

Safety Package - Køge station - Hollow sleeper for cable crossing

SP-FIE-ON-008218
ATM: 1238

banedanmark

Ver.	Date	Author	Review	Approved	Remarks
0.1	17-06-2014	XTRO/XPEBO			
0.4	23.08.2014	WICO			Minor update
0.7	14.10.2014	ZSAEK			Updated with new site survey position done with BDK-SP.
0.8	06.11.2014	ZSAEK			Updated and rewritten
0.9	06.01.2015	ZSAEK			Update after working group meeting between Alstom and BDK-SP
0.10	18.02.2015	ZSAEK			Updated with answers to the questions given by BDK-SP of the Hollow sleeper.
0.11	02.03.2015	ZSAEK			Updated with clarification to the answered questions.
0.12	16.03.2015	ZSAEK			Updated with ballast resistance measurement.
0.13	18.03.2015	ZSAEK			Additional updates
0.14	30.06.2015	ATPZ	MABO ZSAEK KMHA MOCH		Update with BDK's Q&S comments and datasheets
0.15	20.07.2015	ZSAEK	PTLØ MAJN WEVO		Updated with electrical- and track expert review.
0.16	24.07.2015	ZSAEK			Updated competence list with info of Peter Boll and Steen Skygebjerg.
1.0	13.08.2015	ATPZ	KMHA		Updated with comments from Peter Boll. As asked by SP/BDK, major version of the document has been uploaded to SharePoint.
1.1	26.08.2015	ATPZ	ZSAEK		Reference updated in section 2.2.1.2.
1.2	24.09.2015	ATPZ	KMHA		Track changes in the document represent update with comments from Q&S and the technical project owners

2.0	25.09.2015	ATPZ			As asked by SP/BDK, major version of the document has been uploaded to SharePoint.
2.1	10.12.2015	ATPZ	KMHA		Updated after installation, installation reports included in the appendixes as safety documentation. Track changes active with respect to the last major version.
3.0	14.12.2015	ATPZ			Updated regarding comments from SP and raised to major version as asked by SP.

WICO, Wim Conraad, Alstom Safety management
ZSAEK, Sadullah Öztek, Project Engineer, Alstom
MABO, Marco Bosi, Migration Manager, Alstom
WEVO, Wessel Voorthuijzen, Alstom Installation manager
MOCH, Morten Christoffersen, Bravida project manager
XPEBO, Peter Boll, Safety adviser, BDK Fjernbane west
KMHA, Kirsten Mark Hansen, Alstom safety management
ATPZ, Alberto Taravillo Perez, Alstom safety management
PTLØ, Peter Løike Ottosen, Cowi Electrical expert
MAJN, Martin Jørgensen, Cowi Track expert.

Table of Contents

Page

1	**Introduction**	**6**
1.1	Abbreviations	6
1.2	References	6
1.3	System Objective	7
1.3.1	Background	7
1.3.2	System Purpose and Delimitation	7
1.4	Safety Targets	8
2	**System definition**	**9**
2.1	Existing System	9
2.2	New System	9
2.2.1	Hollow sleeper data	10
2.2.2	Operational Scenarios	15
2.3	Installation	15
2.3.1	Execution	16
2.4	Physical and Functional Interfaces/Functional interfaces	17
2.4.1	Technical system boundaries	17
2.4.2	Track	18
2.4.3	Signalling	18
2.4.4	Power supply	18
3	**Safety**	**20**
3.1	Organization	20
3.2	Norm Basis	23
3.3	Quality	24
3.4	Safety activities	24
3.4.1	Hazard log	24
3.4.2	Design basis -Norms and regulations (KS1)	25
3.4.3	Engineering (KS2)	25
3.4.4	Installation (KS3)	25
3.4.5	Plan for commissioning	26
3.4.6	Operation	26
3.5	Safety measures and safety requirements	26
3.5.1	Safety-related application conditions	26
3.5.2	Hazards and safety requirements	26
3.6	Documentation for Phase shift	27
4	**Significance Evaluation**	**28**
4.1	Accumulation	28
4.2	Novelty	28
4.3	Complexity	30
4.4	Consequences	30
4.5	Conclusion of significance evaluation	30
4.6	Conclusion	31
5	**Competences**	**32**

6	**Appendix**	**35**
6.1	Hollow sleeper	35
6.2	Hollow sleeper positions	37
6.3	Hollow sleeper positions on drawing	38
6.4	Schwihag hollow sleeper datasheet, EC declaration and EBA certificate	43
6.4.1	EBA certificate	43
6.4.2	Datasheet for DSB45 1:20	50
6.4.3	Datasheet for DSB45 1:00	51
6.4.4	Datasheet for UIC60 1:00	52
6.4.5	Datasheet for UIC60 1:40	53
6.4.6	EC Declaration	54
6.5	Documentation proving the actions taken during the installation to close the hazard	55
6.5.1	Hollow Sleeper Kj 52+547 UIC-60 01.00	55
6.5.2	Hollow Sleeper Kj 52+707 DSB-45 01.00	56
6.5.3	Hollow Sleeper Kj 52+799 DSB-45 01.20 TRACK 3	57
6.5.4	Hollow Sleeper Kj 52+799 DSB-45 01.20 TRACK 4	58
6.5.5	Hollow Sleeper Kj 53+247 DSB-45 01.20	59
6.5.6	Hollow Sleeper Kj 53+323 DSB-45 01.20	60
6.5.7	Hollow Sleeper Kj 53+790 DSB-45 01.00	61
6.5.8	Hollow Sleeper Kj 53+890 UIC-60 01.00	62
6.5.9	Hollow Sleeper Kj 54+026 UIC-60 01.00	63
6.5.10	Hollow Sleeper Kj 54+093 UIC-60 01.00	64
6.5.11	Hollow Sleeper Kj 54+195 UIC-60 01.40	65

1 Introduction

This system definition defines the installation and use of Schwihag hollow steel sleepers for conveying of cables under the track at Køge station on the EDL EAST of the Signalling Programme.

The hollow steel sleeper is used as an alternative, to under track drilling and cable crossing at ballast level, when crossing the track with cables for the new interlocking system.
The hollow steel sleeper is replacing an existing, conventional, concrete or wood sleeper.

1.1 Abbreviations

ACRONIM	DESCRIPTION
APIS	Authorisation for Placing In Service
ATC	Automatic Train Control
ATP	Automatic Train Protection
BDK-SP	Banedanmark signalling programme
CSM-RA	Common Safety Methods for Risk Assessment
CTC	Centralised Traffic Control
EMC	Electromagnetic Compatibility
EDL	Early Deployment Line
ERTMS	European Rail Traffic Management System
ETCS	European Traffic Control System
IXL	Interlocking
LER	"Ledningsejerregistret" The Danish Register of Underground Cable Owners
MSS	Maintenance System
NSA	National Safety Authority (Trafikstyrelsen)
NTG	Network Transmission Gateway
OCS	Overhead Catenary System
PM	Point Machine
PcP	The Danish company producing the Aluminium cable canals.
RBC	Radio Block Centre
STOB	Satellite Technical Object Building
TC	Track Circuit
TMS	Traffic Management System
Q&S	Banedanmark department for Quality and Safety

1.2 References

[R#] Referenced document	Version	Document number
[R1] Method statement for main trunk cable ducts	A	SP-FIE-FD-007953

[R2] Hollow sleeper in Køge site survey with Alstom and BDK-SP.	Technical note	SP-FIE-FD-009189
[R3] Schwihag Hollow sleeper datasheet.	2.10 dated 20/08/2012	From manufacture. Appendix
[R4] EC Declaration of Conformity	21 march 2014	See appendix
[R5] EBA Certificate	13.10.2014	See appendix
[R6] Drawing for UIC60 1:00 and 1:40 and DSB45 1:20 and 1:1		See appendix
[R7] BAFO Appendix 10 – Attachment 4- Overall Quality Management Plan. Tasks and Responsibilities	2.2	SP-12-055931-E110.004
[R8] Project Management Plan	G	
[R9] Safety Plan	3E	SP-FIE-FD-009394
[R10] Quality management plan	08.08.2013	SP-FIE-FD-008554
[R11] Hazard Log	ver.3.0 14.12.2015	SP-FIE-FD-011230

1.3 System Objective

1.3.1 Background

Cable routing is part of the preparations for installing the new ERTMS and Interlocking equipment on the Early Deployment Line (EDL) between Næstved and Roskilde. Included herein is the necessity of cables crossing the tracks for the different trackside equipment connection.

On Køge station there will be installed 11 hollow sleepers to facilitate cables for the new equipment.

1.3.2 System Purpose and Delimitation

The purpose of the hollow steel sleeper is to be able to cross the track with cables for the new trackside equipment (point machines and wheel sensors on Køge), as an alternative, to under track drilling and cable crossing at ballast level.

Under track drilling is the preferred option to cross the track with cables, but at certain locations this is difficult due to neighbouring tracks, buildings and other physical obstacles. The hollow sleeper will be used at these locations.

The hollow steel sleeper provides better cable protection, compared to conveying of cables in the ballast while still allowing mechanical and manual ballast tamping procedures. As

only one of the sleepers is changed in an area, track structure and alignment is not compromised, and geotechnical impact on the system is avoided.

1.4 Safety Targets

The purpose of the change is to provide an alternative, and in certain situations better, way of crossing the track with cables.
The aim of the change is not to improve the safety of the current system, but to maintain the same level of safety as before the change.

INTERN

2 System definition

2.1 Existing System

Rail type	DSB45 and UIC 60	Unchanged
Sleeper type	Monoblock S89, SP90, Dual-block and Wood	1 concrete and 10 wood sleepers.
Axle load	22,5 t	Unchanged
Tracks	Multiple tracks	Unchanged
Current speed	120 km/t	Unchanged
TIB	4	Unchanged
TEN-T Line	Yes	Yes
Maximum meter weight	7,2 t	Unchanged
Electrification	No. S-bane runs in parallel.	Unchanged
Traffic mgmt. system	Centralized (Roskilde FC)	Unchanged
Traffic	About 66 regional passenger trains a day. About 2 Freight trains per day.	Unchanged
Train control	None	Unchanged

2.2 New System

The new system comprises of the existing system, with 1 concrete and 10 wooden sleepers replaced by 11 hollow steel sleepers at Køge station. The location of these changes in the track can be seen in the appendixes 6.2 and 6.3.

See section [2.2.1] for detailed description of the hollow sleeper.

The hollow steel sleeper will be installed in the ballast within the track, in the same way as a normal concrete or wood sleeper. The hollow sleeper is electrically isolated from the rails in order to prevent occurrence of stray current when the line is electrified, and to secure ballast resistance for the existing track circuit systems.



Figure 1 Side-view of Schwihag hollow steel sleeper for cable crossing.

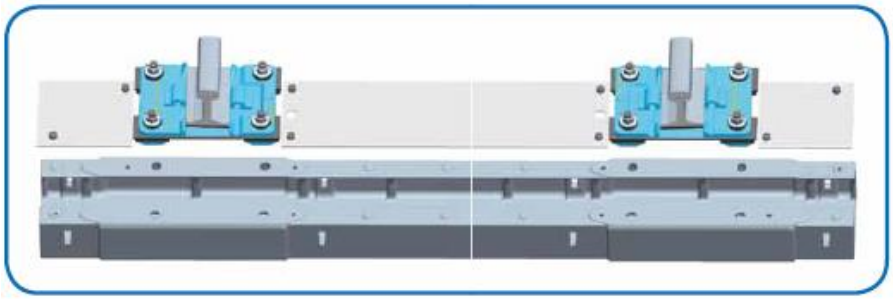


Figure 2 Top-view of Schwihag hollow steel sleeper for cable crossing

2.2.1 Hollow sleeper data

2.2.1.1 Speed

The hollow sleeper is approved for speeds up to and above 120 km/h and complies with Interoperability Directives [R4].

Dimensions:

- Sleeper height: 165 mm
- Sleeper width: 310 mm
- Weight of sleeper body: 225 kg
- Weight completely assembled: 315 kg

Concerning rail foot and pad, two types of rail profile are used (DSB45 and UIC60) with three different inclinations (1:40, 1:20 and 1:00), resulting in four types of sleepers being installed:

- UIC60 rail with 01:00 inclination: new type, see appendix 6.4.4. Four units to be installed.
- UIC60 rail with 01:40 inclination: One unit to be installed. Already in BDK norms, as shown in the next table:

Materialenummer	110400390
Materialetekst	KABELTRUGSVELLE HUL 1:40 KPL
Beskrivelse	RPS 19 MK 4. M SKL 12 SÆT F. SPORVIDDE 1436 MM TEGN LOG 60.01.7001/ SCHWIHAG A04.00390

- DSB45 rail with 01:00 inclination: new type, see appendix 6.4.3. Four units to be installed.
- DSB45 rail with 01:20 inclination: new type, see appendix 6.4.2. Two units to be installed.

Drawings with the different combinations will be delivered to BDK for their acceptance [6.4].

2.2.1.2 Conditions for use and maintenance

Hollow sleepers allow a permanent, safe cable crossing in tracks and switches. The hollow sleeper is maintained as the rest of the existing system, see applying norms in chapter 3.2.

2.2.1.3 Axle load

The hollow sleeper can withstand the same axle load as a concrete sleeper. The axle load today is 22.50 ton and it will remain the same after the installation.

The axle load bearing capacity is a function of the track as whole, not of a single component like the Hollow Sleeper. It is determined by a number of factors mostly the type and weight of the rail and the number of sleepers per km, in conjunction with the quality of the ballast bed. Replacing one sleeper with a hollow sleeper does not change the axle load bearing capacity. In fact, this is the background for the application condition that requires a certain distance (or number of normal sleepers) between two consecutive hollow sleepers.

According to the calculation done by Eisenbahn-Bundesamt [6.4] there has to be at least 24 regular sleepers between two hollow sleepers in order to maintain the same axle load bearing capacity, for speeds above 120 Km./h, decreasing this number along with the speed (120 km/h. is the max. speed in this project). This corresponds to around at least 15m between two consecutive hollow sleepers, when the distance is 60cm between the sleepers. In Køge station, there will be several 100 meters between the hollow sleepers. These calculations are based on the EBA certificate for trial service for the hollow sleeper, attached in the appendix 6.4.1.

The supplier recommends also that the installation shall not take place in the turn-out zone, where axle load is a critical safety requirement. None of the hollow sleepers in Køge are going to be installed in turn out zones.



Figure 3 Sleeper positioning: marked in white, outside the turn-out zone

2.2.1.4 Insulation of the rails

The rail is insulated as shown on the figure below with a plate pad of 5 mm High-Density polyethylene. The insulation of the Hollow sleepers complies with EN 13481-4.

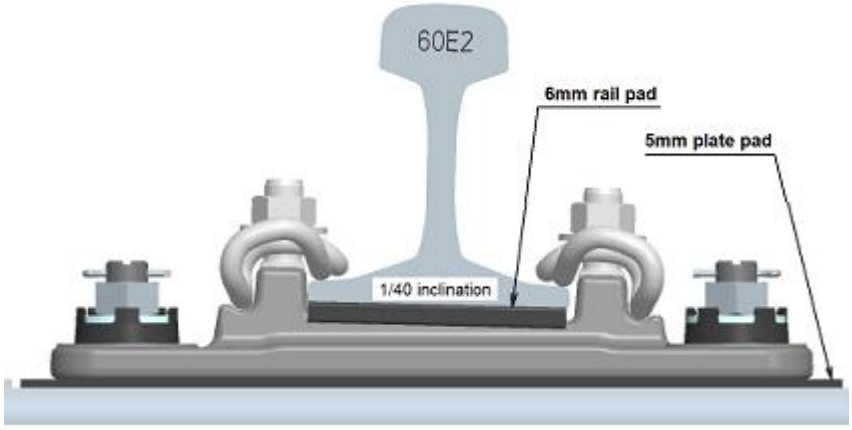


Figure 4 Insulating plates of 5mm and 10mm. Rail clippings are Skl 12.

The material of the plate is High-Density polyethylene, which has following properties.

- High toughness.
- Very low water absorption, which is 0.01%.
- High chemical resistance.
- Electrical insulation strength → dielectric strength is 22.000 kV per millimetre.

The insulation of the rails is important for track circuits, as a short circuit between the two rails will cause the track circuit to be occupied.

