

Sampling procedures for inspection by attributes —

**Part 9: Double sampling plans using
minimal sample sizes, indexed by
producer's risk quality (PRQ) and
consumer's risk quality (CRQ)**

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- BEAMA Ltd.
- British Measurement and Testing Association
- British Standards Society
- City University
- Clay Pipe Development Association
- General Domestic Appliances Ltd.
- Institute of Metal Finishing
- Institute of Quality Assurance
- Ministry of Defence

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- Liverpool John Moores University
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Foreword

This British Standard is published under the authority of Technical Committee SS/5, Application of statistical methods in standardization.

This British Standard is a revision of BS 2635:1955, *Drafting specifications based on limiting the number of defectives permitted in small samples*, which is withdrawn. BS 2635:1955 has been re-designated as BS 6001-9 with a new title that more accurately reflects the revised content.

Annex A is informative.

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 iv, pages 1 to 49 and a back cover.

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Introduction

The first edition of BS 2635, *Drafting specifications based on limiting the number of defectives permitted in small samples*, was published in 1955. It was prepared primarily for the use and guidance of committee secretaries and committees in the drafting of clauses in British Standards, where quality control or acceptance tests based on statistical analysis of sampling results are used. Essentially it presented six double sampling plans by attributes for percent nonconforming items. A lot was acceptable if no nonconforming items were found in the first sample, and not acceptable if it contained two or more nonconforming items. If the first sample contained just one nonconforming item then a second sample of the same size was taken; if no nonconforming items were found in the second sample then the lot was acceptable, otherwise it was not acceptable.

There has been a shift of interest towards sampling plans with smaller acceptance and rejection numbers as production processes and quality levels improved during the latter half of the twentieth century. The plans described above are the double sampling plans by attributes with the smallest possible acceptance and rejection numbers. Four of the six plans of BS 2635:1955 may also be found in BS 6001-1:1999, Table 3, which contains double sampling plans by attributes indexed by acceptance quality limit; however, most of the double sampling plans in BS 6001-1 are for larger acceptance and rejection numbers.

It was therefore decided to revise BS 2635:1955 by broadening its scope and improving the indexation of its plans, in order to address not only the requirements of BSI technical committees but also current market needs. The present edition uses the same acceptance and rejection numbers as before but addresses nonconformities as well as nonconforming items. The new double sampling plans are indexed by up to 17 nominal values of consumer's risk quality (CRQ) and up to 17 nominal values of producer's risk quality (PRQ). The constraint that the first and second sample sizes have to be equal has been removed; for each combination of PRQ and CRQ the first and second sample sizes have been chosen so that the maximum expected amount of sampling is minimized subject to the nominal producer's and consumer's risks not being exceeded; for the double sampling plans in this British Standard these nominal risks are equal to one another and may be chosen to be either 5 % or 10 %.

1 Scope

This British Standard provides double sampling plans by attributes for the acceptance inspection of lots of discrete items. The plans are indexed by the producer's risk quality (PRQ) and the consumer's risk quality (CRQ) where the nominal risks are either 5 % or 10 %. Plans are provided for inspection for percent nonconforming and for inspection for nonconformities per 100 items. The lot is acceptable if there are no nonconforming items (nonconformities) in the first random sample, and not acceptable if it contains two or more nonconforming items (nonconformities). If precisely one nonconforming item is found in the first sample, a second random sample is drawn; the lot is then acceptable if the second sample contains no nonconforming items (nonconformities) and not acceptable otherwise.

The objective of this standard is to provide procedures that enable lot disposition to be determined quickly and economically if quality is particularly good or bad. For intermediate quality a second sample is drawn in order to be able to discriminate more reliably between acceptable and unacceptable lots. The two sample sizes are chosen to minimize the maximum expected sample size with respect to incoming quality subject to the nominal risks not being exceeded.

Similarly, the plans may be used to test the hypothesis that a lot or process quality level is equal to the PRQ (i.e. acceptable) against the alternative hypothesis that the quality level is equal to the CRQ (i.e. unacceptable).

