ÖBB Infrastruktur

Staffposition

Research & Development

(R&D)

Head
Ing. Wolfgang ZOTTL

Research & Development

ÖBB-Infrastructure AG-Research and Development (R&D) is a strategic element of the corporate management of ÖBB-Infrastructure AG for in-house handling of research projects to position and strengthen our modern and environment-friendly railway as a motor for innovation.

R&D co-operates with partners of the ÖBB-group as well as partners from industry and science. R&D supports all parts of ÖBB-Infrastructure AG within the management and processing of R&D projects.

ÖBB-Infrastruktur AG

Corporate Services

Vienna Main Station General Project Management

Business Units

Operations	Infrastructure / Finance	Project Management / Engineering
Network Access	Infrastructure Development	Project Management
Network Operation	Asset Management	Brenner Access Line
Energy	Integrated Track Management	Engineering Services
Shunting	Controlling / Accounting	

R&D

Shares

- ÖBB-TEL GmbH
- IKT GmbH
- MUNGOS GmbH

- IMMO GmbH
- NSE GmbH
- WWG GmbH (30%)
- ARCC GmbH
- REQ GmbH

- BBT SE

Corporate Services

- Safety Management
- Track and Operation Planning
- IT / CIO
- Human Resources
- Corporate strategy, PR & customer relations
- Corporate Law
- Management Assurance Services
- Purchasing department

Our main tasks

- strategical research for the „ÖBB-Infrastructure AG“
- networking of industry, economy and universities
  to develop ideas and possible solution statements
- inspection of international, national and/or regional research projects for our customers
- support in processing research projects (research funding)

The most important task of the staff R&D is to transform the know how of railway technology in an organisational unit, to postion and strengthen our modern railway as an innovation driver.

Fokus of research and development

- The R&D of the „ÖBB-Infrastruktur AG“ does application-oriented research.
- With the help of the industry-network ideas are sucessfully turned into reality.
- We implement international, national and regional research projects together with and for our customers.

ÖBB Infrastruktur

R & D leads to innovation management for application-oriented and results-effective research to develop the infrastructure and interfaces, with 15 employees and a budget of about € 5 million

Currently about 50 projects are from different sectors of infrastructure, for example,

Geodaten

Laserscan

Energie

Brücken-klappverfahren

Wiener Bogen

RailReader

Lärmschutz

Gleislage-Charakterisierung

Argos®

DEST Rail

RSS

Elastizität im Gleis

Ballige Schiene

KLIWA

Tunnelausbruch

GAL-Galileo

Research funding - Objective

- Keep the feed rate of approximately 22% (DB and SBB 9-11%) despite an increase of investment projects
- Each research project will be subject to a test potential funding
- Funded projects are priori, and include intense communication with FFG, Federal Ministry and EU, as well as other national and international funding bodies

The indirect support for R & D projects is at present pa € 800.000, -, as well as direct funding predominantly from the FFG of about € 150.000, -

By participating in consortia, we are working projects worth a total of 93 million €, which means direct information and more know-how

Example: Research Project

> duration 2009-2010

> aim: more safety at level crossings

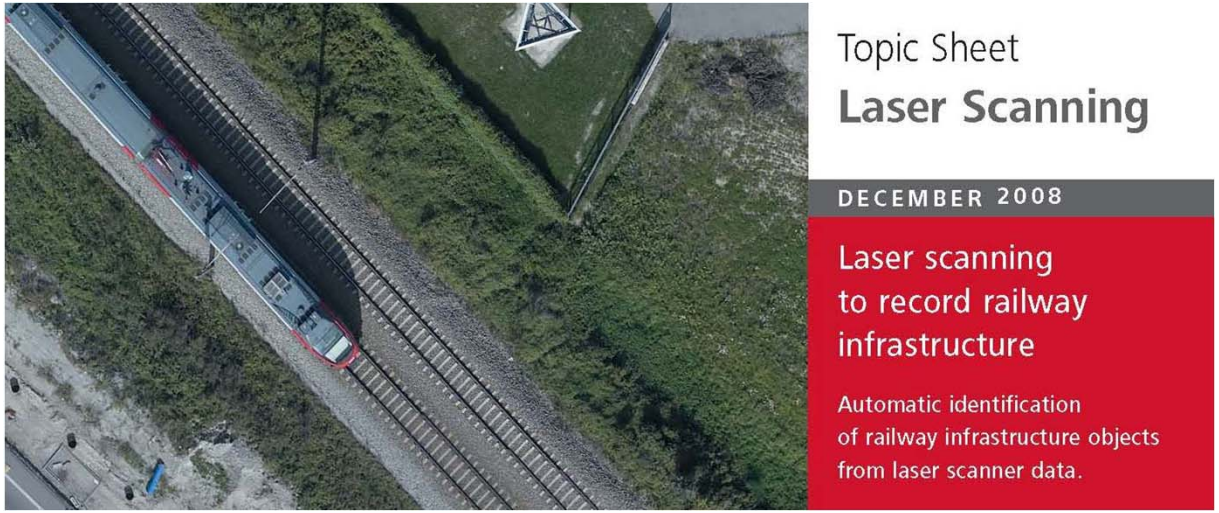
> method: new technologies for better understanding what happens on the road

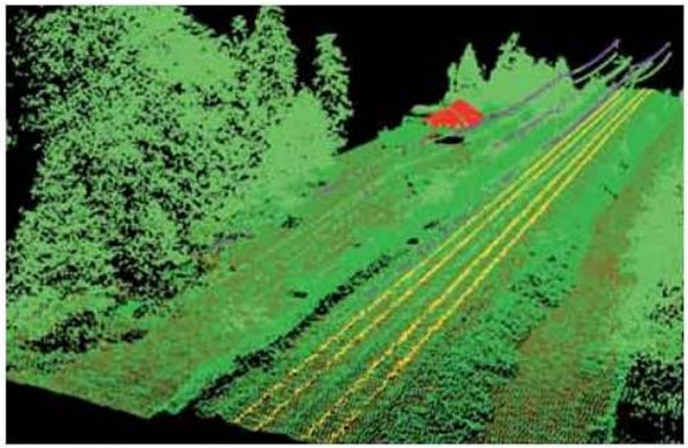
> conclusion:

- generate portal effect
- generate clearness
- add light signals on road sign mast to increase visibility

Example: Research Project

The project „airborne laser scanning and aerial image data identification of railway infrastructure systems“ develops innovative methods to enable the automated recording of information about railway infrastructure.





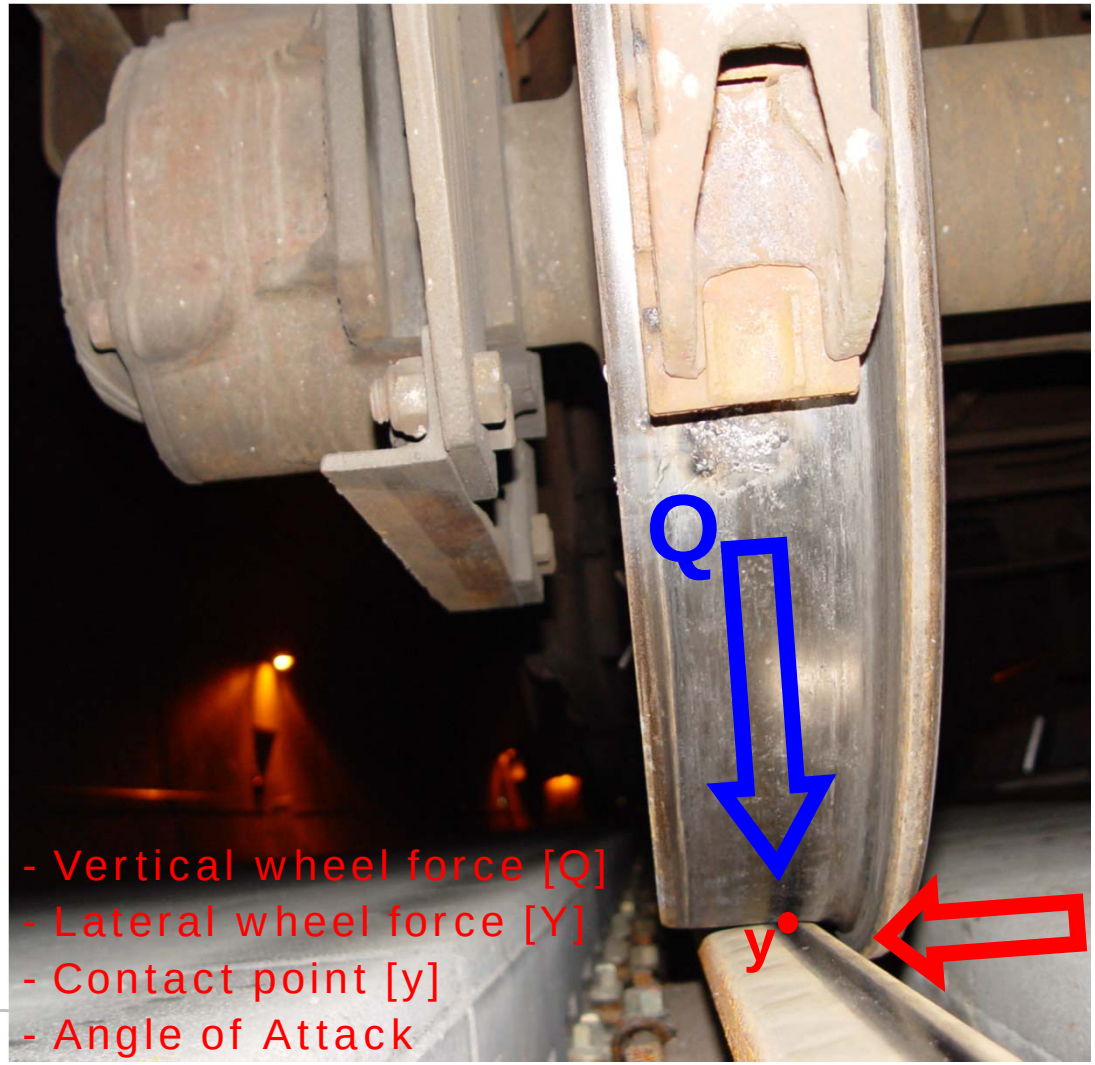
Classified laser points on the track

ÖBB operates a rail network with a total length of around 5700 km.

Project Y/Q

Methods of proofing the safety against derailment.

- The general meaning is that the limit value for existing safety criteria Y/Q ≤ 0,8 could be increased
- Fright wagons and other vehicles exceed the actual limit value of Y/Q
- The actual limit value is accepted for dry rail and flange
- The slip Y/Q depends from friction coefficient of the inner rail



Adapting ÖBB rail infrastructure to climate change

Main research questions within the project

(1) What are the climate change impacts on rail infrastructure?

