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РОЛЬ ЛОКОМОТИВНОГО ДИСПЕТЧЕРА В ОБЕСПЕЧЕНИИ БЕЗОПАСНОСТИ ДВИЖЕНИЯ И РЕГУЛИРОВАНИИ ЛОКОМОТИВНОГО ПАРКА

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Аннотация: Качество перевозочного процесса на железнодорожном транспорте определяется скоростью и безопасностью доставки грузов и пассажиров к месту назначения. В данной статье освещена роль локомотивного диспетчера в обеспечении безопасности движения и регулировании локомотивного парка. Сделан вывод, что непрерывный контроль передачу своевременной и достоверной информации о проследовании контрольных постов и время нахождения локомотивов в депо со стороны диспетчерского аппарата улучшает качества перевозочного процесса.

Ключевые слова: Локомотивный диспетчер, безопасность движения, информационно-коммуникационные технологии, локомотивный парк, диспетчерский аппарат.

THE ROLE OF THE LOCOMOTIVE DISPATCHER IN ENSURING TRAFFIC SAFETY AND REGULATING THE LOCOMOTIVE FLEET

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Abstract: The quality of the transportation process by rail is determined by the speed and safety of delivery of goods and passengers to their destination. This article highlights the role of the locomotive dispatcher in ensuring traffic safety and regulating the locomotive fleet. It is concluded that continuous monitoring, transmission of timely and reliable information about the progress of control

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posts and the time locomotives are in the depot from the dispatch apparatus improves the quality of the transportation process.

Key words: Locomotive dispatcher, traffic safety, information and communication technologies, locomotive fleet, dispatch apparatus.

ВВЕДЕНИЕ

С момента введения диспетчерской системы управления процессом перевозок на железнодорожном транспорте и до момента принятия программы реформирования и структурной перестройки управления железнодорожным транспортом Узбекистана формы и методы организации работы аппарата поездных диспетчеров практически не претерпевали коренных изменений. Работая круглосуточно, диспетчерский аппарат обеспечивает непрерывность перевозочного процесса на сети железных дорог Узбекистана.

Наиболее важным моментом в этом производственном процессе железнодорожного транспорта является постоянная физическая способность диспетчера успевать принимать управленческие решения, планировать и контролировать всю работу предприятий и станций обслуживаемого полигона (участка) железной дороги, в ограниченном трудовой операцией промежутке времени, обеспечивая при этом экономическую эффективность перевозочного процесса и благополучие многотысячного коллектива железнодорожников.

Цель создания автоматизированных рабочих мест (АРМ) – повышение оперативности и достоверности информации о поездной и грузовой работе, которые должны были повысить качество и эффективность управления. Своевременность и достоверность многих видов информации не достигнута еще и сегодня. Но, тем не менее, АРМы уже созданы и функционируют на железных дорогах.

Объектом управления локомотивного диспетчера является обеспечение составов локомотивами и локомотивными бригадами; регулирование эксплуатируемым парком локомотивов на участках обращения; постановка локомотивов в депо на техническое обслуживание и ремонт; вызов локомотивных бригад на работу; соблюдение режима работы и отдыха локомотивных бригад; соблюдение норм содержания и использования локомотивов.

В печати имеются ряд исследований по повышению качества перевозочного процесса на основе современных информационнқх технологий [1-27]. Однако, роль локомотивного диспетчера в обеспечении безопасности движения и регулировании локомотивного парка освещены недостаточно.

ОСНОВНАЯ ЧАСТЬ

Использование в локомотивном хозяйстве системы автоматической идентификации подвижного состава ведется в рамках автоматизированной системы управления (АСУТ). Парк локомотивов оснащается кодовыми бортовыми датчиками, и устанавливаются пункты считывания на контрольных постах депо для отслеживания захода-выхода тягового подвижного состава (ТПС) из депо. В рамках программы АСУТ автоматизированные рабочие места дежурных по депо (АРМ ТЧД) подключены к пунктам считывания САИ.

Система автоматической идентификации подвижного состава призвана поддерживать в локомотивном хозяйстве оперативную модель движения локомотивов для обеспечения отслеживания технологических цепочек в реальном времени, а также для формирования достоверной исходной информации, используемой в оперативном и стратегическом управлении на основе ситуационных и прогнозных методов.

Возникновение отказов технических средств и аварийные ситуации вызывают наибольшие трудности в работе диспетчеров. Большой помощью стало бы помещение в АРМ диспетчера алгоритмов действий в нештатных ситуациях. Это позволило бы быстрее

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находить необходимые документы, более спокойно и четко действовать диспетчеру и всем причастным работникам. То есть один из разделов АРМ диспетчера должен быть посвящен безопасности движения.

Использование наличной пропускной способности участков во многом зависит от эффективности системы регулирования локомотивным парком. В результате колебаний размеров движения поездов на технических и грузовых станциях периодически возникает превышение то числа составов, готовых к отправлению, над наличием локомотивов, то наоборот. Если система регулирования локомотивного парка не обеспечивает своевременной сбалансированности локомотивов и составов в пунктах их формирования и смены локомотивов, то в первом случае не обеспечивается своевременный вывоз составов со станций и недоиспользуется пропускная способность участков, во втором - непроизводительно используется локомотивный парк.

Основой эффективного регулирования локомотивного парка является наличие достоверного плана составообразования на период времени, который позволяет своевременно осуществить регулировочные меры. На такую же глубину времени требуется и план поездной работы, который дает информацию об изменении дислокации локомотивов. Необходимо различать следующие параметры, по которым должно вестись регулирование локомотивного парка: резервный пробег локомотивов, их перепробег между плановыми видами ремонта, своевременная постановка локомотивов на техническое обслуживание и ремонт, простой готовых к отправлению составов, сокращение объема переработки вагонов на станции и несвоевременный прием поездов.

Успешная работа единым парком поездных локомотивов на удлиненных участках обращения, рациональное использование наличной пропускной способности участков, своевременный вывоз составов со станций зависят от диспетчерского регулирования локомотивным парком. Исходной информацией для регулирования локомотивным парком являются: наличие достоверного плана составообразования на период времени, необходимый для своевременного осуществления регулировочных мер, и дислокация локомотивов.

Регулирование локомотивного парка должно вестись по следующим параметрам: резервный пробег локомотивов, пробег между плановыми видами ремонта, своевременная постановка локомотивов на техническое обслуживание и ремонт, продолжительность простоя готовых к отправлению составов, сокращение объема переработки вагонов на станциях и своевременный прием поездов.

Дежурные по депо должны иметь наглядные средства отображения и оперативной информации о дислокации локомотивов на путях депо, планировать постановку локомотивов на техническое обслуживание и ремонт, окончание работ и готовность локомотивов к выдаче под поезда. О плане готовности локомотивов под поезда дежурный по депо должен заблаговременно передавать информацию станционному и локомотивному диспетчерам.

