



## Standard Practice for Classifying Visual Defects in Parts Molded from Reinforced Thermosetting Plastics<sup>1</sup>

This standard is issued under the fixed designation D 2562; 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.

<sup>e1</sup> NOTE—Editorially revised 1.2 in March 2002.

### 1. Scope

1.1 This practice covers acceptance criteria for visual inspection of parts molded from reinforced thermosetting plastics by compression and transfer molding.

1.2 This practice presents word descriptions of possible defects to serve as a guide for contracts, drawings, product specifications, and final inspection.

1.3 This practice also categorizes different inspection requirements for grades of product quality.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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 limitations prior to use.*

NOTE 1—There is no known ISO equivalent to this practice.

### 2. Acceptance Criteria

2.1 The method and frequency of sampling and the allowable defects may be previously agreed to by the purchaser and the seller.

2.2 *Dimensions and Tolerances*—Molded parts shall be inspected for conformance with the dimensions and tolerances specified on the product drawing. Parts with any dimensions falling outside the specified limits shall be rejected.

2.3 *Inserts*—All inserts, nuts, studs, and lugs shall not be damaged in any way, nor coated with molding materials in such a way as to impair function or mechanical fit. Threads in molded-in inserts shall be clean, smooth, and free of nicks, tears, or other damage. There shall be no molding material or flash on the threads. If necessary, threaded inserts may be

retapped to clean them or remove flash. Threads containing locking features may not be retapped.

2.4 *Molded-In Threads or Cored Holes*—Molded-in threads or cored holes shall be free of visible defects, such as nicks, cracks, shorts, etc. Molded-in threads may be retapped or repaired unless otherwise specifically noted on the product drawing.

2.5 *Workmanship*—Workmanship shall be in accordance with good commercial practices.

2.6 *Critical Areas*—Areas in which the presence of imperfections is considered to be detrimental to the proper function of the part shall be designated as critical areas. The areas of a part that are critical structurally, aerodynamically, or electrically shall be uniform and free of defects as listed in Table 1, if so stated on the product drawing. Critical areas may be designated on the product drawing by one of the following means,

2.6.1 Encircle critical areas, or

2.6.2 Cross-hatch areas to designate areas of various levels, or

2.6.3 Word description.

2.7 *Acceptable Defects*—Unless otherwise specified, the following defects shall be acceptable in all instances:

2.7.1 *Ripple Surface*—Generally occurs in parts molded from long, glass-fiber-filled, high-impact-type plastics. Such a surface is a phenomenon resulting from the difference in shrinkage between the resin binder and reinforcement.

2.7.2 *Shrink-Mark*—A dimple-like depression in the surface of a molding where it has retracted from the mold, and which has well-rounded edges. A shrink-mark generally occurs on one surface of a part where there is a boss, flange, rib, or other heavy section on the opposite surface. The shrink-mark may be caused by the difference in total shrinkage when there is a sudden change in section along the surface of the part.

2.7.3 *Resin Voids*—Applicable to chopped fabric-reinforced molding compounds only, appearing as multiple surface interruptions which conform to the pattern of the cloth weave. This is usually due to an insufficient flow or shrinkage of the resin,

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.18 on Reinforced Thermosetting Plastics.

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**TABLE 1 Allowable Defects**

