

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 287

PAPER

METHOD FOR THE DETERMINATION
OF MOISTURE CONTENT OF PAPER

(OVEN-DRYING METHOD)

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 287, *Method for the Determination of Moisture Content of Paper (Oven-Drying Method)*, was drawn up by Technical Committee ISO/TC 6, *Paper*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question by the Technical Committee began in 1958 and led, in the same year, to the adoption of a Draft ISO Recommendation.

In October 1960, this Draft ISO Recommendation (No. 404) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Australia	India	Poland
Belgium	Iran	Republic of South Africa
Chile	Ireland	Romania
Czechoslovakia	Israel	Spain
Denmark	Italy	Turkey
France	Japan	United Kingdom
Germany	Mexico	U.S.S.R.
Greece	Norway	Yugoslavia

Four Member Bodies opposed the approval of the Draft:

Finland, Netherlands, New Zealand, Sweden.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in January 1963, to accept it as an ISO RECOMMENDATION.

PAPER
METHOD FOR THE DETERMINATION
OF MOISTURE CONTENT OF PAPER
(OVEN-DRYING METHOD)

1. OBJECT AND SCOPE

This ISO Recommendation describes a method for the testing of paper to determine its moisture content at the time of sampling.

The method applies to papers that do not contain any appreciable quantity of materials, other than water, which will escape at the temperatures specified for the test.

It applies in general only to paper of a substance below 250 g/m².

2. TERMINOLOGY

- 2.1** *Moisture content.* — Amount of water in a paper. In practice, loss in mass of a test piece when dried to constant mass under the test conditions standardized. It is expressed as a percentage of the initial mass of paper as sampled.
- 2.2** *Moisture content on an oven-dry basis.* — Loss in mass of a test piece, after drying to constant mass under the test conditions standardized, and expressed as a percentage of the constant mass so obtained.
- 2.3** *Constant mass.* — Mass reached by a test piece of paper after drying at the specified temperature until the difference between two successive weighings does not exceed 0.1 per cent of the initial mass of the test piece.

3. PRINCIPLE

Weigh the test piece at the time of sampling, and again after drying to constant mass.

4. APPARATUS

4.1 Balance

The balance should have an accuracy of at least 0.05 per cent of the mass to be weighed.

4.2 Sample containers

Containers for the transporting and weighing of test pieces should be water-vapour proof and made from a light-weight material not subject to change under the conditions of test.

4.3 Oven

The oven should be capable of maintaining the air temperature between 102 °C and 105 °C and should be suitably ventilated.

5. PRELIMINARIES

- 5.1 Before commencing to take samples, clean and dry containers in sufficient quantity are numbered, weighed and kept closed until the sample is about to be taken. Each container should be weighed after having been allowed to attain temperature equilibrium with the atmosphere.
- 5.2 If the atmosphere at the place of sampling is warm and damp, precautions should be taken to prevent errors due to condensation either in or on the container.
- 5.3 Special precautions should be taken in handling the sheets, to avoid contamination and any gain or loss of moisture. In particular, it is recommended that rubber gloves should be worn. To avoid moisture changes due to atmospheric exposure, it is important also to enclose all samples in their containers immediately after taking them.

6. SAMPLING

6.1 Selection of units

The units to be sampled should be selected in accordance with ISO Recommendation R 186, *Method of Sampling Paper for Testing*, i.e. as follows:

Size of lot (n)	Number of units selected	Method of selection
from 1 to 5 units	all	—
from 6 to 99 units	5	at random
from 100 to 399 units	$\frac{n^*}{20}$	at random
400 or more units	20	at random

* Any remainder of less than 20 units should be ignored.

6.2 Selection, preparation and weighing of test pieces

6.2.1 WHEN THE UNIT IS THE REAM OR PARCEL

(a) Determination of the average value of moisture content in the lot

At least four consecutive sheets should be taken from the centre of each ream or parcel; they should be quickly folded or cut, and then enclosed in one of the containers. These test pieces should weigh at least 50 grammes. The containers and contents should be weighed and the mass of the test piece calculated.

(b) *Determination of the variation in moisture content between the centre and edges of sheets*

From the centre of each ream or parcel, a number of consecutive sheets should be taken, sufficient to give test pieces of at least 50 grammes mass after cutting strips in the following manner: from these sheets, four strips 50 mm to 75 mm wide should be cut in the cross direction, one from each edge and two near the centre. The two strips taken near the centre should have the ends trimmed to remove all paper within at least 150 mm of the edge of the original sheet (see Fig. 1).