- ✓ *Literature review*
- ✓ *Synthesis report*

Workshop with internal ÖBB experts

- ✓ *Identification and priorisation of possible climate change impacts on rail infrastructure*

(2) How vulnerable is the ÖBB infrastructure?

- ✓ *Analysis of ÖBB damage database*
- ✓ *Link to meteorological parameters*

Workshop with internal ÖBB experts and external experts

- ✓ *Focus on natural hazards*
- ✓ *Discussion of results from*

(3) What adaptation options are necessary and possible?

- ✓ *Literature review*
- ✓ *Interviews with internal ÖBB experts*

Workshop with internal ÖBB experts and external experts

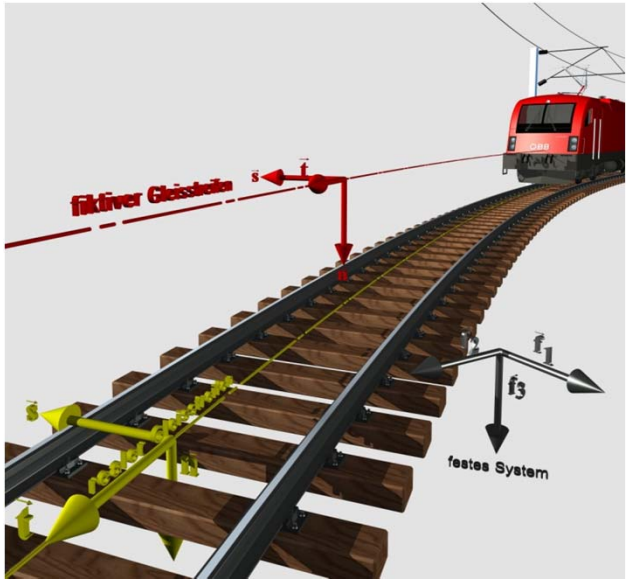
- ✓ *Presentation and discussion of possible adaptation options*

Final results → recommendations of posssible adaption options

The Viennese Transition Curve

A revolutionary Austrian development for track alignment design

It is a new method for defining an optimised and sustainable alignment geometry for railway lines. The chosen route and its layout are extremely long-lived engineering products, which have a substantial impact on infrastructure spending across centuries.

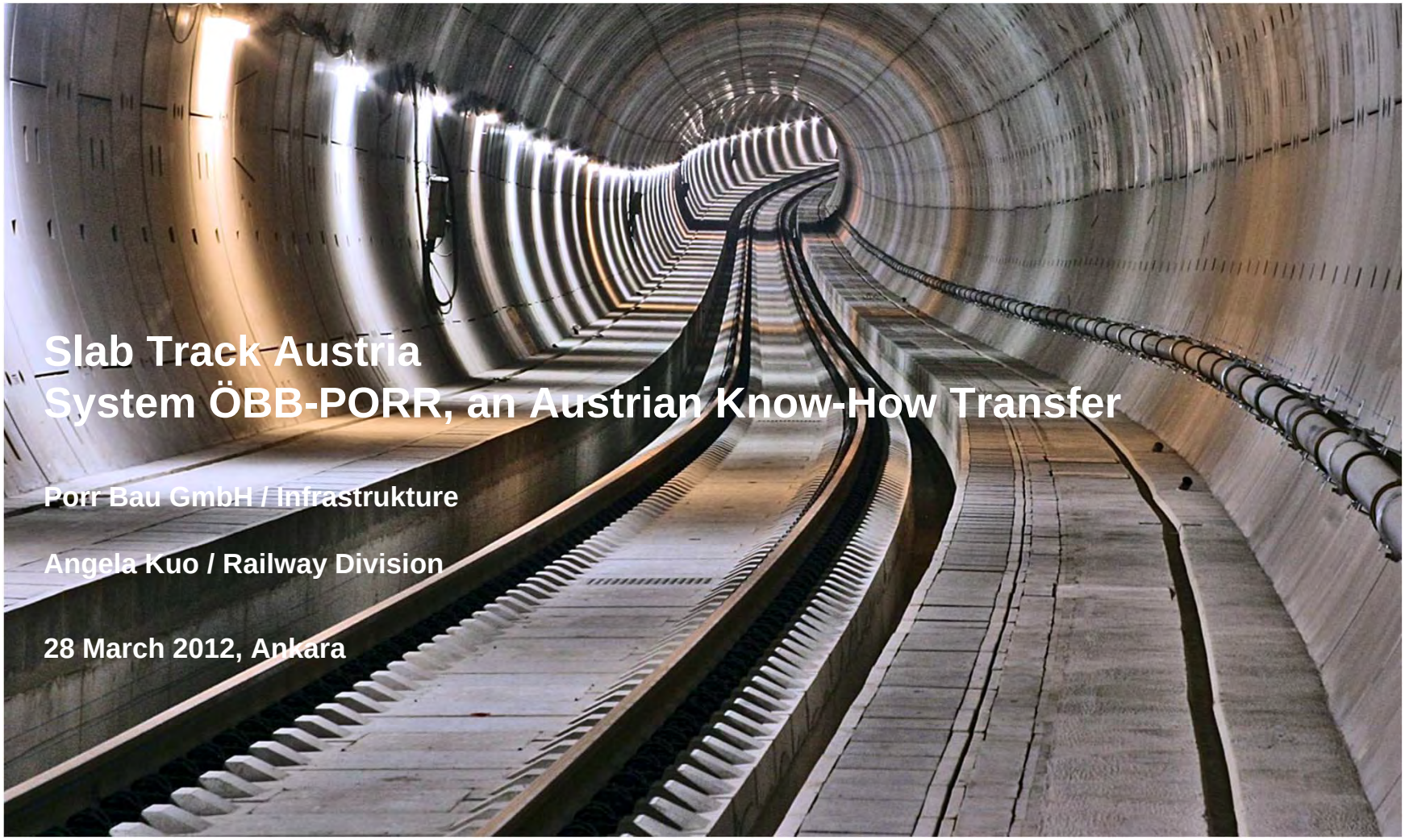


Aim:
- **greater comfort of the passenger**
- **lower forces and wear of permanent way**
- **less maintenance**
- **cost savings (as part of scheduled maintenance)**

Applying the best methods is virtually a must to avoid any unnecessary extra cost for current and future generations.

ÖBB Infrastruktur

Thank you for your attention



Slab Track Austria
System ÖBB-PORR, an Austrian Know-How Transfer

Porr Bau GmbH / Infrastrukture

Angela Kuo / Railway Division

28 March 2012, Ankara

powered by

Decision-making of slab track system in Austria

Entscheidungsfindung FF-System in Österreich

- Construction (space requirements,...)
  Konstruktion (Platzbedarf, ...)
- Method (sensitivity of laying,...)
  Verfahren (Sensibilität der Verlegung, ...)
- Quality (track set, acoustics,...)
  Qualität (Gleislage, Akustik, ...)
- Economy
  Wirtschaftlichkeit

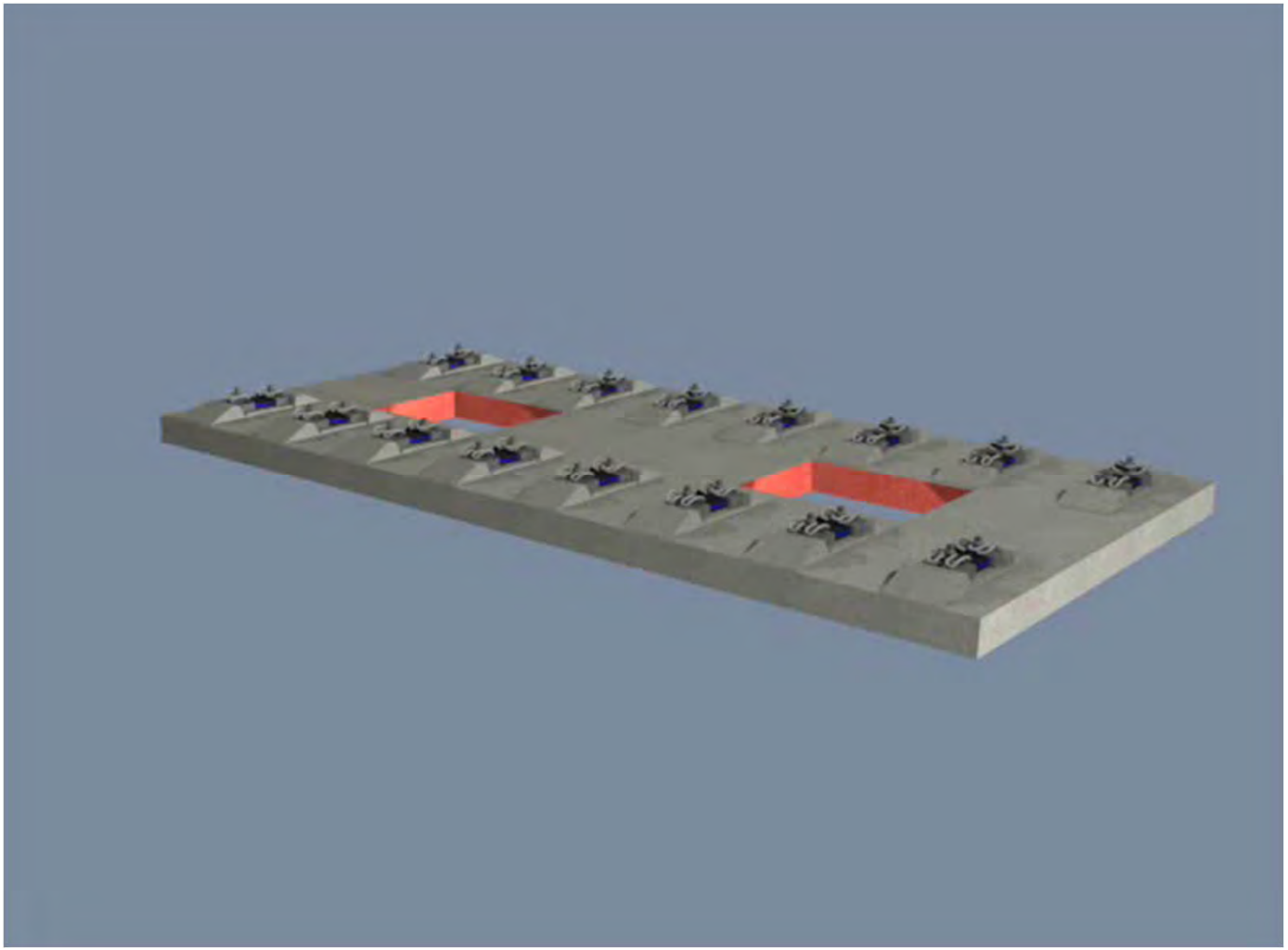
➢ System ÖBB–PORR is the STANDARD SYSTEM in Austria

