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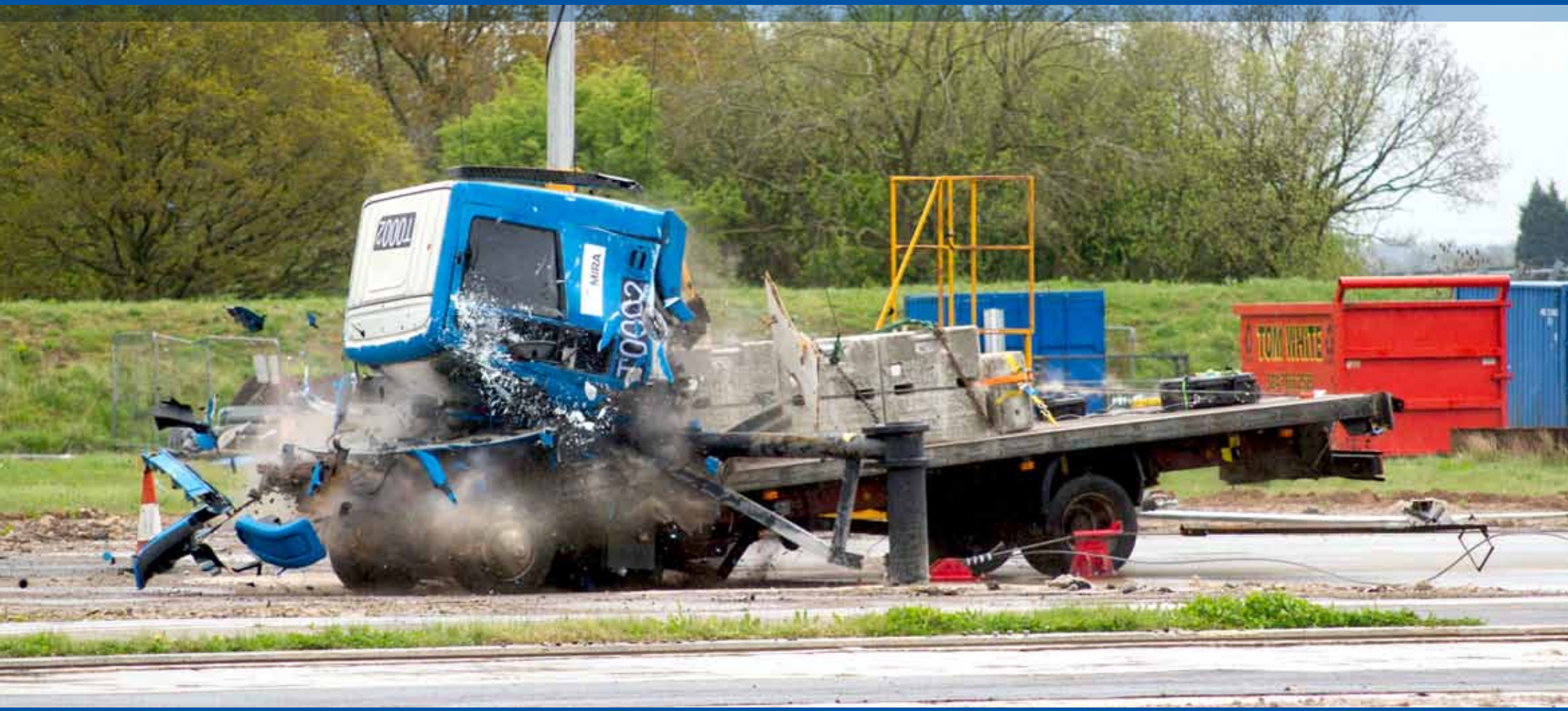
FRONTIER PITTS 2017 GUIDE TO IMPACT TESTING



A White Paper to all the specifications for the impact testing of vehicle security barriers.
Includes IWA 14-1 & 14-2, PAS 68, K12/ASTM F2656.

00 CONTENTS

Finding the right section

01 WHY?

Why have we impact tested Vehicle Security Barriers?

In the UK, and indeed the rest of the world, the current terrorism threat is constantly changing all the time meaning that vulnerable sites need to be constantly assessing the risk. One method of terrorist activity is vehicle borne attacks through suicide missions or ram-raiding. Site owners and operators need to protect their assets, including property and people, from such attacks.

02 WHO IS AT RISK?

Hostile Vehicle Attack

When a terrorist attacks they aim to achieve maximum casualties in a surprise attack.

Crowded Places such as Shopping Centres, Commercial Centres, Education Centres, Health Sector, Hotels & Restaurants, Major Events, Places of Worship, Pubs & Clubs and Visitor Attractions are particularly vulnerable.

INTERNATIONAL AIRPORTS

ARMY BARRACKS

POLICE STATIONS

POWER STATIONS

EDUCATION CENTRES

TRANSPORT HUBS

GOVERNMENT BUILDINGS

CASH HANDLING

SHOPPING CENTRES

CONSTRUCTION SITES

VISITOR ATTRACTIONS

SELF STORAGE

NaCTSO, The National Counter Terrorism Security Office has published Security Advice, including CONTEST and Project Argus, on these relevant areas which can be found at **www.frontierpitts.com/support-documentation/guidance-info/**

03 WHAT IS A VBIED?

Vehicle Borne Improvised Explosive Device (VBIED)

A car bomb, or truck bomb (VBIED), is an improvised explosive device placed in a vehicle then detonated.

It is commonly used as a weapon of terrorism and normally kills the occupants of the vehicle (suicide bombers), people near the blast site, and/or to damage buildings or other property.

