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Overview of **HVM Crash Testing Standards**

Differences between
ISO 22343, ASTM F2656,
IWA14-1 and PAS68

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Region of implementation

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ISO 22343

«International Organization for Standardization»

- **Region: Global**
- Latest version: ISO 22343-1 from 2023
- It replaces older standards such as IWA 14 and PAS 68.



BSI PAS 68:2013

«Publicly Available Specification»

- **Region: Great Britain**
- Latest version: BSI PAS 68 from 2013

Was replaced by ISO 22343



ASTM F2656

«American Society for Testing and Materials»

- **Region: United States of America**
- Latest version: ASTM F2656/F2656M – 20 from 2020
- Superseded “DOS” or SD/STD2.01



IWA 14-1

«International Workshop Agreement»

- **Region: Global**
- Latest version: IWA14-1 from 2013

Was replaced by ISO 22343

Purpose and vehicle types used

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ISO 22343

«International Organization for Standardization»

The new ISO 22343-1:2023 standard for vehicle impact testing, introduced in September 2023, sets a global framework for testing vehicle security barriers (VSBs). It replaces older standards such as IWA 14 and PAS 68, which were commonly used for crash-testing VSBs.

IWA 14-1

«International Workshop Agreement»

To provide a single international standard for impact testing and performance classification of VSBs. To achieve this, the vehicle categories assessed have UK, European, and North American vehicle types present.

ASTM F2656

«American Society for Testing and Materials»

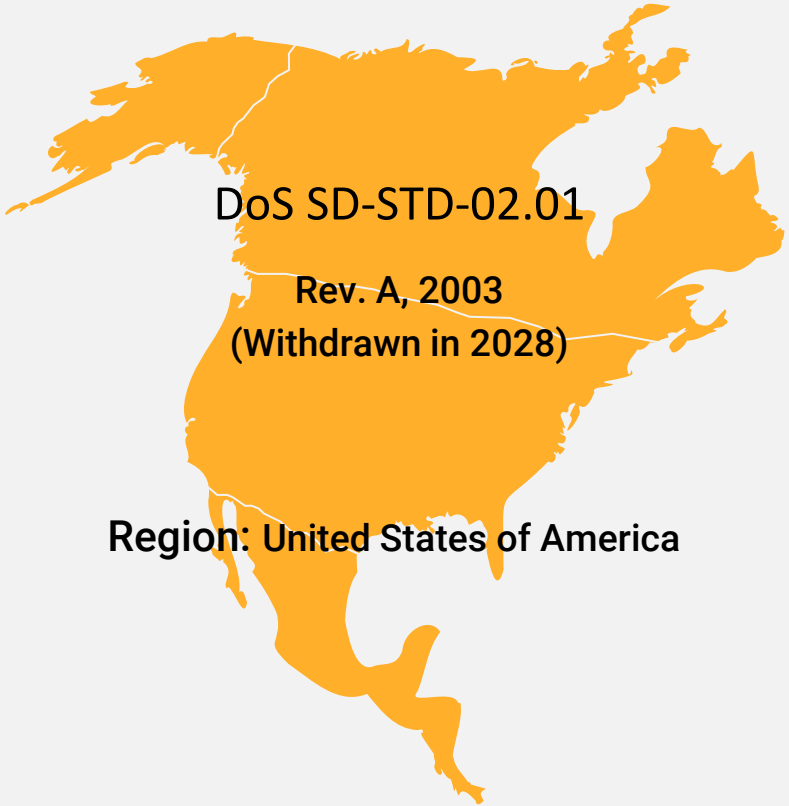
Defines the method for impact testing and assigning performance ratings for a VSB when impacted by different categories of North American vehicles. Now includes a UK/European style vehicle type: C7.

BSI PAS 68

«Publicly Available Specification»

Defines a standard method for testing the impact performance and protection rating of a VSB when impacted by different categories of UK vehicles traveling at specified speeds.

