TINES

Slab Track Forum

2nd International Scientific and Technical Conference Modern Technologies in Planning, Construction, and Maintenance of Slab Track Systems - 2025

Session 7: Slab Tracks for Public Transport Systems

Solutions for Tram Slab Track structures
TINES® TRAM integrated tram - road surface system

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tinesrail.com

6-7 November, Napoli, Italy

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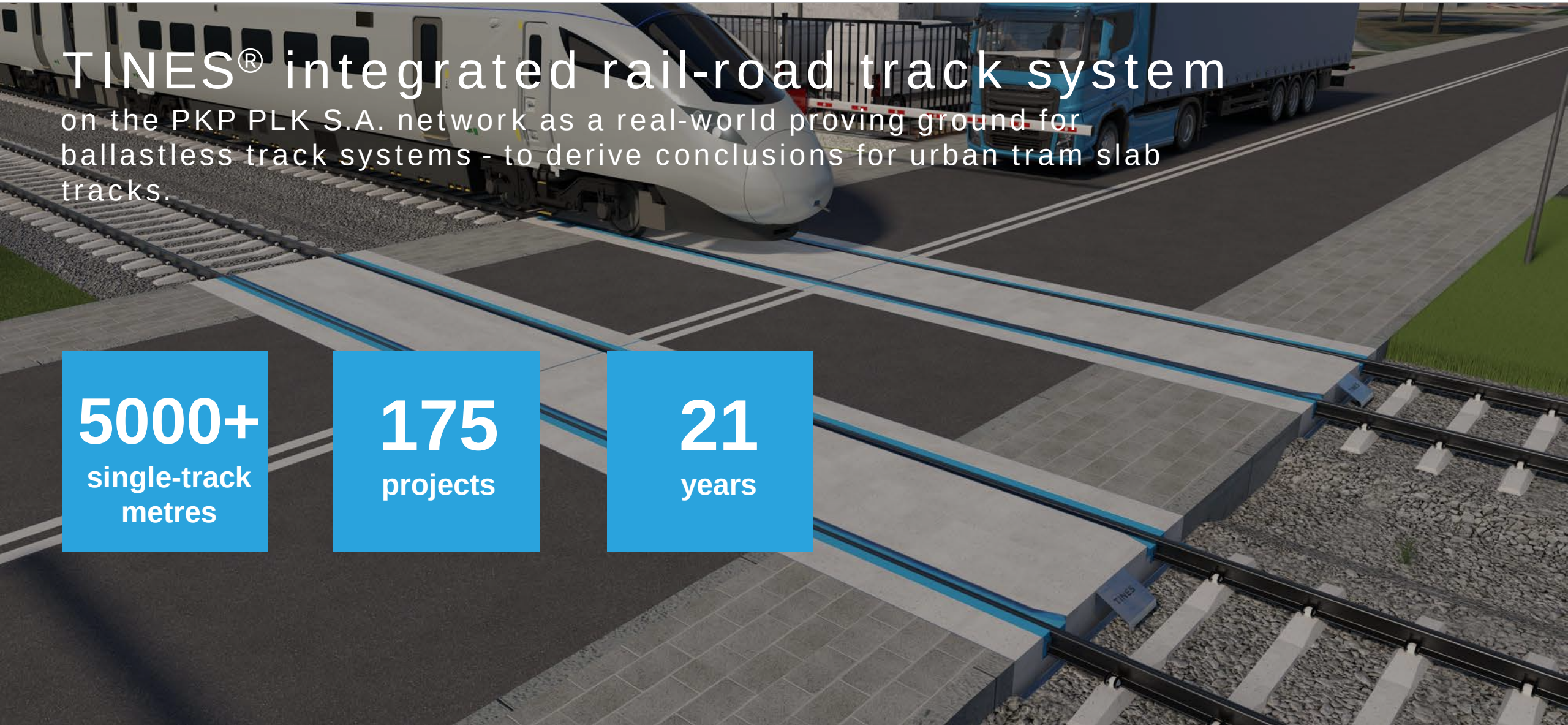
TINES® integrated rail-road track system

on the PKP PLK S.A. network as a real-world proving ground for ballastless track systems - to derive conclusions for urban tram slab tracks.



