ENVIRONMENTAL PRODUCT DECLARATION
as per ISO 14025

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Decorative High-Pressure Laminates

International Committee of the Decorative Laminates Industry (ICDLI)

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com

ICDLI
International Committee of the Decorative Laminates Industry

1 General Information

International Committee of the Decorative Laminates Industry (ICDLI)

Programme holder

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D-53639 Königswinter

Declaration number

EPD-ICDLI-2012112-E

This Declaration is based on the Product Category Rules:

Part B: Requirements on the EPD for Laminates (11-2011)
(PCR tested and approved by the independent expert committee (SVA))

Issue date

01.06.2012

Valid to

31.05.2017

Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt)

Prof. Dr.-Ing. Hans-Wolf Reinhardt (Chairman of the SVA)

High Pressure Laminate

Owner of the Declaration

ICDLI – International Committee of the Decorative Laminates Industry
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Declared product / Declared unit

Decorative High-Pressure Laminate (HPL) according to EN 438 produced by ICDLI members. The EPD applies to 1 m² of HPL without fire-retardant properties with an average density of 1350 kg/m³.

Scope:

The applicability of this document is restricted to HPL produced by member companies of the Laminate Association ICDLI.

Data has been provided by 10 member HPL producing companies of the ICDLI for the year 2010. These companies represent 70 % of the ICDLI members. Production volume of these companies contributes more than 66% to Thin Decorative High-pressure laminates (Thin HPL) and more than 45% to Compact Decorative High-pressure laminates (Compact HPL) production in Europe.

Verification

The CEN standard EN 15804 serves as the core PCR.

Verification of the EPD by an independent third party as per ISO 14025

☐ internally ☒ externally

Dr. Frank Werner (Independent verifier appointed by SVA)

2 Product

Product description

This EPD describes High-pressure decorative laminates (HPL) according to EN 438 part 3 (thin HPL, thickness < 2 mm) and part 4 (Compact Laminates, thickness ≥ 2 mm) with a density of at least 1350 kg/m³.

High-pressure decorative laminates (HPL) are characterised by their aesthetic qualities, strength, durability and functional performance. HPL sheets are available in a wide variety of colours, patterns and surface finishes. They are resistant to wear, impact, scratching, moisture, heat, staining and light and possess good hygienic and antistatic properties. HPL are easy to clean and maintain.

Thin HPL are not self-supporting and require bonding to a substrate. Typically they are glued to wood-based substrates.

Compact HPL can be glued, riveted or screwed on wooden or metallic substructures or anchored in mechanical fastening brackets to be used in invisibly mounting systems.

Dimensions:

Length: up to 5600 mm
Width: up to 2200 mm
Thickness 0,5 ≤ t < 2,0 mm (thin HPL, EN 438-3)
Thickness: 2 ≤ t ≤ 40 mm (Compact HPL, EN 438-4)

A large number of HPL manufacturing plants are certified to ISO 9001 and/or ISO 14001.

Application

High-pressure decorative laminates can be used for private and residential housing, hospitals and laboratories, public buildings, railway stations, airport terminals/infrastructure, transportation, hotels, education, retail and commercial buildings, sport & recreation centers and industrial buildings.

The performance properties of HPL make them suitable for use in a wide variety of interior applications such as: wall cladding, railing infill panels, furniture, tables, desks, column cladding and lab equipment, cubicles, ceilings, window sills, worktops, counter tops, wash basins, etc.

Technical Data

An extract of the technical properties of HPL according to EN 438 part 3 and part 4 are given in the following tables.

For horizontal grade thin HPL used in general purpose products, and for general purpose compact HPL used in products without flame retardants, the following properties are given:

Property	Test Method	Unit	Value for Thin HPL	Value for Compact HPL
Resistance to surface wear	EN 438-2:10	Revolutions	IP ≥ 150	
Resistance to impact	EN 438-2:20	N	≥ 20	n/a
Resistance to scratching	EN 438-2:25	Rating	≥ 3	≥ 2 (smooth)
				≥ 3 (textured)
Resistance to dry heat	EN 438-2:16	Rating	≥ 3 (gloss)	
			≥ 4 (other)	
Resistance to cigarette burns	EN 438-2:30	Rating	≥ 3	
Resistance to wet heat	EN 12721	Rating	≥ 3 (gloss)	
			≥ 4 (other)	
Resistance to water vapour	EN 438-2:14	Rating	≥ 3	n/a
Light fastness (xenon arc)	EN 438-2:27	grey scale	≥ 4	
Density	EN ISO 1183	g/cm³	≥ 1,35	
Flexural modulus	EN ISO 178	MPa	n/a	≥ 9000
Flexural strength	EN ISO 178	MPa	n/a	≥ 80
Resistance to impact by large diameter ball	EN 438-2:21	drop height in mm		
		2 ≤ t < 6	n/a	1400
		6 ≤ t	n/a	1800

Raw materials / Ancillary materials

More than 60 % of the HPL consists of paper, and the remaining 30 to 40 % consists of cured phenol-formaldehyde resin for core layers and melamine-formaldehyde resin for the surface layer.

