

11.D12 This problem asks if it is possible to temper an oil-quenched 4140 steel cylindrical shaft 25 mm (1 in.) in diameter so as to give a minimum yield strength of 950 MPa (140,000 psi) and a minimum ductility of 17%EL. In order to solve this problem it is necessary to use Figures 11.20(b) and 11.20(c), which plot, respectively, yield strength and ductility versus tempering temperature. For the 25 mm diameter line of Figure 11.20(b), tempering temperatures less than about 575°C are required to give a yield strength of at least 950 MPa. Furthermore, from Figure 11.20(c), for the 25 mm diameter line, tempering temperatures greater than about 550°C will give ductilities greater than 17%EL. Hence, it *is possible* to temper this alloy to produce the stipulated minimum yield strength and ductility; the tempering temperature will lie between 550°C and 575°C.