

Installation Manual

Super-Rail Eco on Structure, Post Distance 1.33 m (SR Eco OS)

H2-W4-VI4-A ($W_N = 1.3$ m; $D_N = 0.9$ m; $VI_N = 1.3$ m; test length = 60 m)

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1. General

For the assembly and installation of Super-Rail Eco on Structure with 1.33 m post spacing (SR Eco), 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 FRS 2013 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 S1.2-370, drawing B1.1-403 (screwing) and drawings B2.1-208 or B2.1-209 (anchoring on structure), see Annex I. Drawings of the modified, double-sided version as Super-Rail Eco double on structure (S1.2-390-V) are also included in Annex I.

Product parts and components made by manufacturers producing to RAL-RG 620 and having a CE certificate for this product are compatible with the product.

This construction product does not contain any toxic substances or dangerous substances that must be monitored.

For an installation in accordance with RAL-RG 620, installation gangs have to be permanently supervised by qualified personnel¹. 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 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 can be contemplated whether the standard distance from the road edge can be reduced or whether another barrier system like Super-Rail on structure (SR OS) can be considered more suitable in the specific situation.

The system has been tested without the involvement of a parapet and therefore may be installed without an additional parapet. Due to the system's tested dynamic deflection of $D_N = 0.9\text{ m}$, SR Eco may only be installed on edge beams of 1.4 m width or more.

If a 75 cm wide emergency footway and a parapet are required in accordance with RiZ chapter 1 (German guideline drawing for bridges), the minimum edge beam width is 2.0 m.

Where in a justified exceptional case the distance between the front edge of the system and the edge beam is reduced to less than 50 cm, e.g. due to an existing high kerb (see section 4), the minimum edge beam width may be reduced by the equivalent amount. If the front edge of the beam is installed flush with the front edge of the kerb, the minimum edge beam width is 0.9 m ($= D_N$).

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

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

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. Anchoring on structure or strip foundation

There are no system-specific restrictions as to the maximal compatible inclination of the subsoil. For the posts, deviations of $\pm 2\%$ inclination transverse to the driving direction are admissible (corresponding to ± 2.1 cm to the front/rear referred to the post height above the upper edge of the edge beam).

RAL-RG 620, chapter 1, sections 5.7.11 and 5.7.12 have to be observed.

Installation of safety barrier posts directly into concrete is not admissible.

In Germany, plastic mortars (PC) or plastic-mixed materials (PCC) have to must comply with TL BE-PCC. When using chemical anchors, the anchor manufacturer's instructions have to be followed consistently. Only chemical anchors Hilti HVU M 16 x 125, quality 8.8 are admissible.

- The concrete quality/strength must at least correspond to guideline drawing chapter 1 (C25/30).
- Anchors must be installed by appropriately trained personnel only.
- Only the components supplied by the manufacturer must be used and individual parts (e.g. mortar cartridge) must not be substituted.
- Drilling of boreholes $\varnothing 18$ mm with carbide metal hammer drill in accordance with ISO or national standards or diamond core drilling system DD-EC 1 with top-spin technology. Pneumatic hammers and other core drilling systems are not admissible.
- 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.
- On the backside of the post, the distance of the drill holes to edges and gaps must not be less than 15 cm. On the side facing the traffic as well as to the left and right, the minimum distance is 19 cm. For the modified, double-sided installation, a distance > 19 cm must be maintained on all sides.
- 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 , $< 5\text{mg/m}^3$). Any water must be removed completely.
- The minimal waiting times until installation of the posts in dependence on the temperature of the anchoring ground as per the table have to be observed. Only then must the post be fastened (torque = 80 Nm). Installation of the adhesive anchors at -10°C to -6°C with a 24 h waiting time is possible in exceptional cases.

Temperature in the anchoring ground	Min. waiting time *
-5°C to -1°C	5 h
0°C to 9°C	1 h
10°C to 19°C	30 min
20°C to max. 40°C	20 min

* The waiting times specified only apply to dry anchoring ground. If the anchoring ground is wet, the waiting times need to be doubled.

In the case of pre-fabricated anchors, the anchors must be of Grade 8.8. The minimum tightening torque is 70 Nm.

All anchoring parts are galvanised in accordance with RAL-RG 620. Stainless steel anchors are not admitted.

Testing of chemical anchors acc. to RAL-RG 620 drawing B2.1-202 (part no. 41.05) must be conducted with the test device Hilti DPG 100 and with a centric tensile load of not less than 50 kN. The typical test load is between 55 kN and 65 kN, while it must not fall below 50 kN within one or two minutes. Damage to the structure or slippage must not occur.

To check correct anchoring, a minimum of 3% of the anchors have to be stressed and after relief tightened with the appropriate torque of 80 Nm. No important slippage must occur. If more than half of the 3% anchors tested are defective, all anchors of the structure must be tested. In case that less than half of all the anchors are defective, it is sufficient to test two more anchors as well at the post concerned as at each of the two neighbouring posts.

The test results of the chemical anchor tests have to be documented in the appropriate testing form as per Annex 9 of RAL-RG 620.

In the case of pre-fabricated anchors, it is sufficient to present a certification by the precast anchor supplier instead of testing.

For sealing of the long-holes in the base-plates, it is recommended to either use the big round sealing plate (RAL part no. 40.33 with 41.27) or to fill holes with sealing compound. If no corrosion prevention measures are taken, the inspection intervals specified at section 17 have to be respected.

4. Installation heights and limits of kerbs

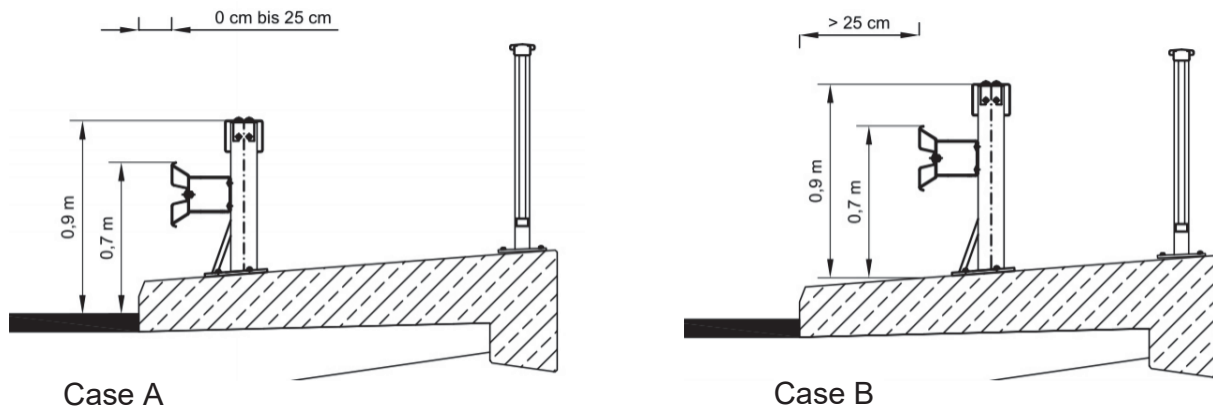
On kerbs showing a height difference to the road surface of 4 - 10 cm and an inclination of $\leq 15\%$, the installation height, regardless of the distance to the kerb edge, is 80 cm \pm 3 cm for the box beams and 60 cm \pm 3 cm for the guardrail beams, measured directly in front of the system. On a German standard pre-cast kerb acc. to RIZ Kap 1, Sheet 1, with a distance to the kerb edge of 50 cm, this corresponds to an installation height of 90 cm \pm 3 cm (box beams) and 70 cm \pm 3 cm (guardrail beams) from the road surface.

