CPNI Centre for the Protection of National Infrastructure

Department for Transport

Traffic Advisory Leaflet 1/11

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Vehicle Security Barriers within the Streetscape

A Vehicle Security Barrier (VSB) is a physical security device that provides perimeter protection to a defined area and can also control vehicular access to that area. A VSB is used to mitigate various styles of criminal or terrorist vehicle-borne threat.

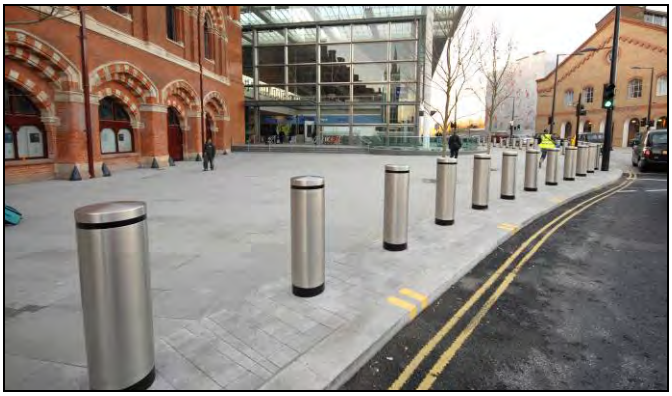
This leaflet describes the main reasons behind the need to deploy a VSB, demonstrates how best to integrate them into the streetscape and outlines:

- Styles of vehicle-borne attack;
- Available VSB technologies;
- Selection and application of VSB technologies;
- Integration of VSB elements into the streetscape;
- Asset management issues;
- Safety audit considerations;
- Anti-Terrorism Traffic Regulation Orders;
- Sources of further information and more detailed advice.

Introduction

Certain parts of the public realm will have anti-ram protective security measures installed to protect the public and key infrastructure from vehicle-borne threats. These measures are known as Vehicle Security Barriers (VSBs).

VSB elements include passive perimeter protection (e.g. fixed bollards, planters, seats, walls or structures concealed within the landscape architecture) and active equipment (e.g. hinged and sliding gates, boom barriers, retractable blockers and retractable bollards) to control vehicular access.



A VSB is usually positioned as far as possible from the vulnerable asset, typically near the existing or extended kerb line. If the barrier line is designed to be permeable to pedestrians the air gaps between structures should be no more than 1200mm. This is sufficient to allow wheelchair users and people pushing prams to permeate the barrier line.

The choice of VSB is based on the security requirements and operational / business needs of the site. The design of the public realm must consider the application of VSB measures carefully and holistically, to ensure that the correct level of protection is provided without compromising the aesthetics or functionality of public spaces.

There is no “one size fits all” design and each site requires an informed and specific solution.

Threat from hostile vehicles

Vehicle-borne threats range from vandalism to sophisticated or aggressive attack by determined criminals or terrorists. The payload capacity and mobility of a vehicle can offer a convenient delivery mechanism for a large explosive device.

There are five main methods of vehicle-borne attack:

1. **Parked:** A Vehicle-Borne Improvised Explosive Device (VBIED) may be parked close to a vulnerable location.

2. **Encroachment:** A hostile vehicle may be able to exploit gaps in perimeter protection, or tailgate a legitimate vehicle through a single layer Vehicle Access Control Point (VACP).

3. **Penetrative:** A vehicle may be used as a weapon to weaken and/or breach a building or physical perimeter.

4. **Deception:** A hostile vehicle may be modified to replicate a legitimate vehicle (i.e. “Trojan” vehicle), or the occupants of a vehicle may use pretence to gain access through a VACP.

5. **Duress:** A guard could be forced to grant hostile vehicle access, or a legitimate driver could be forced to take an Improvised Explosive Device (IED) within their vehicle in to a vulnerable location.

Other attack methods may employ a combination of the above or may include tampering with equipment to damage or control an active VSB in preparation for attack.

Available technologies

Passive VSBs are often preferred over active measures due the latter's susceptibility to deception and duress threats, as well as to tampering.

