

Uncompromising safety, functional beauty

 PROTECT Security Glass Products



vetrotech
SAINT-GOBAIN



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Total protection for you Solutions from us

As we go about our daily lives, we need to feel a basic sense of security. We expect it – we take for granted that we will feel safe. But in today's modern world, threats to that safety are all around us. Just look at any news bulletin. That's why it's sensible to take extra precautions – such as installing the right type of safety glass. Then you will feel sure that your people, property and assets are protected, giving you complete peace of mind.

Government offices, transport terminals, schools, shopping malls, banks, museums, hospitals etc... all these need added protection against various forms of malicious attack.

Making the right choices to provide appropriate protection is a major concern – for the building itself and for its contents, such as valuable assets or sensitive information. But of course, the most important concern is the protection of people, who may even be in a direct line of fire or under threat of physical attack.

It is the responsibility of those involved in the design, specification and building management chain – architects, owners, insurers and system providers – to ensure that suitable and effective levels of protection are in place.

Three main types of risk need to be considered:

- Physical attack, both planned attacks and opportunistic damage (such as vandalism and theft)
- Ballistic impact (firearms of various calibres, including handguns, rifles and shotguns)
- Explosion impact (satchel or car bombs)

Each attack scenario is different. The potential risks and threats have to be evaluated for each situation and location so that appropriate protection can be put in place.

Our range of safety glass for the FIRE and PROTECT sectors has every eventuality covered. Fire resistance, attack resistance, bullet resistance, blast resistance... Covering the entire spectrum of safety glass products, you can trust Vetrotech to provide you with the best tailor-made internal and external solutions to suit your needs.

Vetrotech PROTECT security solutions.

People – Property – Possessions



Let us help you find the right solution

It can be difficult to anticipate the level and extent of attack that might occur. Attackers have a broad range of tools, weapons and attack methods at their disposal, and their motivation and ingenuity can be too easily underestimated.

Whatever the motive, gaining unlawful entry can cause serious damage and injury. But naturally the extent of both can vary.

It is always better to be over-prepared than under-prepared, so the right security glazing solution is the one that will counteract the perceived risk and reduce (or even eliminate) the potential threat. As the saying goes, *“it's better to be safe than sorry”*.

Five key questions should be asked when trying to choose the most suitable solution:

- What is to be protected?
- What is the extent of the possible and probable threats?
- What are the consequences of not providing adequate protection against the risk?
- What could be lost or damaged?
- What type and level of safety glazing is needed as additional protection assurance?

Vetrotech can provide the solution

Vetrotech is one of the world's biggest names in high-performance glass production. We have a continuous programme of investment in targeted R&D to expand our range of products with wide-ranging levels of performance. Alongside this, we have an unwavering commitment to quality in product design, glass technology and manufacturing processes.




This approach includes a dedication to testing and retesting. We do this to make sure that all our products are fit for purpose at various graded performance levels, so that you can be sure that they meet the toughest of today's security challenges. Working together with you, we make sure that we understand exactly what you need so that we can offer you the most appropriate solution.

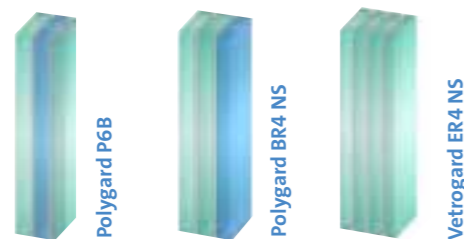
British Embassy, Warsaw, Poland, ©Peter Cook

Comprehensive glass solutions, whatever your requirements

The PROTECT range is based on an ideal combination of the rigidity and compressive strength of glass with the plasticity and energy-absorbing properties of polymer interlayers. The objective is to prevent penetration, reduce the chances of cracks spreading through the composite and minimise the risks of injury to those on the protected side. The ability of the multi-layer structure to do that under increasing levels of attack can be readily raised in proportion by progressively adding glass-plastic layers to effectively counter higher levels of threat.

