

## **Revitalization of Industrial Buildings**

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### **Abstract**

Today, the conservation of natural resources is an integral part of a developed society, it allows you to save time, money and resources, as well as preserve the history of cities. Therefore, it would be quite wasteful to destroy those large industrial areas with their ready infrastructure, buildings and advantageous locations. At the end of the 19th - beginning of the 20th century, the industrial revolution began on the territory of Russia. At that time, a large number of large industrial complexes were built and now a lot of them are abandoned. In this research I consider the research papers and successful experience of other countries and identify the basic principles that make revitalization successful by analyzing successful projects, articles and other scientific research. Based on the analyses of the research papers and existing projects I made a design proposal of an existing former factory located in Moscow.

**Keywords:** Revitalization; Adaptive Reuse; Industrial Buildings; Factory; Reconstruction; Bromley Factory; Renovation; Redevelopment; Architecture; Sustainability.

### **1. Introduction**

During the period of global industrialization, a lot of big factories were built, but a lot of them are not in use anymore. Around fifty years ago people all over the world started processes of redeveloping those factories. In Russia this process started slightly later, which can be an opportunity to not make the same mistakes and base on the experience of other countries, who already walked by it. The preservation and transmission of cultural heritage from generation to generation contributes to the spiritual and value development of human society. Historical buildings, like nothing else, can show the stages of human development. They will capture all the stages of progress from the industrial revolution to progress like a film. For this reason, industrial historic buildings occupy a very important niche in this area.

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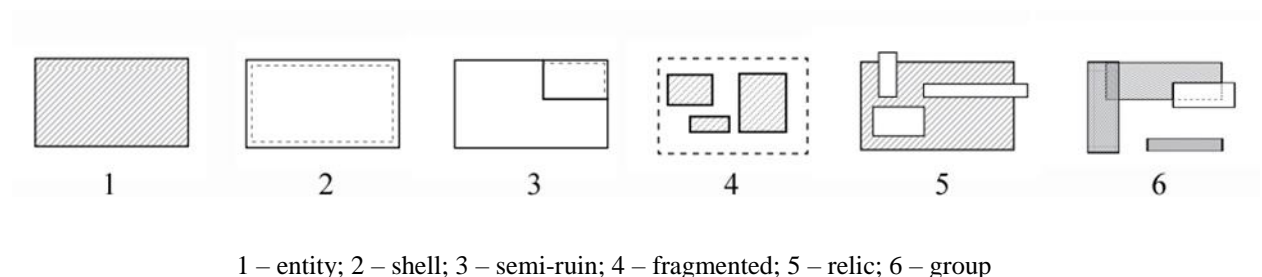
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The adaptive use of industrial buildings is very relevant these days. Since during the industrial revolution a large number of factories and other industrial productions were built. Now many of them are empty, but at the same time they are of great value, since they are an integral part of the history of the country. In addition, many buildings are still in good condition, and reconstruction can give a second life for them. It is also beneficial from the environmental side, since reconstruction can reduce the use of materials for the construction of a new building. The full functional use of historical industrial facilities continued until the end of the 20th century, but due to global macroeconomic processes, it became necessary to convert them. This situation is typical for all technologically developed countries that entered the post-industrial era. As a result of the adaptation of the historical industrial development to the new function, buildings and structures, which reflected the advanced technical, engineering, architectural solutions and the special social order of that time, were under the threat of losing their original features and even completely disappearing.

### 1.1. Adaptive reuse

In the book of the Italian architect, Aldo Rossi - "The Architecture of the City" [1], the process of transforming and rebuilding old existing structures, by changing their functions and adapting to new ones, helps cities to survive from generation to generation. Therefore, in order to extend the life of a historic building, it is necessary to determine the appropriate type of transformation, as well as the principles for successfully adapting the building to new needs. The architectural transformation should reveal and emphasize the architectural "authenticity" of the historical building.

According to the study, Liliane Wong's "Adaptive Reuse Extending the Lives" [2], is a type of historic building that is being implemented with a new feature - The Host-Building. The main characteristic of this type of building is the presence of a structure, which is a framework into which life is introduced. Often such structures are old objects that have lost their relevance, are not used or are used for the remembered. Such buildings change their original appearance and original function. The author of the book deduced the classification of Host-building, depending on their external and internal attributes. Such a classification helps to understand what type of reconstruction is preferable. In Figure 1 you can see a scheme of the typology of the Host Structures.



**Figure 1:** The typology of the Host Structures

### 1.2. Conversion in Architecture

One of the most popular types of reconstruction is conversion. Conversion - from lat. conversion

"transformation". This principle is a complex change in architectural structures, as a change in the functional purpose of the building, the appearance and structural basis of the building. However, often the problem of conversion, according to the dissertation of LO. Titova [3], is the loss of the authenticity of the building in the process of change.