On flat kerbs or boards lower than 4 cm (inclination $\leq 15\%$), the installation height, regardless of the distance to the kerb edge, is 90 cm \pm 3 cm for the box beams and 70 cm \pm 3 cm for the guardrail beams, measured directly in front of the system.

On kerbs or boards higher than 10 cm (average) with an inclination $\leq 15\%$, the reference for installation height depends on the distance of the system from the kerb:

- at distances ≤ 25 cm, reference is the road surface. (Case A)
- at distances > 25 cm, the height is measured directly in front of the system. (Case B)

Deviating installation heights require in justified and locally limited exceptional cases the written confirmation by the client.



Other installation heights are only allowed in justified and exceptional cases and then require a written approval of the customer.

At the transition to the kerb, the banquet before the building should be ramped appropriately with an inclination of 1:20 to avoid an offset between building and terrain.

5. Assembly

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

This construction product does include neither components that have been preassembled at the factory nor pre-stressed parts.

Guardrail beams with A-profile or B-profile may be used equivalently.

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

Generally, the box beam joints must be placed with lateral off-set *to the right* of the guardrail beam joints, see Assembly Instructions in Annex II. The fastening angle is always mounted with the horizontal part facing towards the traffic. Accordingly, the installations on left-side and right-side of the road differ in regard of the off-set of the box beams:

For right-side installations [at the outer edge of the carriageway in right-hand traffic countries], the offset is 76 cm, see drawing S1.2-370 in Annex I. For left-side installations [at the median or dividing strips in right-hand traffic countries], the offset is 57 cm, see drawing S1.2-380 in Annex I).

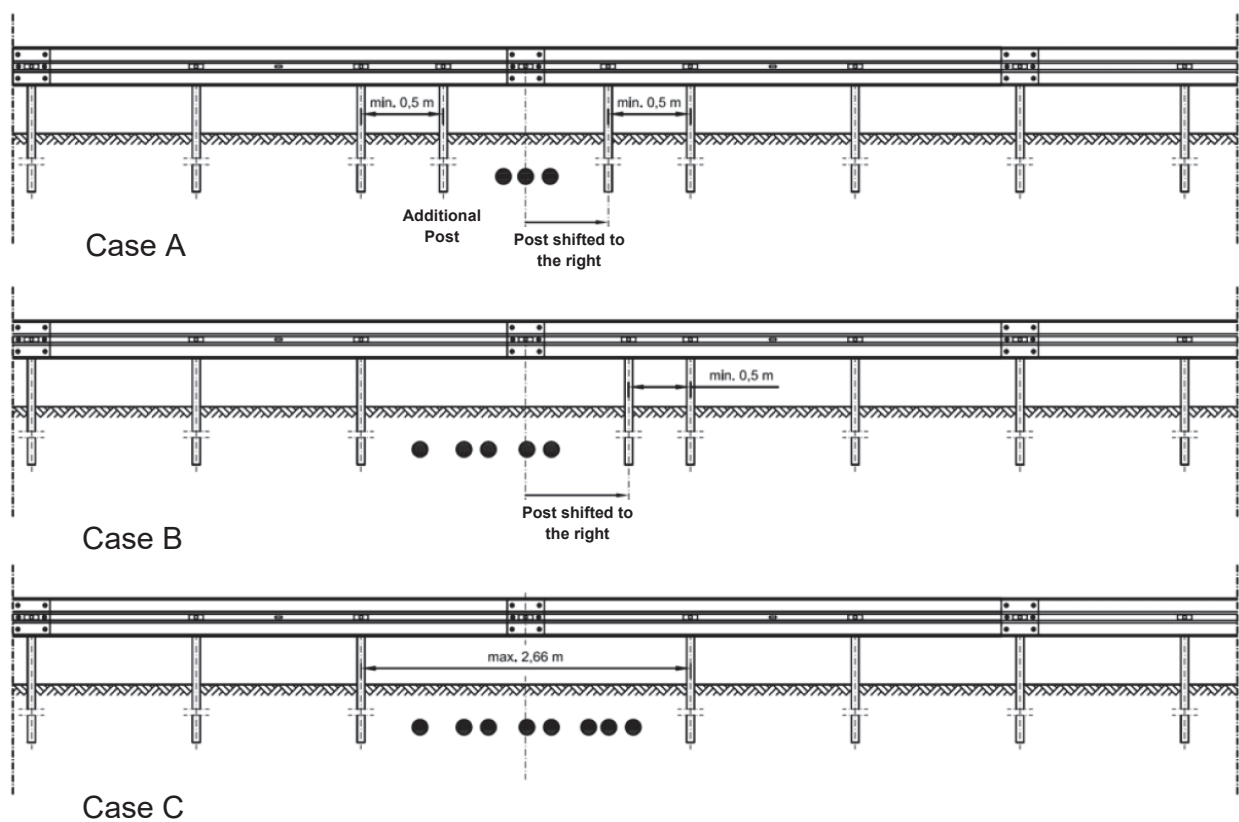
An offset of 1.33 m for the box beams is also permissible.

As a rule, the 1.33 m post spacing must not be exceeded. Where a post cannot be installed in the place intended, e.g. due to a shaft or an expansion joint, this post have to be shifted. As this necessarily leads to a post distance of more than 1.33 m, an additional post must be inserted (see Case A).

Where the obstacle is so wide, that the additional post would have to be positioned closer than 0.5 m to the next post, the additional post may be omitted as an exception (Case B).

If the shifting of a post would likewise lead to a post distance of less than 0.5 m, this post may, with written consent of the customer, instead of being shifted also be omitted, provided that the distance between two posts does not exceed 2.66 m (Case C).

