

# CrocGuard<sup>®</sup>

## Free Span Bridge Barrier

Compliant To MASH TL4 and AS5100 Regular Level Bridges



**SafeDirection**  
CRASH BARRIER SOLUTIONS

[safedirection.com.au](http://safedirection.com.au)



# The CrocGuard® Advantage

## Leading Design

Unique Bridge Barrier spanning up to 16m without posts

Compliance to AS/NZS 5100 Regular Level Bridges

Compliance to MASH Test Level 4

MASH compliant Bridge Approach

## Leading Safety

Full scale crash tested system

Crash Tested Transition

## Unique Benefits

Compliant barrier solution for weak bridge decks

Major reduction in road closure time

Maximises usable bridge width reducing centre line crowding

No additional hydraulic load on bridges from overtopping floodwater

Minimises potential for debris entrapment during overtopping floodwater

Robust and highly resilient to nuisance impacts

Minimal maintenance

## Local Support

Designed by Safe Direction for Australian and New Zealand Standards

Customised solutions available for non-standard applications

Available in varying standard lengths

Australian Made

## 1.0 Introduction

CrocGuard is a unique bridge barrier solution that spans up to 16m without posts yet compliant to AS/NZS 5100 for Regular Level Bridges.

The system has been specifically developed by Safe Direction for applications on bridges sensitive to one or more of the following issues:

- Weak bridge decks such as timber deck bridges that have insufficient structural capacity to withstand impacts on a conventional post and rail barrier
- Culvert applications where there is insufficient fill height to support posts or a strip footing for conventional post and rail barrier
- Concern for horizontal hydraulic loads experienced by the bridge in flood events
- Narrow bridges in need of maximising lane widths

CrocGuard is a patented bridge barrier system design, crash test validated, manufactured and supplied by Safe Direction, a proud Australian owned manufacturing company.

## 2.0 How CrocGuard Works

CrocGuard is a unique composite design bridge barrier with an external conventional Thriebeam guardrail facing rail that encases a concrete core. The result is a very stiff long length free spanning beam that transfers impact loads to the posts at each abutment.

## 3.0 Seamless Interface

The Thriebeam facing rail of CrocGuard seamlessly interfaces with conventional RamShield Bridge Approach system. This maintains continuity of rail height and provides a transition free of any snag points.





## 4.0 CrocGuard Crash Test Validation

AS/NZS5100 Regular Level Bridge criteria stipulates that barrier systems rated to the Regular Level Bridge performance Level require a bridge barrier compliant to MASH Test Level 4.

Successful crash testing on CrocGuard has been performed to the complete MASH TL4 crash test criteria, being:

- 10,000 kg truck, 90 km/h, 15 degree impact angle
- 2,270 kg Pick Up, 100km/h, 25 degree impact angle
- 1,100kg Car, 100km/h, 25 degree impact angle



MASH 4-11 impact – stable controlled redirection



MASH 4-12 impact



The only visible sign after the MASH 4-10 impact is scuff marks from the vehicle. This barrier was re-used for the MASH 4-11 impact (pick up truck 100km/h at 25 degrees) with no maintenance performed on the system.



CrocGuard bridge barrier shown after MASH 4-10 and MASH 4-11 impact remains at full elevation continuing to provide protection

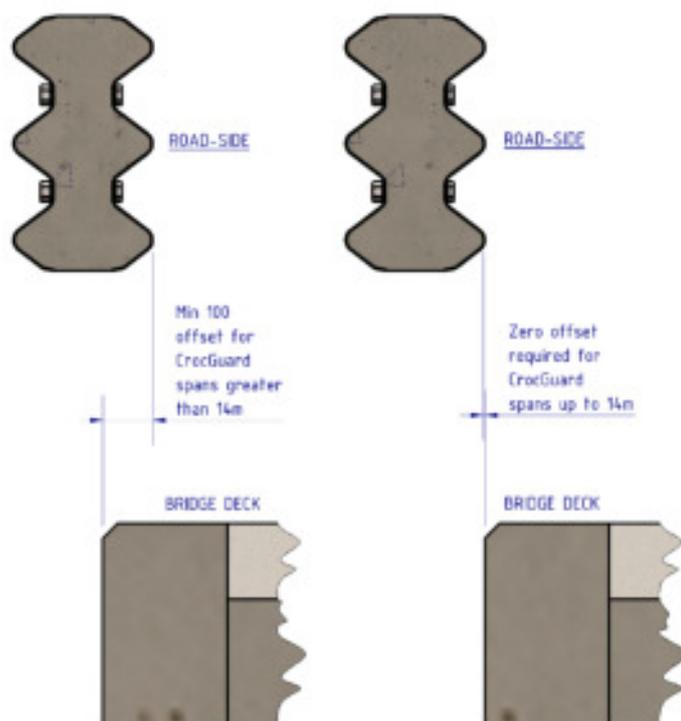
## 5.0 CrocGuard Deflection

CrocGuard midspan/maximum deflection based on crash testing performed on the 16m (largest) span beam:

<b>MASH Test Level 3</b>	<b>0.8m</b>
<b>MASH Test Level 4</b>	<b>0.9m</b>

## 6.0 Barrier Alignment

CrocGuard provides the opportunity to maximise lane widths and reduce centre line crowding especially beneficial for narrow bridges. CrocGuard beams up to and including 14m in length may be installed with the traffic face aligned with the edge of the bridge deck. Beams longer than 14m in length require the traffic face of the beam to have a minimum 100mm encroachment measured from the edge of bridge to the traffic face of barrier.