Диспетчерский аппарат должен контролировать наличие эксплуатируемого парка локомотивов и при превышении заданной нормы своевременно отставлять в резерв управления дороги (РУД). При этом необходимо контролировать отставление в РУД только исправных локомотивов и нахождение не менее 50% резерва в депо приписки.

Диспетчерский аппарат должен контролировать передачу своевременной и достоверной информации о проследовании контрольных постов и время нахождения локомотивов в депо. При превышении установленной нормы нахождения локомотивов в депо при выполнении ТО-2, своевременно исключать их из эксплуатируемого парка.

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На сортировочных станциях контролировать необходимость захода поездных локомотивов в депо. На станциях должны быть выделены места для охраняемого отстоя локомотивов. За смену локомотивных бригад на путях станции целесообразно дополнительно премировать станционных диспетчеров и дежурных по депо.

Локомотивных диспетчеров необходимо освободить от фиксирования прошедшей работы и составления многочисленных справок и сосредоточить их работу на планировании и управлении использованием локомотивов.

Необходимо установить взаимодействие, разграничение полномочий и ответственности между локомотивными диспетчерами, дежурными по районам управления, станционным диспетчерами и дежурными по локомотивным депо.

Необходимо ежемесячно анализировать установленное время явки локомотивных бригад на работу при безвызывной системе. При необходимости обеспечить своевременную корректировку времени явки и ликвидировать ожидание локомотивными бригадами работы и отмены их вызова. Для оперативного переноса времени явки использовать все виды связи для заблаговременного оповещения машинистов. Для своевременного обеспечения составов локомотивами необходимы планы составообразования и готовности выхода локомотивов из депо под поезда.

ЗАКЛЮЧЕНИЕ

Диспетчерский аппарат разных уровней должен заблаговременно сопоставлять и приводить в соответствие число формируемых составов, локомотивов, локомотивных бригад и «ниток» графика движения (единая, сквозная технология):

а) маневровый диспетчер станции совместно с локомотивным диспетчером обеспечивает составы локомотивами, локомотивными бригадами и прикрепляет к «ниткам» графика, поездной и дорожный диспетчеры контролируют этот процесс;

б) если возможности станции для обеспечения всех составов локомотивами и локомотивными бригадами недостаточны, через поездного диспетчера подключаются локомотивный диспетчер и дежурный по району управления;

в) если возможностей района управления недостаточно, то через дорожного диспетчера подключается дорожный локомотивный диспетчер.

Выход поездных локомотивов из депо может планироваться:

а) дежурным по депо в зависимости от планов постановки локомотивов на техническое обслуживание и ремонт, окончания работ и готовности под поезда;

б) станционным (маневровым) диспетчером в соответствии с установленными нормами времени на техническое обслуживание и ремонт локомотивов;

в) локомотивным диспетчером путем равночисленного обмена: при заходе в депо одного локомотива, другой должен выходить.

Последний способ значительно облегчает диспетчерскому аппарату учет и содержание заданного эксплуатируемого парка локомотивов.

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MEANS OF CREATING A SATIRICAL AND HUMOROUS EFFECT IN POLITICAL DISCOURSE

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Abstract: This article delves into the study of literary means which help creating a satirical and humorous effect in political discourse. By analyzing comedy shows, cartoons, social media in politics, this research offers nuanced insights into satire and humor and provide examples of irony, wordplay and pun, exaggeration.

Key words: political discourse, irony, pun, wordplay, parody, exaggeration, humor.

СРЕДСТВА СОЗДАНИЯ САТИРИЧЕСКОГО И ЮМОРИСТИЧЕСКОГО ЭФФЕКТА В ПОЛИТИЧЕСКОМ ДИСКУРСЕ

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Аннотация: Данная статья посвящена изучению литературных средств, которые помогают создавать сатирический и юмористический эффект в политическом дискурсе. Анализируя комедийные шоу, карикатуры, социальные сети в политике, это исследование предлагает тонкое понимание сатиры и юмора и приводит примеры иронии, игры слов и каламбура, преувеличения.

Ключевые слова: политический дискурс, ирония, каламбур, игра слов, пародия, преувеличение, юмор.

There was adopted at the beginning of a new stage of reforms in Uzbekistan in February 2017, the "Action Strategy for the Five Priority Areas of Development of the Republic of Uzbekistan in 2017-2021" , one of the priorities is "to continue the course of further improving the system of continuing education, increasing the availability of quality educational services, training highly qualified personnel, in accordance with the modern needs of the labor market". The development of improving the competitiveness of education in the country on the national and international labor markets was also included in the Concept of Integrated Socio-Economic Development of the Republic of Uzbekistan until 2030.

Education from early childhood prior to the start of the new stage of reforms, preschool education in Uzbekistan did not receive much attention. The situation changed in 2017 when the Ministry of Preschool Education (MDE) was created. If earlier the coverage of children with this form of education was only 27%, then by the end of 2019 it had already increased to 44.5%. During this period, the number of state preschool institutions (preschool institutions) increased by 1.5 times (from 4940 to 7500), and private preschool institutions - 3 times (from 269 to 783).

The gross enrollment rate for general primary and secondary education remained at 99%. Decentralization of education In the course of reforms in secondary education, schools have restored instruction in grades 10-11. The share of teachers with higher education in general education schools exceeded 80%, which can be considered as an indicator of the quality of education. The education reform was accompanied by an increase in the salaries of secondary

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school teachers, which were increased in three stages and, as a result, increased by an average of 50%. During the reform, 4 academic lyceums were also abolished, the educational and material base of which did not meet modern requirements. And 54 lyceums, located far from universities and having low rates of graduate admission to universities, have been gradually transformed into professional colleges. At the same time, new innovative technologies of scientific and technical education are being introduced more and more in the world. In Uzbekistan, preconditions and conditions are being created for the transition to such teaching technologies, which is reflected in the Concept for the development of the public education system of the Republic of Uzbekistan until 2030. Of great importance in this direction is the creation of a system of presidential schools, where gifted children who graduated from the fourth grade according to test results are selected. Presidential schools are already operating in Tashkent, Namangan, Nukus and Khiva, schools have been opened in Bukhara, Jizzakh, Samarkand, Fergana and other regions of the Republic this year.

Specialized educational institutions with in-depth study of ICT, exact sciences, as well as aerospace and astronomy are being created. Thus, by decrees of the President, the school named after al-Khorezmi and the boarding school named after Mirzo Ulugbek were established in Tashkent at the Astronomical Institute of the Academy of Sciences of the Republic of Uzbekistan. There are also private specialized schools. And in 2017, the private school Artel global school was opened, focused on in-depth study of mathematics, physics, and chemistry. Robotics, 3D modeling and programming are also taught here.

