CONTENTS

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INTENSIFICATION OF BUILDING THE TERRITORY OF A HISTORICAL FORMED CITY USING THE EXAMPLE OF LVIV

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Abstract: The article deals with the process of intensification of the urban territory of a historically formed city. The quarters of residential developments of different periods are analyzed and the indicators of density are determined. The urban transformations of a city canvas, which influence the changes in the density indices and their inter-dependence were investigated.

Key words: urban development, urbanization, density, intensification

1. Introduction

Urbanization processes of recent decades have been active in the formation of urban environment and image of a modern city. Significant intensification of people's lifestyle leads to an increase in the density of the city in its various manifestations. Cities of the metropolitan nature, such as Lviv, are maximally intensified within their existing boundaries, taking into account the potential of the formed urban structures and undeveloped territories, as well as outside them.

Fig. 1. Structural plan of a Lviv city building territory (interwar period) (Cherkes B., 2015)

2. Basic Theory

Building intensification and its density are measured by a number of generally accepted indicators. Territory is the basic indicator of the processing boundary needed to form the area of definition in the process of calculating the density as a spatial indicator (Berghauser Pont, M. & Haupt, P., 2010). The territorial boundary of determining the density indicator may be:

1. Main structural and planning elements of a city. For example, in Ukraine, within the township territory, the main structural elements are formed: a residential quarter (housing complex) as the primary structural element of the living environment; residential quarters and complexes form a residential area - a structural element of a township territory within which the institutions and enterprises are located as well as the objects of urban significance. Residential areas can also be formed as the separate structural units. The township territory (residential region) is formed by the residential areas. This structural unit is typical for significant and the most significant cities and is formed as a holistic structural organism with the placement of service facilities for district and urban use there [*English. State Building Standards*];
2. Boundaries of the territories, which are included into the cadastral register;
3. Designed boundaries, which are specified by a certain coordinate network, or determined by the given radius;
4. Limits determined on the basis of the morphological characteristics of the territory.

Taking into account the peculiarities of structural and planning elements of a city, it is possible to intensify them by different methods, taking into account the density indexes (Cherkes B., 2015, p. 1–6), making the most of the potential of the territory and effectively integrating it into the city structure.

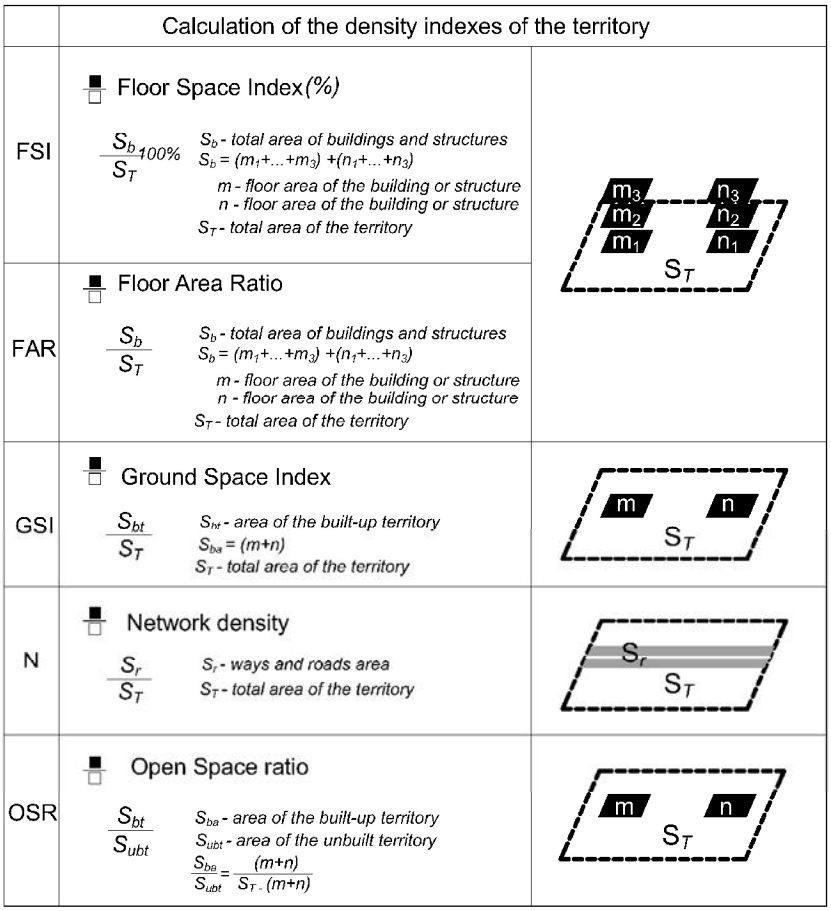


Fig. 2. Calculation of density indicators (performed by S. Konyk based on Berghauser Pont, M. & Haupt, P, 2010): **1. Floor Space Index (FSI)** reflects in percentage the intensity of construction (total area of buildings and structures) to the total land area; **Floor Area Ratio (FAR**); - reflects the same as FSI, but not in percentages. 2. **Ground Space Index (GSI)** shows the correlation of the built-up area to the total area of the land plot; 3. **Network density (N**) shows the correlation of the area of streets and roads of the processing area to the total area of this territory; 4. **Open space ratio (OSR**), the correlation of the area of the built-up territory to the territory free from development

These indicators are standardized in the Ukrainian city-planning legislation as follows: the main restrictions of the territory density are the establishment of the percentage of built-up area in accordance with the defined function of the development. The density of population is established as well, because you can determine the maximum capacity of a given territory in accordance with the chosen building typology, which the future density of the development of the territory will depend on . The estimated population density in the residential area is recommended to be 190–220 people per hectare in the most significant cities, respectively, for the zones of the city of different urban development value. (DBN 360-92**, 1992)

The research of Lviv building territory density based on a next methodology.

The module for density calculation is a territory of living district with the roads borders, which show us the scale changes in territory building. We choose the areas of different building periods, to see the density changes during the time from an old town (till XIX century) to 1980-1900 ties. The constant module is a 1 ha square territory, which show us the scale of a living building district.

City density is an indicator of urban development and demonstrates the quantitative and qualitative use of the urban environment by man. The urban environment is a complex of dynamic physical, economic, sociological and cultural factors that always affect people and communities. This feature allows us to follow the changes that occur with the territory, with building and density indicators during certain time. In different periods the city met needs of its inhabitants by creating relevant for a certain time comfort and forming requirements and standards for the construction and organization of the territory of a given period. Such transformations are especially brightly traced in the historical urban environment.

Let's consider the change of the density index at the example of the territory of residential building in the city of Lviv during different periods (Fig. 1). The medieval Lviv downtown was characterized by a very high density of building, as well as the western and eastern parts of it; this also applies to the quarters outside the walls, which were formed after applying of regulation of the development of Lviv by the Austrian administration at the first part of the 19th century. From the second part of the 19th century up to the World War I the expansion of building grew primarily by increasing the number of storeys of buildings and the size of the districts (Petryshyn H. & Ivanochko U., 2007, p. 16–27). In the interwar period, building in Lviv was formed under the influence of functionalism. In the construction of the periphery of the city the principles of the garden-city of E. Howard were used, actively promoted by I. Drexler, which influenced reduction of the density of the building and creation of the comfortable environment (Sadowska, E. J., 2014, p. 21–32). After the Second World War until 1990, Lviv quickly turned into an industrial center, which caused the construction of the new mass housing, based on the principles of modernism and strict regulations adopted for the entire USSR. The Soviet panel housing estate of Sykhiv in Lviv with its nearly 50 years of design, construction and transformation has become one of the integral symbols of the city. This is the result of the activities of several generations of residents and architects (Cherkes B., 2015., p. 1–6). The period of Independence began on the background of a protracted economic crisis. The new construction was intensified only in the last decade.

The analysis of the density of the building is completed for time periods, which were characterized by the clear urban building features. For the basic unit of study the smallest structural element was chosen, namely, the development quarter. You can follow how the area of design was increased i.e. from 1 to 4 hectares or more over the last centuries.

Having analyzed the density of development of residential quarters during different periods, it became possible to follow the subsequent transformations of indicators GSI and FAR. In the period until the XIX century residential development was represented by dense quarters of middle storey buildings with small inner courtyards, which did not meet the modern requirements regarding the number of open space and public service areas. Indicators GSI and FAR were high which indicated excessive density. At the beginning of the XXth century the approach for building of residential quarters was changed. Low-rise buildings and districts with the buildings of mean height were built less densely and with patios, GSI and FAR showed an optimal ratio. But already in the 60s the need for housing and the rules of regulation of the development process allowed to use territory more intensively by increasing the height of buildings and forming large, non-scale spaces between them. The GSI indicators were significantly reduced and the FAR was markedly increased in the development of residential quarters of the 80s. The district of Sykhiv is a clear example of such approach. This process is well traced on the graph given below.

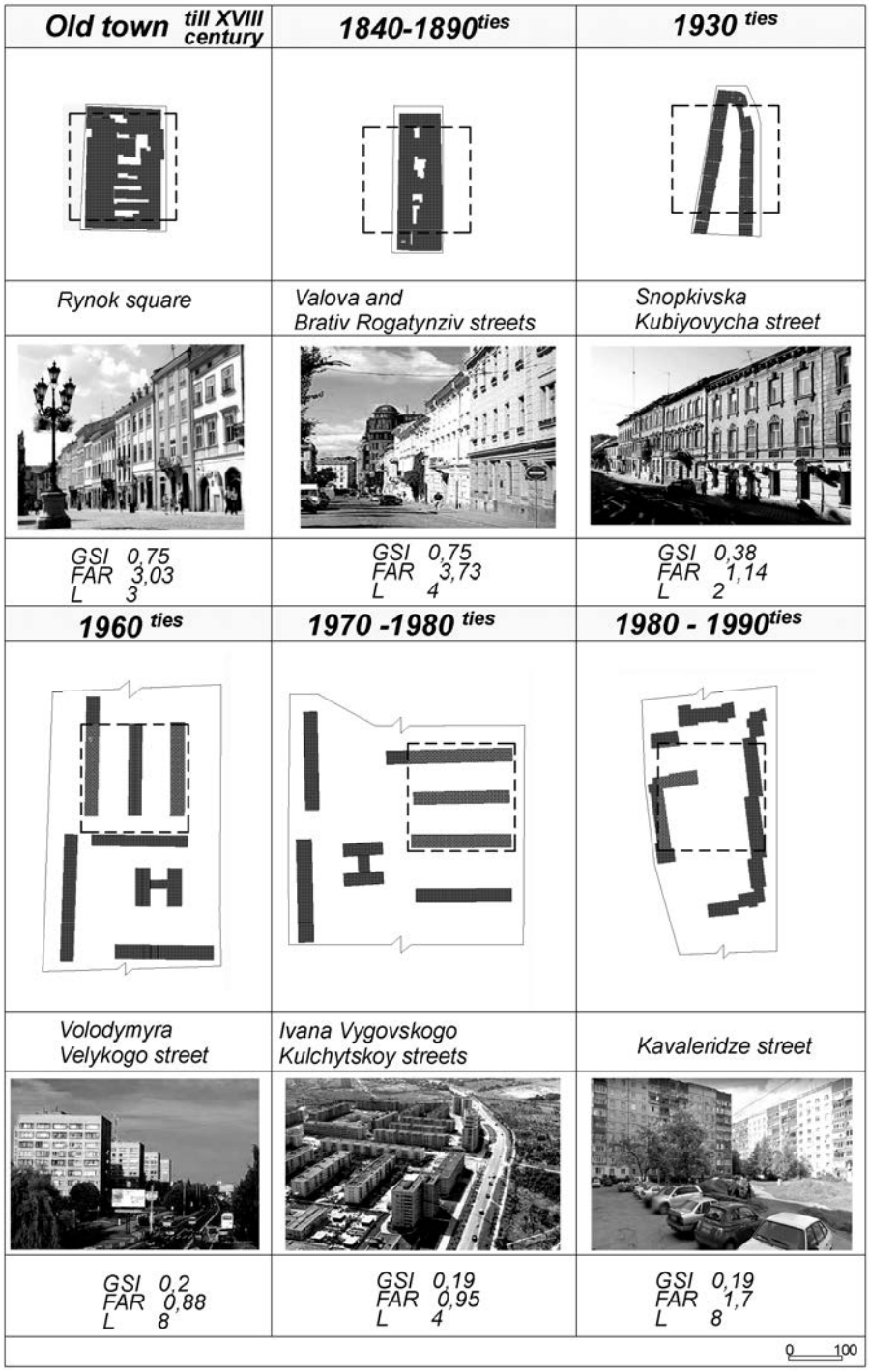


Fig. 3. Calculation of the density of developmental districts in various years in Lviv. On the schemes the provisional territory with an area of 1 hectare is allocated by dotted line GSI, FAR-density indexes (look to table 2), L – height in floors (in this scheme, the "first storey" or "first floor" is the level above ground level. The floor at ground level is usually called "0")[1]

