

RhinoStop[®]

Car Park & Industrial Crash Barriers



SafeDirection
CRASH BARRIER SOLUTIONS

safedirection.com.au



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Leading Safety

Full scale crash tested systems on the edge of suspended thin slabs
Compliance to AS/NZS 1170.1 Structural Design Actions (Clause 3.8)

Available with pedestrian fall protection

Energy Absorbing

Patented yielding base plate design
Controlled absorption of vehicle impact energy
Lower anchor bolt forces
Prevents damage to the concrete substrate

Architectural Solutions

Aesthetic design options
High cross flow ventilation

Fast Assembly

Fully modular systems
Fewer anchor bolts per post

Durable

Galvanised components

Local Support

Designed by Safe Direction for Australian and New Zealand Standards
Customised solutions available for non-standard applications





1.0 Introduction

Car park barriers are a specific range of safety barrier systems designed for the protection of people, buildings, plant and equipment. Their design and function are specific to vehicle movements encountered in a car park or warehouse/industrial 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 a drop to a lower level 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.

2.0 Standards & Guidelines

There are numerous standards and guidelines governing the use of car park barriers. Depending upon the design use for the barrier system, one or more standards or guidelines may be required to be observed.

2.1 AS/NZS 2890.1 Parking Facilities

AS/NZS 2890.1 sets out the minimum requirements for the design and layout for off-street parking facilities, including multi-storey car parks.

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.

AS/NZS 2890.1 states that barriers shall comply with the following requirements:

- a. They shall be designed structurally for the loading requirements of AS/NZS 1170.1;
- b. If at the end of a parking space, they shall be at least 1.3m high so that drivers backing into the space can see the barrier above the rear of the vehicle; and
- c. They shall not be made from brickwork, unreinforced concrete or other materials likely to shatter on impact.

2.2 Building Code of Australia

A 1m high continuous barrier (balustrade) must be provided along the side of a floor if the trafficable surface is 1m or more above the surface beneath.

Openings in the barrier must not allow a 125mm sphere to pass through any opening.

If the drop to a lower level exceeds 4m, any horizontal elements between 150mm and 760mm above the floor must not facilitate climbing.

The barrier must be of strength and rigidity to withstand the foreseeable impact of people and where appropriate, the static pressure of people pressing against it.



2.3 AS/NZS 1170.1 Structural Design Actions, Part 1 (Clause 3.8)

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.

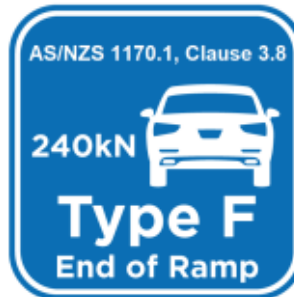
The loads for car park barriers are based on the following:



**1500kg vehicle
travelling at 2m/s
(7.2km/h)**

Impact height: 0.5m
above ground level

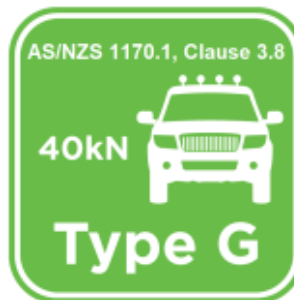
Impact energy = 3.0kJ



**2000kg vehicle
travelling at 6m/s
(21.6km/h)**

Impact height: 0.5m
above ground level

Impact energy = 36.0kJ



**2000kg vehicle
travelling at 2m/s
(7.2km/h)**

Impact height: 1.0m
above ground level

Impact energy = 4.0kJ



3.0 Risk of Rigid Post Systems

The vulnerability of rigid post systems is the high peak load transferred to the anchors upon vehicle impact. This can cause anchor failure, resulting in damage to the concrete substrate.

Damage to the concrete substrate is difficult to repair and may compromise the structural integrity of the car park structure.



Minor impacts causing rigid post anchor failure





4.0 How RhinoStop® Works

RhinoStop® posts are significantly stronger than similarly sized and anchored rigid posts. All RhinoStop® barriers incorporate a unique patented yielding base plate that minimises the peak loads transferred to post anchors.

The defining feature of RhinoStop® posts are the long cuts in the base plate breaking the plate into three fingers connected by a common stem. Upon impact from a vehicle, a plastic hinge will form at the location where the fingers that the post is mounted to begins to rotate backwards. This deformation serves two primary functions:

1. The load capacity of the plastic hinge is designed to be less than the pull-out capacity of the anchor bolt; and
2. The deflection of the system allows for greater load transfer to adjacent posts thereby sharing the impact load from the vehicle.



RhinoStop® energy-absorbing base plate prevents damage to concrete





5.0 Crash Test Validation

The various RhinoStop® systems have been crash test validated to exceed the vehicle impact loads described in AS/NZS 1170.1, Clause 3.8.

Since the publication of AS/NZS 1170.1 in 2002, full-scale crash testing has become the preferred method of validating crash barriers for car parks and roadside applications.

Therefore, Safe Direction has adopted the following criteria, designed to represent the worst, or most critical, impact conditions when evaluating most RhinoStop® systems:

- Posts are installed on the edge of 150mm thick, suspended concrete slabs. This configuration thoroughly evaluates the potential for concrete edge failure and the suitability of anchor embedment depths;
- Vehicle impacts are performed at up to twice the speed nominated by the Standard;
- Short-length barrier systems, designed to distribute the impact load on fewer posts and produce the largest system deflection; and
- Impacts performed at the end of the barrier system to maximise loading on the end post.





