



Presents:

ARIANNA® Slab Track: Meeting Modern Challenges in Sustainable Rail Infrastructure for Future Generations – The Storstrøm Bridge Case

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C h a p t e r 1

WEGH Group S.p.A.

«WEGH» takes its name from an ancient Indo-European root meaning movement. A name that embodies our vision: continuously expanding horizons by welcoming new companies, diversifying our product offering, and strengthening our expertise.



WEGH IN ITALY

Prato



Head Quarters - Parma



Parma



La Spezia



Bergamo

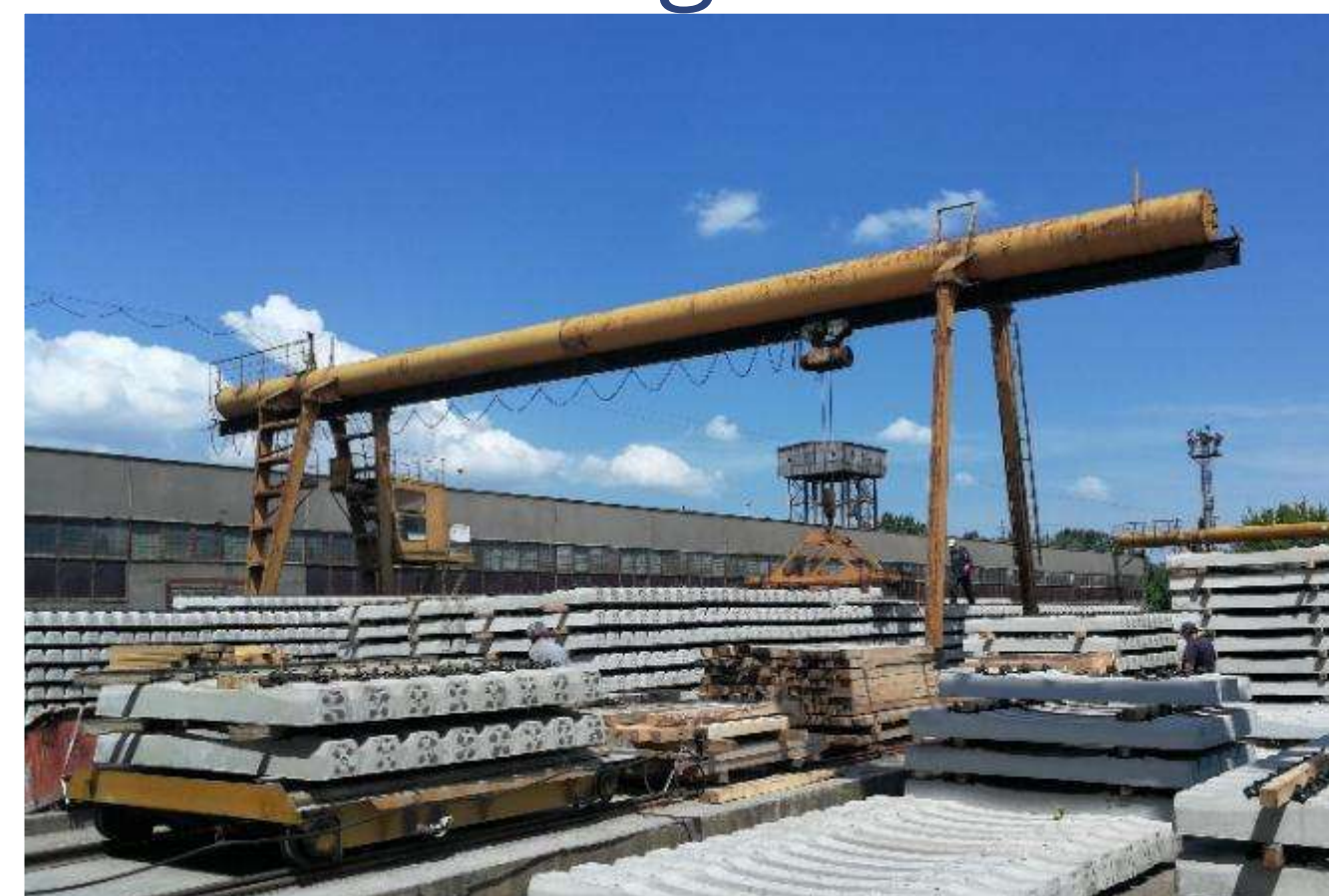


WEGH ABROAD

Uruguay



Bulgaria



Mozambique



Ecuador



BUSINESS UNITS

BALLASTLESS TRACK WORKS

TRACK COMPONENTS PRODUCTION

PLANTS FOR TRACK COMPONENTS PRODUCTION



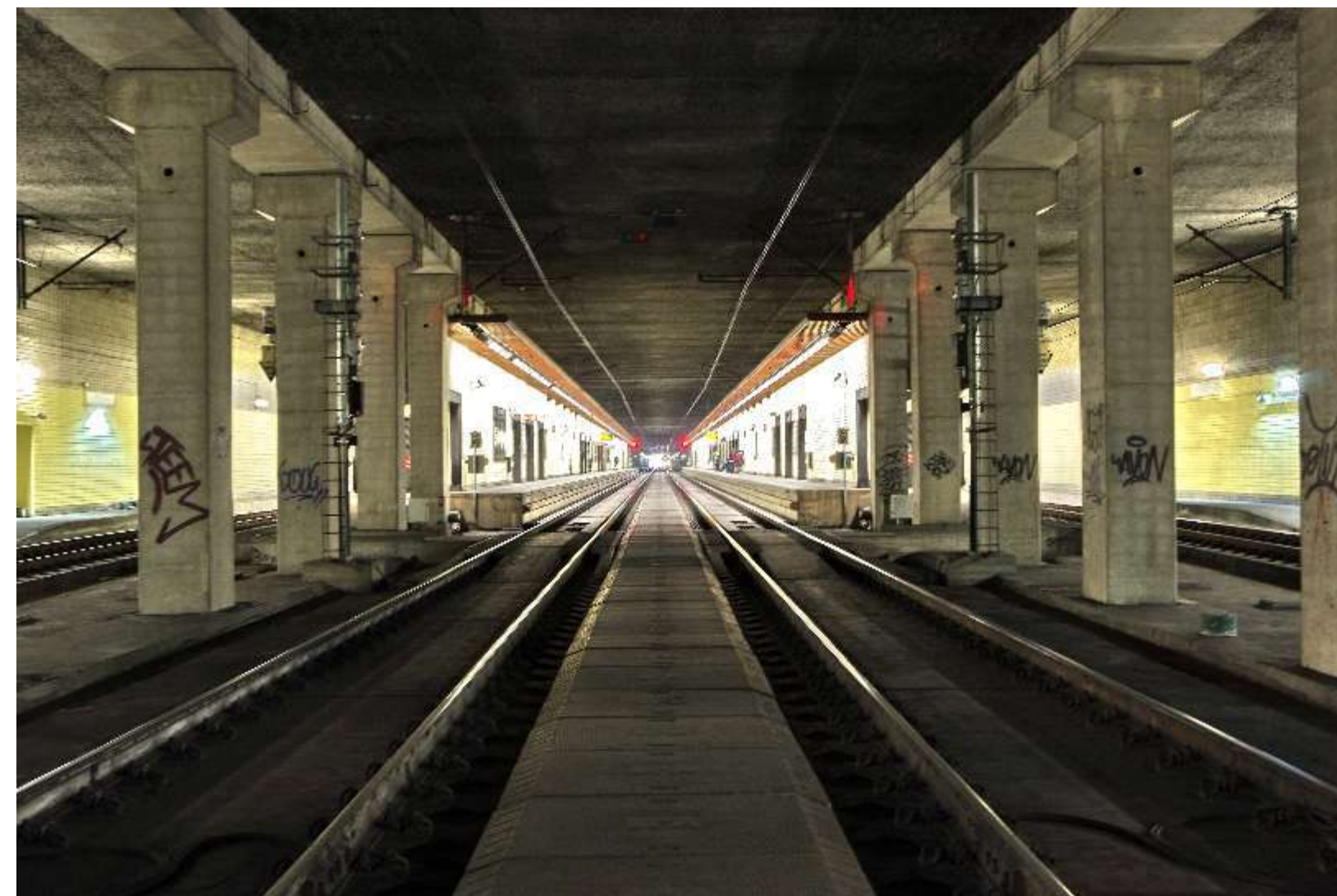
SIGNALING EQUIPMENT



WEGH PARTECIPATIONS



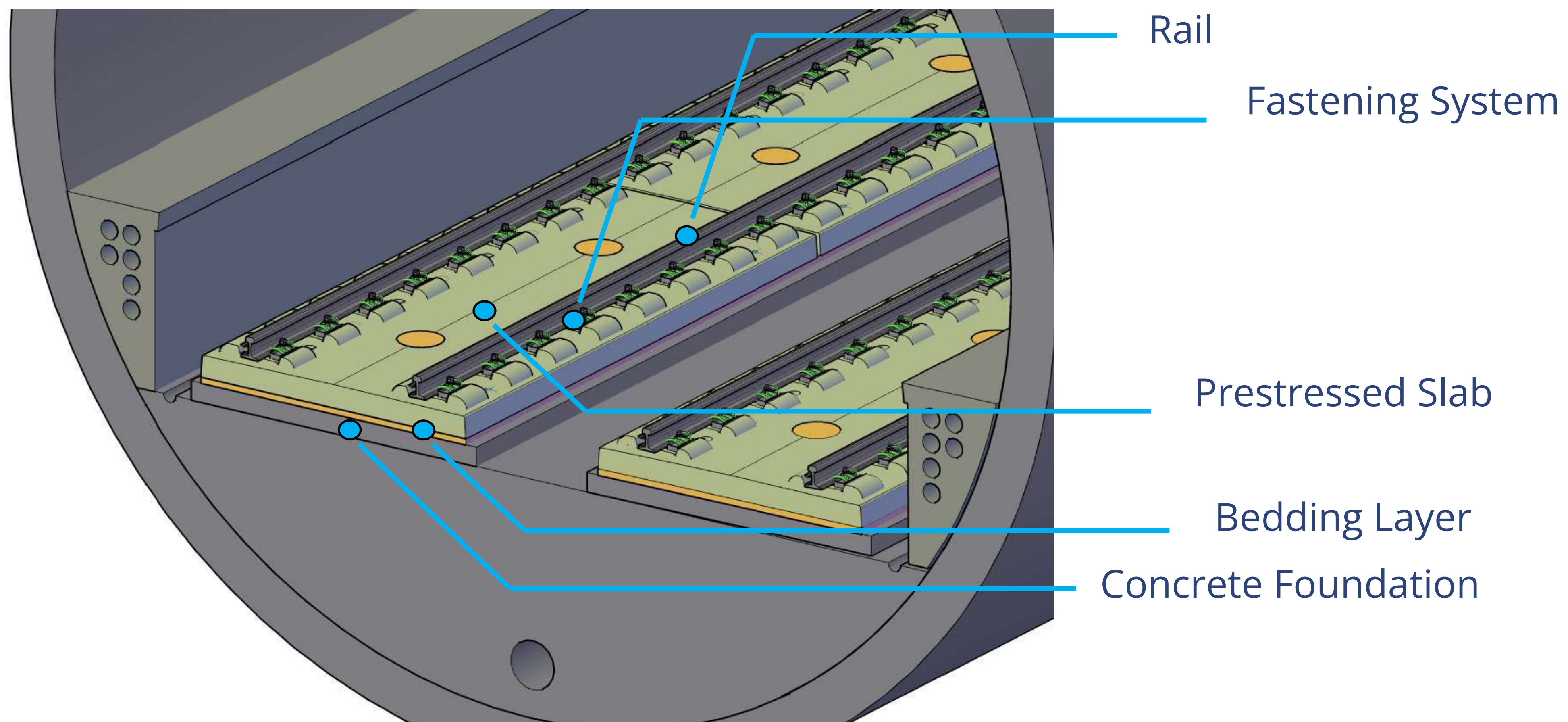
With 60 years of experience, WEGH Group is a strategic partner for rail mobility across railway, metro, and tramway sectors.



