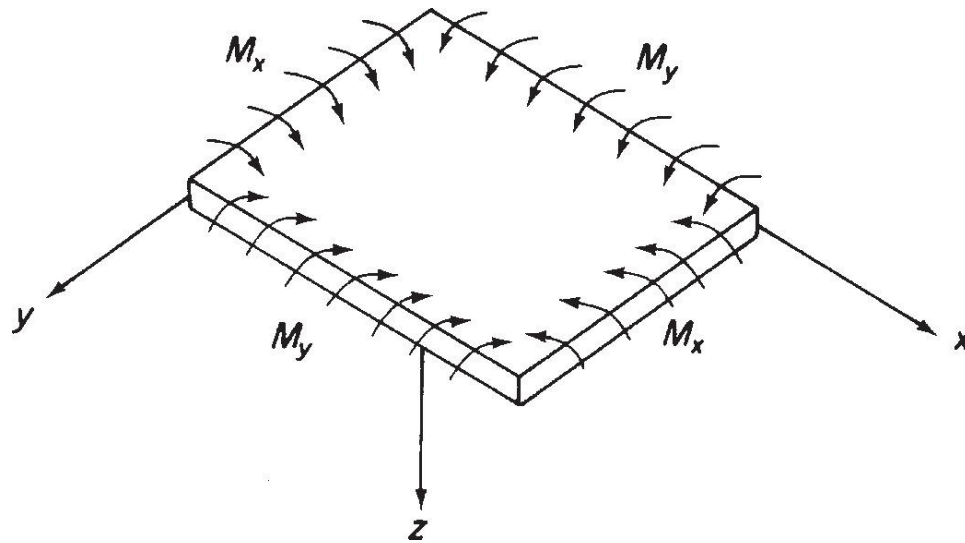
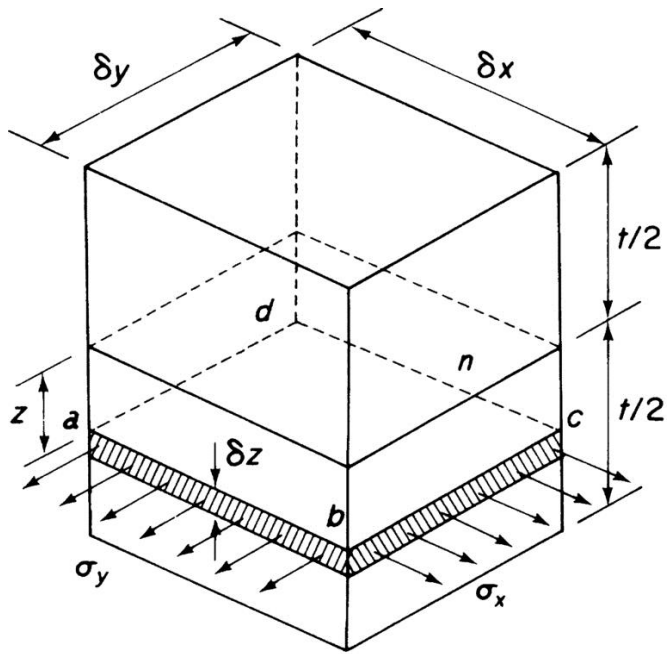


