

Industry Standard from
The National Concrete Masonry Association

Last Revised January 20, 2009

NCMA CMU-WR1-09

**Standard Test Methods for Water Stream and Water Droplet
Tests of Concrete Masonry Units**

1. Scope

1.1 The purpose of these tests is to visually assess the water absorbcency characteristics of the exposed surfaces of a hollow or solid concrete masonry unit when subjected to either a dynamically or statically applied source of water.

Note 1: The water absorbcency characteristics of a concrete masonry unit cannot be directly correlated to the water penetration resistance of a wall assembly.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parenthesis are for information only.

1.3 The text of this standard references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.4 *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 to determine the applicability of regulatory limitations prior to use.*

Note 2: These test methods offer an easy, albeit subjective, assessment of the water absorption characteristics of a concrete masonry unit. These methods are intended to provide an immediate, qualitative assessment of the absorbcency characteristics of the surface of a concrete masonry unit.

2. Referenced Documents

2.1 *ASTM Standards:*

C1093 Practice for Accreditation of Testing Agencies for Unit Masonry

2.2 *NCMA Standards:*

CMU-WR2 Standard Test Method for Spray Bar Test of Concrete Masonry Units

CMU-WR3 Standard Test Method for Assessing Water Uptake Potential of Concrete Masonry Units

2.3 *NCMA TEK*

19-7 Characteristics of Concrete Masonry Units with Integral Water Repellent

3. Summary of Test Methods

3.1 In the Water Stream Test, a stream of water is applied to a vertical, exposed surface of a concrete masonry unit. Observations are made regarding the water's ability to freely flow down the unit or be absorbed by the unit.

Note 3: Although the Water Stream Test can be used to evaluate the water absorbency characteristics of an exposed surface of a concrete masonry unit already placed in service, care should be taken when interpreting observations from such testing for reasons described in Section 4. The Water Stream Test can be used as a preliminary method for evaluating concrete masonry units or assemblies to determine if a Water Droplet Test should be performed.

3.2 In the Water Droplet Test, multiple drops of water are placed on the exposed surface of a concrete masonry unit under evaluation and allowed to stand undisturbed. The condition of the water droplets is documented at specified intervals.

Note 4: Because the water droplets are to remain standing during this test, the surface(s) of the concrete masonry unit being evaluated must remain in a stationary, horizontal position. Therefore, the Water Droplet Test is only practical for evaluating concrete masonry units prior to their installation in a wall.

4. Significance and Use

4.1 The methods in this standard qualitatively evaluate the ability of a concrete masonry unit to resist the absorption of water applied to its surface.

4.2 These tests do not evaluate a concrete masonry assembly's resistance to moisture migration or water penetration.

Note 4: System performance for water penetration resistance is a function of a number of variables in addition to the characteristics of the units themselves, including, but not limited to: design considerations and detailing, workmanship, the characteristics of other materials used in the construction of masonry (mortar, coatings, flashing, weeps, joint sealants, primers, etc.), and the effect of adjacent materials, architectural elements, and building components.

Note 5: Integral water repellent admixtures can be used in the production of concrete masonry units. Other variables, such as manufacturing methods and constituent materials, can have an affect on the water repellency of individual concrete masonry units. These methods do not distinguish effects of separate variables on water repellency, only the overall characteristics of the concrete masonry unit.

4.3 These test methods alone cannot be used to quantitatively determine the water repellent characteristics of a concrete masonry unit. Exposure condition, age of unit, and other variables can have an affect on the water absorption characteristics of the surface of a concrete masonry unit. Additional testing is necessary to evaluate the water absorption characteristics of the entire concrete masonry unit or assembly if unsatisfactory results are obtained using the tests in this standard.

Note 6: Acceptable methods for quantitative determination of the water repellent characteristics of a concrete masonry unit include NCMA methods CMU-WR2 and CMU-WR3.

Note 7: For more information on concrete masonry units with integral water repellent admixtures, as well as performance guidelines and specifications, please see NCMA TEK 19-7.

5. Apparatus

5.1 *Water* – Water applied to the surface of a concrete masonry unit as part of either the Water Droplet or Water Stream Test shall be potable and free of dyes, additives, or other contaminants that may influence the testing observations. The temperature of the water shall be $75 \pm 10^{\circ}\text{F}$ ($24 \pm 5^{\circ}\text{C}$).

Note 8: When testing is performed in the field, water temperature may be outside of the required limit and such deviations should be noted on the final report.

5.2 *Water Droplet Dispenser* – An eye dropper, syringe, or similar device capable of dispensing a single 0.2 ± 0.01 oz (6.0 ± 0.3 mL) droplet of water.

5.3 *Water Stream Dispenser* – A syringe, bottle, or similar device capable of dispensing a single, continuous stream of water with a flow rate of 0.35 ± 0.05 oz/sec (10 ± 1 mL/sec). The diameter of the nozzle shall be 0.1 ± 0.02 in. (2.5 ± 0.5 mm).

6. Specimen Sampling and Preparation

6.1 Sample a minimum of three concrete masonry units of identical configuration representative of the lot for each Water Stream or Water Droplet Test. For units already placed in the wall, identify a minimum of three individual units to be tested using the Water Stream Test.