C h a p t e r 2

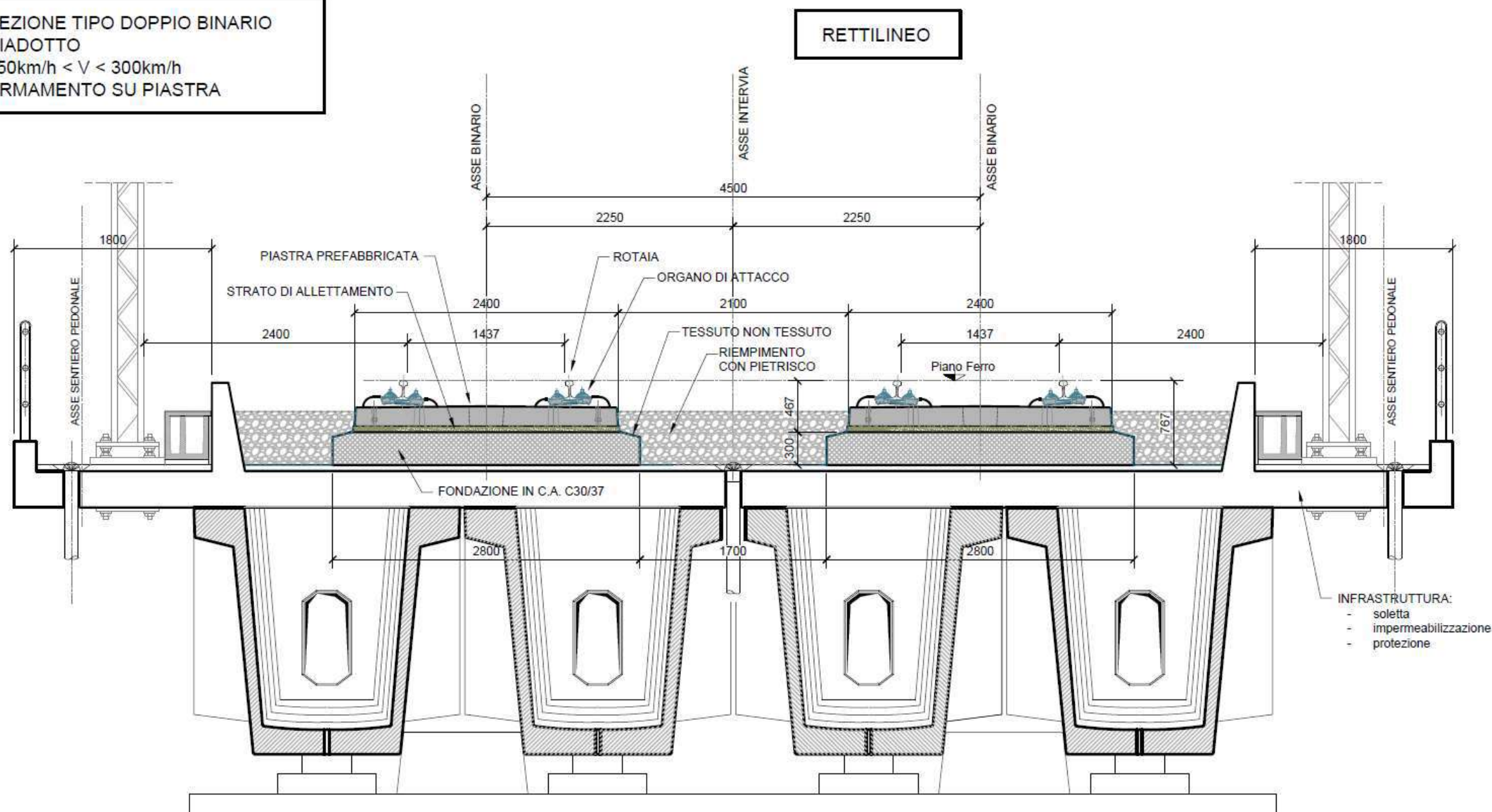
Arianna® Slab Track System

ARIANNA[®] COMPONENTS

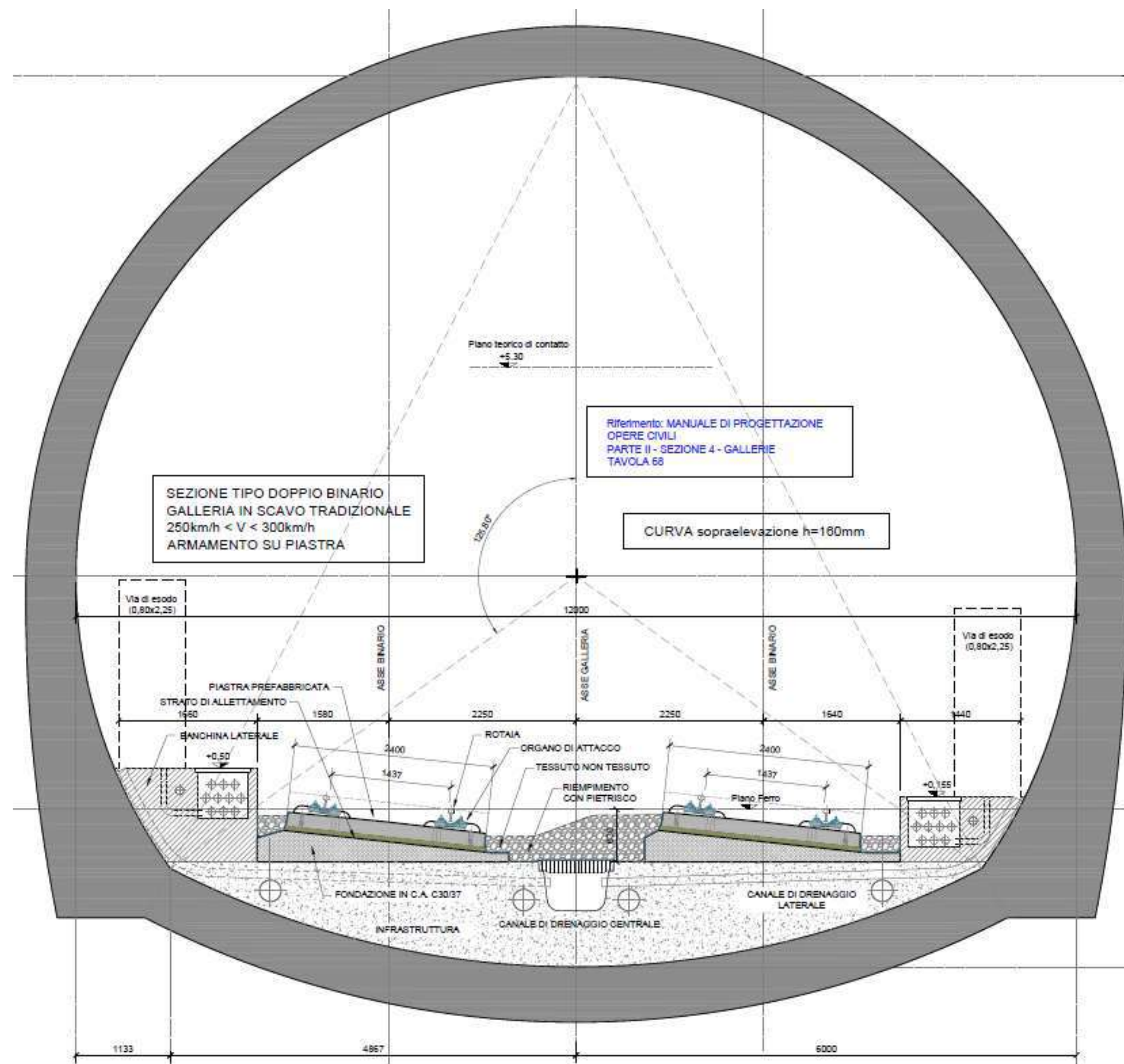


ARIANNA® TYPICAL CROSS SECTIONS

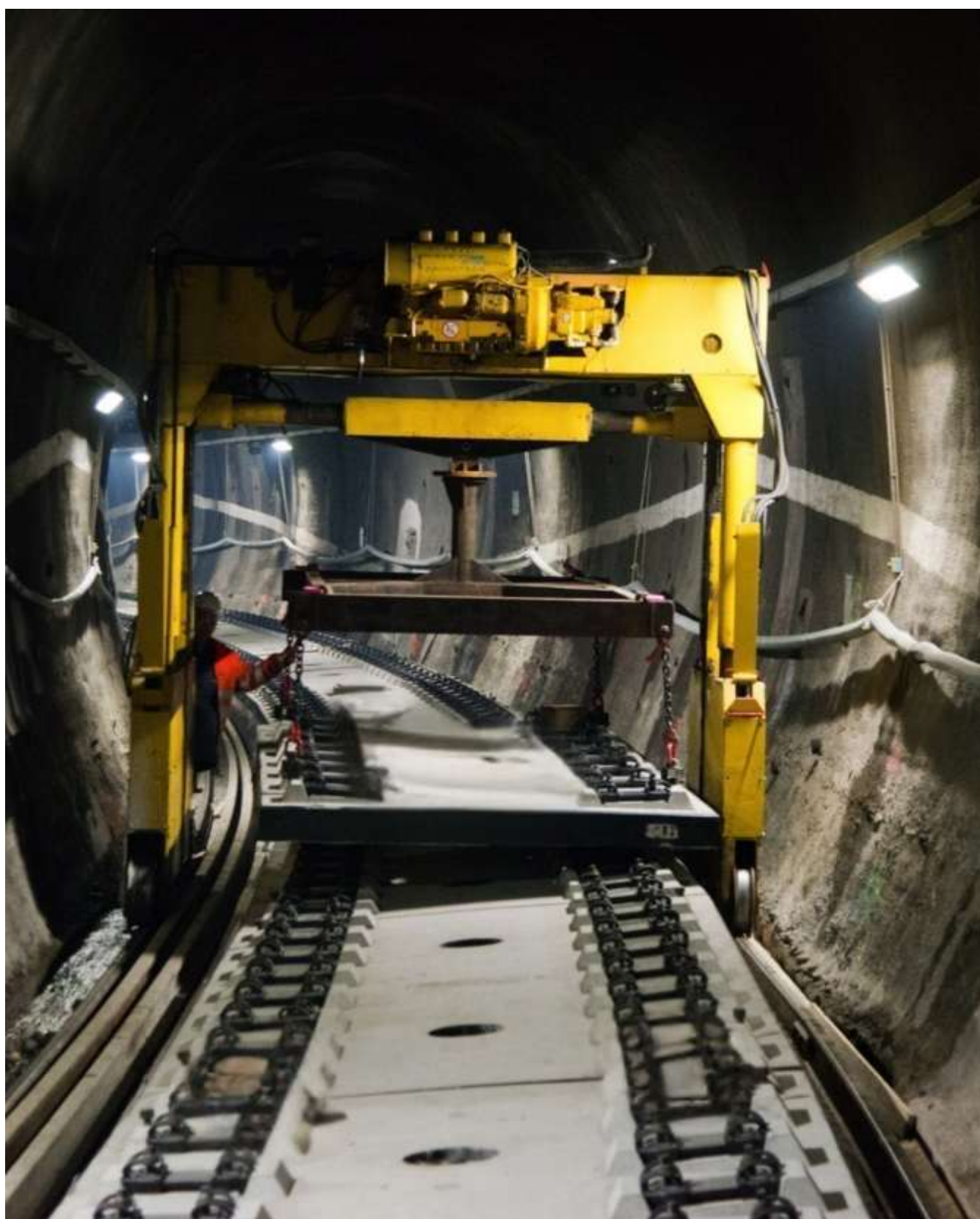
SEZIONE TIPO DOPPIO BINARIO
VIADOTTO
250km/h < V < 300km/h
ARMAMENTO SU PIASTRA



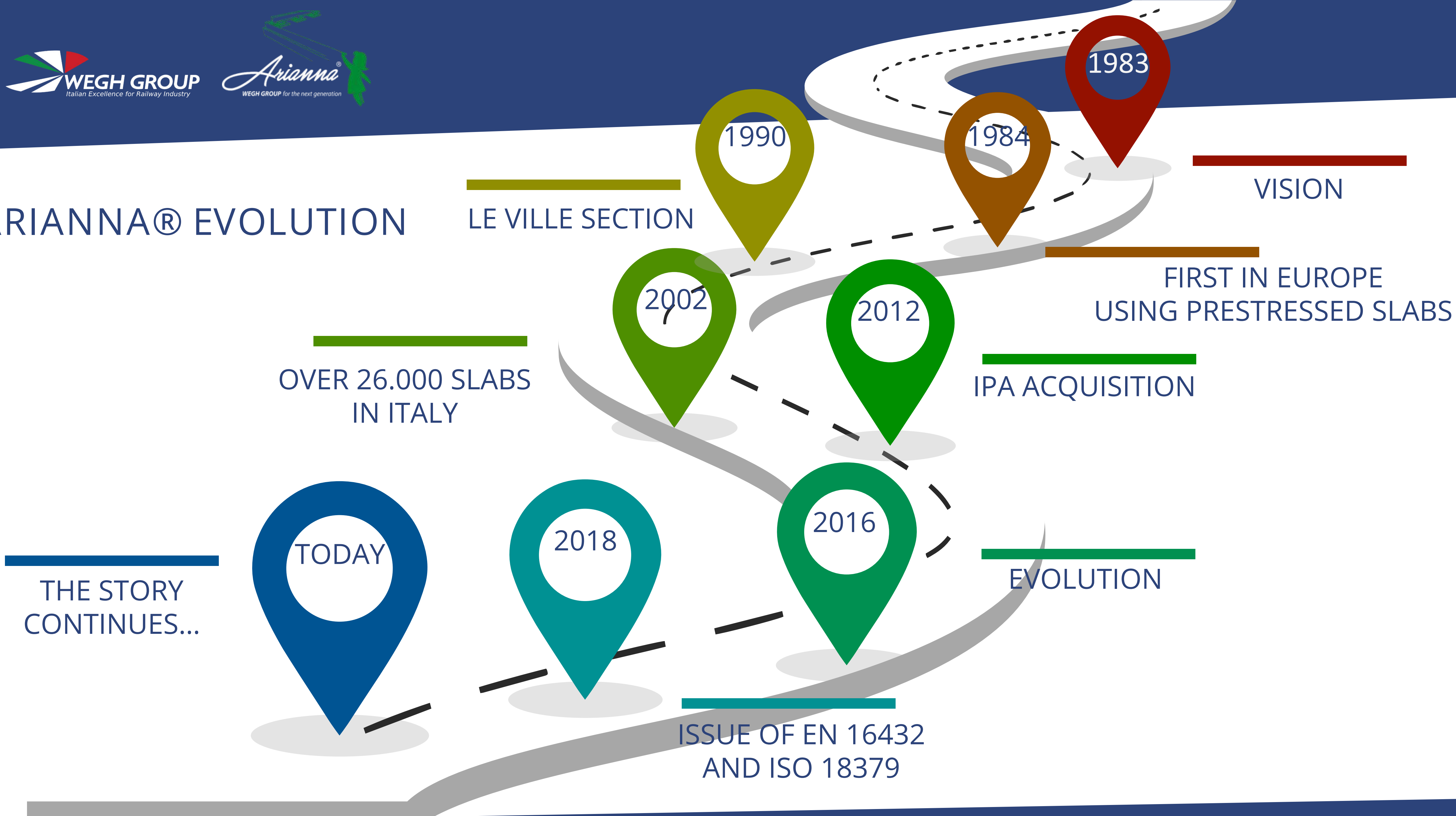
SEZIONE TIPO DOPPIO BINARIO
GALLERIA IN SCAVO TRADIZIONALE
250km/h < V < 300km/h
ARMAMENTO SU PIASTRA



USE IN TUNNELS, BRIDGES, EMBANKMENTS, AND STATIONS.



