



Standard Terminology for Sampling and Analysis of Asbestos¹

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^{ε1} NOTE—Editorial corrections were made to 1.3 in October 2016.

1. Scope

1.1 This terminology standard is a collective vocabulary relating to sampling and analysis of asbestos. As a convenience to general interest, it contains most of the standard terms, definitions, and nomenclature under the jurisdiction of Committee D22.

1.2 Many of the entries in this terminology are copied (with attribution) from the standards of origin referenced in Section 2. The standards of origin are noted in bold type at the right margin of the applicable definition.

1.3 Certain terms in the common language that comprise multiple concepts are included herein with the definition specific to standards and practices of Committee D22.

2. Referenced Documents

2.1 ASTM Standards:

- D1356 Terminology Relating to Sampling and Analysis of Atmospheres
- D2946 Terminology for Asbestos and Asbestos-Cement Products
- D5755 Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading
- D5756 Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Surface Loading
- D6281 Test Method for Airborne Asbestos Concentration in Ambient and Indoor Atmospheres as Determined by Transmission Electron Microscopy Direct Transfer (TEM)
- D6480 Test Method for Wipe Sampling of Surfaces, Indirect Preparation, and Analysis for Asbestos Structure Number Surface Loading by Transmission Electron Microscopy
- D6620 Practice for Asbestos Detection Limit Based on Counts
- D7200 Practice for Sampling and Counting Airborne Fibers, Including Asbestos Fibers, in Mines and Quarries, by

Phase Contrast Microscopy and Transmission Electron Microscopy

D7201 Practice for Sampling and Counting Airborne Fibers, Including Asbestos Fibers, in the Workplace, by Phase Contrast Microscopy (with an Option of Transmission Electron Microscopy)

D7390 Guide for Evaluating Asbestos in Dust on Surfaces by Comparison Between Two Environments

2.2 Government Standards:

USGS Open-File Report 02-458 Tabulation of Asbestos-Related Terminology

3. Terminology

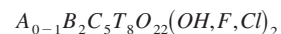
acicular, *adj*—the shape shown by an extremely slender crystal with cross-sectional dimensions that are small relative to its length, that is, needle-like. **D6281**

actinolite asbestos, *n*—asbestiform variety of the monoclinic amphibole silicate minerals of the tremolite-actinolite series. **D2946**

activity generated aerosol, *n*—a dispersion of particles in air that have become airborne due to physical disturbances such as human activity, sweeping, airflow, etc. **D7390**

amosite, *n*—the acronym assigned to grunerite asbestos, and derived from the name of the first developers of a major deposit of this mineral. **D2946**

amphibole, *n*—a group of more than 60 different silicate minerals with similar crystal structures and complex compositions that conform to the nominal formula:



where:

- A = K, Na, Ca;
- B = Fe²⁺, Mn, Mg, Ca, Na;
- C = Al, Cr, Ti, Fe³⁺, Mg, Fe²⁺; and
- Mn and T = Si, Al, Cr, Fe³⁺, Ti.

In some varieties of amphibole, these elements can be partially substituted by Li, Pb, Zn, Be, Ba, or Ni. Amphiboles are characterized by a complex monoclinic or orthorhombic structure that includes a double chain of T-O tetrahedra with a T:O ratio of approximately 4:11; a variable morphology that

¹ This terminology standard is under the jurisdiction of ASTM Committee D22 on Air Quality and is the direct responsibility of Subcommittee D22.07 on Sampling and Analysis of Asbestos.

