RHOMBERG SERSA RAIL GROUP

Barking Riverside Extension – Slab Track Viaduct with Precast S&C

UEEIV Slab Track Forum / Nov 2025

Speaker introduction:

Barnaby Temple & Rhomberg Sersa

I am the Chief Engineer for Rhomberg Sersa in the UK

About me:

1. 38 years in the rail industry
2. Civil Engineer, Chartered since 1997
3. ~13 years with British Rail including the Research Division and successor company AEA Technology
4. ~12 years with Balfour Beatty Rail
5. ~5 years with LB Foster Rail Technologies
6. And since 2016 with Rhomberg Sersa Rail Group, UK
7. Active in standards, member of CEN & ISO Working Groups for Ballastless Track and I chair the GB mirror group
8. Interests and specialisms in vibration and track interfaces with structures and trains, and the diagnosis of problems as well as repair and refurbishment – not just the design and construction of slab track

Rhomberg Sersa is a specialist railway contractor, with particular capability in mechanised track construction and in the engineering, refurbishment, and construction of ballastless track.

Read more at www.rhomberg-sersa.com

Our Rhomberg Sersa Group of companies is known for

Mechanised and conventional ballasted track construction, including:

- Renewals
- New installation
- Maintenance/surfacing

Slab track work across the whole life cycle:

- New installation
- Renewal / replacement
- Maintenance
- Refurbishment

Our capability in support of these areas extends to site investigation, measurement, condition diagnosis, solution development and planning

Agenda

- **01** Introduction to Barking Riverside Extension Project (BRE)
- **02** Early Stage – Key Issues
- **03** Detailed Design Stage
- **04** Installation – Plain Line
- **05** Installation – S&C
- **06** Conclusion, lessons

01

Introduction to Barking Riverside Extension Project (BRE)

Barking Riverside Extension

Brief introduction to the BRE Project

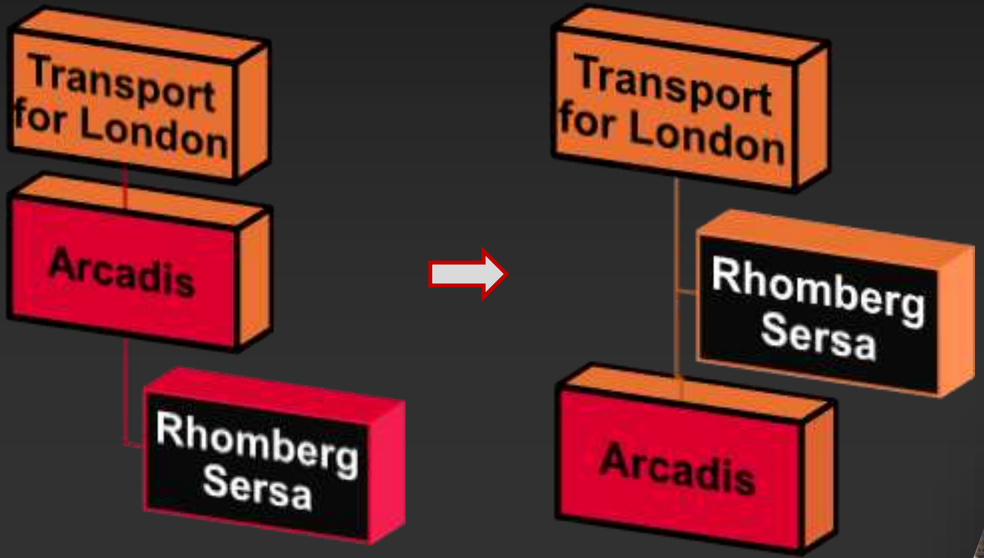
Barking Riverside is a Development Area in North-East London with over 10,000 new homes – this required sustainable infrastructure.

- Railway extension from Barking to new terminus near the Thames North bank "Barking Riverside"
- Track system specified as the precast Slab Track Austria for the 1.5km viaduct
- Includes a scissors crossover close to the station

Image from Google Maps 3D view of London, looking East; video from TfL

Timeline

& Relationships



Transport for London

Arcadis

Rhomberg Sersa

→

Transport for London

Rhomberg Sersa

Arcadis

→

Transport for London

Morgan Sindall-Volker Fitzpatrick

Rhomberg Sersa

Arcadis

2017 – Design Phase

- Arcadis as designer
- RSRG supported Arcadis

2018 – Design complete*, Tender

- RSRG supported TfL in reviewing Track-Bridge Interaction
- MSVF JV awarded contract in December 2018