## 7.0 Low Maintenance

Crash testing has proven CrocGuard's outstanding durability and resistance to damage. During testing the MASH 4-11 impact was performed on the same barrier system as the MASH4-10 impact with zero parts replaced or maintenance performed on the system. Asset owners can have confidence that for the vast majority of impacts that CrocGuard will remain maintenance free. Safe Direction does however recommend periodic visual inspection for confirmation of the barrier's integrity.

## 8.0 Assembly Speed

CrocGuard is easily lifted into position effecting rapid installation with minimal disruption to traffic. This is in contrast to conventional barrier systems mounted to the bridge structure that may necessitate lengthy periods of road closure.

A single 16m CrocGuard beam can be installed in as little as 1 hour, this includes auguring holes, setting reo-cage, assembling posts to the beam, lowering into position and filling abutment footings with concrete.

## 9.0 Eliminate Hydraulic Load

CrocGuard effectively eliminates the often-destructive hydraulic loads applied to bridges from barrier systems during overtopping from flood waters. This provides greater surety to the life expectation of bridge assets and reduction to bridge maintenance costs.

## 10.0 Specifying CrocGuard

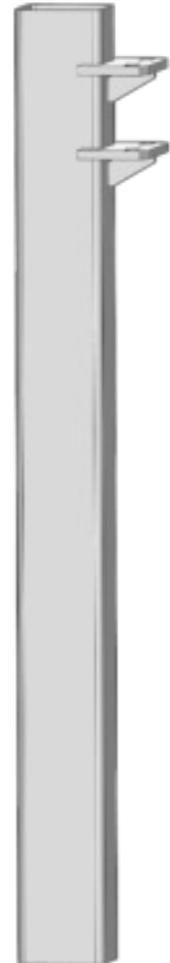
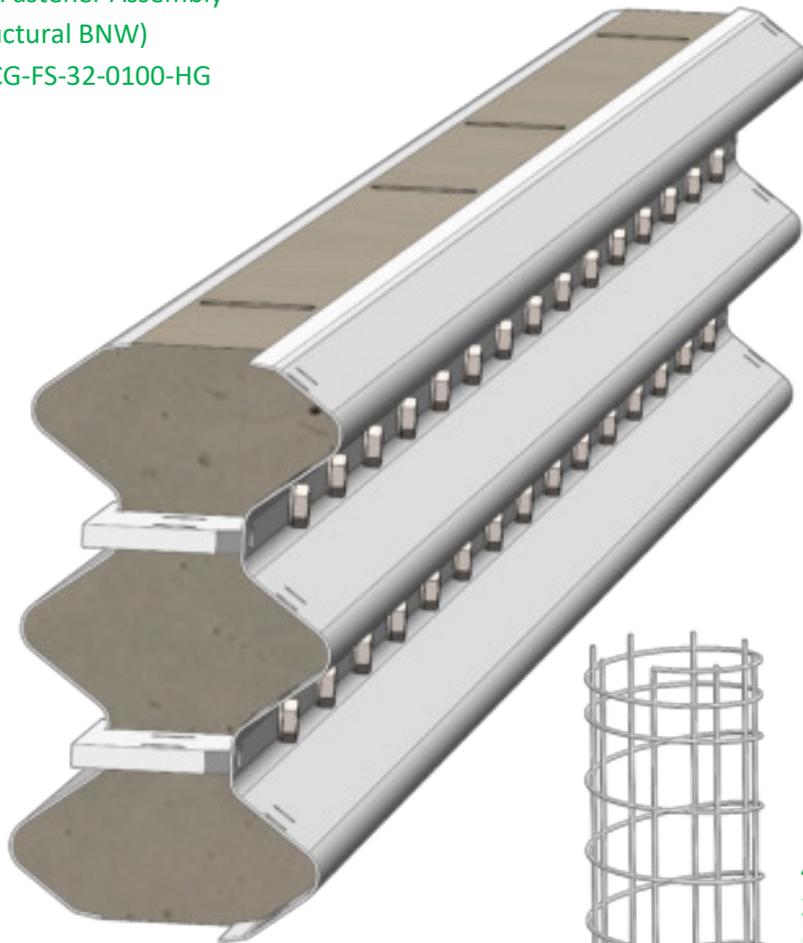
CrocGuard is a registered Trademark of Safe Direction and can be specified by name providing confidence that you are specifying a MASH TL4 compliant and AS5100 compliant bridge barrier solution (Regular Level).