[1] We have to say about floor numbering schemes. In European scheme, the "first storey" or "first floor" is the level above ground level. The floor at ground level is usually called "0". This scheme is used in the United Kingdom, most European countries, Mexico, Cambodia and former British colonies.

In North American scheme the "first" floor is the floor at the ground level and the floor above it is the "second" floor. On some buildings, floors below ground floor are usually marked as basement (B) but some buildings also marked these floors as minus (-), for example; minus one (-1), minus two (-2) and so on. In few cases, the floors below ground floor are marked as lower ground (LG) or sub basement (SB) though this is uncommon. This scheme is used in some part of the United States and Canada, some Latin American countries, Russia and former Soviet Union countries, China (excluding Hong Kong and Macau), South Korea, Japan, Singapore and parts of Indonesia.

Change of the density indicators in residential development quarters in the different time periods.

The growth of the status of Lviv affected the intensification of the construction process in the city, which was considerably accelerated from the 19th century. The number of inhabitants of Lviv was gradually growing. Intensification of the urban environment, in particular in the field of housing construction, became matter-of-fact, and an increase in the density of the development of the territory started to be a positive practice of developing European cities. Today, the process of intensifying of the territory of a city is due to the increase in the number of storeys of the building, respectively, forming large unmanaged space gaps that are non-scale in terms of human feelings and affect the quality of the urban environment. Therefore, it is important, taking into account historical experience, to determine the optimal parameters of the density of the urban environment.

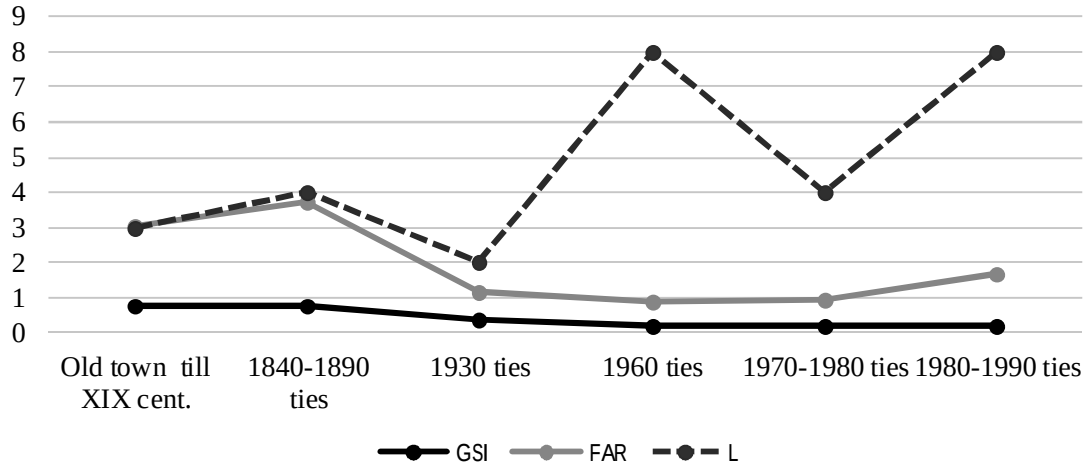


Fig. 4. Graph of changes of the density indicators in residential development blocks during the different time periods (based on the data from Fig. 3).

The city suffered the greatest crisis during the Second World War, when burgers of Jewish nationality were exterminated, Polish – took out, and Ukrainian – subjected to repression. The population of Lviv resumed only in the 1970s due to its transformation into an industrial center, which also resulted in its territorial growth.

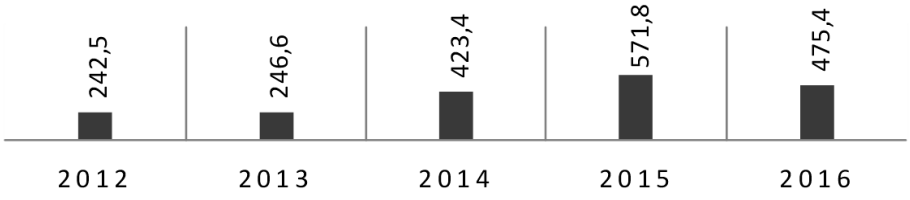


Fig. 5. Putting of houses into operation in Lviv (in thousands of sq. meters of total area).

The number of available population of Lviv, according to the estimates, as of April 1, 2016 had grown to 757.2 thousand people. Thus, in 2016 in Lviv (including satellite small towns of Vynnyky, Bryukhovychi and Rudno), residential buildings with a total area of 475.4 thousand square meters were put into operation. The city of Lviv accounts for 55.3 % of the total residential housing of Lviv region and 633.3 sq. meters of total housing area was constructed per 1,000 inhabitants of the city. In 2016, 403.2 thousand sq. meters of total housing area in residential buildings with two or more- room flats and 72.2 thousand sq. meters in the houses with one- room flats were put into operation. In general, in 2016, 315 new residential buildings for 6,265 flats were put into operation in the city. The average area of one newly built flat was 70.9 sq. meters. Such volumes of housing construction require the active development of infrastructure and an increase in the number of service facilities. However, only one pre-school institution for 160 places, the educational and rehabilitation center for 1.3 thousand square meters of total

area, the outpatient clinics for 56 visits per shift and the memorial museum complex of 5.8 thousand square meters were put into operation (Main Statistics Department of Lviv region, 2016).

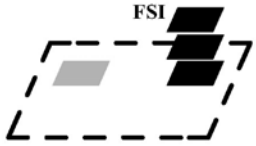
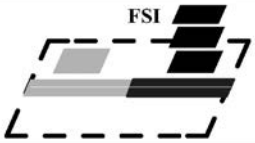
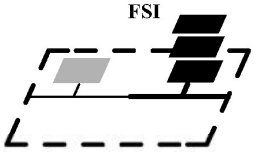
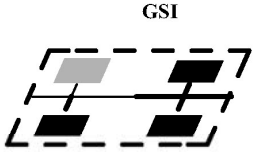
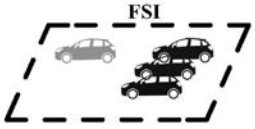
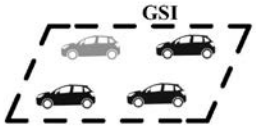
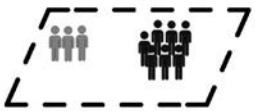
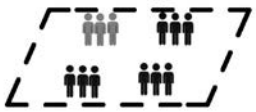
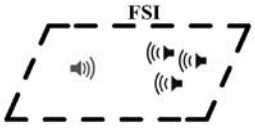
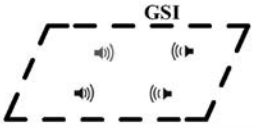
Name of the indicator	The Territory transformation ways	
FSI (Floor Space Index) GSI (Ground Space Index)	 -change of the density index by the FSI, which increases the number of total areas of buildings and structures;	 -change of the density index by the GSI, which increases the number of built-up area ;
Transport network		
	-the intensification of transport infrastructure: the indicator of linear density, a need for optimization of transport network (formation of a pedestrians and roads network)	
Engineering networks		
	-intensification (additional load on existing engineering networks) - engineering support of non-equipped territories.	
Transport		
	- need for parkings;	
Population		
	- functional intensification, which is a direct dependence to the increasing of people number on the territory (permanent and temporary stay) and ensuring of their needs	
Pollution		
	Concentrated localization of pollution sources: - noise; -air Pollution; -visual pollution.	Dispersed localization of pollution sources: - noise; -air Pollution; -visual pollution.

Fig. 6. Intensification of the territory by different density indicators (illustrated by S. Konyk).

Such volumes of construction create a heavy burden on the city infrastructure and do not always take into account the formed environment exacerbating the urban problems (Petryshyn H. & Hanets S., 2014, pp. 141–149). This approach to designing is a parasitic attitude to the city. Today, the regulation of the development of urban facilities is carried out within the framework of free areas of the territory allocated for the design and in areas planned for reconstruction. This approach leads to the following changes: condensation of building; loading on transport infrastructure; additional pressure on engineering networks; increase in a number of sources of noise pollution; air contamination; visual pollution; closure of production; spontaneous building in suburban green areas; the decline of the natural landscape caused by anthropogenic influence; social and domestic conflicts.

Urban planning warranties and restrictions on land development in Ukraine should provide indicators for the following requirements (Urban planning conditions and restrictions, 2011):

– maximum permissible height of buildings;

– maximum allowable percentage of land plot development;

– maximum permissible population density (for residential development);

– distance from the object being projected to the limits of red lines and lines of regulation of the building;

– planning restrictions (zones of protection of monuments of cultural heritage, protected landscape areas, boundaries of historical habitats, coastal protective strips, sanitary protection and other protection zones);

– minimum allowable distances from the objects being projected to other buildings and structures;

– protected zones of engineering communications;

– requirements for the need for engineering surveys in accordance with state building regulations;

– requirements for lanndscaping (including restoration of landscapes);

– provision of transport and pedestrian communication conditions;

– requirements for providing of the necessary number of places for safekeeping of motor vehicles;

– requirements for the preservation of cultural heritage.

Designing of the quarters of buildings depends to a large extent on the needs of people, modern criteria that form a subjective assessment of a comfortable environment. Today, each developer, for an advertising purpose, denominates the projected quarter as the greenest, the most comfortable for families with children, or a separate cluster, which will form a certain model of the environment of livelihoods. Therefore, there is a question of the objectivity of such advertising estimation and the need to determine what significant transformations have taken place in the approaches to building residential quarters. We follow two approaches to the intensification of development on the territory: increase of the area of development and growth of a number of storeys . In these two versions, we proceed from the existing state of the environment which forms the planning restrictions for us, as well as the area of the site for the projected quarter. Today, the fact that the site for designing of one quarter is less than the other is not an indisputable reason for calculating residency in it for a smaller number of people. Let's consider this approach on the example of some new quarters of residential development in Lviv (lun.ua, 2008–2017).

