Designation: E176 – 08a

An American National Standard

Standard Terminology of Fire Standards[1]

This standard is issued under the fixed designation E176; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

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]

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.3 This fire standard cannot be used to provide quantitative measures.

2. Referenced Documents

2.1 *ASTM Standards:*[3]

D3675 Test Method for Surface Flammability of Flexible Cellular Materials Using a Radiant Heat Energy Source

D5865 Test Method for Gross Calorific Value of Coal and Coke

E84 Test Method for Surface Burning Characteristics of Building Materials

E136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

E119 Test Methods for Fire Tests of Building Construction and Materials

E152 Methods of Fire Tests of Door Assemblies[4]

E162 Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source

E603 Guide for Room Fire Experiments

E163 Methods of Fire Tests of Window Assemblies[4]

E603 Guide for Room Fire Experiments

E648 Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

E800 Guide for Measurement of Gases Present or Generated During Fires

E814 Test Method for Fire Tests of Penetration Firestop Systems

E906 Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using a Thermopile Method

E970 Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source

E1317 Test Method for Flammability of Marine Surface Finishes

E1321 Test Method for Determining Material Ignition and Flame Spread Properties

E1352 Test Method for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies

E1353 Test Methods for Cigarette Ignition Resistance of Components of Upholstered Furniture

E1354 Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter

E1355 Guide for Evaluating the Predictive Capability of Deterministic Fire Models

E1474 Test Method for Determining the Heat Release Rate of Upholstered Furniture and Mattress Components or Composites Using a Bench Scale Oxygen Consumption Calorimeter

E1509 Specification for Room Heaters, Pellet Fuel-Burning Type

E1529 Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies

E1537 Test Method for Fire Testing of Upholstered Furniture

E1590 Test Method for Fire Testing of Mattresses

[1] This terminology is under the jurisdiction of ASTM Committee E05 on Fire Standards and is the responsibility of Subcommittee E05.31 on Terminology and Editorial.

Current edition approved Dec. 15, 2008. Published January 2009. Originally approved in 1961. Last previous edition approved in 2009 as E176 – 08. DOI: 10.1520/E0176-08A.

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

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Withdrawn.

E1623 Test Method for Determination of Fire and Thermal Parameters of Materials, Products, and Systems Using an Intermediate Scale Calorimeter (ICAL)

E1678 Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analysis

E1725 Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components

E1740 Test Method for Determining the Heat Release Rate and Other Fire-Test-Response Characteristics of Wallcovering Composites Using a Cone Calorimeter

E1776 Guide for Development of Fire-Risk-Assessment Standards

E1822 Test Method for Fire Testing of Stacked Chairs

E1966 Test Method for Fire-Resistive Joint Systems

E1995 Test Method for Measurement of Smoke Obscuration Using a Conical Radiant Source in a Single Closed Chamber, With the Test Specimen Oriented Horizontally

E2010 Test Method for Positive Pressure Fire Tests of Window Assemblies[4]

E2032 Guide for Extension of Data From Fire Resistance Tests Conducted in Accordance with ASTM E 119

E2058 Test Methods for Measurement of Synthetic Polymer Material Flammability Using a Fire Propagation Apparatus (FPA)

E2061 Guide for Fire Hazard Assessment of Rail Transportation Vehicles

E2067 Practice for Full-Scale Oxygen Consumption Calorimetry Fire Tests

E2074 Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies[4]

E2102 Test Method for Measurement of Mass Loss and Ignitability for Screening Purposes Using a Conical Radiant Heater

E2187 Test Method for Measuring the Ignition Strength of Cigarettes

E2226 Practice for Application of Hose Stream

E2230 Practice for Thermal Qualification of Type B Packages for Radioactive Material

E2231 Practice for Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics

E2257 Test Method for Room Fire Test of Wall and Ceiling Materials and Assemblies

E2280 Guide for Fire Hazard Assessment of the Effect of Upholstered Seating Furniture Within Patient Rooms of Health Care Facilities

E2335 Guide for Laboratory Monitors

E2404 Practice for Specimen Preparation and Mounting of Textile, Paper or Vinyl Wall or Ceiling Coverings to Assess Surface Burning Characteristics

E2405 Test Method for Determination of Fire and Thermal Parameters of Materials Using an Intermediate Scale Test with Vertically Oriented Specimen

2.2 *ISO Standards*[5]:

ISO 1182, Fire Tests-Building Materials-Non-Combustibility Test

ISO 13943, Fire Safety-Vocabulary

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 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) shall 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 E176 are found in ISO 13943. When discrepancies exist, the definition in Terminology E176 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*—persistence of glowing combustion after both removal of the ignition source and the cessation of any flaming. (2005)[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 movement of hot fire effluent caused

[5] Available from International Standardization Organization, ISO Central Secretariat 1, rue de Varembé, Case postale 56, CH-1211, Geneva 20, Switzerland or American National Standards Institute, 11 West 42nd Street, New York, NY, 10046.