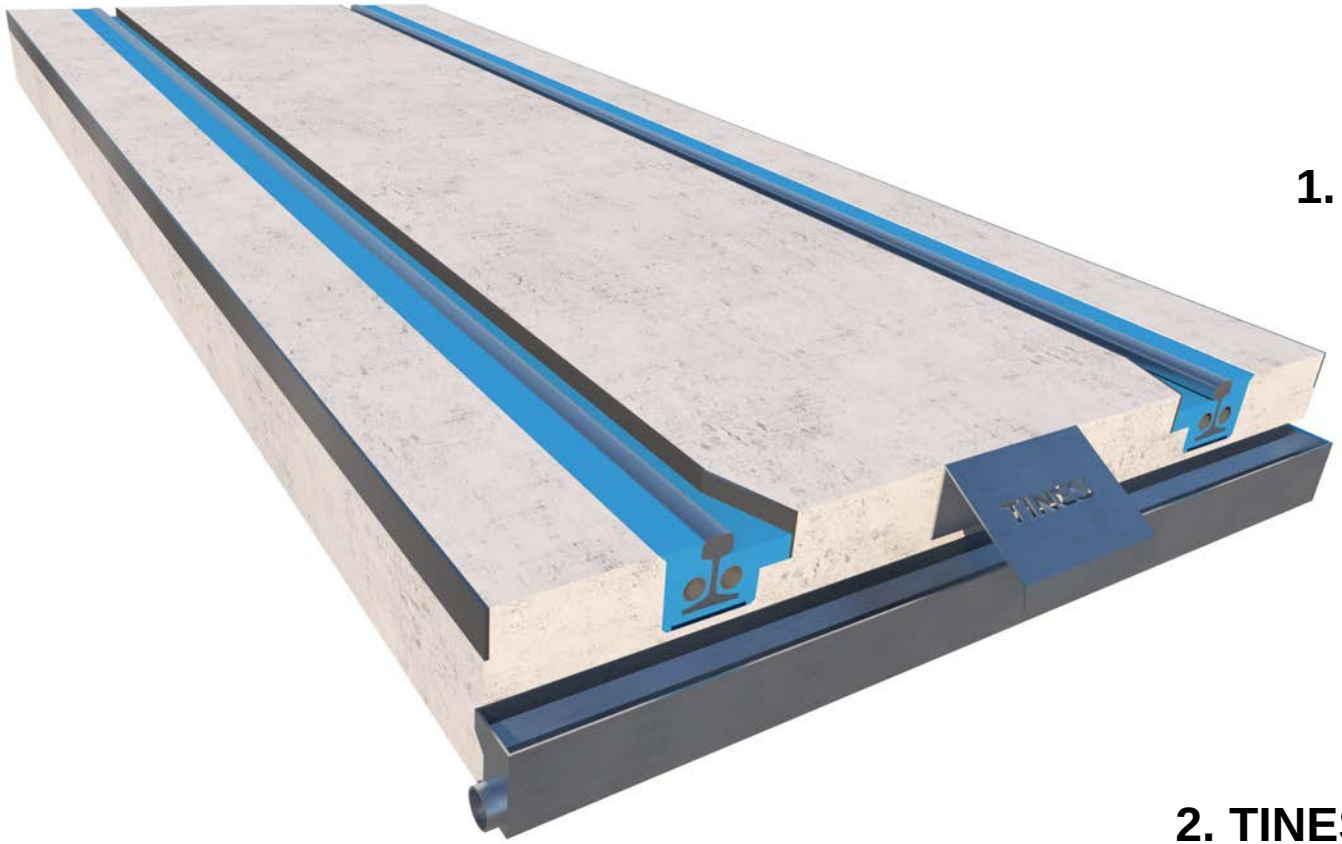
5000+
single-track metres

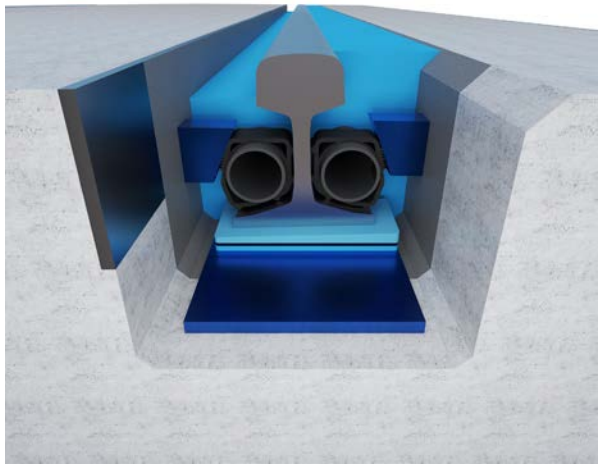
175
projects

21
years

TINES® integrated rail-road track system

1. TINES® LC-L precast concrete track slab





2. TINES® ERS fastening system (Embedded Rail System)

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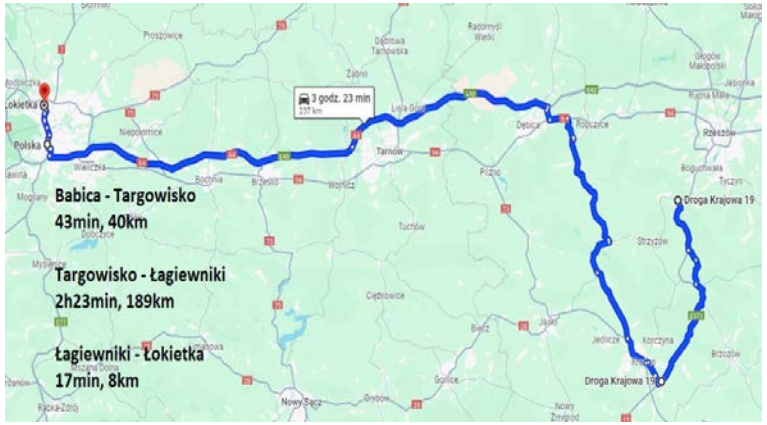
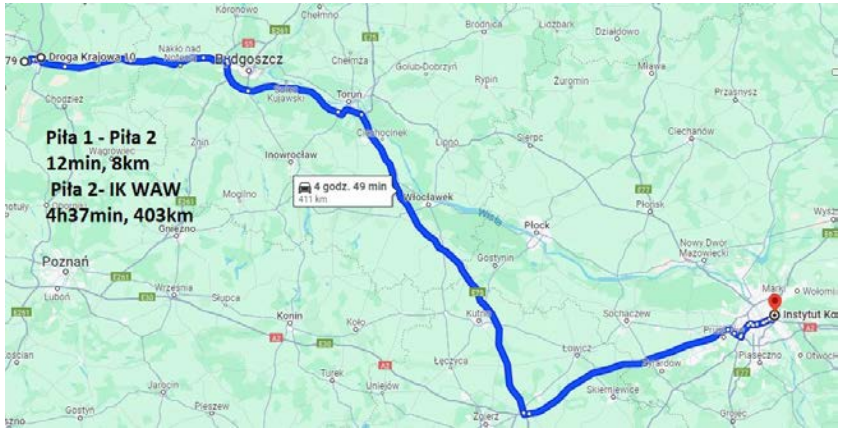
20 years of experience

