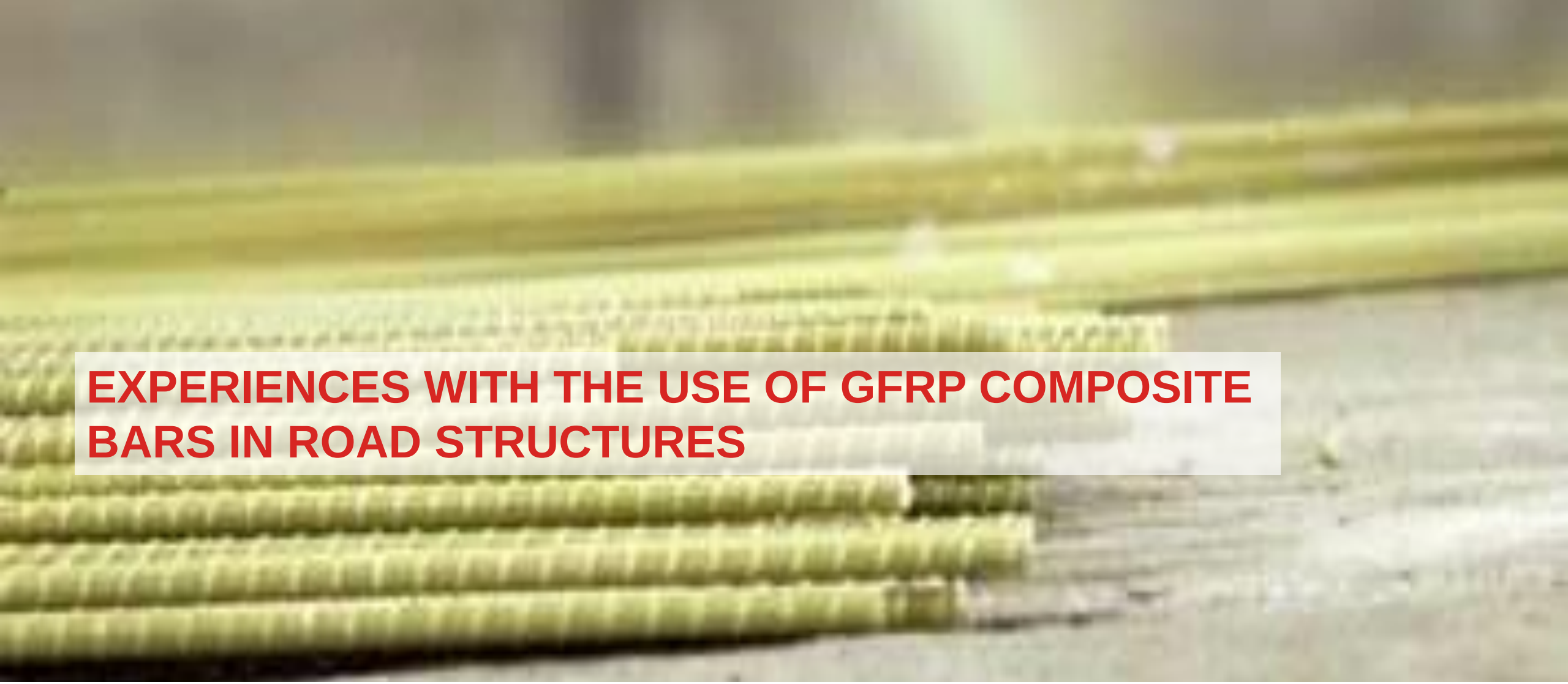

EXPERIENCES WITH THE USE OF GFRP COMPOSITE BARS IN ROAD STRUCTURES

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Laboratorium Badawcze TPA w Pruszkowie

TPA STRABAG TEAMS WORK.

High resistance for tensile strength (2,5 – times higher than steel)

Low weight (1/4 of steel weight)

Resistance to corrosion

Very low thermal conductivity

Lack of electrical conductivity

Low elasticity modulus (1/4 of steel modulus)