Increasing amount of buildings near central part of Lviv is changing primary ideas of area construction, its purpose and functional usage. It traces changes in development trends on the one of central streets of the city - Vyacheslav Chornovil avenue by the end of 19 century till today (Kryvoruchko V., 2017, pp. 5–13). Free or neglected areas adjacent to the main transport connections which form the planning framework of the city were chosen as the territory for development of residential neighborhoods: Shevchenko str., Volodymyr the Great str., Princess Olga str., Pasichna str. and others. Within adjacent to the territory of the named streets, the sites of different sizes - from 2.5 hectares to large plots of 15 hectares were allocated. The quarter type of building remains the main trend, which is formed by the groups of sectional houses of the same, or a various number of floors. Morphologically, this can be building formed around enclosed courtyards with 2 or 3 houses ("Semotsvit", "America"), or the area built up a perimeter ("Villa Magnolia"), or a more dispersed organization of the territory ("Pasichna"). Despite the various number of storeys of building and various planning principles and FAR and GIS indices, the following results were obtained:

– having various area of the site, the percentage of the built-up area is approximately 20–40 %, followed by a tendency to increase the area of development with a smaller total area of site, thus we vividly notice the intensification according to GIS indicator;

– number of storeys of residential building is a parameter that is adjusted to obtain the desired density of a quarter, often without taking into account planning constraints and leveling out the importance of the requirements for comfort of residence appealing to a person's subjective perception;

– FAR index is indicative for a developer, because it is a number of square meters that can be put into operation, and it also gives grounds to talk about the number of people who will live there, limited by this area. For example, the residential quarter of "Dobra Oselia (Good Abide)", which has FAR index close to 3, that is,

the area of all the storeys of the building is three times larger than the total area of the site, gives grounds to say that there is not enough space for recreation and service of the residents;

– a large number of people living in these quarters will require an increase in the number of service facilities, places in educational and pre-school institutions, which, however, are projected less intensively than new residential complexes;

– these residential buildings are the focus for attracting people and, therefore, additional traffic flows, which stimulates the appeal to the issues of parking, organization of transport and pedestrian traffic;

– there is a tendency of a slow transition of mono-functional housing complexes to poly-functional ones. It is evidenced by projected public spaces on the ground floors of some residential buildings.

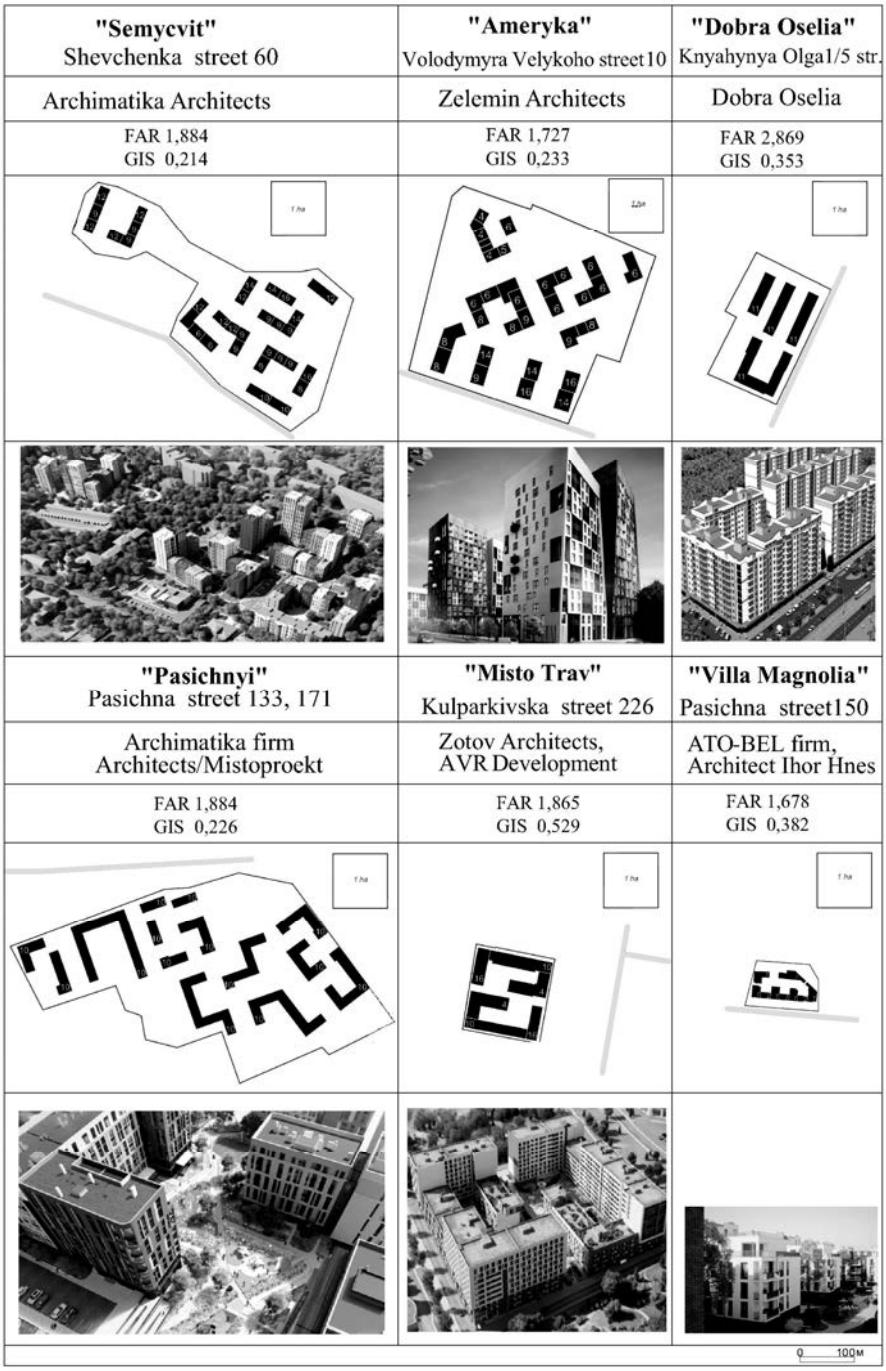


Fig. 7. New building quarters in Lviv with the calculation of density indicators (LUN) (Cherkes B, Petryshyn H., Kolomeytsev A., Konyk S., 2017).

3. Conclusion

Intensification of the urban environment during the period of growth of urbanization should take into account the needs of the city, take into account its problems and maintain the concept of sustainable development. Formation of quarter development should be considered in the city context and create a high-quality urban environment. There is even more responsible task: to find approaches to the intensification of building of historic cities, especially their central parts.

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ІНТЕНСИФІКАЦІЯ ЗАБУДОВИ ІСТОРИЧНО СФОРМОВАНОГО МІСТА НА ПРИКЛАДІ ЛЬВОВА

Анотація. *Міста метрополійного характеру, зокрема Львів, максимально інтенсифікуються у їхніх існуючих межах, враховуючи потенціал сформованих містобудівних утворень та неосвоєних територій, як і поза ними. Міська щільність є показником міського розвитку і демонструє кількісне та якісне використання міського середовища людиною.*

Кількість наявного населення у Львові, за оцінкою, на 1 квітня 2016 року становила 757,2 тисяч осіб. Відтак, у 2016 році у Львові (включаючи міста-сателіти Винники, Брюховичі та Рудно), було здано в експлуатацію житлові будинки загальною площею 475,4 тис кв. м. На Львів припадає 55,3 % загальнообласного введення житла, а у розрахунку на 1000 мешканців міста було збудовано 633,3 кв. м загальної площі житла.

Територією забудови житлових кварталів обрано вільні чи занедбані ділянки, що прилягають до основних транспортних сполучень, які формують планувальний каркас міста: вул. Шевченка, вул. Володимира Великого, вул. Княгині Ольги, вул. Пасічна та інші. В межах прилеглих до цих вулиць територій виділені ділянки різної площі від 2,5 га та великі квартали до 15 га.

Основною тенденцією забудови залишається застосування квартального типу забудови, що формується з груп секційних будинків однієї або ж різної поверховості. Морфологічно це може бути забудова, сформована навколо замкнутих дворів у межах 2–3 будинків ("Семицвіт", "Америка"), або периметрально забудована територія ("Вілла Магнолія"), чи більш розосереджена організація території ("Пасічний"). Незважаючи на різну поверховість забудови та різні планувальні принципи, було отримано такі результати: у досліджених кварталах відсоток забудованої території

становить 20–40 %, також прослідковується тенденція до збільшення площі забудови при меншій загальній площі ділянки; поверховість житлової забудови є параметром, який корегують, щоб отримати бажану щільність кварталу, часто не враховуючи планувальні обмеження та нівелюючи важливість вимог до комфортності проживання; велика кількість людей, що проживатиме у цих кварталах, потребуватиме збільшення кількості об'єктів обслуговування, місць у освітніх та дошкільних закладах, які однак проектуються менш інтенсивно, ніж нові житлові комплекси; нові житлові утворення є фокусами притягання людей, а, значить, додаткових транспортних потоків, що стимулює забезпечення паркомісцями, організації транспортного та пішохідного руху; проявляється тенденція повільного переходу монофункційних житлових комплексів до поліфункційних, про що свідчать запроектовані громадські приміщення у перших поверхах деяких житлових будинків.

Інтенсифікація міського середовища у період зростання рівня урбанізації повинна враховувати потреби міста, зважати на його проблеми та підтримувати концепцію сталого розвитку. Формування кварталу забудови має розглядатись у загальноміському контексті і створювати якісне міське середовище. Ще відповідальнішим завданням є віднайдення підходів до інтенсифікації історичних міст, особливо їх центральних частин.

Ключові слова: *міська забудова, урбанізація, щільність, інтенсифікація*

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Oksana Bilinska

DEPARTMENT OF DESIGN AND ARCHITECTURE BASICS: INTERIORS' DRAWING

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Abstract. The theme of this article is teaching architectural drawing skills. The sequence and stages of public buildings interior drawing are described here. The steps of interiors perspective construction are described taking Lviv Polytechnic National University interiors as an example. Common student's difficulties and mistakes are analyzed since architectural life drawing of the historical buildings' interiors on the spot is useful for obtaining knowledge and skills in professional education of architecture students.

Key words: architectural drawing, interior, perspective, Lviv Polytechnic.

1. Introduction

The Department of Design and Fundamentals of Architecture of Lviv Polytechnic National University plays an important role in the initial stage of the process of preparing future architects. Here, our students carry out multistep tasks in fine arts disciplines, including "Drawing, painting, sculpture". All students draw on the spot interior spaces of the Lviv Polytechnic National University. This helps students improve their understanding and skills of perspective construction of space in modern architectural education. Another way to improve students' skills is practicing academic drawing. It reveals the principles of constructing a realistic image on the plane and provides an opportunity to deepen students' knowledge and improve their skills, which are necessary for an independent creative work of an architect. Students develop the ability to analyze, compare, generalize the depicted objects and the space while drawing on the spot. Students can easily recall objects that they've already drawn on the spot and then they recreate the object on the paper. In order to construct a perspective of an interior, a student-architect must understand the basics of composition and the basics of the perspective studied during the execution of previous tasks with the construction of geometric bodies, still life, architectural details. Sources [1–5] reveal a number of issues related to the use of the figure as a way of expression in architectural creativity. The main focus is set on the study of concepts, techniques and directions of the drawing for the preparation of architects. This research focuses on the problems and mistakes in building perspective for interiors.