The plans are preferable to single sampling plans where the cost of inspection is high, where the delay and uncertainty caused by the possible requirement for second samples is inconsequential and where a relatively large ratio of the consumer's risk quality to the producer's risk quality can be tolerated.

The plans are suitable for isolated lots or for short series of lots, where the sum of the two sample sizes is no larger than about 10 % of the size of the lot. The plans are also suitable for continuing series of lots when lots that fail to satisfy the acceptance criteria are 100 % inspected and all nonconforming items replaced by conforming items; however, for continuing series of lots, consideration should also be given to using double sampling plans from BS 6001-1.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition listed applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

BS ISO 3534-2, *Statistics — Vocabulary and symbols — Part 2: Applied statistics*.

3 Terms, definitions, abbreviations and symbols

3.1 Terms, definitions and abbreviations

For the purposes of this British Standard, the terms and definitions given in BS ISO 3534-2 and the following apply, except for the definition of quality level, which has been made more general. Some of the BS ISO 3534-2 definitions are repeated here for convenience.

3.1.1

consumer's risk

CR

probability of acceptance when the quality level has a value stated by the acceptance sampling plan as unsatisfactory

[BS ISO 3534-2]

3.1.2

consumer's risk quality

CRQ

quality level of a lot or process which, in the acceptance sampling plan, corresponds to a specified consumer's risk

[BS ISO 3534-2]

3.1.3

producer's risk

PR

probability of non-acceptance when the quality level has a value stated by the plan as acceptable

[BS ISO 3534-2]

3.1.4

producer's risk quality

PRQ

quality level of a lot or process which, in the acceptance sampling plan, corresponds to a specified producer's risk

[BS ISO 3534-2]

3.1.5

quality level

quality expressed as a fraction or percentage of nonconforming units or as a number of nonconformities per unit or per 100 units

3.1.6

average sample size

ASS

average number of sampling units inspected per lot in reaching decisions to accept or not to accept when using a given acceptance sampling plan

NOTE The average sample size is dependent on the actual quality level of the submitted lots.

[BS ISO 3534-2]

3.1.7**average outgoing quality****AOQ**

expected average quality level of outgoing product for a given value of incoming product quality level for a given acceptance sampling plan and rectification of all non-accepted lots

[BS ISO 3534-2]

3.1.8**average outgoing quality limit****AOQL**

maximum AOQ over all possible values of incoming product quality level for a given acceptance sampling plan and rectification of all non-accepted lots

[BS ISO 3534-2]

3.2 Symbols

For the purposes of this British Standard the following symbols apply.

α Producer's risk

β Consumer's risk

m Size of the second sample in a double sampling plan

n Size of the first sample in a double sampling plan

4 Choosing and operating a sampling plan**4.1 Choosing a plan**

The appropriate table from among Table 1, Table 2, Table 3 and Table 4 shall be selected in accordance with whether inspection is for nonconforming items or nonconformities and the common value of the nominal producer's and consumer's risks. This table shall be entered with the PRQ and CRQ to obtain the sample sizes n and m of the double sampling plan.

When the table indicates by asterisks that no double sampling plan with the prescribed acceptance and rejection numbers is available with the required properties, consideration should be given to decreasing the PRQ and/or increasing the CRQ.

4.2 Operating a plan for nonconforming items**4.2.1 Acceptance sampling**

A first random sample of size n shall be drawn and inspected, where n is the first sample size given by the plan. If no nonconforming items are found in this first sample, the lot shall be considered acceptable. If the number of nonconforming items found in this first sample is greater than or equal to two, the lot shall be considered not acceptable.

If one nonconforming item is found in the first random sample, a second random sample of size m shall be drawn and inspected, where m is the second sample size given by the plan. If no further nonconforming items are found in this second sample, the lot shall be considered acceptable. If one or more nonconforming items are found in this second sample, the lot shall be considered not acceptable.

4.2.2 Hypothesis testing

The double sampling plan may alternatively be used for hypothesis testing when it is required to test the null hypothesis that the quality level is equal to the PRQ against the alternative hypothesis that the quality level is equal to the CRQ. A first random sample of size n shall be drawn and inspected, where n is the first sample size given by the plan. If no nonconforming items are found in this first sample, the null hypothesis shall be accepted. If the number of nonconforming items found in this first sample is greater than or equal to two, the alternative hypothesis shall be accepted.

