Installation Manual

Reinforced Basic Guardrail ESP+ W1, Post Distance 0,67 m

N2-W1-B (W_N = 0.6 m; D_N = 0.5 m; test length = 40 m)

Content **Page**

1. General

For the assembly and installation of ESP+ W1 with a post distance of 0.67 m, basically the regulations of RAL-RG 620 in their current version apply. In addition, the requirements shown below have to be met precisely in order to achieve the performance of the Initial Type Test (ITT) as declared in the test reports (see data sheet in Annex III). If the requirements are not complied with during installation without consulting the manufacturer, any liability for defects of the product passes from the manufacturer to the installer.

This construction product has been tested to EN 1317. The test results were achieved under the conditions described in the test report. However, the test report scenario cannot cover all applications that may occur in practice. Therefore, this installation manual defines the boundary conditions for installation in correspondence with the state of the art as set out in German installation regulations RAL-RG 620, ZTV-PS 98 and RPS 2009. Provided that these conditions are fulfilled, the barrier system can be expected to perform effectively.

The assembly drawings of the tested product correspond to RAL-RG 620 drawing S1.1-114 (beam A-Profile) or S1.1-115 (beam B-Profile) and drawing B1.1-102 (bolting); see Annex I.

This construction product does not contain any toxic substances or dangerous substances that would have to be monitored.

For an installation in accordance with RAL-RG 620, installation gangs have to be permanently supervised by qualified personnel[1]. Self-inspection tests as required in RAL-RG 620 must be carried out, recording the results in accordance with Annex 9 of RAL-RG 620.

In regions where the minimal outside air temperature T_{min} in accordance with EN 1991-1-5/NA is below -24°C, the installation requires the manufacturer's written confirmation. Within Germany, the product installation can be expected to be unaffected by the ambient temperature with the exception of repairs, see section 15.

The durability of the construction product including the foundation structure is guaranteed by the fact that all components are galvanized. This also applies for places with a corrosive environment such as in industrial or sea atmospheres. Information on the assessment methods and the assessment of durability are contained in RAL-RG 620 and EN ISO 1461 or EN 10346.

In case the space requirements for the working width cannot be fulfilled due to the local situation and confined space, it has to be contemplated whether the distance to the road edge can be reduced further.

To the beginning and end of the installed length, transitions or terminals must always be added.

2. Storage and handling

All safety barrier parts have to be stored and handled properly. Manufacturer-specific requirements such as procedure instructions for storage and transport have to be observed.

The parts must be protected against dirt, corrosion and damage. Parts that are laid out for assembly must be assembled as soon as possible. Only lay out as much material at operation sections as can be installed within one day.

3. Foundation

The ground in front of and under the safety barrier must be compacted so that it is sufficiently strong to bear the load of passenger cars.

Posts are driven into the ground with a pneumatic or hydraulic ram and a hammer headpiece for Sigma-posts.

1 The term of "qualified personnel" applies for certified guard-rail assembly personnel or “certified skilled assembly fitters for safety barriers” according to RAL-RG 620, for instance.

A pneumatic ramming machine should have an impact energy (for single impacts) of at least 420 Nm at 6 bar. For hydraulic ramming machines a pressure of at least 70 bar is recommended.

Before beginning the driving works, all available information must be acquired regarding utility lines (cables, pipelines, etc.) in the installation area. Instructions for the protection of cables as issued by the utility companies must be adhered to.

In concerns of post driving, soils are subdivided into the following soil classes[2]:

- Top soil and flowing soils: soil classes 1-2;
- Light, medium and heavy soils: soil classes 3-5;
- Soft rocks and comparable soils: soil class 6;
- Hard rock: soil class 7.

Driving of posts in soils of classes 1 and 2 is not permitted. In case such kind of soil is found special measures must be agreed with the client. The soil may have to be substituted or strip foundations may have to be installed (see section 4).

In soil classes 3-6 posts must be driven to a depth of 1.20 m. In exceptional cases (ramming obstacles) the fixing length of individual posts may be reduced. Minimum fixing lengths for the individual soil classes are:

- soil classes 3-5: 1.00 m fixing length;
- soil classes 6-7: 0.80 m fixing length;

Any reduction of the posts length is only admissible with the written approval of the customer. If a cutting of the posts is not advisable, special measures such as single dug-in posts, posts with footplate, or an installation strip foundations can be executed by engineering decision and with written approval of the customer.

If the driving time exceeds 4 minutes, while the top of the post is deformed or damaged or the post shifts, the installation methods as for soil class 7 (drilling; see below) apply.

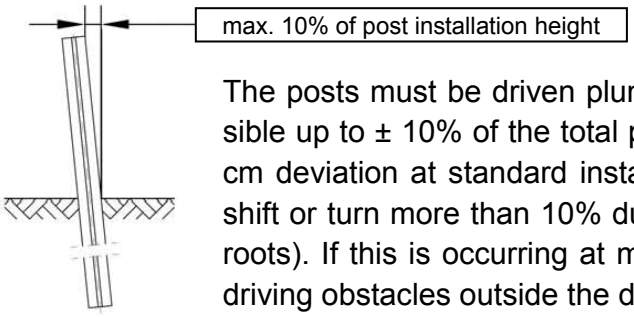
In soil class 7 and if the soil contains slag, the posts must always be inserted in drilled holes. In these cases the fixing length of the posts may be reduced to 0.80 m. The system can be installed on soil of class 7 only if a 20-cm-layer (min.) of verge material sits on top of the solid ground. The drill holes must be filled with sand before the posts are driven into the filled hole. The minimum diameter for the drill holes is 17 cm.

When driving in posts, only an insignificant deformation of the post tops is tolerable.

Since even a single stone may be a driving obstacle, the following procedure must be followed depending on the driving time: in case that the diving time exceeds 4 minutes (driving obstacles outside the defined soil classes, e.g. highly compacted soil with bigger stones) but the driving progresses continuously, then the driving procedure described for soil class 6 applies. If the driving progress stops within the 4 minutes window (e.g. if the post hits a concrete foundation), the procedure for soil class 7 applies. Also in this case, the cutting of posts is permissible only up to a fixing length of 1.00 m.

[2] A suitable definition of soil classes is given in DIN 18300, e.g.

