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GEODETIC WORKS IN BRIDGE CONSTRUCTION

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Abstract:

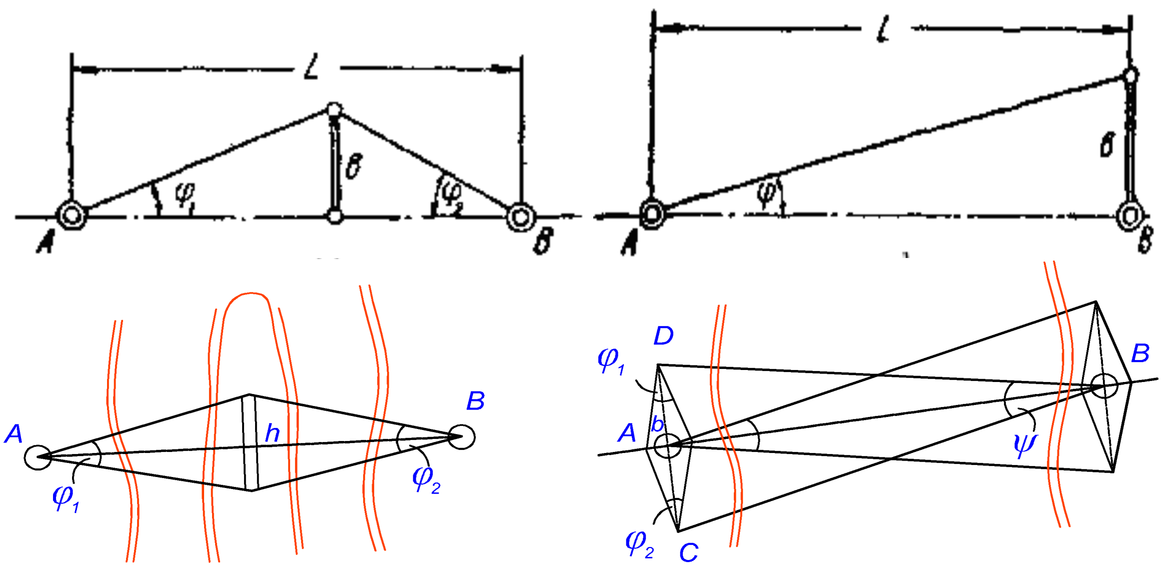
A bridge is an engineering structure built to cross an obstacle (river, canal, ravine or other places). According to its function, the bridge is designed for automobile, railway and pedestrian. Bridge, overpass; instead of being built on city bridges and roads outside the city; combined (built together for automobiles and railways), according to the material used, wood, stone, metal, depending on the reinforced concrete bridge, prolyot systems, girder, arched and suspended, console; according to the number of prolyots, single-prolyot and multi-prolyot; according to their location in relation to the load-carrying structure, to types that move over, from below, from the middle; depending on the continuous and continuous traffic, the bridge is divided into permanent and movable (opening, lifting, sliding) types; It is divided into types that can be assembled and disassembled. There will also be a bridge-canal and bridge-houses. These act as bridges as well as houses and canals. In the past, bridges were mostly made of wood and stone. Old wooden bridges are not preserved.

Keywords: *bridge, triangulation, wood, theodolite, tacheometer, level.*

In the Middle Ages, more arched bridges (Roman, Spanish, Chinese) were built. There were wooden and stone bridges in Central Asia and Russia. A floating bridge was used to cross large rivers. Cast iron bridges in England (1779), then in Russia (1784); suspension (chain) bridge was built in America (1796), then England and Russia. By the beginning of the 20th century, reinforced concrete began to be used as the main material in bridge construction, because it is durable, cheap, easy to assemble, and in the construction of a bridge that is not too long, reinforced concrete is placed on proloit supports entirely with the help of cranes. Arched, girder and frame bridges began to be built from it. The spans of modern arched reinforced concrete bridges reach 300 m in length.

Figure 1.

Bridges across Chirchik, Syrdarya and Amudarya in Uzbekistan are mainly made of reinforced concrete with arches and frames. The bridge mainly consists of an abutment and a beam. The supports are divided into coastal and intermediate supports. In a bridge made of reinforced concrete and masonry, most often, the girders and abutments form a single unit[11]. Mixed constructions (for example, steel beams with reinforced concrete or reinforced concrete beams with steel sprinkling, etc.) are widely used. Modern bridge construction includes precast bridge structures, methods of unification and homogenization of precast elements, development of bridge structural systems, lengthening of beams, high-strength steel, light alloys and concrete, welded joints instead of riveted joints, prefabricated formwork in the construction of adjacent reinforced concrete bridges. and assembly units are used.



2 - picture. Parallax units used in measuring bridge spans

After determining the place where the bridge will be built, the main geodetic works will begin in agreement with various state bodies (architectural, environmental, etc.). The main geodetic works that ensure the construction of bridges include the following.

