



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. This test method is not applicable to end-use materials or products that do not have planar, or nearly planar, external surfaces.

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 calculation method is therefore limited to those materials and products whose smoke toxicity can be attributed to these toxicants.

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 should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire-hazard assessment or a fire-risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard or fire risk of a particular end use.*

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:

E 176 Terminology Relating to Fire Standards²

E 800 Guide for Measurement of Gases Present or Generated During Fires²

2.2 ISO Document:

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

3. Terminology

3.1 *Definitions*—For definitions of general terms used in this test method, refer to Terminology E 176.

3.2 Definitions of Terms Specific to This Standard:

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

3.2.2 *concentration-time curve, n*—a plot of the concentration of a gaseous toxicant as a function of time.

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

3.2.4 *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 is also simply the ratio of the average

¹ This test method is under the jurisdiction of ASTM Committee E-5 on Fire Standards and is the direct responsibility of Subcommittee E05.21 on Smoke and Combustion Products.

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² *Annual Book of ASTM Standards*, Vol 04.07.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.