

The Korean Society for Railway
Railway Seminar in Kyungju University

June 03 – 05, 2004

Dear Ladies and Gentlemen....

The consortium consisting of

Naumburger Bauunion NBU – a highly innovative construction company from Germany – and

ThyssenKrupp – one of the best known steelmaking and railway-related companies in the world for more than 190 years –

wish to present abroad our **SLAB TRACK SYSTEM – NBU** as a sleeper-less track construction system for high performance and durability

during this Seminar to attend is a great pleasure for us.

(Introduction of ThyssenKrupp GfT Gleistechnik/ ThyssenKrupp)

Until now used systems like RHEDA 2000 – costly adjusted before placing concrete should be simplified/optimized



German Railway Industries is developing and using since the 70ies different **concepts of compact ballast-less track** for the increase of efficiency and speed for rail transportation.

These concepts of Slab Track were combining two main elements:

- concrete base plates and
- concrete sleepers

in **one system**. Due to the complex nature of these systems

like the so called **RHEDA 2000** as shown in the picture in front of you

there were seen some disadvantages as:

1. high costs for construction because of time consuming track laying and adaption;
2. high dependence on climatic and weather conditions
3. everlasting problem of durable joint between pre-fabricated sleepers and locally set concrete layer for embedding the whole system in one;

Examination of the new system „Solid Slab Track NBU“ at the University of Munich



A **specimen** / sample was examined by the University of Munich, professorship for groundtrack – transportation.

The main aim of the examination was the check of **durability of the overall system** including rail fixation at the concrete baseplate.

The test was performed **under challenging conditions** of temperature between minus 15 and plus 60 degrees centigrade – so to say with an amplitude of **75 degrees centigrade**.

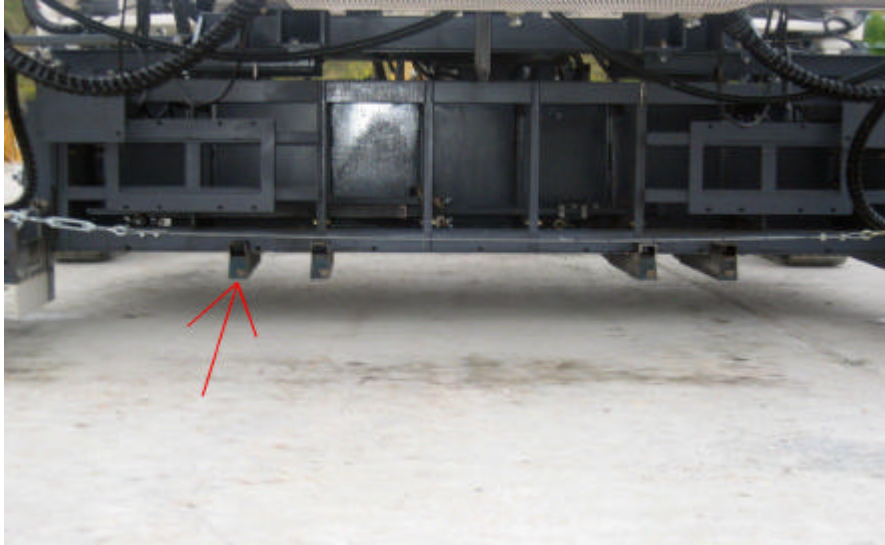
Special /mobile/ concrete fabricator for the production and laying of the concrete slab



For the production of the reinforced concrete slab a **mechanized** and **mobile fabricator** with form-boards was used.

This type of fabricator /type Wirtgen/ is standard too for the concreting of highways.

Sections of the concrete fabricator for the 4 mould channels



On **the bottom** of the concrete fabricator

as an especially adapted device

4 (four) sections were fixed to form the necessary mould channels for the **rail fixation anchors**.

Concrete fabricator after placing reinforcement



The **ribbed steel reinforcement** is placed on the hydraulic setting layer with spacers.

For the correct move of the mobile fabricator in the longitudinal direction were set **distance holder** / spacer.

For bigger projects the fabricator will be navigated by **GPS** – systems.

Charging concrete to the fabricator



Charging of concrete to the mobile fabricator

- **by truck for ready made concrete** from a near-by or mobile mixing-plant.

For the production of concrete the distinct **climatic and weather** conditions have to be observed for the appropriate mixture.

Such influencing factors might be a **higher concentration of sulfur** in the desert sands, wind and extremely high outside temperatures.