HPL is produced in a batch process in multi-opening presses. Papers are impregnated with thermosetting resins and pressed together under simultaneous application of heat (temperature > 120 °C) and high specific pressure (≥ 5 MPa). This method produces a homogeneous, non porous material with a density ≥ 1350 kg/m³.

HPL with thickness < 2,0 mm typically has one decorative surface while Compact Laminates typically have two decorative sides.

Material composition:

Component	Weight %
Decor paper	app. 2-12
Kraft paper	app. 55-62
Melamine resin	app. 2-12
Phenolic resin	app. 20-32

Reference service life

Due to the wide range of applications no single reference service lifetime can be established. For information, the service life in standard applications can range from 20 to 50 years (ICDLI suggestion based on expert judgment).

3 LCA: Calculation rules

Declared unit

The declared unit is 1 m^2 of HPL product with 8 mm thickness for Compact HPL product and 0.8 mm thickness for Thin HPL product with a density of at least 1350 kg/m³. The declared unit refers to the HPL products manufactured with phenolic impregnated kraft paper core and melamine impregnated decor paper and produced with batch press technology. Special decors, fire retardants or alternative core production technologies are not included. The declared unit refers to the average HPL products manufactured by ICDLI members (weighted average).

System boundaries

Type of EPD: Cradle to gate with options.

Raw material extraction and transportation, manufacture of product and packaging materials are declared in the modules A1-A3. Modules A1-A3 also include the manufacturing and supply of energy.

The scenario for the transport of the product to the construction site is declared in module A4.
The end-of-life scenario includes transportation to the waste processing and disposal (C2), emissions and energy requirements of combustion (C3) and landfilling process (C4). Credits for electricity and thermal energy, which result from energy recovery in modules C3 and C4, are declared in module D.

Comparability

A comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and in a building context. The product-specific characteristics and performance must be taken into account when defining the unit of comparison. This includes the HPL thickness, HPL density, HPL decor properties, HPL fire resistance properties etc.

4 LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules. This information can also be used for developing specific scenarios in the context of a building assessment for modules that are not declared (MND).

Transport to the construction site (A4)

Mode	Euro truck
Transport distance	100 km
(Scale linearly depending on the distance)	
Capacity load utilisation (including empty runs)	85 %
Gross density of products transported	1350 kg/m^3
Capacity utilisation volume factor	100 %

End of Life (C1-C4)

Collected separately	0 %
Collected as mixed construction waste	100 %
Reuse	0 %
Recycling	0 %
Energy recovery	50 %
Waste Incineration Plant Efficiency (boiler)	0.944
Ratio power to steam (net calorific value)	0.094
R1-value	< 0.6
Landfilling	50 %
Electricity from landfill gas utilisation	0.0887 MJ/kg waste (net calorific value)

5 LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUC-TION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BE-YOND THE SYSTEM BOUNDARYS (BLBSB)
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
x	x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² HPL Standard

		HPL thin						HPL compact					
		Manufacturing	Transport	End-of-life			BLBSB	Manufacturing	Transport	End-of-life			BLBSB
Parameter	**Unit**	**A1-A3**	**A4**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C2**	**C3**	**C4**	**D**
GWP	[kg CO_2-Eqv.]	3,34	2,25E-02	1,84E-02	1,09	1,08	-0,43	37,4	0,23	1,84E-01	10,9	10,8	-4,26
ODP	[kg CFC11- Eqv.]	1,75E-07	4,55E-11	3,72E-11	4,80E-10	1,66E-09	-3,53E-08	1,68E-06	4,55E-10	3,72E-10	4,80E-09	1,66E-08	-3,53E-07
AP	[kg SO_2- Eqv.]	1,50E-02	1,10E-04	9,01E-05	4,72E-04	2,58E-04	-1,48E-03	1,69E-01	1,10E-03	9,01E-04	4,72E-03	2,58E-03	-1,48E-02
EP	[kg PO_4^{3-}- Eqv.]	2,84E-03	2,53E-05	2,08E-05	1,19E-04	1,05E-03	-9,74E-05	2,93E-02	2,53E-04	2,08E-04	1,19E-03	1,05E-02	-9,74E-04
POCP	[kg Ethen Eqv.]	1,62E-03	1,26E-05	1,04E-05	3,00E-05	6,09E-05	-9,61E-05	1,68E-02	1,26E-04	1,04E-04	3,00E-04	6,09E-04	-9,61E-04
ADPE*	[kg Sb Eqv.]	1,26E-06	4,81E-10	3,93E-10	1,70E-08	5,87E-09	-2,73E-08	1,53E-05	4,81E-09	3,93E-09	1,70E-07	5,87E-08	-2,73E-07
ADPF*	[MJ]	68,9	0,32	0,26	0,44	0,57	-6,21	804	3,16	2,58	4,36	5,67	-62,1
Caption	GWP = Global warming potential; ODP = (Stratospheric) Ozone depletion potential; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources												

* Quantified based on CML characterisatoin factors (updated in 2009).

