

# Ingal Elevated Barrier

Deck and Side Mounted Edge Barrier

*Product Manual*



Release 02/26b

**MASH TL3 COMPLIANT**

**AS/NZS 3845.1 COMPLIANT**

[www.ingalcivil.com.au](http://www.ingalcivil.com.au)

## 1.0 Introduction

The new addition to the Ingal product family is the Ingal Elevated Barrier. Utilising many components from the MASH Test Level 4 Ezy-Guard High Containment system, the Ingal Elevated Barrier system is designed for bridges, culverts and structures requiring AS5100.2 compliant edge protection. The Ingal Elevated Barrier may be deck or side mounted to the structure, conserving valuable lane width.

The standard configuration of the system, with posts at 2m centres, is compliant to AS 5100.2 - Low Performance Level, AS/NZS 3845.1, and MASH Compliant. The Ezy-Guard HC baseplated post arrangement has been evaluated and approved by ASBAP and all state road agencies. When integrated with the MASH TL3, Ezy-Guard 4 system, it provides a high level of roadside safety.

The Ingal Elevated Barrier does not meet all geometrical design aspects of AS5100:2017, however it has been successfully tested to MASH TL3, which exceeds the requirements of AS5100:2017 Low Performance Level.

## 2.0 Specifications

Thrie-Beam Length:	4,000mm
Elevated Barrier Z-Post Mass:	13.5kg
Corrosive Protection:	HDG to AS4680
Rail Height Above Ground:	980mm
Z-Post Height Above Ground:	970mm
Post Spacing:	2m
Elevated Barrier System Width:	245mm

The Elevated Barrier system uses the same Thriebeam Rail, Z- Post and Carriage as the Ezy-Guard High Containment system with the compact footprint conserving valuable lane width.

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**AS5100:2017 LOW PERFORMANCE\***

*\*does not meet all geometrical design aspects*





Approach Transition Rail 1905mm  
10001809



Departure Transition Rail 1905mm  
10001811



W Beam 4000mm NLL  
10000977



Thriebeam 4000mm NLL  
10000837



Ezy-Guard HC Post 2000mm  
10005540



Ezy-Guard 4 Post 1650mm  
10007390



Ezy-Guard HC Base Plated Post 970mm OA Height  
10008366



HC Carriage  
10004116



Smart Carriage  
10004115



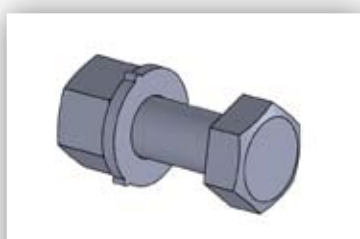
Carriage Bolt M16 x 30mm  
10001832



Splice Bolt M16 x 32  
10001248



Oversized M16 Nut  
10001239



M20 Bolt, Nut, Washer  
10009526



Side Mount Bracket  
10010863

### 3.0 Crash Test Analysis

The Ingal Elevated Barrier has been fully crash tested and evaluated according to the specifications for Test Level 3 (TL-3) of the AASHTO Manual for Assessing Safety Hardware (MASH). The MASH TL3 crash test matrix requires the following impacts;

- 1,100kg car travelling at 100km/h and 25 degrees.
- 2,270kg pick-up travelling at 100km/h and 25 degrees.

### 4.0 Performance

The Ingal Elevated Barrier has been validated for both MASH TL-2 and TL-3 using 2m Post Centres.

AS 5100.2 Low Performance Level is comparable to the MASH Test Level 2 containment level, which nominates a 2270kg vehicle impacting the barrier at 70km/h and 25°. However many structures requiring low performance level barriers have posted speeds of greater than 70 km/h. For both MASH TL-2 and MASH TL-3 locations, post spacing of 2m is suitable.

Refer to Drawings HC-BRG-010 and HC-BRG-020 for further details.

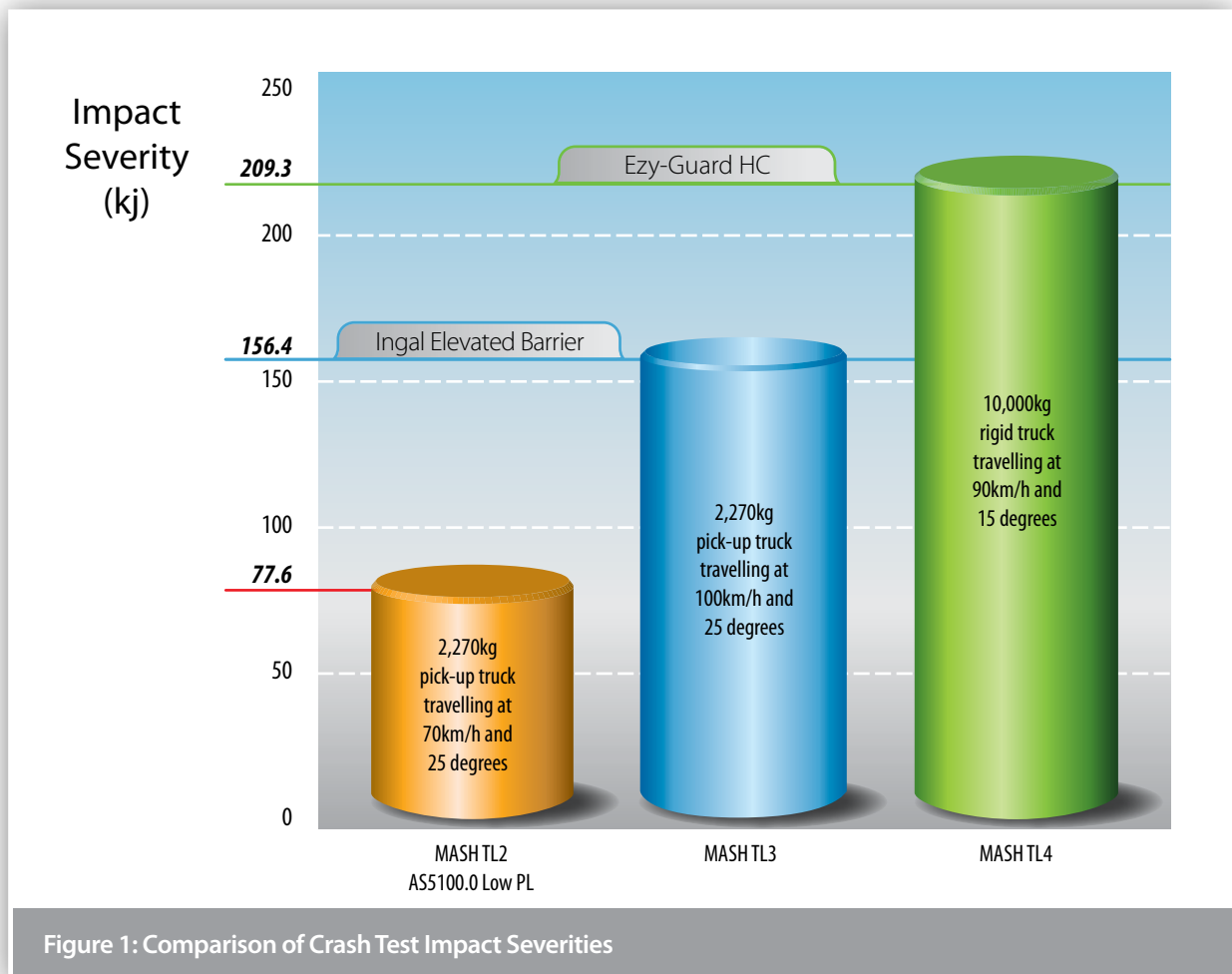


Figure 1: Comparison of Crash Test Impact Severities

## 5.0 Consideration for Vulnerable Road Users

Vulnerable road users include motorcyclists, pedestrians, cyclists and other road users. The Ingal Elevated Barrier has been designed to provide consideration to vulnerable road users as follows:

### 5.1 Rounded Post Corners

The Z-post contains smooth, rounded post edges and corners mitigating the risk and severity of fractures and/or contusions.

### 5.2 Energy Absorbing, Ductile Z-Posts

The Z-posts are designed to yield by bending near ground level. This bending action absorbs impact energy reducing the potential for post fracturing. A fractured or split guardrail post presents a significant laceration hazard to vulnerable road users.

### 5.3 Shielded Posts

The innovative design of Ingal Elevated Barrier system shields the top of the supporting Z-posts by positioning the top of the rail above the posts. This eliminates dangerous snag points, reducing the potential for the barrier to dismount motorcyclists or cyclists. This is a significant safety benefit compared to traditional guardrail and cable barrier systems.

### 5.4 Motorcycle Protection Rail

As the Ingal Elevated Barrier design includes shared componentry from the Ezy-Guard HC system, Ingal Motorcycle Protection Rail may be easily installed with the system for added safety.

