https://shine-aeb.uz

I S A

International Shine-AEB scientific journal

Google Scholar DRJI BASE OPEN ACCESS
doi Digital Object Identifier zenodo OpenAIRE Open Journal Systems OJS ISSN

SHINE-AEB GROUP

INTERNATIONAL SHINE-AEB: ilmiy jurnali.-№1 (5) 2025. Jurnal elektron ko’rinishda chiqariladi. Ta'sischi va noshir: SHINE-AEB MCHJ. https://shine-aeb.uz

TAHRIRIYATNING JOYLASHGAN JOYI: Toshkent viloyati, Chinoz tumani, B. G’ofurov ko’chasi 32-uy. Telefon: 99 837 91 18 Email: elyorbek.begaliyevich@mail.ru

DEVELOPMENT OF THE OPTIMAL COMPOSITION AND ECONOMIC JUSTIFICATION FOR THE USE OF SELF-COMPACTING CONCRETE IN MONOLITHIC STRUCTURES

E.V. Kakharov, N.R.Muhammadiyev, Zhao Yue

Abstract: The study aims to develop an optimal composition of self-compacting concrete (SCC) for use in monolithic structures. The effects of various additives and proportions on concrete properties such as strength, fluidity and durability are considered. An economic justification for the use of SCC is also provided, including an assessment of production and placement costs. It is expected that the use of SCC will improve the efficiency of construction processes and reduce labor costs.

Key words: self-compacting concrete, optimization of the composition, monolithic structures, economic justification , strength characteristics

As a result of the experiments, the dependences of strength on the composition of the concrete mixture were determined. Based on the data obtained, the following composition of self-compacting concrete with a complex additive was proposed, providing the necessary characteristics of the concrete mixture for its use in monolithic construction in our region:

- Portland cement Holcim M500 CEM II/ A-I 42.5;
- 50% crushed sand from granodiorites + 50% Kama sand;
- crushed stone of fraction 5-10 mm;
- 10% microsilica instead of Portland cement;
- 10% fly ash instead of Portland cement;
- superplasticizer Polyplast SP-4.

The concrete mixture contains 10% microsilica - this allows to compact the structure of the cement stone and increase the strength of the concrete, also this amount of MK allows to avoid "overstressing" the concrete to avoid the formation of cracks.

The addition of 10% fly ash increases the mobility of the concrete mixture. The use of microsilica and fly ash allows the reaction of aluminosilicates and silicates to start with calcium hydroxide in cement, resulting in the formation of low-base calcium hydrosilicates CSH (1) and high-strength concrete is obtained.

Polyplast SP-4 was used as a plasticizer ; in combination with fly ash, it allows for the production of a self-compacting mixture, while reducing the price (in comparison with the use of a polycarboxylate- based hyperplasticizer).

This mixture has a workability grade of PK 1 /PK2 - the cone spread is 65 cm. Class - B40. The properties are presented in detail in Table 1.

Table 1 - Properties of the optimal composition

№	Состав	$R_{сж}^{2\ сут}$, МПа	$R_{сж}^{7\ сут}$, МПа	$R_{сж}^{28\ сут}$, МПа	$R_{изг}^{28\ сут}$, МПа	Wm,%	$\rho_{ср}$, г/см3	$\rho_{ист}$, г/см3	П, %
18	МК+ЗУ+СП-4	30,6	51	63,7	7,8	2,3	2,34	2,59	10,2

The strength gain graph for self-compacting concrete with a complex additive is shown in Figure 1.

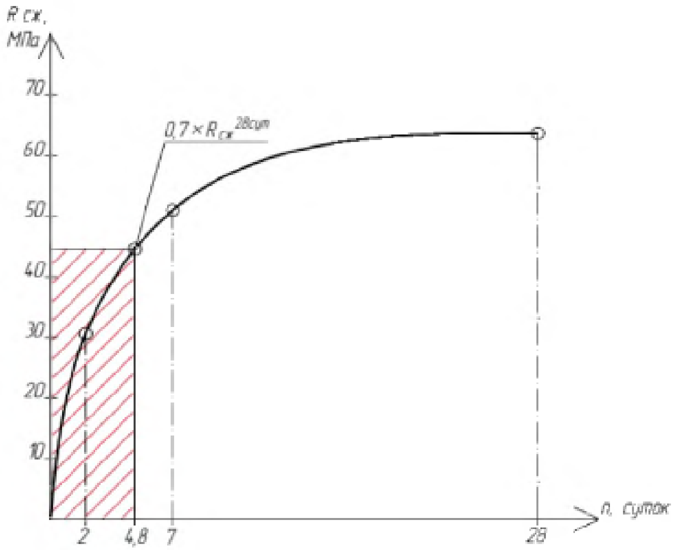


Figure 1 - Dynamics of strength gain of concrete samples of batch 18

The preparation of this concrete mixture is shown in Figure 46.

Figure 2 - Mixing of batch 18

The cost of 1 m3 of this mixture is given in Table 2.

A Table 2 - Cost of self-compacting concrete

Name	Consumption per 1m3	Price	Cost 1m 3
Portland cement Holcim M500 CEM 42.5	0.515	8000	4120
Crushed sand	0.358	1000	358
Kama sand	0.358	750	268
Crushed stone 5-10	0.680	1000	680
Water	0.290	25	7
Microsilica	0.065	12000	780
Fly ash	0.065	600	39
Polyplast	0.1	30000	300
Cost of 1m3 of self-compacting concrete B40			6550
Cost of 1m3 of concrete B35			5800

In the city of Tolyatti, the company " Betongrad " offers for purchase concrete class B35 at a price of 5800 rubles per 1 m3 , classes B40 and higher are not in the assortment. As can be seen from the data obtained, the resulting cost of concrete was 11% higher than that offered by the plant, but in this case we do not get a self-compacting mixture and additional costs will be required for its vibration. Taking into account the developed raw material base and logistics, the cost of self-compacting concrete will be slightly higher than the cost of ordinary concrete of the same strength, but the use of new generation concrete will significantly reduce construction times.

Conclusion

Based on the results obtained, the optimal composition of self-compacting concrete was determined, its properties were studied - class B40 was obtained, the cost of 1 m3 was determined .

List of references

1. Akhmetov, D. A. Experience of using self-compacting concrete in the construction industry of the Republic of Kazakhstan / D. A. Akhmetov, E. N. Root .
— Text: direct // Young scientist. — 2017. — No. 48 (182). — P.
11-14. -URL: https://moluch.ru/archive/182/46775/
2. Balykov A.S. Self-compacting fine-grained concrete and fiber concrete based on highly filled modified cement
binders: dissertation Ph.D. / A.S. Balykov - S.: RSL OD, 2018. - 228 p.
3. Bazhenov, Yu.M. Modified high-quality concretes: [scientific and public health] / Yu.M. Bazhenov, V.S. Demyanova, V.I. Kalashnikov. - M.: ASV Publishing House, 2006. - 368 p .
4. Bolotskikh , O.N. Self-compacting concrete and its diagnostics. Part 1. Self-compacting concrete: history, composition, properties, advantages and prospects / O.N. Bolotskikh // Concrete and reinforced concrete in Ukraine. - 2006. - No. 6. - P. 2-6.
5. High-strength modified concretes from self-leveling mixtures / A.V. Batudaeva , G.S. Kardumyan , S.S. Kaprielov // II All-Russian International Conference on Concrete and Reinforced Concrete “Concrete and Reinforced Concrete – Paths of Development”, September 5-9, 2005. Moscow, vol. 3, pp. 24-31
6. High-strength concrete in the construction of foundations of the high-rise complex "OKO" in the Moscow International Business Center "Moscow-City" / Kaprielov S.S., Sheinfeld , A.V., Al-Omais D., Zaitsev A.S. // Industrial and civil engineering. 2017. No. 3. P. 53-57
7. GOST 10060-2012 Concretes. Methods for determining frost resistance.
Intro . 2014-01-01. - M .: Standartiform . 2018. - 33s.

DETERMINATION OF THE LOAD ON THE ARCH GALLERY FROM THE IMPACT OF A SINGLE STONE

Abdujabarov Abduhamit Khalilovich, Doctor of Technical Sciences, Professor.
Tashkent State Transport University
Shayakhmetov Saulet Berlikashevich, Doctor of Technical Sciences, Professor
Kazakh National Research Technical University named after K. I. Satpayev
Begmatov Pardaboy Abdurakhimovich, Candidate of Technical Sciences (PhD), Associate Professor
Tashkent State Transport University

Abstract: *The load magnitude and penetration depth of an arched gallery structure from a single stone determined theoretically and experimentally. When using antiseismic structures, it is necessary to consider the degree of risk from the proposed changes in the structure, since it is possible that an economically developed structure in case of a possible earthquake will lead to negative end results.*

Keywords: *arch gallery, earthquake, rockfall, rockfall load*

Introduction

Due to sharply increased volumes of transportation, especially in mountainous areas, more stringent requirements to traffic safety in our country and the vital need for uninterrupted traffic at any time of the year, avalanche-protective and kmneprotective galleries on railroads are becoming more and more widespread despite the high estimated cost and difficult conditions of construction. The analysis of the design of these structures shows that the design has a number of deficiencies in the rational consumption of materials and in the technology of construction of the structure. Studies of already built structures show the inaccuracy of existing calculations

Avalanche protection galleries, retaining walls, and massive foundations are engineering structures for which the stiffness parameters in various directions are many times greater than those of the foundation [1,2]. In these cases, the motion of the system under dynamic actions is determined by the deformations of the foundation [3]. Such structures can be modeled by a system of non-deformable bodies, and the soil base can be modeled by distributed elastic bonds.

Research methodology

In the process of theoretical and experimental studies, the depth of immersion of the stone in the ground was obtained and the load transferred to the gallery slab, which works in bending and is the most vulnerable part of the structure, was determined. The gallery overlap is supported by a retaining wall and supporting columns, which are in slightly better conditions for the performance of their functions, but all these parts have different dynamic stiffness, which complicates the conditions of joint operation under the influence of earthquakes. The gallery of the arch structure is a single system in terms of stiffness, and its structural elements work mainly in compression, which makes it possible to fully utilize the strength properties of concrete and reduce the percentage of reinforcement [4].

It is necessary to specify the depth of penetration of a single stone into the soil of the gallery backfill, as well as the impact force of the stone on the structure of the arch stone protection gallery, the working conditions of which differ significantly from the gallery of rectangular outline. In addition, calculations and experimental studies of stone impact loads on the gallery should reveal the influence of the properties of the backfill soils and the degree of their moisture content, which will allow recommending certain soils to improve the working conditions of the gallery during an earthquake, activate the descent and weaken the impact of stones.

The normative impact of avalanche passage is taken as a combination of the following loads [5]:

1. Uniformly distributed vertical load from the weight of avalanche snow

$$q = \gamma_c h_л$$

где $h_л$ – estimated height of avalanche snow layer, m.

2. Normal load to the surface of the shock-absorbing pressure scarp from a snow avalanche impact

$$\rho_л = \frac{\gamma_c}{q} v_л^2 sin^2 \beta_o$$

β_o – angle between the direction of impact and the surface of the cushioning fill;
v^2 – avalanche velocity at the moment of impact (m/s), is determined from the expression

$$S = 2.3 \frac{a}{K^2} lg \, ;$$

S – length of the track section of the same gradient, m;
a – acceleration of motion, m/s

$$a = q(sin\alpha_n - f \cos \alpha_n$$

f – friction coefficient of avalanche snow during movement;
K – avalanche drag coefficient.
v_o – avalanche velocity at the beginning of the section, m/s

$v_o = v_{n-1} \cos(\alpha_n - \alpha_{n-1});$
v_{n-1} – avalanche velocity at the end of the previous section, m/s;
α_{n-1} – slope angle of the previous section, deg;
v – avalanche velocity at the end of this section, m/s.

$$v = \sqrt{v_n^2 + 2g(sin\alpha_n - fcos\alpha_n)S}$$

The maximum velocity of dusty and jumping avalanches is independent of the path gradient

$$v_{max} = \sqrt{2gh\rho_c/\rho_в}$$

where h is the height of the snow cover forming the avalanche, m;
ρ_c – snow density, n/m3;
$\rho_в$ – air density.

The avalanche friction force in the plane of the surface of the cushioning scarp is directed in the direction of avalanche movement

$$t = (qcos \, \alpha_{от} - \rho_0)f - qsin\rho_{от}$$

where t - specific friction force, n/m^2.

Determination of the avalanche velocity is performed using the design profile. The value of the elements of the considered profile is given in Table 1.