RESULTS OF THE LCA - RESOURCE USE: 1 m² HPL Standard													
		HPL thin						HPL compact					
		Manufacturing	Transport	End-of-life			BLBSB	Manufacturing	Transport	End-of-life			BLBSB
Parameter	**Unit**	**A1-A3**	**A4**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C2**	**C3**	**C4**	**D**
PERE	[MJ]	18,1	-	-	-	-	-	259	-	-	-	-	-
PERM	[MJ]	11,6	-	-	-	-	-	117	-	-	-	-	-
PERT	[MJ]	29,7	4,24E-04	3,46E-04	2,84E-03	1,79E-02	-0,21	376	4,24E-03	3,46E-03	2,84E-02	1,79E-01	-2,13
PENRE	[MJ]	66,18	-	-	-	-	-	775,8	-	-	-	-	-
PENRM	[MJ]	9,02	-	-	-	-	-	90,2	-	-	-	-	-
PENRT	[MJ]	75,2	0,32	0,26	0,45	0,63	-7,46	866	3,17	2,59	4,53	6,26	-74,60
SM	[kg]	0	-	-	-	-	-	0	-	-	-	-	-
RSF	[MJ]	1,69E-04	0	0	7,50E-08	0	0	2,02E-03	0	0	7,50E-07	0	0
NRSF	[MJ]	5,69E-04	0	0	2,52E-07	0	0	6,77E-03	0	0	2,52E-06	0	0
FW	[m³]	7,89E-02	2,34E-06	1,91E-06	8,25E-04	2,22E-04	-3,84E-04	0,84	2,34E-05	1,91E-05	8,25E-03	2,22E-03	-3,84E-03
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of non renewable primary energy resources used as raw materials; PENRT = Total use of non renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Use of net fresh water												

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² HPL Standard													
		HPL thin						HPL compact					
		Manufacturing	Transport	End-of-life			BLBSB	Manufacturing	Transport	End-of-life			BLBSB
Parameter	**Unit**	**A1-A3**	**A4**	**C2**	**C3**	**C4**	**D**	**A1-A3**	**A4**	**C2**	**C3**	**C4**	**D**
HWD	[kg]	6,24E-03	0	0	6,66E-03	0	0	6,09E-02	0	0	6,66E-02	0	0
NHWD	[kg]	4,34	7,99E-04	6,53E-04	1,36E-02	6,50E-02	-0,56	48,2	7,99E-03	6,53E-03	1,36E-01	6,50E-01	-5,63
RWD	[kg]	2,17E-03	5,69E-07	4,65E-07	5,95E-06	2,07E-05	-4,43E-04	2,09E-02	5,69E-06	4,65E-06	5,95E-05	2,07E-04	-4,43E-03
CRU	[kg]	-	-	-	-	-	-	-	-	-	-	-	-
MFR	[kg]	-	-	-	-	-	-	-	-	-	-	-	-
MER	[kg]	-	-	-	-	-	-	-	-	-	-	-	-
EE [Power]	[MJ]	-	-	-	0,37	0,49	-	-	-	-	3,73	4,96	-
EE [Steam]	[MJ]	-	-	-	0	3,95	-	-	-	-	0	39,5	-
Caption	HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy per energy carrier												

6 LCA: Interpretation

Most of the environmental impacts evaluated are associated with the product stage. For the GWP impact the HPL manufacturing is a dominant source of the greenhouse gas emissions. Raw material production is contributing much less due to the carbon uptake in paper production chain. The End of Life scenario also plays an important role in GWP due to the release of embodied carbon. The carbon offsets were substracted from the greenhouse gas emissions; however the total offset carbon dioxide is less than 1% of the A1-A3 GWP.

In the product stage the manufacturing of HPL dominates most of the other stages for all environmental impacts. This is mainly due to the production of energy consumed in this stage. This is followed by the production of the raw materials such as paper and main resin precursors.

LCA results can vary significantly between HPL manufacturers with up to 50% variance from the average (average across all environmental impact indicators). The variance is connected to the variable material and energy efficiencies of the HPL production process as well as to the different sources of energy.

The environmental impacts of the HPL product change lineary with the change in thickness of the product.

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