2019-20 – Detailed design for Slab Track by RSRG

- Supported by VCE as designer
- Completed in mid 2020

2021 – Installation of Slab Track by RSRG

2022 – 18 July, LO line extension opens

*excluding slab track

Sections along the Slab Track

Viaduct under construction

1. Ramp
2. 220m radius
3. 400m radius
4. 650m radius
5. Station

6. Pier 14

Image courtesy of MSVF JV

Thanks and acknowledgements to:

Transport for London – *Project Client*

Network Rail – *Technical Authority*

Morgan Sindall – Volker Fitzpatrick Joint Venture – *our client*

Key suppliers involved:

- Schwihag, *especially Paul Insley*
- Voestalpine
- Porr

And our expert designers

- Fritsch Chiari & Partners (FCP/VCE) – *Dietmar Bobacz and co.*
- Schembera Consulting – *Bernhard Schembera*

Dr Chris Hardwick – *my co-author and Lead Engineer through design and construction phases*

02

Early Stage – Key Issues

S&C on Precast Slabs

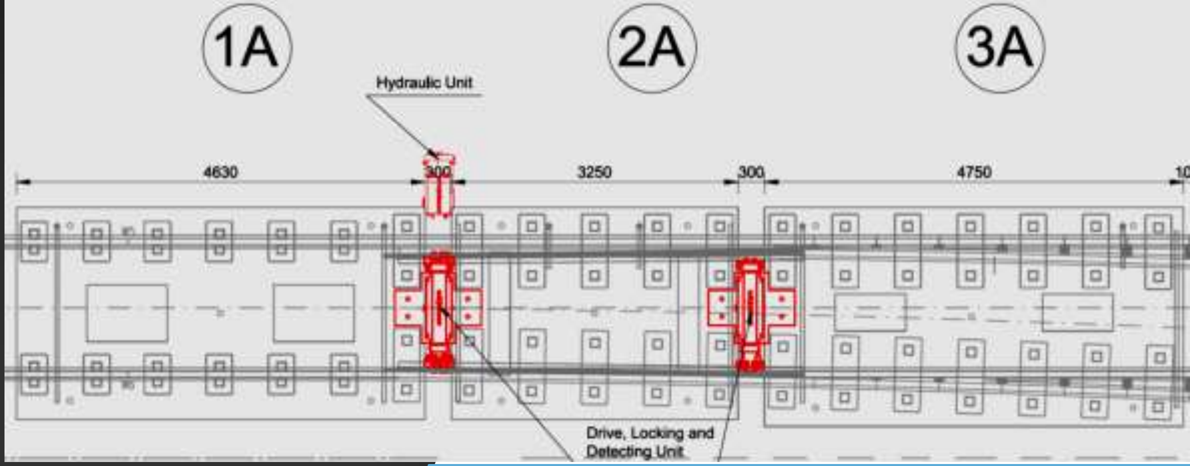
New products and system – acceptance process

From a site visit in Germany in 2017 we identified that for precast slab track new or different:

1. Switch drives
2. Rail supports
3. Precast elements

would be needed.

- TfL and Network Rail supported the processes of
  A. Options review
  B. Product Acceptance
  C. System integration
- Detailed design was developed in parallel



Management System
Rail

MSVF

Barking Riverside Extension Project
Slab Track Design Work Area 3:
BREP Slab Track S&C System Description

A report by Rhomberg-Sersa for MSVF JV on the Barking Riverside Extension Project

RSUK Reference: 388-RS-REP-30004

Issue	Purpose/Description	Originator	Checked/Reviewed	Authorised	Date Issued
B01	For Information	B Temple	C Hardwick	B Temple	10/09/2019
B02	For Information	B Temple	C Hardwick	B Temple	28/11/2019
B03	For Information	B Temple	C Hardwick	B Temple	13/12/2019
B04	For Information	B Temple	C Hardwick	B Temple	02/12/2020

Rhomberg Sersa UK Ltd
Tapton Park Innovation Centre
Brimington Road
Chesterfield
S41 0TZ