Elastisch gelagerte Gleistragplatte ÖBB – PORR REGELSYSTEM in Österreich



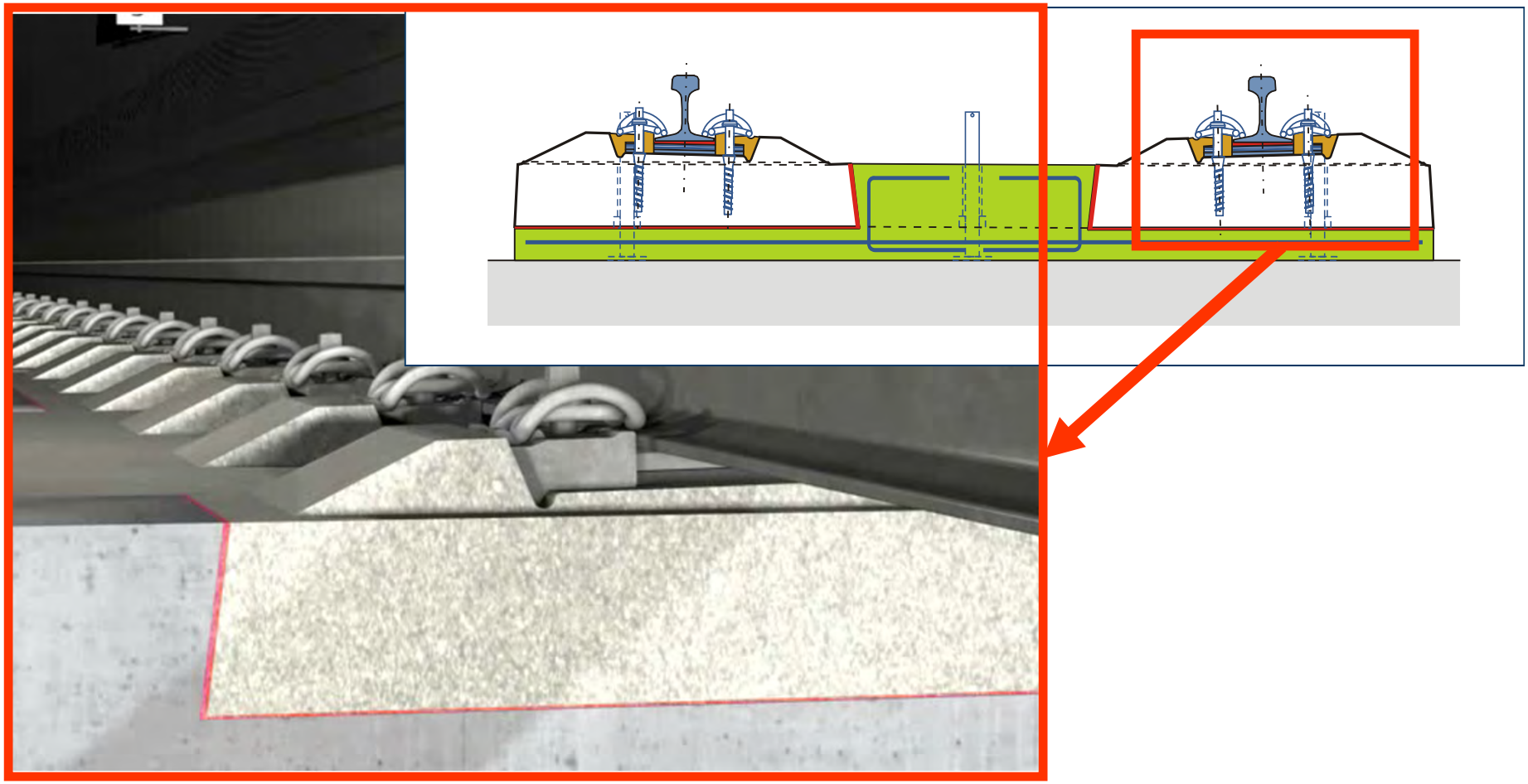

Track Base Plate

Gleistragplatte



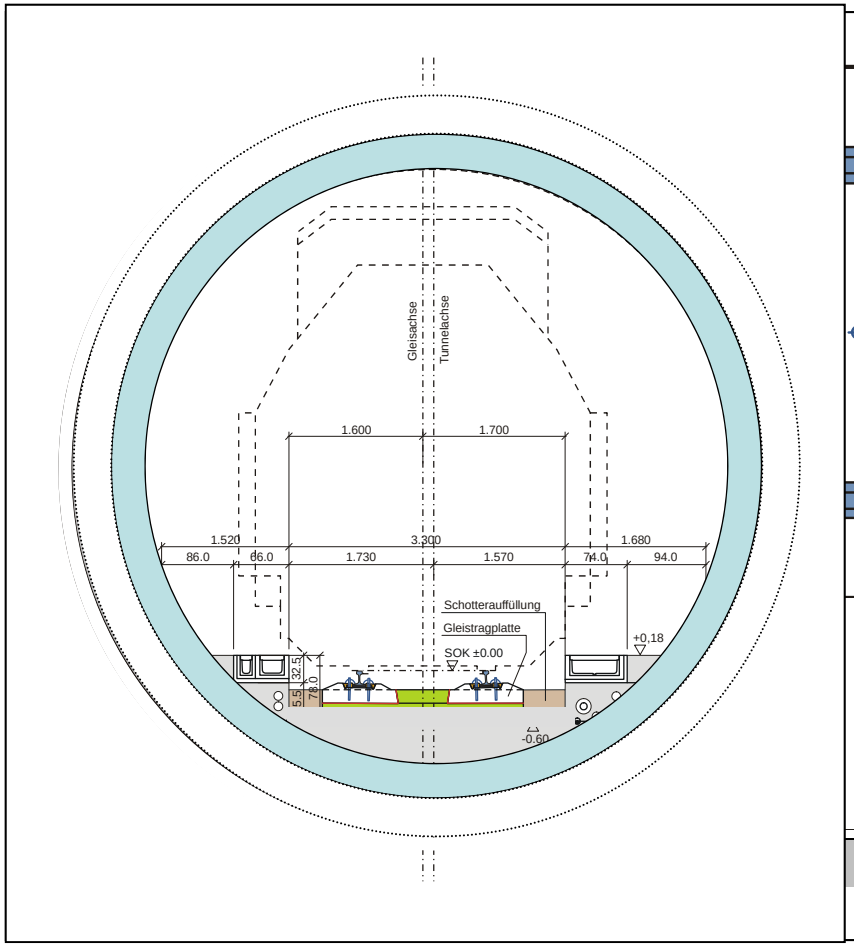
Operating characteristics of elastic separation layer

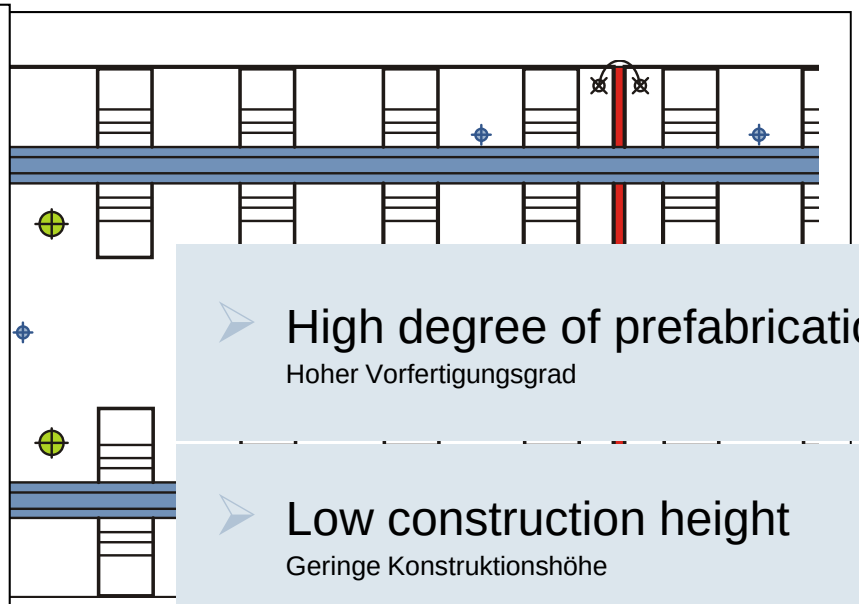
Wirkungsweise Elastische Trennschicht



Description of the system

Systembeschreibung

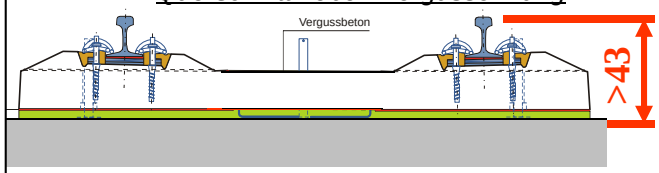




- **High degree of prefabrication**
  Hoher Vorfertigungsgrad
- **Low construction height**
  Geringe Konstruktionshöhe

Cross-section beside pouring aperture

Querschnitt neben Vergussöffnung






Construction process

Bauablauf

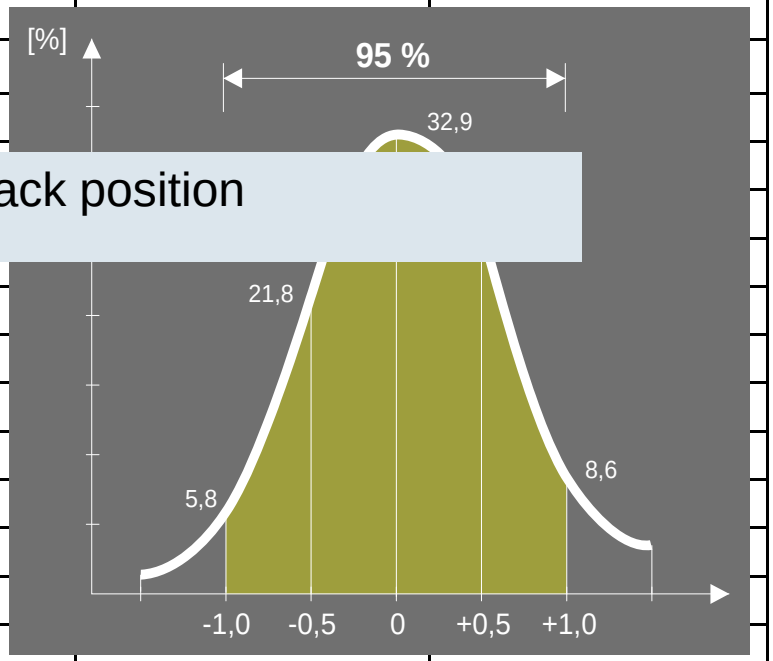
Track alignment quality

Qualitätssicherung Gleislage

Frequency distribution of deviations

Häufigkeitsverteilung der Abweichungen

Deviation Abweichung	Position Lage	Height Höhe	Cant Überhöhung	Track Gauge Spurweite	Position of Creep Wandersehne Lage	Height of Creep Wandersehne Höhe
-4		0,2				
-3,5		0,6				
-3		1,3				
-2,5						
-2						
-1,5	0,2	18,5				
-1	9,1	21,9	5,8	45,1		
-0,5	46,4	19,9	21,8			
0	37,5	14,3	32,9	22,7		
0,5	6,6	5,6	26,3			
1	0,2	2,5	8,6	2,8		
1,5		0,2	3,4			
2						
2,5		0,2				