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ranges from columnar to prismatic to acicular to fibrous; and good prismatic cleavage at angles of about 56 and 124°. The cleavage may not be readily exhibited by small crystals that are bound by irregular growth and fracture surfaces. **D6281**

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 polyhedral that join to form fibrils. The individual strips are made up from three components; these are two double chains of linked (Si, Al)O₄ tetrahedra and a strip of linked MgO₆, FeO₆, or AlO₆ octahedra. **D2946**

, *n*—amphibole in an asbestiform habit. **D6281**
D6480

analytical sensitivity, *n*—the calculated airborne asbestos structure concentration in asbestos structures/L, equivalent to the counting of one asbestos structure in the analysis. **D6281**

, *n*—the calculated airborne asbestos structure concentration in asbestos structures/square centimeter, equivalent to counting of one asbestos structure in the analysis calculated using Eq. 2 in D6480. **D6480**

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

DISCUSSION—Its empirical formula is Mg₇Si₈O₂₂(OH)₂. Its Chemical Abstracts number is 77536-67-5. **D2946**

area sample, *n*—an air sample collected so as to represent the concentration of airborne dust in a specific mine location, or area, or room of a workplace. **D7200**

, *n*—an air sample collected so as to represent the concentration of airborne dust in a specific area or room, which, in the case of this practice, refers to an area or room of a workplace. **D7201**

asbestiform, *adj*—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.” **D2946**

, *adj*—a special type of fibrous habit in which the fibers are separable into thinner fibers and ultimately into fibrils. This habit accounts for greater flexibility and higher tensile strength than other habits of the same mineral. **D5755**
D5756

, *adj*—a specific type of fibrous habit in which the fibers are separable into thinner fibers and ultimately into fibrils. This habit accounts for greater flexibility and higher tensile strength than other habits of the same mineral. **D6281**

, *adj*—a specific type of fibrous mineral growth habit in which the fibers and fibrils exhibit a polyfilamentous growth habit and possess high tensile strength and flexibility. All materials regulated as asbestos are asbestiform, but not all asbestiform minerals are classified as asbestos. Characteristics such as tensile strength and flexibility cannot be ascertained from microscopic evaluation. **D7200**
D7201

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. **D2946**

, *n*—a collective term that describes a group of naturally occurring, inorganic, highly fibrous, silicate dominated minerals, which are easily separated into long, thin, flexible fibers when crushed or processed.

DISCUSSION—Included in the definition are the asbestiform varieties of: serpentine (chrysotile); riebeckite (crocidolite); grunerite (grunerite asbestos); anthophyllite (anthophyllite asbestos); tremolite (tremolite asbestos); and actinolite (actinolite asbestos). The amphibole mineral compositions are defined in accordance with the nomenclature of the International Mineralogical Association. **D5755**

, *n*—a collective term that describes a group of naturally occurring, inorganic, highly fibrous, silicate minerals, which are easily separated into long, thin, flexible fibers when crushed or processed.

DISCUSSION—Included in the definition are the asbestiform varieties of: serpentine (chrysotile); riebeckite (crocidolite); grunerite (amosite); anthophyllite (anthophyllite asbestos); tremolite (tremolite asbestos); and actinolite (actinolite asbestos). The amphibole mineral compositions are defined according to nomenclature of the International Mineralogical Association. **D5756**

, *n*—a collective term that describes a group of naturally occurring, inorganic, highly-fibrous, silicate minerals, that are easily separated into long, thin, flexible, strong fibers when crushed or processed.

DISCUSSION—Included in the definition are the asbestiform varieties of serpentine (chrysotile); riebeckite (crocidolite); grunerite (grunerite asbestos [Amosite]); anthophyllite (anthophyllite asbestos); tremolite (tremolite asbestos); and actinolite (actinolite asbestos). The amphibole mineral compositions are defined according to the nomenclature of the International Mineralogical Association. **D6281**
D6480

, *n*—a term applied to six specific silicate minerals belonging to the serpentine and amphibole groups, which have crystallized in the asbestiform habit, causing them to be easily separated into long, thin, flexible, strong fibers when crushed or processed. The Chemical Abstracts Service Registry Numbers of the most common asbestos varieties are: chrysotile (12001-29-5), riebeckite asbestos (crocidolite) (12001-28-4), grunerite asbestos (Amosite) (12172-73-5), anthophyllite asbestos (77536-67-5), tremolite asbestos (77536-68-6) and actinolite asbestos (77536-66-4). The precise chemical composition of each species varies with the location from which it was mined. Other amphibole minerals which exhibit the characteristics of asbestos have also been observed. The nominal compositions of the most common asbestos varieties are: Chrysotile Mg₃Si₂O₅(OH)₄, Crocidolite Na₂Fe₃²⁺Fe₂³⁺Si₈O₂₂(OH)₂, Amosite (Mg,Fe)7Si8O22(OH)2,

