

*Semko O.V., ScD., Professor
ORCID 0000-0002-2455-752X a.semko@mail.ru
Voskobiynyk Ye.P., post-graduate
ORCID 0000-0002-0664-5307 ygvosko@gmail.com
Poltava National Technical Yuri Kondratuk University*

ANALYSIS OF THE INDUSTRIAL OBJECTS RENOVATION EXPERIENCE

Examples of foreign and domestic experience of renovation the industrial objects are considered. It is shown that in the European Union countries for the last 30 years, according to statistic research, the new construction and renovation index has increased. For the European practice, the expansion of renovation process from typical neutral objects to monuments of industrial architecture is a common thing. It has been noted that domestic practice is usually characterized by the composition of trading and office rooms in the environment of adaptation the typical neutral objects of industrial estate. Analysis of the examples showed that the renovation utilizes structural and planning, as well as aesthetic potential of the industrial buildings. Analysis results allow identification the options and directions for converting the inoperable industrial objects into civil buildings. This experience might be utilized for development the rational architecture-planning and structural solutions for reconstruction.

Keywords: *renovation, inoperable building, reconstruction, converting.*

*Семко О.В., д.т.н., професор
Воскобійник Є.П., аспірант
Полтавський національний технічний університет імені Юрія Кондратюка*

АНАЛІЗ ДОСВІДУ РЕНОВАЦІЇ ПРОМИСЛОВИХ ОБ'ЄКТІВ

Розглянуто приклади закордонного і вітчизняного досвіду реновації промислових об'єктів. З'ясовано, що у розвинутих країнах Європейського Союзу за останні 30 років, згідно зі статистичними даними досліджень, зростає відсоткове співвідношення між новим будівництвом і реновацією; для європейської практики властиве поширення процесу реновації не лише на типові нейтральні об'єкти, але й на пам'ятки промислової архітектури. Відмічено, що вітчизняна практика реновації зазвичай характеризується формуванням торговельних і офісних об'єктів в умовах пристосування типових нейтральних об'єктів промислової нерухомості. Аналізом прикладів засвідчено, що при реновації використовується конструктивно-планувальний та естетичний потенціал промислових будівель. Доведено, що результати проведеного аналізу дають змогу визначити можливості й напрями перепрофілювання не-функціонуючих промислових об'єктів під будівлі громадського призначення, а отриманий досвід можна використовувати при розробленні раціональних архітектурно-планувальних та конструктивних рішень, які застосовуються при реконструкції.

Ключові слова: *реновація, нефункціонуюча будівля, реконструкція, перепрофілювання.*

Introduction. Nowadays a significant number of large industrial enterprises completely or partially suspended production for economic reasons or to be passed beyond the city through sanitary harmfulness. Often located in the central areas of the city of factories are idle creating an environmental and aesthetic imbalance in a time when there is a deficiency of the city for the development of small and medium business sphere. The problem of overdue thanks to the renovation of industrial facilities under the buildings for public use. There is already international and domestic experience in the renovation of industrial objects and territories.

Analysis of recent studies and publications sources indicates that in the developed countries of the European Union for the last 30 years, according to statistics researchings [1], the percentage ratio between new construction and renovation. In General, starting from 2010 in Western Europe investment in renovations existing facilities on average make about 550 billion. euros per year, exceeding almost 1.5 times the volume of new construction. For the European practices with the distribution process of the renovation not only typical neutral objects but also in the interest of industrial architecture. Forming on their basis of public and residential facilities possible for the internal redevelopment of monuments of industrial architecture and while maintaining the facades. The domestic practice of renovation is usually characterized by the formation of a shopping and office facilities in terms of adaptations common neutral industrial estate. But the analysis of [2 – 6] indicates that the formation of retail and office centers based on the renovation of the existing industrial buildings in these works employ a practically independent.

Parts of general problem unsolved before. One of the directions of the perfection of the structure of modern cities is changing the functional purpose of industrial objects, partially or not at all. The creation of public buildings based on the renovation of industrial facilities provides an opportunity to effectively use existing industrial estate and at the same time to solve nazrili problems of development towns. In addition to the economic efficiency of the use of existing industrial buildings, renovation is a means of preserving historical kanvi bridge, solve the aesthetic and ethical problems of the existence of old factories. It should be noted that the percentage of industrial zones in the structure of modern cities is from 10 to 50% [5].

Problem formulation. The main aim of the research is the analysis of the foreign and domestic experience renovating industrial objects [7 – 9] that enable you to identify opportunities and diversifying them under a building for public use.

The basic material and results. In practice, most developed countries observed the formation of community facilities based on the preservation of objects of the industrial heritage, the multifunctional use of buildings and areas of active development of the transport network to form the frame of the city on the updated areas, landscaping and uncovering the natural capacity of the territories, creating a Visual connection with the surrounding environment. Analysis of international and domestic experience renovating industrial objects discovered spreading process of renovation at different structural levels of the industrial zones:

- industrial district;
- industrial site;
- industrial site;
- a group of industrial buildings;
- a separate industrial building.

From this perspective, it is advisable to consider the most famous examples of renovation. So one of the ways to use a full dismantling of existing and construction of new functions of the complex from scratch. An example of such a decision is the heart of the town renovation, Gelizen (Germany) at the factory on manufacture of furnaces, designed by architect m. Koval's'ki (fig. 1) [7].