1. Study of the topography and topography of the bottom of the watercourse;

2. Construction of planned and high-altitude geodetic networks;

3. Planning of centers and axes of bridge supports and channel supports

4. Detailed planning of the support body;

5. Management of the installation of supports and executive shooting during their installation;

6. Planning regulatory and rapper protection structures;

7. Planning the way when approaching the bridge;

8. Executive request for center work and superstructure installation;

9. Measurement of superstructure deformations during bridge tests;

10. Observation of rolls of stays and piers and deformations of superstructures during construction and operation of the bridge[12].

To assess the proposed construction area, basic studies are carried out comprehensively: - engineering-geodesy, engineering-geological and hydrogeological; hydrometeorological, climatic, meteorological, soil-geobotany, etc.

Basic research is carried out on all types of structures.

Engineering-geodesic studies allow obtaining information about the relief and condition of the area and serve as a basis not only for design, but also for other types of research and studies. In the process of engineering-geodetic research, they perform geodetic grounding and topographic photography of various sizes at the construction site, monitoring of linear structures, geodetic orientation of geological works, hydrological sections, geophysical search points and many other works.

Engineering-geological and hydrogeological studies allow to get an idea about the geological structure of the area, physical-geological phenomena, soil strength, composition and nature of underground water, etc. This information will allow you to correctly assess the conditions for the construction of the structure[3].

Hydrometeorological studies provide information about the water regime of rivers and reservoirs, the main features of the climate of the region. In the course of hydrometeorological research, they determine the nature of changes in levels and slopes, study the direction and speed of the flow, calculate the speed of the water flow, conduct depth measurements, take into account sediments, etc.

Construction engineering studies include:

assessment of geotechnical control, danger and risk of natural and man-made processes; justification of activities on engineering protection of territories; local monitoring of environmental components, scientific research in the course of engineering research, field control over the use of research products; cadastre and other related works and studies during the construction, operation and completion of facilities.

The content and scope of engineering studies are determined by the type and size of the designed structure, local conditions and their level of knowledge, as well as the design stage. Research is conducted on various types of constructions and similar layouts with very similar construction technology.

The procedure, methodology and accuracy of engineering studies are mainly established in construction regulations, for example, QMQ 11-02-96 and QMQ 11-04-97.

At the next stage, directly during the construction of the bridge, the main geodetic works are: planning of the axes of centers and supports, planning of intermediate structures, control of the dimensions of assembly elements delivered from the factory, construction planning and control of all parts of the structure, planning of auxiliary and temporary structures (buildings, roads, docks, etc.), executive drawing of built objects, monitoring of deformations[6].

Geodetic and leveling works, which ensure the design condition and dimensions of both the structure and its individual parts, are carried out during the construction of the bridge. At the same time, the geodetic plan and elevation bases are restored to the ground. Bridge axis, abutment axis, flow control dams, etc. are checked.;

Systematic control of the construction of individual parts of the structure, ensuring their design condition; checking the sizes and shapes of assembly elements coming from factories; at the construction site, auxiliary production facilities and household buildings are planned for access roads and steps.

The quality of the man-made structures erected at all stages of construction depends on good organization in many respects and completeness of geodetic, control-measurement works.

1-jadval

Construction	Scale plan	Distance between horizontal risers height, m	The number of axle centers of the bridge and the feature of their determination	The number of standards or stamps and the nature of their designation
Bridge length 100 to 300 m	1 : 2000	0,5	At least two on each coast; capital centers	One rapper on every coast; constant rapper
Bridge length greater than 300 m	1 : 5000	1,0	At least two on each coast; capital centers	Two rappers on each coast; constant rapper

In the construction of bridge and tunnel crossings, the most widely used tools in geodetic work are N-3, N-05. study, as well as used for mounting signs on supports. 2T2, 2T5 theodolites and their modifications are also used. 2T3O theodolites are used at the stage of engineering-geodetic research and in the production of some planning works.

If it is necessary to perform high-precision angular measurements, for example, when constructing break networks on bridges over 1 km, a T1 theodolite is used. Currently, many countries (USA, Switzerland, Germany, Japan, Sweden, East Germany, etc.) have developed automatic electronic tacheometers with a microcomputer and geodetic calculation software system and are mass-produced. The following values can be entered through the control panel for these devices[2].

Corrections for atmospheric conditions, instrument point elevation, vertical and horizontal angles, as well as code numbers, including stand and sight point numbers, topographic features, etc. Determines horizontal distances and heights, taking into account the curvature of the earth. The information is shown on the display.

When measuring the distance in the tachymeter, the signal intensity is automatically set, it is possible to work in the tracking mode, the reference along the horizontal circle is set to zero or to a certain direction. The device provides data input to the external memory, for which it is equipped with a recording device and a data processing and transmission unit.

