Factory towns of the Urals. The uniqueness of the planning structures of these towns

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Abstract. The Urals is rich in raw materials, forests, lakes, rivers, peculiar terrain allowing one to build dams, where factories were formed in the 18th century. A qualitatively new approach to the formation of enterprises based on the use of natural resources was given by the uniqueness of the architectural and planning structure of master plans and architectural treatment, which allowed factories to develop into factory towns. Factory towns currently operate and can develop in the future. The availability of the unique historically developed environment of enterprises and factory environment and the presence of the most valuable monuments of industrial architecture on their territory reveal the major potential for the consistent development and establishment of new functional capabilities of such factory towns. Old factory sites can become resource territories of a town with a further reorientation to new functions since production facilities are valuable as territories equipped with energy and transport communications. This allows one to use them in the future to create centers of innovative technologies, a base for scientists, educational and industrial complexes, cultural centers with the formation of industrial architecture museums and the development of metallurgical technologies, industrial parks, logistics, exhibition and shopping centers, to adapt them for municipal sports and entertainment facilities.

1. Introduction

“Factory towns are a conditional theoretical name reflecting the functional nature of the formation of industrial settlements based on individual factories” [1]. The appearance of a factory town is a unique phenomenon in Russia. The town, as an administrative or trade center, developed on the basis of an already existing settlement or grew out of a developed village. In the latter case, both production (functional) and personal potential had been formed by the time of transition to the new status. Factory towns became typical during the Petrine epoch as an innovation. Their formation was mainly revolutionary but not evolutionary. The entire development of the factory town was not governed by internal laws, but by the ideas of someone else, whether it be a state or manufacturers. “Factory settlements (unlike most rural settlements) were established specifically as envisioned by the manufacturers or factory administration. The population of factory settlements was formed under their guidance and with their direct participation” [2]. Thus, the factory town is a unique form of settlement, which entrenched for centuries, successfully filling and developing. It can be proved by quite modern factory towns: Magnitogorsk, Yekaterinburg (Figure 1), Nizhny Tagil, etc., evolving in all urban structures [3].
2. The main part
The term “factory town” is defined as a specific type of Ural town, which was formed at the end of the 17th – 18th centuries at the ironworks, received the official status of a town after the revolution and retained the production function as the main one throughout its existence. Examples of the Ural factory towns are Katav-Ivanovsk, Sim, Yuryuzan, Alapaevsk, Nizhny Tagil, Verkhnyaya Salda, etc. Being aware of the application of the concept of “town” to the considered type of settlements until 1918 - 1920, we should note that this does not refer to the administrative status, but to the essential characteristics of the settlement. From a formal standpoint, in terms of the population, industrial potential, and place in the national structure of production, these settlements can be validly attributed to towns. The very designation of this type of settlements appeared only in the 20th century (before, it was called a “factory”), such settlements were historically positioned as villages. Such a name was not misplaced because “factories” had many features of an urban culture long before their official recognition as towns. It is no accident that Semenov-Tyan-Shansky defined this type of settlement as “true towns” [4]. Such an assessment was given from the standpoint of their socio-economic characteristics [3].

The choice of the location for a factory town was determined by the presence of ore, wood, and water energy. A site was needed where a small river suitable for the construction of a dam fell into a larger river used as a transport artery.

Layouts of the Ural factory towns repeated the same principles pre-formed in the Middle Urals. The author of the term “factory town” N.S. Alferov notes that by the end of the first quarter of the 18th century, i.e. over just two decades, the principles of planning factory sites, which housed tens of various industrial buildings, were formed and implemented on a massive scale for their time [3].

The commonness of the planning techniques and the technological process allows us to be guided by the work of V.I. Gennin “The description of the Ural and Siberian factories” in identifying...
characteristic features of factory towns. In the drawings of this book, we find a clear strict plan with village houses and adjacent homogeneous estate plots in all factory villages. The altitude dominant was a church located on the pre-factory square (Figure 2). Another altitude focus is production facilities. The active terrain was of particular importance for the spatial composition of factory towns, as they were located in mountainous or foothill areas. Such volumetric natural dominants as mountains, water bodies, and woods played a great role in the spatial structure of factory towns and were often more significant than artificial structures [5].

Figure 2. Kasli factory town. The plan and dominants of streets.

From the accounts of eyewitnesses, already in the 18th century: “Factories were small towns. There was often a church and, perhaps, a school. Literate people were needed to work in offices. There was the police, a fire-engine house was arranged, shops were opening... Manufacturers, if arrived, built mansions calling them palaces. A crowd of servants, huntsmen, and hunters lived there. Some owners asked the Mining board to fortify their plants with shafts, ditches, and pale fencing, to equip them with canons and mortars, and to send in troops.

