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Standard Practice for Sampling and Judging Quality of Solid Electrical Insulating Materials[1]

This standard is issued under the fixed designation D3636; 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.

~~ε^1 NOTE—Changes were made editorially in April 2014.~~

1. Scope*

1.1 This practice covers procedures for obtaining data pertaining to the quality of a lot of electrical insulating material and for making a judgement whether the lot meets the requirements of a material specification.

1.2 This practice is not intended to define a producer's internal quality control procedures but is designed to determine the acceptability of all, or some portion, of a quantity of electrical insulating material that is available for inspection by the user of the material.

1.3 This practice is intended to be used in conjunction with an existing material specification that specifies property characteristic limits, acceptable quality level (AQL), standard test methods, and specific sampling instructions.

1.4 In the absence of a specification as described in 1.3, use this practice as a guide, after establishment of agreed-upon property characteristics, limits, AQL, standard test methods, and specific sampling instructions.

1.5 It is intended that this be a practice for inspection by attributes.

1.6 *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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *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]

E300 Practice for Sampling Industrial Chemicals

2.2 *Military Standard:*

MIL-STD-105E Sampling Procedures and Tables for Inspection by Attributes[3] (last revised May 10, 1989)

ANSI/ASQ Z1.4, MIL-STD-1916 Department of Defense Preferred Methods for Acceptance of Product (last revised April 1, 1996)

2.3 *Other Document:*

ANSI/ASQC A2 -1987[4]

3. Terminology

3.1 *Definitions:*

3.1.1 *acceptance number, n*—the maximum allowable number of nonconformities for a given AQL and sample size (lot-sample size).

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[1] This practice is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.94 on Editorial.

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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] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

***A Summary of Changes section appears at the end of this standard**

3.1.2 *acceptable quality level (AQL), n*—the maximum percent nonconforming which, for purposes of sampling inspection, is considered satisfactory as a process average.

3.1.3 *critical property, n*—a quantitatively measurable characteristic which is absolutely necessary to be met if a material or product is to provide satisfactory performance for the intended use.

3.1.3.1 *Discussion*—

In some situations, specification requirements coincide with customer usage requirements. In other situations, they may not coincide, being either more or less stringent. More stringent sampling (for example, smaller AQL values) is usually used for measurement of characteristics which are considered critical. The selection of sampling plans is independent of whether the term *defect* or *nonconformity* is appropriate.

3.1.4 *defect, n*—a departure of a quality characteristic from its intended level, or state, that occurs with a severity sufficient to cause an associated product or service not to satisfy intended normal, or reasonably foreseeable, usage requirements.

3.1.4.1 *Discussion*—

The terms *defect* and *nonconformity* and their derivatives are used somewhat interchangeably in the historical and current literature. *Nonconformity* objectively describes the comparison of test results to specification requirements, while the term *defect* has a connotation of predicting the failure of a product or service to perform its intended function in use. Since this latter connotation is often unintended, the term *nonconformity* is preferred in full consensus standards. The selection of any sample plan is independent of whether the term *defect* or *nonconformity* is appropriate.

The term *defect* may be appropriate for specifications mutually agreed upon by a producer and a user where specific use conditions are clearly understood. Even in these cases however, use the term *defect* with caution and consider substituting the term *nonconformity.*

For additional comments, see ANSI/ASQC A2-1987 that also states: "When a quality characteristic of a product or service is "evaluated" in terms of conformance to specification requirements, the use of the term *nonconformity* is appropriate."

~~The term *defect* may be appropriate for specifications mutually agreed upon by a producer and a user where specific use conditions are clearly understood. Even in these cases however, use the term *defect* with caution and consider substituting the term *nonconformity*.~~

~~For additional comments, see ANSI/ASQC A2-1987 that also states: "When a quality characteristic of a product or service is "evaluated" in terms of conformance to specification requirements, the use of the term *nonconformity* is appropriate."~~

3.1.5 *group AQL*—the AQL assigned to a group of material properties.

3.1.5.1 *Discussion*—

See 5.2 for additional information about the meaning of AQL.

3.1.6 *lot, n*—an entity of electrical insulating material or product which, insofar as is practicable, consists of a single type, grade, class, size, or composition that was manufactured under essentially the same conditions and is available to the user for sampling at one time.

3.1.7 *lot number, n*—the number used by a producer to identify an entity of electrical insulating material or product.

3.1.8 *major property, n*—a quantitatively measurable characteristic which, if not met, is likely to seriously impair the performance of a material or product for the intended use.

3.1.8.1 *Discussion*—

In some situations, specification requirements coincide with customer usage requirements. In other situations, they may not coincide, being either more or less stringent. More stringent sampling (for example, smaller AQL values) is usually used for measurement of characteristics that are considered important. The selection of sampling plans is independent of whether the term *defect* or *nonconformity* is appropriate.

3.1.9 *minor property, n*—a characteristic which, if not met, is not likely to materially reduce the performance of a material or product for the intended use.

3.1.9.1 *Discussion*—

In some situations, specification requirements coincide with customer usage requirements. In other situations, they may not

coincide, being either more or less stringent. More stringent sampling (for example, smaller AQL values) is usually used for measurement of characteristics that are considered important. The selection of sampling plans is independent of whether the term *defect* or *nonconformity* is appropriate.

3.1.10 *nonconforming unit, n*—a unit of product containing at least one nonconformity.

3.1.11 *nonconformities per hundred units, n*—a calculated ratio of nonconforming units to the number of units inspected, the quotient being multiplied by 100 ~~(See~~(see 3.1.13~~.)~~).

3.1.12 *nonconformity, n*—a departure of a quality characteristic from its intended level or state that occurs with a severity sufficient to cause a test result not to meet a specification requirement.