6.0 RhinoStop® Load Compliance (AS/NZS 1170.1, Clause 3.8)



RhinoStop® Standard



Containment of a 1500kg vehicle travelling at 15km/h
Impact Energy = 13.0kJ
Minimum 3 posts

RhinoStop® SkyEdge



Containment of a 1500kg vehicle travelling at 15km/h
Impact Energy = 13.0kJ
Minimum 3 posts

RhinoStop® Screen



Containment of a 1500kg vehicle travelling at 15km/h
Impact Energy = 13.0kJ
Minimum 3 posts

RhinoStop® Elite



Containment of a 1500kg vehicle travelling at 15km/h
Impact Energy = 13.0kJ
Minimum 2 posts

Containment of a 2000kg vehicle travelling at 20km/h
Impact Energy = 31.0kJ
Minimum 3 posts

RhinoStop® TruckGuard



Containment of a 2500kg vehicle travelling at 20km/h
Impact Energy = 37.0kJ
Minimum 5 posts

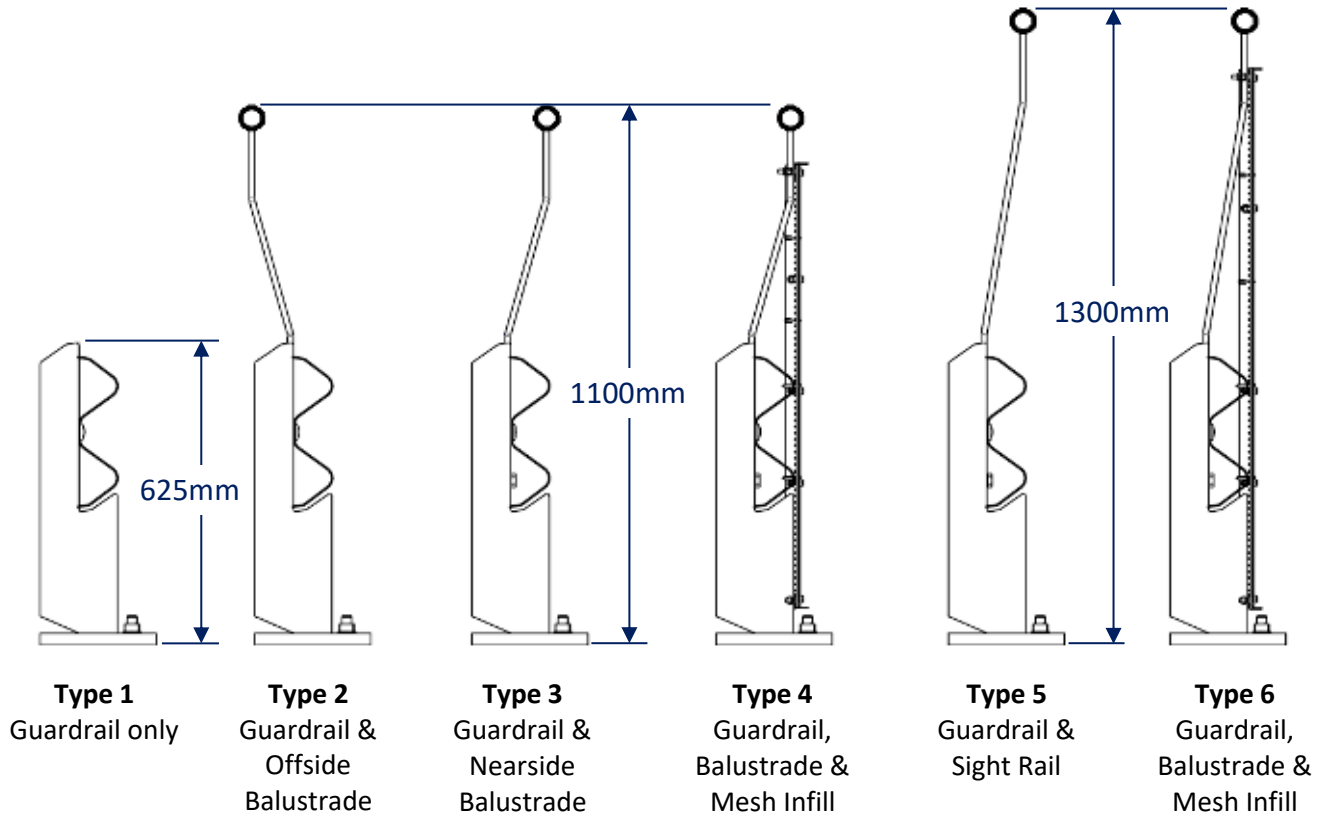
RhinoStop® 240



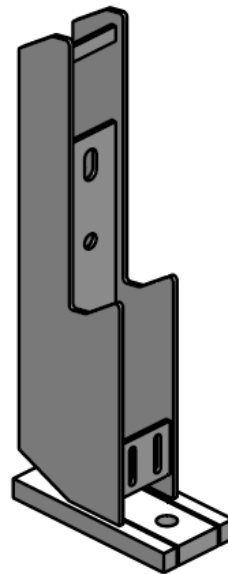
Containment of a 2000kg vehicle travelling at 29km/h
Impact Energy = 65.0kJ
Minimum 6 posts



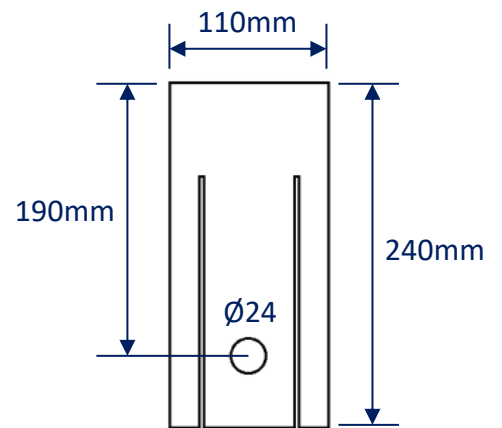
7.0 RhinoStop® Standard



- 1 off M20 anchor per post
- 2.0m maximum post spacing
- Minimum 3 posts per installation



