



Designation: E505 – 22

Standard Reference Radiographs for Inspection of Aluminum and Magnesium Die Castings¹

This standard is issued under the fixed designation E505; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 These reference radiographs illustrate the categories and severity levels of discontinuities that may occur in aluminum-alloy and magnesium-alloy die castings. They are intended to provide:

1.1.1 A guide enabling recognition of discontinuities and their differentiation both as to type and severity level through radiographic examination.

1.1.2 Example radiographic illustrations of discontinuities and a nomenclature for reference in acceptance standards, specifications, and drawings.

NOTE 1—The set of reference radiographs consists of five 8½ by 11-in. cardboard frames containing radiographs covering discontinuities in aluminum and magnesium alloy die castings. The first four frames each contain two sets of four graded levels of increasing severity, while the last frame contains two ungraded radiographs. The 5 frames are contained in a 10½ by 11½-in. ring binder.

NOTE 2—Reference radiographs applicable to aluminum and magnesium castings up to 2 in. (50 mm) in thickness are contained in ASTM Reference Radiographs E155, for Inspection of Aluminum and Magnesium Castings, Volumes I and II.

1.2 Two kinds of illustration categories are covered as follows:

1.2.1 *Graded*—Three discontinuity categories for aluminum die castings and three discontinuity categories for magnesium die castings, each illustrated in four levels of progressively increasing severity. Category A discontinuities are illustrated for aluminum and magnesium die castings having thicknesses of ⅛ in. (3.2 mm) and ⅝ in. (15.9 mm); Category B discontinuities are illustrated for ⅛-in. thick aluminum and magnesium die castings; and Category C discontinuities are illustrated for ⅝-in. thick aluminum and magnesium die castings.

1.2.2 *Ungraded*—One illustration of one discontinuity for 0.20-in. (5.1-mm) thickness aluminum die casting; and one illustration of one discontinuity for ⅛-in. (3.2-mm) thickness magnesium die casting.

1.3 This document may be used for other materials, thicknesses, or with other energy levels for which it has been

found to be applicable and agreement has been reached between the purchaser and manufacturer.

1.4 From time to time, there may be minor changes to the process for manufacturing of the reference radiograph adjunct materials. These changes could include changes in the films or processing chemicals used, changes in the dies or printing for the cardboard mats, etc.; however, in all cases, these changes are reviewed by the Illustration Monitoring Subcommittee and all reference radiographs are reviewed against a fixed prototype image to ensure that there are no changes to the acceptance level represented by the reference radiographs. Therefore, the adjunct reference radiographs remain valid for use with this standard regardless of the date of production or the revision level of the text standard.

1.5 These film reference radiographs are not intended to illustrate the types and degrees of discontinuities found in aluminum and magnesium die castings when performing digital X-ray imaging. When performing digital X-ray imaging of these castings, refer to Digital Reference Images E2973.

1.6 *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.

1.7 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

¹ These reference radiographs are under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and are the direct responsibility of Subcommittee E07.02 on Reference Radiological Images.

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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.

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

TABLE 1 Reference Radiographs for Aluminum and Magnesium Die Castings

Discontinuity	Plate Thickness, in. (mm)	Applicable Casting Thickness, in. (mm)
Aluminum Die Castings		
Category A (Porosity)	1/8 (3.2)	up to 3/8 (9.5), incl
Category A (Porosity)	5/8 (15.9)	over 3/8 to 1 (9.5 to 25.4), incl
Category B (Cold fill)	1/8 (3.2)	up to 3/8 (9.5), incl
Category C (Shrinkage)	5/8 (15.9)	over 3/8 to 1 (9.5 to 25.4), incl
Category D (Foreign material)	0.200 (5.08)	up to 1 (25.4), incl
Magnesium Die Castings		
Category A (Porosity)	1/8 (3.2)	up to 3/8 (9.5), incl
Category A (Porosity)	5/8 (15.9)	over 3/8 to 1 (9.5 to 25.4), incl
Category B (Cold fill)	1/8 (3.2)	up to 3/8 (9.5), incl
Category C (Shrinkage)	5/8 (15.9)	over 3/8 to 1 (9.5 to 25.4), incl
Category D (Foreign material)	1/8 (3.2)	up to 1 (25.4), incl

[E94 Guide for Radiographic Examination Using Industrial Radiographic Film](#)

[E155 Reference Radiographs for Inspection of Aluminum and Magnesium Castings](#)

[E1316 Terminology for Nondestructive Examinations](#)

[E2973 Digital Reference Images for Inspection of Aluminum and Magnesium Die Castings](#)

2.2 ASTM Adjuncts:

Reference Radiographs for Inspection of Aluminum and Magnesium Die Castings³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this document, see Terminology [E1316](#).

4. Appearance of Radiographic Indications

4.1 The following descriptions are for use in discontinuity identification and classification. These descriptions apply to these reference radiographs only.

4.1.1 *Category A (Porosity)*—Round or elongated, smooth-edged dark spots occurring individually distributed or in clusters.

4.1.2 *Category B (Cold Fill)*—A distinct darkened line or band of variable length and definite smooth outline, usually continuous or interconnected.

4.1.3 *Category C (Shrinkage)*—Filamentary or jagged darkened areas, usually continuous or interconnected.

4.1.4 *Category D (Foreign Material)*—Isolated irregular variation in film density, either lighter or darker than surrounding areas. They may indicate the inclusion of oxide or dross or metallic compounds of different density. Illustration shows a more dense material.

5. Significance and Use

5.1 These radiographs are so designed that acceptance standards, which may be developed for particular requirements, can be specified in terms of these radiographs.

The radiographs are of castings that were produced under conditions designed to produce the discontinuities. These reference radiographs are intended to be used for casting thickness ranges in accordance with [Table 1](#).

5.2 The radiographic illustrations listed in [Table 1](#) illustrate three types of discontinuities in four severity levels. Two ungraded illustrations have been included to establish the radiographic appearance of foreign material.

5.3 These reference radiographs were produced in accordance with [Guide E94](#). All of the references are original radiographs.

5.4 *Film Deterioration*—Radiographic films are subject to wear and tear from handling and use. The extent to which the image deteriorates over time is a function of storage conditions, care in handling and amount of use. Reference radiograph films are no exception and may exhibit a loss in image quality over time. The radiographs should therefore be periodically examined for signs of wear and tear, including scratches, abrasions, stains, and so forth. Any reference radiographs which show signs of excessive wear and tear which could influence the interpretation and use of the radiographs should be replaced.

6. Basis for Application

6.1 *Personnel Qualification*—Personnel utilizing reference radiographs to this standard shall be qualified and authorized to perform radiographic interpretation in accordance with a nationally or internationally recognized NDT personnel qualification practice or standard and certified by the employer or certifying agency, as applicable. The practice or standard used and its applicable revision shall be identified in the contractual agreement between the using parties. For assistance with interpreting specifications and product requirements as applied to the reference radiographs, a certified Level III shall be consulted before accept/reject decisions are made (if the Level III is the radiographic interpreter, this may be the same person).

³ Available from ASTM Headquarters. Order RRE0505.