Spectrum Journal of Innovation, Reforms and Development
Volume 25, March, 2024 | ISSN (E): 2751-1731
Website: www.sjird.journalspark.org

"PENOPLEX" THERMAL INSULATION PLATES AND THEIR AREAS OF APPLICATION

Abdullayev Ikromjon Aminjanovich
Andijan Institute of Economy and Construction
Assistant of the Department " Civil Engineering "

Akbarov Jakhongir Nematjon ugli
Andijan Institute of Economy and Construction
Assistant of the Department " Civil Engineering "

Nomanov Mashrabjan Bohodirjan ugli
Andijan Institute of Economy and Construction
Assistant of the Department " Civil Engineering "

Abstract
Penoplex" thermal insulation plates are made by extrusion of polystyrene. The process of extrusion of polystyrene makes it possible to create a foamed material with a homogeneous structure composed of closed pores with a size of 0.1-0.2 mm.
This article provides information about "Penoplex" thermal insulation boards and their areas of application.

Keywords: polystyrene, thermal insulation, foundation, construction, deformation, roof.

Introduction

In addition to the water resistance properties of polystyrene, the foam structure provides the material with high strength, reducing thermal conductivity and water absorption. The thermal conductivity of plates at a temperature of 250C with an average density of 35 kg/m3 is at most 0.028 W/(m•0S), and at an average density of 45 kg/m3 - 0.03 W/ is equal to (m•0S).
Figure 1 shows the structure of the material under a microscope.
The low water absorption capacity of the material is explained by the structure of the plate. When saturated with water for 24 hours, water absorption is at most 0.1 - 0.2%, and at 30 days - at most 0.4%.
"Penoplex" thermal insulation boards are characterized by good resistance to water vapor pressure - the vapor permeability coefficient is equal to 0.018-0.015 mg/(m•ch•Pa). The compressive strength at 10% linear deformation depends on the density and is equal to 0.25...0.5 MPa, that is, the material can bear a load of no less than 25...50 t/m^2.

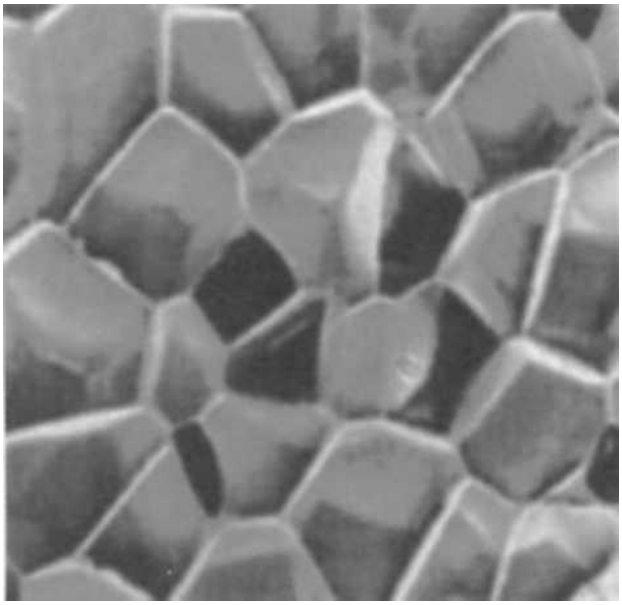

Figure 1. The structure of the material under the microscope

Plates are made by adding substances that increase fire resistance - fire retardants. According to fire - technical indicators, these plates belong to class G1 (according to the requirements of GOST 30244-94 - difficult to burn).

"Penoplex" plates are distinguished from other materials by their durability. They can be used at temperatures from -50 to +75 0C. It is recommended to use the slabs in thermal insulation of foundations, roofs, walls, floors, pipes, and protection of pavements laid on wet soils from spreading in the cold.

Thermal insulation of foundations. One of the main issues faced by builders when constructing the foundations of buildings is the thermal insulation of the elements of the fence structures of basements and plinths.

10-15% of the total heat lost through the foundations of average-sized buildings corresponds to the share of the foundations. In addition, as a result of the freezing of these barrier structures in winter, the waterproofing of the floor can be destroyed. In order to protect the foundation from erosion and reduce heat loss, the structure needs to be well insulated from the outside. One of the common methods of thermal insulation of foundations is to insulate them from the outside. In this case, "Penoplex" plates are first directly glued to the waterproofing of the foundation, and then buried with soil.

