Appendix

A regular feature of ASTM's monthly publication *Standardization News* has been a short contribution called "Terminology Update." A collection of these informal articles. follows. They appear in the chronological order in which they have appeared in the magazine. The articles have not been subjected to the peer review process used for the papers in this volume. Nevertheless, they offer insights that have been of value to many ASTM members. They have been indexed in the back of the book for the convenience of the reader.

TERMINOLOGY UPDATE

When Is a Material *Material*?

In a recent Terminology Update,[1] "brick" was referred to, in an obsolete definition, as a "material of construction." Readers who are expert in materials science objected. "Brick," they said, is not a material, but a manufactured product. When, then, *is* a "material"? This question is of more than passing interest, not only because the ASTM scope concerns standards for (and the promotion of knowledge of) materials, but also because the work of many technical committees intimately involves materials.

The *Compilation of ASTM Standard Definitions* lists only one *material* "relating to, derived from, or consisting of matter (E 375, D-20). *Webster's Ninth New Collegiate Dictionary's* principal definitions are 1) "the elements, constituents, or substances of which something is composed or can be made," and 2) "matter that has qualities which give it individuality and by which it may be categorized." The broad basis for "material" plainly is Webster's second definition concerning matter. The first definition concerns the *use* of matter or material.

But is this rationale an oversimplification? The whole field of materials sciences, now well-established and staffed, has progressed far beyond these roots. In 1960, ASTM established a Division of Materials Sciences, changed the name of its monthly magazine to *Materials Research and Standards* (*Standardization News* since 1973), and changed the name of the Society to the American Society for Testing *and* Materials. These developments simply reflected the strong interest in materials engineering and research engendered by World War II needs.

Strength of materials has been an essential curriculum in engineering schools for a hundred years. "The principal *materials* used in the building of structures and machines include metals and alloys, wood, portland-cement concrete, bituminous mixtures, clay products, masonry materials, and plastics. The principal function of **constructional** (emphasis added) materials is to develop strength, rigidity, and durability adequate to the service for which they are intended."[2] These are categorized as *engineering* materials. So perhaps that really is a narrower field of interest. But a "brick" can be a "clay product," hence an engineering material.

Are these traditional engineering materials now too mundane?[3] to be included among today's more esoteric[4] materials—which may indeed not be engineering or constructional materials? Our ASTM terminology needs to be more explicit. The ASTM brick definition was explicit—"a material of construction"—so perhaps the critics overlooked the delimiting phrase.

In Committee E-6 on Performance of Building Constructions, we have used the term "building element" in the text of some standards. But we could not obtain consensus on its definition. Most reviewers equated "element" with "component" (*Webster's 1*), but others insisted that "element" is a "material" (*Webster's 2*). No two words in the language have exactly the same meaning. Synonyms are approximations, especially for single-word terms. To reach consensus in adopting meanings, it is sometimes best to make the term itself more explicit; for example, "building element" instead of "element," "engineering material" instead of "material."

This recommendation is, of course, a restatement of the principles in ASTM's *Form and Style for ASTM Standards* (the Blue Book). Section E4.3.2, Scope of Definitions says: "The context for the definition of a specialized term shall be clear technically. This can be done either by proper limitation when the term has other meanings or by suitable phrasing when the term is unique to the field." A related rule is E17.1: "Do not attempt to define an adjective when the concept in mind is really a specific noun modified by that adjective. In such cases define the combination of adjective and noun."

These are material precepts in more ways than one. When is a "material" *material*? When it is the subject of a lesson in terminology! The lesson here: Go by the book (the Blue Book).

Wayne Ellis

[1]ASTM *Standardization News*, April 1992.
[2]David, H.E.; Troxell, G.E.; and Wiskocil, C.T.: *The Testing and Inspection of Engineering Materials*. McGraw-Hill, New York, N.Y., 1955.
[3]*mundane*—of or preoccupied with material rather than spiritual or intellectual things.
[4]*esoteric*—beyond the understanding of an average mind.

Reprinted from the October 1992 issue of *Standardization News*, p. 18.

TERMINOLOGY UPDATE

Terminology Harmonization: 1982–1992

During Nancy Trahey's tenure as chair of the ASTM Committee on Terminology (COT) 10 years ago, I first learned how difficult high quality harmonization work in terminology can be. I had known from my work with Committee D-32 on Catalysts and with COT that good, harmonized terminology was financially crucial to knowledgeable commercial interests and central for educators. (Terminology is important for purchase contracts and efficien education, as well as in issues of legal liability.

COT works with technical committees in minimizing redundancies (unnecessary duplications) and harmonizing terminology within a committee and for use by other committees. Developing new terminology and reviewing terminology standards are also principal COT services, as well as continuing efforts to improve the quality and usefulness of the *Compilation of ASTM Standard Definitions*.

To harmonize ASTM terms and definitions, we first needed to know which terms were redundant. In 1982, this was not a simple or quick task. There was only one feasible approach. The committee undertook to read and re-read the entire compilation and to list repeated and related terms along with their definitions. Our plan was to identify redundant terms and then to select or craft a general definition. This generic definition would then be recommended to the concerned technical committees for their consideration and possible adoption.

This all sounds very straightforward, but it isn't. Some definitions are involved in continuing broader debate, such as "density"—"weight per unit volume" vs. "mass per unit volume." Many of the duplicated terms are actually special types of broader concepts, such as "pour density." Some definitions were (and are) unnecessarily restricted, such as, "density—the mass per unit volume of the fluid..." Issues such as these reared their heads in 1982 and, added to the required search and reading time, resulted in a formidable demand on COT volunteers. Harmonizing terminology, even with ASTM, was an elusive objective.

Had the situation changed in 1992? The problem was still as real as even, and with the development of more international trade, even more important. We in ASTM still frequently offered confusion instead of clarity to juridical users of our terms. There was still unnecessary risk to purchasing agents in writing contracts that could not be properly interpreted. We still offered some notable examples of conflicting meanings of the same term. The educational potential of our terminologies had yet to be fully realized.

Nonetheless, COT remains hopeful. One reason is the recent availability of the *Compilation of ASTM Standard Definitions* on diskette. The immense work of reading the compilation repeatedly for each possible offending term is no longer necessary. With simple computer programs, we will be able to find all entries and usages of terms rapidly. This should result in a significantly better assessment of the problem and, by using frequency analysis methods, we expect to be able to attack specific problem areas systematically. (Everyone knows that "density" is always on the list, but how about the others?) Terminology work in 1992 was no easier than in 1982. However, the future offers more promise of success because our efforts can now be focused on serious terminology problems more effectively.

