

## METHODS OF REGENERATION OF DAMAGED HISTORICAL BUILDINGS

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### Abstract

*The article is devoted to the classification of regeneration methods of buildings damaged by factors of aging, emergency situations and military events. Regeneration is becoming more urgent due to the destruction of a large number of historical quarters by military aggression. Different methods inherent in the regeneration of destroyed neighborhoods are classified, namely restoration, reconstruction and various options for new construction. The methods are illustrated with examples of their use mainly based on the experience of regeneration of Kyiv Podol district and other historical areas of Ukraine, as well as foreign ones. In the complex regeneration of neighborhoods, the preservation of architectural monuments, the restoration of the most valuable and preserved objects of the historical background building, the reconstruction of a certain part of the built objects that have value due to their facade solutions, new construction with the reproduction of the traditional character of the environment in various forms. At the moment, the new construction takes on the solution of modern urban planning and functional requirements for city centers as much as possible, and also serves as a hub of ideas for engineering reconstruction of the entire quarter, is the basis of sustainable development. Defined methods of ensuring the diversity of facade sweeps, which corresponds to the nature of background buildings and forms effective scenarios for pedestrian spaces.*

**Keywords:** Ukraine; Regeneration of historical buildings; Restoration; Reconstruction; New construction; Stylization for a traditional environment; Complex regeneration of quarters

### Introduction

A high percentage of destroyed historical buildings due to the lack of planned conservative measures and timely reconstructions requires attention to various methods of the environment and buildings regeneration. The problem is complicated by the massive bombing by Russian aggressors of the historic cities of Ukraine. As a result, the reasoned choice and combination of regeneration methods is becoming more and more relevant.

Regeneration means the reproduction of the historical environment lost elements on the basis of its comprehensive research [1-4]. Regeneration ensures the reproduction of architectural ensembles based on the conservation of existing structures, reconstruction of

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background buildings and new construction on the site of lost fragments of the environment – buildings and their complexes – according to the agreed rules and with the implementation of modern requirements.

***Prerequisites and reasons that actualize*** the issue of regeneration of historical buildings, the need for which is exacerbated in the conditions of military events:

- functional inconsistency of historical buildings with modern operational requirements - requirements for a sustainable environment, the need to implement modern methods of use and polyvalence of public spaces, the demand to demarcate pedestrian zones and transport, provide car parking spaces, fulfill the requirements of inclusiveness of urban spaces and buildings;

- physical wear and tear of historical buildings due to the influence of time factors on building structures, hydro-geological changes in foundations and foundations;

- a change in the load-bearing capacity of structures as a result of intervention (adjustment, repairs, re-planning) - these factors reduce the life cycle and reduce the reliability of buildings, regardless of their architectural value. Instead, there are methods of conservation of monuments, and when they are insufficient, methods of local or complex reconstruction, or new construction on the site of destroyed buildings come into play;

- chemical effects on facades - acid precipitation, rain and flooding, on the other hand, today there is a whole palette of chemicals and technologies for protecting facades, waterproofing foundations, eliminating the consequences of flooding and flooding;

- seismic effects – these factors can be significant in the destruction of facades and the underground part of buildings;

- damage and destruction as a result of artillery strikes and bombings.

The latter reasons are becoming more and more characteristic of Ukraine, and correct methods of overcoming the phenomena of mass destruction of historical quarters and their parts have not yet been worked out. This especially applies to the bearing capacity of building remains. Currently, research is being conducted on the condition of wall materials, reinforced concrete and metal, as well as stone structures after explosive impacts.

One of the tasks of regeneration is also to bring the building and the environment to the updated urban planning, functional and technical and economic requirements, to overcome the inconsistency with the new norms and standards of the historically formed building. An important task of regeneration is the spread of certain ensemble qualities of traditional buildings to undeveloped or abandoned territories. Also, the task of regeneration is the increase of built-up areas, which develop the special qualities of traditional buildings, mitigate the negative impact of disharmonious objects that arose under different circumstances.

The concept of regeneration somewhat complicates the issue of protection of the historical environment, which is unambiguously and uncompromisingly interpreted by the Venice Charter as the preservation under any conditions of the authenticity of buildings and ensembles [1]. In general, the Charter negatively evaluates the intervention of modern construction, even if it leads to the improvement of social and economic phenomena in the city. Instead, there are various project situations that are difficult to support only restore methods tested in other countries.

In practice, the expansion and revitalization of socio-economic processes in historical cities leads to the understanding of new urban trends and directions for the improvement of the historical environment, the search for new values, which is reflected in the article by *R. Blazy et al.* [5].

Regeneration is increasingly becoming a subject of modern urban policy in various countries, which is reflected in a series of guidelines and recommendations that are developed for the practical implementation of regeneration (England, USA, Italy, etc.) [2-9].

