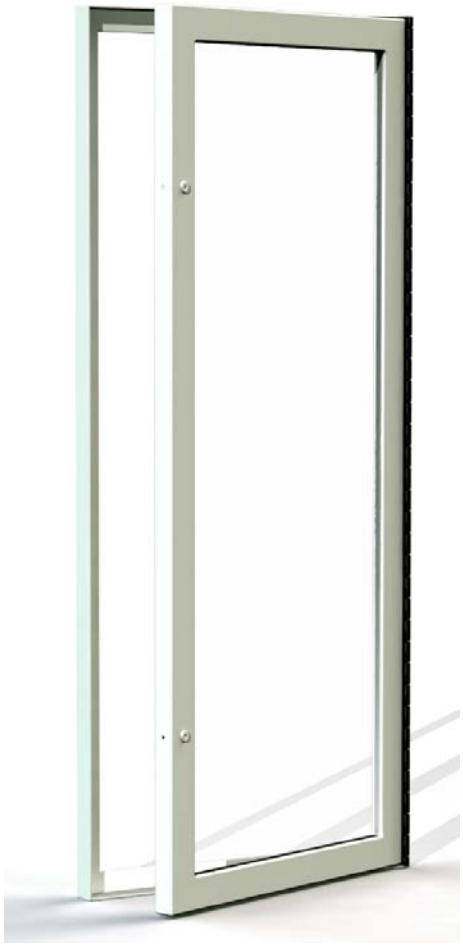
BLAST&BALLISTICS LTD

**Technical Data Sheet**

**TDSBB 1007**

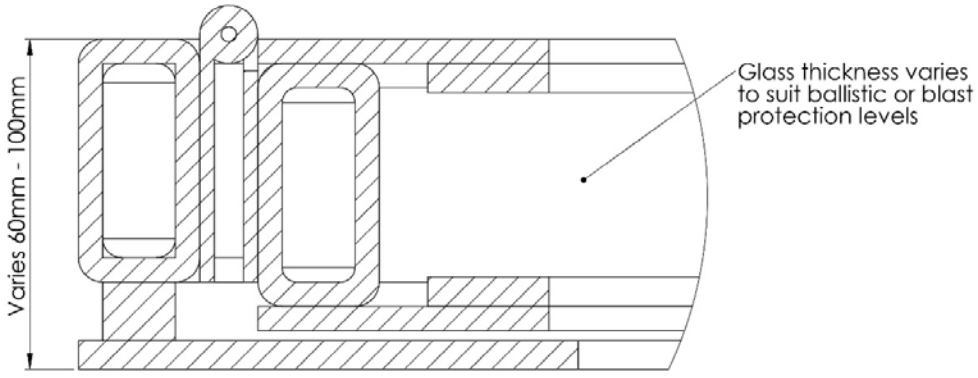


Blast rated ballistic and physical attack 'Secondary' window

# Ballistic, Blast and Physical Attack 'Primary' and 'Secondary' window and glazed protection systems

- Designed primarily for commercial and residential applications
- PPC or anodised factory applied finishes in a wide range of RAL colours or 'solid timber profiles'
- **For internal applications**
- Extensive range of testing
- Configurations – Single and multiple combined units for new or existing windows, doors, shopfronts, display cabinets
- Can be upgraded to offer higher levels of protection in the future should current threat levels change
- An inexpensive method of reinforcing existing fenestration without removing primary glazing
- Can be easily opened for cleaning and maintenance of existing

Typical steel and aluminium frame profiles – see accompanying details for further information

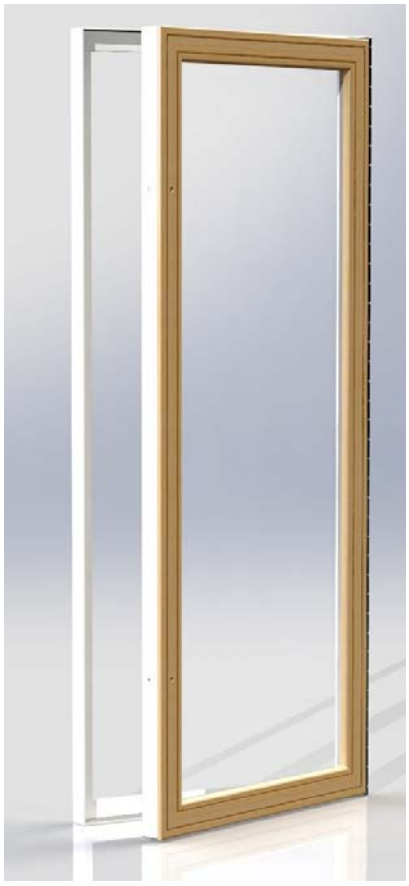


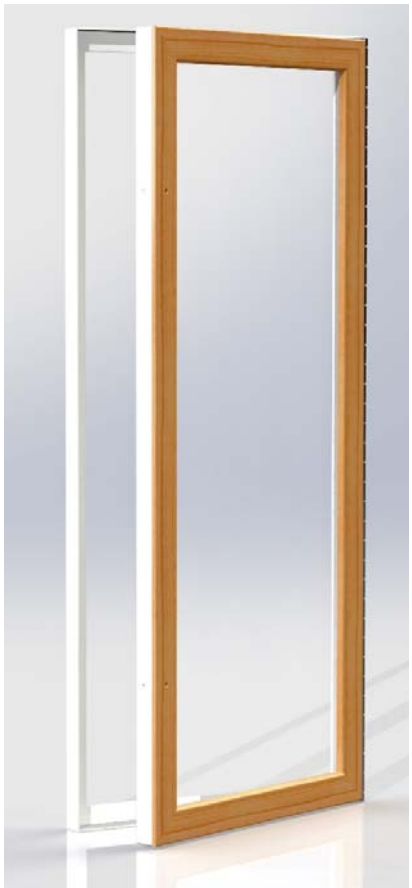
Secondary glazing is fitted ‘inside’ existing windows and doors producing a cost effective ballistic physical attack or blast solution