If one nonconforming item is found in the first random sample, a second random sample of size m shall be drawn and inspected, where m is the second sample size given by the plan. If no further nonconforming items are found in this second sample, the null hypothesis shall be accepted. If one or more nonconforming items are found in this second sample, the alternative hypothesis shall be accepted.

4.3 Operating a plan for nonconformities

4.3.1 Acceptance sampling

In order to determine the acceptability of a lot in a nonconformities per hundred items inspection, the procedure specified in 4.2.1 for nonconforming inspection shall be used, except that the term “nonconforming items” shall be replaced by “nonconformities”.

4.3.2 Hypothesis testing

In order to carry out a hypothesis test in a nonconformities per hundred items inspection, the procedure specified in 4.2.2 for nonconforming inspection shall be used, except that the term “nonconforming items” shall be replaced by “nonconformities”.

4.4 Notation

A notation used to describe such plans is $(n, 0, 2; m, 1, 2)$. This indicates that the acceptance and rejection numbers for the first sample of size n are 0 and 2, and that the acceptance and rejection numbers for the first and second samples combined are 1 and 2, where the second sample is of size m .

5 Operating characteristics

The operating characteristic curves, shown in Figure 1, Figure 2, Figure 3 and Figure 4 indicate the probability that a lot will be accepted under the various sampling plans for a range of quality levels. The curves are based on the assumption that the sum of the two sample sizes is no more than about 10 % of the lot size. If the sum of the two sample sizes exceeds 10 % of the lot size, then the probabilities of accepting the lot are higher than those shown by the curves at all quality levels, so the producer’s risk is reduced and the consumer’s risk is increased.

NOTE A formula for the operating characteristic curves is provided in Annex A; in A.1.3 for nonconforming items and in A.2.3 for nonconformities.

6 Average sample sizes

6.1 Curtailed inspection

Under curtailed inspection, inspection is stopped as soon as the inspection results are sufficient to establish whether or not the lot is acceptable or, in the case of hypothesis testing, as soon as it is clear which hypothesis will be accepted. In the case of the double sampling plans in this British Standard, inspection would cease as soon as two nonconforming items (nonconformities) are found in the first sample or as soon as one nonconforming item (nonconformity) is found in the second sample. The operating characteristic curves are unaffected by curtailment, but the average sample size is reduced. The reduction is small at good quality levels but substantial at very poor quality levels. The disadvantage of curtailment is that it results in less precise estimates of the lot or process quality level; this matters more in the case of a continuing series of lots.

6.2 Average sample size (ASS) for uncurtailed inspection

Average sample size curves for uncurtailed inspection for the double sampling plans of this British Standard are shown in Figure 5, Figure 6, Figure 7 and Figure 8. These curves show the average sample sizes that may be expected to occur under the various sampling plans for a range of levels of process quality. For all the plans the ASS:

- begins at the value n for perfect quality (because only the whole of the first sample is inspected);
- rises to a maximum where the process quality level p is equal to $1/n$, i.e. $100/n$ % nonconforming or $100/n$ nonconformities per 100 items;
- falls more gradually to the value n as the process quality level p worsens beyond $1/n$ (again because only the whole of the first sample is inspected).

NOTE A formula for the average sample size for uncurtailed inspection is provided in A.1.4.1 for nonconforming items and in A.2.4.1 for nonconformities. Formulae for the corresponding maximum ASSs are given in A.1.5 and A.2.5.

The average sample sizes of the double sampling plans at the PRQ and CRQ for uncurtailed inspection are given in Table 5, Table 6, Table 7 and Table 8. Also tabulated are the maximum average sample sizes.

