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To cite this article: E Astakhova 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **698** 033017

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# The residential buildings of the 1960s architectural renovation

**E Astakhova**

Academia Architecture and Arts Southern Federal University, 39, Budennovsky ave.,  
Rostov-on-Don, 344002, Russia

E-mail: astlena@mail.ru

**Abstract.** This article examines the relevance of architectural renovation, in particular the renovation of the industrial house-building first generation old residential buildings. The typical apartment projects with economical apartments developed in 1957-58 were very timely in solving the social problem of settlement, and were designed in two categories - the long and short lifetime. Existing physical deterioration makes it possible to consider their renovation question, since such a type of dwelling is in demand as affordable and cheap housing. This article deals with the features of planning decisions of the 1960s housing stock, emphasizing the elements that do not meet modern functional requirements. A program for renovation of residential buildings of the 60s is proposed. It allows to approach the modern standards of housing. Attention is paid to the algorithms of the apartment redevelopment: with the preservation of the number of apartments on the floor, or with the apartments consolidation. Possible constructive variants of superstructures from the mansards to several floors are considered. The renovation program was experimentally tested on the example of the Rostov-on-Don city, as a part of an academic design. Residential buildings of the 60s were chosen as objects. They are located in the urban areas that have lost their compositional structure due to new construction in order to simulate various options for superstructures.

## Introduction

There is an increased interest in the old buildings' renovation in modern architecture. Reconstruction and modernization have always existed in architecture, but the concept of renovation has appeared in connection with the new architectural understanding of industrial buildings having lost their function. Renovation of Viennese gasometers, a former port warehouse for the Philharmonic Hall in Hamburg, the Battersea power plants in the Tate Modern gallery, etc. have developed the architectural techniques that gave a new direction in the development of modern architecture forms. This has led to a rethinking of old buildings, preventing their unconditional demolition. Each building is a monument of its era, a monument of a historical chronicle, that adds a unique flavor to the architectural environment. The attitude to the old housing stock has changed, in particular, to the buildings of the first generation of industrial house-building.

In 1957-58 the standard projects of residential buildings with economical apartments were developed. The housing stock, created in the 60s, amounted to 36 million m<sup>2</sup> of five-story buildings in Russia. From the point of view of the modern inhabitants, those buildings, called "Khrushchyovka" (named after Nikita Khrushchyov – the leader of USSR) seem archaic and distant from our modern times. However, they were a huge breakthrough in technology and level of social life, allowing thousands of families to move out of communal apartments (that housed several families per



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apartment), and shacks. In order to provide each family with a private apartment, it was necessary to equalize their cost with the similar indicators of room occupancy in communal apartments.

There were two categories of buildings: short term *demolishable*, with a planned service life of 25 years, which should have temporarily resolved the housing problem, and the long term *non-demolishable*, with a planned service life of at least 50 years, which could be in practice extended to 150 years. According to the current standards, the house may be recognized as a run-down and a subject to demolition, if actual deterioration exceeds 70%, and the restoration work is technically impossible or not economically feasible.

For most of the 4-5-storey “Khrushchovka” buildings, physical deterioration, according to expert estimates, is at 29.3%, while the bearing capacity of the foundations is 12–30%, brick walls - 5–50%, panel walls - 20–50%, and roof slabs - 5–30%, staircases - 10 - 40% [1].

To understand the depth of the remaining unresolved problems, it is worth understanding that the average service life of a panel house is 70-100 years, while the mechanical systems’ life in operation is only 25-35 years, the roofing is 50 years and a good brick structure can survive for 800 years.

Currently, the buildings built using this technology are available both in Russia, in European countries and in the former Soviet Union republics. Therefore, raising the issue of demolishing or renovating the housing stock is very important. In the Russian regions, where up to 40% of housing and more represented by “Khrushchovkas”, the demand for them remains as an affordable and cheap housing.

