Risks in housing and communal services and major repairs program for apartment buildings in Moscow. Experience of the first years of implementation

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Abstract. The Housing Code of the Russian Federation has been significantly amended by Federal Law No. 271-FZ of December 25, 2012 [1] with respect to the issues pertaining to major repairs of apartment buildings. Since that moment, the obligation to pay for maintenance and repair of common property has transferred from the state to owners. Since 2013 owners of the premises are required to pay for major repairs the minimum amount (17 rubles per one square meter in Moscow) set by the regulatory legal act of the sub-federal unit of the Russian Federation, or larger amounts (in excess of the minimum) approved by the meeting of owners [2]. In each region of the Russian Federation regional major repair programs were adopted; in Moscow this program was adopted later, at the end of 2014 [3-5], which allowed considering all the pros and cons that had appeared in the regions. Along with the undeniable advantages, the repair in the capital city for the first 3 years (2015-2017) has shown a number of disadvantages and significant risks associated with the low level of design and subsequent problems with the quality, timing and budget constraints encountered by contractors at the repair stage.

1 Introduction

Nowadays, the main issue that has developed in the housing and communal system in Russia is the obvious need for radical reconstruction and modernization of both housing and communal services. Namely, major repairs should be carried out using innovative approaches for sustainable development in the construction business and education [9].

In order to solve the problem of the quality of housing and communal services provided to consumers, first of all, the authorities should pay attention to the management organization of such risks in the housing and communal services as: [10]

- operational management risks that accompany the daily activities of private operators;
- technical and technological risks associated with a malfunction of morally and technically obsolete equipment and inefficient organization of production activities [6-8];
- economic risks affecting the financial performance of private operators [6];

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- social risks associated with the performance by private operators of socially significant functions of life support for the population that provide vital needs of citizens [6-10];
- political risks associated with the specifics of the state and municipal management organization which create external restrictions in the activities of private operators both from the legislative and executive authorities;
- legal risks associated with fragmentation, imperfection, and sometimes “unprofessionalism” of existing legislation.

Until recently Moscow paid for major repairs from the city budget, investing heavily in upgrading the engineering systems of buildings, repairing facades, replacing elevators. For example, according to the Moscow government, in 2011-2014 engineering systems in 10,000 buildings with the area of 85 million sq. m were repaired, more than 1,100 facades were repaired in apartment buildings in the historic center of the city and in the main streets and highways, 17,949 elevators were replaced (number of incompletely repaired elevators was reduced almost 4-fold). Since 2005, a monitoring system for the technical condition of residential buildings has been underway and every building undergoes a technical inspection every 5 years [11].

However, despite the ongoing work, the need for repairs work at the end of 2014 was estimated at more than 173 billion rubles. In total, 72,000 systems (22 %) out of 325,000 basic engineering systems were in unsatisfactory condition at the end of 2014, and according to projections for the beginning of 2023, 145,000 systems (45 %) could already be in unsatisfactory condition. Number of incomplete repairs increased every year. It became obvious that without the involvement of the owners' means, the situation could pass to the point of no return in the next few years: if the building is not repaired today, it will have to be demolished tomorrow. Social tension continued to grow. Due to the absence of mechanisms for accumulating funds for major repairs only the owners of less than 2 % of the buildings were able to independently organize the necessary major repairs.

The major repairs program for apartment buildings in Moscow was adopted at the end of 2014 [3-5] with the total implementation period of 30 years (2015-2044), which was divided into periods of 3 years each, and gives residents an objective understanding of terms and types of work in their building. A specific repair period is identified for each engineering system of the building with regard to the approved periods between repairs and real estimation of the technical condition. The program is implemented on the basis of the data from the automated information systems of the city of Moscow which ensures the exclusion of falsifications and the possibility of verifying their reliability. When entering the building, repairs work is planned pertaining to all systems and components which are in unsatisfactory condition at the time of the beginning of the repair. Incomplete repairs over many years eliminate.

In order to form the primary list of buildings subject to repair of common property, a scoring system is used to determine the priority, which depends on the operation time of each engineering system and structural elements of the apartment building (with regard to deadlines exceeding in relation to the specified terms of effective operation) and on assessing the technical condition on the basis of monitoring (the condition is determined according to the data provided by the Moscow City State Housing Inspectorate). Absolutely all the buildings are included in the major repair program, except for those in which there are fewer than 3 apartments and which are subject to demolition, reconstruction, and renovation, if the sources of financing for such works have been determined. The priority is given to the buildings of the five-storied fund, the pre-war buildings and the buildings of the first period of industrial housing construction [3].

