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STANDARDS  
Australia



# Security and resilience — Vehicle security barriers

## Part 2: Application



AS ISO 22343.2:2024

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- Australasian Fire and Emergency Service Authorities Council
- Australian Emergency Management Institute
- Australian Institute of Human Resources
- Australian Risk Policy Institute
- Australian Security Industry Association
- Australian Strategic Policy Institute
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# Security and resilience — Vehicle security barriers

## Part 2: Application

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## Preface

This Standard was prepared by the Standards Australia Committee MB-025, Security and Resilience.

The objective of this document is to give guidance on the selection, installation and use of vehicle security barrier (VSBs) and describes the process of producing operational requirements (ORs).

It also gives guidance on a design method for assessing the performance of a VSB.

This document is applicable to end users, such as site owners and specifiers, of VSBs, where they are used to protect people in any public or private location from vehicle attacks.

This document does not apply to the performance of a VSB or its control apparatus when subjected to —

- (a) slow speed encroachment;
- (b) slow speed nudging and ramming;
- (c) blast explosion;
- (d) ballistic impact;
- (e) manual attack, with the aid of the vehicle (multiple impacts at slow speed);
- (f) manual attack, with the aid of tools (excluding vehicles);
- (g) electrical manipulation; and
- (h) attack on the control systems by any means.

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 292, *Security and resilience*.

This first edition cancels and replaces IWA 14-2:2013, which has been technically revised.

The main changes are as follows:

- alignment with ISO 22343-1;
- updating of the document in light of changing threat and availability of tested vehicle security barriers (VSBs), i.e. surface-placed and shallow mount systems;
- re-organization of the document for international readability.

A list of all parts in the ISO 22343 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Australian Standard®

## Security and resilience — Vehicle security barriers

### Part 2: Application

#### 1 Scope

This document gives guidance on the selection, installation and use of vehicle security barrier (VSBs) and describes the process of producing operational requirements (ORs).

It also gives guidance on a design method for assessing the performance of a VSB.

This document is applicable to end users, such as site owners and specifiers, of VSBs, where they are used to protect people in any public or private location from vehicle attacks.

This document does not apply to the performance of a VSB or its control apparatus when subjected to:

- slow speed encroachment;
- slow speed nudging and ramming;
- blast explosion;
- ballistic impact;
- manual attack, with the aid of the vehicle (multiple impacts at slow speed);
- manual attack, with the aid of tools (excluding vehicles);
- electrical manipulation;
- attack on the control systems by any means.

NOTE 1 For manual attack, a variety of test methods exist. For assessing intruder resistance of building components, see LPS 1175[53].

NOTE 2 The VSB is designed and tested on the basis of:

- a) vehicle type, mass and speed of the assessed vehicle-borne threat;
- b) its geographical application (e.g. climate conditions);
- c) intended site location (e.g. rigid or non-rigid soil/finished surface (paving, cobblestone, granite, asphalt)).

It does not apply to guidance on design, the operational suitability of a VSB or other impact test methods.

#### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22343-1, *Security and resilience — Vehicle security barriers — Part 1: Performance requirement, vehicle impact test method and performance rating*

#### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22343-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

## 4 Introduction to hostile vehicle mitigation

### 4.1 General

#### 4.1.1 Vehicle-borne threats

Vehicle-borne threats can range from the use of a vehicle for vandalism to determined attacks by adversaries (e.g. criminals and terrorists). The convenience, mobility and payload capacity of a vehicle offers a tactical means to deliver multiple adversaries and weapons (e.g. an explosive device, firearms or other hazardous payloads) closer to their target. Vehicles can also be used as a weapon: to drive into people to cause injury and/or ram into infrastructure to disrupt services.

To conduct such attacks, hostile vehicles can be parked, manoeuvred or rammed into or out of a site, or adversaries can use a deception or duress methodology.

Attacks on the VSB to enable access by the hostile vehicle without damaging the vehicle or occupants can include:

- a) physical: forcing/tampering with the VSB or the use of an explosive device;
- b) electronic: accessing and manipulation of the VSB control system or interfaced platforms (e.g. access control and building management systems).

A clear definition of the asset(s) (e.g. infrastructure and/or people) to be protected, the threat and how an attack can be manifested should be the foundation of a risk-based mitigation strategy.