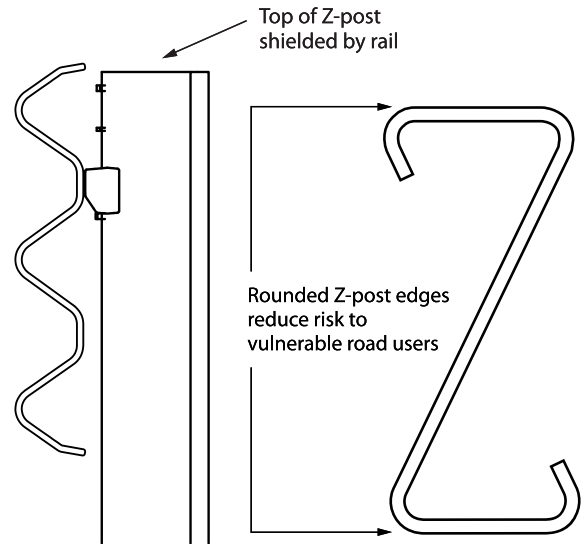


Figure 2: Ingal Elevated Barrier: Consideration for Vulnerable Road Users



## 6.0 Features and Benefits

### 6.1 Structure Preservation

The Ingal Elevated Barrier is designed for minimal load transfer into the structure, reducing potential structural damage in a crash. This means less road closures or need to repair concrete after impact damage.

There is also a lower impact risk to the vehicle occupants through the controlled yielding of the barrier posts.

An easy transition into Ezy-Guard 4 or an ET-SS is achieved with a 1.905m Asymmetrical Transition Panel. When connecting to Ezy-Guard HC, a 1.905m Asymmetrical Transition Panel will be required between the Ezy-Guard HC and ET-SS.

### 6.2 Side Mount and Top Mount Options

Typically a Road Side Safety Barrier would be installed on a Concrete Structure using either Side Mount or Top Mount configurations depending upon site constraints which may include Road Width available.

The Ingal Elevated Barrier was tested in the Side Mount configuration as this layout maximises the road width in conjunction with increased containment risks.

Test results successfully demonstrated the Ingal Elevated Barrier's capacity to contain the vehicle and provide appropriate protection to vehicle occupants in a worst case scenario, verifying the suitability of the system in both Side Mount and Top Mount configurations.

### 6.3 Adaptable to Site Constraints

The Ingal Elevated Barrier can be easily retrofitted to existing structures, with deck or side mounted options available. It also utilises the Z-Post's narrow 245mm footprint, saving valuable lane width.

The Ingal Elevated Barrier system uses all off-the shelf components, with all stock readily available, minimising repair time in the event of a vehicle impact.

### 6.4 Rapid Installation and Repair

An Ingal Elevated Barrier system installation can be up to twice as fast to install than conventional guardrail barriers.

The Ingal Elevated design uses fewer components and features both Base Plated Z-posts and In Ground 2000mm Z-posts. The Z-post embedment depth is just 1,030mm, a significant reduction when compared to other Thriebeam guardrail posts. This reduces installation time providing significant cost savings.

Since the Z-posts are designed to yield by bending near ground level, damaged posts can be removed easily which reduces the time spent by work crews on the roadside.

### 6.5 Narrow Width

With a system width of just 245mm, the Ingal Elevated Barrier system is significantly narrower than the traditional guardrail barriers that incorporate the use of blocking pieces.

The use of Z-Posts in the 1.905m Transition Panel, Ezy-Guard 4 and/or Ezy-Guard HC conserves valuable formation width and allows a greater recovery width to be provided for errant vehicles.



Side Mounted Bracket

## 6.6 Manual Handling

The Ingal Elevated Barrier system uses fewer components than the public domain guardrail systems.

The lightweight Z-post reduces manual lifting by installation crews. The rounded edges of the Z-post provides a handlelike grip when lifting, reducing the possibility of hand lacerations. The Z-profile allows the installer to maintain a firm grip and facilitates correct lifting techniques.

## 6.7 Locally Designed & Produced

The Ingal Elevated Barrier system is manufactured in Australia by Ingal Civil Products using steel manufactured by BlueScope Steel. Z-posts and rail are stamped providing traceability to material mechanical and chemical analysis certificates. Hot dip galvanising is performed internally by Ingal and daily inspections ensure zinc thickness readings are in accordance with AS/NZS standards.

## 6.8 Soft Ride-Down Decelerations

The Z-Post Carriage controls the release of the Three-beam rail from the Z-post. This controlled release reduces the potential for vehicle pocketing and provides a soft ride down for vehicle occupants.



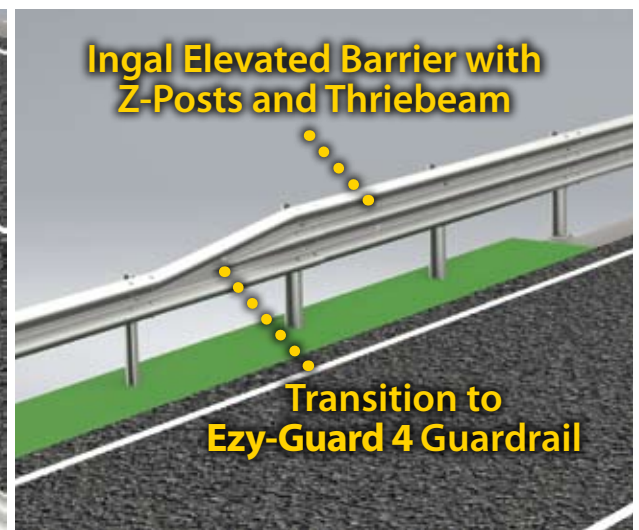
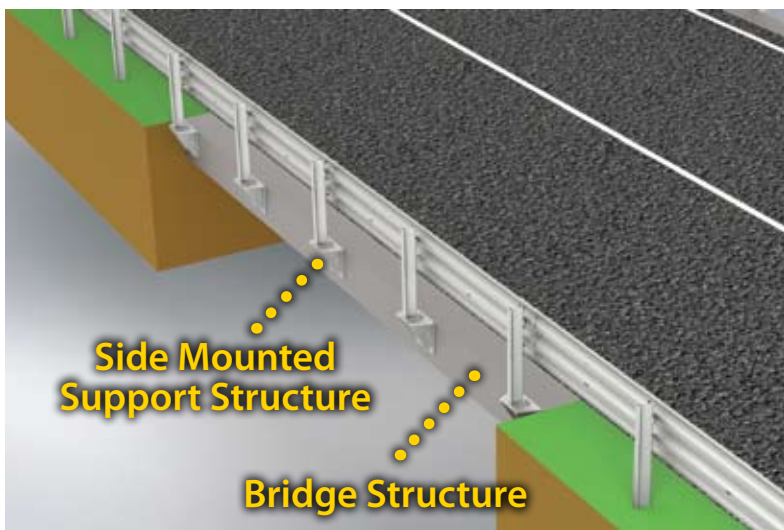
# INGAL ELEVATED BARRIER

INGAL CIVIL PRODUCTS



## The Ingal Elevated Barrier System

The Ingal Elevated Barrier System is compatible with W-Beam and Thriebeam Guardrails, but maximum MASH rating is achieved by connecting to Ingal's proprietary Ezy-Guard 4 or Ezy-Guard HC guardrail systems.



The Ingal Elevated Barrier requires no additional footings and can be bolted directly to the bridge structure itself.



▲ Ezy-Guard 4 Guardrail



▲ Ezy-Guard HC Guardrail and Transition



▲ Ingal Elevated Barrier Support Structure

## 7.0 Installation

### 7.1 Installation Location

The Ingal Elevated Barrier is designed to release the Guardrail while the Posts yield from from the Base Plate, containing the vehicle while controlling the occupancy impact severity and protecting vehicle occupants. As a result of this mechanical behaviour, installation where there is traffic or utilities beneath the structure is not recommended.

### 7.2 Concrete Strength

The Ingal Elevated Barrier may be installed upon a structure with a minimum concrete strength of 30MPa using Grade 8.8 M20x300mm anchors with Hilti HY-200 V3 chemical adhesive which is suitable for use with both cracked and non-cracked concrete.

### 7.3 Terminals

Guardrail end terminals are installed at the beginning and end of a run of guardrail. Their primary purpose is to anchor the longitudinal barrier and to minimise deflection. Crashworthy terminals are typically used in locations where they can be impacted end-on as they are designed to provide a soft gating impact if impacted near the end rail. This prevents any spearing of an errant vehicle. Part of the end-terminal may also be redirective.

The Elevated Barrier is installed at a system height of 980mm, measured to the top of the rail. This height is the same as the Ezy-Guard HC system and must use an assymetrical transition to connect to EzyGuard 4 or the ET-SS End Terminal. Refer to installation Drawings for details.

Terminals should be installed in accordance with the proprietor's drawings and specifications. Z-posts are not to be used in the terminals unless approved by the proprietor.

The installation of terminals will typically incorporate the use of blocking/offset pieces positioned between the posts and rail. This will require the supporting posts to be offset from the set-out line used for the installation of the Z-posts which do not require blocking pieces.

In addition, the post spacing used in the terminals and transitions is likely to vary from the spacing used for installation of the Elevated Barrier system. The required post spacing for terminals and transitions will be contained in the proprietor's drawings.