R.A. Strehlow

Reprinted from the January 1993 issue of *Standardization News*, p. 21.

TERMINOLOGY UPDATE

"Metre" or "Meter" . . . Again?

"Grant us fair weather for Battle."
Col. Jas. O'Neill, Chaplain, Third Army, 1944

Terminology touches all of our ASTM activities. The language of metrication is not an exception. ASTM Standard E 380, Standard Practice for Use of the International System of Units (SI) (The Modernized Metric System), shows the "metre" as the base SI unit of length. Although the "cubic metre" is the base SI unit of volume, the "litre" is allowed as a special name for the "cubic decimetre." (Litre is restricted to volumetric capacity, dry measure and measure of fluids—both gases and liquids.

These SI rules are established by the International Bureau of Weights and Measures (BIPM), founded in 1875 to ensure worldwide unification of physical measurements.[1] The United States is one of 46 members of the Metre (Meter?) Convention that set up the BIPM. Because of its origin in France, the SI system's "-re" spellings "metre" and "litre") follow French parlance. This spelling was adopted in the 1971 edition of National Bureau of Standards (NBS) SP 330 but was discarded in 1975 by the U.S. government in the following way.

The Metric Conversion Act of 1975 (PL 94-168) assigned the Department of Commerce the responsibility to interpret and modify for the United States the International System of Units. The assistant secretary of commerce for science and technology concluded that the "-er" spelling of meter and liter is preferable for U.S. usage with any exceptions limited to those situations where it is appropriate in international relationships.[2] This action standardized the Americanized spelling within the U.S. government; but many non-government organizations have opted for the international spelling of "metre" and "litre." Some believe it confusing if "micrometer" (the device) is not differentiated from "micrometre" (the length) as is done when "real" SI is used.

What do U.S. common-language dictionaries say about this spelling predicament? As you might expect, Merriam-Webster, American Heritage, and Random House dismiss the "-re" spelling as "a chiefly British variation of *meter*, while defining the term as both a fundamental metric unit of length and a measuring device. British dictionaries, contrariwise, list "meter" as an instrument and as the American spelling of "metre"!

For more than 50 years, dictionaries have been reporting language usage, not rules. All languages are dynamic rather than static and, hence, a "rule" in any language can only be a statement of contemporary practice. Change is constant—and normal. "Correctness" can rest only upon usage for the simple reason that there is nothing else for it to rest on. And all usage is relative.[3] No longer do linguist scholars revel in orthoepy (the study of the pronunciation of a language). Thus we have another dictionary imbroglio in the pronunciation of the words "kilometre" and "kilometer." SI adherents say "kilo-metre" (as in "milimetre"), while U.S. usage says "kil-ometer" (as in "speedometer"). Which do you say?

National Institute of Standards and Technology (NIST) SP 330 (1991)[1] does point out a "particular difficulty" arising from "slight" spelling variations which occur in the scientific language of the English-speaking countries. The English translation of the BIPM document is not considered as an official text. In case of dispute, it is always the French text that is authoritative. ASTM E 380 uses the "re" spelling in conformance with the BIPM rules and with International Organization for Standardization (ISO) 1000-1981, *SI Units and Recommendations for the Use of Their Multiples and of Certain Other Units*.

Current ASTM Practice E 380, deplorably, is not listed by NIST in its source documents for technical information,[4] although E 380-89a is mentioned in a footnote. Instead, NIST SP 811 lists American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers Standard 268-1982 as "a comprehensive source of authoritative information for the practical use of SI measurements in the United States." Presumably this identification (of a 10-year-old standard) is based on its spelling conformance to government policy and on its ANSI classification. E 380 is not intended as a source for "practical" (as opposed to "correct") use of SI. It is a practice for correct use of "authentic" (BIPM) SI.

It is not likely that disparate spellings of "metre" and "meter" will result in confusion in understanding documents since they will be used in the context of mensuration, not instrumentation. Nevertheless, for U.S. export activities, "metre" and "litre" will be more "user friendly" in international communications. The "particular difficulty" is under review by the organizations concerned. No doubt an explanatory note in the appropriate publications will resolve the *lingua franca* problem.

Wayne Ellis

[1]*International System of Units (SI)*, NIST SP 330, 1991.
[2]*Metric Manual*, U.S. Department of the Interior, 1978.
[3]Evans, B., "But What's a Dictionary For?," *Atlantic Monthly*, May 1962, pp. 57–62.
[4]*Guide for the Use of the International System of Units*, NIST SP 811, 1991

Reprinted from the February 1993 issue of *Standardization News*, p. 19.

TERMINOLOGY UPDATE

Integrated Standardized Terminology

The new *SAE Dictionary of Aerospace Engineering* by William H. Cubberly, published by the Society of Automotive Engineers (SAE), provides an opportunity to examine a fine example of integrated standardized terminology. This dictionary attempts to provide the best definitions in the field of aerospace engineering drawn from three different sources. The dictionary presents SAE's own standard definition first when there is more than one definition. SAE definitions are identified as either an Aerospace Standard (AS) or an Aerospace report (ARP). These and other designations identify specific references that contain the definition.

The second source of definitions is the *NASA Thesaurus*. The National Aeronautics and Space Administration (NASA) and ASTM led the way in an earlier integrated standardized terminology effort, *NASA Thesaurus Definitions*, which was described in *Standardization News*, May 1989, p. 18. In this early effort, ASTM provided standard definitions to match appropriate *NASA Thesaurus* terms. These definitions were drawn from the *Compilation of ASTM Standard Definitions*, Sixth Edition, 1986. (The 1990 edition is now available). This cooperation has resulted in the wider use of ASTM standard definitions by the aerospace community. Since this initial activity, *NASA Thesaurus Definitions* has also included definitions from the American Geological Institute (AGI) and the Institute of Electrical and Electronics Engineers (IEEE). The AGI definitions are de factor standards and the IEEE definitions are from American National Standards Institute standard 100-1988.