2.2.1.5 Stray current

In general, sleepers (wooden and concrete) do not have a perfect isolating function, and neither do ballast. Weather affects also the conductivity of the whole system. That is why insulating pads are used on the base plate, to isolate the tracks from the sleeper.

Since the hollow sleeper insulation complies with EN13481-4 and EN 13146-5, the possibility of stray currents affecting the rail strings is very low and directly related to the presence of catenary systems close to the sleeper. In that case, and due to weather and moist (due to particles, leaves, etc.) in the fastening area, there is always a risk of corrosion. According to BN1-177-1 inspections of the track will be performed at least 3 times per year, thereby making it possible to detect corrosion.

When rail grinding is performed, the rails will be flushed with water after the grinding according to BN2-47-1 section 12.1 in order to remove the metal shavings, thereby minimizing the risk of short circuiting the rail and the sleeper.

As the hollow sleepers are installed at Køge in the F-bane tracks, and as the S-bane tracks in Køge are equipped with a 1600 V DC catenary system, there is a worry that the stray currents from S-banen will be increased by the hollow sleeper. In order to investigate whether this can cause a problem to existing steel components in Køge, the Signalling Programme has established a measurement programme for measuring stray currents. The meassurement programme has been agreed upon and accepted by Technical System Responsible (“TSA”) Steen Aabech. The measurements will be done for each of the 11 hollow sleepers and repeated after half a year, including wet and dry weather.
The results will be documented in a report and evaluated, in cooperation with the “TSA” for Catenary Systems, and the threshold values for future measurements will be chosen. As a result, the Signalling Programme will produce a maintenance norm (“VN”), including method of measurement, threshold values and check form for future periodic measurements.

2.2.1.6 Fastening system

From the assembly drawings, we obtain the following values:

- For rail fastening: Clamping Set Skl 12 1:2, Tightening torque: ~200Nm for M22/WAF39 bolt (M22/SW39 bolt for UIC60 1:40 type).

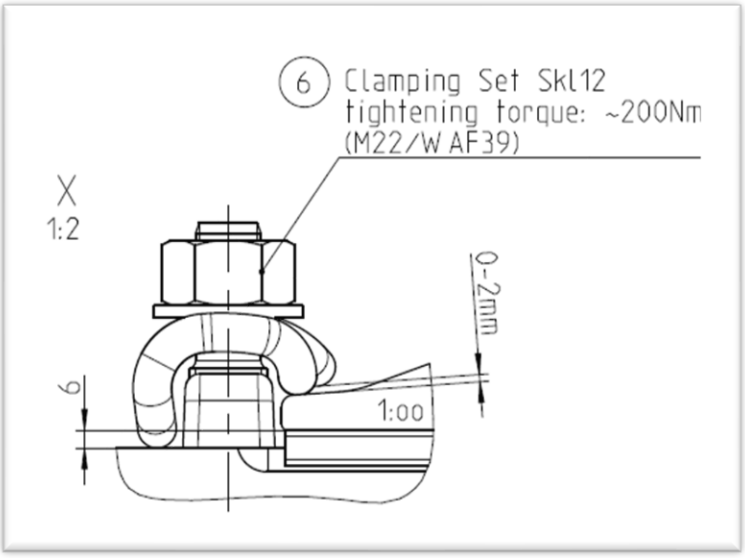


Figure 5 Generic drawing for rail fastening.

- For Insulation Unit: nut locking with split, tightening torque: 450 +/- 20Nm for M24/WAF36 (M24/SW36 for UIC60 1:40 type).

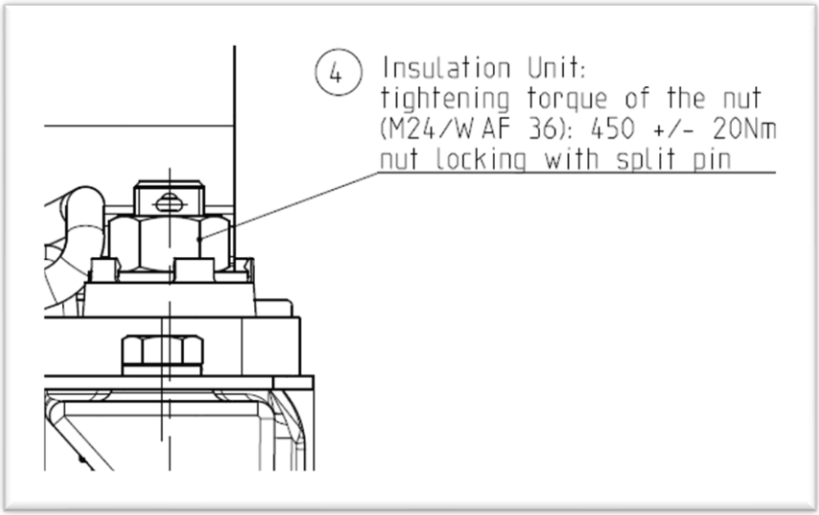


Figure 6 Generic drawing for insulation unit.

2.2.1.7 Norms and rules

Schwihag has provided an EC Declaration of Conformity, that their product meets all the requirements in the TSI [R4]. Other norms and rules requirements are shown in the Norm Basis in chapter 3.2.

2.2.1.8 Hollow sleeper positions and cables inside

The table below shows the locations for the hollow sleepers needed in Køge station. Detailed drawings of the locations are found in chapter 6.3.

Table 1 Hollow sleeper positions at Køge station and cables inside.

	Track	Km reference	Rail type	Rail inclination	Cables to cross inside the Hollow sleeper
1	4	52,547	UIC60	01:00	1 Point Machine and 1 Axle counter cables
2	3	52,707	DSB45	01:00	4 Axle counter cables and 2 PM cable
3 and 4	4 and 3	52,799	DSB45	01:00	2 Axle counter cables and 2 PM cable
5	2	53,247	DSB45	01:20	1 PM cable
6	2	53,323	DSB45	01:20	1 PM cable
7	2	53,792	DSB45	01:00	2 PM cables
8	2	53,890	UIC60	01:00	2 PM cables
9	4	54,026	UIC60	01:00	1 PM cable
10	4	54,093	UIC60	01:00	1 PM cable and 1 Axle counter cable
11	4	54,195	UIC60	01:40	2 PM cable and 4 Axle counter cables

2.2.2 Operational Scenarios

After the installation of the sleepers, there will be no changes in the maintenance of the area. Maintenance will still be performed according to the existing BDK's norms for track maintenance, see chapter 3.2. Railway operations will be affected during the installation, due to track possessions.

2.3 Installation

Banedanmark SP and Alstom have performed a site survey on Køge station and decided to use hollow sleepers for cable crossings in 11 places at the station, due to difficulties in using under drillings. The positions of the hollow sleepers are stated in appendix 6.2 and 6.3.

2.3.1 Execution

The installation of the hollow sleeper will follow the same procedure as for other sleepers being exchanged during maintenance. It will require a track possession, possibly also in the neighbouring track(s).

The installation of the hollow sleeper will follow the usual procedure for changing one sleeper. First the existing sleeper is removed, by side pulling (after removal of ballast around the sleeper), and then the hollow sleeper is inserted/pulled in place, see figure 6.



Figure 7 Test installation of a Schwihag hollow steel sleeper, replacing a wooden sleeper, done by BDK.

None of the hollow sleepers will be place in turnout zones in points.

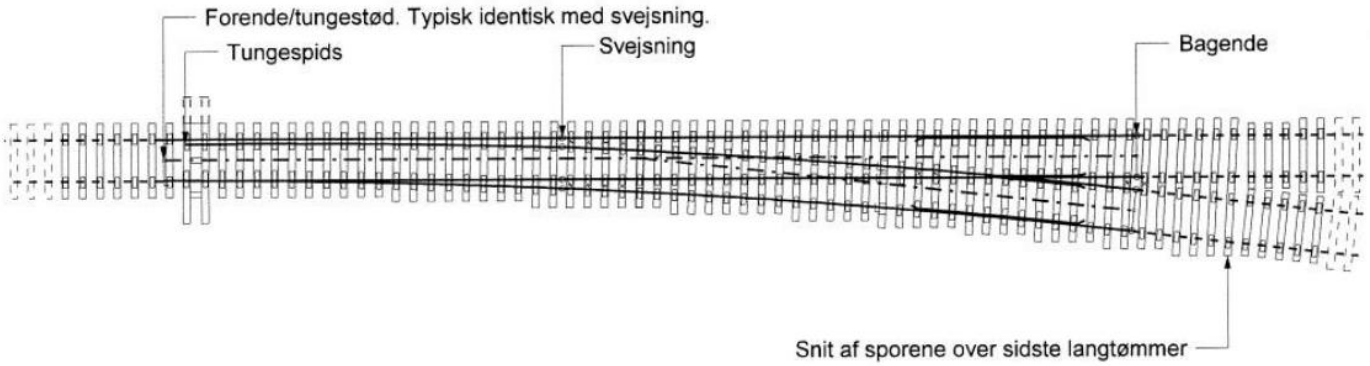


Figure 8 Turnout zone at forefront (forende) and backend (bagende).

The cables crossing through the hollow sleepers are used to connect point machines and wheel sensors with the interlocking systems, carrying both 400V and low voltage. Concerning cable routing, connection of the sleeper to cable duct will be done with a cable duct and T-connection element, that will be inserted in the existing cable ducts (along

both sides of the tracks if necessary). This solution is implemented to protect the cables from ballast related works (tamping operations for example). Concerning the possibility of track adjustments, some extra spare cable (around 10 cm) will be left in the cable duct. Furthermore, the lids of the cable ducts can be taken off during track lifting, to allow cables to be lifted higher.

2.4 Physical and Functional Interfaces/Functional interfaces

The interfaces that are identified based on the system description and the system boundaries are listed and described here. These cover both physical and functional interfaces and can be both internal and external to the system in question.

2.4.1 Technical system boundaries

The following table is used to mark the technical system boundaries. An expert from all affected disciplines must be involved in the process of producing the preliminary system definition and the following significance evaluation.

Discipline	Responsibilities	Affected	Init./Comp
Track	Track and Wheel/rail		
	Track construction	X	MAJN
	structural gauge		
	Welding techniques		
Signalling	Interlocking		
	Point		
	Control command system Centralized traffic control (CTC) for Manuel fjernstyring Traffic Management System (TMS) for mere avancerede totalsystemer som DCTC eller XCTC		
	Track circuits	X	ATPZ/KMHA
	Cables and EMC	X	DADA
	On-board ATC		
	Wayside HKT system		
	Wayside ATC system		
	Operational/technical interface		
	Operational/technical interface		
	Level crossing system Level Crossing		
Power supply	Catenary system	X	PTLØ
	Supply of traction power		
	High voltage current		
	Protective earthing	(X)	PTLØ
Constructions	Bridges and tunnels		
	Soil mechanics		

MAJN, Martin Jørgensen, Cowi Track expert.
KMHA, Kirsten Mark Hansen, Alstom safety management
ATPZ, Alberto Taravillo Perez, Alstom safety management
DAD, Davide Davalli, Alstom EMC expert
PTLØ, Peter Løike Ottosen, Cowi Electrical expert

2.4.2 Track

Replacing a sleeper with a hollow sleeper introduces a boundary to the track construction.

Rail string
The rail string will have a new physical interface to the hollow steel sleeper given that the fastening of the rail string to the hollow sleeper will be with new components. The hollow sleeper has approximately the same static and dynamic properties as the existing sleepers, and spacing between consecutive hollow steel sleepers is applied to maintain the same axle load on the track.

Ballast
There will be an interface between the new sleeper and the ballast. The new sleeper will be placed in the ballast as any other sleeper. The design of the sleeper (sharper in the corners) secures the good stability of the sleeper.

2.4.3 Signalling

Track circuits
Until the new signalling system have been taken into service the existing signalling system will be in operation, and since the existing system uses track circuits, there is a physical interface in the galvanic isolation of the two rail strings, together with a possible change of the ballast resistance. If the resistance between the two rails becomes too low, the track circuit will indicate 'occupied', which is a safe state.

Cables and EMC
The hollow sleeper is installed due to the necessity of pulling cables from one side of the track to the other, creating the interface between the sleeper and the cables. The hollow sleeper is designed with the appropriate mechanical and electrical characteristics to protect the cables and the signals running through them, and has no impact on the railway safety. There are no EMC issues related to the installation of the hollow sleeper itself.

2.4.4 Power supply

Catenary system and earthing

There is an interface with the catenary system, as the S-bane line in some cases runs in near proximity to the hollow steel sleepers, and the S-bane is known to produce stray currents.

Only two of the Hollow Sleepers will be placed near the S-bane tracks: at km 52,547 and km 52,707. See the figures below.

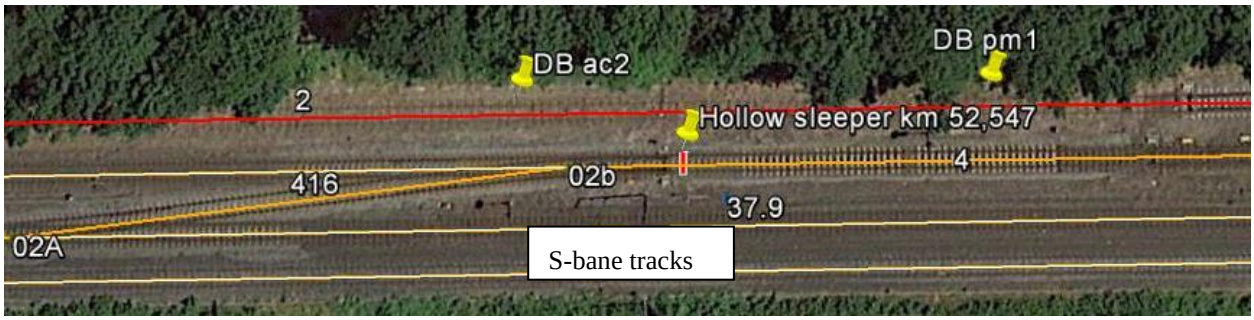


Figure 9 Hollow sleepers at km 52,547

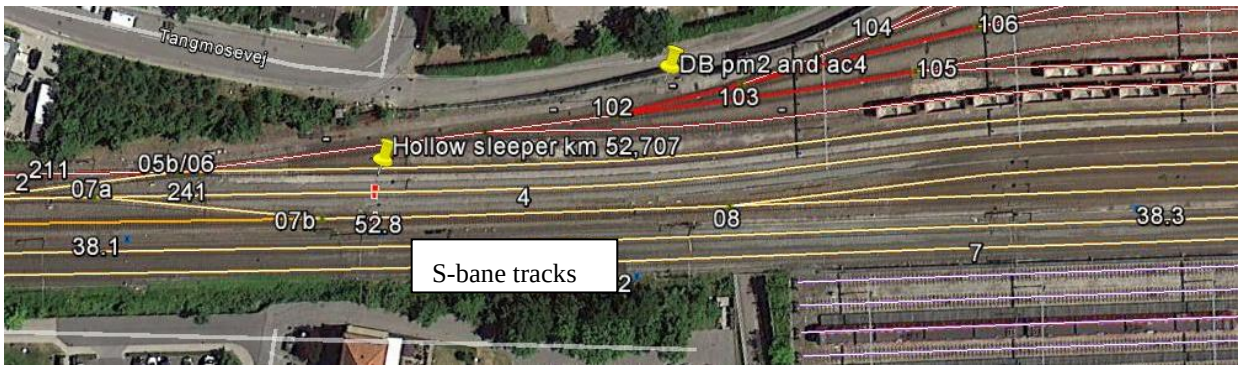


Figure 10 Two Hollow Sleepers at km 52,707

Rail pads will be installed to ensure insulation in 1600 V DC environment. Furthermore, the sleeper complies with EN13146-4 norm. The sleeper in Fig. 8 is the one closest to the S-bane line, being this distance 5.7 meters from nearest rails. The sleeper is therefore outside of the earthing area recommended by the norms SKI and FKI, see section 3.2.

In order to determine whether stray current from S-banen will be increased by the hollow sleeper, a measurement programme will be established around the sleeper, as mentioned in section 2.2.1.5.

3 Safety

3.1 Organization

Alstom is executing this project for Banedanmark's Signalling Program.

