



Standard Guide for Development of Fire-Hazard-Assessment Standards¹

This standard is issued under the fixed designation E1546; 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 guide covers the development of fire-hazard-assessment standards.

1.2 This guide is directed toward development of standards that will provide procedures for assessing fire hazards harmful to people, animals, or property.

1.3 Fire-hazard assessment and fire-risk assessment are both procedures for assessing the potential for harm caused by something—the subject of the assessment—when it is involved in fire, where the involvement in fire is assessed relative to a number of defined fire scenarios.

1.4 Both fire-hazard assessment and fire-risk assessment provide information that can be used to address a larger group of fire scenarios. Fire-hazard assessment provides information on the maximum potential for harm that can be caused by the fire scenarios that are analyzed or by any less severe fire scenarios. Fire-risk assessment uses information on the relative likelihood of the fire scenarios that are analyzed and the additional fire scenarios that each analyzed scenario represents. In these two ways, fire-hazard assessment and fire-risk assessment allow the user to support certain statements about the potential for harm caused by something when it is involved in fire, generally.

1.5 Fire-hazard assessment is appropriate when the goal is to characterize maximum potential for harm under worst-case conditions. Fire-risk assessment is appropriate when the goal is to characterize overall risk (average severity) or to characterize the likelihood of worst-case outcomes. It is important that the user select the appropriate type of assessment procedure for the statements the user wants to support.

1.6 Fire-hazard assessment is addressed in this guide and fire-risk assessment is addressed in Guide [E1776](#).

1.7 *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 appro-*

priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

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

1.9 This standard is used to predict or provide a quantitative measure of the fire hazard from a specified set of fire conditions involving specific materials, products, or assemblies. This assessment does not necessarily predict the hazard of actual fires which involve conditions other than those assumed in the analysis.

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- [D2859](#) Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
- [D5425](#) Guide for Development of Fire Hazard Assessment Standards of Electrotechnical Products
- [E176](#) Terminology of Fire Standards
- [E603](#) Guide for Room Fire Experiments
- [E648](#) Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- [E1354](#) Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
- [E1678](#) Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analysis
- [E1776](#) Guide for Development of Fire-Risk-Assessment Standards
- [E2061](#) Guide for Fire Hazard Assessment of Rail Transportation Vehicles
- [E2280](#) Guide for Fire Hazard Assessment of the Effect of Upholstered Seating Furniture Within Patient Rooms of Health Care Facilities

¹ This guide is under the jurisdiction of ASTM Committee [E05](#) on Fire Standards and is the direct responsibility of Subcommittee [E05.33](#) on Fire Safety Engineering.

Current edition approved July 1, 2021. Published August 2021. Originally approved in 1993. Last previous edition approved in 2015 as E1546–15. DOI: 10.1520/E1546-21.

² 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.

2.2 ISO Standards:³

ISO 13943 Fire Safety – Vocabulary

2.3 NFPA Standards:⁴

NFPA 101 Code for Safety to Life from Fire in Buildings and Structures

NFPA 901 Uniform Coding for Fire Protection

2.4 SFPE Standards:⁵

SFPE Engineering Guide to Performance-Based Fire Protection

3. Terminology

3.1 *Definitions of Terms*—See Terminology E176 and ISO 13943. In case of conflict the definitions in Terminology E176 shall prevail.

3.2 Definitions:

3.2.1 *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 of fire.

3.2.2 *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*.

3.2.2.1 *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.

3.2.3 *fire hazard, n*—the potential for harm associated with fire.

3.2.3.1 *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.

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

3.2.4.1 *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 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.

3.2.5 *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.

3.2.5.1 *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.

3.2.6 *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.

3.2.6.1 *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, product, or assemblies, as measured by different methods or tested under different sets of conditions for a given method.

3.3 Definitions of Terms Specific to This Standard:

3.3.1 *fire 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-characteristics profile, fire hazard, fire risk, fire-test-response characteristic*.

3.3.2 *fire hazard assessment, n*—a process for measuring or calculating the potential for harm created by the presence of a material, product, or assembly in the relevant fire scenarios.

3.3.3 *fire risk assessment, n*—a means for computing the probability of fire loss within a specified period in a defined occupancy or situation.

4. Significance and Use

4.1 This guide is intended for use by those undertaking the development of fire-hazard-assessment standards. Such standards are expected to be useful to manufacturers, architects, specification writers, and authorities having jurisdiction.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.

⁵ Available from Society of Fire Protection Engineers (SFPE), 7315 Wisconsin Ave., Suite 620E, Bethesda, MD 20814, <http://www.sfpe.org>.