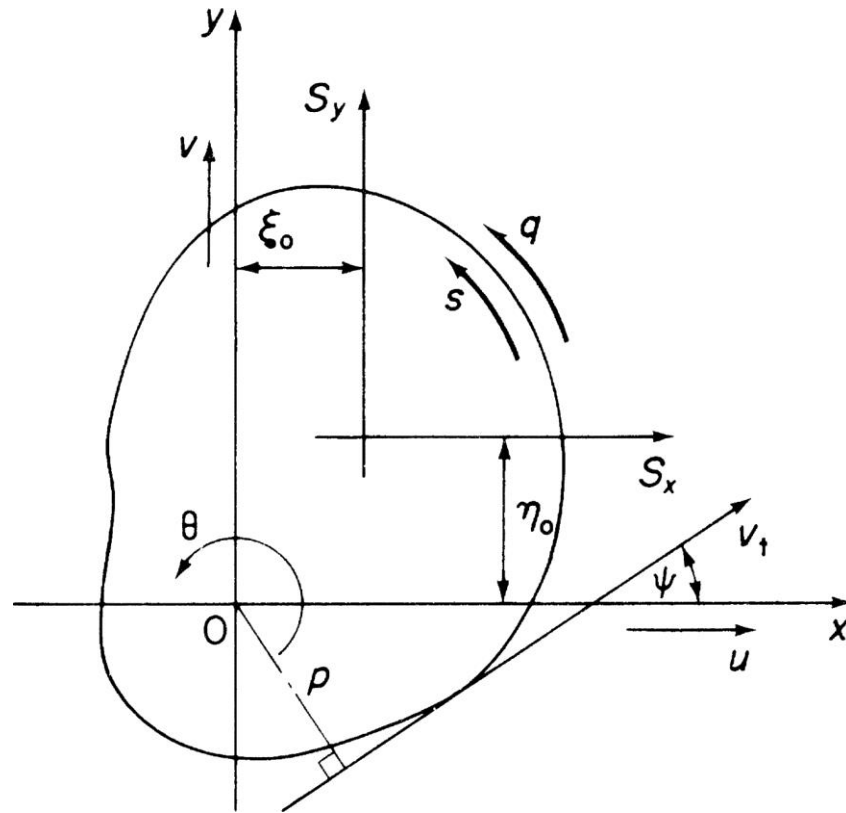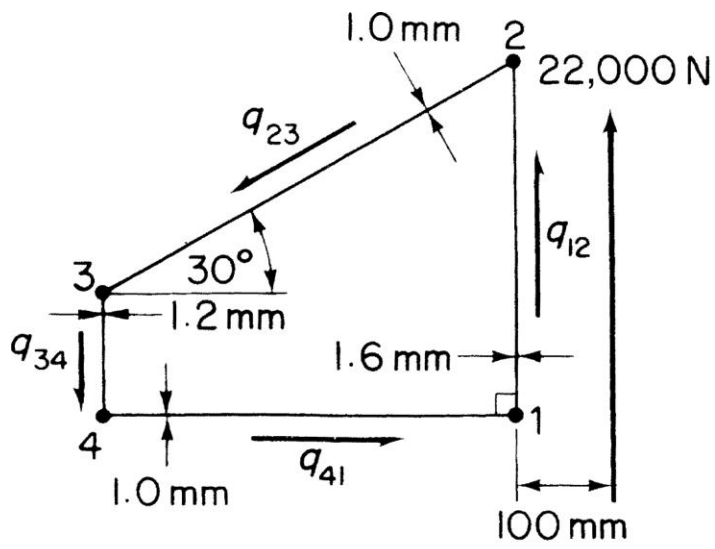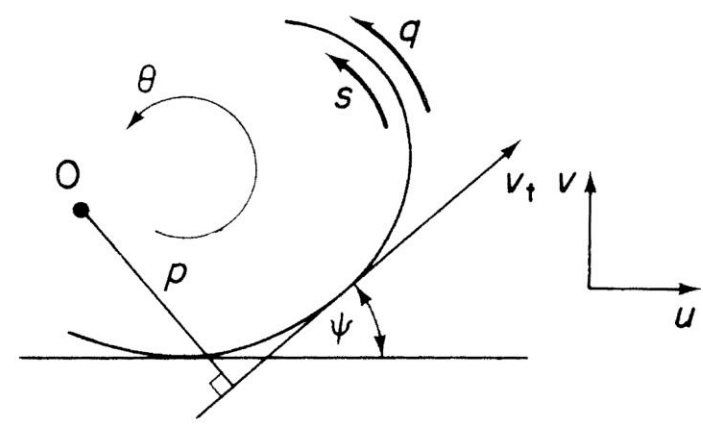# Chapter 26
Closed section beams

FIGURE 26.1 Cross-section of a Thin-Walled Beam at the Built-in End

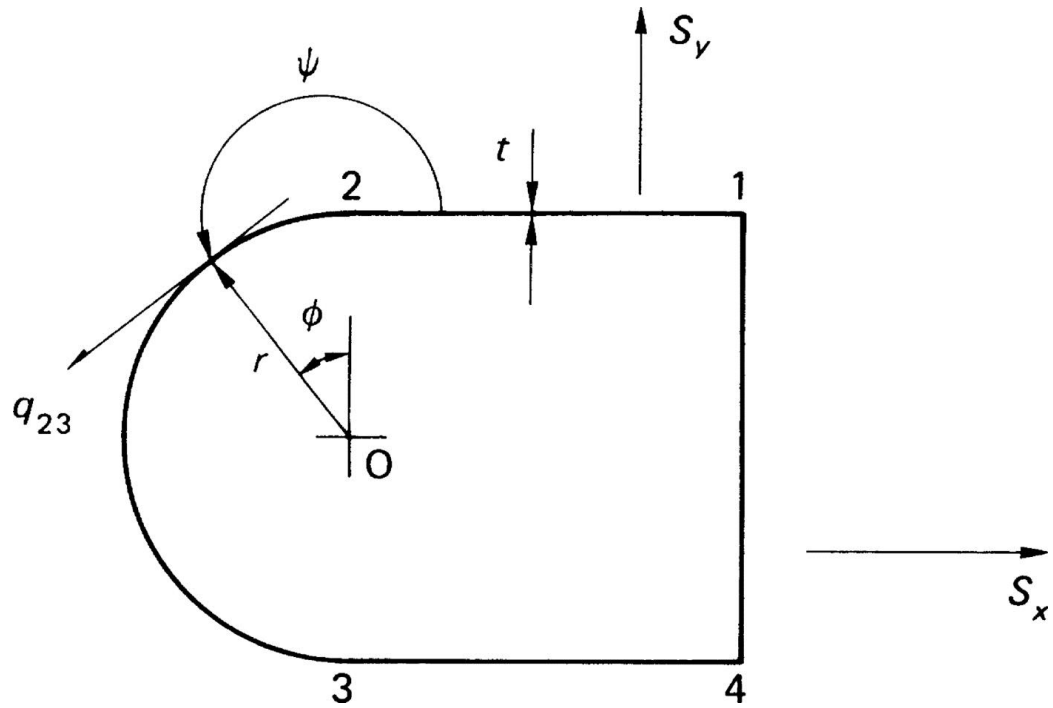**FIGURE 26.2** (a) Beam Cross-Section at Built-in End; (b) Notation and Sign Convention

FIGURE 26.3 Built-in End of a Beam Section Having a Curved Wall
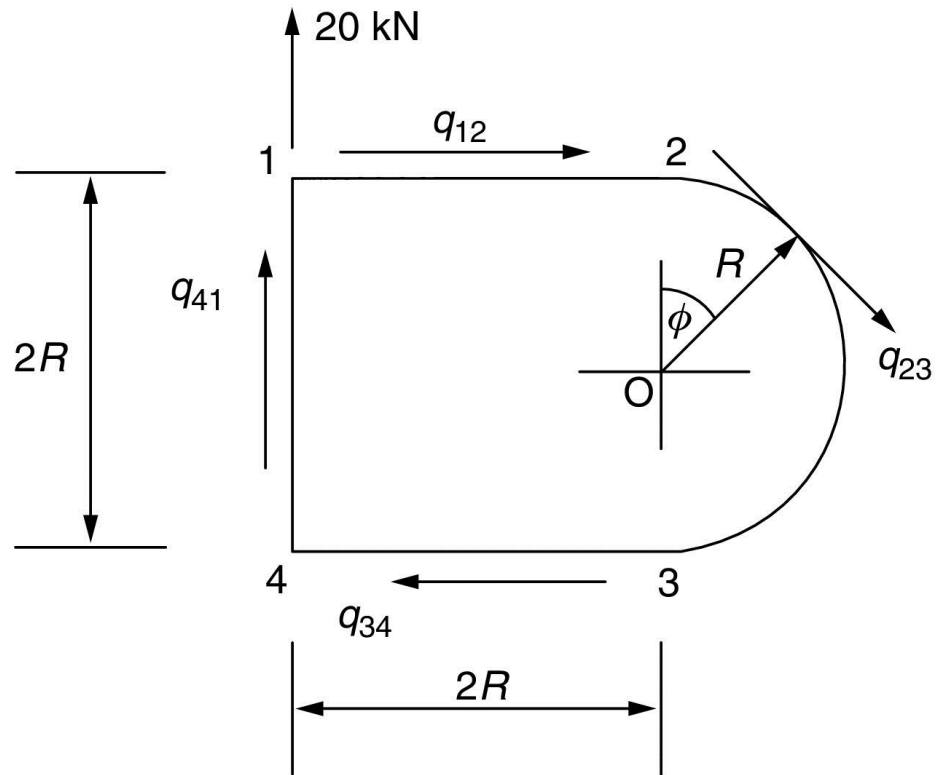
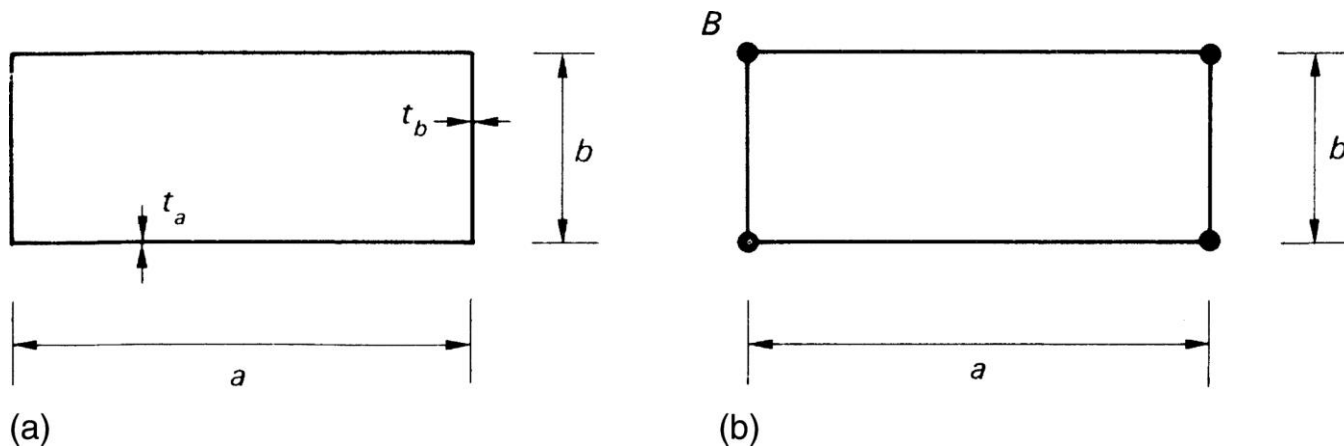**FIGURE 26.4** Beam Section of Example 26.2

