ACP Sentry Barrier W Beam System

TL-3 Longitudinal Barrier

Product and Installation Manual

Please call Australian Construction Products on 1800 724 172 or visit www.acprod.com.au for more information

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SMARTER SAFETY SOLUTIONS

ACP

AUSTRALIAN CONSTRUCTION PRODUCTS

Contents

Introduction

The **ACP Sentry Barrier W Beam System** is a roadside w-beam guardrail system suitable for containing, redirecting and shielding vehicles from roadside obstacles. The barrier has been designed and tested to meet the evaluation criteria of MASH Test Level 3 for a longitudinal barrier. This is the current state of the art performance criteria, exceeding the requirements of NCHRP 350 Test Level 3.

The **ACP Sentry Barrier W Beam System** has an initial installation height of 800 mm (31") to the top of the rail, providing the system with the ability to withstand numerous road surface overlays without the need to relevel of lifting of the barrier. The **ACP Sentry Barrier W Beam System** can be installed with an approved energy absorbing terminal end on the approach end, however it is recommended that an approved tangential or flared MAX-Tension terminal end be used for optimal performance.

The rounded edges to the **ACP Sentry Barrier Post** and closed shape on the approach direction provide increased protection for vulnerable road users. The compact **ACP Sentry Barrier Post** are easy to drive into all soil types and provide increased resistance to rotation in the soil when impacted. Unlike other systems on the market, any damage caused to the top of the posts or to the rail mounting points during installation will not affect the performance of the system.

The connection system between the rail and posts is formed using conventional fasteners providing it with the greatest tolerance of any system on the market. If the connection is damaged in any way it can be easily replaced without replacing the posts allowing for simpler installations and repairs. The **ACP Sentry Barrier W Beam System** is installed quickly using conventional installation tools and equipment.

System Overview

The **ACP Sentry Barrier W Beam System** is designed to provide acceptable structural adequacy, minimal occupant risk and safe vehicle trajectory as required by the latest in safety standards, AASHTO MASH 09 Test Level 3 (TL3). This standard requires the system to be independently evaluated with full scaling testing using 1,100 kg and 2,270 kg vehicles traveling at speeds of 100 km/hr and impacting the system at an angle of 25 degrees. The requirements of MASH 09 TL3 are so stringent that the system is required to absorb more energy during the impact than the out-dated NCHRP 350 standard Test Level 4 (TL4).

When impacted by an errant vehicle, the **ACP Sentry Barrier W Beam System** will redirect the vehicle along the face of the barrier system, bringing it to a controlled stop. The system has been developed to produce no debris during an impact, with all posts designed to remain firmly located in the soil and the connection details to remain attached to the rail. Repair of the system is completed by removing and replacing any bent or damaged w-beam and posts impacted accordingly. Any posts with damaged connections can be repaired by replacing the connection hardware only, reducing the need to remove posts and repair damaged ground.

Key specifications for the **ACP Sentry Barrier W Beam System** are:

Standard Assembly	System Width	201 mm
	Height to top of rail	800 mm
	Height to top of post	790 mm
	Post Weight	13.7 kg
	Post Length	1.64 m
	Post spacing	2.00 m
	MASH TL3.10 dynamic deflection	1.02 m
	MASH TL3.11 dynamic deflection	1.59 m
Variant Assembly	Post spacing	1.00 m
	MASH TL3.10 dynamic deflection	0.70 m
	MASH TL3.11 dynamic deflection	0.99 m

The minimum Length of Need (LON) of the **ACP Sentry Barrier W Beam System** is dependent on the posted speed limit. Please refer to state roading authority approval letters for local minimum length requirements. However, a minimum length of need for a two-way road with a posted speed limit of 100 km/hr with a clear zone of approaching traffic is recommend as 30 m, excluding terminal ends.

The **ACP Sentry Barrier W Beam System** systems rails and posts are manufactured from hot-rolled steel flat products in accordance with AS/NZS 1594 and hot-dip galvanised in accordance with AS/NZS 4680 with an average minimum coating thickness of 35 microns. All galvanising is undertaken after fabrication is completed to ensure no surfaces are left untreated.

The **ACP Sentry Barrier W Beam System** has been designed for strength and resilience. Additional testing was completed to show that the barrier can withstand a second impact when already damaged. With no repairs completed to the barrier after a first test, it successful resisted a direct impact to the damaged region by a 1500 kg vehicle travelling at a nominal 70 km/h and an impact angle of 25 degrees. The vehicle was smoothly redirected with no additional damage caused to the barrier.

Limitations and Warnings

The **ACP Sentry Barrier W Beam System** forms part of an approved roadside protection system and it must be installed in conjunction with an approved terminal end system on both the approach and trailing ends. When installed in accordance with the manufacturer's instruction the barrier system allows an impacting vehicle to be re-directed in a safe and predictable manner under the MASH impact conditions.

Vehicle impacts that vary from the MASH impact conditions for longitudinal barriers may result in significantly different outcomes from those obtained in the experimental testing and may not meet the MASH evaluation criteria.

The selection and placement of the **ACP Sentry Barrier W Beam System** must be in accordance with the Roading Controlling Authorities guidelines and the details shown in the construction drawings. Installation must be within strict accordance with the installation instructions for the product. Alternative installation techniques will be required if the soil conditions on site do not meet the minimum requirements stated in this manual.

Training

All Installers must undergo formal training on the installation of the **ACP Sentry Barrier W Beam System**. This includes the correct identification of each **ACP Sentry Barrier W Beam System** components and installing it as per the product specification and Installation Manual.

By the end of the training installers will be able to identify each component of the **ACP Sentry Barrier W Beam System** and have the knowledge to safely install the barrier as per the Installation Manual and Specifications required.

The training will cover and include the correct Personal Protective Equipment (PPE) required to be worn during installation and maintenance. Additionally, by the end of the training workers will know the correct methods required to handle and install all components of the **ACP Sentry Barrier W Beam System**.

Health and Safety

Installers should comply with all necessary health and safety legislation in the local jurisdiction, including all safe work and lifting practices.

All appropriate traffic safety precautions must be adopted. All workers must wear the required safety clothing, including but not limited to, high visibility vests, steel capped footwear, gloves and protective glasses etc.

Before undertaking any earth works, including drilling or driving of posts, always check with the appropriate service providers that the area is clear of underground services.

All installers must be well clear of machinery when posts are being driven.

Before Installation

Design, selection and placement of the **ACP Sentry Barrier W Beam System** shall be in accordance with the local Road Controlling Authority's guidelines and as per the details shown in the construction drawings. Installation shall be in accordance with the installation instructions supplied for this product.

The **ACP Sentry Barrier W Beam System** is an engineered safety device. Before starting installation ensure familiarity with the makeup of the system.

Note: Soil conditions may require a local geotechnical engineer to confirm the soil condition on site met the required condition described in the manual.

Safety statements

General Safety

- All required traffic safety precautions should be complied with. All workers should wear required safety clothing (examples, but not limited to, include: high visibility vests, steel capped footwear, gloves etc).
- Only authorised trained personnel should operate any machinery. Where overhead machinery is used, care must be taken to avoid any overhead hazards.
- Before drilling or excavation always ensure that the area is clear of underground services. The appropriate service providers may need to be contacted.

ACP Sentry Barrier W Beam System Safety Statements

- All installers must be a safe distance from all drilling or excavating machinery operating.
- The components are not heavy enough to require specialised lifting equipment, but due to the dimensions and bulky nature, care should be taken when lifting the larger components into position.
- Avoid placing hands or fingers in and around moving machine parts when components are being lifted and manoeuvred into place.

Limited Warranty

Australian Construction Products (ACP) has tested the impact performance of its barriers and crash cushion systems, and other highway safety hardware under controlled conditions, however, ACP does not represent nor warrant that the results of those controlled conditions would necessarily avoid injury to persons or property.

ACP EXPRESSLY DISCLAIMS ANY WARRANTY OR LIABILITY FOR CLAIMS ARISING BY REASONS OF DEATH OR PERSONAL INJURY OR DAMAGE TO PROPERTY RESULTING FROM ANY IMPACT, COLLISION OR HARMFUL CONTACT WITH THE PRODUCTS OR NEARBY HAZARDS OR OBJECTS BY ANY VEHICLE, OBJECTS OR PERSONS.

ACP warrants that any product or component part manufactured by ACP will be free from defects in material or workmanship. ACP will replace free of cost any Product or component part manufactured by ACP that contains such a defect.

THE FOREGOING WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES NOT EXPRESSLY SET FORTH HEREIN, WHETHER EXPRESS OR IMPLIED BY OPERATION OF LAW OR OTHERWISE, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ACP'S LIABILITY UNDER THIS WARRANTY IS EXPRESSLY LIMITED TO REPLACEMENT FREE OF COST OF PARTS SUPPLIED BY ACP ONLY (IN THE FORM AND UNDER THE TERMS ORIGINALLY SHIPPED), OR TO REPAIR OR TO MANUFACTURE BY ACP, PRODUCTS OR PARTS NOT COMPLYING WITH ACP SPECIFICATIONS, OR, AT ACP'S ELECTION, TO THE REPAYMENT OF AN AMOUNT EQUAL TO THE PURCHASE PRICE OF SUCH PRODUCTS OR PARTS, WHETHER SUCH CLAIMS ARE FOR BREACH OF WARRANTY OR NEGLIGENCE. ACP SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL LOSSES, DAMAGES OR EXPENSES OF ANY KIND, INCLUDING, WITHOUT LIMITATION, ANY SUCH LOSSES, DAMAGES OR EXPENSES ARISING DIRECTLY OR INDIRECTLY FROM THE SALE, HANDLING OR USE OF THE PRODUCTS FROM ANY OTHER CAUSE RELATING THERETO, OR FROM PERSONAL INJURY OR LOSS OF PROFIT.

Any claim by the Buyer with reference to Products sold hereunder for any cause shall be deemed waived by the Buyer unless ACP is notified in writing, in the case of defects apparent on visual inspection, within ninety (90) days from the delivery date, or, in the case of defects not apparent on visual inspection, within twelve (12) months from the said delivery date. Products claimed to be defective may be returned prepaid to ACP's plant for inspection in accordance with return shipping instructions that ACP shall furnish to the Buyer forthwith upon receipt of the Buyer's notice of claim. If the claim is established, ACP will reimburse that Buyer for all carriage costs incurred hereunder.

The forgoing warranty benefits shall not apply to (i) any Products that have been subject to improper storage, accident, misuse or unauthorised alterations, or that have not been installed, operated and maintained in accordance with approved procedures and (ii) any components manufactured by the Buyer.

System Design and Design Considerations

Kerbs

As with all road side safety hardware, the **ACP Sentry Barrier W Beam System** has been designed and tested so that the centre of gravity of the impacting vehicle is at a constant height in relation to the system. For this reason, it is preferred that kerbs or channels are not in front or directly behind the **ACP Sentry Barrier W Beam System** as they may result in altering the height of the vehicle at impact.

If interaction with a kerb cannot be avoided consult the local Road Controlling Authority guidelines regarding allowable kerb heights, kerb shapes, and barrier offset distance.

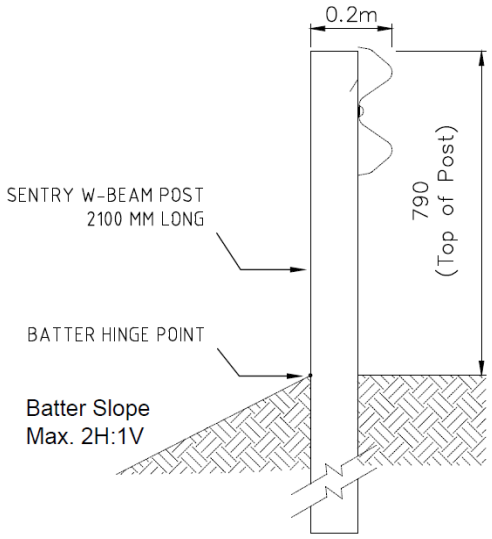
Slopes

The **ACP Sentry Barrier W Beam System** can be installed on ground with a maximum cross fall of 6H:1V. For steeper slopes up to a maximum 3H:1V it is recommended that the system is installed no closer than 300 mm* to the batter hinge point of the slope. For slopes up to a maximum 2H:1V it is recommended that the system is installed no closer than 400 mm* to the batter hinge point of the slope. *Contact your local ACP representative for further guidance on minimum batter hinge offsets.

