



# Hostile Vehicle Mitigation Impact Rated

## Rating System Explained

1 February 2021

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## Introduction

This document provides additional information for users of the ‘HVM – Impact Rated’ chapter in CPNI’s Catalogue of Security Equipment. It is intended to aid security practitioners in the selection of appropriate Vehicle Security Barriers (VSBs).

## Context

It is important to emphasise that no security measures are proof against all threats. You remain entirely responsible for the security measures that you implement and must use your own judgement as to whether and how to implement our recommendations.

Your attention is drawn to the important disclaimer and limitation on liability which is set out in full in the general site terms and conditions on the CPNI website.

## VSBs listed in the CSE chapter ‘HVM – Impact Rated’

Whilst CPNI will generally seek to include VSBs that can be demonstrated to CPNI’s satisfaction to have met the test criteria, there may be circumstances in which CPNI decide that a product is not appropriate for inclusion in this CSE chapter. In such circumstances, CPNI will seek to provide as much information as is possible in all the circumstances, but accepts no liability for the products not being listed in the CSE.

## Scope of the CSE chapter ‘HVM – Impact Rated’

All vehicle security barriers listed in this CSE chapter have been tested to one (or more) of the following test methods (informally known as ‘standards’):

- ISO IWA 14-1:2013
- BSI PAS 68
- CEN CWA 16221:2010
- BSI PAS 170-1:2017

Refer to CPNI’s [Impact Testing of Vehicle Security Barriers](#) for more information.

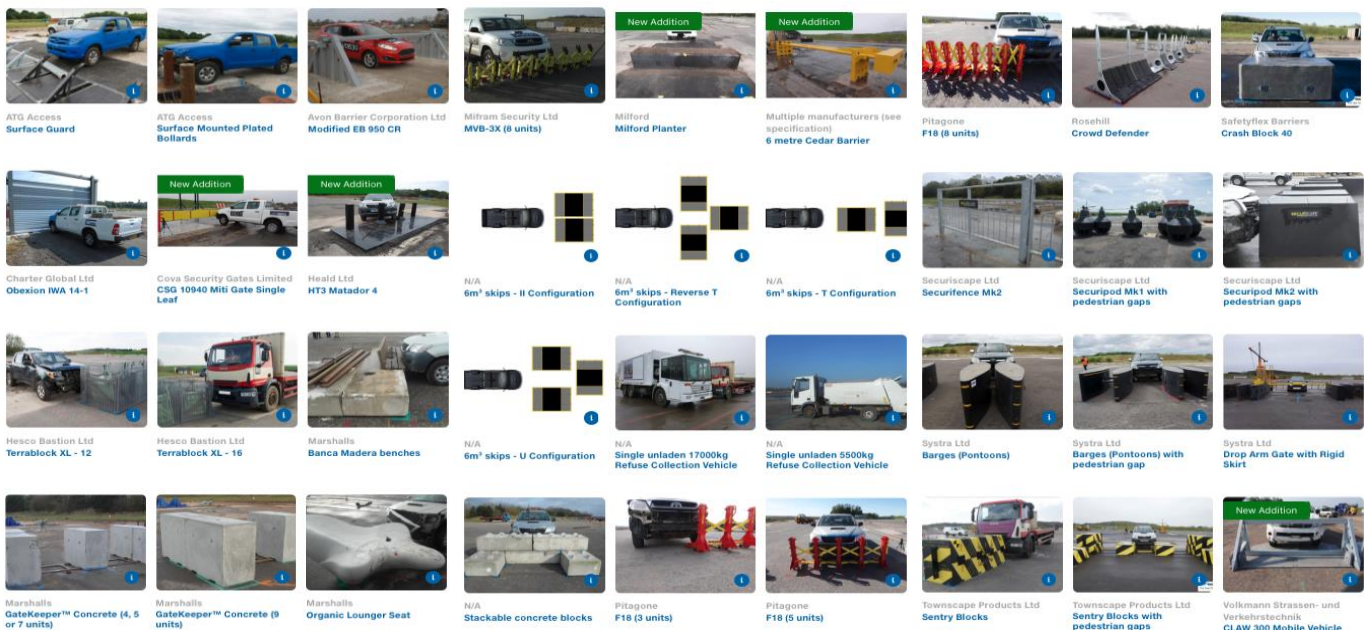
VSBs in this CSE Chapter are listed for their performance only under specific vehicle impact test conditions. The allocation of a performance rating does not imply a barrier will perform as tested in all sites or applications; and against all threat vehicle scenarios (vehicle class, impact speed, impact angle and multiple impacts).

