Designation: D 3715/D3715M – 98

Standard Practice for Quality Assurance of Pressure-Sensitive Tapes[1]

This standard is issued under the fixed designation D 3715/D3715M; 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.
This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice contains uniform quality assurance provisions for pressure-sensitive tapes and establishes sampling plans and procedures for acceptance inspection.

1.2 *Limitations*:

1.2.1 This practice only includes procedures for when an upper or a lower specification limit is given. It does not provide for double, both minimum and maximum, specification limits.

NOTE 1—When double specification limits are given (applies to variables testing only), use may be made of Table C-3 and Example C-3 of ANSI/ASQC Z1.9.

1.2.2 The variables sampling plans apply to a single quality characteristic. Having obtained the sample and the responses to the physical property tests, acceptance is determined on one quality characteristic at a time. The process is repeated for each additional characteristic.

1.2.3 The variables sampling plans require that the response to each quality characteristic is normally distributed either directly or by transformation. If this is not known, the potential user of this practice should seek the counsel of someone with sufficient understanding of statistical techniques to provide that information.

1.3 The values stated in either SI or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system must be used independently, without combining values in any way.

1.4 *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:*

D 996 Terminology of Packaging and Distribution Environments[2,3]

2.2 *ANSI/ASQC Standards:*

ANSI/ASQC A2 Terms, Symbols, and Definitions for Acceptance Sampling[3]

ANSI/ASQC A3 Quality Systems Terminology[4]

ANSI/ASQC Q94 Quality Management and Quality System Elements—Guidelines[4]

ANSI/ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes[4]

ANSI/ASQC Z1.9 Sampling and Tables for Inspection by Variables for Percent Defective

3. Terminology

3.1 *Definitions*—General terms in this practice are defined in Terminology D 996, ANSI/ASQC A2, and ANSI/ASQC A3.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *acceptability criterion*—the comparison made between a factor, number, or constant found in the sampling plan and the examination or test result information from a single quality characteristic to determine if the lot should be accepted or rejected. For inspection by attributes the acceptability criterion is a comparison with the acceptability constant found in Table 1.

3.2.2 *acceptable quality level (AQL)*—a nominal value expressed in terms of percent defective or defects per hundred units, whichever is applicable, specified for a given group of defects of a product (see ANSI/ASQC A2).

3.2.3 *defect*—any nonconformance of the unit of product to specified requirements; it is classified according to its seriousness.

3.2.4 *defects per hundred units—of any given quantity of units of product*, is the number of defects contained therein divided by the total number of units of product, the quotient multiplied by one hundred (one or more defects being possible in any unit of product). Expressed as an equation:

$$\text{Defects per hundred units} = \frac{\text{number of defects} \times 100}{\text{number of units inspected}} \quad (1)$$

3.2.5 *defective unit*—a unit of product that contains one or more defects.

[1] This practice is under the jurisdiction of ASTM Committee D-10 on Packaging, and is the direct responsibility of Subcommittee D10.14 on Tape and Labels.

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

[3] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[4] Available from American Society for Quality (ASQ), 310 West Wisconsin Ave., Milwaukee, WI 53203.

TABLE 1 Sampling Plans for Inspection by Variables[A] (Variability Unknown—Single Specification Limit)

Lot Size (100-m²[yd²] Units)			Sample Size	Acceptable Quality Levels (Normal Inspection)							Sample Size	Acceptable Quality Levels (Reduced Inspection)					
				.65	1.00	1.50	2.50	4.00	6.50	10.00		1.00	1.50	2.50	4.00	6.50	10.00
				k	*k*	*k*	*k*	*k*	*k*	*k*		*k*	*k*	*k*	*k*	*k*	*k*
1	to	300	3	I	↓	↓	0.587	0.502	0.401	0.296	3	I	0.587	0.502	0.401	0.296	0.178
301	to	500	4	I	0.651	0.598	0.525	0.450	0.364	0.276	3	I	0.587	0.502	0.401	0.296	0.178
				↓								I					
501	to	800	5	0.663	0.614	0.565	0.498	0.431	0.352	0.272	3	I	0.587	0.502	0.401	0.296	0.178
801	to	1 300	7	0.613	0.569	0.525	0.465	0.405	0.336	0.266	3	↓	0.587	0.502	0.401	0.296	0.178
1 301	to	3 200	10	0.755	0.703	0.650	0.579	0.507	0.424	0.341	4	0.598	0.525	0.450	0.364	0.276	0.176
3 201	to	8 000	15	0.792	0.738	0.684	0.610	0.536	0.452	0.368	5	0.565	0.498	0.431	0.352	0.272	0.184
8 001	to	22 000	25	0.815	0.779	0.723	0.647	0.571	0.484	0.398	7	0.525	0.465	0.405	0.336	0.266	0.189
				1.00	1.50	2.50	4.00	6.50	10.00	15.00							
Acceptable Quality Levels (tightened inspection)																	

[A]This table contains information extracted from Tables A-2 (inspection level I), C-1, and C-2 from ANSI/ASQC Z1.9.
↓ = Use the first sampling plan below arrow including the larger sample size and the *k* value.
k = Acceptability constant.

