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## Standard Terminology for Asbestos and Asbestos–Cement Products<sup>1</sup>

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### 1. Scope

1.1 This terminology covers terms and definitions, definitions of terms, and abbreviations of terms relating to asbestos and asbestos-cement products.

1.2 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

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

- C150 Specification for Portland Cement
- C296 Specification for Asbestos–Cement Pressure Pipe
- C428 Specification for Asbestos–Cement Nonpressure Sewer Pipe
- C458 Test Method for Organic Fiber Content of Asbestos–Cement Products
- C500 Test Methods for Asbestos–Cement Pipe
- C508 Specification for Asbestos–Cement Underdrain Pipe
- C541 Specification for Linings for Asbestos–Cement Pipe
- C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- C663 Specification for Asbestos–Cement Storm Drain Pipe
- C668 Specification for Asbestos–Cement Transmission Pipe
- C875 Specification for Asbestos–Cement Conduit
- C966 Guide for Installing Asbestos–Cement Nonpressure Pipe
- D123 Terminology Relating to Textiles
- D1067 Test Methods for Acidity or Alkalinity of Water
- D1118 Test Method for Magnetic Rating of Asbestos Fiber and Asbestos Textiles
- D1126 Test Method for Hardness in Water

<sup>1</sup> This terminology 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- D1918 Test Method for Asbestos Content of Asbestos Textiles
  - D2589 Test Method for McNett Wet Classification of Dual Asbestos Fiber
  - D2950 Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
  - D2985 Test Method for Color of Asbestos
  - D3879 Test Method for Sampling Amphibole Asbestos (Withdrawn 2009)<sup>3</sup>
  - E284 Terminology of Appearance
  - E308 Practice for Computing the Colors of Objects by Using the CIE System
  - E849 Practice for Safety and Health Requirements Relating to Occupational Exposure to Asbestos (Withdrawn 1991)<sup>3</sup>
- #### 2.2 Other Documents:<sup>2</sup>
- ASTM STP 834, 1982 Definitions for Asbestos and Other Health-Related Silicates

### 3. Terminology

**accessible bag**, *n*—*for sampling*, a bag (in a pile of bags of asbestos fiber) of which at least one side or one end is fully exposed.

**accessible surface**, *n*—*for sampling*, in a pile of bags of asbestos fiber, a side (of the pile) in which all the bags are accessible bags.

**accessories**—subordinate material such as fasteners, backer strips, closure strips, ridge and corner rolls, roofing starters and finishing pieces, couplings, gaskets, pipe fittings or other supplementary material necessary for the proper application of primary asbestos-cement products.

**actinolite asbestos**—asbestiform variety of the monoclinic amphibole silicate minerals of the tremolite-actinolite series.

DISCUSSION—Its empirical formula is  $\text{Ca}_2(\text{Mg}, \text{Fe}^{+2})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$ . Its Chemical Abstracts<sup>4</sup> number is 77536-66-4 (see Table 1 and Table 2).

**adhesion**, *n*—*for asbestos*, see **fiber adhesion**.

**aggressivity index**, *n*—measure of the corrosiveness of water toward asbestos-cement defined as:

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Taken from Practice E849.

**TABLE 1 Asbestos Minerals, Characterized by their Mineralogy<sup>A</sup>**

Designation of Mineral	Type of Asbestos	Chemical Abstracts Number <sup>A</sup>
Serpentine	Chrysotile	12001-29-5
Reibeckite (glaucofane)	Crocidolite (blue asbestos)	12001-28-4
Grunerite (cummingtonite-grunerite)	Amosite (grunerite asbestos)	12172-73-5
Anthophyllite (Gederite)	Anthophyllite Asbestos	77536-67-5
Tremolite (Ferroactinolite)	Tremolite Asbestos	77536-68-6
Tremolite-actinolite	Actinolite asbestos	77536-66-4

<sup>A</sup> Taken from Practice E849.

**TABLE 2 Chemical Formula for Typical Asbestos Structures**

Mineral	Chemical Formula <sup>A</sup>
Chrysotile	Mg <sub>3</sub> (Si <sub>2</sub> O <sub>5</sub> )(OH) <sub>4</sub>
Amosite	(Mg,Fe) <sub>6</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub>
Crocidolite	Na <sub>2</sub> Fe <sub>3</sub> <sup>2+</sup> + (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub> (Mg,Fe)
Anthophyllite	Mg <sub>7</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub> (Fe > Mg)
Cummingtonite	(Mg,Fe) <sub>7</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub>
Tremolite	Ca <sub>2</sub> Mg <sub>5</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub>
Ferroactinolite	Ca <sub>2</sub> Fe <sub>5</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub>
Actinolite	Ca <sub>2</sub> (Mg,Fe <sup>2+</sup> ) <sub>5</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub>
Glaucofane	NaMg <sub>3</sub> Al <sub>2</sub> (Si <sub>8</sub> O <sub>22</sub> )(OH) <sub>2</sub>