2 Methodology

The article examines the experience of realizing the major repairs of apartment buildings in Moscow on the example of the general contractor KTB Stroitelstvo LLC, which performs the major repairs of 8 residential buildings in the southern administrative district (SAD) of Moscow. The major repairs were carried out in the buildings of the 5-storey, 9-storey and 12-storeyed housing stock of series P-18/22, P-67, MG-601, P-14, II-29, built between 1959 and 1971. The time for carrying out the repairs is 1 calendar year; it was carried out in 2017-2018 (repairs program for 2015-2017). During this period, the authors were monitoring the work, collecting statistics, identifying the reasons that led to difficulties faced by the general contractor while carrying out the work. The customer of the works was such a regional operator of Moscow as the Major Repair and Replacement Fund (hereinafter referred to as the Major Repair Fund).

Before starting work on the site, the contractor is required to sign the act of opening the facility in the Major Repair Fund within 20 days and receive an order for a construction campus in the Association of Administrative and Technical Inspections in Moscow. For signing this act, it is necessary to collect the signatures of 6 representatives: the representative of the premises owners of the apartment building, the municipal deputy of the district, the operating organization (State-Financed Institution Zhilishchnik of the corresponding district), the Head of the district, the district administration, the territorial department of the Major Repair Fund, the Major Repair Fund department. The signing of the act, as a rule, is of a notification nature; however, these representatives have the right to request and study the project documentation for the major repairs of the residential building. In case of any inconsistencies in the project, the signatories have the right to refuse to open the facility, and the contractor has the right to declare the suspension and revision of the work composition or technology. However, this is extremely inappropriate for both the residents and the contractor, since major repairs will be postponed to the next year; residents will have to live in a building requiring repair, and the contractor will freeze the funds spent for the competitive procedures. Therefore, as a rule, acts are signed in any case, and adjustments are made to projects in the course of works by designer's supervision.

It is the poor quality of design documentation that can be identified as one of the main reasons for complicating, and often leading to an increase in the cost of the repairs work at the site [15], which increases the economic risks of the contractor. Despite the fact that the project necessarily passes the state examination of the project documentation (in State Autonomous Institution Mosgoexpertiza), there are a number of inaccuracies and inconsistencies in almost all sections of the documentation (see Table 1):

1. Low quality of technical inspections conducted; verification tests of constructions are not carried out, measurement work is not performed, residents' wishes and complaints on existing problems are not paid attention to. The inspection is often conducted "in absentia", without arranging access to the apartments, because it is associated with some additional work and time consuming communication with residents. Visits to the object are carried out only for photographing the object; a formal sign of "presence" on the object is created. As a result, "diagnosis" is incorrectly defined, project documentation is simply doomed to mistakes which the contractor will correct and incur additional unforeseen and unpredictable losses, and risks that cannot be foreseen.

- 32 Sudostroitel'naya Street, building 1, 30 Sudostroitel'naya Street – the basements are owned or rented by the shops there. In these basements, common engineering networks are hidden by false walls, concreted in the floor, covered with expensive non-separable technological equipment. As a result, there is no access to the general engineering networks for the purpose of carrying out the necessary work.

- building 2, 9 Nagatinskaya Street - the projected heating devices did not meet the necessary requirements of heat engineering calculation, and in some cases, unreasonably increased in size, blocked the exits to the balcony.

2. The divergence of the design documentation in the sections of Architectural concept, Structural solution and Engineering systems with the actual layout in the internal premises of the common premises such as basements, 1st floors, attics, and the inconsistency of the engineering systems accepted in the repair section with constructive and volumetric-planning solution.

- building 2, 9 Nagatinskaya Street - the design documentation indicated the solution for the insulation of inter-panel mounting joints which did not correspond to the type and size of the panels. It took a long time to reconcile and change the design solution, as well as to increase the amount of necessary work by 70 %, which significantly increased the cost and reduced the profitability of these works to the negative indicators.

