# TECHNICAL LEAFLET

## COMPARISON BETWEEN CPL AND HPL

The terms CPL and HPL are in widespread use, and the products have been around for many years now, yet people continue to ask questions about the differences in quality and what possibilities the two alternatives offer in terms of products. In the context of laminates however, there are also a number of terms and materials that crop up repeatedly. These are listed below.

## 1. The terms CPL and HPL

**CPL** stands for **C**ontinuous **P**ressed **L**aminates

**HPL** stands for **H**igh **P**ressure **L**aminates (HPL with a thickness of ≥ 2 mm are, according to the EN 438 standard, compact laminates).

## 2. Raw materials / Terms

### 2.1 DECOR PAPER

The decorative side of the laminate consists of either decor paper, printed as a woodgrain, fantasy decor, uni or white decors. The decor papers range in weight from 60 - 130 g/m².

### 2.2 KRAFT PAPER

Kraft papers which are impregnated with phenol resin are called core layers, because they are pressed in the laminate core, are important components of laminates. Kraft papers range in weight from 80 to 300 g/m², the heavier papers are predominantly used in compact laminates.

### 2.3 OVERLAY

Overlay paper is a bleached, transparent paper with a high resin absorbing capacity. It is used to improve resistance to abrasion and to protect the printed image of decorative papers.

### 2.4 UNDERLAY

Underlay, or barrier paper, is a layer of paper between the decor paper and the sodium kraft paper that aims to prevent a chemical reaction from taking place between the resins. It may also be used to achieve particular visual effects.

### 2.5 RESINS

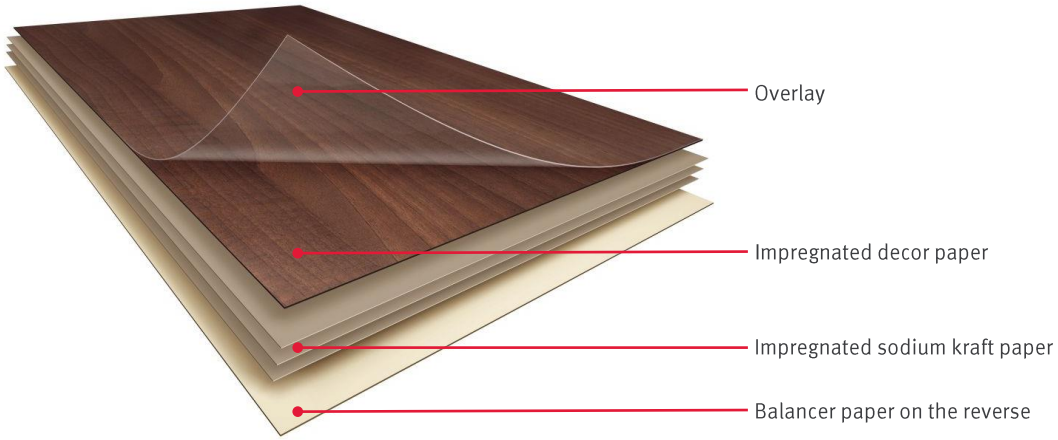
Melamine-formaldehyde resins produce hard, transparent surfaces, making them ideal for impregnating decor papers. Brown, relatively elastic phenol formaldehyde resins are used for impregnating the core layers.

## 3. Laminate description

Decorative laminate boards consist of strips of cellulose fibre (paper) impregnated with heat-hardening resins. These are joined using the manufacturing methods described below. The coating layer generally consists of an overlay impregnated with melamine resin, decor paper and sometimes a barrier. The core of a laminate consists of kraft paper impregnated with phenol resin. Applying heat and pressure causes the resins to flow and subsequently cure. Cross-linking of the resins, reinforced by the cellulose fibres of the papers, results in a very dense material with a sealed surface.

## 4. Laminate structure

The laminate structure provides information on the number of layers of paper and their composition, in other words the laminate thickness and the quality requirements are defined. In addition to the decor paper, the number and weights of the core papers and the use of overlay and underlay are also determined.