3.2.6 *end item*—the actual product or commodity being sold under the material specification. It is in its most complete form and may be either packed for shipping or at a production stage just preceding packing. It may or may not be the same as the unit of product defined in 3.2.17.

3.2.7 *end-item examination*—the inspection of the roll of tape for those characteristics which are either easily discernible by visual inspection or can be simply measured by a hand rule (such as width). All characteristics of this type are considered as attributes.

3.2.8 *end-item testing*—the inspection of the unit of product that involves measurement of physical properties on a continuous scale. All characteristics of this type are considered as variables.

3.2.9 *inspection*—the process of measuring, examining, testing, gaging, or otherwise comparing the unit of product with the applicable requirements (see ANSI/ASQC A2).

3.2.10 *inspection by attributes*—inspection whereby either the unit of product is classified simply as defective or nondefective or the number of defects in the unit of product is counted, with respect to a given requirement or set of requirements (see ANSI/ASQC A2).

3.2.11 *inspection by variables*—inspection wherein a specified quality characteristic on a unit of product is measured on a continuous scale, such as pounds, inches, feet per second, etc., and a measurement is recorded (see ANSI/ASQC A2).

3.2.12 *inspection lot*—a collection of units of product from which a sample is drawn and inspected to determine compliance with the acceptability criteria.

3.2.13 *material specification*—that document covering a product or set of products and specifying the parameters that define the product(s) (see ANSI/ASQC A3).

3.2.14 *percent defective*—the number of defective units of product contained therein, divided by the total number of product, the quotient multiplied by one hundred (a unit being considered defective if it contains one or more defects). Expressed as an equation:

$$\text{Percent defective} = \frac{\text{number of defective units} \times 100}{\text{number of units inspected}} \quad (2)$$

3.2.15 *quality characteristic—for inspection*, that characteristic of a unit of product that is actually measured to determine conformance with a given requirement.

3.2.16 *specification limit(s)*—the requirement that a quality characteristic should meet. This requirement may be expressed as an upper specification limit, or a lower specification limit; called herein a single specification limit.

3.2.17 *unit of product*—the entity of product inspected in order to determine its measurable quality characteristic. For this practice the unit of product will usually be a roll of tape. The unit of product may or may not be the same as the unit of purchase, supply production, or shipment. It is also called sample unit in this practice.

4. Significance and Use

4.1 The quality of a tape product is determined by the quality systems of the tape producer, including all processes involved in the engineering and production of the product. It is recommended that appropriate sections of ANSI/ASQC Q94 be included in a producer's quality systems. This practice does not intend to standardize these systems. A producer's reputation, a producer's certification of conformance, or evidence of a producer's quality systems are often sufficient to ensure a purchaser or user of a consistent quality. Acceptance sampling is useful when an objective basis of contract or specification conformance is desired.

4.2 The intention of this practice is to provide a reasonably simple document which can be used by both the buyer and seller of pressure-sensitive tape to determine if the product offered for sale meets some predetermined specification for the product. This practice offers the procedures for determining the size of the sample to be inspected and the criteria for determining whether the lot (amount of material offered for sale) should be accepted or rejected. This practice draws from and is based on both ANSI/ASQC Z1.4 and ANSI/ASQC Z1.9.

4.3 Two forms of sampling plans are included: sampling by attributes and sampling by variables. Sampling by attributes is used for end-item examination and both are used where appropriate for end-item testing. Sampling by attributes has the

advantage of simplicity while sampling by variables has the advantage of costing less for the equivalent assurance of the correctness of decisions.

4.3.1 Sampling plans for inspection by attributes (see Table 2), should be used for end-item examination (see 5.3).

4.3.2 Sampling plans for inspection by variables (see Table 1 and 5.4), should be used for end-item testing except as indicated in 5.4.1.2(a).

4.4 Use of this practice assumes that a specification defining one or more quality characteristics exists. It is suggested that buyer and seller agree on acceptable quality levels (AQL) from within the choices shown in the tables of this practice.

