

Standard Method of Test for

LINEAR CONTRACTION OF MAGNESIUM OXYCHLORIDE CEMENTS¹



ASTM Designation: C 252 - 52

ADOPTED, 1952.²

This Standard of the American Society for Testing Materials is issued under the fixed designation C 252; the final number indicates the year of original adoption as standard or, in the case of revision, the year of last revision.

Scope

1. This method of test covers a procedure for the laboratory determination of linear changes occurring in magnesium oxychloride cements prior to the point of maximum contraction.

Apparatus

2. (a) *Measuring Apparatus*.—The measuring apparatus (Fig. 1) shall consist essentially of a base on which shall be rigidly mounted a section of angle brass, $1\frac{1}{2}$ in. by $1\frac{1}{2}$ in. in dimensions and approximately 11 in. long, to serve as a cradle for the specimen. A rigidly mounted tail piece at one end of the cradle shall be provided with a bolt for anchoring the test specimen. At the opposite end of the cradle shall be mounted a suitable measuring instrument graduated to permit reading to 0.001 in. and estimating to 0.0001 in. This instrument

¹ Under the standardization procedure of the Society, this method is under the jurisdiction of the ASTM Committee C3 on Magnesium Oxychloride and Magnesium Oxide Cements.
² Prior to adoption as standard, this method was published as tentative from 1950 to 1952.

may be either a micrometer comparator or a dial gage. The tip of the stem of the measuring device shall be hemispherical and shall contact the end of the specimen with a total force of not less than 80 nor more than 120 g. The bolt of the tail piece and the stem of the device shall be horizontal and parallel with the long dimension of the cradle with their centers $\frac{1}{2}$ in. above the apex of the cradle.

(b) *Brass Face Plates*.—Pieces of light-gage, but rigid, brass cut in the form of a right triangle with the two adjacent sides each $1\frac{1}{2}$ in. long shall be used to confine the ends of the test specimen. Shim stock approximately 0.010 to 0.020 in. thick is recommended. One face plate shall have soldered to its surface a brass nut of the proper size and thread to engage the bolt of the tail piece of the cradle. The other face plate shall have soldered to its surface a brass washer approximately $\frac{1}{16}$ in. thick with a center opening sufficiently large to make a loose fit over the stem of the measuring device. The centers of the brass nut and washer,

respectively, shall be $\frac{1}{16}$ in. from the apex of the face plate and on a line bisecting the right angle. Three $\frac{3}{8}$ -in. holes shall be punched in each end plate for keying to the specimen.

Storage and Test Conditions

3. (a) The preparation and subsequent testing of the test specimens shall be conducted in an atmosphere maintained at 70 ± 1 F. and at a relative humidity

half lengthwise. Line the cradle with these folded papers without wrinkling and install the fixed end plate at the tail piece. Insert the other end plate at its approximate location near the opposite end of the cradle. Fill the resulting trough with the plastic cement prepared in accordance with the Standard Method for Mixing Magnesium Oxychloride Cement Compositions with Gauging Solution (ASTM Designation: C 251).³ The ce-

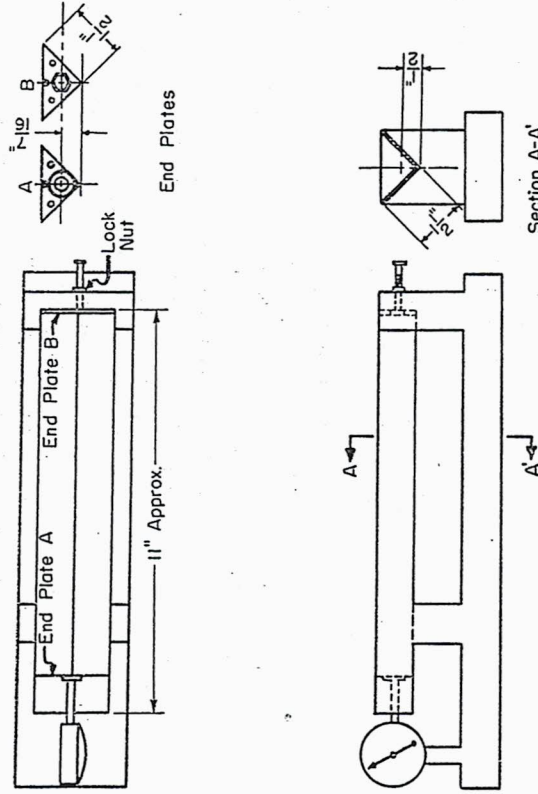


FIG. 1.—Apparatus for Determining Linear Contraction.

of 50 ± 5 per cent (corresponding to a wet bulb temperature range of 56.5 to 60.5 F.). All materials and apparatus shall be equilibrated to these conditions at time of use.

(b) An air circulation velocity of not less than 50 and not more than 100 ft. per min. shall be maintained in the vicinity of the molded specimens for the full duration of the test.

Procedure

4. (a) Cut four pieces of thin, non-sticky, waxed paper (kitchen type) to approximately 4 by 11 in. and fold in

ment shall not have aged more than 10 min. from the time of completion of the mixing. Remove the entrapped air by a cutting motion with the spatula and extrude a small amount of cement through the holes in and around the edges of the end plates. Strike off the excess cement and engage the end plate and stem of the indicating device. Adjust the end plate so that it is vertical and does not bind on the sides of the mold, and so that the test specimen is 10 ± 0.05 in. in length. The test specimen shall remain undis-

³ Appears in this publication, see Contents in Numeric Sequence of ASTM Designations at front of book.

