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Paper and board — Sampling to determine average quality

Papier et carton — Échantillonnage pour déterminer la qualité moyenne



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 186 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 2, *Test methods and quality specifications for paper and board*.

This fourth edition cancels and replaces the third edition (ISO 186:1994), which has been technically revised.

Annex A forms a normative part of this International Standard.

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Paper and board — Sampling to determine average quality

1 Scope

This International Standard specifies a method of obtaining a representative sample from a lot of paper or board, including solid and corrugated fibreboard (see ISO 4046), for testing to determine whether or not its average quality complies with set specifications.

It defines the conditions which apply when sampling is carried out to resolve disputes between buyer and seller relating to a defined lot of paper or board, which has been or is being delivered.

NOTE 1 If less than 50 % of the lot is available for sampling, then sampling in terms of this International Standard will be invalid in the absence of agreement to the contrary.

The method is unsuitable for determining the variability within a lot.

In cases where International Standards make reference to sampling according to this standard but where such sampling is impossible, impractical or inappropriate, and where no dispute is involved, guidance is given in normative annex A.

NOTE 2 Information on the preparation of test pieces is given in the appropriate International Standards.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 4046, *Paper, board, pulp and related terms — Vocabulary*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1 lot

aggregate of paper or board of a single kind with specified characteristics produced under conditions that are presumed uniform, and available for sampling at one time

NOTE A lot comprises one or more nominally identical units. Where the material to be tested has already been incorporated into a manufactured article (for example a packing case), the lot is the aggregate of such articles of a single kind, of specified characteristics.

**3.2
unit**

component of a lot which may be in the form of a reel, a bale, a bundle, a parcel, the contents of a packing case, a pallet load, etc.

See Figure 1.

**3.3
sheet**

area of paper or board taken from the selected units

See Figure 1.

**3.4
specimen**

area of paper or board cut to given dimensions, from the sheets (or manufactured articles)

See Figure 1.

**3.5
sample**

aggregate of all the specimens taken from the lot to provide information on the average quality of the lot and possibly serve as a basis for a decision on the lot

See Figure 1.

**3.6
test piece**

piece or pieces of paper or board on which the measurement is carried out in accordance with the stipulations of the method of test

See Figure 1.

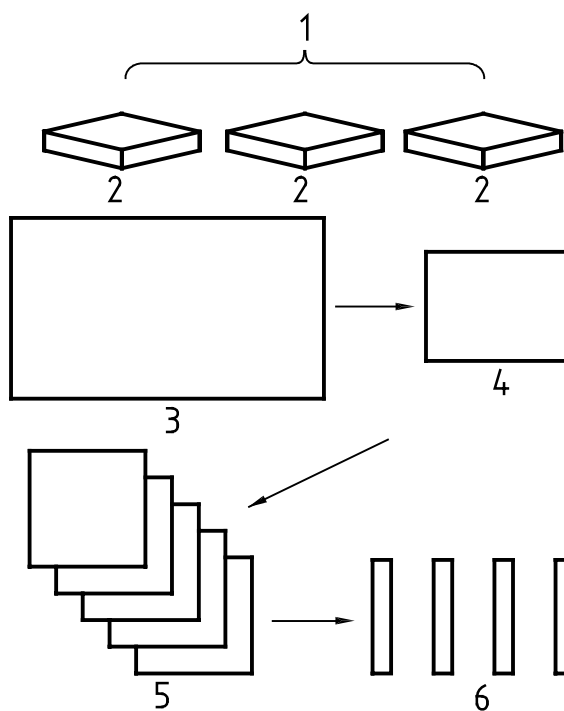
NOTE The test piece is generally taken from a specimen. In some instances, the test piece may be the specimen itself, or several specimens.

**3.7
selected at random**

taken in such a way that each part of the whole has an equal chance of being selected

4 Principle

Selection of the sheets at random from production units selected at random from a lot of paper or board. Further subdivision and combination of these sheets to provide the specimens of the sample from which the test area or test pieces will be taken.



Key

- 1 Lot
- 2 Unit
- 3 Sheet
- 4 Specimen
- 5 Sample
- 6 Test pieces

Figure 1

5 Procedure

5.1 Selection of units

Select the units to be sampled according to Table 1.

The units selected should be intact and in good external condition.

