

**Technical Note No. 7**  
**THREAT RESISTANT FENESTRATION**



## **Introduction**

The threat to buildings and the public from blasts and other violent attacks is of natural concern to the fenestration industry. This threat is more visible today in the form of the London bombings of 1992, 1993 and 1996 and the Manchester bombing of 1996. Present bombings are not necessarily more severe than in the past but industry is having to develop strategies and materials to deal with these concerns and mitigate the effects.

This technical note introduces some of the concepts of protection of the buildings and occupants from damage as a result of internal or external explosions. For the purpose of this technical note internal explosions are considered to be gas explosions, and the principal aim of the building design is to vent the internal pressure either through the windows, cladding or roof to minimise damage to the building structure. For external explosions in the form of explosive devices being placed close to the building, the cladding and windows have to resist the external blast pressure, which may include significant positive and negative pressure loads.

## **Threats**

Threats to buildings and their occupants can come from a variety of sources. This technical note looks at the potential threats and the role of windows and facades in protecting the occupants from injury. The potential threat mechanisms include bomb blasts and gas explosions.

The exact magnitude and location of the threat depends on the circumstance of the threat.

These can be directed from either inside the building, in the case of gas explosions or small portable bombs, or outside the building, in the case of large bombs.

There are two broad groups of explosive, categorised as either high or low explosives. In low explosives the propagation of the reaction is primarily thermal in nature, whereas with high explosives energy is transferred from the exploded to the unexploded material in the form of a pressure shock.

Gas explosions are generally a result of gas build up and are usually internal in nature. These range from small localised explosions (most domestic gas explosions) to major internal explosions causing subsequent collapse, for example, the partial collapse of Ronan Point in 1968. In this incident, the windows and light cladding acted as vents, but a defect in the continuity of the structure led to a disproportionate collapse of the building.

## **Threat assessment**

Terrorist threats to the building and its occupants vary according to the following factors:

- The value of the target to the objectives of the terrorist;
- The vulnerability of the area;
- The accessibility of the area;
- The security measures present on the site.

These factors will vary with time and circumstance; when the threat is low the cost of adequate protection will appear high but where the perceived threat is high the building