

Impact rating **charts**

When impacted something has to “give”

Solid inground bollards have been the mainstay of the industry for decades, but in recent times with more pedestrians and vehicles on our roads there is a growing concern for the safety factor when designing bollards.

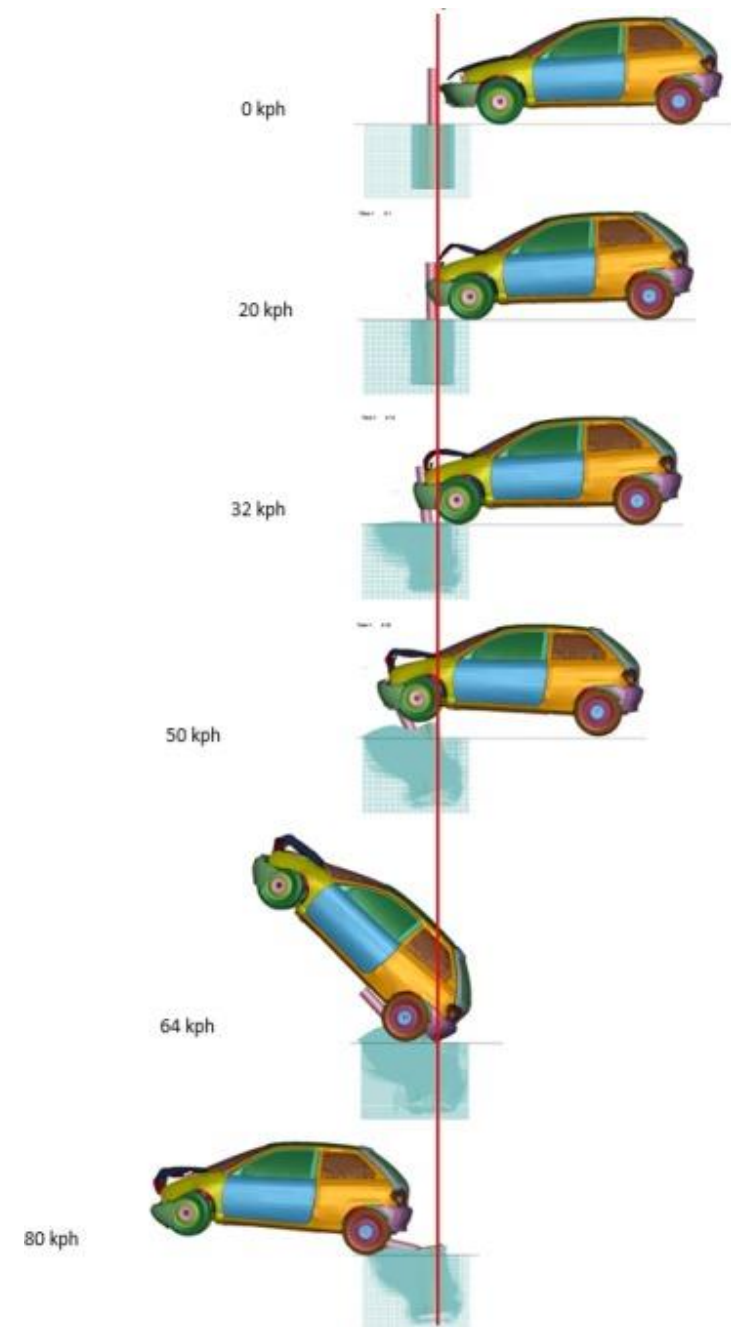


Outcome of impact

When a car hits something like a rigid inground bollard (with a substantial foundation) that **doesn't give**, the impact energy has only a few places to go:

1. **The car deforms hard** (front end crush), *then*
2. The vehicle can **ride up the bollard** as the front suspension collapses and the contact point climbs, *then*
3. The car can **pivot and launch** (you see the nose lift → car rotates → wheels leave ground). That's the "projectile" effect that is not suitable for urban environments.

