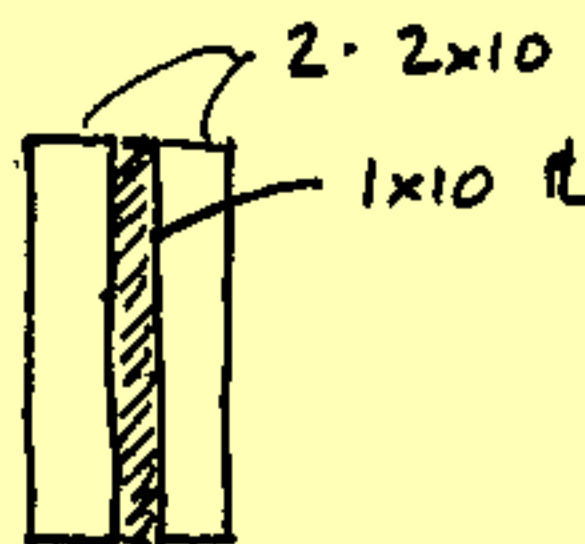
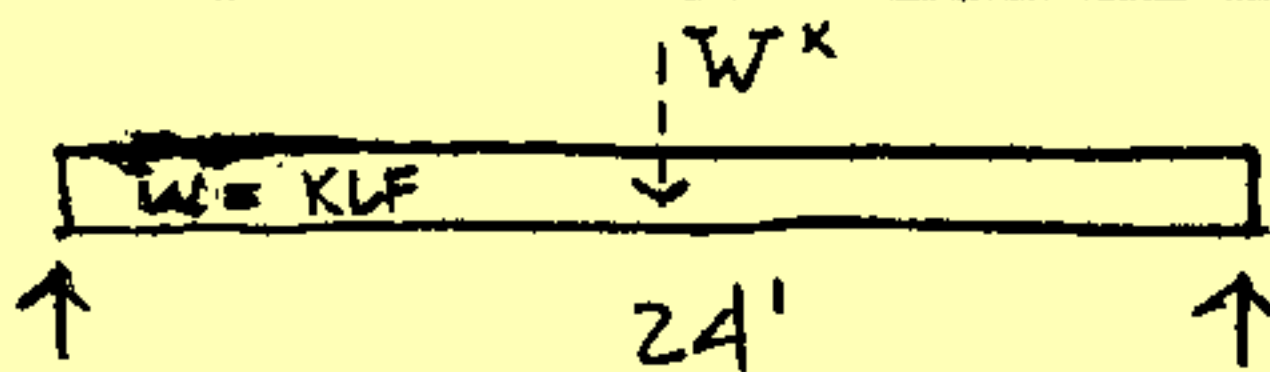


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FOR THE FLITCHED BEAM SHOW
FIND THE MAXIMUM ALLOWABLE
W LOAD.

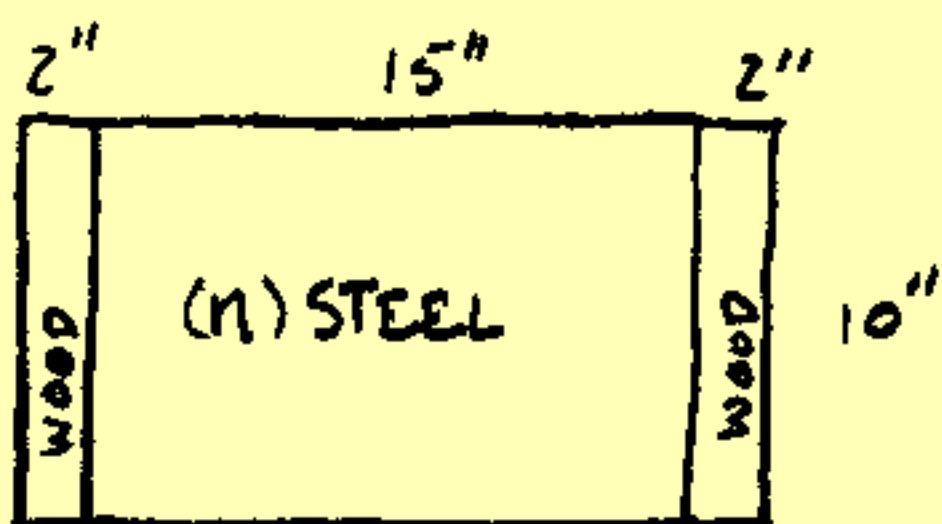
$E_{WOOD} = 2000000 \text{ psi}$

$E_{STEEL} = 30000000 \text{ psi}$

$F_b \text{ WOOD} = 1.5 \text{ ksi}$

$F_b \text{ STEEL} = 20 \text{ ksi}$

TRANSFORMED SECTION:



$$I_{TR} = \frac{bh^3}{12} = \frac{19(10)^3}{12} = 1583.33 \text{ in}^4$$

$$n = \frac{E_{STEEL}}{E_{WOOD}} = \frac{30}{2} = 15$$

FROM $f = \frac{Mc}{I}$

ASSUME WOOD CONTROLS:

$$M_{max} = \frac{wl^2}{8} \quad \text{ALSO} \quad M_{max} = \frac{f I_{TR}}{c}$$

$$\frac{wl^2}{8} = \frac{f I_{TR}}{c} \quad ; \quad w = \frac{f I_{TR} 8}{c l^2} = \frac{1.5(1583.33) 8}{(5)(24 \times 12)^2}$$

$$w = 0.04581 \text{ k/in} = 0.549 \text{ k/f}$$

ASSUME STEEL CONTROLS

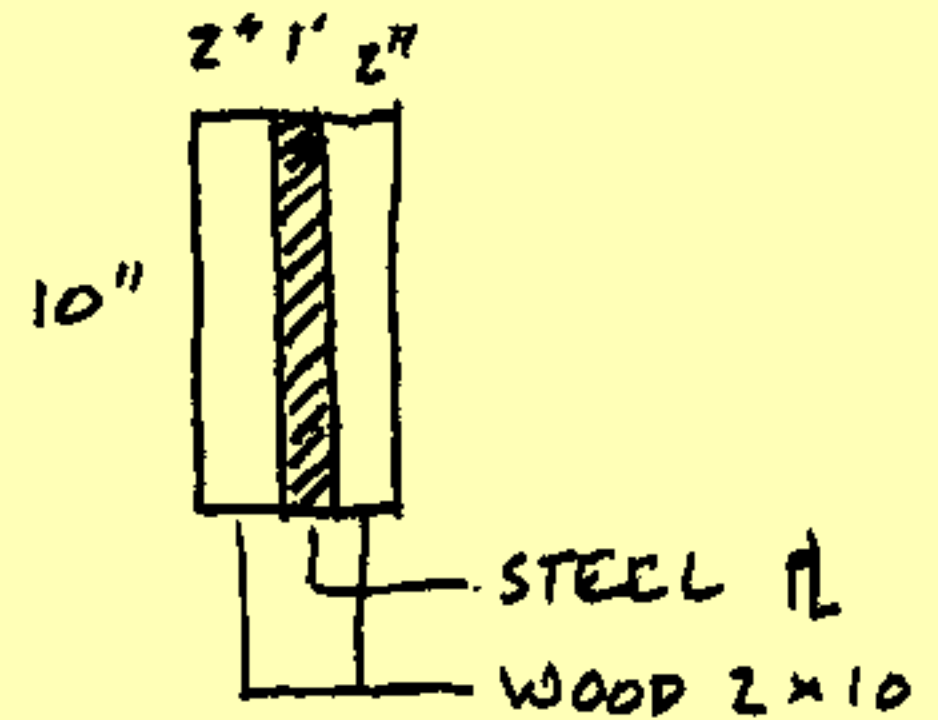
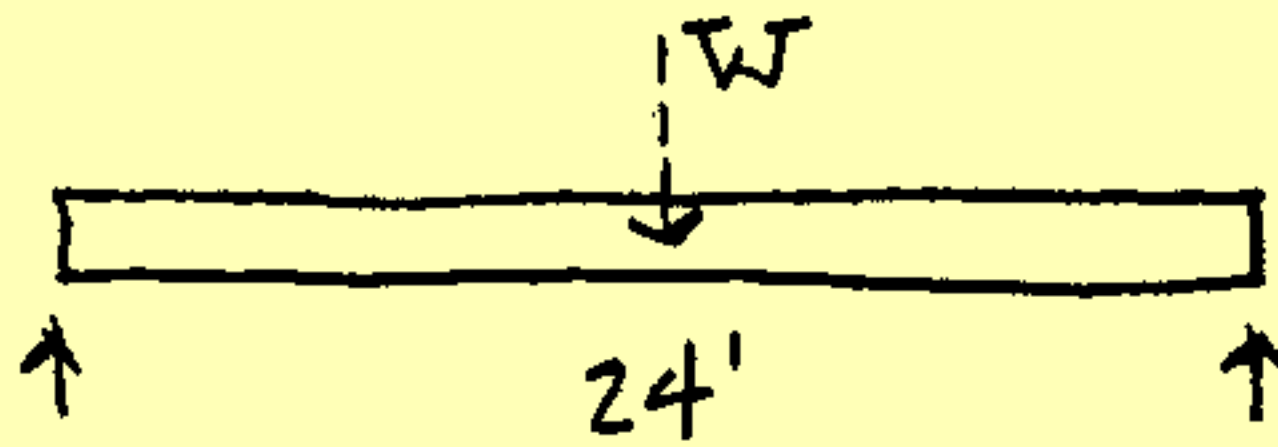
$$w = \frac{f_s I_{TR} 8}{c l^2(n)} = \frac{20(1583.33) 8}{5(24 \times 12)^2(15)} = 0.0407 \text{ k/in} = 0.488 \text{ k/ft}$$

