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TASKS OF ENSURING THE OPERATING LIFE OF STANDARD HOUSING BLOCKS BUILT IN YEREVAN: STRATEGY

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The article touches upon the issues of ensuring the reliability of structures in the field of residential architecture. The aim of the paper is to make a general analysis of the existing database on standard housing blocks built in Yerevan and identify the tasks of the strategy to ensure their operating life. The article has been elaborated based on scientific publications, archival materials and field observations, by scientific methods of theoretical research, analysis, classification and generalization. The available information on the topic has been presented, because of the generalization of which the problems emerged in buildings were divided into structural, engineering and artistic directions. The latter served as the basis for clarifying the tasks, which were discussed in the context of supplementing the existing studies in the following areas: history of development, current state, and international experience. It was substantiated that the completed database will make it possible to develop scientifically founded recommendations aimed at ensuring the operating life of standard housing blocks in Yerevan. The main tasks of the process strategy and directions for future works were identified. The obtained outcomes can be useful both for programs for the modernization of the housing stock in Yerevan, and for the development of theoretical works related to the reconstruction of residential buildings in general.

Keywords: *standard housing block, Yerevan, current state, operating life, strategy, tasks*

Introduction

Housing blocks, like any structures, need reconstruction and modernization over time. It is carried out through the principle of research, analysis and predetermination of development prospects. Although there is a lot of international and local scientific research in this field, the works related to the analysis of the current state as well as to the preservation and ensuring the operating life of the standard housing blocks built in the Soviet years in Yerevan are extremely limited. However, this is an issue of essential importance for the city. Frequent negligence of residential construction issues had already caused enormous human and material damage to our country during the earthquake in Armenia in December 1988, when residential development was the first to be subjected to massive destruction. Of course, after the earthquake of 1988, significant changes have been made to the requirements regulating residential construction, but the issue of the fate of the existing structures has been left indefinite. It is noteworthy that about 70% of the current housing stock of Yerevan was built in the Soviet years, and moreover, the vast majority of them are standard housing blocks. It is also necessary to pay attention to the fact that the reliability of structures is endangered not only because of the inconsistency with the new requirements of their solutions, but also because of the typical factor of socio-economic and political instability of the 1990-2000s - the implementation of numerous unauthorized interventions by citizens (annexes, openings in load-bearing walls, modifications in structures). And taking into account the fact, that almost 40% of the RA population lives in Yerevan, it can be concluded that the

urgency of the problem of the future of standard housing blocks in the context of both economic and security issues is well-founded not only from the perspective of sustainable development of the capital, but also in terms of the whole Republic.

The aim of the article is to make a general analysis of the existing database on standard housing blocks built in Yerevan and identify the main tasks of the strategy to ensure their operating life.

The elaboration of the article was based on the separation of certain problems related to the topic and the study of scientific literature on them. The following subjects have been examined: general issues of Armenian architecture in the Soviet years [1, 2], peculiarities of residential development in Yerevan in 1950-1960 [3, 4], general issues of the development of mass residential architecture in the Republic in 1960-1990 [5], structural and artistic aspects of the architecture of the new residential areas of Yerevan, built in 1960-1970 [6-9], statistical information (2005 General plan of Yerevan), problems of participatory architecture in the process of modernization of residential buildings [10-12], problems of socio-economic and other factors affecting the preservation of social residential buildings, as well as the reorganization of housing [13-17], issues of preservation, reconstruction, resource management and environmental impacts of existing housing stock in different countries [18-23].

