



Standard Test Method for Optical Emission Vacuum Spectrometric Analysis of Blast Furnace Iron by the Point-to-Plane Technique¹

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

1. Scope

1.1 This test method describes the spectrochemical procedure for the analysis of blast furnace iron (hot metal) containing 4.2 to 5.0 % carbon for the following elements in the indicated ranges:

Elements	Concentration Range, %
Silicon	0.50 to 2.00
Manganese	0.20 to 1.50
Phosphorus	0.020 to 0.15
Titanium	0.02 to 0.10
Sulfur	0.010 to 0.050

1.2 *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 Iron²

E 130 Practice for Designation of Shapes and Sizes of Graphite Electrodes²

E 135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials²

E 158 Practice for Fundamental Calculations to Convert Intensities into Concentrations in Optical Emission Spectrochemical Analysis²

E 172 Practice for Describing and Specifying the Excitation Source in Emission Spectrochemical Analysis²

E 305 Practice for Establishing and Controlling Spectrochemical Analytical Curves²

E 876 Practice for Use of Statistics in the Evaluation of Spectrometric Data³

¹ This test method is under the jurisdiction of ASTM Committee E-1 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 Annual Book of ASTM Standards, Vol 03.05.

³ Annual Book of ASTM Standards, Vol 03.06.

3. Terminology

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

4. Summary of Test Method

4.1 The sample is excited in an inert gas atmosphere by a controlled triggered capacitor discharge using the point-to-plane technique. Using a vacuum spectrometer, the radiant energies of selected analytical lines and an internal standard line are measured by photomultipliers. The output current of each photomultiplier is accumulated and stored during the exposure period as a charge on an associated capacitor, where it appears as a measurable voltage. At the end of the exposure period the voltages corresponding to the analytical lines relative to the voltage for the internal standard line are measured. The measuring system may be calibrated in terms of percent concentration.

5. Apparatus

5.1 Sample Preparation Equipment:

5.1.1 *Sample Mold*, to produce gray iron samples that are homogeneous, free of voids or porosity in the region to be excited, and representative of the material to be analyzed. A cast disk approximately 28 mm (1½ in.) in diameter and 12 to 25 mm (½ to 1 in.) thick is satisfactory.

5.1.2 *Grinder*, to prepare a flat clean surface of the sample for analysis.

5.2 *Supporting Electrode*, to hold the sample in optical alignment and provide good electrical contact.

5.3 *Excitation Source*, providing a controlled triggered capacitor discharge with parameters described in 9.2. (See Practice E 172.)

5.4 *Spectrometer*, having the following representative characteristics:

	Vacuum	Air
Focal length, m	1	1½
Concave grating, grooves/mm	2160	960
Reciprocal linear dispersion, Å/mm	4.6	6.9
Primary slit width, µm	25 to 75	25 to 75
Secondary slit width, µm	see Table 1	see Table 1