In all other cases, special measures have to be agreed on with the customer as engineering decisions.



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

6. Dilatations

Dilatation joints are to be installed in places where a movement joint (e.g. building expansion joint) is planned and the displacement path may be greater than about 2 cm. Example: the displacement path of a 30 m bridge at a temperature difference of 60°C is 2.2 cm. Accordingly, a dilatation joint is required. Short bridges of less than 30 m usually do not require dilatation joints.

In the area of carriageway expansion joints, the dilatation joints have to be installed symmetrically. Installation of posts with base plate must always start at the expansion joint.

Dilatation joints are always to be supplied preassembled to the construction site and they are to be installed on the structure with the necessary post spacing.

On bridges of up to 400 m length, dilatation joints have to be installed to achieve a performance as tested (typically as per RAL-RG 620 drawing S5.3-501 or S5.3-505 for the modified, double-sided version), see Annex I. On long bridges with spans of more than 400 m, several dilatation joints have to be installed every 400 m to compensate the different extension behaviours of the structure and the steel safety barrier. If this is not advisable, drawings of dilatation joints allowing an axial displacement of ≥ 320 mm can be requested from the manufacturer.

The mean structure temperature at the time of installation is relevant for the adjustment of the dilatation joints. The bridge's movement due to temperature changes needs to be taken into account when installing the posts or precast anchors next to the expansion joints.

For the dilatation joints, $+10^{\circ}\text{C}$ is deemed to be the zero position at which the long-holes are just congruent. The post spacing relevant for installation results from the system length of the dilatation joint plus length change. For lengths outside the values given in the relevant drawings, the dimension for the pre-setting of the post spacing is to be extrapolated.

Information on the different right-side and left-side versions can be found in the RAL drawing S5.3-501. Fitting pieces with individually adapted lengths can be used as a substitute, for example to compensate for offset installation of the box beams.

7. Screwing

Only screws made or supplied by an RAL manufacturer are admissible.

The screws have to sit vertically in the structural parts to be joined and properly tightened (see Assembly Instructions in table in Annex II).

In the dilatation area, the joint screws are to be tightened so as to enable the necessary movement of the moving structural parts. The nuts are to be locked properly (minimum tightening torque about 70 Nm).

The screws M 10x45 between post and box beam are to be hand-screwed. This corresponds to a tightening torque of not less than 17 Nm.

The screws M 16x27 for the joints of the guardrail beams, the screws M 16x30 for the box beam joints as well as the screws M 16x45 for the mounting of the deformation brackets to posts and the guardrail beams to the deformation brackets have to be tightened with a torque of not less than 70 Nm.

It is recommended to use an impact wrench with a maximal torque of 500 Nm which can be adjusted to the required torque.

Tools required for screwing:

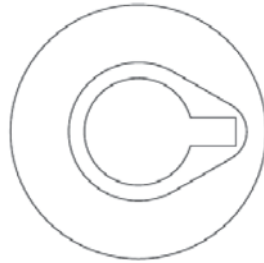
Wrench sockets

- for M16 SW 24 mm,
- for M10 SW 17 mm or SW 16 mm (depending on screw standard).

Wrenches

- for M16 SW 24 mm,
- for M10 SW 17 mm or SW 16 mm (depending on screw 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 strength grades of 4.6 or 8.8 respectively must be strictly adhered to.

Reuse of screwing materials is not permissible.

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 is 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.

When installing radius beams ensure that the overlap at joints does not have gaps. It is recommended to first tighten the bolts at the joints and then to fix the beams at the deformation tubes.

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

The following box beams are recommended for curves:

- Radius > 70 m: 4-meter box beam
- Radius > 35 m: 2-meter box beam
- Radius > 12 m: 0.66-meter box beam

10. Flares

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

11. Installation in water protection reserves

No specific requirements apply to the system in water protection reserves.

12. Terminals

The installation of terminals directly to the system is not admissible. The barrier line on the structure must always be connected to a continuing pile-driven barrier system in front and behind of the structure.

13. Transitions

The following guards may be connected to the system by means of a transition element:

- SR Eco (RAL-RG 620 drawing S3.2-373 or TÖL 5073)
- SR Eco 1a/MÜF (drawing TÖL 5027)
- SR Eco double-sided (drawing TÖL 5028, in case if modified, double-sided installation)

Connections to other safety barriers require a written confirmation by the manufacturer.²

14. Additional components

The following additional components 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 16x27 as specified in the drawing is to be substituted by a button head bolt M 16x45.
- Guardrail beam reflectors fastened to the beam at the centre holes using button head screws.

² Transitions permitted in Germany are listed in the "Technische Übersichtsliste" issued by BASt (Bundesanstalt für Straßenwesen - Federal Road Research Laboratory).

Due to the structural design, the system can be climbed over. In justified exceptional cases, a rear-side climb-over aid may be installed with the written consent of the customer.

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

If only the guardrail beam and the deformation tube show a deformation after an impact, the system still provides sufficient residual protection against break-through.

In case 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: $2.00 \text{ m} + 2.07 \text{ m} = 4.07 \text{ m}$). 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.

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 $\geq 30 \mu\text{m}$ (pre-galvanised steel: $\geq 15 \mu\text{m}$);
- 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 $55 \mu\text{m}$ (pre-galvanised steel with coating ZA300: $\geq 17 \mu\text{m}$; with coating Z600 or ZA600: $\geq 32 \mu\text{m}$) 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 here 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 filled or covering them), the anchors have to be inspected at 5-year intervals by random samples. The minimum anchor sampling size is 3%.

If corroded anchors are found, these anchors have to 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.

18. Approved modifications

Modification 1: Pre-Galvanisation

Corrosion protection of the A-beam (L 1.1-101) and 8-beam (L 1.1-102) can be done via hot dip galvanizing according to DIN EN ISO 1461 :2009 or alternatively via continuous galvanizing according to DIN EN 10346:2009 with steel bands with zinc(Z) (DIN EN 10346-S250GD+Z600-N-A-C) or respectively with zincaluminum(ZA) (DIN EN 10346-S250GD+ZA300 and ZA600-N-A-C)-coating.

Modification 2: Equivalent sealing Washers

Instead of the round sealing washer (RAL-Part no. 40.32) the following washers may be used alternatively:

- a. the oval disc with neoprene sealing disc (RAL part no. 41.41) or
- b. the round pane 80x18x4 mm with neoprene gasket (RAL part no. 40.33 with 41.27).

Modification 3: Additional Post Holes

The beams profile A and profile B may show additional elongated post holes at Meter 1 and 3 according to RAL-Drawing no. L1.1-101 and L1.1-102.

