# Cepi ContainerBoard

DE ES FR EN IT

# European list of corrugated base papers

Definition
Identification
Terms of guarantee for technical specifications
Technical trends & developments

*Document available in English, French, German, Italian and Spanish*

# Foreword

This document represents the outcome of a review of the list of containerboard grades, their specification and classification. These paper grades are produced and sold by the members of the European containerboard industry, and are used in the manufacture of corrugated board.

The list was first issued in 1992, and has regularly been updated in order to integrate the improvements of the knowledge and the understanding of how the properties of papers influence properties of the box and the performance of the corrugator. This document is the sixth update and it represents the conclusions of the review made by the Cepi ContainerBoard[1] Technical Committee, group of technical experts commissioned to review this list and to update it using current knowledge of the papers, their properties, and performance.

The first ambition of the list is to cover most of the containerboard qualities used by the corrugated industry in Europe and to give a brief technical description of them, not to describe the process they are made from. In carrying out this update, the group has endeavored to consider the grades changes and their associated characteristics. Thus, this sixth update details more deeply white liners, uncoated and coated, integrates the new compression characteristic (S-Test) for the recycled fluting, presents in detail the recycled dual grades and their associated physical characteristics. However, it should be recognized that not all of the relevant properties can be described by the existing measuring methods; as a consequence, the group plans to continue adjusting certain parameters in the years to come.

The second ambition of the experts was to maintain most of the existing code structure in the document, and it cannot be pointed out strongly enough that the increased trade between companies and usage of EDI message means an increased demand for all papermakers to mark their products according to the standard described in this document.
However, the Technical Committee recognized that the usage of two digits does not cover all the needs, which can be foreseen for the coming years. It makes it necessary to introduce, in the future, either two extra digits to describe all product variations supplied to the corrugated board industry or a complementary system of identification (e.g. a two-dimensional code).

As in the preceding issue**s**, the document is subdivided into groups of products used for the production of corrugated board. The main changes to the previous document are:

- For the white grades, introduction of brightness references according ISO 2470-2 in parallel of values according to ISO 2470-1 (which were the references until now). In consequence, liners will have to respect either the (historical) references (ISO 2470-1) “OR” the second set of references (according to ISO 2470-2)
- Replacement of the “Mottled white top kraftliner” by “Other white kraftliner, uncoated”
- For coated white liners (kraftliners and testliners), introduction of subgrades in order to be more in line with the current European supply structure.
- The material definition of testliner as well of the brown kraft top liner grade has been redefined
- Introduction of a chapter dedicated to brown high performance recycled liner with its material definition and characteristics
- Due to the limitations seen at measuring CMT of high substances and the rising trend to light weight fluting (used at low flute heights), the Technical Committee developed an alternative method – the S-Test – meant to replace the CMT measurement (A flute) as well the CMT first plateau. Consequently, Medium 1, HP3 and HP2 as well Light weight medium present alternative definitions based on SCT-CD and S-Test.
- Introduction of a chapter dedicated to Dual purpose containerboard and presentation of recycled dual grades with details of subgrades and their characteristics
- Renewed grade numbering table in order to integrate all the modifications mentioned above.

Furthermore, several previous principles were confirmed and completed:

- Grade numbers that are not allocated in the list shall not be used. However, in order to meet the recurrent request for the identification of specialty papers that can be produced by some plants, some specific numbers were allocated for each of the main grade families (brown and white top kraftliner, semi chemical fluting, brown and white top recycled liners, recycled fluting, dual papers). Their fair use remains subject to the compliance with the corresponding Material Definition of the corresponding grade “family” (especially the primary pulp content)
- Producers may either refer to the ISO 2758 or ISO 2759 for the bursting strength of their liners. However, whatever is the standard used, the liners must fulfil the minimum required level of performance of the category claimed, as indicated in the document. The same principle also applies for the brightness of the liners according to ISO 2470-1 or ISO 2470-2.
- All the indicated values in the tables or graphs are either minimum or maximum values, which can be guaranteed, and in no case nominal values (except explicitly mentioned).

Finally, the reference document is the English version and its updated issue can be found on the Cepi ContainerBoard website: http://cepi-containerboard.org.

[1] Cepi ContainerBoard (CCB) is the European industry association of corrugated case materials producers, also called containerboard.

# Cepi ContainerBoard list of grades

## Summary

# Definition of the grades

## Liners

### Brown kraftliner

**MATERIAL DEFINITION**

A brown kraftliner is a paper predominantly made from primary kraft pulp.

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as two of the most important strength properties of kraftliner, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance.

Concerning COBB, a brown kraftliner should be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m$^2$ to 45 g/m$^2$.

| SUBSTANCE (g/m$^2$) | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or SCT-CD INDEX |
|---|---|---|---|
| < 250 | ≥ 3.5 | ≥ 3.6 | ≥ 18.0 |
| ≥ 250 | ≥ 3.0 | ≥ 3.0 | ≥ 17.5 |

### White kraftliner, uncoated

**MATERIAL DEFINITION**

An uncoated white kraftliner is a paper predominantly made from primary kraft pulp.

**BRIGHTNESS MEASUREMENT**

Brightness is measured according to conditions defined by the standard ISO 2470-1 meaning with CIE standard illuminate C and without a UV cut-off filter, or according to conditions defined by the standard ISO 2470-2 with a CIE standard illuminate D65 and without a UV cut-off filter

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as two of the most important strength properties of kraftliner, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance. Optical properties are essential for a white top kraftliner. As a consequence, a white top kraftliner shall reach certain criteria in terms of brightness, roughness and sizing.

