



Brief Overview and Latest Developments concerning EN Standards on Road Restraint Systems

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Technical Seminar on Concrete Safety Barriers - Brussels - 9 June 2009

The sad truth



Last weekend (6-7 June 2009) : 7 people killed
and 10 injured on Belgian roads

- 1 cross-over accident : 3 fatalities
- 2 motorcyclists, 1 hitting a car, 1 a tree
- car hitting a lamppost after losing control
due to aquaplaning
- 1 cyclist hit by a car
- 1 truck hitting a tree
- 1 car – truck collision



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History



December 1988

European Directive on Construction Products
(CE marking)

CEN/ TC226/ WG1 Crash barriers, safety
fences, guard rails and bridge parapets



CEN/TC226/WG1
Warsaw 2009

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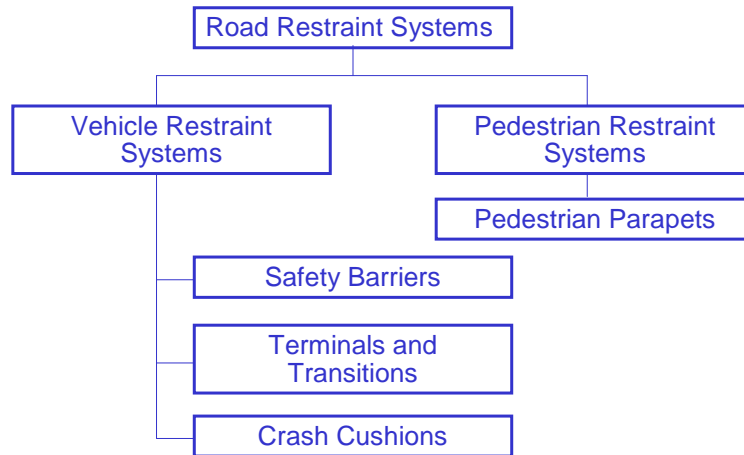
EN 1317 – Road Restraint Systems



- EN 1317-1:1998 Terminology and general criteria for test methods
- EN 1317-2:1998 Performance classes, impact test acceptance criteria and test methods for **safety barriers**
- EN 1317-3:2000 Performance classes, impact test acceptance criteria and test methods for crash cushions
- EN **V** 1317-4:2002 Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers
- EN 1317-5:2007 Product requirements, durability and evaluation of conformity for vehicle restraint systems (**= harmonized part**)
- prEN 1317-6: Pedestrian restraint systems

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EN 1317 - Terminology



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EN 1317-1 & 2



Standard based on performances, evaluated through crash tests

- Containment level
- Impact severity
- Working width



Delta Bloc 65S
T3 - W2 - A
H1 - W6 - B

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EN 1317-1 & 2 Containment level



Containment	Level	Tests
Low angle	T1	TB 21
	T2	TB 22
	T3	TB 41+ TB 21
Normal	N1	TB31
	N2	TB 32 + TB 11
High	H1	TB 42 + TB 11
	H2	TB 51 + TB11
	H3	TB 61 + TB 11
Very high	H4a	TB 71 + TB 11
	H4b	TB 81 + TB 11



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EN 1317-1 & 2 Tests



Test	Type of vehicle	Mass (kg)	Speed (km/h)	Angle (°)
TB 11	Car	900	100	20
TB 21	Car	1300	80	8
TB 22	Car	1300	80	15
TB 31	Car	1500	80	20
TB 32	Car	1500	110	20
TB 41	Rigid truck	10 000	70	8
TB 42	Rigid truck	10 000	70	15
TB 51	Bus	13 000	70	20
TB 61	Rigid truck	16 000	80	20
TB 71	Rigid truck	30 000	65	20
TB 81	Articulated truck	30 000	65	20

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EN 1317-1 & 2 Impact severity



Impact severity class	ASI		Other criteria
A	$\leq 1,0$	and	THIV ≤ 33 km/h PHD $\leq 20g$
B	$\leq 1,4$		
C	$\leq 1,9$		

ASI = acceleration severity index

THIV = theoretical head impact velocity

PHD = post-impact head deceleration

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EN 1317-1 & 2 Working width



Maximum dynamic deflection
(displacement + deformation) inclusive
the width of the barrier itself

W classes	W
W1	$\leq 0,6$ m
W2	$\leq 0,8$ m
W3	$\leq 1,0$ m
W4	$\leq 1,3$ m
W5	$\leq 1,7$ m
W6	$\leq 2,1$ m
W7	$\leq 2,5$ m
W8	$\leq 3,5$ m



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EN 1317-1 & 2 Other criteria



- No ejection of parts
- No roll-over
- VCDI (Vehicle Cockpit Deformation Index)
- Exit trajectory (CEN box)

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EN 1317-5:2007



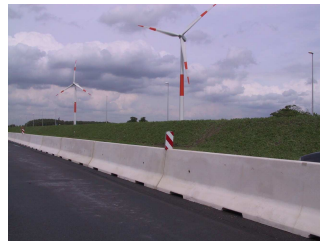
= Product standard
Harmonized part (annex ZA)