Single obstacles (e.g. big stones) that are found at a depth of less than 50 cm are to be removed.



The posts must be driven plumb-vertically. Deviations are generally permissible up to ± 10% of the total post installation height over ground (that is 7.0 cm deviation at standard installation). In some cases, individual posts may shift or turn more than 10% due to driving obstacles in the soil (e.g. stones, roots). If this is occurring at more than 20% of the posts, the provisions for driving obstacles outside the defined soil classes apply (see above).

The inclination of the verge at the location where the system is installed should not exceed 12%. In justified exceptional cases and with written approval by the client, the ground inclination may be up to 1:3.

At downward slopes, it must be made sure that between the front of the system and the theoretical crown of slope, there is left a space that at least equals the dynamic deflection of the system (D_N = 0.5 m). If, in exceptional cases, the installation remains below this value, special measures such as a reduction of the post distance, suitably designed concrete foundations or slope improvements can be taken as engineering decisions with the written approval of the customer. In such a case, the use of longer posts alone would be not enough to compensate the lack of anchor ground in rear of the system.

4. Strip foundations

In exceptional cases (up to a length of 10 m), the system may have to be installed on strip foundations. In these cases, RAL-RG 620, chapter 1, paragraphs 5.7.11 and 5.7.12 as well as the drawing S1.2-110 apply.

It is not admissible to set up posts directly into concrete.

In Germany, plastic mortars (PC) or plastic-mixed materials (PCC) have to must comply with TL BE-PCC. When using chemical anchors, the relevant manufacturer's manuals as well as the following instructions must be closely adhered to:

- the strength class of the bolts must be 4.6 or 5.8, respectively.
- the minimum concrete quality is C20/25.
- the personnel carrying out the installation must be sufficiently qualified.
- only parts and components supplied by the manufacturer must be used and individual parts (e.g. mortar cartridge) must not be substituted.
- the drill hole must have a depth of >125 mm (= anchoring depth). Any shortening of the anchor rod (e.g. in the case of drilling obstacles) is not admissible. If properly installed, the threaded section of the anchor rod must not project more than 15 mm out of the nut.
- the distance of the drill hole to edges and joints must not be less than 15 cm.
- the drill holes has to be blown at least four times with a manual pump or oil-free compressed air (ISO 8573-1, Table 7.3, oil class 4 , < 5mg/m³). Any water must be removed completely.

- keep a waiting time according to the manufacturer's instructions before setting up the posts. When installing at low temperatures of -10 °C to -6 °C, the minimum waiting time is 24 hours.
- fasten the nut to the anchor rod with a torque of 80 Nm.

All components of the anchor are hot-dip galvanised acc. to RAL-RG 620. Stainless steel must not be used.

For testing the anchorage, at least one of the anchors must be strained with a drag force of 30 Nm, using an appropriate checking device. When consequently fastening the nut with a torque of 80 Nm, no slip is allowed in the anchor. If the test fails with one anchor rod, all rods of the concerned post and one anchor of each adjacent post must be checked as well.

It is advisable to seal the anchor holes in the post base plates with the oval sealing plate RAL No. 41.41 or a sealing compound. In case that no anti-corrosion measures are taken, the inspection intervals as specified in Section 17 have to be observed.

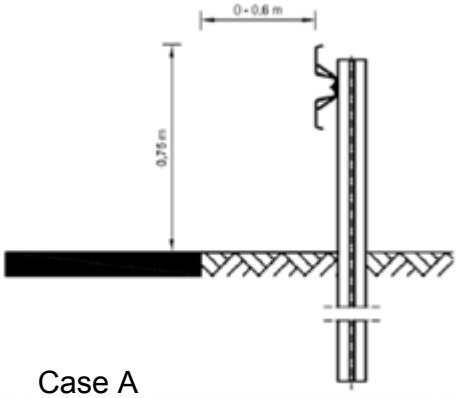
5. Installation height and limits of shoulders

The installation height of the system is 75 cm ±3 cm for the guardrail beams, measured from the road surface to the top of the beam (see Case A). The standard installation distance between the front end of the system and the road edge is 50 cm.

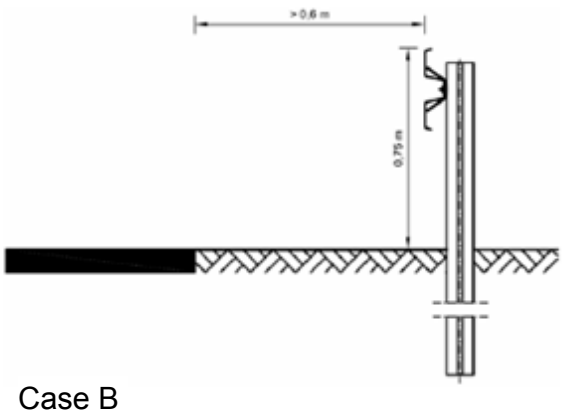
In deviation from the above, the height of the guardrail beam must be measured directly in front of the system in case the front edge of the guardrail beam is installed

1) at a distance of a > 60 cm from the edge of the paved area (see Case B) or

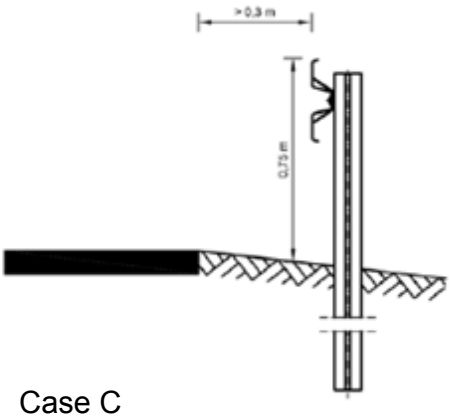
2) at a distance of a > 30 cm from the edge of the paved area, while the verge has a transverse inclination of more than 12% (i.e. 1:8.33) (see Case C). The maximum permitted inclination is described in section 3.



