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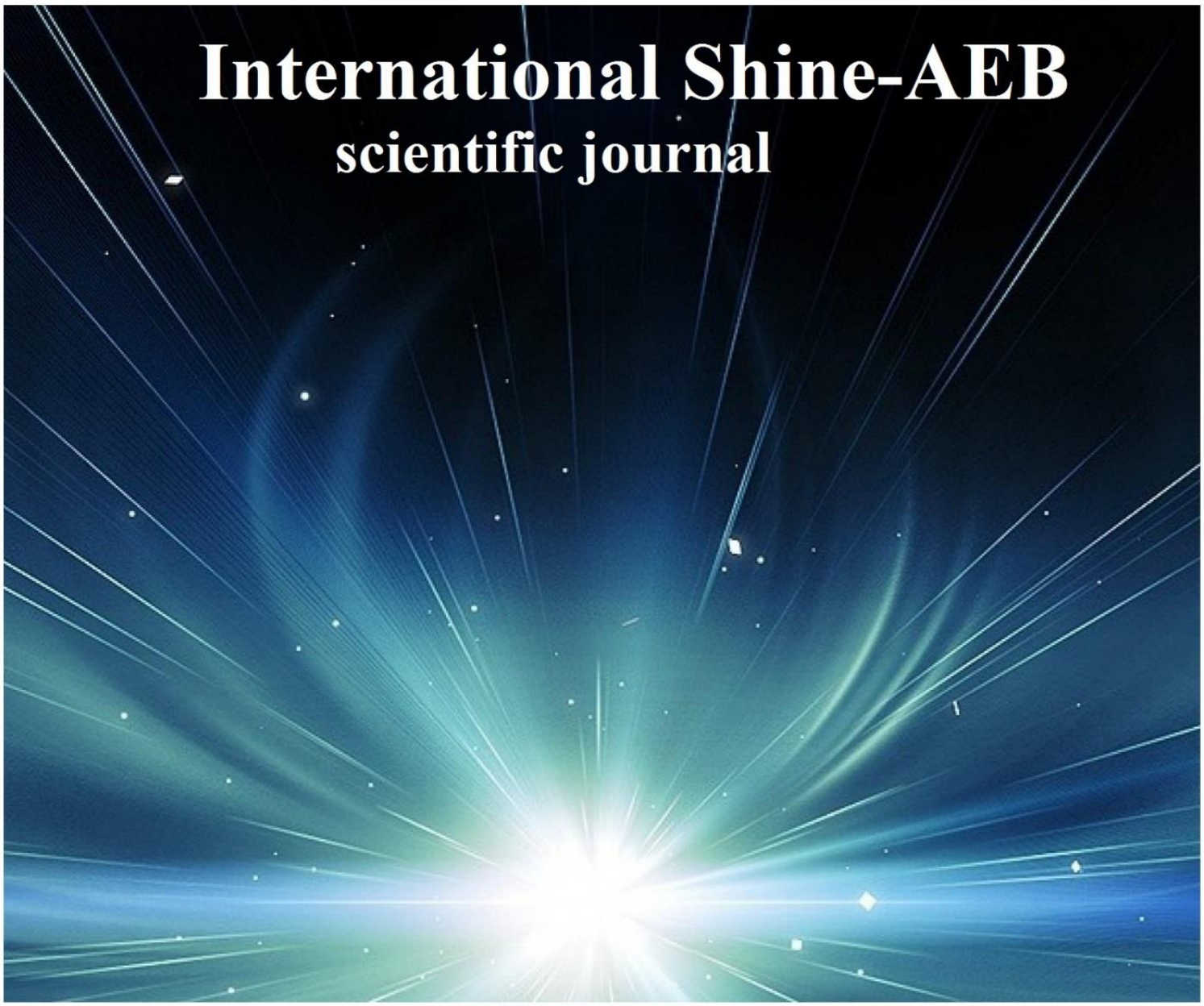

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# ARTIFICIAL INTELLIGENCE ON THE RAILWAY

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**Annotation.** The article considers ensuring the safety of train traffic on railways as a key aspect of their operation. The author emphasizes the importance of technical measures, systematic monitoring of equipment condition and regular maintenance to maintain safety. The concept of heterogeneous system performance is also considered, which helps to understand how the railway transport infrastructure functions.

**Keywords:** Operation, railways, maintenance parameters, technical failures.

# ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ НА ЖЕЛЕЗНОЙ ДОРОГЕ

**Анотация**. В статье рассматривается обеспечение безопасности движения поездов на железных дорогах как ключевой аспект их эксплуатации. Автор подчеркивает важность технических мероприятий, систематического контроля состояния оборудования и регулярного технического обслуживания для поддержания безопасности. Также рассматривается концепция гетерогенной производительности системы, которая помогает понять, как функционирует инфраструктура железнодорожного транспорта.

**Ключевые слова:** Эксплуатация, железные дороги, параметры технического обслуживания, технические отказы.

Ensuring the safety of train traffic is an important condition for the operation of railways. Various technical measures are used here, such as maintenance and repair of equipment, diagnostics and monitoring of the condition of technical means, and improvement of structures. Now it is important to improve technical components to enhance safety. Another factor to consider when servicing equipment is its complexity and the number of components. It is also important to understand the characteristics and principles of rail transport, as it differs from other transportation systems. Train safety depends on timely notification and response to malfunctions. The security analysis allows you to determine the actual level of security and develop appropriate measures. Important parameters in the analysis include statistical data, the risks of accidents and economic damage, as well as safe driving time and the effectiveness of repair work [1].

Characteristics of the external environment of the facility's operation zone. Based on the data obtained, an analysis and processing plan is developed and a report is compiled. The analysis procedure itself, carried out in order to create train safety systems, consists of several stages: establishing the area of analysis and the boundaries of the study, monitoring the analysis, identifying unstable conditions, conducting a point analysis of unstable conditions, determining dangerous traffic conditions trains, conducting a point analysis of dangerous traffic conditions, enumeration of significant factors acting at the time of the occurrence of a dangerous condition, establishment of types and characteristics of losses arising at the facility from the effects of damaging factors, analysis of losses from the effects of damaging factors, performing calculations of the risk of specific losses, documenting the processed data, checking the results [2].

This is a modern approach to the organization of railway management a transport that uses a multi-channel approach to reduce dangerous breakdowns. The principle of microprocessor control is to detect dangerous infrastructure elements during a comprehensive comparison of signals from a number of monitoring control points. Input information about the parameters of the functional blocks is processed not separately within a specific function, but taking into account the neighboring elements of the system. In addition, microprocessor-based security devices Train movements during operation are compared with intermediate data sets that collect statistics on

various indicators. Thus, machine learning elements are being implemented that increase the effectiveness of early detection of technical and operational nodes that may fail in the near future. Disadvantages microprocessor-based multichannel security systems are characterized by the high cost of technical implementation and strict requirements for the qualification of operator personnel.

Video surveillance systems are now being actively implemented in the railway infrastructure and are becoming one of the main elements of comprehensive security. Among the main tasks of intelligent video surveillance systems, visual control of target areas and objects deserves attention. During monitoring, changes in the working environment are recorded, which can be used to create prerequisites for dangerous failures. In addition, modern train safety systems use high-tech video equipment that clearly surpasses previous systems of this kind both in functionality and design. Firstly, the entire infrastructure with cameras, monitors, data warehouses and databases are built on the basis of digital communications [3.4]. Secondly, the intellectual aspect of the equipment it is coordinated by the presence of so-called video analytics, which, with the help of special software and graphic processing systems for video data, allows you to record abnormal situations without participation the operator. The video analytics function is now organically integrated into the overall train safety program and allows you to solve the following tasks: detecting third-party objects using motion sensors, tracking objects from multiple camera positions using special video stream processing algorithms, marking objects according to predefined signs of size and shape, object identification and recognition, predicting the behavior of the observed object.

**Conclusion.**Technical and organizational concepts of traffic safety on railways are constantly being improved as they improve dynamic characteristics of vehicles. To prevent the threat of collisions at crossings, the company 48 annually implements comprehensive measures to improve preventive and protective systems.

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# THE ROLE OF PHILOSOPHICAL HERITAGE IN THE DEVELOPMENT OF COUNTRIES

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**Abstract**

Philosophical heritage is created by people in all eras. The most valuable and valuable achievements are reflected in it. Philosophical heritage is preserved as a great product of human thought. Philosophical culture encompasses human activity. No matter when and where he is, no matter what he does, no matter what he does, people will encounter him.

**Key words:** Philosophical heritage, philosophical culture, Universe, existence, natural thinking.

The roots of the first knowledge about the universe, existence, nature, and man go back a long way. This is confirmed by research conducted in Ancient India, China, and Central Asian countries. Architectural monuments, structures, ancient manuscripts, folklore, literature, works of art that have reached us confirm our opinion. In fact, humanity is witness to the fact that in the early period of human activity, great discoveries were made in the countries of the East, in general, in Asia. In particular, many discoveries made in China alone, which were the first in the world, confirm our opinion. For example, the Bishen script was created as early as 1045 BC. The homeland of the first paper money is China. Because it was used 1900 years before our era. In Europe, paper money appeared eight hundred years later. The first earthquake in the world was detected in China. Porcelain was made 1000 years ago by Europeans. 2000 years ago, the world's only comprehensive bodybuilding training consisting of 40 exercises was invented. The Chinese people invented the bronze compass 300 years before the birth of Jesus Christ. In Europe, this device appeared 1400 years later. The conclusion is that the supporters of Eurocentrism in many respects recognize the spirituality, culture, and enlightenment of Eastern countries, and history is the real measure.

Ancient writings and historical monuments reflect the traditions and worldviews of ancient peoples, from which important conclusions can be drawn. Especially in the ancient myths, the thoughts aimed at knowing the universe are noteworthy. Mythology means legends. More precisely, it is the doctrine of myths. In ancient times, people used this doctrine to understand and explain the universe. In this way, they strive to have an idea about the universe, to understand its future. Legends are the telling of strange stories that happened in different ancient nations. They are more about gods and heroes, the relationship between good and evil, and the activities in the cosmic world. On the basis of these, the first philosophical views were gathered in human activity. The existence and changes in existence, natural phenomena, the animal world, human activities were the focus of people's attention. In the philosophical views of that time, the emergence of the world, its beginning, its structure, the division of irreversible phenomena in nature, and the mutual relations of the world of animals and plants took central places. In legends, there are even ideas about the disappearance of the world and its reappearance. Along with the thoughts about the origin of the world, they also confused about the origin of people, the stages of life, and the death of a person. Human achievements - the use of fire, the origin of handicrafts, the beginning of agriculture and other new traditions, which resulted in the creation of the foundation for various branches of science. Legends began to merge and become large resources. Examples of these are the Indian "Ramayana", the ancient

Greek "Iliad", and the Karelovian "Kalevala". Through them, ancient culture and traditions were passed down from generation to generation. It has become a center of science. It should be noted that the emergence of philosophical views, albeit gradually, began to emerge out of necessity.

