AUSTRALIAN STANDARD
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BENDTSEN ROUGHNESS OF PAPER AND PAPERBOARD

This method describes the procedure to be used when measuring the roughness of paper and board by means of the Bendtsen air permeance/roughness tester. The result is expressed in mL/min, but there is no exact correlation with results by other test methods based on a similar principle.

The test piece is held in a special jig, the roughness head is lowered onto it and compressed air, at a pressure controlled by a manostat weight, is applied to the face of the test piece (Note 6.1). Because the pressure at the test piece can vary with air flow rate, this Standard prescribes that the pressure nominally supplied by each manostat weight be correct at an air flow of 100 mL/min. The flow of air escaping across the test piece is indicated on one of the flow meters. The flow meters are checked by measuring the air flow rate when a specially calibrated capillary tube is connected in place of the roughness head.

A guide to the ability of the paper or board to compress to a smooth surface during printing can be obtained by repeating the measurement while the roughness head is loaded with an overweight, the result obtained being called the Loaded Value. The ratio of roughness to Loaded Value is called the Compression Value.

1. APPARATUS

1.1 Bendtsen air permeance/roughness tester, fitted with variable area flow meters for the ranges 5 to 150, 50 to 500, and in some cases 300 to 3000 mL/min, and changeover cocks for selecting the desired range and for selecting between the air permeance and roughness heads. Other flow measuring systems may be used providing it can be demonstrated that the system gives the same results as the variable area flow meters about which this Standard is written. Included with the instrument are three interchangeable manostat weights, which are used to ensure constant air supply pressures of either 0.74 ±0.01, 1.47 ±0.02, or 2.20 ±0.03 kPa at the measuring point and are identified by that number. It has been demonstrated that the accuracy of instruments must be regularly monitored (Reference 7.1). High rates of 'wear' encountered with new floats make it imperative to check the flow meters of all new Bendtsen roughness and air permeance testers during initial use.

A set of glass capillaries, as described in Appendix C, shall be used to verify the flow meters. Because of the highly specialized nature of the work required to adjust the rotameter tubes, calibration of them must be done by properly qualified technicians.

1.2 Roughness head having a land of mean circumference 100.0 ±0.5 mm and width 0.150 ±0.002 mm, exerting a pressure of 100 kPa on the paper surface when the air pressure in the head is 1.47 kPa. When in use the roughness head shall be attached to the outlet of the flowmeter by a thin-walled soft rubber or plastic tube of at least 5 mm internal diameter and not more than 700 mm long.

1.3 Air compressor, complete with filter, to supply an oil and dirt free air flow. Means of stabilizing the air flow must be provided, a length of airline either by itself or in combination with an equalizing flask being suitable. Unstable readings may be due to surges in air flow and this fault can usually be rectified by adjusting the rate of air flow.

Place the compressor in a suitable position where no vibration will be transmitted from it to the instrument. Vibration gives rise to errors.

1.4 Optically flat glass plate, at least 5 mm thick, or its equivalent, for checking for air leaks in the system.

1.5 Roughness jig, of the type illustrated in Figure 1. The design shall be such as to ensure that the head is lowered gently and squarely onto the test piece.

1.6 Overweight, (optional), which when applied to the roughness head increases the pressure on the land from 100 to 150 kPa.

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