



IPC-TM-650 TEST METHODS MANUAL

1.0 Scope This test method is designed to determine the degree of flame resistance of laminates less than 0.5 mm [0.020 in] in thickness, and prepreg.

2.0 Applicable Documents

IPC-TM-650

Method 2.3.6, Etching, Ammonium Persulfate
Method 2.3.7, Etching Ferric Chloride
Method 2.3.7.1, Cupric Chloride Etching
Method 2.3.7.2, Alkaline Etching

3.0 Test Specimens

3.1 Size The test specimen shall be 25.4 mm [1.0 in] wide by 457 mm [18 in] long by the thickness of the material cut from the sheet such that the 457 mm [18 in] dimension is parallel to the warp yarn. The specimen shall be marked 152.4 mm [6 in] from one end. This mark may be made by cutting a small nick into the edge of the strip.

3.2 Quantity and Sampling A minimum of three specimens shall be used for each material tested and each test condition, unless otherwise specified. The specimens shall be cut from various locations across the width of the sheet no closer than 25.4 mm [1.0 in] from the edge of the sheet.

4.0 Apparatus or Material

4.1 Test Chamber A laboratory hood, totally enclosed, with a heat-resistant glass window for observing the test, shall be used. The exhaust fan shall be turned off during the test, but may be turned on to clear out the fumes between tests.

4.2 Speciman Holder Clamping device shall be provided within the test chamber so that the specimen will hang with its length in a vertical position approximately coincident with the central vertical axis of the test chamber.

4.3 Laboratory Burner A Bunsen or Tirrill Burner shall be used having a tube length of 101.6 mm [4.0 in] and an inside diameter of 9.4 mm [0.370 in]. The burner shall not be equipped with end attachments.

4.4 Gas Supply The gas supply shall be regulated and metered for uniform flow. The standard gas shall be Technical

Number 2.3.9	
Subject Flammability of Prepreg and Thin Laminate	
Date 8/97	Revision D
Originating Task Group MIL-P-13949 Test Methods Task Group (7-11b)	

Grade methane. Natural gas having a nominal heat content of 1000 BTU per cubic foot [37 MJ/m³] or [37 megajoule per cubic meter] may be substituted. Other fuel gases such as butane, propane and acetylene may be used provided they are equivalent in flame temperature. Technical grade methane shall be used for referee testing.

4.5 Timer Stopwatch or other suitable timing device with a precision of 0.5 seconds, minimum.

4.6 Desiccator Desiccation chamber capable of maintaining an atmosphere of less than 30% RH at 23°C [73°F].

4.7 Conditioning oven of circulating draft type capable of maintaining 125 ± 2°C [257 ± 3.6°F].

4.8 Thin steel scale or template for gauging flame height.

4.9 Etching system capable of complete removal of the metal cladding.

4.10 Cutting apparatus such as shears or equivalent equipment.

5.0 Procedure

5.1 Specimen Preparation Metal-clad laminates shall be completely etched using standard industry practices (see IPC-TM-650, Methods 2.3.7, 2.3.7.1, or 2.3.7.2). Unclad laminate and prepreg shall be tested in the as-is condition. Specimens shall be cut to size in accordance with 3.1.

5.2 Conditioning Unless otherwise specified, the specimens shall be conditioned in standard ambient laboratory conditions of 23 ± 2°C [73 ± 3.6°F] and 50 ± 5% RH for a minimum of 24 hours prior to testing.

5.3 Specimen Mounting A specimen shall be clamped to the clamping device in the chamber so that the specimen hangs with its length in a vertical position approximately coincident with the central vertical axis of the test chamber. The marked end of the specimen shall be nearest the laboratory burner. The lower end of the specimen shall be at a height 25.4 mm [1.0 in] more than the height of the laboratory burner used to provide the ignition, as shown in Figure 1.