Name	Definition	Visual Acceptance Levels		
		Level I	Level II	Level III
Chip	a small piece broken off an edge or surface	none	maximum dimension of break, 3.0 mm (1/8 in.)	maximum dimension of break, 6.5 mm (1/4 in.)
Crack	an actual separation of the part, visible on opposite surfaces, and extending through the thickness	none	none	none
Crack, surface	crack existing only on the surface of the part	none	maximum length, 3.0 mm (1/8 in.)	maximum length, 6.5 mm (1/4 in.)
Crazing	fine cracks at or under the surface of a part	none	maximum diameter of crazing, 13 mm (1/2 in.) frequency to be determined by customer	maximum diameter of crazing, 25 mm (1 in.)
Fracture	rupture of the plastic surface without complete penetration	none	maximum dimension, 21 mm (13/16 in.) in diameter	maximum dimension, 29 mm (1 1/8 in.) in diameter
Air bubble	air entrapment within and between the reinforcement, usually spherical in shape	none	maximum diameter, 1.5 mm (1/16 in.); 2 per in. <sup>2</sup>	maximum diameter, 3.0 mm (1/8 in.); 4 per in. <sup>2</sup>
Blister	rounded elevation of the surface of a part, with boundaries that may be more or less sharply defined, somewhat resembling in shape a blister on the human skin	none	maximum diameter, 3.0 mm (1/8 in.); height from surface not to be outside drawing tolerance	maximum diameter, 6.5 mm (1/4 in.); height from surface not to be outside drawing tolerance
Orange-peel	uneven surface somewhat resembling an orange peel	none	maximum diameter, 13 mm (17/32 in.)	maximum diameter, 29 mm (1 1/8 in.)
Pimple	small, sharp, or conical elevation on the surface of a part	none	none	maximum diameter, 3.0 mm (1/8 in.)
Pit (pinhole)	small crater in the surface of the part, with its width approximately of the same order of magnitude as its depth	none	maximum diameter, 0.25 mm (0.010 in.); depth less than 10 % of wall thickness	maximum diameter, 0.50 mm (0.020 in.); depth less than 20 % of wall thickness
Porosity	presence of numerous visible pits (pinholes)	none	maximum of 25 pits in porous area of size listed in Level II frequency to be determined by customer	maximum of 50 pits in porous area of size listed in Level III
Weld- or knit-line	a mark on a molded plastic part formed by the union of two or more streams of plastic flowing together	none	allowable only if surface is not broken	
Dry-spot	area of incomplete surface film where the reinforcement has not been wetted with resin	none	maximum dimension, 10 mm (13/32 in.)	maximum dimension, 13 mm (17/32 in.)
Foreign inclusion (metallic)	metallic particles included in a part which are foreign to its composition	none	none, if for electrical use; maximum dimension, 0.8 mm (1/32 in.), 1 per 0.09 m <sup>2</sup> (1 ft <sup>2</sup> ), if for mechanical use	none, if for electrical use; maximum dimension, 1.5 mm (1/16 in.), 1 per 0.09 m <sup>2</sup> (1 ft <sup>2</sup> ), if for mechanical use
Foreign inclusion (non-metallic)	nonmetallic particles of substance included in a part which seem foreign to its composition	none	maximum dimension, 0.8 mm (1/32 in.); 1 per 0.09 m <sup>2</sup> (1 ft <sup>2</sup> )	maximum dimension, 1.5 mm (1/16 in.); 1 per 0.09 m <sup>2</sup> (1 ft <sup>2</sup> )
Resin-pocket	an apparent accumulation of excess resin in a small localized area within the part	none	maximum diameter, 3.0 mm (1/8 in.)	maximum diameter, 5.0 mm (3/16 in.)
Short	in a laminate, an incompletely filled out condition. Note—This may be evident either through an absence of surface film in some areas, or as lighter unfused particles of material showing through a covering surface film, accompanied possibly by thin-skinned blisters.	none	none	none

which fails to fill all of the interstices of the fabric reinforcement. These defects occur only at the surface layer of resin in contact with the mold.

**2.7.4 Surface Discoloration**—An apparent nonuniformity of a material, evidenced by the appearance of dark streaks. Surface streaks are frequently caused by incorporation into the plastic of ejector pin lubricant, mold release, or metallic matter abraded from ejector pins.

**2.7.5 Weld- or Knit-Lines**—Marks on, or weaknesses in, a molded plastic, formed by the union of two or more streams of plastic flowing together, that do not result in a break or interruption of the molded surface.

**2.8 Allowable Defects**—Defects which, by nature, content, or frequency, do not affect serviceability of the part. These allowable defects shall be fully described as to type, size, number, extent allowed, and spacing. The appropriate acceptance level (Table 1) for defects in these areas must be specified. Defects in excess of those listed as allowable in the product specifications, drawings, or contracts for the part shall be cause for rejection.

**2.9 Repairable Defects**—Repairable defects, if any, shall consist of those which can be repaired without affecting the serviceability of the part, unless otherwise specifically prohibited on the product drawing. Acceptable methods of repair shall

have been agreed to previously by the purchaser and the seller, and shall be fully described on the product specifications, drawings, or contracts for parts.

### 3. Acceptance Levels

3.1 *Visual Inspection*—Each part shall be checked visually without the aid of magnification. Defects shall be classified as to type and level, as shown in Table 1 (see Note 2). The acceptable quality level shall be determined by reference to the part drawing for the applicable acceptance level for allowable defects. If none of the first three levels (Levels I, II, and III) is considered applicable, the level shall be Level IV, and allowable defects must be specified on the product drawing. Any excess of defects, as specified under the required level, shall be cause for rejection. Unless otherwise specified, dimensions are surface dimensions.

