

Požiadavky na bezpečnosť pri používaní požiarňových výťahov

The Requirements for Safety in Use of Fire Elevators

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Abstrakt

Príspevok sa zaoberá tematikou bezpečnosti pri používaní požiarňových výťahov, konkrétne svojimi požiadavkami na ich označenie a prevádzkovanie. Nato, aby sa tieto výťahy mohli zaviesť do budovy musia spĺňať stavebné, konštrukčné a iné požiadavky, keďže zlyhanie pri ich nezastavení môže mať nepriaznivý vplyv na životy zachraňujúcich, ale aj okolitých ľudí. Súčasťou príspevku je analýza a posúdenie rizík v uzavretých priestoroch požiarňových výťahov pomocou grafu rizika.

Kľúčové slová

Bezpečnosť, hasičské jednotky, požiarňový výťah, riziko.

Abstract

The paper deals with the theme of safety in the use of fire elevators, specific requirements for the labeling and operation. In order to bring these elevators into the building, buildings must meet construction, design and other requirements, as failure to do so may have an adverse effect to rescue, but also the surrounding people. Part of the contribution is to analyze and assess the risks in the closed premises of fire elevators using the risk chart.

Keywords

Safety, Fire units, Fire elevator, Risk.

Introduction

As the population increases, there is a need for fire elevators which are of great importance for the safe and rapid evacuation of persons, and are also extremely important for incendiary fire brigades. In the past, this issue has not been addressed due to the low occurrence of high-rise buildings, but today the importance of fire lifts is rising sharply. Although there are several dozen high-rise buildings above 60 m, in Slovakia it is not known to exit a building that would have two fire elevators or one evacuation and one fire elevator at the same time.

Fire elevator

Fire elevators, Fig. 1, there is a technical equipment reserved for the transport of fire units as well as fire fighting equipment. From these elevators, fire brigades have to be secured to all floors of the planned intervention. The elevator must be located in a protected escape route, properly protected and fully under the control of firefighters or other authorized persons. It is also secured by power supply from two independent sources, which is the main difference between a classic elevator and a fire or evacuation elevator. An evacuation lift is also considered a fire elevator. [2]

The protected escape route is understood as a separate part of the building, which forms a separate fire section that is protected by building elements and other protection from other spaces. This part of the building is intended primarily for safe firefighting of fire units but also for safe evacuation of persons. Buildings are equipped with the necessary elevators, according to their type or need. From the point of view of fire protection, fire and evacuation elevators are equipped according to the relevant technical standards. Failure of

any part of the lift or insufficient number of fire and evacuation lifts may have adverse consequences. [2]

Requirements for fire elevators

For proper use and operation of fire elevators, it is necessary to create a number of technical measures. Failure of any part of the elevator or insufficient number of fire and evacuation elevators in buildings with increased fire risk can have adverse consequences for both life and property. [3]

The technical requirements are divided into three basic areas:

- requirements for building solutions,
- ventilation,
- electrical requirements.

However, experience and practice show that two more new requirements are needed to effectively operate fire elevators, namely:

- requirements for the size and design of the elevators,
- human factor requirements. [3]

Requirements for the construction solution concern the allocation of an evacuation or fire elevator shaft to a separate fire department. In such a shaft, a maximum of two fire or evacuation elevators may be located. The shafts of these lifts can not be shared with the ordinary elevators. If hydraulic equipment is used to drive the elevator, then these fluids must be non-flammable. [3]

The project documentation states that the evacuation lift function is performed by a fire elevator, which closes this case and does not address its need. The necessity of installing two fire elevators in buildings over 70-90 m is necessary because of the higher incidence of people, which prolongs their evacuation time.

Each elevator consists of the main parts, which are shown in Fig. 1.

