# Margaritelli Ferroviaria H2BP-02 Safety Barrier System

Longitudinal TL-4 Bridge Railing

Updated September 2022

Trusted infrastructure products

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## Introduction

The Margaritelli Ferroviaria H2BP-02 System is a roadside aesthetic bridge railing compromised of both steel and wood element suitable for containing, redirecting and shielding vehicles from roadside obstacles. As and additional benefit the H2BP-02 provides aesthetic alternatives to standard bridge railing products for use on bridges where scenic beauty would be enhanced by its use. The barrier has been designed and tested to meet the evaluation criteria of EN1317 H2 and meets or exceeds the criteria of MASH Test Level 4 for a longitudinal bridge railing. This is the current state of the art performance criteria, exceeding the requirements of NCHRP 350 Test Level 4.

The Margaritelli Ferroviaria H2BP-02 System has an installation height of 830 mm to the top of the lower rail and 1100mm to the top of the upper rail, providing the system with the ability to withstand numerous road surface overlays without the need to relevel of lifting of the barrier. The Margaritelli Ferroviaria H2BP-02 System is preferably transitioned into the Margaritelli Ferroviaria H2BL-01 on the approaches to the bridge rail but can be installed with a sloped down end or curved terminal end, which are not energy absorbing, on the approaches to the bridge, however it is recommended that these terminals be installed flared outside clear zone.

The rounded edges to the Margaritelli Ferroviaria H2BP-02 Post, the open side of the shape should be away from the roadway, and wood cladding provides increased protection for vulnerable road users. The C-100 post used with the Margaritelli Ferroviaria H2BP-02 Post are easy to install into the bridge decking or curb provide increased resistance to rotation when impacted.

The connection system between the rail and posts is formed using conventional M16 fasteners with slots in the rails providing it with significant installation tolerance. Provided that damage is limited to the rails or connection damaged elements can be easily replaced without replacing the undamaged posts allowing for simpler installations and repairs.  The Margaritelli Ferroviaria H2BP-02 System is installed quickly using conventional installation tools and equipment.

## System Overview

The Margaritelli Ferroviaria H2BP-02 System is designed to provide acceptable structural adequacy, minimal occupant risk and safe vehicle trajectory as required by the latest in safety standards, EN1317 Part 1 and 2 Test Level H2, equivalent to AASHTO's MASH Test Level 4 (TL-4). This standard requires the system to be independently evaluated with full scaling testing using 900 kg and 13,000 kg vehicles traveling at speeds of 100 km/h at a 20° impact angle and 70km/h at a 20° impact angle, respectively. The requirements of EN1317 Parts 1 & 2 are so stringent that the system is required to absorb about 33% (~94kJ) more energy during the impact than the MASH TL-4 requirements.

When impacted by an errant vehicle, the Margaritelli Ferroviaria H2BP-02 System will redirect the vehicle along the face of the barrier system, bringing it to a controlled stop. The system has been developed, through the use of glu-laminated wooden elements, to produce very limited debris during an impact, with all posts designed to remain firmly anchored to the deck/kerb and the connection details to remain attached to the rail. Repair of the system is completed by removing and replacing any bent or damaged rails and posts impacted accordingly. Any posts with damaged only to the connections can be repaired by replacing the connection hardware only, reducing the need to remove posts.

Key specifications for the Margaritelli Ferroviaria H2BP-02 System are:

| | |
|---|---|
| System width | 438mm |
| Height to top of rail | 830/1100mm |
| Height to top of wood post cover | 1162mm |
| Post weight | 18.35kg |
| Post length | 1102mm |
| Post spacing | 2.0m |
| H2 TB11 dynamic deflection | 0.27m |
| H2 TB51 dynamic deflection | 1.5m |

The minimum Length of Need (LON) of the Margaritelli Ferroviaria H2BP-02 System is dependent on the posted speed limit. Please refer to Road 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 recommend as 70m, excluding transitions.

The Margaritelli Ferroviaria H2BP-02 System has been in use in Europe for nearly 10 years and in addition to having an excellent record of in-service performance it also has shown to be able to stand the test of time. The quality of the glu-laminated wooden elements and the preservation processes used to treat them have seen some of the previous designs still in use 20 years after installation. The use of glu-laminated wood, instead of logs, for the wooden elements allows for a specific known structural component to be designed into the system.

## Limitations and Warnings

The Margaritelli Ferroviaria H2BL-02 System forms part of an approved roadside protection system and it must be installed in conjunction with an approved transitions and/or terminal end system that is designated by the manufacturer 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 Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 System. This includes the correct identification of each Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 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 installation of the H2BP-02 system 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 installed.

## Before Installation

Design, selection and placement of the Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 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.

### 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*

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.

## Design Considerations

### Kerbs

As with all road side safety hardware, the Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 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.

### 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 maximise the available clear zone, please refer to your local Road Controlling Authority for confirmation of the minimum width requirements.

### Transitions, Drop and Curved Ends

The Margaritelli Ferroviaria H2BP-02 System is designed to be transitioned into the Margaritelli Ferroviaria H2BL-01 which is a TL-3 aesthetic longitudinal barrier system. Providing transitions rather than terminal ends or crash cushions on the approaches and exits of bridges continues the safety off the bridge that is provided on the bridge.

Drop and curved ends may also be employed when and where needed only when a transition cannot be installed due to site specific reasons.

The ends should be flared away from the roadway and outside the clear zone.

