PROTECTIVE BOLLARD Selection Guide

Choosing the right level of impact protection for carparks, assets and low-speed environments.

BOLLARDS RECOVER FROM IMPACT

When secured on Impact Recovery System bollards absorb vehicle impact and slowly, safely self-recover from low-speed impact

BOLLARDS REUSABLE

Bollards are removable and reusable following even severe impact

FOOTINGS REUSABLE

The Impact Recovery System protects the surrounding pavements and footings protected from damage when bollards are impacted or need replacing.

IMPACT TESTED

ZERO WASTE Foundations are independently tested. Impact Recovery Bollards impact tested and supported by more than two decades of field performance. Visit website to view videos and client testimonials

INDUSTRY SUPPORT

Multi award winning, chosen by leading WA transport, road, utility and local government authorities — including Department of Transport, Main Roads WA, Western Power, City of Perth, City of Fremantle and City of Wanneroo

SAVE THOUSANDS

By making bollards and surrounding foundations reusable and greatly improving the efficiency of bollard maintenance, you save thousands over the life of a development

Photo Dept Transport Safety Yellow Advanced Polymer XHD Impact Recovery Bollards

Bollard Selection Guide

AS 2890 recognises the use of protective devices, including bollards, where required to protect buildings, pedestrian areas and fixed objects from vehicle damage. It also requires protective devices to be clearly visible to drivers.

For most carparks, the objective is not hostile vehicle protection — it is reducing repeated damage, protecting assets and keeping the development safe, functional and presentable.

Impact Recovery Bollards are recommended where low-speed impact resilience, reduced maintenance and whole-of-life cost savings are the priority. Certified crash-rated bollards should be used where vehicle containment is required

In many carpark and low-speed development environments, bollards are not installed as road safety barriers or hostile-vehicle mitigation devices.

They are commonly used to:

- improve driver visibility
- protect buildings, columns, walls, stairs, lifts and services
- prevent minor vehicle encroachment
- guide vehicle movement
- separate pedestrians from parking areas
- reduce repeated damage to pavements, footings and assets

Resistance to impact

Bollard Type	Speed	What happens upon impact
Surface Mount - Standard 140 Steel	≈ 4 km/h	Bolts bend or pull out, and slab damage is likely. These bollards are not protective they are regarded as aesthetic only.
Surface Mount - Standard 165 Steel	≈ 4 km/h	Bolts bend or pull out, and slab damage is likely. These bollards are not protective they are regarded as aesthetic only.
In-ground - Standard 140 Steel	≈ 7 km/h	Survives a very slow nudge. A light car hit can crack the footing. These bollards are not protective they are regarded as aesthetic only.
In-ground - Standard 140 Steel Concrete Filled	≈ 8 km/h	Stiffer but more brittle. Energy drives into the footing and moisture can be trapped causing rust. These bollards are not protective they are **regarded as aesthetic only.**
In-ground - Standard 165 Steel	≈ 7 km/h	Very limited improvement over 140 mm. As there is nowhere for the impact force to go, a car hit (especially with so many SUVs and 4WD on the road) still tends to damage the footing and can **cause cars to become projectiles.**
In-ground - Standard 165 Steel - Concrete Filled	≈ 8 km/h	Stiffer but with little real-world gain. Loads transfer into the footing and footing is dislodged with added **risk of bollard rusting out at base** and simply folding upon impact.
Impact Recovery - Surface Mount with Steel, Stainless steel or Advanced Polymer Bollard casing	≈ 13 km/h	Bollard deflects and self-recovers under low-speed impact and side glances. Upon higher-speed impact, the resistance core can bend and require replacement. **Surrounding footing is not damaged.**
Impact Recovery - In-ground 350 with Steel, Stainless steel or Advanced Polymer Bollard casing	≈ 16 km/h	Improved stability over surface mount. Bollard deflects and self-recovers under low-speed impact and side glances. Upon higher-speed impact, the resistance core can bend and require replacement. **Surrounding footing is not damaged.**
Impact Recovery - In-ground 650 with Steel, Stainless steel or Advanced Polymer Bollard casing	≈ 19 km/h	Greater embedment improves resistance to more serious low-speed impacts. Bollard deflects and self-recovers under low-speed impact and side glances. Upon higher-speed impact, the resistance core can bend and require replacement. **Surrounding footing is not damaged.**
Impact Recovery - In-ground **650 (Extra Heavy Duty)** with Steel, Stainless steel or Advanced Polymer Bollard casing	≈ 21 km/h	Highest-duty option for severe low-speed impacts/ impacts from utility vehicles or trucks. Bollard deflects and self-recovers under low-speed impact and side glances. Upon higher-speed impact, the resistance core can bend and require replacement. **Surrounding footing is not damaged.**