3.1.13 *percent nonconforming, n*—a calculated ratio of nonconforming units to the number of units inspected, the quotient being multiplied by 100.

3.1.14 *rejection number, n*—the minimum number of nonconformities for a given AQL and sample size (lot-sample size) which will subject a lot to rejection.

3.1.15 *sample, n*—one or more units of product taken from a lot without regard to the quality of the ~~unit. (Also~~unit (also often termed lot sample).

3.1.16 *sample size, n*—the number of units of product taken to make up the sample.

3.1.16.1 *Discussion*—

This standard uses only lot sample sizes and not lot sizes since the discriminatory power of any sampling plan is independent essentially of the size of the lot. The sample size selected by the user for a given acceptable quality level (AQL) is optional depending upon the degree of protection desired by the user against the acceptance of nonconforming lots.

3.1.17 *test measurement, n*—a quantitative expression of one value determined for a property of interest by a single application of a specified test procedure.

3.1.18 *test result, n*—the value that expresses the level of a property of the test unit.

3.1.18.1 *Discussion*—

A test result is sometimes a single test measurement but usually a test result is computed from several test measurements.

3.1.19 *test specimen, n*—a portion of a test unit upon which one or more test measurements are made.

3.1.20 *test unit, n*—a fraction of a unit of product from which one or more test specimens are taken for each property.

3.1.20.1 *Discussion*—

If the unit of product is of insufficient size to meet the requirements of a testing method: (*1*) sample adjacent units of product and aggregate units of product for the test unit or, (*2*) obtain a test unit of sufficient size, and representative of the unit of product, from the producer.

3.1.21 *unit of product, n*—an entity of electrical insulating material or product for inspection to determine its classification as conforming or non-conforming.

3.1.21.1 *Discussion*—

A unit of product is established by the user and may or may not be the same as a unit of purchase, supply, production, or shipment. Some examples of a unit of product are:

~~Bag~~
~~Barrel~~
~~Bin~~
~~Bobbin~~
~~Box~~
~~Bundle~~
~~Car~~
~~Carton~~
~~Case~~
~~Container~~
~~Cop~~
~~Drum~~
~~Length~~
~~Pad~~
~~Pail~~
~~Pallet~~
~~Reel~~
~~Roll~~
~~Sheet~~
~~Skid~~
~~Spool~~
~~Tank~~
~~Tank compartment~~
~~Truckload~~

Bag	Case	Reel
Barrel	Container	Roll
Bin	Cop	Sheet
Bobbin	Drum	Skid
Box	Length	Spool
Bundle	Pad	Tank
Car	Pail	Tank compartment
Carton	Pallet	Truckload

4. Summary of Practice

4.1 Instructions are given for obtaining a sample from which specimens are then taken for testing. The test data are compared to the material specification and a judgement is then made as to whether the material meets the requirements of said material specification.

4.2 This practice has been modeled after MIL-STD-105E.

4.3 In those cases where MIL-STD-105E is determined to be unacceptable for a specific application or purpose and a form of C=0 sampling is required instead, ~~it is permissible to~~ alternatively apply ANSI/ASQ Z1.4, MIL-STD-1916, or a similar sampling plan.

5. Procedure

5.1 *General Considerations:*

5.1.1 Assemble the lot of electrical insulating material so that a lot sample is obtained in a manner that will minimize bias in the selection of the units of product that will be inspected. A scheme that offers a good chance of minimizing bias is the assignment of numbers to each unit of product and then using a table of random numbers to select those units of product from which test units are taken.

5.1.2 For a lot of electrical insulating material that is in bulk form (for example, a tank car of powdered resin) take the lot sample from the unit of product in accordance with Practice E300.

5.1.3 Take the material to be removed from any unit of product in a random manner. When it is impracticable to meet this requirement (for example, in the case of long lengths of material wound onto rolls or large, thick, heavy sheets packed on pallets or skids), economy will dictate the removal of material from the end of a roll, or the top of a pile, etc. in which cases the selection cannot be described as "random."

5.1.4 Take the necessary amount of material from the test unit so as to meet the specimen requirements of the various test methods that will be used to evaluate the material.

5.1.5 Refer to the material specification for the allowable maximum elapsed time between the assembly of the lot for inspection and the disposition of the lot. If the material specification (or other pertinent document) does not cover this matter, the maximum allowable time is 30 calendar days.

5.1.6 Exercise care to protect the electrical insulating material contained in the test unit from which specimens are to be prepared. An example of this protection is packaging in metal foil or glass containers so as to prevent or minimize contamination of the material from the effects of the environment to which such material is subjected between sampling and testing.

5.1.7 Test units assembled as described above shall be deemed to be representative of the lot of material being inspected. Disposition of the lot, or portions thereof will be based upon the data generated from these test units unless otherwise agreed upon between the user and the producer.

5.2 *Establishing Acceptable Quality Levels:*

5.2.1 Acceptable quality levels (AQL's) for each critical, major, and minor property shall be as mutually agreed upon by the producer and the user. It is also acceptable to establish group AQL's for given groups of properties. Disclose these AQL's in a purchase order, material specification, or in some other document. This standard is not intended to impose limits upon the risks acceptable to either the user or the producer.

5.2.2 When a user designates some specific value of AQL for a single nonconformity, it indicates that the user's acceptance sampling plan will accept the great majority of the lots submitted by the producer if the process average level of percent nonconforming in the lots is no greater than the designated value of AQL. The preceding statement is also true for a group AQL value designated for a group of nonconformities.

5.2.2.1 The sampling plans of this standard are so arranged that the probability of acceptance, at the designated AQL value, depends upon the sample size. For a given AQL, the probability of acceptance will be generally higher for large sample sizes than for small sample sizes. The AQL alone does not describe the user protection for individual lots, but more directly relates to what a user might expect from a series of lots. Refer to the operating characteristic curve to determine what protection the user will have for a specific AQL.