Polygard® and Vetrogard® offer supreme protection against all forms of attack. In the table below, you find the EU norms and terms for a broad range of attack classifications. You may use it to choose the right option to suit your needs.

Overview of PROTECT glass solutions		
Class		
Composition	Vetrogard® (Glass)	Polygard® (Glass-Polycarbonate)
 Attack-resistant (EN 356)		
	P6B	P6B
	P7B	P7B
	P8B	P8B
 Bullet-resistant (EN 1063)		
	BR1	BR1
	BR2	
	BR3	
	BR4	BR4
	BR5	BR5
	BR6	BR6
	BR7	
	SG1	SG1
	SG2	SG2
 Blast-resistant (EN 13541)		
	ER1	
	ER2	
	ER3	
	ER4	



Bullet and blast solutions are available in splintering and non splintering make-ups.



Attack resistance: are you well protected?

Many private companies and organisations keep valuable assets on their premises: money, jewellery, data, documents... even historic artefacts and art collections. Naturally, they want to be sure that these assets are protected from attacks or theft. Our PROTECT range offers this reassurance and protection.

PROTECT glass doesn't just stop intruders getting in; it also stops people getting out. So for prisons, penal institutions and forensic psychiatric clinics, it is a shrewd choice – not only because it is escape resistant, but because it protects both inmates and wardens against injury should an attempt be made.

Both our Vetrogard® and Polygard® Attack products offer this ultimate security. But unlike other attack-resistant glass, Polygard® offers a lighter, narrower glazing solution, thanks to the addition of polycarbonate. Using glass that is lighter and narrower can result in savings on construction costs. And because of the extra

flexibility, it also means that there is a wider range of possibilities for unique transparent architectural designs, allowing buildings to blend seamlessly with the aesthetics of their surroundings.

The table below shows the results of the impact tests and the resistance classes that apply to PROTECT Attack glass.







It shows:

- the type and classification of tools it was tested against
- for how long the glass can withstand an attack (according to standard tests)

This information is based on “worst-case scenario” test conditions (because of the uncertainties that apply in practice).

To learn more about how we can protect your people, building and assets, visit: www.vetrotech.com/attack-resistance

The figure below illustrates the different classes of attack-resistant security glass and the prescribed resistance specification, the entry tools used per class and the actual penetration time.

System Classification			
Resistance class-system (EN 1627)	Tools	Tool class	Resistance time in minutes (EN 1627)
RC1		A1	
RC2		A2	3
RC3		A3	5
RC4		A4	10
RC5		A5	15
RC6		A6	20

Criminal Court, Ireland, ©Saint-Gobain



Bullet resistance: are you safe under fire?

Unfortunately, some buildings are prone to attacks from firearms: banks, ministries, embassies, consulates, police stations, prisons and military organisations... Where the risk of attack from firearms is a very real threat, occupants need to feel confident in the security measures that are in place.

The bullet-resistant security glass in our PROTECT range offers supreme protection even from powerful weaponry, in the form of Vetrogard® and Polygard® Bullet. These ultra-tough glass solutions include both splintering and non-splintering options. Choosing the non-splintering option means that, even in the event of an attack, there is less risk of injury to those in the immediate vicinity if the glass is broken: it does not splinter into sharp fragments but remains bonded to the interlayer. If there is no danger of injury to those nearby, the splintering option is a cost-effective alternative.

