



Standard Test Method for X-Ray Emission Spectrometric Analysis of Low-Alloy Steels and Cast Irons¹

This standard is issued under the fixed designation E 322; 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 (€) indicates an editorial change since the last revision or reapproval.

€¹ NOTE—Editorial changes were made in October 2000.

1. Scope

1.1 This test method covers the X-ray emission spectrometric analysis of low-alloy steels and cast irons for the following elements in the ranges indicated:

Elements	Concentration Range, %
Manganese	0.20 to 1.50
Nickel	0.10 to 1.00
Chromium	0.10 to 1.00
Molybdenum	0.04 to 0.40
Copper	0.05 to 0.30
Vanadium	0.03 to 0.25

NOTE 1—These concentration ranges can be extended by the use of suitable standards. The detection limit for the elements is lower than the listed value. The ranges represent the actual levels at which this test method was tested.

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

E 350 Test Methods for Chemical Analysis of Carbon Steel, Low Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron²

E 351 Test Methods for Chemical Analysis of Cast Iron—All Types²

E 882 Guide for Accountability and Quality Control in the Chemical Analysis Laboratory³

3. Terminology

3.1 All terms used in this test method are in conformance with Terminology E 135.

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.

4. Summary of Test Method

4.1 The sample is finished to a clean, uniform surface, and then irradiated by an X-ray beam of high energy. The secondary X rays produced are dispersed by means of a crystal and the intensities are measured by a detector at selected wavelengths. The results are obtained by relating measured intensities to an appropriate calibration curve.

5. Significance and Use

5.1 This test method is a comparative method intended for use as a routine method to test materials for compliance with compositional specifications. It is assumed that all who use this test method will be trained analysts capable of performing skillfully and safely. It is expected that work will be performed in a properly equipped laboratory under appropriate quality control practices, such as those described in Guide E 882.

6. Apparatus

6.1 Specimen Preparation Equipment:

6.1.1 *Disk or Belt Sander*, capable of providing test specimens with a uniform, clean surface finish, or other equivalent finishing device.

6.2 Excitation Source:

6.2.1 *X-ray Generator*, with a full-wave rectified power supply, or constant potential power supply.

6.2.2 *X-ray Tube*, with a high-purity tungsten target.

6.3 Spectrometer:

6.3.1 *Analyzing Crystal*, lithium fluoride, flat or curved having a 2d spacing of 0.40276 nm.

6.3.2 *Collimation*—Provide appropriate collimation to achieve the required resolution. For curved optics, no collimation is required.

6.3.3 *Goniometer*—A goniometer that provides an angular scan from 10 to 148°.

6.3.4 *Detectors*, proportional or scintillation counter.

6.4 *Measuring Unit*—An electronic circuit panel capable of amplifying, counting, or integrating pulses received from the detector tube. In addition, a pulse height analyzer should be available for pulse energy discrimination if needed. Good precision and accuracy have been obtained without the use of a pulse height analyzer.