



Designation: D 3806 – 98

Standard Test Method of Small-Scale Evaluation of Fire-Retardant Paints (2-Foot Tunnel Method)¹

This standard is issued under the fixed designation D 3806; 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 test method determines the protection a coating affords its substrate, and the comparative burning characteristics of coatings by evaluating the flame spread over the surface when ignited under controlled conditions in a small tunnel. This establishes a basis for comparing surface-burning characteristics of different coatings without specific consideration of all the end-use parameters that might affect surface-burning characteristics under actual fire conditions.

1.2 In addition to the experimental flamespread rate, the weight of panel consumed, time of afterflaming and afterglow, char dimensions and index, and height of intumescence may be measured in this test. However, a relationship should not be presumed among these measurements.

1.3 This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory 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 risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

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

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.*

¹ This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D 01.22 on Health and Safety.

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2. Referenced Documents

2.1 ASTM Standards:

- C 220 Specification for Flat Asbestos-Cement Sheets²
- D 344 Test Method for Relative Hiding Power of Paints by the Visual Evaluation of Brushouts³
- D 1475 Test Method for Density of Paint, Varnish, Lacquer, and Related Products³
- D 2196 Test Methods for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer³
- E 84 Test Method for Surface Burning Characteristics of Building Materials⁴
- 2.2 *Federal Standard:*
- Fed. Spec. TT-V-119 Varnish, Spar, Phenolic Resin⁵

3. Significance and Use

3.1 A number of laboratory procedures are used to evaluate the effectiveness of fire-retardant and fire-resistant treatments and coatings. In general, these methods measure the three stages of fire development: (1) ignition; (2) flame spread (rate of growth of the fire); and (3) conflagration extent. While all three are of extreme importance, flame spread has been recognized as the main factor associated with testing fire-retardant coatings.

3.2 Flame spread ratings based upon Test Method E 84 have acquired common acceptance by regulatory agencies, but such large-scale tests are seldom practical during the development or modification of a fire-retardant coating.

3.3 This test method provides the relative flame spread of experimental coatings using small test specimens. By calibrating the 2-foot tunnel with Test Method E 84-rated fire-retardant

² *Annual Book of ASTM Standards*, Vol 04.05.

³ *Annual Book of ASTM Standards*, Vol 06.01.

⁴ *Annual Book of ASTM Standards*, Vol 04.07.

⁵ Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

paint, results obtained by this test method should be indicative of those obtained with a large specimen in the Test Method E 84 tunnel.

4. Apparatus

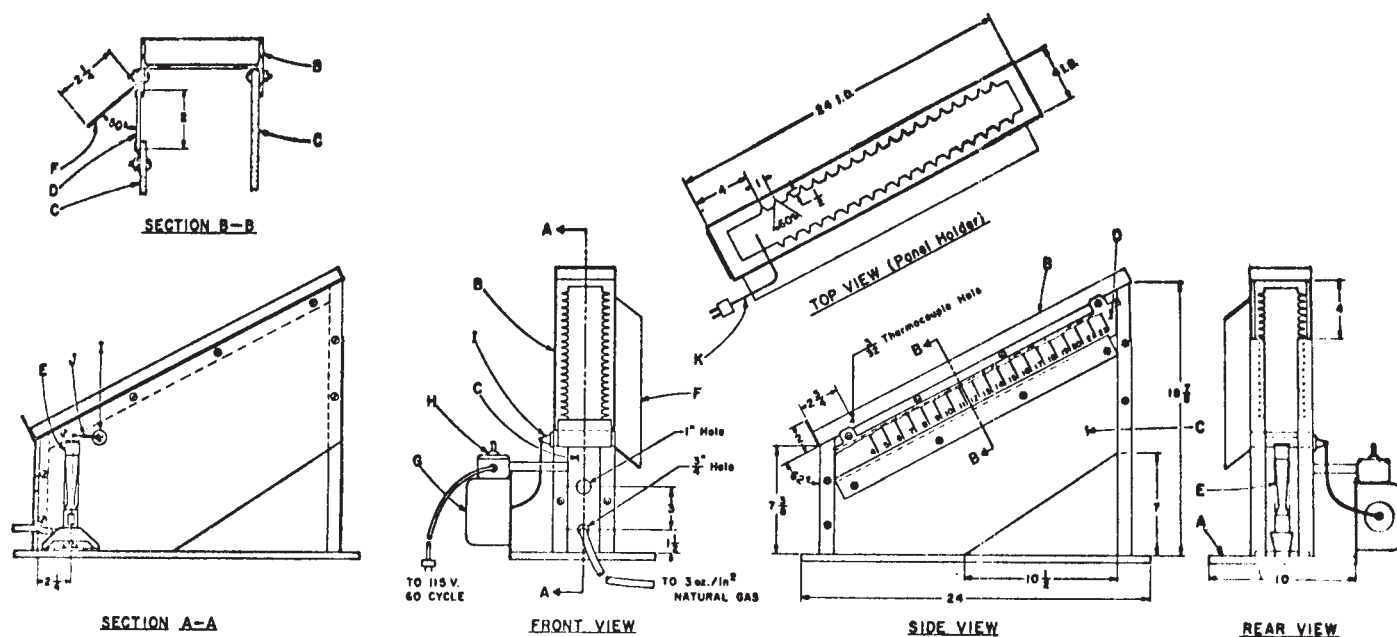
4.1 Flame Tunnel⁶ (see Fig. 1A)—two-foot (610-mm) flame

⁶ The sole source of supply of a suitable cabinet and assembly known to the committee at this time is Dek-Tron Scientific, 244 East 3rd St., Plainfield, NJ 07060. If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which you may attend.

Materials of Construction and Equipment List

Item No	Item	Description	Item No	Item	Description
A	Base Plate	$\frac{1}{2} \times 10 \times 24$ Steel plate	F	Glare Shield	$\frac{1}{16} \times 2\frac{1}{4} \times 22$ Metal sheeting
B	Framework	$\frac{1}{8} \times 1 \times$ Angle iron throughout	G	Ignition Transformer	115 V, 60 Hz, 5000 V, 20 A secondary
C	Side and Front Panels	$\frac{1}{4}$ Transite or Chem-Fil 100S or 100 H ⁶ cut to specifications	H	Spark Switch	Push button type
D	Side Glass	$\frac{1}{8} \times 2 \times 24$ Polished Vycor cut as shown	I	Ceramic Insulator	
E	Burner	Artificial Gas Model	J	Spark Wire	$\frac{1}{16}$ OD Nichrome
	Gas Control Valve (not shown)	$\frac{1}{8}$ Orifice, 1" Pipe size, outlet 3 oz/in ²	K	Thermocouple	Megopak Type J, totally shielded
	Gage, Gas (not shown)	0–30 oz/in ² Dial		Recording Potentiometer	115 V, 60 Hz, 0–300°C, Type J cond

Note: All Dimensions Expressed in Inches Unless Otherwise Noted.



METRIC EQUIVALENTS

in.	mm	in.	mm
$\frac{1}{16}$	1.6	3	76
$\frac{3}{32}$	2.4	4	102
$\frac{1}{8}$	3.2	7	178
$\frac{1}{4}$	6.4	$7\frac{1}{2}$	187
$\frac{1}{2}$	12.7	10	254
1	25.4	$10\frac{1}{2}$	267
$1\frac{1}{2}$	38	18 $\frac{1}{2}$	480
$2\frac{1}{4}$	57	22	560
$2\frac{3}{4}$	70	24	610

FIG. 1 Flame Tunnel