# Chapter 7

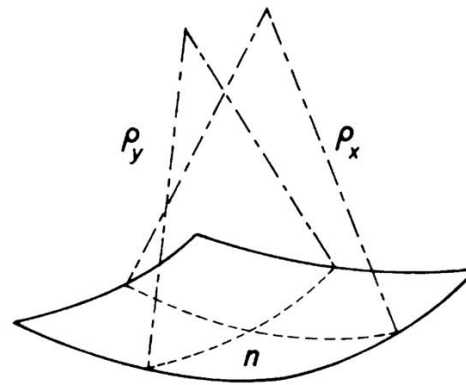
## Bending of thin plates



**FIGURE 7.1** Plate Subjected to Pure Bending

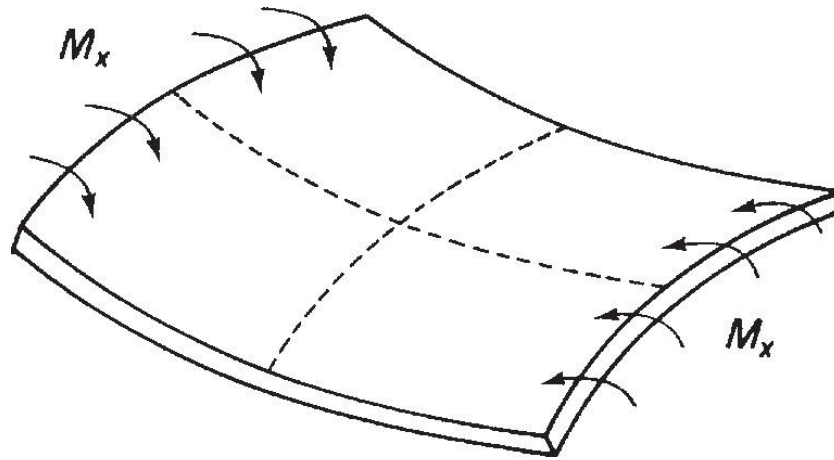


(a)

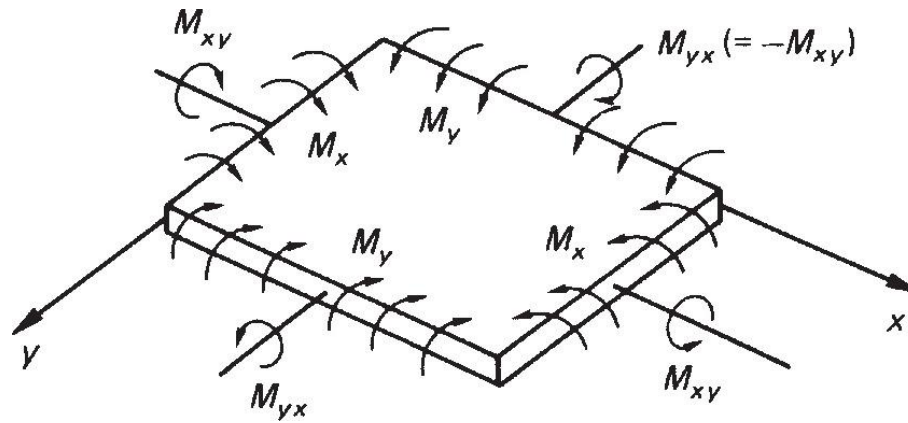


(b)

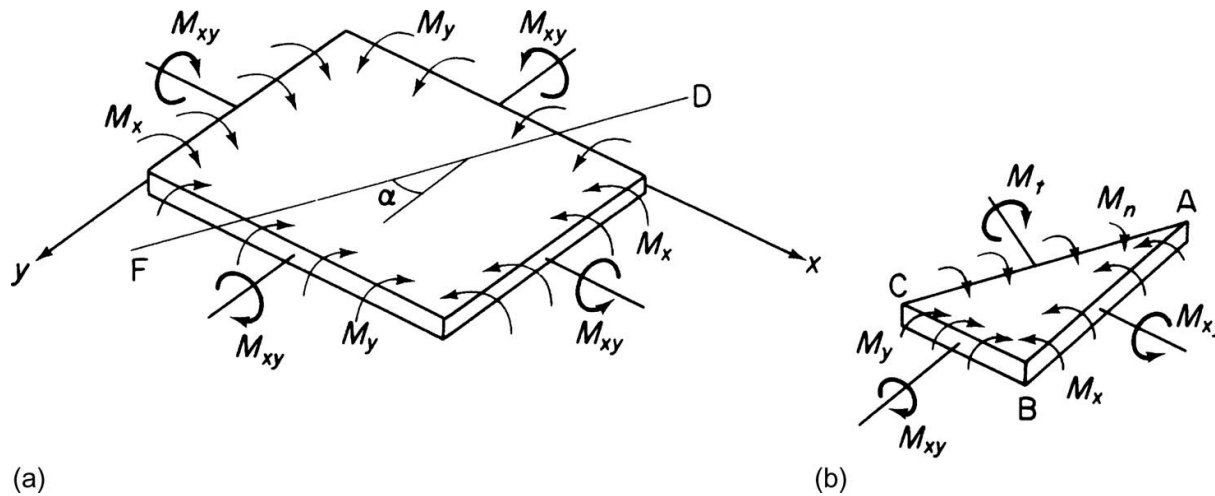
**FIGURE 7.2** (a) Direct Stress on Lamina of Plate Element; (b) Radii of Curvature of Neutral Plane