ARIANNA® EVOLUTION



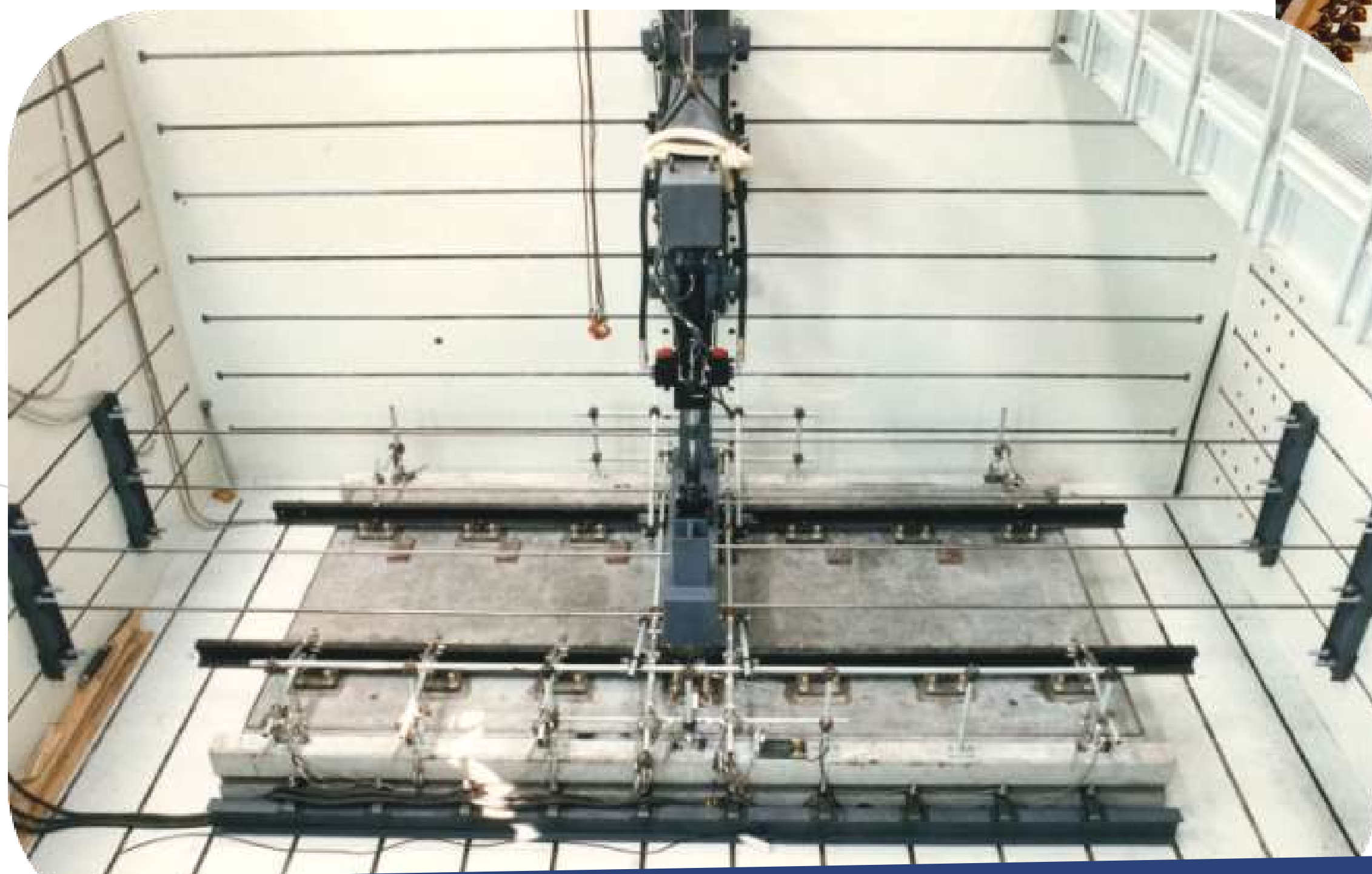
FIRST IN EUROPE USING PRESTRESSED SLABS

In 1984, the line testing began on a section of the Bergamo-Brescia line.



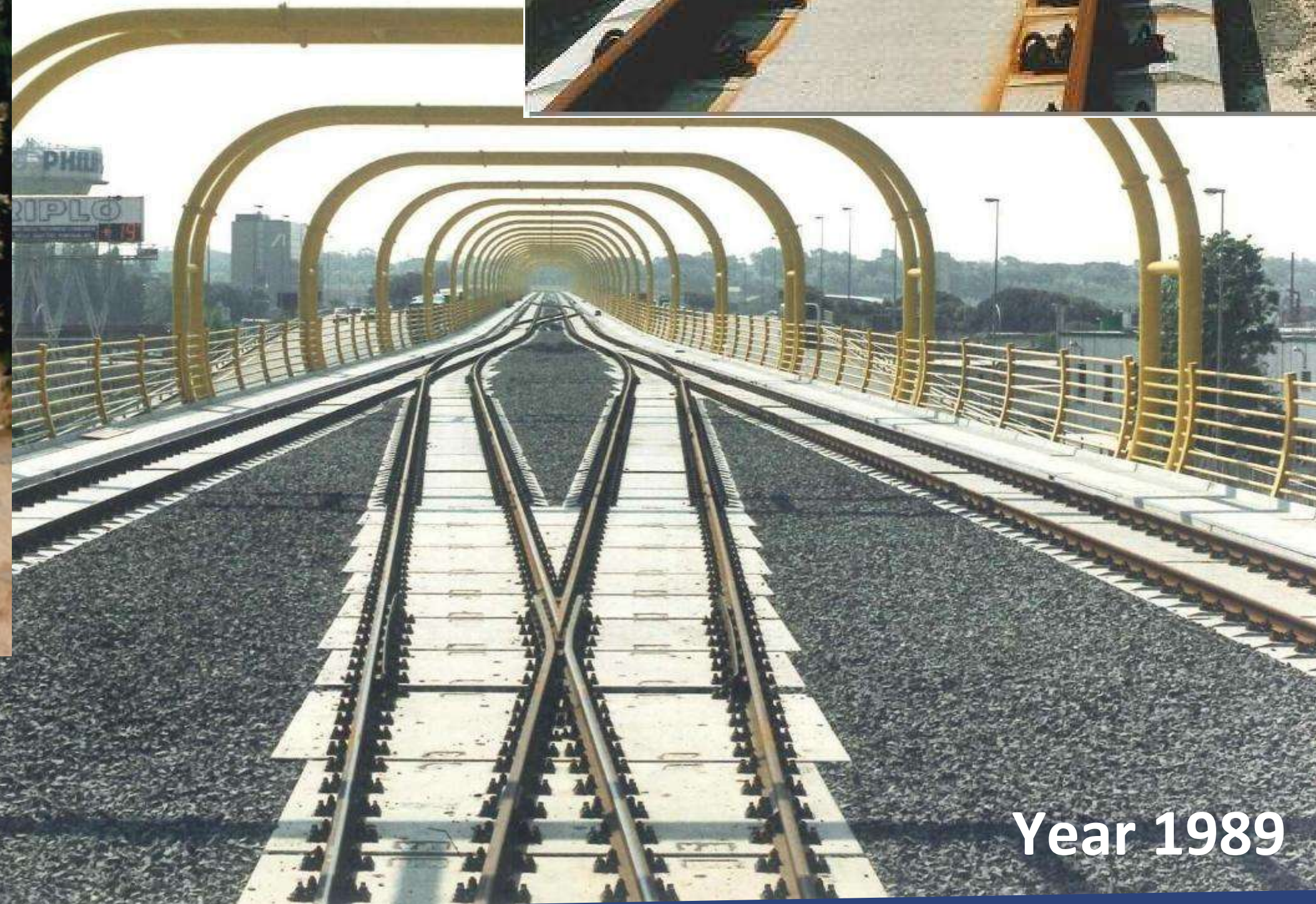
FIRST IN EUROPE USING PRESTRESSED SLABS

IPA was the first company in Europe to begin designing and constructing innovative pre-stressed, pre-fabricated slab track systems



Year 1989

Year 1989



Year 1989

Year 1993



Year 1995

LE VILLE - HIGH SPEED

Built in 1990... 35 years ago

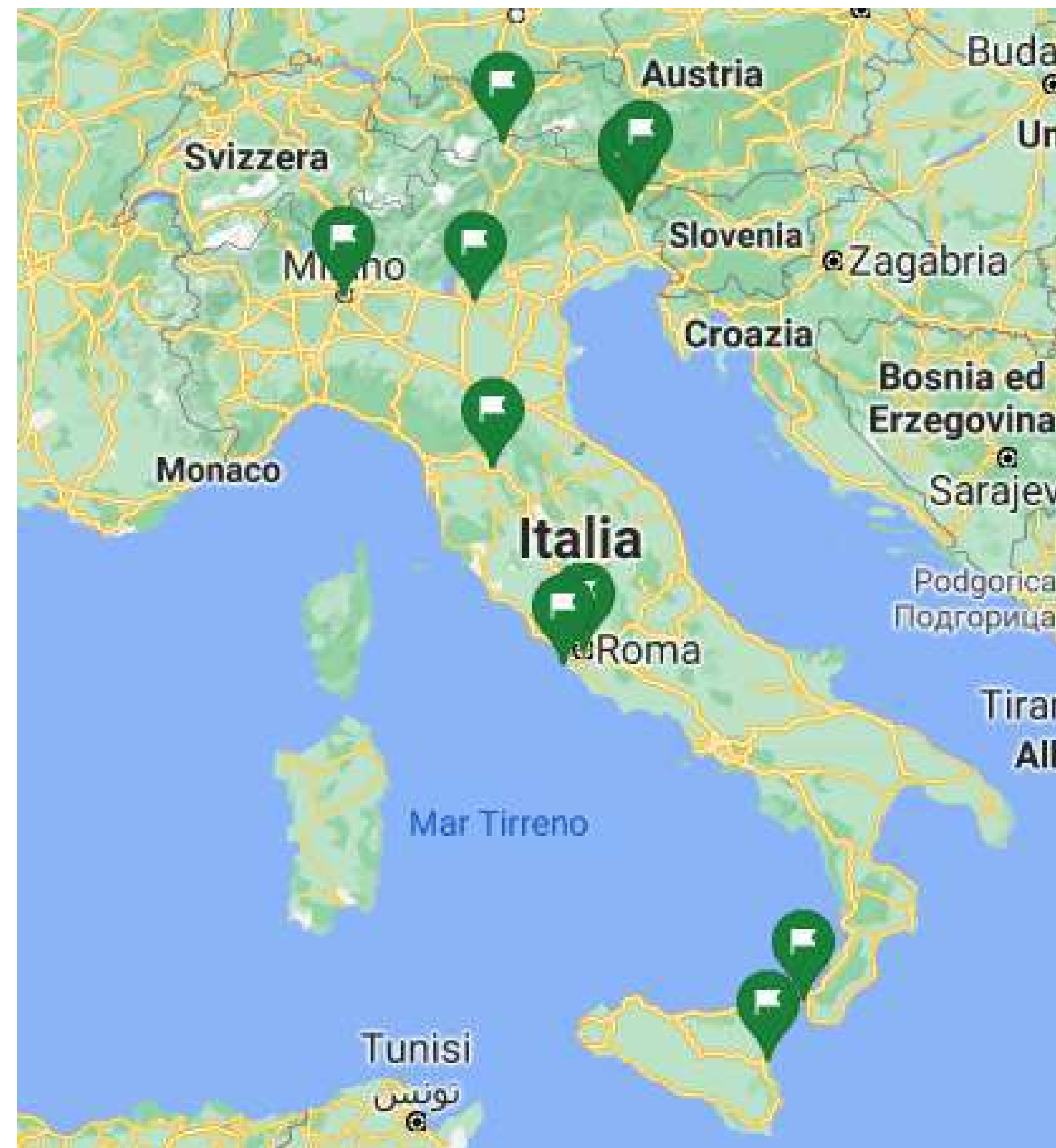
The 5,500 m double track section is built on the «Le Ville» location of the Direttissima High Speed Line on the Rome–Florence line.



