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Standard Practice for the Measurement of the Apparent Attenuation of Longitudinal Ultrasonic Waves by Immersion Method[1]

This standard is issued under the fixed designation E664/E664M; 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 a procedure for measuring the apparent attenuation of ultrasound in materials or components with flat, parallel surfaces using conventional pulse-echo ultrasonic flaw detection equipment in which reflected indications are displayed in an A-scan presentation.

1.2 The measurement procedure is readily adaptable for the determination of relative attenuation between materials. For absolute (true) attenuation measurements, indicative of the intrinsic nature of the material, it is necessary to correct for specimen geometry, sound beam divergence, instrumentation, and procedural effects. These results can be obtained with more specialized ultrasonic equipment and techniques.

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

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E214 Practice for Immersed Ultrasonic Testing by the Reflection Method Using Pulsed Longitudinal Waves

E317 Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Instruments and Systems without the Use of Electronic Measurement Instruments

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 *Definitions*~~Definitions:~~

~~3.1.1For~~—For definitions of terms used in this practice, see Terminology E1316.

~~3.2*Definitions of Terms Specific to This Standard:*~~

~~3.2.1*apparent attenuation*—the *observed* ultrasound energy loss. In addition to the true loss, the apparent attenuation may also include losses attributable to instrumentation, specimen configuration, beam divergence, interface reflections, and measurement procedure.~~

~~3.2.2*attenuation*—a factor that describes the decrease in ultrasound intensity with distance. Normally expressed in decibels per unit length.~~

~~NOTE1—The attenuation parameter is sometimes expressed in nepers (Np) per unit length. The value in decibels (dB) is 8.68 times the value in nepers. If the loss over a path is 1 Np, then the amplitude has fallen to 1/e of its initial value (e=2.7183...).~~

~~3.2.3*decibel (dB)*—twenty times the logarithmic expression of the ratio of two amplitudes.~~

~~$dB = 20\log10(\text{amplituderatio})$~~

~~3.2.4*true attenuation*—that portion of the observed ultrasound energy loss which is intrinsic to the medium through which the~~

[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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[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.