Case A

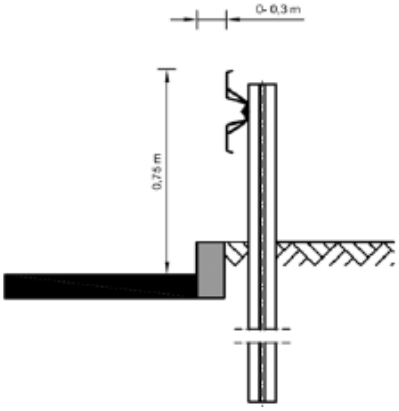


Case B

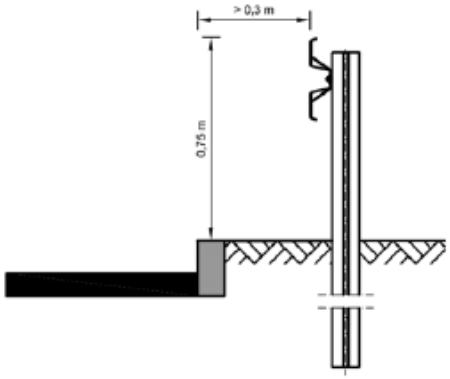


Case C

Kerbs with a level difference of more than 7.5 cm should be avoided, level differences of more than 20 cm are not permissible. If kerbs with a maximum height of 20 cm cannot be removed, one of the following solutions should be chosen in consultation with the client:



Case D



Case E

If possible, the system should be placed so that the front edge of the guardrail beam is aligned with the front edge of the kerb. In case the distance from the front edge of the kerb is not more than 30 cm (Case D), the installation height is measured from the carriageway surface. In case the distance from the front edge of the kerb is > 30 cm (Case E) the height of the guardrail beams is to be measured from the top edge of the kerb.

Any other installation heights must be limited to justified and locally limited exceptions and require the written consent of the client.

6. Assembly

Only parts that have been manufactured or supplied by a recognised RAL-supplier are permitted.

The construction product does not include any components that have been preassembled at the factory and no pre-stressed parts.

Beams with either A or B profile can be used equivalently.

The guardrail beams must overlap in the traffic direction. The posts are to be installed with their closed sides towards the traffic (see Assembly Instructions in Annex II).

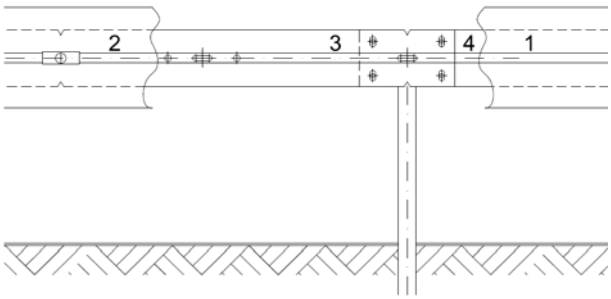
When installing the system with A-beam, the joints between the reinforcement beams are located directly behind the guardrail joints. When using B-beams, the reinforcement beams have to be put with a lateral offset of 0.67 cm towards the direction of traffic, i.e. joints are to be placed before the guardrail joints.

The overlapping of reinforcement and guardrail beam is crucial for the successful operation of the system. The following sketches apply for an installation on the right road side in countries with right hand traffic.

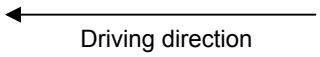
A-Profile (from front to back):

No joint overlapping

1. right guardrail beam (drop hole)
2. left guardrail beam (round hole)
3. left reinforcement beam
4. right reinforcement beam



B-Profile (from front to back):

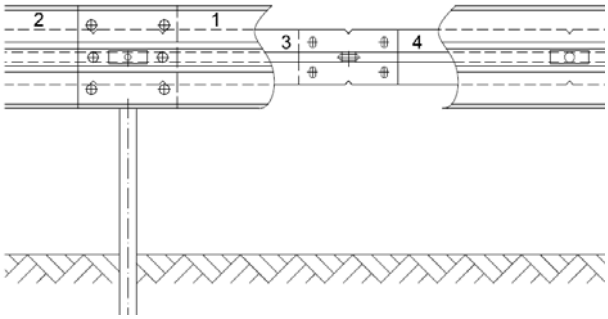


Joint overlapping of 0.67 m

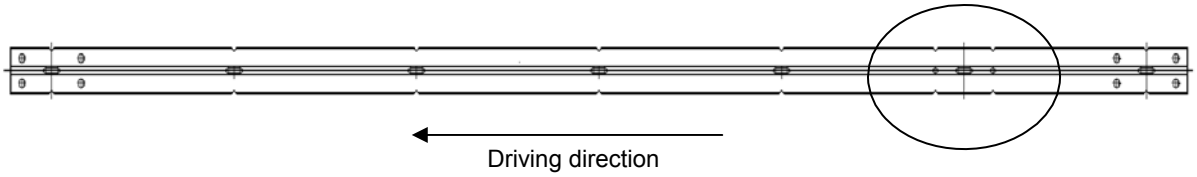
1. right guardrail beam (drop hole)
2. left guardrail beam (round hole)

Joint of reinforcement beam
with 0.67 m offset

3. left reinforcement beam
4. right reinforcement beam



Unlike the guardrail beams, the reinforcement beams do not have round and drop holes to determine the mounting direction. For proper positioning, the side with the additional holes for B-beams (see sketch) must be regarded as the beginning of the profile.



As a rule, a 0.67 m post spacing must not be exceeded. Where a post cannot be installed in the place intended, e.g. due to a shaft or a crossing utility line, one individual post can be omitted with approval of the client, resulting in a gap of 1.33 m.

If two or more posts would have to be omitted or a gap greater than 1.33. m is required, special measures have to be agreed on with the customer as engineering decisions (e.g. single dug-in posts or concrete foundations).

The free standing Sigma-posts that are not screwed to the beam may have a distance to the beam of up to 5 cm.

More details regarding the assembly of the system are provided by the Assembly Instructions in Annex II.

7. Bolting

Only bolts that have been manufactured or supplied by a RAL-supplier are permitted.

The bolts must be fitted vertically in the boreholes of the parts to be assembled and they must be fixed properly (see Assembly Instructions in Annex II).

The bolts connecting the beams to the posts (M 10x45 for B-beams and M 10x45/M 10x55 for A-beams, respectively) must be snug-tight. This equals a torque of at least 17 Nm.

The joint bolts M 16x27 (outer face) and M 16x45 (internal side), the intermediate boltings M 16x45 (two per field) and the joint boltings M16x45 for the reinforcement beams (B-profile only) must be tightened with a torque of at least 70 Nm.