5.2.3 The designation of an AQL shall not imply that a producer has the right to knowingly supply any nonconforming unit of product.

5.2.4 The values of AQL listed in the accompanying tables (see ~~Section~~ Appendix X1) are known as preferred AQL's. If any AQL is designated other than a preferred AQL, these tables are not applicable.

5.3 *Sampling Plan Selection:*

5.3.1 Use the designated AQL and the sample size code letter from Table 1 to select a sampling plan from Tables 2-22. When no sampling plan is available for a given combination of AQL and code letter, the table directs the user to a different code letter. Use the sample size given by the new code letter, not the original code letter.

5.3.1.1 It is possible this procedure will lead to different sample sizes for different classes of nonconformities. In such cases the user of the electrical insulating material shall designate and authorize, for all classes of nonconformities, the selection and use of the code letter corresponding to the largest sample size derived.

5.3.1.2 As an alternative to a single sampling plan with an acceptance number of 0, use the plan with an acceptance number of 1 with its correspondingly larger sample size for a designated AQL (where available) when designated and approved by the user.

5.3.2 *Types of Sampling Plans*—Three types of sampling plans: single, double, and multiple are given in Table 2, Table 3, and Table 4, respectively. When several types of plans are available for a given AQL and code letter, use any one. A decision as to type of plan, either single, double, or multiple, when available for a given AQL and code letter, will usually be based upon the comparison between the administrative difficulty and the average sample sizes of the available plans. The average sample size of multiple plans is less than for double (except in the case corresponding to single acceptance number 1) and both of these are always less than a single sample size. Usually the administrative difficulty for single sampling and the cost per unit of the sample are less than for double or multiple.

5.3.3 *Single Sampling Plans*—From any lot, inspect that number of units which equals the sample size given by the plan.

5.3.3.1 Consider any lot acceptable if the number of nonconformities found in the sample is equal to, or less than, the acceptance number.

5.3.3.2 Consider any lot rejectable if the number of nonconformities found in the sample is equal to, or greater than, the rejection number.

5.3.4 *Double Sampling Plans*—From any lot, inspect that number of units which equals the sample size given by the plan.

5.3.4.1 Consider any lot acceptable if the number of nonconformities found in the first sample is equal to, or less than, the first acceptance number.

5.3.4.2 Consider any lot rejectable if the number of nonconformities found in the first sample is equal to, or greater than, the first rejection number.

5.3.4.3 If the number of nonconformities in the first sample lies between the first acceptance and rejection numbers, inspect a second sample of the size given by the plan.

5.3.4.4 Accumulate the number of nonconformities found in the first and the second samples.

5.3.4.5 Consider any lot acceptable if the cumulative number of nonconformities found in the sample is equal to, or less than, the second acceptance number.

5.3.4.6 Consider any lot rejectable if the cumulative number of nonconformities found in the sample is equal to, or greater than, the second rejection number.

5.3.5 *Multiple Sampling Plans*—Use the procedure of 5.3.4 for multiple sampling plans but the number of successive samples required to reach a decision will be more than two.

5.3.6 *Special Procedure for Reduced Inspection*—Under reduced inspection, it is acceptable for the sampling procedure to terminate without either acceptance or rejection criteria having been met. In these circumstances, the lot will be considered acceptable, but normal inspection will be reinstated starting with the next lot which is submitted to the user.

5.4 *Inspection Levels:*

TABLE 1 Sample Size Code Letters *(See 5.4)*

Lot or Batch Size			Special Inspection Levels				General Inspection Levels		
			S-1	S-2	S-3	S-4	I	II	III
2	to	8	A	A	A	A	A	A	B
9	to	15	A	A	A	A	A	B	C
16	to	25	A	A	B	B	B	C	D
26	to	50	A	B	B	C	C	D	E
51	to	90	B	B	C	C	C	E	F
91	to	150	B	B	C	D	D	F	G
151	to	280	B	C	D	E	E	G	H
281	to	500	B	C	D	E	F	H	J
501	to	1200	C	C	E	F	G	J	K
1201	to	3200	C	D	E	G	H	K	L
3201	to	10 000	C	D	F	G	J	L	M
10 001	to	35 000	C	D	F	H	K	M	N
35 001	to	150 000	D	E	G	J	L	N	P
150 001	to	500 000	D	E	G	J	M	P	Q
500 001	and	over	D	E	H	K	N	Q	R

TABLE 2 A Single Sampling Plans For Normal Inspection (Master Table) *(See 5.3.1 and 5.3.2)*

Sample size code letter	Sample size	Acceptable Quality Levels (normal inspection)																									
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31
B	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45
C	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑
D	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑
E	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	↑	↑	↑
F	20	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑
G	32	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑
H	50	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑
J	80	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑
K	125	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
L	200	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
M	315	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
N	500	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
P	800	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Q	1250	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
R	2000	↑	↑	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

↓ = Use first sampling plan below arrow. If sample size equals, or exceeds, lot or batch size, do 100 percent inspection.
↑ = Use first sampling plan above arrow.

Ac = Acceptance number.
Re = Rejection number.

