Calculation of the estimated cost in the assessment of the market value of real estate

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Abstract. The cases of application of enlarged indicators of the estimated cost of construction are determined. The classification of aggregated indicators and prices of the estimated cost according to the criterion of the base price is carried out. The characteristics of all the enlarged indicators are given, the features of their use in calculations are determined. The advantages and disadvantages of using aggregated indicators and estimates of the estimated cost of construction to determine the market value of real estate are shown. Calculation formulas are proposed for estimating the market value of real estate and a number of price-forming indicators, including indices of appreciation of the estimated cost of construction.

Keywords: estimated cost of construction, the object of evaluation, aggregated indicators and prices, market value of real estate, indexing.

1 Introduction

The scientific foundations of the cost and cost evaluation of real estate and their construction and operation have been considered by various authors [1, 2, 3, 4]. However, the definition of one of the fundamental indicators considered in the calculation of the market value of real estate - the estimated cost of the construction of the object of evaluation, requires further clarification, which is especially relevant in conditions of lack of information [2, 5, 6, 7, 8, 9].

In accordance with the Order of the Ministry of Construction, Housing and Utilities of the Russian Federation dated 4 August 2020 No 421/pr "Methods of Estimated Construction Costs, Reconstruction, Capital Repair, Demolition of Capital Construction Objects, Works on Preservation of Cultural Heritage Objects (historical and cultural monuments) of the Peoples of the Russian Federation in the Russian Federation", estimation of the construction cost can be performed using unit prices or aggregated indices. The above Methodology has no list of enlarged estimated rates and indicators, which was contained in the previous methodology of determining the cost of construction products (MDS 81-35.2004). Besides, in theory, in evaluation activities it is also theoretically possible to use cost estimates which were made at one time by the project organization in the course of preparation of construction work, however, as a rule, at the time of making a report of the independent evaluator this documentation is already lost and

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we will not consider this method of determination of evaluation object cost within the framework of the present article.

The use of unit rates is a priority since it allows to determine the estimated cost of construction more accurately, however, in practice there are cases when it is not possible to use them. The reason for that is the presence of the so-called hidden works, in respect of which it is impossible to define their nomenclature and volume in natural units, which is necessary when applying unit rates. There are at least six such situations:

1. Preparation of investor estimates;
2. Determination of the inventory value of the object and development of technical passports of capital construction objects.
3. Determination of the inventory value of the object and development of technical passports of capital construction objects.
4. Revaluation of newly identified in the inventory of the property of institutions at market or fair value in accordance with the order of the Ministry of Finance of Russia from September 17, 2020 N 204n "On Approval of Federal accounting standards FAS 6/2020 "Fixed assets" and FAS 26/2020 "Capital investment", Appendix. 2;
5. Valuation of investment or liquidation value (Federal Valuation Standard No. 2);
6. Valuation of the market value of real estate (Federal Valuation Standards No. 2 and No. 7).

In the latter case, estimation of the estimated cost of construction and overhaul of the object is required in all known approaches to determining the market value of real estate - comparative, cost-based and income-based. At that, either the cost of restoration or the cost of replacement of the object of evaluation which are modifications of the estimated cost of construction shall be assessed.

Determination of the value of the estimated cost of construction and overhaul when assessing the market value of real estate is performed [1, 10-12]:

1. At the stage of analysis of the most effective use of the object in terms of assessing the investor's costs for various options for the development (building) of the land;
2. In comparative approach at calculation of size of some adjustments;
3. In income approach [13, 14]:
   − in the method of direct capitalization - when assessing the value of net operating income (NOD) in terms of determining the reserve for the replacement of wear and tear elements of the structure and the amount of the initial investment in case of expanding the scope of the direct capitalization method;
   − in the method of discounted cash flow - when assessing the value NOD and costs of the investor;
   − the method of mortgage and investment analysis, including the use of capitalization by calculation models when assessing NOD;
4. In the cost-based approach:
   − in determining the cost of restoration or replacement cost of the object of evaluation;
   − when assessing the amount of investor's indirect costs by the indirect assessment method (as a percentage of the estimated cost of construction of the object) or by the direct account method in case of determining a number of items with the help of estimated pricing;
   − in some methods of evaluation of market cost of land plot in part of evaluation of amount of investor's costs for development of land plot in variant of the most effective use;
   − for determination of entrepreneur's profit by method of cost of alternative project and analytical method, proposed by E.S. Ozerov and D.D. Kuznetsov in part of assessment of amount of investor's costs or by method of discount of project (see Methodic recommendations about assessment of investment projects efficiency) in part of calculation
of investor's costs and in determination of amount of net income (NI) and net discounted income (NDA).