In the book "Building Adaptation" by John Douglas [4], extending the life of existing buildings favors the principles of sustainable architecture, which is based on such features as: conservation of materials, transportation and conservation of energy.

The principles of integration of historical industrial facilities into the modern city formed the basis of many scientific studies. For example, A.A. Yakovlev [5] in his work identified five levels of adaptation, ranging from the level of urban planning to the level of detail of the object.

### ***1.3. Types of building conversion***

#### **1) Changing only the functions of the building**

- **Adaptive reuse/Reorganization.**
- **Redevelopment.** Complex reconstruction of a territory or building, subject to the chosen development strategy. The main reason of using this strategy – profitable investment in real estate.
- **Renovation.** Building changes using partial or complete renovation of functions or purposes.
- **Museumification.** Preservation of the building as a historical object with keeping its architectural uniqueness, but replacing the function to a museum.

#### **2) Changing the architecture of the building**

- **Ruining.** Protection of historical buildings (in different degrees of deconstruction) from the effects of an aggressive environment.
- **Restoration.** The process of restoration and renovation of the original parts of a historical building without any innovations and changes.
- **Modernization.** Improvement of the existing building by updating technological and engineering equipment without changing of the functional purpose and architecture.
- **Reconstruction.** Changing of the technical indicators of the building to improve its efficiency.
- **Regeneration.** Restoration of the lost part of the building or the entire building in order to accurately recreate it.
- **Fasadism.** Restoration of the main façade of the historical building and replacement of old parts of the building with new ones.
- **New construction in the same scale.** Construction of a new building on the site of an old building following same scale.
- **Construction of a new building in a place of old object**

#### ***1.4. Key aspects of returning architectural conversion***

According to the 2nd International Conference on Economy, Management and Education Technology (ICEMET 2016) [6]. Conversion in architecture has several necessary key aspects.

**1) Economic aspects.** In most cases, the cost of repairing or rebuilding is much less than what is required to demolish a building and build a new one. In general, the cost of renovation is roughly 1/3 to 1/4 of the cost of demolition, which is much cheaper than building a building from scratch. The cost is maintained by introducing new materials into existing ones. Moreover, old buildings will receive a new function after renovation, which will create huge economic benefits for society. The reuse of once abandoned buildings and abandoned sites is in line with the idea of recycling economic resources.

**2) Historical and cultural aspects.** Many old industrial buildings are an integral part of the history of the formation of cities. The structure of the city was formed around many of them. Therefore, many of these buildings can be considered historical heritage, as they bear the memory of our cities. It is for this reason that many international organizations have been created to protect old industrial buildings. For example, TICCIH (International Committee for the Conservation of Industrial Heritage) and ICOMOS (International Council for Monuments and Sites). These organizations regularly hold conferences and research on the protection of historically important industrial buildings.

**3) Aesthetic aspects.** Old industrial buildings have their own unique look or architectural style. Their appearance is consistent with postmodern aesthetics, creating a new aesthetic concept called "Industrial Aesthetics". This style is well acclaimed by modern people, especially young people and artists who pursue and find inspiration in places like this. Beijing 798, for example, is the famous and successful Bauhaus-style renovation model of old industrial buildings, designed by a German architect in 1953. Although it has lost its original production function, the style has been retained to create a special creative atmosphere for workers and visitors.

**4) Environmental aspects.** Converting industrial buildings is a subtler way than building from scratch. This helps to avoid a lot of damage to urban development and the environment, especially in terms of air and noise pollution.