2. Basic theoretical section

The drawing is the beginning of any special artistic discipline: painting, composition, designing. Drawing in the work of architects is the main way of expressing architectural design. Different techniques (pencil, ink, charcoal) of drawing or sketch (Fig. 1) can give an architect an idea of the final result of his architectural image. Drawing develops figurative, associative and abstract thinking, and forms the aesthetic outlook of a future architect.

Drawing is also a great way to study architecture. The mastery of educational skills in drawing contributes to the study of the richness of the architecture of historical epochs, which left remarkable examples of virtuoso skill. So, in Lviv Polytechnic, the training of architects for academic drawing takes place in the main building of the university. Students study architectural orders, details, forms, polychrome and history of the construction of the main building of the Polytechnic at the same time.

Students perform the "Drawing of the Interior of the (Public) Building" task in the 2nd semester of the 1st year of studying (A2 format, pencil, coal, sanguine). Instruments are linear, tonal. Lighting is natural lateral, upper. As objects for the classroom drawing of fragments of public interior, it is possible to offer the premises of an educational institution, various spaces of the main building of the Lviv Polytechnic National University (lobby of the main building, corridors of the II-III floors of the educational building, hall halls, volumes of stairs, arcade – atrium II floor, assembly hall, etc.) (Fig. 1–7).

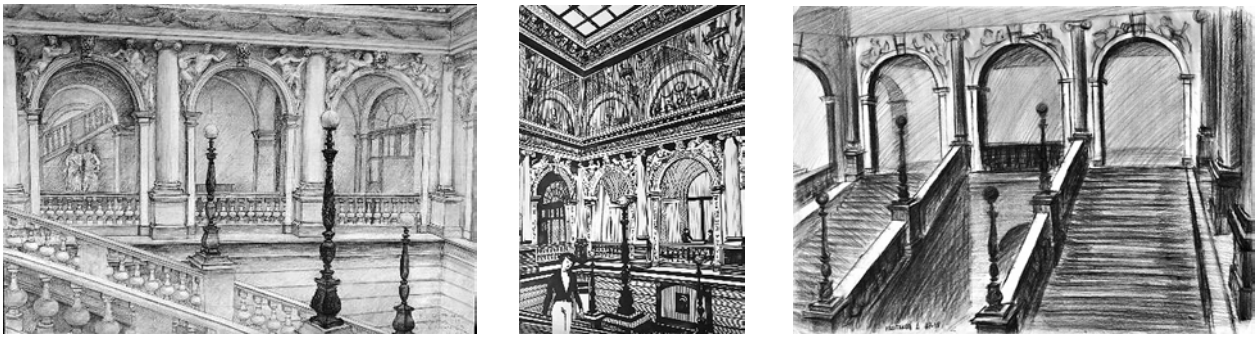

Fig. 1. Interior of the 2nd floor of the Lviv Polytechnic National University
(student works by: Rudetska S., Yuskovets M., Mashtakov D., headed by O. Bilinska, 2014, 2015).
Technique: A2 paper size, pencil, ink, charcoal

Fig. 2. Interior of the lobby of the Lviv Polytechnic National University
(student works by: Naumchuk O., Tkachuk G., headed by O. Bilinska, 2014, 2015).
Technique: A2 paper size, pencil

The purpose of the drawing by students-architects is to master the fundamentals of the graphic language of academic drawing and compositions; study of methods of quick drawing, sketching; development of technology of linear, tonal drawing. The specific goal of the task is to study the perspective and constructive creation of a fragment of the interior of a public building, assimilate the ways of transferring the depth of space, linear scale, revealing the proportional features of perspective contractions of architectural elements in the interior (ordering: pilasters, columns) and distances between them, displaying air perspective by detecting light, shadow, contrast, environmental impact via active lines and local tones. In an academic approach, it is important to perform classical productions for the process of architectural drawing. The creative process of the architectural design of the interior is based on successive stages.

Fig. 3. Interior of the lobby of the Lviv Polytechnic National University (student work by Rakochy S., headed by O. Bilinska, 2014). Technique: A2 paper size, pencil

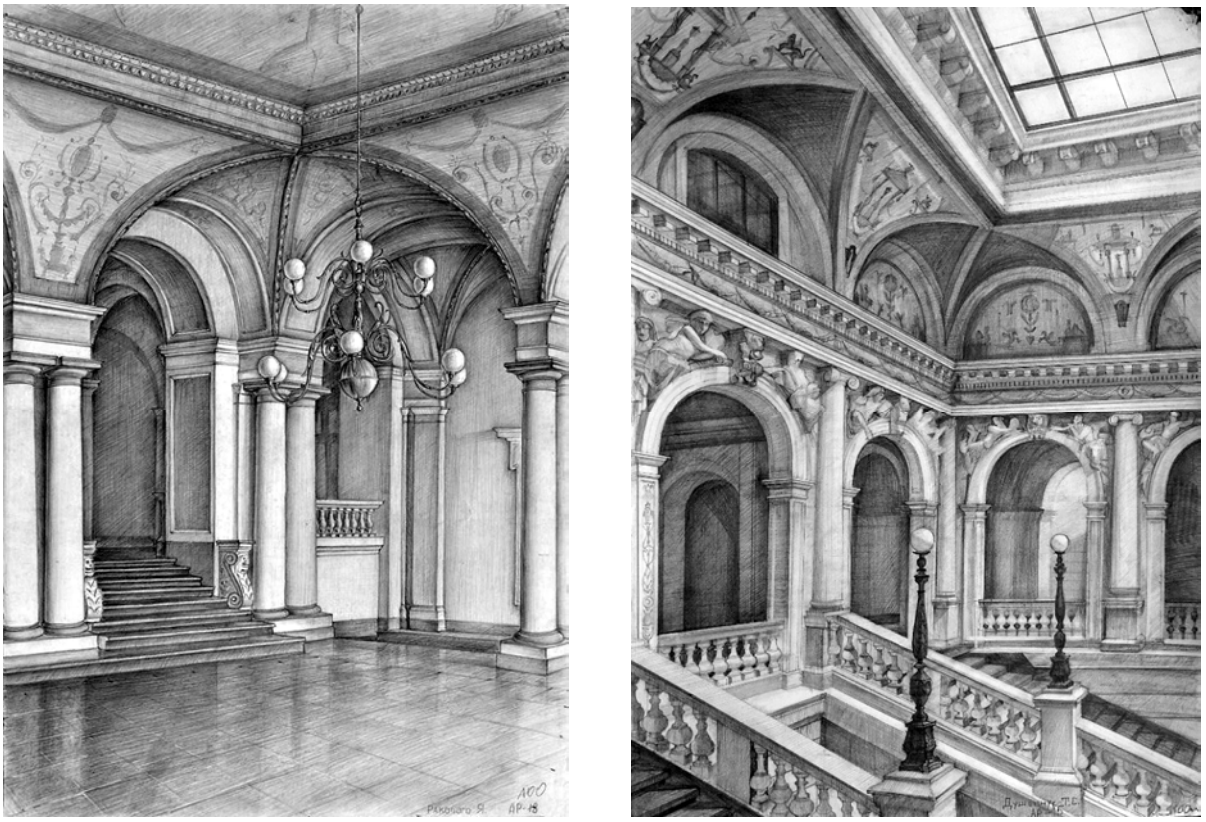

Fig. 4. Interiors of the lobby and stairs of the 2 nd floor of the Lviv Polytechnic National University (student works by: Rakochi Ya., Dushenchuk T., headed by O. Bilinska, 2014, 2015). Technique: A2 paper size, pencil

The first stage is the formation of a problem. Study of the content of form and space: an understanding the structure of the interior in terms of space organization, geometric design (framework, connecting each other in the space of individual elements, parts in a single image) and plastic structure. This is an imaginary layout of a graphic image of an interior fragment: the partitioning of interior planes by columns or pilasters, ending with

cross vaults or mirroring ceilings. Determining the interior style of the building, by means of which the compositional expressiveness of the interior space of the architectural object is encoded, is an artistic material in which aesthetic information, a specific image form is created. Therefore, in the initial stage of the drawing, it is important to find an expressive point of view, to select the composition of the interior fragment, to determine the horizon line and the points of coincidence (in complex multi-level fragments of interiors containing stair marches, the number of conversion points increases).

The second stage is the variability of creative research. Creating sketches of compositional solutions of the perspective of the interior from different positions when choosing a point of view – is a feature of visualizing creative composite solutions, the ideological content of the depicted objects. To create thumbnails use the traditional frameworks, and nowadays students are using images from mobile phone screens more and more. Sketches of an interior design can often be conditional, linear, concise, modest in choice of graphic instruments. In the drawing of the interior students often have difficulty with the layout, the choice of orientation of the perspective of the interior (horizontal or vertical composition). Often, students begin to depict fragments of the interior, and the overall composition turns out to be too full or too sparsely furnished.

The third stage – selecting only one sketch and the optimal angle. You can tone different sketches to find one you're satisfied with. You can use tone on small sketches, setting the tonal difference between the perpendicular planes of the interior. Next, the potential of future graphic work is compared, and the idea of how best to portray a solution is formed.

Fig. 5. Interiors of the 2nd floor of the Lviv Polytechnic National University
(student work by Pivtorak Yu., headed by O. Bilinska, 2015). Technique: A2 paper size, pencil

The fourth stage – the layout of the selected sketch on a large scale, awareness and development of an optimal solution, and implementation using various drawing tools.

After determining the structure of the division of the planes of the interior (for example, ordering elements – pilasters), it is important to further perform a linear constructive perspective construction qualitatively and find out the large-scale coordination of small architectural elements and decor with the main dimensions of the interior.

The fifth stage – the definition of proportions and magnitude. Proportions, magnitude - it is worthwhile to give a special role in the construction of the interior. Proportion means size ratio, the ratio of height to width, one part of the structure to another, a certain ratio of individual parts of the interior. Proportion – one of the

main instruments used in architecture and architectural design. In the drawing, students use knowledge on the study of classical forms, the construction of architectural orders, studied established laws, tested canons, confirmed by nature observations and instructions of great masters. Correct setting of proportions in the interior image contributes to the unity and harmony of academic drawing. Violation of proportions reduces artistic expressiveness of architecture. In the perspective construction, it is important to determine the proportional contractions of the dimensions of the architectural elements and the space between them. The magnitude – the proportionality of the interior of the architectural building with its main "module" – a man. The magnitude (the height of the interior) is measured not in meters, but in the proportional relation to the height of the person. To reveal the magnitude of the image of the human figure and proportional elements and details of the interior.

The sixth stage. Perspective – the spatial construction. The foundations of the drawing are closely related to the descriptive geometry and perspective. The ability to draw geometric shapes in the future greatly facilitates the interior design of buildings. When students build a linear perspective of the interior, using the perspective grid of L.-B. Alberty, they must constantly think, compare, develop accurate eye, reject the methods of drawing and copying. Artists use laws of perspective to change the size and the appearance of the interior of the buildings. Before drawing on the spot, it is necessary to determine the position of the depicted space in relation to the line of the horizon: at a level above or below the horizon. The position of the line of the horizon changes with the position of the student. The basic rules of perspective image of an object are known, which allow to construct a volumetric form with an any aspect and narrowing: the farther the subject is from us the smaller it seems; parallel lines converge at one point on the line of the horizon; For the artist the horizon line is placed at the level of their eyes (depending on the position from which the immobile object is shown (standing or sitting), the horizon line rises (high horizon) or decreases (low horizon)); horizontal lines (planes) that are below the horizon line, when departed into depth, rise to the horizon line; lines (planes) that are above the horizon line, down to the points of ascension on the horizon; The lines (planes) located at the horizon level are depicted by a horizontal line. Vertical lines and lines (planes) parallel to the picture plane (corresponding to the vertical and horizontal edges of the sheet – the frontal position), do not change the direction of the image. Intersection points on the horizon line are usually outside the sheet and are not displayed, but only appear during the drawing. However, mistakes are often encountered when constructing perspective. Students do not always build horizon line on the level of the eye, but mostly above. They neglect the specific rules of constructing a public interior, when the height of the lobbies, corridors and premises itself significantly exceeds the accepted height of other premises. Often, parallel lines do not reach the convergence point, even in simple one-point perspectives.