Choosing the Right Level of Protection

Where a bollard is required to stop an errant vehicle, a certified crash-tested protection device should be specified. ZERO CIVIL Impact Recovery Bollards provide a practical low-speed solution by

- allowing controlled deflection,
- protecting footings from damage and
- enabling fast reinstatement after severe impact.

Where the bollard is being used

- in a low-speed carpark environment for asset protection,
- visibility, parking control or minor vehicle encroachment,

a non-certified bollard may be appropriate where selected following a site-specific risk assessment.

Over-specifying crash-rated bollards in low-speed areas can increase project cost, maintenance complexity and damage to vehicles and pavements. Under-specifying bollards in high-risk pedestrian areas can create safety and liability exposure.

It should be recognized that rigid devices are themselves a hazard; they have the potential to cause serious injuries. The intention of Standard AS/NZS 3845.2 is that these devices are only installed at locations where the risk with the device installed is *significantly* less than the risk **without** the device.

Practical Guidance for Bollard Selection

Bollards should be selected according to the site risk, expected impact speed and required design objective. Impact Recovery Bollards provide a practical low-speed solution where controlled deflection, reusable footings and reduced maintenance are the priority. Where certified vehicle containment is required, a crash-tested bollard system should be specified.

Not all bollards perform the same function. A bollard used for visibility or access control is not the same as a bollard designed to resist vehicle impact. Likewise, a low-speed impact-resisting bollard is not the same as a certified crash-rated containment system.

Correct selection should consider:

- expected vehicle speed
- likely vehicle type
- impact angle
- pedestrian exposure
- asset risk
- required level of containment
- foundation performance
- maintenance requirements
- whether the bollard is expected to guide, resist, recover, deform or contain

Define the purpose of the bollard

- improve visibility
- guide vehicle movement
- prevent vehicle access
- protect buildings, walls, columns, services and assets
- separate pedestrians from traffic
- reduce repeated damage in carparks and low-speed zones
- provide low-speed impact resistance
- provide certified vehicle containment where required

Where the objective is visual guidance or basic access control, a standard bollard may be suitable.

Where the objective is to reduce repeated low-speed impact damage, an Impact Recovery Bollard may be appropriate.

Where the objective is to stop or contain an errant vehicle, a certified crash-tested bollard system should be specified.

Foundation performance is critical

Impact performance is not determined by the bollard alone.

Research into bollard design and testing recognises that the foundation is critical to the performance of a bollard in resisting impact loads. This is especially important in locations where bollards are repeatedly impacted.

Traditional rigid bollards often transfer impact force directly into the concrete footing and surrounding pavement. This can result in bent bollards, cracked concrete, damaged paving and repeated replacement work.

Impact Recovery Bollards are designed to manage impact force through controlled deflection, energy absorption and a replaceable resistance core, helping protect the surrounding footing from repeated damage.

Match the bollard to the risk

In low-speed environments, the objective is often not formal vehicle containment. It is usually to reduce damage, protect assets, improve presentation, improve safety and reduce long-term maintenance costs.

Impact Recovery Bollards occupy the practical middle ground between basic rigid bollards and certified crash-rated vehicle containment systems.

