

Technical Directorate:
Compliance Evaluation of Car Park Barriers?

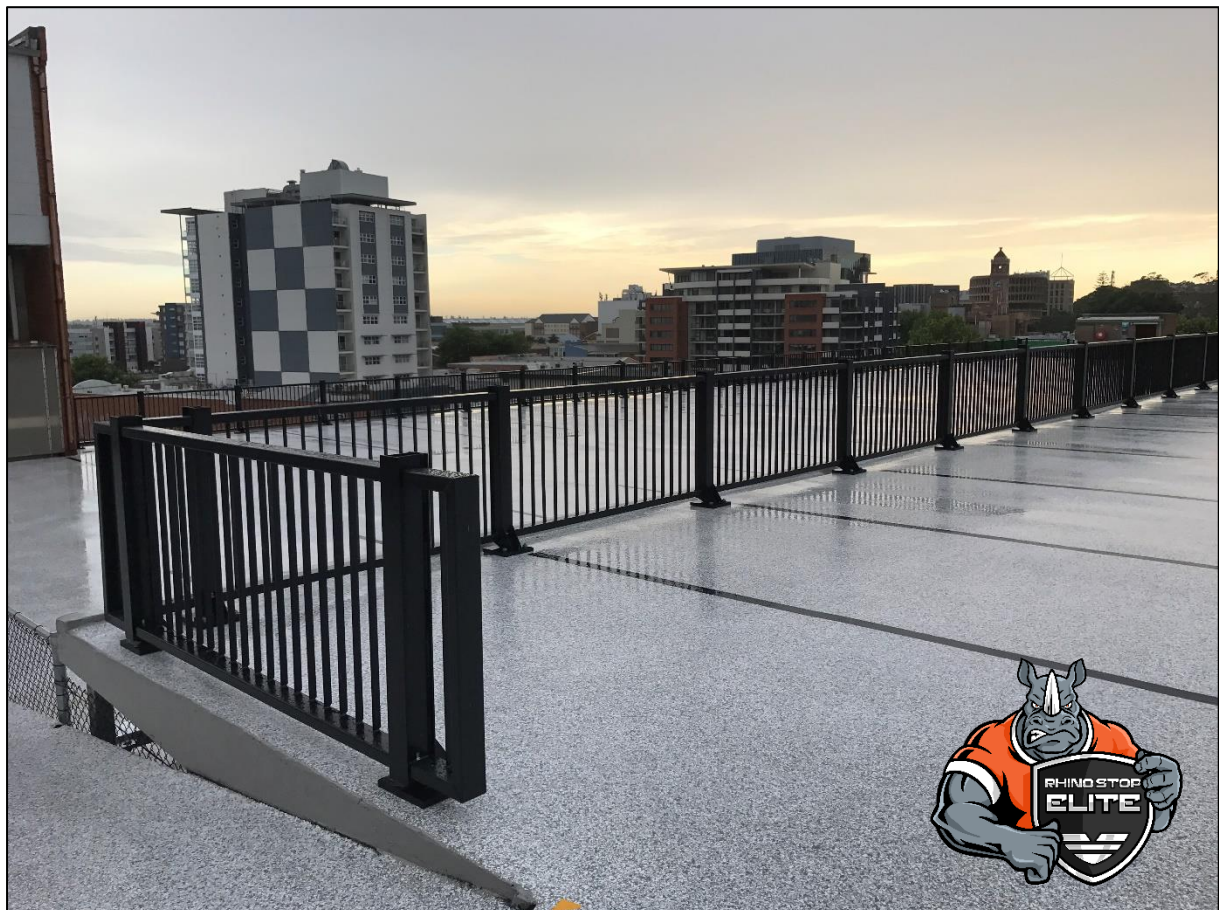
Ref: 0012 rev 0

Introduction:

Car park barriers are a specific range of safety barrier systems designed for the protection of people, plant and equipment. Their design and function are specific to vehicle movements encountered in a car park environment.

Designers of car park and industrial barriers should consider the following:

- The barriers should be capable of withstanding impact loads in accordance with relevant Australian standards and building codes;
- Impacts are likely to be perpendicular to the barrier i.e. 90 degrees;
- Pedestrian walkways or thoroughfares adjacent to the barrier;
- Channelling of people or restriction of access;
- Falls or drops behind the barrier;
- Available space for a barrier system; and
- Impact damage should be confined to the barrier system and not the car park structure.



