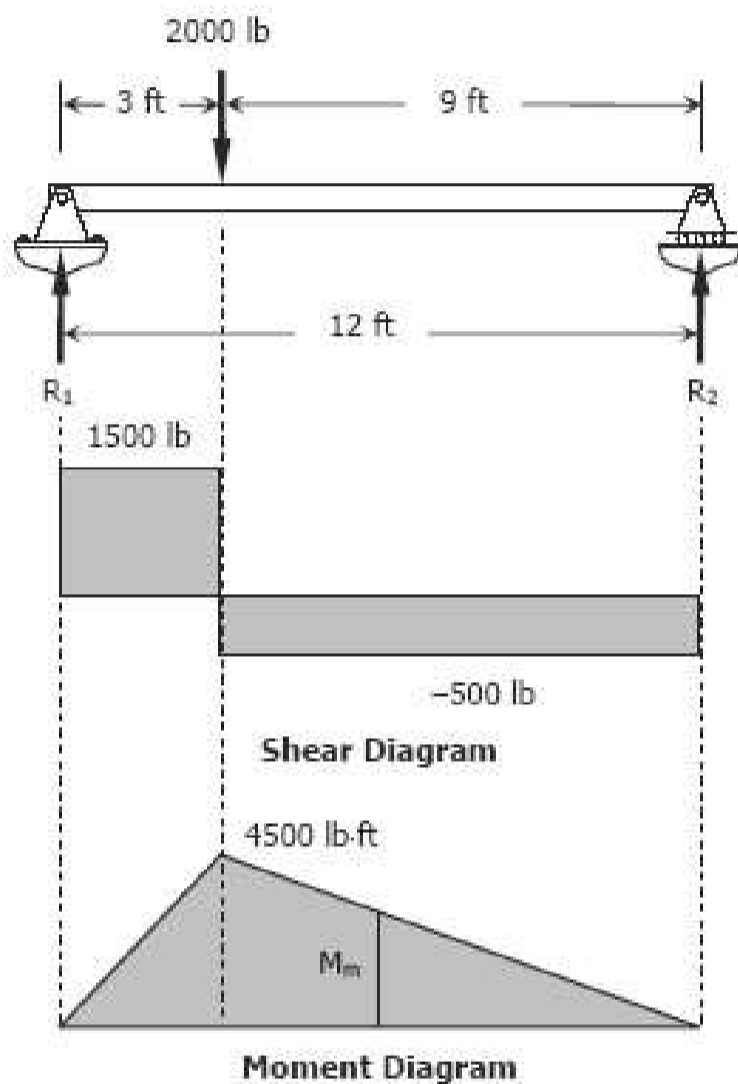


Problem 504

A simply supported beam, 2 in wide by 4 in high and 12 ft long is subjected to a concentrated load of 2000 lb at a point 3 ft from one of the supports. Determine the maximum fiber stress and the stress in a fiber located 0.5 in from the top of the beam at midspan.

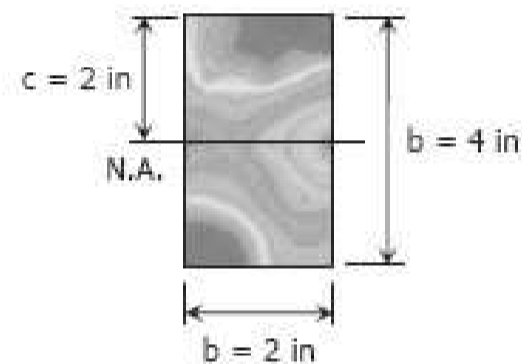
Solution 504



$$\begin{aligned}\Sigma M_{R_2} &= 0 \\ 12R_1 &= 9(2000) \\ R_1 &= 1500 \text{ lb}\end{aligned}$$

$$\begin{aligned}\Sigma M_{R_1} &= 0 \\ 12R_2 &= 3(2000) \\ R_2 &= 500 \text{ lb}\end{aligned}$$

Maximum fiber stress:



$$(f_b)_{\max} = \frac{Mc}{I} = \frac{4500(12)(2)}{\frac{2(4)^3}{12}}$$

$$(f_b)_{\max} = 10,125 \text{ psi}$$

Stress in a fiber located 0.5 in from the top of the beam at midspan:

$$\begin{aligned}\frac{M_m}{6} &= \frac{4500}{9} \\ M_m &= 3000 \text{ lb-ft}\end{aligned}$$

$$\begin{aligned}f_b &= \frac{My}{I} \\ f_b &= \frac{3000(12)(1.5)}{\frac{2(4)^3}{12}} \\ f_b &= 5,062.5 \text{ psi}\end{aligned}$$