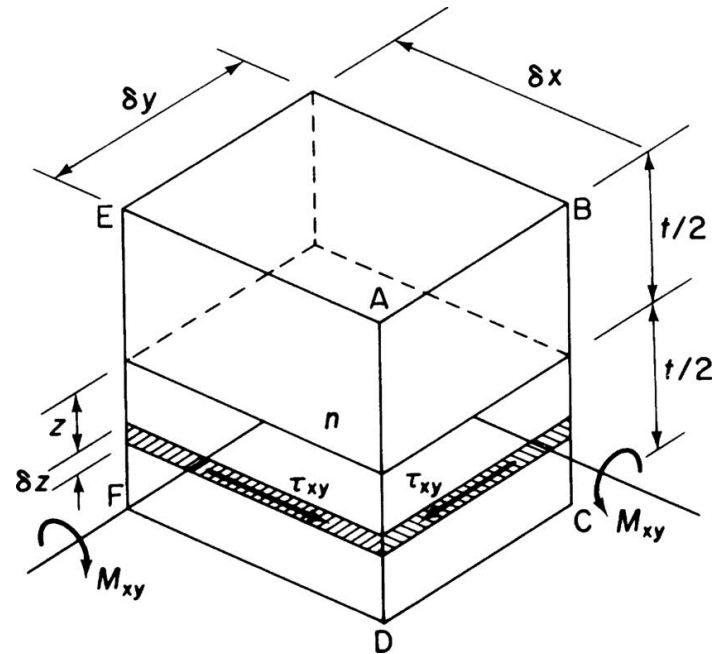
**FIGURE 7.3** Anticlastic Bending



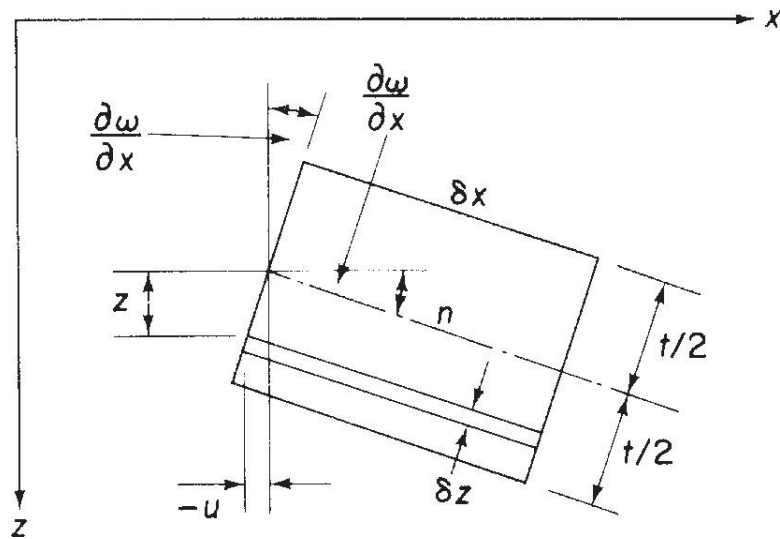
**FIGURE 7.4** Plate Subjected to Bending and Twisting