A vehicle bomb acts as its own delivery mechanism and can carry a relatively large amount of explosives without attracting suspicion.

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04 WHO CAN HELP?

Who is available to help and advise

If your site is at risk the Centre for the Protection of the National Infrastructure can offer further advice and access to the Catalogue of Impact Tested Vehicle Security Barriers (CITVSB).

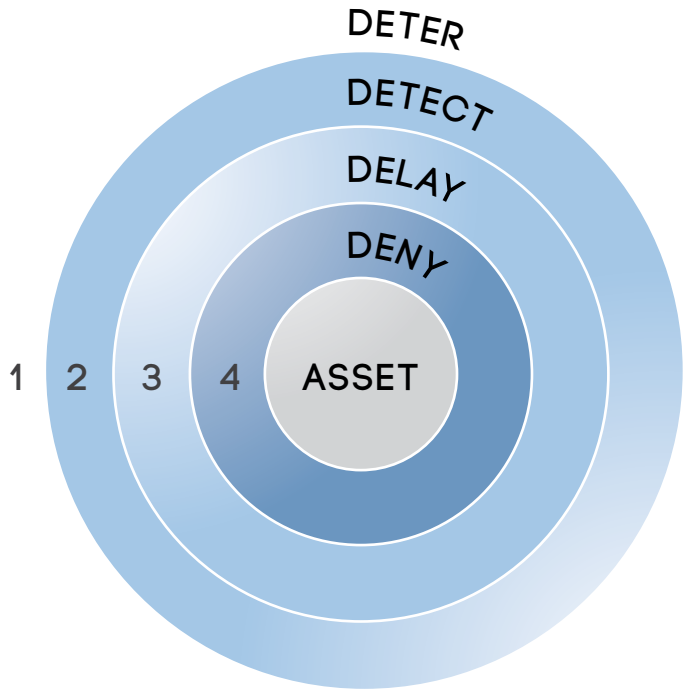
The CITVSB contains all the IWA14 & BSi PAS68 impact tested products CPNI have tested through their research program. Each Police Force across the UK has a number of Counter Terrorist Security Advisors (CTSA's) which are headed by the NaCTSO (The National Counter Terrorism Security Office).

Working alongside CPNI, the CTSA's can visit site to offer non biased advice. The Scoping Document will provide the client with all the relevant questions to ascertain their sites security needs and operational requirements. Once completed, the Scoping Document can be issued to VSB manufacturers to get comparable quotations.

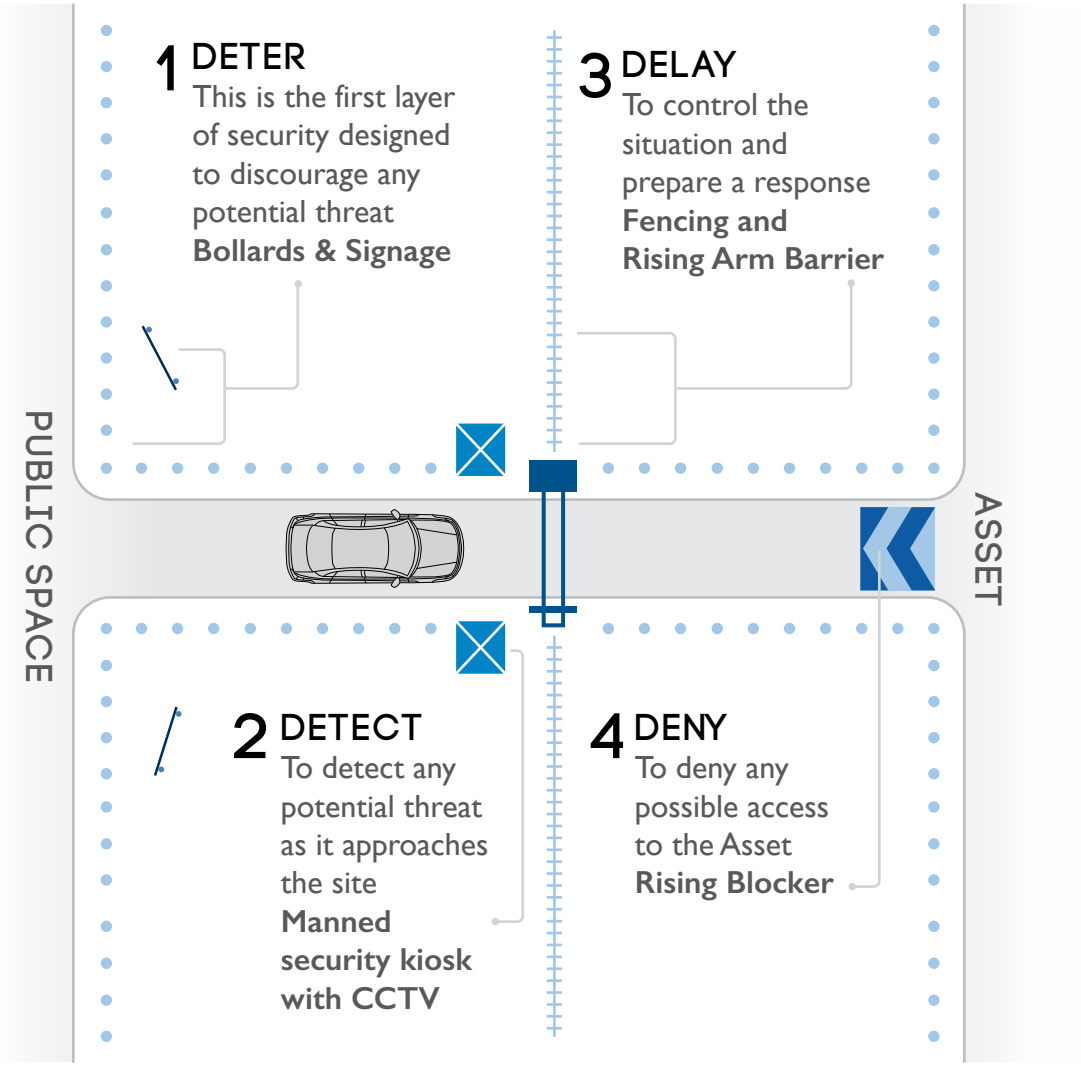
Please also see additional document
Frontier Pitts Scoping Document

