CEE 142 REINFORCED CONCRETE DESIGN
PROBLEM SET #7 – COLUMNS

PS7-1, 7-2 Due Monday 3/4/02
PS7-3, 7-4 Due Friday 3/8/02

PS7-1 Compute the M_n - P_n and ϕM_n - ϕP_n diagrams for a 20-inch square column with 8 - #8 bars symmetrically placed around the column. Assume #4 stirrups and 1.5" of cover to the stirrups. Use f'_c = 4 and f_y = 60 ksi. Compute points for: (1) pure tension, (2) zero axial load, (3) balanced condition, and (4) pure axial compression. Also compute one point between (2) and (3) for a = 2 inches, and two points between (3) and (4) for a = 8 and 12 inches.

PS7-2 For a 30-inch square column with 12 - #11 bars, graph the the M_n - P_n and ϕM_n - ϕP_n diagrams using the CRSI Design Handbook (to be handed out in class). Determine the maximum design and failure axial load that can be applied if the axial load is applied at an eccentricity of 6 inches from the column centroid.

PS7-3 Results from a computer analysis indicate that a column must resist 500 kips of axial load (P_u), 3000 ft-kips of moment (M_u), and 200 kips of shear (V_u). Design an economical square and round column using the CRSI Design Handbook.

PS7-4 The 30-inch square column in PS7-3 is used to resist earthquake forces. The column yields, with positive moment at the top of the column and negative moment at the bottom of the column (or visa versa). The column clear height is 12 ft. Using ACI 318-99 provisions in Section 21.4.5 and Chapter 11, determine shear reinforcement required over the column height. Neglect requirements of Section 21.4.4 except as referenced in S21.4.5.