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Vehicle security barriers —

Part 1: Performance requirement, vehicle impact test method and performance rating

Barrières de sécurité de véhicule —

Partie 1: Exigence de performance, méthode d'essai d'impact du véhicule et taux de performance

Reference number
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Foreword

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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 documents 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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

International Workshop Agreement IWA 14 was sponsored by UK Government's Centre for the Protection of National Infrastructure (CPNI) on behalf of the international community. The development of this IWA was facilitated by BSI Standards Limited. It came into effect on 15 November 2013.

IWA 14 consists of the following parts, under the general title *Vehicle security barriers*:

— *Part 1: Performance requirement, vehicle impact test method and performance rating*

— *Part 2: Application*

This corrected version of IWA 14-1:2013 incorporates editorial modifications.

Introduction

0.1 Workshop contributors

Acknowledgement is given to the following organizations that were involved in the development of this International Workshop Agreement:

— Allen Total Perimeter Security Limited

— APT Security Systems

— ATG Access Ltd

— BRE Global Limited

— Bristorm, Hill and Smith Ltd

— Centre for the Protection of National Infrastructure (CPNI)

— DELTA BLOC International GmbH

— GME Springs/Safetyflex Barriers

— Heald Limited

— HMS Nelson, Portsmouth Naval base

— Kirchdorfer Fertigteilholding GmbH

— L.I.E.R.

— Marshalls

— MFD International Limited

— Ministry of Commerce and Industry - Director General for Standards and Metrology (DGSM) (Sultanate of Oman)

— MIRA Ltd

— Norwegian Defence Estates Agency

— Perimeter Protection Group

— Perimeter Security Suppliers Association

— Rhino Engineering Ltd

— Royal Military Academy - Civil and Materials Engineering Department

— RSSI Barriers

— Sälzer GmbH

— Scorpion Arresting Systems LTD

— Ministry of Home Affairs (Singapore)

— Sudanese Standard and Metrology Organization (SSMO)

— Syrian Arab Organization for Standardization and Metrology (SASMO)

— Tallwang KVI PTY Ltd t/a AVS-elli

— Technical and Test Institute for Construction Prague

— Texas A&M Transportation Institute

— Transport Research Laboratory (TRL)

— US. Department of State

— US. Nuclear Regulatory Commission

— US. Army Corps of Engineers - Protective Design Center

0.2 Relationship with other publications

The following documents have been used to inform the development of this International Workshop Agreement:

— ASTM F 2656

— CWA 16221

— PAS 68

— PAS 69

0.3 Information about this document

Product testing

Users of this part of IWA 14 are advised to consider the desirability of third-party testing of product conformity with this IWA. Users seeking assistance in identifying appropriate conformity assessment bodies or schemes may ask BSI or any National Standards Body to forward their enquiries to the relevant association.

Vehicle security barriers —

Part 1:
Performance requirement, vehicle impact test method and performance rating

1 Scope

This part of IWA 14 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.

It also includes the following optional assessments that can be carried out as part of the vehicle impact test method:

a) pedestrian intruder access;

b) occupant injury.

It does not cover the performance of a VSB or its control apparatus when subjected to:

— blast explosion;

— ballistic impact;

— manual attack, with the aid of tools (excluding vehicles); or

— electrical manipulation/attack of the access control system.

NOTE 1 For manual attack, a variety of test methods exist. For assessing intruder resistance of building components see Bibliography.

NOTE 2 The VSB is designed and tested on the basis of its application, including:

a) vehicle type, mass and speed of the assessed vehicle-borne threat;

b) its geographical application (e.g. climate conditions);

c) intended site conditions (e.g. rigid or non-rigid soil).

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

NOTE 3 Guidance on the selection and specification of a VSB by type and operational suitability is covered in IWA 14–2.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM C39 / C39M 10, *Standard test method for compressive strength of cylindrical concrete specimens*

EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 vehicle security barrier (VSB)

3.1.1
vehicle security barrier
VSB
barrier used to prevent potentially hostile vehicular access to a site, which depending on its type might include as part of its design a foundation and/or operating equipment

Note 1 to entry: Types of VSB and their application are discussed in IWA 14–2.

3.1.2
linear VSB
VSB of variable length with no physical break in profile

Note 1 to entry: Examples of linear VSBs include structural walls, bunds/berms and wire rope systems.