Good to know



DoS SD-STD-02.01

Rev. A, 2003
(Withdrawn in 2028)

Region: United States of America

Forerunner of ASTM F2656, includes only USA vehicles and defines ‘K’ classifications (K4, K8, K12).

DoS SD-STD-02.011 was the first standard developed by the USA Department of State in 1985, which was later handed over to the American Society for Testing and Materials, now known as ASTM.

Good to know

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ISO 22453 replaced previously implemented standards such as the British PAS 68 and the European IWA 14-1

ISO 22343 introduces several key updates:

1. Vehicle Classifications and Mass: The standard updates vehicle classifications and includes an additional mass type to reflect the changing vehicle landscape.

2. Fail Conditions: ISO 22343 introduces stricter fail conditions, particularly for excessive penetration of the vehicle into the protected zone and for vehicles that remain mobile after impact.

3. Debris Reduction: The standard reduces the allowable weight of debris from 25 kg to 2 kg, ensuring better protection against the dispersion of material upon impact.

4. Test Site Requirements: It enforces more uniform ground conditions at test sites to ensure consistent results across different tests.

5. Camera Specifications: A real-time panning camera is now required to capture the full sequence of the impact.

BSI PAS

Was replaced by
ISO 22343

Main characteristics:

- 6 vehicle type categories.
- Impact speed 16-112 km/h.
- Vehicle penetration distance from rear edge of product structure and is exact.
- Major debris dispersion from rear edge of product structure is part of rating.

PAS 68:2013 example performance rating

PAS 68:2013 Road blocker V / 7500 (N2) / 48 / 90 : -1,9 / 0					
V	7500 kg[N2]	48 km/h	90^0	-1,9 m	0 m
Vehicle Impact	Vehicle Mass (class)	Impact Speed	Impact Angle	Vehicle penetration distance	Major debris distance



On the photo is a TiSO road blocker during testing for the PAS 68:2013 standard. The crash test was successful; the road blocker has confirmed its protective properties.

IWA 14-1

Was replaced by
ISO 22343

Main characteristics:

- 9 vehicle type categories.
- Impact speed 16-112 km/h.
- Vehicle penetration distance from the front edge of product structure.
- Major debris is reported but not part of rating.

IWA 14-1:2013 example performance rating

IWA 14-1:2013 Bollard V / 7200 [N2B] / 80 / 90 : 0.7				
V	7200 kg[N2]	80 km/h	90^0	0,7 m
Vehicle Impact	Vehicle Mass (class)	Impact Speed	Impact Angle	Vehicle penetration distance



On the photo is a TiSO Mobile Speedbump (road blocker) during testing for the IWA 14-1 standard. The crash test was successful; the road blocker has confirmed its protective properties.

ASTM F2656

A classification of Test **Method "F2656 M:50-P1“ is equivalent to "DOS K12"**

Main characteristics:

- 6 vehicle categories.
- Impact speed 48-100 km/h.
- Vehicle penetration distance from front edge of product structure and is banded: <1m, 1-7m, 7-30m.
- Major debris is reported but not part of rating.

IWA 14-1:2013 example performance rating

F2656 – 20 M:40 - P2		
Vehicle Category	Impact Speed	Penetration Rating
M	40 mph	P2



On the photo is a TiSO road blocker during testing for the ASTM F2656 standard. The crash test was successful; the road blocker has confirmed its protective properties.

