Designation: E 176 – 99a

Standard Terminology of Fire Standards[1]

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1. Scope

1.1 This terminology covers terms, related definitions, and descriptions of terms used or likely to be used in fire-test-response standards, fire-hazard-assessment standards, and fire-risk-assessment standards. Definitions of terms are special-purpose definitions that are consistent with the standard definitions but are written to ensure that a specific fire-test-response standard, fire-hazard-assessment standard, or fire-risk-assessment standard is properly understood and precisely interpreted.

NOTE 1—For additional information, refer to ASTM Policy on Fire Standards.[2]

2. Referenced Documents

2.1 *ASTM Standards:*

D 3286 Test Method for Gross Calorific Value of Coal and Coke by the Isoperibol Bomb Calorimeter[3]

E 84 Test Method for Surface Burning Characteristics of Building Materials[4]

E 119 Test Methods for Fire Tests of Building Construction and Materials[4]

E 152 Methods of Fire Tests of Door Assemblies[5]

E 163 Method for Fire Tests of Window Assemblies[5]

E 648 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source[4]

E 800 Guide for Measurement of Gases Present or Generated During Fires[4]

E 814 Test Method for Fire Tests of Through-Penetration Fire Stops[4]

E 906 Test Method for Heat and Visible Smoke Release Rates for Materials and Products[4]

E 970 Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source[4]

E 1317 Test Method for Flammability of Marine Surface Finishes[4]

E 1321 Test Method for Determining Material Ignition and Flame Spread Properties[4]

E 1352 Test Method for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies[4]

E 1353 Test Method for Cigarette Ignition Resistance of Components of Upholstered Furniture[4]

E 1354 Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter[4]

E 1474 Test Method for Determining the Heat Release Rate of Upholstered Furniture and Mattress Components or Composites Using a Bench Scale Oxygen Consumption Calorimeter[4]

E 1529 Test Method for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies[4]

E 1537 Test Method for Fire Testing of Upholstered Furniture Items[4]

E 1590 Test Method for Fire Testing of Mattresses[4]

E 1623 Test Method for Determination of Fire and Thermal Parameters of Materials, Products, and Systems Using an Intermediate Scale Calorimeter (ICAL)[4]

E 1678 Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analyses[4]

E 1725 Test Method for Fire Tests of Fire Resistive Barrier Systems for Electrical System Components[4]

E 1776 Guide for Development of Fire-Risk-Assessment Standards[4]

E 1822 Test Method for Fire Testing of Stacked Chairs[4]

2.2 *ISO Standards:*

ISO/IEC Guide 52 Glossary of Fire Terms and Definitions

3. Significance and Use

3.1 *Definitions*—Terms and related definitions given in Section 4 are intended for use uniformly and consistently in all fire test standards and in all fire-test-response standards, fire-hazard-assessment standards, and fire-risk-assessment standards in which they appear.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 As indicated in Section 4, terms and their definitions are intended to provide a precise understanding and interpretation of fire-test-response standards, fire-hazard-assessment standards, and fire-risk-assessment standards in which they appear.

3.2.2 A specific definition of a given term is applicable to

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[2] Available from ASTM Headquarters, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

[3] *Annual Book of ASTM Standards,* Vol 05.05.

[4] *Annual Book of ASTM Standards,* Vol 04.07.

[5] Discontinued; see *1994 Annual Book of ASTM Standards,* Vol 04.07.

the standard or standards in which the term is described and used.

3.2.3 Different definitions of the same term, appearing respectively in two or more standards, are acceptable provided each one is consistent with and not in conflict with the standard definition for the same term, that is, concept.

3.2.4 Each standard in which a term is used in a manner specially defined (see 1.1 and Section 5) should list the term and its description under the subheading, Definitions of Terms.

3.3 Definitions for some terms associated with fire issues and not included in Terminology E 176 can be found in ISO/IEC Guide 52. When discrepancies exist, the definition in Terminology E 176 shall prevail.

4. Terminology

4.1 Terms and their standard definitions within the scope of this standard are given in Section 4 in alphabetical order. Annex A1 contains the definitions of terms that are included in other fire standards.

4.2 Discussions associated with definitions are printed directly under the appropriate definition. The date following each definition or discussion indicates the year of introduction or of latest revision of that particular definition or discussion.

afterglow, *n*—emission of light, usually subsiding, from a material undergoing combustion, but occurring after flaming has ceased. (1986)[6]

assembly, *n*—a unit or structure composed of a combination of materials or products, or both. (1990)

burn, *v*—to undergo combustion. (1989)

char, *v*—to form carbonaceous residue during pyrolysis or during incomplete combustion. (1979)

char, *n*—a carbonaceous residue formed by pyrolysis or incomplete combustion. (1979)

chimney effect—upward thrust of smoke and hot gases by convection currents confined in a vertical enclosure.

combustible, *adj*—capable of undergoing combustion. (1985)

DISCUSSION—The term combustible is often delimited to specific fire-exposure conditions. For example, building materials are considered combustible if they are capable of undergoing combustion in air at pressures and temperatures that might occur during a fire in a building. Similarly, some materials that are not combustible under such conditions may be combustible when exposed to higher temperatures and pressures or to an oxygen-enriched environment. Materials that are not combustible in bulk form may be combustible in finely divided form. (1985)

combustion, *n*—a chemical process of oxidation that occurs at a rate fast enough to produce temperature rise and usually light either as a glow or flame. (See also **glow** and **smoldering.**) (1989)

composite material, *n*—structured combination of two or more discrete materials.

environment, *n—as related to fire,* the conditions and surroundings that may influence the behavior of a material, product, or assembly when it is exposed to ignition sources or fire. (1989)

fire, *n*—destructive burning as manifested by any or all of the following: light, flame, heat, smoke. (1988)

fire-characteristic profile, *n*—an array of fire-test-response characteristics, all measured using tests relevant to the same fire scenario, for a material, product, or assembly to address, collectively, the corresponding fire hazard. (See also **fire hazard, fire risk,** and **fire-test-response characteristic.**) (1993)

