

Technologies for using Geosetting on Cement-Concrete Covered Roads

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Abstract: This article addresses important issues related to the reinforcement and rehabilitation of cement concrete pavements through the application of asphalt concrete overlay layers. Special emphasis is placed on improving the structural performance and service life of existing road pavements that are subject to increasing traffic loads and environmental impacts. The study explores modern reinforcement techniques, including the use of armored geogrids and fiberglass grids, which are widely recognized for their effectiveness in enhancing pavement strength and durability. The findings of this study provide practical recommendations for the design and implementation of reinforced pavement structures, contributing to more reliable, cost-effective, and sustainable road infrastructure development.

Keywords: Cement Concrete Coating, Reinforced Geoset, Fiberglass Grille

Introduction

Today, there are a number of problems and shortcomings in the state management system of the republic's road sector that hinder the formation of a competitive environment and the attraction of investment into the industry. In order to create a modern road management system, clearly delimit control and economic functions, create a healthy competitive environment through demonopolization, attract private sector enterprises, and increase investment attractiveness, and widely introduce innovations into road construction, as well as in 2019-2023 In accordance with the tasks of the Action Strategy on five priority areas of development of the Republic of Uzbekistan, on December 9, 2019, the Decree of the President of the Republic of Uzbekistan "On measures to deeply reform the road management system of the Republic of Uzbekistan" and the Resolution "On measures to further improve the management system of the road sector" were adopted[1,2,3]. Undoubtedly, road construction plays an important role in the country's development. In this regard, there will be tenders for the construction of roads with asphalt concrete or cement concrete pavements. Regardless of the strength of the cement-concrete pavement, if the geology of the road construction site is complex, the pavement is also considered effective. In this regard, a new technology to increase the service life of asphalt concrete and cement concrete pavements and build them even in difficult climatic conditions is geoset. Geosets are made of a specific material and perform the same functions as frame reinforcement inside a concrete mixture when building a house. It is mainly used in uncomfortable and complex areas, where a defect is formed when the road passes through this area.

Methodology

This study investigates the reinforcement and rehabilitation of cement-concrete pavement roads through the application of asphalt concrete overlay layers combined with geosynthetic reinforcement (geogrids). The research is based on a systematic review of scientific literature, analysis of existing road construction practices, and comparative evaluation of technological processes used in pavement strengthening.

The methodological approach includes the following stages:

- assessment of the current condition of cement-concrete pavements;
- identification of structural defects such as cracks, joint failures, and surface deformations;
- analysis of reinforcement technology using "Armdor" geogrids;
- evaluation of adhesion and load distribution properties of asphalt concrete overlay layers;
- comparison of local and continuous reinforcement techniques.

The study also incorporates technical observations and engineering data to evaluate the effectiveness of geogrid reinforcement in reducing crack propagation, improving load-bearing capacity, and extending pavement service life.

Results and Discussion

When reinforcing cement concrete pavements with asphalt concrete layers, the installation of the reinforcing layer is carried out using the "Armdor" geoset. The geogrid absorbs some compressive stresses caused by temperature and transport loads and slows down the development of cracks reflected in the upper asphalt reinforcement layer in the expansion joint zone[4,5]. The technology for reinforcing the cement concrete pavement with asphalt concrete reinforced with "Armdor" geosets includes the following operations:

- cleaning the coating of contaminants;
- elimination of defects in the cement concrete pavement (surface leveling, replacement of damaged slab sections, repair of edges and corners of slabs and expansion joints, joint closure, and maintenance of cracks);
- application of a binder to the surface of the cement-concrete pavement in areas where the laying of geosets is planned;
 - delivery, cutting, laying, tensioning, and securing of the geodetic network;
 - repeated pouring of the connector over the geoset laid on the coating;
 - distribution and compaction of the asphalt concrete mix into layers of the required thickness.

The existing cement concrete pavement is cleaned using dust and mechanical brushes, compressed air from compressors, and irrigation machines, and is dried if necessary. Surface leveling is performed in areas with holes, voids, significant cleaning, and other defects of the cement concrete pavement that prevent stiff contact with the geoset and adhesion to the reinforcing asphalt concrete layer[6,7,8,9].

