

ARCH 614. Assignment #12

Date: 4/15/14, due 4/22/14

Pass-fail work

Problems: from Ambrose & Tripeny, Chapters 14 & 15, pgs 487, and 514.

*Note: Problems marked with a * have been altered with respect to the problem stated in the text.*

- (50%) **Problem 14.1.B***. **USE US UNITS.** A solid one-way slab is to be used for a framing system similar to that shown in Figure 14.1 (*slab on girder supported beams*). Column spacing is 33 ft [10m], with regularly spaced beams occurring at 11 ft [3.33 m] center to center. Superimposed dead load on the structure is 50 psf [2.39 kPa], and live load is 75 psf [3.59 kPa]. Use $f'_c = 4$ ksi [28 MPa] and $f_y = 60$ ksi [414 MPa]. Determine the thickness for the slab and select the size and spacing for the bars. *Also, determine the minimum development lengths of the flexural reinforcement chosen using Table 13.9 on page 469.*
(frame analysis by coefficients and reinforced concrete slab design)

Partial answers to check with: $t \approx 5$ in & ϕV_c enough, $M_{u+end} = 1.82$ k-ft, $M_{u+mid} = 1.59$ k-ft, $M_u = 2.12$ k-ft, $A_s \geq 0.12$ in², $A_{temp-min} \approx 0.11$ in², $L_d = 15$ or 19 in (#3 or #4)

- (20%) **Problem 15.3.C.*** Using Figures 15.7 - 15.10, select the minimum size square tied column and its reinforcement for the following data. *In addition, determine the axial capacity of the column and reinforcement chosen if ties are used ($f'_c = 5$ ksi and $f_y = 60$ ksi).* (*reinforced concrete column analysis and charts*)

Concrete Strength (psi)	Axial Load (kips)		Bending Moment (kip-ft)	
	Live	Dead	Live	Dead
5000	150	200	100	100

Partial answers to check with: $e = 7.0$ in, $\phi P_n = 1078$ kips

- (15%) **Problem 15.3.F.*** From Figure 15.11, determine the minimum size for a rectangular column for the same data as Problems 15.3.C. *Also determine the percentage of savings in reinforcement as compared to the square column (=100xArea saved/original reinforcement or column area).* *In addition, determine the axial capacity of the column and reinforcement chosen if ties are used.* (*reinforced concrete column analysis and charts*)

Partial answers to check with: 51.9% steel saved, ___% concrete saved, $\phi P_n = 793$ kips

- (15%) **Problem 15.3.I.*** Using Figure 15.13, pick the minimum size round column and its reinforcing for the load and moment combination in Problem 15.C. *In addition, determine the axial capacity of the column and reinforcement chosen if spiral reinforcement is used.*
(*reinforced concrete column analysis and charts*)

Partial answers to check with: $\phi P_n = 1295$ kips (text answer wrong)