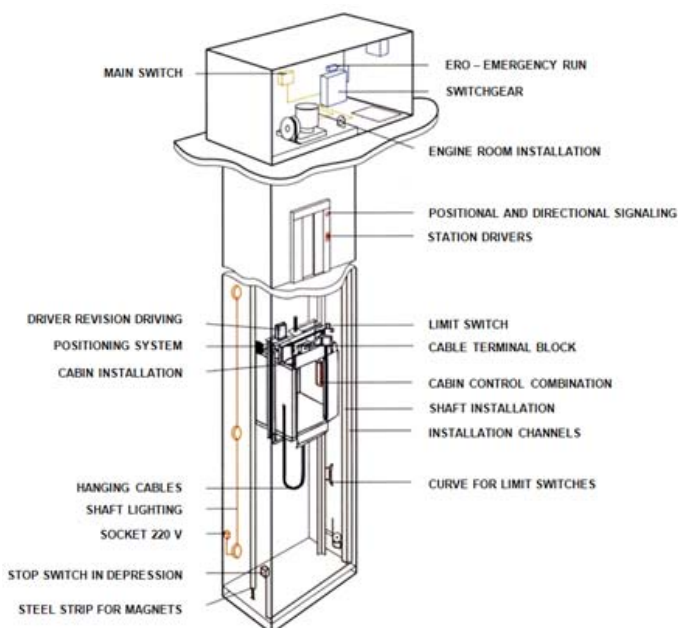


Fig. 1 Fire elevator and its parts [6]

Development of fire

Fire elevators in buildings also have an important function. They facilitate the firefighting of firefighters in the upper floors of buildings by delivering them quickly and effortlessly to the site of fire, thereby effectively using their forces for extinguishing. [4]

When hitting the stairs fire fighters would get very exhausted and the output would take too long. It is also their advantage to easily transport even heavier fire-fighting devices such as hoses or automatic breathing apparatus. This will leave the fireman enough energy to perform rapid intervention. From the mentioned time-heat curve of the fire development, Fig. 2, it can be seen that the fire in its beginning can be more quickly and easily quenched due to its low temperature. In the case of a full-fledged fire, the fire-extinguishing action and the number of incendiary firefighters are involved. [4]

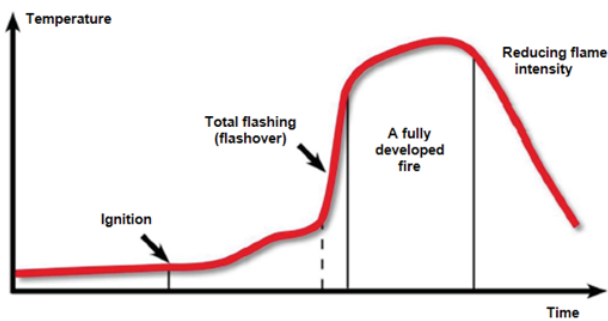


Fig. 2 Time-heat curve development of fire [4]

Safety marking of elevators

Each lifts must be marked with a pictogram in the elevator car and the elevator shaft door. The fire lift must be marked with the pictogram shown in Fig. 3. The label is used in a combination of symbols, texts and various dimensions. It allows use with fire control unit and serves for fire intervention. The pictogram is places in a visible place next to the elevator control and on the given floor, with the assumption of the intervention of the fire units. To compare the difference between the fire and the evacuation elevators. The evacuation lift is indicated by a similar pictogram, but instead of the red color the green color is used, and instead of the flame is a running person, Fig. 4.



Fig. 3 Fire elevator [5]



Fig. 4 Evacuation elevator [5]

KONE has complete solutions for refinement elevators to meet specific customer requirements. Fig. 5. A fire service elevator can be used as a normal passenger elevator even if it has the additional protection, controls and signalization to enable it to be used under the direct control of the firefighter. [7]



Fig. 5 Car interior options for firefighter elevators [7]

Operation fire elevators

Fire elevators and their illumination must be connected to two sources of electricity, both primary and secondary (contingency, emergency, spare), Fig. 6. The replacement source must be sufficient to start and operate the fire elevators. [5]

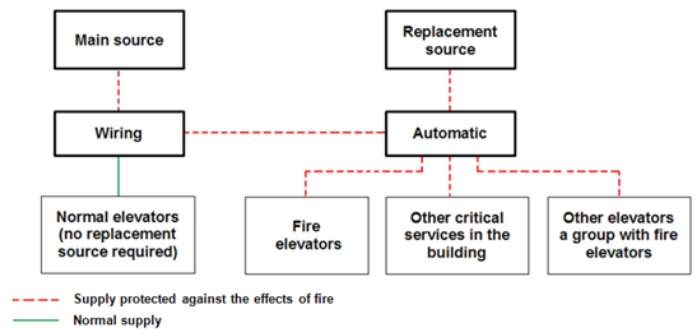


Fig. 6 Example sources of electricity for fire elevators [5]