This method of insulation does not create "cold bridges" in structures. In addition, "Penoplex" reliably protects the waterproofing layer in the structure from freezing and mechanical damage and extends its service life.

Currently, most of the total volume of buildings under construction is low-rise buildings. 25-35% of the total cost of construction corresponds to the foundation structures of such buildings, which are built in regions where the soil freezes seasonally. The foundation does not always withstand the impact of the force created by the expansion of the soil under the influence of cold.

The resulting deformations cause cracks in walls, foundations, window and door jambs. The "Penoplex" plate placed along the perimeter of the building prevents the accumulation of soil and allows the use of inexpensive and shallow foundations.

Thermal insulation of walls. "Penoplex" plates are used in three-layer wall constructions. Plates have a high service life, their service life is not less than that of paint. Plates are non-biodegradable, resistant to deformation and moisture. The resistance requirements for vapor transmission are provided by the heater itself. In addition, the problem of "cold bridges" in the walls is solved as a result of installing "Penoplex" plates at the joints of the outer walls with inter-floor coverings and curtain walls, under window sills, on door and window frames.

Roof thermal insulation. Flat roofs have a special place in modern architecture. In addition to simple flat roofs, many modern building projects include winter gardens, terrace coffee shops, multi-story bus stations, green spaces, pedestrian areas, etc. In such a structure, external aggressive influences, including sudden changes in temperature, ultraviolet rays can cause the complete failure of the roof structure (erosion of waterproofing, mechanical damage, etc.).

Inversion roof structures. An optimal way to eliminate the listed negative effects is to build inversion roofs.

Inversion (Latin inversio - overturning, re-installation) roof refers to "inverted", that is, the waterproofing layer is located directly under the heating layer laid on the concrete covering (roof base). Figures 2, 3, 4, 5 show inversion roof structures using "Penoplex" plates.

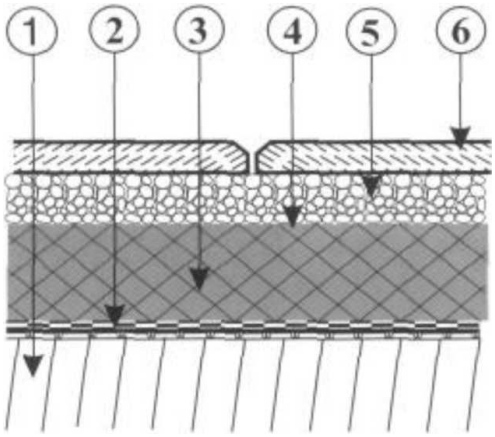

Figure 2. Scheme of operation of the inversion roof.

1- concrete cover with a slope; 2 – bitumen roll waterproofing layer;

3 – PENOPLEX; 4-filtering layer; 5 – sand cushion under the pavement slab; 6 – pavement plate covering.

A "carpet" of waterproofing is laid on the slanted plaster on top of the concrete cover. "Penoplex" plates are stacked tightly on top of it.

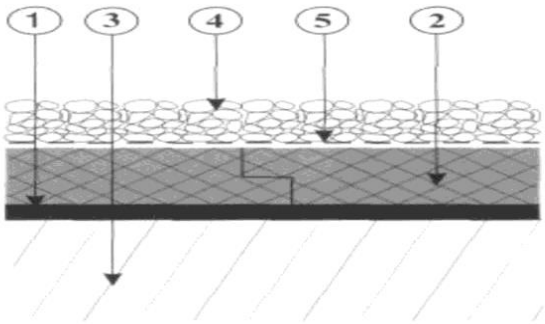

Fig. 3. Inversion roof

1- waterproofing layer; 2 – PENOPLEX; 3 – concrete cover with a slope; 4 – lower layer; 5 – filtering layer

The overlapping side edges of the "Penoplex" plates prevent the formation of "cold bridges". A geotextile filtering layer is laid over the plates.

On unused roofs, 25-32 mm gravel is poured over the geotextile, which acts as a pad. The thickness of the gravel layer should not be less than 50 mm.

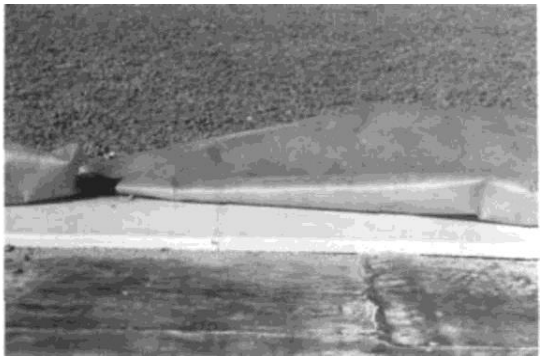

Fig. 3. Inversion roof

Instead of a gravel layer, concrete paving slabs or grossly reinforced concrete can be used (for example, roofs used on garages).

