Bulgarian Chemical Communications, Volume 54, Special Issue B1 (pp. 103-107) 2022 DOI:10.34049/bcc.54.B1.0346

Organizational-technological aspects in the construction of construction sites

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Received: November 17, 2021; Accepted: April 29, 2022

The characteristics of the construction builds in the most general form include: (i) volume-compositional solution – the purpose type and character of the facility (or the building) are clarified; (ii) constructive decision - the accepted constructive scheme, the type and constructive features of the elements and of the facility as a whole, some specific constructive requirements are indicated; (iii) technological features – the type of the adopted construction technology, the type and volumes of construction and installation works are defined (including the quantity bill). In organizational and technological solutions, when drawing up the plan for safety and health of the technology, the methods and sequence of execution of all construction and installation works for the overall construction are clarified and proposed.

The purpose of the development is to analyze the impact of different technologies in the construction of a construction site on the organization and operational management in their implementation. For this purpose, it is intended: (i) to consider different technologies in the construction of construction sites; (ii) to trace the impact of the

chosen technology on the main resources needed for the construction of the sites.

INTRODUCTION

The realization of the construction sites is characterized by great dynamics and complexity. The dynamics is dictated by the great variety of the individual sites, as well as the various mechanization, construction materials, the large number of specialists and others. The technology used to realize the finished product is essential.

The stochastic nature of the construction is not to be underestimated due to its strong dependence on climatic conditions. The organization during the implementation of the construction process aims to create the necessary order for interaction between the participants in compliance with the adopted technology [1].

Methods for optimization of labor and financial expenses

The implementation of investment projects in construction can be called a process of mentoring, regulating and managing the construction project from the initial planning phase to its completion. The main goal in their implementation is to meet the expectations of the client (assignor). The project must be both functional and cost-effective. Their implementation is closely linked to the technical characteristics and budget of the project, but also requires good communication between all participants (contracting authorities, contractors, subcontractors, suppliers, institutions and the external environment).

From the point of view of the country executing the project, the organizational and technological aspects of the planning can be both in the stage of preliminary planning of the implementation of the project and in the process of its implementation. The stage of preliminary planning usually represents the process of preparation of the project-budget documentation, collection of offers from subcontractors and suppliers, collection and specification of the projects in parts. In this phase, the aspects that can affect the subsequent implementation include the correct creation of relevant applications (quantitative tables, comparative tables for subcontractors and suppliers, calendar and financial schedules) which, created according to the standard model adopted for the organization, can be easily used by the project implementation team for the subsequent implementation, serving as an organizational package.

The stage of implementation of the project begins with determining the project team and drawing up a schedule of implementation which corresponds to the set start and end dates to the contracting authority. Based on the prepared comparison tables, a schedule for deliveries is prepared and subcontractors are determined for specific construction and installation works. Possible optimizations for the projects by parts are considered, as well as possible risks during the project implementation. In the process of implementation of the site, statistics are kept on workers and work performed (daily activities), as

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this ould help in planning the next sites. The applications below are a visual aspect of the project implementation, as they guide the team in the implementation of their work and help to reduce errors in the implementation [2, 3].

RESULTS AND DISCUSSION

As an example of optimization in the implementation of the site is considered the construction of an excavation of a 9-storey residential building divided into 5 blocks with a food supermarket on the ground floor. There are 2 underground levels, the elevation of the bottom excavation is -7.20 m. The dimensions of the excavation are 28 m × 95 m.

The initial project envisages the strengthening of the entire excavation to be completed with the so-called "Berlin wall" (shown in Fig. 1).

