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# S10 Guidance for the protection of premises against attacks using vehicles (ram raids)

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This guidance document contains extracts from British Standards Institution (BSI) documents PAS 68: *Impact test specifications for vehicle security barrier systems* and PAS 69: *Guidance for the selection, installation and use of vehicle security barriers*. BSI permission for these extracts to be included is gratefully acknowledged.

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# Contents

# 1 Introduction

This guide contains information to help insurers, intermediaries and policyholders understand the form of crime known as 'ram raiding' and the countermeasures that are available. Site access control measures (gates, barriers, one-way flow plates, tyre shredders, road blockers, rising ramps etc) are not examined in detail. Neither does this guidance consider the measures needed to resist attacks by such groups as political saboteurs or terrorists. Such groups often use vehicles without regard for their own safety in an extreme and militaristic way (eg vehicle borne explosive devices) in order to terrorise and/or cause death, injury and property damage. If assets and personnel are considered to be at risk from such attacks, specialist advice should be sought, eg from a local police force Counter Terrorism Security Adviser (CTSA).

Thus this guidance is limited to use of vehicles as a crude battering instrument to enable criminals to access a site or structure for material gain, or simply to make mischief or inflict malicious damage. However, vehicles are of course used as a criminal tool for theft in other ways, eg to pull grilles from windows or drag automated teller machines (ATMs) from buildings. A burning vehicle may also be used as a method of arson.

Ram raids are not new but as time goes by they evolve into new forms with changing targets according to criminal interest. In recent times, the crime has moved somewhat from retail (eg electrical) towards thefts of ATMs and industrial targets (eg metal stocks) and more effective vehicles are employed, such as mechanical diggers. Moreover, each passing year sees an increase in the proportion of buildings that are of modern, lightweight construction (eg sheet materials and modular pre-fabricated construction).

In essence, a typical ram raid consists of:

- a vehicle (usually stolen) driven or reversed into the premises to achieve forcible entry by breaking down, or through, the physical protections;
- a number of thieves involved in an attack to collect the stolen property as quickly as possible;
- the vehicle used as the ram being damaged with another car or van being required to facilitate a rapid escape with the stolen property.

This type of attack is experienced throughout the UK but is more prevalent in the urban and metropolitan areas. Targets include:

- ATMs;
- computer and electrical products (eg flat screen TVs);
- electronic goods (eg mobile phones);
- high value (eg designer label) sports and fashion clothing;
- metal (especially non-ferrous);
- cigarettes and spirits; and
- golf equipment (particularly golf clubs).

Depending on the premises, the specific point of a ram attack is likely to be:

- the facade, eg a shop front – doors and windows; or
- loading/delivery doors and shutters.

In some cases, vehicles are driven at the external wall and enough damage is done to allow access to the contents.

Exceptional mechanical forces are at play when a criminal employs a vehicle to penetrate a perimeter or the shell of a building. Conventional methods of physical protection usually offer little or no resistance to a ram raid and an intruder alarm system is of no deterrent value due to the noise and speed of the attack. Even robustly constructed premises of traditional materials may be unable to resist the kinetic energy involved.

A counter-balancing factor however is that, unlike the terrorist, the common criminal is normally not prepared to risk serious personal injury and he needs to be able to demount from the attacking vehicle in reasonable physical condition to progress his criminal objective.

The kinetic energy developed when ramming with vehicles is basically dependent on the speed and the weight of the vehicle. For example, a 1.5-tonne family car driven at 145km/hr (90mph) is equal to the kinetic energy of a 30-tonne truck travelling at 32km/hr (20mph). Thus control of approach speeds is important. Nevertheless, the assumption must be made that a heavy vehicle will be used and that ballast may be added to increase effect of the impact.

# 2 What can be done?

This crime can be deterred/frustrated if countermeasures are taken. One approach is to physically strengthen the shell of the building. However, in most cases owners and specifiers opt for an external solution consisting of obstacles. With this approach, the objective is to deploy a line of obstacles across the path of the attacking vehicle. The options may be viewed as consisting of two high-level strategies:

- installing proprietary products, eg posts, fixed or retractable bollards, fixed or moveable barriers, girders or gantries; or
- use of natural barriers such as mounds, embankments, ditches etc and/or civic obstacles such as permanent stone/ concrete structures.

Solutions such as standard roadside safety barriers and planters are often relied upon and the visual deterrent may be impressive but testing has revealed that the actual stopping power can be disappointing when challenged by the determined use of a heavy vehicle.

# 3 Factors influencing anti-ram protection

Before considering anti-ram protection, a number of factors need to be considered including:

- which parts of the premises provide a suitable approach for a vehicle to be used in a ram raid?;
- in the case of a shop front, is there adequate existing shop front security to counter a conventional smash-and-grab attack? There is little point in installing anti-ram protection in isolation;
- in the case of removable anti-ram protection, are the owner's staff capable of erecting and/ or dismantling the protection easily?; and
- can the risk be reduced by altering the placement of target contents? Speed of entry, collection and escape are prime factors of a ram raid. Wherever practicable, bulk supplies of the target property should be held in a separate internal, physically secure area well away from all the building's perimeters. This will limit the amount of stock readily available to the thieves.

