

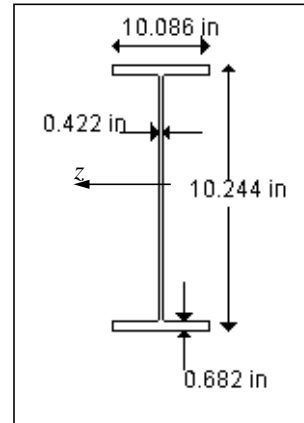
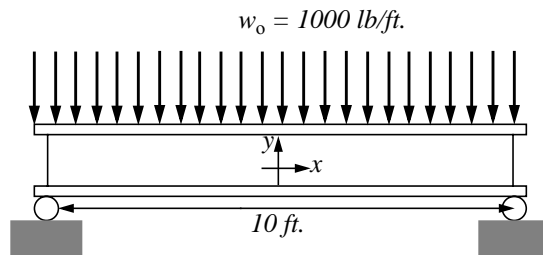
Problem Set #9 1.050 Solid Mechanics Fall 2004

(Due Friday, 12 November)

Problem 9.1

The figure at the right shows the cross section of a steel beam “W10x60” (English units). The moment of inertia about the z axis is given as 344.6 in^4 (See “Tools & Data” Steel Section, MIT server 1.050. Note: Upon launching applet, go to options and choose “Choose Section > W”. Scroll down to W10x60. Click on “Detail” and “English units”).

A beam of this section, 10 ft. in length, is simply supported at its ends and carries a uniformly distributed load of 1000 lb/ft.



W10x60

Sketch the shear force and bending moment diagram.

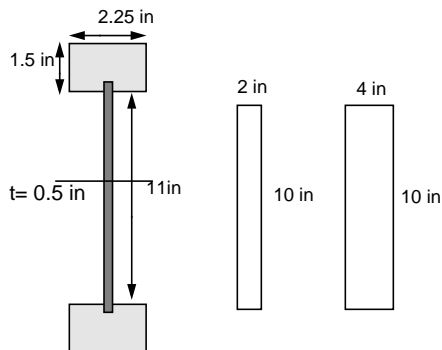
Determine the maximum normal stress due to bending, $\sigma_{x|_{\max}}$; where does it act?

Determine the shear stress σ_{xy} at

- i) a point on the neutral axis, at the left end of the beam
- ii) a point on the web where it meets the flange, again at the left end of the beam.

For (i): Determine the principle stress components, the extreme values of the normal stress components, at the point. Compare these with the maximum normal stress due to bending.

Problem 9.2



In class we computed the moment of inertia of the re-cycled wood chip I section and obtained 320 in^4 .

Compare the relative values for the maximum stress due to bending - given the bending moment - in the wood-chip beam with a standard 2 by 10 in wood beam; with a 4 by 10 in wood beam.

Problem 9.3

Compare the moments of inertia for bending of a hollow tube and a solid shaft of the same area.