We tested our PROTECT bullet-resistant glass against ammunition ranging from class BR1 to BR7, and SG1 and SG2.

www.vetrotech.com/bullet-resistance

System	Glass	Weapon	Calibre	Type
FB1	BR1	Rifle	0.22 LR	L/RN
FB2	BR2	Handgun	9 mm Luger	FJ ¹ , RN, SC
FB3	BR3	Handgun	0.357 Magnum	FJ ¹ , CB, SC
FB4	BR4	Handgun	0.357 Magnum 0.44 Remington Magnum	FJ ¹ , CB, SC FJ ² , FN, SC
FB5	BR5	Rifle	5.56 × 45*	FJ ² , PB, SCP1
FB6	BR6	Rifle	5.56 × 45* 7.62 × 51	FJ ¹ , PB, SC
FB7	BR7	Rifle	7.62 × 51**	FJ ² , PB, HC1
Based on advice	SG1	Shotgun	cal. 12/70	Solid lead slug (Brenneke)
FSG	SG2	Shotgun	cal. 12/70	Solid lead slug (Brenneke)
No class		Rifle	7.62 × 39 AK-47	Kalashnikov

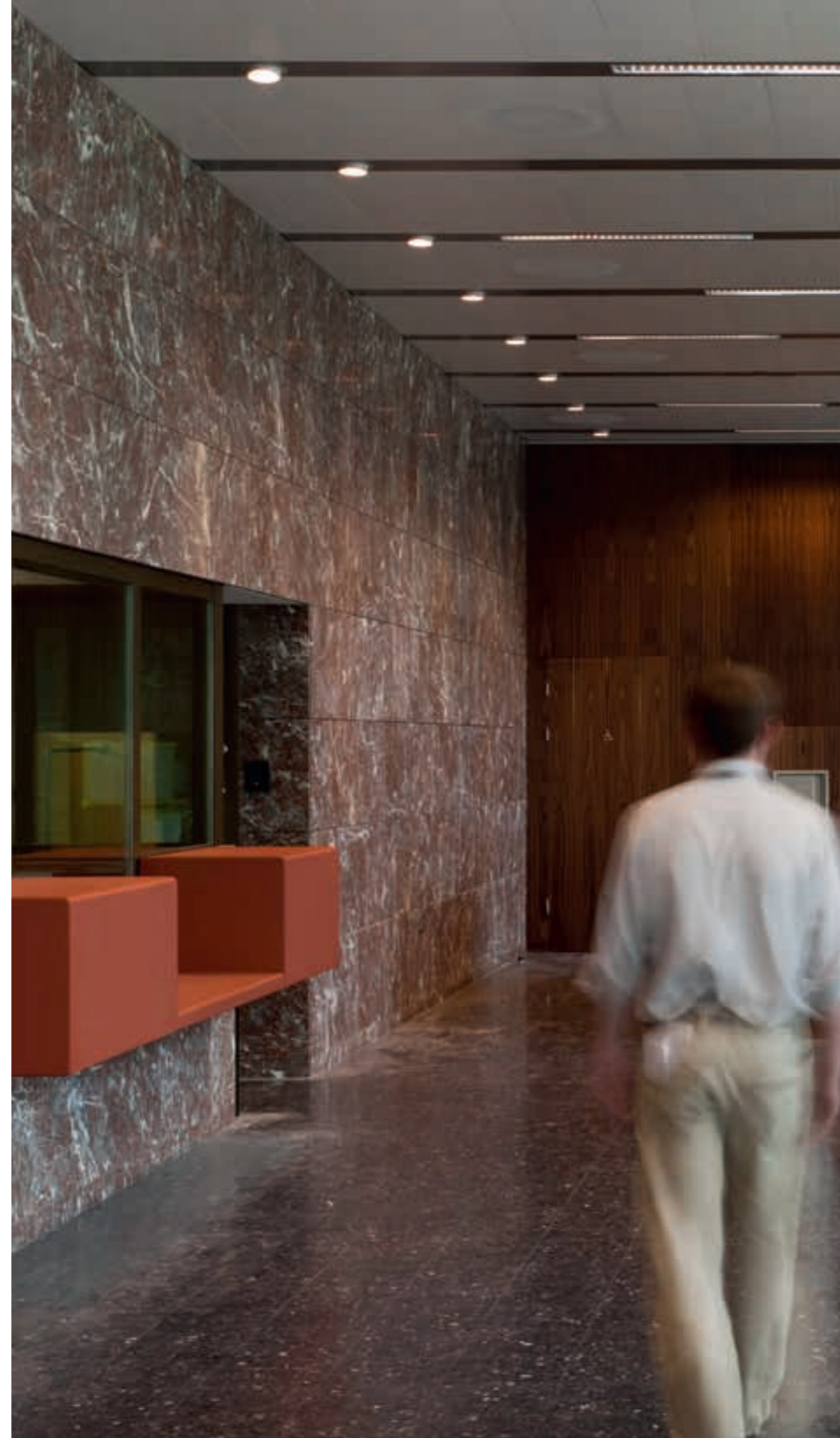
¹Full Steel jacket (plated)

