



# AB-AR INTERLAYER ESTRUCTURAL

# AB-AR Film reforzado estructural AB-AR Structural Interlayer for stronger applications

ABAR es un polímero exclusivo desarrollado por PUJOL con **propiedades reforzadas de EVA regular.**

ABAR es el único producto 100% compatible con el film EVALAM que mantiene todas sus propiedades y prestaciones y con la reticulación EVALAM.

## VENTAJAS:

- Mejoran la dureza
- Soportan cargas más altas
- Actualización a una fase superior de resistencia a la rotura.

ABAR is an exclusive polymer developed by PUJOL **with reinforced properties of regular EVA.**

ABAR Is the only 100% compatible product with EVALAM interlayers keeping all its properties and performances and EVALAM crosslinking

## ADVANTATGES:

- Improve Stiffness
- Withstand Higher Loads
- Upgrading to a superior scale of Post Breakage Strength.



Escalera / Stairs



Marquesina / Canopies

Suelos pisables / Walkable Floor



Barandillas exterior – interior /  
Balustrades Exterior & Interior



# CTE - SE - AE Código Técnico de Edificación

## CTE - SE - AE Technical Edification Code

CATEGORY OF USE		EXAMPLE OF USE		UNIFORM LOADING (kN/M²)	NOMINAL RESISTANCE
A	Residential Areas	A1	Dwellings and living areas in hospitals and hotels	0,8	0,8
		A2	Storerooms	3	
B	Administrative areas, offices			2	0,8
C	Public access areas (except cat. A, B, and D)	C1	Areas with tables and chairs	3	0,8
		C2	Fixed seating areas	4	
		C3	Unobstructed areas that impede the free movement of people, such as vestibules of public buildings, administration, hotels, exhibition halls, etc. in museums...	5	1,6
		C5	Crowded areas (concerts, stadiums, etc.)	5	3
D	Zonas Comerciales	D1	Commercial areas	5	0,8
F	Passable roofs for private use only			1	1,6
G	Accessible covers for maintenance	G1		1	0,8
		G2		0,4	
				0	

### CNR-DT 210/2013 (Instruction)

- Límite de colapso de vidrio
- Verificación post-rotura
- Clasificación estructural
- Resistencia y redundancia
- Límite de deformación
- State limit of glass collapse
- Verification Post-breakage
- Structural hierarchy
- Strength and redundanza
- Limit of deformation

#### CNR - DT 210/2013 TEST OF LIMIT OF DEFORMATION

	1	2	3	4
	Pre load of glass at 30% of it's Nominal work Limit.	Load at Nominal Limit of function	Amplified Limit of breakage at 50% of it's Nominal work Limit	Post-breakage stability limit
	Kg/m²	Kg/m²	Kg/m²	Kg/m²
<b>Cat. A, B</b>	25	80	120	25
<b>Cat. C-1</b>	45	150	225	45
<b>Cat. C-2</b>	60	200	300	60
<b>Cat. C-3</b>	90	300	450	90

At this point is determined the Zero Point

Force is applied per 30sec. Maximum deformation allowed is 100mm

Amplified force is applied for 1min. No glass can break. Does not matter deformation

Internal glass is broken (the on the persons stay) and a 30% of the nominal load is applied. Glass must not collapse

**AB-AR**  
packaging

Presentation  
standard size

<b>AB-AR 1.5 mm</b>		
LAINABAR015P	FILM AB-AR 0,5 mm	1,40 x 30 m
	EVALAM CRYSTAL 0,48 mm	1,40 x 70 m
<b>AB-AR 2.0 mm</b>		
LAINABAR20P	FILM AB-AR 1,0 mm	1,40 x 30 m
	EVALAM CRYSTAL 0,48 mm	1,40 x 70 m
<b>AB-AR 2.5 mm</b>		
LAINABAR25P	FILM AB-AR 1,0 mm	1,40 x 30 m
	EVALAM CRYSTAL 0,76 mm	1,35 x 50 m
<b>AB-AR 4.0 mm</b>		
LAINABAR40P	FILM AB-AR 4 mm (Sheet/Hoja)	2,00 x 4 m

# Estabilidad post-rotura Post-Breakage Stability

Debido a las peculiaridades del vidrio, las estructuras de vidrio requieren un proceso de diseño diferente del enfoque 'tradicional' utilizado para los materiales de construcción. La filosofía de diseño se basa en el concepto de "a prueba de fallos", **según el cual, en una estructura de vidrio, la rotura de uno o más componentes no debe afectar a la seguridad de toda la estructura con el fin de proteger vidas humanas.**

Para ello, existen algunas normas fundamentales en materia de seguridad **UNI 7697:2014 y CNR-DT 210/2013 o CTE Código Técnico de Edificación**. Proporcionan criterios útiles para decidir el tipo de vidrio más apropiado dependiendo de la ubicación y de las diversas condiciones y situaciones en las que se espera que se utilice el elemento de vidrio.