Table 1

Size of lot, number of units <i>n</i>	Number of selected units	Method of selection
1 to 5	All	—
6 to 399	$\sqrt{(n + 20)}^a$	At random
400 or more	20	At random

^a In deciding the number of units to be selected, round down to the nearest whole number.

5.2 Selection of sheets

For each unit withdrawn from the lot, proceed as described in 5.2.1 to 5.2.3.

5.2.1 Units that can be unwrapped

If the unit is a package that can be and may be completely unwrapped, proceed as follows.

5.2.1.1 When the unit is not subdivided (with or without a pallet)

Avoiding all damaged sheets and the three outermost undamaged sheets, take at random, in conformity with Table 2, the same number of sheets from each unit selected (see 5.1) such that the number of sheets taken from the lot is sufficient to provide enough sample for the required testing.

If known, mark the machine direction on the sheets.

Table 2

Number of sheets in the lot	Minimum number of sheets to be taken from the lot
≤ 1 000	10
1 001 to 5 000	15
> 5 000	20

5.2.1.2 When the unit is composed of elements (reams or parcels, etc.) packaged together (with or without a pallet)

Assemble all the selected units (see 5.1) and select elements from the units in the same way that units were selected from the lot in 5.1.

Avoiding all damaged sheets, take at random, in conformity with Table 2, the same number of sheets from each element selected, such that the number of sheets taken from the lot is sufficient to provide enough sample for the required testing.

If known, mark the machine direction on the sheets.

5.2.1.3 When the unit is a reel

Remove all damaged layers from the outside of each selected reel (see 5.1) plus three undamaged layers of paper (grammage less than 225 g/m²) or one undamaged layer of board (grammage equal to or greater than 225 g/m²), whichever is appropriate.

Cut the same number of sheets from each reel such that the number of sheets taken from the lot is sufficient to provide enough sample for the required testing and the number of sheets taken from the lot does not exceed 20. Vary the position of the sheets from each reel so that each 400 mm section across the reel is equally represented.

NOTE 1 The sheets may be taken directly from the reel or the reel may be cut across its full width, the pile of cut sheets allowed to fall to each side, the reel removed and the sheets cut from each pile.

NOTE 2 The term reel is used throughout this International Standard but the same procedure is equally applicable to a roll of paper or board.

5.2.2 Units that cannot/may not be unwrapped

If the unit is a package that cannot be or should not be completely unwrapped, for example a reel, pallet or possibly a ream, in store or selected by customs, assemble the selected units (see 5.1) and proceed as follows.

5.2.2.1 Known machine direction

If the machine direction is known, cut a window from each unit of at least 300 mm × 450 mm, with the long dimension in the machine direction. Vary the position of the window(s) within and between units. Remove all damaged layers and, in addition, as the case may be, at least the three outermost undamaged layers of paper

(grammage less than 225 g/m²) or at least one undamaged layer of board (grammage equal to or greater than 225 g/m²).

Through each window, cut to a sufficient depth to enable the requisite number of sheets, i.e. as derived from Table 2, to be taken. Take, at random from each window, the same number of sheets so that the number of sheets taken from the lot is sufficient to provide enough sample for the required testing.

In the case of lots consisting of less than five units, it is recommended that more than one window be cut in each unit. When only one reel is available, at least three and preferably five windows should be cut.

5.2.2.2 Unknown machine direction

If the machine direction is not known, cut windows of dimensions 450 mm × 450 mm with sides parallel to those of the unit. Then follow the procedure as described in 5.2.2.1.

5.2.3 Individual manufactured articles

If the lot consists of individual manufactured articles (see 3.1 for definition of lot), take at random from the lot a sufficient number of articles in conformity with Table 3 so as to provide enough sample for the required testing.

Table 3

Number of articles in the lot	Minimum number of articles to be taken from the lot
≤ 1 000	10
1 001 to 5 000	15
> 5 000	20

5.3 Preparation of specimens

All specimens in a sample shall be of the same size.

If the machine direction is not known, determine this if possible and, if necessary, for each sheet.

NOTE If the machine direction is not known, it can often be determined by visual investigation or by an appropriate qualitative tear, stiffness or tensile strength assessment.

Cut the specimens as indicated in 5.3.1 to 5.3.3.

For sheets in accordance with 5.2.2, see 5.3.4.

