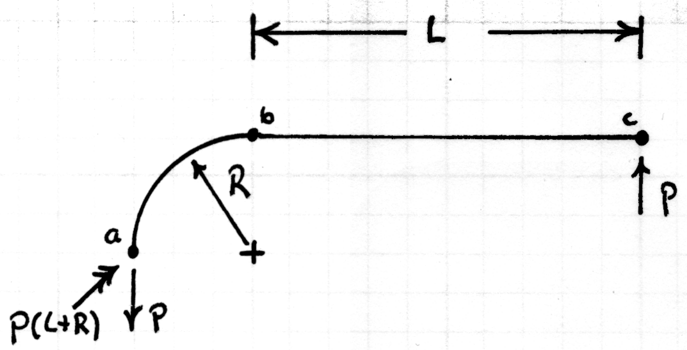


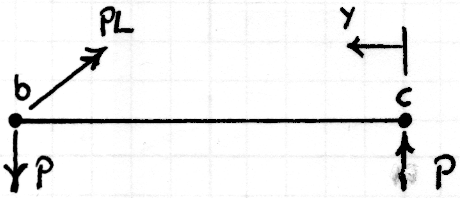
THE MOMENT IN CB IS

$$M_{CB} = Py$$

THE STRAIN ENERGY DUE TO BENDING IN CB

$$U_{CB,B} = \int_0^L \frac{M^2}{2EI}$$

$$= \int_0^L \frac{P^2 y^2}{2EI} = \underline{\underline{\frac{P^2 L^3}{6EI}}}$$

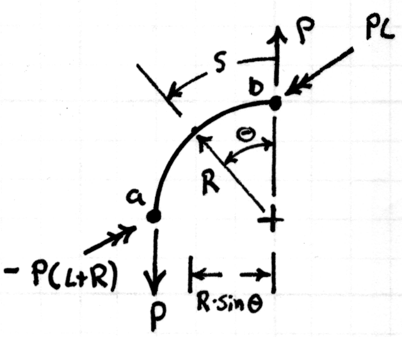


THE MOMENT IN ba IS

$$M = -PL - P \cdot R \cdot \sin\theta$$

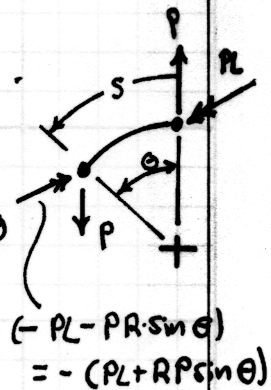
$$= -(PL + PR \cdot \sin\theta)$$

$$= -P(L + R \cdot \sin\theta)$$



$$S = R\theta$$

$$ds = R \cdot d\theta$$



THE ENERGY DUE TO BENDING IN ba

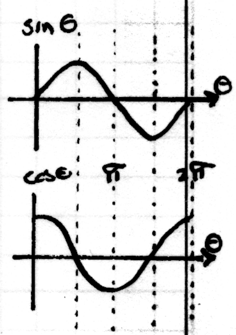
$$U_{ba} = \int_0^{\frac{\pi}{2}R} \frac{P^2(L+R\sin\theta)^2}{2EI} ds = \int_0^{\pi/2} \frac{P^2(L+R\cdot\sin\theta)^2}{2EI} R\,d\theta$$

$$= \frac{P^2}{2EI} \int_0^{\pi/2} (L + R\cdot\sin\theta)^2 R\,d\theta = \frac{P^2 R}{2EI} \int_0^{\pi/2} (L^2 + 2\cdot L\cdot R\cdot\sin\theta + R^2\cdot\sin^2\theta)\,d\theta$$

$$= \frac{P^2 R}{2EI}\left[L^2\theta + 2\cdot L\cdot R\cdot\cos\theta + \frac{R^2\theta}{2} - \frac{R^2}{4}\sin 2\theta\right]_0^{\pi/2}$$

$$= \frac{P^2 R}{2EI}\left[\frac{\pi\cdot L^2}{2} + 2\cdot L\cdot R\,(\cos\tfrac{\pi}{2} - \cos 0) + \frac{R^2\pi}{4} - \frac{R^2}{4}(\sin\pi - \sin 0)\right]$$

$$= \underline{\underline{\frac{P^2 R}{2EI}\left[\frac{\pi L^2}{4} - 2\cdot L\cdot R + \frac{\pi\cdot R^2}{4}\right]}}$$



$$U_T = \frac{P^2 L^3}{6EI} + \frac{P^2}{2EI}\left[\frac{\pi L^2}{4} - 2LR + \frac{\pi R^2}{4}\right]$$

$$\frac{\partial U}{\partial P} = \delta_P = \frac{PL^3}{3EI}\cdot\frac{8}{8} + \frac{PR}{2EI}\left[\frac{\pi L^2}{4}\cdot\frac{3}{3} - 2LR\cdot\frac{12}{12} + \frac{\pi R^2}{4}\cdot\frac{3}{3}\right]$$

$$= \frac{P}{24EI}\left[8\cdot L^3 + 3\pi RL^2 - 24\cdot L\cdot R + 3\pi R^3\right]$$ THIS IS FOR HALF THE BEAM

$$\boxed{2\cdot\delta_P = \frac{P}{12EI}\left[8L^3 + 3\pi RL^2 - 24LR + 3\pi R^3\right]}$$