Banedanmark Signalling Program:

- **Project Management**
  Bagher Ghias Haddadan
  Project manager, Fjernbane East
  +45 23 47 33 57

- **Railway Safety**
  Tim Ravn Olsen
  Safety adviser, CSM-REA and TRACE processes.
  Banedanmark Fjernbane East
  +45 52 51 90 38

ALSTOM Transport Denmark:

- **Project manager**
  Paul Visser
  paul.visser @transport.alstom.com.
  +45 23 22 44 97
  The Project Manager is responsible for the implementation of the Quality & Safety system and for the management and delivery of the project in accordance with the Contract requirements [R7].

- **Migration Manager**
  Marco Bosi
  marco.bosi@transport.alstom.com.
  +45 27 79 17 07
  The Migration Manager function is to coordinate all activities, thereby ensuring the proper migration from the old signalling system to the new. This includes the coordination of installation, planning of possessions, test & commissioning, approvals and training activities [R8].

- **Safety manager**
  Stefano Stanghellini
  stefano.stanghellini@transport.alstom.com
  +39 05 14 16 32 04
  Responsible for safety demonstration at overall System level (including relevant Interfaces) and S-ISA certification.
  Responsible for Banedanmark System Acceptance and interaction with G-ISA. He is also responsible to support the S-NoBo in his activities for the

subsystem level certification. If necessary, he will interact also with G-NoBo.

Responsible for system Validation strategy and activities. In his role of Validation manager is in strict coordination with the VI&T Manager, which is in charge of all the Verification and integration activities, and with the Commissioning Manager, which is in charge of all the commissioning and testing on field.

The validation manager so is in charge of approve the V&V plan in addition to all the testing and integration plans. To draw the validation reports will have in input the verification and testing report produced in accordance with the plan he have approved [R9].

ALSTOM (as actor) has supported BDK in the implementation of the TRACE (specifically part K-10) process defined by BDK (as proposer) and accepted by NSA as compliant with the CSM-RA. ALSTOM (the safety manager) is responsible for the content of all the safety documentation supporting the implementation of the TRACE process.

- **Safety manager, Off shore[1] (Interface with BDK)**
  Wim Coenraad
  Safety Manager
  wim.coenraad@transport.alstom.com
  +31 6 51 13 71 04
  Responsible for interfacing between the BDK-SP safety team and the Alstom Safety Team, to ensure the correct level of synchronization and coordination of all the safety activities planned by Banedanmark until the final approval by the Railway Authority (NSA). Ensure timely delivery of the supplier's safety documents [R9].

- **Installation Manager**
  Wessel Voorthuijzen
  Wessel.voorthuijzen@transport.alstom.com
  +45 26 79 79 19
  The leading person for the day-to-day organization of site works. He is in charge of technical decisions related to the EDL and manages the installation team.

- **Civil Works – Project and Installation Manager**
  Morten Christoffersen
  Bravida Denmark A/S
  Morten.Christoffersen@bravida.dk
  +45 25 25 37 32
  Bravida's Project and Installation Manager has the technical responsibility for ensuring that any work on a specific site in this project is performed in accordance with the rules and requirements in the project, the Project

[1] Off shore means that the person works from Copenhagen. On shore persons work from Bologna.

Management Plan, Quality and EHS Management Systems as well as applicable legislation and rules.

- **Site Supervisor (Tilsynsleder)**
  Lars Pedersen
  Alstom
  Lars.Pedersen@transport.alstom.com
  +45 28 91 47 82
  Prepare and supervise execution of Installation on field in support to one or several Bids / Projects and /or Programs' initiatives for technologies of railway signalling and under direction of the Project Installation Manager in strict application of Transport policies, standards and applicable local regulations and standards.

- **Field Operator and Service Quality Manager**
  Trine Jørgensen
  Alstom
  Trine.Jorgensen@transport.alstom.com
  +45 27 90 09 87

  The FO&S Q Manager is in charge of Field Operation and Services Quality during Project deployment phase (including Maintenance Contracts) as well as Warranty phase. This covers in particular:

  - Control of effective application of installation, test & commissioning and maintenance standards required by the Project.
  - Alert to project manager in case of identified gap – management of waivers.
  - Field Operation and Service Quality performances measurement.
  - Definition and follow-up of internal and external (supplier) continuous improvement plans.
  - For installation and maintenance outsourced parts and / services, Quality Control of parts and Supplier' process control [R10].

Alstom's organization referred to can be found in and their competences in chapter 5.

As the change has been evaluated to be non-significant, no independent safety assessor (ISA) is needed to assess the change.

3.2 Norm Basis

Norms – regulations – standards
The table below lists all identified norms, regulations, and standards to be followed by the project.

Norm	Section
Railway applications – Track Performance requirements for Fastening systems. Part 4: Fastening systems for steel sleepers, electrical resistance.	EN13481-4
Railway applications – Track Test methods for fastening systems. Part 4: Effect of repeated loading	EN13146-4
GAB Spor (General Description of Works: Track)	Chapter 2.4.9 (Track adjusting), 2.4.14 (Ballast cleaning) and 2.6 (Control of execution)
GAB kørestrøm	Chapter 4.3 Work nearby track with catenary system.
BN1-6-5: Tværprofiler for ballasteret spor (Cross section of track with ballast)	Chapter 10 (Safety requirements) and 11 (Maintenance)
BN1-38-4: Sporbeliggenhedskontrol og sporkvalitetsnormer (Monitoring of track position and quality)	Chapter 10 (Track Control), 12 and 13 (Preparation and Execution)
BN1-177-1 Tilstandsinspektion og vedligeholdelse (Operations and maintenance instructions)	10.2.1
BN1-106-1 SKI: Instruction for catenary systems in S-bane lines.	Chapter 2.4: earthing protection
SAB Jording og potentialudligning på elektrificerede baner (Grounding and equipotential on electrified railways)	Whole document

Norm	Section
BN2-47-1 Rifler og bølger samt skinneslibning (Cracks and slopes in rails. Rail grinding)	Chapter 12.1: requirements for rail grinding.
Stærkstrømbekendtgørelsens (Danish Electrical Laws)	Chapter 2, 6, 6B and 8

Derogations
No derogations are needed.

3.3 Quality

Alstom holds an ISO 9001 accreditation, and works according to the quality management system. Further, the specific project works according to the Quality Management Plan. The project performs a quality control of all activities in the following three steps: analysis phase, design phase, and implementation phase.

3.4 Safety activities

The safety activities originate from the hazard log as risk reduction measures. They are documented and controlled in the hazard log, and are not repeated here.

3.4.1 Hazard log

The hazard identification has been performed in the design phase by:

- Wessel Voorthuijzen
- Tim Ravn Olsen
- Sadullah Öztek
- Kirsten Mark Hansen
- Alberto Taravillo Pérez
- Steen Skygebjerg
- Peter Boll

The following persons were not present in the workshop. Therefore, all the identified hazards have been filled into the hazard log and sent to them for review/supplementation:

- Marco Bosi, Alstom migration manager
- Wim Coenraad, Alstom safety manager offshore
- Martin Jørgensen, Cowi track expert
- Peter Løike Ottosen, Cowi electrical expert
- Morten Christoffersen, Bravida project manager

As a result of their comments, a new hazard was identified concerning unseating of the rails on the hollow sleeper and it was registered in the Hazard Log, hazard no. 7.

The competences of these persons are described in section 5.The result of the hazard identification is documented in the hazard log [R11].

3.4.1.1 Assumptions

The risk assessment is performed on basis of this system definition and covers all the described changes as well as the installation.

3.4.2 Design basis -Norms and regulations (KS1)

The norm basis is listed in section 3.2.The norm basis is primarily derived from the hazard identification and supplemented with generic norms that are not used to mitigate hazards. Project members have checked these norms, and they are listed in page 2. Their competences are stated in section 5.

3.4.3 Engineering (KS2)

A survey has been conducted [R2] to identify the places at Køge station where under track drillings are difficult. The survey was also used to verify that the application condition of the hollow sleeper, namely that there shall be at least 24 regular sleepers between two consecutive hollow sleepers, was fulfilled. Further, Alstom's Migration Manager (see chapter 3.1) has inspected the installation locations to avoid possible incongruities. No incongruities were found.

3.4.4 Installation (KS3)

Before installation is initiated Bravida will make and obtain approval of a railway safety plan, according to the Bdk rules, SR §72 section 1.1.2.

The installation of the hollow steel sleeper follows the same principle as the replacement of a monoblock sleeper during corrective maintenance. Bravida's installation manager will control the installation process. After the installation, it will be checked that the ballast profile and the fastening of the rails are correct according to GAB Spor and BN1-6-5. These checks will close out hazards no. 1 and 7. The checks will be performed by a track technician (sportekniker).

Further, the installation will be inspected by the technical responsible for track in Banedanmark (geografiske fagansvarlige).

Asset data in relation to the hollow sleepers will be handed in to Bdk after the installation.

3.4.5 Plan for commissioning

After the installation is checked, the possession will be removed, and the track will be placed in service.

3.4.6 Operation

During operation normal maintenance of the track will be performed. Inspections of the hollow sleeper will be carried out at least 3 times per year, according to BN1-177-1 setion 10.2.1. Further, in order to reveal whether the hollow sleeper influences the stray currents from the S-bane a measurement programme of stray currents has been established around the hollow sleeper, see chapter 2.2.1.5.

3.5 Safety measures and safety requirements

The existing system is assumed to be designed in accordance with the norms and standards that were in force, when the system was constructed. The change described in this system definition is executed in accordance to the present norms and standards. The safety measures and the safety requirements to be implemented are listed in the hazard log [R11].

3.5.1 Safety-related application conditions

The safety related application conditions for the hollow sleeper are:

The sleeper must not be placed in the turnout zone of points.

If the speed is above 120 km/h there shall be at least 24 normal sleepers (corresponding to 15 m) between two consecutive hollow sleepers.

For speeds up to 120 km/h (incl.) there shall be at least seven normal sleepers (corresponding to 4.8 m) between two consecutive hollow sleepers.

All of these application conditions are fulfilled by the design, i.e. the position of the hollow sleepers.

3.5.2 Hazards and safety requirements

These requirements were identified during the risk assessment process, and are listed in the hazard record [R11]. The project has identified seven hazards that are related to railway safety. Five of these hazards were closed during the design phase, and the rest were closed out during the installation by carrying out the activities registered in the hazard log to meet the safety requirements

3.6 Documentation for Phase shift

As this system definition is only concerned with the installation of the hollow steel sleepers, no documentation for phase shift has been produced.

4 Significance Evaluation

This chapter reports the significance evaluation of the installation of hollow steel sleepers in Køge station described in the previous chapter of this document.

In accordance with the Trafikstyrelsen guideline [R10] the significance evaluation will be performed considering the following criteria:

a. Accumulation
b. Novelty
c. Complexity
d. Consequence

Moreover, they will be combined in order to be compared with the Matrix for assessing uncertainty and impact reported in the guideline [R10].
If the combination results in a "cell" of the matrix marked as "yellow", the following two criteria will be used to finalise the significance evaluation:

e. Reversibility
f. Monitoring

If the combination results in the "green" area, the result of the evaluation is that the change is not "significant". If it results in the "red" area, the result is that the change is "significant" and the full process described in the CSM-RA [R7] to keep the risk associated with the change under control shall be applied in order to ask for the APIS to the NSA.

4.1 Accumulation

This installation is a part of the modifications to the railway under the Signalling Programme and therefore affected by other internal (to the SP) changes to the railway. All installation/migration work done as part of the signalling programme Fjernbane east project will be performed by the same entrepreneur (Bravida).

Previously there has been performed installation of manholes, cable ducts, cable ploughing, and marker board foundation and under track drilling in Køge (including the open line towards Ølby). All these actions have a low significance for railway safety. Besides these activities, a number of other projects are in process at Køge station. Among these projects is the establishment of a pedestrian tunnel, shortening of track no. 5, etc. As many projects are taking place at almost the same time in Køge, accumulation is rated as average.

4.2 Novelty

The Schwihag Hollow sleeper has been approved to be installed in other railway projects. The next pictures show two hollow steel sleepers installed and in service at Lyngby Station in the electrified S-bane.



Another project has installed and put in service the MET. This is a switch machine built inside a hollow steel sleeper. One is been installed in Ringsted, electrified line with 25KV AC, and more are planned to be installed due to its maintenance friendliness and its low space requirements.





Steel sleepers are also referred to in BDK's norms and procedures (GAB Spor, 2.3.4.3.), documenting that the steel sleepers are accepted elements in BDK's infrastructure.

The novelty has been evaluated though only as low, due to the relative lack of experience with this product.

4.3 Complexity

Installing a hollow sleeper requires the same procedures as replacing a sleeper for corrective maintenance. Therefore, the complexity has been rated as very low.

4.4 Consequences

As a result of the Hazard Identification Workshop, a Hazard Log [R11] was generated, proving that the installation of a hollow steel sleeper cannot generate any damage to people or vehicles, as long as norms and inspections are followed during the installation in order to fulfil the safety-related application conditions. Consequence is therefore rated as very low.

4.5 Conclusion of significance evaluation

In accordance to the analysis performed in the previous paragraph the uncertainty and the consequence of the change described in this system definition can be rated as follow:

Uncertainty
The uncertainty is the product of the novelty, complexity, and accumulation. Accumulation has been rated as average, novelty has been rated low, and complexity has been rated very low, giving uncertainty a score of 3.

Consequence
Consequence is rated 1, due to no accident type being generated.

The following matrix shows the ranking of the significance as reported in the Trafikstyrelsen guideline for the significance evaluation of the change.

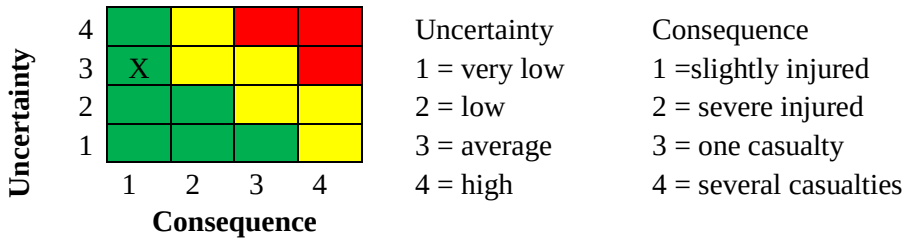


Figure 10: Risk matrix for supporting significance evaluation.

Consequence 1 and Uncertainty 3 results in Green rating. Having landed in the green of the risk matrix the two additional criteria do not need to be taken into account, see figure 10.

4.6 Conclusion

The replacement of sleepers with hollow sleepers can be compared with replacing broken sleepers with new ones. In addition, monitoring of the process, during and after the installation, is possible. Therefore, this system definition considers the change as **non-significant**.

Version 3.0 includes the installation reports in section 6.5 used as safety documentation. These reports are based on installation constrains from section 3.4.4, and are used to close the remaining hazards from the Hazard Log [R11], resulting in the final and major version.

The major versions of these documents prove that the installation has been executed following BDK's procedures and fulfilling the CSM RM process.

5 Competences

In the table below is shown the authors and reviewers competencies in relation to this system definition.

Name	Function	Experience	Reviewed Aspects	Competences
Marco Bosi	Alstom Infrastructure East Migration manager	30+ years' experience with several international infrastructure projects. Migration from the old interlocking system to the new interlocking system. Installation, engineering, test & commissioning, approvals and training activities.	Product selection. Installation methods, Work execution. Site survey accordance to structural gauge. Evaluation of construction and geotechnical evaluation.	Site survey, track Structural gauge. Soil mechanics Geotechnical evaluation.
Morten Christoffersen	Bravida Project Manager	25 years of experience as a project manager, 15 years of experience in infrastructure projects	Installation methods, Work execution, Site Survey, Railway Safety Plan.	Site survey, construction, installation activities, compliance to BN.
Wim Coenraad	Safety Manager Offsite FIE-Alstom	34 years of experience in railway signalling.	Wim Coenraad	Safety Manager Offsite FIE-Alstom
Wessel Voorthuijzen	Installation Manager	25 years of experience with railway signalling.	Safety management process. Installation methods, Work execution and Signalling operations.	Installation activities.
Tim Ravn Olsen	Safety advisor Fjernbane Infrastructure	3+ years of experience with Railway Safety and the Common Safety Method CSM-REA	Safety management process. Risk Analysis, Review of System definition. Significance Evaluation	BDK safety process.