Batter Hinge Proximity

ACP Sentry Barrier W Beam System has been R & D crash tested to MASH TL3 when installed with **nil offset** to a batter hinge point with a batter gradient of **2H:1V**. For a TL-3 containment level, the minimum proximity to the hinge point shall be where the back edge of the Sentry Post meets the Batter Hinge Point as shown in the figure below. Refer to **Appendices** for typical layout detail and assembly detail utilising 2.1m long posts option.

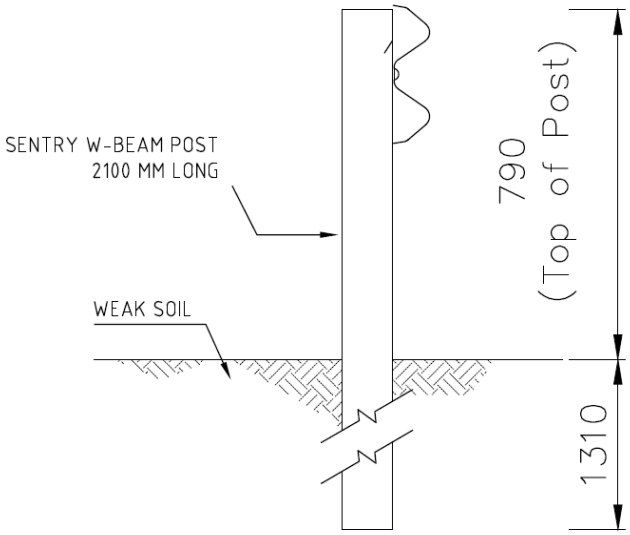
As the proximity to the batter slope reduces the soil support to the post, a **2100mm long Sentry post** is required. Installations in close proximity to a batter hinge point should be considered within the requirements of the road controlling authority Extended Design Domain requirements.



Weak Soil Installations

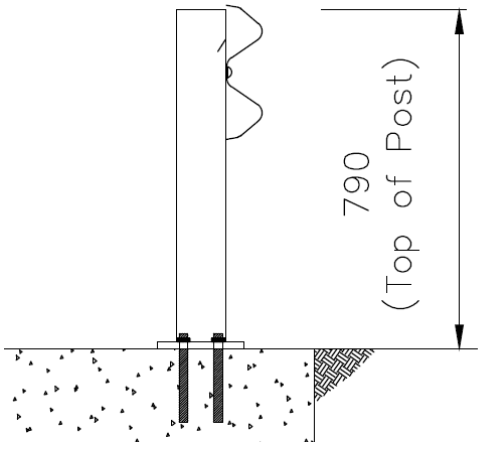
ACP Sentry Barrier W Beam System has been R & D crash tested to MASH TL3 for installation in weak soil in accordance with the AASHTO weak soil classification. When installed in weak soil with the **2100mm long Sentry post**, the 1310mm embedment depth of the longer Sentry post is sufficient to support the system's overall performance in this scenario. See figure below.

The 2100mm long Sentry posts are available from ACP for these applications. Installations in weak soils should be considered within the requirements of the road controlling authority Extended Design Domain requirements. Refer to **Appendices** for assembly detail utilising 2.1m long posts option. Contact ACP for any further guidance and information if required.



Posts on Base Plates

In the event that the **ACP Sentry Barrier W Beam System** cannot be installed to the required in-ground depth, the use of a base plate mounted on a suitable foundation can be adopted. Posts on base plates are typically used at culvert locations, or in areas where underground services restrict posts from being driven into the ground. Refer to **Appendices** for detail drawings on baseplate option. Contact ACP for any further guidance and information if required.



Reduced Post Spacing

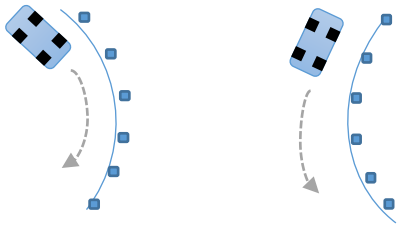
The **ACP Sentry Barrier W Beam System** can accommodate reduced post spacing from 2.0m to 1.0m in the event a reduced dynamic deflection zone is required. The standard assembly TL-3 deflection is reduced by 38% when incorporating the **1.0m post spacing** option.

The variant assembly containing four driven posts and hardware to accommodate the 1.0m spacing can be purchased through your local ACP representative. Refer to the **Appendices** for the detail assembly drawing.

The use of the 1.0m post spacing variant assembly shall be used in accordance with the local state road controlling authority acceptance conditions and guidelines.

Horizontal and Vertical Curves

The **ACP Sentry Barrier W Beam System** can accommodate both horizontally and vertically curved guardrail panels if required by site conditions. For radii less than 25m the system must be anchored with an approved intermediate anchor or terminal end. Please refer to approved details of the local Road Controlling Authority where necessary.



Concave Corner Convex Corner

Undulating Ground Conditions

Site specific grading may be necessary to ensure that there are no 'humps' or 'hollows' that may significantly alter the impacting vehicles stability or substantially alter the W-beam heights in relation to the ground. The **ACP Sentry Barrier W Beam System** is required to be installed level and centred on the barrier line as stated in the Installation Procedure.

Care must be taken to ensure all posts in the **ACP Sentry Barrier W Beam System** are installed to the correct height, alignment and orientation. It is strongly recommended that smoothing of uneven ground conditions be completed along the length of the **ACP Sentry Barrier W Beam System**.

Motorcyclist Protection System

The **ACP Sentry Barrier W Beam System** can accommodate the addition of the **RiderPro** and **RiderPro MP** motorcyclist protections systems.

RiderPro and RiderPro MP attaches directly below the w-beam on new or existing installations. Refer to the ACP website or your local ACP representative for product design and installation information.

Clear Zone / Hazard Free Zone

Clear Zones are areas adjacent to traffic lanes that provide errant vehicles the opportunity to slow down or recover. The clear zone must be kept clear from roadside features that could be hazardous to errant vehicles, such as but not limited to trees, poles, and culverts. Although it is desirable to maximize the available clear zone, please refer to your local Road Controlling Authority for confirmation of the minimum width requirements.

Terminal Ends

The **ACP Sentry Barrier W Beam System** is designed to be compatible with a range of w-beam guardrail terminals ends or crash cushions available in the public domain. It is recommended that **MAX-Tension** terminal ends be used with the **ACP Sentry Barrier W Beam System** for optimal performance. Refer to **Appendices** for connection to end terminals design options.

The purpose of the w-beam guardrail terminals ends, or crash cushions is to provide a soft impact and to prevent the end rail from spearing or impacting the errant vehicle. The terminals ends and crash cushions also provide tensile and deflection strength necessary to ensure the errant vehicle is redirected for the length-of-need required.

- Care must be taken to ensure the correct post spacing is ALWAYS used during the installation.
- Care must be taken to ensure the posts are orientated correctly during installation and to ensure all W-beams bolts are inserted and tightened accordingly.
- Care must be taken to ensure the line posts are installed at the correct height.

Soil Condition

The **ACP Sentry Barrier W Beam System** is a soil-mounted system driven directly into the soil. To meet the barriers performance requires the soil to meet AASHTO Standard Soil requirements set out by MASH 2016 as directed in AS/NZS 3845:1 2015.

Soil conditions on site that do not meet these requirements may require rectification work or alternative installation. Contact your **ACP distributor** for details.

It is strongly recommended that soil tests be completed at the location where the **ACP Sentry Barrier W Beam System** is to be installed. Contact ACP for Post Pull over procedure if required.

Note: All technical information required to assist in designing a site-specific foundation is available from ACP Distributor.

IF SOIL CONDITIONS ON SITE DO NOT MEET OR EXCEED THE REQUIRED STRENGTH, SITE SPECIFIC CONDITIONS, REFER TO A LOCAL GEOTECHNICAL ENGINEER FOR FURTHER ADVICE.

Length of Need

The minimum Length of Need (LoN) of the **ACP Sentry Barrier W Beam System** is dependent on the specific hazard being protected and the posted speed limit. Please refer to state roading authority approval letters for local minimum length requirements.

The minimum length of need for a two-way road with a posted speed limit of 100 km/hr with a clear zone of approaching traffic is recommend as 30 m plus the length of the terminal end regions on either end of the barrier system. We recommend Installers contact their local Roading Control Authority for further information or guidance.

Note: As per the LoN design section of the Roading Control Authorities guidelines, care must be taken when calculating the actual length of a barrier required verses the theoretical length of need.

System Deflection

The transverse deflection of a barrier during a crash is dependent upon the mass, speed, and impact angle of the errant vehicle. The maximum levels of dynamic deflections measured during impact testing are presented below.

	Test 3-10	**Test 3-11**
Vehicle Type	Car	Pick up
Vehicle Mass	1,100 kg	2,270 kg
Vehicle Speed	100 km/hr	100 km/hr
Impact Angle	25°	25°
Dynamic Deflection (2.0m post spacing)	1.02 m	1.59 m

Crash testing typically represents the extremes impact parameters. A review of the proposed barrier location can be undertaken to assess the following variables influence on the likely maximum system deflection;

- Maximum attainable impact angle;
- Design speed; and
- Design vehicle.

The following dynamic deflections results reflect the **1.0m spacing variant** assembly.

	Test 3-10	**Test 3-11**
Dynamic Deflection	0.70 m	0.99 m

The use of the 1.0m post spacing variant assembly shall be used in accordance with the local state road controlling authority acceptance conditions and guidelines.

Please refer to your **ACP distributor** for assistance on determining site specific deflections based on these parameters.

Transitions

A transition zone may be required to connect the **ACP Sentry Barrier W Beam System** to other types of barriers or non-approved terminal ends. Please contact your **ACP distributor** for guidance on acceptable transition systems. Refer to **Appendices** for detailed transition options.

The ACP Sentry Barrier W Beam System can be connected directly to any approved proprietary or public domain **w-beam terminal end** with no transition zone. For terminal ends with an installation height less than 800 mm, the first panel of the barrier system shall be ramped to transition from the terminal end height to the height of the barrier. A maximum ramp angle of 5 degrees is recommended. Please contact your **ACP distributor** for transitions requiring a greater angle change.

ACP Sentry Barrier W Beam System - Parts Identification

ACP Sentry Barrier W Beam System Post (3 views)

ACP Sentry Barrier Bolt, Washer and Nut

W-beam

Splice Bolt and Nut

ALL STEEL COMPONENTS USED IN THE ACP SENTRY BARRIER W BEAM SYSTEM ARE HOT DIPPED GALVANISED IN ACCORDANCE WITH AS/NZS 4680 (AVERAGE MINIMUM COASTING THICKNESS SHOULD BE 35 MICRONS) WITH THE EXCEPTION OF THE ACP SENTRY BARRIER WASHER BEING SPUN GALVANISED.

ACP Sentry Barrier W Beam System – Bill of Materials

Bill of Materials – Checklist per panel (4 m of barrier) installed	Yes
➢ 2x ACP Sentry Barrier W Beam System Posts (per W-beam) ➢ 2x ACP Sentry Barrier Bolt, Washer and Nut (one per post connection) ➢ 1x W-beam ➢ 8x Splice Bolts and Nuts (at the end of W-beam and overlapping the prior W-beam)	
General equipment required ➢ Drilling or compactor suitable for foundation ➢ String line and pegs ➢ Measuring tape ➢ Level ➢ 32mm Wrench ➢ 32mm Ring Spanner	

ACP Sentry Barrier W Beam System – Installation

Getting Started

The **ACP Sentry Barrier W Beam System** is a w-beam barrier designed to run the length of need required and is attached to a compatible terminal end or crash cushion. The minimum Length of Need (LON) allowed is dependent on the post speed limit. For a 100 km/hr zone a minimum LON of 30 metres is recommended, excluding the proposed terminal end or crash cushion.

Preparation

Before installing an **ACP Sentry Barrier W Beam System**, ensure that all components required for the system are on site and have been identified. The **ACP Sentry Barrier W Beam System** is an engineered safety device. Before starting installation ensure familiarity with the makeup of the system. Refer to the Bill of Materials and Parts Identification sections in this manual for more information.

Ensure that the area where the **ACP Sentry Barrier W Beam System** is to be installed is sufficiently flat so that the posts and w-beam can be installed within the allowable tolerance and aligned to the terminal ends or crash cushions. Minor site grading may be required.

