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Standard Guide for Substrates Used in Testing Building Seals and Sealants[1]

This standard is issued under the fixed designation C 1375; 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 guide describes the recommended standard substrates and their recommended surface preparation for use in standard tests of building seals and sealants.

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. Referenced Documents

2.1 *ASTM Standards:* [2]

C 33 Specification for Concrete Aggregates
C 150 Specification for Portland Cement
C 305 Practice for MechanicalMixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
C 566 Test Method for Total Moisture Content of Aggregate by Drying
C 717 Terminology of Building Seals and Sealants
C 1036 Specification for Flat Glass

3. Terminology

3.1 *Definitions*—The terms used in this guide are in accordance with Terminology C 717.

4. Significance and Use

4.1 The guide provides recommendations for substrates and methods of surface preparation to be used in comparative tests of building seals and sealants.

5. Comparison to Other Standards

5.1 The ASTM committee with jurisdiction over this standard[1] is not aware of any comparable standards published by other organizations.

6. Glass Substrate

6.1 The glass used shall be float glass, which conforms to Specification C 1036, Type I, Class 1, q3. This corresponds to a glass that is formed on a float line, is transparent, clear, and intended for architectural fenestration applications.

6.2 Float glass has two surfaces, which are not necessarily identical in surface chemistry. There is a tin side, which was in contact with a batch of molten tin, and an air side, which did not have this intimate contact. These two surfaces may or may not have the same adhesion properties with a given sealant. It is best to test both surfaces for control of testing. If only one surface is to be tested, however, it is preferred to use the air side as this is likely a more consistent surface.

6.3 *Determination of Air Side Versus Tin Side*:

6.3.1 Clean the glass as described in 6.4.

6.3.2 Expose the substrate to the radiation from a short wavelength UV light source of approximately 254 nm. The tin side will fluoresce and display a hazy white reflectance. The air side will not show this effect under the same UV light. (**Warning—**Protect eyes and skin from exposure to UV light when using a UV light source.)

6.4 *Surface Preparation*—The substrate should be cleaned thoroughly with a solution of 50 % isopropyl alcohol (IPA) and 50 % deionized or distilled water and wiped with a clean, lint free, soft cloth or paper towel. Prepared specimens must be used within the same working day. Check surfaces for cleanliness by running distilled or deionized water over the glass surface held in a vertical position. Cleaned parts must pass water-break inspection as indicated by maintenance of a continuous film of water on the surface for not less than 30 s. Panels failing the water-break inspection should be recleaned until the surface can maintain the continuous film of water.

7. Aluminum Substrates

7.1 The aluminum shall be one of two materials, depending on the test sample configuration:

7.1.1 For tests requiring a sheet, less than 6 mm thick, the sheet shall be made of aluminum alloy 5005-H34.

7.1.2 For tests requiring a thicker plate, 6 mm or greater, the plate shall be made of aluminum alloy 6063-T5.

[1] This guide is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.10 on Specifications, Guides and Practices.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

7.2 The aluminum for either a sheet or plate shall have a clear, Class II anodized finish conforming to AA-M12C22A31 (refer to Aluminum Association Circular 45). The anodized surface shall be sealed using a hot water process.[3]

7.3 *Surface Preparation*—The substrate should be cleaned thoroughly with a solution of 50 % isopropyl alcohol (IPA) and 50 % dionized or distilled water and wiped with a clean, soft, lint-free cloth or paper towel. At the request of the manufacturer, cleaning with methyl ethyl ketone or similar solvent may precede the isopropyl wash. Panels must pass the water-break free test described in 6.4. Prepared substrates must be used within the same working day.

8. Mortar Substrates

8.1 Mortar substrates shall be prepared from Portland Cement, Type III – High Early Strength, conforming to Specification C 150, concrete sand conforming to Specification C 33, and potable water.

8.2 *Equipment Needed to Prepare Mortar Substrates*:

8.2.1 Flat metal pan large enough to hold 50 g of sand.

8.2.2 Balance accurate to ± 0.01 g.

8.2.3 Oven capable of maintaining 110°C ± 5°C.

8.2.4 Desiccator.

8.2.5 Molds made from metal or wood, lined with polyethylene. The desired final size of the test block will determine the dimensions of the mold.

