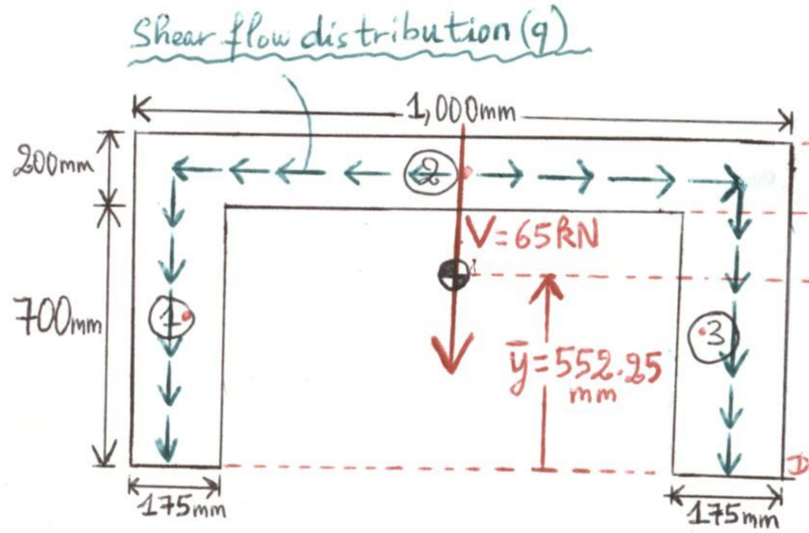
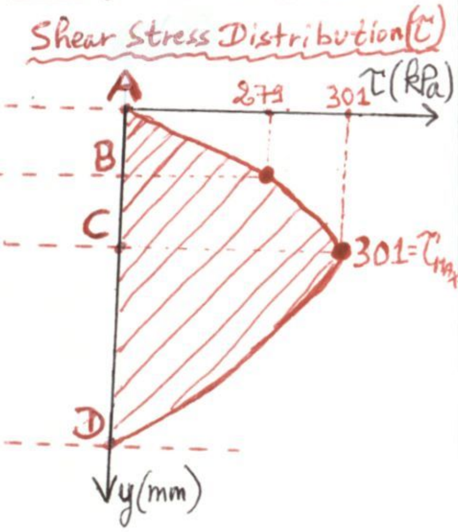
DTY Tutoring, inc.
Email: dtytutoring@gmail.com
Website: www.dtytutoring.com

Date: 6th March 2019





At A & D ⟹ $\tau = 0$

Section	b(mm)	h(mm)	$\tilde{y}$(mm)	A(mm²)	$\tilde{y}A$(mm³)	d(mm) $=\lvert\bar{y}-\tilde{y}\rvert$
1	175	700	350	122,500	42,875,000	202.25
2	1,000	200	$700+\frac{200}{2}$ = 800	200,000	160,000,000	247.75
3	175	700	350	122,500	42,875,000	202.25
				$\Sigma A = 445{,}000$	$\Sigma\tilde{y}A = 245{,}750{,}000$	

$$\bar{y} = \frac{\Sigma\tilde{y}A}{\Sigma A} = \frac{245{,}750{,}000\ mm^3}{445{,}000\ mm^2} = 552.25\ mm$$

$$I_{①} = I_{③} = \frac{bh^3}{12} + Ad^2 = \frac{(175)(700)^3}{12} + (122{,}500)(202.25)^2 = 1.001295349 \times 10^{10}\ mm^4$$

$$I_{②} = \frac{bh^3}{12} + Ad^2 = \frac{(1{,}000)(200)^3}{12} + (200{,}000)(247.75)^2 = 1.294267917 \times 10^{10}\ mm^4$$

$$I_{Tot} = I_{①} + I_{②} + I_{③} = (1.001295 \times 10^{10})(2) + (1.29426 \times 10^{10}) = 3.296858615 \times 10^{10}\ mm^4$$

$$= 3.296858615 \times 10^{10}\ mm^4 \left(\frac{1 \times 10^{-12}\ m^4}{1\ mm^4}\right) = 0.03296858615\ m^4$$

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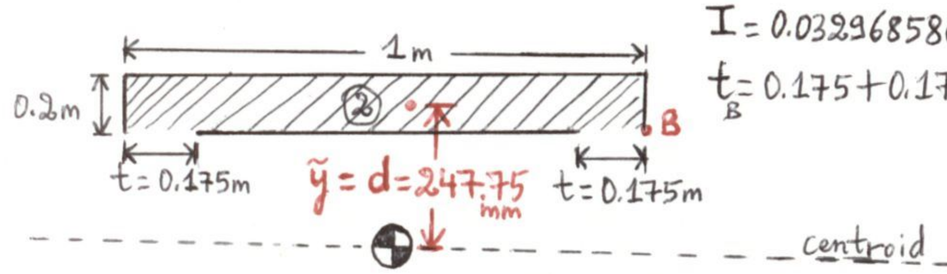
Shear Stress at point B, τ_B

$V = 65\ kN$

$I = 0.03296858615\ m^4$

$t_B = 0.175 + 0.175 = 0.35\ m$



$$Q_B = \Sigma \tilde{y} A = (0.24775m)(0.2m)(1m) = 0.04955\ m^3$$

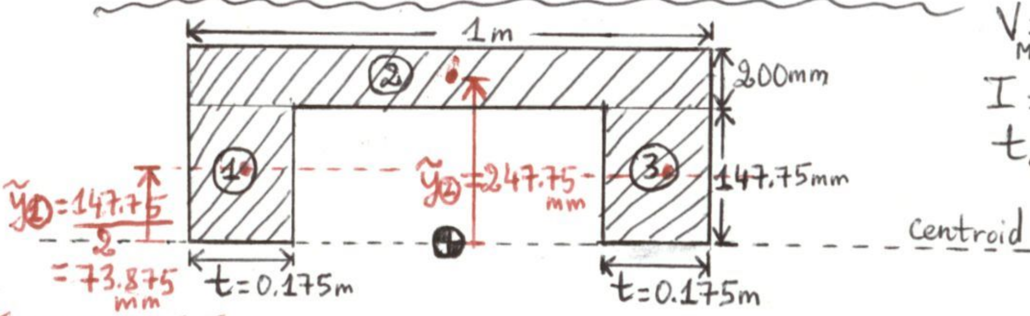
$$\tau_B = \frac{V Q_B}{I t_B} = \frac{(65\ kN)(0.04955\ m^3)}{(0.03296858615\ m^4)(0.35m)} = 279.119\ kPa$$

Shear Stress at point C, Centroid, $\tau_C = \tau_{MAX}$

$V_{MAX} = 65\ kN$

$I = 0.03296858615\ m^4$

$t_C = 0.175 + 0.175 = 0.35\ m$



$\tilde{y}_1 = \tilde{y}_3 = 0.073875m$

$$Q_2 = \tilde{y}_2 A_2 = (0.24775m)(0.2m)(1\ m) = 0.04955\ m^3$$

$$Q_1 = Q_3 = \tilde{y}_1 A_1 = \tilde{y}_3 A_3 = (0.14775m)(0.175m)(0.073875m) = 1.910130469 * 10^{-3}\ m^3$$

$$Q_C = \Sigma \tilde{y} A = Q_1 + Q_2 + Q_3 = (0.04955) + (2)(1.910130469 * 10^{-3}) = 0.05337026\ m^3$$

$$\tau_C = \frac{V_{MAX} Q_C}{I t_C} = \frac{(65\ kN)(0.05337026\ m^3)}{(0.03296858615\ m^4)(0.35m)} = 300.64\ kPa \approx 301\ kPa$$