AS/NZS 2890.1 Parking Facilities, Part 1: Off-Street Car Parking

Barriers shall be constructed to prevent vehicles from running over the edge of a raised platform or deck of a multi-storey car park including the perimeter of all decks above ground level. They are required wherever the drop from the edge of the deck to a lower level exceeds 600mm. At drops between 150mm and 600mm, wheel stops shall be provided. Barriers shall comply with the following requirements:

- They shall be designed structurally for the loading requirements of AS/NZS 1170.1.
- If at the end of a parking space, they shall be at least 1.3m high so that drivers of cars backing into the space can see the barrier above the rear of the car. *Note the upper portion of such a barrier may be a light structure provided for sighting purposes only.*
- They shall not be made from brickwork, unreinforced concrete or other materials likely to shatter on impact.

Reference: Clause 2.4.5.3



AS/NZS 1170.1 Structural Design Actions, Part 1: Permanent, Imposed and Other Actions

Light Vehicle Traffic Areas (Type F): parking, garages, driveways and ramps restricted to cars, light vans, etc not exceeding 2500kg gross mass.

Medium Traffic Areas (Type G): Vehicles exceeding 2500kg and not exceeding 10,000kg. Driveways, ramps, repair workshops, footpaths with vehicle access, and car parking.

The horizontal imposed action on barriers required to withstand the accidental impact from vehicles during parking shall be taken as follows;

- a) For light traffic areas (Type F)
 - i. Barriers - 30kN
 - ii. Barriers at the end of straight ramps exceeding 20m in length and intended for downward travel - 240kN
- b) For barriers in medium traffic areas (Type G) - 40kN

The impact force shall be distributed over a 1.5m length at any position along the barrier and shall be assumed to act 0.5m above floor level for light traffic areas and at 1.0m for medium traffic areas.

Reference: Table 3.1 & Clause 3.8

AS/NZS 1170.1 Supplement 1

The values given in the Standard are based on the force from one vehicle only.

Braking and horizontal impact forces arising from the movement of vehicles may be calculated as follows:

$$F = \frac{mV^2}{2\Delta}$$

Where

F = impact or braking force, in newtons

m = gross mass of the vehicles, in kilograms

V = velocity of the vehicles, in metres per second

Δ = velocity of the vehicles, in metres per second

In calculating the braking force, Δ is taken as the braking distance, and in calculating the impact force on a barrier, Δ is taken as the sum of the deflection of the vehicle and barrier.

The loads given for car park barriers are based on the following:

- 1500 kg at 2 m/s and 0.1 m crumple zone.
- 2000 kg at 6 m/s and 0.15 m crumple zone.
- 2000 kg at 2 m/s and 0.1 m crumple zone.

Wheel stops should not be relied upon to stop a vehicle impacting a barrier except in normal use. The shape and design of wheel stops vary and information is not available on their effectiveness in stopping or reducing the speed of vehicles.

Reference: C3.8

Building Code of Australia:

A continuous balustrade must be provided along any walkway if its level above the surface beneath is more than 1m. The height of the balustrade must not be less than 1m above the floor of any walkway.

Openings in the balustrade must be constructed so that any opening does not permit a 125mm sphere to pass through it.

For floors 4m above the surface beneath, any horizontal elements within the barrier between 150mm and 760mm above floor level must not facilitate climbing.

Reference: BCA Volume Two 3.9.2.3

Evaluation of RHINO-STOP Barriers

The various RHINO-STOP systems have been crash test validated to evaluate compliance with the impact loads described in AS/NZS 1170.1. Crash testing thoroughly evaluates barrier behaviour and potential damage to the post anchor fixings and concrete slab.

Crash testing should evaluate 'worse case impact scenario', introducing a factor of safety into the design process. Therefore, most RHINO-STOP systems are crash tested as follows:

- Short installation lengths comprising of just two (2) or three (3) supporting posts;
- Vehicle impacting the edge of the system to maximise loading on the end post;
- Vehicle impact speeds up to twice the nominate speeds of the Standard;
- Posts are positioned on the edge of a 150mm thick elevated slab.

