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RDT Standards Transmittal

Hanford Engineering Development Laboratory

DISTRIBUTION	DATE December 14, 1973	NO. 163
Lists 1 and 5	RETURN COMMENTS TO: W. F. Stevenson, Westinghouse Hanford Company, P. O. Box 1970, Richland, WA 99352	TYPE SUBMISSION: ☐ 1. PRELIMINARY ☐ 2. DRAFT ☒ 3. TENTATIVE ☐ 4. FINAL ☐ 5.
	NOT LATER THAN	TYPE ACTION: ☐ A. APPROVAL ☐ B. INFORMATION ☐ C. COMMENTS ☒ D. TRIAL USE ☐ E.

NUMBER	DESCRIPTION	ACTION
	RDT F 2-7T, Acceptance Sampling Plans, November 1973	D

Release for Announcement in Nuclear Science Abstracts

SIGNATURE H. T. Knight 12/14/73

AEC-RL RICHLAND, WASH

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RDT F 2-7T

RDT Standard

ACCEPTANCE SAMPLING PLANS

NOVEMBER 1973

Division of Reactor Research and Development
United States Atomic Energy Commission

ACCEPTANCE SAMPLING PLANS

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ACCEPTANCE SAMPLING PLANS

1. INTRODUCTION

This standard is a compilation of attributes and variables acceptance sampling plans and procedures which may be used as a ready reference to provide protection to both supplier and purchaser whenever sampling inspection is involved. Appendix A discusses some of the basic and underlying principles involved in these plans and procedures. The plans and procedures provide for selection of adequate sample quantities and evaluation of inspection data for the purpose of determining conformance to the specified lot tolerance percent defective (LTPD) and β error acceptance criteria.

The plans contained herein, and their respective operating characteristic curves, are identical to those contained in the Military Standards 105D and 414. The procedures for selection and use of the plans have been modified to:

1. Assure the required quality level for each individual inspection lot rather than emphasize the acceptance of a level of quality considered satisfactory as a long term average.

2. Base acceptance calculations on lot tolerance percent defective (LTPD) and β error (purchaser risk) rather than acceptable quality level (AQL) and α error (supplier risk).

2. REFERENCE DOCUMENTS

The following documents are a part of this standard to the extent specified herein. The issue of a document in effect on the date of the invitation to bid, including any amendments also in effect on that date, shall apply unless otherwise specified. Where this standard appears to conflict with the requirements of a referenced document, such conflict shall be brought to the attention of the purchaser for resolution.

2.1 Military Standards.

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

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

3. DEFINITIONS

For additional clarification, see Appendix A.

3.1 Acceptable Quality Level (AQL). That designated value of percent defective (or of defects per hundred units) which is considered satisfactory for a great majority of the purchased product.

3.2 Acceptance Number (AC). The largest number of defective units (or defects) in the sample or samples under consideration that will permit acceptance of the inspection lot.

3.3 Acceptance Sampling. The act of taking samples, from a parent inspection lot, on which to base a decision whether to accept or reject the parent lot.

3.4 Acceptance Sampling Plan. A specific plan that states the sample size or sizes to be used and the associated acceptance and rejection criteria.

3.5 Attributes. The classification of a product simply as conforming or not conforming to specified requirements.

3.6 Inspection. The process of measuring, examining, testing, gaging, or otherwise comparing the unit with the applicable requirements.

3.7 Inspection Lot. A specific quantity of similar materials or units on which acceptance sampling is to be performed.

3.8 Limiting Quality (LQ). The maximum lot percent defective considered acceptable, at a specified β risk, by the purchaser.

3.9 Lot Tolerance Precent Defective (LTPD). Expressed in percent defective, the poorest quality in an individual lot that shall be accepted at a specified β risk, by the purchaser.

3.10 Operating Characteristic (OC) Curve. The probability of accepting products or materials of various levels of proportion defective.

3.11 Rejection Number (Re). The smallest number of defective units (or defects) in the sample or samples under consideration that will require rejection of the inspection lot.

3.12 Risk, Purchaser (β). For a given sampling plan, the probability of accepting a lot of LTPD quality.

3.13 Risk, Supplier (α). For a given sampling plan, the probability of rejecting a lot of AQL quality.

3.14 Sample. One or more units drawn randomly from an inspection lot for purposes of inspection to reach a decision regarding acceptability of the lot.

3.15 Variables. Measurements on a continuous numerical scale which indicate the degree of conformance or nonconformance of the item being measured.

4. ATTRIBUTES ACCEPTANCE SAMPLING PLANS

This section provides sampling procedures and reference tables for use

in planning and conducting inspection by attributes.

These plans have been taken from MIL-STD-105D and provide an identical degree of protection. The procedures for the use of these plans, however, are intended to force attention, by all concerned, on the basic operating characteristic curves of the plans used. Generally, the procedures here more nearly reflect the LQ concept as defined in MIL-STD-105D rather than the AQL concept which primarily emphasizes the supplier risk.

4.1 Formation of Lots or Batches. The product shall be assembled into identifiable lots, sublots, batches, or in such other manner as may be prescribed. Each lot or batch shall consist of units or product of a single type, grade, class, size, and composition, manufactured under essentially the same conditions, and at essentially the same time.

4.2 Presentation of Lots or Batches. The formation of the lots or batches, lot or batch size, and the manner in which each lot or batch is to be presented and identified by the supplier will be designated or approved by the purchaser.

4.3 Acceptability of Lots or Batches. Acceptability of a lot or batch will be determined by the use of a sampling plan or plans associated with the specified LTPD.

4.4 Types of Sampling Plans. A decision as to the type of plan, either single, double, or multiple, 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 one) 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 sampling procedures.

4.4.1 Single Sampling Plan. The number of sample units inspected shall be equal to the sample size given by the plan. If the number of defective units found in the sample is equal to or less than the acceptance number, the lot or batch shall be considered acceptable. If the number of defective units is equal to or greater than the rejection number, the lot or batch shall be rejected.

4.4.2 Double Sampling Plan. In the first phase of inspection, the number of sample units inspected shall be equal to the first sample size given by the plan. If the number of defective units found in the first sample is equal to or less than the first acceptance number, the lot or batch shall be considered acceptable. If the number of defective units found in the first sample is equal to or greater than the first rejection number, the lot or batch shall be rejected. If the number of defective units found in the first sample is between the first acceptance and rejection numbers, a second sample of the size given by the plan shall be inspected. The number of defective units found in the first and second samples shall be accumulated. If the cumulative number of defective units is equal to or less than the second

acceptance number, the lot or batch shall be considered acceptable. If the cumulative number of defective units is equal to or greater than the second rejection number, the lot or batch shall be rejected.

4.4.3 Multiple Sample Plan. Under multiple sampling, the procedure shall be similar to that specified in 4.4.2, except that the number of successive samples required to reach a decision may be more than two.

4.5 Operating Characteristic Curves. The operating characteristic curves for normal inspection, shown in Table 3 in Appendix B indicate the percentage of lots or batches which may be expected to be accepted under the various sampling plans for a given process quality. The curves shown are for single sampling; curves for double and multiple sampling are matched as closely as practicable. The OC curves shown for AQL's greater than 10.0 are based on the Poisson distribution and are applicable for defects per hundred units inspection; those for AQL's of 10.0 or less and sample sizes of 80 or less are based on the binomial distribution and are applicable for percent defective inspection; those for AQL's of 10.0 or less and sample sizes larger than 80 are based on the Poisson distribution and applicable either for defects per hundred units inspection, or for percent defective inspection (the Poisson distribution being an adequate approximation to the binomial distribution under these conditions).

4.6 Obtaining the Sampling Plan.

4.6.1 An OC curve (see 4.5) shall be selected from Table 3 which passes through a point the coordinates of which are the specified LTPD and β values for the characteristic in question. It should be noted that there may be several OC curves in Table 3 which pass through the required point or sufficiently close to satisfy the specified LTPD and purchaser risk β. The OC curve selected should also be examined for its appropriateness as to the supplier's risk. If the supplier's process average is close to, yet less than, the specified LTPD, a larger sample is required to identify the acceptable lots from the unacceptable lots than would be required if the supplier's process average were considerably less than the specified LTPD. The unit cost of inspection and manufacture need to be evaluated by the supplier to arrive at an economically optimum OC curve.

4.6.2 The AQL value and the sample size code letter for the OC curve selected shall be used to obtain the appropriate sampling plan from the table on the page opposite the selected OC curve. When no sampling plan is available in these tables for a given combination of AQL value and sample size code letter, the user is directed to a different sample size code letter and different plan which may be used.

4.7 Time of Sampling. Samples may be drawn after all the units comprising the lot or batch have been assembled, or samples may be drawn during assembly of the lot or batch.

5. VARIABLES ACCEPTANCE SAMPLING PLANS

The variables acceptance sampling plans contained herein have been taken

from MIL-STD-414 and provide an identical degree of protection. The procedures for the use of the plans have been changed in this standard to more adequately assure the quality of each individual lot. These plans and procedures may be used whether inspection is performed at the point of production or at the destination. When applicable, this standard shall be referenced in the specification, contract, or inspection instructions, and the provisions set forth herein shall govern.

Variables acceptance sampling plans may require fewer samples than attributes sampling plans, but they may only be used where the measurements of the quality characteristic are independent, identically distributed normal random variables. In considering applications where the normality or independence of measurements is questionable, statistical evidence supporting normality or independence will be required prior to the use of variables plans.

This section of this standard is divided into three parts:

1. Paragraph 5.1 describes general procedures for the sampling plans.

2. Paragraph 5.2 describes procedures and applications of the sampling plans when the variability of the individual units within the lot is unknown. This part is subdivided into the following two categories:

   a. Sampling plans for the single specification limit case.

   b. Sampling plans for the double specification limit case.

3. Paragraph 5.3 describes the plans which may be used when the variability is known. This part is subdivided into the following two categories:

   a. Sampling plans for the single specification limit case.

   b. Sampling plans for the double specification limit case.

The plans in 5.3 which use known variability, σ, require considerably fewer sample units for comparable assurance than the type of plans in 5.2. However, the use of known variability plans shall be based upon a demonstration by the supplier that his process is controlled in a manner such that the within-lot variance of the affected product characteristic remains stable (see Appendix A). The supplier's method of demonstrating proof of known variability shall be approved by the purchaser prior to the supplier's use of sampling plans using known variability. Purchaser's approval shall be required prior to applying sampling plans using known variability.

Illustrations of the computations and procedures used in the sampling plans are given by examples in the applicable parts and in Appendix B.

5.1 General Description and Procedures.

5.1.1 Selection of Sampling Plan. For the product characteristic in

question, note the specified LTPD and β and value in the RDT standards. An appropriate OC curve shall be selected from Table 4 in Appendix B.

5.1.1.1 Assure the Specified LTPD and β. Select from Table 4 an OC curve which plots through the specified LTPD, at the specified β value, for the product characteristic in question. (Note that the LTPD value is located on the horizontal scale, while the β value is located on the vertical scale.) If there is no OC curve showing exact correspondence to the specified values of LTPD and β in Table 4, the next lower OC curve shall be chosen. No sampling plans with curves passing above these values shall be selected.

5.1.1.2 Assure the Desired Supplier Risk. There may be a choice of several OC curves which will satisfy the specified LTPD and β values; the final choice of which curve to select should be evaluated by the supplier concerning the effect of the varying chances of rejecting lots having acceptable quality level. The supplier should choose an OC curve which, in addition to being adequate for the specified LTPD and β values, also minimizes the risk of rejecting lots of the level of quality which the supplier normally produces--if such lots are of better quality than the specified LTPD. If the supplier's process capability is such that he normally produces lots of a percent defective close to the LTPD, a steeper OC curve (and consequently, more samples) is required to discriminate between the acceptable and unacceptable lots. If the supplier's process average, in terms of lot percent defective, is small in relation to the LTPD, a less steep OC curve (and consequently, fewer samples) is required to minimize the risk of rejecting such lots while at the same time assuring the specified LTPD and β.

5.1.1.3 Determination of Appropriate Sampling Plan. For the appropriate OC curve, selected as above, note its specified AQL value and sample code letter as given in Table 4. Refer these to Table 5 (if the within-lot variability is unknown) or Table 7 (if the within-lot variability is known) for the sample size and acceptance criterion to be used.

5.1.2 Sample Selection. A sample is one or more units of product drawn from a lot. The required number of sample units, as determined from Tables 5 or 7, shall be taken at random from the parent lot without regard to their quality.

5.1.3 Special Plans from Other Sources. Variables acceptance sampling plans from sources other than this standard shall be submitted to the purchaser for review and approval prior to implementation and use.

5.2 Unknown Variability Plans.

5.2.1 Single Specification Limit. The procedures for use with plans for a single specification limit when variability of items within the lot is unknown are as follows (see B.2.1.1 in Appendix B):

1. Enter Table 4 with the specified LTPD and β values. Select a satisfactory OC curve for these values (see 5.1.1). Note the sample size code letter and AQL value for the curve selected.

2. Using the sample size code letter and AQL value determined as above, refer to Table 5 for the sample size n and the maximum allowable percent defective M.

3. Select at random the sample of n units from the lot. Inspect and record the measurement of the quality characteristic for each unit of the sample.

4. Compute the sample mean $\bar{X}$ and the sample standard deviation s.

5. Compute the quality index $Q_U = (U-\bar{X})/s$ if an upper specification limit U is specified, or $Q_L = (\bar{X}-L)/s$ if a lower specification limit L is specified.

6. Using Q_U or Q_L (as the case may be) and the sample size n, determine the estimated lot percent defective p_U (percent defective above the upper specification limit) or p_L (percent defective below the lower specification limit) from Table 6.

7. If the estimated lot percent defective p_U or p_L is equal to or less than the maximum allowable percent defective M, the lot meets the acceptability criterion; if p_U or p_L is greater than M or if Q_U or Q_L is negative, then the lot does not meet the acceptability criterion.

5.2.2 Double Specification Limit.

5.2.2.1 One LTPD Value for Both Upper and Lower Specifications Combined. In cases where a single LTPD value is established for the upper and lower specification limit combined for a single quality characteristic, the following steps summarize the procedures to be used (see B.2.1.2, Appendix B):

1. Enter Table 4 with the specified LTPD and β. Select a satisfactory OC curve for these values (see 5.1.1). Note the sample size code letter and AQL value for the curve selected.

2. Using the sample size code letter and AQL value determined as above, refer to Table 5 for the sample size n and the maximum allowable percent defective M.

3. Select at random the sample of n units from the lot. Inspect and record the measurement of the quality characteristic for each unit of the sample.

4. Compute the sample mean $\bar{X}$ and sample standard deviation s.

5. Compute the quality indices $Q_U = (U-\bar{X})/s$ and $Q_L = (\bar{X}-L)/s$.

6. With the above quality indices and the sample size n, determine from Table 6 the lot percent defective above the upper specification, p_U

and the lot percent defect below the lower specification p_L. Add these to obtain the total estimated percent defective in the lot, $p = p_U + p_L$.

7. If the estimated lot percent defective p is equal to or less than the maximum allowable percent defective M, the lot meets the acceptability criterion; if p is greater than M or if either Q_U or Q_L or both are negative, then the lot does not meet the acceptibility criterion.

5.2.2.2 Different LTPD Values for Upper and Lower Specification Limits. In cases where the LTPD values for upper and lower specification limits differ for a single quality characteristic, the following steps summarize the procedures to be used (see B.2.1.3 in Appendix B):

1. Locate an appropriate OC curve in Table 4 as in 5.2.2.1, step 1, for each specified LTPD value and corresponding β risks. Note the AQL values and sample size code letter for the operating characteristic curves selected (see 5.1.1).

2. Using the above AQL values and sample size code letter, note the appropriate sampling plans in Table 5. Obtain the sample size n and the maximum allowable percent defectives M_U and M_L, corresponding to the AQL values for the upper and lower specification limits, respectively.

3. Select at random the sample of n units from the lot; inspect and record the measurement of the quality characteristic for each unit in the sample.

4. Compute the sample mean $\bar{X}$ and standard deviation s.

5. Compute the quality indices $Q_U = (U-\bar{X})/s$ and $Q_L = (\bar{X}-L)/s$.

6. Using each of the values Q_U, and Q_L, and the sample size n, from Table 6 determine the estimated lot percent defectives p_U and p_L, corresponding to the percent defectives above the upper and below the lower specification limits. Also, determine the combined defective $p = p_U + p_L$.

7. If all three of the following conditions are satisfied, the lot meets the acceptability criteria:

   a. p_U is equal to or less than M_U,

   b. p_L is equal to or less than M_L,

   c. p is equal to or less than the larger of M_L and M_U,

   If either Q_L or Q_U, or both, are negative, the lot does not meet the acceptability criteria.

5.3 Known Variability Plans. This part describes procedures to be used when the variability, σ, of units within the lot is known.

5.3.1 Single Specification Limit. (See B.2.1.1, Appendix B.)

1. Enter Table 4 with the specified LTPD and β. Select a satisfactory OC curve for these values (see 5.1.1). Note the sample size code letter and AQL value for the curve selected.

2. Using sample size code letter and AQL value determined as above, refer to Table 7 for the sample size n, the factor v, and the maximum allowable percent defective M.

3. Select at random the sample of n units from the lot. Inspect and record the measurement of the quality characteristic for each unit of the sample.

4. Compute the sample mean $\bar{X}$.

5. Compute the quality index $Q_U = (U - \bar{X})v/\sigma$ if an upper specification limit U is specified, or $Q_L = (\bar{X} - L)v/\sigma$ if a lower specification limit L is specified.

6. Using the above quality index, determine the estimated lot percent defective above the upper specification, p_U or the estimated lot percent defective below the lower specification, p_L from Table 8.

7. If the estimated lot percent defective p_U or p_L is equal to or less than the maximum allowable percent defective M, the lot meets the acceptability criterion; if p_U or p_L is greater than M or if Q_U or Q_L is negative, then the lot does not meet the acceptability criterion.

5.3.2 Double Specification Limit.

5.3.2.1 One LTPD and β Value for Both Upper and Lower Specification Limits Combined. (See B.2.2.2, Appendix B.)

1. Enter Table 4 with the specified LTPD and β. Select a satisfactory OC curve for these values. (see 5.1.1) Note the sample size code letter and AQL value for the curve selected.

2. Using the sample size code letter and AQL value determined as above, refer to Table 7 for the sample size n, the factor v, and the maximum allowable percent defective M.

3. Select at random the sample of n units from the lot. Inspect and record the measurement of the quality characteristic for each unit of the sample.

4. Compute the sample mean $\bar{X}$.

5. Compute the quality indices $Q_U = (U - \overline{X})v/\sigma$ and $Q_L = (\overline{X} - L)v/\sigma$.

6. Determine the estimated lot percent defective $p = p_U + p_L$ from Table 8.

7. If the estimated lot percent defective p is equal to or less than the maximum allowable percent defective M, the lot meets the acceptability criterion. If p is greater than M or if Q_U or Q_L or both are negative, then the lot does not meet the acceptability criterion.

5.3.2.2 Different LTPD and β Values for Upper and Lower Specification Limits. (See B.2.2.3, Appendix B.)

1. Enter Table 4 with the specified LTPD and β values for each specification limit. Select satisfactory OC curves for each of these limits (see 5.1.1). Note the sample size code letter and AQL values for the OC curves selected.

2. For the sample size code letter and largest of the two AQL values obtained as above, refer to Table 7 for the sample size n and the v factor to be used. Also, for the same sample size code letter note the values of the maximum allowable percent defective M pertaining to each of the selected AQL values.

3. Select at random the sample of n units from the lot. Inspect and record the measurement of the quality characteristic for each unit of the sample.

4. Compute the same mean, $\overline{X}$.

5. Compute the quality indices $Q_U = (U - \overline{X})v/\sigma$ and $Q_L = (\overline{X} - L)v/\sigma$.

6. With the above quality indices, Q_U and Q_L, determine from Table 8 the estimated lot percent defective p_U and p_L which are estimates of the percent defective units in the lot above the upper and below the lower specification limits, respectively. Also, calculate the combined percent defective $p = p_U + p_L$.

7. If all three of the following conditions are satisfied, the lot meets the acceptability criteria:

   a. p_U is equal to or less than M_U,

   b. p_L is equal to or less than M_L,

   c. p is equal to or less than the larger of M_L and M_U,

   If either Q_L or Q_U, or both, are negative, then the lot does not meet the acceptability criteria.

APPENDIX A

BASIC PRINCIPLES OF ACCEPTANCE SAMPLING

A.1 SCOPE

This appendix sets forth some of the basic underlying principles which must be considered, and may be of aid, in the selection and use of those acceptance sampling plans discussed in Sections 4 and 5 and which are involved in the procurement of any components. The contents of this Appendix are not intended to fully cover all the important aspects of acceptance sampling. For a more comprehensive coverage of this subject the user of this standard is referred to the many, and more complete, texts which presently exist.

A.2 AMOUNT OF INSPECTION TO BE PERFORMED

A.2.1 General. Inspection is the examination or testing of units of product to determine whether such products conform to the specified requirements.

A.2.2 Density of Inspection. Initially, a decision must be made as to the amount of inspection which shall be done, i.e., screening (100 percent inspection) or sampling inspection (less than 100 percent inspection). The factors to be considered in this regard are:

1. The criticalness of the characteristic for which inspection is to be done.

2. The nature of the test or inspection, i.e., destructive or nondestructive.

A.2.3 Screening. Product screening should be considered for those product characteristics which can be inspected inexpensively and nondestructively, especially if the characteristic in question is of a critical nature. If the acceptance and use of a defective unit of product is of serious and unacceptable consequences, only 100 percent (or more) inspection is appropriate.

A.2.4 Sampling. If the acceptance of some proportion of defects can be tolerated, a sampling plan can be used which will ensure that no more than that specified proportion of defects is accepted. If the only method of test or inspection is destructive in nature, it will, of course, be necessary to specify some tolerable proportion of defects.

A.3 METHODS OF INSPECTION

A.3.1 Attributes Inspection. Inspection by attributes is inspection to determine whether the unit of product being inspected does, or does not, meet the specified requirements.

A.3.1.1 Advantages. In comparison with variables inspection, inspection by attributes usually requires less detailed records of results, and is faster. Administration of inspection is easier, and the cost of inspection is usually lower.

A.3.2 Variables Inspection. Inspection by variables is inspection wherein certain product characteristics of the unit of product are evaluated with respect to a continuous numerical scale and expressed as precise points along this scale. Variables inspection records the degree of conformance or nonconformance of the unit with specified requirements for the product characteristics involved.

A.3.2.1 Advantages. Variables sampling plans in comparison with attributes sampling plans provide considerably more information regarding the conformance or nonconformance of the particular product characteristic. For this reason, variables plans usually require smaller sample sizes for equivalent assurance as to correctness of decisions to accept or reject a quantity of product. However, the cost of inspection on a variables basis may offset this advantage. The use of variables acceptance sampling plans also requires evidence of the general shape of the distribution of within-lot measurement (see Section 5).

A.4 SUBMISSION OF PRODUCT FOR INSPECTION

A.4.1 General. Units of product may be submitted for inspection on the basis of a continuous production flow; or they may be separated into lots or batches for lot-by-lot inspection.

A.4.2 Continuous Production. Under continuous sampling, units are produced and submitted consecutively for inspection in the order produced. The products may be presented for inspection on a moving conveyor belt as they come from a continuous production line. Continuous sampling inspection may be required when:

1. Storage facilities are inadequate or when it is otherwise impractical to accumulate products into lots or batches for the purpose of inspection.

2. The assembly of small lot sizes greatly increases the amount of inspection and thus results in increased inspection costs.

3. Available inspection and test facilities are limited, and extensive inspection or test times are required relative to the production rate. Under these or other conditions, it may be appropriate to consider use of "continuous sampling" procedures to determine the acceptance or rejection of units or product.

Continuous sampling inspection involves a continuous (unit to unit) sampling procedure that permits a systematic decrease or increase in the fraction of the presented units to be inspected, depending on the quality of the product presented. Continuous sampling inspection is usually characterized by a

requirement of 100 percent inspection of the units at the start. This is continued until a specific number of consecutive units are inspected and found free of defects, after which the inspection of only a fraction of the units is required. If an additional, consecutive, number of units are found free of defects, a further reduction in the fraction of units requiring inspection may be possible. However, the discovery of defective units may require an increase in the fraction of units to be inspected, including the possible return to 100 percent inspection. Continuous sampling inspection plans may also be devised to eliminate the return to 100 percent inspection unless a readily determinable, significant deterioration in the product quality has occurred. A number of continuous sampling plans are available to provide considerable flexibility in the amount of inspection, depending on the desired product quality and the results obtained from successive sampling inspections.*

A.4.3 Lot-by-Lot. Lot-by-lot sampling inspection requires each individual lot to be accepted or rejected as a whole, based on inspection results obtained from a sample or samples drawn at random from the lot. Lot-by-lot sampling inspection may be applied on end products, incoming lots or batches of components, or semifinished products. It may be performed by drawing the units for inclusion in the sample concurrently with production of the lot (i.e., moving lots).

A.4.3.1 Large Lots. Formation of larger lot sizes tends to reduce inspection costs. When conditions of homogeneity are satisfied, small production lots may be combined to form a larger lot called a "grand" lot. The grand lot is sample inspected as a single large lot.

A.4.3.2 Small Lots. The formation of very large lot sizes may be undesirable since they may create an expensive storage problem, disrupt the flow of product to the purchaser on a fixed delivery schedule, and if rejection occurs may cause difficult problems. For large lots, inaccessibility to all units in the lot may make it more difficult to obtain a random sample. Under certain conditions, this problem may be minimized by subdividing the lot into sublots for purposes of sampling inspection. For example, if the lot represents a full work week of production, each inspection sublot may consist of one day's production. Each sublot may be sampled by applying a single plan individually, or a single sample based upon the grand lot apportioned by taking one-fifth of the sample from each sublot. The acceptance/rejection criteria are then applied to the inspection results accumulated over the week.

A.4.3.3 Lot Identity. Proper lot identification and effective maintenance of inspection results for each lot are essential. Arrangements for the formation of inspection lots should include provisions for the identification and physical segregation of inspection lots. Maintenance of lot identity will ensure that acceptance or rejection is made on the lot from which the sample was drawn. Maintaining lot identity will prevent mixture of a

*See MIL-STD-1235.

rejected product with other products not yet inspected or with accepted products awaiting shipment. The simplest way to maintain lot identity is by physical segregation. This facilitates the disposition of the inspected product, whether the decision is to accept or reject the lot. In case of lot acceptance, segregated lots can be readily identified for screening and resubmittal if such action is warranted or desired.

A.5 TYPES OF LOT SAMPLING PLANS

A.5.1 General. A lot sampling plan is a statement of the sampling size or sizes to be used and the associated acceptance and rejection criteria. The acceptance number is the maximum number of defects or defective units in the sample that will permit acceptance of the inspection lot or batch. The rejection number is the minimum number of defects or defective units in the sample that will cause rejection of the lot represented by the sample. Lot sampling plans can be grouped into four basic types: single, double, multiple, and sequential. The use of these four sampling plans usually requires the grouping of production units into stationary lots or batches. Lots or batches are either accepted or rejected depending upon the results of sampling inspection. The terms "accepted" and "rejected" indicate a statistical decision reached on the basis of the sampling plan and criteria used. This decision in itself does not dictate or guarantee final acceptance or rejection, since other contractual, administrative or technical considerations may be involved. The primary purpose of sampling inspection is to obtain information in order to reach a statistical decision regarding the disposition of lots or batches (accepted if they conform to specified quality requirements, or rejected if they do not conform).

A.5.2 Single Sampling. A single sampling plan is a type of sampling plan by which the results of a single sample from an inspection lot are conclusive in determining its acceptability. The number of sample units inspected shall be equal to the sample size given by the plan. This number is usually designated by the letter "n". If the number of defective units is equal to or greater than the rejection number "Re" the lot or batch shall be rejected. A decision concerning the acceptability of a lot is reached on the basis of results obtained from taking a single sample of "n" unit at random from the lot.

A.5.3 Double Sampling. A double sampling plan involves sampling inspection in which the inspection of the first sample leads to a decision to accept, reject, or to take a second sample. The inspection of a second sample, when required, then leads to a decision to accept or reject. Double sampling plans are operated in the following manner.

A.5.3.1 A first sample of "n_1" units is selected at random from the lot and inspected. If the number of defective units is equal to or less than the first acceptance number "c", the lot is accepted. If the number of defective units is equal to or greater than the first rejection number "r_1", the lot shall be rejected. If the number of defective units is greater than the first acceptance number "c_1", and less than the first rejection number "r_1", the next sample step must be taken.

A.5.3.2 A second sample of "n_2" units is selected at random from the lot and inspected. The number of defective units found in the first and second samples shall be accumulated. If the cumulative number of defective units is equal to or less than the second acceptance number "c_2", the lot is accepted. If the cumulative number is equal to or greater than the second rejection number "r_2", the lot shall be rejected. Under certain conditions, it may be more desirable to select both samples of a double sampling plan at one time, rather than draw the second sample after the first sample has been inspected. Inspection of the second sample would not be required if the lot is accepted or rejected based on the inspection results of the first sample.

A.5.4 Multiple Sampling. Multiple sampling is a type of sampling in which a decision to accept or reject an inspection lot may be reached after one or more samples from the inspection lot have been inspected, and will always be reached after not more than a designated number of samples have been inspected. Under multiple sampling, the procedure is similar to that described for double sampling, except that the number of successive samples required to reach a decision to accept or reject the lot may be more than two.

A.5.5 Sequential Sampling. Sequential sampling involves a unit-by-unit plan in which the sample units are selected one at a time. After each unit is inspected, the decision is made to accept, to reject, or to inspect another unit. Sampling terminates when the cumulative inspection results of the sample unit determine that the acceptance or rejection decision can be made. The sample size is not fixed in advance, but depends on actual inspection results. It may be possible to continue sampling under the sequential plan until all units are inspected. From a practical standpoint, this is not desirable and is seldom required. Most sequential sampling plans are "truncated," which means the plan requires either an acceptance or rejection decision after a specified number of units have been inspected. It should be emphasized that for a large majority of lots, the total sample size under sequential sampling will be smaller than under single or double sampling.

A.5.6 Average Sample Number (ASN) Curves. Average sample number curves are a graphic means of showing the average sample sizes which may be expected to occur under the various sampling plans for a given product quality. The average amount of inspection for any sampling plan can be computed. On the average, double sampling plans usually require less inspection than single sampling plans, and multiple sampling plans usually require less inspection than double sampling plans. Usually, the amount of inspection required for single sampling is the number of units in the sample, regardless of the product quality, since inspection is not curtailed (i.e., immediately terminated) as soon as the rejection number is reached. For double and multiple sampling plans the amount of inspection is minimized when the product is of a very good or a very poor quality. Sequential sampling plans may result in a further reduction in the amount of inspection.

A.6 SELECTION OF SAMPLING PLANS

In the preceding, different types of sampling plans have been described and it has been shown that in many instances there are a number of alternative sampling schemes which can be used for a specific situation. The selection of which particular type of sampling plan to use, however, is not always an easy task since the selection is actually dependent upon a number of different factors. Generally, selection involves consideration of the following:

1. Properties of the sampling plan. (See A.7 below)
2. Ease of administering the sampling plan.
3. Amount of inspection required.
4. Unit cost of inspection.
5. Unit cost of manufacture.

In addition to the necessity for appropriately considering these factors, it must be recognized that the plan adopted for one type of product may not be the best for another type. This is particularly true where the submittal of product for inspection depends on the physical layout of a manufacturing facility or operation, the production methods, or both. Further, past quality history of the supplier, source, or process plays an important role in the selection of the appropriate sampling plan. Where this history shows submission of product of consistently high quality, the sampling plan selected should permit the minimum amount of inspection necessary to reach an inspection decision regarding the conformance of the product to specified quality requirements. For suppliers, sources, or processes with relatively poor quality histories, a much greater amount of inspection may be fully justified.

A.7 SAMPLING RISKS AND OPERATING CHARACTERISTIC (OC) CURVES

A.7.1 General. Regardless of the inspection plan used, there is always a risk or chance that some percentage of defective units will be passed, especially if sampling inspection is used. Because of personnel errors, poor judgment in the interpretation of quality tolerances, the improper use of inspection equipment or the incorrect conduct of tests, it is well recognized that there is always some risks that defective units may be missed under 100 percent inspection, and even 200 or 300 percent inspection. This is not to imply that such mistakes are not made under sampling inspection, but that even when circumstances dictate its use, 100 percent inspection incurs some risk of passing defective units. Studies have shown that 100 percent inspection under optimum conditions is only 85 to 95 percent effective in separating bad product from good product (in the absence of completely automated inspection methods). As with 100 percent inspection, therefore, it logically follows that sampling inspection can never guarantee that material it has passed is completely free of defects. In addition to the errors or mistakes in judgment which the inspector may make when using sampling inspection, there is also an additional "statistical" risk; i.e., the "luck of the draw" that must be taken into consideration.

A.7.2 Statistical Considerations Related to Sampling. The first consideration to be weighted in deciding whether sampling inspection can be used for a particular quality characteristic is: "What would be the result of accepting a defect?" If the defect is of such a nature that it could cause a safety hazard, incur great loss, result in intolerable operating efficiency, or result in costly repairs or corrections, the conclusion probably would be that sampling inspection should not be used because the presence of such defects could not knowingly be tolerated. Thus, it would follow that even with its apparent limitations, 100 percent inspection should still be prescribed (see A.2.3). If the defect did not fall into any of the categories described above, the conclusion reached might be to use sampling inspection.

A.7.3 Ideal Sampling Plan. Assuming that 100 percent inspection of the units of product to specified requirements is not mandatory, the (statistical) risks inherent in sampling plans become a factor of importance. Before considering the nature of these risks, however, it is first necessary to establish the standard which defines "acceptable quality." Normally the only desired product quality is zero percent defect (or zero defects per hundred units). A product quality standard which establishes an "acceptable quality" at less than a perfect product results from a compromise between the purchaser who desires a perfect quality product, but cannot afford the related high costs and the supplier who desires to submit a perfect quality product, but is limited by the capabilities of men and machines. Even when such a compromise is reached, 100 percent inspection cannot ensure a complete separation of conforming and nonconforming units of product (see A.7.1). Therefore, since the compromise of acceptable quality is some absolute value of quality greater than zero, expressed in practice as a numerical value (such as "percent defective" or "defects per hundred units"), this standard represents the degree of nonconformance of units of product that can be tolerated and consequently considered acceptable. Therefore, the "ideal" sampling plan is one which rejects all lots worse than the standard and accepts all lots equal to or better than the standard. For example, assume that an ideal sampling plan could be devised so that all groups of product with less than 5 percent defective would be accepted and all groups of product with more than 5 percent defective would be rejected. A sampling plan having this capability is shown graphically in Figure 1. From a practical standpoint however, an ideal sampling plan such as is shown in Figure 1 which will accept all good lots and reject all bad lots cannot be developed. In effect, no sampling plan actually exists that can "discriminate" (distinguish) between "good" and "bad" lots 100 percent of the time. Even 100 percent inspection under highly controlled and ideal conditions may not achieve perfect discrimination between bad and good products.

A.7.4 Power of Discrimination. The extent to which any given sampling plan can approach "absolute" discrimination between good and bad lots (as with the ideal sampling plan) is generally referred to as the "power of discrimination" of the plan. Every sampling plan can therefore be characterized or indexed by its "discriminating power." Although a sampling plan cannot be developed which behaves exactly like the ideal plan, as will be shown in subsequent discussion, sampling plans can be varied to the extent that the ideal plan concept is approached.

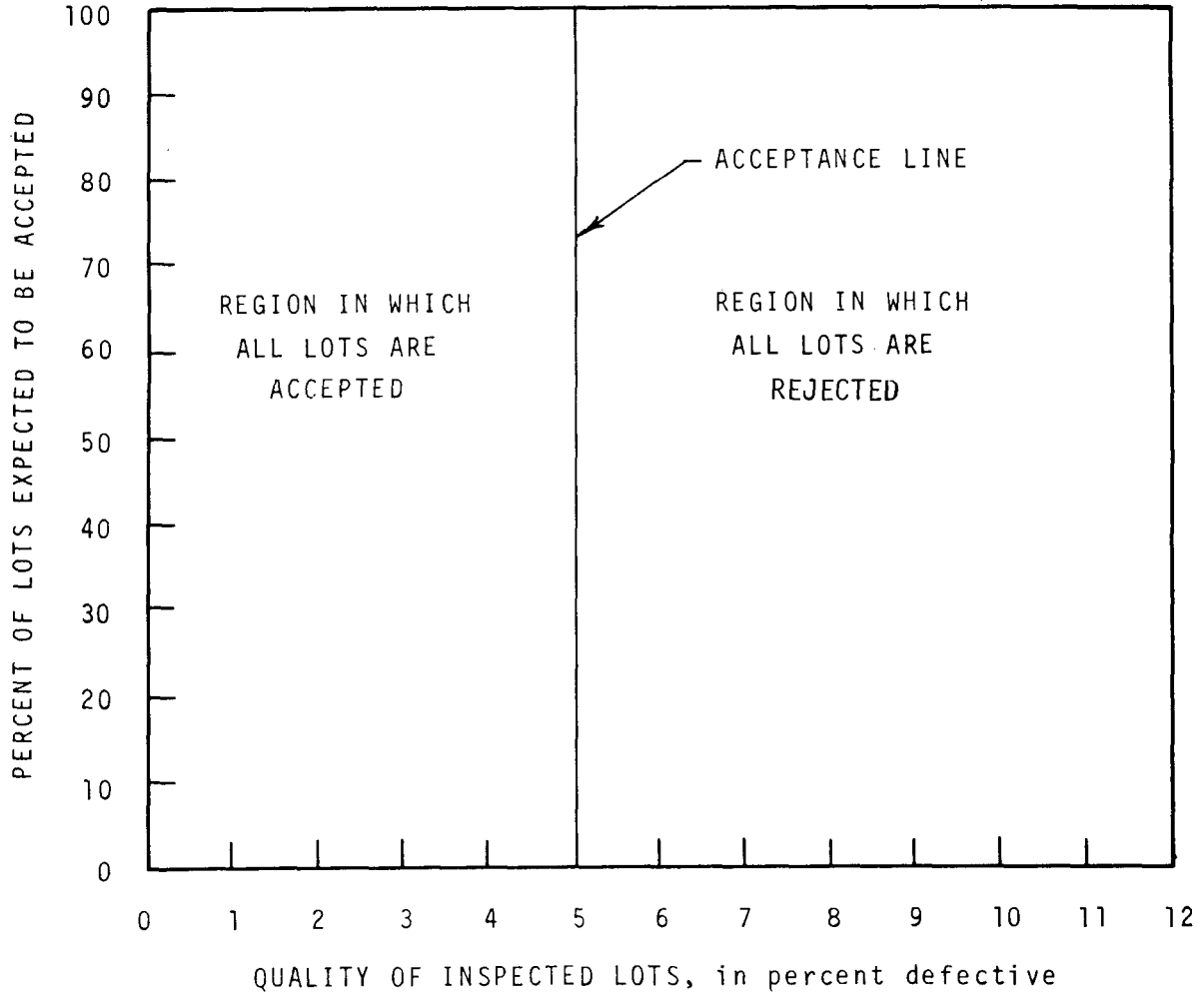


Figure 1. Performance Diagram for an Ideal Sampling Plan

A.7.5 Sampling Risks. The foregoing has shown that there are certain risks inherent with inspection. In the case of sampling inspection, there is in addition to the error in human performance, a special kind of risk that can be attributed to the "luck of the draw" that results in erroneous decisions relative to "good" and "bad" lots. In other words, whenever sampling is involved, there is always the risk (or chance) that good lots may be rejected and bad lots accepted. In general, the smaller the sample size, the

greater the risk of making an erroneous judgment. Since risks are inherent to sampling plans, this relationship should be clearly understood. The significance of these risks may be explained as follows: "Assuming that a lot is some given percent defective, what is the chance (probability) that the lot will be accepted or rejected by the sampling plan?" When the given percent defective is in the region of good quality, interest will be centered on the chance the lot has of being accepted; when the given percent defective is in the region of bad quality, interest will shift to the chance the lot has of being rejected. This can be determined from the performance curve or operating characteristic curve of the sampling plan. The curve shown in Figure 2 for the single sampling plan indicates the chance of lots of varying quality (percent defective) being accepted. Due to variations in the sample, however, a sampling plan will sometimes yield results leading to an incorrect acceptance or rejection decision. That is, the sampling plan may reject a small percentage of good lots (commonly referred to as the supplier's or "alpha"

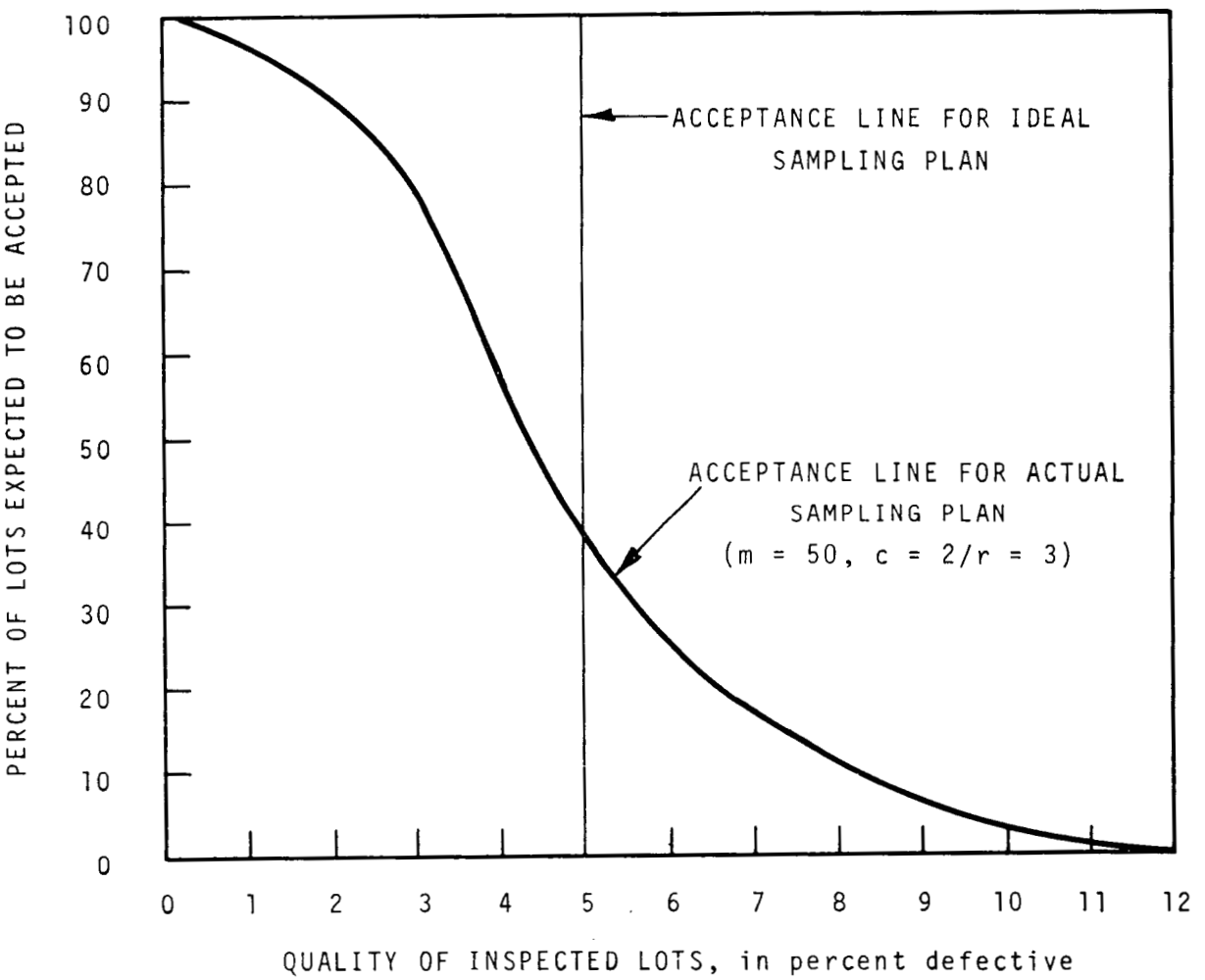


Figure 2. Comparison of a Theoretical "Ideal" Sampling Plan with an Actual Sampling Plan

risk); likewise, the sampling plan will accept a small percentage of bad lots (commonly referred to as the purchaser's or "beta" risk.

A.7.6 Operating Characteristic (OC) Curves. The protection afforded by a sampling plan (that is, its capability to discriminate between varying degrees of good and bad quality) can be accurately calculated. The fact that these risks can be quantified makes it possible to state these risks statistically (numerically), usually in advance. Further quantification of these tests makes it possible to describe with a very high degree of mathematical accuracy the quantity of a product that are likely to be accepted if the quality standard is met, and the quantity rejected if the standard is not met. Such calculations, based on the mathematical theory of probability, provide the basis for the curve shown in Figure 2. As in the case of the "ideal sampling plan," performance of any sampling plan can be shown graphically by these errors. Figure 2 compares the single sampling plan which has a sample size 50 and acceptance number equal to 2, to the theoretical "ideal sampling plan."

The curve of Figure 2 indicates the relationship between the quality of lots submitted for inspection and the probability of acceptance and is identified as the plan's operating characteristic curve, or OC curve. OC curves are a graphical means for showing the relationship between quality of lots submitted for sampling inspection (usually expressed in percent defective, but may also be expressed in defects per hundred units), and the probability that the sampling plan will yield a decision to accept the lot (described as the "probability of acceptance"). In preparing the OC curve, the percent defective of submitted lots is generally shown graphically on the horizontal scale, ranging from zero to some conveniently selected percent defective value representing very bad quality (but not exceeding 100 percent). Along the vertical scale of the graph, the percentage of lots that may be expected to be accepted by the particular sampling plan are shown - also ranging from zero to 100 percent. Obviously, lots which contain zero percent defective will be accepted 100 percent of the time by any sampling plan, and lots which are 100 percent defective will never be accepted; consequently, the initial and terminal points (highest and lowest) on the graph can be plotted without the need for calculation. The points in between follow a smooth curve and are obtained from mathematical probability computation. Textbooks on statistical quality control and related procedures describe the exact procedures for constructing OC curves.

A.7.7 Adequacy of Sampling Plan. Each sampling plan has its own characteristic risk pattern which is represented by the OC curve for the plan. Therefore, each OC curve is distinctly different, a property which provides an effective means for ascertaining the effect of changes in sample sizes and acceptance numbers on the acceptance or rejection of lots. The proper sampling plan can be determined from studying the OC curve for each plan under consideration. By studying the OC curves it is possible to compare the relative risks of two or more sampling plans from a given sampling situation. By virtue of the OC curve, sampling tables can be constructed in which the risks of incorrect decisions have been determined in advance, making it possible to select plans which will have risk factors that are acceptable

from the viewpoint of both the supplier and the purchaser.

The OC curve can be used for classifying sampling plans from the standpoint of the protection afforded to the supplier, purchaser, or both. From this classification, sampling plans may be selected using as a basis for selection, consideration of the supplier's risk, the purchaser's risk, or both risks. Therefore, one of the main advantages offered by sampling inspection over 100 percent inspection is the capability of assessing the risk of incorrect decisions. Quality managers, designers, engineers, specification writers, inspectors, and others who must select sampling plans should become familiar with OC curves.

A.7.8 Effects of Changes to the Sampling Plan on the OC Curve. A sampling plan and its associated risks are complete defined by the lot size, sample size, and acceptance number. The lot size, except in the case of very small lots, has relatively little importance in most cases in determining the risks associated with any given sampling plan. Thus, sample sizes and acceptance numbers are the two important factors that influence the risk pattern of sampling plans. If the risks of a tentative sampling plan are considered unsatisfactory, the question which follows is: "What changes must be made to obtain the desired sampling protection?" This can be answered if the effect of changes in the sampling plan on the OC curve is considered. To understand the effect of such changes, a more detailed study of the OC curve (see Figure 3) is appropriate.

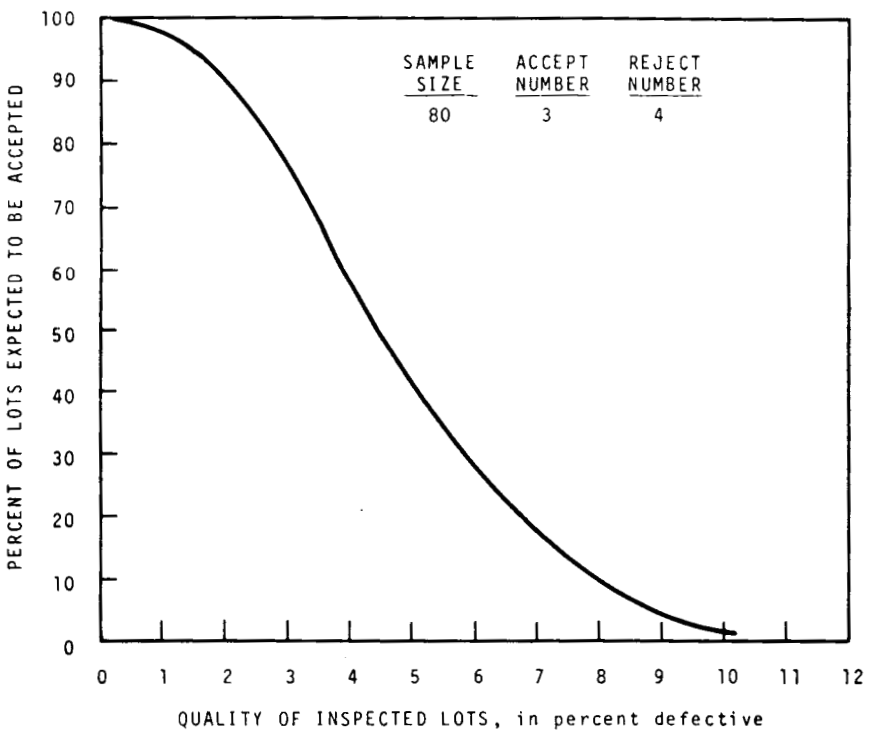


Figure 3. OC Curve for a Typical Sampling Plan

Examination of Figure 3 shows that if lots to be inspected are 2 percent defective, approximately 90 percent of the lots are expected to be accepted, whereas if the lots submitted are 8 percent defective, about 10 percent of the lots are accepted. If 2 percent defective and 8 percent defective represent good and bad quality lots, respectively, the good lots will be rejected 10 percent of the time (100 - 90 = 10) and bad lots accepted but 10 percent of the time. This rejection/acceptance frequency will occur by chance. If this frequency is intolerable, appropriate changes to the sample plan are required.

A.7.8.1 Changes in Lot Size. Except for very small lots, the lot size has relatively little effect on the risks associated with any given sampling plan (see Figure 4). For example, for the situation N = 1000, n = 20, c = 0, p =0.05, the probability of acceptance, p_a, is 0.355 (based on the hypergeometric distribution); for N = ∞, n = 20, c = 0, p =0.05, the probability of acceptance, P_a, is 0.358 (based on the binomial distribution).

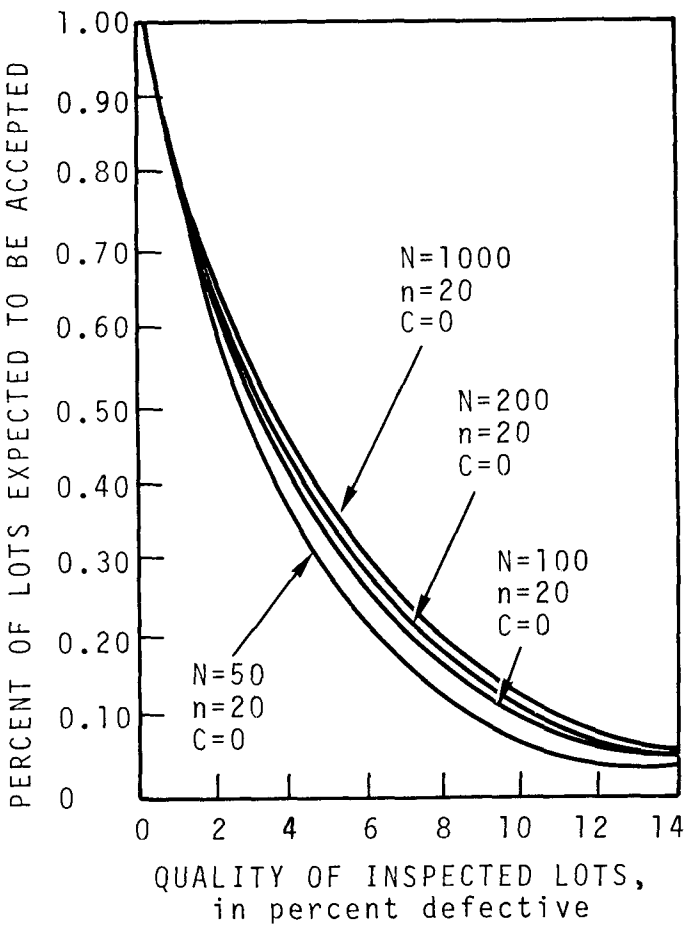


Figure 4. Effect of Lot Size

A.7.8.2 Changes in Sample Size. An increase in sample size results in a steepening of the OC curve, as indicated in Figure 5. The

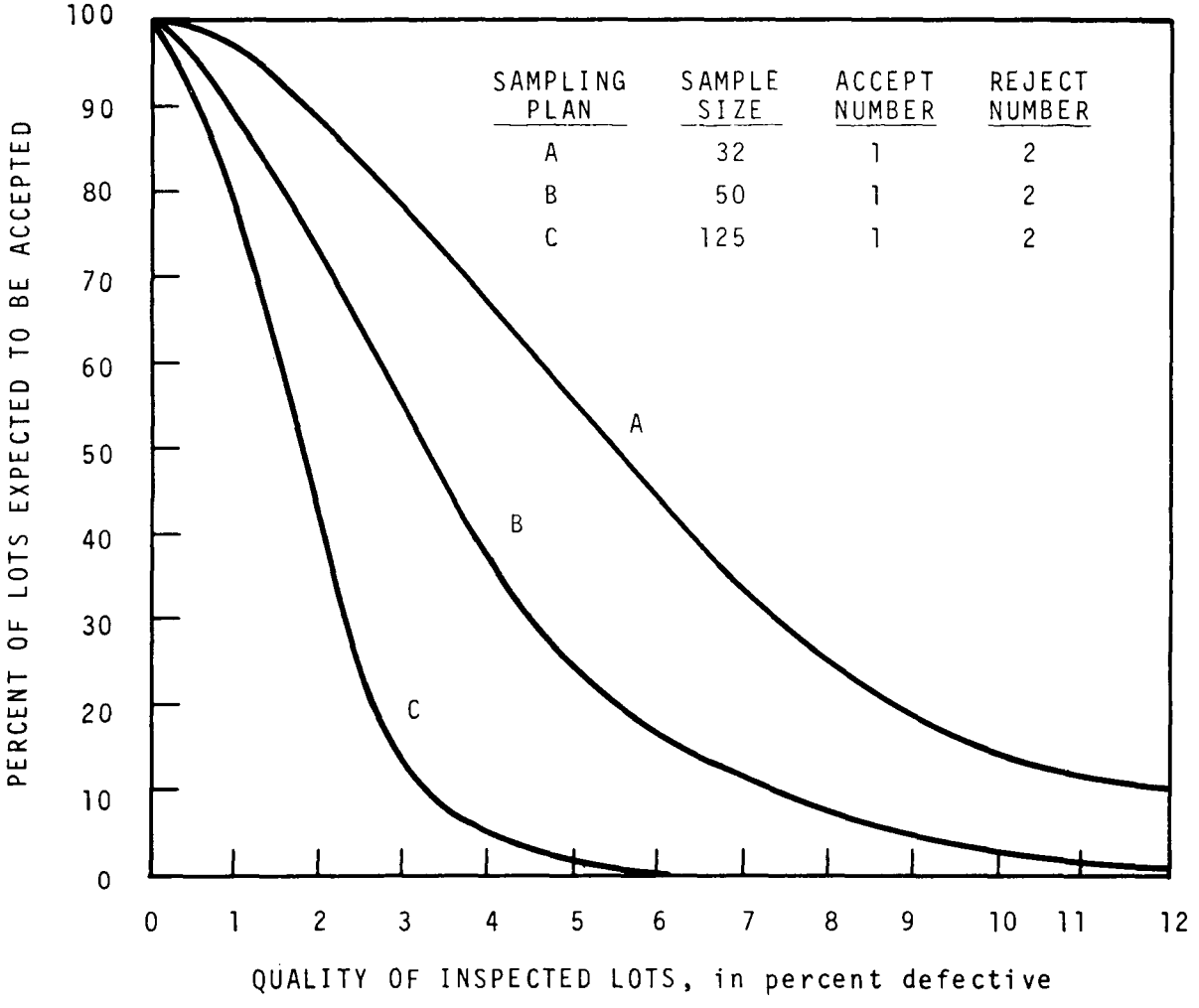


Figure 5. Effect of Changing Sample Size on an OC Curve.

steepness of the OC curve indicates the power of the sampling plan to discriminate between "good" and "bad" quality. Figure 5 clearly illustrates the effect that increasing sample size has on making the OC curve "steeper".

A.7.8.3 Changes in Acceptance Number. Figure 6 illustrates the effect of changes in the acceptance/rejection numbers on the OC curve. In general, the effect of increasing the acceptance number is to shift the location of the entire OC curve to the right.

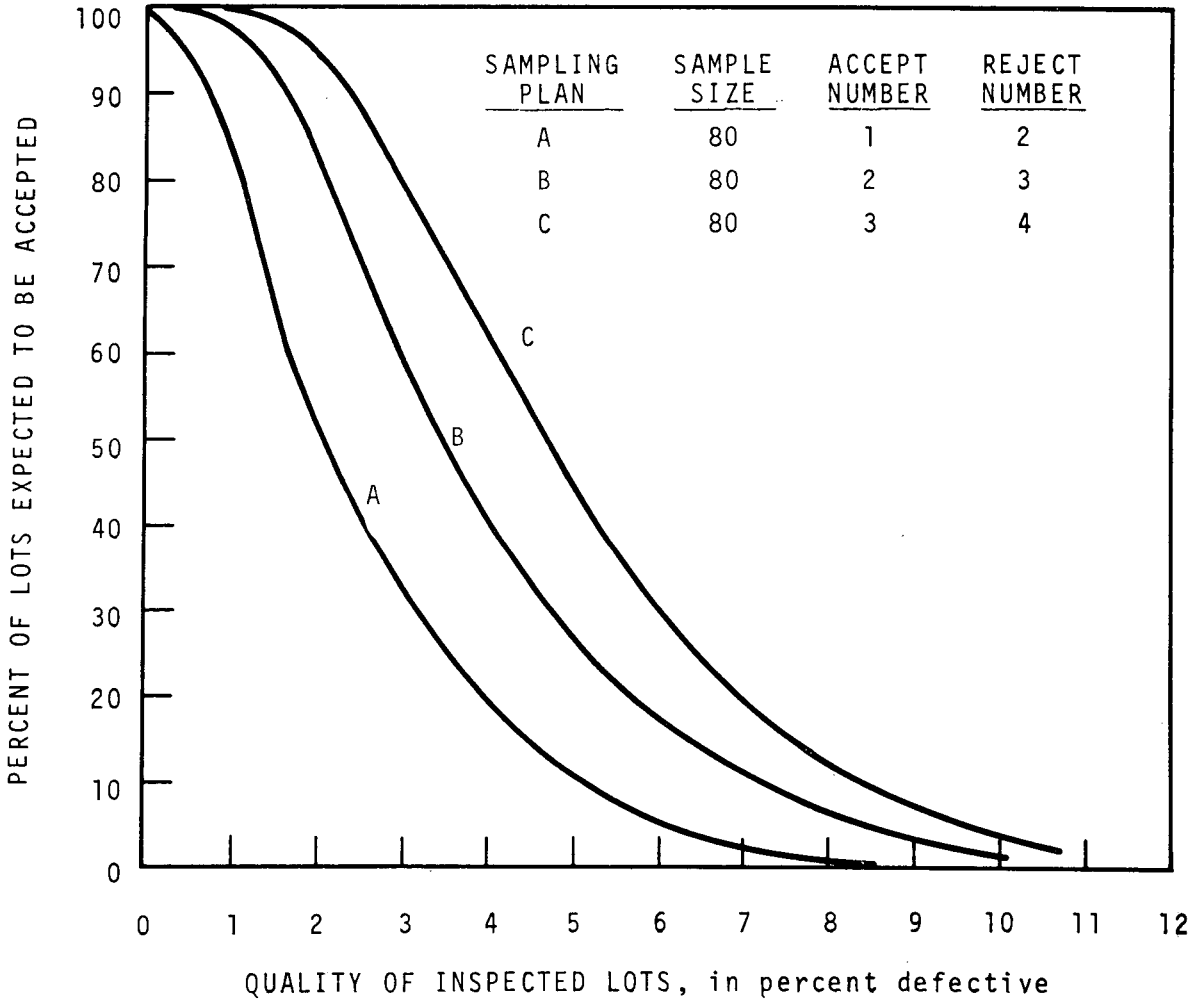


Figure 6. Effect of Changing Acceptance Number on an OC Curve

A.7.8.4 Simultaneous Change of Sample Size and Acceptance Number. If more accurate disposition of the lots whose "percent defective" is close to the selected quality level is desired, the sample size must be increased to provide more discrimination (see Figure 7).

Also, the acceptance number must be selected which will yield the OC curve that is properly located about the "desired" quality level. Thus, if the degree of discrimination of a given plan is considered adequate, but the plan is "too loose" or "too tight" for a given quality, proper adjustment is made by selecting the appropriate acceptance number. Usually in practice, if a sampling plan is desired which has certain desirable risk characteristics,

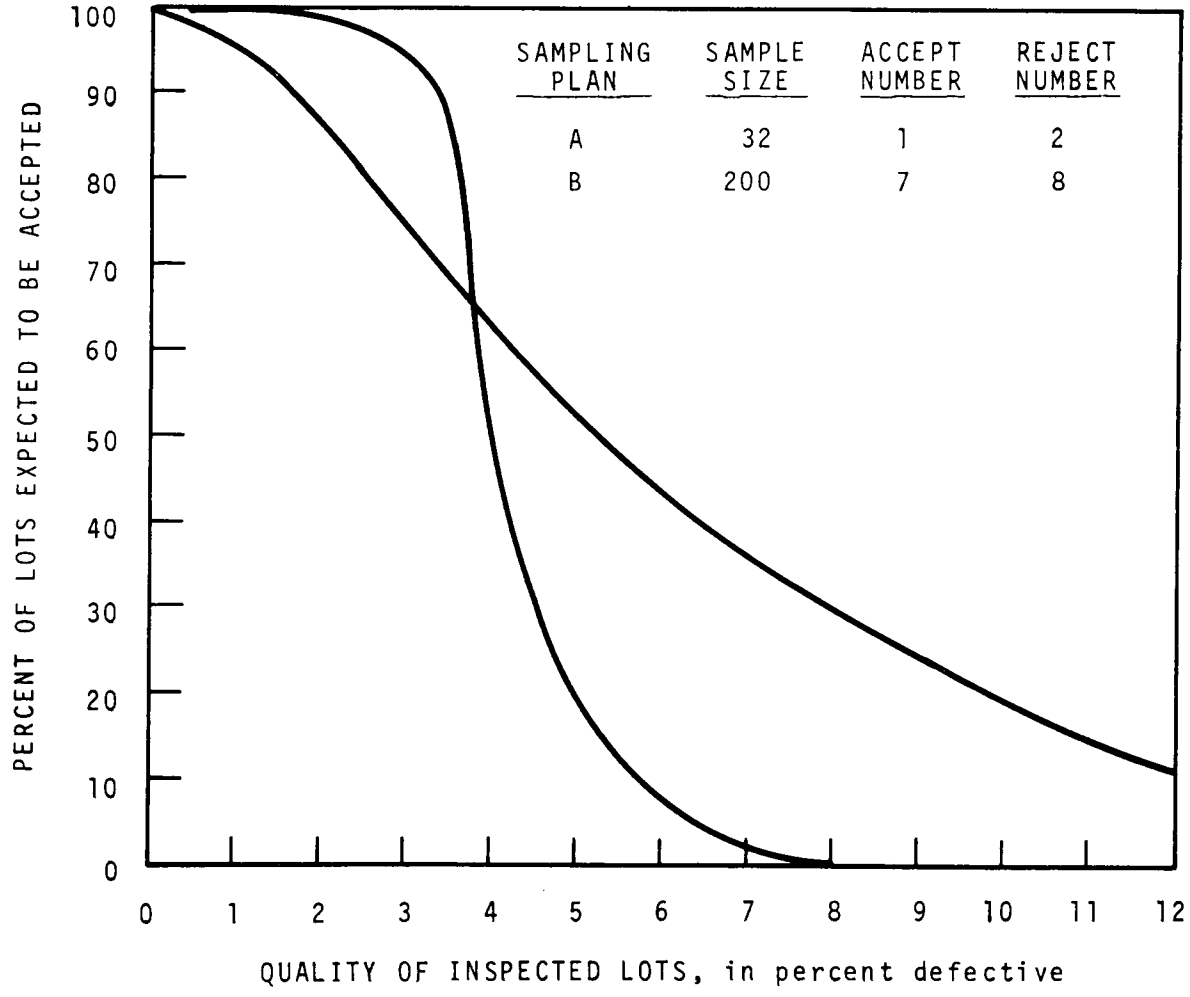


Figure 7. Effect of Simultaneous Change of Sample Size and Acceptance Number on OC Curve.

both sample size and acceptance numbers must be simultaneously adjusted. In order to make proper adjustment, however, the effect of each must be understood.

A.7.9 OC Curves as a Basis for Selecting Sampling Plans. As indicated earlier, one of the advantages of sampling inspection, in which mathematically developed sampling plans are used, is the opportunity one has to determine the risks of incorrect decisions through known risk patterns (as afforded by the OC curves). The preceding should make it apparent that the probability or likelihood of incorrect decisions under a particular sampling plan is

completely described by the OC curve for that sampling plan. By study of the OC curves, therefore, it is possible to compare the relative effectiveness of two or more sampling plans for use in a given situation, or to construct special sampling tables in which the risks of incorrect decision have been rationally determined. In a particular situation, the desired degree of discrimination may result in a large sample size being required. However, if destructive or very expensive testing is involved, it may be uneconomical to inspect such a large percentage of the lot, so that a compromise must be reached. In reality, this kind of a compromise is reached every time a decision to use a sampling inspection plan is made. The purchaser would naturally prefer perfect quality. However, any attempt to guarantee such a high level of quality would require 100 percent (or perhaps 200 or 300 percent) inspection. For characteristics resulting in hazardous conditions, this may be warranted and necessary. For others, a certain degree of imperfection is usually satisfactory, and the actual decision then becomes one of balancing the cost of inspection against the cost of defectiveness which might be accepted by the sampling procedure. In view of this fact, therefore, it should be apparent that administrators (and inspectors who must select their own sampling plans) should familiarize themselves with the basis for interpreting OC curves. Appendix B contains OC curves for each sampling plan (i.e., sample size and acceptance-rejection combination) listed.

A.7.10 Amount of Inspection. The average amount of inspection for any sampling plan can be computed. In general, double sampling plans require less average inspection than single sampling plans. Multiple sampling plans require less average inspection than single or double sampling plans. Normally, the amount of inspection required for single sampling is the number of items in the sample regardless of the quality of the product since inspection generally is not curtailed (that is, immediately terminated) as soon as the rejection number is reached. For double and multiple sampling plans, the savings in the amount of inspection is greatest for product of very good or very bad quality. Double sampling plans may, on the other hand, require more average inspection than single sampling plans when the product is marginal in quality.

A.8 DRAWING OF SAMPLES

A.8.1 General. Basic to sampling inspection is the assurance that the sample selected from a quantity of units represents the quality of that quantity of units. Hence, the procedure used to select units from a lot must be such that it ensures a sample free of bias. The process of selecting a sample meeting this requirement is called random sampling.

A.8.2 Random Sampling. A sample consists of one or more units of product drawn from a lot or batch. Random sampling is the procedure used to draw units from an inspection lot so that each unit in the lot has an equal chance, without regard to its quality, of being included in the sample. A basic requirement of sampling inspection is to ensure that the sample represents the quality of the lot to a high degree. If the units in a lot have been thoroughly mixed, sorted, or arranged without bias as to their quality, a sample drawn anywhere from the lot will meet the requirements of "randomness."

Sometimes it is not practical to mix the units thoroughly because of their physical dimensions or for other reasons. Sometimes the best that can be done in drawing a sample is to avoid any type of obvious bias. For example, if the units are stacked in layers, obvious bias would result if the entire sample is drawn from only the top layer. It is possible to reduce bias by avoiding such pitfalls as drawing units from the same position in containers, stacks or piles; selecting units from the output of one machine and not others; or selecting units which appear to be defective or nondefective. If such biased sampling procedures are avoided, it will be easier to obtain a sample that approaches a random sample and will better reflect the overall quality of the lot.

A.8.2.1 Table of Random Numbers. A table of random numbers, similar to Table 1, may be used to draw a random sample of units from the lot. Each unit in the lot must be identified by a distinctly different number. This can often be done by placing the units in racks or trays where the rows and columns of positions in the racks are distinctly numbered. If the units have serial numbers, these serial numbers can be used. The three-dimensional position of each unit (row, column, depth) in a large grouping can also be used. A table of random numbers, such as Table 1, can then be used to select the random sample. If more extensive tables of random numbers are needed, the ICC "Table of 105,000 Random Decimal Digits" or other suitable source of random numbers may be used.

EXAMPLE 1:

Selecting Random Numbers. Assume a sample of 5 units is to be selected at random from an inspection lot containing 50 units numbered from 1 to 50. In selecting 5 random numbers from Table 1, one method is to begin by letting a pencil fall blindly at some number in the table and start at this point. Toss a coin to decide which way to go: heads, go up; tails, go down. Suppose a pencil falls on column (5) and line (17). The decision is made to read down the column and take only the first two digits in each number of five digits. The selection of random numbers is made as follows: reject 89 since it is over 50, the lot size; take the random numbers 31, 23, 42, 09 and 47. The units numbered 9, 23, 31, 42 and 47 should be drawn from the lot to form a random sample of 5 units.

A.8.2.2 Additional Applications. Tables of random numbers should provide enough digits with numbers at least as large as the number of units in the inspection lot. Two digits will be sufficient for lots having fewer than 100 units. Five digits will be sufficient (Table 1) for lots having fewer than 100,000 units. For larger lot sizes, Table 1 can still be used by ignoring the break between columns. For example, if a series of 6-digit random numbers is desired, the 5 digits of column (1) may be connected to the first digit of column (2); or the last 4 digits of column (1) may be connected to the first 2 digits of column (2); and so on. The random numbers in Table 1 have been generated in a way that gives each digit from 0 to 9 an equal chance to be selected. The randomness of numbers in Table 1 is preserved by any method of reading across, diagonally, up or down the columns.

TABLE 1: TABLE OF RANDOM NUMBERS

Line \ Col.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1	10480	15011	01536	02011	81647	91646	69179	14194	62590	36207	20969	99570	91291	90700
2	22368	46573	25595	85393	30995	89198	27982	53402	93965	34095	52666	19174	39615	99505
3	24130	48360	22527	97265	76393	64809	15179	24830	49340	32081	30680	19655	63348	58629
4	42167	93093	06243	61680	07856	16376	39440	53537	71341	57004	00849	74917	97758	16379
5	37570	39975	81837	16656	06121	91782	60468	81305	49684	60672	14110	06927	01263	54613
6	77921	06907	11008	42751	27756	53498	18602	70659	90655	15053	21916	81825	44394	42880
7	99562	72905	56420	69994	98872	31016	71194	18738	44013	48840	63213	21069	10634	12952
8	96301	91977	05463	07972	18876	20922	94595	56869	69014	60045	18425	84903	42508	32307
9	89579	14342	63661	10281	17453	18103	57740	84378	25331	12566	58678	44947	05585	56941
10	85475	36857	53342	53988	53060	59533	38867	62300	08158	17983	16439	11458	18593	64952
11	28918	69578	88231	33276	70997	79936	56865	05859	90106	31595	01547	85590	91610	78188
12	63553	40961	48235	03427	49626	69445	18663	72695	52180	20847	12234	90511	33703	90322
13	09429	93969	52636	92737	88974	33488	36320	17617	30015	08272	84115	27156	30613	74952
14	10365	61129	87529	85689	48237	52267	67689	93394	01511	26358	85104	20285	29975	89868
15	07119	97336	71048	08178	77233	13916	47564	81056	97735	85977	29372	74461	28551	90707
16	51085	12765	51821	51259	77452	16308	60756	92144	49442	53900	70960	63990	75601	40719
17	02368	21382	52404	60268	89368	19885	55322	44819	01188	65255	64835	44919	05944	55157
18	01011	54092	33362	94904	31273	04146	18594	29852	71585	85030	51132	01915	92747	64951
19	52162	53916	46369	58586	23216	14513	83149	98736	23495	64350	94738	17752	35156	35749
20	07056	97628	33787	09998	42698	06691	76988	13602	51851	46104	88916	19509	25625	58104
21	48663	91245	85828	14346	09172	30168	90229	04734	59193	22178	30421	61666	99904	32812
22	54164	58492	22421	74103	47070	25306	76468	26384	58151	06646	21524	15227	96909	44592
23	32639	32363	05597	24200	13363	38005	94342	28728	35806	06912	17012	64161	18296	22851
24	29334	27001	87637	87308	58731	00256	45834	15398	46557	41135	10367	07684	36188	18510
25	02488	33062	28834	07351	19731	92420	60952	61280	50001	67658	32586	86679	50720	94953
26	81525	72295	04839	96423	24878	82651	66566	14778	76797	14780	13300	87074	79666	95725
27	29676	20591	68086	26432	46901	20849	89768	81536	86645	12659	92259	57102	80428	25280
28	00742	57392	39064	66432	84673	40027	32832	61362	98947	96067	64760	64584	96096	98253
29	05366	04213	25669	26422	44407	44048	37937	63904	45766	66134	75470	66520	34693	90449
30	91921	26418	64117	94305	26766	25940	39972	22209	71500	64568	91402	42416	07844	69618
31	00582	04711	87917	77341	42206	35126	74087	99547	81817	42607	43808	76655	62028	76630
32	00725	69884	62797	56170	86324	88072	76222	36086	84637	93161	76038	65855	77919	88006
33	69011	65795	95876	55293	18988	27354	26575	08625	40801	59920	29841	80150	12777	48501
34	25976	57948	29888	88604	67917	48708	18912	82271	65424	69774	33611	54262	85963	03547
35	09763	83473	73577	12908	30883	18317	28290	35797	05998	41688	34952	37888	38917	88050
36	91567	42595	27958	30134	04024	86385	29880	99730	55536	84855	29080	09250	79656	73211
37	17955	56349	90999	49127	20044	59931	06115	20542	18059	02008	73708	83517	36103	42791
38	46503	18584	18845	49618	02304	51038	20655	58727	28168	15475	56942	53389	20562	87338
39	92157	89634	94824	78171	84610	82834	09922	25417	44137	48413	25555	21246	35509	20468
40	14577	62765	35605	81263	39667	47358	56873	56307	61607	49518	89656	20103	77490	18062
41	98427	07523	33362	64270	01638	92477	66969	98420	04880	45585	46565	04102	46880	45709
42	34914	63976	88720	82765	34476	17032	87589	40836	32427	70002	70663	88863	77775	69348
43	70060	28277	39475	46473	23219	53416	94970	25832	69975	94884	19661	72828	00102	66794
44	53976	54914	06990	67245	68350	82948	11398	42878	80287	88267	47363	46634	06541	97809
45	76072	29515	40980	07391	58745	25774	22987	80059	39911	96189	41151	14222	60697	59583
46	90725	52210	83974	29992	65831	38857	50490	83765	55657	14361	31720	57375	56228	41546
47	64364	67412	33339	31926	14883	24413	59744	92351	97473	89286	35931	04110	23726	51900
48	08962	00358	31662	25388	61642	34072	81249	35648	56891	69352	48373	45578	78547	81788

(continued)

TABLE 1: TABLE OF RANDOM NUMBERS (continued)

49	95012	68379	93526	70765	10592	04542	76463	54328	02349	17247	28865	14777	62730	92277
50	15664	10493	20492	38391	91132	21999	59516	81652	27195	48223	46751	22923	32261	85653
51	16408	81899	04153	53381	79401	21438	83035	92350	36693	31238	59649	91754	72772	02338
52	18629	81953	05520	91962	04739	13092	97662	24822	94730	06496	35090	04822	86774	98289
53	73115	35101	47498	87637	99016	71060	88824	71013	18735	20286	23153	72924	35165	43040
54	57491	16703	23167	49323	45021	33132	12544	41035	80780	45393	44812	12515	98931	91202
55	30405	83946	23792	14422	15059	45799	22716	19792	09983	74353	68668	30429	70735	25499
56	16631	35006	85900	98275	32388	52390	16815	69298	82732	38480	73817	32523	41961	44437
57	96773	20206	42559	78985	05300	22164	24369	54224	35083	19687	11052	91491	60383	19746
58	38935	64202	14349	82674	66523	44133	00697	35552	35970	19124	63318	29686	03387	59846
59	31624	76384	17403	53363	44167	64486	64758	75366	76554	31601	12614	33072	60332	92325
60	78919	19474	23632	27889	47914	02584	37680	20801	72152	39339	34806	08930	85001	87820
61	03931	33309	57047	74211	63445	17361	62825	39908	05607	91284	68833	25570	38818	46920
62	74426	33278	43972	10119	89917	15665	52872	73823	73144	88662	88970	74492	51805	99378
63	09066	00903	20795	95452	92648	45454	09552	88815	16553	51125	79375	97596	16296	66092
64	42238	12426	87025	14267	20979	04508	64535	31355	86064	29472	47689	05974	52468	16834
65	16153	08002	26504	41744	81959	65642	74240	56302	00033	67107	77510	70625	28725	34191
66	21457	40742	29820	96783	29400	21840	15035	34537	33310	06116	95240	15957	16572	06004
67	21581	57802	02050	89728	17937	37621	47075	42080	97403	48626	68995	43805	33386	21597
68	55612	78095	83197	33732	05810	24813	86902	60397	16489	03264	88525	42786	05269	92532
69	44657	66999	99324	51281	84463	60563	79312	93454	68876	25471	93911	25650	12682	73572
70	91340	84979	46949	81973	37949	61023	43997	15263	80644	43942	89203	71795	99533	50501
71	91227	21199	31935	27022	84067	05462	35216	14486	29891	68607	41867	14951	91696	85065
72	50001	38140	66321	19924	72163	09538	12151	06878	91903	18749	34405	56087	82790	70925
73	65390	05224	72958	28609	81406	39147	25549	48542	42627	45233	57202	94617	23772	07896
74	27504	96131	83944	41575	10573	08619	64482	73923	36152	05184	94142	25299	84387	34925
75	37169	94851	39117	89632	00959	16487	65536	49071	39782	17095	02330	73401	00275	48280
76	11508	70225	51111	38351	19444	66499	71945	05422	13442	78675	84081	66938	93654	59894
77	37449	30362	06694	54690	04052	53115	62757	95348	78662	11163	81651	50245	34971	52924
78	46515	70331	85922	38329	57015	15765	97161	17869	45349	61796	66345	81073	49106	79860
79	30986	81223	42416	58353	21532	30502	32305	86482	05174	07901	54339	58861	74818	46942
80	63798	64995	46583	09785	44160	78128	83991	42865	92520	83531	80377	35909	81250	54238
81	82486	84846	99254	67632	43218	50076	21361	64816	51202	88124	41870	52689	51275	83556
82	21885	32906	92431	09060	64297	51674	64126	62570	26123	05155	59194	52799	28225	85762
83	60336	98782	07408	53458	13564	59089	26445	29789	85205	41001	12535	12133	14645	23541
84	43937	46891	24010	25560	86355	33941	25786	54990	71899	15475	95434	98227	21824	19585
85	97656	63175	89303	16275	07100	92063	21942	18611	47348	20203	18534	03862	78095	50136
86	03299	01221	05418	38982	55758	92237	26759	86367	21216	98442	08303	56613	91511	75928
87	79626	06486	03574	17668	07785	76020	79924	25651	83325	88428	85076	72811	22717	50585
88	85636	68335	47539	03129	65651	11977	02510	26113	99447	68645	34327	15152	55230	93448
89	18039	14367	61337	06177	12143	46609	32989	74014	64708	00533	35398	58408	13261	47908
90	08362	15656	60627	36478	65648	16764	53412	09013	07832	41574	17639	82163	60859	75567
91	79556	29068	04142	16268	15387	12856	66227	38358	22478	73373	88732	09443	82558	05250
92	92608	82674	27072	32534	17075	27698	98204	63863	11951	34648	88022	56148	34925	57031
93	23982	25835	40055	67006	12293	02753	14827	23235	35071	99704	37543	11601	35503	85171
94	09915	96306	05908	97901	28395	14186	00821	80703	70426	75647	76310	88717	37890	40129
95	59037	33300	26695	62247	69927	76123	50842	43834	86654	70959	79725	93872	28117	19233
96	42488	78077	69882	61657	34136	79180	97526	43092	04098	73571	80799	76536	71255	64239
97	46764	86273	63003	93017	31204	36692	40202	35275	57306	55543	53203	18098	47625	88684
98	03237	45430	55417	63282	90816	17349	88298	90183	36600	78406	06216	95787	42579	90730
99	86591	81482	52667	61582	14972	90053	89534	76036	49199	43716	97548	04379	46370	28672
100	38534	01715	94964	87288	65680	43772	39560	12918	86537	62738	19636	51132	25739	56947

A.8.3 Constant Interval Sampling. When units of product are arranged in an order without regard to their quality (such as data records on magnetic tapes or product units in a tray), the sample may be drawn by using a constant interval technique. By this method, a constant interval is maintained between the units drawn for the sample. Thus every 8th, 17th or 23rd unit of a consecutively ordered lot may be selected. The first unit to be drawn from the lot may be determined from a table of random numbers. All other units in the sample are drawn at a constant interval following the first unit. The amount of the constant interval is determined by dividing the lot size by the sample size.

EXAMPLE 2:

Constant Interval Sampling. Assume the lot size is 20,000 units and a sample of 315 units is to be drawn. The constant interval is computed by dividing the lot size by the sample size:

$$20{,}000 \div 315 = 63$$

The first step is to select a random number from 1 to 63 from a table of random numbers or by other appropriate methods. After the first unit has been drawn, the remaining units in the required sample size are drawn by selecting every 63rd unit from the lot until the total sample size of 315 is reached.

A.8.4 Stratified Sampling. Under certain conditions it may be necessary to divide the lot into sublots so that information can be obtained about specific parts or strata of the lot. The division of the lot into stratified sublots requires considerable knowledge and judgment concerning the characteristics of the product. A sample is drawn from each sublot as though it were an independent lot. Statistical decisions regarding the acceptance or rejection of the product quality can be made for each sublot.

EXAMPLE 3:

Stratified Sampling. Assume the lot consists of 38,100 units produced from five different machines (or operators) and sampling inspection is used to determine the acceptance or rejection of product for each machine (or operator). The sublot sizes for each machine (or operator) and related sample sizes may be as follows:

Machine No.	Sublot Size	Sample Size
1	30,000	315
2	4,000	200
3	3,000	125
4	1,000	80
5	100	20
Total	38,100	740

Although the acceptance or rejection of the entire lot (38,100 units) might have been determined from a single sample of 500 units drawn at random from the entire lot, much more information is obtained by forming sublots (one for each machine or operator) and accepting or rejecting the product of each machine or operator. Thus, one or more particular machines or operators can be identified as producing acceptable or rejectable quality products.

A.9 DISPOSITION OF DEFECTIVE PRODUCT

A.9.1 General. Under sampling inspection, the entire lot may be rejected when the rejection number is reached or exceeded as determined by the sampling plan. The probability of rejecting lots of any given quality is shown by the OC curve for the sampling plan. The poorer the quality of lots submitted to the sampling plan, the greater the probability of rejection. The rejection of entire lots under sampling inspection will have a greater impact on the supplier than the rejection of individual defective units under 100 percent inspection. The rejection of many lots introduces other problems for the supplier such as the disposition of the rejected lots, determination as to the remedial action to be taken, availability of storage space, rework time, disposition of scrap materials, difficulty in meeting delivery schedules as well as an added financial burden to the supplier. Failure of the supplier to correct the situation may even force a production stoppage, particularly when a large number of rejected lots are accumulated. Sometimes the purchaser may agree to buy the rejected lot at a reduced price, especially when the product is in great demand and short supply. The more customary practice requires the rejected lots to be screened, defective units reworked or replaced, and the lot resubmitted by the supplier.

A.9.2 Obvious Defectives. While drawing the sample, the inspector should identify all units which are observed to be obviously defective. Obviously defective units should not deliberately be included in or excluded from, the random sample. After the sample has been drawn from the lot and inspected, those units previously observed and identified as being oviously defective but not included in the sample must be removed from the lot for disposition in accordance with established procedures for defective products.

A.9.3 Resubmitted Lots.

A.9.3.1 Screening and Resubmission. Screening is the procedure by which each unit of product in rejected lots is inspected and all defective units are rejected. A resubmitted lot is a lot that has been rejected, subjected to screening, and subsequently submitted again for acceptance. When the purchaser rejects lots, the supplier may elect to screen and reprocess the units and resubmit the lot for inspection if not prohibited by contractual provisions.

A.9.3.2 Disposal of Defectives. Defective units found as a result of sampling or screening of rejected lots shall not be mixed with production lots. At the discretion of the responsible authority, defective units may be:

1. Reworked and accumulated over a period of time for subsequent resubmission as a miscellaneous lot which will be inspected for all characteristics.

2. Reworked and submitted with the lot from which they were screened.

3. Submitted by the supplier in a request for deviation approval.

4. Disposed of as scrap by the supplier.

5. Disposed of as agreed upon by the supplier and responsible authority.

A.9.3.3 Classes of Defects. A decision must be made as to whether inspection of resubmitted lots is to be performed for all types of classes of defects or only for the particular types or classes of defects which caused initial rejection. This decision will depend to some extent on whether defects are correlated and the nature of the work performed on the lot prior to its resubmission. If screening is all that was required, reinspection can be limited to the class of the defects that caused rejection. On the other hand, if the lot was reprocessed, a possibility exists that additional defects may have been introducted. In such instances, reinspection should be performed for all classes of defects. When reinspection is limited to the class of defects that caused rejection, defects of other classes may be observed during reinspection. Units containing defects in the other classes should be returned to the supplier for replacement if justified on the basis of cost. However, the observance of such defective units is not counted in the results of reinspection. If counted, the supplier would be placed in double jeopardy, because sampling inspection is not intended to ensure that products are completely free of defective units.

A.10 QUALITY HISTORY

A.10.1 General. Quality history is the compilation of inspection, quality control, or reliability records for a unit of product (or a group of units) suitable for evaluation on a time series basis. The quality history of suppliers producing the same product can be developed, and their quality capabilities can be evaluated. Process capability and design variability studies can be made to provide a factual basis for changes necessary to meet either quality or performance requirements. Deficiencies in unit of product or systems design can be brought to the attention of development, product or systems engineering activities for corrective action. The importance of the quality history of a supplier for a specific product cannot be overstated. When the quality history is very good (the product is consistently high in quality for all characteristics), less inspection will be required and inspection costs will be reduced for both the supplier and the purchaser.

A.10.2 Inspection Records. Inspection records consist of recorded data concerning the results of the inspection with appropriate identifying information as to the characteristic or class of characteristics inspected. The recording of sampling inspection data permits maintenance and continuity of quality history. By analyzing these data, adverse quality trends can be detected and corrective actions initiated. This not only makes it possible

to avoid frequent rejection of product and costly delays in meeting production schedules, but it also increases the supplier's responsibility for quality products. Better control over quality can be exercised when the facts are known and recorded. In order to develop a quality history, it is necessary to compile and maintain data regarding the results of inspection. These data permit the evaluation of the process capability. One of the best techniques for this evaluation is the estimated process average. It is essential that adequate records of inspection results be maintained regardless of the type of inspection performed. Standard forms should be used for this purpose. The records should provide complete identification of the product or operation inspection and as applicable, information such as: the supplier, contract number, specification, instructions or project order, type of sampling used, lot size, sample size, quality level(s) and complete inspection results including acceptance or rejection decisions. Inspection records serve a number of useful purposes such as:

1. The compiled information can be used to determine the severity of inspection needed for current contracts or subsequent contracts with the same supplier.

2. Inspection records indicate the supplier's quality capability and integrity. They can be used in subsequent contract award decisions.

3. They are a source of feedback information to support requests for waivers, engineering redesign, and in the investigation of complaints of defective products by the purchasing activities.

A.10.3 Feedback Information. Feedback information is the collection or receipt of quality data reports regarding the product. Feedback information is most commonly generated by the purchaser when a product fails to satisfy his needs under live environmental conditions; however, feedback also includes satisfactory reports, success data, inservice use data, etc. The inspector also generates feedback information on a product before it reaches the purchaser. Feedback information can be used to aid in making valid decisions regarding adjustments of the product or process to prescribed requirements by alerting supervision to unsatisfactory performance as it occurs. The feedback of sampling inspection results, as well as the frequency and the nature of complaints from the purchaser, is an important feature of feedback information which cannot be overstressed, and is a major factor in the readjustment of quality levels and may provide a realistic and factual measure of the "state-of-the-art." It is also valuable in providing a basis for awarding incentive type contracts.

A.11 RESPONSIBILITIES

A.11.1 Purchaser Responsibilities. Basic responsibilities of the purchaser are to establish realistic quality requirements, conduct an adequate amount of inspection to ensure that product quality conforms to requirements, and operate a data feedback system to improve product design and quality requirements. Inspection by the purchaser is usually performed to determine the adequacy of the supplier's inspection system or quality program, except for inspections reserved for sole performance by the purchaser. Normally,

this is accomplished by the inspection of products that have already been inspected by the supplier and submitted for acceptance. Purchaser inspection is usually in the nature of a verification inspection rather than a duplication of the supplier's inspection effort. Conformance inspection by the purchaser consists of examinations and tests performed to ascertain whether the product meets standards established by the procurement documents. Each of these examinations and tests is characterized by a measurement or comparison which furnishes information relative to a standard established by the procurement documents.

A.11.2 Supplier Responsibilities. The supplier is responsible for controlling the production process which may generate products, produce data records or result in the performance of defined operations. The supplier is also responsible for taking necessary actions to regulate or prevent the occurrence of defects. The supplier is required to perform all inspections, unless otherwise prescribed by the contract. The maximum tolerable "proportion defective" is usually specified by the quality assurance requirements of specifications, purchase descriptions, or other contractual documents. Based on the results of his inspection, the supplier determines whether the products intended for submission to the consumer meet or do not meet the desired quality requirements. The decision as to whether the products should or should not be submitted rests with the supplier. The scope of the supplier's total quality effort is dependent on such factors as the importance of the product, the complexity of the product, the intended usage of the product, and the unit cost. To satisfy these objectives, the supplier may be required to establish an inspection system, a calibration system, or a quality assurance program as specified in the Ordering Data.

A.11.3 Purchaser Versus Supplier. Inadequacies in the supplier's inspection must be demonstrated by objective evidence developed through product inspection. However, sampling variations can occur. It is important to know, when sampling inspection is used, whether any difference between supplier and purchaser inspection results is real or can be considered to be due to chance alone. Procedures have been developed which permit a comparison between supplier and purchaser inspection data for the purpose of determining evidence of statistically significant difference. Such a procedure has been published in DOD H-109. These methods may also be used in procurement, storage and maintenance inspection operations, or whenever an independent check is desired of the reported "fractions defective." Whenever a real difference exists between purchaser and supplier inspection results, an investigation may be needed to determine whether this difference is due to misinterpretation of the inspection requirements. Problems arising from such situations can be minimized if certain administrative actions (on the part of the purchaser) are taken. As a minimum, these actions should ensure that both supplier and purchaser inspection personnel understand and be aware of the need for the following:

1. Proper lot formation and control.

2. Drawing sample units of product in a random manner.

3. Clear description of a defect or a defective unit.

4. Correct application of the sampling plan used.

5. Adequate maintenance and calibration of inspection equipment.

6. Uniform application of quality standards in classifying sample units.

7. Preparation and maintenance of appropriate inspection records.

8. Proper interpretation regarding the amount of inspection to be performed.

A.12 APPLICATIONS OF SECTION 4 (ATTRIBUTES PLANS)

A.12.1 General. This section provides instructions and illustrative examples for applying and administering the attribute sampling procedures contained in Section 4. Nothing that follows in this section shall be interpreted to be in contradiction with any statements in Section 4 since this is intended to serve only as an aid in support of the procedures in that section. Sampling plans designated in Section 4 are applicable, but not limited, to attribute inspection of the following:

1. End Items. These are completed products that may be inspected before or after packaging and packing for shipment or storage.

2. Components and Raw Materials. These are the materials which are shaped, treated, or assembled to form the end items. These materials may be inspected at their source, upon receipt at the point of assembly, or at any convenient place along the assembly process where the end items are formed.

3. Operations. Repetitive work performed by machines and operators may be judged to be acceptable or unacceptable. These work operations may be inspected on a sampling basis to determine whether the process, machine, operator or clerk is performing satisfactorily.

4. Materials in Process. Materials may be inspected on a sampling basis to determine their quality after any step along the production line for: (1) the extent of damage or deterioration while in temporary storage between production steps or (2) quality before proceeding to the next step in the production process.

5. Supplies in Storage. The sampling procedures and tables of Section 4 can be used to determine the quality and quantity of supplies in storage on a sampling basis.

6. Maintenance Operations. These operations are usually performed on repairable materials to restore them to a serviceable condition. When maintenance or overhaul operations are performed, attribute inspection is made to determine the quality of the product after

reconditioning through maintenance operations has been completed.

7. Data or Records. Whenever large volumes of data are processed (i.e, accounting records, cost data, invoices, bills of lading, etc.), the attribute sampling inspection procedures of Section 4 can be used as the basis for determining dollar volume, item count, accuracy, or other measures of quality for the data or records.

8. Administrative Procedures. Procedures of this type may sometimes be questioned as to whether desirable results are being achieved. If the results can be measured on an attribute basis, the sampling plans and procedures of Section 4 can be applied.

A.12.2 Example of Attributes Inspection. A typical sequence of operations in using the sampling procedures and tables of Section 4 and Appendix B for inspection by attributes is illustrated in the following:

EXAMPLE:

1. Contractual arrangements have been made with Supplier X to supply a needed quantity of component parts. Product specifications for these parts have been generated by the purchaser and are referenced in the contract. For those product characteristics for which acceptance sampling is possible, and is agreeable to the purchaser, the purchaser has specified a "Lot Tolerance Percent Defective" (LTPD) and an accompanying Beta (β) risk (see A.7).

2. Assume that for a certain specified product characteristic for which acceptance sampling is permitted and for which the purchaser has specified LTPD = 10, β = 0.10, the supplier elects to conduct lot-by-lot sampling inspection (see A.4.3). The first consideration here is the formation of appropriate inspection lots.

3. Assume that for the product characteristic in question, nothing is known about the usual shape of the within-lot distribution of all possible measurements; i.e., it is not known whether such measurements sufficiently approximate the "normal" distribution. Such cases require the use of attributes inspection. (See Section 5).

4. The selection of an appropriate attributes acceptance sampling plan is the prerogative of the supplier and can be readily accomplished by examining the Operating Characteristic (OC) curves in Table 3 of Appendix B. For the example here, the sampling plan represented by the 4.0 AQL OC curve for code letter L is one of the several plans in Table 3 affording the required purchaser protection of LTPD = 10, β = 0.10. The sampling plan represented by the 1.5 AQL OC curve for code letter H could possibly also be considered adequate in this regard. The code letter L plans require a sample size of n = 200 while the code letter H plans require a sample size of n = 50 for single sampling plans (see A.5 for discussion of appropriateness of single, double, and multiple sampling plans).

5. In addition to assuring that the sampling plan used will afford the required purchaser protection, the supplier should determine the effect of the sampling plan upon his own business costs. To illustrate this, assume that inspection lots are of size n = 3000 items, unit inspection costs are $2.00 and the unit cost of manufacturing is $1.50. Further, assume that the vendor routinely produces lots which are 5 percent defective. Although, at first indication it may seem that the sample size of n = 50 is a more profitable approach for the supplier because of the lesser inspection costs involved, the following figures show that such is not always the case.

6. For each plan, assume a total of 100 lots is to be inspected.

   a. Plan L (n = 200)

Total inspection costs: 100 lots × 200 samples per lot × $2 inspection cost	=	$40,000
Cost (to supplier) of items expected to be rejected by this plan: 0.08 proportion of lots rejected × 100 lots × 3000 items per lot × $1.50 unit manfacturing cost	=	36,000
Total cost (to supplier) for using this plan	=	$76,000

   b. Plan H (n= 50)

Total inspection costs: 100 lots × 50 samples per lot × $2 unit inspection cost	=	$10,000
Cost to (to supplier) of items expected to be rejected by this plan: 0.44 proportion of lots rejected × 100 lots × 3000 items per lot × $1.50 unit manufacturing cost	=	198,000
Total cost (to supplier) for using this plan	=	$208,000

   Note that the use of Plan L, although having four times the inspection cost of Plan H, results in considerably less overall cost to the supplier.

7. Thus, consideration should be given by the supplier to the use of a sampling plan with more discriminating ability, i.e., more samples. The vendor must take into account his process average. If such average (in terms of lot percent defective) is close to the purchaser's required LTPD, then more samples are required to discriminate between "good" and "bad" lots. If the supplier's process is such that he routinely produces substantially fewer defects than the maximum tolerable indicated by the purchaser's LTPD, a less discriminating

plan (i.e., fewer samples) could prove to be more economic for the supplier.

8. After an appropriate plan is chosen (as in the foregoing), there remains the necessity of randomly sampling each inspection lot for the indicated number of samples and rejecting those lots whose sample contains more than the permissible number of defective units as indicated by the reject number (Re).

A.13 APPLICATIONS OF SECTION 5 (VARIABLES PLANS)

A.13.1 General. Up to this point, all of the discussion in this Appendix has dealt with acceptance criteria based on attributes. In plans based on attributes, consideration is given only to the number of articles in a sample conforming or failing to conform to certain design specifications.

In variables acceptance sampling, the characteristic must, of course, be one that can be measured. Acceptance decisions are then based on the actual measured values in the sample rather than on the number of items conforming or failing to conform to the specification limits. Some of the more common variables acceptance criteria are:

1. Criteria in which the decision on acceptance or rejection of a lot is based on the sample average alone. Plans using such criteria may be referred to as "known-sigma" plans.

2. Criteria in which the decision is based on the sample average in combination with a measure of sample dispersion. Such plans may be referred to an "unknown-sigma" plans.

The concept of the use of the OC curve to describe the performance of a sampling plan is as true for variables acceptance sampling plans as for attributes acceptance sampling plans. An OC curve can be computed for each variables plan and shows the probability of accepting, with the specific variables plan involved, lots of stated "percent defective." The methods for doing this, as well as the underlying principles involved in variables acceptance sampling, are well documented in the more comprehensive texts on the subject.

A.13.2 Limitations on the Use of Variables Plans. The computed degree of protection against accepting lots with various percentages of defective units depends upon an assumption regarding the form of the underlying frequency distribution of the quality characteristic in question.

The frequency distribution of many industrial quality characteristics is roughly "normal." This is particularly true where the product comes from a single source and is produced within a short period. For this reason, the assumption of a normal distribution is good enough for practical purposes in many instances. This assumption is most likely to be a reasonable one where inspection lots are formed close to the point of production, so that the chance of mixing products which have different frequency distributions is held to a minimum.

Nevertheless, even though inspection lots have been produced under apparently homogeneous conditions, the assumption of normality must be thoroughly checked to see whether conditions exist that are likely to cause serious departure from a normal distribution. Sometimes the underlying frequency distribution is skewed, or although it may be symmetrical, it could be either peaked or flat-topped. The percentage of defective units in the extreme tails of such distributions may differ considerably from those obtained under a normal distribution. Further, the protection against stated percentages of defective units given by variables acceptance criteria may be either greater or less than the protection indicated by OC curves computed on the assumption of normality.

A.13.3 Unknown Sigma Plans. When there is no satisfactory basis for estimating the within-lot variability, σ, prior to the inspection of a lot, acceptance plans must make use of some measure of the observed sample dispersion; i.e., unknown sigma plans must be used. Section 5 and Appendix B contain many such unknown sigma plans and examples which may be used. Like the known sigma plans, these assume a normal distribution of the quality characteristic.

A.13.4 Known Sigma Plans.

A.13.4.1 Use of Known Sigma Plans. The use of a known sigma plan involves the question of the magnitude of the within-lot variability, σ, and its stability. As the theory underlying known sigma plans assumes this condition, their use must be limited to cases where there is evidence that such variability is known and is stable. Such evidence may be provided as shown in the following example.

A.13.4.2 Example of Procedure Using Sample Ranges. An example of a known and constant within-lot variability, utilizing sample ranges follows:

1. Assume samples of n = 4 are taken from each of six lots (sequentially manufactured under continuous production) with the following results:

	1	2	3	4	5	6
	1.0	4.3	2.4	3.2	2.5	0.9
	0.7	0.9	2.6	4.7	0.7	2.4
	1.7	2.4	4.2	2.4	3.4	2.3
	0.6	1.5	0.8	2.8	2.9	1.0
Range(R) =	1.1	3.4	3.4	2.3	2.7	1.5

Average range $(\overline{R}) = \frac{14.4}{6} = 2.4$

2. Upper control limit for ranges $(UCL_R) = D_4\overline{R} = 2.28\ (2.4) = 5.5$

3. Lower control limit for ranges $(LCL_R) = D_3\bar{R} = 0(2.4) = 0$.

   Note that the D_3 and D_4 values are obtained from the values in Table 2 corresponding to the sample size n.

4. Since all the above sample ranges are within the limits of 0 to 5.5, we conclude that no significant difference exists in the variability of the parent lots.

5. The constant, or known, sigma, σ, to be used for the known sigma plan is estimated from the above data as $\sigma = \bar{R}/d_2 = 2.4/2.06 = 1.17$, where the d_2 is obtained from Figure 8.

6. A control chart for ranges, using the statistical limits as determined in (2) and (3) above shall be maintained to record all lot inspection results. For any lot inspected, the sample range for the lot in question must be within the calculated limits. Evidence of a shift in the within-lot variability shall be cause for repeating the above steps to determine the appropriate σ and the range control limits.

TABLE 2:
FACTORS FOR DETERMINING FROM $\bar{R}$
THE 3σ CONTROL LIMITS FOR R CHARTS

Number of Observations in Sample	Factors for R Chart	
	Lower Control Limit D_3	Upper Control Limit D_4
2	0	3.27
3	0	2.57
4	0	2.28
5	0	2.11
6	0	2.00
7	0.08	1.92
8	0.14	1.86
9	0.18	1.82
10	0.22	1.78

Notes: 1. Upper control limit for R = UCL_R $D_4\bar{R}$.

2. Lower control limit for R = $LCL_R = D_3\bar{R}$.

3. All factors in this table are based on the normal distribution.

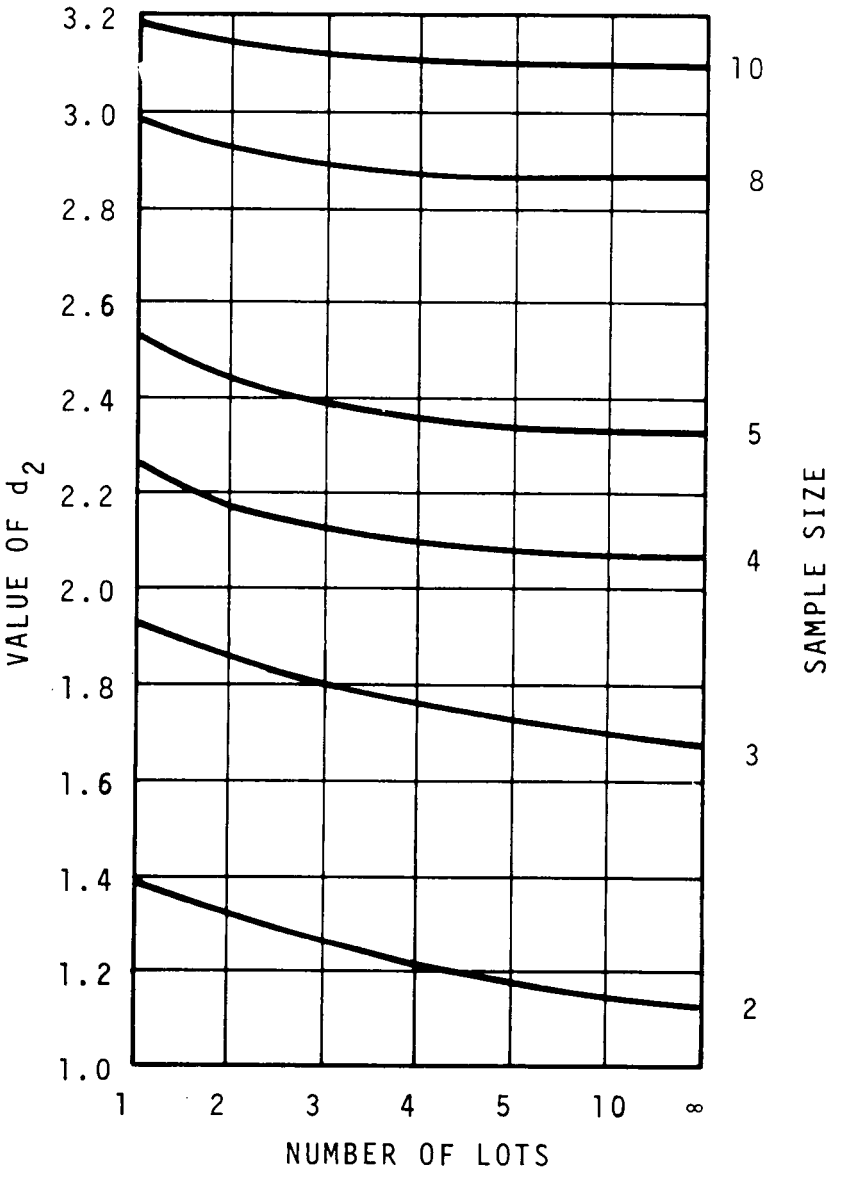


Figure 8. d_2 as a Function of Number of Lots and Sample Size

A.14 BIBLIOGRAPHY

This reference list is presented to identify sources of information as an aid to the user of this standard. These documents do not invoke mandatory requirements for acceptance sampling.

1. DOD H-109, Statistical Procedures for Determining Validity of Suppliers Attributes Inspection

2. MIL-STD-1235, Single and Multilevel Continuous Sampling Procedures and Tables for Inspection by Attributes

APPENDIX B

TABLES AND EXAMPLES

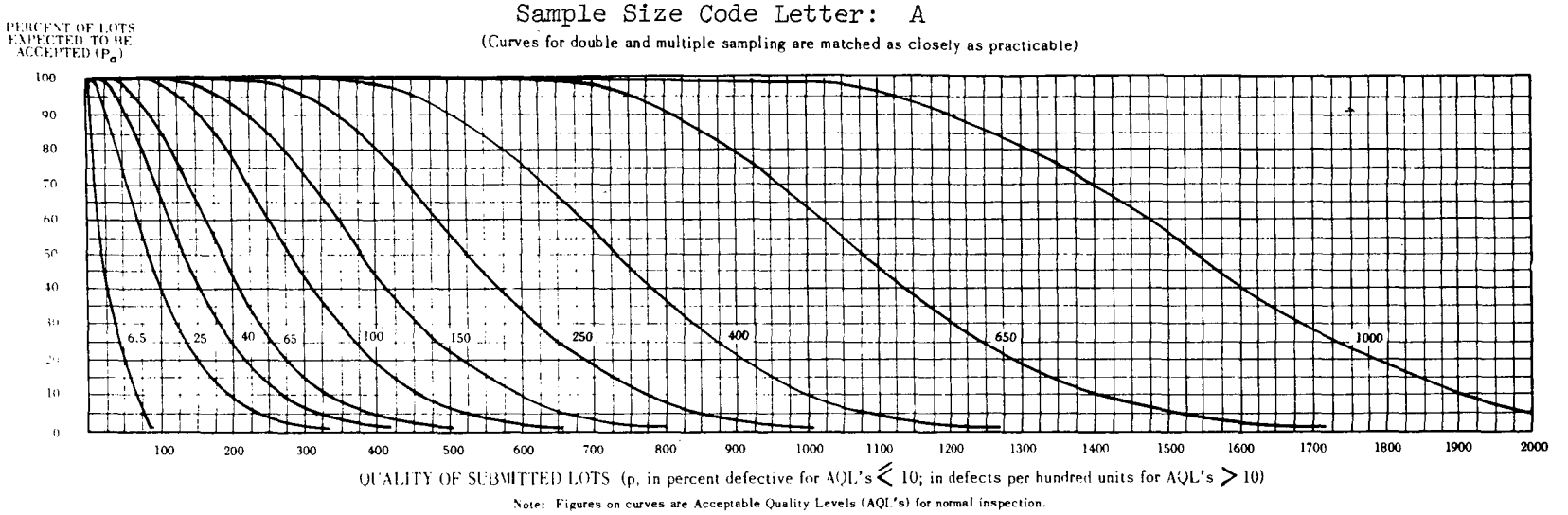
This appendix contains tables and examples referenced in this standard. Table 3 is reproduced from MIL-STD-105D. Tables 4, 5, 6, 7 and 8 are reproduced from MIL-STD-414. Page numbers are shown in parenthesis. Examples start on page 117.

B.1 TABLES

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS

Sample Size Code Letter: A

(Curves for double and multiple sampling are matched as closely as practicable)



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)														
	6.5	6.5	25	40	65	100	150	X	250	X	400	X	650	X	1000
	p (in percent defective)	p (in defects per hundred units)													
99.0	0.501	0.51	7.45	21.8	41.2	89.2	145	175	239	305	374	517	629	859	977
95.0	2.53	2.56	17.8	40.9	68.3	131	199	235	308	385	462	622	745	995	1122
90.0	5.13	5.25	26.6	55.1	87.3	158	233	272	351	432	515	684	812	1073	1206
75.0	13.4	14.4	48.1	86.8	127	211	298	342	431	521	612	795	934	1314	1354
50.0	29.3	34.7	83.9	134	184	284	383	433	533	633	733	933	1083	1383	1533
25.0	50.0	69.3	135	196	256	371	484	540	651	761	870	1087	1248	1568	1728
10.0	68.4	115	195	266	334	464	589	650	770	889	1006	1238	1409	1748	1916
5.0	77.6	150	237	315	388	526	657	722	848	972	1094	1334	1512	1862	2035
1.0	90.0	230	332	420	502	655	800	870	1007	1141	1272	1529	1718	2088	2270

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter A (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																						Cumulative sample size
		Less than 6.5		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	
Single	2	▽		0	1				1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	27	28	30	31	2
Double		▽		*		Use Letter D	Use Letter C	Use Letter B	(*)		(*)		(*)		(*)		(*)		(*)		(*)		(*)		(*)		(*)		(*)		(*)		
Multiple		▽		*					*		*		*		*		*		*		*		*		*		*		*		*		

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

* = Use single sampling plan above (or alternatively use letter D).

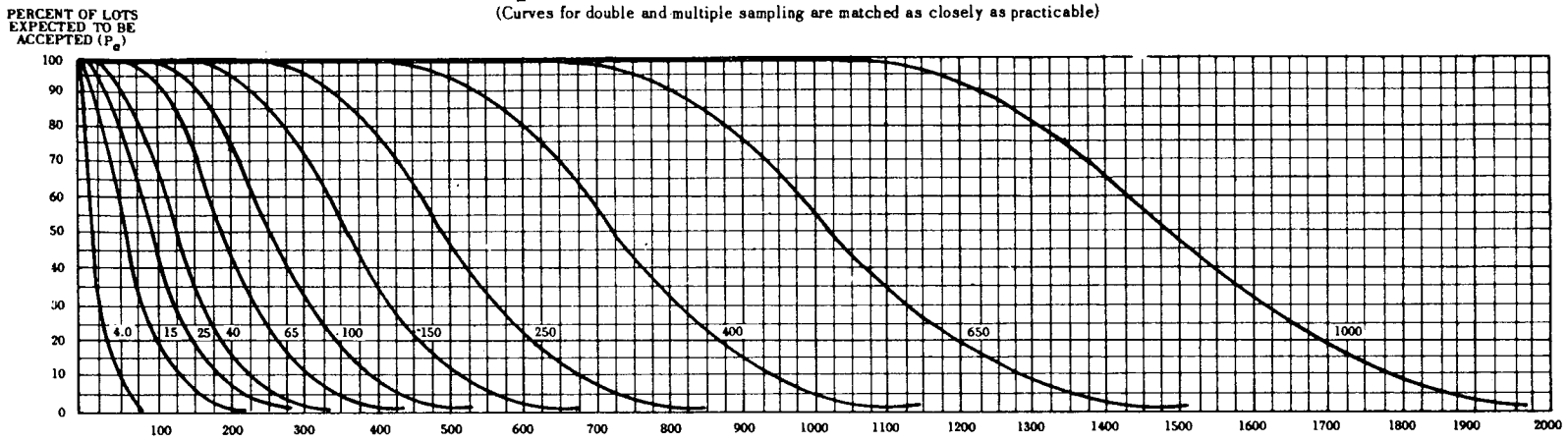
(*) = Use single sampling (or alternatively use letter B).

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: B

(Curves for double and multiple sampling are matched as closely as practicable)



QUALITY OF SUBMITTED LOTS (p, in percent defective for AQL's $\leq$ 10; in defects per hundred units for AQL's $>$ 10)

Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																
	4.0	4.0	15	25	40	65	100	X	150	X	250	X	400	X	650	X	1000
	p (in percent defective)	p (in defects per hundred units)															
99.0	0.33	0.34	4.97	14.5	27.4	59.5	96.9	117	159	203	249	345	419	573	651	947	1029
95.0	1.70	1.71	11.8	27.3	45.5	87.1	133	157	206	256	308	415	496	663	748	1065	1152
90.0	3.45	3.50	17.7	36.7	58.2	105	155	181	234	288	343	456	541	716	804	1131	1222
75.0	9.14	9.60	32.0	57.6	84.5	141	199	228	287	347	408	530	623	809	903	1249	1344
50.0	20.6	23.1	55.9	89.1	122	189	256	289	356	422	489	622	722	922	1022	1389	1489
25.0	37.0	46.2	89.8	131	170	247	323	360	434	507	580	724	832	1046	1152	1539	1644
10.0	53.6	76.8	130	177	223	309	392	433	514	593	671	825	939	1165	1277	1683	1793
5.0	63.2	99.9	158	210	258	350	438	481	565	648	730	890	1008	1241	1356	1773	1886
1.0	78.4	154	221	280	335	437	533	580	672	761	848	1019	1145	1392	1513	1951	2069

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: B (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																										Cumulative sample size
		Less than 4.0		4.0		6.5		X		10		15		25		40		65		100		X		150		X		250		X		400		X		650		X		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	
Single	3	▽		0	1							1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	27	28	30	31	41	42	44	45	3
Double	2	▽		*		Use		Use		Use		0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	15	20	17	22	23	29	25	31	2
	4					Letter		Letter		Letter		1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27	34	35	37	38	52	53	56	57	4
Multiple		▽		*		A		D		C		++		++		++		++		++		++		++		++		++		++		++		++		++		++		++		

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

* = Use single sampling plan above (or alternatively use letter E).

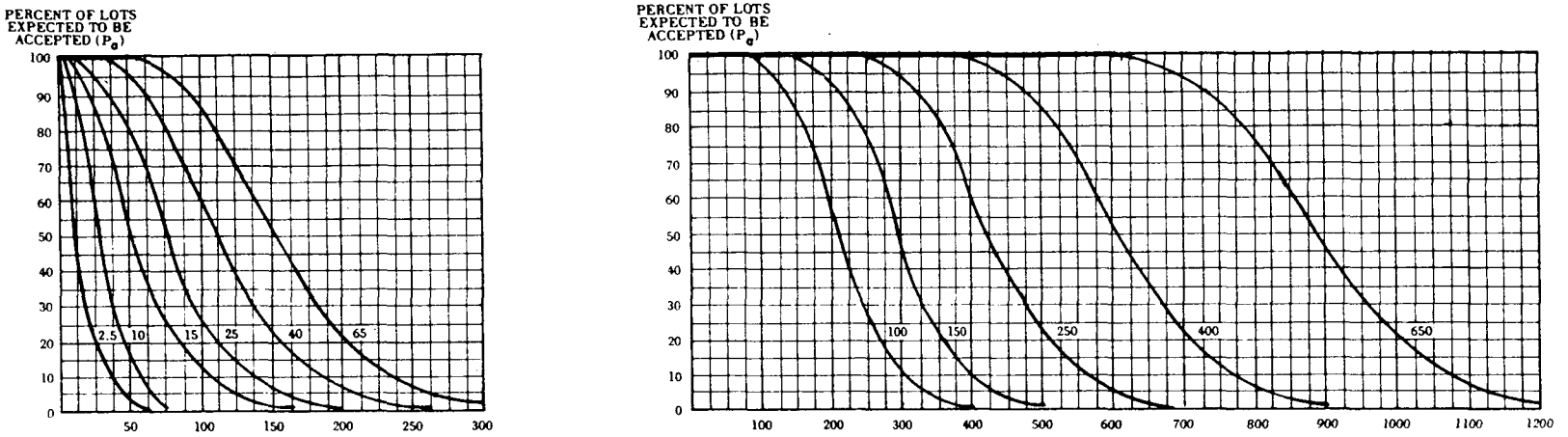
++ = Use double sampling plan above (or alternatively use letter D).

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLINGS PLANS (continued)

Sample Size Code Letter: C

(Curves for double and multiple sampling are matched as closely as practicable)



QUALITY OF SUBMITTED LOTS (p, in percent defective for AQL's $\leq$ 10; in defects per hundred units for AQL's $>$ 10)

Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																	
	2.5	10	2.5	10	15	25	40	65	X	100	X	150	X	250	X	400	X	650
	p (in percent defective)		p (in defects per hundred units)															
99.0	0.20	3.28	0.20	2.89	8.72	16.5	35.7	58.1	70.1	95.4	122	150	207	251	344	391	568	618
95.0	1.02	7.63	1.03	7.10	16.4	27.3	52.3	79.6	93.9	123	154	185	249	298	398	449	639	691
90.0	2.09	11.2	2.10	10.6	22.0	34.9	63.0	93.1	109	140	173	206	273	325	429	482	679	733
75.0	5.59	19.4	5.76	19.2	34.5	50.7	84.4	119	137	172	208	245	318	374	485	542	749	806
50.0	12.9	31.4	13.9	33.6	53.5	73.4	113	153	173	213	253	293	373	433	553	613	833	893
25.0	24.2	45.4	27.7	53.9	78.4	102	148	194	216	260	304	348	435	499	627	691	923	987
10.0	36.9	58.4	46.1	77.8	106	134	186	235	260	308	356	403	495	564	699	766	1010	1076
5.0	45.1	65.8	59.9	94.9	126	155	210	263	289	339	389	438	534	605	745	814	1064	1131
1.0	60.2	77.8	92.1	133	168	201	262	320	348	403	456	509	612	687	835	908	1171	1241

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: C (continued)

Type of sampling plan	Cumulative sample size	Less than 2.5		2.5		4.0		X		6.5		10		15		25		40		65		X		100		X		150		X		250		X		400		X		650		1000		Cumulative sample size
		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	
Single	5	▽		0	1	Use		Use		Use		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	27	28	30	31	41	42	44	45	Use		5
Double	3	▽		•		Letter		Letter		Letter		0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	15	20	17	22	23	29	25	31	Letter		3
	6					B		E		D		1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27	34	35	37	38	52	53	56	57	B		6
Multiple		▽		•								++		++		++		++		++		++		++		++		++		++		++		++		++		++		++				

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number.

Re = Rejection number.

* = Use single sampling plan above (or alternatively use letter F).

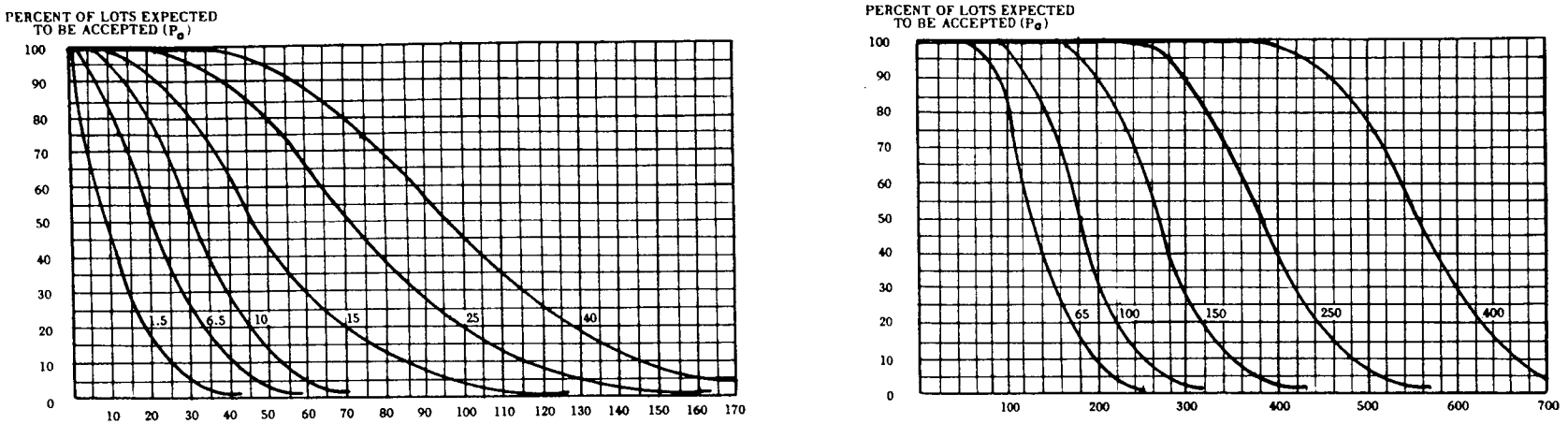
++ = Use double sampling plan above (or alternatively use letter D).

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: D

(Curves for double and multiple sampling are matched as closely as practicable)



QUALITY OF SUBMITTED LOTS (p, in percent defective for AQL's $\leq$ 10; in defects per hundred units for AQL's $>$10)

Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																	
	1.5	6.5	10	1.5	6.5	10	15	25	40	X	65	X	100	X	150	X	250	X	400
	p (in percent defective)			p (in defects per hundred units)															
99.0	0.13	2.00	6.00	0.13	1.86	5.45	10.3	22.3	36.3	43.8	59.6	76.2	93.5	129	157	215	244	355	386
95.0	0.64	2.64	11.1	0.64	4.44	10.2	17.1	32.7	49.8	58.7	77.1	96.1	116	156	186	249	281	399	432
90.0	1.31	6.88	14.7	1.31	6.65	13.8	21.8	39.4	58.2	67.9	87.8	108	129	171	203	268	301	424	458
75.0	3.53	12.1	22.1	3.60	12.0	21.6	31.7	52.7	74.5	85.5	108	130	153	199	234	303	339	468	504
50.0	8.30	20.1	32.1	8.66	21.0	33.4	45.9	70.9	95.9	108	133	158	183	233	271	346	383	521	558
25.0	15.9	30.3	43.3	17.3	33.7	49.0	63.9	92.8	121	135	163	190	218	272	312	392	432	577	617
10.0	25.0	40.6	53.9	28.8	48.6	66.5	83.5	116	147	162	193	222	252	309	352	437	478	631	672
5.0	31.2	47.1	59.9	37.5	59.3	78.7	96.9	131	164	180	212	243	274	334	378	465	509	665	707
1.0	43.8	58.8	70.7	57.6	83.0	105	126	164	200	218	252	285	318	382	429	522	568	732	776

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: D (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																														Cumulative sample size
		Less than 1.5		1.5		2.5				4.0		6.5		10		15		25		40				65		100		150		250		400		Higher than 400		
		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	
Single	8	▽		0	1	Use Letter C		Use Letter F		Use Letter E		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	27	28	30	31	41	42	44	45	△		8
Double	5	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	15	20	17	22	23	29	25	31	△		5
	10											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27	34	35	37	38	52	53	56	57			10
Multiple	2	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	3	10	4	12	6	15	6	16	△		2
	4											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14	10	17	11	19	16	25	17	27			4
	6											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19	17	24	19	27	26	36	29	39			6
	8											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25	24	31	27	34	37	46	40	49			8
	10											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29	32	37	36	40	49	55	53	58			10
	12											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33	40	43	45	47	61	64	65	68			12
	14											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38	48	49	53	54	72	73	77	78			14

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

• = Use single sampling plan above (or alternatively use letter G).

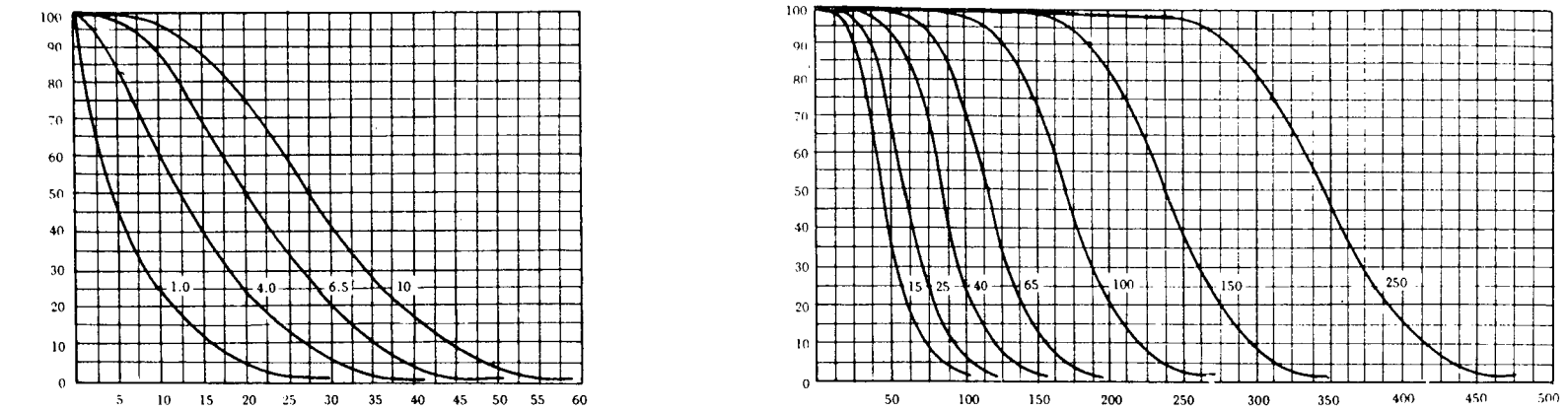
= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: E

(Curves for double and multiple sampling are matched as closely as practicable)



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																		
	1.0	4.0	6.5	10	1.0	4.0	6.5	10	15	25	X	40	X	65	X	100	X	150	X	250
	p (in percent defective)				p (in defects per hundred units)															
99.0	0.077	1.19	3.63	7.00	0.078	1.15	3.35	6.33	13.7	22.4	27.0	36.7	46.9	57.5	79.6	96.7	132	150	219	238
95.0	0.394	2.81	6.63	11.3	0.395	2.73	6.29	10.5	20.1	30.6	36.1	47.5	59.2	71.1	95.7	115	153	173	246	266
90.0	0.807	4.16	8.80	14.2	0.808	4.09	8.48	13.4	24.2	35.8	41.8	54.0	66.5	79.2	105	125	165	185	261	282
75.0	2.19	7.41	13.4	19.9	2.22	7.39	13.3	19.5	32.5	45.8	52.6	66.3	80.2	94.1	122	144	187	208	288	310
50.0	5.19	12.6	20.0	27.5	5.33	12.9	20.6	28.2	43.6	59.0	66.7	82.1	97.5	113	144	168	213	236	321	344
25.0	10.1	19.4	28.0	36.2	10.7	20.7	30.2	39.3	57.1	74.5	83.1	100	117	134	167	192	241	266	355	379
10.0	16.2	26.8	36.0	44.4	17.7	29.9	40.9	51.4	71.3	90.5	100	119	137	155	190	217	269	295	388	414
5.0	20.6	31.6	41.0	49.5	23.0	36.5	48.4	59.6	80.9	101	111	130	150	168	205	233	286	313	409	435
1.0	29.8	41.5	50.6	58.7	35.4	51.1	64.7	77.3	101	123	134	155	176	196	235	264	321	349	450	477

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: E (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																																Cumulative sample size
		Less than 1.0		1.0		1.5		×		2.5		4.0		6.5		10		15		25		×		40		×		65		×		100		×		150		×		250		Higher than 250		
		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	
Single	13	▽		0	1	Use Letter D		Use Letter G		Use Letter F		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	27	28	30	31	41	42	44	45	△		13
Double	8	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	15	20	17	22	23	29	25	31	△		8
	16											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27	34	35	37	38	52	53	56	57			16
Multiple	3	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	3	10	4	12	6	15	6	16	△		3
	6											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14	10	17	11	19	16	25	17	27			6
	9											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19	17	24	19	27	26	36	29	39			9
	12											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25	24	31	27	34	37	46	40	49			12
	15											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29	32	37	36	40	49	55	53	58			15
	18											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33	40	43	45	47	61	64	65	68			18
	21											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38	48	49	53	54	72	73	77	78			21

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number.

Re = Rejection number.

• = Use single sampling plan above (or alternatively use letter H).

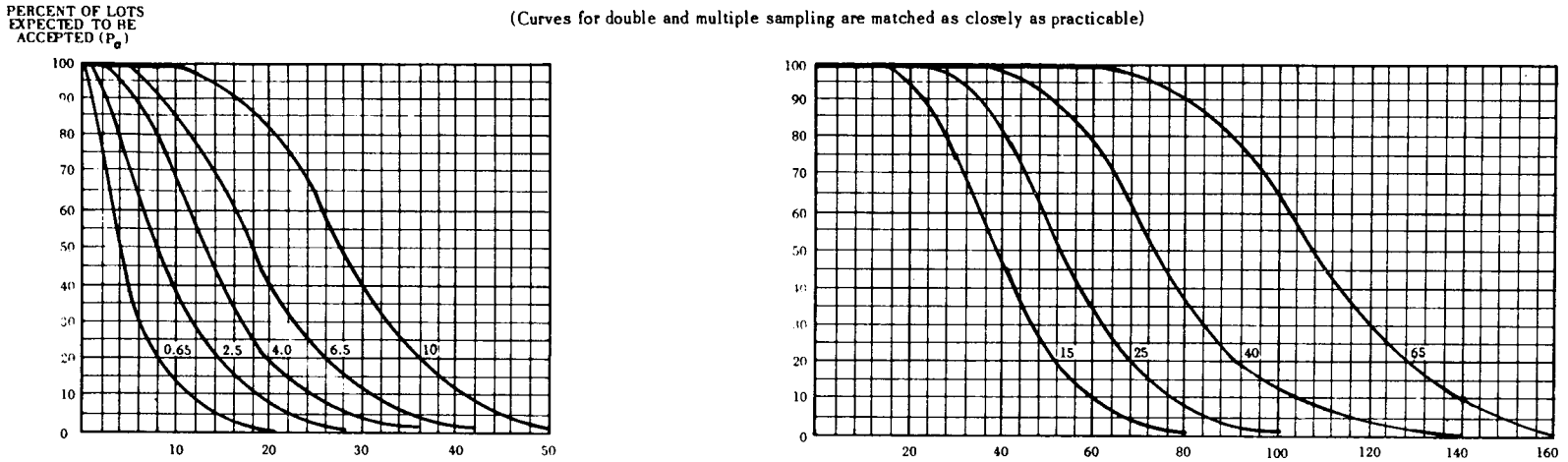
= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: F

(Curves for double and multiple sampling are matched as closely as practicable)



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																
	0.65	2.5	4.0	6.5	10	0.65	2.5	4.0	6.5	10	15	X	25	X	40	X	65
	p (in percent defective)					p (in defects per hundred units)											
99.0	0.050	0.75	2.25	4.31	9.75	0.051	0.75	2.18	4.12	8.92	14.5	17.5	23.9	30.5	37.4	51.7	62.9
95.0	0.256	1.80	4.22	7.13	14.0	0.257	1.78	4.09	6.83	13.1	19.9	23.5	30.8	38.5	46.2	62.2	74.5
90.0	0.525	2.69	5.64	9.03	16.6	0.527	2.66	5.51	8.73	15.8	23.3	27.2	35.1	43.2	51.5	68.4	81.2
75.0	1.43	4.81	8.70	12.8	21.6	1.44	4.81	8.68	12.7	21.1	29.8	34.2	43.1	52.1	61.2	79.5	93.4
50.0	3.41	8.25	13.1	18.1	27.9	3.47	8.39	13.4	18.4	28.4	38.3	43.3	53.3	63.3	73.3	93.3	108
25.0	6.70	12.9	18.7	24.2	34.8	6.93	13.5	19.6	25.5	37.1	48.4	54.0	65.1	76.1	87.0	109	125
10.0	10.9	18.1	24.5	30.4	41.5	11.5	19.5	26.6	33.4	46.4	58.9	65.0	77.0	88.9	101	124	141
5.0	13.9	21.6	28.3	34.4	45.6	15.0	23.7	31.5	38.8	52.6	65.7	72.2	84.8	97.2	109	133	151
1.0	20.6	28.9	35.6	42.0	53.4	23.0	33.2	42.0	50.2	65.5	80.0	87.0	101	114	127	153	172

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: F(continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		Less than 0.65		0.65		1.0		X		1.5		2.5		4.0		6.5		10		15		X		25		X		40		X		65		Higher than 65		
		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	
Single	20	▽		0	1	Use Letter E		Use Letter H		Use Letter G		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		20
Double	13	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		13
	26											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			26
Multiple	5	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		5
	10											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			10
	15											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			15
	20											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			20
	25											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			25
	30											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			30
	35											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			35

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

• = Use single sampling plan above (or alternatively use letter J).

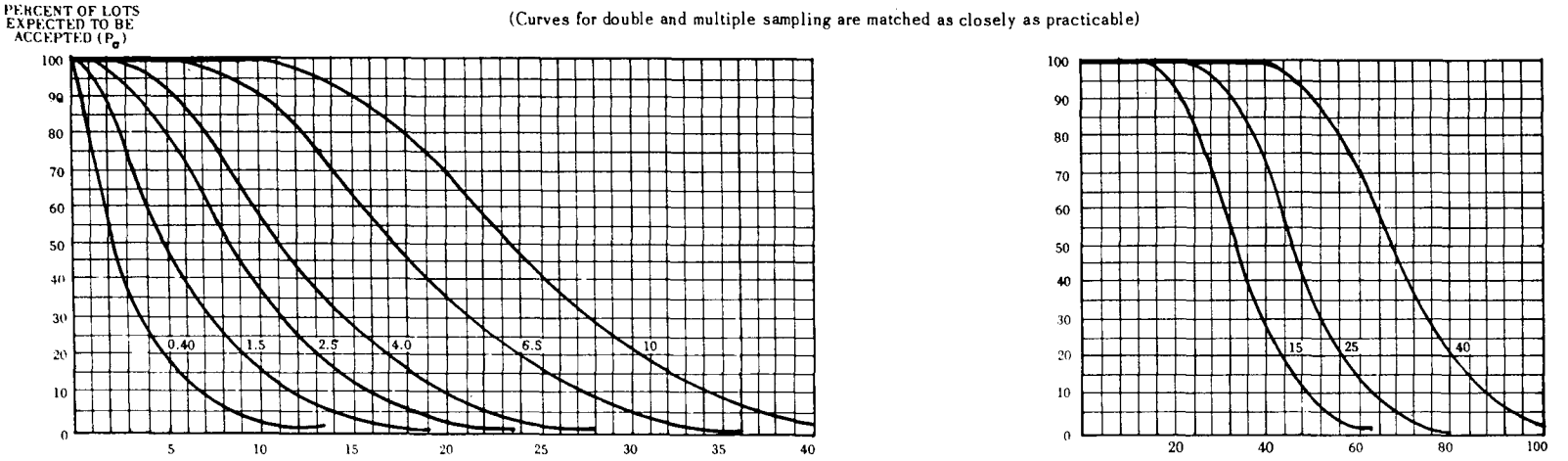
= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: G

(Curves for double and multiple sampling are matched as closely as practicable)



QUALITY OF SUBMITTED LOTS (p, in percent defective for AQL's $\leq$ 10; in defects per hundred units for AQL's $>$ 10)

Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																	
	0.40	1.5	2.5	4.0	6.5	10	0.40	1.5	2.5	4.0	6.5	10	X	15	X	25	X	40
	p (in percent defective)						p (in defects per hundred units)											
99.0	0.032	0.475	1.38	2.63	5.94	9.75	0.032	0.466	1.36	2.57	5.57	9.08	11.0	14.9	19.1	23.4	32.3	39.3
95.0	0.161	1.13	2.59	4.39	8.50	13.1	0.160	1.10	2.55	4.26	8.16	12.4	14.7	19.3	24.0	28.9	38.9	46.5
90.0	0.329	1.67	3.50	5.56	10.2	15.1	0.328	1.66	3.44	5.45	9.85	14.6	17.0	21.9	27.0	32.2	42.7	50.8
75.0	0.895	3.01	5.42	7.98	13.4	19.0	0.900	3.00	5.39	7.92	13.2	18.6	21.4	26.9	32.6	38.2	49.7	58.4
50.0	2.14	5.19	8.27	11.4	17.5	23.7	2.16	5.24	8.35	11.5	17.7	24.0	27.1	33.3	39.6	45.8	58.3	67.7
25.0	4.23	8.19	11.9	15.4	22.3	29.0	4.33	8.41	12.3	16.0	23.2	30.3	33.8	40.7	47.6	54.4	67.9	78.0
10.0	6.94	11.6	15.8	19.7	27.1	34.1	7.19	12.2	16.6	20.9	29.0	36.8	40.6	48.1	55.6	62.9	77.4	88.1
5.0	8.94	14.0	18.4	22.5	30.1	37.2	9.36	14.8	19.7	24.2	32.9	41.1	45.1	53.0	60.8	68.4	83.4	94.5
1.0	13.5	19.0	23.7	28.0	35.9	43.3	14.4	20.7	26.3	31.4	41.0	50.0	54.4	63.0	71.3	79.5	95.6	107

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: G (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																								Cumulative sample size
		Less than 0.40		0.40		0.65		X		1.0		1.5		2.5		4.0		6.5		10		X		15		X		25		X		40		Higher than 40		
		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	
Single	32	▽		0	1							1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		32
Double	20	▽				Use		Use		Use		0	2	0	3	1	4	2	5	3	7	3	7	5	9		10	7	11	9	14	11	16	△		20
	40			*		Letter		Letter		Letter		1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			40
						F		J		H																									
Multiple	8	▽		*								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		8
	16											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			16
	24											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			24
	32											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			32
	40											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			40
	48											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			48
	56											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			56

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number.

Re = Rejection number.

* = Use single sampling plan above (or alternatively use letter K).

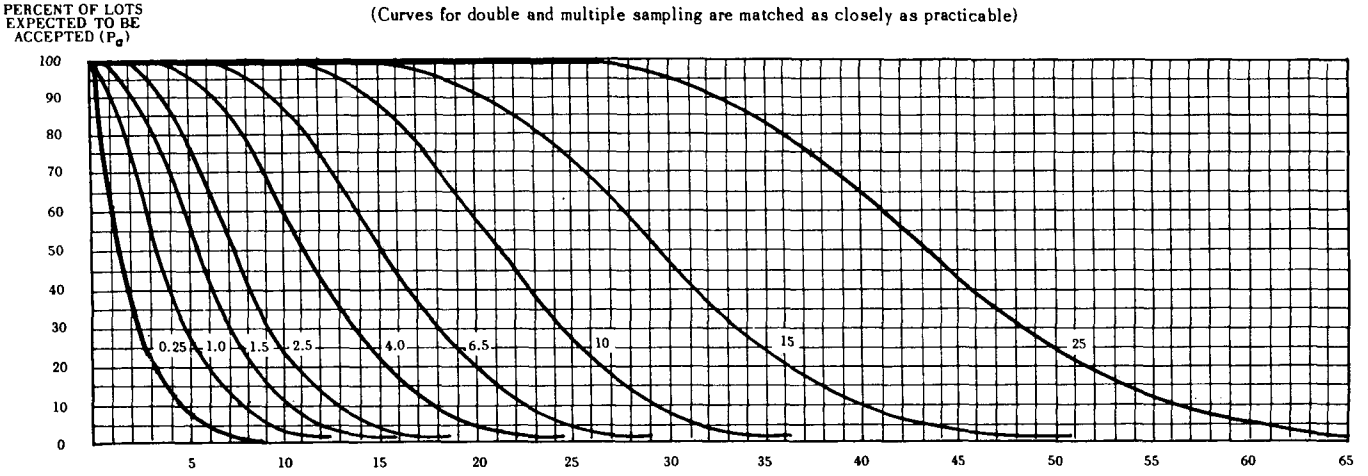
\# = Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: H

(Curves for double and multiple sampling are matched as closely as practicable)



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																					
	0.25	1.0	1.5	2.5	4.0	6.5	X	10	0.25	1.0	1.5	2.5	4.0	6.5	X	10	X	15	X	25
	p (in percent defective)								p (in defects per hundred units)											
99.0	0.020	0.306	0.888	1.69	3.66	6.06	7.41	11.1	0.020	0.298	0.872	1.65	3.57	5.81	7.01	9.54	12.2	15.0	20.7	25.1
95.0	0.103	0.712	1.66	2.77	5.34	8.20	9.74	12.9	0.103	0.710	1.64	2.73	5.23	7.96	9.39	12.3	15.4	18.5	24.9	29.8
90.0	0.210	1.07	2.23	3.54	6.42	9.53	11.2	14.5	0.210	1.06	2.20	3.49	6.30	9.31	10.9	14.0	17.3	20.6	27.3	32.5
75.0	0.574	1.92	3.46	5.09	8.51	12.0	13.8	17.5	0.576	1.92	3.45	5.07	8.44	11.9	13.7	17.2	20.8	24.5	31.8	37.4
50.0	1.38	3.33	5.31	7.30	11.3	15.2	17.2	21.2	1.39	3.36	5.35	7.34	11.3	15.3	17.3	21.6	25.3	29.3	37.3	43.3
25.0	2.74	5.30	7.70	10.0	14.5	18.8	21.0	25.2	2.77	5.39	7.84	10.2	14.8	19.4	21.6	26.0	30.4	34.8	43.5	49.9
10.0	4.50	7.56	10.3	12.9	17.8	22.4	24.7	29.1	4.61	7.78	10.6	13.4	18.6	23.5	26.0	30.8	35.6	40.3	49.5	56.4
5.0	5.82	9.13	12.1	14.8	19.9	24.7	27.0	31.6	5.99	9.49	12.6	15.5	21.0	26.3	28.9	33.9	38.9	43.8	53.4	60.5
1.0	8.80	12.5	15.9	18.8	24.3	29.2	31.7	36.3	9.21	13.3	16.8	20.1	26.2	32.0	34.8	40.3	45.6	50.9	61.1	68.7

(continued)

Note: Binomial distribution used for percent defective computations; Poisson for defects per hundred units.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: H (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																										Cumulative sample size
		Less than 0.25		0.25		0.40		X		0.65		1.0		1.5		2.5		4.0		6.5		X		10		X		15		X		25		Higher than 25		
		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	
Single	50	▽		0	1	Use Letter G		Use Letter K		Use Letter J		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		50
Double	32	▽		*								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		32
	64											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			64
Multiple	13	▽		*								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		13
	26											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			26
	39											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			39
	52											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			52
	65											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			65
	78											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			78
	91											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			91

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available

Ac = Acceptance number

Re = Rejection number

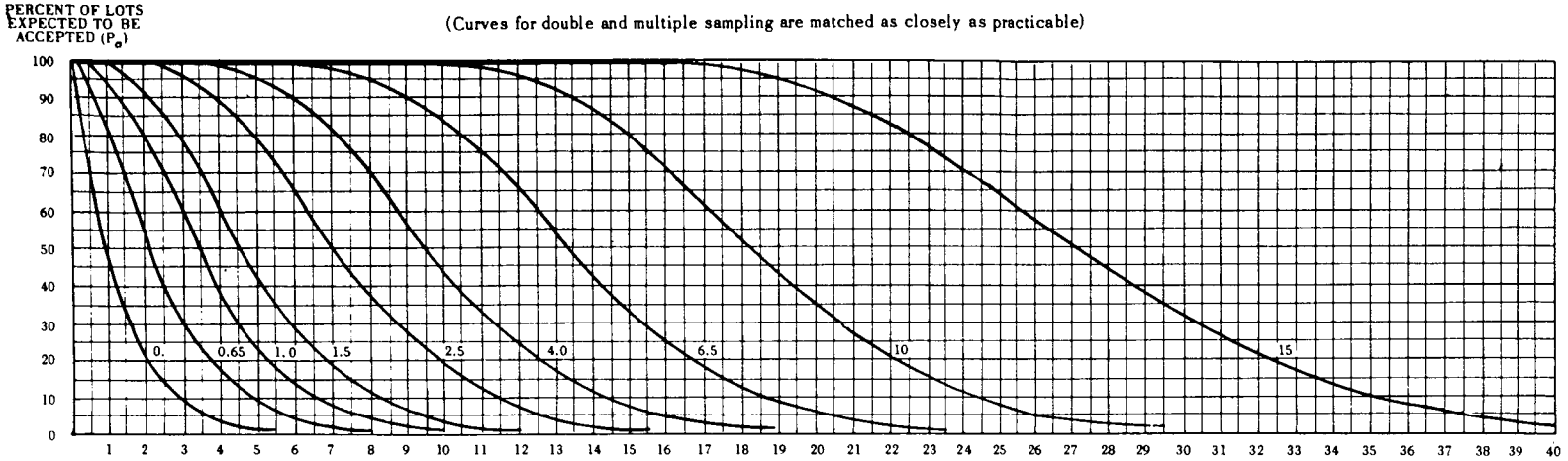
* = Use single sampling plan above (or alternatively use letter L).

\# = Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: J



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)																					
	0.15	0.65	1.0	1.5	2.5	4.0	✕	6.5	✕	10	0.15	0.65	1.0	1.5	2.5	4.0	✕	6.5	✕	10	✕	15
	p (in percent defective)										p (in defects per hundred units)											
99.0	0.013	0.188	0.550	1.05	2.30	3.72	4.50	6.13	7.88	9.75	0.013	0.186	0.545	1.03	2.23	3.63	4.38	5.96	7.62	9.35	12.9	15.7
95.0	0.064	0.444	1.03	1.73	3.32	5.06	5.98	7.91	9.89	11.9	0.064	0.444	1.02	1.71	3.27	4.98	5.87	7.71	9.61	11.6	15.6	18.6
90.0	0.132	0.666	1.38	2.20	3.98	5.91	6.91	8.95	11.0	13.2	0.131	0.665	1.38	2.18	3.94	5.82	6.79	8.78	10.8	12.9	17.1	20.3
75.0	0.359	1.202	2.16	3.18	5.30	7.50	8.62	10.9	13.2	15.5	0.360	1.20	2.16	3.17	5.27	7.45	8.55	10.8	13.0	15.3	19.9	23.4
50.0	0.863	2.09	3.33	4.57	7.06	9.55	10.8	13.3	15.8	18.3	0.866	2.10	3.34	4.59	7.09	9.59	10.8	13.3	15.8	18.3	23.3	27.1
25.0	1.72	3.33	4.84	6.31	9.14	11.9	13.3	16.0	18.6	21.3	1.73	3.37	4.90	6.39	9.28	12.1	13.5	16.3	19.0	21.8	27.2	31.2
10.0	2.84	4.78	6.52	8.16	11.3	14.2	15.7	18.6	21.4	24.2	2.88	4.86	6.65	8.35	11.6	14.7	16.2	19.3	22.2	25.2	30.9	35.2
5.0	3.68	5.80	7.66	9.39	12.7	15.8	17.3	20.3	23.2	26.0	3.75	5.93	7.87	9.69	13.1	16.4	18.0	21.2	24.3	27.4	33.4	37.8
1.0	5.59	8.00	10.1	12.0	15.6	18.9	20.5	23.6	26.5	29.5	5.76	8.30	10.5	12.6	16.4	20.0	21.8	25.2	28.5	31.8	38.2	42.9

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: J (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		Less than 0.15		0.15		0.25		X		0.40		0.65		1.0		1.5		2.5		4.0		X		6.5		X		10		X		15		Higher than 15		
		Ac	Re	Ac	Re	Ac	Rc	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	
Single	80	▽		0	1	Use Letter H		Use Letter L		Use Letter K		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		80
Double	50	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		50
	100											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			100
Multiple	20	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		20
	40											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			40
	60											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			60
	80											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			80
	100											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			100
	120											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			120
	140											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			140

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

• = Use single sampling plan above (or alternatively use letter M)

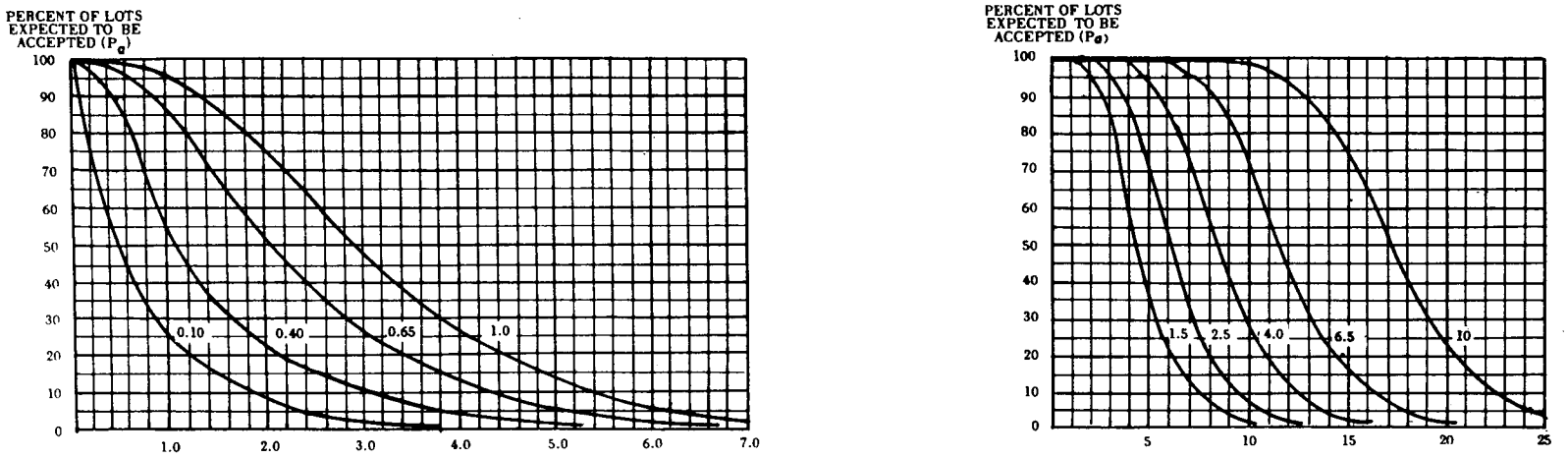
= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: K

(Curves for double and multiple sampling are matched as closely as practicable)



QUALITY OF SUBMITTED LOTS (p, in percent defective for AQL's $\leq$10; in defects per hundred units for AQL's $>$10)

Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)											
	0.10	0.40	0.65	1.0	1.5	2.5	X	4.0	X	6.5	X	10
	p (in percent defective or defects per hundred units)											
99.0	0.0081	0.119	0.349	0.658	1.43	2.33	2.81	3.82	4.88	5.98	8.28	10.1
95.0	0.0410	0.284	0.654	1.09	2.09	3.19	3.76	4.94	6.15	7.40	9.95	11.9
90.0	0.0840	0.426	0.882	1.40	2.52	3.73	4.35	5.62	6.92	8.24	10.9	13.0
75.0	0.230	0.769	0.382	2.03	3.38	4.77	5.47	6.90	8.34	9.79	12.7	14.9
50.0	0.554	1.34	2.14	2.94	4.54	6.14	6.94	8.53	10.1	11.7	14.9	17.3
25.0	1.11	2.15	3.14	4.09	5.94	7.75	8.64	10.4	12.2	13.9	17.4	20.0
10.0	1.84	3.11	4.26	5.35	7.42	9.42	10.4	12.3	14.2	16.1	19.8	22.5
5.0	2.40	3.80	5.04	6.20	8.41	10.5	11.5	13.6	15.6	17.5	21.4	24.2
1.0	3.68	5.31	6.73	8.04	10.5	12.8	18.3	16.1	18.3	20.4	24.5	27.5

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: K (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		Less than 0.10		0.10		0.15				0.25		0.40		0.65		1.0		1.5		2.5				4.0		6.5				10		Higher than 10		
		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	
Single	125	▽		0	1	Use Letter J		Use Letter M		Use Letter L		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		125
Double	80	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		80
	160											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			160
Multiple	32	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		32
	64											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			64
	96											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			96
	128											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			128
	160											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			160
	192											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			192
	224											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			224

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

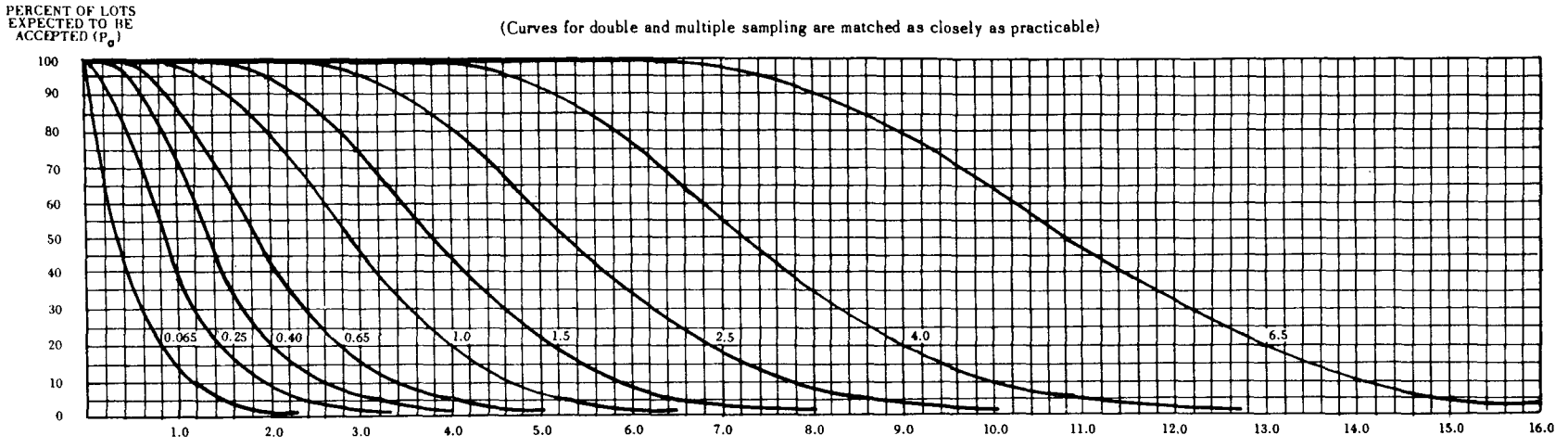
• = Use single sampling plan above (or alternatively use letter N).

= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: L



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)											
	0.065	0.25	0.40	0.65	1.0	1.5	X	2.5	X	4.0	X	6.5
	p (in percent defective or defects per hundred units)											
99.0	0.0051	0.075	0.218	0.412	0.893	1.45	1.75	2.39	3.05	3.74	5.17	6.29
95.0	0.0256	0.178	0.409	0.683	1.31	1.99	2.35	3.09	3.85	4.62	6.22	7.45
90.0	0.0525	0.266	0.551	0.873	1.58	2.33	2.72	3.51	4.32	5.15	6.84	8.12
75.0	0.144	0.481	0.864	1.27	2.11	2.98	3.42	4.31	5.21	6.12	7.95	9.34
50.0	0.347	0.839	1.34	1.84	2.84	3.84	4.33	5.33	6.33	7.33	9.33	10.8
25.0	0.693	1.35	1.96	2.56	3.71	4.84	5.40	6.51	7.61	8.70	10.9	12.5
10.0	1.15	1.95	2.66	3.34	4.64	5.89	6.50	7.70	8.89	10.1	12.4	14.1
5.0	1.50	2.37	3.15	3.88	5.26	6.57	7.22	8.48	9.72	10.9	13.3	15.1
1.0	2.30	3.32	4.20	5.02	6.55	8.00	8.70	10.1	11.4	12.7	15.3	17.2

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: L (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		Less than 0.065		0.065		0.10		X		0.15		0.25		0.40		0.65		1.0		1.5		X		2.5		X		4.0		X		6.5		Higher than 6.5		
		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	
Single	200	▽		0	1	Use Letter K		Use Letter N		Use Letter M		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		200
Double	125	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		125
	250											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			250
Multiple	50	▽		*								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		50
	100											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			100
	150											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			150
	200											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			200
	250											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			250
	300											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			300
	350											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			350

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

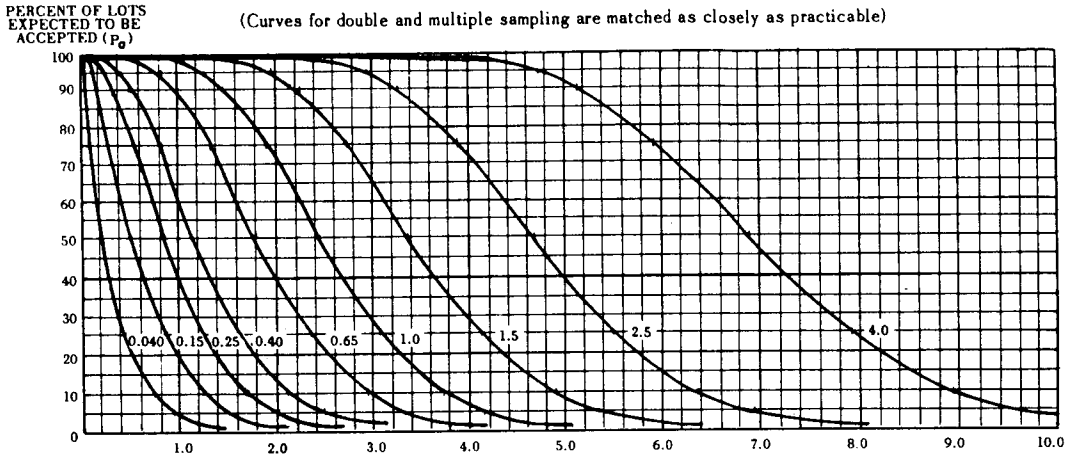
• = Use single sampling plan above (or alternatively use letter P).

= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: M



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)											
	0.040	0.15	0.25	0.40	0.65	1.0	X	1.5	X	2.5	X	4.0
	p (in percent defective or in dejects per hundred units)											
99.0	0.0032	0.047	0.138	0.261	0.566	0.922	1.11	1.51	1.94	2.38	3.28	3.99
95.0	0.0163	0.112	0.259	0.433	0.829	1.26	1.49	1.96	2.44	2.94	3.95	4.73
90.0	0.0333	0.168	0.349	0.533	1.00	1.48	1.72	2.23	2.75	3.27	4.34	5.16
75.0	0.0914	0.305	0.580	0.804	1.34	1.89	2.17	2.74	3.31	3.89	5.05	5.93
50.0	0.220	0.532	0.848	1.17	1.80	2.43	2.75	3.39	4.02	4.66	5.93	6.88
25.0	0.440	0.854	1.24	1.62	2.36	3.07	3.43	4.13	4.83	5.52	6.90	7.92
10.0	0.731	1.23	1.69	2.12	2.94	3.74	4.13	4.89	5.65	6.39	7.86	8.95
5.0	0.951	1.51	2.00	2.46	3.34	4.17	4.58	5.38	6.17	6.95	8.47	9.60
1.0	1.46	2.11	2 67	3.19	4.16	5.08	5.53	6.40	7.25	8.08	9.71	10.9

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: M (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																														Cumulative sample size
		Less than 0.040		0.040		0.065		X		0.10		0.15		0.25		0.40		0.65		1.0		X		1.5		X		2.5		X		4.0		Higher than 4.0		
		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	
Single	315	▽		0	1	Use Letter L		Use Letter P		Use Letter N		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		315
Double	200	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		200
	400											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			400
Multiple	80	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		80
	160											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			160
	240											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			240
	320											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			320
	400											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			400
	480											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			480
	560											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			560

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number.

Re = Rejection number.

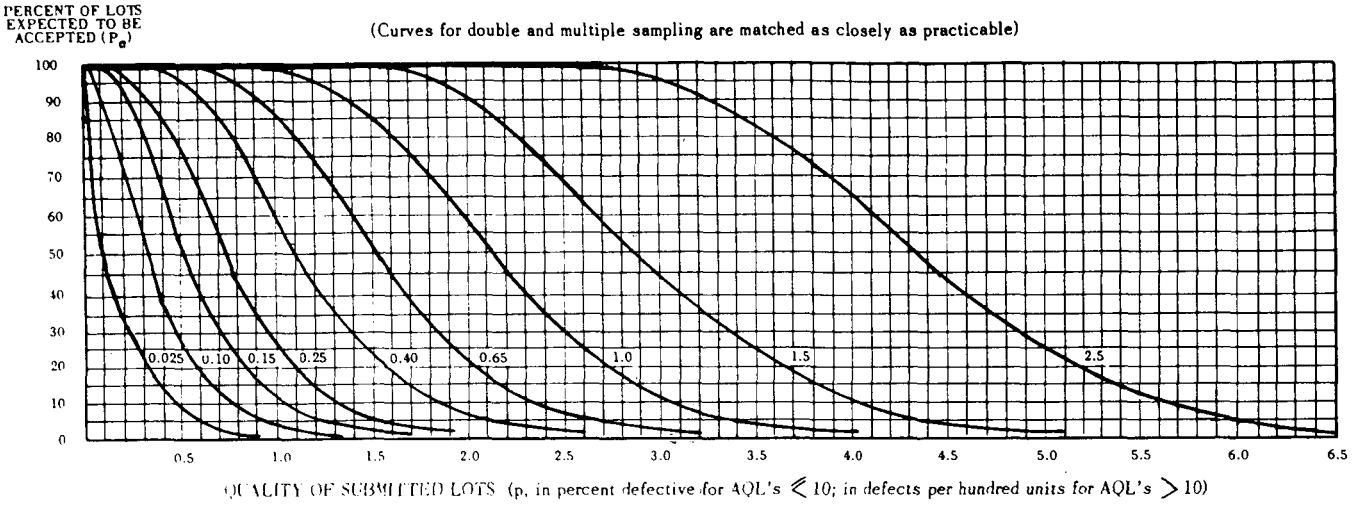
• = Use single sampling plan above (or alternatively use letter Q).

= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: N



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)											
	0.025	0.10	0.15	0.25	0.40	0.65	X	1.0	X	1.5	X	2.5
	p (in percent defective or in defects per hundred units)											
99.0	0.0020	0.030	0.087	0.165	0.357	0.581	0.701	0.954	1.22	1.50	2.07	2.51
95.0	0.0103	0.071	0.164	0.273	0.523	0.796	0.939	1.23	1.54	1.85	2.49	2.98
90.0	0.0210	0.106	0.220	0.349	0.630	0.931	1.09	1.40	1.73	2.06	2.73	3.25
75.0	0.0576	0.192	0.345	0.507	0.844	1.19	1.37	1.72	2.08	2.45	3.18	3.74
50.0	0.139	0.336	0.535	0.734	1.13	1.53	1.73	2.13	2.53	2.93	3.73	4.33
25.0	0.277	0.539	0.784	1.02	1.48	1.94	2.16	2.60	3.04	3.48	4.35	4.99
10.0	0.461	0.778	1.06	1.34	1.86	2.35	2.60	3.08	3.56	4.03	4.95	5.64
5.0	0.599	0.949	1.26	1.55	2.10	2.63	2.89	3.39	3.89	4.38	5.34	6.05
1.0	0.921	1.328	1.68	2.01	2.62	3.20	3.48	4.03	4.56	5.09	6.12	6.87

(continued)

Note: All values given in above table based on Pisson distribution as an approximation to the Binomial

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: N (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		Less than 0.025		0.025		0.040		X		0.065		0.10		0.15		0.25		0.40		0.65		X		1.0		X		1.5		X		2.5		Higher than 2.5		
		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	
Single	500	▽		0	1	Use Letter M		Use Letter Q		Use Letter P		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		500
Double	315	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		315
	630											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			630
Multiple	125	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		125
	250											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			250
	375											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			375
	500											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			500
	625											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			625
	750											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			750
	875											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			875

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number

Re = Rejection number

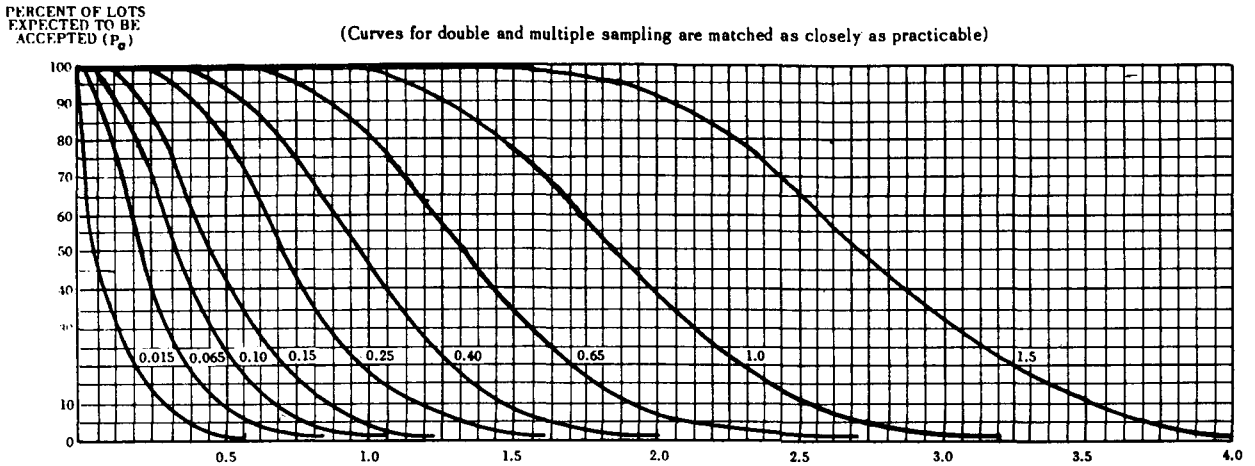
• = Use single sampling plan above (or alternatively use letter R).

= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: P



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)											
	0.015	0.065	0.10	0.15	0.25	0.40	X	0.65	X	1.0	X	1.5
	p(in percent defective or defects per hundred units)											
99.0	0.0013	0.0186	0.055	0.103	0.223	0.363	0.438	0.596	0.762	0.935	1.29	1.57
95.0	0.0064	0.0444	0.102	0.171	0.327	0.498	0.587	0.771	0.961	1.16	1.56	1.86
90.0	0.0131	0.0665	0.138	0.218	0.394	0.582	0.679	0.878	1.08	1.29	1.71	2.03
75.0	0.0360	0.120	0.216	0.317	0.527	0.745	0.855	1.08	1.30	1.53	1.99	2.34
50.0	0.0866	0.210	0.334	0.459	0.709	0.959	1.08	1.33	1.58	1.83	2.33	2.71
25.0	0.173	0.337	0.490	0.639	0.928	1.21	1.35	1.63	1.90	2.18	2.72	3.12
10.0	0.288	0.486	0.665	0.835	1.16	1.47	1.62	1.93	2.22	2.52	3.09	3.52
5.0	0.375	0.593	0.787	0.969	1.31	1.64	1.80	2.12	2.43	2.74	3.34	3.78
1.0	0.576	0.830	1.05	1.26	1.64	2.00	2.18	2.52	2.85	3.18	3.82	4.29

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: P (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		0.010		0.015		0.025				0.040		0.065		0.10		0.15		0.25		0.40				0.65				1.0				1.5		Higher than 1.5		
		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	
Single	800	▽		0	1	Use Letter N		Use Letter R		Use Letter Q		1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		800
Double	500	▽		•								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		500
	1000											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			1000
Multiple	200	▽		•								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		200
	400											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			400
	600											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			600
	800											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			800
	1000											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			1000
	1200											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			1200
	1400											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			1400

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

▽ = Use next subsequent sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number.

Re = Rejection number.

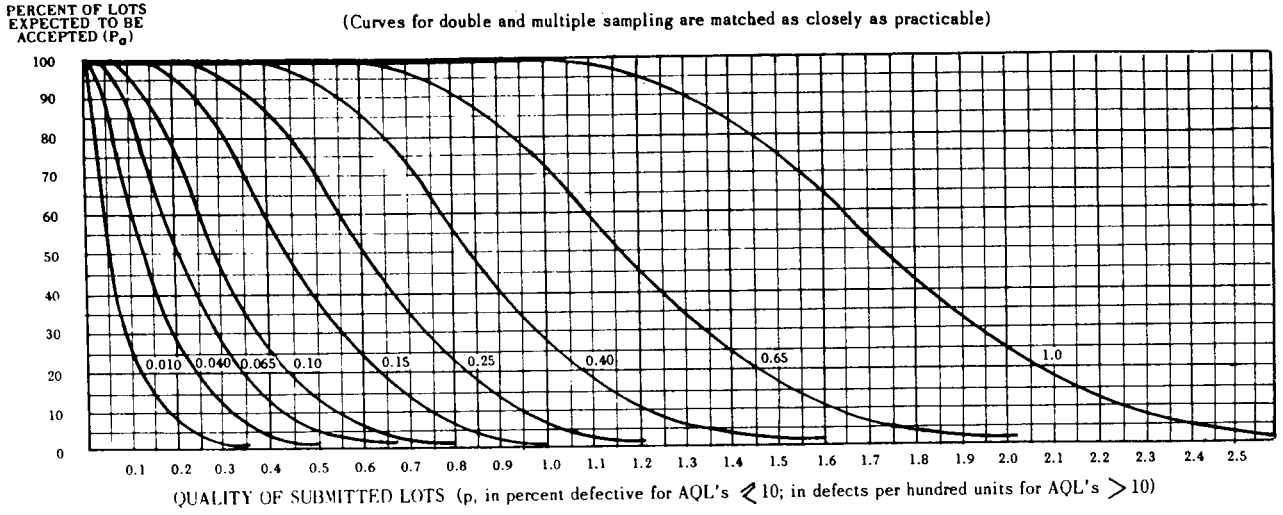
• = Use single sampling plan above.

= Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: Q



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection)

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)											
	0.010	0.040	0.065	0.10	0.15	0.25	X	0.40	X	0.65	X	1.0
	p (in percent defective or defects per hundred units											
99.0	0.00081	0.0119	0.0349	0.0656	0.143	0.232	0.281	0.382	0.488	0.598	0.828	1.01
95.0	0.00410	0.0284	0.0654	0.109	0.209	0.318	0.376	0.494	0.615	0.740	0.995	1.19
90.0	0.00840	0.0426	0.0882	0.140	0.252	0.372	0.435	0.562	0.692	0.824	1.09	1.30
75.0	0.0230	0.0769	0.138	0.203	0.338	0.476	0.547	0.690	0.834	0.979	1.27	1.49
50.0	0.0554	0.134	0.214	0.294	0.454	0.614	0.694	0.853	1.01	1.17	1.49	1.73
25.0	0.111	0.215	0.314	0.409	0.594	0.775	0.864	1.04	1.22	1.39	1.74	2.00
10.0	0.184	0.310	0.426	0.534	0.742	0.942	1.04	1.23	1.42	1.61	1.98	2.25
5.0	0.240	0.380	0.504	0.620	0.841	1.05	1.15	1.36	1.56	1.75	2.14	2.42
1.0	0.368	0.531	0.672	0.804	1.05	1.28	1.83	1.61	1.83	2.04	2.45	2.75

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: Q (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		X		0.010		0.015		X		0.025		0.040		0.065		0.10		0.15		0.25		X		0.40		X		0.65		X		1.0		Higher than 1.0		
		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	
Single	1250	Use Letter R		0	1	Use Letter P	Use Letter S		Use Letter R			1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		1250
Double	800			*								0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		800
	1600											1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			1600
Multiple	315			*								#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		315
	630											#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			630
	945											0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			945
	1260											0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			1260
	1575											1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			1575
	1890											1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			1890
	2205											2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			2205

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available

Ac = Acceptance number

Re = Rejection number

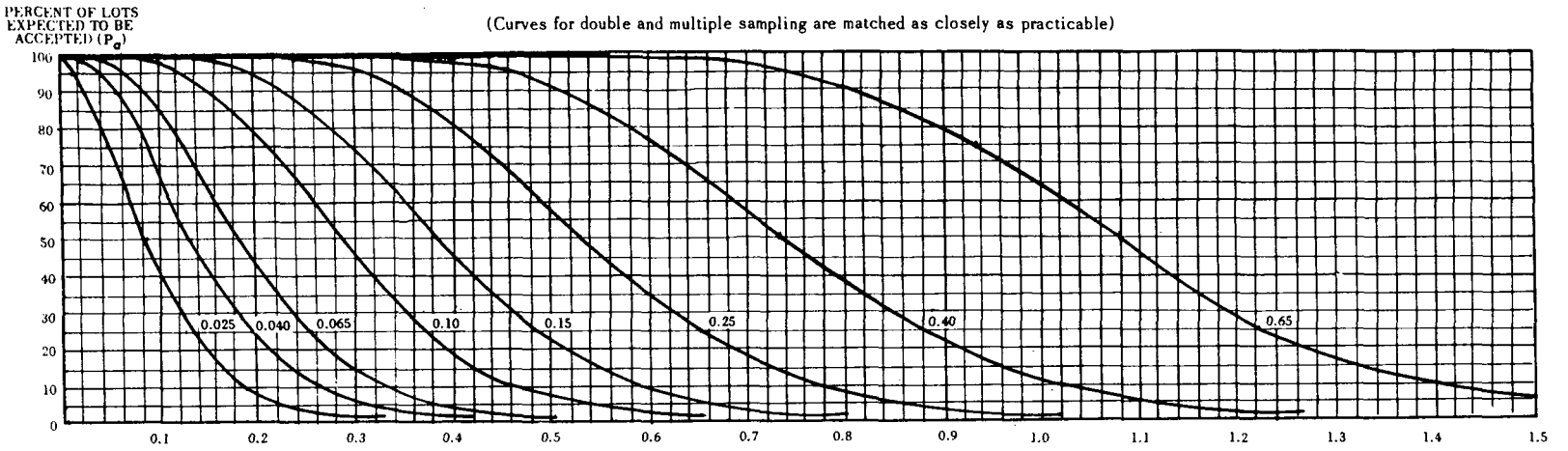
* = Use single sampling plan above.

\# = Acceptance not permitted at this sample size.

(continued)

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sample Size Code Letter: R



Note: Figures on curves are Acceptable Quality Levels (AQL's) for normal inspection.

Tabulated Values for Operating Characteristic Curves for Single Sampling Plans

P_a	Acceptable Quality Levels (normal inspection)										
	0.025	0.040	0.065	0.10	0.15	×	0.25	×	0.40	×	0.65
	p (in percent defective or defects per hundred units)										
99.0	0.0074	0.0218	0.0412	0.0892	0.145	0.175	0.239	0.305	0.374	0.517	0.629
95.0	0.0178	0.0409	0.0683	0.131	0.199	0.235	0.309	0.385	0.462	0.622	0.745
90.0	0.0266	0.0551	0.0873	0.158	0.233	0.272	0.351	0.432	0.515	0.684	0.812
75.0	0.0481	0.0868	0.127	0.211	0.298	0.342	0.431	0.521	0.612	0.795	0.934
50.0	0.0839	0.134	0.184	0.284	0.384	0.433	0.533	0.633	0.733	0.933	1.08
25.0	0.135	0.196	0.256	0.371	0.484	0.540	0.651	0.761	0.870	1.09	1.25
10.0	0.195	0.266	0.334	0.464	0.589	0.650	0.770	0.889	1.01	1.24	1.41
5.0	0.237	0.315	0.388	0.526	0.657	0.722	0.848	0.972	1.09	1.33	1.51
1.0	0.332	0.420	0.502	0.655	0.800	0.870	1.02	1.14	1.27	1.53	1.72

(continued)

Note: All values given in above table based on Poisson distribution as an approximation to the Binomial.

TABLE 3: OPERATING CHARACTERISTIC CURVES FOR ATTRIBUTES SINGLE SAMPLING PLANS (continued)

Sampling Plans for Sample Size Code Letter: R (continued)

Type of sampling plan	Cumulative sample size	Acceptable Quality Levels (normal inspection)																												Cumulative sample size
		X		0.010		0.015		X		0.025		0.040		0.065		0.10		0.15		X		0.25		X		0.40		X		0.65		Higher than 0.65		
		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	
Single	2000	0	1							1	2	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	15	18	19	21	22	△		2000
Double	1250									0	2	0	3	1	4	2	5	3	7	3	7	5	9	6	10	7	11	9	14	11	16	△		1250
	2500	*								1	2	3	4	4	5	6	7	8	9	11	12	12	13	15	16	18	19	23	24	26	27			2500
Multiple	500									#	2	#	2	#	3	#	4	0	4	0	4	0	5	0	6	1	7	1	8	2	9	△		500
	1000									#	2	0	3	0	3	1	5	1	6	2	7	3	8	3	9	4	10	6	12	7	14			1000
	1500									0	2	0	3	1	4	2	6	3	8	4	9	6	10	7	12	8	13	11	17	13	19			1500
	2000	*								0	3	1	4	2	5	3	7	5	10	6	11	8	13	10	15	12	17	16	22	19	25			2000
	2500									1	3	2	4	3	6	5	8	7	11	9	12	11	15	14	17	17	20	22	25	25	29			2500
	3000									1	3	3	5	4	6	7	9	10	12	12	14	14	17	18	20	21	23	27	29	31	33			3000
	3500									2	3	4	5	6	7	9	10	13	14	14	15	18	19	21	22	25	26	32	33	37	38			3500

Use Letter Q | Use Letter P | Use Letter S

△ = Use next preceding sample size code letter for which acceptance and rejection numbers are available.

Ac = Acceptance number.

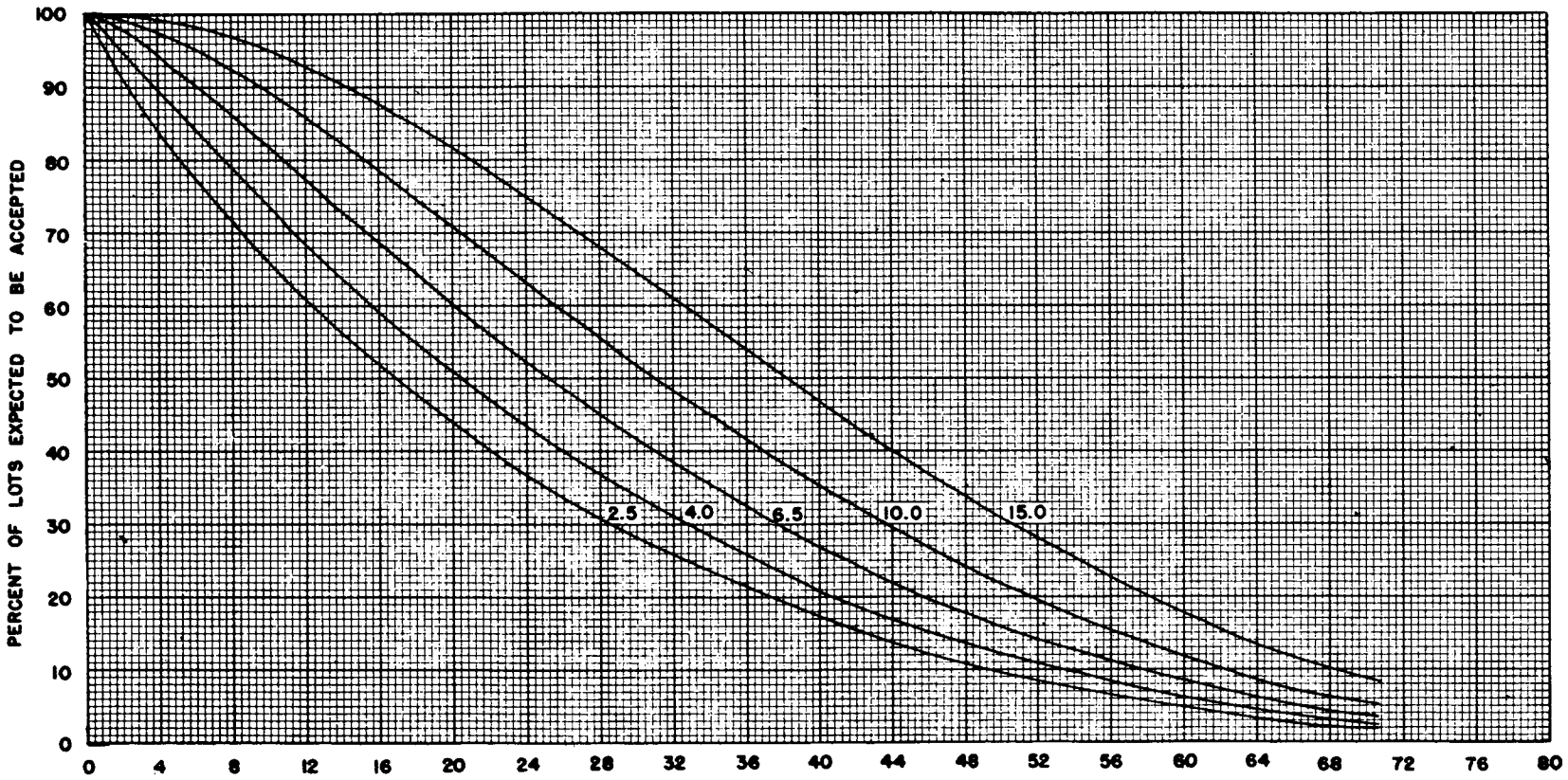
Re = Rejection number.

* = Use single sampling plan above.

\# = Acceptance not permitted at this sample size.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD

Sample Size Code Letter: B



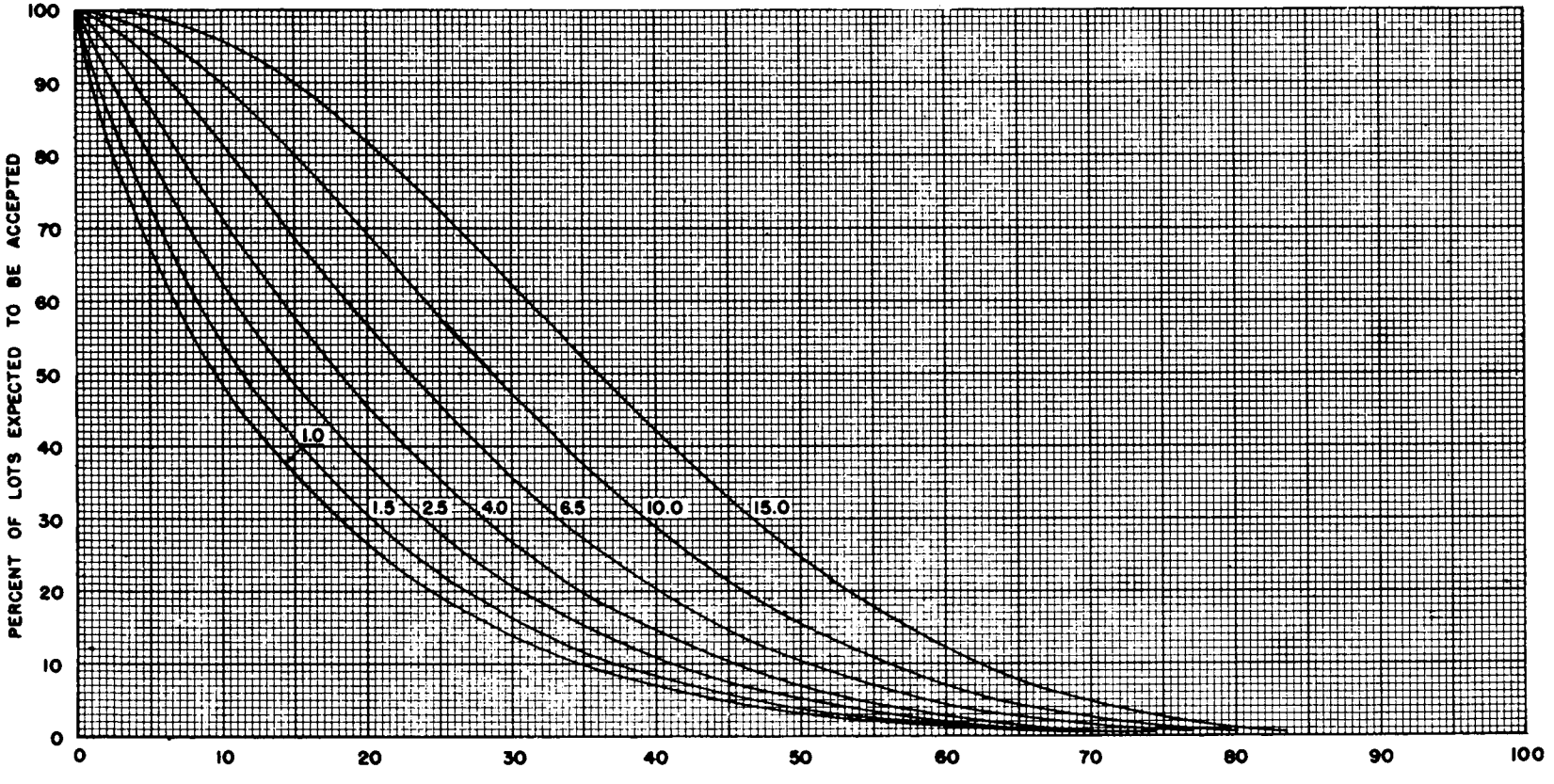
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: C



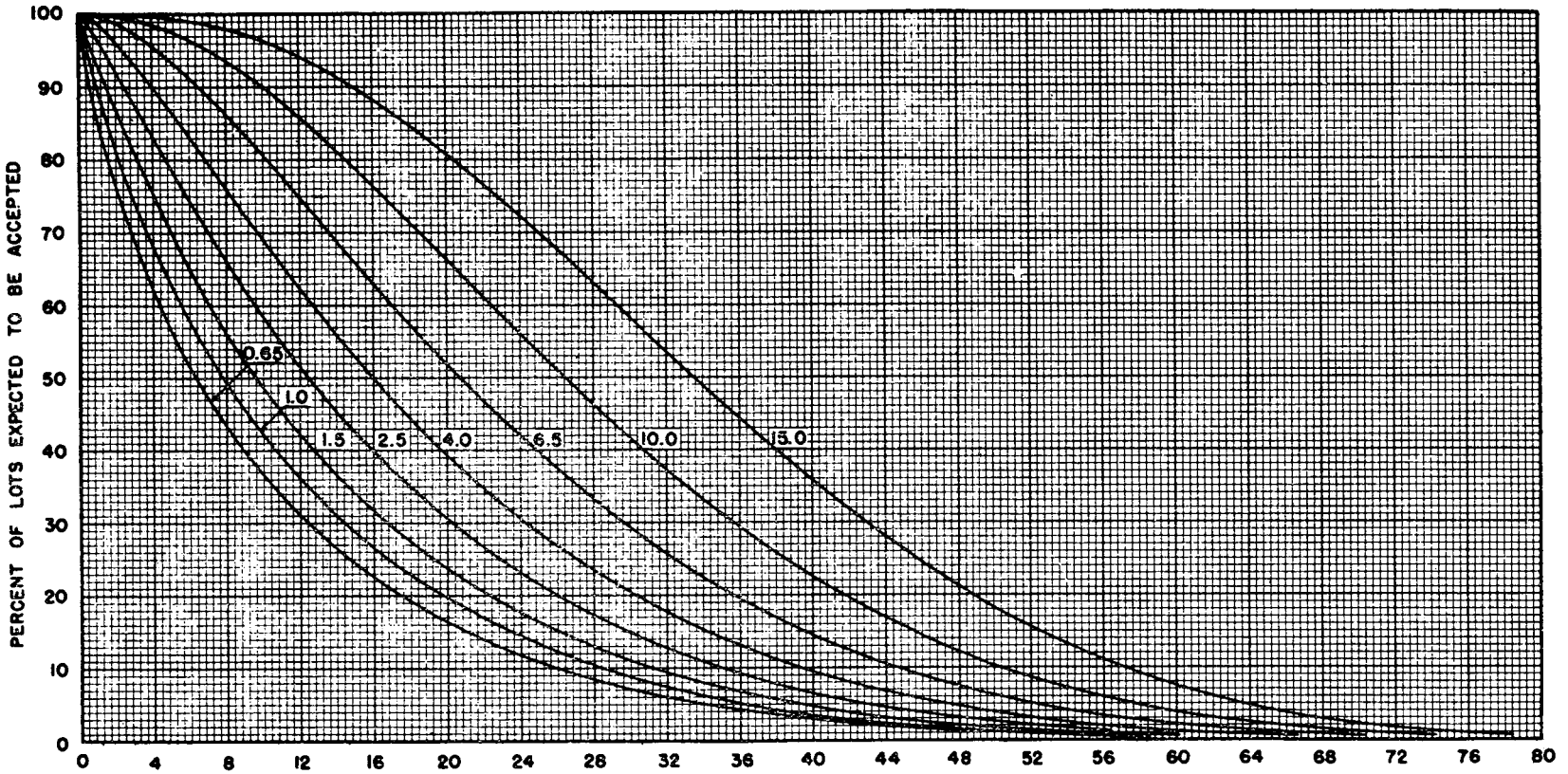
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: D



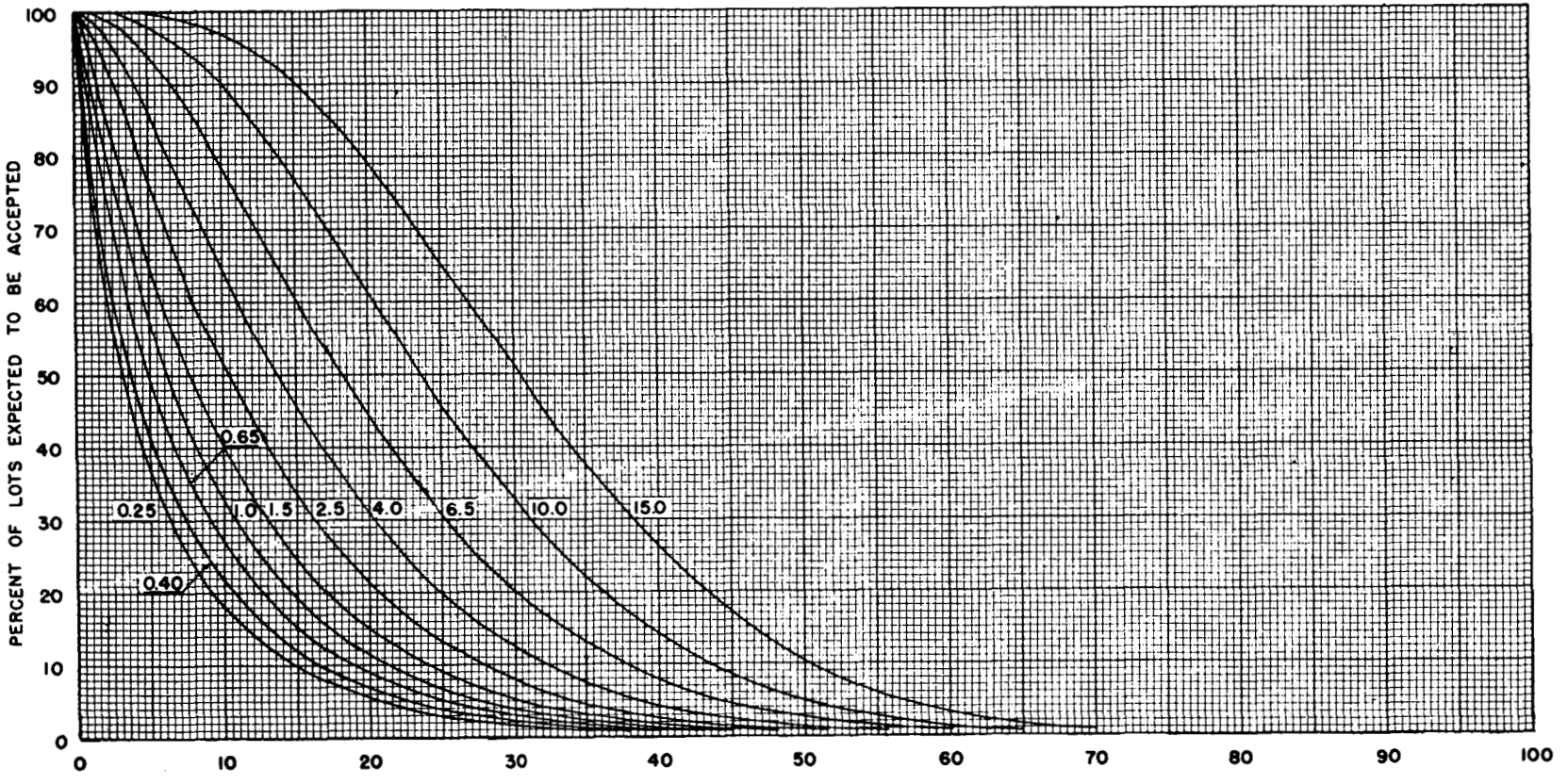
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: E



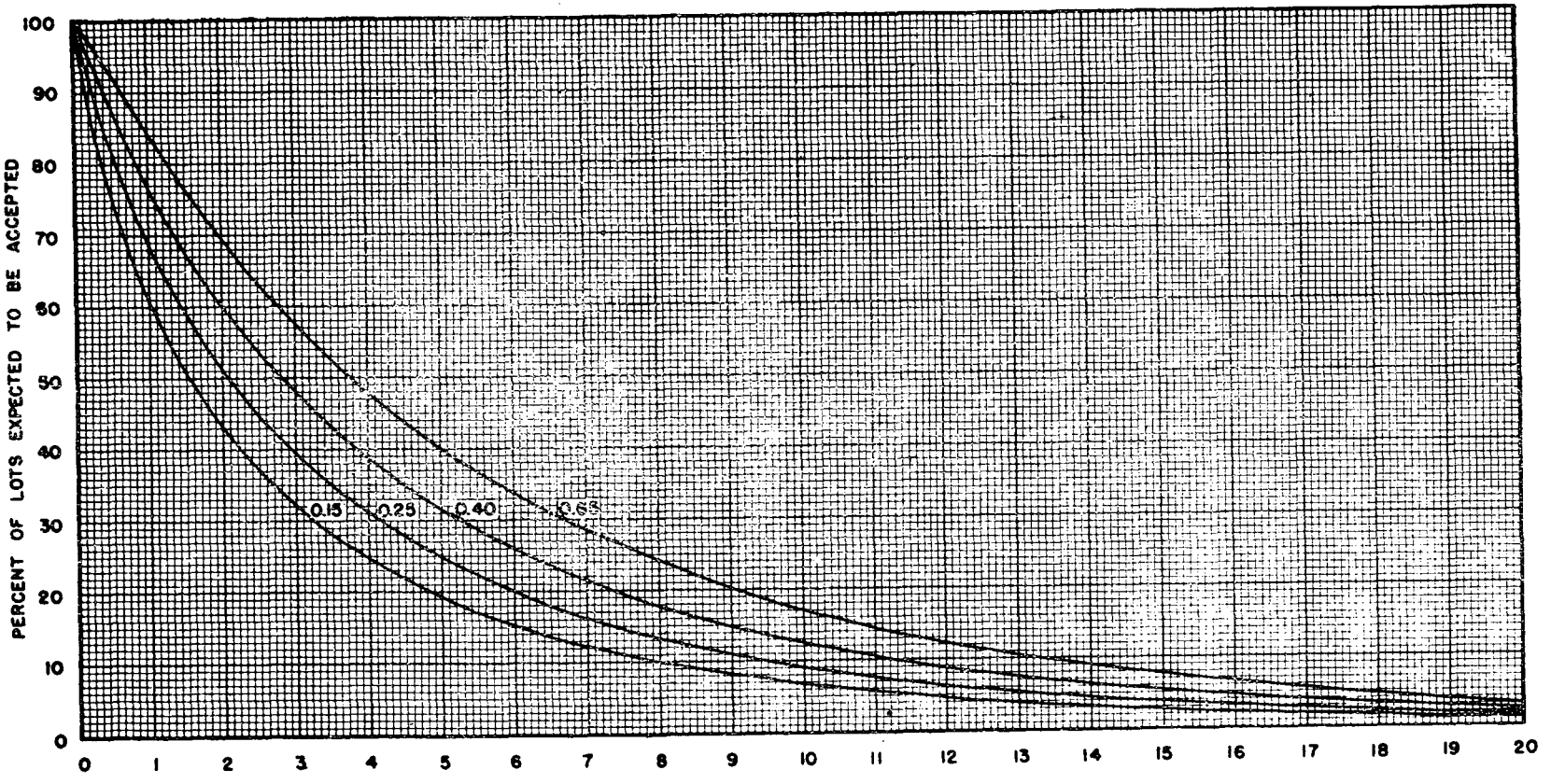
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: F



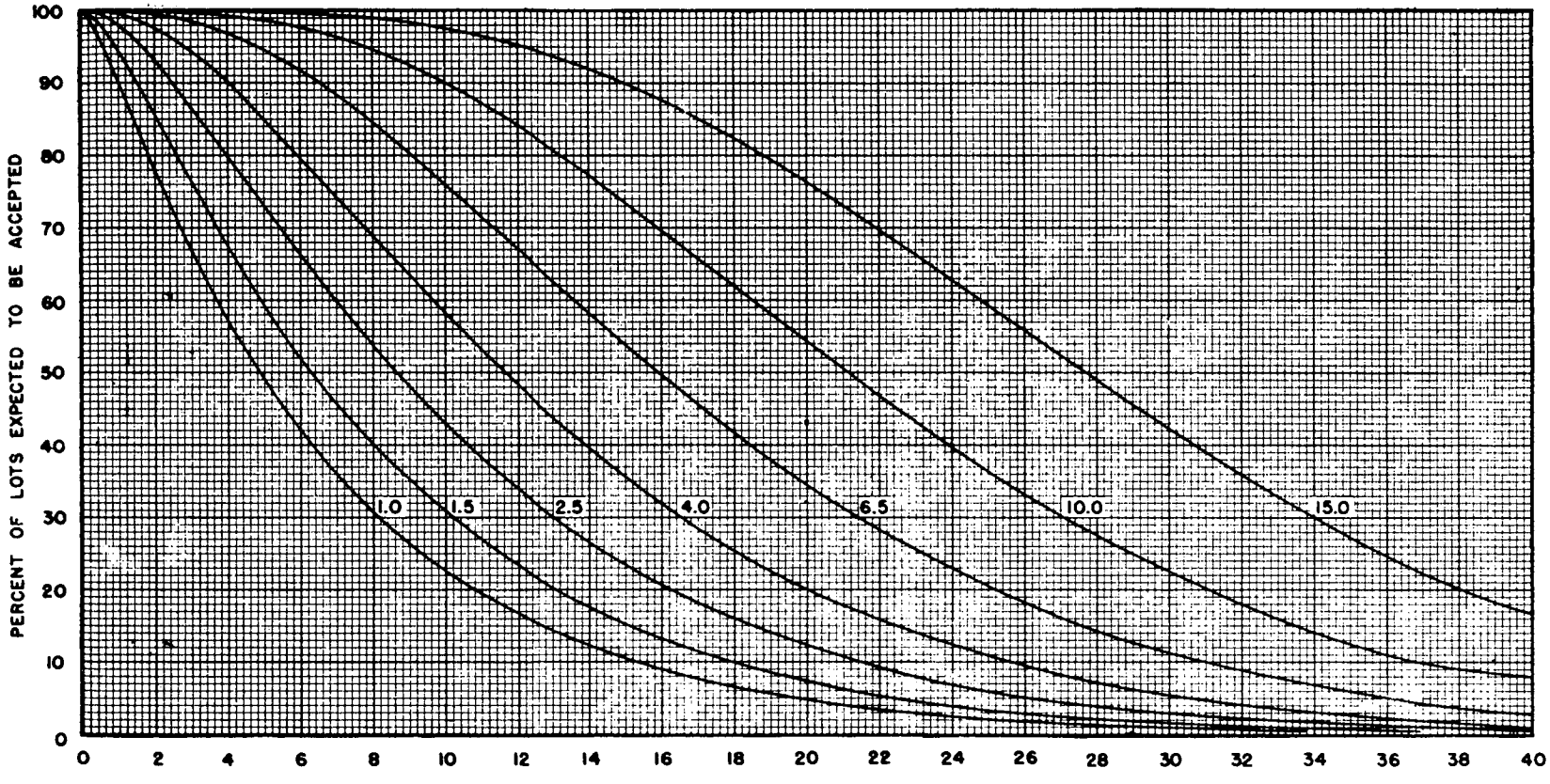
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: F (continued)



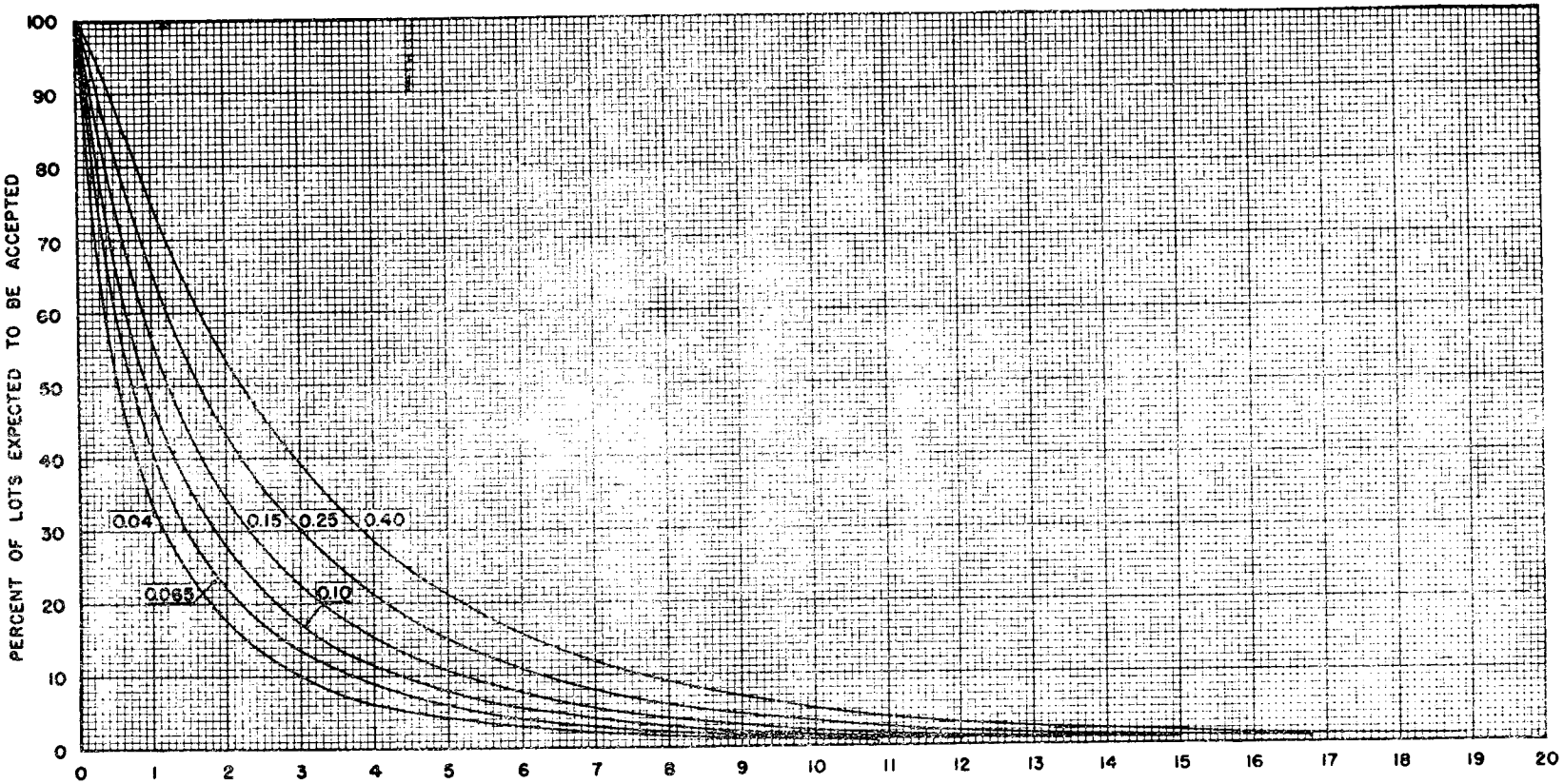
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: G



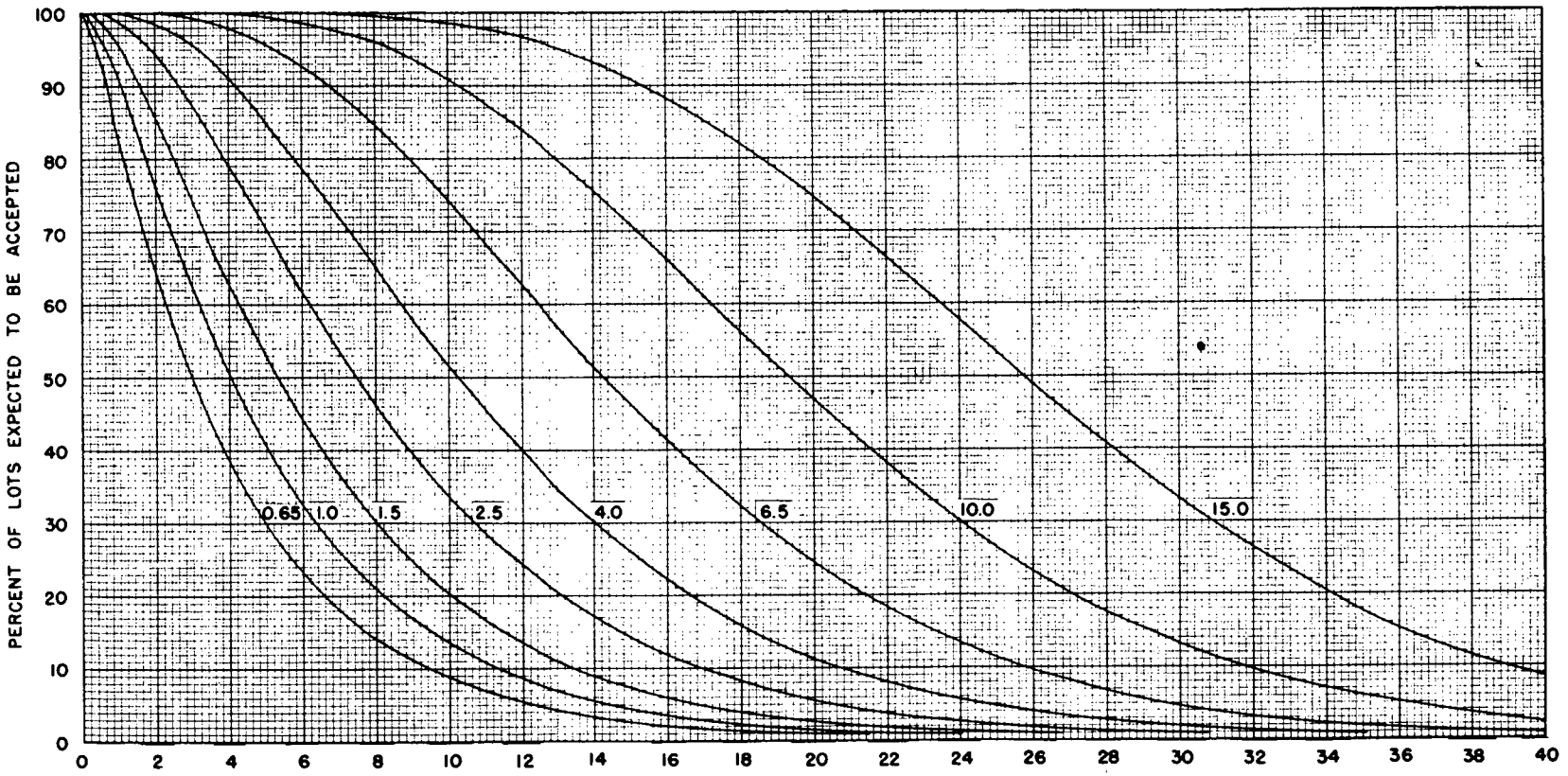
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: G (continued)



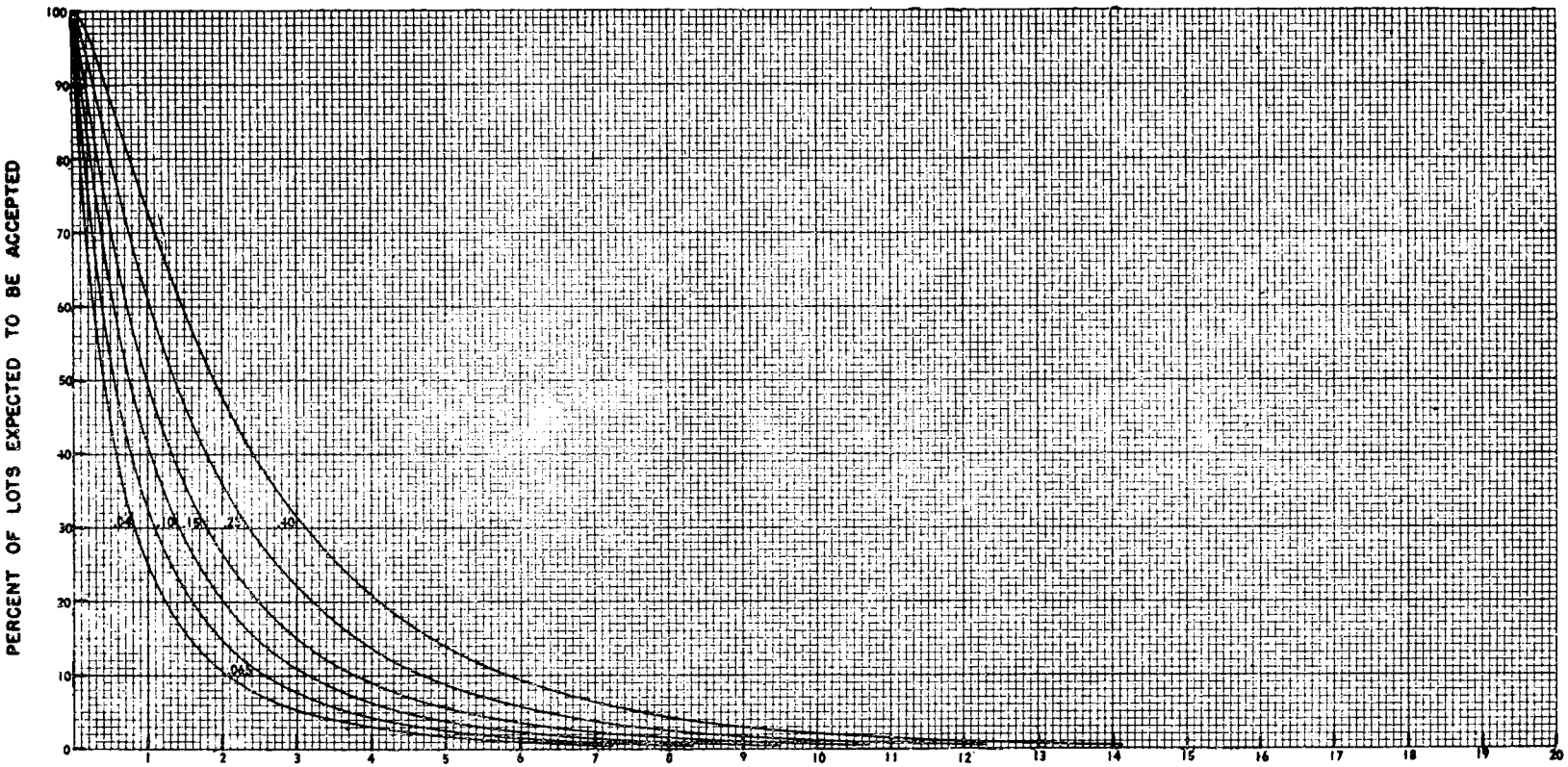
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: H



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

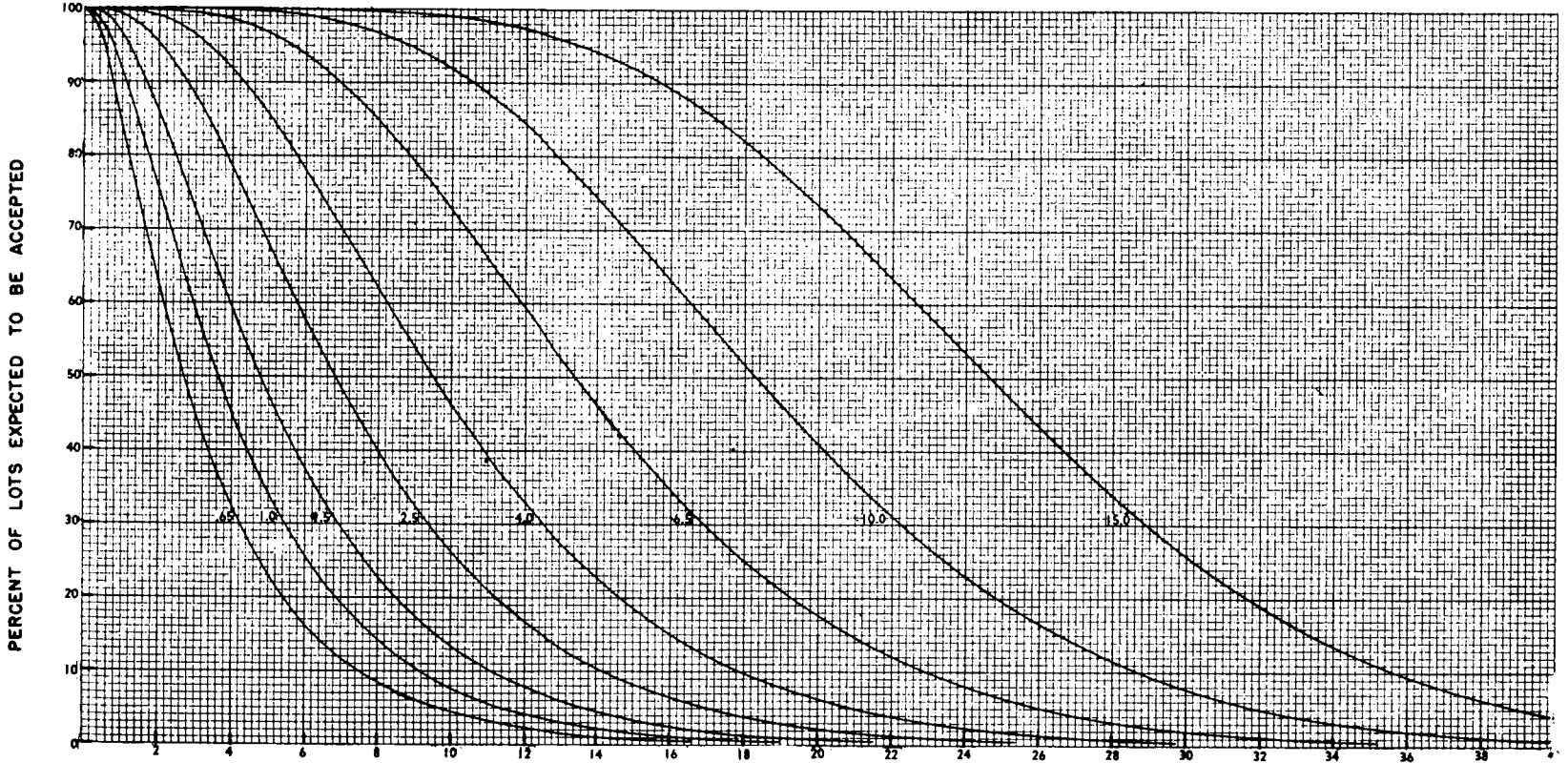
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD(continued)

Sample Size Code Letter: H (continued)



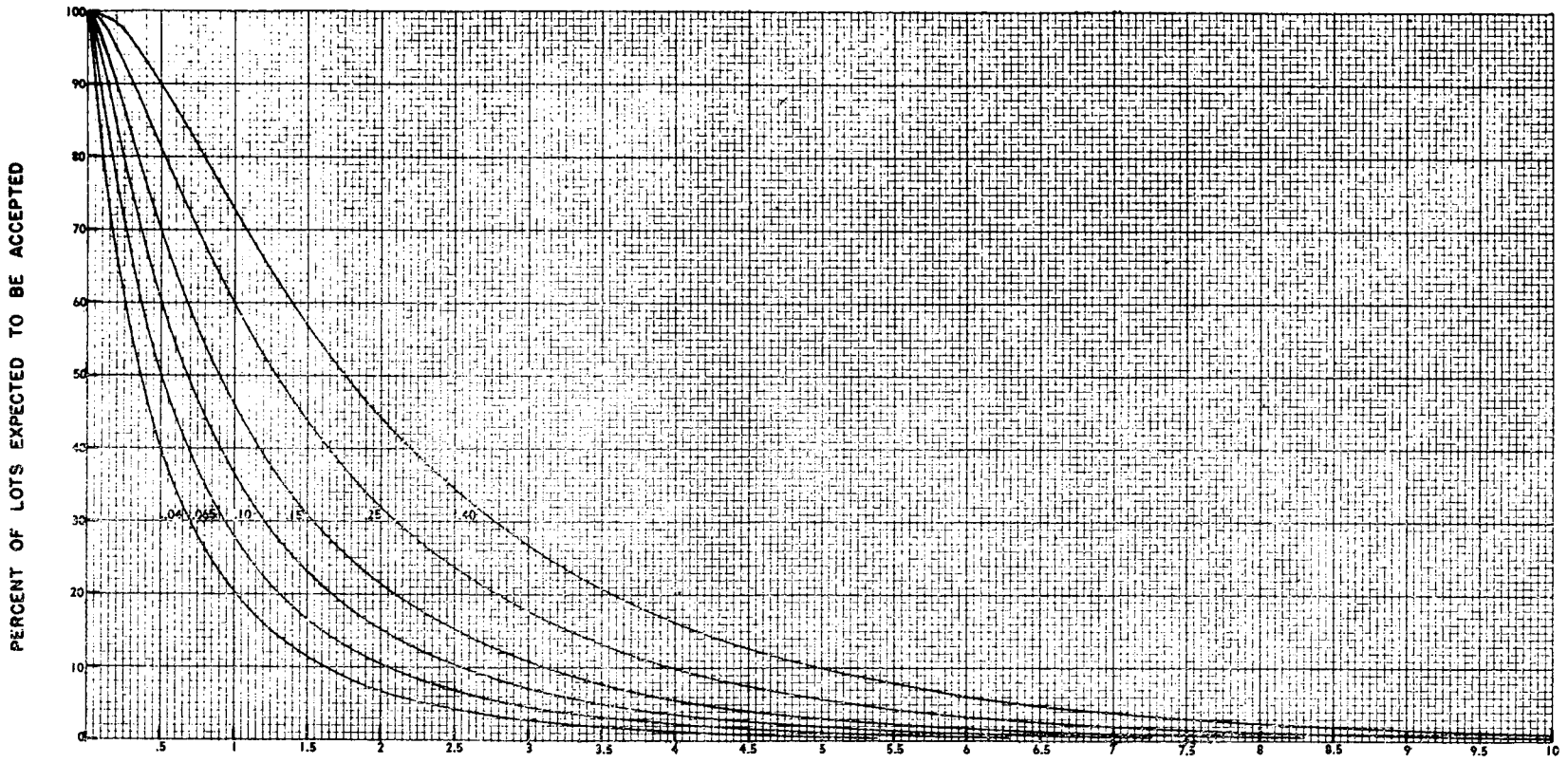
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: I



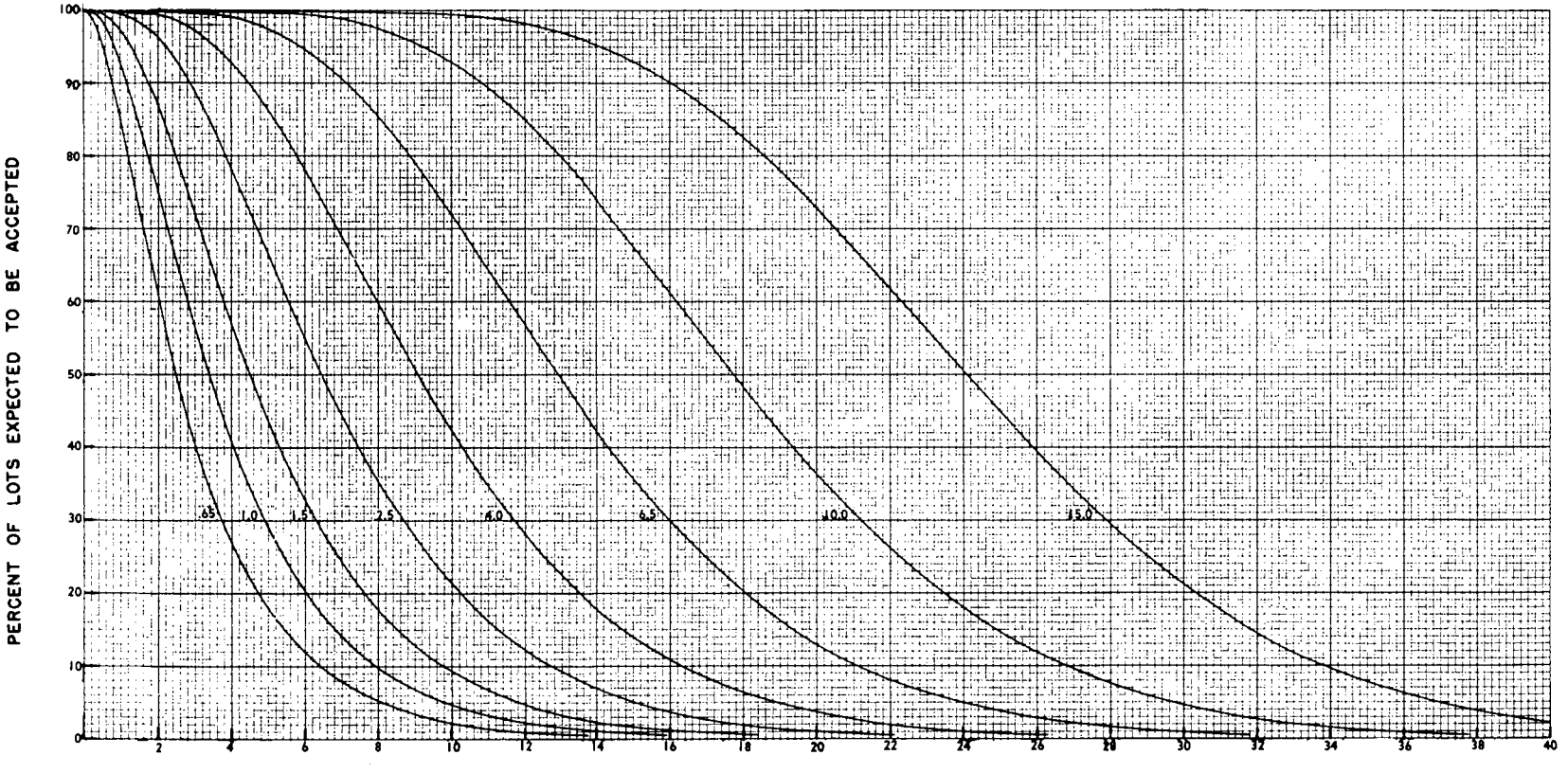
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: I (continued)



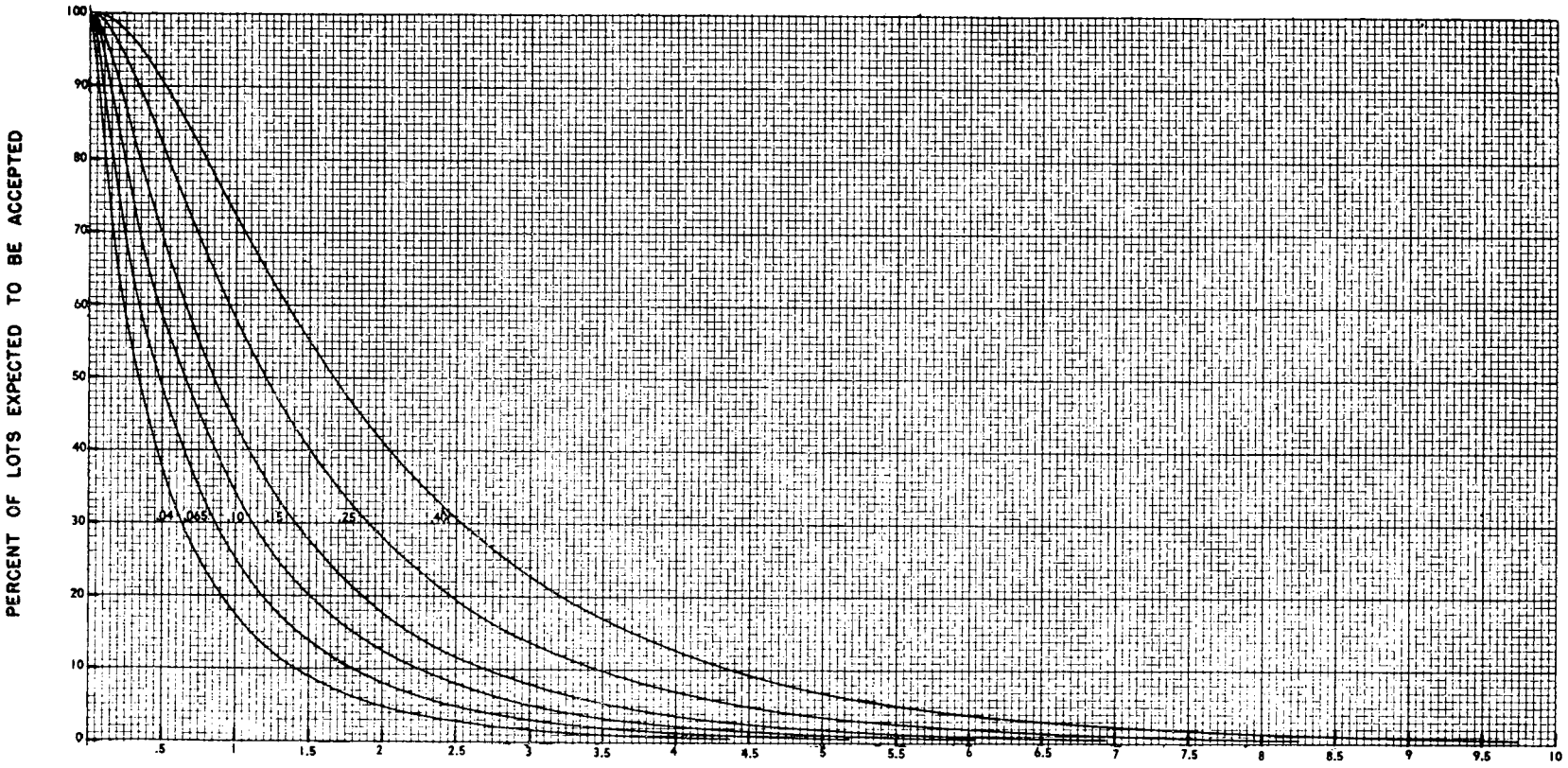
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: J



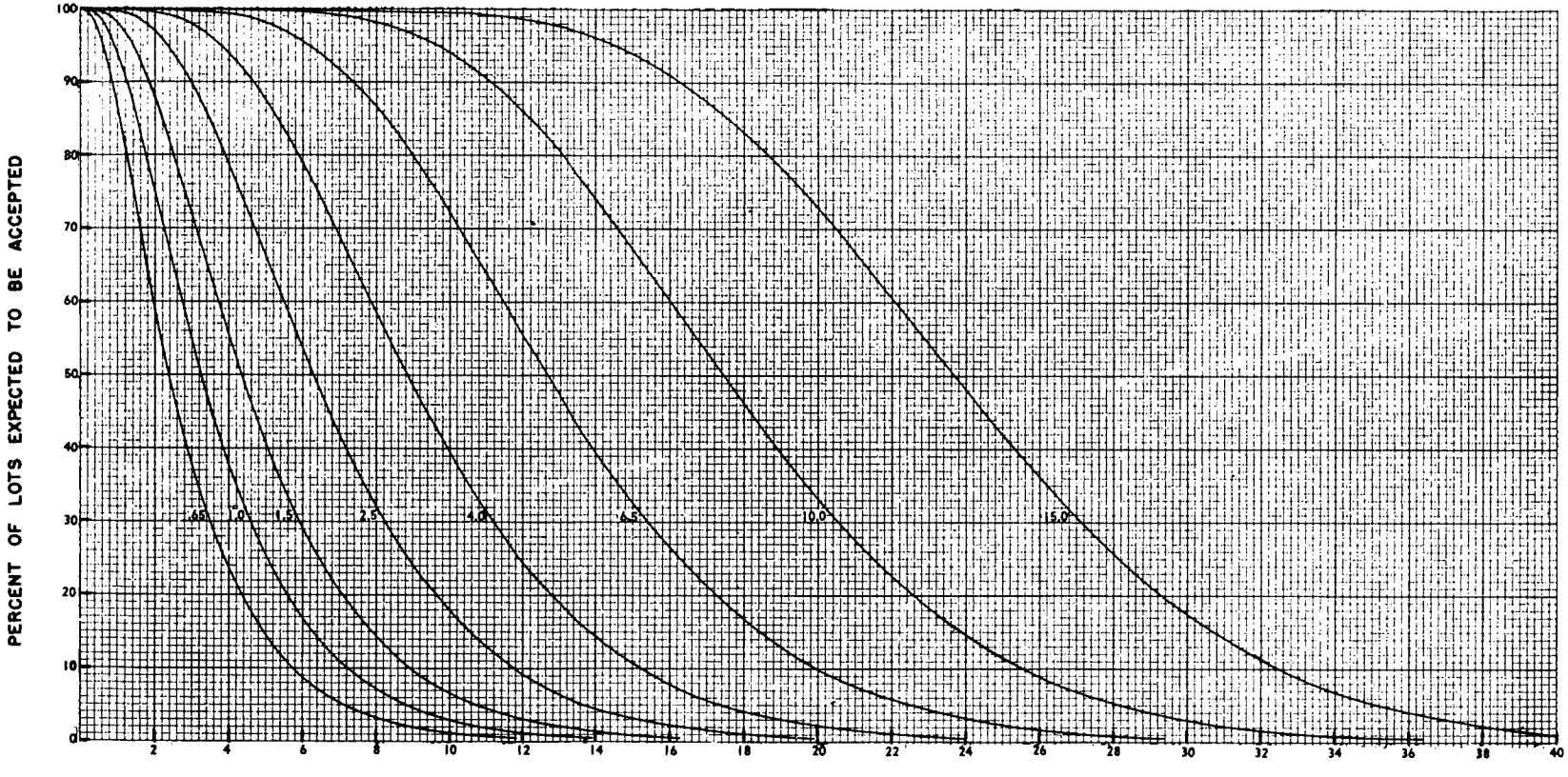
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: J (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

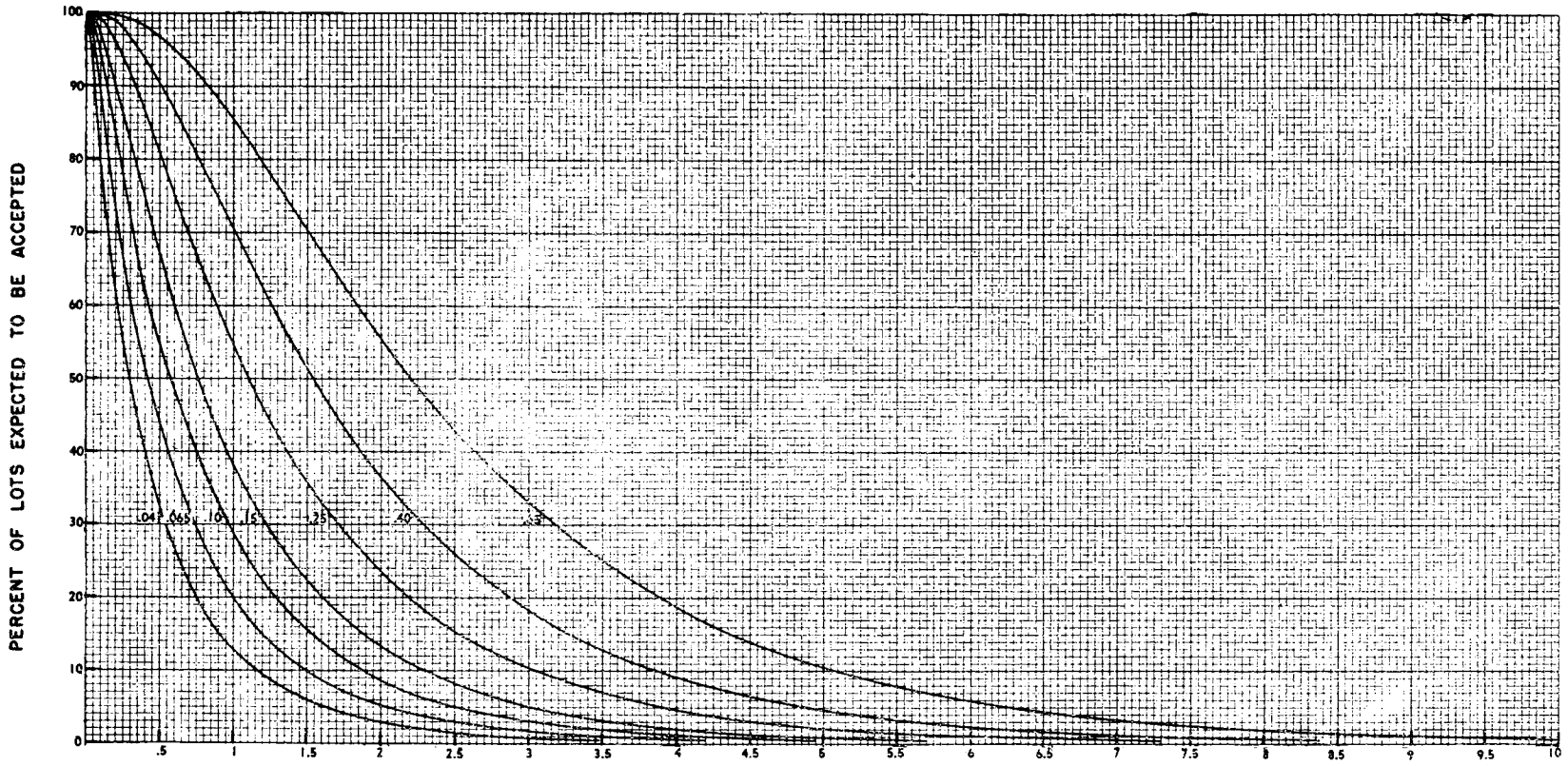
QUALITY OF SUBMITTED LOTS (in percent defective)

Note: Figurer on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: K



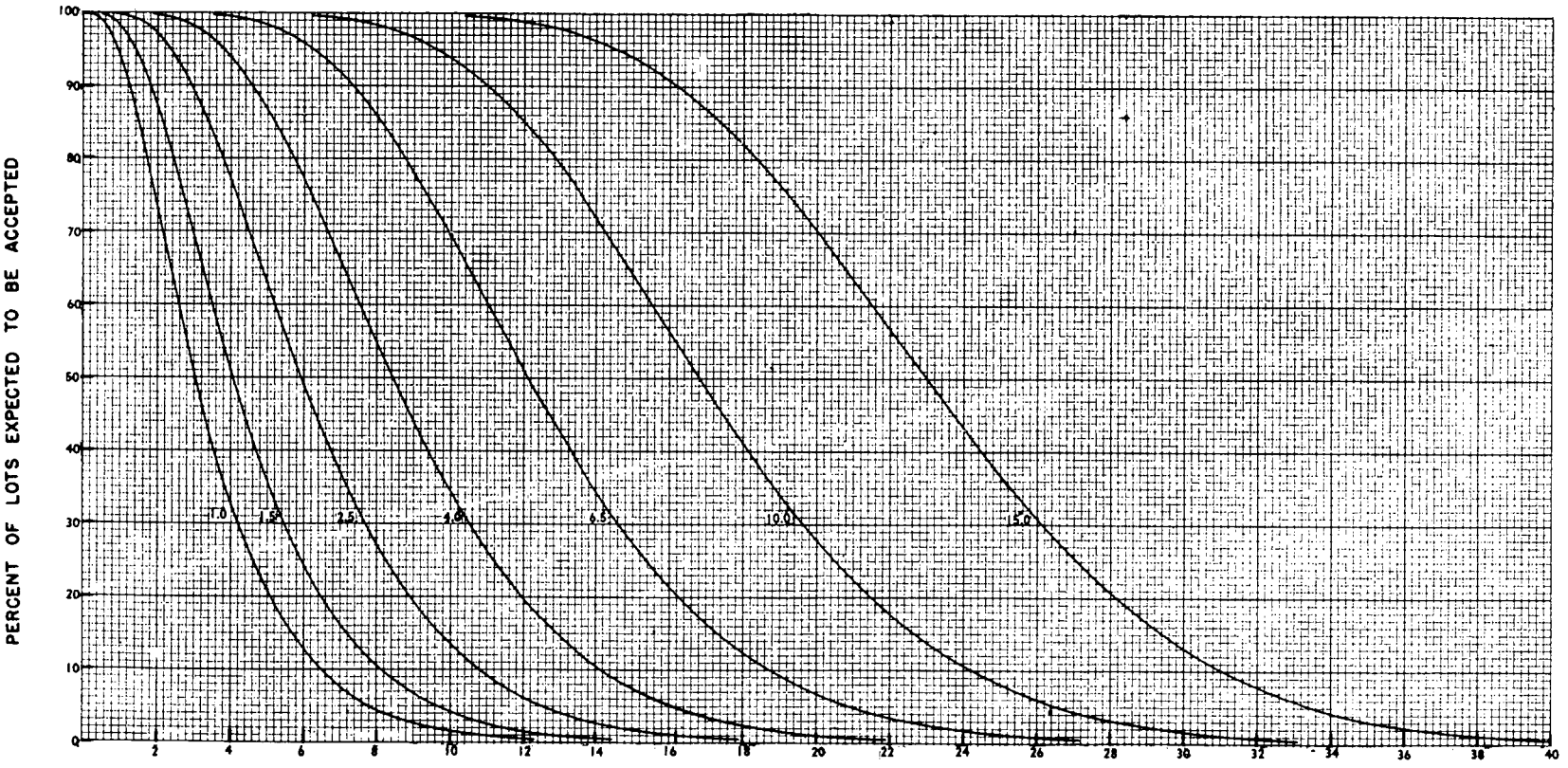
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: K (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

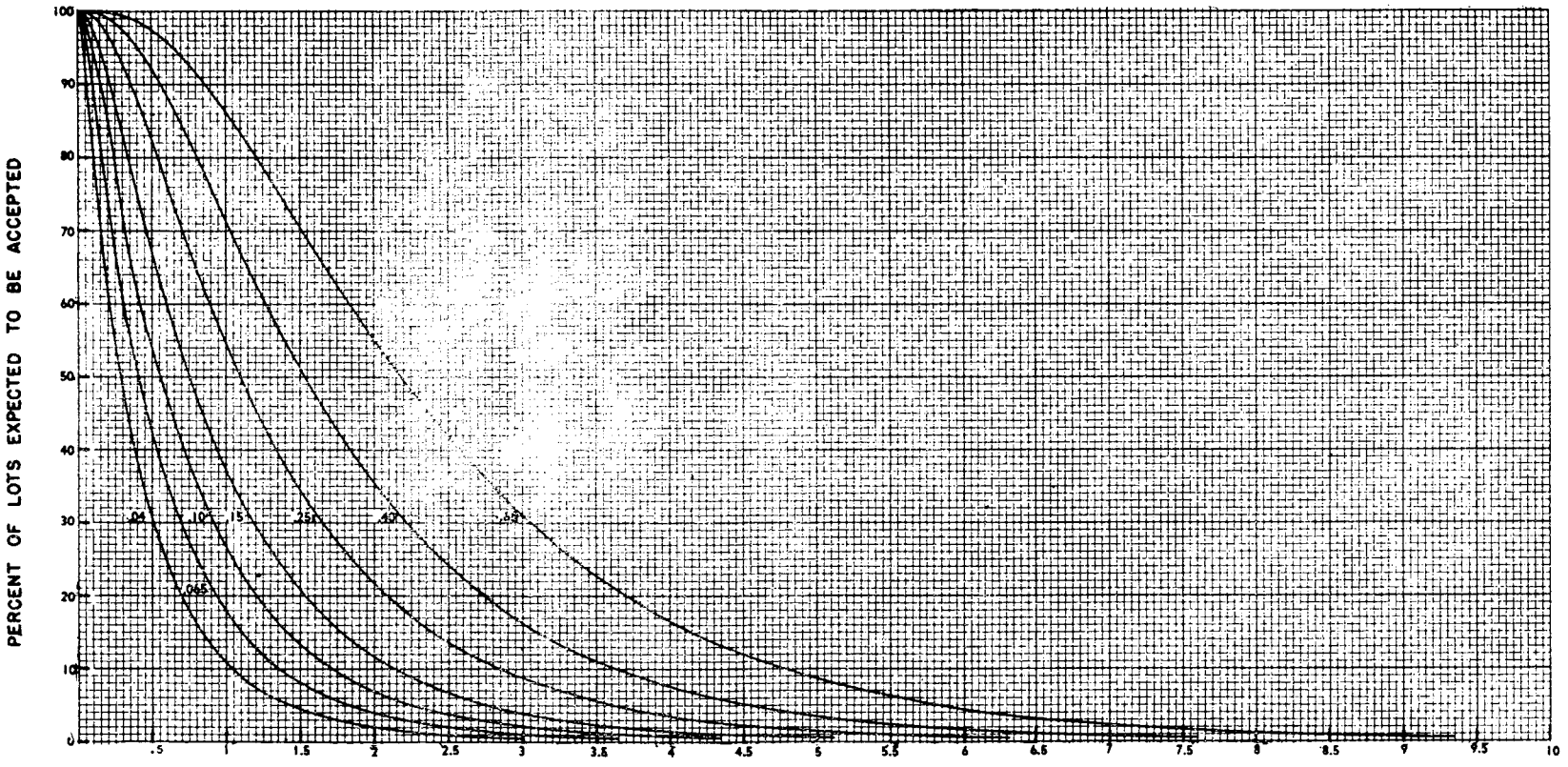
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: L



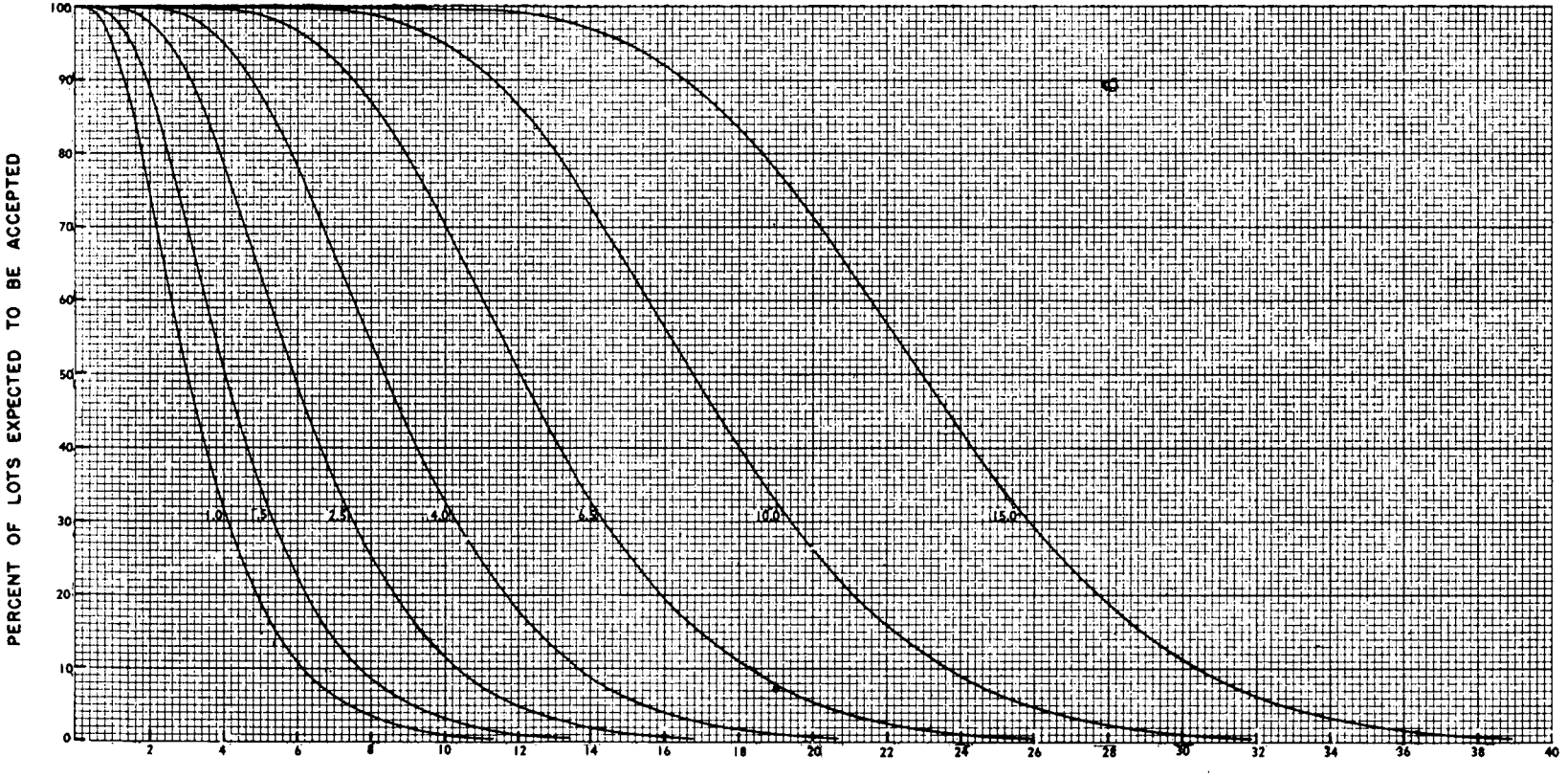
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: L (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

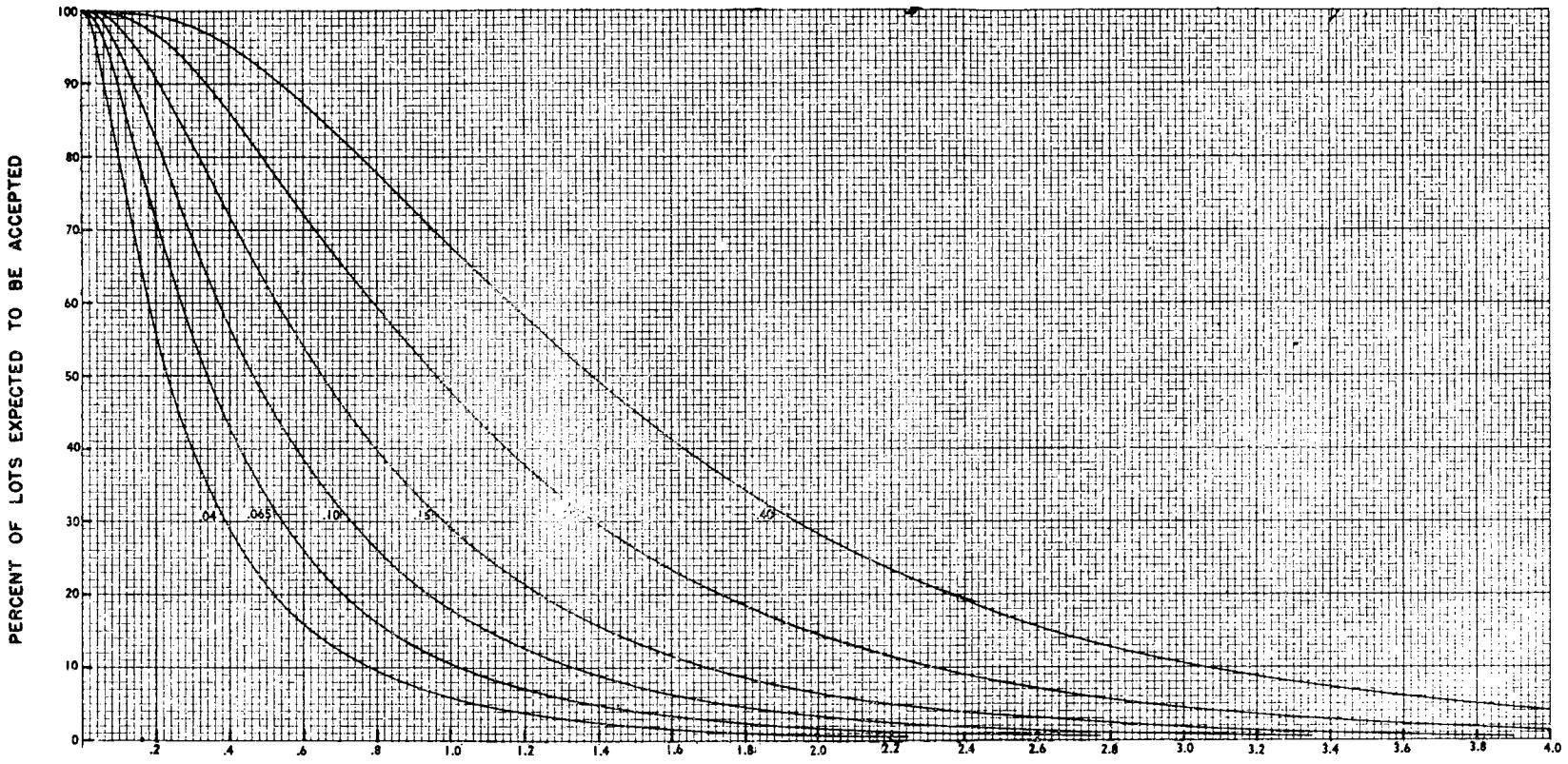
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: M



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

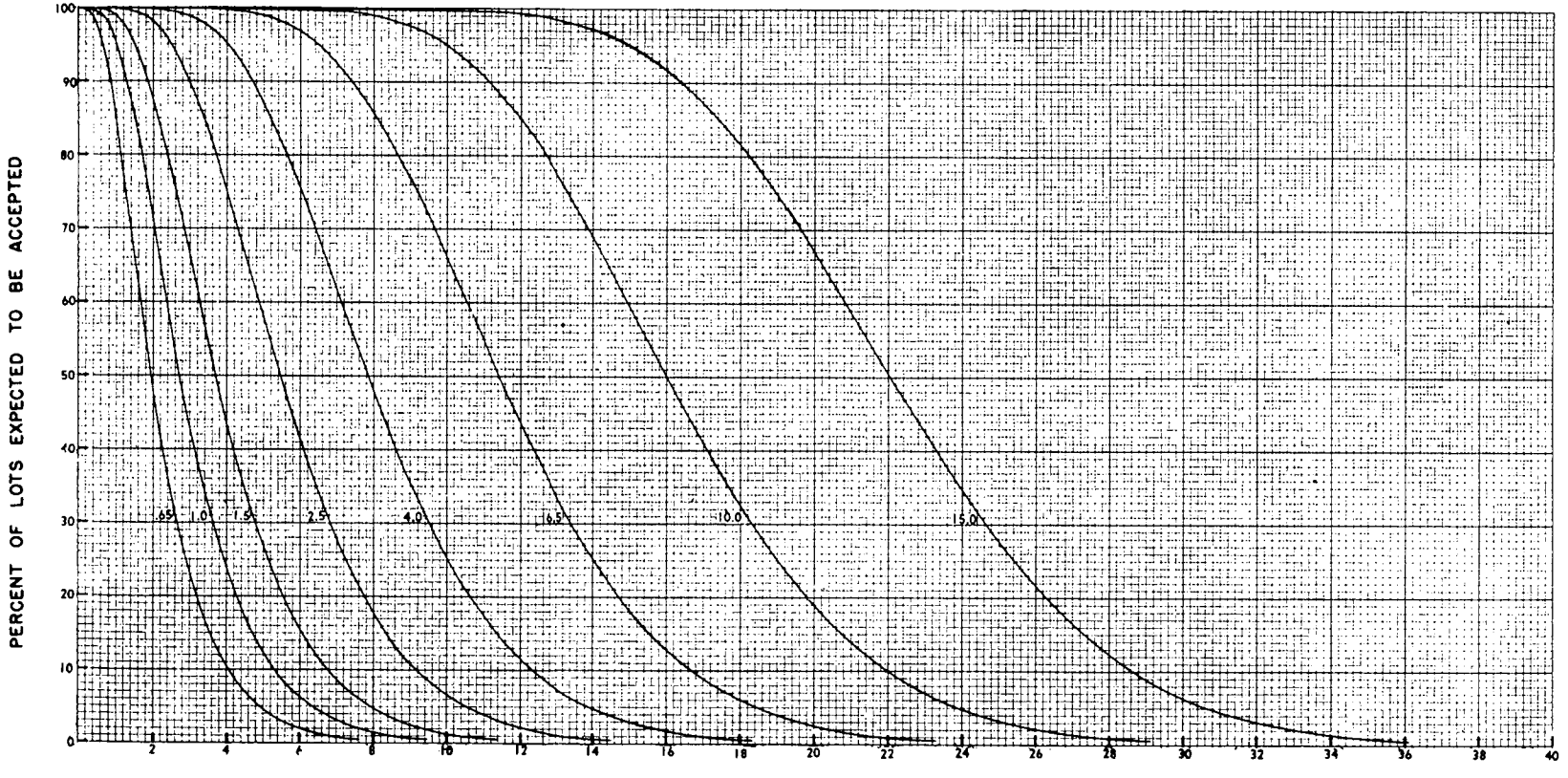
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: M (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

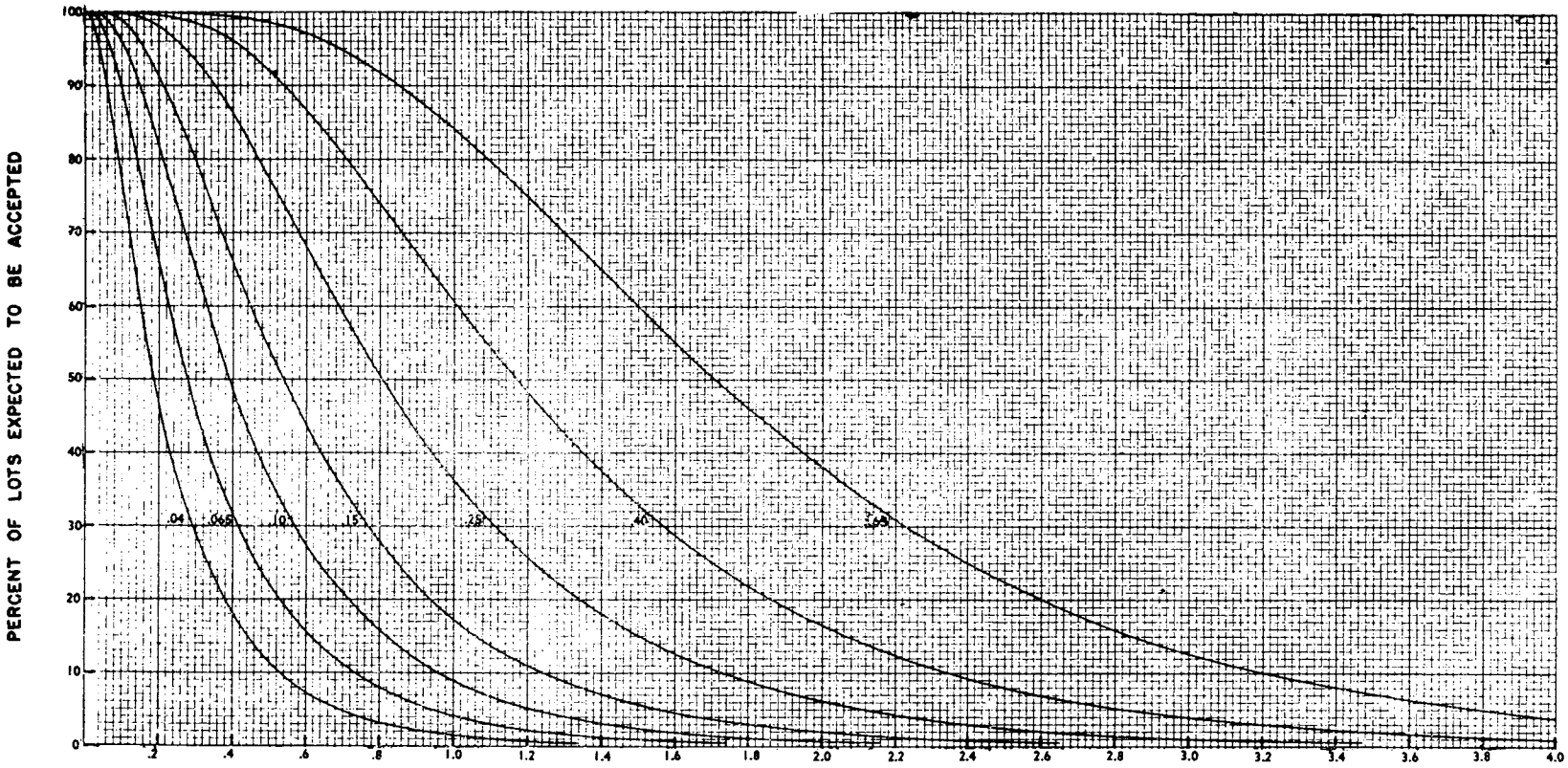
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: N



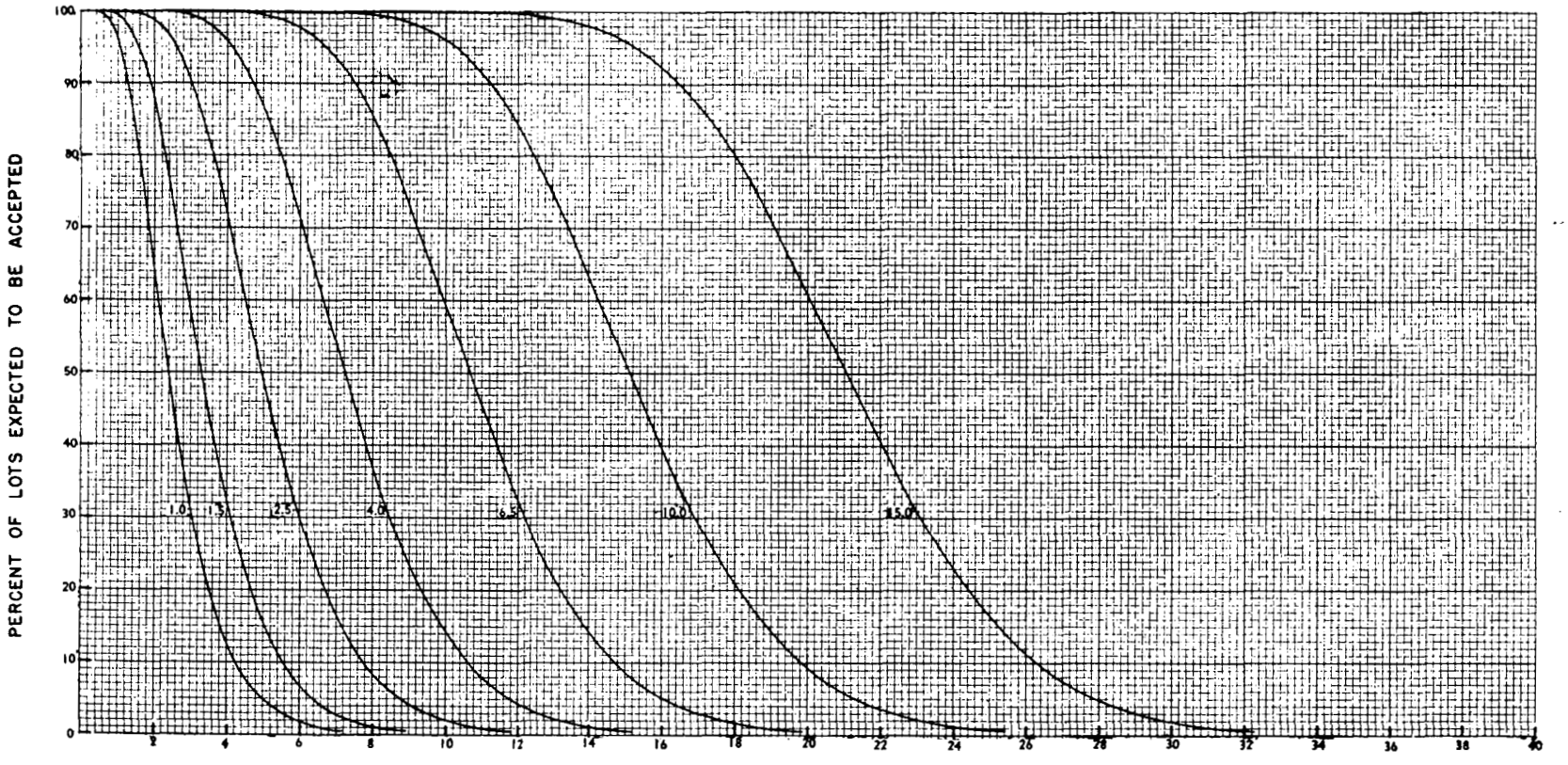
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

(continued)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: N (continued)



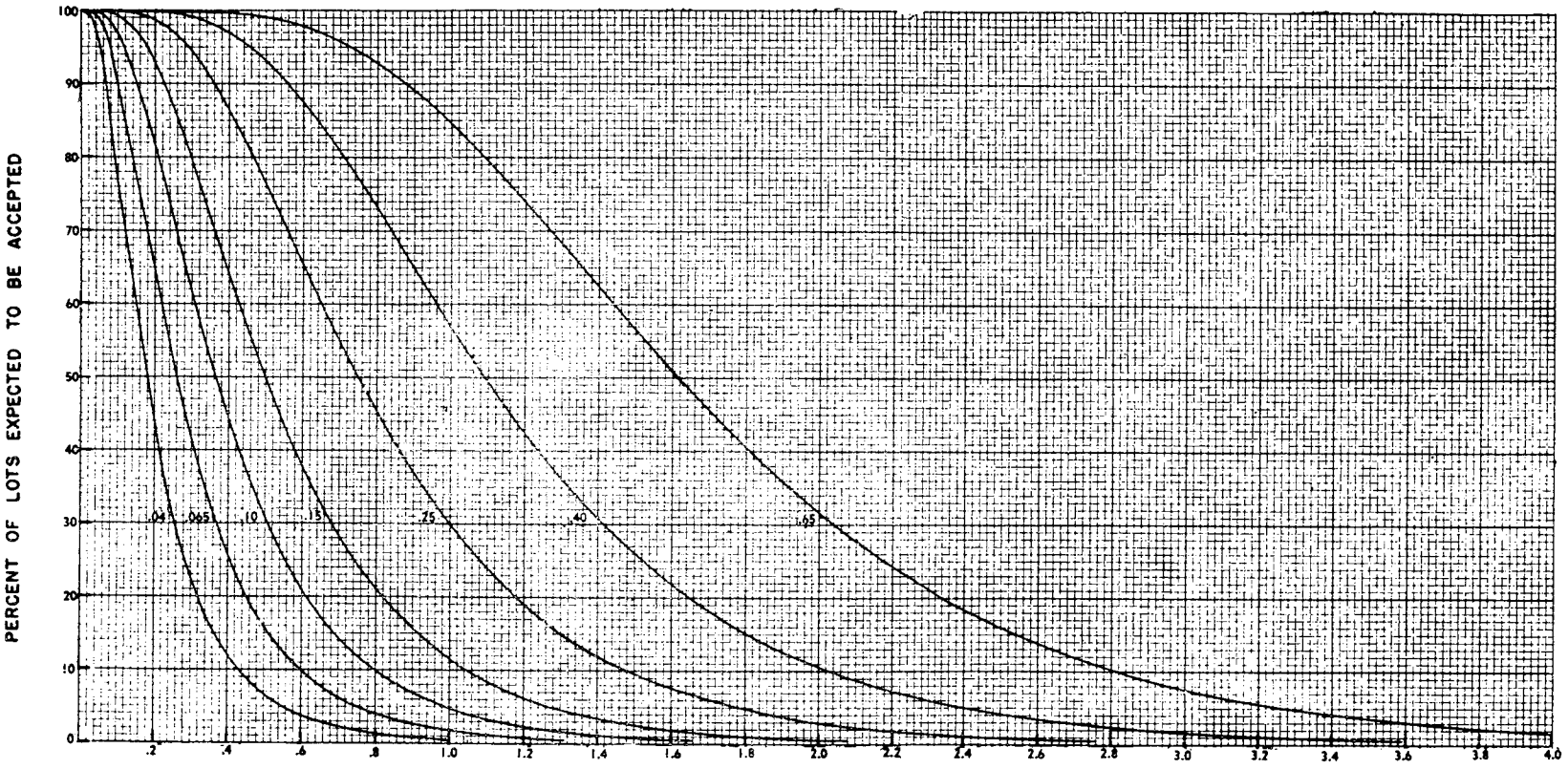
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: O



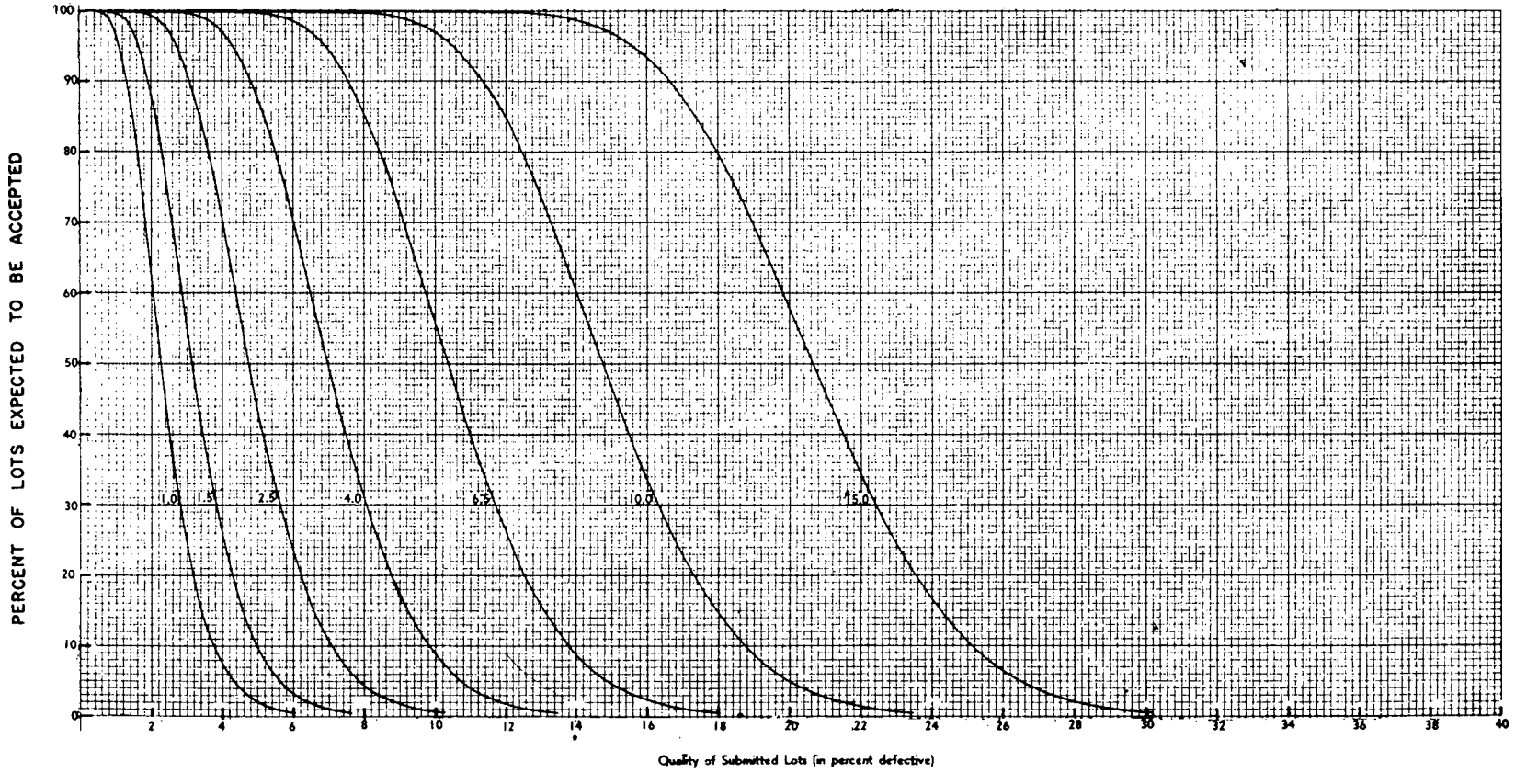
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: O (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

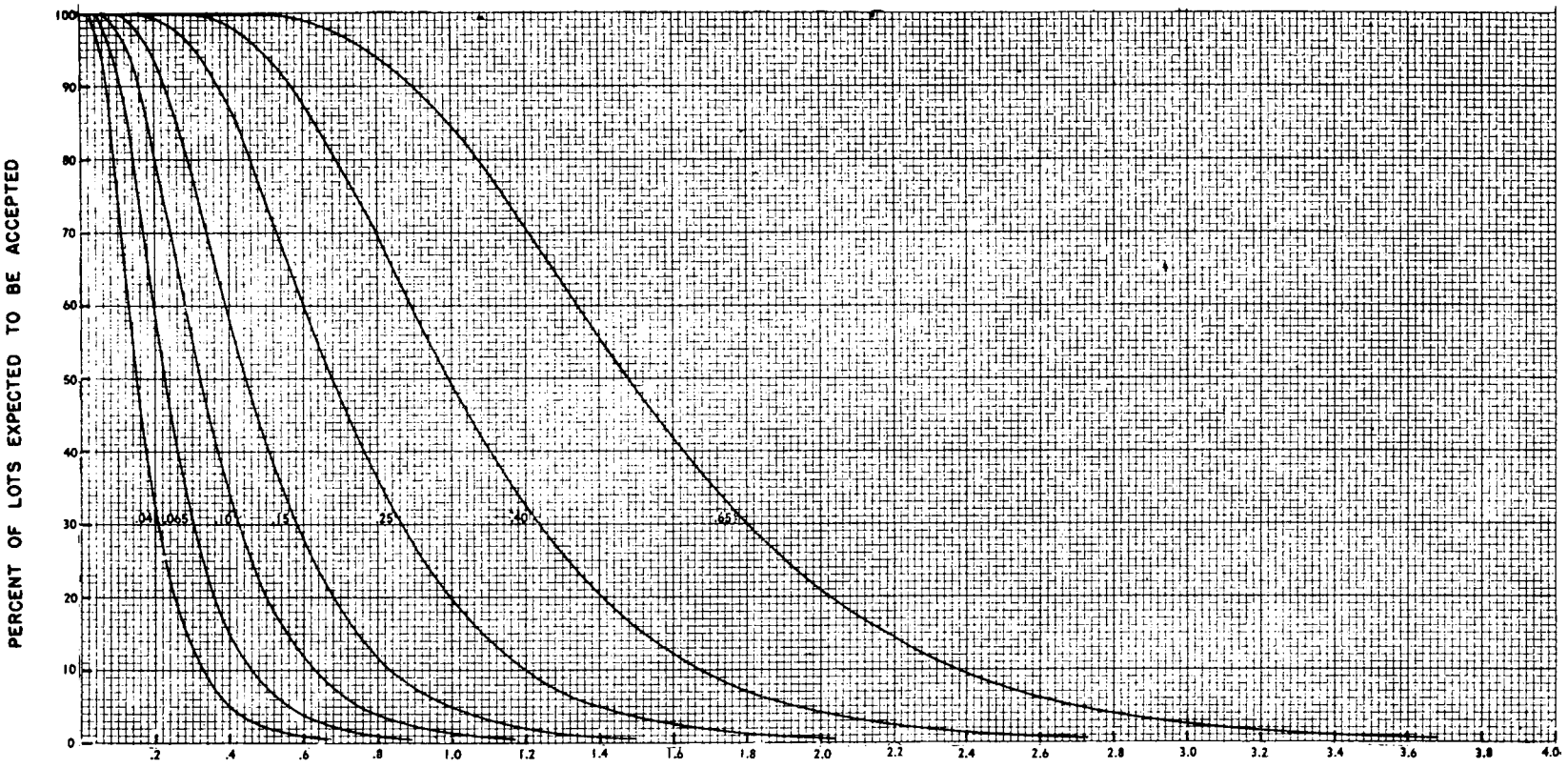
QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: P



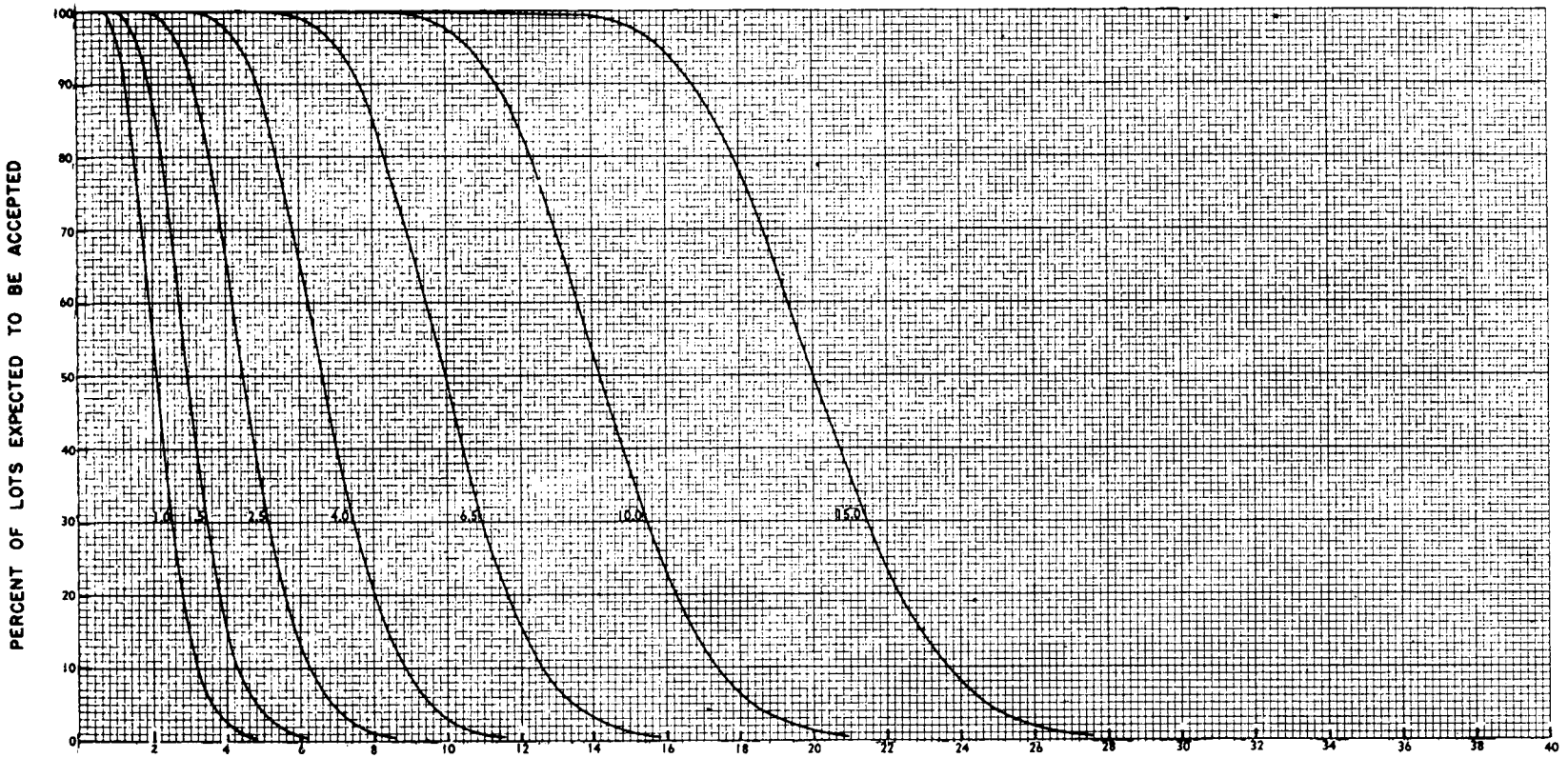
The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

(continued)

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: P (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

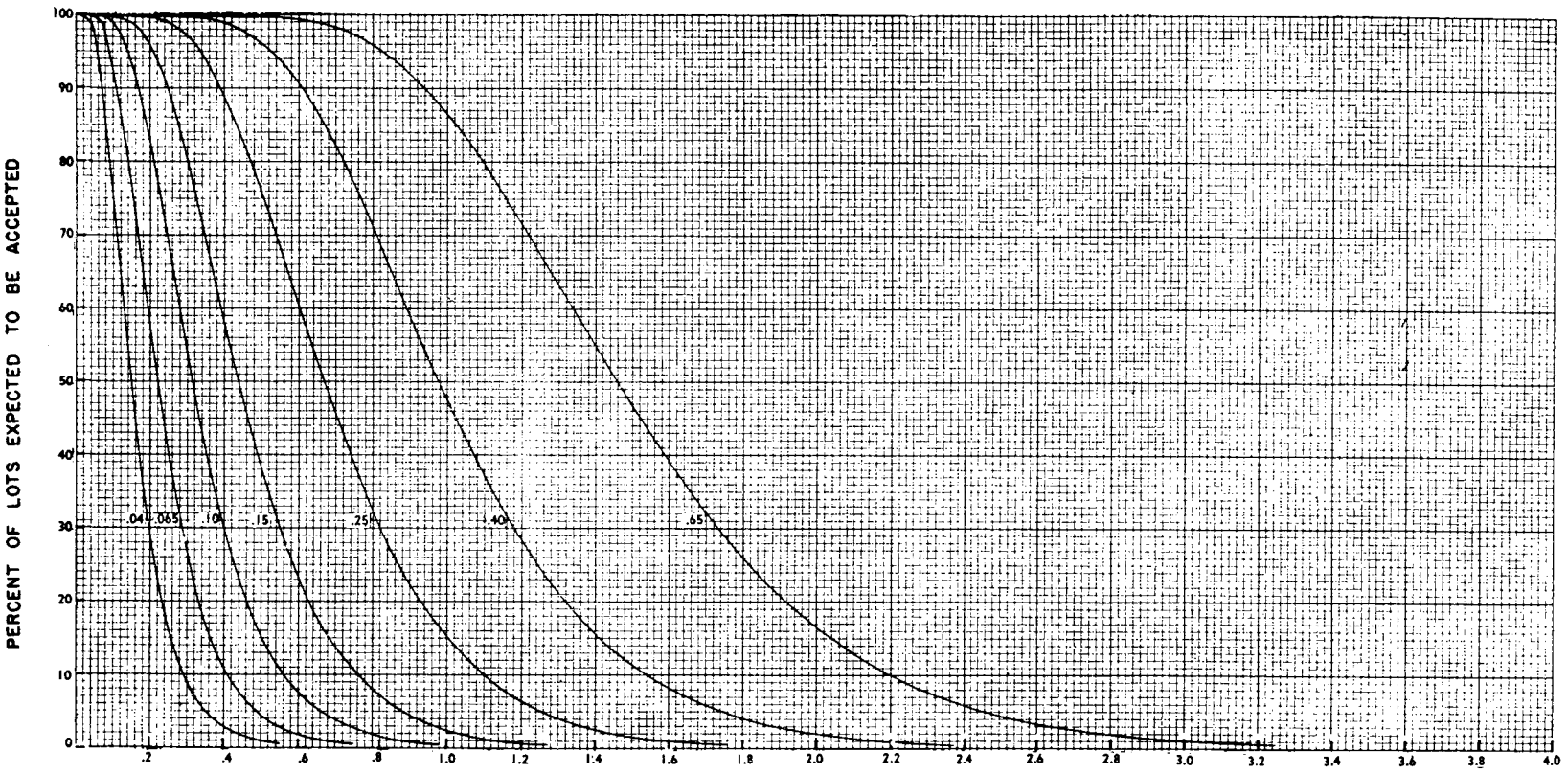
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: Q



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

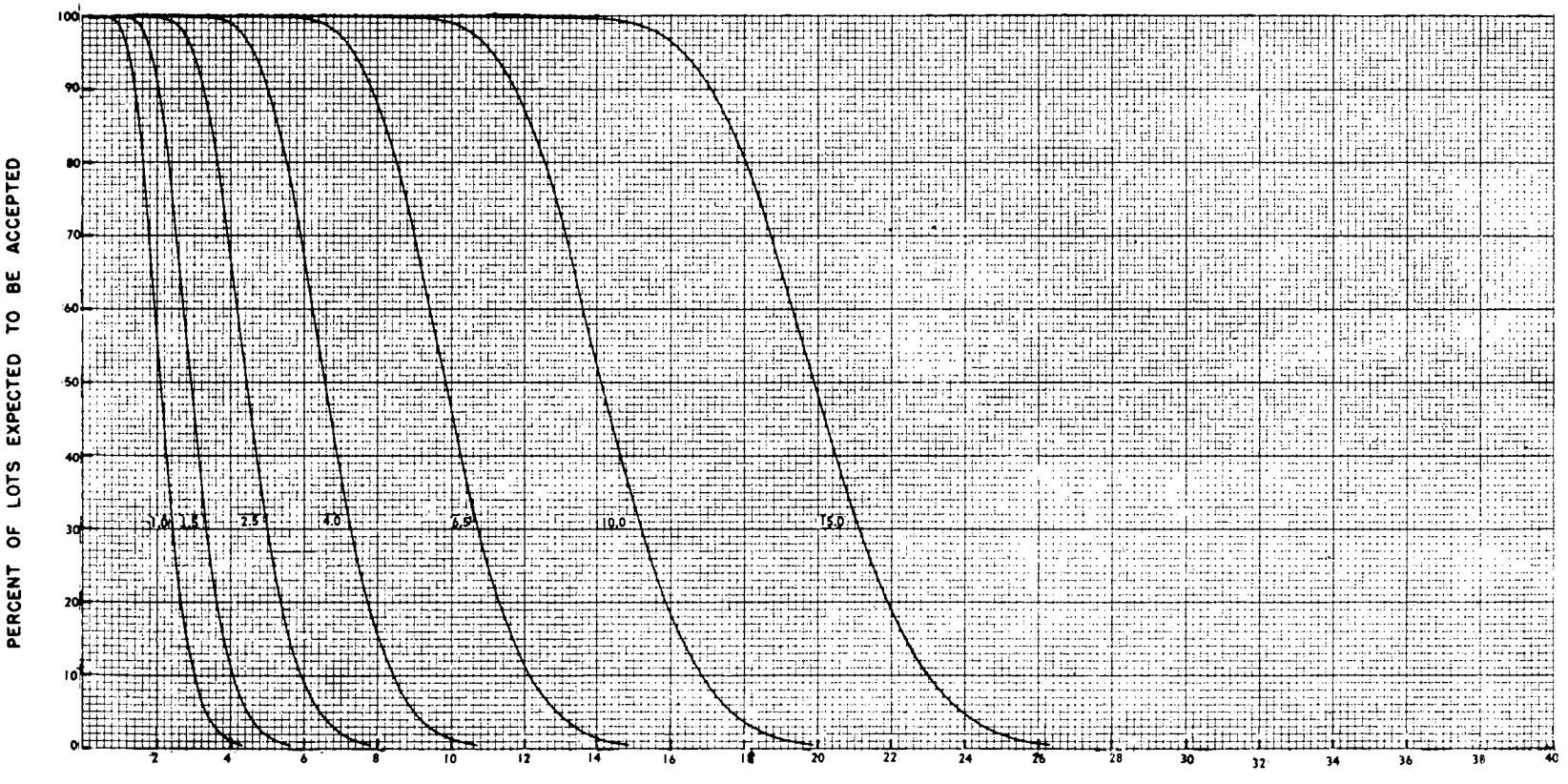
(continued)

QUALITY OF SUBMITTED LOTS (In percent defective)

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 4: OPERATING CHARACTERISTIC CURVES FOR SAMPLING PLANS BASED ON STANDARD DEVIATION METHOD (continued)

Sample Size Code Letter: Q (continued)



The values of the percent of lots expected to be accepted are valid only when measurements are selected at random from a normal distribution.

Note: Figures on curves are Acceptable Quality Levels for normal inspection.

TABLE 5: ACCEPTANCE CRITERIA FOR VARIABLES SAMPLING PLANS - UNKNOWN STANDARD DEVIATION

Sample size code letter	Sample size	Acceptable Quality Levels													
		.04	.065	.10	.15	.25	.40	.65	1.00	1.50	2.50	4.00	6.50	10.00	15.00
		M	M	M	M	M	M	M	M	M	M	M	M	M	M
B	3	↓	↓	↓	↓	↓	↓	↓	▼	▼	7.59	18.86	26.94	33.69	40.47
C	4	↓	↓	↓	↓	↓	↓	↓	1.53	5.50	10.92	16.45	22.86	29.45	36.90
D	5	↓	↓	↓	↓	↓	↓	1.33	3.32	5.83	9.80	14.39	20.19	26.56	33.99
E	7	↓	↓	↓	↓	0.422	1.06	2.14	3.55	5.35	8.40	12.20	17.35	23.29	30.50
F	10	↓	↓	↓	0.349	0.716	1.30	2.17	3.26	4.77	7.29	10.54	15.17	20.74	27.57
G	15	0.099	0.186	0.312	0.503	0.818	1.31	2.11	3.05	4.31	6.56	9.46	13.71	18.94	25.61
H	20	0.135	0.228	0.365	0.544	0.846	1.29	2.05	2.95	4.09	6.17	8.92	12.99	18.03	24.53
I	25	0.155	0.250	0.380	0.551	0.877	1.29	2.00	2.86	3.97	5.97	8.63	12.57	17.51	23.97
J	30	0.179	0.280	0.413	0.581	0.879	1.29	1.98	2.83	3.91	5.86	8.47	12.36	17.24	23.58
K	35	0.170	0.264	0.388	0.535	0.847	1.23	1.87	2.68	3.70	5.57	8.10	11.87	16.65	22.91
L	40	0.179	0.275	0.401	0.566	0.873	1.26	1.88	2.71	3.72	5.58	8.09	11.85	16.61	22.86
M	50	0.163	0.250	0.363	0.503	0.789	1.17	1.71	2.49	3.45	5.20	7.61	11.23	15.87	22.00
N	75	0.147	0.228	0.330	0.467	0.720	1.07	1.60	2.29	3.20	4.87	7.15	10.63	15.13	21.11
O	100	0.145	0.220	0.317	0.447	0.689	1.02	1.53	2.20	3.07	4.69	6.91	10.32	14.75	20.66
P	150	0.134	0.203	0.293	0.413	0.638	0.949	1.43	2.05	2.89	4.43	6.57	9.88	14.20	20.02
Q	200	0.135	0.204	0.294	0.414	0.637	0.945	1.42	2.04	2.87	4.40	6.53	9.81	14.12	19.92

All AQL and table values are in percent defective.

↓ Use first sampling plan below arrow, that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
0	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
.1	47.24	46.67	46.44	46.26	46.16	46.10	46.08	46.06	46.05	46.05	46.04	46.04	46.03	46.03	46.02	46.02
.2	44.46	43.33	42.90	42.54	42.35	42.24	42.19	42.16	42.15	42.13	42.13	42.11	42.10	42.09	42.08	42.08
.3	41.63	40.00	39.37	38.87	38.60	38.44	38.37	38.33	38.31	38.29	38.28	38.27	38.25	38.24	38.22	38.22
.31	41.35	39.67	39.02	38.50	38.23	38.06	37.99	37.95	37.93	37.91	37.90	37.89	37.87	37.86	37.84	37.84
.32	41.06	39.33	38.67	38.14	37.86	37.69	37.62	37.58	37.55	37.54	37.52	37.51	37.49	37.48	37.46	37.46
.33	40.77	39.00	38.32	37.78	37.49	37.31	37.24	37.20	37.18	37.16	37.15	37.13	37.11	37.10	37.09	37.08
.34	40.49	38.67	37.97	37.42	37.12	36.94	36.87	36.83	36.80	36.78	36.77	36.75	36.73	36.72	36.71	36.71
.35	40.20	38.33	37.62	37.06	36.75	36.57	36.49	36.45	36.43	36.41	36.40	36.38	36.36	36.35	36.33	36.33
.36	39.91	38.00	37.28	36.69	36.38	36.20	36.12	36.08	36.05	36.04	36.02	36.01	35.98	35.97	35.96	35.96
.37	39.62	37.67	36.93	36.33	36.02	35.83	35.75	35.71	35.68	35.66	35.65	35.63	35.61	35.60	35.59	35.58
.38	39.33	37.33	36.58	35.98	35.65	35.46	35.38	35.34	35.31	35.29	35.28	35.26	35.24	35.23	35.22	35.21
.39	39.03	37.00	36.23	35.62	35.29	35.10	35.01	34.97	34.94	34.93	34.91	34.89	34.87	34.86	34.85	34.84
.40	38.74	36.67	35.88	35.26	34.93	34.73	34.65	34.60	34.58	34.56	34.54	34.53	34.50	34.49	34.48	34.47
.41	38.45	36.33	35.54	34.90	34.57	34.37	34.28	34.24	34.21	34.19	34.18	34.16	34.13	34.12	34.11	34.10
.42	38.15	36.00	35.19	34.55	34.21	34.00	33.92	33.87	33.85	33.83	33.81	33.79	33.77	33.76	33.74	33.74
.43	37.85	35.67	34.85	34.19	33.85	33.64	33.56	33.51	33.48	33.46	33.45	33.43	33.40	33.39	33.38	33.37
.44	37.56	35.33	34.50	33.84	33.49	33.28	33.20	33.15	33.12	33.10	33.09	33.07	33.04	33.03	33.02	33.01
.45	37.26	35.00	34.16	33.49	33.13	32.92	32.84	32.79	32.76	32.74	32.73	32.71	32.68	32.67	32.66	32.65
.46	36.96	34.67	33.81	33.13	32.78	32.57	32.48	32.43	32.40	32.38	32.37	32.35	32.32	32.31	32.30	32.29
.47	36.66	34.33	33.47	32.78	32.42	32.21	32.12	32.07	32.04	32.02	32.01	31.99	31.96	31.95	31.94	31.93
.48	36.35	34.00	33.12	32.43	32.07	31.85	31.77	31.72	31.69	31.67	31.65	31.63	31.61	31.60	31.58	31.58
.49	36.05	33.67	32.78	32.08	31.72	31.50	31.41	31.36	31.33	31.31	31.30	31.28	31.25	31.24	31.23	31.22
.50	35.75	33.33	32.44	31.74	31.37	31.15	31.06	31.01	30.98	30.96	30.95	30.93	30.90	30.89	30.87	30.87
.51	35.44	33.00	32.10	31.39	31.02	30.80	30.71	30.66	30.63	30.61	30.60	30.57	30.55	30.54	30.52	30.52
.52	35.13	32.67	31.76	31.04	30.67	30.45	30.36	30.31	30.28	30.26	30.25	30.23	30.20	30.19	30.17	30.17
.53	34.82	32.33	31.42	30.70	30.32	30.10	30.01	29.96	29.93	29.91	29.90	29.88	29.85	29.84	29.83	29.82
.54	34.51	32.00	31.08	30.36	29.98	29.76	29.67	29.62	29.59	29.57	29.55	29.53	29.51	29.49	29.48	29.48
.55	34.20	31.67	30.74	30.01	29.64	29.41	29.32	29.27	29.24	29.22	29.21	29.19	29.16	29.15	29.14	29.13
.56	33.88	31.33	30.40	29.67	29.29	29.07	28.98	28.93	28.90	28.88	28.87	28.85	28.82	28.81	28.79	28.79
.57	33.57	31.00	30.06	29.33	28.95	28.73	28.64	28.59	28.56	28.54	28.53	28.51	28.48	28.47	28.45	28.45
.58	33.25	30.67	29.73	28.99	28.61	28.39	28.30	28.25	28.22	28.20	28.19	28.17	28.14	28.13	28.12	28.11
.59	32.93	30.33	29.39	28.66	28.28	28.05	27.96	27.92	27.89	27.87	27.85	27.83	27.81	27.79	27.78	27.77
.60	32.61	30.00	29.05	28.32	27.94	27.72	27.63	27.58	27.55	27.53	27.52	27.50	27.47	27.46	27.45	27.44
.61	32.28	29.67	28.72	27.98	27.60	27.39	27.30	27.25	27.22	27.20	27.18	27.16	27.14	27.13	27.11	27.11
.62	31.96	29.33	28.39	27.65	27.27	27.05	26.96	26.92	26.89	26.87	26.85	26.83	26.81	26.80	26.78	26.78
.63	31.63	29.00	28.05	27.32	26.94	26.72	26.63	26.59	26.56	26.54	26.52	26.50	26.48	26.47	26.45	26.45
.64	31.30	28.67	27.72	26.99	26.61	26.39	26.31	26.26	26.23	26.21	26.20	26.18	26.15	26.14	26.13	26.12
.65	30.97	28.33	27.39	26.66	26.28	26.07	25.98	25.93	25.90	25.88	25.87	25.85	25.83	25.82	25.80	25.80
.66	30.63	28.00	27.06	26.33	25.96	25.74	25.66	25.61	25.58	25.56	25.55	25.53	25.51	25.49	25.48	25.48
.67	30.30	27.67	26.73	26.00	25.63	25.42	25.33	25.29	25.26	25.24	25.23	25.21	25.19	25.17	25.16	25.16
.68	29.96	27.33	26.40	25.68	25.31	25.10	25.01	24.97	24.94	24.92	24.91	24.89	24.87	24.86	24.84	24.84
.69	29.61	27.00	26.07	25.35	24.99	24.78	24.70	24.65	24.62	24.60	24.59	24.57	24.55	24.54	24.53	24.52

[1] Values tabulated are read in percent.

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
.70	29.27	26.67	25.74	25.03	24.67	24.46	24.38	24.33	24.31	24.29	24.28	24.26	24.24	24.23	24.21	24.21
.71	28.92	26.33	25.41	24.71	24.35	24.15	24.06	24.02	23.99	23.98	23.96	23.95	23.92	23.91	23.90	23.90
.72	28.57	26.00	25.09	24.39	24.03	23.83	23.75	23.71	23.68	23.67	23.65	23.64	23.61	23.60	23.59	23.59
.73	28.22	25.67	24.76	24.07	23.72	23.52	23.44	23.40	23.37	23.36	23.34	23.33	23.31	23.30	23.29	23.28
.74	27.86	25.33	24.44	23.75	23.41	23.21	23.13	23.09	23.07	23.05	23.04	23.02	23.00	22.99	22.98	22.98
.75	27.50	25.00	24.11	23.44	23.10	22.90	22.83	22.79	22.76	22.75	22.73	22.72	22.70	22.69	22.68	22.67
.76	27.13	24.67	23.79	23.12	22.79	22.60	22.52	22.48	22.46	22.44	22.43	22.42	22.40	22.39	22.38	22.37
.77	26.77	24.33	23.47	22.81	22.48	22.30	22.22	22.18	22.16	22.14	22.13	22.12	22.10	22.09	22.08	22.08
.78	26.39	24.00	23.15	22.50	22.18	21.99	21.92	21.89	21.86	21.85	21.84	21.82	21.80	21.79	21.78	21.78
.79	26.02	23.67	22.83	22.19	21.87	21.70	21.63	21.59	21.57	21.55	21.54	21.53	21.51	21.50	21.49	21.49
.80	25.64	23.33	22.51	21.88	21.57	21.40	21.33	21.29	21.27	21.26	21.25	21.23	21.22	21.21	21.20	21.20
.81	25.25	23.00	22.19	21.58	21.27	21.10	21.04	21.00	20.98	20.97	20.96	20.94	20.93	20.92	20.91	20.91
.82	24.86	22.67	21.87	21.27	20.98	20.81	20.75	20.71	20.69	20.68	20.67	20.65	20.64	20.63	20.62	20.62
.83	24.47	22.33	21.56	20.97	20.68	20.52	20.46	20.42	20.40	20.39	20.38	20.37	20.35	20.35	20.34	20.34
.84	24.07	22.00	21.24	20.67	20.39	20.23	20.17	20.14	20.12	20.11	20.10	20.09	20.07	20.06	20.06	20.05
.85	23.67	21.67	20.93	20.37	20.10	19.94	19.89	19.86	19.84	19.82	19.82	19.80	19.79	19.78	19.78	19.77
.86	23.26	21.33	20.62	20.07	19.81	19.66	19.60	19.57	19.56	19.54	19.54	19.53	19.51	19.51	19.50	19.50
.87	22.84	21.00	20.31	19.78	19.52	19.38	19.32	19.30	19.28	19.27	19.26	19.25	19.24	19.23	19.22	19.22
.88	22.42	20.67	20.00	19.48	19.23	19.10	19.04	19.02	19.00	18.99	18.98	18.98	18.96	18.96	18.95	18.95
.89	21.99	20.33	19.69	19.19	18.95	18.82	18.77	18.74	18.73	18.72	18.71	18.70	18.69	18.69	18.68	18.68
.90	21.55	20.00	19.38	18.90	18.67	18.54	18.50	18.47	18.46	18.45	18.44	18.43	18.42	18.42	18.41	18.41
.91	21.11	19.67	19.07	18.61	18.39	18.27	18.22	18.20	18.19	18.18	18.17	18.17	18.16	18.15	18.15	18.15
.92	20.66	19.33	18.77	18.33	18.11	18.00	17.96	17.94	17.92	17.92	17.91	17.90	17.89	17.89	17.88	17.88
.93	20.20	19.00	18.46	18.04	17.84	17.73	17.69	17.67	17.66	17.65	17.65	17.64	17.63	17.63	17.62	17.62
.94	19.74	18.67	18.16	17.76	17.57	17.46	17.43	17.41	17.40	17.39	17.39	17.38	17.37	17.37	17.36	17.36
.95	19.25	18.33	17.86	17.48	17.29	17.20	17.17	17.15	17.14	17.13	17.13	17.12	17.12	17.11	17.11	17.11
.96	18.76	18.00	17.56	17.20	17.03	16.94	16.91	16.89	16.88	16.88	16.87	16.87	16.86	16.86	16.86	16.85
.97	18.25	17.67	17.25	16.92	16.76	16.68	16.65	16.63	16.63	16.62	16.62	16.61	16.61	16.61	16.60	16.60
.98	17.74	17.33	16.96	16.65	16.49	16.42	16.39	16.38	16.37	16.37	16.37	16.36	16.36	16.36	16.36	16.36
.99	17.21	17.00	16.66	16.37	16.23	16.16	16.14	16.13	16.12	16.12	16.12	16.12	16.11	16.11	16.11	16.11
1.00	16.67	16.67	16.36	16.10	15.97	15.91	15.89	15.88	15.88	15.87	15.87	15.87	15.87	15.87	15.87	15.87
1.01	16.11	16.33	16.07	15.83	15.72	15.66	15.64	15.63	15.63	15.63	15.63	15.63	15.62	15.62	15.62	15.62
1.02	15.53	16.00	15.78	15.56	15.46	15.41	15.40	15.39	15.39	15.39	15.39	15.38	15.38	15.38	15.38	15.38
1.03	14.93	15.67	15.48	15.30	15.21	15.17	15.15	15.15	15.15	15.15	15.15	15.15	15.15	15.15	15.15	15.15
1.04	14.31	15.33	15.19	15.03	14.96	14.92	14.91	14.91	14.91	14.91	14.91	14.91	14.91	14.91	14.91	14.91
1.05	13.66	15.00	14.91	14.77	14.71	14.68	14.67	14.67	14.67	14.67	14.68	14.68	14.68	14.68	14.68	14.68
1.06	12.98	14.67	14.62	14.51	14.46	14.44	14.44	14.44	14.44	14.44	14.44	14.45	14.45	14.45	14.45	14.45
1.07	12.27	14.33	14.33	14.26	14.22	14.20	14.20	14.21	14.21	14.21	14.21	14.22	14.22	14.22	14.22	14.23
1.08	11.51	14.00	14.05	14.00	13.97	13.97	13.97	13.98	13.98	13.98	13.99	13.99	13.99	14.00	14.00	14.00
1.09	10.71	13.67	13.76	13.75	13.73	13.74	13.74	13.75	13.75	13.76	13.76	13.77	13.77	13.77	13.78	13.78

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
1.10	9.84	13.33	13.48	13.49	13.50	13.51	13.52	13.52	13.53	13.54	13.54	13.54	13.55	13.55	13.56	13.56
1.11	8.89	13.00	13.20	13.25	13.26	13.28	13.29	13.30	13.31	13.31	13.32	13.32	13.33	13.34	13.34	13.34
1.12	7.82	12.67	12.93	13.00	13.03	13.05	13.07	13.08	13.09	13.10	13.10	13.11	13.12	13.12	13.12	13.13
1.13	6.60	12.33	12.65	12.75	12.80	12.83	12.85	12.86	12.87	12.88	12.89	12.89	12.90	12.91	12.91	12.92
1.14	5.08	12.00	12.37	12.51	12.57	12.61	12.63	12.65	12.66	12.67	12.67	12.68	12.69	12.70	12.70	12.70
1.15	0.29	11.67	12.10	12.27	12.34	12.39	12.42	12.44	12.45	12.46	12.46	12.47	12.48	12.49	12.49	12.50
1.16	0.00	11.33	11.83	12.03	12.12	12.18	12.21	12.22	12.24	12.25	12.25	12.26	12.28	12.28	12.29	12.29
1.17	0.00	11.00	11.56	11.79	11.90	11.96	12.00	12.02	12.03	12.04	12.05	12.06	12.07	12.08	12.08	12.09
1.18	0.00	10.67	11.29	11.56	11.68	11.75	11.79	11.81	11.82	11.84	11.84	11.85	11.87	11.88	11.88	11.89
1.19	0.00	10.33	11.02	11.33	11.46	11.54	11.58	11.61	11.62	11.63	11.64	11.65	11.67	11.68	11.69	11.69
1.20	0.00	10.00	10.76	11.10	11.24	11.34	11.38	11.41	11.42	11.43	11.44	11.46	11.47	11.48	11.49	11.49
1.21	0.00	9.67	10.50	10.87	11.03	11.13	11.18	11.21	11.22	11.24	11.25	11.26	11.28	11.29	11.30	11.30
1.22	0.00	9.33	10.23	10.65	10.82	10.93	10.98	11.01	11.03	11.04	11.05	11.07	11.09	11.09	11.10	11.11
1.23	0.00	9.00	9.97	10.42	10.61	10.73	10.78	10.81	10.84	10.85	10.86	10.88	10.90	10.91	10.91	10.92
1.24	0.00	8.67	9.72	10.20	10.41	10.53	10.59	10.62	10.64	10.66	10.67	10.69	10.71	10.72	10.73	10.73
1.25	0.00	8.33	9.46	9.98	10.21	10.34	10.40	10.43	10.46	10.47	10.48	10.50	10.52	10.53	10.54	10.55
1.26	0.00	8.00	9.21	9.77	10.00	10.15	10.21	10.25	10.27	10.29	10.30	10.32	10.34	10.35	10.36	10.37
1.27	0.00	7.67	8.96	9.55	9.81	9.96	10.02	10.06	10.09	10.10	10.12	10.13	10.16	10.17	10.18	10.19
1.28	0.00	7.33	8.71	9.34	9.61	9.77	9.84	9.88	9.90	9.92	9.94	9.95	9.98	9.99	10.00	10.01
1.29	0.00	7.00	8.46	9.13	9.42	9.58	9.65	9.70	9.72	9.74	9.76	9.78	9.80	9.82	9.83	9.83
1.30	0.00	6.67	8.21	8.93	9.22	9.40	9.48	9.52	9.55	9.57	9.58	9.60	9.63	9.64	9.65	9.66
1.31	0.00	6.33	7.97	8.72	9.03	9.22	9.30	9.34	9.37	9.39	9.41	9.43	9.46	9.47	9.48	9.49
1.32	0.00	6.00	7.73	8.52	8.85	9.04	9.12	9.17	9.20	9.22	9.24	9.26	9.29	9.30	9.31	9.32
1.33	0.00	5.67	7.49	8.32	8.66	8.86	8.95	9.00	9.03	9.05	9.07	9.09	9.12	9.13	9.15	9.15
1.34	0.00	5.33	7.25	8.12	8.48	8.69	8.78	8.83	8.86	8.88	8.90	8.92	8.95	8.97	8.98	8.99
1.35	0.00	5.00	7.02	7.92	8.30	8.52	8.61	8.66	8.69	8.72	8.74	8.76	8.79	8.81	8.82	8.83
1.36	0.00	4.67	6.79	7.73	8.12	8.35	8.44	8.50	8.53	8.55	8.57	8.60	8.63	8.65	8.66	8.67
1.37	0.00	4.33	6.56	7.54	7.95	8.18	8.28	8.33	8.37	8.39	8.41	8.44	8.47	8.49	8.50	8.51
1.38	0.00	4.00	6.33	7.35	7.77	8.01	8.12	8.17	8.21	8.24	8.25	8.28	8.31	8.33	8.35	8.35
1.39	0.00	3.67	6.10	7.17	7.60	7.85	7.96	8.01	8.05	8.08	8.10	8.12	8.16	8.18	8.19	8.20
1.40	0.00	3.33	5.88	6.98	7.44	7.69	7.80	7.86	7.90	7.92	7.94	7.97	8.01	8.02	8.04	8.05
1.41	0.00	3.00	5.66	6.80	7.27	7.53	7.64	7.70	7.74	7.77	7.79	7.82	7.86	7.87	7.89	7.90
1.42	0.00	2.67	5.44	6.62	7.10	7.37	7.49	7.55	7.59	7.62	7.64	7.67	7.71	7.73	7.74	7.75
1.43	0.00	2.33	5.23	6.45	6.94	7.22	7.34	7.40	7.44	7.47	7.50	7.52	7.56	7.58	7.60	7.61
1.44	0.00	2.00	5.01	6.27	6.78	7.07	7.19	7.26	7.30	7.33	7.35	7.38	7.42	7.44	7.46	7.47
1.45	0.00	1.67	4.81	6.10	6.63	6.92	7.04	7.11	7.15	7.18	7.21	7.24	7.28	7.30	7.31	7.33
1.46	0.00	1.33	4.60	5.93	6.47	6.77	6.90	6.97	7.01	7.04	7.07	7.10	7.14	7.16	7.18	7.19
1.47	0.00	1.00	4.39	5.77	6.32	6.63	6.75	6.83	6.87	6.90	6.93	6.96	7.00	7.02	7.04	7.05
1.48	0.00	.67	4.19	5.60	6.17	6.48	6.61	6.69	6.73	6.77	6.79	6.82	6.86	6.88	6.90	6.91
1.49	0.00	.33	3.99	5.44	6.02	6.34	6.48	6.55	6.60	6.63	6.65	6.69	6.73	6.75	6.77	6.78

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
1.50	0.00	0.00	3.80	5.28	5.87	6.20	6.34	6.41	6.46	6.50	6.52	6.55	6.60	6.62	6.64	6.65
1.51	0.00	0.00	3.61	5.13	5.73	6.06	6.20	6.28	6.33	6.36	6.39	6.42	6.47	6.49	6.51	6.52
1.52	0.00	0.00	3.42	4.97	5.59	5.93	6.07	6.15	6.20	6.23	6.26	6.29	6.34	6.36	6.38	6.39
1.53	0.00	0.00	3.23	4.82	5.45	5.80	5.94	6.02	6.07	6.11	6.13	6.17	6.21	6.24	6.26	6.27
1.54	0.00	0.00	3.05	4.67	5.31	5.67	5.81	5.89	5.95	5.98	6.01	6.04	6.09	6.11	6.13	6.15
1.55	0.00	0.00	2.87	4.52	5.18	5.54	5.69	5.77	5.82	5.86	5.88	5.92	5.97	5.99	6.01	6.02
1.56	0.00	0.00	2.69	4.38	5.05	5.41	5.56	5.65	5.70	5.74	5.76	5.80	5.85	5.87	5.89	5.90
1.57	0.00	0.00	2.52	4.24	4.92	5.29	5.44	5.53	5.58	5.62	5.64	5.68	5.73	5.75	5.78	5.79
1.58	0.00	0.00	2.35	4.10	4.79	5.16	5.32	5.41	5.46	5.50	5.53	5.56	5.61	5.64	5.66	5.67
1.59	0.00	0.00	2.19	3.96	4.66	5.04	5.20	5.29	5.34	5.38	5.41	5.45	5.50	5.52	5.54	5.56
1.60	0.00	0.00	2.03	3.83	4.54	4.92	5.09	5.17	5.23	5.27	5.30	5.33	5.38	5.41	5.43	5.44
1.61	0.00	0.00	1.87	3.69	4.41	4.81	4.97	5.06	5.12	5.16	5.18	5.22	5.27	5.30	5.32	5.33
1.62	0.00	0.00	1.72	3.57	4.30	4.69	4.86	4.95	5.01	5.04	5.07	5.11	5.16	5.19	5.21	5.23
1.63	0.00	0.00	1.57	3.44	4.18	4.58	4.75	4.84	4.90	4.94	4.97	5.01	5.06	5.08	5.11	5.12
1.64	0.00	0.00	1.42	3.31	4.06	4.47	4.64	4.73	4.79	4.83	4.86	4.90	4.95	4.98	5.00	5.01
1.65	0.00	0.00	1.28	3.19	3.95	4.36	4.53	4.62	4.68	4.72	4.75	4.79	4.85	4.87	4.90	4.91
1.66	0.00	0.00	1.15	3.07	3.84	4.25	4.43	4.52	4.58	4.62	4.65	4.69	4.74	4.77	4.80	4.81
1.67	0.00	0.00	1.02	2.95	3.73	4.15	4.32	4.42	4.48	4.52	4.55	4.59	4.64	4.67	4.70	4.71
1.68	0.00	0.00	0.89	2.84	3.62	4.05	4.22	4.32	4.38	4.42	4.45	4.49	4.55	4.57	4.60	4.61
1.69	0.00	0.00	0.77	2.73	3.52	3.94	4.12	4.22	4.28	4.32	4.35	4.39	4.45	4.47	4.50	4.51
1.70	0.00	0.00	0.66	2.62	3.41	3.84	4.02	4.12	4.18	4.22	4.25	4.30	4.35	4.38	4.41	4.42
1.71	0.00	0.00	0.55	2.51	3.31	3.75	3.93	4.02	4.09	4.13	4.16	4.20	4.26	4.29	4.31	4.32
1.72	0.00	0.00	0.45	2.41	3.21	3.65	3.83	3.93	3.99	4.04	4.07	4.11	4.17	4.19	4.22	4.23
1.73	0.00	0.00	0.36	2.30	3.11	3.56	3.74	3.84	3.90	3.94	3.98	4.02	4.08	4.10	4.13	4.14
1.74	0.00	0.00	0.27	2.20	3.02	3.46	3.65	3.75	3.81	3.85	3.89	3.93	3.99	4.01	4.04	4.05
1.75	0.00	0.00	0.19	2.11	2.93	3.37	3.56	3.66	3.72	3.77	3.80	3.84	3.90	3.93	3.95	3.97
1.76	0.00	0.00	0.12	2.01	2.83	3.28	3.47	3.57	3.63	3.68	3.71	3.76	3.81	3.84	3.87	3.88
1.77	0.00	0.00	0.06	1.92	2.74	3.20	3.38	3.48	3.55	3.59	3.63	3.67	3.73	3.76	3.78	3.80
1.78	0.00	0.00	0.02	1.83	2.66	3.11	3.30	3.40	3.47	3.51	3.54	3.59	3.64	3.67	3.70	3.71
1.79	0.00	0.00	0.00	1.74	2.57	3.03	3.21	3.32	3.38	3.43	3.46	3.51	3.56	3.59	3.63	3.63
1.80	0.00	0.00	0.00	1.65	2.49	2.94	3.13	3.24	3.30	3.35	3.38	3.43	3.48	3.51	3.54	3.55
1.81	0.00	0.00	0.00	1.57	2.40	2.86	3.05	3.16	3.22	3.27	3.30	3.35	3.40	3.43	3.46	3.47
1.82	0.00	0.00	0.00	1.49	2.32	2.79	2.98	3.08	3.15	3.19	3.22	3.27	3.33	3.36	3.38	3.40
1.83	0.00	0.00	0.00	1.41	2.25	2.71	2.90	3.00	3.07	3.11	3.15	3.19	3.25	3.28	3.31	3.32
1.84	0.00	0.00	0.00	1.34	2.17	2.63	2.82	2.93	2.99	3.04	3.07	3.12	3.18	3.21	3.23	3.25
1.85	0.00	0.00	0.00	1.26	2.09	2.56	2.75	2.85	2.92	2.97	3.00	3.05	3.10	3.13	3.16	3.17
1.86	0.00	0.00	0.00	1.19	2.02	2.48	2.68	2.78	2.85	2.89	2.93	2.97	3.03	3.06	3.09	3.10
1.87	0.00	0.00	0.00	1.12	1.95	2.41	2.61	2.71	2.78	2.82	2.86	2.90	2.96	2.99	3.02	3.03
1.88	0.00	0.00	0.00	1.06	1.88	2.34	2.54	2.64	2.71	2.75	2.79	2.83	2.89	2.92	2.95	2.96
1.89	0.00	0.00	0.00	0.99	1.81	2.28	2.47	2.57	2.64	2.69	2.72	2.77	2.83	2.85	2.88	2.90

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
1.90	0.00	0.00	0.00	0.93	1.75	2.21	2.40	2.51	2.57	2.62	2.65	2.70	2.76	2.79	2.82	2.83
1.91	0.00	0.00	0.00	0.87	1.68	2.14	2.34	2.44	2.51	2.56	2.59	2.63	2.69	2.72	2.75	2.77
1.92	0.00	0.00	0.00	0.81	1.62	2.08	2.27	2.38	2.45	2.49	2.52	2.57	2.63	2.66	2.69	2.70
1.93	0.00	0.00	0.00	0.76	1.56	2.02	2.21	2.32	2.38	2.43	2.46	2.51	2.57	2.60	2.62	2.64
1.94	0.00	0.00	0.00	0.70	1.50	1.96	2.15	2.25	2.32	2.37	2.40	2.45	2.51	2.54	2.56	2.58
1.95	0.00	0.00	0.00	0.65	1.44	1.90	2.09	2.19	2.26	2.31	2.34	2.39	2.45	2.48	2.50	2.52
1.96	0.00	0.00	0.00	0.60	1.38	1.84	2.03	2.14	2.20	2.25	2.28	2.33	2.39	2.42	2.44	2.46
1.97	0.00	0.00	0.00	0.56	1.33	1.78	1.97	2.08	2.14	2.19	2.22	2.27	2.33	2.36	2.39	2.40
1.98	0.00	0.00	0.00	0.51	1.27	1.73	1.92	2.02	2.09	2.13	2.17	2.21	2.27	2.30	2.33	2.34
1.99	0.00	0.00	0.00	0.47	1.22	1.67	1.86	1.97	2.03	2.08	2.11	2.16	2.22	2.25	2.27	2.29
2.00	0.00	0.00	0.00	0.43	1.17	1.62	1.81	1.91	1.98	2.03	2.06	2.10	2.16	2.19	2.22	2.23
2.01	0.00	0.00	0.00	0.39	1.12	1.57	1.76	1.86	1.93	1.97	2.01	2.05	2.11	2.14	2.17	2.18
2.02	0.00	0.00	0.00	0.36	1.07	1.52	1.71	1.81	1.87	1.92	1.95	2.00	2.06	2.09	2.11	2.13
2.03	0.00	0.00	0.00	0.32	1.03	1.47	1.66	1.76	1.82	1.87	1.90	1.95	2.01	2.04	2.06	2.08
2.04	0.00	0.00	0.00	0.29	0.98	1.42	1.61	1.71	1.77	1.82	1.85	1.90	1.96	1.99	2.01	2.03
2.05	0.00	0.00	0.00	0.26	0.94	1.37	1.56	1.66	1.73	1.77	1.80	1.85	1.91	1.94	1.96	1.98
2.06	0.00	0.00	0.00	0.23	0.90	1.33	1.51	1.61	1.68	1.72	1.76	1.80	1.86	1.89	1.92	1.93
2.07	0.00	0.00	0.00	0.21	0.86	1.28	1.47	1.57	1.63	1.68	1.71	1.76	1.81	1.84	1.87	1.88
2.08	0.00	0.00	0.00	0.18	0.82	1.24	1.42	1.52	1.59	1.63	1.66	1.71	1.77	1.79	1.82	1.84
2.09	0.00	0.00	0.00	0.16	0.78	1.20	1.38	1.48	1.54	1.59	1.62	1.66	1.72	1.75	1.78	1.79
2.10	0.00	0.00	0.00	0.14	0.74	1.16	1.34	1.44	1.50	1.54	1.58	1.62	1.68	1.71	1.73	1.75
2.11	0.00	0.00	0.00	0.12	0.71	1.12	1.30	1.39	1.46	1.50	1.53	1.58	1.63	1.66	1.69	1.70
2.12	0.00	0.00	0.00	0.10	0.67	1.08	1.26	1.35	1.42	1.46	1.49	1.54	1.59	1.62	1.65	1.66
2.13	0.00	0.00	0.00	0.08	0.64	1.04	1.22	1.31	1.38	1.42	1.45	1.50	1.55	1.58	1.61	1.62
2.14	0.00	0.00	0.00	0.07	0.61	1.00	1.18	1.28	1.34	1.38	1.41	1.46	1.51	1.54	1.57	1.58
2.15	0.00	0.00	0.00	0.06	0.58	0.97	1.14	1.24	1.30	1.34	1.37	1.42	1.47	1.50	1.53	1.54
2.16	0.00	0.00	0.00	0.05	0.55	0.93	1.10	1.20	1.26	1.30	1.34	1.38	1.43	1.46	1.49	1.50
2.17	0.00	0.00	0.00	0.04	0.52	0.90	1.07	1.16	1.22	1.27	1.30	1.34	1.40	1.42	1.45	1.46
2.18	0.00	0.00	0.00	0.03	0.49	0.87	1.03	1.13	1.19	1.23	1.26	1.30	1.36	1.39	1.41	1.42
2.19	0.00	0.00	0.00	0.02	0.46	0.83	1.00	1.09	1.15	1.20	1.23	1.27	1.32	1.35	1.38	1.39
2.20	0.000	0.000	0.000	0.015	0.437	0.803	0.968	1.061	1.120	1.161	1.192	1.233	1.287	1.314	1.340	1.352
2.21	0.000	0.000	0.000	0.010	0.413	0.772	0.936	1.028	1.087	1.128	1.158	1.199	1.253	1.279	1.305	1.318
2.22	0.000	0.000	0.000	0.006	0.389	0.743	0.905	0.996	1.054	1.095	1.125	1.166	1.219	1.245	1.271	1.283
2.23	0.000	0.000	0.000	0.003	0.366	0.715	0.875	0.965	1.023	1.063	1.093	1.134	1.186	1.212	1.238	1.250
2.24	0.000	0.000	0.000	0.002	0.345	0.687	0.845	0.935	0.992	1.032	1.061	1.102	1.154	1.180	1.205	1.218
2.25	0.000	0.000	0.000	0.001	0.324	0.660	0.816	0.905	0.962	1.002	1.031	1.071	1.123	1.148	1.173	1.186
2.26	0.000	0.000	0.000	0.000	0.304	0.634	0.789	0.876	0.933	0.972	1.001	1.041	1.092	1.117	1.142	1.155
2.27	0.000	0.000	0.000	0.000	0.285	0.609	0.762	0.848	0.904	0.943	0.972	1.011	1.062	1.087	1.112	1.124
2.28	0.000	0.000	0.000	0.000	0.267	0.585	0.735	0.821	0.876	0.915	0.943	0.982	1.033	1.058	1.082	1.094
2.29	0.000	0.000	0.000	0.000	0.250	0.561	0.710	0.794	0.849	0.887	0.915	0.954	1.004	1.029	1.053	1.065

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
2.30	0.000	0.000	0.000	0.000	0.233	0.538	0.685	0.769	0.823	0.861	0.888	0.927	0.977	1.001	1.025	1.037
2.31	0.000	0.000	0.000	0.000	0.218	0.516	0.661	0.743	0.797	0.834	0.862	0.900	0.949	0.974	0.997	1.009
2.32	0.000	0.000	0.000	0.000	0.203	0.495	0.637	0.719	0.772	0.809	0.836	0.874	0.923	0.947	0.971	0.982
2.33	0.000	0.000	0.000	0.000	0.189	0.474	0.614	0.695	0.748	0.784	0.811	0.848	0.897	0.921	0.944	0.956
2.34	0.000	0.000	0.000	0.000	0.175	0.454	0.592	0.672	0.724	0.760	0.787	0.824	0.872	0.895	0.915	0.930
2.35	0.000	0.000	0.000	0.000	0.163	0.435	0.571	0.650	0.701	0.736	0.763	0.799	0.847	0.870	0.893	0.905
2.36	0.000	0.000	0.000	0.000	0.151	0.416	0.550	0.628	0.678	0.714	0.740	0.776	0.823	0.846	0.869	0.880
2.37	0.000	0.000	0.000	0.000	0.139	0.398	0.530	0.606	0.656	0.691	0.717	0.753	0.799	0.822	0.845	0.856
2.38	0.000	0.000	0.000	0.000	0.128	0.381	0.510	0.586	0.635	0.670	0.695	0.730	0.777	0.799	0.822	0.833
2.39	0.000	0.000	0.000	0.000	0.118	0.364	0.491	0.566	0.614	0.648	0.674	0.709	0.754	0.777	0.799	0.810
2.40	0.000	0.000	0.000	0.000	0.109	0.348	0.473	0.546	0.594	0.628	0.653	0.687	0.732	0.755	0.777	0.787
2.41	0.000	0.000	0.000	0.000	0.100	0.332	0.455	0.527	0.575	0.608	0.633	0.667	0.711	0.733	0.755	0.766
2.42	0.000	0.000	0.000	0.000	0.091	0.317	0.437	0.509	0.555	0.588	0.613	0.646	0.691	0.712	0.734	0.744
2.43	0.000	0.000	0.000	0.000	0.083	0.302	0.421	0.491	0.537	0.569	0.593	0.627	0.670	0.692	0.713	0.724
2.44	0.000	0.000	0.000	0.000	0.076	0.288	0.404	0.474	0.519	0.551	0.575	0.608	0.651	0.672	0.693	0.703
2.45	0.000	0.000	0.000	0.000	0.069	0.275	0.389	0.457	0.501	0.533	0.556	0.589	0.632	0.653	0.673	0.684
2.46	0.000	0.000	0.000	0.000	0.063	0.262	0.373	0.440	0.484	0.516	0.539	0.571	0.613	0.634	0.654	0.664
2.47	0.000	0.000	0.000	0.000	0.057	0.249	0.359	0.425	0.468	0.499	0.521	0.553	0.595	0.615	0.635	0.646
2.48	0.000	0.000	0.000	0.000	0.051	0.237	0.344	0.409	0.452	0.482	0.505	0.536	0.577	0.597	0.617	0.627
2.49	0.000	0.000	0.000	0.000	0.046	0.226	0.331	0.394	0.436	0.466	0.488	0.519	0.560	0.580	0.600	0.609
2.50	0.000	0.000	0.000	0.000	0.041	0.214	0.317	0.380	0.421	0.451	0.473	0.503	0.543	0.563	0.582	0.592
2.51	0.000	0.000	0.000	0.000	0.037	0.204	0.304	0.366	0.407	0.436	0.457	0.487	0.527	0.546	0.565	0.575
2.52	0.000	0.000	0.000	0.000	0.033	0.193	0.292	0.352	0.392	0.421	0.442	0.472	0.511	0.530	0.549	0.558
2.53	0.000	0.000	0.000	0.000	0.029	0.184	0.280	0.339	0.379	0.407	0.428	0.457	0.495	0.514	0.533	0.542
2.54	0.000	0.000	0.000	0.000	0.026	0.174	0.268	0.326	0.365	0.393	0.413	0.442	0.480	0.499	0.517	0.527
2.55	0.000	0.000	0.000	0.000	0.023	0.165	0.257	0.314	0.352	0.379	0.400	0.428	0.465	0.484	0.502	0.511
2.56	0.000	0.000	0.000	0.000	0.020	0.156	0.246	0.302	0.340	0.366	0.386	0.414	0.451	0.469	0.487	0.496
2.57	0.000	0.000	0.000	0.000	0.017	0.148	0.236	0.291	0.327	0.354	0.373	0.401	0.437	0.455	0.473	0.482
2.58	0.000	0.000	0.000	0.000	0.015	0.140	0.226	0.279	0.316	0.341	0.361	0.388	0.424	0.441	0.459	0.468
2.59	0.000	0.000	0.000	0.000	0.013	0.133	0.216	0.269	0.304	0.330	0.349	0.375	0.410	0.428	0.445	0.454
2.60	0.000	0.000	0.000	0.000	0.011	0.125	0.207	0.258	0.293	0.318	0.337	0.363	0.398	0.415	0.432	0.441
2.61	0.000	0.000	0.000	0.000	0.009	0.118	0.198	0.248	0.282	0.307	0.325	0.351	0.385	0.402	0.419	0.428
2.62	0.000	0.000	0.000	0.000	0.008	0.112	0.189	0.238	0.272	0.296	0.314	0.339	0.373	0.390	0.406	0.415
2.63	0.000	0.000	0.000	0.000	0.007	0.105	0.181	0.229	0.262	0.285	0.303	0.328	0.361	0.378	0.394	0.402
2.64	0.000	0.000	0.000	0.000	0.005	0.099	0.172	0.220	0.252	0.275	0.293	0.317	0.350	0.366	0.382	0.390
2.65	0.000	0.000	0.000	0.000	0.005	0.094	0.165	0.211	0.243	0.265	0.282	0.307	0.339	0.355	0.371	0.379
2.66	0.000	0.000	0.000	0.000	0.004	0.088	0.157	0.202	0.233	0.256	0.273	0.296	0.328	0.344	0.359	0.367
2.67	0.000	0.000	0.000	0.000	0.003	0.083	0.150	0.194	0.224	0.246	0.263	0.286	0.317	0.333	0.348	0.356
2.68	0.000	0.000	0.000	0.000	0.002	0.078	0.143	0.186	0.216	0.237	0.254	0.277	0.307	0.322	0.338	0.345
2.69	0.000	0.000	0.000	0.000	0.002	0.073	0.136	0.179	0.208	0.229	0.245	0.267	0.297	0.312	0.327	0.335

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
2.70	0.000	0.000	0.000	0.000	0.001	0.069	0.130	0.171	0.200	0.220	0.236	0.258	0.288	0.302	0.317	0.325
2.71	0.000	0.000	0.000	0.000	0.001	0.064	0.124	0.164	0.192	0.212	0.227	0.249	0.278	0.293	0.307	0.315
2.72	0.000	0.000	0.000	0.000	0.000	0.060	0.118	0.157	0.184	0.204	0.219	0.241	0.269	0.283	0.298	0.305
2.73	0.000	0.000	0.000	0.000	0.000	0.057	0.112	0.151	0.177	0.197	0.211	0.232	0.260	0.274	0.288	0.296
2.74	0.000	0.000	0.000	0.000	0.000	0.053	0.107	0.144	0.170	0.189	0.204	0.224	0.252	0.266	0.279	0.286
2.75	0.000	0.000	0.000	0.000	0.000	0.049	0.102	0.138	0.163	0.182	0.196	0.216	0.243	0.257	0.271	0.277
2.76	0.000	0.000	0.000	0.000	0.000	0.046	0.097	0.132	0.157	0.175	0.189	0.209	0.235	0.249	0.262	0.269
2.77	0.000	0.000	0.000	0.000	0.000	0.043	0.092	0.126	0.151	0.168	0.182	0.201	0.227	0.241	0.254	0.260
2.78	0.000	0.000	0.000	0.000	0.000	0.040	0.087	0.121	0.145	0.162	0.175	0.194	0.220	0.233	0.246	0.252
2.79	0.000	0.000	0.000	0.000	0.000	0.037	0.083	0.115	0.139	0.156	0.169	0.187	0.212	0.225	0.238	0.244
2.80	0.000	0.000	0.000	0.000	0.000	0.035	0.079	0.110	0.133	0.150	0.162	0.181	0.205	0.218	0.230	0.237
2.81	0.000	0.000	0.000	0.000	0.000	0.032	0.075	0.105	0.128	0.144	0.156	0.174	0.198	0.211	0.223	0.229
2.82	0.000	0.000	0.000	0.000	0.000	0.030	0.071	0.101	0.122	0.138	0.150	0.168	0.192	0.204	0.216	0.222
2.83	0.000	0.000	0.000	0.000	0.000	0.028	0.067	0.096	0.117	0.133	0.145	0.162	0.185	0.197	0.209	0.215
2.84	0.000	0.000	0.000	0.000	0.000	0.026	0.064	0.092	0.112	0.128	0.139	0.156	0.179	0.190	0.202	0.208
2.85	0.000	0.000	0.000	0.000	0.000	0.024	0.060	0.088	0.108	0.122	0.134	0.150	0.173	0.184	0.195	0.201
2.86	0.000	0.000	0.000	0.000	0.000	0.022	0.057	0.084	0.103	0.118	0.129	0.145	0.167	0.178	0.189	0.195
2.87	0.000	0.000	0.000	0.000	0.000	0.020	0.054	0.080	0.099	0.113	0.124	0.139	0.161	0.172	0.183	0.188
2.88	0.000	0.000	0.000	0.000	0.000	0.019	0.051	0.076	0.094	0.108	0.119	0.134	0.155	0.166	0.177	0.182
2.89	0.000	0.000	0.000	0.000	0.000	0.017	0.048	0.073	0.090	0.104	0.114	0.129	0.150	0.160	0.171	0.176
2.90	0.000	0.000	0.000	0.000	0.000	0.016	0.046	0.069	0.087	0.100	0.110	0.125	0.145	0.155	0.165	0.171
2.91	0.000	0.000	0.000	0.000	0.000	0.015	0.043	0.066	0.083	0.096	0.106	0.120	0.140	0.150	0.160	0.165
2.92	0.000	0.000	0.000	0.000	0.000	0.013	0.041	0.063	0.079	0.092	0.101	0.115	0.135	0.145	0.155	0.160
2.93	0.000	0.000	0.000	0.000	0.000	0.012	0.038	0.060	0.076	0.088	0.097	0.111	0.130	0.140	0.149	0.154
2.94	0.000	0.000	0.000	0.000	0.000	0.011	0.036	0.057	0.072	0.084	0.093	0.107	0.125	0.135	0.144	0.149
2.95	0.000	0.000	0.000	0.000	0.000	0.010	0.034	0.054	0.069	0.081	0.090	0.103	0.121	0.130	0.140	0.144
2.96	0.000	0.000	0.000	0.000	0.000	0.009	0.032	0.051	0.066	0.077	0.086	0.099	0.117	0.126	0.135	0.140
2.97	0.000	0.000	0.000	0.000	0.000	0.009	0.030	0.049	0.063	0.074	0.083	0.095	0.112	0.121	0.130	0.135
2.98	0.000	0.000	0.000	0.000	0.000	0.008	0.028	0.046	0.060	0.071	0.079	0.091	0.108	0.117	0.126	0.130
2.99	0.000	0.000	0.000	0.000	0.000	0.007	0.027	0.044	0.057	0.068	0.076	0.088	0.104	0.113	0.122	0.126
3.00	0.000	0.000	0.000	0.000	0.000	0.006	0.025	0.042	0.055	0.065	0.073	0.084	0.101	0.109	0.118	0.122
3.01	0.000	0.000	0.000	0.000	0.000	0.006	0.024	0.040	0.052	0.062	0.070	0.081	0.097	0.105	0.114	0.118
3.02	0.000	0.000	0.000	0.000	0.000	0.005	0.022	0.038	0.050	0.059	0.067	0.078	0.093	0.101	0.110	0.114
3.03	0.000	0.000	0.000	0.000	0.000	0.005	0.021	0.036	0.048	0.057	0.064	0.075	0.090	0.098	0.106	0.110
3.04	0.000	0.000	0.000	0.000	0.000	0.004	0.019	0.034	0.045	0.054	0.061	0.072	0.087	0.094	0.102	0.106
3.05	0.000	0.000	0.000	0.000	0.000	0.004	0.018	0.032	0.043	0.052	0.059	0.069	0.083	0.091	0.099	0.103
3.06	0.000	0.000	0.000	0.000	0.000	0.003	0.017	0.030	0.041	0.050	0.056	0.066	0.080	0.088	0.095	0.099
3.07	0.000	0.000	0.000	0.000	0.000	0.003	0.016	0.029	0.039	0.047	0.054	0.064	0.077	0.085	0.092	0.096
3.08	0.000	0.000	0.000	0.000	0.000	0.003	0.015	0.027	0.037	0.045	0.052	0.061	0.074	0.081	0.089	0.092
3.09	0.000	0.000	0.000	0.000	0.000	0.002	0.014	0.026	0.036	0.043	0.049	0.059	0.072	0.079	0.086	0.089

continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
3.10	0.000	0.000	0.000	0.000	0.000	0.002	0.013	0.024	0.034	0.041	0.047	0.056	0.069	0.076	0.083	0.086
3.11	0.000	0.000	0.000	0.000	0.000	0.002	0.012	0.023	0.032	0.039	0.045	0.054	0.066	0.073	0.080	0.083
3.12	0.000	0.000	0.000	0.000	0.000	0.002	0.011	0.022	0.031	0.038	0.043	0.052	0.064	0.070	0.077	0.080
3.13	0.000	0.000	0.000	0.000	0.000	0.002	0.011	0.021	0.029	0.036	0.041	0.050	0.061	0.068	0.074	0.077
3.14	0.000	0.000	0.000	0.000	0.000	0.001	0.010	0.019	0.028	0.034	0.040	0.048	0.059	0.065	0.071	0.075
3.15	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.018	0.026	0.033	0.038	0.046	0.057	0.063	0.069	0.072
3.16	0.000	0.000	0.000	0.000	0.000	0.001	0.009	0.017	0.025	0.031	0.036	0.044	0.055	0.060	0.066	0.069
3.17	0.000	0.000	0.000	0.000	0.000	0.001	0.008	0.016	0.024	0.030	0.035	0.042	0.053	0.058	0.064	0.067
3.18	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.015	0.022	0.028	0.033	0.040	0.050	0.056	0.062	0.065
3.19	0.000	0.000	0.000	0.000	0.000	0.001	0.007	0.015	0.021	0.027	0.032	0.038	0.049	0.054	0.059	0.062
3.20	0.000	0.000	0.000	0.000	0.000	0.001	0.006	0.014	0.020	0.026	0.030	0.037	0.047	0.052	0.057	0.060
3.21	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.013	0.019	0.024	0.029	0.035	0.045	0.050	0.055	0.058
3.22	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.012	0.018	0.023	0.027	0.034	0.043	0.048	0.053	0.056
3.23	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.011	0.017	0.022	0.026	0.032	0.041	0.046	0.051	0.054
3.24	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.011	0.016	0.021	0.025	0.031	0.040	0.044	0.049	0.052
3.25	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.010	0.015	0.020	0.024	0.030	0.038	0.043	0.048	0.050
3.26	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.009	0.015	0.019	0.023	0.028	0.037	0.041	0.046	0.048
3.27	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.009	0.014	0.019	0.022	0.027	0.035	0.040	0.044	0.046
3.28	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.008	0.013	0.017	0.021	0.026	0.034	0.038	0.042	0.045
3.29	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.008	0.012	0.016	0.020	0.025	0.032	0.037	0.041	0.043
3.30	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.007	0.012	0.015	0.019	0.024	0.031	0.035	0.039	0.042
3.31	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.007	0.011	0.015	0.018	0.023	0.030	0.034	0.038	0.040
3.32	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.006	0.010	0.014	0.017	0.022	0.029	0.032	0.036	0.039
3.33	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.006	0.010	0.013	0.016	0.021	0.027	0.031	0.035	0.037
3.34	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.006	0.009	0.013	0.015	0.020	0.026	0.030	0.034	0.036
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.009	0.012	0.015	0.019	0.025	0.029	0.032	0.034
3.36	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.008	0.011	0.014	0.018	0.024	0.028	0.031	0.033
3.37	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005	0.008	0.011	0.013	0.017	0.023	0.026	0.030	0.032
3.38	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.007	0.010	0.013	0.016	0.022	0.025	0.029	0.031
3.39	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.007	0.010	0.012	0.016	0.021	0.024	0.028	0.029
3.40	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.004	0.007	0.009	0.011	0.015	0.020	0.023	0.027	0.028
3.41	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.006	0.009	0.011	0.014	0.020	0.022	0.026	0.027
3.42	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.006	0.008	0.010	0.014	0.019	0.022	0.025	0.026
3.43	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.005	0.008	0.010	0.013	0.018	0.021	0.024	0.025
3.44	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.005	0.007	0.009	0.012	0.017	0.020	0.023	0.024
3.45	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.005	0.007	0.009	0.012	0.016	0.019	0.022	0.023
3.46	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.005	0.007	0.008	0.011	0.016	0.018	0.021	0.022
3.47	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.006	0.008	0.011	0.015	0.017	0.020	0.022
3.48	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.006	0.007	0.010	0.014	0.017	0.019	0.021
3.49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.004	0.005	0.007	0.010	0.014	0.016	0.019	0.020

(continued)

TABLE 6: TABLE FOR ESTIMATING THE LOT PERCENT DEFECTIVE USING STANDARD DEVIATION METHOD (continued)

Q_U or Q_L	Sample Size															
	3	4	5	7	10	15	20	25	30	35	40	50	75	100	150	200
3.50	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.005	0.007	0.009	0.013	0.015	0.018	0.019
3.51	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.005	0.006	0.009	0.013	0.015	0.017	0.018
3.52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.005	0.006	0.008	0.012	0.014	0.017	0.018
3.53	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.004	0.006	0.008	0.012	0.014	0.016	0.017
3.54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.004	0.005	0.008	0.011	0.013	0.015	0.016
3.55	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.003	0.004	0.005	0.007	0.011	0.012	0.015	0.016
3.56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.004	0.005	0.007	0.010	0.012	0.014	0.015
3.57	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.005	0.006	0.010	0.011	0.013	0.014
3.58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.006	0.009	0.011	0.013	0.014
3.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.006	0.009	0.010	0.012	0.013
3.60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.006	0.008	0.010	0.012	0.013
3.61	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.005	0.008	0.010	0.011	0.012
3.62	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.003	0.005	0.008	0.009	0.011	0.012
3.63	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.005	0.007	0.009	0.010	0.011
3.64	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.007	0.008	0.010	0.011
3.65	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.007	0.008	0.010	0.010
3.66	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.006	0.008	0.009	0.010
3.67	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.006	0.007	0.009	0.010
3.68	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.004	0.006	0.007	0.008	0.009
3.69	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.003	0.005	0.007	0.008	0.009
3.70	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.002	0.002	0.003	0.005	0.006	0.008	0.008
3.71	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.005	0.006	0.007	0.008
3.72	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.005	0.006	0.007	0.008
3.73	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.005	0.006	0.007	0.007
3.74	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.005	0.007	0.007
3.75	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.002	0.004	0.005	0.006	0.007
3.76	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.004	0.005	0.006	0.007
3.77	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.004	0.005	0.006	0.006
3.78	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.004	0.004	0.005	0.006
3.79	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.005	0.006
3.80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.005	0.006
3.81	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.005	0.005
3.82	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.005	0.005
3.83	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.004	0.005
3.84	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.003	0.003	0.004	0.005
3.85	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.003	0.004	0.004
3.86	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.004
3.87	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.004
3.88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.004	0.004
3.89	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.003	0.004
3.90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.003	0.004

TABLE 7: ACCEPTANCE CRITERIA FOR VARIABLES SAMPLING PLANS - KNOWN STANDARD DEVIATION

Sample size code letter	Acceptable Quality Levels																				
	.04			.065			.10			.15			.25			.40			.65		
	n	M	v	n	M	v	n	M	v	n	M	v	n	M	v	n	M	v	n	M	v
B	↓			↓			↓			↓			↓			↓			↓		
C	↓			↓			↓			↓			↓			↓			↓		
D	↓			↓			↓			↓			↓			↓			2	1.28	1.414
E	↓			↓			↓			↓			2	.310	1.414	2	.510	1.414	3	1.94	1.225
F	↓			↓			↓			3	.369	1.225	3	.568	1.225	3	.959	1.225	4	1.88	1.155
G	3	.079	1.225	3	.114	1.225	4	.290	1.155	4	.399	1.155	4	.681	1.155	5	1.09	1.118	5	1.76	1.118
H	4	.111	1.115	4	.161	1.155	5	.296	1.118	5	.445	1.118	6	.721	1.095	6	1.14	1.095	7	1.75	1.080
I	5	.130	1.118	6	.230	1.095	6	.321	1.095	6	.478	1.095	7	.756	1.080	8	1.14	1.069	8	1.80	1.069
J	6	.145	1.095	6	.234	1.095	7	.343	1.080	7	.507	1.080	8	.791	1.069	9	1.18	1.061	10	1.79	1.054
K	7	.141	1.080	7	.226	1.080	8	.330	1.069	9	.469	1.061	9	.760	1.061	10	1.14	1.054	11	1.73	1.049
L	8	.153	1.069	8	.243	1.069	9	.351	1.061	10	.494	1.054	11	.768	1.049	12	1.15	1.045	13	1.74	1.041
M	10	.141	1.054	11	.217	1.049	11	.326	1.049	12	.461	1.045	13	.721	1.041	14	1.08	1.038	16	1.62	1.003
N	14	.138	1.038	15	.211	1.035	16	.308	1.033	17	.438	1.031	19	.673	1.027	21	1.00	1.025	23	1.51	1.023
O	19	.134	1.027	20	.207	1.026	22	.296	1.024	23	.423	1.023	25	.655	1.021	27	.980	1.019	30	1.47	1.017
P	27	.129	1.019	30	.193	1.017	31	.283	1.017	34	.397	1.015	37	.615	1.014	40	.921	1.013	44	1.39	1.012
Q	37	.130	1.014	40	.196	1.013	42	.285	1.012	45	.402	1.011	49	.620	1.010	54	.920	1.009	59	1.39	1.009

All AQL and table values are in percent defective.

↓ Use first sampling plan below arrow, that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.

(continued)

TABLE 7: ACCEPTANCE CRITERIA FOR VARIABLES SAMPLING PLANS - KNOWN STANDARD DEVIATION (continued)

Sample size code letter	Acceptable Quality Levels																				
	1.00			1.50			2.50			4.00			6.50			10.00			15.00		
	n	M	v	n	M	v	n	M	v	n	M	v	n	M	v	n	M	v	n	M	v
B		▼			▼			▼			▼			▼			▼			▼	
C	2	2.73	1.414	2	3.90	1.414	2	6.11	1.414	6	9.27	1.414	3	17.74	1.225	3	24.22	1.225	4	33.67	1.155
D	2	2.23	1.414	2	3.00	1.414	3	7.56	1.225	3	10.79	1.225	3	15.60	1.225	4	22.97	1.155	4	31.01	1.155
E	3	2.76	1.225	3	3.85	1.225	4	6.99	1.155	4	9.97	1.155	5	15.21	1.118	5	20.80	1.118	6	28.64	1.095
F	4	2.58	1.155	4	3.87	1.155	5	6.05	1.118	5	8.92	1.118	6	13.89	1.095	7	19.46	1.080	8	26.64	1.069
G	6	2.57	1.095	6	3.77	1.095	7	5.83	1.080	8	8.62	1.069	9	12.88	1.061	11	17.88	1.049	12	24.88	1.045
H	7	2.62	1.080	8	3.68	1.069	9	5.68	1.061	10	8.43	1.054	12	12.35	1.045	14	17.36	1.038	16	23.96	1.033
I	9	2.59	1.061	10	3.63	1.054	11	5.60	1.049	13	8.13	1.041	15	12.04	1.035	17	17.05	1.031	20	23.43	1.026
J	11	2.57	1.049	12	3.61	1.045	13	5.58	1.041	15	8.13	1.035	18	11.88	1.029	21	16.71	1.025	24	23.13	1.022
K	12	2.49	1.045	14	3.43	1.038	15	5.34	1.035	18	7.72	1.029	20	11.57	1.026	24	16.23	1.022	27	22.63	1.019
L	14	2.51	1.038	15	3.54	1.035	18	5.29	1.029	20	7.80	1.026	23	11.56	1.023	27	16.27	1.019	31	22.57	1.017
M	17	2.35	1.031	19	3.28	1.027	22	4.98	1.024	25	7.34	1.021	39	10.93	1.018	33	15.61	1.016	38	21.77	1.013
N	25	2.19	1.021	28	3.05	1.018	32	4.68	1.016	36	6.95	1.014	42	10.40	1.012	49	14.87	1.010	56	20.90	1.009
O	33	2.12	1.016	36	2.99	1.014	42	4.55	1.012	48	6.75	1.011	55	10.17	1.009	64	14.58	1.008	75	20.48	1.007
P	49	2.00	1.010	54	2.82	1.009	61	4.35	1.008	70	6.48	1.007	82	9.76	1.006	95	14.09	1.005	111	19.90	1.005
Q	65	2.00	1.008	71	2.82	1.007	81	4.34	1.006	93	6.46	1.005	109	9.73	1.005	127	14.02	1.004	147	19.84	1.003

All AQL and table values are in percent defective.

▼ Use first sampling plan below arrow, that is, both sample size as well as M value. When sample size equals or exceeds lot size, every item in the lot must be inspected.

TABLE 8: TABLE FOR ESTIMATING THE LOT PERCENTAGE DEFECTIVE FOR VARIABLES SAMPLING PLANS BASED ON KNOWN VARIABILITY

Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L		Q_U or Q_L	
.00	50.000																										
.01	49.601	.26	39.743	.51	30.503	.76	22.363	1.01	15.625	1.26	10.383	1.51	06.552	1.76	03.920	2.01	02.222	2.26	01.191	2.51	00.604	2.76	00.289	3.01	00.131	3.26	00.056	3.51	00.022	3.76	00.008
.02	49.202	.27	39.358	.52	30.153	.77	22.065	1.02	15.386	1.27	10.204	1.52	06.426	1.77	03.836	2.02	02.169	2.27	01.160	2.52	00.587	2.77	00.280	3.02	00.126	3.27	00.054	3.52	00.022	3.77	00.008
.03	48.803	.28	38.974	.53	29.806	.78	21.770	1.03	15.150	1.28	10.027	1.53	06.301	1.78	03.754	2.03	02.118	2.28	01.130	2.53	00.570	2.78	00.272	3.03	00.122	3.28	00.052	3.53	00.021	3.78	00.008
.04	48.405	.29	38.591	.54	29.460	.79	21.476	1.04	14.917	1.29	09.853	1.54	06.178	1.79	03.673	2.04	02.068	2.29	01.101	2.54	00.554	2.79	00.264	3.04	00.118	3.29	00.050	3.54	00.020	3.79	00.008
.05	48.006	.30	38.209	.55	29.116	.80	21.186	1.05	14.686	1.30	09.680	1.55	06.057	1.80	03.593	2.05	02.018	2.30	01.072	2.55	00.539	2.80	00.256	3.05	00.114	3.30	00.048	3.55	00.019	3.80	00.007
.06	47.608	.31	37.828	.56	28.774	.81	20.897	1.06	14.457	1.31	09.510	1.56	05.938	1.81	03.515	2.06	01.970	2.31	01.044	2.56	00.523	2.81	00.248	3.06	00.111	3.31	00.047	3.56	00.019	3.81	00.007
.07	47.210	.32	37.448	.57	28.434	.82	20.611	1.07	14.231	1.32	09.342	1.57	05.821	1.82	03.438	2.07	01.923	2.32	01.017	2.57	00.508	2.82	00.240	3.07	00.107	3.32	00.045	3.57	00.018	3.82	00.007
.08	46.812	.33	37.070	.58	28.096	.83	20.327	1.08	14.007	1.33	09.176	1.58	05.705	1.83	03.362	2.08	01.876	2.33	00.990	2.58	00.494	2.83	00.233	3.08	00.103	3.33	00.043	3.58	00.017	3.83	00.006
.09	46.414	.34	36.693	.59	27.760	.84	20.045	1.09	13.786	1.34	09.012	1.59	05.592	1.84	03.288	2.09	01.831	2.34	00.964	2.59	00.480	2.84	00.226	3.09	00.100	3.34	00.042	3.59	00.017	3.84	00.006
.10	46.017	.35	36.317	.60	27.425	.85	19.766	1.10	13.567	1.35	08.851	1.60	05.480	1.85	03.216	2.10	01.786	2.35	00.939	2.60	00.466	2.85	00.219	3.10	00.097	3.35	00.040	3.60	00.016	3.85	00.006
.11	45.620	.36	35.942	.61	27.093	.86	19.489	1.11	13.350	1.36	08.691	1.61	05.370	1.86	03.144	2.11	01.743	2.36	00.914	2.61	00.453	2.86	00.212	3.11	00.094	3.36	00.039	3.61	00.015	3.86	00.006
.12	45.224	.37	35.569	.62	26.763	.87	19.215	1.12	13.136	1.37	08.534	1.62	05.262	1.87	03.074	2.12	01.700	2.37	00.889	2.62	00.440	2.87	00.205	3.12	00.090	3.37	00.038	3.62	00.015	3.87	00.005
.13	44.828	.38	35.197	.63	26.435	.88	18.943	1.13	12.924	1.38	08.379	1.63	05.155	1.88	03.005	2.13	01.659	2.38	00.866	2.63	00.427	2.88	00.199	3.13	00.087	3.38	00.036	3.63	00.014	3.88	00.005
.14	44.433	.39	34.827	.64	26.109	.89	18.673	1.14	12.714	1.39	08.226	1.64	05.050	1.89	02.938	2.14	01.618	2.39	00.842	2.64	00.415	2.89	00.193	3.14	00.084	3.39	00.035	3.64	00.014	3.89	00.005
.15	44.038	.40	34.458	.65	25.785	.90	18.406	1.15	12.507	1.40	08.076	1.65	04.947	1.90	02.872	2.15	01.578	2.40	00.820	2.65	00.402	2.90	00.187	3.15	00.082	3.40	00.034	3.65	00.013	3.90	00.005
.16	43.644	.41	34.090	.66	25.463	.91	18.141	1.16	12.302	1.41	07.927	1.66	04.846	1.91	02.807	2.16	01.539	2.41	00.798	2.66	00.391	2.91	00.181	3.16	00.079	3.41	00.032	3.66	00.013	3.91	00.005
.17	43.251	.42	33.724	.67	25.143	.92	17.879	1.17	12.100	1.42	07.780	1.67	04.746	1.92	02.743	2.17	01.500	2.42	00.776	2.67	00.379	2.92	00.175	3.17	00.076	3.42	00.031	3.67	00.012	3.92	00.004
.18	42.858	.43	33.360	.68	24.825	.93	17.619	1.18	11.900	1.43	07.636	1.68	04.648	1.93	02.680	2.18	01.463	2.43	00.755	2.68	00.368	2.93	00.169	3.18	00.074	3.43	00.030	3.68	00.012	3.93	00.004
.19	42.465	.44	32.997	.69	24.510	.94	17.361	1.19	11.702	1.44	07.493	1.69	04.551	1.94	02.619	2.19	01.426	2.44	00.734	2.69	00.357	2.94	00.164	3.19	00.071	3.44	00.029	3.69	00.011	3.94	00.004
.20	42.074	.45	32.636	.70	24.196	.95	17.106	1.20	11.507	1.45	07.353	1.70	04.457	1.95	02.559	2.20	01.390	2.45	00.714	2.70	00.347	2.95	00.159	3.20	00.069	3.45	00.028	3.70	00.011	3.95	00.004
.21	41.683	.46	32.276	.71	23.885	.96	16,853	1.21	11.314	1.46	07.214	1.71	04.363	1.96	02.500	2.21	01.355	2.46	00.695	2.71	00.336	2.96	00.154	3.21	00.066	3.46	00.027	3.71	00.010	3.96	00.004
.22	41.294	.47	31.918	.72	23.576	.97	16.602	1.22	11.123	1.47	04.078	1.72	04.272	1.97	02.442	2.22	01.321	2.47	00.676	2.72	00.326	2.97	00.149	3.22	00.064	3.47	00.026	3.72	00.010	3.97	00.004
.23	40.905	.48	31.561	.73	23.270	.98	16.354	1.23	10.935	1.48	06.944	1.73	04.182	1.98	02.385	2.23	01.287	2.48	00.657	2.73	00.317	2.98	00.144	3.23	00.062	3.48	00.025	3.73	00.010	3.98	00.003
.24	40.517	.49	31.207	.74	22.965	.99	16.109	1.24	10.749	1.49	06.811	1.74	04.093	1.99	02.330	2.24	01.255	2.49	00.639	2.74	00.307	2.99	00.139	3.24	00.060	3.49	00.024	3.74	00.009	3.99	00.003
.25	40.129	.50	30.854	.75	22.663	1.00	15.866	1.25	10.565	1.50	06.681	1.75	04.006	2.00	02.275	2.25	01.222	2.50	00.621	2.75	00.298	3.00	00.135	3.25	00.058	3.50	00.023	3.75	00.009	4.00	00.003

[1]Values tabulated are read in percent.

B.2 EXAMPLES

B.2.1 Unknown Variability Plans.

B.2.1.1 Single Specification Limit. The maximum, U, permissible pellet gas content is 0.08. An inspection lot of fuel pellets is submitted for inspection. The specified LTPD and the accompanying β risk for this characteristic are 10 and 0.10, respectively. From Table 4 it is seen that several OC curves could be selected to satisfy these values. Assume the OC curve having an AQL value of 0.25 and corresponding to sample size code letter F is selected by the supplier after consideration of his inspection costs and possible process capabilities (see 5.1.1). From Table 5 it is seen that this sample size code letter and AQL value calls for a sampling plan of n = 10 and an acceptance criterion of M = 0.716 maximum allowable percent defective.

1. Sample size code letter, from Table 4 — F
   AQL value, from Table 4 — 0.25
2. Sample size n, from Table 5 — 10
   Accept criterion, M, from Table 5 — 0.716
3. Sample measurements — 0.05, 0.06, 0.03, 0.04, 0.05, 0.07, 0.05, 0.05, 0.04, 0.05
4. Sample mean, $\bar{X} = \frac{\Sigma X}{n} = \frac{.49}{10} =$ — 0.049
5. Sample standard deviation, s,
   $$s = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}} = \sqrt{\frac{0.02510 - \frac{0.2401}{10}}{9}} =$$ — 0.011
6. Quality index, $Q_U = (U-\bar{X})/s = (0.08 - 0.049)/0.011 =$ — 2.82
7. $p_U =$ — 0.00
8. Compare p_U and M — 0.00 < 0.716
   The lot meets the acceptance criteria since $p_U < M$.

B.2.1.2 Double Specification Limit (One LTPD value for both upper and lower specification limit combined). The minimum, L, pellet density is specified at 88 percent. The maximum, U, pellet density is 92 percent. The β risk and the LTPD for this characteristic are 0.05 and 5, respectively. Assume the OC curve having AQL value of 0.04 and corresponding to sample size code letter G is selected by the supplier. From Table 5 it is seen that sample size code letter G and AQL level 0.04 call for a sampling plan of n = 15 and an acceptance criteria of M = 0.099 maximum allowable percent defective.

1. Sample size code letter, from Table 4 — G
   AQL value, from Table 4 — 0.04

2. Sample size n, from Table 5 — 15
   Accept criterion M, from Table 5 — 0.099

3. Sample measurements: 90.2, 90,0, 91.1, 89.3, 89.8, 90.3, 91.4, 88.9, 89.7, 90.4, 91.7, 90.4, 90.8, 91.7, 89.7

4. Sample mean, $\bar{X} = \frac{\Sigma X}{n} = \frac{1355.4}{15} =$ 90.36

5. Sample standard deviation, s,

$$s = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}} = \sqrt{\frac{122483.96 - \frac{(1355.4)^2}{15}}{14}} = 0.846$$

6. Quality indices: $Q_U = (U - \bar{X})/s = (92.0 - 90.36)/0.846 =$ 1.94

   $Q_L = (\bar{X} - L)/s = (90.36 - 88.0)/0.846 =$ 2.79

7. $p = p_U + p_L =$ 1.997

8. Compare p and M — 1.997 > 0.099
   The lot does not meet the accept criterion.

B.2.1.3 Double Specification Limit (Different LTPD values for upper and lower specification limits). Assume the lower specification limit, L, for pellet density is specified at 88 percent, and the upper specification limit, U, is 92 percent. A β risk and LTPD of 0.10 and 10, respectively, are specified for the lower specification; a β risk and LTPD of 0.10 and 5, respectively, is specified for the upper specification. From Table 4 it is seen that for the lower specification limit, the OC curve with an AQL value of .65 and sample size code letter G satisfies the required LTPD and β risk; for the upper specification limit, the OC curve with AQL value of 0.15 and sample size code letter G satisfies the required LTPD and β risks. Assume these OC curves are also deemed satisfactory from the supplier's standpoint (see 5.1.1). From Table 5 a sample size n = 15 is shown for sample size code letter G. The accept criteria, M, for the lower and upper specifications is 2.11 and 0.503, respectively, as shown in Table 5 for the AQL values obtained above.

1. Sample size code letter, from Table 4
   lower specification limit — G
   upper specification limit — G
   AQL values, from Table 4
   lower specification limit — 0.65
   upper specification limit — 0.15

2. Sample size n, from Table 5 — 15
   Accept criteria M, from Table 5:
   lower specification limit, M_L — 2.11
   upper specification limit, M_U — 0.503

3. Sample measurements: 90.2, 90.0, 91.1, 89.3, 89.8, 90.3, 91.4, 91.7, 88.9, 89.7, 90.4, 91.7, 90.4, 90.8, 89.7

4. Sample mean, $\bar{X} = \frac{\Sigma X}{n} = \frac{1355.4}{15} =$ 90.36

5. Sample standard deviation, s,

$$s = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}} = \sqrt{\frac{122483.96 - \frac{(1355.4)^2}{15}}{14}} = 0.846$$

6. Quality indices: $Q_U = (U - \bar{X})/s = (92.0 - 90.36)/0.846 =$ 1.94

   $Q_L = (\bar{X} - L)/s = (90.36 - 88.0)/0.846 =$ 2.79

7. p_U — 1.96

   p_L — 0.037

   $p = p_U + p_L = 1.96 + 0.037 =$ 1.997%

8. Compare: p_U and M_U — 1.96 > 0.503

   p_L and M_L — 0.037 < 2.11

   p and M_L — 1.997 < 2.11

The lot does not meet the acceptance criteria, since $p_U > M_U$.

B.2.2 Known Variability Plans.

B.2.2.1 Single Specification Limit. Assume the upper specification limit, U, for pellet moisture content is 30 ppm. The within lot variability, σ, is known to be 3 ppm. An LTPD of 10 with $\beta = 0.10$ is specified in the product specifications for this characteristic. From Table 4 it is seen that the OC curve 0.25, for the sample size code letter F, satisfies the required LTPD and β. The supplier also notes that, additionally, this OC curve is satisfactory from the supplier's standpoint as regards the risk of rejecting lots of an acceptable (to the purchaser) level of quality (see 5.1.1). From Table 7 it is seen that a sample size of n = 3 is required.

1. Sample size code letter, from Table 4 — F
   AQL value, from Table 4 — 0.25

2. Sample size n, from Table 7 — 3
   Factor v from Table 7 — 1.225
   Maximum allowable percent defective M, Table 7 — 0.568

3. Sample measurements: — 25, 27, 29

4. Sample mean $\bar{X} = \frac{\Sigma X}{n} = \frac{81}{3} =$ — 27

5. Quality index $Q_U = (U - \bar{X})v/\sigma = (30 - 27)(1.225)/3 =$ — 1.23

6. p_U, from Table 8 — 10.935

7. Compare p_U and M — 10.935 > 0.568
   The lot does not meet the accept criterion since $p_U > M$.

Note that if a single lower specification limit, L, is given, then compute the quality index $Q_L = (\bar{X} - L)v/\sigma$ in line 5 and obtain the estimate of the lot percent defective p_L. Compare p_L with M; the lot meets the acceptability criterion if p_L is equal to or less than M.

B.2.2.2 Double Specification Limit (One LTPD and β value for both upper and lower specification limits combined). Assume the maximum, U, and minimum, L, specifications for the yield points of certain steel castings are 67,000 psi and 58,000 psi, respectively. The within lot variability is known to be 3,000 psi. The specified LTPD and β values for this characteristic are 10 and 0.10, respectively. From Table 4 it is decided that the OC curve with an AQL = 1.5 and sample size code letter I best satisfies both the purchaser and supplier desires (see 5.1.1).

1. Sample size code letter, from Table 4 — I
   AQL value, from Table 4 — 1.5

2. Sample size n, from Table 7 — 10
   Factor v, from Table 7 — 1.054
   Max. allowable percent defective M, Table 7 — 3.63%

3. Sample measurements — 65,500, 62,500, 60,500, 68,000, 59,000, 62,000, 61,000, 69,000, 58,000, 64,500

4. Sample mean, $\bar{X} = \frac{\Sigma X}{n} =$ — 63,000

5. Quality indices: $Q_U = (U - \bar{X})v/\sigma =$ — 1.41
   $Q_L = (\bar{X} - L)v/\sigma =$ — 1.76

6. $p = p_U + p_L$, from Table 8 — 11.85

7. Compare p and M — 11.85% > 3.63%

   The lot does not meet the acceptability criterion, since $p = p_U + p_L$ is greater than M.

B.2.2.3 Double Specification Limit (Different LTPD and β and values for upper and lower specification limits). Assume the specified maximum, U, and minimum, L, specifications for yield point for certain steel castings are 67,000 and 58,000 psi, respectively. The variability, σ, is known to be 3,000 psi. The specified LTPD and β risks for the upper specifications are 8 and 0.10, respectively; the specified LTPD and β risks for the lower specification are 14 and 0.07, respectively. The OC curve with an AQL value of 1.0 and sample size code letter I satisfies the LTPD and β requirements for the upper specification; the OC curve with an AQL value of 2.5 and sample size code letter I satisfies the LTPD and β requirements for the lower specification. Both these OC curves are satisfactory to the supplier (see 3.2.1).

1. Sample size code letter for upper specification, Table 4 — I
   AQL value for upper specification, Table 4 — 1.0
   Sample size code letter for lower specification, Table 4 — I
   AQL value for lower specification, Table 4 — 2.5

2. Sample size n for code letter I and largest (2.5) of above two AQL values, Table 7 — 11

   Factor v for code letter I and largest (2.5) of above two AQL values, Table 7 — 1.049

   M_U value for upper specification (AQL = 1.0) Table 7 — 2.59

   M_L value for lower specification (AQL = 2.5) Table 7 — 5.60

3. Sample measurements: 62,500, 60,500, 64,000, 59,000, 60,500, 62,000, 61,000, 60,631, 63,000, 62,000, 63,000

4. Sample mean, $\bar{X} = \frac{\Sigma X}{n}$ = 61,648

5. Quality Index $Q_U = (U - \bar{X})v/\sigma$ = 1.87

   Quality Index $Q_L = (\bar{X} - L)v/\sigma$ = 1.28

6. p_U, Table 8 — 3.07%

   p_L, Table 8 — 10.03%

   $p = p_U + p_L$ = 13.10%

7. Compare: p_U and M_U — 3.07% > 2.59%

   p_L and M_L — 10.03% > 5.60%

   p and M_L — 13.10% > 5.60%

The lot does not meet the acceptability criteria, since all of those in 7 are not satisfied; i.e., $p_U > M_U$, $p_L > M_L$, and $p > M_L$.