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Superseding ARP1341A

**Determining Decarburization and Carburization
in Finished Parts of Carbon and Low-Alloy Steels**

1. SCOPE:

This document provides a recommended practice for determining decarburization and carburization in heat treated carbon and low-alloy steel parts other than case hardened parts. It is not applicable to raw materials.

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM E 3 Preparation of Metallographic Specimens
ASTM E 384 Microhardness of Materials
ASTM E 407 Microetching Metals and Alloys

3. PROCEDURE:

3.1 Test Specimens:

3.1.1 Integral Specimens: A metallographic specimen shall be removed from the part after the part has been completely heat treated. Care should be taken in removing the specimen to avoid overheating the specimen.

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3.1.2 Specimens from Separate Samples: A metallographic specimen shall be taken from a sample processed with the part. The sample shall be of the same grade of steel as the part, have the same surface condition as the part, and preferably be from the same heat of steel as the part. The sample shall be hardened and tempered with the part represented, using the specified procedure, except that, when specified, the sample shall be hardened but not tempered (See 5.1).

3.2 Preparation of Test Samples:

The metallographic specimen shall be taken transverse to the surface of the part of sample and shall be at least 0.250 inch (6.35 mm) thick. The specimen shall be prepared in accordance with ASTM E 3 and E 407.

3.3 Examination:

3.3.1 Visual: The etched specimen shall be examined under a microscope at 100X magnification, using a calibrated eyepiece.

3.3.2 Microhardness Survey: A microhardness traverse shall be made with a Knoop indenter and 200 grams load in accordance with ASTM E 384. A minimum of three hardness readings shall be taken to establish the specimen base hardness in an area at least 0.125 inch (3.18 mm) from the outside surface or at midradius or midthickness, whichever is less. Readings shall be taken at 0.001 inch (0.03 mm) intervals starting at 0.002 inch (0.05 mm) from the outside surface in a staggered pattern until the preestablished base hardness is reached. The hardness readings shall be plotted versus distance from the outside surface as shown in Figure 1.

4. DECARBURIZATION AND CARBURIZATION DETERMINATION:

4.1 Complete Decarburization (Free Ferrite):

Shall be determined by visual examination as in 3.3.1. The maximum and average depths shall be reported.

4.2 Total Decarburization (Complete plus partial):

Shall be determined by microhardness survey as in 3.3.2. The depth of total decarburization shall be as follows:

4.2.1 Hardened and Tempered Specimens: That depth below the surface at which the hardness is no more than 20 units on the Knoop scale lower than the base hardness, as illustrated in Figure 1.

4.2.2 Hardened Specimens: That depth below the surface at which the hardness is no more than 30 units on the Knoop scale lower than the base hardness.

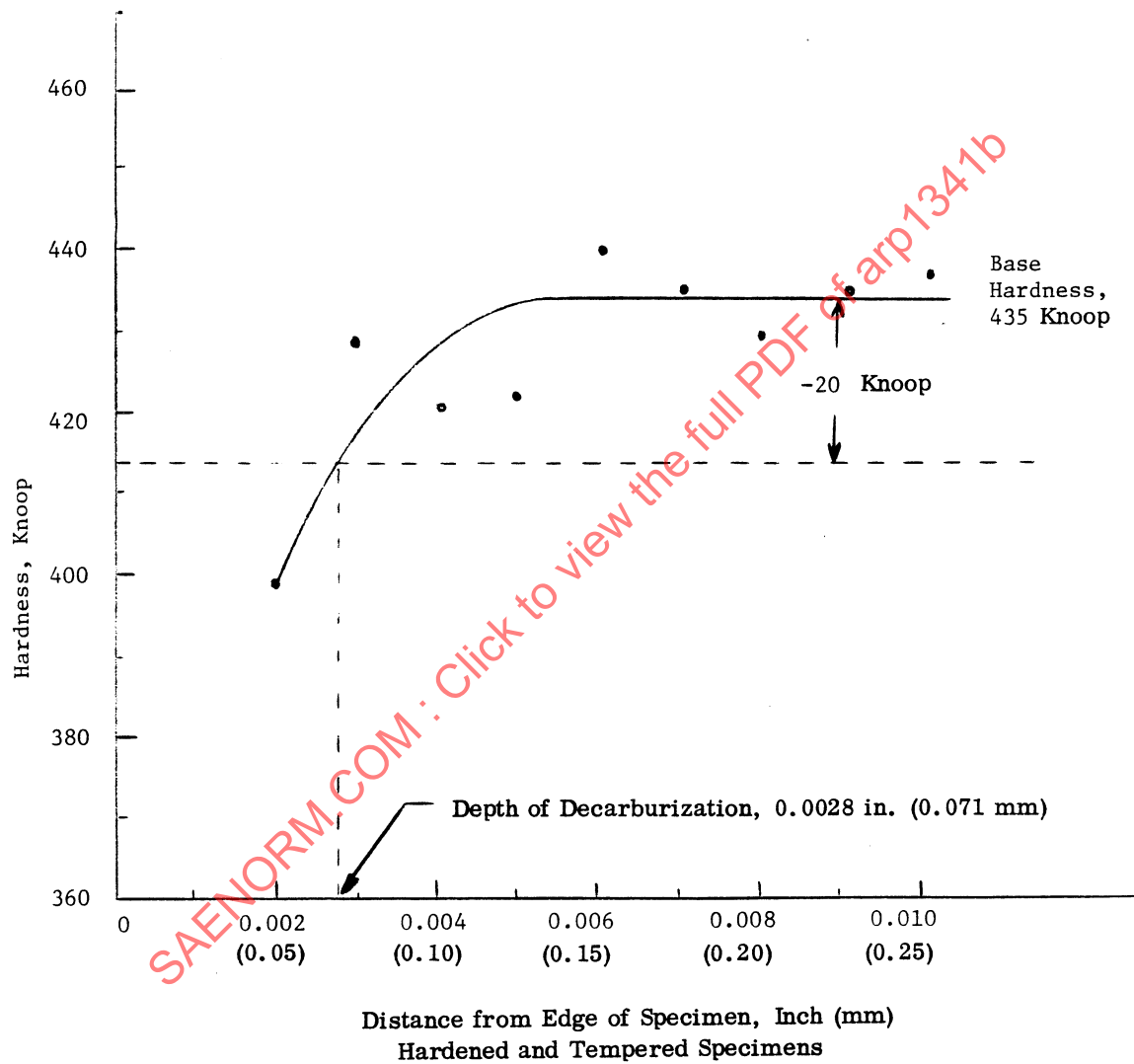


FIGURE 1 - Typical Microhardness Survey