ISO 22343

Replaced the British PAS 68 and the European IWA 14-1

Main characteristics:

- 5 vehicle type categories.
- Impact speed 16-80 km/h.
- Vehicle penetration distance explicitly identifies the datum line
- for surface placed VSBs
- Vehicle penetration distance aligned with the foremost point of the VSB and explicitly identifies the datum line for surface placed VSBs depending on VSB type

ISO 22343 example performance rating

ISO 22343-1: Blocker V/7200[N2A]/80/90:0,2/17,8					
V	7500 kg[N2]	48 km/h	90^0	-1,9 m	0 m
Vehicle Impact	Vehicle Mass (class)	Impact Speed	Impact Angle	Vehicle penetration distance	Major debris distance



Inter-relation of the Standards – Car/LGV

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Vehicle type	ISO 22343	ASTM F2656	BSI PAS 68:2013	ISO IWA 14-1
		Small passenger car Weight: 1100 kg Class: SC	Car Weight: 1500 kg Class: M1	Car Weight: 1500 kg Class: M1
		Multi-passenger passenger car Weight: 2100 kg Class: FS		
		4x4 Pickup Truck Weight: 2300 kg Class: PU	4x4 Pickup Truck Weight: 2500 kg Class: N1G	4x4 Pickup Truck Weight: 2500 kg Class: N1G
			Day cab vehicle Weight: 3500 kg Class: N1	Day cab vehicle Weight: 3500 kg Class: N1
			Day cab vehicle Weight: 7500 kg Class: N2	Day cab vehicle Weight: 7200 kg Class: N2A

Inter-relation of the Standards – Car/LGV

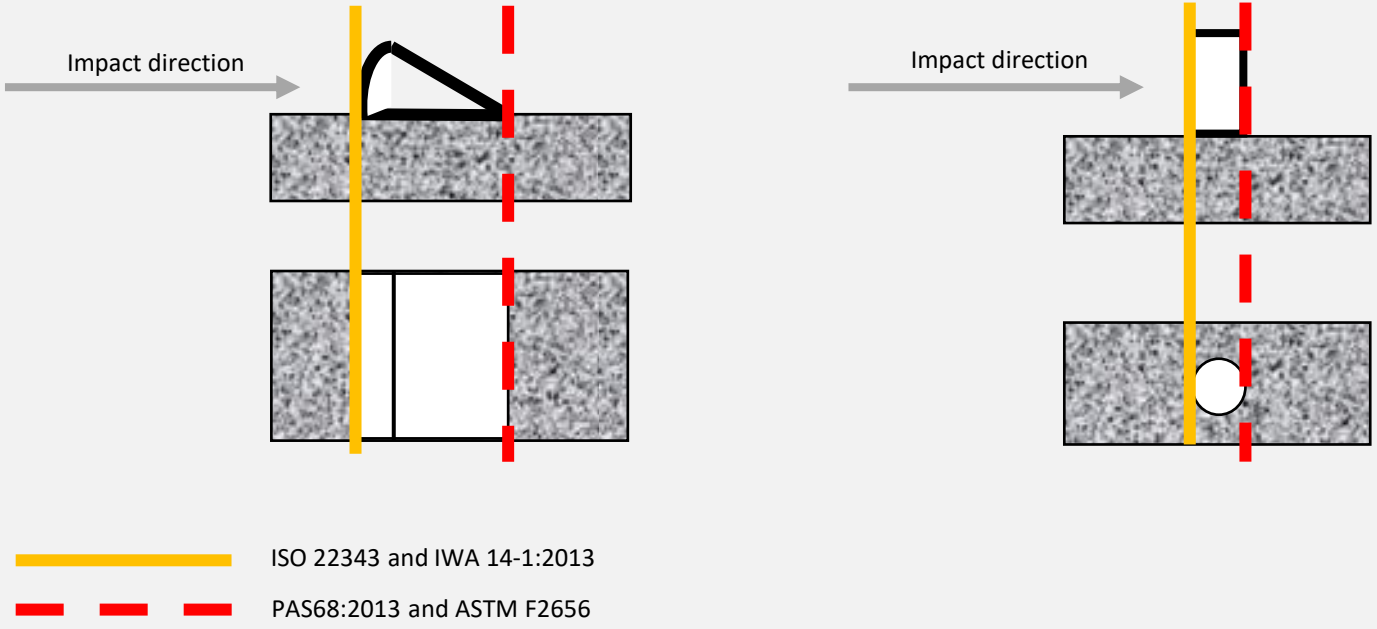
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Vehicle type	ISO 22343	ASTM F2656	BSI PAS 68:2013	ISO IWA 14-1
	N2B 2-axle rigid cab behind Weight: 6800 kg Class: N2B	Medium-duty truck Weight: 6800 kg Class: M	N/A	Day cab vehicle Weight: 7200 kg Class: N2B
		Medium-duty truck Weight: 7200 kg Class: C7	Day cab vehicle Weight: 7500 kg Class: N3	Day cab vehicle Weight: 7200 kg Class: N3C
	N3D 2-axle rigid cab over Weight: 12000 kg Class: N3D			Day cab vehicle Weight: 12000 kg Class: N3D
	N3E 3-axle rigid cab behind tipper Weight: 29500 kg Class: N3E	Heavy good vehicle truck Weight: 29500 kg Class: H		Day cab vehicle Weight: 24000 kg Class: N3E
	N3F 3-axle rigid cab over Weight: 24000 kg Class: N3F		Day cab vehicle Weight: 32000 kg Class: N3	Day cab vehicle Weight: 30000 kg Class: N3F
	N3G 4-axle rigid cab over Weight: 30000 kg Class: N3G			