They are suited to:

- carparks
- disabled parking bays
- shopping centres
- commercial developments
- loading areas
- service vehicle areas
- utility assets
- drive-through areas
- low-speed access control points
- pedestrian separation in low-speed environments

Where pedestrian exposure is high, vehicle speeds are higher, or formal containment is required, a certified crash-tested bollard system should be specified.

Recommended selection hierarchy

1. Standard Bollards

Use where the objective is visibility, guidance or basic access control, and vehicle impact risk is low.

2. Impact Recovery Bollards

Use where the objective is low-speed impact resilience, reusable footings, reduced damage and faster reinstatement.

3. Certified Crash-Rated Bollards

Use where the objective is vehicle containment, pedestrian protection from errant vehicles, hostile vehicle mitigation or compliance with a specific crash-test requirement.

For most carparks and low-speed commercial environments, the objective is not hostile vehicle mitigation or formal vehicle containment. The objective is to reduce repeated damage, protect assets, maintain presentation and reduce long-term maintenance costs.

In these environments, Impact Recovery Bollards provide a practical and sustainable option by allowing controlled deflection, helping absorb impact energy and protecting the surrounding footing from repeated damage.

Where certified vehicle containment is required, a crash-tested system such as the EAB Bollard should be specified.

Recommended Application: Impact Recovery Bollards

ZERO CIVIL Impact Recovery Bollards are designed for carparks, parking zones, commercial developments and other low-speed areas where bollards are likely to be impacted during normal site use.

They are particularly suited to locations where traditional rigid bollards are repeatedly damaged, loosened, bent or replaced.

Typical applications include:

- carparks
- disabled parking bays
- loading areas
- drive-through zones
- service vehicle areas
- commercial developments
- shopping centres
- utilities and service assets
- low-speed access control points
- pedestrian separation in low-speed environments

Why Engineers Should Consider Impact Recovery Bollards

1. **Prevent costly footing damage and repeated repairs**

Traditional rigid bollards transfer impact force directly into the concrete footing. In many cases, the bollard bends, the footing cracks, or the surrounding pavement is disturbed.

Impact Recovery Bollards use an internal resistance core and shock absorbing mechanism to absorb and manage impact force. The purpose is to protect the surrounding footing and pavement from repeated damage, making it reusable.

This is especially important in carparks, where the same bollards are often hit repeatedly over the life of the development.

2. **Controlled deflection and recovery**

Under low-speed impact, the bollard is designed to deflect and slowly self-recover rather than behave as a rigid obstruction.

The system uses two shock absorbing Impact Recovery Rings and an internal resistance core to control movement. The bollard remains rigid in normal use and cannot be pushed over by hand, but under vehicle impact it can deflect up to approximately 20 degrees before recovering.

This provides a practical balance between:

- vehicle resistance
- impact absorption
- footing protection
- bollard protection
- maintenance efficiency
- reduced damage to vehicles
- reduced impact energy transferred to vehicle

3. **Faster replacement after severe impact**

If a severe impact exceeds the recovery range, the internal resistance core may bend and require replacement. This is intentional.

Rather than destroying the bollard, footing and pavement, the replaceable core acts as the sacrificial component. The bollard can be removed, the core replaced, and the system reinstated without excavation or footing replacement.

The existing draft notes that Impact Recovery Bollards are intended to make bollards reusable after severe impact and reduce maintenance costs over the life of the development.

4. **Lower whole-of-life cost**

The cheapest bollard is rarely the cheapest system.

A low-cost rigid bollard installed directly into concrete may be inexpensive at installation, but if it is hit repeatedly, the real cost includes:

- labour
- traffic management
- concrete repairs
- pavement repairs
- replacement bollards
- disposal
- downtime
- safety exposure
- repeat call-outs

Impact Recovery Bollards are designed to reduce these repeated maintenance costs by preserving the footing and allowing faster reinstatement after impact.

For developments where even one bollard is likely to be badly impacted during the life of the project, the whole-of-life cost advantage can be significant.

These bollards have been impacted numerous times (as you can see from the scuffed footings) including being impacted by a large truck, and although the resistance core needed replacing to bollards and footings survived.