# 4 Local authority planning permission

Some forms of anti-ram protection, especially those which alter the appearance of the premises, will require local authority planning consent before work is undertaken.

Planning consent will also be required for the installation of street furniture, eg bollards, posts and planters on any public thoroughfare, including pavements. Local authorities may withhold their consent on grounds that such items will constitute an obstruction to pedestrians and/or may restrict access for emergency service vehicles.

On private property, eg retail parks, such restrictions may not apply but it will still be necessary to obtain the permission of the property owners where the property is tenanted.

# 5 Types of protection

There will normally be a choice of internal or external anti-ram protection, but effective external protection has the benefit of prevention or minimising extensive (and expensive) property damage, and of being a visible deterrent.

Protections may be fixed or removable. Wherever practicable, fixed protection is preferable as it does not fall into disuse with the passage of time. External removable protections are only as secure as their locking mechanisms and therefore good quality and robust locking arrangements will be required.

When applying an external strategy using obstacles the stand- off zone created by the line of obstacles needs to be as wide as practicable – remember, criminals may attach an object to the vehicle such as a rolled steel joist (RSJ) to act as a battering ram. Obviously the obstacles need to be deployed so that they cannot be circumvented and any vehicular gateway giving further access to the buildings needs to offer a level of resistance equal to the permanent obstacles being deployed.

## 5.1 External solutions

PAS 68: 2007: *Impact test specifications for vehicle security barrier systems*, describes methods for the classification of various barrier types in terms of their ability to resist dynamic impacts by vehicles. PAS 69: *Guidelines for the specification and installation of vehicle security barriers* provides guidance on the selection, installation and use of vehicle security barriers to ensure that they are selected and placed as effectively as possible.

The evaluation system in PAS 68 has been determined with the benefit of years of exacting testing undertaken by organisations such as Motor Industry Research Association (MIRA) and Centre for the Protection of National Infrastructure (CPNI).

There are three classfication systems, but the system for vehicle security barrier classification in PAS 68 most frequently used as a benchmark considers vehicle weight and impact speed for five classes of vehicle:

- car (1500kg);
- 4x4 or pick-up (2500kg);
- two-axle van (3500kg);
- two-axle rigid (day cab) (7500kg); and
- four-axle rigid (30,000kg).

Each of these has ‘test types’ according to various speeds up to 80km/h. It is felt that more ram attacks for theft occur around the lower speed range (up to around 48km/hr (30mph)) than the higher speeds. The specifier needs to consider the size of vehicle that might be chosen and the speed permitted by the approaches to the probable points of impact. In the context of many property insurance exposures, however, it might be felt that, even where a heavy vehicle would be permitted by the surroundings to have a good ‘run’ at the building, the target normally attracts only the joyriding types of attacker in smaller commercial vehicles

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**Figure 1: Security barrier product testing**

or four-wheel drives. In such cases, the defences can be specified accordingly. In these cases, products that resist the 2500kg class of vehicle could be considered. However, the assumption should be made that the most formidable vehicles will be involved if the target is high risk.

### 5.2 Fixed and rising bollards

Fixed and rising bollards are available in a variety of types which may vary in height, width, cross section and resistance to impact. They are installed across the direction of attack to prevent vehicle access. They can be installed in a large number of arrangements, from single rows, straight or curved, to multiple staggered groups.

The supplier/installer should be required to provide test evidence (or a declaration by way of 'self certification') that identifies the vehicle type that is resisted by the solution. This must match the conclusions of the risk assessment which will have taken account of the attraction of the target, the location and immediate surroundings including the ease with which, and speed at which, vehicles can be driven at the asset. Foundations are key to the performance of a barrier system and site ground conditions may require a modified foundation to that used in the bollard manufacturer's impact test.

For modest risk situations in which a tested product will not be employed, the CPNI publishes a list of tube diameter sizes/wall thicknesses/steel grades that property owners can arrange to have installed in the correct foundation to achieve protection against specified vehicle types at set speeds (determined by rigorous CPNI testing). It is understood that bollard specifications and foundation details are available by application to CPNI via the 'Contact us' page of their website (www.cpni.gov.uk).

No obstacle of this kind should ever be relied on if it is set in reinforced concrete to a depth of less than 300mm (more usually 400-700mm) and the height of the bollard above ground is less than 750mm. The clear air gap between bollards must not exceed 1200mm.

### 5.3 Foundations

According to BS PAS 69, the majority of designs need specific foundations which are likely to have to be continuous between groups if they are to be successful collectively. The standard maintains that foundation designs prepared by experienced structural engineers are essential,especially where underground services are present. These are likely to be costly to re-locate and would limit construction depth, often resulting in the need for site-specific foundations.

The close spacing of bollards limits the opportunity to construct suitably sized independent foundations. Tests demonstrate that when installing bollards to provide perimeter protection, a continuous, torsionally reinforced, foundation offers both an economical and highly effective solution. The incorporation of adequate end returns or buttresses will provide torsional stiffness to resist the overturning moment (ie the overturning of the bollard and the concrete mass in which it is seated as one unit) generated by the vehicle impact. Possible solutions for fixed bollard foundations are provided in PAS 68.

