



Designation: ~~C1262~~—~~10~~ C1262/C1262M – 16

## Standard Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units<sup>1</sup>

This standard is issued under the fixed designation ~~C1262~~; C1262/C1262M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This test method covers the resistance to freezing and thawing of dry-cast segmental retaining wall (SRW) units (see Specification [C1372](#)) and related concrete units. Units are tested in a test solution that is either potable tap water or 3 % saline solution depending on the intended use of the units in actual service.

NOTE 1—Related concrete units include units such as hollow and solid concrete masonry units, concrete brick, and concrete roof pavers.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. ~~The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.~~ Values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with this standard. Some values have only SI units because the inch-pound equivalents are not used in practice.

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

### 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

[C140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units](#)

[C1093 Practice for Accreditation of Testing Agencies for Masonry](#)

[C1232 Terminology of Masonry](#)

[C1372 Specification for Dry-Cast Segmental Retaining Wall Units](#)

### 3. Terminology

3.1 Terminology defined in Terminology [C1232](#) shall apply for this test method.

### 4. Significance and Use

4.1 The procedure described in this test method is intended to determine the effects of freezing and thawing on SRW and related units in the presence of potable tap water or saline solution.

4.2 The procedure is not intended to provide a quantitative measure to determine an expected length of service for a specific type of concrete unit.

NOTE 2—The testing laboratory performing this test method should be evaluated in accordance with Practice [C1093](#).

### 5. Apparatus

5.1 *Freeze-Thaw Chamber*—Use a chamber that has:

5.1.1 Forced air circulation,

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee [C15](#) on Manufactured Masonry Units and is the direct responsibility of Subcommittee [C15.03](#) on Concrete Masonry Units and Related Units.

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<sup>2</sup> 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.

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

5.1.2 A programmable air-temperature controller capable of automatically performing at least two freezing and thawing cycles per 24-h period during testing,

5.1.3 A temperature range of at least -10 to 100°F (-24[-25 to 38°C],40°C], and

5.1.4 The capability of maintaining the air temperature throughout the chamber within the specified temperature ranges for the duration of the test cycle.

5.2 Containers—Use containers that are:

5.2.1 Made of non-rigid plastic,

5.2.2 Of sufficient size to contain each test specimen and specimen supports as illustrated in Fig. 1,

5.2.3 Of sufficient size to provide a minimum of 1/8 in. (3 mm) and a maximum of 1 1/2 in. (38 mm)[40 mm] of test solution surrounding the sides of the specimen,

5.2.4 Supplied with a tightly-fitting lid to reduce evaporation, and

5.2.5 Flat enough so that the specimen will not deviate from level by more than 1/16 in. (2 mm)[2 mm] from one end of the specimen to the opposite end when placed on the support rods.

5.3 Specimen Supports—Support the specimen above the container bottom. Use supports that are:

5.3.1 Rods having dimensions—a thickness of 1/8 ± 1/24 in. (3 ± 1 mm)[3 ± 1 mm] and a width of the portion that contacts the specimens of no greater than the rod thickness (see Note 3),

5.3.2 Made of a solid, non-corrosive, non-absorptive material (brass, plastic, and so forth), and

5.3.3 Capable of supporting the specimen in both the longitudinal and transverse directions (see Note 34).

NOTE 3—The rods can be of any cross-sectional shape (for example, round, square, or triangular) as long as the specimen is held off the bottom of the container by the required rod thickness and the width of the portion of the rod that contacts the specimen is no greater than the rod thickness.

NOTE 4—Examples of longitudinal and transverse support configurations including placing the supports in the I, Z, or box configurations.

5.4 Temperature-Measuring Equipment:

5.4.1 Reference Temperature-Measuring Device—The reference temperature-measuring device shall be readable and accurate to ±0.5°F (0.2°C)[0.2°C] within the range of use. A certificate or report that verifies the accuracy shall be available in the laboratory for review. Verify the accuracy of liquid-in-glass reference temperature-measuring devices at least once. Verify the accuracy of direct-reading resistance reference temperature-measuring devices every temperature-measuring devices at intervals not exceeding twelve months. The certificate or report shall provide documentation that the reference standard used in the verification is traceable to the National Institute of Standards and Technology (NIST).