## 11.0 Component Identification



Abutment Post Fastener Assembly  
(M36 x 100 Structural BNW)  
Item Number: CG-FS-32-0100-HG



Abutment Post  
250 x 250 SHS x 1800mm  
Item Number: CG-RC-05-1400-AG



Reinforcement Cage  
500 Diameter x 1400mm  
Item Number: CG-RC-05-1400-AG

CrocGuard Beam Length (m)	Item Number
8m	CG-TB-SR-0800-AG
10m	CG-TB-SR-1000-AG
12m	CG-TB-SR-1200-AG
14m	CG-TB-SR-1400-AG
16m	CG-TB-SR-1600-AG

## 11.0 Design Considerations

### 11.1 Selecting Required Beam Length

Care is required to nominate an appropriate length of barrier. Typically the length of the CrocGuard barrier is 2m longer than the actual length of bridge. The additional length of barrier is required to ensure that the abutment posts that support CrocGuard are appropriately located in sound foundation material and formation geometry. Safe Direction can provide guidance to select an appropriate barrier length for your application.

### 11.2 Advance Grading

It is recommended that the area in advance of CrocGuard be limited to a grading of 10H:1V to ensure that the vehicle’s suspension is neither extended nor compressed at the moment of impact

### 11.3 Clearance to Hazards

For non-bridge applications the system should be installed with sufficient clearance behind the barrier to allow for the expected deflection of the system.

Safe Direction can provide deflection requirements for varying length beams. The 0.9m deflection for the MASH TL4 impact on a 16m beam is the ‘worst case impact scenario’.

### 11.4 Shy Line Offset

Drivers tend to reduce speed or laterally move their vehicles away from a road safety barrier if it is in close proximity to the edge of the travelled way.

The distance from the edge of the travelled way beyond which a safety barrier will not be perceived as an immediate hazard by the typical driver is known as the shy line offset. Recommendations for the shy line offset are contained in Table 1

Design Speed (km/h)	Shy Line Offset (m)
50	1.1
60	1.4
70	1.7
80	2.0
90	2.2
100	2.4
110	2.8

### 11.5 Transition Design

The transition to CrocGuard from a W-Beam approach is via a 6m assembly of RamShield Bridge Approach barrier. This stiffens the barrier in advance of the CrocGuard barrier providing a desired progressive strengthening of the system.

The transition design has been successfully crash test validated against MASH Test Level 3 to the requirements of AS/NZS3845 for road barriers.

Alternatively, Safe Direction’s RamShield High Containment system can transition to CrocGuard with a 6m assembly at reduced post spacing.



Table 1: Shy Line Offset



Stable MASH 3-21 transition/coffin corner Impact



Stable MASH 3-20 Impact

### 11.6 End Terminals

End terminals are designed to anchor the w-beam guardrail system and introduce the necessary tensile and flexural strength required for safe vehicle containment and re-direction throughout the length-of-need section.

Some guardrail end terminals also provide the additional feature of reducing the severity of an impact near or at the end of the system.

It is recommended that RAMSHIELD® guardrail transitioning from CrocGuard be anchored at the leading and trailing end of the installation with MASH compliant end terminals, such as the MSKT.

The MSKT is an energy-absorbing tangential end terminal, designed to minimise the severity of impacts occurring at the end of the safety barrier system.

The MSKT terminal is available as a 10m long Test MASH Level 2 system for speed zones of 70km/h or less, or a 15m long MASH Test Level 3 system for speed zones greater than 70km/h.



### 11.7 Minimum Installation Length

Table 2 lists the minimum installation lengths for the entire barrier system incorporating approach side end terminal, transition, CrocGuard beam, transition and departure side terminal. The approach and departure terminal lengths are longer for speeds above 70km/h thereby effecting total installation length.

Table 2: Minimum System Length

CrocGuard Length (m)	System Length (m)	
	≤ 70 km/h	> 70 km/h
8	39.0	48.5
10	41.0	50.5
12	43.0	52.5
14	45.0	54.5
16	47.0	56.5

## 12.0 Installation

Rapid installation can be achieved by assembling the abutment posts to the CrocGuard bridge beam and lowering the assembly into the augured voids for the abutment posts. The assembly will need to be supported in position for the concrete to sufficiently cure (typically 24 hours)

### 12.1 Tools and Services Required

- Traffic Management
- Augur for 600mm diameter hole
- Franna or lifting machinery to lift CrocGuard rail and post assembly
- Forklift, crane truck or other light mechanical lifting aid
- Two off Ring Spanners (preferred) or Shifting spanners to suit M36 structural bolt and nut
- Socket wrench and socket to suit M36 Bolt
- Two off Reid 8.5 tonne Swift Lift Clutches (Safe Direction will loan these to contractor)
- Two off slings or chains recommended minimum length of 3m (see lift mass details to determine minimum load rating)
- Concrete trowel
- Tape measures (long and standard)
- Metal snips
- Sledge hammer

### 12.2 Traffic Planning

Advanced planning should be thought through to minimise disruption to motorists and provide an appropriate safe work space for the installation team. Installation of CrocGuard will require a minimum single lane closure for installation. Depending on the lifting crane/apparatus deployed a two lane bridge can be kept open during installation as a traffic controlled single lane operation.

### 12.3 Underground services

The installation of CrocGuard requires the abutment posts to be set in a concrete footing at each end of the assembly. Similarly approach and departure guardrail assemblies will have guardrail posts embedded in ground.

Prior to the installation of posts an investigation for potential underground hazards and services is recommended.

