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INTRODUCTION

At present, Uzbekistan has created a sufficient reserve of resources and the necessary resource base to ensure the stable and uninterrupted functioning of the financial and economic, budgetary, banking and credit systems, as well as enterprises and industries of the real economy.

At present, new projects are being implemented in the Republic of Uzbekistan to ensure the development of transport and communications.

Experts on the construction of highways in recent years, the improvement of transport relations with foreign countries, the introduction of new techniques and technologies in the field of agriculture, and the development of new technologies.

TASHKENT SUBWAY TODAY AND IN THE FUTURE

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ABSTRACT

The general characteristics of earthquake-resistant structures of running tunnels and shallow underground stations of the Tashkent subway developed and implemented in the design and construction of the first Chilanzar, the second Uzbekistan and the third Yunusabad lines of the Tashkent subway are given. The results of the experimental research carried out by the theoretician are described. The necessity of creating new lines is substantiated. The features of constructive solutions of overhead lines are described.

The history of the Tashkent subway began in 1962, namely, in the plan for the reconstruction of the city, the construction of three metro lines with a total length of 47 km was envisaged. Before the start of the design of the Tashkent subway, Tashkent scientists based on the study and analysis of the aftermath of strong earthquakes, including the Tashkent one (1966) had some experience in earthquake-resistant construction.

The territory of the city of Tashkent, which is a nine-point zone on the MSK scale, has complex engineering and geological conditions, in which there are deposits of subsidence soils of layers.

Therefore, scientists, designers and builders were faced with the question of ensuring the seismic resistance of underground structures of the capital



subway. In the process of designing the Tashkent subway, the scientific foundations of the seismic resistance of underground transport objects were created in a short time.

During the construction of the first Chilanzar line, new earthquake-resistant structures, running tunnels and stations from large-size prefabricated reinforced concrete elements of factory production were developed and introduced.

Tashkent subway today and in the future Tunnels are the most difficult type of road construction. To implement the project, geologists, surveyors, designers, expensive machinery and equipment, and skilled workers are needed.

The shape of the tunnel and the dimensions of the cross section are determined by the purpose for which it is intended to be used. There should be enough space inside the transport tunnel for traffic, pedestrians, and the placement of necessary equipment and devices.

In difficult natural conditions, it is necessary to overcome natural obstacles in the search for highways and railways. Natural barriers can be divided into two categories:

Hill barriers (hills, mountain ranges).

Boundary barriers:

- in mountainous areas - landslides and landslides, avalanches; {{1}} - on the plains - streams and basins, settlements; in cities -

- densely populated areas.

Crossing barriers by tunneling is more efficient than bypassing them. and crossing basins, bridges and tunnels.

Nowadays, in the construction of tunnels, prefabricated coatings with a circular cross-section, designed for mechanized construction methods are widely used.

Traffic tunnels in the city are built for the following purposes:

- to organize traffic at the intersections, junctions and distribution points on the highways at different levels; Improving the planning structure of the road network;

- creation of access roads to underground parking lots, shopping malls, warehouses, railway stations, airports and others.

Road tunnels at intersections, U and T junctions, and at the intersections of two or more trunks to organize traffic at different levels.

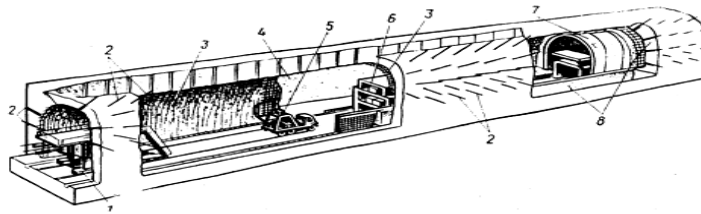
In recent years, the construction of tunnels is widely used sprinkler concrete, which differs from ordinary concrete by its placement technology, high cement content, careful selection of concrete granulometric composition and the use of special additives.

Coarse-grained fillers, water, and a mixture of adhesives and hardeners. Sprinkled concrete obtained by this method quickly hardens and hardens, turning it into a structure to strengthen the artificial cavity.

The process of spray-concrete production consists of the following steps: only very light wet cement particles are

applied to the surface of the rocks; then a gradually thickening layer is formed and sand and aggregate particles of a larger fraction are glued to it; When the dry mix is filled, a uniform adhesion is formed, which

leads to an increase in cement activity, adhesion, density, strength and impermeability.