Anthophyllite $(\text{Mg,Fe})_7\text{Si}_8\text{O}_{22}(\text{OH})_2$, Tremolite $\text{Ca}_2(\text{Mg,Fe})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$ [$\text{Mg}/(\text{Mg}+\text{Fe}^{2+})$ 0.9-1.0], Actinolite $\text{Ca}_2(\text{Mg,Fe})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$ [$\text{Mg}/(\text{Mg}+\text{Fe}^{2+})$ 0.5-0.9].

NOTE 1—Actinolite compositions in which $\text{Mg}/(\text{Mg}+\text{Fe}^{2+})$ is between 0 and 0.5 are referred to as ferroactinolite.

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 predominately parallel orientation.

DISCUSSION—Common usage also designates a collectivity of asbestos fibers as asbestos fiber. **D2946**

, *n*—a fiber of asbestos that meets the criteria specified below for “fiber.” Phase Contrast Microscopy (PCM) does not identify fibers unequivocally as asbestos. Under the light microscope, a population of asbestos fibers may appear as a mixture of fiber agglomerates, fiber bundles (polyfilamentous growth, unique to asbestiform fibers), fibers with split ends, and single fibers, the relative occurrence and frequency of each type depending on the situation. **D7200**
D7201

asbestos structure, *n*—a term applied to isolated fibers or to any connected or overlapping grouping of asbestos fibers or bundles, with or without other nonasbestos particles. **D6281**

, *n*—a term applied to isolated fibers or to any connected or overlapping grouping of asbestos fibers or bundles, with or without other nonasbestos particles. **D6480**

aspect ratio, *n*—the ratio of the length of a fibrous particle to its average width. **D5755**
D5756

, *n*—the ratio of length to width of a particle. **D6281**
D6480

, *n*—the ratio of the length of a fiber to its width. **D7200**
D7201

background, *n*—a statistical distribution of structures introduced by (i) analyst counting errors and (ii) contamination on an unused filter or contamination as a consequence of the sample collection and sample preparation steps.

DISCUSSION—This definition of background is specific to this practice. The only counting errors considered in this definition of background are errors that result in an over-count (that is, false positives). Analyst counting errors are errors such as, determining the length of structures or fibers and whether, based on length, they should be counted; counting artifacts as fibers; determining the number of structures protruding from a matrix; and interpreting a cluster as one, two, or more structures that should be counted only as zero or one structure. For purposes of developing the DL, assume that background contamination sources have been reduced to their lowest achievable levels. **D6620**

background samples, *n*—samples taken from surfaces that are considered to have concentrations of asbestos in surface dust that are representative of conditions that exist in an environment that is affected by only prevailing conditions and has not experienced events, disturbances or activities unusual for the environment. **D7390**

blank, *n*—a structure count made on TEM specimens prepared from an unused filter to determine the background measurement. **D6281**

, *n*—a filter that has not been used to collect asbestos from the target environment. **D6620**

DISCUSSION—Blanks are used in this practice to determine the degree of asbestos contamination that is reflected in asbestos measurements. Contamination may be on the virgin filter or introduced in handling the filter in the field or when preparing it for inspection with a microscope. The data required to determine the degree of contamination consists, therefore, of measurements of field blanks that have experienced the full preparation process.

bundle, *n*—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. **D2946**

, *n*—a structure composed of three or more fibers in a parallel arrangement with the fibers closer than one fiber diameter to each other. **D5755**
D5756
D6480

camera length, *n*—the equivalent projection length between the specimen and its electron 195 diffraction pattern, in the absence of lens action. **D6281**
D6480

chrysotile, *n*—an asbestos mineral belonging to the serpentine group, having a chemical composition close to $\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$.