## **UNI 7697:2014 (Norma)**

- Clasificación del rendimiento en función del destino de la instalación de vidrio.
- Estabilidad del laminado en caso de rotura de ambos vidrios.
- Ensayo de impacto de péndulo según UNI 12600
- Rendimiento del vidrio y de la capa intermedia en caso de rotura posterior.

Prueba de Penetración (Resistencia Dinámica), en esta segunda fase de prueba, la misma configuración de Vidrio y su fijación, realizada durante la prueba de Deformación, será sometida a las pruebas de Resistencia al Impacto por Impacto de Péndulo de acuerdo a la norma UNI 12600.

New glasses without breakage will be placed in same fixation unit.

Three impacts with hard bumper will hit the glass in 3 positions:

- Center
- Upper center
- Upper corner

**TARGET:** Glass must NOT BREAK & MUST NOT GO OUT of its fixation.

According to Categories the force of Resistance will be:

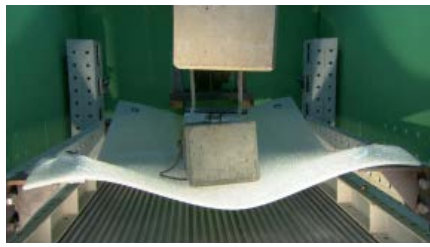
- **C-2:** 350 Jules (700 mm / H)
- **C-3:** 600 Jules(1.200 mm / H)

---

Due to the peculiarities of glass, glass structures require a design process different from the approach used for "traditional" building materials.

The design philosophy will be based on the concept of "fail safe", **according to which in a glass structure the crisis of one or more components must not impair the safety of the whole structure to safeguard human lives.**

To this end, there are some fundamental standards dealing with security **UNI 7697:2014 and CNR-DT 210/2013 or CTE Technical Edification Code**. They provide useful criteria for deciding the most appropriate type of glass depending on the location and the various conditions and situations in which the glass element is expected to be used.



### UNI 7697:2014 (Standard)

- Classification of performance depending of destination of glass installation.
- Stability of the laminate in case of breakage of both glasses.
- Test of Pendulum impact according UNI 12600
- Performance of glass & interlayer in case of post-breakage.



Penetration Test (Dynamic Resistance), in this second phase of test, same Glass & Fixing configuration, run during Deformation test will be submitted to Impact resistance tests by Pendulum Impact according to UNI 12600

New glasses without breakage will be placed in same fixation unit.

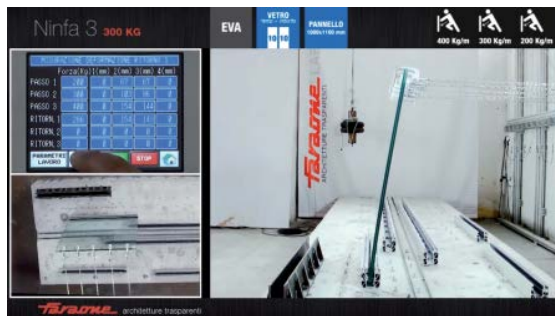
**Three** impacts with hard bumper will hit the glass in 3 positions:

- Center
- Upper center
- Upper corner

**TARGET:** Glass must NOT BREAK & MUST NOT GO OUT of its fixation.

According to Categories the force of Resistance will be:

- **C-2:** 350 Jules (700 mm / H)
- **C-3:** 600 Jules (1.200 mm / H)



