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QUALITY SPECIFICATIONS

OF CORRUGATED BOARD AND CORRUGATED BOARD PACKAGINGS

A corrugated box can be seen as consisting of 3 elements: design, materials and graphics.

Design is usually based on functional requirements in the distribution chain. Typical functions include the method of erecting and closing the box (manually up to fully-automated) and box dimensions (to fit the contents or optimise the load-carrying unit such as a pallet), or opening and display requirements.

Materials are selected from combinations of papers and board configurations (the geometry of the corrugated layer or layers if more than one is used).

Graphics on the outside of the corrugated box are usually printed, anything from a simple one-colour barcode or identification to a full 6 -colour printed box with varnish.

CORRUGATED BOARD AND PRODUCTS OF CORRUGATED BOARD SHALL BE CONSIDERED IN CONFORMITY IF THEY COPLY WITH THE FOLLOWING REQUIREMENTS:

1. REQUIREMENTS OF MATERIAL

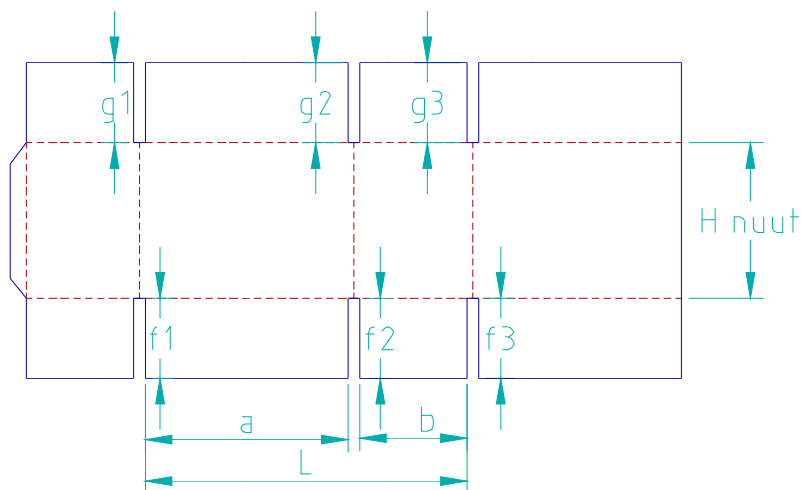
1.1	Humidity:	6 – 10%
1.2	Linear measurements (length, width)	
	linear measurement of E, B, C flute	± 3 mm
	linear measurement of EE, EB, EC, BC flute direction	± 3 mm
	cross direction	± 5 mm
1.3	Location of creasing lines	± 1 mm
1.4	Location of Rip-a-Tape / Sesame tape	± 5 mm
1.5	Curvature (See Annex 2)	≤ 4%
1.6	Sizing	upon separation layers paper fibres remain attached to the glue layer
1.7	Strength qualities	See Annex 1

2. REQUIREMENTS OF PRINT

- 2.1 Material thickness difference (printed and non-printed area) < 0,2 mm
- 2.2 Mutual location of colours ± 1 mm
- 2.3 Shifting on the layout ± 2 mm
- 2.4 Colour tones in compliance with approved colour samples

