Some problems of innovative approaches in determining the cost of construction, reconstruction and major repairs of buildings

E S Dediukhina¹

¹Irkutsk National Research Technical University, Lermontov str. 83, Irkutsk, 664074, Russia
E-mail: ded_es@mail.ru

Abstract. The article deals with the problems of pricing in the construction industry that arose in the process of reforming the system and introducing innovative approaches to determining the estimated cost of construction, reconstruction and major repairs of capital construction objects. Possible consequences are described for the identified problems and recommendations for their elimination are given. The cost of repair and construction works calculated by different methods is compared. The amount of losses of the construction works manufacturer from the use of an imperfect system for calculating the cost of delivering materials to an on-site warehouse for objects of budget financing in the Irkutsk region is calculated.

In recent decades, the accuracy and reliability of determining the cost of construction, capital repairs and reconstruction of capital construction objects (hereinafter – the estimated cost) has become a very urgent problem and not only in our country [1]. This is due to the variety of sources of financing for construction works, changes in the forms and methods of concluding contracts between investors and producers of works on a contractual basis [2].

Absolutely all participants of investment activity in construction are interested in the most accurate determination of construction and capital repairs costs at all life stages of the project [3, 4]. This is due to the fact that the low accuracy of calculations when determining the estimated cost for investors negatively affects the financial planning process, and for work producers, inaccurate calculations can lead to a decrease in the efficiency of their activities. At the same time, understating the estimated cost at the stage of determining the contract price inevitably leads to a decrease in the quality of work, which negatively affects the activities of all parties to the construction process.

To solve the problem of improving the accuracy of estimated cost calculations in 2016, under the leadership of the Ministry of construction and housing and communal services (hereinafter-the Ministry of construction), a reform of the pricing system in construction was initiated, which was to be completed by 2018 [5]. The goal of the reform is to switch to a resource - based method for determining the estimated cost. It is obvious that the Ministry of construction did not cope with the initial task, the process of implementing the resource model for determining the estimated cost was delayed and now, the end of the reform is projected by 2022. At the moment, an action plan is being implemented to improve pricing in the construction industry of the Russian Federation, shown in figure 1 [6].
Figure 1. Measures to reform the pricing system in construction.

As part of the reform, the Ministry of construction issued the second edition of the budget and regulatory framework for determining the estimated cost, issued several new methodological documents, including a new methodology for determining the estimated cost of construction, reconstruction, capital repairs, demolition of capital construction projects, and works to preserve cultural heritage (historical and cultural monuments) of the peoples of the RF on the territory of the RF, approved by order № 421 of August 4, 2020[7].

Despite the measures taken by the Ministry of construction, over the past three years, when determining the estimated cost for objects of budget financing in many regions of the country, calculations with low accuracy are used, which leads to a decrease in the quality of construction work, low efficiency of contractors, and difficulties in finding performers. In the Irkutsk region, due to the great remoteness of localities from the regional center, low availability of construction materials in these areas, the voiced problems are particularly acute. During the transition to a more advanced innovative model for determining the estimated cost, it is unacceptable to use calculation models that give an unreliable result for several years in the industry.

The purpose of our research is to identify problems that affect the reliability of the estimated cost for budget financing facilities located in the Irkutsk region, as well as to offer solutions to them.

Optimization of the methods used for calculating the estimated cost has recently been aimed at reducing it, as a factor of budget savings, that is, to a greater extent, the producers of works have suffered from the current situation. But, in the end, the low cost of construction has a negative effect for the customer, as the quality of work suffers, which leads to an increase in the cost of maintaining the object during operation. As a result, all sides of the investment process suffer from the current situation in construction pricing [8].

As a result of the analysis of the current state of the pricing system in the construction industry of the Irkutsk region, the following problems and their possible consequences are identified, which are presented in Table 1.

Table 1. Pricing problems in construction and their consequences.

| The problem of pricing in the construction industry | Consequences of the highlighted issue |
|-----------------------------------------------------|---------------------------------------|
|                                                     |                                       |
1. Making changes to the urban planning code of the RF regarding the methodology for determining the estimated cost, without the possibility of implementing these changes in practice. In particular, the federal state pricing system in construction (FSIS PC) is not working [9].

2. The basic price level so far is the prices as of 01.01.2000.

3. The Ministry of construction publishes only indexes to the cost of construction and installation works, with a limited range of construction objects.

4. Lack of conversion indexes from basic prices to current ones for major repairs, use of indexes for new construction for repairs.

5. There is no possibility to adjust federal unit prices in accordance with the project data [11].

6. The cost of delivering materials from the supplier to the object at the actual distance cannot be taken into account in the estimated documentation.

7. In the absence of data on the cost of materials, the need to compile a market analysis (at least 3 suppliers) for all missing materials, with the provision of a large amount of data about suppliers [7].

Below we will take a closer look at the main problems listed above.

Over the past three years, the method of determining the estimated cost with the lowest accuracy has been used for construction, repair and reconstruction of which is carried out at the expense of budgetary sources of financing [12]. This is a basic index method using Federal unit prices and conversion indices to the current price level for the cost of construction and installation works. It is especially incorrect to apply this method to the cost of major repairs, since the structure of the cost of construction and installation works differs from the structure of the cost of new construction [10, 13].

