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PECULIARITIES OF ENSURING FIRE SAFETY OF PUBLIC BUILDINGS BY IMPROVING FIRE PROTECTION

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Abstract. One of the most important tasks to protect the life and health of citizens, as well as the safety of material assets, is to ensure the fire safety of public buildings. Innovative technical solutions in the construction industry, which are characterized by an increase in the area of buildings and an increase in the number of people, require the development and implementation of advanced fire protection technologies. Here are considered the current approaches to ensuring fire safety in public buildings, including automated fire protection systems, the rational use of architectural and structural solutions and the competent use of materials for better fire protection.

It is based on an analysis of the current regulatory framework of the Russian Federation governing the design and operation of fire protection systems. Special attention is paid to improving the effectiveness of organizational measures. The need for an integrated approach is emphasized, which is based on the interaction of designers of public buildings, supervisory authorities and preventive work, and people responsible for putting buildings into operation. The findings can be used in the preparation of design documentation and the development of control and supervisory measures for public buildings..

Key words: fire safety, public buildings, fire protection, automation, fire protection

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Introduction

Fire safety of public buildings is an integral part of the overall safety of life. Every year, the requirements for the level of protection of people in places of mass residence – shopping malls, schools, hospitals, administrative institutions - increase. This is due to both technological progress and a change in the nature of threats and an increase in potential risks. In these conditions, it is necessary not only to comply with minimum regulatory requirements, but also to implement effective fire protection systems that ensure timely detection and localization of fire [1].

According to SP 118.13330.2022 «Public buildings and structures», a public building is a structure or room used to perform public functions by accommodating institutions, enterprises and organizations providing services and services to the public [2]. Federal Law №. 123-FL of July 22, 2008 «Technical Regulations on Fire Safety Requirements» establishes requirements for public buildings and their fire protection (Table). [3]:

Table

Requirements for public buildings and their fire protection

№	Requirements	Statute	Article
1	Ensuring the safe evacuation of people	Public buildings should have such design solutions, engineering systems and layout that ensure the rapid and safe evacuation of all people in them in case of fire.	art. 53, 89
2	Classification of buildings by functional fire hazard	Public buildings belong to the functional class F3 (public services: trade, catering, administrative buildings, etc.). Their design and operation must take into account the requirements of the relevant fire hazard class	art. 32
3	Limiting the spread of fire and smoke	Structural elements of buildings (floors, walls, partitions) must ensure the limits of fire resistance and prevent the spread of fire and smoke between rooms and floors.	art. 64, 79

№	Requirements	Statute	Article
4	Fire barriers	In public buildings, it is mandatory to install fire barriers (walls, doors, hatches) that comply with fire resistance standards, especially between rooms with different functional loads.	art. 88
5	Automatic fire protection installations	Public buildings should be equipped with automatic fire alarm systems, warning and evacuation control systems, and, if necessary, fire extinguishing and smoke ventilation systems.	art. 84, 86, 87
6	Fire protection of building structures	To ensure the required fire resistance limits, special fire protection measures are used for building structures – the use of flame retardants, materials, linings.	art. 63
7	Ensuring fire safety at the operational stage	Owners and operating organizations are required to maintain the operability of fire-fighting systems, ensure the availability of escape routes, and conduct regular inspections and maintenance of fire-fighting equipment.	art. 88, 90

The issues of improving fire protection come to the fore in the context of increasing urbanization and increasing complexity of building structures. The problem requires a systematic approach combining engineering, technical and organizational measures aimed at minimizing damage from possible fires.

Specifics of ensuring fire safety of public buildings by improving fire protection

In recent years, the degree of responsibility for ensuring safety in buildings with a large number of people has increased significantly. The peculiarities of the architectural layout, the number of floors, complex engineering communications and the saturation of combustible materials create the prerequisites for the rapid spread of fire. The modern approach to ensuring fire safety in public buildings is based on the principles of prevention and complexity. An analysis of the incidents shows that the main factors contributing to the occurrence of victims in fires are late detection, ineffective evacuation and faulty fire protection systems. [4].

The problem is complicated by the non-compliance of existing facilities with outdated regulatory requirements, the lack of systematic inspections and the insufficient level of fire safety culture among staff and visitors. [5].

One of the most effective ways to reduce risks is the introduction of automatic fire alarm systems [6], fire extinguishing systems [7], smoke protection and warning [8]. Modern digital technology-based systems allow for the integration of monitoring, response, and information functions in real time.

The choice of building and finishing materials with increased fire resistance is of great importance. The use of non-combustible and low-combustible materials makes it possible to slow down the spread of flames, gaining time for evacuation and extinguishing [9]. Materials should provide:

– required fire resistance of building structures;
– limiting the spread of fire on finishing surfaces;
– slowing down the fire process to ensure evacuation [10].

The effectiveness of evacuation directly depends on constructive and organizational solutions: the availability of a sufficient number of exits, an understandable navigation system, autonomous lighting and regular staff training. Another important aspect is the proper design of escape routes. When designing, it is necessary to take into account the psychological and behavioral factors that affect the speed of evacuation of people. The use of light and sound indicators, warning systems and smoke extraction increases the chances of safe evacuation in case of an emergency [11].