Thus, *Hafiza Hamdan* [2], focusing on the use of historical buildings in the regeneration process, draw attention to the fact that "cultural heritage can be perceived as an obstacle to regeneration...There are examples of complex regeneration schemes that destroyed heritage

objects in the name of efficiency, cost, viability and satisfaction of residents' requirements" [2]. On the other hand, the main thing in the mentioned guideline is to emphasize the fact that, under any conditions, the preservation of authentic objects of cultural heritage increases the overall value of the building, can serve to increase the economic attractiveness of the complex building and create additional jobs. *The Role of Historic Buildings in Urban Regeneration* is also emphasized in the House of Commons guideline, ODPM [3]. They lend character to an area and have deep-seated associations for local residents and communities. They offer a foundation for regeneration initiatives [3, 6].

In the guideline of *Steven Tiesdell, Tanner Oc, Tim Heath*, the principles of revitalizing historic urban quarters are defined, which provide for a comprehensive and balanced system of reconstruction of a quarter or area of reconstruction [6].

The guideline *Understanding Place: Character and Context in Local Planning English Heritage* [7] focuses on the study of existing buildings, their stylistics, and construction technologies.

In the *EAHTR manual "Regeneration. Successful Urban Heritage"* [8] proposed a methodology for assessing the advantages of areas where building regeneration is planned, provided a proven methodology of organization into a single consistent system of actions of community participants, in which areas with a large percentage of cultural heritage are modernized, as well as financial organizations and designers. The Institutes of the USA and Canada involved in the preparation of the materials demonstrate the great influence of environmental regeneration on the economic development of specific cities and the increase in the population employment.

In a manual developed by *S. Uricheck et al.* [9] various examples of regeneration of historical areas are studied and analyzed. The basis of CHiFA strategy is the introduction of private sector engagement and the use of innovative financing structures as a complement to local initiative and public resources. "Each case study is structured as follows: key features: a description of the site or lead organization and factors that led to the project's success; in brief: a list of the project's parameters, including participants, dates, business and investment models" [9/8]. Successful examples of building regeneration in Medina of Fez, Morocco, United Kingdom, Historic Center of Mexico City, Mexico, Stadsherstel Amsterdam, The Netherlands, Panama City, Yangon, Myanmar were analyzed. For each example, the cultural advantages, as well as the achievement of specific goals of sustainable development, are demonstrated.

A new manual, published in the form of a monograph, which is dedicated to the problems of destroyed buildings revitalizing in Ukraine is the book by *Karsten Pålsson* [10], in which a quarter is defined as a structural element of urban planning, which is also an object for designing regeneration measures and complex reconstruction projects. The mentioned urban planning structuring of objects for complex regeneration assumes that the balance of meeting modern requirements for sustainable development will more often refer to the quarter. Various scientific and methodological aspects, which are the basis of the next study of building regeneration methods, are reflected in articles [11, 12-22], also studies by Ukrainian authors [23, 24], which will be annotated below.

**The purpose of this article** is an extended systematization of methods of historical quarters regeneration and their separate fragments (houses) with the aim of wider use of such methods taking into account the project situation and in the conditions of complex development.

**The research methodology** is based on the study of the experience of many architects – restorers, modern architects working in the historical environment, reconstructors. In particular, this is the experience of the author of the publication on the reconstruction of the central districts of Kyiv, in particular Podol, in which the architectural reserve "Ancient Kyiv" is located (five built and reconstructed buildings).

Scientific sources were elaborated in the following directions:

- *The conscious deterioration and degradation of the cultural heritage* [11];

- The general methodological bases of preservation and regeneration of protected architectural complexes in historical cities [4];
- Objects-Performances are the Key to Revitalizing the Historical Centers of small towns as methodology was used by the work [12]; also fruitful was methodology of determining the genetic code of the city [13].
- The development of the same of genetic codification [14];
- The works studying the stylistic and construction specificity of different periods of historical building [15]
- Chernihiv Art Nouveau buildings study [16];
- Kyiv and Cracow residential and public architecture of the 19th – early 20<sup>th</sup> [17].

Focusing attention on Podil (Kyiv, Ukraine), in which as an experiment, various directions and methods of regeneration of buildings were worked out and implemented - dilapidated, damaged, with subsidence, biologically affected, emergency, as well as those that at first glance are stable, but have hidden problems [24]. The Podil district of Kyiv was also hit by enemy rockets and projectiles. Overcoming the latest challenges and consequences is yet to come.

The analysis includes not only the observation of positive or contradictory examples, but also grapho-analytical modeling, which takes into account the aesthetic parameters of the ensemble building, the interpretation of the given principles of variability or changeability of the character of the streets composition development that have built at a certain time. At the same time, in the presence of significant damage, there is a task of interpolation or extrapolation of compositions, construction of those parts that do not have reliable prototypes, or were built by secondary objects [14].

Depending on the period of formation of the integral building, it is proposed to use 3 directions of interpretation of the destroyed building elements: *maximum reproduction of the surrounding building, modernized stylization for the preserved building, creation of compositions that correspond to the environment according to certain large-scale indicators, but use modern materials and new stylistics.*

Undoubtedly, the choice of the concept depends on the clarification of the homogeneity and integrity of the building composition, as well as the variability of the facade sweeps of the streets, which will develop depending on the simultaneity of the ensembles formation, previous reconstructions and local rules, that set the parameters of unity, or limited diversity of the building.

