



TECHNICAL REPORT

EIA-585™

Issued 1991-06
Stabilized 2015-07

Zero Acceptance Number Sampling Procedures and Tables for Inspection by Attributes of Isolated Lots

NOTICE

This document has been taken directly from the original TechAmerica document and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE Technical Standards. The release of this document is intended to replace the original with the SAE International document. Any numbers established by the original document remain unchanged.

The original document was adopted as an SAE publication under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of specifications and standards. TSB rules provide for (a) the publication of portions of unrevised specifications and standards without consensus voting at the SAE committee level, and (b) the use of the existing specification or standard format.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2014 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE EIA585

SAE values your input. To provide feedback
on this Technical Report, please visit
<http://www.sae.org/technical/standards/EIA585>

Documents
Document Sharing Hub

TechAmerica Standard

Zero Acceptance Number Sampling Procedures and Tables for Inspection By Attributes of Isolated Lots

EIA-585

June 1991



NOTICE

TechAmerica Engineering Standards and Publications are designed to serve the public interest by eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for his particular need. Existence of such Standards and Publications shall not in any respect preclude any member or nonmember of TechAmerica from manufacturing or selling products not conforming to such Standards and Publications, nor shall the existence of such Standards and Publications preclude their voluntary use by those other than TechAmerica members, whether the standard is to be used either domestically or internationally.

Standards and Publications are adopted by TechAmerica in accordance with the American National Standards Institute (ANSI) patent policy. By such action, TechAmerica does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the Standard or Publication.

This TechAmerica Standard is considered to have International Standardization implications, but the ISO/IEC activity has not progressed to the point where a valid comparison between the TechAmerica Standard and the ISO/IEC document can be made.

This Standard does not purport to address all safety problems associated with its use or all applicable regulatory requirements. It is the responsibility of the user of this Standard to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before its use.

(From Standards Proposal No 4962 formulated under the cognizance of Quality and Reliability Engineering (QRE) Committee.)

Published by

© 2011 TechAmerica
Standards & Technology Department
601 Pennsylvania Ave., NW
North Building, Suite 600
Washington, DC 20004-2650
All rights reserved - Printed in U.S.A.

PLEASE!
DON'T VIOLATE
THE
LAW!

This document is copyrighted by TechAmerica and may not be reproduced without permission.

Organizations may obtain permission to reproduce a limited number of copies by entering into a license agreement with our distributors.

For distributor information please see our web site [www. techamerica.org/](http://www.techamerica.org/) or contact TechAmerica at 703-284-5355

**ZERO ACCEPTANCE NUMBER SAMPLING PROCEDURES AND TABLES
FOR
INSPECTION BY ATTRIBUTES OF ISOLATED LOTS
CONTENTS**

<u>Section</u>	<u>Page</u>
1. SCOPE	
1.1 PURPOSE	1
1.2 APPLICATION	1
1.3 INSPECTION	2
1.4 INSPECTION BY ATTRIBUTES	2
1.5 UNIT OF PRODUCT	2
1.6 NONCONFORMANCE	2
2. PARTS PER MILLION (PPM)	2
2.1 EXPRESSION OF NONCONFORMANCE	2
2.2 PARTS PER MILLION (PPM)	2
3. SAMPLING PLAN APPLICATION	3
3.1 NOTATION	3
3.2 USE	3
3.3 SELECTION	4
4. SUBMISSION OF PRODUCT	5
4.1 LOT	5
4.2 FORMATION OF LOTS	5
4.3 LOT SIZE	5
4.4 PRESENTATION OF LOTS	5
5. ACCEPTANCE AND REJECTION	5
5.1 ACCEPTABILITY OF LOTS	5
5.2 NONCONFORMING UNITS	5
5.3 SPECIAL RESERVATION FOR CRITICAL DEFECTS	6

CONTENTS (Continued)

<u>Section</u>	<u>Page</u>
6. DRAWING OF SAMPLES	6
6.1 SAMPLE	6
6.2 REPRESENTATIVE SAMPLING	6
APPENDIX A OPERATING CHARACTERISTIC (OC) CURVES FOR ISOLATED LOT ACCEPTANCE PLANS, FOR THE COMBINATION OF LOT SIZE, N, AND SAMPLE SIZE, n, USED IN TABLE 2	9
APPENDIX B TYPICAL SAMPLING PLANS	19
APPENDIX C USE OF EIA STANDARD "ZERO ACCEPTANCE NUMBER SAMPLING PROCEDURES..."	25

ZERO ACCEPTANCE NUMBER SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES OF ISOLATED LOTS

(From Standards Proposal No. 2358, formulated under the cognizance of the EIA Quality and Reliability Engineering (QRE) Committee.)