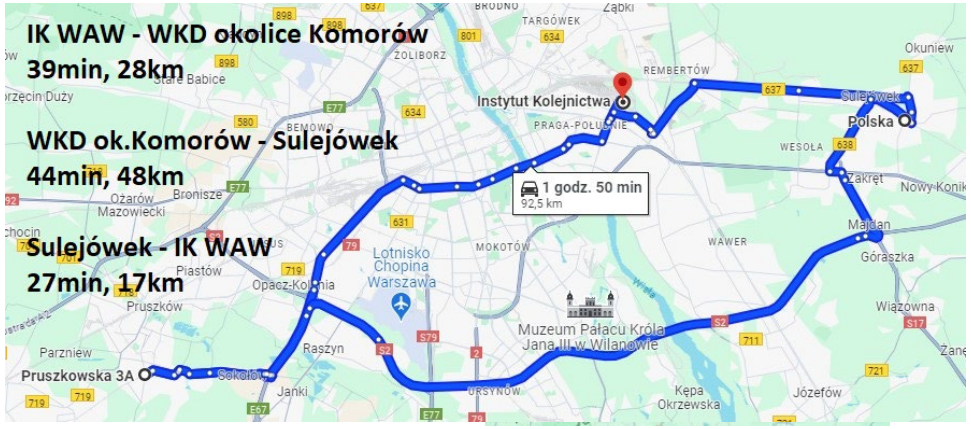
3000 km

10 days

300 man-hours







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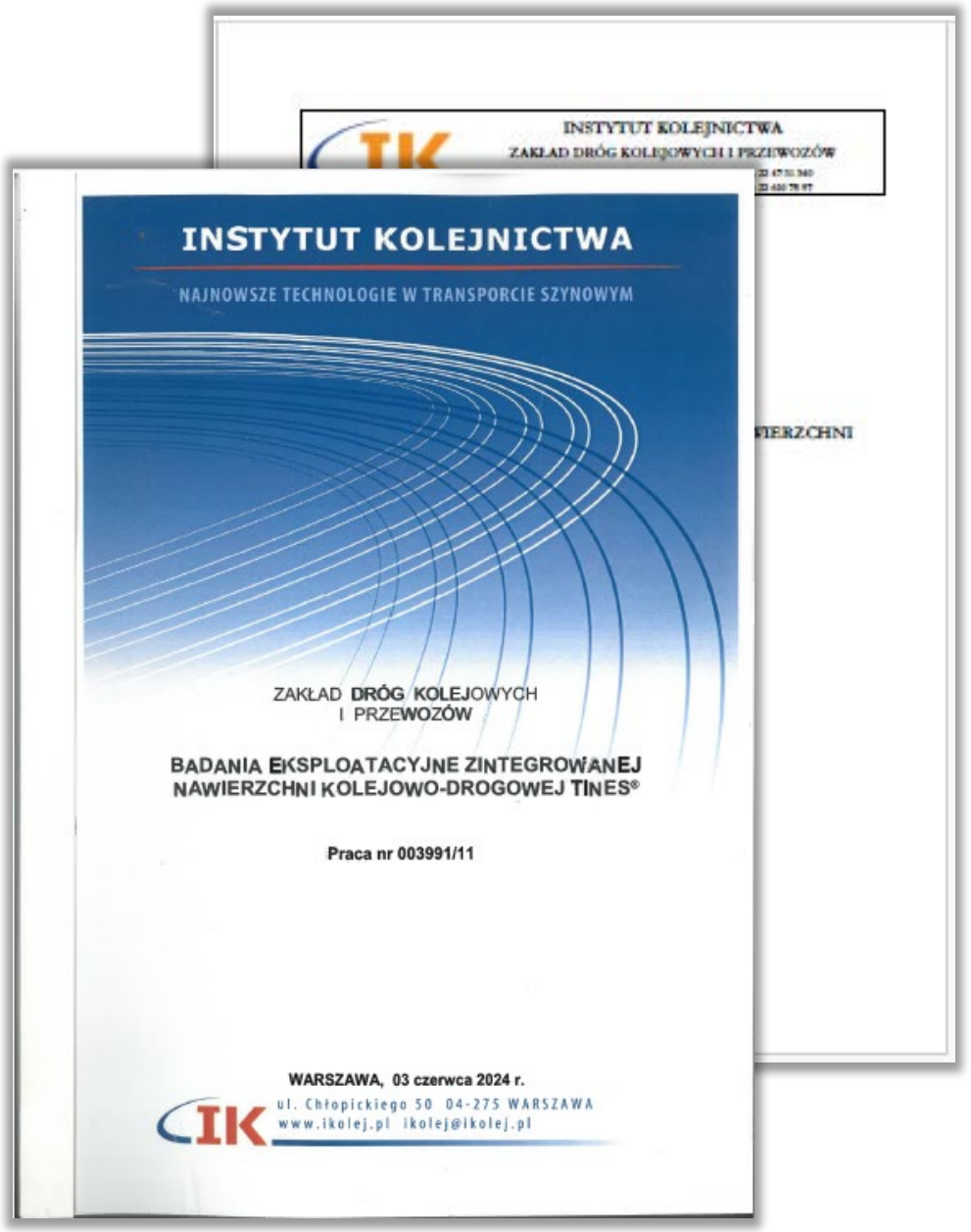
Voluntary in-service survey of 20 rail–road crossings with the TINES® integrated rail–road track system, as part of the “20 Years of TINES” programme.

As part of the survey, one measurement campaign was carried out at each selected crossing, covering the following scope:

- levelling of the track in the crossing area (including transition zones),
- measurements of track-geometry parameters in the crossing area (including transition zones),
- assessment of the condition of the slabs,
- assessment of the condition of the rail fastenings,
- assessment of the condition of the joint between the slabs and the adjacent roadway pavement,
- assessment of drainage in the crossing area.



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Lp.	Locality / stop	Road no.	Annual road traffic [veh/year]	Crossing ID	Rail traffic load [Tg/year]	Year of installation	Railway Lines Maintenance Unit
1	Babica Kolonia	19	13000/3000	106 017 453	1	2011/2012	Rzeszów
2	Cieszków	15	5200/1200	281 053 807	10	2011	Ostrów Wlkp.
3	Jadachy	9	7500/2700	071 005 560	2	2009	Lublin
4	Kąkolewo	32	9300/2900	357 084 405	1	2011	Poznań
5	Krzywizna*	11	8600/2800	272 005 074	11/8	2012	Opole
6	Kraków/Łagiewniki*	b.d.	b.d.	094 004 410	3/3	2011	Kraków
7	Kraków/Łokietka*	b.d.	b.d.	100 004 842	4/3	2006	Kraków
8	Michałów-Reginów	632	9500/1200	010 003 100	4	2018	Warszawa
9	Nielubia k. Głogowa	12	5100/1500	014 291 216	1	2012	Wrocław
10	Nowa Ruda Słupiec	381	6800/1000	327 000 049	2	2012	Wałbrzych
11	Piła	179	7600/1000	405 005 826	4	2013	Szczecin
12	Piła	10	13000/4800	203 175 454	1	2011/2012	Szczecin
13	Pludry*	901	4500/1300	061 168 326	1/1	2013	Opole
14	Poznań/Bałtycka*	92	38300/4800	353 002 724	4/4	2012	Poznań
15	Przybówka	990	6600/1200	106 052 871	1	2014	Rzeszów
16	Stęszew	311	27300/7500	357 093 535	1	2011	Poznań
17	Środa Wlkp.*	432	4700/1200	272 166 734	14/11	2013	Ostrów Wlkp.
18	Targowiska	19	9000/2500	108 075 496	1	2013	Rzeszów
19	Tychy	b.d.	b.d.	179 007 956	5	2012	Sosnowiec
20	Zielonka*	631	32000/4500	021 008 716	5/5	2015	Warszawa

*) Double-track level crossing

Precast reinforced-concrete slab TINES® LC-L

- assessment of slab technical condition
- assessment of the joint between slabs and the adjacent roadway pavement

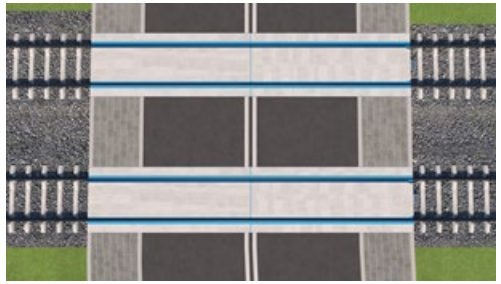
*“In the majority of the crossings analysed, visual inspections of the TINES® LC-L slabs revealed no cracks, blisters, tears or inclusions of foreign matter visible to the naked eye on the running surface. The end faces of the crossings are protected with **cover plates** against damage caused by hanging elements of passing rolling stock.”*

Piła
203 175 454

At all 20 TINES® rail-road crossings, the manufacturer-recommended cover plate was used.

Precast reinforced-concrete slab TINES® LC-L

- assessment of slab technical condition
- assessment of the joint between slabs and the adjacent roadway pavement

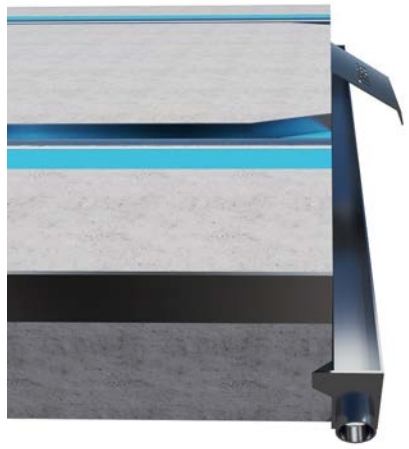


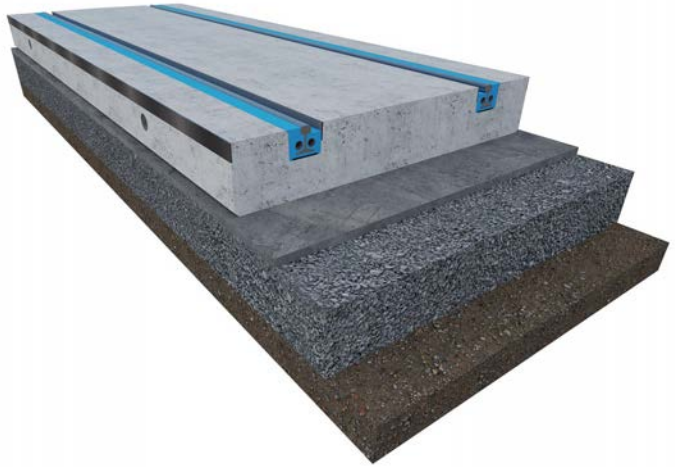
*"In some cases**, gaps were found between the slabs and the asphalt surface**. The probable cause of the asphalt layer chipping is the **lack of proper sealing at the asphalt-slab interface**, which results in the penetration of water and other contaminants into the substructure, eventually leading to the formation of voids in the asphalt surface."*