Year 1990

MORE THAN 42.000 SLABS IN ITALY

Start	End	Duration	Label
1/1/1987	12/31/1988	730	Geomena - Carnia
1/1/1988	12/31/1989	730	Carnia - Pontebba
3/1/1988	4/30/1988	60	Catania - Messina
12/1/1988	3/31/1989	120	Roma - Fiumicino
1/1/1990	2/28/1991	423	Roma - Firenze
1/1/1990	3/31/1996	2281	Stazione Cadorna
1/1/1991	12/31/1993	1095	Verona - Brennero
9/1/1992	5/31/1998	2098	Pontebba - Tarvisio



C h a p t e r 3

A case study: the Storstrøm Bridge, Denmark

ABOUT THE PROJECT

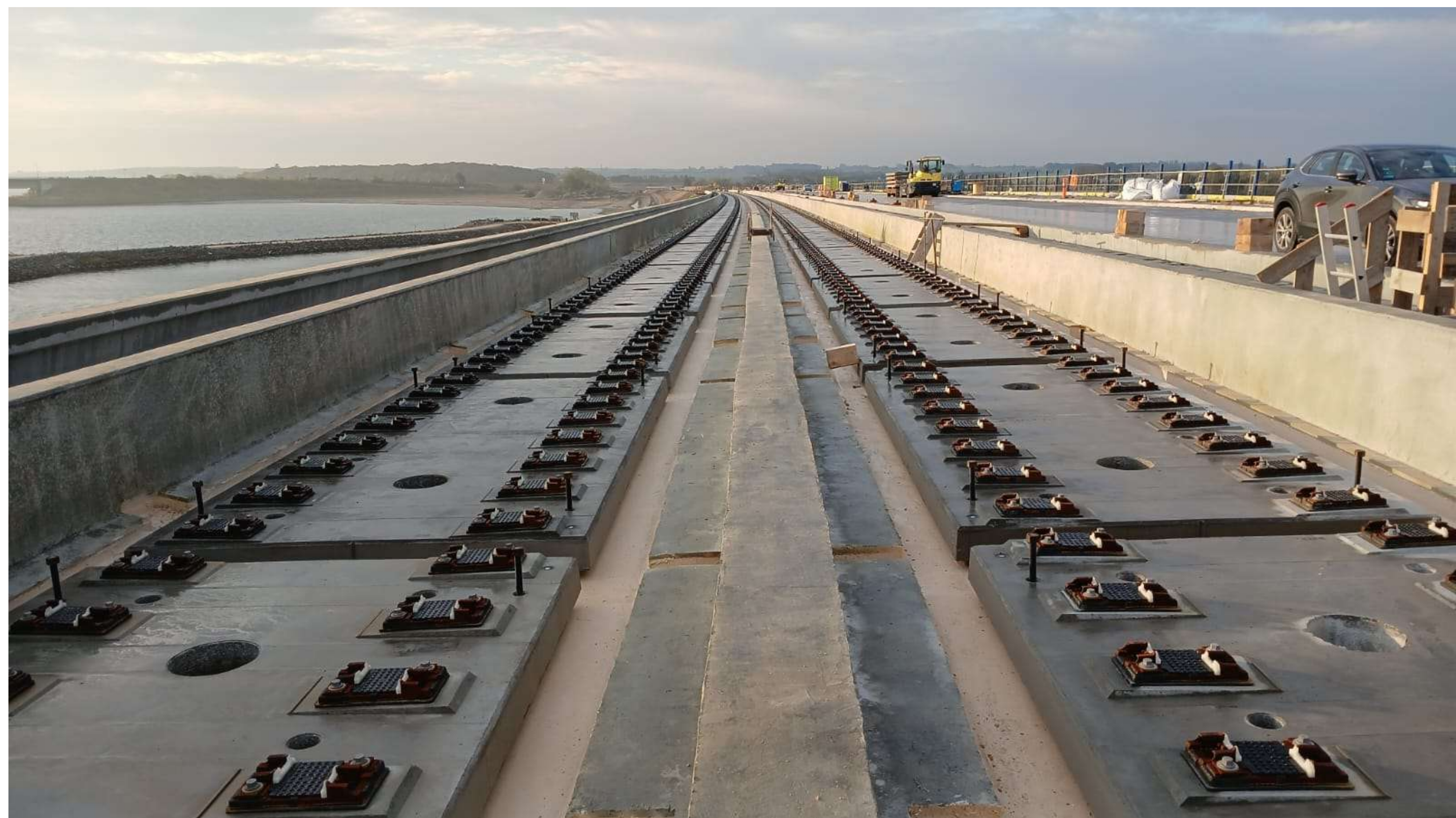
The new Storstrøm Bridge will connect Zealand with Falster via Masnedø. The bridge is a double track railway and road bridge with cycle/walking lane. It is approximately 8 km as single track length and it's the third longest bridge of Denmark.

- Stray cable section: 320 m
- Total height: 100 m
- Width: About 24 m
- Curve Radius: 6200 m



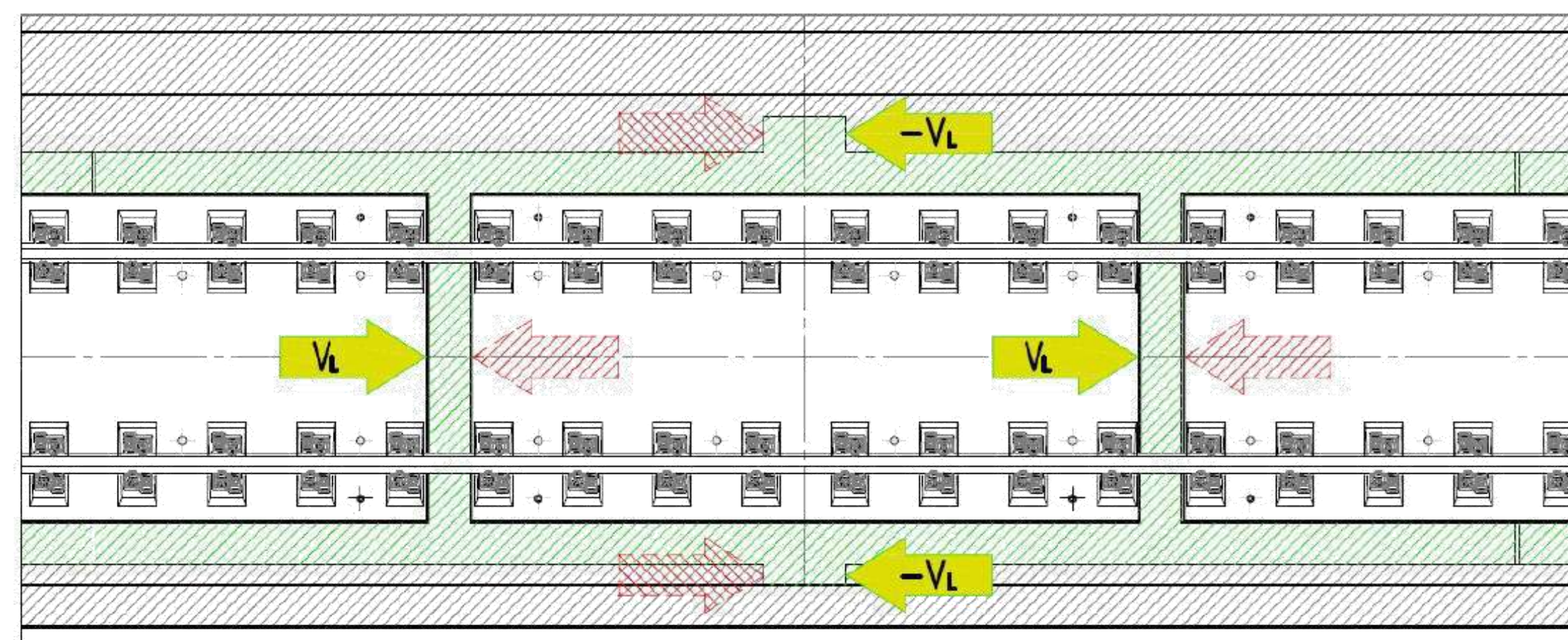
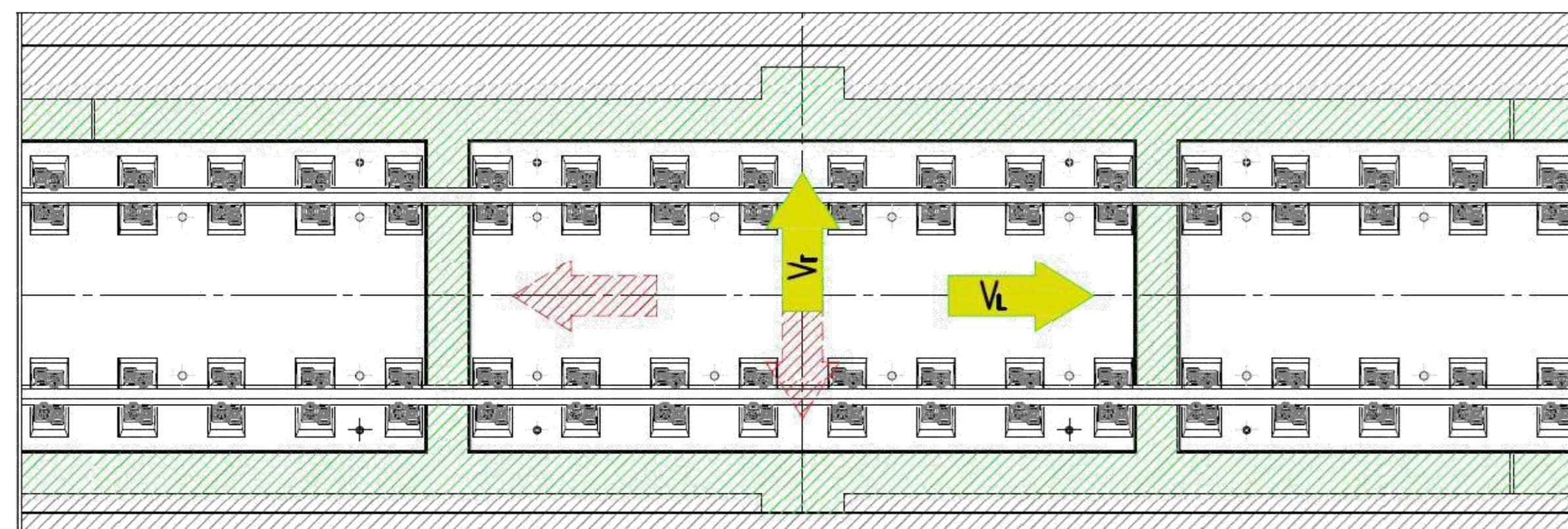
TYPICAL CROSS SECTION ON STROSTRØM BRIDGE PROJECT

The separation gap between consecutive precast slabs, which in the standard configuration is 50 mm, has been increased to create reinforced cast-in-situ curbs approximately 300 mm wide. On the slab sides parallel to the tracks, two reinforced beams are also provided. More details soon!



REINFORCEMENT, SHEAR KEYS AND DETAILS

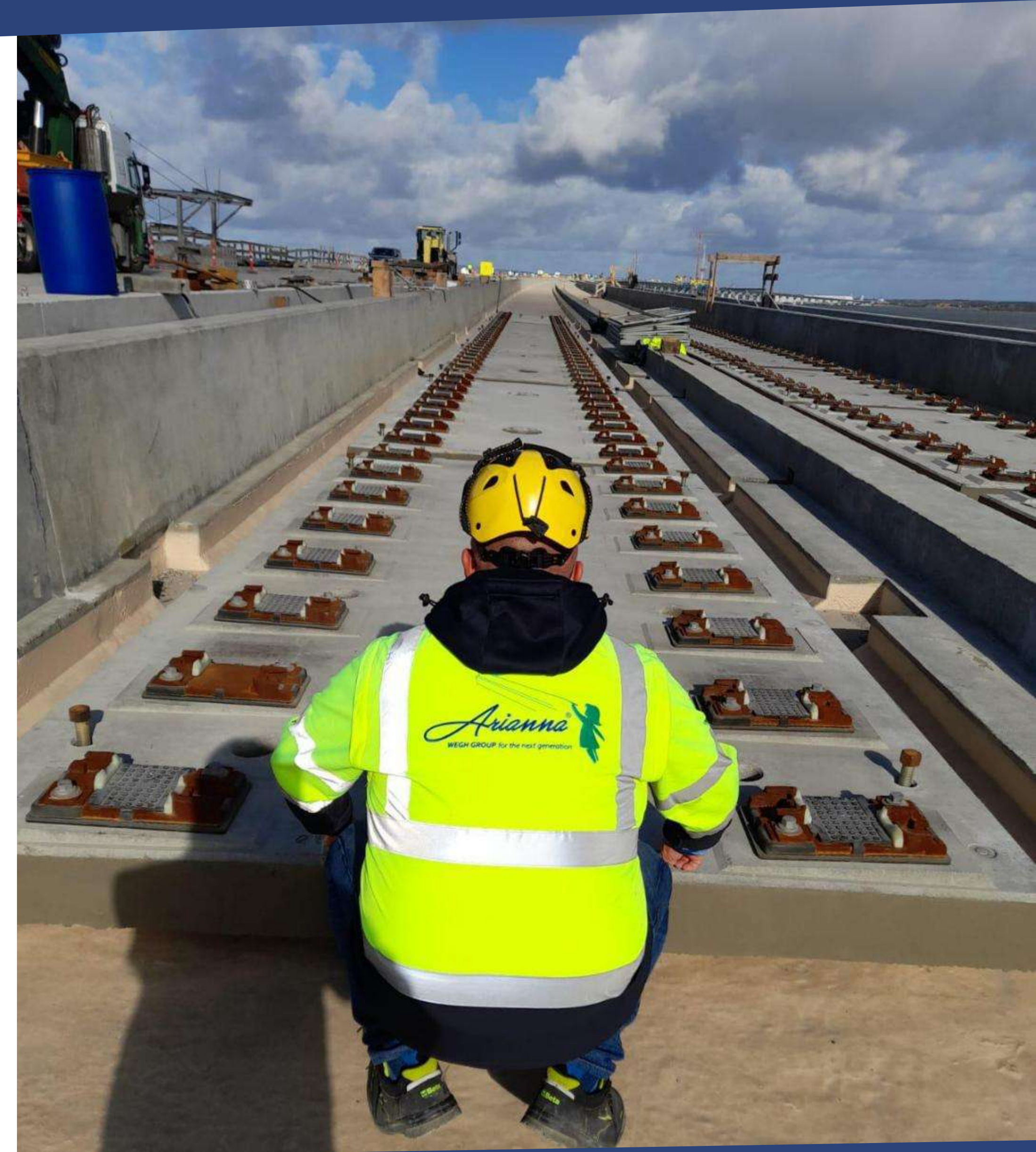
Horizontal forces on the slab are transferred to the anti-derailment walls. Lateral forces are directly transmitted to the side and central walls, while longitudinal forces are transferred through shear keys. This force distribution is facilitated by a frame formed by the perimeter beams and a front brace.



