EN 1317

Steve Bowyer
Senior Engineer
Hill and Smith Ltd

EN 1317

Suite of Performance Standards for the design, manufacture & testing of vehicle restraint systems (VRS) to a common European Standard.

First implemented in 1998, and kept updated by various CEN committees and Working Groups.

Split into various sections.

EN 1317 – Part 1 : 2010

Part 1 – Terminology and general criteria for test methods

Details the measurement of the performance of the VRS,

- Test site data,
- Definitions for VRS's,
- Test vehicle specification,
- Vehicle instrumentation,
- Calculation methods to determine impact data for,
  ASI (Acceleration Severity Index) &
  THIV (Theoretical Head Impact Velocity),
- Vehicle cockpit deformation index (VCDI) measurements.

EN 1317 - Part 1 : 2010

Table 1 — Vehicle specifications

MASS kg ±								
Total mass	900 ± 40	1 300 ± 65	1 500 ± 75	10 000 ± 300	13 000 ± 400	16 000 ± 500	30 000 ± 900	38 000 ± 1 100
Test inertial mass[a]	825 ± 40	1 300 ± 65	1 500 ± 75	10 000 ± 300	13 000 ± 400	16 000 ± 500	30 000 ± 900	38 000 ± 1 100
Including maximum ballast[b]	100	160	180	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
ATD installed	78 ± 4	Not required	Not required	Not required	Not required	Not required	Not required	Not required
DIMENSIONS m (Limit deviation ± 15 %)								
Wheel track (front and rear)	1,35	1,40	1,50	2,00	2,00	2,00	2,00	2,00
Wheel radius (unloaded)	Not applicable	Not applicable	Not applicable	0,46	0,52	0,52	0,55	0,55
Wheel base (between extreme axles)	Not applicable	Not applicable	Not applicable	4,60	6,50	5,90	6,70	11,25
CENTRE OF MASS LOCATION[c d] m								
Longitudinal distance from front axle (CGX) ± 10 %	0,90	1,10	1,24	2,70	3,80	3,10	4,14	6,20
Lateral distance from vehicle centre line (CGY)	± 0,07	± 0,07	± 0,08	± 0,10	± 0,10	± 0,10	± 0,10	± 0,10
Height above ground (CGZ):								
— Vehicle mass (± 10 %)	0,49	0,53	0,53	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
— Load (+ 15 %, - 5 %)	Not applicable	Not applicable	Not applicable	1,50	1,40	1,60	1,90	1,90
TYPE OF VEHICLE	Car	Car	Car	Rigid HGV	Bus	Rigid HGV	Rigid HGV	Articulated HGV
Number of axles[e]	1S + 1	1S + 1	1S + 1	1S + 1	1S + 1	1S + 1/2	2S + 2	1S + 3/4

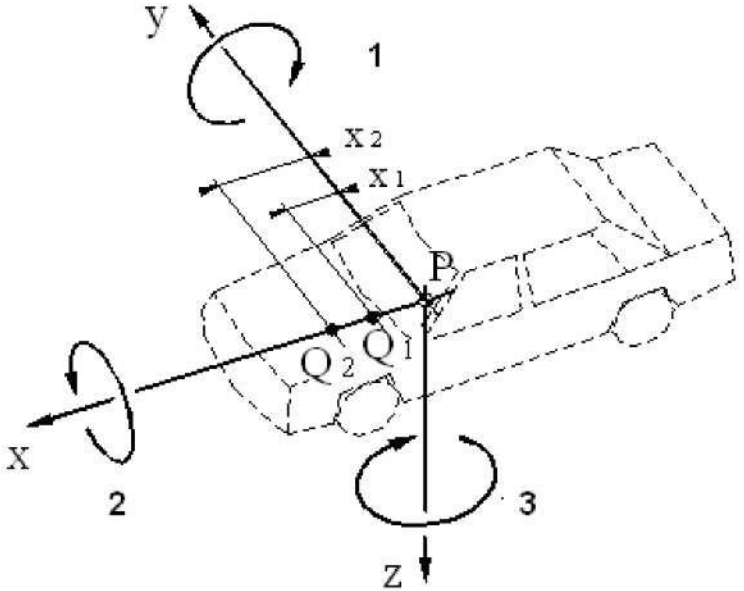
[a] Including load for heavy goods vehicles (HGV).