Materials and Methods

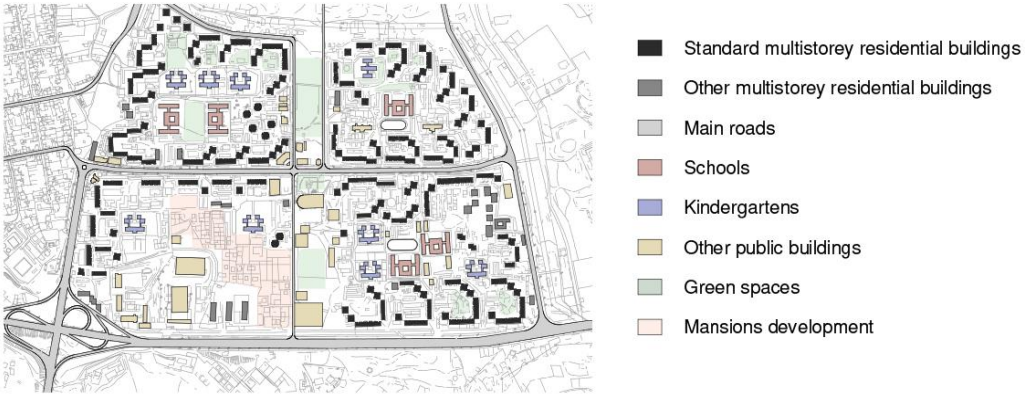
The work was carried out on the basis of research of published and archival materials on the topic, as well as field observations, by scientific methods of theoretical research, analysis, classification and generalization.

Photographs and drawings used in the figures were made by the authors.

Results and Discussion

Generalization of available information. The mass use of standard residential buildings in Armenia began in the second half of the 1950s, and before that, individual design buildings prevailed in the Republic [1, 2]. After World War II, due to a sharp increase in population, it became extremely necessary to build a large amount of housing stock. And already since the 1950s, the design of 4…5-storey standard residential buildings has been developed, the most appropriate for the initial period of mass construction. The decision "On the Elimination of Excesses in Design and Construction" adopted in the USSR in 1955 had a huge impact on the architecture of residential buildings in Yerevan. Fundamental changes in the field were aimed at implementing the basic principles in the design of reusable buildings - reducing costs and shortening construction time. To ensure this industrial methods in construction start to be used [3, 5].

Thus, in 1957, the resolution "On the Development of Housing Construction in the USSR", the main goal of which was to expand the process of mass housing construction, led to major changes in the field of urban planning and architecture. And in the 1960s, throughout the USSR, as well as in Yerevan, the rapid construction of standard residential buildings and the mass development of large territories was launched. As already noted, at first, 4-5-storey standard residential buildings were constructed, then the design of structures with a higher number of storeys was deployed. In addition to the number of storeys, in projects the construction systems of structures were also changed. In parallel with stone buildings, assembled carcass, large-panel, frame-carcass, frame-core structure systems were used [1, 6]. Figure 1 shows the Davitashen residential area in Yerevan, which was fully built up with standard housing blocks in the 1980s (fig. 1).



a)

b)

Fig. 1. Davitashen residential area: a - Master plan diagram, b - Standard residential buildings

The benefits of the standard design were obvious. This largely contributed to the realization of the goal of the rapid formation of relatively low-price housing. As statistics shows, the most intensive period of construction of residential buildings in Yerevan was 1971-1980, when 1405 residential buildings were built and commissioned [4], (fig. 2). This trend continued into the 1980s, but the 1988 earthquake, the collapse of the Soviet Union and the first Artsakh war led to a sharp decline in mass construction in Armenia, and since the beginning of the 1990s, the construction of standard residential buildings in Yerevan has practically ceased [4].