The combination of real practical experience regarding the regeneration of the destroyed quarters of Podol with certain educational and methodological (i.e. experimental) developments made it possible to classify the methods of regeneration of buildings and individual objects, in particular, some features of the use of these methods, reasons, prerequisites, technical solutions and technologies.

Some aspects of taking into account the consequences of military events were studied in the articles, for the post-war reconstruction of historical monuments and historical in Ukraine [18]; principles of rebuilding of Russian aggressor's destructions in Ukraine by *Tomasz et al.* [19]. Further evaluation of the destruction will definitely affect the determination of the features of regeneration methods.

Instead, the existing experience of building regeneration in the conditions of its slow degradation, in our opinion, can be applied with certain corrections and the addition of new approaches in the recovery of waxy destruction.

## Results and discussion

The basic methods of regeneration of historical buildings are: restoration, reconstruction, and new construction in various styles (from imitation, stylization to alternative construction in new forms). Each method has a certain number of application options depending on the implemented architectural tasks. The methods depend not only on the degree of preservation of the buildings, but also on the construction technologies, the activity of intervention in the buildings and the building of new functions of the modern city.

### ***Restoration uses several approaches***

*Conservation (or conservative restoration)* is the most friendly approach to the environment and to the historical building (monument), which maximally corresponds to the principle of preserving the authenticity of the historical environment and its individual objects. On the other hand, pure conservation often does not solve the task of adapting to new functions. Therefore, only a certain number of buildings have a chance to remain in their pure form without changes, the volume-planning structure of which corresponds also with the modern purpose, or is itself an object of demonstration (if it is a temple, museum).

The conservative method in its pure form is difficult to implement with significant damage to the building's structures, especially its foundation. For example, in Podil, the walls of many houses built after 1811 have a multi-layer construction of wood and brick. At the same time, the wood received significant deformations and bio-chemical destructive processes, sometimes irreversible. In some quarters, the groundwater level has changed, which has led to the soaking of the foundations. It is clear that a conservative method of restoration will be cost-effective only in the absence or minimization of the mentioned negative effects.

At the same time, the application of new achievements in the field of sealing and waterproofing foundations made it possible to stop the destruction of many architectural monuments and not to introduce reconstructive methods and modern structures.

*Restoration with adaptation* affects the majority of architectural monuments. Adaptation itself usually involves the introduction of additional planning and structural elements – in the amount that will not lead to fatal changes and will not harm the object of protection. This can be strengthening of foundations, bridges, installation of steel braces, roof repair with replacement of damaged rafters and roofing materials, modern development of internal spaces, development of inclusivity elements (ramps), as well as installation of elevators.

### ***Reconstruction***

*Radical restoration-reconstruction* with the dominant role of imported modern elements. Restoration scientists mostly have a negative attitude towards such restoration. But in parallel with the large number of destructions during natural disasters and military events, the number of examples of such restoration-reconstruction will only increase. Together with his colleagues, the author had to reconstruct several buildings of the beginning of the 21st century. in Podil, with complete replacement of ceilings, strengthening and waterproofing of foundations, which eliminated deformation processes and ensured reliable operation of first floors and basements for public purposes. The positivity of such actions was assessed over time. Because refraining from essential means of engineering conservation on similar objects led to their further deformation and destruction.

In some cases, the structural and planning basis of the building becomes a new construction on independent foundations. The image of the historical building and its authenticity (to a certain extent), as well as stability, are preserved thanks to the "hanging" of the walls on the console or column of the new structural foundation.

A fairly rare form of such restoration can be a superstructure over a historic building using the "Flamingo" method (arrangement of the frame in the middle or outside of the structure), when a hidden new construction crosses the historic building or its remains. At the same time, new superimposed tiers can continue the historical style, or form tiers contrasting in

style. This is how several buildings of the State Tax Academy of Ukraine in Irpin were reconstructed (unfortunately, one of these corps was damaged by artillery fire in 2022).

Sometimes, as a result of significant destruction, a certain amount of debris appears, from which it is difficult to restore a complete wall. The officially recognized method of integrating such fragments into a new wall – "anastylosis" allows at least partially preserving the authentic parts of the building. These possibilities are important for monuments that have to preserve the signs of building culture of certain eras.