#### 4.1.2 Mitigation of vehicle-borne threats

The mitigation of all forms of vehicle-borne threat can be difficult while satisfying other business needs. The following should be considered as a minimum:

- a) security:
  - 1) the level of residual risk deemed acceptable by the organization/interested parties;
  - 2) the asset(s) to be protected (see [Clause 6](#)):
    - i) hard target (buildings and infrastructure);
    - ii) soft target (people and crowded places);
  - 3) the attack method to be mitigated;
  - 4) security measures (their performance, deployment, operational and physical limitations);
  - 5) response to increased threat conditions;
  - 6) enforceable stand-off distance to the asset(s);

- 7) security risks induced by safety concerns or systems;
- b) business needs:
  - 1) lifetime cost (training, manning levels, service, maintenance and replacement, procurement options);
  - 2) traffic management (vehicular and pedestrians);
  - 3) appearance;
  - 4) internal and external interested party requirements;
- c) engineering constraints:
  - 1) site topography;
  - 2) architectural;
  - 3) VSB technical and performance constraints;
  - 4) foundations;
  - 5) buried services;
  - 6) land ownership and available space;
  - 7) local authority planning restriction(s) (e.g. height/mass/noise, utilities).

It is important that a security OR (see [Clause 16](#)) is developed in conjunction with a user requirement document (URD) and that all key interested parties are involved from the outset.

The considered elements (i.e. security ORs, user requirements) can adversely influence each other. Therefore, early consideration of acceptable compromises should be made, particularly with regard to the security and safety aspects of the VSBs.

Risk assessments should be conducted for safety and security early in the design phase of project planning, during commissioning and after final installation to ensure the level of residual risk is identified and owned by the interested parties (e.g. site and or event owner, security and safety representatives, project manager(s), staff representatives).

These assessments should be shared with or jointly produced by the interested parties and regularly reviewed. Early engagement with the interested parties can facilitate the development of business cases and can help identify potential issues, associated costs and constraints.

There is likely to be a need to allow authorized vehicle movement, to allow the safe, secure and timely transit of legitimate vehicles. Additionally, long-term security issues relating to system reliability and a change in threat level can also compromise the initial ORs.

A change in threat can result in heightened security response levels and VSBs and procedures that cannot operate either safely or securely in that new environment.

Often vehicular access has to be provided through the VSB line. The vehicles can be searched or be of known authenticity before allowing access through the vehicle access control point (VACP). In this instance, a single or multiple access point may be provided through the active security barriers. Where the stand-off measure forms the site boundary or security perimeter, the VACP then typically becomes the first point of challenge for all vehicles.

Regardless of the type of active VSB installed, a secondary access control point should be considered. This is to ensure that where the VSBs fail or there is an incident at the main VACP, traffic can easily be diverted to the secondary location. This location should be able to accommodate the traffic volumes typical to the main VACP while maintaining the same level of operational security.

Where an entrance has more than one VSB (e.g. a separate entry barrier and exit barrier), then each VSB should have independent drive and control systems. This is to prevent a cascade or nodal failure as a result of one VSB developing a fault. They may share the same user interface, hydraulic circuits and electrical systems, but should be designed so that a failure does not disable all VACPs. Provision of an uninterruptable power supply (UPS) or standby generator should also be considered. An unreliable VSB is unacceptable and has additional implications that can include costly compensatory measures to correct the condition.

## 4.2 Selection of a VSB

The selection of a VSB is dependent on a number of factors, including but not limited to:

- a) the threat (see [Clause 5](#));
- b) the assets to be protected (see [Clause 6](#));
- c) the site (see [Clauses 7](#) and [8](#));
- d) the required performance of the VSB (see [Clause 9](#));
- e) the procurement strategy (see [Clause 10](#));
- f) deployment and removal of the VSB (see [Clause 11](#));
- g) the type of VSB required (see [Clauses 12](#) and [13](#)).

The decision process for the selection of VSBs is illustrated in the flow diagrams in [Clause 16](#), which covers ORs.

## 5 The threat

### 5.1 Identify and quantify the threat

Previous and emerging terrorist, criminal or malicious incidents should be reviewed and their relevance to the site considered, regarding the target and attack methods used. Threats can evolve or change with time and it is recommended that periodic reviews of the threat and trends are undertaken, and the results recorded and documented, by the interested parties.