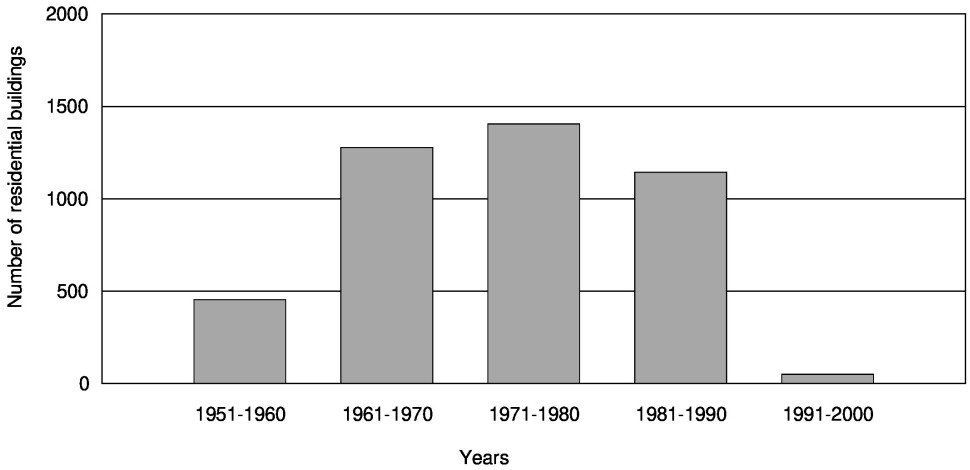


Fig. 2. The pace of construction of housing blocks in Yerevan in 1951-2000

It should be noted that nowadays in most of the standard residential buildings constructed in Yerevan during the Soviet years, problems have emerged associated with structural, engineering and artistic solutions. The reasons are various. For example, during the design stage, from the structural perspective buildings were computed in accordance with the existing norms prior to the 1988 earthquake. But after the earthquake, the

constructive norms and requirements for structures in Armenia have changed fundamentally. The entire territory of Armenia was assessed as a seismicity zone of 9.0, and all series of residential buildings not meeting the new requirements have been decommissioned since 1989 [5]. Standard series, seriously damaged by the earthquake, were taken out of application altogether, and the rest were redeveloped. Another reason for the unsatisfactory current state of residential buildings is that during mass construction the full control on the quality of the work performed frequently failed. It also led to the weakening of the structure of the buildings. A problem of the same kind is the individual intervention of residents in the structure of buildings over the years, for example, the implementation of attic floors, annexes, consoles, openings, etc.

The low level of architectural and artistic solutions of the buildings was caused by the negation of the elements personalizing the image at the design stage, which was related to economic problems. The external changes made by the residents to improve their living conditions, such as the opening of private entrances to the first-floor apartments, the appropriation of the adjacent areas of the buildings, the transformation of balconies and porches, and other individual processes also had a negative impact [7, 8].

Among the problems associated with engineering solutions, it can be noted that although the central heating system initially operated in buildings, after the Soviet years it never worked again, and residents have been solving this problem on their own for a long time. But for example, cooling systems were not initially provided, and this problem is also solved by residents. The new communications of gas supply, television and telecommunications are also implemented in this way. The given circumstances affect both the structural and artistic solutions of the buildings.

Thus, it can be concluded that housing blocks that initially did not meet modern requirements in terms of structural solutions, undergoing numerous uncontrolled changes over the years, especially in terms of safety and aesthetics, are in an extremely uncertain state. And the solution to the problem of ensuring their operating life, first of all, implies the clarification of the strategy directions of this process.

Discussion of the strategy tasks. First of all, it is important to clarify the available information on the discussed buildings. The data obtained as a result of the studies carried out to date may include passports of standard residential buildings, which are available in the archives of the “Armproject” company. Passports contain the series of standard buildings constructed in the Republic and their general architectural drawings (plans, sections, facades, block schemes), basic technical and economic indicators (areas, number of storeys, basic dimensions, materials used and their prices). The materials of the 2005 General Plan of Yerevan are also available, where the number of constructed housing blocks is indicated by administrative districts and dates. In addition to the aforementioned, it should be noted that the topic of standard residential buildings constructed in Yerevan was also discussed in some scientific studies on the architecture of the Soviet era in Armenia [1-3, 9]. It is worthwhile to mention G. Rashidyan's work “Development of Mass Housing Architecture in Armenia and the Tasks of the Current Stage” dated 1999, which presents a detailed architectural and urban planning analysis of the main standard residential buildings used in the Republic, as well as discusses issues related to the future [5]. Some issues of modernization of large-panel buildings constructed in Yerevan are discussed in T. Hakobyan's work [22].

