



Designation: E 689 – 95 (Reapproved 2003)

## Standard Reference Radiographs for Ductile Iron Castings<sup>1</sup>

This standard is issued under the fixed designation E 689; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 These reference radiographs extend the application of reference radiographs for steel castings to ductile iron castings.

1.2 In some instances, reference radiographs for steel castings may not be entirely applicable to ductile cast iron material dependent upon design or other usage criteria. Refer to 4.1 for guidance.

1.3 *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:

- E 186 Reference Radiographs for Heavy-Walled (2 to 4½-in. (51 to 114-mm)) Steel Castings<sup>2</sup>
- E 280 Reference Radiographs for Heavy-Walled (4½ to 12-in. (114 to 305-mm)) Steel Castings<sup>2</sup>
- E 446 Reference Radiographs for Steel Castings up to 2 in. (51 mm) in Thickness<sup>2</sup>
- E 1316 Terminology for Nondestructive Examinations<sup>2</sup>

### 3. Terminology

3.1 Definitions of terms used in these reference radiographs may be found in Terminology E 1316, Section D.

### 4. Significance and Use

4.1 These reference radiographs invoke Reference Radiographs E 446, E 186, and E 280 for establishing categories and severity levels of internal discontinuities common to ductile iron castings subject to mutual agreement between purchaser and supplier in contractual specifications. The casting process has shown radiographic similarities between internal discontinuities for ductile cast iron and cast steel to the extent that the reference radiographs for steel castings are applicable. The

exact application and usage of the above categories and severity levels must, however, give consideration to the differences in material properties between cast steel and ductile cast iron end usage applications.

4.2 Production radiographs are to be compared with the applicable set of reference radiographs for classification on the basis of section thickness, radiation energy level and type, and category and severity level of discontinuity specified.

4.3 The standard reference radiographs are published in three nominal section thickness ranges in separate documents as follows:

- 4.3.1 Castings up to 2 in. [51 mm]: Reference Radiographs E 446.
- 4.3.2 Heavy-walled castings 2 to 4½ in. [51 to 114 mm]: Reference Radiographs E 186.
- 4.3.3 Heavy-walled castings 4½ to 12 in. [114 to 305 mm]: Reference Radiographs E 280.

### 5. Determination of Radiographic Classification

5.1 For purposes of evaluation of castings, a determination must be made of the radiographic classification to be assigned to individual castings or specific areas of castings. The determination of the applicable radiographic-severity classification shall be based on an evaluation of the casting applications, design, and service requirements. In these evaluations, consideration shall be given to such factors as pressure, temperature, section thickness, applicable design safety factor, vibration, shock, resistance to corrosion, involvement of penetrating radiations or radiation products, and involvement of dangerous gases or liquids.

### 6. Classification Specifications

6.1 The applicable radiographic severity level should be designated for each discontinuity type by the contracting agency in formal specifications or drawings and in the specific contract or order. For castings, the level should be independently specified for each discontinuity type, since they have been shown to affect strength properties differently. For example, in the same casting Severity Level 2 might be specified for shrinkage Type 3 and Severity Level 4 for gas porosity Type 1. The specifications, drawings, contract, or order should

<sup>1</sup> This reference radiograph is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.02 on Reference Radiological Images.

Current edition approved June 10, 2003. Published August 2003. Originally approved in 1979. Last previous edition approved in 1999 as E 689 – 95(99).

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 03.03.