Laminate structure MED – Nominal thickness 0.80 mm

## 5. Manufacturing process

### 5.1 CPL PROCESS

The term CPL provides a clue to the manufacturing process; CPL is produced in continuously-operating double-belt presses with a compression force of between 30 and 70 bar and temperatures between 150°C and 170°C. Depending on the thickness of laminate and the length of the pressing zone, the feed speed may vary from 8 to 15 m/min.

### 5.2 HPL PROCESS

HPL is produced in discontinuously operating multi-layer daylight presses with compression pressures of between 50 and 90 bar and temperatures › 120°C. In the context of the laminate production process, pressure is very often also quoted in megapascal [MPa]. Daylight presses can have between 10 to 20 layers and each layer can accomodate approx. 8 laminate boards with a nominal thickness from 0.50 to 0.80 mm. Depending on the loading of the press and its maximum temperature, the entire pressing cycle including recooling takes between 20 and 60 minutes.

## 5.3 FORMATTING / SANDING

The formatting of the length and width and the finishing of the reverse side of HPL boards are done in separate processes. By contrast, CPL Is cut to the required width on-line immediately after pressing, as well as being finished on the reverse side and formatted to length or wound onto a roll.

# 6. Quality inspection / Comparison

CPL and HPL quality is analysed according to EN 438:2005, and testing is conducted in compliance with the same standard. The laminate structure and the resins used are more or less the same for the two types of laminate. This means that if the specifications, such as thickness, decor and finish, are identical, then both will also produce identical test results.

## 6.1 CLASSIFICATION

In EN 438-3, two different systems for the classification of laminates are defined. The alphabetic system uses three letters for classifying laminates as represented in the table below.

| Alphabetic classification | | |
|---|---|---|
| First letter | Second letter | Third letter |
| **H** - Horizontal application<br>or<br>**V** - Vertical application | **G** - General purpose<br>or<br>**D** - Heavy-Duty | **S** - Standard quality<br>or<br>**P** - Postformable grade<br>or<br>**F** - Flame retardant |

A typical classification according to this system is e.g. HGP for Horizontal General-Purpose Postforming, this laminate is suitable for horizontal standard applications and is suitable for postforming.

Alternatively, a numerical system is also defined in the standard which is related to the three most important requirements to the laminate characteristics

- Abrasion resistance - is influenced by the selection of a suitable overlay.
- Impact resistance - is influenced by the laminate thickness.
- Scratch resistance - is influenced by the structure of the finish.

You will find the definition for this system and the reference to the alphabetic system in the table on this page.

| Classification system and typical appilcations | | | | | |
|---|---|---|---|---|---|
| Performance category | Key figures of the numerical classification | | | Equivalents Alphabetic classification | Examples of typical applications |
| | Abrasion resistance | Impact resistance | Scratch resistance | | |
| **Very high resistance** against surface abrasion, impact and scratch resistance. | **4** | **4** | **4** | **HDS** Horizontal Heavy-Duty Standard | Checkout counters, government facilities such as prisons and military cabins. |
| | Initial abrasion point ≥ 350 revolutions | min. 25 Newton | Rating 4 | **HDF** Horizontal Heavy-Duty Flame-retardant | |
| | Abrasion value ≥ 1,000 revolutions | | | **HDP** Horizontal Heavy-Duty Postforming | |
| **High resistance** against surface abrasion, impact and scratch resistance. | **3** | **3** | **3** | **HGS** Horizontal General-Purpose Standard | Kitchen and office worktops, restaurant and hotel tables, doors, wall panelling in public areas. |
| | Initial abrasion point ≥ 150 revolutions | min. 20 Newton | Rating 3 | **HGF** Horizontal General-Purpose Flame-retardant | |
| | Abrasion value ≥ 350 revolutions | | | **HGP** Horizontal General-Purpose Postforming | |
| **Medium resistance** against surface abrasion, impact and scratch resistance. | **2** | **2** | **2** | **VGS** Vertical General-Purpose Standard | Front panels for kitchen, office and bathroom furniture, wall panelling, ceiling panels, shelves and furniture elements. |
| | Initial abrasion point ≥ 50 revolutions | min. 15 Newton | Rating 2 | **VGF** Vertical General-Purpose Flame-retardant | |
| | Abrasion value ≥ 150 revolutions | | | **VGP** Vertical General-Purpose Postforming | |