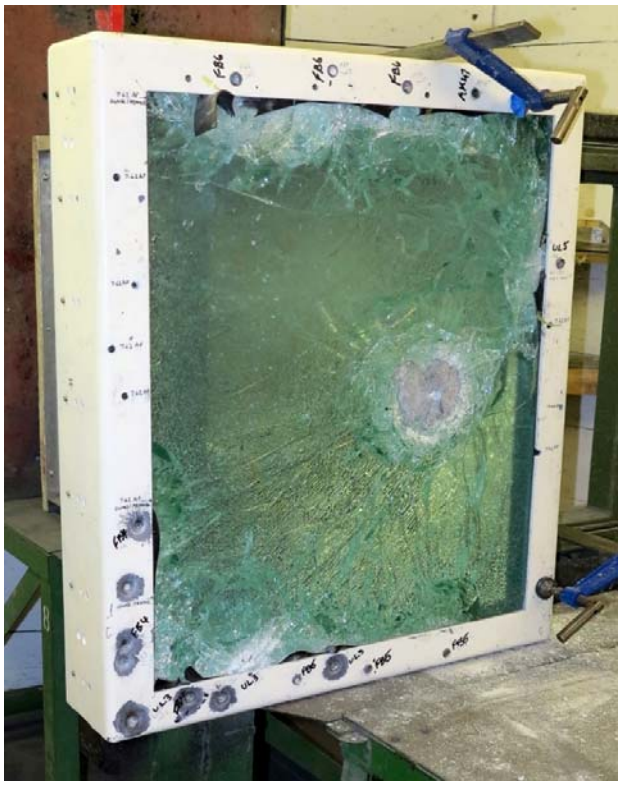

Both frames and glazing are tested together as a system whether for blast or ballistic applications

| | |
|---|---|
| Frame profile | |
| ✓ | Available as steel window profile |
| ✓ | Minimum frame depth/wall thickness 60mm - 100mm |
| Finishes | |
| ✓ | Factory applied Polyester Powder Coat |
| ✓ | Wooden finishes and profiled timber sections |
| ✓ | Galvanised |
| ✓ | Prime paint finish |
| Available sizes | |
| ✓ | Minimum 200mm width x 200mm height |
| ✓ | No maximum single pane size but suggest < 1.5m2 due to weight |
| ✓ | With additional units - indefinite |
| Glass | |
| ✓ | Low iron |
| ✓ | Tinted |
| ✓ | Double glazed units |
| Glazing thicknesses | |
| ✓ | Minimum 7.5mm for blast protection |
| ✓ | Generally 50mm - 82mm offering blast and also ballistic protection |
| ✓ | Maximum single glass pane size 2500mm x 1500mm |
| Certified Ballistic Standards | |
| ✓ | BS EN1522/23/1063 - FB7/BR7 |
| ✓ | BS EN1522/23/1063 - FB6/BR6 |
| ✓ | BS EN1522/23/1063 - FB5/BR5 |
| ✓ | BS EN1522/23/1063 - FB4/BR4 |
| ✓ | BS EN1522/23/1063 - FB3/BR3 |
| ✓ | NIJ 0108.01 IV |
| | NIJ 0108.01 IIIA |
| ✓ | UL752 Level 9 |
| ✓ | UL752 Level 5 |
| ✓ | UL752 Level 3 |
| ✓ | AK47 |
| Physical Attack Glazing | |
| ✓ | EN 356: P1A 6.8mm |
| ✓ | EN 356: P2A 6.8mm |
| ✓ | EN 356: P3A 9.2mm |
| ✓ | EN 356: P4A 9.5mm |
| ✓ | EN 356: P5A 10.3mm |
| ✓ | EN 356: P6B 11mm |
| ✓ | EN 356: P7B 14.5mm |
| ✓ | EN 356: P8B 16.5mm |
| Blast ratings | |
| ✓ | Arena testing 100 kg @25m with ballistic protection |
| ✓ | Protecting against fragmentation - grenades and pipe bombs |
| Options | |
| ✓ | Choice of locking |
| Weights | |
| ✓ | Frame profiles approx. 8kg/m - 15kg/m |
| ✓ | Glass from 32kg/m2 to 196kg/m2 |
| Packing | |
| ✓ | Supplied in international crates for dispatch |

Wide range of colours, profiles and wood finishes available to complement existing decorations and details





Both Internal and also External window systems are extensively tested against a wide range of both ballistic and blast threats producing a cost effective product and solution for all applications.

Below - ballistic test report extract – see data table for comprehensive performance specifications

Shown below – doors and overpanel glazing - also suitable for ‘secondary’ glazing system protection

**Combining BS EN1063 ballistic glass and EN356 attack glass can produce a combination product for both ballistic and also physical attack protection.**

**BS EN1063 and EN 356 are available as both Secondary and also Primary glazing products either within new build projects or as a replacement unit**

## Guide to Security Standards for Ballistic

## and Manual Attack Resistance of Staff Protection Screens

BS EN 356 provides test methods and classification for resistance of glazing against manual attack. No standard exists for the testing and classification of structures containing glass resistant to manual attack. It is recommended that the complete glazed structures should be tested in accordance with BS EN 356 energy levels with pass rates one level lower (i.e. the structure for glass certified Class P5A should be tested to Class P4A energy levels) to verify that the impact does not dislodge the glass from its frame.

## Testing Methods:

EN 356: 1999 Classifications

1. Hard body drop test
4.11 kg steel sphere (100mm diameter)

| | | |
|---|---|---|
| P1A 3 times from 1.5m | Glass thickness 6.8mm | Weight 16kg/m² |
| P2A 3 times from 3m | Glass thickness 6.8mm | Weight 16kg/m² |
| P3A 3 times from 6m | Glass thickness 9.2mm | Weight 21kg/m² |
| P4A 3 times from 9m | Glass thickness 9.5mm | Weight 21kg/m² |
| P5A 9 times from 9m | Glass thickness 10.3mm | Weight 22kg/m² |

2. Axe test
Impact from hammer followed by axe
Minimum no. of strikes to create opening

| | | |
|---|---|---|
| P6B 30 - 50 strikes | Glass thickness 11mm | Weight 23kg/m² |
| P7B 51 - 70 strikes | Glass thickness 14.5mm | Weight 28kg/m² |
| P8B over 70 strike | Glass thickness 16.5mm | Weight 30kg/m² |