Reforms aimed at dramatically improving and improving the quality of school education with the creation of decent conditions for teachers will be accelerated, the president said. In the New Year, 2 trillion sums will be allocated from the budget for the construction of 30 new schools, repair and improvement of the material and technical base of 320 schools. In the next two years, 250 billion soums will be allocated for the introduction of a unified system of "electronic education". “In order to radically improve the quality of education, first of all, it is necessary to bring curricula, teaching aids for teachers in line with advanced international standards,” the head of state emphasized.

- To develop children's analytical and creative thinking skills, you need to create meaningful and understandable textbooks for them. In this regard, in the next academic year in the elementary grades, on the basis of the best foreign experience, a “National Curriculum” will be introduced, which will not overload the child”. The quality of school education should be equally high both in the capital and in remote villages, the president emphasized in his message. For this, it is necessary to implement a program to provide schools in remote areas with qualified personnel and improve the quality of education.

As it has been stated above, Presidential schools operating in Uzbekistan have great opportunities for students’ further development, all the comforts to make students get qualified knowledge. There have been invited around 100 guest lecturers to teach students of these schools with the help of modern technologies, new innovative methods, internationally accepted assessment criteria is also used here.

There is an obvious difference between public schooling and Presidential ones. Capacity, real learning atmosphere, all the availability to study on a high level, long-term strategies, highly qualified professors and personnel, boarding school, extracurricular activities, working with both national and foreign literature, studying science and be capable of solving environmental and social problems can be privilege of Presidential schools.

The main tasks of the Presidential Schools:

- identification, selection and training of gifted children, creation of conditions for their all round development, as well as the disclosure of the intellectual, scientific and creative

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potential of students;

- organizing in-depth study of natural and exact sciences, mastering foreign languages, engineering and information and communication technologies, creating the necessary conditions for the development of innovative ideas and developments of students; •introduction of modern teaching methods and assessment of students' knowledge, as well as an interdisciplinary approach to teaching based on the integration of educational programs with the subsequent dissemination of positive experience in the public education system of the republic;
- implementation of vocational guidance of students, the development of their leadership and public speaking skills, critical thinking, search, analysis and processing of information, application of the knowledge gained in practice;
- ensuring the worthy participation of students in international olympiads, contests and competitions in general education subjects;
- the formation of students' feelings of patriotism and love for the Motherland, tolerance, respect for laws, national and universal values, firm convictions and outlook on life;
- establishing cooperation with domestic and foreign similar institutions of general secondary and higher education on the issues of ensuring the continuity of educational programs, further training of graduates in advanced foreign higher educational institutions and their branches in the Republic.

For the deep development of high technologies and knowledge by our youth of Uzbekistan, training of national personnel of a new formation, a new modern university with "the most advanced educational programs" will be opened in Tashkent, where foreign scientists and teachers will teach.

In Bukhara, one can see newly accommodated, furnished with all modern equipments, all comforts available Presidential school today. Highly-experienced teachers of the region, guest lecturers from the UK, New Zealand, Philippines, South Africa and Kenya are teaching students in comfortable classrooms with different modern methods which will be of great importance in their further development and learn life-long skills.

The aim of the school is preparation of future leaders, students of the nation, who will be able to win international Olympiads, competitions and get access to the best universities in the world, to educate leaders who can be globally competitive.

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THE NEED TO AUTOMATION OF THE PROCESS OF FORMATION OF THE SORTING SHEET OF THE TRAIN

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Abstract: A well-prepared sorting sheet has a positive effect on the process of disbanding the train. This article describes the existing procedure for manually compiling a marshalling slip and its impact on the work of the operator of the station technology center and the compiler of freight trains. Using a specific example, the need to automation the process of forming a wagon list is justified.

Key words: Sorting sheet, freight train compiler, sorting hills, station technology center operator, wagon listt.

НЕОБХОДИМОСТЬ АВТОМАТИЗАЦИИ ПРОЦЕССА ФОРМИРОВАНИЯ СОРТИРОВОЧНОГО ЛИСТКА СОСТАВ

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Аннотация: Качественно подготовленный сортировочный листок положительно влияет на процесс расформирования состава. В данной статье описан существующий порядок ручного составления сортировочного листка и его влияние на работу оператора станционного технологического центра и составителя поездов сортировочного горка. На конкретном примере обосновывана необходимость автоматизации процесса формирования сортировочного листка состав.

Калит сўзлар: Сортировочный листок, составитель поездов сортировочной горки, оператор станционного технологического центра, натурный лист.

INTRODUCTION

Today, achievements in the field of information technology are spreading into all areas. In particular, in recent years, a number of measures have been implemented to automate technological processes of railway transportation and certain results are being achieved in this respect.

In our republic, a number of scientists have conducted research aimed at improving the efficiency of railway transportation and ensuring traffic safety, and have achieved positive results based on their research [1-24]. However, there are cases when the need to identify technological processes that require automation without the help of foreign enterprises and organizations is not justified.

RESEARCH METHOD

Currently, the operator of the technological center of the station is responsible for the preparation of the staff schedule of JSC “Uzbekistan Temir Yollari”. For this purpose, a wagon list of the train, which is planned to be distributed, is taken out of the printer. In the left part of the wagon list, a pen is used to write the track number in the sorting yard where each train (car or group of cars) is being collected (Fig. 1).

The process of marshalling list execution in practice we will consider on the example of distribution of freight train №2634 in Figure 1 from Kandyagash station (66000) of JSC "NC "Kazakhstan Temir Yollari" to Chukursoy station (72000) of Joint Stock Company "Uzbek Railways". As can be seen from Figure 1, freight train №2634 consists of 53 wagons, and its composition should be distributed to the following stations: 1st wagon to Ablik station (72271), 2nd wagon to Sergeli station (72357), 3rd wagon to Chukursoy station (72000), 4th wagon to Bozsu station (72148), 5th wagon to Nazarbek station (72223), 6th wagon to Urtaaul station (72388), 7th wagon to Khamza station (72254), 8th wagon to Keles station (72014), 9th and 10th wagons to Rakhimova station (72374), 11th-18th wagons to Yalangach station (72117), 19th-24th wagons to Sergeli station (72357), 25-28th wagons to Yalangach station (72117), 29th wagon to Khamza station (72254), 30 - wagon to Tashkent-Yuk station (72240) wagon 31 to Sergeli station (72357) wagon 32 to Tashkent-Yuk station (72240) wagons 33-34 to Sergeli station (72357) wagon 35 -37 to Nazarbek station (72223), wagon 38 to Rakhimova station (72374), wagons 39-44 to Bozsu station (72148), 45-46 wagons to Kakir station (74227), 47-50 wagons to Bukhara 2 (73016) station, 51st wagon to Marokand station (72802), 52nd wagon to

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Chukursoy station (72000), 53rd wagon to Daliguzar station (72237). They will be unloaded through the sorting hill.

Figure 1. Sample wagon list prepared on the basis of the wagon list of train №2634 at Chukursay station.

