

Guide to the selection and usage of acceptance sampling systems for inspection of discrete items in lots —

Part 2: Guide to sampling by attributes

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Committees responsible for this British Standard

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- Association for Road Traffic and Safety Management
- British Measurement and Testing Association
- City University
- Clay Pipe Development Association Ltd.
- Institute of Metal Finishing
- Institute of Quality Assurance
- Ministry of Defence — UK Defence Standardization
- Co-opted members

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Foreword

This part of BS 6000 has been prepared by Technical Committee SS/5. Together with BS 6000-1 and BS 6000-3 it supersedes BS 6000:1996, which is withdrawn.

BS 6000:2005, *Guide to the selection and usage of acceptance sampling systems for inspection of discrete items in lots* is in three parts:

Part 1: *General guide to acceptance sampling*

Part 2: *Guide to sampling by attributes*

Part 3: *Guide to sampling by variables*

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 13 and a back cover.

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1 Scope

This part of BS 6000 gives guidance on the selection of an acceptance sampling system, scheme or plan for inspection by attributes. It does this principally by reviewing the available systems specified by various British Standards and showing ways in which these can be compared in order to assess their suitability for an intended application. It is assumed that the choice has already been made to use sampling by attributes in preference to sampling by variables.

The guidance in BS 6000-2 is confined to acceptance sampling of products that are supplied in lots and that can be classified as consisting of discrete items (i.e. discrete articles of product). Each item in a lot can be identified and segregated from the other items in the lot and has an equal chance of being included in the sample. Each item of product is countable and has specific characteristics that are measurable or classifiable as being conforming or nonconforming (to a given specification).

Standards on acceptance sampling by attributes are applicable to a wide variety of inspection situations. These include, but are not limited to, the following:

- a) end items, such as complete products or sub-assemblies;
- b) components and raw materials;
- c) services;
- d) materials in process;
- e) supplies in storage;
- f) maintenance operations;
- g) data or records; and
- h) administrative procedures.

Although this British Standard is written principally in terms of manufacture and production, it is applicable to the selection of sampling systems, schemes and plans for all types of product and processes as defined in BS EN ISO 9000.

2 The selection process

The task of selecting a suitable sampling system, scheme or plan is influenced by production and marketing conditions. In addition, the economics of the sampling system, the resources of the inspection organization and other aspects need to be considered. Therefore, the selection process becomes complex and rarely is there one method of acceptance sampling that fits all situations even though they might appear to be similar.

Table 1, Table 2 and Table 3, together with Figure 1 and Figure 2, illustrate the process of selecting a sampling system, scheme or plan. The tables provide “candidate” sampling systems, schemes and plans to fit given inspection situations, production conditions and market conditions, respectively. The method suggested is to review Table 1, Table 2 and Table 3 and to select as many “candidate plans” as fit the situation. These candidates should then be reviewed through Figure 1 or Figure 2 so that the user finally arrives at a system, scheme or plan that is most feasible and economical for the situation.

The initial selection decisions are for long and short production runs, isolated lots, and attribute or variables sampling; these decisions will point to one or more possible sampling schemes specified in standards.

Figure 1 and Figure 2 are not flow charts. They show, in summary form, the procedures contained within each standard for arriving at a sampling system, scheme or plan. The summaries are listed side by side, which allows direct comparison between them. The solid connecting lines indicate the primary course to be followed in choosing and operating a standard; the broken lines indicate alternatives. These alternatives are applicable only under certain conditions. Text references and notes to the figures are given for guidance in following these procedures. The standards and procedures near the bottom of each of the two figures are for use when economy of average sample size is an important consideration.

The procedure presented in Figure 1 is applicable when production is continuous and there are more than 10 lots of product undergoing inspection. Standards from the BS 6001 series are included here as “candidate” systems.

Figure 2 is applicable when other conditions prevail, e.g. when there is no continuity of production, when the number of lots is 10 or fewer, when the product warranty does not survive acceptance and/or when the presence of a small number of nonconforming items can result in a large loss.

A final selection should be based on both the requirements of the situation and the resources of the inspection organization.

In the process of selecting a sampling system, scheme or plan, it is possible to find that the selection has indicated a system, scheme or plan that has one or more insurmountable deficiencies. This indicates that the process needs to be repeated. The cases in which only one method is appropriate are few. Iterative investigations usually identify two or more methods. The most economical and appropriate method should be chosen.

3 British Standards for acceptance sampling of lots by attributes

3.1 General

This clause summarizes the salient features of each of the current British Standards concerned with acceptance sampling methods by attributes. The summaries of the scope and application of the available British Standards should enable a user to select those standards which are most likely to suit a given purpose.

The comparisons between the various British Standard acceptance sampling systems in these summaries are not enough to allow a final selection of a sampling system, scheme or plan to be made in a particular situation. Before this can be done, a number of factors need to be understood and considered. These factors are reviewed in Clause 4.

3.2 BS 6001-0: Introduction to the BS 6001 attribute sampling system

This is a companion document to BS 6000-2 and can be read in conjunction with it, if desired, but this is not essential. It is not a source of sampling schemes or plans.

Section 2 of BS 6001-0 is essentially an introduction to the sampling schemes employed in BS 6001-1, BS 6001-2 and BS 6001-3, but it treats the subject in a general way. It contains explanations of terms, gives practical advice on sampling inspection and discusses some underlying concepts. Section 3 extends Section 2 and amplifies the introductory text and instructions contained in BS 6001-1, by giving detailed comments and examples to assist in using the procedures and tables that make up the BS 6001-1 system.

3.3 BS 6001-1: Sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection

This presents a sampling system indexed by lot-size ranges, inspection levels and AQLs, and specifies sampling plans and procedures for inspection by attributes of discrete items. It contains sampling plans for single, double and multiple sampling indexed by percent nonconforming and nonconformities per 100 items.

The sampling system specified in BS 6001-1 is intended to employ tightened, normal and reduced inspection on a continuing series of lots to achieve customer protection while assuring the producer that, if quality is better than the AQL, acceptance will occur most of the time.

The objective is to induce a supplier, through the economic and psychological pressure of potential non-acceptance, to maintain a process average quality at least as good as the specified AQL, while at the same time providing an upper limit for the risk to the consumer of accepting the occasional lot of poor quality.

The sampling plans in BS 6001-1 may also be used for the inspection of lots in isolation, but in this case the user is strongly advised to consult the operating characteristic curves (in Table 12 of the 1999 edition) to find a plan which will yield the desired protection. A much simpler procedure to follow in this type of situation is presented in BS 6001-2.

3.4 BS 6001-2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection

This establishes sampling plans indexed by limiting quality (LQ) and procedures for inspection that can be used when the switching rules of BS 6001-1 cannot be applied. The LQ is used to indicate the customer protection. Procedure A is used for single lots and procedure B for lots isolated from a continuing series. Both procedures treat the LQ as an indicator of the actual percentage nonconforming in the lots submitted, though they can also be used in cases where quality is expressed in non-conformities per 100 items.