2 Application of aggregate indicators for estimating the estimated cost of construction

In the above cases, in order to perform the necessary calculations, we use the aggregate rates and indicators of construction cost estimates, among which we can distinguish:

1. the consolidated indicators of replacement cost (CIRC);
2. the aggregated indicators of estimated cost (AIEC), in prices of 1969 and 1984.;
3. the aggregated indicators of the base cost for the types of work (AIBC TW);
4. cost indicators for types of work (CITW);
5. the aggregated indicators of the 2001 base cost (AIBC-2001);
6. territorial consolidated prices for constructions and types of civil and residential construction works (CP-2001);
7. The cost of construction on the spans of railway bridges (CP CJSC INiK);
8. aggregated indicators of the cost of construction by constituent entities of the Russian Federation (AIEC by constituent entities of the Russian Federation);
9. aggregated indicators of the cost of construction CO-INVEST;
10. the consolidated standards for construction prices approved by the Gosstroy of Russia (CSCP), as well as similar territorial standards approved by the subjects of the Russian Federation (ТСSCP);
11. price lists for the construction of buildings and structures;
12. specific indicators of construction costs in current prices, published in various reference (professional) publications.

The above indicators are developed in different base prices (Fig. 1), which requires different mechanisms of indexation to the prices as of the date of the assessment, as well as taking into account the peculiarities of the composition of the above information sources.

What is common for all the aggregated indicators is that they are designed without taking into account the value added tax (except for item 8), which must be additionally included in the construction cost estimates.

As can be seen from Fig. 1, five groups of aggregated indicators and prices of the estimated cost of construction can be applied depending on the level of base prices. The earliest of them were developed in 1969 prices and include two types of indicators: consolidated indicators of replacement cost (CIRC) and consolidated indicators of estimated cost (AIEC-1969). Since there are four types of AIEC, in the text of this paper we will always indicate which AIECs are meant.

Fig. 1. Classification of aggregated indicators and rates of the estimated cost of construction.
When applying the CIRC compilations it should be borne in mind that in most cases they take into account the estimated cost of the objects according to the consolidated estimate. Thus, the general part to the CIRC states that the replacement cost includes all direct costs; overheads; planned savings (in modern terminology - estimated profit), as well as the cost of land allocation and development of the construction site; cost of design and survey work; costs associated with work in winter; costs of piece-rate wages; cost of the management of the enterprise under construction; losses from the liquidation of temporary buildings and structures; costs of transporting workers to a distance.

As a rule, the estimated cost of construction of a facility as of the date of its CIRC appraisal is determined as follows:

$$C_{\text{cur}} = C_{\text{CIRC}} \times K_{\text{coef}}^{\text{adj}} \times K_{\text{fac}}^{\text{adj}} \times M_{\text{obj}} \times I_{\text{inc}}^{\text{84/69}} \times I_{\text{inc}}^{\text{cur/84}} \times 1.20$$

(1)

where $C_{\text{cur}}$ – estimated cost of the object in current prices, rubles.;
$C_{\text{CIRC}}$ – estimated cost of construction of the object-analogues, selected according to the CIRC in prices of 1969.;
$K_{\text{coef}}^{\text{adj}}$ – adjustment coefficient, which allows to eliminate the identified differences between the object estimated and the object-analogues with the help of coefficients given in the General part to the CIRC, technical parts of individual compilations and specific weight of engineering networks in the estimated cost given in the relevant tables of compilations. Some of the coefficients are applied by multiplication, some - by addition or subtraction:

$$K_{\text{coef}}^{\text{tech}} = K_{\text{coef}}^{1} \times K_{\text{coef}}^{2} \times ... \times K_{\text{coef}}^{n} \times (1 \pm K_{\text{coef}}^{m})$$

(2)

where $K_{\text{coef}}^{1} \ldots K_{\text{coef}}^{n}$ – coefficients that allow to eliminate the differences between the object of evaluation and the object-analogues and are taken into account by mutual multiplication;

n – the number of coefficients taken into account by multiplication;
$K_{\text{coef}}^{m}$ – coefficients that allow to eliminate the differences between the object of evaluation and the object-analogues and are taken into account by means of addition or subtraction;

m – the number of coefficients taken into account by adding or subtracting.