Table 1

№	Track length m	Slope of the section 2 π deg	Acceleration of avalanche movement m/s^2	Travel resistance coefficient avalanches	Speed at the end of the section m/s
1	390	31	1,18	0,06	18,7
2	790	29	2,6	0,06	41,5
3	315	23	2,3	0,06	40,6

4	510	19	0,8	0,06	29,4
5	309	24	1,2	0,06	23,5
6	75	10	-0,9	0,06	15,9
7	60	0	-2,8	0,5	0

The slope near the gallery has a maximum steepness α=600, the height of the fall of rock fragments H=65 m. The velocity of the fall of the stone on the gallery rabbet is determined by the formula

$$v_p = \varepsilon\sqrt{H}$$

The normative load from the impact of a single stone is determined by the formula

$$P = 2\gamma x\left[2tg^4\left(45^0 + \frac{\vartheta}{2}\right) - 1\right]F$$

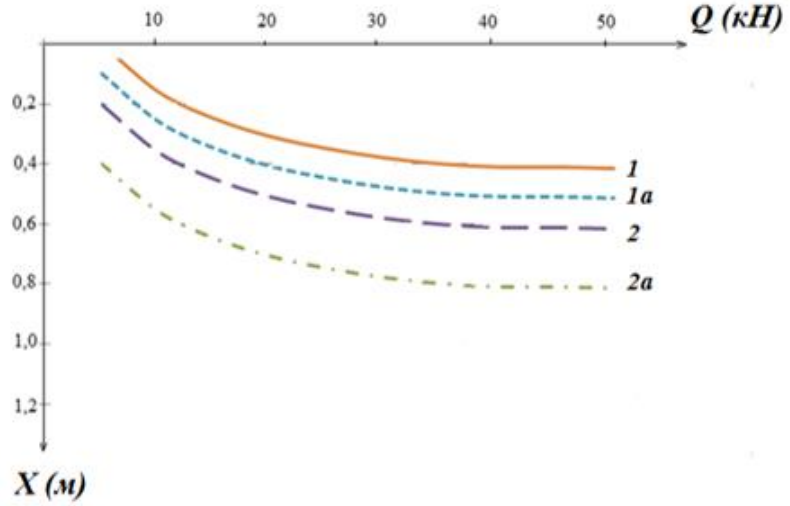


Figure 1. Depth of penetration of stone with weight Q (kN) into the backfill soil: 1– crushed stone with sand; 1a – crushed stone and sand with reinforcement; 2 – loam; 2a – sandy loam with reinforcement.

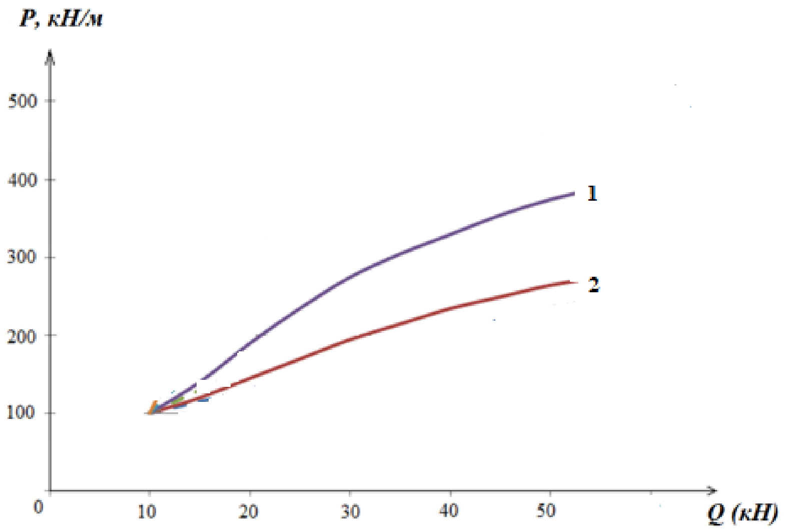


Figure 2. Stone impact force per 1 pg. m of the gallery (vertical component): 1 - soil reinforcement; 2 - without reinforcement.

F – is the area of the diametrical cross-section of the stone of the calculated volume, conditionally accepted spherical shape and assigned according to the materials of special surveys, m^2;

X – depth of stone penetration into the cushioning fill, m;

$$X = v_p \sqrt{\frac{Q}{2g\gamma F}} \sqrt{\frac{1}{2tg^4\left(45^0 + \frac{\vartheta}{2}\right) - 1}}$$

Q – weight of stone of design volume, kN;

v_p – acceleration of gravity, m/s^2.

Calculated volume of stone 1.0 m^3, conventionally accepted spherical shape, radius of ball

$$R = \sqrt[3]{\frac{3}{4}\pi}; \text{ м}$$

Diameter cross-sectional area

$$F = \pi R^2$$

The force of the stone impact will be distributed through the shock absorbing scarp assuming flat spreading action of the scarp at the angle
$\vartheta = 40^0$ to the impact direction. We take the angle of stone fall equal to 60^0 to the horizon in the direction of the slope.

For areas of high intensity of possible earthquakes it is necessary, in order to ensure earthquake resistance of galleries, to connect the structure along the contour, which can be achieved by installing reinforcement on the concrete floor with grouting in the foundations of the column and the upper retaining wall. This measure protects against possible collapse of the column, which sometimes caused the destruction of the column on steep slopes during an earthquake or avalanche. The metal yield is insignificant, as such a connection is needed only in the column supports.

In seismic areas for galleries, these foundation designs are acceptable for a number of reasons:

1. Have a relatively low dead weight.
2. High industrialization.
3. Have a large support part of the ground as a base and the connected mass of the ground, with other foundation structures, and thus the column will receive less settlement both in an earthquake and under normal conditions.
4. Are more pliable under dynamic loads, i.e. allow some deformation without collapsing at the same time.

The result of the analysis of the action of active soil pressure on the upper retaining wall shows that not taking into account the interaction of the upper retaining wall and the entire gallery, not taking into account its spatial work, in general gives overconsumption of material for the construction of the retaining wall. As experimental studies on models and with partial verification on full-scale structures (using industrial explosions) show from 10 to 20% of the active soil pressure on the upper retaining wall is compensated by the spatial work of the gallery as a whole, ie. The slab design together with the ground and supporting reinforced concrete columns together with the foundation, in fact, improves up to 20% of the working conditions of the upper retaining wall, which still does not appear in the calculations of designers and unreasonably goes to the strength reserve of the structure, i.e. overconsumption of construction materials. However, in water-saturated soils, the transfer of active pressure of the retaining wall to the entire structure has a lower limit and reaches 10-12%, but it should be taken into account that in water-saturated soils avalanche protection galleries are almost never built [6, 7, 8, 9].

Conclusions

1. The existing in-service avalanche protection galleries were designed without taking into account the basic requirements of earthquake resistance.
2. The use of reinforced soil in the backfill reduces the forces from rock and avalanche impact and increases the overall seismic resistance of the gallery.
3. The decrease in the depth of penetration of a single stone into the backfill soil and impact load can be explained by the greater overall stiffness of the arched gallery compared to the rectangular gallery, which leads to an increase in the horizontal component of the impact of the stone.

Literature

1. Birulya D.N. Investigation of interaction with the ground under seismic impacts. Avtoref.dis. kand. tehn. nauk. - M.TSNIISK. - 1973. C.4-15.
2. Abdujabarov A.H. Seismic resistance of roads and railroads. Bishkek: KASI, 1996.
3. Nikolaenko N.A., Nazarov Yu.P. Dynamics and earthquake resistance of spatial structures and constructions // Research on the theory of structures. - 1977. Issue. 23. C.69-97.
4. Abdujabarov A.H., Matkarimov A.H., Eshonov F.F. Avalanche protection galleries for railroads of Uzbekistan // Architecture, Construction and Design. Uzbekistan. T. 16. № 4. 2021, December. C. 140-143.
5. Instruction on design and construction of avalanche control structures. SN 517-80. - M.: Stroizdat, 1980. C.16.
6. Abdujabarov A.H., Dzhanserikov T., Bektenov A. Consideration of spatial operation of avalanche protection galleries when calculating for seismic impacts // Construction and Architecture. Express-information. - 1991. - №10. C.5-7.
7. Abdujabarov A.H. Influence of high-speed train traffic on avalanche protection galleries. Materials of the First International Scientific and Practical Conference October 18-19, 2000, Almaty, pp. 96-100..
8. Khozhmetov G., Abduzhabarov A.H., Omelyanenko V. Seismic resistance of special engineering structures // Construction and Architecture of Uzbekistan. - 1986. № 8. C.14-17.
9. Shakhunyants, G. M. Railway track : a textbook for universities of railroad transport / G. M. Shakhunyants - 3rd edition, revision and supplement. - M. : Transport, 1987. - 479 c.

EVALUATION OF THE INFLUENCE OF CHEMICAL ADDITIVES ON THE STRENGTH OF CONCRETE HARDENED UNDER DIFFERENT CONDITIONS

F.F. Karimova, N.R.Muhammadiyev, Wang Meng

Abstract: This article discusses the use of accelerated hardening concrete with the use of chemical additives using the example of the production of hollow-core floor slabs with dimensions of 4.2 ××x 3.0 m, series 1.090.1-1/88.

Key words: accelerated hardening concrete, chemical additive, hardening accelerator, strength.

These floor slabs, 4180 mm long and 2980 mm wide, were developed by SP Binokor Temir Beton Servis (Tashkent) in 2005 for use in the design and construction of multi-story residential buildings, public and industrial buildings. The prerequisites for the development of these floor slabs were: – effective use of "wide" slabs in order to reduce the number of crane lifts during the installation of buildings, – reduction of slab joints falling on the ceiling surface of living rooms, – feasibility of placing stacks of slabs on storage areas with reduced passages between stacks. Slabs of this series are produced without pre-stressing, due to which the technology for the production of hollow-core slabs allows us to consider the possibility of their manufacture without the use of heat treatment, i.e., on natural hardening.

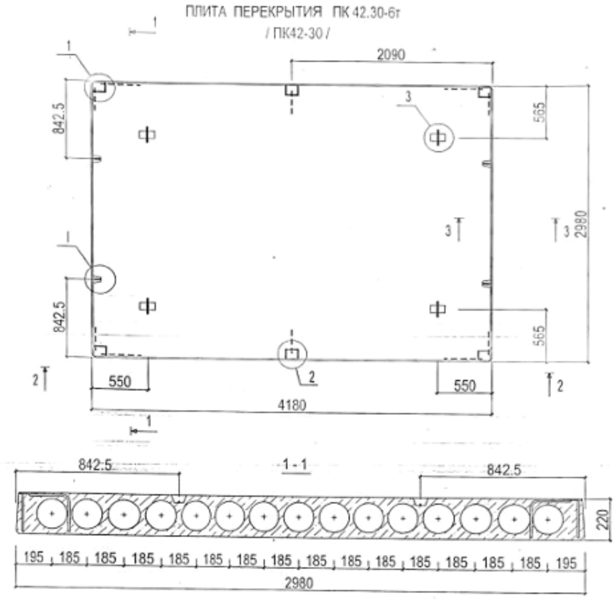


Figure 1 – Hollow-core slab PK 42.30-6t series

Experimental determination of the concentration of a complex additive

It is generally accepted [1, 2] that the selection of a chemical additive is a key point in the production of reinforced concrete products. The most effective complex includes a plasticizing additive and a hardening accelerator. To determine the optimal dosage of additives included in the complex used for the concrete mix, a preliminary study of the effect of the concentration of the plasticizer and hardening accelerator on the strength of concrete was experimentally conducted. On July 25, 2024, 18 cube samples with dimensions of 100.0 × 100.0 × 100.0 mm of class B15 were manufactured in the factory. The samples were divided into two batches: batch 1 - samples containing the ASTM additive C 494 in the amount of 1.0% of the cement weight; batch 2 – 48 samples containing the ASTM additive C 494 in the amount of 1.5% of the cement mass. Both batches of samples were maintained under normal conditions (temperature plus (20±2) °C, relative air humidity (95±5)%) and tested at the age of 12 hours, 7 days and 28 days. Visual inspection of the samples before testing revealed no defects or linear deviations. Then the cubes were weighed on mechanical scales in order to determine the density of each sample using the formula:

$$\rho = \frac{m}{V}, \text{кг/м}^3,$$

where m is the mass of the cube, kg;

V – volume of the cube, m3 .

All values of density and mass of samples, as well as linear measurements were recorded in the test log. After the preparatory work, the experimental cube samples were tested for strength. The tests were carried out similarly to those carried out previously. The cubes were destroyed according to a satisfactory scheme, no structural defects were found.

The dependence of the strength of concrete samples on the concentration of the additive used is shown in Figure 2.

