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Express method of assessment of compliance of the object of supervision with fire safety requirements

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Introduction. The paper considers the new requirements for the activities of the state fire supervision bodies. The ways of solving the problems arising during the implementation of these innovations are given. One of such solutions is the developed by the authors algorithm of the express method for assessing the compliance of the object of supervision with fire safety requirements. The article analyzes the work of inspectors of the state fire supervision during inspections of low-rise retail facilities of small area, taking into account the time spent on them, and the work of the inspector using a new express method of conducting inspections.

Problem Statement. The purpose of the study is to increase the efficiency of managerial decision-making in ensuring fire safety based on the criterion of "fire risk", taking into account the minimum fire safety requirements determined by the calculation.

Conclusions. The developed algorithm for supporting managerial decision-making on the compliance of the protection of commercial facilities with fire safety requirements will allow inspectors of the state fire supervision during inspections to assess the existence of a threat to human life and health and decide on further actions depending on the presence or absence of this threat.

Keywords: state fire supervision, state control, risk-oriented approach.

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Introduction. A number of regulatory legal acts of the Russian Federation and the Ministry of Emergency Situations of Russia have entered into force, which, in particular, relate to the organization of the work of the system of supervisory bodies of the Ministry of Emergency Situations of the Russian Federation. In those of them that relate to a risk-based approach to the inspections of buildings and structures for the compliance with fire safety requirements, there are no criteria for the time spent on conducting inspections, there is no definition of the staff size of structural units of supervisory activities, and also there is no possibility of reducing the burden on the subjects of supervision and minimizing mandatory fire safety requirements, which can only be determined by scientifically based methods.

Problem Statement. In the course of the research work, two algorithms for supporting management decisions in the actions of state fire supervision were compared using the example of small-area and low-rise retail facilities located in the Rostov region, taking into account the risk-oriented model of control and supervisory activities of the Ministry of Emergency Situations of Russia, that is, the existing algorithm, and the proposed algorithm based on the express method of assessing the compliance of the object of supervision with the fire safety requirements. Thus, the work of the state fire supervision inspectors was analyzed when conducting inspections of small-area and low-rise retail

facilities for the time spent on them, and the work of the inspector with the proposed express method of conducting inspections. The analysis showed that the developed algorithm for supporting managerial decision-making on the compliance of commercial facilities with fire safety requirements allows inspectors of the state fire supervision service to assess the presence of a threat to human life and health during field inspections and decide on further actions depending on the presence or absence of this threat and save time spent on conducting inspections according to the existing algorithm and the algorithm proposed in the research work.

Analysis of the existing algorithm if there is no fire risk assessment at the facility. When during the inspection at the facility the federal state fire supervision authorities reveal that the fire risk assessment was not carried out there, it means that there is a violation of Article 5 [1], which states that a fire safety system should be developed in each building. One of its main goals is to ensure the safety of people; this system should exclude the possibility of exceeding the required fire risk value.

Also, in accordance with Article 6 [1], fire safety is ensured if:

— the requirements of technical regulations are fully met, and the fire risk value does not exceed the required one;

— the requirements of technical regulations have been fully complied with, and the voluntary requirements specified in regulatory documents have been met.

It is worth noting that in accordance with Part 3 of Article 4 [1], national standards and codes of rules as well as other documents belong to regulatory documents [2, 3]. These documents also include Order of the Ministry of Emergency Situations of the Russian Federation No. 382 of June 30, 2009 "On approval of the methodology for determining the calculated values of fire risk in buildings, structures and constructions of various functional fire hazard classes" [4].

According to the above two conditions, it can be concluded that it is necessary to perform the calculation of evacuation and the calculation of the occurrence of fire hazards in any case (either as part of the risk calculation in accordance with [3], or as part of the calculation of the level of fire safety of people in accordance with the order of the Ministry of Emergency Situations [4], which is the voluntary standard). This document states that in each building, volumetric and planning solutions should be such that people can evacuate in the case of a fire before the onset of dangerous factors.

It should be noted that if a fire risk assessment has not been carried out, then this is a violation of Article 53 [1], which states that all buildings must be designed and constructed in such a way that their volumetric and planning solutions, as well as the design of evacuation exits and paths ensure safe evacuation of people in case of fire.