Nowa Ruda
327 000 049

TINES® integrated rail-road track system

- assessment of the drainage condition in the area of the TINES® crossing





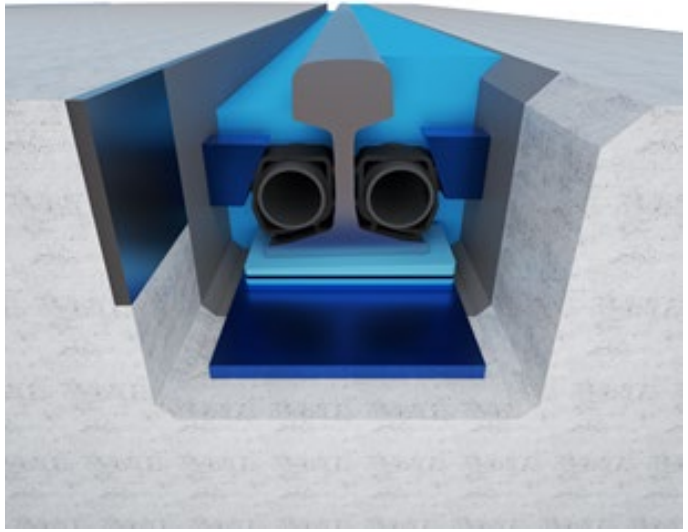
“The manufacturer of the TINES integrated rail-road crossing system recommends the use of a drainage system (drainage channel), which greatly facilitates maintaining the track in proper condition at the beginning and end of the crossing (Fig. 181/182). To ensure the drainage system remains functional, regular cleaning of these areas is also recommended. However, in most of the analyzed crossings, such a drainage system was not installed. This may be due to the absence of drainage requirements for the crossing in the detailed design.”

TINES® integrated rail-road track system

- assessment of the drainage condition in the area of the TINES® crossing


Fastening system - embedded rail system - TINES® ERS

- assessment of the condition of rail fastenings

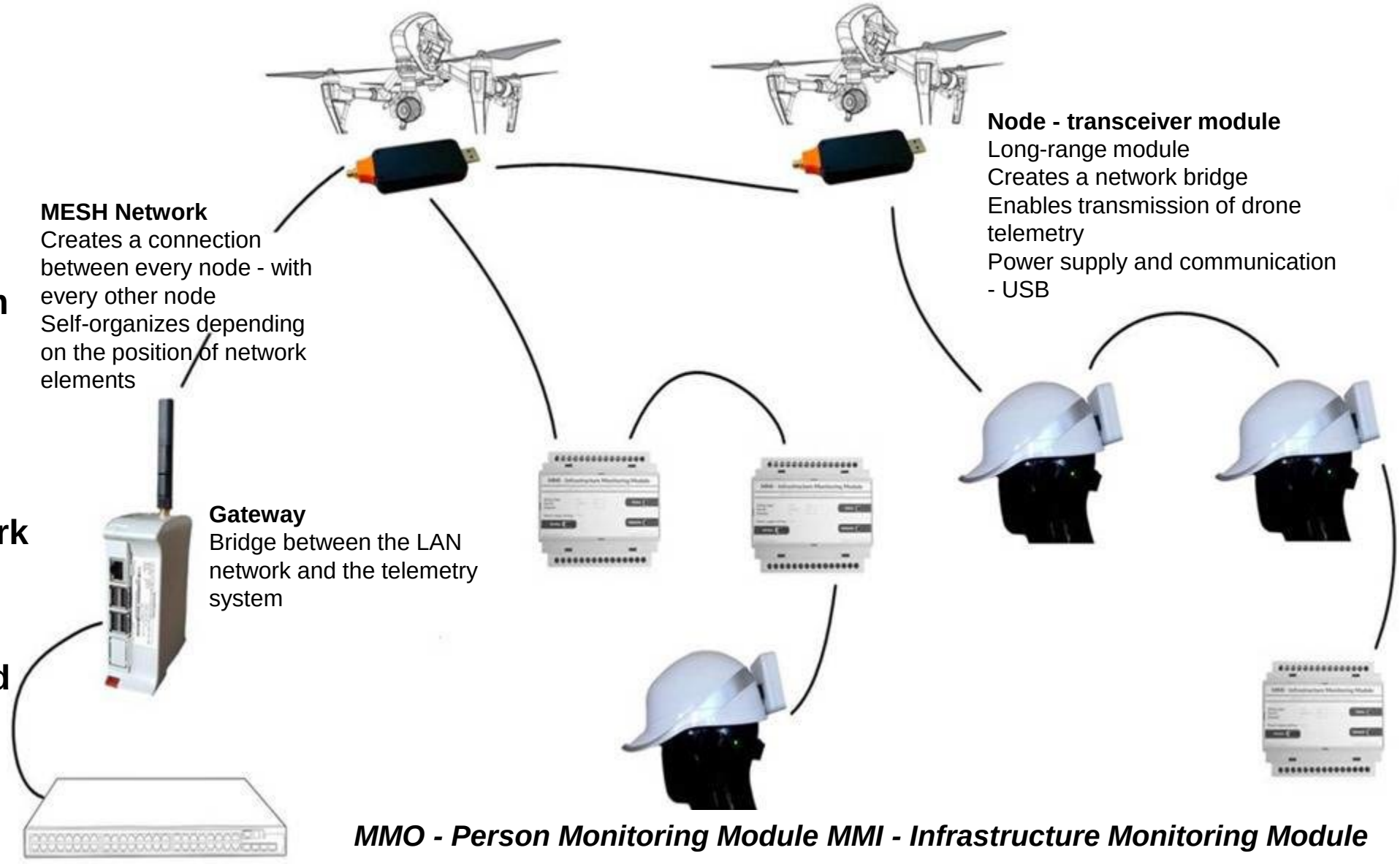


*“The coating serving as an elastic mounting and support is **not cracked, delaminated, or deformed**, and shows no areas of insufficient curing, leakage, or discoloration.”*