Modification 4: Double-sided Installation

The system may be installed in a double-sided version. In this case, the system width changes to 70 cm, and - due to the additional stiffening - the acceleration severity index changes to ASI B.

Modification 5: Equivalent Adhesive Anchors

Instead of adhesive anchors type *Hilti HVU M16x125*, those of type *Fischer Mortar Cartridge RM 16 with anchor rod M16, hot-dip galvanised, 8.8 with washer 50-18-4* may be used equivalently.

Modification 6: Equivalence of A and B Profile

Instead of guardrail beams Profile A and deformation brackets for A-profiles, beams profile B may be used together with B-profile deformation brackets.

Modification 7: Equivalency of Precast Anchors

Instead of adhesive anchors type *Hilti HVU M16x125*, precast anchors M16, 200/200 according RAL part no. 41.11 may be used if a positive report according to German guideline *Prüf1* can be presented. The maximum pull-out force must not exceed 115 kN.

Modification 8: Alternative Anchor Concept

In case of renovations or incorrect drilling, the *Hilti HIT-RE 500-SD* system can be used alternatively to adhesive anchors type *Hilti HVU M16x125*. In this case, the drill holes must be enlarged to $\varnothing 22$ mm (instead of $\varnothing 18$ mm).

Modification 9: Inclined Posts

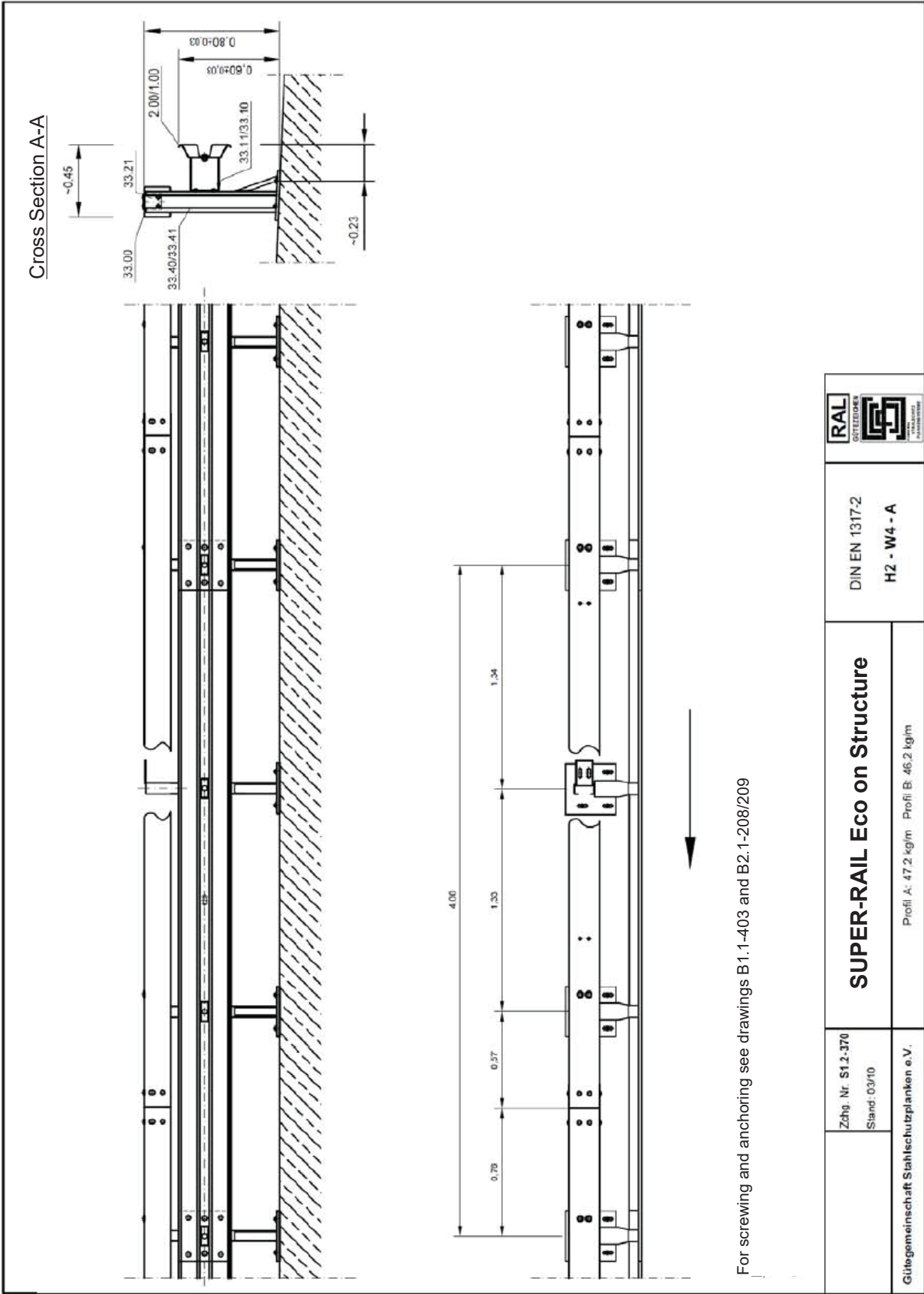
The system may be installed on bridge decks or foundations with inclinations from 0-15 % without changing the main characteristics of the system.

Modification 10: Protective Sheet Metal Version on Steel Bridges

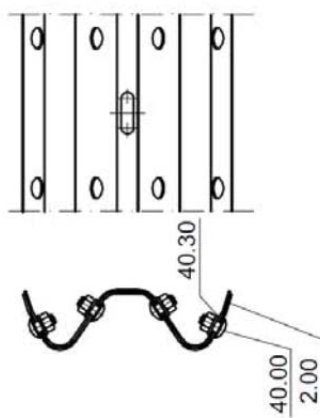
The system can be set up equally on a steel base using protective plates. Instead of using composite adhesive anchors, it is anchored by bolting with hot-dip galvanised anchors or threaded rods.]

Modification 11: Equivalent Use of Adhesive Anchor HVU 2 instead of HVU

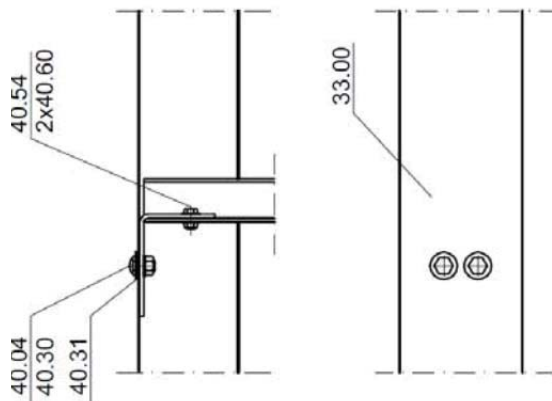
The composite adhesive anchor HVU 2 can be used as equivalent to the composite adhesive anchor HVU.]



