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Standard Terminology Relating to Industrial Textile Stitches and Seams[1]

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1. Scope

1.1 This terminology covers stitches and seams related to industrial textiles.

1.2 Section 3, Terminology, is categorized into two subsections, specific to the two areas of specialization under this document.

1.2.1 Section 3.1 Relating to Seams.

1.2.2 Section 3.2 Relating to Stitches.

1.3 For other terms relating to textiles refer to Terminology D123.

1.4 *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

D1683/D1683M Test Method for Failure in Sewn Seams of Woven Fabrics

D1908 Test Method for Needle-Related Damage Due to Sewing in Woven Fabrics[3]

D5034 Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)

D5646 Terminology Relating to Seams and Stitches Used in Home Sewing

D6193 Practice for Stitches and Seams

3. Terminology

3.1 *Definitions Relating to Seams:*

double-stitched seam-finish, *n*—a finish for the raw edges of a plain seam, in which another row of machine stitching is made through both seam allowances placed together. **D1683/D1683M, D6193**

grin, *v—in sewn seams*, to stress a seam so that the individual stitches can be seen.

needle damage, *n—in sewn fabrics*, the partial or complete yarn severance or fiber fusing caused by a needle passing through a fabric during sewing.

DISCUSSION—This can also be referred to as needle cuts. **D1908-89**

seam, *n*—a line where two or more fabrics are joined, usually near the edge. (See also **sewn seam**. See Terminology D5646 for *glued seam*, *stapled seam*, and *thermally bonded seam*.) **D6193**

seam allowance, *n—in sewn fabrics*, the distance from the edge of a fabric to the parallel stitch line furthest from that edge. **D1683/D1683M, D6193**

seam assembly, *n*—the composite structure obtained when fabric(s) are joined by means of a seam. **D1683/D1683M, D6193**

DISCUSSION—A seam assembly may be described in terms of fabric orientation, seam direction, seam type, stitch type, seam allowance, sewing thread tex number(s) and type(s) stitch density, stitch gage, and rows of stitching. **D1683/D1683M**

seam damage, *n— in sewn fabrics*, an adverse change in the physical condition of one or more of the components in a seam which would reduce the seam acceptability such as yarn slippage, needle damage, or fabric rupture. **D6193**

seam efficiency, *n—in sewn fabrics*, the ratio, expressed as a percentage, of the breaking force required to rupture a sewn seam to that required to rupture the fabric; seam strength to fabric strength. **D1683/D1683M, D6193**

DISCUSSION—For some constructions, yarn strength and stitchtype can contribute to a higher seam efficiency value. **D6193**

seam engineering, *n—in sewn fabrics*, the procedures used to select a specific combination of sewing thread, stitch type, seam type, and stitch density to achieve the maximum sewn seam strength for a particular fabric type. **D1683/D1683M**

seam failure, *n— in sewn fabrics*, that point at which an external force *(1)* ruptures the sewing thread, *(2)* ruptures the

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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] Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

fabric, *(3)* causes excessive yarn slippage adjacent to the stitches, or *(4)* causes any combination of these unacceptable conditions. **D1683/D1683M**

DISCUSSION—Despite the lack of rupture, excessive seam slippage will either significantly reduce seam efficiency, or, result in an unsightly appearance thus creating seam failure. **D1683/D1683M**

seam interaction, *n—in sewn fabrics*, the net effect of the relationship between the combination of fabric, seam type, stitch type, and stitch density on seam efficiency. **D1683/D1683M**

seam slippage, *n—in sewn fabrics*, a mode of failure in production seams; the displacement of the fabric yarn parallel and adjacent to the stitch line. **D1683/D1683M, D6193**

DISCUSSION—Shown as a transverse ratio of junction strength to fabric strength including the ratio of elongation of fabric to the ratio of elongation at the junction. Seam slippage occurs when fabric yarns parallel to the stitch line move away from the seam. It is caused by the yarns in the fabric pulling out from the stitch line, and manifests itself as a gaping opening. Any movement of the warp and weft yarns away from a seam line under transverse stresses, which exacerbate the potential damage. (See **yarn slippage**.) **D1683/D1683M**

seam type, *n—in sewn fabrics*, an alphanumeric designation relating to the essential characteristics of fabric positioning and rows of stitching in a specified sewn fabric seam. **D1683/D1683M, D6193**

DISCUSSION—The first two letters of the designation show seam type; the third and subsequent letters specify a particular mating alignment; the number designation indicates the number of rows of stitches. **D1683/D1683M**

sew, *v*—to unite or fasten with stitches. **D6193**

sewing thread, *n*—a flexible, small-diameter yarn or strand, usually treated with a surface coating, lubricant, or both, intended to be used to stitch one or more pieces of material or an object to a material. **D6193**

sewn seam, *n—in sewn fabrics*, a juncture at which two or more planar structures such as textile fabrics, are joined by sewing, usually near the edge. **D1683/D1683M, D6193**

sewn seam strength, *n—in sewn fabrics*, the maximum resistance to rupture of the sewing thread.

