The song or arpentage? In the spatial context of the quarters of the historical center of Irkutsk

R A Selivanov

1Irkutsk National Research Technical University, 83 Lermontov str., Irkutsk, 664074, Russia

E-mail: romanseliva@yandex.ru

Abstract. Problem. In modern Irkutsk, the nature of the relationship between the cadastral plan of the quarter and its development is a problem. The essence of this problem is the inconsistency of the boundaries of land surveying with buildings on these sites. Goal to develop a methodology for interacting the spatial grid of a quarter with its cadastral plan. Results: A proposal is made for a method of shaping in the context of a historical city based on a spatial grid that includes a mechanism for interacting with the cadastral plan of the Irkutsk quarter. The analysis of the spatial situation of the historical quarter is performed. Spatial and contextual requirements for the proposed architectural object within the boundaries of this quarter have been developed. Conclusions: To get a high-quality project result in working with the districts of the city center of Irkutsk, a contextual approach is necessary, which includes, in addition to the traditional pre-project analysis, research of the spatial structure of the historical environment of the districts. The strategy of spatial development of blocks in the historical center of Irkutsk does not have clear and meaningful prospects without resolving the contradiction in the relationship between the compositional integrity of building blocks and their land surveying. An effective mechanism of urban planning regulation is needed to implement the design methodology of shaping in the context of a historical city based on a spatial grid.

1. Introduction

In conditions where each owner of the site (home ownership) has the opportunity to conduct construction, the rules for which it should be conducted are necessary. Today, there is a common practice of “separate”, self-sufficient buildings that do not agree with the existing development of the quarter, ignoring the issues of ensuring the integrity of its spatial structure. We need a way to eliminate the chaos in the construction of new objects in the structure of the quarter and the reconstruction of existing ones. Inconsistency of boundaries of land plots with buildings on these sites is one of the reasons for the emergence of point development outside the spatial context of blocks. There is no mechanism that allows designed or reconstructed buildings to be thought of as an integral part of the whole-the neighborhood environment. There is no clear understanding of what the whole is and how to get it with chaotic boundaries of land plots. Let's look at the issue in detail. Today, the cadastral map of the historical part of Irkutsk is chaotic. The land of the blocks is divided into sections haphazardly (sporadic approach). The cadastral plan of the quarter looks like a “patchwork” consisting of different-sized land plots of complex configuration. One part of them is not adjacent to the red line of the block at all, the other is adjacent in narrow fragments (less than the width of the standard one-way passage), connecting with its main part in the depth of the block by long narrow “sleeves”. The only way to get to such land plots from the streets adjacent to the boundaries of the quarter is through...
neighboring plots. (pic. 6) Historically, both the boundaries of land surveying and buildings have repeatedly undergone changes. [8][13] (figure. 1 - 5)

Figure 1. “Cadastral plan of 1784. quarter №22”.
Figure 2. “Cadastral plan of 1792. quarter №22”.

Figure 3. “Cadastral plan of 1843. quarter №22”.
Figure 4. “Cadastral plan of 1878. quarter №22”.

Figure 5. “Cadastral plan of 1929. quarter №22”.
Figure 6. “Cadastral plan of 2019. quarter №22”.

Unchanged in the cadastral maps of 1784, 1792, 1843, 1878, and 1929 was the fact that each of the household plots had a geometrically simple configuration and at least one side adjoined the “red line”. This made it possible to form large-scale and dense small-cell structures of blocks with households independent of each other, and to avoid chaotically located idle passages inside blocks. Each of the sections consisted of public and private parts. The public part of the site included buildings with a facade
adjacent to the “red line” that formed the street, and private courtyard outbuildings and spaces.[17] (pic. 1 - 5)

According to P.N. Nikonov [4], the main disadvantages of modern surveying are the following:
1. The boundaries of the land plot are formed along the contour of the Foundation.
2. Different buildings have land plots “nested” or “linked” to each other.
3. There are gaps between the boundaries of land plots, as well as voids inside the plots.
4. Often there are land plots with a small area.
5. The complexity of the configuration of the parcel boundaries.
6. In the process of forming land plots for new construction and reconstruction, the rights of neighbors are violated.
7. In the process of forming land plots, the red line is violated.

Currently, the concept of “red lines” has expanded. Red lines are defined as contours that limit the general use area and land plots with linear engineering objects (highways and railways, communication and power lines, and communications). Red lines can exist in reality or only on plans, be created and changed. (A. 1, p. 11 CCRF) [3]

Strategically, the shortcomings of the current state of land surveying have their origin in the erroneous method of land distribution for privatization purposes. Abandoning the systematic approach in favor of a sporadic approach to surveying built-up areas. Ignoring the layout of the land plot. Revaluation of a land plot in its capabilities. [4]

2. Modern approaches to the reconstruction of historical quarters.

2.1. The method of point construction:

Currently, in the historical quarters of Irkutsk, the design practice is common, in which fragments of land plots that are free from buildings are filled with point buildings that are self-sufficient, separate from the surrounding spatial context of shaping (in terms of mass-void characteristics, positioning, height, the nature of the divisions, and finishing materials). As a result of this approach, historical neighborhoods turn from integral spatial structures with a pronounced morphotype into separate, chaotic formations that have a non-coordinated, structureless character.[12] In particular, examples of this are modern buildings in blocks №9, №39, №51, №79. (pic. 7-11).

