

# technical memorandum

road safety hardware series



## Selection of Barrier Containment Level and Length of Need (LoN)

TM-2001

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### Purpose

To advise on selection of road safety barrier design containment (Test) levels, the preferred method for calculating Length of Need (LoN) and highlighting the circumstances under which the LoN may be reduced.

**Note** that this technical memorandum relates to the **selection** of new road safety hardware systems. For information regarding the required testing of road safety hardware systems, please refer to Technical Memorandum TM-2009 Road Safety Hardware System Testing.

### Background

Road safety barriers are broadly described as flexible (wire rope barrier), semi-rigid (W-Beam or Thrie-Beam steel guardrail) or rigid (concrete) systems.

In New Zealand, all road safety barrier systems installed on the State highway network must comply with NZ Transport Agency Specification M23 Specification for Road Safety Barrier Systems. The **minimum** containment level for State highway road safety barriers is National Cooperative Highway Assessment Programme Report 350 (NCHRP350) Test Level TL3. However, higher containment levels may be specified on a site or project specific basis by the NZ Transport Agency. Evidence of compliance with the specified or a higher containment level must be provided when requested.

All road safety barrier installations should be properly designed by persons suitably qualified to undertake such work.

A barrier system is a hazard in itself and should only be installed when the consequences of vehicle impact with the barrier are likely to be less severe than the consequences of impact with the feature being shielded.

### Recommended practice

#### Containment Level

A road safety barrier containment level can be a consequence of either:

- **Safeguarding vehicle occupants from the hazard of leaving the road.** The containment level is defined by the critical mass of the vehicle which is to be contained on the roadway.

or

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- **Safeguarding the receiving environment.** There can be many examples of a critical receiving environment, such as a pristine natural environment or habitat; a critical public utility; a grade separated arterial crossroad; or a rail line carrying commuter traffic.

The containment level should be based on the maximum size vehicle that could not be tolerated entering the receiving environment.

For example, the base level for State highway side protection is Test Level 3 (TL3) based on a 2000 kg vehicle or less. This corresponds to large sport utility vehicle at the large end of the range.

This value could be set as high as TL4, being up to an 8,000 kg single unit axle truck, or TL5 (36,000 kg semi trailer unit), if decision makers determined that truck drivers should be safeguarded. However the widespread application of trucks as the critical vehicle is very uneconomic.

A real-world example is an electric substation protection installation in South Auckland where it was deemed that no out of control vehicle could be allowed to damage Auckland's main power supply. The containment was set for a 36,000 kg high risk, high centre of gravity vehicle (TL6), such as an LPG/petrol tanker unit.

Also note that a higher containment level may also be adopted through a requirement to limit deflection. For example, the side protection barriers used on bridges are typically of stiffer design to reduce the barrier deflections under impact (i.e. there is less room to accommodate deflection). Higher containment level barrier systems are usually stiffer to manage the impact energy, with rigid concrete barriers having the highest containment levels. These stiffer barriers require a transition section connecting the bridge barrier to the (generally) lower containment level of the roadside safety barrier systems on the bridge approach.

## Length of Need (LoN)

The Length of Need (LoN) is that length of barrier required to ensure that the maximum sized vehicle that requires containment cannot enter the receiving environment. For example, if the 36,000 kg vehicle is defined as the maximum size vehicle to be contained, then the full length of need must meet or exceed the performance of the barrier system that will provide that level of containment.

Due consideration should be given to the three dimensional aspect of the environment when establishing the required LoN. For example, where a TL5 safety barrier is required as bridge edge protection, it may be possible to reduce the extent of the length of need on the approaches to the bridge where the roadside features (earthworks) contribute significantly to preventing an errant vehicle from reaching the protected hazard. In such situations, the barrier containment level may be reduced from TL5 beyond the modified LoN, appropriate for the predominant roadside conditions.

The Project Manager may refer the matter to NZTA National Office for further consideration.

## Design references

Designers should refer to the following documents for further information:

- Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers
- NZ Transport Agency Specification M23 Road Safety Barrier Systems

It is strongly recommended that consultants and contractors undertaking the design and maintenance of road safety barrier systems attend and pass the appropriate NZ Transport Agency training courses.

- Road Safety Barrier Systems Installation and Maintenance Inspections (IMI) Workshop, and/or
- Road Safety Barrier Systems Design Workshop

Details of these courses are available on the NZ Transport Agency website ([here](#)).

**Endorsed by: National Manager Traffic & Safety**