High precision of track position

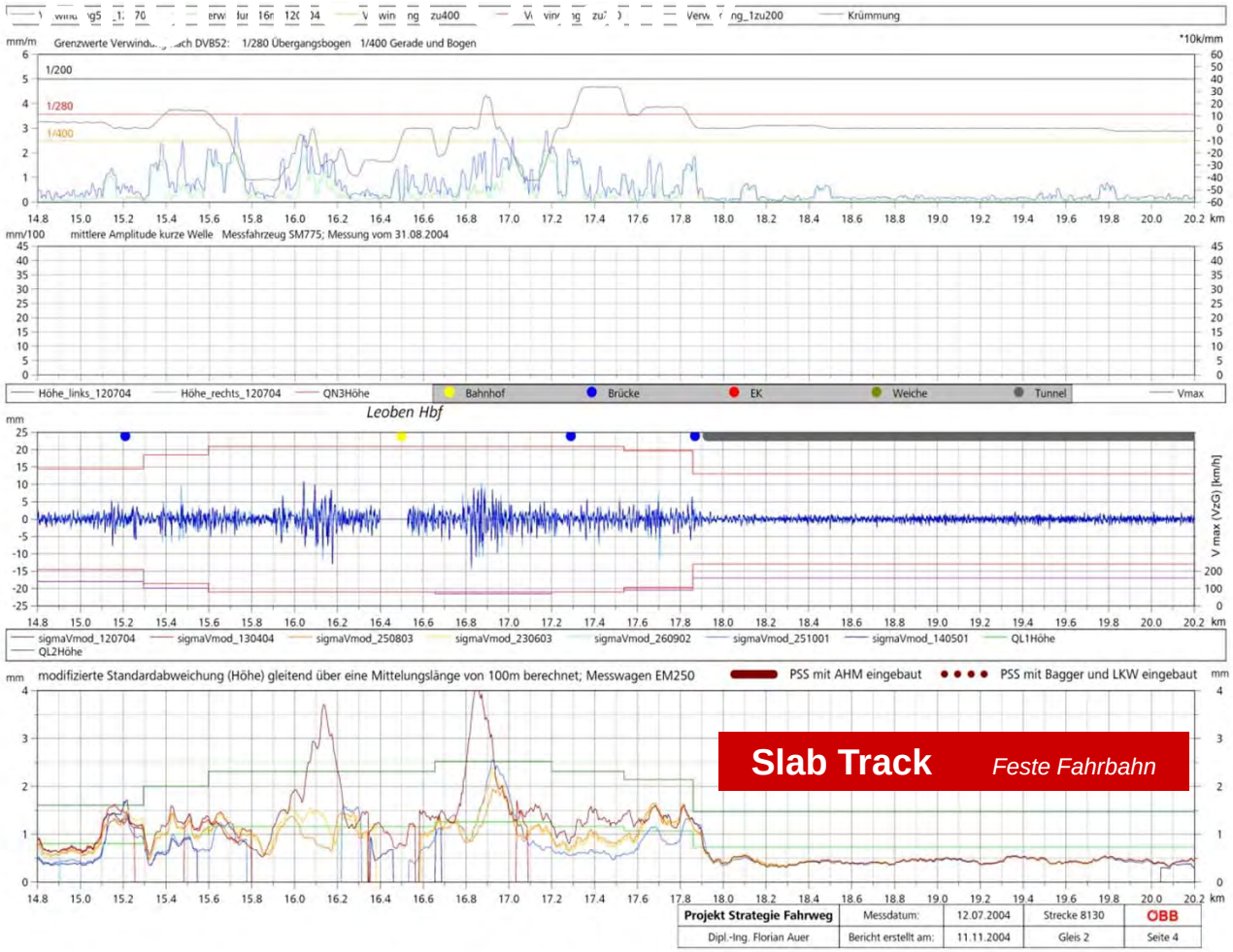
hohe Gleislagegenauigkeit

Wagram connection - 638 measurement points, value as %




Track alignment quality

Qualitätssicherung Gleislage






High speed tests

Test von Hochgeschwindigkeiten

High-speed tests:
V ≥ 300 km/h

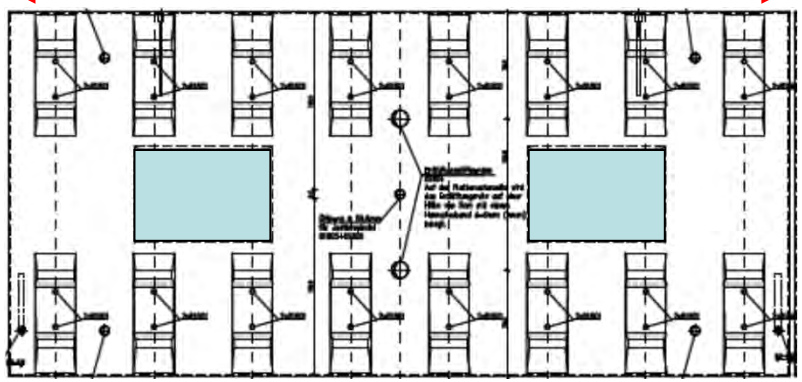
Test von Hochgeschwindigkeiten:
V ≥ 300 km/h
Zulassung für 350 km/h

Highly-modular formwork

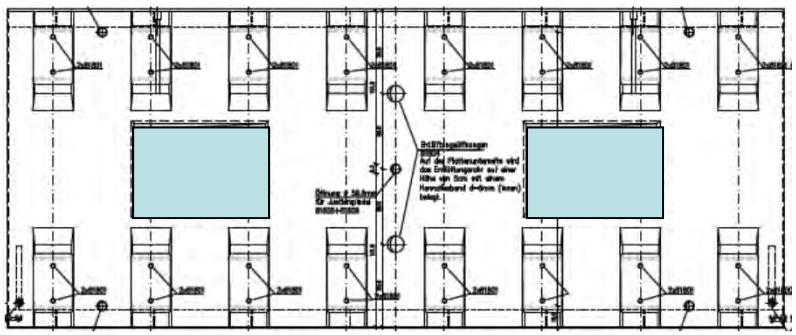
hoch-modularer Schalungen

Standard 5.16 m

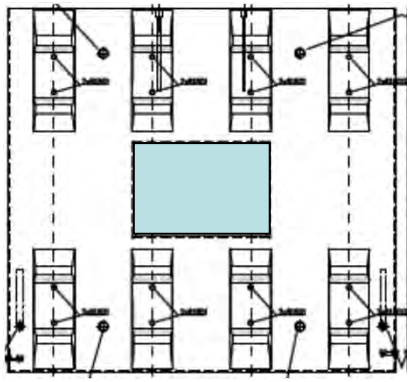
2.4 m



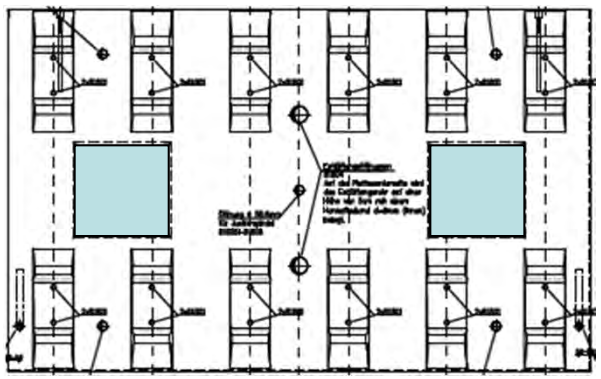
2.1 m



Variation X m



Variation Y m



- Dimensions variable according to the project‘s requirements

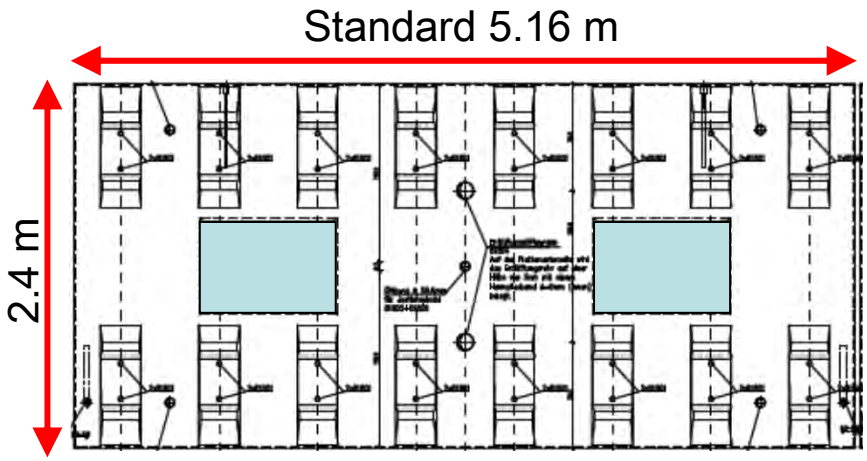
  Dimensionen variable gemäß Anforderung des Projekts