FIGURE 26.5 Idealization of a Rectangular Section Beam Subjected to Torsion: (a) Actual; (b) Idealized
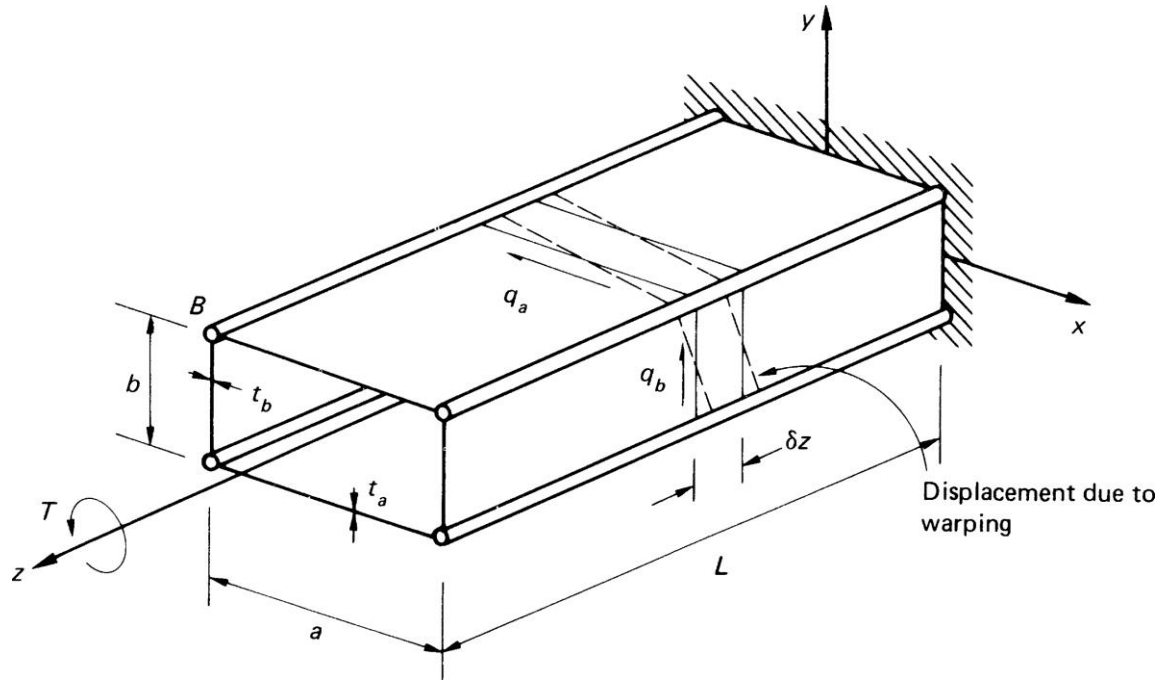
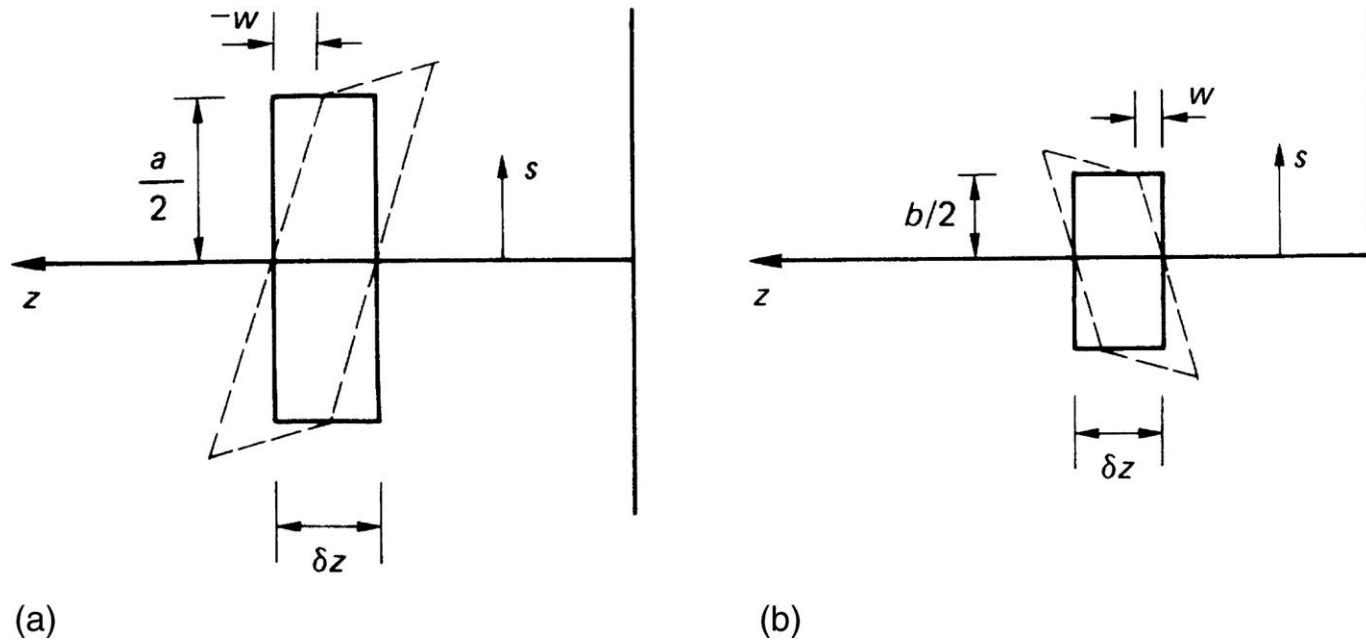**FIGURE 26.6** Idealized Rectangular Section Beam Built-in at One End and Subjected to Torque at the Other

FIGURE 26.7 Shear Distortion of (a) an Element of the Top Cover; (b) an Element of the Right-Hand Web
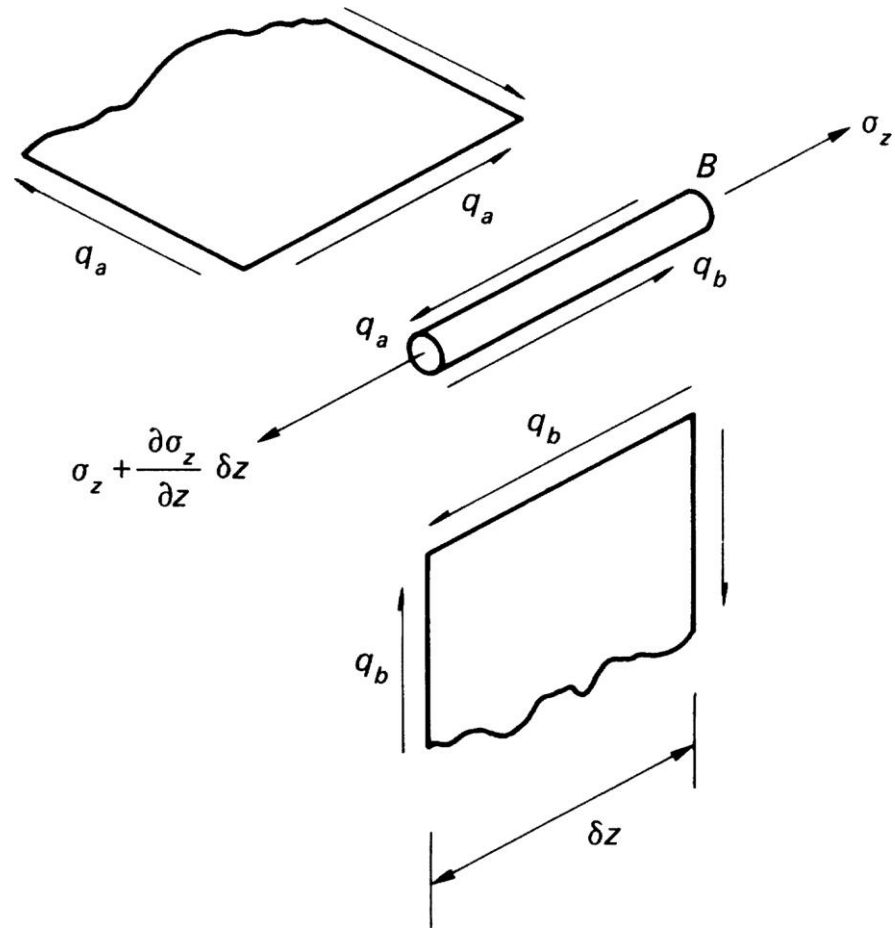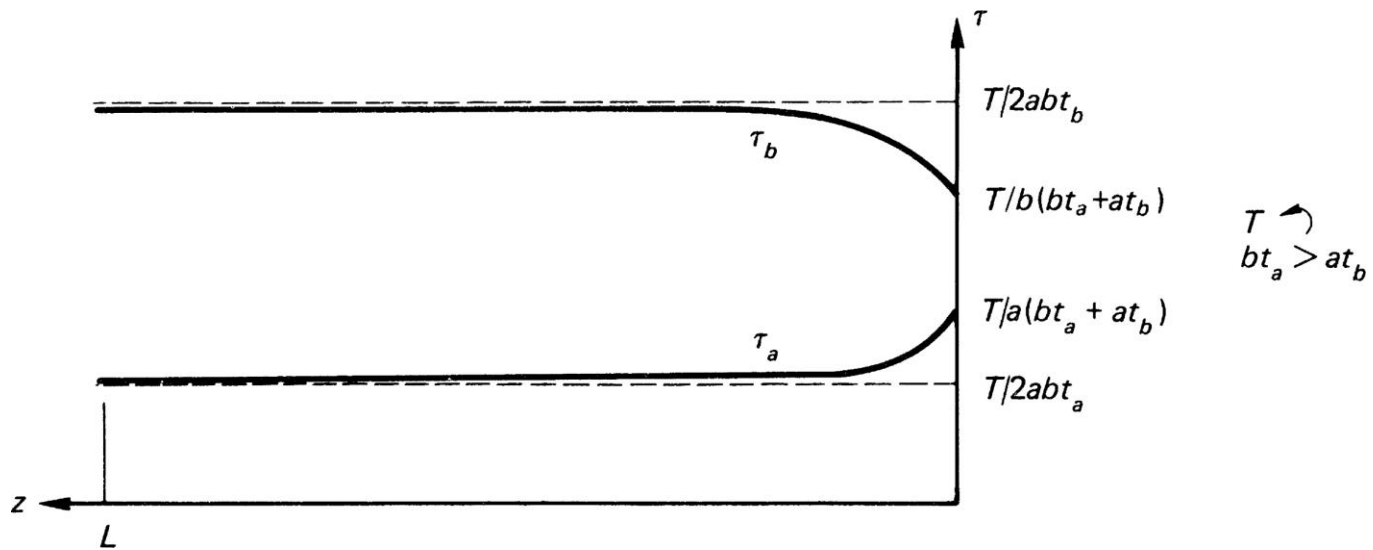
FIGURE 26.8 Equilibrium of Boom Element

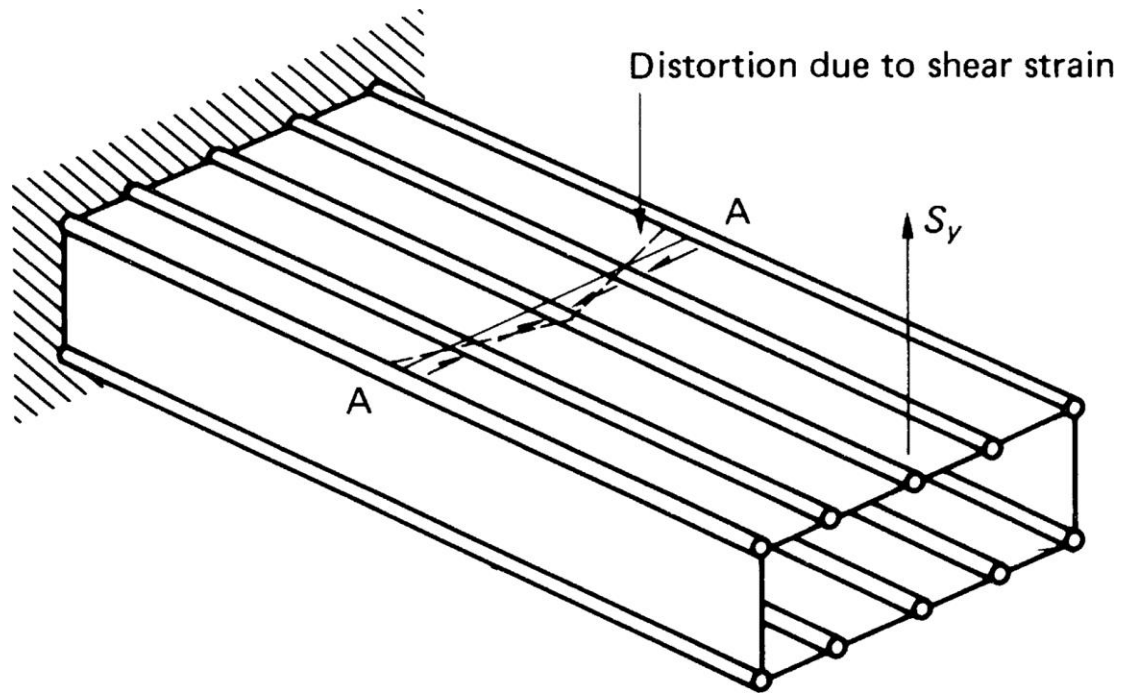**FIGURE 26.9** Shear Stress Distribution along the Beam of Fig. 26.6
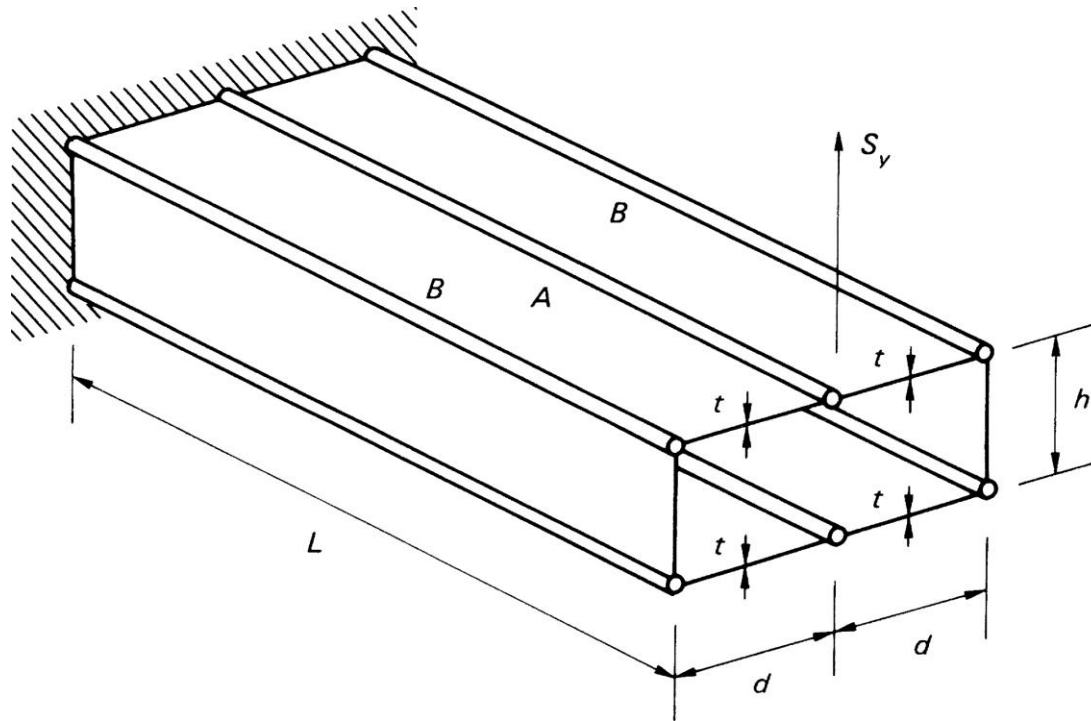
FIGURE 26.10 Shear Distortion in the Covers of a Box Beam

