

LLumar Safety and Security Film Testing Matrix



Type of Protection	Standard/Test Method	SCL SR PS4	SCL SR PS7	SCL SR PS8	SCL SR PS13
Human Impact	ANSI Z97.1	Class B	Class B	Class B	Class A, B
	CPSC 16CFR1201	Cat I	Cat I	Cat I	Cat I, II
	EN 12600	2(B)2	2(B)2	1(B)1 Film Side 2(B)2 Glass Side	2(B)2
Blast*	GSA TS-01	SP-A, DL, 4 psi, 3B	SP-A, DL, 4 psi, 3B	SP-A, DL, 6.64 psi, 3B SP-A, WG, 4.43 psi, 3B SP-A, WG, 6.57 psi, 3B DP-A, WG, 4.48 psi, 2 DP-A, WG, 6.57 psi, 3B SP-T, WG, 4.43 psi, 3B DP-T, WG, 4.48 psi, 1	
	ASTM F1642			SP-A, DL, 6.64 psi, Low Hazard SP-A, WG, 6.57 psi, Very Low Hazard DP-A, WG, 6.57 psi, Low Hazard	
	ISO 16933			SP-A, DL, 7.74 psi, 3 samples: (E) Low Hazard; (D) Very Low Hazard; (E) Low Hazard SP-A, Gullwing, 7.74 psi, All 3 samples (E) Low Hazard	
Windstorm*	PA-201/202/203 ASTM E1886 ASTM E1996			SP-A, WG, Level C, 80 psf DP-T, WG, Level C, 50 psf SP-T, WG, Small, 53 psf	
Forced-Entry	EN 356				SP-A, P2A, Impact Glass Side
NFPA-101 Fire Protection Rating	ASTM E-84	Class A	Class A	Class A	Class A

*Results are for film constructions prior to 2018 reformulation. Until the reformulated films can be tested, order pre-2018 safety film constructions for blast and windstorm projects.

Blast Test Result Designations: Glass Type, Attachment System, Blast Pressure in psi, Hazard Level
psi = pounds per square inch

Windstorm Test Result Designations: Glass Type, Attachment System, Max Wind Load, Missile Type
psf = pounds per square foot

Glass type abbreviations

SP-A Single-pane annealed glass
SP-T Single-pane tempered glass
DP-A Dual-pane annealed glass
DP-T Dual-pane tempered glass

Attachment system abbreviations

DL Daylight film application, no attachment
WG Structural silicone caulking, wet-glazed

Referenced Standards/Test Method

ANSI American National Standards Institute
ASTM American Society for Testing and Materials
CFR Code of Federal Regulations (United States)
CPSC Consumer Product Safety Commission
EN European Standards
GSA General Services Administration
ISO International Standards Organization
NFPA National Fire Protection Association
PA Miami-Dade Windborne Debris Test Methods

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Test Method Information and Criteria

Human Impact

ANSI Z97.1, CPSC 16CFR1201 and EN 12600: tests to determine if a glass sample provides characteristics to minimize the chance of human injury in case of accidental human impact with glass (see below for weight of impactor, drop heights and other classifications)

ANSI Z97.1

100 lb (45.4 kg) **Cat A:** 48-inch (1219 mm) drop height **Cat B:** 18-inch (457 mm) drop ht

CPSC 16CFR1201

100 lb (45.4 kg) **Cat II:** 48-inch drop ht **Cat I:** 18-inch drop ht

EN 12600

50 kg (110 lb)

Class 1 – test sample conforms to the passing requirements at drop heights of 190 mm, 450 mm and 1200 mm (47.2 in)

Class 2 – test sample conforms to the passing requirements at drop heights of 190 mm (7.5 in) and 450 mm (17.7 in)

Type B – numerous cracks appear, but the fragments hold together and do not separate

Windstorm

Small Missile Impacts – Three separate impacts with ten (10), 2-gram, steel balls (to simulate roof gravel), shot at approximately 130 feet per second, 88 mph (40 m/s).

Level C Impact – 4.4 lb (2 kg), 48-inch (1220mm) wood sample, shot at approximately 40 feet per second, 27 mph (12.2 m/s).

Note: Only a portion of the cyclic loading (to simulate wind) is at the maximum pressure
50 psf ~ 140 mph wind (62.6 m/s), 53 psf ~ 145 mph wind (64.8 m/s), 80 psf ~ 175 mph wind (78.2 m/s)

Forced-Entry

EN 356 is a European Standard for glazing to determine ability to withstand an intruder attack. The test uses a steel ball 4.11kg (9lb) to represent a manual attack. Three (3) steel ball impacts per sample, six (6) samples. No impacts can penetrate any sample. P2A - drop height 3000mm (118 inches)

NFPA 101 Fire Protection Rating

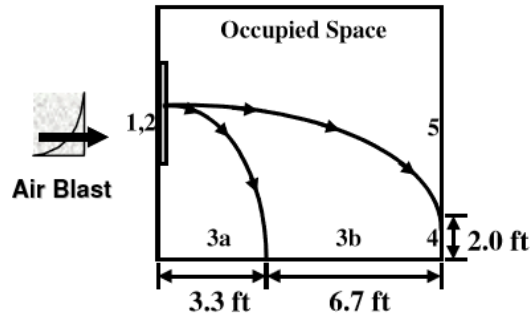
Class A Rating: Flame Spread Index 0- 25, Smoke Developed Index 0-450.