In accordance with Article 89 [1], every building must have escape routes and evacuation exits that will ensure safe evacuation of people in case of fire. And in the same article it is said that it is necessary to provide for the calculation of escape routes and evacuation exits.

Based on the above, it should be emphasized that the confirmation of the safe evacuation of people at the facility should be in any case (either through the calculation of fire risk or through the calculation of the level of fire safety of people).

Analysis of the existing algorithm if there is a fire risk assessment at the facility. If during the inspection by the federal state fire supervision authorities of the protected objects it was revealed that the calculation of fire risk

assessment was carried out, the layout and arrangement of technological equipment correspond to the project and risk calculation, then it can be concluded that the object meets the fire safety requirements.

But if the layout or arrangement of technological equipment and, accordingly, the configuration of escape routes have changed, then in this case the inspector decides not to accept the existing calculation and requires recalculating of the fire risk. The recalculation of fire risk takes a lot of time and brings losses to the owner in the form of lost profits.

In this case, it is necessary to apply an express method, with the help of which it is possible to determine in a short time the possibility of safe evacuation of people before the onset of the maximum permissible values of fire hazards. This method should be simple, do not require high qualifications, powerful computer programs and lengthy calculations. The users of this method may have only basic school knowledge and a small portable electronic computing device (smartphone, tablet, engineering calculator).

The analysis of the existing algorithm for making managerial decisions on the compliance of commercial protection facilities with the fire safety requirements during control measures by the state fire supervision authorities of the Rostov region has showed that there is no fire risk calculation at most facilities (86.4%), and at those facilities where the fire risk calculation was carried out, it usually does not correspond to the actual layout of the facility or the configuration of evacuation routes and the arrangement of technological equipment.

Therefore, it is necessary to develop a new algorithm to support managerial decision-making on the compliance of commercial protected facilities with fire safety requirements when carrying out control measures by the state fire supervision authorities of the Rostov region, which should take into account the risk-oriented model of control and supervisory activities of the Ministry of Emergency Situations of Russia and which would allow the inspectors of the State Fire Control Service to assess the threat to life and health of people in the field.

Development of an algorithm if there is a fire risk assessment at the facility. Let us consider a situation when a fire risk calculation is carried out at a protected facility. If there is a fire risk calculation, the inspector of the federal state fire supervision is obliged to check the correctness of the initial data taken in the calculation, whether they coincide with the actual situation at the facility or not.

Quite a lot of parameters and values are involved in the calculation of fire risk.

Since most commercial objects are rented out, we will consider these objects.

In commercial buildings, the inspector needs to check:

— the frequency of fires in the building during the year;

— the compliance of the automatic firefighting system with the requirements of the regulatory documents on fire safety;

— the probability of the presence of people in the building;

— the probability of evacuation;

— the compliance of the fire alarm system with the requirements of the regulatory documents on fire safety;

— the compliance of the fire warning system and evacuation management with the requirements of regulatory documents on fire safety;

— the compliance of the smoke protection system with the requirements of regulatory documents on fire safety.

It will not be difficult to check the frequency of fires, the availability of fire protection systems, and the probability of presence of people in the building. The greatest difficulty is, as a rule, checking the probability of evacuation.

As a result of numerous calculations, it was found that the minimum width of evacuation routes and evacuation exits in commercial buildings and premises should be at least one meter. This is due to the fact that these buildings and premises can accommodate low-mobility groups of the population, including those with two additional supports. The width of such a person with supports is 0.9 meters. Accordingly, the developed express method can be applied only to rooms with a width of escape routes and a width of evacuation exits of at least one meter. Therefore, it is necessary to check from the array of initial data only the probability of evacuation and the arrangement of technological equipment (trade racks), and, accordingly, the evacuation routes associated with this arrangement.

If the actual arrangement of the equipment corresponds to the one in the calculated evacuation schemes, then it can be concluded that the fire risk calculation meets the fire safety requirements.

If the actual arrangement of the equipment does not correspond to the one in the calculated evacuation schemes, then the inspector needs to find out whether there is a threat to human life and health. In this case, the express method developed by the authors of the article will help him. This method will serve as an indicator that will tell you how to proceed.