3. REQUIREMENTS OF CUT

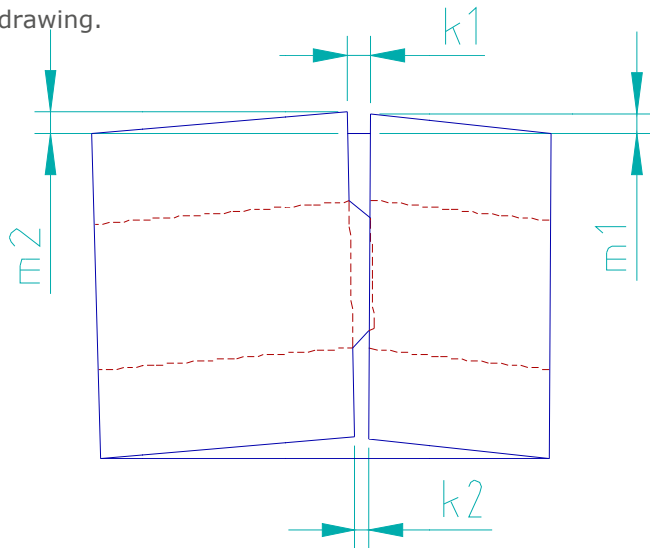
- 3.1 FEFCO 0201 requirements (See the drawing):
 Nominal measure **L**= measure **a** + measure **b** + the width of the **split**
 tolerance = +6 / -3 mm
 depth of split cuts **f_i** and **g_i**: +4 / -2 mm measured from the middle of the joggle



- 3.2 locations of openings (stripping ribbon, suspension openings, etc.) ± 3 mm

4. REQUIREMENTS OF GLUED JOINTS

- 4.1 Glued joint strength upon tearing apart paper fibres remain attached to the glue layer.
- 4.2 Amount of glue sufficient for ensuring moving, but must not protrude from the joint (i.e. the internal surface or sets of packaging must not be glued together)
- 4.3 Gluing tolerances – See the drawing.

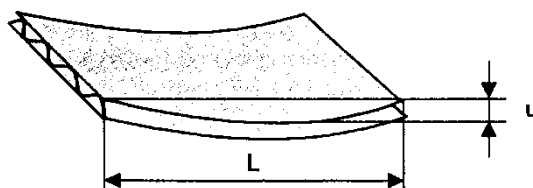


- 4.3.1. Tilt measure m_1 and m_2 < thickness of corrugated board, still < 5mm
- 4.3.2. Gluing the "fishtail" $[k_1 - k_2]$ < 1.5 thickness of corrugated board, still < 7 mm
- 4.3.3. FEFCO 0201 glued joint connection split k
split width \pm thickness of corrugated board, still < \pm 6mm), still > 1mm

5. DEFINITION AND MEASUREMENTS OF THE CURVATURE OF CORRUGATED BOARD

5.1 Definition

The curvature R of the blank is defined through the u/L relationship as a percentage, where u is the height of the curve and L is the length of the blank (See Drawing 1).

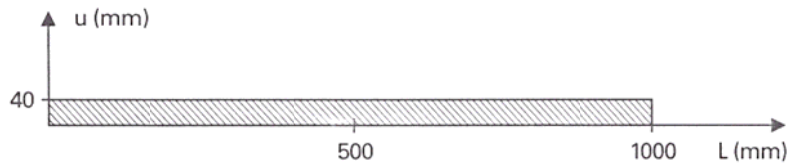


DRAWING 1

5.2 Requirements

Requirement 1: The curvature of the blank must not exceed 4%.

Requirement 2: The curvature of the more curved side of the blank must not exceed 4%. Visually it may be represented with the help of the following drawings.

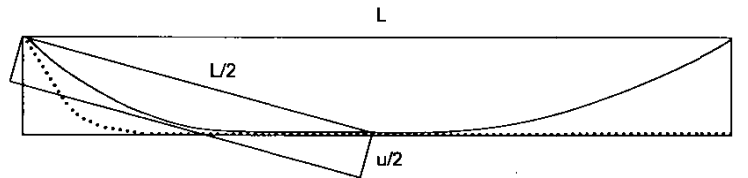


DRAWING 2

Requirement 3: If the length of the blank is for instance $L = 1,000$ mm, the cross-section of the blank must fit in the hatched rectangle.