∴ STEEL CONTROLS

$$w = 0.488 \text{ k/ft} \quad \text{AND} \quad \underline{W = 11.7 \text{ k}}$$

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS





$E_{WOOD} = 2,000,000 \text{ PSI}$
 $E_{STEEL} = 30,000,000 \text{ PSI}$

$F_b \text{ WOOD} = 1.5 \text{ KSI}$
 $F_b \text{ STEEL} = 20 \text{ KSI}$

22-141 50 SHEETS
 22-142 100 SHEETS
 22-144 200 SHEETS

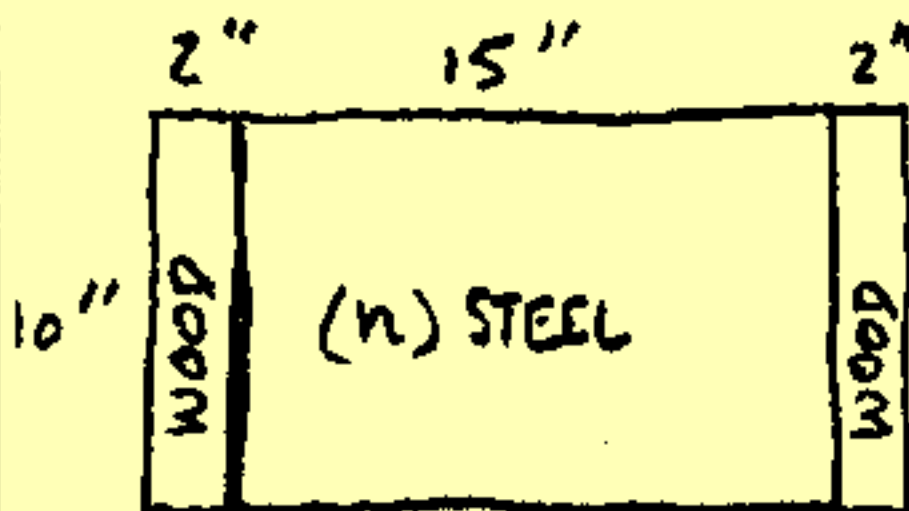


$M_{max} = \frac{W_{TOTAL} l}{8}$; $W_{TOTAL} = \frac{M_{max} 8}{l}$

TRANSFORMED SECTION:

$n = \frac{E_s}{E_w} = \frac{30}{2} = 15$

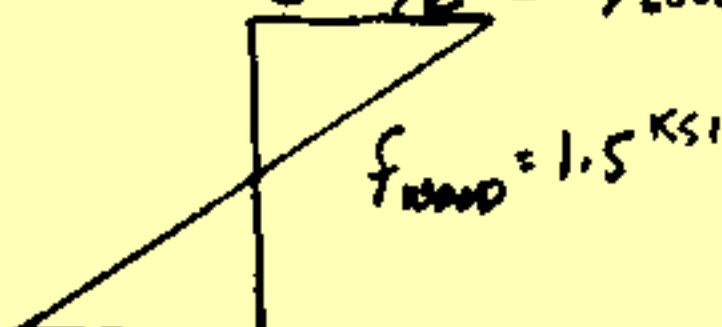
$I_{TR} = \frac{b h^3}{12} = \frac{19 (10)^3}{12} = 1583.33 \text{ in}^4$



STRAIN COMPATIBILITY: (ALTERNATE METHOD)