05 OPTION 1 : LAYERED SECURITY

Vehicle Access Control Points (VACP)



One such solution is a layered security approach, also known as an **'onion'** approach. This provides the facility with layers of security and protection around an asset which will **deter, detect, delay** and **deny** any attack.



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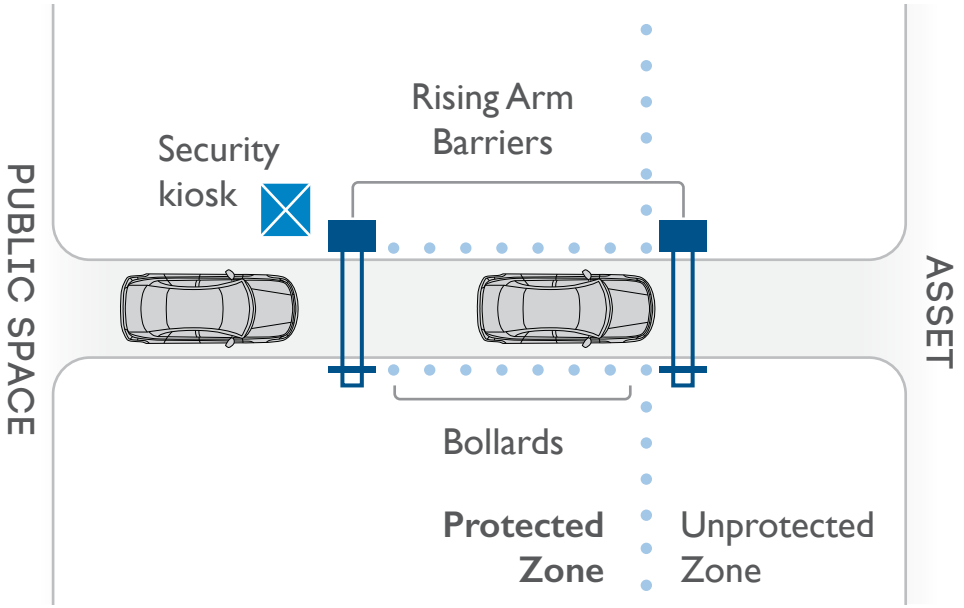
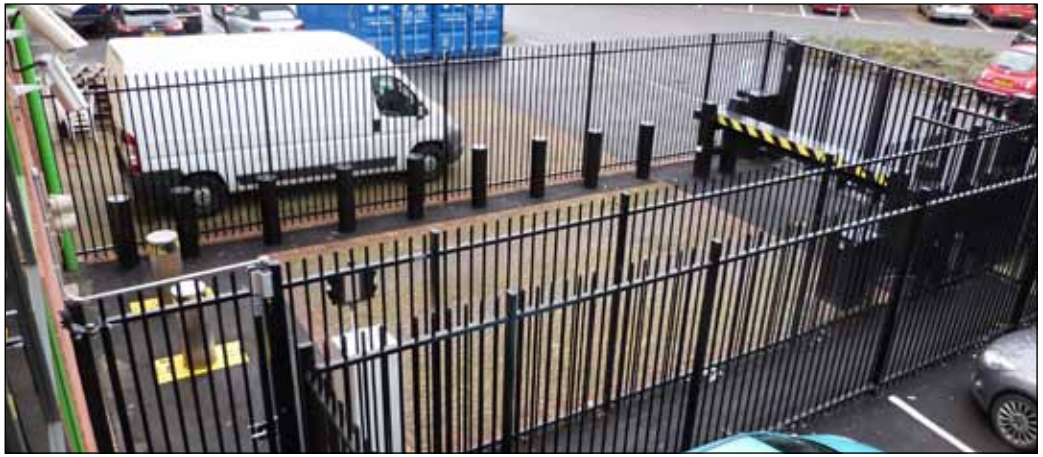
OPTION 2 : INTERLOCK SECURITY

Vehicle Access Control Points (VACP)

An Interlock system, or **'Sally Port'** and **'Tiger Trap'** as it is also known, is another option. This setup provides the site with a secure containment area to check incoming or outgoing vehicles. The traffic throughput for an interlock includes vehicles entering the first section control point and once in, this set will close. If the vehicle is authorised to proceed after security checks, the second control point will open and allow entry to site. At no point during the cycle will both sets of VSBs be in the open position. Only when the first set of VSBs are fully secured in the closed position will the second set open.





HVM Interlock System with Terra Rising Bollards, Terra Ultimate Barrier and Bi-folding Gate. The fence line is backed with HVM Static Terra Jupiter Bollards.

