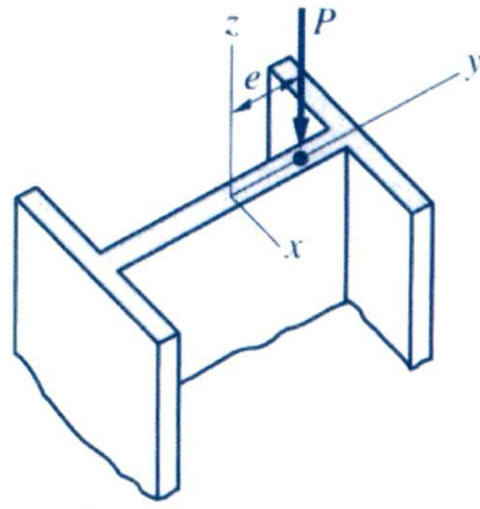
18-16

See Fig. P18-16. Determine the maximum eccentricity e at which the vertical compressive load P can be applied to the wide-flange W14 x 90 steel section without causing tensile stress anywhere in the section. Neglect the weight of the section.

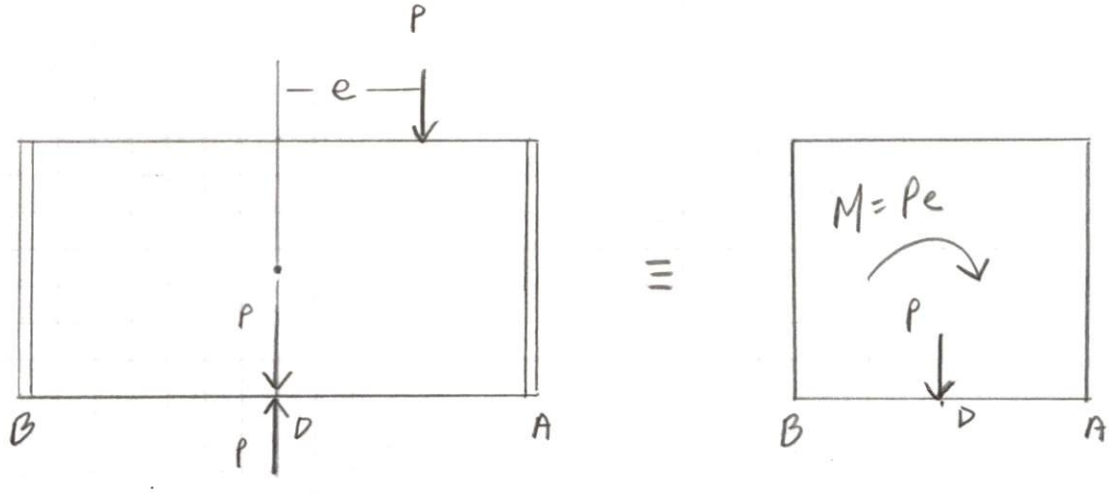
Solution.



W14×90 Table A-1(a)

$A = 26.5 \text{ in}^2$

$S = 143 \text{ in}^3$



The maximum tensile stress at B is:

$$\sigma_B = -\frac{P}{A} + \frac{M}{S} = 0$$

$$\frac{Pe_{max}}{S} = \frac{P}{A}$$

$$e_{MAX} = \frac{S}{A} = \frac{143 \text{ in}^3}{26.5 \text{ in}^2} = \underline{\underline{5.4 \text{ in.}}}$$