



Sentry Barrier

Longitudinal Barrier

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Introduction

The Sentry Barrier 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 (TL-3) for a longitudinal barrier. This is the current state of the art performance criteria, exceeding the requirements of NCHRP 350 TL-3.

The Sentry Barrier has an initial installation height of 800 mm to the top of the rail, providing the system with the ability to withstand numerous road surface overlays without the need to relevel or lifting of the barrier. The Sentry Barrier 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™ End Terminal be used for optimal performance.

The rounded edges to the Sentry Barrier Post and closed shape on the approach direction provide increased protection for vulnerable road users. The compact Sentry Barrier posts 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 Sentry Barrier is installed quickly using conventional installation tools and equipment.

System Overview

The Sentry Barrier 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 TL-3. 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 TL-3 are so stringent that the system is required to absorb more energy during the impact than the out-dated NCHRP 350 standard TL-4.

When impacted by an errant vehicle, the Sentry Barrier 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 Sentry Barrier are:

System width	201mm
Height to top of rail	800mm
Height to top of post	790mm
Post weight	13.7kg
Post length	1.64m
Post spacing	1.905m
MASH TL3.10 dynamic deflection	1.02m
MASH TL3.11 dynamic deflection	1.59m

The minimum Length of Need (LON) of the Sentry Barrier is dependent on the posted speed limit. Please refer to Roadway Controlling 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 recommended as 30 m, excluding terminal ends.

The Sentry Barrier system's 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 Sentry Barrier 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 successfully 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 Sentry Barrier 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 Sentry Barrier must be in accordance with the Roadway Controlling Authority's 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 Sentry Barrier. This includes the correct identification of each Sentry Barrier 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 Sentry Barrier 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 Sentry Barrier.

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 Sentry Barrier 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 Sentry Barrier 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.

Sentry Barrier 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

CSP® has tested the impact performance of its barrier systems and crash cushion systems, and other highway safety hardware under controlled conditions, however, CSP does not represent nor warrant that the results of those controlled conditions would necessarily avoid injury to persons or property.

TO THE MAXIMUM EXTENT PERMITTED BY LAW, CSP 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.

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

TO THE MAXIMUM EXTENT PERMITTED BY LAW, CSP EXPRESSLY DISCLAIMS 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. CSP'S LIABILITY UNDER THIS WARRANTY IS EXPRESSLY LIMITED TO REPLACEMENT FREE OF COST OF PARTS SUPPLIED BY CSP ONLY (IN THE FORM AND UNDER THE TERMS ORIGINALLY SHIPPED), OR TO REPAIR OR TO MANUFACTURE BY CSP, PRODUCTS OR PARTS NOT COMPLYING WITH CSP SPECIFICATIONS, OR, AT CSP'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. CSP 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 CSP 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 CSP's plant for inspection in accordance with return shipping instructions that CSP shall furnish to the Buyer forthwith upon receipt of the Buyer's notice of claim. If the claim is established, CSP 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.

The customer acknowledges that it has acquired the Goods for the purposes of a business and that the Consumer Guarantees Act 1993 will not apply to the supply of the Goods by CSP to it.

System Design and Design Considerations

Kerbs

As with all road side safety hardware, the Sentry Barrier 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 Sentry Barrier 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.

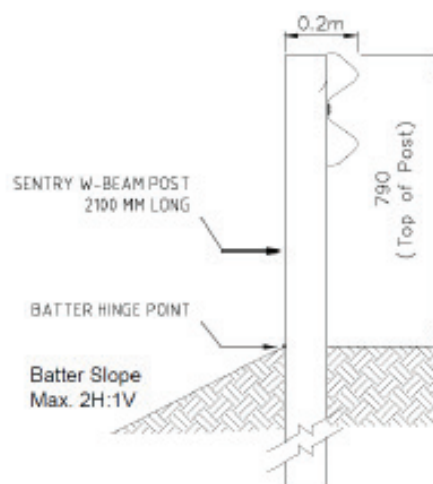
Slopes

The Sentry Barrier can be installed on ground with a maximum cross fall of 6H:1V. For steeper slopes it is recommended that the system is installed no closer than 300 mm to the batter hinge point of the slope. If installations with less clearance are required, please contact CSP.

Batter Hinge Proximity

Sentry Barrier has been R & D crash tested to MASH TL-3 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.

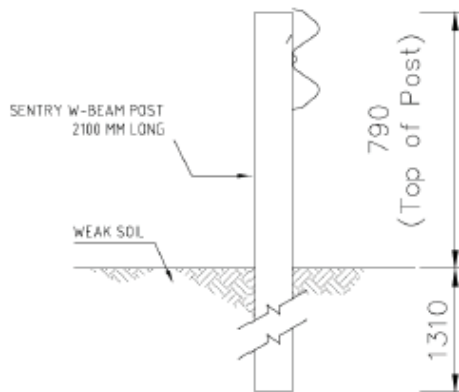
As the proximity to the batter slope reduces the soil support to the post, a 2100mm long Sentry Post is required. Installations in close proximity to a batter hinge point should be considered within the requirements of the Road Controlling Authority Extended Design Domain requirements.



