



Standard Reference Radiographs for Tin Bronze Castings¹

This standard is issued under the fixed designation E 310; 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 These reference radiographs are reproductions of original radiographs and illustrate various types and degrees of discontinuities occurring in tin bronze and related types of alloys. They are intended to provide the following:

1.1.1 A guide to the recognition of common discontinuities and their differentiation both as to type and severity level.

1.1.2 A standard nomenclature for reference in acceptance standards, specifications and drawings.

1.1.3 A source of reference radiographs from which manufacturers and purchasers may, by mutual agreement, select particular radiographs to serve as standards representing minimum acceptability. The standards so established are identified by an alphabetic defect type and severity level (or class) designation.

1.2 The original radiographs are of discontinuities in sand cast 88:8:4 Cu-Sn-Zn, “G” type, bronze alloy plates. These discontinuities are representative of those found in wide solidification range copper-tin base alloys. The following ASTM specifications illustrate alloys covered by these standards; however, it is intended that these reference radiographs also apply to related Government and commercial material specifications:

Valve bronze castings	B 61 ^A
Composition bronze or ounce metal castings	B 62 ^B
Tin bronze sand castings	B 584
Leaded red brass sand castings	B 584
Copper-base alloy centrifugal castings (as applicable)	B 271

^A Similar to MIL-B-16541.

^B Similar to MIL-B-16444.

1.3 The discontinuity types and severity levels represented by the reference radiographs are shown in Table 1, which also indicates the code designation for each discontinuity type.

1.4 The use of this document is not intended to be restricted to the specific energy level or to the absolute thickness limits that are contained in the document title. The title is intended to be descriptive and not restrictive. The document may be used, where there is no other applicable document, for other energy

levels or thicknesses, or both, for which it is found to be applicable and for which agreement has been reached between purchaser and manufacturer.

NOTE 1—The reference radiographs consist of twenty-two 2½ by 5½ -in. radiograph reproductions of low voltage X rays. Fifteen of these were made with newly developed 1-in. plate castings and seven were made with ¾ -in. plate castings used originally for documents NAVSHIPS 250-537-1 and -2. The new plate castings cover Gas Porosity, Linear Shrinkage, and Feathery Shrinkage discontinuity types.

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:

B 61 Specification for Steam or Valve Bronze Castings²

B 62 Specification for Composition Bronze or Ounce Metal Castings²

B 271 Specification for Copper-Base Alloy Centrifugal Castings²

B 584 Specification for Copper Alloy Sand Castings for General Applications²

E 94 Guide for Radiographic Testing³

E 1316 Terminology for Nondestructive Examinations³

2.2 ASTM Adjuncts:

Reference Radiographs for Tin Bronze Castings⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in this document, see Terminology E 1316, Section D.

4. Significance and Use

4.1 These reference radiographs were produced by the use of 88:8:4, Cu-Sn-Zn, “G” plate castings. Table 2 lists the chemical composition and mechanical property limits for the

¹ These reference radiographs are under the jurisdiction of ASTM Committee E-7 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.02 on Reference Radiographs.

Current edition approved Dec. 10, 1999. Published February 2000. Originally published as E 310 – 66 T. Last previous edition E 310 – 95.

² *Annual Book of ASTM Standards*, Vol 02.01.

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

⁴ Available from ASTM Headquarters. Order RRE0310.