

19th Seminar of Track Management STRAHOS 2022

Brief characteristics of the orientation of the scientific research activity of the DRETМ

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13 and 14 October 2022, Poprad, Slovakia

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The orientation of the scientific research activity of the DRETM

- quality diagnostics of the performed construction works,
- quality diagnostics of the track layout and geometry within the slab track and its transition zones to the classical construction of the railway superstructure,
- monitoring of standard and modified sub-ballast layers or transition zones from the point of view of traffic and non-traffic loads.

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The quality diagnostics of the performed construction works

- The DRETM has been involved in the implementation of quality diagnostics of performed construction works of modernized or reconstructed track sections since 2000.
- Quality diagnostics was performed within:
 - a) corridor no. VI: Modernization of the track section Čadca – Skalité,
 - b) corridor no. V: Modernization of the track sections Trnava – Nové Mesto nad Váhom, Nové Mesto nad Váhom – Púchov, Púchov – Žilina, Liptovský Mikuláš– Poprad
 - c) corridor no. IV: Reconstruction of the track section Nové Zámky – Palárikovo.

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The quality diagnostics of the performed construction works

Modernization of the track section Žilina – Púchov

(performing a static plate load test at the sub-ballast upper surface)



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The quality diagnostics of the performed construction works

Modernization of the track section Žilina – Púchov
(performing a dynamic plate load test and a soil investigation)



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The quality diagnostics of the performed construction works

Modernization of the Žilina railway station and adjacent sections
(performing a static plate load test at the level of tie bottom)



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The quality diagnostics of the performed construction works

Modernization of the track section Liptovský Mikuláš – Poprad (performing a static plate load test at the level of subgrade surface and sub-ballast upper surface)



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The quality diagnostics of the performed construction works

Reconstruction of the track section Nové Zámky – Palárikovo
(performing a static plate load test at the subgrade surface)



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The quality diagnostics of the track layout and geometry within the slab track and its transition zones

- Sections of the performance of quality diagnostics of the track layout and geometry:
 - a) Bratislava tunnel no. 1 and its transition zones – application of a slab track structure type ÖBB-PORR.
 - b) Bratislava tunnel no. 2 and its transition zones – application of a slab track structure type SATO.
 - c) Turecký vrch tunnel and its transition zones – application of a slab track structure type RHEDA 2000.
 - d) The bridge over the Váh river in Trenčín – application of a slab track structure type RHEDA 2000.

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Bratislava tunnels no. 1 and no. 2

- Slab track structures – ÖBB-PORR (tunnel no. 1) and SATO (tunnel no. 2)
- Transition zones – combination of cemented ballast bed and track skeleton with concrete sleepers type ŽPSV (tunnel no. 1), reinforced concrete slab + reinforcing rail strings (tunnel no. 2)



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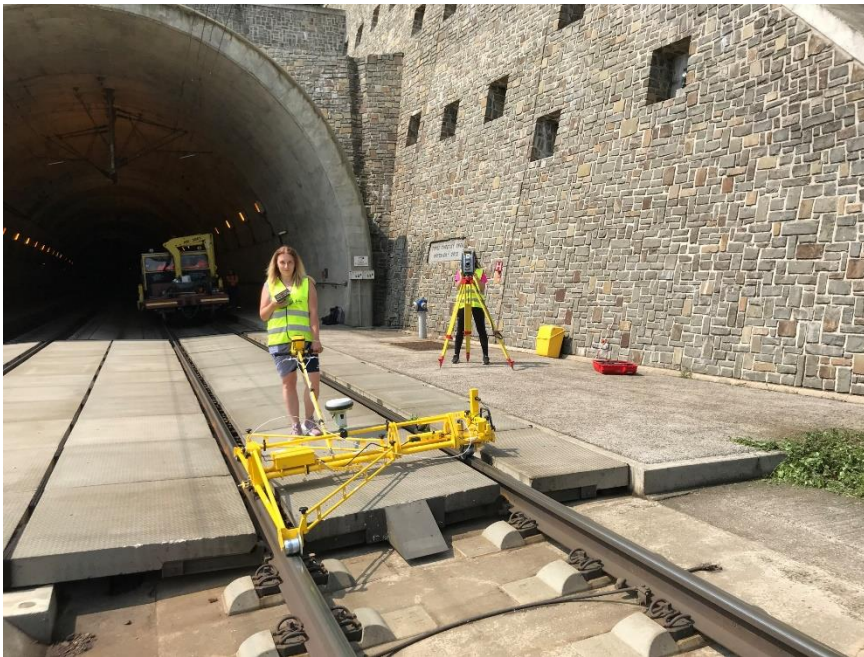
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Turecký vrch tunnel