- 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 rail bolts are inserted and tightened accordingly.
- Care must be taken to ensure the line posts are installed at the correct height

## Reinforced Concrete Foundation

The Margaritelli Ferroviaria H2B2P-02 System is a post on base plate system installed using chemical anchors in concrete foundations. To meet the barriers performance requires the concrete foundation to meet the following requirements:

- Width: 40cm
- Depth: 110cm
- Minimum Compressive Strength of Concrete: 40N/mm$^2$

Reinforced concrete on site which do not meet these requirements will require alternative installation. Contact CSP for details.

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

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

## Length of Need

The minimum Length of Need (LoN) of the Margaritelli Ferroviaria H2BP-02 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 70m plus the length of the transitions or drop end regions on either end of the barrier system. We recommend Installers contact their local Road Controlling 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 level of dynamic deflections measured during impact testing are presented below.

| | Test TB11 | Test TB51 |
|---|---|---|
| Vehicle type | Compact | Bus |
| Vehicle mass | 935kg | 12,615kg |
| Vehicle speed | 100.2km/h | 70.2km/h |
| Impact angle | 20° | 20° |
| Dynamic deflection | 0.27m | 1.5m |

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. The ends should be installed swept back from the roadway and outside the zone of safety.

# Parts Identification

## Steel components

Margaritelli Ferroviaria H2BP-02 System Post (C-100 x 1102)

Margaritelli Ferroviaria H2BP-02 System Splice Plate Lower Rail

Margaritelli Ferroviaria H2BP-02 System Block Out

Margaritelli Ferroviaria H2BP-02 System Splice Plate Upper Rail

## Parts Identification (cont.)

### Hardware

Margaritelli Ferroviaria H2BP-02 System Post Bolt (M16 x 30)

Margaritelli Ferroviaria H2BP-02 System Upper Rail Carriage Bolt (M16 x 105)

Margaritelli Ferroviaria H2BP-02 System Lower Rail Carriage Bolt (M16 x 125)

Margaritelli Ferroviaria H2BP-02 System Threaded Anchors (M20 x 250)

Margaritelli Ferroviaria H2BP-02 System Post Cover Hex Bolt (M10 x 150)

## Parts Identification (cont.)

### Wood components

Margaritelli Ferroviaria H2BL-02 System Post Cover (left and right)

Margaritelli Ferroviaria H2BL-02 System Lower Rail Assembly

Margaritelli Ferroviaria H2BL-02 System Upper Rail Assembly

### End Treatment Assemblies

Margaritelli Ferroviaria H2BP-02 System Drop End Assembly

Margaritelli Ferroviaria H2BP-02 System Curved End Assembly

## Bill of Materials

| Checklist per panel (3 m of barrier) installed | Y |
|---|---|
| 2x H2BP-02 System C-100 Posts | |
| 2x H2BP-02 System Post Covers (Left and Right) | |
| 1x H2BP-02 System Lower Rail Assembly | |
| 1x H2BP-02 System Upper Rail Assembly | |
| 2x H2BP-02 Lower Splice Plates | |
| 2x H2BP-02 Upper Splice Plates | |
| 2x H2BP-02 Block Out | |
| 16x Carriage Upper Rail Bolts M16 x 125mm (1 x washer and nut per bolt) | |
| 12x Carriage Lower Rail Bolts M16 x 105mm (1 x washer and nut per bolt) | |
| 6x Carriage Bolts Post Cover M10 x 150mm (1 x washer and nut per bolt) | |
| 12x Post Bolts M16 x 30mm (1 x washer and nut per bolt) | |
| 8 x Threaded Anchors (M20 x 250) | |
| 5kg of appropriate mortar per 7 posts (HILTI CM-730 EAN recommended) | |
| | |
| General equipment required | |
| Hammer/Rotary drill suitable for foundation | |
| Air Compressor | |
| 5kg of mortar per post | |
| String line and pegs | |
| Measuring tape | |
| Level | |
| 24mm Wrench or Ratchet | |
| 24mm Ring Spanner | |
| 16mm Spanner or Ratchet | |
| 16mm Ring Spanner | |
| Torque Wrench | |

## Installation

### Getting Started

The Margaritelli Ferroviaria H2BP-02 System is an aesthetic safety barrier comprised of both wood and steel elements designed to run the length of need required and is anchored by transitions off the bridge or with the use drop end terminals. The minimum Length of Need (LON) allowed is dependent on the post speed limit. For a 100 km/hr zone a minimum LoN of 70 metres is recommended, excluding the transitions and/or drop end terminal.

### Preparation

Before installing an Margaritelli Ferroviaria H2BP-02 System, ensure that all components required for the system are on site and have been identified. The Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 System is to be installed is sufficiently flat so that the posts and rail assemblies can be installed within the allowable tolerance and aligned to the transitions or drop ends.

### Reinforced Concrete Foundation Conditions

The Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 System must be attached to, preferably, a transition on the approaches of the bridges of the TL-3 Margaritelli Ferroviaria H2BL-01 System but alternatively a drop end which provides proper anchor to provide the necessary safety benefits.

IF FOUNDATION CONDITIONS ON SITE DO NOT MEET OR EXCEED THE REQUIRED STRENGTH DETAILED IN THIS MANUAL, A LOCAL BRIDGE ENGINEER MUST BE CONSULTED.