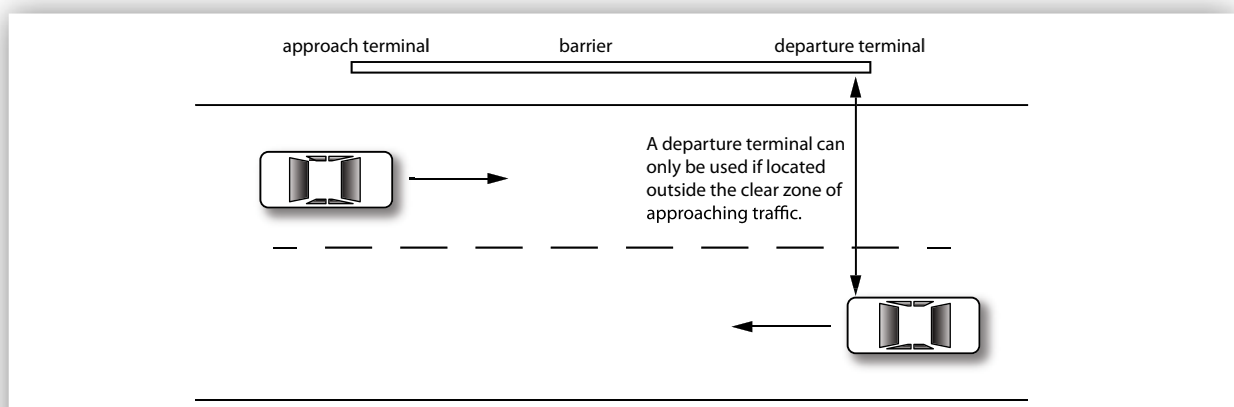


Figure 5: A departure terminal can only be used if located outside the clear zone of approaching traffic and subject to approval of the relevant jurisdiction.

## 7.4 Minimum Length Requirements

There are two geometric methods used to determine the likely trajectory of a vehicle that leaves the road in the vicinity of a roadside hazard and the minimum length of need required to protect from this hazard.

The most common method is the run-out length method and an alternative is a method based on angle of departure.

Prior to design or installation, designers should consult the relevant road controlling authority to establish the local jurisdictional practice as the methods may result in different lengths. Both methods are detailed in the Austroads Guide to Road Design – Part 6.3.

The length of Ingal Elevated Barrier used in crash testing is not intended to reflect the minimum installation length.

The length of 20m installed upon the structure used in testing was chosen to demonstrate vehicle containment and redirection capacity within the structure length in a “worst case scenario”.

Shorter installations of Ingal Elevated Barrier will reduce vehicle interaction with the edge of a structure. A minimum length of 4m of Ingal Elevated Barrier connected to 1.905m Asymmetrical Transition Panels at both ends is recommended.

## 7.5 Sequence of Work

Where the Ingal Elevated Barrier is being constructed on a road open to traffic, it is recommended that the work commence at the end closest to the approaching traffic. Leading terminals and transitions shall be commissioned at the earliest practical time.

## 7.6 Modifications

The Elevated Barrier shall be constructed in the configuration as detailed in Ingal Civil Products’ drawings. This is the configuration in which the system has been crash tested.

No modifications shall be made to the system unless verified by Ingal Civil Products.

Flame cutting of rails or posts is not permitted. Saw cutting and drilling is permitted in the event that a post is to be installed at an irregular spacing and/or rock is encountered and the post embedment depth has been modified.

Any modification carried out after fabrication will require repair to the galvanized coating. This is undertaken by applying two coats of an organic zinc rich epoxy paint complying with AS/NZS 3750.9. This is to be applied to the repair areas in two coats. Each coat shall have a minimum dry film thickness of 50 µm.

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**AS5100:2017 LOW PERFORMANCE\***

*\*does not meet all geometrical design aspects*

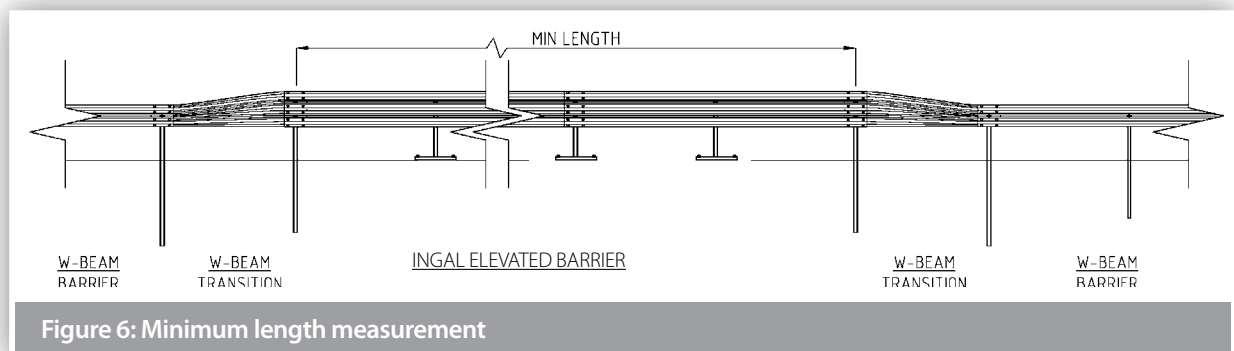


Figure 6: Minimum length measurement

## 7.7 Delineation

A specially designed delineator is attached to the Z-post. Typically, delineation is arranged so that drivers approaching from either direction will see only;

- Red retro-reflectors on their left;
- White retro-reflectors on their right on two-way carriageways; and
- Yellow retro-reflectors on their right on one-way carriageways and medians separating traffic in opposing directions

The spacing of delineators is dependant upon driver line of sight and jurisdictional requirements. As a general rule delineators are provided for installation every 20m on straight alignments. Installation on curves will require a closer spacing dependant upon the radius of the roadway.



## 7.8 Installation Sequence

The following written instructions should be read in conjunction with Ingal Civil Products' drawings.

A generic Safe Work Method Statement is available from Ingal Civil Products to assist in the safe installation of the Ingal Elevated Barrier system.

Only items purchased from Ingal Civil Products shall be used for the construction of the Ingal Elevated Barrier system.

1. Ensure the area has been inspected for underground hazards and that suitable traffic control is in place.
2. Post locations are marked ensuring any fixed object hazard to be protected is located outside the expected dynamic deflection of the barrier.
3. The post in relation to the direction of traffic is orientated as per Figure 10.

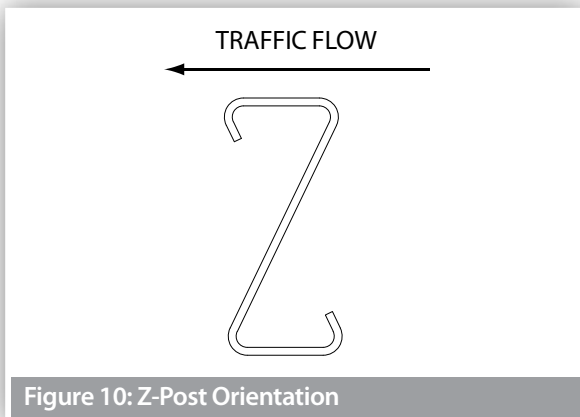


Figure 10: Z-Post Orientation

4. Posts can be anchored to the deck of the structure or to the side via the Side-Mount bracket. The post or bracket is secured to the structure via a series of chemically anchored M20 studs. For a new structure, refer to drawing EZY-HC-030 for anchor specification. For retrofit applications, anchor specification to be confirmed by project engineer.

Anchor studs shall be installed in accordance with the chemical anchor specifications.

5. When connecting to Ezy-Guard 4 or ET-SS End Terminals, the 1.905m Asymmetrical Transition panels located upstream and downstream of the structure shall be installed in accordance with the Ezy-Guard HC product manual. These Posts are typically driven into the ground.
6. The on-structure posts are spaced at 2m based on the required containment level, refer section 4.0.

7. The height of the Z-post above ground level is 970mm.
8. The Z-Post Carriage is attached to the face of the post. The Z-Post Carriage will come to rest on the positioning lug fabricated on the Z-post.