NOTE 2—Typical defects as outlined in the word descriptions of Table 1 are illustrated in Fig. <sup>2</sup>

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<sup>2</sup> Full-size (8 by 10-in.) glossy prints of these typical defects are available at a nominal charge from ASTM Headquarters. Order Adjunct: ADJD2562.

3.2 *Acceptance Level I*—Presence of any defects in excess of those listed in Table 1, Level I, shall be cause for rejection.

3.3 *Acceptance Level II*—Presence of more than one defect of those listed in Table 1, Level II, per estimated 10 in.<sup>2</sup> of surface, shall be cause for rejection. No defect area shall be less than 2 in. from another.

3.4 *Acceptance Level III*—Presence of more than two defects of those listed in Table 1, Level III, per estimated 5 in.<sup>2</sup> of surface area, shall be cause for rejection. No defect area shall be less than 1 in. from another.

3.5 *Acceptance Level IV*—Any defect not specifically defined by size or shape in Levels I, II, and III, which falls into a category between Levels I and II or Levels II and III, or beyond Level III, and is considered acceptable, shall be designated as Level IV, and shall be specified on the product drawing. Any such defect shall be fully described as to size, shape, number, extent, and spacing on the product drawing, product specification, or contracts for parts.

### 4. Keywords

4.1 reinforced thermosetting plastics; visual defects

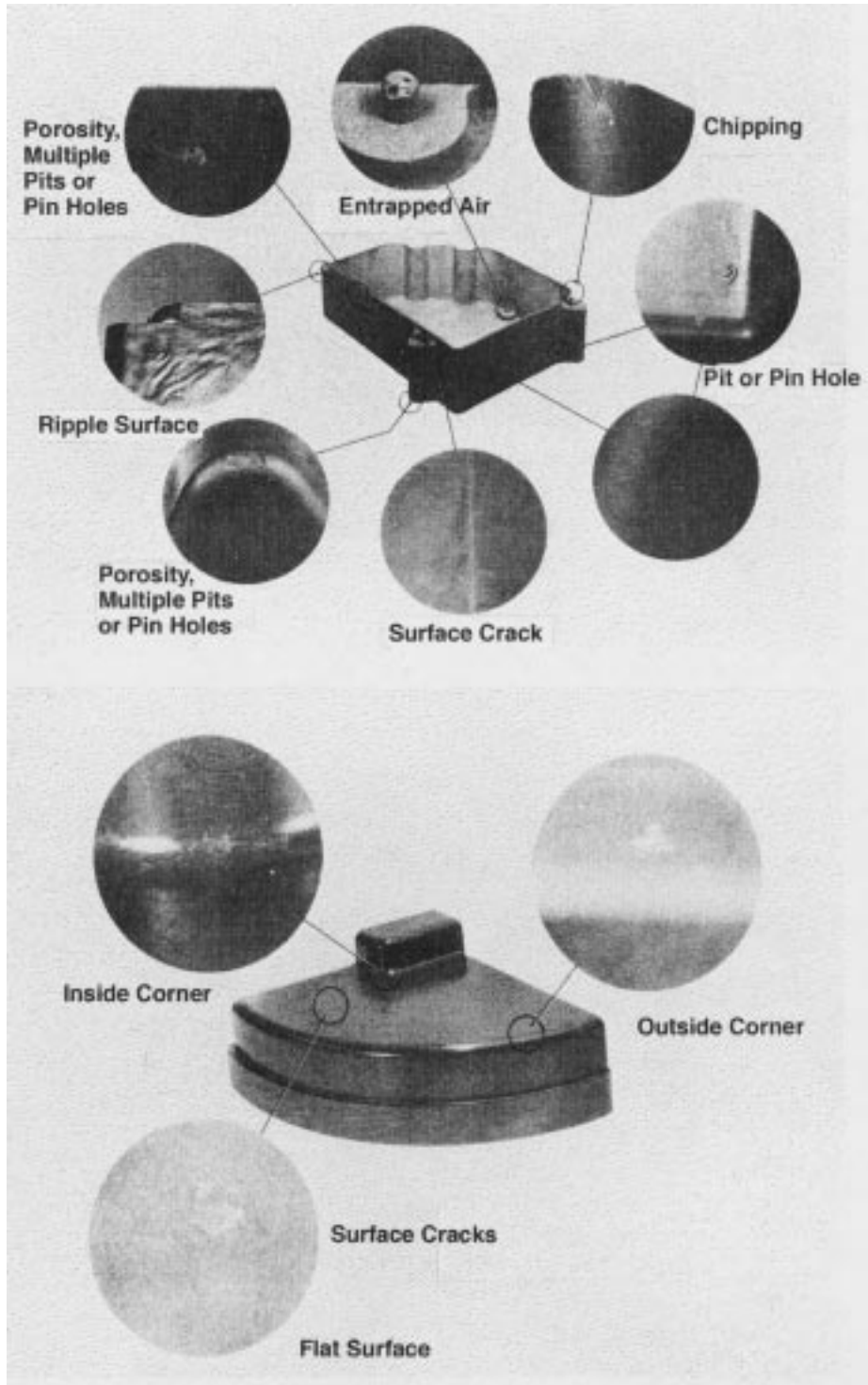


FIG. 1 Typical Defects (see Table 1)