**FIGURE 7.5** (a) Plate Subjected to Bending and Twisting; (b) Tangential and Normal Moments on an Arbitrary Plane

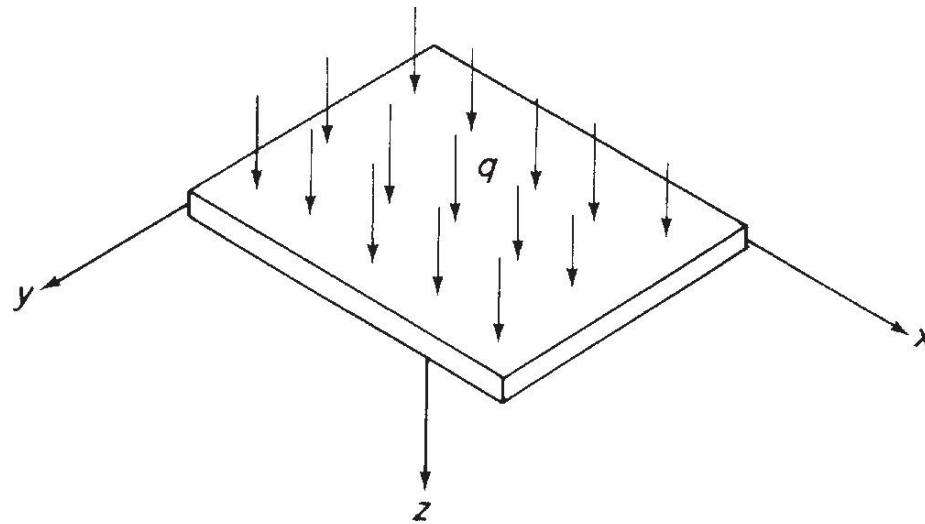


**FIGURE 7.6** Complementary Shear Stresses Due to Twisting Moments  $M_{xy}$

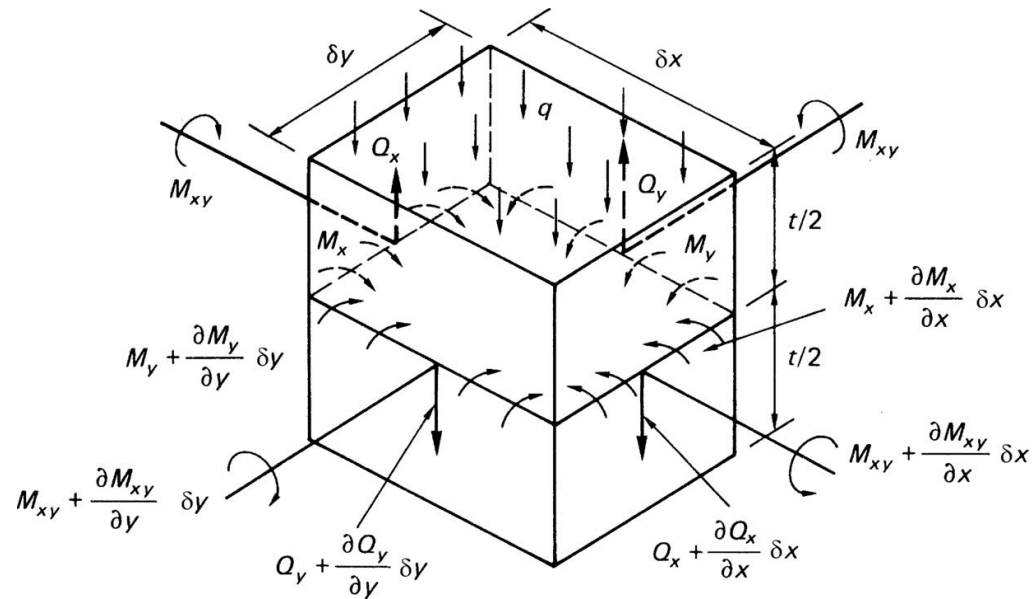


**FIGURE 7.7** Determination of Shear Strain  $\gamma_{xy}$

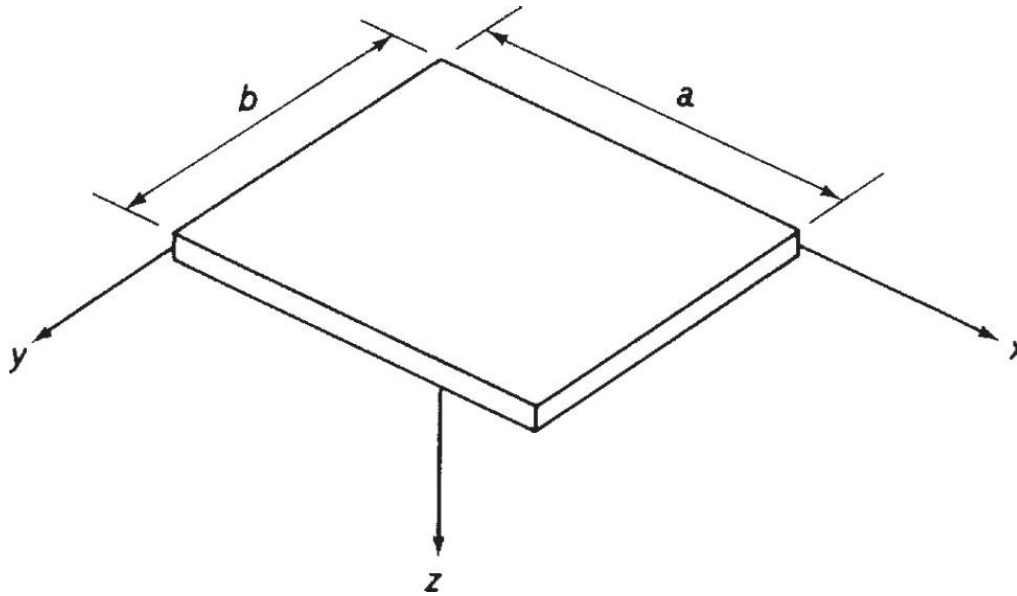