RhinoPost®
Isometric View

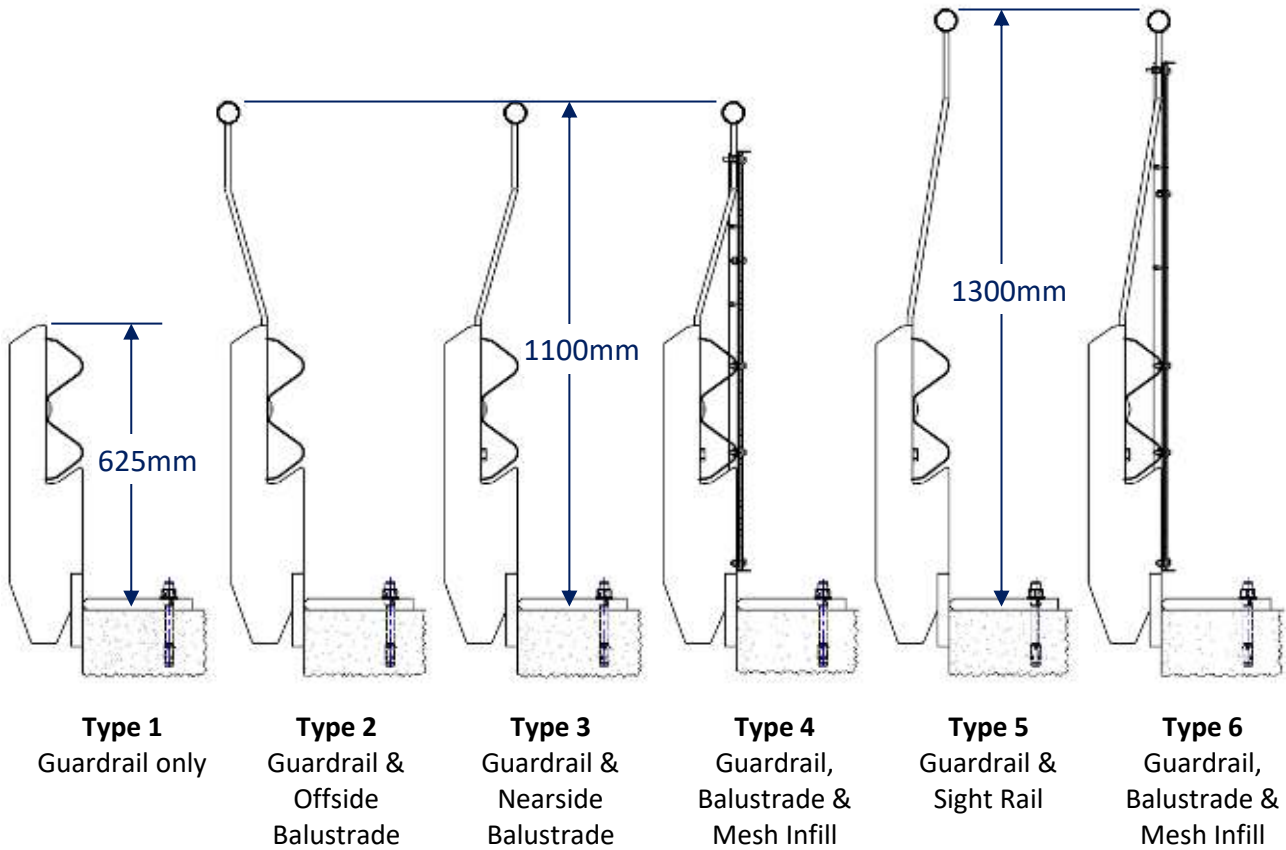


Base Plate
25mm thick

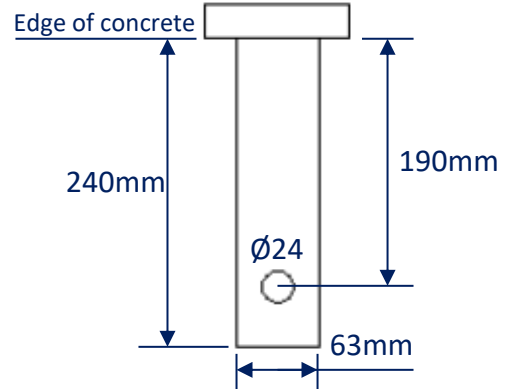
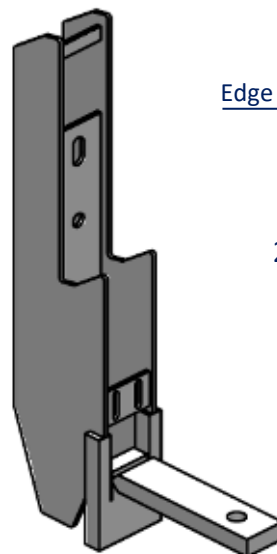




8.0 RhinoStop® SkyEdge



- 1 off M20 anchor per post
- 2.0m maximum post spacing
- Minimum 3 posts per installation



Base Plate
25mm thick

SkyEdge Post
Isometric View

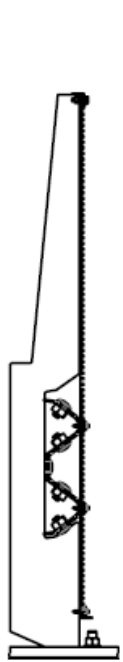




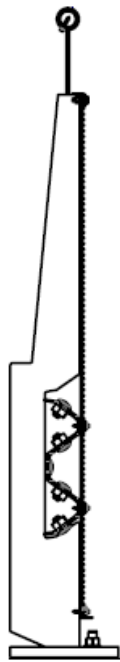
9.0 RhinoStop® Screen



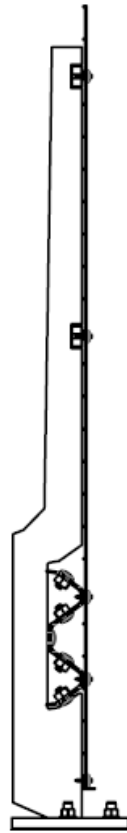
2.0m maximum post spacing
 Minimum 3 posts per installation



