

Industrial technologies of reconstruction of large-panel buildings of the 1-335 series

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Abstract. Technological and constructive decisions of modernization and reconstruction of large-panel buildings of the first mass buildings are considered in the article. The technology of the reinforced concrete diaphragms of the building hardness brings the seismic stability of the building to the normative level. The technologies of erecting a building with bay windows, as well as the construction of attic floors by the method of mounting bulk units enlarged onto the span have been developed. The folding volumetric blocks and the technology of their installation are proposed. The analysis of reconstructive works in two variants showed their rationality and financial attractiveness in comparison with the dismantling of buildings.

1 Introduction

As it is known, in the past 15-20 years, the need for modernization and reconstruction of large-panel buildings of the series 1-335 of various modifications has grown sharply in the Irkutsk region. It should also be noted that over these years, many experts came to conclusion on demolishing the buildings of these series and construction of new modern residential buildings in their place that meet the criteria for safety of life, energy efficiency and comfort of living.

2 Materials and methods

Reconstruction of residential houses of the 1-335C series (A, AS, KS) is the alternative direction of the solution of this issue. Practical foreign and domestic experience indicates that reconstructive works are economically feasible, since there is no need to create an infrastructure for a new district of construction, laying roads, engineering networks, and transport highways.

Two variants of reconstruction are developed:

1. With the eviction of tenants. In this case, the main constructive methods of reconstructive works are the installation of additional internal diaphragms of stiffness, prestressed wall posts and partial unloading of load-bearing wall panels made of gas ash concrete, additional construction of attic floors, elevator shafts and bay windows, warming of the building and installation of new windows. Herewith, sanitary and electrical installation

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systems are replaced in the entire house (see Figure 1). When carrying out reconstruction in this version, it is advisable to apply the “wave principle” of the eviction of residents from vacated houses. To do this, first three or four houses are to be built in the neighborhood, to which all families move to permanent residence from the houses that are being vacated for reconstruction. Families from the following vacated houses move to the reconstructed houses, etc.

2. With partial eviction of tenants. In this version, tenants of the fifth floor are evicted for the duration of the attic installation, and also the tenants of the end apartments for the duration of the work on the shotcrete. This method consists of the installation of through-going external prestressed columns, reinforcement by the spraying ($t=80$ mm) of part of the facade panels and end walls, additional construction of the attic floors, elevator shafts and bay windows, and warming of the building (see Figure 2). Replacement of plumbing and electrical installation systems, as well as replacement of windows is made only in common household property.

According to the data on the reconstruction of various firms (OLLY, MNIITEP, Velux and others), it is revealed that the application of a bulk block superstructure reduces the specific labor costs by 8-10 times, and the cost of 1 square meter of the area by 26-32%.

The technologies of erecting a building with bay windows, as well as the erection of attic floors by the method of mounting bulk units enlarged onto the span have been developed.

The folding volumetric blocks are proposed, which increase the overall and transport manufacturability. With such a constructive solution, the overall dimensions and load-carrying capacity of vehicles are rationally used, and it also makes it possible to bring the volume unit into the designed state in the shortest possible time (Figure 3).