3. The discrepancy between the design documentation in the section of the repair organization project regarding the stage of work and the actual possibility to perform it qualitatively and on time (the periods of the heating season, the seasonality of the roofing and facade works with the actual date of the contractor's start of work on the site are not taken into account). The general plan of the on-site territory with the location of the construction camp is untrue in some projects.

- building 3, 11 Zatonnaya Street - when signing the act of opening the facility and obtaining the place of the premises, a territory with green spaces (lawn, shrubs) was designated for the further opening of an order for the construction camp by the district management. As a result, during the entire period of work, the general contractor received improvement notices from the local administrative and technical inspection authority. After the completion of repairs work of this building, the contractor had to restore the greenery at its own expense.

4. The estimate for the major repairs, as a rule, does not take into account the entire amount of necessary work. The quotations indicated in the estimate documentation tend to have a spread in the rate of profit; during one types of works the contractor has the opportunity to earn, during other types of works it is necessary to perform works at a price much lower than the cost price. In addition, hidden works, which were not noted in the estimate as a result of poor technical inspection, are identified; for example, at building 2, 9 Nagatinskaya Street, when replacing the roof, it turned out that the slabs of the coating had severe damage (holes) and unacceptable cracks, and there was no money for the repairs; as a result, the contractor restored the plates at its own expense.

Here are some more examples when the estimated cost of the system is lower than the cost of the work performed:

- 13 Vysokaya Street. The cost of replacing windows in public places as per the local estimate was 162,030 rubles, but the actual costs amounted to 254,940 rubles. The reason was the insufficient study by the project organization of the building planning during the design and, accordingly, the budget documentation did not take into account the difficult access and complexity of dismantling and installing the windows that were behind the elevator shaft and did not have access from the inside of the premises.

- 32 Sudostroitel'naya Street. The local estimate for the repairs of the façade did not take into account works needed for replacing obsolete wooden doors at the entrances, as well as finishing works on the end of the building with the area of 225 sq. m. and the repair of the basement. The contractor had to perform the work at his own expense. As a result, the cost of the repairs of the facade exceeded the cost of the local estimate by 13.3 %, which equals to 412,000 rubles.

Table 1. Summary list of project documentation inconsistencies with the actual state of the building

Section	Address, design contractor, type of inconsistency							
	Bldn 2, 9 Nagatinskaya Str.	13 Vysokaya Str.	Bldn 2, 25 Sudostroitel'naya Str.	Bldn 1, 30 Sudostroitel'naya Str.	32 Sudostroitel'naya Str.	19 Novinki Str.	Bldn 3, 11 Zatonnaya Str.	5 Yakornaya Str.
	Magistral Telekom LLC	Magistral Telekom LLC	Garant stroy LLC	Magistral Telekom LLC	Magistral Telekom LLC	Garant stroy LLC	Garant stroy LLC	Garant stroy LLC
Architectural concept	Apartment planning	Apartment planning		Basement plans and solutions for facade (increase in cost by 28 %)	Basement plans and solutions for facades and roofing (projected volume of facades 12 %, roofing 79 %)		Solutions for facade (increase in cost by 48 %)	Solutions for facade (projected volume is 42 %)
Construction solution	Insulation knots of inter-panel joints and damage to slabs	Number of damage and breaks of slabs of coating	Walls of engine room and exits to roof		Lack of reinforcement of emergency rafters on pitched roofing	Knots of insulation of inter-panel joints		
M&E		Length of cable runs by 18 % of total volume	Length of lines by 25 % of total volume	Length of tracks by 16%, number of shields and IDD	Length of tracks by 12 %, dimensions and IDD			
Water supply	Placing and connection of drainage line, diameters of CWS and DHW lines	Placing of gutter from roof, diameters of CWS and DHW pipelines	Placing of internal gutter, material and diameters of CWS and DHW pipelines	Placing of CWS and DHW lines (increase in lines length by 15 %), diameters and replacement	Placing of CWS and DHW lines (increase in lines length by 22 %), diameters and replacement	Placing of riser, diameters of CWS and DHW lines	Placing of riser, diameters of CWS and DHW lines	Diameters of CWS and DHW lines
Heat Supply	Heating devices, diameters of heat supply lines	Heating devices, diameters of heat supply lines	Heating risers placing in apartments and diameters of heat supply lines	Placing and diameters of heat supply lines (increase in lines length by 10 %) and replacement	Placing and diameters of heat supply lines, (increase in lines length by 15 %) and replacement	Diameters of heat supply lines	Diameters of heat supply lines	Diameters of heat supply lines
Garbage chute			Placing of garbage chute				Placing of garbage chute	
Estimate	Facade repair amounted to 81 % of cost	Replacement of windows in public areas amounted to 47 % of cost	25 % of cables not shown	Dismantling and restoration cost of false walls not shown when replacing CWS and DHW lines	Dismantling and restoration cost of false walls not shown when replacing CWS and DHW lines			

