# CIVL 1112 – Assignment #7

**Name:** _____

**Objective**

The purpose of this assignment is twofold: first, to continue to develop your engineering spreadsheet skills, and second, to develop analysis tools that will complement your **concrete beam design project**. Assignment #7 should complement and add capabilities to the spreadsheet you develop in **Assignment #6**.

**Part 1.** Develop a spreadsheet to predict the strength-to-weight ratio (SWR) of rectangular reinforced concrete beams subjected to tension and shear forces. Input parameters should include the height and length of the beam, the amount of reinforcement (both tension and shear), the compressive strength of the concrete, the yield stress of the reinforcement, the unit weight of the concrete, the minimum concrete cover for the reinforcement, the minimum spacing between rebars, and the shear reinforcement spacing.

From these inputs, you should compute the minimum width of the beam, the depth to the center of the reinforcement, the area of steel in $A_s$ in both tension and shear, the $b_1$ constant, depth to the neutral axis, the moment capacity, the ultimate force due to both tension and shear, the weight of the beam, and the SWR. Check to see if the given reinforcement allows the beam to be controlled by tension or compression or if it is in the transitional zone (see **class notes**). Also, compute the development length of regular and hooked reinforcing bars.

Based on the value c/d, determine whether the beam is controlled by tension or compression or is in a transitional area. The predictive value for P is the minimum of the tension, shear, and compression values.

If a > d is "a> d," then write "a>d" next to the cell and **"NG"** in the SWR cell.

If the required width of the beam is computed from the concrete cover, the diameter of the tension rebars, and rebar spacing is greater than 8 inches, then write **"Too Wide"** next to the beam width cell.

If the development length is greater than 8 in., then write "**ld>8**" next to the cells.

**Part 2.** Use your spreadsheet to determine the nominal flexural strength and SWR of the rectangular section given: L = 30 inches, h = 6 inches, $f'_c$ = 7,000 psi, $f_y$ = 60,000 psi, $A_s$ = one #4 bars in tension, one #3 rebar in shear, concrete cover = 1 inch, tension bar spacing = 1 inch, and shear bar spacing = 2 inches.