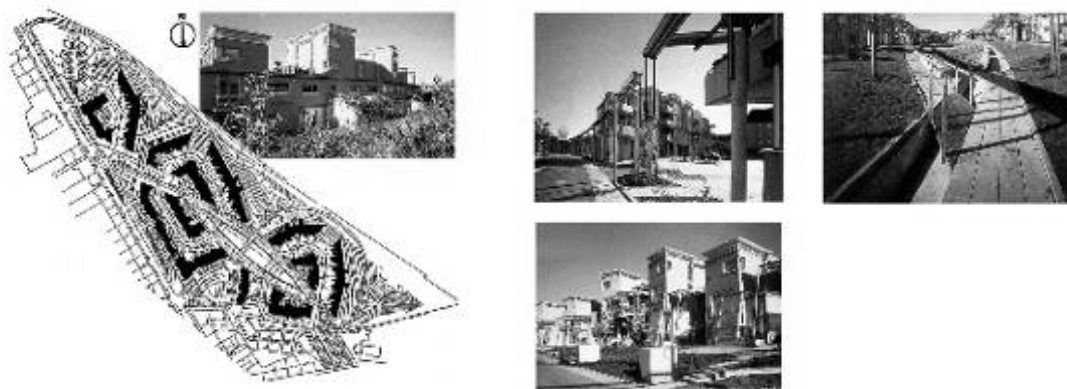


Figure 1 – Renovation of the quarter Gelizen Heart (Germany) at the factory on manufacture of furnaces, designed by architect m. Koval's'ki

However, with this approach substantially increases expenses for demolition objects, clearing and preparing for new construction, etc. Therefore, it is advisable to consider the examples of the various options for the conversion of industrial areas and objects change their functions, as well as to analyze the experience of different countries and architectural workshops in this direction. So, a typical example of such admission is a Center of Arts and media at Karsruê (Zentrum für Kunst und Medientechnologie Karlsruhe), Germany (fig. 2) [7]. Accommodation in 1997 and in buildings of industrial enterprise «IKWA-Karlsruê-Augsburg» modern Civic Center was one of the examples of the radical view of the role of the industrial object in the renewal of the urban landscape. An existing industrial complex of the object represented by the space-planning solutions a wide, height in three floors of the building blocks of the factory, symmetrically arranged around ten domestic branches. The building is made of concrete frame filling brick masonry on the fasadam. An abandoned in 70-ies of the last century, and later busy artists, the building was given the status of monuments of industrial architecture. Competition for the renovation, maintenance, and expansion of the plant won the architectural Studio ASP SCHWEIGER ASSOZIIERTE. Architects aptly preserved the building of 1918 and used new high-tech items.



Figure 2 – Center for arts and media in Karsruê, Germany (renovation of the industrial enterprise «IKWA-Karlsruê-Augsburg»)

For example, in order to eliminate the negative effects of noise and vibration on building a sound Studio was rendered by its Chairperson's factory in the form of a large glass cube in front of the façade. The courtyard was blocked lights that changed the internal environment, these architects have achieved the ideal of modern functional space. On the roof of the solar generators that supply the tramway path adjacent territories.

Particular attention during the renovation architects to transform the area around the building, with the aim of creating a natural complex, using the contrast between high technology and return to nature (at the exit of the building). The problem with the parking was solved thanks to a device recessed parkinga along the building. The whole area above the parking lot is a lawn with modules made from steel sheets, keeping thus the industrial past of the object.

The next object that deserves attention is the renovation of the complex-holders in Vienna, Austria (fig. 3) [7]. Gasholders was built in 1896 – 1899. The building (62 m inner diameter, height is 72 meters) tanked for gas, but in 1970, they ceased to function and all technical equipment was dismantled. The remaining brick shell and 90000 m³ inner space, protected by the State as a monument of architecture.

Reconstruction of the object consisted of 4-architectural workshops, each designed one of the four buildings in the complex. All the architects come to solve the problem differently.

In the Nouvel inner part consists of 9 segments that are located on a circle with a slight retreat from the existing walls. When renovating design the 14-floor accommodation. In the middle is the mall that is covering the dome, which has a relationship with all 4 me gasholders.

If all the architects formed only internal volumes, then Wolfe Priks proposed Supplement 3 – new forms, and one of them is a sticker. In the middle is a cylindrical volume with offices out – lomana flat shape of the screen, with Office space, and on the 1st floor is a multifunctional hall for public events, shops, and entertainment.

In the project Vedorn Architects in the Middle of gas holders' space is divided into 8 sectors, each of which height is divided into functional areas: housing, offices, trade, parking (top-down). Yard above the garage is blocked, a large glass dome, forming a public recreation area.

Wilhelm Holzbauer approached the design of the 4-th gasholders another image. In his project, there is no common interior space. From the middle of the full height rises cylindrical volume of the residential building. From his three blades extending cases that divided this whole inner volume 3 yard.

Building up renovation were the culmination of the industrial zone: absolutely closed, self-sufficient structure, the highest over the warehouses and wastelands. After renovation, they were the highlight of the entire area, but now it is not submitted by «skeletons», and attractive luxury offices, apartments, and shops.

Another interesting facility renovation in terms of originality of the interaction of historical building and the new building is the tall Centre Melbourne, Australia (fig. 4) [7]. Melbourne residents believe their city «the most technically equipped» in the southern hemisphere, so this is often called «Colosseum consumers». The author of this project is to architect Kìšo Norìakì Kurokawa.