# Clasificación Balustradas Balustrades Classification

## TABLA COMPARATIVA RESULTADOS DE LOS TEST COMPARATIVE TABLE OF TEST AND RESULTS

Por espesor y clasificación

Per thickness and classification

GLASS & INTERLAYER FEATURES	Pendulum Springs 150 J	Pendulum body springs 600 J (1b1)	Thrust SLU DM2008 Cat C2 (2kN/m)	Thrust SLU DM2008 Cat C3 (3kN/m)	Thrust SLU CNR210 Cat C2 (2kN/m)	Thrust SLU CNR210 Cat C3 (3kN/m)	Arrow SLE CNR210 Cat C2 Less 100mm"	Arrow SLE CNR210 Cat C3 Less 100mm	Load Pre-Breakage (kN/m)	Last Load Pre-Breakage w/hammer (kN/m)	Further Resistance post critical breakage of all plates	RAILING SYSTEM by FARAONE
8T +1,5 ABAR + 8T (HGlass = 1.100mm)	PASS	PASS	PASS	PASS	PASS	PASS	Not OK (102mm)		2,7	2 (220mm)	PASS	NINFA 100
8T +2,5 ABAR + 10T (HGlass = 1.100mm)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	Not OK (115mm)	3	2 (198mm)	PASS	
10T +1,5 ABAR + 10T (HGlass = 1.100mm)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	4,5	2 (164mm)	PASS	NINFA 4
10T +2,5 ABAR + 10T (HGlass = 1.100mm)	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	4,8	2 (145mm)	PASS	

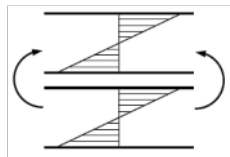
# Capacidad de carga residual

# Residual load bearing capacity

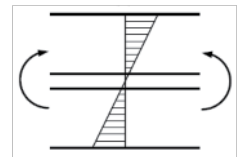
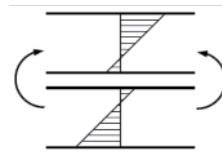
Temperature [°C]	Interlayer YOUNG Modulus [MPa] ABAR							
	Load Duration							
	0,01s	1 s	3 s	1 min	10 min	1 h	24 h	30 d
0	306,9	86,5	70,2	40,2	29,9	24,8	19,0	15,2
10	69,0	32,2	28,1	21,1	17,8	16,0	13,1	11,0
20	25,9	17,7	16,6	13,8	12,2	11,1	9,1	7,4
24	20,3	15,0	14,0	11,9	10,4	9,3	7,8	6,1
30	15,3	11,8	11,1	9,3	8,1	7,3	5,9	4,5
40	10,4	7,9	7,4	6,0	5,1	4,4	3,3	1,8
50	7,4	5,4	5,0	3,8	2,9	2,0	1,4	1,1
60	5,8	4,0	3,7	2,3	1,7	1,4	1,1	1,1

Poisson Number: 0,5 y

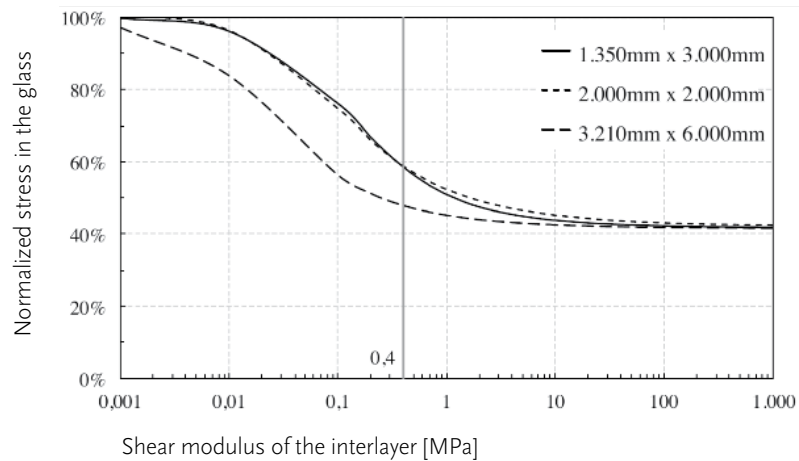
## TRANSFERENCE SHARE



No shear transfer

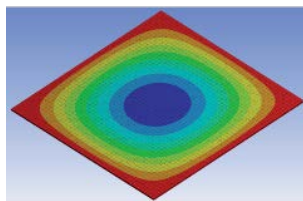
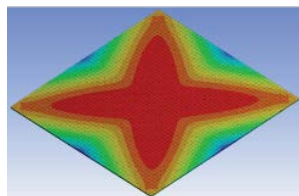


Full shear transfer



Stress in a laminated glass in dependence of the shear modulus of the interlayer for different geometries.