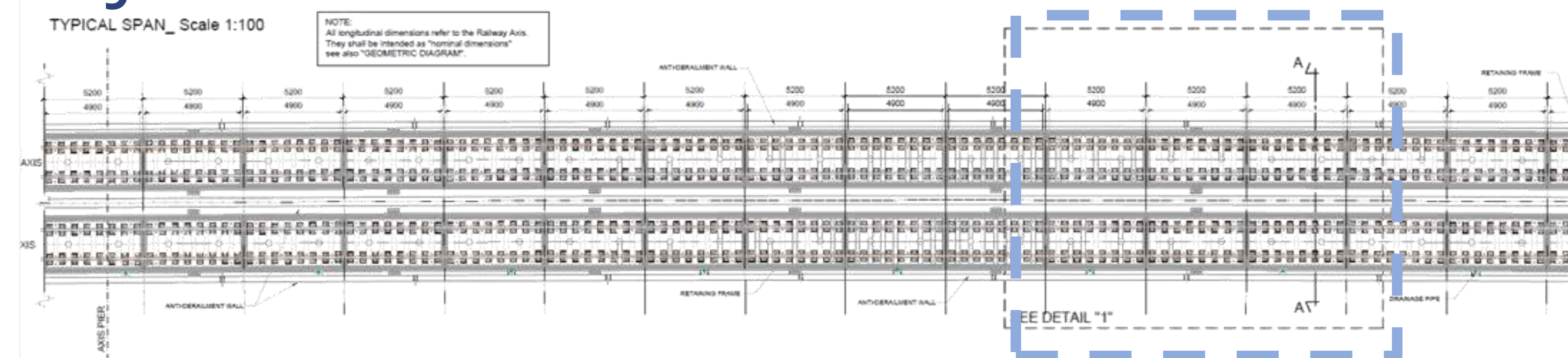
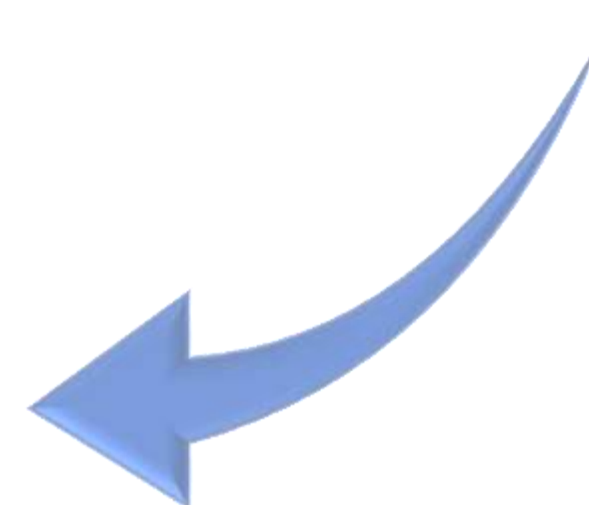
PRECAST AND PRESTRESSED SLAB TRACK

The Prestressed Slab have been manufactured in the WEGH's factory plant located in Calcinate, Italy. The typical slab has the following dimensions for this project:

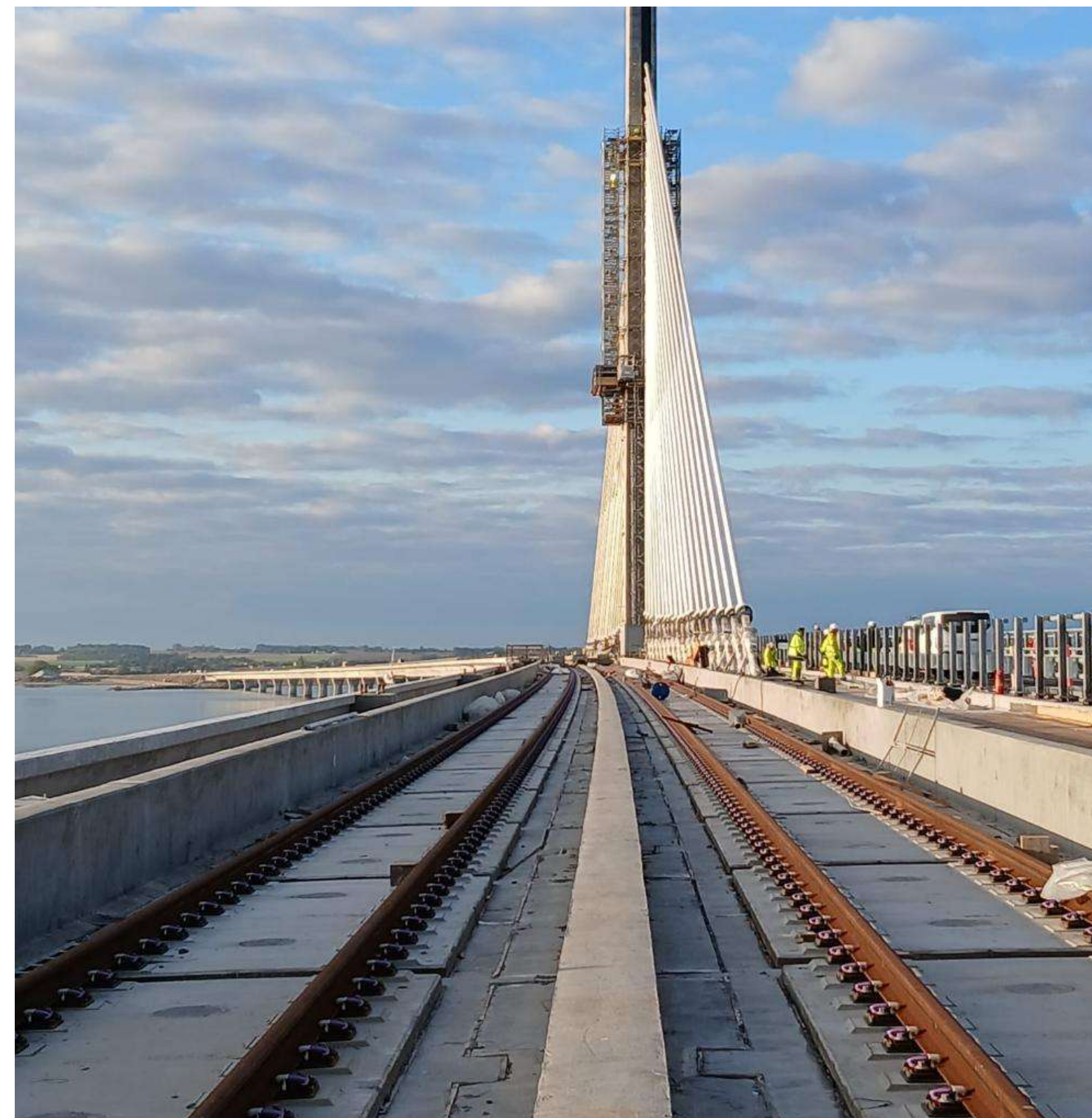
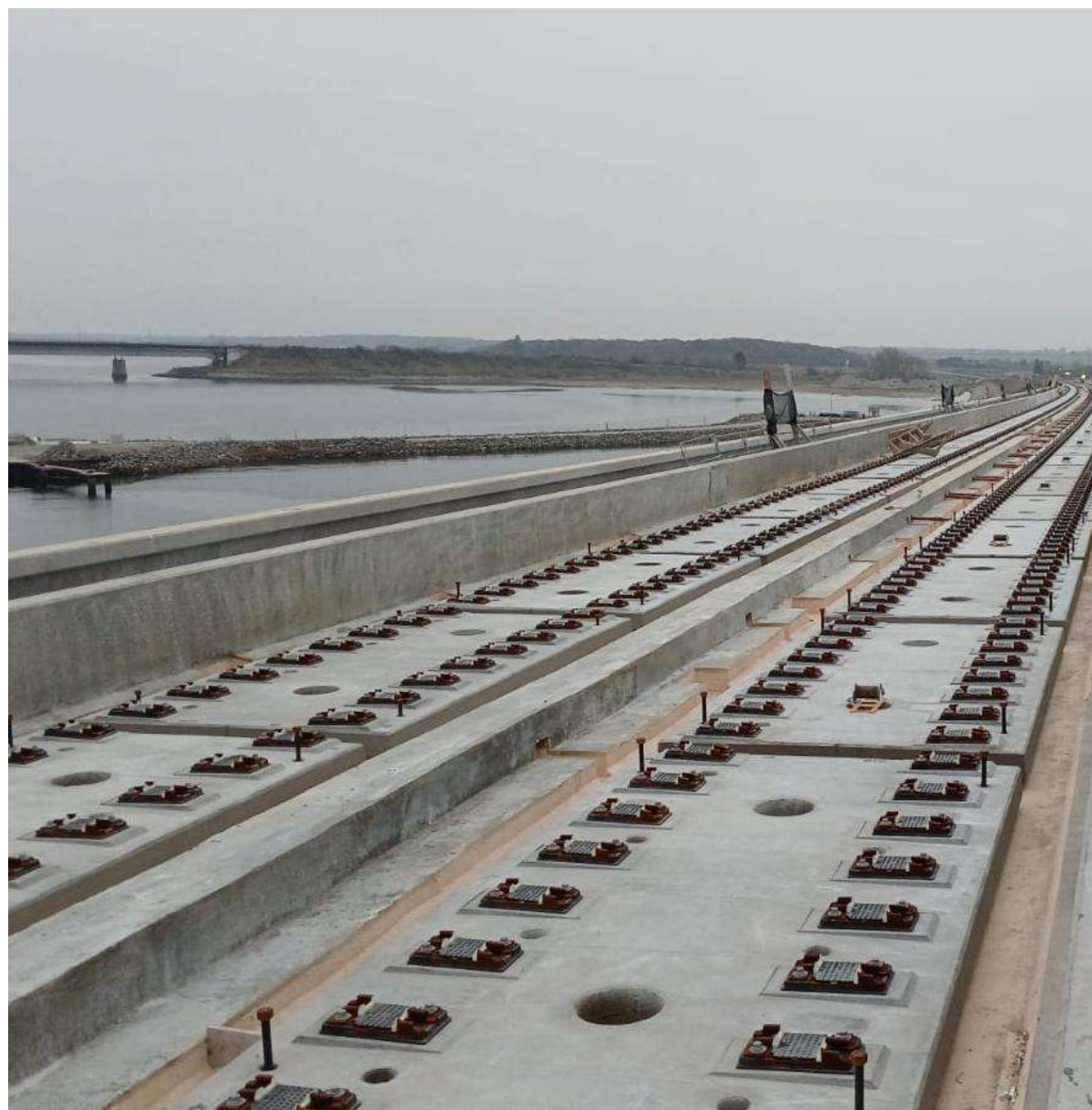
- Length: 4900 mm
- Width: 2400 mm
- Thickness: 180 mm
- Rail Seat: 1/40
- Design Gauge: 1437 mm
- Theoretical mass: 5300 kg