### 12.4 Overhead Obstruction

The site should be evaluated for potential overhead obstructions that may present a risk during the installation process. These obstructions typically include power lines, signage trees etc.

Required clearance heights for crane lifts should be known prior to undertaking this evaluation.

### 12.5 Unloading Exclusion Zone

It is recommended that an exclusion zone be maintained around the unloading process. This provides distance between workers and moving machinery and elevated loads in the event that goods or machinery move unexpectedly.

### 12.6 Site Preparation

Installation may take place by lifting CrocGuard direct from the delivery truck and into position. If however the barrier is to be installed at a separate time to delivery then a set down area will be required and should be prepared in advance.

If being stored then CrocGuard beams should be set down on a level surface. CrocGuard beams are typically shipped to site with cradles for stability. These cradles may be used to stabilise storage on ground.



### 12.7 Lifting

CrocGuard is supplied as a fully assembled beam with four lifting Lift points. Two lifting locations are positioned 3m apart at the centre of the beam. Two further lifting points are each located 1.5m from each end of the beam.

Beams can be lifted from either the two central points or the two outer points. The beam can be lifted with a single or two cranes. The angle of any lifting chain or sling should not be more than 30 degrees from vertical.

Lifting anchors are all 8.5 tonne rated Reid Swift Lifts regardless of Beam size.

Safe Direction will supply two off Reid Swift Lift Clutches on loan for each project.

Table 2 presents the beam mass details for varying CrocGuard lengths.

Table 2: CrocGuard Mass (beam only)

Length (m)	6	8	10	12	14	16
Mass (kg)	1,650	2,150	2,650	3,150	3,650	4,150

Table 3 presents beam mass details for varying lengths plus the mass of two abutment posts for when lifting as an assembly

Table 3: CrocGuard Mass (beam and posts)

Length (m)	6	8	10	12	14	16
Mass (kg)	1,950	2,450	2,950	3,450	3,950	4,450



### 12.8 Procedure

#### Step 1 – Set Out

Mark location for auguring of holes for abutment posts. Confirm exact beam length (measure from midpoint between holes of connection plates at each end of beam). Mark a line on the pavement at each end of the installation at a spacing matching the exact length of the beam measured. Mark a cross point 350mm set back from the desired traffic face of the CrocGuard – this is the centre point for auguring the abutment post holes.

#### Step 2 – Augur Abutment Post Holes

Augur 600mm holes to a minimum 1800mm depth or as per detailed for the specific project. Seek advice from Safe Direction rock is encountered.



### Step 3 – Position Reo Cage

Place reinforcement cage in augured hole in preparation for positioning abutment posts

### Step 4 – Lift CrocGuard Beam

Lift CrocGuard Beam (observe weight of beam and select appropriate rated lifting apparatus). Position beam at shoulder height in alignment with abutment post holes in preparation for pre-assembly of abutment posts.



### Step 5 - Pre-Assemble Abutment Posts

With CrocGuard beam vertically aligned over excavated hole lift and lower abutment post partially into hole to aid at shoulder height connection to the CrocGuard Beam. Use a plate grab to hold posts.

Connection is with 4 off M36 galvanised structural bolt and nuts. Loose bolt the connection and then adjust the post position so the plates on the post and Crocguard Beam are centrally aligned.

Tighten bolt and nut assemblies – Tighten to minimum 100Nm which will easily be achieved with a standard length spanner



### Step 6 – Position CrocGuard Assembly

In preparation for lowering the CrocGuard assembly position one off cradle at each end of the beam.

Lower the Crocguard beam and post assembly until seated on the cradles. Take care while lowering to ensure posts are lowered inside reo cage.



Check beam for correct alignment, offset, verticality and height. Note the cradles are purposefully designed such that the beam will be just below its installed height of 980mm. This is to permit chocking to the finish height allowing for any site vagaries.



#### 12.11 Step 7 – Pour Concrete

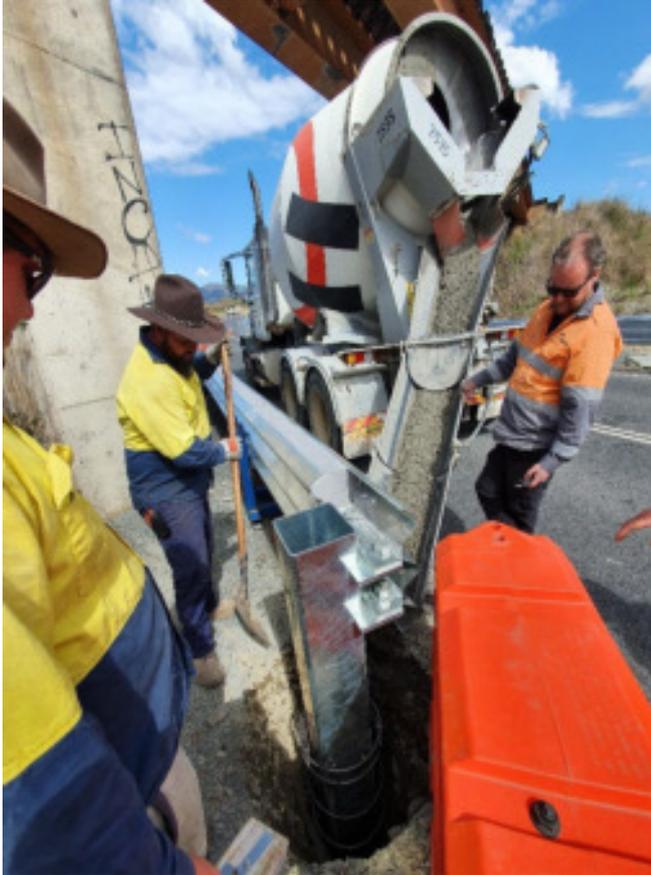
Once alignment is achieved you are ready to pour concrete (32MPa). Concrete may be poured directly into the hole from the chute of a concrete truck.

