



Standard Practice for In Situ Electromagnetic (Eddy Current) Examination of Nonmagnetic Heat Exchanger Tubes¹

This standard is issued under the fixed designation E690; 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 practice describes procedures to be followed during eddy current examination (using an internal, probe-type, coil assembly) of nonmagnetic tubing that has been installed in a heat exchanger. The procedure recognizes both the unique problems of implementing an eddy current examination of installed tubing, and the indigenous forms of tube-wall deterioration which may occur during this type of service. The document primarily addresses scheduled maintenance inspection of heat exchangers, but can also be used by manufacturers of heat exchangers, either to examine the condition of the tubes after installation, or to establish baseline data for evaluating subsequent performance of the product after exposure to various environmental conditions. The ultimate purpose is the detection and evaluation of particular types of tube integrity degradation which could result in in-service tube failures.

1.2 This practice does not establish acceptance criteria; they must be specified by the using parties.

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:²

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.

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² 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 Testing³

ANSI/ASNT-CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel³

NAS-410 NAS Certification and Qualification of Nondestructive Personnel (Quality Assurance Committee)⁴

ISO 9712 Non-destructive Testing—Qualification and Certification of NDT Personnel⁵

3. Terminology

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

4. Summary of Practice

4.1 The examination is performed by passing an eddy current probe through each tube. These probes are energized with alternating currents at one or more frequencies. The electrical impedance of the probe is modified by the proximity of the tube, the tube dimensions, electrical conductivity, magnetic permeability, and metallurgical or mechanical discontinuities in the tube. During passage through the tube, changes in electromagnetic response caused by these variables in the tube produce electrical signals which are processed so as to produce an appropriate combination of visual displays, alarms, or temporary or permanent records, or combination thereof, for subsequent analysis.

5. Significance and Use

5.1 Eddy current testing is a nondestructive method that can be used to locate discontinuities in tubing made of materials

³ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁴ Available from Aerospace Industries Association of America, Inc. (AIA), 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209-3928, <http://www.aia-aerospace.org>.

⁵ Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, CP 56, CH-1211 Geneva 20, Switzerland, <http://www.iso.org>.