



Standard Practice for Electromagnetic (Eddy Current) Examination of Copper and Copper-Alloy Tubes¹

This standard is issued under the fixed designation E243; 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.

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

1. Scope*

1.1 This practice² covers the procedures that shall be followed in eddy current examination of copper and copper-alloy tubes for detecting discontinuities of a severity likely to cause failure of the tube. These procedures are applicable for tubes with outside diameters to 3 $\frac{1}{8}$ in. (79.4 mm), inclusive, and wall thicknesses from 0.017 in. (0.432 mm) to 0.120 in. (3.04 mm), inclusive, or as otherwise stated in ASTM product specifications; or by other users of this practice. These procedures may be used for tubes beyond the size range recommended, upon contractual agreement between the purchaser and the manufacturer.

1.2 The procedures described in this practice are based on methods making use of encircling annular examination coil systems.

1.3 *Units*—The values stated in inch-pound units are to be regarded as the 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—This practice may be used as a guideline for the examination, by means of internal probe examination coil systems, of installations using tubular products where the outer surface of the tube is not accessible. For such applications, the technical differences associated with the use of internal probe coils should be recognized and accommodated. The effect of foreign materials on the tube surface and signals due to tube supports are typical of the factors that must be considered. See E690 for additional details regarding the in-situ examinations using internal probes.

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.*

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.

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² For ASME Boiler and Pressure Vessel Code applications see related Practice SE-243 in the Code.

2. Referenced Documents

2.1 ASTM Standards:³

B111/B111M Specification for Copper and Copper-Alloy Seamless Condenser Tubes and Ferrule Stock

B395/B395M Specification for U-Bend Seamless Copper and Copper Alloy Heat Exchanger and Condenser Tubes

B543 Specification for Welded Copper and Copper-Alloy Heat Exchanger Tube

E543 Specification for Agencies Performing Nondestructive Testing

E690 Practice for In Situ Electromagnetic (Eddy-Current) Examination of Nonmagnetic Heat Exchanger Tubes

E1316 Terminology for Nondestructive Examinations

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

3. Terminology

3.1 Definitions of Terms Specific to this Standard

3.1.1 The following terms are defined in relation to this standard.

3.1.1.1 *artificial discontinuity reference standard*—a standard consisting of a selected tube with defined artificial discontinuities, used when adjusting the system controls to obtain some predetermined system output signal level. This standard may be used for periodic checking of the instrument during an examination.

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.

⁴ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate 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.aiaa-aerospace.org>.