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 analysis. 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 $\text{MgO}_2(\text{OH})_4$ 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 distinctive morphology, a chemical composition close to $\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$, and characteristic X-ray and electron diffraction patterns. Its Chemical Abstracts number is 12001-29-5. **D2946**

, *n*—a group of fibrous minerals of the serpentine group that have the nominal composition $\text{Mg}_3\text{Si}_2\text{O}_5(\text{OH})_4$ and have the crystal structure of either clinochrysotile, orthochrysotile, or parachrysotile. Most natural chrysotile deviates little from this nominal composition. Chrysotile may be partially dehydrated or magnesium-leached, both in nature and in building materials. In some varieties of chrysotile, minor substitution of silicon by Al^{3+} may occur. Chrysotile is the most prevalent type of asbestos. **D6281**
D6480

cleavage, *v*—the breaking of a mineral along one of its crystallographic directions. **D6281**

cleavage fragment, *n*—a fragment of a crystal that is bounded in whole or in part by cleavage faces. Some cleavage fragments would be included in the fiber definition used in this method. **D6281**

, *n*—mineral particles, normally formed by comminution of minerals, which often are characterized by parallel sides and a moderate aspect ratio (usually less than 20:1). Non-asbestiform cleavage fragments do not exhibit fibrillar bundling at any level of examination. **D7200**

cluster, *n*—a structure with fibers in a random arrangement such that all fibers are intermixed and no single fiber is isolated from the group; groupings of fibers must have more than two points touching. **D5755**
D6480

, *n*—an aggregate of two or more randomly oriented fibers, with or without bundles. Clusters occur as two varieties: disperse clusters and compact clusters. **D5756**

, *n*—a structure in which two or more fibers or fiber bundles are randomly oriented in a connected grouping. **D6281**

compact cluster, *n*—a complex and tightly bound network in which one or both ends of each individual fiber or bundle are obscured, such that the dimensions of individual fibers or bundles cannot be unambiguously measured. **D5756**

compact matrix, *n*—a structure consisting of a particle or linked group of particles, in which fibers or bundles can be seen either within the structure or projecting from it, such that the dimensions of individual fibers and bundles cannot be unambiguously determined. **D5756**

control, *n*—an area that is used as the basis for a comparison. This could be an area where the dust has been previously characterized, an area thought to be suitable for occupancy, an area that has not experienced a disturbance of asbestos-containing materials, or that is for some other reason deemed to be suitable as the basis for a comparison. **D7390**

control samples, *n*—samples collected for comparison to the study samples. These differ from background samples in that they are collected either: in an area where the dust has been previously characterized, or in an area that has not experienced a disturbance of asbestos containing materials, or in an area that is for some other reason deemed to be suitable as the basis for comparison. **D7390**

count, *n*—the number of fibers or structures identified in a sample. **D6620**

crocidolite, *n*—common name for riebeckite asbestos. **D2946**
DISCUSSION—Also known as blue asbestos.

d-spacing or interplanar spacing, *n*—the perpendicular distance between identical adjacent and parallel planes of atoms in a crystal. **D6480**

d-value or interplanar spacing, *n*—the perpendicular distance between identical adjacent and parallel planes of atoms in a crystal. **D6281**

debris, *n*—materials that are of an amount and size (particles greater than 1 mm in diameter) that can be visually identified as to their source. **D5755**

, *n*—materials that are of an amount and size (particles greater than 1 mm in diameter as defined by a 1.0 by 1.0 mm

screen) that can be visually identified (by color, texture, etc.) as to their source. **D5756**

detection limit, *n*—the mean of a structure count population that is sufficiently large so a measurement from this population would have a high probability (for example, 0.95 or larger) of exceeding the decision value that determines detection.