$K_{\text{coef}}^{\text{lim}}$ – adjustment factor to eliminate the differences in the norms and methods of calculation of overhead, estimated profit and limited costs in force on the date of evaluation of real estate compared with the estimated cost base of 1969. According to the calculations performed by A.S. Zabrodina in her work "Determination of the complex index of changes in the estimated cost of construction" (Scientific and Technical Vedomosti of St. Petersburg State Polytechnic University. - 2011. - № 5 (132). - p. 82-85), the value of this coefficient is 1.09-1.12, taking into account labor insurance premiums of 30% and accident insurance rate of 1%;

$M_{\text{obj}}$ – capacity of the object, determined in the units for which the CIRC indicators are set, nat.item of measurement;

$I_{\text{inc}}^{\text{cur/84}}$ – index of increase in the cost of construction in the base of 1984 prices as compared to 1969 prices, determined by the Decree of the USSR Gosstroy No. 94 of May 11, 1983 "On approval of indices of change in construction and installation cost estimates and territorial coefficients to them for recalculation of consolidated estimates (consolidated estimates) for construction projects" and differentiated by branch of the USSR national economy, mainly from 1.15 to 1.22;
$I_{inc}^{84/69}$ - index is applied in combination with territorial coefficients, which currently do not reflect the rate of change in the base prices in different regions of the Russian Federation and therefore, in our opinion, cannot be applied. Thus, for example, the above Resolution No. 94 of the USSR Gosstroy sets forth a territorial coefficient of 0.92 for Moscow, and 1.04 for Smolensk or Astrakhan Oblasts, although it is common knowledge that the price level in Moscow construction is now substantially higher than in other constituent entities of the RF;

$I_{inc}^{cur/84}$ – index of construction cost increase in the current price level (as of the assessment date) as compared to the base prices of 1984 and determined by monthly reference publications in the field of estimated pricing, in particular, RCTS of St. Petersburg and CO-INVEST. Thus, in accordance with the Letter of Saint-Petersburg Regional Center for Pricing in Construction of 11.01.2021 № 2021-01i "On introduction of regional indices of recalculation of estimated cost of construction to be applied from January 1, 2021" on 01.01.2021 for the construction in general for Saint-Petersburg established the following indices: for wages of workers - 474.24, for operation of machines - 340.83, for materials with delivery (in average) - 235.4. Since here the indices are set for the elements of direct costs, it is necessary to calculate in the form of a weighted average, where the weight of significance is the specific weight of each element of direct costs:

$$I_{inc}^{cur/84} = (0.25 \times 474.24 + 0.15 \times 340.83 + 0.60 \times 235.4) = 310.92$$

where 0.25; 0.15 and 060 – the specific weight, respectively, of the labor remuneration of workers, operation of machines and materials in the direct costs in the estimated cost of construction and installation works. Two assumptions are used here: firstly, the industry average specific weight of elements of direct costs is used, while other values may be used when assessing a specific object; secondly, it is assumed that the specified specific weight corresponds to other items of the estimated construction cost (design and survey work, other work and costs, temporary buildings and structures, etc.);

1.20 – value added tax accounting ratio.