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As can be seen from Table 1, based on the specialization of ways of the sorting yard of Chukursoy station, the track number for each section is selected based on the number of the Unified Network Sign of the station of destination of wagons on the wagon list. For example, a freight wagon with the number 98023450 will be unloaded on a specialized route at Ablik station (Figure 1) with a unique network identification number 72271Specialization of sorting park roads of Chukursoy station (See Table 1). Wagon with a single network code 72271 should be unloaded on the way 25That is why 25 is written in pen on the wagon list of the freight wagon with the number 98023450. For the following breaks, the number of the road on which they are to be drawn down is written on the wagon list in the indicated order. It can be seen that for 53 wagons, the track number is selected 53 times based on the number of the Unified Network Sign, and each break is separated by a long line (see Figure 1). Thus, a certain amount of time of the station technological center operator is spent on this process. This employee works 12 hours per shift, and during the second half of the shift (especially during the night shift) there is an increased chance of making an error when searching for a road number using the number of the Unified Network Sign. This is the first aspect of the need to automate the content sorting process. The second aspect is related to ergonomic requirements to the workplace [25].

Based on the sorting list, the train driver distributes automatic coupling of wagons to each section. During the allocation process, the train moves at a specified speed. This means that the train driver has to look through the wagon list while the wagons are moving, look for the corresponding wagon number and highlight the automatic coupling of wagons. As can be seen from Figure 1, the greater the number of wagons in the train, the smaller the height of the numbers and letters representing the information on the wagon list. In turn, this makes it more difficult for the train driver to view the data on the wagon list.

In practice, there is a situation that goes through the top of the sorting hill until the train conductor indicates the number of the decommissioned wagon on the wagon list and then searches for this wagon. In such cases, it is ordered to stop the movement of the train in accordance with the “Instructions for the operation of the sorting hill”. In most cases, after stopping the train, the sorting hill has to retreat from the pusher to the plane and the train has to be pushed back onto the hill. Therefore, the complexity of reading the information on the wagon list, stopping the train leads to increased maneuvering time and fuel costsThis, in its turn, causes an increase in loading of the sorting hill and the time of finding the cars to be processed. Thus, automation of the process of creating a wagon list for a train is one of the urgent tasks.

CONCLUSION

Manual preparation of the wagon list by writing the road number corresponding to the wagon list with a pen and dividing each section with lines leads to reduced employee productivity and violation of ergonomic requirements.

In practice, there is a situation that goes through the top of the sorting hill until the train composer indicates the number of the canceled wagon on the wagon list and then starts searching for this wagon. Due to the difficulty of reading the information on the wagon list, stopping the train results in increased time and fuel costs for maneuvering operationsThis, in its turn, causes an increase in the load of the sorting hill and the time of finding the processed cars. The above justifies the need to automation of the train sorting process.

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EXPERIMENTAL STUDY OF THE LOAD CARRYING CAPACITY OF THE "HEAD BEAM - PROTECTIVE LAYER" STRUCTURE WORKING TOGETHER

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Abstract: An experimental study to evaluate the effectiveness of the proposed improved method in order to reduce the negative impact of temporary loads exceeding the standards set in this article on the load-carrying capacity of the intermediate device. As well as to adapt them to the transfer of modern loads (by increasing the height of workers) methodology of work is given.

Key words: Bridges, overpasses, intermediate device, carriageway, load capacity, bending moment, working height, normal stresses.

ЭКСПЕРИМЕНТАЛЬНОЕ ИЗУЧЕНИЕ НЕСУЩЕЙ СПОСОБНОСТИ СОВМЕСТНОЙ РАБОТЫ КОНСТРУКЦИИ «ГЛАВНАЯ БАЛКА – ЗАЩИТНЫЙ СЛОЙ»

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Аннотация: Экспериментальное исследование по оценке эффективности предлагаемого усовершенствованного способа с целью снижения негативного влияния временных нагрузок, превышающих установленные в настоящей статье нормы, на несущую способность промежуточного устройства. А также приспособить их к передаче современных нагрузок (за счет увеличения роста рабочих) приведена методика работы.

Калит сўзлар: мосты, эстакады, промежуточное устройство, проезжая часть, грузоподъемность, изгибающий момент, рабочая высота, нормальные напряжения.

INTRODUCTION. Currently, in the practice of bridge construction in our country, there are two options for increasing the load-bearing capacity of structures, the first option is the complete replacement of load-bearing structural elements (*old regulatory documents (ShNQ 2.05.03-97 " Bridges and pipelines"), the intermediate devices designed and built and in operation will be replaced by the intermediate devices designed according to the regulations*

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currently in force in our republic (ShNQ 2.05.03-12" Bridges and Pipes") and the second the option is to rehabilitate load-bearing elements of structures (*increase load-bearing capacity, repair, strengthen*).

As mentioned above, as an improved method of increasing the load-carrying capacity of structures, the hypothesis of the "head beam - protective layer" construction working together was developed by the author. An experimental study is required to evaluate the performance of this improved method. The purpose of the experimental study is to assess the joint performance and load-bearing capacity of the existing (*old*) concrete layer and the new concrete layer laid to increase the working height of the cross-sectional samples of the highway reinforced concrete bridge and overpass intermediate devices in operation.

The interconnection of old and new concrete is mainly used in the construction of new structures using various repair and precast elements. Effective communication ensures the integrity and stability of the overall system [1]. The bond between old and new concrete can be difficult due to various factors such as differences in concrete composition, age, surface conditions and environmental exposures. However, it should be noted that the quality of adhesion and interconnection between the surfaces of old and new concrete elements is directly related to the above factors. Quality bonding is necessary to transfer stresses and strains between elements and to ensure that the structure works continuously and together as a whole system.

Here are some ways to improve the quality of the bond between old and new concrete:

1) it is necessary to thoroughly clean and wet the surfaces of the construction surfaces. Another main aspect of a quality connection is the compatibility of the type of material (*concrete grade*);

2) it is necessary to mechanically anchor the surfaces, add binders to the concrete mixture, and chemically treat the construction surfaces. Mechanical anchoring is mainly used in cases where the structural integrity of the repair or reconstruction is important;

3) in the chemical treatment of old and new concrete surfaces - binders such as epoxy resins, polyurethanes and acrylics provide an increase in surface adhesion and bonding properties;

4) the unevenness of the surfaces can also increase the interconnection and improve the contact area between the elements. Also, thermal and chemical treatment of surfaces with agents such as water or acid (H3O+) increases the bond strength by changing the properties of the surface of the structure. These tools must be used carefully so as not to adversely affect the properties of concrete.

In order to control and evaluate the quality of the connection between concrete layers, it is recommended to carry out breaking (*using dynamic and static presses*), ultrasound (*impact echo*) and microscopic control tests.

MAIN PART. In order to increase the load-bearing capacity of intermediate devices of bridge structures in operation, the interconnection of new and old (*existing*) concrete layers laid in order to increase the working height of load-bearing structural elements is provided by mechanical anchoring. . We evaluate the quality of the bond between the layers by breaking the prepared reinforced concrete construction samples using static presses.