Concerning COBB, a white top kraftliner should be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m$^2$ to 45 g/m$^2$.

| | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or SCT-CD INDEX | and BRIGHTNESS ISO 2470-1 | or ISO 2470-2 | and BENDTSEN ROUGHNESS |
|---|---|---|---|---|---|---|
| Fully white kraftliner, uncoated | ≥ 3.7 | ≥ 3.8 | ≥ 18.5 | ≥ 78% | ≥ 82% | ≤ 600 |
| White top kraftliner, uncoated | ≥ 3.7 | ≥ 3.8 | ≥ 18.5 | ≥ 70% | ≥ 74% | ≤ 600 |
| Other white kraftliner, uncoated | ≥ 3.7 | ≥ 3.8 | ≥ 18.5 | ≥ 50% | ≥ 54% | ≤ 1000 |

# Definition of the grades

## Liners

### White kraftliner, coated

**MATERIAL DEFINITION**

A coated white kraftliner is a paper predominantly made from primary kraft pulp.
A coated kraftliner is a kraftliner coated with a coating color containing pigments.

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as two of the most important strength properties of kraftliner, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance. Optical properties are essential for a white coated kraftliner. As a consequence, a white coated kraftliner shall reach certain criteria in terms of brightness, roughness, gloss and sizing.

Concerning COBB, a white coated kraftliner should be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m$^2$ to 45 g/m$^2$.

| | | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or SCT-CD INDEX | and BRIGHTNESS ISO 2470-1 | or ISO 2470-2 | and GLOSS | and PPS ROUGHNESS |
|---|---|---|---|---|---|---|---|---|
| Fully white kraftliner, coated | | ≥ 3.5 | ≥ 3.6 | ≥ 18.5 | ≥ 85% | ≥ 89% | ≥ 30 | ≤ 4.5 |
| White top kraftliner, coated | A | ≥ 3.5 | ≥ 3.6 | ≥ 18.5 | ≥ 80% | ≥ 84% | ≥ 40 | ≤ 2.5 |
| | B | | | | ≥ 76% | ≥ 80% | ≥ 30 | ≤ 4.5 |

# Definition of the grades

## Liners

### Brown testliner

**MATERIAL DEFINITION**

A brown testliner is a recycled fibre based paper.

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as important strength properties, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance.

The minimum value of Burst Index of a specified grade is the maximum value of the Burst Index for the next lower paper grade. The minimum value of SCT-CD Index of a specified grade is the maximum value of the SCT-CD Index for the next lower paper grade. If one of the limits either Burst or SCT-CD is exceeded by a testliner, this paper is automatically classified in the next superior testliner grade.

Any containerboard, which does not reach either Burst Index or SCT-CD Index required to define testliner is a special grade which may result from specific negotiations between the producer and the client, and which may be the subject of particular commercial conditions. In no case may these grades be called “testliner”.

| GRADE | SUBSTANCE | BURST INDEX | | or | SCT-CD INDEX |
|---|---|---|---|---|---|
| | g/m$^2$ | ISO 2758 | ISO 2759 | | |
| Testliner 1 | < 200 | ≥ 2.8 | ≥ 3.0 | | ≥ 17.5 |
| | ≥ 200 | ≥ 2.8 | ≥ 2.9 | | |
| Testliner 2 | < 200 | ≥ 2.2 | ≥ 2.5 | | ≥ 15.5 |
| | ≥ 200 | ≥ 2.2 | ≥ 2.4 | | |
| Testliner 3 | < 95 | ≥ 1.6 | ≥ 1.9 | | ≥ 13.5 |
| | ≥ 95 | ≥ 1.7 | ≥ 2.0 | | |
| | ≥ 120 | ≥ 1.8 | ≥ 2.0 | | |
| | ≥ 200 | ≥ 1.8 | ≥ 1.8 | | |
| Testliner 4 | ≥ 90 | ≥ 1.3 | - | | ≥ 11.5 |

# Definition of the grades

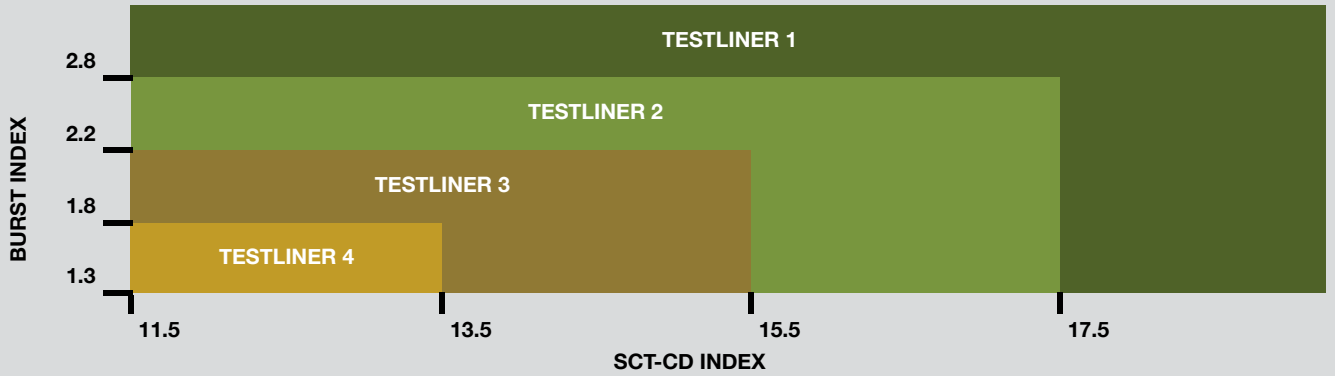
## Liners

### Brown testliner

**PROPERTY REQUIREMENTS *(continued)***

Concerning the COBB, the testliner 4 is “unsized”. Testliners 1, 2 & 3 can be “unsized”, “sized” or “special sized”. The sized grade is measured by the 1 minute COBB test with values typically in the range of 25 g/m² to 45 g/m² (Nb.: the “special sized” is typically used to fulfil the United Nations regulation concerning corrugated board).

