Housing architecture of Yerevan. Typology, Forecast

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Abstract. The stages and features of the housing architecture formation in Yerevan in 1920-2020 are presented. The typological principles of their architectural and planning decisions are considered. The authors emphasize the creative contribution of famous Armenian architects who laid the Yerevan’s housing architecture formation foundation. A number of recommendations for the modernization of housing built in Yerevan during the 1920-2020 period are given.

1. Introduction
Over the hundred years (1920-2020) the Yerevan housing architecture formation reflects its geographical, ideological, socio-economic, construction and technical features, cultural transformations and changes in the city’s urban planning system [1-4]. The paper does not claim to carry out a comprehensive multi-factor analysis of the architecture housing development of the last hundred years in Yerevan. The emphasis is placed on the fundamental principles that we have highlighted for the Yerevan’s housing architecture formation during this period.

By 1920 Yerevan had had only about 45 thousand inhabitants, today its population is about 1 million 200 thousand inhabitants. Under the influence of demographic and other urban core factors, the city’s appearance has undergone a significant transformation during this time [1-4]. The entire period of its development is divided into the Soviet period from 1920 to 1990 and the current period ”The Third Armenian Republic” - from 1991 up to the present day. The period of Yerevan housing architecture development since 1991 up to nowadays needs a special study.

2. Methods
Summarizing the existing research on the issue under study and analyzing the current situation in the housing architecture of Yerevan, a forecast and the recommendations for further solving problems in this sphere have been made.

In our opinion, to select the most significant historical component from the entire volume of housing in Yerevan is of paramount importance in order to preserve it on the principles of the historical layer modernization. In this regard, it is necessary to carry out full the certification of all residential buildings in Yerevan without exception using the contemporary Building Information Modeling (BIM) technologies. At the same time, it is necessary to consider the physical and moral principles and the seismic hazard level.

Modernization should extend to:
The preserved dwellings of the old Yerevan of the 19th and early 20th centuries, reflecting the national traditions and the features of the people’s housing – mansions, family, income, multifunctional houses with gardens, atrium courtyards with pools, external common galleries, wide summer facilities oriented to the East and South, exploited flat or the “glhatun” tent-shaped type roofs, etc. The famous architects Vasily Mirzoyan, Yervand Ter-Avetikyan, Boris Megrabyan, Mikhael von der Nonne, and others made their individual contribution to their creation [5, 6].

The urban residential buildings, which are the single-storey buildings of individual houses and complexes were built in 1921-1928. About 60 thousand m² of housing was built for the refugees from Western Armenia, mainly based on the projects of the Yergorsovet technical Department [3-7].

The settlement of the repatriates (about 200 thousand in 1931-1938, as well in 1946-1948) from the Armenian diasporas of various countries across the world (which was created as a result of mass migration as a consequence of the Armenian genocide in Turkey), occupies a special place in the architecture of the Yerevan housing in 1920-1930. They reflect the national traditions and originality of the abandoned homes (3,600,000 Armenians were deported) on the territory of Turkey from the Mediterranean to the Black sea - the cities of Adana, Aleppo, Urfa, Tigranakert, mush, van, Erzrum, Arakbij, Amasia, Zeitun and hundreds of other cities and settlements. The newly created villages of Nor-Arabkir (1925), Nor-Bayazet (1925), Nor-Evdokia (1925), Nor-Malatia (1927), Nor-Khi (1931), Nor-Tigranakert (1934), Nor-Tamarzy (1931), Nor-Caesarea (1934) and others became a part of modern Yerevan. Such famous architects as Alexander Tamanian, Manuel Kaputikyan, Nikolay Bayev, Tigran Yerkanian, Armen Khachatryan, Mihran Merjanyants (Miron Merzhanov) - made their special contribution to their creation [8].

The housing of Yerevan in 1930-1956 formed the architectural ensembles on the main thoroughfares of the city at that time, avenues and streets (Mashtots Ave., Abovyan st., Nalbandyan, Teryan, Amiryun, Kieyan, Tamantsineri, Baghramyan, Tumanyan, Tamanyan, etc.), as well as the squares (Sakharov, Spandaryan, etc.). This building in the center of Yerevan is the most valuable both in historical and architectural terms, the best Armenian architects of that time participated in its creation – N. Buniatyan, S. Safaryan, A. Nushikyan, M. Grigoryan, M. Mazmanny, G. Kochar K. Alabyan, G. Aghababyan, T. Yerkanian, O. Markarian, G. Tamanyan et al. For the first time, stone architecture was presented in all its beauty and variety, which still defines the appearance of the Yerevan center [3,4,7,9]. This is the surface of facades made of clean-cut masonry with smooth cornices, strict portals, elegant pediments, any touch them requires care and tact. Warmth, calmness are radiated from the stone facades of Yerevan.