6.3 Average sample size (ASS) for curtailed inspection

Average sample size curves for curtailed inspection for the double sampling plans of this British Standard are shown in Figure 13, Figure 14, Figure 15 and Figure 16. As in the case of uncurtailed inspection, for all the plans the ASS begins at the value n for perfect quality and rises to a maximum. For plans for nonconforming items the ASS then falls to the value 2 as quality worsens, because at least two nonconforming items are required for non-acceptance; for plans for nonconformities the ASS falls to the value 1 as quality worsens because, at a quality level of an infinite number of nonconformities per 100 items, the first item will be certain to have more than one nonconformity.

NOTE Formulae for the average sample sizes under curtailed inspection are provided in A.1.4.2 for nonconforming items and in A.2.4.2 for nonconformities.

The average sample sizes of the double sampling plans at the PRQ and CRQ for curtailed inspection are given in Table 17, Table 18, Table 19 and Table 20. Also tabulated are the maximum average sample sizes.

7 Actual producer's and consumer's risks

Because the sample sizes m and n are discrete, the actual producer's and consumer's risks will in general be less than their nominal values. These actual risks are presented in Table 9, Table 10, Table 11 and Table 12. Note that whereas the consumer's risks are typically close to their nominal values, the producer's risks are in some cases much smaller.

8 Average outgoing quality (AOQ)

For a continuing series of lots with rectification of all lots that fail to meet the acceptance criteria, it is of interest to know the long-term average outgoing quality at different levels of incoming quality. Table 13, Table 14, Table 15 and Table 16 present the values of the AOQ at the PRQ and at the CRQ, together with the maximum over all levels of incoming quality. This maximum is called the average outgoing quality limit (AOQL). Average outgoing quality curves for the plans of this British Standard are presented in Figure 9, Figure 10, Figure 11 and Figure 12.

NOTE It is only by means of high (and generally uneconomical) average levels of inspection that good average outgoing quality levels are achieved at poor incoming quality levels.

9 Examples

9.1 Example for nonconforming items

A retailer intends to purchase a single production lot of 10 000 60 watt light bulbs from a BS EN ISO 9001 accredited supplier. The supplier demonstrates by in-house records that only one bulb in 1 000 will fail on first use. The retailer customarily audits such supplies by means of a product sampling plan agreed with the supplier on the basis that:

- a) the cost of sampling is factored into the contract price; and
- b) if the lot is not acceptable, the supplier pays for the 100 % test and the associated cost of replacing the nonconforming light bulbs.

The sampling plan agreed is a double sampling plan with nominal producer's and consumer's risks of 5 %, a PRQ of 0.1 % and a CRQ of 2.5 %. Entering Table 1 with these parameters yields the sample sizes $n = 133$ and $m = 80$. A random sample of 133 light bulbs is drawn from the lot and tested. One light bulb in the sample immediately fails, so a second random sample of 80 bulbs is drawn from the lot and tested. None of these light bulbs fail, so the lot is accepted.

9.2 Example for nonconformities

2 000 m of 17 cm wide weatherboarding is to be supplied to a builder for use in a prestigious barn conversion. The owner of the barn has specifically requested that the weatherboarding be knot-free. From past experience the builder decides, on the basis of the lengths required, that he can manage to comply with this if the supplied weatherboarding contains knots at a rate of no more than 4 per 100 m length on average. The supplier claims that his premium weatherboarding is virtually knot-free and so he is prepared to use a PRQ of 1 knot per 500 m. Both supplier and builder decide to limit their risk to 5 %.

Table 3 is therefore used, and entered with a PRQ of 0.2 % and a CRQ of 4 %, yielding a double sampling plan with $n = 84$ and $m = 51$. 84 one-metre lengths of weatherboarding are selected at random from the consignment and checked for knots. Two are found, so the consignment is rejected and the supplier agrees to carry out 100 % inspection on-site, replacing any lengths of weatherboarding found to have knots.