If paving slabs are used as a protective layer, it is recommended to lay it on gravel (5-10 mm thick), gravel-sand mixture or sand layer. The thickness of the layer should not be less than 30 mm.

Figure 5. A used roof over an underground garage in St. Petersburg

In addition, this solution of the used roof allows to combine the pedestrian area with a simple gravel or landscaped area.

If "Penoplex" heat insulation is covered with concrete, then a separating layer (for example, a polyethylene film) must be laid so that "cement milk" does not penetrate into the seams between the heater plates.

Another important feature of penoplex is that it does not rot, does not allow the development of mold and fungi. This feature is relevant for inversion roof structures, because the heater is in a closed environment without air exchange.

Xulosa

In general, the use of such inversion roof structures gives a great impetus to the construction of a flat roof and leads to a reduction in the costs of use. Nowadays, heat insulation materials "Penoplex" are widely used in construction.

.

References

1. Otakulov, Bakhromjon Adhamovich, Muxtasar Isrolijon Qizi Karimova, and Ikromjon Aminjonovich Abdullayev. "Use of mineral wool and its products in the construction of buildings and structures." *Scientific progress* 2.6 (2021): 1880-1882.
2. Otakulov, Bakhromjon Adhamovich, Ikromjon Aminjonovich Abdullayev, and Jurabek Otabek Oglu Toshpulatov. "IMPORTANCE OF HEAT-RESISTANT CONCRETE IN CONSTRUCTION." *Scientific progress* 2.6 (2021): 1613-1616.
3. Otakulov, Bakhromjon Adhamovich, Muxtasar Isrolijon Qizi Karimova, and Ikromjon Aminjonovich Abdullayev. "Improving the durability of asphalt-concrete." *Scientific progress* 2.7 (2021): 121-124.
4. Otakulov, Bakhromjon Adhamovich, Ikromjon Aminjonovich Abdullayev, and Khumoyun Sharifjon Ogli Sultonov. "Raw material base of construction materials and use of industrial waste." *Scientific progress* 2.6 (2021): 1609-1612.
5. Абдуллаев, Икромжон Аминжанович. "КО. ЛО. ДЦ. ЕВ. АЯ КЛ. АД. КА." *STUDIES IN ECONOMICS AND EDUCATION IN THE MODERN WORLD* 2.10 (2023).
6. Абдуллаев, Икрамжон Аминжанович. "ТЕХНОЛОГИЧЕСКАЯ СХЕМА ПРОИЗВОДСТВА СУХИХ СТРОИТЕЛЬНЫХ СМЕСЕЙ ДЛЯ ТЕПЛОИЗОЛЯЦИИ СТЕН В КОЛОДЦЕВОЙ КЛАДКЕ." *International journal of advanced research in education, technology and management* 2.11 (2023).
7. Абдуллаев, И. А. "ИЗДЕЛИЯ, ИЗГОТАВЛИВАЕМЫЕ НА ПРЕДПРИЯТИИ Г. ФЕРГАНА." *Экономика и социум* 4-1 (95) (2022): 212-215.
8. Абдуллаев, И. А. "ПРОЕКТИРОВАНИЕ СОСТАВА ХОЛОДНОГО АСФАЛЬТОБЕТОНА." *Экономика и социум* 3-2 (94) (2022): 362-366.
9. Akbarov, J. N., No‘monov, M. B., Abdullayev, I. A., & Xasanov, D. D. (2023). QUALITY AND QUANTITATIVE COMPOSITION OF SCREWS RESEARCH. *HOLDERS OF REASON*, *3*(1), 668-671.
10. Akbarov, J. N., M. B. No‘monov, and I. A. Abdullayev. "STUDY OF CENTRIFUGE STRUCTURES AND CLASSIFICATION OF MATERIALS." *HOLDERS OF REASON* 3.1 (2023): 655-661.
11. Пахриддинов, Х. З., И. А. Абдуллаев, and М. Я. Яхшибоев. "Факторы, препятствующие развитию производства железобетонных изделий." *HOLDERS OF REASON* 1.1 (2023): 687-691.
12. Yaqubjon o’g’li, Yaxshiboyev Mirolimjon, Normirzayev Avazxon Akram o’g’li, and Abdullayev Ikromjon Aminjanovich. "Research of expanded clay production technology in the Republic of Uzbekistan." *HOLDERS OF REASON* 1.1 (2023): 676-681.
13. Aminjanovich, Abdullayev Ikromjon, Yaxshiboyev Mirolimjon Yaqubjon o‘g‘li, and Normirzayev Avazxon Akram o‘g‘li. "TEMIRBETON KONSTRUKSIYALAR UCHUN BO'SHLIQLAR MODULLARI TAYYORLASH TEXNOLOGIYASI." *ZAMONAVIY TA'LIMDA FAN VA INNOVATSION TADQIQOTLAR JURNALI* 1.1 (2023).