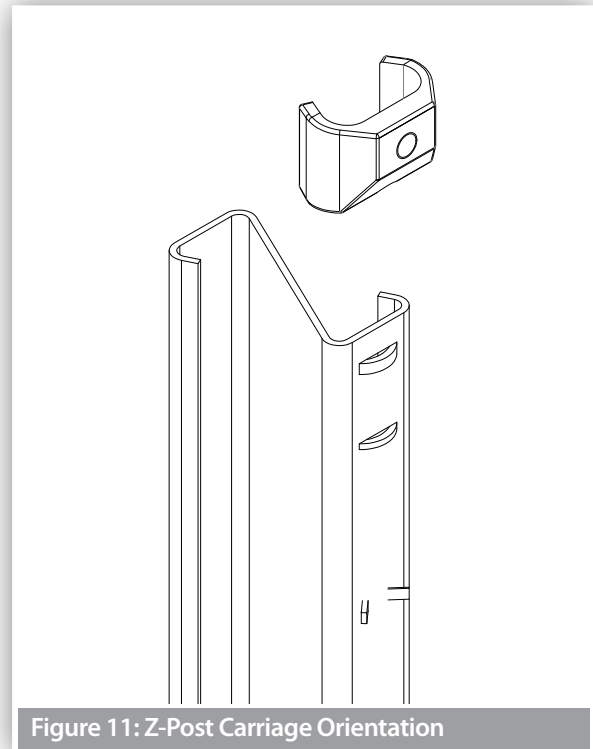


Figure 11: Z-Post Carriage Orientation

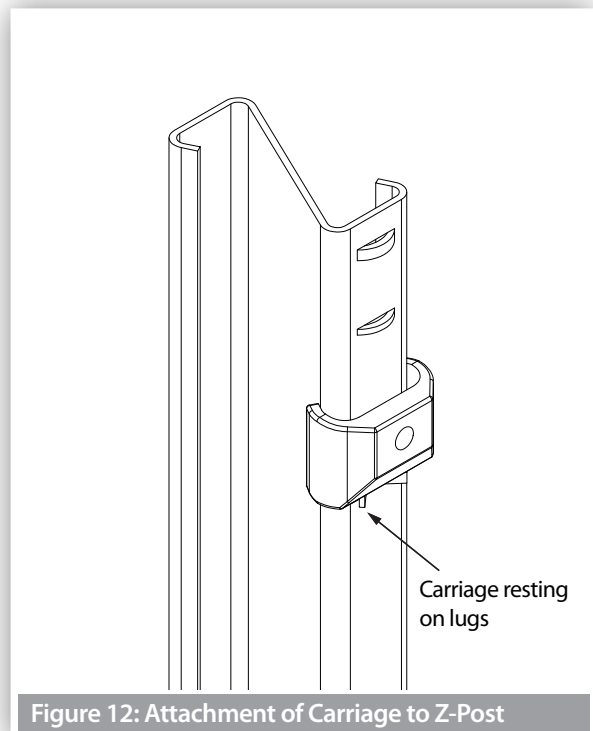


Figure 12: Attachment of Carriage to Z-Post

9. Rails are attached to the Z-Post Carriage using the M16x30mm carriage bolts. The post bolts are identified by the socket recess located in the head of the bolt. The bolts are tightened to snug tight using a 10mm hex key.
10. Rails are spliced together at every second post using M16x32mm mushroom head bolts and oversized nuts. There are 12 bolts required per splice connection. A pinch bar may be used to assist in the alignment of splice holes. The use of a driving pin to elongate the slots is NOT to be used since this may cause tearing of the rail at the slot location. The bolts are tightened to snug tight.

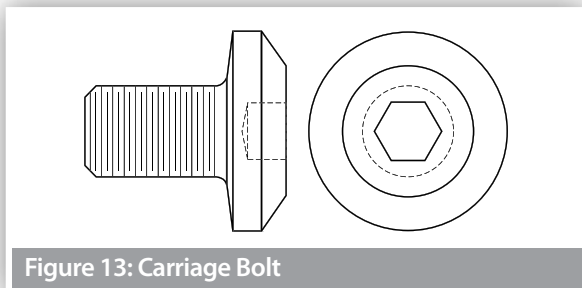


Figure 13: Carriage Bolt

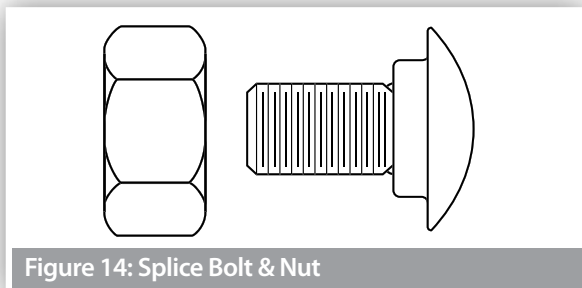


Figure 14: Splice Bolt & Nut

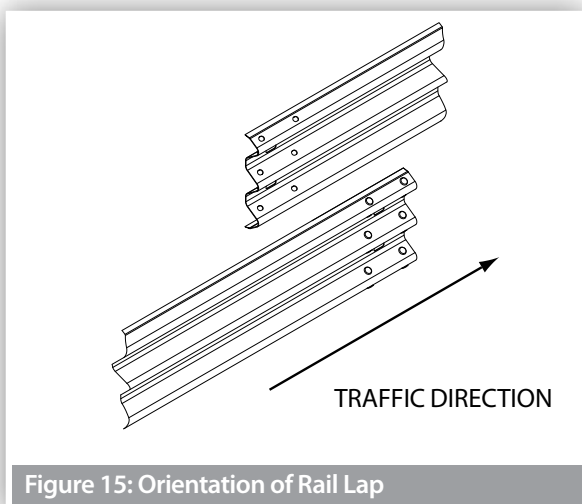


Figure 15: Orientation of Rail Lap

11. Rails are orientated so that no leading edge is presented to the traffic face as shown in Figure 15.
12. It is recommended that posts be installed only a few metres ahead of rail assembly to ensure correct post spacing and alignment. On curves, the rails can be used as a template and laid on the ground to determine post locations.
13. The construction of the Ingal Elevated Barrier shall form a smooth line vertically and horizontally when viewed along the line of the system, free from humps, sags or other irregularities.
14. The Ingal Elevated Barrier components are to be free from splits, burrs or sharp edges after installation. Any minor damage is to be repaired in accordance with section 7.4.

## 7.9 Installation Tolerances

- The tolerance on height of the barrier shall be plus or minus 20mm.
- The tolerance for the line of the barrier shall be plus or minus 20mm in plan view.
- The tolerance for departure from the upright axis shall be plus or minus 15mm at the top of the barrier.
- The tolerance on post spacing shall be plus or minus 25mm.

## 8.0 Maintenance

It is recommended that annual inspections be performed to ensure the following;

- The system is appropriately delineated;
- Debris has not accumulated around the system that may impede the performance of the barrier or the trajectory of an impacting vehicle;
- The system is suitably anchored with appropriate terminals and/or transitions. If the system is anchored with terminals, the cable assembly shall be taut and tensioned to its recommended value; and
- All splice bolts and post bolts are snug tight.

## 9.0 Product Storage

All posts and rails are hot dip galvanized in accordance with AS/NZS 4680. It is important that stored galvanized work is stacked so that each item is well ventilated and can adequately drain rainwater from its surfaces.

Poor storage can give rise to wet storage stain (white rust) which is caused by water (rain or condensation) in badly drained or ventilated conditions. This can occur very quickly, particularly in warm, humid conditions.

## INGAL ELEVATED BARRIER

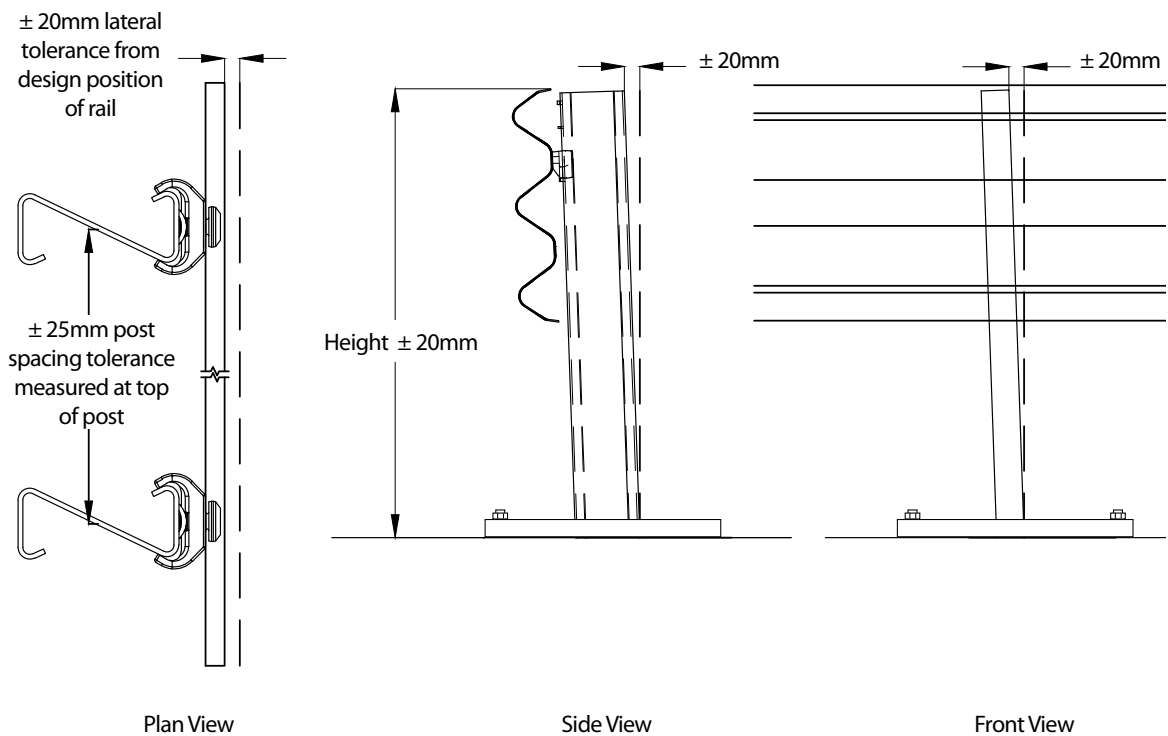
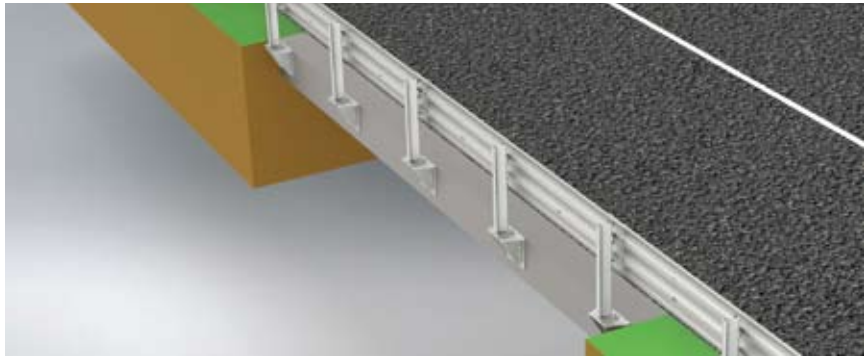


