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.

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An American National Standard

Standard Guide for Preferred Methods for Acceptance of Product[1]

This standard is issued under the fixed designation E2910; 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 establishes lot or batch and continuous sampling plans using MIL-STD-1916 as a basis. It represents an alternative sampling approach to attributes sampling (MIL-STD-105E, same as Practice E2234), variables sampling (MIL-STD-414, Practice E2762), and continuous sampling (MIL-STD-1235B, Practice E2819).

1.2 This guide provides the sampling plans of MIL-STD-1916 in ASTM format for use by ASTM committees and others. It recognizes the continuing usage of MIL-STD-1916 in industries supported by ASTM. Most of the original text in MIL-STD-1916 is preserved in Sections 4 – 6 of this guide. The original wording of "Government" in MIL-STD-1916 has been changed to "consumer", and "contractor" has been changed to "producer" to make this standard more generic.

1.3 *Purpose*—To encourage producers supplying goods and services to its consumers to submit efficient and effective process control (prevention) procedures in place of prescribed sampling requirements. The goal is to support the movement away from an AQL-based inspection (detection) strategy to implementation of an effective prevention-based strategy including a comprehensive quality system, continuous improvement and a partnership with the consumer. The underlying theme is a partnership between consumer and the producer, with the requisite competence of both parties, and a clear mutual benefit from processes capable of consistently high quality products and services. The objective is to create an atmosphere where every noncompliance is an opportunity for corrective action and improvement rather than one where acceptable quality levels are the contractually sufficient goals.

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

E2234 Practice for Sampling a Stream of Product by Attributes Indexed by AQL

E2762 Practice for Sampling a Stream of Product by Variables Indexed by AQL

E2819 Practice for Single- and Multi-Level Continuous Sampling of a Stream of Product by Attributes Indexed by AQL

2.2 *Other Standards:*[3]

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

MIL-STD-1235B Single- and Multi-Level Continuous Sampling for Attributes

MIL-STD-1916 DoD Preferred Methods for Acceptance of Product

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

3. Terminology

3.1 *Definitions*—The terminology defined in Terminology E456 applies to this guide except as modified below.

3.1.1 *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. **E2234**

3.1.2 *inspection, n*—the process of measuring, examining, testing, or otherwise comparing the unit of product with the requirements. **E2234**

[1] This guide 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 DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, http://quicksearch.dla.mil.

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3.1.3 *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. **E2234**

3.1.4 *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. **E2234**

3.1.5 *non-conforming item, n*—an item containing at least one non-conformity. **E2234**

3.1.6 *production interval, n*—a finite period of production, N items in length. **E2819**

3.1.6.1 *Discussion*—In this guide, the production interval is a period of production under continuous sampling assumed to consist of essentially homogeneous quality. It is normally a shift; it can be a day if it is reasonably certain that shift changes do not affect quality of product, but shall not be longer than a day.

3.1.7 *screening, n*—100 % inspection where all defective units are removed from the production flow. **E2819**

3.1.7.1 *Discussion*—The two terms, screening and 100 % inspection, are used interchangeably in this practice.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *acceptance, n*—the act of an authorized representative of the consumer by which the consumer, for itself or as a agent of another, assumes ownership of existing identified supplied tendered or approves specific services rendered as partial or complete performance of the contract.

3.2.2 *contract quality assurance, n*—the various functions, including inspection, performed by the consumer to determine whether a producer has fulfilled the contract obligations pertaining to quality and quantity.

3.2.3 *contract quality requirements, n*—the technical requirements in the contract relating to the quality of the product or service and those contract clauses prescribing inspection, and other quality controls incumbent on the producer, to assure that the product or service conforms to the contractual requirements.

3.2.4 *critical characteristic, n*—see *critical defect*.

3.2.5 *critical nonconforming unit, n*—a unit of product that fails to conform to specified requirements for one of more critical characteristics.

3.2.6 *major characteristic, n*—see *major defect*.

