



Standard Guide for Forensic Examination and Comparison of Pressure Sensitive Tapes¹

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1. Scope

1.1 This guide is intended as an introduction to other standard guides for the forensic examination of pressure sensitive adhesive tape. It is intended to assist individuals who conduct forensic tape analyses in their evaluation, selection, and application of tests that can be of value to their examinations. This guide describes the construction and classification of various tapes and the methods to develop discriminatory information using an efficient order of testing. This standard provides an overview and guidance on the strengths and limitations of various techniques used in the analysis and comparison of pressure sensitive adhesive tapes. The goal is to provide a consistent approach to forensic tape analysis.

1.2 The forensic tape examiner addresses concerns such as sample size, complexity and condition of the sample, environmental effects, collection and packaging methods, and case/investigation specific issues. These factors require that the forensic tape examiner choose test methods, sample preparation schemes, testing sequences, and degree of sample alteration and consumption that are suitable to each specific case.

1.3 This standard is intended for use by competent forensic science practitioners with the requisite formal education, discipline-specific training (see Practice E2917, Practice E3233), and demonstrated proficiency to perform forensic casework.

1.4 The values stated in SI units are to be regarded as standard. Other units of measurement are included in this standard as applicable to industrial usage.

1.5 *Some of the methods discussed in this guide involve the use of chemicals, temperatures, and radiation sources. 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, health, and*

environmental practices and determine the applicability of regulatory limitations prior to use.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D123 Terminology Relating to Textiles

E1732 Terminology Relating to Forensic Science

E2224 Guide for Forensic Analysis of Fibers by Infrared Spectroscopy

E2225 Guide for Forensic Examination of Fabrics and Cordage

E2228 Guide for Microscopical Examination of Textile Fibers

E2917 Practice for Forensic Science Practitioner Training, Continuing Education, and Professional Development Programs

E3085 Guide for Fourier Transform Infrared Spectroscopy in Forensic Tape Examinations

E3233 Practice for Forensic Tape Analysis Training Program

2.2 Other Documents:

SWGAT Guideline for Assessing Physical Characteristics in Forensic Tape Examinations

SWGAT Guideline for Using Light Microscopy in Forensic Tape Examinations

SWGAT Guideline for Using Scanning Electron Microscopy/Energy Dispersive X-Ray Spectroscopy in Forensic Tape Examinations

SWGAT Guideline for Using Pyrolysis-Gas Chromatography and Pyrolysis-Gas Chromatography/Mass Spectrometry in Forensic Tape Examinations

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 Definitions:

3.1.1 For additional terms commonly employed for general forensic examinations, see Terminology E1732.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *adhesive*, *n*—a material that holds two or more objects together solely by intimate surface contact.

3.2.2 *additives*, *n*—materials that are included in adhesive or backing formulations to increase overall volume, impart color, or provide other desired properties.

3.2.3 *backing*, *n*—a thin flexible material to which adhesive is applied.

3.2.4 *backsize*, *n*—a layer applied to the top side of the backing. Its purpose is to coat and fill a porous surfaced backing with a material that is inert to the adhesive formulation to be used.

3.2.5 *biaxially oriented polypropylene (BOPP)*, *n*—an oriented polypropylene film in which the polymer has been stretched in both the machine direction and cross direction during the manufacturing process. Tapes with such films cannot be torn by hand.

3.2.6 *calendering*, *v*—a method of producing adhesive tape by pressing an adhesive to a backing material through a series of heated rollers. The surface appearance depends on the type of roller used.

3.2.7 *calendering marks*, *n*—characteristic marks left on the backing material due to the manufacturing process.

3.2.8 *cellophane*, *n*—a thin, transparent sheet made of regenerated cellulose that can be used as a backing material in tape products.

3.2.9 *cellulose acetate*, *n*—a type of transparent film that is used for tape backings.

3.2.9.1 *Discussion*—A matte surface is used for write-on tapes. Cellulose acetate is more moisture-resistant than cellophane.

3.2.10 *creped paper*, *n*—paper that has small folds in it giving it high stretch and conformability. Used in the backing of masking tape (saturated paper tape).

3.2.11 *elastomer*, *n*—a material that can be deformed but when the forces are removed it returns to its original form. Serves as the base material for pressure sensitive adhesives.

3.2.12 *exclusionary difference*, *n*—a difference in a feature or property between compared items that is substantial enough to conclude that they did not originate from the same source.

3.2.12.1 *Discussion*—An exclusionary difference is statistically supported when an appropriate statistical analysis shows a result outside the range of what usually occurs when the items originate from the same source.

3.2.12.2 *Discussion*—When a statistical analysis is not suitable, an exclusionary difference can be determined by expert judgment.

3.2.13 *fill yarns*, *n*—see *weft yarns (filling)*.

3.2.14 *flatback paper*, *n*—smooth paper backing masking tape (saturated paper tape).

3.2.15 *machine direction*, *n*—the direction of the tape that runs the length of the tape.

3.2.16 *migration*, *n*—the movement over a period of time of an ingredient from one layer to another.

3.2.16.1 *Discussion*—This often occurs in electrical tapes where plasticizer in the polyvinyl chloride (PVC) backing “migrates” into the adhesive.

3.2.17 *monoaxially oriented polypropylene (MOPP)*, *n*—an oriented polypropylene film in which the polymer has been stretched in only one direction during the manufacturing process. Tapes with such films can be torn by hand.

3.2.18 *plasticizer*, *n*—material added to plastics to impart flexibility by creating spaces between the polymer chains and lowering the inter- and intra-chain attractive forces, allowing freer movement of the chains.

3.2.18.1 *Discussion*—Plasticizers are used in pressure sensitive backings (particularly PVC) and some adhesives to lower the glass-transition temperature and allow use at sub-ambient temperatures.

3.2.19 *pressure sensitive adhesive (PSA)*, *n*—an adhesive that consists of a polymeric base, usually with appropriate plasticizers and tackifiers. It can form an adhesive bond with no physical or chemical change and with the application of only slight pressure.

3.2.20 *pressure sensitive adhesive (PSA) tape*, *n*—a combination of a pressure sensitive adhesive with a continuous flexible backing (cloth, paper, metal, or plastic) or with a backing and release liner.

3.2.20.1 *Discussion*—Use of the word “tape” in this guide refers to PSA tapes and their components.

3.2.21 *prime coat*, *n*—a coating of adhesive-like material found between the tape adhesive and backing that serves as a bonding agent.

3.2.22 *reinforcement*, *n*—fabric (scrim), glass filaments, or plastic filaments added to tape to impart stability and strength.

3.2.23 *release coat*, *n*—a coating applied to the top side of the backing that provides ease of unwind and prevents delamination or tearing.

3.2.24 *scrim*, *n*—a loosely-woven gauze-type fabric added to duct tape for reinforcement and to impart strength.

3.2.25 *scrim count*, *n*—the number of warp yarns per inch versus the number of fill yarns per inch.

3.2.26 *tack*, *n*—property of an adhesive that allows it to form a bond immediately with a surface with the application of only slight pressure.

3.2.27 *tackifier*, *n*—low molecular weight organic material that is added to the adhesive base polymer to impart tack.

3.2.28 *thickness*, *n*—distance from one surface of a tape, backing, or adhesive to the other, usually expressed in the United States as thousandths of an inch, or the industrial vernacular as “mils” which represents thousandths of an inch (that is, 1 mil = 0.001 in.).

3.2.29 *warp*, *n*—the yarn running lengthwise in a woven fabric.