VSB DATUM POINT

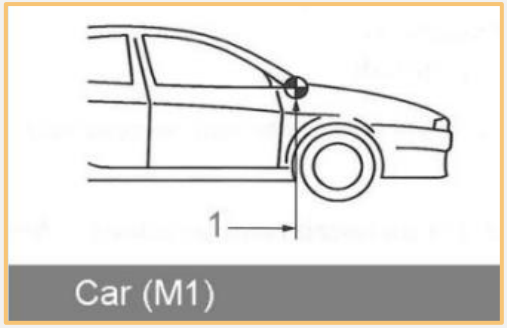
Represents the different points from where penetration distance of the vehicle is measured from in the different standards, for different types of VSB. In ASTM F2656 – 20, the VSB datum point is now at the front face of the VSB.

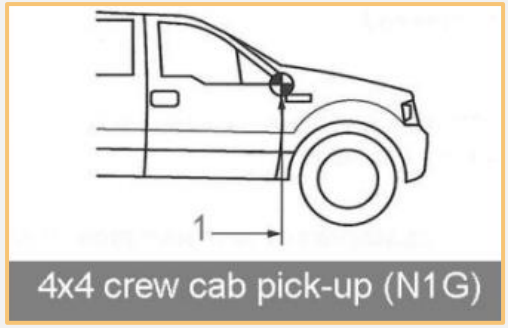


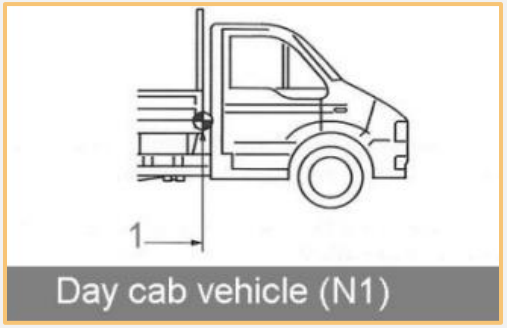
VEHICLE DATUM POINT

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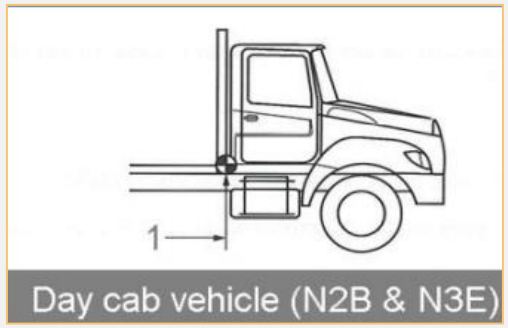
Represents the point on the vehicle where penetration of the vehicle is measured to: marked as 1: the “circle” symbol.