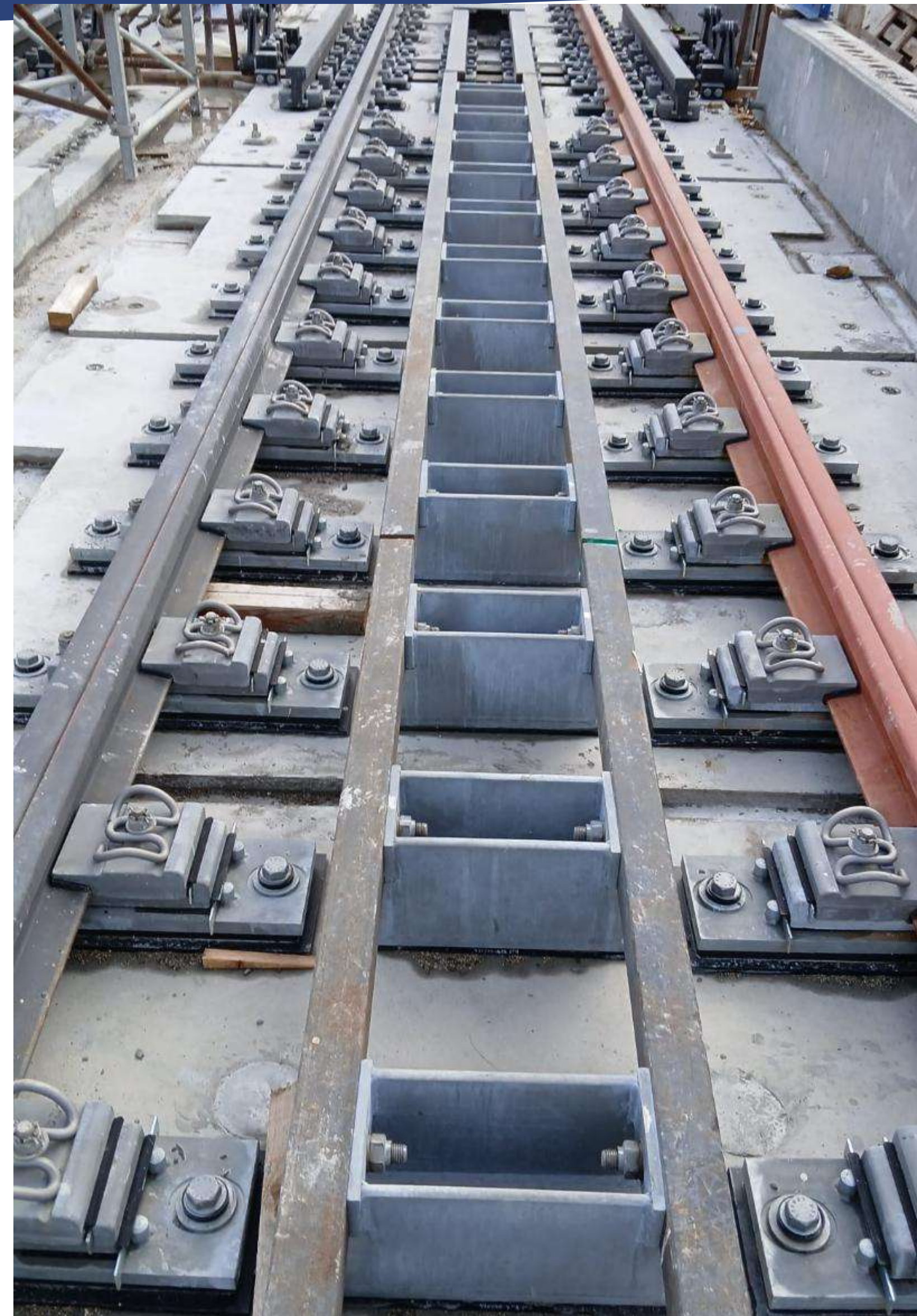
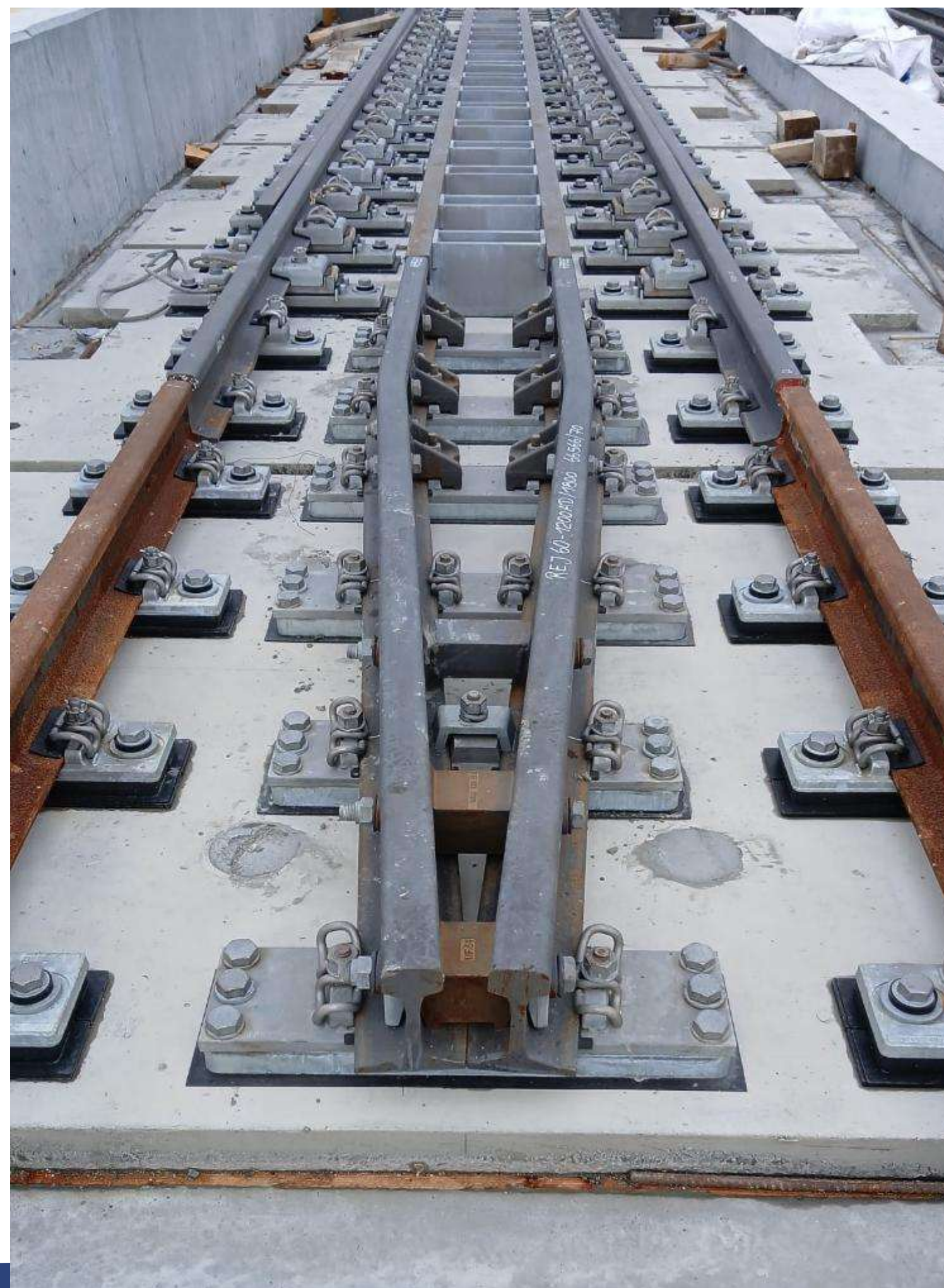
TYPICAL SPAN_ Scale 1:100



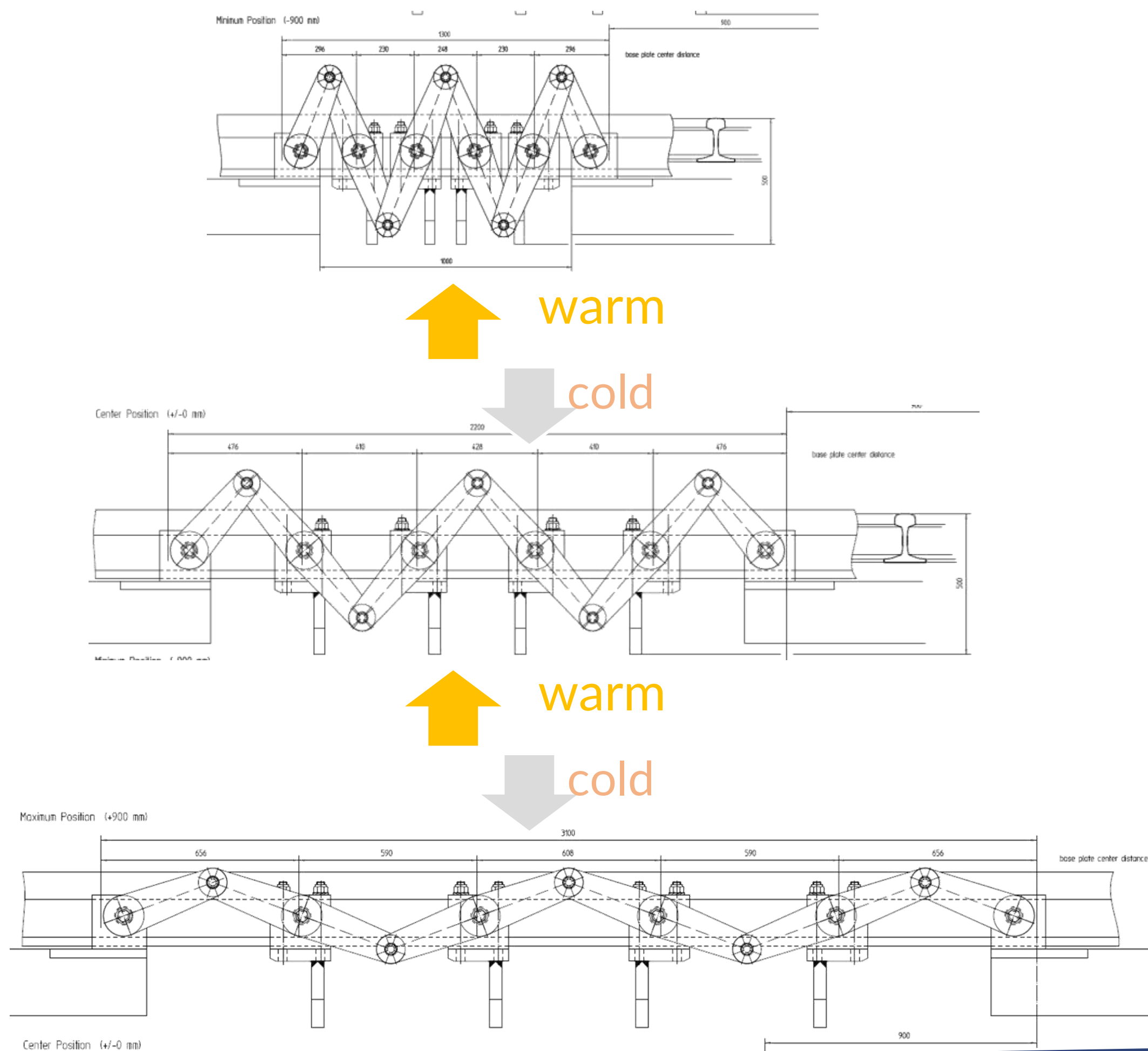
TYPICAL SPAN ON STROSTRØM BRIDGE PROJECT