We recommend using an impact wrench with a maximum torque of 500 Nm that can be adjusted for the required torque.

Tools required for fixing the bolts:

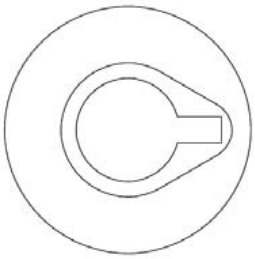
Sockets for socket wrench

- for M16 SW 24 mm;
- M10 SW 17 mm or SW 16 mm (depending upon bolt standard)

Wrench

- M10 SW 17 mm or SW 16 mm (depending upon bolt standard)

When screwing the beam joints, it has to be ensured that the nib of the button-head screw is located at the centre of the drop hole (see sketch).



Only hot-dip galvanised bolts must be used. The property classes (strength) of 4.6 must be strictly adhered to.

Bolts and nuts that have been used before must not be used a second time.

8. Adjustments on site

The following applies where posts or longitudinal elements need to be shortened:

- Use a saw or cutting-off machine and deburr cut edges
- Drill holes properly
- Observe hole diameters and spacing as per the specifications of the relevant RAL-RG 620 drawing
- Protect cut edges and drilled holes against corrosion by using zinc dust coating (in acc. w. EN ISO 1461)

Thermal processing such as welding or flame-cutting are not permissible.

9. Installation in curves

Guardrail beams must be installed tension- and stress-free. In bends with a radius of < 30 m, pre-bent beams (so-called radius-beams) must be used. Radius-beams are available in various lengths staggered in steps of 2.5 m:

25 m – 22.5 m – 20 m – 17.5 m – 15 m – 12.5 m – 10 m – 7.5 m – 5 m – 2.5 m.

The difference between inside and outside bends must be taken into account. For outside bends, convex radius beams must be used while in inside bends concave radius beams are to be installed. Guardrail beams must not be bent on site or upon installation with such force that they are permanently deformed.

Pre-bend reinforcement beams with the same bending radius as the guardrail beams must be used for radii of < 25 m. At radii <10 m, the holes at the joint sections do not match with the guardrail hole pattern, so that they have to be drilled on site. Therefore, per-bent reinforcement beams with holes only at one side are available.

Ensure that the overlap at joints does not show any gaps when installing radius beams. It is recommended to first tighten the bolts at the joints and then to fix the beams at the posts. The use of a crane is advisable. Radii < 50 m generally require increased assembly efforts.

Holes must not be widened, e.g. by means of broaching.

10. Flares

Flares with an inclination of 1:20 (1:12 in exceptional cases) are permitted.

In case a guardrail section begins at a rising slope, it may be turned sideways and terminated in the cut slope. Post distances, fixing and terminal pieces must be executed as for the tested terminal. Installation heights as given in section 5 must be adhered to.

In the area of the flare, the ground in front of and under the systems must be compacted so that it is sufficiently strong to bear the load of passenger cars (also see section 3). Ditches must not be traversed.

11. Installation in water protection reserves

Where in water protection reserves the installation on driven posts would impair the sealing of the reserve, the system can be installed on a strip foundation (see section 4). Note: for water reserves, the minimum containment level is H1 in some countries, e.g. Germany.

12. Terminals

For ESP+ W1, only regular 12-m-terminals in accordance with RAL-RG 620, drawing S4.1-110 are permissible. The terminals are to be connected after a transition to ESP+/2.0 acc. to RAL-RG 620, drawing S3.1-114.

In exceptional cases, a 4 m short terminal may be installed, provided that in public traffic space it is not installed in traffic direction (e.g. at junctions with tracks through fields).

13. Transitions

The following safety barriers may be connected to ESP+ W1

a) by means of transition systems:

- ESP+/2.0 (RAL-RG 620, drawing S3.1-114)
- ESP/2.0 (RAL-RG 620, drawing S3.1-115)
- ESP/4.0 (RAL-RG 620, drawing S3.1-115)

b) by means of untested, modified transitions:

- EDSP/2.0 (RAL-RG 620, drawing S3.1-125)
- EDSP/1.33 (RAL-RG 620, drawing S3.1-126)

Connecting any other safety barriers requires the written approval of the manufacturer[3].

14. Additional Installations

The following additional installations may be mounted to the system:

- Guiding posts fastened to the post.
- Guiding posts fastened to the beam joint. In that case, the bolt with nib M 16 x 27 as specified in the drawing is to be substituted by a button head bolt M 16 x 45.
- Guardrail beam reflectors fastened to the beam at the centre holes using button head screws.
- Shock absorbing post jackets
- Motorcyclist under run protection type Euskirchen (RAL-RG-620, drawing S5.2-101). The manual for the system “ESP/2.0 Motorrad” applies correspondingly.
- Pedestrian and cyclist rub rail (RAL-RG-620, drawing S5.1-301).

Due to the structural design, the system can be climbed over without additional means.

[3] Transitions that are permitted in Germany are listed in the “Einsatzfreigabeliste” issued by BASt (Bundesanstalt für Straßenwesen - Federal Road Research Laboratory).

Any Installation of an additional component (e.g. top rails, anti-dazzle protection, traffic signs) requires the written consent of the manufacturer. These additional components can only be installed if changes to the system's behaviour are ruled out and this is certified by a notified body. The fixing instructions for the respective additional component have to be followed.

Traffic signs may be installed within the working width if they can be run over or they shear off.

15. Repair

As a rule, all system parts showing a permanent (plastic) deformation must be replaced.

Components that are out of line up to 30 cm may be straightened if they are not plastically deformed.

If damaged components are being replaced, special care must be taken regarding the joints between damaged and undamaged beams. The beams remaining after dismantling must not be damaged by the use of angle grinders, mandrels or hammers.

Due to temperature-related changes of length or major deflection after heavy collisions, the hole patterns of the beam joints may no longer match when connecting new beams to the remaining barrier. If the longitudinal deviation of the hole axes does not exceed 5 cm, the beams can usually be adjusted by loosening the bolts at several joints and retightening them after adjustment. If that is not, the following procedure is to be applied:

If repair work is carried out at very low temperatures, the new beams tend to be too short. In that case, the installation length between the post axes is greater than 4.00 m (e.g. 4.07 m), or, in other words, the beams overlap by less than 30 cm. This would be not permissible, so that two fitting beam pieces must be cut for achieving the needed length > 4.00 m. (for our example: 2.00 m + 2.07 m = 4.07 m). An additional post is not required.