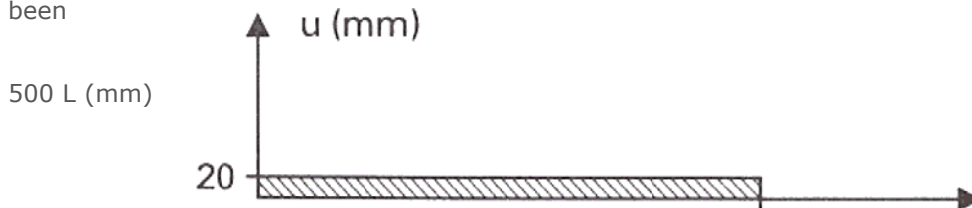
If the linear measurement of corrugated board (the length or width) exceeds 1,000 mm, both sides of the blank have to fulfil the required curvature condition (See Drawing 3).

EXAMPLE: The blank marked with a dotted line does not fit in the curvature standards of $u/2 / L/2 * 100\% = 4\%$.



DRAWING 3

Requirement 4: would mean that the blanks that are strongly curved from one end, such as for example the blank marked with a dotted line in the given drawing should be called acceptable. It is very difficult to process such blanks with machine packaging devices due to which requirement 2 has been established.



Drawing 4

Requirement 5: The more curved part of the blank with a length of $l=L/2$ has to fit in the hatched rectangle.

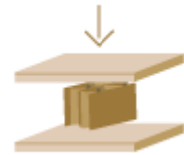
6. QUALITY CONTROL

DSSmith Packaging Estonia has an implemented quality management system. All produced board grades are regularly tested in DSSmith Packaging Vilnius plant laboratory. The regular testing guarantees the performance that every produced board grade has to full fill.

- 6.1.** There are regular board grade testing needed in EUPS quality control (see Annex 1).
Testing and samples preparation conditions in laboratory: ISO 187 ($t=23\pm 1^{\circ}\text{C}$; $\text{RH}=50\pm 2\%$).

ECT – Edge Crush Test, ISO 3037

The edgewise crush resistance of corrugated board is the maximum compressive force that a test piece will sustain without being crushed. A rectangular test piece of corrugated board is placed between the plates of a testing machine with the flutes perpendicular to the plates, and subjected to an increasing compressive force until crushing appears.



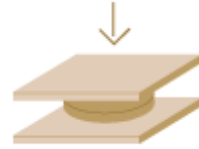
BURST (Mullen) – Burst Strength test value, ISO 2759

Bursting strength is a biaxial strength property. Bursting strength is defined as the maximum hydrostatic pressure required to produce rupture of the material when a controlled and constantly increasing pressure is applied through a rubber membrane to a circular area of the paper.



FCT - Flat Crush Test, ISO 3035

The flat crush resistance of corrugated board is the maximum pressure that the board will sustain until the fluting collapses. A test piece of corrugated board is subjected to an increasing pressure applied perpendicular to the surface by means of a testing machine until the fluting collapses.



B D – Bending Stiffness, ISO 5628:1990

Bending stiffness is defined as the relationship between the applied bending moment and the curvature of the board. A 4-point bending stiffness tester is used. The bending stiffness of corrugated board is very important for attaining high stacking strength, BCT, of a corrugated board box. It is the combination of the board thickness and the tensile stiffness of the liners, which mainly determines the bending stiffness of the board.



DSSmith Tallinn plant uses EUPS board grade standards

7. PACKAGING

- 7.1 Packaging is in compliance with the specifications of the product and special agreements with the customer and be in compliance with the product;
- 7.2 Wooden pallets are used for packaging;
- 7.3 Products are fastened to pallets with plastic or metal ribbons;
- 7.4 To protect the products against environmental effects stretch foil packaging is used and, if necessary, the products are covered with a covering foil and/or covering plywood;
- 7.5 Each pallet is equipped with a pallet label that includes data about the manufacturer and customer, the product data and an amount on the pallet and a delivery address.

8. STORAGE AND PRESERVATION

- 8.1 Corrugated board products are stored on pallets;
- 8.2 Recommended warehouse temperature: 0 – 30°C;
- 8.3 Relative humidity: 40 – 60%;
- 8.4 Pallets and products are to be protected from mechanical damage and punches;
- 8.5 Transport is permitted only in a closed transport room