Figure 16: Ingal Elevated Barrier Installation Tolerances

## Ingal Elevated Barrier Installation Checklist

Customer:

Project:

Barrier ID:

Barrier Length:

Checked By:

Signed:

Date

Is the post spacing in accordance with the project drawings	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Carriages are positioned on the posts between the retaining lugs and the resistance tabs	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Posts are installed to the correct height (970mm) and within the tolerances of section 7.8	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have the Z-Post Carriages been correctly orientated	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have the rails been attached to the Z-Post Carriages using the appropriate carriage bolt	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have the rails been spliced observing the correct lap	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have the rails been spliced with M16x32mm mushroom head bolts	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are all splice bolts and post bolts snug tight	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are Assymetrical Transition Panels installed upstream and downstream of the structure	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are both ends of the run anchored with approved terminals	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Where applicable, are the terminal anchor cables tensioned to their nominated torque (taut)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Has any minor damage been repaired using two coats of an organic zinc rich paint	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Does the barrier form a smooth line vertically and horizontally when viewed along the system	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is the barrier system free from humps, sags or other irregularities	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are the barrier components free from splits, burrs or sharp edges after installation	<input type="checkbox"/> Yes	<input type="checkbox"/> No

**Disclaimer:**

Important Note: The conformity of the installation is the responsibility of the installation contractor, and Ingal Civil Products accepts no liability for or in connection with any installation that is outside of the specifications of this manual or the Road Controlling Authority. For more information, please refer to our Standard Terms and Conditions of Sale available on our website: [www.ingalcivil.com.au](http://www.ingalcivil.com.au).

## 10.0 Repair

### 10.1 Bush Fire Damage

The Ingal Elevated Barrier does not contain any plastic, timber or rubber components that will burn.

The performance of galvanised coatings when subjected to fires depends upon a number of factors, such as flame duration and intensity.

Typical bushfire conditions may expose steel structures to an air temperature of 800°C for periods of up to 120 seconds, however zinc coatings are generally reflective and will not absorb heat at the same rate as an uncoated steel surface. Depending on the section thickness of the steel, the actual steel surface temperature may not exceed 350°C.

Typically, the bushfire flame duration and intensity are not high enough to compromise the structural strength of the steel. The hot dip galvanized coating will also typically remain unaffected through a bushfire event. If the bushfire causes damage to the galvanized surface, then the item(s) shall be replaced.

### 10.2 Damage Assessment

In the event of a vehicle impact, damage to the barrier is to be assessed in accordance with Table 3.

A Safe Work Method Statement is available from Ingal Civil Products upon request to assist in the safe repair of the Ingal Elevated Barrier.

Any item that is replaced is to be reinstated observing the installation tolerances nominated in Section 7.8. Only items purchased from Ingal Civil Products shall be used for the repair of the Ingal Elevated Barrier.

### 10.3 Dismantling Sequence

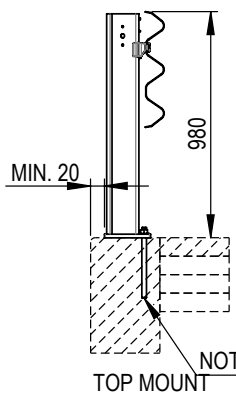
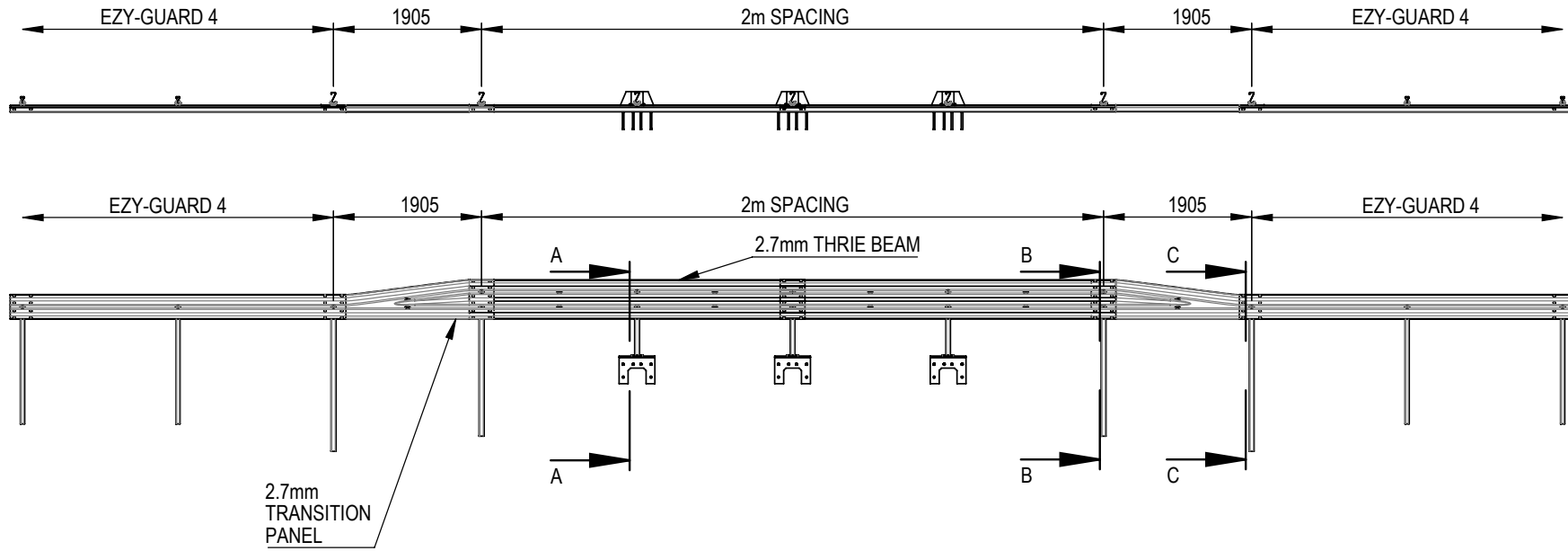
Prior to undertaking dismantling due to a vehicle impact, the area should be assessed for hazards. These include trip hazards, sharp edges and snag points.

During a vehicle impact, the rail will disengage from the posts as they yield by bending at ground level. The recommended dismantling sequence is as follows;

1. Dismantle the rail splice by removing the M16x32mm mushroom head bolts and nuts. There are 8 bolts located at each WBeam splice location and 12 bolts located at each Thriebeam location.
2. Rails that are still attached to posts outside the impact area are disconnected by removing the carriage bolts. A 10mm hex key is required.
3. Once the area is clear of damaged rail, the posts can be removed. Since the posts yield by bending near ground level, a sling or chain can be attached below the bent section.
4. The damaged post can be lifted using a backhoe or post extractor attachment.
5. Any disturbed pavement material shall be left dense, tight, and smooth prior to the installation of replacement posts.
6. Rails, posts and carriages to be disposed of, should be recycled at a ferrous scrap recycling facility.

**Table 3: Damage Assessment of Ingal Elevated Barrier**

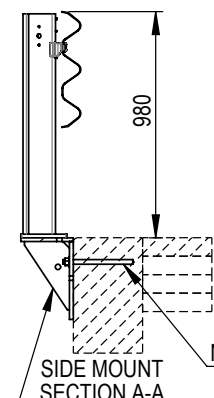
Type of Defect	Description of the Defect	Action to be Taken
Galvanizing damage on Z-Posts.	The sum total of the damaged area does not exceed 35cm <sup>2</sup> (0.5% of the total surface area). The sum total of the damaged area exceeds 35cm <sup>2</sup>	An organic zinc rich epoxy paint is to be applied to the repair area in two coats as per section 7.4. The Z-post is to be replaced.
Galvanizing damage on rails.	The sum total of the damaged area does not exceed 200cm <sup>2</sup> (0.5% of the total surface area) and no individual damaged area does not exceed 40cm <sup>2</sup> . The sum total of the damaged area exceeds 200cm <sup>2</sup> (0.5% of the total surface area) and/or an individual damaged area exceeds 40cm <sup>2</sup> .	An organic zinc rich epoxy paint is to be applied to the repair area in two coats as per section 7.4. The rail is to be replaced.
Mechanical damage on Z-Post Carriages.	The Z-Post Carriage has chips or cracks.	The Z-Post Carriage is to be replaced.
Mechanical damage on Z-Posts.	The post is bent. The Z-Post Carriage cannot travel freely along the post due to distortion.	The post is to be replaced. The post is to be replaced.
Mechanical damage on rail.	The rail is dented, twisted or flattened. There are tears in any part of the rail. The slots in the rail are distorted.	The rail is to be replaced. The rail is to be replaced. The rail is to be replaced.
Shearing, mechanical or physical damage to anchors or bolts	The anchor or bolt has sheared. The body of the anchor or bolt is distorted. The thread of the anchor or bolt is damaged.	The anchor or bolt is to be replaced. The anchor or bolt is to be replaced. The anchor or bolt is to be replaced.
Disturbance of material around posts	The material around the post is loose or uncompacted.	Any disturbed pavement or material around a post shall be left dense, tight and smooth so that resistance to water penetration is similar to that of the adjacent surface.



