ARCH 614. Assignment #12

Date: 4/11/17, due 4/18/17

Pass-fail work

Problems: from Ambrose & Tripeny, Chapters 13, pp. 422, 434, and 449
Note: Problems marked with a * have been altered with respect to the problem stated in the text.

(25%) Problem 13.4.B  Find the area of steel reinforcement required for a concrete T-beam for the following data: $f'_c = 4$ ksi, $f_y = 60$ ksi, $d = 32$ in., $t = 5$ in., $b_w = 18$ in., $b_f = 54$ in., and the section sustains a factored bending moment of $M_u = 500$ k-ft. Note: the effective width does not need to be determined because the flange width is provided.

(reinforced concrete beam design)

Partial answers to check with: $a > 1.1$ in, $A_s > 3.5$ in$^2$, 8#6’s don’t work, $A_{s-min} = 1.92$ in$^2$

(25%) Problem 13.5.A  A one-way solid concrete slab is to be used for a simple span of 16 ft. In addition to its own weight, the slab carries a superimposed dead load of 40 psf and a live load of 100 psf. Using the strength method with $f'_c = 3$ ksi, and $f_y = 40$ ksi, design the slab for minimum overall thickness.

(reinforced concrete slab design)

Partial answers to check with: $t \approx 8$ in, $R_n \approx 256$ psi ($\rho \approx 0.007$) #5’s at 7 in. don’t work, $A_{temp-min} = 0.192$ in$^2$

(35%) Problem 13.6.A  A concrete beam similar to that shown in Figure 13.18 (simply supported) sustains a uniform live load of 1.5 kips/ft and a uniform dead load of 1 kips/ft on a span of 24 ft. Determine the layout for a set of No. 3 U-stirrups using the stress strength method with $f_y = 40$ ksi and $f'_c = 3$ ksi. The beam section dimensions are $b = 12$ in. and $d = 26$ in.

(reinforced concrete beam shear analysis and design)

Partial answers to check with: $V_{u-max} > \phi V_c$ so the minimum of required spacing for strength and maximum based on the size of $\phi V_s$ governs with 7 stirrups

(15%) Problem 13.6.C* Determine the layout for a set of No. 3 U-stirrups for a beam with the same data as Problem 13.6.A, except the uniform live load is 0.75 kips/ft and the uniform dead load is 0.5 kips/ft.

(reinforced concrete beam shear analysis and design)

Partial answers to check with: $V_{u-max} < \phi V_c$ so maximum spacing governs with 6 stirrups