## Options:

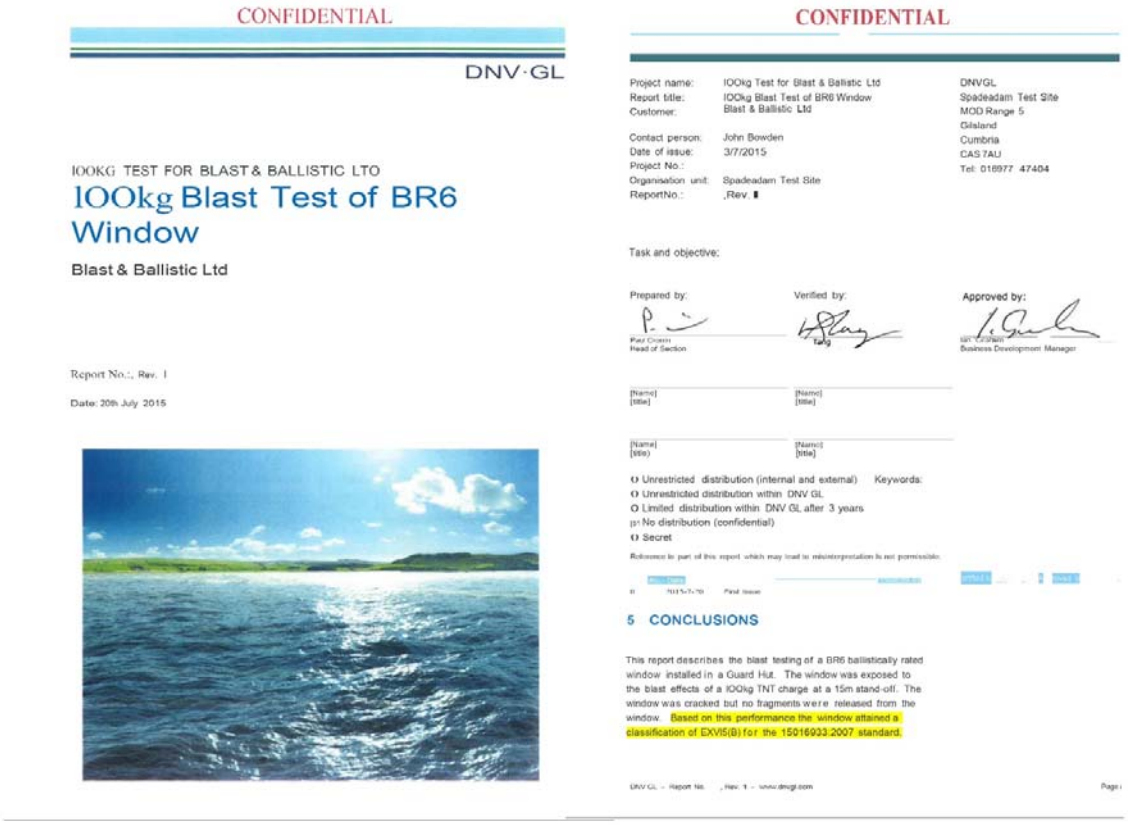
- Available as DGU
- Available in shaped details
- Available in Fire Resistance glazing
- Available as privacy glass
- EN 12600 Impact Rating
- EN 356 Security Rating
- LP 1270 Security Rating
- EN 1063 Ballistic Rating
- ISO 16933 Blast Rating
- Laminate Only
- Multi Directional for Safety, Security or Ballistic

**Replace standard glazing products with attack rated glazing units that meet EN 356 P1A to P8B covering all applications**

Conventional glazing offers little protection against physical attack as shown above

**EN 356 glass/PVB and glass/polycarbonate products are suitable for display cabinets and also large shopfronts in addition to domestic applications**

# Blast Testing – Report extract



CONFIDENTIAL

DNV·GL

100KG TEST FOR BLAST & BALLISTIC LTD

100kg Blast Test of BR6 Window

Blast & Ballistic Ltd

Report No.:, Rev. 1

Date: 20th July 2015

CONFIDENTIAL

Project name: 100kg Test for Blast & Ballistic Ltd
Report title: 100kg Blast Test of BR6 Window
Customer: Blast & Ballistic Ltd

Contact person: John Bowden
Date of issue: 3/7/2015
Project No.:
Organisation unit: Spadeadam Test Site
ReportNo.: ,Rev. ▮

DNVGL
Spadeadam Test Site
MOD Range 5
Gilsland
Cumbria
CA57AU
Tel: 016977 47404

Task and objective:

Prepared by: Verified by: Approved by:

Paul Craven
Head of Section

Ian Graham
Business Development Manager

[Name] [title]

O Unrestricted distribution (internal and external) Keywords:
O Unrestricted distribution within DNV GL
O Limited distribution within DNV GL after 3 years
þ No distribution (confidential)
O Secret

5 CONCLUSIONS

This report describes the blast testing of a BR6 ballistically rated window installed in a Guard Hut. The window was exposed to the blast effects of a 100kg TNT charge at a 15m stand-off. The window was cracked but no fragments were released from the window. Based on this performance the window attained a classification of EXVI5(B) for the 15016933:2007 standard.

Window before and after blast testing

# Ballistic charts showing the relationship between weapons and ammunition

| CLASS | WEAPON TYPE | CALIBRE | AMMUNITION TYPE | MASS (G) | RANGE (M) | VELOCITY (M/S) | STRIKE PATTERN |
|---|---|---|---|---|---|---|---|
| BR1 | Rifle |  .22lr |  Lead round nose | 2.6+/-0.1 | 10+/-0.5 | 360+/-10 | 3 x 120+/-10 |
| BR2 | Handgun |  9mm Luger |  Full steel jacket, plated round nose, soft core (lead) | 8.0+/-0.1 | 5+/-0.5 | 400+/-10 | 3 x 120+/-10 |
| BR3 | Handgun |  .357 Magnum |  Full steel jacket, plated coned bullet, soft core (lead) | 10.2+/-0.1 | 5+/-0.5 | 430+/-10 | 3 x 120+/-10 |
| BR4 | Handgun |  .44 Remington Magnum |  Full copper alloy jacket, flat nosed, soft core (lead) | 15.6+/-0.1 | 5+/-0.5 | 44-+/-10 | 3 x 120+/-10 |
| BR4+ | Rifle |  7.62 x 39 Twist Length 240mm |  Full jacket, pointed bullet Soft/FE-Core 3.6 gram | 8.0+/-0.1 | 10+/-0.5 | 720+/-10 | 3 x 120+/-10 |
| BR5 | Rifle |  5.56 x 45 Twist Length 178mm +/- 10 |  Full copper alloy jacket pointed bullet, soft core (lead) and steel penetrator (Type SS109) | 4.0+/-0.1 | 10+/-0.5 | 950+/-10 | 3 x 120+/-10 |
| BR6 | Rifle |  7.62 x 51 |  Full steel jacket, plated pointed Bullet, soft core (lead) | 9.5+/-0.1 | 10+/-0.5 | 830+/-10 | 3 x 120+/-10 |
| BR7 | Rifle |  7.62 x 51 twist Length 254mm +/- 10 |  Full copper alloy jacket pointed bullet, steel hard core, mass 3.7mm +/-0.1g hardness more than 63HRG | 9.8+/-0.1 | 10+/-0.5 | 820+/-10 | 3 x 120+/-10 |

Above: BS EN 1522/23 and BS EN1063

Below: UL 752 comparisons

| Rating | Ammunition | Weight (grains) | Weight (grams) | Min fps | Max fps | Number of Shots |
|---|---|---|---|---|---|---|
| Level 1 | 9mm Full Metal Copper Jacket with Lead Core | 124 | 8.0 | 1175 | 1293 | 3 |
| Level 2 | .357 Magnum Jacketed Lead Soft Point | 158 | 10.2 | 1250 | 1375 | 3 |
| Level 3 | .44 Magnum Lead Semi-Wadcutter Gas Checked | 240 | 15.6 | 1350 | 1485 | 3 |
| Level 4 | .30 Caliber Rifle Lead Core Soft Point (.30-06 Caliber) | 180 | 11.7 | 2540 | 2794 | 1 |
| Level 5 | 7.62mm Rifle Lead Core Full Metal Copper Jacket Military Ball (.308 Caliber) | 150 | 9.7 | 2750 | 3025 | 1 |
| Level 6 | 9mm Full Metal Copper Jacket with Lead Core | 124 | 8.0 | 1400 | 1540 | 5 |
| Level 7 | 5.56mm Rifle Full Metal Copper Jacket with Lead Core (.223 Caliber) | 55 | 3.56 | 3080 | 3383 | 5 |
| Level 8 | 7.62mm Rifle Lead Core Full Metal Copper Jacket Military Ball (.308 Caliber) | 150 | 9.7 | 2750 | 3025 | 5 |
| Level 9 | 30-06 Caliber Rifle, Steel Core, Lead Point Filler, FMJ (APM2) | 166 | 10.8 | 2715 | 2987 | 1 |
| Level 10 | .50 Caliber Rifle, Lead Core FMCJ Military Ball (M2) | 709.5 | 45.9 | 2810 | 3091 | 1 |
| Shotgun | 12-Gauge Rifled Lead Slug<br>12-Guage 00 Buckshot (12 pellets) | 1oz<br>1.5oz | 28.3<br>42 | 1585<br>1200 | 1744<br>1320 | 3<br>3 |

