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Modern Technology of Application of Cement Concrete in Road Construction

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ABSTRACT: The article describes modernization of the economy of Uzbekistan is impossible without the development of infrastructure and, mainly, the development of the transport system of the country. Recently, considerable attention has been paid to the development of the construction of roads and railways in Uzbekistan and the construction of artificial structures - overpasses, bridges, tunnels.

KEY WORDS: asphalt pavement, cement concrete, road construction.

I.INTRODUCTION

At the same time, it can be noted with the provision of normative that in Uzbekistan due to a number of reasons for the service life of pavements. According to the unfavorable situation, according to Uzavtosanoat, only 52.8% of the republican roads meet regulatory requirements. At the same time, 23.6% of roads operate in overload mode.

The actual overhaul life of roads even on the federal road network is 3-4 years, and recently there has been a tendency to reduce it.

Rutted asphalt pavements, cracks and bumps in the roads indicate the exhaustion of the bearing capacity of road pavements. Volumes of "under repair" of roads with asphalt concrete pavement are constantly growing. With a total length of paved roads in Russia of 624,200 km, the volume of repair in 2015 was 9,529.2 km.

The main advantages of road pavements with cement concrete pavements are that, at approximately the same construction cost, they provide a much longer service life compared to asphalt pavements, and at the same time require significantly less repair costs and ensure a prospective increase in the pavement carrying capacity due to an increase in vehicle mass and traffic intensity.

Therefore, in the case of calculating costs, taking into account operational and operational social and economic losses of users, the cost of a road with cement concrete pavement may be 15-25% lower than the cost of a road with asphalt concrete pavement.

World practice shows that the proportion of roads with cement concrete pavement in developed countries is at least 30% of the total volume of roads: in Germany - 31%, in the USA - 35%, in Belgium - 41%. In the United States, Canada, Argentina, the Netherlands, and the United Kingdom, on the basis of a feasibility study and comparison of options, taking into account operating costs in the construction of cargo-loaded and high-speed railways, cement concrete is usually chosen. The German experience shows that after 28 years of operation only 5% of concrete pavements and 100% of asphalt concrete need to be repaired [1,2].

Non-rigid road pavements with asphalt concrete pavements (97%) and only 3% of roads with improved pavements have cement concrete pavements on the main highways of Uzbekistan.

According toJ.G.Rashidov[3,4,5] and other specialists in assigning the type of coating practically ignore the following advantages of cement concrete coatings:

- significantly greater strength of cement concrete in comparison with asphalt concrete;
- stability of deformative properties of cement concrete with temperature change;
- increase in the strength of cement concrete over time under favorable operating conditions;
- availability of equipment for high-speed construction of concrete pavements with high flatness rates;
- a lighter coating provides greater safety in the dark and less need for lighting;
- high wear resistance, frost resistance of road concrete;
- service life of coatings to overhaul with high quality construction and normal operation can reach 50 years;
- stability of the coefficient of adhesion of the coating to the wheels of cars, its weak dependence on the degree of moisture.

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II.RELATED WORK

Unfortunately, in Uzbekistan after 1990. practically did not build cement concrete pavements on the roads. Recently, the operation was introduced section of the bypass of the city of Novosibirsk with a total length of 50 kilometers, made of cement concrete;
At the same time, new technologies of cement concrete appeared in civil and industrial construction in the world and in Uzbekistan: concrete appeared with a compressive strength of 100 MPa or more, technologies of self-compacting and self-leveling concrete mixtures were developed, new generations of concrete were developed with high performance indicators: guaranteed frost resistance and corrosion resistance. Concretes were obtained with a W / C of less than 0.30, with a tensile strength in bending of more than 8.0 MPa, with high frost resistance, crack resistance. A parametric series of such concretes has already been introduced into regulatory documents, which opens the way for their widespread use.
In accordance with GOST 26633-2015 “Concretes, heavy and fine-grained. The technical conditions are strictly set to the minimum cement content in concrete for foundations - 150 kg / m3 and a water-cement ratio of 0.45 for the top layer of the coating and 0.50 for the bottom layer of the coating, 0.90 for the bases. Abroad, in countries with extensive experience in the construction and operation of cement concrete in road construction, the requirements for concrete composition vary by region of construction. In the list of US technical requirements in the state of California, the total content of cementitious substances (cement and fly ash) in the concrete mix is set to -390 kg / cu. m and the water-cement ratio of 0.42. For comparison: the state of Washington stipulates the minimum total content of cementitious substances in the concrete mix (cement, fly ash, ground granulated slag) 335 kg / m3, and the cement ratio should be at least 65% of the mass and the water-cement ratio (calculated with respect to weight of all cementing materials) should be no more than 0.44 (Washington DOT, 2014). When comparing with the requirements in Europe, it should be borne in mind that in most European countries when calculating the water-cement ratio, additional cementitious materials are not taken into account.
Introduction to normalized characteristics of road concrete is the compressive strength of concrete due to the need to ensure the durability of concrete. The use of high-strength concrete provides a reduction in abrasion, reduction of rutting and, accordingly, an increase in turnaround time.
In solving the tasks of increasing the service life of pavements, new types of cement concrete, for example, cement concrete with a lower modulus of elasticity in the foundations of highways, may be reflected. Such concretes can be obtained by using special damping and polymer additives.
The introduction of new construction technologies - recycling and chemical additives-plasticizers opens up new prospects for the development of soil concrete. Machines for recycling were developed a few years ago by the appropriate modernization of road mills and soil stabilization machines.