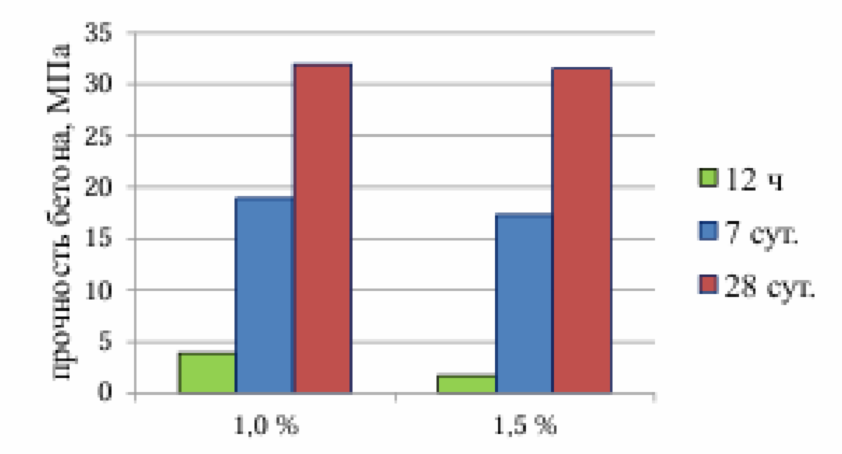


Figure 2 – Diagram of the dependence of the strength of concrete samples on the concentration of the additive used (ASTM (C 494)

The dependence of the strength of concrete samples on the concentration of the additive used is also shown in Figure 3.

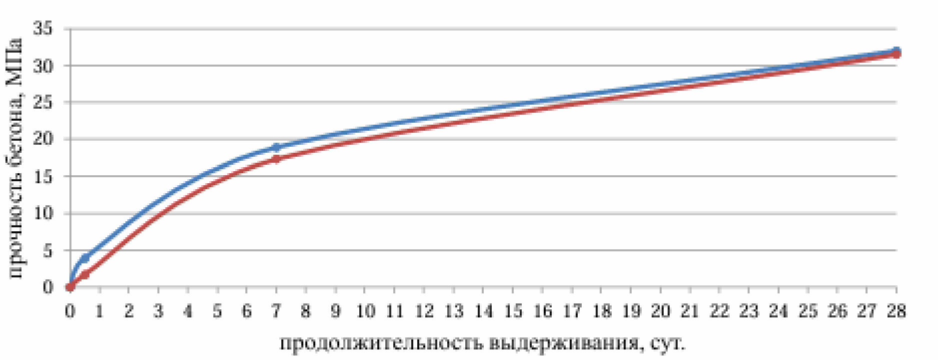


Figure 3 – Graph of the dependence of the strength of concrete samples on the concentration of the additive used (ASTM (C 494)

Conclusion

Based on the test results, it was determined that the optimal dosage of ASTM plasticizer C 494 for this concrete mixture – 1.0%

Based on the results of the conducted research, it can be concluded that with the correct use of a rationally selected experimental complex of chemical additives, it is possible to obtain accelerated hardening concrete for further increasing the volume of manufactured products.

List of references

1. Kalinovskaya N.N., Kotov D.S., Shcherbitskaya E.V. Analytical dependencies and design methodology for modern concrete compositions for hollow-core floor slabs // Bulletin of Polotsk State University. Series F, Construction. Applied Sciences: scientific and theoretical journal. - 2018. - No. 8. - P. 43-49.
2. Usov B.A., Okolnikova G.E. Chemical additives in precast concrete technology // Ecology and construction. - 2015. No. 4. - P. 7-14.
3. Usherov-Marshak, A.V. Additives in concrete: progress and problems / A.V. Usherov-Marshak // Construction materials. - 2006. - No. 10. - P. 8-12.

MAIN REQUIREMENTS AND GENERAL PROBLEMS OF ENSURING SEISMIC RESISTANCE OF SHALLOW METRO STATION STRUCTURES

Normurodov Sh.U. PhD, Associate Professor, normurodovsh 25@ mail .ru
Tashkent State Transport University

Abstract . This article examines the basic requirements and common problems of ensuring seismic resistance of shallow subway station structures. It describes the events that may occur in the operational tunnel and their consequences.

Key words: shallow subway stations, seismic resistance, soil, settlement, seismic vibrations, tunnel.

Аннотация . В данной статье рассматриваются основные требования и общие проблемы обеспечения сейсмостойкости конструкций станций метрополитена мелкого заложения. Описаны события, которые могут привести к увеличению тоннажа, и их последствия.

Ключевые слова: исследование метрополитена мелкого заложения, сейсмостойкость, грунты, осадки, сейсмические колебанияб, тоннель.

Introduction. It is known that underground structures, both during the construction period and during the operational period, are objects of increased danger for the personnel working in them. This is caused by the objective presence of natural and man-made factors, the dangerous combination of which is often difficult to foresee and, consequently, to eliminate in advance. In most cases, forecasting possible undesirable situations and effective measures to prevent or eliminate them should take into account, to the maximum extent, the experience accumulated by world practice [1,2].

It is known that transport tunnels are considered as capital structures designed for a long service life (more than 100-150 years). During this period, they must meet the requirements of operational reliability, ensuring failure-free operation, durability, maintainability and maintainability of the structure as a whole and its components, i.e. the ability of the structure to perform specified functions [3,4].

Materials and methods. Practice shows that in the first 5-10 years of tunnel operation, there are usually no serious damages to structures and operating equipment. After 15-25 years, some defects are observed. After 50-70 years, damages are observed that are a consequence of unsuccessful design and construction, the aging of tunnel structure materials increases, and changes in the surrounding soil occur. However, serious violations of the operational reliability of tunnels can occur almost at any time due to natural disasters, failure to comply with safe operating conditions, defects in structures and operating equipment, as well as untimely inspections and repairs of the structure.

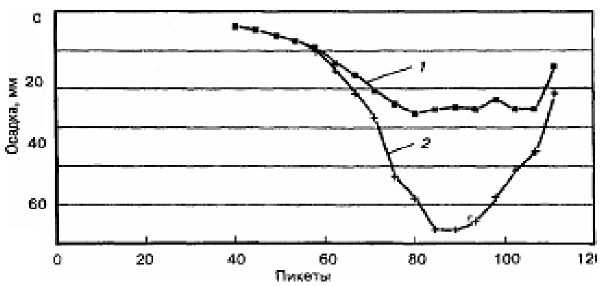


Fig. 1. Tunnel settlement in the “washout” zone:

(1 - one year before the closure of traffic; 2 - at the time of the closure of traffic)

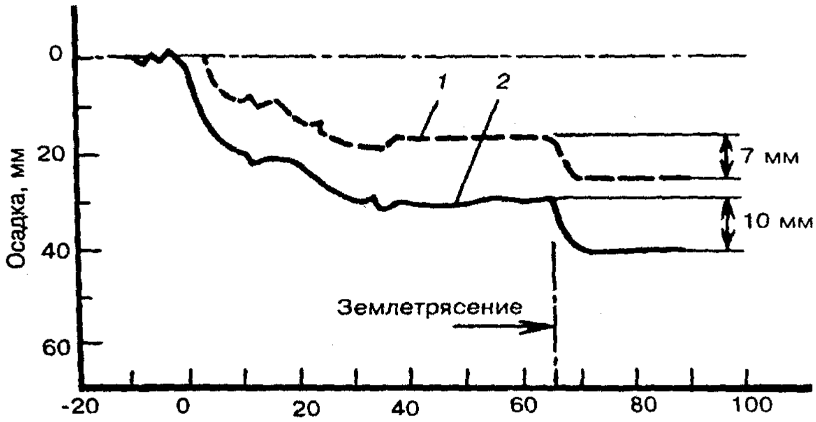
Accidents in operating tunnels, caused by sudden general or partial damage to structures and equipment, often lead to a long-term cessation of tunnel operation, cause economic losses, and in some cases, injuries and deaths.

Serious damage associated with flooding of tunnel workings occurred during the construction and operation of the transfer tunnels between the Lesnaya and Ploshchad Muzhestva stations of the Kirovsko-Vyborgskaya Line of the St. Petersburg Metro. In the section where the tunnels intersect a shallow erosion zone about 450 m wide, quicksand breakthroughs of up to 40 thousand m3 were observed during excavation in 1974 and 1975. Freezing of the soil with liquid nitrogen was used to eliminate the damage. From 1975 to 1994, the tunnels were operated without any particular complications, but in 1994, an increase in tunnel settlements and sand removal were noted. In 1995, precipitation exceeded permissible limits, due to which the operation of the tunnels was stopped (Fig. 1) [5]. The supposed causes of damage should be considered to be the increased mobility of thawed unstable soil under the dynamic impact of moving subway trains.

Results and discussion. Fires pose a particular danger to transport tunnels in operation (London Underground, 1987 - 30 dead and the King Cross station destroyed; underwater tunnels under the bay in San Francisco, 1979 - 1 dead and 23 injured; Nihozaka road tunnel in Japan - 7 dead and 2 injured). Over 13 years of operation of the tunnel under the Elbe River in Hamburg, 36 fires occurred. The largest fire-related disaster occurred in the Baku Metro in October 1995. A train caught fire due to a short circuit caused by a faulty traction motor. 289 people died, and more than 500 were burned and injured. In tunnels under construction, sudden rock collapses in the face, destruction and deformation of the support (Fig. 2), breakthroughs of underground water and quicksand, gas emissions, etc. are possible. Each accident is an uncontrollable situation and can lead to serious consequences (the Lötschberg tunnel, Switzerland, where 25 people died due to a rock collapse; in the approach tunnel in the UK, 16 people died and 30 were injured due to a methane explosion; in 1979, 5 people died in the Severo-Muya tunnel due to a sudden release of water-soil mass, 3 people - in the Rikotsky tunnel due to a roof collapse, etc.). Emergencies have repeatedly arisen during the construction of tunnels on the BAM. Thus, during the excavation of cape double-track tunnels in highly fractured rock formations using the drilling and blasting method, significant rock falls (with a dome height of up to 6 m) were recorded in the face. In the future, in order to avoid possible falls, work was carried out using leading screens made of pipes. The excavation of the Severo-Muya tunnel in a complex tectonic and hydrogeological environment was accompanied by a number of breakthroughs of underground waters with the removal of disintegrated masses, the volume of which reached several thousand cubic meters per hour. Breakthroughs occurred both at the moment of opening the fault zones by the face and after their excavation, as well as during the passage of such zones.

The causes of emergency situations at the initial stage of construction of the Severo-Muya tunnel were the lack of experience and equipment for carrying out special work, as well as the impact of earthquakes on a waterlogged massif disintegrated to sand and clay. Isolated failures associated with rock collapse and destruction of linings occurred during the excavation of the Lesogorsk railway tunnel on the Krasnodar-Tuapse line, the Diligence railway tunnel on the Ijevan-Rozdan line, the transfer tunnels of the St. Petersburg, Minsk and Dnepropetrovsk metros, and the excavations of shallow-level metro stations in Nizhny Novgorod and Yekaterinburg. Severe damage caused by flooding of workings and significantly extended construction periods occurred during the construction of large underwater tunnels "Seikon" in Japan and under the Great Belt Strait in Denmark [6]. The frequency of failures in tunnel construction and the severity of accidents are higher than in other construction industries, which is due to the specific nature of underground work.

When driving 120 km of railway tunnels in Germany, for every 10 km there was one accident related to rock collapse due to difficult engineering and geological conditions, and about 1% of the cost of the tunnel was spent on eliminating the consequences of each of them. In recent decades, there has been a slight decrease in the number of accidents, which is explained by the improvement of the regulatory framework, design and construction technology and techniques, tightening of labor protection requirements, and more thorough geotechnical surveys. However, despite significant progress, modern technology does not have absolutely safe methods for constructing tunnels, methods and means for predicting possible accidents caused by numerous and varied factors, including natural disasters.



Day

Fig. 2. Changes in sediment over time during earthquakes:

1 - in the roof of the tunnel; 2 - on the ground surface.

Such accidents develop so rapidly that it is not always possible to take prompt and adequate measures to prevent them and eliminate the consequences (Fig. 2) [7]. The impact of earthquakes on underground structures indicates that almost every earthquake causes various types of destruction and damage to structures (Fig. 3). Transport tunnels that were in the epicenter of a strong earthquake always suffered damage of varying degrees [8]. In the USA, the number of accidents resulting from accidents in tunnel construction is 1.5 times higher, and in Japan 2 times higher, than in surface construction. During tunnel construction in Japan from 1973 to 1982, 531 accidents with human casualties were recorded. Studies of the causes of accidents during the construction of 75 tunnels with a total length of 158 km along the New Sane railway line showed that the number of accidents increases with an increase in the volume of tunnel construction work, and their frequency is determined mainly by engineering and geological conditions.