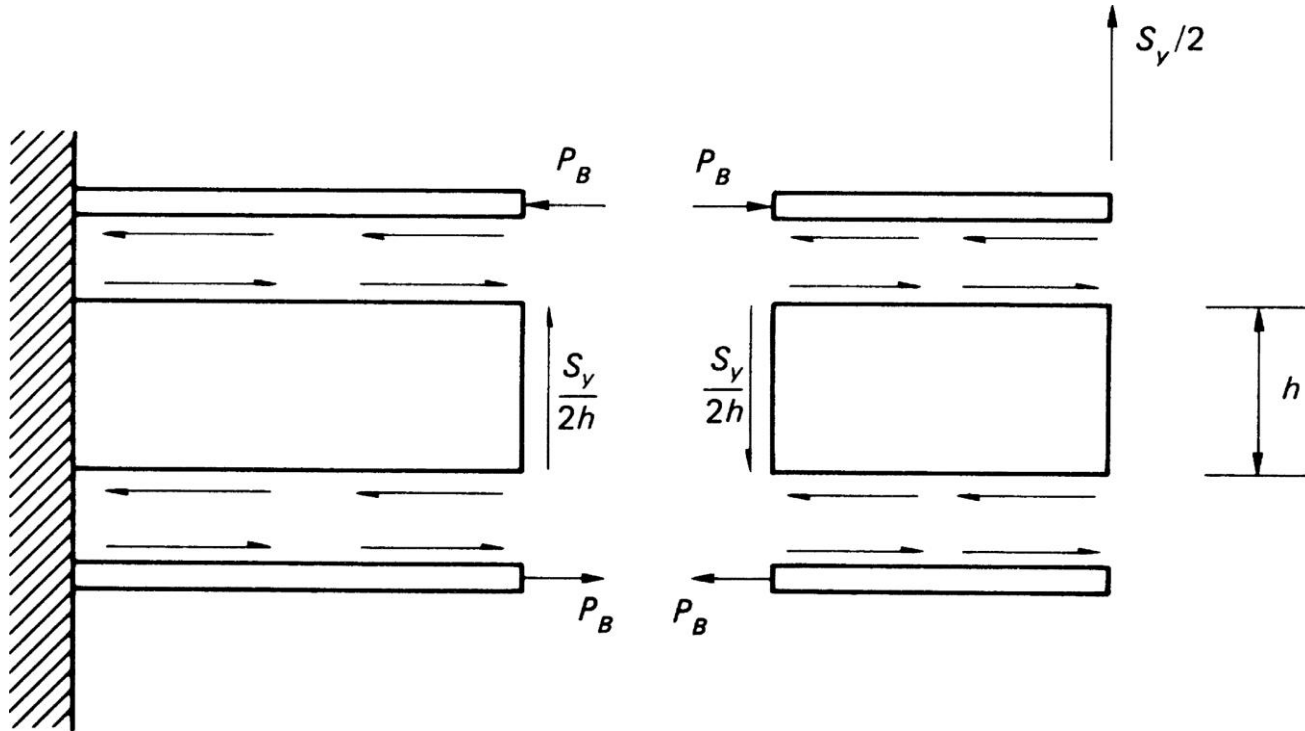**FIGURE 26.11** Six-Boom Beam Subjected to a Shear Load

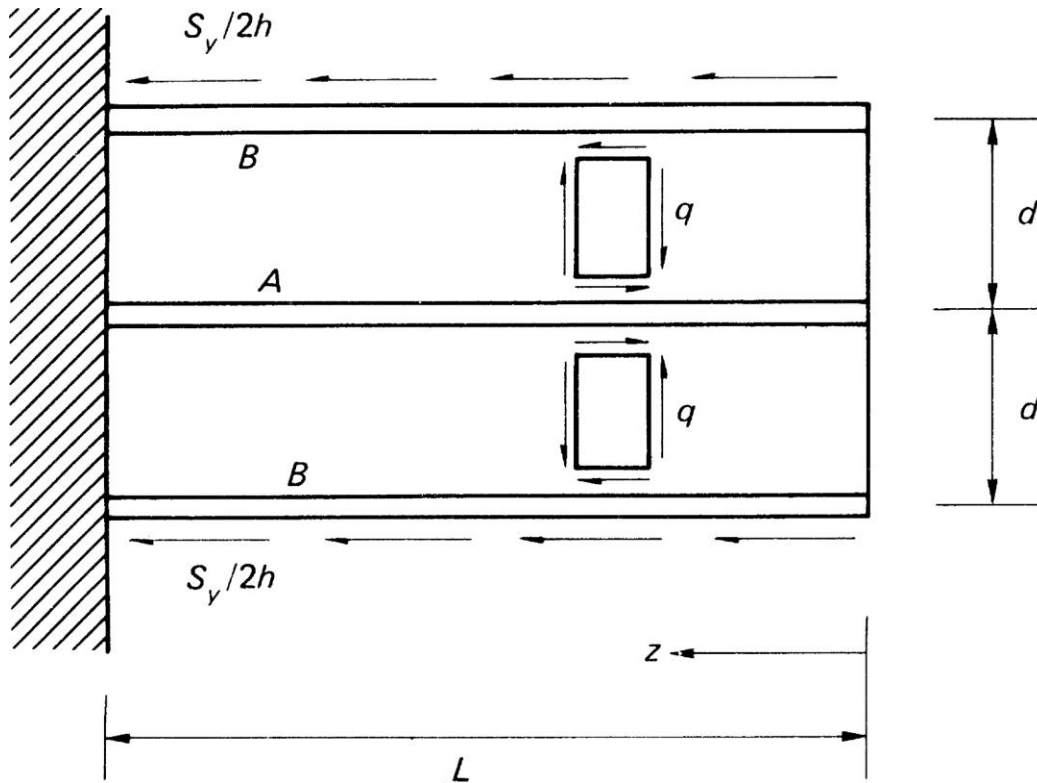**FIGURE 26.12** Loads on Webs and Corner Booms of the Beam of Fig. 26.11

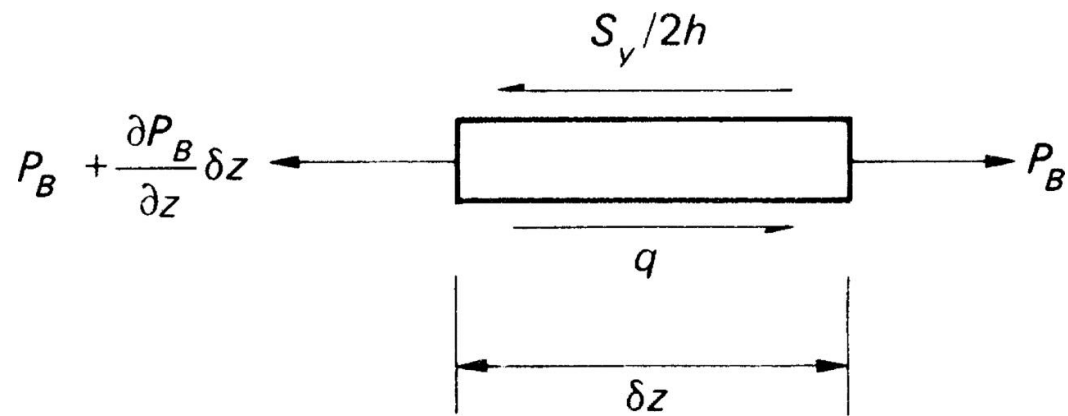**FIGURE 26.13** Top Cover of the Beam of Fig. 26.11
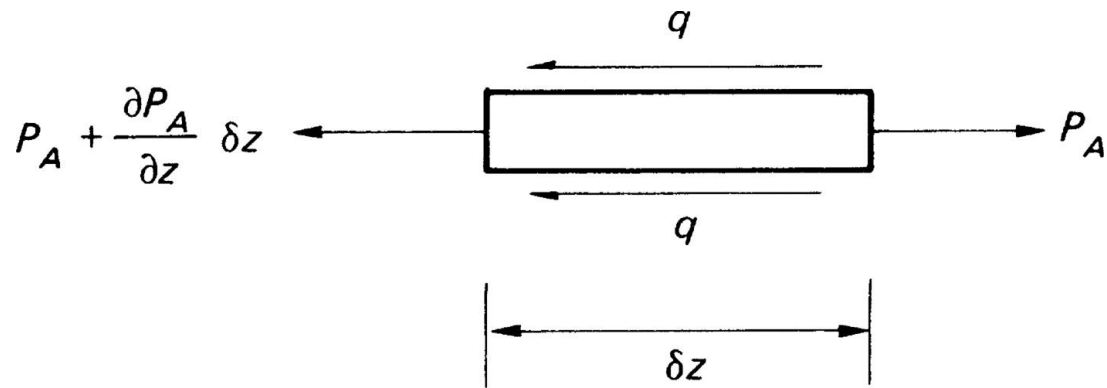
FIGURE 26.14 Equilibrium of Boom Element
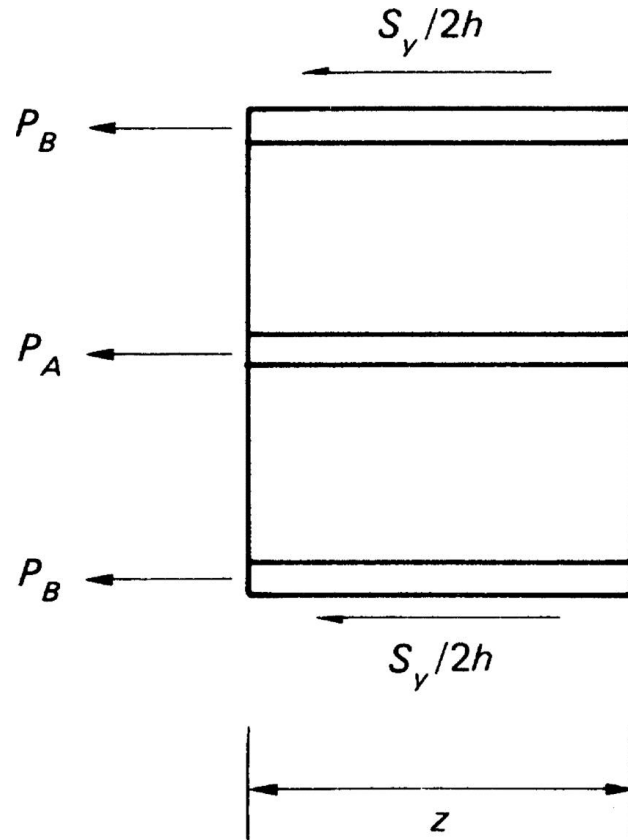
FIGURE 26.15 Equilibrium of Element of Central Boom