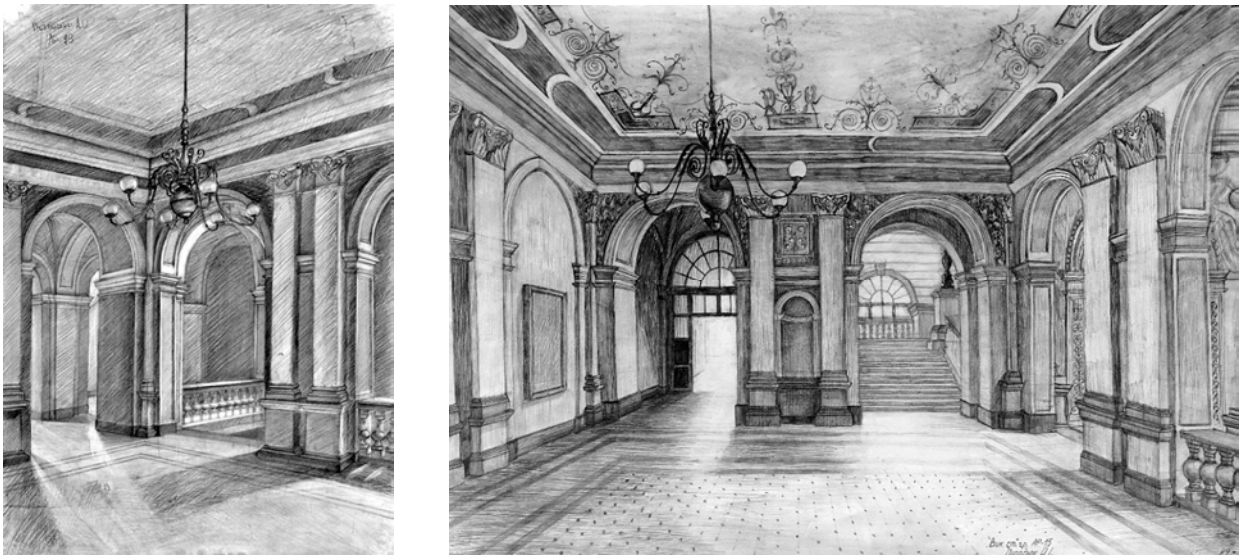

Fig. 6. Interiors of the 2nd floor of the Lviv Polytechnic National University (student works by: Petryshyn A., Popadyuk O., headed by O.Bilinska, 2014, 2015). Technique: A2 paper size, pencil

So, in constructing the perspective of the corridor, one should not forget about the placement of the top of the pilasters, columns and the bottom of their bases (even left and right) on one horizontal line. The linear perspective problem increases with two points of convergence on the side where the convergence point is far and the lines are still drawn as horizontal. Even getting acquainted with the theoretical aspects of the perspective does not help when the perspective climb points are placed too close to each other, the image of perspective is deformed. It is also important that the interior design of the foreground depicts a part of the floor; otherwise, it would seem that these wall surfaces, pilasters capitals were "suspended" in the air.

Due to the lack of spatial imagination it is difficult for some students to build unfolded forms (cornice of pilaster capitals, jumpers, window sills, profiled parapets of balustrades): a large number of perpendicular planes placed horizontally creates problems in constructing a linear perspective. Also, while depicting the interior from the screens of smartphones, vertical elements of the order column and pilasters begin to look like they're leaning and falling. Preliminary study of elements of the order of capitals, bases, provided by the curriculum, facilitates the problem of perspective construction.

The seventh stage is a linear perspective with precise linear construction of the interior and details. The line may be displayed 3D: to be thick, thin, to intensify, to deintensify, to disappear. Contrast of thin and thick lines creates the impression of distance and perspective. Application of different lines gives the architect the opportunity to solve perspective and spatial problems. The linear perspective is the main expressive instrument for building an interior perspective. In addition to the linear perspective, at the final stage of the drawing, it is necessary to convey the air perspective, that is, the illusion of depth of the space by the thickness, saturation of the line, to detect a change in the tonal relation associated with the spatial location and the distance of elements from the light source.

Eighth stage – tonal analysis. This is a depiction of different surfaces of the interior (walls, vaults, floors) using the tone; characteristic features of tone are black, gray, white spots with an established silhouette; the ratio of light-dark, contrast and nuance.

In the tonal drawing, it is necessary to constantly compare images with original, showing errors, inaccuracies and correcting them not only with the help of a line, but also a silhouette of the form. A characteristic feature of a tonal pattern is a silhouette - a plane with defined shape, for example, a wall plane. The concept of the tone is used as a definition of the light or shadow on an object, which is expressed in black to white ratio. Thus, the objects that are neutrally colored (achromatic) – white, gray, black – are defining the tone. Thus, the tone is the property of achromatic colors, that does not depend on the illumination conditions and the air environment, the tone transmits the degree of lightness of this object.

The ninth stage is a light-shade-shadow solution. The concept of the tone is related to the illumination, because the degree of light is displayed only with the tonality of the degrees of lightness (from the maximum of the light, to the maximum of the shadow) and illumination. If the interior perspective is built correctly, then the drawing already creates an impression of depth of space. This impression is intensified when working out the illumination of perpendicular planes in space: walls, floors and ceilings. Also the difference is significant in tone between distant and close areas of the walls and floor planes. Tonal difference created by different force of stroke also increases the impression of depth of space and makes the drawing realistic. The first long interior drawing is better tom do in the frontal position. Contrast tone increases frontal depth. The tone is explained as the degree of illumination of each part of the surface of the form, as its light and shade. The light emitter depends on the illumination, with artificial light the light emitters are clearer, more contrasting, in daylight in diffused light they are vague. The lighted window may be the lightest spot in the picture. Initially, the main relations between light and shadow are outlined without detail. Based on the tonal relation from the dark object to the lightest, observing the difference of objects by tone, it is necessary to compare shadows, revealing the difference in tone. It is needed to determine the direction of the shadows from the light source, determine the areas of own and falling shadows. After expressing lighting in general, we must proceed to the halftones, and pay attention to expression of the basic form and depth of space.

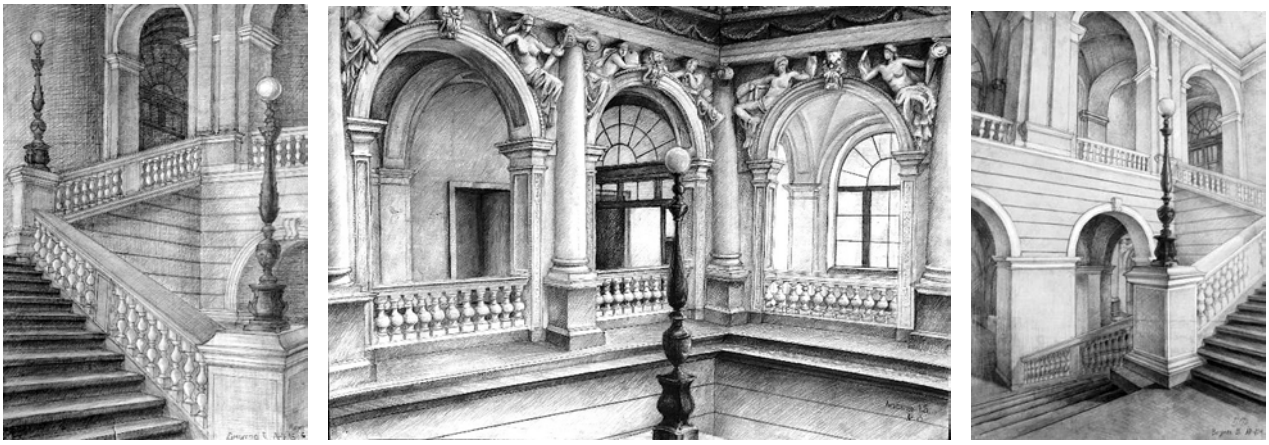

Fig. 7. Interior of the second floor corridor and staircase of the Lviv Polytechnic National University (student works by: Dmitryv K., Lyzanets' I., Voznyak V., headed by O. Bilinska, 2014, 2015). Technique: A2 paper size, pencil

In the final stage, a clear interpretation of plans and generalization of the fragment of the interior of the public building, are common. Errors with inappropriate tinting of the interior perspective are relatively insignificant with regard to the wrong linear perspective, and they can be fixed (obscured, highlighted fragments) in the process of completing the interior drawing.

Conclusions

Academic drawing is one of the most important professional areas of teaching arts disciplines at the Department of Design and Architecture Basics. Therefore, I reviewed one of these mandatory drawing tasks that the students of our department perform. I described the methodology of drawing architectural interiors. I chose the excellent Neo-Renaissance interiors of the Lviv Polytechnic's premises as the objects for performing this task. I have highlighted step-by-step stages of interior perspective drawing. These steps are: analysis of the interior structure and space, sketches creation, one sketch selection, and its layout on a large sheet, proportions and magnitude definition, perspective-spatial construction implementation, linear perspective creation, tonal resolution, light-shadow construction, and air perspective creation. For each of these stages of the interior drawing, I have shown some common difficulties and mistakes that students are most likely to encounter. The article is illustrated with students' drawings of interiors of the Lviv Polytechnic National University main building.

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Оксана Білінська

КАФЕДРА ДИЗАЙНУ ТА ОСНОВ АРХІТЕКТУРИ: РИСУНОК ІНТЕР'ЄРІВ

Анотація. *Кафедра дизайну та основ архітектури Нац. ун-ту "Львівської політехніки" відіграє важливу роль у початковому етапі процесу підготовки майбутніх архітекторів. Тут майже 145 років від дати заснування кафедри студенти виконують етапні завдання з циклу образотворчих дисциплін, а саме з дисципліни "Рисунок, живопис, скульптура". Академічний рисунок допомагає отримати розуміння та навики перспективної побудови простору, вміння аналізувати, порівнювати, узагальнювати зображуваний простір інтер'єрів, ордерні аркади, архітектурні ордери, декор. Для побудови перспективи інтер'єру студент-архітектор використовує знання з основ композиції та основ перспективи. Враховуючи нагальну потребу у визнанні важливості викладання академічного рисунку для освіти архітекторів та у зв'язку з планомірним скороченням годин на цю дисципліну, виникла необхідність у детальнішому аналізуванні методики виконання та типових помилок одного з обов'язкових академічних завдань з рисунку для виконання студентами-архітекторами.*

Подано та узагальнено методику виконання архітектурного рисунку інтер'єру. Натурою для виконання завдання слугують неоренесансні інтер'єри Львівської політехніки. Виділено покрокові етапи виконання побудови перспективи інтер'єру. А саме: аналіз структури і простору інтер'єру, створення ескізів, відбір одного ескізу, компонування його на великому аркуші, визначення пропорцій, масштабності, виконання перспективно-просторової побудови, лінійної перспективи, тональний розбір, світло-тіньова побудова і повітряна перспектива. До кожного етапу виконання рисунку інтер'єру наведено найрозповсюдженіші типові труднощі та помилки, які найчастіше допускають студенти. Статтю проілюстровано студентськими роботами рисунку інтер'єрів головного корпусу Нац. ун-ту "Львівська політехніка". Акцентовано важливість архітектурного рисунку для вивчення особливостей архітектурних стилів інтер'єрів у контексті вивчення історії архітектури. Перспективою подальшого висвітлення може бути методика та особливості виконання архітектурного рисунку інтер'єру сакральних будівель.

