



Standard Practice for Ultrasonic Examination of Longitudinal Welded Pipe and Tubing¹

This standard is issued under the fixed designation E 273; 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 Department of Defense.

1. Scope

1.1 This practice² describes general ultrasonic test procedures for the detection of discontinuities in the weld and adjacent heat affected zones of pipe and tubing. It is intended for tubular products having diameters ≥ 2 in. (≥ 50 mm) and wall thicknesses of $\frac{1}{8}$ to $1\frac{1}{16}$ in. (3 to 27 mm).

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

NOTE 1—Precautions should be exercised when testing pipes or tubes near the lower specified limits. Certain combinations of search unit size, frequency, thin wall thicknesses, and small diameters could cause generation of unwanted sound waves that may produce erroneous test results.

1.3 The values stated in inch-pound units are to be regarded as the standard.

1.4 *This standard does not purport to address all of the safety problems, 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 543 Practice for Evaluating Agencies that Perform Non-destructive Testing³

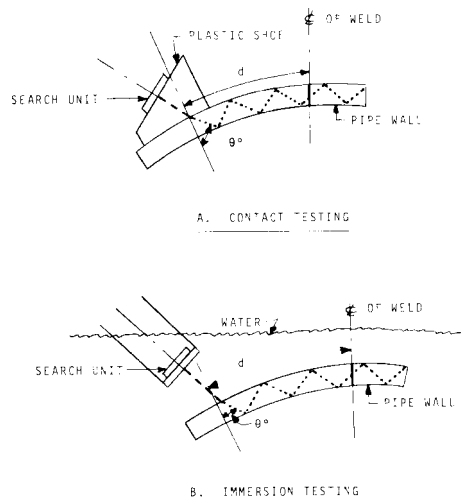
E 1316 Terminology for Nondestructive Examinations³

3. Terminology

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

4. Summary of Practice

4.1 Angle projection of pulsed ultrasonic beam by either the surface contact or immersion method shall be used. Fig. 1 illustrates the characteristic oblique sound entry into the pipe



NOTE 1— $\theta = 35^\circ$ through 70° .

FIG. 1 Angle Projection of Ultrasonic Wave

wall for both contact and immersion testing using a single search unit.

NOTE 2—Immersion test method may include tanks, wheel search units, or bubbler systems.

4.2 Variations of the single search unit method using multiple search units with the same or various angles and special gating are sometimes desirable and may be necessary for efficient examination of thicker wall material.

5. Apparatus

5.1 The instruments and accessory equipment shall be capable of producing, receiving, amplifying, and displaying electrical pulses at frequencies and pulse rates deemed necessary by the using parties. They shall be capable of distinguishing the reference reflectors described in Section 7 to the extent required in the calibration procedure outlined in Section 8.

5.2 For pulse echo test systems, the contact or immersion search units should produce ultrasonic waves that travel in the pipe or tube wall at a refracted angle of from 35° to 70° and perpendicular to the weld seam. For pitch/catch or through transmission test systems, orientation of the entry sound beam other than perpendicular to the weld seam may be required.

5.3 *Couplant*—A liquid such as water, oil, glycerin, etc.,

¹ This practice is under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.06 on Ultrasonic Method.

Current edition approved Sept. 15, 1993. Published November 1993. Originally published as E 273 – 65 T. Last previous edition E 273 – 83 (1989).

² For ASME Boiler and Pressure Vessel Code applications see related Practice SE-273 in Section II of that Code.

³ *Annual Book of ASTM Standards*, Vol 03.03.