TABLE 2 B Single Sampling Plans for Tightened Inspection (Master Table) *(See 8.4 and 8.5) (continued)*

Acceptable Quality Levels (tightened inspection)

Sample size code letter	Sample size	0.010		0.015		0.025		0.040		0.065		0.10		0.15		0.25		0.40		0.65	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2	↓		↓		↓		↓		↓		↓		↓		↓		↓		↓	
B	3	↓		↓		↓		↓		↓		↓		↓		↓		↓		↓	
C	5	↓		↓		↓		↓		↓		↓		↓		↓		↓		↓	
D	8	↓		↓		↓		↓		↓		↓		↓		↓		↓		↓	
E	13	↓		↓		↓		↓		↓		↓		↓		↓		↓		↓	
F	20	↓		↓		↓		↓		↓		↓		↓		↓		↓		↓	
G	32	↓		↓		↓		↓		↓		↓		↓		↓		↓		0	1
H	50	↓		↓		↓		↓		↓		↓		↓		↓		0	1	↓	
J	80	↓		↓		↓		↓		↓		↓		↓		0	1	↓		↓	
K	125	↓		↓		↓		↓		↓		↓		0	1	↓		↓		1	2
L	200	↓		↓		↓		↓		↓		0	1	↓		↓		1	2	2	3
M	315	↓		↓		↓		↓		0	1	↓		↓		1	2	2	3	3	4
N	500	↓		↓		↓		0	1	↓		↓		1	2	2	3	3	4	5	6
P	800	↓		↓		0	1	↓		↓		1	2	2	3	3	4	5	6	8	9
Q	1250	↓		0	1	↓		↓		1	2	2	3	3	4	5	6	8	9	12	13
R	2000	0	1	↑		↓		1	2	2	3	3	4	5	6	8	9	12	13	18	19
S	3150					1	2														

Sample size code letter	Sample size	1.0		1.5		2.5		4.0		6.5		10		15	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2	↓		↓		↓		↓		↓		↓		↓	
B	3	↓		↓		↓		↓		0	1	↓		↓	
C	5	↓		↓		↓		0	1	↓		↓		1	2
D	8	↓		↓		0	1	↓		↓		1	2	2	3
E	13	↓		0	1	↓		↓		1	2	2	3	3	4
F	20	0	1	↓		↓		1	2	2	3	3	4	5	6
G	32	↓		↓		1	2	2	3	3	4	5	6	8	9
H	50	↓		1	2	2	3	3	4	5	6	8	9	12	13
J	80	1	2	2	3	3	4	5	6	8	9	12	13	18	19
K	125	2	3	3	4	5	6	8	9	12	13	18	19	↑	
L	200	3	4	5	6	8	9	12	13	18	19	↑		↑	
M	315	5	6	8	9	12	13	18	19	↑		↑		↑	
N	500	8	9	12	13	18	19	↑		↑		↑		↑	
P	800	12	13	18	19	↑		↑		↑		↑		↑	
Q	1250	18	19	↑		↑		↑		↑		↑		↑	
R	2000	↑		↑		↑		↑		↑		↑		↑	
S	3150														

Sample size code letter	Sample size	25		40		65		100		150		250		400		650		1000	
		Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re	Ac	Re
A	2	↓		1	2	2	3	3	4	5	6	8	9	12	13	18	19	27	28
B	3	1	2	2	3	3	4	5	6	8	9	12	13	18	19	27	28	41	42
C	5	2	3	3	4	5	6	8	9	12	13	18	19	27	28	41	42	↑	
D	8	3	4	5	6	8	9	12	13	18	19	27	28	41	42	↑		↑	
E	13	5	6	8	9	12	13	18	19	27	28	41	42	↑		↑		↑	
F	20	8	9	12	13	18	19	↑		↑		↑		↑		↑		↑	
G	32	12	13	18	19	↑		↑		↑		↑		↑		↑		↑	
H	50	18	19	↑		↑		↑		↑		↑		↑		↑		↑	
J	80	↑		↑		↑		↑		↑		↑		↑		↑		↑	
K	125	↑		↑		↑		↑		↑		↑		↑		↑		↑	
L	200	↑		↑		↑		↑		↑		↑		↑		↑		↑	
M	315	↑		↑		↑		↑		↑		↑		↑		↑		↑	
N	500	↑		↑		↑		↑		↑		↑		↑		↑		↑	
P	800	↑		↑		↑		↑		↑		↑		↑		↑		↑	
Q	1250	↑		↑		↑		↑		↑		↑		↑		↑		↑	
R	2000	↑		↑		↑		↑		↑		↑		↑		↑		↑	
S	3150																		

↓ = Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.
↑ = Use first sampling plan above arrow.
Ac = Acceptance number.
Re = Rejection number.

TABLE 2 C Single Sampling Plans for Reduced Inspection (Master Table) *(See 5.3.1 and 5.3.2) (continued)*

Sample size code letter	Sample size	Acceptable Quality Levels (reduced inspection)†																									
		0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31
B	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	2 4	3 5	5 6	7 8	10 11	14 15	21 22	30 31
C	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	14 17	21 24	↑
D	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	14 17	21 24	↑	↑
E	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	14 17	21 24	↑	↑	↑
F	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑
G	13	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑
H	20	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑
J	32	↓	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑
K	50	↓	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
L	80	↓	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
M	125	↓	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
N	200	↓	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
P	315	↓	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Q	500	0 1	↑	↓	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
R	800	↑	↑	0 2	1 3	1 4	2 5	3 6	5 8	7 10	10 13	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

↓ = Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.
↑ = Use first sampling plan above arrow.
† = If the acceptance number has been exceeded, but the rejection number has not been reached, accept the lot, but reinstate normal inspection (see 10.1.4).

Ac = Acceptance number.
Re = Rejection number.