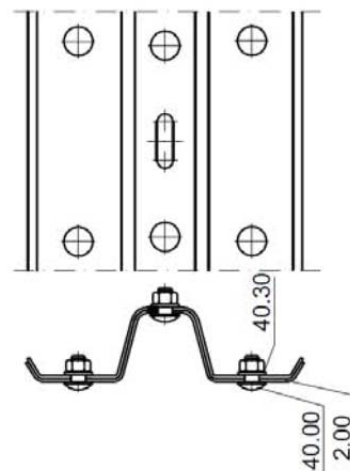
Detail Beam Joints A-Profile



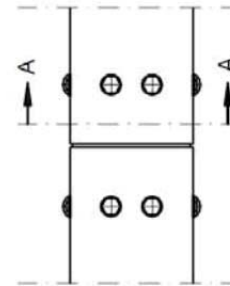
Details Posts



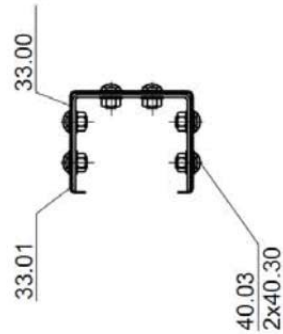
Detail Beam Joints B-Profile



Detail Box Beam Joints



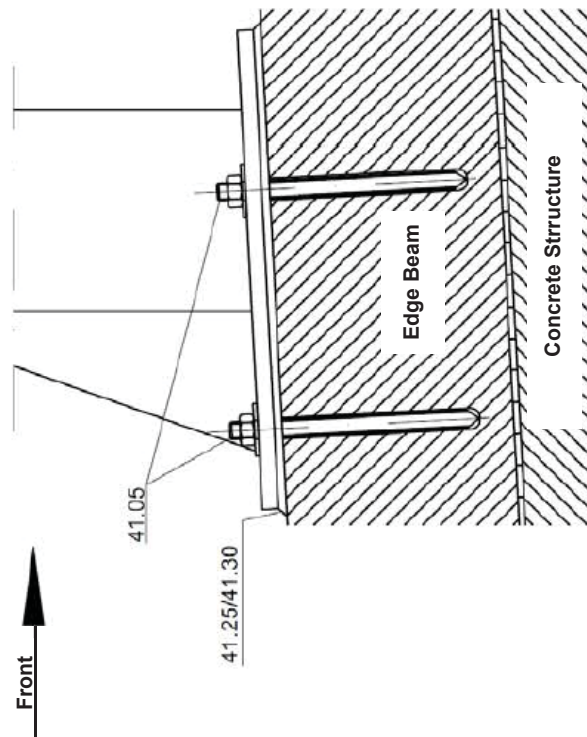
Crossection A-A



* bei SUPER-RAIL Eco Bw: 33.40 bzw. 33.41

<div></div>	<div>Zchg. Nr. B1.1-403 Stand: 03/10</div>	<div>SUPER-RAIL Eco Screwing Details</div>	<div>*****</div>	<div><div><div><div>RAL</div><div>GÜTEGEHEICH</div></div><div><div><div></div><div></div><div></div><div></div></div><div><div>Produktions- nach DIN EN 1090-1 in der Ausführung</div></div></div></div></div>
	<div>Gütemgemeinschaft Stahl/schutzplanken e.V.</div>	<div></div>		

Post Anchorage



SUPER-RAIL Eco with Chemical Anchors

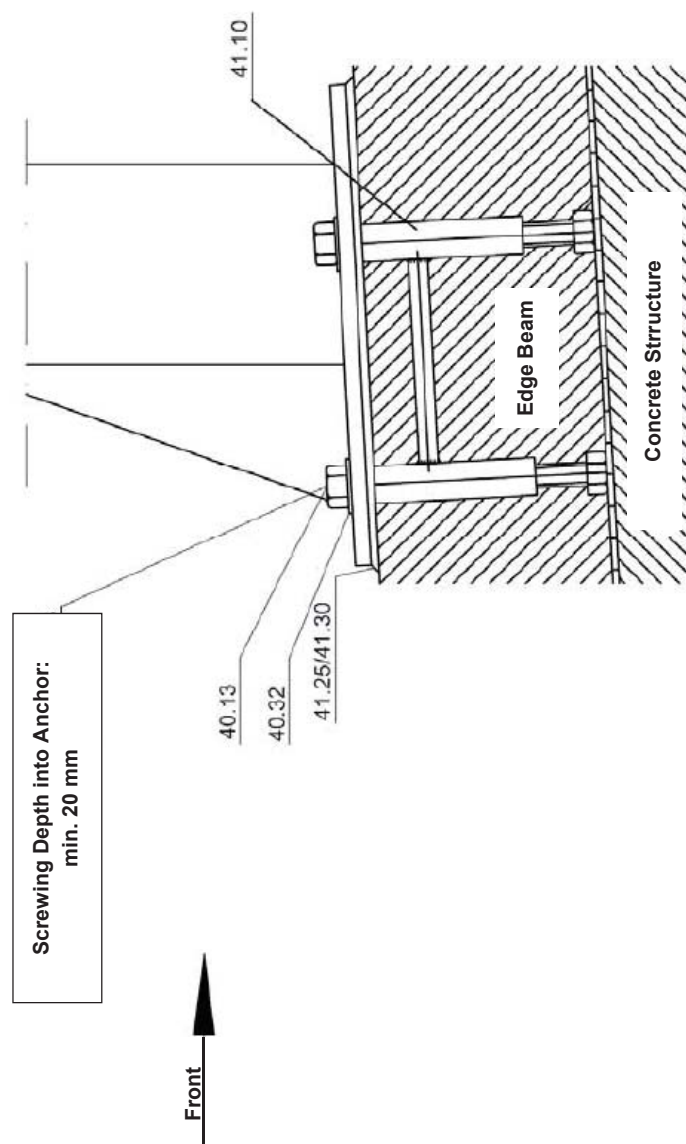
Zchg. Nr. B2.1-208

Stand. 03/10

Gütegemeinschaft Stahlschutzplanken e.V.