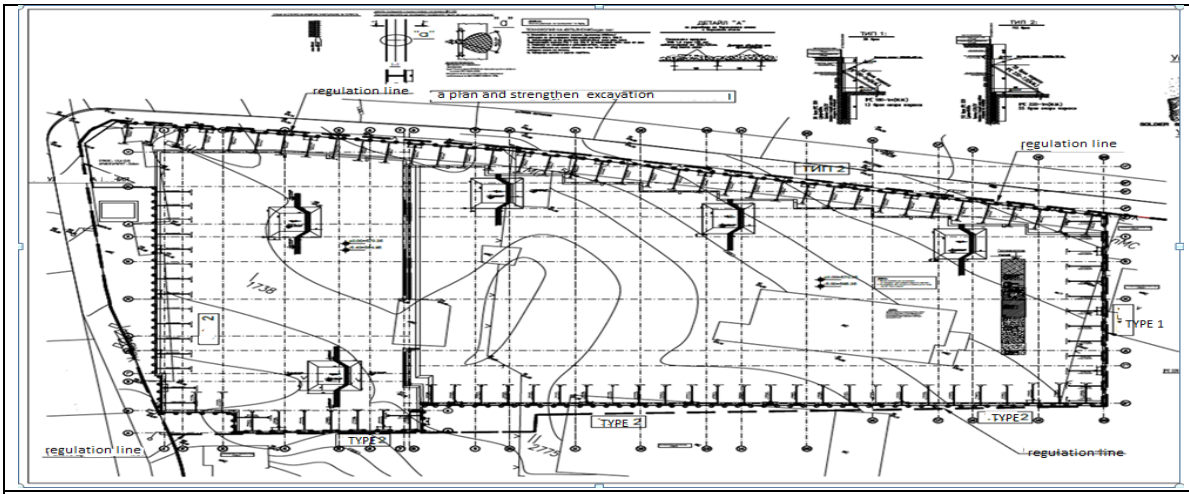

Fig. 1. Excavation plan and strengthening before optimization.

Fig. 2. Leveling of the piles.

Fig. 3. Execution of the trench cladding.

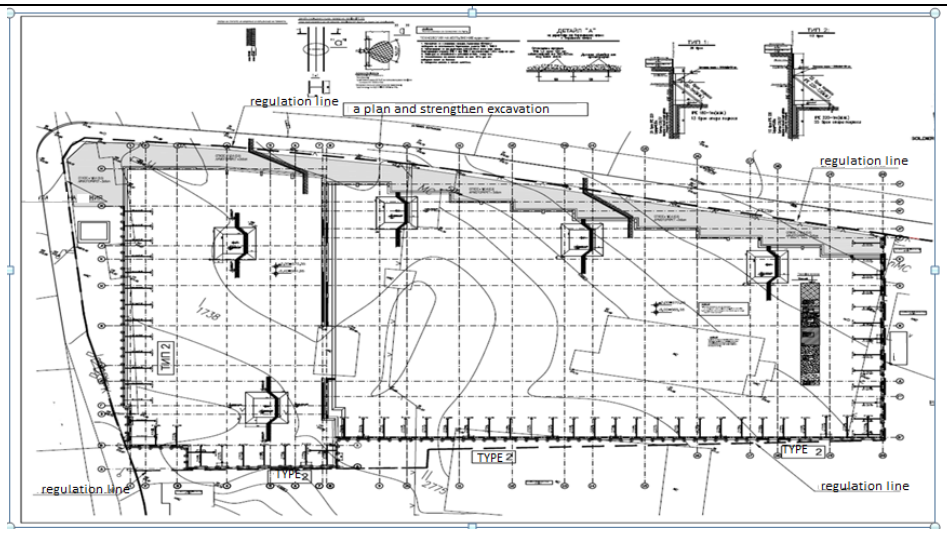

Fig. 4. Excavation plan and strengthening after optimization.

In geotechnical practice, "Berlin walls" are understood as fortifications made of metal profiles with wooden cladding between them. In the general case they are found in two variants: drilling and driving. In the case of drilling walls, a round drilling is prepared in advance, most often with a diameter d = 300 mm. A metal profile is placed in the borehole and concrete is filled to the elevation of the trench. In its second variant, this type of walls is made by nailing the metal profiles. This is done either dynamically by vibrating hammers or by static pressure, for example with an excavator. After the installation of the metal profiles, the excavation begins, and as it progresses, wooden planks are also placed.

In this example, the initial excavation is up to -0.5 m, the depth required for leveling the piles. The excavation is then carried out to the level of the pilot's anchor. Subsequently, the site team decided to reinforce the north wall with shotcreting. (shown in Fig. 4).

Shotcreting is a layering process by spraying a cement mixture, aggregates, water and high pressure additives on various surfaces. Such surfaces can be horizontal, vertical or ceiling areas. (shown in Fig. 5). This decision was accepted because the relief allows the excavation to be filled with a slope on this side. A reinforced mesh ϕ6.5 is laid, Fig. 5.

