

From President

The R & D Committee has been making continuous and consistent efforts in bringing out useful technical booklets and publications for the benefit of our industry. These publications have been well received by everyone connected with the Corrugated Packaging Industry. This is an on going process. We, have to continuously update the information and relevant factors, which will serve as guidelines for the future. These Booklets provide such useful data, and I am sure it will prove every useful for the members of our industry.

This Technical information Booklet on "Standard Test Method for Moisture Content in Paper and Paperboard" is the latest addition to the series of Books being published by the R & D Committee of our Federation.

I congratulate our R & D Committee on its efforts and I do hope the Committee will continue to bring out such useful publications.

Devchand Gala

President

Federation of Corrugated Box Manufacturers of India

1. SCOPE

This test is applicable to all paper, paperboards and paper products except those containing significant quantities of materials other than water that are volatile at $105 \pm 2^\circ\text{C}$. Moisture is significant for economic reasons and for its effect on such properties as printability, shrinkage, dimensional stability, physical strength, and paper runnability. This method should be followed to:

- Determine the amount of moisture in a lot of paper or paperboard as "as received" moisture.
- Determine the amount of moisture in shipping containers.
- To calculate results of analysis on a moisture- free basis.

2. DEFINITION

Moisture Content in paper or paperboards is defined as the percentage by weight of water in paper or paperboard.

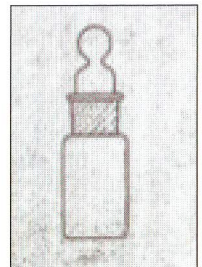
3. PRINCIPLE

A conditioned specimen is weighed and heated to a constant weight to expel moisture. The difference between the two weightings gives the moisture content. When it is required to find the moisture content of paper "as received", the samples shall not be conditioned.

4. APPARATUS

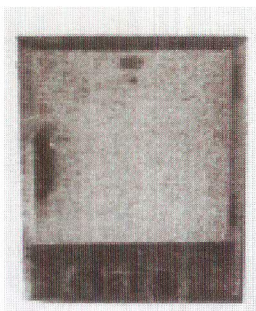
4.1 Weighing Container

Either a wide-mouth, glass-stoppered weighing bottle, approximately 65 mm in height and 45 mm in diameter, or, for larger specimens, a metal or any other air-tight container, preferably provided with a removable wire mesh basket, and of such a size as to accommodate the specimens without their being tightly packed.



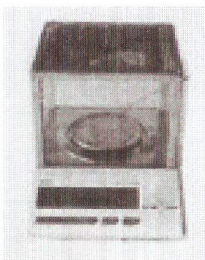
4.2 Drying Oven

Constant-temperature, equipped with means of ensuring adequate temperature control at $105 \pm 2^\circ\text{C}$ and free access of air. Uniform heating in the Oven should be ensured. The oven should be fitted with a thermometer, accurate to within 1 Degree Centigrade and having a range of minimum 0-150 Deg. Centigrade.



4.3 Balance

Sensitive to 1 mg for weighing specimens of 2 grams and less and to 0.05 percent of the original weight of the specimen for larger specimens.



4.4 Desiccators

Anhydrous alumina (indicating grade) is the most suitable desiccant. Calcium chloride and calcium sulphate are unsatisfactory.

5. TEST SPECIMEN

5.1 When the amount of moisture is determined for the purpose of calculating the results of a chemical analysis of paper on a moisture-free basis, use test specimens weighing not less than 1 gram and preferably not more than 2 grams each. When moisture is determined for the purpose of calculating the amount of moisture in a lot of paper, obtain test specimens weighing not less than 50 grams each.

5.2 When the amount of moisture is determined for paperboard or containers, which are to be tested for other physical properties, take test specimens weighing approximately 50 gram, representative of the material being tested. Cut specimens from unsealed sections of containers, and if possible, from unprinted ones.

5.3 General precautions: Do not use bare hands to handle specimens. Handle specimens and weighing containers with clean, dry, rubber or polyethylene gloves or tools and place each specimen as soon as obtained in the tare weighted container and close it immediately. If there is delay of

even a few seconds in making the transfer, keep the specimen covered on both sides with several of its adjacent layers until it is ready for placement in the container. Unless the specimen is to be spread out later in the oven, avoid filling the container tightly.

6. CONDITIONING

6.1 When paper or paperboard is to be tested for moisture content "as received" samples shall not be conditioned.

6.2 Standard Atmospheric Conditions

A relative humidity of 65 ± 2 percent and temperature of $27 \pm 2^\circ\text{C}$ will be taken as the standard atmospheric condition for the purpose of testing.

6.3 Conditioning

A suitable room or chamber is required for conditioning samples. Specific temperature and Rh, as specified in 6.1 above, should be uniformly maintained throughout the chamber. Samples should preferably be suspended so that the conditioning atmosphere has free access to all its surfaces. The samples will be deemed to be conditioned when the results of two weightings, at an interval of not less than one hour, do not differ by more than 0.10 percent of the total weight.