Construction of the complex, located in the historic center of the city, was carried out in 1986 – 1991. It consists of a high-rise office building, shopping center, futuristic shape, as well as other institutions of cultural and entertainment destination. 55-story skyscraper hovering over a nearby trading center; in the processing of its facades used different materials: aluminum, stone, mirrored and tinted glass. In the construction definitely felt Japanese motifs. Part of the Mall became a huge 20-story glass Cone in the middle of which is a monument of Australian history – built in 1894, the brick Tower is the only preserved

building of the former factory of lead pipes that once stood on this spot. In this case, the existing Tower not played special importance from the architectural point of view.

However, it is important a high dominant of the city of Melbourne, which is accustomed to city residents. It is part of the past, urban history, which Kurokawa carefully preserved, protecting the glass Cone, making it part of the Interior of the new shopping center.

Another, quite a good example of a renovation, the Russian Architects – Museum of water in the territory of the enterprise «Vodokanal» outlet (fig. 5) [7] (the renovation of the water tower), Saint-Petersburg, Russia. Reconstruction of the building of the water tower is the first in St. Petersburg experiences a revival of the old industrial buildings that have lost their former purpose. This project is an experiment in mixing styles of the XIX and XXI century. The main objective was to restore, clearing from later «layers» and adapting to the new features of interior spaces. Preservation of the integrity of the Interior – beautiful rooms with arched floors. The red-brick octahedron water tower, projected by Mertz and Šuberskim in 1860 – 1863, associated with water only functionally: monolithic volume denies any fluidity. During the reconstruction failed to solve not only the question of content is placed in the Tower of the Museum «World Water», but also shaped. The requirements for the conservation of historic interiors of the towers caused the takeaway elevator and stairs in a building extension. It has become the main focus of reconstruction. In its forms, and the story can be read in the image.

As a negative example, or unfinished or failed, you can bring the Moscow Project Gallery Yakuta (fig. 6) [7]. An attempt to make art gallery in the building of gas holder's gas factory of Armagh, on the manners of the Austrian project has not been implemented. Create a glamorous Club and Gallery reflected only on the form of the building, and then failed. Monotone overlapping beams and slabs of internal space is not a good example of solving difficult problems. Gallery – this is just the first attempt to convert the factory territory in the Business Park, the planned installation of offices, trading.

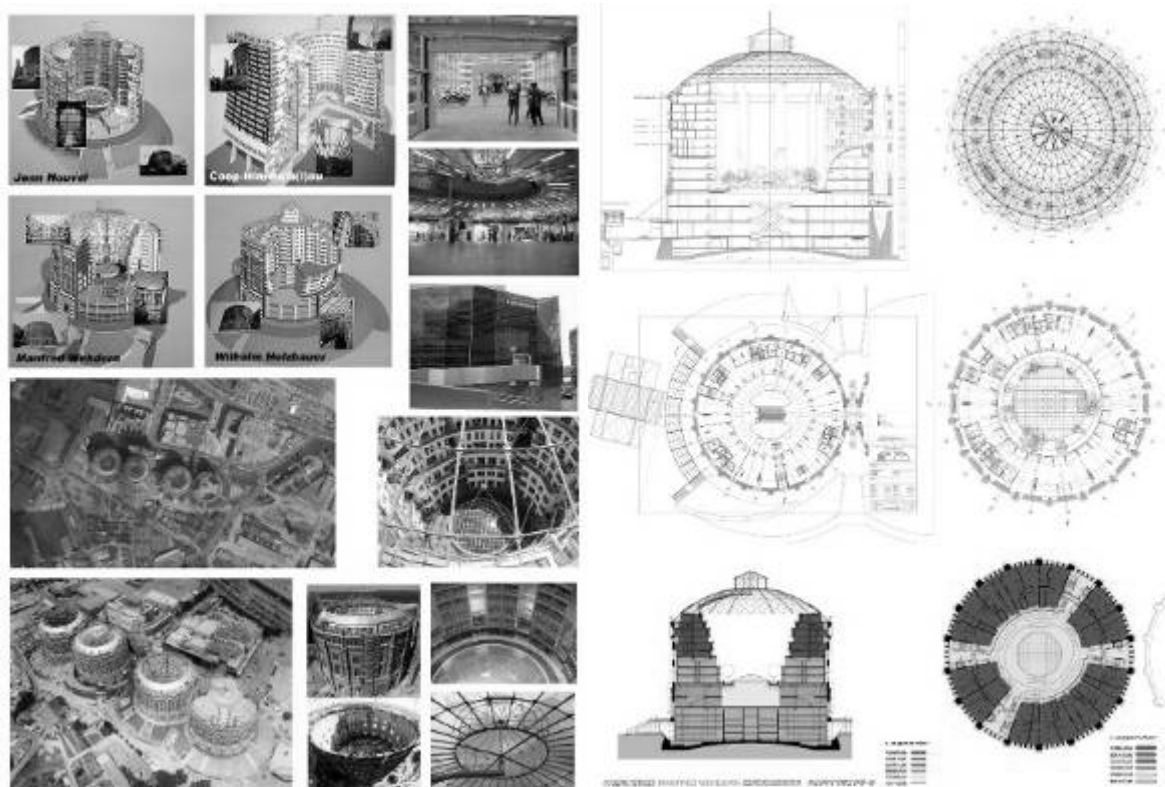
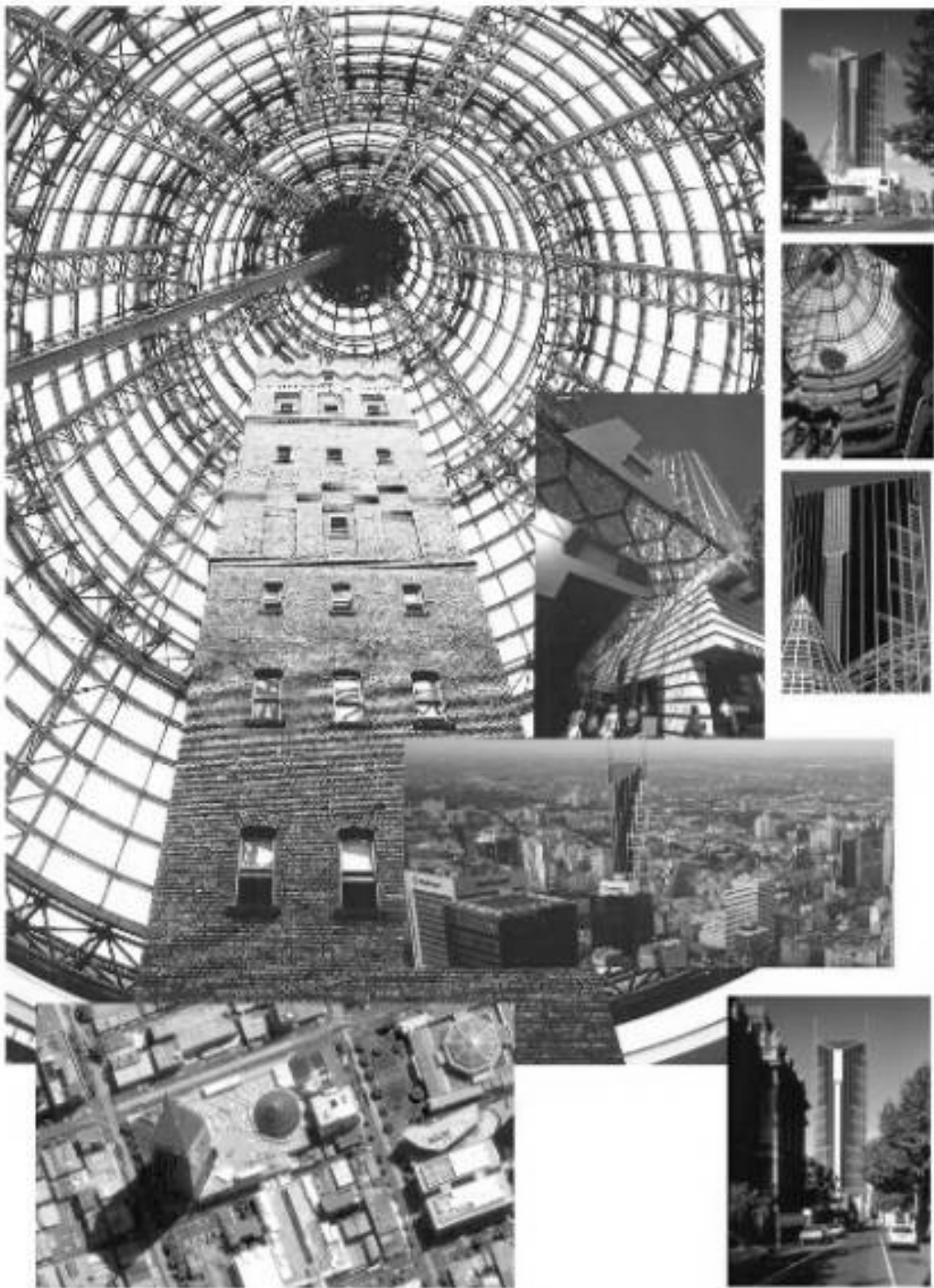