## Tools Required

The tools required to install the Margaritelli Ferroviaria H2BP-02 System are similar to other W-Beam barriers. It requires:

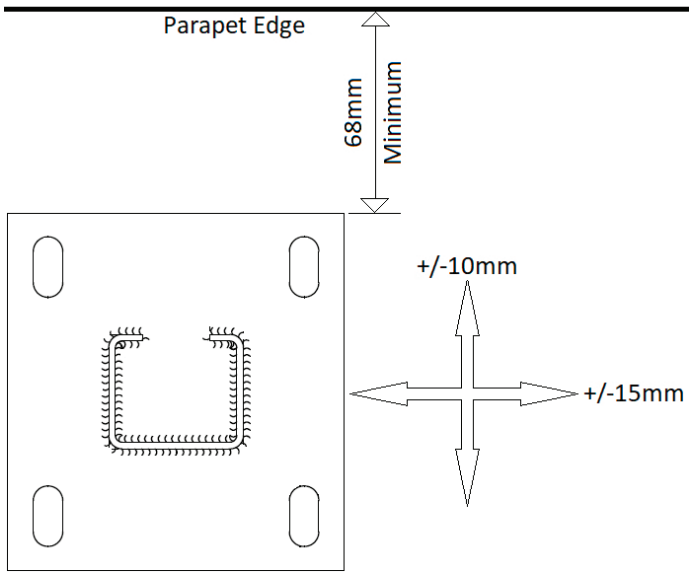
- Appropriate personal protective equipment
- Rotary/Hammer Drill
- Air Compressor
- String line
- Measuring tape
- Level
- 24mm and 16mm Socket wrench or Ratchet
- 24mm and 16 mm Ring spanner
- Torque Wrench

## Installation Tolerances

The Margaritelli Ferroviaria H2BP-02 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. 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.

Margaritelli Ferroviaria H2BP-02 System has to be installed at 1102 mm from the foundation to the top of the post excluding any kerb. If required to be installed on a curb the kerb height should not exceed 10cm above the asphalt. The vertical tolerance of the post is -10mm +30mm. The top of the lower aesthetic rail is to be positioned 830 mm above the top of the asphalt and the upper aesthetic rail is to be positioned 1100 mm above the asphalt with a tolerance of ±5 mm. The placement of the anchor bolts allows for a +/-15mm longitudinal tolerance and a +/-10 mm lateral tolerance. It is of upmost importance for these tolerances to be adhered to in order to ensure safe function of the Margaritelli Ferroviaria H2BP-02 System.



## Installation Instructions

Before installing the Margaritelli Ferroviaria H2BP-02 System, ensure that all components required for the system are on site and have been identified. The Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 System be installed on a flat, level foundation and tethered to the TL-3 Margaritelli Ferroviaria H2BL-01 on the approaches and exits of the bridge. The positioning of the Margaritelli Ferroviaria H2BP-02 System commences from the first post pm bridge and is finished both upstream and downstream with the transitions to the TL-3 Margaritelli Ferroviaria H2BL-01. It is recommended that a string line be used to obtain the correct orientation and placement of the posts.

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

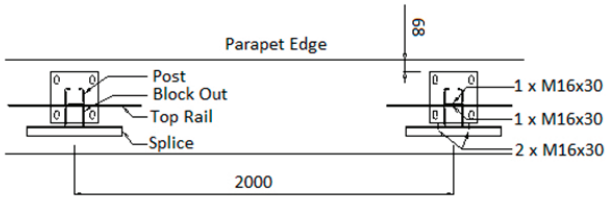
## *Installation procedure (Posts and Rail Assembly)*

### Step 1

Review the site location and identify possible hazards prior to commencing the installation of the Margaritelli Ferroviaria H2BP-02 System. Any concerns, please refer to the local Roading Authority.

### Step 2

Excavate shallow trench 400mm long x 330mm wide x 430mm deep. Install downstream Drop End Post (925mm long) driving it flush and level with the foundation surface. Install Standard C-100 Post (1770mm long) 1587mm from Drop End Post to height of 770mm.




### Step 3

Using a string plot out a post every 2m and repeat Step 2 for each post.

### Step 4

Clean out the holes and the area, using compressed air, of debris and dust.

### Step 5

Prepare 4 threaded anchors for each post by positioning the nut 15mm from the top of the anchor and place the washer on the anchor.

### Step 6

Prepare the mortar. Approximately 5kg per 7 posts that will be installed.

### Step 7

Fill the 4 holes for C-100 post #1. Position the C-100 post #1 over the holes and place the prepared anchor bolts.

NOTE: Ideally, the ambient temperature should be a minimum of 15°C.

### Step 8

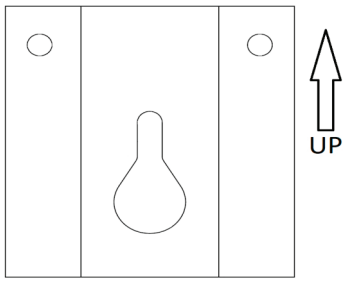
Repeat Step 7 for each post.

### Step 9

After the appropriate time, which varies depending upon project site weather conditions, check for hardness of the mortar. When the hardness of the mortar is confirmed check the nuts of the anchors to confirm that they are tight. Using a level confirm the posts are straight and the tape measure for appropriate post height.

## Step 10

Affix a Block Out for the lower rail to the C-100 Post using one (1) M16x30mm Rail Bolt with the left and right 18mm holes on the flanges up and towards the roadway. The bolts should only be 'finger tight' for now.




Block Out Proper Orientation

Affix a Splice Plate 18mm x 40mm slots to the Block Out 18mm holes using the two (2) M16x30mm Rail Bolts. The bolts should only be 'finger tight' for now.

Next confirm alignment using the level and adjust appropriately. Then tighten the one (1) M16x30mm Rail Bolt between the C-100 Post and Block Out, and the two (2) M16x30mm Rail Bolt (which were 'finger tight') to 120Nm using the Torque Wrench.

## Step 11

Affix the splice plate for the upper rail to the C-100 post using 1 x M16x30 bolt. Finger tighten the nut to the bolt. Then, using the level confirm that the splice plate is level. Once the level is confirmed use the torque wrench and tighten the nut to 200Nm.

