



Standard Terminology Relating to Wool¹

This standard is issued under the fixed designation D 4845; 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.

acid content, *n*—*of felt*, the number of milliequivalents of acid present per unit weight of felt, measured under prescribed conditions. **D 461**

alkali-solubility, *n*—*in wool*, the percent of clean wool that is soluble in a specified alkaline solution under controlled conditions of temperature and time. **D 1283**

alpaca, *n*—the fleece and fiber produced by the alpaca, an animal of the genus *Llama* (*Lama glama pacus*). The fiber is obtained from several species, namely, Huacaya and Suri. **D 2252**

DISCUSSION—Alpaca is normally classified according to type, representing particular combinations of characteristics appropriate to a specific use, or descriptive of geographic origin, breed or species of animal, or preparation for market.

animal fiber, *n*—any natural protein-base fiber. **D 1574, D 4510**

aqueous extract, *n*—*in wool testing*, the solution obtained by digesting a material with water or with a sodium chloride solution to dissolve soluble materials. **D 2165**

average fiber diameter, *n*—*in wool and other animal fibers*, the average width of a group of fibers when measured on a projected image. **D 2130, D 2252, D 3991, D 3992**

black felt, *n*—those classifications of felt manufactured to various shades of the color black. **D 2475**

breaking tenacity, *n*—the tenacity corresponding to the breaking load. **D 1294, D 2524**

DISCUSSION—Breaking tenacity is commonly expressed as grams-force per tex (gf/tex), grams-force per denier (gf/den), millinewtons per tex mN/tex, or millinewtons per denier (mN/den). Millinewtons are numerically equal to grams-force times 9.81.

burr-wool waste, *n*—waste removed by the burr guard of cards or burr pickers having a very short fiber and full of burrs or seeds. **D 4845**

DISCUSSION—The nature of the waste varies according to the wool from which the burrs are taken.

carbonized and neutralized wool, *n*—a term descriptive of scoured wool processed to destroy cellulosic impurities by

treating with a mineral acid or an acid salt, drying and baking, crushing, and dusting out the embrittled cellulosic matter followed by neutralization of the acidified wool.

D 2118

carded wool, *n*—scoured wool which has been processed through a carding machine. **D 1575**

cashmere, *n*—*in roving, yarn, or fabrics*, cashmere hair or products made therewith having a cashmere coarse-hair content not exceeding a specified maximum percentage by length. **D 2816, D 2817**

cashmere coarse-hair, *n*—those coarse fibers in cashmere hair having widths greater than 30 μm . **D 2816, D 2817**

cashmere coarse-hair content, *n*—the total length of the cashmere coarse-hair fibers that are present, expressed as a percentage of the total length of all the cashmere hair fibers; that is, the percentage by length of cashmere coarse-hair in cashmere hair. **D 2816, D 2817**

cashmere down, *n*—those fibers in cashmere hair having widths of 30 μm or less. **D 2816, D 2817**

cashmere hair, *n*—the fibers produced by a form of goat (*Capra hircus*) indigenous to Asia and known as the cashmere goat. **D 2816, D 2817**

DISCUSSION—Characteristically, cashmere hair consists of fine down (undercoat) fibers and coarse (outercoat) fibers.

clean wool fiber present, *n*—*in raw wool*, the mass of wool base present in the raw wool, adjusted to a moisture content of 12 %, an alcohol-extractable content of 1.5 %, and a mineral matter content of 0.5 %. **D 584, D 1060, D 1334**

colored fiber, *n*—*in wool top*, any fiber the color or shade of which differs from the normal color or shade of the fiber mass of the sample. **D 1770**

combing wool, *n*—wool that is strong and strictly of combing length, that is, 2 in. (50 mm) or more. **D 4845**

commercial composition, *n*—*in wool*, the percentages by weight of wool base, moisture, and other nonwool-base components in wool to which a specific commercial designation is applied. **D 2720**

commercial designation, *n*—*in wool*, a term applied to a lot of wool in a stated form, and having a specified commercial composition. **D 2720**

commercial moisture content, *n*—the moisture calculated as a percentage of the weight of the wool, top, noils, yarn, fabric, etc., in the “as-is” condition; that is, containing whatever moisture, oil, grease, or other extraneous matter

¹ This terminology is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.13 on Wool and Wool Felt.

