.0)\sqrt{f'_c}}\frac{(1)(1)(1)}{2.286}$$

Reqd ℓ_d values for #7 uncoated bars;

$f_y = 60{,}000$ psi; A_s reqd = A_s furn

f'_c (psi)	ℓ_d (in.)
3000	31.4
3500	29.1
4000	27.2
4500	25.7
5000	24.4
5500	23.2
6000	22.2

VJC MCE

PROB # 7.24

With reference to Table 7.1 in Chapter 7 of text

$\psi_t = 1.0$, $\psi_e = 1.5$ since cover $< 3d_b$, $\psi_s = \lambda = 1.0$

c_b = cover = 3 in. or ←

$c_b = \frac{1}{2}$ c to c spacing of bars $= \frac{12}{2} = 6$ in.

$$\frac{c_b + k_{tr}}{d_b} = \frac{3+0}{1.128} = 2.66 > 2.50 \quad \therefore \text{Use } 2.50$$

$$\frac{\ell_d}{d_b} = \left(\frac{3}{40}\right)\left(\frac{60{,}000}{\lambda\sqrt{4000}}\right)\left(\frac{1.0 \times 1.5 \times 1.0}{2.50}\right) = 42.69 \text{ diam.}$$

$$\frac{\ell_d}{d_b}\,\frac{A_s \text{ reqd}}{A_s \text{ furn}} = (42.69)\left(\frac{0.87}{1.00}\right) = 37.14 \text{ diam}$$

$\ell_d = (37.14)(1.128) = 41.89$ in. **Say 42 in.**

$> 27''$ available **Not Satisfactory**