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Standard Guide for Locating Combustion Test Methods for Polymeric Materials¹

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1. Scope *

1.1 This guide provides assistance in locating test methods and related documents for determining the combustion properties of polymeric materials used for various applications.

1.2 This guide includes standardized North American and global test methods promulgated by ASTM, CSA, NFPA, SAE, Underwriters Laboratories, North American Government Agencies, IEC, and ISO. It does not include industrial tests, user specification tests, nor nonstandard test methods. This list of tests is not exhaustive and the user must assume other tests may exist for specific materials or applications.

1.3 This guide is arranged according to products and systems.

1.4 The test methods described in this guide should be used solely to measure and describe the properties of materials, products, or systems in response to heat and flame under controlled laboratory conditions and should not be considered or used for the description, appraisal, or regulation of the fire hazard of materials, products, or systems under actual fire conditions.

1.5 *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.* Specific precautionary statements are given in 3.2.

NOTE 1—There is no ISO standard similar or equivalent to this guide.

NOTE 2—Related IEC and ISO standards are referenced in the appropriate places throughout this guide.

2. Terminology

2.1 The terminology used in reference test methods is not consistent from test to test. The terms used in a particular test method shall be utilized only in reference to that test method and only in a manner connected with the definition of the terms given in that test method.

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2.2 For general guidance on terminology for fire tests, reference can be made to the following standards:

2.2.1 ASTM E176, Terminology of Fire Standards (*C1*).

2.2.2 IEC 60695-4, Fire Hazard Testing—Part 4: Terminology Concerning Fire Tests (*N*).

2.2.3 ISO Guide 52, Glossary of Fire Terms and Definitions (*N*).

3. Significance and Use

3.1 Plastics, like many other materials, are combustible. This guide lists the test methods for plastics used in various industries at the present time. These test methods provide some information on the combustibility and burning characteristics of plastics products.

3.2 This guide is intended to assist the user in locating test methods that may provide data of the combustion characteristics of the user's product.

NOTE 3—**Warning:** During the course of combustion, gases or vapors, or both, are evolved that may be hazardous to personnel. Adequate precautions should be taken to protect the operator during execution of any of these test methods.

3.3 The user of this guide is responsible for obtaining the current (latest) edition of any test method selected for use.

4. Source

4.1 The source for the test method is given in Annex A1 as indicated by the letter designations in italics in the text.

5. Aircraft Interiors

5.1 ASTM D 3032, Test Methods for Hookup Wire Insulation, Vertical Flame Test, Section 18 (*C8*).

5.2 FAR 14 CFR 25.853, Paragraphs (a), (b), (c), and (d) and Appendix F, Air Worthiness Standards—Transport Category Airplanes, Compartment Interiors (*D*).

5.3 ISO 2156, Aircraft—Fire-Resisting Electrical Cables—Methods of Test (*N*).

5.4 ISO 2685, Aircraft—Environmental Conditions and Test Procedures for Airborne Equipment—Resistance to Fire in Designated Fire Zones (*N*).

5.5 SAE-AMS 3851A, Fire Resistance Properties for Aircraft Materials (*B*).

*A Summary of Changes section appears at the end of this standard.

5.6 SAE-AMS 3852A, Fire Resistance Properties for Aircraft Materials (*B*).

6. Automotive Interiors

6.1 ASTM D5132, Test Method for Horizontal Burning Rate of Flexible Cellular and Rubber-Like Materials Used in Occupant Compartments of Motor Vehicles (*C5*).

6.2 DOT Motor Vehicle Safety Standard No. 302, Flammability of Materials—Passenger Cars, Multipurpose Passenger Vehicles, Trucks and Buses (*A*).

6.3 ISO 3795, Road Vehicles and Tractors and Machinery for Agriculture and Forestry—Determination of Burning Behaviour of Interior Materials (*N*).

6.4 SAE J369, Flammability of Polymeric Interior Materials—Horizontal Test Method (*B*).

7. Building Materials and Construction

7.1 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials (*C1*).

7.2 ASTM E108, Test Methods for Fire Tests of Roof Coverings (*C1*).

7.3 ASTM E119, Test Methods for Fire Tests of Building Construction and Materials (*C1*).

7.4 ASTM E136, Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C (*C1*).

7.5 ASTM E162, Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source (*C1*).

7.6 ASTM E603, Guide for Room Fire Experiments (*C1*).

7.7 ASTM E800, Guide for Measurement of Gases Present or Generated During Fires (*C1*).

7.8 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops (*C1*).

7.9 ASTM E970, Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source (*C1*).

7.10 ASTM E1354, Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter (*C1*).

7.11 ASTM E1623, Test Method for Determination of Fire and Thermal Parameters of Materials, Products and Systems Using an Intermediate Scale Calorimeter (ICAL) (*C1*).