Various methods for preparing the coating depending on its condition: removing irregularities by milling the coating. In this case, it is preferable to use milling machines that cut irregularities with a set of diamond discs without destroying the microstructure of the cement concrete prepared for reinforcement. When using machines with extrusion tools made of hard metal alloys, the quality of the prepared surface is significantly lower;

If the condition of the cement concrete pavement is satisfactory, this preparation method is permitted.

- thickness 3... 5 cm with the installation of a leveling layer of asphalt concrete mix (usually a dense fine-grained or sandy mixture is used).

The laying of the reinforcing geogrid bed into the corrective layer must be carried out one day before

its installation. [10,11].



Figure 1. using the "Armdor" geogrid Reinforcement of cement concrete pavement with asphalt concrete using a leveling layer device: 1 - asphalt concrete reinforcement layer; 2 - expansion joint; 3 - "Armdor" Geoset; 4 - leveling layer; 5 - old cement concrete pavement; 6 - support; 7 - lower soil

To ensure good adhesion of the top layer to the prepared substrate, a 70% bitumen-containing rapidly decomposing cation-containing bitumen emulsion is applied approximately evenly with a consumption of at least 0.6 kg/m². When used as starting bitumen, the consumption is approximately 1.0–1.2 kg/m². The type and quantity of binder used in this operation are determined to ensure maximum adhesion between the layers. The width of the distributor strip with the automatic aspirator of the used connector is 10...100 mm greater than the width of the geodetic network strip being laid. 25 cm is more marked[12,13,14].

Depending on the condition of the existing concrete pavement, continuous or local reinforcement of expansion joints and cracks with geosets, as well as a combination of permanent and local reinforcement (with appropriate justification), are used.

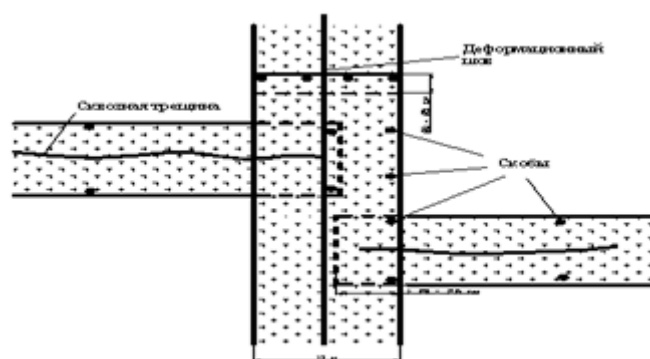


Figure 2. Local reinforcement scheme with "Armdor"

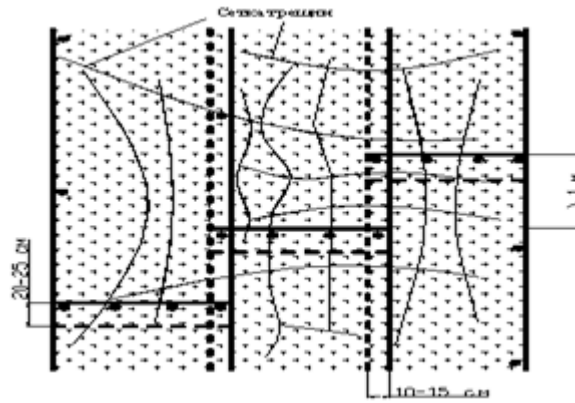
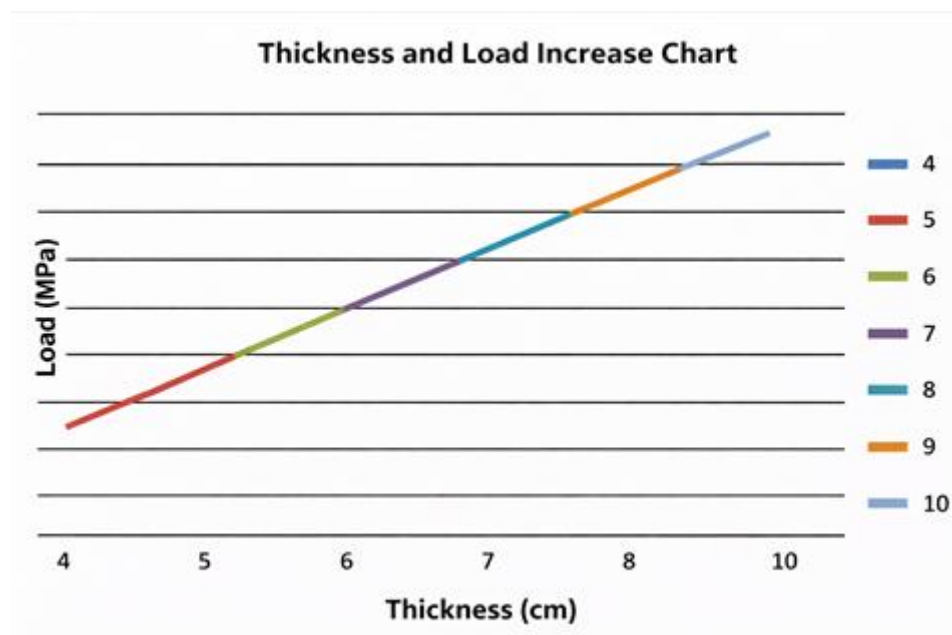