Sadullah Öztek	Alstom Project Engineer	MSc Railway Technology	The whole document	Engineering, installation activities, bane norms and structural gauge.
Kirsten Mark Hansen	Safety management	23 years of experience with designing, verifying, validating, testing and assessing interlocking systems and level crossings. Expert in CSM, risk analysis, and safety management. Has a deep knowledge of the railway system as a whole and the interfaces be-tween the different subsystems like track, catenary, power supply, rolling stock etc.	General review of the document. CSM-RA	CSM-process Safety analysis Interlocking systems, incl. external components like axle counters, track circuits, level crossings, passenger warning systems, etc.
Alberto Taravillo Pérez	Safety assessment	10 years of experience in railway and metro: installation, maintenance, decommissioning and commissioning of interlocking systems, trackside equipment and CSM-RA.	Author	Safety analysis, interlocking systems and trackside equipment

Trine Boas Jørgensen	Alstom Field Operation and Service Quality Manager	Lead Auditor Field Operation and Service Quality on the Fjernbane East project since 2013	Review of coherency and references in Alstom input	Certified ISO 9001 Lead Auditor Field Operation and Service Quality on the Fjernbane East project since 2013
Steen Skygebjerg	Migration management External vital interfaces management BDK-SP	33 years of experience within: • Failsafe design and analysis • Project management and execution • Authority approvals	Hazard Identification Workshop Participant	Compliance with BDK processes.
Peter Boll	Safety advisor for the Fjernbane WEST project.	3 years' experience with CSM and rail safety.	Hazard Identification Workshop Participant	Compliance with BDK processes.
Martin Jørgensen	Cowi Track expert, permanent way.	5 years of experience in railways: permanent way design and descriptions. 1 year of CSM experience as a safety assessor.	Hollow sleeper installation.	Review of the track related technical description in regards to local standards.
Peter Løike Ottosen	Cowi electrical Power	2,5 years' experience with Stray current, equipotential bonding (BPU areas), Electrical power installations.	Stray current, catenary system.	Catenary system Stray current.
Davide Davalli	Alstom EMC expert	Several years of experience with EMC and earthing in railway systems.	Cables and EMC in design phase.	EMC and protective earthing

6 Appendix

6.1 Hollow sleeper

The Schwihag hollow steel sleeper is made of ductile cast iron and is comparable in size and weight to a concrete sleeper. The base of the sleeper has sharp edges designed for stability in the ballast bed.

The integrated cable pipes allow for safe, permanent crossing of cables in points and tracks, even when mechanical maintenance and adjustments are being carried out. The cable pipes at the front are held firmly in place by vibration absorbent rubber pads.

To ensure maximum safety, there is electric insulation between rail and baseplate as well as baseplate and sleeper. The fully machined top surface ensures the correct seating, alignment and level of the running rail.

The easily removable covers offer robust protection from debris and the effects of weather. Unrestricted access from above and at both ends makes it inspection-friendly.

Characteristics:

- Fabricated from one piece of ductile cast iron
- The base of the hollow sleeper has sharp edges and indentation provides high stability in ballast bed
- Completely accessible from above and at both ends
- Comparable in size and weight to concrete sleeper
- Double insulation
- Suitable for any track profile and gauge

HOLLOW SLEEPER FOR TRACKS



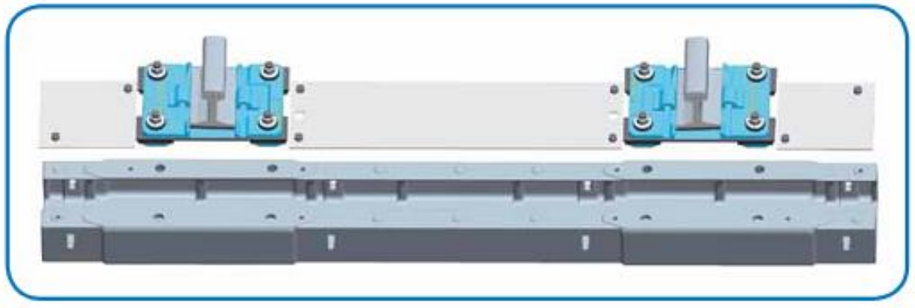


THE HOLLOW SLEEPER IS MADE OF DUCTILE CAST IRON AND IS COMPARABLE IN WEIGHT TO A CONCRETE SLEEPER. THE UNDERSIDE OF THE SLEEPER HAS SHARP EDGES AND INDENTATIONS FOR A STABLE POSITION IN THE BALLAST.



Advantages

:: One-piece made of ductile cast iron
:: The base of the sleeper has sharp edges and indentations for a stable position in the ballast
:: Can be completely opened from above
:: Comparable in weight to concrete sleeper
:: Double insulation
:: Available for any rail profile and track gauge



Hollow sleeper for cable crossing

Due to its integrated cable conduits, the hollow sleeper enables permanent safe cable crossings in tracks and switches, even with mechanical maintenance and straightening.

The cable ducts are also elastically fixed with vibration-damping rubber pads at the end openings of the sleepers. To ensure maximum safety, electrical insulation is placed between the rail baseplate and the sleeper body. Due to the completely machined top of the sleeper, the correct position of the base of the rail is defined by the rail baseplate.

The easily removable cover ensures optimum protection against the weather and dirt. Unhindered access from the top and side make the sleeper inspection-friendly. Thanks to this optimum accessibility, it can be retrofitted for existing cable crossings at any time.

The sleeper body can be easily installed in the ballast bed. It is not necessary to disconnect or cut the cables.

Hollow sleeper for control and safety equipment

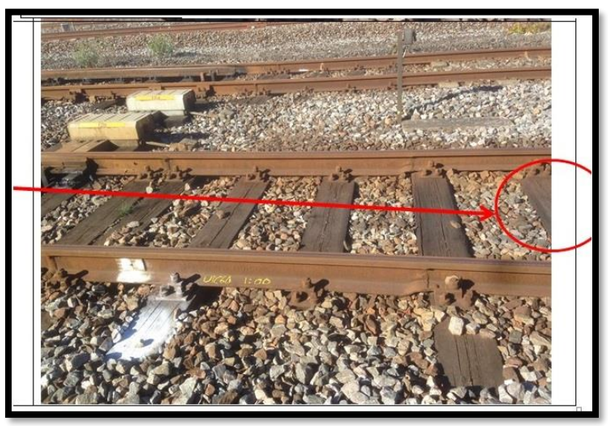
The hollow sleeper is also suitable for holding vehicle monitoring systems, e.g. hot box detectors and wheel locking detection systems.

6.2 Hollow sleeper positions

	Track	Km reference H.S.	Turnout		Rail and Sleeper Type	Rail inclination	Note Distance Between Tracks at Hollow Sleeper Location	Remarks
1	4	52,547	2b	Spsk-Kj-N203	UIC60 Monoblock SP90 DSB60 Cr (Crl)	01:00	5.0 m (Track 3 side) 5.8 m (Track 5 side)	
2	3	52,707	5a	Spsk-Kj-N206	DSB45 on Wood DSB45 Cr (Crl)	01:00	4.8 m (Track 2 side) 5.0 m (Track 4 side)	
3 and 4	4 and 3	52,799	7b	Spsk-Kj-N210	DSB45 on Wood DSB45 Cr (Crl)	01:20 **(1)**	5.0 m (Track 3 side) 5.7 m (Track S-Bane side)	
5	2	53,247	9a Double slip	Spsk-Kj-SN212 Double slip	DSB45 on Wood DSB45 Cr (Crl)	01:20	7 m (Track 3 side) 6,5 m (Track 1 side)	
6	2	53,323	9b	Spsk-Kj-SN214	DSB45 on Wood DSB45 Cr (Crl)	01:20	7,5 m (Track 3 side) 6,5 m (Track 1 side)	
7	2	53,790 **(2)**	12a (13a)	Spsk-Kj-N218	DSB45 on Wood DSB45 Cr (Crl)	01:00	4,4 m (Track 3 side) 6,5 m (Track 1 side)	
8	2	53,890	13b (12b)	Spsk-Kj-N220	UIC60 on Wood DSB60 Cr (Crl)	01:00	4.4 m (Track 3 side) 7.0 m (Track 1 side)	
9	4	54,026	15	Spsk-Kj-N223	UIC60 on Wood DSB60 Cr (Crl)	01:00	5.9 m (Track 2 side)	
10	4	54,093	16a	Spsk-Kj-N224	UIC60 on Wood DSB60 Cr (Crl)	01:00	4.8 m (Track 2 side)	
11	4	54,195	16 b	Spsk-Kj-N225	UIC60 on Wood	01:40	4.8 m (Track 2 side)	

(1): the rail inclination for this two sleepers was stated wrongly in the preliminary system definition. It matches now the real installed rail inclination.

(2): the marking on site (KP 53+792) was made on a UIC60. The 1:00 hollow sleeper for this area was specified as a DSB45 type in the system definition. The installation was moved 2 meters away from the turning area (KP 53+790) such that the sleeper was installed in the area with DSB45 rails. As the sleeper was moved longer away from the turnout zone, its position still complied with the safety-related application conditions ("The sleeper must not be placed in the turnout zone of points").



