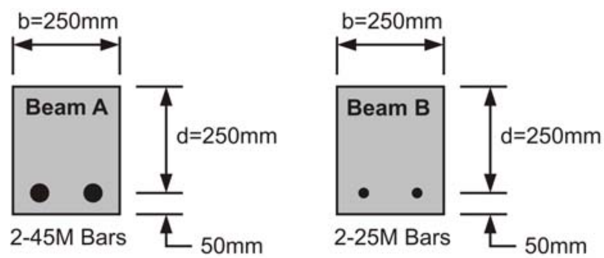
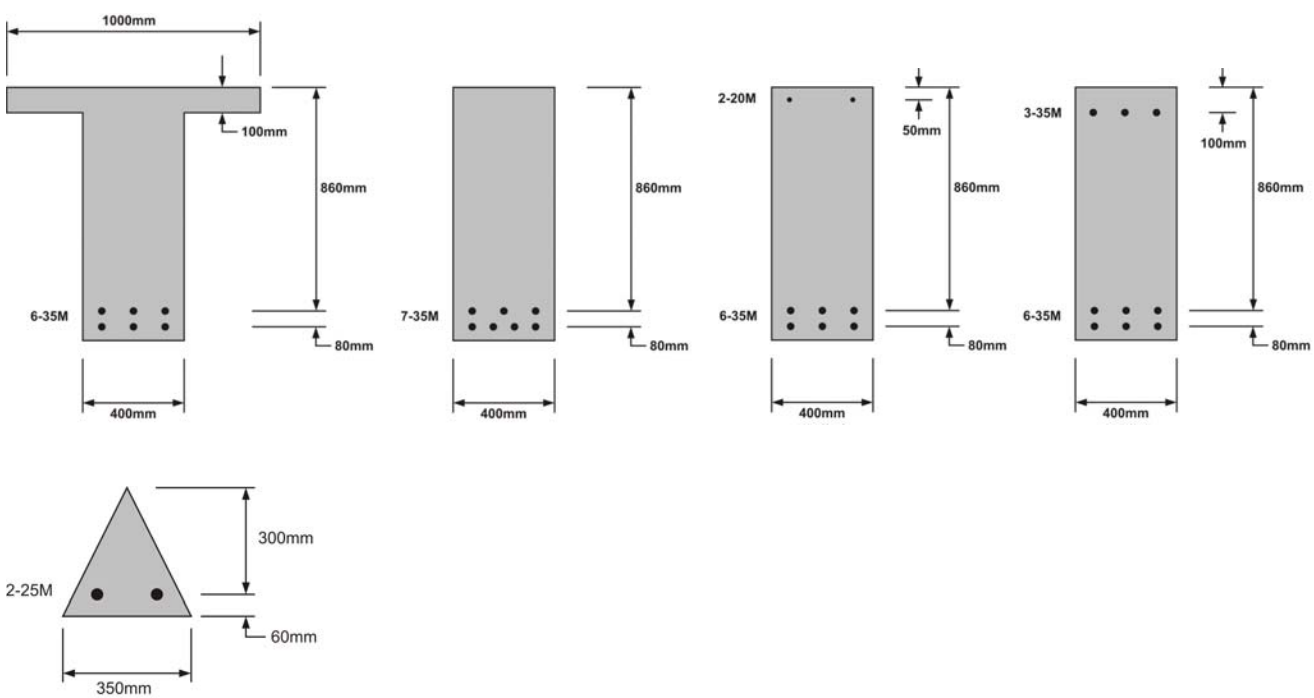
Carleton University
Department of Civil and Environmental Engineering

CIVE 3206 –Design of Reinforced Concrete Components
Assignment #4 –M-ϕ Response and Factored Moment Resistance

1. Calculate and draw the moment-curvature (M-ϕ) curves for the beam sections below. Use a suitable spreadsheet program such as Excel, and use a sufficient number of points to fully capture the shapes of the curves. Plot both curves on the same graph, and comment briefly on the differences in behaviour between the two sections. Identify all important points on the curves, including the points corresponding to cracking, yielding (if this point occurs) and the ultimate moment. Use gross-section properties (I_g) to plot the curves prior to cracking. f'_c=30MPa, ε'_c=-0.002, f_y=400MPa.



2. Calculate the factored moment resistance (M_r) of the sections shown below. For the T-beam, f'_c=25MPa, f_y=400MPa. For the other beams, f'_c=40MPa, f_y=400MPa. For the T-section, also calculate the nominal moment capacity, M_n. (Note: you will have to calculate the effective depth, d, for each of the sections).



This assignment is due at the start of the lecture next Tuesday, February 5 (at no later than 1:05:00pm, EST). Assignments handed in after this time will be considered late.
(see: http://tycho.usno.navy.mil/simpletime.html for the official CIVE 3206 time)