**SCT-CD OR BURST COMBINATION FOR TESTLINER** (example for 150 g/m² - ISO 2758)




### Brown high performance recycled liner

**MATERIAL DEFINITION**

A high performance recycled liner is a recycled fibre based paper.

**PROPERTY REQUIREMENTS**

Concerning COBB, a high performance recycled liner can be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m² to 45 g/m².

| GRADE | SUBSTANCE g/m² | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or | SCT-CD INDEX |
|---|---|---|---|---|---|
| Brown high performance recycled liner | < 200 | ≥ 2.8 | ≥ 3.0 | | ≥ 19.0 |
| | ≥ 200 | ≥ 2.8 | ≥ 2.9 | | |

# Definition of the grades

## Liners

### Brown kraft top liner

**MATERIAL DEFINITION**

A kraft top liner is a recycled fibre based paper with a top layer predominantly made from virgin wood pulp.

**PROPERTY REQUIREMENTS**

Concerning COBB, a brown kraft top liner should be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m² to 45 g/m².

| | BURST INDEX | | or | SCT-CD INDEX |
|---|---|---|---|---|
| | ISO 2758 | ISO 2759 | | |
| Brown kraft top liner | ≥ 2.8 | ≥ 2.9 | | ≥ 14.5 |

### White top testliner, uncoated

**MATERIAL DEFINITION**

An uncoated white top testliner is a predominantly recycled fibre based paper, of which the top side is in general characterized by coverage of white fibres on a recycled base layer.

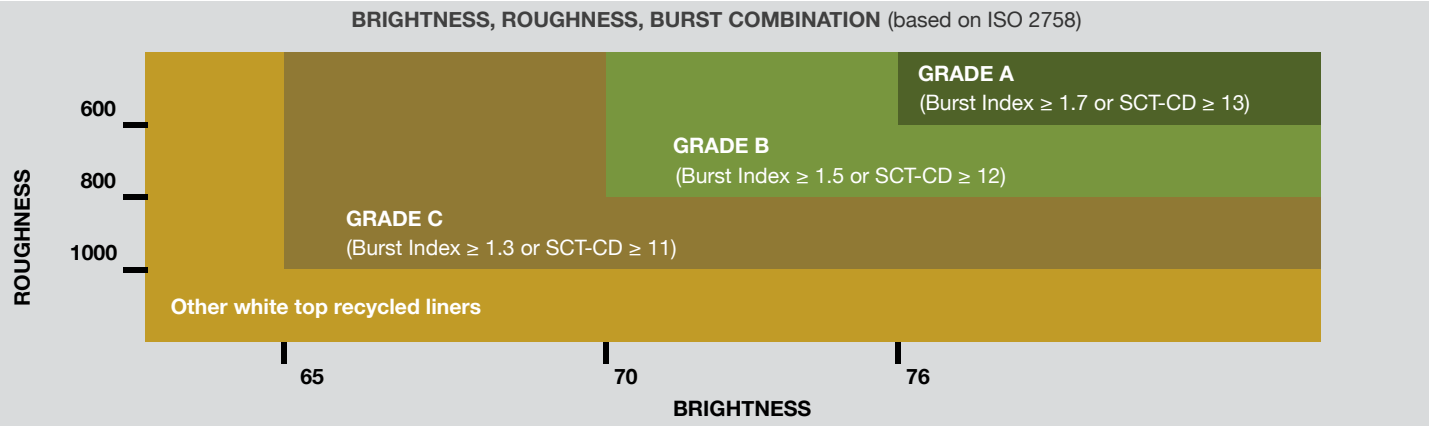
**BRIGHTNESS MEASUREMENT**

Brightness is measured according to the conditions defined by the standard ISO 2470-1 meaning with CIE standard illuminate C and without a UV cut-off filter, or according to the conditions defined by the standard ISO 2470-2 with a CIE standard illuminate D65 and without a UV cut-off filter.

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as important strength properties, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance.
If an uncoated white top testliner does not fulfil the criteria retained to define one of the grades A, B or C (brightness, roughness and burst or SCT-CD), this paper is a special grade that cannot be called 'White Top Testliner' and that can only be classified as 'other white top recycled liners' without guaranteed standardized properties.

Concerning COBB, Uncoated White Recycled Liners classified in categories A and B should be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m² to 45 g/m².



# Definition of the grades

## Liners

### White top testliner, uncoated

**PROPERTY REQUIREMENTS** *(continued)*

| | | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or SCT-CD INDEX | and BRIGHTNESS ISO 2470-1 | or ISO 2470-2 | and BENDTSEN ROUGHNESS |
|---|---|---|---|---|---|---|---|
| White top testliner, uncoated | A | ≥ 1.7 | ≥ 1.9 | ≥ 13.0 | ≥ 76% | ≥ 80% | ≤ 600 |
| | B | ≥ 1.5 | ≥ 1.7 | ≥ 12.0 | ≥ 70% | ≥ 74% | ≤ 800 |
| | C | ≥ 1.3 | ≥ 1.5 | ≥ 11.0 | ≥ 65% | ≥ 69% | ≤ 1000 |

### White top testliner, coated

**MATERIAL DEFINITION**

A coated white top testliner is a testliner coated with a coating color containing pigments.

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as important strength properties, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance.