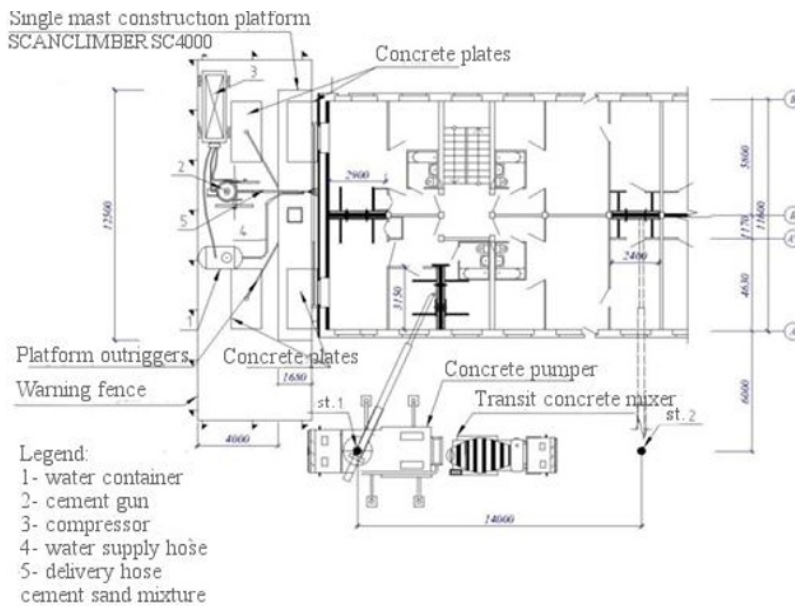


Fig. 1. The scheme of the concrete works production (option 1).

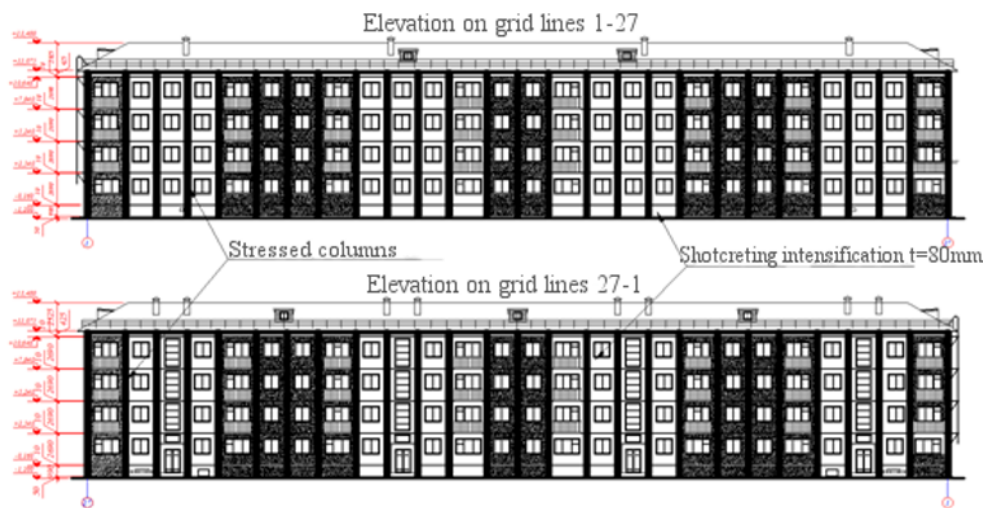


Fig. 2. The layout of prestressed racks and shotcrete part of the facade panels of the series 1-335C building.



Fig. 3. Folding volume blocks.

The developed technologies for construction a building with volumetric blocks, as well as erecting attic floors by mounting large-scale bulk blocks, provide an increase in areas in the following range:

- attachment of bulk bay windows - 7%;
- construction of the attic floor - 15%;
- construction of the attic on two floors - 30%;
- addition of voluminous bay windows and construction of the attic floors - 22 ... 37%.

When erecting attic floors with the use of folding volumetric blocks, the labor intensity are reduced several times that leads to a reduction in the time for reconstructive work.

3 Results

The study of organization and technological models showed that the greatest effect is achieved with a comprehensive reconstruction of the construction quarter, when long-term flows, interrelated in time, are created and functioning.

The construction plan for the complex reconstruction of the block of buildings on the Bauman Street in Irkutsk (Novo-Lenino district) has been developed. As a result of the research, it was revealed that for 10 months it is possible to perform the whole complex of works on the first variant of reconstruction for four large-panel houses of the 1-335C series.

The analysis of reconstructive works on the two variants showed their rationality and financial attractiveness in comparison with the dismantling of the building (see Table 1).