**FIGURE 7.8** Plate Supporting a Distributed Transverse Load



**FIGURE 7.9** Plate Element Subjected to Bending, Twisting, and Transverse Loads



**FIGURE 7.10** Plate of Dimensions  $a \times b$

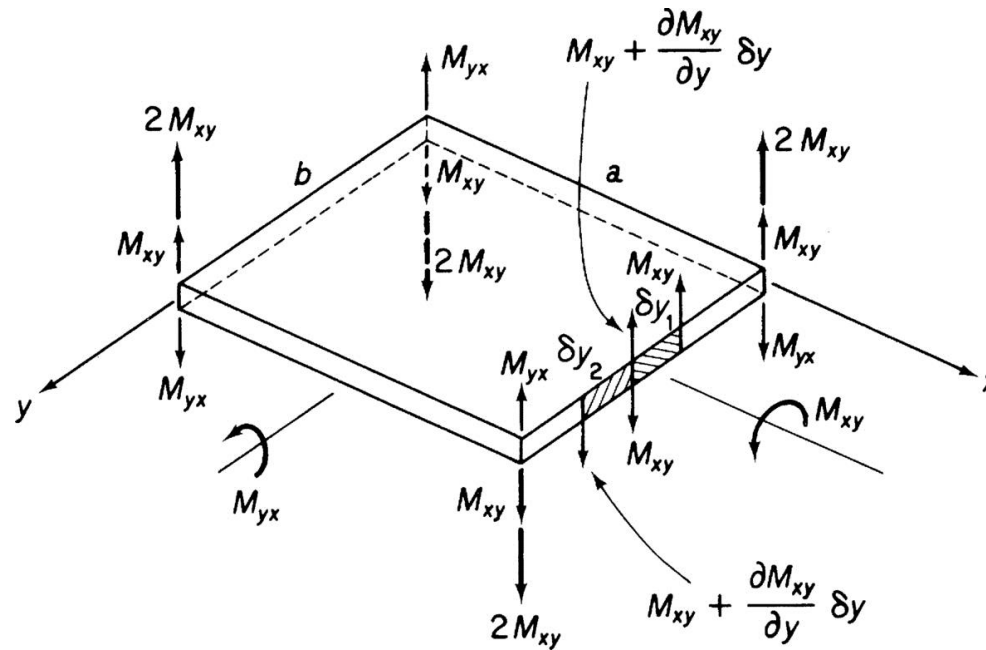
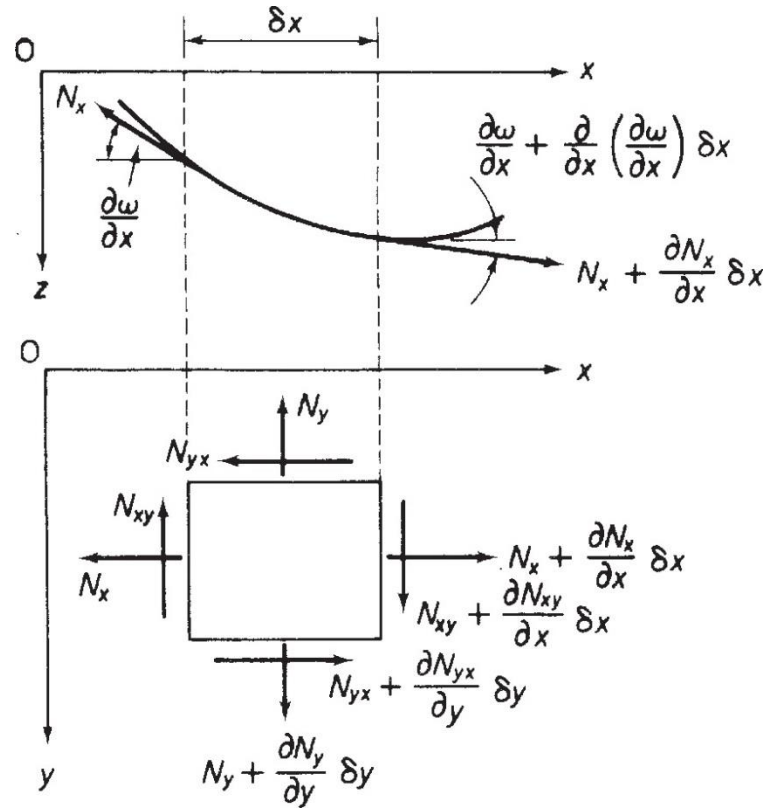
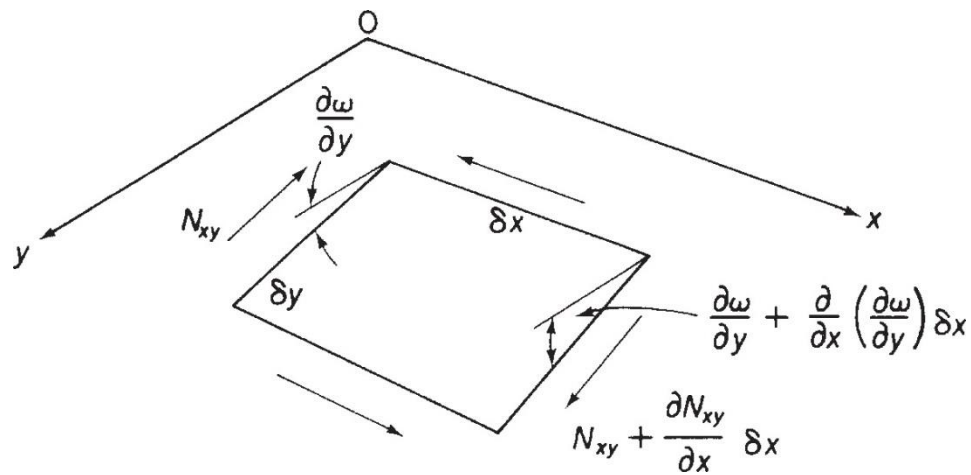