At high temperatures or in the case of major deflection, the overlap of the bars is usually greater than 30 cm. In that case, fitting pieces are not necessary, but new holes need to be drilled. However, this is only permitted where the distance between the outer edges of the new and of the existing boreholes is greater than 2.5 cm.

Generally, both the use of fitting pieces and the drilling of new boreholes should be avoided, even if this means further effort due to dismantling and re-installing of the adjoining barrier.

Widened holes around posts in the verge must be re-compacted so that the posts newly driven are sufficiently fixed in the ground. Multiple damages at the same spot can make it necessary to completely refill the verge or to install additional posts. Please consult the customer regarding these works.

After finishing installation works at roads already in operation (e.g. in case of repair), surplus materials have to be removed completely, so that the road is ready for operation. In case that the works are interrupted for several hours, the barrier ends must be left completely screwed and furnished with a fully-fixed temporary slope-down terminal (lowering angle, one beam, head piece - lying on the ground).

16. Reusability of parts

Used barrier parts (including butt plates, connecting plates and others) may be re-used for retrofitting and/or conversions, provided that:

- the parts do not have any visible deformation and/or damage (e.g. torn open, widened or burned out holes);
- structural parts have a residual zinc layer of ≥ 30 µm (pre-galvanised steel: ≥ 15 µm);
- the manufacturer's mark and the test period mark are still visible on components which require marking.

Reused barrier parts with a minimum residual zinc layer of 55 µm (pre-galvanised steel with coating ZA300: ≥ 17 µm; with coating Z600 or ZA600: ≥ 32 µm) can be expected to have the same durability as new parts.

Fixing material (bolts, nuts, washers) that has been used before must not be used again. Only new fixing material must be used. For repairing damage caused by accidents new material must be used exclusively.

Components that cannot be used any more must be destroyed (e.g. by cutting off parts or dividing it) and recycled. The same applies for removed fixing material.

17. Inspection and maintenance

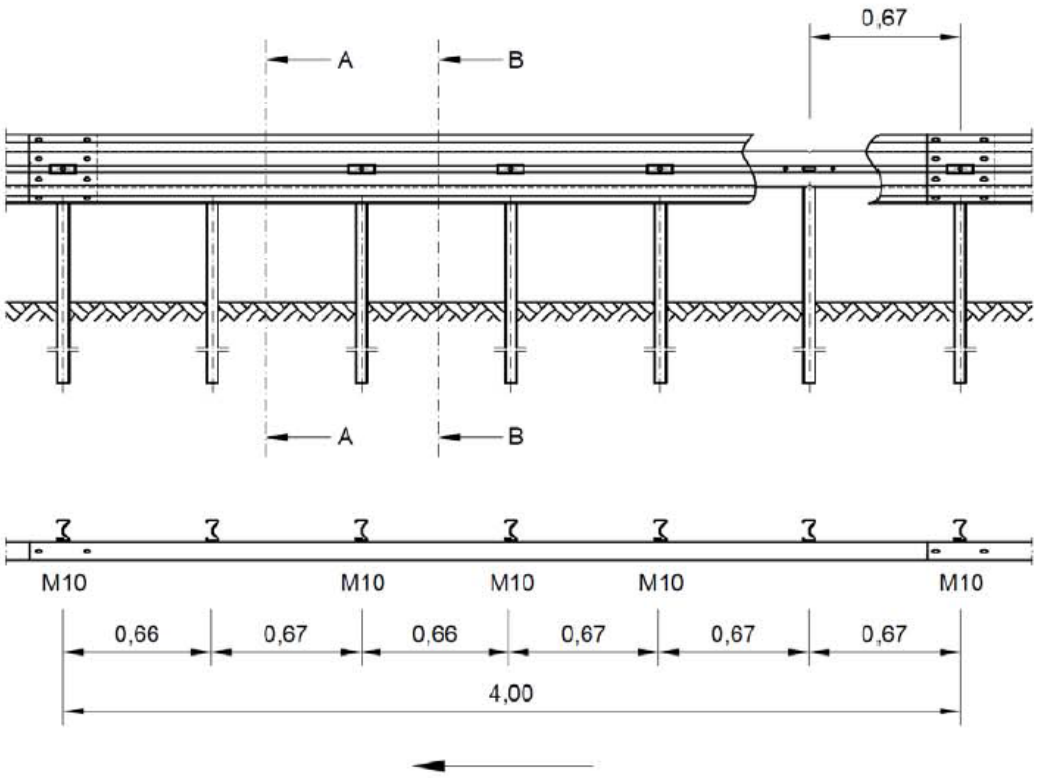
There are no specific requirements with regard to inspection and maintenance, with the following exception for installations on a strip foundation (see section 3):

If in that case, the oval sealing plate (RAL part no. 41.41) is not used and the long holes of the base plates are not otherwise sealed (by filling or covering them), the anchors have to be inspected at 5-year intervals by random samples. The minimum anchor sampling size is 3%.

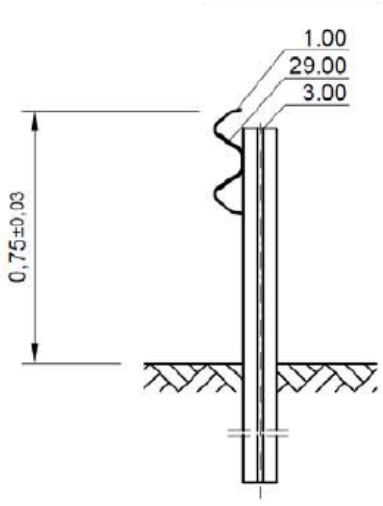
Anchors found corroded must be replaced.

If a defective anchor bolt is found, two bolts at each, the affected post and also its left and right neighbouring posts, have to be inspected. Is then another defective post found, all anchors of the three posts have to be inspected and replaced as necessary.

