Designation: E192 – 04

Standard Reference Radiographs of Investment Steel Castings for Aerospace Applications[1]

This standard is issued under the fixed designation E192; 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 Department of Defense.

1. Scope

1.1 The reference radiographs provided in the adjunct to this standard illustrate various types and degrees of discontinuities occurring in thin-wall steel investment castings.[2] Use of this standard for the specification or grading of castings requires procurement of the adjunct reference radiographs which illustrate the discontinuity types and severity levels. They are intended to provide the following:

1.1.1 A guide enabling recognition of thin-wall steel casting discontinuities and their differentiation both as to type and degree through radiographic examination.

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

1.2 Two illustration categories are covered as follows:

1.2.1 *Graded*—Six common discontinuity types each illustrated in eight degrees of progressively increasing severity.

1.2.2 *Ungraded*—Twelve single illustrations of additional discontinuity types and of patterns and imperfections not generally regarded as discontinuities.

1.3 The reference radiographs were developed for casting sections up to 1 in. [25.4 mm] in thickness.

1.4 This document may be used where there is no other applicable document existing or for other material thicknesses for which it is found to be applicable and for which agreement has been reached between the purchaser and manufacturer.

NOTE 1—The set of reference radiographs, produced with X-rays in the range from 130 to 250 kVp, consist of 16 plates (8½ by 11 in. [216 by 279 mm]) in a 9¾ by 11½-in. [248 by 292-mm] ring binder.

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

1.6 *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]

E94 Guide for Radiographic Examination

E1025 Practice for Design, Manufacture, and Material Grouping Classification of Hole-Type Image Quality Indicators (IQI) Used for Radiology

E1316 Terminology for Nondestructive Examinations

2.2 *ASTM Adjuncts:*

Reference Radiographs of Investment Steel Castings for Aerospace Applications[4]

3. Terminology

3.1 *Definitions*—Definitions of terms used in this standard may be found in Terminology E1316, Section D.

3.2 The terms relating to discontinuities present in these reference radiographs are described based upon radiographic appearance. The terms "darker" and "lighter" as used in this standard refer to the optical density of a radiographic film. Where other radiographic imaging media are used, these terms should be understood to refer to areas of greater or lesser radiologic transmission, respectively.

3.2.1 *Gas*:

3.2.1.1 *gas holes*—round or elongated, smooth edged dark spots, occurring individually, in clusters, or distributed randomly throughout the casting.

3.2.2 *Shrinkage*:

3.2.2.1 *shrinkage cavity*— an area with distinct jagged boundaries.

3.2.2.2 *shrinkage, sponge*—an area, lacy in texture, with a very diffuse outline.

3.2.2.3 *shrinkage, dendritic*—a distribution of very fine lines or small elongated cavities that may vary in darkness and are usually unconnected.

[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 Radiographs.

Current edition approved May 1, 2004. Published May 2004. Originally approved in 1962. Last previous edition approved in 1995 as E192 - 95 (1999). DOI: 10.1520/E0192-04.

[2] The reference radiographs are considered to be applicable to all thin-wall steel castings, requiring close tolerances. Such castings generally include those made by the lost wax, frozen mercury, ceramicast or shell mold processes.

[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.

[4] Available from ASTM Headquarters, Order RRE0192.