Note 2 to entry: A linear VSB can have a change in profile, e.g. height and/or width.

3.1.3
passive VSB
VSB that after installation and deployment is static

Note 1 to entry: Examples of passive VSBs include structural walls, passive bollards and planters.

3.1.4
active VSB
VSB that after installation can be operated either by personnel or powered equipment to change its position and/or deployed state

Note 1 to entry: Examples of active VSBs include manual rising arm barriers and retractable bollards.

3.2 foundation

Note 1 to entry Examples of installations in and on a variety of foundation configurations are illustrated in Figure 1.

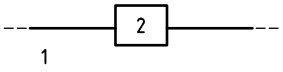
3.2.1
VSB foundation
foundation into which the VSB is installed and tested

3.2.2
generic VSB foundation
VSB foundation that can be used for testing a VSB (usually a passive bollard) which is not specifically designed with a proprietary foundation

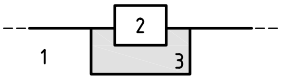
3.2.3
integral VSB foundation
VSB foundation that is a structural component of the VSB

3.2.4
proprietary VSB foundation
bespoke VSB foundation designed and sized solely for use with a specific VSB

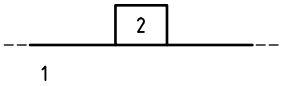
3.2.5
test site ground
surrounding land, in which the VSB foundation is situated or on which the VSB is installed for testing



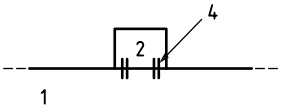
a) VSB in the test site ground



b) VSB in its foundation, installed into test site ground



c) VSB on test site ground (surface mounted)



d) VSB anchored/pinned/bolted to test site ground

Key

1	test site ground	3	VSB foundation
2	VSB	4	anchor/pin/bolt

NOTE VSBs have a variety of foundation configurations, e.g. a) and b), where others are installed directly on the ground, e.g. c) and d).

Figure 1 — Examples of installations in and on a variety of foundation configurations — Section view

3.3 vehicle

3.3.1
test vehicle
commercially available vehicle and load bed (for N1, N2 and N3 vehicles), the vehicle having an unmodified chassis and unmodified frontal structure, used in an impact test to evaluate the performance of a VSB

Note 1 to entry: Modifications that are permissible include the addition of a load bed (in accordance with the vehicle manufacturer's instructions) and methods to restrain movement of ballast.

3.3.2
A-pillar
structural member forming the forward corner of the driver compartment of a vehicle (M1, N1G and N1) or day cab (N2 and N3) of a vehicle

3.3.3
ballast
mass added to the test vehicle to bring the test vehicle mass within tolerance

Note 1 to entry: Table 1 specifies the permissible quantities of secured and unsecured ballast.

3.3.4
crew cab
four door compartment of N1G vehicle for driver and passengers

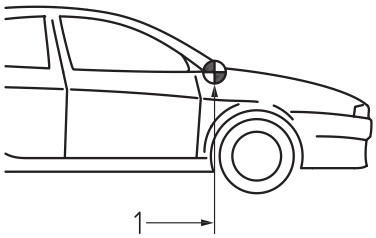
3.3.5
day cab
driver compartment of N1, N2 or N3 vehicle that does not include overnight facilities

3.3.6
unladen mass
mass of test vehicle, excluding ballast but with manufacturer's equipment, quantities of engine oil and coolant, and minimum amount of fuel

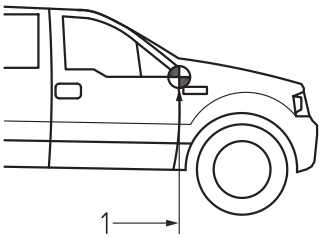
Note 1 to entry: A minimum amount of fuel is required to ensure engine operation during the test which in turn facilitates power steering and braking systems.

