



University of Toronto
CIV352F

Due November 14th 2008

Bridge Design

Problem Set VII

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- 1) Consider an "I" beam made of 3 steel plates 80 x 10 mm welded together (total depth = 10 + 80 + 10 = 100 mm) It is subjected to zero axial force but a shear force equal to 6 metres times the moment.. (That is, for every 1 kNm of moment there is a corresponding 6 kN of shear applied and both of these will increase proportionally). Determine the maximum force that can be applied to the member based on a Von-Mises failure criterion. For this applied failure load, make and label plots showing:
- the longitudinal stress and shear stress distribution over the depth of the member
 - the direction of principal tensile stresses over the depth
 - the principal tensile and compressive stresses with respect to depth
 - the percentage of failure according to the Van Mises Strength criterion.
(Assume yield strength is 350 MPa)
 - the stresses plotted in $(\sigma_1 - \sigma_2)$ stress space where the Von-Mises criterion is an ellipse. Draw on the ellipse as well and indicate which part of the cross section is critical.