



Designation: D7722 – 22

## Standard Terminology Relating to Assembly of Textile Structures<sup>1</sup>

This standard is issued under the fixed designation D7722; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This terminology identifies industrial terms related to stitches and seams that are used for the assembly of textile structures.

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:*<sup>2</sup>

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<sup>3</sup>

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

D6193 Practice for Stitches and Seams

### 3. Terminology

3.1 *Definitions Relating to Seams:*

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.54 on Subassemblies.

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<sup>2</sup> 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.

<sup>3</sup> Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

**critical sewn seam**—*as related to assembly of sewn textile structures*, those junctions of textile fabric sections where failure of the seam assembly results in the textile structure being unable to meet the performance requirements for the intended use. (See *seam failure*; *sewn seam strength*).

DISCUSSION—Textile fabrics, which are manufactured at fixed widths and rolled on holders having various lengths, need to be cut into various shapes for assembly and manufacture of end use textile items. The types of end use items can vary from a small bag with drawstring to a large geotextile stabilization project. As such, the fabrics used for the end use projects can have a mass from 2 oz/yd<sup>2</sup> (67 g/m<sup>2</sup>) up to 80 oz/yd<sup>2</sup> (2665 g/m<sup>2</sup>); and a tensile strength from 3 lbf (13N) up to 1200 lbf (5350 N).

It is anticipated that based on the fabric structure and end use assembly, critical seams be able to achieve seam efficiency that is from 60 % to 80 % of the fabric tensile strength. While a fabric having tensile strength of 13N is anticipated to demonstrate seam efficiency of approximately 10 N, 80 % of the fabric tensile strength; it is anticipated that a fabric having a tensile strength of 5350 N will have a seam efficiency of approximately 3200 N, 60 % of fabric tensile strength.

**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**, *glued seam*, *stapled seam*, *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 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 stitching with sewing thread usually near the edge. (See Practice **D6193**.) **D1683/D1683M, D6193**

DISCUSSION—A sewn seam can join two or more planar structures in one of three directions:

- (1) Parallel to warp yarns which results in sewn seam being perpendicular to weft yarns,
- (2) Parallel to weft yarns which results in sewn seam being perpendicular to warp yarns, and
- (3) Diagonal (45 degrees) which results in both warp and weft yarns being on the bias.

**Specific** – A sewn seam can also be constructed by joining two fabric sections where the warp direction of one fabric is joined to the weft direction of either the same or a dissimilar fabric.

**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**