

EVERLAM N.V.

STRUCTURAL INTERLAYER

EVERLAM™ SUPER TOUGH

EXTRA STRENGTH FOR LAMINATED SAFETY GLASS

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EXTRA STRENGTH
FOR LAMINATED
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INTEREST:

- Higher Young modulus
- Intended for structural applications
- Roll form, refrigerated and interleaved
- Special rheology
- Compliance with national standards for balustrades and canopies

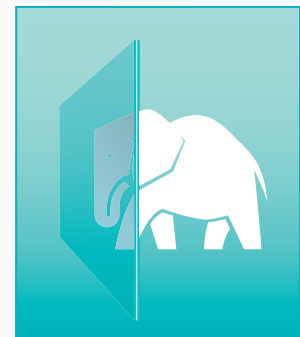
Everlam N.V. is a 35-year experienced company in PVB manufacturing, whose factory is located in Uentrop, Germany.

Everlam™ Super Tough is a PVB-based solution which is intended for applications where higher Young modulus is requested so that laminated safety glass can stand upright longer after breakage, which enhances the protection for people and objects.

From a structural design point of view, the special rheology of this interlayer allows to design thinner glass to get the same mechanical performance as standard laminates, which can lead to glazing weight reduction. Everlam™ Super Tough can be laminated with a standard lamination line and typical autoclave

cycle similarly to other Everlam™ PVB grades, meaning no need for any additional investment in machinery. As well as with fully tempered and heat strengthened glass, it can also be laminated with PLF panels, which makes it ideal to produce structural glazing with a high yield performance in a lamination line.

Everlam™ Super Tough meets architectural safety standards like EN356, EN 12543, EN12600, ANSI Z97.1-2015 and CPSC 16 CFR 1201, together with national standards applicable for balustrade and canopy glazing.



OFFERING

Everlam™ Super Tough structural interlayer is supplied in roll form, refrigerated and interleaved.

Item	Feature
Product code	LAM72T
Color	Clear
Thickness (mm)	0.76
Width range (cm)	100-321
Available SKU's (cm)	100, 120, 130, 160, 225, 260 and 321

EVERLAM™ SUPER TOUGH

TYPICAL PROPERTIES

Group	Property	Test method	Units	Test conditions	Typical value
Physical	Specific gravity	ASTM D792	-	23 °C	1081
	Moisture content	NIR	%	-	0.45
Mechanical	Tensile strength	EN ISO 527	MPa	24 °C/30% RH	36.1
	Elongation at break	EN ISO 527	%	24 °C/30% RH	198
Optical	Light transmission	EN410	%	-	>88
	UV transmission	ISO 9050	%	-	<2
	Haze	ASTM D1003	%	-	0.2
Thermal	Melt flow rate	ISO 1133:2005	g/10 cm	150 °C/5Kg	0.41
	Glass transition temperature (T _g)	DMA	°C	1 Hz at 3 °C/min Maximum phase angle	45
	Heat of combustion	ISO 1716	MJ/Kg	-	29.84
	Thermal expansion coefficient	ASTM E831	10 ⁻⁶ /°C	5 °C-110 °C	233
	Thermal conductivity	ASTM D5930	W/m°K	35 °C	0.33

APPLICATIONS

Thanks to its specific rheology, Everlam™ Super Tough can be the product of choice for the following applications:

Balustrades

Canopies

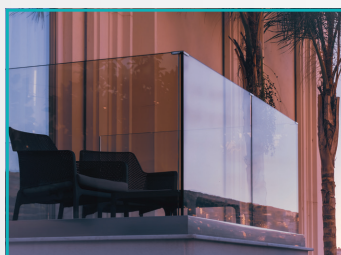
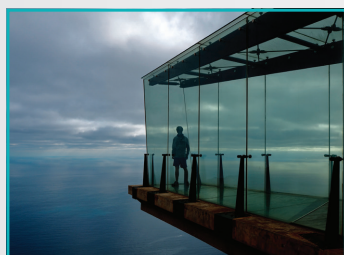
Large glazings

Marine glazing

Slope glazings

Wind barriers

Shop fronts



STRUCTURAL INTERLAYER

RHEOLOGICAL PROPERTIES

Everlam™ Super Tough is a high modulus PVB solution which has been developed to present enhanced mechanical performance for structural application thanks to its special rheological properties, a shown in tables below:

EVERLAM™ SUPER TOUGH (LAM7ZT) Young Modulus E' (Mpa)															
Load Duration	Temperature														
	15 (°C)	20 (°C)	25 (°C)	30 (°C)	33 (°C)	36 (°C)	40 (°C)	43 (°C)	46 (°C)	50 (°C)	53 (°C)	56 (°C)	60 (°C)	65 (°C)	70 (°C)
1 sec	436.25	369.51	284.60	179.09	136.22	77.31	31.02	12.96	5.26	3.09	1.86	1.41	1.29	1.44	1.37
3 sec	406.81	333.05	242.31	130.88	90.72	43.58	13.01	5.66	2.67	1.85	1.38	1.29	1.25	1.32	1.25
30 sec	335.63	249.59	143.66	52.62	25.68	8.58	2.98	1.77	1.38	1.34	1.22	1.14	1.01	1.09	1.01
1 min	314.68	231.64	113.39	33.04	15.89	5.26	2.19	1.45	1.29	1.28	1.17	1.05	0.95	0.98	1.01
5 min	238.01	159.32	55.99	10.54	4.79	2.37	1.38	1.26	1.22	1.11	0.98	0.88	-	-	-
10 min	227.94	129.01	37.08	6.37	3.07	1.65	1.32	1.28	1.14	1.05	0.92	-	-	-	-
30 min	185.16	87.65	17.18	3.07	1.96	1.38	1.28	1.17	1.09	0.92	-	-	-	-	-
1 hour	159.32	60.62	10.53	2.30	1.50	1.44	1.22	1.08	0.95	-	-	-	-	-	-
6 hour	80.05	21.29	3.17	1.38	1.26	1.20	1.01	0.88	-	-	-	-	-	-	-
12 hour	57.59	11.96	2.29	1.32	1.28	1.14	0.95	-	-	-	-	-	-	-	-
1 day	37.08	7.21	1.77	1.38	1.22	1.13	-	-	-	-	-	-	-	-	-
5 days	12.96	2.67	1.32	1.17	1.05	0.88	-	-	-	-	-	-	-	-	-
1 week	9.67	2.30	1.29	1.14	1.01	-	-	-	-	-	-	-	-	-	-
3 weeks	4.76	1.50	1.25	1.01	0.88	-	-	-	-	-	-	-	-	-	-
1 month	3.67	1.42	1.22	0.98	-	-	-	-	-	-	-	-	-	-	-
1 year	1.41	1.25	0.95	-	-	-	-	-	-	-	-	-	-	-	-
10 years	1.25	1.01	-	-	-	-	-	-	-	-	-	-	-	-	-
15 years	1.22	0.95	-	-	-	-	-	-	-	-	-	-	-	-	-
50 years	1.08	-	-	-	-	-	-	-	-	-	-	-	-	-	-

EVERLAM™ SUPER TOUGH (LAM7ZT) Shear Modulus G' (Mpa)															
Load Duration	Temperature														
	15 (°C)	20 (°C)	25 (°C)	30 (°C)	33 (°C)	36 (°C)	40 (°C)	43 (°C)	46 (°C)	50 (°C)	53 (°C)	56 (°C)	60 (°C)	65 (°C)	70 (°C)
1 sec	146.39	124.00	95.50	60.10	45.71	25.94	10.41	4.35	1.77	1.04	0.62	0.47	0.43	0.48	0.46
3 sec	136.51	111.76	81.31	43.92	30.44	14.62	4.37	1.90	0.90	0.62	0.46	0.43	0.42	0.44	0.42
30 sec	112.63	83.76	48.21	17.66	8.62	2.88	1.00	0.59	0.46	0.45	0.41	0.38	0.34	0.37	0.34
1 min	105.60	77.73	38.05	11.09	5.36	1.77	0.74	0.49	0.43	0.43	0.39	0.35	0.32	0.33	0.34
5 min	79.87	53.46	18.79	3.54	1.61	0.79	0.46	0.42	0.41	0.37	0.33	0.30	-	-	-
10 min	76.49	43.39	12.44	2.14	1.03	0.55	0.44	0.43	0.38	0.35	0.31	-	-	-	-
30 min	62.13	29.41	5.77	1.03	0.66	0.46	0.43	0.39	0.37	0.31	-	-	-	-	-
1 hour	53.46	20.34	3.53	0.77	0.50	0.48	0.41	0.36	0.32	-	-	-	-	-	-
6 hour	26.86	7.14	1.06	0.46	0.42	0.40	0.34	0.30	-	-	-	-	-	-	-
12 hour	19.33	4.01	0.77	0.44	0.43	0.38	0.32	-	-	-	-	-	-	-	-
1 day	12.44	2.42	0.59	0.46	0.41	0.38	-	-	-	-	-	-	-	-	-
5 days	4.35	0.90	0.44	0.39	0.35	0.30	-	-	-	-	-	-	-	-	-
1 week	3.24	0.77	0.43	0.38	0.34	-	-	-	-	-	-	-	-	-	-
3 weeks	1.60	0.50	0.42	0.34	0.30	-	-	-	-	-	-	-	-	-	-
1 month	1.23	0.48	0.41	0.33	-	-	-	-	-	-	-	-	-	-	-
1 year	0.47	0.42	0.32	-	-	-	-	-	-	-	-	-	-	-	-
10 years	0.42	0.34	-	-	-	-	-	-	-	-	-	-	-	-	-
15 years	0.41	0.32	-	-	-	-	-	-	-	-	-	-	-	-	-
50 years	0.36	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Based on Everlam™ Super Tough rheological data, below table shows that it is classified as rigid interlayer (class 2) in all load conditions according to EN 16612 and EN 16613, used to determine the lateral load resistance of glass panes and the interlayer viscoelastic properties.