TABLE 3 A Double Sampling Plans for Normal Inspection (Master Table) *(See 8.4 and 8.5)*

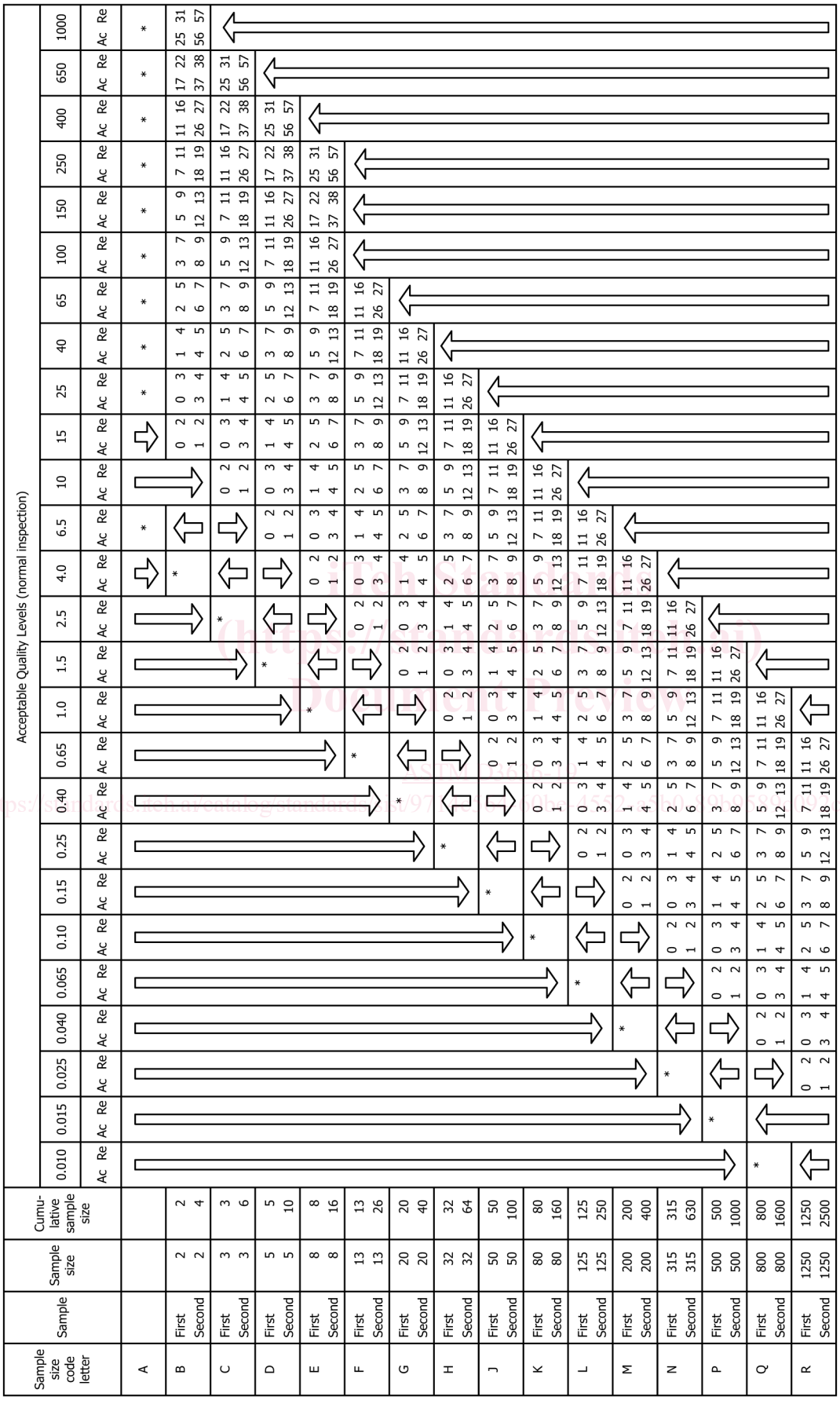
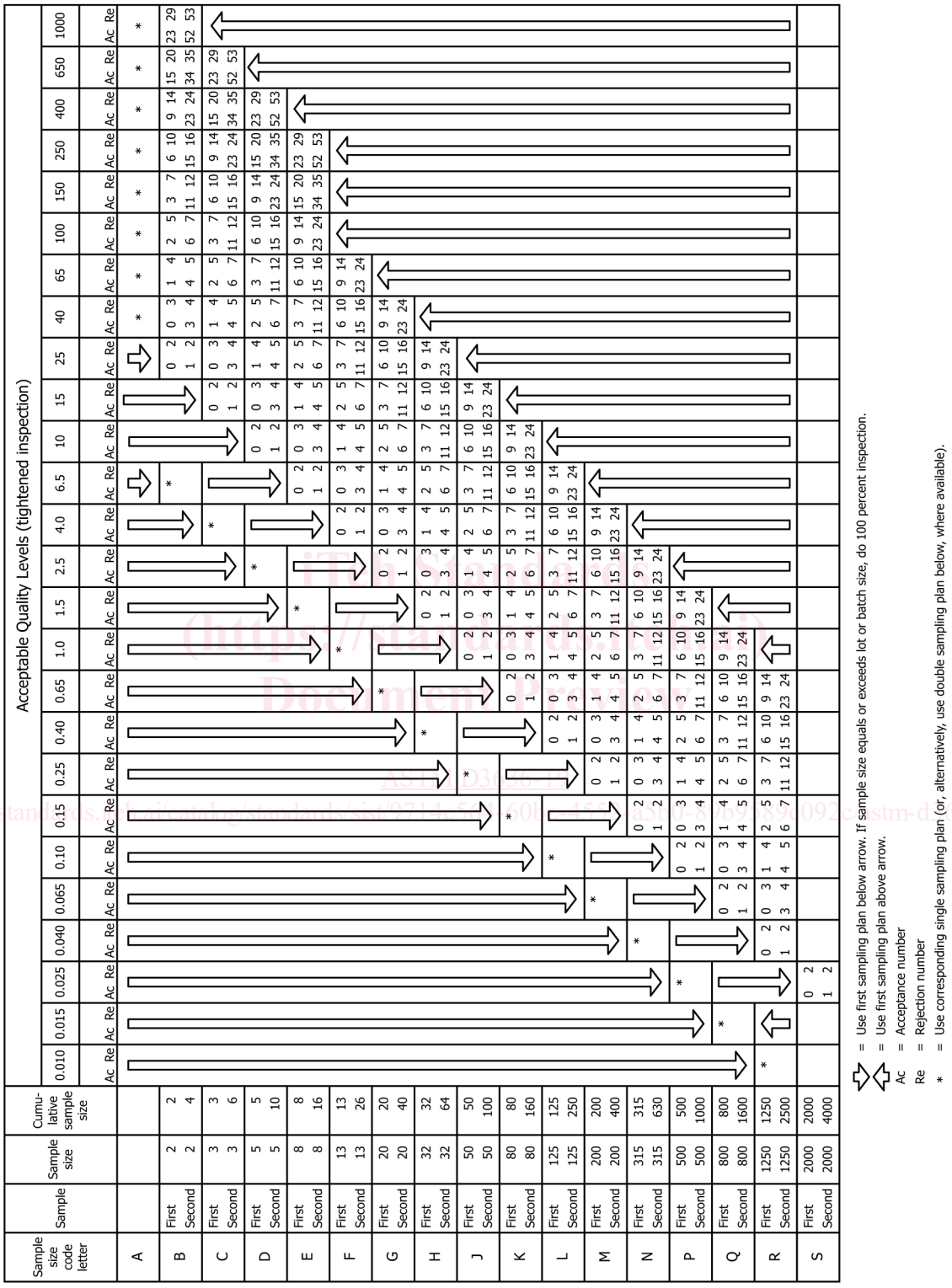


