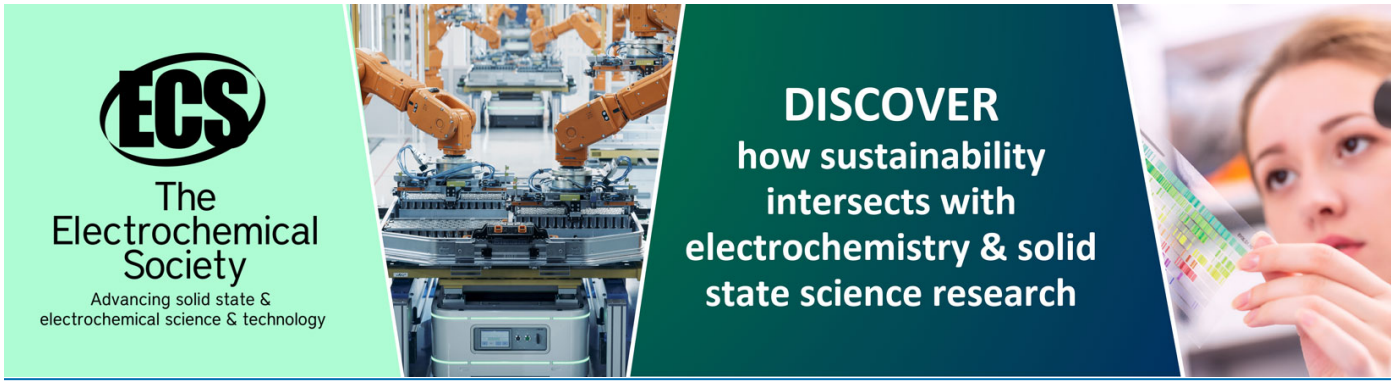
Technological aspects of the use of fire-prevention roller shutters in places of permanent residence and temporary stay of people



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Technological aspects of the use of fire-prevention roller shutters in places of permanent residence and temporary stay of people

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Abstract. This article provides brief statistics on victims of fires in the Russian Federation in preschool educational institutions, medical and medical organizations. It provides a general description of fire-prevention roller shutters, the need for their use in buildings and structures, in accordance with technical regulations, functional fire hazard F1 and F4. The general information and materials used for the manufacture of roller shutters are indicated, the probable places of their installation are suggested - on the internal inter-office and interior windows and doors, on the doors at the entrance and exit from the building, as well as at the gates at the entrance to the garages built into the building. A probabilistic method of using fire-prevention roller shutters on the basis of a preschool educational institution as a result of which hypothetically predicts a decrease in the number of victims during a fire is presented.

1. Introduction

A fire is an uncontrolled combustion outside a special hearth, causing material damage, harm to the life and health of citizens, the interests of society and the state.

Hazardous factors of fire are such factors, the impact of which leads to injury, poisoning or death of people, as well as to property damage.

One of the most dangerous factors for human life is an increased concentration of carbon monoxide (0.1% vol.) And carbon dioxide (6.0% vol.), which acutely paralyzes the respiratory system and vision.

The smoke zone is extremely dangerous for some buildings and structures for functional fire hazard, such as:

- F1 - buildings intended for permanent residence and temporary stay of people (kindergartens and homes, specialized homes for the elderly and disabled, hospitals, apartment buildings, etc.);
- F4 - buildings of educational institutions, scientific and design organizations, management bodies of institutions (buildings of educational institutions, higher professional educational institutions, offices, offices) [1].

A large number of fires occur in Russia every year. The statistics does not pass by those buildings that are mentioned above. For classes of group F1, the danger is manifested by the fact that visitors and guests (preschool children, elderly people, people with disabilities) of these buildings are not able to independently evacuate in the event of a fire. According to statistics, in the period from 2003 to 2013 in

Russia over 10 thousand children died or were injured in fires, including more than 70% are children under 7 years old [2].

It is also necessary to mention cases with mass deaths (over five people) in fires are most typical for such socially significant objects as hospitals, homes for the disabled, boarding schools, etc., which, in turn, belong to buildings of functional fire hazard F1. On average, 230 fires occur annually in medical and medical institutions in the Russian Federation [3]. For example:

- 63 people - on March 20, 2007, in a nursing home for the elderly in the village of Kamyshevatskaya, Krasnodar Territory;
- 23 people - January 31, 2009 in a nursing home for the elderly in the village of Podelsk in the Komi Republic;
- 38 people - on April 26, 2013 in a hospital in the village of Ramenskoye, Dmitrovsky District, Moscow Region;
- 23 people - December 12, 2015 in a psychoneurological boarding school in the Voronezh region [4].

For group F4, the complexity of evacuation lies in the fact that educational institutions are located in mid-rise buildings, multi-storey buildings and high-rise buildings (from 3 to 16 floors). In addition, a very large number of people take part in the simultaneous evacuation. In the event of a congestion on the escape routes, there is a danger of poisoning people with carbon monoxide and toxic combustion products [5].

