# The need and use of “forgiving” roadsides, passive safe infrastructure according EN12767

Carolien Willems, Belgium
Member of WG10, TC226, Europe
Co- owner Safety Product
Designer of the ZIPpole
carolien.willems@safety-product.eu

# Content

- Why is there a need for “forgiving” roadsides?
- How to design roadsides?
- EN12767, European standard to approve passive safe vertical road infrastructure
- Where to use EN12767 approved products?
- How to select the right product?

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Crash test
50km 70km 90km

*In road design, allowances need to be made that can help compensate for human error, and roads and roadsides are built in such a way that their physical characteristics minimize potential harmful consequences to all.*

World Health Organization

DECADE OF ACTION FOR ROAD SAFETY 2011-2020

VISION ZERO INITIATIVE
TRAFFIC SAFETY BY SWEDEN

*Vision zero: "in every situation, a person might fail, the roadsystem should not"*


**47% of curves**
**where traffic flows at 80km/h or more**
**have hazardous roadsides**

**Source: Irap, Vaccines for roads, October 2015**

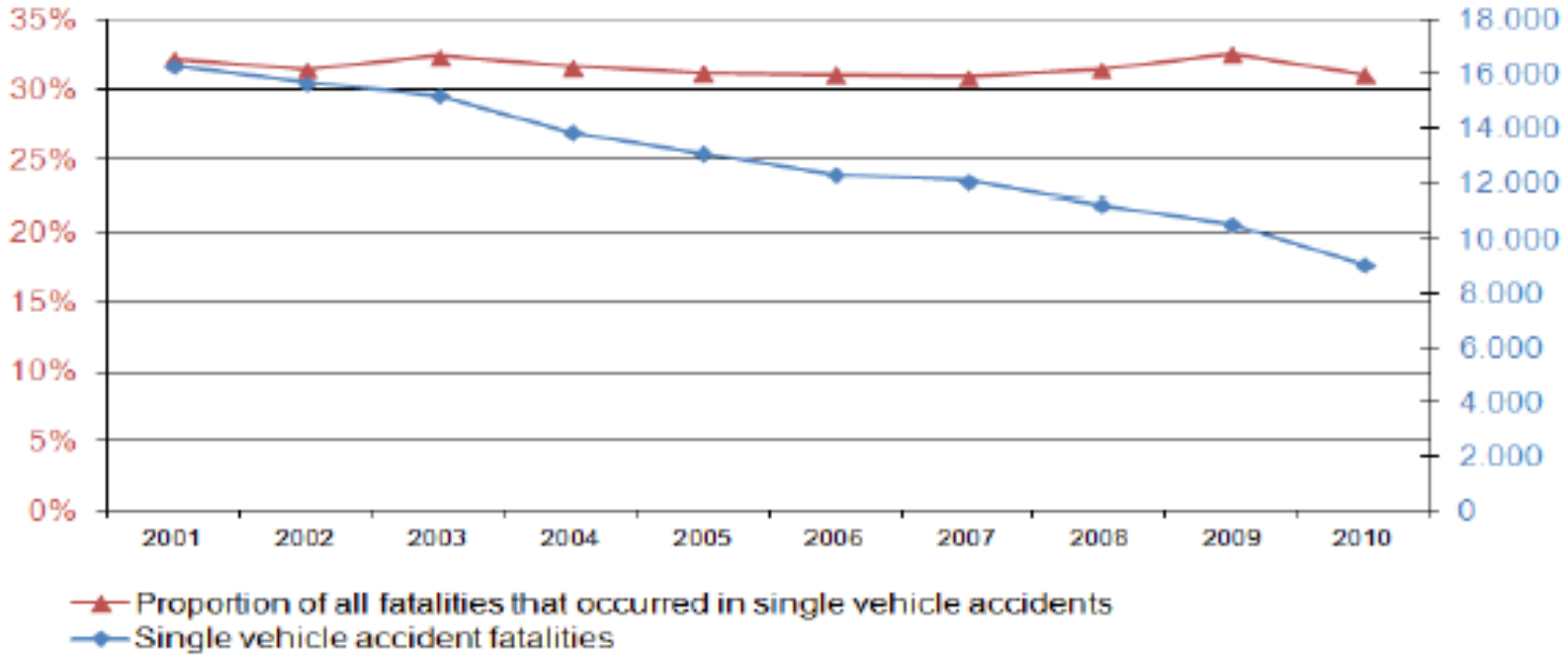
**Table 2: Percentage of fatalities that occurred in single vehicle accidents in the EU -19/23[1], 2001-2010[2]**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|
| BE | 41% | 40% | 43% | 49% | 44% | 44% | 43% | 44% | 45% | 42% |
| CZ | 30% | 31% | 34% | 31% | 31% | 32% | 35% | 30% | 36% | 31% |
| DK | 26% | 30% | 26% | 23% | 23% | 24% | 22% | 28% | 30% | 29% |