Optical properties are essential for a white top testliner coated. As a consequence, a white top testliner coated shall reach certain criteria in term of brightness, roughness, gloss and sizing conditions.

| | | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or SCT-CD INDEX | and BRIGHTNESS ISO 2470-1 | or ISO 2470-2 | and GLOSS | and PPS ROUGHNESS |
|---|---|---|---|---|---|---|---|---|
| White top testliner, coated | A | ≥ 1.3 | ≥ 1.5 | ≥ 11.0 | ≥ 80% | ≥ 84% | ≥ 45 | ≤ 2.5 |
| | B | | | | ≥ 76% | ≥ 80% | ≥ 35 | ≤ 3.5 |
| | C | | | | ≥ 72% | ≥ 76% | ≥ 20 | ≤ 5.0 |

# Definition of the grades

## Liners

### Mottled testliner

**MATERIAL DEFINITION**

A mottled testliner is a predominantly recycled fibre based paper, of which the top side is characterized by an uneven coverage of white fibres on a recycled base.

**PROPERTY REQUIREMENTS**

Burst and SCT-CD are considered as important strength properties, while they are a good indicator of strength performance of a box, flexibility during converting and usage of the corrugated board. Bursting strength, together with compression strength SCT and tensile stiffness in CD and MD, are in many cases used for calculating the box performance.

| | BURST INDEX | | or | SCT-CD INDEX |
|---|---|---|---|---|
| | ISO 2758 | ISO 2759 | | |
| Mottled testliner | ≥ 1.5 | ≥ 1.7 | | ≥ 12.0 |

# Definition of the grades

## Flutings – Medium

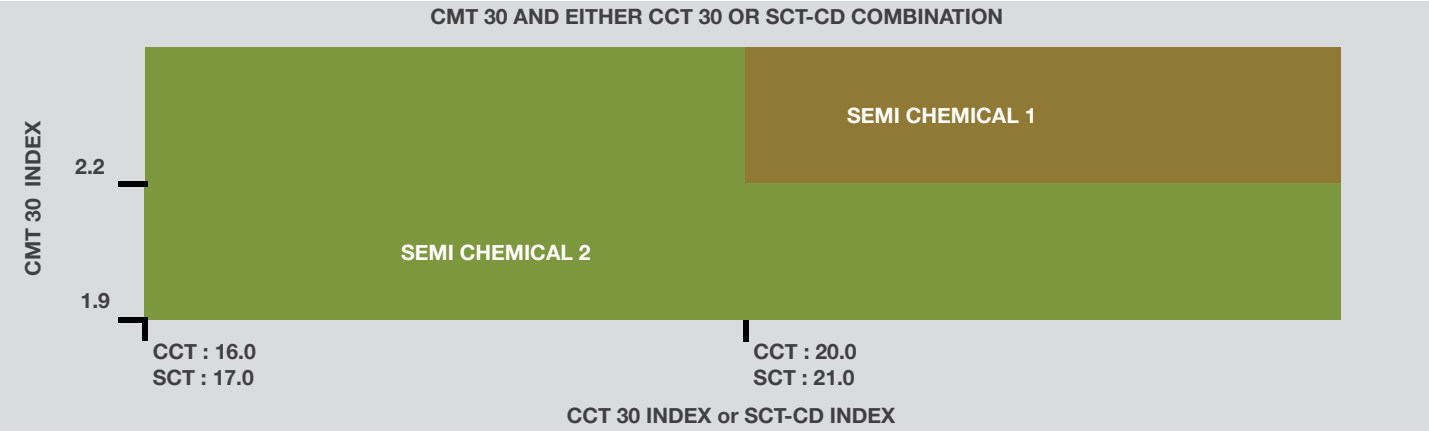
### Semi chemical fluting

**MATERIAL DEFINITION**

A semi chemical fluting is a paper predominantly made from semi chemical primary fibres pulp.
Semi Chemical 1 has generally a content of more than 80% semi chemical primary fibres.

**PROPERTY REQUIREMENTS**

CMT and either CCT or SCT CD, shall be used to express the compression stiffness.
The correlation between CCT and SCT CD is different for Semi Chemical fibres, compared to other type of fibres.




| | CMT 30 INDEX | and either | CCT 30 INDEX | or | SCT-CD INDEX |
|---|---|---|---|---|---|
| Semi Chemical 1 | ≥ 2.2 | | ≥ 20.0 | | ≥ 21.0 |
| Semi Chemical 2 | > 1.9 | | > 16.0 | | > 17.0 |

# Flutings – Medium

## Recycled fluting – medium (other than light weight recycled medium)

**MATERIAL DEFINITION**

A recycled fluting is a recycled fibre based paper.
The substance of recycled fluting is equal or over 100 g/m$^2$.

**PROPERTY REQUIREMENTS**

Since years, the SCT-CD appeared to be the determining characteristic for the quality of corrugated board because it is directly correlated with the stackability of the packaging. Traditionally, the CMT 30 has been used to characterize the crushing resistance of fluting, giving the peak resistance value for fluting. When performing the test, the fluting sample is pressed beyond its elastic range (meaning that the corrugated board deforms irreversibly and does not return to its original shape and size, even when the load is removed) and therefore this measurement does not fully reflect all aspects of the "shock absorbing" characteristics of corrugated board linked to elasticity of flute.

Therefore, containerboard producers have developed a new measurement method, the S-Test, applicable especially to recycled flutings. S-Test has been shown to correspond well to the CMT30 first plateau of the fluting (but not strongly with the CMT30 end value), as well to the max level of the elastic range (reversible deformation) of the paper and or board. More especially, it correlates one to one with FCT first plateau (similar as for CMT 30 first plateau), the measurement used in corrugating to predict crushing of corrugated material. The time-consuming nature of the CMT 30, as well as, the sensitiveness for manual handling and used equipment, e.g. tapes, also support the idea of introducing an alternative method.