Then attach the upper rail using 6 x M16x105 to the upper rail splice plate and finger tighten the nuts. Confirm that the upper rail is level tighten the bolts to 200Nm.

## Step 12

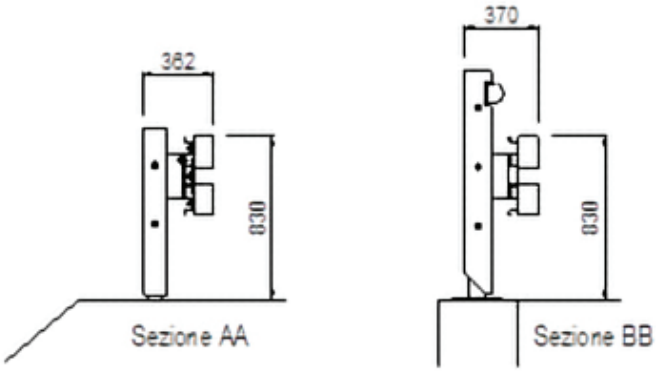
Using the 3 x M10x150 Post Cover Hex Bolt attach the Post Cover (left and right).

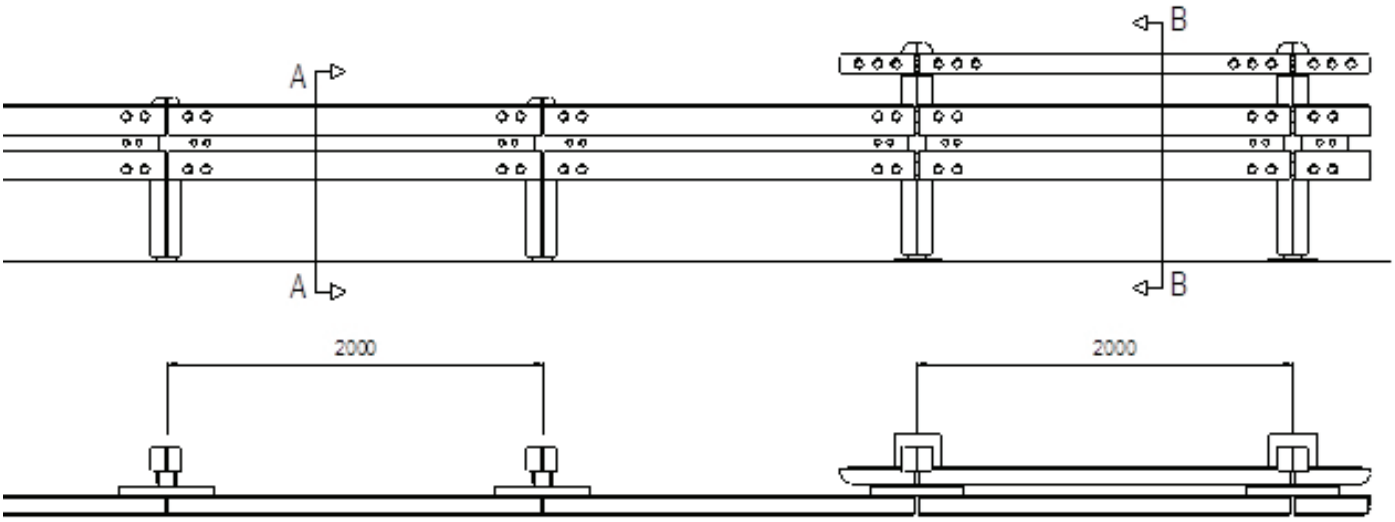
### Step 13

Check and tighten the anchor bolts are at 200Nm.

### Step 14

Install the H2BL-01 to the approaches and exits of the bridge effectively transitioning the H2BP-02 into it. Refer to the installation manual for the H2BL-01 for instructions on how to properly install this system.



## Inspection and Maintenance Frequency

The Margaritelli Ferroviaria H2BP-02 System is maintenance free. However, it is recommended that Margaritelli Ferroviaria H2BP-02 System is inspected after being impacted to ensure that the appropriate strength is maintained. Refer to Installation Procedure in this manual for more information.

## Maintenance requirement for repair after a Bushfire

Following a severe bushfire a detailed inspection of the Margaritelli Ferroviaria H2BP-02 System should be undertaken. If heat damage is noted, it is recommended the Rail Assembly and C-100 posts are replaced immediately.

## Installation Checklist

| Item | Y | N |
|---|---|---|
| Ensure the posts are orientated in the correct direction and consistent with the drop ends. | | |
| The height of the finished rail should be 830mm (-10mm+30mm) above the finished ground level and height of the finished top rail should be 1100mm above the finished ground level. | | |
| The height to the top of the steel posts should be 1102mm above finished ground level. | | |
| The posts are free from damage. | | |
| The correct Margaritelli Ferroviaria H2BP-02 System hardware is installed to the correct torque. | | |
| The Rail Assembly must be level and aligned to the drop ends drawings. Refer to Appendix A for guidance. | | |
| Ensure posts are free of debris prior to installing the Rail Assembly. | | |

| | | | |
|---|---|---|---|
| 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 Margaritelli Ferroviaria H2BP-02 System?

   Standard tools required include a wrench, torque wrench, measuring tape, string line and machinery suitable for drilling in reinforced concrete and a portable air compressor for blowing out debris and dust from drilled holes.