DISCUSSION—An array of fire-test-response characteristics in a set of data relevant to the assessment of fire hazard in a particular fire scenario. In other words, all the fire tests used would have a demonstrated validity for the fire scenario in question, for example by having comparable fire intensities. The fire-characteristic profile is intended as a collective guide to the potential fire hazard from a material, product, or assembly involved in a fire that could be represented by the laboratory test conditions. (1993)

fire endurance, *n*—a measure of the elapsed time during which a material or assemblage continues to exhibit fire resistance. (1986)

DISCUSSION—As applied to elements of buildings, it shall be measured by the methods and to the criteria defined in Test Methods E 119, E 152, E 163, or E 814.

fire exposure, *n*—process by which or extent to which humans, animals, materials, products, or assemblies are subjected to the conditions created by fire. (1991)

fire gases, *n*—the airborne products emitted by a material, product, or assembly undergoing pyrolysis or combustion, that exist in the gas phase at the relevant temperature. (1979)

fire hazard, *n*—the potential for harm associated with fire. (1989)

DISCUSSION—A fire may pose one or more types of hazard to people, animals, or property. These hazards are associated with the environment and with a number of fire-test-response characteristics of materials, products, or assemblies including but not limited to ease of ignition, flame spread, rate of heat release, smoke generation and obscuration, toxicity of combustion products, and ease of extinguishment. (1989)

fire model, *n*—a physical representation or set of mathematical equations that approximately simulate the dynamics of burning and associated processes. (1992)

fire performance, *n*—response of a material, product, or assembly in a particular fire, other than in a fire test involving controlled conditions (different from **fire-test-response characteristic**). (1993)

DISCUSSION—The ASTM Policy on Fire Standards distinguishes between the response of materials, products, or assemblies to heat and flame under controlled conditions, which is fire-test-response characteristic, and under actual fire conditions, which is fire performance. Fire performance depends on the occasion or environment and may not be measurable. In view of the limited availability of fire-performance data, the response to one or more fire tests, appropriately recognized as representing end-use conditions, is generally used as a predictor of the fire performance of a material, product, or assembly. (1993)

fire performance characteristic, *n*—this term is deprecated. (See **fire-test-response characteristic** and **fire performance** (q.v.).) (1990)

fire performance test, *n*—this term is deprecated. (See **fire-test-response characteristic** and **fire performance** (q.v.).)

fireproof, adj—an inappropriate and misleading term. Do not use. (See commentary in X1.2.)

[6] Date indicates year of introduction or latest review or revision.

DISCUSSION—This term was originally used to describe buildings having all noncombustible structural elements and some degree of fire resistance. However, the term has been misunderstood to mean an absolute or unconditional property, and therefore the use of the term, fireproof, is inappropriate and misleading.

fire resistance, *n*—the property of a material or assemblage to withstand fire or give protection from it. (1986)

DISCUSSION—As applied to elements of buildings, it is characterized by the ability to confine a fire or to continue to perform a given structural function, or both.

fire resistant, adj—See **fire resistive**,the preferred term. (1983)

fire resistive, *adj*—having fire resistance (TCG-01). (1983)

fire retardant, n—a deprecated term. Do not use. (1986)

fire retardant, adj—not a defined term. Use as a modifier only with defined compound terms: **fire-retardant barrier, fire-retardant chemical, fire-retardant coating,** and **fire-retardant treatment.** (1986)

fire-retardant barrier, *n*—a layer of material which, when secured to a combustible material or otherwise interposed between the material and a potential fire source, delays ignition and combustion of the material when the barrier is exposed to fire. (1986)

fire-retardant chemical, *n*—a chemical, which when added to a combustible material, delays ignition and combustion of the resulting material when exposed to fire. (1986)

DISCUSSION—A fire-retardant chemical can be a part of the molecular structure, an admixture, or an impregnant.

fire-retardant coating, *n*—a fluid-applied surface covering on a combustible material which delays ignition and combustion of the material when the coating is exposed to fire. (See also **flame-retardant coating.** Compare **fire-retardant barrier.**) (1986)

fire-retardant treatment, *n*—the use of a fire-retardant chemical or a fire-retardant coating. (See also **flame-retardant treatment.**) (1986)

fire risk, *n*—an estimation of expected fire loss that combines the potential for harm in various fire scenarios that can occur with the probabilities of occurrence of those scenarios. (1993)

DISCUSSION—Risk may be defined as the probability of having a certain type of fire, where the type of fire may be defined in whole or in part by the degree of potential harm associated with it, or as potential for harm weighted by associated probabilities. However it is defined, no risk scale implies a single value of acceptable risk. Different individuals presented with the same risk situation may have different opinions on its acceptability. (1993)

fire scenario, *n*—a detailed description of conditions, including environmental, of one or more of the stages from before ignition to the completion of combustion in an actual fire, or in a full scale simulation.

DISCUSSION—The conditions describing a fire scenario, or a group of fire scenarios, are those required for the testing, analysis, or assessment that is of interest. Typically they are those conditions that can create significant variation in the results. The degree of detail necessary will depend upon the intended use of the fire scenario. Environmental conditions may be included in a scenario definition but are not required in all cases. Fire scenarios often define conditions in the early stages of a fire while allowing analysis to calculate conditions in later stages.

fire test exposure severity, *n*—a measure of the degree of fire exposure; specifically in connection with Test Methods E 119, E 152, and E 163, the ratio of the area under the curve of average furnace temperature to the area under the standard time/temperature curve, each from the start of the test to the end or time of failure, and above the base temperatures 68°F (20°C). (1976)

fire-test-response characteristic, *n*—a response characteristic of a material, product, or assembly, to a prescribed source of heat or flame, under controlled fire conditions; such response characteristics may include but are not limited to ease of ignition, flame spread, heat release, mass loss, smoke generation, fire endurance, and toxic potency of smoke. (1992)

DISCUSSION—A fire-test-response characteristic can be influenced by variables of exposure such as ignition source intensity, ventilation, geometry of item or enclosure, humidity, or oxygen concentration. It is not an intrinsic property such as specific heat, thermal conductivity, or heat of combustion, where the value is independent of test variables.