Mythical consciousness sought to reflect the connection and unity of nature and society. An attempt was made to understand the inner feelings of a person to solve the conflicts between man and the world. Through epics, fairy tales, legends, pictures of life entered social life, and in the future, the sources of the foundation of the field of literature, landscape, music, and sculpture appeared. Art and literature were created, the images in them were updated and social life was explained. With the destruction of the primitive society, the mythical views were also damaged. Religious views began to form. Examples of these are Christianity, Buddhism, Judaism, and Islam. However, some areas in the legends were continued in these religious views. These include the origin of man, the secrets of birth and death, social life, worldview.

Each nation has its own philosophical heritage. Philosophical heritage has national aspects. National aspects are reflected in national ideas. As each nation has its own philosophy, this philosophy is also related to the national idea. The national idea reflects the interests, views, and feelings of the people in a certain area. At the same time, it serves to realize the goals and tasks of the people. The national idea helps to determine the future of the nation during the period of radical changes in the development process of the country and people. In this process, through ideas, the nation develops its economic, social, and intellectual development determines the areas of sy. In this respect, philosophy is closely connected with national ideas.

Philosophical heritage is created by people in all eras. The most valuable and valuable achievements are reflected in it. Philosophical heritage is preserved as a great product of human thought.

Philosophical culture encompasses human activity. No matter when and where he is, no matter what he does, no matter what he does, people will encounter him. As a result, a person contributes to the development of society. It is known that there are many types of production in society. One of the most important of these is the production of spiritual wealth. Spiritual wealth is developed and created by people first of all, and also by certain people, scientists, sages, philosophers, writers, composers, intellectuals, theoreticians, and politicians. Spiritual wealth has an impact on the development of philosophical culture and society. It plays a negative or positive role.

Wise people did not leave masterpieces only by commenting on their time or the past, but also thinking about the future, so that we should not accept them as lifeless. It was said that if we honor them and decorate our lives, we will be extremely happy and spiritually rich people.

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# PHILOSOPHICAL HERITAGE AND DEVELOPMENT

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**Abstract**

Philosophical heritage emerges from the legitimate development of knowledge, and this philosophical heritage is used by the future generation, which in turn contributes to the development of philosophical heritage. The development of the philosophical heritage does not stop, it gets richer. Or the next generation will form a new philosophical heritage based on the legacy of the past philosophy.

**Key words:** Philosophical heritage, development, science, technology, discoveries, knowledge, art, literature.

Philosophical heritage is created by people in all eras. The most valuable and valuable achievements are reflected in it. Philosophical heritage is preserved as a great product of human thought.

Philosophical heritage emerges from the legitimate development of knowledge, and this philosophical heritage is used by the future generation, which, in turn, contributes to the development of philosophical heritage. The development of philosophical heritage does not stop, it gets richer. Or the next generation will form a new philosophical heritage based on the legacy of the past philosophy. Philosophical heritage includes the positive aspects of all science, technology, discoveries, knowledge, art, literature, political and legal processes. Because these are the areas that form the foundations of philosophy. Philosophical heritage also follows the rule of negation. A new one appears in place of the old philosophical heritage. This process continues in a spiral. In the development of philosophical heritage, there are retreats, relative stops, and re-advances.

It is necessary for the future to take them as an example to preserve beauty and develop it, even if it is old and useful for human activity. Those who call some cases old philosophical heritage made many mistakes and mistakes in history. In order to raise the philosophical heritage, it is necessary to first understand the history of human heritage. The period of transition to market relations does not deny the historical-philosophical heritage, but tries to develop it. Philosophical heritage that is formed in the period of market relations can be a heritage that has a higher level.

It is natural that sometimes people cannot use philosophical heritage wisely. But in marriage, he faces it and has his own conclusion. The spiritual and philosophical heritage created by the advanced thinkers of mankind certainly affects representatives of each new generation in one way or another. Philosophical heritage is influenced by cultural heritage. There are such common cultural heritage assets that preserve signs of genius. They include, in particular, many works of architecture, art, and literature. These works are great works and an inexhaustible treasure for the spiritual advancement of mankind. Tales, legends, epics, novels - memoirs, soldiers and heroes, ancient buildings - values, discoveries - theories in the world are among these. As the Russian scholar Lev Nikolayevich Tolstoy said: "We have such original fruits of the thinking of great sages who have grown up among billions of people for thousands of years, that the intellectual masterpieces of these great people have withstood the test of time and passed through the abyss. All mediocre things were thrown away, leaving only original, deep, necessary works"1.

The philosophical heritage of the Uzbek people is ancient, and its beginning goes back 4000 years. Various state systems also played an important role in leaving the philosophical heritage on the territory of Uzbekistan. Examples of these are: Sugdiyana, Parthia, Greco-Bactria,

Parkana, Kushan, Tokharistan, Turkic Khanate, Somanids, /Aznavis, Karakhanids, Khorezmshahs, Amir Temur and Timurid states. There are many philosophers and scholars who served in these states and left their works. Not only the ancient monuments or objects left by them, but also the methods of managing the state are masterpieces of the philosophical heritage. The cultural-philosophical heritage of our ancestors, customs and traditions of statehood influenced the development of world statehood and continues to do so.

Now it is known that our great-grandfathers Afro-Siyab, Karakhanids, Aznavis, Khorezmshahs, Amir Temurs organized a just and humane state administration. With this, they contributed to the development of philosophical thinking. The President of the Republic I.A. Karimov said: Today we have such a historical opportunity that we can critically evaluate the path we have traveled, clarify the foundations of our national statehood, return to the veins of our great culture, the roots of our ancient heritage, the rich traditions of our past. we must apply our mothers to the construction of a new society. Or, as one of the scholars said, the construction of each state is a national spiritual product of a certain people, the manifestation of identity and the development of spiritual consciousness. Going step by step through this ladder of development requires taking into account the same standard of action, and at the same time not being ahead of time. Time is omnipotent, thinking, philosophy... everything is embodied in it.

Since the cultural-spiritual and philosophical spheres are dialectical in nature, they complement each other. For example, there are various criteria of spiritual culture in the society, which are important in the life of the people of the country. In particular, these criteria are the culture of the state economy, the process of state management, areas of restoration of national pride, development of art and education, science and technology.

We are living this era is glorious because it embodies the most original wealth of centuries-old human society. We are using the philosophical, spiritual and cultural heritage created by our ancient ancestors, advanced representatives. Even one of the great philosophers who lived before our era proudly mentioned the work of the sages before him. I, he said, have examined the intellectual masterpieces left to us by the ancient sages in their works; if we come across something good in them, we will adopt it and be considered to have gained a great deal of profit. Therefore, the use of the philosophical, spiritual and cultural heritage of the past is also a legacy from our ancestors. Therefore, the philosophical heritage is the material and spiritual spheres that reflect the spirituality and culture created and left in the past. Ensuring progress also depends on the rational use of the philosophical wealth of the past. Every intelligent person, when he wants to increase his intelligence, closely familiarizes himself with previous works and other cultural, spiritual and philosophical sources and embodies them in himself. He looks for the gems in life and singles out only the rarest and most unique things. He carefully preserves them and, if necessary, passes them on to the next generation.

Ancient scholars and sages have left behind such philosophical and spiritual masterpieces that they are a unique ocean. If the appropriate ones are taken from Oman and used in life, they will continue to serve as they do today.

"The spiritual foundation of our people, the pure foundations of our future state, are very ancient and strong. No one can deny that. Our history goes back several thousand years... The spiritual heritage left by our ancestors, the backbone of our nation, is a great treasure. This treasure should be used wisely. You must be faithful and worthy of the will of your ancestors."

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## INFLUENCE ON ETHNO-CULTURAL SOCIAL DEVELOPMENT

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### ANNOTATION

Humanity has been going through huge changes in the process of struggle for existence. The most important thing is that it is a natural process that different economic, social and geographical conditions of the globe affect the external and internal culture of people. Thousands of nations and peoples in Dunè have their own national character and culture. National cultures are created in the process of finding ways to overcome the difficulties of the natural location, geography and climate of the area where each nation or people live, and later become national customs and traditions.

**Key words:** social development, ethnoculture, Turkic peoples.

The Uzbek nation, as the main link of the Turkic peoples, is considered one of the major nations that has experienced a long historical process. It is a fact that Uzbekistan is geographically located in a very convenient place. The qualities of generosity, hospitality, honesty, generosity, loyalty, purity, politeness inherited by the Uzbek people from the long historical past are considered the most important aspects of the national character [5: 16]. virtues such as restraint, patience, and tolerance are passed down from generation to generation.

The great thinker Allama Abu Rayhan Beruni in his "Geodesia" (Thoughts about the structure and shape of the Earth) divides the earth into seven climates. The seven climates mean that the regions from the equator to the North Pole are divided into seven latitudinal (parallel) regions. It is not for nothing that the countries that have passed through history dreamed of owning the territories of the seven climates of the world. In ancient times, countries were defined by their territorial area, the number and size of their army, and the richness of the flora and fauna there. Zahiriddin Muhammad Babur also mentions Mavoraunnahr in the fourth and fifth climates in his "Baburnoma". He says that India is in the first, second and third climate. Today's scientists use the word "region" instead of the word "climate". All nations and peoples scattered around the world are engaged in activities necessary for life based on the climate and geographical possibilities of the area where they live. On the one hand, the fact that the peoples of Central Asia lived in an area with high potential points to the fact that they have created great innovations in the fields of production, science, art, and culture since ancient times, and on the other hand, the Uzbek people have been creative, creative, hardworking, and active in collective work since ancient times. distinguished by It is reported that many canals, bridges, fortress walls, and communication facilities built in the history of our country were built with the help of hashar. Unlike the ancient Egyptians, the peoples of Central Asia made great changes in the field of agriculture. While the representatives of the settled population who lived in our country made a living cultivating the land and growing various agricultural products, the large clans, such as Kungirot, Lokai, Qarluk, Turk, who migrated from Dashti Kipchak, engaged in all kinds of animal husbandry. has been growing. Historical sources show that great cultures were created in our country through these industries, and this culture was gradually exported to the whole world through trade routes. In the book "Bizkim, Uzbeklar" by one of the great writers of our time, Abdukahhor Ibrohimov, in the two-volume book "The World Encyclopedia Dicticnary Book", which was published in Chicago, USA, with 200,000 copies, he told the Uzbek nation, "Uzbek" - a nation that is one of the ancient

