ANALYSIS OF DESIGN PROCESS OF AUTOMATED FIRE PROTECTION SYSTEM

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Abstract. This work addresses topical issue of fire safety, identifying its importance in various spheres of life and emphasizing potential threats to people and property. The importance of automating fire safety systems and developing modern fire protection systems (FPS) as key element for minimizing risks and responding effectively to fire situations is discussed. The work provides details of fire protection system design process, including choice of system type, equipment brand, integration with other systems, and development of equipment layouts. Taking into account the various features of facilities, work recommends optimal approaches to selection and development of fire alarm system, helping to ensure complete control and safety at facilities of various nature.

Key words: system, fire alarm, detector, room, plan.

Introduction. Today, fire safety is becoming subject of serious attention and research, as fire incidents can occur in various areas of our lives, threatening not only human health and life but also causing significant material damage. Ensuring effective fire safety system is critical task to protect communities, businesses and other facilities from potential hazards.

In this context, it is important to consider automation capabilities that can significantly increase efficiency and speed of response to fire threats [1-3].

The development of automated fire protection systems (AFS) that combine modern fire detection, tracking, and response technologies is becoming necessity to ensure complete control and safety at facilities.

A security and fire alarm system is set of jointly operating technical means for detecting signs of intruder at protected facilities and/or fire at them, transmitting, collecting, processing and presenting information in given form.

Such systems can ensure rapid detection and localization of fire, as well as effective timely response, minimizing risks to people and property, so topic is relevant.

Main part. The fire alarm design procedure consists of various equipment, is very laborious and requires certain level of knowledge, skills, and attention to location of all devices, so let's take closer look at design process.

The project is plan that is used to make number of calculations necessary for:

- determining optimal number of devices;
- determining their optimal location during use.

The project indicates route for laying cable communications and takes into

account details that may arise during implementation of alarm system.

Before starting to develop system, it is necessary to conduct pre-design studies of facility and take into account

- building area;
- planning features. Types of premises in accordance with need for FPS (Fig. 1);
- number of floors and complexity of metal structures.

The result will be division of entire building into zones, each of which is subject to control and monitoring.

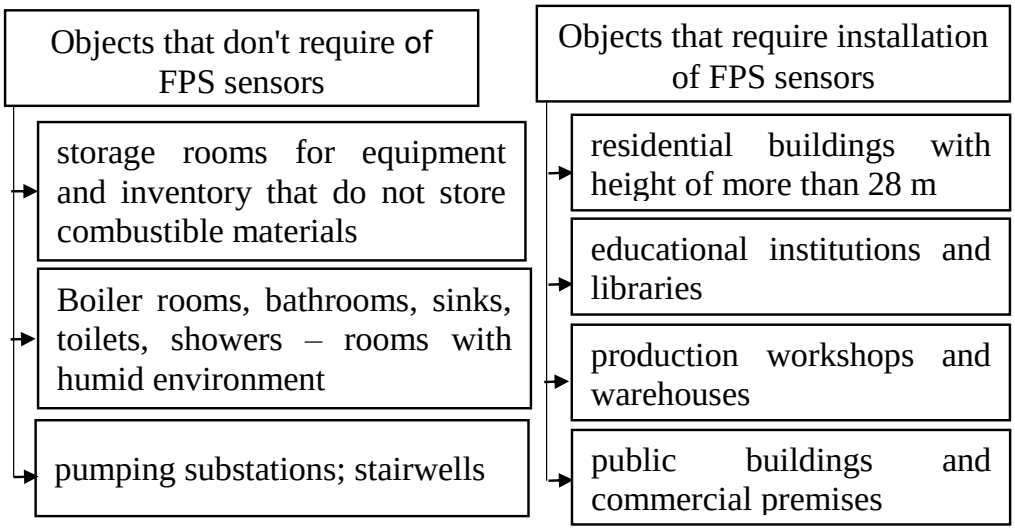

Figure 1 –Types of premises according to need of FPS

Further, stages of designing FPS include:

1. The choice of type (autonomous, centralized or combined) of FPS is strategic step to ensure that security system best meets specific needs and conditions of facility [4].