Refer to Impact Chart



In-ground Bollard rating



Meets requirement



Partially meets requirement

RATING – ONE POINT FOR EACH BENEFIT

1. Bollard casing is resistant to impact
2. Bollard footings resistant to impact
3. Bollards recover from low impact
4. Bollards re-usable following impact
5. Footing re-usable following impact
6. XHD Resistance core provides reduced risk of resistance core bending

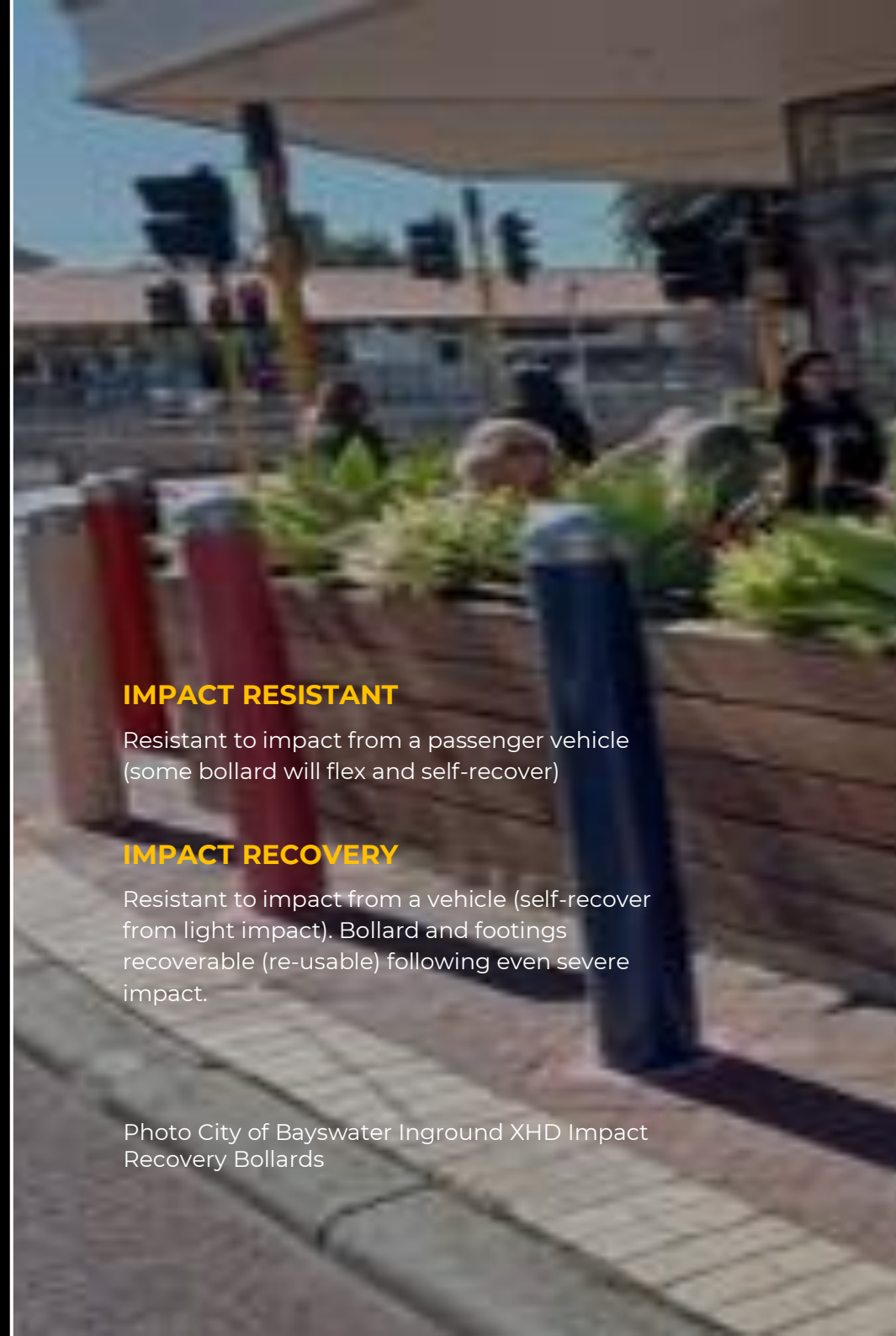
IMPACT RESISTANT

Resistant to impact from a passenger vehicle (some bollard will flex and self-recover)

IMPACT RECOVERY

Resistant to impact from a vehicle (self-recover from light impact). Bollard and footings recoverable (re-usable) following even severe impact.

