

# *Filled corrugated fibreboard containers - Horizontal impact test (inclined plane test)*

*This test is one of a series of performance tests for corrugated fibreboard containers and may be selectively applied as specified, either singly, or in combination with other tests.*

## **1 Object**

To define the apparatus and test procedure to be used to determine the ability of complete filled corrugated fibreboard containers to withstand horizontal impact stresses and to assess the protection provided for the contents by the packaging.

## **2 Scope**

The test is applicable to all types of corrugated fibreboard containers complete with internal fitments and the actual or dummy contents.

## **3 Normative references**

EN 22 206 : Packaging - Complete, filled transport packages - Identification of parts when testing.

EN 22 233 : Packaging - Complete, filled transport packages - conditioning for testing.

## **4 Principle**

A specimen container complete with actual or dummy contents is placed on a carriage mounted on inclined rails. The loaded carriage is released and allowed to run freely down the incline causing the specimen to impact against a rigid flat plane surface mounted at 90° to the inclined plane.

On completion of the specified test cycle, which may consist of a number of impacts from varying distances and with the specimen in differing attitudes, the specimen container and its contents are examined and reported on.

Dummy contents : where the use of the actual contents is prohibitive, because of excessive cost or danger, or for other reasons, an artificial load may be used provided that it has similar dimensions, centre of gravity, etc, and adequately represents the item it replaces.

Attitudes : for the purpose of specifying the attitude in which the specimen is impacted the faces should be identified according to EN 22 206 as follows : Facing one end (with the manufacturer's joint vertical on the right side) the top of the container is numbered as 1, the right side 2, the bottom 3, the left side as 4, the near end 5, and the far end 6 (see fig. 1).

Containers not having or having more than one manufacturer's joint will be dealt with on the same principle by arbitrarily selecting one end as face 5.

Thus, the edges will be identified by the numbers of the two faces which make the edge ; and corners by the numbers of the three faces which meet to form the corner e.g. 2-3-5 will designate the corner at the bottom of the manufacturer's joint in fig. 1.

## **5 Apparatus**

The principal apparatus shall consist of :

**5.1.** A track consisting of two parallel steel rails inclined at an angle of 10° to the horizontal rigidly supported and braced to minimise deflection when loaded.

**5.2.** A flat, smooth, rigid impact surface integral with the main structure at the lower end of the incline. The plane of the impact surface shall be at 90° to the plane of the track and to its direction.

The impact surface shall be adequately reinforced to withstand the impact energy, without significant deflection or movement.

The dimensions of the impact surface shall be greater than those of the impacting face of the test specimen.

**5.3.** A sturdily constructed flat-bed carriage with four steel wheels with roller bearings.

Note : four steel guide wheels may be additionally used.

The surface of the carriage, normally of wood, must be flat, smooth, and free from bolt or nail heads and other projections, and must be parallel to the plane of the track.

The friction between the test specimen and the carriage shall be sufficient to maintain its position during the run.

The dimensions of the carriage shall be sufficient to accommodate the test specimen without overhang.

**5.4.** A graduated scale with convenient increments e.g. 5cm increments- along the inclined plane to permit accurate control of the distance of travel before impact.

- 5.5.** A motorised or manually operated mechanism to elevate the loaded carriage, and an automatic tripping device to release the carriage at predetermined distances from the impact face.

The apparatus may also be fitted with an automatic counting device to record each passage of the carriage down the incline.

Note : figure 2 shows a diagram of the main features of the apparatus with some typical dimensions suitable for most purposes.

- 5.6.** Calibration : the apparatus shall be calibrated so that the velocity at the point of impact is known in metres per second. The calibration shall be made with an empty carriage using an electric timing device. The average velocity shall be calculated from the known distance of travel and the elapsed time. The velocity at impact shall be taken as twice the average velocity.

A chart or graph shall be prepared from the calibration values and this will be used to determine the distance of travel required to produce the desired velocity at impact.

It is necessary, when calibrating the apparatus, and when carrying out tests, that the carriage wheels and the track shall be generously lubricated to minimise friction.

## 6 Conditioning

The specimen containers, with any internal fitments, shall be conditioned prior to filling in accordance with EN ISO 22 33. Unless otherwise specified, condition 'G' ( $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ,  $50\% \text{ rh} \pm 3\% \text{ rh}$ ) shall be used.

**Note :** For packaging tests, FEFCO recommends  $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ,  $50\% \text{ rh} \pm 3\% \text{ rh}$ , but draws the attention that ISO sets  $\pm 2\% \text{ rh}$ , which is quite strict for plants that cannot condition a big room.

## 7 Procedure

- 7.1.** Test specimen : a test specimen shall consist of a container, with actual or dummy contents, filled, closed and sealed in the manner intended for normal usage. The faces should be numbered for identification in accordance with clause 4.

- 7.2.** The test should be carried out in the same atmosphere used for conditioning . Alternatively the test should be commenced within 5 minutes of removal of specimen from the conditioning atmosphere.

If specified the contents may be conditioned before filling the container, which shall be retained in the conditioned atmosphere during filling, closing and testing.