Of particular note is a large residential building built in the 1930-s (architects: K. Kochar, M. Mazmanny, O. Markarian, S. Safaryan), consisting of 4 blocks of 3-4-storey buildings for the workers of the synthetic rubber chemical plant, between Chekhov, Ovsepyan, Bratsvto and Bagratyunyants streets [3]. For the blocks’ development, a three-story residential building project was developed and on its basis, an articulated grouping of residential buildings was created in the form of semi-closed landscaped courtyards that give dense shade in the hot summer months and at the same time protect from the dusty northern winds. On the first floors of some houses the shops were placed. In addition to the playgrounds, water pools were built inside the blocks – a popular element in the structure of residential units in Yerevan. For the first time, a complex development of residential areas was carried out, the blocks were organized as an independent organism, and a move away from the principle of streets corridors was made [3-7].

Housing of mass developments in the districts of Acharnayak, Nork, Zeitun, AvanArinj in 1960-1980 and individual buildings on highways, the intra-block territories were mainly implemented according to the standard and individual projects [1, 3, 4, 10, 13]. In fact, over a 30-year period, a new alien Yerevan was built, in the appearance of the residential environment dominated by a single-faced, mechanical replication of the same type of residential buildings. In creating the model and individual projects of neighborhoods and developments of large housing estates involved many creative teams under the guidance of such leading architects as S. Safaryan, M. Mazmanny, S. Badalyan, M. Grigoryan, A. Babajanyan, A. Tarkhanyan, Yu. Safarian, C. Chakhalyan, G. Rashidjan, J. Isahakyan,
K. Martirosyan and others. This was a period of widespread implementation of a standard projects’ series, including the use of bearing walls made of natural stone and products of large-panel and frame-panel housing construction. Despite the fact that the series themselves were developed at a high professional level, and their urban layout was handled by the best architects and the attempts to move away from the techniques of building separate houses to the semi-enclosed structures of residential groups and plastic compositions of curved outlines were made, the result, in general, left much to be desired. Mass replication of the same type of piece houses led, as a result, to inefficient functional and uneconomical solutions with low artistic qualities, monotony of the entire residential development’s architectural appearance.

This result was predetermined from the very beginning, when the basis for planning decisions section houses typologically was laid only on the structural planning scheme (like medium 4 -5 floor, and in multistory 6-9 floors of the home, usually with 2 apartments per floor in a private 3 apartments in frontal sections), which, in turn, also determined the housing orientation in the closed system of assembling, i.e. the only possible replication houses in the form of a parallelepiped. They are easy to design and build with only the minimum of domestic comfort provision. The implementation of this vicious program in practice has led to a habitat creation in the form of faceless residential areas of mass construction. Against the common background, the exemplary and promising residential district of Norashen and the micro district “Erebuni-3” stand out favorably [10, 13].

The distinctive feature of these residential structures is that for the first time in the practice of mass industrial housing construction in Yerevan, they were designed and implemented according to the principles of ensemble development, when all the types of residential and communal buildings were solved harmoniously: Norashen - for individual projects in the open technology, and in “Erebuni-3” – in the closed assembly for standard projects. Unfortunately, the above-mentioned residential formations have remained the only examples of such a principled approach to development. The residential areas of Achapnyak, Nork, Avan, etc. there are inherent differences and disharmony due to the industrial housing construction different systems’ use [3, 13].

Architectural methodology Norashen (architect Yu. Safaryan), which made it possible to move away from the traditional rigid rectangular compositions, was new centric system-an integrated approach to the inter-highway areas development with a regional perspective, and specifically designed new types of buildings is capacious, compact with a high linear density, projected by the proposed system of open assembling based on the identified architecture, technology, a method of the floors’ lifting. Two types of capacious compact 16-storey block houses of the “cross” and “Shamrock” type, respectively, with 8-and 9 - grouping apartments on the floor, were developed specifically. The programmed compactness of the centric formations for the block houses, schools, kindergartens led to a compact urban planning solution, providing high architectural and artistic quality, comfort and economy. A feature of the “Erebuni-3” idea (architect A. Tarkhanyan) is performed by means of the model projects’ single series use for a 9-storey residential unit with 3 in the end section and 2 in the private section on the floor of a 16-storey sections of the tower type – 4 apartments on each floor, pursued for the schools and kindergartens.

Also noteworthy are the 16-storey buildings on Mashtots Avenue (architect L. Balayan), on Bagramyan street (architect A. Aleksanyan), on Amiryan street (architect A. Tarkhanyan) and others.

