



Standard Practice for Sampling a Stream of Product by Attributes Indexed by AQL¹

This standard is issued under the fixed designation E2234; 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 practice establishes lot or batch sampling plans and procedures for inspection by attributes using MIL-STD-105E as a basis for sampling a steady stream of lots indexed by acceptance quality limit (AQL).

1.2 This practice provides the sampling plans of MIL-STD-105E in ASTM format for use by ASTM committees and others. It recognizes the continuing usage of MIL-STD-105E in industries supported by ASTM. Most of the original text in MIL-STD-105E is preserved in Sections 4 – 6 of this practice.

1.3 No system of units is specified in this standard.

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

1.5 *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

E456 Terminology Relating to Quality and Statistics

E1994 Practice for Use of Process Oriented AOQL and LTPD Sampling Plans

E2586 Practice for Calculating and Using Basic Statistics

2.2 Other Standard:

MIL-STD-105E Sampling Procedures and Tables for Inspection by Attributes³

3. Terminology

3.1 *Definitions*—For a more extensive list of terms in E11 standards, see Terminology E456.

3.1.1 *acceptance quality limit (AQL), n*—quality limit that is the worst tolerable process average when a continuing series of lots is submitted for acceptance sampling.

3.1.1.1 *Discussion*—This definition supersedes that given in MIL-STD-105E.

3.1.2 *average outgoing quality (AOQ), n*—the average percent defective of outgoing product including all accepted lots or batches after any defectives found in them are replaced by acceptable units, plus all lots or batches which are not accepted after such lots or batches have been effectively 100 % inspected and all defective units replaced by acceptable units.

E1994

3.1.3 *average outgoing quality limit (AOQL), n*—the AOQL is the maximum of the AOQ's for all possible incoming percentages defective for the process for a given acceptance sampling plan.

E1994

3.1.4 *classification of defects, n*—the enumeration of possible defects of the unit of product classified according to their seriousness, that is, critical, major, or minor defect.

3.1.5 *critical defect, n*—a defect that judgment and experience indicate would result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the product, or a defect that judgment and experience indicate is likely to prevent performance of the function of a major end item.

3.1.6 *defect, n*—any nonconformance of the unit of product with specified requirements.

3.1.7 *double sampling plan, n*—a multiple sampling plan in which up to two samplings can be taken and evaluated to accept or reject a lot.

¹ This practice is under the jurisdiction of ASTM Committee E11 on Quality and Statistics and is the direct responsibility of Subcommittee E11.30 on Statistical Quality Control.

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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>.

3.1.8 *inspection, n*—the process of measuring, examining, testing, or otherwise comparing the unit of product with the requirements.

3.1.9 *inspection by attributes, n*—inspection whereby either the unit of product is classified simply as defective or non-defective, or the number of defects in the unit of product is counted, with respect to a given requirement or set of requirements.

3.1.10 *inspection lot, n*—a collection of units of product produced under conditions that are considered uniform and from which a sample is drawn and inspected.

3.1.11 *major defect, n*—a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose.

3.1.12 *minor defect, n*—a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit.

3.1.13 *multiple sampling plan, n*—a sampling plan in which successive samples from a lot are drawn and after each sample is inspected a decision is made to accept the lot, reject the lot, or to take another sample, based on quality level of the combined samples.

3.1.13.1 *Discussion*—When the quality is much less or much more than the AQL, the decision can be made on the first sample, which is smaller than that of a single sampling plan with equivalent acceptance quality level. For samples that are close to the AQL in quality, additional samples are required and the total sample size will be larger than the corresponding single sampling plan.

3.1.14 *operating characteristic, n*—probability of acceptance using a specified acceptance sampling plan, as a function of parameters describing quality of the lot.

3.1.15 *sample, n*—a group of observations, test results, taken from a large collection of observations, test results, which serves to provide information that may be used as a basis for making a decision concerning the larger collection. **E2586**

3.1.15.1 *Discussion*—A sample consists of one or more units of product drawn from an inspection lot, the units of the sample being selected at random without regard to their quality. The number of units of product in the sample is the sample size.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *batch (in inspection), n*—a collection of units of product produced under conditions that are considered uniform and from which a sample is drawn and inspected, and may differ from a collection of units designated as a batch for other purposes, for example, production, shipment, etc.

3.2.2 *batch size, n*—the number of units of product in a batch.

3.2.3 *critical defective, n*—a unit of product which contains one or more critical defects and may also contain major or minor defects, or both.

3.2.4 *defective, n*—a unit of product which contains one or more defects.

3.2.5 *defects per hundred units, n*—any given quantity of units of product is one hundred times the number of defects contained therein (one or more defects being possible in any unit of product) divided by the total number of units of product, that is:

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

3.2.6 *lot, n*—see *batch*.

3.2.7 *lot size, n*—see *batch size*.

3.2.8 *major defective, n*—a unit of product which contains one or more major defects, and may also contain minor defects but contains no critical defect.

3.2.9 *minor defective, n*—a unit of product which contains one or more minor defects but contains no critical or major defect.

3.2.10 *percent defective, n*—any given quantity of units of product one hundred times the number of defective units of product contained therein divided by the total number of units of product, that is:

$$\text{Percent Defective} = \frac{\text{Number of defectives} \times 100}{\text{Number of units inspected}} \quad (2)$$

3.2.11 *process average (in inspection), n*—the average percent defective or average number of defects per hundred units (whichever is applicable) of product submitted by the supplier for original inspection.

3.2.11.1 *Discussion*—Original inspection is the first inspection of a particular quantity of product as distinguished from the inspection of product which has been resubmitted after prior rejection.

3.2.12 *sample size code letter, n*—a device used along with the AQL for locating a sampling plan on a table of sampling plans.

3.2.13 *sampling plan (in inspection), n*—a plan that indicates the number of units of product from each lot or batch which are to be inspected (sample size or series of sample sizes) and the criteria for determining the acceptability of the lot or batch (acceptance and rejection numbers).

3.2.14 *unit of product, n*—that which is inspected in order to determine its classification as defective or non-defective or to count the number of defects.

3.2.14.1 *Discussion*—It may be a single article, a pair, a set, a length, an area, an operation, a volume, a component of an end product, or the end product itself. The unit of product may or may not be the same as the unit of purchase, supply, production, or shipment.

4. Significance and Use

4.1 *Purpose*—This publication establishes lot or batch sampling plans and procedures for inspection by attributes. This publication shall not be interpreted to supersede or conflict with any contractual requirements. The words “accept,” “acceptance,” “acceptable,” etc, refer only to the contractor’s use of the sampling plans contained in this standard and do not imply an agreement by the customer (formerly “Government” in original text) to accept any product. Determination of