A fire-test-response characteristic may be described in one of several terms. Smoke generation, for example, may be described as smoke opacity, change of opacity with time, or smoke weight. No quantitative correlation need exist between values of a fire-test-response characteristic for different materials, products, or assemblies, as measured by different methods or tested under different sets of conditions for a given method. (1992)

flame, *n*—a hot, usually luminous zone of gas that is undergoing combustion. (1991)

DISCUSSION—The luminosity of a flame is frequently caused by the presence of glowing particulate matter suspended in the hot gases. (1991)

flame front, *n*—the leading edge of a flame propagating through a gaseous mixture or across the surface of a liquid or solid. (1983)

flameproof, adj—an inappropriate and misleading term. Do not use.

DISCUSSION—This term was originally used to describe the treatment of textile fabrics or other organic products to make them resistant to ignition. However, the term has been misunderstood to mean an absolute or unconditional property, and therefore the use of the term, flameproof, is inappropriate and misleading.

flame resistance, *n*—the ability to withstand flame impingement or give protection from it. (1983)

flame resistant, *adj*—having flame resistance. (1983)

flame resistive, n—See **flame resistant,** the preferred term. (1983)

flame retardant, n—a deprecated term. Do not use. (1986)

flame retardant, *adj*—not a defined term. Use only as a modifier with defined compound terms: **flame-retardant chemical, flame-retardant coating,** and **flame-retardant treatment.** (1986)

flame-retardant chemical, *n*—a chemical, which when added to a combustible material, delays ignition and reduces flame spread of the resulting material when exposed to flame impingement. (See also **fire-retardant chemical.**) (1986)

flame-retardant coating, *n*—a fluid-applied surface covering on a combustible material which delays ignition and reduces flame spread when the covering is exposed to flame impingement. (See also **fire-retardant coating.**) (1986)

flame-retardant treatment, *n*—the use of a flame-retardant

chemical or a flame-retardant coating. (See also **fire-retardant treatment.**) (1986)

flame speed, *n*—the velocity of propagation of a flame front through a gaseous mixture (fuel and oxidizer) relative to a reference point. (1982)

flame spread, n—See **surface flame spread, volumetric flame spread.** (1989)

flame spread index, *n*—a number or classification indicating a comparative measure derived from observations made during the progress of the boundary of a zone of flame under defined test conditions. (1986)

flameproof, *adj*—an inappropriate and misleading term. Do not use.

DISCUSSION—This term was originally used to describe the treatment of textile fabrics or other organic products to make them resistant to ignition. However, the term has been misunderstood to mean an absolute or unconditional property, and therefore the use of the term, flameproof, is inappropriate and misleading.

flammable, *adj*—(*1*) capable of burning with a flame under specified conditions, or (*2*) when used to designate high hazard, subject to easy ignition and rapid flaming combustion. (1995)

DISCUSSION—The first definition is needed as it is the definition recognized by the principal international standardization bodies, the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO). The second definition has been the ASTM Terminology E 176 definition and is the principal definition recognized by the lay public. The terms in the second definition "easy ignition" and "rapid flaming combustion," may seem insufficiently precise but are made precise in standards that use the terms in that way, such as standards on the fire hazards of materials (for example, NFPA 704; NFPA 321, on flammable liquids; and NFPA 55, on flammable gases). (1995)

flashover, *n*—the rapid transition to a state of total surface involvement in a fire of combustible materials within an enclosure.

DISCUSSION—Flashover occurs when the surface temperatures of an enclosure and its contents rise, producing combustible gases and vapors, and the enclosure heat flux becomes sufficient to heat these gases and vapors to their ignition temperatures. This commonly occurs when the upper layer temperature reaches 600°C or when the radiant heat flux at the floor reaches 20 kW/m^2.

glow, *n*—(*1*) the visible light emitted by a substance because of its high temperature. (*2*) visible light, other than from flaming, emitted by a solid undergoing combustion. (1989)

gross heat of combustion, *n*—the maximum amount of heat per unit mass that theoretically can be released by the combustion of a material, product, or assembly; it can be determined experimentally only under conditions of high pressure and in pure oxygen (See **effective heat of combustion**).

heat release rate, *n*—the heat evolved from the specimen, per unit of time.

heat stress, *n*—(physiological) adverse condition caused by exposure to elevated temperature, radiant heat flux, or combinations of these factors. (1988)

ignition, *n*—the initiation of combustion. (1989)

DISCUSSION—The combustion may be evidenced by glow, flame, detonation, or explosion. The combustion may be sustained or transient. (1989)

ignition temperature, *n*—the lowest temperature at which sustained combustion of a material can be initiated under specified test conditions. (1990)

DISCUSSION—While the phenomenon of combustion may be transient or sustained, in fire testing practice, the ignition temperature is reached when combustion continues after the pilot source is removed. (1990)

incandescene, *n*—emission of light produced by a material when intensely heated. It can be produced with or without combustion.

mass burning rate, *n*—mass loss per unit time by materials burning under specified conditions. (1989)

noncombustible, *adj*—not combustible. (See **combustible.**) (1989)

optical density of smoke, *D, n*—a measure of the attenuation of a light beam passing through smoke, expressed as the common logarithm of the ratio of the incident flux, I_o, to the transmitted flux, *I.* ($D = \log_{10}(I_o/I)$). (1989)

orientation, *n*—the plane in which the exposed face of the specimen is located during testing. (1977)

DISCUSSION—The orientation may be vertical, horizontal or at an angle. In the latter two cases, the specimen may be facing up or down. (1977)

oxygen consumption principle, *n*—the expression of the relationship between the mass of oxygen consumed during combustion and the heat released.

oxygen depletion, *n—in a fire,* reduction of oxygen (O_2) content of an atmosphere as a result of combustion. (1988)

piloted ignition, *n*—ignition of combustible gases or vapors by a pilot source of ignition (compare **spontaneous ignition, unpiloted ignition**). (1991)

pilot source of ignition, *n*—a discrete source of energy, such as, for example, a flame, spark, electrical arc, or glowing wire (compare **piloted ignition, unpiloted ignition**). (1991)

pyrolysis, *n*—process of simultaneous phase and chemical species change caused by heat (compare **smoldering**). (1991)

screening test, *n—as related to fire,* a fire-response test performed to determine whether a material, product, or assembly (*a*) exhibits any unusual fire-related characteristics, (*b*) has certain expected fire-related characteristics, or (*c*) is capable of being preliminarily categorized according to the fire characteristic in question. (1993)

self heating, *n*—a rise in the temperature of a material, assemblage, or product caused by internal, exothermic chemical reaction. (1985)

self ignition, n—See **spontaneous ignition,** the preferred term. (1985)

smoke, *n*—the airborne solid and liquid particulates and gases evolved when a material undergoes pyrolysis or combustion. (1989)

