PRODUCT TECHNICAL DATA

Vanceva® - Colored Polyvinyl Butyral Interlayer

Vanceva® interlayers are premium colored plasticized polyvinyl butyral (PVB) sheets produced by Eastman Chemical Company and its affiliates. These interlayers are permanently bonded through a heat and pressure process to two or more pieces of glazing to produce laminates with impact and glass containment properties. Laminated glass with the properly selected type of Saflex interlayer are capable of being classified as safety glass in accordance with, but not limited to, various regulations such as ANSI Z26.1, ANSI Z97.1, AS/NZS 2208; CNS 1183, CPSC 16 CFR 1201, EN 12600 and ISO 29584.

Product Overview:
Vanceva interlayers, including Vanceva Colors, Vanceva Earth Tones and Vanceva Illusion White, are Saflex R formulation products. Vanceva Colors and Vanceva Earth Tones have premium colorants uniformly distributed throughout the sheeting. Vanceva Illusion White has a white gradient band of 30 cm with a gentle fade to clear in the width of a single roll. All Vanceva products have demonstrably met or exceeded many regulations for laminated safety glazing (including those listed above) when properly selected, laminated, and installed. Vanceva interlayers are specifically formulated to provide exceptional durability when exposed to natural weathering, especially when laminate edges are left unprotected from the elements. Vanceva interlayers have been shown to be compatible and durable when laminated in intimate contact with most infrared reflective, metal coated, ceramic frit, and printed glasses. Compatibility should always be verified through the coating, frit or ink manufacturer.

Color Designations:
Vanceva Colors are typically an assembly of interlayer layers, up to 4 layers, between two pieces of glass and are designated by the abbreviation “VCV” followed by a four-digit color code (e.g. #0234) so the designation for the above example would be VCV #0234. Vanceva Illusion White is designated in the Vanceva Colors system as layer code “J”.

Vanceva Earth Tones are designed to match traditional colored float glass. They are typically a single layer of colored interlayer and are designated with the abbreviation “VCV” followed by a five-digit code which always starts with an “S” (indicating a single layer). The “S” is followed by the color code (e.g.: #3773). This example would be specified as VCV #S-3773. The use of the “S” is critically important when specifying by the color code. Figure 1 shows the dramatic difference between products with the same numeric code with and without the “S” present.

Figure 1: Vanceva Color (left) versus Vanceva Earth Tone (Right, requires “S”) nomenclature for code 3773.

Vanceva Colors and Vanceva Earth Tones, when used as a single layer are also given a descriptive name as outlined in the table below. The table shows only the product nomenclature. A more detailed listing of Vanceva Colors and other formulations as well as solar and optical properties for most transparent layered combinations can be found at www.vanceva.com or by contacting your local Eastman representatives.

Table 1: Vanceva Color and Vanceva Earth Tones – Codes and Descriptive Names

Vanceva Code	Formulation Code	Product Code	Vanceva Name	Color
Vanceva Colors				
1	RB17	807800	Coral Rose	Red
2	RB17	827800	Aquamarine	Blue
3	RB17	837800	Smoke Gray	Black
4	RB17	817800	Sahara Sun	Yellow
5	RB17	805000	Ruby Red	Red
6	RB17	825000	Sapphire	Blue
7	RB17	835000	Evening Shadow	Black
8	RB17	818600	Golden Light	Yellow
9	RB17	216500	Arctic Snow	White
A	RB17	218000	Cool White	White
C	RB17	851500	Deep Red	Red
D	RB17	841400	True Blue	Blue
E	RB17	864100	Tangerine	Orange
F	RB17	220700	Polar White	White
G	RB17	830000	Absolute Black	Black
H	RB17	876100	Ocean Gray	Grey
J	RB45	216500	Illusion White	Gradient White
Vanceva Earth Tones				
S-0828	RB17	082800	Graphite	Grey
S-3609	RB17	360900	Truffle	Brown
S-3628	RB17	362800	Mocha	Brown
S-3655	RB17	365500	Dusk	Brown
S-3773	RB17	377300	Marine	Blue-Green
S-3773	RB47	377300	Marine	Blue-Green
S-5538	RB47	553800	Limestone 38	Bronze
S-5558	RB17	555800	Limestone	Bronze
S-6376	RB17	637600	Glacier	Blue
S-6428	RB17	642800	Gobi	Bronze
S-6452	RB17	645200	Dolomite	Bronze
S-6452	RB47	645200	Dolomite	Bronze
S-6544	RB17	654400	Shale	Grey
S-6544	RB47	654400	Shale	Grey
S-7558	RB17	755800	Sky	Blue

Available Forms:
All Vanceva interlayers are supplied in roll form on 15.2 cm (6 inch) diameter cores.