322 LINEAR CONTRACTION OF MAGNESIUM OXYCHLORIDE CEMENTS (C 252 - 52)

turbed in the apparatus until the completion of the determination.

(b) Exactly 30 min. after starting to add the gauging solution to the dry ingredients in the mixing procedure, record the reading of the indicating device to the nearest 0.0001 in. No adjustment of the end plate or the specimen length shall have been made within 5 min. prior to this base-point reading. Record the length of the test specimen at $\frac{1}{2}$ -hr. intervals until maximum contraction is reached. Maximum contraction is the point of minimum length of the test specimen after which two consecutive measurements at $\frac{1}{2}$ -hr. intervals show either a decrease in length of not more than 0.0001 in. or an actual expansion.

(c) Concurrently with the linear contraction determination, determine the setting time of the oxychloride cement in accordance with the Standard Method of Test for Setting Time of Magnesium Oxychloride Cements (ASTM Designation: C 254),³ using test specimens prepared from the same batch of cement.

Calculations

5. (a) Plot the linear change measurements, expressed as percentage change from the base-point, against time on suitable coordinates in order to make it possible to interpolate linear change values corresponding to the independently measured setting times.

(b) Calculate *nonplastic contraction* as the percentage change in length of the test specimen between the time of final set and the time at which maximum contraction occurs.

(c) Calculate *net contraction* as the percentage decrease in length of the test specimen between the initial base-point (at $\frac{1}{2}$ -hr. age) and the point of maximum contraction. With some types of mixes expansion may occur prior to maximum contraction and the test specimen may increase in length beyond the length recorded at the initial base-point. In such cases the contraction shall be considered as the difference between the maximum length and the length at maximum contraction, and shall be reported as percentage *gross contraction*.

(d) Round off final calculated values to the nearest 0.001 per cent in accordance with the rounding-off method given in Section 3 (d) to (h) of the Recommended Practices for Designating Significant Places in Specified Limiting Values (ASTM Designation: E 29).³

Report

6. The report shall include the following:

- (1) Percentage of nonplastic contraction, and
- (2) Percentage of net contraction, or percentage of gross contraction.

3, p. 323 (C 253 - 52).
Make the following editorial changes in Standard Methods C 253 - 52:
Section 7 (a) (2).—Change lines 9 through 15 to read: "graduated to at least 0.001 in. The graduations shall be such that length changes of 0.0001 in. may be estimated. When tested at any point throughout its range, the error shall not be greater than ± 0.0001 in."

The difference between repeated measurements shall not be greater than 0.0001 in.
Section 9 (a).—Change dimension at left of center drawing from " $\frac{3}{4}$ in." to " $\frac{3}{8}$ in."
Section 12.—In Item (2) of the Note change "0.3% per cent" to read "±, as the case may be, 0.3% per cent."

Standard Methods of Test for

LINEAR CHANGE OF MAGNESIUM OXYCHLORIDE CEMENTS¹



ASTM Designation: C 253 - 52

ADOPTED, 1952.²

This Standard of the American Society for Testing Materials is issued under the fixed designation C 253; the final number indicates the year of original adoption as standard or, in the case of revision, the year of last revision.

Scope

1. (a) These methods of test cover procedures for the laboratory determination of linear changes occurring in magnesium oxychloride cements subsequent to final set.

(b) Two types of apparatus and procedures are covered. In Method A, use is made of molds and a length comparator conforming to the Standard Method of Test for Autoclave Expansion of Portland Cement (ASTM Designation: C 151).³ Method B covers the apparatus and procedure currently in use by the oxychloride cement industry.⁴

METHOD A

Apparatus

2. (a) *Molds*.—The test specimen molds shall provide for 1 by 1-in. test specimens of 10-in. effective gage length. The effective gage length shall be con-

¹ Under the standardization procedure of the Society, this method is under the jurisdiction of the ASTM Committee C-2 on Magnesium Oxychloride and Magnesium Oxychloride Cements.

² Prior to adoption as standard, these methods were published as tentative from 1950 to 1952.

³ Apparent ASTM Designations at front of book. Sequence of ASTM Designations that further experience with the two different types of equipment and procedures may result in the selection of one method as standard.

sidered as that length between the innermost points of the metal inserts used as reference points. The parts of the molds shall be tight fitting and firmly held together when assembled. The molds shall be made of steel or hard metal not readily attacked by the cement paste. The sides of the molds shall be sufficiently rigid to prevent spreading or warping. Each end plate of the molds shall be equipped to hold properly in place, during the setting period, a stainless steel or noncorroding metal reference point having a diameter of $\frac{1}{4}$ in. The reference points shall be set so that their principal axes coincide with the principal axes of the test specimen, and shall extend into the specimen $\frac{3}{8}$ in. The distance between the inner ends of the reference points shall be 10 ± 0.1 in. The distance between opposite faces of the molds shall be 1 ± 0.03 in. The height of the mold measured separately for each specimen compartment, shall be 1 ± 0.03 in. both for new molds and for molds in use.

(b) *Length Comparator*.—Changes in length of the test specimen shall be measured by a dial gage or micrometer comparator having a range of at least