Figure 3. Continuous reinforcement scheme with "Armdor" geosets

When constructing a continuous fracture layer for the entire width of the track, the armor geoset rolls are rolled smoothly parallel to the track axis, without waves or folds, with a coating between the strips of 10... 15 cm longitudinal edges of the directions. Additives should be spread in areas where the geoset strips are laid side by side and in sequence. The "Armdor" geoset directions are placed on top of each other so that the ends in the direction of the longitudinal direction (parallel to the road axis) are 20-25 cm on top of each other. To improve the adhesion of the "Armdor" geoset to the asphalt concrete layer of the upper layer, it is recommended, if necessary, to pre-fill with bitumen emulsion or hot bitumen at a rate of 50... A 70% refill is recommended. Before distributing the reinforced concrete mixture, it is necessary to protect the geogrid networks installed on the cement concrete pavement (or the leveling asphalt concrete layer) from damage by construction vehicles. [15].



On the road surface, workers and vehicles must move with extreme caution, minimizing the shear loads on the geogrid. When contacting an asphalt paver, it is preferable for them to move without braking. When applying geosets impregnated with binders to the wheels of vehicles, a thin layer of clean sand or fine crushed stone is applied to the surface of the reinforcing layer at the vehicle's moving parts. To enter and exit the road, it is recommended that vehicles move slowly along the same road in the opposite direction to the interlayer. With a satisfactory condition of the existing cement concrete pavement, local reinforcement of the asphalt concrete is installed only in the zone of expansion joints and through cracks. In this case, the geoset branches of the required length are

laid along the seam or cut asymmetrically to the axis along the width of the roll. The width of the layer must be at least 1.0 m.

Conclusion

To ensure the necessary adhesion of the coating to the lower and upper layers, the rules provided in the paragraphs must be followed. The distribution and compaction of the asphalt concrete mixture over the crack-breaking layer, as well as the monitoring of work performed using armored geosets, are carried out in accordance with current regulatory documents, standards, rules, and other recommendations. If fiberglass grilles are not used, the asphalt pavement will crack, loosen, detach, age, and encounter other defects that will turn into pits if these defects are not treated in time. This is due to the fact that as the road opens and the service life of the road increases, the aging of the asphalt gradually decreases. Asphalt aging is a very complex process involving harmful agents and mechanical pressure from vehicles. Various physical and chemical reactions occur simultaneously. For example: oxidation, hardening of exudate, loss of volatile substances, these factors lead to changes in the performance of the asphalt: low degree, ductility, high brittleness, thermal crack resistance of the asphalt layer, anti-fatigue damage, anti-bulb and water-resistant damage abilities gradually weaken, the phenomenon of damage to the asphalt surface layer gradually increases, and the structure of the road surface creates pits, loosening, cracking, cracking, chips and other phenomena. Cracks that form in the asphalt surface layer. There are many external causes of cracks, but most of them are temperature cracks, that is, cracks caused by changes in temperature, such as a sharp drop in temperature in winter and a large drop in temperature. In a sense, asphalt paving is about solving the problem of water leakage, waterproofing, and blocking, which is why the use of fiberglass grilles is so important. If the road barrier is unstable before the construction of a fiberglass fence, which leads to the cracking of the road network, the roadbed can be treated with lime or cement or reinforced with soil, and the depth can be determined depending on the specific situation, usually 20–40 cm. The amount of slag lime is 5–10%, or the amount of cement is 4–6%. Once the soil pavement is stabilized, the underlying layer of the left and right sidewalks is restored. Weak or weak underlying layer of the road network.

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