Weak Soil Installations

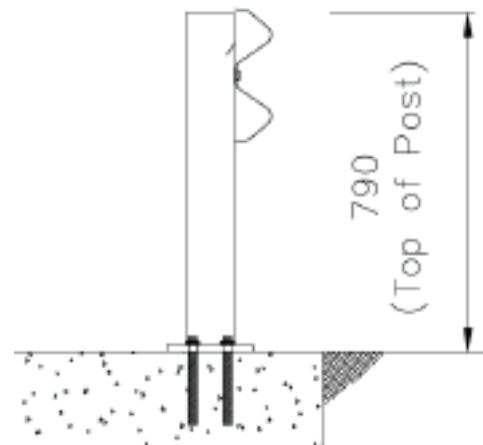
Sentry Barrier has been R & D crash tested to MASH TL-3 for installation in weak soil in accordance with the AASHTO weak soil classification. When installed in weak soil with the 2100mm long Sentry Post, the 1310mm embedment depth of the longer Sentry Post is sufficient to support the system's overall performance in this scenario. See figure below.

The 2100mm long Sentry Posts are available from CSP for these applications. Installations in weak soils should be considered within the requirements of the Road Controlling Authority Extended Design Domain requirements. Contact CSP for any further guidance and information if required.



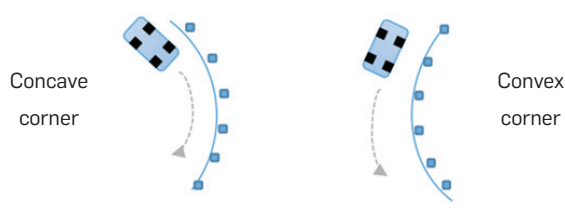
Posts on Base Plates

In the event that the Sentry Barrier 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, and in areas where underground services restrict posts from being driven into the ground. Refer to Appendix G – SENTRY W-BEAM BARRIER BASE PLATE OPTION. Contact CSP for any further guidance and information if required.



Horizontal and Vertical Curves

The Sentry Barrier 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.



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 Sentry Barrier 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 Sentry Barrier 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 Sentry Barrier.

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 an 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 Sentry Barrier 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 End Terminal be used with the Sentry Barrier for optimal performance. Refer to Appendix F – Sentry Barrier TRANSITION TO MAX-Tension End Terminal.

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 Sentry Barrier is a soil-mounted system driven directly into the soil. Sentry Barrier posts should be installed in soil conditions that meet AASHTO Grade B standard and requirements set out by AS/NZS 3845:1999 and TNZ Specification M/4 2006.

Soil conditions that do not meet these requirements will require alternative installation. Contact CSP for details.

It is strongly recommended that soil tests be completed at the location where the Sentry Barrier is to be installed.

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

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 Sentry Barrier is dependent on the specific hazard being protected and the posted speed limit. Please refer to Road Controlling Authority approval letters for local minimum length requirements.

The minimum length of need for a two-way road with a posted speed limit of 100km/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 Authority's 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	1,100kg	2,270kg
Vehicle speed	100km/h	100km/h
Impact angle	25°	25°
Dynamic deflection	1.02m	1.59m

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.

Please refer to CSP for assistance on determining site specific deflections based on these parameters.

Transitions

A transition zone may be required to connect the Sentry Barrier to other types of barriers or non-approved terminal ends. Please contact CSP for guidance on acceptable transition systems. Refer to Appendix F & Appendix G for guidance.

The Sentry Barrier 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 800mm, 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 CSP for transitions requiring a greater angle change.

Parts Identification



Sentry Barrier Post (3 views)



Sentry Barrier Bolt, Washer & Nut



W-Beam



Splice, Bolt and Nut

ALL STEEL COMPONENTS USED IN THE SENTRY BARRIER ARE HOT DIPPED GALVANISED IN ACCORDANCE WITH AS/NZS 4680

Bill of Materials

Checklist per panel (3.81 m of barrier) installed	Y
2x Sentry Barrier Posts (per W-Beam)	
2x 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)	
Drilling or compactor suitable for foundation	
String line and pegs	
Measuring tape	
Level	
32mm Wrench	
32mm Ring Spanner	

Installation

Getting Started

The Sentry Barrier 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 100km/hr zone a minimum LoN of 30 metres is recommended, excluding the proposed terminal end or crash cushion.

Preparation

Before installing an Sentry Barrier, ensure that all components required for the system are on site and have been identified. The Sentry Barrier 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 Sentry Barrier 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 Sentry Barrier 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 Sentry Barrier 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 Sentry Barrier prior to being installed.