SUMMARY TABLE OF ALL CERTIFIED TiSO BOLLARDS AND ROAD BLOCKERS

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TiSO product range includes road blockers and bollards certified according to each of these standards that were mentioned before. In the table below, you can familiarize yourself with each certified model.

HVM type / Model	Standard	Perfomance rating	Crash-test video
ISO 22343 SHALLOW HIGH SECURITY ROAD BLOCKER (RB 33X)	ISO 22453	ISO 22343-1: Blocker V/7200[N2A]/80/90:0?2/17,8	https://www.youtube.com/watch?v=j3QdJcj8-aA
ISO 22343 FIXED BOLLARDS (273-09-S)	ISO 22453	ISO 22343-1: Bollard V/7200[N2A]/80/90:2.5/30.8	n\a
Automatic (hydraulic) bollard / RB348	ASTM F2656-07	M30, P1 (-1,2m)	https://www.youtube.com/watch?v=kU5XaEzWKcQ
Automatic (hydraulic) bollard / RB342	ASTM F2656-07	M50, P1 (-0,6m)	https://www.youtube.com/watch?v=3659eGmW8Lw
Removable bollard / RB343-68	ASTM F2656/F2656M-15 IWA 14-1:2013	M50, P2 (3,8m) Bollard V/7200 [N2B]/80/90:4.1	https://www.youtube.com/watch?v=NBICnwzVSTg
Fixed bollards (triple bollards set) / RB345-09-S	ASTM F2656/F2656M-15 IWA 14-1:2013	C750, P1 (0,7m) Bollard V/7200[N2B]/80/90:0.7	https://www.youtube.com/watch?v=fgWnyE_BB3w
Automatic (hydraulic) road blocker | Cyclope series / RB320-02	ASTM F2656/F2656M-15 IWA 14-1:2013	C740, P1(-1,7m) Blocker V/7200 [N2B]/64/90:-0,2	https://www.youtube.com/watch?v=nZLchE9yctc
Automatic (hydraulic) road blocker | Speedbump series / RB359-04	ASTM F2656/F2656M-15 IWA 14-1:2013	M30, P1 (-0,7m) Blocker V/7200 [N2B]/48/90:-0,3	https://www.youtube.com/watch?v=FYQehSByLiY

SUMMARY TABLE OF ALL CERTIFIED TiSO BOLLARDS AND ROAD BLOCKERS

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HVM type / Model	Standard	Perfomance rating	Crash-test video
Automatic (hydraulic) road blocker / RB313	ASTM F 2656-07	M30, P1 (-2,1m)	https://www.youtube.com/watch?v=AEjJSqh3I_E
Automatic (hydraulic) mobile road blocker | Speedbump series / RB358-08	ASTM F2656/F2656M-18a IWA 14-1:2013	M30, P2 (4,66m) Blocker V/7200(N2B)/48/90:5,3	https://www.youtube.com/watch?v=YXsqinNXSRg
Automatic (hydraulic) road blocker / RB333	ASTM F 2656-07	M50, P1 (-2,4m)	https://www.youtube.com/watch?v=WwWVgPzSVXY
Automatic (hydraulic) road blocker / RB313-01	PAS 68:2013 IWA 14-1:2013	Blocker V/7500[N2]/48/90:-1.9/0.0 Blocker V/7200[N2A]/48/90:-0.7	https://www.youtube.com/watch?v=xw6rkBifjhA
Automatic (hydraulic) road blocker / RB323-01	PAS 68:2013	Blocker V/7500[N3]/64/90:-1.5/0.0	https://www.youtube.com/watch?v=PhtvtIX8Nvw
Automatic (hydraulic) road blocker / RB333-01	PAS 68:2013 IWA 14-1:2013	Blocker V/7500[N3]/80/90:-1.0/24.1 Blocker V/7200[N3C]/80/90:-0.1	https://www.youtube.com/watch?v=GkY2xn_gAzo
Portable road blocker / RB319-25M	PAS 68:2013 IWA 14-1:2013	Blocker V/7500 [N2]/48/90:24.8/0.0 Blocker V/7200 [N2A]/48/90:25.4	https://www.youtube.com/watch?v=0unWRnzpgis

FREQUENTLY ASKED QUESTIONS

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? Does equipment tested in accordance with IWA 14-1 and PAS 68 remain certified and considered reliable following the introduction of ISO 22343-1:2023?