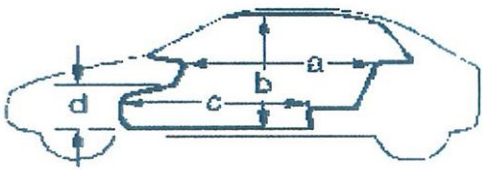
[b] Including measuring and recording equipment.

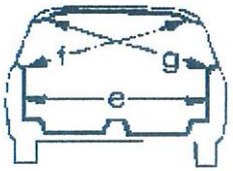
[c] The vehicle's centre of mass shall be determined when the ATD is not in the car.

[d] The centre of mass of vehicles with two axles shall be determined in conformity with ISO 10392.

[e] S: steering axle.







EN 1317 – Part 2 : 2010

Part 2 – Performance classes, impact test acceptance criteria and test methods for safety barriers including vehicle parapets

Details the impact performance class of the VRS,

- Vehicle impact test criteria,
- Classes of containment,
- Working width,
- Vehicle intrusion,
- Impact severity levels.

EN 1317 – Part 2 : 2010

Vehicle impact test criteria

Test	Impact speed km/h	Impact angle °	Total mass kg	Type of vehicle
TB 11	100	20	900	Car
TB 21	80	8	1 300	Car
TB 22	80	15	1 300	Car
TB 31	80	20	1 500	Car
TB 32	110	20	1 500	Car
TB 41	70	8	10 000	Rigid HGV
TB 42	70	15	10 000	Rigid HGV
TB 51	70	20	13 000	Bus
TB 61	80	20	16 000	Rigid HGV
TB 71	65	20	30 000	Rigid HGV
TB 81	65	20	38 000	Articulated HGV

EN 1317 – Part 2 : 2010

Classes of containment

Containment levels		Acceptance test
Low angle containment	T1	TB 21
	T2	TB 22
	T3	TB 41 and TB 21
Normal containment	N1	TB 31
	N2	TB 32 and TB 11
Higher containment	H1	TB 42 and TB 11
	L1	TB 42 and TB32 and TB 11
	H2	TB 51 and TB 11
	L2	TB 51 and TB32 and TB 11
	H3	TB 61 and TB 11
	L3	TB 61 and TB32 and TB 11
Very high containment	H4a H4b	TB 71 and TB 11 TB 81 and TB 11
	L4a L4b	TB 71 and TB32 and TB 11 TB 81 and TB32 and TB 11

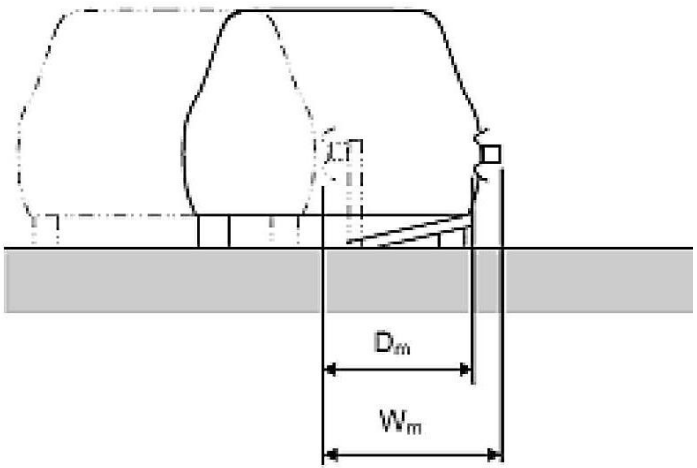
EN 1317 – Part 2 : 2010

Classes of containment

Containment levels			Acceptance test
Normal containment	N1		TB 31
	N2		TB 32 and TB 11
Higher containment	H1		TB 42 and TB 11
		L1	TB 42 and TB32 and TB 11
	H2		TB 51 and TB 11
		L2	TB 51 and TB32 and TB 11
	H3		TB 61 and TB 11
		L3	TB 61 and TB32 and TB 11