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 Sentry Barrier are similar to other W-Beam barriers. It requires:

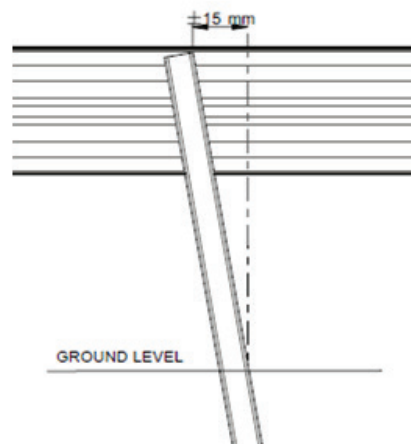
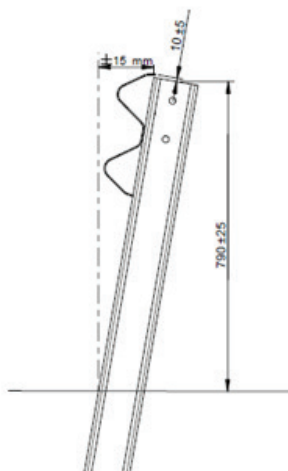
- Appropriate personal protective equipment
- Drilling or compactor machinery (suitable for soil conditions and with a driving head to avoid damage to posts during installation)
- String line
- Measuring tape
- Level
- 32mm Socket wrench or Ratchet
- 32mm Ring spanner

Installation Tolerances

The Sentry Barrier is an engineered safety device. To obtain optimal performance it is 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.

Sentry Barrier has to be installed at 790mm to the top of the post. A vertical height tolerance of $\pm 25\text{mm}$ is acceptable for Sentry Barrier post. The top of the W-Beam is to be positioned 10mm above the top of the Sentry Barrier post with a tolerance of $\pm 5\text{mm}$. The Sentry Barrier Post laterally is constrained to $\pm 15\text{mm}$ tolerance. It is of upmost importance for these tolerances to be adhered to in order to ensure safe function of the Sentry Barrier.



Installation Instructions

Before installing the Sentry Barrier, ensure that all components required for the system are on site and have been identified. The Sentry Barrier 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.

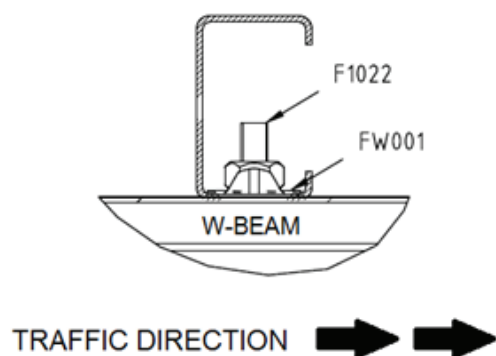
Site Preparation

It is preferred that the Sentry Barrier be installed on flat, level ground and tethered to an approved terminal end or crash cushion. The positioning of the Sentry Barrier 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

Ensure posts are correctly orientated in relation to traffic flow direction by positioning the closed side of the post towards oncoming traffic. Refer to below.

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



Post driver machine - Impact head

Ensure a suitable post driver impact head that has been designed to drive Sentry posts is used in order to avoid damage to posts during installation. Below are examples of suitably designed impact heads. Contact CSP for assistance if required.



In cases where very hard ground conditions are encountered, minor deformation may occur near the top of the post. If it occurs, please refer to Appendix I – ACCEPTABLE POST DEFORMATION MEASURES & TOLERANCES, to determine if the deformation is acceptable for the continuation of installation.

Construction of Terminal End or Crash Cushion

The Sentry Barrier 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 Sentry Barrier. 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.



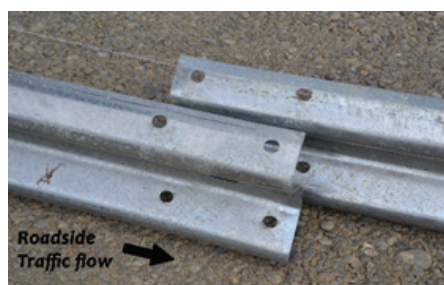
Step 3

Identify the correct orientation of the post (refer to Appendix A - Sentry Barrier) and drive post to the predetermined depth of 850mm (790mm protruding above ground) as stipulated in Appendix A - Sentry Barrier. 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.

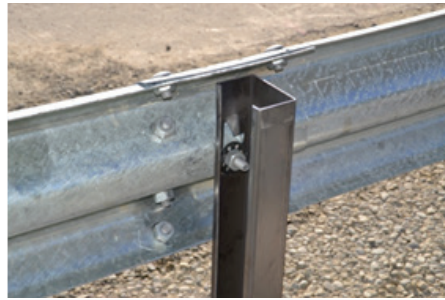


Step 4

Supporting the W-Beam in the desired 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 ensure all components are correctly installed. All bolts should be confirmed to be installed snug tight.