Table 1 — Sample sizes n and m for double sampling plans of the form $(n, 0, 2; m, 1, 2)$ for nonconforming items: $\alpha, \beta \leq 5\%$

PRQ (%)	Sample sizes	Consumer's risk quality (%)													
		1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5
0.1	n	210	169	133	105	84	66	52	41	33	26	20	15	12	9
	m	122	94	80	64	46	39	31	23	17	14	11	10	7	6
0.125	n	*	169	133	105	84	66	52	41	33	26	20	15	12	9
	m	*	94	80	64	46	39	31	23	17	14	11	10	7	6
0.16	n	*	*	133	105	84	66	52	41	33	26	20	15	12	9
	m	*	*	80	64	46	39	31	23	17	14	11	10	7	6
0.2	n	*	*	*	105	84	66	52	41	33	26	20	15	12	9
	m	*	*	*	64	46	39	31	23	17	14	11	10	7	6
0.25	n	*	*	*	*	84	66	52	41	33	26	20	15	12	9
	m	*	*	*	*	46	39	31	23	17	14	11	10	7	6
0.315	n	*	*	*	*	*	66	52	41	33	26	20	15	12	9
	m	*	*	*	*	*	39	31	23	17	14	11	10	7	6
0.4	n	*	*	*	*	*	*	52	41	33	26	20	15	12	9
	m	*	*	*	*	*	*	31	23	17	14	11	10	7	6
0.5	n	*	*	*	*	*	*	*	41	33	26	20	15	12	9
	m	*	*	*	*	*	*	*	23	17	14	11	10	7	6
0.63	n	*	*	*	*	*	*	*	*	33	26	20	15	12	9
	m	*	*	*	*	*	*	*	*	17	14	11	10	7	6
0.8	n	*	*	*	*	*	*	*	*	*	26	20	15	12	9
	m	*	*	*	*	*	*	*	*	*	14	11	10	7	6
1.0	n	*	*	*	*	*	*	*	*	*	*	20	15	12	9
	m	*	*	*	*	*	*	*	*	*	*	11	10	7	6
1.25	n	*	*	*	*	*	*	*	*	*	*	21	15	12	9
	m	*	*	*	*	*	*	*	*	*	*	9	10	7	6
1.6	n	*	*	*	*	*	*	*	*	*	*	*	17	12	9
	m	*	*	*	*	*	*	*	*	*	*	*	6	7	6
2.0	n	*	*	*	*	*	*	*	*	*	*	*	*	12	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	7	6
2.5	n	*	*	*	*	*	*	*	*	*	*	*	*	*	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	6

NOTE Cells containing asterisks indicate that no double sampling plan of the form $(n, 0, 2; m, 1, 2)$ for nonconforming items exists with $\alpha, \beta \leq 5\%$ for that combination of producer's risk quality and consumer's risk quality; consider decreasing the PRQ and/or increasing the CRQ.

Table 2 — Sample sizes n and m for double sampling plans of the form $(n, 0, 2; m, 1, 2)$ for nonconforming items: $\alpha, \beta \leq 10\%$