The relevance of this topic is proven by the fact, that there are currently a large number of buildings of the first generation of industrial housing construction, the operational period of which nears the end. At the same time, this housing stock meets the modern requirements of not only municipal low-cost housing, but also meets the modern criteria for the rational dwelling comfort for a number of its main characteristics, turning it into an inexpensive and comfortable housing for a modern-day human.

## Main Text

### 1.1. Features of the housing stock of the 1960s

The housing stock of the 60s is distinctive with typical solutions for houses with economical apartments. The cost of apartments was reduced by 30-35% at the expense of significant reduction in the size of premises, in particular utility rooms: kitchens significantly decreased - 5.8 - 6.0 m<sup>2</sup> (at least 4.5 m<sup>2</sup>), the entrance to which was arranged through a common room, the bathrooms became combined, entrance hallways - narrow, common rooms became walk-through, and the corridors began to be included in their area. The ceiling height was reduced to 2.5 m.

The presented types of apartments - 1-, 2- and 3-room living areas of 18-20 m<sup>2</sup>, 26-30 m<sup>2</sup> and 36-40 m<sup>2</sup> respectively, took into account only the number of families, ignoring their different composition by sex, age, and there were no “large families” projects. For calculating the apartment area, the standard was established as 9 m<sup>2</sup> of living space per person, defined by Le Corbusier as the minimum required area for a human life.

Considering the accepted settlement formula,  $k = n - 1$ , (often and  $k = n - 2$ ), where “k” is the number of rooms in the apartment, and “n” is the number of family members, the apartments were over-compacted. If in Europe in the 1960s the indicator for the number of rooms in a typical apartment was taken as:  $k = n + 1$ , where all the family members could have their own room and one room shared, then in the Soviet Union Khrushchev defined the coefficient “ $n + 1$ ” as a “bourgeois surplus” [2].

All typical houses were built as five-storey buildings – this made it possible to build without an elevator and has provided savings of up to 15% of the funds.

According to the modern functional requirements for renovation, it is necessary to increase the area of the kitchen, the hallway, exclude adjoining living rooms, solve insulation and ventilation issues, compliance of stairs with fire safety rules, etc.

### 1.2. The renovation program of residential buildings of the 60s.

Currently, there are 2 approaches: either *the demolition of dilapidated buildings*, or their *renovation*. In the early 90s the German architects estimated that the modernization of such buildings will take only 30% of the cost of newly built housing [3].

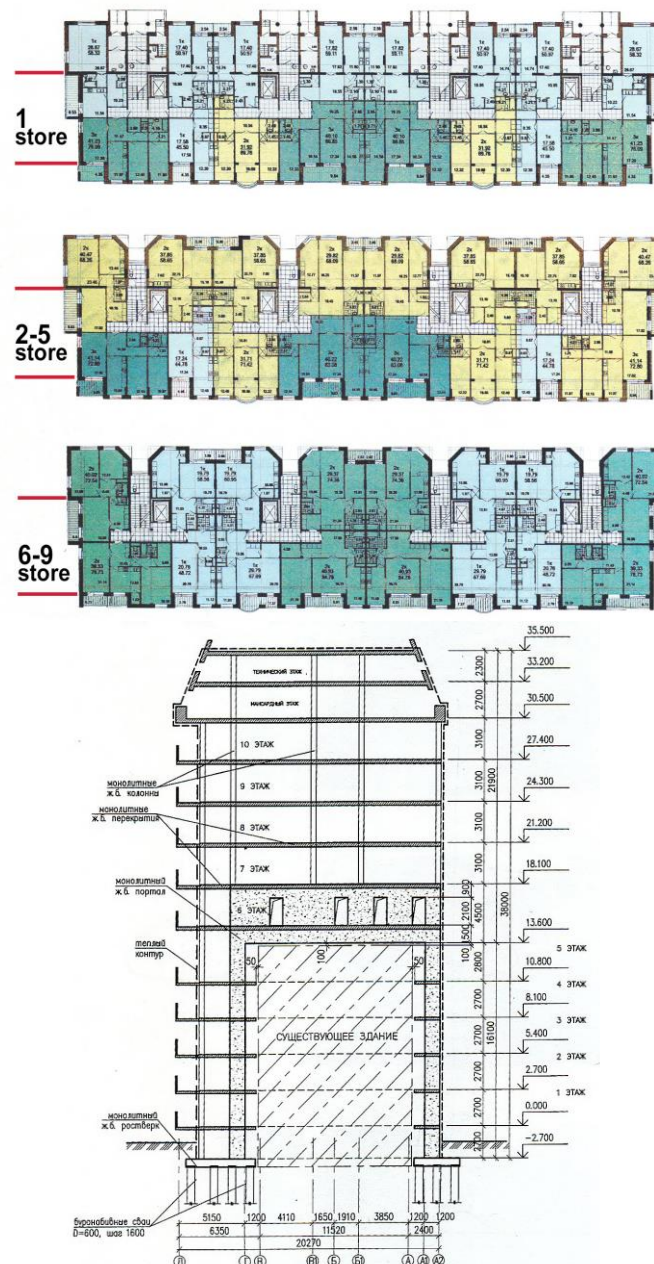
In Germany and Europe there is considerable experience in very effective renovation (figure 1).