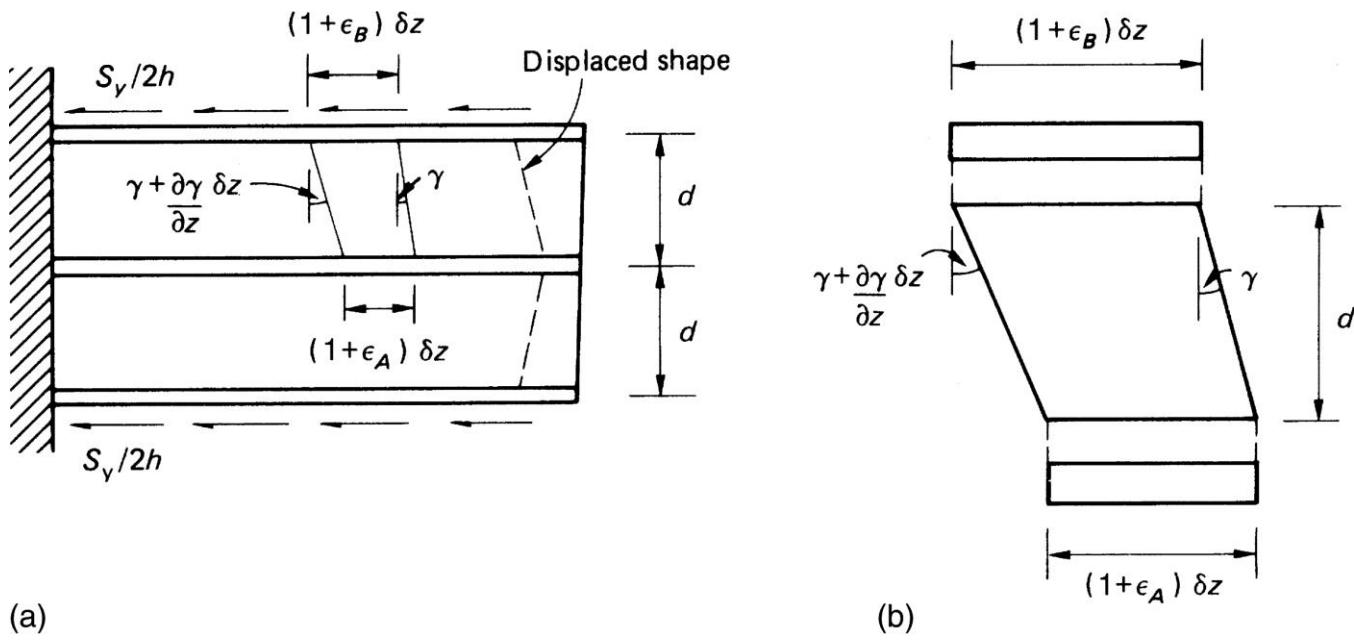**FIGURE 26.16** Equilibrium of a Length *z* of Cover
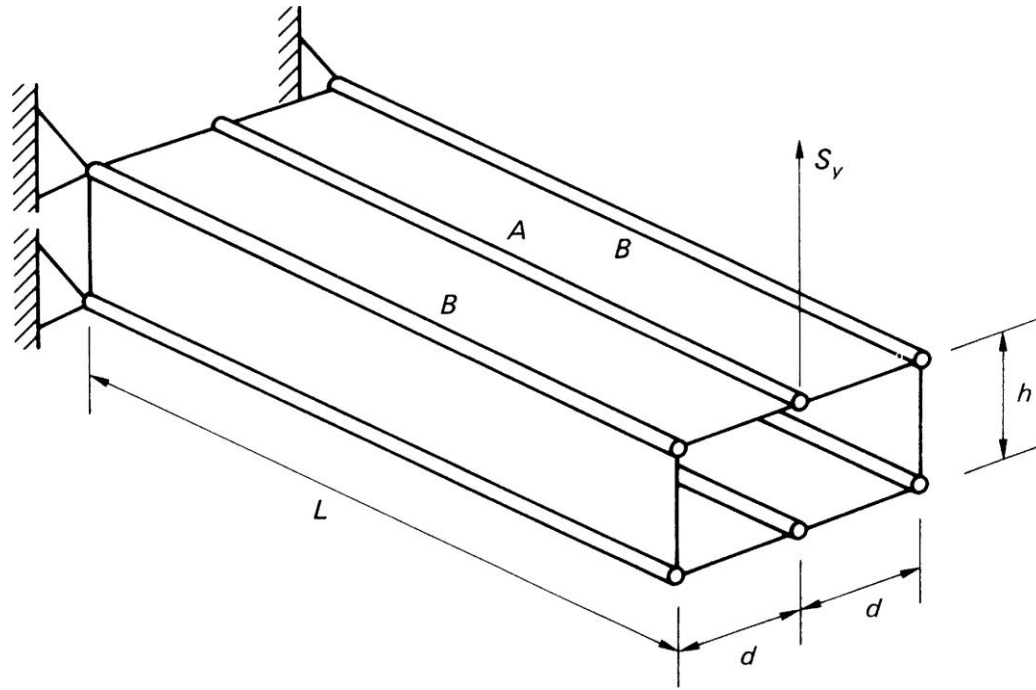
FIGURE 26.17 Compatibility Condition

FIGURE 26.18 Rectangular Section Beam Supported at Corner Booms Only
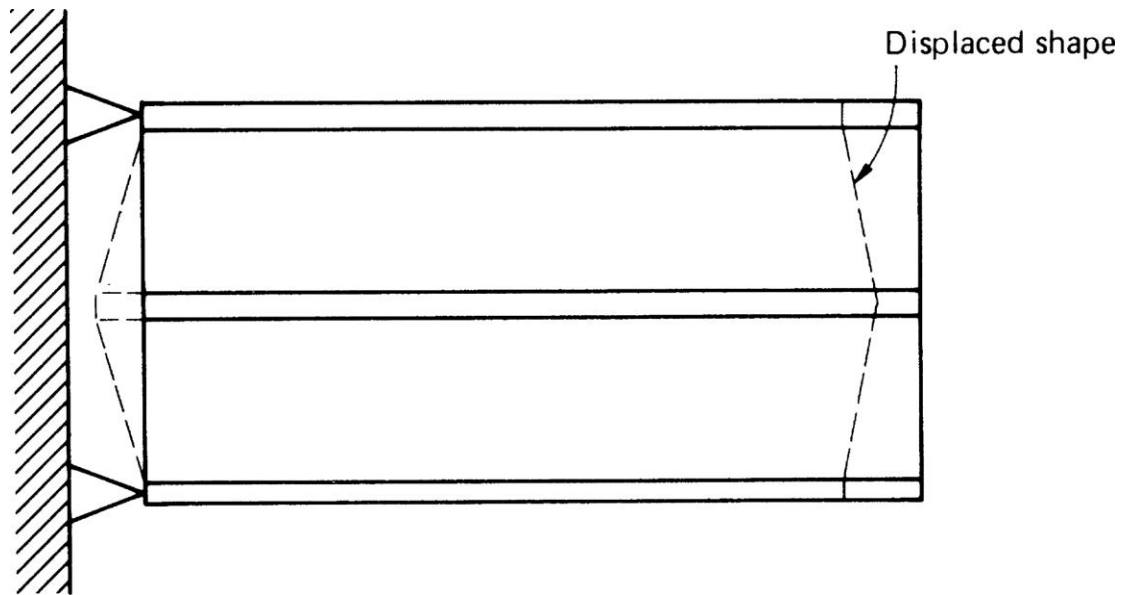
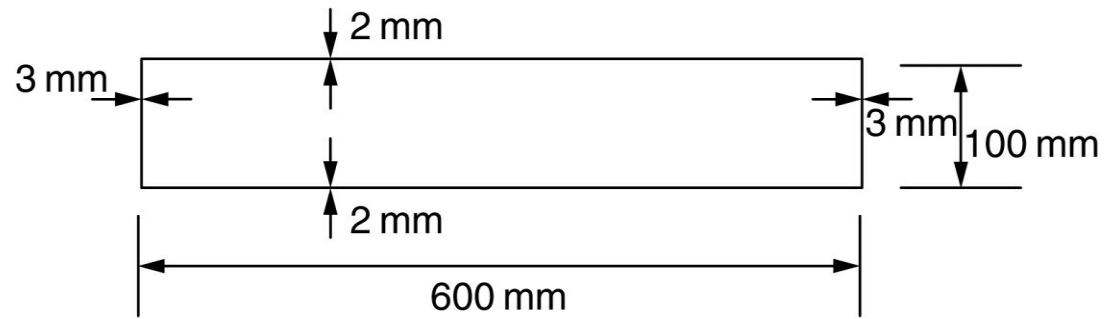**FIGURE 26.19** Displaced Shape of top Cover of Box Beam of Fig. 26.18
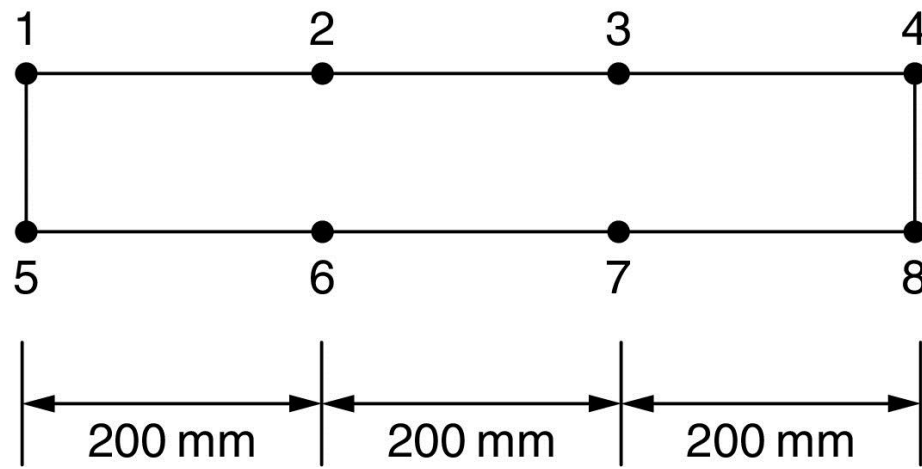
FIGURE 26.20 Beam Section of Example 26.4
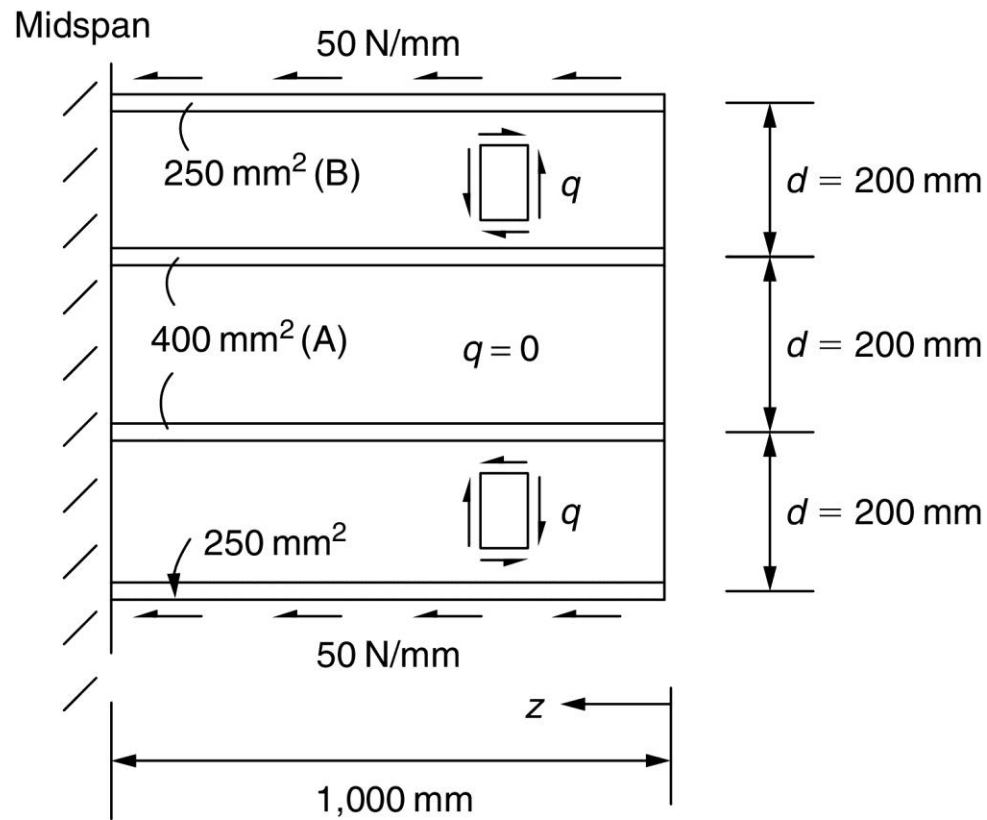
FIGURE 26.21 Idealized Beam Section of Example 26.4

