CHAPTER 6

**MECHANICAL PROPERTIES OF METALS**

**6-8, 6-19, AND 6-42**

6.8 A cylindrical rod of copper (E = 110 GPa, 16 × 106 psi) having a yield strength of 240 MPa (35,000 psi) is to be subjected to a load of 6660 N (1500 lbf). If the length of the rod is 380 mm (15.0 in.), what must be the diameter to allow an elongation of 0.50 mm (0.020 in.)?

6.19 Consider a cylindrical specimen of some hypothetical metal alloy that has a diameter of 8.0 mm (0.31 in.). A tensile force of 1000 N (225 lbf) produces an elastic reduction in diameter of 2.8 × 10-4 mm (1.10 × 10-5 in.). Compute the modulus of elasticity for this alloy, given that Poisson's ratio is 0.30.

6.41 Using the data in Problem 6.28 and Equations 6.15, 6.16, and 6.18a, generate a true stress–true strain plot for aluminum. Equation 6.18a becomes invalid past the point at which necking begins; therefore, measured diameters are given below for the last four data points, which should be used in true stress computations.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Load*** | | ***Length*** | | ***Diameter*** | |
| ***N*** | ***lbf*** | ***mm*** | ***in.*** | ***mm*** | ***in.*** |
| *46,100* | *10,400* | *56.896* | *2.240* | *11.71* | *0.461* |
| *42,400* | *10,100* | *57.658* | *2.270* | *10.95* | *0.431* |
| *42,600* | *9,600* | *58.420* | *2.300* | *10.62* | *0.418* |
| *36,400* | *8,200* | *59.182* | *2.330* | *9.40* | *0.370* |

6-42: A tensile test is performed on a metal specimen, and it is found that a true plastic strain of 0.2 is produced when a true stress of 575 Mpa; for the same metal the value of K is 860Mpa; calculate the true strain that results from the application of a true stress of 600Mpa.