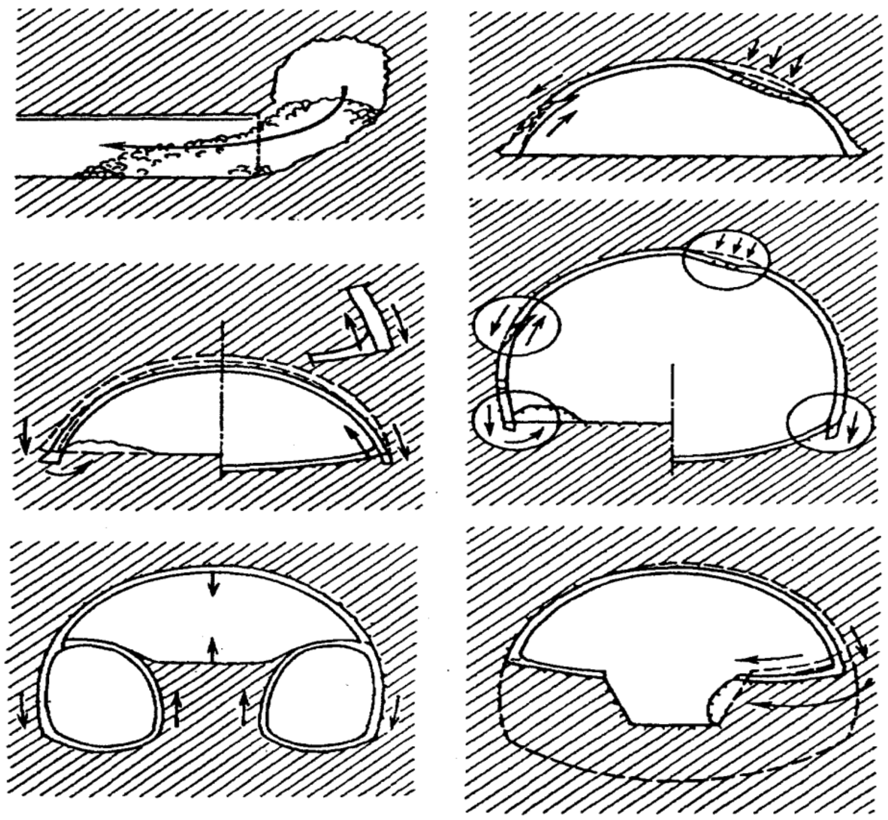


Fig. 3. Types of destruction and damage to shallow subway stations during earthquakes

In difficult conditions with an increased risk of accidents, it is advisable to increase the volume of survey work to 4 - 5% of the total cost of tunnel construction.

Conclusion. Scientific analysis of the geotechnical situation in the tunnel construction area makes it possible to predict with a high degree of accuracy the emergence of high-risk zones and take timely measures to prevent accidents:

- full-scale and thorough geotechnical surveys and studies both before and during the construction of the tunnel, identifying gravitational, seismotectonic, hydro and gas-dynamic, geothermal, intracrystalline, cryogenic conditions.

- optimal design in strict accordance with current regulatory documents and taking into account specific natural, climatic , topographic , engineering - geological and urban planning conditions .

- implementation of comprehensive anti-seismic measures . Installation of specially designed anti-seismic joints that facilitate longitudinal and transverse movement of tunnels in areas with sharply different soil conditions ; reinforcement of the structure of tunnels and tunnel structures using precast - monolithic structures , ensuring independent operation during earthquakes of both tunnels and stations , as well as tunnel structures for various purposes ; avoidance, if possible, of abrupt changes in the elevation of the tunnel base along the route , sharp turns in plan and profile;

- safe construction using efficient technologies , high-quality materials and products , reliable tunnel boring equipment in strict compliance with labor protection regulations . In the tunnel under construction, strict operational laboratory and geodetic control of technological processes and the quality of building materials and products must be organized , as well as monitoring of the stress-strain state of the rock mass , temporary and permanent support structures .

- when choosing the route of a subway tunnel, determining its depth, developing design and technological solutions, and operating equipment, it is necessary to predict the probability and nature of the manifestation of destruction and outline measures to prevent it and eliminate the consequences.

References

1. Абрамсон В.М., Закиров А.З., Муравин П.И. Автодорожный тоннель на трассе Краснопресненского проспекта от МКАД до проспекта Маршала Жукова // Метро и тоннели. - 2003. - № 3. - С. 22-25.
2. Никольский Б.В. Тоннели третьего кольца - крупнейшие подземные сооружения Москвы // Метро и тоннели. - 2001. - № 2. - С. 2-5.
3. Черняков А.В. Опыт строительства обхода Лефортово по тоннельно-эстакадному варианту // Метро и тоннели. - 2003. - № 5. - С. 10-15.
4. Быкова, Н.М. Протяженные транспортные сооружения на активных геоструктурах. Технология системного подхода / Н.М. Быкова. – Новосибирск: Наука, 2008. – 212 с.
5. Miralimov, M. X., & Normurodov, S. U. (2019). CONSTRUCTION FEATURES OF TRANSPORT TUNNELS IN THE MOUNTAIN AREAS OF UZBEKISTAN. Journal of Tashkent Institute of Railway Engineers, 15(3), 26-35.
6. Miralimov, M. X., & Normurodov, S. U. (2022). BIR IZLI METROPOLITEN TONNEL QOPLAMASI HISOBI. PEDAGOGS jurnali, 2(2), 92-94.
7. Нормуродов, Ш. У. (2022). ТОННЕЛАРНИ ҚУРИШ БИЛАН БОҒЛИҚ ДЕФОРМАЦИОН ЖАРАЁНЛАРНИ АНИҚЛАШ МАСАЛАЛАРИ. Academic research in educational sciences, 3(10), 447-460.
8. Miralimov, M., Normurodov, S., Akhmadjonov, M., & Karshiboev, A. (2021). Numerical approach for structural analysis of Metro tunnel station. In E3S Web of Conferences (Vol. 264, p. 02054). EDP Sciences.

STUDY OF THE INFLUENCE OF ADDITIVES AND MODIFIERS ON THE PROPERTIES OF FINE-GRAINED CONCRETE

L.V. Bacharova, N.R. Muhammadiyev, Guo Tianyu

Abstract. This paper examines the effect of various chemical and mineral additives, as well as modifiers, on the physical and mechanical properties of fine-grained concrete. Changes in compressive strength, mobility, water resistance, and crack resistance are analyzed when introducing various types of additives, including superplasticizers, microsilica, fly ash, and organic fillers. Particular attention is paid to optimizing the composition in order to improve the durability and cost-effectiveness of the concrete mix. The results of the study make it possible to recommend specific modifying components for use in the production of building elements where improved performance characteristics and a minimum filler size are required.

Key words: fine-grained concrete, additives, modifiers, strength, superplasticizer, microsilica, mobility, durability.

Microscopic examination of concrete samples on natural sand after strength testing shows that in most cases destruction occurs in the filler-cement stone contact zone, as a result of which sand grains are torn out of their "nests" in the cement stone. Data on the composition of concrete mix with filler from Kama sand are given in Table 1. The results of strength testing of samples are presented in Table 2.

Table 1 - Composition of concrete mix

Batch No.	1	2	3	4	5	6
Unit of measurement	kg/m3					
Cement	629	666	641	625	621	596
Volzhsky sand	1258	-	-	1250 (fr.0.315-0.63)	-	
Kamsky sand	-	1333	-		1241 (fr.0.315-0.63)	-
Crushed granite sand	-		1283	-		1191 (fr.0.315-0.63)
Water	314	333	321	312	310	298
W/C	0.5	0.5	0.5	0.5	0.5	0.5
Density of concrete mix, kg/m3	2201	2332	2245	2187	2172	2085

With the same composition, concrete mixtures on Volga fine sand showed a smaller cone spread than on Kama sand. Crushed sand has a greater water absorption [1] due to the rough surface and cracks in the grain, as a result of which the concrete mixture on crushed sand is more rigid than on natural sands, the mobility of the concrete mixture is sharply reduced compared to the mobility of mixtures on natural sands, the data are given in Table 2 and presented in the form of a graph in Figure 1.

Table 2 - Concrete strength

Age of samples	Batch No.					
	1	2	3	4	5	6
Compressive strength, Rcj , MPa						
7 days .	30.3	30.3	40.8			
14 days .	46	42.5	49.5			
28 days .	47.8	47.2	51.5	51.5	52.9	56.1
120 days .	53.1	52.4	57.5			
Bending strength, Rбзг , MPa						
28 days .				79.69	70.31	75,00

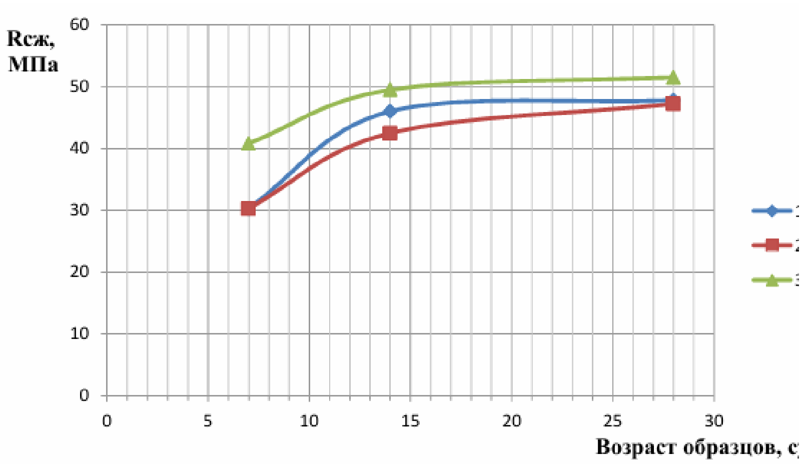


Figure 1 - Dependence of concrete strength on the type of filler

The dependence of concrete strength on the type and size of aggregate is shown in Figure 2.

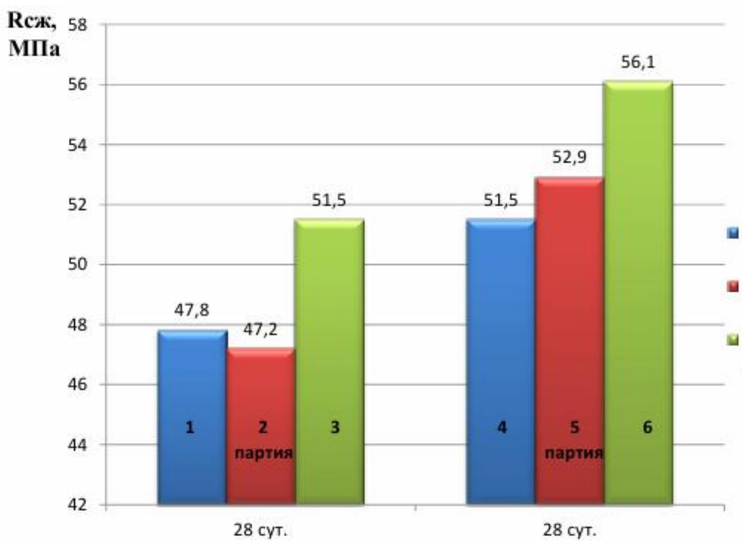


Figure 2. - Dependence of concrete strength on the type of filler

According to the test results, the strength of concrete samples on crushed granite sand is higher than the strength of samples on Kuiluk sand.

Conclusion

The results of experiments to determine the compressive and tensile strength of sand concrete samples on dense disturbed granite show that sand concretes on crushed sand from weathered granites have significantly lower compressive and tensile strength. The main reason for the significant decrease in the strength of sand concretes on crushed sand from disturbed granites is the high (up to 15-20%) content of biotite and its intermittent contact with the cement stone. The highest ultimate strength was shown by concrete samples (aged 28 days) on sand from crushed granite (51.5 MPa), then in descending order - on Volzhsky (47.8 MPa) and Kama sand (47.2 MPa).

