



Designation: E664/E664M – 10

Standard Practice for the Measurement of the Apparent Attenuation of Longitudinal Ultrasonic Waves by Immersion Method¹

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.

1.3 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E214 Practice for Immersed Ultrasonic Testing by the Reflection Method Using Pulsed Longitudinal Waves (Withdrawn 2007)³

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

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

4. Summary of Practice

4.1 This practice describes a procedure for determining apparent attenuation by measuring the decay of multiple back reflections of longitudinal ultrasonic waves introduced into specimens with flat, parallel surfaces by the immersion technique.

5. Significance and Use

5.1 The measurement of apparent attenuation in materials is useful in applications such as the comparison of heat treatments of different lots of material or the assessment of the degradation of materials due to environment.

5.2 Several different modes of wave vibration can be propagated in solids. This practice is concerned with the attenuation associated with longitudinal waves introduced into the specimen by the immersion method.

5.3 This practice allows for the comparison of the apparent attenuations of geometrically similar specimens.

5.4 For the determination of apparent attenuation, the procedures described herein are valid only for measurements in the far field of the ultrasonic beam.

6. Apparatus

6.1 *Ultrasonic Flaw Detection System*—A system capable of generating, receiving, and displaying electrical pulses at the frequency of interest. Display shall be an A-scan presentation.

6.1.1 *Performance Characteristics*—The vertical linearity limits shall be determined as specified in Practice **E317**. All measurements shall be made only within the linear ranges of the system.

6.2 *Search Unit*—The size and frequency should be determined to suit the application, and only non-focused search units may be used.