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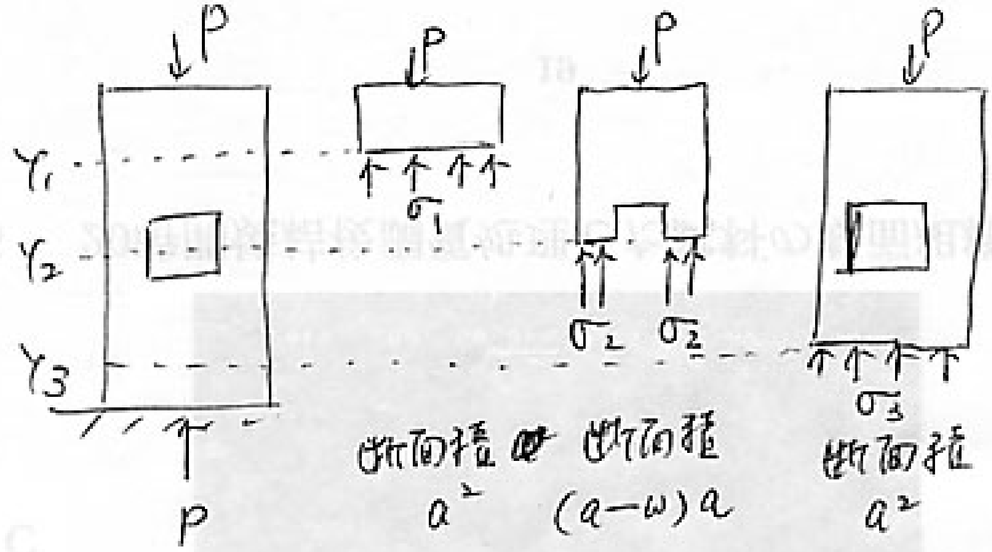

高さ Y_1, Y_2, Y_3 で切った自由体上部の応力と切断面の断面積は上の図のようになる。

(1) $\sigma_1 = -\dfrac{P}{a^2}$ …① $\varepsilon_1 = \dfrac{\sigma_1}{E} = -\dfrac{P}{Ea^2}$ …② ~~$\Delta l_1 = (H-h-w)$~~

$\Delta l_1 = (H-h-w)\varepsilon_1 = -\dfrac{(H-h-w)P}{Ea^2}$ …③

$\sigma_2 = -\dfrac{P}{(a-w)a}$ …④, $\varepsilon_2 = \dfrac{\sigma_2}{E} = -\dfrac{P}{E(a-w)a}$ …⑤

$\Delta l_2 = w\varepsilon_2 = -\dfrac{wP}{E(a-w)a}$ …⑥

$\sigma_3 = -\dfrac{P}{a^2} (= \sigma_1)$, …⑦ $\varepsilon_3 = \dfrac{\sigma_3}{E} = -\dfrac{P}{Ea^2}$ …⑧

$\Delta l_3 = h\varepsilon_3 = -\dfrac{hP}{Ea^2}$ …⑨

棒全体の縮み ~~ΔH~~

~~$\Delta H = \Delta l_1 + \Delta l_2 +$~~

$$\Delta H = \Delta l_1 + \Delta l_2 + \Delta l_3 = -\frac{P}{E}\left\{\frac{H-h-w}{a^2} + \frac{w}{(a-w)a} + \frac{h}{a^2}\right\}$$

$$= -\frac{P}{E}\left\{\frac{H-w}{a^2} + \frac{w}{(a-w)a}\right\} = -\frac{P}{Ea^2}\left(H - w + \frac{aw}{a-w}\right)$$

(2) $|\sigma_2| < \sigma_Y$ より, $P < (a-w)a\sigma_Y$

(3) $|\sigma_2| < \sigma_B$ より, $\dfrac{P}{(a-w)a} < \sigma_B$, $\dfrac{P}{\sigma_B a} < a - w$。

$\therefore\ w < a - \dfrac{P}{\sigma_B w}$

Yuzo