| DE | 33% | 33% | 34% | 33% | 33% | 32% | 32% | 31% | 33% | 31% |
| EL | 35% | 33% | 36% | 36% | 38% | 38% | 38% | 37% | 38% | 40% |
| ES | 36% | 35% | 35% | 36% | 35% | 35% | 35% | 36% | 37% | 34% |
| FR | 38% | 37% | 39% | 39% | 37% | 38% | 38% | 38% | 41% | 39% |
| IT | 29% | 27% | 30% | 28% | 29% | 29% | 28% | 27% | 30% | 30% |
| LU | 43% | 48% | 32% | 36% | 51% | 44% | 41% | 40% | 40% | 56% |
| HU | 25% | 21% | 23% | 23% | 24% | 25% | 24% | 24% | 28% | 18% |
| NL | 32% | 35% | 33% | 23% | 24% | 22% | 22% | 36% | 35% | - |
| AT | 44% | 37% | 35% | 37% | 37% | 37% | 35% | 36% | 38% | 35% |
| PL | 22% | 23% | 23% | 21% | 24% | 24% | 27% | 27% | 26% | 23% |
| PT | 36% | 34% | 35% | 35% | 40% | 41% | 40% | 43% | 28% | 40% |
| RO | 41% | 40% | 40% | 41% | 27% | 24% | 26% | 29% | 28% | 26% |
| SI | 21% | 23% | 20% | 22% | 18% | 22% | 22% | 20% | 21% | 22% |
| FI | 28% | 32% | 28% | 31% | 34% | 38% | 31% | 36% | 39% | 30% |
| SE | 35% | 34% | 37% | 40% | 42% | 35% | 36% | 39% | 42% | - |
| UK | 23% | 24% | 24% | 26% | 25% | 27% | 25% | 25% | 26% | 24% |
| EU-19 | 32,2% | 31,5% | 32,4% | 31,7% | 31,2% | 31,1% | 30,9% | 31,5% | 32,6% | 31,1% |
| EE | - | - | - | - | 30% | 32% | 41% | 31% | 33% | - |
| LV | - | - | - | 28% | 27% | 29% | 24% | 38% | 33% | 33% |
| MT | - | - | - | - | 18% | 27% | 42% | 11% | 33% | 54% |
| SK | - | - | - | - | 31% | 26% | 28% | 28% | 30% | 25% |
| EU-23 | - | - | - | - | 31,2% | 31,0% | 30,9% | 31,5% | 32,6% | 31,0% |
| IS | - | 55% | 48% | 43% | 47% | 45% | 47% | 50% | 47% | 38% |

