

| Call Letters     | Appendix B |
|------------------|------------|
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| Revised          | 05/07      |

## Test Equipment

### 1. SCOPE

1.1 This appendix describes equipment used in methods found in this standard. It includes a description of equipment used in more than one method, and a table referencing each test method and the appropriate equipment required to conduct the tests described in these methods.

### 2. TEST EQUIPMENT DESCRIPTION

2.1 This paragraph describes equipment required by more than one test method in this standard.

#### 2.2 Adhesion testers

##### 2.2.1 Adhesion peel tester or slip/peel tester

The testing machine will be of the constant rate of extension type composed of a device for fixing the sample in a configuration that facilitates the testing of samples in the 90° as well as the 180° position, and a clamp that falls in a position where the center of each device is in the same plane. The tester sample holders also will be oriented so that they will be parallel to the direction of stress, and so aligned so that they will hold the specimen wholly in the same plane. A stress gauge or load cell and recording device will be part of the sample-holding apparatus and will be capable of recording the force required. A means of moving the stress jaw at a uniform rate of 300 mm/min (12"/min.).

##### 2.2.2 Adhesion/release tester

This equipment is the same as the above except the speed of the test can be adjusted to 300; 750; 1,500; 7,500; 15,000; and 30,000 mm/min (12, 30, 60, 300, 600 and 1,200"/min.) for the combination adhesion/release tester. The test bed stroke can be adjusted to as much as 400 mm (16").

##### 2.2.3 Tensile tester as described below in paragraph 2.3

#### 2.3 Tensile tester

2.3.1 The testing machine shall be of the constant rate of extension type composed of two clamps whose center shall be in the same plane, parallel with the direction of the motion of the stressing clamp, and so aligned that they will hold the specimen wholly in the same plane; a device for recording the tensile load and the amount of jaw separation; and a means of moving the stressing jaw at a uniform rate to be specified in the test method.

2.3.2 The tester should have a load range such that the test mean value falls between 20% and 80% of full scale.

2.3.3 In lieu of the clamping jaws, a pair of 102 mm (4") diameter cylinders shall be used when specified. These cylinders shall be constructed so that when they are attached to the tensile machine, the line of the tape during testing shall be parallel to the motion of the applied stress.

A Summary of Changes section appears at the end of this appendix.

## 2.4 Cutter, specimen.

2.4.1 The specimen cutter shall hold two single-edged razor blades in parallel planes, a precise distance apart, to form a cutter of exact specimen widths. Two cutters, 12 mm (0.5") and 24 mm (1") cutting width, shall be available.

2.4.2 The 12 mm (0.5") cutter shall consist of a 12 mm (0.5") thick by 200 mm (8") length of aluminum barstock 12 mm (0.5") wide. The edges for about 125 mm (5") from one end shall be rounded slightly to form a handle. The width of the bar for 75 mm (3") from the opposite end shall be narrowed to exactly 12 mm (0.5") minus the thickness of a single razor blade (one of two used as cutting edges). The razor blades shall be held in position using side plates. The end of the cutter shall be cut away at a 45° angle to expose the cutting edge at one end of the blades. The edges shall be separated by  $12 \pm 0.1$  mm ( $0.500 \pm 0.005$ ").

2.4.3 The 24 mm (1") cutter shall follow the same description as in 2.3.2, except that the barstock width shall be 24 mm (1") and shall be narrowed to exactly 24 mm (1") minus the thickness of a single razor blade.

## 2.5 Cup, water vapor transmission rate, and water penetration rate test.

2.5.1 The test cups shall be made from materials that are non-hygroscopic. The cup shall have a zero moisture vapor transmission rate (MVTR). The cups shall be rectangular with a flat, smooth, rigid flange, and shall have the following dimensions:

Flange: Outside  $50 \times 150 \pm 0.5$  mm ( $2.0 \times 6.0 \pm 0.02$ ").

Inside (opening):  $25 \times 102 \pm 0.5$  mm ( $1.0 \times 4.0 \pm 0.02$ ").

Body: Inside  $25 \times 102 \times 37.5$  (depth)  $\pm 0.5$  mm ( $1.0 \times 4.0 \times 1.5$  (depth)  $\pm 0.02$ ").

The mass shall not exceed 80% of the balance capacity used in weighing.

