DELTABLOC®

Crash tested safety barriers

STANDARDS IN ROAD SAFETY
EN 1317 AND MASH

Standards are improving road safety

Road fatalities are a major concern for all countries. Modern and tested Vehicle Restraint Systems protect vehicles from deviating off the lane and contribute significantly to road safety.

In many countries neither clear regulations nor standards on Vehicle Restraint Systems (e.g. Road Safety Barriers) exist. They are usually defined in tender documents according to mechanical and geometrical properties like height, shape and material.
The European Norm EN 1317 and the U.S. MASH norm represent the highest international standards for safety barriers and define common testing and certification procedures. To be installed, safety barriers must meet the requirements of the EN 1317 or MASH and have to successfully pass crash tests, whose parameters and acceptance criteria are defined by these norms. The 3 main criteria in EN 1317 are: Containment Level, Working Width and Impact Severity.

1.35 mio
Road traffic deaths worldwide per year

Source: World Health Organization

1 — Containment Level

Ability of safety barriers to hold back vehicles

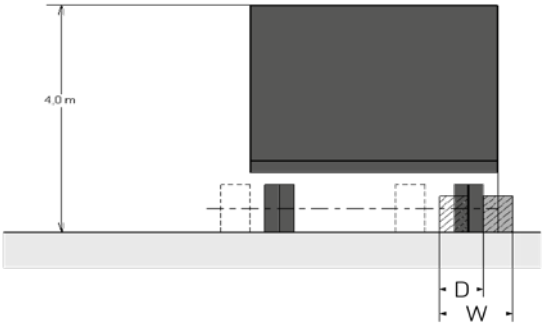
The EN 1317 classifies Vehicle Restraint Systems into Containment Levels which express the ability of the system to hold back vehicles. The Containment Level, along with the Working Width and Impact Severity, is determined with up to three crash tests with defined weights, speeds and impact angles for the test vehicles. Crash tests are conducted at accredited and certified test institutes only.

Containment	Containment levels	Acceptance test	Vehicle total mass in kg	Impact speed in km / h	Impact angle in °
Low Containment	T1	TB 21	1.300	80	8
	T2	TB 22	1.300	80	15
	T3	TB 21	1.300	80	8
		TB 41	10.000	70	8
Normal Containment	N1	TB 31	1.500	80	20
	N2	TB 32	1.500	110	20
		TB 11	900	100	20
High Containment	H1	TB 42	10.000	70	15
		TB 11	900	100	20
	L1	TB 42	10.000	70	15
		TB 32	1.500	110	20
		TB 11	900	100	20
	H2	TB 51	13.000	70	20
		TB 11	900	100	20
	L2	TB 51	13.000	70	20
		TB 32	1.500	110	20
		TB 11	900	100	20
	H3	TB 61	16.000	80	20
		TB 11	900	100	20
	L3	TB 61	16.000	80	20
		TB 32	1.500	110	20
		TB 11	900	100	20
Very high Containment	H4a	TB 71	30.000	65	20
		TB 11	900	100	20
	L4a	TB 71	30.000	65	20
		TB 32	1.500	110	20
		TB 11	900	100	20
	H4b	TB 81	38.000	65	20
		TB 11	900	100	20
	L4b	TB 81	38.000	65	20
		TB 32	1.500	110	20
		TB 11	900	100	20

2 — Working Width

Required space for the Vehicle Restraint System

The working width W measures the space needed behind the barrier in order for the system to function properly in case of impact. W is the distance between the front side of the undeformed barrier and the rearmost part of the deformed barrier after impact.



Working width	Displacement
W1	W ≤ 0.6 m
W2	W ≤ 0.8 m
W3	W ≤ 1.0 m
W4	W ≤ 1.3 m
W5	W ≤ 1.7 m
W6	W ≤ 2.1 m
W7	W ≤ 2.5 m
W8	W ≤ 3.5 m

3 — Impact Severity Level

Passenger protection

The Impact Severity Level assesses the risk of injury to the occupants of a passenger car during impact with a barrier. It is determined on the basis of ASI and THIV which are values calculated from data provided by sensors on the test vehicle during the 100 km/h impact. Level A indicates higher safety for vehicle passengers than level B, and B higher safety than level C.