It may also be noted that some of the adjustments taken into account in the calculation $k_{coef}^{tech}$ are established on the basis of the cost approach and do not reflect the trends on the real estate market. For example, in paragraph 4 of the technical part of the CIRC № 28 states that the replacement value is given at an average room height of 3 m, with a decrease in height by every 10 cm correction factor from 1.01 to 1.05 is introduced. From the point of view of the cost approach it is understandable, because the lower the height of the floor, the greater the number of ceilings required for the same volume of the building. However, market requirements are different - the cost increases with increasing ceiling height from 2.5 m to 3.0 m in residential apartments. This is taken into account, in particular, in the AIEC for the subjects of the Russian Federation, which states that in these consolidated figures of the construction cost of 1 m² of the total area of the apartments, the height of the floor from the floor to the ceiling is taken as 2.8 m. When calculating the cost of construction of a facility with a floor height different from that adopted in the AIEC on the subjects of the Russian Federation, the given figures are adjusted to take into account the following surcharges:

<table>
<thead>
<tr>
<th>Index</th>
<th>Values of the indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor height, m</td>
<td>2.8</td>
</tr>
<tr>
<td>Amount of allowance, %</td>
<td>-</td>
</tr>
</tbody>
</table>
Note that expression (1) does not always apply when using CIRC. In some cases, when CIRC is used, it is necessary to prepare an estimate that includes certain types of work. In particular, it is necessary when estimating railway transport facilities (compilations No. 18, No. 19, No. 21), when the estimate includes work on the construction of the earth bed, laying and ballasting of track and track switches, construction of crossings, stops, etc., which is explained by the difference in measurement units for individual elements of the construction.

The CIRC compilations also contain tables with the specific weight of the elements of structures in the estimated cost, which makes it possible to estimate the value of physical deterioration by element-by-element evaluation when assessing the market value of real estate.

The AIEC-1969 compilations partially repeat the CIRC, but unlike them:
1. Developed for a limited range of objects;
2. A number of compilations contain details of estimated construction costs. For example, the compilation "New Railways" includes an indicator of the estimated cost of construction with its technological structure - the cost of construction, installation works, equipment and other works and costs. Thus, if the cost, for example, production and service buildings of railway transport is estimated actually one line, the estimated cost of railroad track requires, as in the use of CIRC, make a small estimate, because the indicators are given for its individual elements - laying track and track switches, ballasting track;
3. A number of digests, for example, "Administrative and domestic buildings", contains the total value of direct costs, with their detailed elaboration on the types of work and types of structural elements, which allows to accurately consider the composition of the estimated property and also perform an assessment of physical deterioration by item-by-item evaluation method. When using these digests of AIEC-1969 one should take into account overheads and estimated profit. It is possible to do it only if labour remuneration is singled out from direct costs.
4. The AIEC-1969 indicators are designed for the first territorial area and contain coefficients for other territorial areas. Indexation to current prices is carried out in the same way as in the application of CIRC.

The CIRC and AIEC-1969 compilations should be applied when evaluating the cost of rehabilitation of buildings and structures built before 1980s. In the case of valuation of facilities built in the pre-war period or since the 1990s and later, the application of CIRC should be considered as a forced measure, in the absence of alternative sources of information. In this case, we should talk about determining the replacement value of the object of evaluation. However, since the collections CIRC and AIEC-1969 developed on the basis of obsolete materials and construction technologies at the present time, it is advisable to carry out the evaluation of the estimated cost of the object additionally using other aggregated indicators, with subsequent harmonization of the results of calculations.


In the collections AIEC-1984 and price lists developed in the basic prices of 1984, direct costs, their individual elements and labor costs of workers for convenient, from the point of view of estimated cost, units of measurement. Thus, for example, in Digest No 1-14 СНиП IV-14-84 "Stairs" - 1 floor, in Digest No 2-1 "Earthworks" - 100 m long strip foundation, 100 m² area (excavation) or 100 m long row of columns. Similarly, in СНиП IV-15-83, the units are, for example, 1 substation, 1 kiosk, 1 building. However, the complexity of using СНиП IV-14-84 and СНиП IV-15-83 is, firstly, the need to know the structural composition of the estimated object (range of works), secondly, the calculation of other items of the Bill of quantities other than construction work (design and survey work, preparation of the construction site, other work and costs, etc.), and thirdly, the calculation
of all limited costs. It is possible to do it with the help of other aggregated indices and modern norms and prices. However, it complicates considerably the estimate cost of construction of the estimated object in comparison with the use of other aggregated indices. Indexation to current prices is performed by multiplying by the index $i_{inc}^{cur/84}$.

There are two types of aggregate indicators developed in the base prices of 1991: aggregate base cost indicators per type of work (AIBC TW) and cost indicators per type of work (CITW).

AIBC TW contains 50 sections, corresponding to the names of federal or territorial unit rates (FUR or TUR). The collection contains the value of direct cost elements and their total sum (in the column "total" - the final result with the overheads and the estimated profit) in the prices for the Moscow region. For the valuation of the real estate located in other RF constituent territories the AIBC TW contains territorial coefficients. Therefore, the application of AIBC TW requires the estimate for the construction of the object of evaluation, which is possible for technically simple buildings and structures. In this case the appraiser independently or with the help of an expert must determine the nomenclature of works and their volume in physical units. For technically simple buildings on general construction works it is not so difficult to do, especially if there is a technical passport for the object of evaluation. It is difficult to determine the volume of work on engineering networks, because they are almost entirely referred to the so-called hidden works, and the technical passport gives only a mention of the existing engineering equipment of the object. Way out here is to determine their estimated cost, or as a percentage of the cost of general construction works (in accordance with tables CIRC), or on the basis of price lists for the construction of buildings and structures, or on UR-2001.

The AIBC TW tables provide rates for the main types of work. The cost of other types of work is estimated with the help of correction factors, which are given in the annexes to each section of the AIBC TW. The rules for applying them are given in the technical part of the AIBC TW.

Indexation of the base cost of construction works from 1991 prices ($Indbccw$) to current prices as of the date of evaluation is performed as:

$$C_{cost}^{cur} = C_{Indbccw}^{cur/84} i_{inc}^{cur/84} / i_{inc}^{91/84},$$

where $i_{inc}^{91/84}$ – The index of increase in the base prices of 1991 in comparison with the base prices of 1984, determined by the letter of the USSR Gosstroy of September 6, 1990 No. 14-d "On the indexes of change in the cost of construction and assembly work and other work and costs in construction".

Such double recalculation, i.e. the conversion from 1991 into the base prices of 1984 is necessary due to the fact that in 2021 the RF Ministry of Construction started to report the value of the appreciation indices of 1991 into the current price level only for design and survey works. For example, in accordance with Annex 4 to the letter of the Ministry of Construction of Russia from 25.10.2021 № 46012-IF/09 "On the indexes of change in the estimated cost of construction in the IV quarter of 2021", for the IV quarter of 2021 from 1991 prices - 54,75. The administrations of the various constituent entities of the Russian Federation periodically report these indices, but appraisers and quantity surveyors constantly have questions about its value.

Cost indicators for types of work (CITW) were developed on the basis of construction norms and prices approved by Decree of the USSR State Construction Committee of December 29, 1990 N 115 "On Approval of collections of cost estimate norms and prices for construction work (SNiR-91) and general provisions for their application" in basic
prices of 1991 in prices as of January 1, 1993, and are analogous to modern state elementary cost estimate norms (GESN). Order of the Russian Ministry of Construction dated 26.12.2019 No. 871/pr "On Approval of Estimated Norms for Construction Work" approved 47 CITW collections that coincide in numbers with FUR or TUR, for example, GESN 81-02-28-2020 "Railways". The CITW compilations are developed in the prices for the base area (Moscow region), which contain the information on the direct costs of construction works, including the nomenclature of materials. As with the use of other aggregate indicators and rates containing data on direct costs, when using CITW, it is necessary to determine the estimated cost of construction in accordance with the chapters of the consolidated cost estimate. In this case, for example, the estimated cost of design and survey works can be defined by an aggregate of 7-10% of the cost of construction and installation works.

At first it is necessary to index the prices to the price level as of January 01, 1993, taking into account the indexation of prices (1000 times), which was performed in 1997 in accordance with the Decree of the President of the Russian Federation N 822 of August 4, 1997 "On changing the face value of the Russian currency units and the scale of the prices". At the beginning - to the price level as of January 01, 2000, using December 1999 indices, and then - to the current price level on the evaluation date by the direct costs elements. Indexation to the price level as of 01.01.2000 is carried out by multiplying by the estimated index of construction appreciation, defined as:

$$I_{99/93} = \frac{I_{12.99}}{I_{01.93}},$$

(4)

where $I_{12.99}$ and $I_{01.93}$ – respectively, the appreciation indices for December 1999 and January 1993. For St. Petersburg the values of these indices are presented in the table below.

Table 2. Construction appreciation indices and specific weight of cost elements.

<table>
<thead>
<tr>
<th>№№ n/n</th>
<th>Elements of direct costs</th>
<th>Jan 1993</th>
<th>Dec 1999</th>
<th>Specific weight of PP elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Basic salary of workers</td>
<td>48.0</td>
<td>18.85</td>
<td>0.25</td>
</tr>
<tr>
<td>2.</td>
<td>Cost of operating machines and mechanisms</td>
<td>118.0</td>
<td>20.37</td>
<td>0.15</td>
</tr>
<tr>
<td>3.</td>
<td>Estimated cost of materials</td>
<td>108.0</td>
<td>21.50</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Price increase index $I_{12.99}$ is counted

$$I_{12.99} = (0.25*18.85 + 0.15*20.37 + 0.60*21.50)*1000 = 20668,$$

where 1000 – coefficient taking into account the price denomination in the Russian Federation since January 1, 1998.

The index 101.93 is determined in a similar way. Thus, the value of the index for converting the prices in which CITW (1993) were developed into the level as of 01.01.2000, from which the indexation is performed into the current price level as of the assessment date, is equal to 218.71.

AIBC-2001, CP-2001, CP CJSC INiK and a number of price lists were developed in the base prices of 2000. All these consolidated indicators and rates are issued for a limited range of objects, which gives a rare opportunity to use them to determine the estimated cost of construction for the purposes of real estate appraisal.

Thus, the AIBC-2001 (Handbook of the Estimator and Appraiser of Real Estate Objects. (Under general ed. by P. V. Goryachkin and V. S. Bashkatov), 2nd edition revised
and supplemented, SPb, 2009) contains a limited number of comparable objects in St. Petersburg - more than 700 items, for which photographs, technical and economic indicators, specific weight of cost items and a brief description of the main structural elements of buildings are given. The cost of construction in general, including the cost of civil and erection works and equipment, the cost of 1 sq. m. and 1 cubic m. of the total building area, the total area of apartments, non-residential part of the building are given as the estimated figures. For residential buildings, in particular, it is specified that the cost of construction is specified when the internal finishing is performed at the level of "preparation for finishing".

The disadvantages of the compilation are limited range of objects, in particular, not containing specialized railway transport objects, and the fact that the data on the estimated cost are included in the compilations without critical analysis - directly from the data provided to the administration of St. Petersburg by contractors, which may be the source of some, sometimes, significant distortions.

The aggregated figures for the construction costs of railway bridge spans (CP CJSC INiK) were developed at the price level as of 01.01.2000 excluding the value-added tax and contain:

- Indicators of the estimated cost of construction of the spans of railway bridges with the allocation of the cost of construction work, the cost of installation work, the cost of equipment and the cost of other works and costs;
- Indicators by cost items - the cost of basic wages of workers; the cost of operation of machines and mechanisms; the cost of materials, products and structures; the amount of overhead costs and estimated profit.
- Resource sheets, which are an analogue of GESN;
- Technical characteristics of spans.

Territorial Integrated Building and Civil Engineering Construction Rates (CP-2001) were developed in the basic price level as of January 01, 2000 for application in Saint-Petersburg and approved by Order 146-p of the Committee for Economics and Industrial Policy of the Saint-Petersburg Administration of April 23, 2003.

The publication of engineering network performance rates with the unit of measurement allowing the appraiser to easily determine the volume of hidden works is of significant importance. In particular, in this collection for plumbing works there are standard units: 1 riser, 100 cubic meters of the building, 1 or 100 apartments, 1 bathroom, 100 sq. m of the total area.

The fee schedule CP-2001 contains the value of direct costs and their separate elements - workers compensation, machinery maintenance cost and cost of materials, which allows to easily perform indexing to the current price level on the date of assessment. The appraiser is additionally required to take into account overhead costs, estimated profit, limited costs, cost of design and survey work, VAT value, i.e. to develop a consolidated estimate calculation.