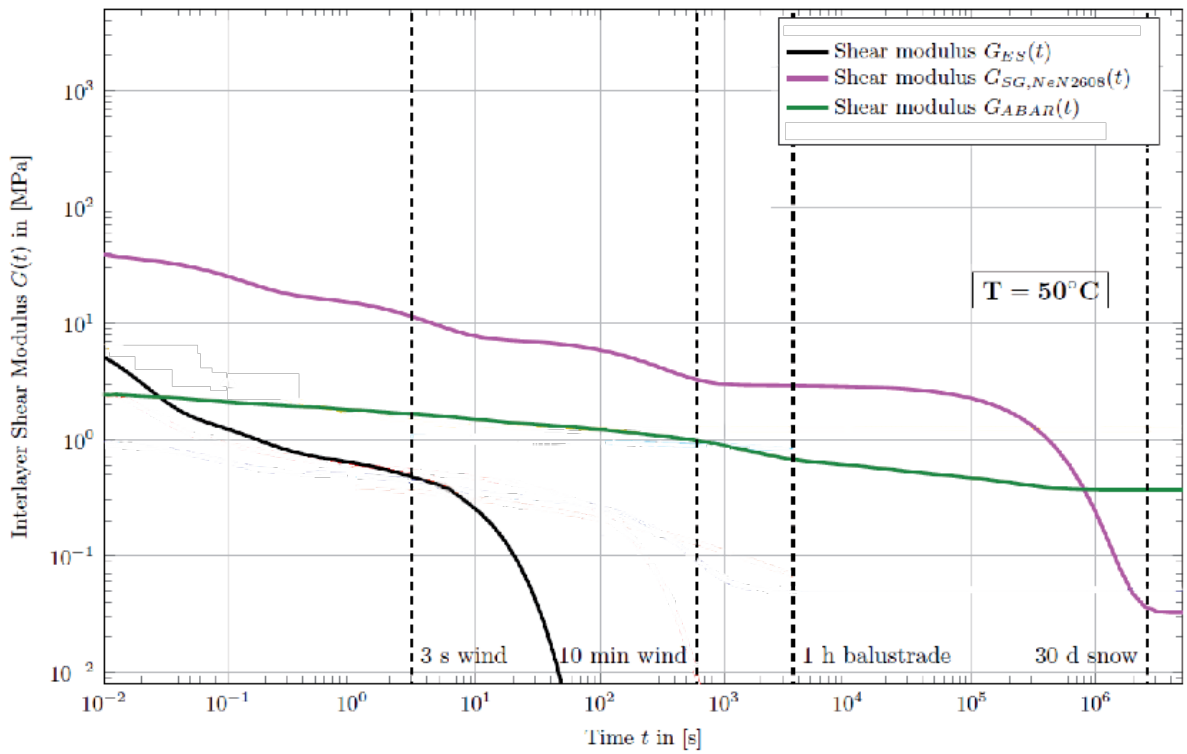
- 2 x 4mm glass thickness
- 0,76mm interlayer thickness
- all edges simply supported



der Bundeswehr  
**Universität München**



Modulus share Graphic [MPa] at 50°C



Temperature dependency – Assignment of Interlayers / Tg Concept			
PVB:	amorphous thermoplastic		
	glass transition temperature around room temperature:		
e.g.	softer / acoustic PVB:	$T_g \sim (+15^\circ\text{C})$	
	standard PVB:	$T_g \sim (+25^\circ\text{C})$	
	stiffer PVB:	$T_g \sim (+45^\circ\text{C})$	
	min. and max shear modulus $T[-60^\circ, +80^\circ\text{C}]$	$G_T \sim 0-500 \text{ MPa}$	
EVA/ABAR:	elastomer thermosetting (crosslinking while lamination)		
	glass transition temperature	$T_g \sim (-20^\circ\text{C})$	
	min. and max shear modulus $T[-60^\circ, +80^\circ\text{C}]$	$G_T \sim 0.5-500 \text{ MPa}$	
Ionoplast:	semi-crystallin thermoplastic		
	glass transition temperature	$T_g \sim (+55^\circ\text{C})$	
	min. and max shear modulus $T[-60^\circ, +80^\circ\text{C}]$	$G_T \sim 0-500 \text{ MPa}$	



C. del Pla, nº 108-110  
Pol. Ind. El Plà - 08980  
Sant Feliu de Llobregat  
Barcelona - España (Spain)  
Tel. +34 93 685 56 72  
Fax +34 93 685 53 92  
hipujol@hornospujol.com  
www.hornospujol.com

**Evalam**

Parque Empresarial de  
Penapurreira, Parcela C-4B  
As Pontes (15320)  
A Coruña, ESPAÑA  
Tel.: +34 93 685 56 72  
Fax: +34 93 685 53 92  
www.hornospujol.com  
hipujol@hornospujol.com

**Evalam** es una marca registrada de Hornos Industriales Pujol, S.A.