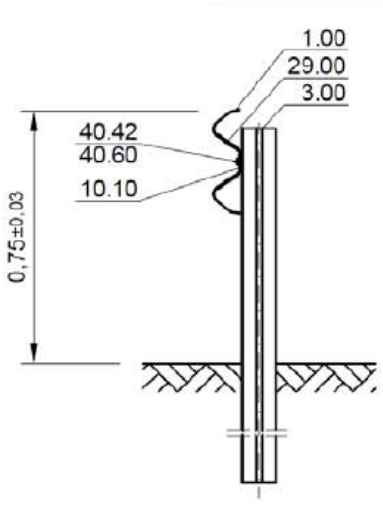
Annex I: Installation Drawings acc. to RAL-RG 620



Cross Section A-A



Cross Section B-B

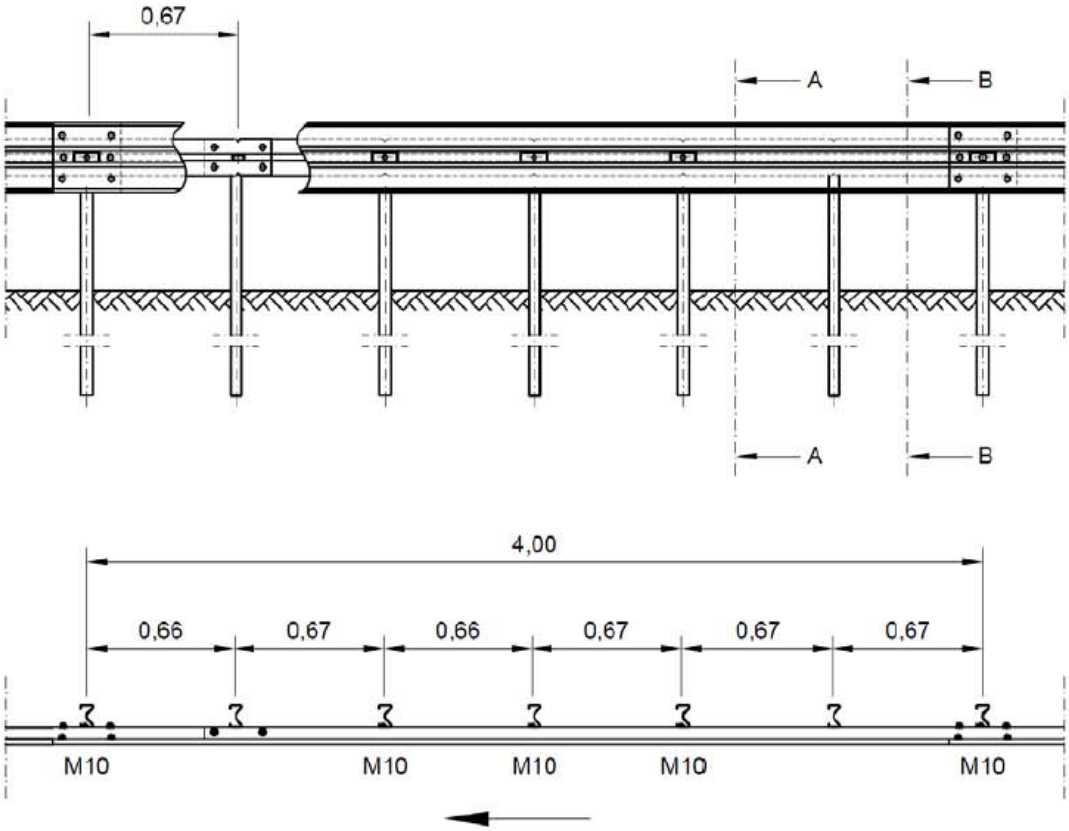


For screwing, see drawing No. B1.1-101

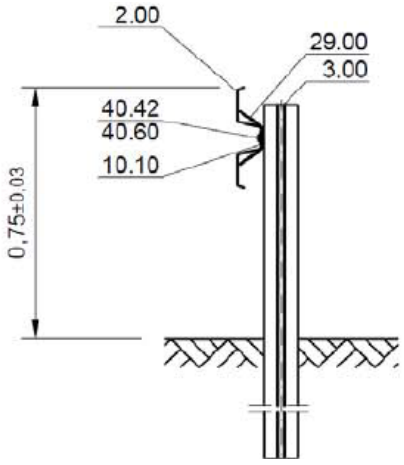
Patent No. DE 10 2007 026 919
European Patent No. EP 2 017 387

	Zchg. Nr. S1.1-114 Stand: 03/10	**Reinforced Basic Guardrail ESP+ W1** **Post Distance 0.67 m / Profile A**	DIN EN 1317-2 **N2 - W1 - B**	RAL
Gütegemeinschaft Stahlschutzplanken e.V.		41,6 kg/m		

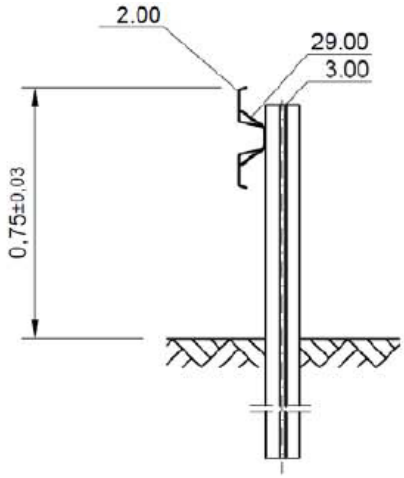
S1.1-114



Cross Section A-A



Cross Section B-B



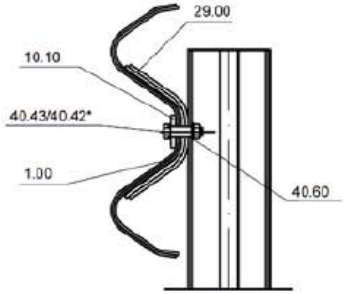
For screwing, see drawing No. B1.1-102

Patent No. DE 10 2007 026 919
European Patent No. EP 2 017 387

	Zchg. Nr. S1.1-115 Stand: 03/10	**Reinforced Basic Guardrail ESP+ W1** **Post Distance 0.67 m / Profile B**	DIN EN 1317-2 **N2 - W1 - B**	RAL GÜTEZEICHEN
Gütegemeinschaft Stahlschutzplanken e.V.		40,7 kg/m		