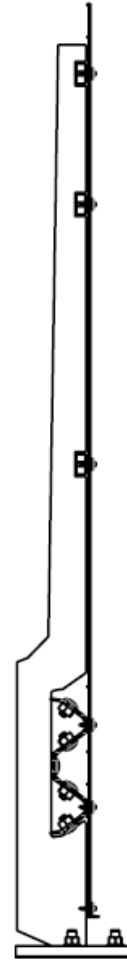
Type 1
 1300mm high



Type 2
 1500mm high



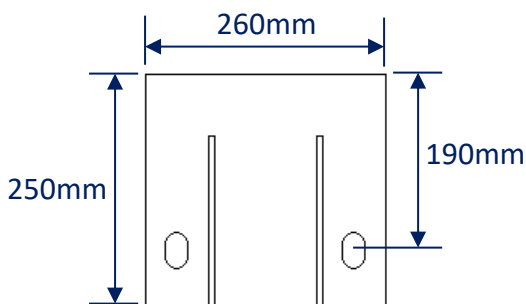
Type 3
 1900mm high



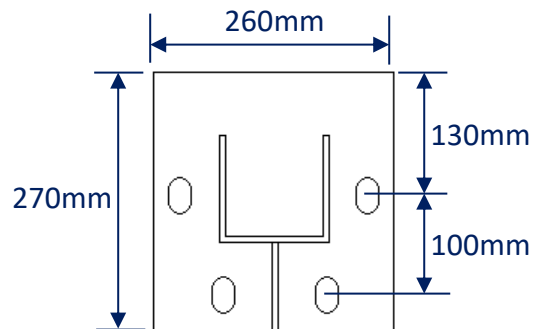
Type 4
 2200mm high



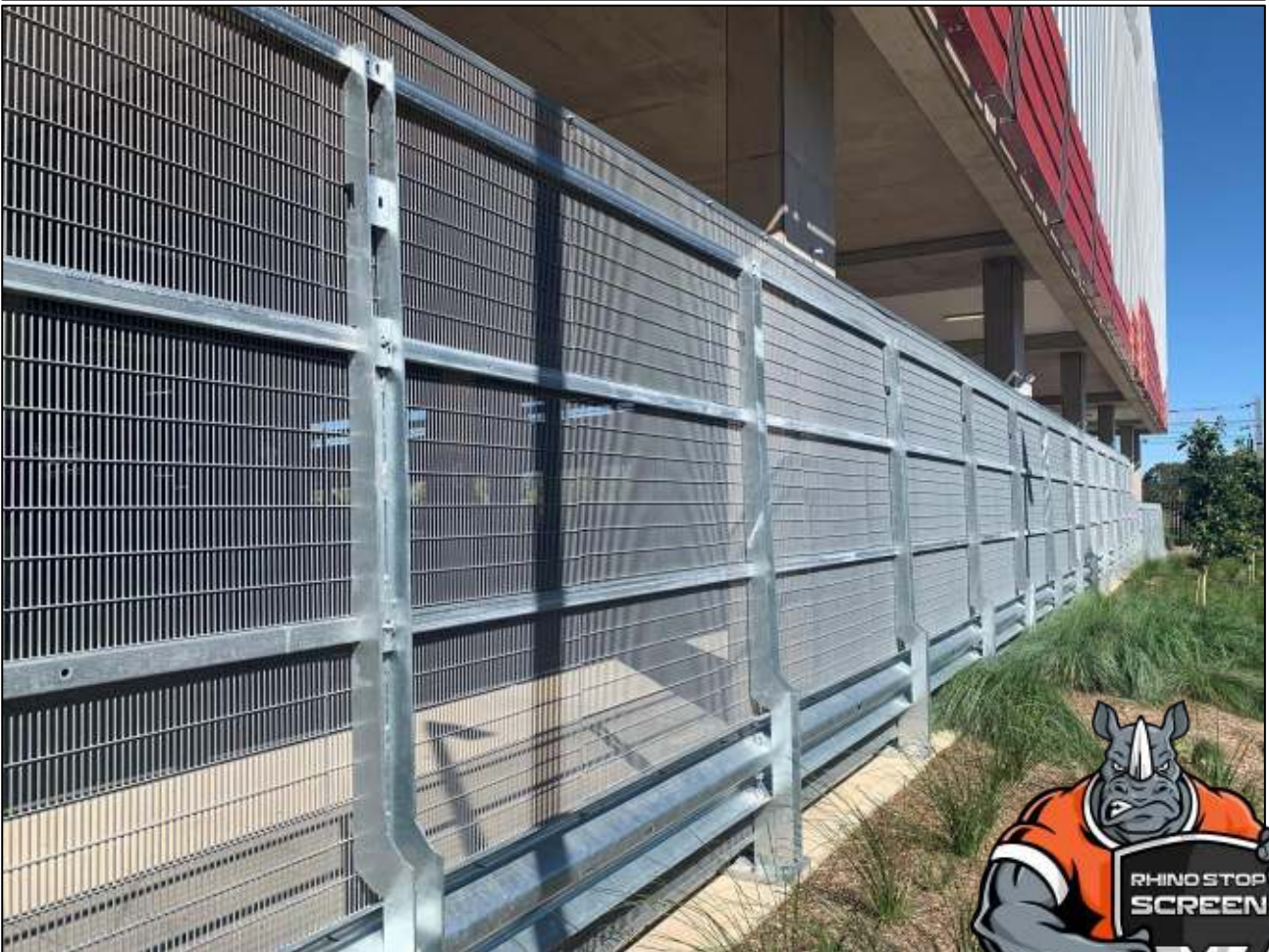
Type 5
 2500mm high



Type 1 & 2 Base Plate