Yes — equipment tested in accordance with IWA 14-1 and PAS 68 remains proven as reliable and continues to be covered by these certifications, which remain valid and recognised; the introduction of ISO 22343-1:2023 does not invalidate previous testing, although it is increasingly becoming the new reference point for future projects.

? How can I determine which tested equipment best meets my site's specific threat scenario?

To choose the most suitable equipment, assess your expected vehicle types, impact speeds, installation conditions, and the required penetration distance. It is also important to consider project-specific requirements and the regulations of the country where the project is located.

FREQUENTLY ASKED QUESTIONS

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? What if my client wants an ASTM K12 test?

‘K’ ratings have never existed in ASTM F2656. ‘K’ ratings were superseded in 2007 by the introduction of ASTM F2656. The Department of State K12 rating should be stated as a corresponding ASTM F2656 rating: M50. This also applies to K8 and K4 ratings, which have corresponding F2656 ratings: K8 ~ M40; K4 ~ M30.

? Is there a vehicle I can use in a test to get a rating to both an international/European and ASTM F2656 standard?

The IWA 14-1:2013 N2B vehicle is a direct equivalent of the ASTM F2656 Medium duty truck. To qualify at this category the vehicle should be a USA style cab-behind-engine and NOT a European style cab-over the engine. To be compliant with F2656 as well as IWA 14-1, the product installation should be undertaken in accordance with the F2656 specification (non-cohesive soil surrounding the foundation). ASTM F2656 also has a site-specific ground condition which could be used for a test; this must be specified and recorded.

? Is it possible to issue a rating to cover PAS 68:2013 and IWA 14-1:2013?

Yes, it is possible to cover both standards with a single test as the trucks are all the same specification. Care must be taken over the test mass requirements to ensure meeting the tolerances of all of the regulations. Additionally, a reputable Test House should ensure that they are not deliberately making testing easier by choosing the lowest end of the tolerance of any of the regulations. For example, the Test House should conduct the test to PAS 68:2013 with a test mass as close to 7500kg as possible, and subsequently assess the test against IWA 14-1:2013.

FREQUENTLY ASKED QUESTIONS

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? What is the equivalent of an ASTM F2656 M50 test in PAS 68?

There is no equivalent. The closest test specification is PAS 68:2013 V/7500(N3)/80/90. This is the N3 class vehicle (18,000kg GVW at a test mass of 7500kg) at 80km/h and 90 degrees, however, there are significant differences in the vehicle structure that will mean markedly different vehicle impact test results.

? Does the presence of IWA 14-1 negate previously tested products or render them obsolete?

No, products tested to superseded/withdrawn standards retain a valid performance rating and may still be considered by the end user. The end user should satisfy themselves that the product meets their requirements, whether it should be tested against a current impact test standard or an alternative product should be used.

? Why can I not have a rating to IWA 14-1:2013 at N2A or N3C level and ASTM F2656 M level?

The IWA 14-1:2013 N2A/N3C vehicles are European style trucks with the cab over the engine and the F2656 M truck has the cab behind the engine. Therefore, the vehicle specifications are NOT compatible.



This material was prepared with informational support from **Perimeter Security Suppliers Association** and the **National Protective Security Authority of UK**.

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TiSO team will be glad to answer to all your questions and help you to choose equipment with the appropriate certification that will fit your project.