7.12 ASTM E1725, Test Methods of Fire Tests of Fire Resistive Barrier Systems for Electrical System Components (*C1*).

7.13 ASTM E1740, Test Method for Determining the Heat Release Rate and Other Fire-Test-Response Characteristics of Wallcovering Composites Using a Cone Calorimeter (*C1*).

7.14 DASMA 107, Room Fire Test Standard for Garage Doors Using Foam Plastic Insulation (*N*).

7.15 FM Standard 4880, Factory Mutual Building Corner Fire Test Procedure (*L*).

7.16 FM Standard 4450, Approval Standard for Class I Insulated Steel Deck Roofs (*L*).

7.17 ISO 834 Fire-resistance Tests—Elements of Building Construction (*N*).

7.18 ISO 1182, Fire Tests—Building Materials—Non-Combustibility Test (*N*).

7.19 ISO 1716, Reaction to Fire Tests for Building Products—Determination of the Gross Calorific Value (*N*).

7.20 ISO 5657, Reaction to Fire Tests—Ignitability of Building Products Using a Radiant Heat Source (*N*).

7.21 ISO/TR 5658-1, Reaction to Fire Tests—Spread of Flame—Part 1: Guidance on Flame Spread (*N*).

7.22 ISO 5658-2, Reaction to Fire Tests—Spread of Flame—Part 2: Lateral Spread on Building Products in Vertical Configuration (*N*).

7.23 ISO 5660-1, Fire Tests—Reaction to Fire—Part 1: Rate of Heat Release from Building Products (Cone Calorimeter Method) (*N*).

7.24 ISO 5924, Fire Tests—Reaction to Fire—Smoke Generated by Building Products (Dual-Chamber Test) (*N*).

7.25 ISO 6944, Fire Resistance Test—Ventilation Ducts (*N*).

7.26 ISO 9705 Fire Tests—Full Scale Room Test for Surface Products (*N*).

7.27 ISO 11925-2, Reaction to Fire Tests—Ignitability of Building Products Subjected to Direct Impingement of Flame—Part 2: Single Flame Source Test (*N*).

7.28 ISO 11925-3, Reaction to Fire Tests—Ignitability of Building Products Subjected to Direct Impingement of Flame—Part 3: Multi-Source Test (*N*).

7.29 ISO/TR 12470, Fire Resistance Tests—Guidance on the Application and Extension of Results (*N*).

7.30 NFPA 251, Methods of Tests of Fire Endurance of Building Construction and Materials (*J*).

7.31 NFPA 252, Fire Tests of Door Assemblies (*J*).

7.32 NFPA 255, Surface Burning Characteristics of Building Materials (*J*).

7.33 NFPA 256, Fire Tests of Roof Coverings (*J*).

7.34 NFPA 257, Fire Tests of Window Assemblies (*J*).

7.35 NFPA 259, Test Method for Potential Heat of Building Materials (*J*).

7.36 NFPA 265, Methods of Fire Tests for Evaluation of Room Fire Growth Contribution of Textile Wall Coverings (*J*).

7.37 NFPA 268, Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source (*J*).

7.38 NFPA 269, Test Method for Determining Toxic Potency Data for Use in Fire Hazard Modeling (*J*).

7.39 NFPA 273, Determining Degrees of Combustibility of Building Materials (*J*).

7.40 NFPA 285, Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload Bearing Wall Assemblies Containing Combustible Components Using the Intermediate Scale Multi-Story Test Apparatus (*J*).

7.41 UBC Standard 26-3, Room Fire Test Standard for Interior of Foam Plastic Systems (*M*).

7.42 UBC Standard 26-4, Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-Bearing Wall Panel Assemblies Using Foam Plastic Insulation (*M*).