*Reconstruction with imitation of authentic buildings.* This method is considered undesirable in a series of charters for the protection of the historical environment, especially the Venice Charter [1], as it misleads the viewer. In order to prevent endless resistance to this method, it is desirable not to attribute it to restoration, but to consider it as reconstruction. At the same time, world practice has numerous examples of this form of regeneration of destroyed heritage. It is in Podil (Kyiv) that there is a significant number of such reconstructions – Hostynyi Dvir on Kontraktova Square, the Church of the Virgin of Pyrohoshchi, the estate at the intersection of Ihorivska and Naberezhno-Khreshchatytska streets, 18th-century manor oat 40 Knyaziv Ostrozkikh Street. An even larger-scale project of this type is the restoration of the Stare Miasto district in Warsaw after the Second World War. The counterbalance of the negative reactions to such reconstructions by orthodox specialists in monument protection activities is the positive attitude of the population of certain cities and the emotional need for the return of destroyed building blocks and individual iconic buildings. Today, there will be many such contradictory examples, and the mass need of people to restore the destroyed part of the city dear to the heart will prevail over any other arguments and postulates.

Regarding the estate at the intersection of Ihorivska and Naberezhno-Khreshchatytska streets – this project began as exactly the restoration of the object with its conservation. Careful measurements were made and the restoration project was based on them. Instead, the technical condition of the building turned out to be in an emergency – and at the time of restoration, no effective conservation methods were found. Various designers refused to continue project work. Therefore, the object was built entirely in new materials and structures identical to the drawings, reproducing the appearance of the former monument (Fig. 1).



**Fig. 1.** Identical reconstruction in new constructions of the 18th century manor.  
Corner of Ihorivska and Naberezhno-Khreshchatytska streets

*New construction in monument protection and regulation zones.* The new construction is quite widely used for the tasks of regeneration of the destroyed building. In Podil, in addition

to the self-destruction of buildings, the deformations of which occurred due to subsidence and jamming of the foundations.

### ***New construction with stylization for historical buildings***

A strip along the subway line with a shallow foundation turned out to be a large area of loss of historical buildings. The very technology of laying the subway forced the dismantling of historic, sometimes unstable buildings.

The strip above the subway line with a width of an entire block and a length of two blocks was built up with new multi-storey (multi-functional) buildings – modern, but with the use of historical motifs. This example is the most common method of regeneration in Kyiv (1990-2000), when there was a need to restore a destroyed historical area (Fig. 2).

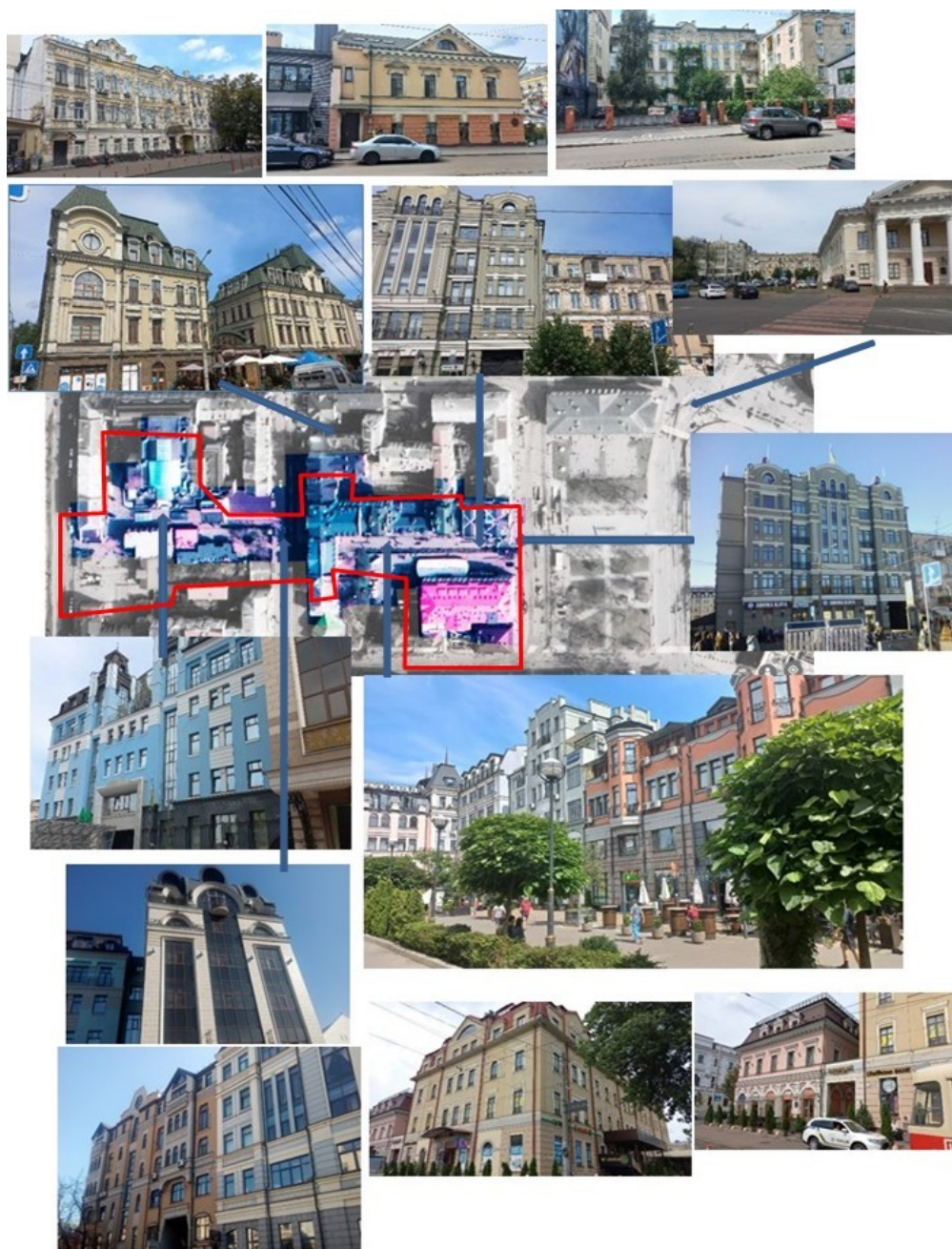
At the same time, a completely modern building was created, both in terms of functional organization with tiered zoning (built-in shops, cafes, offices, residential apartments), and friendly to the environment in terms of style. Some of the architects at the time of construction and today consider consistent stylization (imitation of historical style) an excessive fascination with "historicism" – bad taste, reluctance to look for equivalent forms in modern constructions and modernized facade structures. But the situation is that the system of power in the "Ancient Kyiv" reserve, under the slogan of preserving the traditional architectural environment at that time, harshly interfered in the creative process and demanded exactly this kind of architecture – with brick details and colored facades. Architects were selected on the basis of loyalty to these principles. But in fact, the architects involved in these tasks combined the experience of designing multi-functional residential and public spaces, which are quite complex in terms of volume and planning organization (today such architecture is called "hybrids") – with a fairly grounded technique of stylization under "Staryi Podil".

