ASTM STANDARDS ON PSA TAPE

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ASTM International is a not-for-profit, independent, standards writing organization. It develops and publishes voluntary consensus standards for a wide variety of materials, products, systems, and services. 30,000 members work on one or more Technical Committees to develop more than 12,000 standards that can be found in the 77-volume Annual Book of ASTM Standards.

The ASTM standardization process is well defined. Members are classified as producers, users, or general interest (academia, government, etc): Membership on Technical Committees is controlled so the producers of products cannot dominate them. In each stage of balloting (Subcommittee, Committee, Society), all voters must be allowed to have their say. All comments and negative votes must be considered. A negative ballot, however, can be overridden by an appropriate Committee vote: non-persuasive, non-germane, etc. The result of the strict and fair consensus process is a set of standards that are highly respected throughout the world.

A summary of ASTM standards relating to pressure sensitive tape is attached. This list does not include the standards for components of tapes that might be papers, films, foils, adhesive components, etc. Neither does it include the end uses of PSA tapes. The list includes the ASTM designation and the title. Note that the designation, such as ASTM D3611-89 (2003), includes the year of the last revision (1989) and the year of the last re-approval (2003). When using an ASTM standard, be sure to check that you are using the current version: Go to the ASTM web site at astm.org and type in the designation to determine the current version.

Most of the ASTM standards related to PSA tapes are under the jurisdiction of three ASTM Technical Committees. ASTM D10.14 covers Tape and Labels (This is the group I am most active in). The subcommittee consists of 55 members and handles 27 active standards. These are mostly test methods (how to measure something), practices (how to do something), and specifications (a set of requirements for purchasing). D14.50 on Hot Melts, Pressure Sensitive, and Archival Adhesives has nine active standards, several directly related to PSA tape. Committee D9 on Electrical and Electronic Insulating Materials has test methods and specifications specifically for electrical grades of tape. It is noteworthy that a member of one group can join or monitor the other groups without additional dues.

ASTM and PSTC have cooperated on test method development for many years. This continued with the harmonization process with our European counterparts at AFERA. ASTM tape committees support international harmonization with other standards writing bodies. ASTM also has an excellent working relationship with ANSI which represents the USA at ISO.
Peel Adhesion

A couple of years ago, the harmonized peel adhesion tests were published: ASTM D3330 and PSTC 101. These and the AFERA counterpart are harmonized and are essentially the same. The tests are conducted in the same way and equivalent results are obtained. All use the new roll-down procedure of four passes of the rubber covered roller at 24 in/min. The test methods are not identical, however. One difference is that the AFERA and PSTC documents are metric-only while ASTM members decided to have a dual unit standard. When peel adhesion is conducted by AFERA and PSTC methods, a 24 mm wide slitter is used to cut the tape sample: Users of ASTM D3330 can either use the 24 mm wide slitter or continue to use a one inch slitter. Some segments of our industry still prefer to use the US customary units of inches and pounds for conducting the tests and reporting the results. This minor difference in documents will not change the test outcomes: test results are calculated and reported as a force per unit width. The tests are harmonized, even with this minor difference.

Shear Adhesion

The shear test procedures are also harmonized: ASTM D3654-02 and PSTC 107. As with peel adhesion, the harmonized shear test methods use the new roll-down procedure. Again, PSTC and AFERA are metric-only, with some flexibility allowed. ASTM is a dual unit standard that allows users to continue to test with a ½ inch x ½ inch (or 1 in x 1 in) tape contact area if they want. With shear, the specific choice of tape contact area affects the test result, and not always in a fully predictable manner.

ASTM D3654 has recently been revised (to be published soon). One minor point is about conditioning. D3654-02 testing conditions have required 23 +/- 1 deg C, as does PSTC 107 and AFERA. The revision changes conditioning to reference ASTM D4332 which is equivalent to PSTC Appendix A. This allows for some short-term fluctuation in temperature which should not affect the test results. Harmonization should be maintained.

Another minor revision to D3654 is in the Calculation section. This would allow the use of right censored data that has a time-to-termination rather than a traditional time-to-failure. As background, recall that shear testing of several replicates often produces one or two which seem to hang on for much longer than the others: Data is skewed with a longer right tail (see left of Figure 1). Conducting calculations based on a log-normal or Weibull distribution handle this well.
What should we do if we are testing five replicates and four have failed, but the testing room swings out of calibration before the last sample fails? We cannot continue that tainted test, we should not discard that sample, and we should not just repeat that sample. Procedures, such as maximum likelihood estimation, are available to calculate the average time to failure using all of our tests: This would use our four times-to-failure and our one time-to-termination (see right of Figure 1). Good discussions are available in reliability texts and in Chapter 8 of NIST/SEMATECH e-Handbook of Statistical Methods: www.itl.nist.gov/div898/handbook. Special experimental designs are also available which can reduce the total testing time by intentionally creating censored data. This is a minor change or option to the calculation section of the test method that should not affect the test outcome. Harmonization with PSTC and AFERA should be maintained while improving the test method.