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

by convection currents confined within an essentially vertical enclosure. (2006)

DISCUSSION—This usually draws more air into the fire. (2006)

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)

combustion products, *n*—effluent produced when a material undergoes combustion (see also **smoke**; see also **combustion**). (2001)

DISCUSSION—The combustion process releases effluents that have mass, in gaseous, liquid, or solid form, and generates radiant energy, as heat or light, and sometimes sound. However, the common usage of the term *combustion products* in ASTM E05 standards is only for those which have mass. (2001)

composite, *n*—structured combination of two or more discrete materials. (2008)

continuous, *adj—in data collection*, conducted at intervals of 5 s or less. (2008)

effective heat of combustion, *n*—the amount of heat generated per unit mass lost by a material, product or assembly, when exposed to specific fire test conditions (contrast **gross heat of combustion**) (2003).

DISCUSSION—The effective heat of combustion depends on the test method and is determined by dividing the measured heat release by the mass loss during a specified period of time under the specified test conditions. Typically, the specified fire test conditions are provided by the specifications of the fire test standard that cites effective heat of combustion as a quantity to be measured. For certain fire test conditions, involving very high heat and high oxygen concentrations under high pressure, the effective heat of combustion will approximate the gross heat of combustion. More often, the fire test conditions will represent or approximate certain real fire exposure conditions, and the effective heat of combustion is the appropriate measure. Typical units are kJ/g or MJ/kg. (2001)

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 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.).) (1990).

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

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. (1990)

fire resistance, *n*—the ability of a material, product, or assembly to withstand fire or give protection from it for a period of time. (Contrast **fire resistance rating**.) (2004)

DISCUSSION—As applied to elements of buildings, fire resistance is characterized by the ability to confine a fire or to continue to perform a given structural function, or both. More specific examples of this ability include retention of stability (loadbearing capacity), integrity or thermal insulation. Once a measure of time is defined for fire resistance,

and exposure conditions specified for that measure, the result is a fire resistance rating. (2004)

fire resistance rating, *n*—a measure of the elapsed time during which a material, product, or assembly continues to exhibit fire resistance under specified exposure conditions. (Contrast **fire resistance**.) (2004)

DISCUSSION—This term is defined because it is used in codes. As applied to elements of buildings, it is commonly measured by the methods and to the criteria defined in Test Methods E119 or Specification E1509. (2004)

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. (1986)

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. (1998)

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. (1998)

fire test exposure severity, *n*—a measure of the degree of fire exposure; specifically in connection with Test Methods E119, E152, and E163, 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 resistance, and toxic potency of smoke. (1992)

DISCUSSION—A fire-test-response characteristic can be influenced by variable characteristics of the heat source, such as its intensity, or of the burning environment, such as 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. (2005)

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. (1983)

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. (1983)

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*—propragation of a flame front (see **surface flame spread, volumetric flame spread**). (2005)

flame spread index, *n*—a comparative measure expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time in Test Method E84. (2001)

DISCUSSION—Classifications have been developed using these values. This index is different from that derived in Test Methods E162 or D3675. (2001)

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 E176 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. (1997)

DISCUSSION—Flashover is a fluid–mechanical combustion instability within an enclosure that occurs when the surface temperatures of an enclosure and its contents rise rapidly, producing combustible gases and vapors, and the enclosure heat flux becomes sufficient to heat these gases and vapors to their ignition temperatures. At flashover, the volume occupied by hot combustion gases rapidly increases and ends up comprising more than 50% of the enclosure's volume. Experimentally it is found that flashover occurs when the upper gas layer temperature surpasses 600°C or when the radiant heat flux at the floor surpasses 20 kW/m^2. Visually, flashover often corresponds to a transition from flaming on a few surfaces to flames throughout the volume of the enclosure. (2002)

gasification, *n*—transformation of a solid and/or liquid material into a gaseous state. (2001)

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 (contrast **effective heat of combustion**). (2003)

heat flux, *n*—heat transfer to a surface per unit area, per unit time (see also **initial test heat flux**).(2008)