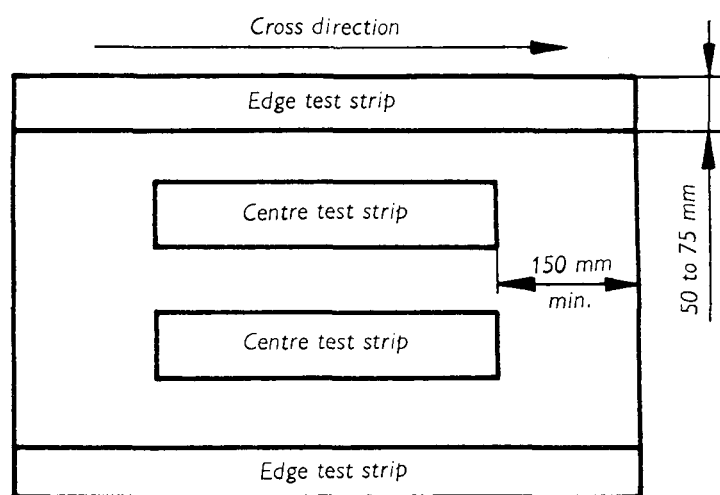


FIG. 1

Each of the four sets of strips should have the top and bottom strips removed; the two sets of strips representing the centre should constitute one test piece, and the two sets from the edges another. The two test pieces should immediately be placed in separate, previously weighed, containers. Each test piece should weigh at least 50 grammes.

The containers and contents should be weighed, and the mass of the test pieces calculated.

6.2.2 WHEN THE UNIT IS COMPOSED OF REAMS OR PARCELS PACKAGED TOGETHER

Reams or parcels should be selected in accordance with ISO Recommendation R 186, i.e.:

If there are 20 or more reams or parcels in each unit, assemble all the reams or parcels from the various units previously taken according to clause 6.1, and consider this group as a lot from which reams or parcels are selected according to clause 6.1.

If there are less than 20 reams or parcels in each unit, then one ream or parcel should be selected at random from each unit.

For each ream or parcel thus retained, select sheets as indicated in clauses 6.2.1 (a) and/or 6.2.1 (b) above.

6.2.3 WHEN THE UNIT IS THE REEL

(a) *Determination of the average value of moisture content in the lot*

Specimens should be taken from each selected reel in accordance with ISO Recommendation R 186, i.e.:

Remove all damaged layers from the exterior of the reel, and take, by cutting in the cross direction, a layer at least 5 mm thick, and lay it out flat. (This thickness may need to be increased according to the thickness and type of the paper involved, efficiency of wrapping and possible influence of storage conditions).

Strips should be taken from the grouped specimens at each edge and the centres, or from the complete width of the reel. Their width should be between 50 mm and 75 mm.

Sufficient of the upper and lower layers of each group of strips should be discarded to ensure that the remainder has not been affected by exposure to the atmosphere. This remainder constituting the test piece should be quickly folded or cut, then enclosed in one of the containers.

This test piece should weigh at least 50 grammes.

The container and contents should be weighed, and the mass of the test piece calculated.

(b) *Determination of variations in moisture content across the reel*

Proceed as in clause 6.2.3 (a) above, taking test pieces from at least three positions across the reel, the greater dimension being in the machine direction; each position should be tested and reported separately.

7. DRYING AND WEIGHING: PROCEDURE

The test piece should be dried in the oven, either in its container with the lid or lids removed, or after being removed from the container and spread out, the air temperature being maintained between 102 °C and 105 °C. If the test piece is removed from its container, the container should also be dried, preferably in the same oven.

When the test piece is considered to be completely dry, it should be enclosed quickly in the container and the container allowed to cool. The air pressures inside and outside the container should then be equalized by momentarily opening and reclosing the container. The container and contents should then be re-weighed, the mass of the dried test piece being obtained by difference.

The test piece should then be replaced in the oven and a further period of drying allowed, equal to at least one half of the initial drying period. The test piece should then be re-weighed in its container. This process of further drying and re-weighing should be repeated as necessary, until constant mass is reached, the drying period between consecutive weighings being in all cases at least one half of the total drying time previously received. The test piece should be considered to have reached constant mass when two consecutive weighings, at the required time interval, do not differ by more than 0.1 per cent of the original mass of the test piece.

In no case should the initial drying period be less than half an hour.

8. EXPRESSION OF RESULTS AND ACCURACY OF THE METHOD

8.1 Expression of results

The result should be expressed as the *percentage moisture content* calculated on the original mass of the test piece and rounded to the nearest 0.1 per cent.

For certain purposes, it may be preferable to express the loss in mass of the sample on drying as a percentage of the final oven-dry weight of the sample. In this case, the result should be reported as the *percentage moisture content on an oven-dry basis*.

8.2 Accuracy of the method

The accuracy of the method will be affected by:

- variations in moisture content throughout the lot,
- the number of test figures averaged,
- handling and atmospheric exposure,
- drying errors,
- weighing errors.

Consequently, no general figure can be given for the accuracy of the method.

9. TEST REPORT

The following details should be reported:

(a) When an average value of moisture content in the lot is required

- | | | |
|----------------------------|---|--------------------------|
| — mean value | } | for the total selected.* |
| — coefficient of variation | | |
| — number of tests | | |

(b) When information on variations in moisture content across the sheets is required

- | | | |
|------------------------------|---|------------------------------|
| — mean | } | for each of the selections.* |
| — coefficient of variation | | |
| — number of tests | | |
| — position of the selections | | |

Where alternative procedures are given, state which has been adopted, and give particulars of any circumstances or influences which it is thought may have affected the results.

* It is recommended that 95 per cent confidence limits of the mean be given.