



Standard Test Method for Alkali Resistance of Porcelain Enamels¹

This standard is issued under the fixed designation C 614; 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.

1. Scope

1.1 This test method² covers the measurement of the resistance of a porcelain enamel to a hot solution of tetrasodium pyrophosphate. Although the specific alkali mentioned herein is tetrasodium pyrophosphate the equipment and techniques are equally applicable to other alkali solutions.

1.2 *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. Significance and Use

2.1 This test method is intended specifically for testing the resistance to alkaline attack of porcelain enamels to be used as a final finish on washing machines, dishwashers, combination washer-dryers, and similar appliances where the surface is normally exposed to an alkaline environment at elevated temperatures.

3. Apparatus

3.1 *Test Chamber*, of a type illustrated in Fig. 1, Fig. 3, and Fig. 6. This part of the equipment consists of a stainless steel beaker fitted with an O-ring sealed cover which supports an immersion heater, a stirring device, thermometer and thermistor wells; three specimen holders; a reflux condenser; a flow channeling shield to slide over and be supported by the immersion heater; and a stirring motor.³ The beaker, heater sheath, stirring device, thermometer and thermistor wells, specimen holders, and the flow channeling shield shall be made from stainless steel alloys from the AISI 300 Series.

3.2 *Temperature Controller*, thermistor-actuated, capable of maintaining the temperature of the alkali solution in the beaker at $96.00 \pm 0.20^\circ\text{C}$.

3.3 *Thermometer*, calibrated, approximately 15 in. (380 mm) long and $\frac{9}{32}$ in. (7.1 mm) in diameter, with 0.1° divisions.

3.4 *Drying Oven*, electrically heated.

3.5 *Balance*, having a sensitivity of 0.1 mg and a capacity of not less than 200 g.

3.6 *Desiccator*.

3.7 *Hot Plate*, or burner suitable for heating the test solution.

3.8 *Sponge*, soft, cellulose.

3.9 *Aluminum Alloy Sheets*, approximately $3\frac{1}{2}$ by $3\frac{1}{2}$ by $\frac{1}{8}$ in. (89 by 89 by 3.1 mm).

4. Reagents and Materials

4.1 *Tetrasodium Pyrophosphate*, hydrated ($\text{Na}_4\text{P}_2\text{O}_7 \cdot 10\text{H}_2\text{O}$), recrystallized, reagent grade.

4.2 *Trisodium Phosphate* ($\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$).

5. Test Specimens

5.1 *Preparation of Specimens*—The test specimens shall be $3\frac{1}{2}$ in. (89 mm) square and may be prepared by enameling metal blanks of that size or by cutting from a larger piece. Hanging holes, if necessary for firing or weighing or both, may be placed at the corners. The specimens shall be sufficiently flat to permit sealing in the holders. The edges of cut specimens shall be stoned or filed to remove any sharp or loosely adhering fragments of metal or porcelain enamel. It is recommended that the specimens be permanently marked on the back side for identification.

5.2 *Number of Specimens*—Six specimens shall be tested simultaneously.

5.3 *Cleaning of Specimens Before Alkali Exposure*—The specimens shall be rinsed with running tap water and washed with a soft cellulose sponge dampened with a 1 % solution of trisodium phosphate. A light pressure and a back-and-forth motion in two directions, 90° apart, shall be used in the washing. After washing, the specimens shall be rinsed first with running tap water, next with distilled water and then allowed to drain in a near vertical position prior to oven-drying at 110°C for 15 min. The specimens shall be cooled in a desiccator for 30 min prior to weighing.

5.4 *Weighing of Test Specimens*—The specimens shall be weighed immediately upon removal from the desiccator. Weights shall be recorded to 0.0001 g. The weighed specimens shall be stored in a desiccator until tested.

¹ This test method is under the jurisdiction of ASTM Committee B-8 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 This test was developed at the National Bureau of Standards under the sponsorship of The Porcelain Enamel Institute, Inc., and published as P. E. I. Bulletin T-25.

³ See the appendix for drawings of the equipment. This equipment may be purchased from the Hoover Instrument Service, Inc., 401 N. Home Rd., Mansfield, OH 44906.