RHOMBERG SERSA

BREP-EG26-ECV-REP-MVJ-82803-B04
December 2020
Page 3 of 35

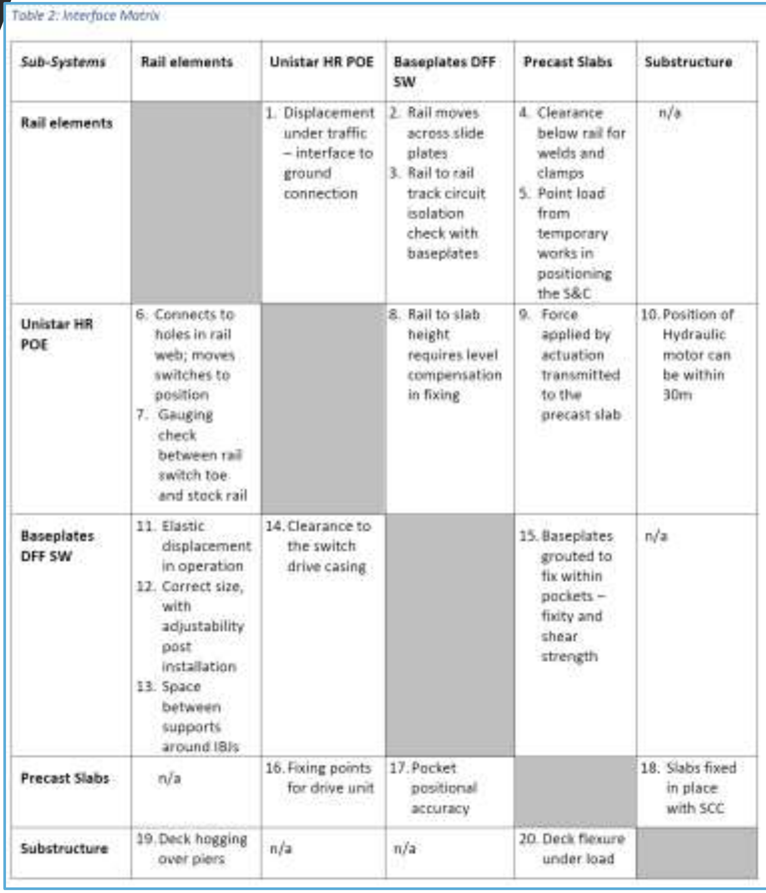


Table 2: Interface Matrix

Sub-Systems	Rail elements	Unistar HR POE	Baseplates DFF SW	Precast Slabs	Substructure
Rail elements		1. Displacement under traffic – interface to ground connection	2. Rail moves across slide plates 3. Rail to rail track circuit isolation check with baseplates	4. Clearance below rail for welds and clamps 5. Point load from temporary works in positioning the S&C	n/a
Unistar HR POE	6. Connects to holes in rail web; moves switches to position 7. Gauging check between rail switch toe and stock rail		8. Rail to slab height requires level compensation in fixing	9. Force applied by actuation transmitted to the precast slab	10. Position of Hydraulic motor can be within 30m
Baseplates DFF SW	11. Elastic displacement in operation 12. Correct size, with adjustability post installation 13. Space between supports around IBJs	14. Clearance to the switch drive casing		15. Baseplates grouted to fix within pockets – fixity and shear strength	n/a
Precast Slabs	n/a	16. Fixing points for drive unit	17. Pocket positional accuracy		18. Slabs fixed in place with SCC
Substructure	19. Deck hogging over piers	n/a	n/a	20. Deck flexure under load	

S&C = Switches & Crossings

Key suppliers for the S&C

VCE and Porr

Precast concrete track slabs with pocket concept

Before installation of S&C components

Schwihag

DFF SW modular elastic baseplate system for S&C

Partially assembled

Voestalpine

Unistar switch drive system

Finally installed

Key Interfaces

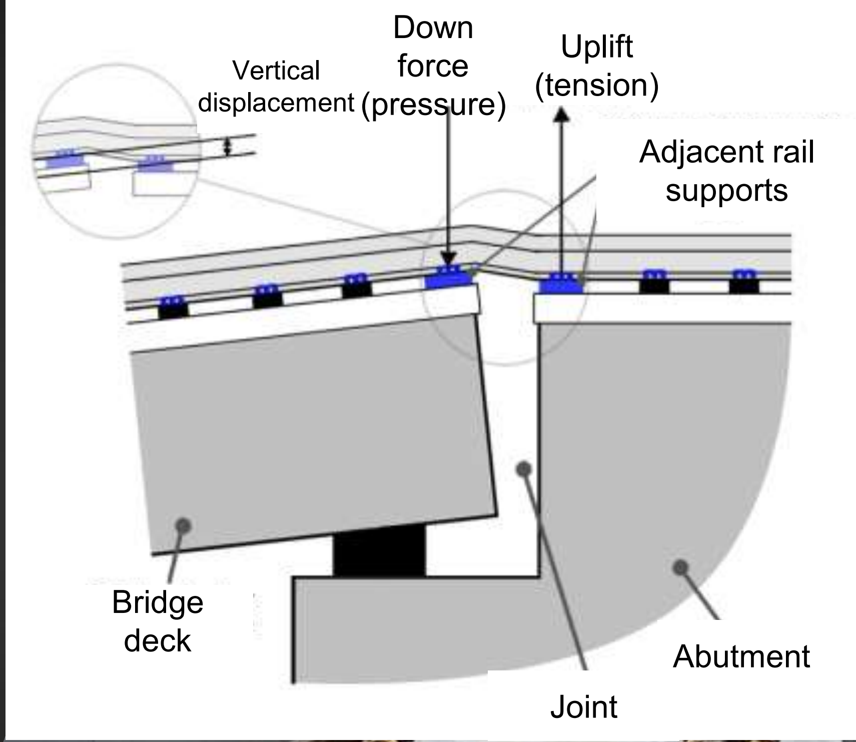
In addition to Transport for London and MSVF JV