DISCUSSION—So-called chemical smokes are excluded from this definition. (1989)

smoke obscuration, *n*—reduction of light transmission by smoke, as measured by light attenuation.

smoke toxicity, *n*—the propensity of smoke to produce adverse biochemical or physiological effects. (See **smoke.**) (1988)

smoldering, *n*—combustion of a solid without flame, often evidenced by visible smoke. (1979)

DISCUSSION—Smoldering can be initiated by small sources of ignition, especially in dusts or fibrous or porous materials, and may persist for an extended period of time after which a flame may be produced. (1979)

spontaneous ignition, *n*—unpiloted ignition caused by an internal exothermic reaction (compare **piloted ignition**). (1991)

standard temperature/time curve (standard time/temperature curve), *n—in fire testing,* a graphical representation derived from prescribed time-temperature relationships and used to control furnace temperature with progressing time. (1989)

DISCUSSION—One example is found in Test Methods E 119. (1989)

superimposed load, *n*—force applied to a specimen or structure other than that associated with its own mass. (1979)

surface flame spread, *n*—the propagation of a flame away from the source of ignition across the surface of a liquid or a solid. Compare: **volumetric flame spread** and **burning velocity.** (1989)

thermal decomposition, *n*—a process of extensive chemical species change caused by heat (different from thermal degradation, q.v.; compare **pyrolysis**). (1992)

thermal degradation, *n*—a process whereby the action of heat or elevated temperature on a material, product, or assembly causes a loss of physical, mechanical, or electrical properties (different from **thermal decomposition,** q.v.). (1992)

toxicity, *n*—the propensity of a substance to produce adverse biochemical or physiological effects. (1988)

toxic hazard, *n—as related to fire,* the potential for physiological harm from toxic products of combustion. (1995)

DISCUSSION—Toxic hazard reflects both the quantity of toxic products and the quality of those products, which is given by toxic potency. Toxic hazard is not the only hazard associated with fire. Toxic hazard is not an intrinsic characteristic of a material or product but will depend upon the fire scenario, the condition of use of the material or product, and possibly other factors. (1995)

toxic potency, *n—as applied to inhalation of smoke or its component gases,* a quantitative expression relating concentration and exposure time to a particular degree of adverse physiological response, for example, death, on exposure of humans or animals. (1991)

DISCUSSION—The toxic potency of the smoke from any material, product, or assembly is related to the composition of that smoke which, in turn, is dependent upon the conditions under which the smoke is generated. (1991)

unpiloted ignition, *n*—ignition caused by one or more sources of energy without the presence of a pilot source of ignition (compare **piloted ignition, spontaneous ignition**). (1991)

upholstered, *adj*—covered with material (as fabric or padding) to provide a soft surface.

volumetric flame spread, *n*—flame propagation through the volume of a gaseous mixture. (1989)

ANNEX

(Mandatory Information)

A1. DEFINITIONS OF TERMS

A1.0.1 Terms, their definitions, and the standard(s) to which they apply are given below in alphabetical order:

air drop, *n*—lengths of open run conductors or cables supported only at each end. (1995) **E 1725**

attic, *n*—an accessible enclosed space in a building immediately below the roof and wholly or partly within the roof framing. (1996) **E 970**

backing board, *n*—a noncombustible insulating board, mounted behind the specimen during actual testing to satisfy the theoretical analysis assumption of no heat loss through the specimen. It shall be roughly 25 ± 5 mm thick with a density no greater than 200 ± 50 kg/m^3. (1997) **E 1321**

batch sampling—sampling over some time period in such a way as to produce a single test sample for analysis. (1981) **E 800**

blackbody temperature, *n*—the temperature of a perfect radiator—a surface with an emissivity of unity and, therefore, a reflectivity of zero. (1997) **E 648**

bolster, *n*—pillow or similarly shaped unit containing upholstery material covered by upholstery cover material that may or may not be attached to the upholstered furniture item but is sold and delivered with it. (1994) **E 1352**

carboxyhemoglobin saturation, *n*—the percent of blood hemoglobin converted to carboxyhemoglobin from reaction with inhaled carbon monoxide. (1996) **E 1678**

combustion products—airborne effluent from a material undergoing combustion; this may also include pyrolysates. (1981) **E 800**

concentration-time curve, *n*—a plot of the concentration of a gaseous toxicant as a function of time. (1996) **E 1678**

corridor, *n*—an enclosed space connecting a room or compartment with an exit. The corridor may include normal extensions, such as lobbies and other enlarged spaces. (1997) **E 648**

compensating thermocouple, *n*—a thermocouple for the purpose of generating an electrical signal representing long-term changes in the stack metal temperatures wherein a fraction of the signal generated is subtracted from the signal

developed by the stack-gas thermocouples. (1997) **E 1317**

critical flux at extinguishment, *n*—a flux level at the specimen surface corresponding to the distance of farthest advance and subsequent self-extinguishment of the flame on the centerline of a specimen. (1997) **E 1317**

DISCUSSION—The flux reported is based on calibration tests with a special calibration dummy specimen.

critical radiant flux, *n*—the level of incident radiant heat energy on the floor covering system at the most distant flame-out point. It is reported as W/cm^2(Btu/$ft^2 \cdot s$). (1997) **E 648**

critical radiant flux, *n*—the level of incident radiant heat energy on the attic floor insulation system at the most distant flame-out point. It is reported as W/cm^2(or Btu/$ft^2 \cdot s$). (1996) **E 970**

Ct product, *n*—the concentration-time product in ppm · min obtained by integration of the area under a concentration-time curve. (1996) **E 1678**

deck, *n*—the upholstered support under the seat cushion in a loose-seat construction. (1994) **E 1352**

deck, *n—in upholstered furniture*, the upholstered support under the seat cushion in a loose seat construction. (1994) **E 1353**

dummy specimen, *n*—a noncombustible (as defined by 46 CFR 164.009) specimen used for standardizing the operating condition of the equipment, roughly 20 mm in thickness with a density of 750 ± 100 kg/m^3. (1997) **E 1317**

dummy specimen, *n*—a noncombustible insulating board used for stabilizing the operating condition of the equipment, mounted in the apparatus in the position of the specimen and removed only when a test specimen is to be inserted. It shall be roughly 20 ± 5 mm in thickness with a density of 750 ± 100 kg/m^3. (1997) **E 1321**