The SAE dictionary includes those appropriate NASA definitions that are not derived from ASTM, AGI or IEEE. Thus NASA terminology definitions are provided along with standard SAE definitions. Not only are existing SAE definitions amplified upon, but many definitions are provided for terms that would not otherwise be defined.

A third source further amplifies SAE's definitions base: engineering and computer terms from a leading developer of engineering definitions, Engineering Resources Inc. Through the use of integrated standardized terminology, SAE is able to quadruple its initial list of some 5,000 definitions to some 20,000 standard definitions. Cross references or variant forms are also given where appropriate.

The interuse of standardized definitions is also evident in International Organization for Standardization/ASTM activity, reinforcing the contributions each can make to the other. Although standard definitions from different standards bodies may differ, their combined strength reinforces the lexicographical process. Using related standard definition resources can also lead to better definitions by any ASTM terminology subcommittee.

Ronald L. Buchan

Reprinted fom the March 1993 issue of *Standardization News*, p. 24.

TERMINOLOGY UPDATE

Stress . . . and a Pain in the Neck!

Another friendly dialogue over imprecise engineering terminology is coursing through Committee E-6 on Performance of Buildings. It concerns the semantics[1] of the terms "strength" and "stress." Professor E. George Stern, and E-6 stalwart, postulates that "strength" is resistance of an external force and "stress" is resistance to an internal force. He says, "We should make an effort not to use the term 'strength' when we mean 'stress.' I like to refer to the 'strength' *of* an individual and to 'stress' *in* an individual. Why not apply this concept by speaking of the 'strength' *of* a material and the 'stress' *in* a material!"

In a proposed revision of ASTM Standard E 631, Terminology of Building Constructions, "strength" is expressed in terms of units of force (pounds force (lbf) or newtons (N)), while stress is expressed in terms of force per unit area (pounds force per square inch (psi) or megapascals (MPa)).

A principal objection to this terminology expostulates that in testing materials, the strength at failure of a test specimen customarily is reported in force per unit area. The rebuttal to this belief is that the external load reported to cause failure in actuality is internal resistance (stress), properly reported in units of force per unit area.

Examination of the definitions for "strength" in the *Compilation of ASTM Standard Definitions* reveals: "stress required to break, rupture, or cause failure," "property of a material that resists deformation indued by external forces," "maximum stress which a material can resist without failing for any given type of loading," "ability of a member to sustain stress without failure," and "in a specific mode of test, the maximum stress sustained by a member loaded to failure." In referring to internal stress induced by external loading, these definitions seem to confirm the Stern position.

Mansfield Merriman (1848-1925) was a distinguished professor of civil engineering at Lehigh University, first chairman of the American Section of the International Association for Testing Materials (the predecessor to ASTM), and president of ASTM from 1915 to 1916.[2] He was also a prolific author of engineering texts. His *Mechanics of Materials*, first published in 1885, was still in print in 1928, having gone through many editions for a total of 64,000 copies! Merriman defined strength as "the capacity of a body to resist force," and stress as "internal resistance which balances an exterior force or load." These basic concepts remain in today's technology.

Thus, the current semantic problem is revealed as one of synonymy, the relationship of "sameness" of meaning[3] (of strength and stress). It is well to remember that lexemes (words—in the linguistic world) rarely, if ever, have *exactly* the same meaning. There are usually stylistic, regional, emotional or other differences to consider. And context must be taken into account. Two lexemes might be synonymous in one sentence but different in another. Strength and stress are not synonyms in the field of materials and structures.

Professor Stern is convinced that ASTM standard definitions must conform to the requirements for precision given in *Form and Style for ASTM Standards* (the "Blue Book") and that caution has to be observed in adopting synonyms for technical terms. He feels that "bothering ASTM voters with finical concepts, such as these two, may be 'a pain in the neck,' but rectitude is a requirement for terminological integrity. So, here are the two definitions now being balloted as revisions to ASTM E 631.:

strength, n—resistance to external force or load or generation of internal strain, expressed in terms of units of force, lbf, pounds force (N, newtons). Discussion: Strength is the resistance to tensile, compressive, or shear forces, or a combination of these; as compared to *stress* that is expressed in terms of force per unit area.

stress, n—internal force developed by application of external force or load or generation of internal strain, expressed in terms of units of force per unit area, psi, pounds force per square inch (MPa, megapascals). Discussion: When the forces are parallel to the plane on which it acts, the stress is called *shear stress*; when the forces are normal to the plane on which it acts, the stress is called *normal stress*; when the normal stress is directed toward the plane on which it acts, it is called *compressive stress*; when the normal stress is directed toward the plane on which it acts, it is called *compressive stress*; when the normal stress is directed toward the plane on which it acts, it is called *compressive stress*; when the normal stress is directed away from the plane on which it acts, it is called *tensile stress*.

It is wondrous to observe that in the 100 years separating Merriman from Stern, the integrity of this terminology has been maintained!

Wayne Ellis

[1]*semantics*, n—branch of linguistics dealing with the study of meaning, including the ways meaning is structured in language and changes in meaning and form over time. (Random-House's *Webster's Collegiate Dictionary*, 1991)
[2]*ASTM Standardization News*, June 1988, p. 39.
[3]David Crystal, *Cambridge Encyclopedia of Language*, 1987.

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TERMINOLOGY UPDATE

Achieving a Balance: One Committee's Success Story

Having received the ASTM Committee on Terminology's prestigious Reinhart Award—which is indeed a humbling experience, especially since it is rooted in recognition by one's peers—has prompted the question, "How did you do it?" More to the point in this particular case, "How did Committee C-24 on Building Seals and Sealants do it?

From the beginning of C-24's organizational days in the early 1960s, there was a subcommittee on definitions and nomenclature. As in most endeavors, it takes time to get organized and chart a direction. To say the least, or maybe the most, we stumbled along until the mid-1970s. By then, regular meetings of the subcommittee were organized and efforts began to gel in providing needed definitions of terms or descriptions of terms. By 1976, Standard C717, Terminology of Building Seals and Sealants, contained a grand total of 13 terms and their definitions.

Two forces came into play between 1976 and 1980. First of all, ASTM initiated a program encouraging its technical committees to place more emphasis on terminology (maybe it had always been an emphasis, but Committee C-24 had not heard the call). The second, and perhaps the more significant force, was a realization by C-24's Executive Subcommittee and members that there was insufficient coordination between C-24 subcommittees and the committee's subcommittee on terminology, resulting in a multiplicity of definitions for the same term in various standards.

