Designation: C 1601 – 04

Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces[1]

This standard is issued under the fixed designation C 1601; 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 covers the field determination of water penetration of a masonry wall surface under specific water flow rate and air pressure conditions. This test is intended for use on any masonry wall surface that can be properly instrumented and tested within the requirements of this standard.

1.2 This test method is not identical to and the results are not directly comparable with the laboratory standard Test Method E 514 "Test Method for Water Penetration and Leakage Through Masonry."

1.3 Surface penetration, as determined by this test method, is defined as the amount of water passing through the wall surface exposed to testing per unit time per unit area. This property is not directly comparable to water penetration and leakage, which are typically defined as the amount of water travelling completely through a masonry system.

1.4 *This standard may involve hazardous materials, operations, or equipment. This standard does not purport to address all of the safety problems 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]

E 514 Test Method for Water Penetration and Leakage Through Masonry

3. Significance and Use

3.1 This non-destructive test method contains procedures and equipment requirements to determine the water penetration of a masonry wall surface. In general, excessive water penetration of masonry may degrade masonry wall performance with respect to thermal conductivity, durability, efflorescence, staining, corrosion of embedded metal items, and water leakage. This test is used to determine surface water penetration quantitatively at any single location, and it may not accurately predict leakage quantities or locations.

3.2 This test may be used to evaluate masonry walls in-situ or for field mock-up testing. Common applications of this method have been comparison of water penetration rates of walls before and after repairs, and testing the efficacy of coatings. Alternative procedures are also provided to simulate the effect of local climatology on water penetration of masonry wall surfaces.

3.3 The outer surface of all masonry walls will experience water penetration when subjected to wind-driven rain. The resistance to water penetration is dependent on materials, workmanship, design, and maintenance. Some wall types accommodate large volumes of water penetration, without deleterious effects, through the presence of properly designed and installed drainage systems including flashing and weep holes. Use of this standard without consideration of the overall wall system may lead to incorrect conclusions regarding performance.

3.4 It is the intent of this standard that a sheet of water be developed and maintained on the wall surface during testing. In some cases, due to the surface texture of the masonry, the application of a coating, or other factors, a sheet of water will not consistently form. In those cases, results of this test method will likely be inaccurate.

3.5 This test method is similar to but distinct from the laboratory Test Method E 514. This field test method is designed to test in-situ walls. E 514 laboratory test method is designed to test laboratory wall specimens. This test method determines water penetration of the masonry at its surface. Test Method E 514 measures the water that has penetrated into and through the masonry specimen and is collected. Direct comparison of results from this test method and Test Method E 514 are inappropriate.

4. Apparatus

4.1 *Test Chamber*—Use a test chamber similar to that shown in Fig. 1. Provide a rectangular opening with a minimum area of 12 ft^2 (1.08 m^2) with a minimum dimension of 24 in. (0.6 m) for each side of the opening (Note 1). Seal the

[1] This Test Method is under the jurisdiction of ASTM Committee C15 on **Manufactured Masonry Units** and is the direct responsibility of Subcommittee C15.04 on **Research**.

Current edition approved August 1, 2004. Published September 2004. Originally approved in 2004.

[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.