**NOTE** The national, regional or local security force can be contacted for threat level updates.

There are seven main methods a vehicle-borne threat (e.g. vehicle as a weapon (VAW) or a vehicle-borne improvised explosive device (VBIED)) can be deployed with or without the use of suicide operatives, as follows:

- a) **Parked vehicles:** Unscreened vehicles are parked adjacent to a site, in underground parking facilities or overlooking a site.
- b) **Encroachment (exploiting gaps in defences):** A hostile vehicle negotiates through/round an incomplete line of barriers or an incorrectly spaced line of barriers without the need to impact. An alternative form of encroachment attack is exploitation of an active barrier system at a VACP by a hostile vehicle “tailgating” a legitimate vehicle.
- c) **Penetrative attacks:** The front or rear of the hostile vehicle is used as a ram, either as a single or a repetitive impact, against the VSB.
- d) **Deception techniques:** A “Trojan” vehicle (one whose model, livery or registration is familiar to the site) is used or where hostile occupants negotiate their way through by pretence or by using stolen (or cloned) access control or ID passes. Alternative scenarios include a driver unknowingly delivering an improvised explosive device (IED) or weapon(s) surreptitiously

planted in their vehicle by an attacker, or an “insider” bringing an IED/weapon(s) in to their own work site. Deception techniques prey on human and operational weaknesses.

- e) Duress techniques: The driver of a legitimate vehicle is forced to carry an IED/weapon(s) or where a guard controlling a VACP is forced to allow a vehicle entry. These are perhaps the most difficult forms of vehicle-borne threat to defend against.
- f) Insider: A person with legitimate access willingly facilitates an attack by operating the security measures locally or remotely, managing or issuing access rights or tampering with the security measures.
- g) Tamper/sabotage: With the intent of leaving no evidence, this attack facilitates hostile vehicle access at a later time. This can involve altering, weakening or disabling a barrier and/or associated security systems. This can be a physical or cyber-attack that occurs gradually over time or immediately before, in order to facilitate a fast-moving attack.

Consideration should be given to addressing the threat of layered attack scenarios using one or more of the threat types given in this subclause, and how physical and operational security measures should be introduced to counter that threat. For instance, the use of a first hostile vehicle to create a gap by way of penetrative attack or blast which then allows a second to encroach through.

## 5.2 Deployment considerations

### 5.2.1 General

The period for which security measures are required (design-life) should be defined.

The threat(s) should be assessed and an identification should be made of whether a permanent, semi-permanent or temporary installation is required as well as the level of protection that the security measure is required to provide.

### 5.2.2 Installation

For a new installation, the following types should be considered as part of the risk assessment and operating plans:

- a) permanent installation, which can require significant civil engineering works and is expected to remain for the life of the asset;
- b) semi-permanent installation, which is a hybrid that incorporates some transitory elements that can be retracted or removed leaving any permanent foundation or anchorage *in situ*;
- c) temporary installation that may be deployed on the basis that it remains *in situ* for a short period of time. The extent of the remedial measures required upon removal are kept to a minimum.

It is recommended that interested parties consider the advantages of choosing each of the above options where regular events are undertaken at the location, and whether there is a cost benefit to choosing option a) or b) rather than repeated deployment of option c).

It should be decided if, how and from where the system is to be controlled, e.g. controlled locally by guard, from a central control room or through the use of automatic access control systems (AACS).

An assessment and review should be made at regular intervals as to whether the security measures need to be adapted to a change in the threat.

## 6 Assets

### 6.1 Identification of the critical assets

The assets and their users to be protected should be identified as soft targets (e.g. people, an area, public event, crowded place) and hard targets (e.g. machinery, infrastructure, equipment, one or more buildings).

If more than one asset is identified, they should be prioritized.

It should be determined whether there is an existing defensible security perimeter and whether there is a need to establish a temporary or permanent perimeter security scheme.

The physical VSB strategy may be coordinated with adjacent interested parties.

### 6.2 Identification of interested parties

Interested parties should be identified and engaged at the start of the project and include both those who can deliver the solution as well as those affected by the proposed security measures. These include, but are not limited to, management, staff, security, local authorities, public transport, emergency services, utility companies, highway authorities, architects, security consultants, neighbours and landlords.

### 6.3 Consequence evaluation

The consequences of an attack and the likely disruption in terms of loss of life, damage, and business and financial impact and reputation should be assessed.

Locations or other assets which can suffer short- or long-term disruption to their operations from an attack should be identified. For example:

- a) neighbouring buildings (e.g. government, military, residential, business, emergency services, schools, religious sites, other assets);
- b) people;
- c) major communication networks (above and below ground);
- d) control rooms;
- e) electricity, water and gas lines or storage facilities (above and below ground);
- f) underground tunnels, basements and subways;
- g) ventilation shafts;
- h) bridges;
- i) public transport infrastructure and airports.

Threat displacement should be considered and communicated with all interested parties.

## 7 Site assessment

### 7.1 New locations

It should be recognized that the majority of measures to be installed will be retro-fitted to an existing asset, often in an urban environment, with challenges that come with working with existing services and structures, which can limit scope for innovation. When considering a new (green field) location, interested parties should introduce measures which can be specified for the site location, as well as the

design of the asset that can incorporate measures from the start of the build. This should minimize any compromise in security and will typically be more cost effective than installing a subsequent retrofit.