#### ***1.5. Criteria for sustainable development historical architectural heritage***

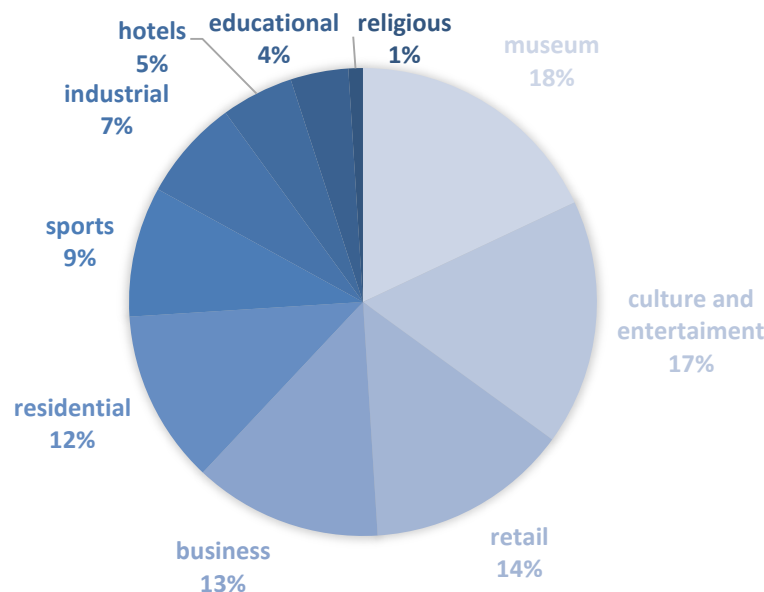
According to the comprehensive assessment of buildings - "Green Print", published in the journal AMIT (Architecture and Modern information technologies) [7], the main aspects of sustainable development must take into account local employment of the population, i.e. creation of new jobs, transport-oriented development of the territory and reduction of car traffic, planning solutions for territories, landscaping and preservation of local identity and strengthening of local ties within society. A comprehensive environmental assessment "Green Print" has 8 main points: climate, resources, transport, ecology, business, society, location, buildings.

- **Criterion "Ecology"** - assessment of the ecological situation in the territory and its harm to humans

and the environment.

- **Criterion "Transport"** - assessment of transport and pedestrian accessibility, convenience of location and development of transport infrastructure.
- **Criterion "Buildings"** - assessment of the effectiveness of the use of buildings and their adaptation to modern conditions. It is possible to restore the exteriors if necessary.
- **Criterion "Location"** - The degree of awareness of the population and interest in the monument of cultural heritage.
- **Criterion "Resources"** - assessment of the effectiveness of the use of resources.
- **Criterion "Society"** - focus on all age groups of society, supporting various activities based on the social group with which they identify themselves.
- **Criterion "Business"** - assessment in terms of investment, creation of new jobs and attraction of business.
- **Criterion "Climate"** - orientation of the building and technical standards of objects based on climatic conditions.

Today, a large proportion of industrial buildings in Russia after the shutdown go through the process of museumification, since this is the easiest way of the adaptive reuse. Figure 2 shows the percentage of functional use after the redevelopment process.



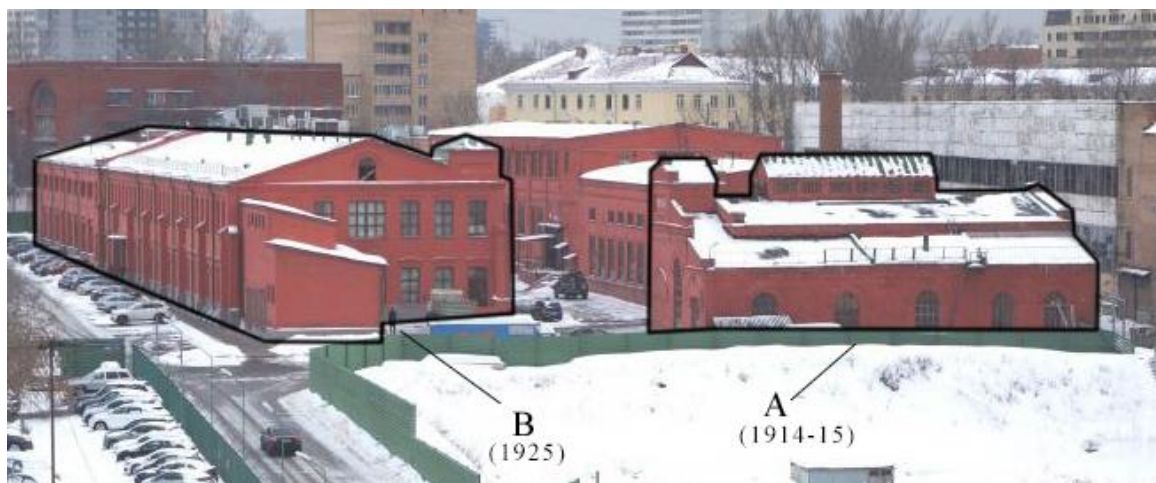
**Figure 2:** Functions of buildings after the redevelopment

## 2. Materials and Methods

I will conduct an analysis of existing successful examples and, on their basis, identify the main principles of a successful strategy for adapting historical buildings to modern needs. At the same time, explain why it is so important to restore rather than build from scratch. Consider several case studies completed in different countries to understand ways and trends in revitalization nowadays. For the practical part, the Bromley factory