Inspection and Maintenance Frequency

The Sentry Barrier 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 the installation procedure in this manual for more information.

Maintenance requirement for repair after a fire

Following a severe fire a detailed inspection of the Sentry Barrier 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 Sentry Barrier Installation Manual or contact CSP for recommendations or inspections of the Sentry Barrier itself.

Installation Checklist

Item	Y	N
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 800mm (± 25 mm) above the finished ground level.		
The height to the top of the posts should be 790mm (± 25 mm) above finished ground level. It should be ensured that the post DOES NOT protrude above the W-Beam.		
The posts are free from damage.		
The correct 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 Appendix F of the Product and Installation Manual for guidance.		
Ensure posts are free of debris prior to installing the W-Beam.		
The top edge of the W-Beam must align, both vertically and horizontally, between the Sentry Barrier and the nominated terminal end in accordance with transition drawings. Refer to Appendix F of the Product and Installation Manual.		

Job Number:	
Location:	
Client/Asset Owner:	
Principal Contractor:	
Installer:	
Installed by:	Date:
Inspected by:	Date:

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

Frequently Asked Questions

1. What type of equipment is required to install the Sentry Barrier?

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 Sentry Barrier?

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 (4.0m 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 Sentry Barrier 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 Sentry Barrier be restored after impact?

Sentry Barrier is easily repaired following an impact. Damaged posts can be removed using a crow bar 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 Sentry Barrier 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.

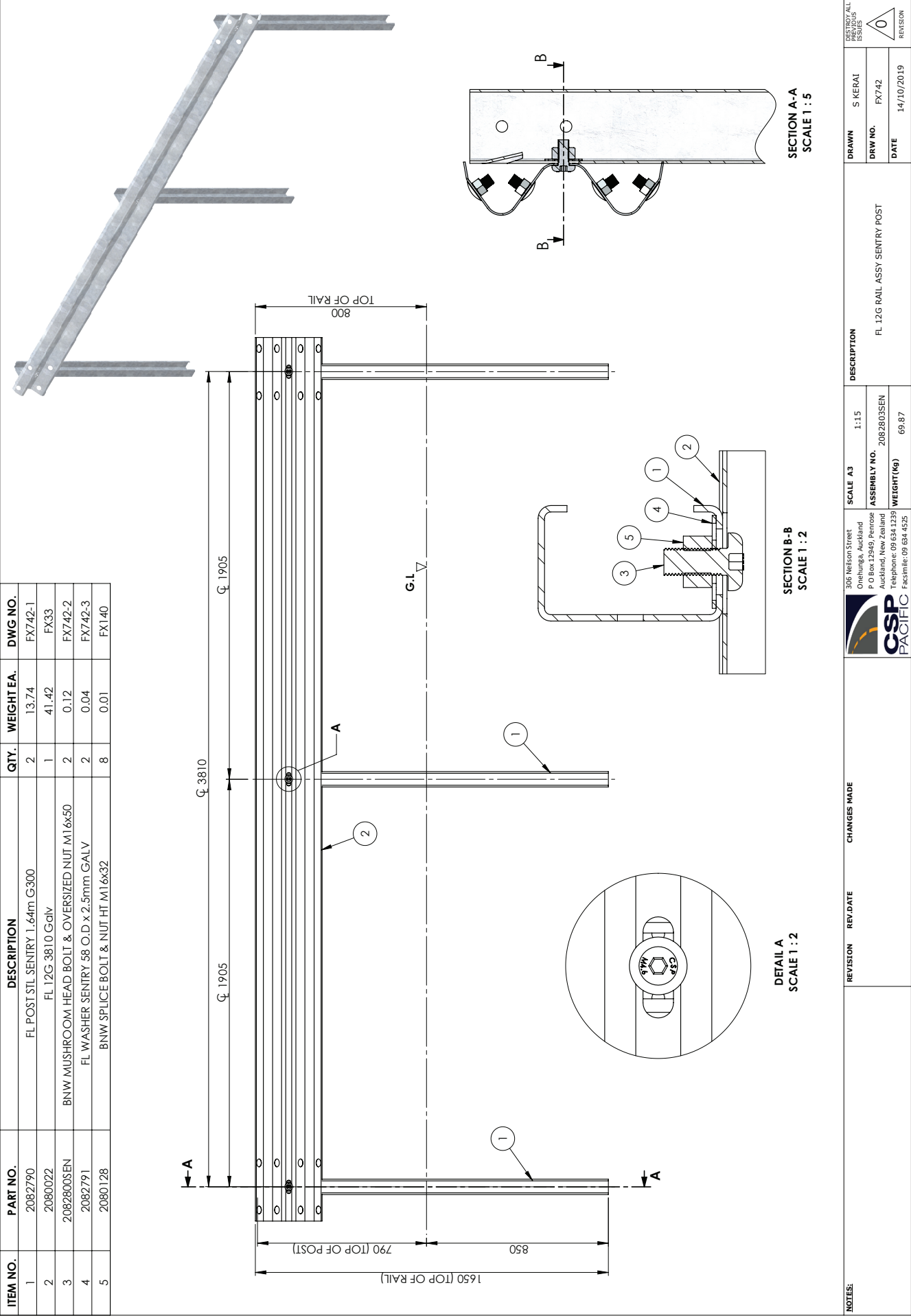
6. What maintenance does the Sentry Barrier require?