Next to this also high **chloride concentration** close to the sea-side and **sand-corosion** have to be considered.

For the mixture of the concrete special additives/ingredients have to be selected, for instance:

- so called HS-cement / high sulfur resistance
- or NW-cement / low temperature-developing by hydration
- stabilizer / foam-restricter / air-porous-developer
- loose-gravel addition to the concrete...etc. like for highways under similar conditions;

Production of concrete slab with mould channel



The fabricator charged with concrete is starting with the **setting** and **profiling** of the slab.

One can see the (already mentioned) sections forming the **4 mould channels during the setting** of the slab in the same time and continuously.

Tolerances for the hight should be within plus/minus 10 mm range.

Fabrication of solid the slab track in one step



The continuously set concrete slab will be **surfaced** and **smoothed** by a vibrating board.

Solid Slab Track with mould channels



Two finalized concrete slabs with **prefabricated moulding-channels** for mounting the rails.

Rail sections with fastenings handled by track laying unit



After finishing the concrete slab a **surface treatment** is made by **special emulsion**.

Subsequently follows the **placement** of **pre-mounted rails** together with the fixings.

The pre-mounted rails might have a **length up to 120 meters** and can be handled with high precision.

The laying down of rails will be made by help of rail **transportation and handling units** as shown in the picture.

Measurement and fixing of rail sections

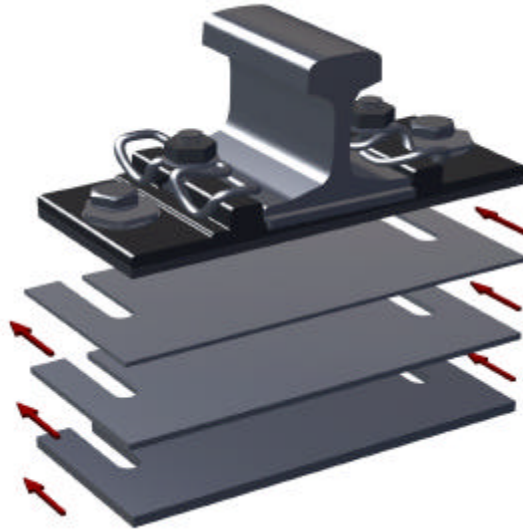


Afterwards the rail-grid will be fixed and positioned in it' s accurate setting by **lifting-jacks and adjustment devices**.

All measurements will be made at the **inner limit / running edge** of the rails to guarantee a precise positioning of the track.

Before filling the mould channels by **jointing compound** a final and control measurement is made.

Fixing the rail section by means of Krupp ECF adjusting pads and excentric bolts



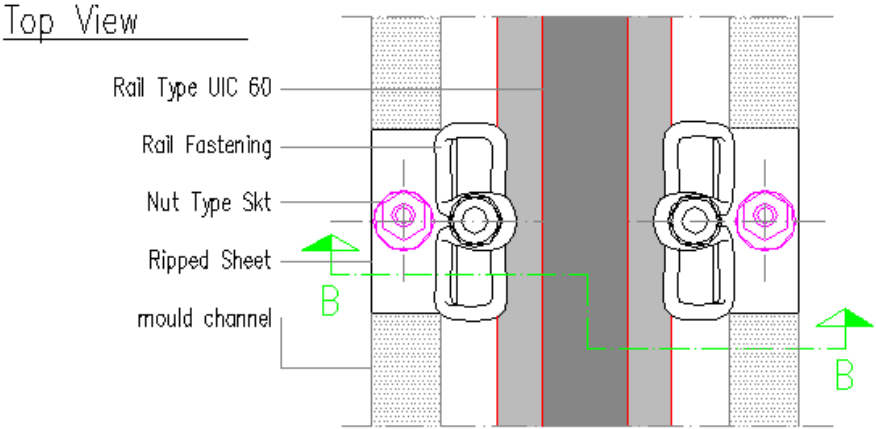
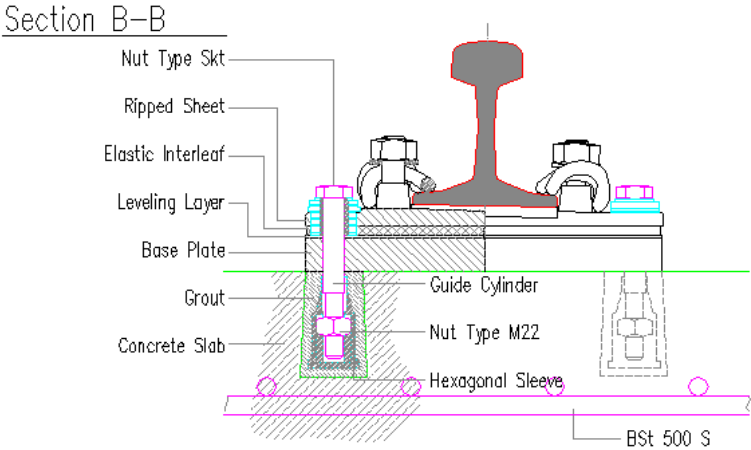
By the Krupp **ECF Rail Fastening System** supplied by ThyssenKrupp the rails will be fixed and adjusted on the slab.