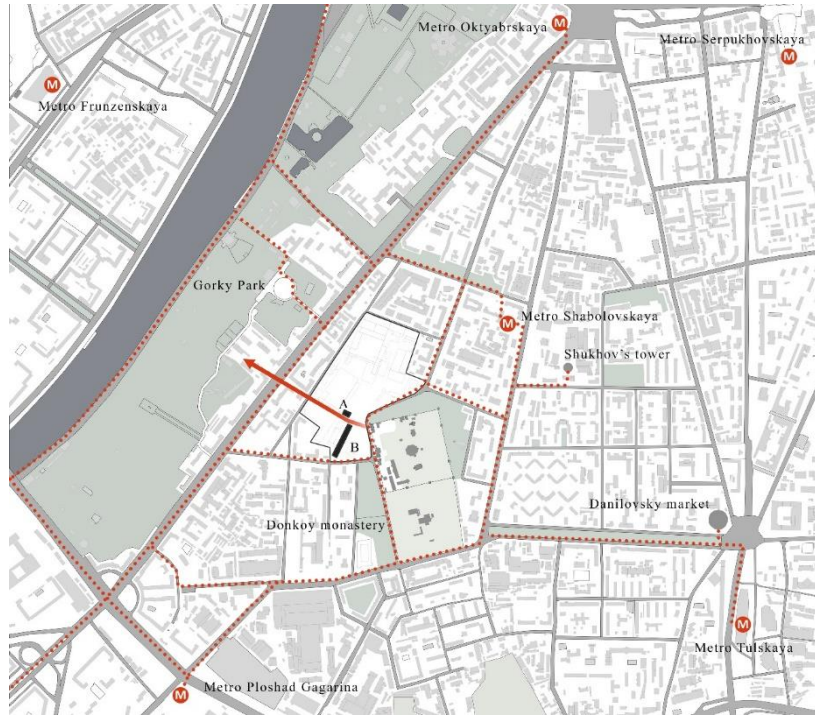
was picked. It is a complex of historical buildings located on Malaya Kaluzhskaya Street, next to the Donskoy Monastery and Gorky park. This factory is a monument of history and architecture made of red brick. Dated to the beginning of the 20th century and right now it is a partly abandoned closed territory. The method used for this research was in summarizing researches, design projects, measuring the historical building, making the analyses of the territory and creating the design proposal.

I analyzed the territory for better understanding the way of the revitalization, purposes and main principles for the best development of the factory. Figure 3 shows the view on the two buildings for the revitalization. To understand the purpose of use I made a map of the territory with a portrait of users. Figure 3 shows this map. As you can see there are a lot of educational establishments, the average age of students 17-25 years old. The convenient location between two public areas would help for the visitors' attraction. It was decided to pave the way between two green areas through the territory, between historical buildings. In Figure 4 is shown the suggested walking route map. In Figure 5 you can see the transport map. The circles on this map - stations of the metro, surrounding the territory. According to this, the territory of the factory doesn't need the creation of a special transportation system.

