АЛЮМИНИЕВАЯ
АССОЦИАЦИЯ

APPLICATIONS OF ALUMINIUM IN BRIDGE BUILDING

Head of projects
in transport infrastructure
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ALUMINIUM BRIDGES ARE GAINING POPULARITY THROUGHOUT THE WORLD

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

GERMANY

- Approximately 70(!) aluminium pedestrian overpasses are built every year, mostly over small creeks and canals.
- Bridge format: 12 m to 60 m
- The first highway pedestrian overpass was built in 2015, with an option to 'move' it after additional 2 lanes are added to the highway.

Ballingdon Bridge, UK (2003)

SWEDEN AND NORWAY

- 80 new aluminium bridges have been built since 1990.
- In Sweden, aluminium is seeing broad use in repairing old bridges: extruded parts replace the damaged concrete. Additional benefit is the reduction of the load on old bridge pillars.

OTHER COUNTRIES

- Aluminium bridges are also being built in China, France, the Netherlands, Italy, Canada, USA.
- So called 'military bridges' are quite common in Germany and Sweden. These bridges are quick to build and can be easily moved if necessary.

Riekerhaven, movable span bridge in Amsterdam, the Netherlands (2003)

JAPAN

- There is an active program to replace old bridges with new aluminium ones. It is estimated that 0.8 to 1 mln tonnes of aluminium will be used in the program.
- The basis of the program is that aluminium structures have better resistance to earthquakes.

RUSSIA

- In 2017-2019, a total of 8 aluminium pedestrian overpasses were built (2 in Nizhegorodskaya region, 3 in Krasnoyarsk, 2 in Moscow and 1 in Tula)
- More than 20 projects of bridges with aluminium structures are currently being developed

RUSSIA'S FIRST ALUMINIUM BRIDGE (SAINT PETERSBURG)

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Kolomensky pedestrian overpass over Griboyedov canal

- Built in 1969
- All-welded

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Lighter structures and prettier design
Achieving the optimal quantity of metal; creating economically feasible structures that are lighter than the comparable steel parts

Bridge compexes for 2008 Beijing Olympics

Helix Bridge, Singapore

Bridge over Randselva river in Norway

Helix Pedestian Bridge, USA

ALUMINIUM BRIGES
ENVIRONMENTAL AND ECONOMIC SOLUTION

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Aluminium bridge parts are 3 times lighter than steel and 6 time lighter than concrete structures, resulting in lower costs (up to 30% lower) related to foundation and pillars, transportation and use of specialized vehicles.

Highway bridge illustration, Canada

In Russia, aluminium orthotropic plates are produced at press plants (KRAMZ). These plates can be used in and are appropriate for building of new and refurbishing of existing motor-road bridges

The world's first 100% aluminium bridge was built in 1949 over Saguenay river in Canada

ADVANTAGES OF ALUMINIUM BRIGES

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Low specific weight

Cost-saving on foundation and pillars (up to 30%)
3 times lighter than steel
6 times lighter than reinforced concrete

Service life of superstructures

More than 70 years

Corrosion resistance

Does not require painting during its entire service life

Physical properties of alloys

Anodized aluminium structures are classified as 'non-flammable' (for coatings)

Comparable to steel structures in terms of fire resistance (if fire retarders are used)

Recyclability

Can be recycled with minimum costs of disassembly and disposal

DESIGN AND AESTHETICS

Modern design, can be used to create complex architectural shapes, can be of any color in RAL color chart

STATUTORY REGULATIONS RELATED TO BRIDGE STRUCTURES MADE WITH THE USE OF ALUMINIUM ALLOYS

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ


МИНИСТЕРСТВО СТРОИТЕЛЬСТВА
И ЖИЛИЩНО-КОММУНАЛЬНОГО ХОЗЯЙСТВА
РОССИЙСКОЙ ФЕДЕРАЦИИ

СВОД ПРАВИЛ СП 443.1325800.2019

МОСТЫ С КОНСТРУКЦИЯМИ
ИЗ АЛЮМИНИЕВЫХ СПЛАВОВ
Правила проектирования

Издание официальное

Москва 2019

In 2019 the Russian Ministry of Construction has issued the Rules for Design of Aluminium Bridges no. SP 443 1325800 2019, the document has been in force since 01 November 2019. The document's scope of application includes the design of aluminium pedestrian overpasses.

In 2021, UC RUSAL together with the Aluminium Association and the Moscow National University for Research in Construction (NIU MGSU) will complete the additional tests that will expand the scope of the document to cover motor-road bridges.

Testing of an aluminium orthotropic plate with paving (poured asphalt-concrete) at NIU MGSU

COMPLETED PEDESTRIAN OVERPASSES WITH ALUMINIUM ALLOY SUPERSTRUCTURE IN RUSSIA

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

2017

Nizhegorodska ya region

2018

Krasnoyarsk

2020

Tula

A total of 8 pedestrian overpasses have been built since 2017:

- Nizhegorodskaya region – 2 overpasses

Customer: Government of Nizhegorodskaya region

Project design documentation: developed based on project-specific design conditions coordinated with the Russian Ministry of Construction

Manufacturers: OOO GS-Rezerv, AO RUSAL TD, AO AMR, AO Arconic SMZ, ZAO Cheboksarskoye predpriyatiye Sespel

- Krasnoyarsk – 3 overpasses

Customer: MKU UKS Krasnoyarsk

Project design documentation: developed based on project-specific design conditions coordinated with the Russian Ministry of Construction

Manufacturers: OOO KraMZ and AO RUSAL TD, AO Giprostroymost (Ulyanovsk)

- Moscow – 2 overpasses (in Yauza natural park)
- Tula – 1 overpass

Customer: Government of Tulskaya region

Project design documentation developed on the basis of SP 443.1325800.2019 "Bridges with aluminium alloy structures. Rules of design".

Manufacturers: OOO KraMZ, AO RUSAL TD, OOO GS-Rezerv

OVERPASSES IN OPERATION

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Nizhegorodskaya region
In operation since 2017

Красноярск
In operation since 2018

EXAMPLES OF BRIDGES, COMPLETED OR UNDER CONSTRUCTION

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

BRIGES BUILT IN 2020

Tula
Construction period 2020

Krasnoyarsk
Construction period 2019 - 2020

BRIDGES UNDER CONSTRUCTION IN 2020 - 2021

Moscow (architectural envelope

Town of Bor in Nizhegorodskaya region

Krasnoyarsk

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

"Construction of a pedestrian overpass over a motor-road as part of the Tula Eastern Bypass project"

The project has been completed as part of the National Project "Safe and Sound Motor-Roads".

Design period:
November 2019 - April 2020

Construction period:
May – October 2020 г.

Bridge length: 41.22 m
Metal quantity: 60.0 t
(KRAMZ – extrusion AD 35T1, AMR – rolling 1915T1)

Customer: Government of Tulskaya region
GU TO Tulauprador

Designed by: PI Morrissot

Aluminium parts contractor: GS Rezerv

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

"Construction of a pedestrian overpass over a motor-road as part of the Tula Eastern Bypass project"

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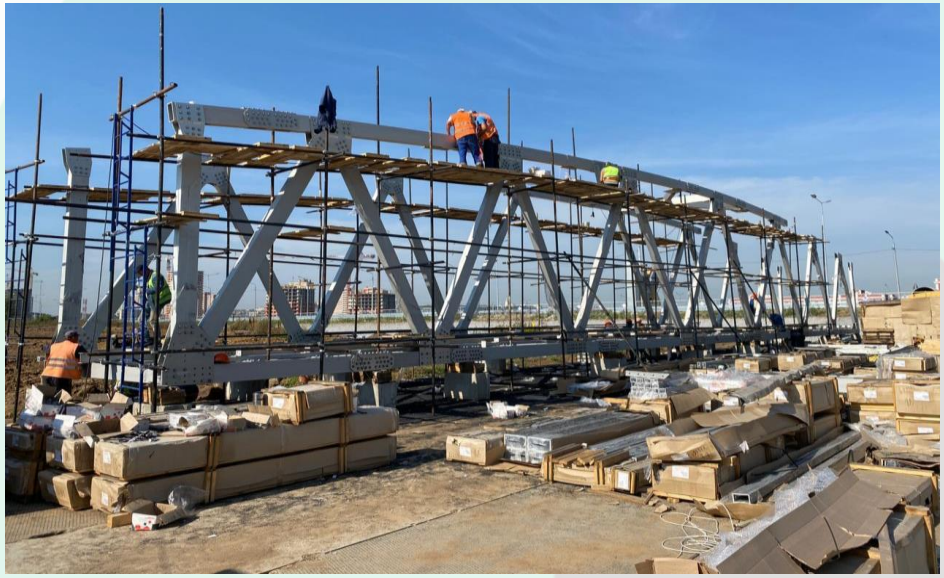
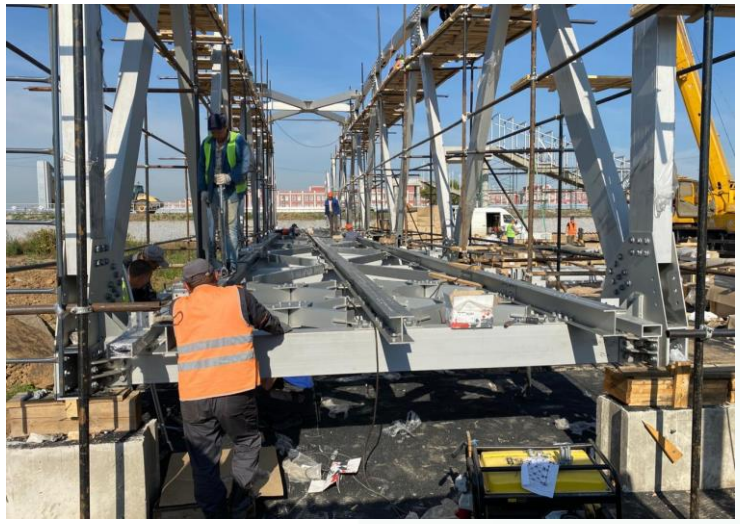
On-site assembly of the superstructure





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АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

"Construction of a pedestrian overpass over Volochayevskaya street in Krasnoyarsk"

Design period:
March – July 2019
Construction period:
3кв. 2019- Sep 2020

Bridge span length 19.5 m and 43.5 m
Metal quantity: 41.1 t
(KRAMZ – extrusion AD 35T1)

Customer: Fixed Assets Construction Directorate of Krasnoyarsk

Designed by: ZAO Girpotransmost

Contractor: AO Giprostroymost

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

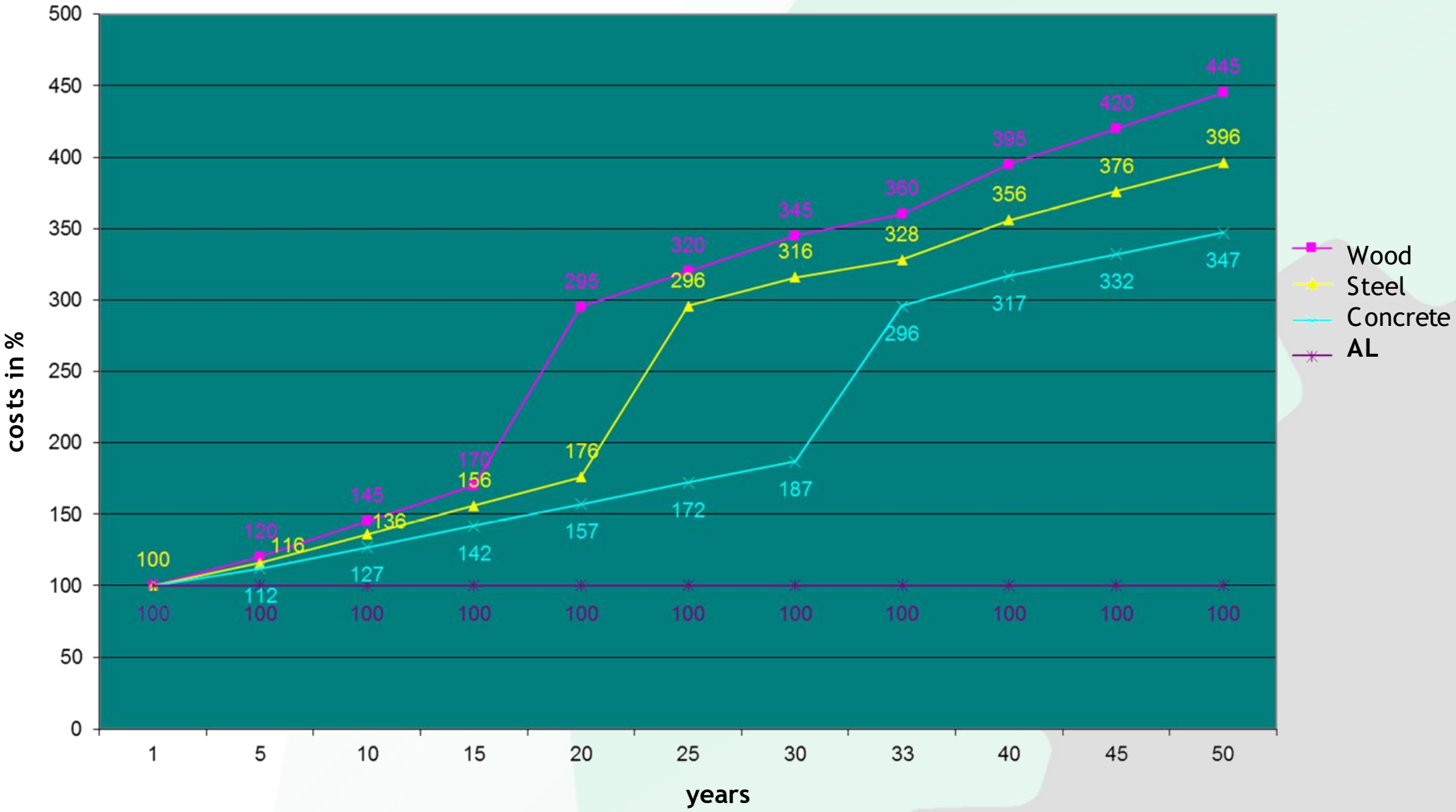
"Construction of a pedestrian overpass over Volochayevskaya street in Krasnoyarsk"

Assembly of the superstructure elements at KraMZ

Installation of superstructure on-site

GLOBAL DATA REGARDING THE MAINTENANCE COSTS OF BRIDGES MADE FROM DIFFERENT MATERIALS

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ



PROSPECTS FOR FURTHER DEVELOPMENT EXTRUDED ORTHOTROPIC PLATES FOR BRIDGES

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

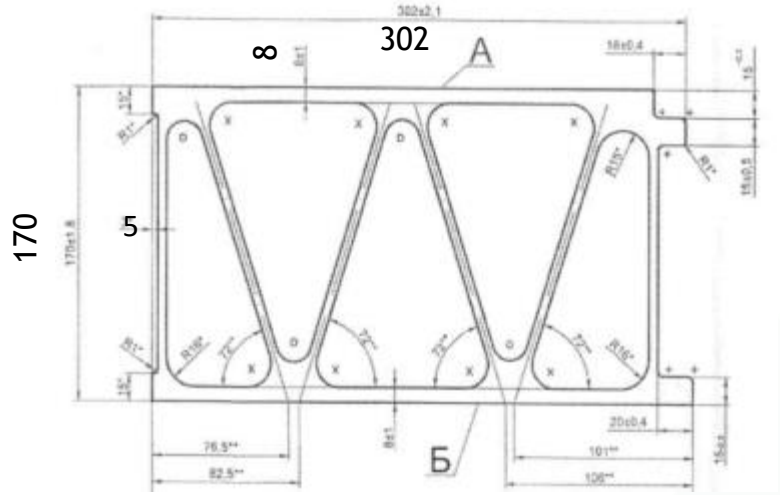
In Russia, aluminium orthotropic plates are produced by **KRAMZ**. These plates can be efficiently used for construction of new and refurbishing of existing motor-road bridges, and also for replacing old (in critical state) decking with aluminium plates while preserving existing pillars.

This solution substantially reduces the 'dead' load generated by the weight of the decking, reduces the costs of building pillars and foundations, speeds up and simplifies the assembly: the descking is assembled in large sets that are installed in one go.

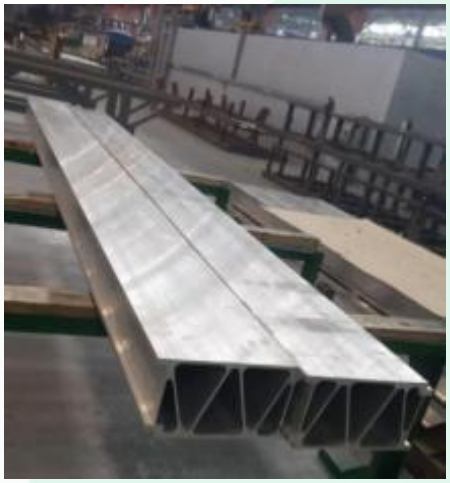
ORTHOTROPIC PLATES FOR BRIDGES — MANUFACTURING CHAIN

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Development of the shape with cross-section fit for the estimated load



Manufacturing the extruded shape at **Krasnoyarsk Metallurgical Plant** (OOO KRAMZ)



Production of orthotropic plate from separate elements using friction stir welding at ZAO Sespel

POSSIBLE APPLICATIONS OF ALUMINIUM ALLOYS IN TRANSPORT INFRASTRUCTURE

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Pedestrian bridges over rivers and creeks

Transport hubs

LOCATIONS OF THE MANUFACTURERS OF STRUCTURES AND PRODUCTS FROM ALUMINUM ALLOYS

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

Moscow region
- AL5 DMD-Tekh

Sverdlovskaya region
- KUMZ

Krasnoyarsk region
- KraMZ
- Segal

Kaluga region
- AGRISOVGAZ

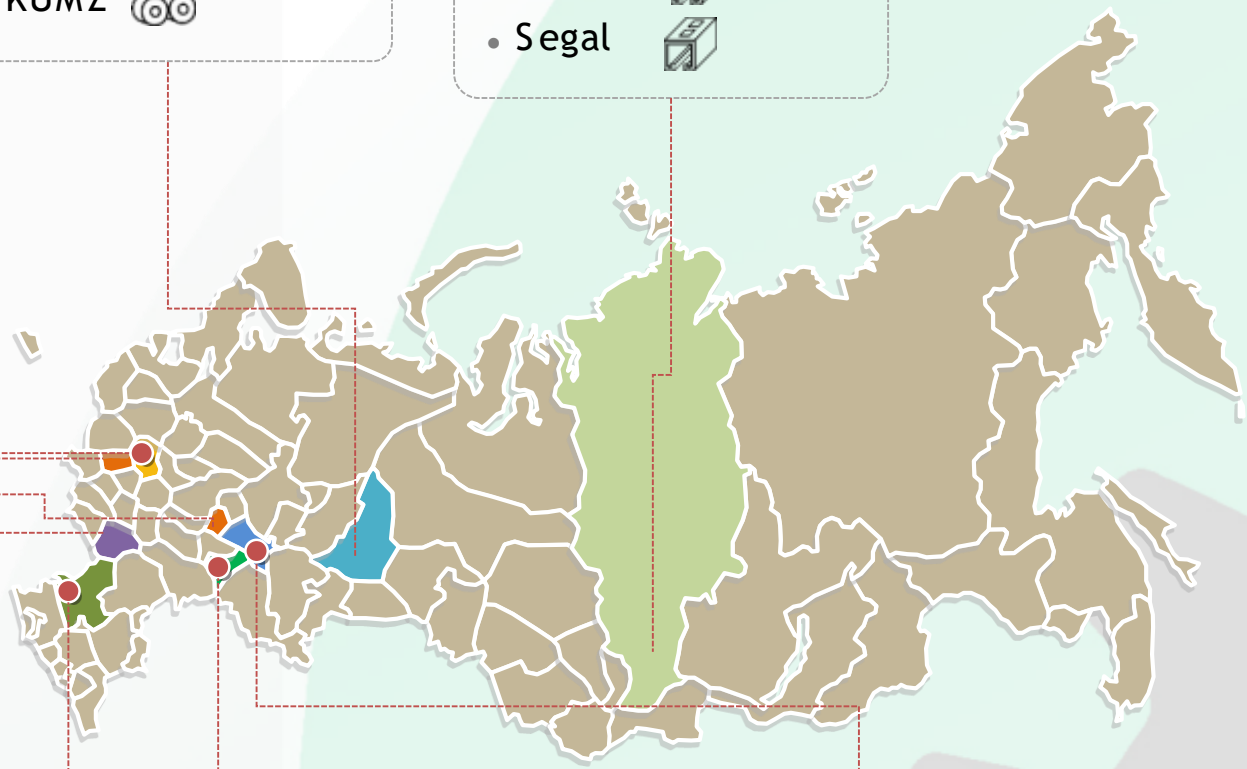
the Chuvash Republic
- ZAO Sespel
- GS Rezerv, TMI

Voronezh region
- AVA-Trade (AL5)

Rostov region
- AL5-YUG
- BK ALPROF
- AMR

Samara region
- ARCONIC SMZ

Tatarstan
- TATPROF



Companies:
- *Production of extruded products*
- *Production of rolled products*
- *Engineering companies*

CONTACTING
THE ALUMINIUM ASSOCIATION

АЛЮМИНИЕВАЯ АССОЦИАЦИЯ

The Aluminium Association is open to discussing different forms of cooperation and projects aimed at broadening the use of aluminium.

We are looking forward to cooperating with you!

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