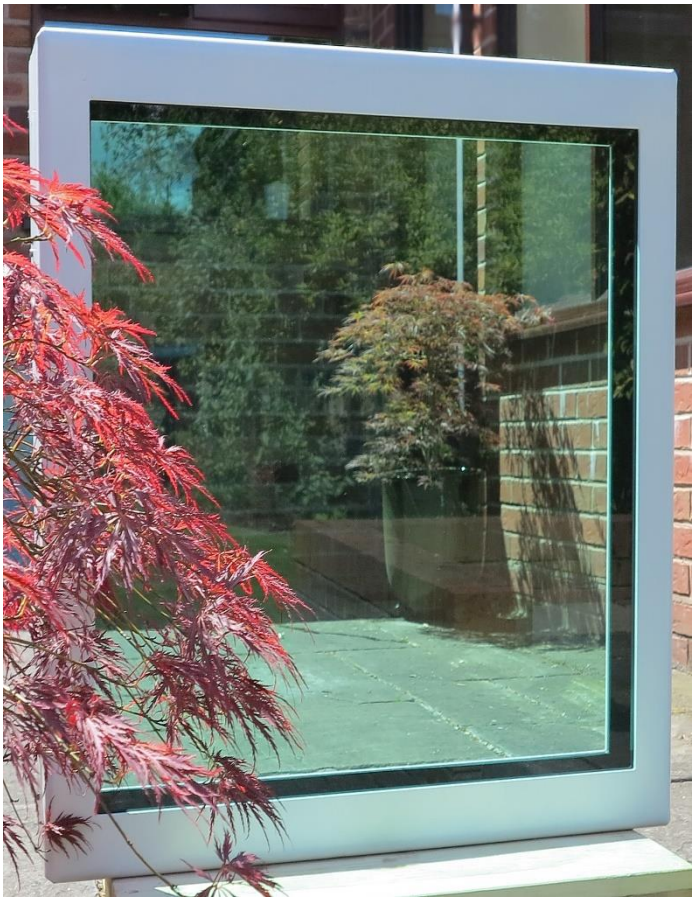
BLAST&BALLISTICS LTD

**Technical Data Sheet**

**TDSBB 1005**

# Blast tested to 100kg and now 500kg charges and also IED devices

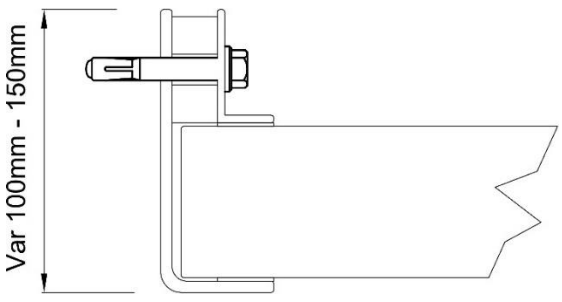
## Ballistic and Blast Steel and Aluminium Window Systems

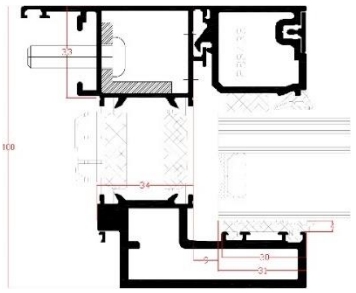


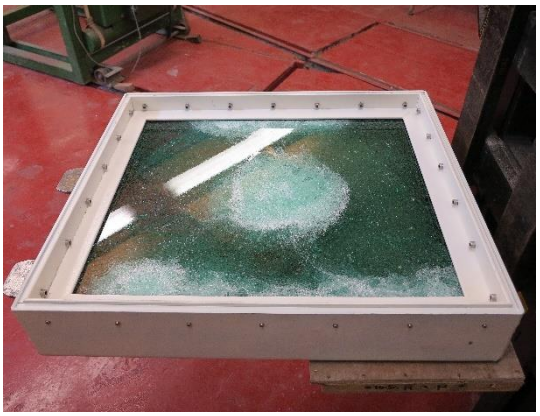
Blast rated ballistic window

- Designed primarily for commercial and military environments.
- PPC or anodised factory applied finishes in a wide range of RAL colours
- For internal and external applications
- Extensive range of testing
- Configurations – Single and multiple combined units
- Can be upgraded to offer higher levels of protection in the future should current threat levels change

Typical steel and aluminium frame profiles – see accompanying details for further information






Both frames and glazing are tested together as a system whether for blast or ballistic applications

| | |
|---|---|
| Frame profile | |
| ✓ | Available as steel window profile |
| ✓ | Available as aluminium profile |
| ✓ | Minimum frame depth/wall thickness 100mm - 150mm |
| Finishes | |
| ✓ | Factory applied Polyester Powder Coat |
| ✓ | Galvanised |
| ✓ | Prime paint finish |
| ✓ | Anodised |
| Available sizes | |
| ✓ | Minimum 200mm width x 200mm height |
| ✓ | No maximum single pane size but suggest < 1.5m2 due to weight |
| ✓ | With additional units - indefinate |
| Glass | |
| ✓ | Low iron |
| ✓ | Tinted |
| ✓ | Double glazed units |
| Glazing thicknesses | |
| ✓ | Minimum 7.5mm for blast protection |
| ✓ | Generally 50mm - 82mm offering blast and also ballistic protection |
| ✓ | Maximum single glass pane size 4000mm x 3000mm |
| Certified Ballistic Standards | |
| ✓ | BS EN1522/23/1063 - FB7/BR7 |
| ✓ | BS EN1522/23/1063 - FB6/BR6 |
| ✓ | BS EN1522/23/1063 - FB5/BR5 |
| ✓ | BS EN1522/23/1063 - FB4/BR4 |
| ✓ | BS EN1522/23/1063 - FB3/BR3 |
| ✓ | NIJ 0108.01 IV |
| ✓ | NIJ 0108.01 IIIA |
| ✓ | UL752 Level 9 |
| ✓ | UL752 Level 5 |
| ✓ | UL752 Level 3 |
| ✓ | AK47 |
| Blast ratings | |
| ✓ | Arena testing 100 kg @15m with ballistic protection |
| ✓ | Protecting against fragmentation - grenades and pipe bombs |
| Options | |
| ✓ | Thermally broken |
| ✓ | Fire rated 60 minutes |
| Weights | |
| ✓ | Frame profiles approx. 8kg/m - 15kg/m |
| ✓ | Glass from 32kg/m2 to 196kg/m2 |
| Packing | |
| ✓ | Supplied in international crates for dispatch |