2. Does your company provide spare parts? What is the lead-time for supply?

   It is important to fix a damaged Margaritelli Ferroviaria H2BP-02 barrier as soon possible because it most probably won't perform as designed when damaged. For this reason, it is recommended that CSP is contacted directly for spare parts purchases. The lead time for in-stock items are generally 1-2 days. Lead time for non-stock items will vary, contact CSP for assistance.

3. On average, how long does it take to install the Margaritelli Ferroviaria H2BP-02 System?

   Depending on circumstances at the site, installation and assembly of the system should take a three-person crew less than 15 mins per Rail Assembly panel (2.0 m length) provided the anchors are not damaged. Installation time will vary depending on the need to replace anchors.

4. What about vandalism, can the Margaritelli Ferroviaria H2BP-02 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 Margaritelli Ferroviaria H2BP-02 System be restored after impact?

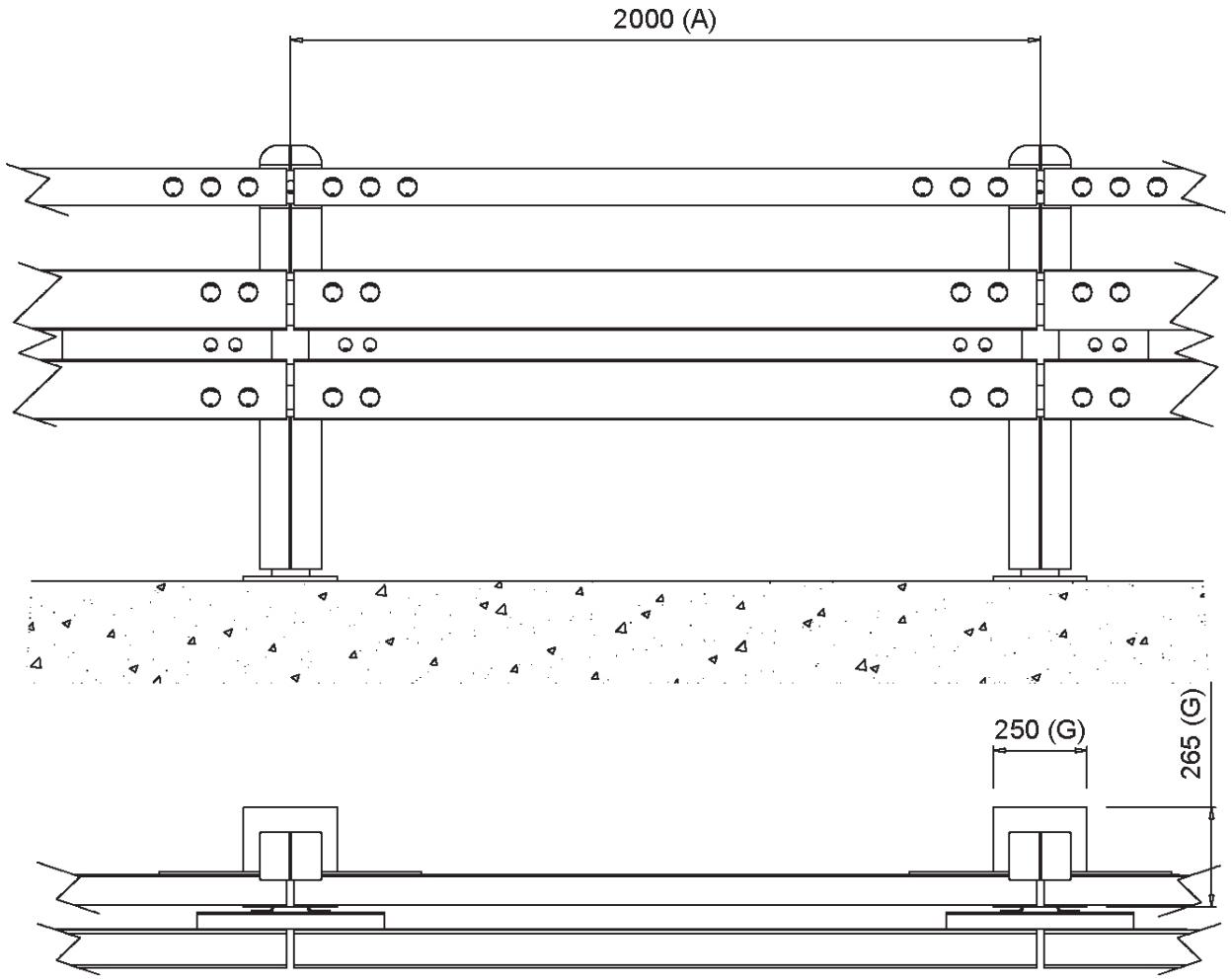
   Margaritelli Ferroviaria H2BP-02 System is easily repaired following an impact. Damaged posts can be removed by backing the nuts off the anchors provided that the anchors have not been damaged.

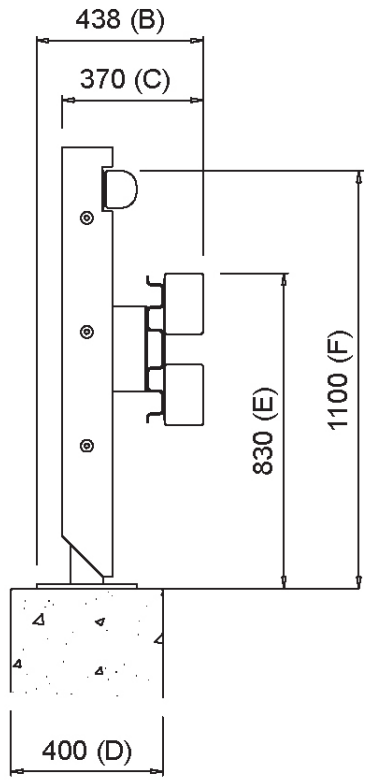
6. What maintenance does the Margaritelli Ferroviaria H2BP-02 System require?