3 Results

Studying the gained experience of organizations involved in the implementation of the major repairs of apartment buildings, it is possible to identify both the most profitable types of work, and the least profitable, as well as unprofitable works. Thus, the most profitable systems, in most cases, are mainly works inside apartments, with the maximum access to them, such as repair of risers of in-house engineering systems of cold and hot water supply, heat supply, facade repair, roof repair, repair of in-house engineering networks of power supply. The least profitable and unprofitable, in turn, are such systems as the replacement

of a garbage chute, repair of lines of in-house engineering systems of cold and hot water supply, heat supply, risers and prefabricated pipelines of the sewerage system, replacement of gutter and fire water supply, replacement of windows in public areas.

In general, there is a direct correlation between the percentage of admission in apartments and the profitability of the object. The more work was done by the contractor, together with the representatives of operating organizations (State-Financed Institution Zhilishchnik) and representatives of the local administration (District Administrations and Prefectures) to ensure maximum access to apartments for capital repair, the higher the percentage of the profitability of the facility as a whole is.

In order to increase the quality of design, since 2018, a system for selecting contractors for the whole range of works has been introduced in the Major Repair Fund of Moscow, which includes both design and repair work done by one company. It is assumed that in this case the responsibility of the contractor performing repairs is much greater than that of the third-party designer who is practically not responsible for the further quality and economics of the repair work [15].

An integrated approach in the performance of work by one contractor from an inspection of the apartment building to the implementation of works helps the contractor to approach the design more rationally, taking into account existing restrictions on the cost of works performed by the Major Repair Fund and approved by Moscow government in 2015 [6]. On the other hand, the Major Repair Fund is obliged to determine the initial maximum contract price in accordance with the short-term plan for the implementation of the regional program for the major repairs of common property in apartment buildings on the territory of the city of Moscow. After carrying out design and inspection work, the parties under the contract are not entitled to go beyond the initial maximum contract price for each of the apartment building systems set by the contract. If the estimated cost of the work required for implementation in accordance with the project documentation exceeds the initial maximum contract price, then the lowering coefficient is applied to the estimate, which negatively affects the profitability of works.

4 Conclusions

1. The major repairs program for apartment buildings in Moscow, adopted in late 2014 for a period of 30 years, by raising funds from apartment owners, allowed to ensure a positive dynamics of eliminating the incomplete repairs of engineering systems and to reduce this figure to zero by 2044.

2. The existing repair planning system has a ballroom system that allows the most effective identification of problem buildings and individual engineering systems as well as structures that require immediate repair. To assess the priority need for repairs, the results of the evaluation of the technical condition of the structures and engineering systems of buildings carried out by the Moscow City State Housing Inspectorate every 5 years and the actual service life are taken into account.

3. Along with the undeniable advantages of the major repairs program, there are a number of problems at the repair stage that do not always allow contractors to finish the work on time and with the proper quality. These problems are mainly related to the poor quality of the developed design documentation.

4. According to the results of monitoring the major repairs of 8 apartment buildings in SAD of Moscow, the main inaccuracies of design documentation were found.

5. When calculating the economic component, it was determined that the profitability of the work remains at the level of 5-10 % if several conditions are observed [7]:

- agreeing on the specific scope of work at the design stage in order not to introduce a reduction factor;
- performance of works on designing and repair on time or ahead of schedule;
- auction reduction should not exceed 5%;
- performance of works with the minimum possible staffing involved.

6. To improve the quality of design, since 2017, the Major Repair Fund of Moscow has been introducing a new system of integrated performance of works, according to which both design and repair works are carried out by one company.

7. The policy of the Major Repair Fund of Moscow solves the problem of budgeting expenses in the scale of a megacity, possible overstating of the cost of works performed, and also strictly regulates the speed of their implementation.

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