In the fall of 1980, the chairmanship of C24.01 on Terminology of Building Seals and Sealants was vacant and I volunteered. The Executive Subcommittee delineated some aspects of the subcommittee that needed attention, among them: a better process for coordination of terminology development between subcommittees, cessation of duplication, and the need to focus attention on desired definitions that several of the subcommittees were struggling to develop. That struggle was draining off valuable energy toward the development of much-needed standards.

C24.01 was reorganized and limited membership to officers and subcommittee chairmen and a few persons who were either liaisons with other committees or specialists in terminology. This gave all subcommittees equal representation and served as a channel for coordinating terminology efforts, eliminating duplication, and allowing the technical subcommittees to focus on developing standards.

Over a period of the next three to four years, the backlog of needed definitions was reduced to a manageable level, largely because the terminology subcommittee members were committed and devoted to the task. Terminology development was considered important and it was obviously in the best interest of several subcommittees to see C-24's terminology subcommittee be successful. A minimum of two subcommittee ballots per year was made a policy. Also adopted as a guide on terminology development and kept in the forefront was Section E4 of the *Form and Style for ASTM Standards*, which candidly states, "a definition should be concise, technically correct, and as broad in scope as possible, consistent with the meaning intended."

In 1985, C24.01 initiated a project to transfer and consolidate all definitions and descriptions of terms in the 50 standards under Committee C-24 jurisdiction into one standard: C

717. An inventory was taken and lists of definitions and descriptions of terms were compiled consisting of the terms, the definitions or descriptions of terms, and the subcommittee(s) involved for each term. The inventory lists of some 80 definitions and 100 descriptions of terms were next divided into smaller groupings of 10 to 20 terms for review by subcommittees to ensure accuracy and, where language varied between two or more definitions of a term, to attain agreement on a single definition.

Once reviewed and agreed upon, the lists were submitted to ASTM for inclusion in Standard C 717. Today, this process has been nearly completed and it can be said candidly that, as a result, a more useful terminology standard has come to fruition. Today, C 717 contains 100 terms and their definitions plus 95 descriptions of terms in one document for easy user reference.

Now, back to the original question: How did C-24 do it? The most important ingredient was the recognition that a problem prevailed. Time was being misused in subcommittees to provide terminology while inhibiting standards development. The need existed for sound, applicable terminology. On a personal basis, not only myself but the whole committee had to make a commitment and persist toward a solution. Fortunately C-24 signed on and my part was almost reduced to keeping track of progress, coordinating and facilitating compromise, and occasionally following up on the status of commitments. Frustration also occurred but, with the backing of the membership, it has been and continues to be, even after 12 years, a rewarding experience. The Reinhart Award is truly frosting on the cake.

Marvin Newton

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TERMINOLOGY UPDATE

Absolute Terms in Standards—Part One: The Problem

"If the law is a science, it is not an exact science, and its language must share some of the ambiguity of life."

—*Levin*, Language, Symbol Cycles and the Constitution[1]

"It is impossible that the language of the law become completely precise. No matter how thin a principle sliced, particularization is always possible . . . Lawyers customarily choose their words more carefully than non-lawyers. But it is characteristic of a large part of the selection that there is a deliberate choice of the flexible—a peculiarly plastic terminology . . . There is, however, a recurrent choice of absolutes: *all, none, perpetuity, never, unavoidable, last clear chance, unbroken, uniform, irrevocable, outright, wherever, whoever*. Successful or not, the attempts at extreme precision serve to distinguish the language of the law from the common tongue."

—*David Melinkoff*, The Language of the Law[2]

Because standards often find reference in legal proceedings, it follows that the language in standards also requires precision of meaning. In agreement with this principle, the ASTM

Board of Directors adopted in 1978 an "ASTM Policy Concerning Clarity and Precision of Terminology" and directed that it appear in the manual, *Form and Style for ASTM Standards*, Part E.[3] Among other rules, it mandates: "qualitative adjectives and nouns that *could* be taken to denote or connote an *absolute*, *unqualified* or *unconditional* property or capability shall not be used unless *actually used and defined* in their absolute sense." Examples include: "waterproof," "stainless," "rigid," "pure," etc.

The initiative and stimulant for this action was the misinterpretation of a particular ASTM standard test method. It defined technical terms associated with the behavior of certain plastic materials in a small-scale test. These terms had definite meaning for the technical person and were used in the context of the limitations spelled out in the test method. However, as experience demonstrated, sales and public relations people excerpted these terms from the standard and used them out of context in a way not intended by the drafters.

For this reason, the Board determined to adopt a policy to restrict the use of absolute terms in ASTM standards. In addition to general rules of terminology usage, the policy names, as examples, certain absolute terms that can be used only with specific validation.[4] Since adoption of the policy, some standards have been revised for policy conformance, such as the change from "vapor barrier" to "vapor retarder."

There remain in standards texts other absolute terms and definitions that should be revised to conform to the policy. One of the longest-standing of those terms in ASTM is "waterproofing." This term appeared in 1905 with the formation of Committee 5 (now Committee D-8) on waterproofing materials. Note that "waterproofing" was used as an adjective, while today it is used as a participle—a verbal noun. This is a figurative sense in which "waterproofing" now stands for waterproofing material. But this participle also stands for a waterproofing treatment—a process. (Current usage will be discussed further in part two of this series of articles.)

Consider also the term "stainless steel." It is defined as an alloy of iron with chromium and sometimes nickel or manganese that is highly resistant to rusting and ordinary corrosion. Here, "stainless," an absolute term, is used in the figurative sense because "everyone" knows that staining can occur under adverse conditions.

Another absolute is the term "inhibitor," as in "corrosion inhibitor." Common language dictionaries define "inhibit" in two senses: "to prohibit" or "to hold back." The term has been defined by several ASTM committees to mean both concepts, for example: "prevents or reduces," "retards or prevents," "stops or slows." Here is a typical example of conflict with the policy. When an ASTM standard qualifies a material as a "corrosion inhibitor," does the purchaser of the material expect it to *prevent* or just to *retard* corrosion? If the former, while the supplier intends the latter, grounds are laid through a misleading standard for dispute and litigation.

