AP23487832. Development and calculation of a mobile overpass. p.m. – Ganyukov A.A.

Relevance: The project is aimed at developing a mobile utility overpass designed to eliminate traffic jams during repairs to urban utility networks. The overpass is a temporary bridge structure that allows vehicles to cross repair trenches, reducing detours and improving the traffic situation in the city. The technology includes installing the overpass on supports across the trench, ensuring continuous traffic flow. The project also provides for the expansion of the overpass application in the field, during natural disasters and in the mining industry. The main idea of the project is to develop and calculate the design of the overpass to improve the organization of traffic.

The project objective is to develop the design and calculation of a mobile overpass used in the repair of utility networks.

Expected and achieved results

Achieved results

The conducted studies have shown an almost complete absence of work on the development of mobile overpasses to eliminate traffic jams during the repair of urban utility networks. Existing urban structures, as a rule, are stationary structures that require long-term repairs or construction. At the same time, the engineering troops use mobile structures (tank bridge layers, assault bridges, etc.), but their use in urban conditions is difficult due to their high cost and bulkiness.

The development of mobile overpasses for civil road construction requires a comprehensive study. The analysis showed that such structures are in demand by public and private organizations, including akimats, road departments, emergency ministries and companies engaged in the extraction of minerals. They are especially relevant in large cities, where the repair of utility networks causes significant traffic jams.

Based on the analysis and design, a prototype of a single-span overpass was selected, combining the supporting structure of the roadway and a wheeled chassis, which allows it to be transported by trailer. This design eliminates the shortcomings of existing solutions and represents a new type of transport equipment: a mobile overpass.

In the course of the work, morphological tables were developed, optimal design options were determined, and 10 of the most effective were selected from more than 122 thousand possible ones. The design parameters of the supporting structures were determined, strength, rigidity and stability calculations were performed.

The main calculations include:

• Analyzing longitudinal and transverse frames using the displacement method. • Checking the rigidity of a structural orthotropic plate using the Bubnov-Galerkin method.

• Calculating the rear axle for natural and forced vibrations, including dynamic diagrams of moments and transverse forces. The thickness of the roadway slab is set at 20 mm to prevent unsteadiness. Axle turning mechanisms, wheel lifting systems and mounting jacks have been developed.

Expected results:

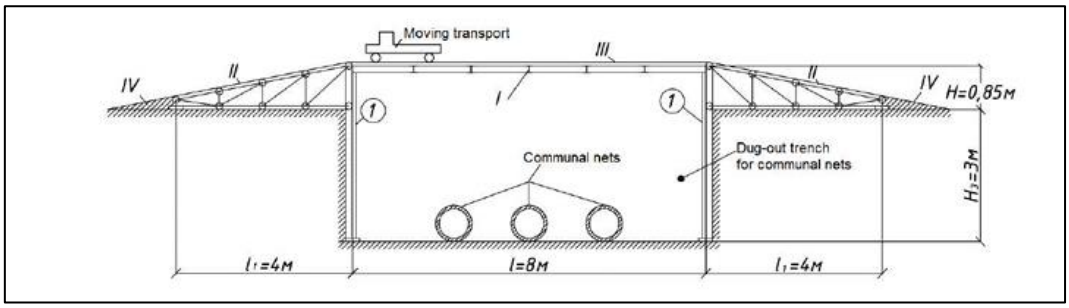
- cross-sections will be selected, all undercarriage elements will be tested for strength, rigidity and stability;

- a fundamentally new calculation method of the optimal placement of overpass supports will be developed, taking into account the nonlinear properties of the soil base;

- a report will be prepared and an application for a patent for an invention will be submitted;

- a report will be prepared and an application for copyright will be submitted;

- an article and/or review will be published in peer-reviewed scientific journals indexed in the Science Citation Index Expanded and included in the 1 (first) and/or 2 (second) quartile by impact factor in the Web of Science database and/or having a CiteScore percentile in the Scopus database of at least 65 (sixty-five).



a) Facade

b) Plan

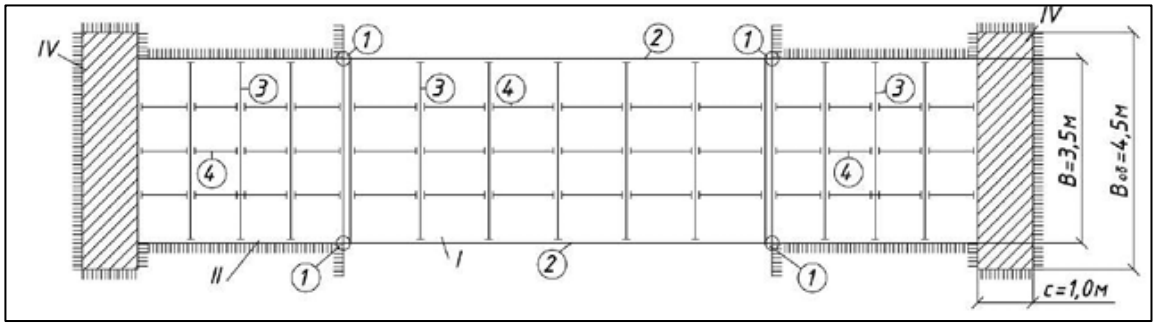


Figure 1 – Diagram of a mobile overpass

Research team

No.	Participant	Role in the team	Scientometric indicators
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List of publications:

1. Ganyukov A.A., Sinelnikov K.A., Kabikenov S.Zh., Karsakova A.Zh. Studying and Calculating the Deformed State of the Roadway Mobile Overpass. Material and Mechanical Engineering Technology, No.3, 2024, P. 88-95.
https://mmet.kstu.kz/download/articles/01102024091607_journalFile.pdf

Information for potential consumers

The developed mobile utility overpass is intended for use by public and private organizations, such as akimats, road departments, emergency ministries, as well as enterprises engaged in construction, repair and mining. The design is highly mobile, which allows for the prompt elimination of traffic jams caused by repair work on utility networks and increases the efficiency of transport infrastructure.

Scope:

• City road services to ensure uninterrupted traffic during utility network repairs.

• Construction and repair companies to temporarily solve transport problems at construction sites.

• Organizations involved in the elimination of consequences of natural disasters to quickly restore transport accessibility.

• Mining industry to temporarily close trenches and to ensure process flows.

• Military and rescue services for use in the field and emergency situations.

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