CE-marking

Dow (date of withdrawal) : 2011

prA1 : extra specifications on durability for
concrete and wooden barriers

prA2 : Specifications on resistance to snow
removal



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Revision of EN1317 parts 1,2,3



- prEN1317-1,2,3
- Sent for formal vote (June 3th 2009)
- Several editorial modifications
- Some significant technical changes :
 - Specifications for the test site removed from parts 2 and 3 to part 1
 - Vehicle instrumentation required for the calculation of ASI and THIV :
“The accelerometers shall be mounted at a single point on the tunnel close to the vertical projection of vehicle centre of mass of the undeformed vehicle,...”
 - Calculation of ASI (data filters, ...)

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Revision of EN1317 parts 1,2,3



- Requirement for PHD has been removed. ASI and THIV still are required.
- VCDI extended to a class where the reduction of the dimension of a vehicle part > 20 % or cannot be measured due to deformation
- New containment classes L1, L2, L3, L4a and L4b have been added, requiring the same tests of the corresponding H classes plus the test TB32

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Revision of EN1317 parts 1,2,3



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Revision of EN1317 parts 1,2,3



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Higher	H1	TB 42 + TB 11
	L1	TB 42 + TB 32 + TB 11
	H2	TB 51 + TB11
	L2	TB 51 + TB 32 + TB 11
	H3	TB 61 + TB 11
Very high	L3	TB 61 + TB 32 + TB 11
	H4a	TB 71 + TB 11
	H4b	TB 81 + TB 11
	L4a	TB 71 + TB 32 + TB 11
	L4b	TB 81 + TB 32 + TB 11

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Revision of EN1317 parts 1,2,3



- New definitions of Vehicle Intrusion (VI), Normalised Dynamic Deflection DN, Normalised Working Width WN and Normalised Vehicle Intrusion (VIN)
- New specifications for families of barriers
- Installation details
 - Test length
 - Anchorages,...
- Photographic coverage of the tests (high speed and normal speed cameras)
- New template for the test report (much more detailed)

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Revision of ENV 1317-4



ENV 1317-4
Terminals and
Transitions

prEN 1317-4
Transitions

prEN 1317-7
Terminals



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Revision of ENV 1317-4



A proposal has been made to define three types of approval for terminals and transitions :

- Based on complete testing
- Based on partial testing
- Based on design rules, only applicable to particular situations (sloped down terminals)



Transition from precast Delta-bloc to in-situ cast STEP
H2 – W4 - C

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Motorcyclist protection



Dangerous situations for motorcyclists, created by the presence of road equipment

- Lighting and other posts
- Posts of guardrails or cable barriers
- Any other obstacle next to the road



Additional requirements requested by ACEM and FEMA

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Motorcyclist protection



Statistical analysis in Italy based on all road accidents (cars, trucks, motorcycles, bicycles,...) with fatalities or injuries from 2003 to 2006
About 230.000 records per year)

Italy : 90 mopeds and 79 motorcycles per 1000 inhabitants, 5 million registered motorcycles

Number of motorcyclist fatalities per year : 1700

Number of motorcyclist fatalities against safety barriers per year : 20...of which ?? sliding on the pavement

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Motorcyclist protection



A specific standard is needed because some countries refuse installing something else then provided by EN1317

prEN(V) 1317-8 in development

Only the “sliding” configuration and only safety barriers will be considered in the first version of this standard.

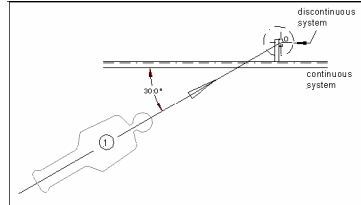
Some systems already on the market

Evaluation : Head and neck injury – two severity levels (HIC 650 and 1000)

The system must also comply with the EN1317-2 requirements !

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Motorcyclist protection



Test conditons :
ATD (dummy)
Three possible impact points
60 or 70 km/h
Impact angle 30°

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Motorcyclist protection



Technical aspects to be examined and clarified :

- Evaluation of protective clothing and helmet
- ATD injury measurements

Further development (requested by Germany) :
specifications for upright impacts

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Computer modelling



- CME – WG (Computational Mechanics)
- Collaboration with U.S. Colleagues
- Development of technical methods for the evaluation of computer models
- The intention is not to replace the crash tests

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Revision of EN 1317-5



Development of a new harmonized part regrouping the actual parts 5 and 6.

Adaptation to revised parts 1,2 and 3.

And what about in situ cast barriers ?



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Considerations and conclusions



A standard remains only a standard and is a tool for road safety management.

The main decisions are still to be made by the responsible road authorities.

EN1317 does not cover all of the decision criteria

- maintenance
- price (investment + life-cycle-cost)
- sustainability (environmental aspects)

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Thank you for your
kind attention