



Standard Test Methods for Estimating the Depth of Decarburization of Steel Specimens¹

This standard is issued under the fixed designation E 1077; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

^{ε1} NOTE—Sections 2.1 and 3.1.1 were editorially revised in June 2001.

INTRODUCTION

These test methods may be used to estimate the average or greatest depth of decarburization in hardened or non-hardened steel products. The test methods described range from simple screening tests to more statistically rigorous test methods depending upon the needs of the investigation.

1. Scope

1.1 These test methods cover procedures for estimating the depth of decarburization of steels irrespective of the composition, matrix microstructure, or section shape. The following basic procedures may be used:

- 1.1.1 Screening methods.
- 1.1.2 Microscopical methods.
- 1.1.3 Microindentation hardness methods.
- 1.1.4 Chemical analysis methods.

1.2 In case of a dispute, the rigorous quantitative or lineal analysis method (see 7.3.5 and 7.3.6) shall be the referee method. These methods can be employed with any cross-sectional shape. The chemical analytical methods generally reveal a greater depth of decarburization than the microscopical methods but are limited to certain simple shapes and by availability of equipment. These techniques are generally reserved for research studies. The microindentation hardness method is suitable for accurate measurements of hardened structures with relatively homogeneous microstructures.

1.3 The values stated in SI units are to be regarded as standard. The inch-pound equivalents are in parentheses and may be approximate.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys and Ferroalloys²
- E 3 Practice for Preparation of Metallographic Specimens³
- E 7 Terminology Relating to Metallography³
- E 340 Test Method for Macroetching Metals and Alloys³
- E 350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron⁴
- E 384 Test Method for Microindentation Hardness of Materials³
- E 407 Practice for Microetching Metals and Alloys³
- E 415 Test Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel⁵
- E 1951 Guide for Calibrating Reticals and Light Microscope Magnifications³

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in these test methods, see Terminology E 7 and Terminology A 941.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *average depth of decarburization*—the mean value of five or more measurements of the total depth of decarburization.

3.2.2 *average free-ferrite depth*—the mean value of five or more measurements of the depth of complete decarburization.

¹ These test methods are under the jurisdiction of ASTM Committee E04 on Metallography and are the direct responsibility of Subcommittee E04.14 on Quantitative Metallography.

Current edition approved March 10, 2001. Published May 2001. Originally published as E 1077 – 85. Last previous edition E 1077 – 91 (1997).

² *Annual Book of ASTM Standards*, Vol 01.02.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 03.05.

⁵ *Annual Book of ASTM Standards*, Vol 03.06.