



СӘУЛЕТ ЖӘНЕ ҚҰРЫЛЫС
АРХИТЕКТУРА И СТРОИТЕЛЬСТВО
ARCHITECTURE AND CONSTRUCTION

СӘУЛЕТ ЖӘНЕ ҚҰРЫЛЫС
АРХИТЕКТУРА И СТРОИТЕЛЬСТВО
ARCHITECTURE AND CONSTRUCTION

DOI 10.51885/1561-4212_2025_1_263
IRSTI 67.07.01

L.T. Baimuratova¹, T.M. Murat¹, G.D. Maulenova¹, T.K. Kuatbayeva¹, T.S. Bakirova²

¹Satbayev University, Almaty, Kazakhstan

E-mail: l.lin.b@mail.ru

E-mail: mtomiris2812@gmail.com*

E-mail: g.maulenova@satbayev.univerity

E-mail: t.kuatbayeva@satbayev.university

²Azerbaijan University of Architecture and Construction, Baku, Azerbaijan

E-mail: taranabakirova@gmail.com

SPECIFITIES OF RECONSTRUCTION OF PANEL HOUSES IN 1950-1970 OF THE HISTORICAL CENTER OF KARAGANDA

ҚАРАҒАНДЫ ҚАЛАСЫНЫҢ ТАРИХИ ОРТАЛЫҒЫНЫҢ 1950-1970 ЖЫЛДАРДАҒЫ ПАНЕЛЬДІ ҮЙЛЕРІН ҚАЙТА ҚҰРУ ЕРЕКШЕЛІКТЕРІ

ОСОБЕННОСТИ РЕКОНСТРУКЦИИ ПАНЕЛЬНЫХ ДОМОВ 1950-1970 гг. ИСТОРИЧЕСКОГО ЦЕНТРА ГОРОДА КАРАГАНДЫ

Аннотация. Настоящая научная статья посвящена исследованию перспектив реконструкции жилого фонда исторического центра города Караганды, представленного панельными домами, построенными в период с 1950-е по 1970-е годы. В исследовании проведен анализ архитектурных особенностей и технического состояния домов, выявлена потребность в их модернизации и адаптации к современным требованиям комфортного проживания. В статье рассматриваются различные аспекты реконструкции, включая использование новых технологий, материалов и архитектурных решений с целью улучшения энергоэффективности, безопасности и удобства жильцов. Реконструкция, как комплекс организационных и технических мероприятий, направленных на устранение морального и физического износа зданий в целом или их отдельных элементов и систем, включает в себя модернизацию и обновление инфраструктуры здания. Она повышает качество жилья, помогает продлить сроки эксплуатации, делает данный жилой фонд актуальным и востребованным для людей, и способствует улучшению состояния главных улиц города. Научная статья обращает внимание на проблему панельного жилого фонда, и предлагает методы и инструментарий по проведению реконструкции в историческом центре города Караганды с учетом необходимых мероприятий конкретно для нынешней градостроительной ситуации. Результаты исследования могут быть полезными для городских планировщиков, архитекторов, инженеров и других специалистов, работающих в области обновления и модернизации жилых комплексов. Данный анализ может быть использован не только по отношению к панельному жилому фонду Караганды, но и к другим городам с учетом их историко-географического и градостроительного контекста.

Ключевые слова: Архитектура; реконструкция; панельные дома; Караганда; историческая застройка.

Аңдатпа. Бұл ғылыми мақала 1950-1970 жылдар аралығында салынған панельдік үйлермен ұсынылған Қарағанды қаласының тарихи орталығының тұрғын үй қорын қайта құру

