

## Membrane LD-PE (R) **black ecological**



CPD 89/106 → Appendix ZA of UNI EN 13984 :2007 – 13967:2007 – 13361:2008 – 13362:2005 – 13491:2008 – 13492:2008 – 13493:2008



**Applications :** Water vapour control layer (Type A according to EN 13984).  
Membrane against moisture rising from the basement (Type T acc. to EN 13967).  
Polymeric geosynthetic (GBR-P) barriers to fluids for use in reservoirs, dams, canals, tunnels, disposal sites and containments of liquids and solids waste.

**Notified Body (AoC2+)**  
N.o id. 1370 - BUREAU VERITAS ITALIA S.p.A.

N.o cert. FPC.....

**Year of Apposition  
of CE Marking**

**2010**

**Notified Laboratory (AoC3)**  
N.o id. 0987 - LAPI S.p.A.

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**Description of material:** monolayer sheet composed of R PE (recycled polyethylene) added with black masterbatch (LD-PE + carbon black), derived from the blown film extrusion of the aforesaid blend and packaged in coils.  
The material does not contain flame retardants, resins or glues.

**Installation :** flame light welding of overlapping flaps (at least 10 cm) of contiguous membranes.

### Properties

Legend : MDV = Manufacturer Declared Value, given by the Nominal Value ± Tolerance  
MLV = Manufacturer Limit Value (derived from the Nominal Value - o + the Tolerance)  
Note : for intermediate thicknesses apply intermediate values of table properties

Dimensional characteristics <b>CE</b> (at 23°C)	Method	Unit	Nominal Values			Tolerance
Average thickness	EN 1849-2	mm	<b>0,50</b>	<b>0,80</b>	<b>1,00</b>	± 5%
Point to point thickness						± 15%
Weight or mass per unit area	EN 1849-2	g/m <sup>2</sup>	470	752	940	± 6%
Length	EN 1848-2	m	Contractual nominal values			± 4%
Width	EN 1848-2	m	Contractual nominal values			Min 0%,Max +4%
Straightness	EN 1848-2	mm/10m	≤ 75			Limit required by std EN 13984 and 13967
Visible defects	EN 1850-2		Absent			Limit required by std EN 13984 and 13967

Mechanical characteristics $\text{C}\epsilon$	Method	Unit	Nominal Values			Tolerance
Tensile strength at break (MD direction)	EN 527-1,-3 specimen type 2 large	N/mm <sup>2</sup>	16			± 30%
Tensile strength at break (TD direction)	15 mm	N/mm <sup>2</sup>	15			± 30%
Tensile strength at break (MD direction)	EN 527-1,-3 specimen type 5 large	N/mm <sup>2</sup>	21			± 30%
Tensile strength at break (TD direction)	6 mm	N/mm <sup>2</sup>	20			± 30%
Elongation at break (MD direction)	EN 527-1,-3	% elong.	500	550	600	± 100% elong.
Elongation at break (TD direction)	EN 527-1,-3	% elong.	550	600	650	± 100% elong.
Tensile strength at break (MD direction)	EN 12311-2	N/50mm	330	530	660	± 30%
Tensile strength at break (TD direction)	EN 12311-2	N/50mm	310	500	620	± 30%
Elongation at break (MD direction)	EN 12311-2	% elong.	310	340	370	± 100% elong.
Elongation at break (TD direction)	EN 12311-2	% elong.	340	370	400	± 100% elong.
Resistance to impact	EN 12691	mm	≥ 130	≥ 220	≥ 280	Expressed in MLV
Resistance to static loading: perforates for	EN 12730 method A	kg	> 20			Expressed in MLV
Resistance to static loading: perforates for	EN 12730 method B	kg	> 20			Expressed in MLV
Static puncture test (CBR test)	EN 12236	kN	0,9	1,6	1,9	± 30%
Resistance to tearing (MD, TD directions)	EN 12310-1	N	≥ 100	≥ 160	≥ 200	Expressed in MLV
Shear resistance of flame light welded joints	EN 12317-2	N/50mm	To fully welded joints, the tensile strength is similar to that of the original material in the direction T.			
Deformation under load (at 7,32 N/mm <sup>2</sup> )	Append. B EN 13984	%	≤ 17	≤ 13	≤ 10	Expressed in MLV after 100 hrs of load