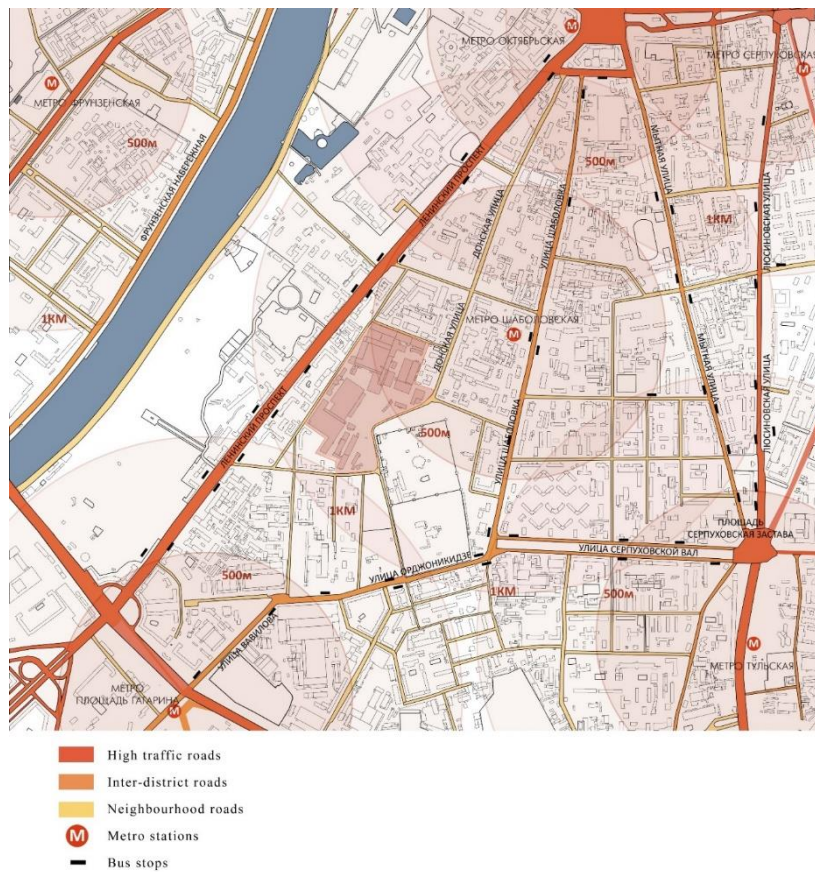


**Figure 3:** View on the two historical buildings





**Figure 4: Walking route map**



**Figure 5: Master plan of the territory.**

Through the analyses of the territory the best way for redevelopment was identified. The social portrait of the user was the reason of the creation a public center with different types of activities. The analyses of walking

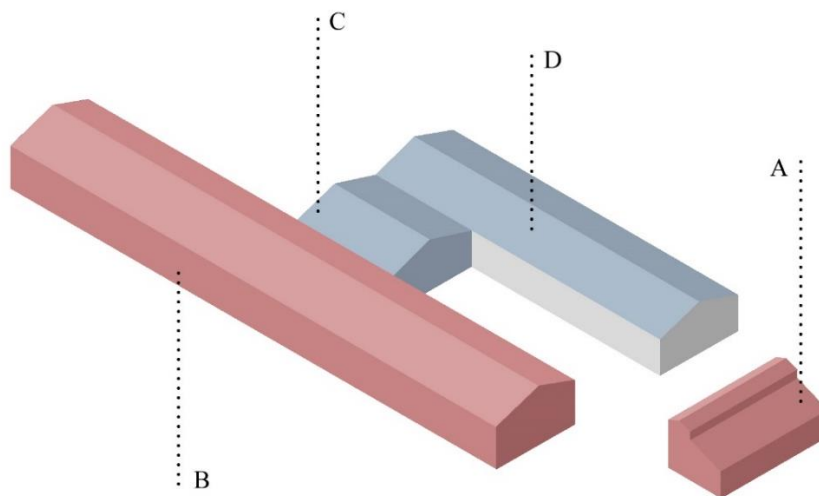
routes helped with the decision to put the pavement between parks and create the buffer zone for visitors which would be the part of this walking route.

### 3. Results and Discussion

The result of the study was the plan for the future development of the territory. Figure 6 illustrates the master plan for the development of the area. It was decided to add two new volumes to the historical building B - the main volume and the connecting volume, which is attached to the building B. The composition of the attached buildings is oriented to the north, creating a closed space outside the complex and open and safe inside. Also, the territory of the complex does not contain internal roads for cars, such roads are located only along the perimeter of the building. There is a car-free zone on the territory of the complex. However, the layout of the roads is made with the expectation of fire safety and the minimum extinguishing distance of the building.