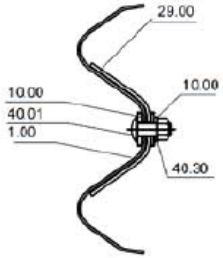
S1.1-115

Beam A-Profile and Post

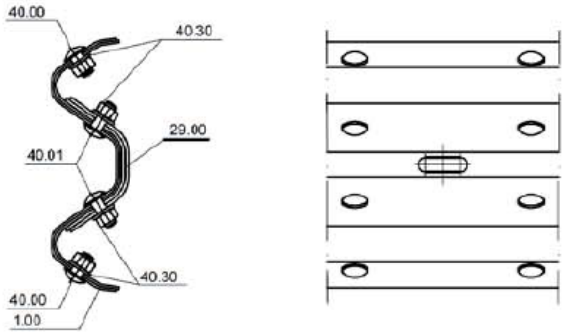


at joint : 40.43 / at intermediate post: 40.42

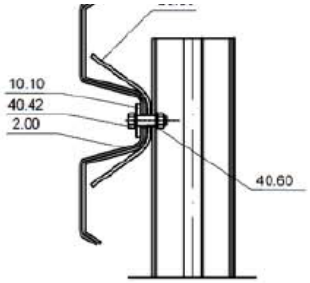
Baem A-Profile and Reinforcement Beam



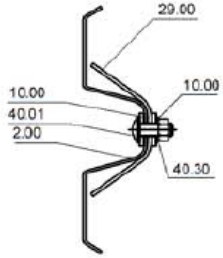
Joint Baem A-Profile and Joint Reinforcement Beam



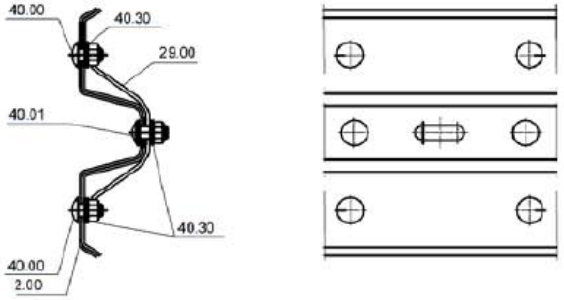
Beam B-Profile and Post



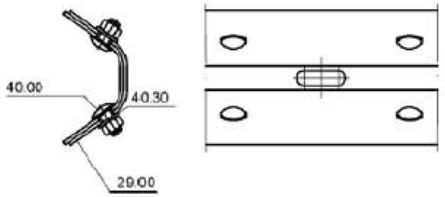
Baem B-Profile and Reinforcement Beam



Joint Baem B-Profile



Joint Reinforcement Beam (when using B-Profile

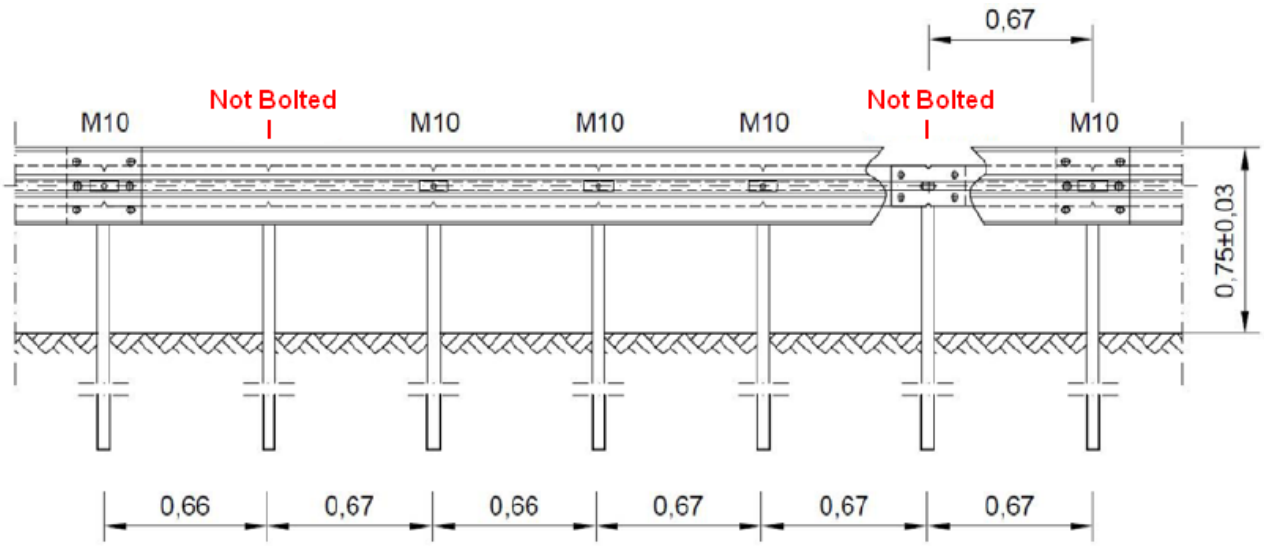


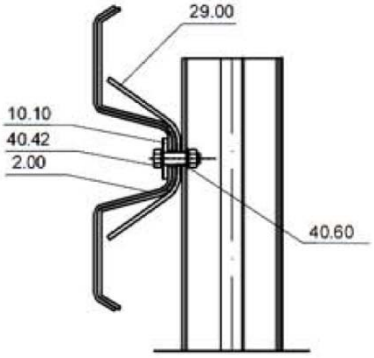
	Zchg. Nr. B1.1-102 Stand: 03/10	**ESP+ W1 Screwing Details**	----------	RAL
Gütegemeinschaft Stahlschutzplanken e.V.		----------		

B1.1-102

RAL-RG 620

Annex II: Assembly Instructions ESP+ W1





Parts per 4 m

6/8 pcs.	40.00	Bolt, button head, M 16x27, 4.6 incl. nut
16 pcs.	40.03	Bolt, button head, M 16x30, 8.8 incl. nut
6 pcs.	40.04	Bolt, button head, M 16x45, 8.8 incl. nut
4 pcs.	40.54	Bolt, hex head, M 10x45, 8.8 incl. nut
40/42 pcs.	40.30	Washer 18
4 pcs.	40.40	Washer 40/18/4
4 pcs.	40.60	Washer 11
2 pcs.	10.00	Butt Plate M16

Locking torque:

Bolt M 10: finger-tight

Bolt M 16: 70 Nm, max. 140 Nm

Mount A and B Profile analogously

Post Sigma:1.9 m (3.00)

Post distance: 2.0 m

Post height: 0,70 m
tolerance ± 3 cm

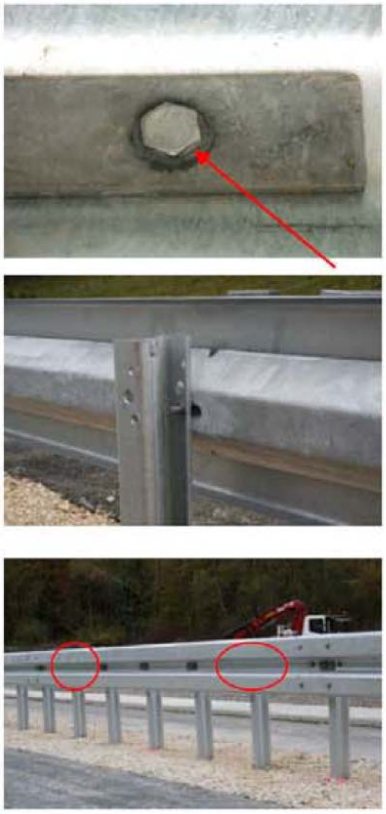
Distance posts to road edge =
Distance system to road edge +10 cm

Direction of Traffic

Reinforcement Beam (29.00)

Joints to overlap in direction of traffic.

Front view: offset 0.67 m right of guardrail beam joint

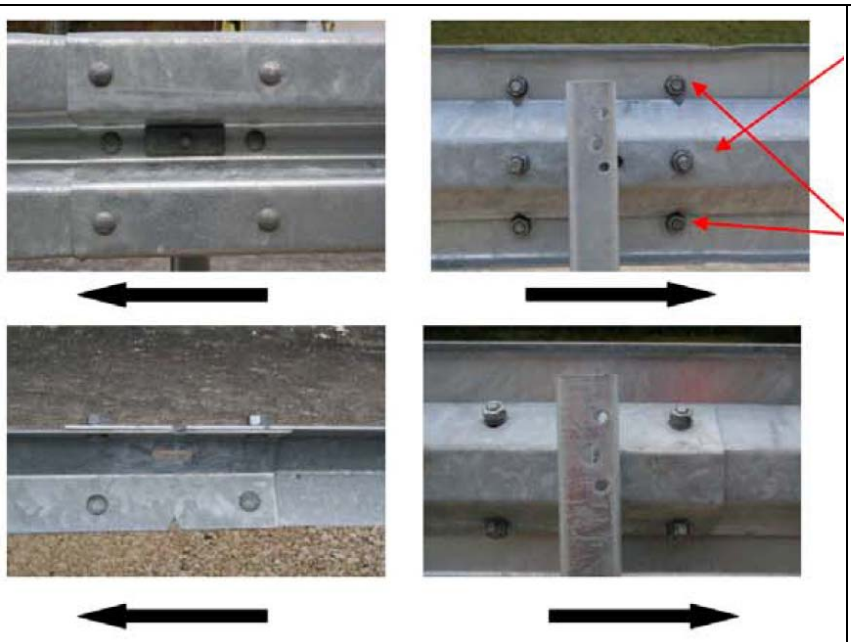


Bolting of Posts:

Butt Plate M 10 (10.10) and Bolt hex head M 10x45, grade 4.6 with nut (40.43) ans washer (40.60)

Fastening of posts **only** at:
1.33 m - 2.00 m – 2.66 m – 4.00 m

Unfastened posts at:
0.67 m – 3.33 m



2 pcs. button head bolt with nib M16x45, 4.6 incl. nut (40.01) and 2 pcs. washers 18 (40.30) bolted with reinforcement beam.

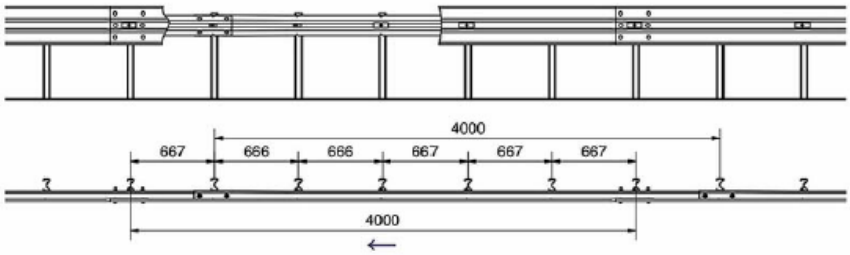
4 pcs. button head bolt with nib M16x27, 4.6 incl. nut (40.00) wirh washer 18 (40.30) under each nut

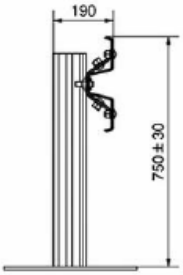
4 pcs. button head bolt with nib M16x27, 4.6 incl. nut (40.00) wirh washer 18 (40.30) under each nut

Joints to overlap in direction of traffic.

Annex III: Data sheet

	ESP Plus W1	Dated: 23.06.2014





The single-sided vehicle restraint system for installation on driven posts is composed of galvanised components acc. to RAL-RG 620.The lengths of the beams and posts are determining the shape of each segment.The system is characterised by its beams of 4 m length and a post spacing of 0.67 m. The joints of the guardrail beams overlap in direction of traffic. They are connected to each other by multiple screwingsand fixed to the posts together with the reinforcement beams.

System Name	ESP Plus W1
EG Certificate of Conformity	0176-CPD-2010
Initial Type Tests	TB11: PSG 68 (TSR Engeneering GmbH, 2010) TB32: PSG 67 (TSR Engeneering GmbH, 2010)
Typic Material	Steel
System Width	0.18 m
System Height (form Road Surface)	0.75 m
System Length (Unit)	4.00 m
Weight per m of System Length	40.8 kg (A) / 39,8 kg (B)
Installation Length	40 m
Tested Installing Method	driven posts

Performance acc. to EN 1317	
Containment Level	**N2**
Working Width (W_m)	**W1 (0.6 m)**
Impact Severity Level	**B**
Dynamic Deflection (D_m)	**0.5 m**
Vehicle Intrusion (VI_N)	**No performance determined (NPD)**

N° 2013017