Constructed by a closed method, the structures of the running tunnels of a circular outline from precast concrete blocks have specially designed seismic nodes. These seismic units ensure the joint operation of individual blocks in each ring and of the rings with each other at a distance between antiseismic and expansion joints along the length of the tunnel.

The running tunnels of the open method are constructed from large-sized prefabricated volumetric reinforced concrete blocks manufactured at factories. In terms of their design, these structures meet modern requirements for seismic resistance of the structure and construction industrialization. It should be noted that these constructions were widely used in the Tashkent subway not only for running tunnels, but also for pedestrian crossings, restoration of various tunnel structures.

The column-type station structures were redesigned taking into account the seismic, engineering-geological and climatic conditions of the city of Tashkent. As anti-seismic measures, longitudinal and transverse seismic beams are used at the levels of connection of station columns, floor slabs, ensuring their combined work. This design was further improved, and the

design of the station was developed from round-sized volumetric reinforced concrete elements, which was introduced during the construction of the Aibek subway station of the Uzbekistan line.

The construction of a single-vaulted station has the form of a dome, the thickness of which decreases from the base part to the ceiling. The construction of such a monolithic reinforced concrete structure of the station, built with the help of movable metal formworks, meets the requirements of earthquake resistance and corresponds to oriental architectural traditions. Subsequently, a constructive solution was developed for a one-piece station made of large precast concrete elements.

The process of development and implementation of seismic-resistant structural solutions of the subway was carried out simultaneously with the creation of methods for calculating these structures and testing them under the influence of dynamic forces (2). In carrying out theoretical studies, the dynamic theory of seismic resistance of underground structures, developed by academician T.R. Rashidov, was taken as a basis. Methods, algorithms and programs for calculating the seismic resistance of structures of running

tunnels of circular and rectangular outlines, stations of columnar and single-vaulted types have been developed.

Calculations were carried out on the parameters of these structures and the route of the Tashkent subway, under the action of dynamical (seismic) effects, and the strength-deformed states of the structures of these structures were determined. The diagrams of displacements of bending moments and shearing forces obtained as a result of calculations show the strength-deformation states of the elements of these structures in time and coordinates. For a wide application of the methods of dynamic calculation of the created subway structures, it was necessary to test these structures under the influence of dynamic loads and compare the obtained experimental results with the results of theoretical calculations. For this purpose, experimental studies were carried out on the constructed sections of the Chilanzar line of the Tashkent subway.

The dynamic load, which acts on the structure through the soil, is created by the operation of a powerful vibratory hammer VH-160, which is mounted on a specially prepared reinforced concrete slab in the

form of a rectilinear prism with dimensions of 2.5x2, 5x0,6m, into which a reinforced pile shell with a reduced height, diameter 1,6 m.

The results of the experiments were used to test theoretical studies. On the basis of the created algorithm and program, the structures were calculated for the effect of the accelerogram obtained as a result of the experiment. Comparison of the diagrams of displacements, bending moments and shear forces obtained theoretically and under the action of an accelerogram recorded as a result of the experiment shows the similarity of the diagrams of the strength-strain states of these structures, that is, the reliability of theoretical studies.

It should be noted that in recent years there have been built: a section of extension of the Yunusabad underground subway line with a length of 2.9 km by two stations. Here, the structures of tunnel lining of a circular outline with an inner diameter of 5.1 m and an outer diameter of 5.62 m from prefabricated reinforced concrete blocks of a new type are used (Figure 1).

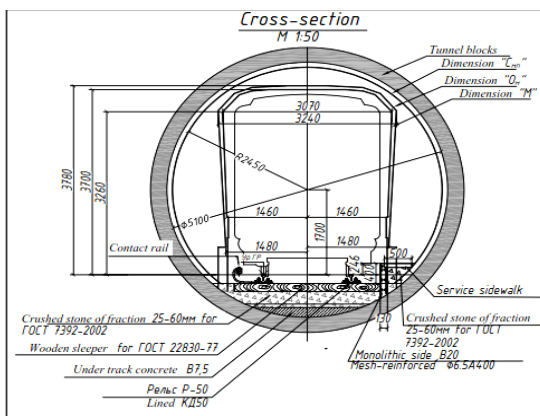


Figure 1. Cross-section of a running tunnel with a circular outline of the section of the A new direction in lengthening the lines of the Tashkent subway is the development and implementation of new constructive solutions for the overground subway.

