



IPC-TM-650 TEST METHODS MANUAL

1 Scope This test is to determine the tensile strength and elongation on specimens exposed to mechanical loads.

2 Applicable Documents None

3 Test Specimen The test specimen shall consist of a strip of flexible material 152.4 mm long x 12.7 mm wide. A minimum of 10 specimens, five from the machine direction, and five from the transverse direction, shall be prepared.

4 Apparatus

4.1 Equipment Tinius-Olson Super L Tester or equivalent (with appropriate load cell). The machine used for tension testing shall be in current calibration. The loads used in determining tensile strength shall be within the loading range of the testing machine.

4.2 Gripping Devices Various types of gripping devices may be used to transmit the measured load applied by the testing machine to the test specimens. To ensure axial tensile stress within the gauge length, the axis of the test specimen should coincide with the centerline of the heads of the testing machine.

4.3 Sample Cutter Thwing Albert Sample Cutter, Model No. JDC-50, or equivalent.

4.4 Etcher

4.5 Sander

4.6 Micrometer with 0.0025 mm resolution

4.7 Conditioning chamber or work area 23°C ± 2°C, 50% ± 5% RH

5 Procedure

5.1 Preparation of Specimens

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Originating Task Group Flex Peel Strength Test Methods Task Group (D-13A)	

5.1.1 Condition specimens for 24 hours at 23°C ± 2°C and 50% ± 5% relative humidity (RH). Stabilization time may be reduced if statistically sound evidence has been generated on the specific product line to support shorter conditioning times to reach equilibrium.

5.1.2 Cut at least 10 specimens, 152.4 mm long by 12.7 mm wide, using a precision sample cutter, which produces smooth and undistorted edges. Specimens may be sanded on the edges with 400-600 grit emery paper to further smooth the edges and improve the repeatability of the test.

5.2 Test

5.2.1 Measure and record the width and thickness of the specimen at several points along its length. Calculate the minimum cross-sectional area using the measured width. For coated materials, ignore the thickness of the coating, assumed to contribute nothing to the tensile properties of the composite, and use the nominal substrate thickness for the cross-sectional area calculation.

5.2.2 Set the grip separation to 101.6 mm and the rate of grip separation to 50.8 mm per minute.

5.2.3 Place the test specimen in the grips of the testing machine, taking care to align it with the centerline of the grips. There should be no slack in the specimen.

5.2.4 Start the machine and record load versus extension (grip separation).

5.3 Evaluation

5.3.1 Tensile strength shall be calculated by dividing the load at break by the original cross-sectional area of the specimen. Average the five values obtained for the machine direction samples and report the average. Average the five values obtained for the transverse direction samples and report the average.

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5.3.2 Elongation shall be calculated by the following formula:

$$\frac{D2 - D1}{D1} \times 100 = \% \text{ Elongation}$$

Where:

D1 = Initial grip separation 101.6 mm

D2 = Grip separation at break

Average the five values obtained for the machine direction samples and report the average. Average the five values obtained for the transverse direction samples and report the average.

6 Notes If a statistically sound evaluation shows that MD and TD differ, the direction giving the lower measurement shall be the only direction tested. If the two are the same, only MD needs to be tested.