

65. A concentrated load of $P \sim N(4000, 400^2)$ N is applied to a rectangular-cross-section beam as shown in the figure. The beam is simply-supported and has a rectangular cross section with width and height of $b = 90$ mm and $h = 100$ mm, respectively. If the allowable bending stress is $S_a \sim N(30, 3^2)$ MPa and the maximum probability of failure is designed to be $p_f = 10^{-5}$, determine the maximum length of the beam. Assume that P and S_a are independent.

Answer: $l = 2.34$ m