DISCUSSION—The sewn seam strength of various end use products can demonstrate either a one-time catastrophic failure of the material on either side of the sewn seam; or, a failure of the stitching configuration that can, or cannot, permit the assembly to be repaired.

General – One-time failure

(1) Examples of one-time failure of the stitching configuration where the assembly cannot be repaired include baseballs, soccer balls, and American footballs. Conversely, examples of a stitching configuration, which has an intentional one-time use, is a feed, concrete, seed, or fertilizer bag that is stitched to provide closure and adequate seam strength to keep the contents secure; until the stitching is intentionally ruptured so that the container can be emptied.

(2) Another category of textile products designed for a one-time catastrophic failure are inflatable restraints used to protect the occupants in the passenger compartment of an automobile. The millisecond needed for the accelerant to initiate the simultaneous inflation/deflation of the air cushion requires that sewn seam strength combine two performance properties:

(a) The necessary strength to resist forces exerted by the multi-angular displacement of the fabric during the inflation stage, and

(b) The structural integrity to retain the shape during the simultaneous deflation of the cushion.

General – Repair of Assembly—Sewn seam strength can be estimated so that the structural integrity of the stitching, used to construct an assembly can meet a value that indicates a seam efficiency that is from 80 – 85 % of the fabric break strength. While this percentage does not match the maximum break strength that the fabric can attain when tested using Test Method D5034, the differential between these two is usually an indicator that the assembly can be repaired which can contribute to the extended service life of the products.

Specific – Career Apparel/Protective Clothing that is flame resistant—The higher costs typically associated with career apparel and protective clothing are a factor that creates a need for extended service life. Both career apparel garments and protective clothing that is flame resistant are regularly maintained and repaired so that the service life of the garment can be extended. A cost/value analysis can be performed to learn if data supports reducing the seam efficiency to less than the 80 – 85 % threshold, in order to extend the service life while not increasing the number of repairs. **D1683/D1683M**

slippage, *n—in sewn fabrics*, the displacement of one or more fabric yarns from their original position, so as to cause differences in alignment, spacing, or both. **D1683/D1683M**

standard seam, *n*—a seam assembly which uses a specific seam type for a designated fabric having specific weight, density and construction. **D1683/D1683M**

stitch, *n—in sewn seams*, the repeated unit formed by the sewing thread(s) in the production of seams. **D1683/D1683M**

stitch density, *n—in sewn seams*, the number of stitches per unit length in one row of stitching in the seam. **D1683/D1683M, D6193**

DISCUSSION—This is usually expressed as stitches per inch (spi). **D6193**

stitch gage, *n— in sewn fabrics*, the perpendicular distance between adjacent parallel rows of stitching. **D1683/D1683M, D6193**

yarn slippage, *n*—a mode of failure of fabrics when sewn using a standard seam. **D1683/D1683M, D6193**

DISCUSSION—The displacement of one or more fabric yarns from the original position(s) so as to cause differences in alignment and spacing of both yarns. **D1683/D1683M**

yarn severance, *n*—a numerical value expressed on a percentage basis from this test that is used as an index of the degree of cutting of fabric yarns by the sewing machine needle in making sewn seams.

3.2 *Definitions Relating to Stitches:*

stitch, *n—in sewing*, the configuration of the interlacing of sewing thread in a specific repeated unit. (See also **stitching**, and **stitch type**.) **D6193**

stitch type, *n*—a numerical designation relating to the essential characteristics of the interlacing of sewing thread(s) in a specified seam type. **D1683/D1683M, D6193**

DISCUSSION—Stitch types are described in Practice D6193.

stitching, *n*—a series of stitches embodied in a meterial or materials of planar structure such as woven textile fabrics usually for ornamental purposes or finishing an edge, or both. **D6193**

4. Keywords

4.1 stitch; seam