



SECURITY AND RESILIENCE

Hostile Vehicle Mitigation ISO 22343-1:2023 NPSA Guidance Note

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1 Introduction

- ISO 22343-1 has now been published as the new standard for vehicle impact testing of Vehicle Security Barriers (VSBs).
- ISO 22343-1 supersedes IWA 14-1 and PAS 68, which are now both withdrawn.
- Since late 2023, the industry has been in a transition period while test houses receive their ISO 22343-1 accreditation.
- For VSBs tested on 1st March 2024 onwards, NPSA will only recognise those with an ISO 22343-1 performance rating.
- VSBs tested before this, to withdrawn standards, will still be considered for entry into [NPSA's Catalogue of Security Equipment](#).
- There are several differences in ISO 22343-1 compared to its predecessors; some are minor language and editorial changes; others are substantial and affect how tests are conducted and how VSBs are rated.
- This guidance note explains the substantial differences in ISO 22341-1.
- Additionally ISO 22343-2 has now been published, which relates to the application of vehicle security barriers (VSBs).
- ISO 22343-2 supersedes IWA 14-2 and PAS 69, which are now both withdrawn.

2 Scope

ISO 22343-1 now acknowledges alternative and emerging modes of attack, which are, or will be, covered by other standards or test methodologies, for example [NPSA's Vehicle Attack Delay Standard \(VADS\)](#).

The method now explicitly excludes modes of attack by:

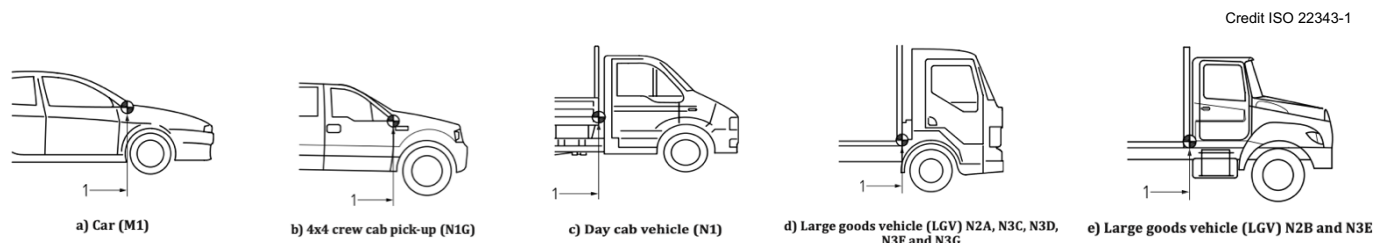
- slow speed encroachment;
- slow speed nudging and ramming;
- manual attack with the aid of the vehicle (multiple, slow speed);
- manipulation of the VSB and control systems by any means.

3 Terms and definitions

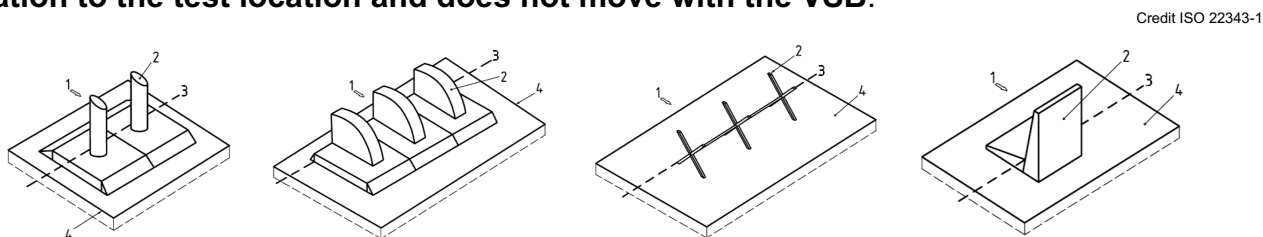
Portable and *Linear* barriers are now recognised types of VSB (Clause 3.1 and Figure 3).

The *surrounding ground* at the test location is now included in the definition of the VSB foundation.

The **vehicle datum point** is more clearly defined, in particular for N1, N2 and N3 vehicle types (Clause 3.4.1 and Figure 2).



The **VSB datum line** (clause 3.4.2) remains “vertically aligned with the foremost point of the VSB” but the definition has been slightly amended: this now explicitly identifies the datum line for surface placed VSBs in Figure 3. Note that the **VSB datum line is a static reference point in relation to the test location and does not move with the VSB.**



A formal definition for **impact** is provided, described as the “sequence of events between a moving vehicle engaging with a VSB” (Clause 3.5). Similarly, a definition for **data**, in the context of the test method and reporting is provided (Clause 3.6).