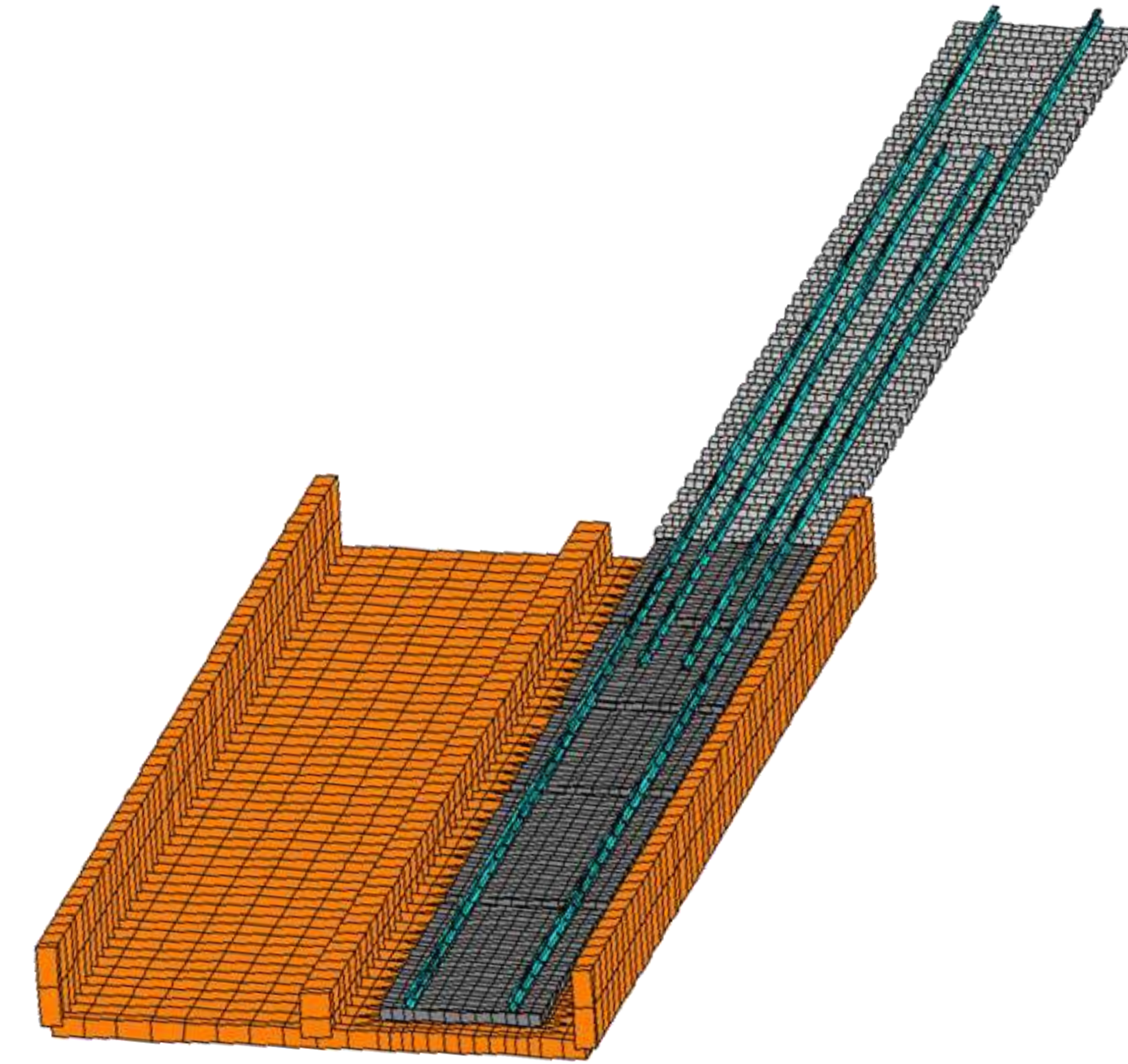
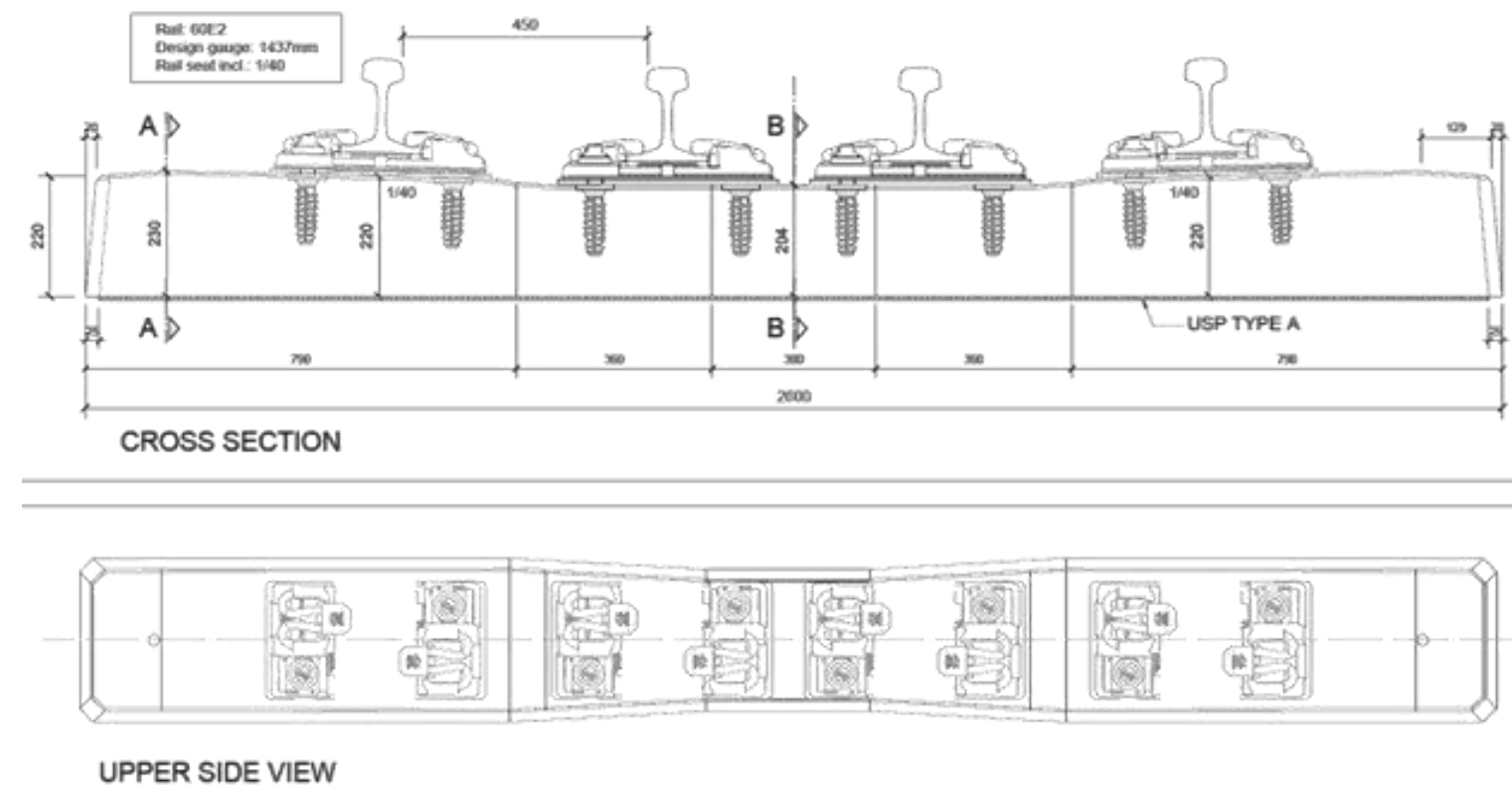
SLAB TRACK FOR RAIL EXPANSION DEVICE



SLAB TRACK FOR RAIL EXPANSION DEVICE REJ60-1800

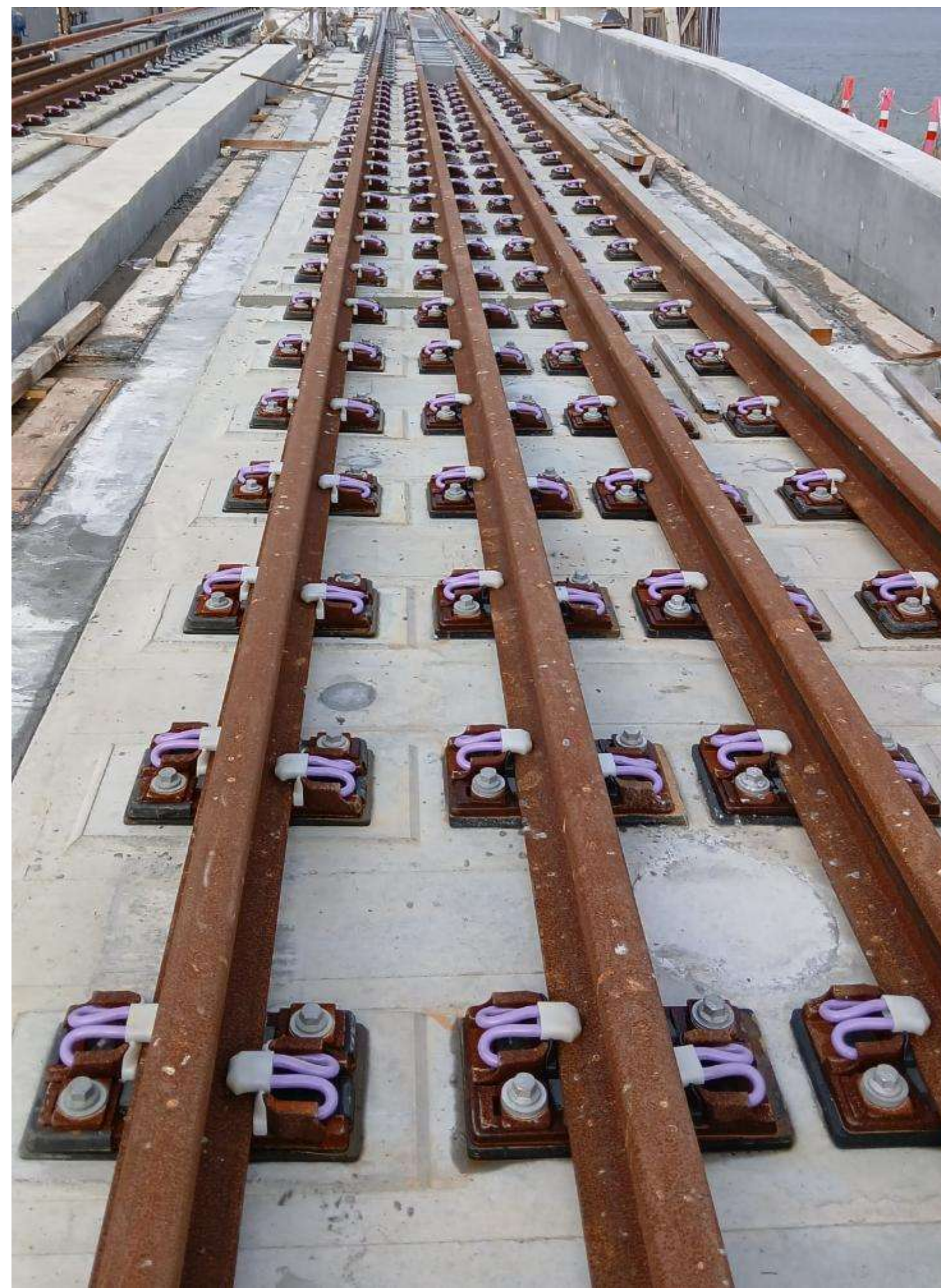
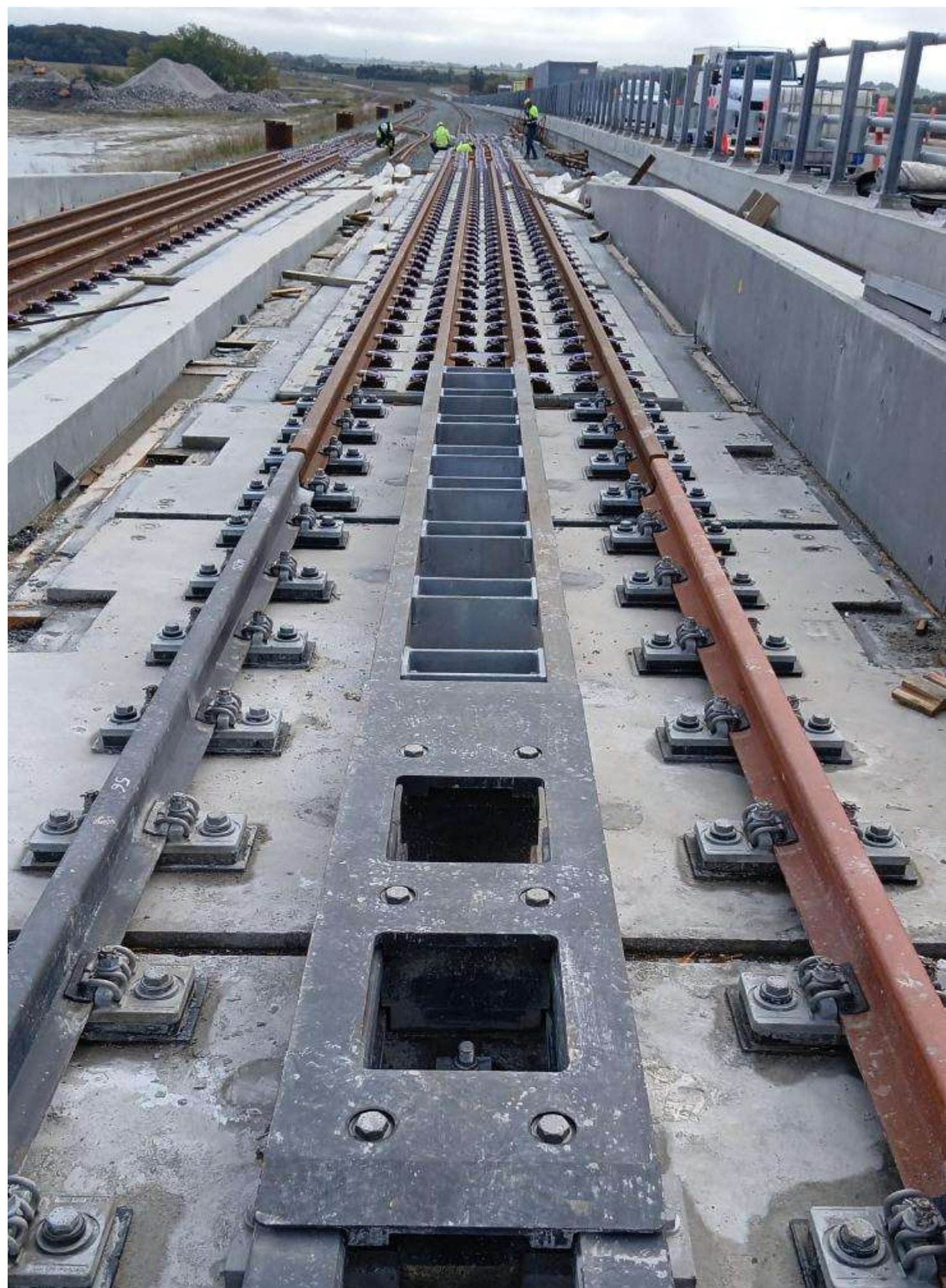


