

**NOTICE: This document is a TAPPI Standard in ballot. Although available for public viewing, it is still under TAPPI's copyright and may not be reproduced or distributed without permission of TAPPI. This document is current under review to be maintained as a TAPPI Standard.**

WI \_\_\_\_\_ 230308.01 \_\_\_\_\_

T \_\_\_\_\_ 812 \_\_\_\_\_

BALLOT NO. \_\_\_\_\_ 02 SARG \_\_\_\_\_

DRAFT NO. \_\_\_\_\_ 02 \_\_\_\_\_

DATE \_\_\_\_\_ May 16, 2024 \_\_\_\_\_

WORKING GROUP  
CHAIR \_\_\_\_\_ Ben Frank \_\_\_\_\_

SUBJECT  
CATEGORY\_ Fiberboard Shipping  
\_\_\_\_\_ Container Testing \_\_\_\_\_

RELATED  
METHODS \_\_\_\_\_ See "Additional Information" \_\_\_\_\_

**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.

## **Ply separation of solid and corrugated fiberboard (wet)**

***Five-year review of Official Method T 812 om-19  
(Underscores, notes, and strikethroughs show changes from  
Draft 1)***

### **1. Scope**

This method describes a laboratory test for evaluating the resistance to ply separation of solid or corrugated fiberboard after exposure to water. It is intended primarily to distinguish between boards fabricated with weather-

---

*Approved by the Standard Specific Interest Group for this Test Method*  
TAPPI

resistant adhesives and those with nonweather-resistant adhesives.

## 2. Significance

The ability of a fiberboard shipping container to meet certain wet weather-resistance requirements is influenced by the resistance of the plies of the solid or corrugated fiberboard to separation after exposure to water. An appraisal of the strength of the combining adhesive after a period of immersion in water is therefore one of the criteria for weather-resistant fiberboard shipping containers.

## 3. Apparatus

3.1 *Corrosion-resisting tank*, for holding water and test specimens, of suitable size so that water has free access to all surfaces of each specimen.

**NOTE 1:** The tank must be kept clean.

3.2 *Rack*, or other means for supporting the specimens vertically and keeping them separated from each other and from the sidewalls of the tank in such a manner that ply separation is not restricted.

3.3 *pH meter and thermometer*, to record pH and temperature. To be routinely calibrated using manufacturers' procedures and recommendations.

## 4. Materials

*Water*, use tap or potable water maintained at a temperature of  $23 \pm 3^\circ\text{C}$  ( $73 \pm 5^\circ\text{F}$ ) with a pH between 6.5 and 7.5, drawn fresh for each batch of specimens. [The pH of some tap or potable waters may fall outside of this range and would require pH adjustment.](#)

## 5. Conditioning

[After manufacture precondition and condition the solid or corrugated fiberboard in accordance with TAPPI T 402 "Standard Conditioning and Testing Atmospheres for Paper, Board, Pulp Handsheets and related products" or otherwise allow for the adhesive to fully cure.](#) For specific customer requests that require the preconditioning and conditioning steps to take place outside the time or temperature/humidity limits shown in T 402, the special preconditioning and/or conditioning procedures shall be listed in the 8.2.4 section of the Report.

**NOTE 2:** For control purposes only, a quick test of the board at the time of manufacture may be made by placing it in an oven for 10-20 min at a temperature of  $105^\circ\text{C}$  ( $221^\circ\text{F}$ ) to accelerate the cure of the adhesive prior to cutting and submerging the test specimens.

**Deleted:** Preliminary conditioning.

**Deleted:** .

## 6. Sampling and test specimens

6.1 From each test unit obtained in accordance with TAPPI T 400 "Sampling and Accepting a Single Lot of Paper, Paperboard, Containerboard, or Related Product," depending on lot size, cut 3-5 specimens, 150 x 250 mm (6 x 10 in.) in size, from undamaged, unscored, unprinted portions of the board.

6.1.1 Cut corrugated fiberboard specimens so that the flute openings are along the 250-mm (10-in.) dimension.

6.1.2 If finished containers do not permit specimens of this size, use smaller size specimens. Some printing or a score near the middle of the specimen (not near an edge) is acceptable if unavoidable.

## 7. Procedure

7.1 Submerge the specimens vertically with the 250-mm (10-in.) edges horizontal and the top edge 25 mm (1 in.) below the surface of the water. Support the specimens so that the water has free access to all surfaces and ply separation, if it occurs, is not restricted.

7.2 Allow the specimens to remain submerged for  $24 \pm 1$  h.

**NOTE 3:** For reduced levels of (wet) weather or moisture resistant adhesives, reduced immersion times may be selected and so reported.

7.3 Remove the specimens from the water and continue to support them in a vertical position, allowing them to drain until their surfaces no longer glisten, and in the case of corrugated fiberboard allow any excess water to drain from the flutes. Also, for corrugated board samples, to assist in the removal of entrained water and air within the flutes, samples may be "tapped" or shaken after they are removed from the water.



**Fig. 1.** Procedure for overcoming surface tension.

- 7.4 Immediately following drainage, check the specimens for adhesion between components.

**NOTE 4:** Separation of components may occur spontaneously and freely during soaking; however, surface tension may often cause the wet components of fiberboard to cling together even though not bonded by adhesive. To overcome the surface tension, brush lightly with the ball of the thumb across the cut edges of the specimen at several points on both faces of each of the four edges, particularly the 250-mm (10-in.) or machine direction edges.

## 8. Report

8.1 Report whether the specimen exhibited separation of the edges, and if so, the extent of separation expressed in millimeters (inches) of delamination measured inward from the edge of the specimen.

8.2 Report also the following:

- 8.2.1 Number of specimens tested.
- 8.2.2 Dimensions of the specimens, if not of standard size.
- 8.2.3 The temperature and pH of the water.
- 8.2.4 Any additional relevant information.

## 9. Precision

A precision statement is not applicable to this qualitative method.

## 10. Keywords

Corrugated boards, Fiberboards, Ply separation, Bonding strength

## 11. Additional information

11.1 Effective date of issue: To be assigned..

11.2 Significant changes were included in the 2008 revision: The conditioning atmosphere has been narrowed to TAPPI standards and the length of conditioning time has been reduced prior to cutting and submersion of specimens.

11.3 Housekeeping changes were made to sections 5.1 and 7.3 in 2013. [An acknowledgement that some tap water may need pH adjustment \(section 4\) was added in 2023.](#)

**Reference**

ASTM D4727 – “Standard Specifications for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes.” Glue bond separation of weather-resistant and water and water-vapor resistant classes. (American Society for Testing and Materials)

*Your comments and suggestions on this procedure are earnestly requested and should be sent to the TAPPI Standards Department.*