EN 1317 – Part 2 : 2010

Working Width



Classes of normalised working width levels	Levels of normalised working width m
*W*1	$W_N \leq 0,6$
*W*2	$W_N \leq 0,8$
*W*3	$W_N \leq 1,0$
*W*4	$W_N \leq 1,3$
*W*5	$W_N \leq 1,7$
*W*6	$W_N \leq 2,1$
*W*7	$W_N \leq 2,5$
*W*8	$W_N \leq 3,5$

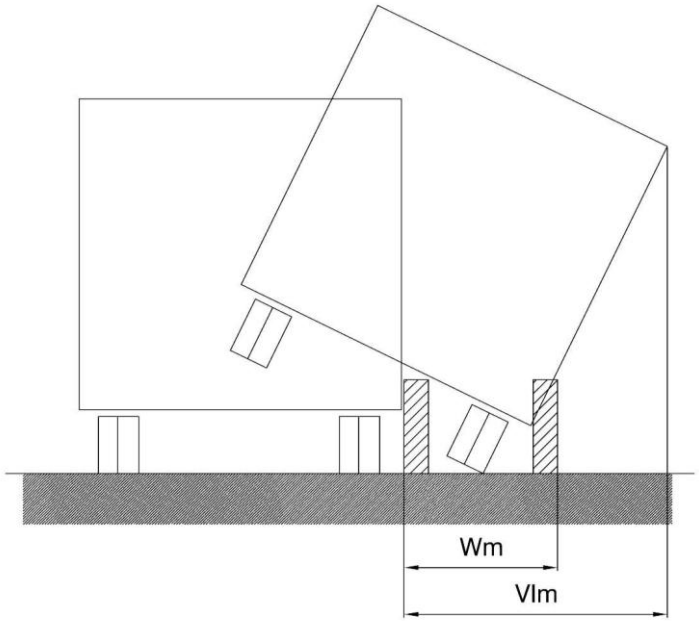
NOTE 1 In specific cases, a class of working width level less than *W*1 may be specified.

NOTE 2 The dynamic deflection, the working width and the vehicle intrusion allow determination of the conditions for installation of each safety barrier and also to define the distances to be provided in front of obstacles to permit the system to perform satisfactorily.

NOTE 3 The deformation depends on both the type of system and the impact test characteristics.

EN 1317 – Part 2 : 2010

Vehicle Intrusion



Classes of normalised vehicle intrusion levels	Levels of normalised vehicle intrusion m
*VI*1	$VI_N \leq 0,6$
*VI*2	$VI_N \leq 0,8$
*VI*3	$VI_N \leq 1,0$
*VI*4	$VI_N \leq 1,3$
*VI*5	$VI_N \leq 1,7$
*VI*6	$VI_N \leq 2,1$
*VI*7	$VI_N \leq 2,5$
*VI*8	$VI_N \leq 3,5$
*VI*9	$VI_N > 3,5$

NOTE 1 In specific cases, a class of vehicle intrusion level less than *VI*1 may be specified.

NOTE 2 The dynamic deflection, the working width and the vehicle intrusion allow determination of the conditions for installation of each safety barrier and also to define the distances to be provided in front of obstacles.

EN 1317 – Part 2 : 2010

Impact Severity Level

Impact severity level	Index values		
A	ASI ≤ 1,0	and	THIV ≤ 33 km/h
B	ASI ≤ 1,4		
C	ASI ≤ 1,9		

EN 1317 – Part 3 : 2010

Part 3 – Performance classes, impact test acceptance criteria and test methods for crash cushions

Details the impact performance class of crash cushions. Similar to the requirements as EN1317:2, with extra test requirements and redirection zone classes. Impact Severity Levels limited to A and B class only.