## 7.2 Review of existing security arrangements

Once the site security plans have been implemented that establish the acceptable level of security risk, a change control process should be adopted for any proposed site changes (e.g. site infrastructure, safety related, physical security related, VSB hardware and procedures) to ensure an acceptable level of risk is maintained. As part of the configuration control process, an analysis should be performed that ensures that acceptance of the proposed change does not reduce the effectiveness of the previous site security plans.

The type of vehicles and their frequency of access and egress to the site should be established. The vehicles should also be assigned authorized and unauthorized pre-notified status and the means of access control defined for the different visitor types.

## 7.3 Site survey

All traversable routes along which a hostile vehicle can challenge a VSB or perimeter should be determined. This includes all carriageways, footways, cycle paths, open spaces and gaps. It should be recognized that there is likelihood that hostile vehicles can travel against the expected direction of traffic. The location and usability of drop kerbs and other adaptations in the streetscape should be considered.

A vehicle dynamics assessment (VDA) should be undertaken as part of the site survey. This provides a formalized evaluation of the speed that a threat vehicle, as identified in ISO 22343-1, can achieve at a specific location round the site. This enables the site to identify products including VSBs that have achieved a performance classification under ISO 22343-1 or an equivalent impact test standard for vehicle security barriers.

In many locations, it can be necessary to incorporate a vehicle swept path analysis to demonstrate the ability of the threat vehicle to access specific location or to ensure that authorized vehicles will not be compromised when accessing the site, by the location of the VSB.

The site survey should incorporate each of the site access locations such that the daily operation of the site is covered and that peak vehicle and pedestrian flow rates can be accounted for in the operation of the VACP and pedestrian barriers where appropriate.

Existing features should be identified that can be integrated into the vehicle mitigation scheme, such as enhanced street furniture and traffic management measures. Consideration should be given to the effect on security of possible future changes to these features.

Any environmental conditions that can arise throughout the year that can be particular to the site should be identified, such as flooding, leaf mulch, frost, snow, ice, high wind speeds, sand storms or extremes of temperature (see [7.5](#)).

The existing road surface, kerbs and verges, gradients, camber or crossfall, at and in advance of, any proposed VSB location should be considered.

Any existing, or proposed road improvements or other works in the immediate area should be confirmed through the local planning office and highways department.

The need for a wider area traffic management plan should be reviewed and the impact of a perimeter security scheme on existing traffic movements should be considered.

If the potential threat exceeds the current security arrangements and any currently deployed VSBs' capability, additional protective measures should be considered.

The presence and location of all underground and above-ground services and utilities should be considered.

## 7.4 Traffic survey

Where appropriate, traffic surveys should be commissioned to identify traffic patterns and legitimate vehicle types at all proposed entry and exit points for representative periods. The peak traffic times and volumes and any special days/occasions which can create different traffic movements should also be identified.

The survey should consider the various categories of vehicle and their occupants that need to enter the proposed security zone legitimately, including public service vehicles, delivery vehicles, over-sized vehicles, taxis, very important people (VIPs), employees and emergency services. Site design should also accommodate infrequent over-sized vehicle access. Non-motorized vehicles and pedestrian movements should also be included in the survey. Contingency measures (e.g. movable elements of the VSB) can be used for infrequent over-sized vehicles and separate access points can be necessary to handle the volume of delivery vehicles determined by the traffic survey.

NOTE 1 See [Clause 8](#) for additional site design considerations.

NOTE 2 Over-sized vehicles can include cranes, vehicle-mounted plant, multiple trailer vehicles, emergency equipment with extended wheelbase dimensions, etc.

## 7.5 Civil works

### 7.5.1 Variations between VSB performance under vehicle impact test conditions and site conditions

Having identified a VSB with a performance classification that meets the requirements of the specific location, it should be recognized that the impact test will be undertaken within specific parameters. Therefore, the site should ensure that the site conditions are recognized when installing the VSB in order that the performance rating is maintained and the VSB will operate reliably.

Factors that should be considered, include but are not limited to:

- urban areas, where utilities are frequently present;
- low temperature locations, i.e. frequently below -10 °C;
- high temperature locations, i.e. frequently above 40 °C;
- desert environments, where soil conditions are significantly different;
- wetland environments, where soil conditions are significantly different.

It is recommended that a suitably qualified engineer determines how the VSB can be affected by non-standard conditions and assess whether the VSB is fit for purpose under site conditions. It is recommended that the engineer has experience in geotextiles, structural and mechanical work.

A process that should be followed to minimize the likelihood of performance variation is shown in [Figure 1](#).