 25mm thick
 2 off M20 anchors per post

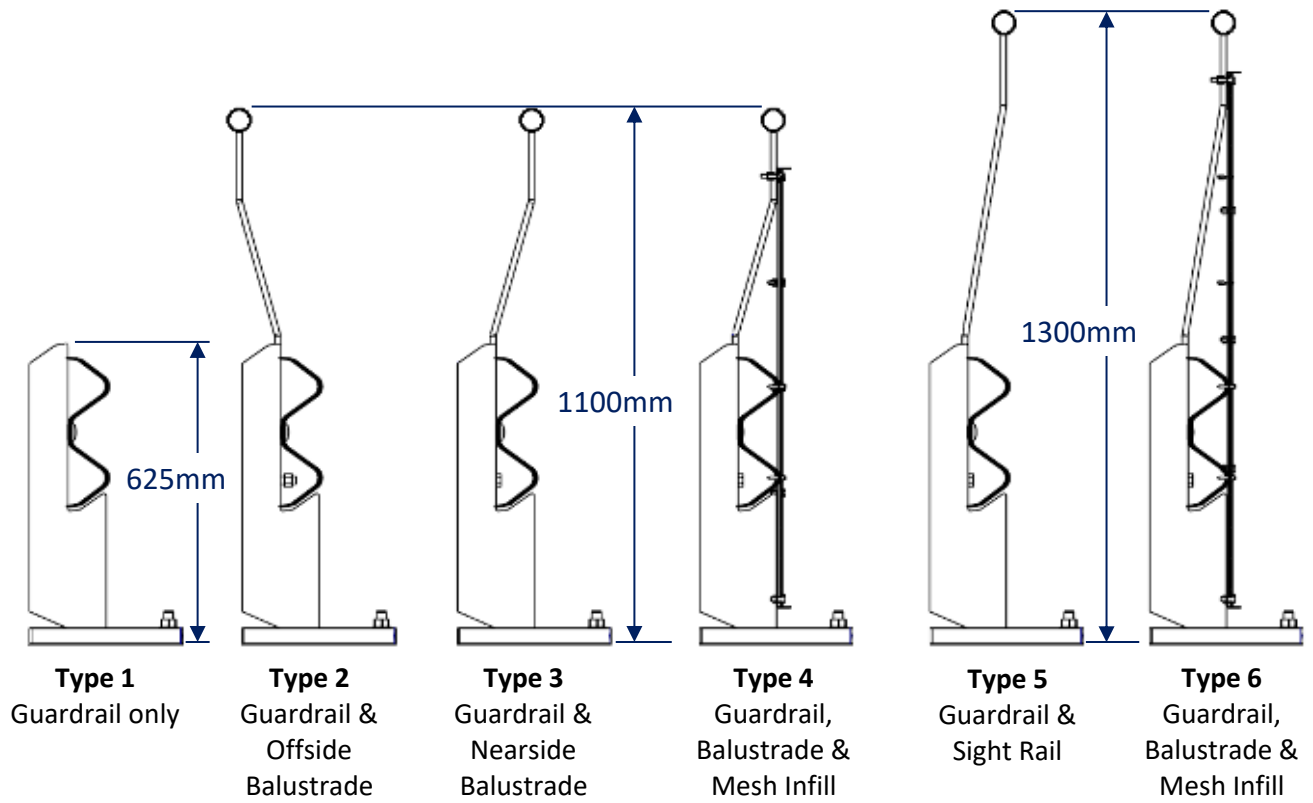


Type 3, 4 & 5 Base Plate
 25mm thick
 4 off M20 anchors per post

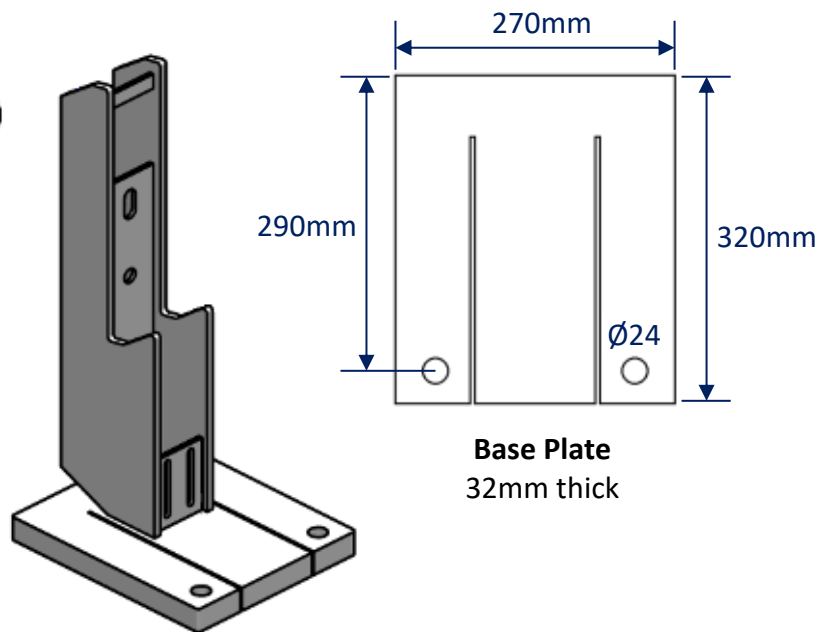




10.0 RhinoStop® 240



- 2 off M20 anchors per post
- 0.8m maximum post spacing
- Minimum 6 posts per installation