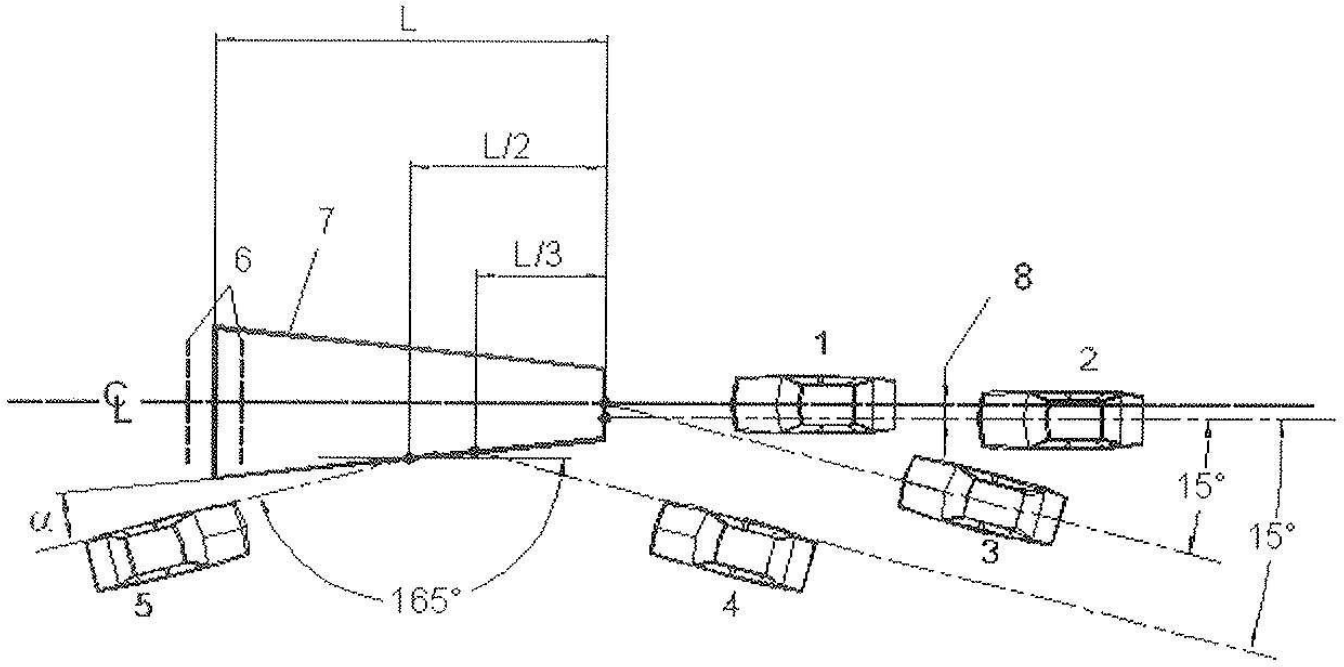
Two types:

Redirective – contains and redirect vehicles

Non-redirective – contains but does not redirect vehicles

EN 1317 – Part 3 : 2010

Up to 5 compliant tests required at various angles.



DD ENV 1317 – Part 4 : 2002

Draft code Part 4 – Performance classes, impact test acceptance criteria and test methods for terminals and transitions.

Details the impact performance class of terminals and transitions.