Soil Conditions

The **ACP Sentry Barrier W Beam System** has been designed to withstand a constant static load, thermal loading, and dynamic impact load that can be applied from the impact of an errant vehicle. To perform, the **ACP Sentry Barrier W Beam System** must be attached to either a semi rigid or rigid terminal end or crash cushion to provide the necessary safety benefits. It is recommended that the soil tests are carried out at the location the **ACP Sentry Barrier W Beam System** prior to being installed. Contact ACP for **Post Pull** over procedure to test soil adequacy for posts, if required.

IF SOIL CONDITIONS ON SITE DO NOT MEET OR EXCEED THE REQUIRED STRENGTH DETAILED IN THIS MANUAL, SITE SPECIFIC FOUNDATIONS MUST BE DESIGNED BY A LOCAL GEOTECHNICAL ENGINEER

Tools Required

The tools required to install the ACP Sentry Barrier W Beam System are similar to other W-beam barriers. It requires:

- Appropriate personal protective equipment

- Drilling or compactor machinery (suitable for soil conditions and with a driving head to avoid damage to posts during installation)

- String line

- Measuring tape

- Level

- 32mm Socket wrench or Ratchet

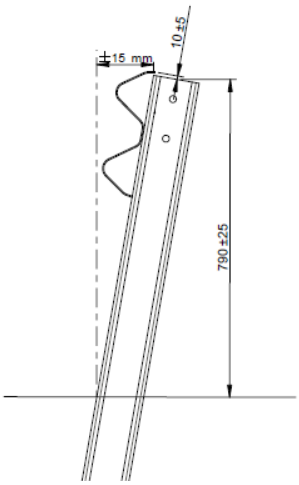
- 32mm Ring spanner

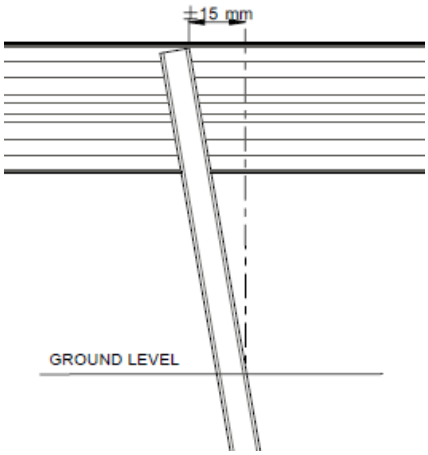
Installation Tolerances

The **ACP Sentry Barrier W Beam System** is an engineered safety device. To obtain optimal performance is it important to install all components of the system to within the allowable tolerances stated below (also in Appendix D and Appendix E). Particular care must be taken to ensure;

- Suitable horizontal alignment and verticality of the line posts.
- Consistency in the vertical height of the line posts.
- Orientation and height of the terminal end or crash cushion.

ACP Sentry Barrier W Beam System has to be installed at 790mm to the top of the post. A vertical height tolerance of ±25mm is acceptable for both the **ACP Sentry Barrier Post**. The top of the W-beam is to be positioned 10mm above the top of the **ACP Sentry Barrier Post** with a tolerance of ±5mm. The **ACP Sentry Barrier Post** laterally is constrained to ±15mm tolerance. It is of upmost importance for these tolerances to be adhered to in order to ensure safe function of the **ACP Sentry Barrier W Beam System**.





ACP Sentry Barrier W Beam System – Installation Instructions

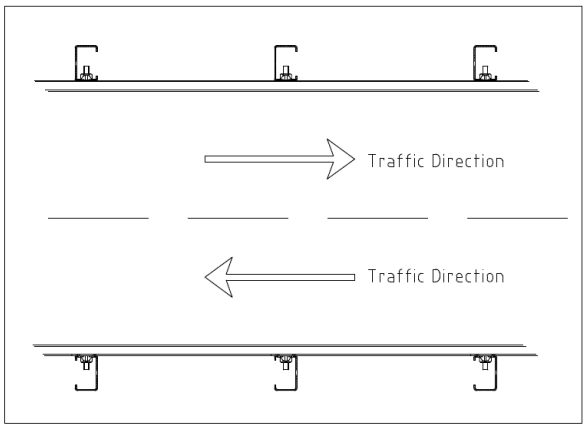
Before installing the **ACP Sentry Barrier W Beam System**, ensure that all components required for the system are on site and have been identified. The **ACP Sentry Barrier W Beam System** is an engineered safety device made up of relatively small number of parts. Please ensure familiarity with the makeup of the system and the installation process prior to commencing. If required, refer to the **Bill of Materials** and **Parts Identification** sections in this manual for more information.

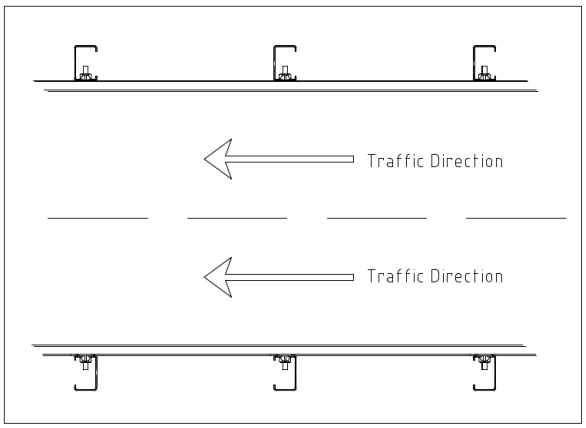
Site Preparation

It is preferred that the **ACP Sentry Barrier W Beam System** be installed on flat, level ground and tethered to an approved terminal end or crash cushion. The positioning of the **ACP Sentry Barrier W Beam System** commences from the last post connected to the terminal end or crash cushion, working upstream to the prior terminal end or crash cushion. It is recommended that a string line be used to obtain the correct orientation and placement of the posts and are aligned to the terminal end or crash cushions.

Post Orientation with traffic flow direction

The Sentry Post Orientation has been successfully tested in both traffic directions and therefore can be placed on the LH and RH side locations of Bi-directional and Uni-directional roads. Refer to below example figures.





BEFORE DRILLING OR EXCAVATION ALWAYS ENSURE THAT THE AREA IS CLEAR OF UNDERGROUND SERVICES

Construction of Terminal End or Crash Cushion

The **ACP Sentry Barrier W Beam System** is compatible with a variety of terminal ends and crash cushions. The selection of a suitable design will depend primarily upon the soil type, and geometric constraints of the site. Please refer to the relevant terminal end or crash cushion Installation Manual for guidance to the construction and installation procedure of that specific device.

Installation Procedure (Posts and W-beam)

Step 1

Review the site location and identify possible hazards prior to commencing the installation of the **ACP Sentry Barrier W Beam System**. Any concerns, please refer to the local Roading Authority.

Step 2

Place a string line from the centre of the downstream terminal end or crash cushion to required location of the upstream terminal end. The string line should pass over the centre of each post location and be marked accordingly as the required location for drilling or driving each post.

Step 3

Identify the correct orientation of the post (refer to Appendix A - ACP SENTRY BARRIER W BEAM SYS) and drive post to the predetermined depth of 850mm (790 mm protruding above ground) as stipulated in Appendix A - ACP SENTRY BARRIER W BEAM SYS. The post must be vertically aligned and within the tolerance level stated in the Installation Tolerance section (page 16). The driving of the post should not incur any damage to the post. If a post is damaged it must be inspected and removed if considered that the damage will affect the performance.

Step 4

Supporting the w-beam in the desire location, install the Sentry Barrier Bolt, Washer and Nut. Once supported, the 8 Splice Bolts and Nuts can be inserted into the W-Beam splice joint. It is vital that each w-beam must overlap the prior w-beam positioned downstream. Failure to correctly overlap the w-beam may cause snagging, poor barrier performance or risk injury or death to the driver of the errant vehicle. Snug tighten all bolts once installed.

Splice Joint location

W-beam Ends






Intermediary Post (middle section)



Step 5

Continue working along the barrier from the first installed w-beam to the terminal end or crash cushion positioned at the other end of the barrier system. Once the barrier is installed a detailed visual inspection should be completed to install all components are correctly installed. All bolts should be confirmed to be installed snug tight.

Inspection and Maintenance Frequency

The **ACP Sentry Barrier W Beam System** is maintenance free. However, it is recommended that all W-beam barrier systems are checked after being impacted to ensure that the appropriate strength is maintained. Refer to Installation Procedure n this manual for more information.

Maintenance requirement for repair after a Bushfire

Following a severe bushfire, a detailed inspection of the **ACP Sentry Barrier W Beam System** should be undertaken. If heat damage is noted, it is recommended the w-beam and posts are replaced immediately.

A detailed inspection should also be completed on the post footings and the transition between the w-beam barrier and terminal end or crash cushion. Any concerns, please refer to the **ACP Sentry Barrier W Beam System** Product Manual or contact ACP for recommendations or inspections of the **ACP Sentry Barrier W Beam System** itself.

	Y	N
General ➢ Ensure the posts are orientated in the correct direction and consistent with the terminal ends or crash cushions. ➢ The height of the finished rail should be 800 mm (±25 mm) above the finished ground level. ➢ The height to the top of the posts should be 790 mm (±25 mm) above finished ground level. ➢ The posts are free from damage. ➢ The correct ACP Sentry Barrier Washer is installed and seated correctly in the back of the post. ➢ All bolts are tightened snug. ➢ The w-beam must be level and aligned to the terminal end or crash cushion in accordance with transition drawings. Refer to *Appendices* for guidance. ➢ Ensure posts are free of debris prior to installing the w-beam.		
Connected to a W-beam Terminal End or Crash Cushion ➢ The top edge of the W-beam must align, both vertically and horizontally, between the **ACP Sentry Barrier W Beam System** and the nominated terminal end in accordance with transition drawings. Refer to *Appendices.*		

Installation Checklist for the ACP Sentry Barrier W Beam System

Comments:

Location:			
Installed by:		Date:	
Inspected by:		Date:	

Contact ACP for more information on this or other road safety products.

Frequently Asked Questions

1. What type of equipment is required to install the ACP Sentry Barrier W Beam System?
   Standard tools required include a wrench, measuring tape, string line and machinery suitable for drilling or compacting the post into soil.

2. Does your company provide spare parts? What is the lead-time for supply?
   It is important to fix a damaged W-beam barrier as soon possible because it most probably won't perform as designed when damaged. For this reason, it is recommended that spares are held by Maintenance Contractors. The lead time for parts will generally be next day delivery or collection from one of our distribution centres.

3. On average, how long does it take to install the ACP Sentry Barrier W Beam System?
   Depending on circumstances at the site, installation and assembly of the system should take a three-person crew less than 15 mins per W-beam panel (4.0 m length) when using automatic post driving equipment. Installation time will vary depending on ground conditions when hand digging and re-compacting posts.

4. What about vandalism, can the ACP Sentry Barrier W Beam System be damaged easily?
   No, once the system has been fully installed it becomes a rigid system unlikely to be damaged or weaken the performance of the system.