However, these were not copies of traditional architecture – many updated details (large stained-glass windows, showcases, roof lights, bay windows with large windows) became a sign of the modern origin of such a building. This approach somewhat resembled the "double coding" of post-modernism – for the mass public and for specialists.

Another example of the historical environment imitation was the construction of the street Vozdvyzhenska (Honchary-Kozhumiaky tract). This area was reserved for mass stylization and such stylization for historical buildings in his pre-project studies by the well-known Kyiv architect A. Miletskyi. There were many publications in architectural magazines regarding the illustrations for this concept. Over the years, the allowed floor space for stylized architecture has increased significantly. The stylization of the traditional building became the cause of criticism from the community of architects. On the other hand, this not overpopulated cozy area arouses great interest among the authors of television films – it turned out to be extremely "photogenic" for filming. Probably the created environment has its connoisseurs and the right to exist.

The composite structures of the facades basing on the stylization used in the building on the Petra Sahaidachnoho Street – architect O. Drozdov (Fig. 3), against the background of the addition to the imitation of the 19th century buildings previously executed in the adjacent houses (Method 2.1).

In general, the complex problem of reconstruction of this quarter, adjacent to the street. P. Sahaidachny is described in the article by N.A. Leshchenko and D.V. Gulei [24] and is the subject of student master's studies.



**Fig. 2.** Quarters from Kontraktova Square to Verkhni Val Street in the creation of the metro line is a combination of objects of restoration and reconstruction with objects of new construction stylized according to historical buildings. The upper row of photos shows preserved historical houses that are being modernized by methods of restoration and partial reconstruction. In the center is a scheme of the master plan with visible objects of new construction inside color line. In the lower row – the objects of mainly new construction are stylized according to the traditional architectural environment with certain features of modern architecture (large glazing surfaces)





**Fig. 3.** New objects in the structure of Petra Sahaidachnoho Street. On the right is a 2-3 storey building that is an imitation of the historical style, on the left – a modern stylization for the traditional building of the street (architect O. Drozdov)

***New construction with preservation of the architectural scale without historical detailing with the search for "friendly" forms of facade plastics***

Such an experiment was carried out a decade earlier (1980-90) in two areas of Podil – in the area of the Illinska church, H. Skovorody, Khoryva, Spaska, Voloska streets (arch. V. Rosenberg, S. Zakharchenko, V. Yudin, N. Rodichkina, etc.) and in the quarters between Kyrylivska Street – Ratmanskyi Lane (arch. I. Shpara, Yu. Shalatskyi, G. Dukhovychyny). The post-modern somewhat ascetic (without small details) style of these quarters, modern for that time, received many controversial, sometimes critical reviews. At the same time, there were no literal copies of architectural details in the houses, but rather an interpretation of the fashionable style of that time. Especially many such quarters arose in the Baltic countries. They were inspired by such examples, and Baltic architects at competitions highly appreciated the experiments of Ukrainians. People are used to these "innovations", but today the lapidary and verified architecture of the mentioned micro-districts already requires a comprehensive reconstruction with a rethinking of the color and plasticity of the facades. The need for such a reconstruction arises due to the chaotic thermal modernization of the facades, which completely destroys the original ideas of the architects, who at one time received recognition from colleagues far beyond the borders of Ukraine and numerous prizes at competitions.