Current edition approved Oct. 10, 1996. Published February 1997. Originally published as D 4845 – 88. Last previous edition D 4845 – 95.

that may be present.

D 2118

DISCUSSION—The term “moisture regain” as defined in Terminology D 123,² leads to certain difficulties in defining the clean wool basis for calculation, which do not occur when the term “moisture content” is used. Moisture content can be applied directly to the product in the as-is condition while moisture regain cannot.

commercial weight, *n*—billed weight as determined by a generally accepted method or as agreed to by the purchaser and the seller.

D 2720

DISCUSSION—For shipments of commercially designated scoured wool, wool top, or wool noil, the generally accepted commercial weight is the weight of wool base contained in the shipment as determined by definite prescribed methods, plus the weights of moisture and other components corresponding to the commercial composition of the commercially designated material.

constant-rate-of-extension (CRE) type tensile testing machine, *n*—in *tensile testing*, an apparatus in which the pulling clamp moves at a uniform rate, and the force-measuring mechanism moves a negligible distance with increasing force, less than 0.13 mm (0.005 in.).

D 1294, D 2524

constant-rate-of-loading (CRL) type tensile testing machine, *n*—in *testing tensile*, an apparatus in which the rate of increase of the force is uniform with time after the first 3 s and the specimen is free to elongate, this elongation being dependent on the extension characteristics of the specimen at any applied force.

D 1294, D 2524

constant-rate-of-traverse (CRT) type tensile testing machine, *n*—in *tensile testing*, an apparatus in which the pulling clamp moves at a uniform rate and the force is applied through the other clamp, which moves appreciably to actuate a force-measuring mechanism, producing a rate of increase of force or extension that is usually not constant and is dependent on the extension characteristics of the specimen.

D 1294, D 2524

core, *n*—in *sampling fiber packages*, the portion of wool or other fiber obtained by using a sampling tube.

D 1060

cortex, *n*—in *mammalian hair fibers*, the principal body of the fiber made up of elongated cells.

D 4510

cuticle, *n*—in *mammalian hair fibers*, the layers of flattened cells enclosing the cortex, which forms an envelope of overlapping scales surrounding the fiber.

D 4510

diameter, average fiber—See **average fiber diameter**.

dimensional change in boiling water (felt), *n*—the change in length and width with any associated change in thickness produced by immersion in boiling water under specified conditions.

D 461

epidermis, *n*—in *mammalian hair fibers*, the outside or surface layer of the fiber consisting of flat, irregular, horny cells or scales.

D 4845

extractable matter, *n*—nonfibrous material in or on a textile, not including water, which is removable by a specified solvent or solvents as directed in a specified procedure.

D 461, D 1574

DISCUSSION—Extractable matter does not include moisture but (*I*) is

non-fibrous material, (2) is usually oily, waxy, or resinous in nature, and (3) may include protein, particularly if the extracting solvent is ethyl alcohol or contains ethyl alcohol.

felt, *n*—a textile structure characterized by interlocking and consolidation of its constituent fibers achieved by the interaction of a suitable combination of mechanical energy, chemical action, moisture, and heat but without the use of weaving, knitting, stitching, thermal bonding, or adhesives.

D 2475

DISCUSSION—In practice, light needling may be used to supplement the ability of the fibers to interlock and consolidate.

fineness, *n*—of *textile fibers*, a relative measure of size, diameter, linear density or mass per unit length expressed in a variety of units.

D 2252, D 3991, D 3992

DISCUSSION—The fineness of alpaca, wool, and other animal fibers is expressed as the average fiber width or average fiber diameter in micrometers (μm).

flame resistance, *n*—the property of a material whereby flaming combustion is prevented, terminated, or inhibited following application of a flaming or nonflaming source of ignition, with or without subsequent removal of the ignition source.

D 461

gage length, *n*—in *tensile testing*, the length of a specimen measured between the points of attachment to clamps while under uniform tension.