перспективаларын зерттеуге арналған. Зерттеу үйлердің архитектуралық өрекшеліктері мен техникалық жағдайына талдау жүргізді, оларды модернизациялау және жайлы тұрудың заманауи талаптарына бейімделу қажеттілігі анықталды. Мақалада қайта құрудың әртүрлі аспектілері, соның ішінде энергия тиімділігін, қауіпсіздігін және тұрғындардың ыңғайлылығын жақсарту мақсатында жаңа технологияларды, материалдарды және архитектуралық шешімдерді қолдану қарастырылады. Жалпы ғимараттардың немесе олардың жекелеген элементтері мен жүйелерінің моральдық және физикалық тозуын жоюға бағытталған ұйымдастырушылық және техникалық іс-шаралар кешені ретінде қайта құру ғимараттың инфрақұрылымын жаңғыртуды және жаңартуды қамтиды. Бұл тұрғын үй сапасын арттырады, пайдалану мерзімін ұзартуға көмектеседі, бұл тұрғын үй қорын адамдар үшін өзекті және сұранысқа ие етеді және қаланың басты көшелерінің жағдайын жақсартуға ықпал етеді. Ғылыми мақала панельдік тұрғын үй қорының проблемасына назар аударады және қазіргі қала құрылысы жағдайы үшін қажетті іс-шараларды ескере отырып, Қарағанды қаласының тарихи орталығында қайта құру жүргізу әдістері мен құралдарын ұсынады. Зерттеу нәтижелері қала жоспарлаушыларына, сәулетшілерге, инженерлерге және тұрғын үй кешендерін жаңарту және жаңарту саласында жұмыс істейтін басқа мамандарға пайдалы болуы мүмкін. Бұл талдау Қарағандының панельдік тұрғын үй қорына ғана емес, олардың тарихи-географиялық және қала құрылысы контекстін ескере отырып, басқа қалаларға да пайдаланылуы мүмкін.

Түйін сөздер: сәулет; қайта құру; панельдік үйлер; Қарағанды; тарихи құрылыс.

Abstract. This scientific article is devoted to the study of the prospects for the reconstruction of the housing stock of the historical center of the city of Karaganda, represented by panel houses built in the period from the 1950s to the 1970s. The study analyzes the architectural features and technical condition of the houses, identifies the need for their modernization and adaptation to modern requirements of comfortable living. The article discusses various aspects of reconstruction, including the use of new technologies, materials and architectural solutions to improve energy efficiency, safety and convenience of residents. Reconstruction, as a complex of organizational and technical measures aimed at eliminating moral and physical deterioration of buildings as a whole or their individual elements and systems, includes modernization and renovation of the building infrastructure. It improves the quality of housing, helps to extend the service life, makes this housing stock relevant and in demand for people, and contributes to improving the condition of the main streets of the city. The scientific article draws attention to the problem of panel housing stock, and offers methods and tools for reconstruction in the historical center of the city of Karaganda, taking into account the necessary measures specifically for the current urban development situation. The results of the study can be useful for urban planners, architects, engineers and other specialists working in the field of renovation and modernization of residential complexes. This analysis can be used not only in relation to the panel housing stock of Karaganda, but also to other cities, taking into account their historical, geographical and urban planning context.

Keywords: Architecture; reconstruction; panel houses; Karaganda; historical buildings.

Introduction. Building reconstruction is a set of construction works and organizational and technical measures associated with changes in the main technical and economic indicators, functional purpose of the building, replacement of individual structures, carried out in order to improve living conditions, quality of service, and maximum elimination of physical and moral deterioration (SN RK 1.04-26-2011). Reconstruction allows to extend the operational life of the building, increase its energy efficiency, improve the general living conditions and aesthetic characteristics.

Many residential buildings have recommendations for operation, including reconstruction works. Typical panel construction built during the USSR period has a life cycle of 100 years with reconstruction every 25 years (Cheredina, Rybakova, 2017). Many countries of the former 'socialist camp', such as Germany, Estonia, Latvia, Lithuania, where similar series of panel houses were also common, have been carrying out reconstruction and renovation activities since the collapse of the Soviet Union. However, in Kazakhstan, no such reconstruction programs and standards have been introduced, apart from point-by-point works to improve the energy saving and aesthetic characteristics of individual panel houses.

In Karaganda also massively did not carry out such works on modernization of Soviet buildings, although almost the whole area of «New City» – the main administrative and cultural

district of Karaganda – is represented by panel buildings of 1950-1970s. This is a typical housing stock of industrial method of construction, consisting of panel buildings of Khrushchev (1953-1964) and Brezhnev eras (1964-1982), which still has advantages in terms of location, cost of housing and relationship with the urban environment (Melikov, 1997). Based on the study of real estate objects in the city of Karaganda for 2020, the main specific weight of supply in the market is occupied by flats in typical industrial housing – «Khrushchevki» 1950-1970 years of construction – 47%. Panel houses make up 50% of the specific weight of the supply compared to 47% of brick houses, and the maximum specific price per square of housing is in the central part of the «New City» – 313.6 thousand tenge (Sihimbaev, Cherkasov, 2021). This indicates the continuing demand and interest of residents in typical panel housing in the historical development of Karaganda, from which the issue of reconstruction of such housing is relevant.

Among the most important problems of reconstruction of panel microdistricts of the «New City» we can highlight the need for major repairs, energy audit and sanitation of housing. This list includes modernization and renovation of structures and equipment with a high degree of wear and tear, increasing the level of energy saving and energy efficiency of buildings, adaptation of buildings for a wide category of citizens, including immobile groups, as well as the creation of a harmonious architectural and urban environment through the design code of streets or districts.

