

Features of the examination of project documentation for ensuring fire safety of oil industry facilities

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Abstract. The article presents the issues of researching the existing system of expertise of design and estimate documentation in order to determine potential reserves for improving the quality of measures being developed to ensure fire safety of facilities. To solve this problem, studies of the existing basic provisions on the examination of design and estimate documentation for assessing the level of fire safety of the facility were carried out. A review and detailed study of the requirements for the examination of design and estimate documentation in terms of ensuring fire safety of construction facilities contained in regulatory and technical, reference, industry and departmental profile documents. Based on the data obtained, conclusions are drawn about the need to improve the examination procedure of project documentation in order to increase the reliability of fire safety assessment of projects for the construction of oil industry facilities through the use of a quantitative indicator to verify the effectiveness of fire safety measures being developed.

1 Introduction

The assessment of the existing level of fire safety of the facility is carried out in order to identify deviations from the requirements of fire safety standards. Supervision of the facility begins from the moment of its design by conducting an examination of design materials directly in the organizations involved in their development, and continues during the construction of the facility. Supervision of the facility begins from the moment of its design by conducting an examination of design materials directly in the organizations involved in their development, and continues during the construction of the facility. Therefore, it is advisable to start supervision of the facility at the design stage and continue at all stages of construction. In this regard, the task of conducting a qualitative and objective examination of design and estimate documentation arises. But at the same time, the existing practice of conducting an expert examination of design estimates does not always allow for a reliable assessment of the entire range of projected measures to ensure fire safety of capital construction facilities, which are included in the design documentation. Therefore, it is necessary to analyze and identify, based on its results, further directions for improving the fire safety expertise of project documentation.

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2 Research of the regulatory and technical documentation

Regulatory legal acts on fire safety include:

- federal laws on technical regulations;
- federal laws and other regulatory legal acts of the Russian Federation that regulate fire safety requirements are mandatory.

Regulatory documents on fire safety include:

- national standards;
- codes of rules containing fire safety requirements (norms and rules).

Depending on the functional purpose and characteristic features, in accordance with the provisions of regulatory documents, capital construction facilities are divided into the following types:

- a) industrial facilities (buildings, structures, industrial facilities, including defense and security facilities), with the exception of linear facilities;
- b) objects of non-industrial purpose (buildings, structures, constructions of housing stock, socio-cultural and communal purposes, as well as other objects of capital construction of non-industrial purpose);
- c) linear objects (pipelines, roads and railways, power lines, etc.).

The requirements for fire safety measures developed in the project documentation are contained in paragraph 26 (Section 9) of the Decree of the Government of the Russian Federation No. 87 of 02/16/2008.

All the main objects of the oil industry belong to hazardous production facilities, in terms of obtaining, using, processing, formation, storage of flammable, oxidizing, combustible substances.

The active part of oil field development can be divided into several stages:

- drilling and arrangement of wells;
- production, collection and transportation of oil well products;
- preparation of oil and gas mixture;
- maintaining reservoir pressure;
- methods of impact on the formation and auxiliary processes.

Fire safety assessment is one of the important aspects of the examination of construction projects of such facilities and the results of engineering studies.

The need for the examination of project documentation is laid down in Article 49 [1]. The procedure for organizing and conducting an examination is regulated by Government Decree No. 145 [2].

The expertise is not subject to implementation in relation to the design documentation of such an object of the oil industry as drilling wells [1].

The procedure for conducting a fire examination of the project documentation of objects referred to the powers of the Russian Federation in accordance with the Federal Law of January 31, 2005* N 199-FZ "On Amendments to Certain Legislative Acts of the Russian Federation in connection with the improvement of the delimitation of powers" is considered with the participation of the State Expertise of projects of the Ministry of Emergency Situations of Russia, which prepares conclusions on issues, within its competence, including fire safety issues [3].

The order of its work is determined by the letter of Glavgosexpertiza dated January 12, 2005 N 11-3/11 [4]. It indicates that the expert bodies of the Ministry of Emergency Situations are preparing an independent conclusion on fire safety issues of the analyzed object. It is later included in the general opinion on this project. The involvement of the State Expertise of the Ministry of Emergency Situations is also provided for facilities for which current fire safety standards have not been developed. In order to assess the existing level of

fire safety of an object (building, structure), it is necessary to conduct an examination of the object for compliance with fire safety requirements.