nations among the nations of the world, the first to settle among the Turkic nations, a culturally living nation that contributed to the world civilization...‖[4:27] - saying that it was defined as The fact that it has been passed will certainly please all of us. On October 24, 1998, at the 155th session of the UNESCO Executive Council, the first President of the Republic of Uzbekistan Islam Karimov said, "I consider the development of universal values to be the mutual harmony of the culture and individuality of each nation." - Only such a combination of cultures creates the beauty and value of the universal culture and the entire civilization. After all, the common civilization is formed from the cultures of different nations‖ [3] - he emphasizes. With this, he pointed out that the Uzbek people are one of the peoples who made a great contribution to world civilization in historical times. The high spirituality characteristic of its nature has been protecting us from various calamities, floods and storms for centuries. In spite of all invasions and conquests, even in all difficult and complicated conditions, our ancestors lived without losing their identity, following the standards of spiritual life and etiquette, and striving for perfection. , giving strength. It is known that the thinking, way of life, and spiritual views of any nation or nation are not formed by themselves, in a vacuum. We all know that their emergence and development are based on specific historical, natural and social factors. For example, in the Eastern world, including our own Uzbekistan, the feeling of living together as a community is very important and creates a basis for bringing people closer to each other, supporting and supporting each other. In this sense, if we look at the way of life and thinking of our people, it is different from others we see a number of unique features that are not shy, have been formed over thousands of years, and are manifested not only in mutual interaction, but also as an integral part of our life. This is why the above-mentioned qualities of our people are of particular importance in the consistent implementation of the reforms carried out in our country. It is not an exaggeration to say that at the time of various tensions in the social, economic, cultural, spiritual and political landscape of the world, the actions carried out in our country are surprising the world opinion. Unfortunately, we are witnessing the formation of new traditions, customs, and a character that is completely foreign to us, which have been introduced into our country while following the principles of openness in the foreign policy of our country. It is natural to observe such events in the process of globalization. The famous Indian statesman Mahatma Gandhi said to the globalization process: "I cannot keep the gates and doors of my house closed all the time, because fresh air must enter my house." At the same time, I don't want the wind coming in through my open doors and windows to turn my house upside down and knock me down." With this, he puts forward the idea that it is necessary to understand the positive and negative aspects of the globalization process in time and respond to them with ideas and enlightenment. Taking into account that more than 60 percent of the population of our country are Esh, it is appropriate to spread the classic moral rules about the ancient and high moral qualities of our people among the Esh. However, the Uzbek term is the equivalent of the Turkish word, meaning self-confident, independent thinker and worker, hero, brave, devout, unyielding. Abdurauf Fitrat also mentions in his tragedy "Abulfayzkhan" that "Uzbek boys will be heroes". Because today's great results achieved by our people in the fields of sports, science, culture and art in the international fields, we think, prove that they are the heirs of ancestors who created a great and high culture from long ago. Today, within the framework of the action strategy, among the comprehensive programs such as "Youth is the entrepreneur of the future", "Prosperous village", "Prosperous neighborhood", "Smart city", "Safe city", "Safe area", "Every family is an entrepreneur", "Young people are our future" The active participation of all layers of our people, who take initiative and approach every issue in a new way, in the organization and implementation

of funds like ‖, without a doubt, pleases all of us. At this point, we considered it permissible to list the examples cited in the book of the First President Islam Karimov, "High spirituality - invincible power". That is, "If we look at the history of the world, other nations have also relied on such qualities in the process of gaining freedom and independence, national revival, strengthening their statehood, enviable civil society, and in all fields - whether it is the economy, social life, culture, education and science - we see that it has achieved progress due to the use of its unique internal abilities and potential, its realization.‖[ 2: 68] As an example, First President Islam Karimov singled out Japan and South Korea, which fell into a difficult situation in every way after the Second World War. These regions are among the countries with abundant natural raw materials and very few mineral resources. However, it is not a secret to anyone today that the Japanese and Korean people have been formed over the centuries and developed due to their unique national spirituality, which has become a great creative force. Therefore, when talking about the "Japanese miracle" or "Korean miracle", experts in the fields of international economics first of all mention the expressions "Japanese character", "Korean nature". It's done. To bring this to our attention, it is enough to bring to our attention the works carried out within the framework of the Strategy of Actions and the Strategy of Development. He has gone through many trials in history; Our people, who have no equal in patience and contentment, are working valiantly in all fields, showing their true character and nature in the period of changes that are sweeping over our country. Our government is carrying out reforms based on the will of our people. At this place, the President of Uzbekistan Shavkat Mirziyev said, "Our main achievement is the ability of our multi-ethnic nation to overcome any difficulties and trials, its modern outlook, political consciousness and social activity are rising, without being indifferent to the events around us. on the contrary, he lived with a sense of belonging" [1: 286] - he emphasizes. Of course, within the framework of ensuring the effectiveness of these reforms, we must emphasize that our people have united around the idea of entrepreneurship put forward by our government.

In conclusion, it should be emphasized that the mentality of the Uzbek people requires the development of many qualities that are common to all social strata and protect the interests of the community. The qualities of tolerance, hospitality, hospitality, peace-loving, mutual cooperation, mutual agreement in times of joy and sorrow, and comradeship in the internal character of our people are the qualities that ensure collective unanimity, unity of language and heart, and unity of thought. it was born and polished from the needs of preservation. It should also be said that one of the important aspects specific to the mentality of our nation's intellectual and spiritual character is the extreme respect for science, and it can be observed that special attention is paid to education and profession. It is of particular importance that the unique positive aspects of our people are at the heart of the huge changes implemented in our country.

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## AS THE CENTER OF HUMAN CULTURE OF CENTRAL ASIA

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**Abstract**

It is one of the oldest centers of personal culture in Central Asia. Our ancestors took an active part in the development of their culture. In ancient times, science, architecture, fine arts, music, sculpture and other philosophical, spiritual and cultural monuments were left behind.

**Key words:** Central Asia, culture, philosophical, spiritual, cultural monuments, thought.

It is one of the oldest centers of personal culture in Central Asia. Our ancestors took an active part in the development of their culture. In ancient times, science, architecture, fine arts, music, sculpture and other philosophical, spiritual and cultural monuments were left behind. However, due to many wars of aggression, they faced a crisis. But it is clear that our ancestors glorified their dreams, the realms of light and darkness, tyranny and justice through writings, oral art, and legends. They sincerely explained the events in the field of nature and society, their conflicting views. Their patriotism and values have reached us through songs and poems. People's situation, work and pleasure, joy and sadness, seasons and nature are depicted in different genres. Proverbs and philosophical words propagate good intentions. All this shows that the ancestors of the Uzbek people made a great contribution to the history of the world. These are our philosophical heritage.

The history of the peoples of Central Asia spans several thousand years. In the first millennium BC, people called Scythians and Massagets lived in this country. They had their own culture, philosophy, lifestyle, and their own sources of development. They lived on the basis of their worldview and traditions. Therefore, based on their historical conditions, they formed philosophical processes. These depended on the economic and social conditions of Central Asia. The use of rivers for irrigation, the development of handicrafts, product exchange, etc. have been improved. These did not affect the culture and spirituality of that time. Historian Istarkhy connects Amudarya with the development of Khorezm. The development of agriculture, crafts, and trade in Central Asia was the impetus for the emergence of cities. As a result, the culture and spirituality of the city changed based on the demand of the time. It can be known from the written sources that the Central Asian region was favorable for the development of philosophy from the point of view of economy, geography and climate at that time.

In ancient times, Bactria, Khorezm, Sugdiyona, Margiyona, Parthia, the lower reaches of Amudarya, Zarafshan oases, Parkana (Fergana) and other places were considered important from the point of view of living in Central Asia. Therefore, many investigations were conducted in these areas in the 20th century. For example, Russian archaeologist S.P. Tolstov in Khorezm, academician Ya. /ulomov's research helps to form many opinions. They opened very ancient cities, fortresses, mausoleums, irrigation facilities, various fortifications belonging to different eras. Various objects and remains found in places such as Tuproq Qala, Kozali Qira, Yonbosh Qala, Chust, Dalvarzin, Kizil Qira, Varakhsha (Bukhara), Oktepa (Tashkent) are a constant element in determining the specific characteristics of that period. can be Or in the works of the historians of the ancient world, Clement of Alexandria, Xenophon, Strabo, Ptolemy, Herodotus, what are the philosophical values of the peoples of the past are reflected, which are currently considered the main scientific sources. It is known that people in Central Asia worked in mines, smelted copper and iron, made various items, military and other tools from them, and engaged in shipbuilding,

weaving, construction, jewelry, and trade. . Even in those times, people in the Fergana Valley worked using oil. The great historian Herodotus expressed the following opinion about our ancestors: "They fight on horseback and on foot, they know these two types of fighting; they are armed with bows and arrows, spears and dudama, and short swords. They make these weapons out of brass, and decorate their headdresses, belts and ties with gold. Horses' chest shields are made of brass. Gold is also attached to Yugan, suvluq and other horse harnesses. They do not use iron and silver at all, because in their country there is a lot of gold and copper, and there is absolutely no iron and silver. In the ancient world, the peoples of Central Asia established good relations with other countries and neighboring countries, which led to the rise and internationalization of philosophy.

The fact that our ancestors established economic and cultural relations with the countries of the Urals, Siberia, the Volga, China, India, Greece, Iran, Syria, Mesopotamia, Babylon, and Egypt led to a change in their way of life and an improvement in their philosophy. That's the meaning It would not be wrong to say that it was a center connecting Central Asia/West and East. Especially, it is not difficult to notice that some aspects of the philosophical views of the countries of the Volga region, the Urals, South Siberia, Kazakhstan, Iran, and India are closer to our spirituality and culture. Even before the first millennium BC, there were economic and cultural relations between Central Asia and China, which were primarily connected by the Great Silk Road. It can be concluded that already in those times, Central Asia was considered a region of strategic importance. It was considered a ground for the development of high culture and philosophy.

It is known from our history that in ancient times, Central Asia learned a lot from China, and China learned a lot from Central Asia. It was the Chinese people who learned cotton growing, grape growing, winemaking, and glassmaking from Central Asia, and the people of Central Asia learned silk making, paper making, and porcelain making from China. Such mutual relations can be learned from historical annals. One of the Chinese annals contains the following thoughts: "The people (of Central Asia) who traded in the capital of the provinces of Yue-zhi (China) said that we know how to melt stone and make different colored glass from it, and they brought ore from the mountains and mines and from them in the capital experimented with glass casting; their glass was so brilliant that it surpassed that of the Western countries (probably meaning Roman or Syrian glass) in their throne halls or He ordered them to be used in the palaces; the bottles were of a brilliant color and very clear; everyone was amazed and considered these bottles to be divine."

Undoubtedly, the economic, political and cultural relations of that period did not fail to influence the creation of local philosophy of the people. The specific features of the folk oral and written art of the ancient period can be known on the basis of the monuments left from that period.

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# STRENGTHENING THE SLOPES OF THE RAILWAY TRACKBED

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**Abstract:** The article deals with the scientific direction related to determining the actual state of the roadbed. Also with periodic reinforcement of the roadbed. To strengthen the slopes of embankments and recesses, various types of geosynthetics are used-geotextiles, geogrids, drainage trays made of composite materials.

