Australian/New Zealand Standard™

Methods of test for pulp and paper

Method 458rp: Glue bond strength of wetted corrugated fibreboard

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The following are represented on Committee PK-019:

Appita Inc.
Australian Paper Industry Council
CSIRO Forestry and Forest Products
Forest Research (New Zealand)
National Association of Forest Industries
New Zealand Pulp and Paper Industry Association

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Preface

This Standard was prepared by Joint Technical Committee PK-019, Methods of Test for Pulp and Paper, as a part of AS/NZS 1301, *Methods of test for pulp and paper*.

This edition cancels and replaces AS/NZS 1301.458rp:1994.

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

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Foreword

Failure of the glue bonds between the liners and corrugating medium in corrugated fibreboard is a major factor in the collapse of corrugated containers under wet conditions. When board is expected to be used in wet or humid conditions, a water resistant adhesive is normally used to overcome this problem. This Standard describes a method of determining the strength of the glue bonds of wet board. It is applicable to all types of corrugated fibreboards, including double and triple wall boards.

In this test, test pieces are immersed in water at a controlled elevated temperature for a predetermined time. A progressively increasing load is then applied to the selected glue lines until failure occurs. The direction of application of load is parallel to the glue lines and in the plane of the board. The force at failure is measured and expressed in N/m.

Different glue lines cure at different rates, depending on their formulation. While the maximum wet bond strengths of two different glue formulae may be similar, the rates at which their strengths develop may be quite different.

A related method is Tappi T 842 pm-99.

There are a number of other Standards, including ISO 3038:1975, which describe different methods for determination of this property, but all of them suffer from the same deficiency, namely that they do not apply the stress in the direction in which it occurs when containers fail in service. In service the failure-causing stress is in the plane of the board in a direction parallel to the flutes. This Standard applies the stress in that direction. ISO 3038 applies the stress in the plane of the board, but in a direction at right angles to the flutes, it measures the time taken for water to penetrate the glue line rather than the stress required to cause failure of a partially wet glue line, and it takes a substantial time to obtain a result.

Glue bond strength of wetted corrugated fibreboard

1 Scope

This recommended practice is intended to apply to corrugated boards in which the glue line has reached a condition of maximum cure, i.e. a condition after which further ageing at room temperature produces no further increase in wet strength.

2 Apparatus

2.1 Tensile testing machine—a testing machine which applies a progressively increasing tensile load at a rate of 10.0 ±0.5 N/min and is calibrated in accordance with the manufacturer's specifications to ensure that it indicates the maximum load at failure to within 0.01 N. The machine is fitted with a special clamping device which is described in Annex A. A separate comb with appropriate rod spacing must be provided for each flute type to be tested. An example of a suitable set-up is depicted in Figure 1.

2.2 Plastic strips—a supply of plastic strips (test piece holders) 40 mm wide, at least 1.2 mm thick and a suitable length for the testing machine (see Figure 2). The strips may have a hole near one end for attaching to the draw bar of the testing machine.

2.3 Water tank or bath—a thermostatically controlled water bath or tank to maintain the temperature of the water to 40 ±1°C. It shall be fitted with racks to which the test piece holders can be attached to ensure that the test pieces are submerged to a depth of 25 mm to 30 mm.

2.4 Test piece cutter—a double bladed cutter of the Billerud type or a template and sharp knife suitable for cutting 25 mm wide strips.

2.5 Thin-bladed knife—the blade should be 0.3 mm to 0.6 mm thick.

2.6 Stop watch or timer

2.7 Tape—double-sided adhesive tape with adequate water resistance.

3 Preparation of test pieces

3.1 Samples need not be conditioned prior to testing.

3.2 Allow the sample to stand for sufficient time to ensure that the glue bond reaches maximum cure. In most cases, board left in a stack for 24 h following manufacture will reach a condition of maximum cure. If it is suspected after testing that the glue bond had not reached a condition of maximum cure, allow the sample to stand for a further 24 h and retest.

3.3 Cut strips of board 25.0 ±0.2 mm in the cross machine direction, using a Billerud type cutter or a template and a sharp knife. Using the thin-bladed knife, cut the strip into test pieces, each of which has four glue lines on the side to be tested and five on the other side. Both liners and the medium must be cut right through in a direction parallel to the flutes and about midway between the glue lines (see Figure 3). The cut is easier to make in one pass if the blade is held at an angle to the plane of the board. Cut four test pieces for each of the sides to be tested. If the two sides are not easily distinguished, divide the test pieces into two groups, identify each group and the sides to be tested.

If the glue lines on double wall board are to be tested, cut a strip as above. Using the thin-bladed knife, remove the liner and corrugated medium on the side of the middle liner opposite to that on which the glues lines to be tested are located, cutting as close as possible to the middle liner without damaging it. The remainder is then cut into test pieces in the same way as normal single wall board. A similar technique can be applied to triple wall board.