## 6.2 COMPARISON OF THE ESSENTIAL CHARACTERISTICS

The table below shows some of the other essential properties of laminates. The listed values for abrasion resistance, impact resistance and scratch resistance conform to the values required for kitchen worktops.

| Characteristic | Test method EN 438-2 | Unit | Setpoint EN 438-3 | CPL | HPL |
|---|---|---|---|---|---|
| Min. thickness | - | mm (inch) | - | 0.15 | 0.50 |
| Max. thickness | - | mm (inch) | - | 1.50 | 40.0 |
| Max. depth of texture | - | µm | - | 150 | 500 |
| High gloss | - | - | - | yes | Yes |
| Compact laminates*1 | - | - | - | No | yes |
| Abrasion resistance | 10 | Rev. IP<br>med. Rev. abrasion | ≥ 150<br>≥ 350 | ≥ 150<br>≥ 350 | ≥ 150<br>≥ 350 |
| Shock resistance | 20 | N | ≥ 20 | ≥ 20 | ≥ 20 |
| Scratch resistance | 25 | Grade | 3 | 3 | 3 |
| Light fastness | 27 | Grey scale | 4 to 5 | 4 to 5 | 4 to 5 |
| Reaction to dry heat | 16 | Level | ≥ 4 | ≥ 4 | ≥ 4 |
| Resistance against glowing cigarette | 30 | Level | ≥ 3 | ≥ 3 | ≥ 3 |
| Resistance against water vapour | 14 | Level | ≥ 3 | 3 to 5 | 3 to 5 |
| Resistance to stains<br>Groups 1 + 2<br>Group 3 | 26 | Level | <br>≥ 5<br>≥ 3 | <br>≥ 5<br>≥ 3 | <br>≥ 5<br>≥ 3 |

*1 Compact lamines = laminates ≥ 2 mm thickness

# 7. Advantages and disadvantages of CPL and HPL

## 7.1 CPL PROCESS

The continuous production process of CPL dispenses with waste being incurred on length cuts and facilitates online finishing. This means that job-related lengths are flexible and can be produced economically. It is also possible to produce thin laminates, ‹ 0.5 mm thickness, and to supply a specific range of thicknesses as rolled goods.

## 7.2 HPL PROCESS

This manufacturing process enables compact laminates (laminates ≥ 2 mm thick) and surfaces with deep textures to be produced. In combination with multi-layer daylight presses it is also, in theory, possible to produce one single board, although this would never be advisable from an economic point of view.

## 7.3 Similarities and Differences in the CPL & HPL Manufacturing Processes

You will find an overview of the similarities and differences in the two manufacturing processes in the following table.

| Criteria | EGGER CPL | HPL | Comments |
|---|---|---|---|
| Material | Paper & resins | Paper & resins | Definition EN 438-3:2005 |
| Material density | ≥ 1.35 g/cm³ | ≥ 1.35 g/cm³ | Definition EN 438-3:2005 |
| Manufacturing temperature | 150 - 170 °C | ≥ 120 °C | Pressing cycle - HPL |
| Pressure during production | 30 - 70 bar | ≥ 50 bar | HPL multi-layer presses require higher pressure - 20 daylights of ~ 8 HPL per daylight |
| Manufacturing process | continuous | stationary | - |
| Pressing time | 8 to 15 seconds | 20 to 60 minutes | HPL pressing time depends on the number of layers and the amount of HPL per daylight |
| Minimum quantity | ~ 260 m² | ~ 160 m² | Minimum quantity HPL producer ~ 300 pcs. per format, distributed to several decors ~ 40 pcs. each |
| Laminate lengths | variable from 800 to 5,600 mm | Fixed lengths from 2,180 , 3,050; 4,100 mm etc. | HPL special formats have to be cut from the next higher standard length |
| Laminate widths | 1,000 and 1,310 mm | 1,000; 1,320 mm etc. | On-line width separating cut possible at EGGER |
| Laminate thicknesses | 0.15 up to 1.50 mm | 0.50 up to 2.00 mm | The standard defines compact laminates as from a thickness of ≥ 2 mm |