List of references

1. GOST 12730.3-78 Concretes. Method for determination of water absorption . - Introduced . 2007-06-01. – M .: Standartinform , 2007. – 4 p.
2. Alimov, L. A., Voronin, V. V. Construction materials: a textbook for bachelors , training in the direction of "Construction" / L. A. Alimov, V. V. Voronin. - M .: Academy, 2012. 319 p. 2.
3. Akhverdov, I.N. Fundamentals of the physics of concrete / I.N. Akhverdov. - M.: Stroyizdat , 1981. 464 p. 3.
4. Bazhenov, Yu.M., Demyanova, V.S. Kalashnikov V.I. Modified high-quality concretes / Yu.M. Bazhenov, V.S. Demyanova. - M.: Publishing House of the Association of Construction Universities, 2006. 368 p. 4.
5. Bazhenov, Yu.M., Lukutsova , N.P., Matveeva, E.G. Study of nanomodified fine-grained concrete / Yu.M. Bazhenov, N.P. Lukutsova , E.G. Matveeva // Bulletin of MGSU. 2010. No. 4. P. 415-421. 5.
6. Bazhenov, Yu.M., Kharchenko, A.I. Shrinkage-free fine-grained concretes using substandard sands /Yu.M. Bazhenov, A.I. Kharchenko // Scientific and Technical Bulletin of the Volga Region. 2012. No. 5. P. 86-88.

ANALYSIS OF THE STATE OF THE RAILWAY CONNECTION AREA OF OPERATING RAILWAYS

Khamidov Maqsudjon Kamolovich assistant
Mahamadzhonov Shuhrat Shavkatovich assistant
Maxmaisayev Aziz Yodgor o‘g‘li assistent
Tashkent State Transport University (Uzbekistan)

Abstract: Despite its advantages and development, the railway transport system has not been free from technical difficulties that lead to road malfunctions. For freight and passenger trains moving along the railway, it is difficult to ensure the stable operation of rail connections after each track or on linked tracks. Therefore, it is relevant to study what defects and shortcomings arise in the connection zone of rails and why.

Key words: The butt zone, path malfunctions, current contents, railway, rail, sleeper, ballast layer, drawdown, vibration, fluctuations.

Introduction. The main task of rail transport is to timely and qualitatively meet all the needs of the population and people's economic entities for transport services, to ensure the efficiency and stability of the transport system.

Sustainable development of industry enterprises, wide implementation of innovation technologies, high growth rates in economic and technical terms create favorable conditions for the development of the transport sector and the economy of our country as a whole. Our railways are actively working in the implementation of new and modern construction and investment projects of the world scale, modernization and Technical re-equipment of existing and under construction infrastructure facilities.

Railways are required to fully meet all the needs of the population and the national economy for transportation, to carry out transportation in a timely manner with high quality. Even a slight delay in orders for transportation will seriously harm the normal operation of enterprises, leaving the farm on contractual grounds without a trace of reprieve [2-3].

Main part. Heavy-type and high-speed trains are a major factor in the development of movement, the ability to transport and transfer both freight and passenger traffic to the railway network and its individual lines [1].

Increase in the volume of cargo loaded and transported on wagons on the railways of our republic – leads to an increase in the load and tension falling on the rail, as well as an increase in noise and vibration, in addition to the fact that the rails sink in the connection area of the rails, the appearance of defects in the rail geometry, cracks and scratches on the 4-hole rail fasteners, breakage of the soles, breakage and fatigue in the fastening elements, crumbling, malfunctions and residual deformations in the earthen floor increase (Figure 1)

Figure 1. The rails are failures in the butt zone

One of the measures that allows you to reduce these problems involves the installation of elastic and strain-resistant elements on the rail trail. Currently, the need to implement the most effective means of reducing the vertical biking of the railway, as well as reducing the malfunctions of the above-mentioned Road and increasing the service life of the elements, reducing the noise and vibration level caused by train passing, and applying work to the process increases. At the same time, problems with road biking, deterioration of geometry and vibration, and descriptions of elastic elements, a deeper study and the application of new materials on the railway are some of the pressing issues.

Under the influence of many forces and factors, problems and failures in the current maintenance of the road occur precisely in the region of the connection of the rails. That is why it is relevant to lay and increase the number of roads in their place, where there are fewer roads on the Railways of industrial enterprises under the Uzbekistan Railways JSC and in the territory of the Republic. Through this, it is achieved to reduce the number of pairs of the connecting part of the rails. But after each laid dowel – free track-plates, three pairs of equalizer rails with a length of 12.5 m are laid. This means that there is butt zone from four pairs on each or two uncrowded tracks, if we take the tracks from the entire territory of our Republic, and the rails by plots are considered link areas-this leads to many rail link pairs. Therefore, as a result of scientific research above in the regions of the rails connection, several road failures occur, we must solve and reduce these problems, reduce the complexity of technological processes for the current maintenance of the road, improve and implement new structures and elements of the road top device [4].

Reinforced concrete sleepers will have a high rigidity of the laid rail track, which can be reduced either due to changes in the rigidity of the intermediate fastener pads, or due to the application of additional pads on the elements, such as elastic sleeper under pads. The increase in rigidity leads to an increase in the dynamic effect of the movement Content on the road. Analysis of the above cases shows that by directly installing elastic elements under reinforced concrete sleepers in the region of the rails connection, it is advisable to consider the issues of correcting the irregularities of the road without disrupting the compacted bed of the sleepers and carry out scientific research.

Based on theoretical scientific research on ensuring the stability of rail junction areas of railway sections and in order to solve the problems posed as a result of the conducted research, it is necessary to conduct experimental research aimed at reducing vibrodynamic forces arising in rail junction areas and stresses on the materials of the upper part of the track, and to determine the amplitude-frequency characteristics of rail junction areas. As a result, we will develop measures to reduce malfunctions arising in the contact areas of the rails.

Conclusion:

1. Study of the causes of road malfunctions and shortcomings in the areas where the rails are attached, development of measures to solve these problems.
2. Development of new technological processes for repair work, introduction of additional gaskets into elements and structures of road superstructures, and analysis of test results.

References

1. M.K. Khamidov and Sh.Sh. Makhamadzhanov - maintenance and ensuring the stability of the track in the static zones on the lines of JSC "Uzbekistan Railways." Scientific and Technical Journal "Problems of Architecture and Construction." Samarkand, 2024, pp. 134-138.
2. Kreinis Z.L., Selezneva N.E. Technical Maintenance and Repair of Railways. Textbook 2019. - 453 p.

3. Railway Road: Textbook, 2nd ed., revised and supplemented / edited by E.S. Ashpiz. - M.: FBGU DPO "Training and Methodological Center for Education in Railway Transport." 2021. - 575p.
4. Abdudjabarov A.Kh., Mekhmonov M.Kh., Khamidov M.K. Testing of railway structures using elastic sleeper gaskets in the joint zone. Scientific and Technical Journal "Problems of Architecture and Construction." 2024, No. 4 Samarkand, pp. 249-253.

THE APPLICATION OF THE RIGIDLESS TRACK ON ARTIFICIAL CONSTRUCTIONS

Eshonov Farhod Fayzullahuzhaevich
Senior Lecturer, Tashkent State Transport University
Makhamadjanov Shukhratjon Shavkat ugli
Makhmaisaev Azizjon Yodgor ugli
Khamidov Maksudjon Kamolovich
Assistants of Tashkent State Transport University

Annotation. In this article the materials on constructions of the elements of trackless track on artificial constructions are given. The peculiarities of laying and maintenance of jointless track on bridges are described.

Key words: jointless track, rail track, bridge, spanning structure, bridge deck, counterbars, bridge timbers, reinforced concrete slabs.

The main peculiarity of jointless track operation on bridges is the mobility of the under-rail base due to the change in the length of the spans in case of temperature changes and under the influence of rolling stock.

In the presence of 'rail-rail-spanning structure' connections, additional longitudinal forces arise in the rails of the track, which are transmitted both to the bridge spans and to the bridge supports and approaches to the bridge. Therefore, prior to the laying of jointless track on bridges, they are inspected and, if necessary, repaired [2].

Two types of bridge deck are used on bridges: ballasted (ballast driven) and ballastless. The design of the bridge deck must comply with the technical standards and requirements set out in the 'Guidelines for the design and construction of the bridge deck on railway bridges'. The ballasted bridge deck is used with reinforced concrete spans up to 33 m long and steel reinforced concrete spans over 33 m long (Fig. 1).

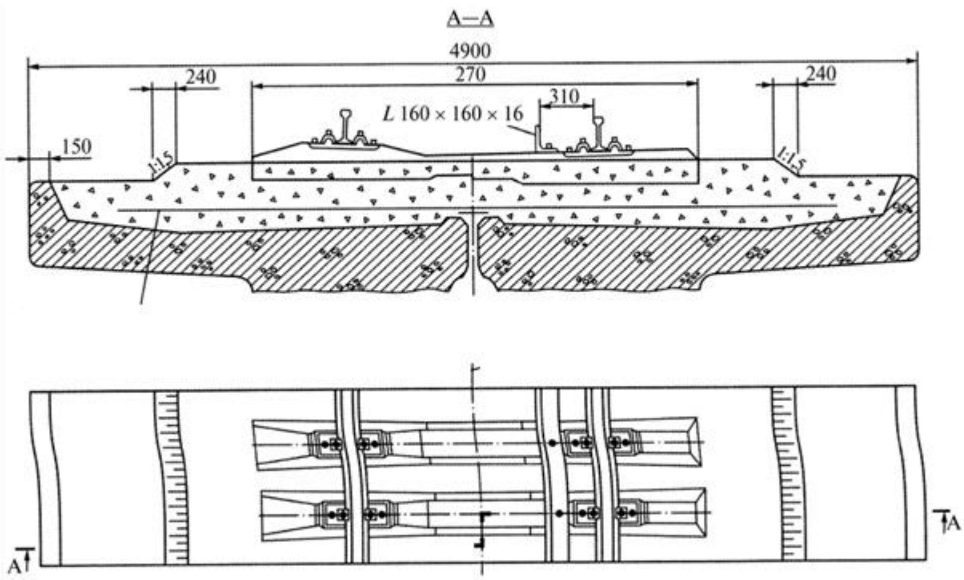


Fig. 1. Bridge deck with driving on crushed stone ballast and reinforced concrete sleepers with ballast trench providing for passing of crushed stone cleaning machines: left - without guards; right - with guards.

On reinforced concrete bridges with spans up to 33 m and travelling on ballast, a track of the same design as on the earth bed is used. As a rule, the rails span the entire bridge and their ends are located no closer than 50-100 m from the wardrobe walls of the bridge foundations [3].

On ballasted bridges with a length of more than 50 m, as well as on overpasses with ballasted bridges with a full length of more than 25 m, counter-tracks are laid. Special reinforced concrete bridge sleepers are used to which the countertunnels can be attached. Contrugolkas form a kind of shuttle, the points of which should be no closer than 10 m to the rear wall of the bridge abutment (Fig. 2.).

On reinforced concrete ballasted bridges with girder spans up to 33.6 m in length and arch structures, the track is laid without limiting the total lengths of the spans. As intermediate fastenings, underlay fastenings with elastic or rigid terminals are used. Hard rock crushed stone with strength I1 and PM-U75 is used as ballast on bridges and approaches to them. The width of the ballast prism shoulder should be at least 35 cm and the thickness of the ballast layer under the sleeper should be at least 25 cm.

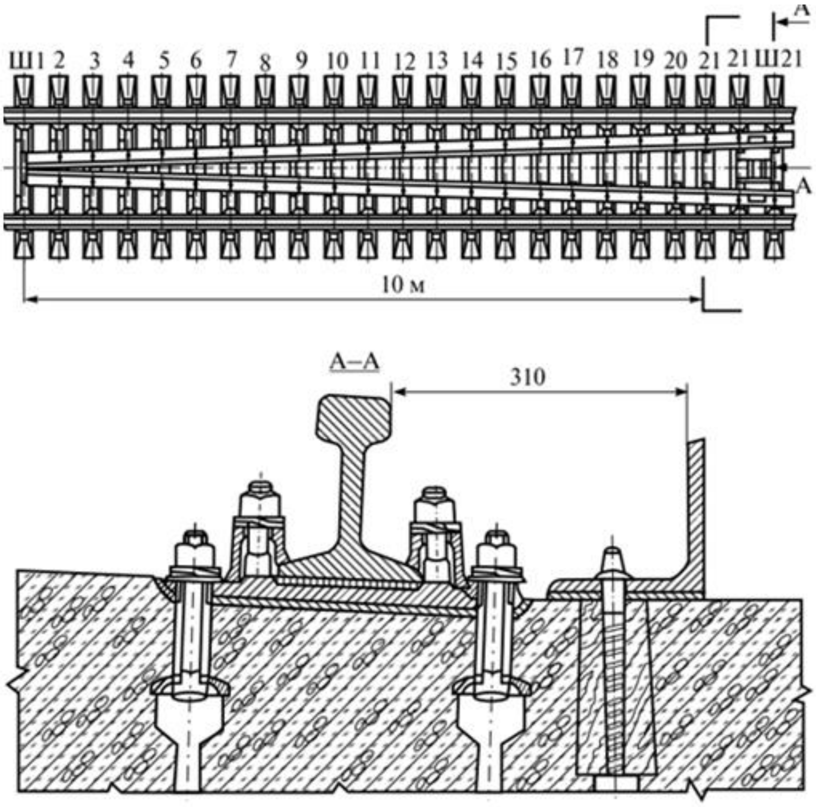


Fig. 2. Scheme of reinforced concrete sleepers laying within ‘shuttles’

The ballastless bridge deck can be constructed on wooden or metal cross members or on reinforced concrete slabs. On ballastless bridges with wooden bridge timbers, metal crossbeams and reinforced concrete slabs, the track is laid: on single-span bridges - for span lengths up to 55 m and multi-span bridges - for total span lengths up to 66 m, subject to the following conditions [1]:

- on bridges with a total span length of up to 33 m, the rails are fastened to the bridge timbers with KD-65 fasteners, to the metal cross members and reinforced concrete slabs of the BMP with KB-65 fasteners without pinching the rail sole with terminals, which are supported on the flanges of the pads;

- on bridges with a total span length of 33 m or more, the rails are fastened to bridge timbers, metal cross members and reinforced concrete BMP slabs at the fixed supporting parts of each span at a distance of a quarter of the span length with terminal fasteners with standard tightening of terminal bolts, i.e. with pinching of the rail sole. i.e. with pinching of the rail sole with terminals, and for the rest of the span, as on bridges up to 33 m long, i.e. without such pinching.