The reo cage should be held up from the bottom of the hole until sufficient concrete is poured to position the reo cage at rest such that the top of the cage is 50 to 100mm below the finished concrete height.

Continue pouring and vibrating the concrete until the concrete reaches ground level.

There is no requirement to fill the post with concrete although surplus concrete can be poured into the post cavity up to ground level.





After pouring concrete, trowel the surface for a neat finish and the installation of the CrocGuard bridge barrier is complete.



### 12.12 Connection to Bridge Approach Guardrail

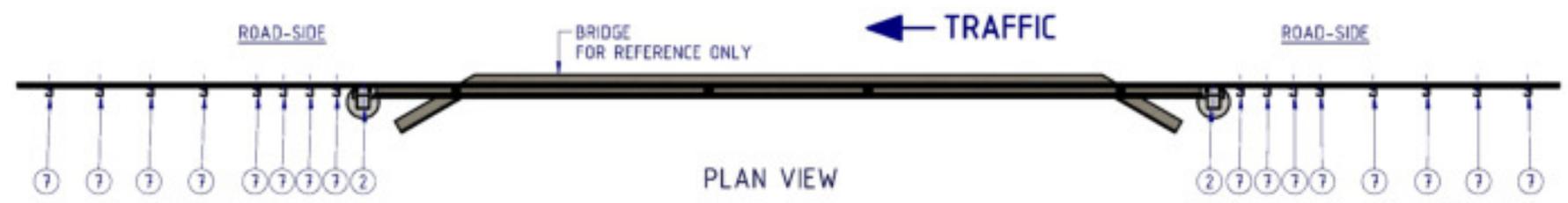
CrocGuard is designed for seamless transition to the RamShield Bridge Approach system. Both systems utilise a Thriebeam facing rail allowing for conventional splice connection.

Rail lap at both the approach and departure end is with the CrocGuard beam underneath the RamShield Bridge Approach rail.

