



LEADER IN THE UNDERGROUND SPACE DEVELOPMENT IN RUSSIA

**THE GROUP OF COMPANIES ENSURES
THE FULL AND COMPLETE IMPLEMENTATION
OF THE TASKS OF ANY COMPLEXITY
IN ALL MAIN ACTIVITY AREAS**

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Drawing on the long-standing expertise, as well as applying the most advanced technologies, the group of companies «Mosproekt-3» team implements the projects of any complexity effectively. We have won the trust of the state customers and private investors, who can entirely rely on us and have complete confidence of the efficient outcome. Our team involves upscale engineers, the acknowledged technical elite of the country, who are whenever challenged with the most ambitious objectives, are always there to succeed.

Anna Merkulova
CEO



Anna Merkulova, the Group of Companies “Mosproekt-3” CEO: We ensure infrastructure breakthrough



The rate of Moscow rapid transportation system expansion is one of the fastest in the world. Its length has already reached 780 km. Commuter rail system has been partly integrated into the city's metro network, thus increasing development potential of the metropolitan area.

Tunneling and Underground Construction has discussed the solutions that provide consistently rapid pace of designing and construction with the Group of Companies “Mosproekt-3” CEO and a personal member of ITA in Russia Anna Merkulova.

The Group of Companies’ engineers are involved in implementation of crucial segments of this megaproject.

- What changes has been introduced to the transportation system of the Russian capital in the last several years?

- We've managed to make an outright transportation breakthrough. It has taken us 10 years to perform, and the development program continues.

The off-street rail transportation network remains the centerpiece of the Moscow transportation framework, and in this field the attention has been predictably focused on the metro. 7 million passengers use it daily.

The metro network expansion by its' sheer scale is unparalleled in the history of the Moscow underground. It required concentration of vast technical and engineering resources. The success of the project and consistently high pace of the Moscow metropolitan area urbanization has incentivized the city's government to develop commuter rail system that practically assumes the function of ground-level metro lines.

To implement large-scale transportation projects, within our Group of Companies we've formed a team of top tier specialists that provides solutions for the most challenging tasks.

- What stages of the program has already been implemented?

- Firstly, the outreach of the metro network has been expanded to cover remote areas. To achieve this goal 7 already existing radial lines has been extended, receiving about 20 new stations, and the construction of 5 new lines has been commenced.

Nevertheless low flexibility of passenger traffic patterns remained obvious. Pronounced commuting effect inherent to Moscow was amplified by the lack of lateral connections between radial lines. To change lines passengers had to use stations in the city center.

To mitigate this effect the Moscow government has launched two projects that create alternative routes.

The first one is the Moscow Central Circle, or MCC. It has been implemented more promptly thanks to the existing freight rail infrastructure that had been modernized and adapted for passenger transportation.

The network of transport hubs developed by the engineers of the Group of Companies “Mosproekt-3” helped to seamlessly entwine the new line into the city landscape and connect it to other transportation systems. Unified ticket system and metro-like train operating mode made it possible to fully integrate the line with the Moscow underground. Nowadays MCC carries more than 120 million passengers a year.

The second project is the “classic” underground Big Circle Line, or BCL, that will become the longest metro circle in the world. More than 70 km long, it'll have 31 stations.

Two sections of the line designed by engineers the Group of Companies “Mosproekt-3” are to become operational this year. With the launch of these sections passengers will have access to 2/3 of the line. Once complete, we expect BCL to take up to 30% of passenger traffic from radial lines.



Novatorskaya station, BCL

- What solutions make it possible to implement these large-scale projects within such a short time frame?

- Implementation of such an ambitious program has become a real challenge for the Russian construction industry and has required involvement of all the specialists in the country as well as engagement of foreign experts.

We've increased the pace of implementation by switching to construction of close-to-surface stations that allowed more extensive use of TBMs.

As of today Moscow metro builders employ more than 30 TBMs. 23 of them were simultaneously engaged in construction of BCL – a registered World Guinness Record.