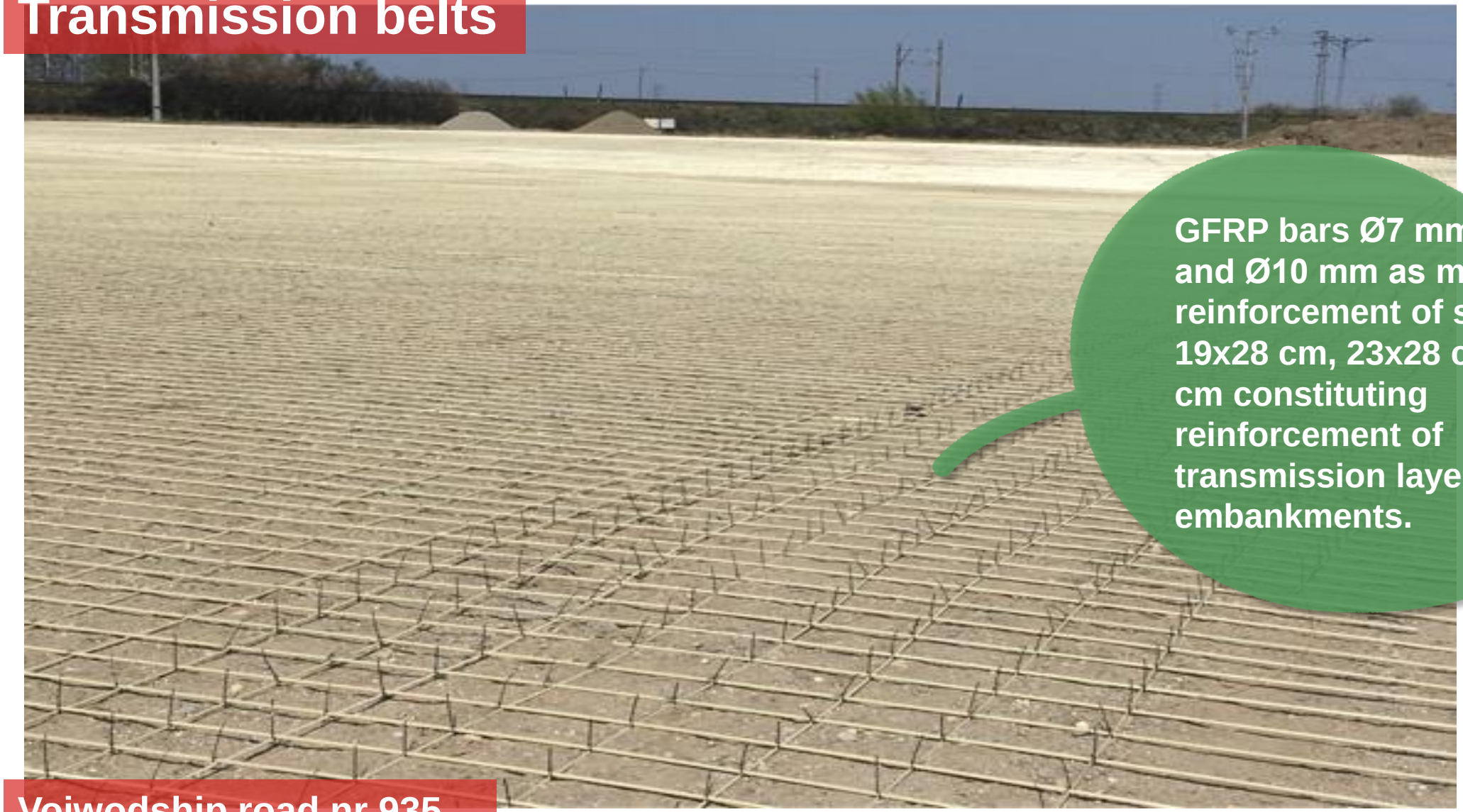
Low fire resistance

Lack of yield point

TPA STRABAG TEAMS WORK.

Formal conditions

Transmission belts



GFRP bars Ø7 mm and Ø10 mm as mesh reinforcement of spacing 19x28 cm, 23x28 cm, 29x28 cm constituting reinforcement of transmission layer of road embankments.

Voiwodship road nr 935

TPA STRABAG TEAMS WORK.

Slab-pavement of bridge structure

GFRP bars Ø7 mm
as a anti-shrinkage mesh of spacing 10x10 cm with 3 cm concrete cover, in thicker slab of bridge structure, being as well a concrete pavement.

Express road S7 section Pieńki - Płońsk

TPA STRABAG TEAMS WORK.

Slab of tram subbase

GFRP bars Ø12 mm each 10 cm as a mesh reinforcement of concrete slabs of tram subbase with concrete cover of 3 cm.

Tram communication system in Warsaw

TPA STRABAG TEAMS WORK.

Slabs of tram subbase

GFRP bars Ø10 mm each 10 cm as a mesh reinforcement of concrete slabs of tram subbase with concrete cover of 3 cm.

Tram communication system in Grudziądz

TPA STRABAG TEAMS WORK.

Retension reservoirs

GFRP bars Ø16 mm
As a mesh reinforcement of spacing 15x15 cm, in concrete bottom slabs of retension reserviors.

Grodzisk Mazowiecki by-pass along DW 579

TPA STRABAG TEAMS WORK.

Doveled concrete pavement

GFRP bars
Ø26 mm
As dovels in concrete pavement.

MOP Starcza Wschód on A1 Motorway

TPA STRABAG TEAMS WORK.

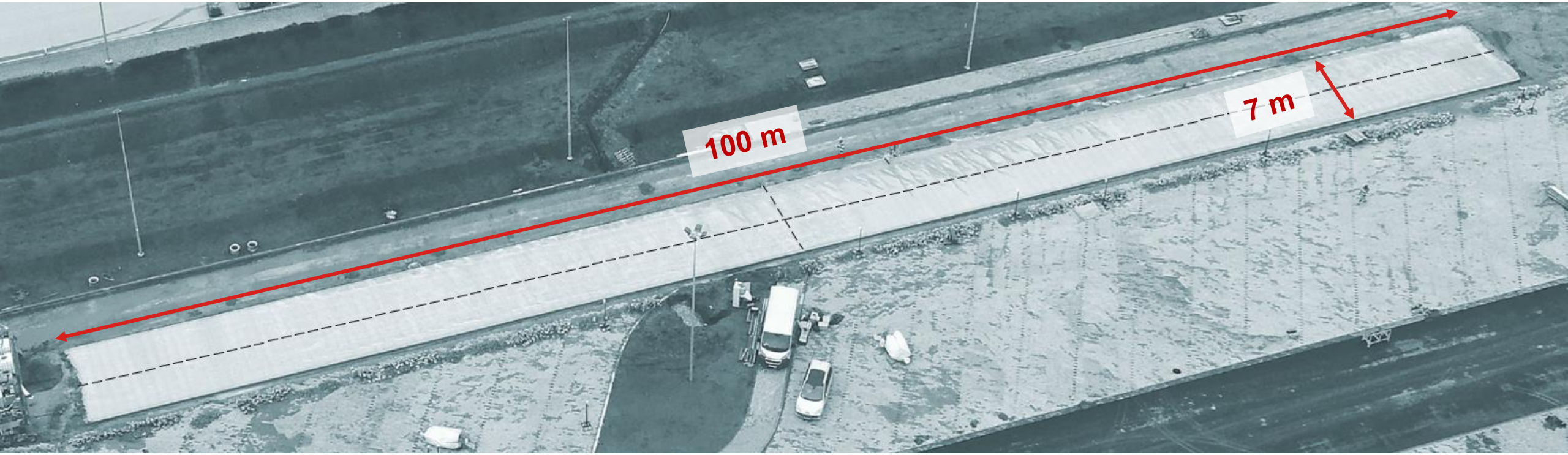
Concrete pavement with continuous reinforcement

GFRP bars Ø18 mm each 18 cm or 12 cm (longitudinal reinforcement) and GFRP bars Ø10 mm each 70 cm (diagonal reinforcement) as continuous reinforcement of concreto pavement

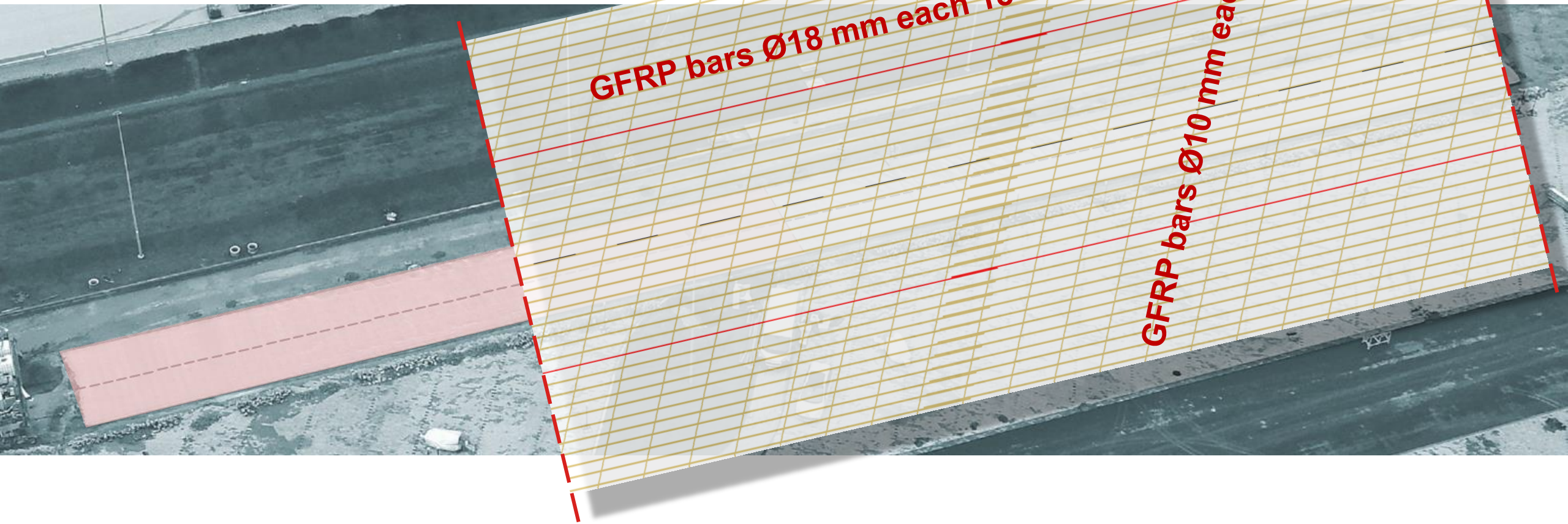
MOP Starcza Wschód on A1 Motorway

TPA STRABAG TEAMS WORK.

Concrete pavement with continuous reinforcement GFRP - MOP Starcza-Wschód

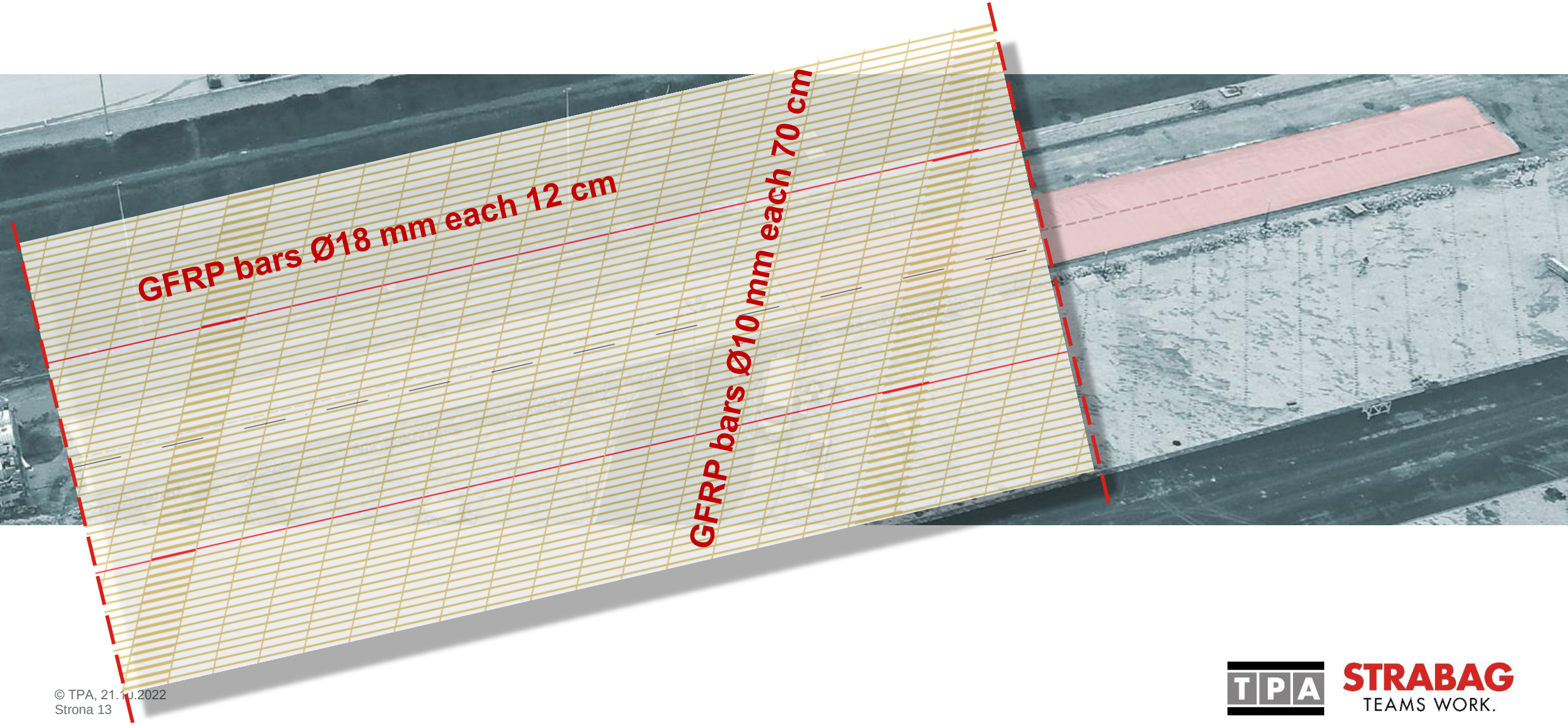


Reinforcement ratio 0,6%



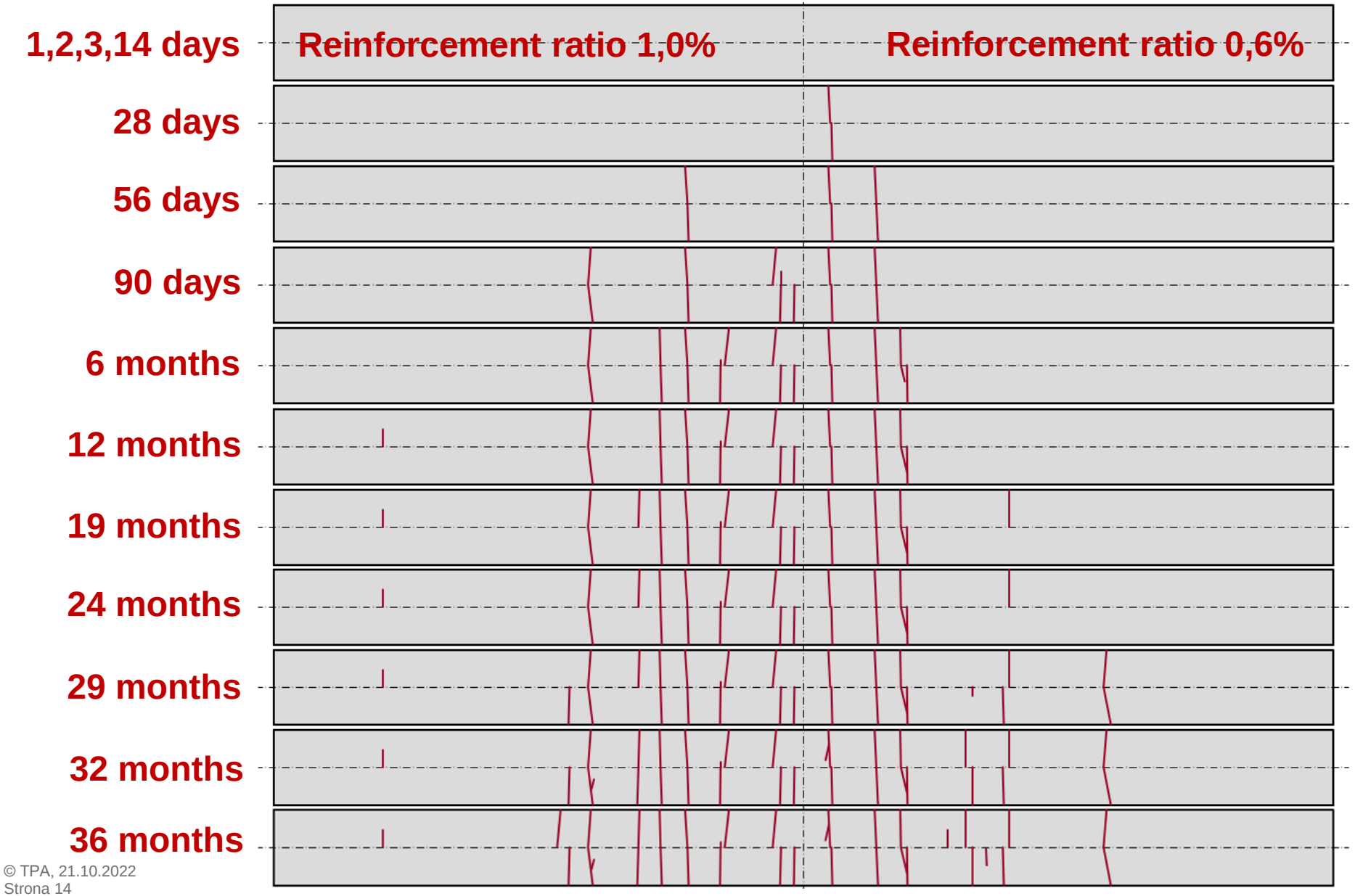
TPA STRABAG TEAMS WORK.

Reinforcement ratio 1,0%



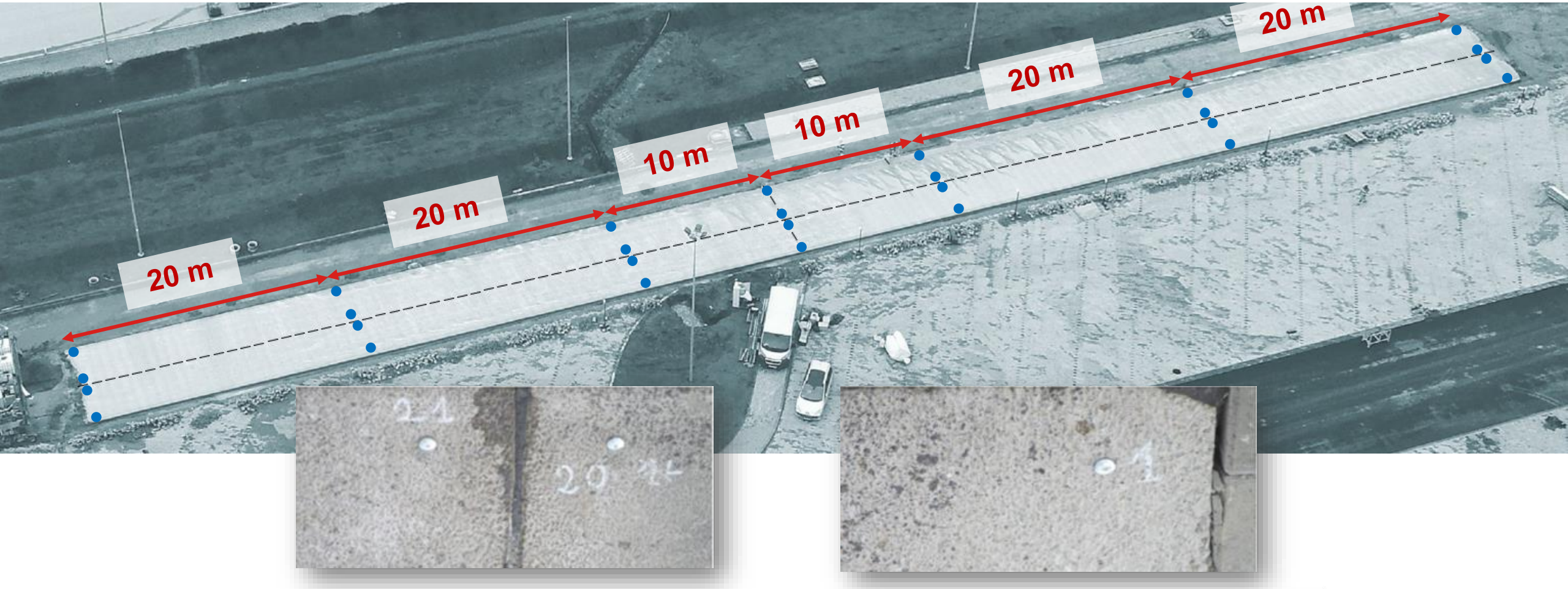
TPA STRABAG TEAMS WORK.

Visual assessment of pavement cracks

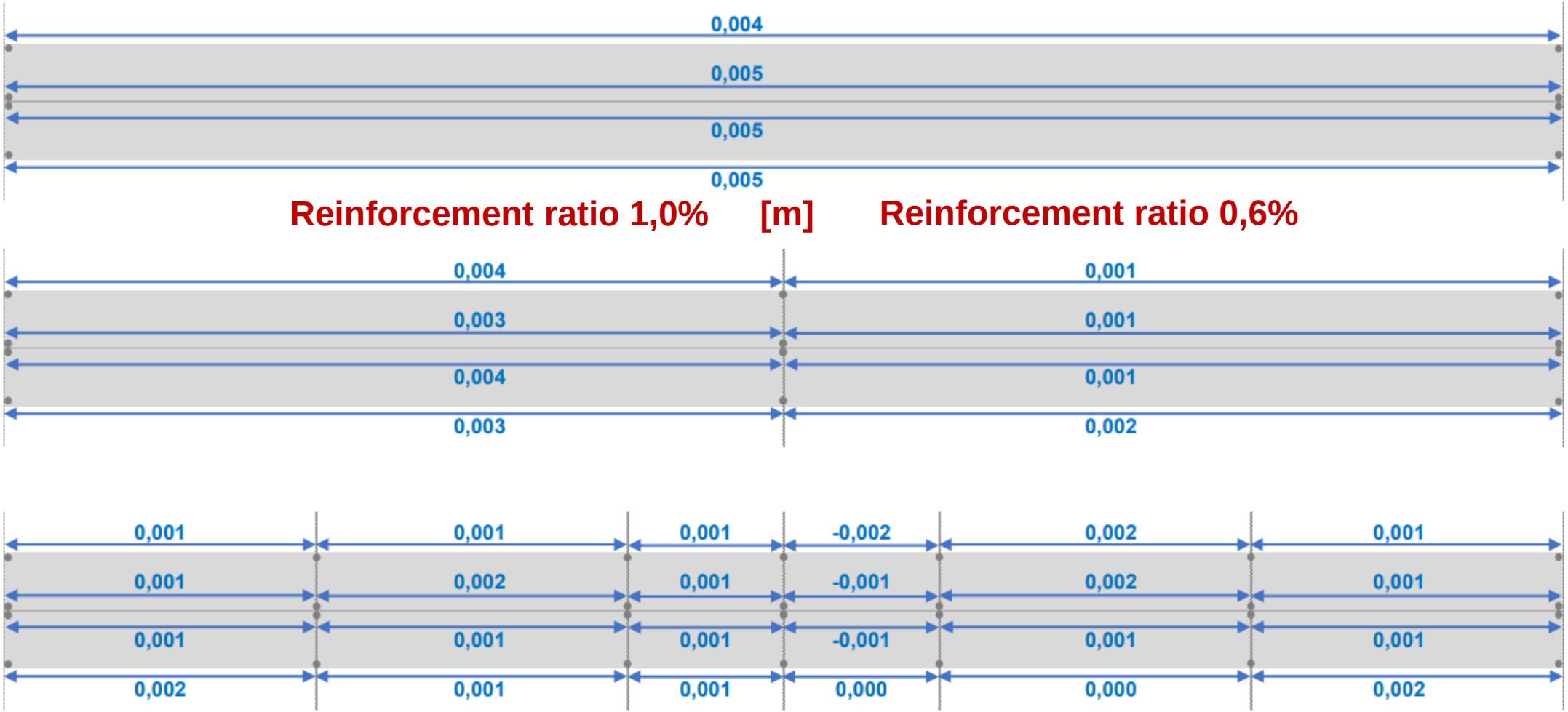


TPA STRABAG TEAMS WORK.

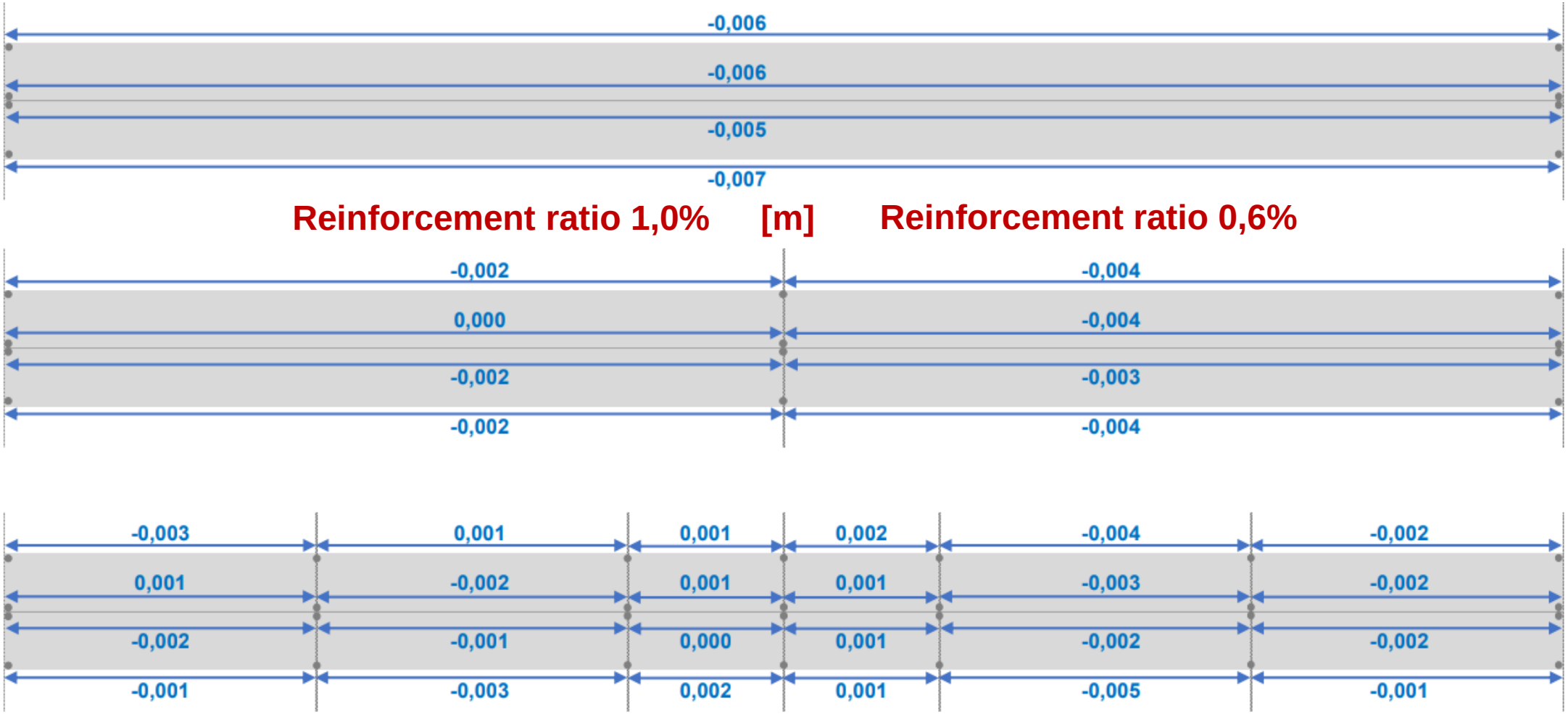
Location of geodetic benchmarks



12.08.2020 Outdoor temperature +26ºC



17.01.2021 Outdoor temperature -12ºC



Location of measuring sensors on MOP Starcza-Wschód

TPA STRABAG TEAMS WORK.

Location of measuring sensors on MOP Starcza-Wschód

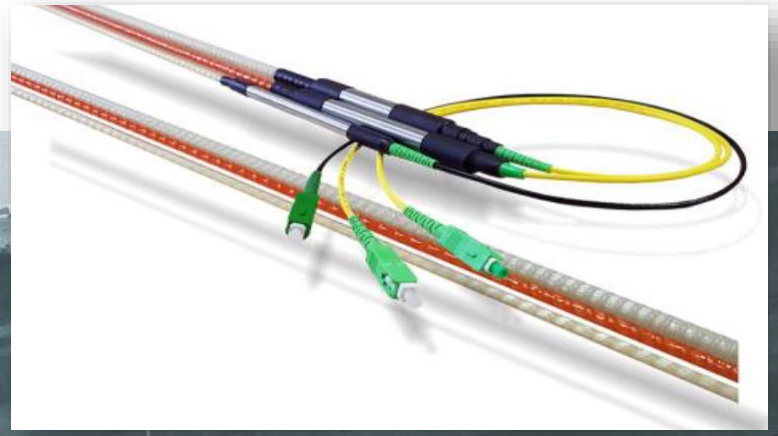
Measuring lines with fiber optic sensors in longitudinal reinforcement bars

TPA STRABAG TEAMS WORK.

Location of measuring sensors on MOP Starcza-Wschód

Measuring lines with fibre optic sensors in diagonal reinforcement bars

Location of measuring sensors on MOP Starcza-Wschód

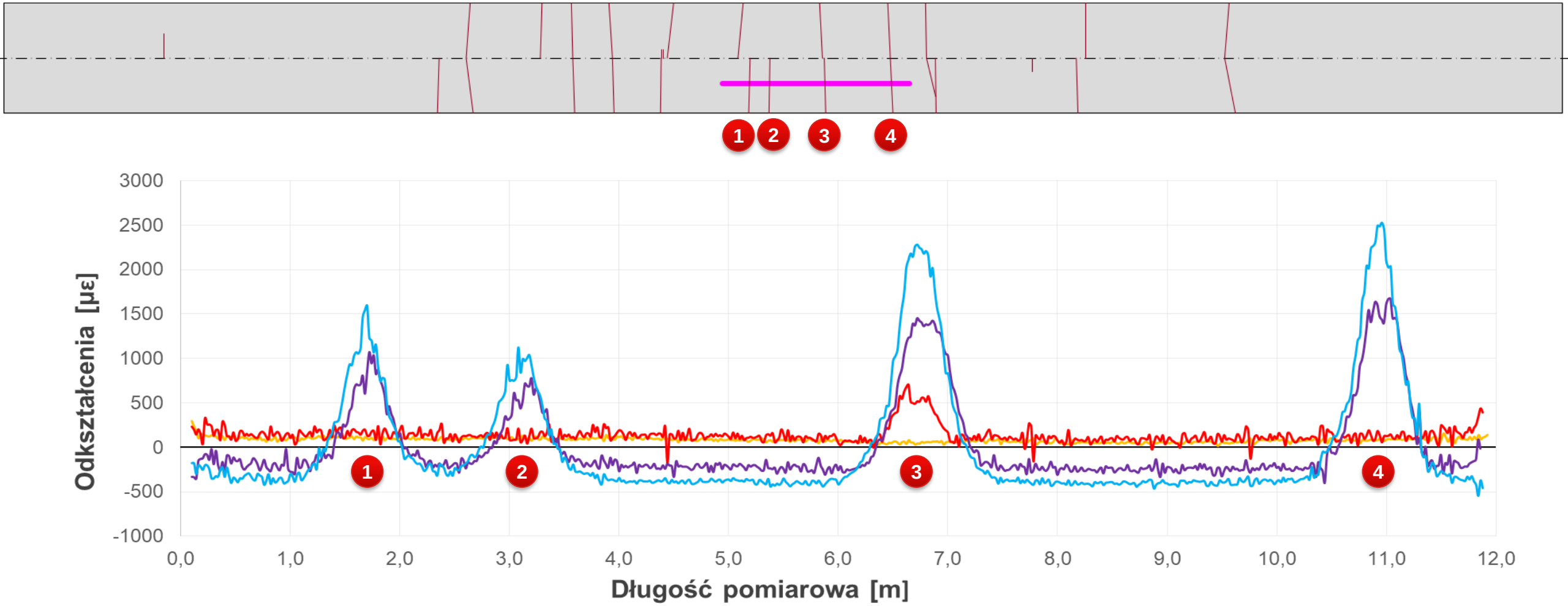


Measuring lines with additional fibre optic sensors over and below longitudinal reinforcement bars

TPA STRABAG TEAMS WORK.

Location of measuring sensors on MOP Starcza-Wschód

Fibre optic sensors (line 2/bar 6)



dzień po betonowaniu
temp. betonu 25°C
(maj)

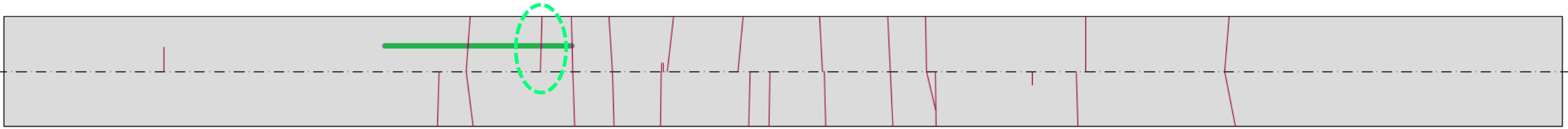
28 dni po betonowaniu
temp. betonu 29°C
(czerwiec)

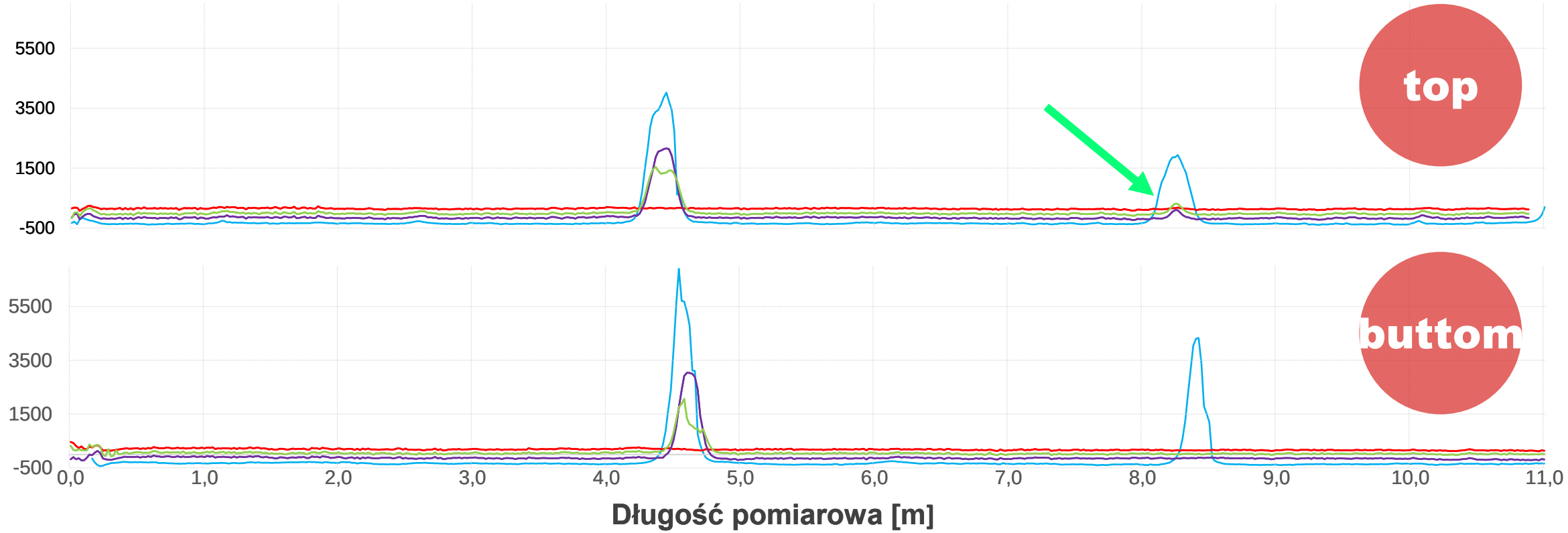
6 miesięcy po betonowaniu
temp. betonu 5,5°C
(listopad)

20 miesięcy po betonowaniu
temp. betonu -5°C
(styczeń)

TPA STRABAG TEAMS WORK.

Fibre optic sensors (ER1 upper and bottom of slab)





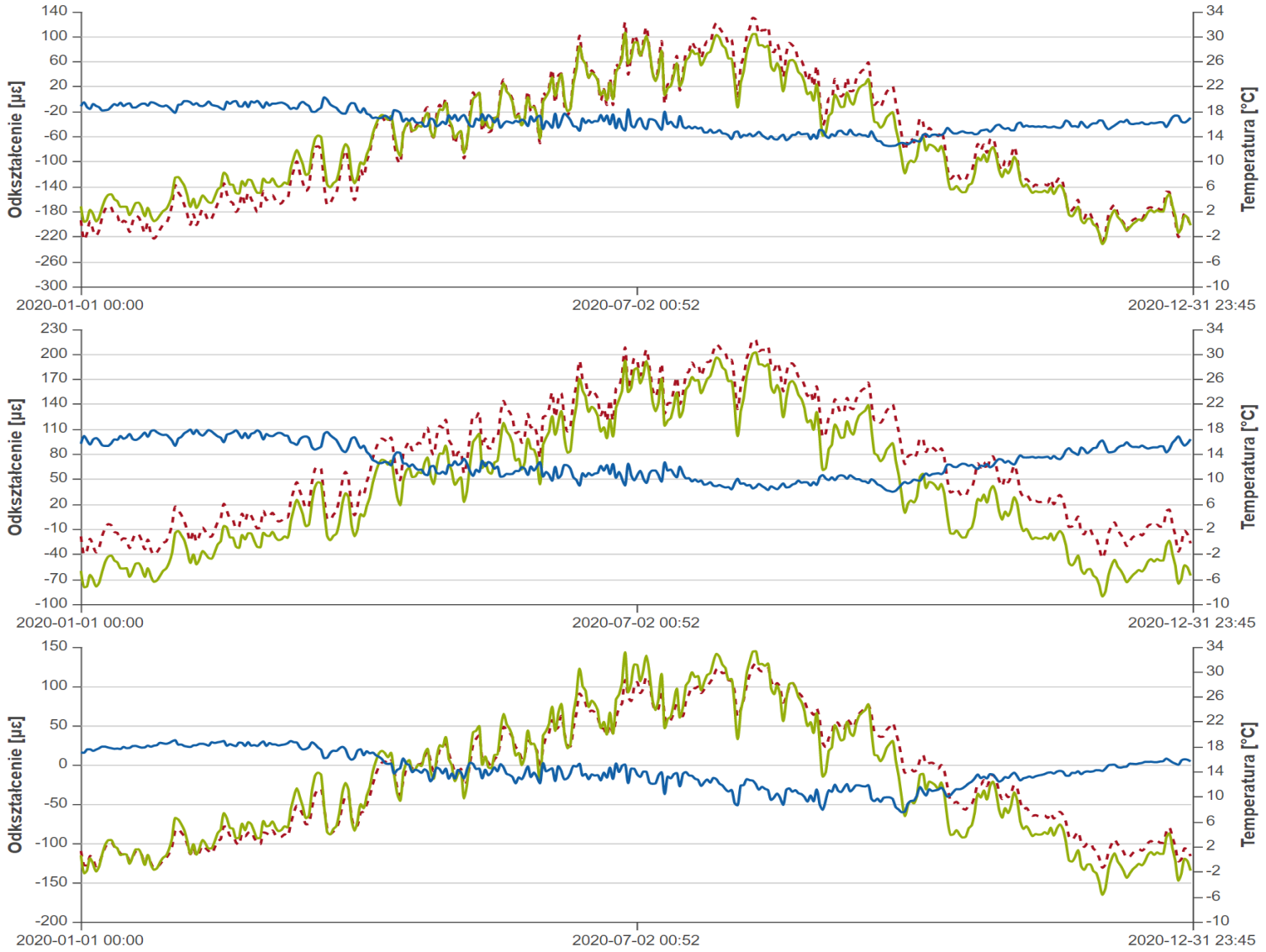
28 dni po betonowaniu
temp. betonu 29°C (czerwiec)

6 miesięcy po betonowaniu
temp. betonu 5,5°C (listopad)

12 miesięcy po betonowaniu
temp. betonu 25°C (maj)

20 miesięcy po betonowaniu
temp. betonu -5°C (styczeń)

Examples of results dated since 01.01 to 31.12.2020 (P7)

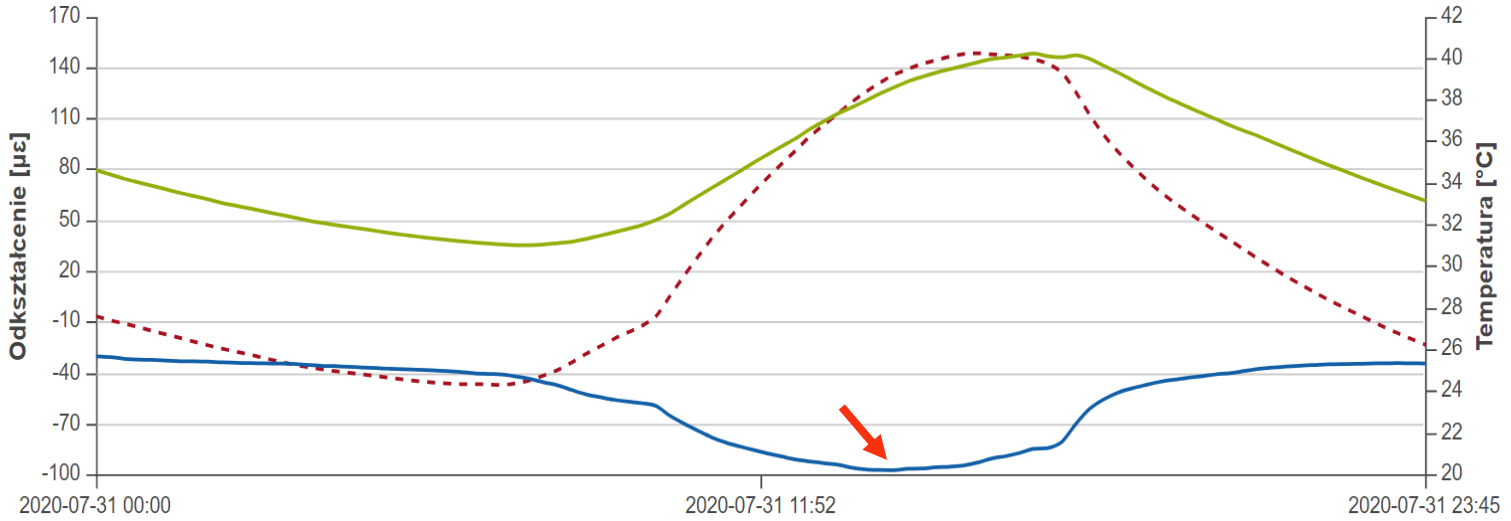


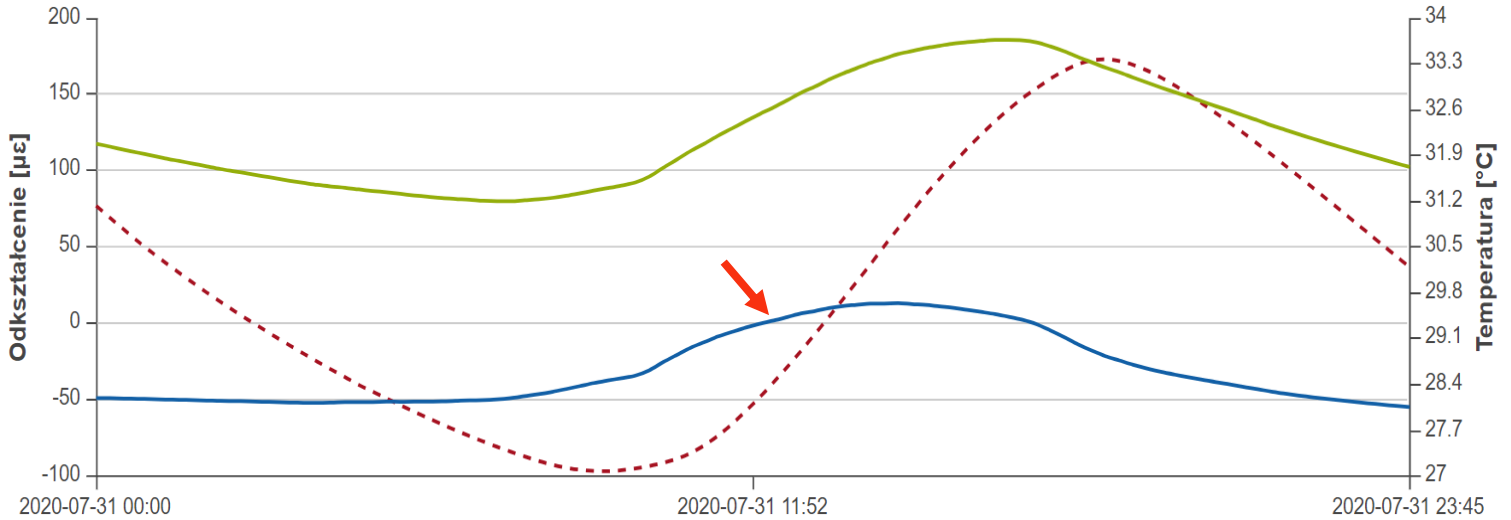
Temperatura

Odkształcenia rzeczywiste **ε(L)**

Odkształcenia powodujące naprężenia **ε(N)**

Examples of daily results (31.07.2020) (p7)





Temperatura

Odkształcenia rzeczywiste **ε(L)**

Odkształcenia powodujące naprężenia **ε(N)**

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