DISCUSSION—For the ignition tests, the dummy specimen board shall have a hole at the 50-mm position for mounting the fluxmeter.

effective heat of combustion, *n*—the measured heat release divided by the mass loss for a specified time period. (1997) **E 1474, E 1354**

effective heat of combustion, *n*—the measured heat release divided by the mass loss for a specific time period. (1994) **E 1623**

effective thermal property, *n*—thermal properties derived from heat-conduction theory applied to ignition/flame-spread data treating the material as homogenous in structure. (1997) **E 1321**

electrical system components, *n*—cable trays, conduits and other raceways, open run cables and conductors, cables, conductors, cabinets, and other components, as defined or used in the National Electrical Code, and air drops as defined in A1.1.1. (1995) **E 1725**

emissivity, *n*—the ratio of the power per unit area radiated from a material's surface to that radiated from a black body at the same temperature. (1994) **E 1623**

fire-resistive barrier system, *n*—a specific construction of devices, materials, or coatings installed around, or applied to, the electrical system components. (1995) **E 1725**

fire stop—a through-penetration fire stop is a specific construction consisting of the materials that fill the opening around penetrating items such as cables, cable trays, conduits, ducts, and pipes and their means of support through the wall or floor opening to prevent spread of fire. **E 814**

fire test, *n*—a procedure, not necessarily a standard test method, in which the response of materials to heat or flame (or both) under controlled conditions is measured or otherwise described. (1981) **E 800**

fire-test-response-characteristic index, *n*—a single quantitative measure that combines two or more fire-test-response characteristics for a material, product, or assembly, all developed under test conditions compatible with a common fire scenario, addressing collectively the corresponding threat. See also *fire-test-response-characteristic profile, fire hazard, fire risk, fire-test-response characteristic*. (1996) **E 1776**

fire-test-response-characteristic profile, *n*—array of fire-test-response characteristics for a material, product, or assembly, all developed under test conditions compatible with a common fire scenario, addressing collectively the corresponding threat. See also *fire hazard, fire risk, fire-test-response characteristic.* (1996) **E 1776**

flame-out, *n*—the time at which the last vestige of flame or glow disappears from the surface of the test specimen, frequently accompanied by a final puff of smoke; Time 0 is the time at which the specimen is moved into the chamber and the door closed. (1997) **E 648**

flux profile, *n*—the curve relating incident radiant heat energy on the specimen plane to distance from the point of initiation of flaming ignition, that is, 0 cm. (1997) **E 648**

fractional exposure dose (FED), *n*—the ratio of the Ct product for a gaseous toxicant produced in a given test to that Ct product of the toxicant which has been determined statistically from independent experimental data to produce lethality in 50 % of test animals within a specified exposure and postexposure time. Since the time values in this ratio numerically cancel, the FED also is simply the ratio of the average concentration of a gaseous toxicant to its LC_{50} value for the same exposure time. When not used with reference to a specific toxicant, the term FED represents the summation of FEDs for individual toxicants in a combustion atmosphere. (1996) **E 1678**

fume stack, *n*—a box-like duct with thermocouples and baffles through which flames and hot fumes from a burning specimen pass whose purpose is to permit measurement of the heat release from the burning specimen. (1997) **E 1317**

furniture mock-up or assembly, *n*—a representation of production furniture that uses the same upholstery cover material and upholstery material, constructed in the same manner as in production furniture, but with straight, vertical sides. (1994) **E 1352**

gas phase ignition, *n*—ignition of pyrolysis products leaving a heated surface by a pilot flame or other ignition source that does not impinge on nor significantly affect (by re-radiation) the heated surface. (1997) **E 906**

heat for ignition, *n*—the product of time from initial specimen exposure until the flame front reaches the 150-mm position and the flux level at this position, the latter obtained in prior

calibration of the apparatus. (1997) **E 1317**

heat for sustained burning, *n*—the product of time from initial specimen exposure until the arrival of the flame front, and the incident flux level at that same location as measured with a dummy specimen during calibration. (1997) **E 1317**

heating flux, *n*—the prescribed incident flux imposed externally from the heater onto the specimen at the initiation of the test. (1997) **E 1354**

heating flux, *n*—the incident flux imposed externally from the heater on the specimen at the initiation of the test. (1996) **E 1623, E 1474**

DISCUSSION—The specimen, once ignited, also is heated by its own flame.

heat release rate, *n*—the heat evolved from the specimen, expressed per unit area of exposed specimen area per unit of time. (1997) **E 1354**

heat release rate, *n*—the heat evolved from the specimen per unit of time. (1996) **E 1474**

heat release rate, *n*—the heat evolved from the specimen per unit of time and area. (1994) **E 1623**

ignitability, *n*—the propensity to ignition, as measured by the time to sustained flaming, in seconds, at a specified heating flux. (1997) **E 1623, E 1354**

ignitability, *n*—the propensity for ignition, as measured by the time to sustained flaming at a specified heating flux. (1996) **E 1474**

LC_{50}, *n*—a measure of lethal toxic potency; the concentration of gas or smoke calculated statistically from concentration-response data to produce lethality in 50 % of test animals within a specified exposure and postexposure time. (1996) **E 1678**

marine board, *n*—an insulation board of 750 ± 100 kg/m^3 density that meets the noncombustibility criteria of 46 CFR 164.009. (1997) **E 1317**

mass loss concentration, *n*—the mass loss of a test specimen per unit exposure chamber volume in $g \cdot m^{-3}$. (1996) **E 1678**

mattress, *n*—a mattress is a ticking (outermost layer of fabric or related material) filled with a resilient material, used alone or in combination with other products, intended or promoted for sleeping upon. (1996) **E 1474**

measured heat release of specimen, *n*—the observed heat release under the variable flux field imposed on the specimen and measured. (1997) **E 1317**

mirror assembly, *n*—a mirror, marked and aligned with the viewing rakes, used as an aid in quickly identifying and tracking the flame front progress. (1997) **E 1321, E 1317**