Vanceva interlayers are supplied in a variety of roll lengths and widths. Most common standard roll length is 100 meters (328 feet). The most common thickness is 0.38 mm (0.015 inch), although some colors are available in 0.76 mm (0.030 inch) thickness.

Vanceva interlayers are produced in one adhesion level. Please contact your Saflex Sales Manager, Technical Service Representative, Customer Service Representative or visit www.saflex.com for further information.

Storage Conditions:
Vanceva interlayers should be stored inside the moisture barrier bag that the roll is shipped in and maintained within the temperatures recommended in the Saflex laminating guide. It is recommended that the interlayer be used within a two-year period from purchase to minimize this roll blocking.

Laminating Conditions:

Eastman makes available to our fabricating customers a Saflex® Laminating Guide which details nominal methods for storage, handling, and lamination of both Saflex and Vanceva PVB interlayer products. This technical guide is available only from a Saflex Technical Service (TS) Representative or Saflex Sales Manager. To find the name of the Saflex representative for your organization, call 1-800-636-8670.

Select Vanceva® Properties[1]:

Test	Technical Data Property	Test Method	Units	Conditions	Vanceva® interlayer
Flammability	Extent of Burning	ASTM D635	mm	-	7.9
	Flame Spread Index	ASTM E84	-	-	10
	Heat of Combustion	ASTM E1354	Joules/Kg	-	37
	Rate of Burning	ASTM D 635	mm/min ºC	-	<25
	Self-Ignition	ASTM D1929	ºC	-	760
	Smoke Density	ASTM D2843	%	-	5
Mechanical	Coefficient of Thermal Expansion	ASTM E831	ppm/C	30-100ºC	155
	Conductivity, Thermal, K	ASTM F433	W/m-ºK	65ºC	0.20
	Elongation at Failure	JIS K6771	%	23ºC/50% RH	205
	Emissivity	ASTM C1371		19.5ºC	0.94
	Modulus of Elasticity (E)	Calculated	MPa	60ºC/1 Hz	1.56
	Poisson's Ratio	ASTM D638		23ºC/50% RH	0.5
	Shear Modulus (G')[2]	See Table Below			
	Tear Resistance	ASTM D1004	N/cm	-	112
	Tensile strength	JIS K6771	MPa	23ºC/50% RH	27
	Young's Modulus (E)[2]	See Table Below			

1 - Data supplied on Saflex RB (0.76 mm) formulation in 3 mm clear glass unless otherwise specified.
2 - Shear modulus (G) and Young's modulus data for other temperatures and durations are provided in a separate table at the end of this document.

Technical Data	Property	Test Method	Units	Test Conditions	Vanceva® interlayers
Optical	Haze	ASTM D1003	-	Clear 3 mm Glass	<1
	Refractive Index	ASTM D542		23ºC	1.478
	Visible Transmittance	NFRC 300	D65	Clear 3 mm Glass	89%
	Yellowness Index	ASTM E313	-	Clear 3 mm Glass	<1
Physical	Glass Transition Temperature	---	ºC	Frequency 1 Hz Heating Rate 3º C/min	30ºC±1
	Hardness	ASTM2240	Shore D	cut/stacked to 12.5 mm	52
	Moisture	EMN	%	-	Target ± 0.05
	Plasticizer	EMN	PHR	-	Target ± 2
	Roll Length	EMN	m	-	ordered minimum
	Specific Gravity/Density	ASTM D792	g/cm^3	23ºC	1.07
	Specific Heat	ASTM E1269	Joules/Kg -ºK	50ºC	1980
	Thickness	EMN	mm	0.38, 0.76	±0.025 mm
	Width	EMN	cm	-	Ordered minimum

Impact Data[3]

Test	Test Method	Conditions	Vanceva® interlayers
5-lb (2,227g) Ball Impact	ANSI Z26.1; ASTM F3006; ECE R43	ANSI Z26.1; ASTM F3006; ECE R43	Comply
Twin Tyre	ISO 29584; EN12600	1B1	Comply
100 lb (45,359g) Shot Bag Impact	ANSI Z97.1; CPSC 16 CFR 1201	Class B; Cat I 667 N (150 ftlb)	Comply
100 lb (45,359g) Shot Bag Impact	ANSI Z97.1; CPSC 16 CFR 1201	Class A; Cat II 1779 N (400 ftlb)	Comply

3 - Impact data tested on nominal 0.76 mm Saflex R series interlayer.

