

## Tolerances and quality parameters for finished products

### 1. Tolerances resulting from technician capabilities production machines.

#### 1.1 Tools

On a flat die cutting for corrugated board tolerance for burning and assembling takes approx. +/- 0,5mm.

Tolerances are given on a 1 meter distances.

#### 1.2 Printing process

Image component shift tolerance: offset printing  $\pm 0.2\text{mm}$ , flexographic printing  $\pm 2\text{mm}$ .

#### 1.3 Laminating process

Tolerances of shifts of laminating process of solid cardboard with corrugated cardboard 2mm

#### 1.4 Die cutting process

Tolerances for shifts of artwork in connection with construction drawing 3mm

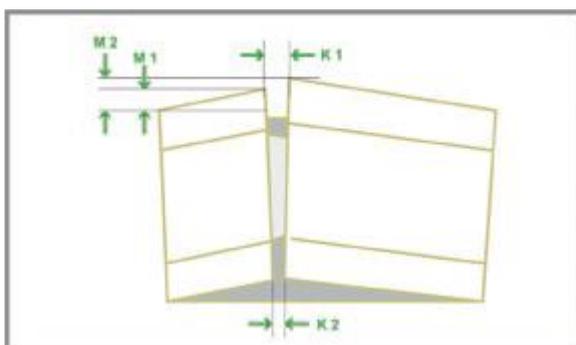
#### 1.5 Gluing process

Tolerances of internal dimensions +/- 2mm

Placing of double side adhesive tape +/- 2mm

Fish tail

The term of „fish tail” is used to define the missing of analogies between by the edges on the connection side / at the gluing flap.



Differences (K1-K2) distances, showed on a picture are depends from fluting type and they not should be larger than:

- E-flute: 4,5mm

- B-flute: 4,5mm

- CA-flute: 6,5mm
- AB-flute: 8mm

## 2. Colour of packaging

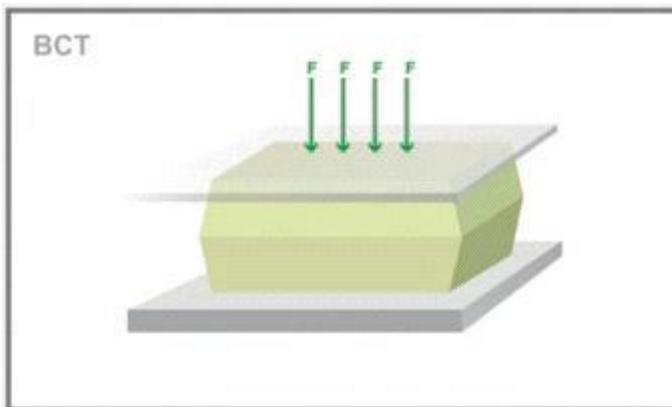
For so-called „grey” / „brown” packaging colour is not specified and it need to be tread as a characteristic for a papers products. Possible differences in the appearance of the paper used are acceptable.

## 3. BCT Parameters

The basic and most frequently used indicator for measuring the strength of corrugated packaging is specifying their resistance for compression.

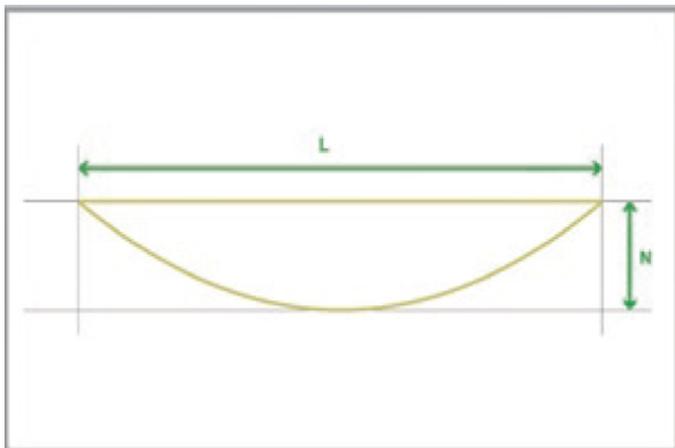
This parameter is define to marked the resistance of packaging on effect of the loads that appears in the trade of goods, caused by the pressures or stacking.

The study involves crushing of the packaging between two parallels plates till the walls of packaging collapse. The strength test shall be carried out on empty packages after they have been formed and glued. Strength in compression in the vertical, transverse and longitudinal direction is tested. Strength in the transverse and longitudinal direction does not reach the strength value in the vertical direction (PN - EN ISO 12048: 2002). The parameter tolerance for BCT  $\pm 10\%$  from the typical value.



## 4. Corrugated board curving (flatness)

It is defined as ratio of curve height of cardboard sheet “H” to the length of that sheet “L”. Is determined in % and shouldn't exceed 4%.



Corrugated board warping:

I - Corrugated board warping %

N - maximum height of the curve [mm]

L - length of the sheet [mm]

## 5. Weight

The basis weight test is based on the PN-ISO 536: 1996 standard. This is the weight of a corrugated board sheet with a surface area equal to 1 m<sup>2</sup>. It is served in [g/m<sup>2</sup>]. The field of the sheet sample to the assay should be respectively not less than 100cm<sup>2</sup> and not more than 1000 cm<sup>2</sup>. This is one of the basic characters parameters of paper products (including corrugated board). The tolerance for grammage is 5 %.

## 6. Humidity

Humidity is determined according to the method using a chamber dryer based on the PN-EN ISO 287: 2009 standard. Humidity in cardboard is determined as the ratio of mass loss of the test sample after drying to the mass of the sample at the time of collection usually expressed in [%].

This is the one of the main parameters which should be measured during production process. Humidity of the corrugated board has impact for the strength properties and the product processing. Humidity has also effect for dimension stability of the cardboard and packaging. The nominal value should be in the range 6-9%. The tolerance for this parameter is +/- 2%.

## 7. Storage conditions

Storage conditions for corrugated board packaging recommended as below”

-Temperature: 14-30 °C

- Air humidity 30-60%

The products should be:

- protect against changes in the temperature and humidity
- protect against getting wet and direct sunlight

Assortment is very susceptible to damage- please be careful during store and transporting the pallets

#### **8. Shrinkage size of packaging in changing conditions (humidity, temperature)**

- On the 1500mm dimension -> shrinkage size approx. 6mm
- On the 1000mm dimension -> shrinkage size approx. 4mm
- On the 600mm dimension -> shrinkage size about 2mm

In order to minimize the problem it should take into consideration the estimation of shrinkage of the material in the initial phase of the design and the validation of the product. Due to the fact that graphic files are closed files and each change needs to go through the approval process, the above tolerances regarding shrinkage should be taken into account by the customer during the design of the packaging and graphics.

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