The first start-up section of the 11.42 km long overhead ring line with 7 overground stations is connected by an

underground pedestrian crossing with the Uzbekistan line; The places of the axes of the metro supports during the design were

assigned from the condition of the maximum possible length of the adopted reinforced concrete prestressed beams of the span structures with a length of 26.0 m.

The supports of the elevated metro are located outside the existing highways, local motorways, as well as difficult to re-lay underground communications and watercourses.

The structures of the foundations of the supports were assigned depending on the soil conditions, the height of the

supports and the bearing capacity of the foundations. With pebble soils, foundations on a natural foundation are sized depending on the planned location of the track on straight and curved sections of the track.

The design of the supports on the straight sections of the route between the stations is of a single-column V-shape with a rectangular support without through cutouts, but with a deepened central part (Fig 2).

General view of the distillation support

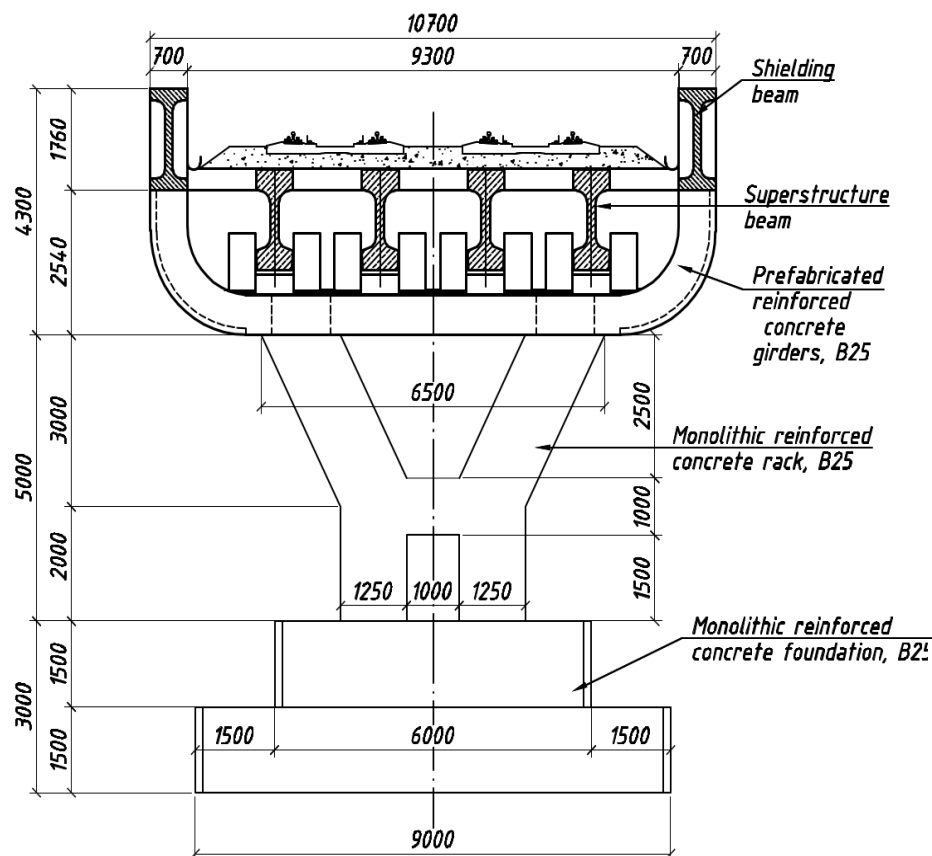


Figure 2 General view of the cross-section of an elevated metro support.

The height of the racks is assigned in two standard sizes 5.0 and 5.5 m for the location of the subway above motorways with a dimension of 5.5 m. The transverse

expansion joints between the spans are covered with metal sheets, which create a general longitudinal slope for drainage. The

superstructure of the track is laid along the insulated roadway.

The recently put into operation Sergeli overground line with a length of 6.2 km with 5 stations is connected to Chilanzar without a change. The overpass design of this overground line is prefabricated and monolithic. Structurally, the overpass consists of a superstructure and intermediate supports. The estimated distance between the supports is 26.7 m.

The double-track superstructure with an inter-track of 3.7 m on the tracks and 9.9 m at the stations is made of ribbed prestressed beams of the T-section superstructure with a length of 26.0 m. In the section, two beams of the driving track

are installed under each track and two enclosing beams.

