



Standard Practice for Setting an Upper Confidence Bound For a Fraction or Number of Non-Conforming items, or a Rate of Occurrence for Non-conformities, Using Attribute Data, When There is a Zero Response in the Sample¹

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^{ε1} NOTE—Section 3 was editorially corrected in August 2013.

^{ε2} NOTE—Terms were editorially corrected in April 2016.

1. Scope

1.1 This practice presents methodology for the setting of an upper confidence bound regarding a unknown fraction or quantity non-conforming, or a rate of occurrence for nonconformities, in cases where the method of attributes is used and there is a zero response in a sample. Three cases are considered.

1.1.1 The sample is selected from a process or a very large population of discrete items, and the number of non-conforming items in the sample is zero.

1.1.2 A sample of items is selected at random from a finite lot of discrete items, and the number of non-conforming items in the sample is zero.

1.1.3 The sample is a portion of a continuum (time, space, volume, area etc.) and the number of non-conformities in the sample is zero.

1.2 Allowance is made for misclassification error in this standard, but only when misclassification rates are well understood or known and can be approximated numerically.

2. Referenced Documents

2.1 ASTM Standards:²

E141 Practice for Acceptance of Evidence Based on the Results of Probability Sampling
E456 Terminology Relating to Quality and Statistics
E1402 Guide for Sampling Design
E1994 Practice for Use of Process Oriented AOQL and

LTPD Sampling Plans

E2586 Practice for Calculating and Using Basic Statistics

2.2 ISO Standards:³

ISO 3534-1 Statistics—Vocabulary and Symbols, Part 1: Probability and General Statistical Terms

ISO 3534-2 Statistics—Vocabulary and Symbols, Part 2: Statistical Quality Control

NOTE 1—Samples discussed in this standard should meet the requirements (or approximately so) of a probability sample as defined in Terminologies E1402 or E456.

3. Terminology

3.1 *Definitions*—Unless otherwise noted in this standard, all terms relating to quality and statistics are defined in Terminology E456.

3.1.1 *attributes, method of, n*—measurement of quality by the method of attributes consists of noting the presence (or absence) of some characteristic or attribute in each of the units in the group under consideration, and counting how many of the units do (or do not) possess the quality attribute, or how many such events occur in the unit, group or area.

3.1.2 *confidence bound, n*—see *confidence limit*. **E2586**

3.1.3 *confidence coefficient, n*—see *confidence level*. **E2586**

3.1.4 *confidence interval, n*—an interval estimate [L, U] with the statistics L and U as limits for the parameter θ and with confidence level $1 - \alpha$, where $\Pr(L \leq \theta \leq U) \geq 1 - \alpha$. **E2586**

3.1.4.1 *Discussion*—The confidence level, $1 - \alpha$, reflects the proportion of cases that the confidence interval [L, U] would contain or cover the true parameter value in a series of repeated random samples under identical conditions. Once L and U are given values, the resulting confidence interval either does or does not contain it. In this sense "confidence" applies not to the

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² For referenced ASTM Standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.