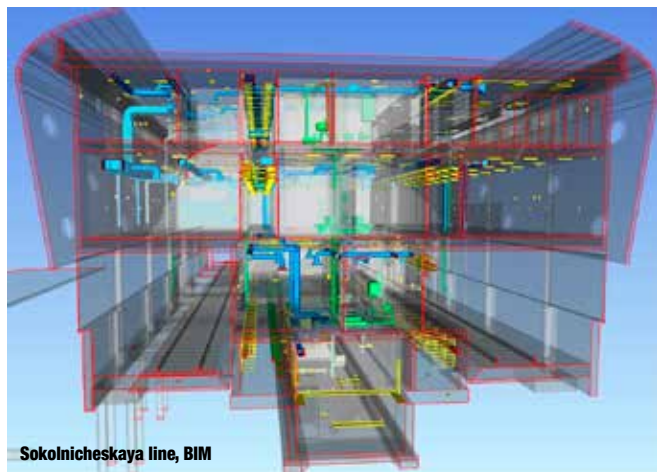
Engineers of the Group of Companies "Mosproekt-3" has also adjusted the Spanish technology of double-track tunnel boring with 10-meter TBMs to be used in complex geological conditions of the Russian capital.

More rapid construction of metro stations has become possible due to the use of standard designs. It allows continuous flow production of different elements of station structures.

At the same time it is important to preserve unique architectural identity of the stations that grants the Moscow metro its inimitable glamour. For that reason standard designs are used only for structural and planning layout while exterior is developed individually for each station, and our specialists constantly look for approaches that are new and unconventional for the Moscow metro. E.g. for south and south-east sections of BCL has been designed in parametricism – a style that give up on traditional geometric figures in favor of dynamic elements, which require complex mathematical formulas and 3D-modelling programs to calculate their forms.

- What advanced technologies do you use in designing process?

- Our team puts the emphasis on digitalization of designing process - primarily BIM-technologies and common data environment. Specialists of the Group of Companies "Mosproekt-3"



are engaged in development of application methods and promotion of information modelling in the field of infrastructure construction. Russian customers and industry players have acknowledged the advantages of BIM: this approach enhances transparency and quality of projects, improve their cost efficiency and time frame.

Program interoperability is one of key focuses of our BIM-expertise development. We've decided on using open formats that give possibility to employ software from different manufacturers. Thus we expand capabilities of digital models and facilitate cooperation while working on large-scale projects with several contractors.

At the same time we consistently study and test new software that appear on the market, evaluating the possibility of its' implementation in our workflow.

- How long have you been using information modelling technologies?

- We were aware of BIM advantages early on and started to proactively implement these technologies while engaging in creation and introduction of industry standards even before the government has set course on digitalization of the field. As of today we have experience in designing huge infrastructure objects like part of a Moscow metro line completely within BIM environment – such expertise is unique for Russia. Tremendous amount of work done by our specialists helped us to secure the title of BIM-leader in Russia.

In the process of transferring to information modelling we've run into a problem of the lack of standard tools for tunnel design. Our specialists have found a solution by implementing visual programming technologies.

We've also optimized the workflow in BIM environment inside the Group of Companies. Design of various engineering systems is allocated to several departments. To increase cooperation efficiency we've codified our BIM frameworks that regulate the rules of exchange and administration of information about facilities under construction.

Moreover, a BIM-competency center has been formed within the Group of companies. It is entrusted with the task of expanding database and component library. In such a way engineers can use effectively the practices developed while working on previous BIM projects. All technical data is already included into component description. This facilitates calculations and compilation of data sheets.

BIM potential becomes completely evident while designing facilities to be constructed in densely built-up urban areas packed with utility lines. Accumulated knowledge and expertise helps engineers of the Group of Companies "Mosproekt-3" to blend new structures in the crowded metropolitan landscape with no impact on operation of existing infrastructure.

- What about the future of the Moscow metro development program?

- City's government has already announced ambitious plans aimed at development of the Moscow metropolitan area transportation network. Construction of two new metro lines (Rublevo-Arkhangelskaya and Biryulevskaya) will be launched in the near future.

Furthermore the process of commuting system integration into the rapid rail transportation network is still under way. Within the next several years the number of MCD lines will increase from 2 to 5, adding 240 km of tracks and 115 stations.

The success of the Moscow metro expansion program has prompted administrations of other cities to consider an array of transportation network development options. Such future projects include the creation of both "classic" underground and hybrid systems. The latter is now under development in Chelyabinsk, where the infrastructure left after an unfinished metro program is going to be merged with the tram network.

Meanwhile the underlying concept of MCC and MCD – adaptation of railroad network for metro-like passenger transportation – can be further adjusted for other Russian cities.



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