Analysis and risk assessment in confined spaces

The life of elevators, whether personal, evacuation, fire or other, is very low due to a non-compliant technical site. If we look at this from the older outdated period, it can be said that they corresponded to the level of safety. Security is evolving every year and brings new systems to reduce the level of risk to the current state of safety. [1]

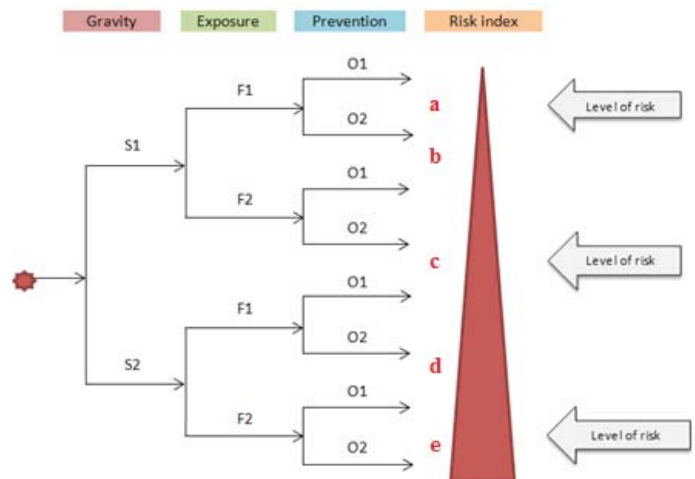


Fig. 7 Risk chart with an indication of the required level of risk [1]

The identification, assessment and risk assessment are made they are currently using many methods. One is also the „risk chart“ which is a graphical output for risk assessment. Coming from so called. Decision tree, where each node of the graph represents a certain quantity, the risk parameter and the graph direction represent the degree of severity of the parameter. [1]

Risk charts illustrate and describe the individual risk parameters that allow them to decide how to reduce them to the desired level, Fig. 7.

Tab. 1 Parameters for risk assessment [1]

S	Severity of injury / damage
S1	small injury (easy injury, reversible), e.g. scratches, cutting wound, bruise
S2	serious injury (e.g. usually irreversible, including death, secession or tingling of limbs)
F	Frequency and / or time of threat
F1	twice or less for working hours (rarely) or shorter than 15 minutes exposure (short exposure time)
F2	more than twice for work change or longer than 15 minutes
O	Possibility of preventing or limiting damage
O1	possible under certain conditions (e.g. if the parts move at a lower speed as 0,25 m/s, workers are using personal protective equipment)
O2	not possible

Tab. 2 Risk calculation using the spot method

Danger / Threat	S	F	O	IR	LR
The heat of sulfuration into the shaft / machinery space (electric elevators shortcut option)	2	1	1	c	MR
Do not protect or block the elevator (prevention of firefighting)	2	1	1	c	MR
Draining the water into the shaft (electric short)	2	2	2	e	HR
Fighting in the firehouse (elevator failure)	1	2	1	b	MR
The construction structure is twisted (rather than firefighters ending the liberation of people)	2	2	2	e	HR
Insufficient or incorrect placement of fire elevators for firefighting in a building (fire brigade)	1	2	1	b	MR
Disturbance or malfunction of the switchboard (elevator failure)	1	1	1	a	LR
Invalid marking of manual elevator control (latch lock)	1	1	1	a	LR
Power supply failure (elevator disability)	1	2	1	b	MR
The presence of harmful combustion products (inhalation of burns from evacuated persons)	2	2	2	e	HR
Drive with incorrect stopping accuracy (stopping the elevators on the mezzanine)	1	2	1	b	MR

The risk graph as shown in Tab. 2, than fire elevators and hence evacuation elevators belong to a group where MR - medium risk.

Conclusion

The importance of fire elevators is increasing due to the construction of higher buildings. Therefore, these elevators are subject to specific requirements. The project documentation lacks the participation of fire protection specialists in the implementation projects and then submission of documentation to the competent fire and rescue authority, whereas the introduction of fire elevators can not only rely on the availability of fire elevators and fire ventilation without verification by functional tests.

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