A new plan is drawn up, which after passing the approval procedures, is implemented on the spot.

In the second option, shotcrete is applied - concrete of 350 sq. m. Its application is more economical. The result is:

- Saving 280 sq.m. of "Berlin wall";
- Saving 25 938 kilograms of structural steel profile IPE220;
- Concreting 55 piles less.

The total value of the saved funds after the optimizations amounts to about BGN 22 000.

Fig. 5. Strengthening by shotcreting.

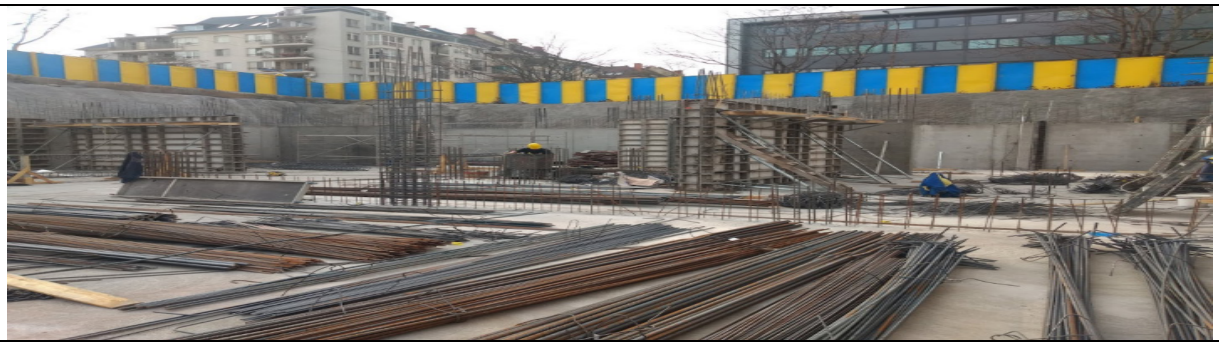

Fig. 6. Final view of the strengthening of the northern side.

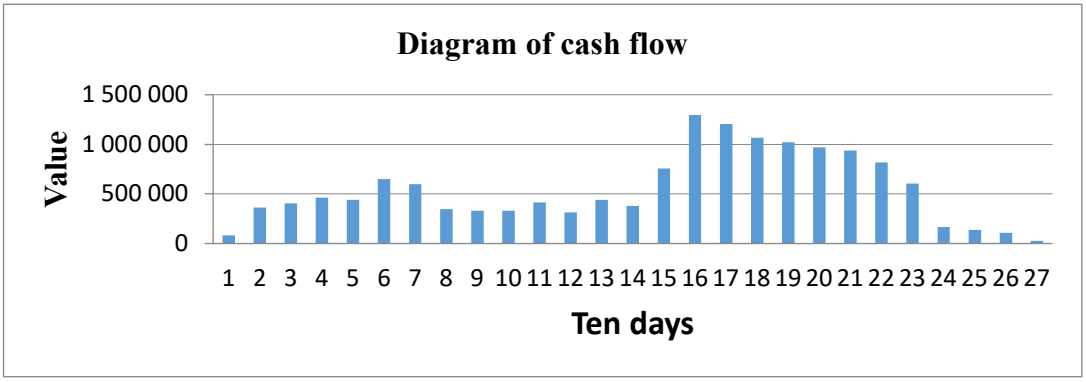

Fig. 7. Diagram of cash flow

Other factors affecting the optimization of performance

The cash flow chart presents the intensity of financial investment in construction. It is a consequence of the payment schedule and the completed stages of the project, having a direct impact on the human and material resources that can be invested in the site for specific periods of time. Drawing up a rational diagram for investing funds will allow the investor to draw up a rational plan for financing and construction of the construction site.

The workforce diagram is compiled on the basis of a calendar plan and is a differential diagram that shows the number of workers needed to complete the project at certain intervals. It is the main factor on which the situation of the site should be created under part of Plan of safety and health, as it is necessary to provide a sufficient area for rest, first aid and storage of accessories for all workers. It is also a major factor in the distribution of human resources in an organization and its possible optimization leads to the implementation of the specific site in a shorter time. It is desirable for the labor diagram to be uniform - to increase gradually with the development of construction, to have a relatively constant level during the period of the most intensive construction and to gradually decrease with the completion of construction.