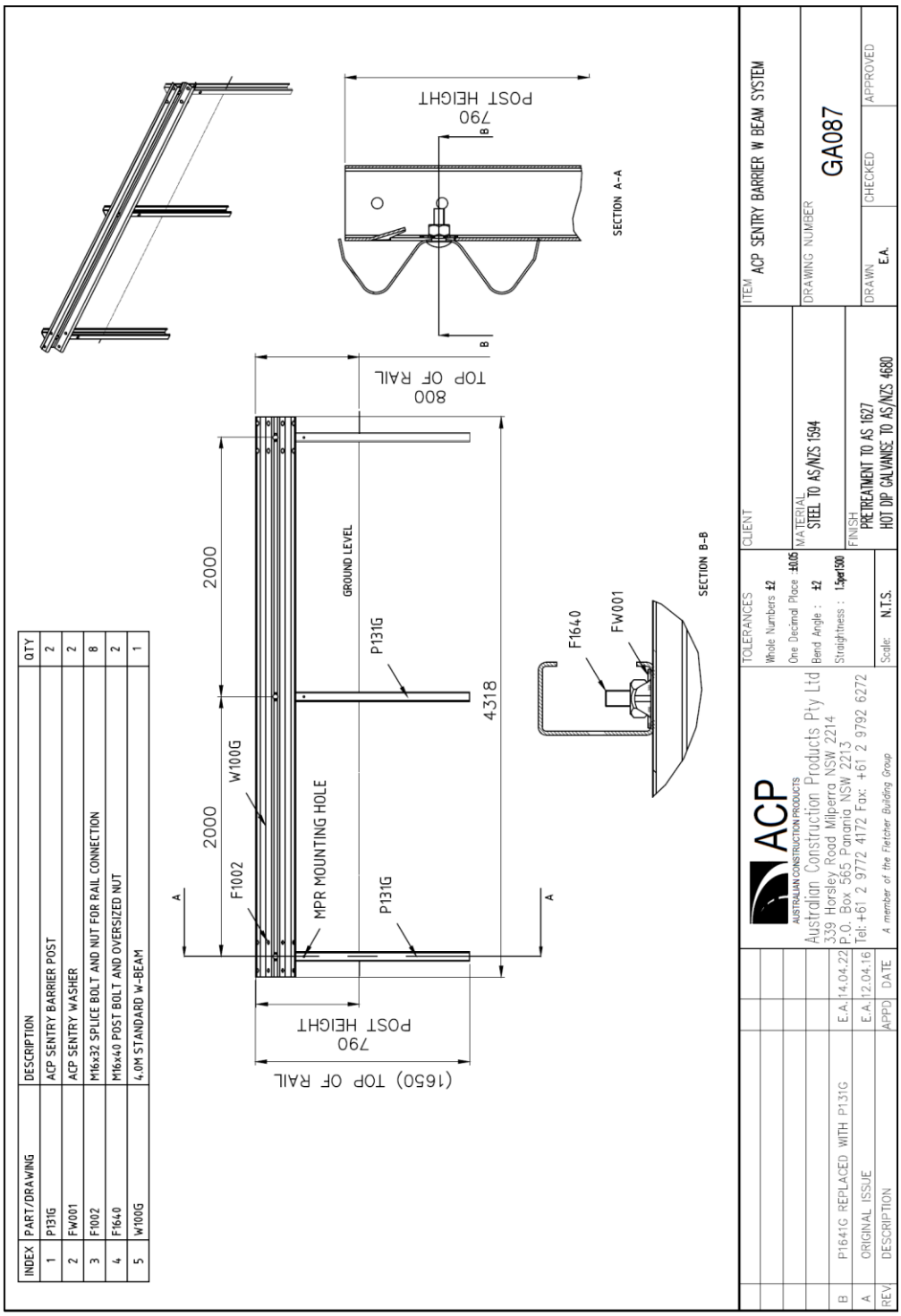
5. How easily can the ACP Sentry Barrier W Beam System be restored after impact?
   ACP Sentry Barrier W Beam System is easily repaired following an impact. Damaged posts can be removed using a crowbar and new posts installed before replacement W-beams and splice bolts are positioned.

   The connection detail used between the post and the rail of the ACP Sentry Barrier W Beam System is designed to limit damage to the post outside of the immediate zone of impact. When the connection is damaged, the washer detail can be easily replaced without needing to replace the post.

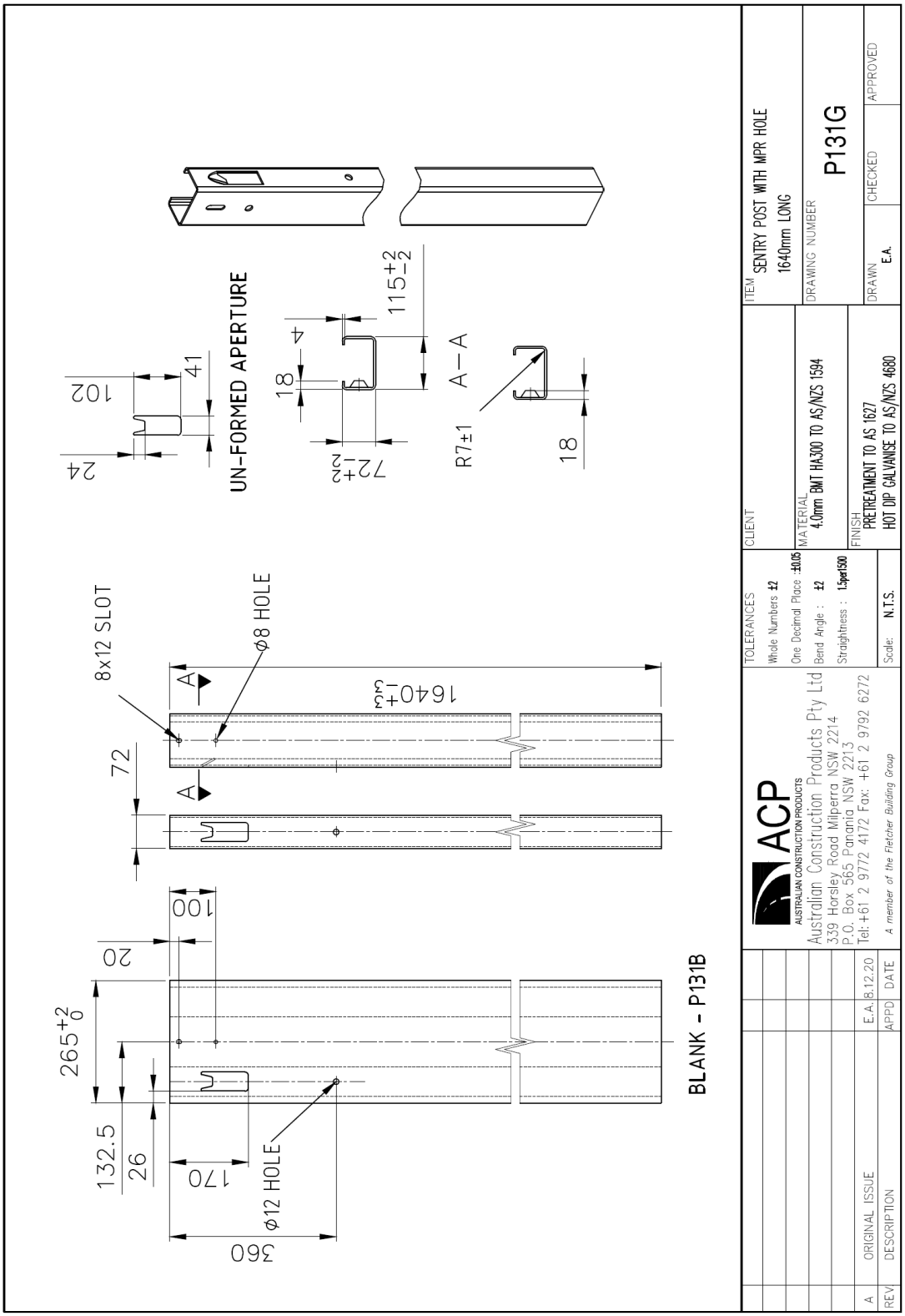
6. What maintenance does the ACP Sentry Barrier W Beam System require?
   The ACP Sentry Barrier W Beam System is maintenance free. However, it is recommended that all W-beam barrier systems are checked after impacts to ensure that the integrity of the barrier is maintained.

Appendices

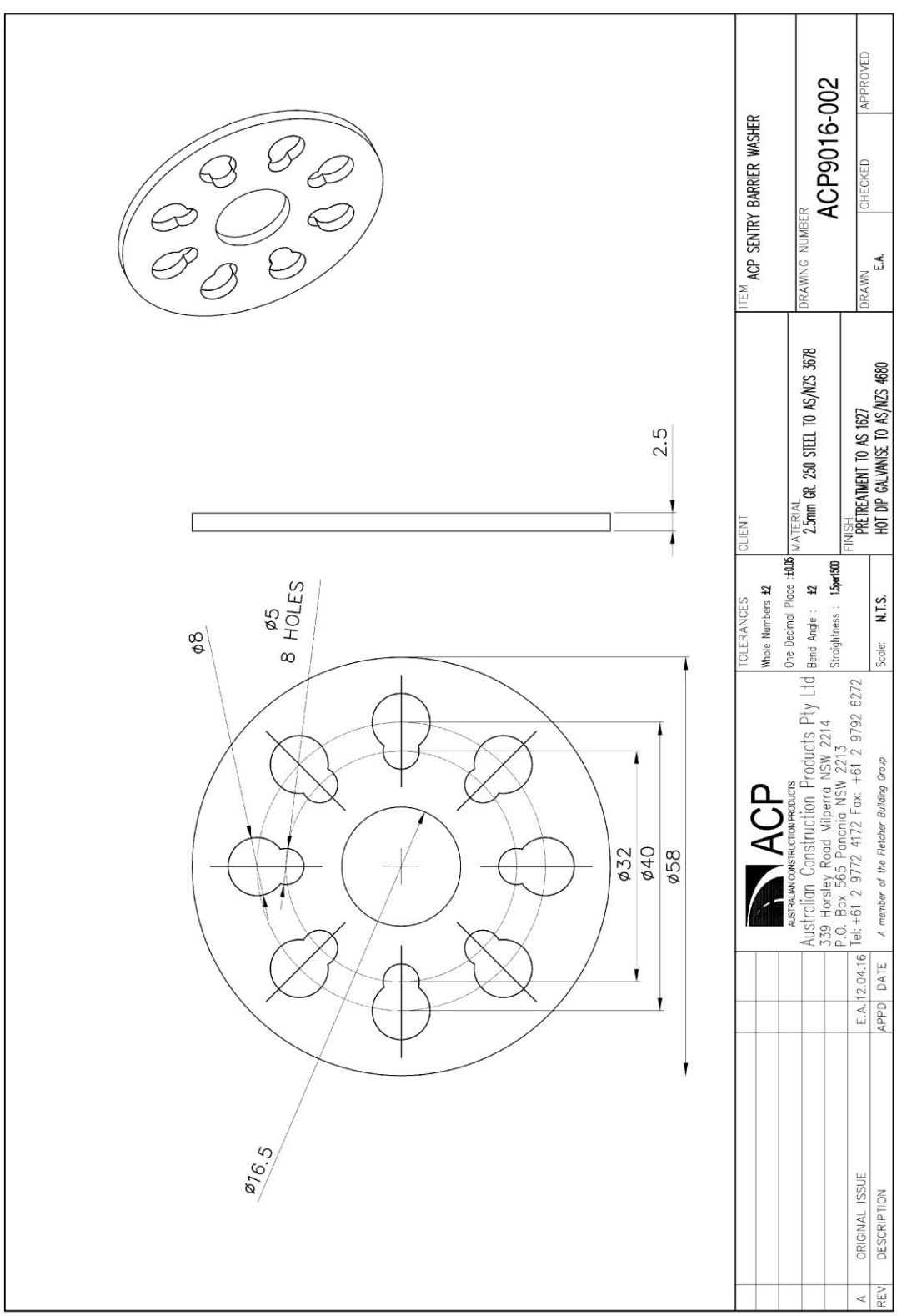
Appendix A – ACP SENTRY BARRIER W BEAM SYSTEM



