

Assignment 7 – APPROACH

METHOD 1

One way to go about this is to set up some (fancy) algebraic expressions for shear and bending moment and solve for the 'w' values directly, namely,

1. Let $M = w_{sw}L^2/8 + w_{DL}^2/8 + w_{LL}L^2/8 = M_{cr} = f_r S \dots$

where $w_{DL} = 1/3 w_a$ and $w_{LL} = 2/3 w_a \dots$ call it w_{cr} .

and solve for $w_a \dots$ CALL IT w_{cr} .

2. Let $V = w_{sw}L/2 + w_{DL}L/2 + w_{LL}L/2 = V_c = 2bdvf_c' \dots$ solve for w_a ($w_{a,v}$ or just w_v)

... being careful to use the correct 'L' values.

3. Let $M = w_{sw}L^2/8 + w_{DL}^2/8 + w_{LL}L^2/8 = M_{ult} \dots =$ solve for w_a (w_{ult}).

4. Let $V_u = 1.2 w_{sw}L/2 + 1.2 w_{DL}L/2 + 1.6 w_{LL}L/2 = \phi V_c = \phi 2bdvf_c' \dots$ (bringing in the factors of safety) then solve for w_a ($w_{safe,v}$).

and

5. Let $M_u = 1.2 w_{sw}L^2/8 + 1.2 w_{DL}^2/8 + 1.6 w_{LL}L^2/8 = \phi M_{ult} \dots =$ solve for w_a ($w_{safe,ult}$).

And then of course choose which 'safe' load governs.

METHOD 2

Solve for M_{cr} , V_c , M_{ult} , ϕV_c , and $\phi M_{ult} \dots$ (which we already did in class) ...

Then set up equations for ...

$$M = w_{sw}L^2/8 + w_{DL}^2/8 + w_{LL}L^2/8 \dots w_{DL} = 1/3 w_a \dots \text{blah, blah} \dots$$

and

$$V = w_{sw}L/2 + w_{DL}L/2 + w_{LL}L/2$$

And with the factors of safety ...

$$V_u = 1.2 w_{sw}L/2 + 1.2 w_{DL}L/2 + 1.6 w_{LL}L/2$$

and

$$M_u = 1.2 w_{sw}L^2/8 + 1.2 w_{DL}L^2/8 + 1.6 w_{LL}L^2/8.$$

And then just start dumping in values of w_a , say, starting with 0, and increasing by, say, 100 plf at a time, until the numbers that crank out hit our various strength values ...

Let's do it this way, using a spreadsheet ...

BABY!