Designation: E317 – 11

Standard Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-Echo Testing Instruments and Systems without the Use of Electronic Measurement Instruments[1]

This standard is issued under the fixed designation E317; 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 U.S. Department of Defense.

1. Scope*

1.1 This practice describes procedures for evaluating the following performance characteristics of ultrasonic pulse-echo examination instruments and systems: Horizontal Limit and Linearity; Vertical Limit and Linearity; Resolution - Entry Surface and Far Surface; Sensitivity and Noise; Accuracy of Calibrated Gain Controls. Evaluation of these characteristics is intended to be used for comparing instruments and systems or, by periodic repetition, for detecting long-term changes in the characteristics of a given instrument or system that may be indicative of impending failure, and which, if beyond certain limits, will require corrective maintenance. Instrument characteristics measured in accordance with this practice are expressed in terms that relate to their potential usefulness for ultrasonic testing. Instrument characteristics expressed in purely electronic terms may be measured as described in E1324.

1.2 Ultrasonic examination systems using pulsed-wave trains and A-scan presentation (rf or video) may be evaluated.

1.3 The procedures are applicable to shop or field conditions; additional electronic measurement instrumentation is not required.

1.4 This practice establishes no performance limits for examination systems; if such acceptance criteria are required, these must be specified by the using parties. Where acceptance criteria are implied herein they are for example only and are subject to more or less restrictive limits imposed by customer's and end user's controlling documents.

1.5 The specific parameters to be evaluated, conditions and frequency of test, and report data required, must also be determined by the user.

1.6 This practice may be used for the evaluation of a complete examination system, including search unit, instrument, interconnections, fixtures and connected alarm and auxiliary devices, primarily in cases where such a system is used repetitively without change or substitution. This practice is not intended to be used as a substitute for calibration or standardization of an instrument or system to inspect any given material. There are limitations to the use of standard reference blocks for that purpose.[2]

1.7 Required test apparatus includes selected test blocks and a precision external attenuator (where specified) in addition to the instrument or system to be evaluated.

1.8 Precautions relating to the applicability of the procedures and interpretation of the results are included.

1.9 Alternate procedures, such as examples described in this document, or others, may only be used with customer approval.

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

1.11 *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:*[3]

E114 Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing

E127 Practice for Fabricating and Checking Aluminum Alloy Ultrasonic Standard Reference Blocks

[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] Beck, K. H., "Limitations to the Use of Reference Blocks for Periodic and Preinspection Calibration of Ultrasonic Inspection Instruments and Systems," *Materials Evaluation*, Vol 57, No. 3, March 1999.

[3] 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.

***A Summary of Changes section appears at the end of this standard**

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