The purpose of this scientific article is to study the foreign experience in reconstruction of the panel housing stock, to highlight successfully used methods and solutions, and to describe the prospects of their application in the typical panel building of Karaganda. The object of the research is the methods and tendencies of reconstruction of typical panel houses; the subject of the research is the panel housing stock of the «New City» district of Karaganda.

Literature review. To date, there is a large amount of information review and theoretical data on the issues of reconstruction of typical industrial construction of the Khrushchev and Brezhnev eras. I.A. Prokofieva reviewed the history of development and construction of «Khrushchevka», as well as their condition and compliance with their current requirements for the convenience of living, energy efficiency and sanitation (Prokof'eva, 2015). In her works it is noted that the reconstruction of panel houses is a justified and optimal solution in modern conditions. The methodology of reconstruction of the panel housing stock in Germany and the Baltic countries was considered in the studies of Meerovich M.G., Malko A.V., Kozlova L.V., Gladkova E.A. (Meerovich et al., 2017) and Kharicheva E.Ya. (Kharicheva, 2012). The adaptation of these methods in the CIS countries was proposed in the article «Russian practice of panel house building and German experience in reconstruction of typical industrial housing» (Cheredina I.S., Rybakova E.Y.), describing the possibility of applying the German experience in reconstruction taking into account national characteristics (Cheredina, Rybakova, 2017). Glebushkina L.V. and Peretolchina L.V. conducted a study on the issues of complex reconstruction of five-storey residential buildings of series 1-447 and 1-464 and the prospects of their compaction and decompaction (Glebushkina, Peretolchina, 2016) Such modernization techniques allow not only to change the volume-planning solutions of buildings, but also to improve the urban planning situation.

Architecture and panel building of Kazakhstan and Karaganda in particular was considered in the scientific works of Konobritskaya E. M. (Konobrickaya, 1954) and Samoilov K.I. (Samojlov, 2004), as well as in studies and articles by Tuyakaeva E.K., Danibekova E.T., Abdrasilova G.S., Onishchenko O.V. (Tuyakayeva A. et al., 2023), Verkhoturov V.F., Vinogradova T.V., Zolotareva L.R. (Verhoturov, Vinogradova, Zolotareva, 2014). They provide information on the history of typical industrial construction in Kazakhstan and Karaganda, and also note the need to improve the housing stock and adaptation to modern conditions.

The issue of improving energy-efficient qualities and modernization of the housing stock in the city of Karaganda was raised in the article «Modernization of reconstructed areas and

transformation of urban planning approaches to the solution of modern urban environment» (Borisevich, Imanov, 2021), but from the point of view of only urban planning and reconstruction of the urban environment. They noted that the mass typical building of the Soviet time in Karaganda requires major repairs, sanitation and energy audit, as well as modernization and renovation of structures. In this article, however, it is proposed to delve into the topic and consider the prospects of reconstruction of panel houses in Karaganda from the point of view of architectural, planning and engineering solutions.

Materials and research methods. The research and its methodology are based on a detailed analysis of the problem from different sides. In the course of the work a comprehensive approach was applied, including a variety of methods such as:

1. Analysis of theoretical information and historical data on the reconstruction of panel houses, statistical data on the improvement of building performance, advantages and disadvantages of conducting reconstruction programs on existing examples.

2. Analysis of archival and reference data with the study of historical development of the «New City» district of Karaganda, field survey of the panel housing stock of the city by means of photo-fixation.

Results and their discussion. As mentioned above, the panel housing construction was in demand not only in the CIS, but also in Europe, in particular, in Germany.

In 1990, the Federal Ministry of Construction carried out an analysis of the available panelized housing stock. The question about the nature of work with the buildings, demolition or improvement, was particularly relevant, since at that time one third of the population of East Germany lived in panel houses (Bake, 1999). In the course of work and research it was found that this type of housing was still necessary and had the potential for improvement.

One clear example is the project of architect Stefan Forster, a neighborhood in Linefelde, where seven neighborhoods came under redevelopment as part of the Eastern Renaissance initiative (Meerovich et al., 2017). The project utilised the original materials and structural elements of the buildings. The internal structure and layout of the flats was revised, the number of storeys was reduced, and terraces were provided on the roofs.

A six-storey panel block of flats, some of which were already empty, was transformed into a modern four-storey residential building. In the process of reconstruction, the height of the building was reduced by removing the top two floors, and the layout of the flats and balconies was revised, thus enlarging them. In addition to the building itself, the landscaping of the site has been revised and improved to reflect modern trends. (Figure 1)





Figure 1. The result of the reconstruction of panelized housing designed by Stefan Forster, Linefelde, Germany

Note – compiled by the website mediamall.ge, 2019

Renovation can be more radical, significantly transforming the appearance and functional features of a building. A good example is a 180-meter-long panel house that was transformed into individual apartment villas by Stefan Forster Architects. (Figure 2)



Figure 2. The result of the reconstruction of panelized housing designed by Stefan Forster Architects, Linefelde, Germany

Note – compiled by the website mediamall.ge, 2019

Seven segments were removed in a staggered pattern, thus forming eight individual houses, each of which also had one upper floor removed. Two facades are distinguished by a contrasting color scheme. On the east (blue) side of the building, a wall was left to unite the individual structures into a single complex. On the west side, there is a public space and open courtyards adjacent to the first floors. (Figure 3).



Figure 3. West side of panelized housing designed by Stefan Forster Architects

Note – compiled by the website mediamall.ge, 2019

As one of the main trends in German reconstruction experience, we can emphasize the desire to create a private individual space for residents in the form of a courtyard, and the organization of its relationship with the external, public space (Borisevich, Imanov, 2021) Stone masonry forms private gardens for the residents of the first floor and a buffer zone separating the territory

of the house from the outside. (Figure 4)



Figure 4. Improvement of panel housing, Linefelde, Germany.

Note – compiled by the website mediamall.ge, 2019

The desire to form an open, but at the same time isolated space, both outside and inside the building itself, is evident in the principles of redevelopment. Barrier-free space has become a relevant and suitable solution as a housing solution, especially for the elderly and low-mobility groups, which are more common in post-war panel houses. Apartments became more spacious, free and comfortable for wheelchair mobility (Figure 5).

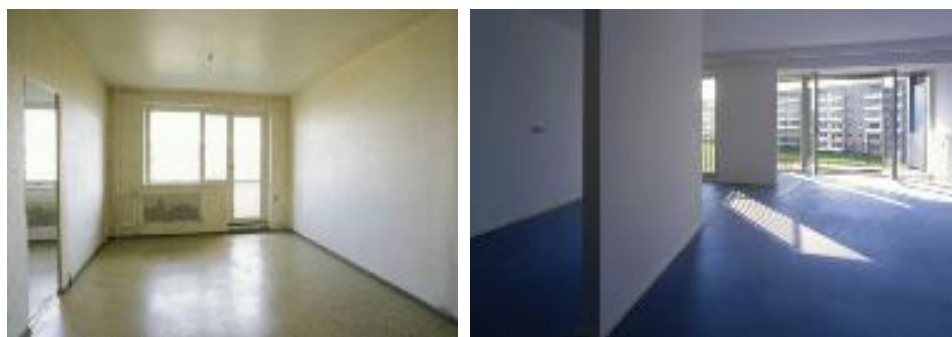


Figure 5. Result of redevelopment of a panel house apartment, Linefelde, Germany.

Note – compiled by the website mediamall.ge, 2019

Based on German experience, it can be concluded that “renovation” of existing five-storey residential buildings is cheaper and more affordable than building from scratch. Also, a peculiarity of reconstruction measures in Germany is to lower the number of storeys and reduce the number of apartments in the building, which is a bit contrary to the trends of modern architecture, which tends to high-rise buildings.

To improve the energy efficiency of an old building, various heat-insulating building materials are often used. Such measures were carried out in Vilnius, in the Zhirmunai district, as part of the program “Renewal of Housing Means Renewal of Vilnius” (Korotaeva, Malyar, 2018). It was first applied on a five-story panel house of the 1-464 series, which was common in all Soviet republics (Figure 6).



Figure 6. The result of reconstruction of a typical panel house of series 1-464 in the district of Zhirmunai, Vilnius, Lithuania

Note – compiled by I. Salnikov, 2013

As part of the program, before the repair works, a deterioration assessment and building rehabilitation studies were carried out. With 10-30% deterioration of load-bearing structures, which is a good indicator for further operation of the building, roof coverings, balconies, eaves, parapets, joints between panels, surface finish and stairs were badly deteriorated and needed repair. To improve the comfort of living and reduce heat losses, the basement was insulated with EPS 100 expanded polystyrene foam laid at a depth of 600 meters, as well as the external walls and roof. Mineral wool boards with windproof film covered with finishing boards on a metal frame were used to insulate the walls. Similar boards were used to insulate the roof. The entrance doors were replaced with new ones, and all balconies were combined and converted into glazed loggias (Jakavičiūtė, 2005).

The reconstruction carried out in Lithuania has improved the temperature parameters of apartments, reduced heat losses by 1.7 times and reduced carbon dioxide emissions into the atmosphere (Lithuanian Hygienic Standard. HN 42:2004). In general, due to the reconstruction, the operational life of the building was increased, which favorably affected the quality of life in the apartments and their market value.

Despite the fact that energy efficiency improvement is the main objective in the modernization of old buildings, the most common method of reconstruction of panel buildings in the post-Soviet space is facade modification and renewal of cladding materials. Most often this comes from a lack of financial resources and the reluctance of tenants to radically change their own house. However, even in such cases, reconstruction can increase the comfort of living by improving the aesthetic characteristics of the building.

Architects from the GutGut bureau have remodeled the facade of one of the panel houses in the Slovak town of Rimavska Sobota. In addition to the addition of the upper floor, the facade finish was changed to a laconic gray plaster. The exterior design was improved with differently shaped window frames and accent steel balconies (Figure 7).



Figure 7. Result of the facade reconstruction of a panel house in Rimavská Sobota, Slovakia

Note – compiled by J. Skokan, M. Tüma, 2020

From the urban planning point of view, reconstruction can also be used as a tool for organizing the architectural appearance of the city and creating a design code. It can be carried out by “stylizing” the external appearance of buildings to a certain architectural style, corresponding to the historical context of the city. The project to recreate the historical development of Leningradsky Prospekt in Kaliningrad in the pre-war “Hanseatic” style was proposed by the Moscow Architectural Institute (MARHI) and architects I. Kiselev and A. Saranitz (Braune, Rau, 2000). Three of the twelve “Khrushchevs” proposed for reconstruction have already been modernized to improve energy efficiency: the upper floor was converted into an attic, the facades were insulated and finished with high-quality plaster ceramic clinker tiles under brick, which are characterized by durability and frost resistance (Figure 8).

The facades were also decorated with architectural details in the style of pre-war Kaliningrad and “brick gothic”. The roof was covered with ceramic tiles, the balconies on the main facade were made open with wrought iron fencing and glazed on the courtyard side. “Stylization” was complemented by decorative vases made of plastered concrete, arched window openings with capstone, decorative inserts with plant ornament (Korotaeva, Malyar, 2018).

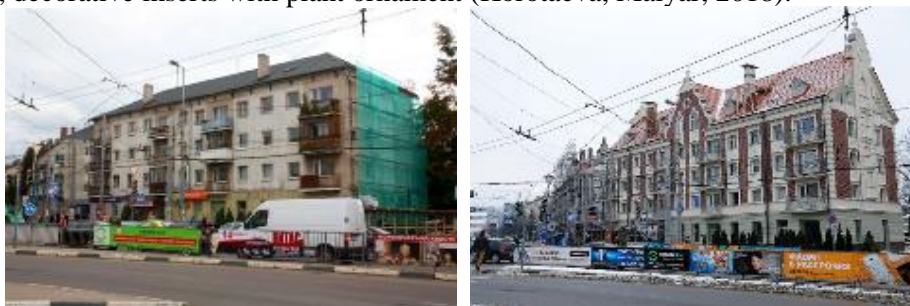


Figure 8. Result of reconstruction by “stylization” of house 2-4 on Leninsky Prospekt, Kaliningrad, Russia

Note – compiled by Capital Repair Fund for common property in apartment buildings in the Kaliningrad region, 2016

Despite the increase in aesthetic characteristics and tourist demand, the main disadvantage of such reconstruction is its attachment to a particular style, urban planning situation and design code of the district or street. Also, in «stylization» there is no reconstruction of engineering networks and the internal condition of the building, which has little effect on the improvement of living conditions.

Based on the studied experience in the reconstruction of panel houses, we can distinguish the following methods and techniques:

– Reducing the number of storeys of buildings: demolishing the upper floors and converting them into terraces, as well as combining the lower floors to create a single stylobate as a space for service and commerce.

– Redevelopment of premises: expansion of the number of rooms and space of apartments by reducing their number, which leads to an increase in the comfort of housing and adaptation to low-mobility groups.

– Repair and renovation of building structures: improving the energy efficiency and durability of the building by improving the insulation of walls, roofs, basements and attics, balconies, as well as reinforcing entrance groups and vertical communications.

– Improvement of aesthetic characteristics: repair and renovation of facades, color solutions, decorative elements, creation of a unified architectural style.

– Improvement of yard territories: creation of recreation zones, active and quiet recreation, organization of parking spaces, paths, sidewalks, landscaping systems.

These methods can be adapted and applied only taking into account the peculiarities of architectural heritage, the nature of the building, natural and geographical features of Karaganda and the social order of the city residents.

The history of the New Town area under consideration begins in 1930, with the development of the first general plan of Karaganda. The new administrative and cultural center of the city according to the plan of «Mosoblproekt» was planned to be built on the site of collective farm village Bolshaya Mikhailovka due to the need to create a high-rise city away from industrial enterprises and settlements of the Old City. Initially, brick residential buildings in the city were built in the «Stalinist» style according to the principles and methods of Russian classicism. During the period from 1936 to 1941, dozens of multi-storey residential buildings and large public facilities were built in the New Town. The main development of this territory was carried out by complex ensembles, according to a unified architectural plan. During the Second World War, the construction of high-rise buildings was reduced, increasing the housing stock was at the expense of low-rise construction. Since 1948, multi-storey building with houses of «Stalinist» style was resumed (Melikov, 1997).

In 1955, the Decree of the Central Committee of the CPSU and the USSR Council of Ministers «On the elimination of excesses in design and construction» prescribed simplicity, strictness of forms and economical solutions to provide each family with a separate apartment. In connection with this and with the beginning of the Karaganda house-building plant in 1959, a large-scale standard construction of prefabricated reinforced concrete, characterized by the simplicity of layouts, facades and cheapness of production. In the southern and southeastern part of the New City begin to build brick apartment buildings according to standard projects of series 447, developed in 1957-1959 by the institute «Giprogor», as well as panel «Khrushchevka» series 464 and 515, developed by the institute «Giprostroyindustriya» (Konobrickaya, 1954). The territories of the New Town began to be built up according to the micro-district system in the form of large residential areas with mid-rise houses of 4-5 floors, from 3 to 6 sections. (Figure 9).



Figure 9. Panel houses in Karaganda city, A - Series 1-464, B - Series 1-515

Note – compiled by the authors

These brick and panel houses are the most typical types of houses for the central part of the city, which, based on the short history of the city, represents the main part of the architectural heritage. Their service life has just begun to come to an end, so relatively recently the representatives of the state authorities have put forward ideas about preservation and possible reconstruction of important buildings for the history of the city. Before that, the main method of reconstruction applied by the local authorities was the renewal of engineering networks in the «South-East» area – Gulder, Stepnoy-2 and Kungei micro-districts, and the renovation of facades on the main streets of the city – Nursultan Nazarbayev Avenue (former Peace Boulevard), Abaya Street (former Lenin Street) and Bukhar Zhyrau Street (former Sovetskaya Street).

In 2019, the first project of renovation of the houses of the center of the «New City» along Ermekova, Gazaliev and Alikhanov Streets was proposed (EKaraganda.kz, 2024). The choice of this segment of the territory was obvious: the development of these streets is represented by brick «stalinkas» and panel houses of the mid-20th century series 1-464 and 1-515. The number of storeys varies from two-storey to three to five-storey houses. The apartment layouts are typical, the facades are decorated simply, in an aged gray, white and beige color scheme. All of them have similar problems that require reconstruction: outdated utilities, poor heat and noise insulation, roofs in need of repair, vertical communications, entrances and facades (Figure 10).

It is important that the renovation plans included not only the reconstruction of old houses, but also the demolition of dilapidated and emergency housing and its replacement with new construction. This was the main reason for the residents' indignation at the public hearings and in the framework of the social survey conducted by the Center for Social Design. The proposed project did not take into account the needs of the residents and did not guarantee careful reconstruction of the 1950s houses on Ermekova Street, which are of special value for Karaganda, reflecting the peculiarities of industrial and national architecture. (Figure 11). There was also a distrust of the population to the quality of the proposed new housing instead of the proven and long-standing Soviet houses.

**Figure 10.** Panel and brick houses on Ermekova, Gazalieva and Alikhanov Streets

Note – compiled by the authors



Figure 11. Houses of the 1950s on Yermekova Street.

Note – compiled by the authors

This was not an isolated case, initiatives to implement the housing renovation program were raised further, as the issue remained relevant in the context of Karaganda. However, the opinion of the population about these works remained negative against the background of the lack of established dialog and incorrect informing of residents about the reconstruction process and its essence. In addition, according to residents, the expected result seemed abstract and incomprehensible due to the lack of a program, a clear work plan and uncertainty at the main stages of the organization of works.

In order to approve and start the reconstruction works, the consent of the majority of tenants was needed, the result of which could not be achieved. Thus, it can be concluded that the wrong strategy was chosen in terms of communication with the people. As an effective tool to convince people of the necessity and advantage of the reconstruction, a visual and intuitive sketch design with a demonstration of the intended result could have been used, which would have prompted a better understanding of the goals and expectations of the project as a whole.

Thus, in the panel construction of the 1950-1970s within the historical center of the city of Karaganda, the relevant items as part of the preliminary design, as well as general recommendations for consideration when working on the reconstruction of the housing stock are:

- Repair and modernization of load-bearing structural elements of the building: improvement of energy efficiency and durability of the building by improving insulation of walls, roofs, basements, attics and balconies, which includes thermal insulation, noise insulation, wind and moisture insulation, etc.
- Renovation and modernization of entrance groups and staircases
- Enhancement of aesthetic qualities: restoration and renovation of facades, selection of relevant and harmonious color solutions, decorative elements
- Creation and maintenance of a single harmonious architectural style within a district, neighborhood or ensemble of buildings.
- Improvement of comfortable courtyard territories: formation of recreation and recreational areas, parking spaces, children's and sports grounds, walking areas, sidewalks, as well as the organization of aesthetic and practical landscape.

Conclusion. The study showed that the reconstruction of panel houses from the 1950s to the 1970s in the historical center of Karaganda is an urgent task requiring an integrated approach. The technical condition of the buildings indicates the need for modernization, including increased energy efficiency, improved architectural appearance, redevelopment of residential premises and landscaping of adjacent territories. The analysis of foreign experience has demonstrated successful methods of reconstruction, such as reducing the number of floors, updating facades, adapting buildings for low-mobility groups of the population and the introduction of modern building materials.

The application of these solutions in Karaganda will not only extend the service life of the

existing housing stock, but also preserve the historical appearance of the city, increase the comfort of living and improve the urban environment. It is important to take into account the opinion of residents and ensure effective cooperation with local governments for the successful implementation of renewal programs.

As a result of analysis and research of foreign realized projects on the topic of reconstruction of panel housing stock, as well as Karaganda experience in the organization of these works, it was possible to determine the main world trends and, on their basis, to make a list of recommendations for the main relevant and necessary solutions at the stages of proposal formation.

Conflict of interest. The authors declare that there is no conflict of interest.

Acknowledgments. This research is funded by the authors' own funds.

Notification of the use of generative AI and technologies using it in the process of writing the manuscript. The authors did not use tools of artificial intelligence services in the preparation of this paper.

References

- SN RK 1.04-26-2011. Rekonstrukciya, kapital'nyj i tekushchij remont zhilyh i obshchestvennyh zdaniy. – 2011.
- CHeredina I.S., Rybakova E.YU. Rossijskaya praktika panel'nogo domostroeniya i opyt Germanii po rekonstrukcii tipovogo industrial'nogo zhil'ya //Novye idei novogo veka: materialy mezhdunarodnoj nauchnoj konferencii FAD TOGU. – Federal'noe gosudarstvennoe byudzhethoe obrazovatel'noe uchrezhdenie vysshego obrazovaniya Tihookeanskij gosudarstvennyj universitet, 2017. – T. 1. – S. 402-407.
- Melikov, E.G. Goroda ne stroyatsya, oni sozdayutsya: etapy arhitekturno-planirovochnogo razvitiya goroda Karagandy (1930-1980). – Almaty; Karaganda, 1997. – 67 s.
- Sihimbaev M., CHerkasov M. Issledovanie ob"ektov nedvizhimosti po gorodu Karaganda //Bezopasnost' gorodskoj sredi. – 2021. – S. 310-315.
- Prokof'eva I. A. Hrushchevki-snos ili rekonstrukciya: sovremennye tendencii // ZHilishchnoe stroitel'stvo. – 2015. – № 4. – S. 43-46.
- Meerovich M.G. i dr. Renovaciya panel'noj zastrojki 1960-1980-h gg. v Germanii //Izvestiya vuzov. Investicii. Stroitel'stvo. Nedvizhimost'. – 2017. – T. 7. – № 1 (20). – S. 111-119.
- Kharicheva E. YA. " Renovaciya" massovogo zhil'ya v pribaltijskom regione (Germaniya, Pol'sha, Estoniya, Latviya, Litva, Rossiya) // Dom Burganova. Prostranstvo kul'tury. – 2012. – № 3. – S. 17-30.
- CHeredina I.S., Rybakova E.YU. Rossijskaya praktika panel'nogo domostroeniya i opyt Germanii po rekonstrukcii tipovogo industrial'nogo zhil'ya // Novye idei novogo veka: materialy mezhdunarodnoj nauchnoj konferencii FAD TOGU. – Federal'noe gosudarstvennoe byudzhethoe obrazovatel'noe uchrezhdenie vysshego obrazovaniya Tihookeanskij gosudarstvennyj universitet, 2017. – T. 1. – S. 402-407.
- Glebushkina L.V., Peretolchina L.V. Rekonstrukciya zhiloi zastrojki: uplotnenie ili razuplotnenie //Sistemy. Metody. Tekhnologii. – 2016. – № 3. – S. 182-191.
- Konobrickaya E.M. Karagandinskaya oblast' // Alma-Ata, Izd-vo Akad. nauk KazSSR. – 1954.
- Samojlov K.I. Arhitektura Kazahstana XX veka (razvitie arhitekturno-hudozhestvennyh form). – Moskva; Almaty, 2004
- Tuyakayeva A. et al. Regional identity in the architecture of residential buildings in the 1930s-1990s of the Karaganda city // Vestnik KazGASA. – 2023. – T. 4. – № 90. – S. 44-58.
- Verhoturov F.V., Vinogradova T.V., Zolotareva L.R. Istoriya i arhitekturnaya estetika Karagandy: novyj general'nyj plan goroda (posvyashchaetsya 80-letiyu Karagandy) // Aktual'nye problemy stroitel'stva, ekologii i energosberezheniya v usloviyah Zapadnoj Sibiri. – 2014. – S. 43.
- Borisevich YU.A., Imanov M.O. Modernizaciya rekonstruiruemih territorij i preobrazovanie gradostroitel'nyh podhodov k resheniyu sovremennoj zhiloi sredi // Arhitekturno-stroitel'nyj i dorozhno-transportnyj komplekсы: problemy, perspektivy, innovacii. – 2021. – S. 606-611.
- Bake O. i dr. Social'no orientirovannoe mestnoe upravlenie: opyt gorodov Germanii dlya Rossii= Sozial orientierte kommunalpolitik: Die erfahrung Deutscher städte als beispiel für Russland/pod red BM Grinchelya, NE Kostylevoj; Ros. akad. nauk. In-t soc.-ekon. problem, In-t Evrograd. – 1999.
- Braune U., Rau O. Der Altbau. Leinfelden-Echterdingen, 2000.
- Korotaeva E.A., Malyar V.V. Fasady i ih rekonstrukciya // Mezhdunarodnyj studencheskij nauchnyj vestnik. – 2018. – № 6. – S. 200-200.

- Jakavičiūtė A. The programme „The renewal of dwellings means the renewal of Vilnius”. Nauja statyba, 3 (17), 2005. – P. 58-59.
- Lithuanian Hygienic Standard. HN 42:2004. Inner climate of residential and administrative buildings. Vilnius: Ministry of Health of Lithuanian Republic, 2004. – P. 12.
- EKaraganda.kz [Elektronnyj resurs] – URL: https://ekaraganda.kz/?mod=news_read&id=90795 (data obrashcheniya 30.07.2024).

Information about authors

Baymuratova Linara Tohirovna – master student of department of «Construction and building materials», Satbayev University, 22 Satpayev st., Almaty, Kazakhstan, E-mail: l.lin.b@mail.ru

Murat Tomiris Mukaramkyzy – master student of department of «Architecture», Satbayev University, 22 Satpayev st., Almaty, Kazakhstan, E-mail: henrytasmaneh@gmail.com

Maulenova Gulnara Djuparbekovna – Candidate of Architecture, Associate Professor of the Department of Architecture of the Institute of Architecture and Construction, Satbayev University, 22 Satpayev st., Almaty, Kazakhstan, E-mail: g.maulenova@satbayev.university

Kuatbayeva Togzhan Kuangalievna – Doctor of Technical Sciences, Professor of the Department of "Construction and Building Materials", Satbayev University, 22 Satpayev st., Almaty, Kazakhstan, E-mail: aitzhanova.tokzhan@mail.ru

Bakirova Tarana Shaig – PhD-Doctor of Philosophy in Architecture, Head of the Department of Graphic and Media Design, Faculty of Design, Azerbaijan University of Architecture and Civil Engineering, 4 Aina Sultanova st., Baku, Azerbaijan, E-mail: taranabakirova@gmail.com