United Kingdom Ministry of Defence approved test centres

# Miilux Protection 380/400/450/500 Datasheet

Chemical composition content % maximum (ladle analysis)

| Steel grade | Thickness | C | Si | Mn | P | S | Cr | Ni | Mo | B |
|---|---|---|---|---|---|---|---|---|---|---|
| Miilux® Protection 380 | 6 – 25 mm | 0,13 | 0,40 | 1,40 | 0,020 | 0,010 | 1,50 | 0,40 | 0,40 | 0,005 |
| Miilux® Protection 400 | 5 – 40 mm | 0,20 | 0,70 | 1,70 | 0,030 | 0,015 | 1,50 | 0,40 | 0,50 | 0,004 |
| Miilux® Protection 450 | 5 – 40 mm | 0,25 | 0,60 | 1,50 | 0,030 | 0,015 | 1,50 | 0,70 | 0,50 | 0,005 |
| Miilux® Protection 500 | 2,5 – 40 mm | 0,30 | 0,70 | 1,70 | 0,030 | 0,015 | 1,50 | 0,80 | 0,50 | 0,004 |

Typical mechanical properties

| Steel grade | Thickness | Yield strength $R_{p0,2}$ N/mm² | Tensile strength $R_m$ N/mm² | Elongation A5% | Impact Charpy-V -40°C kV | Hardness Range HBW |
|---|---|---|---|---|---|---|
| Miilux® Protection 380 | 6 – 25 mm | 800 | 1000 | 12 | 20 J | 320 – 370 |
| Miilux® Protection 400 | 5 – 40 mm | 1000 | 1250 | 10 | 30 J | 360 – 420 |
| Miilux® Protection 450 | 5 – 40 mm | 1200 | 1450 | 8 | 30 J | 420 – 480 |
| Miilux® Protection 500 | 2,5 – 40 mm | 1250 | 1600 | 8 | 20 J | 480 – 540 |

Technical specification of Miilux® Protection 500

| Class acc.to EN1522 | Thickness of the test (nominal) | Type of weapon | Calibre | Type of bullet | Weight of the bullet | Shooting distance | Speed of the bullet V 2,5 (m/s) |
|---|---|---|---|---|---|---|---|
| FB3 | 2,5 mm | Revolver | 357 Mag | Fulljacket, coned bulled, soft core | 10,2 g | 5 m | 430 ± 10 m/s |
| FB4 | 3,0 mm | Revolver | 44 Rem. Mag | Fulljacket, flat nose, soft core | 15,6 g | 5 m | 440 ± 10 m/s |
| | 4,2 mm | Rifle | 7,62 x 39 mm | AK-47 MEB | 8,0 g | 10 m | 720 ± 10 m/s |
| FB5 | 6,0 mm | Rifle | 5,56 x 45 mm | SS109 (M855) | 4,0 g | 10 m | 950 ± 10 m/s |
| FB6 | 6,0 mm | Rifle | 7,62 x 51 mm | M80 Nato Ball | 9,5 g | 10 m | 830 ± 10 m/s |
| FB7 | 14,0 mm | Rifle | 7,62 x 51 mm | P80 Nato AP | 9,5 g | 10 m | 820 ± 10 m/s |
| | | | | | | | |
| Stanag 4569 Level 1 | 6,0 mm<br>6,0 mm<br>9,0 mm | Rifle | 7,62 x 51 mm<br>5,56 x 45 mm<br>5,56 x 45 mm | M80 Nato Ball<br>SS109 (M855)<br>M193 | 9,5 g<br>4,0 g<br>3,5 g | 30 m<br>30 m<br>30 m | 833 ± 20 m/s<br>900 ± 20 m/s<br>937 ± 20 m/s |
| Stanag 4569 Level 2 | 12,0 mm | Rifle | 7,62 x 39 mm | API BZ | 7,7 g | 30 m | 695 ± 20 m/s |
| Stanag 4569 Level 3 | 24,0 mm<br>16,0 mm | Rifle | 7,62 x 51 mm<br>7,62 x 54R mm | AP (WC core)<br>B32 API | 8,4 g<br>10,3 g | 30 m<br>30 m | 930 ± 20 m/s<br>854 ± 20 m/s |

Above mentioned test results are according to EN 1522 and Stanag 4569, but we have tested also other classes e.g. MIL-A 46100D.
Ask for more information about delivery-specific tests from technical customer service and sales.

## Miilux Protection
## 380 | 400 | 450 | 500

BALLISTIC STEEL PLATES AND COMPONENTS
FOR HUMAN PROTECTION

DELIVERY CONDITION
- Quenched

TOLERANCES
- Dimensions according to EN 10029 or EN 10051
- Thickness according to EN 10029 class C and flatness according to EN 10029 class N, steel type H

SURFACE CONDITION
- According to EN 10163-2 class B subclass 3

GENERAL TECHNICAL DELIVERY CONDITION
- According to EN 10021. Unless otherwise agreed. Inspection documents EN 10204-2.2. Issued in English.

## Dimensional tolerances according to EN 10029

| Plate thickness in mm | Tolerances in mm |
|---|---|
| 3-4 | - 0,0 + 0,35 |
| 5-6 | - 0,0 + 0,70 |
| 7-9 | - 0,0 + 0,90 |
| 10-13 | - 0,0 + 1,00 |
| > 13 | - 0,0 + 1,10 |

Other thickness tolerances by special agreement


MACHINING
Miilux Protection products can be machined with rapid steel and hard metal (HSS) drills with a satisfactory service life if the drill advance and cutting speed are correspondingly accommodated.

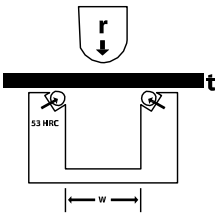
WELDING
Miilux Protection 380 and 400 can be welded well. Miilux Protection 450 and 500 are more limited with heat input and maximum welding energy. With Miilux Protection 380 and 400 preheating is needed when combined plate thickness is more than 40 mm and with Miilux Protection 450 and 500 when combined plate thickness is more than 20 mm. More information available in Miilux Protection welding brochure.