The runner beams and the guardrail beams are identical in design. The beams of the driving track are combined along the upper plate with each other, forming a flooring for the superstructure of the track. The enclosing beams, in addition to their purpose, also serve to reduce noise from train traffic.

Intermediate supports are monolithic circular outlines of ordinary reinforced concrete with a U-shaped transom. The structure of the support, depending on the longitudinal profile of the metro line, can be one or two posts. (Figure 3).

General view of the station support

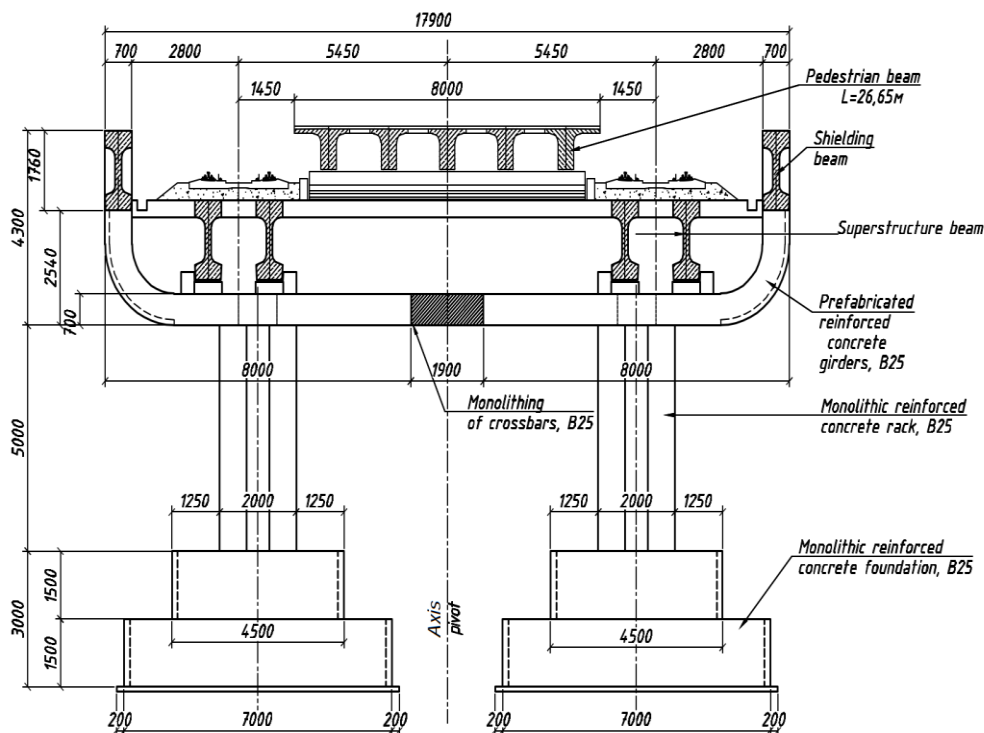


Figure 3 - Cross-section of the aboveground station structure of the Sergeli line.

The height of the racks is taken depending on the longitudinal profile and should provide a minimum underbridge clearance of 5.5 m for passage under the

overpass for vehicles on crossed roads. Racks at low heights are monolithic in the formwork of metal pipes filled with concrete and design reinforcement. At high



heights, the support body is made massive of monolithic reinforced concrete in the formwork of their prefabricated slabs.

The superstructure beams are installed on a prefabricated transom. After mounting the beams in the design position, a monolithic core 0.7 m wide is arranged on the crossbar between the ends of the beams. The rack rests on a foundation made of monolithic reinforced concrete in a formwork made of prefabricated slabs.

Depending on the soil of the foundation and the depth of the groundwater, the foundations of the supports are made on bored pillars or on a natural foundation. With the "island" platform, the section of the railway overpass in front of the station is divided into two single-track overpasses with an inter-track up to 9.9 m. The main advantages of the new metro lines put into operation are:

- they will contribute to the growth of passenger traffic on the metro, facilitate urban transit;
- an increase in the total length of the metro line will ensure transport accessibility to the project's gravity area;
- improving the quality of passenger traffic;
- distribution of passenger traffic on land transport, reducing the load on highways;
- ensuring labor migration of the population, which will contribute to the development of the labor market and will have a positive multiplier effect on the country's economy;
- saving time and money for citizens;
- development of environmentally friendly transport;
- an increase in the rhythm of movement, which will undoubtedly affect the increase in demand for this type of public transport;
- increase in the Park Utilization Ratio (PUR).

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