**Key words:** Railway track, roadbed, geotextile, geogrid, drainage trays, train traffic.

The railway roadbed, unlike the upper structure of the track, is a long-term structure that can not be replaced and is operated during the entire life of the railway. Under the influence of external factors, defects and deformations occur in the roadbed, which affect the condition of the track and the safety of train traffic [1].

In General, the roadbed over a large area of the railway network of our country, despite its long service life, increased loads from rolling stock, and increased weight of the upper structure of the track, works satisfactorily. However, defects and deformations of the roadbed account for more than 6% of the operational length of the network's roads.

The defect of the roadbed is characterized by a violation of its transverse outlines of more than 31 %, ballast troughs of 2.6 %, deformations of the body of the embankment (sediments, alloys) of more than 30 %, and depths of more than 12 %. The rest are water washes, landslides, landslides, mudslides, karst, ice [2].

Laying the geogrid on the main site of the roadbed is performed during the repair of the path (modernization, reconstruction, major repairs) in two ways.

Fig.1. Protection of roadbed slopes

The mechanized complex should significantly speed up and reduce the cost of repairing the track using a volumetric geogrid, since there will be no need to remove the rail grid, the planned laying capacity should be approximately 100-150 m / h, the costs associated with closing the stretch will be reduced more than twice, the time of preparatory earthworks for laying geomaterials, their installation, filling and compaction will be reduced, the number of track workers will be reduced significantly, manual labor will be significantly reduced [3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.18.19.20].

The original technological solution that made it possible to significantly simplify the mechanized technology of laying was the filling of crushed stone-gravel-sand mixture using the applied technology before the complex reaches the repaired site.

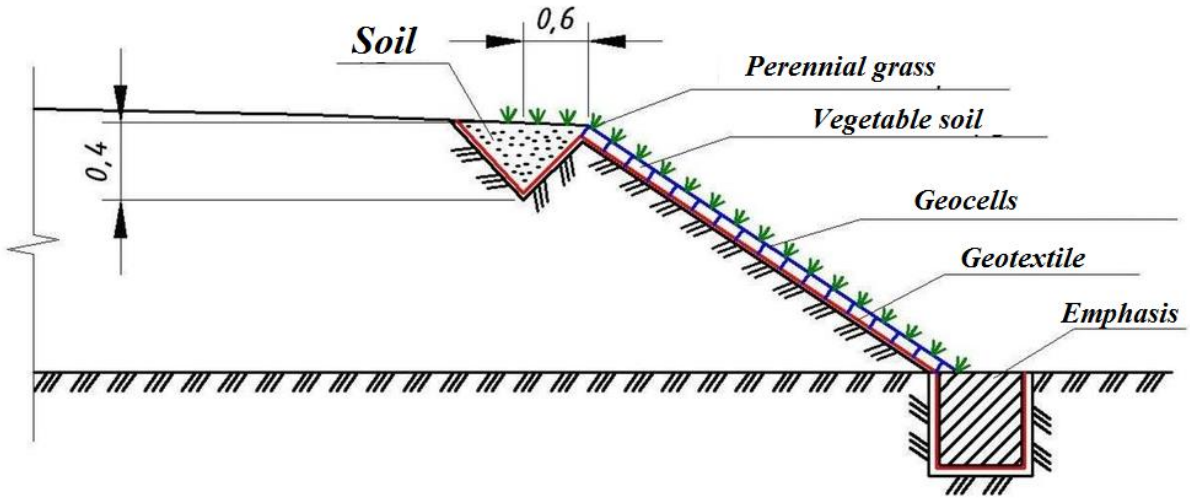


Fig.2. Strengthening of slopes of embankments with the use of joycec.

Stacked between the gravel prism and the upper platform of the subgrade intermediate protective layer performs several important functions: it works as a filter, preventing the penetration of pollutants on the upper area of the subgrade; receiving very little rainfall; increases frost heaving of the ground on the way; with sufficient thickness and proper sealing has a high load-bearing capacity, the load evenly; acts as a shock absorber, absorbing the vibrations during the passage of rolling stock.

To strengthen the main site of the roadbed, a number of methods are used: injection of cement mortar, mixing of soils, modification of the properties of clay by liming, and reinforcement.

To ensure the safety, reliability and profitability of Railways, optimal technologies should be applied, especially in conditions of increasing traffic volumes, increasing axial loads and train speeds.

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# MAINTENANCE OF WATER PIPES ON THE RAILWAY

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**Annotation:** In this article, we consider the case of waterproofing pipes, the most common type of artificial structures located in the railway network.

**Key words:** Artificial structures, waterproofing pipes, small bridges, reinforced concrete, concrete and iron pipes.

**Introduction.** The role of Railways in the development of the country's economy, the increase in export potential and the supply of goods to consumers is of great importance. It is not surprising that the railways are called the blood vessels of the country's economy. Therefore, great importance is attached to the development of railway networks and the maintenance of Railways in operation and the maintenance of cargo capacity at the required level [1.2.3.4.5.6.7.8.9.10]. Pipes under the embankment on the railways and make up half of all artificial structures, and these are the most common artificial structures.

Water-permeable pipes are divided into types of reinforced concrete, concrete and iron pipes [11.12]. According to the mode of operation, there are pipes with no pressure, half-pressure and no pressure. In order to regulate the flow of water, to ensure the smoothness of its flow and to prevent longitudinal displacement (elongation) of the pipe elements during the landslides of the raised flanks, the inlet and outlet sections of the pipe are equipped with hoists. During the study period, Tashkent-Sirdarya direction was chosen as the experimental site. This is because the lines direction is characterized by high-speed and high-speed trains. For this reason, the technical case of the road in such networks is of great importance. We can see the case of artificial structures in the railway network from the Table 1 below [13.14.15.16.17.18.19.20].

1- Table

| № | Case of a water-conducting pipe | Number | Percent % |
|---|---|---|---|
| 1) | Without pressure | 36 | 59 |
| 2) | Half-pressure | 2 | 3 |
| 3) | Pressurized | 23 | 38 |

Water pipes have a significant margin of safety, but in the absence of systematic inspections and timely repairs, sudden serious violations may occur, which require significant costs to eliminate.

Water pipes should be carefully inspected after each heavy downpour and passage of spring water in order to establish the safety of the fortifications of the bottom of the log, entrance and exit holes and embankment slope, as well as to detect possible washouts, landslides and filtration of water into the body of the embankment. If the embankment is filled out of dusty soils, then if water is filtered into its body, it creates a threat of erosion.


1-Figure. Condition of water pipes on the railway track
a) clogged water pipes headings; b) water pipes cleaned headings.

It is very important to keep the approaches to the pipes in good condition. If the attachment of the embankment slopes and the tray at the pipe heads is in poor condition, it is strongly silted up with particles of eroded soil. Wash outs of the embankment slopes lead in some cases to the separation of the heads from the pipe. In pipes laid on permanent water courses, to ensure the normal passage of water, it is necessary and cleaning of ice to avoid filling the entire opening of the pipe.

With the onset of spring, the pipe openings are opened, the channel is cleared, and the slopes above the pipe heads are cleared. It is necessary to monitor the flow of melt water to prevent congestion and clogging the channel with floating objects.

Conclusion. It is necessary to formulate data (puteizmeritelny train) from the train № 106 road inspection on the impact of railway tracks on the water-conducting pipes from the network of high-speed and high-speed trains and conduct detailed inspections of the state of water-conducting pipes.

Such checks help for high-speed and high-speed trains smooth movement and passenger safety.

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# METHODS OF SEISMIC RESISTANCE OF RAILWAY ROADBED

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Mirxanova Mavjuda Mixayilovna
Embergenov Avezmurat Bekmuratovich

**Annotation:** Based on the analysis of damage to earthen engineering structures and special studies, specific and economically acceptable proposals for the design of the railway roadbed have been developed.

**Key words:** railways, earthen engineering structures, roadbed, low-intensity earthquake.

An earth bed is an engineering structure made of soil, on which the upper structure of the railway track is located. The roadbed receives static loads from the upper structure of the track and dynamic loads from the rolling stock and elastically transfers them to the base. In addition, the roadbed is designed to align the earth's surface within the railway track and give the track the necessary plan and profile. The roadbed is the most important element of the railway track, its load-bearing structure, on the reliability of which depends technical speed of trains and allowed static load on the rails, transmitted from the wheelsets of the rolling stock, the capacity and carrying capacity of the line. The roadbed must be strong, stable and durable, require a minimum of costs for its construction, maintenance and repair, as well as provide the possibility of extensive mechanization of work. An increase in trainloads and train speeds is possible with high strength and stability of the roadbed objects. The roadbed, being an open dynamic geotechnical system, functions in the following conditions difficult natural and climatic conditions, which negatively affects the state of the soil environment. Therefore, ensuring the stability of the roadbed is a complex problem that requires optimal technical solutions[1.2.3.4.5.6.7.8.9.10].

The roadbed is affected by loads from the rolling stock, the weight of the upper structure of the track, taking into account the drain prism and the weight of the overlying soil layers of the roadbed itself. The load from the rolling stock is temporary, and from the weight of the upper structure of the track and the ground of the roadbed – constant. Load from rolling stock on the main site of the earthworks the web is transmitted through the sleepers and the ballast layer and depends on the method of its transmission. During different periods of track operation, the pressure on the main platform can be different and have a maximum under the end parts of the sleeper in the sub-rail zone or along the track axis under the middle part of the sleeper[11.12.13.14.15].

The most unfavorable case for calculating the required soil density and stability of the roadbed is the case of a uniform load of the main platform of the roadbed, the width of which B0 is equal to the length of the sleeper lsh or the width of the slab base, the intensity of, equal to the permissible stress on the main platform of the roadbed. In this case, the end sections where the stress plot disappears are replaced by the corresponding rectangular section (Figure 1).

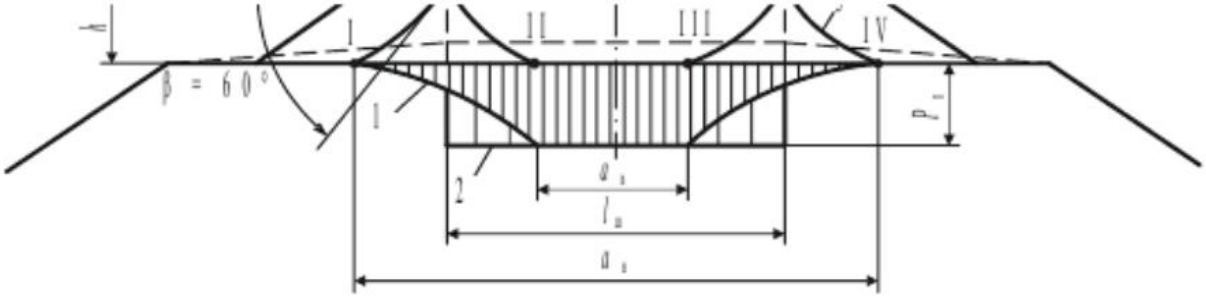

Figure 1-Diagram of the load transfer from the rolling stock to the main platform: I-IV – pressure transfer points to the main platform; 1-actual load plot; 2-conditional plot; 3-pressure propagation cone.