## Cold forming

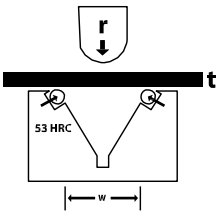
Cold forming directive limits

| Steel grade | Plate thickness (mm) | Free bending < 90° rounding radius of press/ plate thickness R/t Bending line to rolling direction | | Free bending - Free hole width/ plate thickness W/t | | Bottoming 90° - Free hole width/ plate thickness W/t |
|---|---|---|---|---|---|---|
| | | Transverse | Longitudinal | Transverse | Longitudinal | |
| Miilux® Protection 380 | 6 – 20 | 2,5 | 3,0 | 9,0 | 9,0 | ~ 15,0 |
| Miilux® Protection 400 | 5 – 20 | 3,0 | 4,0 | 9,0 | 11,0 | ~ 15,0 |
| Miilux® Protection 450 | 5 – 20 | 4,0 | 5,0 | 11,0 | 13,0 | ~ 15,0 |
| Miilux® Protection 500 | 2,5 – 20 | ~ 10,0 | ~ 12,0 | 23,0 | 27,0 | - |

Bending should be done with one press | Slow pressing speed is recommended | Lower tool should be roller-type (see drawings)



Free bending



Bottoming

Miilux®
Hard from edge to edge

Miilux Ltd
Ruonankatu 1, 92100 Raahe, Finland
Tel. +358 8 2113 500
Fax. +358 8 2113 692
www.miilux.fi
www.miiluxprotection.fi

# VETROGARD™ BULLET

Bullet resistant security glass for interior and exterior application

BR6-NS

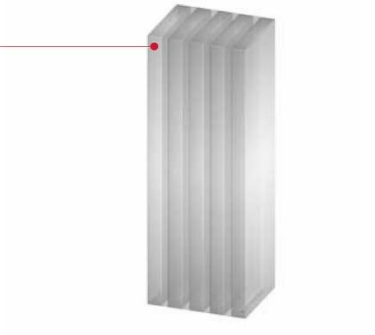
## CLASSIFICATION

= Bullet Resistant

Bullet resistant glazing offering an effective resistance against specific weapons and ammunition types. A distinction is made between splintering and non-splintering glass.

## PRODUCT FEATURES

Laminated safety glass



## TECHNICAL SPECIFICATIONS

| Reaction (EN 1063) | BR6-NS (no splinters) |
|---|---|
| Maximum Glass Size (max. 8,0 m²) | ≤ 2000 mm x 4000 mm*** |
| Thickness tolerance | ±3 mm |
| Length/height tolerance | ±4 mm to 1000 mm, ±5 mm to 2000 mm, ±6 mm over 2000 mm |
| Impact resistance (EN 12600) | 1 (B) 1 classification |
| Application Conditions | For exterior applications the glazing must be configured as insulating glass unit with low emissivity or solar control properties to achieve an adequate u-value. For more information and assistance, please contact your local Vetrotech agent and refere to the relevant "Quality Guideline, Application Conditions". |
| CE certificate No. of conformity | CPD/0497/4882/13 (you can obtain a DoP* from your national sales office) - AoC-Level 1 |
| ID-No. | HN 673-NS |
| Hazardous material contained | None |

| Nominal thickness | 73 mm (Planilux®) | 73 mm (Diamant® - extra clear) |
|---|---|---|
| Weight | 175 kg/m² | 175 kg/m² |
| Sound reduction Rw (EN 140-3) | NPD** | NPD** |
| Light transmission (EN 410) | 65% | 80% |
| Light reflection ρL (exterior/interior) | 6%/6% | 7%/7% |
| U value, W/m²K (EN 673) | 4,2 | 4,2 |
| g value | 0,46 | 0,63 |
| Energy transmission τE | 31% | 54% |
| Energy reflection ρE (exterior/interior) | 5%/5% | 6%/6% |

* Declaration of Performances
** NPD = No Performance Declared
*** Bigger sizes available on request

# VETROGARD™ BULLET

Bullet resistant security glass for interior and exterior application

BR4-NS

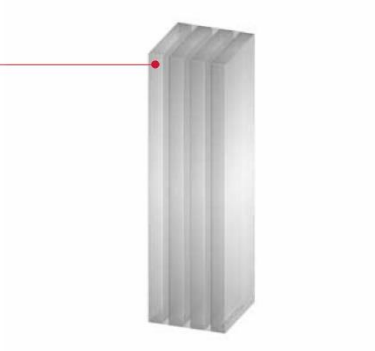
## CLASSIFICATION

= Bullet Resistant

Bullet resistant glazing offering an effective resistance against specific weapons and ammunition types. A distinction is made between splintering and non-splintering glass.