Figure 3 – Project of renovation of the complex-holders in Vienna, Austria



**Figure 4 – The tall Centre Melbourne (Australia)
architect Kīšo Noriaki Kurokawa**

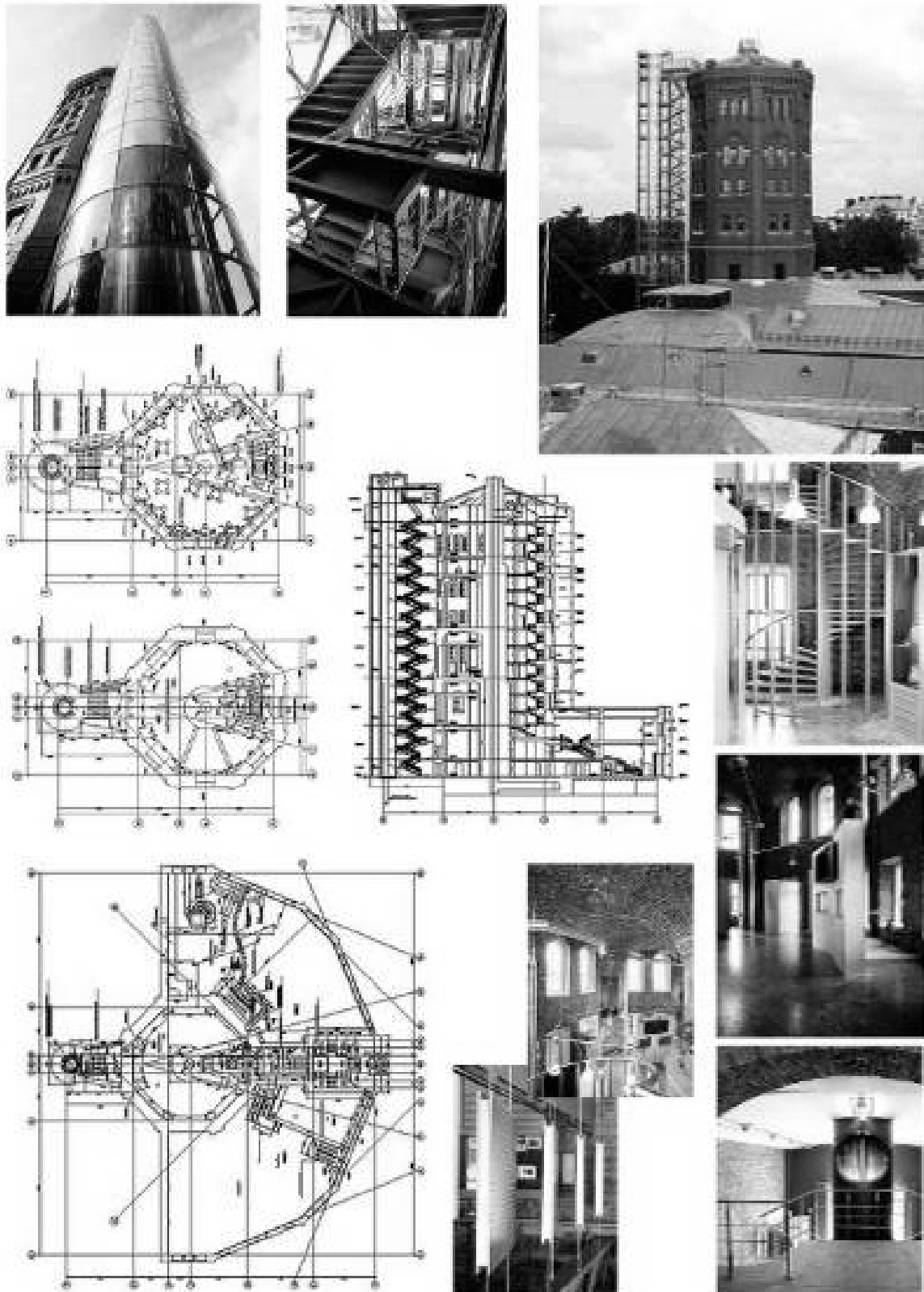


Figure 5 – Museum of water in the territory of the enterprise «Vodokanal» outlet (renovation of the water tower), Saint-Petersburg, Russia

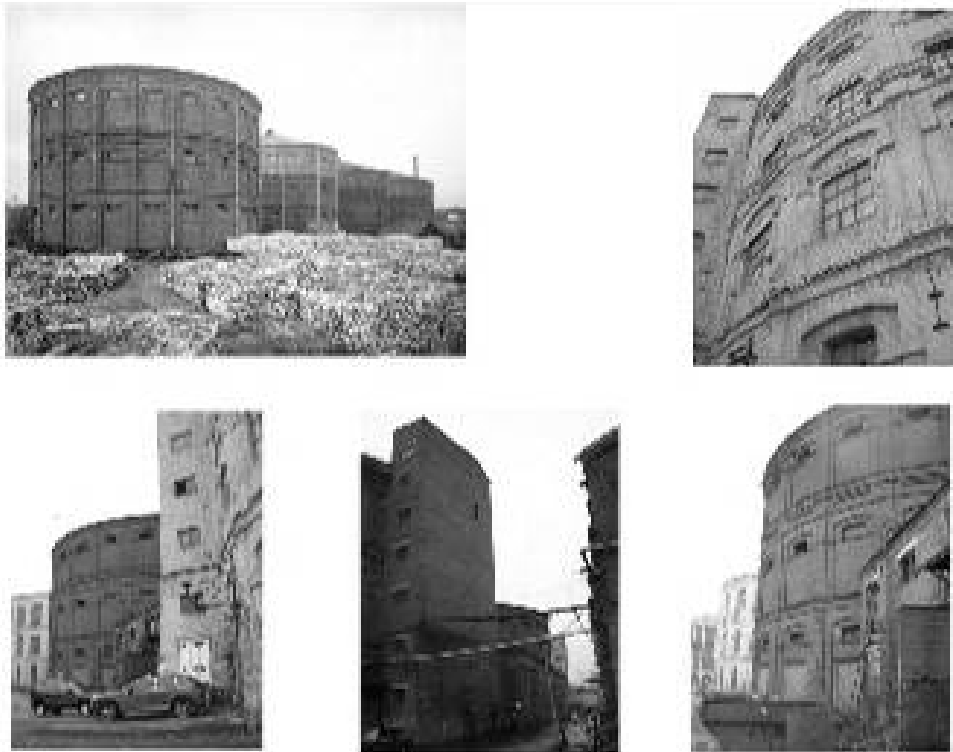


Figure 6 – Yakuta Gallery, Moscow, Russia

In conclusion the analysis of the existing experience of renovating, you should select the best, in our opinion, projects, industrial renovation (fig. 7) [2, 8], among which:

- The project of renovation of the coal power station, Battersea, London (United Kingdom), Figure 7, a . The project involves creating a theme park dedicated to the history of the English industry. The main target of this complex will be the unusual roller coaster going through all levels of a building, including, and inside;

- Museum of glass The Corning Museum of Glass (renovation of the factory on manufacture of glass), Kornìng, New York (United States of America), Figure 7, b;

- Office complex (renovation of the caramel factory), m. Lajnat (Italy), Figure 7, c;

- Art Gallery «Great Hall of pictures» (renovation of railway workshops), Provence (France), Figure 7, d;

- Multifunctional complex of Xintiandi Factory (plant renovation), Guangzhou (China), Figure 7, e, which combines a shopping center, as well as Office and hotel space. Thus according to the adopted concept of most industrial equipment it left as soon;

- Entertainment complex Tropical Islands Resort (the renovation of aviation hangars), Germany, Figure 7, f – a giant water park, located in the aviation hangar during World War II;

- Parking in the building of the Michigan theater, Detroit (United States of America), Figure 7, g – the only in the world of parking in the style of the Italian Renaissance. The irony is that the theater with a capacity of 40000 spectators, that gradually became unprofitable, was built at the beginning of the 20th century on the place of the first Henry Ford automobile plant shop;

- Rock climbing (renovation of silage towers of sugar factory), Montreal (Canada), Figure 7, h, k where deciding to keep the Interior of the marked building, the walls were decorated in the form of the rocks white, symbolizing the sugar stocks, which was once filled with silage.

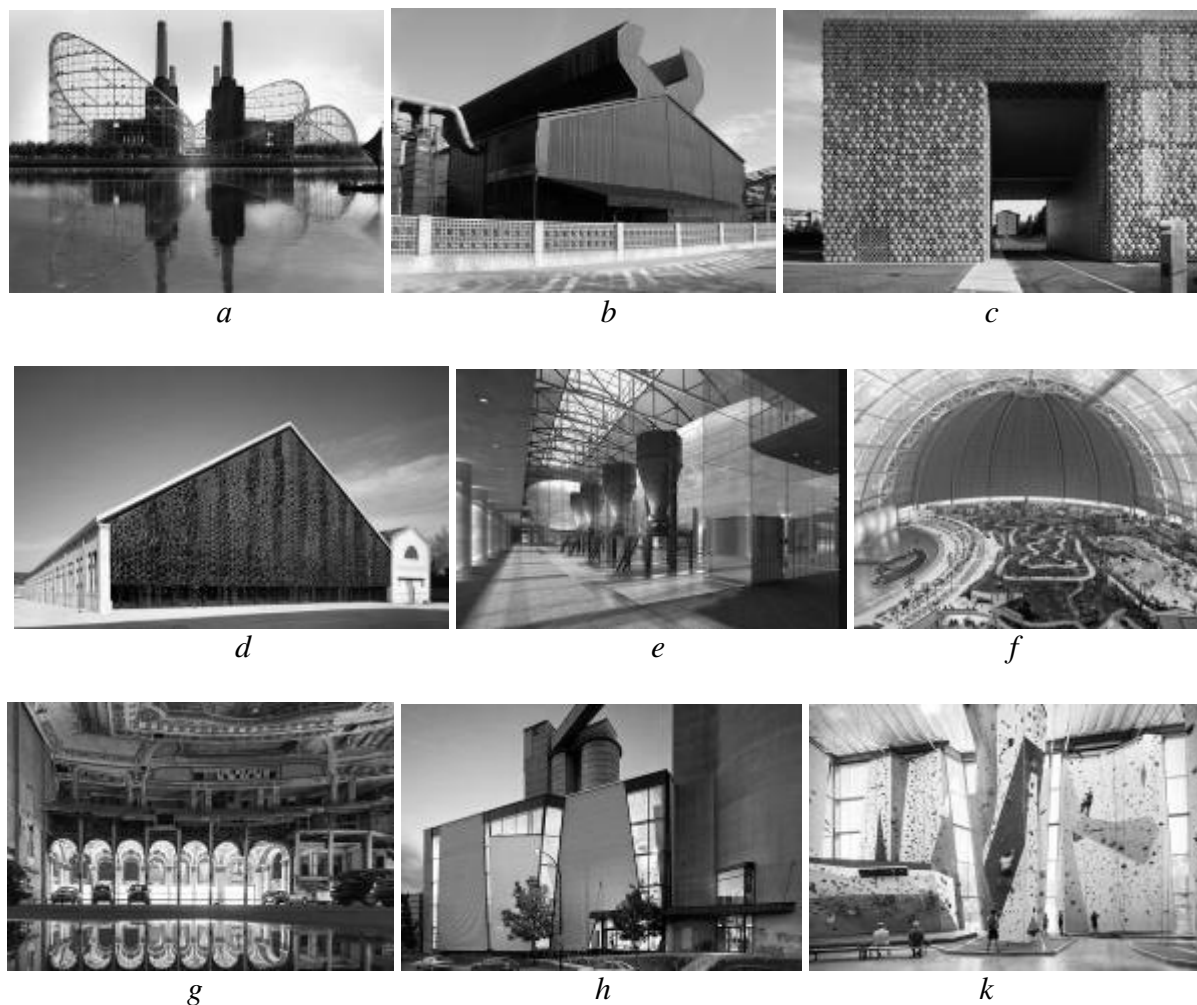


Figure 7 – Foreign examples of industrial renovation projects:

a – The project of renovation of coal-fired power plant Battersea, London (United Kingdom); *b* – Museum of glass (renovation of the factory for the production of glass), Corning, New York (United States of America); *c* – Office complex (renovation of the caramel factory), Lajnat (Italy); *d* – Picture Gallery Great Hall of pictures (renovation of railway workshops), Provence (France); *e* – Multifunction complex Xintiandi Factory (the renovation of the plant), Guangzhou (China); *f* – Entertainment complex Tropical Islands Resort (the renovation of aviation hangars), Germany; *g* – Parking in the building of the Michigan theater, Detroit (United States of America); *h, k* – Rock climbing (renovation of silage towers of sugar factory), Montreal (Canada), the facade and interior of the building

For the domestic practice characterized by the spreading process of renovation on a typical neutral industrial objects. Basically, you create objects that perform the trademark function. Despite the fact that in Ukraine there are a large number of nonfunctioning industrial areas, factories, warehouses building cases when the objects of the real estate are given a second life, still, do not have a mass character.

Examples of the domestic refurbishment of industrial objects is represented in Figure 8:

– Shopping Center «Macros» erected on the basis of unfinished industrial plants, Kiev, the total area of 16000 m², the shopping area of 8300 m², (fig. 8, a). The functional structure of the Center: supermarkets, specialized shops, fast food restaurant, cafe, children's room, parking;

– Shopping mall «Gorodok», Kyiv was established on the basis of renovation of plant factory «Welding» (fig. 8, b), the total area of the Centre of 9000 m², shopping area of 7000 m². The functional structure of the Center: supermarkets of electronics, perfumes, and jewelry, a fast food restaurant. The line-up also includes specialty stores, beauty salon, children's room, Tour Desk, parking for 250 seats. Handling facilities are located on the back side of the building in two levels and make up a 28.9% of the trading area;

– Shopping complex «Promenada», Kyiv, Architects L. Merkulova, V. Zaplatnikov, (fig. 8, c), based on the renovation of the building of the plant «Promkabel». While pereprofiluvanni successfully uses the pro Gono VU structure of industrial building – top lihtarne lighting in the direction of the runs. One by one are perfumery supermarket, venture catering, household appliances (first level) and food supermarket (at the end of the ground level with a convenient way of parking);

– Shopping and entertainment center «Megamax» Kyiv, Architect Y. Antoniuk, (fig. 8, d), the total area of 12700 m², shopping area of 6500 m², built on the basis of the refurbishment of the factory workshops «Promsvyaz», contains: supermarket goods and necessities (ground floor); grocery store of household appliances; cinema-mul'tipleks; extra service in the form of a café, specialty shops, slot machines (on the second floor). Wide mesh supports (12 x 18 m) on the second floor has the possibility to place rooms for viewing. Food supermarket has a direct relationship with the parking. Serving the entire premises are grouped and arranged on two levels along the backside of the building façade;

– Shopping and entertainment center «Megamax» Kyiv, on the Uritskogo street, based on the refurbishment of the factory workshops «Promsvyaz», (fig. 8, e), the total area of 42000 m², trade area 31000 m². The functional structure of the Center: supermarkets, specialized shops, fast food restaurant, cafes, bars, cinema, parking;

– Renovation of part of the territory of turbo mechanical plant, located along the red line construction Zinkivska Street, Poltava. Well-developed infrastructure, access roads and parking lots to accommodate, as well as the proximity to the railway station, led to the choice of a new purpose for an industrial facility that is subject to reconstruction. It should be noted that when this was applied a few common techniques:

1) complete disassembly of the main building of the plant with a summary in its place the trade and entertainment complex «Kyiv», the architect of Dudnec R. P., (fig. 8, f);

2) change the administrative case of factory under the building for public use with the placement of commercial and Office premises, (fig. 8, g);

3) renovation of mechanical casing factory when building for public use with the placement of trading premises food market and commuter bus (fig. 8, h).

Renovation of buildings of the turbo mechanical plant is a shining example of a partial refurbishment of what is happening in the composition of the existing enterprises in the derivation of individual shops that do not meet the requirements of modern technology, providing them with public function;

– Renovation of the territory of Poltava plant «Prod mash» on the Covpaca street, 26 with the creation on its basis of trade and entertainment complex «Equator» (fig. 8, k) and the «City.com» (fig. 8, l). It should be noted that this territory is today a number of not functioning buildings that make up the prospect of the development of this urban area.