The mentioned database, however, is not complete from the point of view of ensuring the further operation of the buildings. In this regard, it is necessary to carry out a number of research works.

First of all, it is necessary to generalize the study of the history of the standard housing construction formation in Yerevan. Here it is important to get a clear idea - in what conditions and for what purpose the process of designing a standard housing in Yerevan began and what were its political, economic and social

prerequisites. Has the mass construction of residential buildings reached the solution of the assigned tasks and the achievement of the goals of the time? Are there any intentions to continue this process today and to what extent do they correspond to current requirements? An important part of the study of the history of formation should be the architectural and planning, structural and artistic analysis of the completed buildings.

Particular attention should be paid to the study of the actual state of existing structures. To achieve this aim, it is necessary to issue passports for the buildings. As already mentioned, significant changes have been made in the normative requirements during the last decades. However, first of all, it is necessary to analyze to what extent the architectural and planning, structural and artistic solutions of the designs had been implemented. In addition, it is necessary to analyze the interventions made by residents and relevant authorities over the years, as well as their impact on the reliability of structures. All the specified information should be reflected in the passports of individual buildings. As a result of the analysis carried out on their basis it will be possible to understand what is the level of their inconsistency with the current requirements of environmental safety, comfort and aesthetics.

It should also be considered that the series of standard residential buildings differ significantly from each other, therefore, architectural planning, structural and artistic analyses, as well as assessments based on them, should be made according to the peculiarities of the corresponding types or their groups. Classifications need to be carried out in a number of directions, including:

- according to the structural system;
- number of storeys;
- the availability of elevators;
- the effectiveness of the evacuation system;
- energy efficiency;
- the flexibility of planning solutions.

A number of statistical data should also be completed. In particular, the quantitative data of buildings by type, by administrative districts of Yerevan and by construction time are unknown. There is no factual data about their current state. We need information on the following issues:

- types and number of constructed residential buildings (by series),
- types of the structural systems used;
- terms of commissioning of individual buildings;
- the number of actually existing buildings;
- reasons for the dismantling of certain buildings;
- the number of existing emergency buildings, the availability of analytical information on them;
- the outcomes of technical studies carried out to date.

An equally important task is to study international experience in ensuring the operating life of residential buildings, which will make a significant contribution to the process of finding more suitable solutions to the problems posed. Among the works carried out in this area, one can note a series of studies on participatory architecture in the process of modernizing residential buildings, which, in particular, are discussed for the conditions of various countries in South America, Africa and South Asia [10-12]. Studies of demographic, social, economic, technical, climatic conditions and other effects in the field of housing reconstruction were carried out in Germany, Poland and other European countries [13-15]. The work done on the modernization of housing stock in post-socialist Yugoslavia is noteworthy, where residential buildings reconstructed for the upper stratum of society are being discussed [16].

Modernization, reconstruction and preservation of social housing is discussed in studies summarizing the work done in England [17]. Research and calculations related to the management of housing resources in the Netherlands, Germany, Great Britain, France and Finland are of great importance, which also reveal the approach of the state legislative and legal system to residential buildings and the problems of ensuring operating life that have emerged in connection with this [18, 19]. Among the studies in this area, the work devoted to the comparison of prefabricated and monolithic buildings in China stands out, which identifies their advantages and disadvantages, the impact on the environment, as well as presents a comparison of statistical data relating to similar structures in different countries [20]. There are also works devoted to the problems of the housing stock formed in the post-Soviet countries, where the issues of preservation, reconstruction, modernization, as well as the management of residential buildings are analyzed, for which certain proposals are also submitted [21-23]. Analyzing in detail the mentioned, as well as other works developed in the direction of the reconstruction of residential structures, it is necessary to find out in which countries and when standard residential buildings were used. What tasks were set at the design stage and to what extent were they implemented? What questions arose during the construction and what solutions did they receive? Here it will be important to find out for how many years of operating life standard residential buildings were intended and how long they have been in operation. Particular attention should be paid to identifying problems that have emerged in the architectural and structural solutions of buildings over time, as well as to the demonstrated approaches towards them. A comparative analysis of the reconstruction of residential buildings in Armenia and other countries will be crucial. One can try to understand if there are countries where normative changes have taken place and what impact they have had on the existing residential buildings.