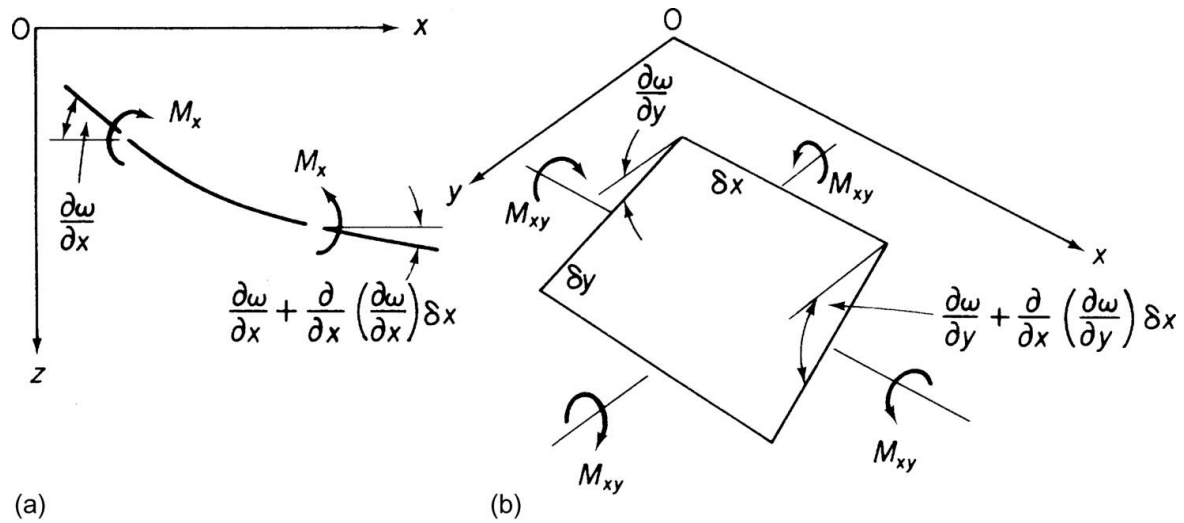
FIGURE 7.11 Equivalent Vertical Force System