## PRODUCT FEATURES

Laminated safety glass



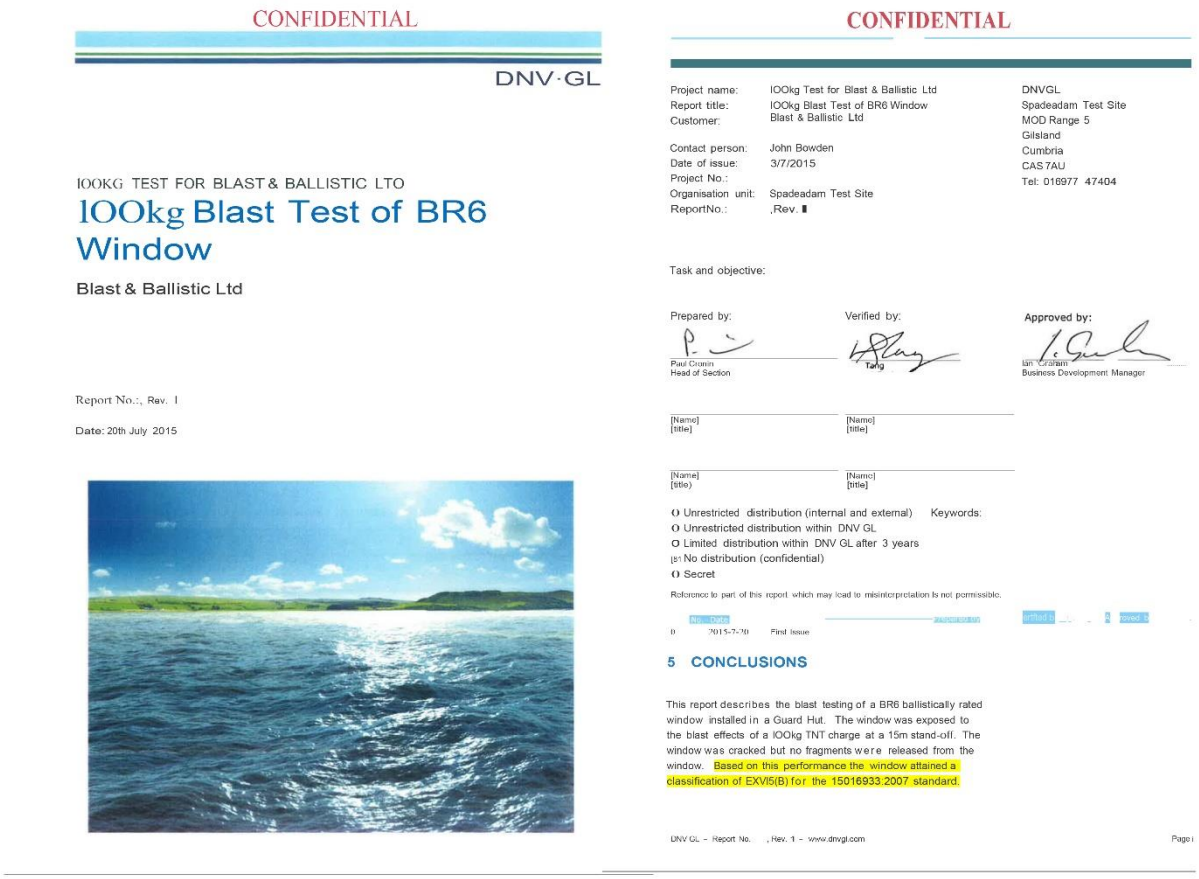
## TECHNICAL SPECIFICATIONS

| Reaction (EN 1063) | BR4-NS (no splinters) |
|---|---|
| Maximum Glass Size (max. 11,6 $m^2$) | ≤ 2600 mm x 5000 mm*** |
| Thickness tolerance | ±3 mm |
| Length/height tolerance | ±4 mm to 1000 mm, ±5 mm to 2000 mm, ±6 mm over 2000 mm |
| Impact resistance (EN 12600) | 1 (B) 1 classification |
| Application Conditions | For exterior applications the glazing must be configured as insulating glass unit with low emissivity or solar control properties to achieve an adequate u-value. For more information and assistance, please contact your local Vetrotech agent and refere to the relevant "Quality Guideline, Application Conditions". |
| CE certificate No. of conformity | CPD/0497/4882/13 (you can obtain a DoP* from your national sales office) - AoC-Level 1 |
| ID-No. | HN 454-NS |
| Hazardous material contained | None |

| Nominal thickness | 54 mm (Planilux®) | 54 mm (Diamant® - extra clear) |
|---|---|---|
| Weight | 129 kg/$m^2$ | 129 kg/$m^2$ |
| Sound reduction Rw (EN 140-3) | NPD** | NPD** |
| Light transmission (EN 410) | 71% | 83% |
| Light reflection ρL (exterior/interior) | 7%/7% | 8%/8% |
| U value, W/$m^2$K (EN 673) | 4,5 | 4,5 |
| g value | 0,51 | 0,67 |
| Energy transmission τE | 37% | 59% |
| Energy reflection ρE (exterior/interior) | 5%/5% | 6%/6% |

* Declaration of Performances
** NPD = No Performance Declared
*** Bigger sizes available on request

# Blast Testing – Report extract



CONFIDENTIAL

DNV·GL

IOOKG TEST FOR BLAST & BALLISTIC LTO

## 100kg Blast Test of BR6 Window

Blast & Ballistic Ltd

Report No.:, Rev. 1

Date: 20th July 2015

CONFIDENTIAL

| | | |
|---|---|---|
| Project name: | IOOkg Test for Blast & Ballistic Ltd | DNVGL |
| Report title: | IOOkg Blast Test of BR6 Window | Spadeadam Test Site |
| Customer: | Blast & Ballistic Ltd | MOD Range 5 |
| | | Gilsland |
| Contact person: | John Bowden | Cumbria |
| Date of issue: | 3/7/2015 | CA57AU |
| Project No.: | | Tel: 016977 47404 |
| Organisation unit: | Spadeadam Test Site | |
| ReportNo.: | ,Rev. | |

Task and objective:

Prepared by: Paul Cronin, Head of Section

Verified by: Tang

Approved by: Ian Graham, Business Development Manager

[Name] [title]

[Name] [title]

[Name] [title]

[Name] [title]

O Unrestricted distribution (internal and external) Keywords:
O Unrestricted distribution within DNV GL
O Limited distribution within DNV GL after 3 years
[x] No distribution (confidential)
O Secret

Reference to part of this report which may lead to misinterpretation is not permissible.

| No. | Date | | |
|---|---|---|---|
| 0 | 2015-7-20 | First issue | |

### 5 CONCLUSIONS

This report describes the blast testing of a BR6 ballistically rated window installed in a Guard Hut. The window was exposed to the blast effects of a IOOkg TNT charge at a 15m stand-off. The window was cracked but no fragments were released from the window. Based on this performance the window attained a classification of EXVI5(B) for the 15016933.2007 standard.

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Window before and after blast testing

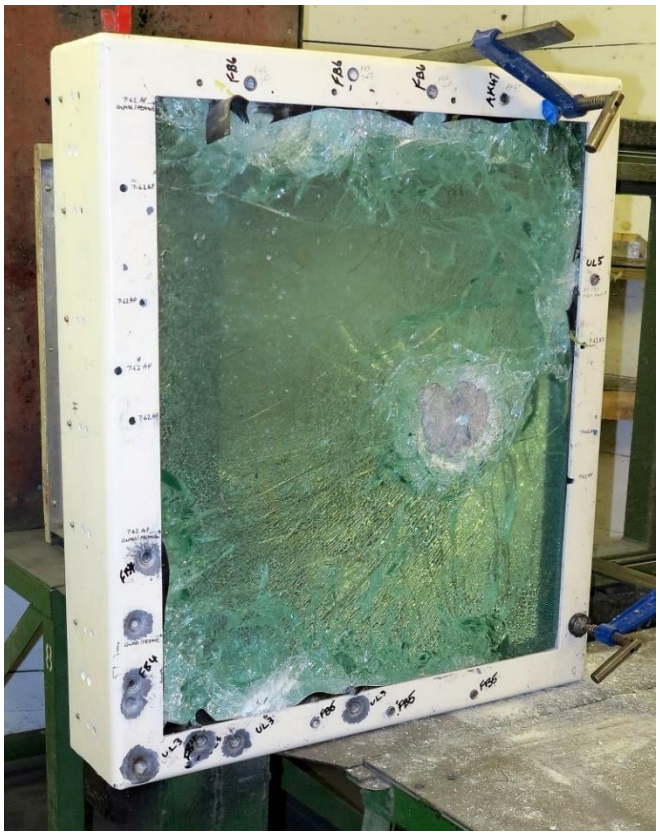
# Ballistic charts showing the relationship between weapons and ammunition