14. Aminjanovich, Abdullayev Ikromjon, Yaxshiboyev Mirolimjon Yaqubjon o‘g‘li, and Normirzayev Avazxon Akram o‘g‘li. "Temirbeton konstruksiyalarni bevosita qurilish obektlarida monolit quyish uchun bo'shliqlar modullari tayyorlash texnologiyasi." *HOLDERS OF REASON* 1.1 (2023): 682-686.
15. Aminjanovich, Abdullayev Ikromjon, and Xasanov Davlatbek Davronbek o‘g‘li. "Beton va qorishmalarning xususiyatlariga qo'shimchalarning ta'siri." *HOLDERS OF REASON* 1.1 (2023): 667-670.
16. Aminjanovich, Abdullayev Ikromjon. "Innovatsoin texnologiyalar asosida ishlab chiqarilgan uyali betonlar." *Science Promotion* 1.1 (2023): 1-5.
17. Akbarov, J. N., M. B. No‘monov, and I. A. Abdullayev. "STUDY OF TYPES OF AUTONOMOUS SEWAGE SYSTEMS ACCORDING TO WASTEWATER TREATMENT METHOD." *HOLDERS OF REASON* 3.1 (2023): 662-667.
18. Akbarov, J. N., M. B. No‘monov, and I. A. Abdullayev. "INVESTIGATION OF FACILITIES USING PARTIAL CLEANING OF WATER FROM SLUDGE BEFORE WATER COLLECTION." *HOLDERS OF REASON* 3.1 (2023): 672-679
19. Research of physical-mechanical and physical-chemical properties of expanded direction concrete with complex polymer - mineral additive of a new generation based on local raw materials
20. Bakhodir Mirzaev, Bakhromjon Otakulov, Khamidulla Mamatov and Olmosbek Otajonov
21. E3S Web of Conf., 452 (2023) 06002
22. DOI: https://doi.org/10.1051/e3sconf/202345206002
23. Gypsum binders based on ceramic industry waste
24. Mamurjon Mirzajanov, Bakhromjon Otakulov, Shoirjon Kuziboev, Bakhodir Mirzaev, Adkhamjon Khamidov and Zokhidjon Abdulkhaev
25. E3S Web of Conf., 452 (2023) 06015
26. DOI: https://doi.org/10.1051/e3sconf/202345206015
27. Flow trajectory analysis and velocity coefficients for fluid dynamics in tubes and holes
28. Zokhidjon Abdulkhaev, Mamadali Madraximov, Shairakhon Abdujalilova, Saxiba Mirzababayeva, Bakhromjon Otakulov, Abdusalom Sattorov and Zuhriddin Umirzakov
29. E3S Web of Conf., 452 (2023) 02010
30. DOI: https://doi.org/10.1051/e3sconf/202345202010
31. Mirzajanov, M. A., M. M. Ergashev, and B. A. Otakulov. "Steam structure and thermal conductivity of lightweight concrete aggregate." E3S Web of Conferences. Vol. 401. EDP Sciences, 2023.
32. Mathematical modeling of particle movement in laminar flow in a pipe
33. Abdulfatto Ibrokhimov, Jahongir Orzimatov, Mavlonbek Usmonov, Bakhromjon Otakulov and Saxiba Mirzababayeva
34. BIO Web Conf., 84 (2024) 02026
35. DOI: https://doi.org/10.1051/bioconf/20248402026
36. Абдукаримов Бекзод Абобакирович, Отакулов Бахромжон Адхамович, Рахмоналиев Санжарбек Мухаммаджон Угли, & Муродалиева Нилуфар Авазбек Кизи (2019). Способы снижения аэродинамического сопротивления калориферов в системе воздушного отопления ткацких производств и вопросы расчета их тепловых характеристик. Достижения науки и образования, (2 (43)), 28-33.

37. Бахромов Махмуд Маматхонович, Отакулов Бахром Адхамович, & Рахимов Элбек Хасанбой Угли (2019). Определение сил негативного трения при оттаивании околосвайного грунта. European science, (1 (43)), 22-25.
38. Bakhromjon Adhamovich Otakulov, Muxtasar Isrolijon Qizi Karimova, & Ikromjon Aminjonovich Abdullayev (2021). USE OF MINERAL WOOL AND ITS PRODUCTS IN THE CONSTRUCTION OF BUILDINGS AND STRUCTURES. Scientific progress, 2 (6), 1880-1882.
39. Юсупов Абдулхамид Рахмонбердиевич, Милладжонова Зулхумор Рахматовна, Отакулов Бахромжон Адхамович, & Рахимов Элбек Хасанбой Угли (2019). К расчёту неравнопрочных термогрунтовых тел на сдвигающие нагрузки. Достижения науки и образования, (2 (43)), 22-23.
40. Мирзажонов Мамур Алимович, & Отакулов Бахром Адхамович (2018). Восстановление разрушенных частей бетонных и железобетонных конструкций. Достижения науки и образования, (13 (35)), 13-14.
41. Xalimjon o'gli, S. J. (2021). Influence on durability of contact zone of working joint time of the endurance of a new concrete. EPRA International Journal of Environmental Economics, Commerce and Educational Management, 8(5), 1-2.
42. Bakhromjon Adhamovich Otakulov, Ikromjon Aminjonovich Abdullayev, & Khumoyun Sharifjon Ogli Sultonov (2021). RAW MATERIAL BASE OF CONSTRUCTION MATERIALS AND USE OF INDUSTRIAL WASTE. Scientific progress, 2 (6), 1609-1612.
43. Tulaganov, A., Hodjaev, S., Sultanov, A., Tulaganov, B., Otakulov, B., Hodjaev, N., & Abdasov, D. (2021). Festigkeitsbeschreibung des schwerbetons auf alkalischlacken–bindemittel. The Scientific-Practice Journal of Architecture, Construction and Design, 1(1), 5.
44. Abdukarimov Bekzod Abobakirovich, Otakulov Bahrom Adhamovich, Mahsitaliyev Barhayot Iftihorjon Ugli, & Murodaliyeva Nilufar Avazbek Qizi (2019). Increasing the efficiency of solar air heaters in free convection conditions. Достижения науки и образования, (2 (43)), 26-27.
45. Bakhromjon Adhamovich Otakulov, Ikromjon Aminjonovich Abdullayev, & Jurabek Otabek Oglu Toshpulatov (2021). IMPORTANCE OF HEAT-RESISTANT CONCRETE IN CONSTRUCTION. Scientific progress, 2 (6), 1613-1616.
46. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Halimjon O'G'Li Salimjonov (2021). ABOUT MONOLITHIC REINFORCED CONCRETE STRUCTURES IN CONSTRUCTION. Scientific progress, 2 (7), 722-724.
47. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Halimjon O'G'Li Salimjonov (2021). WAYS TO SAVE CERAMICS AND FIRE BUILDING MATERIALS. Scientific progress, 2 (7), 718-721.
48. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Halimjon O'G'Li Salimjonov (2021). THE SCIENCE OF BUILDING MATERIALS TAKES PLACE IN ARCHITECTURE. Scientific progress, 2 (7), 725-727.
49. Bakhromjon Adhamovich Otakulov, Yusufjon Amonovich Isoyev, & Jasurbek Xalimjon O'G'Li Sailimjonov (2021). IMPROVING THE EARTHQUAKE RESISTANCE AND HEAT RESISTANCE OF BUILDINGS BUILT OF MODERN ENERGY-SAVING MATERIALS. Scientific progress, 2 (7), 117-120.