If a VSB is being evaluated for use at a specific site, it can be beneficial to test the VSB in a site-specific construction.

NOTE 1 A suitably qualified and experienced engineer can then evaluate the test result and adapt the installation for the specific site. See EN 1317-1 or Reference [\[49\]](#).

NOTE 2 Reference [\[51\]](#) contains information about soil varieties.

It is known that varying the type of foundation (rigid/non-rigid) in which a VSB is installed or the surface on which it is placed can affect the performance of the VSB. Further testing can be required if the tested conditions differ from the site conditions.

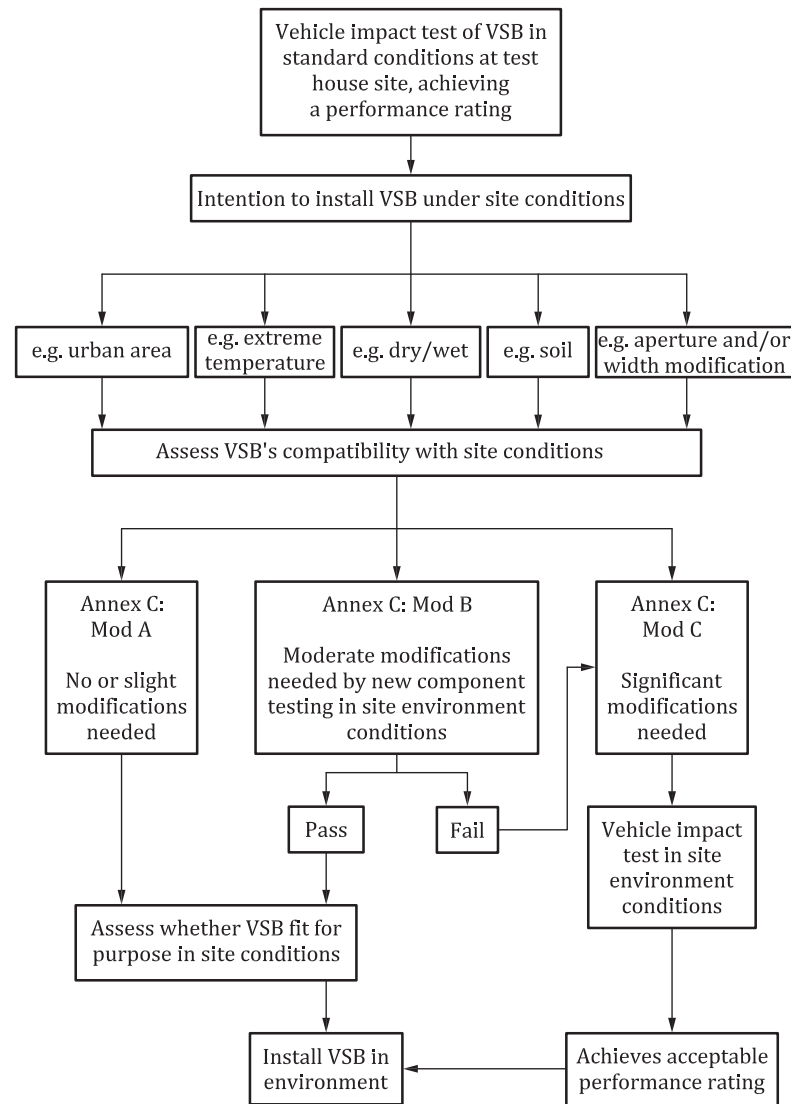


**Figure 1 — Process for assessing a VSB for use under site conditions**

## 7.5.2 Ground types

The ground should be assessed for its suitability for fixing to and supporting the selected VSBs.

It is recommended that this be assessed by a suitably qualified and experienced civil/structural engineer and appropriate preparatory or remedial measures taken to ensure suitability. It is recommended that the engineer has experience in structural and mechanical work.

## 7.5.3 Foundations

The depth required for foundations as well as the supporting ducting infrastructure for foul water drainage, sump pumps, soakaways, power and signal cables and contaminant (oil) collection should be assessed.

The ability of the concrete mix to flow in and around foundation steel (sections and reinforcement) should be considered to minimize voids and aggregate segregation.

In many urban locations, underground services tend to be very close to the surface and often pass through gateways that are to be protected. In such locations, consideration should be given to

surface-mounted products, shallow foundations or those with foundations designed to accommodate underground services.

VSBs typically require a stable foundation. Consideration should be given to the suitability of any foundation to provide adequate resistance to the forces applied.