The S-Test is meant to replace the CMT-30 in the future, but it is still quite innovative, consequently the Technical Committee considered as appropriate to maintain open, for the time being, the possibility to characterize the fluting either via the SCT-CD or the CMT-30, or via the SCT-CD and the S-Test.

| | SCT-CD INDEX | or | CMT 30 INDEX |
|---|---|---|---|
| Medium high performance 2 | ≥ 19.0 | | ≥ 2.0 |
| Medium high performance 3 | ≥ 17.0 | | ≥ 1.8 |
| Medium 1 | ≥ 15.0 | | ≥ 1.6 |
| Medium 2 | ≥ 13.5 | | ≥ 1.3 |

| | SCT-CD INDEX | and | S-Test in kN/m |
|---|---|---|---|
| Medium high performance 2 | ≥ 19.0 | | **Minimum value according the substance** *(see the table next page)* |
| Medium high performance 3 | ≥ 17.0 | | |
| Medium 1 | ≥ 15.0 | | |
| Medium 2 | ≥ 13.5 | | - |

# Flutings – Medium

## Recycled fluting – medium (other than light weight recycled medium)

**PROPERTY REQUIREMENTS** *(continued)*

The S-Test is indicated in kN/m and for a set of grammages.

| | SUBSTANCE ($g/m^2$) | S-Test in kN/m |
|---|---|---|
| Medium 1<br>Medium high performance 2<br>Medium high performance 3 | 100 | ≥ 0.80 |
| | 105 | ≥ 0.90 |
| | 110 | ≥ 1.00 |
| | 115 | ≥ 1.10 |
| | 120 | ≥ 1.20 |
| | 125 | ≥ 1.35 |
| | 130 | ≥ 1.45 |
| | 135 | ≥ 1.60 |
| | 140 | ≥ 1.70 |
| | 145 | ≥ 1.80 |
| | 150 | ≥ 1.90 |
| | 155 | ≥ 2.00 |
| | 160 | ≥ 2.15 |
| | 165 | ≥ 2.25 |
| | 170 | ≥ 2.35 |
| | 175 | ≥ 2.45 |
| | 180 | ≥ 2.60 |
| | 185 | ≥ 2.70 |
| | 190 | ≥ 2.80 |

# Flutings – Medium

## Light weight recycled medium – LWM (other than recycled fluting - medium)

**MATERIAL DEFINITION**

A Light weight medium is a recycled fibre based paper.
The substance of this paper is strictly below 100 g/m2.
The abbreviation of this name is LWM (Light Weight Medium).

**PROPERTY REQUIREMENTS**

Due to the limitations seen at measuring CMT of light weight fluting (measured with A flute) and the development of the S-Test method as an alternative to it, the CMT 30 values of the Light Weight Medium are mentioned in the list only as indicative.

As the S-Test is meant to replace in the future the CMT-30, but knowing that it is still quite innovative, the Technical Committee considered as appropriate to maintain open, like for the Medium 1 and HP, the possibility to characterize the light weight fluting either via the SCT-CD (the CMT-30 remaining indicative) or via the SCT-CD and the S-Test.

| | **SUBSTANCE ($g/m^2$)** | **SCT-CD in kN/m** | *CMT 30 in N (Indicative values)* |
|---|---|---|---|
| Light weight medium (LWM) | 95 | ≥ 1.45 | ≥ *135* |
| | 90 | ≥ 1.35 | ≥ *125* |
| | 85 | ≥ 1.30 | ≥ *110* |
| | 80 | ≥ 1.15 | ≥ *95* |
| | 75 | ≥ 1.00 | ≥ *90* |

| | **SUBSTANCE ($g/m^2$)** | **SCT-CD in kN/m** | **and** | **S-Test in kN/m** |
|---|---|---|---|---|
| Light weight medium (LWM) | 95 | ≥ 1.45 | | ≥ 0.70 |
| | 90 | ≥ 1.35 | | ≥ 0.60 |
| | 85 | ≥ 1.30 | | ≥ 0.55 |
| | 80 | ≥ 1.15 | | ≥ 0.45 |
| | 75 | ≥ 1.00 | | ≥ 0.35 |

# Dual papers

## Recycled dual papers

**MATERIAL DEFINITION**

A dual purpose paper (Liner or Fluting) is a recycled fibre based paper

**PROPERTY REQUIREMENTS**

The minimum value of Burst Index of a specified grade is the maximum value of the Burst Index for the next lower paper grade. The minimum value of SCT-CD Index of a specified grade is the maximum value of the SCT-CD Index for the next lower paper grade. If one of the limits either Burst or SCT-CD is exceeded by a Dual paper, this one is automatically classified in the next superior Dual paper grade.

Concerning COBB, a recycled dual paper can be sized. The sized grade will be measured by the 1 minute COBB test with values typically in the range 25 g/m² to 45 g/m².