Table 1 - Weight of the upper structure of the track

| Type of rails | $P_{вс(2)} = P_{вс(1)}$, кН | | | $B_0$, м | | | $P_{вс}$, кПа | | |
|---|---|---|---|---|---|---|---|---|---|
| | sleepers | | reinforced con slab | sleepers | | reinforced con slab | sleepers | | reinforced con slab |
| | Wooden | reinforced con | | Wooden | reinforced con | | Wooden | reinforced con | |
| P75 | 72,5 | 77,0 | 88,0 | 4,50 | 4,50 | 4,20 | 16,1 | 17,1 | 21,0 |
| P65 | 67,0 | 71,5 | 88,0 | 4,35 | 4,35 | 4,20 | 15,4 | 16,4 | 21,0 |
| P50 | 62,0 | 66,5 | 87,5 | 4,2 | 4,20 | 4,20 | 14,8 | 15,8 | 20,8 |

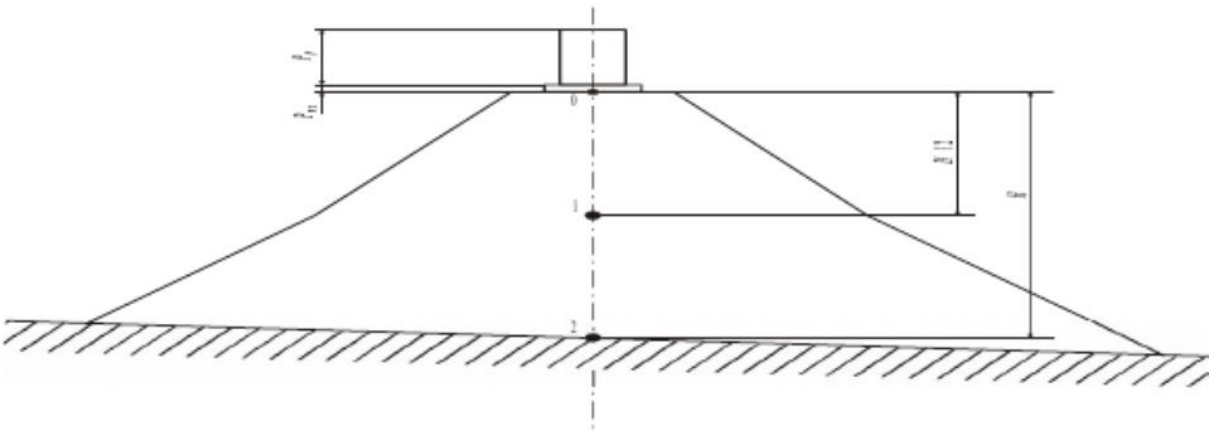

Figure 2-Design scheme of loads from the rolling stock and the upper structure of the track[16.17.18].

Therefore, arranging a ground seismic-insulating layer in the ground bed with dynamic characteristics significantly different from the main ground, it is possible to change the frequency and shape of vibrations of structures within a wide range, which is why the value of the seismic load on the ground bed will decrease.

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# CULVERTS ON A HIGH-SPEED SECTION OF A RAILWAY LINE

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**Abstract:** This article shows the hydraulic calculation of culverts, which are the most common type of artificial structures in roads and railways. For the passage of water at the intersections of watercourses with the roadbed, culverts are arranged, which, depending on the topographic, hydrological, geological and other conditions, can be of various types.

**Key words:** Culverts, bridges, pipes, chutes, duckers, earthwork.

**Introductions**. The role of Railways in the development of the country's economy, the increase in export potential and the supply of goods to consumers is of great importance. It is not surprising that the railways are called the blood vessels of the country's economy. Therefore, great importance is attached to the development of railway networks and the maintenance of Railways in operation and the maintenance of cargo capacity at the required level [1.2.3.4]. Pipes under the embankment on the railways and make up half of all artificial structures, and these are the most common artificial structures. The scope of application of the pipes is mainly due to the fact that small running water flows from time to time, that is, when it rains and snow melts, ensure that the dressing waters pass without damaging the railway network [5.6.7.8.9].

The main regulatory documents in the design of culverts are building codes and regulations. Culverts are designed to pass the maximum estimated costs of a certain probability of exceeding. The probability of exceeding is determined depending on the type of road (railway, automobile), the type of structure (bridge, pipe), the category of road (I, II...V). As a result of hydraulic calculations, the following parameters should be established that determine the main dimensions of the structures [10.11.12.13].:

a) the greatest depth in front of the structure, which determines the height of the road embankment;

b) the depth of water at the entrance and in the structure, which determines the mode of flow and filling of the water pipe;

c) the depth of the water and the speed at the exit of the structure, according to which the size and type of fortifications at the exit are assigned;

d) the depth of erosion at the end of the fortifications, the size of which is assigned to the dimensions of the structures of the water-breaking elements. The required hydraulic and structural conditions can be met by different versions of culverts that differ in cost. The optimal construction option should be established by a technical and economic comparison of the options[14.15].

By hydraulic operation, culverts are classified:

1. According to the conditions of the flow entrance, flat and sloping pipes are distinguished.
2. By the nature of the roughness of the inner surface of the pipe:
- technical, smooth (concrete, reinforced concrete, cast iron, etc.);
- corrugated (metal, plastic, etc.).
3. By the effect of length on throughput:
- short, in which the length does not affect the throughput;
- long, in which the length affects the throughput (Figure 1).

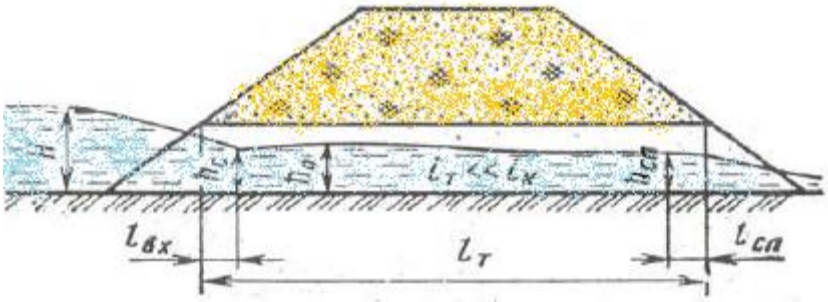


Fig. 1. Flow diagram of water in the pipe:

H – head in front of the pipe; $h_c$ – flow depth in the compressed section; $h_0$-normal water depth; $h_{sl}$ – water depth at the beginning of the discharge section; $l_{xx}$ – length of the inlet section; $L_T$ – the length of the pipe; $l_{sl}$ – the length of the drain section; $i_T$ – the slope of the pipe; $i_k$-the critical slope[16.17].

**Methods**. Culverts operate depending on the amount of water intake in front of the pipe in non-pressure mode, semi-pressure mode and in pressure mode. Non-pressure mode of operation is formed if the backstop is less than the height of the pipe at the inlet or exceeds it by no more than 20%. In the non-pressure mode, the free surface above the flow is preserved and calculated by the formula:

$$Q_c = \varphi_в * \omega_c * \sqrt{2 * g * (H - h_c}$$

$Q_c$ – flow rate of water passing through the structure;

$\omega_c$ – the area of the compressed section in the pipe, calculated at $h_c$= 0.5H;

$\varphi_B$ – speed coefficient in non-pressure mode, $\varphi_B$=0,82;

For rectangular pipes: $Q_c$=1.35b$H^{3|2}$.

The semi-pressure mode is formed when 1,2$h_T$<H<1.4$h_T$

In the semi-pressure mode, the free surface above the flow is preserved. A funnel is formed in front of the pipe, in which all floating objects that can clog the holes of the pipe can be tightened. Semi-pressure mode is unstable, it can break down to non-pressure or pressure mode.

$$Q_c = \varphi_в * \omega_т * \varepsilon * \sqrt{2 * g * (H - h_c)}$$

$h_c$=0.6$h_T$

$h_T$ – pipe inlet height;

$\varphi_p$ – speed coefficient of the semi-pressure mode $\varphi_p$=0,85

$\omega_T$ – total cross-sectional area of the entrance;

$\varepsilon$ – the coefficient of lateral compression; $\omega_T$ it is easy to calculate for both circular and rectangular cross-sections.

The pressure mode is formed at H>1.4$h_T$. At the beginning of the pipe, a vacuum zone is formed at the entrances of the head, which can lead to the destruction of the embankment above the pipe. In order to eliminate the vacuum zone, the inlet head is arranged with a curved outline so that the flow smoothly enters the curve.

$$Q_c = \varphi_в * \omega_c * \sqrt{2 * g * (H - h_c) - (i_w - i)}$$

$\Phi_H$=0,95 – the speed ratio of the pressure mode;

l и i – the length and slope of the pipe;

$i_W$ – the slope of the friction;

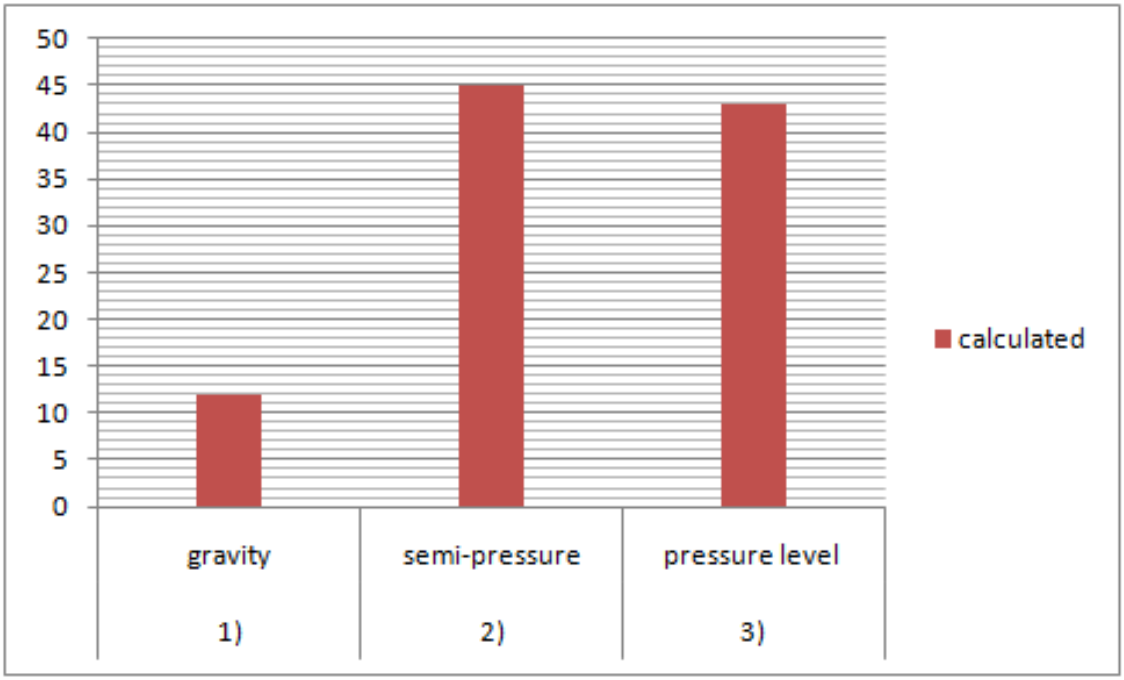
$i_W=Q_0^2/K_0$

$K_0$ – flow characteristics of a fully filled pipe[17.18].

