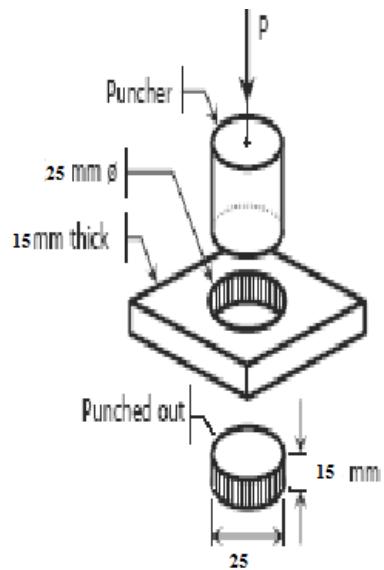


Answer on Question #49629-Physics-Mechanics-Kinematics-Dynamics

What force is required to punch a 25mm diameter hole through a 15mm thick plate? The ultimate shear stress of the material of the plate is 380 MPa. Express the answer in kN.

Solution



The resisting area is the shaded area along the perimeter and the shear force V is equal to the punching force P .

$$V = \tau A = \tau \cdot \pi d h.$$

$$P = 380 \cdot 10^6 \text{ Pa} [\pi \cdot 25 \cdot 10^{-3} \text{ m} \cdot 15 \cdot 10^{-3} \text{ m}] = 447676.95 \text{ N} = 447.7 \text{ kN}.$$

Answer: 447.7 kN.