



Standard Specification for Asbestos-Cement Flat Sheet for Cooling Tower Fill¹

This standard is issued under the fixed designation C1082; 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 specification covers three classes of flat asbestos-cement sheets for use as cooling tower fill.

1.2 Specifically excluded from this specification are asbestos-cement products intended for use as tower partitioning and casing materials, splash bars, water distribution conduits, and demisters. Also excluded are corrugated sheets and splash bars used as cooling tower fill (heat exchange surfaces) that are covered in Specification C1081.

1.3 The values stated in the SI system are to be regarded as the standard. The inch-pound units in parentheses are provided for information only.

1.4 **Warning**—Breathing of asbestos dust is hazardous. Asbestos and asbestos products present demonstrated health risks for users and for those with whom they come into contact. In addition to other precautions, when working with asbestos-cement products, minimize the dust that results. For information on the safe use of chrysotile asbestos, refer to “Safe Use of Chrysotile: A Manual on Preventive and Control Measures.”²

1.5 *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:³

C150 Specification for Portland Cement

C458 Test Method for Organic Fiber Content of Asbestos-Cement Products

C459 Test Methods for Asbestos-Cement Flat Products

¹ This specification is under the jurisdiction of ASTM Committee C17 on Fiber-Reinforced Cement Products and is the direct responsibility of Subcommittee C17.03 on Asbestos - Cement Sheet Products and Accessories.

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² Available from The Asbestos Institute, http://www.chrysotile.com/en/sr_use/manual.htm.

³ 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.

C500 Test Methods for Asbestos-Cement Pipe

C1081 Specification for Asbestos-Cement Corrugated Fill
For Use in Cooling Towers

D2946 Terminology for Asbestos and Asbestos-Cement
Products

3. Terminology

3.1 Definitions:

3.1.1 *autoclaved product, n*—in asbestos cement, product treated in a saturated steam atmosphere at between 689 to 1517 kPa (110 to 220 psi) for at least 8 h, and that contain portland cement as defined in Specification C150 together with silica in the ratio of 3:2 that can react to form calcium silicate reaction products.

3.1.2 *pressed product, n*—product pressed singly or in stacks interlayered with templates, at a minimum pressure of 12 MPa (1740 psi).

3.1.3 *textured product, n*—product with bas-relief motifs that extend the external surface of a sheet sufficiently to increase its heat transfer capacity by at least 10 % under conditions of turbulent gravity flow.

3.1.4 For additional definitions, refer to Terminology D2946.

4. Classification

4.1 *Type I*—Fill consisting of autoclaved pressed sheets without textured surfaces that meet the requirements set forth in Table 1.

4.2 *Type II*—Fill consisting of non-autoclaved pressed sheets without textured surfaces that meet requirements presented in Table 1.

4.3 *Type III*—Fill consisting of non-autoclaved, non-pressed sheets with textured surfaces, conforming to requirements stated in Table 1.

5. Test Methods

5.1 Apparent Density:

5.1.1 This is determined by dividing the mass of a specimen after drying to constant weight at 110°C ± 10°F, by the volume of the specimen.

5.2 *Water Absorption*—In accordance with Test Methods C459.

TABLE 1 Manufacturing Composition and Performance Requirements

Type No.	I	II	III
Manufacturing Requirements:			
Autoclaved	yes	no	no
Pressed	yes	yes	no
Textured	no	no	yes
Thickness, mm (in.)	4.2± 0.1 (0.165 ± 0.005)	4.2 ± 0.1 (0.165 ± 0.005)	4.2 ± 0.1 (0.165 ± 0.005)
Composition Requirements:			
Silica passing through a 149 µm sieve (No. 100)	yes	no	no
Ratio, cement:silica	3:2
Mineral diluents	no	no	no
Cellulose	no	no	no
Maximum organic content per Test Method C458, %	0.01	0.01	0.01
Cement type; per Specification C150 or ISO type	1 10	I or V 10 or 50	I, II or V 10, 20 or 50
Performance Requirements:			
Minimum apparent density g/cm ³ (lb./ft ³)	1.6 (100)	1.6 (100)	1.4 (100)
Maximum water absorption, %	25	25	30
Average of lengthwise and crosswise orientations:			
Minimum flexural modulus of rupture: MPa (psi)	24.8 (3600)	24.8 (3600)	20.7 (3000)
Minimum deflection (per Test Methods C459): mm (in.)	3 (0.13)	3 (0.13)	2 (0.09)
Minimum freeze-thaw, cycles	200	100	50
Minimum Harkort test, cycles	7	5	3
Maximum free lime, per Test Methods C500,%	1	6	7

5.3 Flexural Strength—In accordance with Test Methods C459.

5.4 Freeze-Thaw Resistance:

5.4.1 The number of freeze-thaw cycles specified must not cause any apparent deterioration. Check for signs of delamination by means of a magnifying glass. Inspect the specimens for the presence of invisible cracks by spraying isopropyl alcohol from a hand spray bottle onto the specimen (hairline cracks are revealed when the alcohol evaporates from the surface).

5.4.2 Each cycle shall consist of saturating the specimen by submerging in water at 30 ± 2°C (36 ± 3°F) during 2 h followed by rapid drainage and freezing to –20 ± 2°C (–4 ± 3°F) during 10 ± 0.2 h. The twice-daily cycle then repeats starting with the 2 h period of thawing and saturation in water at 30°C.

5.5 Harkort Test:

5.5.1 The specimen is dried in an oven at 100 ± 2°C (212 ± 3°F) for 2 ± 0.2 h before rapidly dunking it in 10 ± 0.1 kg (20 ± 0.2 lb) of water at 20 ± 2°C (68 ± 3°F) for 10 ± 0.2 min. Then the specimen is examined for signs of deterioration. Check and inspect as in 5.4.1. If the specimen does not appear deteriorated, return it to the oven for drying during 24 ± 0.2 h at 110 ± 2°C (230 ± 3°F) before dunking again in the same way.

5.5.2 Subsequent drying cycles are all of 23 h 45 ± 12 min. duration at the following temperatures:

3rd drying	120 ± 2°C (258 ± 3°F)
4th drying	130 ± 2°C (266 ± 3°F)
5th drying	140 ± 2°C (284 ± 3°F)
6th drying	150 ± 2°C (302 ± 3°F)
7th drying	160 ± 2°C (320 ± 3°F)

5.5.3 Report the number of cycles sustained without deterioration.

6. Inspection

6.1 Inspection of the material shall be agreed upon by the purchaser and the supplier as part of the purchase contract.

7. Rejection and Rehearing

7.1 Material that fails to conform to the requirements of these specifications may be rejected. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the tests, the producer or supplier may make claim for a rehearing.

8. Certification

8.1 When specified in the purchase order or contract, a producer's or supplier certification shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

8.2 Upon request of the purchaser in the contract or order the certification of an independent third party indicating conformance to the requirements of this specification may be accepted instead of the manufacturer's certification.

9. Product Marking

9.1 For Types I and II, print or stencil on each piece, in alkali-resistant ink or paint, the identification either "Type I" or "Type 2."

10. Keywords

10.1 asbestos; asbestos-cement; cooling tower fill; flat sheet

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