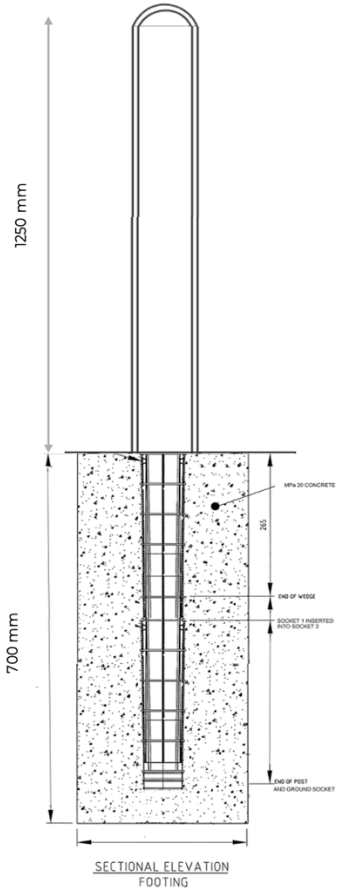
Recommended Carpark Specification

For carparks and low-speed vehicle environments, ZERO CIVIL recommends the Impact Recovery Bollard System

Typical configuration:

- Advanced Polymer, steel or stainless-steel bollard casing
- ZERO WASTE 350 mm or 650 mm inground Foundation or surface-mount base, depending on site conditions
- Impact Recovery Rings
- Internal resistance core
- 30 MPa concrete footing
- Heavy or Extra heavy Duty resistance core, depending on expected impact risk

For higher-risk carpark zones, service vehicle areas or areas exposed to utility vehicles, a **650 mm footing with the Extra Heavy Duty resistance core** may be selected to increase resistance and reduce the likelihood of core replacement.



Where Impact Recovery Bollards provide a safe, sustainable option

Impact Recovery Bollards sit in the practical middle ground between conventional rigid bollards and high-cost crash-rated vehicle barriers.

They are suitable where the engineering objective is to:

- reduce damage
- preserve footings
- improve low-speed impact resilience
- reduce long-term maintenance
- improve safety around carparks
- reduce vehicle and asset damage
- avoid repeated excavation and replacement
- keep developments looking clean and well maintained

They are not intended as certified crash-rated barriers where formal vehicle containment is required.

They are intended to provide a more practical, reusable and maintainable bollard system for carparks and other low-speed environment

Upon low impact the bollard deflects up to 20 degrees and self recovers.

Under higher impact, the resistance core is designed to act as a sacrificial structural element. Depending on vehicle type, speed and impact angle, the vehicle may become partially immobilised or hung up on the core, making further movement difficult without recovery assistance.

Shallow Installation

Because the Impact Recovery System absorbs the impact force, the depth of foundations can be substantially reduced, saving time and money and reducing disturbance to underground services.

For this reason:

- **Surface Mount foundations are adequate for standard carpark applications**
- **350 mm Depth are suitable for carparks**
- **650 mm for more industrial applications**
- **XHD 650 mm for high impact locations**

These Stainless steel Surface Mount Impact Recovery Bollards were installed in St George's Terrace more than 10 years ago, and despite impact from vehicles they remain in good condition today

Take a drive down the Terrace and through Northbridge to see them in action.

Advanced Polymer Bollards provide a safe, sustainable option

Advanced Polymer Bollards provide a safe and extremely resilient alternative to steel bollards.