LITERATURE

1. Kreinis Z.L., Korshikova N.P. Maintenance and repair of railway track. Textbook. 2012.

2. Kreinis Z.L., Selezneva N.E. Tracks. Ч. 1. How the trackless track is arranged and works. Training manual. M. GOU UICJDT. 2009. - 84 c.

3. Technical instructions on arrangement, laying, maintenance and repair of the track without joints. Moscow. Transport. 2000. 96 c.

MEASURES TO REDUCE DEFECTS AND SHORTCOMINGS IN THE AREAS OF RAILWAY ATTACHMENT

Khamidov Maqsudjon Kamolovich assistant
Mahamadzhonov Shuhrat Shavkatovich assistant
Maxmaisayev Aziz Yodgor o'g'li assistent
Tashkent State Transport University (Uzbekistan)

Abstract: As a result of the movement of heavy freight and high-speed passenger trains in the rail junction area of the railway, measures are provided to ensure the stable operation of the rail junction area together with wagon wheel pairs, reduce malfunctions and shortcomings, and extend the duration of their occurrence.

Key words: road malfunctions, locomotive, rails, sleepers, ballast layer, sleeper padding, vibration.

Introduction. In our republic, large-scale work is being carried out on the construction and operation of new railways, the repair, reconstruction, and modernization of existing railways, the creation and application of new track superstructures, and much attention is paid to increasing the speed of train traffic, increasing freight and loading volumes, and reducing the cost of transportation.

The role of railways in the state, national economy, and defense capabilities is immense. In the current era of independent development and market relations, the role of railways is steadily increasing. Railways are required to fully satisfy all the transportation needs of the population and the national economy, to carry out transportation with high quality and in a timely manner. Even a slight delay in transportation orders seriously harms the normal operation of enterprises and disrupts the stable operation of the enterprise on a contractual basis [1-2].

Railway transport is among the priority sectors with a certain advantage in the restructuring of the country's economy, also occupies a key place in the country's transport system, and consists of interconnected and interacting industries that form a single system and an integral economic unit.

An increase in the volume of freight transported by wagons on railways leads to an increase in the load and stress on the rails, as well as an increase in noise and vibration in the area as a result of the interaction of rolling stock and the railway, in addition, there is an increase in the settlement of one or both tracks in the area of rail connections, distortions, defects in the geometry of the rails, cracks and fissures in 4 (four) or 6 (six) perforated joints, breakage of supports, breakage and fatigue of fastening elements, splines, tilted sleepers, breakage and cracking of the sleeper, violation of the geometry of the ballast prism, crumbling of gravel grains below the established norm of 25-60 mm, malfunctions and residual deformations in the earthwork [3].

Considering the complexity of the interaction of various elements and objects of the railway transport complex with rolling stock, it is advisable to include the following priority tasks in the industry:

- introduction of new elements of railway infrastructure and innovative testing tools;
- implementation of low-maintenance technical means and structures;
- implementation of innovative programs and materials;
- conducting simulation modeling and experimental research on the interaction of structural elements, as well as rolling stock and railway track in complex technical systems of rolling stock and road infrastructure, with an increase in axial load and train speeds;

- conducting research on monitoring the interaction of "train and railway track infrastructure," carried out within the framework of a comprehensive approach to the development of heavy and high-speed train traffic [4].

The time of the research is mainly focused on the change in the properties of the materials of the upper part of the railway track and the increase in the factors influencing them, as well as the peculiarities of the seasons (winter, spring, and summer).

For conducting research, a site was selected where there is a shrinkage of rail tracks in the area of rail connections, where the grain size of the under-sleeper gravel is smaller than the norm 25-60 mm, and where there are defects. The materials of the railway track surface are as follows: rail type R65, sleepers - reinforced concrete BF-70, ballast layer - 30 cm thick, and the height of the earthwork embankment is 1.2 m, as shown in Figure 1.

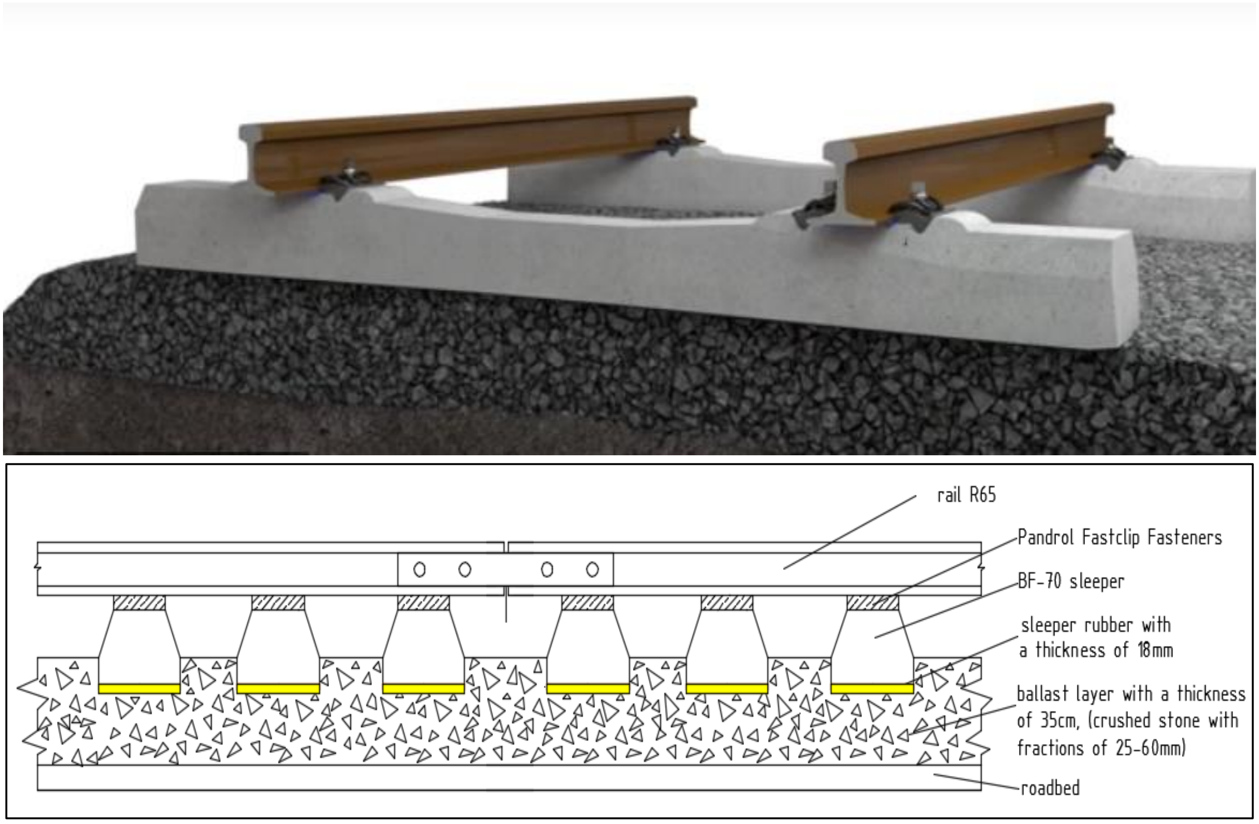


Figure 1. The position of uninstalled and installed under-sleeper gaskets in the rail joint area.

It is recommended to install elastic sub-sleeper gaskets on three sleepers in the area where the rails are attached, and as a result - we can achieve a significant reduction in the above-mentioned impacts.

To clarify this, we can observe the occurrence of various oscillations during the transfer of rolling stock using special sensors that allow obtaining information in the three-axis coordinate system (x, y, z) and record them on a computer - a laptop.

As a result of the joint operation of train wheel pairs with the rail in the area of rail connection, the influence of vibrodynamic forces increases, the occurrence of situations that threaten the safety of train traffic, and in order to ensure the long-term service of track surface materials, the following conclusions are recommended based on the data considered above.

Conclusion:

3. The problem of ensuring the long-term stability and stable operation of the railway in the area of rail junctions remains relevant today.
4. Analysis of experimental studies showed the expediency of continuing scientific research on the effective use of sleeper pads to ensure the stability and stability of the track to ensure the safety of train traffic.
5. Reduction of defects in rails, crumbling of gravel, disruption of the diagram, occurrence of settlements is achieved by applying under-sleeper gaskets.

References

5. M.K. Khamidov and Sh.Sh. Makhamadzhanov - maintenance and ensuring the stability of the track in the static zones on the lines of JSC "Uzbekistan Railways." Scientific and Technical Journal "Problems of Architecture and Construction." Samarkand, 2024, pp. 134-138.
6. Kreinis Z.L., Selezneva N.E. Technical Maintenance and Repair of Railways. Textbook 2019. - 453 p.
7. Abdudjabarov A.Kh., Mekhmonov M.Kh., Khamidov M.K. Testing of railway structures using elastic sleeper gaskets in the joint zone. Scientific and Technical Journal "Problems of Architecture and Construction." 2024, No. 4 Samarkand, pp. 249-253.
8. Kaplen V.N. "Current track maintenance in the zone of rail junctions on especially heavily loaded lines using elastic sleeper gaskets," RUT MIIT Moscow 2022. 126 p.

PECULIARITIES OF THE CONSTRUCTION OF THE TOP STRUCTURE OF THE JOINTLESS TRACK

Eshonov Farhod Fayzullahuzhaevich
Senior Lecturer, Tashkent State Transport University
Makhamadjanov Shukhratjon Shavkat ugli
Makhmaisaev Azizjon Yodgor ugli
Khamidov Maksudjon Kamolovich
Assistants of Tashkent State Transport University

Annotation. In this article the materials on the structures of the top structure of the jointless track are given. Elements of rail braids and schemes of jointing of jointless track on reinforced concrete sleepers are described.

Key words: jointless track, rail braid, equalising span, reinforced concrete sleeper, block section, insulating joint.

The rail whip is the main element of the upper structure of the jointless track. Rail improvement is carried out in the course of a complex of interrelated measures carried out in the following main directions: increase of rail mass, improvement of its cross profile, improvement of manufacturing quality, as well as improvement of conditions of its operation on the track and improvement of the rail management system. Rail mass, transverse profiles, chemical composition of rail steel, and the technology of their manufacture are interrelated and together determine the operational qualities of the rail as an element of trackless track [1].

Rail whips of the jointless track of out-of-class lines and lines of the 1st and 2nd classes are made by electric contact welding from new heat-strengthened rails of R65 type with the length of 25 m without bolt holes. For the 3rd class lines, the spans can be welded from old-aged R65 rails that have undergone comprehensive repair; for the 4th and 5th class lines - from old-aged rails, including those that have been repositioned without repair.