50. Bakhromjon Adhamovich Otakulov, Muxtasar Isrolijon Qizi Karimova, & Ikromjon Aminjonovich Abdullayev (2021). IMPROVING THE DURABILITY OF ASPHALT-CONCRETE. Scientific progress, 2 (7), 121-124.
51. Bakhromjon Adhamovich Otakulov, Dilfuza Tillavoldiyevna Sobirova, & Madinakhon Tolib Qizi Yokubova (2021). RAW MATERIALS AND OPTIMAL COMPOSITIONS FOR NEW GENERATION CELLULAR CONCRETE. Scientific progress, 2 (8), 473-478.
52. Otakulov Bakhromjon Adhamovich, Abduganiyev Nu'Monjon Nabijonovich, & Risolatkhon Gayratjon Qizi Madaminova (2021). THE ROLE OF MONOLITHIC REINFORCED CONCRETE CONSTRUCTION IN MODERN CONSTRUCTION. Scientific progress, 2 (8), 735-739.
53. Bakhromjon Adhamovich Otakulov, Nu'Monjon Nabijonovich Abduganiyev, & Risolatkhon Gayratjon Qizi Madaminova (2021). WORKING JOINTS OF MONOLITHIC AND PREFABRICATED STRUCTURES AND METHODS OF OVERCOMING THEIR NEGATIVE CONSEQUENCES. Scientific progress, 2 (8), 731-734.
54. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). SELECTING THE OPTIMAL BITUMEN CONTENT. Scientific progress, 2 (8), 415-420.
55. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). ASPHALT CONCRETE PREPARATION TECHNOLOGY. Scientific progress, 2 (8), 421-425.
56. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). CALCULATING THE COMPOSITION OF THE MINERAL PART. Scientific progress, 2 (8), 403-408.
57. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). ASSESSMENT OF THE QUALITY OF SOURCE MATERIALS FOR ASPHALT CONCRETE. Scientific progress, 2 (8), 396-402.
58. Bakhromjon Adhamovich Otakulov, Bekzod Xomidjonovich Kodirov, & Hojiakbar Solijon O'G'Li Solijonov (2021). DETERMINATION OF ASPHALT CONCRETE COMPOSITION. Scientific progress, 2 (8), 409-414.
59. Bakhromjon Adhamovich Otakulov, Dilfuza Tillavoldiyevna Sobirova, & Madinakhon Tolib Qizi Yokubova (2021). FACTORS THAT REDUCE THE HEAT-SHIELDING PROPERTIES OF ENCLOSING STRUCTURES. Scientific progress, 2 (8), 479-485.
60. Tulaganov, A., Hodjaev, S., Sultanov, A., Tulaganov, B., Otakulov, B., Hodjaev, N., & Abdasov, D. (2021). FESTIGKEITSBESCHREIBUNG DES SCHWERBETONS.
61. Bakhromjon Adhamovich Otakulov, Dilfuza Tillavoldiyevna Sobirova, & Madinakhon Tolib Qizi Yokubova (2021). INFLUENCE OF DRY AND HOT CLIMATE ON CONCRETE AND REINFORCED CONCRETE STRUCTURES. Scientific progress, 2 (8), 486-489.
62. Бахромов, М. М. Отакулов Бахром Адхамович, & Рахимов Элбек Хасанбой Угли (2019). Определение сил негативного трения при оттаивании околосвайного грунта. European science,(1 (43)), 22-25.
63. Мирзажанов, М. А., & Отакулов, Б. А. Бетон ва темирбетон конструкция-ларининг ишчи чоклари муста^ камлигига таъсир этувчи факторлар. ФерПИ научно-технический журнал, 21.