DISCUSSION—The heat flux from an energy source, such as a radiant heater, can be measured at the initiation of a test (such as Test Method E1354 or Test Method E906) and then reported as the incident heat flux, with the understanding that the burning of the test specimen can generate additional heat flux to the specimen surface. The heat flux can also be measured at any time during a fire test, for example as described in Guide E603, on any surface, and with measurement devices responding to radiative and convective fluxes. Typical units are kW/m^2, kJ/(s m^2), W/cm^2, or BTU/(s ft^2). (2001)

heat release rate, *n*—the thermal energy released per unit time by an item during combustion under specified conditions. (2006)

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)

incandescence, *n*—emission of light produced by a material when intensely heated; it can be produced with or without combustion. (1997)

initial test heat flux, *n*—the heat flux set on the test apparatus at the initiation of the test (see also **heat flux**). (2007)

DISCUSSION—The initial test heat flux is the heat flux value commonly used when describing or setting test conditions. (2007)

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

non-combustible, *adj*—not capable of undergoing combustion under specified conditions. (Contrast **combustible**.) (2004)

DISCUSSION—In fire testing, non-combustibility is often assessed by means of Test Method E136 or ISO 1182. (2001)

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. (1998)

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

oxygen index, *n*—minimum concentration of oxygen in a mixture of oxygen and nitrogen that will just support flaming

combustion of a material under specified conditions. (2000)

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)

reaction to fire, *n*—response of a material in contributing by its own decomposition to a fire to which it is exposed, under specified conditions. (2002)

DISCUSSION—In fire testing, it is usual to distinguish between two types of fire-test-response characteristics: those associated with "reaction to fire" and those associated with "fire resistance" or "fire endurance." (2002)

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)

self-propagation of flame, *n*—propagation of a flame front after the removal of any applied energy source. (2001)

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 developed index, *n*—a comparative measure expressed as a dimensionless number, derived from measurements of smoke obscuration versus time in Test Method E84. (2001)

DISCUSSION—Classifications have been developed using these values. (2001)

smoke obscuration, *n*—reduction of light transmission by smoke, as measured by light attenuation. (2001)

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 E119. (1989)

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

surface flame spread, *n*—propagation of flame away from the source of ignition across the surface of a liquid or a solid (compare **volumetric flame spread**). (2005)

thermal decomposition, *n*—process whereby the action of heat or elevated temperature on an item causes changes to the chemical composition (different from **thermal degradation**, q.v.; compare **pyrolysis**). (2006)

thermal degradation, *n*—process whereby the action of heat or elevated temperature on a material, product, or assembly causes an adverse change in one or more properties (contrast **thermal decomposition,** q.v.). (2007)

DISCUSSION—Examples of properties that can be affected are physical, mechanical and electrical properties. Adverse change typically involves a loss in property. (2007)

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. (1999)

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:

acoustical ceiling panel, *n*—a form of a prefabricated sound absorbing ceiling element used with exposed suspension systems (see Specification E1264). (1999) **E2032**

acoustical ceiling tile, *n*—a form of a prefabricated sound absorbing ceiling element used with concealed or semi-exposed suspension systems, stapling, or adhesive bonding (see Specification E1264). (1999) **E2032**

air drop, *n*—lengths of open run conductors or cables supported only at each end. (1995) **E1725**

attic, *n*—an accessible enclosed space in a building immediately below the roof and wholly or partly within the roof framing. (1996) **E970**

assembly, *n*—a unit or structure composed of a combination of materials or products, or both. (2000) **E1995, E2102**

backing board, *n*—a board with the same dimensions as the specimen and used to back the specimen so as to represent end-use conditions. (2005) **E2405**

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) **E1321**

batch sampling—sampling over some time period in such a way as to produce a single test sample for analysis. (1981) **E800**

beams, *n*—all horizontally oriented structural members employed in building construction and known variously as beams, joists, or girders. (1999) **E2032**

blackbody temperature, *n*—the temperature of a perfect radiator—a surface with an emissivity of unity and, therefore, a reflectivity of zero. (1997) **E648**

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) **E1352**

building element, *n*—a component or assembly of materials using products manufactured as independent units capable of being joined with or placed within other components or assemblies to create a structure. (2002) **E2226**

carboxyhemoglobin saturation, *n*—the percent of blood hemoglobin converted to carboxyhemoglobin from reaction with inhaled carbon monoxide. (1996) **E1678**

ceiling protective membrane, *n*—a ceiling membrane attached to or suspended from the structural members of the floor or ceiling assembly, usually by hanger wire or threaded rods, consisting of a grid suspension system with lay-in ceiling panels or a grid of steel furring channels to which the ceiling membrane is directly attached, intended to provide fire protection, acoustical and or aesthetic enhancements, or both. (1999) **E2032**

combustion products—airborne effluent from a material undergoing combustion; this may also include pyrolysates. (1981) **E800**