DISCUSSION—The DL is the value of a parameter, the true mean of a structure count population in the statistical hypothesis testing problem, that underlies the DL concept. Specifically, it is the true mean of the alternative hypothesis that ensures a sufficiently high power for the statistical test that determines detection. **D6620**

differential counting, *v*—a term applied to the practice of excluding certain kinds of fibers from the fiber count because they do not appear to be morphologically consistent with fibers of a specific variety thus modifying the definition of fiber given below. **D7200**
D7201

disperse cluster, *n*—a disperse and open network in which both ends of one of the individual fibers or bundles can be separately located and its dimensions measured. **D5756**

disperse matrix, *n*—a structure consisting of a particle or linked group of particles, with overlapping or attached fibers or bundles in which at least one of the individual fibers or bundles can be separately identified and its dimensions measured. **D5756**

dust, *n*—any material composed of particles in a size range of <1 mm. **D5755**
D5756
D7390

electron diffraction, *n*—techniques in electron microscopy, including selected area electron diffraction (SAED) and microdiffraction, by which the crystal structure of a specimen is examined. **D6281**
D6480

electron scattering power, *n*—the extent to which a substance scatters electrons from their original courses. **D6281**

energy dispersive X-ray analysis, *n*—measurement of the energies and intensities of X-rays by use of a solid state detector and multichannel analyzer system. **D6281**
D6480

environment, *n*—well defined three-dimensional area and everything that is in it. **D7390**

eucentric, *n*—the condition when the area of interest of an object is placed on a tilting axis at the intersection of the electron beam with that axis and is in the plane of focus. **D6281**
D6480

fiber, *n*—any material in a form such that it has a minimum length to average maximum 310 transverse dimension of 10 to 1, a maximum cross-sectional area of 5.06 by 10⁻² mm² (corresponding to a circular cross section of 0.254 mm in

diameter) and a maximum transverse dimension of 0.254 mm. **D2946**

, *n*—a structure having a minimum length of 0.5 μm, an aspect ratio of 5:1 or greater, and substantially parallel sides. **D5755**

, *n*—a structure having a minimum length of 0.5 μm with an aspect ratio of 5 to 1 or greater and substantially parallel sides. Fibers are assumed to have a cylindrical shape. **D5756**

, *n*—an elongated particle that has parallel or stepped sides. For the purposes of this test method, a fiber is defined as having an aspect ratio equal to or greater than 5:1 and a minimum length of 0.5 μm. **D6281**

, *n*—an elongate particle with parallel or stepped sides. For the purposes of this test method, a fiber is defined to have an aspect ratio equal to or greater than 5:1 and a minimum length of 0.5 μm (see 40 CFR 763). **D6480**

, *n*—any of various discrete entities with essentially parallel sides counted by a particular method that specifies length, width, and aspect ratio.

DISCUSSION—The definitions of “fiber” and “structure” are similar because the measurement method employed specifies the shape, length, width, and aspect ratio. **D6620**

, *n*—an elongated particle that is longer than 5.0 μm, with a minimum aspect ratio of 3:1, and sometimes also classified as having a maximum width of 3.0 μm as this latter dimension may equate to the size of fiber of the density of many silicate minerals capable of penetrating the lung. An asbestos fiber should further exhibit the asbestiform habit, although analysis of airborne fibers by PCM may not be sufficient in itself to determine asbestiform habit. **D7200**
D7201

fiber bundle, *n*—a structure composed of parallel, smaller-diameter fibers attached along its length. A fiber bundle may exhibit diverging fibers at one or both ends. **D6281**

fibril, *n*—for asbestos, a fiber composed of a single crystal.