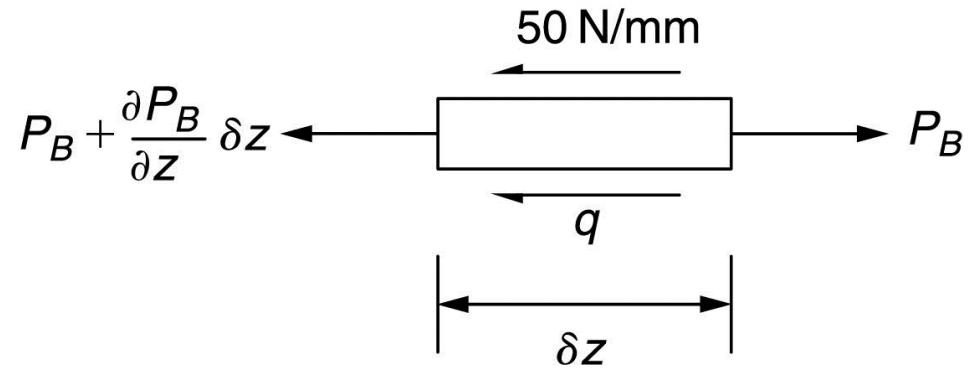**FIGURE 26.22** Shear Flows Acting on Top Cover of Idealized Beam Section of Example 26.4

$$P_B + \frac{\partial P_B}{\partial z}\,\delta z \longleftarrow \boxed{} \longrightarrow P_B$$

50 N/mm

q

δz

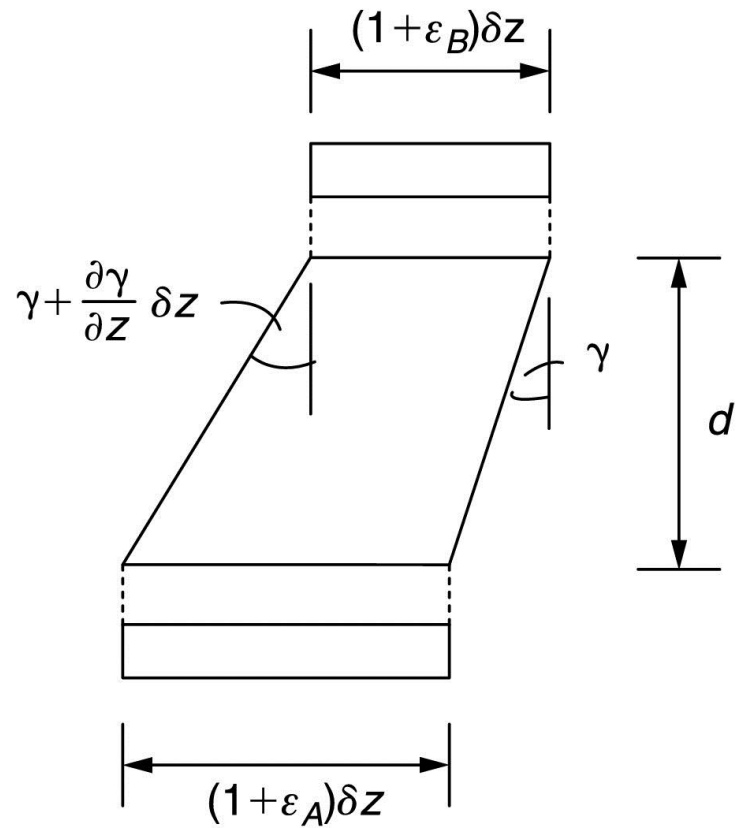**FIGURE 26.23** Element of Boom B

FIGURE 26.24 Compatibility Condition for the Top Cover of the Beam of Example 26.4
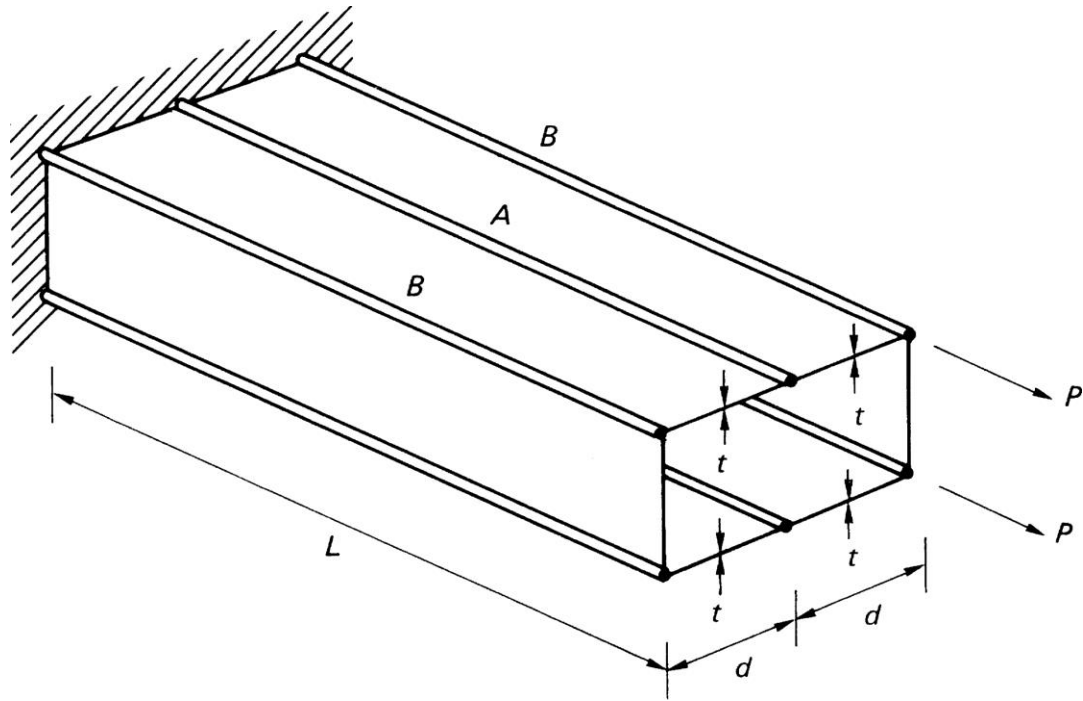
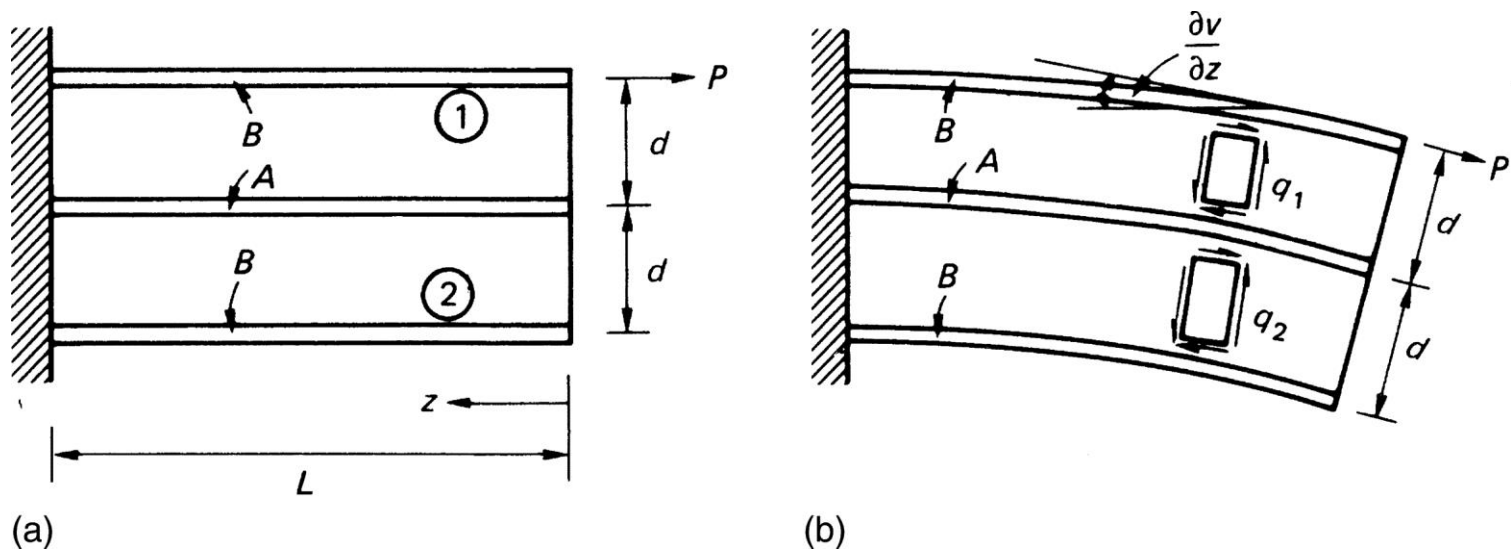**FIGURE 26.25** Beam Subjected to Combined Bending and Axial Load
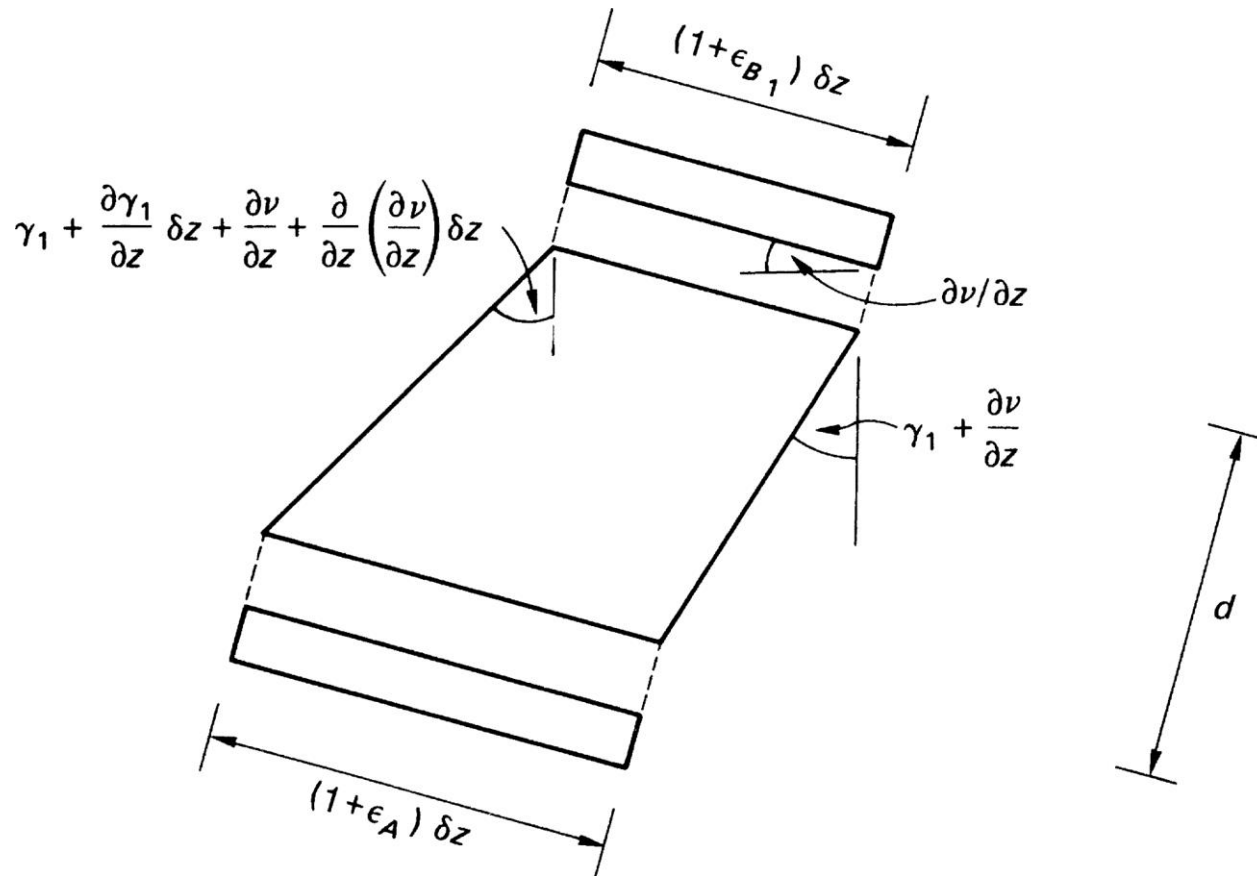
FIGURE 26.26 Cover of Beam of Fig. 26.25