**Results and Discussion.** During the study period, Tashkent-Sirdarya direction was chosen as the experimental site. This is because the uchachtka direction is characterized by high-speed and high-speed trains. For this reason, the technical case of the road in such networks is of great importance. We can see the case of artificial structures in the railway network from the tables presented below[19.20].

Table-1

| № | Pipe states | Quantity KM3367-3436 pieces | % |
|---|---|---|---|
| 1) | gravity | 12 | 15 |
| 2) | semi-pressure | 45 | 49 |
| 3) | pressure level | 43 | 46 |




On the Tashkent-Syrdarya section, the design and condition of culverts are shown in 2-tables.

Table-2

| № | Pipe states | Quantity KM3367-3436 pieces | % |
|---|---|---|---|
| 1) | gravity | 36 | 59 |
| 2) | semi-pressure | 2 | 3 |
| 3) | pressure level | 23 | 38 |

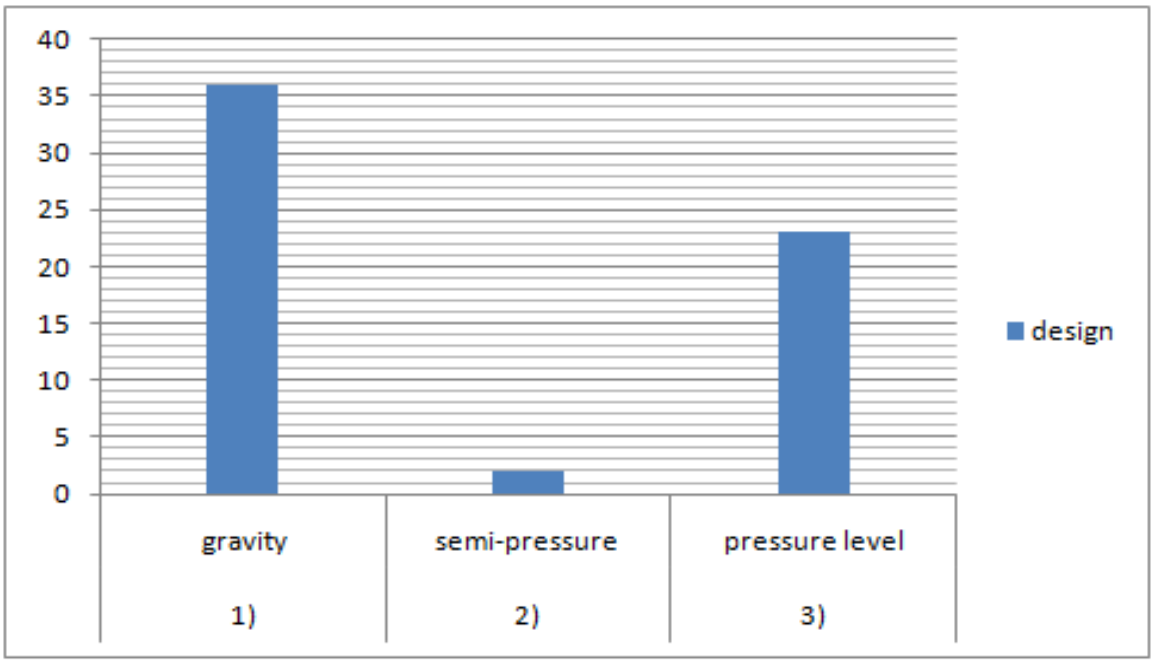
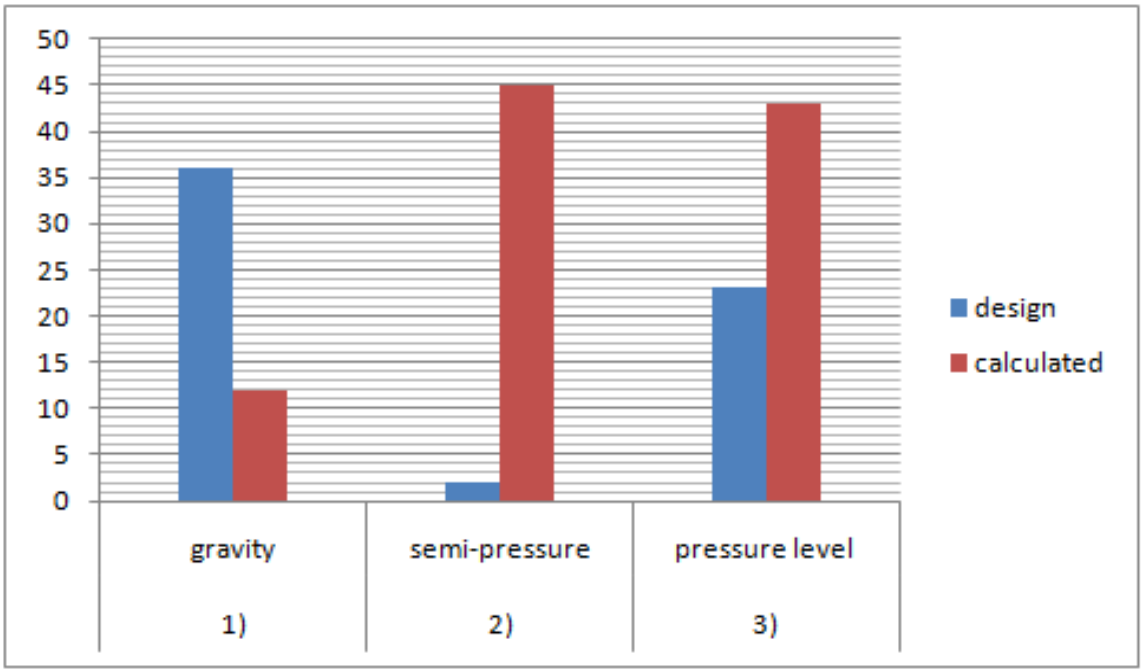



Table-3

| № | Pipe states | Quantity KM3367-3436 pieces | |
|---|---|---|---|
| | | Calculeted | Design |
| 1) | gravity | 36 | 12 |
| 2) | semi-pressure | 2 | 45 |
| 3) | pressure level | 23 | 43 |




**Conclusions.** Based on the results of culvert studies, it is necessary to study the condition of culverts located on high-speed and high-speed lines and their impact on the safety of train traffic. It is necessary to conduct detailed surveys of the condition of culverts on high-speed sections, as pipe failures negatively affect the condition of the track structure and rolling stock.

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# CHECKING THE RAILWAY TRACKBED WITH GEOLOCATION

Abdualiyev Elyorbek Begali o'g'li
Mirxanova Mavjuda Mixayilovna
Embergenov Avezmurat Bekmuratovich

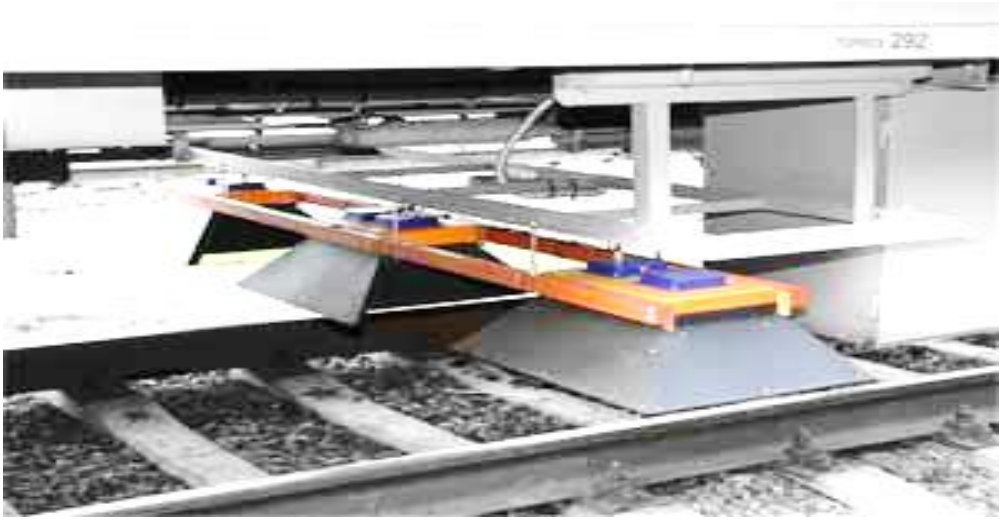
Abstract: The article deals with the scientific direction related to determining the actual state of the roadbed. Also with periodic monitoring of the roadbed during the operation of the railway track. And diagnostics of the roadbed is a system consisting of a set of interrelated elements. The economic effect of using a geophysical diagnostic system is due to the faster removal of the speed limit for trains.

Key words: Railway track, roadbed, diagnostics, train traffic, geophysical system.

Scientific direction related to determining the actual state of the roadbed, qualitative and quantitative assessment of changes occurring in it under the influence of dynamic train loads and the influence of natural and climatic factors, as well as periodic monitoring of the roadbed during the operation of the railway track, diagnostics of the roadbed is a system consisting of a set of interrelated elements. It includes: objects of research; methods and technical means of diagnostics; classification of diagnostic features (criteria for recognizing deformations); specially trained personnel who interact with the object of diagnosis according to the rules established by the relevant regulatory and methodological documentation; conclusion about the technical condition of the object with justification for its further operation or suggestions for taking urgent measures to strengthen it [1.2.3.4.5.6.7.8.9.10].

From the diagnostic point of view, the operated roadbed is divided into the following categories: category I – emergency roadbed, i.e. there are areas where major deformations have occurred and the movement of trains has been stopped (for example, alloys of slopes, destruction of embankments, karst sinkholes). In this case, there is an urgent restoration of the roadbed and at the same time, a survey is performed not only of the destroyed section, but also of the adjacent sections of the roadbed; Category II-operated sections with detected deformations of the roadbed, which are subject to warnings about limiting train speeds; category III-sections of the roadbed, located in difficult engineering and geological conditions, therefore requiring increased attention due to the possibility of manifestation of deformations on them (areas of karst, swamps, landslides, permafrost); category IV-high mounds of clay soils, which are usually potentially unreliable; Category V is a stable roadbed, but its condition must be evaluated when setting the timing of track repairs.