- 7.3.** Individual tests : the test specimen shall be placed on the carriage in the specified attitude with the face or edge to be impacted coincident with the lower edge of the carriage flat-bed (see fig. 2).

The carriage will then be elevated and released at the predetermined point required to give the specified impact velocity.

Impact testing shall be repeated as specified unless there is evidence of severe damage necessitating termination of the test sequence.

- 7.4.** Number of tests : unless otherwise specified a minimum of three containers shall be tested.

## 8 Test report

The test report shall contain the following :

- a** date and place of testing
- b** description, including internal fitments and contents, identification and quantity of specimens tests.
- c** test climate used (if other than  $23^{\circ}\text{C}$  50 % rh)
- d** a statement whether the contents have been conditioned
- e** description of the apparatus employed
- f** description of the test sequence carried out on each specimen
- g** if impact testing is carried out as part of a series of tests - reference to that series
- h** observations for each specimen indicating :
  - 1) damage sustained by the container fitments
  - 2) damage to and/or loss of contents
  - 3) whether the test sequence was completed and if not, the point at which it was terminated.
- i** details of any deviations from this testing method, conditioning etc
- j** any other information which may assist in the interpretation of the test result.

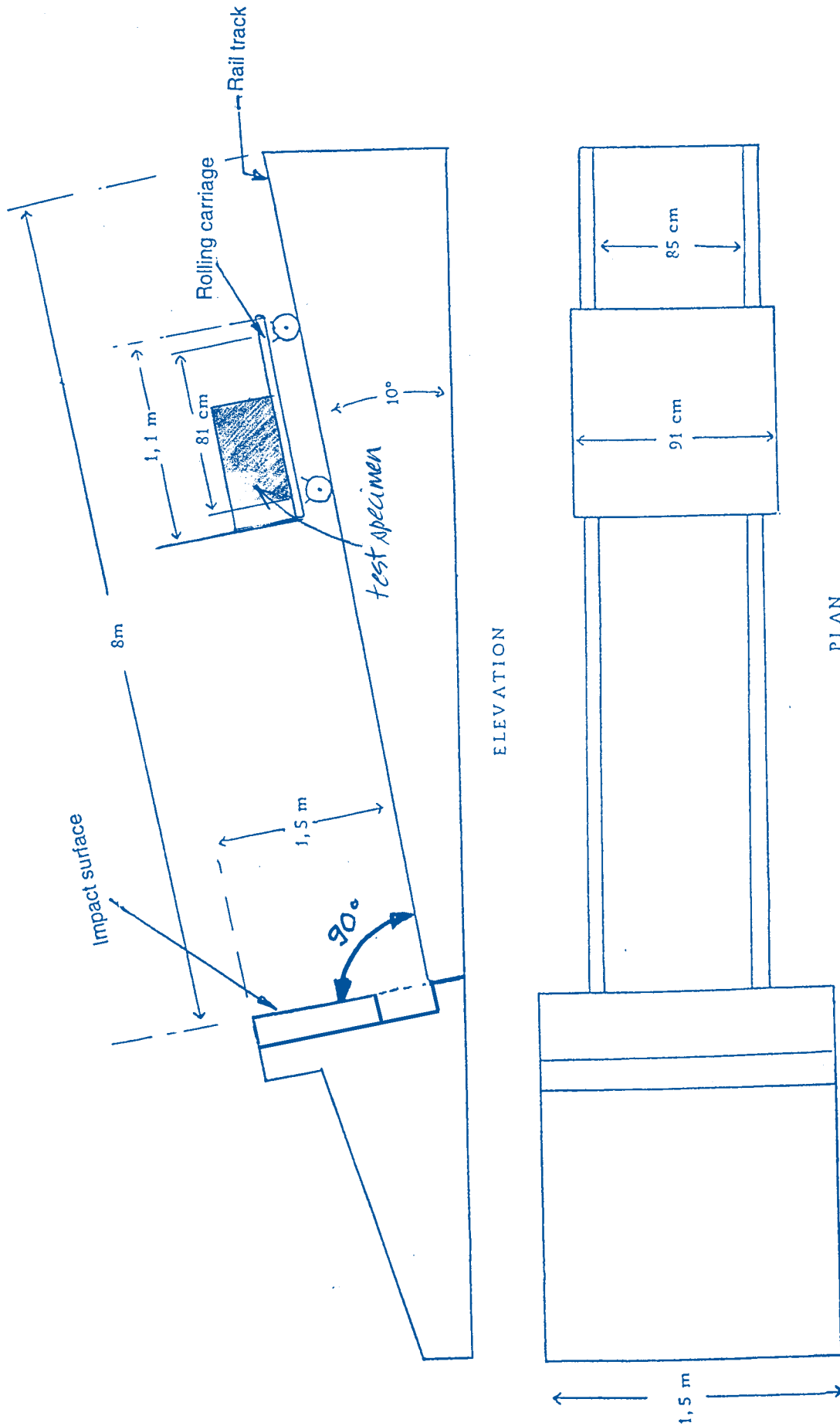


Figure 1