3.4 datum line

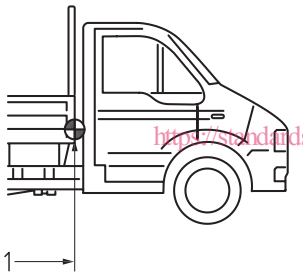
3.4.1
vehicle datum point
for car (M1) or 4x4 crew cab pick-up (N1G) vehicle [see Figure 2a) and Figure 2b)]:reference line passing through the centre of the A-pillars, at the lowest point of the windscreen; for N1, N2 or N3 day cab vehicles [see Figure 2c) and Figure 2d)]:reference line intersecting the load bed and the headboard



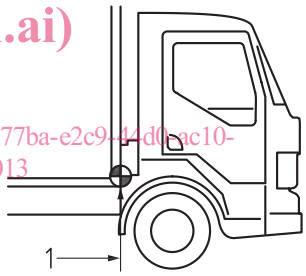
a) Car (M1)



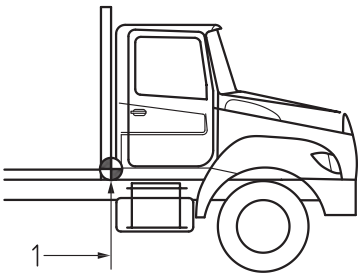
b) 4x4 crew cab pick-up (N1G)



c) Day cab vehicle (N1)



d) Day cab vehicle (N2A, N3C, N3D and N3F)



e) Day cab vehicle (N2B and N3E)

Key
1 vehicle datum point

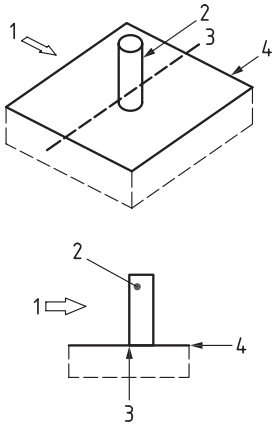
Figure 2 — Vehicle datum point — Side view

3.4.2
VSB datum line
vertical line taken pre-impact, from the ground to the furthest protrusion of the front face of the VSB structure designed to withstand the impact

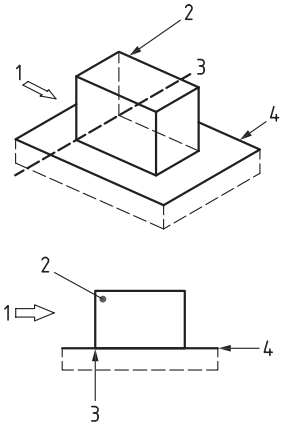
Note 1 to entry: The VSB front face could be flat and perpendicular to the ground. In this case, the whole VSB front face is in line with the VSB datum line. In the case of a blocker, it is the furthest protrusion of the VSB structure designed to withstand the impact [see Figure 3c)].

Note 2 to entry: The front face of the VSB is not the same as the front face of the VSB foundation or any supporting structure. In the case of a ditch, it is the point where the front face of the ditch meets the ground level.

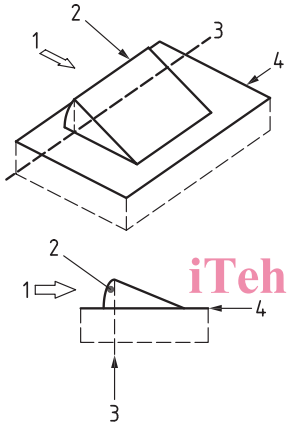
Note 3 to entry: The VSB datum line is illustrated in Figure 3.



