

## 8-6 FLEXIBLE CABLES

Flexible cables are used for suspension bridges and aerial tramways for power transmission and telephone lines, for guy wires on radio and television towers, and for many other engineering applications. A cable is said to be perfectly flexible when it offers no resistance to bending. Actual cables are not perfectly flexible; however, the resistance they offer to bending is generally so small that any bending effects can be neglected in the analysis of the cable without introducing serious error. Once it is assumed that the cable offers no resistance to bending, the resultant internal force on any cross section must act along a line tangent to the cable at that cross section.

In previous applications, cables were assumed to be straight two-force members capable of transmitting only axial tensile forces. When transverse loads are applied to a cable, it cannot remain straight but sags. Sag is defined as the difference in elevation between the lowest point on the cable and a support. When the supports are not at the same elevation, the sag measured from one support will be different from the sag measured from the other support. The span of a cable is defined as the horizontal distance between supports.

Flexible cables may be subjected to a series of distinct concentrated loads, or they may be subjected to loads that are uniformly distributed over the horizontal span of the cable or uniformly distributed over the length of the cable. The weights of cars and their contents on an aerial tramway is an example of a cable subjected to a series of concentrated loads. The weight of a suspension-bridge roadway is an example of a load that is uniformly distributed along the horizontal span of the cable. The weight of a power transmission cable of constant cross section is an example of a load that is uniformly distributed along the length of the cable.

In the following discussion of cables it will be assumed that the cables are perfectly flexible and inextensible. Relationships between the length, span, and sag of the cable, the tension in the cable, and the loads applied to the cable will be determined from equilibrium considerations.