Major debris (Clause 3.6.2) is now classified as any piece of VSB, vehicle or ballast totally detached during the impact whose mass is **≥2 kg**, reduced from 25 kg (IWA 14-1, PAS 68). The maximum major debris dispersion is still measured to the furthest edge of the outermost piece, as per IWA 14-1.

4 Vehicle Security Barrier performance requirement

Reflecting the importance of protecting people, two headline changes:

1. **Major debris ≥2 kg is now in the performance rating: it is the last number in the performance rating** (as per PAS 68, having been excluded from IWA 14-1).
2. **The maximum penetration distance is now limited to 25 metres beyond the VSB datum line (Note 2). A penetration distance greater than this will automatically be deemed a failure regardless of the final position of the VSB. This requirement will challenge the performance of surface-mounted and temporary VSBs, which are prone to larger penetration distances.**

5 Vehicle Security Barrier documentation

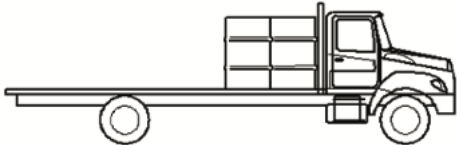
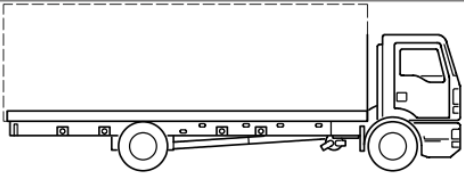
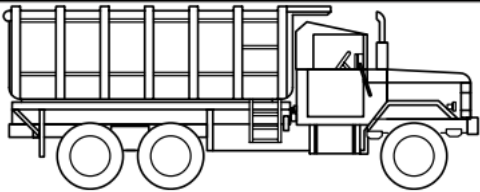
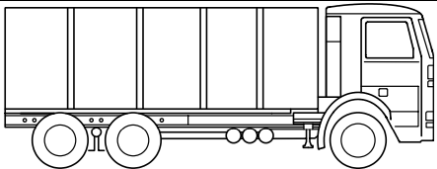
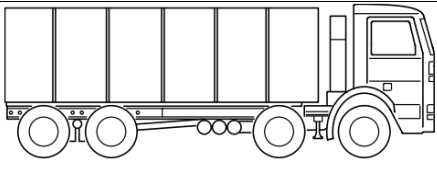
Additional information and documentation is required (Clause 5.1) to be submitted to the test house before a test (more demanding than IWA 14-1):

- detailed drawings, sufficient for the test house to undertake checks for conformity. An example technical drawing is now included in Annex B (new);
- the concrete specification and strength must now be specified by the VSB manufacturer or test client;
- surface finishes are to be specified, such as asphalt, concrete, granite paving etc.

However, the requirement for conformity has not changed. Non-conformities identified within the VSB product, foundation or installation will be logged and reported by the test house, which must be rectified for the successful continuation of the test programme (Clause 5.2).

6 Test vehicles

Reflecting changes seen in the global vehicle fleet since 2013 and improving the consistency of vehicles being used in testing, there have been subtle changes to the existing vehicle classifications and the addition of one new vehicle (Table 1 and Table 2):

Vehicle Classification	Test Mass	Gross Vehicle Mass	Image
N2B 2-axle rigid cab behind (axle)	Was 7,200 kg Now 6,800 kg	Was 12,000 kg Now 14,970 kg	
N3D 2-axle rigid cab over	12,000 kg	Was 15,000 kg Now 20,500 kg	
N3E 3-axle rigid cab behind tipper	Was 24,000 kg Now 29,500 kg	27,300 kg	
NEW N3F 3-axle rigid cab over	24,000 kg	26,000 kg	
N3G 4-axle rigid cab over (previously N3F)	30,000 kg	Was 32,000 kg Now 36,000 kg	

Smaller vehicles (M1 and N1G) mass must now be measured to an accuracy of ± 5 kg, whereas the accuracy remains at ± 50 kg for larger vehicle types (Clause 6.1.6).

7 Test house requirements – Test method

The broad test method is largely the same but includes a number of notable changes to improve the consistency of testing across the industry.

7.1 Cameras

The test house must now provide a real-time panning camera, sited perpendicular to the vehicle approach path, which must be capable of recording the full impact sequence from at least 5 m pre-impact to 25 m post-impact. This was previously only a recommendation.

7.2 Test site

There is a new stipulation that the test site has uniform ground properties such as to minimise the effect on vehicle stability and VSB performance.

The test site must provide a minimum 25 m distance beyond the VSB datum to meet the new maximum penetration distance requirement. The standard notes that the maximum 25 m radius can be marked on the test site as an aid.