TABLE 3 B Double Sampling Plans for Tightened Inspection (Master Table) *(See 8.4 and 8.5) (continued)*



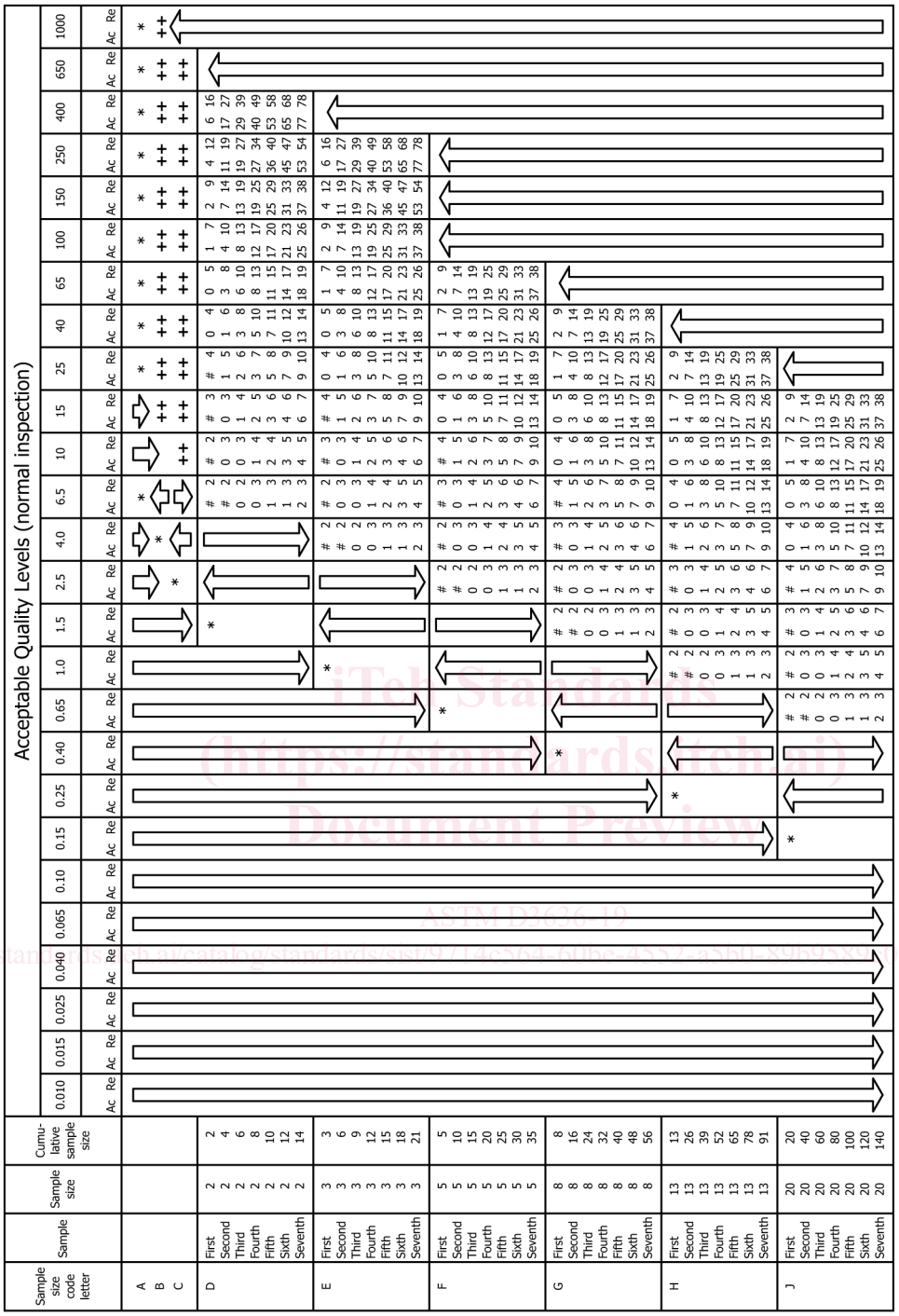
5.4.1 The inspection level determines the relationship between the lot size and the sample size. The inspection level to be used for any particular requirement will be prescribed by the user. Three inspection levels: I, II, and III, are given in Table 1 for general