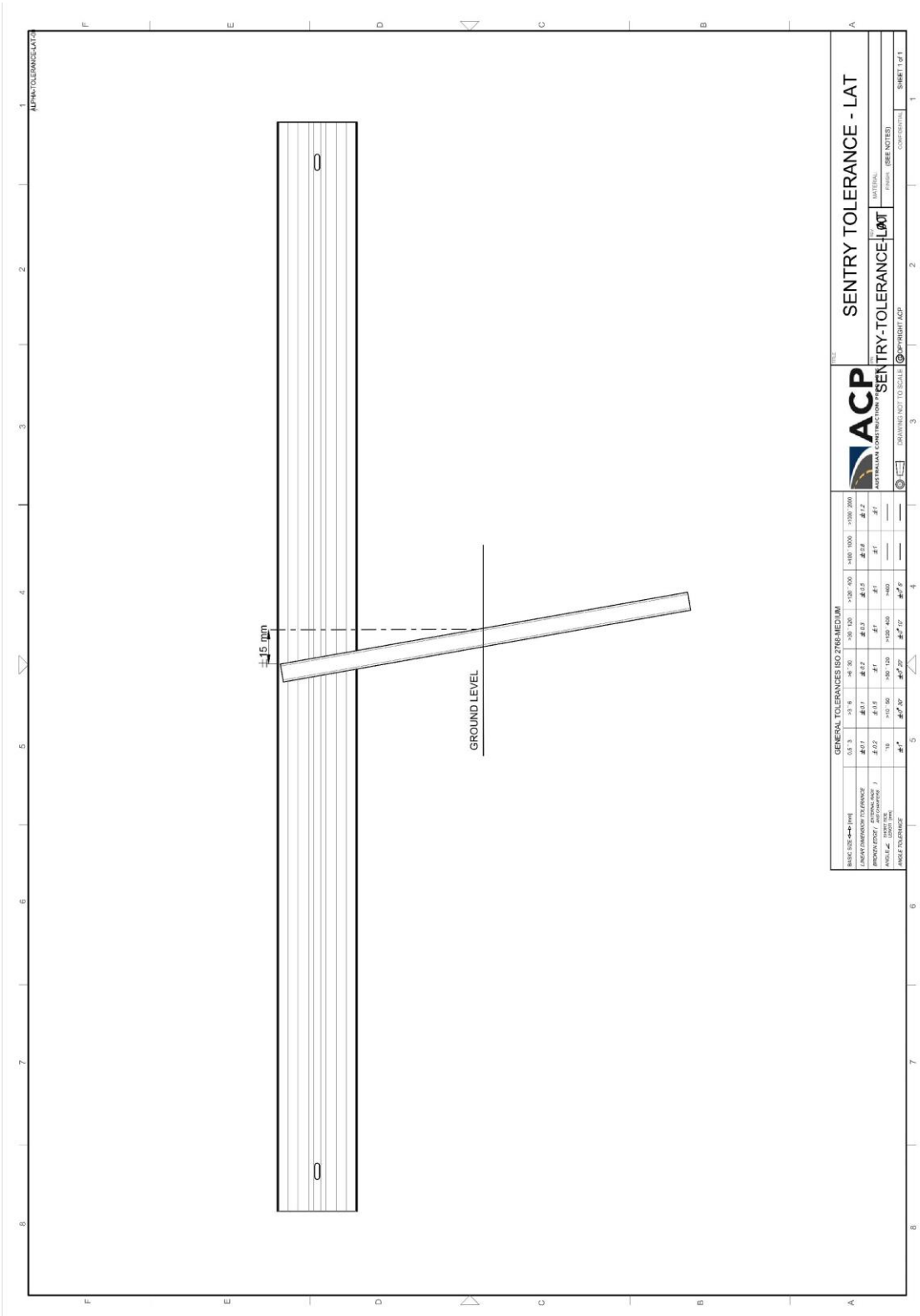
Appendix B – ACP SENTRY BARRIER POST



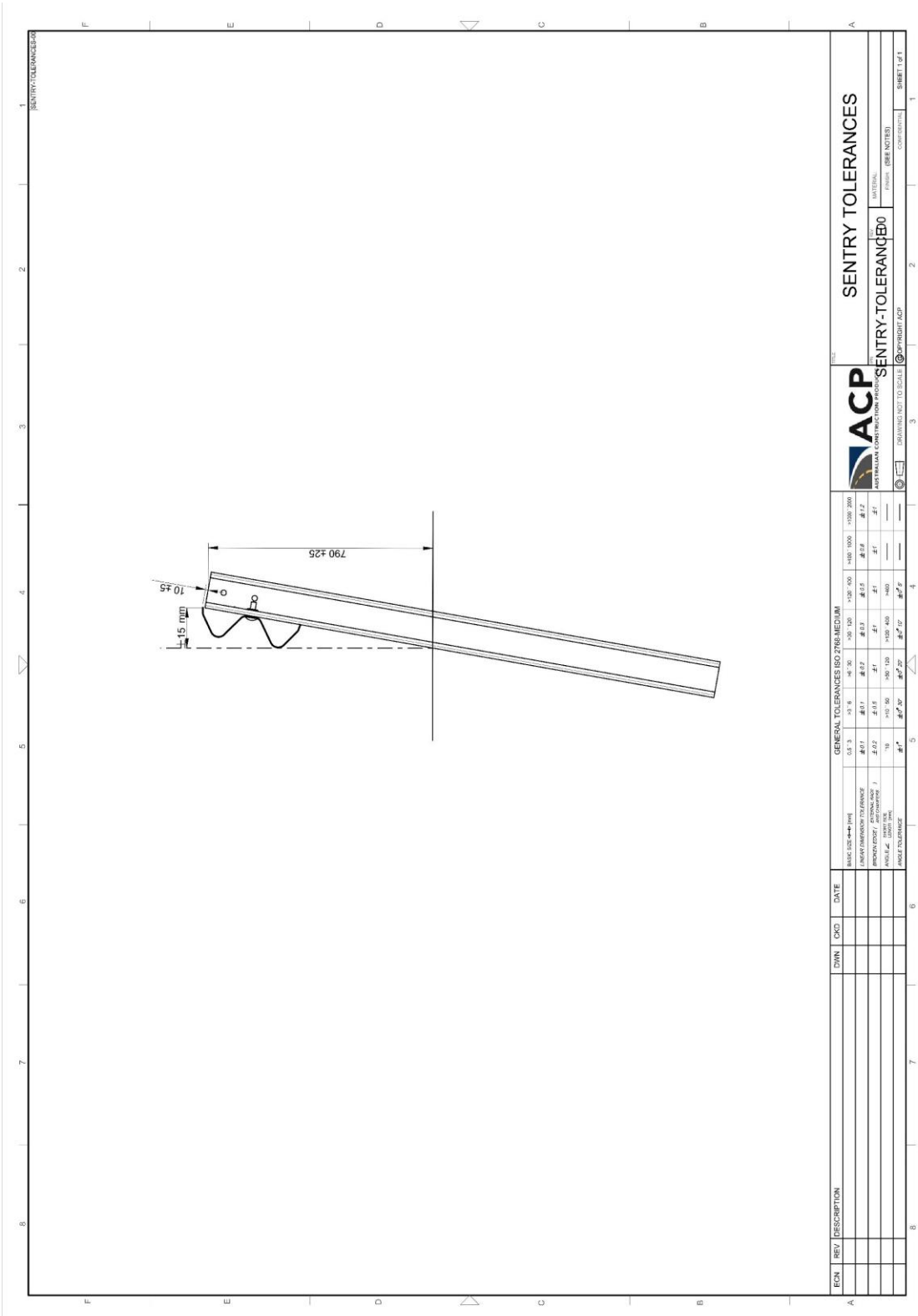
Appendix C – ACP SENTRY BARRIER WASHER



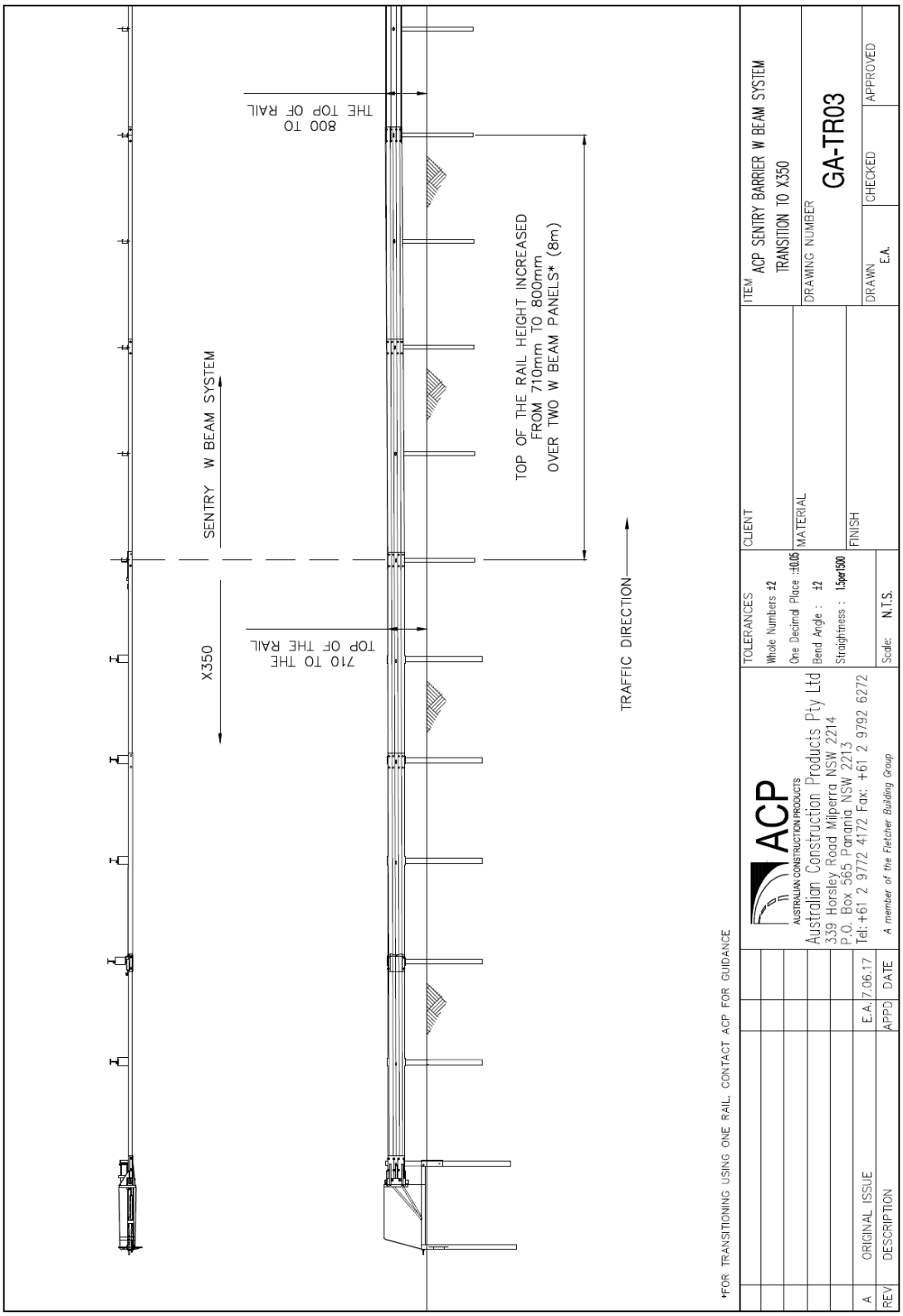
Appendix D – INSTALLATION TOLERANCE (LATERAL)



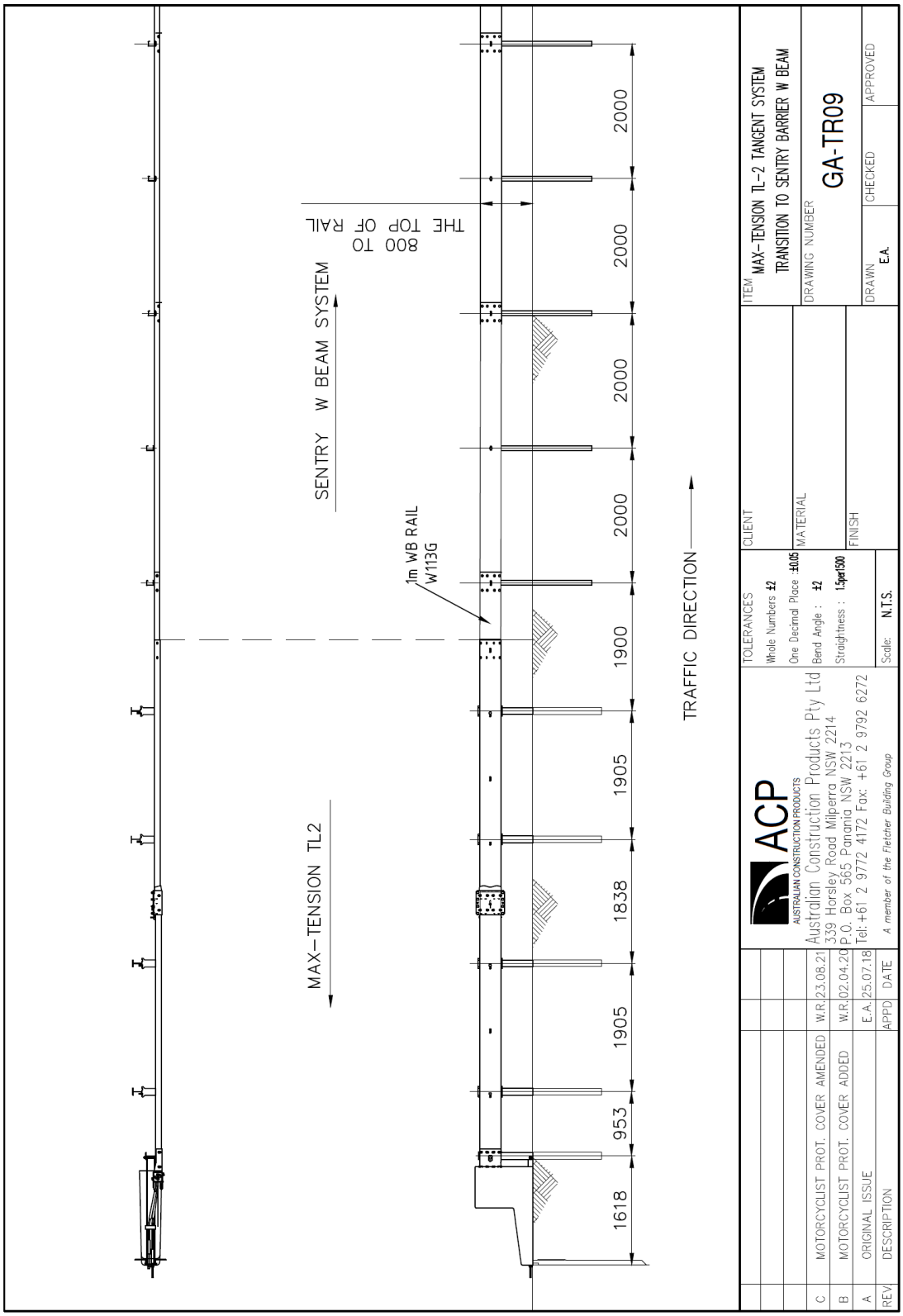
Appendix E – INSTALLATION TOLERANCE (VERTICAL)