net heat of combustion, *n*—the oxygen bomb (see Test Method D 3286) value for the heat of combustion, corrected for gaseous state of product water. (1997) **E 1623, E 1354**

obvious ignition, *n*—pronounced continuous and self-sustaining combustion of the test system accompanied by rapid generation of heat and smoke. It is a matter of operator judgment based upon experience in this type of operation. (1994) **E 1353**

orientation, *n*—the plane in which the exposed face of the specimen is located during testing, either vertical or horizontal facing up. (1997) **E 1354**

oxygen consumption principle, *n*—the expression of the relationship between the mass of oxygen consumed during combustion and the heat released. (1997) **E 1354**

post-flashover, *adj*—the stage of a fire at which the average air temperature in the upper half of the room exceeds 600°C. (1996) **E 1678**

product, *n*—the upholstered furniture for which information is required. (1996) **E 1537**

product, *n*—mattress, or mattress with foundation, for which fire-test-response characteristics are to be measured. (1996) **E 1590**

quilted, *n*—fused or stitched with thread through the upholstery cover material and one or more layers of upholstery material. (1994) **E 1352**

radiant flux profile, *n*—the graph relating incident radiant heat energy on the specimen plane to distance from the point of initiation of flaming ignition, that is, 0 mm. (1996) **E 970**

reverberatory wires, *n*—a wire mesh located in front of, but close to, the radiating surface of the panel heat source which serves to enhance the combustion efficiency and increase the radiance of the panel. (1997) **E 1317**

sample integrity—the unimpaired chemical composition of a test sample upon the extraction of said test sample for analysis. (1981) **E 800**

sampling—a process whereby a test sample is extracted from a fire test environment. (1981) **E 800**

smoke developed index, *n*—a number or classification indicating a comparative measure derived from smoke obscuration data collected during the test for surface burring characteristics. **E 84**

smoke obscuration, *n*—reduction of light transmission by smoke, as measured by light attenuation. (1997) **E 1354**

SMOKE unit, *n*—the concentration of smoke particulates in a cubic metre of air that reduces the percent transmission of light through a 1-m path to 10 %. SMOKE = standard metric optical kinetic emission. (1997) **E 906**

special calibration board, *n*—a specially assembled noncombustible insulating board used for standardizing the operating condition of the equipment which is used only to measure the flux distribution at specified intervals along the specimen surface. It shall be roughly 20 ± 5 mm in thickness with a density of 750 ± 100 kg/m^3. (1997) **E 1321**

special calibration dummy specimen, *n*—a dummy specimen made of the same material as the dummy specimen, intended only for use in calibration of flux gradient along the specimen. (1997) **E 1317**

specimen, *n*—manufactured item of the product, representative prototype of the product, or mock-up of the product. (1996) **E 1537**

specimen, *n*—the manufactured item of the product, or representative prototype of the product. (1996) **E 1590**

specimen, *n*—a construction consisting of electrical system components and a fire-resistive barrier system. (1995) **E 1725**

stacking chair, *n*—chair that is intended to be stacked when not in use. **E 1822**

surface flame spread, *n*—the propagation of a flame away

from the source of ignition across the surface of the specimen. **E 84**

sustained flaming, *n*—existence of flame on or over most of the specimen surface for periods of at least 4 s. (1997) **E 1354**

DISCUSSION—Flaming of less than 4 s duration is identified as flashing or transitory flaming.

sustained flaming, *n*—the existence of flame on or over the surface of the specimen for a period of 4 s or more. (1996) **E 1474**

sustained flaming, *n*—existence of flame on or over the surface of the specimen for periods of 5 s. (1994) **E 1623**

DISCUSSION—Flaming of less than 4 s duration is identified as flashing or transitory flaming.

test assembly—the wall or floor into which the test sample(s) is (are) mounted or installed. (1981) **E 814**

test assembly, *n*—horizontal or vertical construction on which test specimens are to be mounted together with associated instrumentation. (1995) **E 1725**

test sample—a representative part of the experimental environment (gases, liquids, or solids) for purposes of analysis. (1981) **E 800**

test specimen, *n*—the fire stop being tested. **E 814**

test specimen, *n*—stack of five identical stacking chairs. **E 1822**

thermal operating level, *n*—the operating condition at which the radiance of the heat source produces a specified constant heat flux to some specified position at the specimen surface. (1997) **E 1321**

thermally thick, *n*—the thickness of a medium that is large enough to have the predominate thermal (temperature) effects experienced within that distance, that is, negligible heat is lost from its unexposed side. (1997) **E 1321**

total cold wall heat flux, *n*—the heat flux that would be transferred to an object whose temperature is 70°F (21°C).

total flux meter, *n*—the instrument used to measure the level of radiant heat energy incident on the specimen plane at any point. (1997) **E 970, E 648**

tufted, *n*—buttoned or laced through the upholstery cover material and upholstery material.

upholstered, *n*—covered with material (as fabric or padding) to provide a soft surface. (1994) **E 1353**

upholstered, *adj*—covered with material (as fabric or padding) to provide a soft surface. (1996) **E 1474**

upholstery cover material, *n*—the outermost layer of fabric or related material used to enclose the main support system or upholstery materials, or both, used in the furniture item. (1994) **E 1352**

upholstery cover material, *n*—the outmost layer of fabric or related material used to enclose the main support system or upholstery materials, or both, used in the furniture item. (1994) **E 1353**

upholstered furniture, *n*—a unit of interior furnishing that (*1*) contains any surface that is covered, in whole or in part, with a fabric or related upholstery cover material, (*2*) contains upholstery material, and *(3)* is intended or promoted for sitting or reclining upon. (1994) **E 1353, E 1352**

upholstery material, *n*—the padding, stuffing, or filling material used in a furniture item, which may be either loose or attached, enclosed by an upholstery cover material, or located between the upholstery cover material and support system, if present. (This includes, but is not limited to, material, such as foams, cotton batting, polyester fiberfill, bonded cellulose, or down). (1994) **E 1353, E 1352**

viewing rakes, *n*—a set of bars with wires spaced at 50-mm intervals for the purpose of increasing the precision of timing the flame front progress along the specimen. (1997) **E 1321, E 1317**

welt, *n*—the piping effect produced when welt cord and cover fabrics are sewn together for ornamental purposes to finish the edges between intersecting surfaces of upholstered furniture cushions, pillows, arms, or backs. (1994) **E 1353, E 1352**

welt cord, *n*—the continuous small-diameter cylindrical material that is wrapped in fabric and sewn as part of the cover to make a welt edge on upholstered furniture. (1994) **E 1352**

APPENDIXES

(Nonmandatory Information)

X1. HISTORICAL COMMENTARY

X1.1 In the 1970's ASTM decided to develop a Policy on Fire Standards. At the same time, the ASTM Committee on Terminology (COT) created a Terminology Coordinating Group under its auspices. This Terminology Coordinating Group was designated TCG-01. It consisted of representatives of Committee E05 on Fire Standards, COT and other interested technical committees.

