



FEFCO RECOMMENDATION N°. 104 **(July 2006)**

PROCEDURE FOR THE DETERMINATION OF THE ANGLE OF SLIP FOR CORRUGATED BOARD

This FEFCO recommendation is one of a series numbered from 101 upwards, which gives guidance to FEFCO Members appropriate to the issue described in the title, in practical matters dealing with production, or customer-related problems. It is hoped that it will provide a uniform means of operation, for example in a comparative study of a problem.

The issuing body is the FEFCO Standards Committee working under the auspices of the FEFCO Board.

The FEFCO Recommendations are supplementary to the internationally recognized FEFCO Testing Methods. The latter will continue to be developed for testing corrugated board products.

1. **OBJECTIVE:** To define the apparatus and the testing method to be used to determine the angle of slip of corrugated board.
2. **SCOPE:** This testing method is applicable to all types and grades of corrugated board.
3. **PRINCIPLE:**

The test specimens of pre-determined dimensions, taken from a representative sample of corrugated board, are placed on an inclinable surface of the same corrugated board grade, the angle of which is increased at a constant rate until the commencement of slippage occurs.

The angle of inclination (in degrees) at which the commencement of slippage occurs is directly read from the apparatus and constitutes the result of the measurement.

4. APPARATUS:

4.1. A device designed to increase the inclination of the surface on which the test specimen rests progressively and without vibration, to allow the termination of the test at the commencement of slippage: the operator will then be able to read directly the angle of slip in degrees.

4.2. A weight of 1000g (about 1kPA) and 100 x 100 mm in dimension

Measurement scale. The angle of inclination can vary from 10 to 45°.

4.3. Increase rate of inclination. The rate of change of the inclination angle shall be constant and equal to 2° per second +/- 0.5 degrees per second.

5. TEST SPECIMEN PREPARATION

Ten test specimens of 100 x 250 mm, which shall be numbered from 1 to 10 from the two ends of the opposite sides which are to be tested, shall be taken from a representative sample of corrugated board in such a way that the dimension 250 mm is parallel to the glue lines of the corrugated board.

These test specimens shall be free from all marks occurring in preparation, irregularities and damage, and shall not be taken at less than 50 mm from scores, slots or printed area (unless otherwise specified).

The initial test specimen (100 x 250 mm) shall be divided into two specimens of dimensions 100 x 100 mm and 100 x 150mm. The cutting shall be made with the side to be tested facing upwards.

The two specimens which have the same number shall be kept together and shall be considered as a sample pair for the test.

6. CONDITIONING

The test specimens shall be conditioned in accordance with ISO 187 (23°C; 50% r.h).

7. PROCEDURE

The test shall be carried out in the climatic conditions specified in Clause 6.

The test specimen of dimensions 100 x 150 mm shall be placed on the inclinable equipment in its lowest position, the lower end contacting the stop of the inclined plane of the equipment with the side to be tested facing upwards.

The test specimen 100 x 100 mm shall be placed on this surface, the face to be tested facing downwards. The weight of 1000g shall be placed on this latter test specimen and shall cover it entirely.

To prevent any relative movement between the weight and the test specimen, 100 x 100 mm during the test, this test specimen shall be secured to the weight*.

Unless otherwise specified, carry out ten tests for the face of which the angle of slip is measured: five tests for each principal direction of the test specimen 100 x 100 mm (glue lines of the test specimen 100 x 100 mm parallel or perpendicular to the steepest line of the inclined surface).

Allow a dwell time of 10 seconds before inclination.

8. TEST REPORT

The test report shall include:

- Date and place of the tests
- Description and identification of the corrugated board grade
- Number of tests carried out
- Arithmetic mean and standard deviation of the 5 measurements for each direction of the corrugated board at the first slide
- Indication of any departure from the principle of this Recommendation

- Indication of any other information likely to facilitate interpretation of the results
 - *Two-sided adhesive tape, layer of expanded polystyrene (or similar) of dimensions 100 x 100 and 3 to 5 mm in thickness, placed between the weight and the test specimen 100 x 100 mm.

Bibliography:

Inclined Plane Tappi T815. Coefficient of static friction inclined Plane method.

Horizontal Plane ISO 15359. Coefficient of static and kinetic friction.

FEFCO Round Robin test 1997: Determination of the static coefficient of friction