A comprehensive study of the history of the formation and the actual state of standard housing blocks built in Yerevan, and the combination of the obtained outcomes with international experience, will make it possible to develop scientifically founded recommendations aimed at ensuring the operating life of these structures. The development of such recommendations, first of all, implies the division of the inspected structures into the following groups:

- to be preserved;
- to be reconstructed;
- to be demolished.

The classification, of course, must be preceded by the definition of the minimum and maximum criteria for each group. With this classification of the existing structures, it will be possible to develop an appropriate action plan for each group. In the case of buildings to be preserved, in particular, the necessary preservation measures should be developed, the possibilities of their targeted use should be clarified. In the case of reconstruction, mandatory measures should be distinguished, which may include strengthening structures, reducing the number of storeys, partial demolition (reducing the length of the building), reorganizing facades, increasing energy efficiency, modernizing communications and technical systems. In the event of demolition of structures, it will be important to identify the possibilities for reuse of dismantled structural elements, as well as generated waste and garbage.

Conclusion

The analysis of standard housing blocks built in Yerevan, carried out on the basis of scientific methods of theoretical research, analysis, classification and generalization, makes it possible to divide the problems that have emerged in buildings into structural, engineering and artistic directions. This, in turn, provides a basis for

clarifying the tasks of the strategy for ensuring the operating life of structures, which involve two main groups of actions: supplementing the available information in the following areas: history of formation, actual state, and international experience; development of proposals for solving problems.

Accordingly, the following key tasks can be distinguished for the strategy:

- to summarize international and local experience in the reconstruction of housing blocks;
- to study the process of formation of standard residential buildings constructed in Yerevan;
- to analyze the current state of standard residential buildings and identify the emerged issues;
- carry out certain classifications of the existing structures based on the identified issues and characteristic features;
- develop scientifically founded recommendations to ensure the operating life of standard residential buildings.

The decisive directions for developing the recommendations should be: ensuring security; increasing energy efficiency; improvement of the architectural image and its integration into the existing environment; further targeted use.

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References

[1] **А.Г. Григорян, М.Л. Товмасян,** Архитектура Советской Армении. Стройиздат, Москва, 1986, 320 с.

[2] **В.М. Арутюнян, М.М. Асратян, А.А. Меликян,** Архитектура Советской Армении. Стройиздат, Москва, 1972, 158 с.

[3] **В.М. Арутюнян, М.М. Асратян, А.А. Меликян,** Ереван. Изд-во литературы по строительству, Москва, 1968, 302 с.

[4] **K.R. Azatyan,** The evolution of the 20th century residential architecture of Yerevan in space and time. DSc Thesis in Architecture. National University of Architecture and Construction of Armenia, Yerevan, 2018, 232 p. (in Armenian)

[5] **Г.Г. Рашидян,** Развитие архитектуры массового жилища Армении и задачи современного этапа. Изд-во ЕГУАС, Ереван, 1999, 88 с.