The problem addressed by the policy on absolute terms is the inappropriate use of absolute terms in ASTM. The difficulty is to "rescue" existing nonconforming absolutes by appropriate revisions without alienating those who believe that such usage is "grandfathered" into standards and need not be altered.

Next month, Part Two of this series will review and discuss current examples of absolute terminology in ASTM standards. Part Three will recommend appropriate measures to assure policy conformance.

Wayne Ellis

References

[1]71 U.S. Law Review, 258, 265, 1937, quoted in Melinkoff (Reference 2).
[2]David Melinkoff, *The Language of the Law*, Little, Brown, Boston, Mass., 1963.
[3]Minutes, ASTM Board of Directors, May 1978, p. 13.
[4]Using Absolute Terms: Boon or Bane?" *Standardization News*, April 1986, ASTM, p. 19.

Reprinted from the June 1993 issue of *Standardization News*, p. 24.

TERMINOLOGY UPDATE

Absolute Terms in Standards—Part Two: Usage Today

"Such is the character of human language, that no word conveys to the mind, in all situations, one single definite idea; and nothing is more common than to use words in a figurative sense."

—*Chief Justice Marshall, McCulloch vs. Maryland, 4 Wheat, 316, 414 (1819).*

"(c) Qualitative adjectives and nouns that *could* be taken to denote or connote an *absolute, unqualified* or *unconditional* property or capability shall not be used unless *actually used and defined* in their absolute sense.
(Examples of such terms are: waterproof, stainless, unbreakable, vapor barrier, gas-free, flat, safe, rigid, pure, etc.)"

—Form and Style for ASTM Standards, *1989*.

To determine whether present usage of absolute terms in ASTM standards conforms to the policy above, we made an electronic search of the *Compilation of ASTM Standard Definitions* for three typical terms, including two of the stated examples. These observations necessarily were limited to terminology standards because electronic searching of the entire standards base is not yet possible. However, the variety of disciplines and fields covered by the compilation *is* representative of all ASTM committee writings. Thus, this analysis of usage of absolute terms is undoubtedly applicable to the entire *Annual Book of ASTM Standards*.

The search disclosed that the term "barrier" is used in 49 entries; "inhibitor" in 37, and "-proof" in 42. In the common-language dictionary, each of these terms has a dual meaning: "barrier"—a material that separates or that restrains; "inhibitor"—a material that prohibits or that holds in check, "-proof"—able to resist or to repel. Usage in ASTM standard definitions was found to be as follows:

Barrier

"Barrier"—related identifications among the 49 entries were: flexible barrier material, anti-personnel barrier, grease-resistant barrier, water-resistant barrier, water-vapor-resistant barrier, mechanical barrier, barrier device, electric barrier, grouting barrier, fire-retardant barrier, membrane barrier, groin barrier, ground-water barrier, impermeable barrier, moisture barrier, sound-reducing barrier, selective barrier, inflexible barrier material, palladium barrier, solid barrier, safety barrier, toe-board barrier, contamination barrier, and potential barrier. In the text of these "barrier" definitions, stated meanings included either separation or restraint. However, many did not define the meaning, leaving an ambiguity for the reader.

Inhibitor

"Inhibitor"—related identifications among the 37 entries were: alcohol with inhibitors, anodic inhibitor, coating which inhibits, may contain inhibitors, volatile corrosion inhibitor, agent that inhibits, substance to inhibit, alkaline inhibitors, treated to inhibit, polymerization inhibitor, oxidation inhibited, transformer oil uninhibited, inhibitor used to suppress, cathodic inhibitor, inhibitors to minimize, inhibitor to reduce, inhibitor that slows down, inhibitor to reduce the rate, inhibitor to improve resistance, inhibitor that increases the time, inhibit rusting (not synonymous with rustproof), prevents or reduces corrosion, kills or inhibits pests, retards or prevents undesirable reactions, retards or prevents deterioration, and stops or slows. Again, ambiguity resides in definitions that either do not define the meaning at all, or that state dual meanings.

Proof

"-Proof"—uses of the suffix among the 42 entries were: greaseproof, seal and waterproof, waterproofing, waterproofing system waterproofing membrane, bituminous waterproofing, waterproof film, weatherproofing, rustproof—all without further definition. Others, to comply with the policy, do state meaning within the definition, for example, waterproofing—exclusion of water; prevent passage of water under hydrostatic pressure; prevent passage of liquid water under hydrostatic, dynamic or static pressure; property of inpenetrability by liquid water. But "proofing" was defined—to impede penetration by a liquid. Again, of these standard definitions many did not state the meaning. Others did state an absolute meaning, and yet another allowed less than an absolute meaning.

An assumption is made in the policy that absolute terms are to be used in the literal sense, that is, according to the primary meaning of the term. Some absolute terms, through long use in the vernacular language, have acquired a figurative meaning that departs from the absolute concept. "Waterproof" and "fireproof" are such figurative terms. The former term has been defined in the absolute sense by Committees D-8 on Roofing, Waterproofing and Bituminous Materials, and C-24 on Building Seals and Sealants; the latter term is deprecated by Committee E-5 on Fire Standards.

The ambiguity difficulty arises with polysemous terms, that is, those words having more than one meaning. When a polysemous term is used in a technical absolute sense, writers need to understand and to state which of the dictionary meanings is intended, as required by the policy. In the review just described, it is apparent that usage of absolute terms in ASTM standards, with a few exceptions, does not promote clear comprehension. How, then, can we improve the quality of usage in this respect? Next month, the final article in this series will propose some remedies.

Wayne Ellis

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TERMINOLOGY UPDATE

Absolute Terms in Standards—Part Three: The Future

"The methodology of science, with its demand for objective, systematic investigation, and exact measurement, has several linguistic consequences. There is an overriding concern for impersonal statement, logical exposition, and precise description . . . Everyday words are too vague for many scientific purposes, so new ones have to be invented . . . Lawyers point to the risk of ambiguity inherent in the use of everyday language for legal or official documents."

—*Cambridge Encyclopedia of Language*, 1987

"Seal up the mouth of outrage for a while, Till we can clear these ambiguities."
—Shakespeare, "Romeo and Juliet," V. iii. 216

ASTM Terminology Policy

The terminology policy of ASTM ("standards shall use terminology that is clear, explicit, and not liable to misinterpretation or misconstruction when referred to in technical operations, commercial contracts, or legal proceedings") is itself clear and explicit. Parts One and Two of this series (June and July 1993 *SN*) give details. Views that adherence to the policy is "idealistic," and that noncompliance is acceptable given "full consensus and due process," are evasions of the ASTM Regulations that need not be condoned.

Standards-developing organizations recognize that standards and regulations must be written in clear and explicit language. As an example, in the field of chemistry, chemical reagents for analytical work many years ago were labeled as "C.P." (chemically pure). Although an analysis appeared on most labels, actual "purity" remained undefined. To rectify this anomaly, standard specifications of purity were developed by the American Chemical Society Committee on Analytical Reagents, and the "C.P." designation was changed to "Reagent Grade."

ASTM Terminology Techniques

How can standards writers assure compliance with the policy on terminology, a requirement of the *Regulations Governing ASTM Technical Committees*? The following practices are recommended:

- Identification of absolute terms in a standards draft is the responsibility of editors in both the committee and the staff. Upon identification, examine each use of an absolute term for policy compliance. Neglect of this procedure could trigger a negative vote based on noncompliance. Subsequent consideration of the negative by the responsible subcommittee should then assure compliance. Such negative comments normally can be averted by observing the review procedures described here.
- ASTM policy expresses the need to define technical terms in standards. Within their fields, most committees have defined technical terms that have meanings more specialized or more restricted than their common-language definitions. Therefore, begin editorial review of a draft standard with an inspection of the general and specific terminology to identify terms and definitions that are questionable for compliance. Policy forbids the use of terms (usually nouns) that express an absolute, unqualified or unconditional property or capability; and it cautions against use of quantifiable terms (usually adjectives) unless quantification is included.
  - Avoid absolute nouns that express broad figurative concepts. They are most likely to cause confusion in the general user. Typical nouns are: *damage*, *defect*, *failure*, *imperfection*, *inhibitor*, *reinforcement*, *resistance*, *safety*, *seal*, *waterproofing*. It is best to narrow such concepts using a descriptive adjective to make a specific (and more easily defined) term. Examples might then become: *impact damage*, *skin defect*, *adhesion failure*, *surface imperfection*, *decay inhibitor*, *concrete reinforcement*, *water resistance*, *fire safety*, *window seal*, *foundation waterproofing*. These enhanced terms comply with the policy, and the figurative sense is thereby obviated.
  - Do not use or define absolute adjectives singly. Typical adjectives are: *clean*, *flat*, *high*, *hot*, *pure*, *representative*, *rigid*, *safe*, *standard*, *strong*, *thick*. Instead, use the absolute adjective to modify an appropriate noun. The compound term thus formed can be defined in an explicit sense. Examples could then become: *clean room*, *flat asphalt*, *high vacuum*, *hot cathode*, *pure shear*, *representative sample*, *rigid plastic*, *safe harbor*, *standard test method*, *strong box*, *thick place*. Ambiguity and confusion are thus avoided.

- The policy directs that quantifiable terms be given quantitative standard definitions. The following definition is a good example:

  water-resistance, n—measured ability to retard both penetration and wetting by water in liquid form. Discussion: The method of test must be stated since the degree of resistance depends on the way it is determined or measured. *D 966*

  Ambiguous descriptive terms such as *resistance*, *repellency*, *conductance*, *permeance* are meant to express perfomance properties. But unless standards indicate how the performance is to be measured, the term can be understood only as a general criterion and not as describing a specific property

- If an absolute term requires qualification for the purpose of a particular standard, write a suitably delimited definition. An example:

  waterproofing, n—in building construction, treatment of a surface or structure to prevent passage of liquid water under hydrostatic, dynamic or static pressure. *C 717*

  This definition, although properly delimited, would be improved by including in a discussion the method test that validates the concept.

- The ambiguity inherent in polysemous terms (terms with multiple meanings) can cause misunderstanding and confusion. The reader may assume a meaning not intended by the standards writers. Do not adopt such terms. If unavoidable, however, it is essential that the intended meaning be clearly defined in the standard. Examples (some discussed earlier in this series) are: *inhibitor*, *barrier*, *test*, *protocol*, *reference*, *need*, *sample*, *specimen*.

ASTM Terminology Management

Improper use of absolute terms, as well as the "overriding concern for impersonal statement, logical exposition and precise description" mandate that terminology management in technical committees supersede random and unorganized adoption of standard terms and definitions. Bylaws of several committees do include terminology management rules. Specific guidance is provided in Part E of *Form and Style for ASTM Standards* ("Blue Book"). The ASTM Standing Committee on Terminology offers guidance upon request.

When nearly 400 years ago, Escalus (Shakespeare's Prince of Verona) declaimed against ambiguities, he could not have thought his negative comment would reach far beyond Romeo and Juliet and into the standards development world. Yet today the consequences of inadvertently adopting ambiguities and improper absolutes in standards must indeed "give us pause."

Wayne Ellis

Reprinted from the August 1993 issue of *Standardization News*, pp. 18, 19.

TERMINOLOGY UPDATE

Keywords, Index Terms, and Thesauri*

Keywords are the words and terms found in text that provide clues as to what a document is about. As such, they may be used to assist in the retrieval of documents and other information. At ASTM, keywords are selected by the authors of documents and provide the indexer with guidance in selecting terms used for indexing. They may be selected as index terms themselves, but by no means are they the only index terms.

One example used by ASTM Senior Indexer H. Joel Shupak in an earlier Terminology Update (April 1987) is the term "liquid chromatography" that might have been used in the title, scope or text of a standard, but would be best indexed as "chromatographic techniques or procedures." The indexer and the authors thus complement each other's work by offering both general and specialized terms that provide access to the intellectual content of a document. Index terms are frequently broader than keywords and, in turn, broaden the audience that may find and then use the information.

Keywords used in titles and scopes of standards should be defined in the committee's terminology standard, which is a source for possible keywords that the author may select. Both keywords and index terms are useful in retrieving a document or its contained information. They can be used as entry points to aid a reader in finding textual material on a particular subject. Although some keywords are suitable terms of an index, the "aboutness" of a document generally requires judgment calls that are typically supplied by an experienced indexer.