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) **E1317**

composite, *n*—a combination of materials, which generally are recognized as distinct entities, for example, coated or laminated materials. (2000) **E2067, E2102, E1995**

composite, *n—as applied to loadbearing elements*, an interaction between structural components which is to be taken into account in the evaluation of load capacity. (1999) **E2032**

composite, *n—as related to a pipe or duct insulation*, see **duct insulation system** or **pipe insulation system**. (2002) **E2231**

concentration-time curve, *n*—a plot of the concentration of a gaseous toxicant as a function of time. (1996) **E1678**

continuous (as related to data acquisition), *adj*—conducted at data collection intervals of 5 s or less. (2000) **E906, E1995, E2102**

continuous (as related to data acquisition), *adj*—conducted at data collection intervals of 6 s or less. (2000) **E2067**

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, where present. (1997) **E648**

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)

DISCUSSION—The flux reported is based on calibration tests with a special calibration dummy specimen. (1997) **E1317**

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 · s). (1997) **E648**

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 · s). (1996) **E970**

Ct product, *n*—the concentration-time product in ppm · min obtained by integration of the area under a concentration-time curve. (1996) **E1678**

deck, *n—in upholstered furniture,* the upholstered support under the seat cushion in a loose-seat construction. (1994) **E1352, E1353**

design load, *n*—the intended maximum design load condition allowed by design under appropriate nationally recognized

structural design criteria. (1999) **E2032**

directly applied fire resistive coating, *n*—materials that are normally sprayed onto substrates to provide fire-resistive protection of the substrates. (1999) **E2032**

duct, *n—as related to heating ventilating, air conditioning or exhaust systems*, a passageway made of sheet metal or other suitable material used for conveying air or other gases. (2002) **E2231**

duct insulation system, *n—as related to fire testing*, system intended to insulate and cover, continuously for an extended length, the outside surface of a duct; the system shall have an insulation core, with or without a covering or vapor retarder facing which includes longitudinal closure systems (if used) and perhaps other duct insulation supplementary materials such as adhesives, fasteners, or tapes (if used). (2002)

DISCUSSION—Duct system components, including tapes, sealants, and fitting covers, that do not cover the duct continuously for an extended length, but which are associated with the duct insulation system are considered separately (see duct insulation supplementary materials). An extended length is not intended to imply a length of 25 ft, but a length of at least 3 ft.(2002) **E2231**

duct insulation supplementary materials, *n—as related to fire testing*, components, including tapes and sealants used for transverse joints as well as fitting covers that are intermittently spaced, as needed, within the duct insulation system, as well as adhesives used to bond the insulation to the duct substrate and that do not cover the duct continuously for an extended length. (2002) **E2231**

duct lining, *n*—material such as an insulation, coating or film, including adhesive, used to line the inside surface of a duct. (2002) **E2231**

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) **E1317**

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)

DISCUSSION—For the ignition tests, the dummy specimen board shall have a hole at the 50-mm position for mounting the fluxmeter. (1997) **E1321**

effective heat of combustion, *n*—the measured heat release divided by the mass loss for a specified time period. (1997) **E1354, E1623**

effective heat of combustion, *n*—the amount of heat generated per unit mass lost by a material, product, or assembly, when exposed to specific fire test conditions (see *gross heat of combustion*). (2007) **E1474, E1623, E1740**

DISCUSSION—The effective heat of combustion depends on the test method and is determined by dividing the measured heat release by the mass loss during a specified period of time under the specified test conditions. Typically, the specified fire test conditions are provided by the specifications of the fire test standard that cites effective heat of combustion as a quantity to be measured. For certain fire test conditions, involving very high heat and high oxygen concentrations under high pressure, the effective heat of combustion will approximate the gross heat of combustion. More often, the fire test conditions will represent or approximate certain real fire exposure conditions, and the effective heat of combustion is the appropriate measure. Typical units are kJ/g or MJ/kg. (2007)