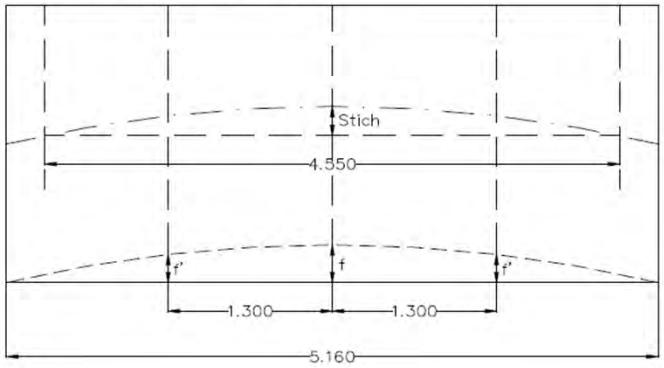

Highly-modular formwork

hoch-modularer Schalungen

GRUNDTYPEN WEGEN GRUNDRISSGEOMETRIE:				
Plattentyp	**Stich [mm]**	**R Stich**	***R max.***	***R min.***
G	0,0		*Gerade*	*6.500*
0,8	0,8	3.235	*6.500*	*2.350*
1,4	1,4	1.848	*2.350*	*1.362*
2,4	2,4	1.078	*1.362*	*941*
3,1	3,1	835	*941*	*761*
3,7	3,7	699	*761*	*631*
4,5	4,5	575	*631*	*534*
5,2	5,2	498	*534*	*462*
6,0	6,0	431	*462*	*404*
6,8	6,8	381	*404*	*357*
7,7	7,7	336	*357*	*319*
8,5	8,5	304	*319*	*292*
9,2	9,2	281	*292*	*270*
10,0	10,0	259	*270*	*237*
11,8	11,8	219	*237*	*211*
12,7	12,7	204	*211*	*198*



Prinzipskizze (nicht maßstäblich):



- Radien - GTP




Precision of Track Base Plate

Genauigkeit der Gleistragplatte

VSP — GTP - Qualitätsprüfung

Prüfer: Wascher

Herstelldatum: 15.03.2010 | Schalung: 19

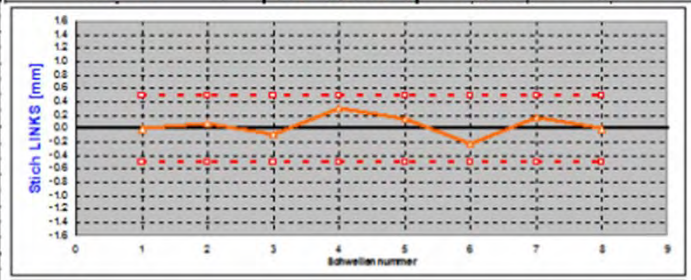
Prüfgegenstand			IST [mm]	SOLL [mm]
EBENHEIT LINKS	Ebenheit L8	EL8	0.0	0.0
	Ebenheit L7	EL7	0.3	0.0
	Ebenheit L6	EL6	0.1	0.0
	Ebenheit L5	EL5	0.2	0.0
	Ebenheit L4	EL4	0.0	0.0
	Ebenheit L3	EL3	0.0	0.0
	Ebenheit L2	EL2	-0.1	0.0
	Ebenheit L1	EL1	0.0	0.0
EBENHEIT RECHTS	Ebenheit R8	ER8	0.0	0.0
	Ebenheit R7	ER7	0.1	0.0
	Ebenheit R6	ER6	0.0	0.0
	Ebenheit R5	ER5	-0.1	0.0
	Ebenheit R4	ER4	-0.2	0.0
	Ebenheit R3	ER3	0.1	0.0
	Ebenheit R2	ER2	0.1	0.0
	Ebenheit R1	ER1	0.0	0.0
Sickenmaß AUSSEN	Sickenmaß 8	S8	1891.8	1891.8
	Sickenmaß 7	S7	1891.7	1891.8
	Sickenmaß 6	S6	1891.6	1891.8
	Sickenmaß 5	S5	1891.6	1891.8
	Sickenmaß 4	S4	1891.7	1891.8
	Sickenmaß 3	S3	1891.6	1891.8
	Sickenmaß 2	S2	1891.7	1891.8
	Sickenmaß 1	S1	1891.7	1891.8
Stichmaß Links	Stichmaß L8	StL8	0.0	0.0
	Stichmaß L7	StL7	0.6	0.4
	Stichmaß L6	StL6	0.5	0.7
	Stichmaß L5	StL5	1.0	0.8
	Stichmaß L4	StL4	1.1	0.8
	Stichmaß L3	StL3	0.6	0.7
	Stichmaß L2	StL2	0.5	0.4
	Stichmaß L1	StL1	0.0	0.0
Stichmaß Rechts	Stichmaß R8	StR8	0.0	0.0
	Stichmaß R7	StR7	0.4	0.4
	Stichmaß R6	StR6	0.3	0.7
	Stichmaß R5	StR5	0.8	0.8
	Stichmaß R4	StR4	0.9	0.8
	Stichmaß R3	StR3	0.3	0.7
	Stichmaß R2	StR2	0.6	0.4
	Stichmaß R1	StR1	0.0	0.0
Neigung 1:40 Links	Neigung 1:40 L8	NL8	-0.1	0.0
	Neigung 1:40 L7	NL7	-0.1	0.0
	Neigung 1:40 L6	NL6	0.0	0.0
	Neigung 1:40 L5	NL5	-0.1	0.0
	Neigung 1:40 L4	NL4	-0.1	0.0
	Neigung 1:40 L3	NL3	0.0	0.0
	Neigung 1:40 L2	NL2	-0.1	0.0
	Neigung 1:40 L1	NL1	-0.1	0.0

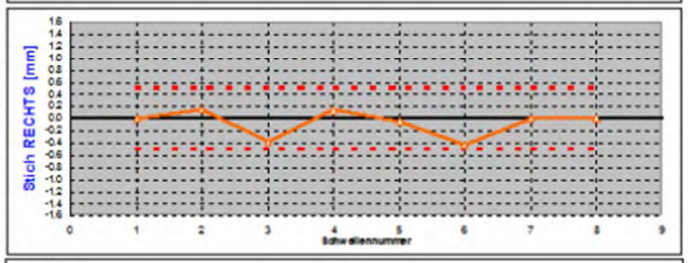
VSP — GTP - Qualitätsprüfung

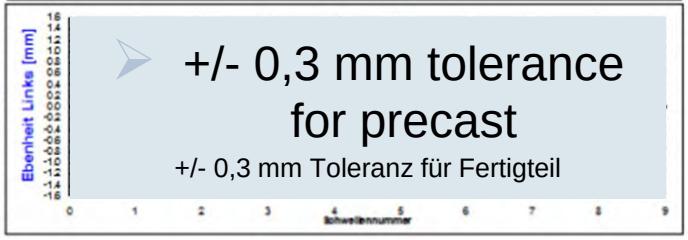
Prüfer: Wascher | geprüft am: 08.04.2010 | ABA