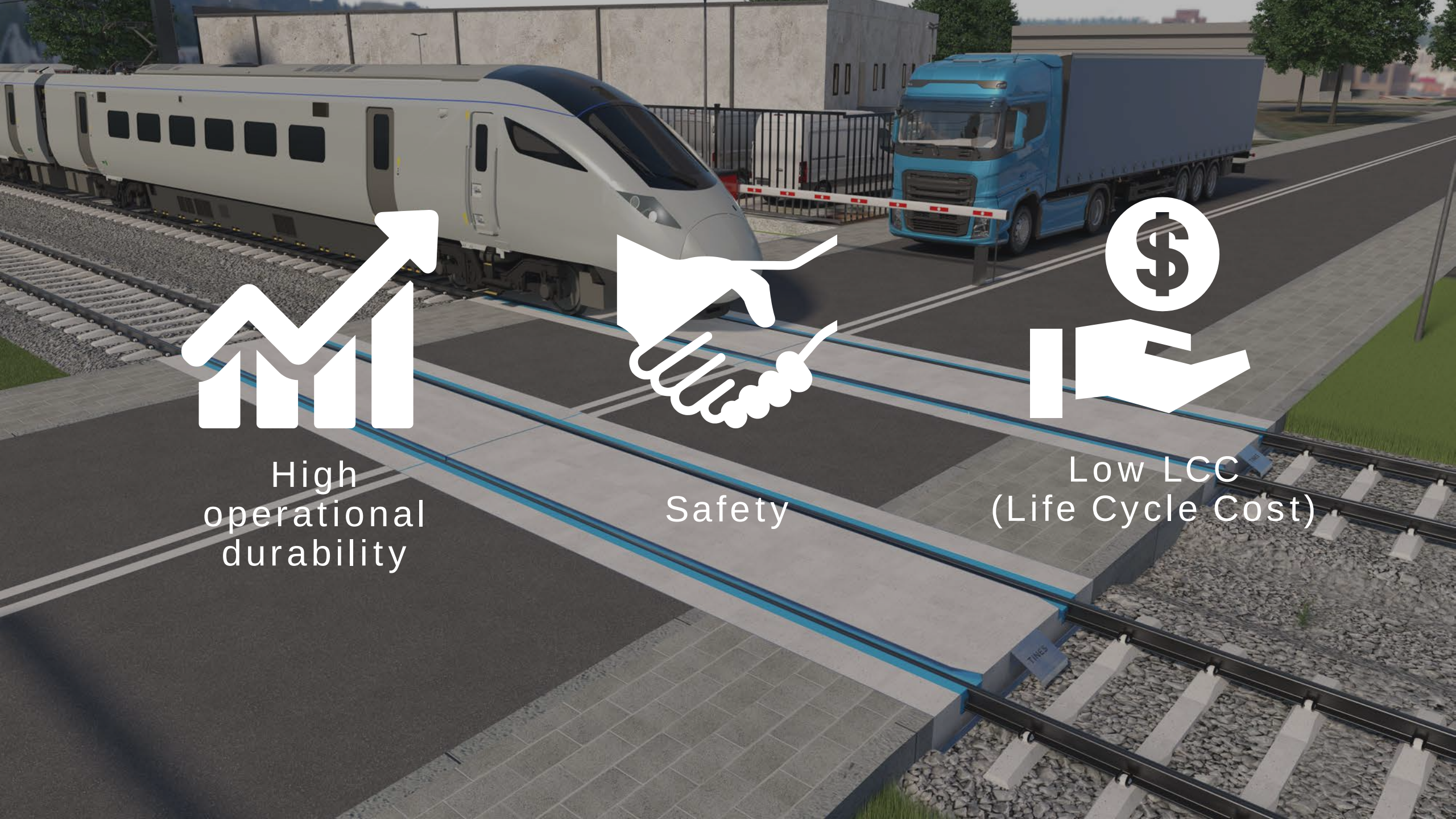
Stęszew 357 093 535

The tested sensor monitoring system creates a MESH telemetric network

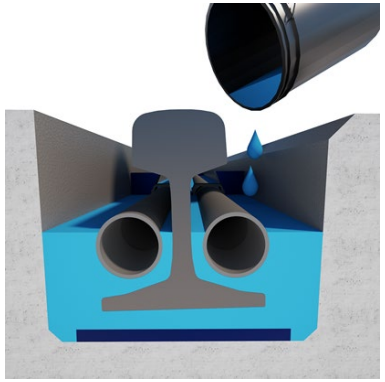
- **self-organization,**
- **data transmission from telemetric devices during BSP flights,**
- **operation independent of Wi-Fi or GSM network area coverage**
- **data transfer to the end user via an IP LAN network**



MMO - Person Monitoring Module MMI - Infrastructure Monitoring Module

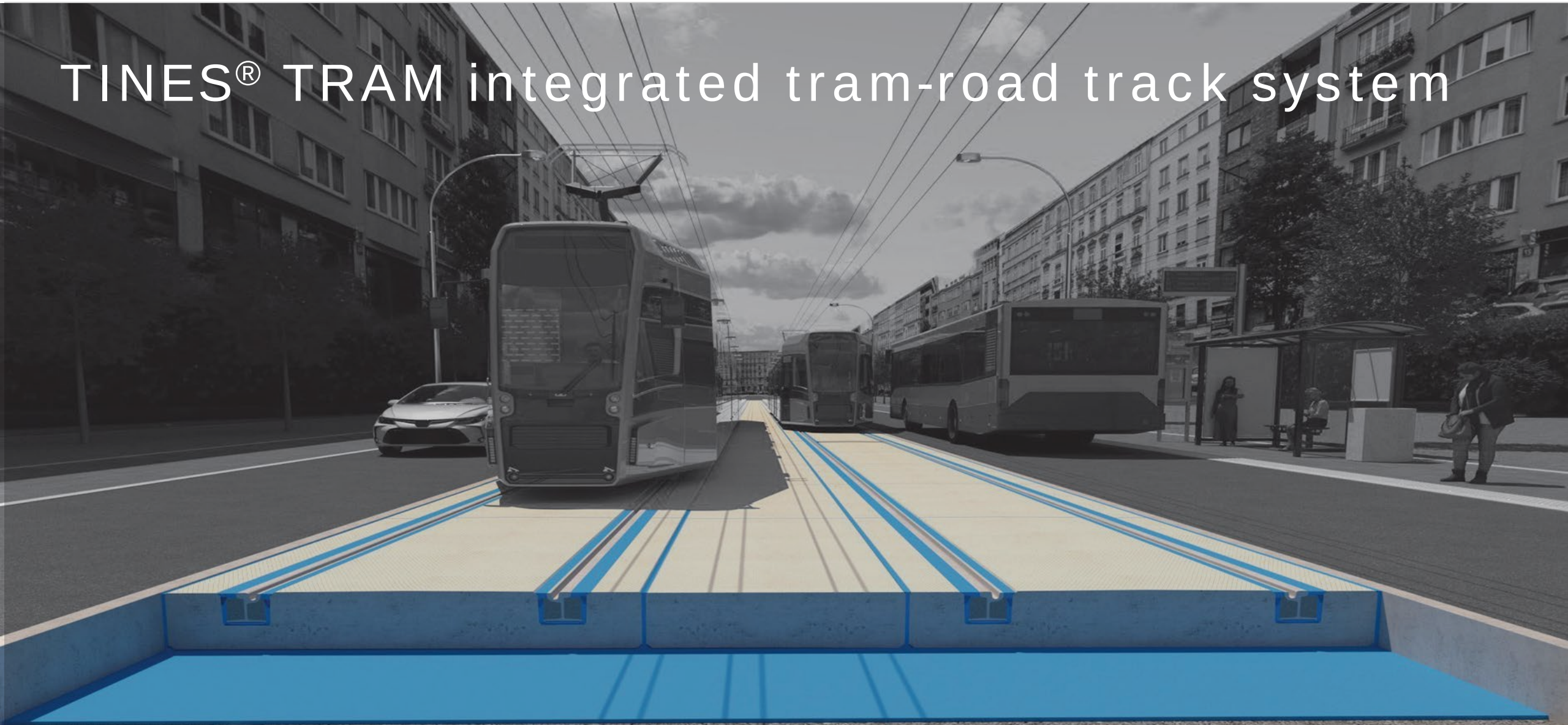

High operational durability
Safety
Low LCC (Life Cycle Cost)

