



Standard Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analysis¹

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INTRODUCTION

The pyrolysis or combustion of every combustible material or product produces smoke that is toxic. It is, therefore, desirable to establish a test method for the development of data characterizing smoke toxicity as an element of fire hazard analyses for both pre-flashover and post-flashover fires. The test method includes quantification of the toxicity of the smoke and ascertain whether the observed toxicity can be attributed to the major common toxicants.

1. Scope

1.1 This fire-test-response standard covers a means for determining the lethal toxic potency of smoke produced from a material or product ignited while exposed to a radiant heat flux of 50 kW/m² for 15 min.

1.2 This test method is limited to test specimens no larger than 76 by 127 mm (3 by 5 in.), with a thickness no greater than 51 mm (2 in.). Specimens are intended to be representative of finished materials or products, including composite and combination systems.

1.3 Lethal toxic potency values associated with 30-min exposures are predicted using calculations that use combustion atmosphere analytical data for carbon monoxide, carbon dioxide, oxygen (vitiation) and, if present, hydrogen cyanide, hydrogen chloride, and hydrogen bromide. The predictive equations are therefore limited to those materials and products whose smoke toxicity can be attributed to these toxicants. An animal check determines the extent to which additional toxicants contribute to the lethal toxic potency of the smoke.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 This standard measures and describes the response of materials, products, or assemblies in response to heat under controlled conditions, but does not by itself incorporate all factors required for fire hazard or fire risk assessment of the materials, products, or assemblies under actual fire conditions.

1.6 *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 (particularly with regard to the care and use of experimental animals) prior to use.* For specific hazards statements, see Section 7 and **Note X1.1**.

2. Referenced Documents

2.1 *ASTM Standards:*²

E176 Terminology of Fire Standards

E800 Guide for Measurement of Gases Present or Generated During Fires

2.2 *ISO Document:*

TR 9122 (Parts 1–5) Toxicity Testing of Fire Effluents³

2.3 *FFPA Standard:*⁴

NFPA 269–2012 Standard Test Method for Developing Toxic Potency Data for Use in Fire Hazard Modeling

3. Terminology

3.1 *Definitions*—For definitions of general terms used in this test method, refer to Terminology **E176**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *carboxyhemoglobin saturation, n*—the percent of blood hemoglobin predominately converted to carboxyhemoglobin from reaction with inhaled carbon monoxide.

3.2.1.1 *Discussion*—The chemical reaction between carbon

¹ This test method is under the jurisdiction of ASTM Committee **E05** on Fire Standards and is the direct responsibility of Subcommittee **E05.21** on Smoke and Combustion Products.

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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.

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 02269, <http://www.nfpa.org>.