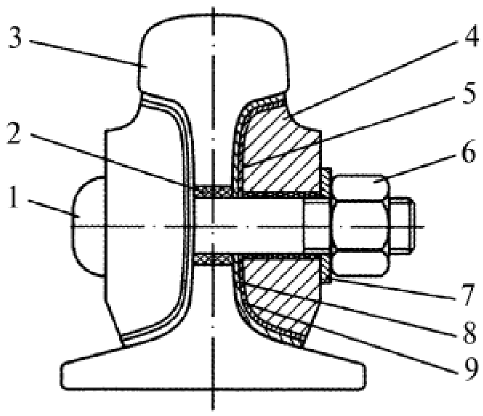


Fig. 1. High-strength insulating joint: 1 - bolt; 2 - insulating sleeve; 3 - rail; 4 - metal lining; 5 - insulating gasket; 6 - nut; 7 - washer; 8 - adhesive paste; 9 - metal shell

At rail-welding plants, rails 25 m long are welded into bundles up to 800 m long. Welded joints are marked on the rail neck inside the track with two vertical stripes symmetrically with respect to the axis of the joints at a distance of 10 cm from them. In the middle of the whip, a vertical stripe is marked on the rail neck.

In order to create rail splices of the designed length, splices up to 800 m long are transported to the crossing and welded by a track rail-welding machine (TRWM). The joints after such welding are heat treated. The length of rail shoulders set by the project depends on local conditions: location of switches, bridges, tunnels, curves with radius less than 350 m, etc.

At present the lengths of railway track shoulders can be:

- from station to station (length of the crossing from 2 to 4 km) on sections with tonal rail chains or at welding of rail inserts with high-strength insulating joints (Fig. 1) with resistance to rupture not less than 2.5 MN;
- equal to the lengths of block-partitions (in the absence of tonal interlocking), as a rule, not less than 400 m.

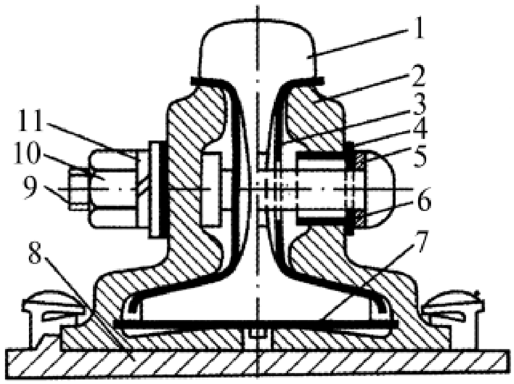


Fig. 2. Insulating joint with volumetric metal overlays: 1 - insulating gasket; 2 - overlay; 3 - metal locking strip; 4 - fibre or polyethylene strip for bolts; 5 - end gasket.

In the absence of insulating joints, two or three pairs of equalising rails 12.5 m long are laid between the rail spans, regardless of their length [3].

When prefabricated insulating joints, including those with fibreglass overlays, are installed in the equalising span, four pairs of equalising rails are laid with insulating joints located in the middle of the spans or three pairs of equalising rails - in the middle of the second pair of rails, insulating joints, which provide a tensile strength of not less than 1.5 MN.

A typical insulating joint (Fig. 2) has volumetric overlays instead of double-headed ones.

In the case of adjoining of a track without joints to a link or switches, which are not welded into the rail tracks, two pairs of equalising rails 12.5 m long are laid at the adjoining (Fig. 3). To compensate for the movements of the 'active' ends of the rail lines, the equalising rails have standard shortenings of 40, 80 and 120 mm [2].

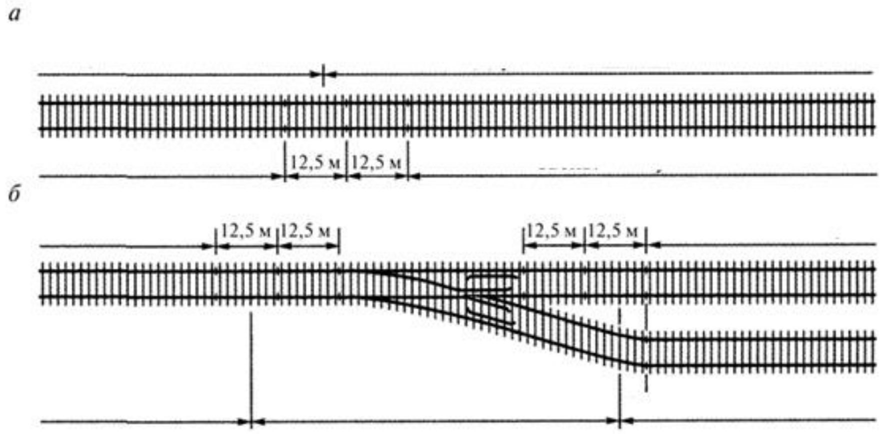


Fig. 3. Schemes of adjoining the reinforced concrete sleeperless track on reinforced concrete sleepers to the link track (a) and to the switch (b)

The equalising rails are connected to each other and to welded rail spans with six-hole plates without the use of graphite grease. Nuts of joint bolts of ordinary quality are tightened with a torque of at least 600 N-m, and of high-strength bolts - 1100 N-m.

LITERATURE

1. Kreinis Z.L., Korshikova N.P. Maintenance and repair of railway track. Textbook. 2012.

2. Kreinis Z.L., Selezneva N.E. Tracks. Ч. 1. How the trackless track is arranged and works. Training manual. M. GOU UICJDT. 2009. - 84 c.

3. Technical instructions on arrangement, laying, maintenance and repair of the track without joints. Moscow. Transport. 2000. 96 c.

APPLICATION OF ENERGY-SAVING MATERIALS TO ENSURE THE STABILITY OF EMBANKMENT SLOPES IN SANDY SOILS.

Shayaxmetov Saulet Berlikashevich, Professor, Almaty, Kazakhstan.
Tadjibayev Sherzod Amirkulovich, Associate Professor, Tashkent, Uzbekistan
Eshonov Farxod Fayzullaxujayevich, assistant Tashkent, Uzbekistan
Xamidov Maksud Kamolovich, assistant, Tashkent, Uzbekistan

Abstract. This article examines ways to ensure the stability of railway embankments constructed from sandy soils using energy-saving (geosynthetic) materials.

Keywords: sandy soil, stability, method, earthwork, structures, reinforcement, stability, geosynthetic materials, embankment.

Increasing the requirements for more economical land use necessitates the application of new methods for strengthening the slopes of embankments and excavations. Depending on the physical properties of the soils and the steepness of the slopes, for this purpose, grass sowing, planing, slope paving, as well as various structures, such as gravitational retaining walls, filling walls, and armor-soil structures, are used. Often, various combinations of the listed methods are used to strengthen slopes and improve water drainage. Some of them are based on the application of volumetric geogrids. Separating or filtering geosynthetics can replace multilayer deposits made of fractional material. Stabilizing geosynthetics, in turn, strengthen the underlying soil layers, providing a sufficiently strong foundation for retaining walls [1,3,5,6,9,10].

Some types of slope reinforcement are designed to ensure their temporary stabilization for a period sufficient for the development of the planted plant's root system. So-called "soft" systems, after a predetermined period, decompose under the influence of microorganisms or solar radiation [2,4,7,8].

Along with roll nonwoven and mesh structures, volumetric geogrids designed to protect slopes from erosion are promising.

The applied volumetric geogrids consist of thermally fastened or sewn (preferably) strips of nonwoven roll materials. The width of the strips depends on the required thickness of the slope covering and lies within the range of 15-40 cm. The cells of volumetric georets have, as a rule, a six-sided or four-sided shape, which are obtained after laying and stretching volumetric georets on the slope. The fastening of strips between themselves is carried out in factory conditions. Packages of volumetric geogrids are being delivered to the construction site. The area covered by one packaging is an average of 100m2, while the packaging weight is 20 kg.

Filling the cells of volumetric georings is performed after stretching and securing the packaging of volumetric georings with anchors. Sand-gravel mixtures and vegetable soil are more commonly used as the filling material. Additionally, crushed stone or concrete can be used as filling. The technological feature of filling cells is the uniform filling of the aggregate with compaction. The loading speed is not high, as it often requires manual labor. The optimal technological equipment is an excavator-planner with a telescopic sliding handle [7,8].

Однако чаще при заполнении грунтом применяется экскаватор с планировочным ковшом. При отсыпке грунта ячейки объёмных георешеток испытывают знакопеременные нагрузки, вначале, при заполнении ячейки, рёбра растягиваются, а при заполнении смежных ячеек усилия растяжения уменьшаются.

However, excavators with a leveling ladle are more often used when filling with soil. When filling the soil, the cells of the volumetric georates experience variable sign loads, initially, when filling the cell, the edges stretch, and when filling adjacent cells, the stretching forces decrease.

In general, with sufficient adhesion of the filling soil to the base, the cells of the volumetric georates do not experience significant loads during operation, and the peak load occurs at the beginning of filling the cells.

The technological sequence of the anti-erosion protection device involves manual and partially mechanized filling in the cells of volumetric georets, while the laying and anchoring of the volumetric georets structure is carried out over the entire area [5,6].

Volumetric geogrids can also be made from rolls of nonwoven materials by drilling special holes. The construction of volumetric georates is obtained by stretching a perforated roll across the slots. The roll with slots is laid on the slope surface and unfolded with the necessary and sufficient tension for the formation of sockets [11,12, 13, 14].

Roll rotation is carried out both across the slope and along it. The use of slots in rolls allows for the simultaneous laying and filling of volumetric geographic lattice structures. For the stability of volumetric georets during the unfolding of rolls, it is necessary to know the rational ratio of the width of the cell strips and their lengths depending on the stiffness of the initial material of geosynthesis. These factors are taken into account in technological calculations for the stability of volumetric georates when filled with soil or gravel.

Geosynthetic materials combined with load-bearing lattice assembled reinforcement structures with grate cells filled with 40-70 mm gravel, 50-100 mm stone, as well as with protective insulating lattice assembled lightweight reinforcement structures with grate cells filled with vegetable soil with grass sowing [15,16,17,18].

The purpose of slope reinforcement structures using geosynthetic materials is carried out in accordance with current regulatory and technical documents, taking into account soil, hydrological, climatic conditions, and the parameters of the earthbed[18].

When designing new railways being built in desert regions of Uzbekistan, "Boshtransloyiha" JSC developed a technological scheme for strengthening the earthwork in sandy soils. This technological scheme provides for the strengthening of the embankment slopes with the construction of a berm and the laying of 0.15 m thick vegetation soil (Fig. 1).

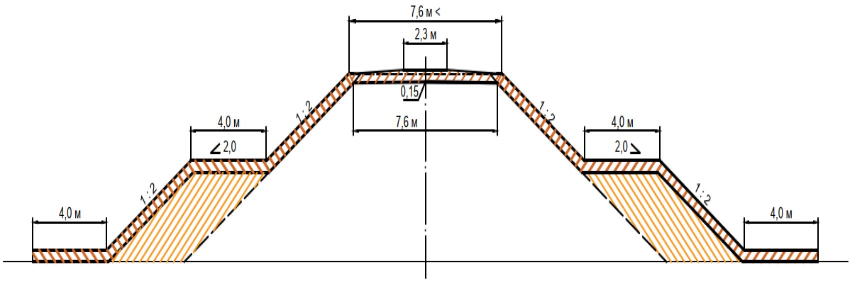


Fig.1. Technological scheme for strengthening the earthwork on sandy soils, developed by JSC "Boshtransloyiha."

In order to ensure the stability of the railway track, constructed from barchan sands using innovative technologies, based on the "Program and Methodology of Experimental Research on Reinforcing Railway Track Slopes" by laying geosynthetic materials (geotextiles, volumetric geogrids), a structural and technological scheme for anti-deflation and anti-deformation reinforcement was developed (Figure 2) [18].

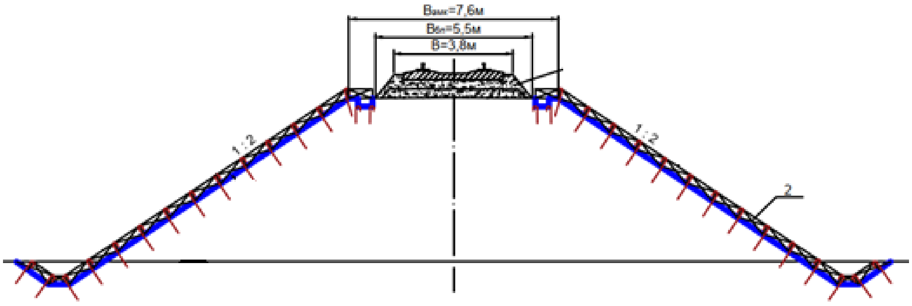


Fig.2. Embankment structure reinforced with geosynthetic materials

The following factors depress the development of plants in sandy deserts: the scarcity of atmospheric precipitation, high summer air and soil surface temperatures, the mobility of the sandy substrate, the nutrient scarcity of the sands, and sometimes the strong salinity of the surface sand horizons. As a result of the prolonged influence of these factors, various forms of adaptation have developed in plants. Thanks to them, vegetation settles on the sands, securing them [18].

