

40. A bending moment $M \sim N(8000, 800^2)$ lbf·in is applied to a round shaft. The yield strength of the shaft is $S_y \sim N(80, 8^2)$ kpsi. If the maximum probability of failure is designed to be $p_f = 10^{-5}$, determine the minimum diameter of the shaft. Note that M and S_y are independent.

Answer: $d = 100$ mm