AMERICAN NATIONAL STANDARD

An attribute chain sampling program

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Approved as an American National Standard by:
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An attribute chain sampling program provides procedures and properties for plans that can contribute to reducing inspection and improving performance characteristics of sampling inspection. The standard can be used alone or in conjunction with ANSI/ASQ Z 1.4 and ANSI/ISO/ASQ 2859-1.

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ANSI/ASQ Z1.9-2008: Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming

ANSI/ISO/ASQ 2859-1:1999: Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

ANSI/ISO/ASQ 2859-4:2002: Sampling procedures for inspection by attributes – Part 4: Procedures for assessment of declared quality levels

ANSI/ISO/ASQ Q9001-2008: Quality management systems – Requirements

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This Foreword is not a part of the American National Standard *ASQ/ANSI S3-2012: An attribute chain sampling program*.

The purpose of this publication is to provide a source of a limited selection of chain sampling plans and their operating characteristics (OC), and to assist in the application of the chain sampling procedures while performing attribute, lot-by-lot, single sampling inspection. It is also intended to explain the rationale behind, and to provide the operating characteristics for, the *fractional acceptance number* plans for single sampling that are included in ANSI/ISO/ASQ 2859-1: *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*.

This is the first version of a new standard. It includes a collection of 29 sample sizes as well as the operating characteristics for the plans presented. The complete operating characteristics are presented in the form of both table and OC curve for each sample size.

Writers and Editors:

The 2012 version of this standard was prepared by the S3 Writing Group of the ASQ Statistics Division consisting of the following members: Aridaman Jain (chair), Jack Keyser, Ed Shecter, and Ken Stephens. Assistance received from reviewers, Mark Johnson, Dean Neubauer, and Harry Wadsworth is greatly appreciated.

Introduction

This publication is intended as a stand-alone standard to provide a source of a limited selection of chain sampling plans and their operating characteristics (OC), and to assist in the application of the chain sampling procedures while performing attribute, lot-by-lot, single sampling inspection. It is also intended to serve as a further explanation of and to provide the operating characteristics for the *fractional acceptance number* plans for single sampling that are included in ANSI/ISO/ASQ 2859-1: *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*. Fractional acceptance number plans are essentially chain sampling procedures and are provided in ISO 2859-1 as an optional procedure in cases where the combination of sample size code letters and AQLs result in plans between the 0 and 1 acceptance numbers. It is expected that this optional procedure will be included in ANSI/ASQ Z1.4 in a subsequent revision. Chain sampling plans are ideally suited to replace zero (0) acceptance number plans for single sampling during essentially continuous lot submissions under steady production. As shown herein their operating characteristics fall between those of c = 0 and c = 1 sampling plans, hence the name used in ANSI/ISO/ASQ 2859-1 plans.

1 Scope and purpose

This standard describes the process of chain sampling, the theory, applications, plans for use, operating (performance) characteristics, and the utility of chain sampling as compared to single sampling via the operating characteristics. The purpose of this standard is to provide the procedures for a collection of sample sizes as well as to present the static operating characteristics for the plans presented, for use of the chain sampling technique. There is no direct indexing of the plans such as that of acceptance quality limit (AQL) used in ANSI/ASQ Z1.4 and ANSI/ISO/ASQ 2859-1. However, the complete OC are presented in both table and OC curve form for every sample size included. Furthermore, formulations are provided to compute the average outgoing quality limit (AOQL) for any of the chain sampling plans presented, related to the five values of the parameter, i, the sample size, n, and the lot size N, being applied. Those interested in using chain sampling to replace attribute sampling plans indexed either by AQL or limiting quality level (LQL) as given in ANSI/ASQ Z1.4 and ANSI/ISO/ASQ 2859-1, may select an appropriate plan from this standard by consulting the table of operating characteristics for the various sample sizes to find a plan with p at the desired AQL with probability of acceptance (Pa) equal to 0.95, 0.98, etc and/or the desired LQL at Pa equal to 0.10, Table 1 is also given herein that summarizes the $p_{0,95}$ and the $p_{0,10}$ values for combinations of the parameters, n and i, to assist with this possible interest.

1.1 Field of application

Sampling plans designated in this publication are applicable, but not limited to, inspection of the following:

a) end items such as complete units or sub-assemblies;

b) components and raw materials;

c) operations or services;

d) materials in process;

e) maintenance operations;

f) data or records;

g) administrative procedures.

These plans are intended primarily to be used for a continuing series of lots or batches (operations), essentially a series of continuous supply, preferably in order of production (service). It is recommended that they not be used for isolated lots. Normally, lots or batches (operations) are expected to be of essentially the same satisfactory quality. They are particularly applicable to situations where the customer (receiving the inspected lots) has some degree of confidence in the integrity of the producer/supplier. Chain sampling plans are particularly suited to situations satisfying the preceding conditions and involving destructive, complex, and/or costly tests for which a relatively small sample is desired yielding good quality discrimination. They are additionally useful for achieving better discrimination (than single sampling plans in particular) in situations associated with assuring tighter quality levels (with comparably larger sample sizes). A special purpose of chain sampling is to achieve a more favorable