This experimental investigation includes two stages:

- preparatory stage;
- trial stage.

At the stage of preparation for experimental testing, 12 samples of reinforced concrete structures (*2 copies of each sample with a construction height of 20, 21, 22, 23, 24 and 25 cm*) are prepared (Fig. 1).

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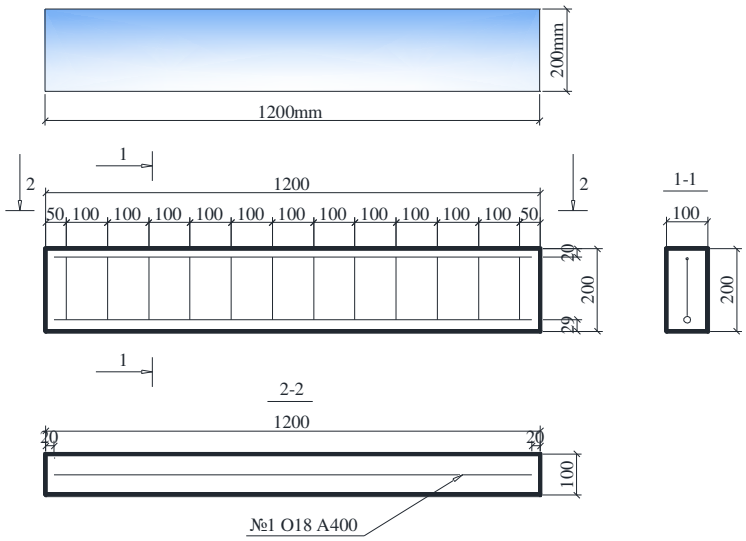

Fig. 1. Schematic view of the construction sample

The preparatory period is divided into several stages, which are carried out in turn.

1. In order to assemble the structural base of reinforced concrete construction samples, their reinforcement frames are prepared in the specified sizes based on the material consumption. Below are the material costs for the preparation of reinforced concrete construction samples (Table 1).

Table 1

Amount of material consumption for construction samples

№		Nomenclature of materials				
		Concrete M-350, m^3	Armature A240 Ø6,5, kg	Armature A400 Ø18, kg	Connector wire, kg	Emulsion oil, l
1	a	0,024	0,731	2,32	0,031	0,128
	b	0,024	0,731	2,32	0,031	0,128
2	a	0,025	1,061	2,32	0,034	0,133
	b	0,025	1,061	2,32	0,034	0,133
3	a	0,026	1,089	2,32	0,034	0,138
	b	0,026	1,089	2,32	0,034	0,138
4	a	0,028	1,118	2,32	0,034	0,144
	b	0,028	1,118	2,32	0,034	0,144
5	a	0,029	1,147	2,32	0,035	0,149
	b	0,029	1,147	2,32	0,035	0,149
6	a	0,030	1,175	2,32	0,035	0,154
	b	0,030	1,175	2,32	0,035	0,154

2. Preparation of B25 (M-350) class concrete mixture for samples - compositional mixing according to predetermined correction of material proportions (*based on the data of the laboratory of "Ko'prik sifat nazorati" LLC at the disposal of "Ko'prikqurilish" JSC*) includes (Table 2).

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Table 2

The composition of the concrete mixture for construction samples (calculation)

Name	Unity	B25 (M-350)
		Standard cost
Cement	T	0,480
Sand	m^3	0,629
Sheben	m^3	0,499
Water	m^3	0,160

**These data are given for 1 m^3 of concrete mixture*

3. Reinforcement frames are installed on the molds prepared for construction samples (1200x200x100mm in size) and concrete mixture is laid. In the process of filling the molds prepared in this process with a concrete mixture, it is necessary to control the elimination of voids and equal distribution throughout the volume of the mold. Samples are dried for 28 days in natural conditions, keeping 70-80% humidity. After 28 days, some of the samples (10 pieces) are mechanically anchored.

4. For anchoring, the upper part of the samples is drilled using special equipment and pre-made anchors are hardened. In this case, the length of the anchor is determined according to the following formulas based on the ratio of the planned height of the working height. Then, the reinforcement frame is attached to these hardened anchors.

$$L_{ank} = l_1 + a_u \quad (1)$$

$$l_1 = (h_n - h_{n-1}) \cdot k_1 \quad (2)$$

5. The upper surface of the prepared structural samples is cleaned with water (surfaces can be treated with additional chemical compounds to ensure high-quality bonding) and the arrangement of the upper part of the samples (Fig. 2, 10mm for samples 2a and 2b, Samples 3a and 3b are laid with an additional concrete mixture with 20mm...). These samples with increased working heights are also dried in natural conditions for 28 days. As a result, we will have 12 samples of reinforced concrete structures with a construction height of 200 mm to 250 mm (Fig. 2).

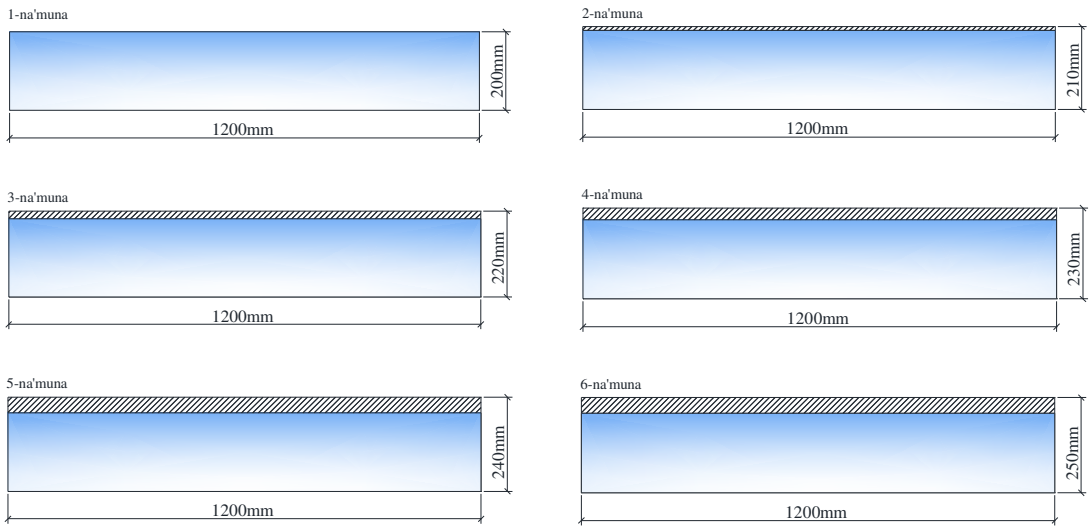

Fig. 2. Examples of increased construction height

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Ready samples of reinforced concrete structures were sent to the scientific research laboratory of the "Republic of Engineering Research and Laboratory Research Center" for experimental testing.