A VSB may be tested in a rigid foundation and/or a non-rigid foundation. When selecting a VSB, the application for which the foundation is designed should be taken into account. Where a VSB has been tested in one type of foundation but its application is considered in a different foundation, an engineering assessment should be made as to whether the VSB is appropriate and will perform as required.

Some VSB systems need to be mechanically secured to the foundation or be made suitably robust by way of using dowels or bolts. Rebating or trenching can be enough by itself or may be combined with additional mechanical fixtures to add strength. Other VSBs are designed to be laterally displaced and rely upon friction against the substructure to dissipate impact energy and resist movement of the VSB.

In general, the larger the force to be resisted, the greater the required size of foundation. Otherwise, there can be insufficient support to enable the VSB to achieve its design requirements and required impact performance.

Foundations are required to satisfy two principal objectives, as follows:

- a) To provide adequate support for the VSB. This is usually achieved by the strength of the concrete, the design of the reinforcement and the overall size of the foundation, particularly with regard to its depth.
- b) To provide adequate resistance to foundation movement/rotation. This can occur when the VSB remains intact after an impact. If it is not deformed or displaced, then it does not absorb a large proportion of the impact energy. If the foundation is embedded into the subsoil, a concrete foundation is almost always necessary in order to achieve the durability and design-life requirements.

When designing a foundation, prior knowledge of the sub-surface conditions of a site is essential and this should be obtained by site investigations such as ground radar supported by trial pits or inspection trenches. Historic records of site services can be unreliable and desktop method of site survey is not recommended as a replacement for the physical investigation outlined above. The presence of services can limit the available construction depth, and in extreme cases, re-routing of services can be the only option.

It is recommended that any foundation design, including those meeting site-specific requirements, be approved by a suitably qualified and experienced civil/structural engineer.

#### **7.5.4 Surface-placed VSB**

Friction between surface-placed, non-anchored VSBs and the supporting surface is key to achieving the performance of the VSB under impact. Placing the VSB on a surface which is harder/softer than the surface used for testing will have a significant effect on the performance classification, such that the performance is not necessarily predictable. Environmental effects such as weather conditions, especially rain, snow or ice, can be detrimental and therefore the possible implications on protection should be considered.

## **8 Site design**

### **8.1 Traffic management**

The requirements for vehicle entry and exit through the security perimeter and the options for access control management should be assessed. The type and frequency of vehicles passing through the security perimeter influences the choice of VSBs.

The following traffic management issues should be considered:

- a) the number of entry and exit points during routine operations (including the possibility of limiting traffic to one entry and one exit point during routine operations);
- b) the locations of the entry and exit point(s) (same or different locations);
- c) the need for a vehicle marshalling, holding and/or search area; the provision of off-site delivery consolidation;
- d) the potential risks created by the VSB, cordon (i.e. search procedures) and traffic management scheme (e.g. those with legitimate access becoming at risk from accident or attack if delayed at the perimeter);
- e) the arrangements needed for vehicles that are not to be permitted entry (e.g. off-site parking or drop-off areas);
- f) the need for rejection routes or lanes;

NOTE 1 This is to avoid the need to open VSBs to grant entry and exit to errant vehicles for the purpose of turning around.

- g) the identification of vehicles that require access to the asset and management of their attendance/arrival, and the segregation of staff and visitors;
- h) speed management/reduction features necessary to enhance safety and security;
- i) warning signs/lights/road markings needed to indicate the presence and status of the VSB;
- j) distance needed between warning signs and the VSBs;
- k) provision of safety and security lighting (it is recommended that where measures are placed in pedestrianized areas, these be clearly marked);
- l) maintenance of sightlines for guard force and road users;

NOTE 2 Ancillary equipment (e.g. hydraulic cabinets) can affect sightlines.

- m) reaction time needed for emergency operation of the VSB (it is recommended that the VSB always be deployed so as to keep the site secure and only operated under controlled conditions to enable access to site);
- n) prevention of “tailgating” vehicles;
- o) traffic types and volumes;
- p) the separation of pedestrian and vehicular traffic and the distance of pedestrian crossing points from VACPs;
- q) contingency measures (e.g. for VSB maintenance/failure) to provide the same or greater resistance to attacks by the threat applicable to the site;
- r) maintenance of access for business-critical vehicle movements at all times;
- s) maintenance of access in a timely manner for the emergency services at all times;
- t) speed of operation of active VSB(s) for both peak and off-peak access.

Based upon the threat applicable to the site, proposed vehicle access control measures and procedures should be analysed to determine if and how they can be compromised by attack scenarios.

## 8.2 Aesthetics

It is advisable to consult with the local planning authority at an early stage of the design and procurement process, to gain insight on the acceptability of the project and to identify what documentation needs to be submitted in order to be granted approval under the planning process.