7.3 VSB and test vehicle preparation

There are minor updates to the requirements of the test house for VSB, foundation and vehicle preparation. It is now mandatory to measure and record the conditions into which the VSB/foundation are installed.

Any modification of the concrete formulation shall be recorded and reported (Clause 6.4.3).

The temperature range to achieve concrete design strength through curing has been amended to between 5°C and 25°C (previously <10°C in IWA 14-1), by observing 'common and recognised practices' rather than hinting at additional cure time and the use of additives or insulation (Clause 6.4.3.1).

A minimum ground bearing capacity of 75 kN/m² is stipulated, where soil subgrade is used to form the VSB foundation (Clause 6.4.4).

The test house must respect anonymity by removing or covering easily identifiable vehicle details such as former logos / branding, registration plates etc. from view, although the vehicle make and model information is included within the report (Clause 6.5.1).

7.4 Pre- and post-impact data

In addition to the data specified in IWA 14-1, the following is to be recorded:

- Details of the supporting ground conditions, sub soil grade and bearing capacity (Clause 6.7.1.1);
- Surface finish material and specification for surface-mounted VSBs (Clause 6.7.1.1);
- VSB location within foundation and installation depth, accounting for standard finish depths (Clause 6.7.1.2);
- Photographs of the finish surface of the VSB and condition of the surface beyond (Clause 6.7.1.2);

- To help understanding of the above points, a new figure has been included showing typical foundation types – deep, shallow, surface placed and surface pinned, highlighting terminology (Figure 9).
- The centre of gravity of the ballast and distribution should not exceed values specified by the vehicle manufacturer (Clause 6.7.1.3);
- **If the vehicle is not free from restraint or external control for 25 m post-impact, a VSB shall not receive a performance rating (Clause 6.7.2). In practice, this means the test house must not prematurely stop the vehicle before it has travelled 25 m beyond the VSB datum line.**
- In-situ still photographs of the VSB, foundation and test surface, debris field and VSB after the vehicle has been removed post-impact (Clause 6.7.4);
- The maximum distance of the furthest piece of major debris (now ≥ 2 kg) beyond the VSB Datum line. Additional major debris coordinates can be recorded as observations.

8 Test report

In addition to the reporting requirements of IWA 14-1, the following is to be included in the test report (Clause 6.8.1):

- Full description of the VSB including product type, pre-test alignment of the VSB and foundation, intended mode of operation particularly for surface-placed systems (e.g. surface engagement, friction, inertia, deformation);
- Detailed description of the foundation including type, depth of excavation, thickness, finish;
- For a surface-placed and fixed VSB, the method, quantity and description of fixings and a description of the surface onto which the VSB is placed, including the conditions at the time of the test (i.e. wet or dry);
- Vehicle country of origin, manufacturer, model and year of manufacture;

The report must include a summary of results which, in addition to previous requirements, includes:

- Foundation type (surface, shallow or pinned in accordance with Figure 9);
- Whether the VSB and foundation arrangement is for a single VSB or designed to accommodate more than one VSB;
- Impact kinetic energy of the test vehicle (kJ);
- Measurements and coordinates of furthest major debris (other pieces of major debris can be recorded as an observation);
- It is an option to have a graph of vehicle deceleration included.

9 Performance rating

ISO 22343-1 clarifies that the award of a performance rating does not imply that a VSB 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 within it.

Upon successful completion of a test to the prescribed method, a performance rating classification code is awarded in the format:

ISO 22343-1 VSB Type V / 2500 [N1G] / 48 / 90 : 7.6 / 5.0

which includes the following parameters:

- the VSB type;
- the test type (note ISO 22343-1 only covers one type of test: the vehicle impact test, 'V');
- test vehicle mass;
- vehicle classification;
- impact speed;
- impact angle;
- maximum recorded penetration distance (dynamic / static) recorded;
- maximum recorded distance of major debris (≥ 2 kg).

This format is similar to PAS 68:2013 with the inclusion of the major debris rating, which was removed in IWA 14-1.

10 Product Information

There are no changes to the requirements of the manufacturer for publication of tested VSB product information.

11 Annexes (informative)

Annex A – Test vehicle specification measurements remains as a normative annex to the main body of the standard.

Annexes B, C, D are new to ISO 22343-1, however Annex C and D contain information formerly in the main text of IWA 14-1. In summary:

- Annex B – Example of product and foundation drawings to be submitted to the test house, which include general arrangements and technical detail on foundations, installation, test item, components. The annex also provides advice on good practice for technical drawings. An installation manual should also be included as part of the documentation.
- Annex C – Determination of post-impact access (for vehicles and pedestrian intruders)
- Annex D – Post-impact measurements of foundation and VSB (displacement and angle, active VSB operation)

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