Herstelldatum: 15.03.2010 | Schalung: 19 | Stich: 0.8 | lfd.Nr.: 4387

Prüfgegenstand	IST [mm]	SOLL [mm]	Toleranz [mm]	Außerhalb der Toleranz





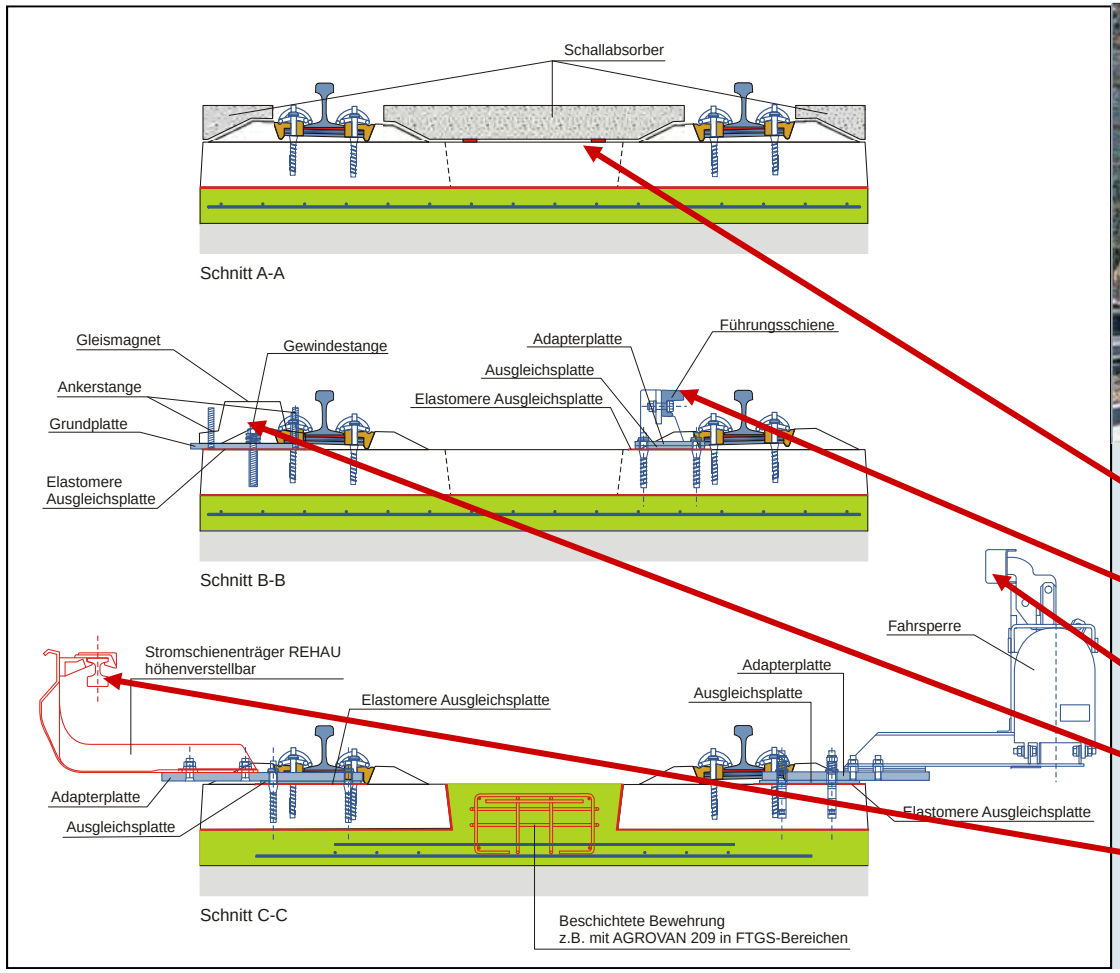


- +/- 0,3 mm tolerance for precast

+/- 0,3 mm Toleranz für Fertigteil

Track equipment

Gleisausrüstung

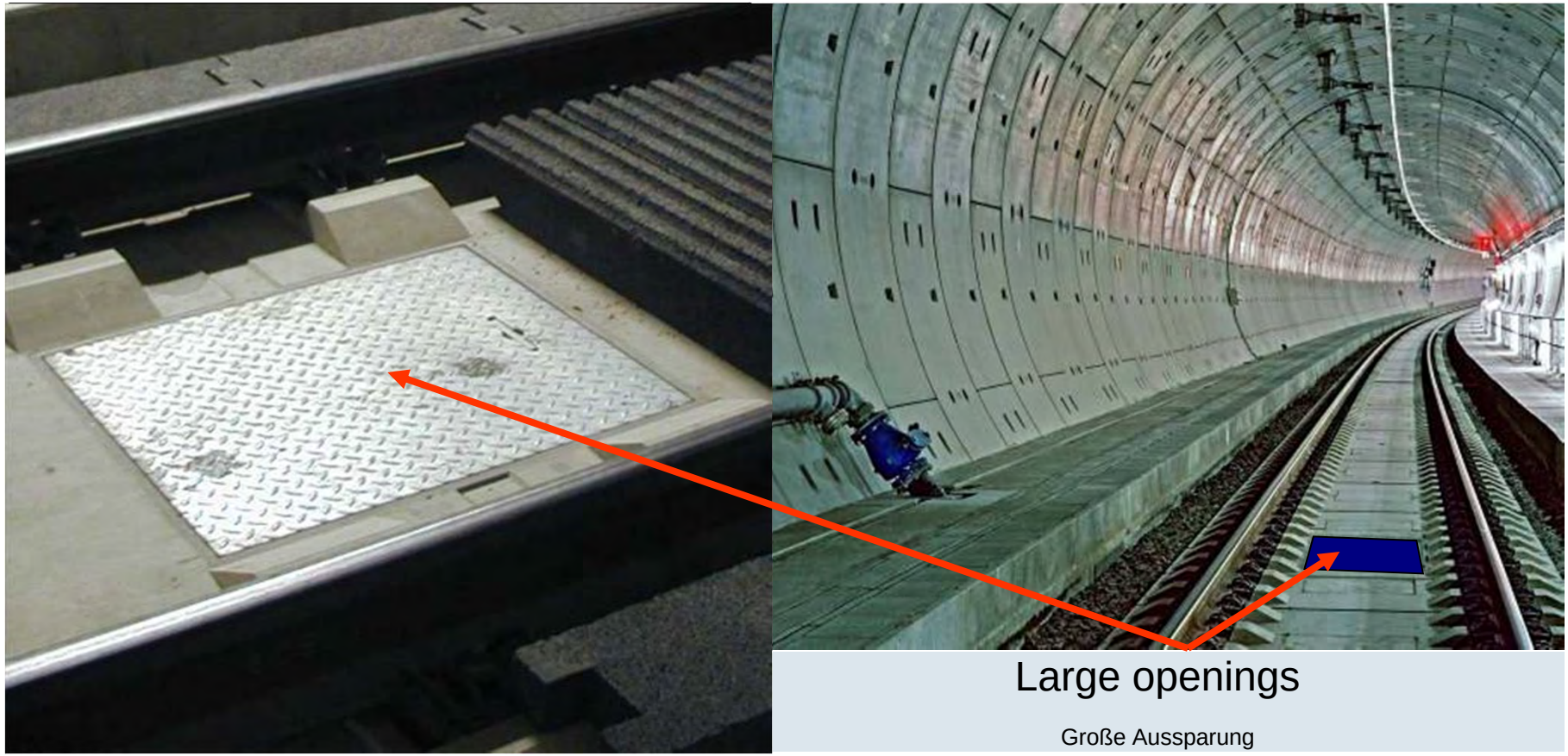


- **Accessble noise absorbers**
  befahrbare Schallabsorber
- **Guard rails**
  Führungsschienen
- **Buffer stops**
  Fahrsperren
- **Track magnets**
  Gleismagneten
- **Power rails**
  Stromschienen




