

11.D7 (a) This problem calls for us to decide which of 8660, 8640, 8630, and 8620 alloys may be fabricated into a cylindrical piece 57 mm (2-1/4 in.) in diameter which, when quenched in mildly agitated water, will produce a minimum hardness of 45 HRC throughout the entire piece.

The center of the steel cylinder will cool the slowest and therefore will be the softest. In moderately agitated water the equivalent distance from the quenched end for a 57 mm diameter bar for the center position is about 11 mm (7/16 in.) [Figure 11.17(a)]. The hardnesses at this position for the alloys cited (Figure 11.15) are given below.

<u>Alloy</u>	<u>Center Hardness (HRC)</u>
8660	61
8640	49
8630	36
8620	25

Therefore, only 8660 and 8640 alloys will have a minimum of 45 HRC at the center, and therefore, throughout the entire cylinder.

(b) This part of the problem asks us to do the same thing for moderately agitated oil. In moderately agitated oil the equivalent distance from the quenched end for a 57 mm diameter bar at the center position is about 17.5 mm (11.16 in.) [Figure 11.17(b)]. The hardnesses at this position for the alloys cited (Figure 11.15) are given below.

<u>Alloy</u>	<u>Center Hardness (HRC)</u>
8660	59
8640	42
8630	30
8620	21

Therefore, only the 8660 alloy will have a minimum of 45 HRC at the center, and therefore, throughout the entire cylinder.