Passive VSB: Typically used for perimeter protection and to enforce blast stand-off distance. Options include:

- Bollards (fixed or removable);
- Planter units;
- Structural walls;
- Enhanced fences;
- Specialist structural cycle racks;
- Integrated / strengthened street furniture (e.g. seating, lighting columns or shelters);
- Earthworks and level changes (e.g. steps, ditches or bunds);
- Water features (e.g. fountains or ponds);
- Trees (of certain species and sufficient dimensions).

Active VSB: Used at a VACP where site access is required through a secure perimeter, such as:

- Bollards (retractable);
- Road blockers (retractable);
- Gates (folding, rising, sliding or swinging).

Selection and application

Once it is decided that mitigation of vehicle-borne threats is required – a specialism referred to as Hostile Vehicle Mitigation (HVM) – it is imperative that careful thought is given to the security and operational requirements.

Full consideration of these needs at the earliest stages of project design will reduce the risk of incorrect product selection and the need for expensive remedial action.

In addition, integration of security measures into the public realm (i.e. consideration of aesthetics, accessibility, function, and inter-operability with other security systems) is critical to successful design.

Security requirements

These determine the level of protection to be provided based on a detailed assessment of the:

- Threat vehicle(s);
- Attack method(s);
- Maximum possible impact speed;
- Blast stand-off distance (to be maintained around the vulnerable asset).

Operational requirements

A practical site assessment is needed to determine business needs and environmental constraints, and should take account of:

- Local environment (e.g. geography, architecture and transport network);
- Enforceable blast stand-off perimeter (e.g. boundary definition, neighbours and existing countermeasures);
- Traffic management (including vehicle access control and parking);
- Protocols and planning (e.g. unauthorised vehicle rejection procedures, emergency access and ongoing maintenance plans).

Integration within the streetscape

VSB design should provide the required level of protection while taking into account the aesthetics, function and accessibility of the public realm.

Aesthetics: In almost every project, be it a commercial site or a public space of historic importance, maintaining or enhancing the look and feel of the environment is essential.

Function: Full integration within the highway dictates that the key functions of the location must be maintained. Functions may include ensuring accessibility at transport interchanges or providing a safe and effective means of vehicle access control.

Accessibility: To prevent vehicle encroachment, it is recommended that the clear distance between adjacent VSB measures or to the next structural object (e.g. wall or building) should be a maximum of 1200mm, measured at 600mm above finished ground level to maintain access for people with impaired mobility.

Discussion is recommended with groups representing disabled people regarding alternative setting down or parking arrangements which may need to be considered if VSB measures restrict vehicular access to certain areas.

Traffic calming: The application of horizontal deflections (e.g. chicanes) that are enforced by VSBs to prevent overrun or circumvention, will limit hostile vehicle approach speed thus reducing the effectiveness of a penetrative vehicle impact.

In turn this can reduce the security requirements, thus providing the opportunity to deploy more discreet protection and decrease the cost of associated countermeasures.

Although effective for road safety purposes, the use of vertical deflections (e.g. road humps) is not an effective security measure as it provides only negligible speed reduction against a determined vehicle-borne attack.

Pedestrian crossings: When integrating VSBs (usually bollards) at a pedestrian crossing, the designer should ensure that the barriers do not unduly impede accessibility. Consideration should be given to barrier position relative to the kerb line and to the layout of any associated tactile paving.

Bus stops: The design of security measures should be sympathetic to the needs of passengers both waiting at the stop and boarding/alighting the bus. The VSB design should accommodate bus movements with particular attention paid to front and rear vehicle overhangs and door positions.

Provision of access by people with impaired mobility is also important. Space should be provided as necessary to allow the use of ramps to extend out from the bus to the waiting area.

Vehicle access control: The design of a Vehicle Access Control Point (VACP) as part of a secure perimeter should also follow the 1200mm maximum clear gap rule and is typically allied to other static VSB elements to prevent circumvention. Most permanent security access control schemes on the public highway will be unmanned. As a result, there are many procedural and management factors that need to be considered:

- Permitted vehicles;
- Health and safety;
- Routes for vulnerable road users;
- Instructions, warning signs and signals;
- Activation method (e.g. token, induction loop or manual operator);
- Rejection of unauthorised vehicles (e.g. via rejection lane or turning space prior to a VACP);
- Emergency access procedures;
- Maintenance and running costs;
- Failure modes (i.e. fail open or fail secure);
- Monitoring systems (e.g. CCTV);
- Compliance management.