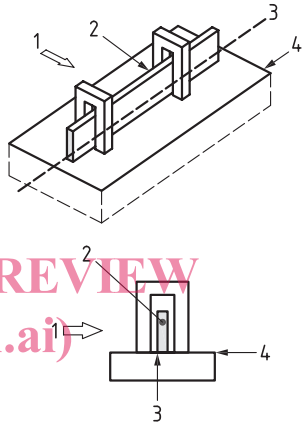
a) Bollard



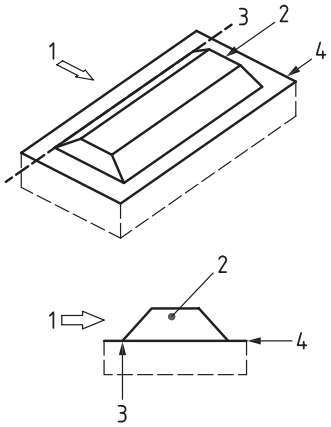
b) Planter, wall, balustrade



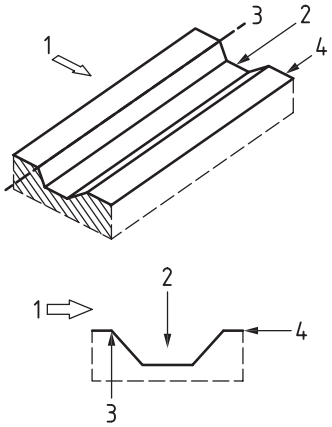
c) Blocker



d) Gate barrier, rising/swing arm barrier



e) Bund/berm



f) Ditch

Key

1	direction of impact	3	VSB datum line
2	VSB	4	ground level

NOTE 1 IWA 14-2 provides information on the different types of VSB available.

NOTE 2 For c), refer to Note 1 to 3.4.2

Figure 3 — VSB datum line — Isometric and side view

3.5 impact

3.5.1
impact speed
speed of the freely moving test vehicle before reaching the initial contact point

3.5.2
impact angle
angle >0° and ≤90° in the horizontal plane between the VSB datum line and the vehicle approach path into the VSB

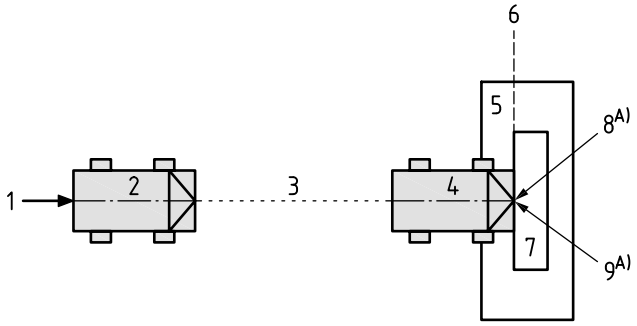
Note 1 to entry: The impact angle is illustrated for clarity in Figure 4.

3.5.3
target impact point
intersection between the longitudinal centre line of the test vehicle and the lateral position on the VSB impact face

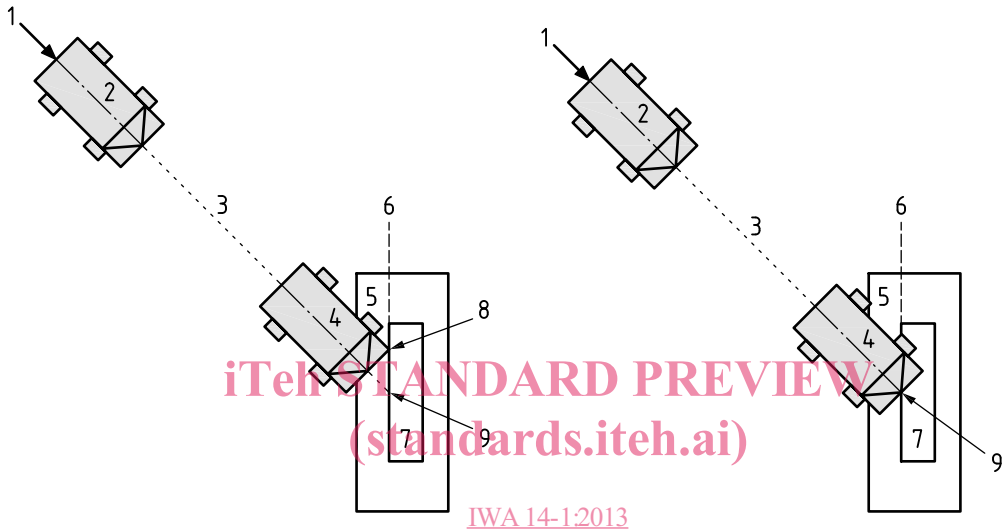
Note 1 to entry: The target impact point is illustrated for clarity in Figure 4 and is used to determine test vehicle to VSB alignment for impact angles > 45°. For an impact test with a 90° impact angle, the target impact point and the initial contact point are the same.

3.5.4
initial contact point
point at which the test vehicle and the VSB impact face first touch during the impact test

Note 1 to entry: The initial contact point is illustrated for clarity in Figure 4 and is used to determine test vehicle to VSB alignment for impact angles ≤ 45°.



a) Impact angle = 90°



b) Impact angle = 45°

Key

1	centre line of the test vehicle	6	VSB datum line (impact face)
2	test vehicle, pre-impact	7	VSB
3	vehicle approach path	8	initial contact point
4	test vehicle at impact	9	target impact point
5	VSB foundation	A)	For an impact test with a 90° impact angle, the target impact point and initial contact point are the same.

