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**PROBLEMS ARISING IN THE TECHNOLOGY OF CONSTRUCTION OF BUILDINGS
AND STRUCTURES**

Author: **ASKAROVA MUHLISA BAKHROMJON KIZI**

NURIDDINOVA FATIMAKHAN MAHAMA DALI KIZI

Organization: Andijan state technical institute

Abstract. The article systematically analyzes the problems associated with organizational and technological, structural, material science, labor safety, digital management and quality control in the technology of construction of buildings and structures. The study assessed the main losses in the construction process, violation of technological discipline, inconsistency between design and execution documentation, inefficient use of resources, increased time and cost, and limitations in the introduction of innovative technologies in local conditions. To reduce problems, a scientific and practical model based on the integrated application of BIM/ISO 19650 principles, electronic control, phased technological maps, prefabrication, lean construction, risk-based quality management and labor safety was proposed.

Keywords: buildings and structures, construction technology, construction process, technological map, quality control, BIM, lean construction, prefabrication, occupational safety, risk management.

Abstract. V state systemically analyzed organizational-technological, constructive, material science, digital and management problems, driving, building and construction. Obosnovana neobhodimost vnedreniya integrirovannoy modeli upravleniya stroitelnyim proizvodstvom na osnobe BIM , elektronogo kontrolya, tekhnologicheskikh kart, predvaritelnogo izgotovleniya elementov, principov berejlivogo stroitelstva i risk-orientirovannogo kontrolya kachestva.

Key words: building and construction, construction technology, construction process, technological card, control kachestva, BIM , berejlivoe stroitelstvo, prefabrication, safety at work.

Abstract. The article provides a systematic analysis of organizational, technological, structural, material-related, digital and quality-control problems arising in the construction technology of buildings and structures. An integrated construction management model based on BIM/ISO 19650 principles, electronic supervision, technological process maps, prefabrication, lean construction and risk-oriented quality control is proposed to improve productivity, safety and reliability of construction works.

Keywords: buildings and structures, construction technology, construction process, process map, quality control, BIM, lean construction, prefabrication, occupational safety, risk management.

ENTRANCE

The modern construction industry is directly related to the rapid urbanization, the increase in the standard of living of the population, the need to upgrade industrial and social infrastructure. However, the process of constructing buildings and structures is not just a repetition of the

geometric shape of the project on the construction site; it is a complex production process that combines many resources, technical means, labor operations, safety requirements, quality control and management decisions into a single system.

In practice, there are often problems with extended construction periods, increased cost estimates, excessive material consumption, unstable quality of work performed, non-compliance with technological sequence, increased occupational safety risks, and insufficient coordination of design solutions at the implementation stage. These problems may seem like minor shortcomings when viewed individually, but they lead to systematic losses and reduced operational reliability in the overall construction cycle.

The issue of improving construction processes in Uzbekistan is even more urgent. Because regional climatic conditions, seismic hazard, diversity of local material properties, logistics capabilities and the need for a qualified workforce require the organization of construction technology on a scientific basis. Legislation on urban development activities, state expertise, construction supervision, regulatory documents and digitalization processes constitute an important institutional basis for improving the quality of construction.

The purpose of the article is to conduct a comprehensive analysis of the main problems arising in the technology of constructing buildings and structures, determine their cause-and-effect relationships, and develop an improved management model based on modern constructive, technological, and organizational solutions.

LITERATURE ANALYSIS AND PROBLEM STATEMENT

In the modern interpretation of construction production, technological processes are considered not as a set of traditional sequential operations, but as an integrated system connected by information, material, labor and time flows. ISO 19650 standards on BIM technologies define the principles of creating, exchanging, classifying and managing information during the design and construction stages. This approach is important for early detection of non-conformities in construction, streamlining of execution documents and accelerating the decision-making process.

The concept of lean construction is aimed at reducing non-value-added operations, minimizing waiting, over-transportation, defective work, rework and excess inventory. Labor productivity at the construction site often decreases due to the lack of readiness of the work front, the untimely arrival of materials, the lack of accuracy in project drawings, and the incorrect distribution of equipment and labor. Therefore, in construction technology, it is necessary to solve the problem not only with technical means, but also with a management culture, information discipline and control system.

The introduction of electronic platforms in the direction of state control and digitalization in the construction system of Uzbekistan serves to strengthen quality, transparency and accountability. However, for digital control tools to be effective, the project, estimate, technological map, material certificates, laboratory tests and acts of work performed must be maintained in a single information chain. Otherwise, digitalization will remain only in the form of document exchange and will not have a sufficient impact on real technological discipline.

Existing research and practical observations show that problems in construction are often concentrated in five blocks: design-technological inconsistency, material and resource

management, execution quality and laboratory control, occupational safety, and insufficient integration of digital monitoring. The article conducted a systematic analysis of these blocks.

RESEARCH METHODOLOGY

The research methodology was based on the approaches of systematic analysis, comparative assessment, cause-and-effect diagram, risk score assessment, technological process modeling and expert assessment. Problems in the construction process were grouped by the design stage, preparatory stage, main construction and installation works, quality control, occupational safety and commissioning stages.