²Full copper alloy jacket

*twist length (178 ± 10)mm

**twist length (254 ± 10)mm

L Lead
 CB Coned bullet
 FJ Full metal jacket bullet
 FN Fat nose
 HC Steel hard core, mass (3,7 ± 0,1) g, Hardness more than 63 HRC
 PB Pointed bullet
 RN Round nose
 SC Soft core (lead)
 SCP1 Soft core (lead) and steel penetrator (type SS109)
 No class In the standard of the system, there is no classification for Kalachnikov



PRO – combined strength for combined performance

Where there is a risk of attack from a combination of firearms and powerful tools, we have developed special PRO versions of our attack- and bullet-resistant PROTECT glass. This purpose-built range of certified solutions is always kept up to date against a catalogue of the latest weaponry, so the range is constantly expanding, offering even greater resilience.

We can offer both splintering and non-splintering versions of Vetrogard® PRO and Polygard® PRO – the non-splintering version being a shrewd choice if people are likely to be nearby during an attack, as it offers effective protection against injury from flying glass.



Blast protection: is your building safe?

Barely a week goes by without an accident or act of terrorism being reported. The targets of explosive attacks usually take place in very public areas: airports, railway stations, public buildings, offices and laboratories. Naturally, the biggest concern is for loss of life. This can be minimised by protecting the building too in the event of an explosion.

Vetrogard® Blast provides a trustworthy preventative solution in these dangerous situations, offering ultimate protection against explosions. Where there is no danger of injury from flying glass fragments, the splintering version of Vetrogard® Blast is a safe yet cost-effective solution.

To protect those in the immediate vicinity of the glass, the non-splintering variant can be chosen, which further counteracts the effects of explosive attack by eliminating the risk of injury from flying glass. The table below illustrates the level of blast resistance for classes ER1 to ER4.

Class	Pressure loading	Positive specific impulse	Time
(EN 13541)	Pr (kPa)	kPa milliseconds	milliseconds
ER 1	>50 <100	370 – 900	≥20
ER 2	>100 <150	900 – 1500	≥20
ER 3	>150 <200	1500 – 2200	≥20
ER 4	>200 <250	2200 – 3200	≥20

View our range of blast-resistant glass at www.vetrotech.com/blast-resistance

British Embassy, Warsaw, Poland, ©Peter Cook



Ingenious innovations

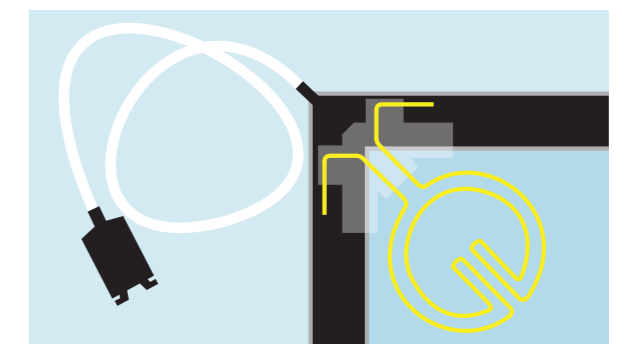
Escape Doors – providing an extra-safe exit

Doors in escape routes need to offer intrusion resistance from the outside whilst also ensuring open and safe passage from the inside in the event of an emergency. The addition of polycarbonate in our Polygard® security glass means that the system will meet these requirements.