The Sentry Barrier 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.

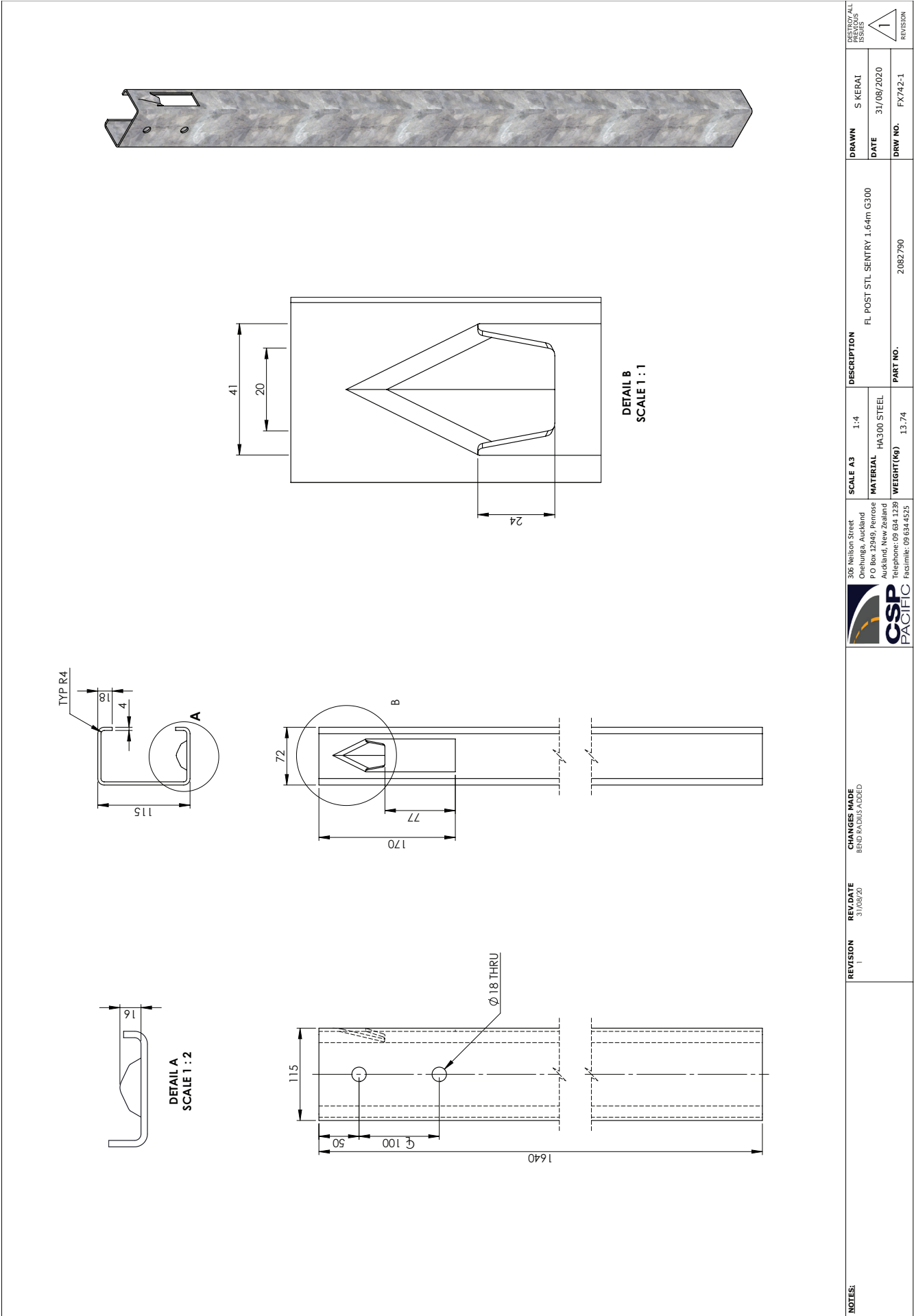
Appendix

Technical Drawings