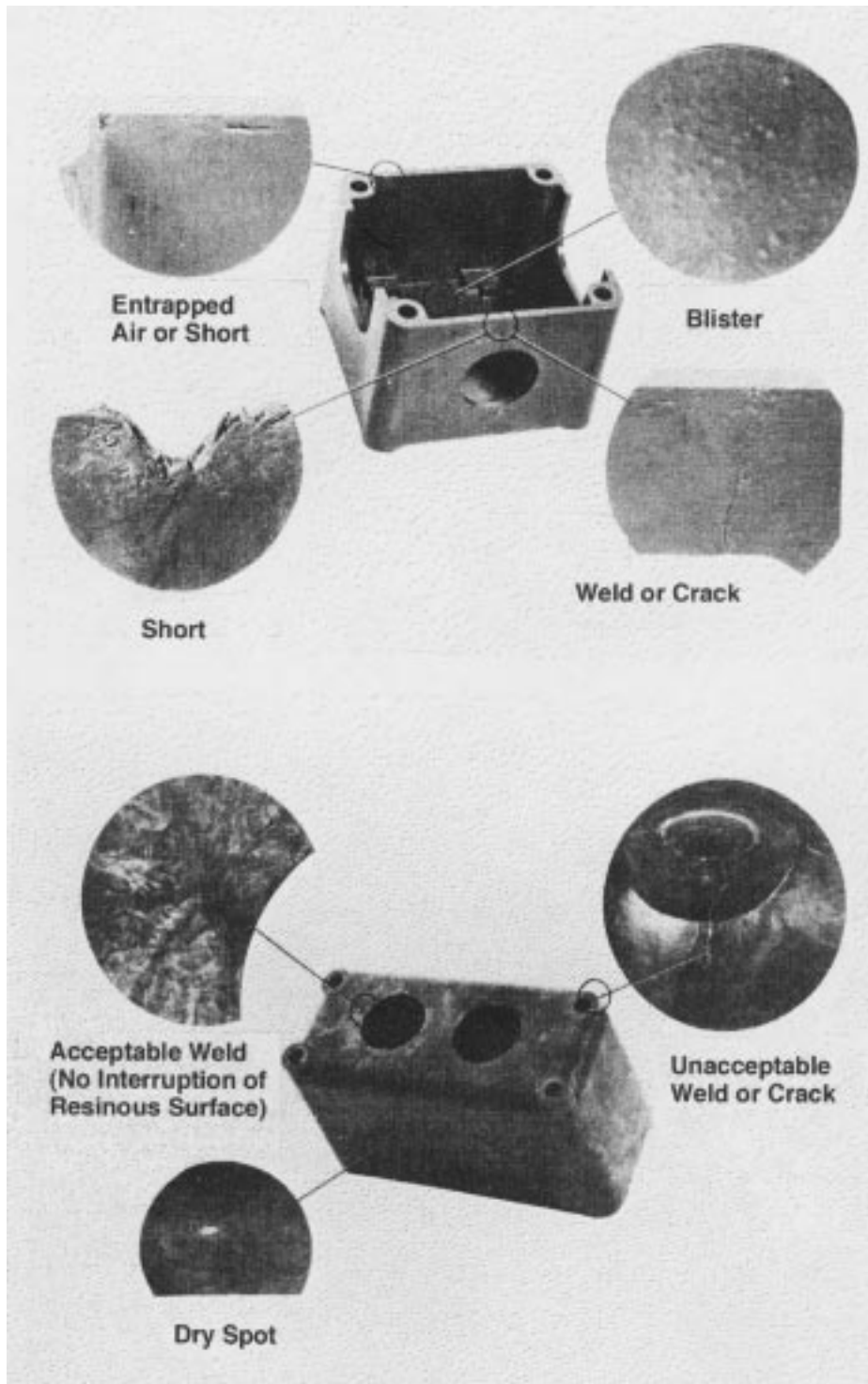



FIG. 1 Typical Defects (see Table 1) (continued)

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