"Method of supporting the process of designing fire detection and fire alarm systems in transport facilities"

The main goals of the doctoral thesis were to develop a method for supporting the process of designing fire alarm systems for selected transport facilities, taking into account selected reliability and operational requirements; to develop generalised algorithms for designing fire alarm systems depending on the system structure, adopted alarming variants and scope of protection of transport facilities, taking into account selected reliability and operational requirements; and to develop generalised models of algorithms for designing fire alarm systems for transport buildings, taking into account the system structure, adopted alarming variants and scope of protection.

Scientific thesis of the paper: it is possible to develop a method of supporting the process of designing selected fire alarm systems for transport buildings ensuring the assumed level of reliability and exploitation indicators.

The dissertation is divided into twelve numbered chapters.

At the beginning, an introduction to the subject matter of the doctoral dissertation is presented and the basic types of fire alarm systems and their block diagrams are discussed. Then the aim, the thesis and the scope of the work are presented. A discussion on the fire alarm systems that are the subject of the research follows.

Subsequently, legislation on safety, fire alarm systems and fixed gas extinguishing systems is reviewed. Standards for the design of fire alarm systems and fixed gas extinguishing systems are presented.

Further on, the statistics on the number of fires in passenger service facilities in transport, in particular railway and bus stations, river and sea ports and airports in the years 2014-2017 are presented.

Description of eleven models of fire alarm systems follows. For each of the models, a block diagram is created and its reliability analysis is presented on a graph, which in turn shows the individual transitions between the system states. Each graph is described with the Chapman-Kolmogorov-equations. Under the assumed initial conditions and using Laplace's transformations, the sets of linear equations were obtained. Appropriate transformations and calculations of the sets of these linear equations allowed for obtaining the probability of the system staying in particular states.

Subsequently, operational statistics (repairs, damage) on representative fire alarm systems are presented.

In the paper, five generalised algorithms of a fire alarm system design, fulfilling one of the goals set in the paper are presented and the models of the operation process in a specialised Reliasoft BlockSim type software are validated.

Then there is a presentation of the developed IT application called "Supporting the process of designing fire alarm systems of transport facilities" (WPP-SSP-OT).

It is followed by a summary, conclusions from the dissertation and statements concerning the demonstration of the scientific thesis. The extent to which the aim of the trial was achieved is also described. Two patent applications that were filed during the preparation of the dissertation are discussed. The conclusions and observations concerning the obtained calculation results are described and the indications to be taken into account in the standards concerning the design of fire alarm systems are presented.

In the last chapter, the paper contains a list of sources on which I based my dissertation.

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