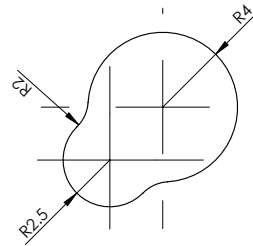
Appendix A – Sentry Barrier



Appendix B – Sentry Barrier Post

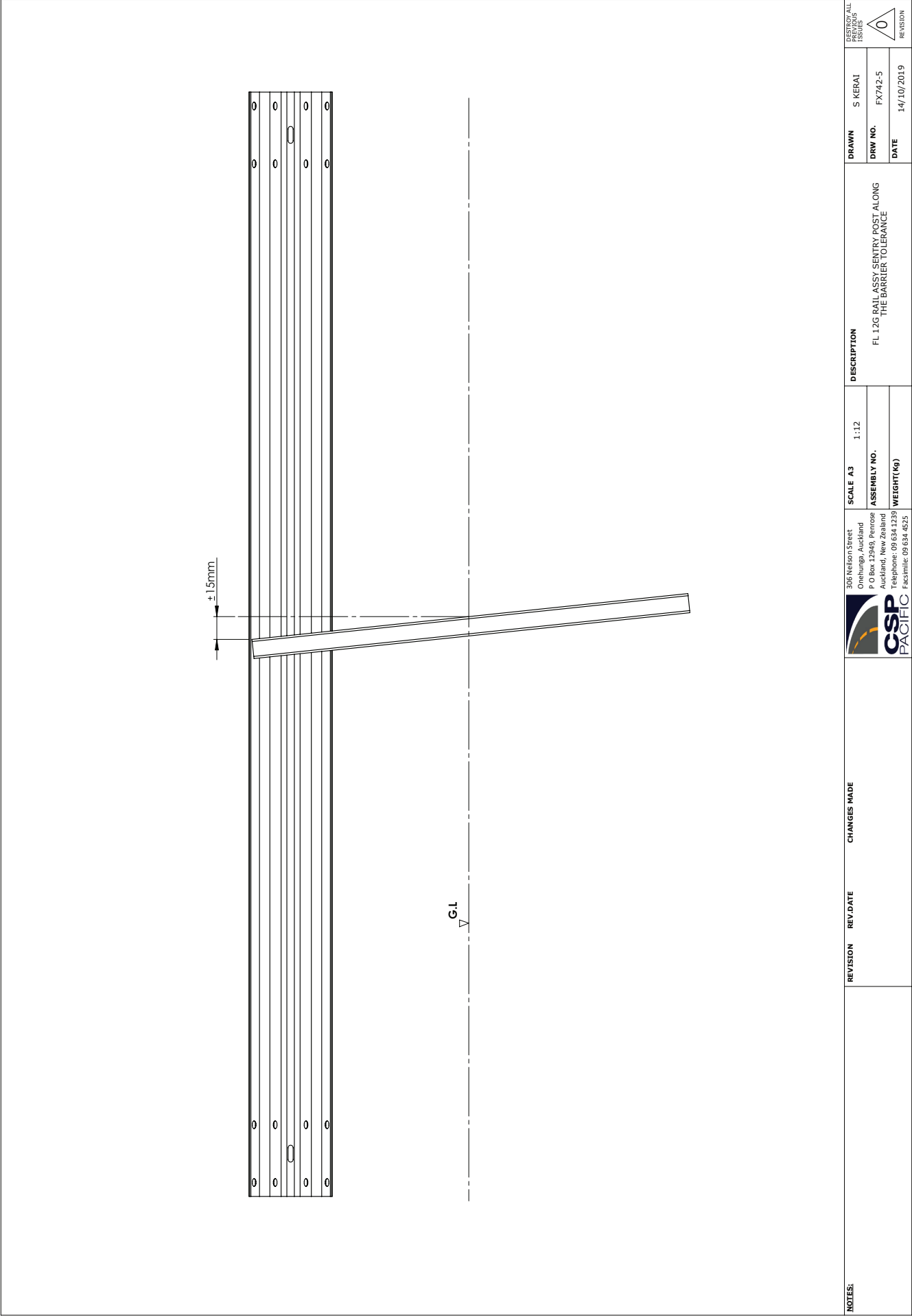


Ph 0800 655 200 or visit www.csp.co.nz