Ключові слова*: архітектурний рисунок, інтер'єр, перспектива, Львівська політехніка.*

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Brych Mariia

APPLICATION OF THE MULTIMEDIA EXHIBITION TECHNOLOGIES FOR ARCHITECTURAL SPACE FORMATION OF THE OPEN-AIR MUSEUMS

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Abstract. The characteristics of different types of multimedia exhibition technologies are investigated in this article. The author considers the features of virtual and real historical and architectural environment interaction. The peculiarities of space formation of the open-air museums, created on the basis of architectural monuments, with the help of multimedia technical means are analyzed. The feasibility of multimedia exhibition technologies application for the open-air museums is substantiated.

Key words: open-air museum, architectural monument, exhibition technologies, multimedia technologies.

1. Introduction

The artistic organization of leisure that combines both the cognitive and entertaining functions becomes increasingly important today. This entails the need to adjust the traditional approach to the architectural and spatial organization of museums. Museum functions are supplemented, the scope of their activities expands. Most clearly this tendency can be traced in open-air museums. In modern conditions, the use of the museum environment as an entertainment space is the most interesting and actual form of preservation and demonstration of the large architectural and urban complexes or ensembles. And the multimedia technologies can help implement this approach qualitative way.

2. Analysis of recent researches and publications

The open-air museums are actively developed and investigated. The theoretical and methodological aspects of the architectural and spatial organization of open-air museums study begin to appear in the scientific works of foreign and native authors in recent years. Despite the popularity of this type of museums in Europe and in the world, the problem of the architectural ensembles − museumification and the creation of museums on their base is only starting to be explored in Ukraine. This issue is mentioned in the theoretical works of museum science by E. Dobrovolska, M. Maystrovska, O. Mishura, O. Soustin, T. Yurieneva, O. Mastenitsa. Due to the development of technical facilities and the promotion of multimedia technologies, many researchers are investigating the prospects for their use in museum exhibitions. V. Severin, L. Kalinina, T. Belofastova, I. Shevtsov and others are among these researchers. However, the use of such technologies in the open-air museums hasn’t been, practically, considered in the scientific works.

3. Basic Theory Part

To determine the effective way of preserving and use of monuments, it is important to identify their fundamental characteristics. The main feature of architectural, urban, landscape and archaeological ensembles and complexes is large scale and complexity, due to multifaceted elements that coexist in such objects. They include the natural, historical and cultural environment, as well as the architectural and artistic image.

Large architectural and urban ensembles should be considered within the framework of the integrated approach. The specificity of open-air museums, created on the basis of mentioned objects, lies in the combination of diverse objects and the environment. The open-air museums are the most common way of multifaceted cultural heritage museumification in the world practice. The memorial ensembles should be perceived as a complex system in the place of its origin, development and modern use. Therefore, the search for the architectural solutions for the organization of open-air museums, which would create the optimal conditions for the perception of such monuments with a minimal interference in their original structure, is the most relevant.

The "in situ" method is predominantly used to create the open-air museums based on the architectural ensembles. Scilicet, the museum is created in the place of monuments' historical emergence and functioning, that is in their authentic environment. In the open-air museums, diverse objects play the role of "exhibits" – architectural buildings and structures, economic and industrial objects, landscape and archaeological monuments. The main purpose of this type of museums is not the transformation of urban heritage objects into the objects of museum display and the use of architectural monuments as the museum premises, but the preservation of their historical and memorial value. Therefore, it is important to keep not only the material structure but the location and the historical environment during monuments museumification as well.

The plurality of the mentioned monuments maximally complicates the task of their preservation and use. Restoration, conservation, protection areas assignment and other protective measures often miss in looking the problem of high-quality transmission of historical and cultural information to the observer. The model of interaction between the museum and visitors is fundamentally changing nowadays. The "culture of participation" gains more and more popularity. It can be interpreted as a free, conscious, active participation of people in the formation of cultural and social processes, an opportunity not only to consume but also to create, to be a part of cultural events, to comprehend and actualize cultural heritage.

Museums exposition space goes to a qualitatively new level. Increasingly, it combines the material and virtual environment by means of new information and multimedia technologies. The use of modern technologies in museums makes it possible to expand the informational component of the exposition, to demonstrate the subject in the context of virtual space, in the atmosphere of the relevant time period. Multimedia technologies can become the means of creating various kinds of games, interactive co-ordinations, and entertainments. These technologies are used in plasma and LCD screens, projection and holographic systems, lighting design and sound accompaniment of the exposition [1].

Multimedia technologies provide the exhibition interactivity, visitor's engagement in the game, active participation in the display, they demonstrate the phenomena and processes impossible or difficult to be observed in a real life, as well as serve as an orientation point in a museum space, being important in open-air museums, which often occupy a large territory.

Multimedia technologies provide a wide area for action, and technological development makes them increasingly flexible in use. They are mostly used indoors now, but they are also often used outdoors while organizing various shows and cultural events (Fig. 1). Therefore, for a valuable information transmission in the open-air museums, it is quite a rational solution to fill the environment with multimedia that would transform valuable architectural spaces into a kind of exposition without destroying the integrity.

Fig. 1. 3D mapping in Lyon, France.
Project by 1024 Architecture [2]

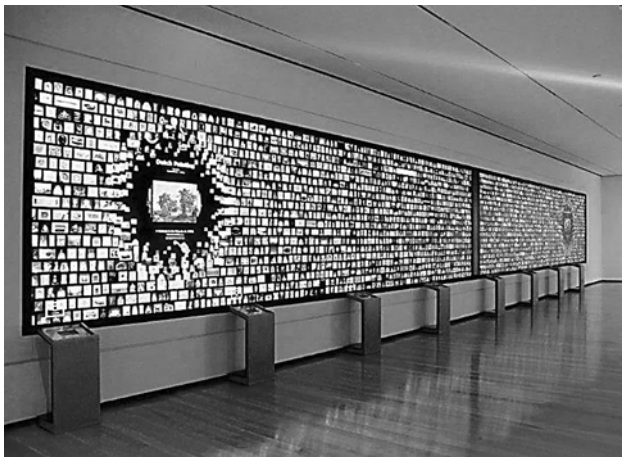

Fig. 2. Wall touchscreen
at Cleveland Museum of Art, USA.
Inspiration Author:
Jeremy Weatherford, Zenith Systems, LLC [3]

The main approach to an open-air museums space formation created on the basis of architectural and urban architectural ensembles is the principle of minimal interference with the historical structure of monuments. Transformation in the viewers' perception also gives a reason for the new spatial solutions. Visitors are more oriented towards getting pleasure, rather than prescriptive, educational information. Hence, the multimedia exhibition technologies that supplement authentic exhibits will enrich and popularize the exposition.

Multimedia museum technologies include a variety of exhibition systems: interactive booths, special information zones, integrated into the museum computer network, that allow the visitor to work with databases of various collections, multimedia installations, embedded in exhibition space, museum guides, various role or simulation games, holographic and projection devices, as well as light and sound equipment [4].

The use of information touch screens is quite popular today. The variety of their forms and design, as well as the compactness and the ability to be located practically anywhere in the museum, make these tools indispensable for obtaining the necessary information with illustrative additions.

The use of floor information booths is widespread for the architectural and spatial organization of the museum environment. The use of such booths, where displays are integrated into a common horizontal surface is much less common. Wall-mounted displays are used more rarely (Fig. 2). The advantage of using this technology is that the interactive screen can be integrated into the object of industrial design [1]. Information booths are easily combined with any small architectural form that does not ruin the integrity of the ensemble.

In order to show artificially created by humans environment of existence and self-realization to the visitor, museum space should include a set of the physical and symbolic objects [5]. The means of complementary and virtual reality are gaining more popularity today. The use of such technologies is of great interest to young people, for which electronic sources of information have become more common than books. Practically all people own mobile phones or tablets. That provides a wide range of actions. The relevant software will give visitors the opportunity to see things in the virtual environment that do not exist in reality. And this applies not only to supplementing information. The structure of ensembles and complexes includes many elements. Some of them may be damaged or completely lost. Restoration of destroyed monuments can be carried out in individual cases, in the presence of sufficient scientific base and illustrative materials that allow accurate reproduction of the object, as well as on the condition of its exceptional value. But such actions are not recommended by both native and foreign law in the field of monuments protection. Multimedia technologies using QR-codes or similar coding will allow visitors to observe lost elements of monuments or even individual structures, without ruining preserved objects. Such a technology can show some hypothetical images if there is no confirmation how exactly a particular element looks like.

Fig. 3. Reconstructive model in the Carnuntum Archaeological Park, Austria. Scientific developer: Ludwig Boltzmann Institute [6]

Fig. 4. Reconstructive model in the Siponto historical park, Italy. Author: Edoardo Tresoldy [7]

Fig. 5. Holographic installation at the Abraham Lincoln Museum, Springfield, USA. Realization: BRC Imagination Arts [8]

Occasionally, the image of lost or damaged elements and structures of architectural and urban architectural ensembles is reproduced by means of temporary or permanent installations that do not ruin the environment and preserved parts of the monument. This may be, for example, a transparent screen with a drawn image that, from a certain point of view that shows the original appearance of the monument (Fig. 3), or a light model made of a metal mesh (Fig. 4). In combination with the multimedia exhibition technologies, such solutions will become even more appealing to the visitor. For example, a conventional glass screen, similar to the one mentioned above, is used for a holographic installation in the Museum of Abraham Lincoln, Springfield, USA (Fig. 5).

In the approaches to the architectural and spatial organization of open-air museums, the preservation of a free space, which focuses on exhibits and creates space for interactive coordination between the visitor and individual monuments, is actual today. Because of versatility of architectural monuments, the visual environment, in which the visitor's attention focuses on the exhibit due to the illumination, color, and sound making an increased emotional impact on the viewer, as well as raising the cognitive value and expressiveness of monuments, is created. The development of computer graphics and virtual technologies enable museums to create the effective sensory feelings. These feelings are those emotional interactions that evoke the audience's interest and promote the visitor to immerse in the exposition [9].

Information carriers should be located not only outdoors. In open-air museums, restored exteriors of architectural monuments often are supplemented by museumificated interiors of individual buildings, where additional expositions are placed. Small interactive installations can be integrated into the public welfare, accompanying the visitor at the locations of the main attractions outdoors. The large size of most open-air museums makes it necessary to arrange the recreation areas. Here a larger technique, that will provide some entertaining and performance activities − for example, the interactive games, can be placed. The use of the projection screens and interactive windows will be the most optimal in the interiors of the individual buildings. Using the architectural projection, holography and complemented reality means with the help of special equipment will be expedient inside and outside the museum. Light and sound equipment will also enhance the emotional impact of the monument exhibits both indoors and outdoors. One-time shows and other entertainment activities with multimedia means can be arranged as well.