Wayne Ellis provided guidance for the selection of keywords for standards in a five-step process:

1) Make sure the scope section contains explicit information about the intent and content of the standard.
2) Use the scope to compose a concise title that is complete enough to identify the "aboutness" of the standard.
3) With information retrieval in mind, select appropriate terms from the title, scope and body of the standard.
4) Compare these terms with your committee's terminology standard. If you have a suitable hierarchical thesaurus, use your list of keywords to find additional broader terms that are likely to be invoked by the searcher who is not an expert in your field. Add these to the keyword list to assist the staff indexer.
5) Review the list of keywords you have generated for relevance and coherence, comparing them with phrases and terms already in the index to the *Annual Book of ASTM Standards*.

*This Terminology Update is based in great measure on papers by Wayne Ellis and others found in the most recent ASTM terminology Special Technical Publication (STP), *Standardizing Terminology for Better Communication: Practice, Applied Theory, and Results*, STP 1166 (R.A. Strehlow and S.R. Wright, editors), 1993, pp. 65–74, 95–105 and 255–269. The Terminology Update by H.J. Shupak discussed above provides still more helpful information and is found reprinted in an earlier STP, *Standardization of Technical Terminology: Theory* and *Practice*, Vol. II, ASTM STP 991 (R.A. Strehlow, editor), 1988, pp. 115–116. These terminoloty STPs along with STP 806 are recommended to those who want practical terminological advice and assistance.

If a suitable thesaurus reflecting a clear, conceptual structure does not exist for your field, consider helping your committee develop one for your committee needs. A thesaurus that is generated without detailed specialized terminology at its base conceivably may be useful, but will generally have fatal omissions that make it distinctly less valuable.

Keywords, index terms, and thesauri are all part of the terminology apparatus that allow your standards to be found, understood and used. They're worth taking seriously.

Richard A. Strehlow

Reprinted from the January 1994 issue of *Standardization News*, p. 17.

TERMINOLOGY UPDATE

Parentheses—Curse of an Old Technology?

My venerable *University of Chicago Style Guide* says that parentheses are used for clauses that are "wholly irrelevant to the main argument." If so, *why are parentheses found in ASTM definitions*?

Even the casual reader can be taken aback by a pair of parentheses in a definition, or (even worse) in a term. I (as a loyal ASTM terminologist) read the *Compilation of ASTM Standard Definitions* avidly. (Shockingly) I find parentheses—many parentheses.

Why are they used? Here are some examples:

- From E-20: **centigrade (obsolete),** *n*—...

  → *A comment;*

- *From E-18:* **cth, r.n. (odor),** *n*—...

  → Used with two different definitions, apparently a class not otherwise identified;

- From D-13: **inches per rack (IPR),** *n*–...

  → An abbreviation;

- From D-11: **mixer, internal**—a machine with...a specially shaped rotor (or rotors)...

  → A qualification;

- From G-1: **mixed potential**—the potential of a specimen (or specimens in a galvanic couple) when...

  → A possible alternate designation;

- From E-10: **ionizing radiation**—...processes. (For example, ...)

  → An example that would properly be in discussion;

- From E-21: **regular (direct) transmission**—...

  → A synonymous term;

- From E-12: **density** (of solids and liquids)–...
  → Properly, a delimiter; and
- From F-5: **vertical field separators**–(1) a vertical line...(2) See **field separator.**
  → Two definitions under one term deserve separate treatment.

Apparently, in ASTM, parentheses are used to indicate lack of agreement, synonymy, reference, variants, delimitation, or other unnamed reasons.

In these examples, we see only the surface of a problem that leads to ambiguity even as we try to achieve clarity. The uses for parentheses as specified in Part E of *Form and Style for ASTM Standards* are: synonyms, "see also," comparisons, unit equivalences, or year designations in references.

Parentheses don't belong in the term itself. They don't need to be used gratuitously if there could remain some confusion in the originating committee about what is intended. And they don't need to be used to add qualification when a single definition could not be agreed or in committee.

For many centuries, technical innovations in text presentation have led to enhanced clarity and usefulness in expression. Lower case letters (generally attributed to Charlemagne in the ninth century) and periods signifying the ends of sentences in late medieval times are examples of early technical means used in texts for specific purposes. Other technical devices such as commas, boldfaced type, fonts, italics, parentheses and more were developed later.

Perhaps these old technologies have become so commonplace that they have lost their special functions and are now cursed with ambiguous significance. I don't think so. All have their proper place, and they should not be abused.

Richard A. Strehlow

Reprinted from the February 1994 issue of *Standardization News*, p. 17.

TERMINOLOGY UPDATE

ASTM Special Technical Publication 1166—State of the Art in Terminology

This third volume in the series of ASTM books on terminology, as with the earlier ones, is essential reading for any standardizer who strives to write unambiguous, high-grade standards. The papers in this volume describe activity in the field of terminology around the world and show how terminology work can be applied to increase communication efficiency and add value to both documents and databases.

Since the first ASTM Special Technical Publication (STP) on Terminology was published almost 10 years ago, containing papers from a symposium on terminology standardization, both practical methodology and the theory of terminology standardization have progressed.

This volume presents 27 new papers from authors in North America, Europe and Asia and provides an overview of terminology work today.

The volume is arranged into four parts:

- Issues in Terminology;
- Applying Terminological Principles and Theories;
- Compuerization and Database Applications; and
- Terminology for Special Languages and Nomenclatures

The importance of particular issues in terminology varies with locale and language. The first section of the volume consists of a selection of six papers representing significant current concerns and activities in the United States, Canada, the Commonwealth of Independent States, and China. The increasing role of technical terminologies for broader and larger user groups, the growing role of computerized databases with their unique terminological challenges, and the role of terminology in computer-based knowledge representation are all detailed, along with accurate descriptions of practical methods.

Clear descriptions of terminological principles and theories are presented in five papers in the second section for subject specialists engaged in terminology work. Recognizing that unambiguous terminology is crucial in comptuter applications where the retrieval of information hinges on high terminological precision, 10 papers in the third section cover both general and theoretical aspects. Practical methods and techniques are presented along with theoretical basics. Data element terminology, the growing role of Standard Generalized Markup language (SGML), and other applications of new technologies are all treated.

The final section on specific subject applications gives guidance, tips and pitfalls for standardizers. Information on keyword selection, naming rules, and management procedures for technical committees are described.