Solar Data[4] – Due to the colorants in Vanceva products, the solar, thermal, optical and color data will vary. Visit www.vanceva.com for this data in thousands of combinations in 3 mm clear glass. Eastman also supplies calculated data upon request for most transparent configurations.

4 - Solar, Thermal, Optical and Color calculations are done using OPTIC and WINDOW by Lawrence Berkeley National Laboratory.

Vanceva® - PVB interlayer Shear Storage Modulus

Load Duration	Temperature								
	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C
	MPa								
1 sec	26	6.9	2.1	1	0.7	0.6	0.5	0.5	0.4
3 sec	14	3.4	1.2	0.8	0.6	0.5	0.5	0.4	0.4
30 sec	3.5	1.1	0.7	0.5	0.5	0.4	0.4	0.3	0.3
1 min	2.4	1	0.6	0.5	0.5	0.4	0.4	0.3	0.3
5 min	1.1	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2
10 min	0.9	0.6	0.5	0.4	0.4	0.3	0.2	0.2	0.2
30 min	0.7	0.5	0.4	0.4	0.3	0.2	0.2	0.2	0.1
1 hour	0.6	0.5	0.4	0.4	0.3	0.2	0.2	0.1	0.1
6 hours	0.5	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1
12 hours	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1	--
1 day	0.5	0.4	0.3	0.2	0.1	0.1	0.1	--	--
5 days	0.4	0.3	0.2	0.1	0.1	--	--	--	--
1 week	0.4	0.3	0.2	0.1	0.1	--	--	--	--
3 weeks	0.3	0.2	0.1	0.1	0.1	--	--	--	--
1 month	0.3	0.2	0.1	0.1	--	--	--	--	--
1 year	0.2	0.1	0.1	--	--	--	--	--	--
10 years	0.1	0.1	--	--	--	--	--	--	--
15 years	0.1	0.1	--	--	--	--	--	--	--
50 years	0.1	--	--	--	--	--	--	--	--

Vanceva® - PVB interlayer Young's Modulus[5]

Load Duration	Temperature								
	20°C	25°C	30°C	35°C	40°C	45°C	50°C	55°C	60°C
	MPa								
1 sec	78	21	6.3	3.0	2.1	1.8	1.5	1.5	1.2
3 sec	42	10	3.6	2.4	1.8	1.5	1.5	1.2	1.2
30 sec	11	3.3	2.1	1.5	1.5	1.2	1.2	0.9	0.9
1 min	7.2	3.0	1.8	1.5	1.5	1.2	1.2	0.9	0.9
5 min	3.3	1.8	1.5	1.2	1.2	0.9	0.9	0.6	0.6
10 min	2.7	1.8	1.5	1.2	1.2	0.9	0.6	0.6	0.6
30 min	2.1	1.5	1.2	1.2	0.9	0.6	0.6	0.6	0.3
1 hour	1.8	1.5	1.2	1.2	0.9	0.6	0.6	0.3	0.3
6 hours	1.5	1.2	1.2	0.9	0.6	0.3	0.3	0.3	0.3
12 hours	1.5	1.2	0.9	0.6	0.6	0.3	0.3	0.3	--
1 day	1.5	1.2	0.9	0.6	0.3	0.3	0.3	--	--
5 days	1.2	0.9	0.6	0.3	0.3	--	--	--	--
1 week	1.2	0.9	0.6	0.3	0.3	--	--	--	--
3 weeks	0.9	0.6	0.3	0.3	0.3	--	--	--	--
1 month	0.9	0.6	0.3	0.3	--	--	--	--	--
1 year	0.6	0.3	0.3	--	--	--	--	--	--
10 years	0.3	0.3	--	--	--	--	--	--	--
15 years	0.3	0.3	--	--	--	--	--	--	--
50 years	0.3	--	--	--	--	--	--	--	--

5 - Young's modulus E' is calculated using formula E'= 2G'(1+v) where v = Poisson's ratio of approximately 0.50 for isotropic polymeric material.