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Standard Guide for Selection of Sampling Plans for Inspection of Electrodeposited Metallic and Inorganic Coatings[1]

This standard is issued under the fixed designation B697; 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 guide gives guidance in the selection of sampling plans to be used in the inspection of electrodeposited and related coatings on products for the purpose of deciding whether submitted lots of coated products comply with the specifications applicable to the coatings. This supplements Test Method B602 by giving more information on sampling inspection and by providing additional sampling plans for the user who finds the limited choice of plans in Test Method B602 to be inadequate.

1.2 When using a sampling plan, a relatively small part of the articles in an inspection lot is selected and inspected. Based on the results, a decision is made that the inspection lot either does or does not satisfactorily conform to the specification.

1.3 This guide also contains several sampling plans. The plans are attribute plans, that is, in the application of the plans each inspected article is classified as either conforming or nonconforming to each of the coating requirements. The number of nonconforming articles is compared to a maximum allowable number. The plans are simple and relatively few. Additional plans and more complex plans that cover more situations are given in the Refs (**1-7**) at the end of this guide and in MIL-STD-105.

1.4 Acceptance sampling plans are used:

1.4.1 When the cost of inspection is high and the consequences of accepting a nonconforming article are not serious.

1.4.2 When 100 % inspection is fatiguing and boring and, therefore, likely to result in errors. In these cases a sampling plan may provide greater protection than 100 % inspection.

1.4.3 When inspection requires a destructive test. Here, sampling inspection must be used.

1.5 Another general type of acceptance sampling plan that is not covered in these guidelines is the variables plan in which measured values of characteristics are analyzed by statistical procedures. Such plans, when applicable, can reduce inspection cost and increase quality protection. Information on variables plans is given in Test Method B762, MIL-STD-414, ANSI/ASQC Z1.9-1979, and Refs (**1-2**).

1.6 *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]

B602 Test Method for Attribute Sampling of Metallic and Inorganic Coatings

B762 Test Method of Variables Sampling of Metallic and Inorganic Coatings

2.2 *ANSI Standard:*[3]

ANSI/ASQC Z1.9-1979 Sampling Procedures and Tables for Inspection by Variables for Percent Nonconformance

2.3 *Military Standards:*[4]

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-414 Sampling Procedures and Tables for Inspection by Variables for Percent Defective

3. General

3.1 *Procedure*—The use of acceptance sampling consists of a series of decisions and actions. These are listed in order below and are discussed in this standard.

3.1.1 Select characteristics to be inspected,

3.1.2 Select type of sampling plan,

3.1.3 Select quality level,

3.1.4 Define inspection lot,

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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 American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

3.1.5 Select sample,
3.1.6 Inspect sample,
3.1.7 Classify inspection lot, and
3.1.8 Dispose of inspection lot.

3.2 The need for acceptance sampling arises when a decision must be made about what to do with a quantity of articles. This quantity (called the inspection lot in this guide) may be a shipment from a supplier, may be articles that are ready for a subsequent manufacturing operation, or may be articles ready for shipment to a customer.

3.3 When acceptance sampling is done, several of the articles in the inspection lot are selected at random (see Section 7). These articles constitute the sample. Each article in the sample is inspected for conformance to the requirements placed on it. If an article meets a requirement, it is classified as conforming. If not, it is classified as nonconforming. If the number of nonconforming articles in the sample is no more than a predetermined number (called the acceptance number), the inspection lot is accepted. If it exceeds the acceptance number, the inspection lot is rejected.

3.4 The disposition of rejected inspection lots is beyond the scope of this guide because, depending on the circumstances, lots may be returned to the supplier, kept and used, put to a different use, scrapped, reworked, or dealt with in some other way. An exception is rectifying inspection (3.11) in which rejected lots are screened and used.