Discipline	Company	Interface
Multi-Discipline	Arcadis	Design
Track	Pod Trak	OCS, Ballast Track, Rail welding
	Progress Rail	S&C parts
	Porr / VCE	Precast Panels
	Schwihag	Baseplates
Signalling	Alstom	Installer
	Voestalpine	Switch drives
Track & S&C, Signalling	Network Rail	Form B sign-off, Product Acceptance

Image courtesy of David Mansfield, TfL

Track-Bridge Interaction

(Diagram with thanks to Schwihag)



Bridge behaviour impacts on track

1. Longitudinal stresses arise for example from:
    - Thermal effects of expansion and contraction of the decks
    - Traction and braking
2. Deck flexure and thus deck end rotation apply uplift forces

In curves, there are additional effects

a) Transverse and torsional rail stresses are higher due to train loading

b) Additional bridge effects in the transverse direction at deck joints, according to

- Bearing configuration (layout, orientation)
- Bearing type (elasticity, tolerances)

Deck-End Solution

This structure needed some mitigation and used both

1. Low toe-load (yellow) fasteners
   - Reduce longitudinal stress build-up in the rails
2. Schwihag BSP supports
   - Resist higher uplift
   - Allow greater transverse displacement

03

Detailed Design Stage

Detailed design challenges

Slab types, examples – there were over 700 slab panels, with over 100 geometries produced

Standard slabs in station platforms

(there were also special versions at buffer stops)

Slabs with low toe-load fasteners for bridges

(lengths varied)

Deck end slabs

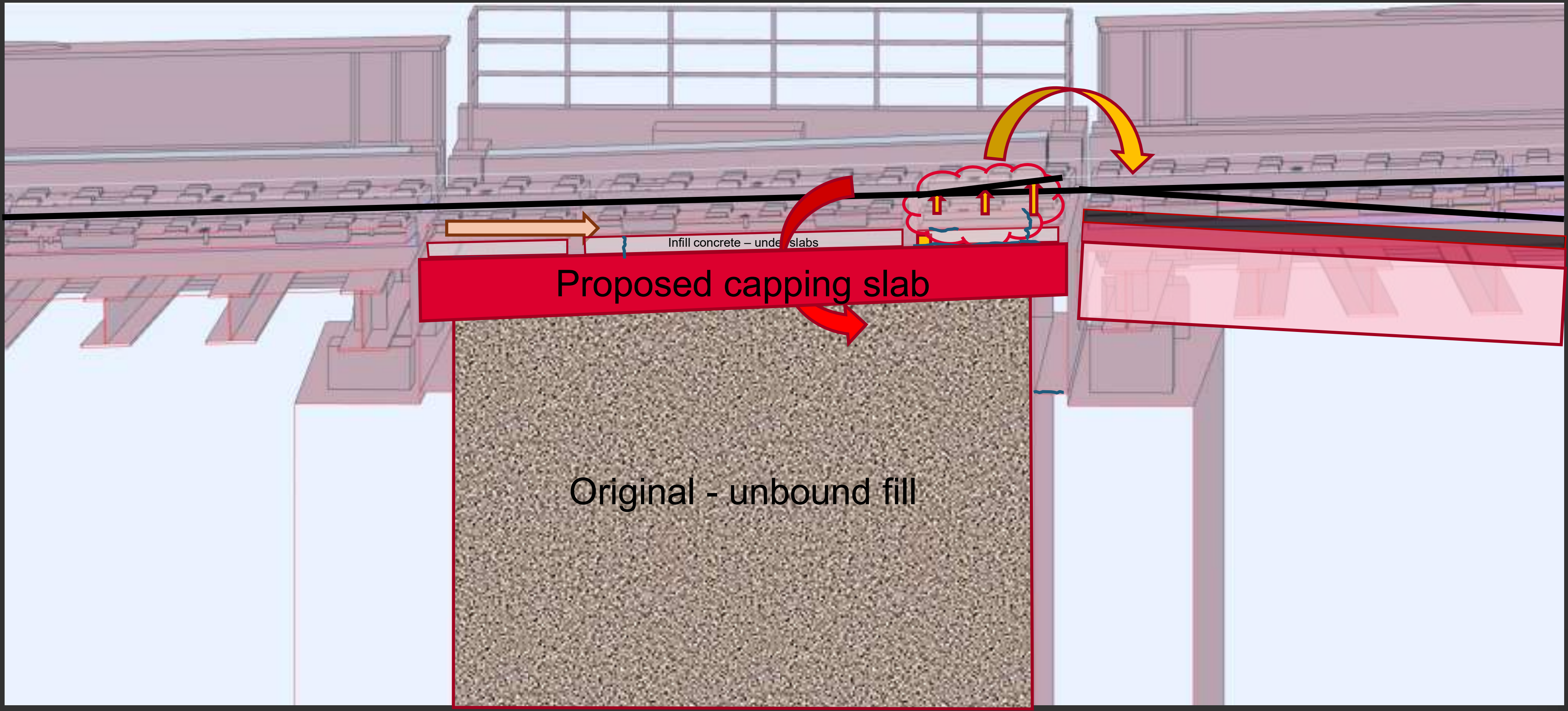
(2 lengths/types)