**Break - Tensile Strength**

The breaking (tensile) strength test methods have also been harmonized. Past versions of ASTM D3759 and PSTC 31 have had four procedures in the tensile test standard; but AFERA only had two. Thus, the procedure for tapes with under 200% elongation and for filament reinforced tapes are harmonized among ASTM, PSTC, and AFERA. This increased the crosshead speed to 300 mm/min (12 in/min). PSTC put the remaining high stretch method and the cross direction method in an Annex to PSTC 131 (most recent PSTC draft of harmonized method). ASTM retained the four test method options in D3759-05, clearly indicating that only two are harmonized.

Other minor differences in testing the break (tensile) strength test methods are also present. Again, ASTM members wanted the option of testing either 24 mm wide samples or one-inch wide samples. PSTC and AFERA are metric-only standards. Each test result is calculated and reported as a force per unit width so the results should be the same for testing either tape width. ASTM D10.14 also clarified some of the wording in the text of other sections and retained some other testing options but I believe that the test method is still in harmony with PSTC and AFERA.
Other

Current work in ASTM Committee D10.14 includes efforts to write a new Specification for PSA labels used for transport packages. D3611 on accelerated roll aging is being revised to allow an environmental chamber rather than just a desiccator with a salt solution. (PSTC Currently allows this in PSTC-9.) Other existing Specifications, Practices, and Test Methods are being updated or corrected as necessary. New standardization activities may be added, as the need develops.

ASTM will continue to cooperate with PSTC and other standards writing bodies. If you are interested in participating in this or the other ASTM Committees, you would certainly be welcome.

ASTM Standards related to PSA Tapes
(Not including component materials or end uses)

D69-01 Standard Test Methods for Friction tape

D1000-04 Standard Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications


D1876-01 Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)

D2148-02 Standard Test Methods for Bondable Silicone Rubber Tapes Used for Electrical Insulation


D2484-00 Standard Specification for Polyester Film Pressure-Sensitive Electrical Insulating Tape

D2686-00 Standard Specification for Polytetrafluoroethylene-Backed Pressure-Sensitive Electrical Insulating Tape


D2860/D2860M-04 Standard Test Method for Adhesion of Pressure-Sensitive Tape to Fiberboard at 90 Angle and Constant Stress
D2979-01 Standard Test Method for Pressure-Sensitive Tack of Adhesives Using an Inverted Probe Machine


D3330/D3330M-04 Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape


D3652/D3652M-01 Standard Test Method for Thickness of Pressure-Sensitive Tapes

D3654/D3654M-02 Standard Test Methods for Shear Adhesion of Pressure-Sensitive Tapes


D3759/D3759M-05 Standard Test Method for Breaking Strength and Elongation of Pressure-Sensitive Tapes


D3815/D3815M-99 Standard Practice for Accelerated Weathering of Pressure-Sensitive Tapes by Carbon-Arc Exposure Apparatus


D4325-02 Standard Test Methods for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

D4388-02 Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

D4514-00 Standard Specification for Friction Tape

D4592-05 Standard Specification for Preformed Retroreflective Pavement Marking Tape for Limited Service Life

D5105-05 Standard Practice for Performing Accelerated Outdoor Weathering of Pressure-Sensitive Tapes Using Concentrated Natural Sunlight


D5330/D5330M-04 Standard Specification for Pressure-Sensitive Tape for Packaging, Filament- Reinforced


D5486/D5486M-04 Standard Specification for Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing


D6195-03 Standard Test Methods for Loop Tack


D6463-99 Standard Test Method for Time to Failure of Pressure Sensitive Articles Under Sustained Shear Loading
D6551-00 Standard Practice for Accelerated Weathering of Pressure-Sensitive Tapes by Xenon-Arc Exposure Apparatus

D6590/D6590M-00 Standard Specification for Pressure-Sensitive Tape for Sealing Fiber Containers and Cans

D6787-02 Standard Specification for Repositionable Note Pads

D6788-02 Standard Specification for Repositionable Pressure-Sensitive Flags