1. SCOPE

1.1 PURPOSE

Conventional attribute sampling plans based upon acceptance numbers that permit acceptance of a lot when some allowable number of nonconformances are encountered during inspection are no longer desirable. In addition, emphasis is now placed on the quality level that is received by the customer. This relates directly to the Lot Tolerance Percent Defective (LTPD) value or the Limiting Quality Protection of MIL-STD-105. Measuring quality levels in percent nonconforming, although not incorrect, has been replaced with quality levels measured in parts per million (PPM). As a result, this standard addresses the need for sampling plans that can augment MIL-STD-105, are based upon a zero acceptance number, and address quality (nonconformance) levels in the parts per million range. This document does not address minor nonconformances, which are defined as nonconformances that are not likely to reduce materially the usability of the unit of product for its intended purpose.

1.2 APPLICATION

The sampling plans based upon a zero acceptance number designated in this standard are applicable, but not limited, to inspection of the following:

- a. End items.
- b. Components and raw material.

These plans are designed for use with isolated lots, and the Operating Characteristic curves are located in Appendix A. The manufacturer's risk, which is approximately equal to the AQL values of MIL-STD-105, is of little concern to consumers and users of zero acceptance number sampling plans. What is of interest is the level of nonconformances that will not be exceeded at a given confidence level, in any shipment of material to the consumer.

1.3 INSPECTION

Inspection is the process of measuring, examining, testing, or otherwise comparing the unit of product with the requirements.

1.4 INSPECTION BY ATTRIBUTES

Inspection by attributes is inspection whereby either the unit of product is classified simply as nonconforming or conforming, or else the number of nonconformances in the unit of product is counted and compared to a given requirement or set of requirements.

1.5 UNIT OF PRODUCT

The unit of product is the thing inspected in order to determine its classification as nonconforming or conforming or to count the number of nonconformances. 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.

1.6 NONCONFORMANCE

A nonconforming unit is one that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose.

2. PARTS PER MILLION (PPM)

2.1 EXPRESSION OF NONCONFORMANCE

The extent of nonconformance of product shall be expressed in parts per million (PPM).

2.2 PARTS PER MILLION (PPM)

This document is a sampling document which provides a graph (Operating Characteristic Curve) showing the risk that the producer is taking (probability of rejecting a good lot) and the risk the customer is taking (probability of accepting a bad lot), when the lot quality is expressed in PPM.

3. SAMPLING PLAN APPLICATION

3.1 NOTATION

Equations are provided for all quantities tabulated or graphed in this standard, using the following notation:

p = proportion of nonconforming items in the lot ($0 \leq p \leq 1$).

N_p is a positive integer.

n = sample size (a positive integer).

N = lot size (a positive integer, $N \geq n$).

P_a = probability of lot acceptance under the sampling plan used ($0 \leq P_a \leq 1$). That is, P_a is the probability that all items in the sample will be conforming.

In the equations given later, p , and P_a must always be used as decimal fractions between zero and one ($0 \leq p \leq 1$ and $0 \leq P_a \leq 1$). However, in the tables and graphs, these same quantities may be expressed in percents or in parts per million. To convert a decimal fraction to percent, multiply it by one hundred (100). To convert a decimal fraction to parts per million, multiply it by one million (1,000,000).

The acceptance number for all sampling plans considered in this standard is $c = 0$; this results in relatively simple equations for analyzing the sampling plans, as will be seen later.

3.2 USE

The sampling plans of this document are intended for use with isolated lots of product. Appendix A includes the Operating Characteristic (OC) curves for isolated lot inspection plans. Appendix B includes typical sampling plans for different values of protection for five different lot proportion nonconforming levels.

Selection of the appropriate sampling plan depends upon the amount of consumer protection desired for a selected PPM level of product quality desired, and the size of the lot when inspecting isolated lots of material. Appendix C explains how to use this document in selecting the appropriate sampling plan.