Literature

1. Лесов, К., Таджибаев, Ш., Мавланов, А., & Кенжалиев, М. (2021). Расчет устойчивости насыпи и укрепление откосов земляного полотна с использованием геосинтетических материалов. *Транспорт шелкового пути*, (1), 78-83. Лесов, К., Таджибаев, Ш., Мавланов, А., & Кенжалиев, М. (2021). Расчет устойчивости насыпи и укрепление откосов земляного полотна с использованием геосинтетических материалов. *Транспорт шелкового пути*, (1), 78-83.

2. Лесов, К. С., Таджибаев, Ш. А., & Кенжалиев, М. К. У. (2022). ПОВЫШЕНИЯ УСТОЙЧИВОСТИ ОТКОСОВ НАСЫПИ ЗЕМЛЯНОГО ПОЛОТНА С ПРИМЕНЕНИЕМ ОБЪЕМНЫХ ГЕОРЕШЕТОК. *Central Asian Research Journal for Interdisciplinary Studies (CARJIS)*, *2*(10), 229-236.

3. ЛЕСОВ, К., ТАДЖИБАЕВ, Ш., МАВЛАНОВ, А., & КЕНЖАЛИЕВ, М. ТРАНСПОРТ ШЁЛКОВОГО ПУТИ. *ТРАНСПОРТ ШЁЛКОВОГО ПУТИ Учредители: ННО" Научно-исследовательский информатизационный центр"*, (1), 78-83.

4. Лесов, К. С., Таджибаев, Ш. А., & угли Кенжалиев, М. К. (2023, May). ПРОТИВОЭРОЗИОННАЯ ЗАЩИТА ЗЕМЛЯНЫХ СООРУЖЕНИЙ НА УЧАСТКЕ ЖЕЛЕЗНОДОРОЖНОЙ ЛИНИИ БУХАРА–МИСКЕН. In *International Conference" Technical and technological sciences in the modern world"*. (Vol. 1, No. 1, pp. 34-37).

5. Лесов, К. С., Таджибаев, Ш. А., Кенжалиев, М. К. У., & Мирханова, М. М. (2022). ТЕХНИКО-ЭКОНОМИЧЕСКАЯ ОЦЕНКА ЭФФЕКТИВНОСТИ УКРЕПЛЕНИЯ И ПОВЫШЕНИЯ УСТОЙЧИВОСТИ ОТКОСОВ ЗЕМЛЯНОГО ПОЛОТНА. *Universum: технические науки*, (11-3 (104)), 39-42.

6. Лесов, К. С., & Таджибаев, Ш. А. (2022). ИССЛЕДОВАНИЕ УСТОЙЧИВОСТИ ОТКОСОВ ЗЕМЛЯНОГО ПОЛОТНА ЖЕЛЕЗНЫХ ДОРОГ ПРИ УКРЕПЛЕНИИ ГЕОСИНТЕТИЧЕСКИМИ МАТЕРИАЛАМИ. *Universum: технические науки*, (8-1 (101)), 57-61.

7. Лесов, К. С., Таджибаев, Ш. А., & угли Кенжалиев, М. К. (2023, May). ПРОТИВОЭРОЗИОННАЯ ЗАЩИТА ЗЕМЛЯНЫХ СООРУЖЕНИЙ НА УЧАСТКЕ

ЖЕЛЕЗНОДОРОЖНОЙ ЛИНИИ БУХАРА–МИСКЕН. In *International Conference" Technical and technological sciences in the modern world"*. (Vol. 1, No. 1, pp. 34-37).

8. Таджибаев Шерзод Амиркулович (2023). ИССЛЕДОВАНИЕ УСТОЙЧИВОСТИ ОТКОСОВ НАСЫПИ ЗЕМЛЯНОГО ПОЛОТНА ПРИ УКРЕПЛЕНИИ ОБЪЕМНЫХ ГЕОРЕШЕТОК. Universum: технические науки, (9-3 (114)), 5-9.

9. Saginovich, Lesov Kuvandik, and Tadjibayev Sherzod Amirkulovich. "Calculation of the reserve coefficient of local stability of the slopes of the roadbed reinforced with a volumetric geogrid." *ACADEMICIA: An International Multidisciplinary Research Journal* 11.11 (2021): 115-120.

10. Lesov, K. S. (2021). Tadjibaev Sh. A., Kenjaliev MK Experimental researches on strengthening the slopes of the roadbed with geomaterials on the experimental section of the Bukhara–Misken railway line. *Journal NX*, *7*(2).

11. Lesov, K. S. (2019). Tadjibaev Sh. A. and Kenjaliyev MK, Technology for strengthening slopes of the subgrade of railroads made of sandy soils using geosynthetic materials. *Problems of architecture and construction*, 15-18.

12. Таджибаев Шерзод Амиркулович, Бегматов Пардабой Абдурахимович, Мехмонов Машхурбек Хусен угли. (2024). 8.3 СПОСОБЫ РЕЗЕРВИРОВАНИЯ ДЛЯ ПОВЫШЕНИЯ НАДЕЖНОСТИ. *Innovative Technologies in Construction Scientific Journal*, *8*(1), 10–11.

13. Таджибаев Шерзод Амиркулович Бегматов Пардабой Абдурахимович Мехмонов Машхур Хесейн угли. (2024). 8.8 Базовые требование земляного полотно магистральных железных дорог. *Innovative Technologies in Construction Scientific Journal*, *8*(1), 27–28

14. Begmatov, P. A., Sulaymanov, S., & Tadjibayev, S. A. (2020). SUBSTANTIATION OF TECHNICAL AND ECONOMIC INDICATORS OF MODERN TECHNOLOGIES WITH THE CURRENT MAINTENANCE OF THE SUBGRADE OF RAILWAYS. *Journal of Tashkent Institute of Railway Engineers*, *16*(2), 9-13.

15. Лесов, К. С., Кенжалиев, М. К., & Таджибаев, Ш. А. (2019, November). Определение устойчивости насыпи земляного полотна железных дорог, возведенного из мелких песков. In *Международная научно-техническая конференция «Глобальное партнерство-как условие и гарантия устойчивого развития» II том. Ташкент* (pp. 248-252).

16. Лесов К. С., Таджибаев Ш., Кенжалиев М. К. Технология укрепление откосов земляного полотна железных дорог из песчаных грунтов с применением геосинтетических материалов Проблемы архитектуры и строительства (научно-технический журнал). № 4, 2019 //Самарканд, СамГАСИ. – 2019. – №. 4. – С. 15.

17. Лесов К. С., Мирахмедов М. М., Таджибаев Ш. А. Мировой опыт применения геосинтетических материалов в конструкциях земляного полотна //Архитектура. Строительство. Дизайн. Научно-практический журнал. – 2019. – №. 2. – С. 194-197.

18. Таджибаев Ш.А., Хамидов М.К., Шоматов З.А. // Применение геосинтетических материалов для обеспечения устойчивости откосов земляного полотна железных дорог // Международный научный журнал «Modern scientific Research » Москва, 2023г. выпуск: №3 С. 174-180

THE ISSUES OF RESTORING THE TEMPERATURE REGIME OF OPERATION AND INTEGRITY OF RAIL SPRINGS

Eshonov Farhod Fayzullahuzhaevich
Senior Lecturer, Tashkent State Transport University
Makhamadjanov Shukhratjon Shavkat ugli
Makhmaisaev Azizjon Yodgor ugli
Khamidov Maksudjon Kamolovich
Assistants of Tashkent State Transport University

Abstract. This article presents materials on the restoration of the operating temperature regime and the integrity of the rails of the contactless track. Options for performing work on the decomposition of temperature stresses are described.

Keywords: contactless track, rail web, work technology, fastening temperature, calculated interval.

Modern junctionless track designs, fixed to a constant operating mode within the calculated temperature range, do not require systematic temperature stress reduction.

The dissipation of temperature stresses in the rails of the continuous track is considered an exceptional work and is carried out in the following cases [2]:

- when reinforcing rail strips to the permanent operating mode, if they were previously laid outside the calculated interval;
- in necessary cases, before welding rail strips into longer ones;
- urgent need for repair work (for example, sudden appearance of a sharp angle in the plan) when the actual temperature of the rails exceeds the maximum temperature of the calculated interval;
- after the integrity of the rail web is finally restored, if it was welded at rail temperatures outside the calculated temperature range, etc.

There are two possible options for performing work to relieve temperature stresses (introducing the rail rails into the calculated fastening interval for a constant mode): unfastening the rails starting from one end, accompanied by the change of leveling rails (or one rail) from the same end of the rails; simultaneous unfastening of the rails from both ends, accompanied by the change of leveling rails from both ends of the rails.

When introducing the braids into the calculated fastening interval, the requirements for the uniform distribution of stresses along the length of each braid must be observed: the difference in the braid temperature during fastening during the entire production period should not exceed 3°C, and in the rail braid temperatures of both rail threads - not more than 5°C.

To reduce friction forces when moving rail members along the linings, either suspended rollers, or sliding pairs, or rolling supports installed on the linings, are used. After the sign, the whip is shaken with a percussion device. During the work process, the actual temperature of the rail joints along their length is measured, and the full change in the length of the joints along the ends, as well as the uniform distribution of stresses along the length of the joints, is monitored by the displacement of the marks applied to the rail sole above the beacon sleepers.

Then, the method and technology of work production are selected, depending on the length of the rail web, the duration of the "window" for work production, and the availability of workforce. The method of unilateral loosening of the whip is usually used when the length of the whip is less than 500-600 m and the calculated length is up to 180-200 mm. The welded rail without bolted holes must have a length 80 mm longer than the cut part and must not differ from the rail in height and lateral wear of the head by more than the values specified in the Instructions for the Current Maintenance of the Track [3].

The technology of welding into the rail web can be of two types: with partial unfastening of the web and its bending or with full unfastening of the short part of the web and its movement. When welding a rail with a whip bend (Fig. 1), the nuts are unscrewed by several turns in the BV section with a length of 5 m, and in the EA and GD sections with a length of 50 m, the terminal bolts are secured to prevent the whip from moving. Then, the whips are raised above the substrate edges and bent in the horizontal plane: on straight sections of the road - towards the road axis, and on curved sections of the road - to the outer side of the curve. The whip bend is completed when its end coincides with the end of the rail insert.

During the welding process, the bent part of the wire is gradually straightened by the longitudinal force created by the welding machine.

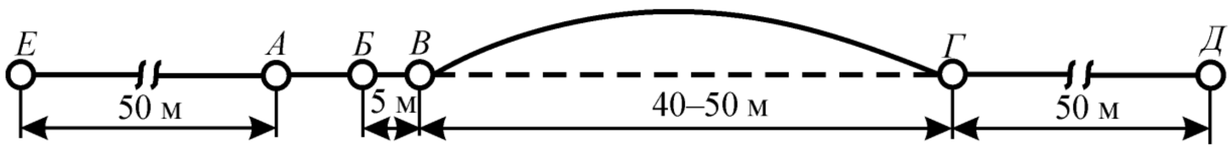


Fig. 1. Rail joint bending diagram: AB - insert; BV - section where the terminal bolts are loosened by three to four turns; WG - whip bending section

After welding, the whip remains bent. In this case, the remaining bend arrow, measured at the point where the inner edge of the bent woven sole is most distant from the edge of the lining ribbon, should remain within 15-30 cm. Otherwise, the welded joint is rejected and cut out of the woven. After the closing joint cools down (usually 2-3 min after welding), the bent part of the whip is straightened. Installation of terminals and tightening of nuts are carried out in the direction from the closing weld joint. Sliding of the braid in the WG section during its bending before welding and straightening after welding should be carried out along metal slides, which are evenly distributed in the bending section. Welded joints are marked with white paint on the inner side of the rail with two pairs of vertical strips and then recorded [1].

Welding of the rail into the wire is carried out at the actual wire temperature, which should not differ from the wire fixing temperature to the constant mode by more than 5°C. If this condition cannot be met, then in the future, when the temperature of the calculated interval arrives, the whip must be reinforced.

LITERATURE

1. Kreinis Z.L., Korshikova N.P. Railway Maintenance and Repair. Textbook. 2012.

2. Kreinis Z.L., Selezneva N.E. Stitchless Path. Part 1. How the non-joint road is structured and operates. Study Guide. M. GOU UMSJDT. 2009. - 84 p.

3. Technical instructions for the construction, laying, maintenance, and repair of the no-joint track. Moscow. Transport. 2000. 96 p.

TABLE OF CONTENTS