Asset management

Wherever possible, assets on the public highway should be registered on the Highway Authority's Asset Management database. This is especially important where VSB and associated construction works are the responsibility of the highway authority.

This will reduce the possibility of subsequent street works affecting the integrity of the barrier e.g. damage to a structural foundation.

Safety audit

VSBs typically comprise special materials and structural foundations. They are designed to resist forced attack and to not be frangible, therefore they are unlikely to bend if accidentally hit.

If a security scheme is subjected to a Road Safety Audit then the following issues may be pertinent:

- Skidding resistance of the road surface on the approach to VSB locations to reduce the chance of loss-of-control accidents in the vicinity of the barriers;
- Gaps and potentially differential surface skid resistance values when automated VSB measures are retracted flush to the ground (particularly for two-wheeled vehicles that may then traverse them);
- The effect of security features on visibility splays;
- Conspicuity of barrier system finishes (e.g. colour contrast) for visually impaired people and night time visibility;
- The clarity of intended pedestrian access routes, particularly if in the vicinity of any active VSB systems.

ATTRO

An Anti-Terrorism Traffic Regulation Order (ATTRO) can be made if vehicular and/or pedestrian traffic into, or along, a road needs to be temporarily or permanently restricted for counter-terrorism purposes.

An ATTRO can only be initiated by the traffic authority on the recommendation of a Chief Officer of Police, typically advised by a police Counter Terrorism Security Adviser (CTSA) and specialists at the UK Government's Centre for the Protection of National Infrastructure (CPNI).

The process is similar to that for any other Traffic Regulation Order (TRO) typically made under Sections 1, 6 or 14 of the *Road Traffic Regulation Act 1984* (RTRA), but an ATTRO is also made with reference to Sections 22(c) and (d) of the RTRA (as amended by the *Civil Contingencies Act 2004*). An ATTRO can only be made in England, Wales and Scotland.

Recommended further reading

PAS 69: Guidance for the selection, installation and use of vehicle security barriers. BSI (2006);

PAS 68: Impact test specifications for vehicle security barriers. BSI (2010);

CWA 16221: Vehicle security barriers. Performance requirements, test methods and guidance on application. CEN (2010);

Manual for Streets 2. CIHT (2010);

Guide to producing operational requirements. CPNI (2010);

Level 2 OR for HVM. CPNI (2010);

Vehicle security barrier scoping document. CPNI (2010);

Integrated Security – A Public Realm Design Guide for Hostile Vehicle Mitigation. CPNI (2011);

LTN 1/95. *The Assessment of Pedestrian Crossings.* TSO (DfT 1995);

LTN 2/95. *The Design of Pedestrian Crossings.* TSO (DfT 1995);

LTN 1/97. *Keeping Buses Moving.* TSO (DfT 1997);

Inclusive Mobility; A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure. (DfT 2002);

TAL 6/02, *Inclusive Mobility:* (DfT 2002);

Manual for Streets. Thomas Telford (DfT, CLG, Welsh Assembly Government, 2007);

LTN 1/11. *Vehicle Access Control.* (DfT - Due for publication in 2011);

B1P/06. *Accessible Bus Stop Design Guidance*. (TfL 2006).

Contacts

Protective security advice and a palette of appropriately resilient vehicle security barriers or structural elements for embedding in the public realm are available from specialists at the UK Government's Centre for the Protection of National Infrastructure (CPNI) or via the local police Counter Terrorism Security Adviser (CTSA).

Centre for the Protection of National Infrastructure (CPNI)
Email: enquiries@cpni.gsi.gov.uk
Web: www.cpni.gov.uk

Home Office
Web: www.homeoffice.gov.uk/counter-terrorism

National Counter Terrorism Security Office (NaCTSO)
Web: www.nactso.gov.uk

Acknowledgements

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Traffic Advisory Leaflets (TALs) are available to download on the Department for Transport website at www.dft.gov.uk/pgr/roads/tpm/tal/

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