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MONITORING - EFFECTIVE METHOD FOR DETERMINING THE TECHNICAL CONDITION OF BEARING ELEMENTS OF BUILDINGS AND STRUCTURES

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МОНИТОРИНГ-ЭФФЕКТИВНЫЙ МЕТОД ОПРЕДЕЛЕНИЯ ТЕХНИЧЕСКОГО СОСТОЯНИЯ НЕСУЩИХ ЭЛЕМЕНТОВ ЗДАНИЙ И СООРУЖЕНИЙ

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ABSTRACT

This work describes the essence of the monitoring method for the detection of the technical condition of the bearing structures of buildings and structures. The considered method is the main forecasting of the technical condition and expecting from the modern trends in the field of construction.

АННОТАЦИЯ

В настоящей работе изложен суть мониторингового метода при выявлении технического состояния несущих конструкций зданий и сооружений. Рассматриваемый метод является основной прогнозирования технического состояния и ожидая из современных направления в области строительстве.

Keywords: monitoring, observation, surveys, technical condition, building structures, instrumental monitoring, sensors.

Ключевые слова: мониторинг, наблюдения, обследование, технического- состояния, строительных конструкций, инструментальный мониторинг, датчики.

INTRODUCTION. Monitoring is a continuous process of observing and registering the parameters of an object, comparing them with specified criteria. Monitoring of critical and dangerous objects, which include unique buildings and structures, is the process of instrumental automated round-the-clock monitoring of individual parameters of objects. Its purpose is to prevent

emergencies and damage or destruction of objects. The main difference of this type of monitoring is that in the process of monitoring deformations and displacements of the object and its individual elements are monitored, which makes it possible to prevent the onset of a negative event, and not inform the emergency services about an emergency that has already happened. Monitoring of

critical and hazardous objects is carried out using optical, laser and geophysical methods and instruments [1].

Monitoring of the technical condition of the foundations and building structures of buildings and structures is carried out in order to ensure their safe operation, its results are the basis for operational work at these facilities. During monitoring, they control the processes taking place in the structures of objects and in the ground. Monitoring is carried out for early detection at an early stage of tendencies of negative changes in the stress-strain state of structures and foundations, which may lead to the transition of an object to a limited operable or emergency state, as well as to obtain the necessary data for the development of measures to eliminate the negative processes that have arisen.

The scope of work on monitoring the technical state of foundations and building structures of unique buildings and structures is regulated by individual programs for measuring and analyzing the state of load-bearing structures, depending on the technical solution of the building or structure and its deformation state.

In an operating unique building or structure, access to most of the load-bearing structures is significantly limited, and work on the traditional inspection of the technical condition of structures is laborious and expensive. For such objects, special methods and technical means of early detection and localization of places of change in the stress-strain state of structures are used, followed by examination of the technical state of the identified hazardous sections of structures.

The purpose of monitoring is to conduct observations and timely identify unacceptable deviations in the behavior of newly existing objects located in the zone of influence of new construction, as well as preserving the natural environment.

Modern construction and technical maintenance of buildings must ensure and resolve issues of human life safety.

When designing a building, performance is determined by the choice of materials, structural analysis, space-planning solution, engineering equipment in accordance with the purpose of the building.

One of the tools aimed at maintaining the required levels of reliability and functionality of the structure is instrumental monitoring. Monitoring is a process of continuous control of the current state of an object with the accumulation of information and assessment of the information received in order to identify the current state of the object, control of changes in this state over time and the interaction of objects with natural and man-made impacts on them [2]. A monitoring system for engineering structures is a system of sensors distributed

throughout the structure, information from which is constantly brought to the reception center.

METHODS. After that, this information is displayed in an easy-to-read form and stored. The technical base of monitoring systems is equipment manufactured by leading companies - generally recognized world leaders in the production of control and measurement instruments, as well as computer technology and electronics. The system for instrumental monitoring of engineering structures consists of sensors and autonomous data collection units that are installed at the facility or control station. The sensors are connected to the data acquisition units using a wired or wireless transmission system [3]. The control station is used to collect information from the data collection units, record the results on stationary and removable media. The nomenclature used and the number of sensors are determined by the project and may vary.

Nomenclature of modern sensors used:

- climatic sensors: wind strength and direction, temperature and humidity.
- strain gauge strain gauges (stress).
- accelerometers - acceleration and vibration sensors.
- inclinometers - tilt sensors.
- displacement sensors - mechanical, laser or GPS.

Monitoring of the technical condition of buildings and structures is carried out for:

- control of the technical condition of buildings and structures and timely adoption of measures to eliminate emerging negative factors leading to the deterioration of this condition;
- identification of objects on which changes in the stress-strain state of supporting structures have occurred and for which an examination of their technical condition is necessary;
- ensuring the safe functioning of buildings and structures due to the timely detection at an early stage of a negative change in the stress-strain state of structures and foundation soils, which may lead to the transition of objects to a limited working condition or to an emergency state;
- tracking the degree and speed of changes in the technical state of the object and taking, if necessary, emergency measures to prevent its collapse.