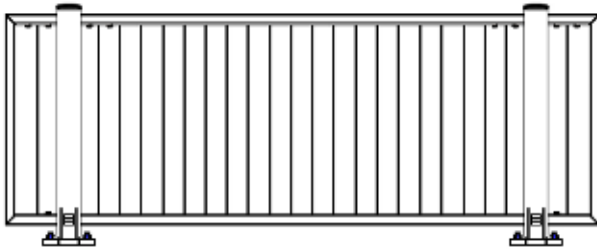


RhinoPost® 240
Isometric View

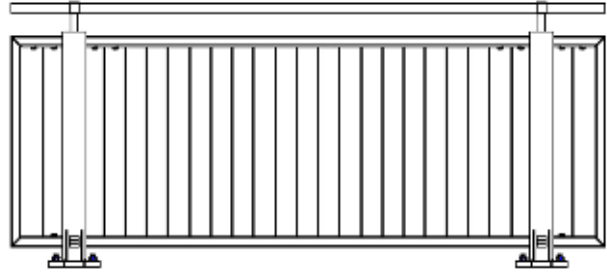




11.0 RhinoStop® Elite



Type 1
1100mm high



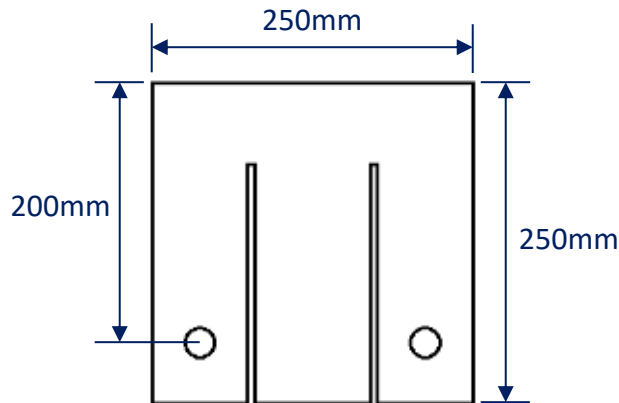
Type 2
1300mm high



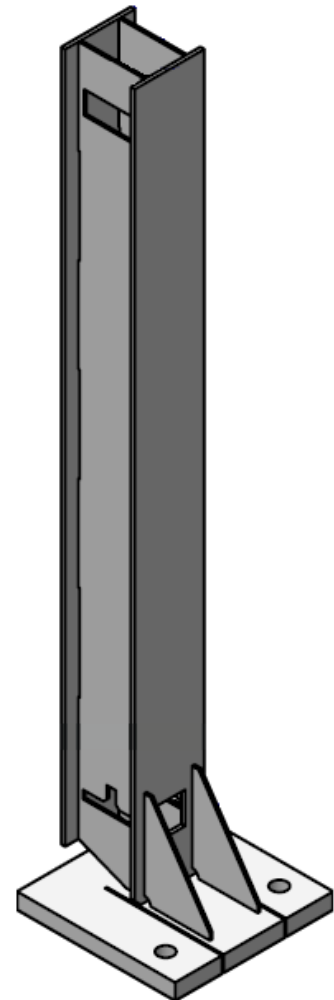
- 2 off M20 anchors per post
- 2.3m maximum post spacing
- Minimum 2 posts per installation



- 2 off M20 anchors per post
- 2.3m maximum post spacing
- Minimum 3 posts per installation



