

4-9. A beam is subjected to a normally distributed force $P \sim N(100, 10^2)$ lb/ft as shown. The beam has a square cross-section and $L = 8$ ft. If the allowable bending stress is $S_a \sim N(20, 2^2)$ ksi, and the allowable shear stress is $\tau_a \sim N(230, 15^2)$ psi, what is the minimum length of b for a probability of failure due to excessive bending stress less than 10^{-4} and a probability of failure due to excessive shear stress less than 10^{-4} ? Assume P , S_a , and τ_a are independent.

(Ans. $b = 6.91$ in)