Source: CARE Database / EC
Date of query: October 2012


| EU-19 | 32,2% | 31,5% | 32,4% | 31,7% | 31,2% | 31,1% | 30,9% | 31,5% | 32,6% | 31,1% |
|---|---|---|---|---|---|---|---|---|---|---|

**Figure 2: Proportion of all fatalities that occurred in single vehicle accidents and single vehicle accident fatalities in the EU-19, 2001-2010[2]**




Source: CARE Database / EC

Date of query: October 2012

Belgium:

35,1% of people who die in traffic,
die by driving off road.

The biggest risk to die in an accident is by driving into an obstacle in the roadside.

Source: BIVV, Belgian Institute for road safety, 2013

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# How to design roadsides?

What to do with obstacles:

- remove
- relocate
- fragilise or make “forgiving”, EN12767
- isolate obstacles, EN1317

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# EN 12767, passive safety of support structures for road equipment – requirements and test methods

The severities of accidents for vehicle occupants are affected by the performance of support structures for items of road equipment under impact. Based on safety considerations, these can be made in such a way that they detach or yield under vehicle impact.

This European Standard provides a common basis for testing of vehicle impacts with items of road equipment support.

This European standard considers three categories of passive safety support structures:

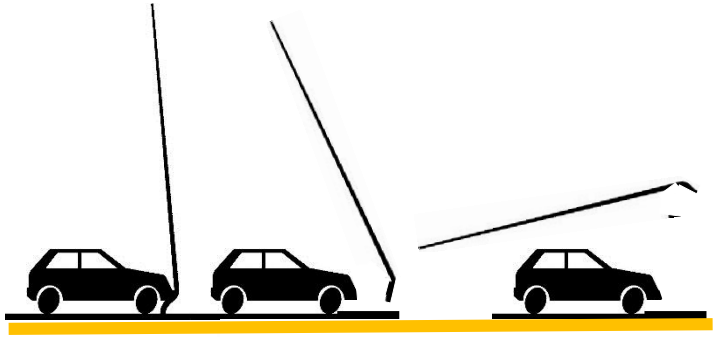
— high energy absorbing (HE);

— low energy absorbing (LE);

— non-energy absorbing (NE).

Energy absorbing support structures slow the vehicle considerably and thus the risk of secondary accidents with structures, trees, pedestrians and other road users can be reduced.

Non-energy absorbing support structures permit the vehicle to continue after the impact with a limited reduction in speed. Non-energy absorbing support structures may provide a lower primary injury risk than energy absorbing support structures.



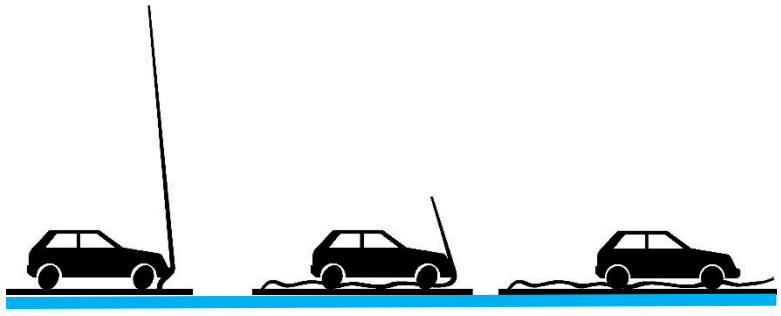
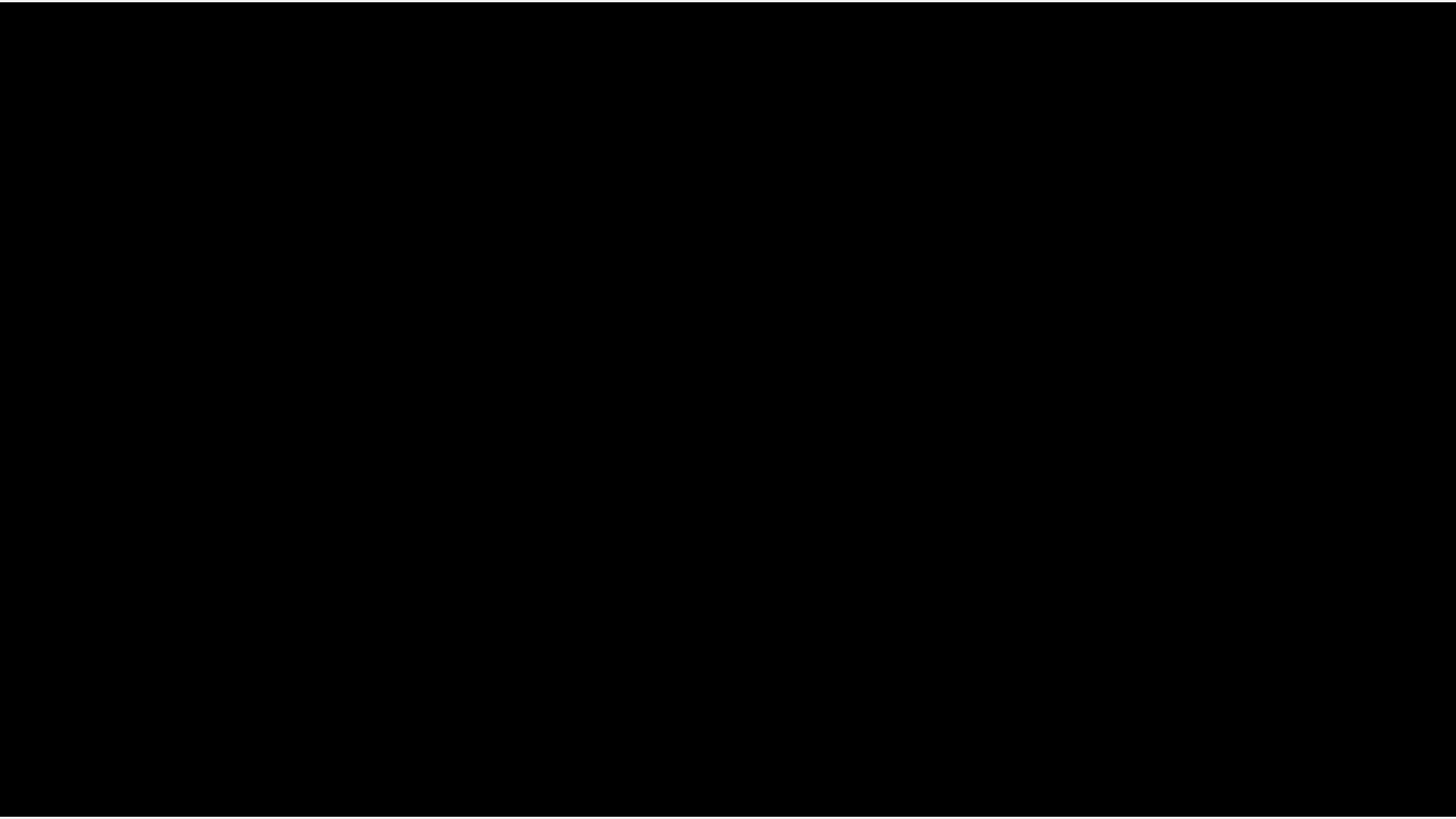