To do this, the inspector needs a portable computing device on which the program with this express method will be installed.

Below there is a set of actions that the inspector needs to perform in order to assess the threat to life and health of people in case of fire evacuation:

— to find out the height and area of the room. This can be done by measurements using a laser tape measure;

— in the calculation program, to select a formula for determining the occurrence of fire hazards depending on the height of the room;

— to enter the area of the room into the formula for determining the time of occurrence of fire hazards (the required evacuation time) and to get this time (T required);

— to enter the area of the room into the formula for determining the maximum permissible length of the evacuation path from the most remote point of the room to the evacuation exit and to get this length (L maximum permissible);

— to measure the maximum length of the rack in the room and to subtract from the maximum permissible length of the evacuation path (L maximum permissible) this length of the rack;

— to measure with a laser tape measure the actual length of the escape route from the most remote point of the room to the evacuation exit (L actual);

— to compare the actual length of the escape route and the required maximum permissible length of the escape route.

If the actual length is less than the required one, then the condition of safe evacuation is fulfilled and there is no threat to human life and health (L actual < L maximum permissible — corresponds), if the actual length is greater than the required one, then the condition of safe evacuation is not fulfilled and there is a threat to human life and health (L actual > L maximum permissible — does not correspond).

Next, the inspector needs to decide how to proceed based on the conclusions obtained by the express method.

If, according to the results of the express method, it is revealed that there is no threat to the life and health of people, then the inspector decides to make a requirement to recalculate fire risks in accordance with the new arrangement of technological equipment. And the owner then chooses the organization that will perform this recalculation or does it himself.

If, according to the results of the express method, it is revealed that there is a threat to the life and health of people, then the inspector decides to send the calculation of fire risk for examination to the fire testing laboratory.

The fire testing laboratory issues a conclusion on whether there is a threat to human life and health in accordance with the new arrangement of technological equipment.

If the conclusion of the fire testing laboratory indicates that, in accordance with the new arrangement of equipment, there is no threat to human life and health, that is, people will have time to evacuate before the onset of fire hazards, then the inspector decides to make a risk recalculation requirement in the assignment.

If the conclusion of the fire testing laboratory indicates that, in accordance with the new arrangement of equipment, there is a threat to human life and health, that is, people will not have time to evacuate before the onset of fire hazards, then the inspector decides to send the case to the court to suspend the activities of the inspected object.

Development of an algorithm if there is no fire risk assessment at the facility. Let us consider a situation when the fire risk calculation has not been carried out at the protected facility. If there is no fire risk calculation at the inspected facility, this means that it is necessary to check this facility according to the regulatory voluntary documents: codes of rules, national standards and others.

If, according to the results of the inspection, it is revealed that the requirements of the regulatory voluntary documents are fully met at the facility, it can be concluded that the facility meets the fire safety requirements.

If, according to the results of the inspection, it is revealed that the requirements of the regulatory voluntary documents are not fully met, then the inspector, in order to understand what to do next, needs to identify whether there is a threat to people's life and health or not. Since the standard fire safety requirements in the codes of regulations and national standards do not take into account the fire hazards, it is necessary to use the express method to assess this threat. According to the algorithm specified above, the inspector assesses the threat to people in case of fire.

If, according to the results of the express method, the absence of a threat is revealed, then the inspector decides to include into the assignment the requirements for the elimination of violations of the regulatory voluntary documents. There are no grounds for suspending this facility. If, according to the results of the express method, the presence of a threat is revealed, the inspector decides to transfer the case to the test fire laboratory for a full study and identification of a threat to human life and health based on the methodology approved by [3].

The fire testing laboratory, after the conducted research, indicates in its assignment the presence or absence of a threat to people. In the absence of a threat, the inspector decides to include requirements for compliance with the rules and national standards in the assignment. If there is a threat, the inspector decides to send the case to the court to suspend the activities of the facility.

Figure 1 presents the draft algorithm.