**Figure 6:** Master plan of the territory

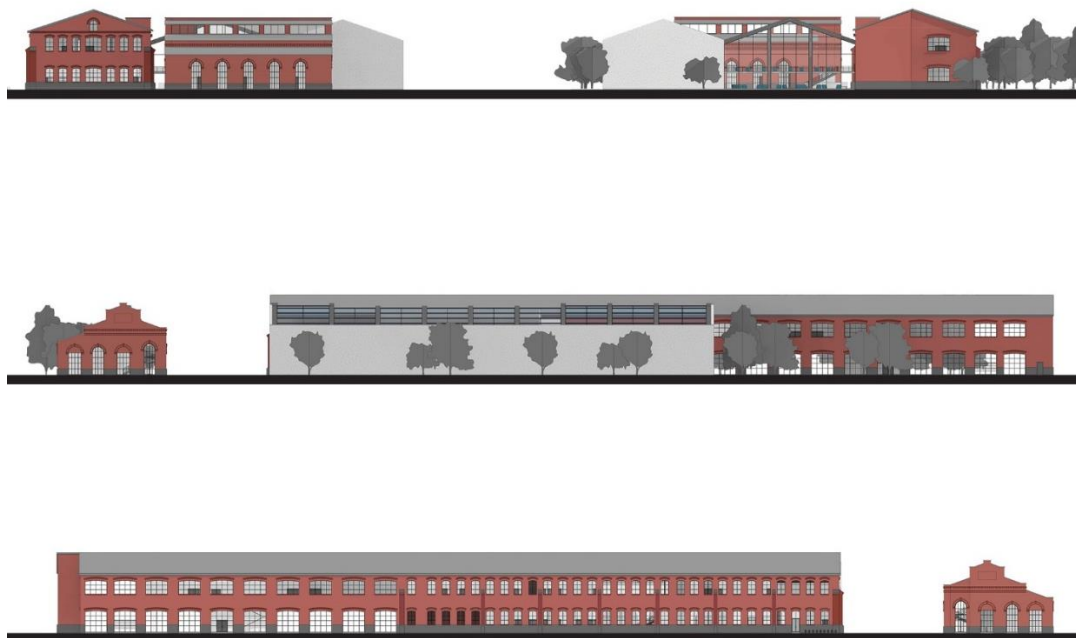


**Figure 7:** Scheme of the building volumes



Figure 7 shows the scheme of the building volumes. Buildings C and D are annexes to building B. Building B is a completely open glass volume with a double-height space. Inside this volume is a winter garden with a coffee shop and a seating area for visitors. I decided to create a winter garden in this area, because in Moscow the climate is rather cold and therefore such a space will have a positive effect on the emotional state of the residents. Also, based on the analysis of the social portrait of the district, a large number of educational institutions are located here, the average age of students ranges from 17-18 years. In the coffee house, combined with the winter garden, students will have the opportunity to study and spend their free time enjoying nature, even in winter. Building B is divided into two levels by a mezzanine. There is an additional seating area on the mezzanine. Building D is partly open. The walls of the building are closed, made of concrete, the roof of the volume is glazed. This building is also divided into two floors - the public ground floor and a more closed one on the first. The attached volumes are quite simple; they follow a simple rectangular shape with a sloped roof. Building A - closes the composition from the north side.

Figure 8 illustrates the facades of the design suggestion. Historic buildings almost completely retain their historical appearance, with the exception of ground floor windows, the bottom line of which has been extended to ground level, creating a more open space. Building C has stained glass windows on all sides. Building D has a gallery with arches at ground level. Also on the ground floor of this building, the walls are glazed, so the light penetrates to the ground floor through the gallery of arches and to the first floor through the glazing on the roofs. In building A, a window gallery was created on the first floor, which increases the penetration of daylight into the building.



**Figure 8:** Facades of buildings

Figures 9, 10, 11 show 3D models of the design suggestion. Here you can see the inner space of the courtyard, which is a square. On the left side and on the right side there are two shallow pools in the summer to help with

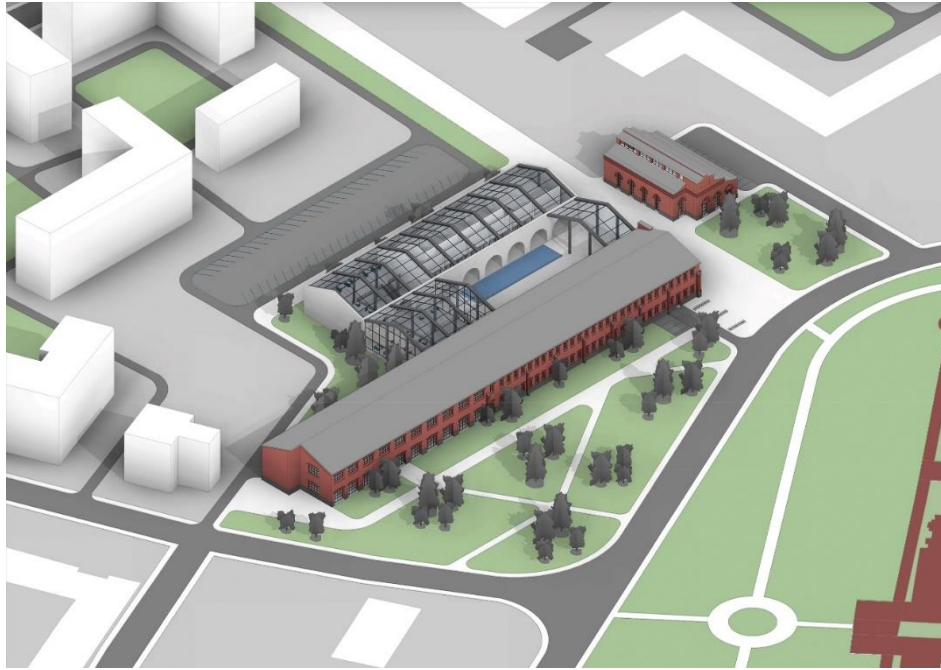
cooling. The entrance to the buildings is through the propylaea, the roof of which follows the shape of the roof of buildings C and D. On the west side, behind the D building, there is a parking lot for 54 places for visitors to the center. Behind building A, on the north side, there is also a package for 11 places. On the east side there is a loading package for three places for unloading the warehouse of the restaurant located in building B on the ground floor. Parking for bicycles is also located here.