64. Mirzaev B., Otakulov B., Mamatov K., Otajonov O. Research of physical-mechanical and physicalchemical properties of expanded direction concrete with complex polymer – mineral additive of a new generation based on local raw materials //E3S Web of Conferences. – EDP Sciences, 2023. – T. 452.
65. Research of physical-mechanical and physical-chemical properties of expanded direction concrete with complex polymer - mineral additive of a new generation based on local raw materials Bakhodir Mirzaev, Bakhromjon Otakulov, Khamidulla Mamatov and Olmosbek Otajonov E3S Web of Conf., 452 (2023) 06002 DOI: https://doi.org/10.1051/e3sconf/202345206002
66. Gypsum binders based on ceramic industry waste Mamurjon Mirzajanov, Bakhromjon Otakulov, Shoirjon Kuziboev, Bakhodir Mirzaev, Adkhamjon Khamidov and Zokhidjon Abdulkhaev E3S Web of Conf., 452 (2023) 06015 DOI: https://doi.org/10.1051/e3sconf/202345206015
67. Flow trajectory analysis and velocity coefficients for fluid dynamics in tubes and holes Zokhidjon Abdulkhaev, Mamadali Madraximov, Shairakhon Abdujalilova, Saxiba Mirzababayeva, Bakhromjon Otakulov, Abdusalom Sattorov and Zuhriddin Umirzakov E3S Web of Conf., 452 (2023) 02010 DOI: https://doi.org/10.1051/e3sconf/202345202010
68. Mirzajanov, M. A., M. M. Ergashev, and B. A. Otakulov. "Steam structure and thermal conductivity of lightweight concrete aggregate." E3S Web of Conferences. Vol. 401. EDP Sciences, 2023.
69. Otakulov B.A. (2022). AERABLE CONCRETE AND MODERN FACING MATERIALS AND PRODUCTS BASED ON THEM. Экономика и социум, (11-1 (102)), 1125-1127.
70. Otakulov B.A. (2022). WALL DESIGNS AND THEIR HEATING AND TECHNICAL INDICATORS OF MODEL HOUSES BUILT INDIVIDUALLY. Экономика и социум, (4-1 (95)), 130-133.
71. Otakulov B.A., & Ismoiljonova M.M. (2022). USE OF BINDERS IN CONSTRUCTION. Экономика и социум, (4-2 (95)), 373-375.
72. B. A. Otakulov, & Z. B. Mahmudov (2022). OPERATION OF BUILDINGS ON SEDIMENTARY SOILS. Scientific progress, 3 (7), 104-107.
73. B. A. Otakulov, & Z. B. Mahmudov (2022). TECHNICAL OPERATION OF BUILDINGS IN SEISMIC REGIONS. Scientific progress, 3 (7), 99-103.
74. Otakulov B.A., Abdurasulova N.Sh., & Xaydarov J.O. (2022). IMPORTANCE OF SULPHATE-RESISTANT PORTLAND CEMENT IN CONSTRUCTION. Экономика и социум, (5-1 (96)), 161-163.
75. Bakhromjon Adhamovich Otakulov, & Khumoyun Sharifjon O‘Gli Sultonov (2022). FACTORS AFFECTING THE QUALITY OF CONCRETE AGGREGATES. Scientific progress, 3 (3), 616-620.
76. Bakhromjon Adhamovich Otakulov, & Khumoyun Sharifjon O‘Gli Sultonov (2022). EXPLOITATION OF EXPANDED CLAY IN CONSTRUCTION. Scientific progress, 3 (3), 621-624.
77. Bakhromjon Adhamovich Otakulov, & Ulug’Bek Maxmudovich Abdullayev (2022). INCREASING THE DURABILITY OF STRUCTURAL ELEMENTS OF TANKS FOR WATER USING COMPOSITE MATERIALS. Scientific progress, 3 (3), 358-361.

78. Ergashev M.M., & Otakulov B.A. (2021). ABOUT THE USE OF WOLLASTONITE AGGREGATE CONCRETE. Экономика и социум, (11-1 (90)), 180-183.
79. Otakulov B.A., & Abdullayev U.M. (2021). HISTORY OF FOAM CONCRETE PRODUCTION DEVELOPMENT. Экономика и социум, (12-1 (91)), 485-488.
80. Ergashev M.M., & Otakulov B.A. (2021). USE OF VERMICULITE FOAMED WITH THERMAL INSULATION MATERIAL. Экономика и социум, (11-1 (90)), 173-175.
81. Otakulov B.A., & Abdullayev U.M. (2021). IMPROVING THE SORBTION PROPERTIES OF SALT UNDERWAY. Экономика и социум, (12-1 (91)), 482-484.
82. Ergashev M.M., & Otakulov B.A. (2021). USE OF ALKALINE CEMENT OBTAINED WITHOUT BURNING IN CONSTRUCTION. Экономика и социум, (11-1 (90)), 176-179.
83. Adhamovich, B., Amonovich, Y., & Halimjon o'g'li, J. ABOUT MONOLITHIC REINFORCED CONCRETE STRUCTURES IN CONSTRUCTION.
84. Adhamovich, B., Amonovich, Y., & Halimjon o'g'li, J. THE SCIENCE OF BUILDING MATERIALS TAKES PLACE IN ARCHITECTURE.
85. Adhamovich, B. WORKING JOINTS OF MONOLITHIC AND PREFABRICATED STRUCTURES AND METHODS OF OVERCOMING THEIR NEGATIVE CONSEQUENCES