6.3 Hollow sleeper positions on drawing

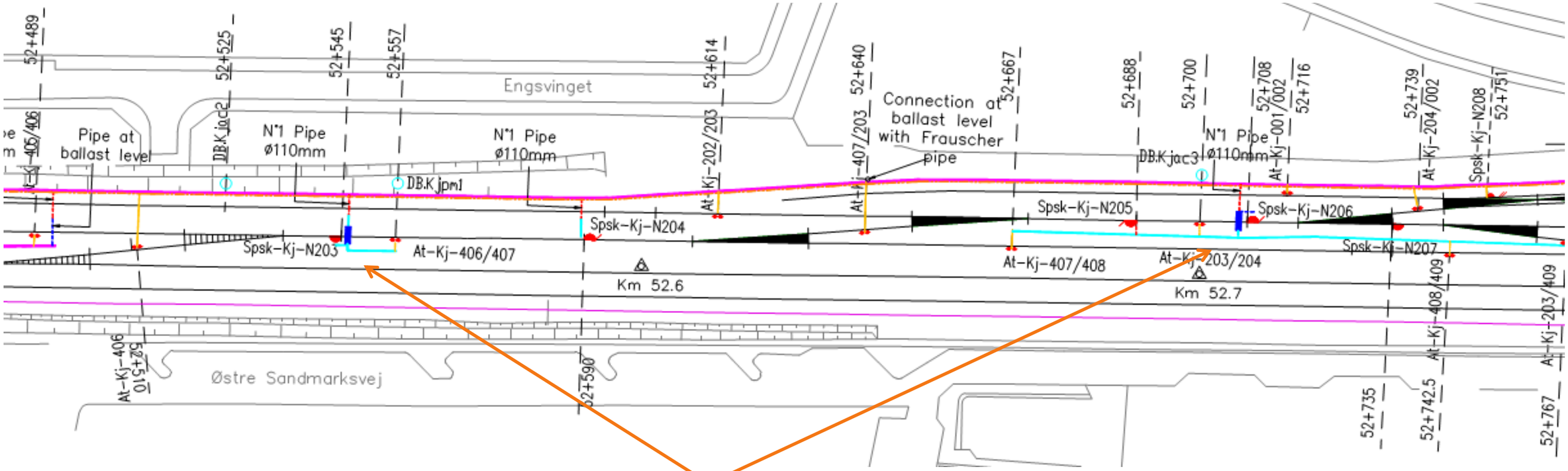


Figure 11 Hollow sleeper at km 52,547 and km 52,707

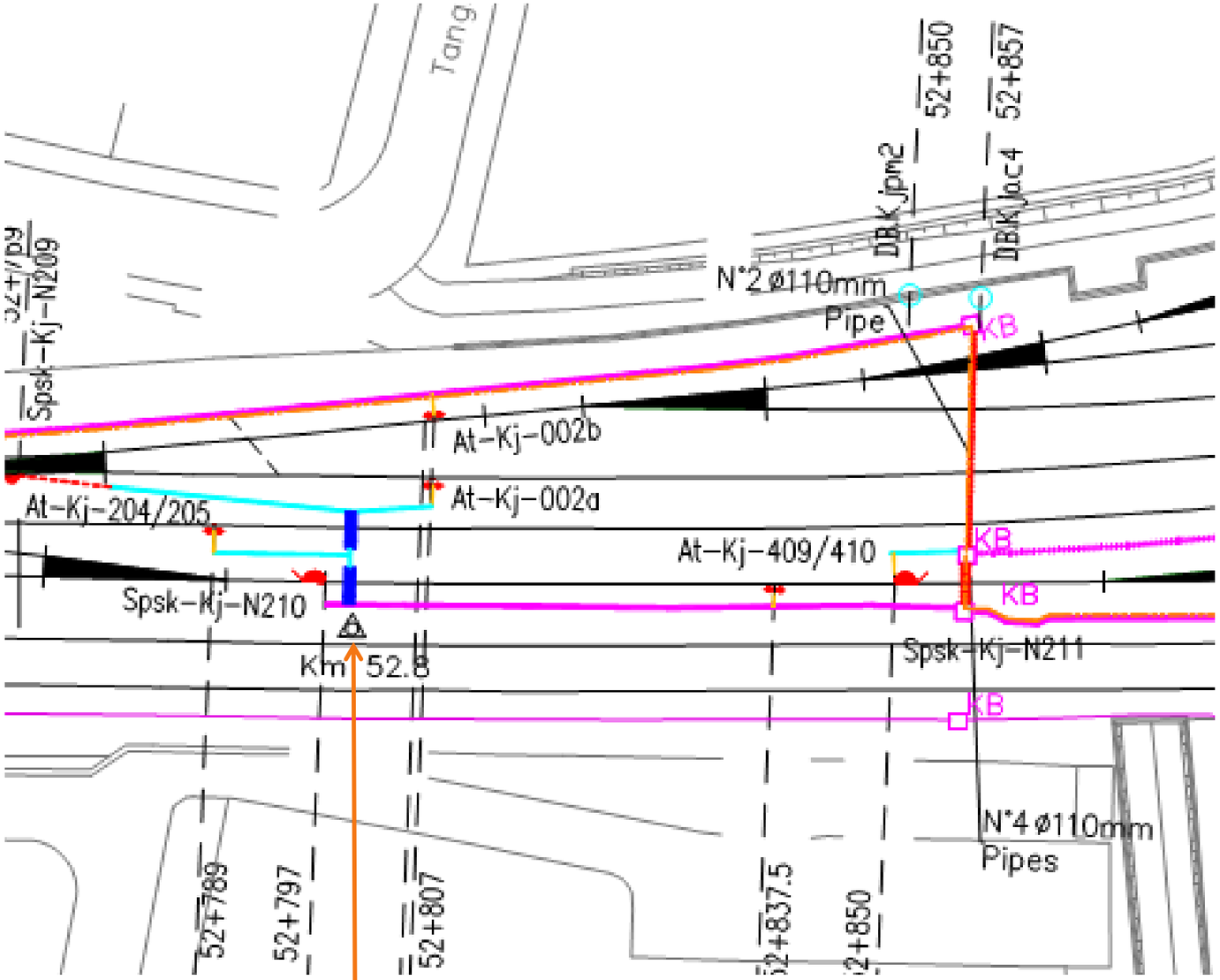


Figure 12 km 52,799

2x Hollow Sleeper

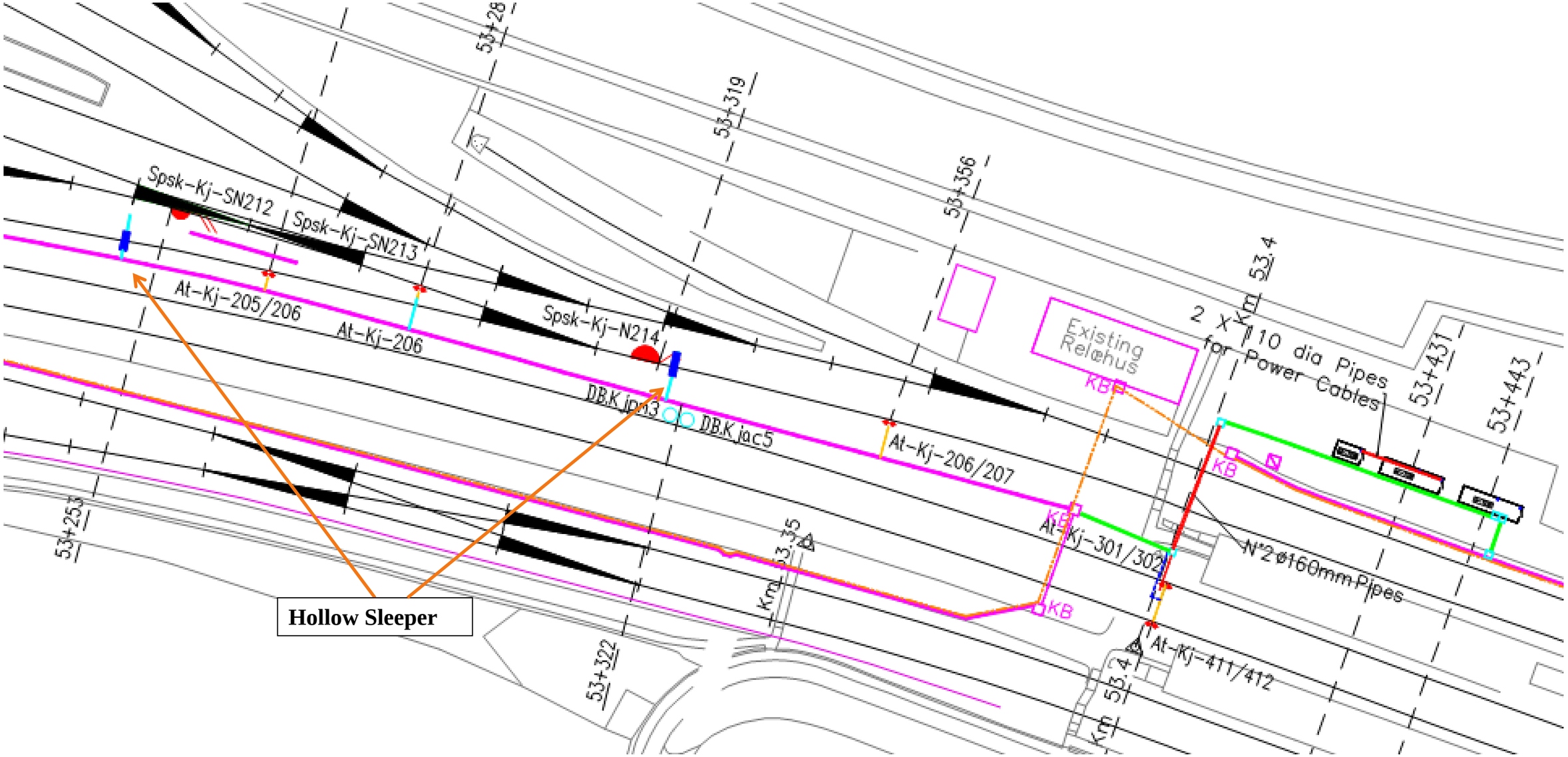


Figure 13 Hollow sleeper at 53,247 and 53,323

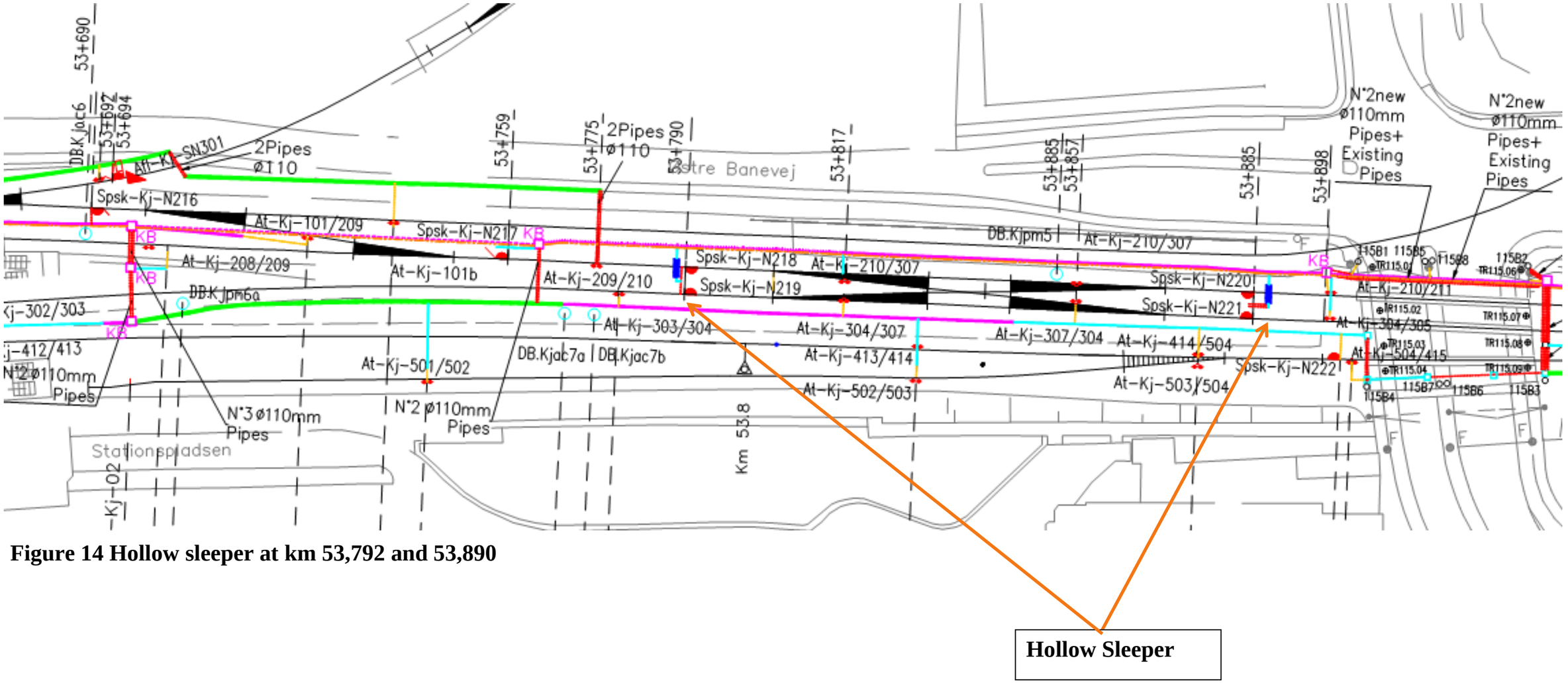


Figure 14 Hollow sleeper at km 53,792 and 53,890

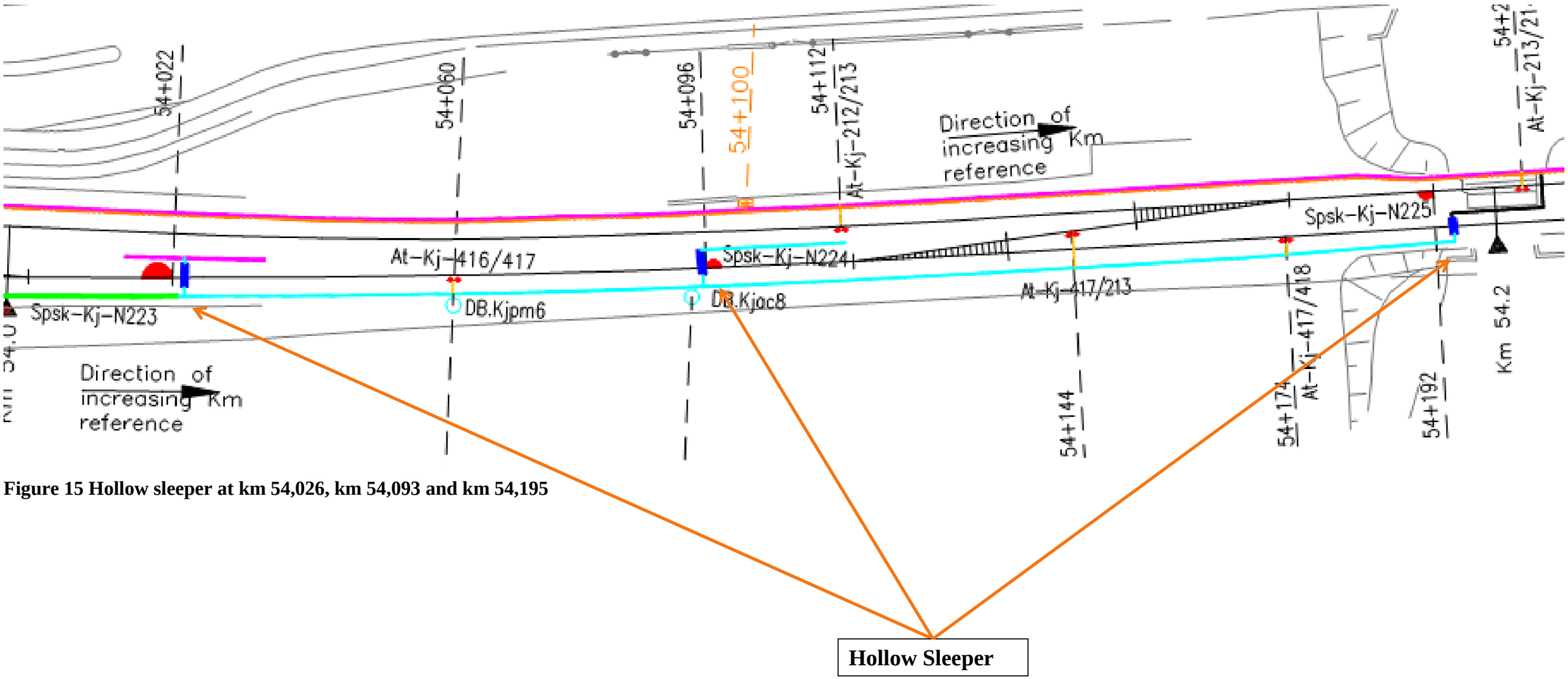


Figure 15 Hollow sleeper at km 54,026, km 54,093 and km 54,195

6.4 Schwihag hollow sleeper datasheet, EC declaration and EBA certificate

6.4.1 EBA certificate

Eisenbahn-Bundesamt

Zentrale

Eisenbahn-Bundesamt, Postfach 20 05 65, 53135 Bonn

Schwihag AG
Lebernstraße 3
CH-8274 Tägerwillen

Bearbeitung: Christoph Schniggenberg
Telefon: +49 (228) 9826-213
Telefax: +49 (228) 9826-9213
E-Mail: SchniggenbergC@eba.bund.de
Ref21@eba.bund.de
Internet: www.eisenbahn-bundesamt.de
Datum: 13.10.2014

Geschäftszeichen (bitte im Schriftverkehr immer angeben)
21.63-21izbo/017-2101#064

VMS-Nummer: 3310333

Betreff: (545/13-Zul.) Zulassung der Hohlschwelle mit vollisolierter Plattenbefestigung der Schwihag AG
Bezug: Ihr Antrag vom 10.12.2013
Anlagen: 1

Sehr geehrte Damen und Herren,

auf Ihr im Bezug genanntes Schreiben, mit dem Sie die Zulassung der Hohlschwelle mit vollisolierter Plattenbefestigung der Schwihag AG beantragen, ergeht folgender

Bescheid

I. ich erteile die (allgemeine) Zulassung der Hohlschwelle mit vollisolierter Plattenbefestigung (im Folgenden mit Hohlschwelle bezeichnet) für den Einsatz bei den Eisenbahnen des Bundes.

Die Zulassung ist befristet bis zum 31.10.2019.
Die Zulassung besteht aus 5 Seiten.

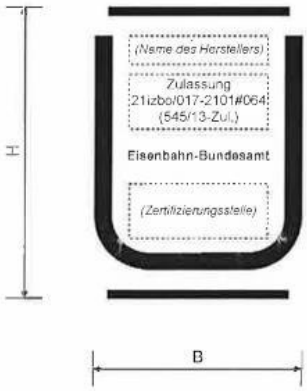
II. Der Zulassungsgegenstand „Hohlschwelle" wird in Bezug auf seine Geometrie, seine zulässigen Toleranzen und seine Werkstoffe nach den in der Anlage 1 zitierten Zeichnungen spezifiziert.

III. Die Zulassung wird mit folgenden Nebenbestimmungen verbunden:

1. Bauliche oder sicherheitsrelevante Veränderungen an der Hohlschwelle sind dem Eisenbahn-Bundesamt vorab anzuzeigen. Bei einem sicherheitsrelevanten Ausfall oder Versagen ist das Eisenbahn-Bundesamt, Ref 21, unverzüglich zu verständigen. Das EBA entscheidet dann über das weitere Vorgehen.
2. Eine Kopie der (allgemeine) Zulassung mit den zugehörigen technischen Unterlagen ist dem Bauherrn vor Beginn der Baumaßnahme zur Verfügung zu stellen. Der Bauherr hat dafür zu sorgen, dass die Zulassung auf der Baustelle und bei den örtlich zuständigen Stellen vorliegt.
3. Der bauausführenden Firma ist eine Einbauanleitung zu übergeben.
4. Die Kabelschachtschwelle darf nur als Einzelschwelle zwischen zugelassenen Regelschwellen verwendet werden. Zwischen den Hohlschwellen müssen mindestens 24 Regelschwellen liegen (dies entspricht einem Abstand der Hohlschwellen von 15 m bei einem vorhandenen Schwellenabstand von 60 cm). Der Abstand darf auf sieben dazwischen liegende Regelschwellen verringert werden (dies entspricht einem Abstand der Hohlschwellen von 4,80 m bei einem vorhandenen Schwellenabstand von 60 cm), wenn die Geschwindigkeit max v ≤ 120 km/h beträgt und die Anzahl der Hohlschwellen auf fünf in Folge beschränkt ist.
5. Wird durch Messungen im Gleis nachgewiesen, dass der Querverschiebewiderstand (QVW) der Hohlschwelle dem der Regelschwellen entspricht, kann in Absprache mit dem Fachdienst des Infrastrukturbetreibers von den Regelungen in Nr. 4 abgewichen werden. Das Eisenbahn-Bundesamt, Ref 21, ist über Durchführung und Ergebnis der Messungen zu informieren.
6. Beim nachträglichen Einbau von Hohlschwellen ins bestehende Gleis gilt, analog der Einzelauswechslung von üblichen Regelschwellen, die Ril 824.3610 „Kleine Instandsetzungsarbeiten an Schwellen durchführen; Einzelschwellenwechsel von Hand oder mit Gerät durchführen". Es ist im Einzelfall zu Beurteilen, ob Folgestopfungen zur Vermeidung von Schwellenhohllagen und zur Stabilisierung der Gleislage erforderlich sind.
7. Für die Sollverspannung zwischen Schiene und Rippenplatte ist die Ril 824.5050 "Lückenlose Gleise und Weichen herstellen; Befestigungsmittel verspannen; Kleineisen teilweise lösen bzw. teilweise ausbauen" maßgebend.
8. Für die Rückstromführung, Bahnerdung und den Potentialausgleich sind die Bestimmungen der Geschäftsbereichsrichtlinie 997.02 der DB AG maßgebend. Die Vorgaben in den Normen, insbesondere die der DIN EN 50122-1, müssen eingehalten werden.
9. Die Bauteile der Hohlschwelle müssen einer laufenden Güteüberwachung nach DIN 18 200 unterzogen werden. Die Eigenüberwachungsprüfungen dürfen in eigenen Labors und Prüfständen durchgeführt werden. Die Fremdüberwachung ist

von einer anerkannten Stelle durchzuführen. Als solche gilt bis auf weiteres auch die Deutsche Bahn AG, Beschaffung Infrastruktur, Lieferantenmanagement und Qualitätssicherung, Caroline-Michaelis-Straße 5-11, 10115 Berlin.

10. Die Bestätigung der Übereinstimmung der Hohlschwelle mit den Bestimmungen dieser Zulassung muss mit einer Übereinstimmungserklärung des Herstellers (Übereinstimmungsnachweis) nach folgendem Muster erfolgen:



Abmessungsverhältnis (Außenmaß):
B:H = 0,75 (≥ 4,5cm : 6,0 cm)

11. Das oben dargestellte Übereinstimmungszeichen ist auf der Hohlschwelle oder, wenn dies nicht möglich ist, auf dem Lieferschein anzubringen.

IV. Die (allgemeine) Zulassung kann mit sofortiger Wirkung widerrufen werden, wenn ihren Nebenbestimmungen nicht entsprochen wird. Die Zulassung wird widerrufen, ergänzt oder geändert, wenn sich die Hohlschwelle nicht bewährt oder wenn neue technische Erkenntnisse dies begründen.

