

GUIDANCE NOTE: BULLET RESISTANT GLASS

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Introduction

The use of guns by both terrorists and criminals may be considered a threat for some locations. If this is the case bullet resistance may need to be provided for parts of the building. Guidance to assist the building owner in selecting a design threat is contained in EBP Note 13/14.

The aim of this guidance note is to assist the building owner, security manager and facility managers to ensure that suitable bullet resistant glass is selected to mitigate the threat and that have been certified as meeting the required standard.

If in doubt, technical advice should be sought from specialist engineers with experience and training in designing and implementing bullet resistant measures. These may be Members of the Register of Security Engineers and Specialists (RSES) www.rses.org.uk or will be able to demonstrate that they have similar levels of competence to those required for membership.

Test standards¹

There is a European test standard (BS EN 1063) for bullet resistant glass (BRG). However BRG will need to be mounted in a window frame which should also be subject to testing in accordance with the separate, complementary standards for bullet resistant windows, doors, shutters and blinds (BS EN 1522 and BS EN 1523). Further guidance is in EBP Note 15/14.

Bullet resistant glass (BRG)

Test requirements for BRG are specified in BS EN 1063. When a bullet hits BRG, the glass is badly cracked for some distance from the point of impact. This means that a subsequent bullet may hit glass that has already been damaged and weakened. To ensure this effect is assessed the standard requires that three shots are fired so that the points of impact form a 120 mm triangle (as shown in Figure 1). This ensures that any reduction in performance after the first shot is assessed.

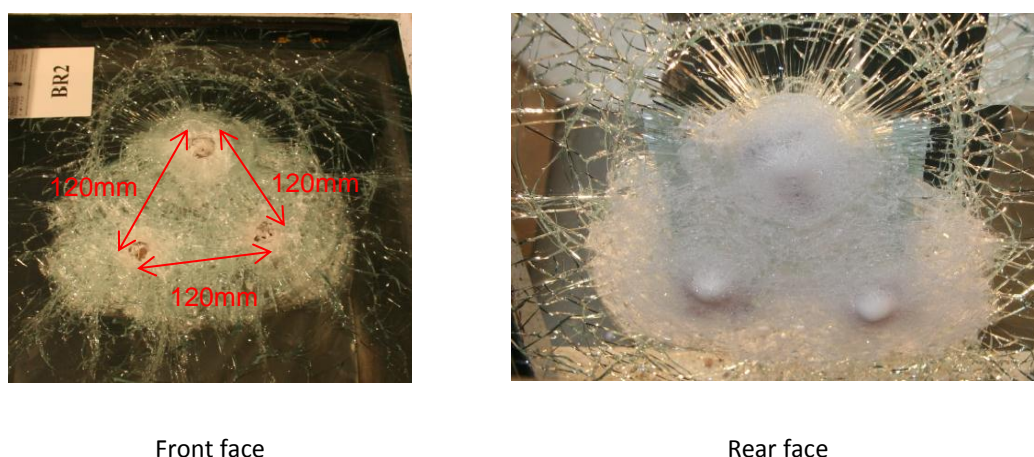


Figure 1 - Test of conventional BRG with Spall

Conventional BRG is made by laminating layers of glass with poly-vinyl butyrate (PVB). In some cases the bullets will be stopped by the glass but splinters of glass may be ejected from the rear surface into the protected space. These splinters are unlikely to cause serious injury but could cause eye damage or enter the skin if personnel are close to the glass. In some locations this may be acceptable but, if it is not, thicker glass will be needed. To identify products which achieve this, the standard (BS EN 1522) provides the opportunity of specifying the glass as Splinters (S) or No Splinters (NS).

Improved BRG can be made using glass and polycarbonate layers. This type of BRG is thinner and considerably lighter than conventional BRG and eliminates splinters however it is considerably more expensive.

¹BS EN 1063:2000 Glass in building – Security Glazing – Testing and classification against bullet attack
BS EN 1522:1999 Windows, doors, shutters and blinds – Bullet resistance – Requirements and classification

BS EN 1523:1999 Windows, doors, shutters and blinds – Bullet resistance – Test method

BRG is made by a number of manufacturers who may use different combinations and thicknesses of layers to defeat a threat. The manufacturer should be able to produce evidence of their product having been tested by an accredited test organisation.

It should be noted that the construction of the sheets are not usually symmetrical so that it is important that they are installed with the correct side facing the potential threat.

Table 1 provides thicknesses and weights of BRG glass for the standard range of threats in BS EN 1522 and for the S and NS requirement. As manufacturers' products differ, the thickness and weights shown are only indicative.

Table 1 – Summary of indicative BRG thickness required to protect against BR threats

Threat	Conventional Glass		Conventional Glass		Glass Polycarbonate		Gun	Calibre	Bullets
	Splinters(S)		No Splinters (NS)		No Splinters (NS)				
	Thickness	Mass	Thickness	Mass	Thickness	Mass			
	mm	kg/m ²	mm	kg/m ²	mm	kg/m ²			
BR 1	15	36	ND	ND	13	27	Rifle	.22 in LR	Lead (x3)
BR 2	20	48	ND	ND	17	36	Hand gun	9 mm Luger	Ball (x3)
BR 3	26	63	ND	ND	17	36	Hand gun	.357 in Magnum	Ball (x3)
BR 4	32	77	54	130	24	52	Hand gun	.44 in Magnum	Ball (x3)
BR 5	42	101	58	140	35	66	Rifle	5.56 mm x 45	Ball with steel penetrator (x3)
BR 6	62	152	71	170	38	83	Rifle	7.62 mm x 51	Ball (x3)
BR 7	83	200	81	195	74	170	Rifle	7.62 mm x 51	Armour piercing (x3)
SG 1	34	78	54	130	24	52	Shot gun	12 bore x 70	Solid lead slug (x3)
SG 2	42	103	71	170	38	83	Shot gun	12 bore x 70	Solid lead slug (x1)

ND – No data

Further guidance

Further guidance is contained in:

EBP Note 13/14 – Protection against bullets

EBP Note 15/14 – Bullet resistant windows, doors, blinds and shutters