In addition to the listed basic documents containing fire safety requirements for the design of facilities, the requirements of Federal Law No. 123-FZ of July 22, 2008 "Technical Regulations on fire Safety requirements" apply. This document was adopted in "... in order to protect the life, health, property of citizens and legal entities, state and municipal property from fires, defines the main provisions of technical regulation in the field of fire safety and establishes general fire safety requirements for objects of protection (products), including buildings and structures, production facilities, fire and technical products and general-purpose products" One of the provisions of this Federal Law is the fulfillment of the requirements for "... design, construction, major repairs, reconstruction, technical re-equipment, change of functional purpose, maintenance, operation and disposal of protection facilities."

The examination of the project documentation of the facility for compliance with fire safety requirements is carried out in order to assess the existing level of fire safety of the facility (buildings, structures).

Supervision of an object begins from the moment of its design by conducting an examination of project materials directly in organizations engaged in their development, and continues during the construction (construction, reconstruction or overhaul) of the object. Regulatory and technical work (NTR) is assigned to employees of all structural divisions of the state fire supervision (GPN), as well as to GPN inspectors working at fixed facilities (sites), and is carried out in the following areas:

- supervision of compliance with fire protection requirements in the design;
- supervision of compliance with fire protection requirements, norms and rules during construction, reconstruction, major repairs, expansion, technical re-equipment, re-profiling of facilities;
- consideration and approval of design solutions in terms of fire protection in the absence of approved standards for the projected objects for reasonable deviations from the design standards;
- consideration and issuance of expert opinions on the project materials of the facility in terms of ensuring fire safety and proposals to eliminate identified deviations from fire safety standards.

3 Directions for improving the fire safety expertise of project documentation

The development and improvement of the issues of designing objects of the oil industry necessitates the search for new approaches in assessing the effectiveness of fire safety of project documentation for the creation of objects of the oil industry. Research on existing scientific developments in this issue allows us to identify the main directions and approaches to studying the stated problem.

In order to identify design objects to fire safety requirements, measures are proposed to improve the quality of fire supervision management carried out by state bodies [4].

Among the results of solving the task was the development of an algorithm for assessing compliance with fire safety requirements (TPB) by the Federal State Fire Supervision Authorities (FGPN); a definition of TPB compliance assessment carried out in the form of FGPN was formulated; an efficiency indicator used in the study for quoting developed management decisions in the field of assessing compliance with TPB protection facilities in the implementation of FGPN was proposed; Proposals have been formulated to change the current procedure for the organization and implementation of conformity assessment of TPB

protection objects by FGPN bodies, taking into account interaction with other participants in relations arising during the assessment of compliance with TPB.

When solving the problem of changing the methods of calculating quantitative indicators of fire risk values, which make it possible to cover a wide range of fire safety forecasting for various facilities, the results of work [5, 6] are used. The need for such a study is explained by the existing practice of designing and constructing a large number of complex and new for the Russian Federation industrial buildings and structures in which various fire and explosion hazardous technological processes are carried out. Therefore, it is necessary to increase the accuracy of calculation methods; to ensure the possibility of taking into account a wider list of measures to ensure fire safety; to more accurately account for the impact of fire hazards on humans, implemented under various scenarios of fire development. The results of the conducted research on the issues raised in this paper were the development of an improved methodology for assessing fire risk for buildings of industrial facilities, taking into account various scenarios of fire development; the development of effective technical solutions for fire protection.

To optimize the current algorithm for calculating fire risk indicators, the method of specifying and detailing the operating conditions of facilities used to house preschool children in them is used [7, 8].

In this scientific work, options are being developed to optimize existing programs that guarantee compliance with fire safety standards in the design and operation of preschool educational institutions, deaths in fires, by clarifying coefficients when calculating the magnitude of fire risks, developing technical solutions and recommendations for the design of buildings of preschool educational institutions.

The main idea of the work is to improve design and construction solutions aimed at preserving the life and health of children during fires in buildings of preschool educational institutions on the basis of research and systematization of data on the patterns of behavior of children during forced evacuation.