And 32 S&C slabs

(19 different types)

Detailed design challenge example

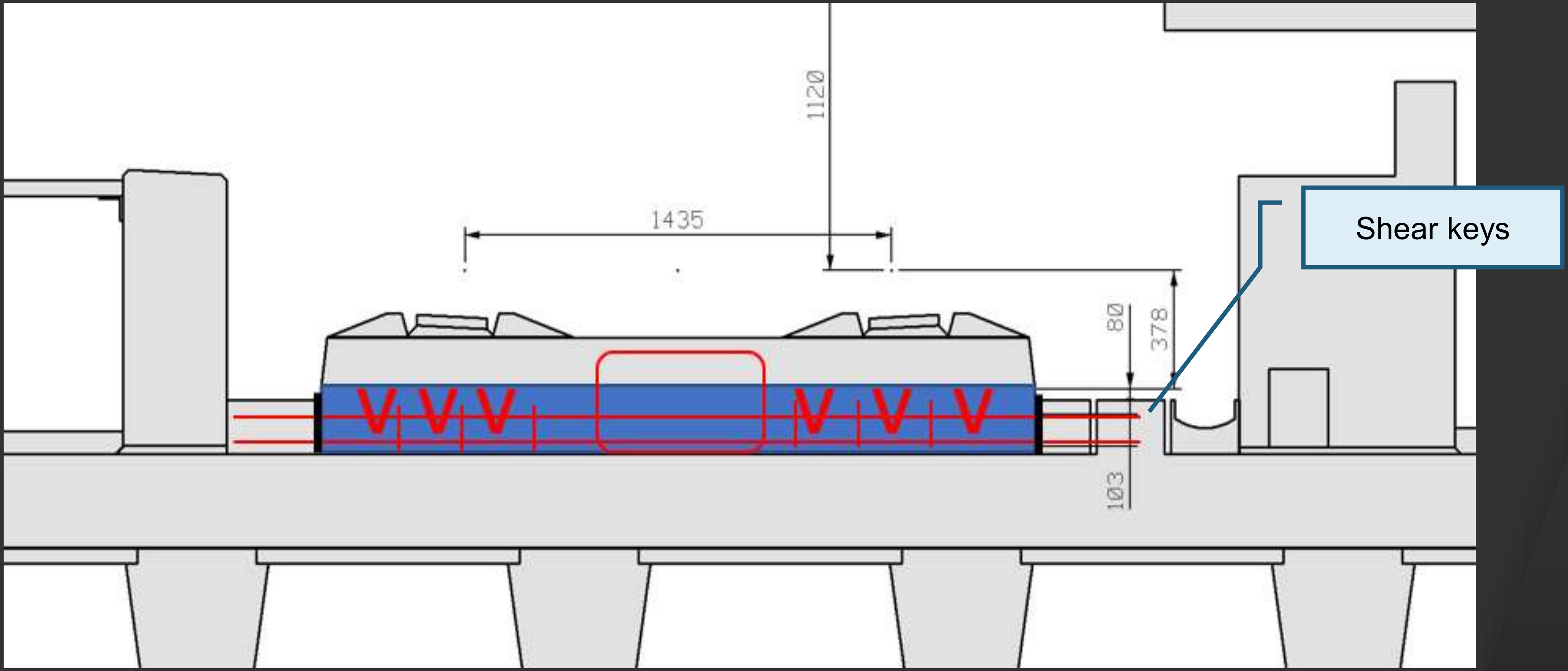
Pier 14