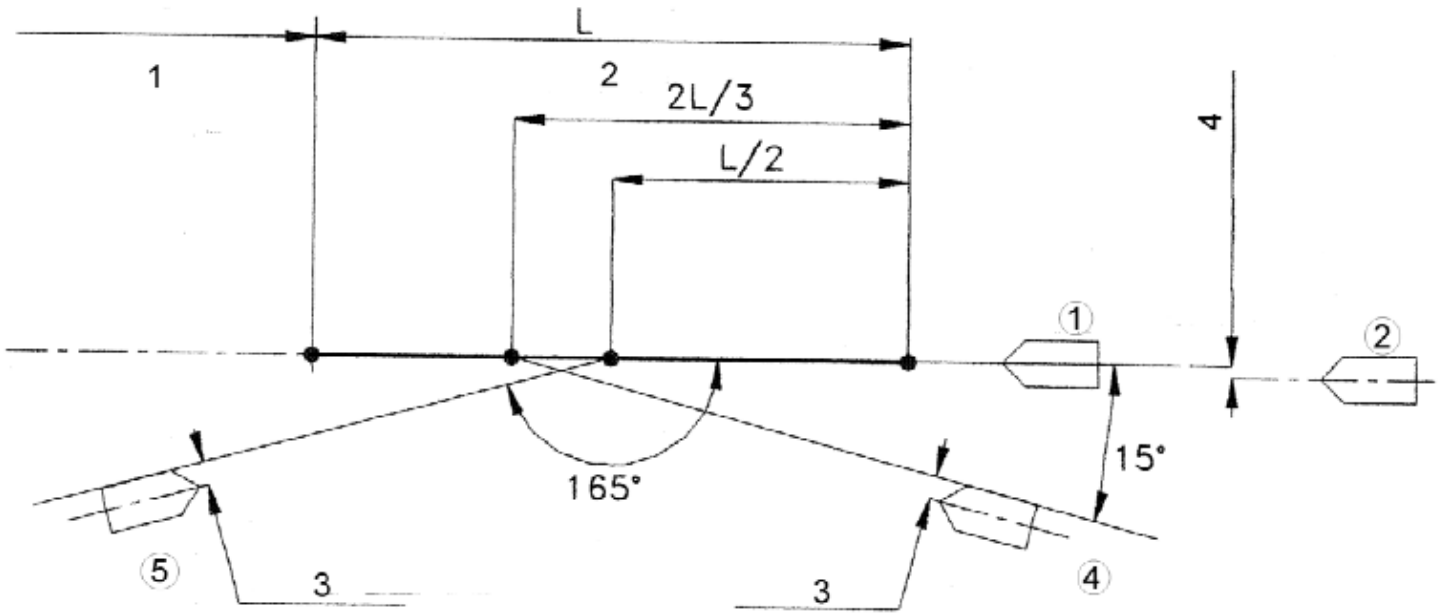
DD ENV 1317 – Part 4 : 2002

Terminals

Similar to the requirements as EN1317:2, but with extra tests and redirection zone classes. Impact Severity Levels limited to A and B class only.

DD ENV 1317 – Part 4 : 2002

Up to 4 compliant tests required at various angles.



DD ENV 1317 – Part 4 : 2002

Transitions

To the requirements as EN1317:2, however the critical impact point can be determined by the test house.

DD ENV 1317 – Part 4 : 2002

Terminals & Transitions

DD ENV 1317 – Part 4 is being revised and will be split into two parts,

- EN 1317 – 2013(?) Part 4 detailing transition testing
- EN 1317 – 2013(?) Part 7 detailing terminal testing

DD ENV 1317 – Part 4 : 2002

EN 1317 – 2013(?) Part 4 – Performance classes, impact test acceptance criteria and test methods for transitions of safety barriers.

(Formally transitions incorporated in DD ENV 1317: Part 4.)

Is likely to contain additional test requirements over DD ENV 1317: Part 4.

Computational mechanics likely to be used to determine critical impact points.

EN 1317 – Part 5 : 2007(2012)

Part 5 – Product requirements and evaluation of conformity for vehicle restraint systems.

- Durability
- Factory Production Control (FPC)
- Evaluation of the Initial Type Testing (ITT)
- Evaluation of the VRS Installation Manual
- Reduced Test Matrix for similar VRS types
- Accepted modification categories against original ITT
- CE marking Declaration of Conformity and labelling

2012 revision to harmonise with latest EN1317 : Parts 1, 2 & 3.

prEN 1317 – Part 6 : 2003

Part 6 – Pedestrian Restraint Systems; Pedestrian Parapets.

Specifies geometrical and technical requirements and defines design and manufacture of pedestrian parapets on bridges carrying a road or cycle path or footpath or on top of retaining walls and other similar elevated structures.

- Height and void/mesh classes defined
- Designed to Serviceability and Ultimate Limit States
- Dynamic, Static, Wind, Snow and accidental action loading cases assessed
- Durability requirements
- Verification by Dynamic and Static load testing
- Evaluation of Conformity and labelling

prEN 1317 – Part 6 : 2003

prEN/TR1317 Part 6 will shortly be issued as a Technical Report.

‘**Technical Reports (TRs)** are documents produced within a CEN Technical Committee that provide background information, for example on how to implement standards in specific cases.’