During experimental tests, we determine the bending deformations of reinforced concrete construction samples under the influence of temporary loads, the characteristics of reinforced concrete construction samples in bending and compression zones, the characteristics of long-term deformations in samples with and without old and new concrete layers, and the qualities of connections between layers.

When checking samples for strength and tear resistance, we accept the control load as equal to the standard load. The amount of the load during the experimental test work and the dynamics of the load increase during its application, the loading intervals were determined in accordance with the established regulatory documents (*ГОСТ 26633-2015 "Бетоны тяжелые и мелкозернистые" va ГОСТ 18105-2018" Правила контроля и оценки прочности"*) [2].

Initially, to determine the practical strength of the samples, tests were conducted using special equipment based on the relevant rules (Fig. 3). That is, the conformity of the samples to the concrete class specified in the correction of material consumption provided by the laboratory of "Ko'prik sifat nazorat" LLC, non-breakable (using the equipment IPS-MG 4.04. №407) and breakable (ONIKS-1.OC. using equipment №795) were checked using the methods and the results were recorded in the record table (Table 3).

Fig. 3. Checking the practical strength of the samples

Table 3

Results of determination of strength of samples

№	Examples	Test result				
		Concrete practical strength	Coefficient of variation	Concrete class		Age of concrete, day
Concrete strength IPS-MG 4.04. detection with equipment №407						
1	Sample №1	33.6	0.78	26.2	B25	28+
2	Sample №2	32.9	0.78	25.7	B25	28+
3	Sample №3	33.4	0.78	26.1	B25	28+
4	Sample №4	33.8	0.78	26.4	B25	28+
5	Sample №5	34.1	0.78	26.6	B25	28+
6	Sample №6	33.2	0.78	25.9	B25	28+
Concrete strength ONIKS-1.OC. detection with equipment №795						
1	Sample №1	34.1	0.78	26.6	B25	28+
2	Sample №2	34.8	0.78	27.1	B25	28+
3	Sample №3	33.9	0.78	26.4	B25	28+

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4	Sample №4	34.2	0.78	26.7	B25	28+
5	Sample №5	34.1	0.78	26.6	B25	28+
6	Sample №6	33.9	0.78	26.4	B25	28+

After determining the practical strength indicators of the samples, they were subjected to a preliminary inspection (the presence or absence of defects should be checked). In addition, it was checked that the structure samples mounted on hydraulic presses were installed on fixed supports, that the temporary load affecting the structure was evenly distributed, and that it conformed to the specified loading scheme (Fig. 4). Then, the control measuring equipment and tension sensors were checked. Cracks formed under the influence of loading on the samples were painted white to ensure transparency and measurement accuracy (Fig. 5).

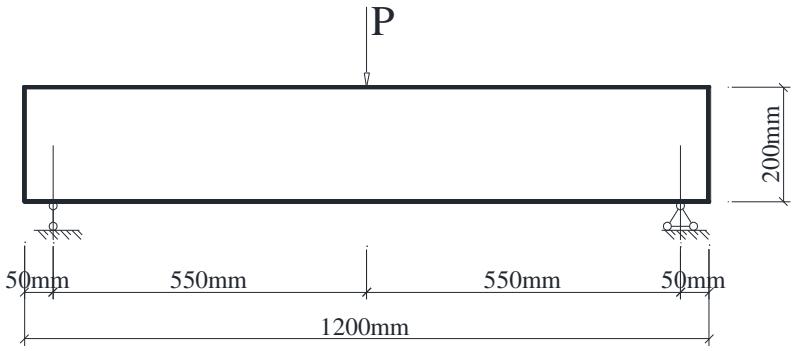

Fig. 4. Sample loading scheme

After the start of experimental testing, temporary loads were gradually loaded over time. At each stage of loading, the temporary loads were held for at least 10 minutes, the cracks that appeared on the surfaces of the structural samples were numbered, and their sizes and the indicators of the measuring instruments were recorded in the record table (Table 4).

Table 4

The results of experimental work

№	Sample test results				
	Naming of samples	Pressure, at	Loaded surface, cm^2	Placed load, kg	Increased load capacity, %
1	№1a (1200x200x100)	4.12	100	425.62	100%
	№1b (1200x200x100)	4.08	100	421.85	100%
2	№2a (1200x210x100)	4.53	100	468.18	110%
	№2b (1200x210x100)	4.53	100	468.26	111%
3	№3a (1200x220x100)	4.82	100	497.98	117%
	№3b (1200x220x100)	4.82	100	497.78	118%
4	№4a (1200x230x100)	5.19	100	536.28	126%
	№4b (1200x230x100)	5.14	100	531.53	126%
5	№5a (1200x240x100)	5.56	100	574.59	135%
	№5b (1200x240x100)	5.47	100	565.28	134%
6	№6a (1200x250x100)	5.77	100	596.94	141%
	№6b (1200x250x100)	5.67	100	586.37	139%

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The process of loading reinforced concrete structures continued until the structural integrity of the samples was broken, that is, until they broke (Fig. 5).

Fig. 5. Sample testing process

The results of the conducted experimental tests showed that the new concrete layer and the old concrete layer are not able to work perfectly together as a whole system. However, the load-carrying capacity of structures with an increased working height with the help of an additional concrete layer increased from 11% to 41%, respectively, compared to the load-carrying capacity of samples prepared without an additional concrete layer (Fig. 6). From this, it can be concluded that increasing the working height of operational highway bridges and overpasses can be a technically and economically alternative option compared to other methods of increasing the load carrying capacity.

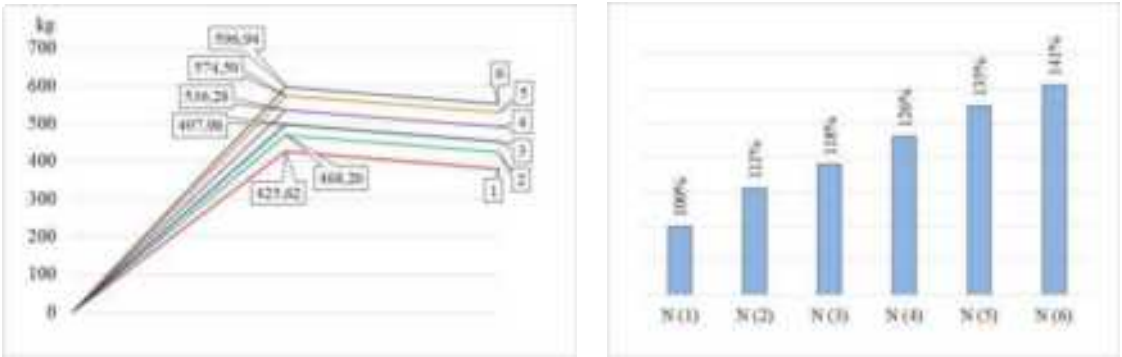

Fig. 6. The effect of increasing working heights on load carrying capacity

From the above figure, we can see that the experimental tests carried out, in proportion to the theoretical calculations presented in the previous section, vary within the margin of error of 3-5%, showing the reliability of the results of 95-97%. To increase the accuracy of these results,

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it is advisable to carry out further checks using special software. Therefore, the repeated inspection works carried out with the help of software serve to increase the level of accuracy and reliability of the results obtained as a comprehensive inspection.