## 2.6 Panel

2.6.1 A  $50 \times 125 \times 1.2$  mm ( $2 \times 5 \times 0.048$ ")  $\pm 10\%$  panel of 304 stainless steel, free from burrs or sharp edges, having a bright annealed finish. The surface roughness shall be  $0.05 \pm 0.025$  microns ( $2 \pm 1$  micro inches) ( $R_a$ ). The deviation in flatness in both the machine and the cross direction of the bright annealed surface shall be 0.125 mm (0.005") maximum. The surface shall be free of contaminants such as process oils, and visual defects such as blemishes and scratches.

2.6.2 Panels with other shapes and dimensions may be formed or cut from the same steel and finish when specified by an individual method. The surface, directional flatness, and edges should still meet the requirements of 2.6.1. This paragraph will be cited with the necessary exceptions.

2.6.3 The bright annealed surface of any panels during storage or shipment should be covered with a residue free wrapper.

2.6.4 Panels showing or developing stains, discoloration, or scratches are not acceptable.

## 2.7 Roller, mechanically operated, rubber covered.

2.7.1 A steel roller,  $81 \pm 2.5$  mm ( $3.25 \pm 0.1$ ") in diameter and  $43.75 \pm 1.25$  mm ( $1.75 \pm 0.05$ ") in width, covered with rubber approximately 6.25 mm (0.25") in thickness and having a Shore scale A durometer hardness of  $80 \pm 5$ . The surface of the roller shall be a true cylinder void of any concave or convex deviations. The mass of the roller shall be  $2 \pm 0.05$  kg ( $4.5 \pm 0.1$  lb<sub>m</sub>).

2.7.1.1 A simple check to determine if the rubber surface is cylindrical is to wrap a very thin paper (onion skin) and roll it across a flat glass plate on which is placed carbon paper, face up. The carbon rubs off onto the thin paper to reveal high spots or hollows on the rubber surface.

2.7.1.2 For foil tapes only. A steel roller  $125 \pm 25$  mm ( $5.0 \pm 1$ "") in diameter with a total weight of  $4.5 \pm 0.05$  kg ( $10.0 \pm 0.10$  lb<sub>m</sub>) shall be used. The cylindrical surface of the roller shall be a true cylinder void of any concave or convex deviations so that the roller will apply a uniform pressure across the width of its entire surface.

2.7.2 A mechanically driven mount for the roller to move at either 300 or  $600 \pm 12$  mm/min. ( $12$  or  $24 \pm 0.5$ ""/min.) in one direction and return at the same speed in the opposite. The mount shall hold the roller so that, during rolling, the full weight of the roller (but only the weight of the roller) shall be allowed to act on the specimen. The roller shall be free turning on its own axis. The mount shall provide a means of lifting the roller so that, at rest the roller surface does not contact any object.

2.8 Roller, hand operated, rubber covered.

2.8.1 Roller as in 2.7.1

2.8.1.1 Roller as in 2.7.1.2

2.8.2 The roller construction shall not allow the weight of the handle to increase the weight of the roller during use.

2.9 Tear tester

2.9.1 The apparatus shall be an Elmendorf-type of tester conforming to the following:

2.9.2 A stationary clamp and a movable clamp carried on a pendulum preferably formed by a sector of a wheel or circle, free to swing on a balance or other substantially frictionless bearings;

2.9.3 A pointer and pointer stop to record the maximum arc of swing of the sector pendulum;

2.9.4 A sector release to hold the pendulum in the raised position during the mounting of the sample, and permitting it to follow through the force of gravity;

2.9.5 Pendulum carrying a circumferential graduated scale, so as to indicate the force used in tearing the specimen;

2.9.6 A knife attachment for initial slitting of the specimen.

2.9.7 With the pendulum in the raised position, the movable clamp shall lie in the same plane as the fixed clamp forming as it were an extension to the fixed clamp. This plane shall be perpendicular to the plane of oscillation of the pendulum. The gripping surface of the jaws in each clamp shall be 24 mm (1.0") by 16.5 mm (0.65"). The clamps shall be separated by a distance of 2.5 mm (0.1"). The knife attachment shall slit this specimen midway between the clamps at right angles to the upper edge of the clamps. The slit shall extend from the bottom edge of the specimen to a point of 4 mm (0.16") above the top edge of the clamps leaving a distance of 43 mm (1.72") of uncut specimen perpendicular to the long dimension of the specimen. The perpendicular from the line formed by the top edge of the clamps to the axis of suspension shall be 104 mm (4.2") and shall make an angle of  $27.5^\circ$  with the plane of the specimen.