V. Die Kosten des Verfahrens trägt die Antragstellerin.

VI. Hinweise:

1. Die Zulassung wird unbeschadet der Rechte Dritter, insbesondere privater Schutzrechte, erteilt.
2. Bei der Zulassung durch das Eisenbahn-Bundesamt stehen vor allem sicherheitstechnische Aspekte im Vordergrund. Der Anwender kann eventuell zusätzliche, nicht zulassungsrelevante Kriterien vor einem Einsatz im Betriebsgleis fordern. Es wird deshalb empfohlen, sich frühzeitig mit den zuständigen Stellen der Betreiberbahn in Verbindung zu setzen und unabhängig von der öffentlich-rechtlichen Zulassung eine Anwendererklärung mit Festlegung der Ausführungsbestimmungen einzuholen.

3. Eine Verlängerung der befristeten Zulassung ist bei der Zulassungsstelle mindestens 6 Monate vor Ablauf der Geltungsdauer mit den einschlägigen Unterlagen zu beantragen.
4. Für Einsätze im Bereich des Transeuropäischen Eisenbahnnetzes (TEN) wird auf die Anforderungen der Ril 2008/57/EG und zugehörigen Technischen Spezifikationen (TSI) hingewiesen.

Begründung:
Das Eisenbahn-Bundesamt ist aufgrund des § 3 des Gesetzes über die Eisenbahnverkehrsverwaltung des Bundes (Bundeseisenbahnverkehrsverwaltungsgesetz – BEVVG) vom 27.12.1993 (BGBl. I S. 2378, 2394) in Verbindung mit § 4 Abs. 6 des Allgemeinen Eisenbahngesetzes (AEG) vom 27.12.1993 (BGBl I S. 2378, 2396, 1994 I S. 2439 in der aktuellen Fassung) zuständig für die Erteilung von Baufreigaben, Zulassungen und Genehmigungen sowie Abnahmen, Prüfungen und Überwachungen im Hinblick auf Errichtung, Änderung, Unterhaltung und Betrieb der Betriebsanlagen von Eisenbahnen des Bundes.

Hohlschwellen wurden entwickelt um eine einfache Gleisquerung für Elektroenergie- und Steuerungsleitungen sowie für Leitungen für Druckluft und Druckflüssigkeiten zu ermöglichen. Durch den Einsatz einer Hohlschwelle kann ggf. auf aufwändigen Tiefbau verzichtet werden.

Die Hohlschwelle entspricht in Gewicht und Abmessungen etwa einer Regelbetonschwelle B70 W. Sie kann dort eingesetzt werden, wo auch Betonschwellen zum Einsatz kommen.
Für die Hohlschwelle wurden mit Hilfe der Finite-Elemente-Methode die auftretenden Spannungen analysiert und durch eine Ermüdungsfestigkeitsanalyse der Dauerfestigkeitsnachweis geführt. Der statische und der dynamische Festigkeitsnachweis konnte erbracht werden. Für die Materialbeanspruchungen kann mit einer ausreichenden Sicherheit gerechnet werden.
Bei der dynamischen Prüfung (2 Mio. Lastspiele im Schienenauflagerbereich und in Schwellenmitte) an der TU Dresden konnte an der Hohlschwelle kein ungewöhnlicher Verschleiß (Beschädigungen, Risse oder Dauerverformungen) festgestellt werden. Die Funktionsfähigkeit blieb voll erhalten.

Eine Betriebserprobung wurde mit ca. 500 Hohlschwellen im Gleisnetz der DB Netz AG durchgeführt. Als Ergebnis dieser Betriebserprobung sind folgende Erkenntnisse festzuhalten:

- Lockerungen oder auffällige Verschleißerscheinungen an den Schienenbefestigungen zwischen Schiene und Rippenplatte sowie zwischen Rippenplatte und Schwellenkörper konnten nicht festgestellt werden.
- Lockerungen der Abdeckbleche auf dem Schwellenkörper wurden nicht festgestellt.
- Schäden am Schwellenkörper durch Bau- und Montagearbeiten wurden nicht festgestellt.

- Am Schwellenkörper wurden keine Risse festgestellt.

Die Zulassung kann der Firma ausgesprochen werden, weil:

- nur einzelne Hohlschwellen innerhalb eines Standardoberbaus mit Regelschwellen als Einzelschwelle verwendet werden,
- eine entsprechende Betriebserprobung der Hohlschwellen positiv abgeschlossen werden konnte,
- davon ausgegangen werden kann, dass bei sach- und qualitätsgerechter Ausführung mit Qualitätsbaustoffen die Lagesicherheit des Gleises und die Lasten aus dem Eisenbahnbetrieb dauerhaft und sicher abgetragen werden und
- technische und sicherheitsrelevante Bedenken nicht bestehen.

Die Anordnung der Nebenbestimmungen ist zur Gewährleistung der Sicherheit des Eisenbahnbetriebes erforderlich.
Entscheidungsgrundlage für diese (allgemeine) Zulassung sind die in der Anlage 1 zitierten Dokumente.

Für die Antragsbearbeitung werden Kosten gemäß § 3 Abs. 4 Satz 1 BEVVG i.V.m. der Verordnung über die Gebühren und Auslagen für Amtshandlungen der Eisenbahnverkehrsverwaltung des Bundes (BEGebV) vom 27.03.2008 (BGBl. I. S. 546), in der aktuellen Fassung, erhoben.
Über die Höhe der Kosten ergeht ein gesonderter Bescheid.

Rechtsbehelfsbelehrung:
Gegen diesen Bescheid kann innerhalb eines Monats nach Bekanntgabe Widerspruch eingelegt werden. Der Widerspruch ist schriftlich oder zur Niederschrift beim Eisenbahn-Bundesamt, Heinemannstraße 6, 53175 Bonn einzulegen. Die Frist ist auch gewahrt, wenn der Widerspruch innerhalb des o.g. Zeitraumes bei einer Außenstelle des Eisenbahn-Bundesamtes eingelegt wird.

Mit freundlichen Grüßen
Im Auftrag
gez. Köppel

beglaubigt

EISENBAHN-BUNDESAMT 3 ZENTRALE
(Christoph Schniggenberg)

Anlage 1 zu Bescheid 21.63-21izbo/017-2101#064 vom 13.10.2014



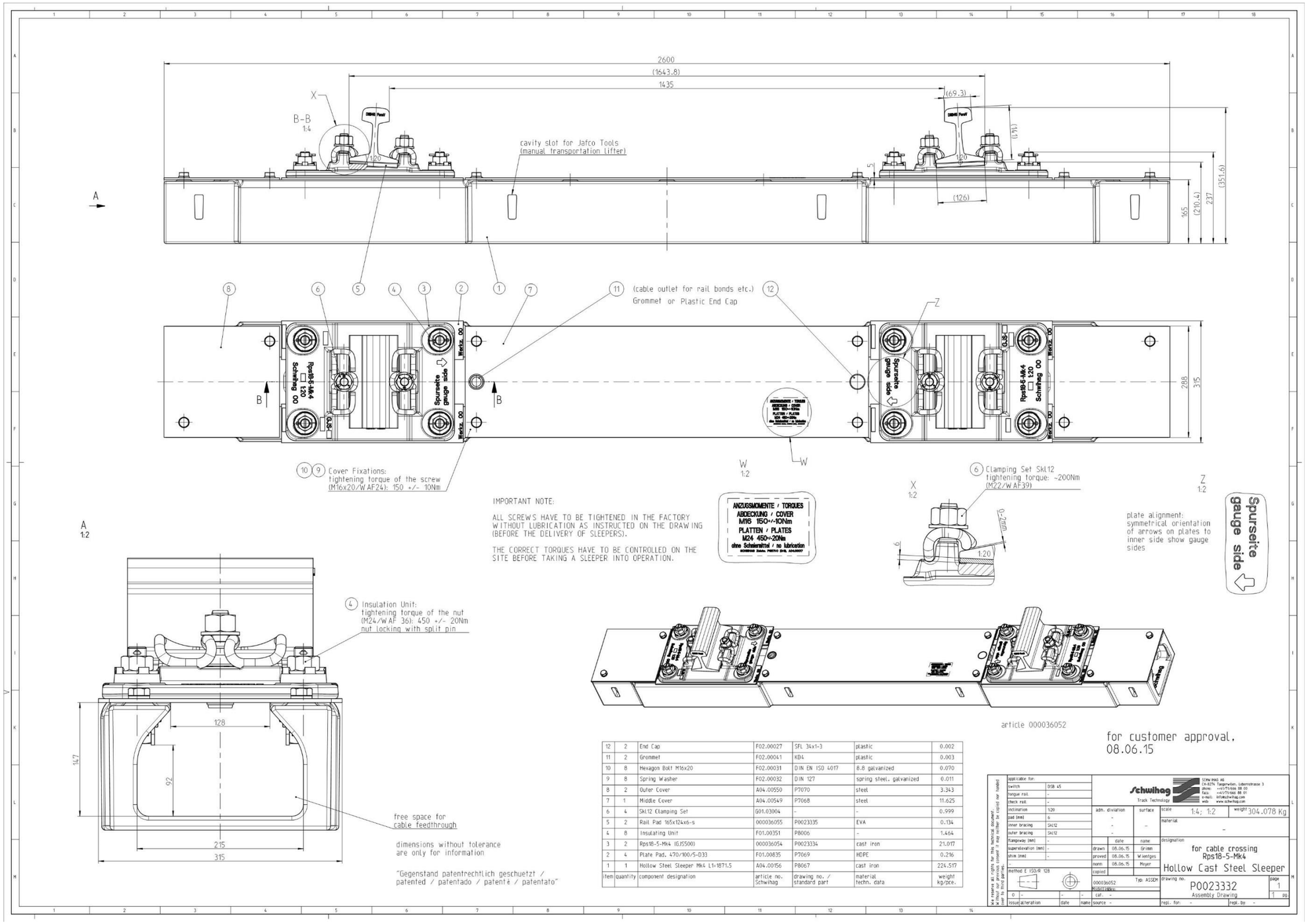
Dokumente

Lfd.Nr.	Inhalt	Zeichnung Nr.	Stand
1.	Versuchsbericht der Schwihag AG, Bericht Nr. 11 „Vorqualifikationsprüfung der Isolationseinheit an der Kabelschachtschwelle“		05.05.2008
2.	Erfahrungsbericht der DB Netz AG zum Abschluss der Betriebserprobung der Hohlschwelle der Schwihag AG Bearbeitungszeichen: 140903 I.NVT 41(G)KI-14G148 Schwihag Hohlschw		03.09.2014
3.	Isolationstest nach Railtrack-Norm RT/CE/S/021/1 der Fa. Elektro Z'graggen, CH-8274 Tägerwilen „Schwihag Kabelkastenschwelle; Vergleichsmessungen zwischen Isolationseinheit P7914 (alte Ausführung) und P8669 (neue Ausführung)“		17.06.2008
4.	Versuchsbericht der TU Dresden, Bericht Nr. 08.2 „Vorqualifikationsprüfung an einer Kabelschachtschwelle“		08.02.2008
5.	Versuchsbericht der TU Dresden, Bericht Nr. 09.4 „Bestimmung des elektrischen Widerstandes an einer Schwihag-Kabel-schachtschwelle“		05.02.2009
6.	Versuchsbericht der TU Dresden, Bericht Nr. 08.6 „Dauerschwingversuch an einem Schienenstützpunkt auf einer Schwihag-Kabelschachtschwelle“		14.01.2009
Lfd.Nr.	Inhalt	Zeichnung Nr.	Stand
7.	Zwischenplatte Zwp 212	log 35.9002	27.11.2008
8.	Schienenbefestigung KS 18 auf Hohlschwelle für Gleise Schienen 49E5 und 54E4	log 54.01.7001	31.10.2011
9.	Isolationseinheit IE 1	log 55.7008	08.12.2008
10.	Schienenbefestigung KS 19 auf Hohlschwelle für Gleise Schiene 60E2	log 60.01.7001	31.10.2011
11.	Abdeckung Mitte Fertigungszeichnung	P7068	15.08.2006
12.	Abdeckung Außen Fertigungszeichnung	P7070	04.02.2008
13.	Isoliereinheit Kastenschwelle – Schraube M24x110 Fertigungszeichnung	P8011	22.09.2008
14.	Druckplatte Fertigungszeichnung	P8012	15.11.2007
15.	Isolierbuchse Fertigungszeichnung	P8014	17.10.2008
16.	Isoliereinheit Kastenschwelle – Isolierscheibe Fertigungszeichnung	P8015	05.12.2006
17.	Isoliereinheit Kastenschwelle – Zwischenplatte Fertigungszeichnung	P8022	15.11.2007
18.	Vollisolierte Plattenbefestigung mit Schnapper – Isolierplatte Fertigungszeichnung	P8023	23.06.2008
19.	Kabelschachtschwelle mit vollisolierter Plattenbefestigung Fertigungszeichnung	P8067	05.05.2010
20.	Rippenplatte Rps 18(-3)-Mk4 – Ausführung „Guss“ Schienen 49E5 und 54E4	P8676 Blatt 1	22.12.2010
21.	Rippenplatte Rps 18(-3)-Mk4 – Ausführung „Stahl“ Schienen 49E5 und 54E4	P8676 Blatt 2	22.12.2010



22.	Zwischenplatte Fertigungszeichnung	P8877	15.11.2008
23.	Grundplatte mit Rippenplatte Rps-fs Mk4 1435	P8878	12.11.2008
24.	Abdeckung kurz Mitte Fertigungszeichnung	P8884	15.11.2008
25.	Kabelschachtschwelle mit Führungsschiene, einseitig Fertigungszeichnung	P8885	17.10.2011
26.	Rippenplatte Rps 19-Mk4 Schiene 60E2 - Gießzeichnung	P9493	18.02.2010
27.	Rippenplatte Rps 19-Mk4 – Ausführung „Guss“ Schiene 60E2	P9494 Blatt 1	27.05.2010
28.	Rippenplatte Rps 19-Mk4 – Ausführung „Stahl“ Schiene 60E2	P9494 Blatt 2	27.05.2010
29.	Rippenplatte Rps 18(-3)-Mk4 Schienen 49E5 und 54E4 - Gießzeichnung	P9908	22.12.2010

6.4.2 Datasheet for DSB45 1:20



item	quantity	component designation	article no. Schwihag	drawing no. / standard part	material techn. data	weight kg/pce.
12	2	End Cap	F02.00027	SFL 34x1-3	plastic	0.002
11	2	Grommet	F02.00041	KD4	plastic	0.003
10	8	Hexagon Bolt M16x20	F02.00031	DIN EN ISO 4017	8.8 galvanized	0.070
9	8	Spring Washer	F02.00032	DIN 127	spring steel, galvanized	0.011
8	2	Outer Cover	A04.00550	P7070	steel	3.343
7	1	Middle Cover	A04.00549	P7068	steel	11.625
6	4	Skl12 Clamping Set	G01.03004	-	-	0.999
5	2	Rail Pad 165x124x6-s	000036055	P0023335	EVA	0.134
4	8	Insulating Unit	F01.00351	P8006	-	1.464
3	2	Rps18-5-Mk4 (GJS500)	000036054	P0023334	cast iron	21.017
2	4	Plate Pad, 470/100/5-D33	F01.00835	P7069	HDPE	0.216
1	1	Hollow Steel Sleeper Mk4 L1=1871.5	A04.00156	P8067	cast iron	224.517

applicable for:						
switch	DSB 45					
tongue rail	-					
check rail	-					
inclination	1:20					
pad [mm]	6					
inner bracing	Skl12					
outer bracing	Skl12					
flangeway [mm]	-					
superelevation [mm]	-					
shim [mm]	-					
method E ISO/R 128						
issue	alteration	date	name	source	-	

Schwihag Track Technology
SCHWIHAG AG
CH-8274 Tägerwilen, Libernstrasse 3
phone: +41/71/666 88 00
facs: +41/71/666 88 01
e-mail: info@schwihag.com
web: www.schwihag.com

