

$$(2.) L = 1.5 \text{ m}$$

$$P = 2500 \text{ N}$$

$$b = 150 \text{ mm} = 0.15 \text{ m}$$

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Composite Face sheets:-

$$\rho_f = 1500 + 1.0 (82)$$

$$\Rightarrow 2320 \text{ Kg/m}^3$$

$$E_f = 25 + 84$$

$$\Rightarrow 109 \text{ GPa}$$

$$\sigma_f = 500 + 5 (75)$$

$$\Rightarrow 875 \text{ MPa}$$

Polymer foam Core :-

$$\rho_c \Rightarrow 25 + 5 (31)$$

$$\Rightarrow 180 \text{ Kg/m}^3$$

$$\sigma_c \Rightarrow 0.3 + 9.2 \left(\frac{31}{100} \right)^{1.5}$$

$$\Rightarrow 1.888 \text{ MPa}$$

$$\tau_c \Rightarrow 0.3 + 7.4 \left(\frac{31}{100} \right)^{1.5}$$

$$\Rightarrow 1.577 \text{ MPa}$$

Failures:-

- Elastic Indentation
- Core Shear
- Face Micro Buckling.

$$M \Rightarrow 2bLt f_y + bLc f_c$$

$$\Rightarrow 348t + 13.5c$$

Elastic Indentation:

$$P = 2500 \Rightarrow b t \left(\frac{\pi^2 E_f \sigma_c^2}{3L} \right)^{1/3}$$

$$\Rightarrow b \left(\frac{\pi^2 E_f \sigma_c^2}{3L} \right)^{1/3} \times t \times (t+c)^{1/3}$$

Some
Conclusions
due to error
in calculations
in earlier please
ignore.

$$2500 \Rightarrow \frac{4.7269}{(10^{-6})} \times t \times (t+c)^{1/3}$$

$$\left(\frac{5.288}{(10^{-6})} \right) = t \times (t+c)^{1/3}$$

$$\Rightarrow 2500 = 4726.93 \times t \times (t+c)^{1/3}$$

$$\Rightarrow t \times (t+c)^{1/3} - 0.5274 = 0$$

Applying $f = (348t + 13.5c)$

$$g = (t \times (t+c)^{1/3} - 0.5288)$$

$$x \Leftrightarrow t$$

$$y \Leftrightarrow c$$

$$L(x, y, \lambda) = f(x, y) - \lambda (g(x, y))$$

$$\nabla L(x, y, \lambda) = 0 \quad ; \text{ we set ;}$$

$$\frac{d}{dx} \left(\frac{348t + 13.5c}{t \times (t+c)^{1/3}} \right) = 0$$

$$t \Rightarrow 2.0529 \text{ mm}$$

$$c \Rightarrow 14.9026 \text{ mm}$$

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~~$$\text{Mass} \Rightarrow 0.16305 \text{ kg or } 163.05 \text{ g}$$~~

$$\text{Mass} \Rightarrow 0.9155943 \text{ kg or } 915.594 \text{ grams}$$

For. Core shear \rightarrow Neglected as ~~Not~~ $\Delta M = \lambda \Delta P$, not possible

For Miss Buckling \rightarrow

$$P \Rightarrow \frac{465_f}{L} \times t \times (t+c)$$

$$2500 \Rightarrow 116.667 \times (t(t+c))$$

$$q \Rightarrow t(t+c) - 21.628 = 0$$

$$t \Rightarrow 0.9300 \text{ mm}$$

$$c \Rightarrow 22.1121 \text{ mm}$$

$$\text{Mass} \Rightarrow 0.6556335 \text{ kg or}$$

$$\underline{\underline{655.6335 \text{ g}}}$$

min Mass

~~Given the light weight & Considerably the appropriate values of t & c , we can use the~~

The Ratio of σ_f to σ_c is quite on the extreme here & hence using the polymer might not be a good idea. Though then t & c come in quite comparable orders, the failure chance due to the ~~non-buckling~~ Elastic Indentation is quite high. There is a fair chance of core-shear failure for each combination.