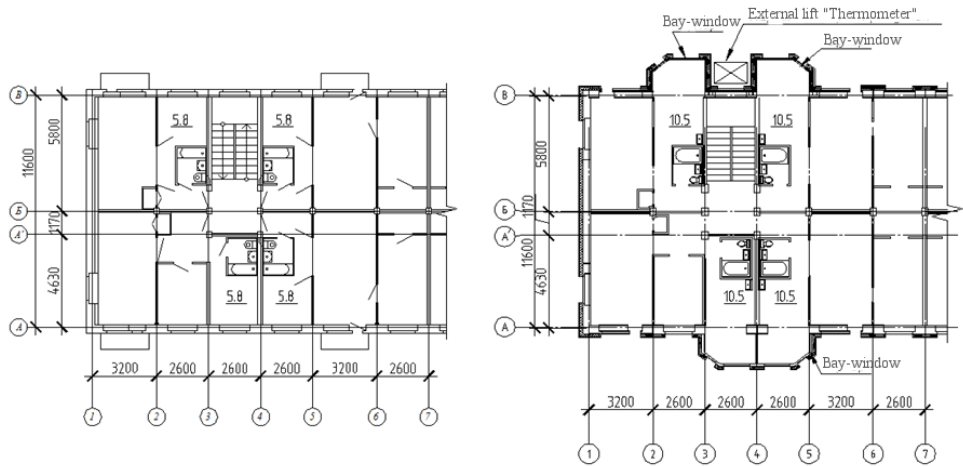


Fig. 4 Fragment of the plan of the series 1-335C building before (left) and after (right) reconstruction.



Fig. 5. Building of the series 1-335C after reconstruction.

Table 1. Technical and economic parameters of a residential building of the series 1-335-1C (5-storeyed and 4-access building) before and after reconstruction with full and partial eviction of tenants, with the installation of bay windows and an attic on one floor.

No	Indicators	Unit	Before reconstruction	After reconstruction with full eviction of tenants (1 st option)	After reconstruction with partial eviction of tenants (2 nd option)
	Space planning				
1	Building volume of a building	m ³	12,155.6	14,181.5	14,181.5
2	Built-up area	m ²	890.6	1,190	1,190
3	Total area	m ²	5,343/6	6,493.6	6,493.6
4	Living space	m ²	2,518	3,213	3,213
5	The ratio of the building volume to the total area	-	2.27	2.18	2.18
6	Area growth	%	-	22	22
	Indicators of the estimated cost in current prices				
7	Estimated cost of reconstruction	Thousand rubles	-	29,580 ⁽¹⁾ +26,820 ⁽²⁾ =56,400	26,959 ⁽¹⁾ +26,820 ⁽²⁾ =53,779
8	Estimated cost of 1 m ² reconstruction	Rubles / m ²	-	5,530 ⁽³⁾ +23,320 ⁽⁴⁾ =28,85	5,045 ⁽³⁾ +23,320 ⁽⁴⁾ =28,365
9	Estimated cost of building dismantling	Rubles	35,327 000	-	-
10	Estimated cost of 1 m ² of building dismantling	Rubles / m ²	6,611	-	-
11	Profit at an average cost of 1 m ² - 55 thousand rubles	Thousand rubles	-	6,850	9,471
12	Duration of reconstruction	Days	-	120	90
13	Duration of the dismantling of the building and the average duration of the construction of one similar building	Days	150+365=515	-	-

Notes:

1 – 29,580 (26,959) thousand rubles is the estimated cost of plumbing and electrical installation works, warming by a ventilated facade, replacement of windows, installation of diaphragms of rigidity and wall metal columns.

2 – 26,820 thousand rubles is the estimated cost of the attic floor, erection of bay windows and the elevator equipment of the “thermometer” type.

3 – 5,530 (5,045) thousand rubles is the price per m² of plumbing and electrical installation works, warming by a ventilated facade, replacement of windows, installation of wall metal columns, girding (reinforcement) of panels.

4 – 23,320 thousand rubles is the price per m² of the attic floor, bay windows and the installation of the elevator equipment of the “thermometer” type.

4 Discussion

The analyzed technologies of reconstruction of large-panel buildings of the series 1-335 are eligible for practical implementation in Irkutsk. At the same time, the approach considered in the paper remains debatable. Are only these technologies appropriate for all the houses in this series?

5 Conclusions

The problem of large-panel buildings of the series 1-335 requires an urgent solution. For the adoption of a solution, an integrated approach is needed.

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