| CLASS | WEAPON TYPE | CALIBRE | AMMUNITION TYPE | MASS (G) | RANGE (M) | VELOCITY (M/S) | STRIKE PATTERN |
|---|---|---|---|---|---|---|---|
| BR1 | Rifle |  .22lr |  Lead round nose | 2.6+/-0.1 | 10+/-0.5 | 360+/-10 | 3 x 120+/-10 |
| BR2 | Handgun |  9mm Luger |  Full steel jacket, plated round nose, soft core (lead) | 8.0+/-0.1 | 5+/-0.5 | 400+/-10 | 3 x 120+/-10 |
| BR3 | Handgun |  .357 Magnum |  Full steel jacket, plated coned bullet, soft core (lead) | 10.2+/-0.1 | 5+/-0.5 | 430+/-10 | 3 x 120+/-10 |
| BR4 | Handgun |  .44 Remington Magnum |  Full copper alloy jacket, flat nosed, soft core (lead) | 15.6+/-0.1 | 5+/-0.5 | 44-+/-10 | 3 x 120+/-10 |
| BR4+ | Rifle |  7.62 x 39 Twist Length 240mm |  Full jacket, pointed bullet Soft/FE-Core 3.6 gram | 8.0+/-0.1 | 10+/-0.5 | 720+/-10 | 3 x 120+/-10 |
| BR5 | Rifle |  5.56 x 45 Twist Length 178mm +/- 10 |  Full copper alloy jacket pointed bullet, soft core (lead) and steel penetrator (Type SS109) | 4.0+/-0.1 | 10+/-0.5 | 950+/-10 | 3 x 120+/-10 |
| BR6 | Rifle |  7.62 x 51 |  Full steel jacket, plated pointed Bullet, soft core (lead) | 9.5+/-0.1 | 10+/-0.5 | 830+/-10 | 3 x 120+/-10 |
| BR7 | Rifle |  7.62 x 51 twist Length 254mm +/- 10 |  Full copper alloy jacket pointed bullet, steel hard core, mass 3.7mm +/-0.1g hardness more than 63HRG | 9.8+/-0.1 | 10+/-0.5 | 820+/-10 | 3 x 120+/-10 |

Above: BS EN 1522/23 and BS EN1063

Below: UL 752 comparisons

| Rating | Ammunition | Weight (grains) | Weight (grams) | min fps | max fps | Number of shots |
|---|---|---|---|---|---|---|
| **Level 1** | 9mm Full Metal Copper Jacket with Lead Core | 124 | 8.0 | 1175 | 1293 | 3 |
| **Level 2** | .357 Magnum Jacketed Lead Soft Point | 158 | 10.2 | 1250 | 1375 | 3 |
| **Level 3** | .44 Magnum Lead Semi-Wadcutter Gas Checked | 240 | 15.6 | 1350 | 1485 | 3 |
| **Level 4** | .30 Caliber Rifle Lead Core Soft Point (.30-06 Caliber) | 180 | 11.7 | 2540 | 2794 | 1 |
| **Level 5** | 7.62mm Rifle Lead Core Full Metal Copper Jacket Military Ball (.308 Caliber) | 150 | 9.7 | 2750 | 3025 | 1 |
| **Level 6** | 9mm Full Metal Copper Jacket with Lead Core | 124 | 8.0 | 1400 | 1540 | 5 |
| **Level 7** | 5.56mm Rifle Full Metal Copper Jacket with Lead Core (.223 Caliber) | 55 | 3.56 | 3080 | 3383 | 5 |
| **Level 8** | 7.62mm Rifle Lead Core Full Metal Copper Jacket Military Ball (.308 Caliber) | 150 | 9.7 | 2750 | 3025 | 5 |
| **Level 9** | .30-06 caliber rifle, steel core, lead point filler, FMJ (APM2) | 166 | 10.8 | 2715 | 2987 | 1 |
| **Level 10** | .50 caliber rifle, lead core FMCJ Military Ball (M2) | 709.5 | 45.9 | 2810 | 3091 | 1 |
| **Shotgun** | 12-Gauge Rifled Lead Slug<br>12-Gauge 00 Buckshot (12 pellets) | 1 0z.<br>1.5oz | 28.3<br>42 | 1585<br>1200 | 1744<br>1320 | 3<br>3 |



Window systems are extensively tested against a wide range of both ballistic and blast threats producing a cost effective product and solution for all applications

Wiltshire Ballistic Services Ltd
The Ranges, Station Road,
Devizes, Wiltshire, SN10 1BZ
Tel: 01380 721644
Fax: 01380 721421

TEST REPORT
10474b - WBS - 05/001/2016
01 January 2016

Blast and Ballistics Ltd
26 Birmingham Road
Walsall
West Midlands
WS1 2LZ

| | | | |
|---|---|---|---|
| Trial Number | 10474b | Range Temp (°C) | 16.0 |
| Trial Date | 05/01/2016 | Range Humidity (%) | 88 |
| Trial Start Time | 09:00 | Range Pressure (mBar) | 971 |
| Trial Finish Time | 13.00 | Range Technician | Ben Smith |
| | | Range Technician | James Philbrook |
| | | Range Technician | |

Report Completed James Philbrook Approved Signatory Sharon Pflieger-Taylor

BALLISTICTESTDETAILS

UL 752 Level 5; UL 752 Level 3; EN 1522/23 and EN 1063 FB/BR 3, 4, 5 and 6.

| Shot No. | Velocity m/s | Trauma/Spall | Comments | Area of Assembly | Test |
|---|---|---|---|---|---|
| 1 | 861.10 | No Spall | Level 5 | Frame System | Pass |
| 2 | 835.94 | No Spall | Level 5 | Glass | Pass |
| 3 | 420.20 | No Spall | Level 3 | Frame System | Pass |
| 4 | 419.74 | No Spall | Level 3 | Frame System | Pass |
| 5 | N/R | No Spall | Level 3 | Frame System | Pass |
| 6 | 425.68 | No Spall | Level 3 | Frame System | Pass |
| 7 | 431.85 | No Spall | Level 3 | Glass | Pass |
| 8 | 430.28 | No Spall | Level 3 | Glass | Pass |
| 9 | 430.26 | No Spall | Level 3 | Glass | Pass |
| 10 | 831.46 | No Spall | FB6 | Frame System | Pass |
| 11 | 824.33 | No Spall | FB6 | Frame System | Pass |
| 12 | 829.05 | No Spall | FB6 | Frame System | Pass |
| 13 | 953.74 | No Spall | FB5 | Frame System | Pass |
| 14 | 954.56 | No Spall | FB5 | Frame System | Pass |
| 15 | 958.68 | No Spall | FB5 | Frame System | Pass |
| 16 | 427.42 | No Spall | FB4 | Frame System | Pass |
| 17 | N/R | No Spall | FB4 | Frame System | Pass |
| 18 | 475.08 | No Spall | FB4 | Frame System | Pass |
| 19 | 468.24 | No Spall | FB4 | Frame System | Pass |
| 20 | 434.07 | No Spall | FB4 | Frame System | Pass |
| 21 | 432.21 | No Spall | FB3 | Frame System | Pass |
| 22 | 437.18 | No Spall | FB3 | Frame System | Pass |
| 23 | 432.11 | No Spall | FB3 | Frame System | Pass |
| 24 | 830.08 | No Spall | BR7 | Glass | Pass |
| 25 | 676.64 | No Spall | AK47 | Frame System | Pass |

Summary of test data from trial No. 10474b carried out on 5th January 2016 on behalf of Blast and Ballistics Ltd.



Ballistic test report extract – see data table for comprehensive performance specifications