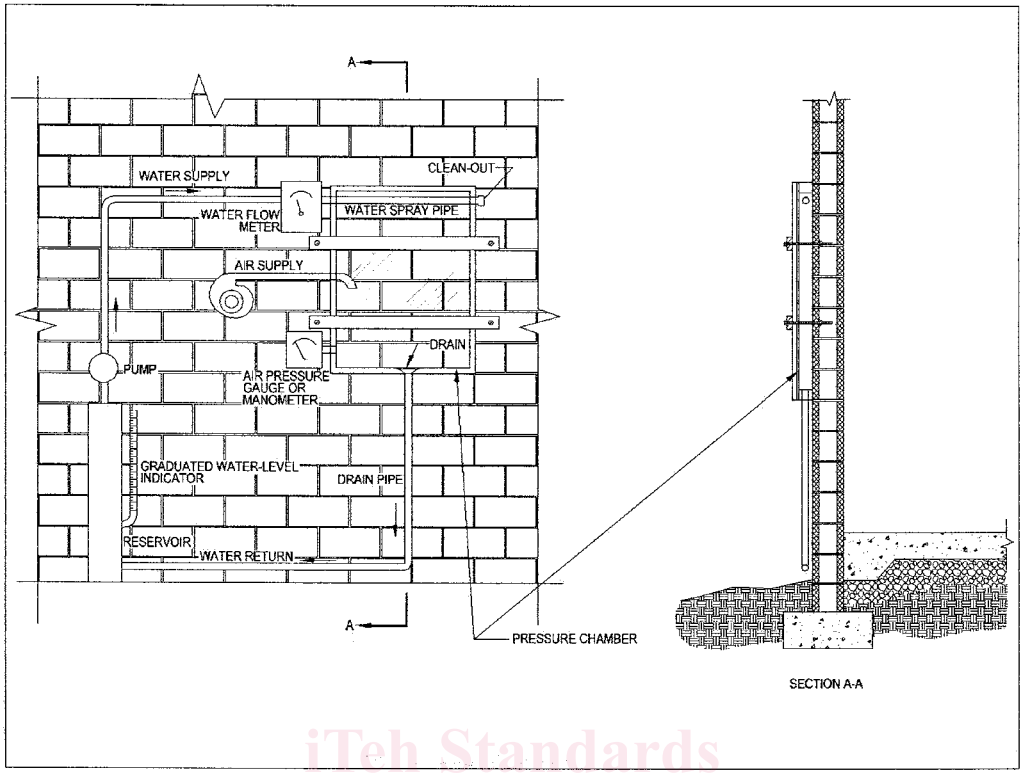

FIG. 1 Water Surface Penetration Test System

contact surface between the frame of the chamber and the test area to prevent loss of water and maintain air pressure. Cover the face of the chamber with a tough, transparent material capable of withstanding the test pressure (Note 2). Provide a ¾-in. (19-mm) diameter, corrosion-resistant, water spray pipe with a single line of 0.04-in. (1.0-mm) diameter holes spaced 1 in. (25 mm) apart, starting within 1 in. (25 mm) of each end (Note 3). Position the water spray pipe within the chamber so that the water impinges the wall perpendicular to the wall not more than 1.5 in. (40 mm) below the interior top of the test chamber.

NOTE 1—A size of 36 in. (0.9 m) wide and 48 in. (1.2 m) high is common.

NOTE 2—Clear acrylic sheets 3⁄16 to ¼ inch (5 to 6 mm) thick have been shown to perform well. Plexiglas® and Lexan® are two sources of clear acrylic sheets.

NOTE 3—Clean-outs at the end of the spray bar to facilitate cleaning the spray bar are common.

4.2 *Fixtures and Appurtenances to Chamber*—Fixtures and appurtenances to the chamber include an air line with manometer or pressure gauge able to read air pressure to within 0.50 lb/ft^2 (24 Pa), a water line with valves, a flow meter in the water supply line able to read flow within 0.02 gpm (4.5 L/h), and a water drain pipe at the bottom of the chamber. The water is stored in a calibrated reservoir with a minimum volume of 3 gal. (13 L), with graduations to allow readings within 0.015 gal (0.055 L) (Note 4). Pump water from the reservoir to the spray bar. Return water which drains from the bottom of the chamber directly to the reservoir.

NOTE 4—Use of a cylindrical reservoir having dimensions of approximately 4 to 8 inches (100 to 200 mm) in diameter by 5 ft. (1.5 m) or taller is common.

4.3 Other equipment includes devices for handling and mounting the chamber and measuring time, water quantities, and ambient temperature.

5. Hazards

5.1 The use of this test method requires careful design of both air chamber and support of the wall system to avoid possible injury due to equipment or masonry failure. Assure that the chamber and its attachment to the wall are adequate for the applied pressures during testing.

5.2 Water penetration resulting from this test can cause saturation of adjacent materials and leakage into occupied spaces of the buildings. Take into consideration the effects of potential water infiltration and leakage.

6. Procedure

6.1 *Mounting Chamber*—Attach the test chamber with mechanical fasteners using sufficient pressure to form an air- and water-resistant seal (Note 5).

NOTE 5—Use of a gasket or sealant at the contact surface is common.

6.2 *Sealing*—If needed, apply a perimeter sealant between the chamber and wall surface to ensure that leakage does not occur at the interface. Allow the sealant to cure sufficiently to ensure adequate bond and water resistance.

6.3 *Application of Air Pressure and Water Flow*—Adjust the water flow rate to 3.4 gal/ft^2/h (138 L/m^2/h) times the area of the chamber opening. Simultaneously, increase the air