**Table 5 — Occupant safety**

| Energy absorption categories | Occupant safety level | Speeds | | | |
|---|---|---|---|---|---|
| | | Mandatory low speed impact test 35 km/h | | Speed class impact tests 50 km/h, 70 km/h and 100 km/h | |
| | | Maximum values | | Maximum values | |
| | | ASI | THIV km/h | ASI | THIV km/h |
| HE | 1 | 1,0 | 27 | 1,4 | 44 |
| HE | 2 | 1,0 | 27 | 1,2 | 33 |
| HE | 3 | 1,0 | 27 | 1,0 | 27 |
| LE | 1 | 1,0 | 27 | 1,4 | 44 |
| LE | 2 | 1,0 | 27 | 1,2 | 33 |
| LE | 3 | 1,0 | 27 | 1,0 | 27 |
| NE | 1 | 1,0 | 27 | 1,2 | 33 |
| NE | 2 | 1,0 | 27 | 1,0 | 27 |
| NE | 3 | 0,6 | 11 | 0,6 | 11 |
| NE | 4 | No requirement | No requirement | See 5.6 | |

crash test 100 km/h

view with more detail



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# When using passive safe poles on state roads?

= country guidelines

**Finland:** on roads where speed is ≥ 60km/h and 1000 vehicles/day

**Belgium:** roads where speed is ≥ 50 km/h and within the safety zone, without guardrails

**Holland:** NE3 poles if clear zone of 40m by 50m, HE3 if the clear zone is smaller

…

# When using passive safe poles on city roads?

Categorize roads:

urban roads

connecting roads

arterials

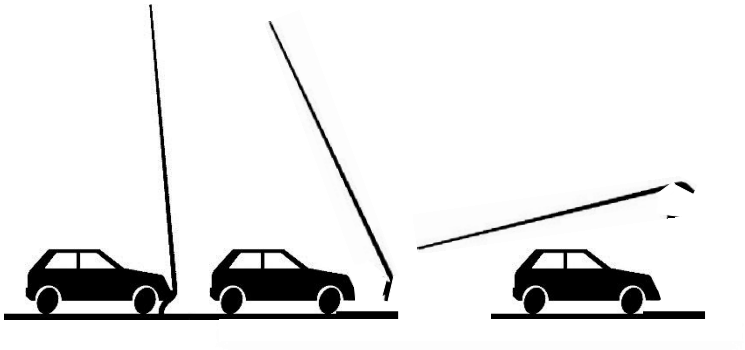
highest risk for injuries


⇒ on roads designed to have fluent traffic

⇒ don't only check allowed speed limits, check the design of the road, lowering speed is often not enough