The very basis for new construction in alternative forms was based on large volumes of unorganized, sometimes spontaneous housing stock in the peripheral quarters of Podol. The appearance of new residential units led to the improvement of the microclimate of these quarters, although it entailed changes in the established building style, as well as a slight simplification of equipment.

In the architecture of the residential building on Shchekavitskyi Lane (arch. V.Knysh) a modern approach was developed, which differs from the perimeter construction of adjacent quarters. Designed and built a long house with a curdoner and a lot of turns. It was a rather free interpretation of the quarter with the identification of free spaces open to the outside. At the same time, the planned equipment using pediments decorated with smalt in the "Art Nouveau" style could create a level of expressiveness of details inherent in historical architecture. Instead, the decoration was not fully realized – the gables remained without mosaics.

***New construction with preservation of architectural scale with alternative types of facades plastical forms.***

In the zones of building regeneration, Kyiv in 1900-2000 was distinguished by conservative approaches in the interpretation of building forms (Methods 1.2, 2.1, 2.2, 3.1, 3.2). To a certain extent, this was a form of authoritarian pressure from the bodies that approved the projects. But the majority of architects showed compliance with the "power" that imposed its tastes. The appearance of the buildings of the Embassy of the Netherlands in Podil (arch. Hans van Beek) and the Embassy of Germany on Volodymyrska Street somewhat changed the

canons of fashion. Buildings with irregular facades began to appear in other places as well (for example, a group of buildings on Mykhailivska Street (arch. Yu Borodkin). A modern approach to the interpretation of facades, as well as the adoption of a certain increase in the number of floors in the second front of the building (in the depth of the plot, as an option - not in the plane of the facades) was initially the newest, but today it has become almost regulated.

***New construction using large stained glass windows made of architectural glass***

Architectural glass – tinted, mirrored with variable properties (color, transparency, light transmission coefficient) provides additional opportunities in conditions of complex reconstruction and regeneration of historical buildings. The use of new buildings with glass facades or parts of facades made of glass allows:

- to a certain extent increase the real height of the building or its superstructure without changing the feeling of storey (visual vision of the blue line);
- to build gaps between buildings while maintaining a sense of gap or undeveloped space;
- reflect in a mirror image the plastic facades of the opposite side of the street;
- to modernize the architectural details that were inherent in the historical building;
- to provide a sense of depth of space of the first floors oriented to the street or square.

The first buildings in Kyiv with solid glass facades – the Hyatt Hotel on Sofiiivska Square (arch. Ya. Vig) or the Renaissance Center and Podil Plaza (arch. S. Babushkin) were considered rather controversial, but they quickly adapted to the architectural environment and to residents' ideas about acceptable architecture despite its dominant role from certain angles of perception and almost absolute "mimicry" from other angles. In any case, these buildings served the idea of modernizing the historical building. This method is widely used in the centers of many European cities and has become an acceptable method of regeneration for the designated areas.

The architectural effects of dissolution in the historical environment are demonstrated by the "Ibis" hotel on the Shukhevycha Street in the city of Lviv. Careful observation of such objects gives an idea that they play an important role in the regeneration of historical ensembles. They form modern accents – sufficiently large-scale compositional spots, and at the same time allow the new object to become invisible in the historical environment (Fig. 4).

A separate role of glass facade structures in the decision to improve the thermophysical properties of the facades of the historical building. It is prohibited to apply a layer of insulation on the facades of architectural monuments, which hides the authentic material of the facade. The installation of a double glass facade (i.e., covering the facade in a glass shell) in some cases allows to significantly improve the thermal and physical characteristics of the building, as well as to protect the facade from precipitation and not to interfere with the construction of the facade. An example of historic buildings along the contour is the Sony Center in Berlin.

***Complex regeneration of historical quarters.***

Historical quarters are simultaneously objects of protection (regulation) and urban planning formations in city centers. Therefore, in certain cases, their comprehensive regeneration is appropriate, bringing the value of the territory into line. For this purpose, almost all appropriate methods of regeneration will be used, taking into account their advantages, disadvantages and programmed capabilities. In the case of complex regeneration, it is expedient to support the balance of preservation of authentic buildings and multifunctional integrated structures that a modern city needs, in particular parking lots, office spaces, and shops.

At the same time, the rhythm of visual variability and the scale of former households (plots) must be preserved from the facade sides of the blocks.

In the modernized architecture of Kyiv's Podol, the block within Borysoglibska, Bratska, Voloska, and Illinska streets (arch. V. Shyriaev), named in the directories as "Business Center Illinskyi", can stand out as a model of complex regeneration. Houses from the end of the 19th – beginning of the 20th century, facing mainly the Bratska Street, partly in Illinska Street, are objects of restoration with adaptation for shops and offices (Method 1.2).