Pier 14 outcome

Full size capping slab implemented

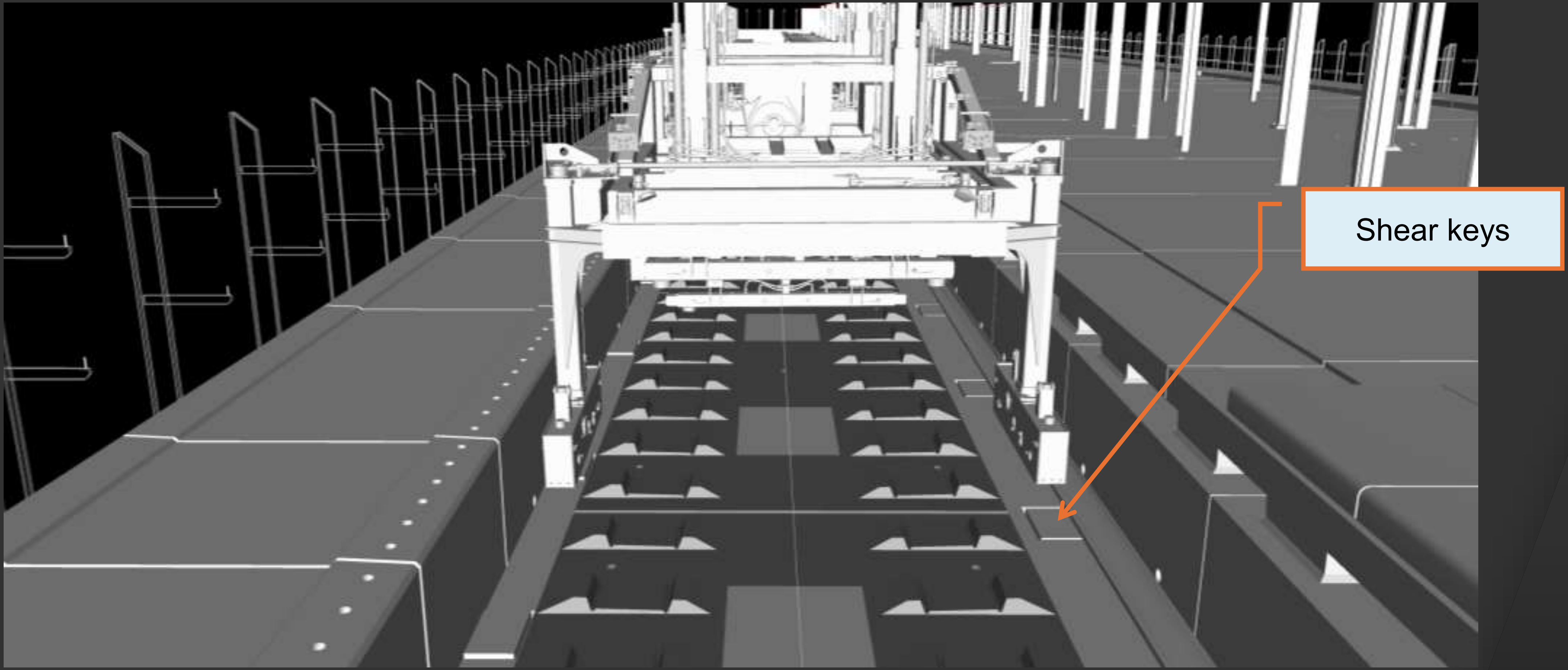
Detailed design specifics – station platforms