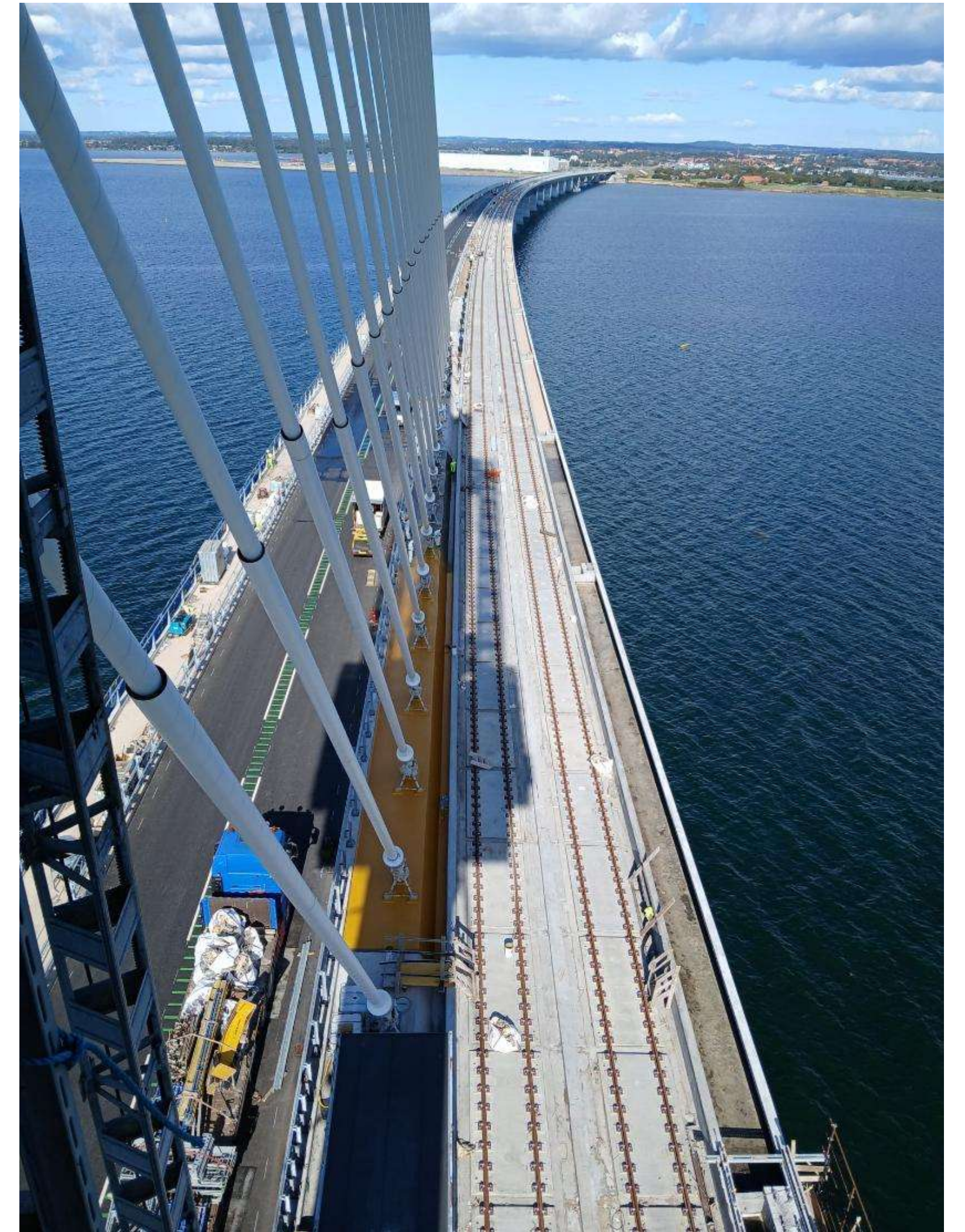
SPECIAL SLAB TRACK AND SLEEPERS FOR BALLASTED-BALLASTLESS TRANSITION



In the transition zone special slabs and sleepers were used. Both components are equipped with two additional rails in the middle, in order to avoid an abrupt change in stiffness between ballasted and ballastless track. The slabs on the foundation have a different restraint solution compared to regular slabs. Instead of being restrained by a curb, they are held in place by circular stoppers fixed to the underlying concrete foundation.

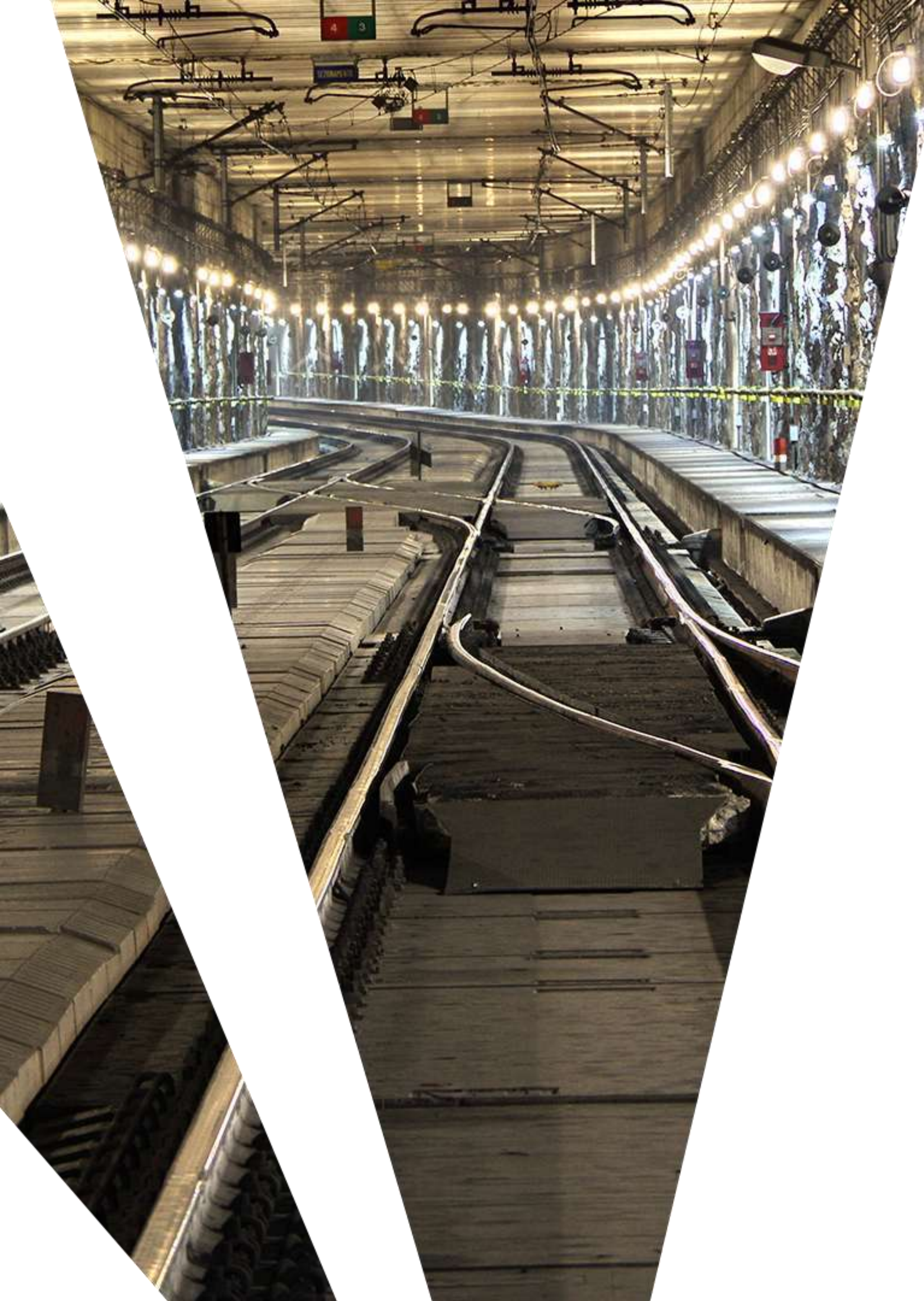
SPECIAL SLAB TRACK AND SLEEPERS FOR BALLASTED-BALLASTLESS TRANSITION





C h a p t e r 4

Sustainability for Future Generations



SERVICE LIFE

In the Arianna® system, all design measures have been implemented to ensure a nominal service life of 90 YEARS, in accordance with technical construction standards. It should be noted that this service life is three times longer than that of conventional track.



LIFE CYCLE ASSESSMENT

Assumptions:

Track Length considered: 1 km

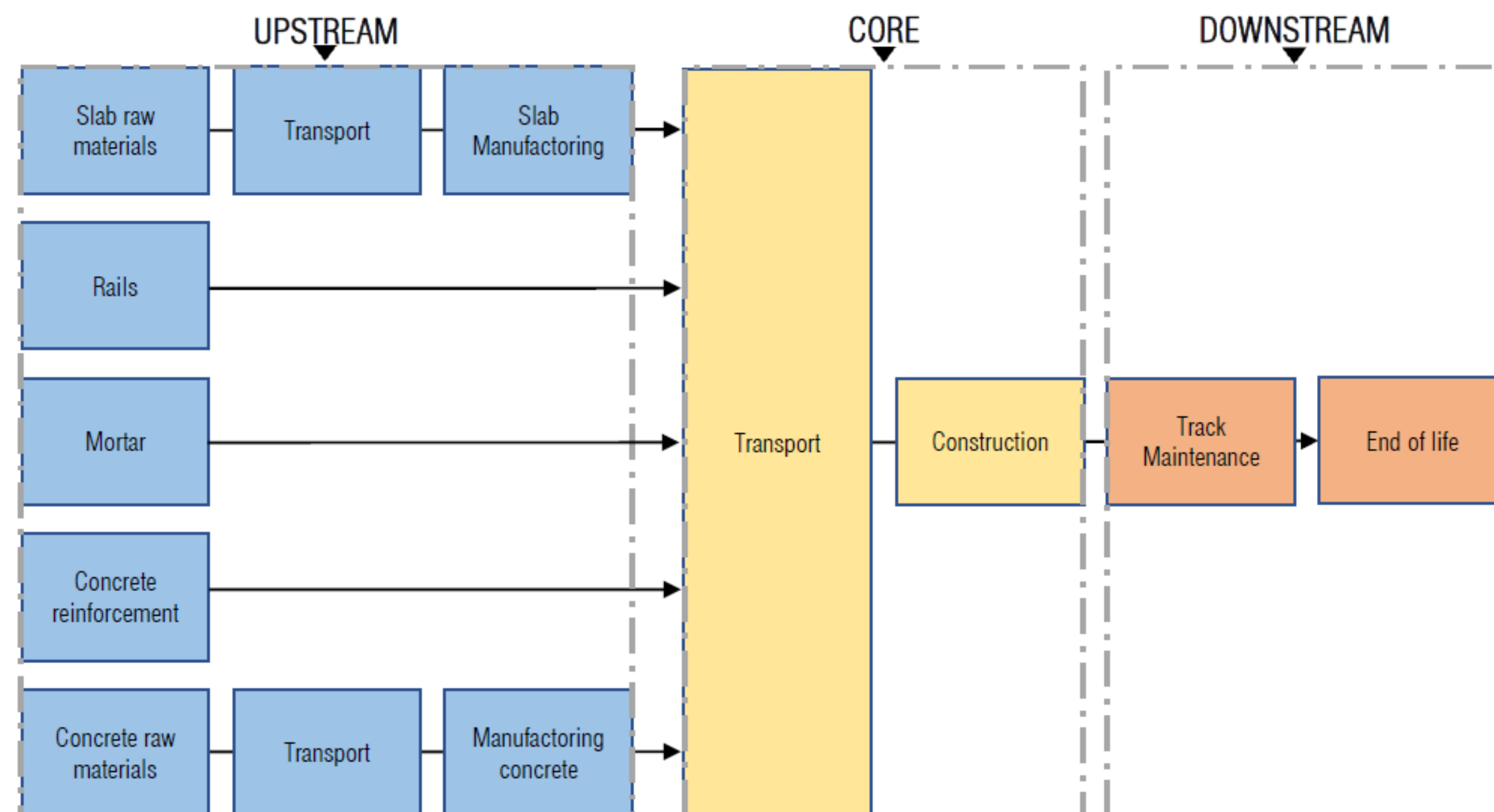
Time Window: 90 years

Arianna®

- Concrete Foundation
- Bedding Layer
- Precast Slab Track
- Fastening Systems
- Rails

Ballasted Track

- Ballast
- Sleepers
- Fastening Systems
- Rails



LIFE CYCLE ASSESSMENT

INDICATOR PER DECLARED UNIT ▼	UNIT ▼	UPSTREAM ▼	CORE ▼	DOWNSTREAM ▼	TOTAL ▼
Global warming	kg CO ₂ eq	1,78E+08	6,11E+04	2,42E+04	1,87E+08
Acidification	kg SO ₂ eq	6,70E+03	3,56E+02	1,76E+02	7,23E+03
Eutrophication	kg PO ₄ ³⁻ eq	3,56E+03	7,31E+01	2,98E+01	3,66E+03
Photochemical oxidation	kg NMVOC	6,97E+03	4,55E+02	2,11E+02	7,64E+03
Abiotic depletion, elements	kg Sb eq	2,31E+01	7,15E-01	3,95E-01	2,42E+01
Abiotic depletion, fossil fuels	MJ	1,71E+07	8,76E+05	3,55E+05	1,83E+07
Water scarcity	m ³ eq	5,86E+05	6,35E+03	1,28E+03	5,94E+05

- Over 90% of the environmental impacts are due to the upstream process
- The downstream phase accounts for less than 3%



Reduction of land use

Reduction of land use equivalent to an area of 37 football fields per kilometer of line with Arianna® track system.



46% reduction in carcinogenic emissions

Reduction of carcinogenic substance emissions per kilometer of line with the Arianna® track system



Reduction of CO₂

109 tons less carbon dioxide emitted into the atmosphere per kilometer of line with the Arianna® track system



EPD Certification

The Arianna® system is certified with an EPD (Environmental Product Declaration) in accordance with EN 15804 and ISO 14040/14044 standards

Thank you for your attention

www.weghgroup.com