Similarly, restored historical buildings of the first half of the last century overlook the street. hair



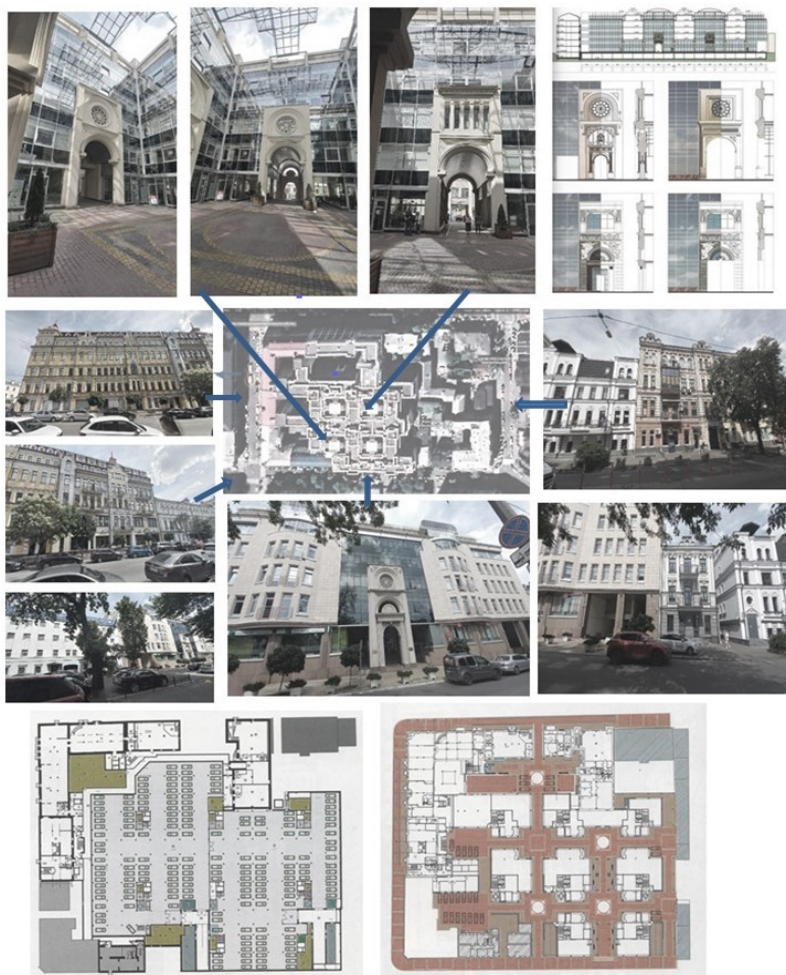
**Fig. 4.** Modern methods of new construction in a historical environment. The upper row (from the left) is the building of the Embassy of the Netherlands in Kyiv (arch. Hans van Beek, D. Zaplatnikov, A. Khmelov); on the right, the facade of the Ibis hotel, which mirrors the facades of the slums of the opposite side of the street; in the middle – the Saree Art Center in Nîmes, France (arch. Norman Foster) – a building with glass facades, which is also a paraphrase of a monument of the ancient era; the bottom row of the newest houses in the architecture of the new streets of Barcelona.

Most of the block (in the middle) is made up of office buildings combined into a single structure with underground parking and nine courtyards. At the same time, the outer contour of the new buildings (the new construction method with stylization according to traditional architecture is used around the perimeter, preserving the established floor plan, facade parcellation and stylization of details and the character of the equipment (Method 3.1). The central facade along Illinska Street is a quote from the "interior" part, it repeats the theme of the inner courtyards – a glass plane with a stylized historical portal in the "Renaissance" style. The inner courtyards (except for the central facade) do not affect the external perception of the quarter, in which a complex of works on the regeneration of the building was carried out. The office premises mainly open into the inner courtyards, which are completely glazed with structural glass. The enclaves of corridors between courtyards are framed by portals. Large surfaces of glass in the courtyards improve the lighting of the premises and emphasize the goal of creating a modern business center in the old quarter, becoming the basis of the prestige of the new complex. It was the new constructions in the middle of the quarter. It would make it possible to organize a spacious car park at the underground level.

Thus, in order to implement successful projects of regeneration of historical quarters, it is advisable to combine all the classified methods in the possible proportion.

We believe that these methods of local and complex regeneration of buildings can be used in the post-war period as well. When restoring a destroyed building, it is important to reproduce certain compositional characteristics of the traditional environment, to find methods of equivalent reproduction of n compositional solutions, which are elements of the memory of

the place, traditional urban planning structures. At the same time, large-scale destruction can provide architects with additional degrees of freedom to raise functionality to modern requirements and standards, to resolve all possible contradictions and challenges of the modern city. Objects of underground urban planning should solve not only transport problems, but also issues of civil protection, accompanying services, and alternative communications (Fig. 5).



**Fig.5.** Complete regeneration of the quarter within Borysohlibska, Bratska, Voloska and Illinska streets (arch. V. Shyriaev). The top row of pictures shows the interior of the courtyards. The middle row is the master plan of the quarter and the historic buildings that were to be restored with adaptation. The middle row (under the master plan) – fragments of facades along the Illinska Street, the bottom row – plan of the underground floor with parking, plan of the business center at the mark 0.00.