The price-list of construction of underground street and internal quarter networks approved by Decree of the Committee for Construction of the Leningrad region of 24.02.2009 No. 10 was developed at prices as of 01.01.2000 for 4 types of networks: water supply, sewage, gas and heat supply networks for the conditions of the Leningrad region and contains indicators of the construction cost estimates for three price zones. In addition to the price list price, this price list also indicates the labor costs of construction workers and machinists and direct costs with the allocation of their elements. The price list can be used to determine the estimated cost of demolition work. Clause 6 of the General part of this Pricelist states that limit costs can be additionally charged if necessary. It is possible to note a number of drawbacks of the General part to the price-list, where, in particular, the estimated profit is referred to with the outdated term "planned accumulation", it is not
specified whether the VAT is taken into account or not. However, since paragraph 1 of the General part states that the price list is made by GESN and TUR-LO-2001, which do not include VAT, we must assume that in these consolidated figures the value added tax is not taken into account.

In current prices (for January 01 of the next calendar year) three kinds of integrated indicators and prices are regularly published: Integrated indicators of construction costs on the subjects of the Russian Federation (AIEC on the subjects of the Russian Federation); integrated indicators of the construction costs, developed by CO-INVEST in the series "Appraiser's handbook" (AIEC CO-INVEST) and integrated standards of construction costs, approved by the Ministry of Construction of Russia (CSCP) and their territorial analogues (TCSCP).

AIEC by constituent entities of the Russian Federation (see, for example, the letter of the Ministry of Regional Development of the Russian Federation of 27.01.2010 № 2670-KK/08 "On the publication of information and reference materials in the field of pricing and rationing in urban planning activities (collection of aggregate indicators of construction costs (AIEC) in the Russian Federation) are published, such as in legal information systems" Consultant "and" Garant " and the website of the Russian Ministry of Construction (minstroyrf.gov.ru) and contain information on the estimated cost of construction (including VAT, item 7 of the Technical Part) for the construction of multi-storey and individual residential buildings, external water supply, sewerage and heating networks, including:

- the cost of construction materials and equipment (taking into account the average transportation costs and procurement and warehousing costs);
- labor costs of workers and operation of construction machines (mechanisms);
- overheads and estimated profit;
- the cost of construction of temporary buildings and structures;
- costs of winter works;
- expenses relating to obtaining by the customer and the design organization of the initial data, technical specifications for designing and carrying out of the necessary approvals for design solutions;
- expenses for construction risk insurance,
- the cost of design and survey work and project expertise;
- maintenance of the construction customer service, technical and author's supervision;
- reserve of funds for unforeseen works and expenses.

When using AIEC by constituent entities of the Russian Federation of previous years, it should be remembered that the VAT rate changed periodically (Table 3).

### Table 3. VAT rate since the transition to market relations.

<table>
<thead>
<tr>
<th>Years</th>
<th>Basic rate</th>
<th>Preferential rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>28%</td>
<td>15%; 0%</td>
</tr>
<tr>
<td>1993-2003</td>
<td>20%</td>
<td>10%; 0%</td>
</tr>
<tr>
<td>2004-2018</td>
<td>18%</td>
<td>10%; 0%</td>
</tr>
<tr>
<td>2019 up now</td>
<td>20%</td>
<td>10%; 0%</td>
</tr>
</tbody>
</table>

The disadvantage of AIEC on the subjects of the Russian Federation is that they contain information only on the objects of residential real estate. However, this information can be used to approximate the value of the estimated cost of non-residential objects by the analogy method, applying the so-called leading indicator - a coefficient representing the ratio of the estimated cost of construction of non-residential and residential objects.
AIEC CO-INVEST are a commercial publication, which limits the possibilities of their use. In the prices as of 01.01.2021 there are 10 digests issued in electronic and printed editions with the branch orientation and developed, including, on the basis of CIRC 1969. The cost indexes presented in AIEC CO-INVEST correspond to the sum of summary estimates (without VAT), however, with the reservation that the estimators introduce special correction for the level of other works and expenses, the unaccounted items of which are listed in the introduction part of the digests.

In addition, the CO-INVEST editions publish appreciation indices for civil and erection works to the base price levels of 1969, 1984, 1991, and 2000.