OPTION 3 : LPS 1175 SECURITY

Pedestrian Access Control Points (PACP)

The standards for the protection of Building Fabrics and External Perimeters are set by the Loss Prevention Board (LPCB). The Loss Prevention Standard LPS 1175 covers the "Requirements and Testing Procedures for the LPCB Approval and Listing of Intruder Resistant Building Components, Security Enclosures and Free Standing Barriers". Products tested and approved to this standard are widely recognised by Government Agencies and Datacentres as being an effective means of protecting people and assets.

The objective of this equipment is to Deter, Detect, Deny, Delay and Defend, thus reducing the risks of loss to crime or terrorism.

Security Rating grades illustrate the different attack times and tools.

Our Terra Diamond Turnstile has been successfully tested and awarded a security rating of 3 and 4 within the category of Building Fabric.

LPCB
Certified to LPS1175 Issue 6.1
Security Rating 3&4
Certificate No. 1059a/01 & 1059a/02

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Centre for the Protection of National Infrastructure

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06 WHAT IS THE THREAT?

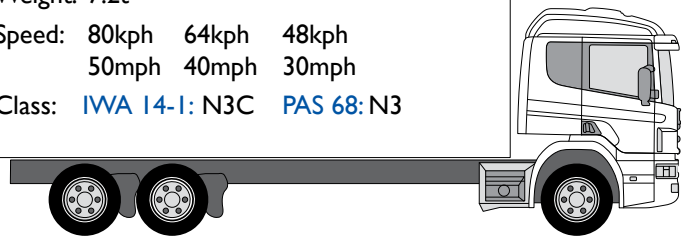
Type & Mass of the Vehicles used for IWA 14 & BSi PAS 68 Testing

GOODS VEHICLE

Weight: 7.2t

Speed: 80kph 64kph 48kph
50mph 40mph 30mph

Class: IWA 14-1: N3C PAS 68: N3

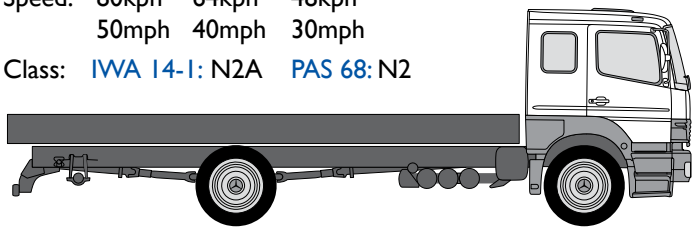


GOODS VEHICLE

Weight: 7.2t

Speed: 80kph 64kph 48kph
50mph 40mph 30mph

Class: IWA 14-1: N2A PAS 68: N2

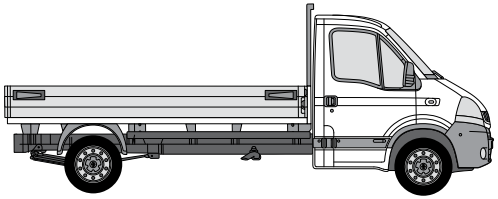


LIGHT GOODS VEHICLE

Weight: 3.5t

Speed: 80kph 64kph 48kph
50mph 40mph 30mph

Class: IWA 14-1: N1 PAS 68: N1

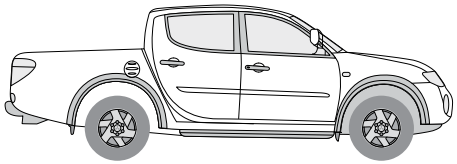


4X4 PICKUP TRUCK

Weight: 2.5t

Speed: 80kph 64kph 48kph
50mph 40mph 30mph

Class: IWA 14-1: N1G PAS 68: N1G

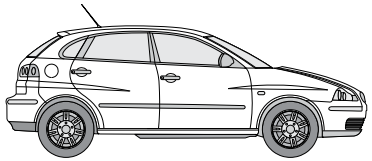


CAR

Weight: 1.5t

Speed: 80kph 64kph 48kph
50mph 40mph 30mph

Class: IWA 14-1: M1 PAS 68: M1



The test criteria (vehicle weight and impact speed combinations) shall be selected from one of the combinations specified from Vehicle Type and Vehicle Speed.

“What could be the maximum approach speed of these types of vehicle?”

07 IWA 14 CLASSIFICATION CODE

What information does the IWA code represent?

1	2	3	4	5	6
V	Terra Blocker	7200 N2A	80	90	0

1 **Classification of Test:**

V = Impact Test – Actual vehicle impact tested to repeatable scientific conditions

2 A retractable road blocker

3 Capable of withstanding an impact by a 7200kg rigid vehicle at 80kph (50mph)

4 Impact speed at 80kph (50mph)

5 IWA 14 – Angle of test impact. The majority of impacts are head on, i.e. 90 degrees. Other approach impact angles include 45° (fencing)

6 Where the vehicle penetrates 0.0m beyond the original position of the **front/impact** face of the blocker. i.e. How far into site the test vehicle would stop

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In many specifications only parts **2**, **3** and **4** are detailed, but the other parts are just as important and need to be clarified.

Note: When specifying IWA 14 products the short hand or long hand information must be given.

PAS 68 2013 CLASSIFICATION CODE

What information does the PAS code represent?

