



Hygard® EX1100 sheet

Extreme blast resistant

Hygard® EX1100 laminates are engineered to meet U.S. Federal Government anti-terrorism force protection standards for blast resistant glazing. Glazed monolithically or as the interior lite in a dual glazed system with glass, Hygard EX1100 is suitable for commercial and government window applications requiring the highest level of transparent protection against defined high pressure loads and shock waves. These laminates are designed specifically for architectural applications that require blast mitigation performance of 42 psi or higher.

Applications

Government buildings, embassies, military buildings/facilities, chemical plants, airports, mass transit terminals, nuclear plants, power generation facilities, federal courthouse and 911 emergency centers

Additional high performance security features that can be specified include:

- Ballistic resistance
- Containment and forced entry resistance
- Hurricane and tornado protection

Typical Properties

Property	Test Method	Units	Values
PHYSICAL			
Specific Gravity	ASTM D 792	-	1.2
Chemical Resistance	ASTM D 1308	-	Pass
Poisson's Ratio**	ASTM E 132	-	0.38
OPTICAL			
Light Transmission @ 1.00"	ASTM D 1003	%	72
Haze	ASTM D 1003	%	<1
MECHANICAL			
Tensile Strength, Ultimate**	ASTM D 638	psi	9,500
Tensile Modulus**	ASTM D 638	psi	340,000
Elongation**	ASTM D 638	%	110
Flexural Strength**	ASTM D 790	psi	13,500
Taber Abrasion @ 100 Cycles, Delta Haze CS-10F Wheel @ 500 g load	ASTM D 1044	%	2
THERMAL			
Coefficient of Thermal Expansion	ASTM D 696	in/in/°F	3.75 x 10 ⁻⁵
Heat Deflection Temperature @ 264 psi	ASTM D 648	°F	270
Heat Deflection Temperature @ 66 psi	ASTM D 648	°F	280
U-Factor	NFRC 100-2010***	Btu/h-ft ² -°F	0.60
Shading Coefficient	NFRC 100-2010	-	0.88
Solar Heat Gain Coefficient	NFRC 100-2010	-	0.76
FLAMMABILITY			
Burn Rate Class	ASTM D 635	<1" extent of burn	CC-1
Ignition Temperature, Self	ASTM D 1929	°F	890
Ignition Temperature, Flash	ASTM D 1929	°F	800

Physical Performance Data

Performance	Standard / Test Method	Protection Level
Blast Resistance – 42 psi*	Dept. of State Level	Complies
Blast Resistance – GSA D*	GSA/ISC TS201	Performance Condition 2
Blast Resistance – 21 psi*	ASTM F 1642	No Hazard
Ballistic Resistance	UL 752	Level II
Ballistics – Forced Entry	ASTM F 1233-08	Class 5
Forced Entry and Containment	ASTM F 1915 H.P. White TP 0.500.03	Grade 1 Level IV Sequence 43

*Dual Glazed System with Exterior Lite of Glass.

**Values reported are for the Makrolon® sheet component of the laminate

***National Fenestration Rating Council

Agency Information

ICC-ES Evaluation Report ESR-2728

Miami-Dade NOA #12-0605.05

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Glazing recommendations

Hygard EX1100 is one component in a blast resistant window and must be modeled and tested in structural framing which is designed and approved for specified government blast pressure levels and impulses.

- Properly size material thickness based on window aspect ratio
- Glazing bite – recommend a minimum of 1-1/2"
- Rabbet depth to allow glazing bite + material thermal expansion and contraction (approx. 1/16"/ft.)
- Cut and fabricate Hygard EX1100 with approved equipment and techniques
- Utilize compatible structural sealants, gaskets, tapes, and setting blocks
- Choose an approved structural frame design rated for the appropriate blast load with an appropriate anchor type
- Conduct computer modeling on complete window design
- Mockup testing and engineering – industry standards are either shock tube or live explosives open arena testing
- Following recommended cleaning procedures per Covestro manual
- Remove protective masking
 - after the glazing operations are completed but not before other trades have completed their work and cleanup
 - before prolonged exposure to direct sunlight, moisture, and high temperatures

NOTE: Consult Covestro Makrolon Sheet Fabrication Guide for additional information

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