The visual impact, including layout, construction and appearance, of some VSBs can deter an attacker, whereas others can appear less robust despite performing well.

**NOTE** The appearance and location (e.g. close to a public highway) of the VSB and any associated security devices can be subject to planning, building and highway regulations.

## 9 VSB performance

### 9.1 Impact performance

As impact test standards for VSBs have developed, there will be products that have been tested in accordance with standards which include ISO 22343-1, IWA 14-1, PAS 68, CWA 16221 and ASTM F2656. The end user should make sure that they are aware of the differences between the standards in order to make an informed decision on the product to be specified.

Where modifications to the VSB are required for a specific site, these should be reviewed within the context of [Annex C](#).

The end user should ask to see all documentary evidence from the manufacturer relating to the impact test(s) for the VSB(s) that have been identified for the site.

It is recommended that when specifying a VSB, documentation does not restrict choice to a single impact test standard, in order that the maximum product choice is available for the specific location.

It is recommended that when specifying a VSB, the user is aware of the performance of the VSB against slow speed attacks, i.e. nudging, ramming and pushing.

Vehicle impact tests are dependent on the characteristics of the test vehicle and the specified VSB for the location should have a performance classification for the identified threat vehicle and impact speed.

**NOTE 1** The award of a performance rating does not imply that a barrier will perform, as rated for this single impact test, in all site applications and against all vehicles types or test options (mass, speed, or impact angle) specified in the impact test document.

**NOTE 2** If there are differences between the tested vehicle and threat vehicle, mass, speed and impact angle, it can be necessary to consult a suitably qualified and experienced structural/mechanical engineer to assess the VSBs capability to resist the threat vehicle.

### 9.2 Vehicle speed

#### 9.2.1 General

ISO 22343-1 tests the performance of a VSB against an impact from a vehicle travelling at a specified speed. Caution should be exercised when specifying a VSB.

**EXAMPLE** It can be assumed that a rising arm barrier impact tested with a truck can stop all vehicle types up to that mass and speed. However, the rising arm barrier design can allow a smaller vehicle, such as a car, to force the rising arm up and the vehicle to pass under the barrier.

Vehicle speed is an important factor in determining the kinetic energy of a moving vehicle at the point of impact. Physical characteristics of the VSB and threat vehicle as well as the vehicle dynamics and the geometry of the roadway should be taken into consideration when selecting a VSB.

A range of speed reduction features (see [9.2.4](#)) is available and should be considered where appropriate while taking account of any access that can be required for emergency service vehicles.

### 9.2.2 Vehicle dynamics assessment

A VDA should be undertaken at each specific site/location in order to determine the impact speed for the identified threat vehicles such that risk can be assessed and suitable VSBs can be specified.

### 9.2.3 Road layout

There is the potential to limit the approach speed of the vehicle, e.g. through changing the approach road layout to induce the driver to slow to an appropriate speed or risk losing control of the vehicle. However, precautions should be taken to provide adequate warning to an errant motorist based on national/local guidance.

### 9.2.4 Speed reduction features

Speed reduction features (e.g. chicanes, serpentines) should be constructed from vehicle impact rated products. One element of the feature can be removable or retractable to enable over-sized and emergency vehicles' entry if alternate access arrangements are not available.

## 9.3 Impact angle

The majority of impact tests on currently available VSBs are undertaken at 90° to the approach of the specified threat vehicle and therefore the VSB design and its foundation are optimized for this impact. When the site survey and threat assessment is undertaken, the approach angle of the threat vehicle should be considered and in addition to the ability of the identified product and its foundation to withstand the impact if not at 90°.

Where shallow impact angles are specified, the possibility of the vehicle being redirected rather than stopped should be considered.

## 9.4 Vehicle penetration distance and major debris distance/coordinates

### 9.4.1 Vehicle penetration distance

Some physical perimeter security schemes allow for vehicle penetration to be a prescribed distance beyond the VSB datum line. Vehicle penetration distance is recorded for product tests undertaken in accordance with ISO 22343-1.

NOTE Where vehicle penetration exceeds 25 m under ISO 22343-1, the VSB does not receive a performance classification.

### 9.4.2 Major debris distance/coordinates

Some physical perimeter security schemes allow for major debris dispersal beyond the VSB datum line. Subsequently, several VSB designs allow for major debris dispersal. It is a requirement of the ISO 22343-1 test method to record (as an observation) the major debris distance post-impact.

This aspect of the impact between the vehicle and the barrier can be considered relevant when allowing for a vehicle component breaching a building or, for example, part of its load passing into a sensitive area.

