



Standard Test Method for Spectrographic Determination of Boron In Carbon and LowAlloy Steel by the Point-To-Plane Technique¹

This standard is issued under the fixed designation E 404; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Editorial changes were made in October 2000.

1. Scope

1.1 This test method covers the spectrographic determination of boron in carbon and low-alloy steel for boron in the concentration range from 0.001 to 0.01 %.

NOTE 1—The concentration range of the element listed has been established through cooperative testing² of reference materials. The scope is underwritten by available spectrochemical reference materials.

1.2 This test method is applicable for the analysis of carbon and low-alloy steel samples, chill-cast, rolled, or forged, of miscellaneous sizes and shapes on which a flat surface at least 12.7 mm in diameter can be prepared, and which are sufficiently massive to prevent overheating during the discharge. Thin samples less than 3.2 mm but greater than 0.79 mm thick, may be analyzed if these samples are soldered to steel plate having a thickness of at least 3.2 mm.

1.3 *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:

E 30 Test Methods for Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron, and Wrought Iron³

E 115 Practice for Photographic Processing in Optical Emission Spectrographic Analysis⁴

E 116 Practice for Photographic Photometry in Spectrochemical Analysis⁴

E 130 Practice for Designation of Shapes and Sizes of Graphite Electrodes⁴

E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials⁴

¹ This test method is under the jurisdiction of the ASTM Committee E01 on Analytical Chemistry for Metals, Ores, and Related Materials and is the direct responsibility of Subcommittee E01.01 on Iron, Steel, and Ferroalloys.

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² Supporting data for this test method have been filed at ASTM Headquarters, 1916 Race St., Philadelphia, PA 19103, as RR:E2-1000.

³ Discontinued 1995; see 1994 Annual Book of ASTM Standards, Vol 03.05.

⁴ Annual Book of ASTM Standards, Vol 03.05.

E 172 Practice for Describing and Specifying the Excitation Source in Emission Spectrochemical Analysis⁴

E 305 Practice for Establishing and Controlling Spectrochemical Analytical Curves⁴

E 327 Test Method for Optical Emission Spectrometric Analysis of Stainless Type 18-8 Steels by the Point-to-Plane Technique⁵

E 409 Practice for Description and Performance of the Microphotometer⁴

3. Terminology

3.1 For definitions of terms used in this test method, refer to Terminology E 135.

4. Summary of Test Method

4.1 A flat sample surface is excited by a controlled arc discharge using the point-to-plane technique. The intensity ratio of a boron line and an iron line is determined photometrically. The concentration of boron is read from an analytical curve relating log intensity ratio to log concentration.

5. Significance and Use

5.1 Some hot-worked surfaces may be severely deboronized (up to $\frac{1}{8}$ in.) into the sample. Tests should be performed to establish the amount of sample for each process that needs to be removed to allow a correct boron analysis.

6. Apparatus

6.1 Sample Preparation Equipment:

6.1.1 *Cut-off Machine*, capable of cutting test specimens 63.5 mm in diameter.

6.1.2 *Belt Sander*, with 36 and 60-grit aluminum oxide belts.

6.2 *Electrode Cutter*, for shaping electrodes to the configurations described in Section 7.

6.3 *Excitation Source*, providing a controlled arc with the parameters described in 11.1.1. (See Practice E 172.)

6.4 *Spark Stand*, suitable for mounting in optical alignment a flat surface of the specimen in opposition to a graphite counter electrode. The stand may be water-cooled.

⁵ Discontinued 1999; see 1998 Annual Book of ASTM Standards, Vol 03.06.