



Standard Practice for Measuring the Ultrasonic Velocity in Polyethylene Tank Walls Using Lateral Longitudinal (L_{CR}) Waves¹

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1. Scope*

1.1 This practice covers a procedure for measuring the ultrasonic velocities in the outer wall of polyethylene storage tanks. An angle beam lateral longitudinal (L_{CR}) wave is excited with wedges along a circumferential chord of the tank wall. A digital ultrasonic flaw detector is used with sending-receiving search units in through transmission mode. The observed velocity is temperature corrected and compared to the expected velocity for a new, unexposed sample of material which is the same as the material being evaluated. The difference between the observed and temperature corrected velocities determines the degree of UV exposure of the tank.

1.2 The practice is intended for application to the outer surfaces of the wall of polyethylene tanks. Degradation typically occurs in an outer layer approximately 3.2 mm (0.125 in.) thick. Since the technique does not interrogate the inside wall of the tank, wall thickness is not a consideration other than to be aware of possible guided (Lamb) wave effects or reflections off of the inner tank wall. No special surface preparation is necessary beyond wiping the area with a clean rag. Inside wall properties are not important since the longitudinal wave does not strike this surface. The excitation of Lamb waves must be avoided by choosing an excitation frequency such that the ratio of wavelength to wall thickness is one fifth or less.

1.3 UV degradation on the outer surface causes a stiffening of the material and an increase in Young's modulus and the longitudinal wave velocity.

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

1.5 *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 appro-*

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

2. Referenced Documents

2.1 ASTM Standards:²

E494 Practice for Measuring Ultrasonic Velocity in Materials

E543 Specification for Agencies Performing Nondestructive Testing

E1316 Terminology for Nondestructive Examinations

E2373 Practice for Use of the Ultrasonic Time of Flight Diffraction (TOFD) Technique

2.2 ASNT Documents:³

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

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

2.3 AIA Document:⁴

AIA/NAS-410 Nondestructive Testing Personnel Certification and Qualification

2.4 ISO Standard⁵

ISO 9712 Non-Destructive Testing—Qualification and Certification of NDT Personnel

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, see Terminology E1316.

4. Summary of Practice

4.1 The lateral longitudinal wave (henceforth called the L_{CR} wave) used in this practice is selected because it is the fastest wave in the tank wall, and, therefore its arrival at the receiver

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.

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), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

¹ 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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