   The Margaritelli Ferroviaria H2BP-02 System is maintenance free. However, it is recommended that all barrier systems are checked after impacts to ensure that the integrity of the barrier is maintained.

# *Appendix*

Technical Drawings




measure of the anchors:
threaded rod 6.8 class M20x250 mm

injectable mortar:
HILTI CM 730-EAN or similar

crash test length:
70 m

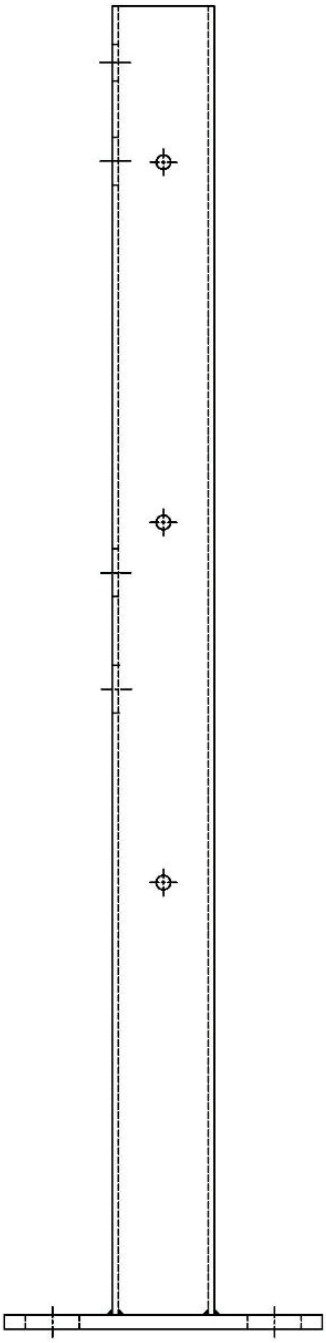
**technical sheet**:
*in millimeters*

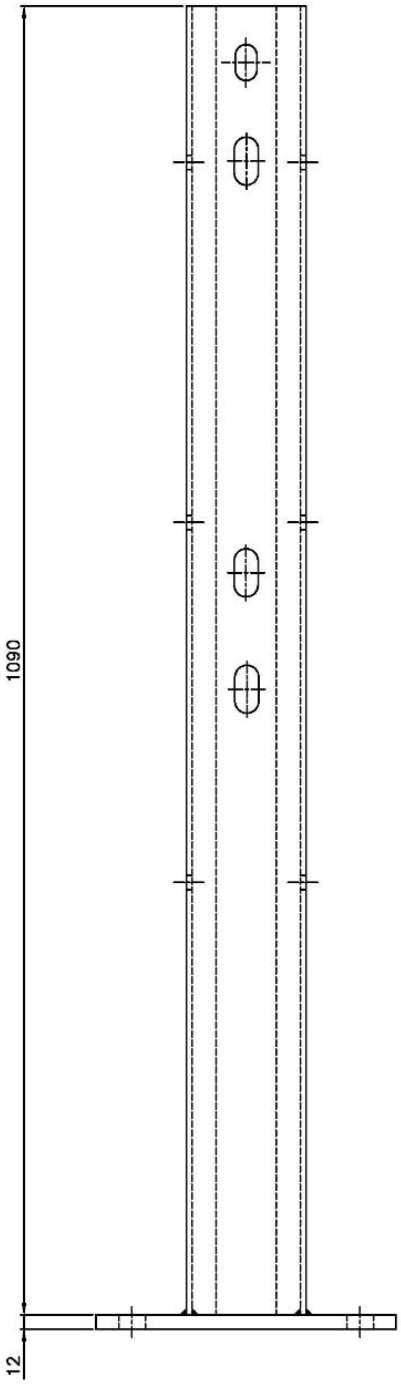
A = post spacing
B = maximum lateral size
C = lateral size (baseplate not included)
D = minimum concrete curb width
E = main protection rail height
F = pedestrian handrail height
G = baseplate measures
H = straight terminal maximum size
I = curved terminal maximum size

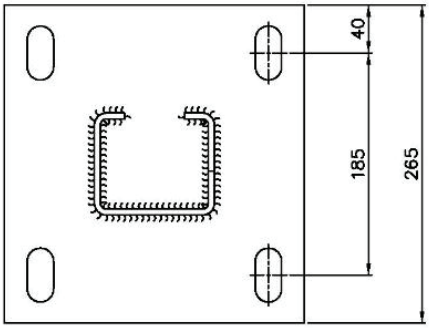
MARGARITELLI S.p.A. | Divisione Ferroviaria

Bridge safety barrier - H2 containment level - **H2BP-02**
**CE** Conformity Certificate n°CPD/0497/3247/09