The domestic experience of mastering not functioning industrial certifies such negative phenomenon as a chaotic renovation – self-development of the territory on the basis of its distribution among private owners, characterized by multi functionality using schattered or rebuilt territory, buildings, lack of forecasting the development of individual elements of the system [10, 11].



a



b



c



d



e



f



g



h



k



l

Figure 8 – Examples of domestic projects, industrial renovation:

a – Shopping Center «Macros» (erected on the basis of unfinished industrial plants), Kyiv;

b – Shopping mall «Gorodok» (renovation plant factory «Welding»), Kyiv.;

c – Shopping complex «Promenada» (renovation of the plant «Promkabel»), Kyiv;

d, e – Shopping and entertainment centre «Megamax»

(renovation factory workshops «Promsvyaz», Kyiv;

f – Trade and entertainment complex «Kyiv», Poltava;

g – Trade-Office complex, Poltava;

h – Commercial premises, food market and commuter bus station

(turbo mechanical renovation of the plant), Poltava;

k – Trade and entertainment complex «Equator», Poltava;

l – Shopping mall «City.com» (renovation of the plant «Prodmash»), Poltava

Conclusions. Reconstruction of not-functioning industrial buildings is one of the current options for improving the image of the city, which effectiveness is tested in many countries. The leading European experience analysis shows attractiveness for industrial objects reconstructed thanks to the determination of the existing industrial image of the object, subject to renovation. For the European practice is spreading the renovation not only typical neutral objects but also in the interest of industrial architecture. Among the domestic practice of building is characterized, as a rule, the formation of trade and office facilities in terms of adapting industrial estate. Despite the fact that Ukraine has a large number of nonfunctioning industrial zones (factories, plants, warehouses), cases of renovation when the objects of the real estate are given a second life, did not have the mass character. Analysis of the examples showed that the renovation is used constructively-planning and aesthetic potential of the industrial buildings. The results of the analysis, you can identify opportunities and directions for converting not functioning industrial facilities under the buildings for public use. You can use the experience gained in the development of rational architecture planning and design solutions that are used for reconstruction.

References

1. Vainio T. *Building renovation – a new industry?* / T. Vainio // *Management and Innovation for a Sustainable Build Environment*, 20 – 23 June 2011. – Amsterdam, The Netherlands.
2. Новая жизнь заброшенных построек [Электронный ресурс]. – Режим доступа: <http://zabort.ru/blog/poznavatelno/25705.html>.
3. Реконструкция зданий и сооружений / А. Л. Шагин, Ю. В. Бондаренко, Д. Ф. Гончаренко, В. Б. Гончаров. – М. : Высшая школа, 1991. – 352 с.
Rekonstruksiya zdaniy i sooruzheniy / A. L. Shagin, Yu. V. Bondarenko, D. F. Goncharenko, V. B. Goncharov. – М. : Vysshaya shkola, 1991. – 352 s.
4. Сносить нельзя, перепрофилировать [Электронный ресурс]. – Режим доступа: <http://www.redeveloper.ru/ru/np1.html>.
5. Супрунович Ю. О. Реновація як засіб відродження нефункціонуючих промислових підприємств міста в новій якості / Ю. О. Супрунович, Н. Ю. Житкова // *Сучасні проблеми архітектури та містобудування: зб. наук. праць.* – К. : КНУБА, 2005. – Вип. 14. – С. 15 – 28.
Suprunovich Yu. O. Renovatsiya yak zasib vidrodzhennya nefunktsionuyuchih promislovih pidpriemstv mista v noviy yakosti / Yu. O. Suprunovich, N. Yu. Zhitkova // Suchasni problemi arhitekturi ta mistobuduvannya: zb. nauk. prats. – К. : KNUBA, 2005. – Vip. 14. – S. 15 – 28.
6. Шепелев Н. П. Реконструкция городской застройки / Н. П. Шепелев, М. С. Шумилов. – М. : Высшая школа, 2000. – 269 с.
Shepelev N. P. Rekonstruksiya gorodskoy zastroyki / N. P. Shepelev, M. S. Shumilov. – М. : Vysshaya shkola, 2000. – 269 s.
7. Реновація промислових територій і об'єктів [Електронний ресурс]. – Режим доступа : arch-grafika.ru/publ/bez_kategorij/bez_kategorij.
8. Бывшие фабрики, бывшие заводы. ТОП-10 примеров промышленной реновации [Электронный ресурс]. – Режим доступа : <http://www.novate.ru/blogs/250313/22729>.
9. Koebel C. *Urban Redevelopment, Displacement and the Future of the American City* / C. Koebel. – Community Affairs Office Federal Reserve Bank of Richmond, 1996. – 32 p.
10. Супрунович Ю.О. Застосування архітектурно-містобудівних принципів реновації промислових об'єктів при дослідженні заводу «Радикал» // *Региональные проблемы архитектуры и градостроительства.* – Одесса, 2004 – 2005. – Вып. 7–8. – С. 32 – 39.
Suprunovich Yu. O. Zastosuvannya arhitekturno-mistobudivnih printsipiv renovatsiyi promislovih ob'ektiv pri doslidzhenni zavodu «Radikal» // Regionalnye problemy arhitektury i gradostroitelstva. – Odessa, 2004 – 2005. – Vyp. 7–8. – S. 32 – 39.
11. Супрунович Ю.О. Реновація промислових об'єктів // *Перспективні напрямки проектування житлових та громадських будівель.* – К. : КиївЗНДІЕП, 2004. – С. 98 – 101.
Suprunovich Yu. O. Renovatsiya promislovih ob'ektiv // Perspektivni napryamki proektuvannya zhitlovih ta gromadskih budivel. – К. : KiiVZNDIEP, 2004. – S. 98 – 101.

© Semko O., Voskobiynyk Ye.
Received 21.11.2016