To quantify the problems, an integrated technological problem index has been proposed. This index allows assessing the sustainability of the construction process according to several criteria:

$$ITMI = 0.25K_1 + 0.20K_2 + 0.20K_3 + 0.15K_4 + 0.20K_5$$

where: ITMI - integrated technological problem index; K_1 - coefficient of inconsistency of design and execution documentation; K_2 - coefficient of violation of material and logistics discipline; K_3 - coefficient of deviation in quality control; K_4 - coefficient of occupational safety risks; K_5 - coefficient of efficiency of use of terms and resources. The coefficients are evaluated in the range from 0 to 1: 0 - almost no problem, 1 - the problem is critical.

The advantage of this approach is that it brings together problems of different nature into a single management indicator. As a result, it is possible to determine in which areas urgent measures need to be taken at the construction site.

Problem block	Main reasons	Consequences	Recommended solution
Project-technological inconsistency	Discontinuity between drawings, estimates and technological maps	Recycling, extension of time, additional cost	BIM coordination, clash-detection, execution model
Material quality	Weak certification and laboratory control	Decreased strength and endurance	Access control, electronic material passport
Labor productivity	The work front is not ready, the equipment distribution is incorrect	Idleness, cost increase	Lean planning, weekly work plans
Occupational safety	Formal conduct of risk assessment and briefing	Injury, stoppages, legal risk	HSE audit, risk map, digital checklist
Quality control	Execution documents and test results are not	Late detection of a defect	Risk-based control, mobile photo

	in a single system		evidence
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Table 1. Main problem blocks and solutions in the technology of construction of buildings and structures

RESULTS AND DISCUSSION

1. Disruptions between the design and execution phases

One of the most common problems encountered during construction is the incompatibility of design solutions with the real conditions at the construction site. Inaccuracies in design documentation, insufficient development of structural nodes, conflicts between engineering networks and structural elements, inconsistencies in estimates and technological maps lead to redesign at the execution stage.

In this case, the BIM model should be considered not only as a 3D view, but also as an information environment that combines structural, technological, estimate and time parameters. For example, if the foundation, column, lintel, wall, engineering communications and finishing works are checked in an interconnected 4D/5D model, many collisions are detected before construction begins.

2. Problems in materials and logistics management

The unstable quality of building materials, non-compliance with storage conditions, violation of the delivery schedule and the formal organization of incoming control directly affect the construction technology. If parameters such as the temperature of the concrete mix, its mobility, water-cement ratio, diameter and steel grade of reinforcement, humidity and geometry of bricks or blocks are not controlled, hidden defects form in subsequent structural layers.

Although the use of local materials is economically feasible, their physical and mechanical properties, compliance with standards, and batch stability must be confirmed by laboratory tests. Therefore, the movement of materials - supplier, certificate, transport, warehouse, access control, zone used, and test report - must be maintained in the form of an electronic passport.

Control object	Minimum inspection content	Responsible department	Digital proof	Risk level
Concrete mix	Mobility, temperature, sample preparation	Laboratory, technical control	Photo, test protocol	High
Armature	Diameter, grade, certificate, corrosion condition	Technical control	QR-passport, act	High
Brick/block	Size, density, moisture, consistency	Laboratory	Party card	Medium

Thermal insulation	Density, humidity, fire safety document	Technical control	Certificate, photo	Medium
Makeup supplies	Shelf life, humidity, compatibility	Master, supervisor	Admission form	Low-medium

Table 2. Indicators of access control for building materials

3. Technological sequence and organization of the work front

In the construction of buildings and structures, each operation is technologically linked to the previous and subsequent operations. If foundation work, vertical structures, interfloor overlappings, engineering networks, waterproofing, thermal insulation and finishing works are performed in the wrong sequence, part of the work will have to be redone or hidden defects will appear.

Technological maps are often drawn up in a general descriptive form and are not adapted to the conditions of a specific facility. As a result, the crane zone, temporary storage of materials, safe passageways, waste flow, movement of work crews and quality control points are not sufficiently coordinated. In this situation, it is necessary to introduce a weekly work plan and a daily operational planning system.

The lean construction approach focuses not on maximizing resources, but on reducing waste such as idle time, over-hauling, waiting, incorrect execution, and excess inventory. This approach can also be effective on local construction sites, as most problems are due to poor coordination rather than technical deficiencies.

4. Quality control and acceptance of confidential work

An important condition for ensuring the quality of construction is that control is carried out not at the final stage, but during the technological process. Hidden works, such as reinforcement, formwork installation, waterproofing layers, closed sections of engineering networks and thermal insulation elements, are not subsequently visually inspected. Therefore, a digital act with photo evidence, geolocation, time stamp and signature of the responsible person should be kept for such works.

In quality control, it is important to determine the cause of deviations, not just compliance with regulatory requirements. For example, if a concrete test gives an unsatisfactory result, the cause may not only be in the composition of the mixture, but also in the transportation time, laying technology, vibration mode or maintenance conditions. Therefore, quality control must be combined with a risk-based analysis.