IPC-TM-650		
Number 2.3.9	Subject Flammability of Prepreg and Thin Laminate	Date 8/97
Revision D		

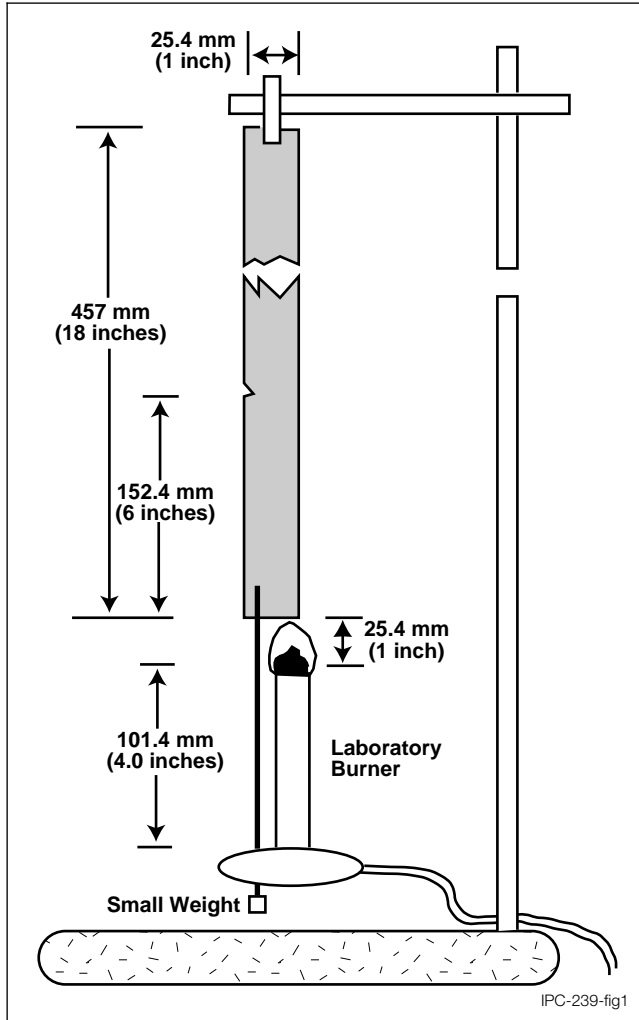


Figure 1

Note: A small weight may be hung from the lower end of the specimen by a wire at least 127 mm [5.0 in] in length to prevent it from curling during burning.

5.4 Adjustment of Test Flame The burner is ignited and adjusted to produce a blue flame 25.4 mm [1.0 in] high. The correct flame is obtained by adjusting the gas supply and the air ports of the burner until a blue flame with a yellow-tipped outer cone 25.4 mm [1.0 in] high is produced. The air supply is increased slightly by opening the air ports only until the yellow tip just disappears and completely blue inner and outer flame cones are formed. The flame is remeasured for correct height. The procedure is repeated as necessary until all con-

ditions are met. The burner tube is vertical during adjustment and testing.

5.5 Measurement Position the burner beneath the specimen and allow the flame to impinge upon the specimen for 5 ± 0.5 seconds (see 6.3). Remove the burner from beneath the specimen, and determine the time from removal of burner to when burning has stopped. Record the time of burning and record whether the burning has progressed beyond the 152.4 mm [6.0 in] length. If the burning has progressed beyond the 152.4 mm [6.0 in] mark, measure the total length of the burned material.

5.6 Evaluation

5.7.1 Nonburning by This Test If the specimen does not ignite on two attempts, it shall be reported as "Nonburning by this test."

5.7.2 Burning by This Test If a specimen burns up to 152.4 mm [6.0 in], it shall be reported as "Burning by this test."

5.7.3 Self-extinguishing by This Test If a specimen begins to burn after the first or second ignition but extinguishes before the flame burns up to 152.4 mm [6.0 in], it shall be reported as "Self-extinguishing" by this test.

5.8 Report the total time of burn and the total length of burn.

6.0 Notes

6.1 Since laminates and prepregs do not drip molten or flaming material, provisions for this evaluation have been deleted from the method.

6.2 The inside of the burner barrel should be cleaned frequently. Specimen combustion by-products can collect around and inside the barrel tip. These deposits can be flushed out during burner ignition and flame adjustment resulting in a false yellow flame tip. Proper flame adjustment becomes very difficult.

6.3 Desiccator Conditions The Test Methods Task Group determined that a great majority of test laboratories are unable to consistently hold the Relative Humidity in a desiccator to less than 20%. Based on data from participating company lab management, the lowest practically feasible RH for use with the affected IPC Test Methods is 30% maximum.