BLAST MITIGATION RESISTANT PRODUCTS

arcadia®

John M. Roll U.S. Courthouse
Yuma, Arizona
Ehrlich Architects

UNIFIED FACILITIES CRITERIA (UFC)

UFC 4-010-01 9 FEBRUARY 2012

UNIFIED FACILITIES CRITERIA (UFC) DoD MINIMUM ANTITERRORISM STANDARDS FOR BUILDINGS

1-6 INTENT

The intent of these standards is to minimize mass casualties in buildings or portions of buildings owned, leased, privatized, or otherwise occupied, managed, or controlled by or for DoD in the event of a terrorist attack. These standards provide appropriate, implementable, and enforceable measures to establish levels of protection against terrorist attacks for all inhabited DoD buildings where no known threat of terrorist activity currently exists. While complete protection against all potential threats for every inhabited building is cost prohibitive, the intent of these standards can be achieved through prudent master planning, real estate acquisition, and design and construction practices.

Where the conventional construction standoff distances detailed in these standards are met, most conventional construction techniques can be used with only marginal impact on the total construction or renovation cost. The financial impact of these standards will be significantly less than the economic and intangible costs of a mass casualty event.

DoD - UFC

Department of Defense Unified Facilities Criteria UFC 4-010-01
"Minimum Anti-Terrorism Standards for Buildings"
Table B-1

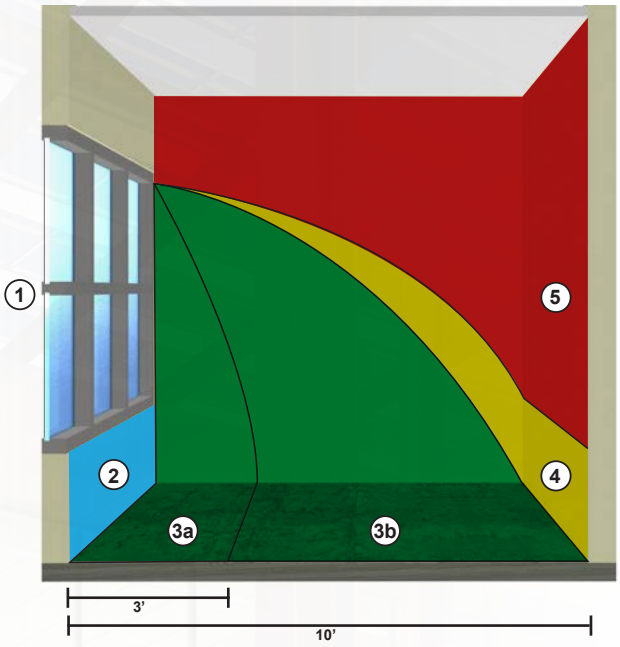
Distance to:	Building Category	Standoff Distances				
		Applicable Level of Protection	Conventional Construction Standoff Distance: Load Bearing Walls (1)	Conventional Construction Standoff Distance: Non-Load Bearing Walls (1)	Minimum Standoff Distance (2)	Applicable Explosive Weight (3)
Controlled Perimeter or Parking and Roadways without a Controlled Perimeter	Billeting and High Occupancy Family Housing	Low	A	C	18 ft (5.5 m)	I
	Primary Gathering Building	Low	A	C	18 ft (5.5 m)	I
	Inhabited Building	Very Low	B	D	18 ft (5.5 m)	I
Parking and Roadways within a Controlled Perimeter	Billeting and High Occupancy Family Housing	Low	E	G	12 ft (3.6 m)	II
	Primary Gathering Building	Low	E	G	12 ft (3.6 m)	II
	Inhabited Building	Very Low	F	H	12 ft (3.6 m)	II
Trash Containers	Billeting and High Occupancy Family Housing	Low	E	G	12 ft (3.6 m)	II
	Primary Gathering Building	Low	E	G	12 ft (3.6 m)	II
	Inhabited Building	Very Low	F	H	12 ft (3.6 m)	II

1-7 LEVELS OF PROTECTION

The levels of protection provided by these standards meet the intent described below and establish a foundation for the rapid application of additional protective measures in higher threat environments. These standards may be supplemented where specific terrorist threats are identified, where more stringent local standards apply, or where local commanders or senior leaders dictate additional measures. Detailed descriptions of the levels of protection are provided in Chapter 2 and UFC 4-020-01.