B2.1-208

Post Anchorage



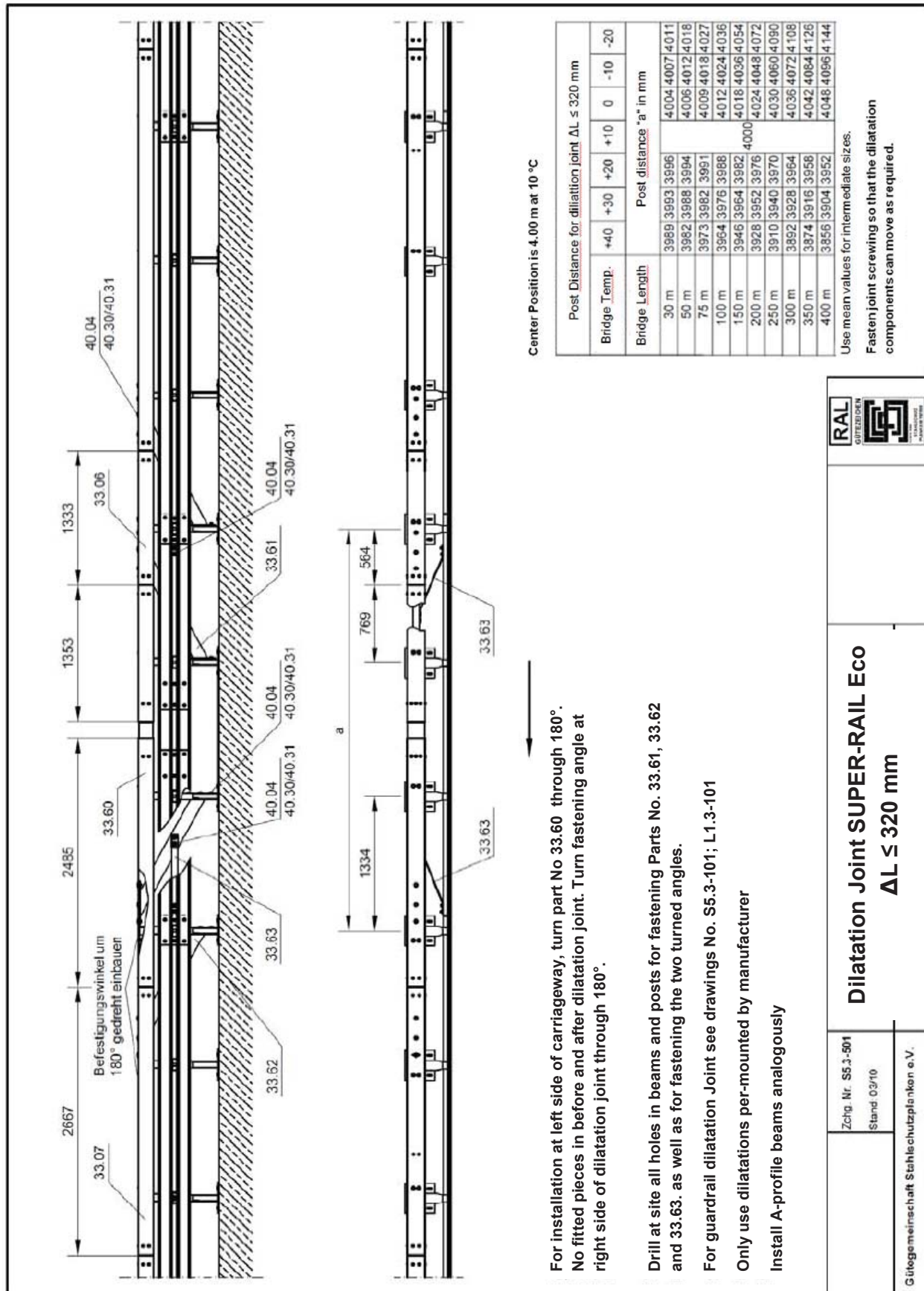
**SUPER-RAIL Eco with
pre-fabricated Anchors**