Load condition	Load duration	Interlayer temperature range (°C)	Interlayer Stiffness family	Shear transfer coefficient (α)
1 Wind gust load (Mediterranean areas)	3s	0<T<35	2	0.5
2 Wind gust load (other areas)	3s	0<T<20	2	0.7
3 Wind storm load (Mediterranean areas)	10min	0<T<35	2	0.1
4 Wind storm load (other areas)	10min	0<T<20	2	0.5
5 Balustrade Loads- no crowds (e.g. Building use categories A,B,C1 and E from E1991-1-1)	30s	0<T<30	2	0.5
6 Balustrade Loads- crowds	5min	0<T<30	2	0.3
7 Maintenance loads	30min	0<T<40	2	0.1
8 Snow load - external canopies and roofs of unheated buildings *	3weeks	-20<T<0	no data	0.3
9 Snow load - Roofs of heated buildings	5days	-20<T<20	2	0.1
10 Climatic laos of insulating glass units : summer	6h	20<T<40	2	0.1
11 Climatic laos of insulating glass units : winter	12h	-30<T<20	2	0.3

EVERLAM™ SUPER TOUGH

COMPLIANCE WITH NATIONAL STANDARDS

DEUTSCHES INSTITUT FÜR BAUTECHNIK

DIBt Allgemeine Bauartgenehmigung (Z-70.3-277) for use in laminated safety glass according to DIN 18008

NBN B03-004:2017 BELGIUM

The purpose of this standard is to check the capability of the balustrade to resist forces applied normally or by accident by one or several users.

The loads applied to rank the system performance are:

- Service load.
- Security load
- Limit service
- Last service
- Soft body impact

Everlam™ Super Tough laminates have successfully been tested to be fit for use in residential areas, offices, restaurants, cinemas theaters, dancing halls, gyms, shops...

CTE SPAIN

The Spanish Technical Building Code (Código Técnico de la Edificación) is compulsory in that country. This document ranks the balustrade system resistance category in function on the installation area.

The system is submitted to:

- Static charge.
- Impact: soft and hard body.

Everlam™ Super Tough laminates are able to withstand a linear load of 3KN/m, allowing them to be fit for use in crowded areas.

UNI 11678 ITALY

This standard defines the test methods to determine the performance of anti-fall glass versus static linear and dynamic loads.

The system is ranked according to performance for:

- Linear static load test.
- Impact test: hard body and soft body.

Everlam™ Super Tough laminates have successfully been tested up to a linear load of 2 KN/m for slab and floor mounted systems.

EOTA, EAD- 220025-00-0401 AND EOTA, TR001 FOR CANOPY TESTING

The mechanical performance requested for this application is described in the European Assessment document issued by the European Organization for Technical Assessment.

The system is evaluated according to:

- Snow load mechanical resistance.
- Impact: soft and hard body.
- Residual load capacity.

Everlam™ Super Tough laminates did not fail either hard body or soft body impact or residual load tests.

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