Here we should pay attention to:

- adaptation to specifics of facility, as different buildings have different characteristics, structures, and sizes. The choice of system type depends on specific features of facility. For example, stand-alone systems may be more suitable for smaller facilities, while centralized or combined systems can provide greater control and management over large areas. The need for centralized management – if centralized management of all security system components is required, including monitoring, data analysis, and decision-making, then centralized system is logical choice;
- scalability requirements, because if building is expected to expand further or change in structure, system choice should provide for ability to scale and adapt to changes in security needs;
- level of security, as security is extremely important issue in these difficult times, and different types of systems provide different levels of security.

Centralized systems, for example, can provide centralized management and monitoring, which is important for high-security facilities such as banks or large enterprises;

- integration with other systems because choice of system type is also related to ability to integrate with other security systems at facility, such as video surveillance, access control, and building management systems. This ensures that different aspects of security are coordinated and interoperable.

2. Selection of fire alarm system type. Currently, 3 types of fire alarm systems are being actively implemented at facilities: addressless, addressable, and address-analog. They differ in principle of operation and specifics of installation in building.

Addressless devices usually use inexpensive alarms with primitive circuit; they recognize fire, loop breakage, and short circuit conditions. Budget devices require large number of cables during installation; latter are usually placed in metal hoses and hidden in walls.

Addressable devices here receive information from all sensors distributed in premises to be serviced, they read characteristics of surrounding space. The control devices analyze dynamics of changes in these parameters, on basis of which it can be concluded that fire has occurred – corresponding signal is sent.

Addressed-analog systems use receiving and control circuit rather than detector directly, as in addressless systems, to process information and make decision about emergency.

3. Selection of brand of equipment for fire protection system.

Selection of fire safety detectors according to the type of premises:

- industrial buildings: heat, smoke, flame;
- premises used for distributors and transformers: heat, smoke, flame;
- buildings for domestic, administrative, public purposes: smoke;
- administrative and economic facilities: heat, smoke;
- hospital wards, catering establishments, hostels and hotels, commercial facilities, office premises: heat, smoke. FPS equipment (Fig. 2).

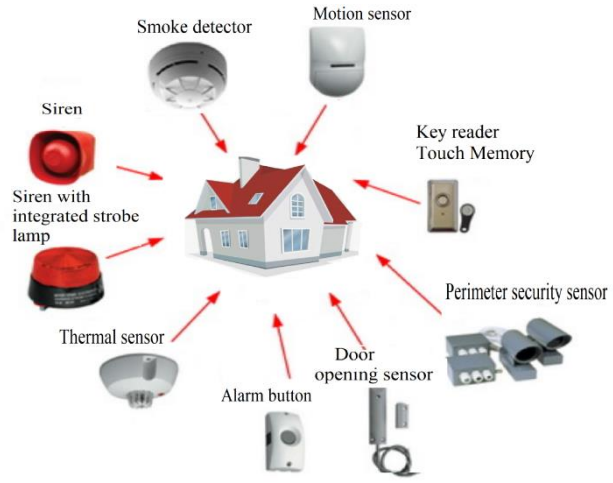

Figure 2 – FPS equipment

4. Design of alarm system. The structure of alarm system is developed, including types of signals, their distribution by zones, and means of notification.

5. Designing access control system. If necessary, system includes access control mechanism that determines access rights to different areas of building.

6. Backup power supply. The system takes into account measures to ensure uninterrupted power supply for main components of security system.

7. Development of equipment layouts. Schemes for location of all system components at facility are created, taking into account optimal coverage and efficiency.

Conclusions. Thus, designing fire and security system requires careful analysis and integrated approach to ensure maximum efficiency and safety of facility.

The selection and design of fire protection system is complex process that requires careful consideration of facility's characteristics and identification of specific security needs. Important aspects include adapting to characteristics of building, selecting type of system based on its size and structure, and considering need for centralized management and integration with other security systems. Pre-design studies that cover ability of system.

Important design stages include selecting type of security system, choosing brand of equipment, designing structure of alarm and access control system, taking into account backup power supply, and developing equipment layout plans.

This comprehensive approach ensures optimal facility security and system efficiency in face of various potential threats.

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