When choosing an observation system, it is necessary to take into account the purpose of monitoring, as well as the speed of the processes and their change in time, the duration of measurements, measurement errors, including due to changes in the state of the environment, as well as the influence of interference and anomalies of a natural-man-made nature [4].

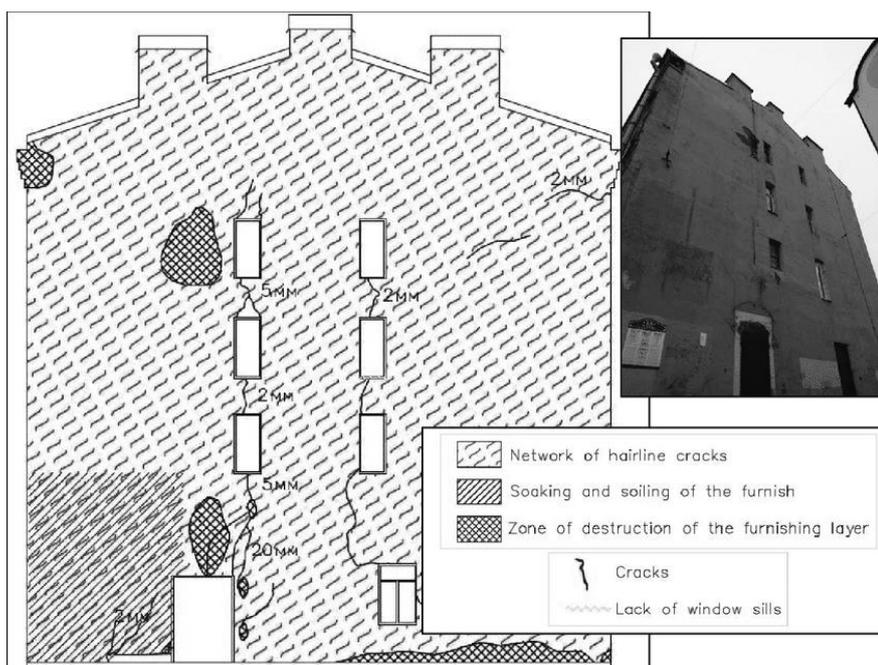


Figure 1. Survey the crack size in the building and monitoring the change

When erecting buildings and structures near or close to existing ones, additional deformations of previously built buildings and structures occur.

Experience shows that neglect of the special conditions of such construction can lead to the appearance of cracks in the walls of previously constructed buildings, distortions of openings and staircases, to a shift of floor slabs, destruction of building structures, i.e. to the disruption of the normal operation of buildings, and sometimes even to accidents.

With the planned new construction on the built-up area, the customer and the general designer, with the involvement of interested organizations operating the surrounding buildings, must resolve the issue of examining these buildings in the zone of influence of new construction.

A nearby building is an existing building located in the zone of influence of the settlement of the foundations of a new building or in the zone of influence of the production of work on the construction of a new building on the deformation of the foundation and structures of an existing one. The zone of influence is determined during the design process.

If at any stage of monitoring data is received indicating a deterioration in the technical condition of the entire structure or its elements, which may lead to the collapse of a building or structure, the monitoring organization must immediately inform the owner of this, including in writing. facility, operating organization, local executive authorities.

They are used for unique, high-rise and technically complex buildings.

Funding for the design and implementation of measures in existing buildings is decided by agreement between the customer and the general designer of the new construction and interested organizations operating the buildings.

Along with the above-mentioned problems of ensuring the safety and operational reliability: both existing and new buildings, the problem of environmental and geological risk is urgent, which makes it mandatory in design and construction to take measures to reduce the intensity of hazardous processes and increase the stability of the environment, including geological environment.

The development of such measures should be carried out as part of a new construction project and be based on the results of comprehensive monitoring of the state of the environment at the stages of geotechnical and environmental surveys, construction and operation of buildings and structures.

Monitoring carried out during the survey phase should be complemented by monitoring during the construction phase. The latter provides data on the progress of the project and changes in the environment, and for critical structures it is a source of information for decision-making in the course of scientific support of construction.

CONCLUSION. Monitoring the technical condition of buildings and structures is an independent area of construction activity, covering a range of issues related to ensuring the operational reliability of buildings, carrying out repair and restoration work, as well as developing project documentation for the reconstruction of buildings and structures.

The volume of monitoring of buildings and structures is increasing every year, which is a consequence of a number of factors: their physical and moral deterioration, re-equipment and reconstruction of industrial buildings of industrial enterprises, reconstruction of low-rise old buildings, changes in forms of ownership and a sharp increase in prices for real estate, land, etc. It is especially important to monitor buildings and structures, which is often associated with changes in existing loads, changes in structural schemes and the need to take into account modern building design standards. During

the operation of buildings, due to various reasons, physical deterioration of building structures occurs, a decrease and loss of their bearing capacity, deformation of both individual elements and the building as a whole. To

develop measures to restore the operational qualities of structures, it is necessary to monitor in order to identify the causes of the premature wear of a decrease in their bearing capacity.

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