T 536 om-02
PROVISIONAL METHOD – 1978
CLASSICAL METHOD – 1985
OFFICIAL METHOD – 1988
REVISED – 1996
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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.

Resistance of paper to passage of air (high-pressure Gurley method)

1. Scope

1.1 This method is used to measure the air resistance of approximately 6.4 sq. cm. (1 sq. in.) circular area of paper using a pressure differential of approximately 3 kPa. The recommended range of this instrument is for papers that require 10 or more seconds for 10 mL of air to pass through. Refer to the manufacturer's instructions for the upper range limits. For more permeable papers, other techniques are preferable. Instruments are available with automatic timing devices.

1.2 This method measures the time it takes for a given volume of air to pass through the test specimen, along with any possible leakage of air across the surface; therefore it is unsuitable for rough-surface papers which cannot be securely clamped so as to avoid significant surface and edge leakage.

1.3 For a similar method of measuring air resistance that tests paper at a lower pressure (approx. 1.22 kPa), and has higher volume capabilities, refer to TAPPI T 460 “Air Resistance of Paper.” For a similar method of measuring air permeance at pressures up to 9.85 kPa, using both smaller and larger test areas, refer to TAPPI T 547 “Air Permeance of Paper and Paperboard (Sheffield Type).”

2. Summary

This method measures the amount of time required for a certain volume of air to pass through a test specimen. The air pressure is generated by a gravity-loaded cylinder that captures an air volume within a chamber using a liquid seal. This pressurized volume of air is directed to the clamping gasket ring, which holds the test specimen. Air that passes through the paper specimen escapes to atmosphere through holes in the downstream clamping plate.

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6. Materials

6.1 Refer to Appendix A.1.3 for a description of the sealing fluid for the mercury-type instrument.
6.2 Refer to Appendix A.2.3 for a description of the sealing fluid for the oil-type instrument.

7. Calibration

7.1 The instrument can be tested for air leakage by clamping a thin piece of smooth, hard surfaced, airtight material such as metal shim stock (0.025 mm or thicker) between the clamping plates. A maximum leakage of 5 mL in 5 h is allowable for the mercury-type instrument, and 0.1 mL in 12 h is allowable for the oil-type instrument. This test does not ensure a similar low surface leakage for a paper specimen under test.

7.2 If the inner cylinder of the mercury-type instrument does not descend smoothly, the ball bearings probably need cleaning with a liquid such as alcohol. Refer to the caution statements regarding the handling of mercury.

7.3 Electronic timing devices should be checked in accordance with the manufacturer's instructions. Calibration flow restrictor plates will facilitate this test. Perform the calibration checks in accordance with the manufacturer's instructions.

8. Sampling

Obtain a sample of the paper in accordance with TAPPI T 400 “Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product.”

9. Test specimens

Prepare 10 test specimens of sufficient size from each test unit of the sample. A 50 mm square, or larger size, is generally adequate.

10. Conditioning

Condition and test the specimens in an atmosphere in accordance with TAPPI T 402 “Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets, and Related Products.”

11. Procedure

11.1 Place the instrument on a level surface, free of vibrations, so that the outer cylinder is vertical. Fill the outer cylinder with sealing fluid to the proper depth. The mercury filled model is filled with 907 g (2.00 lbs) of mercury. Refer to the manufacturer’s instructions for filling the high-pressure oil version, as the technique is critical to the instrument performance.

11.2 Raise the inner cylinder before inserting the specimen in the test clamp until its rim is supported by the catch. Clamp the specimen between the clamping plates. Some versions use a hand-tightened capstan (jackscrew), while other versions are equipped with an eccentric cam lifting mechanism. Since the capstan version has no measurement or control of the clamping force, tighten with care in order to ensure proper specimen sealing. Over tightening, as well as under tightening, can cause erroneous results. Excessive clamping force may over stress the structural parts of the instrument and affect the parallel alignment of the upper and lower gasket surfaces. The eccentric cam lifting mechanism is actuated by turning one of the two knobs to the left or to the right of the lifting assembly. This self-locking design decreases the potential of using excessive clamping force. After the specimen is properly clamped, gently lower the inner cylinder until it floats.

NOTE 2: To avoid spilling the sealing fluid, raise the inner cylinder with no test specimen in the clamp area. Raise the cylinder slowly.

11.3 As the inner cylinder moves steadily downward, measure the number of seconds, to the nearest 0.1 s, required for the inner cylinder to descend from the 0 mL mark to the 10 mL mark, referenced to the rim of the outer cylinder.

11.4 For the mercury-type instrument, refer to Table 1 for the appropriate correction factors if displacement intervals other than the 0 to 10 mL marks are used. Multiply the measured time by the correction factors from Table 1 to