[6] **G.H. Rashidyan, K.R. Azatyan,** The features of architecture of the mass housing in new residential areas in Yerevan. Scientific Proceedings of YSUAC IV (51) (2013) 47-57. (in Armenian)

[7] **K.R. Azatyan, A.R. Yengoyan, K.R. Khanoyan,** The problems of architectural image of residential development in Yerevan in the first decades of mass housing (1960s). Scientific Proceedings of YSUAC II (53) (2014) 3-10. (in Armenian)

[8] **K. Azatyan, M. Igitkhanyan, A. Ohanyan,** Challenges to Residential Quarter Reconstruction: The Case of the Center of Yerevan City. Journal of Architectural and Engineering Research, 3, 10–31. (2022) https://doi.org/10.54338/27382656-2022.3-002

[9] **Ю.А. Сафарян,** Архитектура зданий и сооружений, возводимых методом подъема. Айастан, Ереван, 1988, 240 с.

[10] **Nguyen Huy Dan & Yoshimitsu Shiozaki,** A Study on Upgrading Projects of Public Housing in Hanoi, Vietnam. Journal of Asian Architecture and Building Engineering 10:1 (2011) 69-76. DOI: 10.3130/jaabe.10.69

[11] **F. Meijer, L. Itard & M. Sunikka-Blank,** Comparing European residential building stocks: performance, renovation and policy opportunities. Building Research & Information 37:5-6 (2009) 533-551. DOI: 10.1080/09613210903189376

[12] **P. Monkkonen,** Do we need innovation in housing policy? Mass production, community-based upgrading, and the politics of urban land in the Global South. International Journal of Housing Policy 18:2 (2018) 167-176. DOI: 10.1080/19491247.2017.1417767

[13] **C. Deilmann, K.-H. Effenberger & J. Banse,** Housing stock shrinkage: vacancy and demolition trends in Germany. Building Research & Information, 37:5-6 (2009) 660-668. DOI: 10.1080/09613210903166739

[14] **T.V. Radionov,** Standardized development objects reconstruction in difficult geoclimatic conditions. Journal of Architecture and Urbanism 38:2 (2014) 142-147. DOI: 10.3846/20297955.2014.916507

[15] **E. Marcinkowska, K. Gawron, & M. Rejment,** Technical and economic aspects of revitalization of down-town tenement-houses in Wrocław. Journal of Civil Engineering and Management 21(8) (2015) 1036-1045. DOI: 10.3846/13923730.2015.1027259

[16] **M. Petrović,** Post-socialist housing policy transformation in Yugoslavia and Belgrade. European Journal of Housing Policy 1:2 (2001) 211-231. DOI: 10.1080/14616710110083434

[17] **P. Malpass & C.Victory**, The Modernisation of Social Housing in England. International Journal of Housing Policy 10:1 (2010) 3-18. DOI: 10.1080/14616710903565647

[18] **M. Sunikka & C. Boon,** Environmental policies and efforts in social housing: the Netherlands. Building Research & Information 31:1 (2003)1-12. DOI: 10.1080/0961321021000013858

[19] **Uta Hassler** Long-term building stock survival and intergenerational management: the role of institutional regimes. Building Research & Information 37:5-6 (2009) 552-568. DOI: 10.1080/09613210903189533

[20] **Yuna Wang, Xiaolong Xue, Tao Yu & Yaowu Wang** Mapping the dynamics of China's prefabricated building policies from 1956 to 2019: a bibliometric analysis. Building Research & Information 49:2 (2020) 216-233. DOI: 10.1080/09613218.2020.1789444

[21] **С.Г. Абрамян,** Реконструкция и модернизация зданий, введенных в эксплуатацию во второй половине XX века: цели и задачи. Интернет-журнал «НАУКОВЕДЕНИЕ» 8(1) (2016). DOI: 10.15862/40TVN116

[22] **Т.Д. Акопян,** Пути модернизации крупнопанельных жилых зданий г. Еревана. Вестник МГСУ 12 (2014) 9-19.