D 1294, D 2524

grade, *n*—in *wool and mohair*, a numerical designation used in classifying wool and mohair in their raw, semi-processed, and processed forms based on average fiber diameter and variation of fiber diameter.

D 2130, D 3991, D 3992

DISCUSSION—The term “grade” should not be confused with the terms “quality” and “type.” “Quality” is a term that includes not only fineness but also characteristics such as length, crimp, strength, elasticity, luster, tactile hand, and color, all of which affect the spinnability of the fiber and the properties of the resulting yarn and fabric. The Bradford designations, for which no standards exist, use a scale similar to that for grade designations (for example: 64s, 56s, etc.) and refer to quality and not solely to fineness. “Type” is a term designating a particular combination of characteristics applicable to a specific use or descriptive of geographical origin, breed of sheep, or preparation for market.

gray felt, *n*—a blend of white fibers with naturally colored or dyed fibers or both and that has an overall gray appearance.

D 2475

grease wool, *n*—wool taken from the living sheep and which has not been commercially scoured.

D 1234, D 1574, D 1576, D 2462

hair, *n*—natural animal fiber other than sheep’s wool or silk.

D 4845

DISCUSSION—It is recognized that this definition implies a distinction between sheep’s wool and the covering of other animals, notwithstanding similarity in their fiber characteristics. Thus the crimped form and the scaly structure are not confined to sheep’s wool. It seems desirable in the textile trade, however, to avoid ambiguity by confining the term wool to the covering of sheep and to have available a general term for other fibers of animal origin. Normally the less widely used fibers are known by name, for example, alpaca, mohair, etc., but collectively they are classed as hairs.

kemp fiber, *n*—a medullated animal fiber in which the

² *Annual Book of ASTM Standards*, Vol 07.01.

diameter of the medulla is 60 %, or more, of the diameter of the fiber. **D 2968**

laboratory sample, n—a portion of material taken to represent the lot sample, or the original material, and used in the laboratory as a source of test specimens. **D 2525**

laboratory sample, n—*in wool top*, the portions drawn from the lot in accordance with the described procedure. **D 1770**

lot, n—*in acceptance sampling*, that part of a consignment or shipment consisting of a material from one production lot. **D 2525**

lot, n—*in wool, top*, the entire quantity, not exceeding 20 000 lb (9100 kg) of a single combing, that comprises a single unit for which a test for neps, vegetable matter or colored fiber, or all three combined is desired. **D 1770**

lot sample, n—one or more shipping units taken at random to represent an acceptance sampling lot and used as a source of laboratory samples. **D 2525**

med fiber, n—a medullated animal fiber in which the diameter of the medulla is less than 60 % of the diameter of the fiber. **D 2968**

medulla, n—*in mammalian hair fibers*, the more or less continuous cellular marrow inside the cortical layer in most medium and coarse fibers. **D 2968**

medullated fiber, n—an animal fiber that in its original state includes a medulla. **D 2968**

merino, adj—from pure-bred merino sheep. **D 4845**

DISCUSSION—Merino wool usually has a fiber diameter of 24 μm or less.

mohair, n—the hair of the Angora goat, *Capra* species. **D 3991, D 3992**

moisture content, n—the amount of moisture in a material determined under prescribed conditions and expressed as a percentage of the mass of the moist material, that is, the original mass comprising the dried substance plus any moisture present. **D 1576, D 2462**

DISCUSSION—The term “mass” is the correct designation for the property commonly designated as “weight.” A slight amount of residual moisture may not be removed from a specimen subjected to oven drying because of the relative humidity of the ambient air. The amount of moisture retained by a specimen may be estimated from published data.³ There may also be a slight additional loss in mass caused by the evaporation of volatile material other than water, the amount depending on the characteristics of any added oils or emulsions.

moisture-free, adj—the condition of a material that has been exposed in an atmosphere of desiccated air until there is no further significant change in its mass. **D 1576, D 2462**

DISCUSSION—Heating the material and the desiccated air to temperatures as high as 110°C increases the rate of moisture loss but does not change the final equilibrium mass of the moisture-free material.