### 9.4.3 Stand-off distance

The stand-off of the VSB and the asset to be protected should be taken into account when specifying the product for the specific location. A VSB should be positioned at a distance from the asset that exceeds the penetration distance, major debris distance and blast stand-off.

**NOTE** Having insufficient stand-off distance means there is a risk that the asset is hit by an impacting vehicle, major debris or increased blast loading. To achieve sufficient stand-off distance, it can be possible to specify a VSB with a lower vehicle penetration distance and/or major debris distance, re-position the VSB or relocate the asset.

## 9.5 Operational performance

### 9.5.1 Vehicle access control

Often vehicular access has to be provided through the VSB line. The vehicles can be searched or be of known authenticity before allowing access through the VACP. In this instance, a single or multiple access point may be provided through the active security barriers. Where the stand-off measure forms the site boundary or security perimeter, the VACP then typically becomes the first point of challenge for all vehicles.

Regardless of the type of active VSB installed, a secondary access control point should be considered. This is to ensure that where the VSBs fail or there is an incident at the main VACP, traffic can easily be diverted to the secondary location. This location should be able to accommodate the traffic volumes typical to the main VACP while maintaining the same level of operational security.

Vehicle access control measures should be identified as follows:

- a) manual: no control system required, physical operation by guard for all movements;
- b) semi-automatic: opened or closed by guard using push button control and/or closing automatically via detection loops or similar;
- c) fully automatic: opening by an access control system, closing automatically via detection loops or similar;
- d) automatic system technologies such as automatic number-plate recognition (ANPR) should not be relied upon as the sole means of identifying and enabling access by a vehicle into a site.

The following factors should be considered at access points:

- prevention of “tailgating” (e.g. by a second set of VSBs located past the first set of VSBs that are closed and only released when the vehicle has been cleared for entry and the initial barrier has been closed);
- remote control override with emergency close/reset;
- VSB working with other equipment (e.g. rising arm barriers or gates);
- security of control unit;
- how the VSB is to operate in the event of a power or system failure.

The ability for an attacker to covertly defeat inductive detection loops to gain access (e.g. by sliding a metal plate over free exit induction loops or activate any free exit detection system) should be considered.

Maintenance, operation and removal costs in conjunction with the development of life cycle costs of both permanent and temporary physical perimeter security schemes should be considered.

### 9.5.2 Speed of legitimate access

When considering the design of a VACP, it should be noted that most VSBs are only effective at stopping a vehicle when closed. The type of VSB, speed of operation, system duty rating, traffic volumes, mode of operation, safety systems, driver and guard force attentiveness, and system reliability can all compromise the effectiveness of the VSBs in stopping a hostile vehicle.

### 9.5.3 Power requirement

How a VSB system functions in the event of a power failure should be identified. The following information should be obtained to develop an informed specification or policy:

- a) The position of the VSB, upon primary power loss, is acceptable to establish and maintain security;
- b) An uninterruptible power (UPS)/generator backup power system is available, if immediate backup power is required to establish and maintain security to an acceptable level. The indication of backup power start-up should be sent to the site security force (or an appropriate monitoring station) in both an audible and visual manner (e.g. by phones, intercom or AACs).
- c) The power supply can be from two physically diverse and stable routes (the safety implications of the VSB position/movement given a primary loss of electrical power to the VSB system).
- d) The VSB position when switched between power supplies.
- e) The VSB does not change position when switched from:
  - 1) primary power to no power (when no UPS/generator backup is used);
  - 2) primary power to UPS/generator backup;
  - 3) UPS/generator backup to primary power;
  - 4) no power to primary power.
- f) Any provision for surge protection for electrically powered security equipment to protect against lightning strikes.
- g) How the power failure and source of failure is indicated and if the indication is acceptable.  
 NOTE Typically the indication goes to a guard location and emits both audible and visual signals. For high security sites, the indication can go to a primary and secondary alarm station.
- h) If after a primary power failure, the manual operation of the VSB system can be accomplished in such a manner that security is maintained at an acceptable level.
- i) If alternative security measures have to be applied after primary loss of power to the VSB system, and if the time required to implement them maintains risk to the acceptable level.

### 9.5.4 Environmental conditions

The durability of the VSB depends on how and where it is deployed. The following factors that affect durability should be considered:

- a) low temperature effects (e.g. slippery road surfaces, VSB freezing in position or failing (increase in oil viscosity or freezing of wheels or external gears), increased corrosion due to road salt and grit deployment, potential damage due to snow ploughs);
- b) high temperature effects (e.g. overheating of motors, hydraulic systems or control systems, distortion of components parts);