The **adjustment** is made

- **vertically/in the hight** by distance plates and
- **laterally/in length direction** by the excentric collar bush;

During the setting of the mortar or polyurethan compound the fixations must be loose to avoid any undesired traction and **tensions** due to the elongation of rails;

Rail fastening system Krupp ECF (Elastic Compact Fastener)



Elements of the KRUPP Elastic Compact Fastener in **section** and **top view**:

Nut – Ribbed plate – base plate – excentric bolt- elastic clamp

Adjusted and fixed track section



Slab track in the factory –

prepared and finally measured for **bringing in the jointing compound**

Gauge meter for precise positioning!

Casting of mould channels



Afterwards

by means of a mobile mortar device

the mould channels are filled !

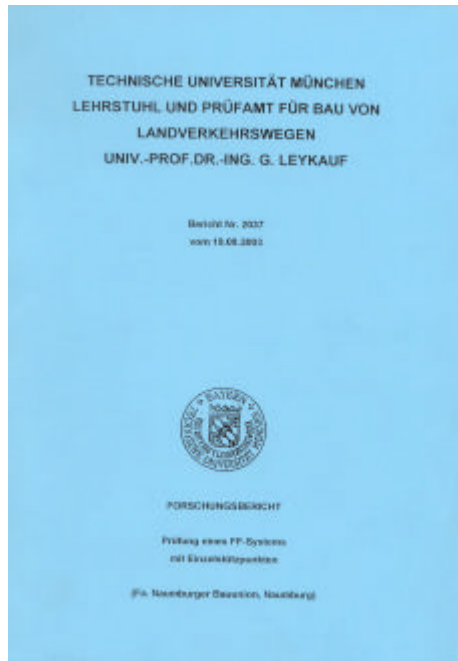
To optimize the jointing the channels have to be **cleaned** and **moistured**, the setting of the mortar compound is made best in a temperature range between 5 and 35 degrees centigrade;

Mould channels filled by jointing compounds like mortar or polyurethane



The jointing compound is filled **directly by hoses** into the mould channels – the precondition of **precise and continuous** filling by mortar or polyurethane.

Examination report of the University of Munich

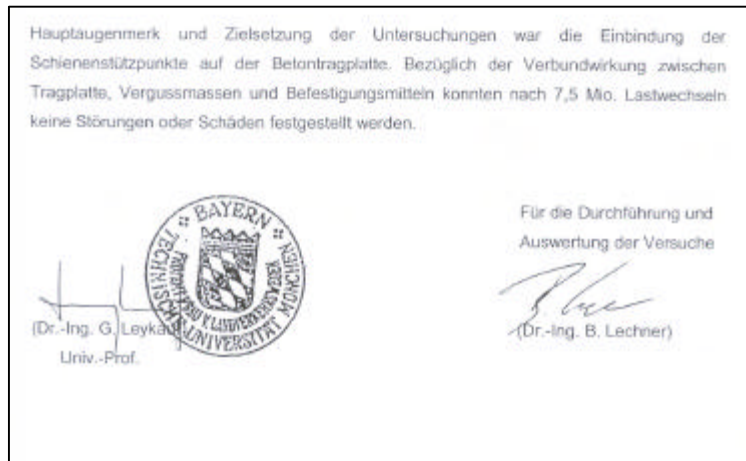


Test Report no. 2037 elaborated by

Professor **Leykauf** of Munich University (2003)

confirming excellent results in terms of tolerances and all technical parameters for track – checks.

Examination/test report of the University of Munich



After **7,5 Mio manipulations** as under real practice conditions

no disturbances or failures were observed on the

Solid Slab Track NBU....so the system met the challenge of a new construction concept to be used under different climatic conditions...