7.43 UBC Standard 8-2, Method of Test for Evaluating Room Fire Growth Contribution of Textile Wall Covering (*M*).

7.44 UL263, Standard for Fire Tests of Building Construction and Materials (*G*).

7.45 UL723, Standard for Test for Surface Burning Characteristics of Building Materials (*G*).

7.46 UL790, Standard for Tests for Fire Resistance of Roof Covering Materials (*G*).

7.47 UL1040, Fire Test of Insulated Wall Construction (*G*).

7.48 UL1256, Standard for Fire Test of Roof Deck Constructions (*G*).

7.49 UL1715, Standard for Fire Test of Interior Finish Material (*G*).

7.50 UL1820, Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics (*G*).

7.51 UL1887, Fire Test of Plastic Sprinkler Pipe for Flame and Smoke Characteristics (*G*).

7.52 UL1975, Fire Tests for Foamed Plastics Used for Decorative Purposes (*G*).

7.53 UL2043, Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces (*G*).

7.54 UL2079, Standard for Tests for Fire Resistance of Building Joint Systems (*G*).

8. Conveyor Belting

8.1 MSA, Flame Tests for Conveyor Belting and Hose (*E*).

8.2 ASTM D378, Test Methods for Rubber Belting, Flat Type (*C5*).

8.3 ISO 340, Conveyor Belts—Flame Retardation—Specifications and Test Method (*N*).

9. Electrical Cable and Insulation

9.1 ASTM D350, Test Methods for Flexible Treated Sleeving Used for Electrical Insulation (*C6*).

9.2 ASTM D876, Test Methods for Nonrigid Vinyl Chloride Polymer Tubing Used for Electrical Insulation (*C6*).

9.3 ASTM D2633, Methods of Testing Thermoplastic Insulations and Jackets for Wire and Cable (*C7*).

9.4 ASTM D2671, Test Methods for Heat-Shrinkable Tubing for Electrical Use (*C7*).

9.5 ASTM D3874, Test Method for Ignition of Materials by Hot Wire Sources (*C7*).

9.6 ASTM D5424, Test Method for Smoke Obscuration of Insulating Materials Contained in Electrical or Optical Fiber Cables When Burning in a Vertical Cable Tray Configuration (*C7*).

9.7 ASTM D5537, Test Method for Heat Release, Flame Spread and Mass Loss Testing of Insulating Materials Contained in Electrical or Optical Fiber Cables When Burning in a Vertical Cable Tray Configuration (*C7*).

9.8 ASTM D6113, Test Method for Using a Cone Calorimeter to Determine Fire-Test-Response Characteristics of Insulating Materials Contained in Electrical or Optical Fiber Cables (*C8*).

9.9 Bureau of Mines Schedule 2G Electric Motor-Drive (*E*).

9.10 CSA C22.2 No. 0.3-M, Test Methods for Electrical Wire and Cables (*H*).

9.11 CSA C22.2 No. 198.3, Coated Electrical Sleeving; Section 5.7 “VW-1/FT-1 (Vertical-Wire) Flame” (*H*).

9.12 IEC 60112, Method for Determining the Comparative and the Proof Tracking Indices of Solid Insulating Materials Under Moist Conditions (*N*).

9.13 IEC 60332, Tests on Electric Cables Under Fire Conditions (*N*).

9.14 IEC 60332-1, Tests on Electric Cables Under Fire Conditions—Part 1: Fire Test for a Single, Vertical Insulated Wire or Cable (*N*).

9.15 IEC 60332-2, Tests on Electric Cables Under Fire Conditions, Part 2: Test on a Single Small Vertical Insulated Copper Wire or Cable (*N*).

9.16 IEC 60332-3, Tests on Electric Cables Under Fire Conditions, Part 3: Tests on Bunched Wires or Cables (*N*).

9.17 IEC 60587, Test Methods for Evaluating Resistance to Tracking and Erosion of Electrical Insulating Materials Used Under Severe Ambient Conditions (*N*).

9.18 IEC 60695-2-3, Bad Connection Test with Heaters (*N*).

9.19 IEC 60707, Methods of Test for the Determination of the Flammability of Solid Electrical Insulating Materials When Exposed to an Ignition Source (*N*).

9.20 IEC 60754-2, Test on Gases Evolved During Combustion of Electric Cable—Part 2: Determination of Degree of Acidity of Gases Evolved During the Combustion of Materials Taken from Electric Cables by Measuring pH and Conductivity (*N*).

9.21 IEC 61034-1, Measurement of Smoke Density of Cables Burning under Defined Conditions Part 1: Test Apparatus (*N*).

9.22 IEC 61034-2, Measurement of Smoke Density of Cables Burning Under Defined Conditions—Part 2: Test Procedure and Requirements (*N*).

9.23 IEC 61300, Fibre Optic Interconnecting Devices and Passive Components—Basic Test and Measurement Procedures—Part 2-36: Tests—Flammability (Fire Hazard) (*N*).

9.24 IEEE 383, Standard for Type Test of Class IE Electrical Cable, Field Splices and Connections for Nuclear Power Generating Stations (*F*).

9.25 IEEE 1202, Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies (*F*).

9.26 ISO 2156, Aircraft—Fire-Resisting Electrical Cables—Methods of Test (*N*).

9.27 MIL-C7078C, General Specification for Cable, Electric Aerospace Vehicle (*I*).

9.28 NFPA 262, Method of Test for Fire and Smoke Characteristics of Wires and Cables (*J*).

9.29 SAE J558, Low Tension Cable Flame Test (*B*).

9.30 UL224, Extruded Insulating Tubing; Section 14 “All-Tubing Flame Test” and Section 15 “Optional VW-1 (Vertical Wire) Flame Test” (*G*).

9.31 UL493, Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Section 13 “Flame Test” and Section 14 “Vertical-Tray Flame Test” (*G*).

9.32 UL510, Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape, Section 4 “Flame Test” (*G*).

9.33 UL588, Standard for Christmas-Tree and Decorative Lighting Outfits, Section 48 “Downward Burning Rate Test” (*G*).

9.34 UL651, Schedule 40 and 80 PVC Conduit; Section 13 “Flame” (*G*).

9.35 UL719, Non-Metallic-Sheathed Cables; Section 12 “Flame Test” and Section 13 “Vertical-Tray Flame Test” (*G*).