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Standard Guide for Forensic Examination of Fabrics and Cordage¹

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1. Scope

1.1 The intent of this guide is to assist individuals and laboratories conducting examinations of fabrics and cordage. It is not designed as a detailed methods description or protocol for the analysis and comparison of fabric and cordage evidence, but as a guide to an acceptable procedure to strengthen the usefulness of the analytical method.

1.2 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

2. Referenced Documents

2.1 *ASTM Standards*:²

E1459

D123 [Terminology Relating to Textiles](#)

E1459 [Guide for Physical Evidence Labeling and Related Documentation](#)

E1492

E1492 [Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory](#)

E2228

E2228 [Guide for Microscopical Examination of Textile Fibers](#)

2.2 *AATCC Standards*:³

AATCC Test Method 20:Qualitative Test Method 20-2007 Fiber Analysis: Qualitative

3. Terminology

3-1

3.1 *Definitions*—For definitions of terms used in this guide, refer to Terminology D123.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *cordage*—twine, ropes, and cords, collectively.

3-2

3.2.2 *core*—fibers or other textile materials running lengthwise through the center of a cordage.

3-3

3.2.3 *course*—the row of loops or stitches running across a knit fabric, corresponding to the filling in woven fabrics.

3-4—in knitted fabrics, a row of successive loops in the width direction of the fabric.

3.2.4 *crow*—the raised portion of a strand in a twisted cordage.

3-5

3.2.5 *fabric*—a planar textile structure produced by interlacing yarns, fibers, or filaments.

3.6 *knit fabric*—a structure produced by interlocking one or more loops of yarn or comparable material.

3-7

3.2.6 *fiber*—in textiles, a generic term for any one of the various types of matter that form the basic elements of a textile and that is characterized by having a length at least 100 times its diameter.

3.2.7 *filament*—in textiles, a continuous fiber of extremely long length.

3.2.8 *knitted fabric*—a structure produced by interlooping one or more ends of yarn or comparable material.

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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 The boldface numbers in parentheses refer to the list of references at the end of this standard.

³ Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, <http://www.aatcc.org>.

3.2.9 nonwoven fabric—a textile structure produced by bonding or interlocking of fibers, or both, accomplished by mechanical, chemical, thermal, or solvent means, or combinations thereof.

3.2.10 pitch—the number of crowns per inch of the same strand.

3-8

3.2.11 ply—the number of single yarns twisted together to form a plied cord; an individual yarn in a plied yarn or cord.

3-9

3.2.12 selvage—the narrow edge of woven fabric that runs parallel to the ~~warp~~. ~~It~~warp; it is made with stronger yarns in a tighter construction than the body of the fabric to prevent raveling.

~~3-10~~3.2.13 staple fiber—natural fibers or cut lengths from filaments.

3-11

3.2.14 strand—filaments or yarns twisted together or laid parallel to form a unit for further twisting or plaiting into cordage.

3-12

3.2.15 tracer—a marker (such as color-coded yarns or labels) integrated into the manufacture of a cord that assists in identifying the manufacturer.

3-13

3.2.16 twist direction (lay)—the direction of twist in yarns is indicated by the capital letters S and Z. ~~Yarn~~Z; yarn with an S-twist is seen when a yarn is held vertically and the plies spiral around its central axis slope in the same direction as the middle portion of the letter S, and Z-twist is seen when the plies slope in the same direction as the middle portion of the letter Z.

~~3-14~~3.2.17 wale—a column of loops lying lengthwise in a knit fabric.

~~3-15~~—in knitted fabrics, a column of successive loops in the length direction of the fabric; in woven fabrics, one of a series of raised portions or ribs lying warpwise in the fabric.

3.2.18 warp—the set of yarn in all woven fabrics that runs lengthwise and parallel to the selvage and is interwoven with the filling.

3-16

3.2.19 weft (filling)—in a woven fabric, the yarn running from selvage to selvage at right angles to the warp.

3-17

3.2.20 woven fabric—generally used to refer to fabric composed of two sets of yarns, warp and weft (filling), that is formed by weaving, which is the interlacing of these sets of yarns.

3-18

3.2.21 yarn—~~filaments (fibers) with or without a twist used to form a strand.~~—a generic term for a continuous strand of textile fibers, filaments, or material in a form suitable for knitting, weaving, or otherwise intertwining to form a textile fabric.

4. Summary of Guide

4.1 Due to the general availability of fabric and cordage, they are often encountered by the forensic scientist. This guide assists the forensic scientist in determining and documenting the structural details of fabric and cordage such as design, construction and composition. These structural details can often provide information of significant forensic value.

5. Significance and Use

5.1 The construction, composition, and color of textiles as evidence in crimes are useful comparison characteristics for forensic examinations. Textiles appear in a variety of weaves, knits, and nonwoven constructions; a combination of fabric types can occur in any one textile. There is a vast range of colors in which textiles are offered in the marketplace. Therefore, the construction, composition, and color of a textile can aid the Examiner in including or excluding a textile for consideration in a forensic examination.

5.2 A comprehensive forensic fabric or cordage examination should consist of a complete characterization of the construction and materials used in the composition of the item (such as sewing thread).

6. Sample Handling

6-1

6.1 The general handling and tracking of samples should meet or exceed the requirements of Practice E1492 and Guide E1459.

6.2 Photographs may be taken of the item prior to conducting any analyses in order to provide documentation of the original condition. Document and remove other evidence (for example, hair, blood, paint, etc.) which may require additional analysis. Document any physical damage (for example, worn, cut, broken, frayed, etc.). The following general macroscopic characteristics should be observed and documented:

~~6-2.1~~6.2.1 Severed ends for possible physical ~~matches~~; matches;

~~6-2.2~~6.2.2 Knots or ligatures, or ~~both~~, both (1);⁴

~~6-2.3~~6.2.3 Dimensions (size, length, diameter, etc.); etc.);

⁴ The boldface numbers in parentheses refer to the list of references at the end of this standard.