



## Standard Practice for Ultrasonic Examination of Metal Pipe and Tubing<sup>1</sup>

This standard is issued under the fixed designation E 213; 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<sup>2</sup> covers a procedure for detecting discontinuities in metal pipe and tubing during a volumetric examination using ultrasonic methods. Specific techniques of the ultrasonic method to which this practice applies include pulse-reflection techniques, both contact and non-contact (for example, as described in Guide E 1774), and angle beam immersion techniques. Artificial reflectors consisting of longitudinal, and, when specified by the using party or parties, transverse reference notches placed on the surfaces of a reference standard are employed as the primary means of standardizing the ultrasonic system.

1.2 This practice is intended for use with tubular products having outside diameters approximately ½ in. [12.7 mm] and larger, provided that the examination parameters comply with and satisfy the requirements of Section 12. These procedures have been successful with smaller sizes. These may be specified upon contractual agreement between the using parties. These procedures are intended to ensure that proper beam angles and beam shapes are used to provide full volume coverage of pipes and tubes, including those with low ratios of outside diameter-to-wall thickness, and to avoid spurious signal responses when examining small-diameter, thin-wall tubes.

1.3 The procedure in Annex A1 is applicable to pipe and tubing used in nuclear and other special and safety applications. The procedure in Annex A2 may be used to determine the helical scan pitch.

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

1.5 The values stated in inch-pound units are to be regarded as standard. The SI equivalents are in brackets and may be approximate.

1.6 *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*

*appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>3</sup>

E 543 Practice for Evaluating Agencies that Perform Non-destructive Testing

E 1065 Guide for Evaluating Characteristics of Ultrasonic Search Units

E 1316 Terminology for Nondestructive Examinations

E 1774 Guide for Electromagnetic Acoustic Transducers (EMATs)

E 1816 Practice for Ultrasonic Examinations Using Electromagnetic Acoustic Transducer (EMAT) Techniques

#### 2.2 ASNT Documents:

Recommended Practice SNT-TC-1A for Nondestructive Testing Personnel Qualification and Certification<sup>4</sup>

ANSI/ASNT CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel<sup>4</sup>

#### 2.3 Military Standards:

MIL-STD-410 Nondestructive Testing Personnel Qualification and Certification<sup>5</sup>

#### 2.4 Aerospace Industries Association Document:

NAS 410 Certification and Qualification of Nondestructive Testing Personnel<sup>6</sup>

### 3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, see Terminology E 1316.

### 4. Summary of Practice

4.1 A pulsed ultrasonic angle beam by means of non-contact, surface contact or immersion method shall be used. Fig. 1 illustrates the characteristic ultrasonic angle beam entry

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.06 on Ultrasonic Method.

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<sup>2</sup> For ASME Boiler and Pressure Vessel Code applications see related Practice SE-213 in the Code.

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>4</sup> Available from American Society for Nondestructive Testing, Inc., 1711 Arlingate Lane, Columbus, OH 43228.

<sup>5</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

<sup>6</sup> Available from Aerospace Industries Association of America, Inc., 1250 Eye St. NW, Washington D.C. 20005.