New-generation TINES® Polyrail polyurethane elastomers

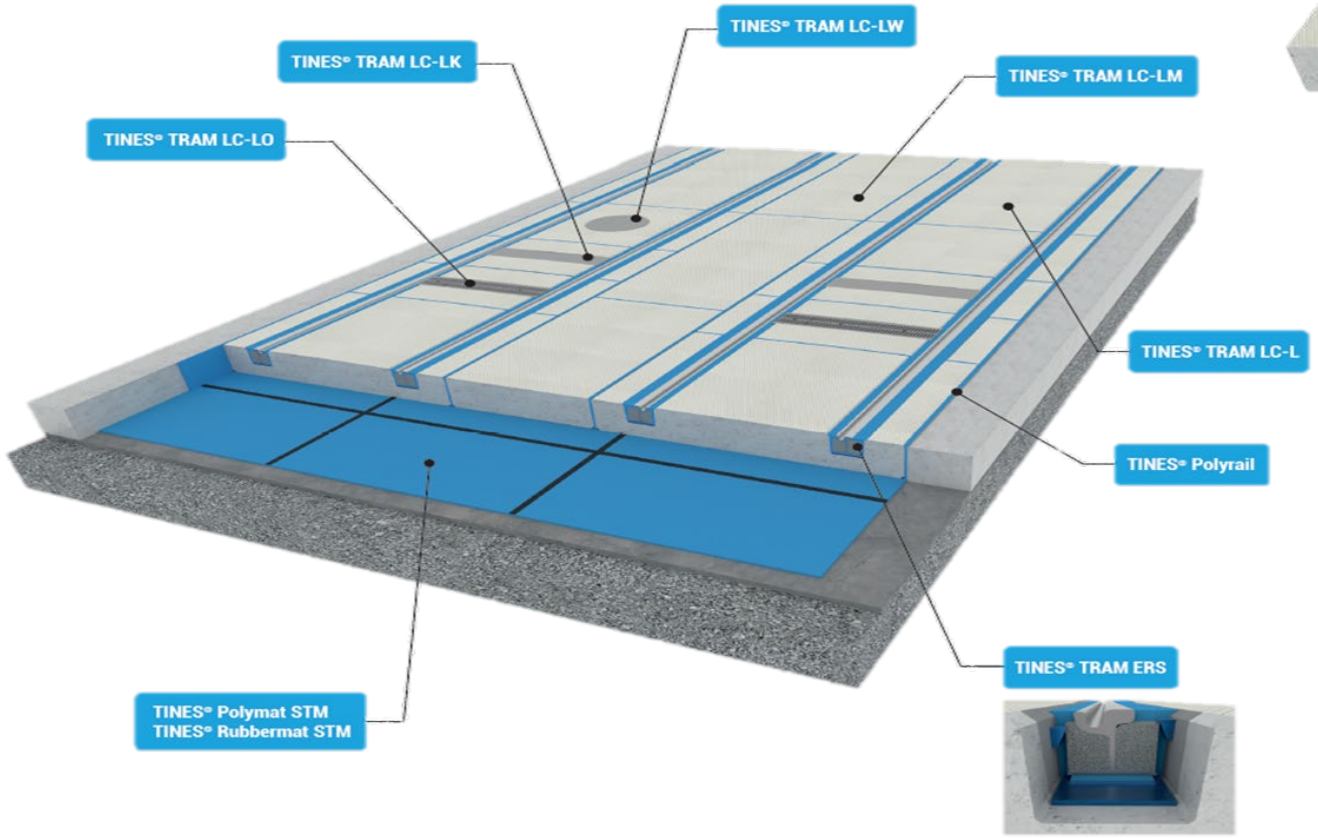


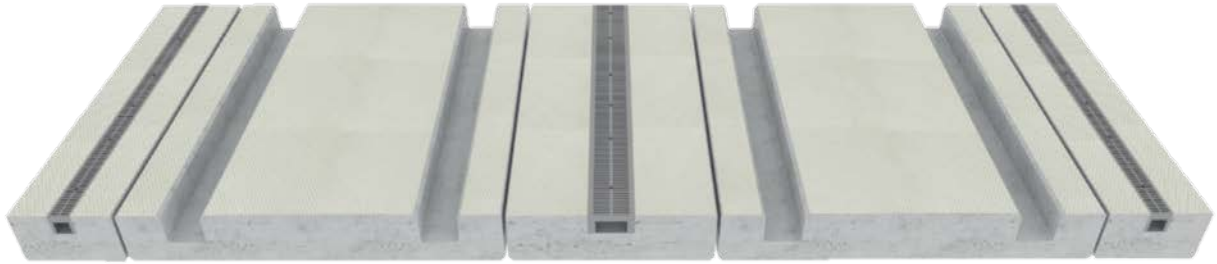
- TINES® Polyrail 40
- TINES® Polyrail 50
- TINES® Polyrail 60
- TINES® Polyrail 70
- TINES® Polyrail 50/55
- TINES® Polyrail 60/65
- TINES® Polyrail Primer
- TINES® Polyrail 53+
- TINES® Polyrail EPX
- TINES® Polyrail Flex

TINES® TRAM integrated tram-road track system

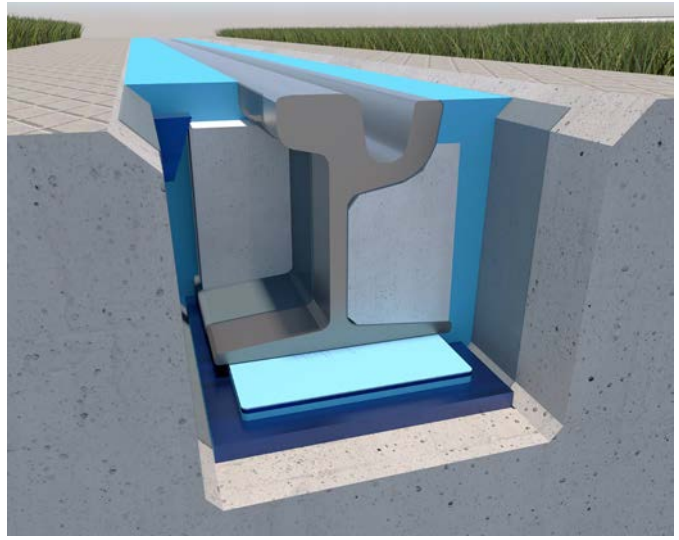


TINES® TRAM integrated tram-road track system





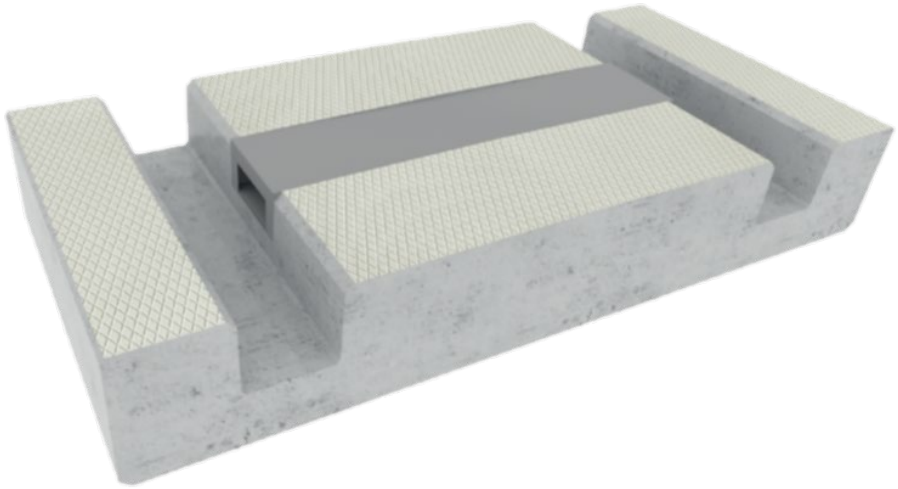
1. TINES® TRAM LC-L precast concrete track slab