Revisions within the track

Gleisachse Aussparungen

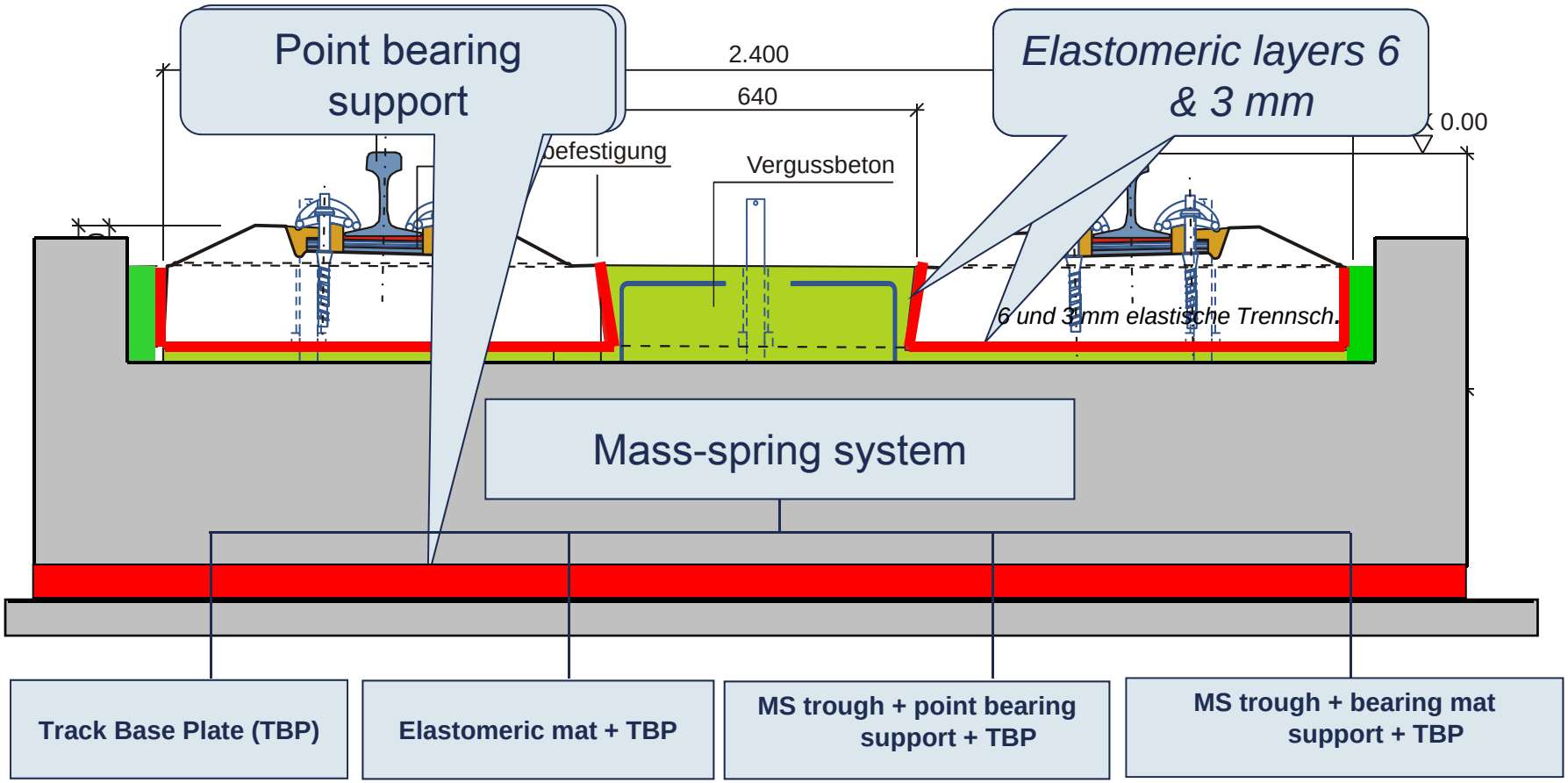


Large openings

Große Aussparung

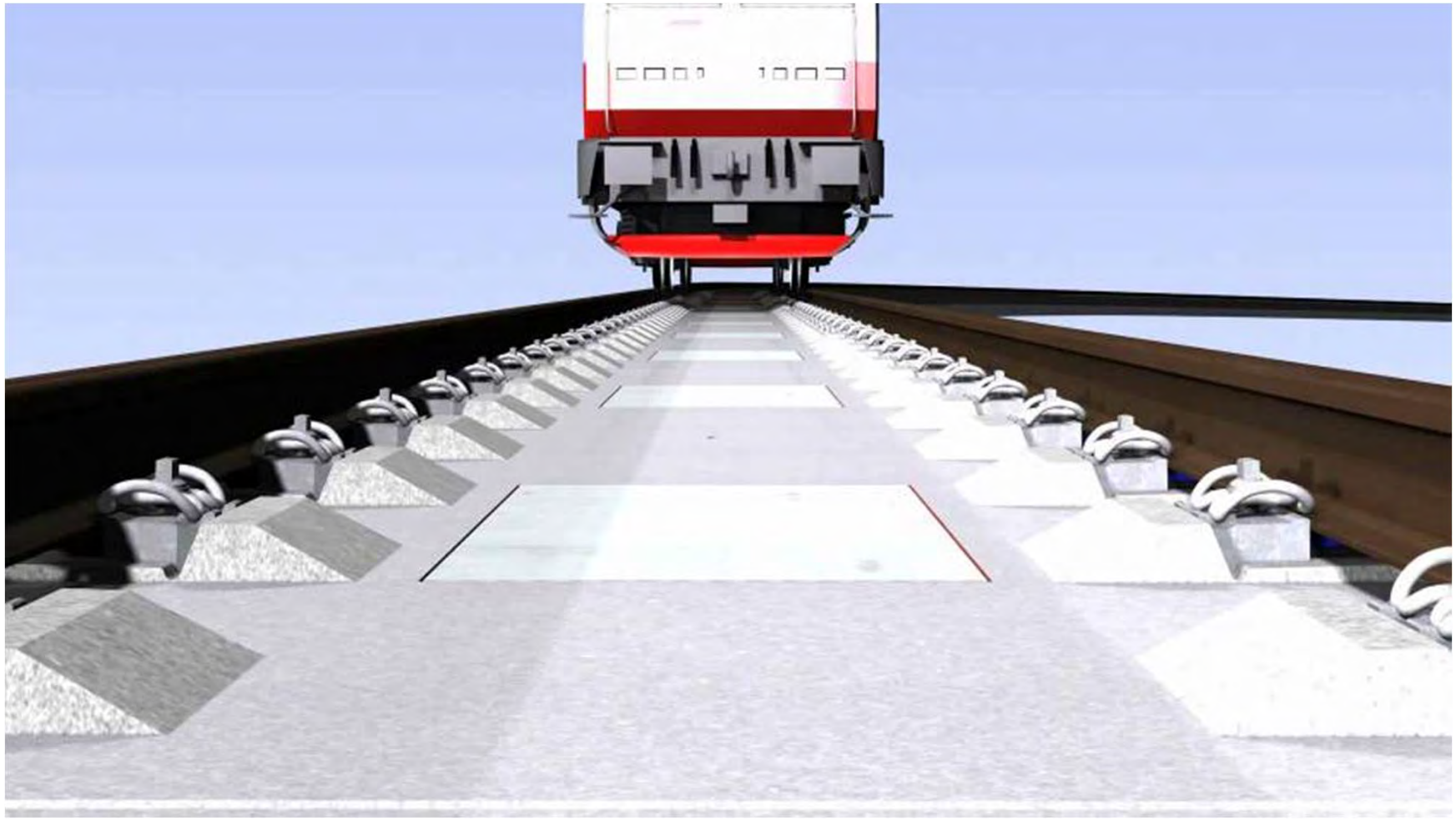
Mass-spring-systems

Masse-Feder-Systemen



Derailment and repair

Unfall und Reparatur



Derailment and repair

Unfall und Reparatur

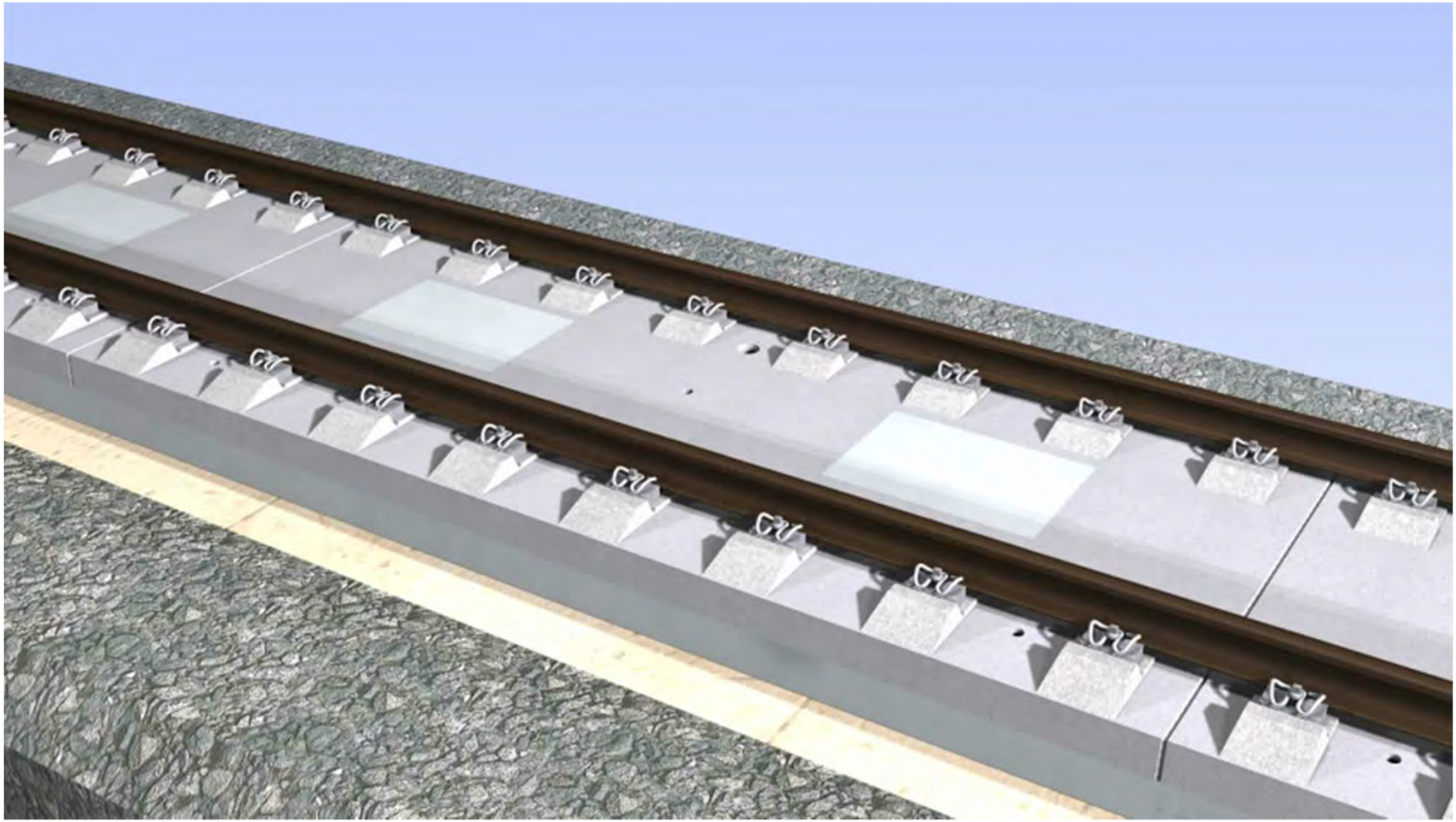
Photos of derailment damage

Schädenfotos der Entgleisung

- Slab track Feste Fahrbahn
- Ballast track Schotter
- Turnout Weichen

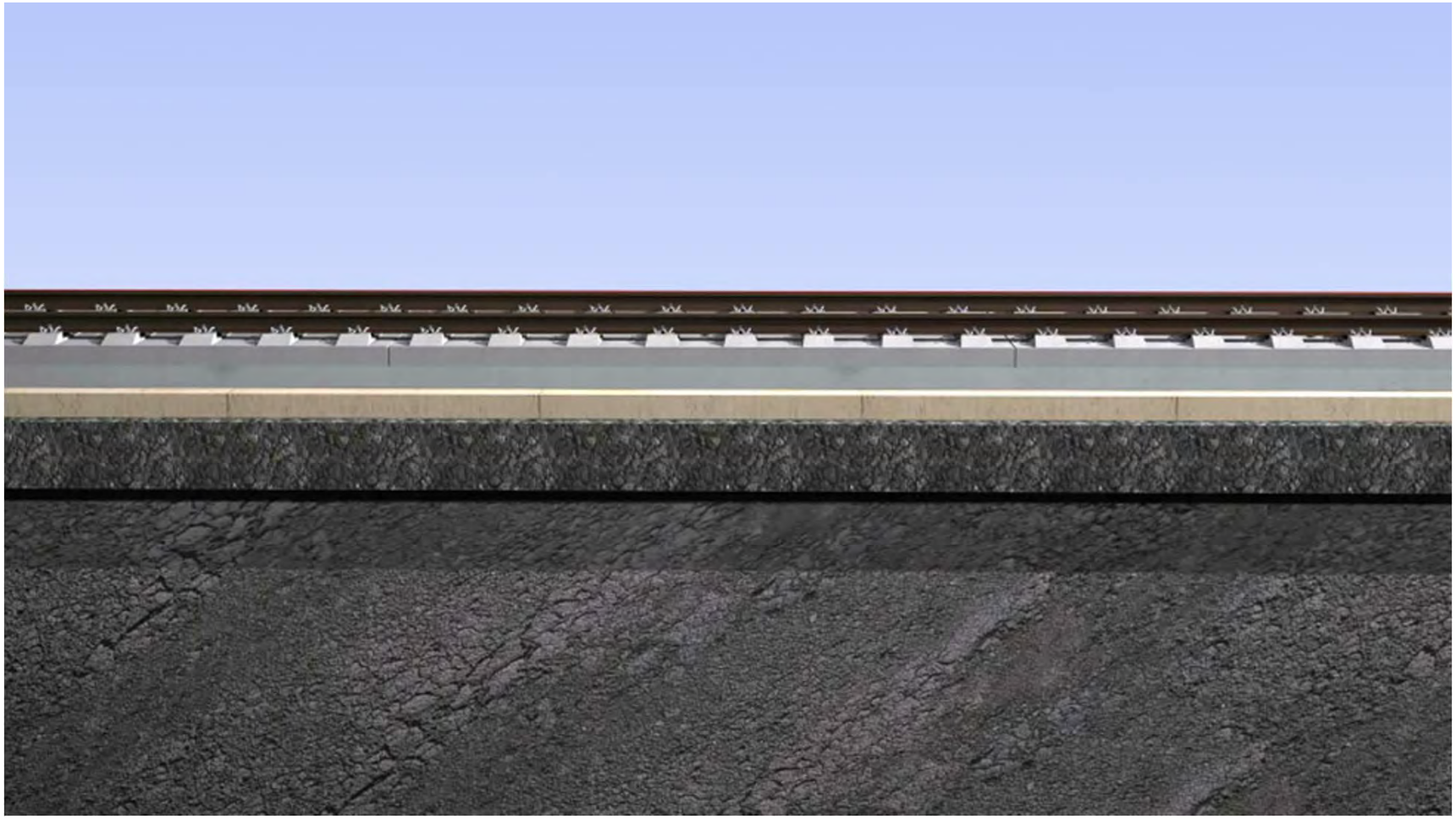
Repair and replacement

Reparatur und Austausch



Level adjustment (large settlement)

Niveauregulierung



Slab track projects

Feste Fahrbahn Projekte

Austria – Melk

- 8 km of slab track
  8 km FF
- 800 m mass spring system
  800 m MFS
- Tunnel
  im Tunnel
- Bridge
  auf Brücke
- Earthwork
  auf freier Strecke

Slab track projects

Feste Fahrbahn Projekte

Austria – Arlberg Tunnel

- 20.8 km of slab track

  20,8 km FF
- Double track old tunnel

  2-Gleisigen Tunnel
- 3.5m between track centrelines

  3,5m zwischen Gleisachse
- Widening tunnel clearance

  Verbreitung des Lichtraumprofils
- Installation water supply line

  Installation von Wasserleitung
- Track accessible for emergency road vehicles

  Befahrbarkeit für Rettungsfahrzeug

Slab track projects

Feste Fahrbahn Projekte

Germany - Berlin Lehrte station East-West connection

- 25 bridges
  auf 25 Brücken
- 5.6 km of slab track
  5,6 km FF
- Mass-spring-system
  mit MFS
- 4 Turnouts in slab track
  4 Weichen in FF
- 6 bridge expansion joint construction
  6 SAV in FF
- 50 transitional construction
  50 FÜK

