Modular Slab Track
Asfordby Slab Installation
IVES – PORR – V-Tras

PWI Winter Conference December 2014
Development of the Modular concept

Although many forms of slab track have been developed it can be argued that the birthplace of high speed slab system is Japan.

1965 JNR started to develop “new track structures”, the design specification being

- Construction cost being less than twice that of ballasted track
- Elasticity and lateral/vertical strength be greater than that of ballasted track
- Construction rate of >200m per day

In 1972 the ballastless track structure was named “Slab Track” and first applied on the Sanyo Shinkansen line
Development of the Modular concept

- Slab dimensions 5m x 2.2m x 0.19m
- Stopper gives lateral stability
Comparison of maintenance cost (Sanyo Shinkansen)

Life Cycle Cost

Ballasted track

Year

Costs 1/4

Slab track

Maintenance cost (million Yen/year/km)

Others
Fastenings
CA-mortar
Alignment
Leveling
Overall leveling
The lighter weight reduce the dead load of viaducts. The lower height reduce the cross section area of tunnels.
Many variations have since been developed as well as alternative slab systems.

**Standard Frame Slabs - Japan**

**Rheda 2000 - Germany**
Continued Development

Bogl - Germany

PORR - Austria
Network Rail made the decision to undertake a trial of two slab track forms in 2013 with the addition of a new form of transition module

➢ System 1 – Rhomberg Sersa IVES
Asfordby

System specifics

- laying of cross bearing elements (3)
  over the dowelled joint (6)
- base layer (1)
- cross bearing element (3)
- dowelled joint (6)
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System 2 – PORR
Asfordby
Asfordby

- Transition Module – Rhomberg Sersa V-Tras
Asfordby

situation immediately after construction / maintenance
(without additional measures)

situation after a period of use
(without additional measures)
Asfordby

situation immediately after construction / maintenance

situation after a period of use
Asfordby

LH Curve radius 1655m
70m transition
180m straight
50m transition
LH Curve radius 1785m

V-Tras 165 IVES Blocks 24 PORR Slabs 209 IVES Blocks
Sequence of works;

- Formation prepared with 100mm of Type 1 material compacted to achieve a minimum stiffness of 30kN/mm

- Using standard highways asphalt machine (laser controlled) lay two layers of hot rolled asphalt, total depth is 250mm with a minimum width of 2700mm

Tolerance of Asphalt layer: +0mm / -10mm
Asfordby

Installation of IVES;

- IVES blocks are lifted and placed on the Asphalt layer.

Total accuracy of the vertical and horizontal alignment is not required at this stage.
Baseplates are laid in readiness for rail installation
Rails are installed and clipped up
RhoTas system is installed
Rail and Baseplate are lifted and aligned to the final design
Asfordby

- Rails are installed and clipped up
- RhoTas system is installed
- Rail and Baseplate are lifted and aligned to the final design

- Hergie measuring system is used to measure the track position / gauge / super elevation
- Accuracy of +/- 1mm is achievable
Shutters are fitted to the Baseplates

Grout is poured through the grout aperture to fill the void below the Baseplate
Installation of PORR:

- PORR slabs are lifted and placed on the Asphalt layer
- Wire mesh is laid / supported 50mm above the Asphalt layer
- Five threaded support bars hold the slab to design height
Reinforcement cages are fitted in the slab recesses
Shuttering is fitted to the sides of the slab
Rails are installed and clipped up
Final design is achieved by adjusting the threaded support bars
Self Compacting Concrete is poured to fill the void below the slab
Asfordby

Installation V-Tras;

- Concrete slab is cast to hold the pivot rail
Installation V-Tras;

- V-Tras unit is lifted into place
Asfordby

Installation V-Tras;

- V-Tras is lifted to final design
- Sleepers are placed on V-Tras
- Ballast is placed and compacted in layers
Installation V-Tras:

- Rail is installed and clipped up
- Adjustment made to the horizontal alignment
- Horizontal alignment is fixed
- V-Tras is lifted to final vertical alignment and ballast compacted
Summary of Benefits

Simple and robust structure
- Use existing sub structure
- Standard asphalt / concrete formation layer
- Single design of pre stressed concrete bearer for straight and curved track
- Low surface pressure

Fast and simple construction
- Simplicity and robustness of the “bottom up” system with accuracy of the “top down” rail positioning
- Only the final rail positioning requires time consuming accuracy
- Mechanised construction
- Single line working construction
- Simple and effective surface drainage
- Low surface pressure
Summary of Benefits

Efficiency in design

- Long term track stability
- Designed and managed track stiffness
- Improved track drainage – eliminates drainage faults such as wet beds
- Low ground bearing forces
- High accuracy of rail positioning with long term stability of the rail geometry – thus reduction a in track component failure.
Summary of Benefits

Efficiency in operation
- Line speed handback
- Increased infrastructure performance
- Reduced impact on operational running
- Reduced faults
  - ballast deterioration
  - drainage failure
  - reduced rail wear – therefore increased rail life (+25%)
  - eliminates maintenance interventions
  - reduced renewal interventions
  - increase in S+T performance
- System will allow for track lowering in tunnels for gauging or OLE installations – fixed geometry allowing reduced gauge clearances