[23] **И.Х. Давлетов,** Комплексный подход к совершенствованию системы управления, содержания и модернизации жилых домов. Бюллетень науки и практики 6(9) (2020) 248-255. DOI: 10.33619/2414-2948/58/26

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Ճարտարապետության և շինարարության Հայաստանի ազգային համալսարան, ք.Երևան, ՀՀ

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Հոդվածը վերաբերում է բնակելի ճարտարապետության ասպարեզում կառույցների հուսալիության ապահովման խնդիրներին: Աշխատանքի նպատակն է ընդհանրական վերլուծության ենթարկել Երևանում կառուցված տիպարային բազմաբնակարան շենքերի վերաբերյալ առկա տեղեկատվական բազան և վեր հանել դրանց շահագործման երկարակեցության ապահովման ռազմավարության խնդիրները: Հոդվածը մշակվել է գիտական հրապարակումների, արխիվային նյութերի և բնօրինակ ուսումնասիրությունների հիման վրա՝ տեսական հետազոտման, վերլուծության, դասակարգման և ընդհանրացման գիտական մեթոդներով: Ներկայացվել է թեմայի շուրջ առկա տեղեկատվությունը, որի ընդհանրացման արդյունքում շենքերում առաջացած խնդիրներն առանձնացվել են կառուցվածքային, ինժեներական և գեղարվեստական ուղղություններով: Վերջինս հիմք է հանդիսացել ռազմավարության խնդիրների հստակեցման համար, որոնք քննարկվել են առկա հետազոտությունները հետևյալ ուղղություններով լրացման համատեքստում՝ ձևավորման պատմություն, փաստացի իրավիճակ, միջազգային փորձ: Հիմնավորվել է, որ ամբողջացված տեղեկատվական բազան հնարավորություն կտա մշակել Երևանի տիպարային բազմաբնակարան շենքերի շահագործման երկարակեցության ապահովմանն ուղղված գիտականորեն հիմնավորված հանձնարարականներ: Նախորոշվել են գործընթացի ռազմավարության հիմնական խնդիրներն ու ապագա աշխատանքների ուղղությունները: Ստացված արդյունքները կարող են օգտակար լինել ինչպես Երևանի բնակելի ֆոնդի արդիականացման ծրագրերի, այնպես էլ բնակելի կառույցների վերակառուցմանն առնչվող տեսական աշխատանքների մշակման համար:

Բանալի բառեր. *տիպարային բազմաբնակարան շենք, Երևան, փաստացի իրավիճակ, շահագործման երկարակեցություն, ռազմավարություն, խնդիրներ*

ЗАДАЧИ ПО ОБЕСПЕЧЕНИЮ ДОЛГОЛЕТИЯ ЭКСПЛУАТАЦИИ ТИПОВЫХ МНОГОКВАРТИРНЫХ ДОМОВ В ЕРЕВАНЕ: СТРАТЕГИЯ

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В статье обсуждаются вопросы обеспечения надежности сооружений в сфере архитектуры жилища. Цель работы - выполнить общий анализ существующей базы данных по типовым многоквартирным домам, построенным в Ереване, и определить задачи стратегии по обеспечению долголетия

их эксплуатации. Статья разработана на основе научных публикаций, архивных материалов и полевых наблюдений, научными методами теоретического исследования, анализа, классификации и обобщения. В результате обобщения имеющегося материала по теме, проблемы в домах были разделены на конструктивные, инженерные и художественные. Последнее послужило основанием для уточнения задач стратегии, которые рассматривались в контексте дополнения существующих исследований по следующим направлениям: история развития, фактическое состояние, зарубежный опыт. Обосновано, что дополненная база данных позволит разработать научно подтвержденные рекомендации по обеспечению долголетия эксплуатации типовых многоквартирных домов в Ереване. Определены стратегические задачи процесса и направления дальнейших работ. Результаты могут быть полезными как для проектов модернизации жилого фонда Еревана, так и для теоретических разработок, связанных с реконструкцией жилых домов в целом.

Ключевые слова: *типовой многоквартирный дом, Ереван, фактическое состояние, долголетие эксплуатации, стратегия, задачи*

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