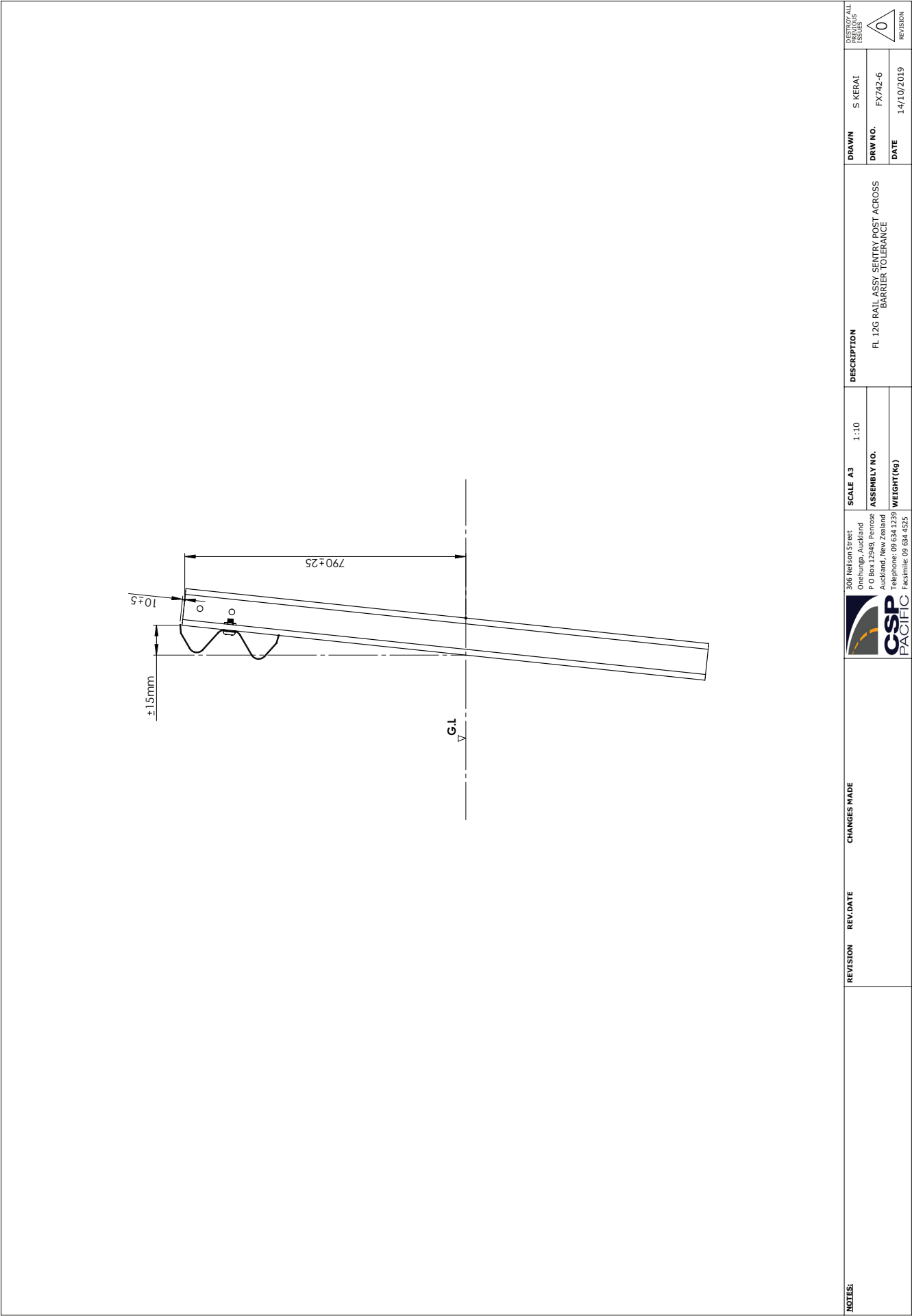


NOTES:

Appendix D – Installation Tolerance (Lateral)



Appendix E – Installation Tolerance (Vertical)