GSA-ISC

General Services Administration Inter-Agency Security Committee
"Security Design Criteria for New Federal Office Buildings or Major Modernizations"



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 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 greater than 2 ft. above the floor.

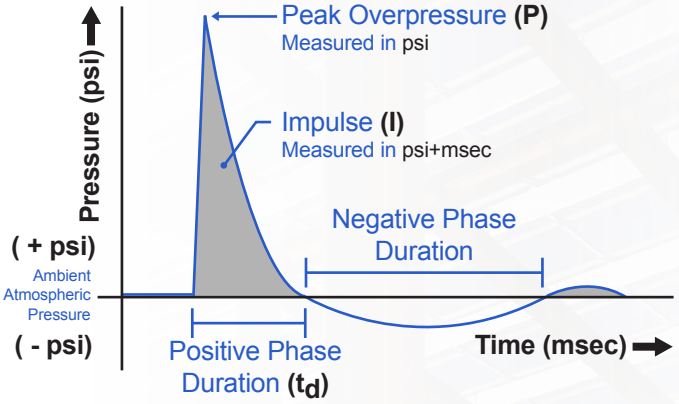
Salt Lake City - FBI Building

TYPICAL BLAST WAVE

A blast wave is an extreme energy release manifested in 4 forms; light, sound, heat and a shock wave. The chronology of a blast wave consists of a instantaneous positive pressure, wave that quickly reaches the peak overpressure point measured in psi, exerting positive pressure on a glazing assembly which decreases exponentially in milliseconds, to the zero pressure point followed by a negative pressure phase, where air rushes into the void behind the blast wave pulling the glazing assembly and debris outward as shown in the illustration below.

BLAST WAVE CHART

Incident (Side-on) Overpressure



Positive Pressure: The pressure that is produced by a blast in a positive movement.

Negative Pressure: When the positive pressure wave passes and the air is trying to fill the void left behind, i.e., rushes back in.

Duration: The time a blast pressure load is applied to the target 30-40 blast durations occur in 1 blink of the human eye measured in milliseconds. (msec, 1/1000 of a second)

Peak Pressure:

- Occurs instantaneously
- Dissipates exponentially
- Maximum pressure during incident

Over Pressure: Pressure reading over atmospheric pressure.

Reflected Pressure: Pressure wave that has rebounded off the target or surrounding structures.

Peak & Over Pressure: Used interchangeably. It is just the maximum pressure generated by a detonation at the target or at the point of measurement of the pressure.

Air Blast Pressures: Occurs very quickly and are typically measured in milliseconds.

Please keep in mind that results vary for differing structural materials. Flexible materials will absorb the energy and rigid materials essentially resist the energy. Both are valid design approaches. Material strength will be affected by the choice of a flexible or less ductile material.

ARCADIA'S COMMITMENT

Arcadia's experience to design, analyze, and develop Blast Mitigation Glazing Systems, manufactured to the highest stringent standards, to provide cost effective protection for GSA, DoD and private sector facilities.

Arcadia's Blast Mitigation Assemblies are intended to create elegant, quiet, daylight-filled, environmentally responsible, and safe buildings.

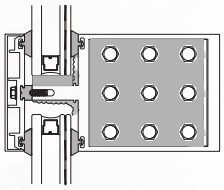
Arcadia's application engineers provide assistance in selecting the appropriate Blast Mitigation System for each project. It is strongly recommended that each project design team work with an qualified experienced blast consultant to ensure compliance.