Depending on the category of the condition of the roadbed and operational conditions, diagnostic studies of the roadbed (the study of signs that characterize its technical condition) are divided into detailed, reconnaissance (preliminary) and regime studies. Detailed diagnostics is carried out on the objects of the roadbed with already detected or obvious signs of deformation (I, II, III categories) and aims to obtain initial data for the development of measures to strengthen the roadbed. Reconnaissance diagnostics is performed for the purpose of preliminary assessment of the object's condition and determining the need for further detailed examination (category III, IV and V). Routine diagnostics of the object (monitoring of its technical condition) is carried out periodically during the operation of the path to identify abnormal and doubtful sections (in the future they are examined in detail) and determine the timing and order of repair work. They apply to all categories of roadbed, but above all to categories IV and V. The diagnostic system contains traditional and new methods based on various physical principles (geophysical methods), and specially designed mobile diagnostic systems[11.12.13.14.15.16.17.18.19.20].



Rice.1. Application of GPR In Railways.

Traditional methods include operational observations (visual inspection, track alignment, measurements of ground mass displacements by beacons and marks, checking the position and growth of cracks); geodetic methods (levelling at the points of gates and rail heads, checking the track shift, shooting transverse and longitudinal profiles of the roadbed); engineering and geological methods (drilling wells, construction of pits, slots, clearing, soil sampling and laboratory tests to determine the physical and mechanical properties). In some cases, special mechanical methods of testing soils in the array are used. Methods of operational observations and geodetic methods characterize the external signs of deformation; engineering and geological methods determine the internal structure and condition of the soil of the roadbed; mechanical methods allow us to assess the strength characteristics of soils in the massif without sampling Using only traditional methods and the existing rates of their use. the problem of timely detection of dangerous sections of the roadbed for train traffic cannot be solved in the next decade.

Geophysical methods are the basis of the modern system of diagnostics of the earth bed, based on the study of patterns of changes in various physical fields in the soil of the earth bed, depending on their composition, properties and condition. Physical fields in the roadbed can arise from the direct effects of direct or alternating electric current through electrodes hammered into the ground (electrometric method); from the impact of shock loads (for example, a hammer) on the ground (seismic method); from a moving train (vibration method); from the radiation of electromagnetic high-frequency probing signals (radar method). The basic scheme of application of geophysical methods is as follows: excitation of physical fields in the groundbed reception and conversion of response signals (system response) registration of signals by measuring equipment automated system for processing the received information interpretation and engineering-geological interpretation of diagnostic results. Geophysical methods are usually used in conjunction with a small amount of control drilling (usually 10-15% of the total amount of drilling performed in a traditional survey), which is necessary for a more reliable interpretation and engineering-geological interpretation of the data obtained. Below is a brief description of the geophysical methods that are used in the diagnosis of the roadbed.

The electrometric method using profiling and vertical sensing allows detecting deformations of the main site in the form of ballast depressions and moistened soil zones; determining karst cavities; estimating the amount of embankment precipitation in swamps; identifying the boundaries of frozen soils in the body of embankments and their base, as well as solving a number of other tasks. Along with electrical measurements using profiling and probing techniques, when measurements are made on the surface of the roadbed, a modification of the electrometric method - electrodynamic probing (EDS) - has been developed. The essence of the EDZ is that a metal probe consisting of several interconnected pipes is hammered into the soil array at the depth being studied by the blows of the reference load. As the probe dives into the ground at certain intervals,

the depth of the current passed into the ground through the electrodes at the end of the probe is measured. The EDS method allows you to obtain not only a lithological section of the roadbed, but also data on the strength characteristics of sand and clay soils to a depth of about 5-7 m.

The seismic method in modification of profiling, longitudinal (along the path) and circular (on the slopes of embankments) sounding, x-ray (seismotomography) of the body of the embankment from opposite slopes allows solving the vast majority of problems that occur in all types of diagnostic studies of the earth bed. Among them, detailed studies of the internal structure of the roadbed, determination of water saturated zones in the embankments and the level of ground water at their base, assessment of soil properties and determination of weakened strength zones in the embankments and their base; survey of the roadbed operated in difficult engineering and geological conditions.

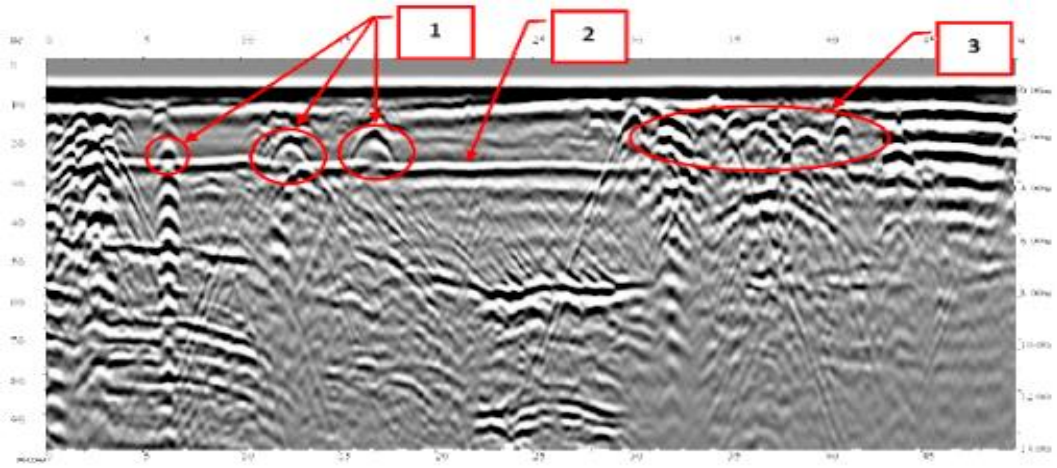
The vibration method is developed for the diagnosis of embankments, which are considered as a system that converts the input dynamic effect in the form of a train load into an output response (system response), for example, in time-varying oscillatory processes. A certain state of the operated embankment corresponds to a group of features that appear as different parameters of oscillations. As a result of research on reference objects of the roadbed, a classification of diagnostic features for various types of deformations was developed. A significant advantage of this method is the ability to assess the dynamic state of the embankment during its operation, i.e. during the impact of the rolling stock. The vibration method is used for reconnaissance diagnostics of embankments with the identification of anomalous objects; for monitoring the condition of embankments during the operation of railway tracks in the year-round cycle in order to predict their condition, including the organization of high-speed passenger trains; to detect embankments that are prone to sudden emergency deformations during the movement of the rolling stock.

The radar method is based on the use of short electromagnetic signals emitted by the radio transmitter that penetrate the ground through the transmitting antenna. Reflecting from layers of soil that have different electromagnetic properties, signals with information about the state of the environment are picked up by the receiving antenna. The echo depth of the reflecting contact is determined by the delay time between the probing and reflected signals (t) and the propagation speed of radio waves (v): h=v*t/2. The rate of propagation of radio waves depends on the dielectric permittivity of the soil (e). The difference in e values for different soils allows you to determine the boundaries between the layers of soil in the roadbed and detect various inhomogeneities. The radar method is characterized by high resolution, technology and high technical and economic indicators. This is due to the possibility of continuous non-contact measurements using the vehicle. To survey a relatively small extent of the plots is used for moving track radar complex "Geodirectory", created on the basis of the GPR (vehicle type defectoscopic bogie) and other accessories. The Geodefectoscope measuring system is designed to assess the state of the upper part of the roadbed at depths of 1.5-2 m with reference to specific pickets. Objectives: the identification of ballast recesses in the main site, the definition of the boundaries of the freezing and thawing of the soil, the allocation of plots with the ballast splashes etc. Measurements are performed continuously along the length of the path with the speed of movement of the operator 3-4 km/h is possible in principle, the location of the GPR system in the car potismedicine and receive comprehensive information on the diagnosed parameters of track structure and subgrade.

Methods of engineering analysis and computer processing of data are used in the diagnosis of the roadbed at the stage of reconnaissance surveys or monitoring the technical condition of the path for processing track measuring tapes. The technology of testing by special mobile complexes with reference loads is also used (for example, LIGO structures of NPF "Spetsmash"), which allow to assess the quality of the sub-rail base and identify potentially dangerous areas where detailed diagnostic studies need to be organized [three].

The modern system of diagnosis of the subgrade allows for the basis of assessment of its actual technical condition to substantiate the order and to set the dates of repair and reinforcement fabrics; to provide increased security of trains, which is achieved timely identification of damaged areas;

to create safe working conditions on the paths personnel, as in the application of geophysical methods using a portable handheld apparatus, and a measurement is performed outside of the envelope approximation buildings.




Rice.2. Detection of a fault in the roadbed.

During the production of works, the train schedule is not violated and the provision of technological "Windows"is not required. The economic effect of using a geophysical diagnostic system is due to the faster removal of the speed limit for trains when passing deformed sections (restrictions are removed after work on strengthening the roadbed); the exception of interruptions in train traffic due to timely prevention of sudden destruction of high embankments and the occurrence of karst failures near the track; significant reduction of expensive and time-consuming exploration work.

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# DETERMINATION OF PULSE IRREGULARITIES ON THE RAIL HEAD

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Mirxanova Mavjuda Mixayilovna
Embergenov Avezmurat Bekmuratovich

**Abstract:** In this article, the analysis of intensity of the pulse roughness's arising on a surface of rolling of heads of rails on a site of high-speed movement of trains is carried out. Rail grinding technologies in the conditions of the railway track, which allowed to form technical and technological solutions, the introduction of which makes a significant contribution to the development of the railway industry and the economy of the country as a whole by improving the efficiency of operation, maintenance and repair of the railway track by ensuring the quality of rail profiling.

**Key words:** Rail, pulse irregularities, measure, indicator, pilot area.

**Introductions**. Durability of rails, driving comfort and high-speed trains, the rolling stock is largely related to the condition of the running surface of the rail heads. In the course of movement of trains on a surface of rails there are either local, or extended roughnesses (wave-like deformation of rails). According to the accepted classification of rail defects NTD CP-2-93 the most significant are:

- undulating deformation of the rail head (defect 40);
- crumpling and vertical wear of the head (defects 41.1-2);
- lateral wear of the head in excess of the available standards (defect 44).

Undulating wear of the rails (defect 40) causes intense noise, impairs the smoothness of the train and reduces the service life of the elements of the upper structure of the track and the running gear of the rolling stock. It manifests itself as periodic irregularities on the rail head. The occurrence and development of wavy wear are the result of many factors, so there can be no single means to eliminate it. In the presence of initial wave-like defects (on new rails) in the process of dynamic effects during the movement of trains there are further development of the defect, the formation of wave-like irregularities (long waves) with an increase in their amplitude. The wave irregularities on the rail head are essential. Their origin and development are connected both with the technology of production of rails, and with the conditions and nature of their work under moving load [1.2.3.4.5.6.7.8.9.10].

For reliable detection of differently oriented internal defects of rails in the flaw detector several methods of ultrasonic testing are implemented, below are signs of detection of defects and corresponding channels of continuous control of both rail threads. This article deals with the local irregularities of the surface of the rolling head of the rails arising in the areas of high-speed and high-speed movement of trains of JSC "O'zbekistan Temir Yo'llari". At the same time, the so-called "impulse irregularities" (hereinafter referred to as in) are considered, which are measured and evaluated by the track measuring car №. 106 of the track management Department.