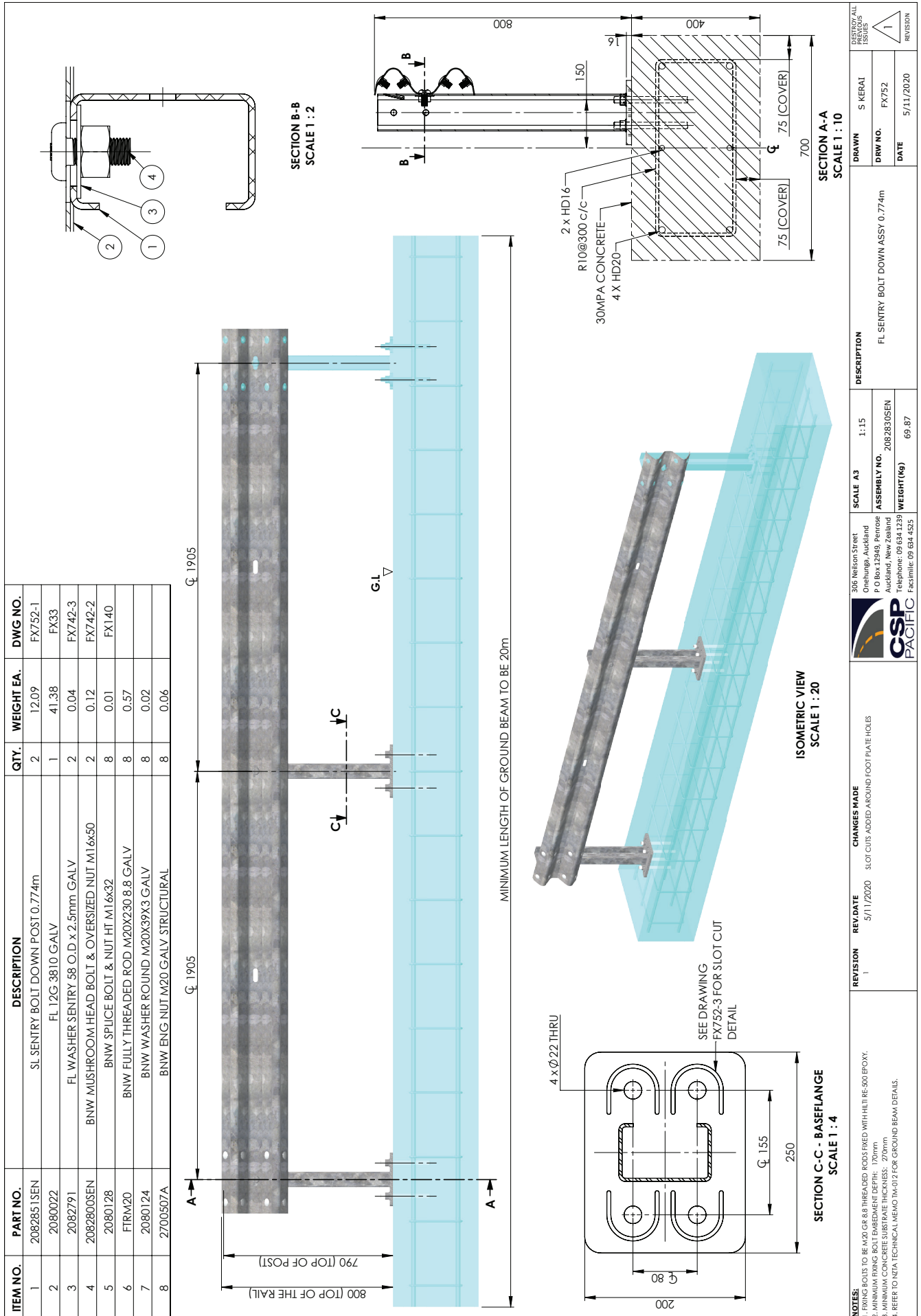


NOTES:	REVISION	REV. DATE	CHANGES MADE	 306 Nelson Street Onehunga, Auckland P.O. Box 12949, Penrose Auckland, New Zealand Telephone: 09 634 1335 Facsimile: 09 634 4525	SCALE A3 1:10 ASSEMBLY NO. WEIGHT (kg)	DESCRIPTION FL 12G RAIL ASSY SENTRY POST ACROSS BARRIER TOLERANCE	DRAWN S KERAI	CARE OF ALL PREVIOUS ISSUES 
							DRW NO. FX742-6	
							DATE 14/10/2019	

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Appendix G - Sentry Barrier Bolt Down Assembly



NOTES: 1. RATING BOLTS TO BE M20 GR 8.8 THREADED RODS FIXED WITH HILTI RE-500 EPOXY. 2. MINIMUM FINISH BOLT EMBEDMENT DEPTH: 170mm 3. MINIMUM CONCRETE SUBSTRATE THICKNESS: 200mm 4. REFER TO NTA TECHNICAL MEMO TM-012 FOR GROUND BEAM DETAILS.	REVISION 1	REV/DATE 5/11/2020	CHANGES MADE SLOT CUTS ADDED AROUND FOOT PLATE HOLES	 CSP PACIFIC	 306 Nelson Street Orchunga, Auckland P O Box 12949, Penrose Auckland, New Zealand Telephone: 09 634 1239 Facsimile: 09 634 4525	SCALE A3 1:15	DESCRIPTION FL SENTRY BOLT DOWN ASSY 0.774m	DRAWN S KERAI	 REVISION
						ASSEMBLY NO. 2082830SEN		DRW NO. FX752	
						WEIGHT (kg) 69.87		DATE 5/11/2020	

Appendix I – Acceptable Post Deformation Measures & Tolerances

Test 1: Nut Pass-through

Ensure the nut can adequately pass through the slot at all locations along the slots length. This can be confirmed by physically checking fitment of the nut or alternatively measuring the width of the slot to ensure it is greater than that of the widest part of the bolt, typically 36.0mm.

Any posts where the nut cannot pass through the slot should be rejected, and the deformation considered excessive.



Test 2: Washer Fitment

Ensure the washer can adequately fit into the required location to ensure the deformation is not excessive. This can be confirmed by physically placing the washer in the correct location and checking if it fits, even if tightly. For any post where the washer cannot be physically installed even if the fitment is tight, shall be rejected and the deformation considered excessive.



Test 3: Post deformation bending and cracking tolerance

If the bending deformation on any part of the post is less than 20mm then the post shall be considered suitable for use. The deformation shall be measured by running a straight rule over the element to be measured and the peak off-set measured with a suitable rule or tape. See figure below to the left.

For cracking deformations, the maximum allowable deformation on the open side of the post will be limited to 15mm. This limit is increased to 25mm on the closed side of the post section due to the increased structural capacity of the web. See figure below to the right.