As part of the study of the project documentation, tasks were set to analyze typical construction projects of preschool educational institutions for possible places of occurrence and development of fires, development options and evacuation scenarios in buildings of preschool educational institutions; to take into account existing architectural and construction solutions of typical buildings of preschool educational institutions for the development of an embedded means for the rescue and self-rescue of children if it is impossible evacuations through the provided escape routes and exits.

The following solutions are offered to detail the design solutions using the developed measures:

- the methodology of fire risk assessment has been improved in relation to preschool educational institutions built according to standard projects, based on coefficients obtained by experimental and calculated methods that characterize the features of the evacuation process of children;
- a technical solution has been proposed for the rescue and self-rescue of children from buildings of preschool educational institutions built according to standard projects using an embedded rescue inflatable device;
- recommendations on the design of buildings of preschool educational institutions are proposed;
- proposed measures to improve the architectural and construction solutions of preschool educational institutions: changing the geometric parameters of staircases, installing smoke ventilation, if necessary, dividing the building into fire compartments with additional exits.

Scientific research in the dissertation work [8] contains solutions to the issues of the development of the regulatory framework in terms of substantiating fire protection

requirements for structures and space-planning solutions for underground parking lots, which contain solutions for risk-free withdrawal of people and reduction of material damage.

In order to achieve this goal, the work, among other things, sets the task of developing regulatory fire protection requirements for structures, space-planning solutions and other fire safety systems of underground parking lots for their inclusion in the state regulatory framework, i.e. the development of fire safety requirements for project documentation.

The practical significance of the work lies in the fact that, based on the established parameters of the temperature regime and the dynamics of the spread of fire hazards, scientifically sound recommendations have been developed for the design of underground parking lots built into multi-storey buildings containing requirements for passive fire protection elements, taking into account the prevention of explosive destruction of reinforced concrete structures, aimed at ensuring the safe evacuation of people and reducing material damage.

The entire range of research results on the issue of maintaining fire-fighting operation of oil industry facilities indicates a wide range of approaches and directions for improving the quality and development of methods for achieving fire protection of design solutions.

But at the same time, the issues of evaluating a set of organizational and technical measures to maintain fire-fighting operation of a capital construction facility, developed as part of the design documentation, are not considered, which is explained by the lack of methods and regulatory and technical documentation (NTD) for such an analysis of fire safety.

Assessment of compliance of objects of protection with the rules of fire safety standards imposed by the requirements of regulatory, reference and technical documents is carried out in the following forms: control and monitoring of the fire situation at facilities; state fire supervision; declaration of fire safety; research (testing); confirmation of compliance of objects of protection (products); acceptance into the production process of completed construction facilities; acceptance and commissioning of protection facilities (products), as well as fire safety systems; expertise.

In accordance with GOST 12.1.004-91, various methods of certifying the satisfaction of buildings and structures with fire safety standards have been established.

The algorithm for calculating the degree of achievement of fire safety standards in the production activities of service personnel determines the requirements for maintaining safe working conditions and reducing the likelihood of exposure to fire hazards.

The method of diagnosing the possibility of a fire at a fire-explosive facility is a method of guaranteed calculation of the risk of a fire situation at the facility.

The method of assessing the economic efficiency of fire safety systems is an economic assessment of the cost effectiveness of fire safety.

All these methods are based on mathematical calculation and the probabilistic nature of these calculations.

Hence, it can be concluded that the assessment of the complex of measures to ensure fire safety of the capital construction facility in organizational and technical terms, developed as part of the project documentation, should be based on a quantitative assessment obtained using a mathematical tool.

4 Conclusion

One of the promising, but insufficiently studied methods of increasing the stability of oil production facilities to the effects of fire hazards is to ensure the quality of project development through the development of a system for the implementation of fire expertise of project documentation.

Solving problems to improve the quality of the system for conducting an examination of project documentation to achieve the required fire protection standards for oil industry facilities leads to new problems in the methods of quoting the effectiveness of design decisions.

The priority direction in increasing the degree of diagnosis of the optimal fire-fighting level of projects for the construction of oil production facilities is research on the rationalization of the examination of project documentation in terms of using a quantitative indicator to verify the effectiveness of organizational and technical fire-fighting design decisions.

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