Refer to CPNI’s [Due Diligence in the selection and procurement of vehicle security barriers](#) for more information.

## The ‘HVM – Delay Rated’ CSE Chapter

There is also a neighbouring CSE chapter, ‘[HVM – Delay Rated](#)’. Security Equipment listed in this CSE Chapter has been allocated a rating in accordance with CPNI’s Vehicle Attack Delay Standard (VADS). VADS provides a means for testing VSBs against aggressive and repetitive vehicle impacts, rather than the single impact methods listed above.


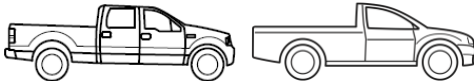
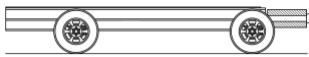
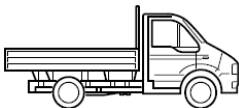
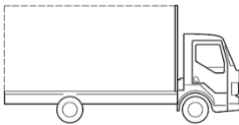
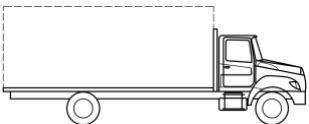
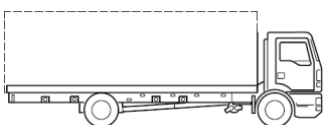

For organisations concerned with vehicle borne threats, including Vehicle As a Weapon attacks, VADS rated VSBs are not a substitute for IWA 14-1 and PAS 68 rated vehicle security barriers. VADS rated VSBs provide an alternative risk-based option for event managers and other risk owners: pragmatic, affordable and achievable levels protection, typically for, but not exclusively, temporary events.

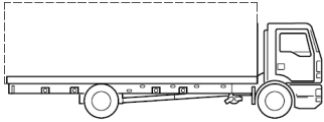
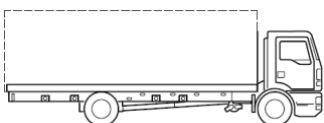

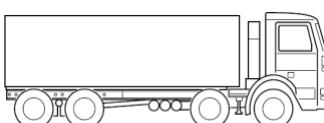
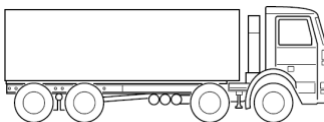


## Test vehicles

All full scale vehicle impact tests require a vehicle to impact the VSB. Numerous vehicles are used across the standards. The size, mass and structure of vehicles are factors that influence how the VSB will perform when impacted. Other factors are the impact speed and impact angle specified for the test.

The vehicles below are classified in terms of their size, the ‘standard’ they feature in, their classification (e.g. M1, N1G etc.) and the mass they have in the tests.

Type of test vehicle	Test method ('standard') Gross Vehicle Weight Description	Test vehicle classification and mass (kg)	Illustration <i>Taken from: BSI PAS 68 (various), BSI PAS 170-1 and ISO IWA 14-1</i>
Car	IWA 14-1, PAS 68, CWA 16221 2-axle	<b>M1</b> 1500	
4x4 crew or single cab pick-up	IWA 14-1, PAS 68, CWA 16221 (newer standards specify crew cab) 2-axle	<b>N1G</b> 2500	
Impact Trolley	PAS 170-1 Equivalent to 4x4 pick-up 2-axle rigid with deformable front	<b>IT</b> 2500	
Flat bed	IWA 14-1, PAS 68, CWA 16221 3500kg GVW, 2-axle rigid flatbed	<b>N1</b> 3500	
Day cab goods lorry	IWA 14-1 7500 kg GVW, 2-axle rigid (flat bed, curtain side or rigid box)	<b>N2A</b> 7200	
	IWA 14-1 12000 kg GVW (flat bed, curtain side or rigid box)	<b>N2B</b> 7200	
	IWA 14-1 18000 kg GVW, 2-axle rigid (flat bed, curtain side or rigid box)	<b>N3C</b> 7200	
	PAS 68, CWA 16221 7500 kg GVW, 2-axle rigid (flat bed, curtain side or rigid box)	<b>N2</b> 7500	