NOTE 3

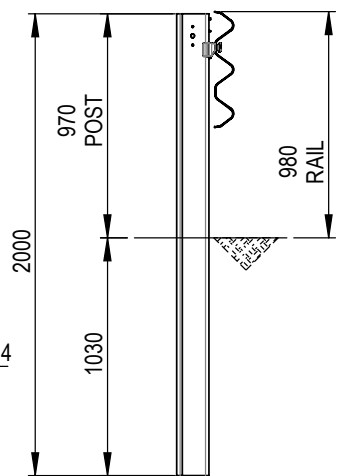
TOP MOUNT

SIDE MOUNT BRACKET

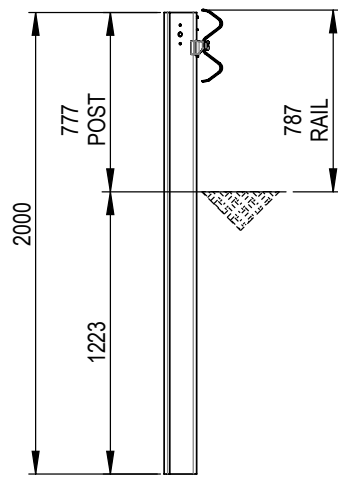


NOTE 4

SIDE MOUNT SECTION A-A



EZY-GUARD HC POST SECTION B-B



EZY-GUARD HC POST SECTION C-C

**NOTES:**

1. ALL DIMENSIONS IN MM, UNLESS SPECIFIED OTHERWISE.
2. MIN CONCRETE STRENGTH TO BE 30MPa
3. TO BE READ IN CONJUNCTION WITH EZY-GUARD 4 AND EZY-GUARD HC PRODUCT MANUALS.
4. TOP MOUNT ANCHORING:
  1. HILTI HY-200 WITH 2 NO. M20 x 215mm G8.8 ANCHOR STUDS WITH MIN EMBEDMENT 150mm. MIN EDGE DISTANCE 170mm.
5. SIDE MOUNT ANCHORING:
  1. RAMSET REO 502 CHEMICAL ANCHOR EPOXY. 4 NO. M20 x 300mm GRADE 8.8 WITH MIN EMBEDMENT 250mm.
  2. HILTI HY-200 WITH 4 NO. M20 x 300mm G8.8 ANCHOR STUDS WITH MIN EMBEDMENT 250mm.
6. FOR SIDE MOUNT OPTION, THE POST TO BE CONNECTED TO BRACKET VIA 2 SETS OF M20 x 65mm BOLTS / NUTS / WASHERS ANCHOR SPEC ASSUMING 30MPa CONCRETE. FOR RETROFIT APPLICATIONS, ANCHOR SUITABILITY TO BE CONFIRMED BY PROJECT ENGINEER.
- 7.
8. 2m POST SPACING: MASH TL3 / AS5100 LOW PERFORMANCE LEVEL.

REVISIONS

REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED
1	8/12/2025	ADDED NOTE 8	KZ	HF	KZ

REFERENCES

DRAWING NUMBER	REFERENCE DRAWINGS

NAME	DATE
DRAWN KZ	24-01-2025
CHECKED HF	14-02-2025
APPROVED KZ	14-02-2025
SCALE	1:80
ISSUE FOR	SHEET: 1 of 1

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PH: +61 2 9827 3333  
www.ingalcivil.com.au

PROJECT	
TITLE	INGAL ELEVATED BARRIER - 2m SPACING

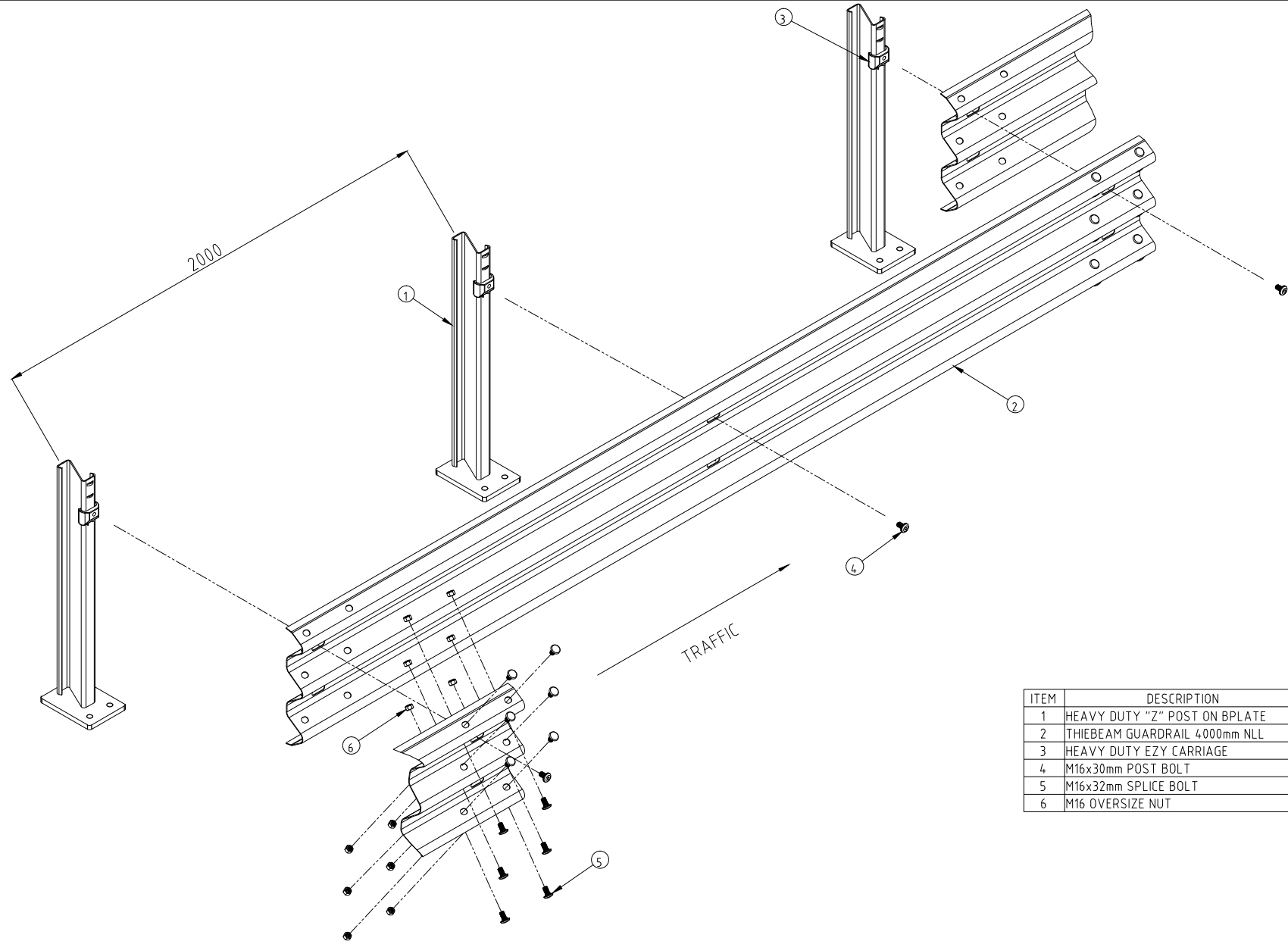
INGAL CIVIL PRODUCTS PART NO.	
DRAWING NO.	HC-BRG-010
Rev.	1

FOLDER: C:\USERS\KZ717643\ONE DRIVE - VALMONT INDUSTRIES, INC.\SOLIDWORKS MODEL IN PROGRESS\INGAL ELEVATED BARRIER\MODEL









ITEM	DESCRIPTION
1	HEAVY DUTY "Z" POST ON BPLATE
2	THIEBEAM GUARDRAIL 4000mm NLL
3	HEAVY DUTY EZY CARRIAGE
4	M16x30mm POST BOLT
5	M16x32mm SPLICE BOLT
6	M16 OVERSIZE NUT