The permission to fortify factories came at the beginning of the Pugachev revolt” [6]. In the last quarter of the 18th century, due to the uprising of Pugachev, fortifications were built in factories
towns. From an architectural standpoint, the introduction of fortifications led to the creation of an expressive silhouette and a variety of building developments (Figures 3, 4).

Figure 3. A fortified factory town. Fortress. Polevskoy region.

Figure 4. An example of a fortified factory town.
At the end of the 18th - the first half of the 19th century, South Ural factory towns undergo two stages of development: the initial formation and redevelopment of the adjacent territories with the stone reconstruction of the central buildings of the settlement. The structure of factory towns generally located not on a steep bank, but in lower territories, included a pond and a non-navigable river. The presence of a pond and a river led to the lack of isolation of the building and its visual connection with the surrounding landscape.

Master plans of the factory towns show that, subject to the general principle of rectangular planning, housing estates, as a rule, have different axial directions (Figure 5). Groups of rectangular sections often had different directions even within one settlement. In general, the layout of the Ural factory towns differs from similar settlements in other regions by less regularity. The irregular layouts of the Ural factories were explained by the rugged terrain, the direction of the river, the large number of lakes, and the fact that the factories most often belonged to individuals [5].

The following types of the rectangular layout of factory towns are found:
- long panels of blocks parallel to the pond and perpendicular to the dam;
- a compact settlement around the factory and the pond, where individual blocks have different sizes and directions;
- a segmented settlement around the pond and the factory;
- two perpendicular settlement areas

The second stage of planning and development of the factory towns led to the harmonization of settlements. An important outcome was the creation of a territory reserve to expand the factory and residential areas. Despite some schematism of plans and insufficient consideration of construction sites, the core of the town and its regular planning principles remained unchanged, as the primary basis of the towns. Spontaneously formed outskirts were subject to redevelopment [5-7].

The system of spots in factory towns becomes increasingly complicated. The volumetric and spatial composition of the centers is enriched by stone residential buildings and developing industrial facilities with hydraulic engineering installations. Industrial facilities remain the main spots supplemented by a system of places of worship. In several cases, natural objects play a greater role in the volumetric and spatial composition of the factory towns than artificial structures. Metallurgical plants formed on the basis of “water-operating” factories of the 18th century are currently operable
and will develop in the future in the Urals, which is rich in raw materials, forests, small rivers, and peculiar terrain allowing to build dams. This created a unique architectural and planning structure of the master plans, the architectural treatment of modern cities, which appeared and developed together with the factory. The availability of a unique historically developed environment of enterprises and factory environment and the presence of the most valuable monuments of industrial architecture reveal the consistent development and formation of domestic industrial architecture from its foundation to the present day on the territory of factories [8-10].

3. Conclusion
Factories were an essential element of the urban structure during all their development periods. Today, the peculiar nature of the planning structure of historical industrial territories and industrial buildings located in the center of small and medium-sized towns and large megalopolises of the Urals retains the importance of essential components of the urban landscape, determines the appearance of the entire city, and is its symbol (Figure 6).

![Figure 6. A museum in Nizhny Tagil. An example of preserving historical industrial territories.](image)

Starting from the 17th century, the specialized regular labor force was formed and workers’ dynasties of metallurgists were educated in the Urals. In the new economic formation, the historically established factory complexes become memorial centers of culture. Therefore, the preservation of the territories and monuments of industrial architecture as an “industrial chronicle” of the city is an important direction in the historical development of the society. The results of the study can serve as the basis for a further analysis of the formation and development of the planning structures of enterprises and urban areas, which is an essential aspect for the Ural industrial towns, which appeared on the basis of these enterprises. Once appeared, towns tend to grow and develop constantly, although there are examples when the changing conditions of the appearance of towns (for example, depletion of mineral resources or the rapid growth of neighboring competing towns) led to their stagnation or even disappearance. However, most often, already by the very fact of existence and the originally created potential (human, material, technical, infrastructural, educational), the towns generate new urban functions, including those that also become basic. At the same time, the process of urban development can flow not only through the increment of new functions but also based on the transformation and replacement of those functions, which served as an impetus for the appearance of
towns but became outdated over time. The growth of basic activities gives rise to large cities characterized by a variety of functions. The largest cities with a population exceeding one million people represent almost all city functions. The city’s functions and its activities are associated with the number of inhabitants - the main indicator determining the size of the city and the volume of all types of construction on its territory. Its prospective value is set depending on the estimated scale of the socio-economic development and labor resources - the employable population participating in public production [11-15].

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