Base Plate
25mm thick

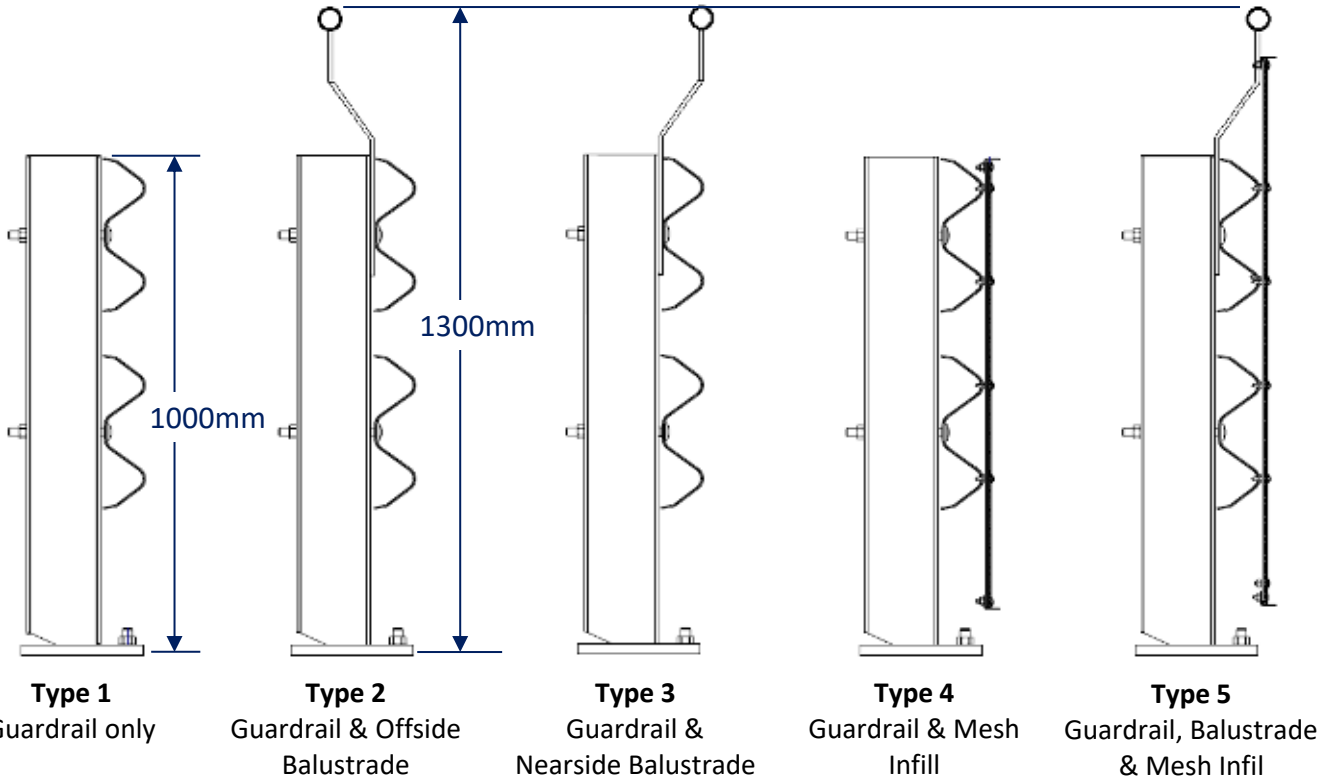


Elite Post
Isometric View

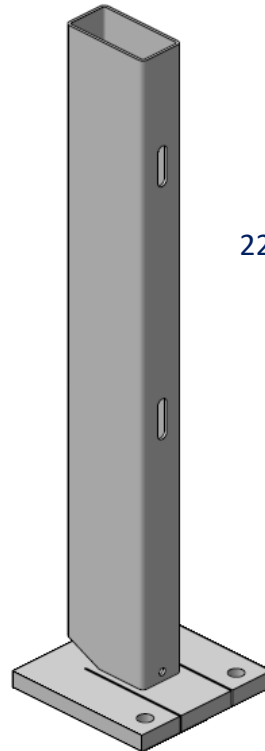




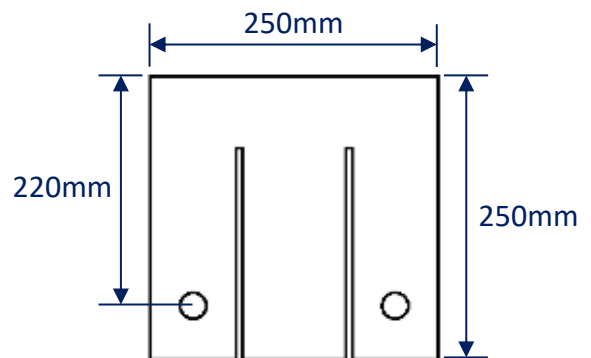
12.0 RhinoStop® TruckGuard



- 2 off M20 anchors per post
- 2.0m maximum post spacing
- Minimum 5 posts per installation



TruckGuard Post
Isometric View



Base Plate
25mm thick





13.0 Installation

13.1 Tools Required

Tools required for the installation of RhinoStop® includes:

- Impact drill with 20mm masonry bit;
- Rattle gun or wrench with 24mm and 32mm socket;
- Torque wrench (capacity up to 200Nm);
- Drop saw;
- Driver, small socket set and step drill bit;
- Grinder with metal cutting disk;
- Hammer;
- 12mm Pinch bar;
- Metal snips;
- String line;
- Tape measure; and
- Slings or chains

13.2 Recommended PPE

It is recommended that the following personal protective equipment (PPE) be provided for the safe installation of RhinoStop®:

- Safety footwear;
- Gloves;
- Hearing protection;
- High visibility clothing;
- Sun protection (broad brimmed hat, sunscreen & tinted safety glasses); and

13.3 Traffic Control

Prior to the commencement of any work, the site should be evaluated for risks to workers, pedestrians and vehicles. The establishment of traffic control should provide safe travel for passing vehicles and/or pedestrians.

13.4 Below Ground Obstructions

The installation of the RhinoStop® requires drilling of holes into a concrete substrate. Prior to the installation of posts an investigation for potential underground hazards such as post tensioned cables, rebar, service conduits or electrical cables. These items should be clearly identified prior to set-out of the barrier.

13.5 Unloading Exclusion Zone

Only appropriate load-rated slings and chains should be used for the safe unloading of product. It is recommended that an exclusion zone be maintained around the unloading process. This provides distance between moving machinery and workers in the event that goods or the machinery move unexpectedly.

Unloading and the storing of the product on a level surface is recommended. Storing product adjacent to the installation area eliminates the requirement for workers to carry items over long distances.

The load capacity of car park decks should be known and height clearances identified prior to transporting goods and vehicles into an elevated car park.



13.6 Concrete Curing

When installing RhinoStop® barriers onto a recently poured concrete substrate, the concrete must be fully cured prior to the installation of anchor bolts.

Curing time can vary from site to site and is to be advised by the site construction manager.

13.7 Concrete Thickness

Crash testing of RhinoStop® barriers has been undertaken on a 150mm thick, 32MPa, reinforced, elevated concrete slab.

Please contact Safe Direction when thinner slabs are encountered.

13.8 Set-Out

It is recommended that a string line be used to establish alignment of the post locations. When establishing the post locations, take care to note the following:

- Locate and identify and below-ground obstructions;
- Post spacings are not to exceed the maximum (refer to guidelines provided for each RhinoStop® barrier);
- Each installation comprises the minimum number of posts (refer to guidelines provided for each RhinoStop® barrier);
- The back of the base plate must not extend beyond the edge of the concrete slab (not applicable to RhinoStop® SkyEdge); and
- Sufficient clearance behind the post to a fixed hazard is required to allow for deflection of the system (contact Safe Direction for guidelines).

13.9 Anchor Installation

The installation method for anchors applies to all RhinoStop® systems. Please refer to specific system types for guidelines on number of anchors required per post.