### 3. EQUIPMENT

3.1 Possible sources of test equipment are:

ChemInstruments, 510 Commercial Drive, Fairfield, OH 45014; tel: 513-860-1598;  
www.chemsultants.com.

Paul N. Gardner Company, Inc., 316 North 1st First Street, Pompano Beach, FL 33060;  
tel: 954-946-9454; www.gardco.com.

Instron® Corporation, 825 University Ave., Norwood, MA 02062-2643; tel: 781-575-5000;  
www.instron.com.

IMASS Inc., PO Box 134, Accord, MA 02018; tel: 781-834-3063; www.imass.com.

MTS Systems Corporation, 14000 Technology Drive, Eden Prairie, MN 55344;  
tel: 800-328-2255; info@mts.com; www.mts.com.

Testing Machines, Inc., 2 Fleetwood Court, Ronkonkoma NY 11779; tel: 631-439-5400 or  
1-800-678-3221; info@testingmachines.com; www.testingmachines.com.

Texture Technologies Corporation, 18 Fairview Road, Scarsdale, NY 10583; tel: 914.472.0531;  
www.texturetechnologies.com.

Thwing-Albert Instrument Company, 14 Collings Ave., West Berlin, NJ 08091; tel: 856-767-1000;  
info@thwingalbert.com; www.thwingalbert.com.

Tinius Olsen, Inc., 1065 Easton Road, PO Box 1009, Horsham, PA 19044-8009; tel: 215-675-7100;  
info@tiniusolsen.com; www.tiniusolsen.com.

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## **SUMMARY OF CHANGES**

- Corrected surface roughness measurement in section 2.6.1.
- Corrected mass of roller in 2.7.1.
- Corrected weight of steel roller in 2.7.1.2.
- Made consistent metric references of 24 mm and 48 mm for standard 1" and 2" tape rolls.
- Updated equipment supplier listings in section 3 and table 2.

**TABLE I - Method with Equipment Reference**

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| <b>Method</b> | <b>Equipment</b>   |
|---------------|--|
| PSTC-101      | Cutter, specimen<br>Panel<br>Roller, rubber covered, mechanically operated<br>Adhesion tester / Tensile tester with 90° fixture  |
| PSTC-5        | Cutter, specimen<br>Panel<br>Quick stick test fixture<br>Tensile tester  |
| PSTC-6        | Rolling ball tack tester<br>Steel ball 11 mm (7/16") diameter  |
| PSTC-107      | Holding power test stand - room temperature version<br>Holding power test stand - oven temperature version<br>Holding power cut-off fixture<br>Panel<br>Roller, rubber covered, hand or mechanically operated<br>Specimen tester |
| PSTC-8        | Fixture with free-turning mandrel<br>Tensile tester  |
| PSTC-9        | Vessel forced-convection oven, ammonium sulfate, distilled water   |
| PSTC-11       | Roller, rubber covered, hand operated<br>Nonrotating metal cylinder<br>Oven, circulating (65.5 °C [150 °F]), Cold Chamber (-18.3 °C [-1 °F])   |
| PSTC-13       | Variable speed unwind machine  |
| PSTC-14       | Panel<br>Stop watch<br>Cutter, specimen<br>Punch, paper, single hole<br>Holding power test stands, horizontal<br>Roller, rubber-covered per Appendix B   |
| PSTC-15       | Coating apparatus (50 microns [2 mil] dry thickness capable)<br>Vented drying chamber<br>Circulating oven<br>Tensile Tester with 90° fixture or release testing machine<br>Panels<br>Roller per Appendix B                       |
| PSTC-16       | Cutter, specimen<br>Panel<br>Test fixture<br>Tensile tester<br>Loop tack tester  |
| PSTC-21       | Roller, rubber covered, hand operated<br>Ultraviolet light source (RS lamp)<br>102 x 102 mm (4 x 4") test panels<br>Paint spray equipment<br>Convection oven   |
| PSTC-22       | Roller, rubber covered, hand operated<br>102 x 102 mm (4 x 4") test panels<br>Paint spray equipment  |