**Figure 1.** Renovation of panel housing in the German cities of Halle and Leinefelde (arch. Bureau Stefan Forster) [4].

According to the Crimean architects' calculations, for \$3 million in "Khrushchovka", which has at most three thousand m<sup>2</sup> of living space, it is possible to create another 15 thousand m<sup>2</sup>, otherwise \$3 million will be spent just for demolishing the building and digging the foundation [5].

In Surgut, Siberia, a project to modernize a 5-storey building of series 1 - 464 into a 10-storey building - with redevelopment, extension of loggias and full-fledged rooms was completed.



**Figure 2.** A project proposal for the reconstruction of a residential house in Surgut. Beam-wall structure on the 6<sup>th</sup> "transitional", technical floor and frame-bond structural scheme (the dotted line in the plan is the old outline of the building) [6]

When renovating an existing housing, different approaches are proposed, which in general can be combined into the following *Program*:

- reconstruction of walling (wall insulation and replacement of windows, because 40% of heat is lost through the windows);
- redevelopment (elimination of walk-through rooms, increasing the area of kitchens, etc.) with optimal insolation and ventilation;
- replacement of soft roofs for pitched;
- mansard superstructure over reconstructed buildings;
- elevator extensions;



- modernization of engineering systems (mechanical ventilation systems, replacement of plumbing, pneumatic garbage disposal);
- landscaping with allocation of parking space;
- use of alternative energy sources whenever possible, the construction of “passive houses”;
- organization of ladders according to fire safety standards.

The simplest version of modernization is addition of one or two floors, an attic, and installation of an elevator system in the outer part of the building, which allows for reconstruction without moving residents. Attic device is already the norm of effective reconstruction.

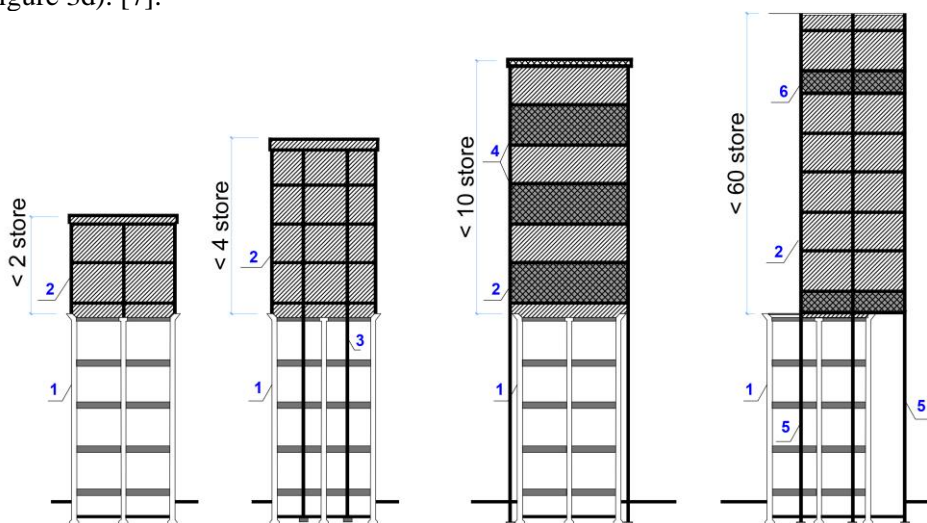
Redevelopment of existing apartments can be implemented according to 2 principles: with *preservation of the number of apartments per floor*, and with *enlargement of apartments*. In the first case, the area of rooms is increased by attaching bay windows, loggias, and rooms. Small apartment ceases to be so. For example, a dining room of 10-12 m<sup>2</sup> can be attached to a kitchen of 4-5 m<sup>2</sup>. Separating the common room requires the creation of an isolated passage into the sleeping. But the nomenclature of one-, two- and three-room apartments remains.