In any of the examples given, there is the task of optimizing the urban planning sweep and at the same time the scenario of the sequence of changes in the facades of individual buildings – that is, the components of the facade sweep. This task depends on understanding how short-lived and controlled from above by one chief architect (city architect, "court" architect or influential mayor), the emergence of a particular street was. Therefore, the medieval principle of pedestrian [14] space formation will be the reason for the active (i.e. introduced by the new author) intervention of new solutions in the conditions of regeneration, addition of modern compositional techniques.

The author worked out the very possibility of different regeneration alternatives with students of the Faculty of Architecture of the National Aviation University (Ukraine, Kyiv) for 5 years as part of the course "Monument protection activities", in which one of the tasks concerned alternative solutions for the facades of filling a partially destroyed street. Therefore, in itself stylization to the objects of the environment, or copying (identical reproduction) of them did not always offer the most expressive and witty solution. Very often, the presence of already built disharmonious objects required the search for modern solutions that would be able to organize the composition into a coherent balanced system with fluctuating emotional impact on the viewer.

The specified method of exploratory design forced students to act in a wider range with the understanding that reproduction of buildings is a complex dialectical process. At the same time, an appropriate decision should take into account a combination of various factors: the number of floors, the linear size of the household, the presence of solutions with deviations from the typical parameters, the color scheme and the mandatory furnishing materials, the slope and materials of the roof, etc.

As far as our experience of working with students is concerned, in any of the given examples there is the task of optimizing the urban planning sweep and at the same time the scenario of the sequence of changing the facades of individual buildings – that is, the components of the facade sweep. This task depends on understanding how short-lived and controlled from above by one chief architect (city architect, "court" architect or influential mayor), the emergence of a particular street was. Therefore, the medieval principle of pedestrian [14] space formation will be the reason for the active (i.e. introduced by the new author) intervention of new solutions in the conditions of regeneration, addition of modern compositional techniques.

As for our personal experience of working with students, each of the future architects should form compositions for the development of regeneration projects on an alternative basis, understanding that when making a final decision, the factors of the current project situation and subjective circumstances will also apply (Fig. 6).

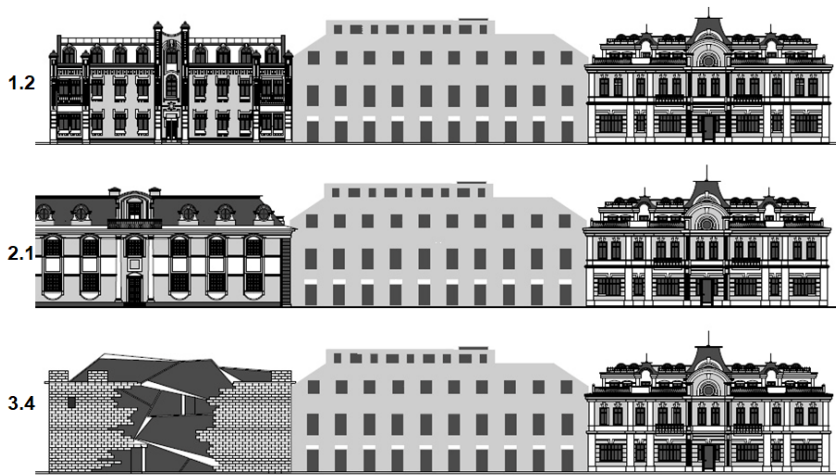


Fig. 6. Alternative options for the development of street regeneration (student course assignment) – on the example of Petra Sahaidachnoho Street in Kyiv. Variants implementing Methods 1.2, 2.1 and 3.4.

## Conclusions

A number of expressive, aesthetically perfect, non-controversial, meeting modern standards and economically justified decisions on the regeneration of the historical environment

were carried out during the peacetime with the availability of planned funds, time and restoration technologies.

Regeneration of damaged buildings should take into account all accumulated positive experiences. The main methods of regeneration of damaged buildings considered as:

restoration-conservation of valuable buildings and environmental objects, restoration with adaptation;

reconstruction-radical restoration – reconstruction with the dominant role of imported modern elements; reconstruction with reproduction – with imitation of authentic buildings;

new construction in security zones and development regulation zones – new construction with stylization for historical buildings; new construction with the preservation of architectural scale without historical detailing with the search for "friendly" forms of plasticity; new construction preserving the architectural scale with alternative types of plastic facades; new construction using large surfaces of architectural glass;

Complex regeneration of historical quarters involves the use of almost all of the above methods of regeneration, taking into account their advantages, disadvantages and programmed possibilities. Regeneration of buildings damaged by fire impacts will inevitably cause additional structural studies of the bearing capacity of building tails. Regardless of this, one of the following methods will be the main one for a specific fragment of the quarter. In some cases, with a high percentage of destruction will become a justification for new construction, with the possibility of reproducing certain qualities of the traditional environment, or using new methods of its formation.

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