1	2	3	4	5	6	7
V	Terra Blocker	7500 N2	80	90	0	5.2

1 Classification of Test:

- **V =** Impact Test – Actual vehicle impact tested to repeatable scientific conditions
- **F =** Computer simulation FEA or Design method (check validation body)
- **P =** Pendulum testing weight used for bollards instead of vehicles (this test method has been removed from PAS 68 and is now part of PAS 170-1 Vehicle security barriers – Non-vehicle low energy impact testing)

2 A retractable road blocker

3 Capable of withstanding an impact by a 7500kg rigid vehicle at 50mph (80kph)

4 Impact speed at 50mph (80kph)

5 BSi PAS 68 – Angle of test impact. The majority of impacts are head on, i.e. 90 degrees. Other approach impact angles include 45° (fencing)

6 Where the vehicle penetrates 0.0m beyond the original position of the rear face of the blocker. i.e. How far into site the test vehicle would stop.
Note: With surface mounted products, check how far the arresting equipment travelled on impact

7 Where major debris landed beyond the original position of the blocker. Major debris is classed as 25kg or more. This is important when trying to maintain a "stand off" from a building

In many specifications only parts **2**, **3** and **4** are detailed, but the other parts are just as important and need to be clarified.

Note: When specifying IWA 14 products the short hand or long hand information must be given.

08 DIFFERENT SPECIFICATIONS EXPLAINED?

The VSB specifications from around the World

There are various specifications for the impact testing of VSBs (Vehicle Security Barriers). From the beginning of 2014, the UK's Government elite VSB testing program has impact tested products under IWA 14. This replaced the British Standards Institution (BSi) Publicly Available Specification PAS 68, however products tested under this specification have been given Grand Father rights and remain on the Catalogue of Impact Tested products.

IWA14-2 and PAS 69 complements the impact test specifications by providing guidance on the product installation.

Other international specifications include:

- **US ASTM F2656-07 (M50-P1)**
  Formerly the Department of State K12 rating
- **European Workshop Agreement CEN CWA 16221**

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IWA 14.1 & 14.2

International Workshop Agreement

A new international ISO International Workshop Agreement that combines and updates elements from PAS 68, PAS 69, ASTM F 2656 and CWA 16221, as well as new content.

PART 1: PERFORMANCE

The vehicle impact test method and performance rating.

IWA 14-1:2013 is the International Workshop Agreement which specifies the essential impact performance requirement for a vehicle security barrier (VSB) and a test method for rating its performance when subjected to a single impact by a test vehicle not driven by a human being.

PART 2: APPLICATION

IWA 14-2:2013 provides guidance for the selection, installation and use of vehicle security barriers (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.