Photo City of Bayswater Inground XHD Impact Recovery Bollards



| | DEPTH | IMPACT RESISTANT | IMPACT RECOVERY | SPEED AT FAILURE |
|--|-----------|------------------|-----------------|------------------|
| IN-GROUND BOLLARDS | | | | |
| 140 mm Galv steel Bollard | 400 mm | NO | NO | 7 kmph |
| 165 mm Powder coated Bollard | 400 mm | NO | NO | 8 kmph |
| | 650 mm | NO | NO | 10 kmph |
| 165 mm Powder coated Bollard IR | 350 mm | YES | YES | 16 kmph |
| | 650 mm | YES | YES | 19 kmph |
| | XHD 650mm | YES | YES | 21 kmph |
| 150 mm Advanced Polymer | 600 mm | YES | NO | 10 kmph |
| 150 mm Advanced Polymer IR | 350 mm | YES | YES | 16 kmph |
| | 650 mm | YES | YES | 19 kmph |
| | XHD 650mm | YES | YES | 21 kmph |

** Indicative only, as outcome is affected by vehicle mass, impact angle, braking, height of contact and conditions.*

In High speed zones MRWA recommends our 60 mm Traffic Bollards that are frangible when impacted at high speed without risking injury to vehicle occupants.



| | DEPTH | IMPACT OUTCOME | APPLICATION |
|--|-------|----------------|-------------|
|--|-------|----------------|-------------|

IN-GROUND BOLLARDS

| | | | |
|---------------------|-----------|---|---|
| 140 PC Steel | 400 mm | Light vehicle contact can bend the bollard or damage the footing. Typically suited to visual separation rather than impact-prone areas. | Visual boundary marking where vehicle contact is unlikely. |
| 165 PC Steel | 400 mm | With 5mm wall thickness they are slightly stronger than 140 mm steel but still a rigid bollard. Impact loads transfer into the footing and repairs are often required after a strike. | Low-risk urban applications where bollards are primarily for delineation. |
| 165 PC Steel | 650 mm | Greater embedment improves resistance to minor contact, though footing damage may still occur under vehicle impact. | Industrial locations requiring static protection or delineation. Not recommended for high speed zones due to risk of injury to occupants upon impact. (Refer to Impact Chart for rigid bollards. P30) |
| 165 mm PC | 350 mm | Designed to deflect and self-recover under lower-speed impacts while reducing damage to the surrounding footing. | Carparks and roadside parking areas with solid concrete foundations like traffic islands, concrete footpaths, asphalt. |
| | 650 mm | Greater embedment improves impact resistance and stability while retaining recovery performance. | Roadsides, carparks and council assets exposed to more frequent vehicle contact. Any free-standing bollard with no existing concrete footing |
| | XHD 650mm | XHD configuration provides the highest resistance in this range for severe low-speed impacts and repeated strikes. | High-risk roadside zones, truck routes, utilities and heavy-duty transport environments. |
| 150 mm AP IG | 600 mm | Corrosion-resistant and will flex upon minor impacts, but as a non-recovery bollard it may still require replacement after a heavier strike. | Coastal areas, corrosive environments and locations prioritising durability with lower maintenance. Electrical asset protection |
| 150 mm AP IR | 350 mm | Combines corrosion resistance with impact recovery, allowing the bollard to deflect and reduce footing damage under impact. | "as above" Plus Urban streets, car parks, shopfront, transport nodes and sustainability-focused council projects. |
| | 650 mm | Greater embedment increases low-speed impact resistance and improves performance in higher-risk locations. | Higher-risk urban roadsides, intersections and areas with repeated vehicle contact. |
| | XHD 650mm | Highest-performance polymer option, designed for severe low-speed impacts while preserving the footing and simplifying replacement. | Heavy-duty roadside applications, high density carparks, utilities, industrial areas and transport corridors. |

| | DEPTH | ON-GOING REPAIRS | RE-USE FOOTING | RE-USE BOLLARD | RATING |
|--|-------|------------------|----------------|----------------|--------|
|--|-------|------------------|----------------|----------------|--------|

| | | | | | |
|--------------------------|--|--|--|--|--|
| INGROUND BOLLARDS | | | | | |
|--------------------------|--|--|--|--|--|

| | | | | | |
|---------------------|-----------|---|---|---|---|
| 140 PC Steel | 400 mm |  |  |  | |
| 165 PC Steel | 400 mm |  |  |  | |
| 165 PC Steel | 650 mm |  |  |  |  |
| 165 mm PC | 350 mm | ZERO | YES | YES |  |
| | 650 mm | ZERO | YES | YES |  |
| | XHD 650mm | ZERO | YES | YES |  |
| 150 mm AP IG | 600 mm | WITH BAD IMPACT | WITH LIGHT IMPACT | WITH LIGHT IMPACT |  |
| 150 mm AP IR | 350 mm | ZERO | YES | YES |  |
| | 650 mm | ZERO | YES | YES |  |
| | XHD 650mm | ZERO | YES | YES |  |

