



Designation: D 6673 – 01

Standard Practice for Sewn Products Pattern Data Interchange—Data Format¹

This standard is issued under the fixed designation D 6673; 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 reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This standard is designed to facilitate communication between CAD/CAM systems that represent two-dimensional flat pattern pieces. This standard also provides conventions for representing related information such as grade rule tables. This standard is not intended to represent the relationships between pattern pieces or the correspondence between 2D or 3D sewn product pattern piece geometries.

1.2 The file format for the pattern data exchange file defined by this standard complies with the Drawing Interchange File (DXF) format. Autodesk, Inc. developed the DXF format for transferring data between their AutoCAD(r) product and other software applications. This standard documents the manner in which pattern data should be represented within the DXF format. Users of this standard should have Autodesk, Inc.'s documentation on Drawing Interchange Files, found in the AutoCAD Reference Manual, in order to assure compatibility to all DXF format specifications. The AutoCAD Version 13 DXF specification is to be used. The file format for the grade rule table exchange file is an ASCII text file.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

- 2.1 *ANSI/AAMA Standard:*
ANSI/AAMA-292A

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *alternate grade reference line, n*—an optional internal line whose orientation is used for the x axis of a grade rule.

3.1.1.1 *Discussion*—The application of a grade rule will be oriented to the grade reference line unless an alternate grade reference line is specified. (See grade reference line.)

3.1.2 *annotation text, n*—optional user defined text that can be displayed when the pattern piece is plotted.

3.1.3 *base size, n*—the digitized or created size of a style.

3.1.3.1 *Discussion*—Base size is a synonym of sample size. (See sample size.)

3.1.4 *block, n*—a DXF keyword that is used to identify a section of the file that has information about one object.

3.1.4.1 *Discussion*—a block keyword should be used to identify the start of information for a pattern piece and the section should be ended with an endblk keyword.

3.1.5 *curve interpolation point, n*—points generated between curve points by a curve interpolation algorithm in a CAD vendor's system to create a curve which represents a contour.

3.1.6 *curve point, n*—a user defined point on a contour.

3.1.6.1 *Discussion*—When a curve interpolation algorithm is used to generate a curve, the resulting curve must pass through all user defined curve points. (See curve interpolation points, validation curve)

3.1.7 *curve tolerance, n*—the maximum perpendicular distance that the resulting curve can deviate from the original curve after transferring the data for the first time.

3.1.7.1 *Discussion*—Sufficient points should be added by the originating system to keep the shape of the curve within the user defined curve tolerance.

3.1.8 *cut lines, n*—the outside edges of a pattern piece used as a guide for cutting out the pattern piece. (See piece boundary.)

3.1.9 *drill hole, n*—a point that is part of a pattern piece that is not part of any line.

3.1.9.1 *Discussion*—Drill holes may be used to denote pocket or buttonhole placement.

3.1.10 *entities, n*—a DXF keyword that is used to identify the section of the DXF file describing file identification information.

3.1.10.1 *Discussion*—Style system text must be placed in the entities section of the DXF file.

3.1.11 *graded nest, n*—a collection of pieces that represent every size in the size line for a particular pattern piece.

3.1.11.1 *Discussion*—The CAD vendor's system will apply the grade rules from the grade rule table to the base size of a piece to create the graded nest.

3.1.12 *grade reference line, n*—the horizontal line that defines the x axis for the pattern piece.

¹ This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.63 on Sewn Product Automation. Current edition approved May 10, 2001. Published August 2001.



3.1.12.1 *Discussion*—The position of all other graded lines and points on the piece are determined in reference to grade reference line(s). a piece must have a grade reference line and may have one or more alternate grade reference lines. (See alternate grade reference line.)

3.1.13 *grade rule, n*—a named set of grade rule values consisting of one grade rule value for each size in the size line. (See grade rule values.)

3.1.13.1 *Discussion*—a grade rule is named by the grade rule identifier.

3.1.14 *grade rule identifier, n*—a user defined numeric name given to a grade rule.

3.1.15 *grade rules values, n*—values that define how an associated data point on a pattern piece moves from one size to another expressed in delta XY units.

3.1.16 *grade rule table, n*—a collection of grade rules.

3.1.17 *grade rule table name, n*—a user defined name given to a grade rule table.

3.1.18 *grade rule table data exchange file, n*—a text file to communicate grade rule values between different CAD/CAM systems.

3.1.19 *grainline, n*—line used to define the horizontal orientation, normally the X-axis, of a piece in a marker.

3.1.19.1 *Discussion*—The grain line is always parallel to the selvage (edge) of the material.

3.1.20 *internal cut outs, n*—lines, part of a pattern piece, not part of the piece boundary, which are cut during the cutting process.

3.1.21 *internal lines, n*—lines, part of a pattern piece, not a part of the piece boundary, which are not cut.

3.1.21.1 *Discussion*—Internal lines are not cut but may be drawn during the cutting process.

3.1.22 *line, n*—a collection of points that define part of a pattern piece.

3.1.23 *mirror line, n*—a line, part of a pattern piece, that divides two symmetrical parts.

3.1.23.1 *Discussion*—Since the pattern piece is symmetrical, only half of the piece needs to be digitized or created in the system. The other half is reflected across the mirror line.

3.1.24 *notch, n*—a shape used to mark a location.

3.1.24.1 *Discussion*—Notches are often used to line up two pieces of material to be sewn together.

3.1.25 *piece boundary, n*—a collection of lines that define the shape of a piece.

3.1.26 *piece information, n*—information that is piece specific.

3.1.27 *piece system text, n*—information provided in the transfer file that is piece specific.

3.1.28 *plaid reference line(s), n*—used for alignment of pattern pieces on plaid material during marker making.