Today, one of the main problems is the urban development transformation against the background of its constant compaction, which puts forward the task of providing an optimal habitat for humans [11, 12]. The search for ways to humanize the urban environment is conducted in several directions: the formation of a special structural cooperative type with a multi-tiered distribution of functions; the need for the large-scale pedestrian use of urban space, which provides a high intensity of its application; the transformation of underground spaces by expanding them to capacious galleries with a set of elements of trade, public and recreational functions; expansion of pedestrian spaces by creating the arcades, galleries along the sidewalks on the first floors of buildings; creation of a new type of intra-block territory in the form of passages, atriums with their arrangement of trade and public objects. The proposed options for transforming the urban environment with the ethnographic zones’
allocation [14, 15] will contribute to its humanization and can be a means for the effective transformation of the urban structure in the Yerevan downtown. To increase the pedestrian space of the center, it is proposed to include the sections of Abovyan and Tumanyan streets in the zone of the only pedestrian street in the city - Northern Avenue, with the reorientation of Abovyan street into a pedestrian one from the Ring Boulevard to the Republic square. This is appropriate, due to the presence of a large number of architectural and historical monuments on this segment of the street, the trade saturation, public and recreational facilities, the street is also very popular with the population and tourists. According to the research, the new street objects are spontaneously placed in its space and are not connected well with the historical buildings. In this regard, it is proposed to implement the functional zoning of the street with the allocation of shopping, entertainment, theater, exhibition, and the museum zones, placing them on the first floors and widened parts of the sidewalks. Thus, the segment of Abovyan street and Northern avenue with the theater zone named after Stanislavsky can become an expanded pedestrian space of the capital with the inclusion of trade objects, public buildings, historical and architectural monuments, recreational areas and ensuring close connections of the street zones, building interiors and intra-block sections. Putting various functions on pedestrian connections, including underground tunnels, platforms, arcades, and galleries in the structure of buildings helps to merge various areas of urban space into a single multi-functional, continuous whole, and eliminates the spatial barriers between buildings and the surrounding development.

3. Summary
Summarizing the research results, the following conclusions have been made and the following recommendations have been given:
1. The solution to the problem of modernizing the residential environment in Yerevan requires the development of a separate clear comprehensive program.
2. When drawing up a program, it is necessary to follow the principle of the “least action”, which consists in the fact that any process or phenomenon in living and inanimate nature tends to the minimum necessary energy expenditure. According to the principle of “maximum simplicity”, the optimal role of architecture is given to compactness, capacity of linear density, which determines the economy of the structure with high functional consumer qualities, contributing to a more rational organization of life processes.
3. The program should reflect a differentiated approach to each of the administrative districts in Yerevan, since each of them has its own specifics of formation and development.
4. “Kenton”- the downtown of Yerevan requires special attention. Here, first of all, it is necessary to separate the issues of physical and moral obsolescence of each building, ensemble as a whole and work out the issues of their modernization. It is also necessary to work out the visualization, in particular, the fifth facade - roofs. It is desirable to carry out the reconstruction in order to fully exploit them, considering the issue of solving the courtyard façade - the architecture of summer facilities. The specific solutions for the main facades of each building separately and for the development as a whole are given. The attention to the architecture of the 1st floors in the building is paid. The issue of intra-block spaces, freeing them from all sorts of alien structures and improving them for the needs of residents is solved. A functional layout of the entrance and passage of vehicles and their parking lots for each residential quarter is developed. It is necessary to work out the issue of the ethnographic zones’ allocation with the inclusion of streets, squares, 1st floors of buildings and underground spaces.
5. It is expediently and necessary to develop a collapsible layout of Yerevan displaying the underground space and the occurrence of tuff and basalt bedrock, using the latest digital technologies based on simulation the building full life cycle, starting from the engineering surveys, design, construction, to the stages of operation, reconstruction, capital repairs, demolition and waste treatment, which will further contribute to the global goals of the residential development modernization.
6. It is proposed to provide an ethnographic zone (zones) with fixed territories in each administrative district of Yerevan, which may include the squares, residential quarters and streets with their development, etc. For each of the ethnographic formations, it is necessary to develop a target sub-program for its organization, functioning and long-term development, which will create a new type of distinctive ethnographic units in the system of the current urban organization. At the same time, a prerequisite for the organization and functioning of ethnographic zones should be the direct active participation of the residents themselves.

7. We believe it expedient to provide for the gradual and systematic demolition of the mass construction residential buildings built according to the standard projects, completely excluding major reconstruction works due to their:
   - physical wear and tear (over 50 years of operation),
   - moral obsolescence (small apartments, floor height of 2.5-2.7 m, combined lavatories, etc.),
   - unavailability of architectural and artistic expressiveness that is alien to national identity,
   - low quality of the construction works carried out.

It’s recommended:
   - To establish the sequence of buildings to be demolished in the residential development of the administrative districts of Yerevan, as well as to identify and fix the ethnographic zone.
   - To start on urgent basis a number of design and survey works to build the new residential structures to replace the demolished ones.

8. During designing new residential units, it is usually preferable to give preference to the articulated buildings with a combination of medium-sized- and multi-storey housing, with a shift away from the existing typological schemes, including the sections with 2-3 apartments on a typical floor and attached verandas in a medium-rise building, widely use the complex forms of capacious, compact with a high linear density of radial, turntable planning compositions with courtyards, introducing the design and construction of promising and economical gallery as well as the corridor houses and their combinations with galleries and corridors on 3 floors with 2-level apartments into practice.

9. During designing the structure of residential units and apartments, it is recommended to provide for:
   - the presence of green spaces; the use of modern devices for the use of renewable energy sources (in particular, solar); as well as the water supply systems with a closed loop of multiple use.

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