Slab track projects

Feste Fahrbahn Projekte

Germany - Berlin Lehrte Station North-South connection

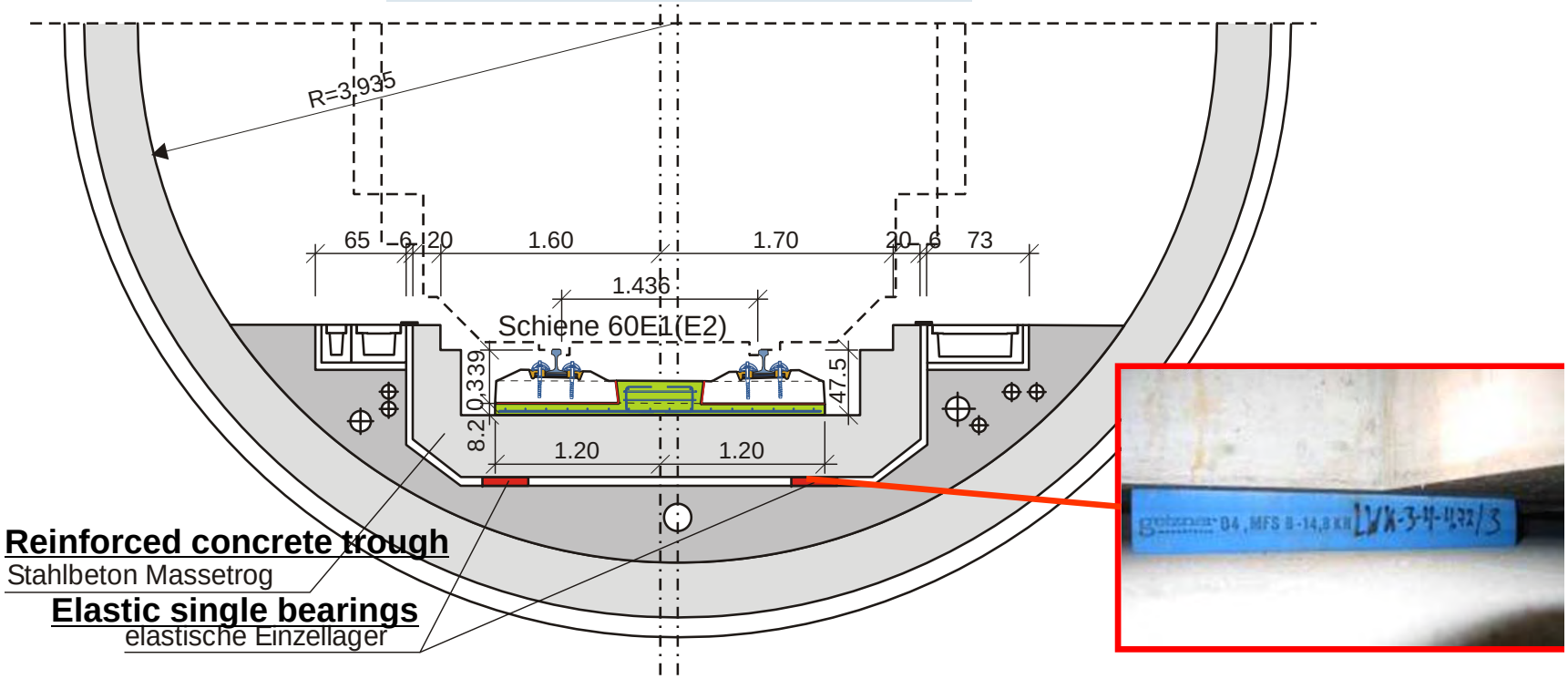
- In tunnel
  Im Tunnel
- 20 km of slab track
  20 km FF
- 13 km of light, medium & heavy mass-spring-systems
  13 km leichte, mittlere uns schewere MFS
- 49 turnouts in slab track
  49 Weichen in FF

Slab track projects

Feste Fahrbahn Projekte

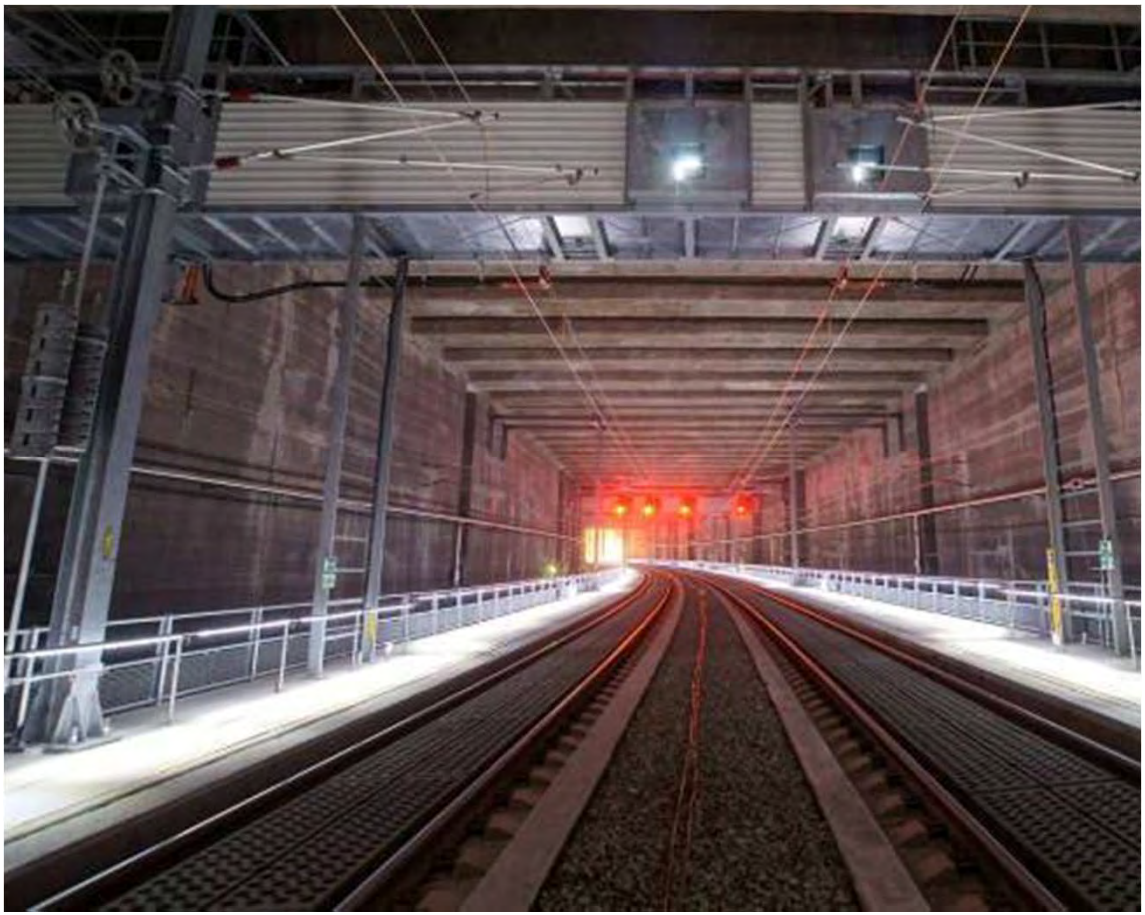
Mass-spring systems with point bearing supports

Einzelgelagerte Masse-Feder-Systeme



Slab track projects

Feste Fahrbahn Projekte



Austria – Vienna-St. Pölten High Speed Connection

- 73 km of slab track
  73 km FF
- Mass-spring-systems
  MFS
- Earthwork
  Freier Strecke
- Bridges
  Auf Brücken
- Tunnels
  im Tunnnel
- In construction until 2012
  Bau bis end 2012

Slab track projects

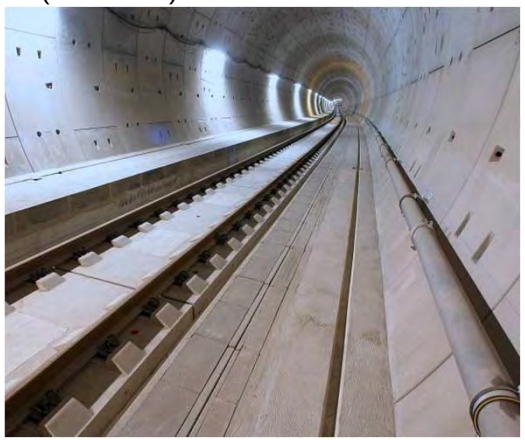
Feste Fahrbahn Projekte

Germany - High Speed Line VDE 8.2 Erfurt – Leipzig / Halle 90km x 2 (180km slab track)

DE – HGS VDE 8,2 Erfurt – Leipzig / Halle 90km x 2 (180km FF)

67 % earthwork 60,5 (121 km)

67 % freier Strecke 60,5 (121 km)



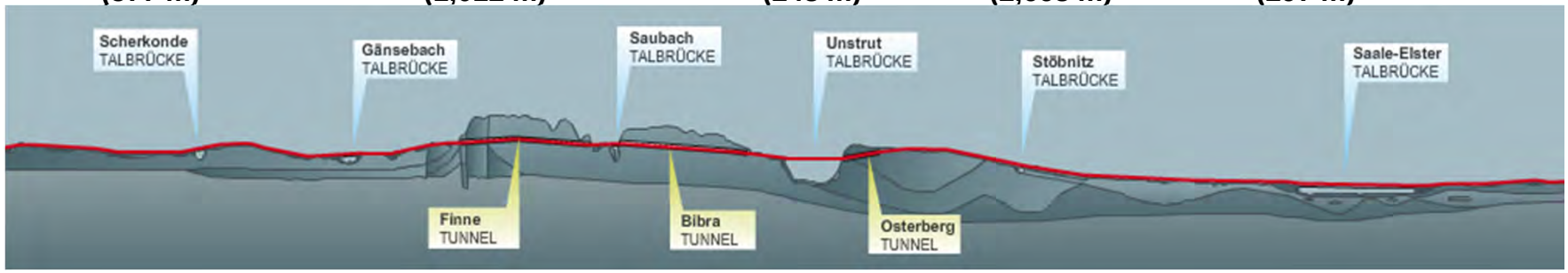
17% in tunnels 16,5 (31 km)

17% im Tunnel 16,5 (31 km)

16% on bridges 14,5 (29 km)

16% auf Brücken 14,5 (29 km)

(577 m) **(1,012 m)** **(248 m)** **(2,668 m)** **(297 m)**



(6.970 m) **(6.466 m)** **(2.082 m)**




System advantages

Systemvorteile

Low maintenance
wartungsarm

Structural-born noise and vibration control
Körperschallreduktion

High track precision
hohe Gleislagegenauigkeit

Settlement adjustments possible
Setzungsregulierung möglich

Small construction width and height
geringe Bauhöhe u. Baubreite

Fast installation
hohe Verlegeleistung

High degree of prefabrication
hoher Vorfertigungsgrad

High early strength of SCC
hohe Frühfestigkeit des SCC

Great driving comfort
Hoher Fahrkomfort

Repair plan
Reparaturkonzept

Large openings possible
große Aussparungen

Even surfaced concrete quality
Sichtbetonqualität

Little reworking
geringe Nacharbeiten

High added value
hohe Wertschöpfung




Bringing a vision to reality!