TABLE 3 C Double Sampling Plans for Reduced Inspection (Master Table) *(continued)*

Sample size code letter	Sample	Sample size	Cumulative sample size	Acceptable Quality Levels (reduced inspection)†																									
				0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
				Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A																	↓	*		↓	*	*	*	*	*	*	*	*	*
B																↓	*	↑	↓	*	*	*	*	*	*	*	*	*	*
C															↓	*	↑	↓	*	*	*	*	*	*	*	*	*	*	↑
D	First	2	2											↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	7 12	11 17	↑	
	Second	2	4															0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16	18 22	26 30		
E	First	3	3										↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	7 12	11 17	↑		
	Second	3	6														0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16	18 22	26 30			
F	First	5	5									↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑	↑	↑			
	Second	5	10													0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16						
G	First	8	8								↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑						
	Second	8	16												0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16							
H	First	13	13							↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑							
	Second	13	26											0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16								
J	First	20	20						↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑								
	Second	20	40										0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16									
K	First	32	32					↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑									
	Second	32	64									0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16										
L	First	50	50				↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑										
	Second	50	100								0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16											
M	First	80	80			↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑											
	Second	80	160							0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16												
N	First	125	125		↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑												
	Second	125	250						0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16													
P	First	200	200	↓	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑													
	Second	200	400					0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16														
Q	First	315	315	*	↑	↓	0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑														
	Second	315	630				0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16															
R	First	500	500	↑		0 2	0 3	0 4	0 4	1 5	2 7	3 8	5 10	↑															
	Second	500	1000			0 2	0 4	1 5	3 6	4 7	6 9	8 12	12 16																

↓ = Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.
↑ = Use first sampling plan above arrow.
Ac = Acceptance number.
Re = Rejection number.
* = Use corresponding single sampling plan (or alternatively, use double sampling plan below, when available.)
† = If, after the second sample, the acceptance number has been exceeded, but the rejection number has not been reached, accept the lot, but reinstate normal inspection (see 10.1.4).

TABLE 4 A Multiple Sampling Plans for Normal Inspection (Master Table) *(See 8.4 and 8.5)*



use. Unless otherwise specified, Inspection Level II shall be used. Use Inspection Level I when less discrimination is needed, or use Level III for greater discrimination. Four additional special levels: S-1, S-2, ~~S-3~~S-3, and S-4, are given in the same table for use where relatively small sample sizes are necessary and large sampling risks can or must be tolerated.

NOTE 1—In the designation of inspection levels S-1 to S-4, exercise care to avoid AQLs inconsistent with these inspection levels.

5.4.2 *Code Letters*—Sample sizes are designated by code letters. Use Table 1 to find the applicable code letter for the particular lot size and the prescribed inspection level.

5.4.3 *Initiation of Inspection*—Use normal inspection at the start of inspection unless otherwise directed by the user.

TABLE 4 A Multiple Sampling Plans for Normal Inspection (Master Table) *(Continued)* *(See 8.4 and 8.5) (continued)*

Sample size code letter	Sample	Sample size	Cumulative sample size	Acceptable Quality Levels (normal inspection)																									
				0.010	0.015	0.025	0.040	0.065	0.10	0.15	0.25	0.40	0.65	1.0	1.5	2.5	4.0	6.5	10	15	25	40	65	100	150	250	400	650	1000
				Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
K	First	32	32	↓	↓	↓	↓	↓	*	↑	↓	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	32	64									# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14										
	Third	32	96									0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19										
	Fourth	32	128									0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25										
	Fifth	32	160									1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29										
	Sixth	32	192									1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33										
	Seventh	32	224									2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38										
L	First	50	50	↓	↓	↓	↓	*	↑	↓	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	50	100								# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14											
	Third	50	150								0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19											
	Fourth	50	200								0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25											
	Fifth	50	250								1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29											
	Sixth	50	300								1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33											
	Seventh	50	350								2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38											
M	First	80	80	↓	↓	↓	*	↑	↓	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	80	160							# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14												
	Third	80	240							0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19												
	Fourth	80	320							0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25												
	Fifth	80	400							1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29												
	Sixth	80	480							1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33												
	Seventh	80	560							2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38												
N	First	125	125	↓	↓	*	↑	↓	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	125	250						# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14													
	Third	125	375						0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19													
	Fourth	125	500						0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25													
	Fifth	125	625						1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29													
	Sixth	125	750						1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33													
	Seventh	125	875						2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38													
P	First	200	200	↓	*	↑	↓	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	200	400					# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14														
	Third	200	600					0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19														
	Fourth	200	800					0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25														
	Fifth	200	1000					1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29														
	Sixth	200	1200					1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33														
	Seventh	200	1400					2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38														
Q	First	315	315	*	↑	↓	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	315	630				# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14															
	Third	315	945				0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19															
	Fourth	315	1260				0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25															
	Fifth	315	1575				1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29															
	Sixth	315	1890				1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33															
	Seventh	315	2205				2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38															
R	First	500	500	↑	↑	# 2	# 2	# 3	# 4	0 4	0 5	1 7	2 9	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
	Second	500	1000			# 2	0 3	0 3	1 5	1 6	3 8	4 10	7 14																
	Third	500	1500			0 2	0 3	1 4	2 6	3 8	6 10	8 13	13 19																
	Fourth	500	2000			0 3	1 4	2 5	3 7	5 10	8 13	12 17	19 25																
	Fifth	500	2500			1 3	2 4	3 6	5 8	7 11	11 15	17 20	25 29																
	Sixth	500	3000			1 3	3 5	4 6	7 9	10 12	14 17	21 23	31 33																
	Seventh	500	3500			2 3	4 5	6 7	9 10	13 14	18 19	25 26	37 38																

↓ = Use first sampling plan below arrow. If sample size equals or exceeds lot or batch size, do 100 percent inspection.
↑ = Use first sampling plan above arrow (refer to preceding page, when necessary).
Ac = Acceptance number.
Re = Rejection number.
* = Use corresponding single sampling plan (or alternatively, use multiple plan below, where available).
\# = Acceptance not permitted at this sample size.