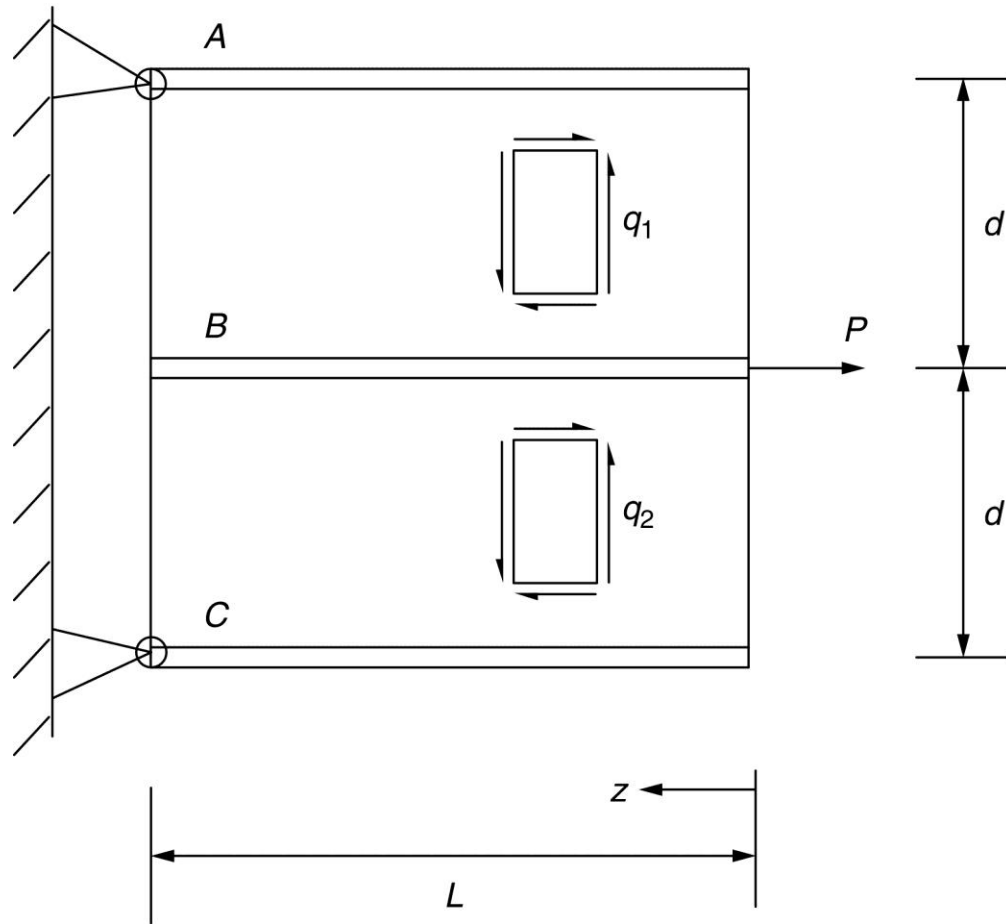**FIGURE 26.27** Compatibility Condition for Combined Bending and Axial Load
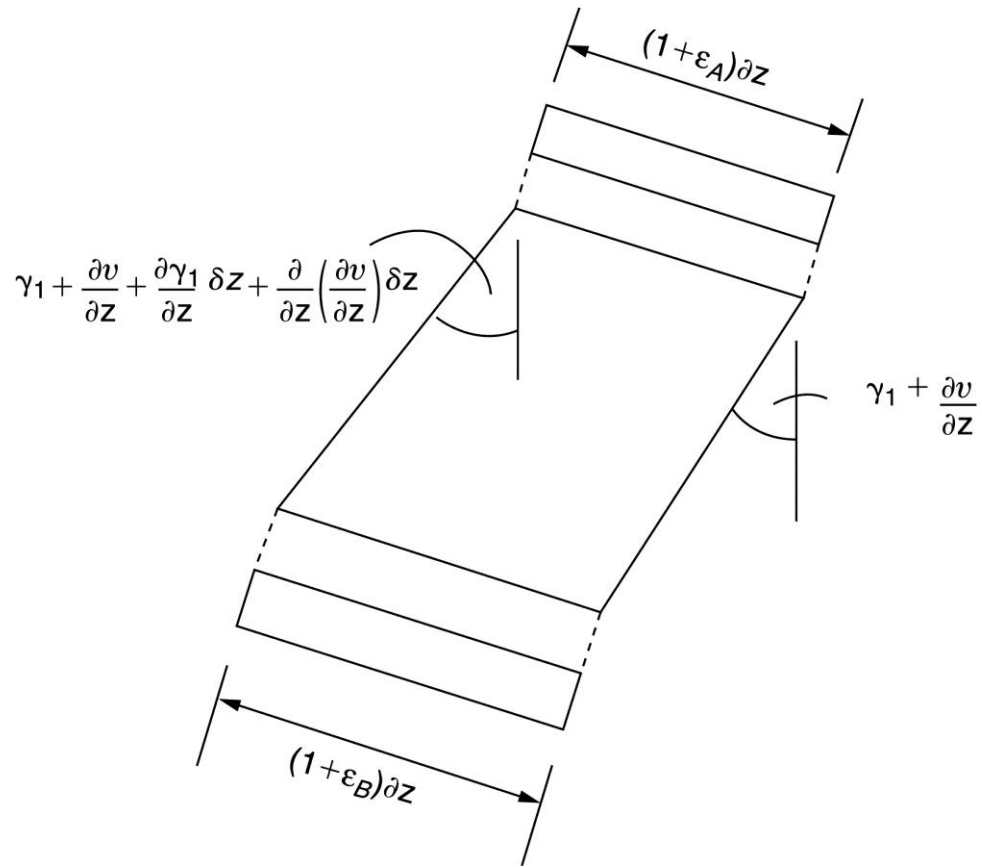
FIGURE 26.28 Panel of Example 26.5

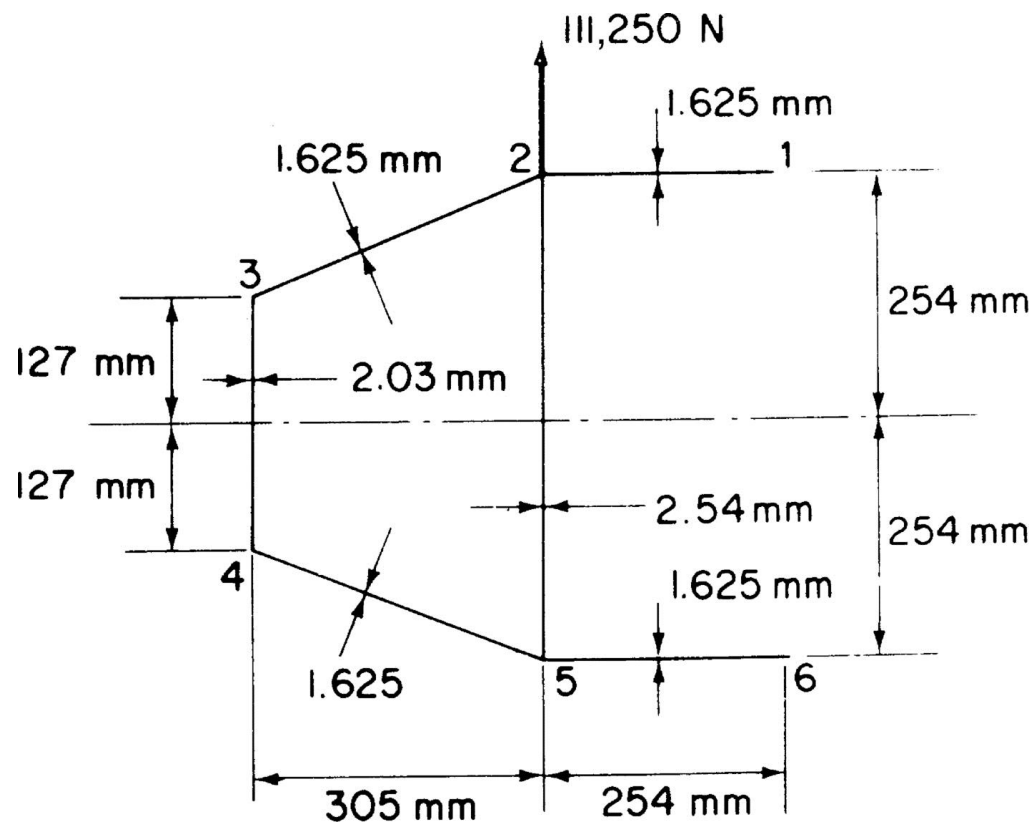**FIGURE 26.29** Compatibility Condition for the Panel of Example 26.5

