



Standard Test Method for Measuring the Static Heat Resistance of a Self-Cleaning Oven Coating¹

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1. Scope

1.1 This test method covers the procedure for the qualitative and quantitative evaluation of static heat effects on porcelain enamel coatings.

1.2 This test method is adaptable to various temperatures and times, since the requirements in the porcelain enameling industry differ between manufacturers.

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:

D 523 Test Method for Specular Gloss²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *blistering, n*—a defect caused by gas evolution consisting of a bubble that protrudes on the surface of the glass.

3.1.2 *color and gloss change, n*—this is determined by the color and gloss delta values calculated between each heat test cycle.

3.1.3 *copper heads/stickers, n*—protrusions of iron oxide crystals permeated from the steel substrate or conglomerated metal components in the enamel.

3.1.4 *crazing, n*—a defect appearing as one or more fine cracks in the porcelain enamel from thermal contraction and expansion in the glass.

3.1.5 *edge burn off, n*—this may occur in the first 24 to 72 h and appears as a thin dull discolored gray line around the entire edge of the test plate.

3.1.6 *enamel breakdown, n*—the point at which the glass composite has disintegrated. Microscopic examination will show loss of enamel bubble structure and devitrification of the enamel. This stage reveals metallic type elements derived from

the glass composition and the iron oxide from the steel substrate that has completely permeated the glass.

3.1.7 *hazy appearance/scumming, adj*—the glass will develop an opaque film that exhibits low gloss on the surface of the porcelain enamel.

3.1.8 *metalizing, n*—enamel on test plates will have a reflective copper color from condensed metals in the enamel that may increase with the deterioration of the glass during the heat test cycle.

4. Significance and Use

4.1 This test method is intended for testing the porcelain enamel finish on oven parts of self-cleaning ranges.

4.2 The numerical values and visual evaluation derived by this test method are used to measure differences in heat resistant characteristics between enamel formulas intended to meet oven manufacturer specifications.

5. Apparatus

5.1 *Furnace*, capable of holding a constant temperature of 920°F (493°C) minimum.

5.2 *Standing Bracket*, approximately 10 by 10 by 6 in. (25.4 by 25.4 by 15.24 cm). Dimensions may vary according to test plate size.

5.3 *Two Heavy-Gauge Steel Rods*, approximately 12 in. (30.48 cm) long and 1/8 in. (0.32 cm) in diameter.

5.4 *Standard Size 3/8-16 or 3/8-24 (0.96-cm) Nuts*, used for spacers between heat test plates.

5.5 *Spectrocolorimeter*, capable of reading color by reflection of enameled plates on reflectance 45°/0° and L*, a*, b* color space.³ Equipment available for making color readings is an instrument that reads Spectrocolorimeter L, a, b scale⁴ such as Macbeth Color Eye or a Hunter Lab ColorQUEST.⁵

5.6 *Gloss Meter*, capable of reading 60° ASTM gloss

¹ This test method is under the jurisdiction of ASTM Committee B08 on Metallic and Inorganic Coatings and is the direct responsibility of Subcommittee B08.12 on Materials for Porcelain Enamel and Ceramic-Metal Systems.

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² *Annual Book of ASTM Standards*, Vol 06.01.

³ L*, a*, b* color space: "A uniform-color space using an Adams-Nicherson cube root formula, suggested in 1974 for adaptation by the CIE (International Commission on Illumination) in 1976 for use in the measurement of small color differences."

⁴ Hunter L, a, b scales: "A uniform color scale devised by Hunter in 1958 for use in a color difference meter, based on Herings opponent-colors theory of color vision."

⁵ Hunter Associates Laboratory, Inc., 11491 Sunset Hills Rd., Reston, VA 22092-5280. Macbeth, Little Britain Road, P.O. Box 230, Newburgh, NY 12550.