



Standard Guide for Planar Flaw Height Sizing by Ultrasonics¹

This standard is issued under the fixed designation E 2192; 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 guide provides tutorial information and a description of the principles and ultrasonic examination techniques for measuring the height of planar flaws which are open to the surface. The practices and technology described in this standard guide are intended as a reference to be used when selecting a specific ultrasonic flaw sizing technique as well as establishing a means for instrument standardization.²

1.2 This standard guide does not provide or suggest accuracy or tolerances of the techniques described. Parameters such as search units, examination surface conditions, material composition, etc. can all have a bearing on the accuracy of results. It is recommended that users assess accuracy and tolerances applicable for each application.

1.3 This document does not purport to provide instruction to measure flaw length.

1.4 This standard guide does not provide, suggest, or specify acceptance standards. After flaw-sizing evaluation has been made, the results should be applied to an appropriate code or standard that specifies acceptance criteria.

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 appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

E 1316 Terminology for Nondestructive Examinations³

3. Terminology

3.1 *Definitions*—Related terminology is defined in Terminology E 1316.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *bi-modal*—ultrasonic examination method that utilizes both the longitudinal (L-wave) and shear (S-wave) modes of propagation in order to estimate or measure flaw height.

3.2.2 *corner reflector*—the reflected ultrasonic energy resulting from the interaction of ultrasound with the intersection of a flaw and the component surface at essentially 90 degrees.

3.2.3 *creeping wave*—a compression wave that travels in a solid immediately adjacent to a free boundary and generates a shear mode “headwave” (q.v.) traveling away from the boundary at the critical angle. (Some users reserve the term lateral wave for the creeping wave following a flat parallel surface and the creeping wave is used for those waves following curved surfaces).

3.2.4 *diffraction*—a wave front whose direction has been changed by an obstacle or other non-homogeneity in a medium, other than by reflection or refraction.

3.2.5 *doublet*—two ultrasonic signals that appear on the screen simultaneously and move in unison as search unit is manipulated toward and away from the flaw. During tip-diffraction flaw sizing, the flaw tip signal and flaw base signal (corner reflector) will appear as a doublet.

3.2.6 *echo-dynamic*—the amplitude versus time of arrival (or distance through the component) curve created by the ultrasonic signal as the search unit is moved perpendicular to the reflector toward and away from the flaw.

3.2.7 *far-surface*—the surface of the examination piece opposite the surface on which the search unit is placed. (For example, when examining pipe from the outside surface the far-surface would be the inside pipe surface).

3.2.8 *focus*—the term as used in this document applies to dual crossed-beam search units that have been manufactured so that they have a maximum sensitivity at a predetermined depth or sound path in the component. Focusing effect may be obtained with the use of dual-element search units having both refracted and roof angles applied to each element.

3.2.9 *headwave*—a shear wave that is generated by mode conversion when a compression wave travels at a grazing angle on a free solid surface.

3.2.10 *insonify*—the interrogation of an area in the examination piece with ultrasonic energy.

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

Current edition approved April 10, 2002. Published June 2002.

² This Standard Guide is adapted from material supplied to ASTM Subcommittee E07.06 by the Electric Power Research Institute (EPRI).

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