Impact severity level	Index value	
A	ASI ≤ 1.0	THIV ≤ 33 km / h
B	ASI ≤ 1.4	
C	ASI ≤ 1.9	

Comparison EN 1317 versus MASH

The two main standards for road safety

The two main standards for testing of Vehicle Restraint Systems worldwide are the European Norm EN 1317 and the MASH norm. Both norms define guidelines for crash tests of safety barriers and specify evaluation criteria for assessing test results. EN 1317 and MASH enable containment level comparison of different systems. The EN 1317 norm has a clear advantage classifying safety barriers not only according to their ability to restraint errant vehicles but also according to risk of injury to vehicle occupants (Impact Severity Level) and space requirements in case of vehicle impact (Working Width).

Impact Energy Comparison & Classification EN 1317 – MASH						
Containment	EN 1317	MASH	Maximal Vehicle Mass in kg	Speed in km / h	Impact angle in °	Impact Energy in kJ
Normal Containment		TL1	2.270	50	25	39,1
	N1		1.500	80	20	43,3
		TL2	2.270	70	25	76,6
	N2		1.500	110	20	81,9
High Containment	H1		10.000	70	15	126,6
		TL3	2.270	100	25	156,4
		TL4	10.000	90	15	209,3
	H2		13.000	70	20	287,5
	H3		16.000	80	20	462,1
Very high Containment	H4a		30.000	65	20	572,0
		TL5	36.000	80	15	595,4
		TL6	36.000	80	15	595,4
	H4b		38.000	65	20	724,6

Benefits of EN 1317 and MASH

Clear benefits for Authorities, Planners and Highway Operators

- Enables professional, easy and independent classification of safety barriers based on performance
- Provides possibility to compare different suppliers and achieve the best return on investment
- Increases safety barriers quality and reduces amount of deaths on roads

Public Authorities and Planners are defining the safety barrier performance level on facts like application (temporary, permanent, highway, bridge,...), local conditions (traffic intensity, speed limits, percentage of trucks,...) and the available space.

Below are examples how safety barriers would be specified within tender documents according to EN 1317:

- H2 | W5 | ASI B for central reserve applications
- H4b | W2 | ASI B for bridge applications
- T3 | W2 | ASI A for temporary workzone applications

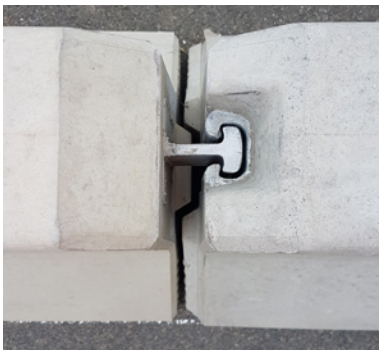
Local Production

DELTABLOC® offers the possibility to produce EN 1317 and MASH certified safety barriers in any country worldwide

DELTABLOC® is the leading developer of concrete and steel vehicle restraint systems and of modern noise protection systems. We offer solutions for any road project application and our solutions are installed in more than 45 countries.

DELTABLOC® safety barriers are produced as close as possible to the project site by the general contractor or a third party partner. DELTABLOC® takes care of engineering and supports system approvals by local authorities. We provide moulds and some key components and our production engineers come on site for training to reach together the best possible efficiency and production quality.

We protect roads worldwide. For more than 20 years.



DELTABLOC® patented coupling system

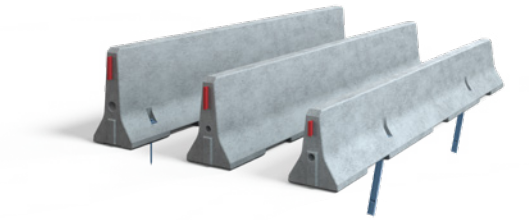
On site production in South Africa

Advantages of local production

- Reduced costs
- Fast and efficient production
- Added value for local economy
- Certified, crash tested and tailor made solutions

Permanent Safety Barriers

Permanently installed safety barriers with high containment levels



- All containment levels available
- Very low working width possible
- Solutions for central reserve and verge