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Blast

GSA TS-01, ASTM F1642 and ISO 16933 are tests to determine the level of protection provided by window glass when subjected to blast pressure

GSA TS-01 Performance Conditions (ASTM F1642 similar performance conditions)



ISO 16933 Hazard Ratings

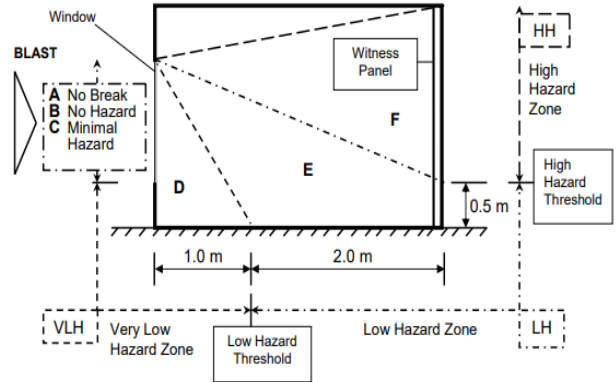


Figure 1. Glazing protection levels based on fragment impact locations.

Table 1. Glazing protection levels based on fragment impact locations.

Performance Condition	Protection Level	Hazard Level	Description of Window Glazing Response
1	Safe	None	Glazing does not break. No visible damage to glazing or frame.
2	Very High	None	Glazing cracks but is retained by the frame. Dusting or very small fragments near sill or on floor acceptable.
3a	High	Very Low	Glazing cracks. Fragments enter space and land on floor no further than 3.3 ft. from the window.
3b	High	Low	Glazing cracks. Fragments enter space and land on floor no further than 10 ft. from the window.
4	Medium	Medium	Glazing cracks. Fragments enter space and land on floor and impact a vertical witness panel at a distance of no more than 10 ft. from the window at a height no greater than 2 ft. above the floor.
5	Low	High	Glazing cracks and window system fails catastrophically. Fragments enter space impacting a vertical witness panel at a distance of no more than 10 ft. from the window at a height greater than 2 ft. above the floor.

Hazard rating	Hazard rating description	Definition
A	No Break	The glazing is observed not to fracture and there is no visible damage to the glazing system
B	No Hazard	The glazing is observed to fracture but the inner, rear face leaf is fully retained in the facility test frame or glazing system frame with no breach and no material is lost from the interior surface. Outer leaves from the attack face may be sacrificed and may fall or be projected out.
C	Minimal Hazard	The glazing is observed to fracture. Outer leaves from the attack face may be sacrificed and may fall or be projected out. The inner, rear face leaf shall be substantially retained having the total length of tears plus the total length of pull-out from the edge of the frame less than 50 per cent of the glazing sight perimeter. Also, there are no more than 3 rateable perforations or indents anywhere in the witness panel and any fragments on the floor between 1 m and 3 m from the interior face of the specimen have a sum total united dimension of 250 mm or less. Glazing dust and slivers are not accounted for in the hazard rating. If by design intent there is more than 50 % pull-out but the glazing remains firmly anchored by purpose designed fittings a rating of C (Minimal Hazard) may be awarded provided the other fragment limitations are complied with. The survival condition and anchoring provisions shall be described in the test report
D	Very Low Hazard	The glazing is observed to fracture and significant parts are located no further than 1m behind the original location of the rear face. Parts may be projected any distance from the attack face towards the blast source. Also, there are no more than 3 rateable perforations or indents anywhere in the witness panel and any fragments on the floor between 1 m and 3 m from the interior face of the specimen have a sum total united dimension of 250 mm or less. Glazing dust and slivers are not accounted for in the rating
E	Low Hazard	The glazing is observed to fracture but glazing fragments or the whole of the glazing fall beyond 1 m and up to 3 m behind the interior face of the specimen and not more than 0,5 m above the floor at the vertical witness panel. Also, there are 10 or fewer rateable perforations in the area of the vertical witness panel higher than 0,5 m above the floor and none of the perforations penetrate more than 12 mm.
F	High Hazard	Glazing is observed to fracture and there are more than 10 rateable perforations in the area of the vertical witness panel higher than 0,5 m above the floor or there are one or more perforations in the same witness panel area with fragment penetration more than 12 mm.

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All test results are from certified, independent lab testing. Test reports available on request. Samples used for testing were taken from representative product samples and are subject to normal manufacturing variances.

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