Note 9: Surface cleaning and other washing operations can affect the surface water repellency of a concrete masonry unit. Units that have been exposed to these types of treatments are unlikely to produce repeatable or representative observations.

6.2 Specimens shall be stored at $75 \pm 10^{\circ}\text{F}$ ($24 \pm 5^{\circ}\text{C}$) and a relative humidity of $50 \pm 15\%$ for at least 48 hours prior to testing (See Note 9).

Note 10: When testing in the field, specimen conditioning and testing temperature and humidity may be outside of prescribed limits. Such deviations may affect the results of testing, and should be noted on the final report.

6.3 Samples shall be free of visible moisture before testing.

Note 11: Surfaces intended to be exposed in construction should be used for these tests. Surface features (such as split face, ribbed, etc) may make application and observation of the water stream or water droplet difficult.

6.4 The surfaces of the sample to be evaluated shall be free of any dirt, dust, coatings, films, or other contaminants prior to testing unless testing is specifically intended to evaluate the effect of such treatments on the water absorbency characteristics of a concrete masonry unit.

7. Water Stream Test Procedure

7.1 For units that have not been placed in a wall, place the specimen to be evaluated using the Water Stream Test with the test surface in a vertical orientation. The units shall be plumb and level to within 1/16 in. (1.6 mm) in each 10 in. (254 mm) distance from its intended orientation when installed.

7.2 For specimens already placed in the wall, identify the specimen location in the wall to be evaluated using the Water Stream Test. Do not mark the surface to be tested.

7.3 Using the water stream dispenser, apply a steady stream of water onto the face of the specimen for a period of $3 \text{ seconds} \pm 1 \text{ second}$ from a distance of $12 \pm 1 \text{ in.}$ ($305 \pm 25 \text{ mm}$). The stream shall be applied near the top of the specimen surface being tested.

7.4 Observe and record the condition of the water streamed onto the surface according to the scale in Table 1.

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|--------------------|--|
| Not Absorbed | The applied water stream readily flows down the face of the specimen. No water is absorbed into the surface. |
| Partially Absorbed | A portion of the applied water is absorbed into the test surface, but some water flows down the surface of the specimen. |
| Totally Absorbed | All of the applied water is readily absorbed in the test specimen. |

Note 12: For some architectural finishes (such as split-face, ribbed, scored, etc.) water may be observed to trickle or bead due to the uneven surface. In this event, this shall be recorded as an observation during the water stream test.

8. Water Droplet Test Procedure

8.1 For the Water Droplet Test, place the specimen with the test surface on the top. The test surface shall be level to 1/16 in. (1.6 mm) in each 10 in. (254 mm) distance over the testing surface.

Note 13: When a concrete masonry unit has architectural features, such as a split face, on the bottom surface that makes leveling the unit difficult, placing the unit in a bed of leveling sand has been shown to be a convenient method of leveling the top testing surface of the unit. As the leveling sand may be reused, it may be convenient to keep sand in a container of sufficient size to accommodate placing the concrete masonry unit inside the container during testing.

8.2 From a height of no more than 2 in. (50.8 mm), apply approximately 0.2 ± 0.01 oz (6.0 ± 0.3 mL) of water meeting the requirements of Section 5.1 at one location on the test surface of the unit using the water droplet dispenser. Repeat at 4 other locations for a total of 5 spots per test surface of each specimen. Do not allow the droplets to touch each other. Throughout testing, the ambient temperature shall be $75 \pm 10^\circ\text{F}$ ($24 \pm 5^\circ\text{C}$) and the ambient relative humidity shall be $50 \pm 15\%$. The specimens shall be protected from breeze, direct light, or other influences that could accelerate evaporation of the water droplet or influence the testing observations.

8.3 Continuously monitor the water droplets for the first five minutes. Record observations at 1 minute ± 5 seconds, 5 minutes ± 10 seconds, and 10 minutes ± 20 seconds after applying the water droplets. Optionally, observations may also be performed at 15 minutes ± 30 seconds, 30 minutes ± 1 minute, and 60 minutes ± 2 minutes after applying the water droplets. At each observation interval, record the condition of each water droplet according to the scale in Table 2.

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|--------------------|---|
| Standing | The appearance of the water droplet has not changed and does not appear to have been absorbed into the unit. |
| Partially Absorbed | A portion of the water droplet has been absorbed into the unit, but free water still remains on the surface at the location of the water droplet. |
| Totally Absorbed | The entire water droplet has been absorbed into the unit with no free water remaining on the surface, but the surface appears damp at the original location of the water droplet. |
| Dry | The entire water droplet has been absorbed into the unit with the original location of the water droplet appearing dry. |

9. Report

9.1 At a minimum, the report shall include the following:

9.1.1 The information from Table 2 of ASTM C1093.

9.1.2 Where applicable, observations of the water streamed onto the specimen for the Water Stream Test.

9.1.3 Where applicable, observations of each water droplet at each time observed for the Water Droplet Test.

9.1.4 Type of units and description of any surface features

10. Precision and Bias

10.1 There is no precision and bias information available for this method.

11. Keywords

11.1 concrete masonry unit, testing, test method, water absorption, water droplet, integral water repellent, water stream.