<sup>A</sup> Taken from Deer, Howie, and Zussman, *Rock Forming Minerals*, Vol. 3, Longmans, London, 1967.

$$\text{pH} + \log(AH) \quad (1)$$

where:

**pH** = negative of the logarithm of the hydronium molarity (index of acidity of the water) pH units.

**A** = total alkalinity, ppm as CaCO<sub>3</sub>, as determined by Test Methods D1067, and

**H** = calcium hardness, ppm as CaCO<sub>3</sub>, as determined by Test Method D1126.

DISCUSSION—The aggressiveness of water toward asbestos-cement is classified as follows:

Aggressivity Index	
highly aggressive	<10
moderately aggressive	10 to 11.9
nonaggressive	≥12

**American method**—method of application for roofing shingles, generally rectangular in shape, to provide double coverage with head lap and no side lap.

**amosite**, *n*—the acronym assigned to **grunerite asbestos**, and derived from the name of the first developers of a major deposit of this mineral. See Table 1 and Table 2.

**amphibole asbestos**, *n*—asbestiform amphibole silicate minerals including the orthorhombic anthophyllite series and the monoclinic cummingtonite (grunerite asbestos [amosite]) series, the tremolite-actinolite series, and the alkali amphibole (riebeckite asbestos [crocidolite]) series, among others.

DISCUSSION—The amphiboles contain essential (OH) groups in the structure, and the Si:O ratio is 4:11. A considerable amount of elemental substitution can take place in these varieties of asbestos. The crystal structures are composed of strips or ribbons of linked polyhedra that join to form fibrils. The individual strips are made up from three

components; these are two double chains of linked (Si, Al)O<sub>4</sub> tetrahedra and a strip of linked MgO<sub>6</sub>, FeO<sub>6</sub>, or AlO<sub>6</sub> octahedra. (See Table 1 and Table 2.)

**anthophyllite asbestos**, *n*—asbestiform variety of the orthorhombic amphibole silicate minerals of the anthophyllite series.

DISCUSSION—Its empirical formula is Mg<sub>7</sub>Si<sub>8</sub>O<sub>22</sub>(OH)<sub>2</sub>. Its Chemical Abstracts number<sup>A</sup> is 77536-67-5 (see Table 1 and Table 2).

**asbestiform**—having an inherent fine-textured morphology, resulting from unequal relative development of the principal crystal axes in a silicate mineral, that predetermines subdivision into strong flexible fibers having microscopic to submicroscopic thickness and a high length to width ratio when the mineral is subjected to comminution.

DISCUSSION—Term derived from “asbestos.”

**asbestos**, *n*—the generic term for naturally occurring inorganic hydrated silicates, occurring in layered structures composed of chains of silicon and oxygen tetrahedra, that can subdivide into flexible fibers.

DISCUSSION—Refer to STP 834, also, see Table 1 and Table 2.

**asbestos fiber**, *n*—acicular silicate mineral, with a structure based upon silicon-oxygen tetrahedra, that fits the definition of a fiber, and is composed of single crystals in predominantly parallel orientation.

DISCUSSION—Common usage also designates a collectivity of asbestos fibers as asbestos fiber.

**asphalt felt, breather type**—an underlayment sheet material, saturated with asphalt, which allows the transmission of water vapor.

DISCUSSION—This material is used with asbestos-cement products.

**autoclave cure**—means for accelerating the cure reaction at elevated temperature and pressure in saturated steam, where reactive siliceous material has been incorporated into the cementitious matrix, such that a hydrothermal reaction takes place between the cement and silica yielding calcium silicate.

**autoclaved products**, *n*—for *asbestos-cement*, those that have been treated in a saturated steam atmosphere at between 689 and 1517 MPa (100 and 200 psi) for at least 8 h, and that contain portland cement as defined in Specifications C150 and C618, together with silica in the ratio of 3:2, that can react to form calcium silicate reaction products.

**backer strip**—water-repellent strip of asphalt-coated felt applied behind each joint where the vertical edges of two shingles meet.

**bag**, *n*—for *sampling*, any quantity of asbestos fiber corresponding to one particular grade that is packed in a suitable container.

DISCUSSION—In the asbestos industry, the typical quantity contained in a bag is 45 kg (approximately 100 lb).

**batten**—long narrow strip of asbestos-cement, either flat or corrugated, used to conceal the joints in butt joint application of flat or corrugated sheets.

**black, adj**—color description applied to opaque objects that are highly light absorbing throughout the visible spectrum.

**bloom, n**—for *asbestos-cement*, see **efflorescence (bloom)**.

**bundle**—an assemblage of asbestos in which the fibers remain entirely in their original close-packed parallel configuration (or not appreciably displaced therefrom) and having a transverse dimension typically between 2 and 8 mm (see [Table 3](#)).