PRQ (%)	Sample sizes	Consumer's risk quality (%)																
		0.8	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5
0.1	n	336	269	216	168	133	106	84	66	53	42	33	26	20	15	12	9	7
	m	214	170	133	105	87	70	55	43	33	26	20	16	14	12	9	8	6
0.125	n	*	269	216	168	133	106	84	66	53	42	33	26	20	15	12	9	7
	m	*	170	133	105	87	70	55	43	33	26	20	16	14	12	9	8	6
0.160	n	*	*	216	168	133	106	84	66	53	42	33	26	20	15	12	9	7
	m	*	*	133	105	87	70	55	43	33	26	20	16	14	12	9	8	6
0.2	n	*	*	*	168	133	106	84	66	53	42	33	26	20	15	12	9	7
	m	*	*	*	105	87	70	55	43	33	26	20	16	14	12	9	8	6
0.25	n	*	*	*	*	133	106	84	66	53	42	33	26	20	15	12	9	7
	m	*	*	*	*	87	70	55	43	33	26	20	16	14	12	9	8	6
0.315	n	*	*	*	*	*	106	84	66	53	42	33	26	20	15	12	9	7
	m	*	*	*	*	*	70	55	43	33	26	20	16	14	12	9	8	6
0.4	n	*	*	*	*	*	*	84	66	53	42	33	26	20	15	12	9	7
	m	*	*	*	*	*	*	55	43	33	26	20	16	14	12	9	8	6
0.5	n	*	*	*	*	*	*	*	66	53	42	33	26	20	15	12	9	7
	m	*	*	*	*	*	*	*	43	33	26	20	16	14	12	9	8	6
0.63	n	*	*	*	*	*	*	*	*	53	42	33	26	20	15	12	9	7
	m	*	*	*	*	*	*	*	*	33	26	20	16	14	12	9	8	6
0.8	n	*	*	*	*	*	*	*	*	*	42	33	26	20	15	12	9	7
	m	*	*	*	*	*	*	*	*	*	26	20	16	14	12	9	8	6
1.0	n	*	*	*	*	*	*	*	*	*	*	33	26	20	15	12	9	7
	m	*	*	*	*	*	*	*	*	*	*	20	16	14	12	9	8	6
1.25	n	*	*	*	*	*	*	*	*	*	*	*	26	20	15	12	9	7
	m	*	*	*	*	*	*	*	*	*	*	*	16	14	12	9	8	6
1.6	n	*	*	*	*	*	*	*	*	*	*	*	*	20	15	12	9	7
	m	*	*	*	*	*	*	*	*	*	*	*	*	14	12	9	8	6
2.0	n	*	*	*	*	*	*	*	*	*	*	*	*	*	15	12	9	7
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	12	9	8	6
2.5	n	*	*	*	*	*	*	*	*	*	*	*	*	*	*	12	9	7
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	*	9	8	6
3.15	n	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	9	7
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	8	6

NOTE Cells containing asterisks indicate that no double sampling plan of the form $(n, 0, 2; m, 1, 2)$ for nonconforming items exists with $\alpha, \beta \leq 10\%$ for that combination of producer's risk quality and consumer's risk quality; consider decreasing the PRQ and/or increasing the CRQ.

Table 3 — Sample sizes n and m for double sampling plans of the form $(n, 0, 2; m, 1, 2)$ for nonconformities: $\alpha, \beta \leq 5\%$

PRQ (%)	Sample sizes	Consumer's risk quality (%)													
		1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5
0.1	n	213	169	136	108	84	69	55	43	35	27	21	17	14	11
	m	119	99	77	61	51	36	28	23	17	16	13	10	7	6
0.125	n	*	169	136	108	84	69	55	43	35	27	21	17	14	11
	m	*	99	77	61	51	36	28	23	17	16	13	10	7	6
0.160	n	*	*	136	108	84	69	55	43	35	27	21	17	14	11
	m	*	*	77	61	51	36	28	23	17	16	13	10	7	6
0.2	n	*	*	*	108	84	69	55	43	35	27	21	17	14	11
	m	*	*	*	61	51	36	28	23	17	16	13	10	7	6
0.25	n	*	*	*	*	84	69	55	43	35	27	21	17	14	11
	m	*	*	*	*	51	36	28	23	17	16	13	10	7	6
0.315	n	*	*	*	*	*	69	55	43	35	27	21	17	14	11
	m	*	*	*	*	*	36	28	23	17	16	13	10	7	6
0.4	n	*	*	*	*	*	*	55	43	35	27	21	17	14	11
	m	*	*	*	*	*	*	28	23	17	16	13	10	7	6
0.5	n	*	*	*	*	*	*	*	43	35	27	21	17	14	11
	m	*	*	*	*	*	*	*	23	17	16	13	10	7	6
0.63	n	*	*	*	*	*	*	*	*	35	27	21	17	14	11
	m	*	*	*	*	*	*	*	*	17	16	13	10	7	6
0.8	n	*	*	*	*	*	*	*	*	*	27	21	17	14	11
	m	*	*	*	*	*	*	*	*	*	16	13	10	7	6
1.0	n	*	*	*	*	*	*	*	*	*	*	21	17	14	11
	m	*	*	*	*	*	*	*	*	*	*	13	10	7	6
1.25	n	*	*	*	*	*	*	*	*	*	*	*	17	14	11
	m	*	*	*	*	*	*	*	*	*	*	*	10	7	6
1.6	n	*	*	*	*	*	*	*	*	*	*	*	*	14	11
	m	*	*	*	*	*	*	*	*	*	*	*	*	7	6
2.0	n	*	*	*	*	*	*	*	*	*	*	*	*	*	11
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	6

NOTE Cells containing asterisks indicate that no double sampling plan of the form $(n, 0, 2; m, 1, 2)$ for nonconformities exists with $\alpha, \beta \leq 5\%$ for that combination of producer's risk quality and consumer's risk quality; consider decreasing the PRQ and/or increasing the CRQ.