EN 1317 – Part 7 : 2013(?)

Part 7 – Performance classes, impact test acceptance criteria and test methods for terminals of safety barriers.

(Formally terminals incorporated in DD ENV 1317: Part 4.)

Part 7 is likely to contain up to 2 more test requirements per terminal class than DD ENV 1317: Part 4.

Performance classes will be designated as T50 to T110(km/h), formally P1 to P4.

prEN/TS 1317 – Part 8 : 2012(?)

Part 8 –Motorcycle road restraint systems which reduce the impact severity of motorcyclist collisions with safety barriers.

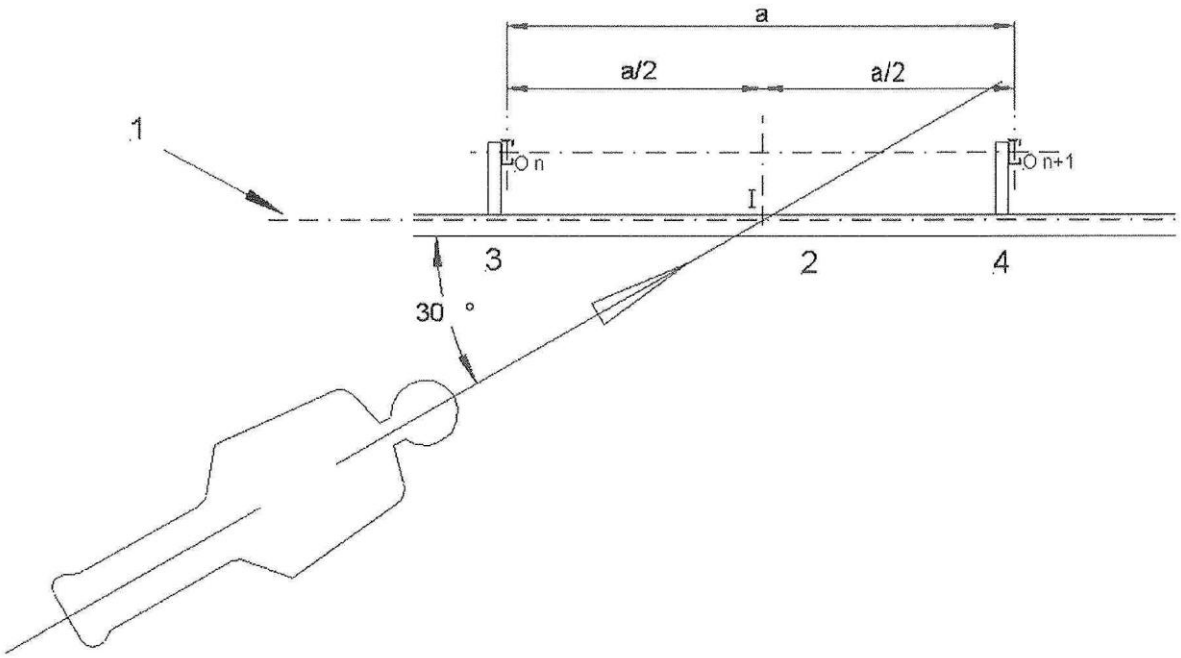
Specifies the requirements for the impact performance of (Powered Two Wheeler) PTW rider protection systems to be fitted to barriers or for the rider protection aspect of the barrier itself.

(The performance of the impacting vehicle on the motorcycle restraint system is assessed according to EN 1317 parts 1 & 2).

- Full scale on-ground sliding impact testing of ATD (Anthromorphic Test Dummy)
- Three test configurations, on post, offset post and mid span of posts
- Two test speed classes, 60 and 70 km/h
- Two severity levels
- Determination of dummy test Working Width, Wd

prEN/TS 1317 – Part 8 : 2012(?)