Ulterior mechanical characteristics	Method	Unit	Nominal Values			Tolerance
Tear resistance ( trouser specimen )	EN 6383-1	N/mm	150			± 40 N/mm
Puncture resistance with punch		N/mm	50			± 6 N/mm
Puncture resistance with 7,5 mm sphere		N/mm	450			± 100 N/mm
Puncture resistance with 9,5 mm sphere		N/mm	500			± 100 N/mm

Physical characteristics $\text{C}\epsilon$	Method	Unit	Nominal Values			Tolerance
Density at 23°C	EN 1849-2	kg / dm <sup>3</sup>	0,940			± 0,019
Watertightness at 60 kPa	EN 1928 Method A		Confirmed			
Water vapour transmission ( $\mu$ )	EN 1931		190.000			± 80.000
Coefficient of linear thermal expansion ( $\alpha$ )	ASTM D696	°C <sup>-1</sup>	1,8 * 10 <sup>-4</sup>			± 15%
Stress crack resistance	ASTM D5397	h	≥ 200			Expressed in MLV
Permeability to water	EN 14150	m <sup>3</sup> /m <sup>2</sup> /d	< 10 <sup>-6</sup>			Expressed in MLV
Gas permeability: oxygen (at 23°C, 1 bar)	ASTM D1434	ml / cm s bar	1,7 * 10 <sup>-8</sup>			± 20%
Reaction to fire	EN 11925-2	Classification	E (according to EN 13501-1)			

Note : the results refer to the lowest thickness, except where otherwise indicated; higher thickness have better performance

Durability characteristics $\text{C}\epsilon$	Methods	Residual properties	Results
Thermic in air at 70°C for 84 days	EN 1296	EN 1931 Water vapour transmission ( $\mu$ ) :	- 20% (within $\pm$ 50%) Confirmed
		EN 1928 B Difference from nominal value Watertightness at 60 kPa	
Chemical in milk of lime at 23°C for 112 days	EN 1847	EN 1928 B Watertightness at 60 kPa	Confirmed
Compatibility with bitumen at 70°C for 28days	EN 1548	EN 1928 B Watertightness at 60 kPa	Confirmed
To oxidation in air at 85°C for 90 days	EN 14575	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	93% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	88% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	96% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	94% $\geq$ 75%
To leaching at 50°C for 56 days: With B simulant ( milk of lime )	EN 14415	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	88% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	85% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	98% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	94% $\geq$ 75%
To leaching at 50°C for 56 days: With C simulant ( alcohols )	EN 14415	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	95% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	94% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
To leaching at 50°C for 56 days: With A simulant ( water )	EN 14415	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	100% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	99% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
Chemical at 50°C for 56 days: With A simulant ( sulphuric acid )	EN 14414	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	92% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	93% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	98% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
Chemical at 50°C for 56days(0.50mm thickness): With C simulant ( alkanes )	EN 14414	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	73% < 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	69% < 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	90% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	95% $\geq$ 75%
Chemical at 50°C for 56days(1.00mm thickness): With C simulant ( alkanes )	EN 14414	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	100% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	89% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
Chemical at 50°C for 56 days: With D simulant ( synthetic leachate )	EN 14414	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	93% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	83% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	97% $\geq$ 75%
To weathering : In QUV at 340 nm for 3.000 hours	EN 12224	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	100% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	95% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	96% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	95% $\geq$ 75%
Microbiological : In active soil at 26°C, H = 95% for 112 days	EN 12225	EN 527-1,-3 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	100% $\geq$ 75%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	96% $\geq$ 75%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	98% $\geq$ 75%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	98% $\geq$ 75%
Chemical to concrete at 90°C for 168 days	Append. C EN 13984	EN 12311-2 MD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	96% $\geq$ 50%
		TD Tensile strength at break ( $\sigma/\sigma_{IN}$ )	95% $\geq$ 50%
		MD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	94% $\geq$ 50%
		TD Elongation at break ( $\epsilon/\epsilon_{IN}$ )	100% $\geq$ 50%

This information corresponds to our current knowledge on EIFFEL SpA products and are based on data considered accurate and reliable.

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