



Designation: **C1378 – 04 (Reapproved 2019) C1378 – 20**

Standard Test Method for Determination of Resistance to Staining¹

This standard is issued under the fixed designation C1378; 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 method is intended to determine the resistance to staining of ceramic tile surfaces. covers a procedure for determining whether ceramic tiles and glass tiles are affected by prolonged exposure to staining agents.~~

~~1.2 The resistance to staining is determined by maintaining test solutions in contact with ceramic tile surfaces for a specified period of time. After exposure, the surface is cleaned in a defined manner, and the test specimens are inspected visually for change.~~

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Summary of Test Method

2.1 The resistance to staining is determined by maintaining staining agents in contact with tile surfaces for a specified period of time. After exposure, the surface is cleaned in a defined manner, and the test specimens are visually inspected for change.

3. Significance and Use

3.1 This test method is intended to determine the resistance to staining of tile surfaces. This test method is suitable for use in specifications, quality control, and research and development.

4. Staining Agents

4.1 *Contrasting Grout*, unsanded tile grout, applied as a neat paste.

4.2 *Carbon Lamp Black*.

4.3 *Waterproof Ink Black*.

4.4 *Washable Ink*.

4.5 *Potassium Permanganate Solution, 1 %*, prepared from 99 % KMnO_4 crystals, dissolve 1g of reagent into 100 mL of distilled water.

4.6 *Methylene Blue Solution, 1 %*.

4.7 This test method may be used for exposing tile to any staining agent deemed appropriate for the expected service conditions and may specify any reasonable combination of time and temperature for the exposure period. Exposure substances, time, and temperatures should be selected so as to either simulate service conditions, or accelerate staining that is possible under expected service conditions, or bear some other meaningful relation to expected service conditions.

5. Apparatus

5.1 *Test-Glass Test Tubes or PVC Tubes*, plain end glass test tubes or PVC tubes with a diameter of approximately 20 mm and a length of 150 mm sufficient to contain the required amount of test solution

¹ This test method is under the jurisdiction of ASTM Committee C21 on Ceramic Whitewares and Related Products and is the direct responsibility of Subcommittee C21.06 on Ceramic Tile.

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3.2 *Pipets*, glass pipet with a volume of at least 50 mL with gradations in 1-mL increments.

5.2 *Oven*, capable of maintaining a constant temperature of $110 \pm 5^\circ\text{C}$: at least 110 °C.

5.3 *Cloths*, a supply of lintless, absorbent ~~cloths~~ cloths or paper towels.

5.4 *Distilled or Deionized Water*, ~~Water~~, for preparation of the solutions.

5.5 *Light Source*, standard light source that supplies a minimum of 300 lux of illumination.

5.6 *Cleaning Agents*.

5.6.1 *Hot water*: Water.

5.6.2 *Weak cleaning agent*: Cleaning Agent, a commercial agent, not containing abrasive, with a pH of 6.5 to 7.5.

5.6.3 *Strong cleaning agent*: Cleaning Agent, a commercial cleaning agent containing abrasive, with a pH of 9 to 10.

5.6.4 *Suitable solvents*: Solvents:

3% (v/v) HCl solution, prepared from 38 % hydrochloric acid by adding 79 mL of the reagent hydrochloride acid solution to 951 mL of distilled water.
 20 % KOH solution (200 g/L), prepared by dissolving 200 g of 90 % potassium hydroxide into 1 L of distilled water.
 Acetone (technical grade).

(1) 3 % (v/v) HCl solution, prepared from 38 % hydrochloric acid by adding 79 mL of the reagent hydrochloride acid solution to 921 mL of distilled water.

(2) 20 % KOH solution (200 g/L), prepared by dissolving 222 g of 90 % potassium hydroxide into 1 L of distilled water.

(3) Acetone (technical grade).

6. Samples

6.1 *Number of Test Specimens*—One defect-free test specimen, which is representative of the entire surface, for each test solution is to be used. Test specimens shall be representative of the sample, and where tiles have different colors of decorative effects, care should be taken to include all distinctive parts. More test specimens may be necessary to ~~incorporate~~ incorporate all surface features.

6.2 *Size of Specimens*—The original tile for testing ~~should~~ may be cut to ~~50-50~~ 50 mm by ~~50 mm~~ 50 mm squares for testing with each cut piece labeled according to the testing solution to be applied.

6.3 The sample surfaces ~~should~~ may be ~~thoroughly~~ thoroughly cleaned with a ~~suitable~~ suitable solvent, such as ~~acetone~~ acetone and ~~completely~~ completely dried before testing. ~~acetone.~~

6.4 The test specimens can be glazed or unglazed tile. If the tiles are glazed, then the staining agent should be applied to the glazed surface. <https://standards.iteh.ai/catalog/standards/sist/70298810-3d1b-4b36-925a-6e459c16f0a2/astm-c1378-20>

7. Procedure for Staining Agent Application

7.1 *Application of the Staining Agent*:

5.1.1 ~~Dry the test specimens thoroughly at $110 \pm 5^\circ\text{C}$ before testing and then cool the tile to room temperature.~~

7.1.1 The labeled test specimens are laid out on a table in a well-ventilated area. (**Warning**—This test method involves the use of chemical substances. Proper precautions for the handling of these chemicals should be taken, such as protective clothing and fume hoods.)

NOTE 1—**Precaution:** This test method involves the use of chemical substances. Proper precautions for the handling of these chemicals should be taken, such as protective clothing and fume hoods.

7.1.2 ~~Transfer 5 mL~~ Using a glass test tube or PVC tube, place approximately 5 mL of the liquid staining agent described in ~~2.34.3 – 2.64.6~~ to a test tube in contact with the surface of the specimens. If the surface of the specimen is textured, using a non-reacting sealing agent such as plumber's putty or petroleum jelly around the outside of the tube may be necessary to prevent leaking.

5.1.4 ~~Place the surface to be tested of the tile face down on the open end of the test tube.~~

5.1.5 ~~While firmly holding the test tube and tile assembly together, invert the assembly so that the back of the tile is facing the table and the closed end of the test tube is facing up.~~

7.1.3 Carefully place the assembly on the table and leave undisturbed for 24 h.

7.1.4 For the dry staining agents described in ~~2.14.1 and 4.2 and 2.2~~, apply a generous amount of the staining agent with a cloth in the center of the test specimen, being sure to leave some unexposed area for comparison. The grout described in ~~2.14.1~~ should be mixed with enough ~~distilled~~ distilled water to make a neat paste before application. For light-colored tile, black grout should be used, and for dark tile, white grout should be used.

7.2 *Removal of the Test Solutions* ~~– Solutions~~: