

WI _____ 070808.05 _____

T _____ 550 _____

DRAFT NO. _____ 2 _____

DATE _____ January 17, 2008 _____

TAPPI

WORKING GROUP
CHAIRMAN _____ John Walkinshaw _____

SUBJECT
CATEGORY _____ Physical Properties _____

RELATED
METHODS _____ See "Additional Information" _____

CAUTION:

This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Determination of equilibrium moisture in pulp, paper and paperboard for chemical analysis (Revision of T 550 om-03) (underscores and strikeouts indicate changes from Draft 1)

1. Scope and significance

1.1 The following procedure applies to pulp, paper, paperboard, and paper products, except those containing significant quantities of materials other than water that are volatile at $105 \pm 2^{\circ}\text{C}$, or less, or for materials that are oxidized or decomposed above 102°C .

1.2 This method should be followed to calculate the results of a chemical analysis of pulp, paper and paperboard on a moisture-free basis.

1.3 This method should not be used to determine an "as received" or "use" moisture content. Use TAPPI T 412 "Moisture in Paper," or T 210 "Sampling and Testing Wood Pulp Shipments for Moisture."

2. Apparatus

2.1 *Weighing container*, a wide-mouth, glass-stopper weighing bottle approximately 65 mm in diameter and 45 mm high. For larger specimens, use an airtight metal or other suitable airtight container (the container should not absorb moisture), preferably equipped with a removable wire basket, and of such a size as to accommodate the specimens without their being tightly packed.

2.2 *Drying oven*, constant-temperature, with means of ensuring adequate temperature control at $105 \pm 2^\circ\text{C}$ and free access of air.

NOTE 1: There is danger of local overheating if the specimens are exposed to direct rays of unshielded heating elements.

2.3 *Balance*, accurate to 1 mg, for weighing specimens of 2 g; for larger specimens, accurate to 0.05% of the original weight of the specimen.

3. Sampling

3.1 Sample in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product." Pulp samples should be obtained in accordance with T 210 or as required.

3.2 For moisture in containers that are to be tested for other physical properties, cut specimens from unsealed and unprinted sections.

4. Test specimens

4.1 For moisture determination used to calculate results of a chemical analysis of pulp, paper or paperboard on a moisture-free basis, use duplicate test specimens each weighing at least 2 g.

5. Procedure

5.1 Condition the specimens in the atmosphere near the balance in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products."

NOTE 2: In some cases, specimens may be conditioned in a conditioning environment as will be used for the corresponding chemical analysis.

5.2 *General precautions:* Handle specimens and weighing containers with clean, dry, rubber or polyethylene gloves or tools. Place the specimens into the weighing container. Unless the specimen is to be spread out in the oven, avoid filling the container tightly.

5.3 Weigh the specimen in the tared dried weighing bottle to the nearest milligram, place it in the drying oven, remove the stopper and heat for about 30 min; for grammages greater than 224 g/m², heat for 1 h.

5.4 Restopper the bottle, remove it from the oven, cool to room temperature in a 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 vapor by the paper.

5.5 After an initial drying period as specified in 5.3, use a second drying period, at least equal to the first, and subsequent drying periods, each of which is at least one-half the total of all previous drying periods, until two successive weighings do not differ by more than 0.1% of the weight of the specimen. During these periods do not put any new test specimens in the oven.

6. Report

Calculate the moisture for each specimen as the percentage loss of the original weight of the specimen, to the nearest 0.1%. Report as moisture the average of the values for the two specimens. Any variations from the recommended method should be stated in the report.

$$\text{Percent moisture content} = \frac{W_2 - W_1}{W_2 - W_T} (100)$$

W_2 = weight of bottle and specimen prior to drying

W_1 = weight of bottle and specimen after drying

W_T = tare weight of bottle

7. Precision

7.1 The repeatability is 0.2% moisture content units based on ten specimens of average moisture content of 4.7%. This data is based on the within laboratory repeatability from 33 laboratories participating in the March, 1993 CTS-TAPPI Collaborative Reference Program. Reproducibility is not applicable to this method as the moisture content of the test material will vary from laboratory to laboratory as there are no specified conditions for the environment. (See Note 2.)

7.2 The user of these precision data is advised that it is based on actual mill testing, laboratory testing, or both. There is no knowledge of the exact degree to which personnel skills or equipment were optimized during its generation. The precision quoted provides an estimate of typical variation in test results which may be encountered when this method is routinely used by two or more parties.

7.3 The precision and accuracy of test results will be affected by: (a) handling and atmospheric exposure; and (b) the ambient relative humidity of the drying oven.

8. Keywords

Equilibrium moisture, Pulp, Paper, Paperboard, Moisture content, Chemical analysis, Analysis

9. Additional information

9.1 Effective date of issue: to be determined.

9.2 Related methods: ASTM D 644; British BSI 3433; ISO 287; Canadian PAPTAC G-3; Scandinavian SCAN P 4, TAPPI T 804.

9.3 This method was initially part of T 412. The only changes in this 2008 edition were minor editorial.

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department.



WI _____ 070808.05 _____

T _____ 550 _____

DRAFT NO. _____ 1 _____

DATE _____ June 15, 2007 _____

TAPPI

WORKING GROUP
CHAIRMAN _____ to be dertermined _____

SUBJECT
CATEGORY _____ Physical Properties _____

RELATED
METHODS _____ See "Additional Information" _____

CAUTION:

This Test Method may include safety precautions which are believed to be appropriate at the time of publication of the method. The intent of these is to alert the user of the method to safety issues related to such use. The user is responsible for determining that the safety precautions are complete and are appropriate to their use of the method, and for ensuring that suitable safety practices have not changed since publication of the method. This method may require the use, disposal, or both, of chemicals which may present serious health hazards to humans. Procedures for the handling of such substances are set forth on Material Safety Data Sheets which must be developed by all manufacturers and importers of potentially hazardous chemicals and maintained by all distributors of potentially hazardous chemicals. Prior to the use of this method, the user must determine whether any of the chemicals to be used or disposed of are potentially hazardous and, if so, must follow strictly the procedures specified by both the manufacturer, as well as local, state, and federal authorities for safe use and disposal of these chemicals.

Determination of equilibrium moisture in pulp, paper and paperboard for chemical analysis (Five-year review of T 550 om-03)

1. Scope and significance

1.1 The following procedure applies to pulp, paper, paperboard, and paper products, except those containing significant quantities of materials other than water that are volatile at $105 \pm 2^\circ\text{C}$ or less or for materials that are oxidized or decomposed above 102°C .

1.2 This method should be followed to calculate the results of a chemical analysis of pulp, paper and paperboard on a moisture-free basis.

1.3 This method should not be used to determine an "as received" or "use" moisture content. Use TAPPI T 412 "Moisture in Paper," or T 210 "Sampling and Testing Wood Pulp Shipments for Moisture."

2. Apparatus

2.1 *Weighing container*, a wide-mouth, glass-stopper weighing bottle approximately 65 mm in diameter and 45 mm high. For larger specimens, use an airtight metal or other suitable airtight container (the container should not absorb moisture), preferably equipped with a removable wire basket, and of such a size as to accommodate the specimens without their being tightly packed.

2.2 *Drying oven*, constant-temperature, with means of ensuring adequate temperature control at $105 \pm 2^\circ\text{C}$ and free access of air.

NOTE 1: There is danger of local overheating if the specimens are exposed to direct rays of unshielded heating elements.

2.3 *Balance*, accurate to 1 mg, for weighing specimens of 2 g; for larger specimens, accurate to 0.05% of the original weight of the specimen.

3. Sampling

3.1 Sample in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product." Pulp samples should be obtained in accordance with T 210 or as required.

3.2 For moisture in containers that are to be tested for other physical properties, cut specimens from unsealed and unprinted sections.

4. Test specimens

4.1 For moisture determination used to calculate results of a chemical analysis of pulp, paper or paperboard on a moisture-free basis, use duplicate test specimens each weighing at least 2 g.

5. Procedure

5.1 Condition the specimens in the atmosphere near the balance in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products."

NOTE 2: In some cases, specimens may be conditioned in a conditioning environment as will be used for the corresponding chemical analysis.

5.2 *General precautions:* Handle specimens and weighing containers with clean, dry, rubber or polyethylene gloves or tools. Place the specimens into the weighing container. Unless the specimen is to be spread out in the oven, avoid filling the container tightly.

5.3 Weigh the specimen in the tared dried weighing bottle to the nearest milligram, place it in the drying oven, remove the stopper and heat for about 30 min; for grammages greater than 224 g/m², heat for 1 h.

5.4 Restopper the bottle, remove it from the oven, cool to room temperature in a 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 vapor by the paper.

5.5 After an initial drying period as specified in 5.3, use a second drying period, at least equal to the first, and subsequent drying periods, each of which is at least one-half the total of all previous drying periods, until two successive weighings do not differ by more than 0.1% of the weight of the specimen. During these periods do not put any new test specimens in the oven.

6. Report

Calculate the moisture for each specimen as the percentage loss of the original weight of the specimen, to the nearest 0.1%. Report as moisture the average of the values for the two specimens. Any variations from the recommended method should be stated in the report.

$$\text{Percent moisture content} = \frac{W_2 - W_1}{W_2 - W_T} (100)$$

W_2 = weight of bottle and specimen prior to drying

W_1 = weight of bottle and specimen after drying

W_T = tare weight of bottle

7. Precision

7.1 The repeatability is 0.2% moisture content units based on ten specimens of average moisture content of 4.7%. This data is based on the within laboratory repeatability from 33 laboratories participating in the March, 1993 CTS-TAPPI Collaborative Reference Program. Reproducibility is not applicable to this method as the moisture content of the test material will vary from laboratory to laboratory as there are no specified conditions for the environment. (See Note 2.)

7.2 The user of these precision data is advised that it is based on actual mill testing, laboratory testing, or both. There is no knowledge of the exact degree to which personnel skills or equipment were optimized during its generation. The precision quoted provides an estimate of typical variation in test results which may be encountered when this method is routinely used by two or more parties.

7.3 The precision and accuracy of test results will be affected by: (a) handling and atmospheric exposure; and (b) the ambient relative humidity of the drying oven.

8. Keywords

Equilibrium moisture, Pulp, Paper, Paperboard, Moisture content, Chemical analysis, Analysis

9. Additional information

9.1 Effective date of issue: to be determined.

9.2 Related methods: ASTM D 644; British BSI 3433; ISO 287; Canadian PAPTAC G-3; Scandinavian SCAN P 4, TAPPI T 804.

9.3 This method was initially part of T 412.

Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department.