|          |   |
|----------|---|
| PSTC-131 | Cutter, specimen<br>Tensile tester with pneumatic clamps or 102 mm (4") diameter cylinders  |
| PSTC-133 | Thickness gauge or micrometer as specified  |
| PSTC-34  | Cup, water vapor transmission rate<br>Humidity chamber maintained at $37.8 \pm 2^{\circ}\text{C}$ ( $100 \pm 3.6^{\circ}\text{F}$ )<br>and 90% to 95% RH<br>Balance, analytical |
| PSTC-35  | Cup, water penetration rate<br>Container for water at least 102 mm (4") deep<br>Balance, analytical   |
| PSTC-38  | Elmendorf tear test tester  |
| PSTC-39  | Tensile tester, die   |
| PSTC-50  | Cutter, specimen<br>Tensile tester  |
| PSTC-51  | Dielectric strength tester per ASTM D 149   |
| PSTC-53  | Holding power test stands<br>Cutter, specimen<br>Roller, rubber covered, hand operated<br>Weight, 500 g (1.1 lbm)   |
| PSTC-54  | Tape winding fixture (see ASTM D 1000)<br>Weight, 500 g (1.1 lbm)<br>Air-circulating oven ( $130^{\circ}\text{C}$ )   |
| PSTC-55  | Panel<br>Roller, rubber covered, hand operated  |
| PSTC-56  | Penetration tester per Figure 1, ASTM D 876<br>Oven with $1^{\circ}\text{C} / 2$ minute increase rate   |
| PSTC-57  | Brass rods<br>Winding fixture<br>Weights<br>Bunsen burner<br>Stop watch<br>Stands and clamps<br>Level<br>Enclosure<br>Gas supply  |
| PSTC-71  | Ruler (Metric or English)   |

Individual methods may require different test weights.  
Refer to Section 4 of the different methods.

**TABLE 2 - Equipment Sources**

| TYPE               | PSTC TEST NO. | DESCRIPTION                    | OTHER TEST METHODS |                     |           |                    | CHEM INSTRUMENTS EQUIPMENT      | CHEM INSTRUMENTS ACCESSORIES             | IMASS                          | INSTRON | THWING ALBERT |             |
|--------------------|---------------|--------------------------------|--------------------|---------------------|-----------|--------------------|---------------------------------|--|--------------------------------|---------|---------------|-------------|
|                    |               |                                | TLMI               | ASTM                | AFERA     | FINAT              |                                 |  |                                |         |               |             |
| Peel & Release     | 101(A-F) 4B   | 90 & 180 deg Peel/Release      | L-IA1              | D3330 (A - F)       | 5001 P-11 | 1, 2, 3, 5, 10, 11 | AR-1000 or TT-1000 PA-90 PA-180 | RD-3000 HR-100 TP-26 SC-012 / 024        | SP-2000 SP-2100 TL-2200 SPEC-1 | Yes     | EJA Vantage   |             |
|                    |               |                                | L-IA2              | D5375 (A,B) D6252   |           |                    | SO-8 AR-1000 TT-1000            | TP-26 HR-100                             |                                |         |               |             |
|                    |               |                                | L-IA3              |                     |           |                    | LC-100 SOS-8 AR-1000 or TT-1000 | PF-90 HR-100 TP-26                       |                                |         |               |             |
| High-speed Release | 55            | Oil Resistance                 |                    |                     |           | 4                  | HSR-1000                        | NA                                       | ZPE-1100W                      |         |               |             |
|                    |               |                                |                    |                     |           |                    |                                 |  |                                |         |               |             |
| Tack               | 16            | Loop Tack                      | LT                 | D6195 (A)           |           | 9                  | LT-1000 or TT-1000              | TP-13 TP-16 SC-100 LTF-100               |                                |         | EJA Vantage   |             |
|                    |               |                                |                    | D2979               |           |                    | PT-1000                         | NA                                       |                                |         | EJA Vantage   |             |
|                    |               |                                |                    | D3121               | 5015      |                    | TT-100 TT-1000                  | NA PF-90                                 | Yes                            |         | EJA Vantage   |             |
| Shear              | 107 (A-F), 14 | Shear at ambient temperature   | 7                  | D6463 (B) D3654 (A) | 5012      | 8                  | RT-10 or RT-30                  | HR-100 TP-23 SC-012 SC-024 TW-500 & 1000 |                                | Yes     |               |             |
|                    |               |                                |                    |                     |           | 18                 |                                 |  |                                |         |               | EJA Vantage |
|                    |               |                                |                    |                     |           |                    |                                 |  |                                |         |               |             |
| Heated Shear Aging | 53 107 (G)    | Shear at elevated temperatures | SHR                | D6463 (A) D4498     |           |                    | HT-8 or HT-30 & SO-8            |  |                                |         | EJA Vantage   |             |
|                    |               |                                |                    |                     |           |                    | TT-1000 SO-8                    | HR-100                                   |                                |         | EJA Vantage   |             |
| Thickness          | 33            | Thickness Measurement          | T-411              | D3652 D645 D374     | 5006      |                    | MI-1000                         | NA                                       |                                |         | ProGage       |             |
|                    |               |                                |                    |                     |           |                    |                                 |  |                                |         |               |             |
| Unwind             | 8, 13         | High Speed Unwind Force        |                    | D1000               | 5008      |                    | HSU-1000                        | NA                                       |                                |         | EJA Vantage   |             |
|                    |               |                                | 8                  |                     | 5013      |                    | TT-1000                         | UWF-100                                  | SPA2-09                        |         | EJA Vantage   |             |