CONCLUSION

Manual preparation of the wagon list by writing the road number corresponding to the wagon list with a pen and dividing each section with lines leads to reduced employee productivity and violation of ergonomic requirements.

In practice, there is a situation that goes through the top of the sorting hill until the train composer indicates the number of the canceled wagon on the wagon list and then starts searching for this wagon. Due to the difficulty of reading the information on the wagon list, stopping the train results in increased time and fuel costs for maneuvering operationsThis, in its turn, causes an increase in the load of the sorting hill and the time of finding the processed cars. The above justifies the need to automation of the train sorting process.

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ANALYSIS OF EXISTING TYPES OF CAR BRIDGE WATERPROOFING AND THEIR DEFECTS

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Abstract: This article presents an analysis of the causes of defects and damages in the waterproofing systems and deformation seams of highway bridges and overpasses, as well as the resulting corrosion, as well as the negative impact of this corrosion on existing reinforced concrete and metal structures. Also, the types of waterproofing materials, the process of operation and their effectiveness were analyzed, and conclusions and recommendations on the use of modern waterproofing materials were developed.

Key words: Bridges, overpasses, carriageway, load capacity, bending moment, working height, defect and damage, overpasses, waterproofing, bitumen, membrane, road construction

СУЩЕСТВУЮЩИЕ ВИДЫ ГИДРОИЗОЛЯЦИИ МОСТОВ И АНАЛИЗ ИХ ПОВРЕЖДЕНИЙ

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Аннотация: В данной статье представлен анализ причин возникновения дефектов и повреждений в системах гидроизоляции и деформационных швов автомобильных мостов и путепроводов, а также возникающей в результате коррозии, а также негативного влияния этой коррозии на существующие железобетонные и металлические конструкции. Также были проанализированы виды гидроизоляционных материалов, процесс эксплуатации и их эффективность, а также разработаны выводы и рекомендации по использованию современных гидроизоляционных материалов.

Калит сўзлар: Мосты, эстакады, проезжая часть, грузоподъемность, изгибающий момент, рабочая высота, дефект и повреждение. эстакады, гидроизоляция, битум, мембрана, дорожное строительство

INTRODUCTION

Waterproofing is a building material that serves to protect construction structures, buildings and structures from the effects of water and other aggressive (corrosive) environments. Waterproofing works ensure normal use of buildings, structures and equipment, and increase their service life.

According to the function of waterproofing - anti-filtration, anti-corrosion, according to the type of the main material used - bituminous, plastic, mineral, metal coating, according to the

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coating of the working surface - it is divided into types such as paintable, plastered, glued, poured, soaked, injected.

The strength and durability of highway bridge structures directly depends not only on the quality of the structures, but also on the quality of the waterproofing material and its installation technology. Consequently, 31-32% of the defects and damages in the reinforced concrete constructions of highway bridge structures in operation in Tashkent city and Tashkent region alone were caused by insufficient functioning of waterproofing systems (Fig. 1).

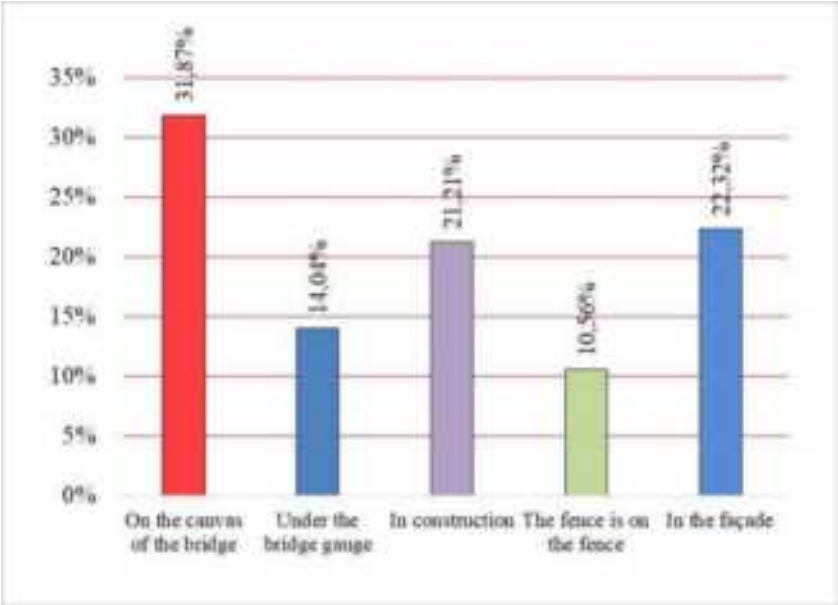

Fig. 1. Distribution of defects in highway bridges

It should be emphasized that only high-quality waterproofing system protects reinforced concrete and metal structures from corrosion caused by water, moisture and aggressive environment. As a result of precipitation, water entering the reinforced concrete structure dissolves calcium hydroxide (Ca(OH)2), which ensures the strength of the structure, and other chemical elements (components) in the concrete. As a result, the structure of the construction is damaged and its strength decreases. Especially in the cold months of the year, the water that enters the spaces of the reinforced concrete structure freezes and causes the concrete to crack due to its increased volume. The presence of water chlorides in reinforced concrete causes the corrosion of the reinforcement and, as a result, weakens the strength of the highway bridge elements. If we take into account the practice of melting ice and snow with salt in urbanized areas, the decrease in strength of structures as a result of damage accelerates the process [1].

As we said in the previous section, corrosion caused by defects and damage in waterproofing systems and deformation seams destroys at least 4-5% of existing reinforced concrete and metal structures every year (Figures 2-3). This indicator will cost tens of thousands of additional jobs across the country. Usually, the cost of the waterproofing system is about 2-3% of the construction cost of the structure. This is a relative indicator, depending on the complexity of the construction process, the level of use of modern materials and technologies, it can reach 9-10%, respectively [4, 9].

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Fig. 2. Damage to the structure caused by malfunctions in the waterproofing system

Fig. 3. Defects and damages caused by deformation seams

There are many types of waterproofing materials, and choosing the right type of it during construction and assembly work is an important factor in increasing the durability of reinforced concrete and metal structures. Types of waterproofing materials are selected depending on the local conditions and climatic conditions of the construction area.

In recent years, companies producing waterproofing materials in the world are seriously approaching the issue of maintaining reinforced concrete structures based on the achievements of modern science and the latest production technologies.

Today, as a traditional waterproofing material in the construction of bridges in our country, we will mention below the waterproofing materials that are widely used in construction:

– *Polyurethane;*
– *Mineral mixture;*
– *Insulated roll;*
– *PVC (polyvinyl chloride);*

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– Bituminous waterproofing membranes.

