

Miscellaneous Techniques

11.17 This problem asks that we specify and compare the microstructures and mechanical properties in the heat-affected weld zones for 1080 and 4340 alloys assuming that the average cooling rate is $10^{\circ}\text{C}/\text{s}$. Figure 10.27 shows the continuous cooling transformation diagram for an iron-carbon alloy of eutectoid composition (1080), and, in addition, cooling curves that delineate changes in microstructure. For a cooling rate of $10^{\circ}\text{C}/\text{s}$ (which is less than $35^{\circ}\text{C}/\text{s}$) the resulting microstructure will be totally pearlite--probably a reasonably fine pearlite. On the other hand, in Figure 10.28 is shown the CCT diagram for a 4340 steel. From this diagram it may be noted that a cooling rate of $10^{\circ}\text{C}/\text{s}$ produces a totally martensitic structure. Pearlite is softer and more ductile than martensite, and, therefore, is most likely more desirable.