- Slab track structures – Rheda 2000
- Transition zones – reinforced concrete bath with a layer of elastic mat



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The bridge over the Váh river in Trenčín

- Slab track structure – Rheda 2000
- Transition zones – reinforced concrete bath with a layer of elastic mat



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Monitoring of standard and modified sub-ballast layers

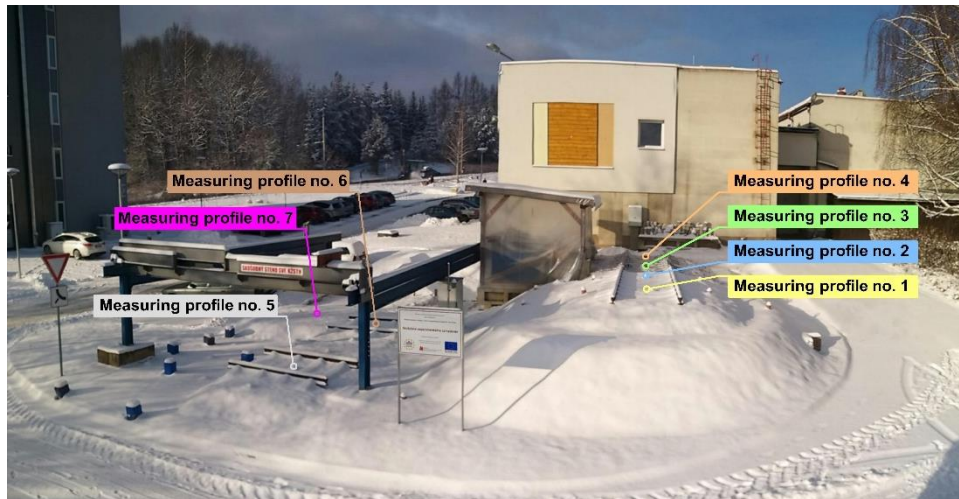
- Monitoring of non-traffic load – Experimental stand DRETM.
- Monitoring of traffic load:
 - a) static load component – Experimental stand DRETM,
 - b) dynamic load component – experimental sections built in a real railway line:
 1. experimental section in the transition zone of the bridge in front of the Svit station (state before modernization)
 2. experimental section in the transition zone of the bridge near the Milochov tunnel (state after modernization)
 3. experimental section in the transition zone of the bridge on the line relocation near the village of Lučivna (new construction)

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Experimental stand DRETM

- the measurement of climatic characteristics has been carried out since 2013,
- consists of 7 measuring profiles with different structural and material composition of the sub-ballast layers,
- thermal-insulating materials such as liapor, liapor concrete, extruded polystyrene, composite foam concrete are built in.



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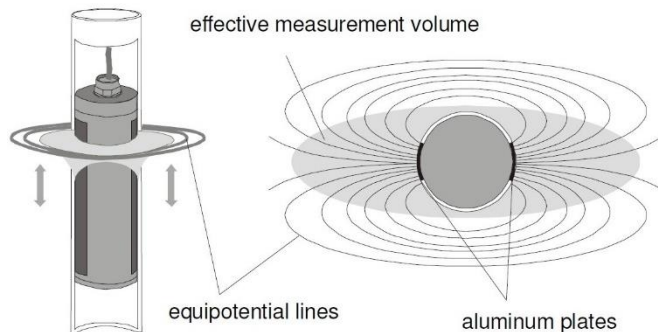
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Non-traffic load monitoring method

- Monitoring of the air temperature and the temperature of individual structural sub-ballast layers (ground thermometers Pt 1000) – measurement performed every 30 minutes



- Moisture monitoring of the individual structural sub-ballast layers – TDR method (TRIME PICO IPH T3 probe)