The diagram of the necessary mechanization for the construction period is a very important attribute in the management of the mechanization of a given organization. Based on the examination of the diagrams of all sites of the organization it can be understood whether the necessary mechanization of the site can be provided without hiring external and if necessary rent of external mechanization - what will be its exact quantity and for what period of time. It is possible to rearrange the individual stages of the implementation of the site so that the respective construction and installation works can enter the time limit in which the organization has its own equipment available. The presence of this type of diagram allows to optimize the use of machines according to certain criteria and on the basis of the diagram to compile route schedules when necessary. The cash flow chart presents the intensity of financial investment in construction. It is a consequence of the payment schedule and the completed stages of the project, having a direct impact on the human and material resources that can be invested in the site for specific periods of time. Drawing up a rational diagram for investing funds will allow the investor to draw up a rational plan for financing and construction of the construction site.

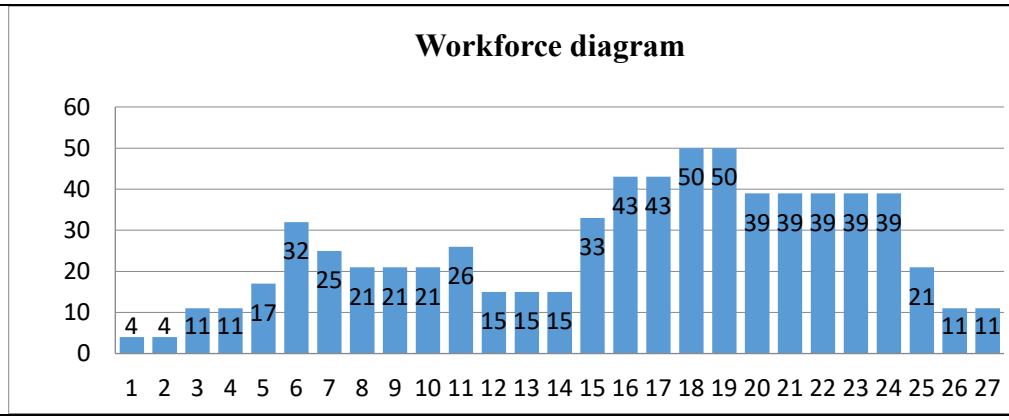

Fig. 8. Workforce diagram

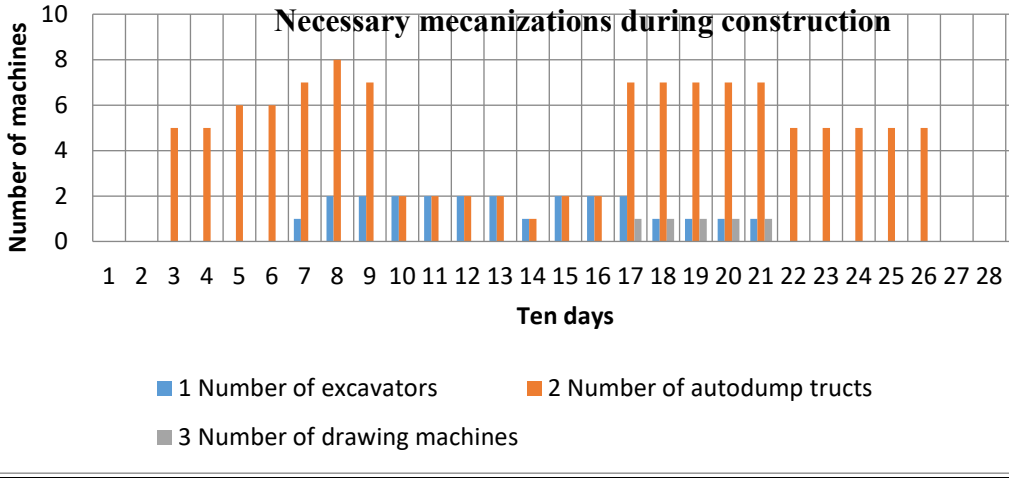

Fig. 9. Diagram of mecanizations

CONCLUSION

When choosing a particular technology, it is necessary to make an in-depth analysis of the technical and economic indicators for the different options. The quantity-value account is the economic indicator for the choice of a given variant. The choice of technology is determined by several indicators such as lead time, choice of equipment, maximum number of workers and others.

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