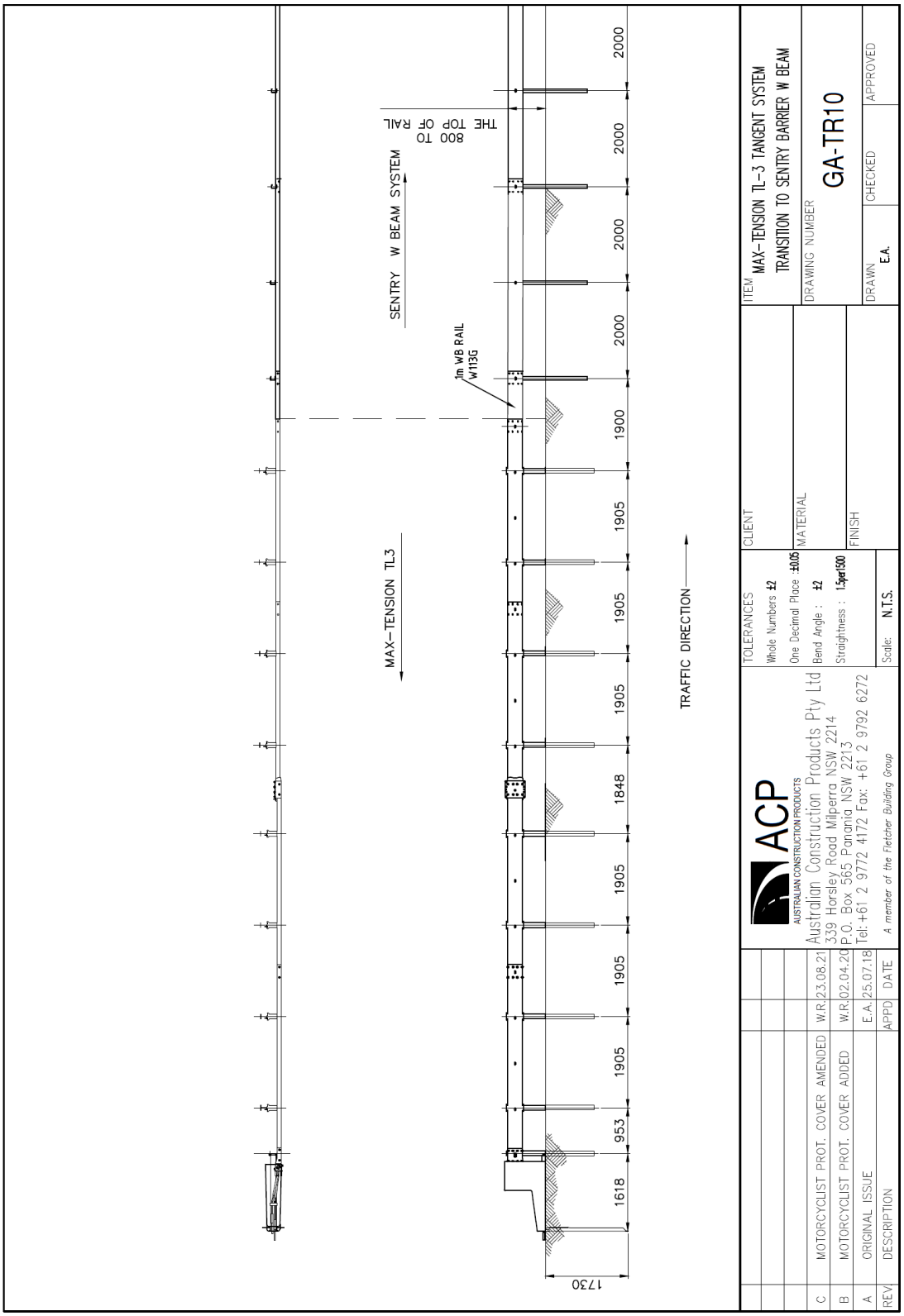
Appendix F – SENTRY W BEAM TRANSITION TO X350 TERMINAL



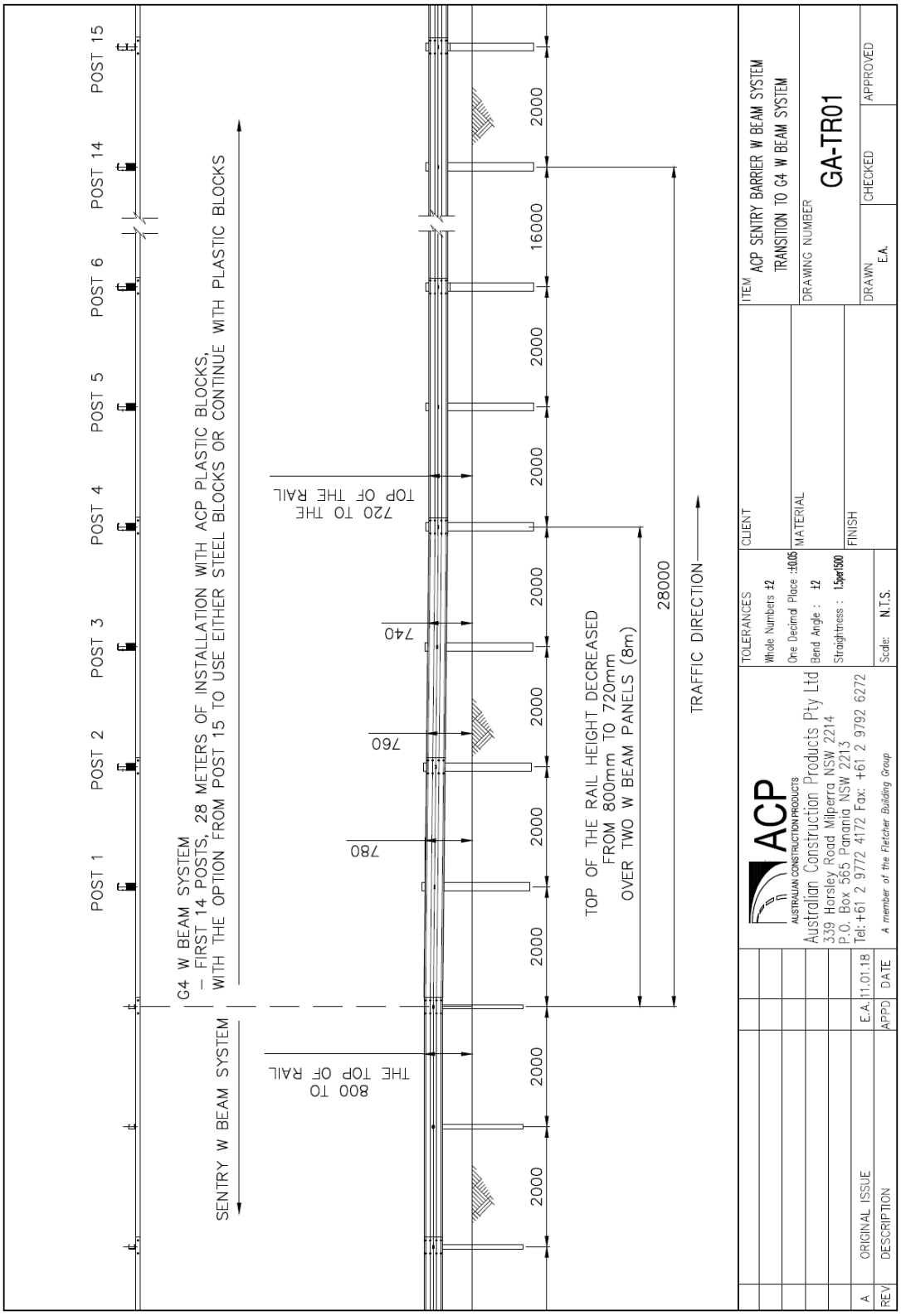
Appendix G – SENTRY W BEAM TRANSITION TO MAX-TENSION TL-2 TERMINAL



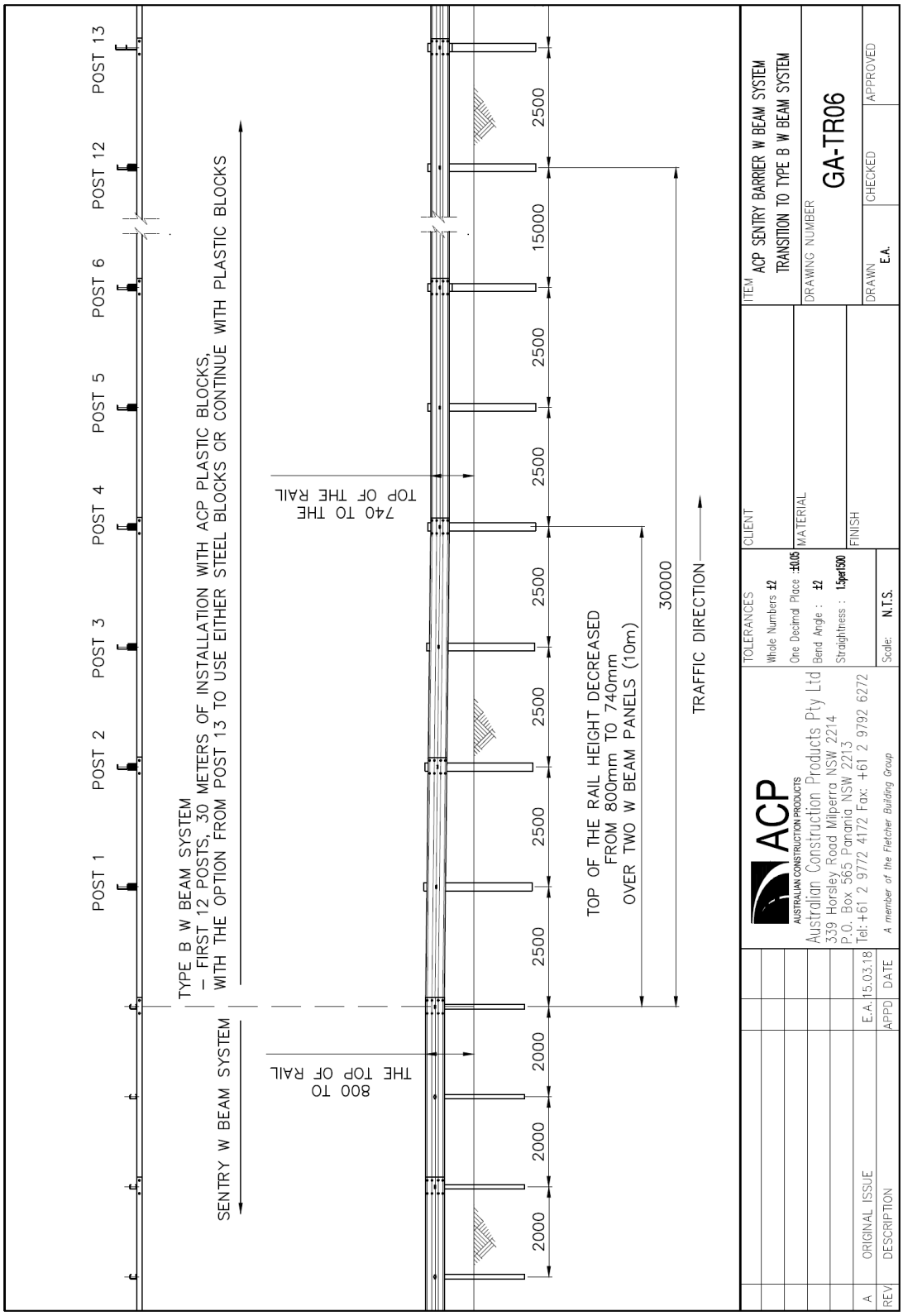
Appendix H – SENTRY W BEAM TRANSITION TO MAX-TENSION TL-3 TERMINAL