Type of test vehicle	<i>Test method ('standard')</i> Vehicle classification Gross Vehicle Weight Description	Test vehicle classification and mass (kg)	Illustration <i>Taken from: BSI PAS 68 (various), BSI PAS 170-1 and ISO IWA 14-1</i>
<b>Day cab goods lorry</b>	PAS 68, CWA 16221 18000 kg GVW, 2-axle rigid (flat bed, curtain side or rigid box)	<b>N3</b> 7500	
	IWA 14-1 N3D 18000 kg GVW, 2-axle rigid (flat bed, curtain side or rigid box)	<b>N3D</b> 12000	
	IWA 14-1 29500 kg GVW, 3-axle rigid	<b>N3E</b> 24000	
	IWA 14-1, PAS 68, CWA 16221 N3F N3 N3 32000 kg GVW 4-axle rigid (Tipper)	<b>N3F &amp; N3</b> 30000	
	<i>PAS 68:2007 only</i> 32000 kg GVW 4-axle-rigid (Tipper)	<b>N3</b> 32000	

## Vehicle impact test performance classification

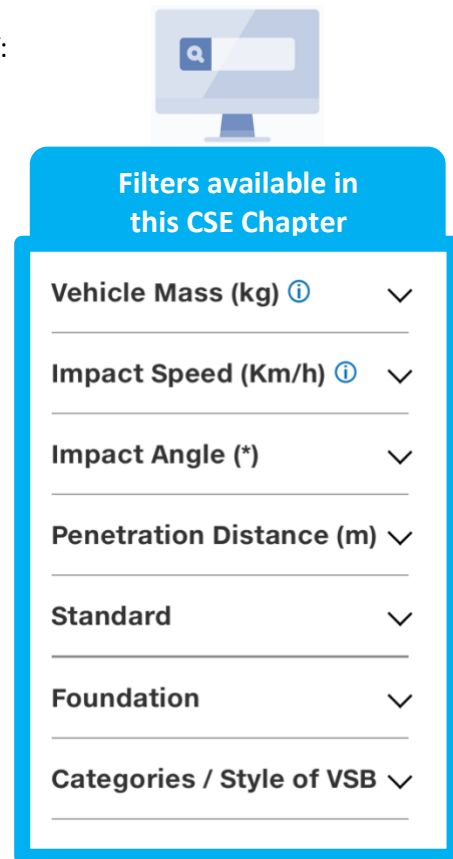
This CSE Chapter features several parameters that enable the user to filter down prospective VSBs based on the operational and user requirements. Some parameters relate to the impact test conducted on a VSB.

All vehicle security barriers listed in this CSE chapter have been tested to one (or more) of the following test methods ('standards'): IWA 14-1, PAS 68, CWA 16221 and PAS 170-1.

VSBs in this CSE chapter are listed for their performance only under those specific vehicle impact conditions, which are listed below.

The performance is generally rated and presented in terms of:

Impact test parameter	Example
Test method ('standard')	IWA 14-1
Barrier type	Bollard
Test type	V for vehicle impact
Vehicle test weight	7200 kg
Vehicle classification	N2A
Impact speed	64 km/h
Impact angle	90°
Vehicle penetration distance	3.6 m



There are numerous differences between the test methods; the most pertinent ones arise within the test performance ratings (or classifications), which contain different parameters.

**Refer to CPNI's [Impact Testing of Vehicle Security Barriers](#) for more information.**

Standard	Region	Latest Version	Purpose and vehicle types used
ISO 14000-1:2013	Global	2013	To provide a single international standard for impact testing and performance classification of VSBs. To achieve this, the vehicle categories assessed based on European and North American vehicle types present.
ISO 14000-2:2013	Global	2013	In support of ISO 14000-1, designed to provide guidance on the selection, installation and use of VSBs.
BSI PAS 68:2013	UK	2013	Defines a standard method for testing the impact performance and protection rating of a VSB when required by different categories of UK vehicles travelling at specified speeds.
BSI PAS 69:2013	UK	2013	Guidance on the selection, installation and use of VSBs used along FMS 68.
ASTM F2369/F2369M - 20	USA	2020	Defines the method for impact testing and assigning performance ratings for a VSB when impacted by different categories of North American vehicles. This includes a UK Consumer style vehicle type C1.
CEN ENA 18221:2019	Europe	2019 (EN18221:2019)	Derived from PAS 68 and PAS 69. This document assesses both impact testing (using European vehicle types) and guidance on selection, installation and use of VSBs.
SAS SD-17D-02-01	USA	Rev. A, 2019 (initial issue)	Evolution of ASTM F2369, includes only USA vehicles and defines 'C' classifications.

Differences of note are:

PAS 68 includes major debris dispersal: the distance beyond the original position of the rear face of the barrier to the location of the furthest item of major debris ( $\geq 25$  kg). †

The vehicle penetration distance is measured from different positions on the vehicle security barriers: IWA 14-1 from the front face, PAS 68 from the rear face.