moisture regain, n—the amount of moisture in a material determined under prescribed conditions and expressed as a

percentage of the mass of the moisture-free material. **D 1576, D 2462**

natural fiber, n—a class name for various genera of fibers (including filaments) of (1) animal, (2) mineral, or (3) vegetable origin. **D 4845**

DISCUSSION—Examples—(1) Silk and wool, (2) asbestos, (3) cotton, flax, jute, ramie.

needled felt, n—a textile structure composed entirely of fibers physically interlocked and reoriented through the action of felting needles. **D 2475**

nep, n—one or more fibers occurring in a tangled and unorganized mass. **D 1770**

noil, n—the short fibers removed in combing; applied particularly to wool, but also to other fibers such as cotton, silk, and rayon. **D 4845**

other alkali-insoluble impurities, n—*in scoured wool*, oven-dried, ash-free, alcohol-extractives-free, alkali-insoluble substances other than vegetable matter base, such as skin, cotton or other fibers, paper, string, tag (dung) pieces, paint pieces, etc. **D 584, D 1113, D 1334**

oven-dried, adj—the condition of a material that has been heated under prescribed conditions of temperature and humidity until there is no further significant change in its mass. **D 584, D 1113, D 1334, D 1576, D 2462, D 2720**

DISCUSSION—An oven-dry material will retain a small amount of moisture which is dependent on the temperature and relative humidity of the atmosphere in contact with the material during the drying process. An oven-dry material will only be moisture-free when the air supplied to the drying oven has been previously desiccated. The term “mass” in the above definition is the correct designation for what is commonly designated “weight”.

orthopedic and surgical felt, n—a white, soft, low density, highly resilient felt. **D 2475**

DISCUSSION—Such felts are commonly used in splint pads, abdominal supports, orthopedic devices, and fracture cast linings as well as other medical applications.

papermaker’s felt, n—a fabric, made from wool or man-made fibers or mixtures of both, fabricated as an endless belt for use on a paper making machine. (See also **felt** and **needled felt**.) **D 2475**

DISCUSSION—Papermaker’s felt received its name because it replaced the sheets of felt used in squeezing the water from newly formed, manually made sheets of paper. Some finished papermaker’s felts have matted surfaces similar to wool felts.

partial cleavage, n—*in textiles*, a transverse gouge, cut or other cross-wise rent in the fiber. Clearly penetrating at least the cuticle of the fiber. **D 4510**

part wool felt, n—a felt composed of any one of, or a combination of, new and recycled wool fibers mixed with one or more man-made fibers, vegetable fibers, or animal fibers other than wool. **D 461, D 2475**

pH, n—*in common usage*, a measure of acidity or alkalinity of a solution, on a logarithmic scale, with neutrality represented by a *value of seven*, with increasing acidity represented by decreasingly smaller values, and with increasing alkalinity

³ Toner, R. K., Bowen, C. F., and Whitwell, J. C., “Equilibrium Moisture Relations for Textile Fibers,” *Textile Research Journal*, Vol 17, January 1947, pp. 7–18.

represented by increasingly larger values. **D 461**

DISCUSSION—For a technical discussion of pH, including such phenomena as the effect of temperature on pH, see any recognized chemistry text. The pH of textiles is generally determined on aqueous extracts of the textile being tested.

pulled wool, *n*—wool taken from the pelt of a slaughtered sheep and which has not been commercially scoured. Syn. *slipe wool* and *skin wool*. **D 1576, D 2462**

raw wool, *n*—wool or hair of the sheep in the grease, pulled, or scoured state. **D 584, D 1060, D 1334, D 2462, D 1576**

recycled wool, *n*—*as defined in the Wool Products Labeling Act as amended in 1980*, “the resulting fiber when wool has been woven or felted into a wool product which, without ever having been utilized in any way by the ultimate consumer, subsequently has been made into a fibrous state, or the resulting fiber when wool or reprocessed wool has been spun, woven, knitted, or felted into a wool product which, after having been used in any way by the ultimate consumer, subsequently has been made into a fibrous state.” **D 1294, D 1574, D 1576, D 2475, D 2462**