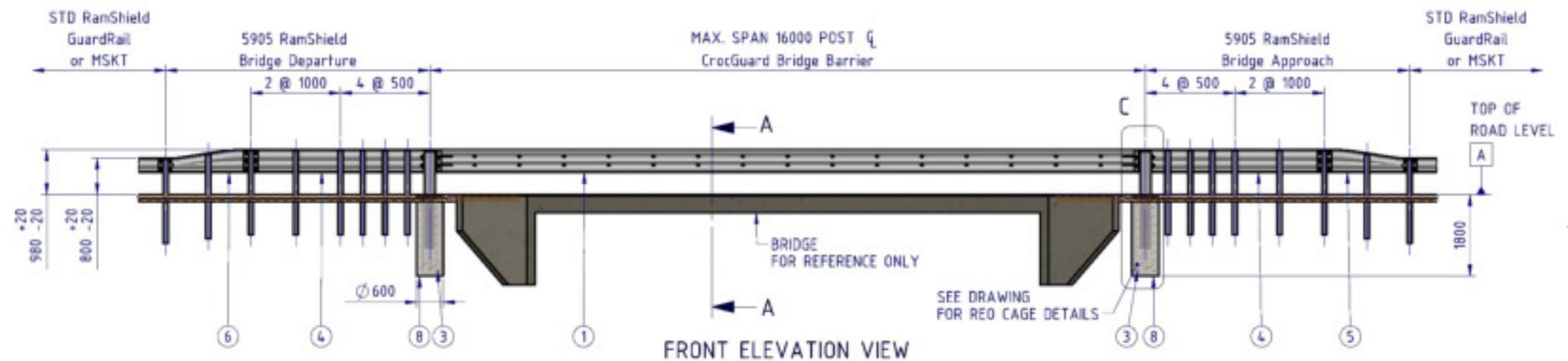




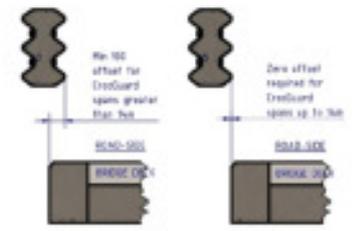
REVISIONS				
REV.	ZONE	DESCRIPTION	DATE	APPVD
		ORIGINAL ISSUE	7/10/2021	WR



PLAN VIEW



FRONT ELEVATION VIEW



SECTION A-A SCALE 1:50  
CrocGuard >14m

SECTION B-B SCALE 1:50  
CrocGuard ≤14m

BOM				Weight
ITEM NO.	QTY	PART NUMBER	DESCRIPTION	kg
1	1	CG-TB-SR-1600-AG	CrocGuard Beam 16m NLL	4105
2	2	CG-PG-SH-2150-AG	CrocGuard Abutment Post	162
3	2	CG-RC-05-1400-AU	CrocGuard Reinforcing Cage for abutment post	21
4	2	GE-TB-SR-4000-BG	THREE-BEAM BRIDGE APPROACH 3.5mm BMT	86
5	1	GE-TB-SR-1905-AG	ASSYMETRIC APPROACH W-BEAM TO THRIEBEAM TRANSITION	37
6	1	GE-TB-SR-1905-DG	ASSYMETRIC DEPARTURE THRIEBEAM TO W-BEAM TRANSITION	37
7	16	GR-PG-CS-1860-AG	RAMSHIELD HIGH CONTAINMENT POST 1860mm	24
8	2	RND0010-03	Concrete Footing 32 MPa (BY OTHERS)	1140
9	8	AS-NZS 1252 - M36 x 100-N-Gr8.8-BL	M20x100 Hex Structural Bolt Gr8.8 HDG	
10	8	AS-NZS 1252 - 36-Gr8.8-HDG	M36 Washer Structural HDG	
11	8	AS-NZS 1252 NS - M36-W-N-Gr8.8-HDG	M36 Hex Nut Structural HDG	

MATERIAL:	AS SHOWN
FINISH:	HOT-DIP GALVANISED AS/NZS 4680
STATUS:	NAME DATE
DRAWN:	W.ROGULSKI 7/10/2021
CHK'D:	H.WALLACE 7/10/2021
APPV'D:	H.WALLACE 7/10/2021

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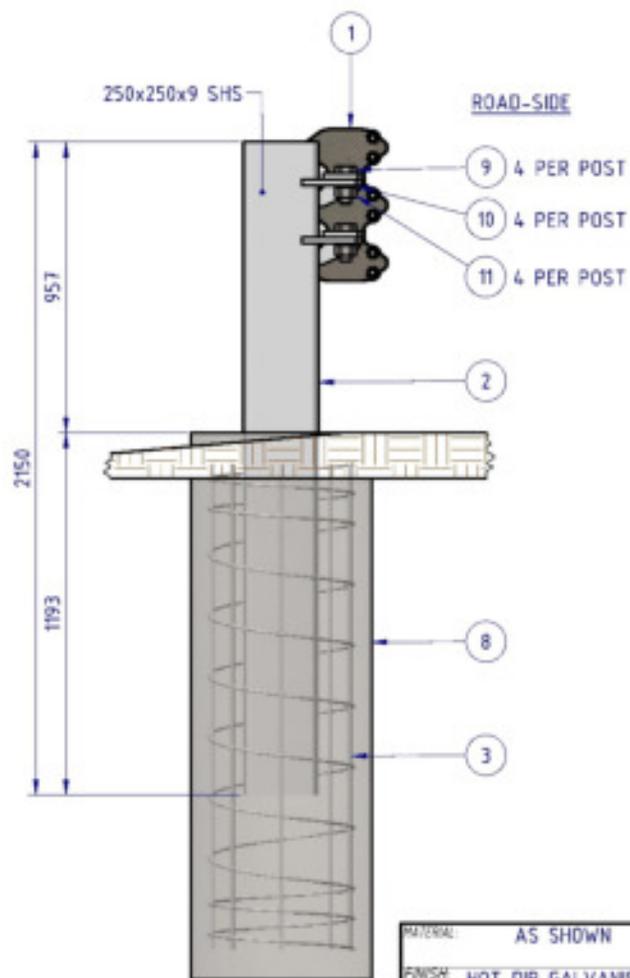
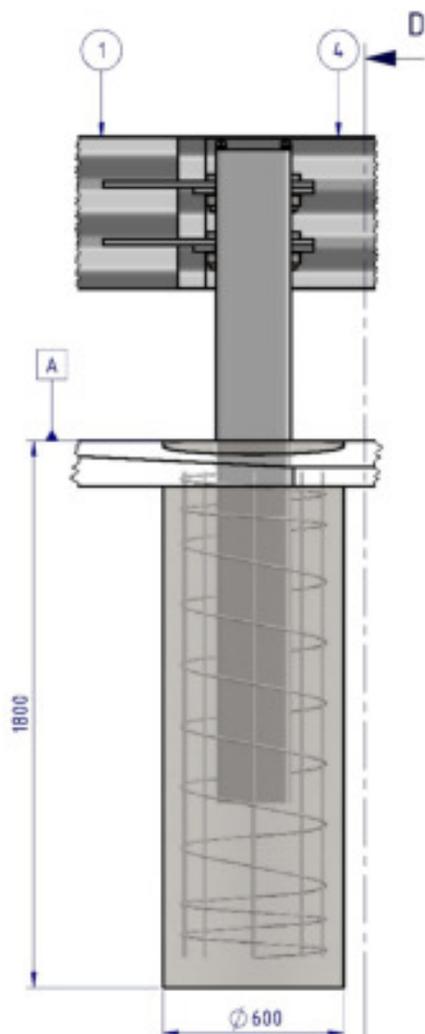
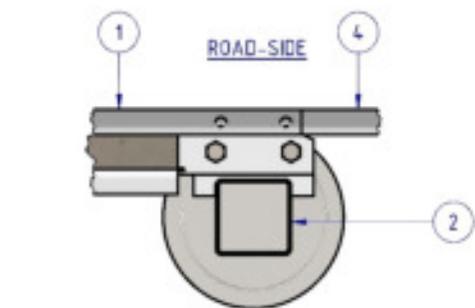
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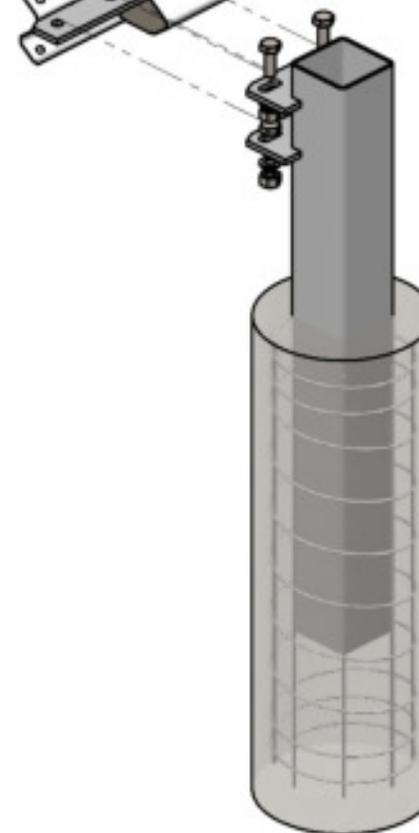
THIRD ANGLE PROJECTION