5. Occupational safety and technological discipline

The construction site is a high-risk production area. Working at height, lifting heavy loads, electrical equipment, temporary structures, excavation work and traffic are constant sources of danger. Formal safety training, poor use of personal protective equipment and lack of clear marking of danger zones also disrupt the technological process.

To improve safety, each technological map should contain an HSE block: hazard source, probability, consequence severity, preventive measure, responsible person and control period.

Information management approaches such as ISO 19650-6 indicate the need to maintain safety-related information in a structured manner throughout the entire construction life cycle.

Technological stage	Source of danger	Prevention	Control tool
Excavation work	Ground shaking, machinery movement	Slope reinforcement, signalman	Daily checklist
Formwork and reinforcement works	Cut, fall, heavy element	Protective clothing, safe platform	Photo checklist
Concreting	Electric vibrator, sliding, load drop	Vibrator isolation, walkways	Technical control log
Installation work	Crane area, height	Sling control, danger zone	Permit and video evidence
Makeup work	Dust, chemical, altitude	Ventilation, respirator, ladder trailer	HSE audit

Table 3. Safety risk management at construction technology stages

PROPOSED INTEGRATED SOLUTION MODEL

Based on the analysis, an integrated technological management model is proposed to reduce problems in the technology of construction of buildings and structures. The main idea of the model is that the design document, technological map, material passport, work schedule, quality control and HSE requirements should be managed not as separate documents, but as a single information flow.

At the first stage, project documentation is coordinated with BIM. At the second stage, a technological map adapted to the object is developed for each main type of work. At the third stage, material access control is linked to an electronic passport. At the fourth stage, construction and installation work is controlled through a 4D work schedule. At the fifth stage, hidden work and laboratory tests are formalized with a digital act. At the sixth stage, occupational safety risks are monitored through a daily checklist.

The proposed model accelerates the identification of problems during the construction process, clearly defines the boundaries of responsibility, reduces the share of rework, and ensures completeness of documentation at the stage of handover of the facility. Most importantly, the model does not link construction quality only to the final inspection, but also shapes quality at each stage of the technological process.

Model element	Content	Expected result	Validation tool	Priority
BIM coordination	Identifying project conflicts	Recycling is reduced	3D/4D model	High
Technological map	Workflow and resources	Technological discipline	Object-specific card	High

		increases		
Electronic material passport	Certificate, testing, batch control	Hidden defect is reduced	QR/ID list	High
Lean planning	Reduce waiting and idle time	The deadline is shortened.	Weekly plan	Medium-high
HSE integration	Preliminary risk assessment	Injury is reduced	Digital checklist	High
Risk-based quality control	Deep examination of important points	Quality stabilizes	Audit and report	High

Table 4. Structural elements of the integrated technological management model

SCIENTIFIC NEWS

An integrated technological problem index has been developed to assess problems in the technology of constructing buildings and structures. This index allows expressing design-execution inconsistency, material-logistics discipline, quality control, labor safety, and resource efficiency in a single indicator.

To eliminate problems in the construction process, a comprehensive model combining BIM, lean construction, electronic material passport, risk-based quality control and HSE management was proposed. Unlike traditional control, this model is aimed at preventing problems at an early stage of the technological chain, rather than at identifying them at the end.

Practical recommendations have been developed for local construction practice on adapting technological maps to facility conditions, maintaining digital records, and linking material access control with an information model.

PRACTICAL RECOMMENDATIONS

1. At each large construction site, project, estimate, technological map, work schedule, and quality control documents must be maintained in a single digital register.
2. Before construction begins, it is advisable to conduct BIM coordination of the main structural and engineering systems and create a separate register of collisions.
3. It is necessary to introduce an electronic material passport for concrete, reinforcement, thermal insulation, wall materials, and waterproofing products.
4. When accepting confidential cases, photo evidence, time stamp, responsible person, and laboratory protocol must be attached.
5. Occupational safety risks should be included as a separate block in each technological map, and high-risk work should be carried out on the basis of a special permit.

6. Weekly work plans at the construction site should be based on lean construction principles, and the reasons for uncompleted work should be regularly analyzed.

CONCLUSION

The problems that arise in the technology of construction of buildings and structures are multifactorial in nature, and are associated with disruptions between design, materials, technology, occupational safety, quality control and management systems. Solving the problem through a single technical measure alone is not enough; the construction process must be managed in an integrated manner throughout its entire life cycle.

The results of the study show that BIM-based information management, lean construction principles, electronic material passport, risk-based quality control and HSE integration serve to reduce losses in the construction process, stabilize quality and shorten the period. In particular, digitalization of hidden work control and material access control plays an important role in ensuring the operational reliability of the facility.

The proposed integrated technological problem index allows for a rapid assessment of the current situation at the construction site, identification of problem areas, and scientific justification of management decisions. This approach can be used as a scientific and practical tool aimed at improving quality, safety, and efficiency in construction practice in Uzbekistan.

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