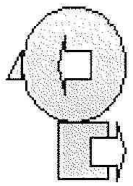
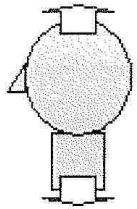
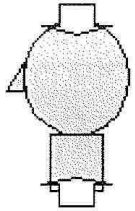
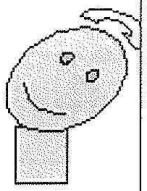
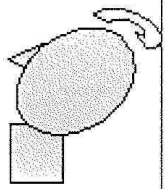
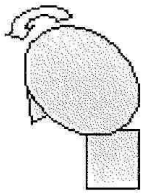
Full scale on-ground sliding impact testing of ATD (Anthromorphic Test Dummy).



prEN/TS 1317 – Part 8 : 2012(?)

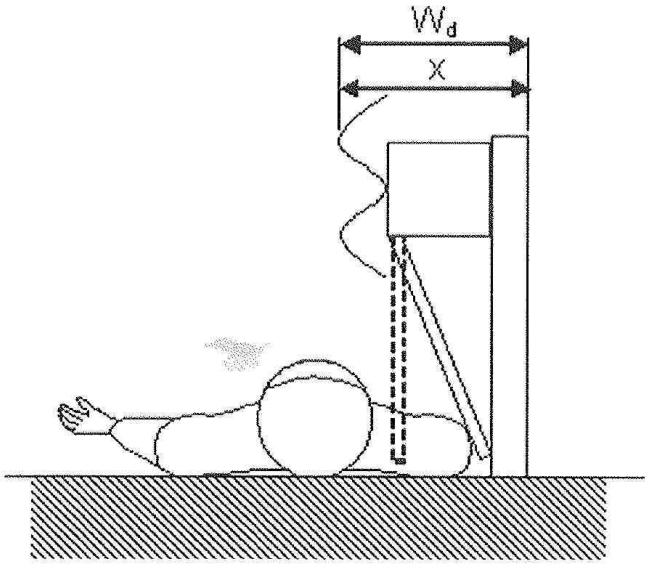
Two severity levels

Table 4 — Severity levels

Severity level	Maximum admissible values						
	Head	Neck					
		F_x N	$F_{z\ tension}$ N	$F_{z\ compression}$ N	Moc_x N m	$Moc_{y\ extension}$ N m	$Moc_{y\ flex}$ N m
	HIC_{36}						
I	650	Figure 7	Figure 8	Figure 9	134	42	190
II	1 000	Figure 10	Figure 11	Figure 12	134	57	190

prEN/TS 1317 – Part 8 : 2012(?)

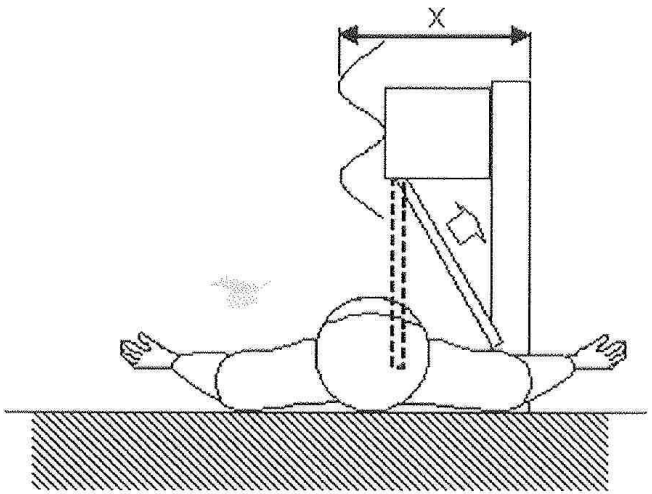
Determination of dummy test Working Width, Wd



a) **Example: barrier + MPS**

No protrusions rearward of complete system

→ ACCEPTABLE PERFORMANCE



b) **Example: barrier + MPS**

Arm protrudes rearward of complete system

→ SYSTEM FAILS TEST

prEN/TS 1317 – Part 8 : 2012(?)

prEN/TS1317 Part 8 will shortly be issued as a Technical Specification.

‘**Technical Specifications (TSs)** can be used by CEN Technical Committees as a European Pre-Standard for innovative features of technology. They are also helpful in a case where various alternatives need to co-exist in anticipation of future harmonization.’

Thank you for your attention

Steve Bowyer
Senior Engineer
Hill and Smith Ltd
United Kingdom