document: ENG BSS H2BP-02 date: 07/09/10 | rev: 00 date: --/--/--





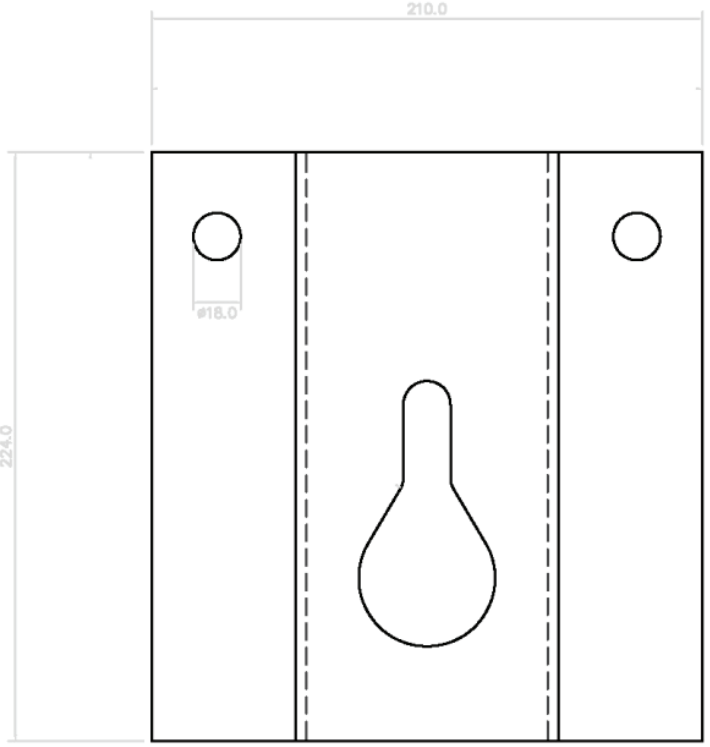

| MODIFICATION | | |
|---|---|---|
| REV | DATE | DESCRIPTION |
| 01 | 26/11/09 | Correction of the dimension of the base plate |
| | | |
| | | |

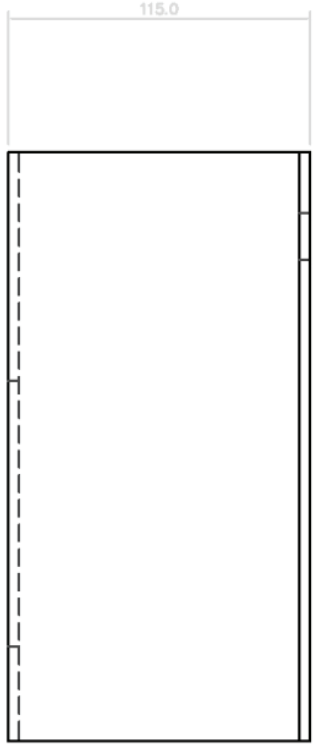
**Margaritelli Ferroviaria S.p.A. - Esterni Eterni**

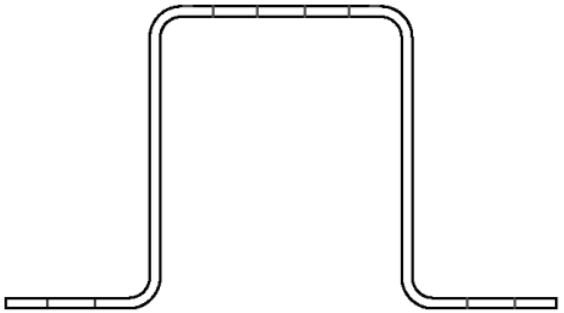
| DRG No E PdP 02/09 06 | date 12/10/09 | REV. 01 | date 26/11/09 |
|---|---|---|---|

Object: Single beam Aesthetic Side Bridge Guardrail
C section cor-ten steel post 5x25x85x100 mm

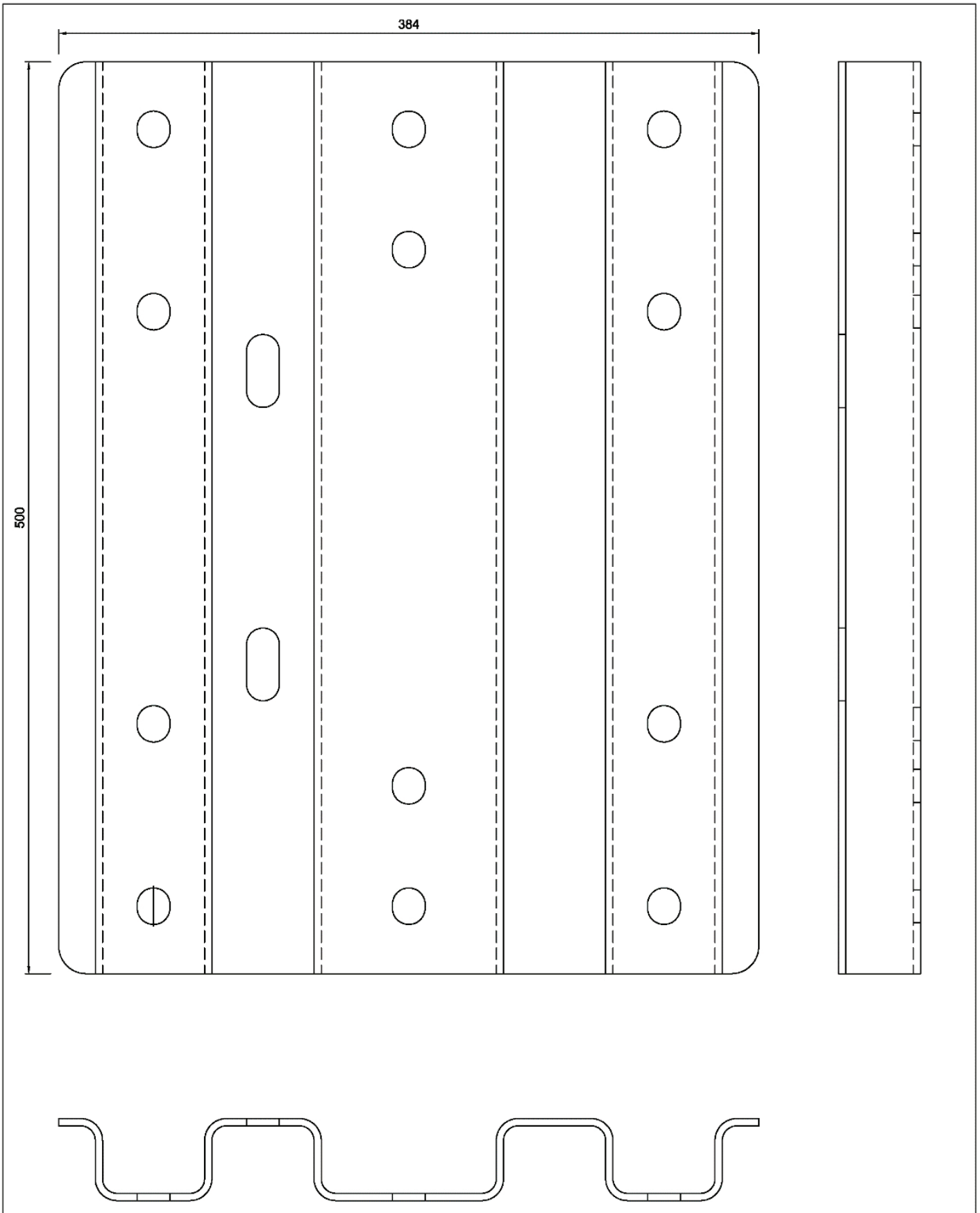
Issued by: Approved by:



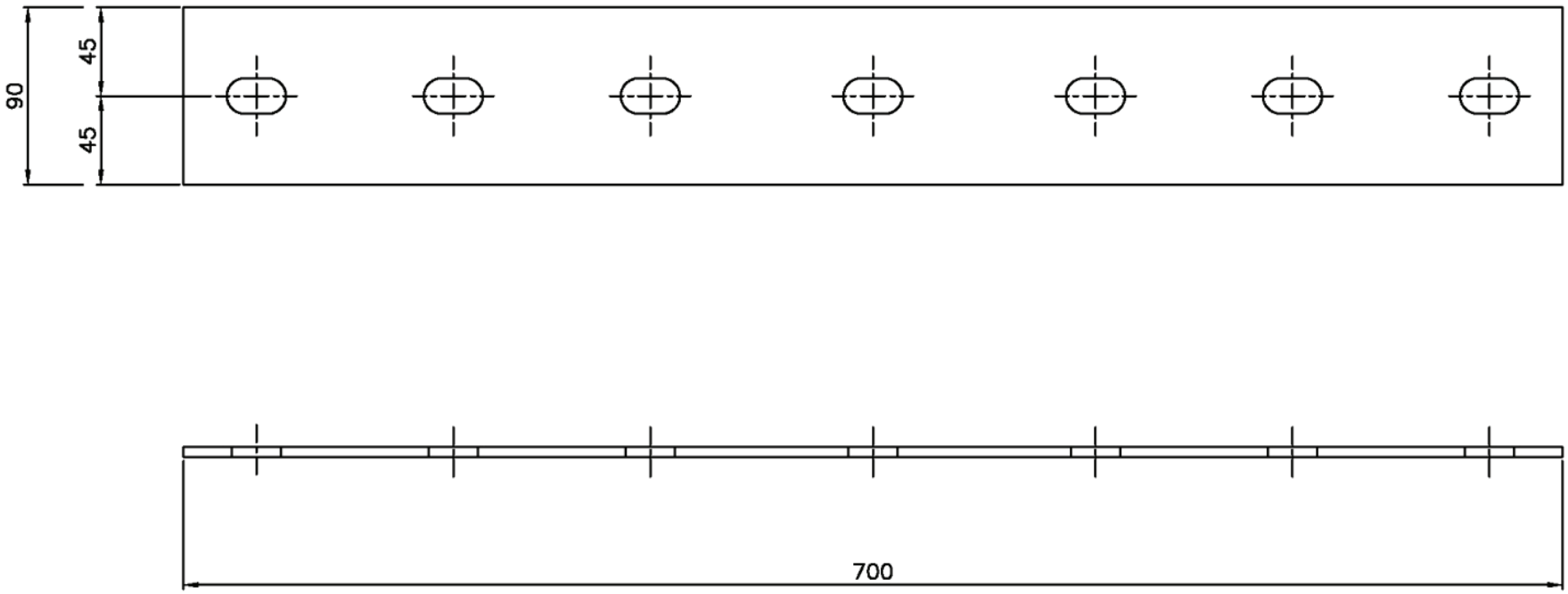



| Margaritelli Ferroviaria S.p.A. - Esterni Eterni | |
|---|---|
| DRG No E PdP04/07 03 date 05/02/08 | REV. 00 date --/--/-- |
| Object: Double beam Aesthetic Guardrail<br>Cor-ten steel Blockout 210x224x115 mm | |
| Issued by: | Approved by: |




| Margaritelli Ferroviaria S.p.A. - Esterni Eterni | | | |
|---|---|---|---|
| DRG No | E PdP02/00 05 date 22/05/00 | REV. 08 | date 27/03/08 |
| Object: | Double beam Aesthetic Guardrail<br>Cor-ten Steel Splice plate 500x384x45 mm | | |
| Issued by: | | Approved by: | |




| MODIFICATION | | |
|---|---|---|
| REV | DATE | DESCRPTION |
| | | |
| | | |
| | | |

Margaritelli Ferroviaria S.p.A. - Esterni Eterni

| | |
|---|---|
| DRG No E PdP 04/09 04 date 01/06/09 | REV. 00 date --/--/-- |

Object: Double beam Side Bridge Aesthetic Guardrai
Handrail steel plate 5x90x700 mm

Issued by: Approved by: