



Standard Practice for Electromagnetic (Eddy-Current) Examination of Nickel and Nickel Alloy Tubular Products¹

This standard is issued under the fixed designation E571; 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.

1. Scope*

1.1 This practice² covers the procedures for eddy-current examination of nickel and nickel alloy tubes. These procedures are applicable for tubes with outside diameters up to 2 in. (50.8 mm), incl, and wall thicknesses from 0.035 to 0.120 in. (0.889 to 3.04 mm), incl. These procedures may be used for tubes beyond the size range recommended, by contractual agreement between the purchaser and the producer.

1.2 The procedures described in this practice make use of fixed encircling test coils or probe systems.

1.3 *Units*—The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

NOTE 1—For convenience, the term “tube” or “tubular product” will hereinafter be used to refer to both pipe and tubing.

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:³

E309 Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation

E543 Specification for Agencies Performing Nondestructive Testing

E1316 Terminology for Nondestructive Examinations

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.07 on Electromagnetic Method.

Current edition approved Aug. 1, 2012. Published September 2012. Originally approved in 1976. Last previous edition approved in 2007 as E571 - 98(2007). DOI: 10.1520/E0571-12.

² For ASME Boiler and Pressure Vessel Code applications see related Practice SE-571 in Section II of that Code.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 Other Documents:

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing⁴

ANSI/ASNT-CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel⁴

NAS-410 Certification and Qualification of Nondestructive Personnel (Quality Assurance Committee)⁵

3. Terminology

3.1 Standard terminology relating to electromagnetic testing may be found in Terminology E1316, Section C, Electromagnetic Testing.

4. Summary of Practice

4.1 Examination is usually performed by the use of one of two general techniques:

4.1.1 *Encircling Coil Technique*—Examination is performed by passing the tube lengthwise through a coil energized with alternating current at one or more frequencies. See Fig. 1. The electrical impedance of the coil is modified by the proximity of the tube, the tube dimensions, electrical conductivity, saturating magnetic field, magnetic permeability, and metallurgical or mechanical discontinuities in the tube. As the tube passes through the coil, the changes in electromagnetic response caused by these variables in the tube change the coil impedance, which activates an audible or visual signaling device or a mechanical marker.

4.1.2 *Probe Coil Technique*—Probe coils are positioned in close proximity to the outside diameter or to the inside diameter, or to both diameter surfaces, of the tubular product being examined as shown in Fig. 1. Since the probe is generally small and does not encircle the tube, it examines only a limited area in the vicinity of the probe. When required to examine the entire volume of the tubular product, it is common practice to rotate either the tubular product or the probe around the tube. Frequently, in the case of welded tubular products, only the weld is examined by scanning along the weld zone. In the case

⁴ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlington Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁵ Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.

*A Summary of Changes section appears at the end of this standard