3.1.29 *sample size, n*—the base size from which grade rule values are established.

3.1.30 *sew lines, n*—internal lines that indicate where stitching of pattern pieces is to be done.

3.1.31 *size list, n*—a list of all size names, in order from smallest to largest, for a particular style.

3.1.32 *size name, n*—a user defined name for a graded size.

3.1.32.1 *Discussion*—The size names can be alphabetical, numerical, or alphanumeric.

3.1.33 *smoothing, n*—a process in a CAD vendor's system that adds curve interpolation points to a curve. (See curve interpolation point.)

3.1.34 *stripe reference line, n*—line used for alignment of pattern pieces on stripe material during marker making.

3.1.34.1 *Discussion*—The stripe reference line can be either inside or outside the piece.

3.1.35 *style, n*—a collection of pattern pieces and related information that defines a sewn product.

3.1.36 *system text, n*—information related to either the style and/or pattern pieces in the DXF file.

3.1.37 *system text identifier, n*—keywords used in DXF file to construct syntax and associate values with specific system text.

3.1.38 *turn point, n*—point where a contour makes a sudden change in direction.

3.1.38.1 *Discussion*—If either line coming into the turn point is being smoothed, the turn point marks the end of smoothing.

3.1.39 *validation curve, n*—a set of points that represent the original curve in the exporting CAD system within curve tolerance of the original curve.

4. Summary of Practice

4.1 *Pattern Piece Transfer File Format*—The file format defined by this standard complies with the DXF format. A DXF file is a specially formatted ASCII text file. It consists of an optional header as well as tables, blocks and entities sections. The tables section allows for user-defined functional layering of a CAD drawing. Using this provision, this standard organizes the CAD data representing a pattern piece into a number of layers.

This standard currently can incorporate the following pattern piece information:

annotation (plotted) text;
alternate grade reference line(s);
cut line;
drill holes;
graded nests;
grade reference line;
grade rule identifiers;
grade rule table name;
grain line;
internal cutouts;
internal lines;
mirror line;
notches;
piece boundary, including turn points and curve points;
plaid reference lines;
sew lines;
stripe reference lines;
style information: style name; creation date and time, author, sample size, grade rule table name, units, standard version.
piece information: piece name, quantity, category, rotation, flip, tilt, fold.

4.2 *Header*—An optional header may precede the information in the file defined by this standard. However, because many CAD programs on the market today are unable to generate or accept a header, it is recommended that the use of the optional header be minimized.





4.3 *Layers*—The ASTM D13 proposed standard utilizes a layered file format. Information contained in the file defined by this standard is separated into distinct layers, each layer providing a specific type of information. Layer numbers are used to identify each layer and indicate which information is found in the layer.

Numbers are used, rather than text, since many programs that support the DXF format are unable to generate or accept non-numeric layer designations. Layer 1 is required. Information about each layer is described in 4.3.1 through 4.3.15.

The following four restrictions are placed on layer information:

(1) On Layer 1 the boundary line will be represented as one or more polylines that form a closed polygon.

(2) Layer 2 will contain all the turn points in the piece whether they are part of the boundary or internals.

(3) Layer 3 will contain all the curve points in the piece whether they are part of the boundary or internal lines.

(4) Layers 5,6,7,10 and 13 cannot contain polylines.

The following list for layer numbers are provided:

Layer 1	boundary line
Layer 2	turn points
Layer 3	curve points
Layer 84	quality validation curves
Layer 4	V-notch and slit notch
Layer 80	T-notch
Layer 81	castle notch
Layer 82	check notch
Layer 83	U-notch
Layer 5	grade reference and alternate grade reference line(s)
Layer 6	mirror line
Layer 7	grain line
Layer 8	internal line(s)
Layer 9	stripe reference line(s)
Layer 10	plaid reference line(s)
Layer 11	internal cutout(s)
Layer 12	intentionally left blank
Layer 13	drill holes
Layer 14	sew line(s)
Layer 15	annotation text

4.3.1 *Layer 1—Boundary Line Layer*—The boundary line layer contains the boundary lines for each piece in the file. A separate BLOCK is used for each piece. Within each BLOCK are one or more polylines that constitute the piece boundary. Each polyline within the BLOCK corresponds to an individual pattern element.

The Boundary Line BLOCK includes Turn Points, Curve Points, Notch Base Points, Grade Points and Mirror Line Points. The boundary is a continuous, closed line, with points ordered in either the clockwise or counter clockwise direction. This layer is required.

DXF example of a boundary polyline containing vectorized curves:

```

0
POLYLINE
8
1 layer 1—boundary line
66
1 closed-polyline flag
0
VERTEX
8
1 layer 1—boundary line
10

```

```

450.369 X coordinate
20
338.697 Y coordinate
0
VERTEX
8
1 layer 1—boundary line
10
459.322 X coordinate
20
338.316 Y coordinate
0
VERTEX
8
1 layer 1—boundary line
10
457.195 X coordinate
20
327.486 Y coordinate
0
SEQEND

```

DXF example of a boundary polyline containing circular-interpolated curves:

```

0
POLYLINE
-8
1 layer 1—boundary line
66
1
70
1
0
VERTEX
8
1 layer 1—boundary line
10
0.0 X coordinate
20
0.0 Y coordinate
42
-0.014743 bulge value
0
VERTEX
8
1 layer 1—boundary line
10
-45.900000 X coordinate
20
-53.800000 Y coordinate
42
-0.005465 bulge value
0
VERTEX
8
1
10
-34.200000 X coordinate
20
-38.600000 Y coordinate
42
-0.018913 bulge value
0
VERTEX
8
1 layer 1—boundary line
10
-19.100000 X coordinate
20
-20.200000 Y coordinate
0
SEQEND

```