Broadly, it is defined as the maximum distance the leading edge of the:

- load bed – for larger goods carrying vehicles: N1, N2 and N3 vehicle classes; or
- ‘A’ pillar in passenger vehicles: M1 and N1G vehicle classes ...

... travels beyond the vehicle security barrier (measured from the front or rear face).

† PAS 68:2010 and 2013 require a minimum of 25 metres clearance on a firm surface behind the VSB and therefore, where the penetration distance or majors debris dispersal are greater than this, a value of 25.0 will be given in the PAS 68 classification. If available, the exact value will be noted in the observations but may be subject to external influences i.e. hitting other obstructions.

## IWA 14-1:2013 example performance rating

Vehicle Impact	Vehicle Mass (class)	Impact Speed	Impact Angle	Vehicle penetration distance
V	7200 kg [N2A]	64 km/h	90°	3.6 m

**IWA 14-1:2013 Bollard V / 7200 [N2A] / 64 / 90 : 3.6**

## PAS 68:2013 example performance rating

Vehicle Impact	Vehicle Mass (class)	Impact Speed	Impact Angle	Vehicle penetration distance	Major debris distance
V	7500 kg (N3)	80 km/h	90°	2.2 m	5.4 m

**PAS 68:2013 Bollard V / 7500 (N3) / 80 / 90 : 2.2 / 5.4**



## Categorising Vehicle Security Barriers

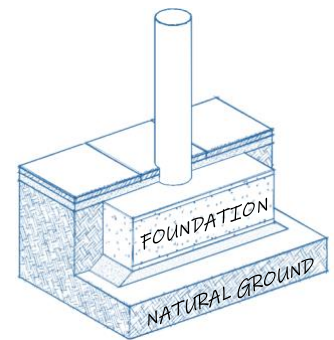
This CSE Chapter features several parameters that enable the user to filter down prospective VSBs based on the operational and user requirements. Some parameters relate to the **VSB characteristics** (below) and others relate to the impact test criteria.

### Activity – movement of barrier

Active	Barrier that may be opened to enable passage of vehicles
Passive	Static system with no moving parts

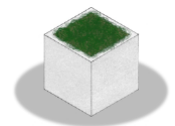
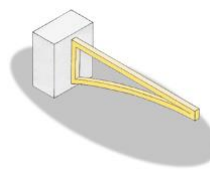
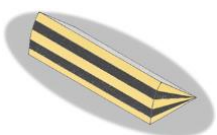
### Foundation – amount of ground depth required

A	Freestanding with no ground fixings
Ap	Surface mounted but pinned or bolted to the ground
B	Depth less than or equal to 0.5 metre below ground level
C	Depth greater than 0.5 metre below ground level



### Styles of VSB – provide different functions (accessibility, aesthetics, demarcation)

Blocker	Active access control unit, typically retracting into the ground
Bollard	Passive post or active access control post (typically retracting vertically)
Door	Active access control system in a wall
Fence	Continuous passive barrier that is impermeable to pedestrians
Gate	Active access control system typically rising, swinging or sliding
Perimeter	Continuous demarcation preventing vehicle passage. Can be pedestrian permeable (e.g. bollard) or modular (extendable in specific units) and may be active or passive
Portal	Pedestrian access point, often part of a perimeter
Street furniture	Passive objects with a public realm purpose and are also vehicle impact rated. Examples: bus shelters, control cabinets, cycle racks, litter bins, planters, post boxes, railings, seating, signage, telephone boxes, traffic posts
Vehicle as barrier	A driveable vehicle positioned to provide (usually temporary) hostile vehicle mitigation



## Operation – motion to open active VSBs, allowing vehicle access

Retractable	Vertical or rotating movement in the vertical plane, towards ground level
Rising	Vertical or rotating movement in the vertical plane, away from ground level
Sliding	Horizontal movement to the side
Swinging	Pivoting in the horizontal plane

## Measurements & units

Unless otherwise stated in this CSE Chapter:

All dimensions are in millimetres (mm)

All masses are in kilograms (kg)

The measurements of the different styles of VSB will detail (where available):

Blocker	height, width (of front face)
Bollard	height, diameter
Door	aperture height, aperture width
Fence	height, length of fence line
Gate	upper and lower height of arm or boom, aperture width
Perimeter	height, length
Portal	aperture height, total height, aperture width, total width
Street furniture	height, width (of front face), depth (front to rear face)
Vehicle as barrier	mass, height, width (facing threat vehicle)