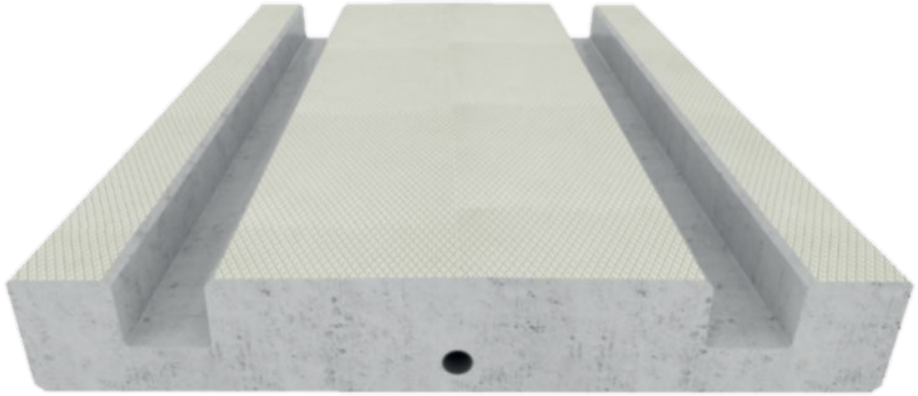
2. TINES® TRAM ERS fastening system
(Embedded Rail System)

TINES® TRAM LC-L - precast concrete slab

TINES® TRAM LC-LT - designed for installation on horizontal curves with a small radius



TINES® TRAM LC-LK with a built-in steel cable tray, enabling cable connections between the rails

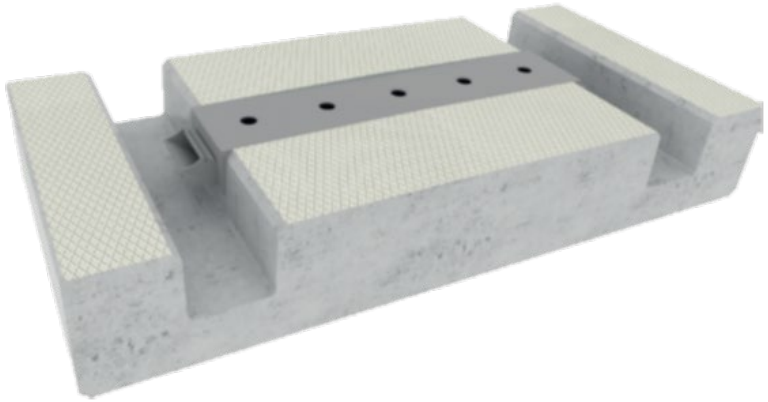


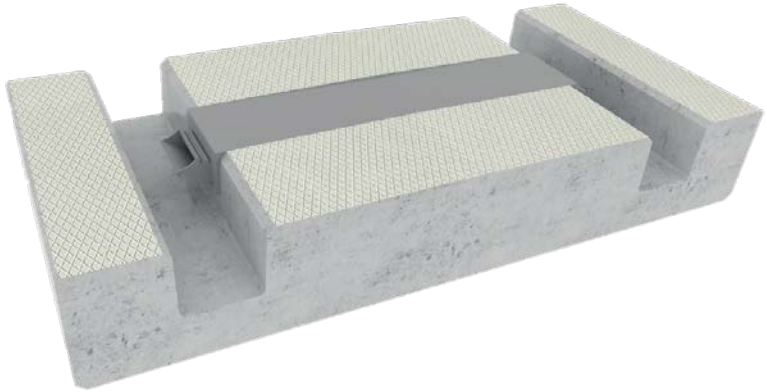
TINES® TRAM LC-LK with a built-in PVC conduit, allowing cables to be routed along the slab

TINES® TRAM LC-L - precast concrete slab

TINES® TRAM with a built-in drainage channel protected by a grate

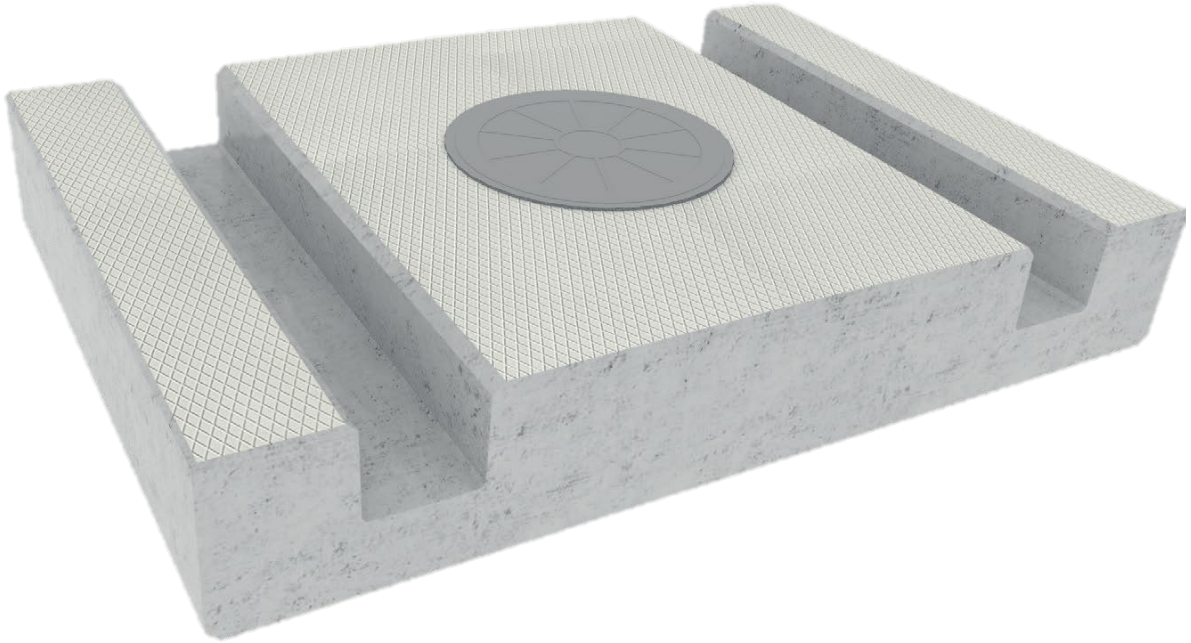
TINES® TRAM LC-LO with a built-in drainage channel protected by a perforated steel cover