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) **E1321**

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) **E1725**

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) **E1623**

equivalent thickness, *n*—the calculated solid thickness of concrete or masonry for purposes of determining fire resistance ratings of barrier elements on the basis of heat transmission end-point criteria. (1999) **E2032**

essentially flat surface, *n*—surface where the irregularity from a plane does not exceed ±1 mm. (2000) **E1995, E2102**

expanded vinyl wall covering, *n*—a wall covering consisting of a woven textile backing, an expanded vinyl base coat layer (which is a homogeneous vinyl layer that contains a blowing agent), and a nonexpanded vinyl skin coat. **E2404**

exposed area—the total surface area of the test assembly that is subjected to the fire endurance test including, when required, the supporting construction. (2002) **E2226**

exposed surface, *n*—that surface of the specimen subjected to the incident heat. (2000) **E906, E1995, E2102**

fire-characteristic profile, *n*—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. (2000) **E2061**

fire endurance, *n*—a measure of the elapsed time during which a material or assemblage continues to exhibit fire resistance. (1999) **E2032**

fire performance, *n*—response of a material, product, or assembly in a specific fire, other than in a fire test involving controlled conditions (different from fire-test-response characteristics, q.v.) (2000) **E2061**

fire propagation, *n*—increase in the exposed surface area of the specimen that is actively involved in flaming combustion. (2003) **E2058**

fire resistance, *n*—the property of a material or assemblage to withstand fire or give protection from it. (1999) **E2032**

fire-resistive barrier system, *n*—a specific construction of devices, materials, or coatings installed around, or applied to, the electrical system components. (1995) **E1725**

fire resistive joint system, *n*—a device or designed feature that provides a fire separating function along continuous linear openings, including changes in direction, between or bounded by fire separating elements. (2000) **E1966**

fire scenario, *n*—a detailed description of conditions, including environmental, of one or more of the steps from before ignition to the completion of combustion in an actual fire, or in a full-scale simulation. (2001) **E2061**

fire separating element, *n*—floors, walls, and partitions having a period of fire resistance determined in accordance with Test Methods E119 or E1529. (2000) **E1966**

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. (1997) **E814**

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) **E800**

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) **E1776**

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) **E1776**

fire window assembly, *n*—a window or glass block configuration, intended for use in walls or partitions, for which a fire endurance rating has been determined in accordance with this fire-test-response standard. (1999) **E2010**

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) **E648**

flaming mode, *n*—the mode of testing that uses a pilot flame. (1998) **E1995**

flashing, *n*—the flame fronts of 3 seconds or less in duration. (1999)

DISCUSSION—All flame fronts, however temporary, are to be taken into account. (1999) **E162**

flashing, *n*—existence of flame on or over the surface of the specimen for periods of less than 4 s. (1999) **E906**

flashing, *n*—existence of flame on or over the surface of the specimen for periods of less than 1 s. (2000) **E2102, E2405**

floor covering, *n*—an essentially planar material having a relatively small thickness in comparison to its length or width, which is laid on a floor to enhance the beauty, comfort, and utility of the floor. (1999) **E648**

floor covering system, *n*—a single material, composite or assembly comprised of the floor covering and related installation components (adhesive, cushion, etc.) if any. (1999) **E648**

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) **E648**

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) **E1678**

full length burn, *n*—the outcome of a determination in which the cigarette burns to or past the front plane of the tipping paper, which covers the filter and perhaps a short section of the tobacco column in a filter tip cigarette, or past the tips of the metal pins if the cigarette has no filter. (2002) **E2187**

full scale test, *n*—a test in which the product(s) to be tested is utilized in the same size as its end use. (1998)

DISCUSSION—In practical applications, this term is usually applied to tests where the item to be tested is larger than would fit in a bench-scale test. (1998) **E603**

fully developed stream—a coherent, forceful projection of water similar in shape and intensity to the stream being applied to the exposed side of the test assembly from the nozzle. (2002) **E2226**

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) **E1317**

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) **E1352**

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, for example, by re-radiation, the heated surface. (1997) **E906**

glass block assembly, *n*—a light transmitting configuration constructed of glass block held together with mortar or other suitable materials. (1999) **E2010**

glazing material, *n*—transparent or translucent material used in fire window assemblies. (1999) **E2010**

heating flux, *n*—the prescribed incident flux imposed externally from the heater onto the specimen at the initiation of the test. (2001)

DISCUSSION—The specimen, once ignited, also is heated by its own flame. This differs from the generic definition of heat flux in Terminology E176, because in this test method the heating flux of primary interest is the one imposed at the initiation of the test. (2001) **E1474, E1740**