DISCUSSION—In the amended Act of 1980, the term “recycled wool” replaced the terms “reprocessed wool” and “reused wool.”

roping, *n*—a term used for roving in the woolen system of spinning. **D 4845**

sample, *n*—(1) a portion of a lot of material which is taken for testing or record purposes. (2) the group of specimens used, or observations made, which provide information that can be used for making statistical inferences about the population from which they were drawn. **D 2525**

sampling unit, *n*—*in wool*, a portion of material that is taken at one time from one physical location and that is combined with similar portions to make up the laboratory sample. **D 2525**

DISCUSSION—A sampling unit may or may not have the same physical size as a specimen. Examples of sampling units include: (1) for bulk materials seen as scoured wool, a handful of wool conforming to a stated mass range, (2) for cored material, a minimum mass of material collected by one insertion of a coring tool, (3) for sliver, a stated length of material, and (4) a single package, such as a ball of top.

scoured wool, *n*—wool from which the bulk of impurities has been removed by an aqueous or solvent washing process. **D 1575, D 1576, D 2462**

shrinkage, *n*—a decrease in one or more dimensions of an object or material. **D 461**

slipe wool—See **pulled, wool**.

skin wool—See **pulled, wool**.

sliver, *n*—a continuous strand of loosely assembled fibers that is approximately uniform in cross-sectional area and without twist. **D 1282**

specialty felt, *n*—one of a number of special purpose felt structures available for, but not limited to, a specific end-use application. **D 2475**

DISCUSSION—Orthopedic and surgical felts are examples of specialty felts. Additional information on these types is available in NTA

Specifications FS14-68/71.⁴

specific area, *n*—*of wool*, the ratio of the fiber surface to fiber volume. **D 1282**

specific gravity, *n*—*of felt*, the relative mass per unit volume of felt expressed as a percentage of the mass per unit volume of water. **D 2475**

specimen, *n*—a specific portion of a material or a laboratory sample upon which a test is performed or which is selected for that purpose. **D 2525**

splitting resistance, *n*—*of felt*, the force required to overcome the interfacial strength of a material and specifically to separate a felt into two layers (of approximately equal thickness). **D 461**

staple, *n*—*in grease wool*, a tuft or lock of fibers which naturally cling together, as found in a fleece. **D 1234**

staple length, *n*—*in grease wool*, the length of a staple obtained by measuring the natural staple without stretching or disturbing the crimp of the fibers. **D 1234**

supported needled felt, *n*—a needled felt that is composed entirely of fibers physically interlocked and reoriented in combination with interlay, scrim, or foundation of knitted, stitched, bonded, or extruded structure. **D 461, D 2475**

tenacity, *n*—the tensile stress expressed as force per unit linear density of the unstrained specimen. **D 1294**

tenacity, *n*—*in a tensile test*, the force exerted on the specimen based on the linear density of the unstrained specimen.

DISCUSSION—*In textiles*, tenacity is considered a property of fibers and yarns, and tensile strain is the complimentary property of fabrics. In direct yarn numbering systems, tenacity is force divided by linear density. In indirect yarn numbering systems, tenacity is force times the reciprocal linear density.

tensile strength, *n*—the strength of a material under tension as distinct from compression, torsion, or shear.

DISCUSSION—Technically, strength is a characteristic that is expressed in terms of force. Historically, however, tensile strength has been commonly expressed in terms of force per unit base, for example, the cross-sectional area of the unstrained material. Some common units are newtons per square metre (N/m²) and pounds-force per square inch (psi).

test specimen, *n*—*for wool top*, a length of specified mass taken at random from a length of wool top selected as a laboratory sample. **D 1770**

top, *n*—*in wool*, a continuous untwisted strand of wool fibers from which the shorter fibers or noils have been removed by combing. **D 519, D 1282, D 1770, D 3992**

unsupported needled felt, *n*—a needled felt that is composed entirely of fibers physically interlocked and reoriented with, and of themselves without an interlay, scrim, or foundation of knitted, stitched, bonded, or extruded structure. **D 461, D 2475**

vegetable matter, *n*—*in wool top*, the pieces of burrs, seeds, shive, leaves, twigs, and grasses which have escaped removal in processing, also foreign vegetable fibers such as hemp, sisal, etc., if present. **D 1770**

⁴ Available from Northern Textile Association, 230 Congress St., Boston, MA 02110.

vegetable matter base, *n*—*in raw wool*, oven-dried scoured burrs, seeds, twigs, leaves, and grasses, free of mineral matter and alcohol-extractable matter.