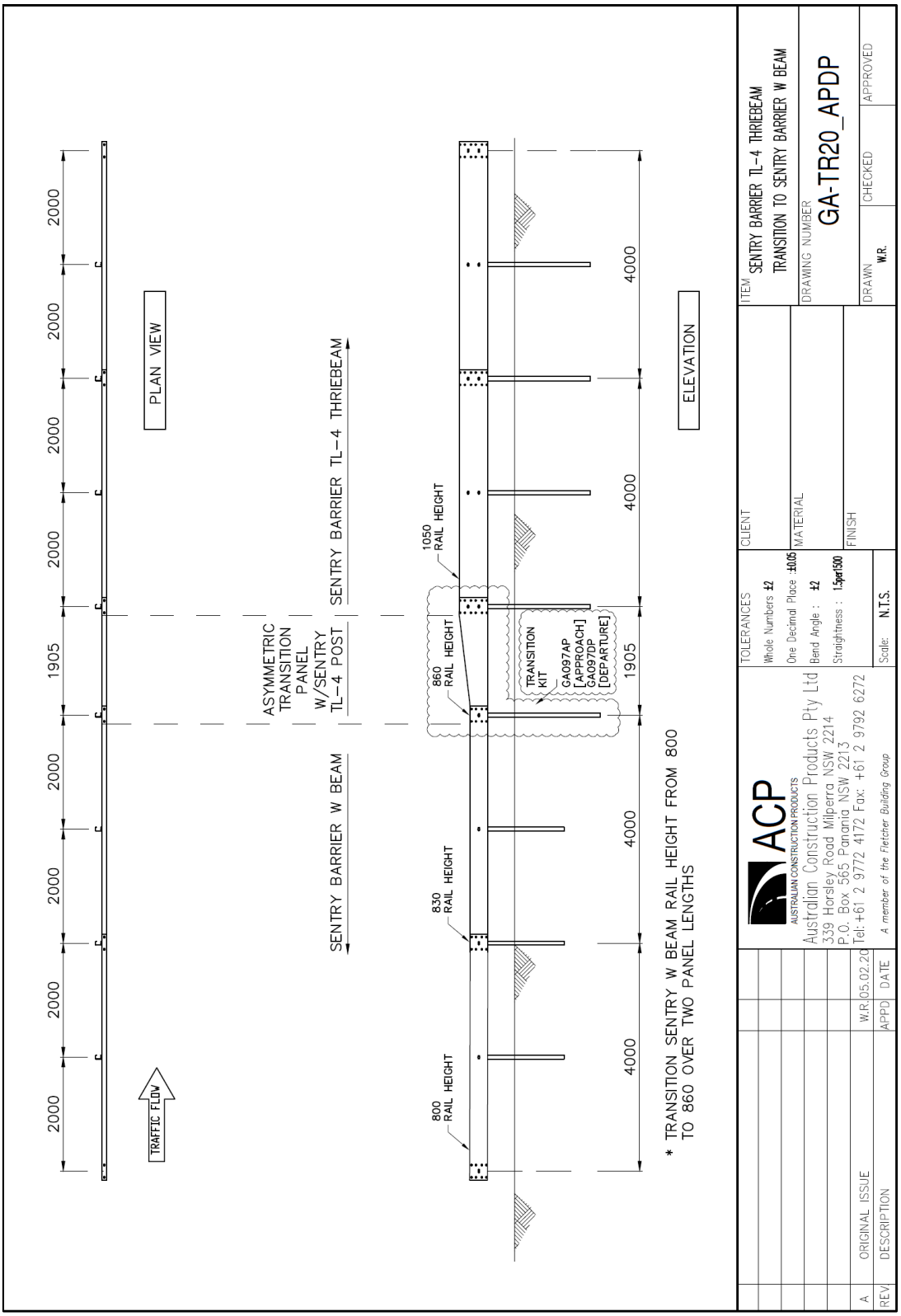
Appendix I – SENTRY W BEAM BARRIER TRANSITION TO G4 W BEAM SYSTEM



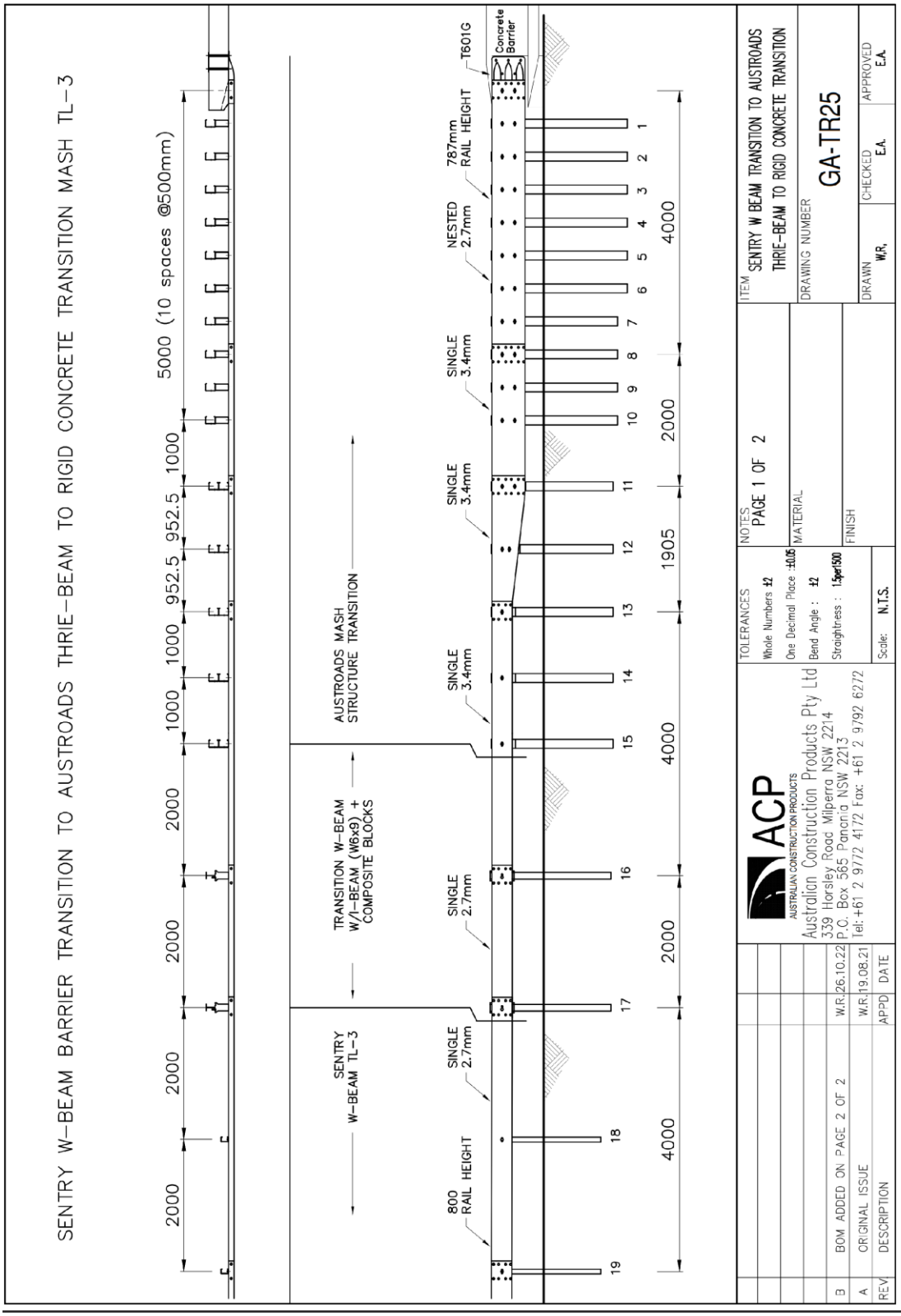
Appendix J – SENTRY W BEAM BARRIER TRANSITION TO TYPE B W BEAM SYSTEM



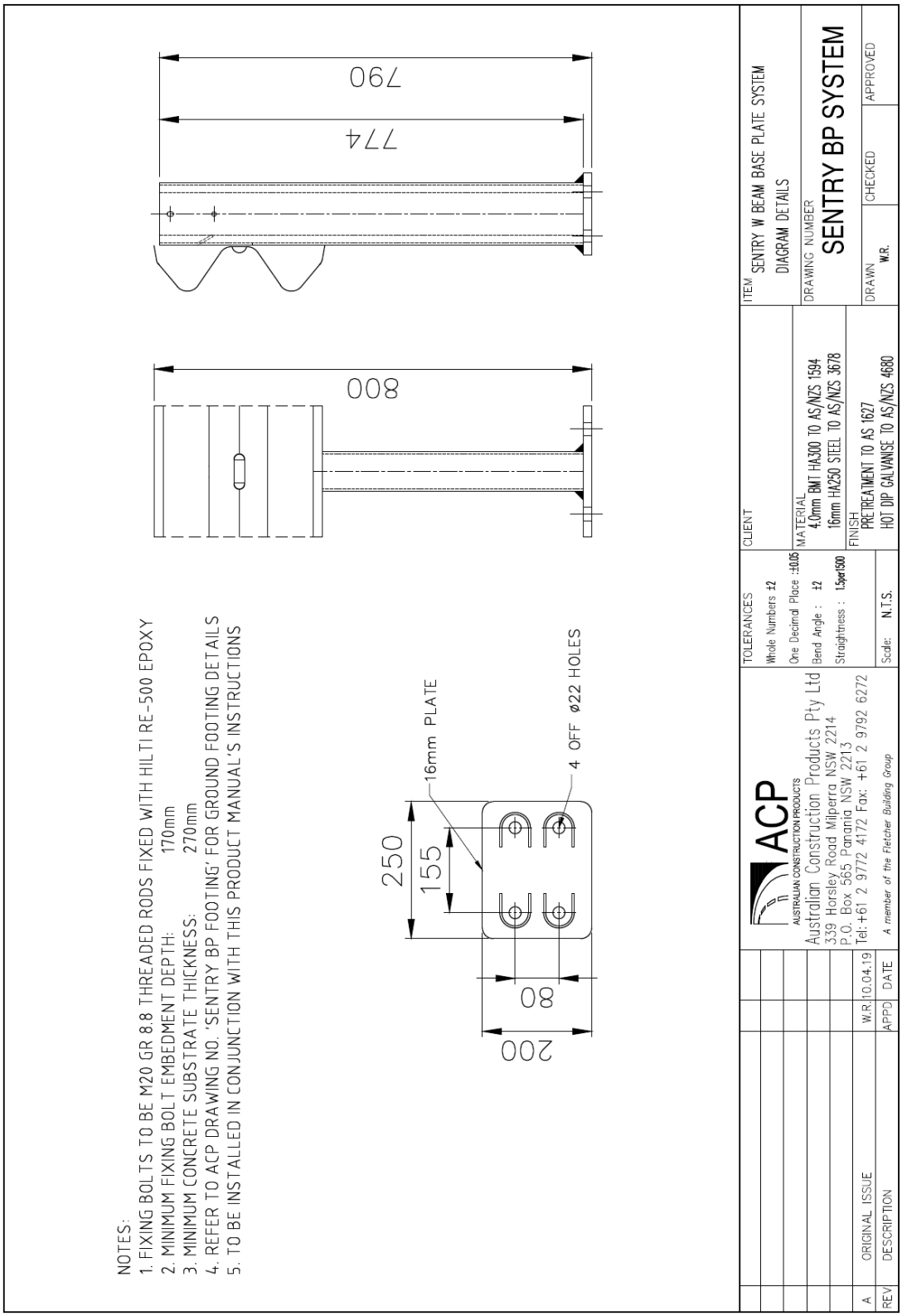
Appendix K – SENTRY W BEAM BARRIER TRANSITION TO SENTRY TL-4 THRIEBEAM



