



$$E_1 = \frac{V}{L} \tan \alpha$$

$$E_2 = E_3 = \frac{V}{L} \sin \alpha \cos \alpha$$

Equil:  $F = N_1 + (N_2 + N_3) \cos \alpha$   
 $N_2 = N_3$

$$F = N_1 + 2N_2 \cos \alpha$$

if elastic, with  $A_1 = A_2 = A_3 = A$ ,  $E_1 = E_2 = E_3 = A$

$$N_1 = \sigma_1 A$$

$$N_2 = \sigma_2 A$$

$$= E_1 EA$$

$$= E_2 EA$$

$$= \frac{EAV}{L} \tan \alpha$$

$$= \frac{EAV}{L} \sin \alpha \cos \alpha$$

$$F = \frac{EAV}{L} (\tan \alpha + 2 \sin \alpha \cos^2 \alpha)$$

to decide whether 1 or 2 will reach yield first, simply compare

$$\sigma_1 = E E_1 = \frac{EV}{L} \tan \alpha \quad \text{and} \quad \sigma_2 = E E_2 = \frac{EV}{L} \sin \alpha \cos \alpha$$

or, compare  $\sigma_1 \left( \frac{L}{EV} \right) = \frac{\sin \alpha}{\cos \alpha}$  with  $\sigma_2 \left( \frac{L}{EV} \right) = \sin \alpha \cos \alpha$

since  $0 < \alpha < \frac{\pi}{2}$ ,  $\sin \alpha > 0$  and  $\cos \alpha > 0 \therefore \frac{1}{\cos \alpha} > \cos \alpha \therefore \sigma_1 > \sigma_2 \Rightarrow \text{1 yields first}$