To study the presence, intensity and dynamics of IN accumulation randomly within the Tashkent-Samarkand line.

In accordance with the developed research methodology, at the first stage, the presence and intensity of IN is assessed at the experimental sites. Subsequently, it is planned to study the possible causes of IN, to develop recommendations for their elimination and prevention.

For the initial assessment of the condition of the rail heads in the experimental sections, the results of track measurements by track measuring car №. 106 of March 15, 2024 were used. After that, to assess the condition of the rail heads in the experimental sections, the results of track measurements by the track measuring car №. 106 of September 28, 2024 were used.

The main indicators of the state of the rail heads in the experimental sections by the presence and intensity of IN are presented in table. 1, 2.

Table 1.The number of pulse irregularities in the experimental area №1. 15.03.2024 year

| Km | Number of pulse irregularities | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Right thread with depth, mm | | | | Left thread with depth, mm | | | |
| | to 1.0 | from 1.0 to 2.0 | from 2.0 to 3.0 | more 3.0 | to 1.0 | from 1.0 to 2.0 | from 2.0 to 3.0 | more 3.0 |
| 3714 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 3715 | 0 | 0 | 0 | 0 | 1 | 3 | 1 | 0 |
| 3716 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 1 |
| 3717 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 3718 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 1 |
| 3719 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3720 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 |
| 3721 | 0 | 0 | 0 | 0 | 0 | 8 | 1 | 0 |
| 3722 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 |

For picture 1, 2 and 3 presents a graphical interpretation of the number of pulse irregularities on the rails of the experimental sections. Thus it is possible to state that on the left rail thread on all experimental sites the number of impulse roughnesses is more than on the right rail thread.

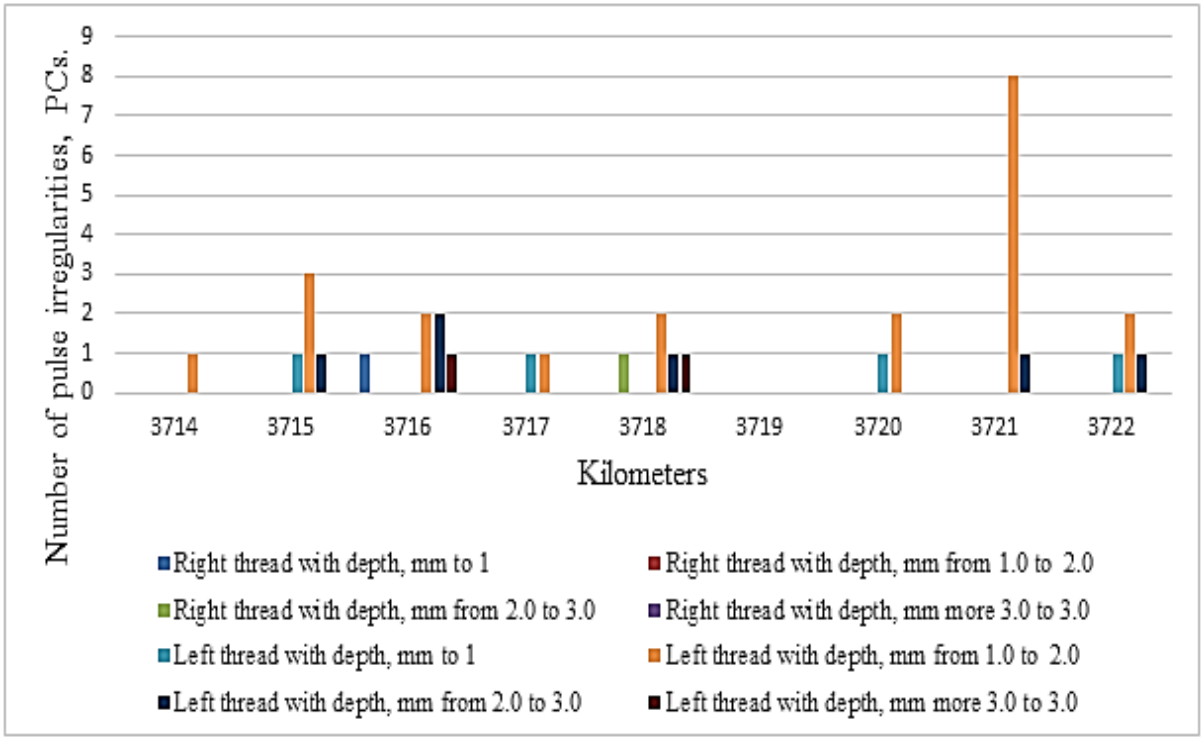


Figure 1. The number of pulse irregularities in the experimental site number 1 [11.12.13.14.15].

Table 2.The number of pulse irregularities in the experimental area №1. 28.09.2024 year

| Km | Number of pulse irregularities | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Right thread with depth, mm | | | | Left thread with depth, mm | | | |
| | to 1.0 | from 1.0 to 2.0 | from 2.0 to 3.0 | more 3.0 | to 1.0 | from 1.0 to 2.0 | from 2.0 to 3.0 | more 3.0 |
| 3714 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 3715 | 0 | 1 | 0 | 0 | 0 | 2 | 3 | 1 |
| 3716 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 1 |
| 3717 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 3718 | 0 | 0 | 0 | 1 | 0 | 3 | 2 | 2 |
| 3719 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 3720 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 0 |
| 3721 | 0 | 1 | 0 | 0 | 0 | 8 | 1 | 0 |
| 3722 | 0 | 1 | 0 | 0 | 1 | 2 | 1 | 0 |

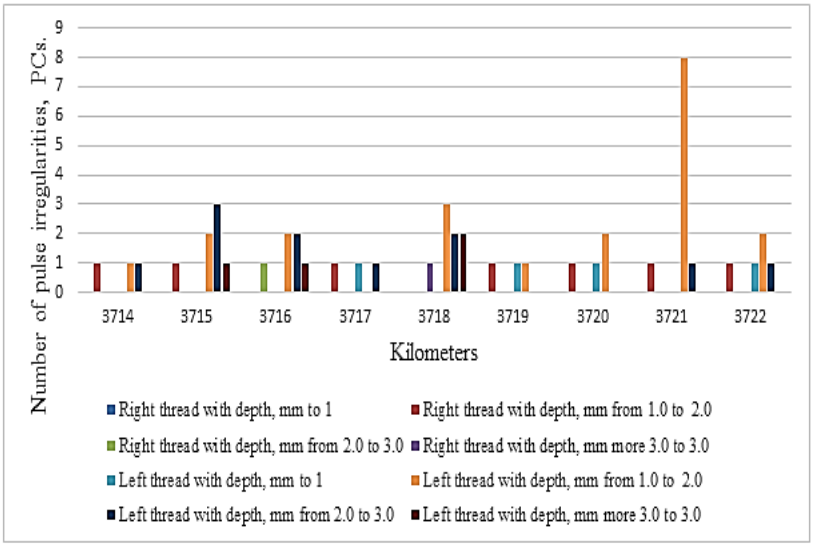


Figure 2. The number of pulse irregularities in the experimental site number 1.

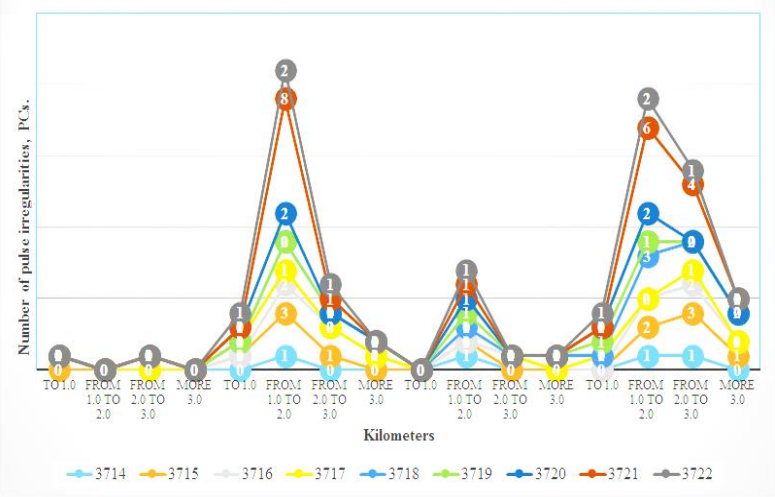


Figure 3. The number of pulse irregularities in the experimental site number 1.

The rail condition indicators are shown in table 3. At the same time, it can be noted that the intensity of pulse irregularities for all experimental sections differs significantly for the left and right rails. This fact requires additional study with the analysis of the state of the surface of the rolling rails directly at the full-scale survey of the rails of the experimental sites.

Table 3. Indicator of the state of the rails by the presence of impulse irregularities.

| Number of tests at the test site | Rail condition indicator at pilot site № 1 | | |
|---|---|---|---|
| | the left rail | right rail | two rails |
| 15.03.2024 year | 9,00 | 0,40 | 4,70 |
| 28.09.2024 year | 11,88 | 2,63 | 7,26 |

As follows from tables 1-2 the number and intensity of the manifestation of impulse irregularities associated with the speeds of trains on the experimental site. Despite the lowest missed tonnage on the rails of the experimental section 1, the intensity of the manifestation of impulse irregularities as of 28.09.2024 significantly exceeds the same indicator for other experimental sites [16.17.18.19.20].

The running surface of the rail heads in areas of high-speed trains is observed the formation of impulsnykh irregularities, which are fixed measuring system puteizmeritelny car №. 106 and the number of pulse irregularities are unevenly distributed along the path and adversely affecting the structural condition of road and rolling stock. To do this, it is necessary to grind the head of the rails of the railway track.

Based on many years of experience, German railwaymen argue that grinding rails can seriously extend the service life of metal elements of the railway web. In addition, the search is still ongoing for the grade of rail steel that will require the least frequent grinding, which will reduce the running costs of both workers and the life cycle of the rails.

Experience suggests that the damage in its most part do not arise from the actual contact of the wheel and rails, but due to the rocking of the train left and right in the direction of movement. As a result, there are dents and mesh cracks. Scientists aim to increase the operational life of the rails to 40-45 years.

In railways the following variants of grinding of steel rails are accepted:

- ✓ primary treatment of newly commissioned tracks;
- ✓ periodic grinding operations on lines where rolling stock runs at speeds exceeding 250 km / h;
- ✓ periodic processing of suburban railways of the most intensive train traffic;
- ✓ periodic processing of curves with the most significant radius, which are in the register of the basic part of the railways;
- ✓ grinding work required as needed.

Rail grinding technologies in the conditions of the railway track, which allowed to form technical and technological solutions, the introduction of which makes a significant contribution to the development of the railway industry and the economy of the country as a whole by improving the efficiency of operation, maintenance and repair of the railway track by ensuring the quality of rail profiling.

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