

## ABSTRACT

### **Method for assessing the effect of temperature on the resistance of electrical wires.**

The research undertaken in this work showed that the exposure time of the ambient temperature field was very important for the physicothermal state of electric cables affected by this field. The knowledge of the heating process of (N) HXH cables to a degree that allows to determine the rate of temperature increase of copper conductive wires and the heat flux flow inside the cable, makes it possible to assess the transmission capacity of the entire power supply line for fire-fighting electrical devices. The test results were used to develop the theoretical model that allowed, for the assumed heating time, to determine the temperature profile of the cable.

The experimental studies were carried out for the three most commonly used (N) HXH cable cross-sections in three variants of cable installation: open cable tray, fireproof thermal insulation and non-combustible lightweight concrete cable channel. In addition to theoretical calculations for a specific heating time, the mathematical model was implemented in the Matlab SIMULINK program, in which a simulation of the temperature increase of conductive wire for thermal excitation up to 400 °C was carried out.

The simulation results make it possible to determine the resistance of conductive wires, which will cause an additional drop in the supply voltage, thus making it difficult or even impossible to start the fire protection devices.

The analysis of the results of experimental research and theoretical calculations confirmed that the type of cable construction is also essential. This effect is manifested by different heating times and different length of the intermediate zone and hot zone. The simulation carried out in Chapter Seven showed that disregarding the existence of this intermediate zone is a great simplification in the description of the effects of heating of electric cables, which may lead to the immobilization of fire-fighting devices during a start-up attempt.

The theoretical model described in the work is the author's original contribution to the field of research to support and develop the knowledge of electrical installations when applied to building security engineering. The application of an analytical solution to the problem of determining the temperature of pipes and, on this basis, assessing their suitability for fighting the effects of fire, the distributed parameter method is also innovative and the author sees new possibilities of using this method to further development of research in this field.

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