4.5 When conditions warrant switching from normal to tightened or reduced inspection, the appropriate sampling plans are available in Table 1 and Table 2. The decision to switch should be agreed upon between the buyer and the seller. When lots are rejected under normal inspection it is usual to go to tightened inspection. No change in AQL is made, but the assurance of making the correct decision is improved usually by the sampling plan calling for a larger sample size. Reduced inspection is a switch from normal inspection made when some number of lots, usually 10, passes in consecutive order. Switching should move from reduced to normal and from normal to tightened or from tightened to normal without skipping an intermediate step.

5. Procedure

5.1 Where it can be demonstrated that a supplier's quality control system provides a similar degree of assurance as that obtained through the use of this practice, the supplier may use that system in place of the system described herein. In case of conflict, the system described in this practice shall be used.

5.2 Where applicable, inspection (examination or testing) at some prior stage of manufacture, for example in-process or raw material, can be used instead of inspection of the end item. An example of this might be the use of the tensile strength test performed at the raw material testing stage rather than on the end item.

5.3 *End-Item Examination*:

5.3.1 *Sampling*:

5.3.1.1 *Lot Size*, for the purpose of determining the sample size, shall be expressed in units of rolls for examination under 5.3.2.1-5.3.2.3 inclusive, and shall consist of all the tape material presented for examination at one time. The material shall be of the same type, class, and color, manufactured by the same process, from the same components, at one plant by one manufacturer under the same conditions.

5.3.1.2 *Sample Size*—The number of units of product (rolls of tape) to be examined shall be found in Table 2 under sample size. Use the sampling plans for normal inspection unless tightened or reduced inspection has been specifically agreed upon.

5.3.1.3 The following table illustrates the AQLs that have commonly been used with the examinations found in 5.3.2. The graduation follows traditional levels of importance for the attributes collected together in the tables given in 5.3.2.1, 5.3.2.2, and 5.3.2.3. Table 2 illustrates only these AQLs.

Examination Paragraph	AQL, %
5.3.2.1	2.5
5.3.2.2	4.0
5.3.2.3	10.0

5.3.2 *Examination*—Examine in accordance with the defects listed in 5.3.2.1, 5.3.2.2 and 5.3.2.3 and AQLs set forth in the table in 5.3.1.3 when sampled from the shipment. No more than two rolls, randomly selected, shall be drawn from any one shipping container from each lot of material for each type and color of tape offered for inspection for visual and dimensional characteristics.

NOTE 2—The same rolls of tape shall be used for examination under 5.3.2.1-5.3.2.3 inclusive, and these examinations should be made concurrently.

5.3.2.1 *Major Defects*—The sample unit for this examination shall be one roll.

Examine	Major Defect
Form	Not type, class, or grade specified. Adhesive side not wound on inside of roll, unless otherwise specified.
Backing	Not colored or transparent, as specified. Tape does not consist of the specified backing (if one is specified).

TABLE 2 Sampling Plans for Inspection by Attributes[A]

Lot Size in Number of Rolls	Normal Inspection					Tightened Inspection					Reduced Inspection				
	Sample Size	AQL				Sample Size	AQL				Sample Size	AQL			
		2.5		4.0		10		2.5		4.0		10		2.5		4.0		10	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
2–15	2	|Ch		|Co		|Ch		2	|Ch		|Ch		|Ch	2	|Ch		|Co		|Ch	
16–50	3	|Co		0	1	|Co		3	|Ch		|Co		|Ch	2	|Co		0	1	|Co	
51–150	5	0	1	|Cu		1	2	5	|Ch		0	1	|Ch	2	0	1	|Cu		0	2
		|Cu							|Co		|Ch		|Co		|Cu					
151–500	8			|Co		2	3	8	0	1	|Ch		1	2	3			|Co		1	3
501–3200	13	|Co		1	2	3	4	13	|Ch		|Co		2	3	5	|Co		0	2	1	4
3201–35 000	20	1	2	2	3	5	6	20	|Ch		1	2	3	4	8	0	2	1	3	2	5
									|Co												
35 001–500 000	32	2	3	3	4	7	8	32	1	2	2	3	5	6	13	1	3	1	4	3	6
500 001 and over	50	3	4	5	6	10	11	50	2	3	3	4	8	9	20	1	4	2	5	5	8

[A]This table is based on Tables I, II-A, II-B, and II-C of ANSI/ASQC Z1.4 using an inspection level of S-3.
|Co = Use first sample plan below arrow. If sample size equals or exceeds lot or batch size, do 100 % inspection.
|Cu = Use first sample plan above arrow.
Ac = Acceptance number.
Re = Rejection number.