3.2.7 *major nonconforming unit, n*—a unit of product that fails to conform to specified requirements for one or more major characteristics, but conforms to all critical characteristics.

3.2.8 *minor characteristic, n*—see *minor defect*.

3.2.9 *minor nonconforming unit, n*—a unit of product that fails to conform to specified requirements of one or more minor characteristics, but conforms to all critical and major characteristics.

3.2.10 *nonconformance, n*—a departure from a specified requirement for any characteristic.

3.2.11 *nonconforming unit, n*—see *non-conforming item*.

3.2.12 *quality, n*—the composite of material attributes including performance features and characteristics of a product or service to satisfy a given need.

3.2.13 *quality assurance, n*—a planned and systematic pattern of all actions necessary to provide adequate confidence that adequate technical requirements are established; products and services conform to established technical requirements; and satisfactory performance is achieved.

3.2.14 *quality audit, n*—a systematic examination of the acts and decisions with respect to quality in order to independently verify or evaluate the operational requirements of the quality program or the specification or contract requirements of the product or service.

3.2.15 *quality program, n*—a program which is developed, planned, and managed to carry out cost effectively all efforts to effect the quality of materials and services from concept through validation, full-scale development, production, deployment, and disposal.

3.2.16 *screening inspection, n*—see *screening*.

3.2.17 *traceability, n*—the ability to trace the history, application or location of an item or activity, or similar items or activities, by means of recorded identification.

3.2.18 *verification level (VL), n*—prescribes the level of significance or utility of a characteristic to the user.

3.2.18.1 *Discussion*—The amount of effort to assure conformance can be allocated on the basis of importance to the user. (Major characteristics will require more verification effort than minor characteristics.) VL-VII requires the highest level of effort, and the effort decreases as the VL decreases to the lowest level, VL-I.

4. Summary of Practice

4.1 *Acceptance by Producer-Proposed Provisions:*

4.1.1 *General:*

4.1.1.1 This standard, when referenced in the contract or product specifications, requires the producer to perform sampling inspection in accordance with paragraph 4.2 and the product specification. However, it is recognized that sampling inspection alone does not control or improve quality. Product quality comes from proper product and process design and process control activities. When such activities are effective, sampling inspection is a redundant effort and an unnecessary cost. Producers that have an acceptable quality system and proven process controls on specific processes are encouraged to consider submitting alternate acceptance methods for one or more contractually specified characteristics. In addition, producers that have a successful quality system and a history of successful process controls relevant to the products/services being procured in this contract, are encouraged to consider submitting a systemic alternate acceptance method for all the contractual sampling inspection requirements associated with paragraph 4.2.

4.1.1.2 Submissions shall describe the alternate acceptance methods, the sampling inspection provision to be replaced, and an evaluation of the protection provided by the alternate methods as compared with the inspection requirements to be

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replaced. The alternate acceptance method shall include evidence of process control and capability during production together with adequate criteria, measurement, and evaluation procedures to maintain control of the process. The acceptability of the alternate acceptance methods is dependent upon the existence of a quality system, the demonstration of its process focus, and the availability of objective evidence of effectiveness.

4.1.2 *Requirements and Procedures:*

4.1.2.1 Producers currently operating quality systems in accordance with such models as ISO 9000, ANSI/ASQC Q9004, or others that are deemed satisfactory to the consumer representative are qualified to apply for alternate acceptance methods if demonstration of process focus and objective evidence of effectiveness exists.

4.1.2.2 The producer shall include in his request for approval of an alternate acceptance method an assessment plan to periodically verify process stability, capability, and other conditions under which the alternate acceptance method was developed. The current minimum values of process capability are equivalent to a Cpk of 2.00 for critical characteristics, 1.33 for major characteristics, and 1.00 for minor characteristics. Upon approval of the assessment plan, the producer may reduce or eliminate inspection sampling when the plan criteria are met or exceeded.