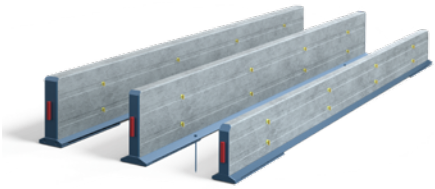
Bridge Safety Barriers

Safety barriers specifically tested for bridges

- Very low working width
- Reduced load transfer to the bridge deck
- Solutions for expansion joints

Temporary Safety Barriers

Temporary safety barriers for work zone protection



- Super slim systems
- Highest installation speed
- 2-in-1 method, temporary and permanent use

Steel Guardrails

Steel guardrails for road and bridges

- One post design only
- Very efficient installation
- Modular design

Tailor-made solutions

DELTABLOC® provides solutions for every road situation

System Transition

- Light Mast Foundation elements
- System transitions
- Emergency openings
- Connections to bridge piers and gantries

Light Mast Foundation

Reference Projects

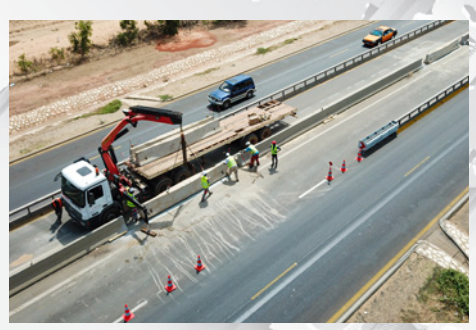
DELTABLOC® safety barriers are approved by Public Authorities in more than 45 countries globally

Spain

- Bilbao, Antzuola bridge GI632
- Highest containment level using minimal displacement bridge safety barriers
- H4b | W2 | ASI B (EN 1317)

United Kingdom

- Edinburgh, Scotland, Highway M90
- High containment level central reserve protection
- H2 | W1 | ASI B (EN 1317)



Senegal

- Dakar, Airport Highway A1
- Tailor made Light Mast Foundation
- H2 | W1 | ASI C (EN 1317)

Paraguay

- Asunción, Ruta 2 & 7
- Over 100 km verge protection
- H2 | W5 | ASI B (EN 1317)

Brazil

- Rio de Janeiro, Niteroi Expressway
- "2-in-1 method", temporary and permanent use
- H1 | W4 | ASI B (EN 1317)

Germany

- Siegen, Highway 45
- Highest containment level bridge safety barriers
- H4b | W5 | ASI B (EN 1317)

Saudi Arabia

- Riyadh, Metro Line 3
- Highest containment level with very low displacement
- TL5 (MASH)

France

- RCEA highway A79
- Over 50 km “2 in 1 method”, temporary and permanent use
- H2 | W5 | ASI B and T3 | W2 | ASI B (EN 1317)

Tanzania

- Dar Es Salaam, Tanzanite Bridge
- High containment level using minimal displacement bridge safety barriers
- H2 | W1 | ASI B (EN1317)

South Africa

- East London, Gonubie Main Road
- Central reserve upgrade
- TL4 (MASH)

About DELTABLOC®

Founded in 2000, DELTABLOC® is the leading developer of concrete and steel vehicle restraint systems and modern noise protection systems. For 20 years now, we have been doing our utmost to create a safe environment for all road users. That is why we are the number one in road safety.

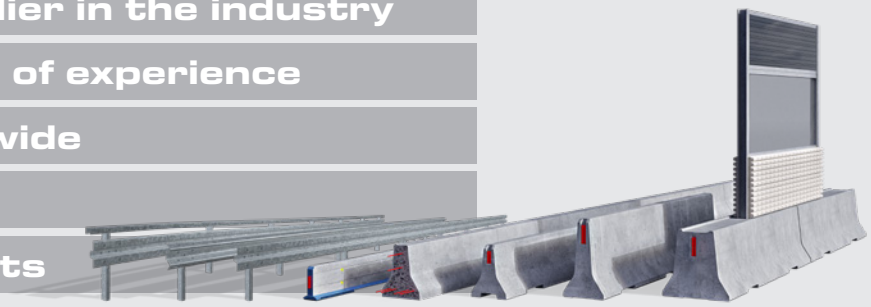
Sole full-range supplier in the industry

More than 20 years of experience

45 countries worldwide

140 employees

Over 300 crash tests



KIRCHDORFER
ROAD & TRAFFIC

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