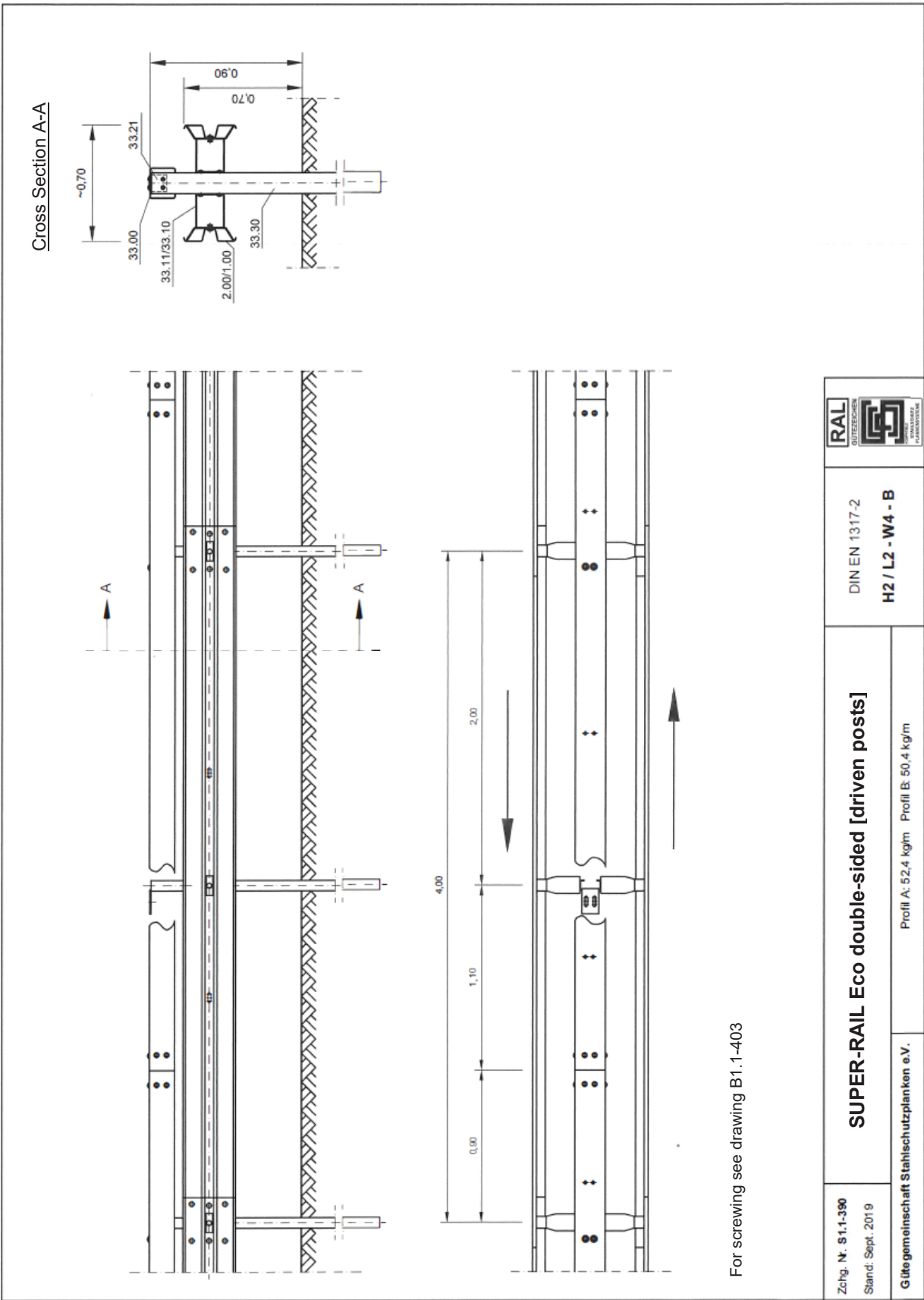
Zchg. Nr. 82.1-209

Stand: 03/10

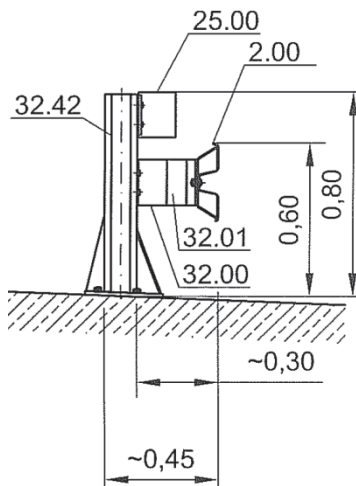
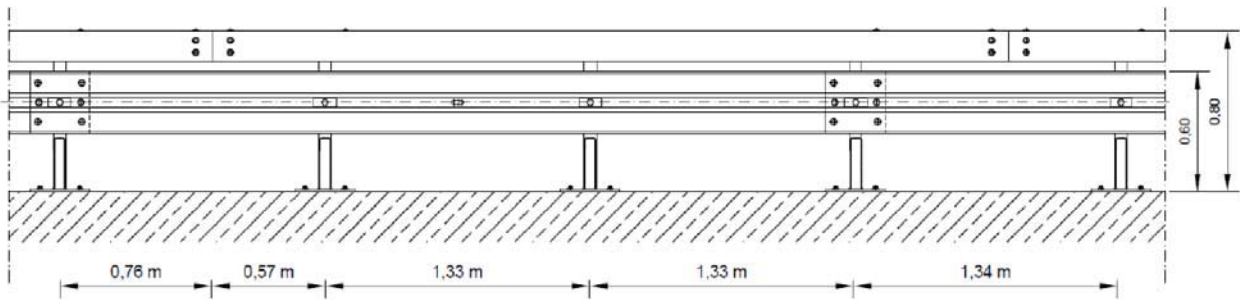
Gütergemeinschaft Stahlschutzplanken e.V.

B2.1-209





Annex II: Assembly Instructions SUPER-RAIL Eco on structure (OS)



Pieces 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, hexhead, 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 C-125: 0,79 m (32.42)

Post distance: 1.33 m

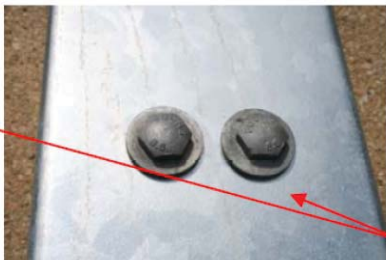
Post height: 0,79 m
 tolerance ± 3 cm

Distance posts to road edge =
 Distance system to road edge +30 cm





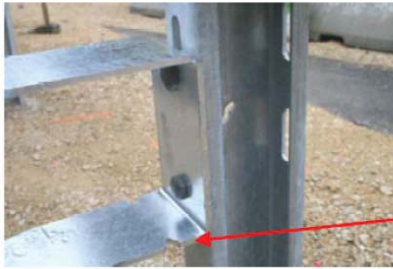
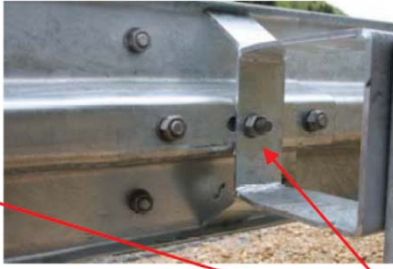


Fastening angle
 (Part No. 33.21)

Connection to post:
 2 pcs. Hexhead bolt M 10x45,
Grade 8.8 incl. nut (40.54) and
 4 washers 11 (40.60), one
 under each bolt head and one
 under each nut

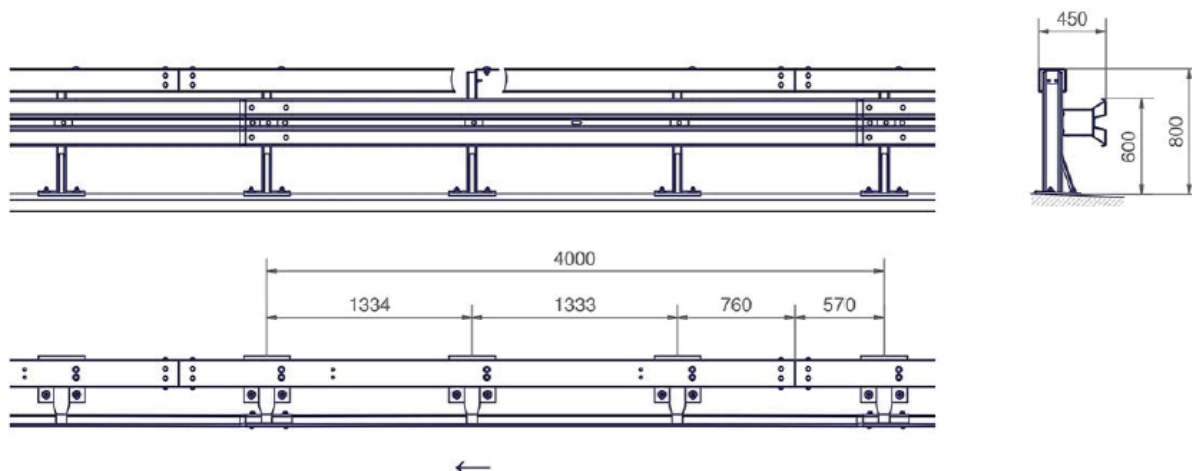


Connection to box beam:
 2 pcs. Button head bolt M
 16x45, 8.8 incl. nut (40.04),
 each with one washer 40/18/4
 (40.31) under bolt head and
 one washer 18 (40.30), under
 nut