5.4.2 Temperature Recorder—Equip the chamber with a device to record the air temperature every 15 min or less; this device shall be accurate and readable to 2°F (1°C)[1°C]. Verify the accuracy of the temperature measuring device at least every six months. During testing, evaluate the data from the temperature recording device at least once every twenty cycles to ensure that cycles meet the temperature requirements of 7.2.17.3.1 and 7.2.27.3.2. A record of this evaluation documenting the date checked, a confirmation that the data is within the required temperature range, and the name of the individual performing this evaluation shall be maintained in the laboratory.

NOTE 5—This requirement may be satisfied by an initialed and dated temperature recorder chart. Brief changes in the temperature due to door openings should be ignored.

NOTE 6—A convenient time to evaluate the temperature results is when the chamber is stopped for residue collection.

5.4.3 To verify the accuracy of the temperature-measuring devices, position the reference temperature-measuring device in the chamber in a readable position as near to the temperature-measuring device probe as possible. Close the door and leave undisturbed for at least 5 min. Read the temperature immediately after opening the chamber door. Record the temperature readings of both devices. If the temperature readings differ by more than 2°F, 2°F [1°C], adjust or replace the temperature-measuring device.

5.5 Scales—Scales for weighing full-size specimens shall have a capacity of at least 50 % greater than the weight of the largest specimen tested and shall be accurate to at least 1 g (0.002 lb)-g. Scales for weighing the filter paper and specimen residue (spall), as required in 7.2.37.3.3, shall be accurate to at least 0.2 g (0.0005 lb)-g.

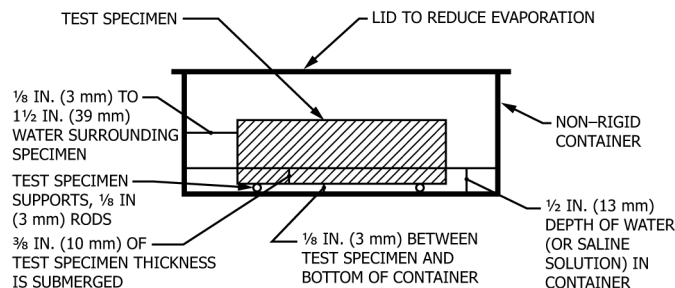


FIG. 1 Test Specimen in Freeze-Thaw Container

5.6 Oven—A ventilated oven of appropriate size capable of maintaining a uniform temperature of  $230 \pm 9^\circ\text{F}$  [ $110 \pm 5^\circ\text{C}$ ]. Ovens shall be verified in accordance with Practice **C1093**.

## 6. Sampling and Preparation of Test Methods Specimens

6.1 *Selection of Units*—Select five whole SRW units representative of the lot from which they are selected. The units shall be free from visible cracks or structural defects.

6.2 *Freeze-Thaw Test Specimens*—*Specimens*—Test specimens shall consist of solid coupons saw-cut from full sized units. Do not saw-cut test specimens from units that have been previously oven-dried. Do not subject test specimens to oven-drying prior to completion of freeze-thaw testing.

6.2.1 Cut one coupon from each of the five sampled units. Cut the coupon from the exposed surface of the unit as the unit is used in service unless the exposed surface is an architectural or other nonplanar surface (see **Note 67**). In the case of a unit with an exposed architectural or other nonplanar surface, cut the coupon from another flat molded surface ideally as far as possible from the architectural or other nonplanar face and in no case less than 2 in. (~~50 mm~~) [50 mm] from that surface. Immediately following saw-cutting, remove loose particles and residue from the coupon by rinsing in tap water and brushing with a soft bristle brush. Do not fully immerse coupons in water. Each specimen shall be marked with a unique identification number on the non-molded surface of the specimen.

**NOTE 7**—Split-faced surfaces are the most common surfaces used to provide an architectural appearance to segmental retaining walls. However, other means could be used to obtain similar architectural effects like tumbling, grinding, and slumping.

