



Standard Practice for Sewn Products Pattern Data Interchange—Data Format¹

This standard is issued under the fixed designation D6673; 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 (Practice D6673) 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 ASTM Standards:

D6963 Terminology Relating to Sewn Products Automation

2.2 ANSI/AAMA Standard:

ANSI/AAMA-292A

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:* For all terminology related to Sewn Products Automation see Terminology **D6963**.

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

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

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

3.1.3.1 *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.

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

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

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

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

3.2 Definitions of Terms Specific to This Standard:

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

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

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

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

3.2.4 *validation vertex, n*—vertex that is inserted into a polyline in order to guarantee that the resulting polyline represents the original curve in the exporting CAD systems within a given curve tolerance

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.

¹ This practice is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.66 on Sewn Product Automation.

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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;
grainline;
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 piece 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 as found on layers 1, 8, 11, and 14.

(3) Layer 3 will contain all the curve points in the piece as found on layers 1, 8, 11, and 14.

(4) Layers 5, 6, 7, 9, 10 and 13 cannot contain polylines.

The following list for layer numbers are provided:

Layer 1	piece boundary
Layer 2	turn points
Layer 3	curve points
Layer 4	V-notch and slit notch
Layer 5	grade reference and alternate grade reference line(s)
Layer 6	mirror line
Layer 7	grainline
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
Layer 80	T-notch
Layer 81	castle notch
Layer 82	check notch
Layer 83	U-notch
Layer 84	piece boundary quality validation curves
Layer 85	internal lines quality validation curves
Layer 86	internal cutouts quality validation curves
Layer 87	sew lines quality validation curves

4.3.1 Layer 1—Piece Boundary Layer—The piece boundary 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 Piece Boundary BLOCK includes Turn Points, Curve Points, Notch Base Points, Grade Points and Mirror Line Points. The piece 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 piece boundary polyline containing vectorized curves:

```

0
POLYLINE
8
1
66
1
0
layer 1—boundary line
closed-polyline flag
0
VERTEX
8
1
10
450.369
20
338.697
0
Y coordinate
0
VERTEX
8
1
10
459.322
20
338.316
0
Y coordinate
0
VERTEX
8
1
10
457.195
20
327.486
0
Y coordinate
0
SEQEND

```

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

```

0
POLYLINE
-8
1
66
1
70
1
0
layer 1—boundary line
0
VERTEX
8
1
10
0.0
X coordinate

```