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### **TECHNOLOGICAL FEATURES OF THE RESTORATION OF THE DESTROYED INFRASTRUCTURE OF THE ROAD TRANSPORT NETWORK**

The transport infrastructure consists of a number of buildings that create a system of communication networks of all types of transport. Firstly the transport network meets the needs of production in the transportation of raw materials and finished products, which especially affects the development of the country's economy. Secondly, the transport network meets the needs of regular, non-regular and special passenger transportation.

The development of the economy, the competitiveness of the economy, the quality of life of the population depends on the development, condition and safety during the operation of roadways.

According to the data of the World Economic Forum (WEF), during the calculation, in 2019, of the global index of competitiveness according to the "Transport infrastructure" index, Ukraine took 59th place out of 141. Road transport infrastructure is in the worst condition among other types of transport infrastructure in Ukraine. During 2014–2019, the road quality index was in the range of 2.2–3 points out of a possible 7, the data are presented in the table. While the port infrastructure sub-index was 3.2–3.9 points, air transport infrastructure – 3.7–4 points, railway transport – 3.9–4.3 points. [1]

*Table*

Indexes	Years				
	2014 -2015	2015 -2016	2016 -2017	2017 -2018	2018- 2019
Quality of the motor transport network, points (1-7)	2,2	2,4	2,4	2,4	3
Railway transport infrastructure, points (1-7)	4,3	4,2	4	3,9	4,2
Air transport infrastructure, points (1-7)	3,8	3,7	3,7	4	4
Port infrastructure, points (1-7)	3,3	3,2	3,4	3,5	3,9

With the beginning of the full-scale war of the Russian Federation against Ukraine, a large number of objects of the transportation network were destroyed, thousands of kilometers of highways were damaged, and a large number of bridges and overpasses were destroyed. Construction organizations face the issue of restoring destroyed objects of the auto transport network, building new objects.

In this situation, for the restoration of construction objects of the motor vehicle network, it will be advisable to implement construction 3D printing technologies. In contrast to traditional methods of restoration and construction of objects, the 3D printing method will, on the one hand, reduce the cost and labor intensity of restoration and construction works, and on the other hand, increase the speed.

For example, a Ukrainian company has developed a stop project - a shelter from debris. To speed up the construction of the facility, the project was developed to use construction 3D printing in the construction process. [2]



Fig.1 Project of a public transport stop printed on a 3D printer - a shelter from debris  
a – front view                      b – back view

In conclusion, it can be noted that the use of construction 3D printing technologies will speed up the restoration and construction of objects. The use of construction 3D printing technologies in the process of restoration and construction of the road network is expedient. With the help of 3D printing technology, you can restore and build roadside facilities, gas stations, public transport stops, etc. It should be noted that existing construction 3D printers require design improvements, development of new and improvement of existing construction mixes. As a result, improvements will increase the quality of construction objects and allow to expand the range of use of 3D technologies in the construction industry.

#### REFERENCES

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2. The concept of a stop-shelter from 3D printing. URL: <https://urbisair.com.ua/news/makhno-studio-predstavlyly-kontsept-zupyanky-ukryttia-z-3d-druku/>

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#### MODERN MATERIALS FOR REDUCING HEAT CONSUMPTION IN UKRAINE

Energy crisis in Ukraine, rising prices for energy sources, and their deficit necessitate the need to improve the quality of thermal insulation of structures and thermal units. One of the ways to address this issue is through the use of special high-efficiency thermal insulation materials capable of providing the desired thermal resistance values for constructions.

Modern material science trends are focused on technologies using organic substances in human life activities. Therefore, the development of thermal insulation materials based on minerals, characterized by low flammability and non-toxicity both during manufacturing and operation stages can be considered a priority. The properties of insulation materials are usually divided into three main groups: physical, ecological, and health-related.

This overview study is analyzing several types of thermal insulation materials that could be effectively used in Ukraine:

*Rockwool.* This is a type of insulator made from gabbro-basalt rocks, which allows for thermal and sound insulation of various structures or providing fire resistance. Rockwool insulation gained wide popularity at the beginning of the last century. Due to its physical and chemical properties, this type of