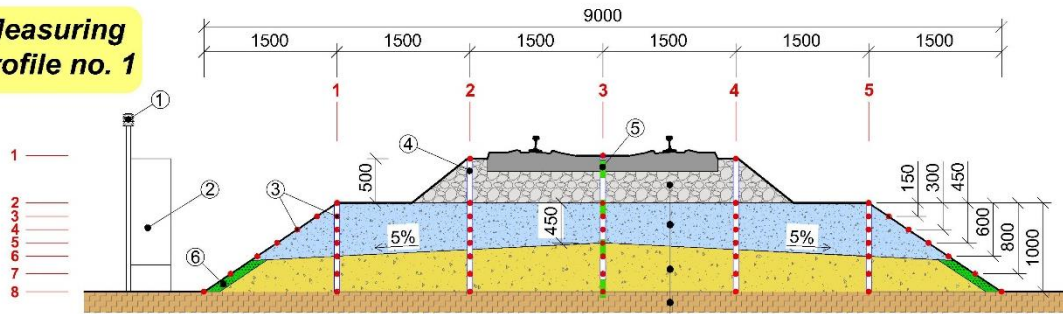


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Experimental stand DRETM

Measuring profile no. 1

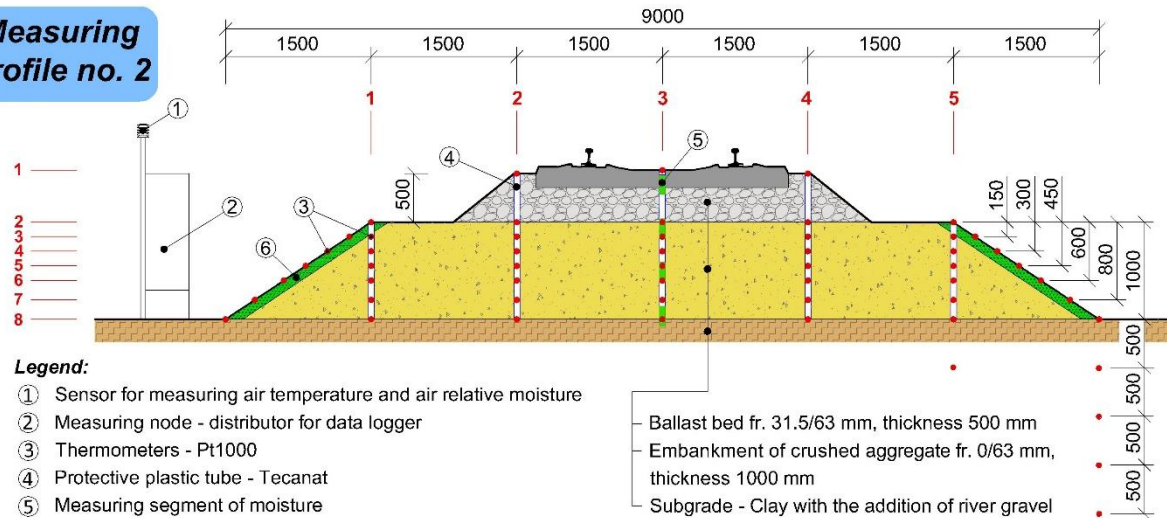


Legend:

- ① Sensor for measuring air temperature and air relative moisture
- ② Measuring node - distributor for data logger
- ③ Thermometers - Pt1000
- ④ Protective plastic tube - Tecanat
- ⑤ Measuring segment of moisture
- ⑥ Humus, thickness 100 mm

- Ballast bed fr. 31.5/63 mm, thickness 500 mm
- Crushed aggregate protective layer fr. 0/31.5 mm, thickness 450 mm
- Embankment of crushed aggregate fr. 0/63 mm, thickness 550 mm
- Subgrade - Clay with the addition of river gravel

Measuring profile no. 2



Legend:

- ① Sensor for measuring air temperature and air relative moisture
- ② Measuring node - distributor for data logger
- ③ Thermometers - Pt1000
- ④ Protective plastic tube - Tecanat
- ⑤ Measuring segment of moisture
- ⑥ Humus, thickness 100 mm

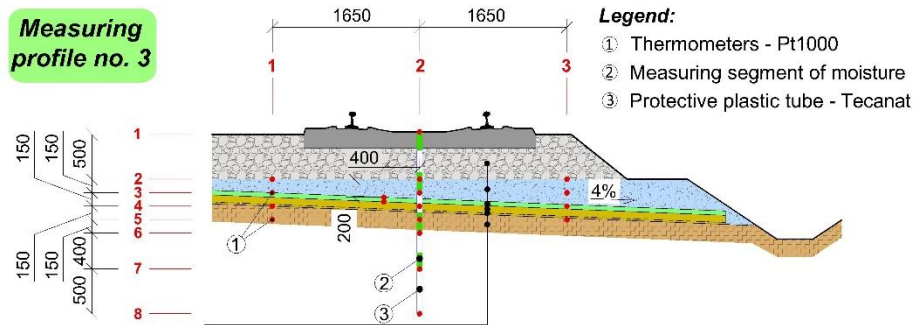
- Ballast bed fr. 31.5/63 mm, thickness 500 mm
- Embankment of crushed aggregate fr. 0/63 mm, thickness 1000 mm
- Subgrade - Clay with the addition of river gravel