| | BURST INDEX ISO 2758 | BURST INDEX ISO 2759 | or SCT-CD INDEX | *S-Test in kN/m (Indicative values)* | *CMT 30 INDEX (Indicative values)* |
|---|---|---|---|---|---|
| Dual paper high performance | ≥ 2.8 | ≥ 2.9 | ≥ 19,0 | *Minimum value according to the substance (see the table below)* | *≥ 2.0* |
| Dual 1 | ≥ 2.2 | ≥ 2.4 | ≥ 17.0 | | *≥ 1.8* |
| Dual 2 | ≥ 1.8 | ≥ 2.0 | ≥ 15.0 | | *≥ 1.6* |
| Dual 3 | < 1.8 | < 2.0 | < 15.0 | | *< 1.6* |

| | SUBSTANCE (g/m²) | *S-Test in kN/m (Indicative values)* |
|---|---|---|
| Dual paper high performance Dual 1, Dual 2 & Dual 3 | 100 | *≥ 0.80* |
| | 105 | *≥ 0.90* |
| | 110 | *≥ 1.00* |
| | 115 | *≥ 1.10* |
| | 120 | *≥ 1.20* |
| | 125 | *≥ 1.35* |
| | 130 | *≥ 1.45* |
| | 135 | *≥ 1.60* |
| | 140 | *≥ 1.70* |
| | 145 | *≥ 1.80* |
| | 150 | *≥ 1.90* |
| | 155 | *≥ 2.00* |
| | 160 | *≥ 2.15* |
| | 165 | *≥ 2.25* |
| | 170 | *≥ 2.35* |
| | 175 | *≥ 2.45* |
| | 180 | *≥ 2.60* |
| | 185 | *≥ 2.70* |
| | 190 | *≥ 2.80* |

# Other papers used in the corrugated industry

## Cartonboard

**MATERIAL DEFINITION**

Cartonboard is a multi-ply material made from a combination of primary and/or recovered fibres, mainly used in the production of packaging. It can be coated on one side with pigments.
Also known as solid board, folding box board or white lined chip board.

## Printing & writing papers

**MATERIAL DEFINITION**

Paper suitable for printing or other graphic method, which can be coated on one or both sides with pigments.

## Kraft papers

**MATERIAL DEFINITION**

A brown kraft paper is normally made from unbleached softwood primary kraft pulp.
A white kraft paper is normally made from bleached primary kraft pulp.
MF and MG papers have often an addition of hardwood kraft pulp.

**SUB CATEGORIES**

**SACK-PAPERS**
A sack paper is a porous paper made from any combination of primary fibres, with high elasticity and high tear resistance, designed for packaging of products with high demands for durability.

**MF-PAPERS (Machine Finished)**
An MF-paper is a paper from any combination of primary fibres that has been finished by calandering on the papermaking machine. It is designed for good printability in combination with good durability.

**MG-PAPERS (Machine Glazed)**
An MG-paper is a paper made from any combination of primary fibres, which has been glazed on a drying cylinder in the papermaking machine. It is designed for high printing demand or further converting with demand of a smooth surface.

# Identification of the grades

## Grade numbers

### LINERS

#### Primary fibre based liners

| | |
|---|---|
| **00** | Brown kraftliner |
| *01* | *number not allocated ** |
| **02** | Fully white kraftliner, uncoated |
| **03** | Fully white kraftliner, coated |
| **04** | White top kraftliner, uncoated |
| **05** | White top kraftliner, coated – Grade A |
| **85** | White top kraftliner, coated – Grade B |
| **06** | Other white kraftliner, uncoated |
| *07* | *number not allocated ** |
| **08** | Coloured kraftliner |
| **09** | Wet strength kraftliner |
| **92** | Brown liners with barrier or special treatment |
| **93** | White liners with barrier or special treatment |
| **94** | Pre-printed primary fibre based liner |
| **97** | *Other brown kraftliners *** |
| **98** | *Other white top kraftliners *** |
| *99* | *number not allocated ** |

#### Recovered fibre based liners

| | |
|---|---|
| **10** | Brown testliner 1 "sized" |
| **11** | Brown testliner 1 "unsized" |
| **12** | Brown testliner 1 "special sized" |
| *13 to 19* | *numbers not allocated ** |

### FLUTINGS

#### Primary fibre based flutings

| | |
|---|---|
| **40** | Semi chemical 1 |
| **46** | Semi chemical 2 |
| **47** | *Other semi chemical fluting *** |
| *48 & 49* | *numbers not allocated ** |

#### Recovered fibre based flutings

| | |
|---|---|
| **41** | Medium 1 |
| *42* | *number not allocated ** |
| **43** | Medium 2 |
| **44** | Medium High Performance 3 |
| **45** | Medium High Performance 2 |
| **60** | Light Weight Medium |
| **61** | *Other recycled fluting *** |
| *62 to 66* | *numbers not allocated ** |

#### Recovered fibre based liners *(continued)*

| | |
|---|---|
| **20** | Brown testliner 2 "sized" |
| **21** | Brown testliner 2 "unsized" |
| **22** | Brown testliner 2 "special sized" |
| *23 to 29* | *numbers not allocated ** |
| **30** | Brown testliner 3 "sized |
| **31** | Brown testliner 3 "unsized" |
| **32** | Brown testliner 3 "special sized" |
| *33 to 37* | *numbers not allocated ** |
| **38** | Brown testliner 4 |
| **39** | *number not allocated ** |
| **50** | *Other brown recycled liners *** |
| *54* | *number not allocated ** |
| **55** | Brown testliner with barrier or special treatment |
| **56** | Coloured testliner |
| *59* | *number not allocated ** |
| **70** | White top testliner, uncoated – Grade A |
| **71** | White top testliner, uncoated – Grade B |
| **72** | White top testliner, uncoated – Grade C |
| **73** | *Other white top recycled liners *** |
| **74** | Mottled testliner |
| **75** | Pre-printed recycled liners |
| **76** | White top testliner with barrier or special treatment |
| **77** | White top testliner, coated – Grade A |
| **78** | White top testliner, coated – Grade B |
| **79** | White top testliner, coated – Grade C |

### DUAL USE PAPERS & OTHER LINERS

| | |
|---|---|
| **51** | Recycled Dual 1 |
| **52** | Recycled Dual 2 |
| **53** | Chip paper, e.g. Schrenz |
| **57** | Recycled Dual 3 |
| **58** | Recycled Dual High Performance |
| **89** | Brown high performance recycled liner |
| **90** | Brown kraft top liner |
| **91** | White kraft top liner |