DISCUSSION—The smallest structural component of an asbestiform mineral. **D2946**

, *n*—a single fiber that cannot be separated into smaller components without losing its fibrous properties or appearance. **D5755**
D5756

, *n*—a single fiber of chrysotile that cannot be further separated longitudinally into smaller components without losing its fibrous properties or appearances. **D6281**
D6480

, *n*—a single fiber of asbestos that cannot be further separated longitudinally into smaller components without losing its fibrous properties or appearances. **D7200**
D7201

fibrous, *adj*—for asbestos, pertaining to fine acicular (needle-like), flexible crystalline morphology associated with the subdivision of macro-assemblages of an asbestiform mineral. **D2946**

, *adj*—of a mineral composed of parallel, radiating, or interlaced aggregates of fibers, from which the fibers are

sometimes separable. That is, the crystalline aggregate may be referred to as fibrous even if it is not composed of separable fibers, but has that distinct appearance. The term fibrous is used in a general mineralogical way to describe aggregates of grains that crystallize in a needle-like habit and appear to be composed of fibers. Fibrous has a much more general meaning than asbestos. While it is correct that all asbestos minerals are fibrous, not all minerals having fibrous habits are asbestos. **D5755**

, *adj*—a habit of minerals composed of parallel, radiating, or interlaced aggregates of fibers, from which the fibers are sometimes separable. A crystalline aggregate may be referred to as fibrous even if it is not composed of separable fibers, but has that distinct appearance. The term “fibrous” in mineralogy is used to describe aggregates of mineral grains that crystallize in a needle-like habit and appear to be composed of fibers. Asbestos minerals are fibrous, exhibiting a specific type of fibrous habit termed asbestiform. However, not all minerals having fibrous habit are asbestos. **D7200**
D7201

fibrous mineral, *n*—a mineral that is composed of parallel, radiating, or interlaced aggregates of fibers, from which the fibers are sometimes separable.

DISCUSSION—The crystalline aggregate may be referred to as fibrous even if it is not composed of separable fibers, but has that distinct appearance. The term fibrous is used in a general mineralogical way to describe aggregates of grains that crystallize in a needle-like habit and appear to be composed of fibers. Fibrous has a much more general meaning than asbestos. While it is correct that all asbestos minerals are fibrous, not all minerals having fibrous habits are asbestos. **D5756**
D6480

fibrous particulate, *n*—for asbestos, fiber, fiber fragment, or fiber agglomerate. **D2946**

fibrous structure, *n*—a fiber or connected grouping of fibers with or without other particles. **D6281**
D6480

field (of view), *n*—the area within the graticule circle that is superimposed on the microscope image. **D7200**
D7201

field blank, *n*—a filter cassette that has been taken to the sampling site, opened, and then closed. Such a filter is used to determine the background structure count for the measurement. **D6281**

field wipe blank, *n*—a clean, unused, moistened wipe from the same supply that is used for sampling. Field wipes shall be processed in the same manner used to collect field samples with the exception that no surface is wiped. Each wipe designated as a field wipe should be removed from the bulk pack, moistened, and folded in the same manner as the field samples and placed in a sample container labeled as field wipe. **D6480**

filter blank, *n*—an unused, unprocessed filter of the type used for liquid filtration. **D6480**

filtration blank, *n*—a filter prepared from 250 mL of water. **D6480**

grunerite asbestos, *n*—a member of the mineral group of monoclinic amphiboles derived from grunerite or cummingtonite-grunerite.

DISCUSSION—Its representative chemical formula is approximately $(\text{Mg,Fe})_6(\text{Si}_8\text{O}_{22})(\text{OH})_2$. Its Chemical Abstracts number is 12172-73-5.

D2946

habit, *n*—the characteristic crystal growth form or combination of these forms of a mineral, including characteristic irregularities.

D6281

D6480

D7200

D7201

homogeneous samples, *n*—group of samples that are collected from surfaces that are visually similar in texture, dust loading and environment.

D7390

HSE/NPL test slide, *n*—a calibration slide designed to determine the limit of visibility of a PCM and an observer.

D7200

D7201

indirect preparation, *n*—a method in which a sample passes through one or more intermediate steps prior to final filtration.

D5755

D5756

, *n*—a method in which a sample passes through one or more intermediate steps prior to final filtration. The particles are removed from the original medium and deposited on a second filter prior to analysis.

D6480

laboratory blank, *n*—a cassette or wipe taken from laboratory stock that are not affected by field activities.

