

Example 2.1.1

- a) A plastic rod of solid circular cross-section with diameter 30 mm and length 0.5 m is subjected to a tensile load of 12 kN as shown in Figure 1. The rod is made of PMMA (polymethyl methacrylate, or 'acrylic') with a Young's modulus of 3.1 GPa. Calculate the elongation e_a of the rod.

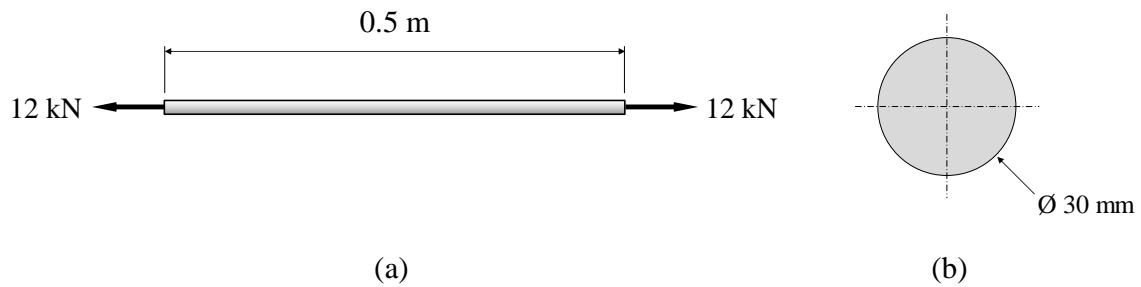


Figure 1: A plastic rod loaded in tension.

- b) In order to increase the axial stiffness, engineers decided to adhesively-bond a sleeve on to the rod as shown in Figure 2. The sleeve has an outer diameter of 45 mm, length of 0.3 m and is made of polyamide (or 'Nylon') with a Young's modulus of 2.5 GPa. Calculate the total elongation e_b of the assembly when subjected to the same tensile load of 12 kN. Assume that no slippage can occur between the rod and sleeve.

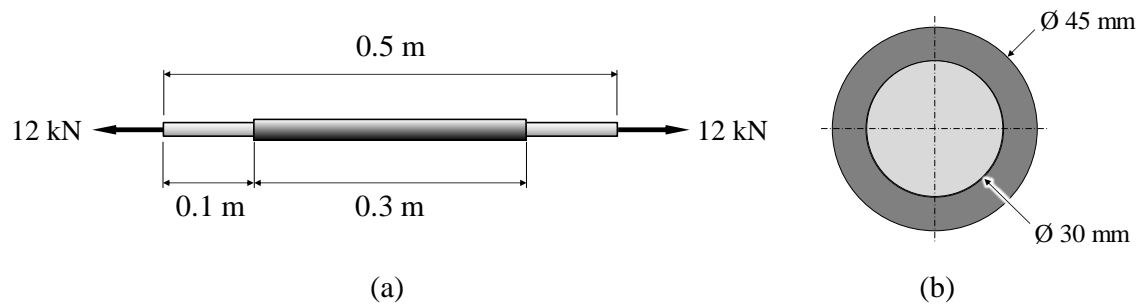


Figure 2: The plastic rod with a bonded sleeve.