Shear keys

Detailed design specifics – station platforms

This phase was also about **how** to do it



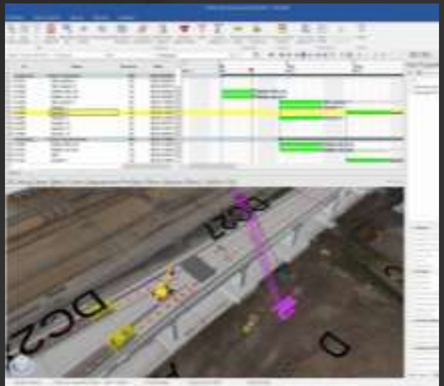
04

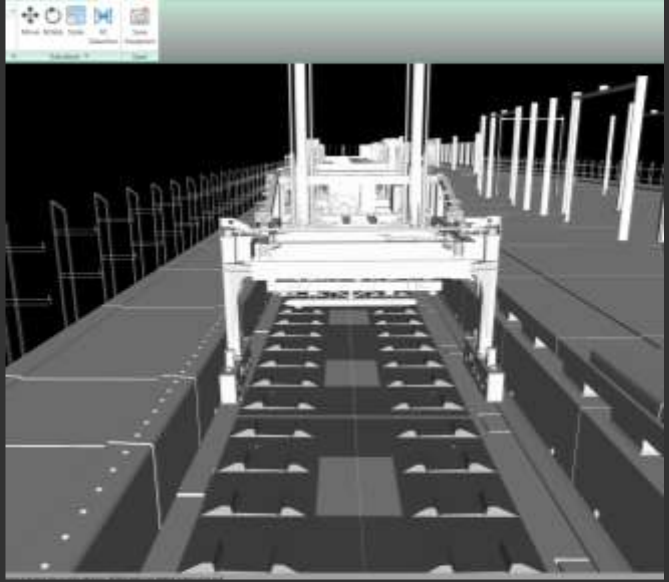
Installation – Plain Line

Planning for installation

Key aspects of planning for installation

- Digital planning using 3D model and visualisation tools
- Development of bespoke plant also using digital tools
- Testing and training off the viaduct to prove
  - The concrete mix and testing
  - The gantry operation
  - Formwork assembly
- Surveying equipment trial, including positioning without rails
- Development of Slab Distribution List for logistics and daily plans



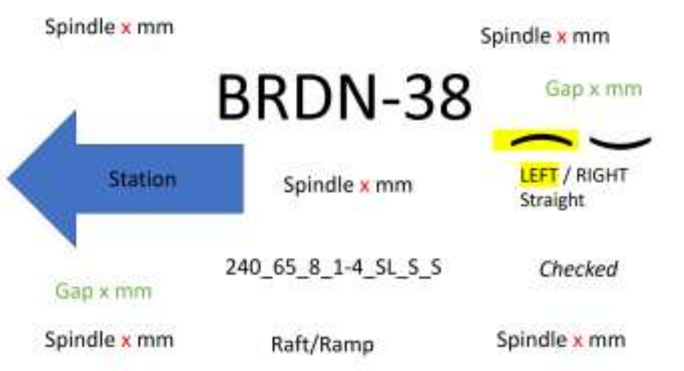


Handover for slab track installation

With over 700 slabs already delivered

Our design of the intermediate layer on the bridge included stirrups to link into the track slab openings