4.1.3 *Submission and Incorporation:*

4.1.3.1 *Submission*—There are two ways of submitting alternate acceptance methods:

(1) Submission of individual alternate acceptance methods for one or more contractually specified sampling inspection requirements through the consumer quality assurance representative (QAR) to the procuring contracting officer (PCO) for approval at any time during the contract period of performance.

(2) Submission of a systemic alternate acceptance method to the PCO prior to contract being awarded. This pre-approval allows the producer to adopt alternate acceptance methods throughout the length of the contract. After contract award, submissions of a systemic alternate acceptance method should be made through the administrative contracting officer (ACO) to the PCO.

4.1.3.2 *Incorporation*—All approved alternate acceptance methods shall be incorporated into the producer's manufacturing and quality program plans or other vehicles acceptable to the contracting agency, as applicable.

4.1.4 *Withdrawal of Approval of Alternates*—The consumer reserves the right to withdraw approval of alternate acceptance methods that are determined to provide less assurance of quality than the inspection requirements originally specified or when the inability to maintain process stability and capability over time becomes apparent.

4.2 *Acceptance by Tables:*

4.2.1 *Preferred Sampling Plans*—This standard establishes three sets of matched sampling plans for the sampling inspection of product submitted to the consumer for acceptance. These sampling plans provide for inspecting the samples from lots or batches by attributes or variables measurement and for continuous sampling by attributes measurement. The three sets of matched sampling plans are indexed by seven specified verification levels (VL) and five code letters (CL), which are determined by the lot or production interval size. The sampling plans are matched between corresponding VL and CL combinations to result in essentially similar protection. The producer has the option to utilize the type of plan, at the same verification level, that best complements the production process.

4.2.2 *Formation and Identification of Lots or Batches*—The product shall be assembled into identifiable lots, sublots, or batches, or in such other manner as may be prescribed. Each lot or batch shall, as far as practicable, consist of units of product of a single type, grade, class, size, and composition, manufactured under essentially the same conditions, and at essentially the same time. The lots or batches shall be identified by the producer and shall be kept intact in adequate and suitable storage space. Although lot or batch size is not used to select a continuous sampling plan, the formation of lots or batches may remain desirable for reasons of homogeneity, shipping convenience, and facilitation of payment.

4.2.3 *Determination of Sampling Plan*—A sampling plan is determined by:

4.2.3.1 Verification level (VL) as specified,

4.2.3.2 Type of sampling (attributes, variables, or continuous),

4.2.3.3 Lot or production interval size code letter (CL) from Table 1, and

4.2.3.4 Switching procedure (normal, tightened, reduced).

4.2.3.5 For lot acceptance situations (attributes or variables), the occurrence of one or more nonconformances

TABLE 1 Code Letters (CL) for Entry into the Sampling Tables

Lot or Production Interval Size	Verification Levels						
	VII	VI	V	IV	III	II	I
2-170	A	A	A	A	A	A	A
171-288	A	A	A	A	A	A	B
289-544	A	A	A	A	A	B	C
545-960	A	A	A	A	B	C	D
961-1632	A	A	A	B	C	D	E
1633-3072	A	A	B	C	D	E	E
3073-5440	A	B	C	D	E	E	E
5441-9216	B	C	D	E	E	E	E
9217-17408	C	D	E	E	E	E	E
17409-30720	D	E	E	E	E	E	E
30721 and larger	E	E	E	E	E	E	E

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shall result in withholding acceptance of the product submitted and initiation of corrective action. When continuous sampling is in effect, the occurrence of a nonconforming unit while in a sampling phase results in withholding acceptance of that unit, a return to screening, and initiation of corrective action. If a nonconforming unit is found while in a screening phase, acceptance is withheld for that unit and screening is continued until the requirements of paragraph 6.2.3.3*(2)* are satisfied.

4.2.4 *Sampling of Lots or Batches:*

4.2.4.1 *Selection of Units*—Units of product drawn from a lot for a sample shall be selected at random from the lot without regard to their quality. Random sampling requires that each unit in the lot, batch, or production interval has the same probability of being selected for the sample.