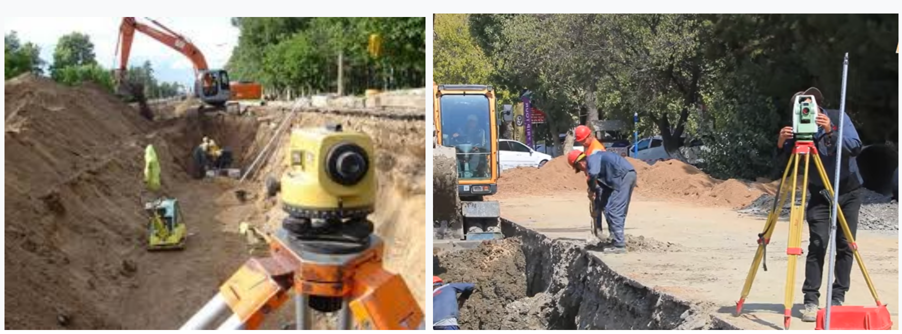


Figure 3.

Electronic general stations of the latest models can work in tracking mode, that is, constantly determining the position of a moving reflector with constant vision. In this case, the new values of the horizontal direction and the distance will be periodically shown on the display. Data output to data storage devices (storage devices) or data processing devices is provided[8].

Bridge triangulation is complexly equalized and calculated as an independent network. One of the starting points is usually taken as the coordinate head, and the bridge axis is taken as the abscissa axis.

Angles are measured and the sum of the angles in each triangle must be 180º.

From the logarithm table, each angle is found to the nearest 1″. These results can be calculated using the formula.

$$\beta = \mathrm{d} * \mathrm{lgSinA} = \frac{M * 10^2}{206265.8 * tgA}$$

where M is the decimal logarithm module, M=0.43429448

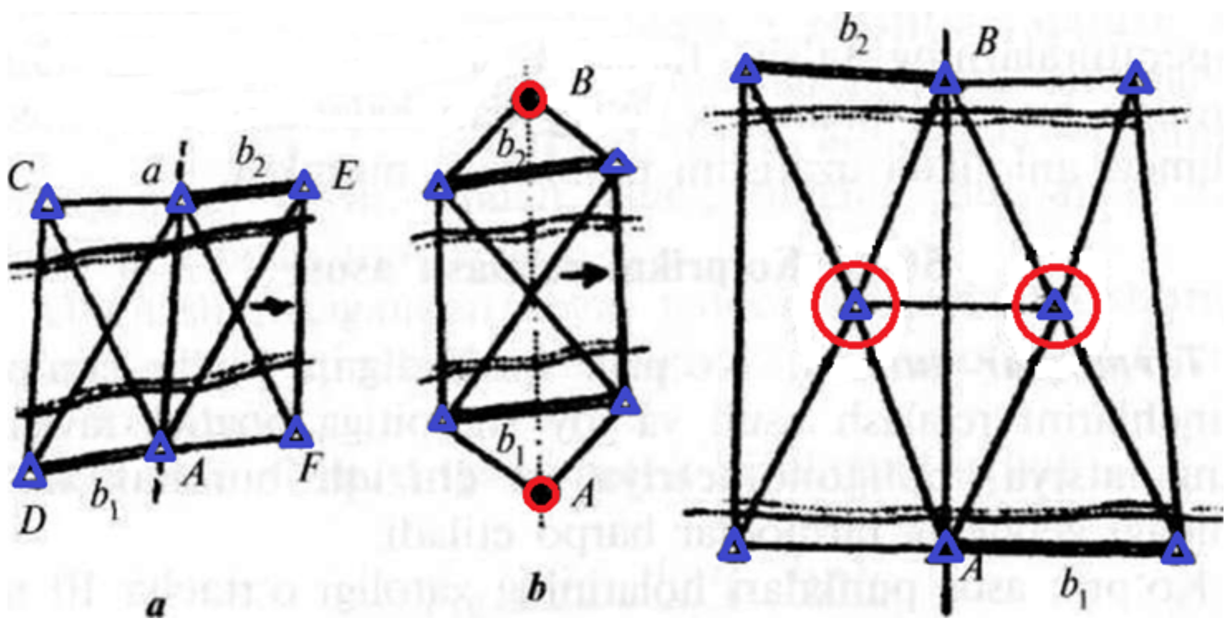


Figure 4. Bridge triangulation

Linear angle networks. In connection with the application of accurate light gauges in geodetic production, special linear corner grids are recommended in the planning of bridges (Fig. 4).

A sample form of such networks is presented in the figure, four sides S1, S2, S3, S4 and four angles β1, β2, β3, β4 are measured. The sides and angles on the shore are measured. Sides 1-2 are superimposed with the axis of the bridge, sides 3-4 and 5-6 are the base side for planning[4].

These devices make it possible to determine the spatial position of research points directly in the field, according to measurement data, by the method of free selection of fixed points. It should be noted that computer programs for processing networks and evaluating their accuracy are built according to the most general algorithms, and they can be used with equal success in analyzing the accuracy of any type of network - triangular, linear-angular, polygonometry, trilateration. such calculations can be done manually using desktop calculators, but doing them with modern equipment equipped with electronic computers increases the efficiency of our work even more.

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