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

DISCUSSION—The specimen, once ignited, is also heated by its own flame. (1996) **E1354, E1623**

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) **E1317**

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) **E1317**

heat release rate, *n*—the calorific energy released per unit time by the combustion of a material under specified test conditions. (2001) **E2061**

heat release rate, *n*—the heat evolved from the specimen, expressed per unit area of exposed specimen area per unit of time. (2000) **E1474, E1740**

heat release rate, *n*—the heat evolved from the specimen, per unit of time. (2000) **E1354, E2067**

heat release rate, *n*—the heat evolved from the specimen per unit of time and area. (1994) **E1623**

hypothetical accident conditions, *n*—a series of accident environments, defined by regulation, that is a Type B package must survive without significant loss of contents. (2002) **E2230**

ignitability, *n*—the propensity to ignition, as measured by the time to sustained flaming, in seconds, at a specified heating flux. (1997) **E1354, E1623**

ignitability, *n*—the propensity for ignition, as measured by the time to sustained flaming at a specified heating flux. (1996) **E1474, E1740**

ignition, *n*—the initiation of combustion. (2000)

DISCUSSION—The combustion may be evidenced by glow, flame, detonation, or explosion. The combustion may be sustained or transient. (2000) **E1995, E2067**

insolation, *n*—solar energy incident on the surface of a package. (2002) **E2230**

insulation, *n*—a material that is normally added to an assembly to provide resistance to heat flow for purpose of energy conservation. (1999)

DISCUSSION—Insulation materials are also used to improve sound control or improve fire resistance. (1999) **E2032**

insulation blanket, *n*—a relatively flat and flexible insulation in coherent sheet form furnished in units of substantial area. (2002) **E2231**

integrity, *n*—the ability of a test assembly, when exposed to fire from one side, to prevent the passage of flame and hot gases through it or the occurrence of flames on its unexposed side. (2000) **E2074**

irradiance, *n*—quotient of the radiant flux incident on an infinitesimal element of surface containing the point, by the area of that element. (2005) **E2405**

irradiance (at a point of a surface)**,** *n*—ratio of the radiant flux incident on a small but measurable element of surface containing the point, by the area of that element. (2000) **E2102**

joint, *n*—the linear void located between juxtaposed fire-separating elements. (2000) **E1966**

laboratory monitor, *n*—a representative of a subcommittee who is appointed to determine if the qualifications, equipment, personnel, and level of skill at a test facility meet the criteria necessary to participate in an interlaboratory test protocol. (2004) **E2335**

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) **E1678**

light flame, *n*—a flame approximately 6 in. (152 mm) long. (1999) **E2010**

lightweight aggregate concrete, *n*—concrete made with aggregates of expanded clay, shale, slag, or slate or sintered fly ash, and weighing 1360 to 1840 kg/m^3 (85 to 115 pcf). (1999) **E2032**

marine board, *n*—an insulation board of 750 ± 100 kg/m^3 density that meets the noncombustibility criteria of 46 CFR 164.009. (1997) **E1317**

mass loss concentration, *n*—the mass loss of a test specimen per unit exposure chamber volume in $g \cdot m^{-3}$. (1996) **E1678**

mass optical density, *n*—the ratio of the optical density of smoke and the mass loss of the test specimen, multiplied by the volume of the test chamber and divided by the length of the light path. (1998) **E1995**

material, *n*—single substance, or uniformly dispersed mixture, for example metal, stone, timber, concrete, mineral fiber, or polymer. (2000) **E2102**

material, generic, *n*—is one for which a nationally recognized Standard Specification exists. (1999) **E2032**

material proprietary, *n*—is one whose fire performance characteristics are determined in consideration of a formulation or process of production that is proprietary. (1999) **E2032**

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) **E1474**

maximum joint width, *n*—the widest opening of an installed joint system. (2000) **E1966**

mineral fiber insulation, *n*—insulation composed principally of fibers manufactured from rock, slag, or glass processed from molten state into fibrous form to comprise flexible batts or blankets, rigid or semi-rigid blocks and boards, or loose fill insulations, with or without binder. (1999) **E2032**

minimum joint width, *n*—the narrowest opening of an installed joint system. (2000) **E1966**

measured heat release of specimen, *n*—the observed heat release under the variable flux field imposed on the specimen and measured. (1997) **E1317**

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) **E1317, E1321**

model evaluation, *n*—the process of quantifying the accuracy of chosen results from a model when applied for a specific use. (1997) **E1355**

model validation, *n*—the process of determining the degree to which a calculation method is an accurate representation of