D7390

limit of detection, *n*—the calculated airborne asbestos structure concentration in structures/L, equivalent to counting 2.99 asbestos structures in the analysis. The detection limit has been set at 2.99 structures counted in any area of any filter because of concerns that false positives (counting a structure when none exists) may occur in both blanks and sample filters. Based on the assumption of a Poisson distribution of false positives, the detection limit of 2.99 would protect against a false positive rate as high as 5 % (five false positive structures per 100 blank filters counted). This level is very conservative, since the actual false positive rate is believed to be 2 % or lower. Thus, many of the samples reported as being below the detection limit (less than three structures counted) will actually contain true positives. Note that concentration values are included in the test report, even if they are below the limit of detection.

D6281

, *n*—the limit of detection for a measurement by this test method is 2.99 multiplied by the analytical sensitivity for the measurement.

DISCUSSION—This limit of detection is based on the assumption that the count resulting from potential filter contamination, sample preparation contamination, and other uncontrollable background sources is no greater than 0.05 structures per sample. At this time, however, this subcommittee has no empirical data to confirm this rate.

D6480

, *n*—the number of fibers necessary to be 95 % confident that the result is greater than zero.

D7200

D7201

matrix, *n*—a structure in which one or more fibers, or a fiber bundles that are touching, are attached to, or partially concealed by a single particle or connected group of non-fibrous particles. The exposed fiber must meet the fiber definition.

D5755

D6480

, *n*—a structure in which one or more fibers, or fiber bundles, touch, are attached to, or partially concealed by a single particle or connected group of non-fibrous particles. The exposed fiber must meet the fiber definition. Matrices occur as two varieties: disperse matrices and compact matrices.

D5756

, *n*—a structure in which one or more fibers or fiber bundles touch, are attached to, or partially concealed by a single particle or connected group of nonfibrous particles.

D6281

miller index, *n*—a set of three integer numbers used to specify the orientation of a crystallographic plane in relation to the crystal axes.

D6281

open field blank, *n*—cassette or wipe opened in the field as if for sample collection and then immediately closed. This blank is analyzed in the same manner as a regular sample.

D7390

PCM equivalent fiber, *n*—a particle of aspect ratio that is greater than or equal to 3:1, is longer than 5 μm, and that has a diameter between 0.2 and 3.0 μm.

D6281

PCM equivalent structure, *n*—a fibrous structure of aspect ratio that is greater than or equal to 3:1, is longer than 5 μm, and has a diameter between 0.2 and 3.0 μm.

D6281

personal sample, *n*—a sample taken by a collection apparatus (membrane filter) positioned in the breathing zone of the subject (near the nose and mouth) such that the collected particles are representative of airborne dust that is likely to enter the respiratory system of the subject in the absence of respiratory protection.

D7200

D7201

power, *n*—power of the test is the probability, expressed as a decimal fraction, that a specified difference between asbestos surface loadings in two environments will be detected by the test.

D7390

primary structure, *n*—a fibrous structure that is a separate entity in the TEM image.

D6281

process blank, *n*—an unused wipe (that has not been taken into the field) processed in accordance with the entire preparation and analytical procedure.

D6480

replicate, *n*—a second measurement is a replicate of the initial measurement if the second measurement is obtained from an identical sample and under identical conditions as the initial measurement.

DISCUSSION—“Identical,” as applied to sample, can mean “same subsample preparation,” “separate preparation of a distinct subsample,” or a distinct sample obtained from the same population as the initial sample. For this practice, “identical” means distinct sample obtained from the same population as the initial sample.

D6620

replicate sampling, *n*—one of several identical procedures or samples.