Organizational measures, including regular staff training and fire-fighting training, play an equally important role. The participation of responsible persons in the development of evacuation plans, coordination with supervisory authorities and the use of relevant methodological materials make it possible to ensure preparedness for emergency situations. Modern standards require institutions not only to be equipped with appropriate protective equipment, but also to have well-developed algorithms for personnel actions in the event of a fire [12].

Based on the above, the following scheme can be distinguished (Fig.):

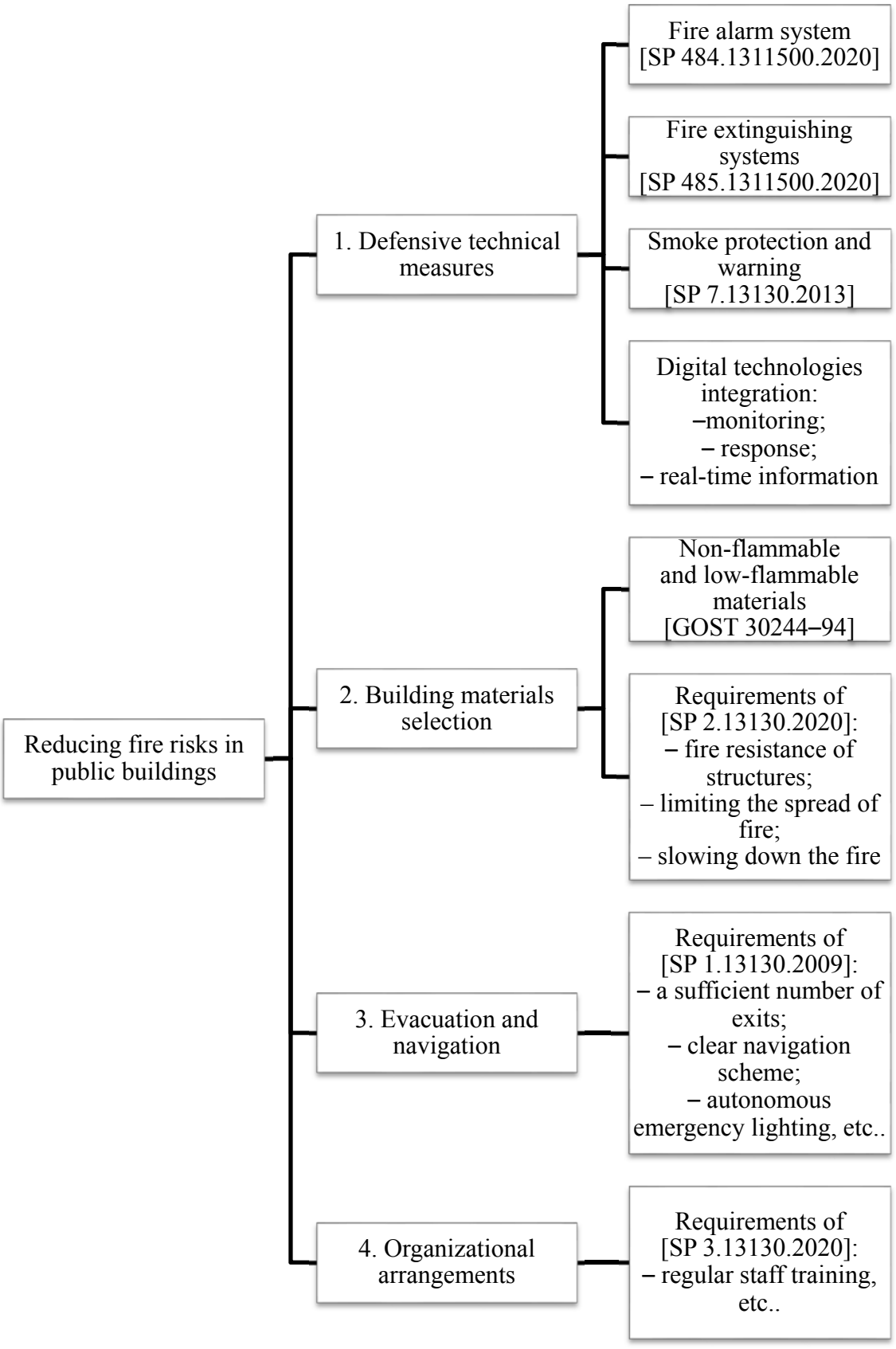

Fig. **Reducing fire risks in public buildings**

Conclusion

Ensuring the fire safety of public buildings requires an integrated approach, including both technical and organizational measures. The improvement of fire protection systems based on the use of innovative technologies can significantly increase the level of protection of people and property. Automation of processes, introduction of new materials and improvement of architectural solutions contribute to reducing the consequences of possible fires.

In the context of dynamically developing urban development and increasing population density, public buildings should be designed and operated taking into account modern fire safety requirements. Only continuous improvement of fire protection, based on scientific developments, will ensure effective protection in the face of real threats.

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