REV	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED

DRAWING NUMBER	REFERENCE DRAWINGS

NAME	DATE
DRAWN AUSCOL	05-07-2016
CHECKED LG	12-07-2016
APPROVED LG	12-07-2016
SCALE N.T.S. @ A3	
ISSUE FOR	

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A valmont COMPANY

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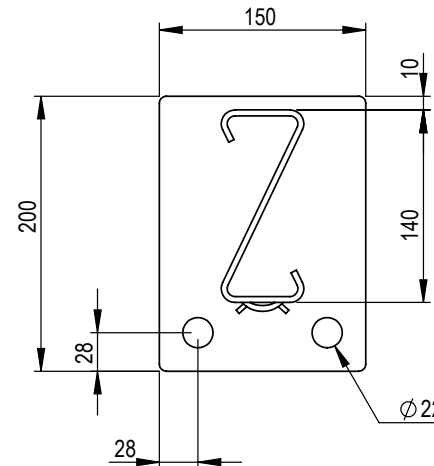
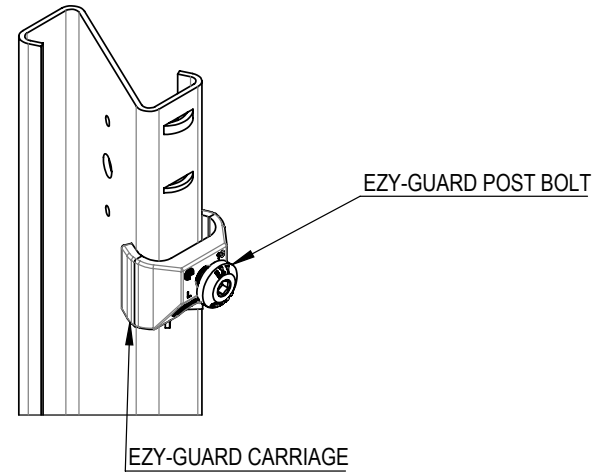
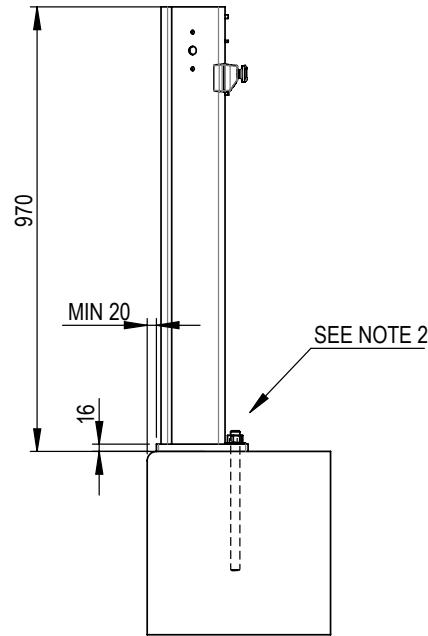
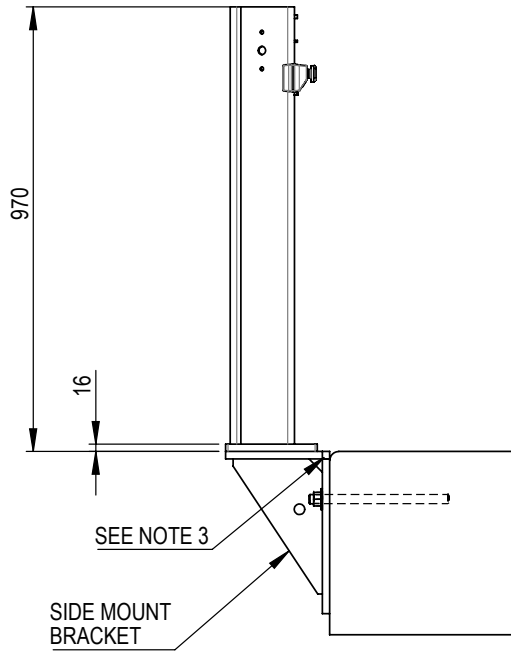
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MINTO, N.S.W 2566 www.ingalcivil.com.au

PROJECT	TITLE
	EZY-GUARD HIGH CONTAINMENT POST ON BASE PLATE ASSEMBLY DETAIL EXPLODED VIEW

INGAL CIVIL PRODUCTS PART No.	DRAWING No.
	EZY-HC-005

Rev: 0

J:\SALES & MARKETING\DRAWINGS\EZY-GUARD\HC\EZY-HC-005 - EXPLODED ASSEMBLY BPLATE.DWG

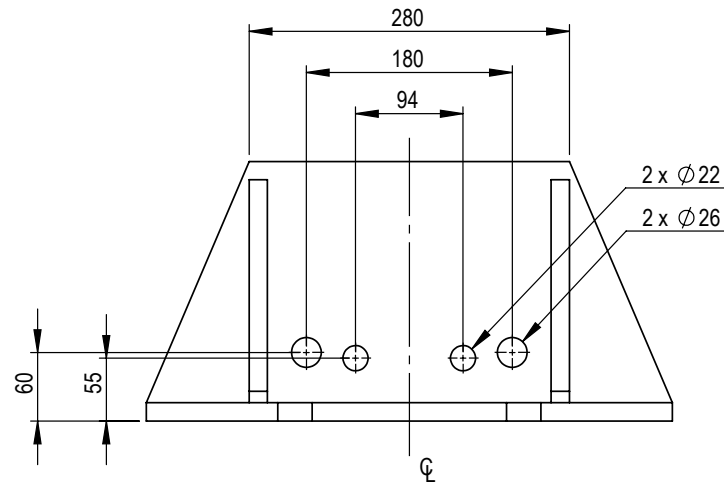
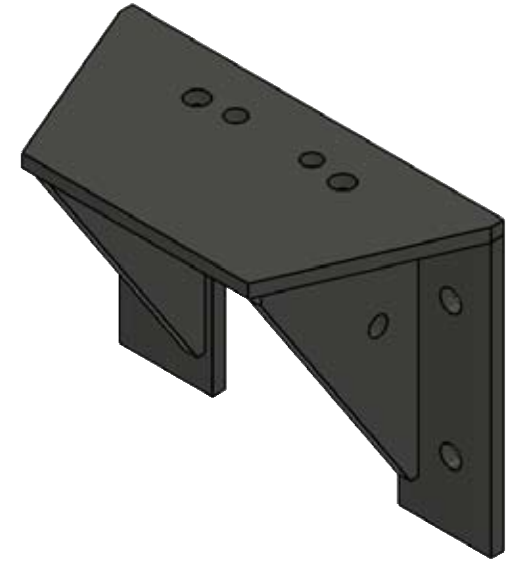
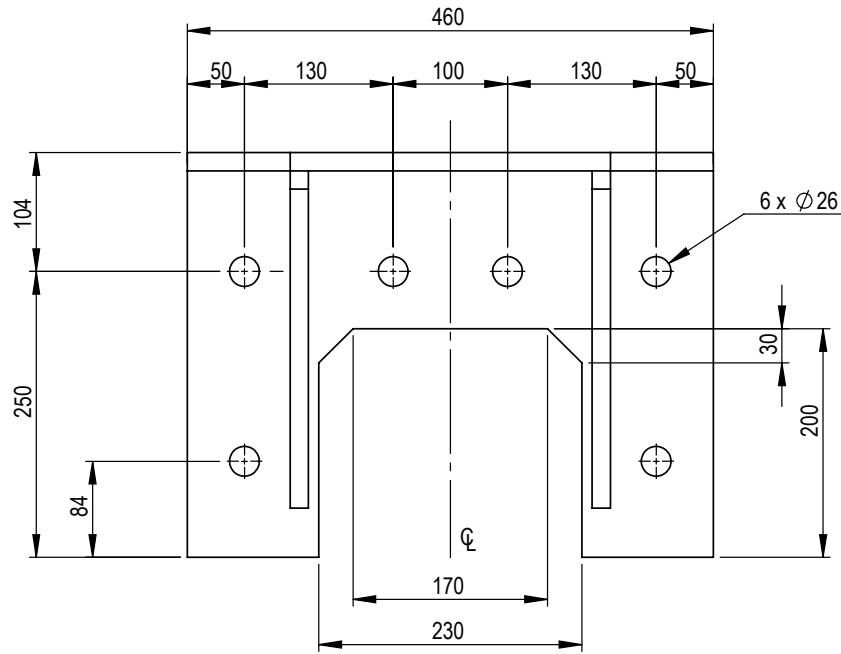
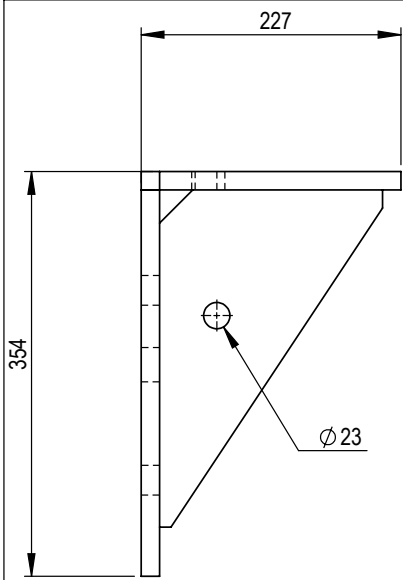


**NOTES:**

1. ALL DIMENSIONS IN MM, UNLESS SPECIFIED OTHERWISE.
2. MIN CONCRETE STRENGTH TO BE 30MPA
3. TOP MOUNT ANCHORING:
  1. HILTI HY-200 WITH 2 NO. M20 x 215mm G8.8 ANCHOR STUDS WITH MIN EMBEDMENT 150mm. MIN EDGE DISTANCE 170mm.
4. SIDE MOUNT ANCHORING:
  1. RAMSET REO 502 CHEMICAL ANCHOR EPOXY. 4 NO. M20 x 300mm GRADE 8.8 WITH MIN EMBEDMENT 250mm.
  2. HILTI HY-200 WITH 4 NO. M20 x 300mm G8.8 ANCHOR STUDS WITH MIN EMBEDMENT 250mm.
5. FOR SIDE MOUNT OPTION, THE POST TO BE CONNECTED TO BRACKET VIA 2 SETS OF M20 x 65mm BOLTS / NUTS / WASHERS ANCHOR SPEC ASSUMING 30MPa CONCRETE. FOR RETROFIT APPLICATIONS, ANCHOR SUITABILITY TO BE CONFIRMED BY PROJECT ENGINEER.
- 6.

