Ensuring the density coefficient in road foundation construction works

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Article history:

Received: 10 th March., 2022
Accepted: 11 th March., 2022
Published: 12 th March., 2022

Annotation: ***There is talk of increasing the strength of the pavement using composite materials in the construction of the pavement and the study of foreign technologies.***

Keywords: ***Road, structure, subgrade, train, developed, vehicle, quality, factor, economy, price, methodology, elasticity, repair, safe, passenger, substrate, technology, reconstruction.***

Introduction. Road structures perceive various types of external influences, the main of which are the impacts from the vehicle load and weather and climatic factors. In addition to external influences, road structures must take loads (sometimes significant) from their own weight. The main elements of the road structure are pavement and subgrade. Road pavement is considered strong enough if, under the influence of all loads, it maintains continuity and the required evenness of the pavement for a given period. The subgrade is considered stable if the change in its bearing capacity, height and geometric parameters does not go beyond the calculated limits during the service life [1]. In recent years, with the advent of heavy-duty road trains, the vehicle wheel load has increased significantly, which causes extreme vertical and horizontal stresses and deformations in the structural layers of the road pavement and the upper layers of the subgrade [2]. This entails the need to build ever more powerful and expensive structures. To assess the effectiveness of the practical use of the developed road structures [3] and the methodology for designing cement-soil mixtures for the construction of structural layers under production conditions, sections of forest roads were built and tested on a pilot scale using local soils reinforced with composite low-cement binders [4].

Methodology. The aim of the work is to test the theoretical prerequisites and results of laboratory experiments to determine the strength and deformation properties of cement soils obtained by strengthening local soils with composite low-cement binders, as well as the transport and operational characteristics of the developed road structures of forest roads [5]. The purpose of using a structural layer of cement soil and reinforcing cage "geogrid-cement soil" is to create a reinforced layer of pavement with improved characteristics in relation to the layer of aggregate: - increased strength (increased resistance to emerging shear stresses) [6]; − increased rigidity (the elastic modulus of the layer increases with respect to the elastic modulus of the filler) [7]; - reduced temperature deformations with filler containing composite binders.

Analysis and results: To determine the modulus of elasticity of road structures made of cement soil (IV type) and the reinforcing cage "geogrid cement soil" (III AK type), three model

ISSN 2277-3630 (online), Published by International journal of Social Sciences & Interdisciplinary Research., under Volume: 11 Issue: 03 in March-2022
https://www.gejournal.net/index.php/IJSSIR

sections 1.5 m long, 1.0 m wide and 0.5 m deep were laid on the soil channel, while the third section is the control, ground cover. The first section was a road structure (type IV) of layer-by-layer laid and compacted soil, brought to the maximum density at optimal humidity [12]. The top layer of the first section with a thickness of 0.15 m was obtained by strengthening the soil with a composite low-cement binder No. 1, consisting of Portland cement and micro-fillers - granitoid screenings and ground waste from asbestos-cement production. The principle of laying the second section is the same as in the first section, and the base of the road structure (type III AK) consisted of a reinforcing cage "geogrid-cement soil", obtained by backfilling the geogrid of the Belgeosot cellular structure with a cement-soil mixture. The mixture consisted of soil reinforced with composite low-cement binder No. 1, consisting of Portland cement, granitoid screenings and ground waste from asbestos-cement production. The third section is a control one, and reinforcement throughout the depth was not carried out. The model area was a soil compacted in layers at optimal moisture content. During the tests, after a certain number of passes of the bogie, the track depth was measured, and the nature of the formation of residual deformations was recorded. In the section with type IV and IIIAK road structures, the rut depth was fractions of a millimeter, i.e., with 40 bogie passes, rut formation practically did not occur. In the area with a soil coating, the most intensive rut formed during the first 17 passes, stabilized after 23 passes, and in the end its depth was 3.7 cm. Thus, the results of bench tests showed good agreement with the results of theoretical studies and confirmed the effect of the structural layer of cement soil and reinforcing cage for the strength and operational condition of forest transport routes.

Conclusion. In summary, road sections and their parameters correspond to category III and IV forest roads. The following parameters were adopted to calculate the consumption of components as an input: length of plots - 200 m; The width of the lower floor - 5.0 m and 4.5 m for III For IV; width of the carriageway - 3.5 m; shoulders - 0.75 m for III and 0.5 m for IV; pavement thickness - 0.2 m for III and 0.15 m for IV; transverse slope - 30 ‰. The total volume of the cement-soil mixture was 140 m^3 and 105 m^3 in the first and second cases, respectively. While the average density of cemented soil is 1800 kg / m^3, the weight of reinforced soil is 252,000 kg and 189,000 kg, respectively.

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ISSN 2277-3630 (online), Published by International journal of Social Sciences & Interdisciplinary Research., under Volume: 11 Issue: 03 in March-2022
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ISSN 2277-3630 (online), Published by International journal of Social Sciences & Interdisciplinary Research., under Volume: 11 Issue: 03 in March-2022
https://www.gejournal.net/index.php/IJSSIR