The principle of enlargement of apartments reduces their amount on the floor (2 instead of 4), but increases the predominance of 4- and 5-room apartments, where it is possible to preserve the walk-through common room, arranging two or even three bathrooms (guest and near bedrooms), a large lighted bath in place one of the kitchens, walk-in closets, a dining room, and also a dwelling for several generations. This brings the reconstructed housing to the modern comfort standards. At the same time, the perimeter of the walls varies slightly, only due to the extension of the elevator shaft, bay windows and loggias.

An extension to the internal staircase facade (even lighted) makes it possible to build the apartments on two levels, the extension of the elevators allows the use of panoramic elevators

The *superstructure* is possible in the following variants (the choice of which is absolutely specific after examining the existing structures):

- arrangement of up to 2 mansard floors in own light designs;
- the superstructure itself with the transfer of the load on the existing load-bearing walls (not more than 2 floors) (figure 3a);
- the superstructure itself with the transfer of the load on the existing load-bearing walls with a change in the design scheme (no more than 4 floors) (figure 3b);
- addition of up to 10 floors to new frame-type structures with wall-beams and grillage construction (the “flamingo” principle) (figures 2, 3 c);
- addition of up to 60 floors to new structures with horizontal discs - platforms (grillage) every 5 floors (figure 3d). [7].



**Figure 3.** Structural schemes of superstructures; a, b - with the transfer of the load on the existing load-bearing walls; c, d - non-loaded structure of the superstructured building [7]

### 1.3. Experimental renovation of residential buildings of the 60s

The first “Khrushchovka” and the buildings of subsequent generations of industrial house-building are widely represented in Rostov-on-Don: the Lenin square and the Lenin street, the Severniy and Zapadniy microdistricts - mainly five-storey brick houses of the I-511 series and large-panel residential buildings of the I-464 and I-468 series.

As a part of the course design at the SFedU Academy of Architecture and Arts, the project proposals for the residential buildings of the 1960s renovation were developed. Students were offered fragments of the urban environment as the design objects having significant compositional “gaps” in height, silhouette, and architectural and artistic expressiveness, which were formed as a result of the recent high-rise construction. Arrangements for the renovation of the housing stock were carried out in the buildings, such as redevelopments, extensions, added elevators, and heat-insulated facades. Considering the existing environment, the modernized buildings include public spaces, green terraces, operated roofs, etc. (figure 4).



**Figure 4.** Renovation of 5-storey buildings on 2nd Krasnoarmeyskaya street (student project).



**Figure 5.** Renovation of 8-section 5-storey building on Nagibina street (student project)

Special attention during the reconstruction should be given to the environmental requirements, in particular, the utilization of materials and the reuse of disassembly elements, work methods excluding pollution, increasing noise and vibration.

### Summary

Renovation of the residential buildings of the 60s will create low-cost comfort that meets modern criteria and at the same time is a comfortable, rational housing for a modern person. The experience of real modernization and virtual design provides the answer to the question: how to most effectively

modernize existing residential buildings, taking into account architectural standards, modern living comfort, economic factors, environmental issues, while preserving the wealth of our history, breathing new life into old buildings - buildings embodying the whole an era.

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