Table 4 — Sample sizes n and m for double sampling plans of the form $(n, 0, 2; m, 1, 2)$ for nonconformities: $\alpha, \beta \leq 10\%$

PRQ (%)	Sample sizes	Consumer's risk quality (%)																
		0.8	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5
0.1	n	336	269	216	168	136	109	86	69	55	43	34	28	22	17	14	11	9
	m	218	174	137	109	83	66	54	39	32	27	21	15	13	11	8	7	5
0.125	n	*	269	216	168	136	109	86	69	55	43	34	28	22	17	14	11	9
	m	*	174	137	109	83	66	54	39	32	27	21	15	13	11	8	7	5
0.160	n	*	*	216	168	136	109	86	69	55	43	34	28	22	17	14	11	9
	m	*	*	137	109	83	66	54	39	32	27	21	15	13	11	8	7	5
0.2	n	*	*	*	168	136	109	86	69	55	43	34	28	22	17	14	11	9
	m	*	*	*	109	83	66	54	39	32	27	21	15	13	11	8	7	5
0.25	n	*	*	*	*	136	109	86	69	55	43	34	28	22	17	14	11	9
	m	*	*	*	*	83	66	54	39	32	27	21	15	13	11	8	7	5
0.315	n	*	*	*	*	*	109	86	69	55	43	34	28	22	17	14	11	9
	m	*	*	*	*	*	66	54	39	32	27	21	15	13	11	8	7	5
0.4	n	*	*	*	*	*	*	86	69	55	43	34	28	22	17	14	11	9
	m	*	*	*	*	*	*	54	39	32	27	21	15	13	11	8	7	5
0.5	n	*	*	*	*	*	*	*	69	55	43	34	28	22	17	14	11	9
	m	*	*	*	*	*	*	*	39	32	27	21	15	13	11	8	7	5
0.63	n	*	*	*	*	*	*	*	*	55	43	34	28	22	17	14	11	9
	m	*	*	*	*	*	*	*	*	32	27	21	15	13	11	8	7	5
0.8	n	*	*	*	*	*	*	*	*	*	43	34	28	22	17	14	11	9
	m	*	*	*	*	*	*	*	*	*	27	21	15	13	11	8	7	5
1.0	n	*	*	*	*	*	*	*	*	*	*	34	28	22	17	14	11	9
	m	*	*	*	*	*	*	*	*	*	*	21	15	13	11	8	7	5
1.25	n	*	*	*	*	*	*	*	*	*	*	*	28	22	17	14	11	9
	m	*	*	*	*	*	*	*	*	*	*	*	15	13	11	8	7	5
1.6	n	*	*	*	*	*	*	*	*	*	*	*	*	22	17	14	11	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	13	11	8	7	5
2.0	n	*	*	*	*	*	*	*	*	*	*	*	*	*	17	14	11	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	11	8	7	5
2.5	n	*	*	*	*	*	*	*	*	*	*	*	*	*	*	14	11	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	*	8	7	5
3.15	n	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	11	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	7	5
4.0	n	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	9
	m	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	5

NOTE Cells containing asterisks indicate that no double sampling plan of the form $(n, 0, 2; m, 1, 2)$ for nonconformities exists with $\alpha, \beta \leq 10\%$ for that combination of producer's risk quality and consumer's risk quality; consider decreasing the PRQ and/or increasing the CRQ.