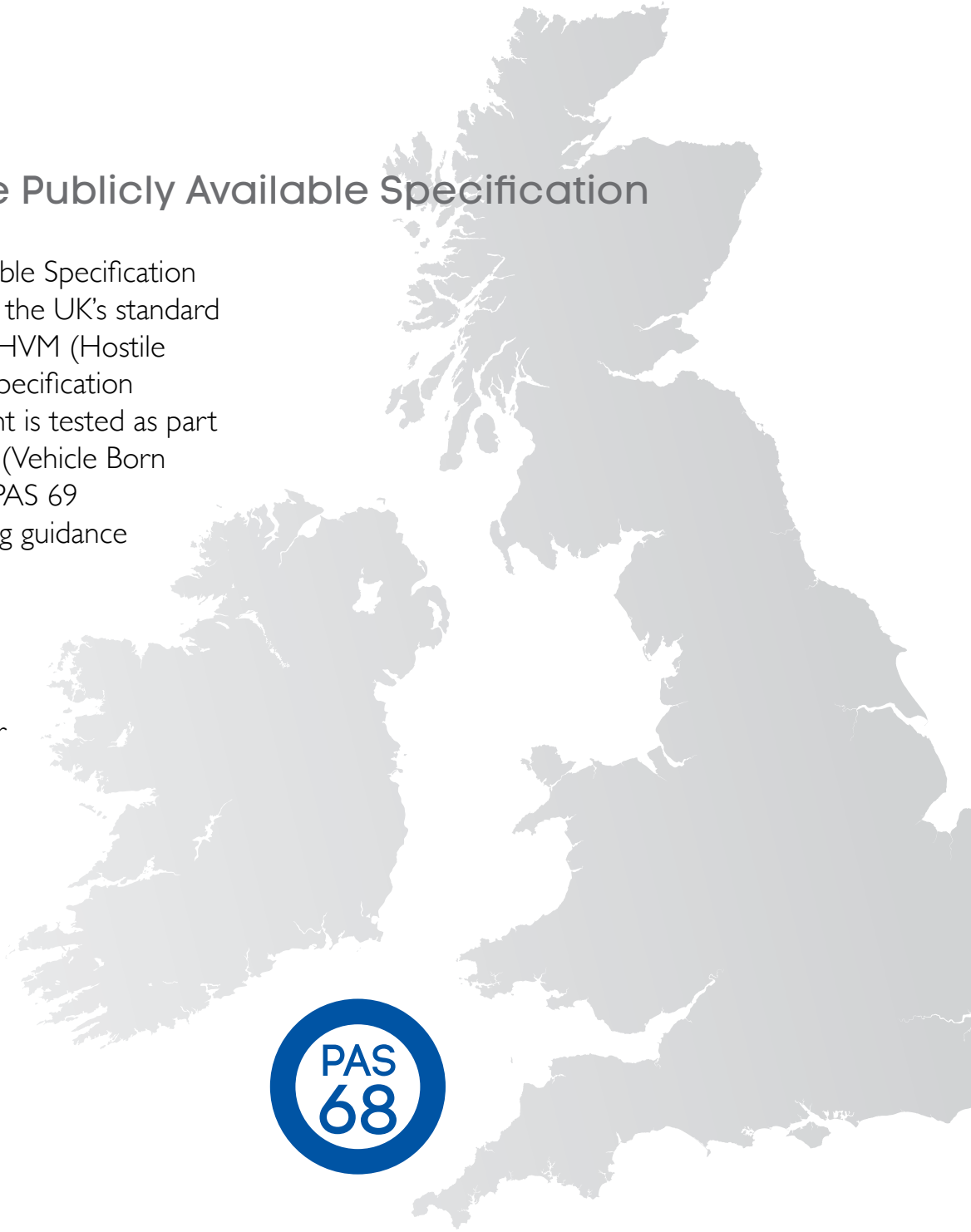
BSI PAS 68

British Standards Institute Publicly Available Specification

BSi PAS 68 is the latest BSi's Publicly Available Specification for vehicle security barriers. It has become the UK's standard and the security industry's benchmark for HVM (Hostile Vehicle Mitigation) equipment, and is the specification against which perimeter security equipment is tested as part of the ongoing research to prevent VBIED (Vehicle Born Improvised Explosive Device) attacks. BSi PAS 69 complements this specification by providing guidance on the installation of the tested product.

The ratings and specifications illustrate the different levels of BSi PAS 68.
The importance of after sales and who should maintain your equipment is another aspect which should be considered. BSi PAS 69 should be considered to ensure this equipment is installed correctly.

France and Australia have adopted the British PAS 68 specification.



PAS 68

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ASTM AND DEPARTMENT OF STATE K12

Standards for the United States of America

ASTM (previously K12 standard)
Designation: F 2656 – 07

Standard Test Method for Vehicle Crash Testing of Perimeter Barriers. This standard superseded the Department of State K ratings, as explained below:

M50-P1 = 6.8t @ 80kph
(K12) (15,000lbs @ 50mph)

M40-P1 = 6.8t @ 64kph
(K8) (15,000lbs @ 40mph)

M30-P1 = 6.8t @ 48kph
(K4) (15,000lbs @ 30mph)

What the code means

M	50	P1
Test Vehicle (i.e Medium duty truck 6800kg)	Test Speed (mph)	Penetration (i.e. 23-98ft)
M	50	P1 <=1m (3.3ft)
M	40	P2 1.01m to 7m (3.3ft to 23.1ft)
M	30	P3 7.01m to 30m (23.1ft to 98.4ft)
M	20	P4 30m (98ft) or greater

High Commission for Industrial Security Directives (HCIS) for crash barriers

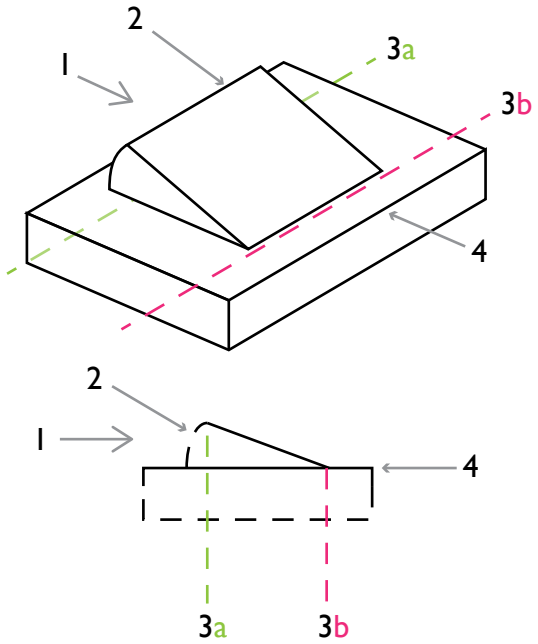
Frontier Pitts HCIS Terra Blocker has been specifically designed to comply with the Kingdom of Saudi Arabia's (KSA) Ministry of Interior, HCIS Security Directives for crash barriers.

THE HCIS Terra Blocker has been successfully impact tested stopping a 6.8t vehicle travelling at 80kph.

For more information please visit
www.frontierpitts.com/support-documentation/standards/american-k12/

IWA 14 vs. PAS 68

Comparing the International and UK specifications



KEY

1. Direction of impact
2. VSB
3a **IWA 14** VSB Datum line
3b **PAS 68** VSB Datum line
4. Ground level

IWA 14 combines and updates elements (mainly vehicles) from PAS 68, PAS 69, ASTM F 2656 and CWA 16221.

Points of difference between IWA14 and PAS 68:

- Vehicle Penetration is now measured from the front of the VSB (Vehicle Security Barrier) in IWA 14 whereas in PAS 68 it is actually measured from the back face of the system. Therefore penetration results from IWA14 and PAS68 cannot be compared, particularly with a wide product such as a road blocker
- The IWA 14 classification code just has a value for penetration now, whereas the PAS 68 classification code also included a value for debris – 25kg+ mass landing past the datum point
- IWA 14 includes more vehicles types, incorporating the vehicles from the other specifications

All vehicle types can be tested at 80kph (50mph).

The above is only a brief summary. For further information, please contact Technical Sales.

