



Designation: C1601 – 11

Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces¹

This standard is issued under the fixed designation C1601; 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 the same as the laboratory standard Test Method E514.

1.3 This test method evaluates the surface water penetration, which is not the same as through-wall water penetration evaluated by Test Method E514.

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 *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

C1232 Terminology of Masonry

E514 Test Method for Water Penetration and Leakage Through Masonry

3. Terminology

3.1 Definitions:

3.1.1 *surface water penetration, n*—water that passes through the exterior face of the masonry.

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 Dec. 15, 2011. Published January 2012. Originally approved in 2004. Last previous edition approved in 2010 as C1601 – 10. DOI: 10.1520/C1601-11.

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.

3.1.2 *through-wall water penetration, n*—surface water that penetrates through a wall and exits the interior face of the masonry.

3.1.3 *water penetration, n*—water that passes into or through the masonry.

3.1.4 *wind-driven rain, n*—rain water that is directed against the surface of the wall by wind.

3.2 For additional definitions of terms used in this test method, refer to Terminology C1232.

4. Significance and Use

4.1 This non-destructive test method contains procedures and equipment requirements to quantitatively determine the surface penetration of water at a single location on a masonry wall. It is not designed to determine the overall water penetration and leakage of a masonry system.

4.2 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.

4.3 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.

4.4 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.

4.5 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

*A Summary of Changes section appears at the end of this standard

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.

4.6 This test method is similar to but distinct from the laboratory Test Method E514. This field test method is designed to test in-situ walls. E514 laboratory test method is designed to test laboratory wall specimens. This test method determines water penetration of the masonry at its surface. Test Method E514 measures the water that has penetrated into and through the masonry specimen and is collected. Results from Test Method C1601 and Test Method E514 are not the same.

5. Apparatus

5.1 *Test Chamber*—Use a test chamber similar to that shown in Fig. 1. Provide a rectangular opening with a minimum area of 12 ft² (1.08 m²) with a minimum dimension of 24 in. (0.6 m) for each side of the opening (Note 1). Seal the 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 3/4-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—Transparent plastic sheets 3/16 to 1/4 inch (5 to 6 mm) thick have been shown to perform well. Plexiglas® and Lexan® are two products that have been used.

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

5.2 *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/ft² (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.

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

6. Hazards

6.1 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.

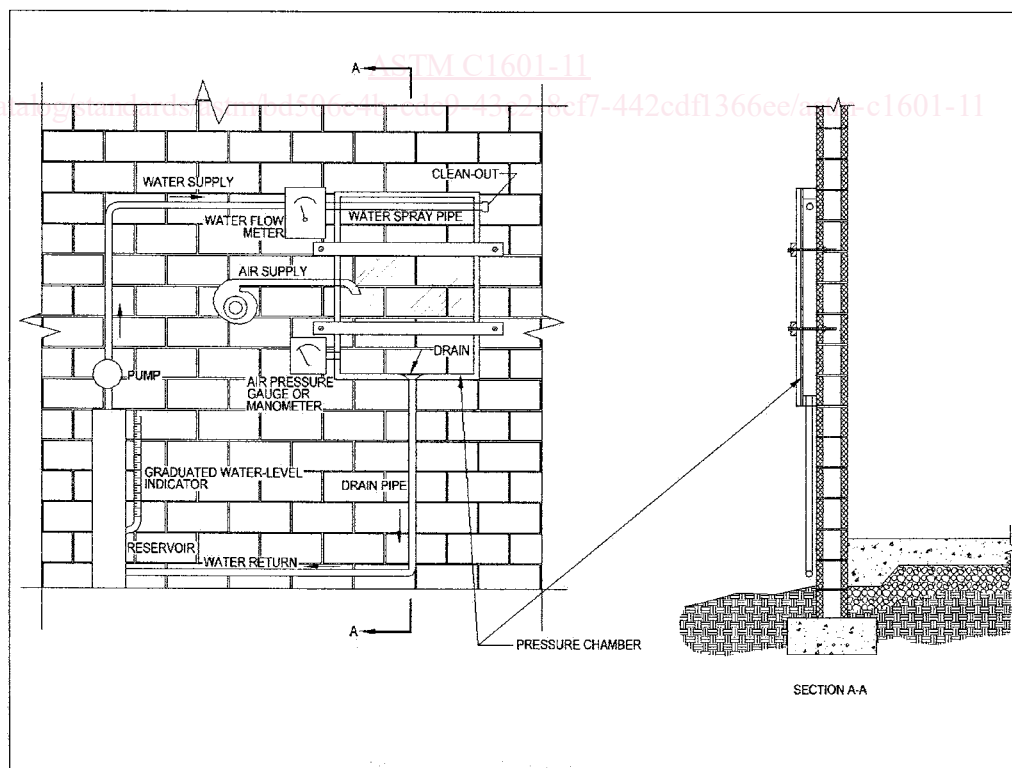


FIG. 1 Water Surface Penetration Test System