The method of non-conflict reconstruction: it involves the use of pre-existing (historical) land use and development boundaries, which are based on the principles of neighborhood relations, in architectural and construction activities.

These rules are in the version of the arch. Bureau "Ostozhenka" (Moscow) [4]

1. Enclosing structures of buildings bordering neighboring areas must be made of fire-fighting materials without windows and doors.
2. Walls of buildings facing the red line or separated from adjacent households may have windows and doors.
3. The distance from buildings to the borders of adjacent sections should not be less than the width of the passage.
4. The method assumes a return to the historical boundaries of household plots (parcels) and the development of the territory in the structure of the historical parcel.
5. Method of interaction of the spatial grid of a quarter with its cadastral plan:

In the modern architectural practice of Irkutsk, a utilitarian approach to design is common, taking into account only three aspects: property rights in the framework of the cadastral plan, building rules and regulations, as well as urban planning regulations, which include the project of protection zones with restrictions on the height of buildings in the historical part of the city. Unfortunately, in 95% of the hundred, the result of this approach is contextually inappropriate buildings that peremptorily
invasive historical neighborhoods, as much as possible filling the area allocated for construction with square meters. Design and construction in the historical center of Irkutsk is carried out without any methodology on a scientific basis, based on pre-project studies that contribute to tactful inclusion of the projected structure in the spatial context of the historical architectural environment of the quarters. In order for the buildings being built in the historical quarters of Irkutsk to represent contextually relevant spatial solutions, a methodology is necessary. The projected structure can only become relevant to the
spatial context if it becomes part of the whole, part of the context in which it is included. It is necessary to objectively characterize what the whole is and how to measure it? In what case does the whole cease to be such?

“The true is the whole. But the whole is only an entity that is completed through its development” (Phenomenology of the spirit) by Hegel Georg Wilhelm Friedrich.

In mathematics, a set of objects that are considered as a whole is called a set. The set is defined by some characteristics. These characteristics are those properties that all objects that belong to a given set have and do not have that do not belong to it. In the proposed method, the set is a spatial lattice.

3. Method
1. The spatial structure of the block is based on the grid of the block [1] where the new building is supposed to be built. The lattice is based on mass-void relations. The cells of the lattice are empty. The “mass” bands outline the cells. (pic. 15). Dimensions and configuration of lanes and cells are built by projecting the contours of existing buildings on the borders (picture plane) of the block. (pic. 13) the Contours of new buildings lie within the boundaries (traces) of the “mass” spot built in this way (pic. 14). [6]

2. The boundaries of the survey are accepted in the original state. If necessary, changes (interleaving, purchase, sale, change of ownership, etc.) are adjusted at the time when the need arises.

3. The spatial grid of the block is superimposed on the cadastral plan of the block. The lattice is based on mass-void relations. The cells of the lattice are empty. The "mass" bands outline the cells (Pic. 18).

4. The delineation on the cadastral outlines through walls is carried out exclusively within the gray box the “masses”. If necessary, major external fire walls without windows are built along the boundaries of land boundaries within the mass spot of the spatial grid (gray field) [6].

5. If new construction is necessary, capital external walls with windows and doors are built along the borders of the gray field [6].

6. It is strictly forbidden to build up cells of empty blocks. In land use rules, void cells must be assigned to protection zones [2]. Align the cell contours of empty blocks with the red lines. (pic. 20).
Figure 14. “Identification of open space cells in the flat grid structure of the quarter №22”.

Figure 15. “Cutting open space cells from a solid mass field (author’s schemes)”.

Figure 16. “Existing boundaries of the block boundary of the quarter №22”.

Figure 17. “Areas that are not adjacent to the red lines within the existing boundaries of the block boundary of the quarter №22 (author’s schemes)”.

Figure 18, 19. “Applying the grid of the quarter to the cadastral plan of the quarter №22.”
7. Cells of empty blocks belong to open public spaces and are subject to improvement at the level of paving and landscaping. Void cells remain fully visually permeable, regardless of cadastral surveying. They perform two key functions: they limit the density of the block's development, and they dictate the structural patterns of the block's development. (pic. 20).

![Diagram of a block with grid lines and existing buildings]

Figure 20. “Applying the grid of the quarter to the cadastral plan of the quarter № 22 in the existing boundaries of land surveying. Axonometry. (author's scheme)”.

8. The maximum building height of a block is determined by the spatial grid of the block in question. Within the grid of the block, the basic (predominant) height of the building block should be taken as the height of buildings that are more common in the block, as well as buildings that stand along the streets along the perimeter of the projected block.

4. Conclusion
As the mass density increases in a block, the structure becomes more and more ordered, since its external contours are pre-defined and express the integrity of the spatial structure of the block. Surveying in the framework of this method of forming a spatially integral architectural environment of the quarter, acts as if as internal partitions in the planning structure of a complex quarter development, and the contours of the spatial cells and the outer contour along the border of the quarter development (the outer contour of the gray field) are its enclosing walls.

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