# When using passive safe poles on state and city roads?

## state roads



**Non Energy absorbing,** EU: 100NE3

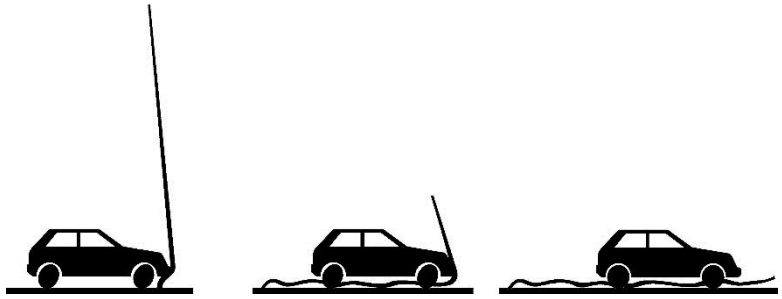
in case of no other road users

in case of stable / flat roadside

in case of no secondary risk

in case of a large clear zone, > 40-40m

## state ánd city roads



**High Energy absorbing,** EU: 100HE3

in case of other road users

in case of unstable roadside, ditches

in case of secondary risk

in case of a limited clear zone, < 40-40m

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# Selecting the right product:

**Risk of installation**
The installation guidelines of the manufacturer should be followed to guarantuee the right functioning of the product.

=> require installation guidelines

**Size of the safety zone**
If the product has a specific zone to hit in a car crash, the installation should be done accordingly.

**Multidirectional**
If the product can be hit from different directions, the product should be safe in all directions.

=> investigate the offered products

**Risk for secondary accidents**
If there are other obstacles, it is best to slow down the colliding vehicle.

# Thank you !
# Some questions or remarks?

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**Table 1 — Impact speeds**

| Speed class km/h | Impact speeds km/h |
|---|---|
| 50 | 35 and 50 |
| 70 | 35 and 70 |
| 100 | 35 and 100 |

**Table 2 — Energy absorption categories**

| Impact speed, $v_I$ km/h | 50 | 70 | 100 |
|---|---|---|---|
| Energy absorption category | Exit speed, $v_e$ km/h | | |
| HE | $v_e = 0$ | $0 \leq v_e \leq 5$ | $0 \leq v_e \leq 50$ |
| LE | $0 < v_e \leq 5$ | $5 < v_e \leq 30$ | $50 < v_e \leq 70$ |
| NE | $5 < v_e \leq 50$ | $30 < v_e \leq 70$ | $70 < v_e \leq 100$ |

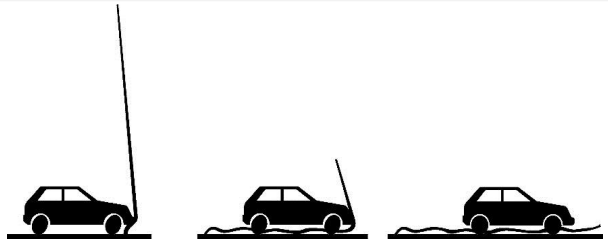
$E (J) = m/2 * v^2$ :

$(50^2 - 0^2) < (70^2 - 5^2) < (100^2 - 50^2)$

$2500 < 4875 < 7500$

| Impact speed, $v_I$ km/h | 50 | 70 | 100 |
|---|---|---|---|
| Energy absorption category | Exit speed, $v_e$ km/h | | |
| HE | $v_e = 0$ | $0\ v_e\ 5$ | $0\ v_e\ 50$ |
| LE | $0 < v_e\ 5$ | $5 < v_e\ 30$ | $50 < v_e\ 70$ |
| NE | $5 < v_e\ 50$ | $30 < v_e\ 70$ | $70 < v_e\ 100$ |

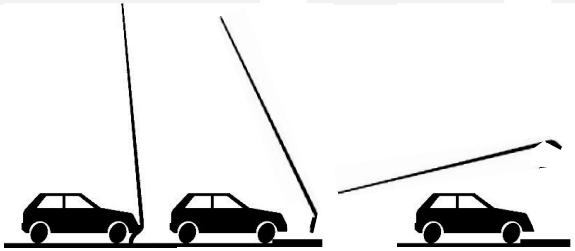
HE



Impact at 100 km/h:
Speed after impact: < 50 km/h

LE

NE



Impact at 100 km/h:
Speed after impact: > 70 km/h