НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ
СТРОИТЕЛЬНЫЙ УНИВЕРСИТЕТ

SP **443.1325800.2019**
Bridges with aluminum alloy structures
Extension for road bridges

Moscow 2020

НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ СТРОИТЕЛЬНЫЙ УНИВЕРСИТЕТ

RUSAL- MGSU R&D joint program 2020 for road bridges made of aluminum alloys

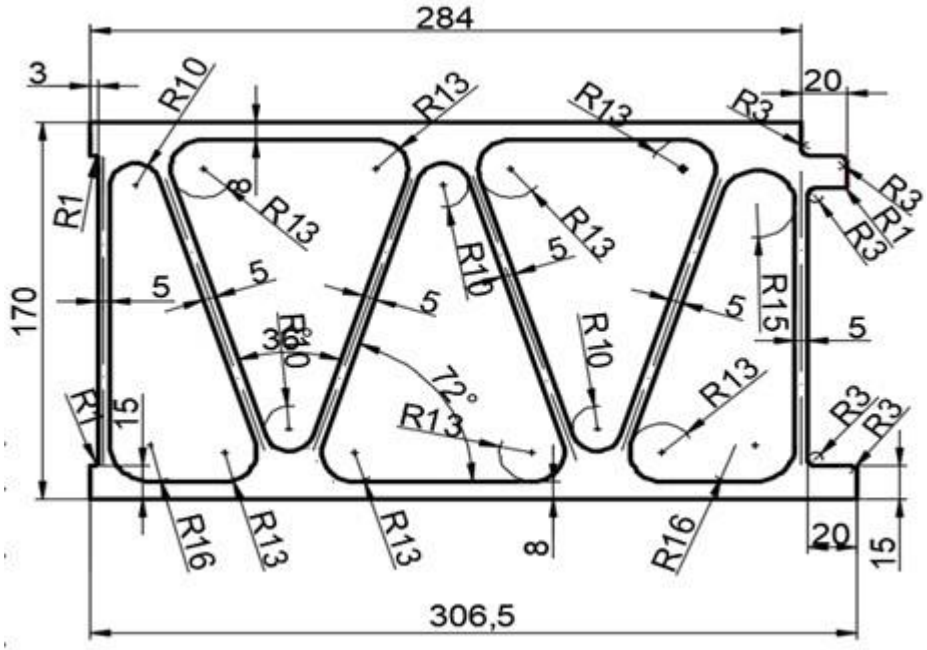
The program was compiled based on the results of the meeting in the Ministry of CONSTRUCTION 4.04.2019

- Investigation of physical and mechanical properties of structural elements and joints made of aluminum alloy 6082 T6 under operational effects on bridge structures.
- Design, scientific and technical support of production of orthotropic plates made of aluminum alloys.
- Static and fatigue tests of orthotropic plates and connecting units without road surface and with road surface.
- Testing of welded joints and joints with high-strength bolts.
- Determination of the corrosion resistance of structural components in extreme temperature and humidity conditions.
- Investigation of the dynamic nature of the work of bridge structures made of aluminum alloys, determination of the vibration decrement and dynamic parameters of calculation for wind and seismic loads
- Scientific and technical support for the design and construction of the road bridge made of aluminum alloy 6082 T6.

Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Drawings of the elements of the orthotropic plate developed by MGSU R&D.

Block 1



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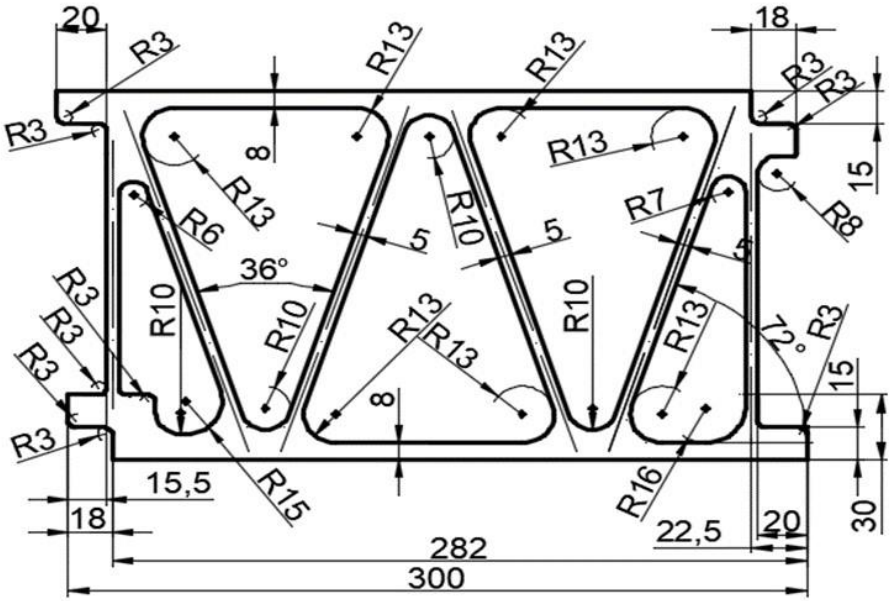
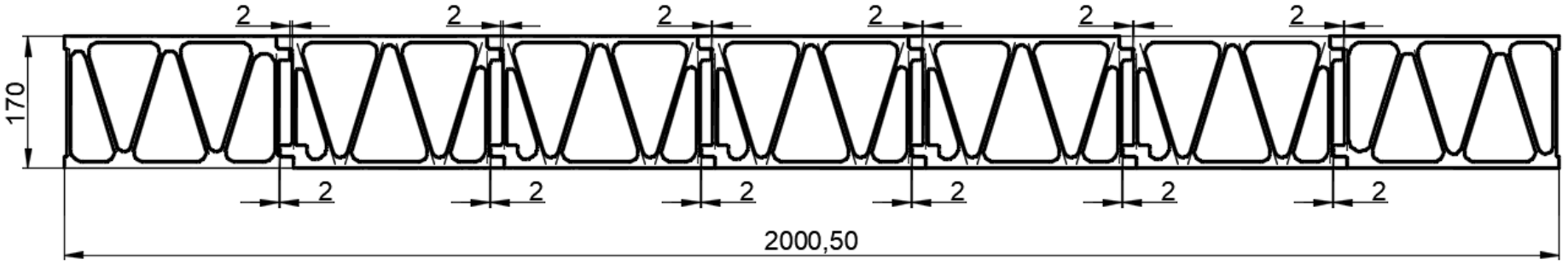
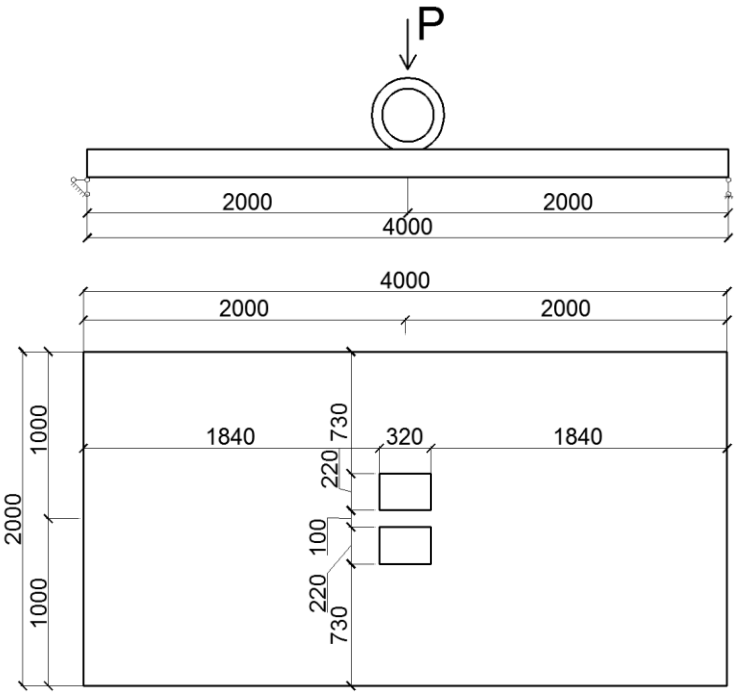


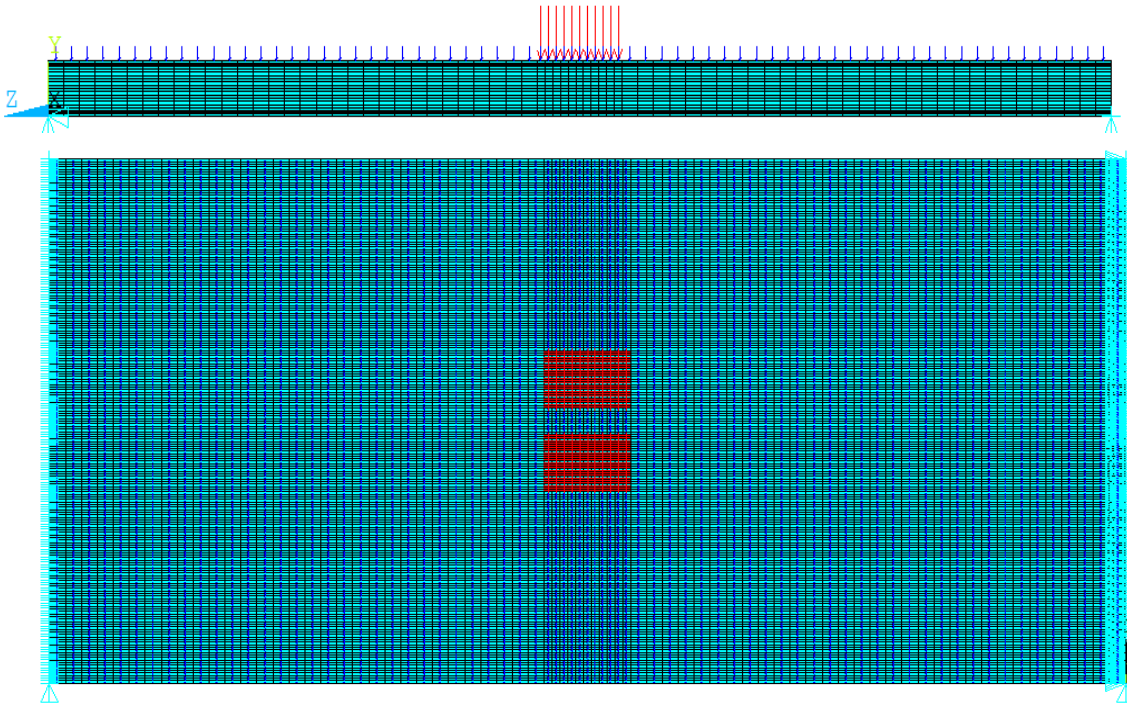


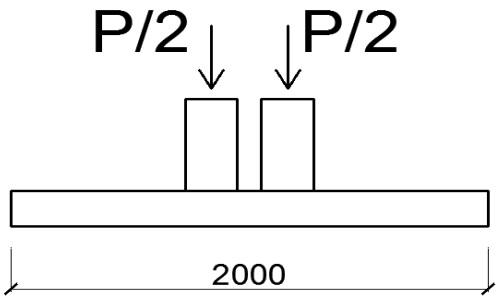
Research and development of SP «Bridges with aluminum alloy structures» for road bridges

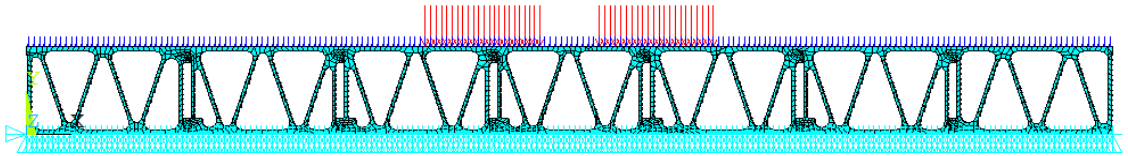
Computer simulation of the orthotropic plate operation.

Load on the plate



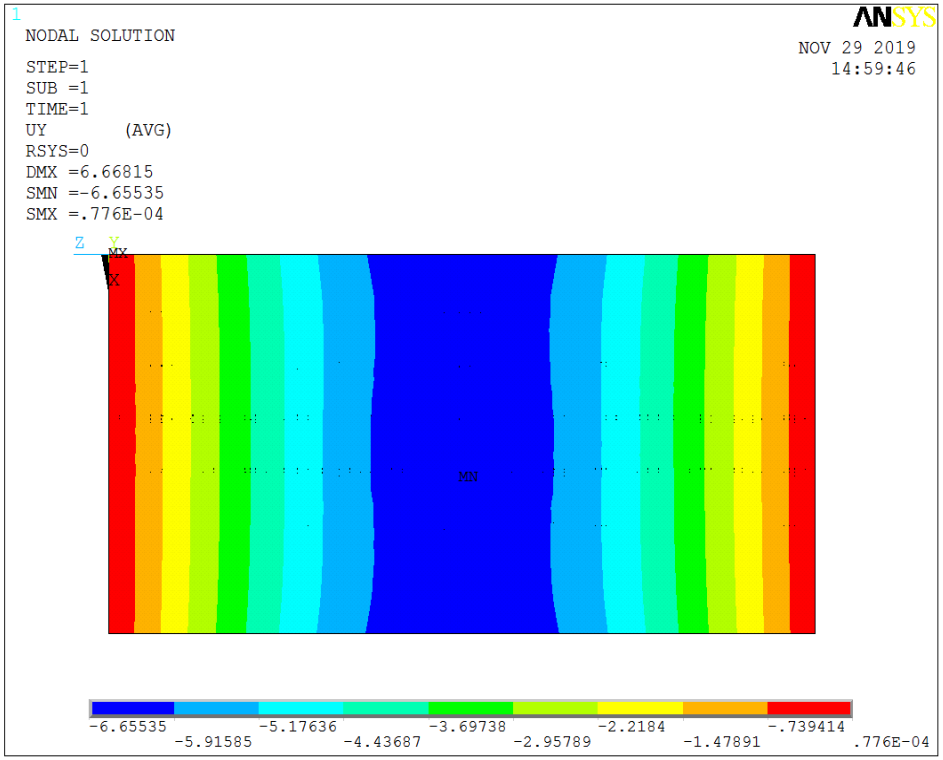


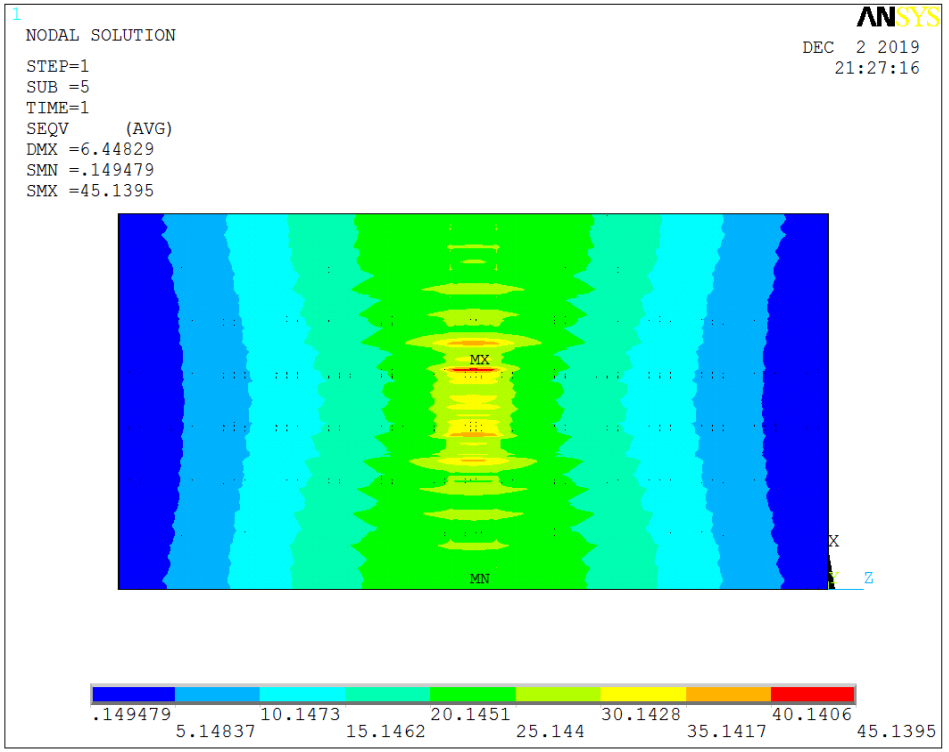




Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Computer simulation of orthotropic plate operation in the ANSYS FEM system. Displacements and stresses.





Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Elements of an orthotropic plate extruded at the KraMZ plant (Krasnoyarsk) and welded at the Sespel plant (Cheboksary)

Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Ready-made orthotropic plates for testing in MGSU R&D

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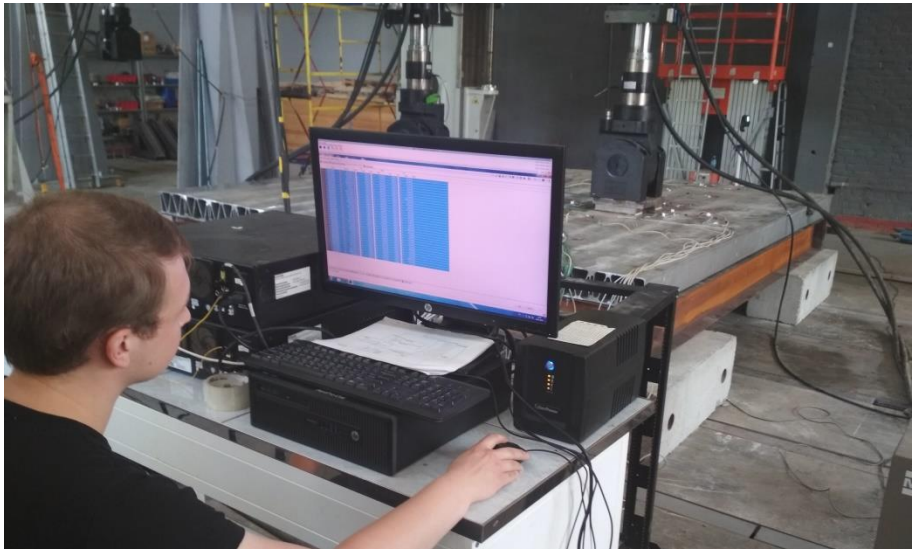
Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Preparation for testing of orthotropic plates in MGSU R&D



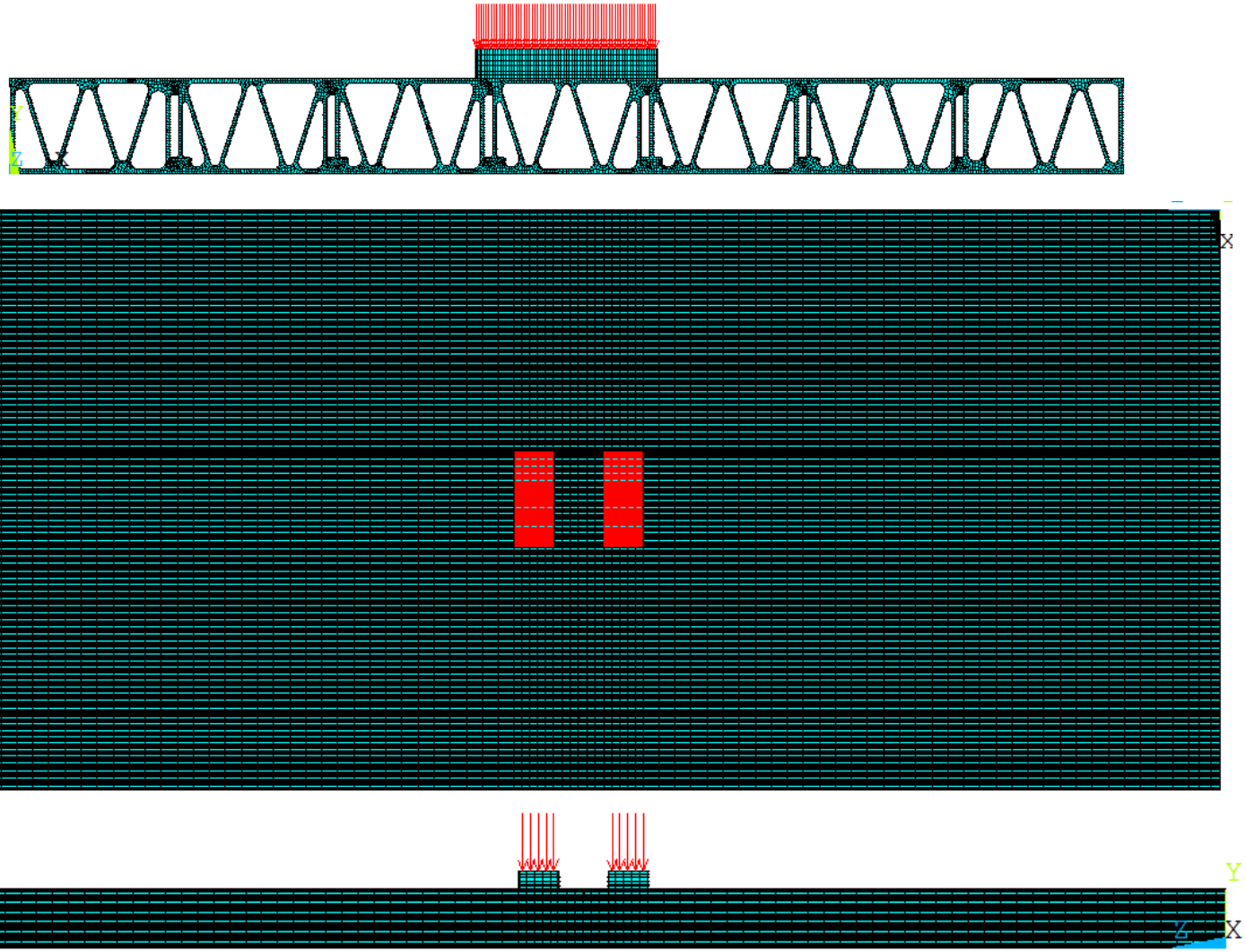
Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Preparation for testing of orthotropic plates in MGSU R&D (sensors installation)

Research and development of SP «Bridges with aluminum alloy structures» for road bridges

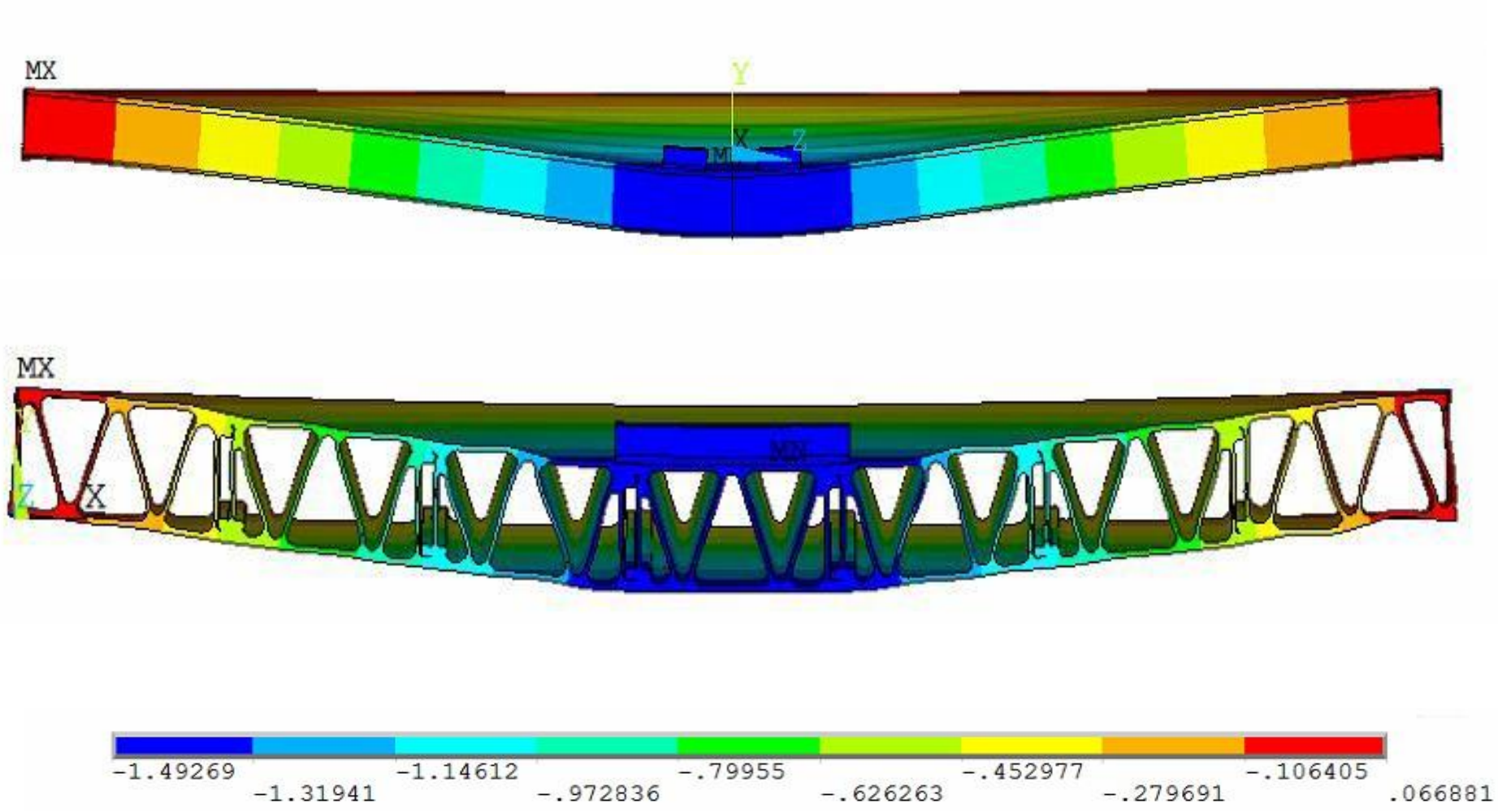
Computer simulation of the orthotropic plate operation, 2.0×4.0×0.17 m

Load on the plate P= 2×9=18 tonn (A14 acc.to SP 35)



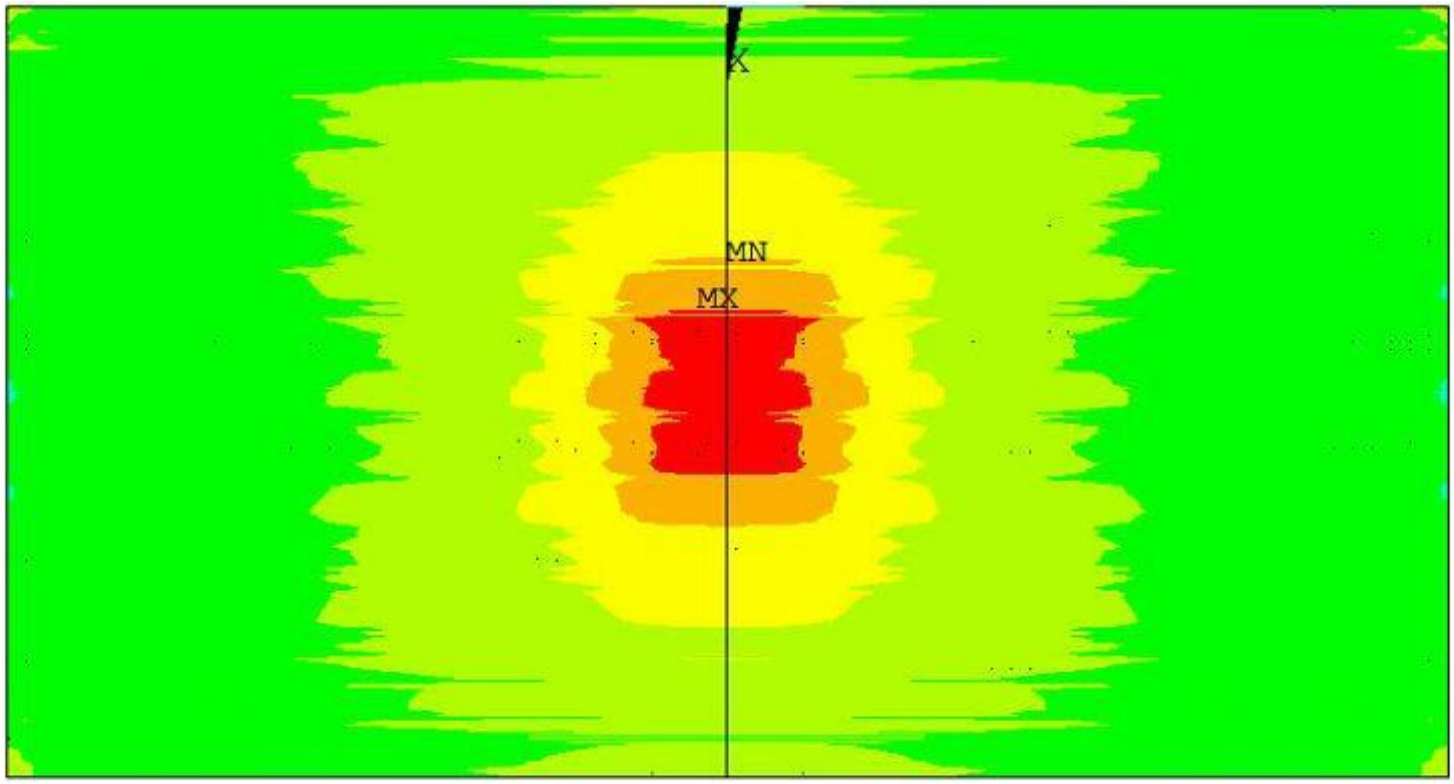
Research and development of SP «Bridges with aluminum alloy structures» for road bridges

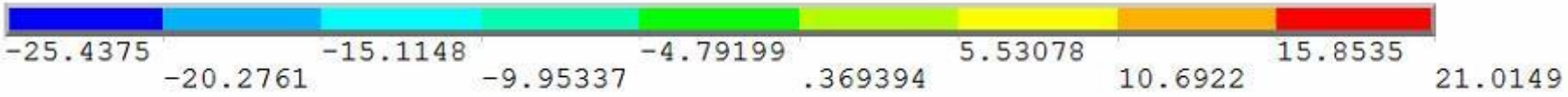
Deflection,
mm



Research and development of SP «Bridges with aluminum alloy structures» for road bridges

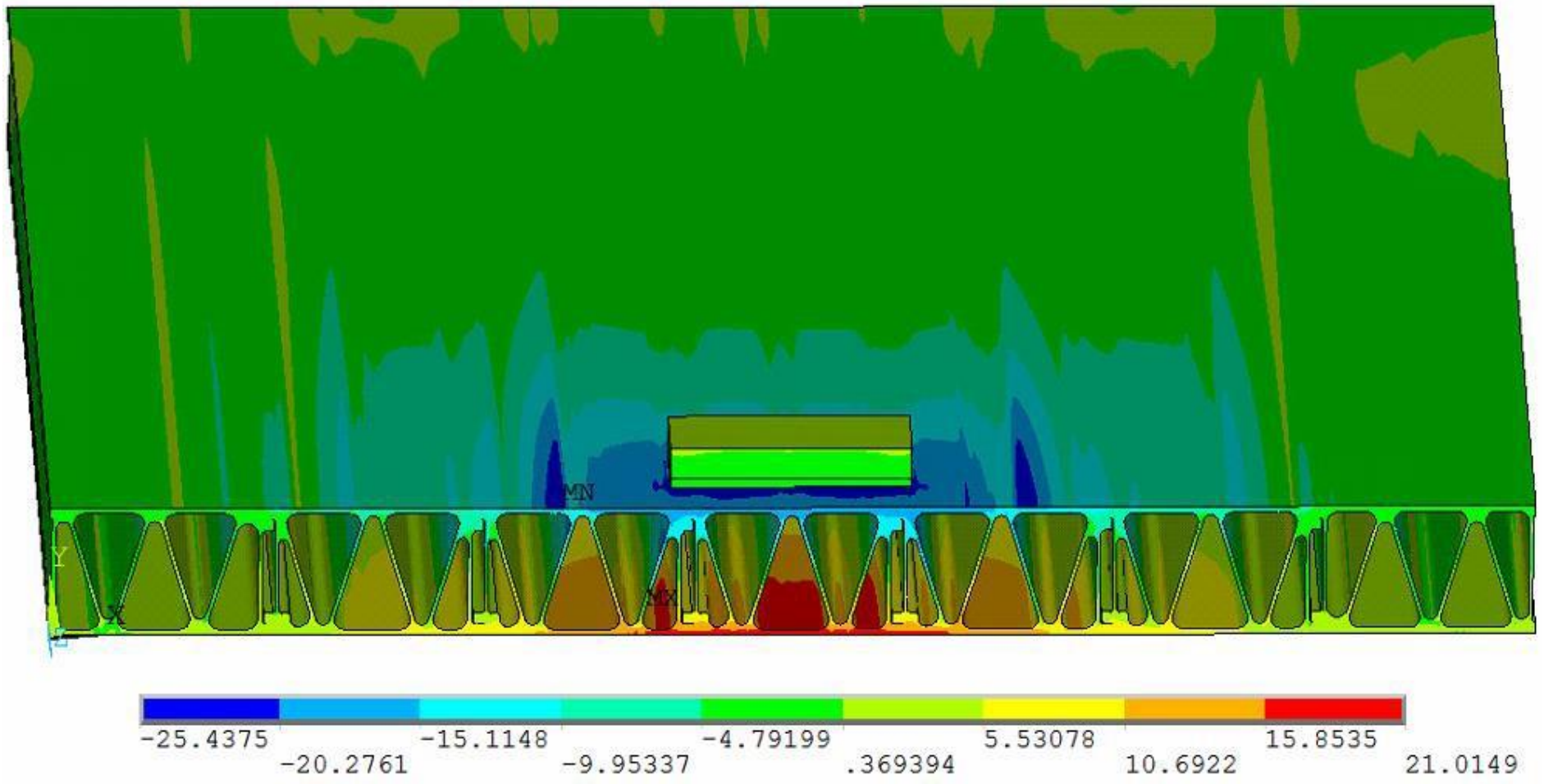
Stresses σz (along the plate) in lower panel, MPa





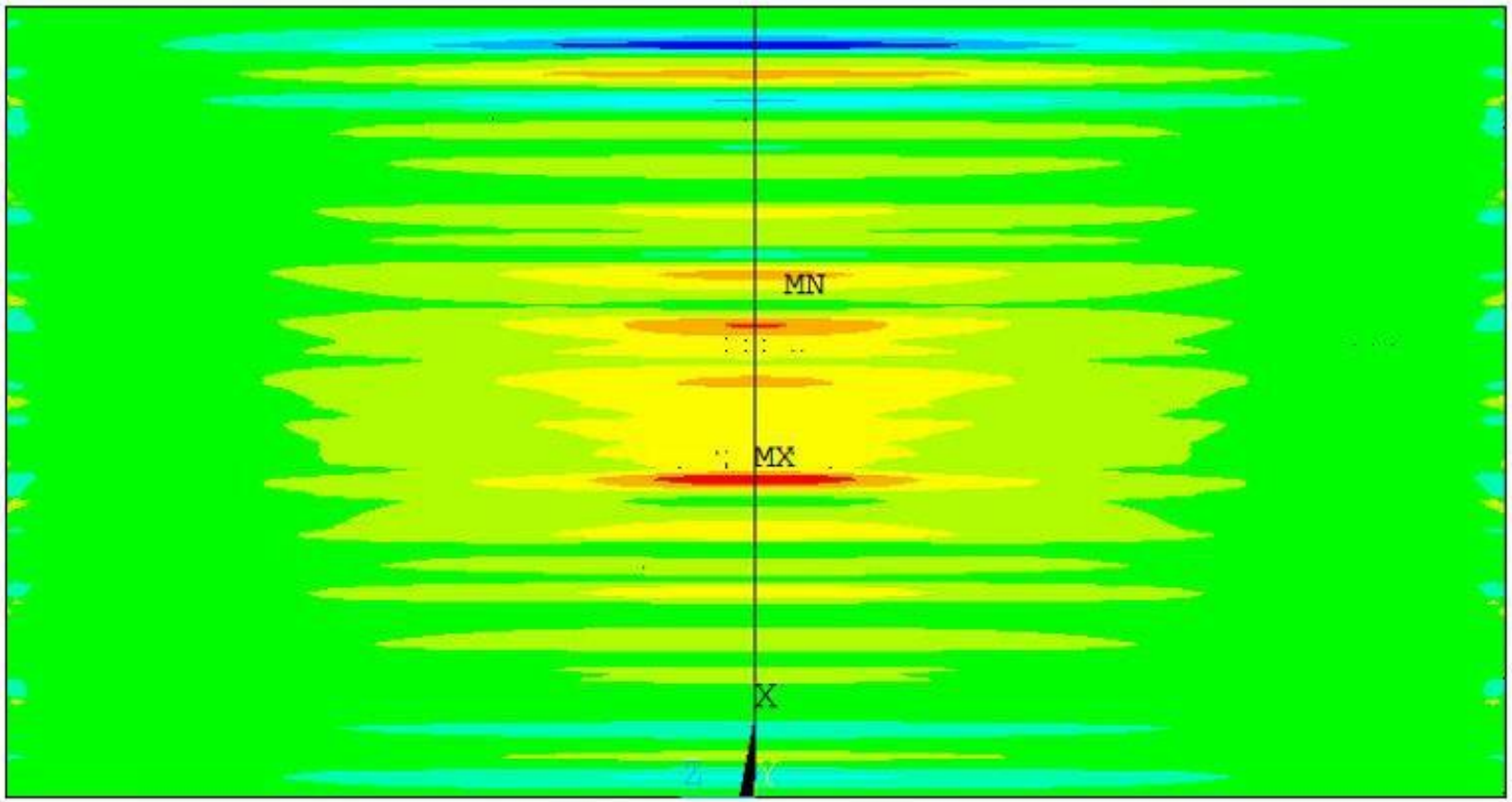
Research and development of SP «Bridges with aluminum alloy structures» for road bridges

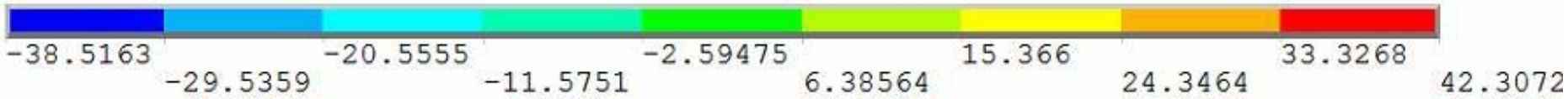
Stresses σz (along the plate) in lower panel, MPa
Section top view



Research and development of SP «Bridges with aluminum alloy structures» for road bridges

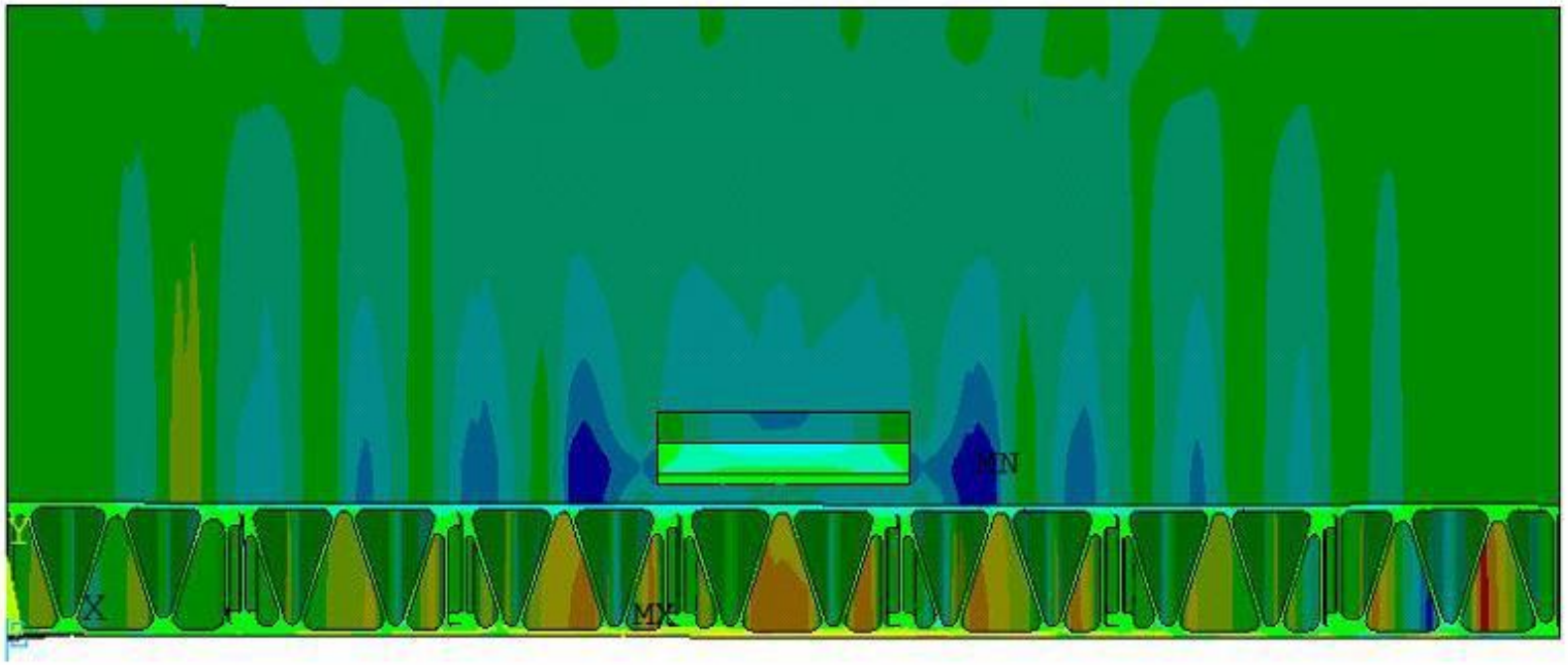
Stresses σx (across the plate) in lower panel, MPa

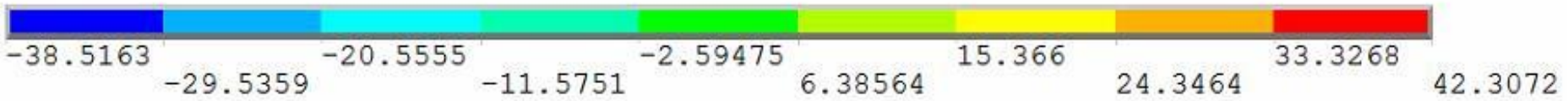




Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Stresses σx (across the plate) in lower panel, MPa
Section top view



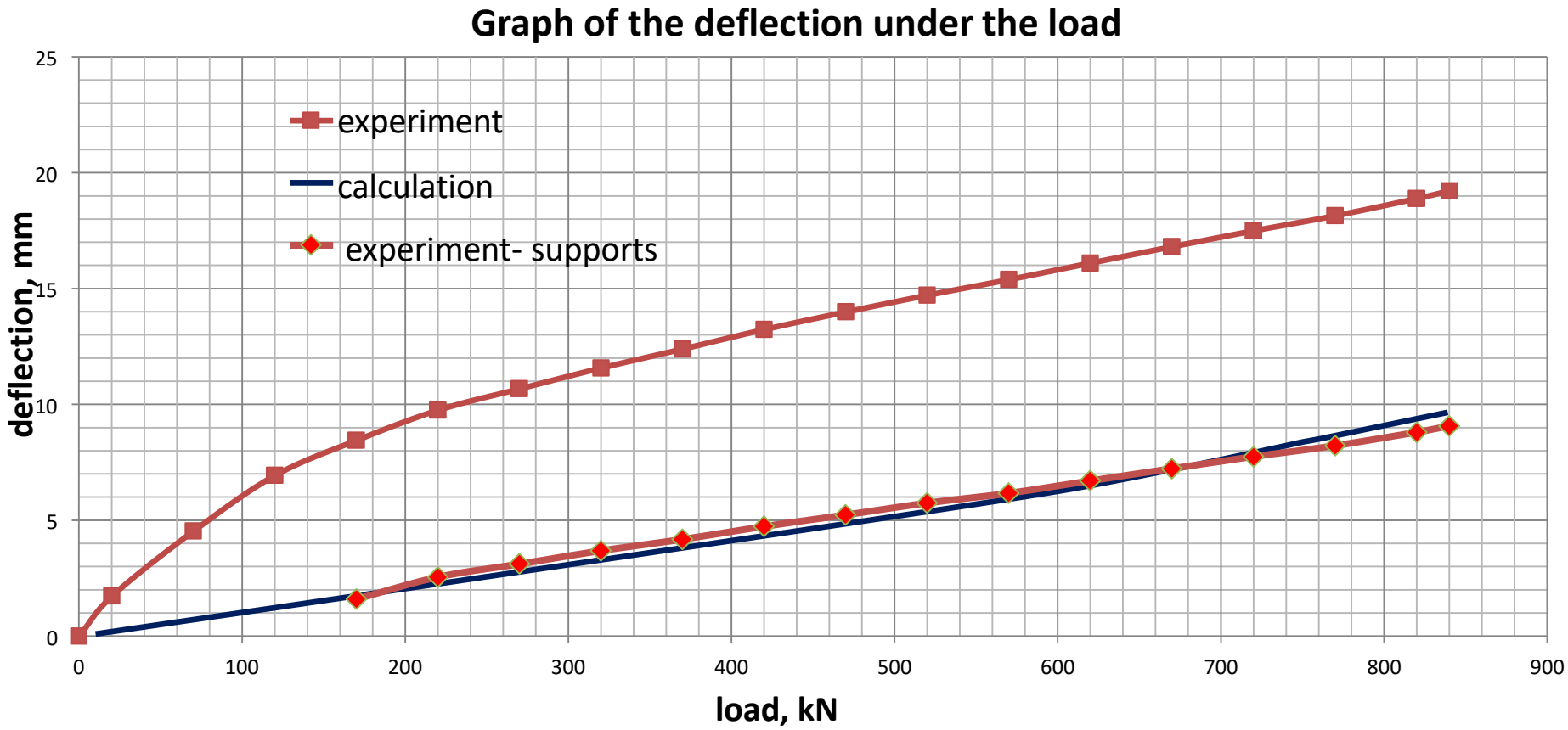


Bridges made of aluminum alloys in USSR and RF

Static testing of the plate

Pmax = 85.8 t; Ymax = 19.2 mm; Yт=9.6 mm;

Ymax – Yопор = 9.1 мм

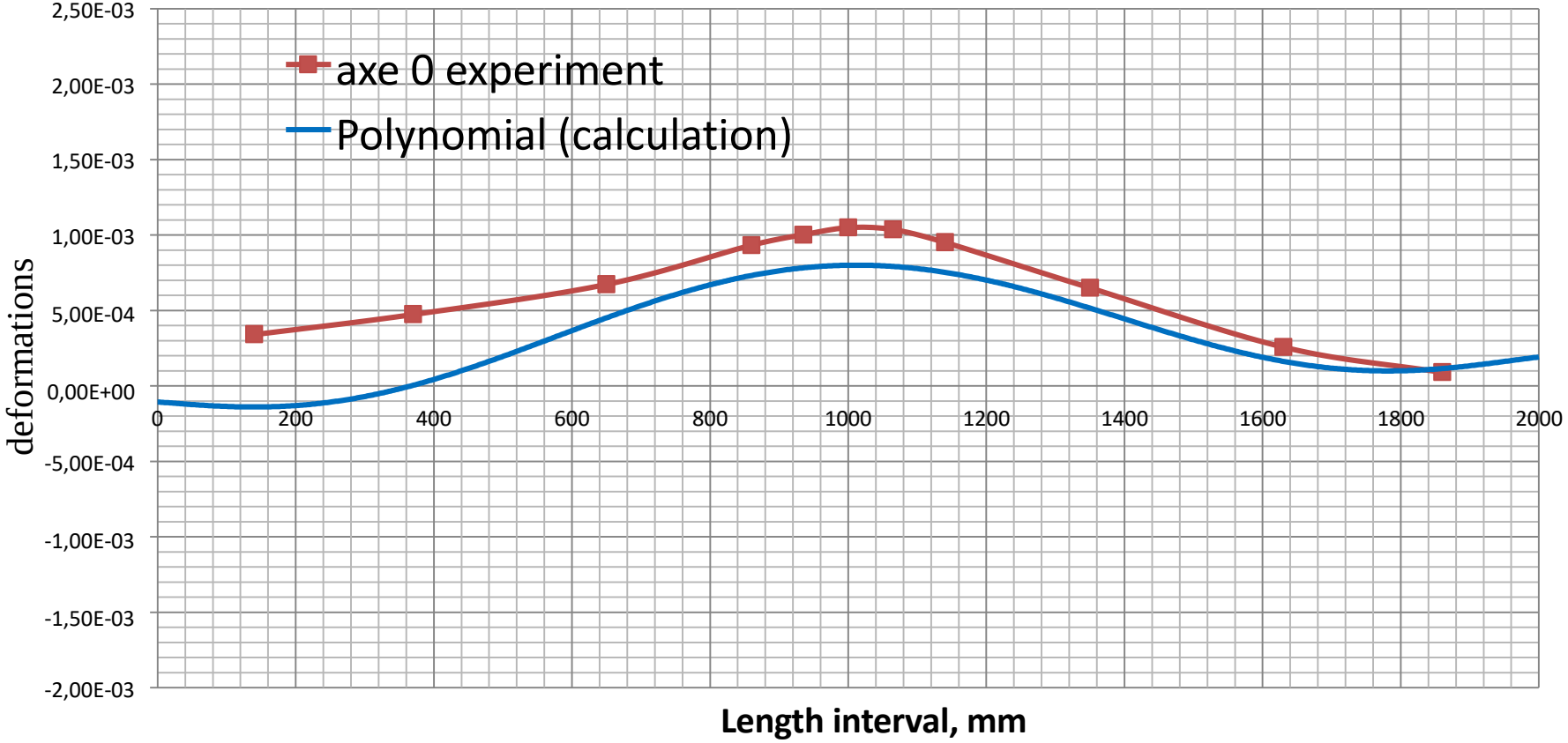


Bridges made of aluminum alloys in USSR and RF

Static testing of the plate

Longitudinal deformations εz in the median cross section

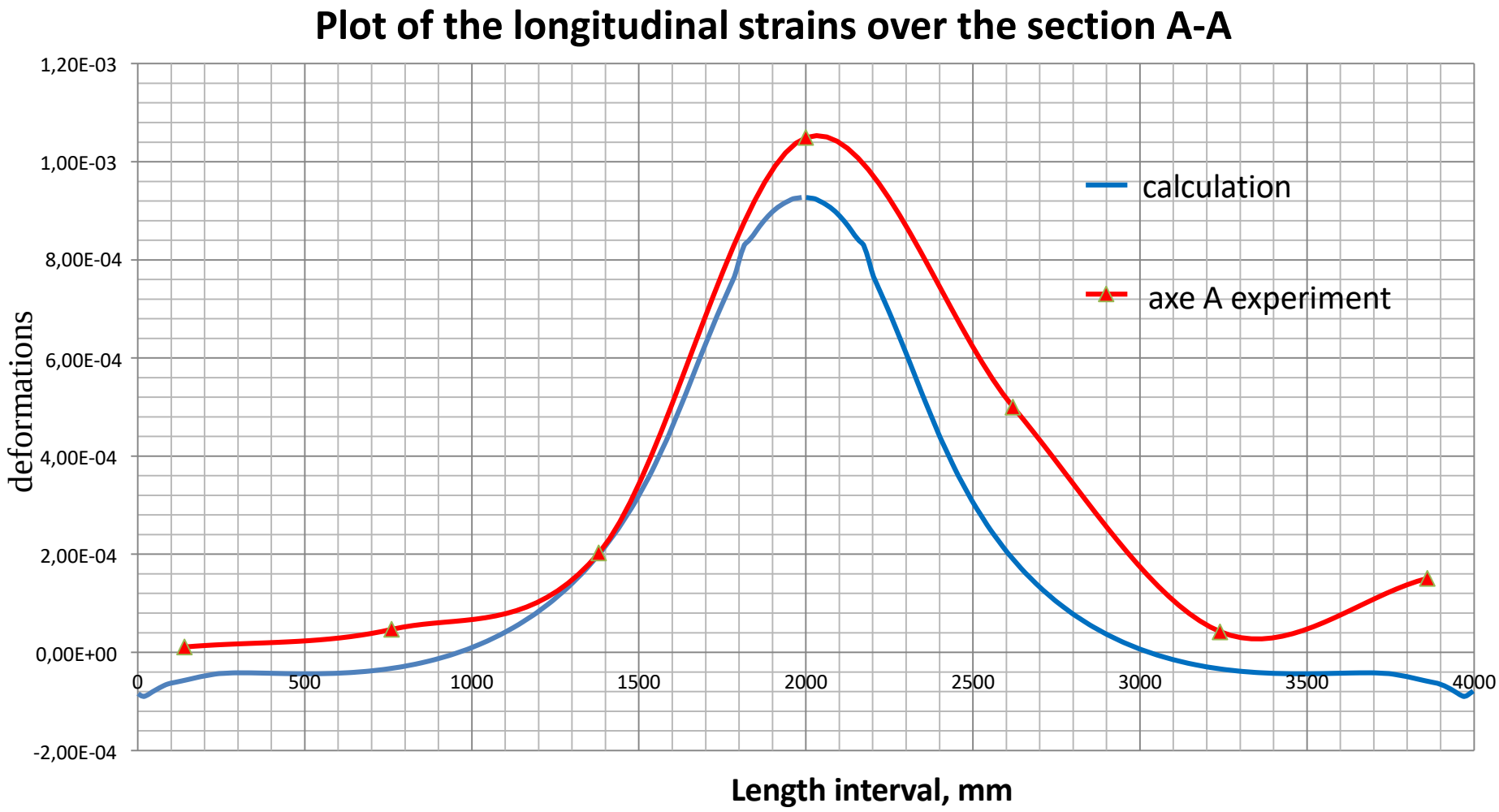
Plot of the longitudinal strains over the cross section 0-0



Bridges made of aluminum alloys in USSR and RF

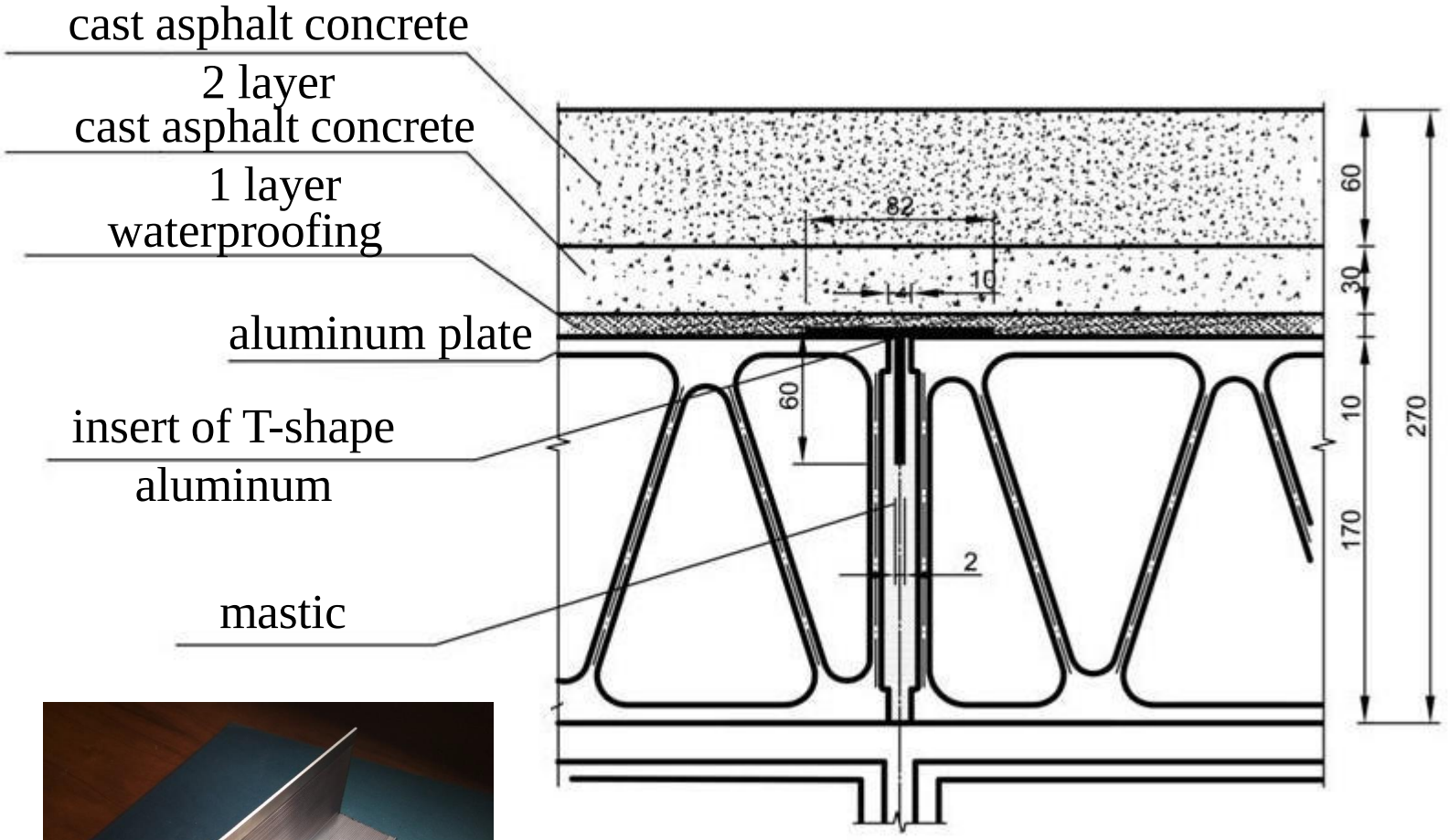
Static testing of the plate

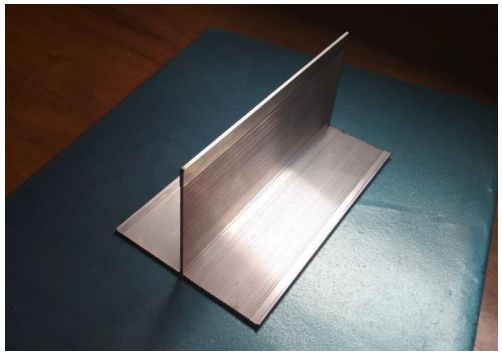
Longitudinal deformations εz in the median cross section



Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Construction of the joint of orthotropic slabs coated with cast asphalt concrete





Insert of T-shape aluminum into the gap between plates

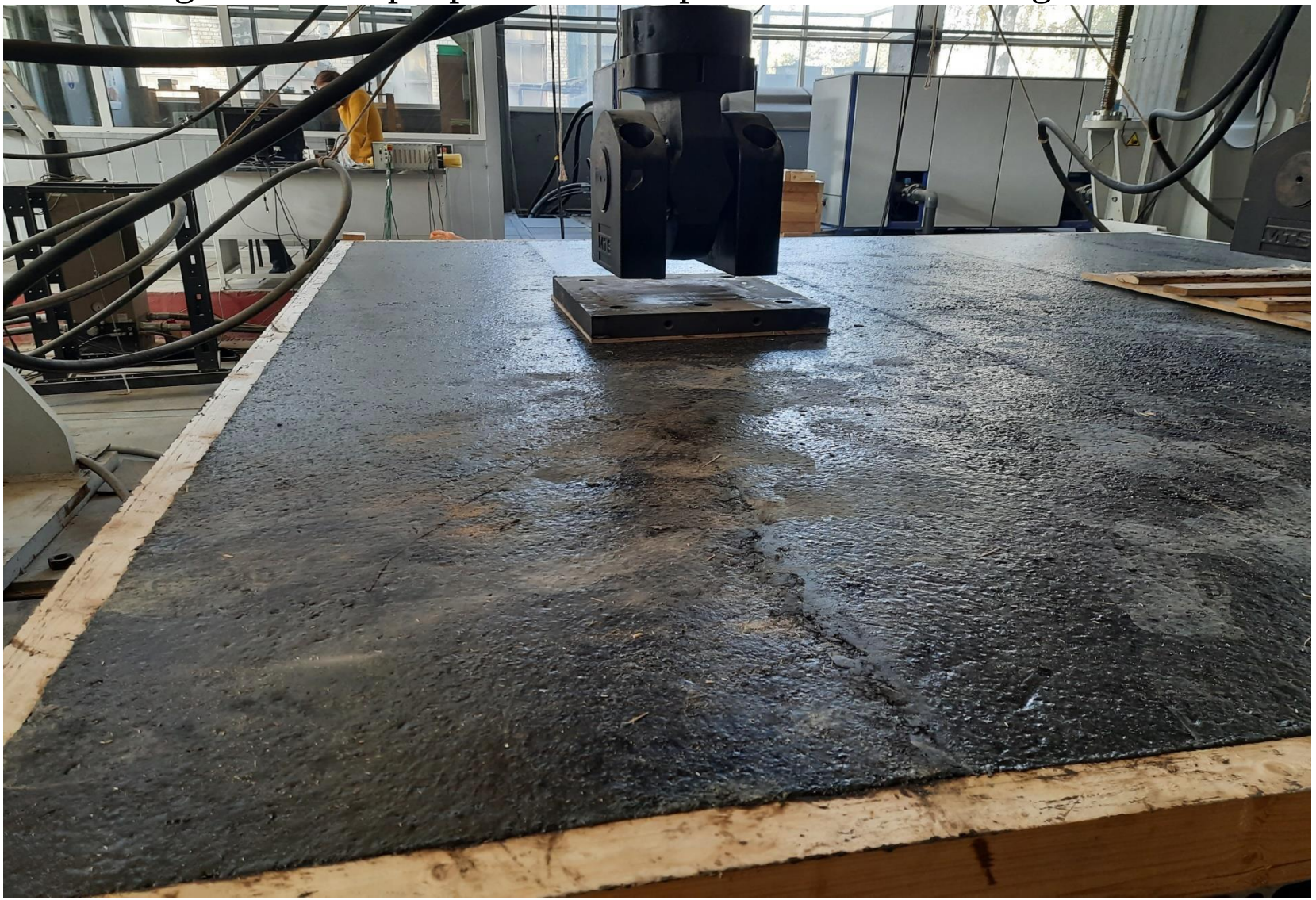
НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ СТРОИТЕЛЬНЫЙ УНИВЕРСИТЕТ

Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Preparation for testing of orthotropic plates with asphalt concrete coating

Research and development of SP «Bridges with aluminum alloy structures» for road bridges

Testing of orthotropic plates with asphalt concrete coating



НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ СТРОИТЕЛЬНЫЙ УНИВЕРСИТЕТ

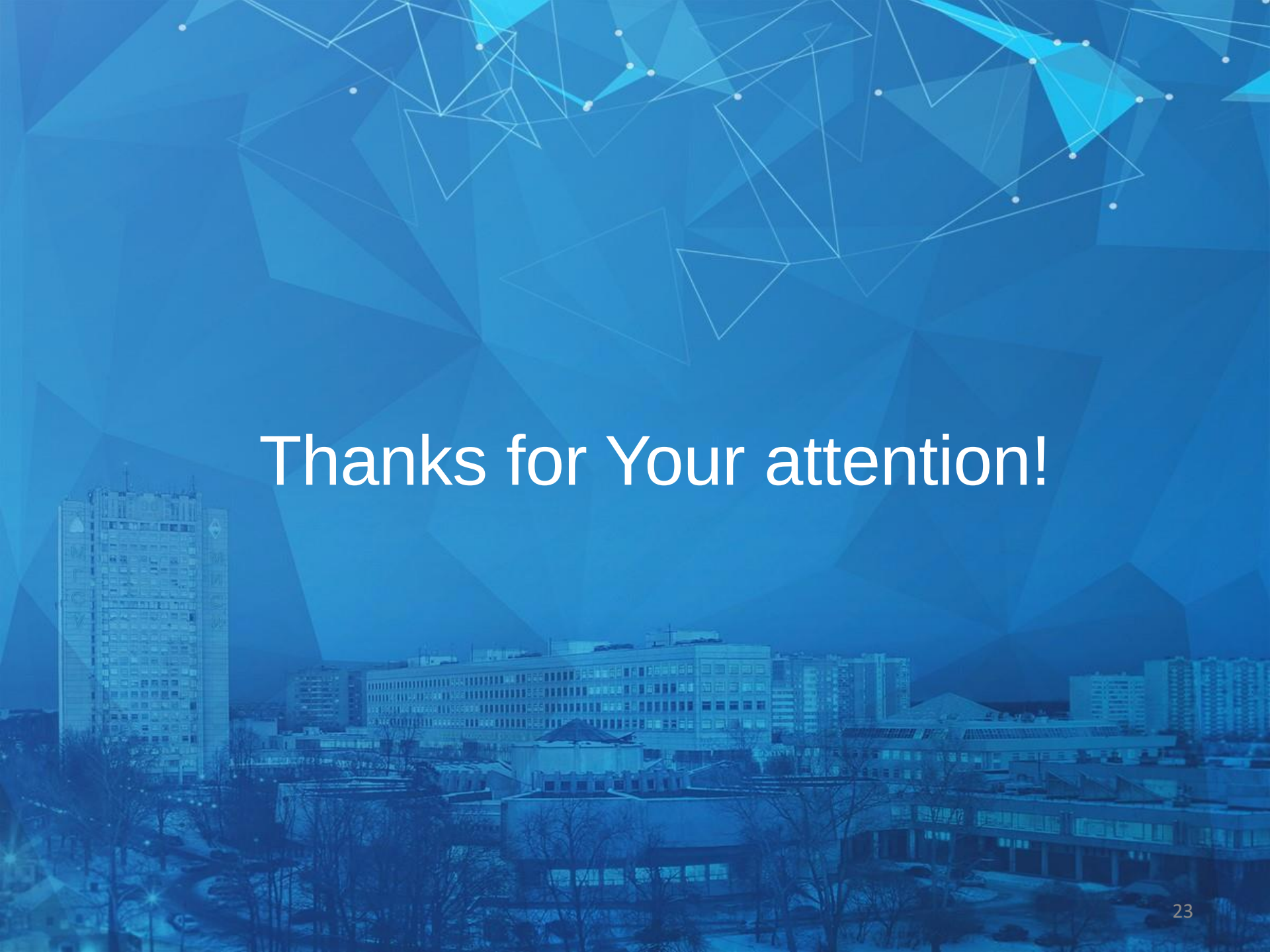
Scientific and technical support of the road bridge reconstruction project

Reconstruction of the Tolokontsevo-Mogiltsy roadway with the roadbridge over the Linda river at km 5+351 in the district of Bor of the Nizhny Novgorod region.

Parameters of a road section.	Option
Option description	Continuous superstructure made of aluminum alloys with a two-lane roadway
Category of the road	IV
Static diagram of the main load-bearing structures	Continuous beam
Bridge scheme	4x18
Lengh, m	72.429
Construction area $L_м \times B_м$, m^2	932.89
Bridge dimension, m	Г-8+2×0.75
Design load	А14 НК-102.8

Before

After


Thanks for Your attention!