We have analyzed the estimated cost calculated using resource and base-index methods. Along with this, the cost deviations are determined for different calculation methods. When comparing, the estimated cost calculated by the resource method was taken as the standard, since this method gives the most accurate result. The calculation results are shown in table 2.
Table 2. Comparative analysis of the estimated cost of repair and construction works.

| Name of the object | Methods for determining the estimated cost | Cost | Deviation from the resource method thd. rub/% | Cost | Deviation from the resource method thd. rub/% |
|--------------------|------------------------------------------|------|-------------------------------------------|------|-------------------------------------------|
|                    | Resource method, thd. rub                |      |                                           |      |                                           |
|                    | Basic index method with indexing by cost items, thd. rub |      |                                           |      |                                           |
|                    | Basic index method with indexing to the cost of the CIW, thd. rub |      |                                           |      |                                           |
| Major repairs of an apartment building at the address: Irkutsk, Kievskaya str., 19 | 5269,26 | 5528,46 | 259,2/5 | 4295,39 | -973,86/-18 |
| Repair of the city's animal disease control station in Tulun | 936,098 | 650,432 | -285,67/-31 | 430,781 | -505,32/-54 |
| Dismantling (demolition) of an apartment building at: Irkutsk region, Irkutsk, Frunze str., 2-a (Letter A) | 1512,556 | 1464,505 | -48,05/-3 | 1222,129 | -290,43/-19 |

According to the table, the largest deviation of the cost from the resource method gives the calculation of the cost of the basic index method with an index to the cost of construction and installation works. It is worth noting that for repairs, deviations for all the objects under consideration in the direction of understating the estimated cost, the value of deviations varies from 18% to 54%. It follows that when determining the cost of capital repairs and dismantling of capital construction objects, the index cannot be applied to the cost of construction and installation works. But, as mentioned above, in the Irkutsk region, this method of calculation is the only one possible for objects of budget financing.

We also analyzed the lost costs from the estimated cost of building a children's art school for 650 places in the city of Svirsk, Irkutsk region. The construction of the object in question is planned in a small city with a population of about 14 thd. people, the distance of the city from the regional center is 150 km. There are no suppliers or manufacturers of construction materials in the city, so the customer has formed an actual transport scheme for delivering construction materials to the object. The range of transportation of materials from the presented scheme is shown in table 3.

The cost of construction is determined by the basic index method with an index to the cost of construction and installation works. When passing the state examination of the design and estimate documentation for the construction of this object, in accordance with the comments of experts, it was not possible to account for the delivery of materials, the cost of which is determined by the collection of the FCEP 81-01-2001 “Prices for materials, products, structures and equipment used in construction” [14], more than included in the estimated cost of materials, that is, up to 30 km. As can be seen from table 3, the actual delivery distance of materials is from 40-123 km. When justifying the impossibility of accounting for these transport costs, experts refer to the lack of explanations in the current regulatory framework for accounting for additional transport costs in excess of the estimated cost of materials in the collection of FCEP 81-01-2001.
The results of calculating the lost cost of transportation of materials for the construction of the school of arts are presented in table 3. The Cost of additional transport costs is determined for the main price-forming materials in the collection of the FCEPft 81-01-2001 “Federal estimated prices for transportation of goods for construction” [15].

**Table 3.** The amount of transportation costs not included in the estimated cost of construction of the school of arts.

| Name of materials, products and structures | Weight, t | Transportation distance, km | Amount of lost transport expenses, thd. rub |
|------------------------------------------|-----------|-----------------------------|------------------------------------------|
| Inert material                           | 5855.507  | 40                          | 708.71                                   |
| Concretes, solutions                     | 8642.144  | 70                          | 2958.6                                   |
| Lumber                                   | 164.041   | 123                         | 72.09                                    |
| Bricks, blocks                           | 539.827   | 123                         | 201.62                                   |
| Metal structures, fittings               | 506.4007  | 123                         | 386.96                                   |
| Asphalt concrete reinforced              | 226.56    | 40                          | 105.12                                   |
| Concrete structures                      | 220.982   | 123                         | 168.86                                   |
| Bitumen, mastic                          | 17.194    | 100                         | 17.08                                    |
| Other                                    | 668.376   | 123                         | 476                                      |
| **Total**                                | **5095.05**|                             |                                          |

The cost of delivering materials that are not included in the estimate documentation was about 5 million rubles, which is 2% of the construction cost of the facility.

The identified problems in the pricing of the construction industry in the Irkutsk region reduce the efficiency of all participants in the investment and construction process, reduces the quality of repair, construction and installation work performed, and as a result, the quality of construction products [16]. To solve the above problems, prompt actions are required to eliminate them. In our opinion it is necessary to:

- expanding the range of types of construction for which the Ministry of construction publishes indices of changes in the estimated cost, including indices for road and rail transport;
- publication of indices of changes in the estimated cost by cost items for all regions of the RF;
- publication of indices of changes in the estimated cost for repairs;
- providing an opportunity to adjust the resource part of federal unit prices, in accordance with the project;
- slow down the introduction of market analysis of the cost of materials as a necessary document in the budget documentation before the start of FSIS PC;
- providing explanations on accounting for transport costs for territories remote from suppliers of construction materials.

It should be noted that the implementation of these recommendations will reorient the action of the authorities to solve not only the problems of customers in the construction industry, but also to protect the interests of work producers, which will have a positive impact on the entire construction industry.

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