After cutting, mark the machine direction on each specimen or mark that the machine direction is not known.

Where manufactured articles have been selected, proceed as in 5.3.5.

5.3.1 If the sheets have been selected in accordance with 5.2.1 and have dimensions greater than or equal to 300 mm CD¹⁾ × 450 mm MD²⁾:

1) CD = cross direction

2) MD = machine direction

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If the machine direction is known, cut one or more specimens from each selected sheet (the same number from each sheet). Each specimen shall be at least 300 mm CD × 450 mm MD. If the sheets are already of an appropriate size, they may constitute the specimens.

If the machine direction could not be determined, cut one or more specimens from each selected sheet (the same number from each sheet). Each specimen shall be square and if possible 450 mm × 450 mm.

5.3.2 If the sheets have been selected in accordance with 5.2.1 and have one dimension or both less than 300 mm CD and 450 mm MD as indicated in 5.3.1, but the surface area of the sheet is greater than 0,1 m²:

Cut one or more specimens from each selected sheet (the same number from each sheet) in such a manner that the surface area of each specimen is between 0,100 m² and 0,135 m².

5.3.3 If the surface area of each sheet selected in accordance with 5.2.1 is less than 0,1 m²:

The selected sheets constitute the specimens, provided they are the same size.

The number of selected sheets should be sufficient to provide enough samples for the required testing.

5.3.4 If the sheets have been selected in accordance with 5.2.2:

These sheets constitute the specimens.

5.3.5 If the manufactured articles have been selected in accordance with 5.2.3:

For each selected article, cut one or more specimens (the same number from each article) varying the position of selection in each article. If convenient, a whole article may comprise a specimen.

6 Additional requirements

6.1 Specimens

6.1.1 Precautions

Specimens shall be kept flat, free from wrinkles and folds³⁾ and protected from exposure to conditions which may change the relevant properties. Care shall be taken in handling specimens, as contact with the hands can appreciably affect the chemical, physical, optical, surface or other characteristics of the paper.

6.1.2 Marking

Each specimen shall be provided with identification marks sufficient to ensure that it can be recognized beyond all doubt. These marks shall be indelible; they may be limited to the number of the sampling report and the signature of the sampler. They shall, where possible, be in one corner and be as small as practicable.

Marking should be on the same face of the specimen, so as to identify the two faces unambiguously.

6.2 Re-sampling

If, as a result of an accident during sampling or testing or if, for any other reason, re-sampling is necessary, a new sample shall be taken as described in this International Standard. Unless otherwise indicated, it is permissible for the selection to be made from the same unit or units as before.

3) If the specimens are in the form of very narrow strips, wind them on a core of diameter of at least 75 mm.

7 Sampling reports

The sampling report shall include the following information:

- a) reference to this International Standard;
- b) the name of the person taking the sample;
- c) the date and place of sampling;
- d) all information necessary for complete identification of the lot;
- e) the number of units in the lot;
- f) the number of units selected and, if necessary, the number of selected units retained;
- g) the number of sheets or articles selected from each unit;
- h) a description of the identification marks on the sample;
- i) all circumstances of such nature as to influence the results of future tests.

Annex A
(normative)

Alternative sampling procedures

A.1 This annex shall not be applicable in the case of any dispute where sampling to determine the average quality of a lot is required.

A.2 If sampling according to the procedure described in the main body of this standard is impossible, impracticable or inappropriate, sampling shall be carried out in the best possible manner for the purpose concerned or according to agreed criteria.

When a sample is taken for subsequent testing, the sampling procedure shall be documented, and details of the sampling procedure shall accompany the sample to the test laboratory, who will include it in the test report.

If a specimen is submitted for testing in a situation where the sampling procedure is unknown or where the specimen is isolated so that there is no sampling procedure, this shall be stated and recorded in the test report.

Bibliography

- [1] ISO 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptable quality limit (AQL) for lot-by-lot inspection*
- [2] ISO 2859-2:1985, *Sampling procedures for inspection by attributes — Part 2: Sampling plans indexed by limiting quality (LQ) for isolated lot inspection*
- [3] ISO 2859-3:1991, *Sampling procedures for inspection by attributes — Part 3: Skip-lot sampling procedures*
- [4] ISO 3951:1989, *Sampling procedures and charts for inspection by variables for percent nonconforming*

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