

DOI 10.36074/logos-13.12.2024.032

## RESEARCH ON THE EFFICIENCY OF FIRE EXTINGUISHING WITH GEL-FORMING COMPOUNDS IN A LIMITED SPACE UNDER A METRO CAR

Andriy Postoev<sup>1</sup>, Kostiantyn Ostapov<sup>2</sup>

---

1. Student

*National University of Civil Defence of Ukraine, UKRAINE*

2. PhD, Associate Professor of the Department

*National University of Civil Defence of Ukraine, UKRAINE*

---

To achieve the set goal, a laboratory experiment was conducted to study the proposed under-carriage extinguishing trolley with a sprayer of gel-forming compositions using different feeding methods and spraying parameters of the fire extinguishing agent components.

The object of the research is a project to improve a special trolley, namely, the operation of its equipment with improved tactical and technical characteristics, which is recognized by laboratory experiments on fire extinguishing elements of equipment located under subway cars.

To conduct laboratory experiments on fires and the development of fires under a subway car, a fragment of the car floor was made, which in terms of its fire load is equal to model fire 1A.



Fig. 1. **Providing experiments on extinguishing model fires in the classroom 1A:**  
**a) – A fragment of a subway car floor approximated in terms of its fire load;**  
**b) – lighting a model fire in the form of a fragment of a wagon floor**

## ABSCHNITT 9.

### FEUER UND ZIVILE SICHERHEIT

In order to bring the experimental conditions as close as possible to the real extinguishing of the undercarriage space, a special stand was used, which simulated the movement of a modernized cart at different angles of inclination. This made it possible to study the influence of the angle of inclination of the fire extinguishing surface on the adhesion stability and extinguishing efficiency. Thanks to the stand, the fire extinguishing agent was supplied to a fragment of the car floor at a variable angle  $\alpha$ . The position of the model fire was changed from vertical (Fig. 1b) to supply from the bottom up to the horizontally located surface of the car floor. The size of the drops of gel-forming compositions was assessed visually, before extinguishing tests, by examining under a microscope a sample of hydrophobic material with fire extinguishing agent sprayed onto its surface.

The test procedure had the following sequence. A model fire was placed on a special stand (Fig. 1b), under which a pallet was inserted, in which 1 liter of gasoline was poured over a layer of water. The gasoline was ignited. After complete burnout (in 3 min), the pallet was removed. The free burning time was chosen to be 1 min. The total ignition time of the model cell was 4 min, after which the supply of finely atomized HUS components began. The extinguishing efficiency was characterized by the time interval from the start of the solution supply to the cessation of burning. The result was considered positive if the extinguishing lasted up to 45 s and when within 600 s after the end of extinguishing, no flame was observed. However, the main criterion for efficiency was the mass of HUS components spent on extinguishing, which directly depended on the adhesion of the gel to the fire extinguishing surface. The mass of fire extinguishing agent used for extinguishing was determined by weighing the installation before the start of extinguishing and after it.

To obtain and process the results of the interconnected tasks of the project to improve the trolley for effective and safe under-car fire extinguishing at subway stations, we used the laboratory experiment methods developed by us in the work [1].

#### REFERENCES:

- [1] Ostapov K. M., Senchykhin Yu. M., Avetisyan V. H., Haponenko Yu. I., Kyrychenko I. K. (2023). Pidvyshchennya efektyvnosti hasinnya pozhezh u pidvahonomu prostori metro heleutvoryuyuchymy skladamy. Problemy nadzvychaynykh sytuatsiy, 2(38), 267–280. url: <http://pes.nuczu.edu.ua/images/arhiv/38/18.pdf>