FIGURE P.26.1
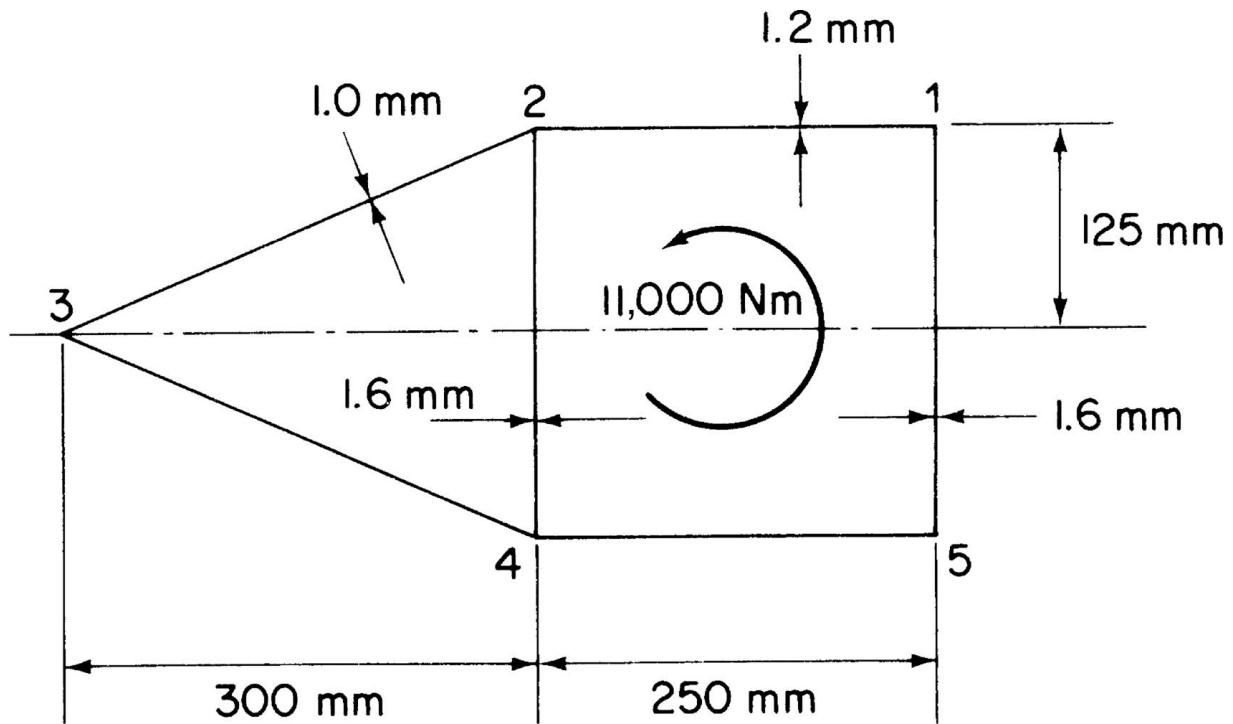
FIGURE P.26.2
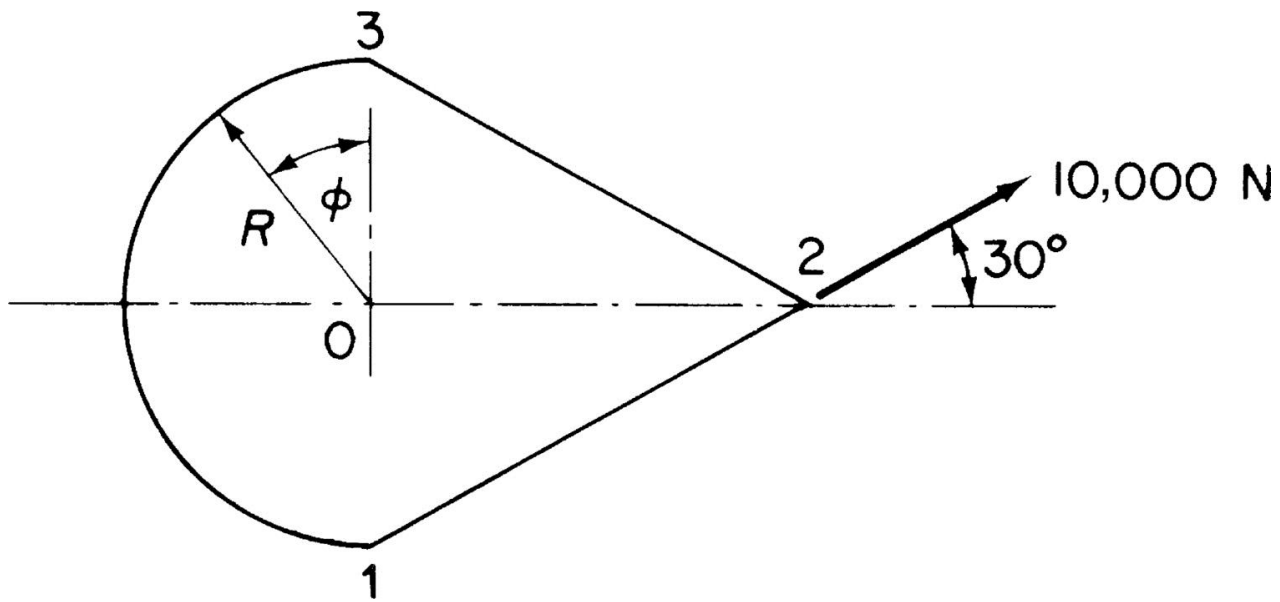
FIGURE P.26.3
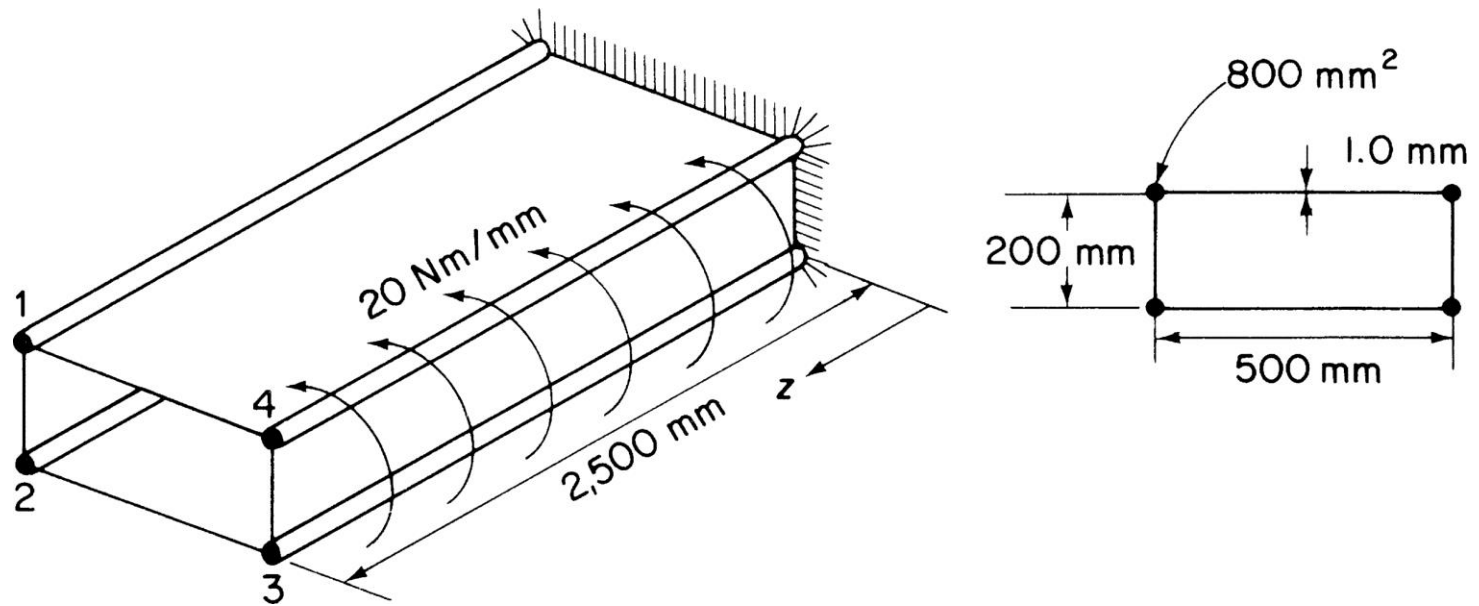
FIGURE P.26.4
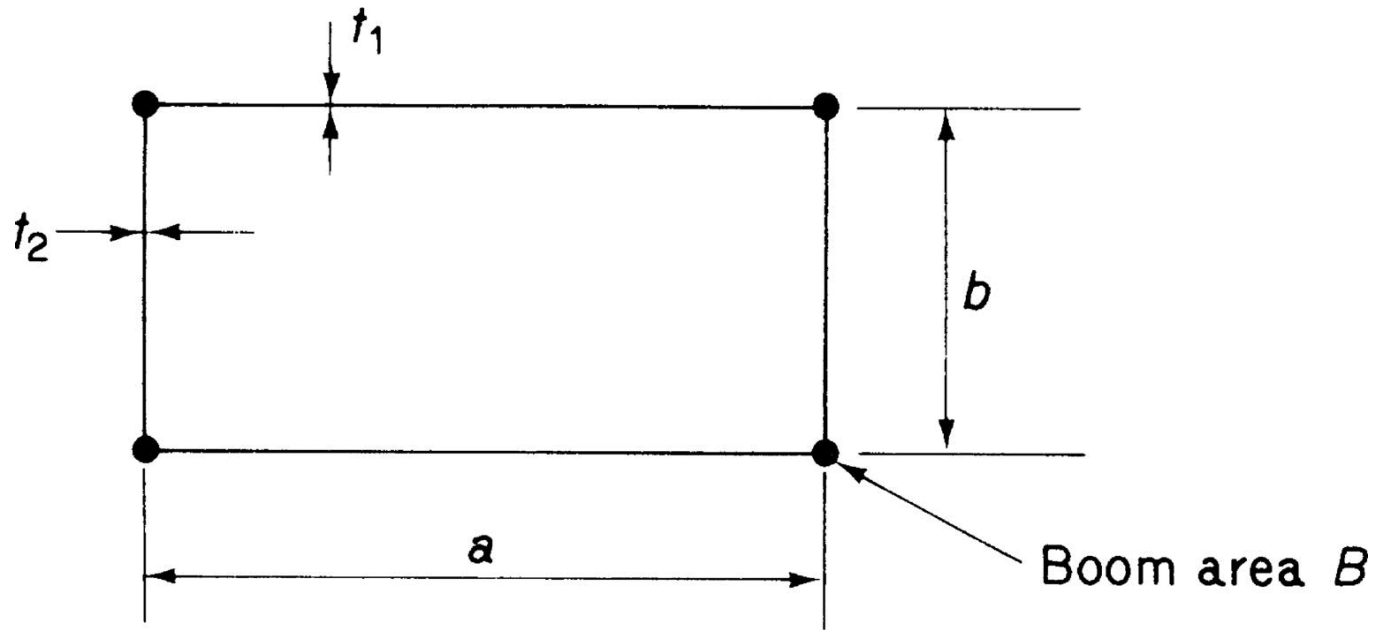
FIGURE P.26.5
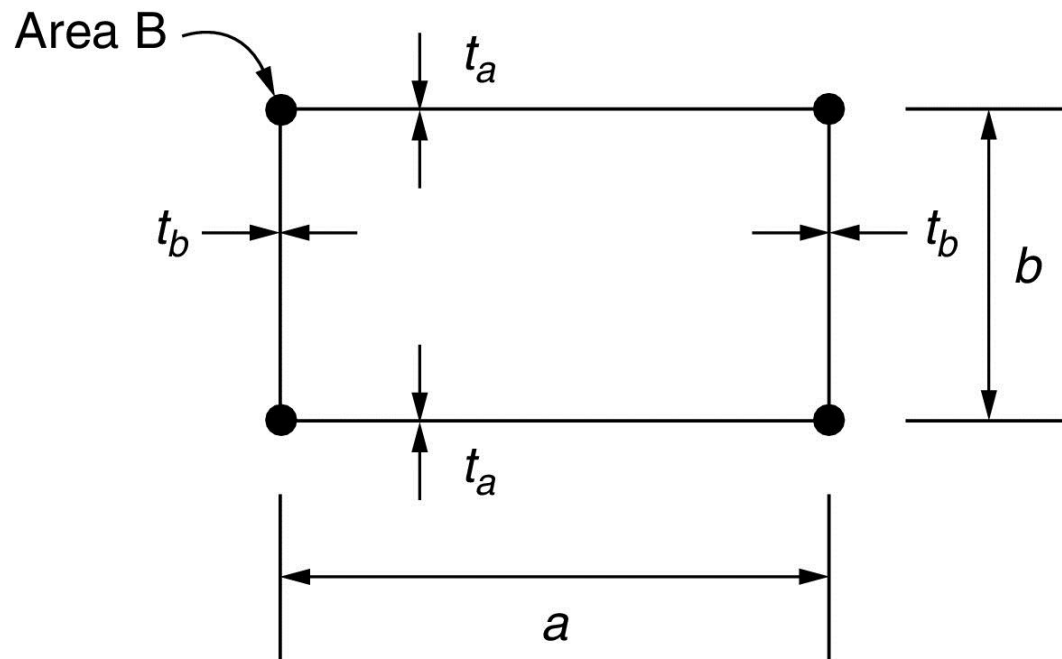
FIGURE P.26.6
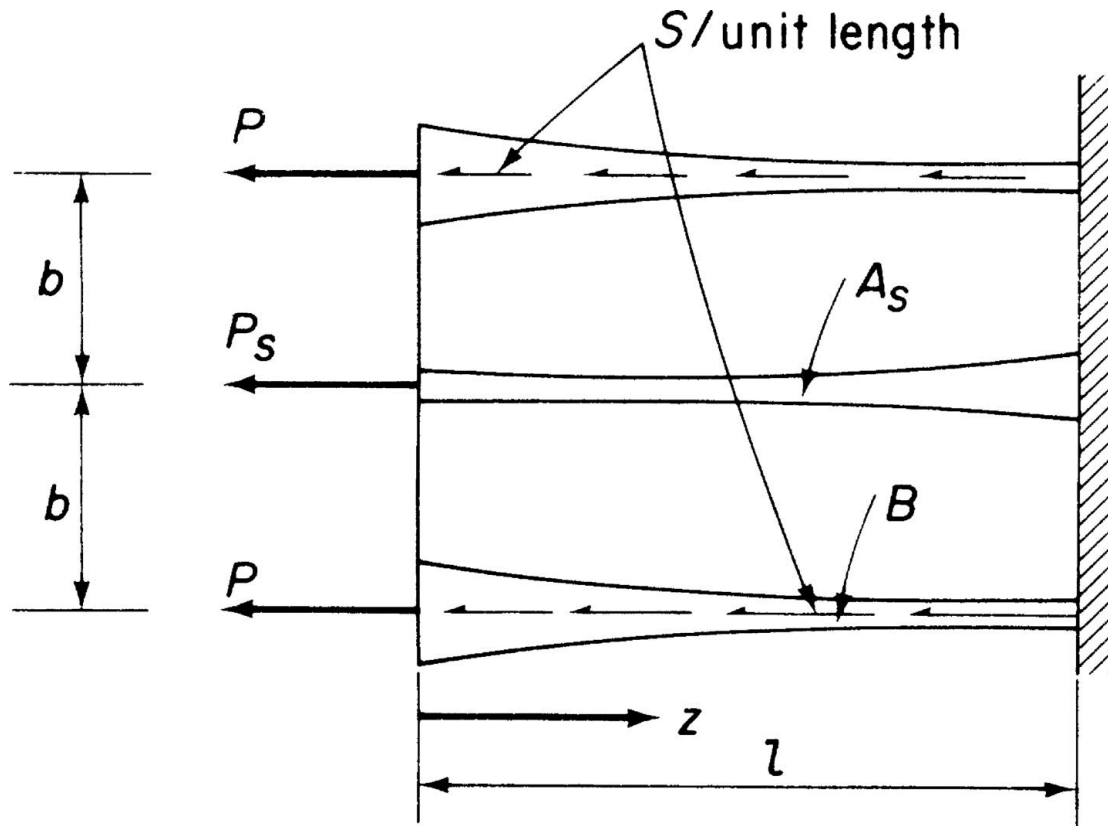