		<p>Box beam (33.00) to be put to post from above</p> <p>Connection to butt joint (33.01): 12 pcs. button head bolt M16x30, 8.8 incl. nut (40.03) and 24 pcs. washers 18 (40.30), one under each bolt head and one under each nut</p>
		<p>Box beam joints to be placed with lateral off-set to guardrail beam joints.</p> <p>Right side of the carriageway: 0.76 m off-set</p> <p>Left side of the carriageway: 0.57 m off-set</p> <p>Off-set of box beam to the right of guardrail beam.</p>
 		<p>Deformation (33.10/33.11) Bracket</p> <p>Connection to post: 2 pcs. button head bolt M16x30, 8.8 incl. nut (40.03) and 2 pcs. washers 18 (40.30) under nuts</p> <p>Jog to bottom.</p>
 <p>Joints to overlap in direction of traffic </p>		<p>Guardrail beam (01.00/02.00)</p> <p>B-Profile: 6 pcs. button head bolt with nib M16x27, 4.6 incl. nut (40.00) and 6 pcs. washers 18 (40.30) under nuts</p> <p>A-Profile: 8 pcs. button head bolt with nib M16x27, 4.6 incl. nut (40.00) and 8 pcs. washers 18 (40.30) under nuts</p> <p>Fishplates (10.00) and button head bolt M16x45, 8.8 incl. nut (40.04) and washer 18 (40.30) under nuts</p>

Annex III: Data sheets – No. 1 Super-Rail Eco single-sided

	Super-Rail Eco OS	Dated: 18.12.2013
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The single-sided vehicle restraint system for installation on structures is comprised of galvanised components acc. to RAL-RG 620. The lengths of the beams and posts as well as the dimensions of the deformation brackets are determining the shape of each segment. The system is characterised by its beams of 4 m length and a post spacing of 1.33 m. The posts are fixed to the structure by 4 chemical anchors or by pre-cast anchors. The open box beams are fixed to the posts by fastening angles. The open box beams are connected by butt joint connectors positioned inside of the beams. The joints of the guardrail beams overlap in direction of traffic. They are connected to each other by multiple screwings and connected to the posts by deformation brackets.

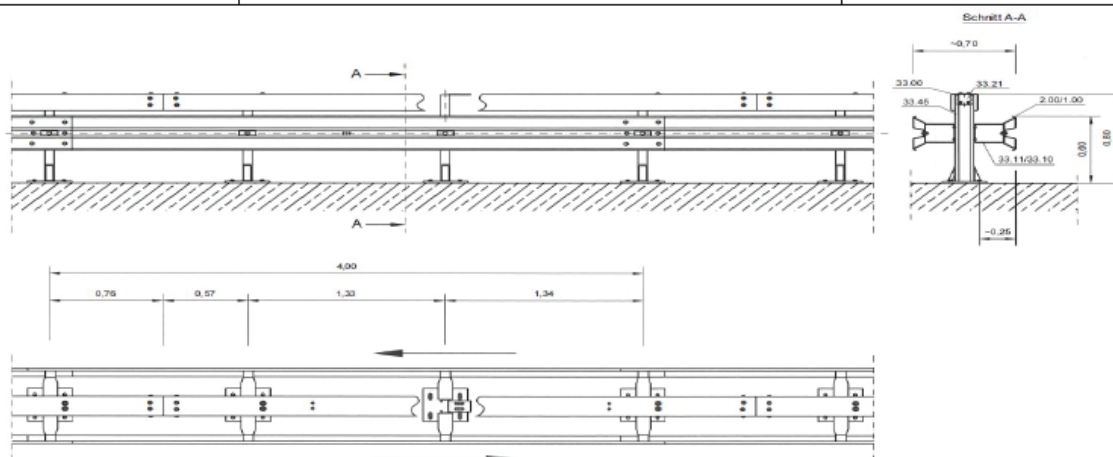
<i>System Name</i>	Super-Rail Eco on structure
<i>EG Certificate of Conformity</i>	0531-CPD-1317-0482
<i>Initial Type Tests</i>	TB11: X53.06.J09 TB51: X53.07.J09
<i>Typic Material</i>	Steel
<i>System Width</i>	0.45 m
<i>System Height (form Road Surface)</i>	0.90 m
<i>System Length (Unit)</i>	4.00 m
<i>Weight per m of System Length</i>	47.2 kg (A) / 46.2 kg (B)
<i>Installation Length</i>	60 m
<i>Tested Installing Method</i>	on structure

Performance acc. to EN 1317	
Containment Level	H2
Working Width (W_m)	W4 (1.3 m)
Impact Severity Level	A
Dynamic Deflection (D_m)	0.90 m
Vehicle Intrusion (VI_N)	No performance determined (NPD)

Nº 2013029

No. 2 Super-Rail Eco single-sided

	Super-Rail Eco OS DS	Dated: 28.10.2020
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The double-sided vehicle restraint system for installation on structures is composed of galvanised components acc. to RAL-RG 620. The lengths of the beams and posts as well as the dimensions of the deformation brackets determine the shape of each segment. The system is characterised by its beams of 4 m length and a post spacing of 1,33 m. The posts are fixed to the structure by 4 chemical anchors or by pre-cast anchors. The open box beams are fixed to the posts by fastening angles. The open box beams are connected by butt joint connectors positioned inside of the beams. The joints of the guardrail beams overlap in direction of traffic. They are connected to each other by multiple screwings and fixed to the posts by deformation brackets.

System Name	Super-Rail Eco on structure double-sided
CE Certificate of Performance	0531-CPR-1317-0482
Initial Type Tests	TB11: X53.06.J09 (TÜV Süd GmbH, 2009) TB51: X53.07.J09 (TÜV Süd GmbH, 2009)
Typical Material	Steel S235 JR, S355 JR
System Width	0,70 m
System Height (from Road Surface)	0,90 m
System Length (Unit)	4,00 m
Weight per m of System Length	62,4 kg (A) 60,4 kg (B)
Installation Length	60 m
Tested Installing Method	on structure

Performance acc. to EN 1317	
Containment Level	H2
Working Width	W4 ($W_N = 1,3$ m)
Impact Severity Level	B
Dynamic Deflection	$D_N = 0,9$ m
Vehicle Intrusion	VI5 ($V_{IN} = 1,4$ m)
Resistance Class Snow Removal	3

*) NPD = no performance determined

Nº 0