**Figure 9:** Design suggestion. Northeastern view

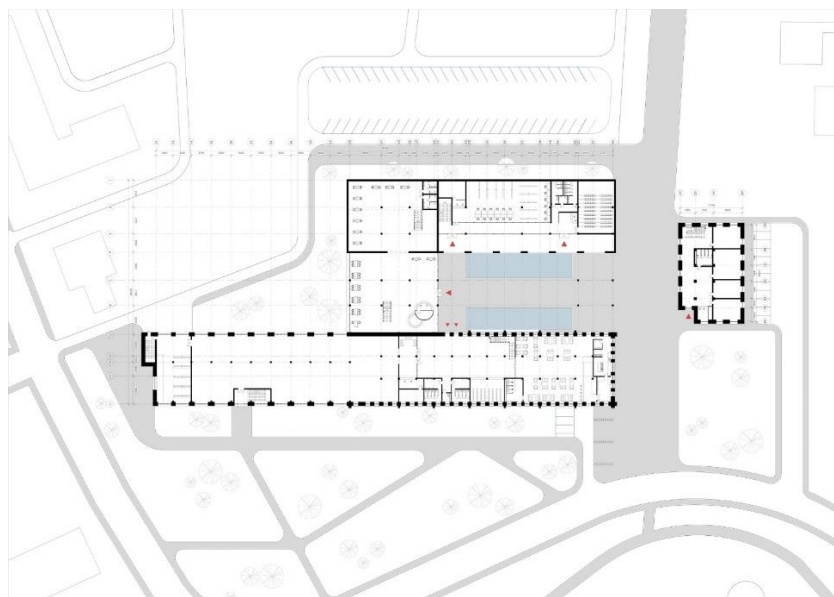


**Figure 10:** Design suggestion. Northwestern view



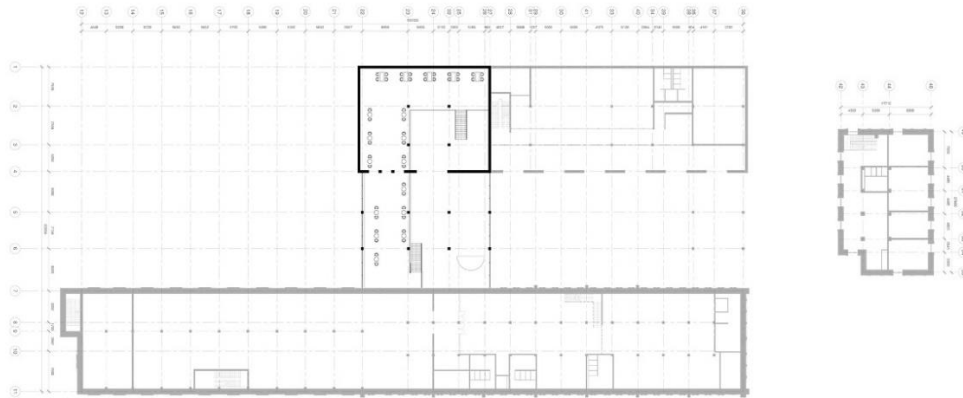
**Figure 11:** Design suggestion. Southeastern view

Figure 12 shows the ground floor plan. In building A, on the ground floor, there are offices for the workers of the center. Building B contains a restaurant on the north side and an open exhibition space, as well as a cloakroom, restrooms and a staircase leading to the first floor to a children's leisure center. In building C, as already mentioned, there is a winter garden with a coffee shop, at the entrance to the building there are cash desks and a coffee dispensing area in a circular volume. Building C and D are separated by a bearing wall. Building D has two entrances from the gallery of arches. One entrance leads to the stairs to the first floor, the other entrance leads to the library and lecture hall. The center is surrounded with a lot of grass, trees and other greens.



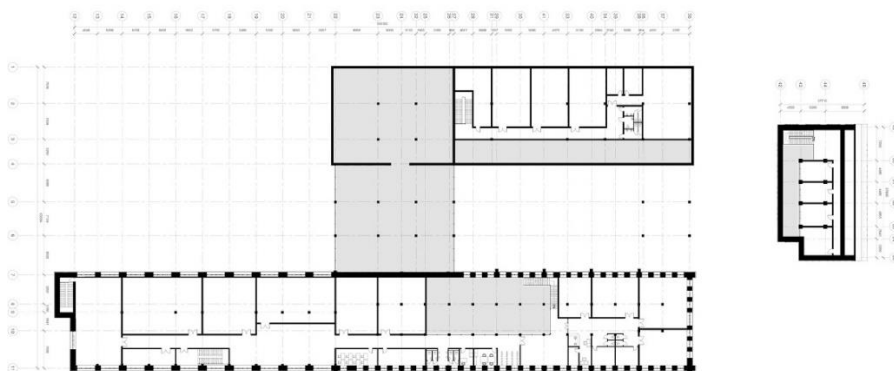
**Figure 12:** The ground floor layout

Figure 13 shows the mezzanine floor of building C. Here is an area with tables and chairs. The mezzanine occupies about half of the area of the building and is located at the level of three meters. This was done in order to create a two-level open space for a comfortable arrangement of tall plants inside the winter garden.