FIGURE P.26.7
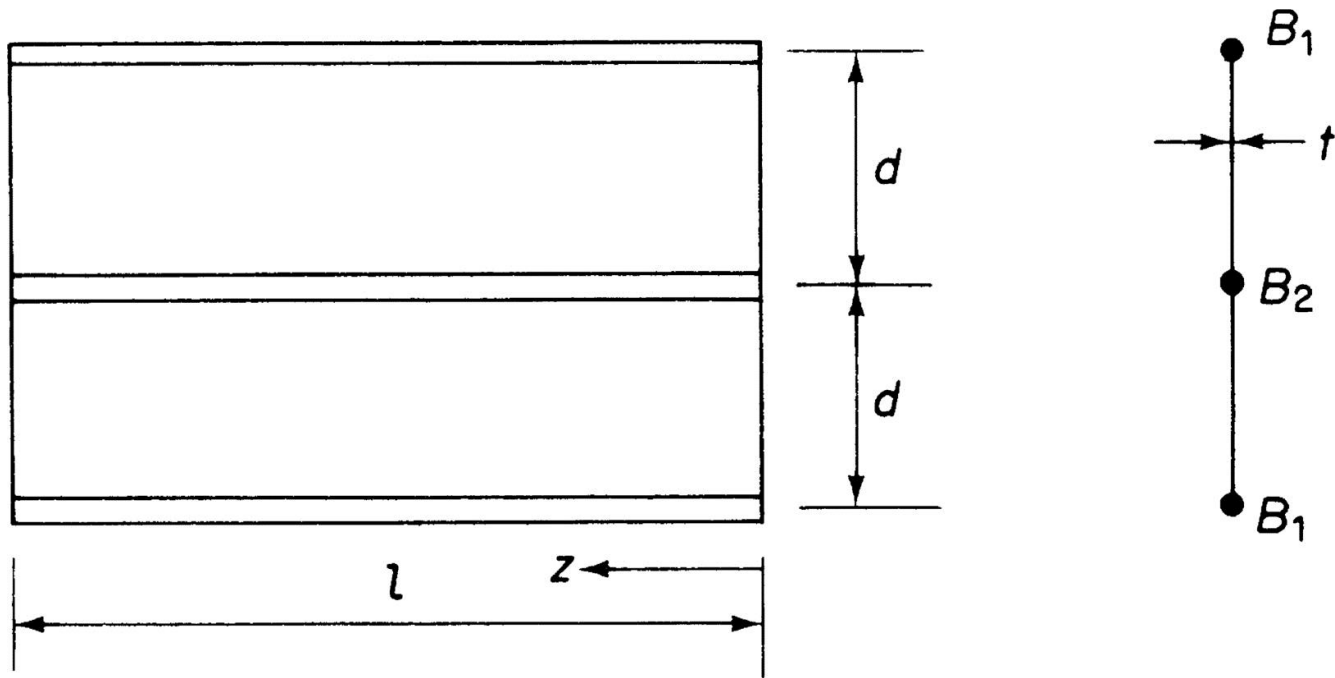
FIGURE P.26.8
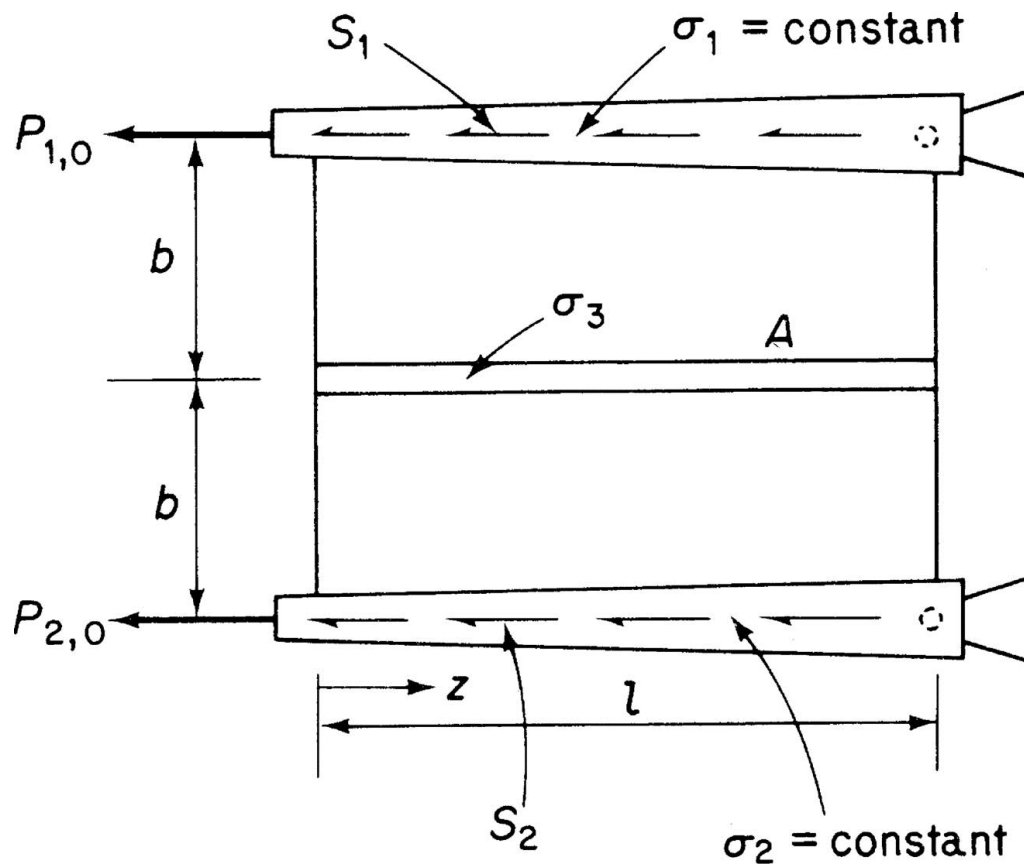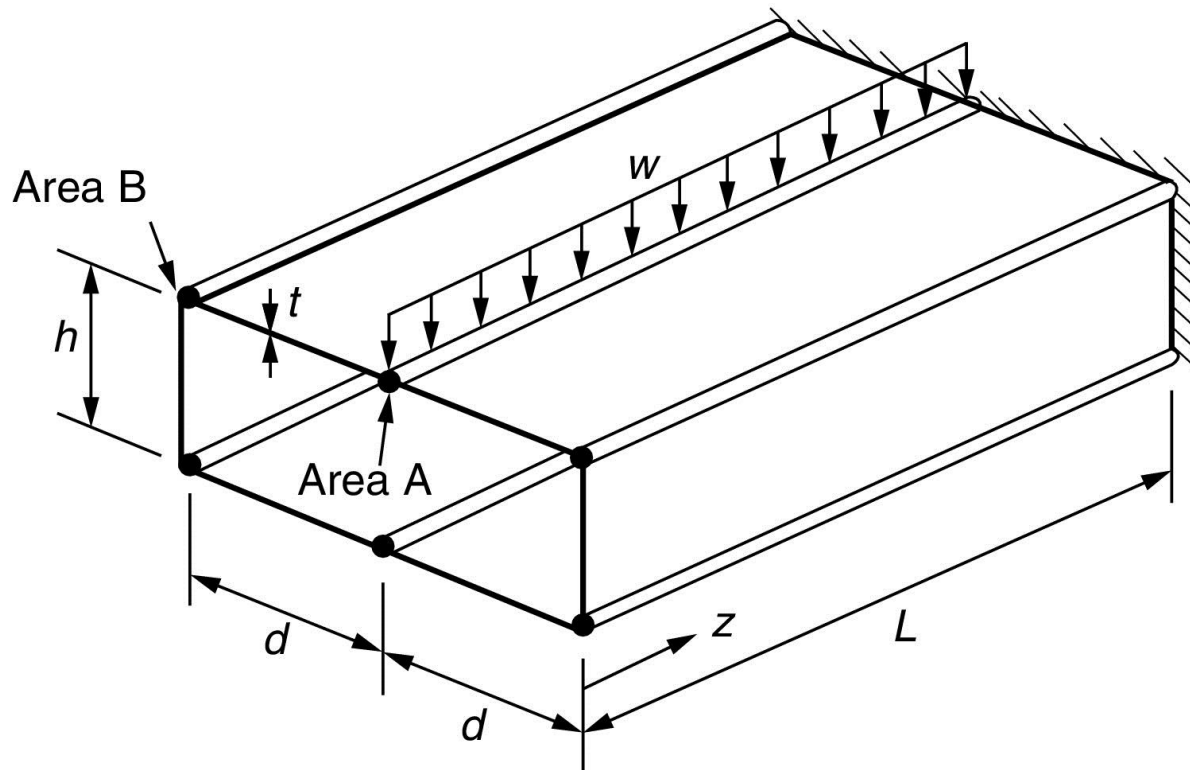
FIGURE P.26.9
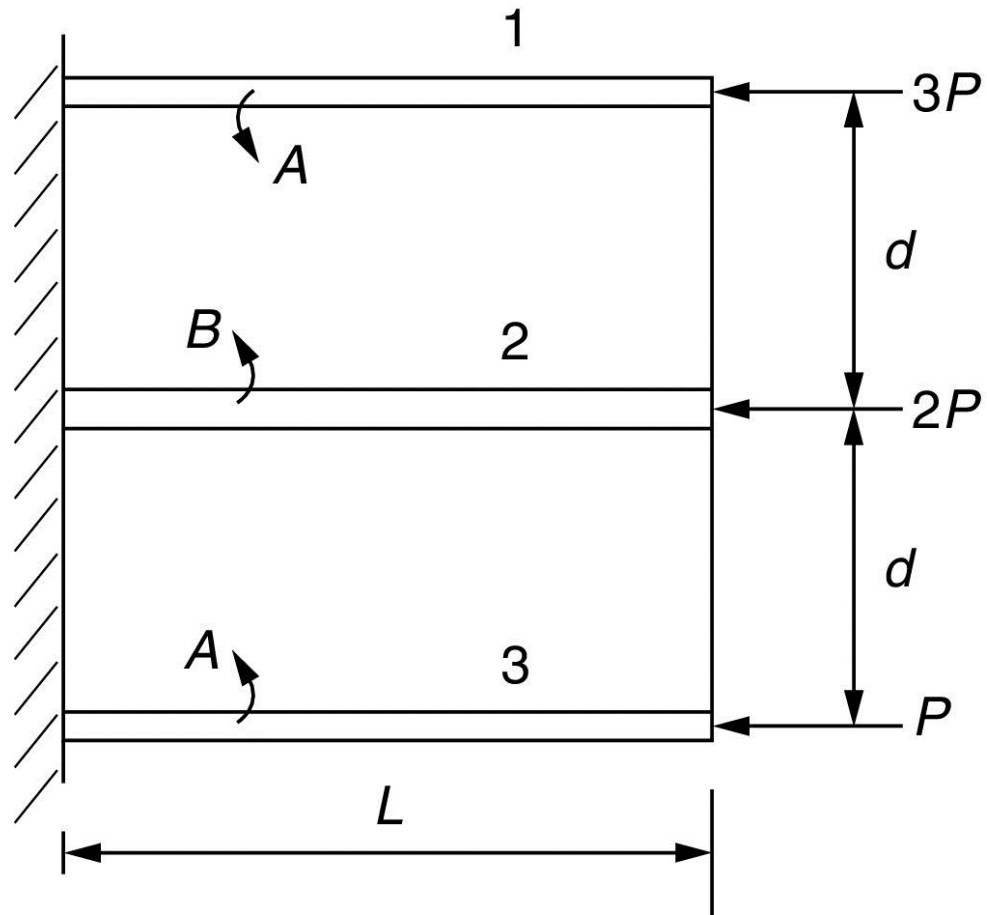
FIGURE P.26.10
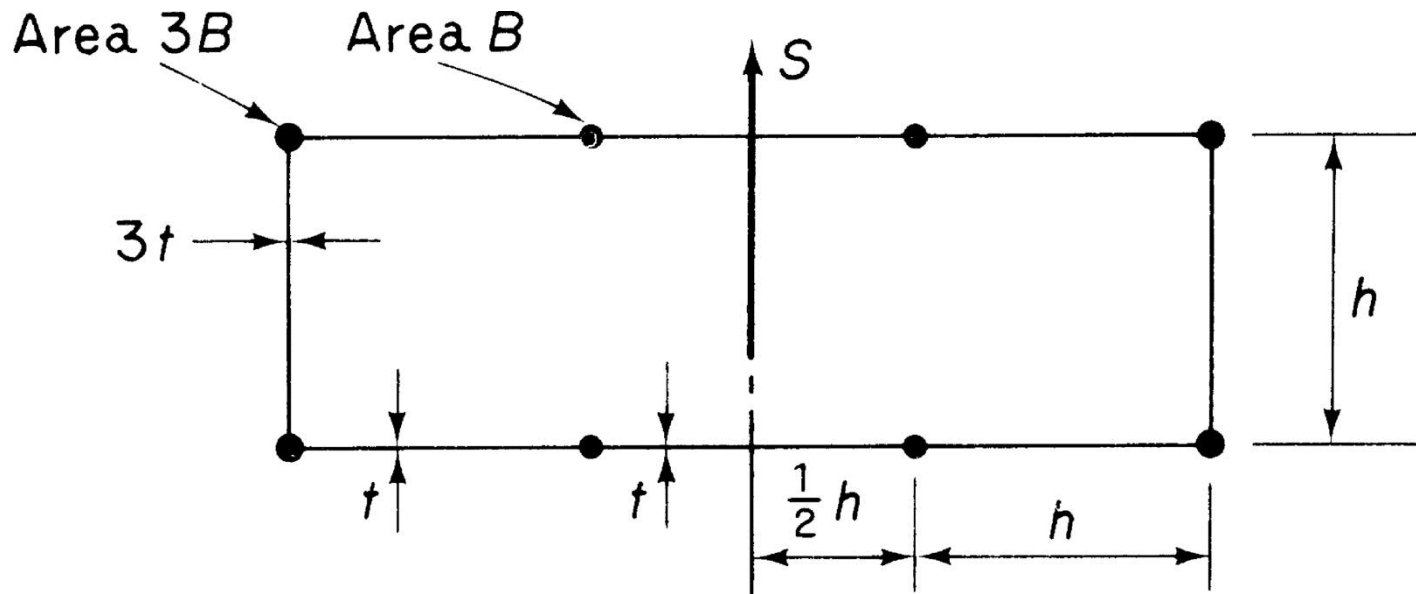
FIGURE P.26.11

FIGURE P.26.12

FIGURE P.26.13