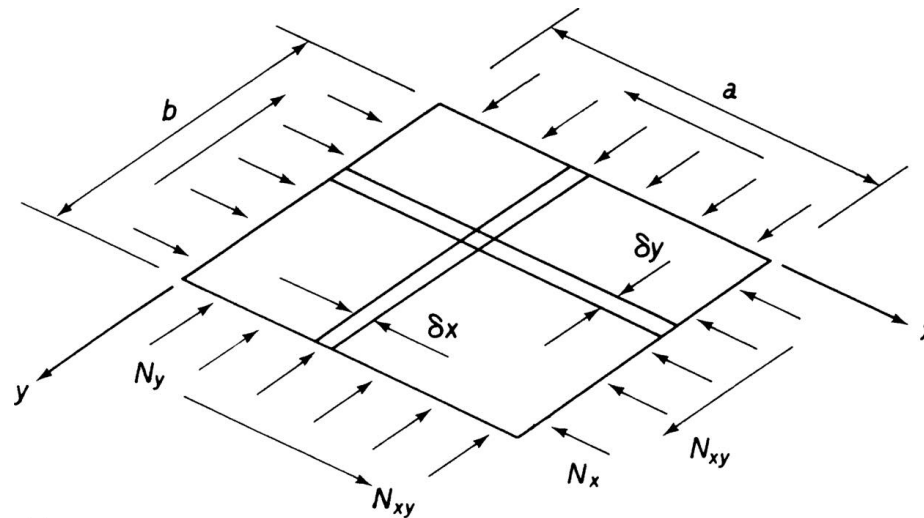
**FIGURE 7.12** In-Plane Forces on Plate Element



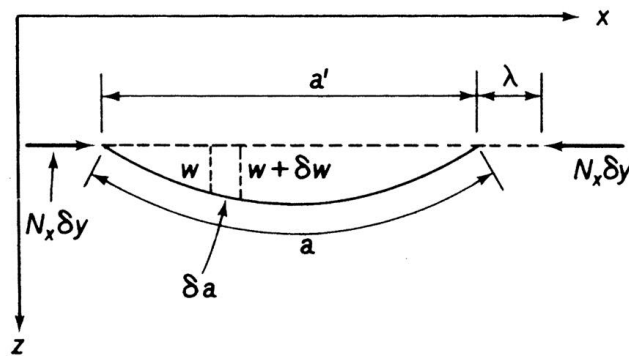
**FIGURE 7.13** Component of Shear Loads in the z Direction



**FIGURE 7.14** (a) Strain Energy of an Element Due to Bending; (b) Strain Energy Due to Twisting



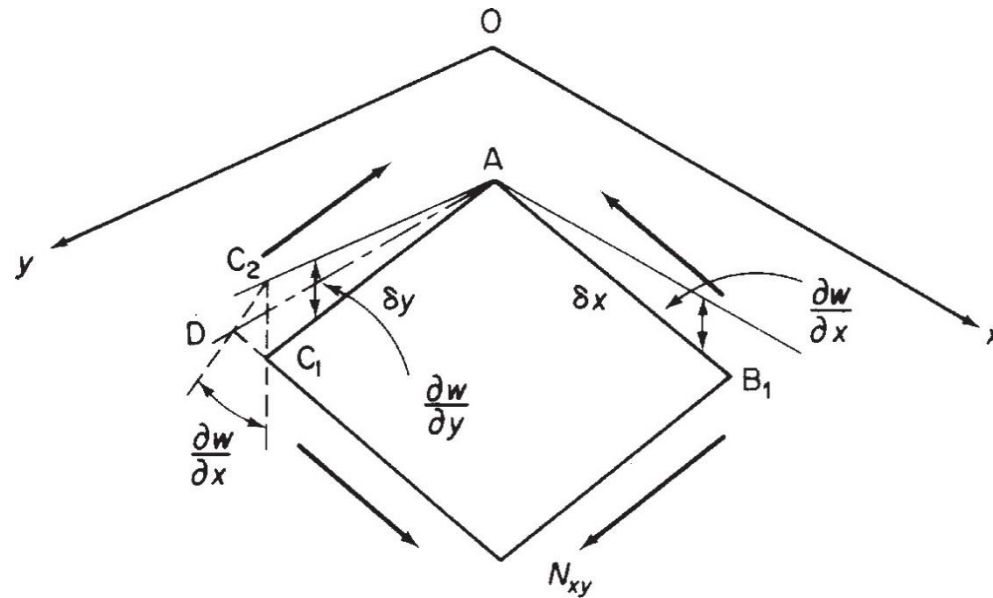
(a)



(b)

**FIGURE 7.15** (a) In-Plane Loads on a Plate; (b) Shortening of an Element Due to Bending





**FIGURE 7.16** Calculation of Shear Strain Corresponding to Bending Deflection