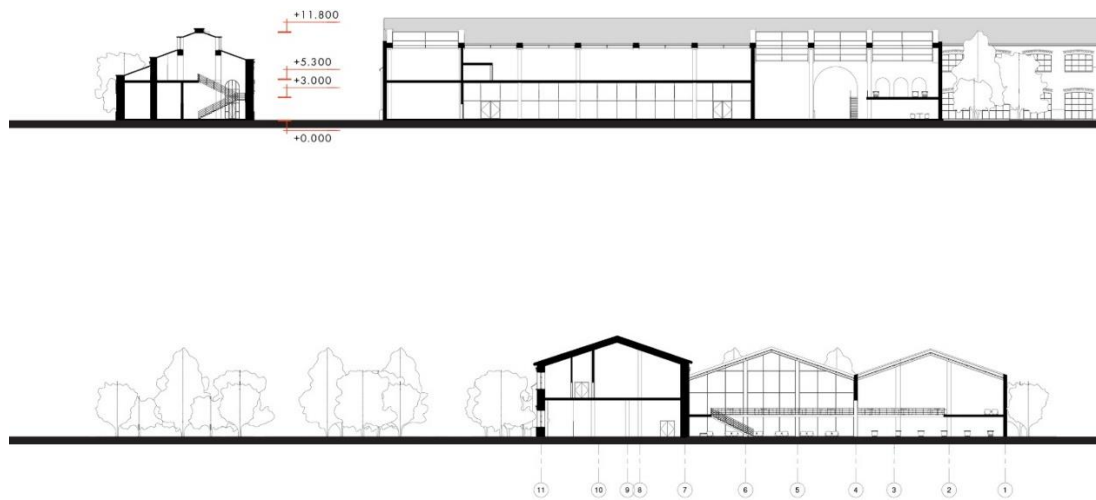


**Figure 13:** The mezzanine floor layout

Figure 14 illustrates the first floor plan of the center buildings. Building A houses offices for rent. In building B, the first floor is occupied by leisure facilities for children. In the northern part there are classes for active classes such as dancing, gymnastics, karate, etc. In the southern part there is an art school with various size classrooms. In building D there are four rooms for various workshops and a yoga studio. (The gray areas show the two-level spaces of the ground floor). Figure 15 shows sections of buildings with their level marks.



**Figure 14:** The first floor layout



**Figure 15:** Sections of buildings

#### **4. Conclusion**

The creation of a community center on the territory of the plant was chosen due to the analysis of the surrounding areas of the district. The area in which the territory is located is quite densely populated and has a large number of educational institutions. Thus, the creation of such a place, which will serve as a kind of leisure center that attracts visitors, was a reasonable decision.

Analysis of the stage of cases helped me with the choice of the trajectory of the building change. Therefore, the design proposal almost completely preserves the historical appearance of the buildings. However, the addition of new volumes using contrasting materials creates the interest of visitors. Despite the contrast of materials, the use of similar forms, the buildings are perceived as a single large ensemble. In addition, a way to increase the openness of the space for visitors, borrowed from Renzo Piano's GES-2, was also used in the project.

The main idea in the project was the openness of the territory for the city. This development of closed areas contributes to a friendlier perception of the city. For this purpose, a route was created through the center, glazing of buildings and the absence of any fences.

After the reconstruction processes for the adaptation of buildings, the community center will be held according to eight Green print criteria. This means that the building can be called sustainable architecture. Table 1 provides a summary of these criteria.

**Table 1:** Bromley factory after the revitalization according to Green Print criteria

Criterion	Bromley factory
<b>Ecology</b>	Creation of new green areas.
<b>Transport</b>	Location within walking distance of public transport stops. Creation of pedestrian walking route to connect two public zones.
<b>Buildings</b>	Preservation of the historical appearance with the creation of two new blocks.
<b>Location</b>	Location in a residential area near the park area.
<b>Recourses</b>	Use of energy-saving materials, natural lighting, energy production with solar panels, local materials.
<b>Society</b>	Interest of all age groups.
<b>Business</b>	A large number of jobs, small, medium and large businesses. Variety of activities.

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