### OTHER PAPERS USED IN THE CORRUGATED INDUSTRY

| | |
|---|---|
| **80** | Primary fibre based cartonboard |
| **81** | Recovered fibre based cartonboard |
| **82** | Writing papers |
| *83, 84 & 86 to 88* | *numbers not allocated ** |
| **95** | Brown primary pulp based papers, e.g. Brown MG kraft paper |
| **96** | White primary pulp based papers, e.g. White MG kraft paper |

*(*) Number not allocated shall not be used, only Cepi ContainerBoard decides on the grade number.*
*(**) These numbers can be used to identify "specialty" grades not mentioned in the list, but fulfilling the corresponding "Material Definition" of the grade family (especially the primary pulp content)*

# Terms of guarantee for technical specifications

Generally speaking, the containerboard producer guarantees the following technical specifications of their products under the conditions defined below, and for all the grades mentioned in the preceding pages. On particular agreement, other properties can be recommended (in writing) to be guaranteed.

## A/ List of properties that can be guaranteed by the paper producer

| | |
|---|---|
| | The usual specifications guaranteed by the containerboard producers, are the following for the different grades of containerboard: |
| **KRAFTLINERS** | Substance, moisture content, burst, compression resistance, water absorption and, for white grades, brightness and roughness. |
| **RECYCLED LINERS** | Substance, moisture content, burst, compression resistance, water absorption and, for white grades, brightness and roughness. |
| **FLUTINGS – MEDIUM** | Substance, moisture content, compression resistances. |
| **DUAL PAPERS** | Substance, moisture content, burst, compression resistance. |

## B/ Terms and conditions of the guarantee

| | |
|---|---|
| **SAMPLING METHOD** | In case of a dispute between the customer and supplier, the only authentic measures are those made with both parties present, under the conditions laid down by the standard ISO 186 for sampling methods and ISO 187 for the climate conditions.<br>These measures are made by the customer's and supplier's laboratories, and a third-party laboratory may be called upon which is accepted by both parties. |
| **CHARACTERISTICS VALUE VARIATIONS** | Characteristics are respected if 97.5% of the measured values of an agreed sample are not less or higher (depending the characteristic) than a guaranteed value. |
| **TYPICAL VALUE** | Typical value is defined as a long term (at least six months) average outcome value of paper production. |
| **GUARANTEED VALUE** | Guaranteed value is the lowest customer reel mean value of the supplied paper. |
| **SUBSTANCE GUARANTEE CONDITIONS** | The containerboard producers will guarantee the substance of their papers in standardized measuring conditions. The check of this item will only be considered as valid by the producer, if it has been made according the standard ISO 536, with a sampling procedure complying with the standard ISO 186. |
| **BASIS WEIGHT VARIATIONS** | The mean value of the basis weight of the supplied paper has to be within ± 3% of the agreed basis weight for a paper with a substance ≤ 200 g/m2, and ± 4% of the agreed basis weight for paper with a substance > 200 g/m2. The check of this item will only be considered as valid by the producer, if it has been made with a sampling procedure complying with the standard ISO 186. |

# Terms of guarantee for technical specifications

## PAPER MOISTURE

The containerboard producers will guarantee the moisture of their papers in standardized measuring conditions. The check of this item will only be considered as valid by the producer, if it has been made according the standard ISO 287, with a sampling procedure complying with the standard ISO 186. Paper moisture and variation in paper moisture are defined as absolute units.

**CONTAINERBOARD REQUIREMENTS FOR MOISTURE CONTENT AND VARIATION**

| | Kraftliner | Testliner & other recycled liners | Semi chemical fluting | Recycled fluting medium | Recycled dual papers |
|---|---|---|---|---|---|
| Average moisture content of a customer reel in % | 6.5 - 9.5 | 6.0 - 9.0 | 7.5 - 11 | 6.5 - 9.5 | 6.0 - 9.0 |
| Without reference, in % | 8.0 | 7.5 | 9.0 | 8.0 | 7.5 |
| Maximum CD moisture peak to peak difference over the width of customer reel with measuring a box * of 15 cm (6 inches) width around the average content in %-unites | ± 1.5 | ± 1.5 | ± 2 | ± 2 | ± 1.5 |
| Maximum CD moisture peak to peak difference between two adjacent measuring boxes * of 15 cm (6 inches) width in a customer reel in % -unites | 2.8 | 2.8 | 2.8 | 2.8 | 2.8 |

** For the future the target of the paper production should be above guidelines with a measuring box of 7.5 cm.*

### KRAFTLINER

The agreed moisture content of the supplied paper should be specified to be between 6.5 and 9.5% moisture content. If there is no reference to the moisture of the supplied paper, the moisture content is understood to be 8.0%. The individual moisture content values over the width of the customer reel may not differ by more than ± 1.5% (calculated on a sampling width/measuring box of 15 cm) around the customer reel moisture content mean value. Between two adjacent measuring boxes of 15 cm the maximum peak to peak difference is 2.8%.

### TESTLINER AND OTHER RECYCLED LINERS

The agreed moisture content of the supplied paper should be specified to be between 6 and 9% moisture content. If there is no reference to the moisture of the supplied paper, the moisture content is understood to be 7.5%. The individual moisture content values over the width of the customer reel may not differ by more than ± 1.5% (calculated on a sampling width/measuring box of 15 cm) around the customer reel moisture content mean value. Between two adjacent measuring boxes of 15 cm the maximum peak to peak difference is 2.8%.

