Static Loading Failure Analysis
Materials are assumed homogeneous and isotropic.

Find all applied forces, moments, torques, etc. and draw free-body diagrams to show them applied to the part's geometry.

Based on the load distributions over the part's geometry, determine what cross sections of the part are most heavily loaded.

Determine the stress distributions within the cross sections of interest and identify locations of the highest applied and combined stresses.

Draw a stress element for each of the selected points of interest within the section and identify the stresses acting on it.

Calculate the applied stresses acting on each element and then calculate the principal stresses and maximum shear stress resulting therefrom.

Ductile Material
If the material is ductile, then calculate the von Mises effective stress at each selected stress element based on the calculated principal stresses.

Choose a trial material and compute a safety factor based on tensile yield strength of that material.

Brittle Material
If the material is brittle, calculate the Coulomb-Mohr effective stress at each selected stress element based on its principal stresses.

Choose a trial material and compute a safety factor based on the ultimate tensile strength of that material.

If a known or suspected crack is present, calculate the stress intensity factor from equation 5.14 and compare it to the fracture toughness of the material to determine if there is any danger of a crack propagation failure.

FIGURE 5-26
Flow Chart for Static Failure Analysis