4.2.4.2 *Representative (Stratified) Sampling*—When appropriate, the number of units in the sample shall be selected in proportion to the size of sublots or subbatches, or parts of the lot or batch, identified by some rational criterion. When representative sampling is used, the units from each sublot, subbatch, or part shall be selected at random.

4.2.4.3 *Process of Sampling*—A sample may be drawn after all units comprising the lot or batch have been assembled, or sample units may be drawn during assembly of the lot or batch, in which case the size of the lot or batch shall be determined before samples are drawn. When the lot or batch passes the sampling plan, such lots or batches are acceptable and may be submitted to the consumer.

4.2.4.4 *Non-Conforming Product*—When sample units are drawn during lot or batch assembly and nonconforming units are found, the producer shall withhold from acceptance that portion of the lot completed and all additional production occurring prior to the initiation and verification of corrective action. For lots or batches withheld from acceptance, the producer shall take the following actions:

(1) Screen the lots or batches and dispose of all nonconforming units in accordance with paragraph 4.3.

(2) Determine the cause of the nonconformances and implement appropriate process changes.

(3) Initiate the switching requirements of paragraph 6.2.1.3.

(4) Advise the consumer representative of actions taken and resubmit the screened lot or batches to the consumer for evaluation/consideration.

4.3 *Disposition of Nonconforming Product*—All units of product found to be nonconforming by the producer shall be removed and kept apart from the flow of production or otherwise identified or segregated to preclude submission to the consumer. The producer may rework or repair these units unless the contract excludes such activities. Corrected product shall be screened by the producer and resubmitted to the consumer apart from the regular flow of the product.

4.4 *Critical Characteristics*—Unless otherwise specified in the contract or product specifications, the producer is required for each critical characteristic to implement an automated screening or a fail-safe manufacturing operation and apply sampling plan VL-VII to verify the performance of the screening operation. The occurrence of one or more critical nonconformances requires corrective action as specified in paragraph 4.5.

4.5 *Special Reservations for Critical Nonconformance*—When a critical nonconformance is discovered at any phase of production or during any inspection, the following immediate actions are required:

4.5.1 Prevent delivery of critical nonconforming units to the consumer,

4.5.2 Notify the consumer representative,

4.5.3 Identify the cause,

4.5.4 Take corrective action, and

4.5.5 Screen all available units.

4.5.6 Records of corrective actions shall be maintained and made available to the consumer representative.

5. Significance and Use

5.1 Procurement practices encourage industry innovation and provide flexibility to achieve the benefits of continuous improvement.

5.2 There is an evolving industrial product quality philosophy that recognizes the need for quality policy changes that will provide producers with opportunities and incentives toward improvement of product quality and cooperative relationships between the producer and the consumer.

5.3 Process controls and statistical control methods are the preferable means of preventing nonconformances, controlling quality, and generating information for improvement. An effective process control system may also be used to provide information to assess the quality of deliverables submitted for acceptance. Producers are encouraged to use process control and statistical control procedures for their internal control and to submit effective process control procedures in lieu of prescribed sampling requirements to the consumer for approval.

5.4 Sampling inspection by itself is an inefficient industrial practice for demonstrating conformance to the requirements of a contract and its technical data package. The application of sampling plans for acceptance involves both consumer and producer risks; and increased sampling is one way of reducing these risks, but it also increases costs. Producers can reduce risks by employing efficient processes with appropriate process controls. To the extent that such practices are employed and are effective, risk is controlled and, consequently, inspection and testing can be reduced.

5.5 The following points provide the basis for this standard:

5.5.1 Producers are required to submit deliverables that conform to requirements and to generate and maintain sufficient evidence of conformance.

5.5.2 Producers are responsible for establishing their own manufacturing and process controls to produce results in accordance with requirements.

5.5.3 Producers are expected to use recognized prevention practices such as process controls and statistical techniques.

5.6 This standard also provides a set of sampling plans and procedures for planning and conducting inspections to assess

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