The application of the multimedia exhibition technologies is becoming a promising direction of the museums' development today. The cooperation of the multimedia specialists, museum designers, restorers, and architects is extremely important for their effective involvement in organizing the open-air museums, created on the basis of monuments ensembles. It is also worthwhile to use world experience in the implementation of multimedia technologies in the museum environment in Ukraine. Over the past decades, under the auspices of the International Council of Museums, there is the Multimedia Working Group, which specializes in developing the methodological principles of using the abovementioned technology by the museums.

4. Conclusions

Expansion of the activity spheres creates the need to revise the previous approaches to the creation of museum exhibitions and, accordingly, its architectural and spatial organization. The complex, multilevel system of open-air museums performs a number of functions. Among them, the artistic organization of leisure, the integration of cognitive, entertaining and artistic and creative functions are becoming more and more prominent. The wide range of the modern multimedia exhibition technologies possibilities gives grounds for their application for open-air museums. They are especially effective for transmitting the maximum amount of information to the visitor while maintaining the authentic structure and the environment of large urban ensembles, which include architectural, landscape, archaeological and historical monuments, inextricably linked together. In the open-air museums, it is possible to use such technologies inside the individual monuments as well as outside them, complementing the museum space with virtual elements. They not only can play the role of auxiliary means but also act as an independent tool for the formation of architectural space of the open-air museum. Such particular tools property as the ability to combine with the elements of industrial design leads to their being an excellent way to organize the interior. On the other hand, the large-scale equipment, which is expediently placed outdoors, allows forming attractions and recreation areas in the exterior. Thus, multimedia exhibition technology is an effective means for architectural space formation of the open-air museums.

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Брич Марія

ВИКОРИСТАННЯ МУЛЬТИМЕДІЙНИХ ВИСТАВКОВИХ ТЕХНОЛОГІЙ ДЛЯ ФОРМУВАННЯ АРХІТЕКТУРНОГО ПРОСТОРУ МУЗЕЇВ ПІД ВІДКРИТИМ НЕБОМ

Анотація. *Сьогодні художня організація дозвілля поєднує у собі пізнавальну та розважальну функції, що спричиняє необхідність коригування традиційного підходу до архітектурно-просторової організації музеїв. Основною особливістю архітектурних, містобудівних, ландшафтних та археологічних ансамблів та комплексів є великий масштаб і складний характер, тому їх варто розглядати в рамках комплексного підходу. У світовій практиці поширеним способом музеєфікації багатогранної культурної спадщини є музеї під відкритим небом. У сучасних умовах, використання середовища музеїв під відкритим небом як розважального простору є найцікавішою та найбільш актуальною формою збереження і демонстрації великих архітектурних та містобудівних комплексів чи ансамблів. Одним зі способів якісно реалізувати подібний підхід є використання мультимедійних технологій. Багатогранність згаданих пам’яток ставить перед нами важке завдання – якісно транслювати історико-культурну інформацію спостерігачеві. Сьогодні модель*

взаємодії музею з відвідувачами принципово міняється, все більшої популярності набуває "культура участі" – можливість не тільки споживати, але і бути частиною культурних заходів.

Використання сучасних технологій у музеях дають можливість розширити інформаційну складову експозиції, а технологічний розвиток робить їх дедалі гнучкішими у використанні. Популярним сьогодні є використання інтерактивних кіосків, інформаційних сенсорних екранів, мультимедійних інсталяцій, голографічних та проекційних установок, засобів доповненої та віртуальної реальності, світло- та звукоапаратури, а також організація різних рольових або симуляційних ігор. Мультимедійні виставкові технології можуть відігравати роль і допоміжного засобу, і слугувати самостійним інструментом формування архітектурного простору музею.

Широкий спектр можливостей сучасних мультимедійних виставкових технологій дає підстави для їх використання у музеях під відкритим небом. Вони є особливо ефективним для трансляції максимального об'єму інформації відвідувачеві при збереженні автентичної структури і середовища великих містобудівних ансамблів, які включають архітектурні, ландшафтні, археологічні та історичні пам'ятки, нерозривно поєднані між собою. Таким чином, мультимедійні виставкові технології доцільно використовувати для формування архітектурного простору музеїв під відкритим небом.

Ключові слова: *музей під відкритим небом, пам'ятка архітектури, виставкові технології, мультимедійні технології.*

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REPRODUCTION OF THE LOST MONASTIC COMPLEXES OF OSBM

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Abstract. The degree of the Basilian monastic complexes preservation in general and each object in particular is being investigated and the possibilities of their reproduction with adaptation to the original function are determined in the article.

Key words: Monastery, modern state of the Basilian monastery, reproduction of the monastic complex.

1. Introduction

Monasteries play a significant role in many spheres of the life of Ukrainian society and are the objects of Ukrainian cultural heritage. They were the monuments of spiritual, material and artistic culture, which played an ideological part in the history of our nation. Nowadays, many monastic complexes have been lost, and the ones that are still preserved, contain the dilapidated objects. The problem of preservation and reproduction of destroyed monastic objects as the objects of our spiritual and cultural heritage is extremely important at the present time.

Basilian monastic complexes as well as the ensembles were actively developed in the 17–18th centuries. Architecturally, they were the unique objects with a peculiar artistic and architectural-spatial solution. Being aware of the importance the valuable historical and architectural complexes preservation, the issue of comprehensive study and comparison of written sources, illustrative, archival, cartographic materials, field surveys, in order to identify the architectural and spatial structure of the Basilian monasteries can be considered as one of the urgent questions.

Monastic complexes and ensembles were located in the cities and villages of Ukraine. They were located on the outskirts of the cities and villages or beyond them. Over time, the buildings were built around them. The monasteries also occupied a special place among the monuments of architecture and urban development. The architectural image of monastic complexes was formed under the influence of special socio-economic and conditions of the life of the Ukrainians, their culture and national traditions, a landscape environment and the features of the relief. By architectural and spatial solution, the monasteries represented a compact urban building, with sacral, residential, educational and economic zones, functionally interconnected. The entire monastery was surrounded by the walls on all sides. As a rule, monasteries were located on the high hills or natural terraces and occupied a dominant position over the environment.

2. Analysis of the current state of monastic objects

The material and technical state of the objects of historical and cultural heritage, which includes directly the monastic complexes and ensembles that embodied the highest achievements of the Ukrainian people in architecture and art and were the centers of spirituality and culture, had been greatly influenced by socio-

economic, political and cultural changes in our society. However, the greatest damage to the monuments was caused by the functional use of them not for purpose, which led to redevelopment, rebuilding, completion and superstructure, or even partial or complete destruction of monastic buildings. Especially in the Soviet era, during the reign of atheistic ideology, Basilian monastic complexes and ensembles were adapted mainly for social and economic needs: in the museums (Lviv, Chervonograd), psycho-neurological dispensaries (Krasnopushcha, Dobromil, Krekhiv, Pogonia), schools, vocational schools and dormitories (Zhovkva, Lavriv, Buchach, Ulashkivtsi, Chervonograd), clubs (Drohobych, Ulashkivtsi), recreation centers (Goshiv), tuberculosis clinics (Zolochiv, Pidhirtsi), warehouses for agricultural purposes (Ulashkivtsi, Krekhiv), schools, vocational schools and dormitories, different workshops (Krasnopushcha, Zhovkva). As a result of such transformation of the Basilian monasteries, monastery buildings suffered irreparable damage: loss of decor on the facades and in interiors, ruined valuable fresco paintings of the temples, destruction of individual objects, loss of unique artistic works (iconostases, altars, icons, sculptures, valuable books and old paintings), the change of the historical landscape, the disappearance of the monasteries gardens, alleys, parks.

After the independence of Ukraine and the return of monastic complexes to the Basilians, their active reconstruction and development with the involvement of specialists of the "Ukrzakhidproektrestavratsya" institute began. In modern conditions, in connection with the mass influx of pilgrims, there is a question of the expansion of monasteries and the construction of new types of living quarters (hotels) for the higher clergy and pilgrims. During the restoration work on monastic monuments there is the implementation of reconstruction works, in particular, the creation of additional premises through the placement them in the cellar of the attic floor.

In order to reproduce a monastic complex or ensemble with its landscape environment (gardens, parks, alleys), architects of architectural and planning, compositional features of the Basilian monasteries need to be studied in depth, which will allow them to determine their historical, artistic and cultural value while the analysis process. Monastic monuments, which were not only the centers of spirituality but had a decisive influence on the development of Ukrainian culture, architecture and art during a long historical period and were associated with historical events, outstanding personalities or the creativity of genius architects, sculptors, artists, were the unique works of a certain style, with the significant losses which subject to a priority reproduction [1]. The scientifically substantiated documentation about these objects, taking into account the laws of the architectural and spatial organization, allows architects and restorers to reproduce a holistic and compositionally completed monastic ensemble, as a part of the historical environment of the city or the village.

An important place in the historical and cultural heritage belongs to the defensive monasteries-fortresses with centuries-old history, connected with the historical past of the region, ranging from the Mongol-Tatar invasion to the Tatar incursions. These monuments include a defensive monastic complex in the village. Pidgoryany on the outskirts of the city of Terebovlya, founded in the 16^{th} – beg. 17^{th} [2], but now, it presents only the ruins remained (Fig. 1, 2). The monastery is located on a high mountain hill where the rivers Gnisna and Seret are merged. The monastery-fort in plan is shaped like a trapezium, surrounded by the high stone walls with four corners of the two corners of the two-tiered cylindrical tower. In the middle of the northern defense wall there is an entrance gate along the axis which, in the depths of the monastery's yard, is a three-storey masonry, defensive church of the Transfiguration of the Lord, which from the north is adjoined to an elongated monastic complex with the cells, a refectory, a library, a kitchen and other premises. This building on the northern end adjoined to the premises at the gate, forming a G-shaped plan. Two of the four corner towers have been preserved – south-west and north-east ones. Nowadays, only the monastery church has been restored. In the restoration process of the monastic complex it is necessary to apply conservation, fragmentary and integral restoration, in order to maximize the preservation of the monument [3].

The monastic church in the tract Monastirok, which is 2 km to the south of Buchach, is located on a rocky hill on the right bank of the Stripa River, has also survived to this day only in ruins (Fig. 3,4). The massive walls with the thickness of 1,7–1,8 m testifies of their defensive character. The temple is three konh with a rectangular porch and a high tower-bell tower over it. The height of the walls of nave and konh reaches 9

meters. The eastern part of the temple was completed by the apse conch, the two smaller conches emerged from the southern and northern walls of the church. The width of the apse is approximately equal to the nave width. Two narrow, high windows with semicircular jumper cut through the southern wall and one round window cut through the southern konh. The apse and the northern wall of Navi and the northern conch are without windows. Such construction of the northern facade was apparently due to the defensive needs – the northern wall of the church was turned towards the monastery gate, from where the enemy was expected to attack. The western facade of the temple completed a square in the plan tower-bell. The main defensive function was performed by a tower, approximately 15 m high, in the western wall of which was the entrance of the temple. Above the entrance there were two battle tiers, with one loophole on each side of the tower. A staircase, arranged in the thickness of the stone wall of the tower provided the connection between the tiers. Till now, only the church has gone to ruins. Such type of monuments is one of extremely rare in Ukraine. This monastery temple is of historical and artistic value and prompts the need for restoration measures to preserve it.

