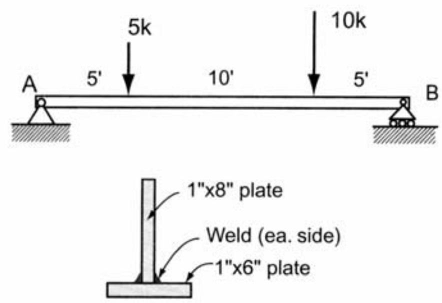
ENDS 231. Assignment #9

Date: 3/29/07, *due 4/5/07* *Pass-fail work*

Problems: from Onouye, Chapter 9.
*Note: Problems marked with a * have been altered with respect to the problem stated in the text. Multiframe2D may be used for V & M diagrams.*

9.1.11 Two steel plates (A572, $F_y = 50$ ksi) are welded together to form an inverted T-beam. Determine the maximum bending stress developed. Also determine the maximum shear stress at the neutral axis (N.A.) of the cross-section and at the intersection where the stem joins the flange.

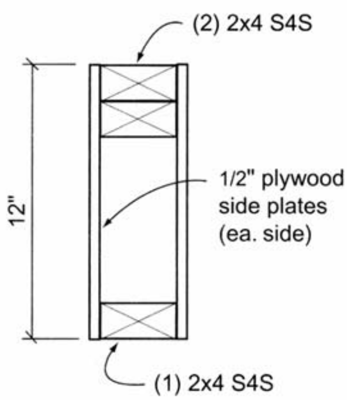


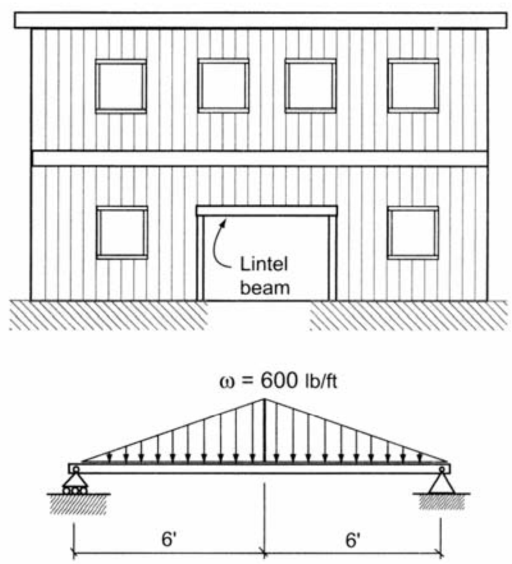
Problem 9.1.11

Partial answers to check with: $\hat{y} = 3.07$ *in from bottom,*
$I_x = 112.6$ in.^{4}, $f_b = 27.6$ ksi,
$f_{v\text{-}max} = 1.37$ ksi, ($Q_{na} = 17.6$ in^3),
$f_{v\text{-}joint} = 1.20$ ksi ($Q = 15.44$ in^3).

9.1.14 A lintel beam 12' long is used in carrying the imposed loads over a doorway opening. Assuming that a built-up box beam is used with a 12" overall depth as shown, determine the maximum bending stress and shear stress developed.

*** Also determine the required pitch spacing for the bottom 2x4 with 1 nail each side (2) with a shear capacity of 300 lb.**





Problem 9.1.14

Partial answers to check with: $\hat{y} = 6.71$ in, $I_x = 496.2$ in.^{4}, $f_b = 1168$ psi, $f_v = 195$ psi ($Q = 53.8$ in^3), $p = 5.3$ in. ($Q = 31.3$ in^3)
Note: The negative area method is quicker for finding I_x.

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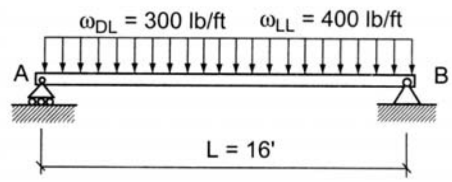
9.1.22 Design a Douglas fir–larch No. 1 beam to support the load shown.

$F_b = 1300$ psi

$F_v = 85$ psi **$*\gamma \approx 32$ lb/ft^3 for Douglas fir**

$E = 1.6 \times 10^6$ psi

$\Delta_{allow(LL)} = L/360$



Problem 9.1.22

Partial answers to check with:

$S_{x\text{-}req'd}$ = 207 in.^{3}, $A_{req'd}$ = 99 in^2., Self weight ≈ 25 lb/ft and new $S_{req'd}$ ≈ 214 in^3, $A_{req'd}$ ≈ 103 in^2. $\Delta_{(LL)}$ ≈ 0.2 in.