Slab-type records in the storage was key to a logistics plan



Spindle x mm

Spindle x mm

BRDN-38

Gap x mm

Station

Spindle x mm

LEFT / RIGHT
Straight

240_65_8_1-4_SL_S_S

Checked

Gap x mm

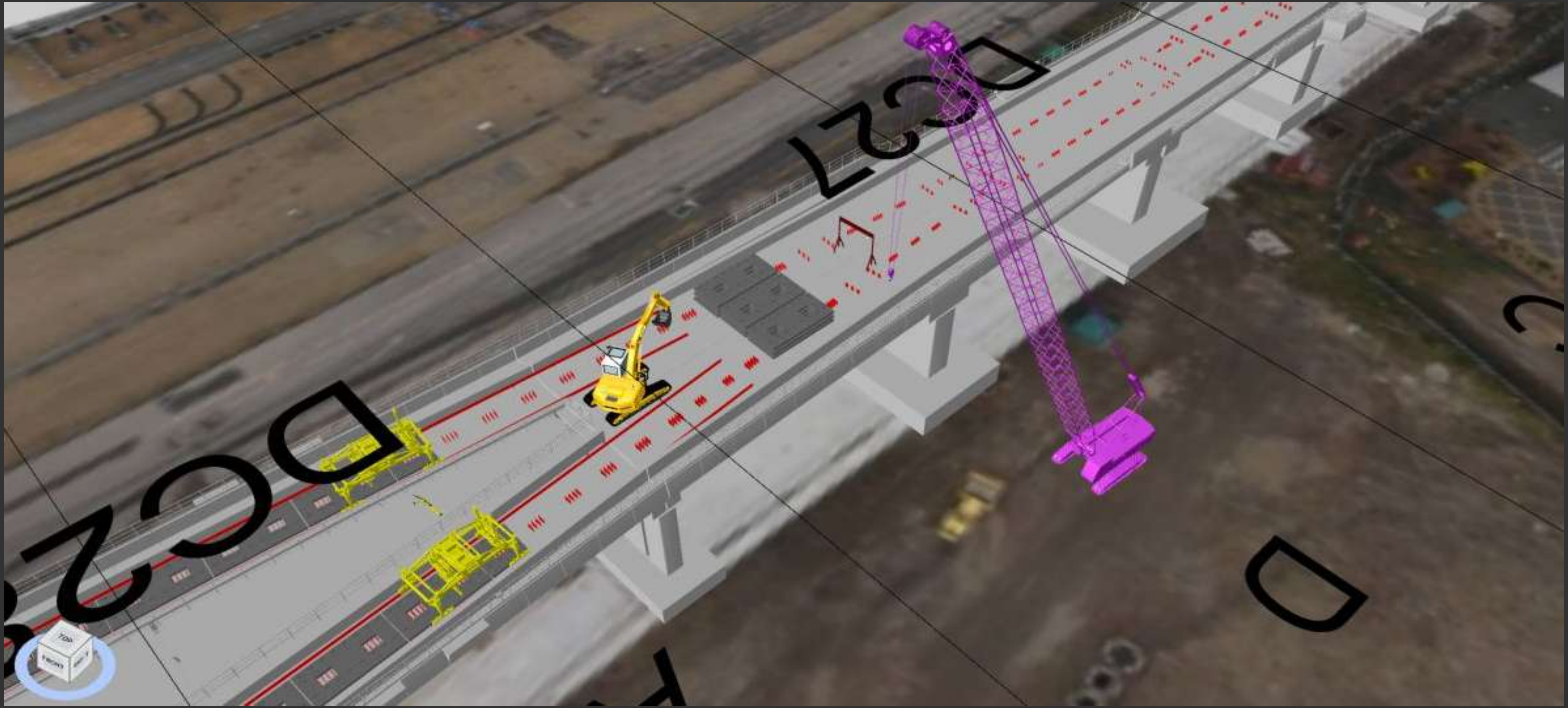
Spindle x mm

Raft/Ramp

Spindle x mm

The only way was up!

Plant used included: Cranes, HI-AB, Bespoke Gantries, Road-Rail Excavator with trailer



The only way was up!

Plant used included: Cranes, HI-AB, Bespoke Gantries, Road-Rail Excavator with trailer

A crane lifted plant up, then precast slabs, one at a time

Gantries then distributed slabs to position

The station had specific challenges

Clearance was tight

Reinforcement dense

Concrete was poured in 2 steps, edges first

Then under the slabs to fix them

Positioning

Sometimes by crane

Mostly by gantry

And sometimes by night

(hogging of steel girder spans)

Concreting variations

Bracing against temperature change

Concrete was delivered mostly direct by crane

Not possible everywhere!

Overall – a good result!

05

Installation – S&C

S&C Installation

The depth to deck varied from 8cm to over 30

This required a range of reinforcement

The reason was longitudinal falls for drainage along the deck

The alignment was done in two steps

1. With the precast and rails positioned (below)
2. After the SCC was poured

The S&C complete

s\f

06

Conclusions, lessons

Lessons

- Application of BIM in track still requires care in combining
  - Alignment details
  - Products
  - Civil structures
- Not just a case of “working in 3D”
- Implementation in reality also involves such dimensions as temperature and time
- Assurance processes work well when ALL parties work together

Track-Bridge Interaction

lessons

- Involve track system input to bridge design - as early as possible!
- On curved alignment and with slab track, attention to detail is needed
- Solutions in the track can have impact on other details (e.g.: drainage)

Conclusion

On Monday July 18, 2022 the Barking Riverside Extension was opened to customers

- The slab track involved some 711 precast slabs
- Laid over a period of 4 months
- Including 32 for the S&C
- Some 1250 cubic metres of SCC was used to fix them
- 4 switches were installed in a scissors crossover
- A total slab track route length of 1716m

- Performance of the track asset I'm told, is as intended: smooth and without issues

Barnaby Temple

Chief Engineer, RSUK

e-mail: Barnaby.temple@rsrg.com
tel no.: +44 7702 898741

RHOMBERG SERSA RAIL GROUP

Visit us on: