

## Use of mastic asphalt for bridge construction in Russia

ZAO Institute Stroyproekt started using mastic asphalt in 2001. Before then there was not reliable and durable surfacing for bridge draw spans and orthotropic plates. As you may know, there are many draw bridges in St. Petersburg; therefore it has been always a challenge to design and to construct a durable bridge pavement that would not require frequent repairs. We managed to find a solution to this problem when executing the rehabilitation project for Alexander Nevsky Bridge over the Neva. ABZ-1 Company, which also strives to improve pavement quality, contributed a lot to our solution. ABZ-1 suggested constructing mastic asphalt pavement. At that time mastic asphalt was not produced in Russia yet and we approached a Finish company Lemminkainen. Using their mix design and components made in Finland, their experts together with specialists from ABZ-1 produced and laid asphalt on the draw span of the bridge. As far as we know, this pavement served for minimum 10 years. This experience showed that durable surfacing for carriageways of bridge steel decks does exist.

ABZ-1 has mastered German mastic asphalt technologies. The method developed by ABZ-1 has been used for rehabilitation of Troitsky Bridge over the Neva in St. Petersburg. Its carriageway was surfaced with mastic asphalt, produced by ABZ-1. At the draw span, the thickness of laid mastic asphalt makes 55 mm. Other spans have 2 layers of 40 mm where tram rails are located, and on the carriageway mastic asphalt was used as a 40 mm thick protection layer. As the base layer, a 60 mm thick layer of dense fine asphalt of type B Grade I was used, which was laid over a 50 mm thick layer of dense coarse asphalt of type B Grade I. But we faced a problem with waterproofing. Local materials could not be used under mastic asphalt due to its peculiarities. For example, its laydown temperature is higher and the available local waterproofing materials could not resist it. We once again had to take advantages of European expertise and used Ergobit material produced in Germany.

In 2003, mastic asphalt produced by ABZ-1 was used for construction of the cable-stayed bridge within St. Petersburg Ring Road. For waterproofing we applied already Russian material Tekhnoelastmost which had been tested in a German laboratory. German experts confirmed high quality of the above material and possibility to use it in combination with mastic asphalt. They also recommended shifting a reinforcing layer to the roll bottom surface. The above recommendations were implemented and Tekhnoelastmost has been successfully applied together with mastic asphalt for over 10 years.

Hundreds of bridge decks in various regions of Russia, from St. Petersburg to Novosibirsk, have now the surface made of mastic asphalt. In our designs for bridges with carriageway orthotropic plates, we always provide for a 2-layer mastic asphalt pavement (the top layer to be 50 mm thick mastic asphalt type I and the bottom (protective) layer to be 40 mm thick mastic asphalt of type II). For bridges with reinforced concrete carriageway slabs, we use mastic asphalt as a bottom (protective) layer, while for the top layer we propose crushed stone mastic asphalt.

Advantages of mastic asphalt are as follows:

- It resists high tensile deformations (due to high content of organic binder it has high ultimate tensile deformation capacity and good elasticity). This property is even more explicit if polymer bituminous binder is used. Actually, it is the best material to be used on bridges where mechanical and temperature tensile deformations are larger than on the earth road bed;

- Due to high content of binder, it has improved ageing and fatigue strength, i. e. it is more durable;
- It has high density and impermeability (due to presence of binder which fills in all cavities and voids in the mineral base);
- It is easy to implement on bridges as it does not require compaction by rolling due to its flow characteristics in hot condition;
- Due to high content of binder (especially if it is polymer bituminous binder), it has improved wear resistance to spiked tyres, i.e. it has higher washboarding strength.

Today the main problem of mastic and other types of asphalt is washboard formation as a result of use of spiked tyres on passenger cars in winter. This phenomenon is not covered yet in current Russian regulations and standards; therefore most experts believe that washboard formation is a result of asphalt plastic deformation under heavy trucks in summer. Stroyproekt has been studying this problem. Since 2011 we have been using our own dedicated laboratory equipment to assess asphalt wearing.

I hope that our joint efforts will make our roads better. I would like to thank ABZ-1 Company for their fruitful work and contribution to promotion and development of mastic asphalt and other asphalt coatings in Russia.