If rising bollards are used, the foundation depth will also need to accommodate the retracted bollard. Consideration needs to be given to the services needed to operate rising bollards as these will need to penetrate the foundation. Services to consider are pneumatic or hydraulic hoses, or mains and signal cables. The effect of mains power supply on the bollard (whether raised or retracted) also needs to be considered.

The security of 'ancillaries' must not be overlooked. For example, the control cabinet to a rising device must robustly resist interference and sabotage otherwise the obstacle might simply be lowered by the criminal in advance of the attack. Ideally, any such equipment will be located inside the premises. Furthermore, it is good security practice to check that anti-tamper measures are designed so that the device parks in the 'secure' rather than 'non-secure' position when attack or failure is detected.

## 5.4 Specifying fixed and rising bollards

### Normal insurance risks

It is usually not practical or necessary for insurance personnel to specify the product and foundations in accordance with the performance criteria and very comprehensive guidance in PAS 68 and PAS 69. However, if an effort is made to employ PAS 68/69 terms and concepts when identifying the relevant parameters suggested by the risk assessment, the possibility of mismatch between bollard installation and risk will be reduced. It is suggested that the following are included in the specification for the work:

- location of defence line (distance from structure);
- performance required: ie prevention of penetration of any part of the vehicle into the building or prevention of an aperture that would permit pedestrian access (such evaluation to include any building features involved, eg loading doors);
- maximum weight of vehicle to be resisted (ie 1500/2500/3500/7500/30,000kg);
- maximum speed of specified vehicle; and
- foundations to be in accordance with manufacturer's instructions and recommendations in PAS 68.

### Exceptional insurance risks

Where the specification needs to be exacting due to target type/size, creation of a comprehensive specification within the PAS 68/69 framework will be desirable and this may require the services of a consultant or national security advisor.

## 5.5 Planters

Defensive planters rely on either their weight, or sometimes their ability to deform (in order to absorb energy), as a means of inhibiting the progress of vehicles.

Planters vary considerably in form. They are constructed from a variety of materials such as timber, metal, plain or reinforced concrete. PAS 69 advises that they are generally unsuitable for deflecting or redirecting vehicles unless linked together.

The standard suggests that at the design stage, consideration should be given to providing bracing between individual lighter units as an alternative to selecting heavy ones. This is relevant for a site where existing underground services would be costly to relocate. The presence of underground services may not only restrict the type of planter suitable to be installed, but there will almost certainly be a need to retain access for maintenance of the services. These considerations need to take place at the design stage of the scheme.

The ability for a planter to resist an impact can be supplemented by a degree of attachment to the ground, eg by use of steel pins or studs or rebating the planter into the surface or the foundations.



**Figure 1: Expert selection and installation of planters is essential**

## 5.6 Internal solutions

Bollards/posts fitted internally should be sited as close as is practicable to the protected opening or surface.

Other protection may be rigid or flexible, eg rigid metal barriers or steel hawsers,supported on suitably installed posts. Removable or hinged barriers can be used with effect to protect vulnerable doors and other openings. The barrier should be of substantial construction, eg minimum 6mm thick x 75mm box section steel work or rolled steel joist with commensurate mountings, supports or fixings. High security locking arrangements should be provided at one or both ends of the barrier depending upon the method of fixing.


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**Figure 3: Examples of site perimeter security**

## 5.7 Facade reinforcement

Frequently, external anti-ram protection is not feasible and it is necessary to consider reinforcement of the facade. This may include the following:

- when external shutters or grilles are fitted, these can be reinforced by installing vertical anti-ram barriers between the shutter/grille and the shop front. The vertical barrier should be located at the centre of the shutter (the usual point of attack). On very wide shutters additional barriers may be necessary;
- stall risers can be introduced or rebuilt in brickwork which can be reinforced by the location of a horizontal anti-ram barrier either set into the brickwork or placed behind and adequately fixed thereto; and
- wide shop fronts can be redesigned into smaller sections with vertical anti-ram protection provided between each section.

## 5.8 Site perimeter security

Where the siting and location of the premises allows, consideration should be given to the use of perimeter walls, gates and fences, or earth mounds and/or ditches of suitable dimensions to prevent vehicle access. Expert advice should be obtained as some modern four-wheel drive vehicles can negotiate openings and obstacles that in the past were assumed to afford a secure perimeter. Although outside the scope of this document, a variety of specialist solutions, such as blockers and heavy duty barriers, are available for effective control of vehicular access along site roads and through entrances. These can also be used if necessary to form a vehicle airlock system whereby the vehicle is prevented from passing through the second of two barriers unless the first is secure. Where the site road(s) are under the owner's control, 'traffic calming' measures (chicanes, obstacles etc) can be used to limit approach speeds. BS 8220-3: *Guide for security of buildings against crime: Storage, industrial and distribution premises* section 7 provides further information on site perimeter security arrangements.

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