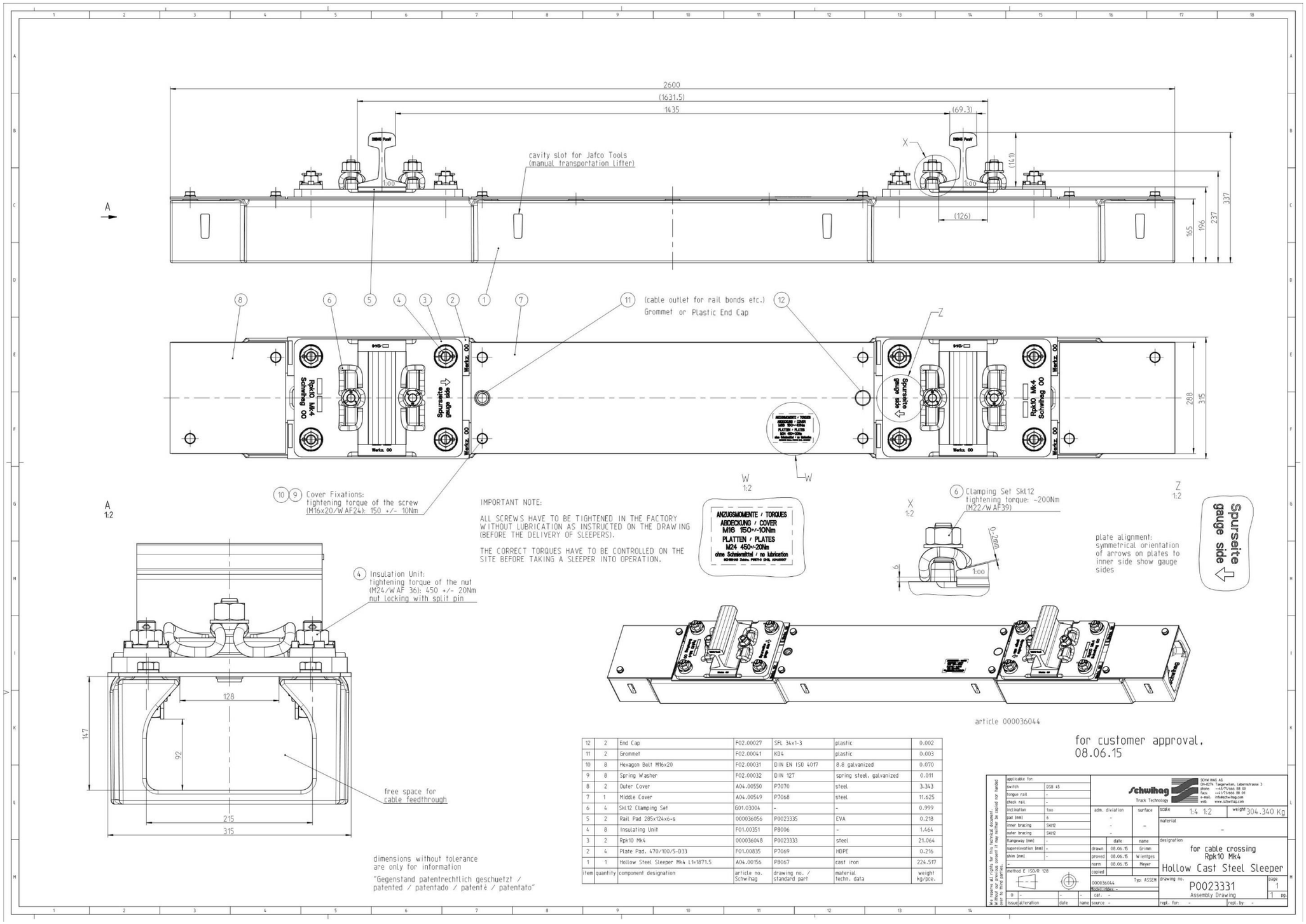
adm. diviation	-	surface	-
date		name	
drawn	08.06.15	Grimm	
proved	08.06.15	Wiemtges	
norm	08.06.15	Meyer	
copied			
000036052		Typ: ASSEM	
Modelledex:			
cat.	-		

scale	1:4; 1:2
weight	304.078 Kg
material	-
designation	for cable crossing Rps18-5-Mk4 Hollow Cast Steel Sleeper
drawing no.	P0023332 Assembly Drawing
page	1
1 pg.	
repl. for:	-
repl. by:	-

We reserve all rights for this technical document. Without our previous consent it may neither be copied nor handed over to third parties.

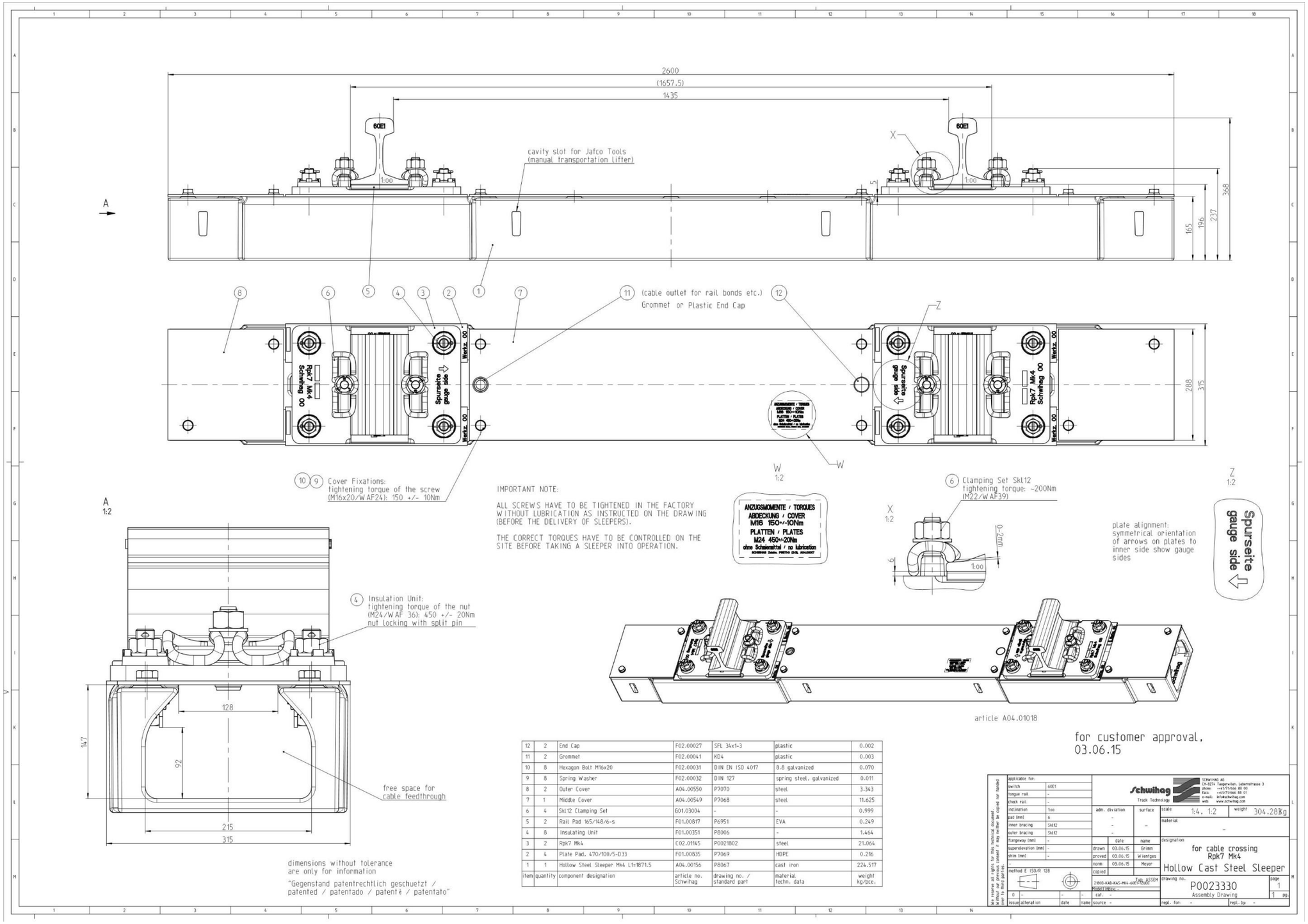
Safety Package – Køge station – Hollow sleeper for cable crossing ver. 3.0

6.4.3 Datasheet for DSB45 1:00



item	quantity	component designation	article no. Schwihag	drawing no. / standard part	material techn. data	weight kg/pce.
12	2	End Cap	F02.00027	SFL 34x1-3	plastic	0.002
11	2	Grommet	F02.00041	K04	plastic	0.003
10	8	Hexagon Bolt M16x20	F02.00031	DIN EN ISO 4017	8.8 galvanized	0.070
9	8	Spring Washer	F02.00032	DIN 127	spring steel, galvanized	0.011
8	2	Outer Cover	A04.00550	P7070	steel	3.343
7	1	Middle Cover	A04.00549	P7068	steel	11.625
6	4	SkL12 Clamping Set	G01.03004	-	-	0.999
5	2	Rail Pad 285x124x6-s	000036056	P0023335	EVA	0.218
4	8	Insulating Unit	F01.00351	P8006	-	1.464
3	2	RpK10 Mk4	000036048	P0023333	steel	21.064
2	4	Plate Pad, 470/100/5-D33	F01.00835	P7069	HDPE	0.216
1	1	Hollow Steel Sleeper Mk4 L1=1871.5	A04.00156	P8067	cast iron	224.517

6.4.4 Datasheet for UIC60 1:00

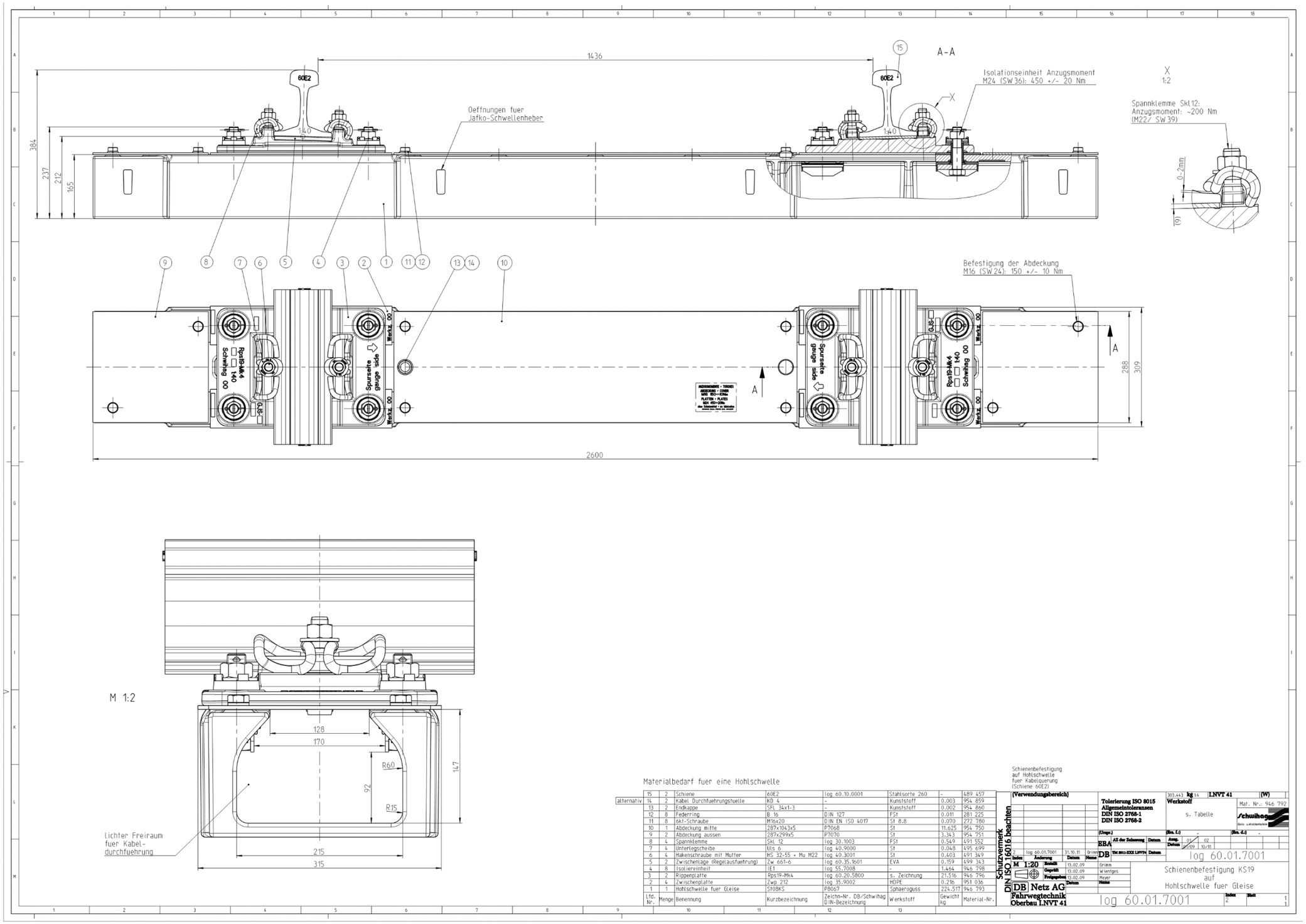


12	2	End Cap	F02.00027	SFL 34x1-3	plastic	0.002
11	2	Grommet	F02.00041	KD4	plastic	0.003
10	8	Hexagon Bolt M16x20	F02.00031	DIN EN ISO 4017	8.8 galvanized	0.070
9	8	Spring Washer	F02.00032	DIN 127	spring steel, galvanized	0.011
8	2	Outer Cover	A04.00550	P7070	steel	3.343
7	1	Middle Cover	A04.00549	P7068	steel	11.625
6	4	Skl12 Clamping Set	G01.03004	-	-	0.999
5	2	Rail Pad 165/148/6-s	F01.00817	P6951	EVA	0.249
4	8	Insulating Unit	F01.00351	P8006	-	1.464
3	2	Rpk7 Mk4	C02.01145	P0021802	steel	21.064
2	4	Plate Pad, 470/100/5-D33	F01.00835	P7069	HDPE	0.216
1	1	Hollow Steel Sleeper Mk4 L1=1871.5	A04.00156	P8067	cast iron	224.517
item	quantity	component designation	article no. Schwihag	drawing no. / standard part	material, techn. data	weight kg/pce.

applicable for:					
switch	60E1	Schwihag	Track Technology		
tongue rail	-				
check rail	-				
inclination	1:00	adm. diviation	surface	scale 1:4, 1:2	weight 304.28kg
pad [mm]	6	-	-	material -	
inner bracing	Skl12	-	-		
outer bracing	Skl12			designation	
flangeway [mm]	-		date name	for cable crossing Rpk7 Mk4	
superelevation [mm]	-	drawn	03.06.15 Grimm	Hollow Cast Steel Sleeper	
shim [mm]	-	proved	03.06.15 Wientges		
-		norm	03.06.15 Meyer		
method E 150/R 128		copied		drawing no. P0023330	page 1
		cat. -		Assembly Drawing	1 pg.
issue alteration	date name	source -		repl. for: -	repl. by: -

We reserve all rights for this technical document and the data contained therein. Unauthorized use, disclosure or copying of this document or any part thereof by third parties is not permitted.

