

## **Determination of direct correlation between the cost of design the industrial objects and the cost of expertise of design documentation**



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### **Abstract**

In this paper the author describes the course of investigation of determination of direct correlation between the cost of design the industrial objects and the cost of expertise of design documentation through constructions cost. Author developed correspondence tables between the cost of design documentation of production facilities and the cost of expertise of design documentation, that allow you to move to determining the value of expertise of design documentation in the absence of pre-project stage object counterpart.

**Keywords:** INDUSTRIAL OBJECT; OBJECT COUNTERPART; CONSTRUCTION; DESIGN; EXPERTISE OF DESIGN DOCUMENTATION; COST OF BUILDING; ESTIMATE; COMPLEXITY CATEGORY.

### **Statement of the problem**

Metallurgical and mining industry, side by side with other types of industrial production in Ukraine, can fully develop only under the condition of technological progress, periodic creation of new production facilities, reconstruction and regular overhaul of existing assets.

In terms of chronology of events, one of the first steps on the way to getting the finished product and the profit from its sale is to calculate the efficiency of investment in future production.

In terms of the construction industry for this purpose can be used pre-processing,

feasibility calculation, feasibility study of an industrial facility.

Design standards of construction are restricted number of averaged reference data for calculation of investments and on preliminary stage, especially to determine their effectiveness.

However, the list of expenses for pre-design, design, and related work for the creation of the object of construction includes a number of components, namely: the cost of obtaining initial data for design (cost of land issues; geodetic and geological surveys the construction area, instrumental examination of existing building structures the object to the planned reconstruction; urban cost calculation for urban conditions and limitations, etc.); development costs for each of the stages of design; cost of expertise of design documentation; cost of copyright and engineering supervision.

Conducting of to establish a direct relationship between the individual components of the construction cost of the construction object, even in the absence of reference data for each of these components, will determine their approximate numerical value by expressing one value over another. In this context merit two successive processes: planning and expertise of design documentation.

### Analysis of recent research and publications

The issue of pricing and cost in the construction industry studied A.V. Bercuta, A.V. Kolesnikov, J.P. Yavorovsky etc. [1, 2, 3].

Specifically, A.V. Bercuta dedicated work of new approaches to pricing [1]. A.V. Kolesnikov studied the cost of construction products [2]. J.P. Yavorovsky paid attention to the design phase as one of the main factors of influence on future construction project [3].

**The purpose of investigation** is establishing a direct relationship between the

cost of the design of production facilities and the cost of expertise of design documentation.

### The main material research

On January 1, 2014 enacted DSTU B D.1.1-7:2013 "Rules of the value of design and survey work and expertise of design documentation for construction" The points of DSTU B D.1.1-7:2013 include determining the estimated cost of the project works by applying the average percentage of the cost of design work to the cost of construction works, and for production facilities to the cost of construction works including the cost of equipment on the basis of the cost parameters of objects-analogues or aggregated indices of average construction cost per unit of capacity (1 m<sup>2</sup> of total area, etc.) [4].

Mean specific indicators of construction costs of housing and social facilities established and regularly reviewed Regions Ministry of Housing and Communal Services of Ukraine. Similar index for industrial facilities is not provided. Thus, the use of new DSTU B D.1.1-7:2013 for the design of industrial buildings is very limited.

If it is impossible to determine the cost of design work on averages cost of construction, estimated cost of these works in accordance with DSTU B D.1.1-7:2013 may be determined on the basis of the collections of the price of project works, having cognitive nature and can be used in determining the value of development works in construction at the appropriate coefficients.

The cost of design work is a part of consolidated estimated calculation of the cost of new construction, reconstruction, repair of industrial buildings, ranging from 0,89 % to 5,91 % [4] value of construction works (table 1).

The cost of expertise of design documentation depends on the composition and work has a specific numerical value that does not have the interest, depending on construction costs and complexity of the construction, the cost of design.

**Table 1.** Indicators of cost of design work for the complexity of production facilities in percentages [4]

№	Estimated base, thousand UAH *)	Complexity of objects				
		I	II	III	IV	V

1	До 5000	2,85	3,42	4,11	4,93	5,91
2	5000–25000	2,85–2,49	3,42–2,99	4,11–3,59	4,93–4,30	5,91–5,16
3	25000–50000	–	–	3,59–2,96	4,30–3,55	5,16–4,26
4	50000–100000	–	–	2,96–2,14	3,55–2,75	4,26–3,08
5	100000–200000	–	–	–	2,75–1,76	3,08–2,11
6	200000–300000	–	–	–	1,76–1,31	2,11–1,57
7	300000–400000	–	–	–	1,31–1,04	1,57–1,25
8	400000–500000	–	–	–	1,04–0,93	1,25–1,11
9	500000–1000000	–	–	–	0,93–0,85	1,11–0,97
10	1000000–1500000	–	–	–	0,85–0,80	0,97–0,92
11	1500000–2000000	–	–	–	0,80–0,78	0,92–0,89
12	over 2000000	–	–	–	0,78	0,89
*) Intermediate values determined by interpolation						

The cost of expertise of design documentation is determined at the stage of submission of documentation for examination on the basis of calculating the estimated aggregate cost of construction.