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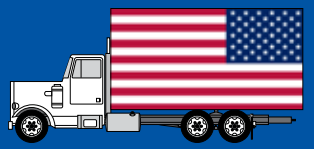
PAS 68 vs. K12

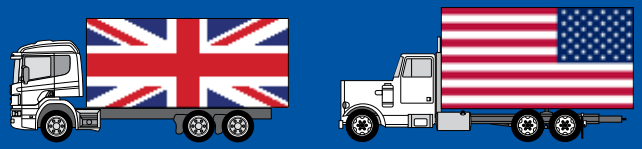
Comparing the UK and USA specifications

	BRITISH TEST (PAS68)  7.5t	**USA TESTS** (DOS-K12 and ASTM M50)  6.8t
Vehicle weight (gross vehicle weight)	**7.5 tons** (7500 kg, 16500 lbs)	**6.8 tons** (6800 kg, 15000 lbs)
Vehicle speed	**50 mph** (80 kmh)	**80 kmh** (50 mph)
Impact energy	**1852 kJ**	**1695 kJ**

*__VSB__ : Vehicle Security Barrier such as Gates, Barriers, Bollards or Blockers

PAS 68 VS. IWA 14

Comparing the UK and International specifications

	PAS 68  British Vehicles **7.5t**	IWA 14  British & US Vehicles **7.2t**
Vehicle weight (gross vehicle weight)	**7.5 tons** (7500 kg, 16500 lbs)	**7.2 tons** (7200 kg, 15873 lbs)
Vehicle speed	**50 mph** (80 kmh)	**80 kmh** (50 mph)
Impact energy	**1852 kJ**	**1777 kJ**
Penetration measured from: (VSB Datum Line) *	**Front** of VSB/Impact Face	**Rear** of VSB
Vehicle Datum Line	**Front** of Vehicle Cab	**Rear** of Vehicle Cab
Dispersion/Distance Major Debris (+25kg)	**Included**	**Excluded**

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***VSB** : Vehicle Security Barrier such as Gates, Barriers, Bollards or Blockers

09 HVM CONSIDERATIONS

When purchasing HVM the following should be considered:

SECURITY

1. the level of residual risk is deemed acceptable by the organisation
2. attack method to be mitigated
3. countermeasures
4. response to increased threat conditions
5. enforceable stand-off distance

BUSINESS NEEDS

1. lifetime cost (training, manning levels, service, maintenance and replacement)
2. traffic management
3. appearance
4. internal and external stakeholder requirements
5. security risks induced by safety concerns or systems

ENGINEERING CONSTRAINTS

1. architectural
2. foundations
3. buried services
4. land ownership and available space

PLANNING RESTRICTIONS

(Local Authority or other)

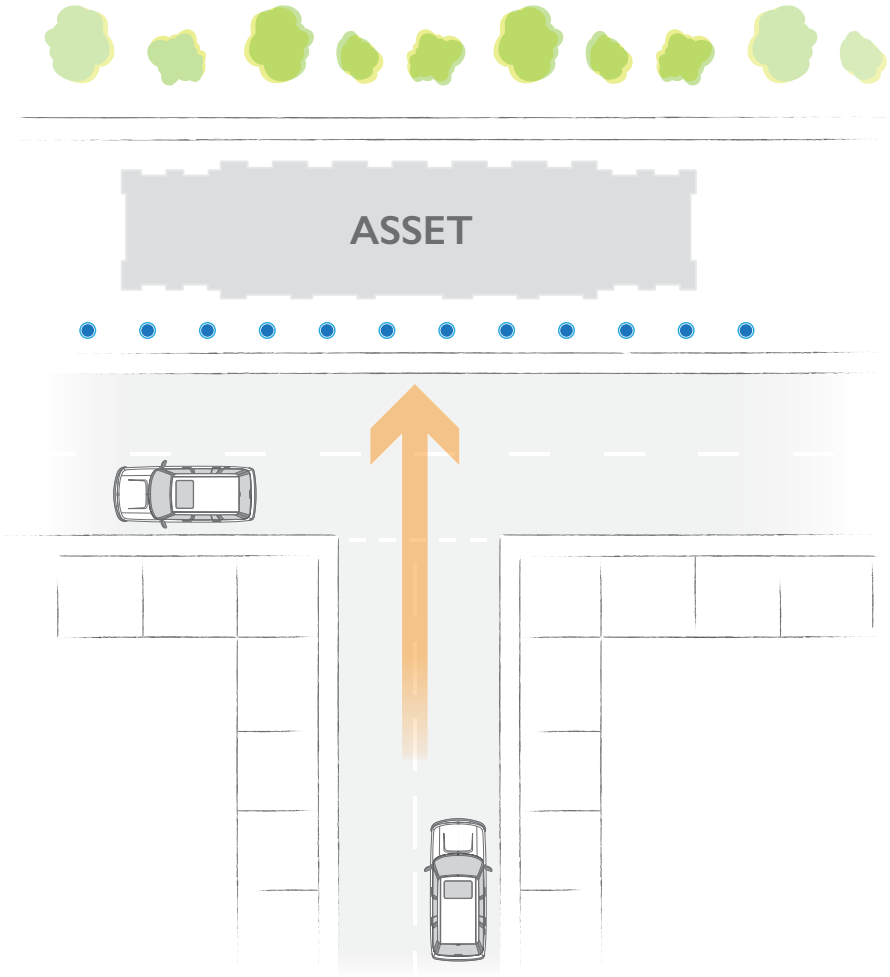
1. height
2. weight
3. restrictions of area
4. utilities and traffic control

PRODUCT

1. Reputable Company
2. Standards, Specifications and Technical Requirements
3. Testing
4. Accreditations (i.e. ISO 9001, PSSA Verified)
5. Aftersales

10 HVM AND ARCHITECTURE

Integrating HVM into Architectural Design



The main purpose of any type of security is to protect an asset. An asset can include people (staff, visitors, guests) or physical assets (buildings, contents, equipment and sensitive materials). Depending on what the asset is will depend on the threat level. The threat level may remain constant, or may change throughout the day, month or year depending on an event (i.e. Crowded Places venue) or the current political environment.