Securit® alarm – audible protection, whether you're there or not

Securit® Alarm is a special toughened glazing connected through an integral burnt-in ceramic conducting loop to a separate warning system. This is visible to an intruder. If this loop is broken, the glazing immediately breaks into small fragments, interrupting the circuit and triggering a signal that can either activate a loud alarm or send an instant alert a remote monitoring location. This might be, for example, the police, another emergency service, a private security company or a central control room. An attempted break-in will be detected and reported automatically. This provides valuable additional protection and offers peace of mind, even when the building is unoccupied.



FIRE & PROTECT – Combination means extra protection

From blast- and bullet-resistant glass to the many variants in our security glass range, all our products can be combined with our fire-resistant solutions to give another dimension to the word “safety”. We know that your main concern is to protect lives – and we address that concern by making your building as safe as possible.

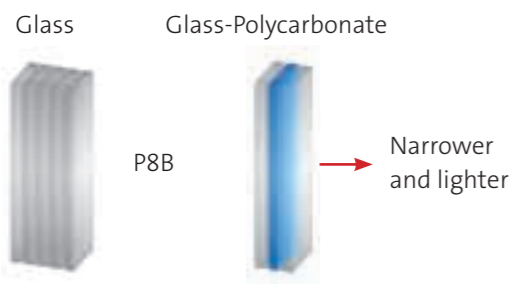
Choose Vetrotech for a clear advantage:

Polygard® is a highly durable product that offers powerful protection against bullet, blast and intrusion attacks. But Polygard® goes beyond being simply security glass. Thanks to its polycarbonate make-up, it is much narrower and lighter than other comparable products, but without any compromise on strength.

Many businesses depend on face-to-face contact, such as the counter service in banks. This can put these employees at more immediate risk because they are most likely to encounter the attackers first. So the staff behind the glazing need to feel confident that they're protected against both direct attack and potential personal injury.

Polygard®'s enhanced levels of protection offer this security and reassurance. The polycarbonate and glass combination provides highly effective fracture and splintering resistance, but without any compromise in essential transparency.

Class	Type	Thickness	Weight
P7B	PVB	22 mm	50 kg/m ²
P7B	Polycarbonate	15 mm -7 mm	28 kg/m ² -22 kg/m ²
BR4-NS	PVB	54 mm	129 kg/m ²
BR4-NS	Polycarbonate	21 mm -33 mm	43 kg/m ² -86 kg/m ²



Crystal clear benefits

Standard Planiclear® glass has a perceptible green hue that occurs naturally due to the presence of iron. But Diamant®, a low-iron glass, is much clearer. This offers another level of protection: potential intruders will not realise that it is as strong as standard security glass because its clarity and transparency are so good that its real thickness is imperceptible. This also improves visible daylight transmission and colour rendering compared to Planiclear® glass.

Sound investment

The prime aim of the products in our PROTECT range is, as the name clearly suggests, to offer protection against all manner of attacks. They also carry the additional benefit of offering impressive acoustic insulation as well – even the thinner products, such as Polygard®. If noise is a particular concern (in an airport, for example), we can offer PROTECT glass solutions that incorporate Stadip Silence® – an extra acoustic film applied between the two panes that reduces noise transfer even further.

Climaplus and Climatop – for improved comfort and energy savings

Products in the PROTECT range can also be constructed as Climaplus® or Climatop® products to offer very effective thermal insulation, which results in reduced energy costs in both summer and winter. These double- and triple-glazed units, which contain a special insulating gas between the panes, offer excellent U-values and solar control factors while also remaining relatively thin.