X1.2 The responsibility of TCG-01 was to consider and recommend terms and definitions in the field of fire technology for the purpose of minimizing redundancies and eliminating conflicts in such terminology.

X1.3 That committee recommended several definitions, many of which have been amended over the years. Such definitions have included: afterglow, char (both as a noun and as a verb), fire exposure, fire gases, fire resistant (inappropriate and misleading), fire resistive, flame, flame front, flame resistance, flame resistant, flame resistive (as a less satisfactory alternative to flame resistant), flash point, glow, ignition, mass burning rate, optical density of smoke, piloted ignition, smoke, spontaneous ignition, surface flame spread rate, temperature

and unpiloted ignition. Not all of these terms are still included in Terminology E 176 and some of the definitions have since been amended.

X2. KEYWORDS

X2.1 Scope

X2.1.1 This appendix of keywords is provided as a resource and a convenience to aid in providing index and keyword items for fire standards of Committee E-5 as well as other ASTM Committees preparing fire standards. The list has been compiled from a list prepared by the Subcommittee at the time when mandatory keyword sections were first being added to most ASTM standards. Other appropriate keywords may apply.

X2.2 Guidelines

X2.2.1 Keywords should be selected on the basis of those that best represent the technical information presented in the standard.

X2.2.2 Select the keywords from the title and body of the standard and include general, vernacular and trade terms.

X2.2.3 Select three or more keywords that describe the names of tests, procedures, special materials, or the specific application(s) that will facilitate the identification and retrieval of the standard.

X2.2.4 All selected keywords should be stand-alone terms; the type of standard, incomplete phrases, unattached adjectives, and so forth should not be used.

X2.3 Resource List of Keywords

acid gases
activation energy
acute toxicity
afterburner
afterburning
afterglow
air leakage
air mixtures
air ratio
air movement
air velocity
analyzer
anhydrous fuels
animal models atmospheric
animal atmosphere
anoxia
asphyxia
autoignition
autoignition temperature
autoxidation
axisymmetric
behavior models
bench scale tests
blackbody
blackbody temperature
building code
buoyant flumes
buoyant flow
burn room
burnout parameter
burnout
burn through
burner
burning
burning velocity
burning rate
burning brand test
cable insulation
cable jacket
cable trays
cable sheath
calibrate
calibration burner
calorimeter
calorimetry
candle
carbon monoxide
carbon balance method
carbon dioxide
carboxyhemoglobin
ceiling jet
cellulosic fuel
chamber
char
char depth characteristic
characteristic time
charring
chimney
cigarette ignition
cigarette test method
combustibility
combustible properties
combustible elements
combustible
combustion gases
combustion toxicity
combustion efficiency
combustion products
combustion rate
combustion theory
combustion temperature
combustion toxicology
combustion test
combustion
cumulative smoke release
compartment fire
compartment
conductive heat transfer
conduction

conductivity
cone calorimeter
cone corrosimeter
confined conical heater
conical heater
containment
convection
convective heat transfer
corner test
corridor test
corridor test, quarter scale
crib fire
crib test
crib
critical temperature
critical radiant flux
critical flux for spread
critical irradiance
critical temperature ignition
critical flux for ignition
damper
decomposition
deformation
degradation
deluge
detection systems
differential pressure
diffusion fire
diffusion flame
diffusivity
door assemblies
dosage
dosimeter
drape
dual lcso
dummy specimen
effective heat of combustion
effective thermal properties
egress
electrical cable
emission
emissivity
emittance
enclosure environment
enclosure fire
endothermic
energy balance
enthalpy
entrainment
entropy
evacuation
event
exhaust duct
exhaust gases
exhaust velocity
exit
exothermic
experimental animals
experimental design
explosion
exposure
extinction
extinction coefficient
extinction time
extinguish
extinguisher
fabric flammability
fabric flammability testing
false alarm
fatality
fault trees
field models
fire
fire area
fire behavior
fire brand
fire chemistry
fire code
fire containment
fire containment walls
fire characteristic index
fire characteristic profile
fire control
fire effect
fire effluent
fire endurance
fire endurance test
fire exposure
fire gases
fire hazard
fire hazard analysis
fire hazard assessment
fire incident
fire model
fire penetrations
fire performance
fire physics
fire point
fire prediction
fire prevention
fire propagation
fire propagation index
fire properties
fire protection
fire research
fire resistance
fire resistive
fire resistive material
fire retardant barrier
fire retardant chemical
fire retardant coating
fire retardant treatment
fire risk
fire risk analysis
fire risk assessment
fire risk assessment standard

fire safety
fire scenario
fire severity
fire simulation
fire size
fire spread
fire statistic
fire stop
fire test
fire test chamber
fire test response
fire test response standard
fire tube apparatus
fire tube assembly
fire test response
fire test response standard
fire wall
fireball
firebox
firestop
flame
flame emissivity
flame entrainment coefficient
flame extinction coefficient
flame front
flame heating parameter
flame heat transfer factor
flame propagation
flame radiation
flame region
flame resistance
flame resistant
flame retardant chemical
flame retardant coating
flame retardant treatment
flame speed
flame spread
flame spread rate
flame spread test
flame temperature
flame travel rate
flame spread classification
flame spread index
flame velocity
flameless
flameout
flameover
flameproofing
flaming
flaming combustion
flaming ignition
flammability
flammability apparatus
flammability limits
flammability measurements
flammability tests
flammable gases
flammable liquids
flammable materials
flammable solids
flashpoint
flashback
flashover
floor radiant panel tests
flue
flux
flux distribution
flux gage
flux profile
flux time products
flux uniformity
fluxmeter
flying brand test
forest fuels
fractional radiation
free burning fires
free convection
free radical
free ventilation
froude number
fuel
fuel-air
fuel-air ratio
fuel-contributed index
fuel load
full-scale fire tests
furnace
furniture calorimeter
gas air
gases
gas density
gas phase ignition
gas velocity
gasification
glow
gravimetric soot sampler
graybody radiation
halon
hazard
hazard analysis
hazard assessment
hazardous materials
hazardous vapors
heat
heat balance
heat capacity
heat feedback
heat flow
heat flux coefficient
heat loss
heat of activation
heat of combustion
heat of gasification
heat of pyrolysis
heat of reaction
heat of solution

