

# Legitimization of work on the survey of buildings and structures

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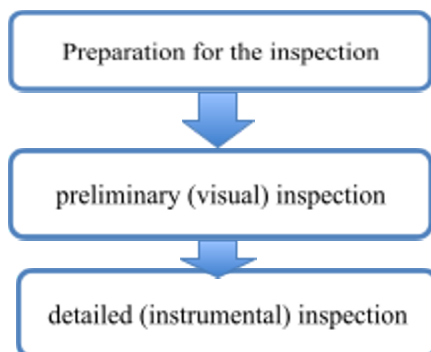
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**Abstract.** This article is devoted to the problem of determining the duration of survey work. In this article, the main stages of conducting a survey of legal and structures are considered, and the principle of determining the maximum duration of the survey is proposed. This principle consists in dividing the object into groups according to the complexity of the object and the work performed. The geometric characteristics of the object were taken as the basis of the complexity of the object, and the types of work were based on the group of complexity of the work. After determining the complexity at the representative objects of each combination of complexity groups, time measurements were made based on the results of which the average time of work on the survey of legal and structures per 100 m<sup>2</sup> of the object was determined

**Key words:** survey of legal and structures, duration of work, rationing of the duration of work

## INTRODUCTION

Survey of legal and structures is a process that allows you to determine the technical condition of legal and structures. For this, various methods of determining the condition are used. In the normative and scientific and technical literature [1-4] on the survey of legal and structures of work, the performance of these works is provided in 3 stages (Fig. 1).



**Fig. 1.** Stages of engineering and technical survey

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Stage 1 involves familiarization with various documentation on this object. This preparation significantly speeds up the process of work, as the design scheme, type of material, volumetric breadding solutions are clearly defined [5].

Stage 2 gives an idea of the object, which defects can be fixed visually, to understand where the elements have weaknesses and a calculation justification of each element is required [6].

Stage 3 allows you to form a complete picture of the structures by testing the structures with destructive and non-destructive methods, carrying out various verification calculations, as well as, if necessary, drawing up a model of the building in order to determine the category of the condition of the structure [7].

**MATERIALS AND METHODS**

The main problem is that there is no single scientifically based mechanism for determining the duration of work. Since at the moment the duration of the work is determined based on the experience of performing such work, various problems arise [8-10]:

- 1. The deadlines for the work are not correctly determined, which entails disruptions in the delivery of the final result;
- 2. The customer, who has no experience of survey work, cannot assess how optimal the duration of the process is;
- 3. If there is no experience of examining such objects, the duration can be determined with an excessive "margin".

These problems lead to:

- 1. Loss of reputation, which affects the number of orders and a decrease in the profitability of the organization;
- 2. Incorrect calculation of the economic effect, due to the late delivery of the object, as well as the delivery of the object in advance;
- 3. The quality of the work performed is reduced;
- 4. The calculation of labor costs is performed incorrectly.

Accordingly, the purpose of this study is to form an approach to determining the maximum duration of work. Defining clear deadlines for the work will allow:

- 1. Accurately determine the time of work completion;
- 2. Calculate the profitability of the company more clearly;
- 3. Plan the work of the company.

To achieve this goal , it is necessary to solve a number of tasks:

- 1. Classification of survey objects;
- 2. Determine the complexity of the work;
- 3. Make full-scale measurements of time on representative objects;
- 4. Output the average time required for the survey per 100 m2 of the object.

**RESULTS AND DISCUSSION**

To solve the first problem, an analysis of scientific, technical and regulatory literature was carried out, during which it was revealed that the most convenient classification would be in the form of dividing the object into 2 main groups: Single-storey legal and multi-storey legal, which in turn would be divided into levels of complexity (Table 1).

**Table 1.** The level of complexity of the object

The level of complexity of the object	Complexity characteristics
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Single - storey legal	
1	legal of rectangular shape, up to 5 meters high, with the same type of structures
2	The building in the plan consists of several rectangles or curved outlines, with the same type of structures.
3	The building in the plan consists of several rectangles or curved outlines, with the same type of structures and / or a height of more than 5 meters
Multi- storey legal	
1	The legal are rectangular in plan, with the same type of premises within the floor
2	legal consisting of 2-3 rectangles in the plan, legal of rectangular shape in the plan, with different types of rooms (differing in area, purpose, etc.) within the floor
3	legal consisting in plan of several rectangles (more than 3) or curved outlines, with different types of rooms within the floor

Initially, it was planned to classify according to the purpose and number of floors of objects, but with such a division, a large number of subtypes of objects themselves arise, which at this stage of the study complicates the determination of duration. Since this study is working to determine the maximum duration of the survey, a classification was made according to the geometric characteristics of the building, since the geometry of legal and structures affects the duration during measurement work, linking defects on the plan, and the construction of drawings.

The second task is to determine the complexity of the work. The complexity of the work depends on what type of examination needs to be performed and whether it is necessary to perform a detailed examination and to what extent. For this purpose, a classification of the complexity of the work performed was made

**Table 2.** The level of complexity of the work

The level of complexity of the work	Complexity characteristics
1	Performance of measurement works necessary for the formation of a report on the results of visual survey and / or performance of measurement works.
2	Performance of measurement works necessary for the formation of a visual survey report, as well as the determination of strength characteristics, followed by the preparation of a report on the results of the survey
3	Performing the measurement work necessary for the formation of a report on the results of a visual examination, as well as determining the strength characteristics, studying the foundation soils and forming a verification calculation, followed by the preparation of a report on the results of the survey
4	Performance of measurement works necessary for the formation of a visual survey report, as well as the determination of strength characteristics and the formation of a spatial design model of the building, followed by the preparation of a report on the results of the survey

To solve the third and fourth tasks, full-scale measurements were carried out on objects of 3 objects of each complexity group (Figure 2).



**Fig. 2.** Examples of representative objects

The calculation of time included field work, desk work, and, depending on the complexity of the work, time was added to carry out constructive calculations (Table 3).

**Table 3.** Duration of work on the survey of legal and structures per 100 m<sup>2</sup>

The level of complexity of the object	The level of complexity of the work			
	1	2	3	4
Single - storey buildings				
1	2	4,33	6,71	9,29
2	2,31	5,02	6,91	10,03
3	2,66	5,65	7,11	10,58
Multi- storey buildings				
1	3,12	5,23	7,43	9,79
2	4,11	6,01	7,95	11,54
3	4,89	6,95	8,31	12,38

**CONCLUSION**

Based on the results, a table of the average duration of work performed on the survey of buildings and structures has been formed, which will help to more clearly determine the duration of work and reduce work disruptions.

It should be noted that this study is the first iteration of the method for determining the duration of work. Further development of this topic lies in the definition of the formation of uniform standards for the performance of work, which will determine the time standards for each work performed, determine the minimum composition of performers, specify the composition of actions necessary to perform the work, and also specify a minimum set of tools and equipment. This collection will help in the formation of technological maps of work with the construction of the schedule of work, which in turn will increase the quality of work performed, increase work productivity, and also allow you to more accurately determine the time of work.

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