AWB 52 156 459 684

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DWG NO.:	RND0010-00	REVISION: SHEET SIZE
WEIGHT:	kg	A4
SCALE:	1:125	SHEET 1 of 4



ROAD-SIDE

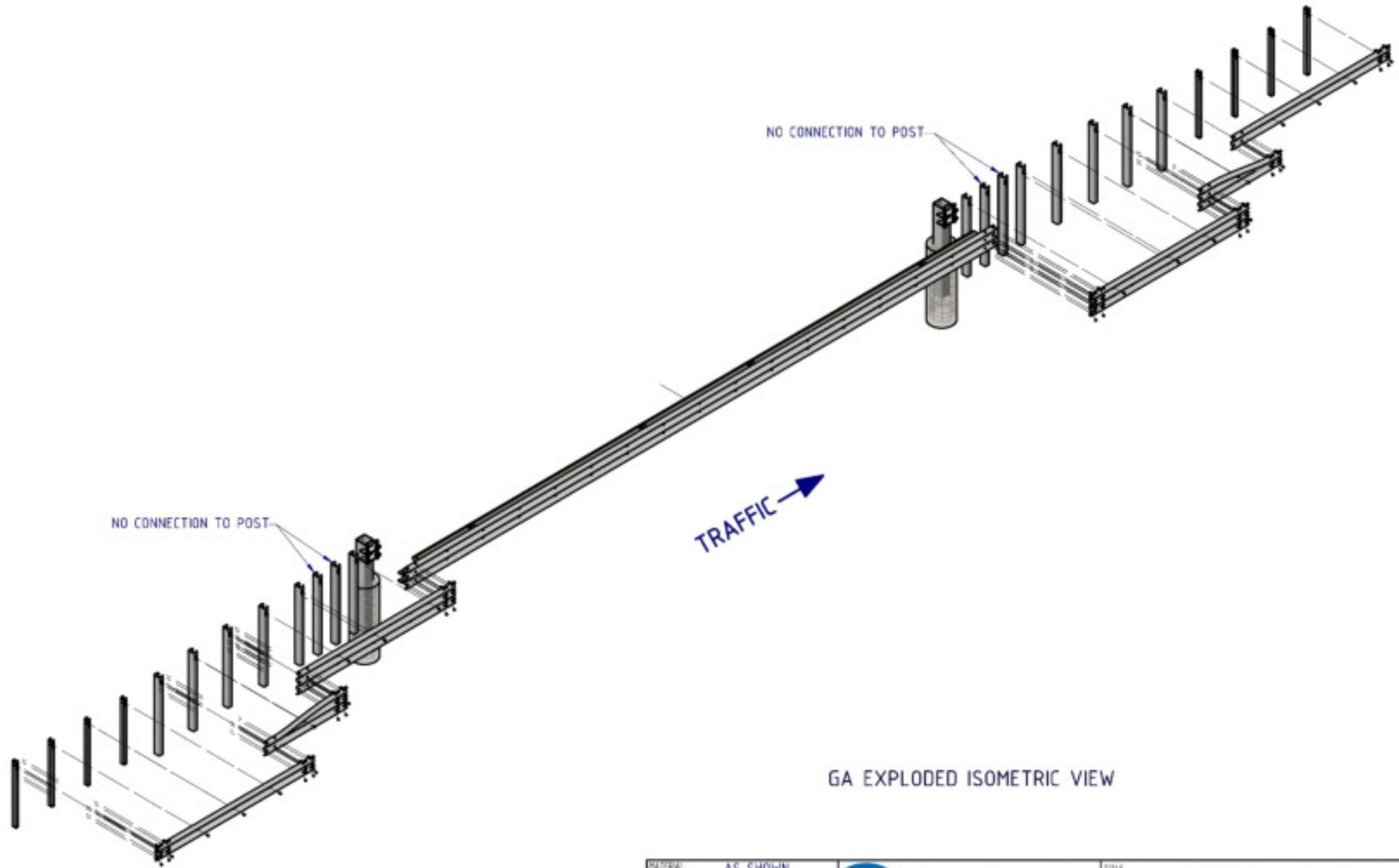


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STATUS	NAME	DATE
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CHECKED	H.WALLACE	7/10/2021
APPROVED	H.WALLACE	7/10/2021