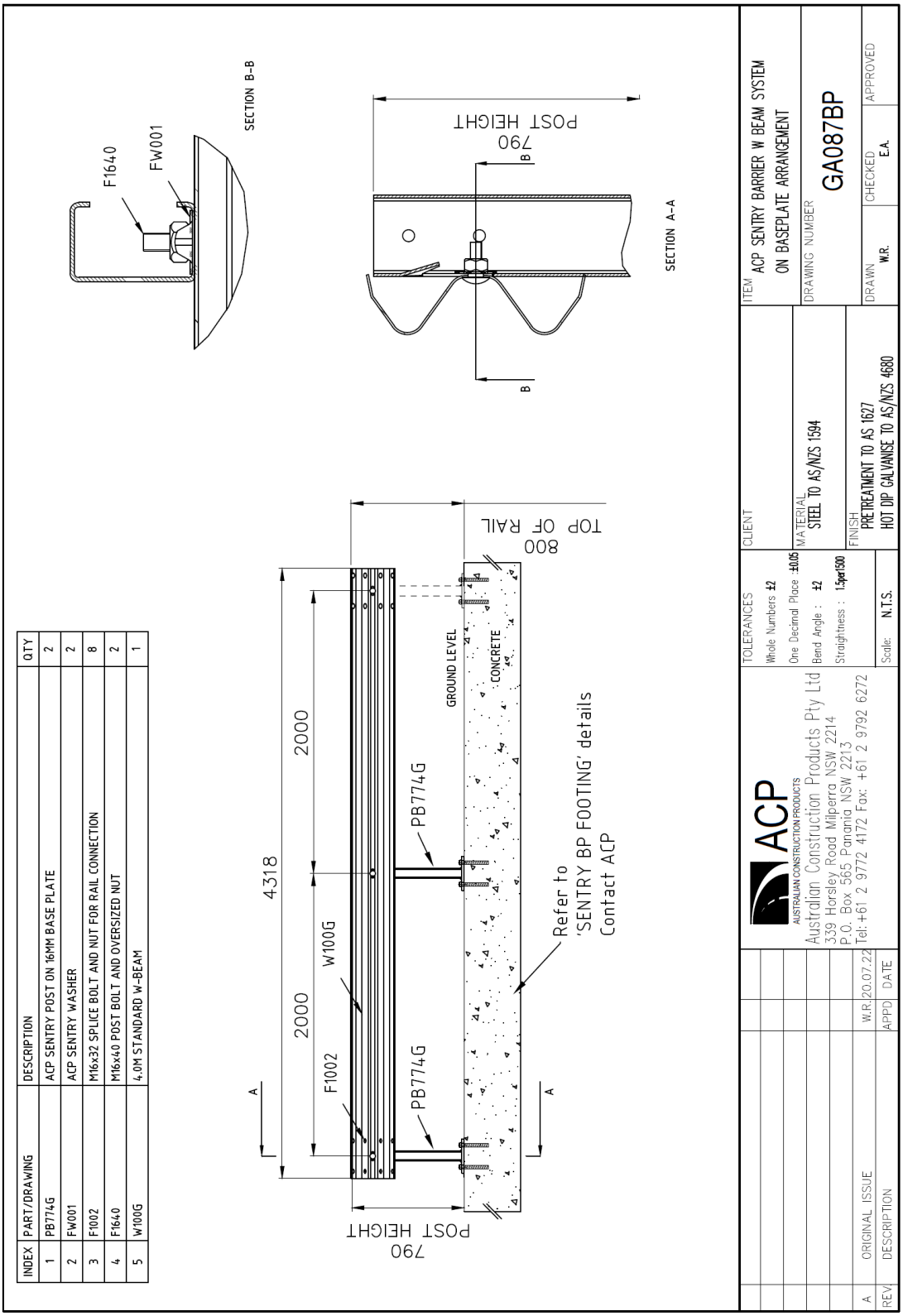
Appendix L – SENTRY W BEAM BARRIER TRANSITION TO AUSTROADS CONC. TL-3



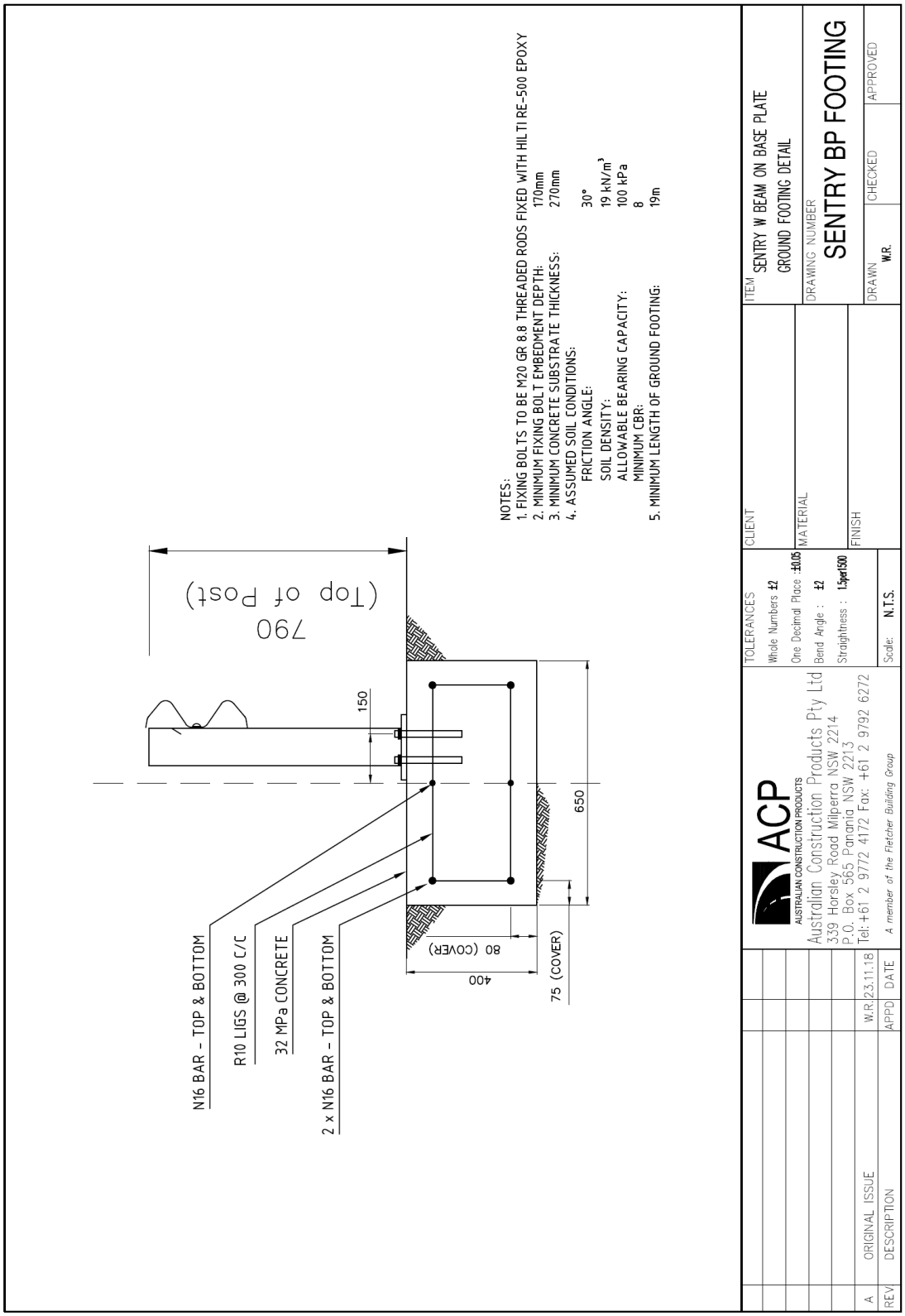
Appendix M – SENTRY W BEAM BARRIER BASE PLATE OPTION



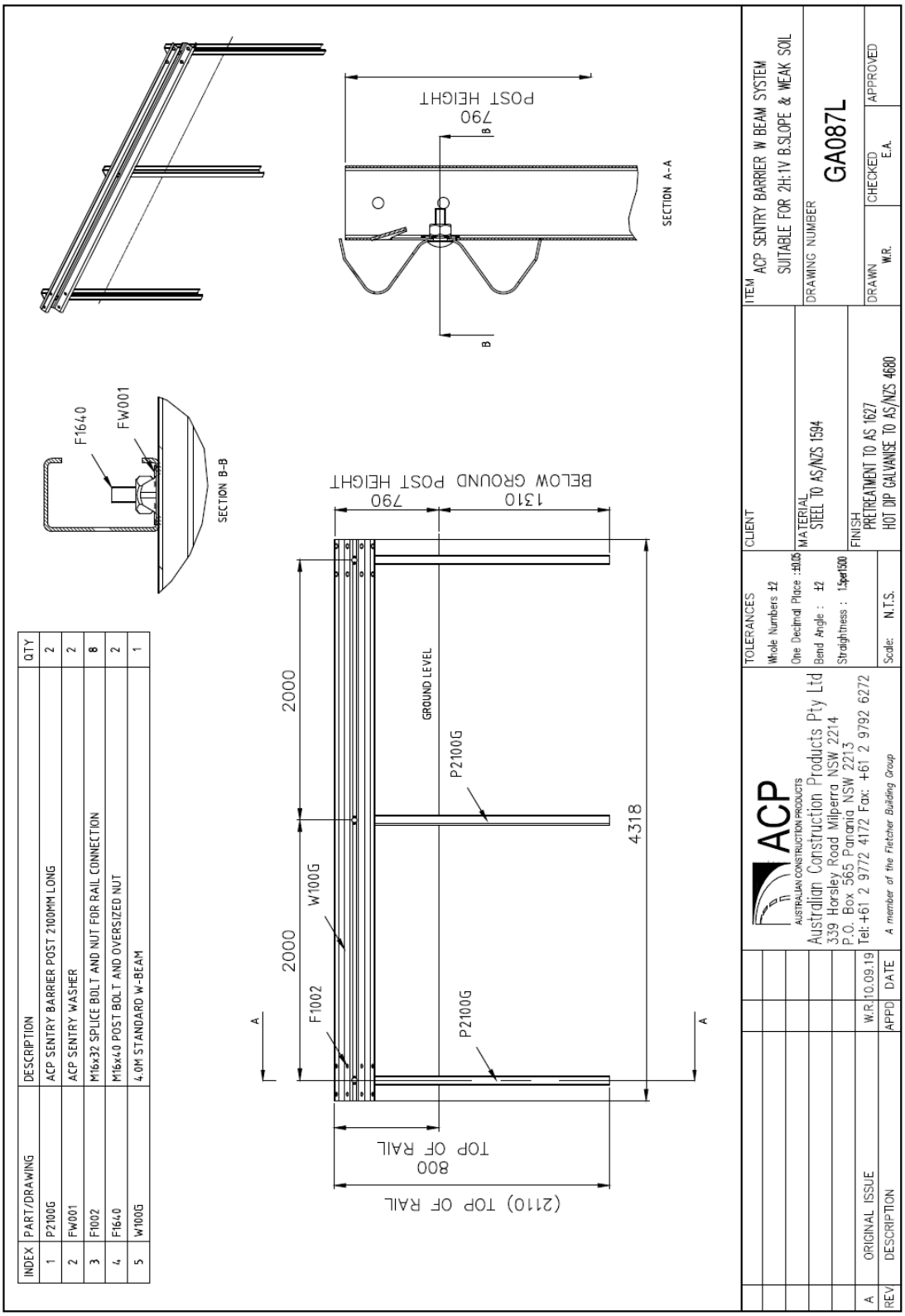
Appendix N – SENTRY W BEAM BASE PLATE OPTION – ASSEMBLY DETAILS



Appendix O – SENTRY W BEAM BASE PLATE OPTION – FOOTING DETAILS



Appendix P – ACP SENTRY W BEAM TO SUIT 2H:1V B.SLOPE & WEAK SOIL



Appendix Q – ACP SENTRY W BEAM – 1.0 M POST SPACING ASSEMBLY DETAILS