At the stage of pre-investment studies because of the presence of a minimum of information about the upcoming construction project is a high probability of error in the calculation of aggregated individual components of the total construction cost.

These components, in particular, include the cost of collecting baseline data for the design, development cost of project documentation, cost examination of project documentation, cost of implementation copyright and engineering supervision and so on.

It is advisable to track the relationship between cost and value of design expertise of project documentation.

According to [4], the cost of design, so the cost of examination of project documentation depends on construction costs, with the difference that the cost of the examination is determined basing on estimates for the construction of a particular object, and the cost of design - based on estimates of object-analogue. Designing and reviewing

project documentation are mutually consistent processes.

Another issue is the need for expertise or prior knowledge of customer solutions using its right of examination of project documentation even when it is not required by law (if the object belongs to the category of complexity, lower than III, based not on a budget and is not in difficult geological conditions).

The value of the cost of examination of project documentation depends on the range of estimated cost as the cost of the design depends on the range of the estimated base. However, unlike the cost of design, it is a fixed amount rather than a percentage of the estimated base depending on the complexity, the cost of design. Intermediate values in both cases are determined by interpolation.

The minimum cost of a comprehensive examination of project documentation in all directions is 2 700.00 UAH, excluding VAT, maximum - 2 888 000.00 UAH. Examination for durability, reliability and durability of construction projects worth at least 1 080,00 UAH, excluding VAT, maximum - 115 200.00 UAH. As for the cost estimate of the project expertise, it will cost from 1 000.00 to 57 600.00 (excluding VAT). The latter figure is

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less interesting to private (foreign or domestic) investors in connection with that assessment only estimates of project documentation applies only to objects constructed from budget funds or their partial involvement (table 2).

The main method of determining the value of the design is its calculation of the cost of the facility-analogue, depending on complexity of the construction. The method according to [4]

is the main but not the only one. In particular, the cost of new construction and reconstruction of industrial facility on the basis of its productive capacity can be determined by the price collection for design work at the appropriate conversion factor of cost price in 1991 at current prices; the cost of any kind of design work can be determined by the 3-P on the basis of labor costs planners and others.

**Table 2.** Indicators of cost examination of project documentation for construction in accordance with [4]

№	The estimated cost of construction, thousand UAH *)	Expertise in all directions, thousand UAH, without VAT	Expertise on durability, reliability, durability of construction, thousand UAH, without VAT	Survey estimate of the construction project, thousand UAH, without VAT
1	2	3	4	5
1	До 500	2,7	1,08	1,00
2	500–1000	2,7–4,0	1,08–1,6	1,0–1,09
3	1000–2000	4,0–5,4	1,6–2,16	1,09–1,25
4	2000–5000	5,4–9,0	2,16–3,60	1,25–1,8
5	5000–15000	9,0–22,5	3,60–9,00	1,8–4,5
6	15000–25000	22,5–32,5	9,00–13,00	4,5–6,5
7	25000–50000	32,5–45,0	13,00–18,00	6,5–9,0
8	50000–100000	45,0–70,0	18,00–28,00	9,0–14,0
9	100000–500000	70,0–288,0	28,00–115,2	14,0–57,6
10	over 500000	288	115,2	57,6

\*) Intermediate values determined by interpolation

Where the design value can be determined by any way other than according to the value of the analogue-it is appropriate to use

dependencies between the design value calculated in this way, and the value of examination of project documentation (table 3).

**Table 3.** Correspondence between the value ranges to determine the cost of design work and cost expertise of design documentation

№	The range of value according to [4] to determine the cost of design work	The range of value according to [4] for determining the value of expertise of design documentation
	Estimated thousand UAH *)	Estimated cost of construction, thousand UAH *)
1	2	3
1	to 5000	to 500
2		500–1000
3		1000–2000
4		2000–5000
5		5000–15000
6		15000–25000

7	25000–50000	25000–50000
8	50000–100000	50000–100000
9	100000–200000	100000–500000
	200000–300000	
	300000–400000	
	400000–500000	
10	500000–1000000	over 500000
11	1000000–1500000	
12	1500000–2000000	
13	over 2000000	
*) Intermediate values determined by interpolation		

Note. Development of author

Table between the value ranges to determine the cost of design work and cost examination of project documentation shows that there is a direct correlation between the value of design and cost examination of project documentation.

#### Findings from the research and prospects for further research:

- the cost of design documentation and expertise of design documentation depends on the estimated cost of the construction;
- the result of the research is founding a direct relationship between the cost of design documentation and value expertise of design documentation;
- the dependence for additional calculations will determine the cost of expertise of design documentation on pre-stage in the absence of the object-analogue.

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