In the first volume of the series, the editor, Frank Heymann, lists a series of specific actions that a voluntary standards-writing body such as ASTM might undertake in response to the points raised during the initial symposium. Heymann's six points provide good perspective on the course that terminology work in ASTM has taken in the last decade:

1) Establish liaison with international bodies;
2) Promote a better awareness of terminology standardization;
3) Promulgate specific guidelines for systematic development of standard vocabularies or terminologies;
4) Develop a standardized vocabulary relating to terminology;
5) Establish a computerized terminology bank; and
6) Standardize the use and meaning of terms in ASTM's own standards.

In the decades since that first volume in the series, progress has been made in ASTM on each of these issues. The present work documents the progress and charts a course that continues this work, but also addresses information management issues that are likely to grow in importance in the coming years.

Richard A. Strehlow

Standardizing Terminology for Better Communication: Practice, Applied Theory, and Results, ASTM STP 1166 (R.A. Strehlow and S.E. Wright, editors), ASTM, Philadelphia, Pa., 1993, pp. 390.

Reprinted from the March 1994 issue of *Standardization News*, p. 14.

TERMINOLOGY UPDATE

Defining Mathematical Expressions

An equation can represent a concept with the utmost precision and accuracy. Why, when we write a standard definition for a mathematically defined concept, can't we simply list the equation along with the description of symbols used in it and then move on to other pursuits? Why does Part E of the guide, *Form and Style for ASTM Standards*, specify that such concepts be described verbally?

Equations are the substance of handbooks. They offer precision and accuracy and are readily comprehended by experts in a field. Verbal descriptions are harder for the expert to write, but provide an understanding of the concept for the nonexpert. A verbal description may outline the usefulness and applicability of a concept. This is why a simple paraphrasing of an equation is not sufficient.

How does one craft a definition statement of a concept typically specified by a mathematical equation? Some useful examples from the *Compilation of ASTM Standard Definitions* show a variety of approaches.

- **Resistivity**—that property of a material which determines its resistance to the flow of electric current.
- **Sauter mean diameter**—the diameter of a drop that has the same ratio of volume to surface area as the ratio of total volume to total area for a distribution of drops
- **Resolution**—the fineness of detail in an object which is revealed by an optical device.
- **Contrast**—the degree of dissimilarity of a measured quantity such as luminance of two areas
- **Magnetic moment**—a measure of the magnetizing force.

These samples from the compilation show how some ASTM definition writers have met the problem of selecting a genus for a concept. Here we see "measure, degree, fineness, and property." On the other hand, phrasing such as "–is defined as ...," or "the defining equation for ... is" followed by an equation are not satisfactory verbal definition statements.

Mathematical expressions such as "ratio," "quotient," "a number," "dimensionless number," "product," "slope," "logarithm," "difference," "square-root," and "cotangent" are generally found in the compilation. Often, these expressions flag definitions that may only re-state a mathematical expression or equation, and do not contribute to conceptual understanding.

If definitions like these are found in some of your committee's standards, you might ask whether there is a conceptually sound description that might be an improvement. Certainly, the equation or formula itself is appropriate for inclusion in the discussion relating to a term but, in the definition itself, we should strive to write verbal descriptions that aid readers in gaining conceptual understanding.

A definition of a quantity should express its qualitative meaning as well as indicate how the quantity is calculated. Two useful hints are to read the compilation and to follow the guidance of Part E of *Form and Style for ASTM Standards*.

Richard A. Strehlow

Reprinted from the April 1994 issue of *Standardization News*, p. 12.

TERMINOLOGY UPDATE

Resistivity Revisited

I would like to comment on the definition for "resistivity" cited by Richard Srehlow in the Terminology Update in April's *Standardization News*. The definition states in part: "that property of a material which determines its resistance to the flow of electric current." The *Compilation of ASTM Standard Definitions* indicates that this definition was generated within a technical committee having expertise in the technology of magnetic materials, Committee A-6 on Magnetic Properties.

In the first place, the definition is at variance with the recommendations set forth in Part E4.1 of *Form and Style for ASTM Standards* (the Blue Book) which states, "If a term can have different meanings in other technical fields or contexts, the definitions shall contain an italicized phrase which limits the definition to its field of application." In the above example, it may not be obvious to any reader that the term "resistivity" is limited in this definition to the *electrical* resistiity rather than to a *thermal* resistivity.

In the second place, as a definition for electrical resistivity, it is technically incorrect. The technical error in the definition is the use of the expression "resistance to the flow of electrical current." An electric current does not flow! In an electrical circuit, a current exists as a direct result of subjecting a material to the application of an electrical potential (a voltage). Electric charges may be in motion, energy quanta may be moving; but the electric current *does not flow*.

In the third place, let's focus attention upon the word "resistance" which appears in the definition. The implication is that the resistance in an electrical resistance. Electrical resistance is an impediment to the transmission of electric charges or quanta of electrical energy between two locations. These two locations may be either within the bulk of a material or upon a single surface of a material. Thermal resistance is an impediment to the transmission of light between two locations. These two locations may be either within the bulk of a material or upon a single surface of a material. Optical resistance is an impediment to the transmission of light between two locations. These two locations may be either within the bulk of a material or upon a single surface of a material.

A specimen consisting of a good electrical conductor will have a very low electrical resistance. A specimen consisting of a very poor electrical conductor will have a very high electrical resistance. The magnitude of an electrical resistance can depend upon several other factors as well. Among these factors, but not limited to them, are:

1) The arrangement of electrodes in contact with a specimen of material;
2) The geometry of the material between each electrode;
3) The characteristics of the voltage applied to the electrodes;
4) The length of time of application of that voltage;
5) The homogeneity of the material between electrodes;
6) The temperature of the material; and
7) The arrangement of atoms within a moleule of the material.

In my opinion, the following statement is a fact: an electrical resistivity is a characteristic of a material which is calculated from an electrical resistance and the geometry of a specimen of the material. If one accepts the factual nature of that statement, logic dictates that resistivity is a characteristic of a material which is calculated from a resistance and the geometry of a specimen of the material.

I strongly recommend that the use of "resistivity" without a modifying adjective be prohibited from use in ASTM standards. Committee D-9 on Electrical and Electronic Insulating Materials has taken such an approach in D 1711, Terminology Relating to Electrical Insulation. That standard covers the terminology of electrical insulation and refrains from defining "resistivity" as a stand-alone term.

Carl Ackerman

Richard Strehlow, past chairman of the Committee on Terminology and author of several Terminology Updates, encourages responses such as this to Terminology Update columns.

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