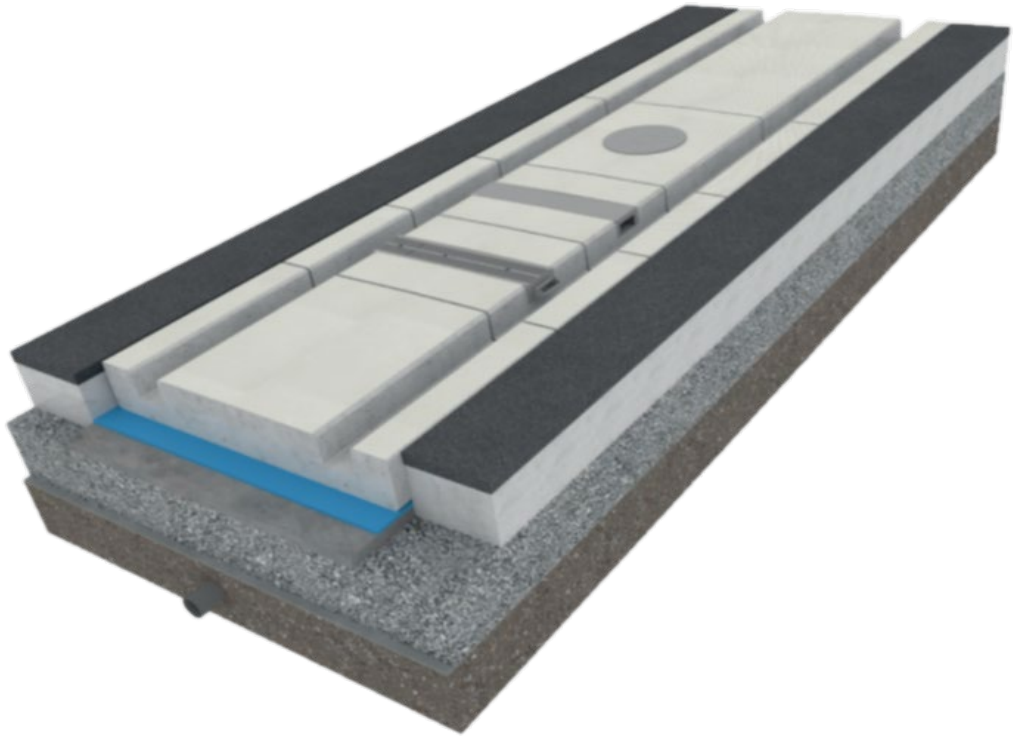


TINES® TRAM LC-LO with a built-in drainage channel, protected by a solid steel cover

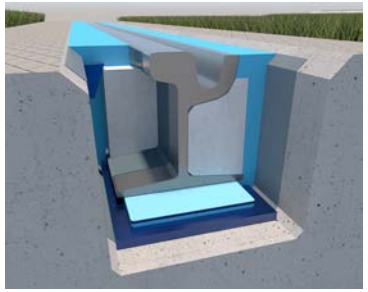
TINES® TRAM LC-L - precast concrete slab



TINES® TRAM LC-LW with a built-in manhole



TINES® TRAM in many other special variants, dedicated to specialized applications of special slabs



TINES® TRAM ERS - embedded rail fastenig system

EN 13146-9:2020-09: Railway applications - Track - Test methods for fastening systems - Part 9: Determination of stiffness

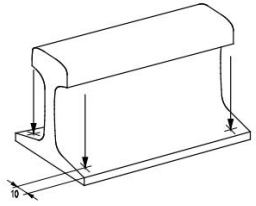
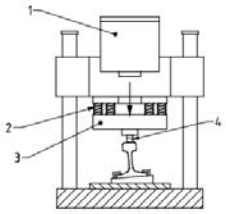
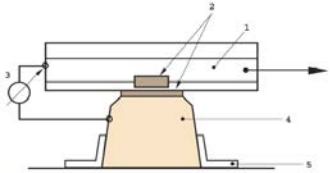


Figure 2 — Displacement-measuring points



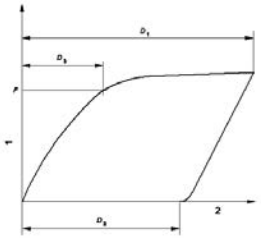
Key
1 Shaker for dynamic loading isolated from loading frame
2 Static preload $F_{Fstatic}$ via elastic elements
3 Load distribution plate, measurement of acceleration a_{RAFL}
4 Measurement of force F_{RAFL}

EN 13146-1:2019-04: Railway - Track - Test methods for fastening systems - Part 1: Determination of the resistance of the longitudinal rail



Key
1 rail as described in 5.1
2 fastening assembly including rail pad
3 load-displacement measuring and recording instruments
4 rail support as described in 6.1
5 rigid support and restraint to prevent rotation of the rail support

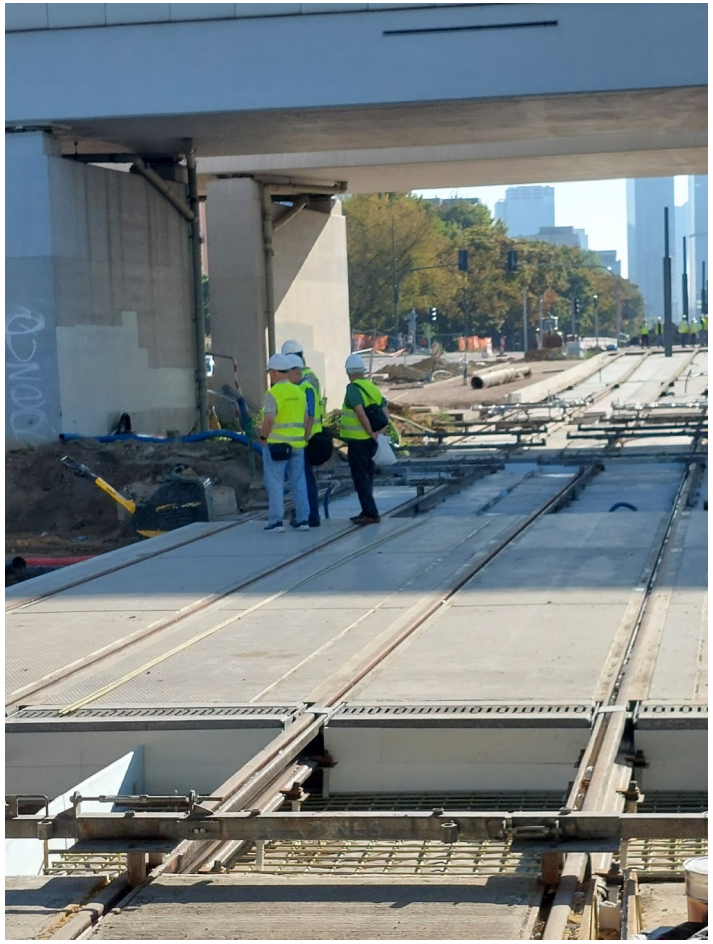
NOTE For fastenings which hold the rail foot, the force application should be at the rail foot and for fastenings which hold the rail web the force should be applied at the rail centroid.



Key
1 longitudinal force (kN)
2 displacement (mm)

Figure 2 — Load-displacement diagram for one loading cycle

TINES® TRAM integrated tram-road track system




https://www.youtube.com/watch?v=Qle08yYa3d4

Thank you for your attention

Solutions for Tram Slab Track structures

TINES® TRAM integrated tram - road surface system

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