Advanced Polymer Bollards offer:

- Non conductivity
- high impact resistance
- excellent toughness
- flexibility under load
- reliable performance across a wide range of temperatures
- UV Stabilisation
- reduced risk of brittle failure over time

Under lighter impact, the bollard can flex and recover. Scuff marks from tyres can typically be cleaned away

Design life of 50 years
(25 in direct sunlight)

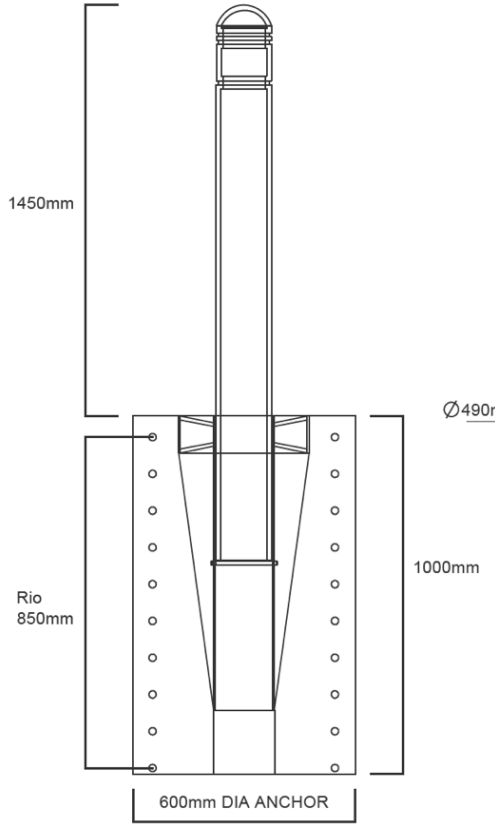
Advanced Polymer Impact Recovery Bollards were installed on a recent Department of Transport project (as an alternative to crash rated bollards for a train station carpark)

When Certified Crash-Rated Bollards Should Be Used

Impact Recovery Bollards are not hostile-vehicle mitigation barriers or high-speed road safety barriers. Certified crash-rated bollards should be specified where the design intent is to:

- stop or contain an errant vehicle
- protect high-risk pedestrian zones
- protect crowded public areas
- provide hostile vehicle mitigation
- act as a formal road safety barrier
- meet a specific crash-test containment requirement

For certified vehicle containment, specify EAB — the Australian road-authority approved impact-absorbing bollard system. Available for carparks and 60 km zones.



Footing	700Ø x 1000mm
Vehicle Stopped	Hatchback, Sedan, SUV, Pickup
Crash Tested	1600kg/3500lb vehicle at 60kmh/38mph

Bollard Placement is Important

A bollard is only as effective as its placement. In many carpark and low-speed environments, a properly spaced row of bollards provides better resistance to vehicle encroachment than a single isolated bollard, especially where vehicles may approach at an angle, mount a kerb, overrun a footpath or attempt to pass between protection points.

Correct spacing helps ensure the protected object, pathway or pedestrian area is properly shielded.

Designers should consider vehicle approach direction, turning paths, impact angle, pedestrian exposure, bollard spacing and distance from the asset being protected.

Impact Recovery Bollards can be installed individually or in rows to provide practical low-speed protection while preserving reusable footings and allowing faster reinstatement after impact.

A single bollard protects a point. A correctly spaced row protects a zone.

As a guide: For carparks, footpaths and asset protection areas, bollards should generally be positioned approximately 1.0–1.2 m from the object being protected and spaced with a clear gap of approximately 1.0–1.2 m between bollards**,** depending on vehicle access requirements, pedestrian access, impact risk and site conditions.