3.5 Because the decision about the disposition of an inspection lot is based on the inspection of a sample, and because there is a chance that a sample will not be representative of an inspection lot, some inspection lots that have the desired quality level (Note 1) will be rejected and some inspection lots that do not have the desired quality level will be accepted. There are only two situations in which the results of acceptance sampling are totally predictable (Note 2). One is when there are no nonconforming articles in the inspection lot. There, of course, will be no nonconforming articles in the sample and the decision to accept the lot will always be made. The other situation is when no article in the inspection lot conforms. All of the articles in the sample will be nonconforming and the decision to reject the lot will always be made (Note 3).

NOTE 1—In this guide the term "quality level" means the percentage of nonconforming articles in an inspection lot or it means the average percentage of nonconforming articles in a series of inspection lots received from a single source. Terms such as high quality, increased quality, and better quality mean a relatively smaller percentage of nonconforming articles, while terms such as low quality, decreased quality, and poorer quality mean a relatively larger percentage of nonconforming articles.

NOTE 2—In this discussion and elsewhere in this guide, it is assumed that no errors are made.

NOTE 3—To be strictly correct, lots that contain no more nonconforming articles than the acceptance number will always be accepted, and lots that contain fewer conforming articles than the sample size minus the acceptance number will always be rejected.

3.6 The discussion in 3.5 leads to two important points: (*1*) acceptance sampling plans will permit the acceptance of inspection lots that contain nonconforming articles, and (*2*) in a series of inspection lots, each containing the same percentage of nonconforming articles, some will be accepted and some will be rejected, and the percentage of nonconforming articles in the accepted inspection lots will be the same as in the rejected lots. In other words, acceptance sampling does not, by itself, result in higher quality. Rectifying inspection (3.11) will result in higher average quality in the product leaving inspection.

3.7 Because acceptance sampling plans permit the acceptance of inspection lots that contain nonconforming articles, basic to the selection of a sampling plan is a decision about the percentage of nonconforming articles that is acceptable. If the function of the article is so important that no nonconformers can be tolerated, acceptance sampling cannot be used. In these cases, every article must be inspected, and, to guard against error, may have to be inspected twice.

3.8 The protection that an attributes sampling plan provides against accepting an undesirable number of nonconforming articles is determined by the size of the sample and by the acceptance number. The protection provided by a plan is usually expressed in the form of an operating characteristic (OC) curve. Fig. 1 is the OC curve for the plan that calls for a sample of 55 articles and an acceptance number of two. Plotted along the horizontal axis is the quality level of an inspection lot expressed as the percentage of the articles in the lot that are nonconforming (Note 1). The vertical axis is the probability, as a percentage, that an inspection lot will be accepted by the plan (Note 4). Inspection lots with zero percent nonconforming articles will be accepted 100 % of the time (Note 2). As the percentage of nonconforming articles in the inspection lot increases, the probability of acceptance decreases. For example, as shown in Fig. 1, an inspection lot containing 1.5 % nonconforming articles has a 95 % chance of being accepted, while one containing 9.6 % nonconforming articles has only a 10 % chance of being accepted.

NOTE 4—The vertical axis of the OC curve can have two meanings. One is the probability that a particular inspection lot will be accepted. The other meaning is the percentage of a series of lots of a given quality level that will be accepted. The latter meaning is the one that is strictly correct mathematically. The former meaning is also correct, as long as the inspection lot is at least ten times bigger than the sample.

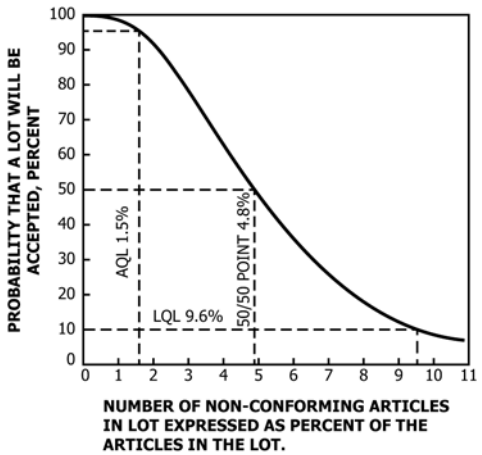

FIG. 1 Operating Characteristic Curve for Single Sample, Attributes Sampling Plan, Sample Size = 55, Acceptance Number = 2