III. RESULTS

Soils Approximate consumption of mineral binders,% (kg / m3)
Portland cement, slag portland cement
Coarse uncemented (gravel, wood, crushed-stone); soil and gravel mixtures, close to the optimal composition; gravel sands, large and medium (non-uniform) 4-8 (80-180) 3-6 (60-120)
Coarse uncemented; crushed stone mixtures of non-optimal composition; gravelly, coarse, medium, fine (homogeneous), silty sands 6-12 (100-210) 4-8 (70-140)
Coarse uncemented; soil and gravel mixtures; sands of large non-optimal composition with the addition of 15 - 20% of non-ground nepheline or bauxite sludge 6-8 (100-180) 4-6 (80-120)
The sands are medium and small, including homogeneous; sandy loam large and dusty with a plasticity number of not more than 5 with the addition of 15-20% ground nepheline or bauxite sludge 4-6 (80-110) 3-4 (60-80)
Sandy loam, close to the optimal composition, light large, light and heavy silty; loams 8-12 (160-240) 4-7 (80-140)
Sands and sandy loams with plasticity less than 3 with the addition of 15 - 25% of fly ash or ash-slag mixture 4-7 (80-140) 3-4 (60-80)
Heavy and heavy clay loams 11-14 (200-250) 8-12 (150-220)
Sandy clay, silty with the number of plasticity not more than 22 13-15 (230-270) 10-12 (180-220)
Ash and slag mixture of water removal 5-7 (100-140) 4-6 (80-120)
Slags of ferrous and nonferrous metallurgy, phosphoric, etc. 5-8 (110-180) 4-7 (90-160)
"Tails" - solid waste of various types of industries of different grain composition 5-9 (110-190) 4-8 (90-170)

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1. Above the line - with the device of the upper layer of the base or coating, below the line - the lower layer of the base.
2. To obtain reinforced materials of class I strength (4.0–6.0 MPa), the maximum dosages of binders should be taken, grade III strengths (1.0–2.0 MPa) should be minimal.

suspension preparation. Another direction is the production of soil mix with mixing in the installation and subsequent distribution. The use of modern chemical additives significantly expands the boundaries of soil types for strengthening. Such materials can be successfully used both in foundations and in coatings. In the construction of cement concrete coatings and bases fine and very fine sands can be successfully used in a mixture with crushing screenings. The introduction of crushing screenings in the fine aggregate significantly increases the strength and wear resistance of concrete; at the same time, concrete with crushing screenings can have an economic and environmental advantage due to the provision of economic preferences to enterprises consuming industrial waste. The use of fine-grained and specially-treated concrete concretes (with crushed stone consumption up to 600 kg / m3) is especially important for many regions of Russia with a shortage of qualified and coarse aggregate. The effective development of cement concrete coatings should be promoted by the technology of high-speed repair and reinforcement of cement concrete using new phosphate and cement-polymer-based materials, which allow movement to be opened in 45-60 minutes.

A promising type of cement concrete used in pavement layers is drainage (large-pore) concrete. The use of a complex of modern chemical and mineral additives and a careful selection of materials makes it possible to obtain such concrete with a strength of more than 30.0 MPa. Using it as the top or intermediate layer of the pavement completely eliminates the effect of aquaplaning, and, in addition, helps to increase the service life of the whole structure by eliminating water accumulation in the base layers.

To expand the scope of application of promising designs of cement concrete (hard) pavements, it is necessary to develop new methods for calculating and designing pavements, including on weak grounds, a design system focused on the operating conditions of pavement work. In accordance with the design standards of countries where cement concrete is successfully operated, the coating should be separated from the base, for example, with an asphalt concrete substrate, in order to be able to move horizontally with a change in temperature and ensure waterproofing of the underlying layers. Plate thickness in Germany and the United States is assumed to be 10-15% more by

compared with Russian design standards. In addition, the thickness of the coating plate significantly depends on the area of construction. There is no analysis of the existing one. Currently, two-layer cement concrete coatings are also being distributed abroad, which are arranged by the method of merging layers when concreting fine-grained concrete on freshly coarse-grained concrete. As a basis for the design of road pavement, taking into account the life cycle, you can use the techniques of quality assessment adopted in the United States and taking into account the amount of permissible longitudinal, transverse and angular cracks; the average height of the ledge in the seams; flatness indicator; allowable buckling of plates in the seams; at the same time the destruction associated with the properties of comp.

IV. CONCLUSION AND FUTURE WORK

It is known that reinforced concrete road (PDN) and airfield plates (PAG), despite the apparent simplicity of design, are one of the most complex products in the field of factory technology of reinforced concrete. In accordance with GOST 25912-2015 “Reinforced concrete plates prestressed for airfield pavements”, the plates are made of prestressed reinforced concrete with a concrete class of strength not lower than B30, frost resistance not lower than G2200; They are subject to the relevant requirements for crack resistance. The introduction of heated forms with a soft warming mode, instead of steaming, and the use of chemical additives to the manufacturing technology, will significantly increase the service life and reliability of road and airfield pavements made from such plates.

It should be noted that the development of new territories in large cities of Tashkent, Samarkand and others will require cargo-intensive transportation, which may be more economical by reducing operating costs for road repairs.

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