A LAYERED APPROACH

Security is most effective when implemented with layers of HVM, access control and vehicle management. The immediate vicinity of the asset should be protected, with further layers added at different standoff distances to mitigate the threat.

It is important that the security system is equal to the assessed threat level to avoid potentially highlighting a vulnerable site, whilst not impeding on the sites day to day operations (deliveries, visitors etc.).

Traffic Management Options include:

- Vehicle Exclusion
- Vehicle Inclusion
- Temporary Protection (during heightened times of threat)
- Traffic Calming Methods (developing exterior landscape to slow down potential hostile vehicles)

Frontier Pitts are HVM Specialists and trained to provide expert knowledge and advice.

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11 RAISING THE STANDARDS

PSSA Perimeter Security Suppliers Association

PSSA Verification Scheme

As an ISO 9001 British Manufacturing Organisation, Frontier Pitts understands the importance of quality, standards, operating systems, technical specifications and drawings within the Hostile Vehicle Mitigation market to ensure the equipment specification that is impact tested, is also installed on site.

With seven PSSA verification awards, Frontier Pitts has illustrated a commitment to conform to internationally recognized standards that assure:

Products are fit for purpose – designed to meet customer, market and regulatory requirements

Products are consistently manufactured and supplied conforming to their agreed specification

Products, when in use, produce the intended performance outcomes specified by the customer

12 OTHER CONSIDERATIONS

Installation

IWA 14-1 & PAS 68 details the Guidelines for the specification and installation of vehicle security barriers.

IWA 14-2 & PAS 69 provides guidance on the selection, installation and use of vehicle security barriers to ensure that they are selected and placed as effectively as possible. IWA14-2 & PAS 69 is intended to be used by designers, planners, architects, security managers and facilities managers within the public and private sectors.

Frontier Pitts are specialists in designing, installing and maintaining IWA14 &PAS68 HVM equipment. When specifying counter terrorist equipment, it is especially important to ensure that the installer is proficient in installing impact tested products so that the products rating is not affected.

Once the HVM equipment is installed the site will have a commitment to guarantee the integrity of the product and ensure that it operates within health and safety guidelines for the public and staff. Frontier Pitts also provide Maintenance Contracts for complete peace of mind, so the engineer that installed the equipment can also maintain it.

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OTHER CONSIDERATIONS CONTINUED

After Sales Support & Maintenance

Frontier Pitts fleet of over 35 engineers provide cover across the whole of the UK and parts of Europe with a response time of just 04 hours.

Our nationwide teams of suitably trained and vetted engineers are backed by a comprehensive spares department, which will ensure one can have a prompt repair no matter where your site is located.

Other important factors to consider when choosing a service provider include that they undertake health and safety training, along with holding the relevant insurances and working to a quality assured standard.

Sites that require a high level of security equipment are most likely to also require emergency response to breakdowns (say 04 hours day or night) from a company that is practised in working with large organisations and to their specific site procedures. A responsible maintenance specialist will provide site specific risk management and will ultimately prolong the operational life of your equipment.

13 GLOSSARY

Definition of Terms

CPNI The Government authority which provides protective security advice to businesses and organisations across the national infrastructure.

PSSA The perimeter security industries trade association

The trade associations Verification Scheme www.pssasecurity.org

UK's National Standards Organisation. PAS68 document can be purchased from BSi.

STANDARDS

IWA 14-1 14-2 International Workshop Agreement for Vehicle security barriers; performance and application

BSi PAS 68 is the BSi's Publicly Available Specification for vehicle security (versions 2005, 07, 10 & 13) barriers

BSi PAS 69 provides guidance on the installation of PAS 68 equipment (versions 2006, 2013)

ASTM F2656 US standard, replaced Department of State K12 SD-STD-2.01 Revision A Certification

CWA16221:2010 The European Workshop Agreement for vehicle barrier performance

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Transport Research Laboratories

MIRA
Independent Crash Laboratories

UKAS Approved

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14 ACRONYMS

Explanation of the terminology and abbreviations used

AACS : Automatic Access Control Systems

Blast Test : Test for Shrapnel Dispersion

CTSA : Counter Terrorism Security Advisors

Design Method : Assessment method which includes finite element analysis (FEA) procedures

DDA Approval : The Disability Discrimination Act came into force in 1995

EFO : Extra Fast Operation

Fail Safe : Equipment is set to fail safe or in the open position in case of emergency i.e. Unlocked

Fail Secure : Equipment is set to fail secure or in the secure position in case of Emergency

FEA Finite Element Analysis : Crash Testing Simulations

FF Fully Functional : Product remains fully functional after impact

HVM : Hostile Vehicle Mitigation

HVMG : Hostile Vehicle Mitigation Guide

Impact Test : Test of Vehicle Impact against vehicle security barriers.
Please see the various standards in the Glossary

LPCB : Lost Prevention Certification Board

LVBIED : Large Vehicle-Borne Improvised Explosive Device

NBA : National Barrier Asset

NaCTSO : National Counter Terrorism Security Office

Pendulum Method : Assessment method only suitable for testing bollards at lower energy levels

PSSA : Perimeter Security Suppliers Association

PSSA Verified : Accreditation

SVBIED : Suicide Vehicle-Borne Improvised Explosive Device

SLA : Service Level Agreement

VACP : Vehicle Access Control Points

Vehicle Impact Method : An assessment method to determine the performance classification of vehicle security barriers

VBIED : Vehicle Born Improvised Explosive Device

VDA : Vehicle Dynamics Assessment

VSB : Vehicle Security Barrier

VSB OR : Vehicle Security Barriers Operational Requirements

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