6.4.5 Datasheet for UIC60 1:40



Materialbedarf fuer eine Hohlschwelle

	Lfd. Nr.	Menge	Benennung	Kurzbezeichnung	Zeichn-Nr. DB/Schwihag DIN-Bezeichnung	Werkstoff	Gewicht kg	Material-Nr.
	15	2	Schiene	60E2	log 60.10.0001	Stahlsorte 260	-	489 457
alternativ	14	2	Kabel Durchfuehrungstuelle	KD 4	-	Kunststoff	0.003	954 859
	13	2	Endkappe	SFL 34x1-3	-	Kunststoff	0.002	954 860
	12	8	Federring	B 16	DIN 127	FSt	0.011	281 225
	11	8	6kt-Schraube	M16x20	DIN EN ISO 4017	St 8.8	0.070	272 780
	10	1	Abdeckung mitte	287x1043x5	P7068	St	11.625	954 750
	9	2	Abdeckung aussen	287x299x5	P7070	St	3.343	954 751
	8	4	Spannklemme	SkL 12	log 30.1003	FSt	0.549	491 552
	7	4	Unterlegscheibe	Uls 6	log 40.9000	St	0.048	495 699
	6	4	Hakenschraube mit Mutter	HS 32-55 + Mu M22	log 40.3001	St	0.403	491 349
	5	2	Zwischenlage (Regelausfuehrung)	Zw 661-6	log 60.35.1601	EVA	0.159	499 343
	4	8	Isolierereinheit	IE1	log 55.7008	-	1.464	946 798
	3	2	Rippenplatte	Rps19-Mk4	log 60.20.5800	s. Zeichnung	21.516	946 796
	2	4	Zwischenplatte	Zwp 212	log 35.9002	HDPE	0.216	951 036
	1	1	Hohlschwelle fuer Gleise	St08KS	P8067	Sphaeroguss	224.517	946 793

Schienenbefestigung
auf Hohlschwelle
fuer Kabelquerung
(Schiene 60E2)

(Verwendungsbereich)

Tolerierung ISO 8015
Allgemeintoleransen
DIN ISO 2768-1
DIN ISO 2768-2

Werkstoff: s. Tabelle

Mat. Nr.: 946 792

Schuzvermerk
DIN ISO 16016 beachten

M 1:20

DB Netz AG
Fahrwegtechnik
Oberbau I.NVT 41

log 60.01.7001

Schienenbefestigung KS19
auf
Hohlschwelle fuer Gleise

6.4.6 EC Declaration

EC Declaration of

Company responsible for placing the product on the market:
Schwihag AG
Gleis- und Weichentechnik
Lebernstrasse 3
CH-8274 Tägerwilen

Represented by the CEO Mr Karl-Heinz Schwiede

Company responsible for production:
Schwihag GmbH

Am Ostergraben 5
D-04435 Schkeuditz-Radefeld

Represented by the Managing Director Mr. Eric Danneberg

Railway sleeper for cable crossing

Declaration:
This EC Declaration of Conformity confirms that the interoperability component conforms to the following Directives and technical specifications:
Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community
Technical specification for the interoperability of the "Infrastructure" subsystem of the conventional rail system (Decision No. 2011/275/EC; Official Journal of the European Union L77 dated 19.03.08)

Test results:
- Dynamic bending B in the bottom area of the rail
  Static preloading: B = 1.72 mm
  Dynamic fatigue loading: B = 0.95 mm
  Static reloading: B = 1.98 mm
- Dynamic bending B in the middle section
  Static preloading: B = 1.42 mm
  Dynamic fatigue loading: B = 0.73 mm
  Static reloading: B = 1.63 mm

Applied Directives: **-Test reports:**
RFI TCAR SP AR 03 001 B (1) *TU Dresden No.. 08.2 08.02.2008*

System types: **-Drawings:**
P 8067
P 7056

Scope and interfaces within the scope of this TSI:
- Hollow sleepers for cable crossing and hot axlebox detectors in the ballast track of railway lines.

Place and Date

Tägerwilen, 21.03.2014

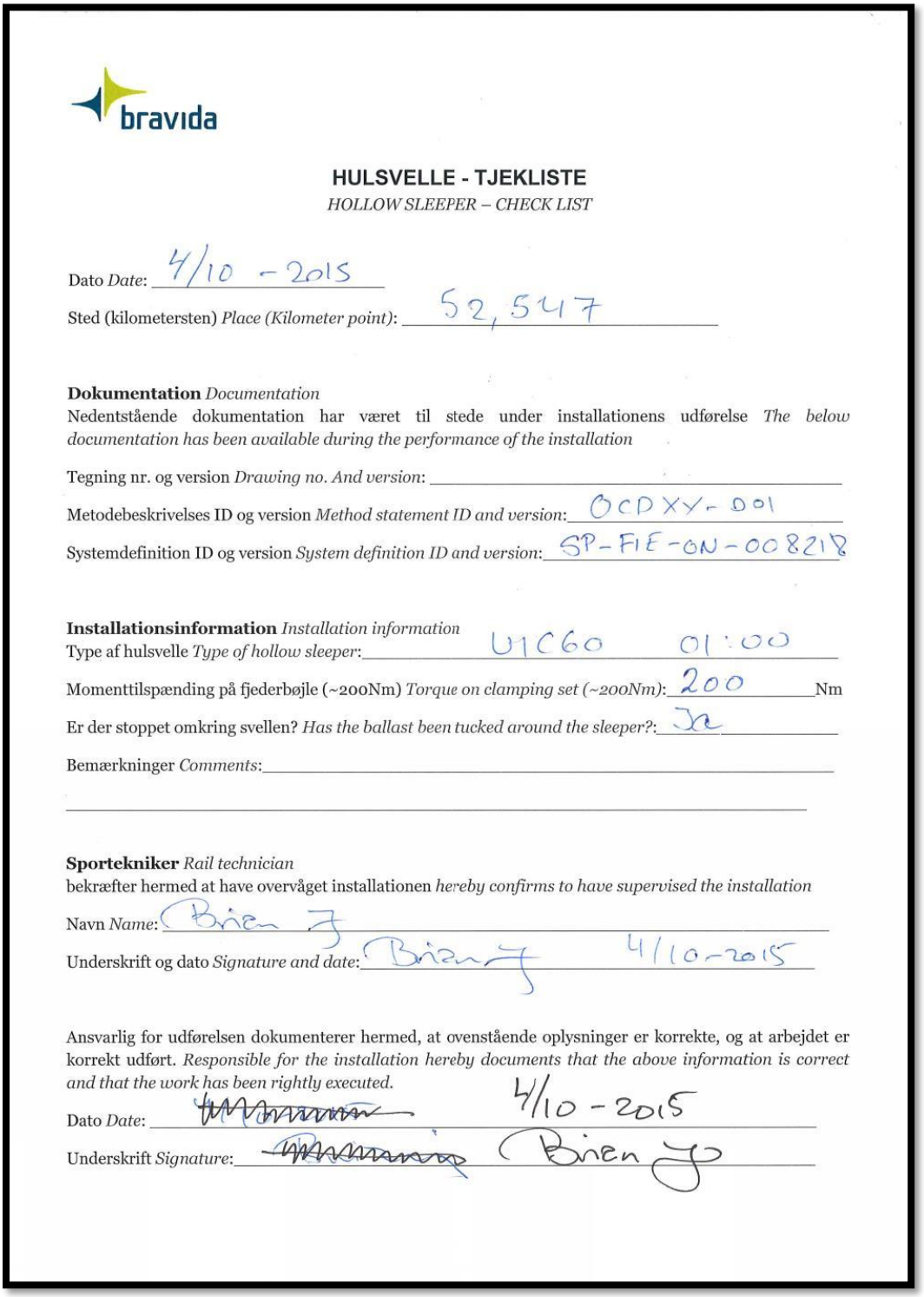
CEO: Karl-Heinz Schwiede

Changes to the product not agreed with Schwihag AG beforehand invalidate this declaration

Version 1 Date 21 05 2013

6.5 Documentation proving the actions taken during the installation to close the hazards

6.5.1 Hollow Sleeper Kj 52+547 UIC-60 01.00



bravida

HULSVELLE - TJEKLISTE
HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 4/10 - 2015

Sted (kilometersten) *Place (Kilometer point)*: 52,547

Dokumentation *Documentation*
Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*:

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXY-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-008218

Installationsinformation *Installation information*
Type af hulsvelle *Type of hollow sleeper*: UIC60 01:00

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*:

Sportekniker *Rail technician*
bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian J

Underskrift og dato *Signature and date*: Brian J 4/10-2015

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 4/10 - 2015

Underskrift *Signature*: Brian J

6.5.2 Hollow Sleeper Kj 52+707 DSB-45 01.00

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 4/10 - 2015

Sted (kilometersten) *Place (Kilometer point)*: 52,707

Dokumentation *Documentation*

Nedenstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX - 001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-008218

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: DSB 01:00

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 4/10-15

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 4/10 - 2015

Underskrift *Signature*: Brian J

6.5.3 Hollow Sleeper Kj 52+799 DSB-45 01.20 TRACK 3

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 21/10 - 2015

Sted (kilometersten) *Place (Kilometer point)*: 52,799 (spor 3)

Dokumentation *Documentation*

Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXx-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-OW-CCD215

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: DSB45 01.20

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

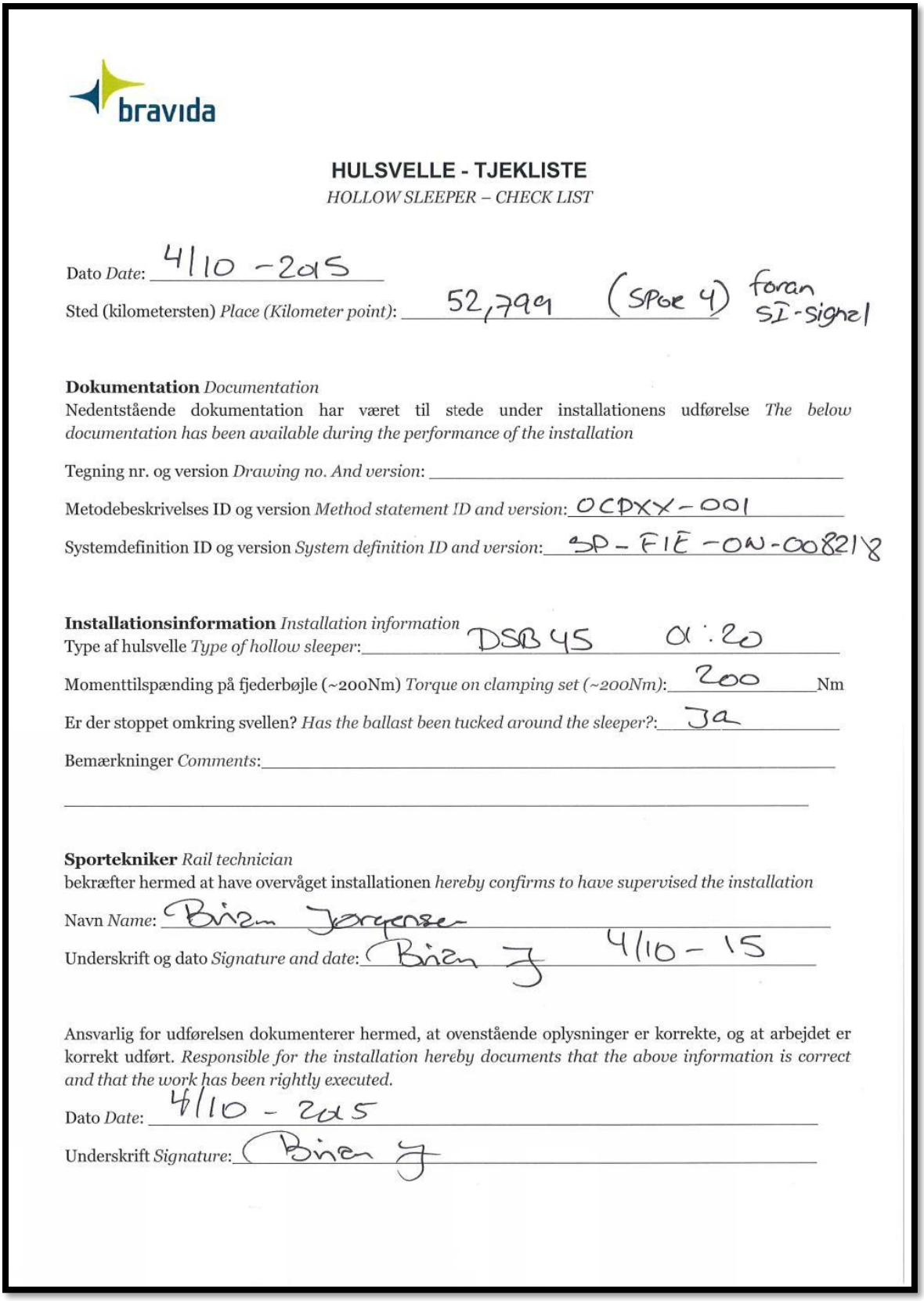
Underskrift og dato *Signature and date*: _____

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 10/12-2015

Underskrift *Signature*: _____

6.5.4 Hollow Sleeper Kj 52+799 DSB-45 01.20 TRACK 4



bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 4/10 -2015

Sted (kilometersten) *Place (Kilometer point)*: 52,799 (Spor 4) foran SI-signal

Dokumentation *Documentation*

Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*:

Metodebeskrivelses ID og version *Method statement ID and version*: OCPXX-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-008218

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: DSB 45 01.20

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*:

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 4/10 - 15

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 4/10 - 2015

Underskrift *Signature*: Brian J

6.5.5 Hollow Sleeper Kj 53+247 DSB-45 01.20

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 5/10 - 2015

Sted (kilometersten) *Place (Kilometer point)*: 53,247

Dokumentation *Documentation*

Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX - 001

Systemdefinition ID og version *System definition ID and version*: SP - FIE-OW-00822

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: DSB 45 01:20

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: JA

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 5/10-15

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 5/10 -2015

Underskrift *Signature*: Brian J

6.5.6 Hollow Sleeper Kj 53+323 DSB-45 01.20

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 5/10-2015

Sted (kilometersten) *Place (Kilometer point)*: 53,323

Dokumentation *Documentation*

Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-008218

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: DSB 45 01:20

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 5/10-15

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 5/10-2015

Underskrift *Signature*: Brian J

6.5.7 Hollow Sleeper Kj 53+790 DSB-45 01.00

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 6/10-15

Sted (kilometersten) *Place (Kilometer point)*: 53,792

Dokumentation *Documentation*

Nedenstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-06828

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: DSB 45 01:00

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: svelle forkert mærket op. flyttet 2 meter! (overgangs skinne)

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 6/10-15

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 6/10 - 15

Underskrift *Signature*: Brian J

6.5.8 Hollow Sleeper Kj 53+890 UIC-60 01.00

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 6/10 -2015

Sted (kilometersten) *Place (Kilometer point)*: 53, 890

Dokumentation *Documentation*

Nedenstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX -001

Systemdefinition ID og version *System definition ID and version*: SP -FIE- ON-008218

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: UIC60 ~~[illegible]~~ 01:00

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 6/10 -2015

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 6/10 -2015

Underskrift *Signature*: Brian J

6.5.9 Hollow Sleeper Kj 54+026 UIC-60 01.00

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 6/10 -2015.

Sted (kilometersten) *Place (Kilometer point)*: 54,026

Dokumentation *Documentation*

Nedenstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-00827

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: UIC60 - 01:00

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 6/10-15

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 6/10-2015

Underskrift *Signature*: Brian J

6.5.10Hollow Sleeper Kj 54+093 UIC-60 01.00

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 7/10-2015

Sted (kilometersten) *Place (Kilometer point)*: 54,093

Dokumentation *Documentation*

Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-00 8218

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: UIC60 -01:00

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: _____

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 7/10 - 2015

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 7/10-2015

Underskrift *Signature*: Brian J

6.5.11Hollow Sleeper Kj 54+195 UIC-60 01.40

bravida

HULSVELLE - TJEKLISTE

HOLLOW SLEEPER – CHECK LIST

Dato *Date*: 7/10 -2015

Sted (kilometersten) *Place (Kilometer point)*: 54,195

Dokumentation *Documentation*

Nedentstående dokumentation har været til stede under installationens udførelse *The below documentation has been available during the performance of the installation*

Tegning nr. og version *Drawing no. And version*: _____

Metodebeskrivelses ID og version *Method statement ID and version*: OCDXX-001

Systemdefinition ID og version *System definition ID and version*: SP-FIE-ON-008219

Installationsinformation *Installation information*

Type af hulsvelle *Type of hollow sleeper*: ~~S76~~ UIC-60 Hel hæining 01:40

Momenttilspænding på fjederbøjle (~200Nm) *Torque on clamping set (~200Nm)*: 200 Nm

Er der stoppet omkring svellen? *Has the ballast been tucked around the sleeper?*: Ja

Bemærkninger *Comments*: Havde problemer med sporvidden Var 1441mm skal være 1435mm

Sportekniker *Rail technician*

bekræfter hermed at have overvåget installationen *hereby confirms to have supervised the installation*

Navn *Name*: Brian Jørgensen

Underskrift og dato *Signature and date*: Brian J 7/10 - 2015

Ansvarlig for udførelsen dokumenterer hermed, at ovenstående oplysninger er korrekte, og at arbejdet er korrekt udført. *Responsible for the installation hereby documents that the above information is correct and that the work has been rightly executed.*

Dato *Date*: 7/10-2015

Underskrift *Signature*: Brian J.