### SEMI CHEMICAL FLUTING

The agreed moisture content of the supplied paper is proposed to be between 7.5 and 11% moisture content. If there is no reference to the moisture of the supply, the moisture content will be understood to be 9.0%. The individual moisture content values over the width of the customer reel may not differ by more than ± 2% (calculated on a sampling width/measuring box of 15 cm) around the customer reel moisture content mean value. Between two adjacent measuring boxes of 15 cm the maximum peak to peak difference is 2.8%.

**PAPER MOISTURE**
***(Continued)***

**RECYCLED FLUTING - MEDIUM**

The agreed moisture of the supplied paper should be specified to be between 6.5 and 9.5% moisture content. If there is no reference to the moisture of the supplied paper, the moisture content is understood to be 8%. The individual moisture content values over the width of the customer reel may not differ by more than ± 2% (calculated on a sampling width/measuring box of 15 cm) around the customer reel moisture content mean value. Between two adjacent measuring boxes of 15 cm the maximum peak to peak difference is 2.8%

**RECYCLED DUAL PAPERS**

The agreed moisture content of the supplied paper should be specified to be between 6 and 9% moisture content. If there is no reference to the moisture of the supplied paper, the moisture content is understood to be 7.5%. The individual moisture content values over the width of the customer reel may not differ by more than ± 1.5% (calculated on a sampling width/measuring box of 15 cm) around the customer reel moisture content mean value. Between two adjacent measuring boxes of 15 cm the maximum peak to peak difference is 2.8%.

**TEST METHODS AND UNITS OF MEASUREMENT**

| | | STANDARDS | UNITS |
|---|---|---|---|
| Sampling method | | ISO 186 | - |
| Climate | | ISO 187 | °C and RH in % |
| Paper moisture | | ISO 287 | % |
| Substance | | ISO 536 | g/m$^2$ |
| Burst | > 350 kPa | ISO 2758 + ISO 2759 | kPa |
| | < 350 kPa | ISO 2758 | kPa |
| CMT 30 | | ISO 7263 | N |
| SCT | | ISO 9895 | kN/m |
| CCT 30 | | SCAN P42 | kN/m |
| S-Test | | DIN 5014 | kN/m |
| Tensile Stiffness | | ISO 1924 | kN/m |
| Cobb | | ISO 535 | g/m$^2$ |
| Brightness | | ISO 2470-1 + 2470-2 | % |
| Roughness - Bendtsen | | ISO 8791 - 2 | ml/mn |
| Roughness – PPS s10 | | ISO 8791 - 4 | µ/m |
| Gloss 75 degrees | | ISO 8254 - 1 | % |

**STATISTICAL REPORT**

If the mill producing the containerboard does not have certified quality system and the customer is requesting a statistical report on the properties of the delivered papers, the containerboard producer would normally send a report on a monthly basis.

## C/ reel identification and finishing

Concerning the identification and the finishing of the delivered reels, the reference document is the “Guidelines” published in common by FEFCO and Cepi ContainerBoard (this document is available on the Cepi ContainerBoard website: http://cepi-containerboard.org).

For traceability reasons it is recommended to save the reel label until the reel is completely converted.

## Box performance and creep

The strength of a corrugated box can be measured by the Box Compression test (BCT test). This value gives the compression strength during a time interval of some seconds. Experience shows however, that a box subjected to considerably lower loads than the BCT value can collapse after much longer time intervals (days, weeks, months). This is due to the so-called creep behavior of the material in the box. This behavior must be taken into consideration when a box is designed. The time to collapse cannot easily be predicted since it is a function of the paper raw material used to build the box, the climate that the box is subjected to, and especially climate variations. Normally, the risk of creep collapse is considered by using safety factors to reduce the BCT value. These safety factors are influenced by the predicted use of the box as well as the paper material used.

## Box performance and tensile stiffness

It is well known that the bending stiffness of the corrugated board is an important factor for the deflection and buckling of the corrugated package.
For a given flute height and board substance the tensile stiffness of the liners is the determining factor for the bending stiffness.
The tensile stiffness of the liner and medium is today often used for computer modelling/calculations of the corrugated box performance – to reach a theoretical BCT value.
Consequently, it is recommended to the paper producers to present typical test values for tensile stiffness, for both liner and medium. The recommended test method is ISO 1924-3.

## Optical properties and visual appearance

The ISO Brightness (ISO 2470-1) was so far the official classification for white paper grades. However, the perceived brightness also depends on the light source (light spectrum and position), observation angle and the paper involved. Usually, two standards (ISO 2470-1 and 2470-2) are used within the containerboard industry to express brightness. Both measurements are made with diffused light and with an observation wavelength of 457 nm (blue reflectance factor). The two methods are differentiated by the different light source C alternative D65 and observation angle 2 respectively 10 degrees. They are often referred to indoor daylight conditions (ISO C brightness) and outdoor daylight conditions (D65 brightness). Fluorescent whitening agents (FWA), which transform UV light into visible light, influence both measurements done with C and D65 light, but the effect is bigger with D65 light. In daily communication, the results from both measurements are very often mixed-up. Thus, due to this, the Technical Committee has introduced ISO 2470-2, as an alternative brightness standard, with different brightness limits compared with limits achieved with ISO 2470-1.

## Fibre angle and tensile stiffness orientation (TSO)

Warp – poor flatness of corrugated board sheets is not an unusual problem within the corrugated industry. Twist warp – when the four corners of a corrugated sheet have different distance to the average horizontal plane of the board, may occur for different reasons.

The fibre orientation or TSO-angle of a paper can be measured with different methods. Variations of the fibre orientation in the used liners may be a reason for twist-warp.
As a guideline the deviation of the fibre/TSO-angle shall be within or close to ± 5° to avoid paper related twist warp.

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