Figure 4 — Impact angle, target impact point and initial contact point — Aerial view

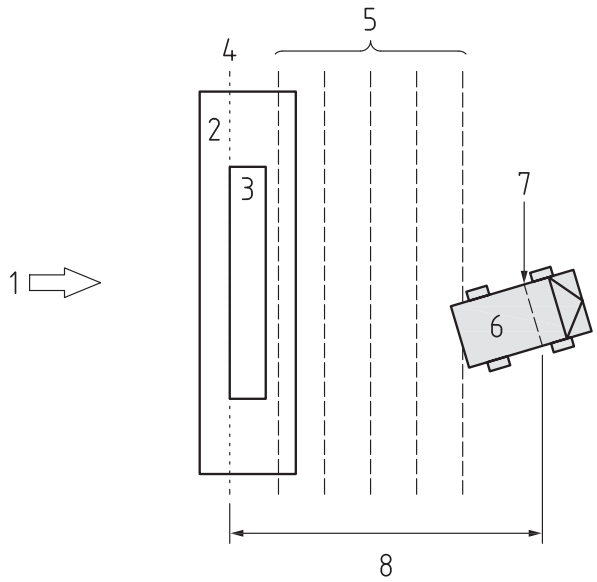
3.6 performance data

3.6.1
vehicle penetration distance

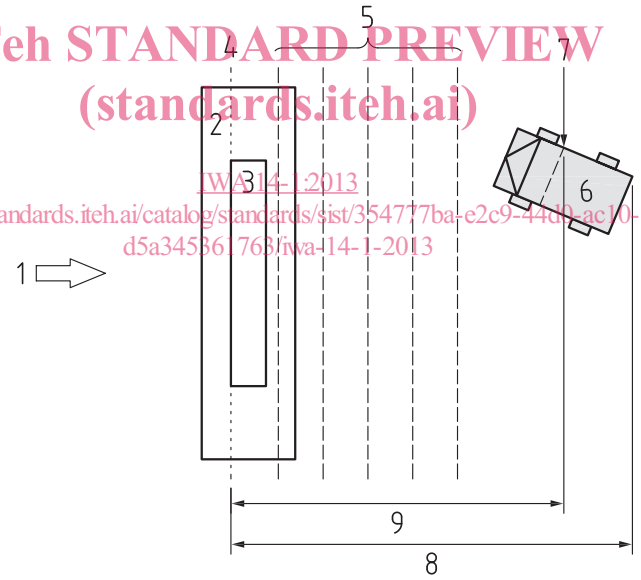
maximum perpendicular distance between the VSB datum line and either: a) where there is <90° yaw and/or pitch of the test vehicle, the vehicle datum point; or b) where there is ≥90° yaw and/or pitch of the test vehicle, the furthest part of the load bed (for N1, N2 and N3 vehicles) or furthest part of the vehicle (M1 and N1G vehicles), achieved either dynamically (during impact) or statically (post-impact), whichever is the greater

Note 1 to entry: Vehicle penetration distance is illustrated in Figure 5a) (aerial view) and Figure 6 (side views) with < 90° yaw and/or pitch of the test vehicle.

Note 2 to entry: Vehicle penetration distance is illustrated in Figure 5b) (aerial view) with ≥ 90° yaw and/or pitch of the test vehicle.



a) Impact at 90° to the VSB datum line, with <90° yaw and/or pitch of the test vehicle



b) Impact at 90° to the VSB datum line, into a VSB with an angled impact face, with ≥90° yaw and/or pitch of the test vehicle (i.e. test vehicle facing towards the VSB post-impact)

Key

1	direction of impact	6	test vehicle, post-impact
2	VSB foundation	7	vehicle datum point
3	VSB	8	vehicle penetration distance
4	VSB datum line	9	VSB datum line to vehicle datum point (informative observation when vehicle has ≥ 90° yaw and/or pitch)
5	distance marks at ground level		

NOTE See Note 2 to 6.2.5.

Figure 5 — Vehicle penetration distance — Aerial view