Surface mount Bollard rating



Meets requirement



Partially meets requirement

RATING – ONE STAR FOR EACH BENEFIT

1. Bollard casing is resistant to impact
2. Bollard footings resistant to impact
3. Bollards recover from low impact
4. Bollards re-usable following impact
5. Footing re-usable following impact
6. XHD Resistance core provides reduced risk of resistance core bending



IMPACT RESISTANT

Resistant to impact from a passenger vehicle (some bollard will flex and self-recover)

IMPACT RECOVERY

Resistant to impact from a vehicle (self-recover from light impact). Bollard and footings recoverable (re-usable) following even severe impact.

Photo City of Perth Surface Mount Stainless Steel Impact Recovery Bollards

DEPTH

IMPACT RESISTANT

IMPACT RECOVERY

SPEED AT FAILURE

SURFACE MOUNT BOLLARDS

140 Steel Bollard

Surface Mount

NO

NO

4 kmph

140 Steel Bollard PC

Surface Mount

NO

NO

4 kmph

165 Steel Bollard PC

Surface Mount

NO

NO

4 kmph

165 Steel PC IR

Surface Mount

YES

YES

13 kmph

150 mm Advanced Polymer IR

Surface Mount

YES

YES

13 kmph

168 mm Stainless Steel Heavy Walled Pipe IR

Surface Mount

YES

YES

13 kmph

DEPTH

IMPACT OUTCOME

APPLICATION

SURFACE MOUNT BOLLARDS**140 Steel Bollard**

Surface Mount

Surface-mounted rigid bollard. Under impact, anchor bolts may loosen, bend or pull out and slab damage is likely.

Visual separation where vehicle strikes are unlikely. Not suitable for carparks or shopfront protection.

140 Steel Bollard PC

Surface Mount

Similar performance to the standard 140 steel bollard, with powder coating providing finish protection only, not impact recovery.

Low-risk visual delineation in pedestrian environments. Not suitable for carparks or shopfront protection.

165 Steel Bollard PC

Surface Mount

Larger round base redirects impact energy reducing damage but a surface mount bollard without any shock absorbing mechanism ultimately relies on the strength of the concrete anchors.

Used in low-risk areas where installing a foundation is difficult. Not a protection bollard. Not recommended for use on roads with speed limits over 10kmph

165 Steel PC IR

Surface Mount

Designed to absorb and recover from lower-speed impact while reducing damage to the slab and surrounding footing zone.

Car parks, service areas, loading zones and urban spaces exposed to low-speed vehicle contact. Bollard can still chip, scratch rust and corrode (Maximum lifespan if not impacted 20 years)

150 mm AP IR

Surface Mount

Corrosion-resistant impact recovery bollard suited to repeated low-speed strikes and reduced maintenance.

Coastal sites, public realm projects, car parks and sustainability-focused infrastructure. Protecting assets- including electrical. Provide soft surface and low impact for Bike Paths and Disabled parking bays. (Lifespan Bollard 25-50 years/ Foundation 100 years)

168 mm Stainless Steel IR

Surface Mount

Durable impact recovery bollard with corrosion resistance and good low-speed recovery performance.

Premium public realm projects, coastal areas and sites needing appearance, durability and impact recovery. (Lifespan Bollard 25-50 years/ Foundation 100 years)

| | DEPTH | MAINTENANCE | REUSE FOOTING | REUSE BOLLARD | RATING |
|--|-------|-------------|---------------|---------------|--------|
|--|-------|-------------|---------------|---------------|--------|

| SURFACE MOUNT BOLLARDS | | | | | |
|------------------------|--|--|--|--|--|
|------------------------|--|--|--|--|--|

| | | | | | |
|----------------------------------|---------------|--|---|---|---|
| 140 Steel Bollard | Surface Mount |  |  |  | |
| 140 Steel Bollard PC | Surface Mount |  |  |  | |
| 165 Steel Bollard PC | Surface Mount |  |  |  |  |
| 165 Steel PC IR | Surface Mount | NO | YES | YES |  |
| 150 mm AP IR | Surface Mount | NO | YES | YES |  |
| 168 mm Stainless Steel IR | Surface Mount | NO | YES | YES |  |

Advanced Polymer Bollard rating

RATING – ONE POINT FOR EACH BENEFIT

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2. Bollard footings resistant to impact
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5. Footing re-usable following impact
6. XHD Resistance core provides reduced risk of resistance core bending



Meets requirement



Partially meets requirement

IMPACT RESISTANT

Resistant to impact from a passenger vehicle (some bollard will flex and self-recover)

IMPACT RECOVERY

Resistant to impact from a vehicle (self-recover from light impact). Bollard and footings recoverable (re-usable) following even severe impact.

