

# SAFE ARMOURED GLAZING



**TNO** innovation  
for life

Criminals opening fire on a car, terrorists planting a bomb... sadly, these are things we have to be prepared for.

TNO has therefore developed a new type of armoured glazing to protect people inside vehicles and buildings.

#### **TNO IS WORKING ON A SAFE FUTURE**

When missiles or bombs explode, windows in nearby buildings and vehicles perish.

Glass that has no protective coating will shatter, allowing high-velocity, razor-sharp fragments to fly inside, often causing serious injury to occupants.

TNO has developed an elastomer-backed glazing that can withstand both projectile impact and explosive blasts. The glazing has two components: glass, and a special transparent polyurethane elastomer.

Conventional protection usually involves laminated glass plate, which means heavy windows several centimetres thick. An elastomer-backed glass window is a mere 1 or 2 cms thicker than an ordinary window without a protective coating, and lighter than conventional transparent armour because of the low-density elastomer.

These properties make the system simple to install in normal frames, or even on

existing panes. The backing is also almost invisible. Elastomer-backed panes can be produced either flat or contoured, making them suitable for buildings and vehicles alike.

Some examples of application areas are embassies, courthouses, police stations and hotels, and police and VIP vehicles.

#### **COMBINED STRENGTH**

A glass pane alone cannot stand up to bullets, and neither can a layer of polyurethane. But when they are combined, they become strong: if you apply an elastomer backing to a glass pane, or fill a double-glazing cavity with the material, the combination resists explosions and blasts, and can withstand ammunition favoured by criminals, such as the .44 Magnum and 9 mm FMJ. The TNO innovation is also an effective shield against explosive devices and roadside bombs. A bomb fragment travelling at 300 m/s could easily perforate

an ordinary glass window, but an elastomer-backed type will survive even a 1300 m/s hit.

#### FROM THREAT TO PROTECTION

Elastomer-backed glazing stops bullets and resists explosive blasts. Whereas windows usually form the greatest threat to people, with flying glass fragments responsible for 80% of all blast injuries, elastomer-backed glazing actually provides protection.

Elastomer-backed glazing is patented by TNO.



**TNO.NL**

#### TNO

TNO is an independent innovation organisation that connects people and knowledge in order to create the innovations that sustainably boost the competitiveness of industry and wellbeing of society.

TNO focuses its efforts on seven themes including Defence, Safety and Security: TNO works on a safe and secure society by creating innovations for people working in defence organisations, the police, emergency services and industry.

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