**TABLE 3 Relative Dimensions of Naturally Occurring Chrysotile Agglomerates in Increasing Order of Transverse Dimension**

Order	Name	Approximate Transverse Dimension	
		min	max
1	Fibril	0.0 μm	0.1 μm
2	Fiber (single)	0.015 μm	0.1 μm
3	Spicule	...	...
4	Nonfibrous spicule	...	...
4	Fiber spicule	...	1 mm
5	Pencil	1 mm	8 mm
5	Spelk	1 mm	8 mm
6	Bundle	8 mm	...
6	Crudy bundle	8 mm	...

**caulking**—material ranging in physical characteristics from plastic, to solid, to preformed, used to seal and waterproof joints and overlaps in structures, other assemblies or portions thereof where movement may occur.

**chemical resistance**—for *asbestos cement products*, the ability of the product to resist chemical attack, dissolution, decomposition or other chemical changes when in contact with liquid, gaseous, or solid media normally encountered in its service environment.

**chrysotile, n**—an asbestos mineral belonging to the serpentine group, having a chemical composition close to  $Mg_3Si_2O_5(OH)_4$ .

DISCUSSION—Moderate amounts of aluminum may substitute for silicon and moderate amounts of iron may substitute for magnesium. Small amounts of MnO, CaO,  $K_2O$ , and  $Na_2O$  are also reported in the chemical analyses. The crystal structure of chrysotile asbestos consists of double layers, each consisting of a layer of linked  $SiO_4$  tetrahedra that is coordinated to a second layer of linked  $MgO_2(OH)_4$  octahedra linked through the sharing of oxygen atoms; the composite double layer rolls up, like a scroll to form long hollow tubes. The outer diameters of the individual tubes are in the order of 25 nm; the length-to-diameter ratio can vary from 20 to well over 10 000. Chrysotile is characterized by a combination of a distinctive morphology, a chemical composition close to  $Mg_3Si_2O_5(OH)_4$ , and characteristic X-ray and electron diffraction patterns. Its Chemical Abstracts number<sup>4</sup> is 12001-29-5 (see [Table 1](#) and [Table 2](#)).

**chrysotile asbestos**—see **chrysotile**.

**CIE, n**—abbreviation for International Commission on Illumination, which in French is Commission Internationale de l'Éclairage.<sup>5</sup>

<sup>5</sup> Commission Internationale de l'Éclairage (International Commission on Illumination). The CIE color-order system is the most important of those used in connection with instruments for color measurement. See Practice [E308](#).

**CIE observer, n**—for *color determination*, see **standard observer, CIE 1931** and **supplementary observer, CIE 1964**.

**CIE source C, n**—see **standard source**.

**clip, n**—for *shingles*, see **storm anchor (clip)**.

**closure strip**—asphalt or rubber preformed filler strip having the same shape and pitch as the asbestos-cement corrugated product and used to close openings in the corrugated sheets at window beads, eaves, lower edge of siding, and similar places.

**cohesion, n**—for *asbestos*, lateral force resisting separation of adjacent fibrous elements.

DISCUSSION—Asbestos may be described as having low to high cohesion.

**color variation**—for *asbestos-cement products*, property of nonuniform color exhibited before or after weathering.

**compacted backfill, n**—for *pipe laying*, backfill material that has been compacted to the density specified by the engineer.

**composite sample, n**—for *asbestos*, a set of unit samples of asbestos fiber (drawn systematically or at random) taken from a lot, comprising not less than two and not more than 200 bags, for use in the laboratory as a test sample, that is, as a source of test specimens.

**conditioning, n**—for *sampling*, the process by which the fiber is put into a consistent state to be tested.

**conduit, n**—for *asbestos-cement*, asbestos-cement pipe used to protect wires for electric-power or communication systems, for both underground and exposed situations.

**constructor, n**—for *pipe laying*, party that furnishes the work and materials for placement and installation.

**contaminants, n**—for *asbestos*, any foreign matter (other than associated minerals and fines) in a sample of asbestos fiber.

**corner roll**—half-round unit of asbestos cement used to trim and flash corners in asbestos-cement corrugated applications.

**corrugated**—denotes an asbestos-cement sheet product having a design of alternating ridges and valleys manufactured according to a specified pitch.

**coupling, n**—for *asbestos-cement conduit, sewer, underdrain, and storm drain pipe*, component made from a larger diameter pipe of the same type or type II and of the same class, or of a higher class, or produced otherwise to yield at least equal performance, for joining asbestos-cement pipe that when properly installed, forms a silt-tight joint, allows alignment corrections and slight changes in direction, and provides an assembled joint equivalent in serviceability and strength to the pipe sections.

DISCUSSION—Alternatively, for storm drain couplings, plastic sleeves that, when properly installed develop sufficient tightness to prevent the surrounding soil from entering the drain, may be used as couplings.

**coupling, n**—for *asbestos-cement non-pressure sewer pipe*, section for joining asbestos-cement non-pressure sewer pipe, that when properly installed with the proper accessories,