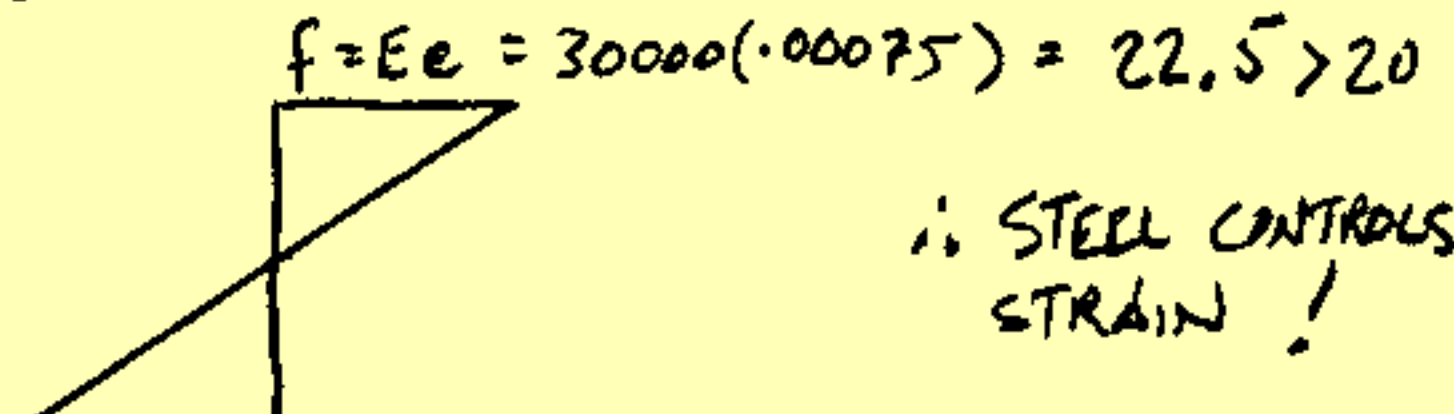
ASSUME WOOD CONTROLS STRAIN

$\epsilon = \frac{F}{E} = \frac{1.5}{2000} = 0.00075$



STRAIN - WOOD

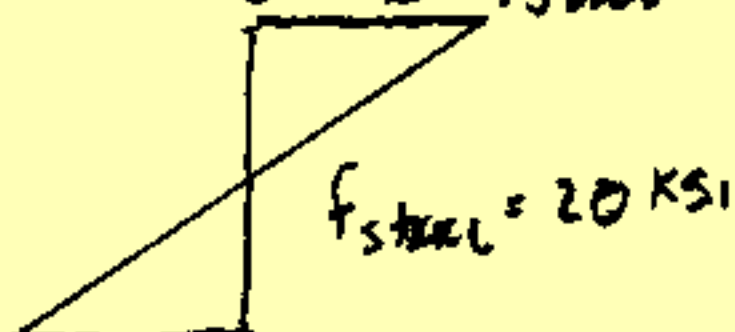
CHECK →



STRESS - STEEL

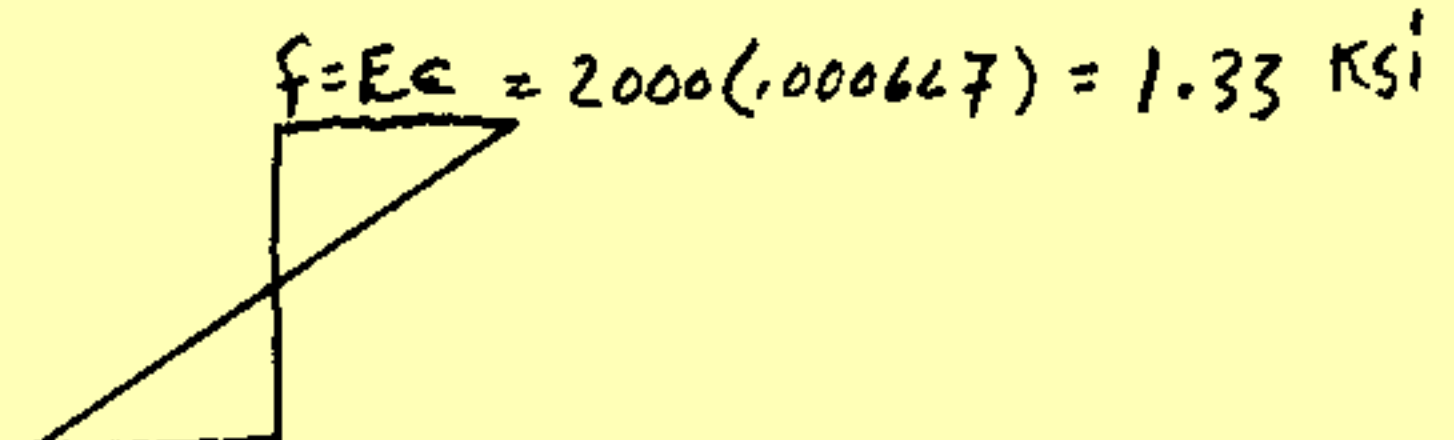
∴ STEEL CONTROLS STRAIN!

$\epsilon = \frac{F}{E} = \frac{20}{30000} = 0.000667$



STRAIN - STEEL

FIND →



STRESS - WOOD

FIND MAX ALLOWABLE MOMENT :

$$f = \frac{M c}{I} ; M = f \frac{I}{c} = \frac{\text{FOR WOOD : } 1.33 (1583.33)}{5} = 422.22 \text{ in-K}$$

$$= 35.185 \text{ FT-K}$$

FOR STEEL :

$$M = f \frac{I}{c(n)} = \frac{20 (1583.33)}{5 (15)} = 422.22 \text{ in-K}$$

$$= 35.185 \text{ FT-K}$$

MOMENTS AGREE !, OK ✓

FIND LOAD W :

$$W = \frac{M}{l} = \frac{35.185 (2)}{24} = \underline{11.73} \text{ K TOTAL}$$