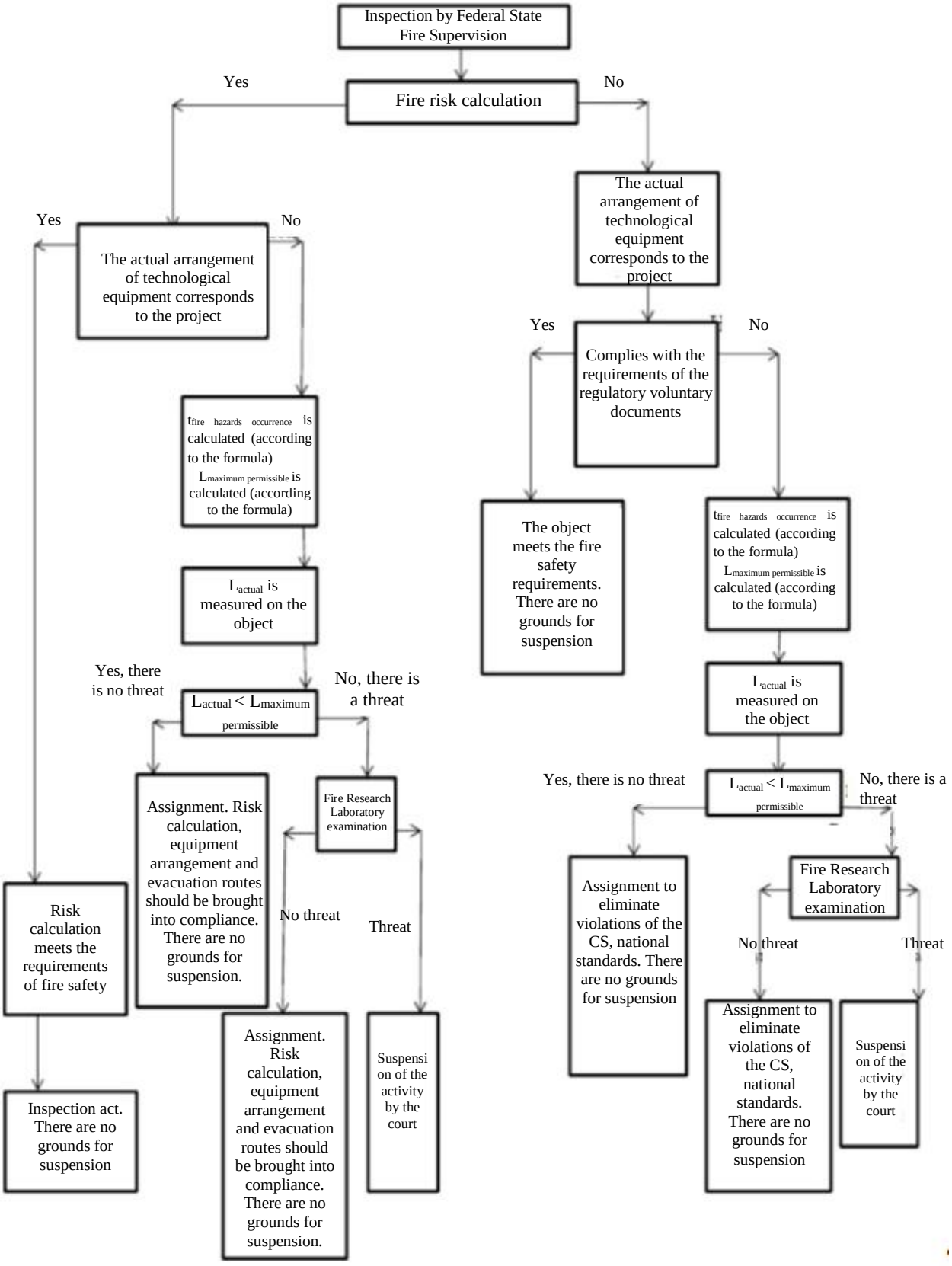

Fig. 1. The draft algorithm for supporting managerial decision-making on the compliance of commercial protection facilities with the fire safety requirements

Conclusion. Having analyzed the application of the developed algorithm for supporting managerial decision-making on the compliance of commercial protected facilities with the fire safety requirements, it can be concluded that

this algorithm allows state fire supervision inspectors to assess the existence of a threat to human life and health during field inspections and decide on further actions depending on the presence or absence of this threat.

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