D 584, D 1113, D 1334, D 2720

vegetable matter present, *n*—*in raw wool*, the weight of vegetable matter base present in the raw wool, adjusted to a moisture content of 12 %, an alcohol-extractives content of 1.5 %, and a mineral matter content of 0.5 %.

D 584, D 1334

virgin wool, *n*—*as defined in the Wool Products Labeling Act*, “the terms ‘virgin’ or ‘new’ as descriptive of a wool product, or any fiber or part thereof, shall not be used when the product or part so described is not composed wholly or new or virgin fiber which has never been reclaimed from any spun, woven, knitted, felted, braided, bonded, or otherwise manufactured or used product.”

D 1576, D 2462

water retained, *n*—*in textiles*, the amount of water absorbed by the fibers, adsorbed on the surface of the fibers, and held within the voids of the fabric after immersion, measured under specified conditions.

D 461

white wool, *n*—wool having shade variations from true white to creamy white but free of pigmented, dyed, or otherwise colored wools.

D 2475

DISCUSSION—The shade variations in white wool can be caused by range conditions including forage, soil, rain, or lack thereof as well as the health of the animal.

wool, *n*—the fibrous covering of the sheep, *Ovis* species.

D 1282, D 1283, D 1294, D 1574, D 1575, D 1576, D 2118, D 2462, D 2475, D 2524, D 2968, D 3991, D 3992

wool, *n*—*as defined in the Wool Products Labeling Act of 1939*, “the fiber from the fleece of sheep or lamb, or hair of the Angora goat or Cashmere goat (and may include the so called specialty fibers from the hair of the camel, alpaca, llama, and vicuna) which has never been reclaimed from any woven or felted wool product.”

D 1294, D 1574, D 1576, D 2462, D 2475, D 4510

wool base, *n*—oven-dried scoured wool free of alcohol-

extractable matter, mineral matter, vegetable matter, and all impurities.

D 584, D 1334, D 2720

wool content, *n*—the quantity of new and recycled wool, as defined in the Wool Products Labeling Act, which is determined by chemical analysis.

D 2475

DISCUSSION—Felt 34R1, as an example, which theoretically is made from 100 % wool fiber, may contain incidental amounts of other natural or man-made fibers, residual wool fats and oils, and processing soaps which may reduce the actual wool content on the chemical analysis basis to 95 %.

wool felt, *n*—a felt composed wholly of any one of or a combination of new or recycled wool fibers.

D 461, D 2475

wool, grease—See **grease wool**.

wool, new—See **wool, virgin**.

wool, raw—See **raw wool**.

wool, recycled—See **recycled wool**.

wool, reprocessed—See **recycled wool**.

wool, reused—See **recycled wool**.

woolen yarn, *n*—yarn spun from wool fibers which have been carded but not combed or gilled.

D 4845

worsted-spun, *adj*—of, or pertaining to, materials produced by the worsted system of yarn spinning as distinct from materials made by the woolen system of spinning.

D 4845

worsted yarn, *n*—yarn spun from wool fibers which have been carded, and either gilled or combed, or both.

D 4845

yield, *n*—*in raw wool*, the combined weight (mass) of clean wool fiber present and vegetable matter present, as a percentage of the raw wool weight.

D 584

yield, *n*—*of wool*, the percentage of a designated commercial composition obtained by processing a lot of raw wool.

D 2720

zephyr yarn, *n*—a variety of soft worsted yarn characterized by a low twist and spun from wool which is as fine or finer in average diameter with U.S. Standard 64’s grade tops.

D 4845

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

This standard is copyrighted by ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (<http://www.astm.org>).