In the collections of CO-INVEST AIEC indicated that the estimated cost of buildings is determined in accordance with the Rules of calculation (SNiP 31-05-2003), with reference to a not applicable document, Resolution of the RF State Committee for Construction and Housing and Communal Complex of 23 June 2003 N 108 "On the adoption and enactment of building codes and regulations "Public buildings of administrative use", in connection with the refusal in its state registration, which was reported by a letter of the RF Ministry of Justice on 15.04.2004 № 07/3893-UD.

During the estimation of the specific object the possibility of correction of the reference indices is foreseen, taking into consideration incomplete correspondence of the evaluated object to a similar object concerning space-planning, constructional parameters, quality of the materials and constructions, types of engineering systems, regional economic, natural-climatic and local conditions of the construction.

Provides for the introduction of corrections both in absolute terms and in the form of adjustment coefficients, allowing to adjust the value of the cost as a whole for the building and in the context of the main structural elements, types of work and building engineering systems.

Indexation of the estimated cost to the current price level when using AIEC CO-INVEST collections is carried out as follows:

\[ I_{yd} = \frac{I_{tek}}{I_{KO-IN}} \]

where \( I_{tek} \) – the value of the construction appreciation index as of the assessment date; \( I_{KO-IN} \) – the value of the index of appreciation of construction works as of January of the calendar year, in the prices of which the next AIEC compilation CO-INVEST.

The Ministry of Construction of Russia annually approves 21 collections of consolidated standards of construction prices (CSCP), which contain the value of the estimated construction cost per capacity indicator of the object without VAT. The technical parts of the NCS collections contain various coefficients allowing to make adjustments for differences between the estimated object and the analogue given in the collection, calculation formulas and examples of calculations. The advantage of these consolidated indicators is the simplicity of calculation - the value of the estimated cost is determined by one line, similarly to the UBVS, availability (posted on the website of the Russian Ministry of Construction), annual updates, which allows you to take into account modern construction technologies.

Subjects of the Russian Federation can take similar standards of construction prices. For example, the order of the Committee on the state order of St. Petersburg from 10.08.2017 № 122-r "On approval of collections of territorial estimated standards "Unified standards of construction prices. St. Petersburg" in the price level as of 01.01.2017" 11 collections of territorial estimated standards "Enlarged Standards of Construction Prices" (TSCP) were put into effect in St. Petersburg.

Territorial enlarged standards for construction prices, are designed to determine the need for financial resources required to create a unit of capacity of construction products,
assess the efficiency of use of funds allocated for capital investments, preparation of technical and economic indicators in the design assignment, planning of investments (capital investments), other purposes established by the legislation of the Russian Federation of facilities whose construction is planned in St. Petersburg with involvement of

Besides the abovementioned sources, unit construction cost indicators in current prices may be used in appraisal activities as a reference material with the help of which one can expertly verify the accuracy of determination of aggregate figures of estimated construction cost of the appraisal object. These indicators are published in various analytical materials or can be reported by professional participants of the construction market - contractors, designers and developers. Such expert estimation is useful exactly as verification data since it will not be right methodically to estimate the estimated cost of the object only on the basis of such information due to subjectivity of opinions of various individuals and legal entities. In the case of estimating the estimated cost of construction on the basis of unit values, as in any expert evaluation, it is necessary to ensure the reliability of the sample of experts (ideally - at least 7-8, which in practice is not always possible and in some cases have to be limited to 2-3), as well as to harmonize the results.

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3 Conclusion

In conclusion, we can note the presence of a significant number of different information sources in Russia, that are developed in reference prices of different years. Some of the aggregated indices are developed according to outdated technologies, some of them contain information which has not been analyzed for truthfulness. Under the existing conditions, it is advisable to determine the market value of the construction of the object of evaluation several times - using a variety of sources of information with subsequent reconciliation of the result, which will increase the reliability of calculations and ensure the observance of consumer rights of reports on the evaluation of the market value of real estate. Preference should be given to modern sources of information such as "CO-Invest" URS, NCS federal or territorial edition, as well as reference data obtained from professional participants of the construction market - design organizations, developers, construction management bodies.

In addition to assessing the market value of real estate, the aggregate indicators mentioned in the article are often the only way to determine the value of the estimated construction cost in all the situations mentioned in the introduction, for example, when assessing the efficiency of investment projects, in particular, the creation of infrastructure for railroad transportation [15, 16].

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