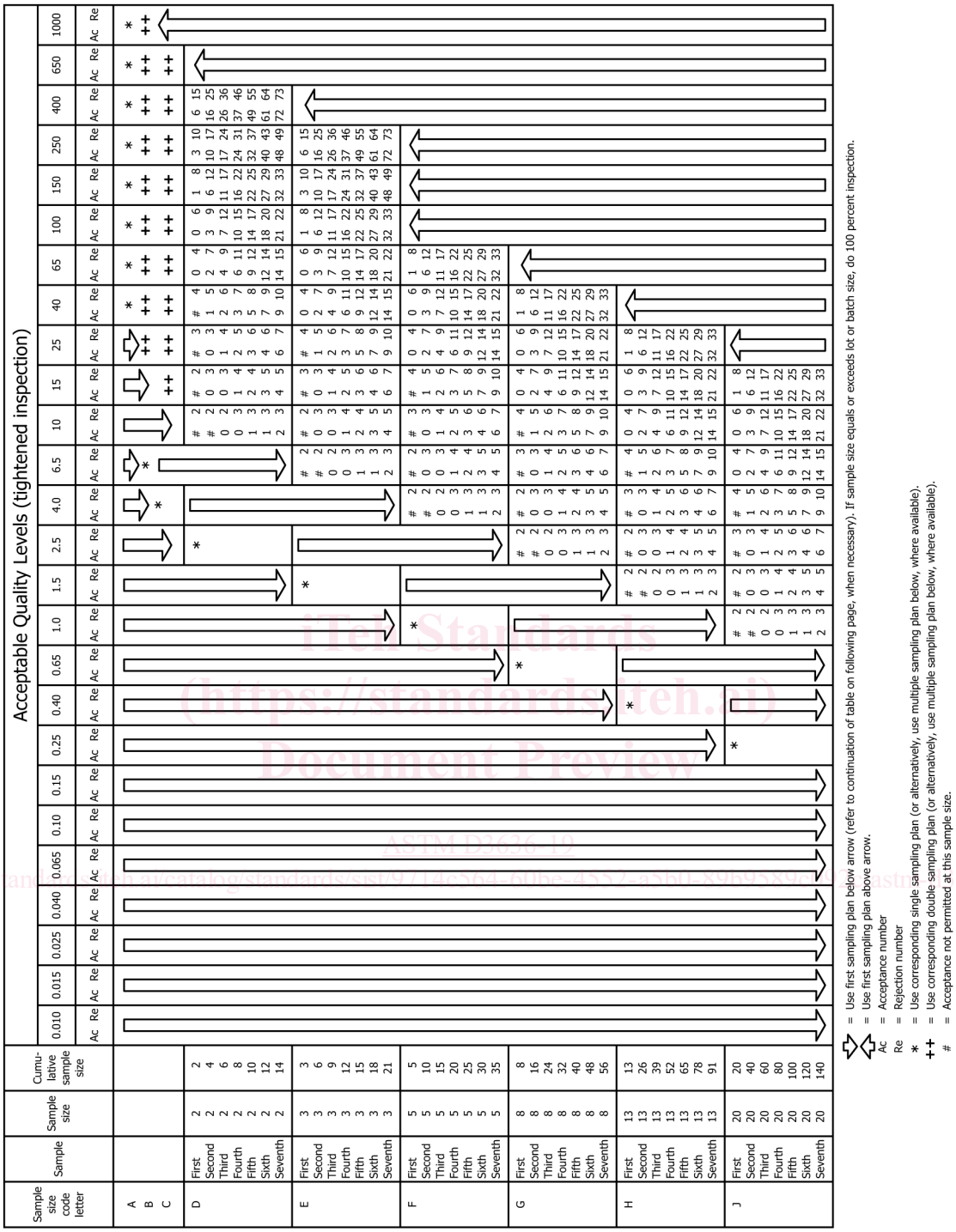
5.4.4 *Continuation of Inspection*—Continue normal, tightened, or reduced inspection unchanged for each class of nonconformities on successive lots except where the switching procedures described in 5.4.5 to 5.4.5.4 require change.

5.4.5 *Switching Procedures*—Apply switching procedures in 5.4.5.1 to 5.4.5.4 independently to each class of nonconformity.

5.4.5.1 *Normal to Tightened*—When normal inspection is in effect, institute tightened inspection when two out of five consecutive lots have been rejected after original inspection. Do not count among the five any lots that were resubmitted for inspection (see also 6.4).

5.4.5.2 *Tightened to Normal*—When tightened inspection is in effect, institute normal inspection after five consecutive lots have been considered acceptable after original inspection.

TABLE 4 B Multiple Sampling Plans for Tightened Inspection (Master Table) *(See 8.4 and 8.5) (continued)*



5.4.5.3 *Normal to Reduced*—When normal inspection is in effect, institute reduced inspection only if conformance with each of the four following criteria exists: (*1*) The preceding ~~10~~ten lots (or more, as indicated by the note to Table 5) have been on normal inspection and none have been rejected after original inspection. (*2*) The total number of nonconformities in the samples from the preceding ten lots (or such other number as indicated by 1 > above) is equal to, or less than, the applicable number given in Table 5. If double or multiple sampling is in use, include all samples inspected, not "first" samples only. (*3*) Production is at a steady rate. (*4*) Reduced inspection is considered desirable by the user.