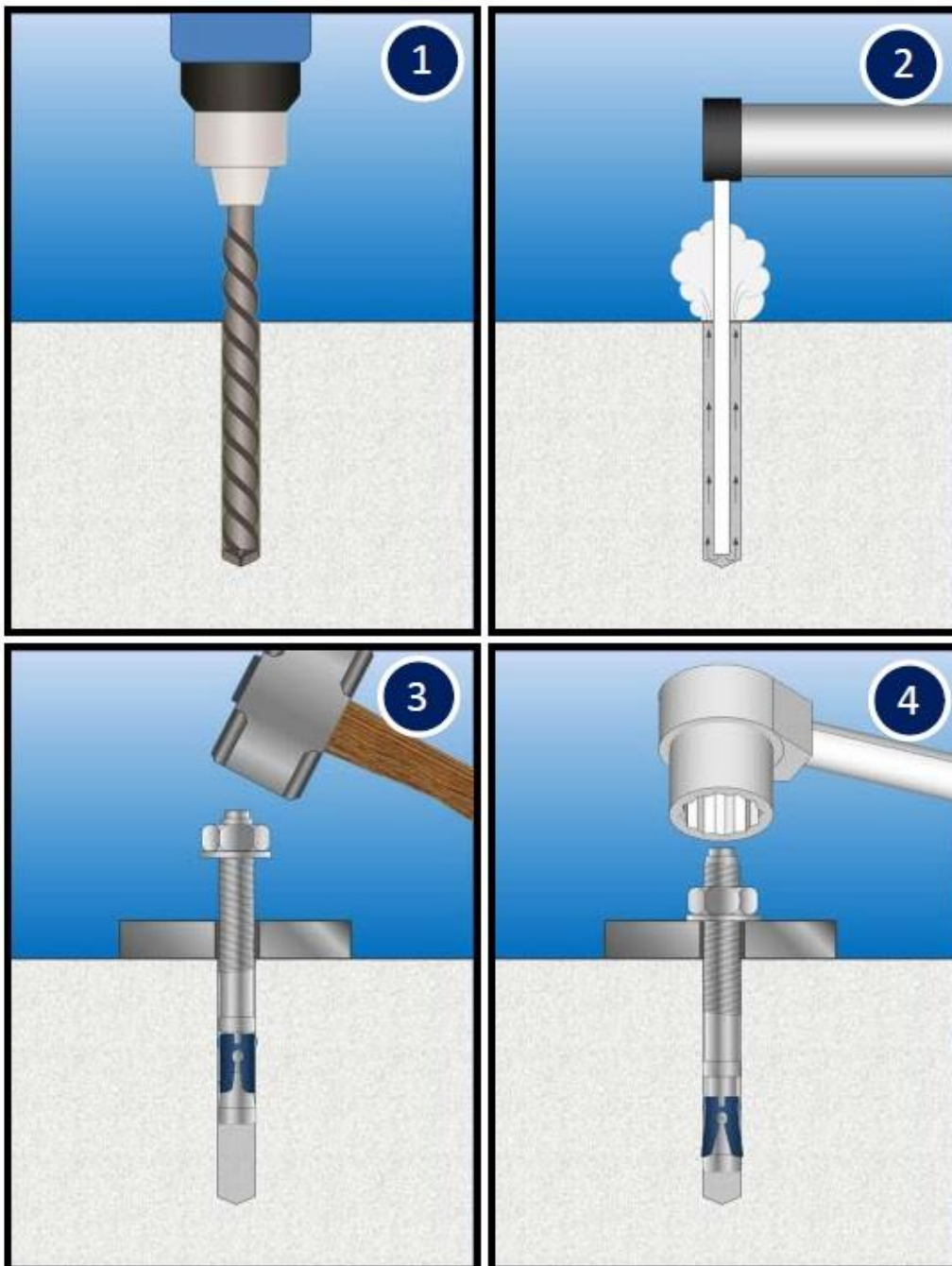
The crash test validation of the various RhinoStop® systems has been performed using Fischer FBN II galvanised anchors. The minimum embedment depth per anchor shall be 100mm and the required bolt torque is 200Nm.

When applying torque to the Fischer FBN II galvanised anchor, the cone bolt is pulled into the expansion clip forcing it against the side walls of the drilled hole.





1. Using a 20mm masonry drill bit (same diameter as the Fischer FBN II galvanised anchor), drill the anchor hole to the depth nominated on the Safe Direction assembly drawing.
2. Using compressed air or a pump, thoroughly clean the hole, removing all loose debris.
3. Position the nut 3mm below the top of the anchor and drive the anchor into the drilled hole to the full depth.
4. Torque the anchor to 200Nm.





13.10 Cutting & Drilling

RhinoStop® is supplied as a modular barrier system, manufactured to suit standard post spacing. During assembly, it may be necessary to cut and drill standard length panels to suit site specific dimensions.

Cutting of w-beam guardrail panels, handrail pipe, mesh panels and angles is undertaken using a metal cutting disk.

Drilling of holes is recommended using a step drill bit.

Any damage to the galvanised coating shall be repaired by applying two (2) coats of a zinc rich paint. A silver topcoat is recommended for aesthetics.

Flame cutting is not permitted for cutting or drilling of any RhinoStop® assembly item.

Cutting of the Fischer FBN II galvanised anchors is not permitted

13.11 Assembly Sequence

Assembly Drawings and Installation Checklists for each RhinoStop® barrier configuration are available for download at www.safedirection.com.au.





14.0 Health Sector



Our projects include:



Health





15.0 Transport Sector



Our projects include:

Transport for NSW



TOLL





16.0 Education Sector



Our projects include:



Education
Public Schools



17.0 Community Sector



Our projects include:





18.0 Retail Sector



Our projects include:





SafeDirection

CRASH BARRIER SOLUTIONS



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