3.2.1 ISOLATED LOTS

The sampling plans of Appendix A were developed using hypergeometric probabilities and are suited only for accepting or rejecting isolated lots, each unique in itself. Rectification plans do not apply to isolated lots, even though rejected lots might be 100% inspected, because there is no long-term average involved. As a result, no Average Outgoing Quality curves are provided for these Operating Characteristic curves.

3.3 SELECTION

For sample inspections of isolated lots, the plans in Appendix A can be used, or exact Operating Characteristic curves can be generated for any lot size by using the equation at the bottom of Table 1. First, locate the chart that has a lot size nearest to the lot size to be inspected. Table 1 may be useful here. Then for this lot size, select from Table 2 the desired level of protection for the consumer. [i.e., the lot proportion nonconforming (p) that it is desired to protect against and a corresponding probability of lot acceptance (P_a), the consumer's risk. This determines the appropriate sample size (n).]

For example, assume a lot size of 500. A consumer protection of 90% is selected, which means the probability of accepting a lot is only 10% when the proportion (p) of nonconforming items in that lot equals the value where the 10% P_a line and the sample size curve intersect, as read across the bottom of the chart for lot sizes of 500 in Appendix A.

In this case, p equals 5000 PPM for a sample size of 315. The probability of accepting a lot, which has a proportion of nonconforming items equal to 5000 PPM, is only 10%, with a sample size of 315. If more protection is needed, 100% inspection may be required. If less protection is desired, select a smaller sample size. For the same conditions, a sample size of 125 results in a value of p of approximately 16,000 PPM for a P_a of 10%.

For isolated lots, the probability of accepting a lot of size N , containing a proportion p of nonconforming units (so pN is an integer), based on inspecting a sample of size n with an acceptance number of zero, is found using hypergeometric probabilities as

$$P_a = \frac{(N-Np)! (N-n)!}{(N-Np-n)! N!}$$

The probability of rejection, i.e., $Pr = 1 - P_a$, is the statistical confidence with which the lot proportion nonconforming may be claimed to not exceed the value of p , if a random sample of n items from the lot of N items contains no nonconforming items.

4. SUBMISSION OF PRODUCT

4.1 LOT

The term lot shall mean "inspection lot", i.e., a collection of units of product from which a sample is to be drawn and inspected to determine conformance with the acceptability criteria, and may differ from a collection of units designated as a lot for other purposes (e.g., production, shipment, etc.).

4.2 FORMATION OF LOTS

The product shall be assembled into identifiable lots, sublots, or in such other manner as may be prescribed. Each lot shall, as far as is practicable, consist of units of product of a single type, grade, class, size, and composition.

4.3 LOT SIZE

The lot size, N , is the number of units of product in a lot.

4.4 PRESENTATION OF LOTS

The formation of lots, lot size, and the manner in which each lot is to be presented and identified by the consumer shall be designated or approved by the responsible authority. As necessary, the consumer shall provide adequate and suitable storage space for each lot, equipment needed for proper identification and presentation, and personnel for all handling of product required for drawing of samples.

5. ACCEPTANCE AND REJECTION

5.1 ACCEPTABILITY OF LOTS

Acceptability of a lot will be determined by the use of a sampling plan or plans that accept on zero nonconformances and reject on one or more nonconformances.

5.2 NONCONFORMING UNITS

The right is reserved to reject any unit of product found nonconforming during inspection, whether that unit of product forms part of a sample or not, and whether the lot as a whole is accepted or rejected. Rejected units may be repaired or corrected and resubmitted for inspection with the approval of, and in the manner specified by, the responsible authority.

5.3 SPECIAL RESERVATION FOR CRITICAL DEFECTS

The supplier may be required at the discretion of the responsible authority to inspect every unit of the lot for critical nonconformances. The right is reserved to inspect every unit submitted by the supplier for critical nonconformances, and to reject the lot immediately when a critical nonconformance is found. The right is reserved also to sample, for critical nonconformances, every lot submitted by the supplier and to reject any lot if a sample drawn therefrom is found to contain any critical nonconformance.

6. DRAWING OF SAMPLES

6.1 SAMPLE

A sample consists of one or more units of product drawn from a 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, n .

6.2 REPRESENTATIVE SAMPLING

When appropriate, the number of units in the sample shall be selected in proportion to the size of the lot, identified by some rational criterion. When representative sampling is used, the units from each part of the lot shall be selected at random.