Figure H1 — Two bollards protecting rigid object

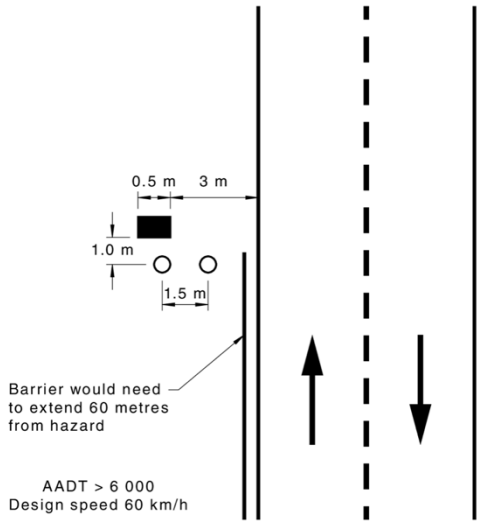
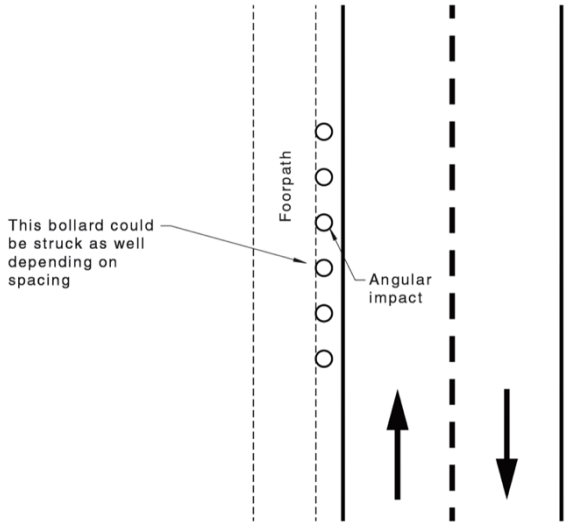


Figure H2 — Bollard array protecting footpath

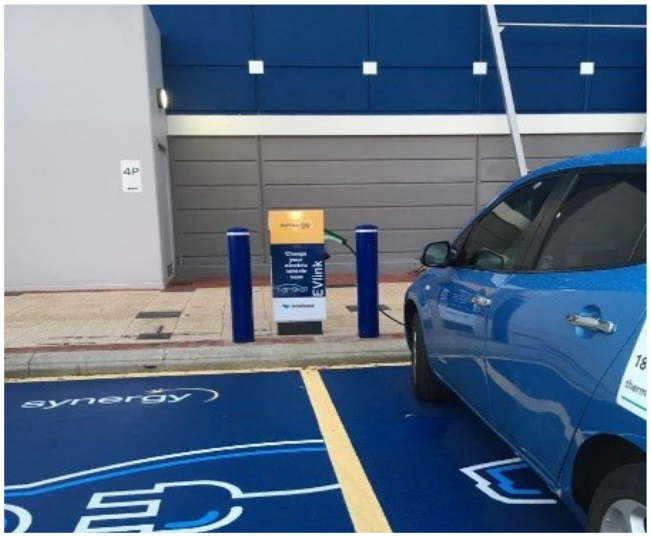


Proven Field Use Across WA

CITY OF Fremantle

Fremantle has used Steel inground Impact Recovery Bollards throughout the city as roadside bollards, for the past twenty years. They use plain galv. bollards for low maintenance and designer caps.

synergy



Synergy carparks use Steel Impact Recovery Bollards to protect expensive charging stations. They look like solid in-ground steel bollards but are removable and self-recover from impact. They do need repainting occasionally or removal for blasting and powder coating.

Department of Transport

Advanced Polymer Impact Recovery Bollards were installed on a recent Department of Transport project (as an alternative to crash rated bollards for a train station carpark) to improve safety and resilience.

CITY OF PERTH
City of Light

These Stainless steel Surface Mount Impact Recovery Bollards were installed in St George's Terrace more than 10 years ago, and remain in good condition today

City of
Bayswater

These bollards have been impacted numerous times (as you can see from the scuffed footings) including being impacted by a large truck, and although the resistance core needed replacing to bollards and footings survived.

WANNEROO

Wanneroo City council uses Steel Impact Recovery Bollards to block pathways and allow access for maintenance staff. They look and feel just like inground rigid bollards- until impacted by a vehicle.

KFC

KFC use our Impact Recovery Bollards in the drive-throughs where bollards are highly vulnerable to “glances”, to substantially reduce on-going damage and maintenance costs.

western power

Western Power use our Advanced Polymer Non-conductive bollards both inground and Impact Recovery depending upon site conditions.

Westfield

Westfield Shopping Centres have used our Advanced Polymer Bollards to reduce maintenance on bollards in their shopping centre carparks.

ZERO CIVIL

ADVANCED ZERO WASTE TECHNOLOGIES

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