| TYPE                     | PSTC TEST NO. | DESCRIPTION                           | OTHER TEST METHODS |                      |       |          | CHEM INSTRUMENTS EQUIPMENT | CHEM INSTRUMENTS ACCESSORIES | IMASS | INSTRON        | THWING ALBERT |
|--------------------------|---------------|---------------------------------------|--------------------|----------------------|-------|----------|----------------------------|------------------------------|-------|----------------|---------------|
|                          |               |                                       | TLMI               | ASTM                 | AFERA | FINAT    |                            |                              |       |                |               |
| Tensile                  | 31, 39        | Tensile Strength of Material          | L-1A1              | D828                 | 5004  | TT-1000  | SC-100                     |                              | Yes   | EJA Vantage    |               |
|                          |               |                                       | II-E               | D903                 |       |          |                            |                              |       |                |               |
| Burst                    |               | Burst Strength of Perforated Material | Burst DC1          |                      |       | BP-1000  | NA                         |                              |       | Yes            |               |
|                          |               |                                       |                    |                      |       |          |                            |                              |       |                |               |
| Aging & Drying           | 9,11          |                                       |                    | 5026                 |       | SOS-8    | NA                         |                              |       |                |               |
| Water Vapor Transmission | 34            |                                       |                    | 5002                 |       | WV-100   | NA                         |                              |       | Vapometer Cups |               |
| Stain Test               | 21,22         |                                       |                    |                      |       | SO-8     | HR-100                     |                              |       |                |               |
| Water Penetration        | 35            |                                       |                    |                      |       | SO-8     | NA                         |                              |       | Yes            |               |
| Tear                     | 38            | Tear Resistance                       | T-4141 om-98       |                      |       |          |                            |                              | Yes   | Pro Tear       |               |
| Dielectric Breakdown     | 51            |                                       |                    |                      |       |          |                            |                              |       |                |               |
| Flagging                 | 54            |                                       |                    |                      |       |          |                            |                              |       |                |               |
| Penetration              | 56            |                                       |                    |                      |       |          |                            |                              |       |                |               |
| Flamability              | 57            |                                       |                    |                      | 5009  |          |                            |                              |       |                |               |
| COF                      |               | Coefficient of Friction               | Yes                | D1894-99<br>D4518-91 |       | COF-1000 |                            | Yes                          |       | Friction/Peel  |               |
| Contact Angle            |               |                                       | Yes                | D724-99              |       | CAM-Plus |                            |                              |       | PG-3           |               |

**Equipment Supplier Web Sites**

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| <p>ChemInstruments: <a href="http://www.chemsultants.com">www.chemsultants.com</a><br/> Paul N. Gardner Company, Inc.: <a href="http://www.gardco.com">www.gardco.com</a><br/> Instron® Corporation: <a href="http://www.instron.com">www.instron.com</a><br/> IMASS Inc.: <a href="http://www.imass.com">www.imass.com</a><br/> MTS Systems Corporation: <a href="http://www.mts.com">www.mts.com</a></p> | <p>Testing Machines, Inc.: <a href="http://www.testingmachines.com">www.testingmachines.com</a><br/> Texture Technologies Corporation: <a href="http://www.texturetechnologies.com">www.texturetechnologies.com</a><br/> Thwing-Albert Instrument Company: <a href="http://www.thwingalbert.com">www.thwingalbert.com</a><br/> Tinius Olsen, Inc.: <a href="http://www.tiniusolsen.com">www.tiniusolsen.com</a></p> |
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