Non-Splintering glass – be on the safe side

At a distance of just a few metres, the terminal velocity at which a bullet hits the glass can be up to 950 metres per second. In general, glass will naturally splinter on the interior side due to the pressure of the impact from the outside.

Flying fragments of glass can cause severe injuries to those inside the building if normal (splintering) bullet-resistant glass is used. By choosing a non-splintering bullet-resistant glass from our extensive PROTECT product range, you can prevent that unnecessary risk and ensure maximum safety.

Rentenanstalt, Hamburg, Germany, ©Olaf Rohl

Commercial Applications

Our PROTECT range provides glazing solutions to protect people, property and possessions from violent attack where both visibility and security are important.

Function

The multi-layer make-up of the various options delays and prevents penetration, withstanding repetitive impacts and frustrating attack. The aim is to secure the building and protect those behind the glass from harm either due to direct attack or as a result of flying fragments of glass (a situation that can be minimised if “non-spall” or non-splintering glass is installed).

Our safety glass is effective:

- for separating public areas from internal working areas (e.g. government buildings, embassies, offices)
- at key access and crowd control points where people congregate (e.g. transport hubs and public buildings)
- at contact points between the public and the business (especially financial institutions and post offices)
- as a barrier to display but at the same time safeguard valuable goods or exhibits (e.g. museums, art galleries, jewellers and luxury retail premises).

The appropriate glass should be selected depending on the particular application, the function of the building, the type of occupancy and the desired level of protection.

Applications

These are some of the most common applications:

- Whole external façades (especially offering blast protection)
- Internal façades such as atriums
- Doors and glazed screens at entrances and transfer points within the building
- Shop fronts and internal displays
- Ground-floor external glazing that prevents opportunistic intrusion or damage (e.g. in schools)
- Bank cashier windows, counters, reception desks and screens

- Stand-alone enclosed display cases
- Doors and glazed walls for rooms containing sensitive material or expensive equipment (e.g. computer rooms, storage facilities, medical equipment storage)
- Entrances and circulation spaces for entertainment or sporting venues
- Secure facilities (e.g. prisons, psychiatric units and clinics) to prevent escape or rescue and to separate residents from staff safely.

Fire safety

Like attack-resistant security glass, effective fire-resistant glass is crucial for the protection of people, property and possessions. It is also suitable for many similar applications, including entrances, transit points, corridors, doorways and walls, and for both internal and external façades.

Vetrotech provides an unrivalled range of fire-resistant glazing solutions to keep everyone and everything safe should the worst happen.

For more information, visit us online at www.vetrotech.com/fire

Ballistic Testing Laboratory, Germany, ©Olaf Rohl



Continually testing to deliver assured reliability

Construction Products Regulation (CPR)

The CPR requires that seven requirements are met in order for products to qualify for the CE mark. These include mechanical resistance and stability; safety in case of fire; hygiene, health and the environment; safety and accessibility in use; protection against noise; energy economy and heat retention; and sustainable use of natural resources.

We make sure that all our products meet these CPR requirements. We also include a Declaration of Performance (DoP), which contains all the data relating to the performance of the product.

Extreme Testing

Reliability is essential for life safety products. But CE marking is not a quality process. That's why Vetrotech goes further than required for basic CE marking. We follow a regular programme of thorough testing and retesting, monitored by independent experts – pushing our products to the limit. By following these rigorous processes and exposing our glazing to the most extreme conditions, we can instil in our customers the utmost confidence in the dependable performance of our products.

Bullet and attack resistance

All our testing takes place in our own high-tech laboratories – an area where we have always invested heavily. Routinely putting our products through their paces, we test their impact resistance against all manner of weapons – from axes to sledgehammers, from handguns to rifles.

Blast resistance

Our customers need to have complete confidence in their choice of blast-resistant glass. We combine our experience of shock-tube plane-wave impact tests and open-range testing, detonating different TNT charges at various distances from the glazing. This provides realistic exposure to both blast overpressure and suction after-effect.





vetrotech.com

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