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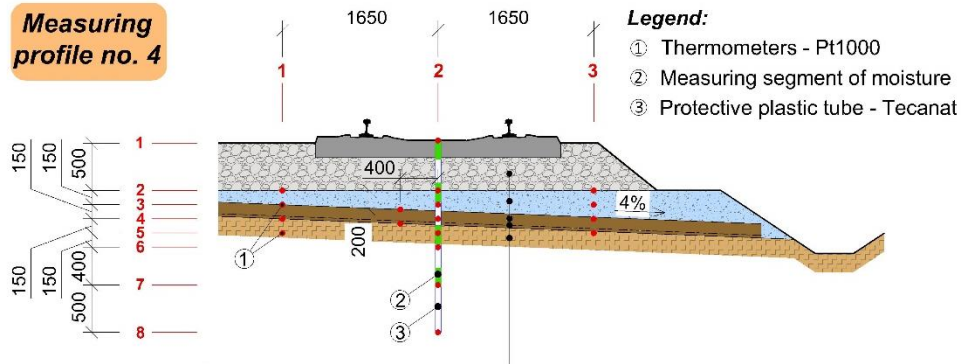
Experimental stand DRETM

Measuring profile no. 3



- Ballast bed fr. 31.5/63 mm, thickness 500 mm
- Crushed aggregate protective layer fr. 0/31.5 mm, thickness 150 mm
- Extruded polystyrene (Styrodrü 2800 CS), thickness 50 mm
- Leveling layer of sand, thickness 100 mm
- Separation geotextile
- Subgrade - Clay with the addition of river gravel

Measuring profile no. 4



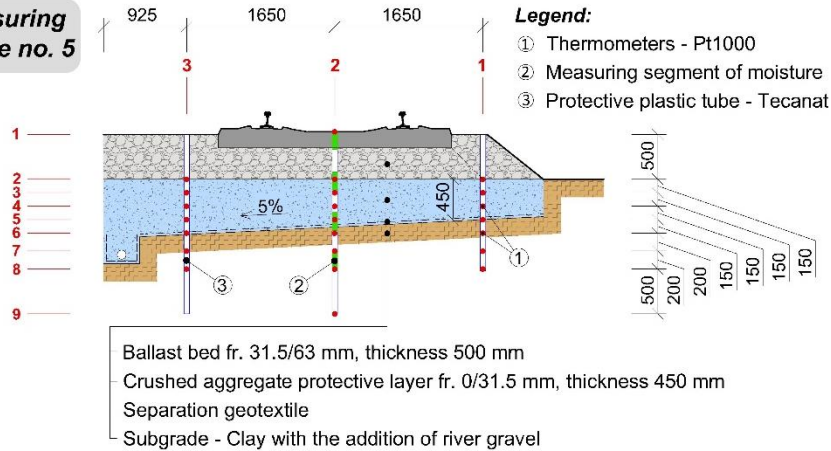
- Ballast bed fr. 31.5/63 mm, thickness 500 mm
- Crushed aggregate protective layer fr. 0/31.5 mm, thickness 150 mm
- Liapor concrete layer LB 12.5, thickness 150 mm
- Separation geotextile
- Subgrade - Clay with the addition of river gravel

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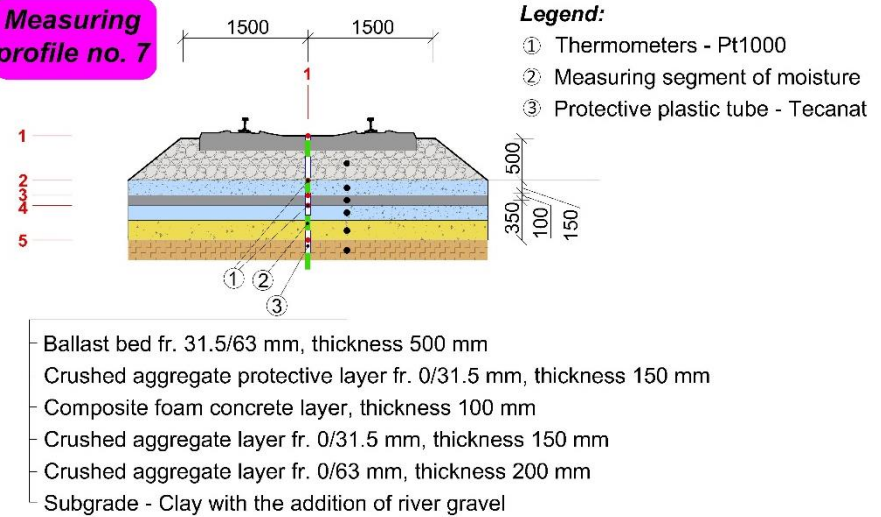