BLAST PRODUCTS

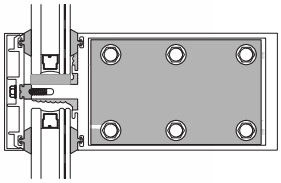
FRAMING OPTIONS

T500B-OPG3005, OPG3007 & OPG3010

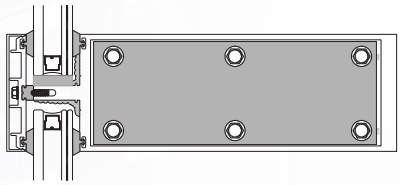
- 5-1/2, 7", 10" frame depth
- 3" sightline
- Systems may be glazed from inside or outside
- Shear block construction
- Accommodates glass up to 2-1/8" thick custom



T500B-OPG3005



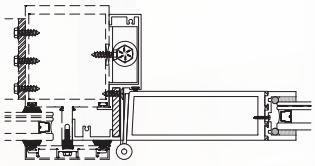
T500B-OPG3007



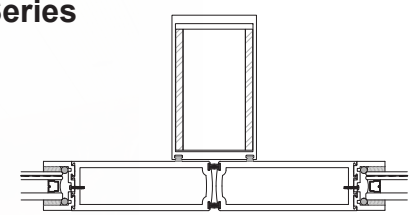
T500B-OPG3010

ENTRANCE OPTIONS

WS512B Wide Stile Series



Jamb Condition



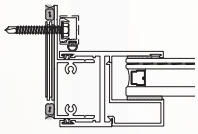
Mullion at Pair

WINDOWS OPTIONS

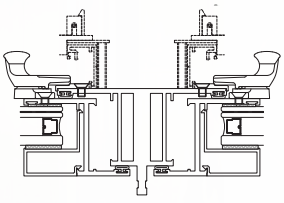
2000B, 52B, 80B

Fixed, Casement, Awning, Single Hung, Slider

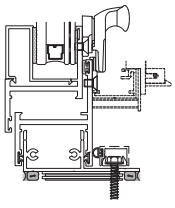
Non-Thermal/Thermal



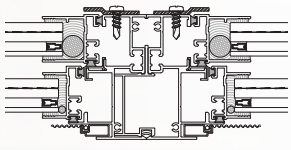
2000B Fixed



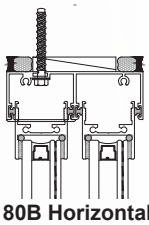
2000B Casement



2000B Awning



52B Single Hung



80B Horizontal Slider

Corporate Location

2301 East Vernon Avenue
Vernon, CA 90058

Ph 323.269.7300
Fx 323-269-7390

info@arcadiainc.com

Washington Location

7830 S. 196th Street
Kent, Washington 98032

Ph 425-869-7300
Fx 253-395-4234

Arizona Location

2510 West Geneva Drive
Tempe, AZ 85282

Ph 602-437-2514
Fx 602-437-2515

New Mexico Location

4705 Mcleod Road N.E.
Albuquerque, NM 87109

Ph 505-341-4222
Fx 505-341-4225

Nevada Location

1850 East Maule Avenue
Las Vegas, NV 89119

Ph 702-798-7300
Fx 702-798-7305

Connecticut Location

60 Bonner Street
Stamford, CT 06902

Ph 203-316-8000
Fx 203-316-8200

Hawaii Location

94-410 Uke'e Street, Bldg #A
Waipahu, HI 96797

Ph 808-678-9700
Fx 808-676-8663

Northern California Location

2187 Alpine Way
Hayward, CA 94545

Ph 510-783-4990
Fx 510-783-1149

Sacramento Location

2324 Del Monte Street
Sacramento, CA 95691

Ph 916-375-1478
Fx 916-375-1523

arcadia®

arcadiainc.com