8.2.6 Paddle type mortar mixer or laboratory Hobart-type mixer.

8.2.7 Metal finishing trowel.

8.2.8 Plastic to cover molds or moist cabinet.

8.2.9 Container for storing mortar substrates in lime water.

8.2.10 Plastic or natural bristle scrub brush.

8.2.11 Surface grinder, grinding wheel, or belt sander with No. 60 silicon carbide or aluminum oxide grinding medium.

8.2.12 Masonry saw with wet cut diamond blade, optional.

8.3 *Preparation of Sand*:

8.3.1 The sand shall be clean and free of contaminants, according to the requirements of Specification C 33.

8.3.2 Determine the moisture content of the sand according to Test Method C 566 with the following exceptions:

8.3.2.1 Test in duplicate.

8.3.2.2 Determine the moisture content as a decimal, not a percent. This value may be determined by dividing percent moisture content by 100.

8.3.2.3 Determine the mean moisture content of the two sand samples (MC). This factor will be used when measuring the weight of the sand in the mix to normalize the water content.

8.4 *Mortar Recipe*:

8.4.1 Determine the total weight needed to fill the mold(s) to prepare the mortar substrates. Use 2.3 g/cm^3(0.083 lbs/in.^{3}) as the density of the wet mortar. Combine the sand, cement, and water according to the following ratio by weight:

1 part Type III Portland Cement
2 parts + 2 MC Sand
0.5 part – 2 MC Water

where MC is the moisture content of the sand expressed as a decimal as determined in 8.3.2.

8.4.2 For example, if 1000 g total mortar are required to fill the mold, and the MC of the sand has been determined to be 0.10, then the total weight of sand added must be increased by 10 % or 57.1 g and the amount of water actually added must be reduced by the same amount. The recipe now becomes:

1 part =	286 g Type III Portland Cement
2 parts + 2 MC = 571 + 57.1 =	628.1 g wet sand
0.5 part – 2 MC = 143 – 57.1 =	85.9 g actual water
	1000 g total recipe

8.5 *Mixing Procedure*—Combine the sand and the cement in a paddle type mortar mixer, if mixing large quantities, or a Hobart-type mixer, if preparing small quantities of mortar for laboratory use. For paddle-type mixers, mix until homogenous in color and texture. Add the water slowly, making several additions and allowing it to blend thoroughly between additions. Once the last portion of water had been added, allow the mortar to mix for 2 to 5 min more to assure complete mixing. For Hobart-type mixer, mix as described in 8.1 of Practice C 305.

8.6 *Mold Filling*—Transfer the wet mortar to the mold(s) in at least two equal lifts. Shake the molds between lifts to level the concrete and work out any trapped air. Scrape the concrete flat and level with the top of the mold, and push away any standing water with the edge of a steel trowel. Work the surface with the trowel only enough to make it smooth and level. Do not overwork the mortar or a thick laitance layer will accumulate during curing.

8.7 *Curing*:

8.7.1 Loosely cover molds with plastic or transfer them to a moist cabinet at 100 % relative humidity for 24 h. Remove the mortar from the molds and finish curing underwater in clean saturated lime water for six days.

NOTE 1—The water is considered to be saturated when lime precipitates from the solution and forms a layer of white material in the bottom of the container.

8.7.2 Store blocks in saturated lime water until ready for use or further processing.

8.8 *Cutting and Grinding*:

8.8.1 Mortar may be molded into large blocks and cut to substrate size using a masonry saw with a wet cut diamond blade. Finished substrates shall be rinsed in clear water and scrubbed clean with a plastic or natural bristle scrub brush to remove loose mortar dust left there by the saw. The cut surface shall be used as the test surface.

8.8.2 Mortar may be molded into blocks of the correct size for substrates initially. After the cure cycle is complete, remove the surface laitance and expose the embedded aggregate by grinding with 60 grit aluminum oxide or silicon carbide. A surface grinder, grinding wheel or belt sander may be used to surface the blocks. Continue surfacing the face of the block until the aggregate is uniformly exposed. Rinse the finished blocks in clear water and scrub them with a plastic or natural bristle scrub brush to remove loose mortar dust left there by the grinder. The face surfaced by grinding shall be used as the test surface.

[3] Aluminum Association Circular 45 Designation System for Aluminum Finishes.

8.9 *Storage*—Return the finished substrates to lime water until needed for use. Just before use, rinse the blocks under running tap water and allow them to dry in an oven at 110°C ± 5°C for 30 min. Allow the substrates to cool to room temperature in a desiccator.

9. Keywords

9.1 aluminum; glass; mortar; substrate; surface preparation