

49. A torque  $T \sim N(8, 1^2)$  kN·m is applied to a steel thin-wall tube as shown in the figure. The tube has a square cross section with side length  $b = 100$  mm. The shear modulus of the tube is  $G = 80$  GPa and the allowable shear stress is  $\tau_a \sim N(100, 10^2)$  MPa. If the maximum probability of failure is designed to be  $p_f = 10^{-5}$ , estimate the minimum wall thickness of the tube using the First Order Second Moment Method.

**Answer:**  $t_{min} = 10$  mm