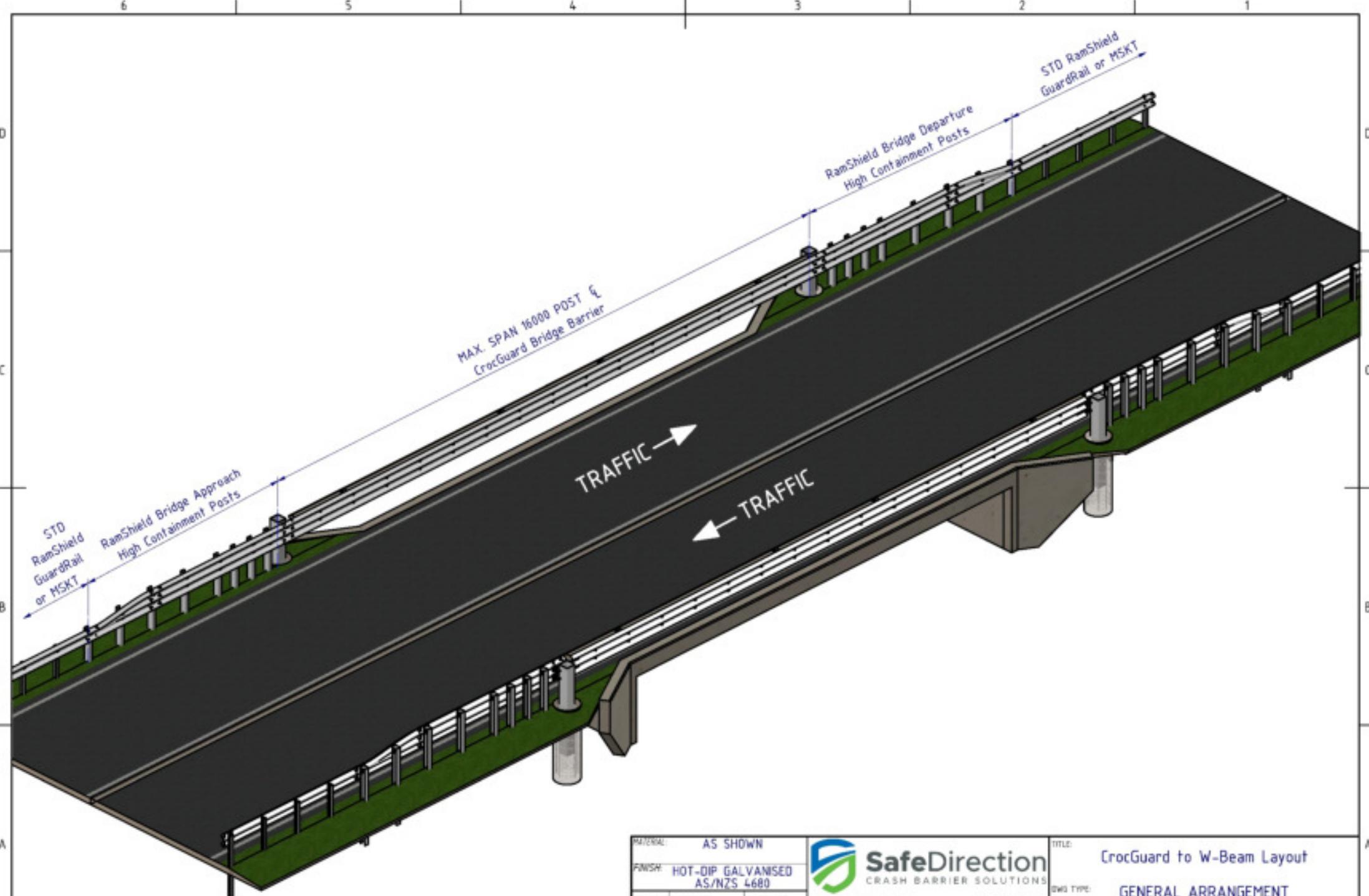


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DWG NO: RND0010-00		SCALE: 1:25	SHEET 2 of 4
WEIGHT: kg	DO NOT SCALE DRAWING		



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CHK'D	H.WALLACE	7/10/2021		WEIGHT: kg	DO NOT SCALE DRAWING
APP'D	H.WALLACE	7/10/2021	SCALE: 1:100	SHEET 3 of 4	



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 THIRD ANGLE PROJECTION

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WEIGHT: kg	SCALE: 1:100 SHEET 4 of 4