2. Application of fire-prevention roller shutters

In a standard situation, in the event of a fire, it is necessary to immediately begin to evacuate the building to a safe place [6]. Depending on the degree of fire resistance, as a result of a fire and its dangerous factors, the fact is likely that in a matter of minutes the building can be completely engulfed in an open flame or a smoke zone [7]. In order not to waste precious time on evacuation, I consider it necessary to introduce fire-prevention roller shutters (figure 1) into these groups of functional fire hazard.

Figure 1. Fireproof shutters (shutters).

Fireproof roller shutters prevent smoke and fire spread. Fireproof roller shutters are reliable fire protection of individual rooms, buildings, floors and even individual zones. Protected objects are cut off from the fire zone. Such roller shutters have a wide range of applications: from ordinary doors to warehouse gates, which are able to pass even heavy vehicles.

Fire-prevention shutters are divided into groups according to their fire resistance time - from 30 minutes to several hours, depending on the materials used [8]. Usually roller shutters are made of steel, aluminum or galvanized iron.

Due to its simplicity and ease of use and installation, roller shutters can be installed on almost any opening:

- internal interior and office doors and windows;
- entrance to the garage or corporate parking;
- entrance to various buildings and structures for industrial or domestic purposes.

After correct installation, you cannot be afraid of a possible fire due to the closing of the contact of the mechanism.

Fireproof roller shutters can work with various automation systems in case of fire. The first is connecting the roller shutter circuit to the fire alarm system. In this case, when the alarm is triggered, a signal is given and the roller shutters are automatically opened. Also, in the roller shutter control system, a light-alloy element can be used, which at certain temperatures gives a signal to automatically open the roller shutters to ensure free exit from the room or close to prevent the spread of fire. However, the best option is to use an electric drive in the roller shutter control system. Modern electric drive systems were designed to work in harsh conditions, which is an advantage in the event of a fire - if used correctly, they will not fail even in the most critical situation.

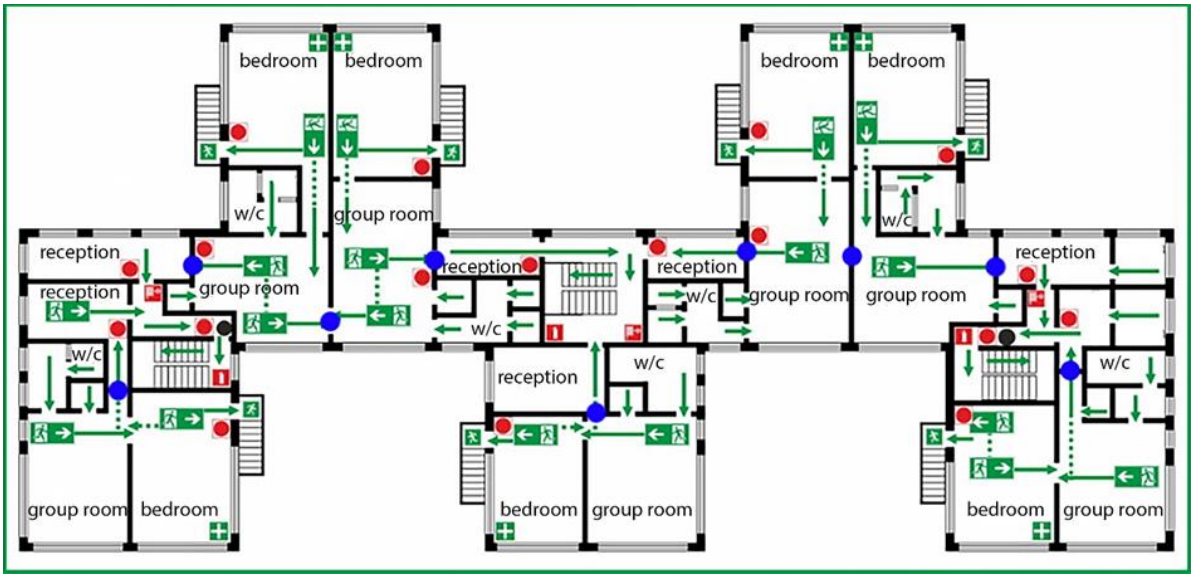

Figure 2. Plan for evacuation from a preschool educational institution.

For example, Figure 2 shows a kindergarten evacuation plan. Recommended mounting locations for fire-prevention roller shutters are marked with a blue marker. According to the standard, the first fire brigade must arrive within 10 minutes after reporting a fire [9]. Earlier it was mentioned that the most low-melting fire-prevention roller shutters protect from open fire and smoke from 30 minutes. During this time, you can have time to evacuate by emergency or emergency exits, or wait for the complete elimination of the fire, while not fearing harm to the health and life of people.

3. Conclusion

The use of fire-prevention roller shutters will definitely reduce the number of people killed and injured in a fire. If we summarize the above advantages, then the following can be distinguished from here:

- the time of protection of roller shutters from dangerous fire factors - from 30 minutes, which makes it possible to easily evacuate, or wait for the elimination of the fire in a place protected from it;
- installation of roller shutters is possible in almost any doorway with load-bearing walls;
- the possibility of preserving property and material values;
- relatively low cost - as of 2020, roller shutters on doors measuring 80x200 cm are estimated from 9-10 thousand rubles (excluding delivery and installation), depending on the materials used and the type of drive;
- durability and ease of use.

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