After the samples are so conditioned, they shall be touched and/or handled as little as possible and tested immediately.

7. PROCEDURE

7.1 For Large specimens (50 grams)

7.1.1 Weigh each specimen to the nearest 0.02 gram in a closed container. Unless the container has a removable basket, remove the specimen from the container; spread it on a tray preferably made of wire mesh to enable free circulation of air around it and place it with its container in the oven. Heat for about 1 hour (If grammage is greater than 220 GSM, heat for 2 hour) at $105 \pm 2^\circ\text{C}$.

7.1.2 Replace the specimen in its container and close it, doing this in the oven if possible. Allow the closed container and contents to cool to room temperature. When cool, open the container momentarily to allow air to enter before reweighing and reweigh to the nearest 0.02- gram.

7.2 FOR SMALL SPECIMENS (2 GRAMS)

7.2.1 Weigh the specimen in the tared weighing bottle to the nearest milligram, place it in the drying oven, remove the stopper and heat for about one hour.

7.2.2 Restopper the bottle, remove it from the oven, cool to room temperature in the desiccator, loosen the stopper momentarily to allow air to enter, and reweigh. Carry out this weighing step within 30 min after removal of the bottle from the oven to prevent reabsorption of water vapour by the paper.

7.3 FOR ALL SPECIMENS:

Repeat the periodic drying and weighing of the specimen until the difference in weight between two successive weightings is not more than 0.1 percent of the weight of the specimen.

7.4 CALCULATIONS:

Calculate the moisture content as percentage (to nearest 0.1%) on original weight of the material as follows:

$$\text{Moisture content, percent by weight} = 100 \frac{W - w}{W}$$

Where W = original weight of the conditioned specimen before drying, and w = weight of the specimen after drying.

8. TOLERANCE

The percentage results of duplicate determinations of moisture made at the same time are expected to agree within 0.2%.

9. REPORT

Report the moisture as the percentage loss in original weight of the specimen to the nearest 0.1%.

10. LIMITATION

The precision and accuracy of test results will be affected by:

- (a) variations in moisture content throughout a reel;
- (b) handling and atmospheric exposure; and
- (c) the ambient relative humidity of the drying oven.

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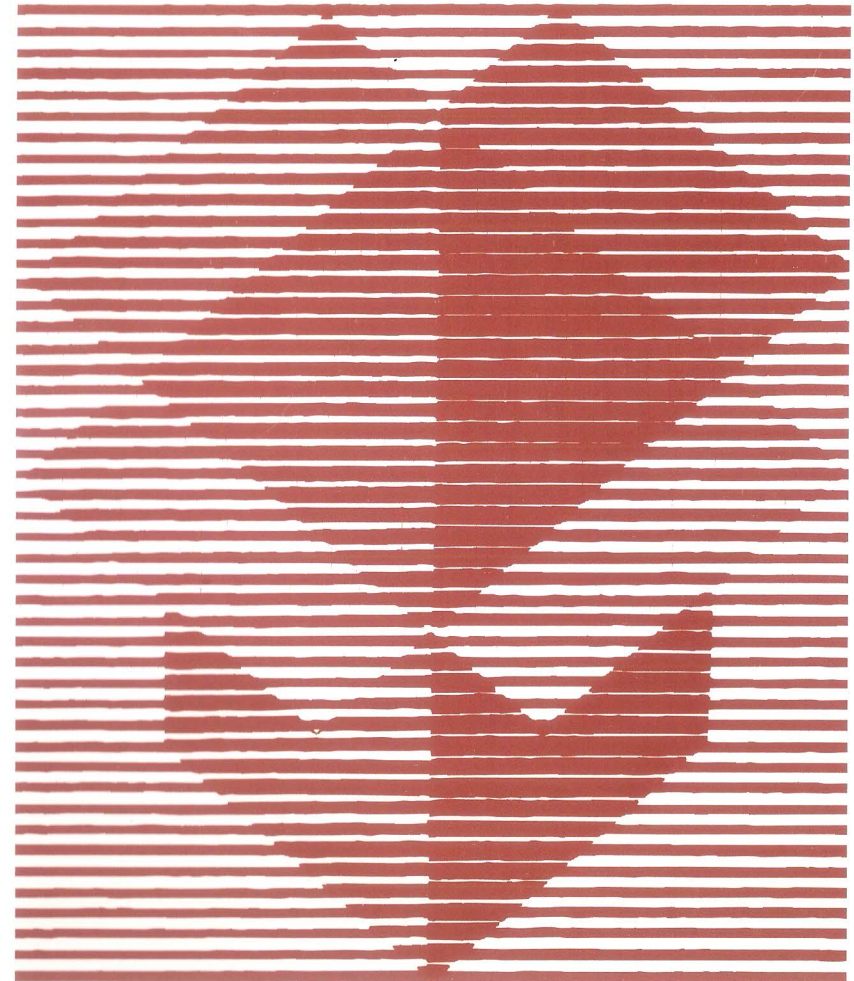
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