Polyurethane is a waterproofing material with a liquid membrane, one of the main advantages of which is that this material ensures seamless installation on the upper surface of the intermediate device. Also, the polyurethane liquid membrane fills all the capillary cracks on the surface of the reinforced concrete structure and hardens the concrete surface.

Waterproofing materials with a mineral mixture are made on the basis of cement, clay and other viscous minerals, and are produced in the form of cement and silicate paints, hydrophobic coatings, clay-concrete fillers. They are used in painting and plastering of protected materials, as well as anti-filtration fillers. Mineral mixture waterproofing materials consist of solid and liquid: mineral powder, sand particles, polymer liquid, organic and inorganic chemical compounds. As a result of the interaction of chemically active substances, a waterproof layer is formed on the upper surface of structures [3].

Izol roll waterproofing material is widely used in regions with a relatively cold climate. This material is applied based on rolled insulation and cold insulating mastic, glued between the layers reinforced with reinforcement and between the rolled layers. In continental regions with a harsh climate, rubber-quality roll waterproofing materials are usually used. The composition of the roll material consists of technical rubber.

PVC is a common waterproofing material membrane made of polyvinyl chloride. One of the main advantages of this material is its simplified installation technology and long service life. The basis of PVC waterproofing material is fiberglass polyester [3].

Bituminous waterproofing material is used from diluted bitumen's (bitumen lacquers and enamels) or water-soluble bitumen's (bitumen emulsions, pastes) and is applied directly to the surface of protected materials. Waterproofing materials with bitumen mastic can be used in different climate zones.

"Mostoplast" is a rolled material based on modified bitumen, designed to create a waterproof protective layer on the surfaces of reinforced concrete bridge structures. Advantages: high flexibility, long service life, uncomplicated construction and assembly process, heat capacity and high technical characteristics. Roll insulation was used as a waterproofing material on the Trotsky bridge in St. Petersburg. Mostoplast was used as a waterproofing material on the Alexander Nevsky, Dvortsovy, Ushakovsky, Birjevoy, Poselev bridges in St. Petersburg. Modified types of Mostoplast waterproofing material were widely used in the construction and reconstruction of bridges in many other cities of Russia (before the reconstruction, ergobit materials were also used as waterproofing in most of the bridges.

In addition, metal materials, brass, copper, lead, and steel sheets were used as waterproofing materials. In today's modern construction industry, highly elastic and non-crack able plastic, glass-plastic, bituminous-polymer waterproofing materials are widely used. For example, plastic, epoxy resin, polyester, polyvinyl and other types of lacquers, polymer solutions, polyethylene, polyvinyl chloride curtains, rubber sealants, rubber tapes, and fiberglass can be mentioned [3].

Depending on the installation technology of the above-mentioned waterproofing materials, we can divide them into two (glued and applied) groups.

First group: One of the main disadvantages of glued waterproofing materials is the presence of seams and joints. In addition, in order for these materials to stick to the intermediate devices

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firmly enough, the complexity of the processing process with the help of a high level of heat (Fig. 4). This, in turn, creates additional difficulties for the builders during the construction assembly process. An increase or decrease in temperature beyond the specified standards may cause the structures of the waterproofing materials to be glued to be damaged or, on the contrary, not to adhere firmly to the surface of the structure.

Fig. 4. The installation process of adhesive waterproofing materials

Second group: In contrast to adhesive type materials, membrane materials in a liquid (applicable) state have several advantages. As a result of the installation of these materials in a liquid state, they form a monolithic and fully connected membrane over the entire surface of the bridge structure. That is, the liquid waterproofing membrane works as a seamless system along the surface of the structures due to the even distribution of any complex geometric shapes of the elements of the bridge structure over the entire surface (Fig. 5). As a result, this membrane waterproofing system prevents the migration of water and aggressive environment to the structural elements of the building even in any extreme climate. One of the main advantages of liquid bridge waterproofing membranes is their high efficiency; the membrane provides a high-quality chemical bond between the surface of the bridge structure and the surface of the asphalt pavement.

Also, by using waterproofing membrane products applied in liquid state, it is possible to achieve a number of cost reductions. That is, the installation process of liquid waterproofing material is simple and effective. Also, when construction and installation works are carried out using cold and liquid waterproofing membranes, it will be possible to avoid potential risks arising during heat treatment. These types of potential hazards force many construction regions to adopt additional regulations for the assembly process. For example, in most areas, general contractors must hire specially trained workers and fire safety inspectors to permit heat treatment processes and supervise the work. This, in turn, causes additional expenses to increase.

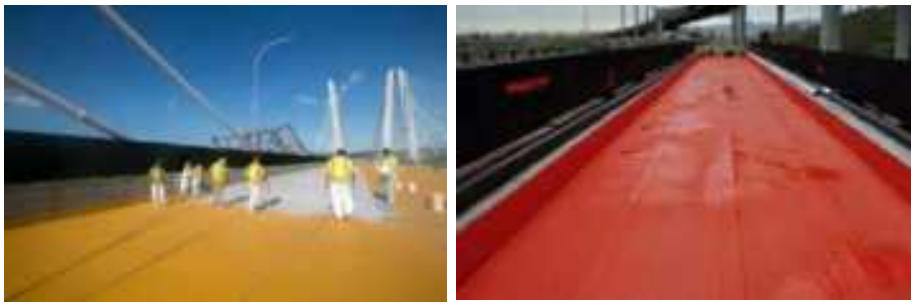

Fig. 5. Installation process of applied waterproofing membranes

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Liquid-applied or applied waterproofing membranes are currently used by many construction organizations around the world on highway and railway bridges. In particular, on road and rail bridges in Great Britain (BBA HAPAS UK and Network Rail UK), on road bridges in France (CEREMA and SNCF), Belgium (UBATC-ATG), Finland (SILKO), It is widely used in countries such as Poland (IBDM), USA (AREMA), Australia (NSW), China, Canada, Sweden, Czech Republic and India. The «Sika» consortium of the Federal Republic of Germany «Icosit» series of waterproofing materials mainly produces modern and modified types of this type of waterproofing materials.

CONCLUSION. Currently, the tendency to reduce the cost of construction while developing new waterproofing materials and improving existing types is considered urgent. Therefore, only waterproofing materials containing modern components can protect bridge constructions from wet and aggressive environment in a high quality and reliable manner. It should be emphasized that the use of modern waterproofing materials and technologies in the processes of construction, reconstruction and capital repair of bridges is of particular importance. After all, the construction and assembly works performed because of the combination of traditional and modern technologies serve to increase the service life of transport structures, the durability, safety and strength of reinforced concrete and metal structures.

In accordance with the modern trends of the world bridge construction, it is recommended to use liquid waterproofing membranes as waterproofing materials in the road section of the structures, based on indicators such as technical-economical and aesthetic appeal.

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