6.2.2 Sawing shall be performed in an accurate, competent manner, subjecting the specimen to as little saw vibration as possible. Use a diamond saw blade of proper hardness.

6.2.3 Place the coupons on edge on a  $\frac{3}{8}$  in. (~~10 mm~~) [10 mm] or coarser mesh such that there is an air space of not less than 1 in. (~~25 mm~~) [25 mm] between coupons. Allow the coupons to dry for not less than 48 h in laboratory air at a temperature of  $75 \pm 15^\circ\text{F}$  ( $24$  [24  $\pm$  8 $^\circ\text{C}$ ])  $8^\circ\text{C}$ ] and a relative humidity of less than 80 %.

6.2.4 The thickness of each coupon shall be  $1\frac{1}{4}$  in. (~~32 mm~~)  $\pm$   $\frac{1}{16}$  in. (~~2 mm~~), [32 mm  $\pm$  2 mm], unless the unit does not permit this minimum thickness, in which case the thickness shall be the maximum thickness that can be obtained from the unit. The thickness of the coupon shall not be less than  $\frac{3}{4}$  in. (~~19 mm~~), [20 mm].

6.2.5 The area of the submerged surface of the test specimen shall be at least 25 in.<sup>2</sup> (~~161~~ [160 cm<sup>2</sup>]) ~~and~~ shall not exceed 35 in.<sup>2</sup> (~~225~~ [225 cm<sup>2</sup>]), unless the unit does not permit a coupon meeting the minimum area, in which case the test specimen shall consist of two coupons. The combined area of the two coupons shall be at least 25 in.<sup>2</sup> (~~161~~ [160 cm<sup>2</sup>]) ~~and~~ shall not exceed 35 in.<sup>2</sup> (~~225~~ [225 cm<sup>2</sup>]). These two coupons shall be tested as and considered to be a single specimen.

6.3 When compression and absorption testing will be conducted in addition to freeze-thaw testing, obtain a specimen (coupon) for each test from each of five SRW units to facilitate correlation among the properties. If this is not possible, then obtain compressive strength and absorption specimens from different units manufactured in the same production lot as the freeze-thaw specimens. Take compressive strength and absorption specimens in accordance with Test Methods **C140**. Specimens used for Test Methods **C140** tests shall not be used as specimens for freeze-thaw tests.

**NOTE 8**—While compressive strength and absorption values by themselves have been shown by research<sup>3</sup> to not be reliable indicators of durability, they have been shown to be good reference values for units manufactured from a given set of materials.

## 7. Procedure

### 7.1 Test Solution:

7.1.1 The test solution shall be either potable tap water or a  $3 \pm 0.1\%$  (by weight) sodium chloride saline solution (see **Note 9**).

**NOTE 9**—The 3 % saline solution can be prepared by adding 0.03 lb [3 g] of sodium chloride to each 0.97 lb [97 g] water.

7.1.2 The test solution shall be at a temperature of 60 to 80°F [16 to 27°C] when added to the container or when used to rinse the specimens or residue.

### 7.2 Specimen Conditioning:

7.2.1 After preparation of the freeze-thaw specimens in accordance with Section 6, weigh each specimen to the nearest 1 g and record as  $W_{start}$ .

**NOTE 10**—The weight  $W_{start}$  as determined in 7.2.1 is not required to be reported at the conclusion of the test, nor is it used to calculate the reported weight loss of the specimen throughout the test. However, because the initial dry-weight of the specimen is not determined until the completion of freeze-thaw testing by adding the dry-weight of the collected residue to the dry-weight of the remains of the specimen (see 8.2), this  $W_{start}$  weight is needed as a reference weight to be used during the testing to estimate percentage weight loss and to predict relative performance among test specimens.

<sup>3</sup> Chan, C., Hover, K. C., Folliard, K. J., Hance, R. M., Trejo, D., *Durability of Segmental Retaining Wall Blocks: Final Report*, Federal Highway Administration Report No. FHWA HRT-07-021, April 2007, pp. 42–55.  
Available from <http://www.tfhr.gov/structure/pubs/07021/index.htm>.