SPEED AT FAILURE












Failure speed indicates the approximate impact speed at which the bollard is likely to require replacement

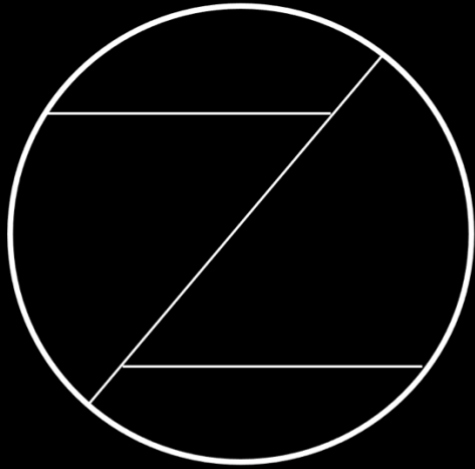
| | DEPTH | IMPACT RESISTANT | IMPACT RECOVERY | SPEED AT FAILURE |
|----------------------------------|---------------|-------------------|-----------------|------------------|
| ADVANCED POLYMER BOLLARDS | | | | |
| Hollow Bollard | 600 mm | YES, LIGHT IMPACT | NO | 4 kmph |
| Concrete Fill | 600 mm | NO | NO | 4 kmph |
| Surface Mount IRS | Surface Mount | YES | YES | 4 kmph |
| 350 IRS | 350 mm | YES | YES | 13 kmph |
| 650 IRS | 650 mm | YES | YES | 13 kmph |
| 650 XHD IRS | 650 mm | YES | YES | 13 kmph |

| OPTION | INSTALL | RESILIENCE | FORGIVENESS | BENEFITS |
|----------------------------------|---|--------------------------|--------------------|--|
| ADVANCED POLYMER BOLLARDS | | | | |
| Hollow Bollard | 1800 advanced polymer bollard installed directly in concrete footing | Medium | High | Flexible response, softer interface between vehicle and asset, simple installation, lower upfront cost |
| Concrete Fill | 1800 advanced polymer bollard with internal concrete infill terminating at ground level | Medium-High | Medium | Additional base support through buried section, more support at ground line than hollow version, above-ground impact zone remains more forgiving than a fully filled bollard |
| Surface Mount IRS | Secured using S-Mount IRS | Medium-High | High | Easy install, reusable mounting system, easier replacement, less disruption to existing slab than direct replacement of fixed bollards |
| 350 IRS | Secured using 350 IRS | High | High | Strong balance of flexibility, resilience and maintainability, suitable for asphalt and solid concrete footing areas, bollard and footings reused after impact |
| 650 IRS | Secured using 650 IRS | Very High | Medium-High | Greater embedment depth for more demanding locations, better suited to repeated low-speed strikes and service vehicle areas, bollard and footings reused after impact |
| 650 XHD IRS | Secured using 650 XHD IRS | Extreme / Highest | Medium | Most resilient installation option in the range, best for severe service conditions, minimises maintenance in harder-hit locations |

| | DEPTH | MAINTENANCE | REUSE FOOTING | REUSE BOLLARD | RATING |
|--|-------|-------------|---------------|---------------|--------|
|--|-------|-------------|---------------|---------------|--------|

| | | | | | |
|----------------------------------|--|--|--|--|--|
| ADVANCED POLYMER BOLLARDS | | | | | |
|----------------------------------|--|--|--|--|--|

| | | | | | |
|--------------------------|---------------|---|---|---|---|
| Hollow Bollard | 600 mm |  |  |  |  |
| Concrete filled | 600 mm |  |  |  | |
| Surface Mount IRS | Surface Mount | NO | YES | YES |  |
| 350 IRS | 350 mm | NO | YES | YES |  |
| 650 IRS | 650 mm | NO | YES | YES |  |
| 650 XHD IRS | 650 mm | NO | YES | YES |  |



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