Experimental stand DRETM

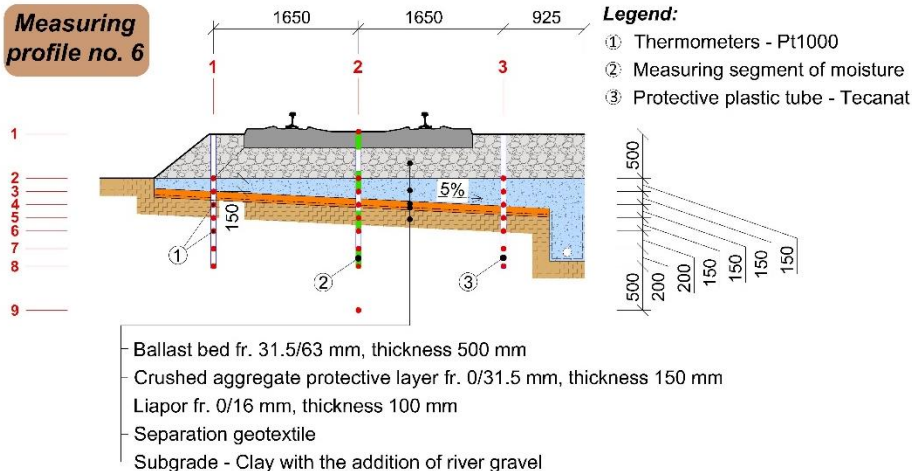
Measuring profile no. 5



Measuring profile no. 7



Measuring profile no. 6



Monitoring of static load component of the traffic load (modified construction of the sub-ballast layers)



a) extruded polystyrene



b) foam glass



c) aggregate of foam glass

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Monitoring of static load component of the traffic load (modified construction of the sub-ballast layers)



d) composite foam concrete

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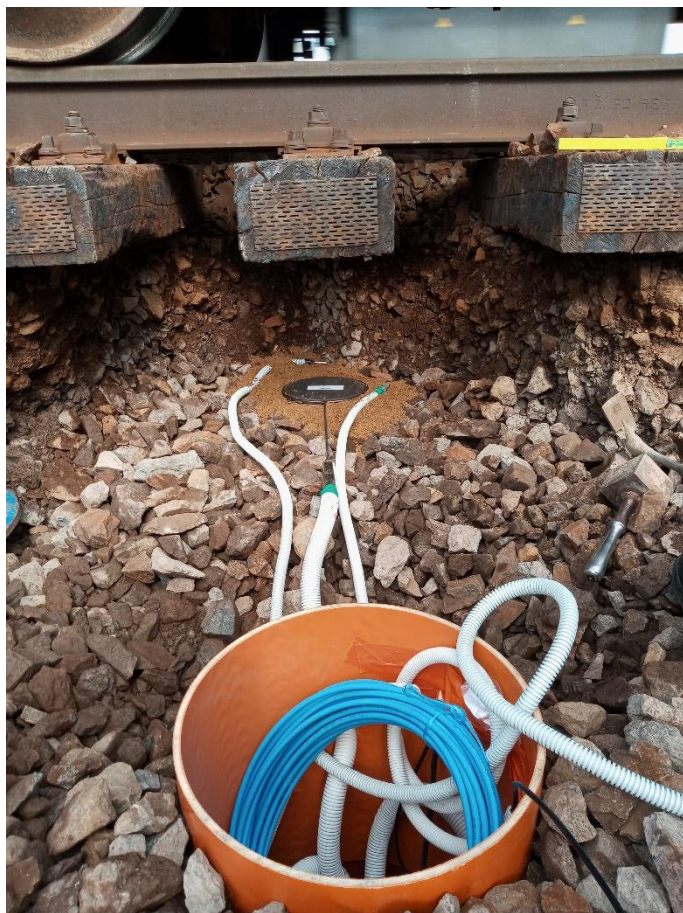


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Monitoring of dynamic load component of the traffic load within transition zones



a) Monitoring of the transition zone of the bridge in front of the Svit station (state before modernization)

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Monitoring of dynamic load component of the traffic load within transition zones



b) Monitoring of the transition zone of the bridge near the Miločov tunnel (state after modernization)

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