REVISIONS				REFERENCES				DRAWING INFORMATION				PROJECT INFORMATION			
REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	DRAWING NUMBER	REFERENCE DRAWINGS	NAME	DATE	PROJECT	TITLE	INGAL CIVIL PRODUCTS PART No.	DRAWING No.	Rev.	
								DRAWN	KZ	24-01-2025	<p>INGAL CIVIL PRODUCTS A valmont COMPANY</p> <p>DRAWING AND CONTENTS ARE COPYRIGHT ICG INGAL CIVIL PRODUCTS AND CAN ONLY BE USED WITH PRIOR WRITTEN CONSENT FROM INGAL CIVIL PRODUCTS</p>	INGAL ELEVATED BARRIER - POST MOUNTING	HC-BRG-018	0	
							CHECKED	HF	14-02-2025						
							APPROVED	KZ	14-02-2025						
							SCALE	1:15	SHEET: 1 of 1						
								ISSUE FOR		57-65 AIRDS ROAD MINTO, N.S.W. 2566	PH: +61 2 9827 3333 www.ingal-civil.com.au				

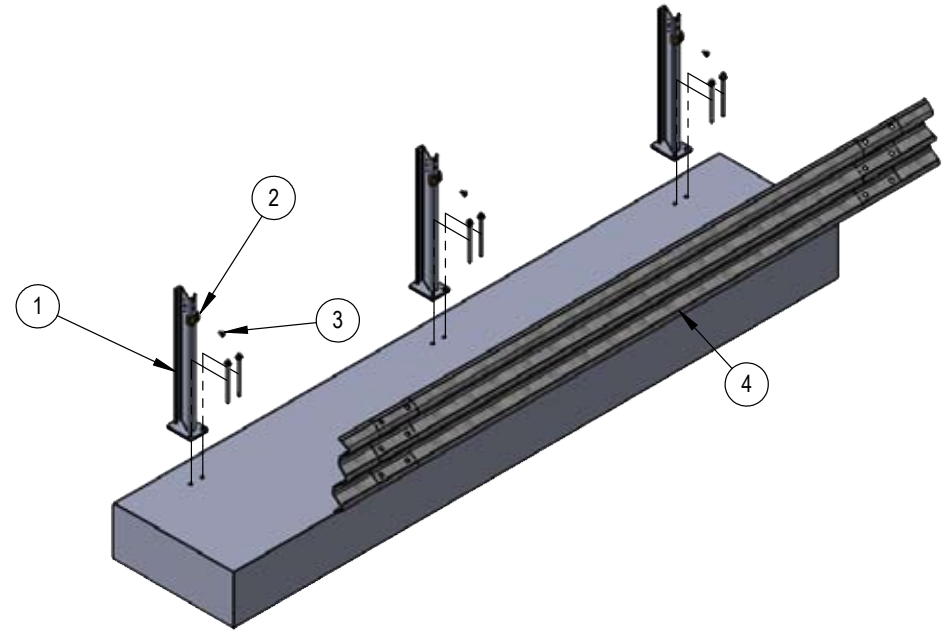
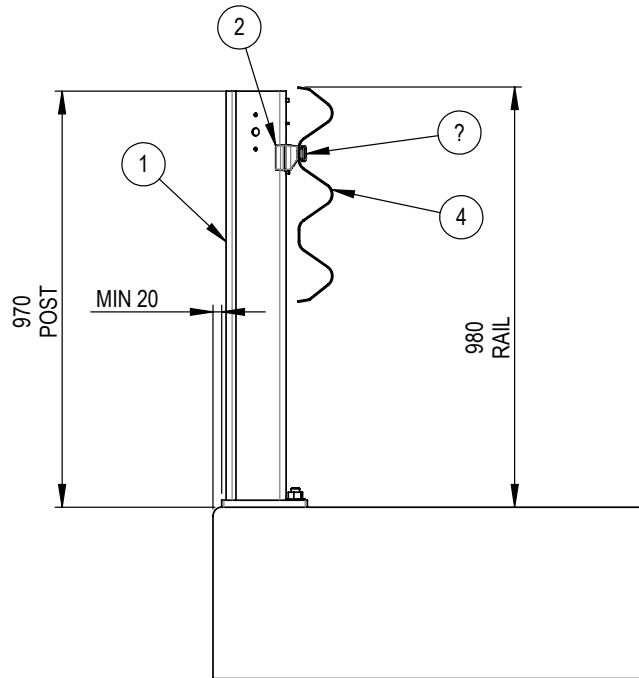
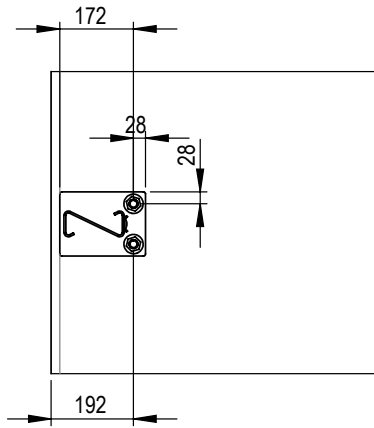
FOLDER: C:\USERS\KZ717943\ONEDRIVE - VALMONT INDUSTRIES\INGAL - SOLIDWORKS MODEL IN PROGRESS\INGAL ELEVATED BARRIER\MODEL



- NOTE:
1. MATERIAL = G250
  2. SHEET THICKNESS = 16mm
  3. FINISH = AS4680 GALV
  4. BLACK PART = 10010862

REVISIONS		REFERENCES			DRAWING NUMBER		REFERENCE DRAWINGS		NAME		DATE		PROJECT		INGAL CIVIL PRODUCTS PART No.	
0	06/07/2022	ORIGINAL ISSUE - DESIGNED BY GN DRAFTED BY KZ			KZ	LG	LG		DRAWN	KZ	29-07-2024	INGAL ELEVATED BARRIER		10010863		
									CHECKED	LB	29-07-2024					
									APPROVED	KZ	29-07-2024					
									SCALE	1:6	SHEET: 1 of 1					
									ISSUE FOR			INGAL ELEVATED BARRIER MOUNTING BRACKET		DRAWING No. HC-BRG-004		
												57-65 AIRDS ROAD MINTO, N.S.W. 2566		PH. +61 2 9827 3333 www.ingalcivil.com.au		
														Rev. 0		

FOLDER: C:\USERS\KZ717943\ONE\DRIVE - VALMONT\INDUSTRIES-INGAL\_SOLIDWORKS MODEL IN PROGRESS\INGAL ELEVATED BARRIER\MODEL



ID	DESCRIPTION	PART NO.
1	EZY-HC POST 954mm ON BASEPLATE (970mm OVERALL)	10008366
2	EZY-GUARD HD CARRIAGE - C2903G	10004116
3	M16 x 30mm EZY-GUARD SMART POST BOLT	10001832
4	THRIEBEAM (2.7) 4000mm NLL	10000837

**NOTES:**

1. ALL DIMENSIONS IN MM, UNLESS SPECIFIED OTHERWISE.
2. MIN CONCRETE STRENGTH TO BE 30MPa
3. ANCHORING OPTION: HILTI HY-200 WITH 2 NO. M20 x 215mm G8.8 ANCHOR STUDS WITH MIN EMBEDMENT 150mm. MIN EDGE DISTANCE 170mm.
4. ANCHOR SPEC ASSUMING 30MPa CONCRETE. FOR RETROFIT APPLICATIONS, ANCHOR SUITABILITY TO BE CONFIRMED BY PROJECT ENGINEER.

REV.	DATE	DESCRIPTION	DRAWN	CHECKED	APPROVED	DRAWING NUMBER	REFERENCE DRAWINGS	ISSUE FOR	NAME	DATE	PROJECT	TITLE	INGAL CIVIL PRODUCTS PART No.
1	8/12/2025	ADDED NOTE 4	KZ	HF	KZ							INGAL ELEVATED BARRIER - TOP MOUNT GENERAL ARRANGEMENT	HC-BRG-020
<p><b>REVISIONS</b></p> <p><b>REFERENCES</b></p> <p><b>INGAL CIVIL PRODUCTS</b> A valmont COMPANY</p> <p>DRAWING AND CONTENTS ARE COPYRIGHT TO INGAL CIVIL PRODUCTS AND CAN ONLY BE USED WITH PRIOR WRITTEN CONSENT FROM INGAL CIVIL PRODUCTS</p> <p>57-65 AIRDS ROAD MINTO, N.S.W 2566 PH. +61 2 9827 3333 www.ingalcivil.com.au</p>													
<p>FOLDER: C:\USERS\KZ\71943\ONE\DRIVE - VALMONT INDUSTRIES - INCL_SOLIDWORKS MODEL IN PROGRESS\INGAL ELEVATED BARRIER\MODEL</p>													



# INGAL

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