**Table 5 — Average sample sizes (ASSs) for plans for nonconforming items:
uncurtailed inspection with $\alpha, \beta \leq 5\%$**

PRQ (%)	ASSs at:	Consumer's risk quality (%)													
		1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	31.5
0.1	PRQ	231	182	142	111	87.6	68.4	53.5	41.9	33.5	26.4	20.2	15.1	12.1	9.1
	max	255	204	163	129	101	80.5	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	224	180	142	113	89.2	70.6	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.125	PRQ	*	185	144	112	88.4	69.0	53.9	42.1	33.7	26.4	20.3	15.2	12.1	9.1
	max	*	204	163	129	101	80.5	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	180	142	113	89.2	70.6	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.160	PRQ	*	*	147	114	89.4	69.7	54.4	42.4	33.9	26.6	20.3	15.2	12.1	9.1
	max	*	*	163	129	101	80.5	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	142	113	89.2	70.6	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.2	PRQ	*	*	*	116	90.5	70.5	54.9	42.7	34.1	26.7	20.4	15.3	12.2	9.1
	max	*	*	*	129	101	80.5	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	113	89.2	70.6	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.25	PRQ	*	*	*	*	91.8	71.5	55.5	43.1	34.3	26.9	20.5	15.4	12.2	9.1
	max	*	*	*	*	101	80.5	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	89.2	70.6	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.315	PRQ	*	*	*	*	*	72.6	56.3	43.6	34.6	27.1	20.7	15.5	12.3	9.2
	max	*	*	*	*	*	80.5	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	*	70.6	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.4	PRQ	*	*	*	*	*	*	57.3	44.2	35.0	27.3	20.8	15.6	12.3	9.2
	max	*	*	*	*	*	*	63.5	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	*	*	55.7	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.5	PRQ	*	*	*	*	*	*	*	44.9	35.4	27.6	21.0	15.7	12.4	9.3
	max	*	*	*	*	*	*	*	49.6	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	*	*	*	43.7	34.9	27.6	21.3	16.3	12.9	9.8
0.63	PRQ	*	*	*	*	*	*	*	*	35.9	28.0	21.2	15.9	12.5	9.3
	max	*	*	*	*	*	*	*	*	39.4	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	*	*	*	*	34.9	27.6	21.3	16.3	12.9	9.8
0.8	PRQ	*	*	*	*	*	*	*	*	*	28.4	21.5	16.1	12.6	9.4
	max	*	*	*	*	*	*	*	*	*	31.3	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	*	*	*	*	*	27.6	21.3	16.3	12.9	9.8
1.0	PRQ	*	*	*	*	*	*	*	*	*	*	21.8	16.3	12.75	9.5
	max	*	*	*	*	*	*	*	*	*	*	24.2	18.8	14.7	11.3
	CRQ	*	*	*	*	*	*	*	*	*	*	21.3	16.3	12.9	9.8
1.25	PRQ	*	*	*	*	*	*	*	*	*	*	22.8	16.6	12.9	9.6
	max	*	*	*	*	*	*	*	*	*	*	24.4	18.8	14.7	11.3
	CRQ	*	*	*	*	*	*	*	*	*	*	21.9	16.3	12.9	9.8
1.6	PRQ	*	*	*	*	*	*	*	*	*	*	*	18.3	13.1	9.8
	max	*	*	*	*	*	*	*	*	*	*	*	19.3	14.7	11.3
	CRQ	*	*	*	*	*	*	*	*	*	*	*	17.6	12.9	9.8
2.0	PRQ	*	*	*	*	*	*	*	*	*	*	*	*	13.3	9.9
	max	*	*	*	*	*	*	*	*	*	*	*	*	14.7	11.3
	CRQ	*	*	*	*	*	*	*	*	*	*	*	*	12.9	9.8
2.5	PRQ	*	*	*	*	*	*	*	*	*	*	*	*	*	10.1
	max	*	*	*	*	*	*	*	*	*	*	*	*	*	11.3
	CRQ	*	*	*	*	*	*	*	*	*	*	*	*	*	9.8

NOTE Cells containing asterisks indicate that no double sampling plan of the form $(n, 0, 2; m, 1, 2)$ with $\alpha, \beta \leq 5\%$ exists for that combination of producer's risk quality and consumer's risk quality; consider decreasing the PRQ and/or increasing the CRQ.