D7390

replicates, *n*—samples collected from an area that is visually identified as homogeneous. **D6480**

replication, *v*—a procedure in electron microscopy specimen preparation in which a thin copy, or replica, of a surface is made. **D6281**

residual structure, *n*—matrix or cluster material containing asbestos fibers that remains after accounting for the prominent component fibers or bundles, or both. **D6281**

RIB Graticule, *n*—an eyepiece graticule specifically designed for asbestos fiber counting. It consists of a circle with a nominal projected diameter of 100 μm (nominal area of 0.00785 mm²) with a cross-hair having dash lines 5-μm long and 1-μm wide in the orthogonal direction. There are also examples around the periphery of the circle to illustrate specific sizes and shapes of fibers. The graticule is placed in one of the microscope eyepieces so that the design is superimposed on the field of view. **D7200**
D7201

riebeckite asbestos, *n*—a member of the mineral group of monoclinic amphiboles derived from riebeckite (glaucophane) of the alkali amphibole series.

DISCUSSION—Usually referred to by the varietal name crocidolite. Its empirical formula is Na₂Fe⁺²Fe⁺³(Si₈O₂₂)(OH,F)₂. Its Chemical Abstracts number is 12001-28-4. **D2946**

sample, *n*—the segment of the filter that is inspected, and thereby, embodies the air or dust that was collected and the subset of structures that were captured on the portion of the filter subjected to microscope inspection (also, see Terminology **D1356**). **D6620**

sampling set, *n*—samples collected on the same day on surfaces in an area for the purpose of characterizing the asbestos loading in the dust of the samples surfaces in that area. **D7390**

sealed field blank, *n*—cassette or wipe taken to the field but remaining closed at all times. **D7390**

sensitivity, *n*—the structure concentration corresponding to a count of one structure in the sample. **D6620**

serpentine, *n*—a group of common rock-forming minerals having the nominal formula: Mg₃Si₂O₅(OH)₄. **D6281**
D6480

set, *n*—a group of samples that are collected, submitted to the laboratory, and analyzed for a report that is generated. **D7200**
D7201

structure, *n*—a single fiber, fiber bundle, cluster, or matrix. **D6281**
D6480

, *n*—any of various discrete entities counted by a particular method that specifies shape, length, width, and aspect ratio. **D6620**

structure number concentration, *n*—concentration expressed in terms of asbestos structure number per unit of surface area. **D6480**

structures, *n*—a term that is used to categorize all the types of asbestos particles which are recorded during the analysis (such as fibers, bundles, clusters, and matrices). Final results of the test are always expressed in asbestos structures per square centimetre. **D5755**

, *n*—a term that is used to categorize all the types of asbestos particles which are recorded during the analysis (such as fibers, bundles, clusters, and matrices). **D5756**

study samples, *n*—samples collected in an area believed to have experienced events, disturbances or activities affecting asbestos-containing materials. The area in which these samples are taken is called the study area. Study samples are compared to background samples or control samples. **D7390**

tremolite asbestos—asbestiform variety of the monoclinic amphibole silicate minerals of the tremolite-actinolite (ferroactinolite) series.

DISCUSSION—Its empirical formula is Ca₂Mg₅Si₈O₂₂(OH)₂. Its Chemical Abstracts number is 77536-66-4. **D2946**

twinning, *v*—the occurrence of crystals of the same species joined together at a particular mutual orientation, and such that the relative orientations are related by a definite law. **D6281**

unopened fiber bundle, *n*—a large-diameter asbestos fiber bundle that has not been separated into its constituent fibrils or fibers. **D6281**

Walton Beckett Graticule, *n*—an eyepiece graticule specifically designed for asbestos fiber counting. It consists of a circle with a nominal projected diameter of 100 μm (nominal area of 0.00785 mm²) with a cross-hair having tick-marks at 3-μm intervals in one direction and 5-μm intervals in the orthogonal direction. There are also examples around the periphery of the circle to illustrate specific sizes and shapes of fibers. The graticule is placed in one of the microscope eyepieces so that the design is superimposed on the field of view. **D7200**
D7201

zone-axis, *n*—the crystallographic direction parallel to the intersection edges of the crystal faces defining the crystal zone. **D6281**

, *n*—the crystallographic direction of a crystal that is parallel to the intersection edges of the crystal faces defining the crystal zone. **D6480**

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