heat of vaporization
heat release
heat release fraction
heat release rate
heat resistant coatings
heat resistant materials
heat resistant plastics
heat transfer
heat transfer coefficient
heat transport
heater
heating
heating flux
heating tests
homogeneous gas reactions
homogeneous mixtures
hose stream test
hydrant
hydrocarbon combustion
hydrocarbon fuel
hydrocarbon pool fires
hyperbaric
hyperoxia
hypoxemia
hypoxia
ic50
ideal gas law
ignitability
igniter
igniting burner
ignition burner
ignition
ignition circuit
ignition correlation parameter
ignition resistance
ignition source
ignition temperature
ignition tests
ignition time
incandescence
incendiary
incinerator
index
induction
inert
infrared
inhalation toxicity
input
intensity
interior finish
intermittent flame exposure
intumescence test
intumescent
intumescent coatings
irradiance
irradiation isothermal
jet entrainment
jet flames
kindling
kinetic
laminar burning
laminar burning velocity
laminar flame propagation
laminar flames
laminar flow
laminar heat transfer
laminar jet flames
laminar mixing
large scale tests
laser extinction beam
latent heat
lateral flame spread
lc50
lc (ct) 50
life hazards
life safety
lift apparatus
light
light absorption
light extinction beam
light intensity
light path
limiting oxygen index
liquid fuel
luminous flames
mass burning rate
mass flow
mass loss
mass loss rate
mass optical density
mass transfer
mass transfer rate
mathematical models
measurement methods
medium scale tests
melting point
methenamine pill
methodology
model
model validation
model verification
modeling
moisture
mortality
mounting methods
multiple lc50
multiroom fires
multiventilation
national fire incident
reporting system (nfirs)
net heat of combustion
noncombustibility
noncombustibles
nonconductor
nonflaming
nonflaming combustion

nonignition
non-load bearing
nonluminous
nonthermal damage
occupational hazards
occupancy
occupancy classification
offgassing
Ohio State University
Ohio State University model
opacity
optical calibration filters
optical density
optical path length
optical properties
output
oven
overheating
oxygen concentration
oxygen consumption
oxygen consumption calorimeter
oxygen consumption principle
oxygen index
oxygen index test
particulate mass concentration
party-wall
pathological effects
permeability
photochemical oxidation
photochemical reaction
photometer
physiological effects
pill test
pilot
pilot burner
pilot flame
pilot source of ignition
piloted ignition
plasma
plenum cable
plume
plume entrainment coefficient
pool fire
post-fire
post-flashover
post-ignition
postheating
potential heat
precombustion
prefire
preflashover
preignition
propagation
purposeful ignition
pyrolysis
pyrolysis front
pyrolysis temperature
pyrometer
radiant combustion apparatus
radiant energy
radiant flux
radiant flux profile
radiant heat
radiant heat fill
radiant heat furnace
radiant heat source
radiant heat transfer
radiant panel test method
radiation
radiation absorption
radiation exposure
radiometer
rate of heat release
rate of mass loss
rate of smoke release
refractory tube method
release rates
residence time
residual flame time
residue
response surface method
response time
restraint
reynolds number
risk
risk analysis
risk assessment
risk elements
risk rating factors
room burns
room fire tests
room fires
scale effect
scaling
scenario
scorching
screening test
self propagating flux
self extinguishment
self-heating
side wall sprinkler systems
skin burns
small scale fire test
smoke
smoke control
smoke corrosivity
smoke damage
smoke density
smoke density chamber (e 662)
smoke density index
smoke emission factor
smoke filling
smoke flow
smoke generations
smoke measurement
smoke movement

smoke obscuration
smoke opacity
smoke penetration
smoke release
smoke release rate
smoke toxicity
smoke unit
smoke yield
smoldering
smoldering combustion
smoldering ignition
solid fuels
solid propellant ignition
soot
soot formation
soot sampling
spark
specific extinction area
specific heat
specific optical density
specific smoke extinction area
spontaneous combustion
spontaneous ignition
sprinkler
sprinkler system
stack
stack action
stack effect
stagnation
standard fire tests
standard flammability apparatus
standard temperature time curve
steady state combustion
steady state gasification
steiner tunnel
stephan-boltzman constant
stoichiometric ratio
stove
stratification
stratified flow
sublimation
substrate
superimposed load
suppression
suppression devices
surface emissivity
surface flame spread
surface flame spread rate
sustained flaming
temperature
temperature effects
temperature gradients
temperature measurements
temperature rise
temperature tests
thermal analysis
thermal conductivity
thermal damage
thermal decomposition
thermal degradation
thermal draft coefficient
thermal effects
thermal equilibrium
thermal inertia
thermal operating level
thermal properties
thermally thick
thermally thin
thermochemistry
thermocouple
thermogravimetric analysis
thermometer
thermopile
through penetration fire stop
time to ignition
time to sustained burning
torch
total flux meter
total heat flux
total heat release
total smoke release
toxic fire hazard
toxic hazard
toxic potency
toxic potency test
toxicity
toxicity tests
tunnel furnace
tunnel tests
turbulent burning
turbulent burning velocity
turbulent combustion
turbulent flames
turbulent jet flames
two stage ignition
University of Pittsburgh
unpiloted ignition
unpiloted ignition toxicity
urban fires test (upitt)
urban fuels
van der waals effects
vertical furnace
visible smoke
volume flame spread
wall fires
weight loss rate
wood smoke
xp2 chamber test
zone models