According to the relevant studies, one can distinguish the following ways of strengthening and restoring each element of the monastery fortifications:

– Foundations. It is obligatory that the Existing booty foundations of natural stones should be strengthened by the way of arrangement with metal clips. While reinforcing the foundations, it is necessary to take measures for anti-corrosion protection of reinforcing elements, and also carefully monitor the injection of the solution in the channels.

– Defensive walls**.** It is necessary to disassemble the dissonant non-authentic elements of the wall (if any). When restoring the masonry one should use the option of restoring the surface: the conservation of historical material, with the addition of stone masonry losses with authentic material and reinforcement of emergency sections of the walls strengthening reinforcement. When reinforcing masonry of fragments of walls it is necessary to take measures in anti-corrosion protection of the reinforcing elements. The technology of the works on the masonry surface conservation involves the following operations:

– cleaning the outer surface from contamination, salinity and de-structured layers;
– addition of the losses in the masonry;
– injection of the cracks and voids in the masonry;
– strengthening the loose, brittle stones with special solutions.
– restoration of the seams;
– spackling caverns, supplementing minor losses;
– tinting the areas of inserted stones;
– surface protective treatment.

All supplements of losses in the masonry of building mortar, stone, splicing of cracks must be performed by solutions, similar in composition to the authentic (lime and sandy solution).

Fig. 1. Transfiguration Monastery in Pidhora village. Fhoto 2017

Fig. 2. Transfiguration Monastery in Pidhora village. Fhoto 2017

Fig. 3. The church's ruins in the tract Monastirok. Fhoto 2014

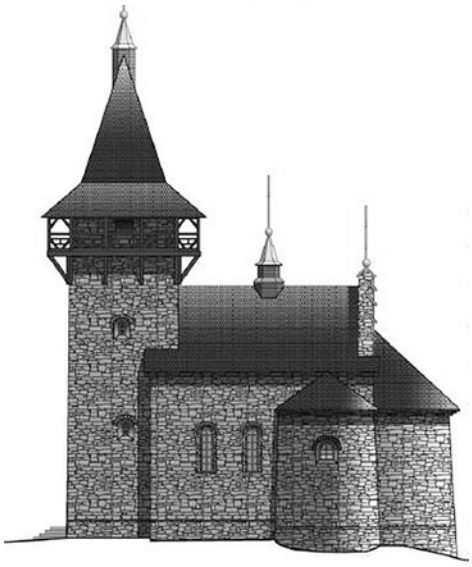

Fig. 4. Hypothetical reconstruction of the church in the tract Monastirok

Among the historical sacred sights characterized by the unique and special features are the rock-cave monasteries, the most ancient monuments that attract the attention of many researchers due to their mystery. They are also important for the development of religious tourism.

The monastery of St. Ivan the Baptist in Ulashkivtsi of Chortkiv district of the Ternopil region was founded in the 14th and was housed in the rocky folds of the highly elevated right arm of the Seret River [4]. According to the legend, the monks settled in rocky caves, brought a miraculous icon of Ivan the Baptist. Subsequently, in 1565, the family of the Dobrutsky-Rakitsborovskys presented the icon of Our Lady. According to the legend, the cave, which was equipped with the chapel of Ivan the Baptist, expanded in 1673 by Jan III Sobieski, who stayed at the monastery, while heading a battle of Khotin. In 1678 above the cave church of John the Baptist, there was built the church of the Nativity of the Virgin [5]. It should be emphasized that the information about the rock monastery appears much earlier than the very settlement. In 1797, both cave churches were renewed [6]. During World War I, the cave temples were damaged.

The new masonry monastery complex was built somewhat higher on a plain natural terrace in 1898 [7]. The ruins of the monastery cave church and the cell under it have survived to this day (Fig. 5, 6). To get to the monastic cave cells one has to climb the steep slopes. The monastery was located on the two levels. On the first tier of the caves there is a small cell with a window where the monks lived, overlooking the river Seret and the surrounding villages. The only entrance is covered due to the collapse. The church of Ivan the Baptist is added to the cliff. The cell located on the second tier, was really hard to get, as one need go down six meters deep into the cave with the help of the chain built by the local inhabitants. The cave monastery is belonged to those unique monuments which require an urgent systematic survey of open monastic objects, instrumental cave surveys and archaeological research, hence, any restoration measures for the preservation and restoration of the monuments have to be based on these investigations. We propose the following measures:

– strengthening, restoration and reproduction of bases and foundations;
– installation of waterproofing;
– conservation, restoration and reproduction of the masonry and bearing structures;
– restoration and repair of the roofs;
– conservation and restoration works in the interiors;
– conservation and restoration works on the facades;
– conservation and restoration of an architectural and stucco decoration;
– conservation, restoration and reproduction of the wooden products and constructions;
– conservation, restoration and reproduction of the metal and stone products and constructions;
– restoration and repair of the floors.

Fig. 5. Ruins of the monastery cave churches in Ulashkivtsi. Photo 2014

Fig. 6. Ruins of the monastery cave-cell churches in Ulashkivtsi. Photo 2014

3. Conclusions

Based on the thorough study of literary, archival and cartographic materials and field surveys, the urban structure of the ruins of the Basilian monasteries has been studied. Public recognition of the role of monastic memorials as the centers of spirituality, having a scientific, historical and artistic value, prompts the need for their protection as the objects of cultural heritage. Depending on the town-planning situation, the values of monastic objects, the degree of their preservation, individually proposed for each particular Basilian monastic complex restoration measures for the preservation and restoration of lost monastic structures.

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Леся Чень, Іван Знак

ВІДТВОРЕННЯ ВТРАЧЕНИХ МОНАСТИРСЬКИХ КОМПЛЕКСІВ ЧСВВ

Анотація. *У статті порушено проблему відтворення втрачених монастирських комплексів Чину Святого Василія Великого, що в наш час є надзвичайно актуальною. Монастирі відіграють значну роль у багатьох сферах життя українського суспільства і являються об'єктами української культурної спадщини. За архітектурно-просторовим рішення монастирі являли собою компактне містобудівне утворення, з сакральними, житловими, просвітницькими та господарськими зонами, функціонально поєднаними між собою. На сьогодні багато монастирських комплексів втрачено, а в тих, що дійшли до наших днів, є об'єкти, що перебувають в напівзруйнованому стані. Найбільшої шкоди пам'яткам завдало функціональне використання їх не за призначенням, що призводило до перепланування, перебудови, добудови і надбудови, а то й до часткового чи повного руйнування монастирських будівель.*

Автори звертають увагу на необхідність ґрунтовного комплексного вивчення і зіставлення письмових джерел, ілюстративних, архівних, картографічних матеріалів, натурних обстежень, щоб ідентифікувати архітектурно-просторову структуру василіанських монастирів. Науково обґрунтована документація про розглянуті об'єкти із врахуванням закономірностей архітектурно-просторової організації, дозволяє архітекторам-реставраторам відтворити цілісний і композиційно довершений монастирський ансамбль як складової історичного середовища міста чи села.

На основі опрацювання літературних, архівних і картографічних матеріалів та натурних обстежень у статті вивчена містобудівна структура руїн василіанських монастирів.

Суспільне визнання ролі монастирських пам'яток як осередків духовності, що мають наукову, історичну та мистецьку цінність спонукає до необхідності їх охорони, як об'єктів культурної спадщини. Залежно від містобудівного положення, цінності монастирських об'єктів, ступеня їх збереженості, автори публікації запропонували індивідуально для кожного конкретного василіанського монастирського комплексу реставраційні заходи і збереження і відтворенню втрачених монастирських споруд.

Ключові слова: *монастир, сучасний стан василіанського монастиря, відтворення монастирського комплексу.*

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Yurii Dyba

TO THE PROBLEM OF INTERPRETATION OF HISTORICAL EVIDENCES CONCERNING ANNALISTIC 'NOVGOROD' IN IX – X CENTURIES (the comments referred to a new publication by E. Nosov)

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Abstract. Author considers the main problems connected with the question about the founding of an ancient city of Kievan Rus – Novgorod on Volkhov River. The reason for the reflections on this topic was the authors critical analisis of Yevgeni Nosov`s new publication. Also the author considers an important question of this city localization in the IX – X centuries. These questions are analyzed on the background of ancient chronicles messages.

Key words: Novgorod, Νεμογαρδάς (Nemogardas), Hólmgarđr (Holmgardr), 'Rurikovo Gorodysche' (Rurik's Hillfort), localization, archaeological dating, foundation of the city, place names, architectural and archaeological research.

1. Introduction

In the collection of scientific articles published in honor of the famous Kyiv archaeologist Gleb Ivakin there was the research of his colleague Yevgeni Nosov about the early history of Novgorod on the Volkhov River [1]. The essence of the considered issue was defined by the author in the subtitle "To the history of the name of the Northern Rus' center". The researcher thus focuses attention on the name (or rather – the names) of the city. However, the examined subject is much broader. The objectives set by the author face at least four significant problems: 1) the problem of chronicle dating of Novgorod beginnings; 2) the problem of archeological dating; 3) the problem of parallel use of place names; 4) the problem of localization of the ancient Novgorod.

2. Wording of the problem

The **first** of these problems is that the several of records about the events of 9–10th centuries mentioning Novgorod in the general chronicles of Rus' are not consistent with the evidence of the local Novgorod Chronicle about founding of the city in 1044 by Prince Volodymyr, son of PrinceYaroslav the Wise: "*В лѣто ×sѳ҃нв* . [6552 (1044)] *Ходи Ярослав на литву . на весну же Володимиръ . заложи Новгородъ и здѣла и*" [2]. (***In the summer of 6552 (1044) Yaroslav went to the Lithuanians and in spring Volodymyr founded Novgorod***).

The **second** problem is associated with the unsuccessful attempts to discover the layers of 8–9th centuries on the territory of the Novgorodian "Dytynets" (Citadel) and 'Slavenskyi Kholm' (Slavenskyi Hill). The unearthed remains of the original defensive shaft of the citadel (Dytynets) confirmed its foundation in the 40's of the 11th century. The layers of the 9th century are found only in a fortified settlement located on the Volkhov source, 2 km south of Novgorod Dytynets, known as "Gorodische" (Hillfort) (artificial name – "Rurikovo Gorodische" / Rurik's Hillfort) (Fig. 1). In addition, there are reasons to doubt the veracity of accurate dating of Novgorod cultural layers based on dendrochronology, which allows 20–30 years of a possible error. D. Machynsky drew attention to this problem referring to A. Uryeva's works [3].

The **third** problem is caused by the fact that in the 9th, 10th and 11th centuries Scandinavians do not know the name of 'Novgorod', the city was known only as 'Hólmgarđr' (Holmgardr). The identity of these names is proved by late evidence of Göngu-Hrólfs saga: "*главный стол конунга Гардов находится в Хольмгардаборге, который*

теперь зовется Ногардар" [4]. (*The main throne of konung of Gards is in Holmgardr which is now named Nogardr*). The oldest copy of the saga dates from the second half of the 14th century. In addition, Constantine Porphyrogenitus in his treatise "On the Management of the Empire" dated 948–952 mentions the name 'Nemogardas' (Νεμογαρδάς) where, according to the emperor, was Sviatoslav (Σφενδοσθλάβος), son of Igor (Ιγγωρ) archon of Rus'. There is no certainty, whether the same settlement is mentioned in different chronological sources under these names.

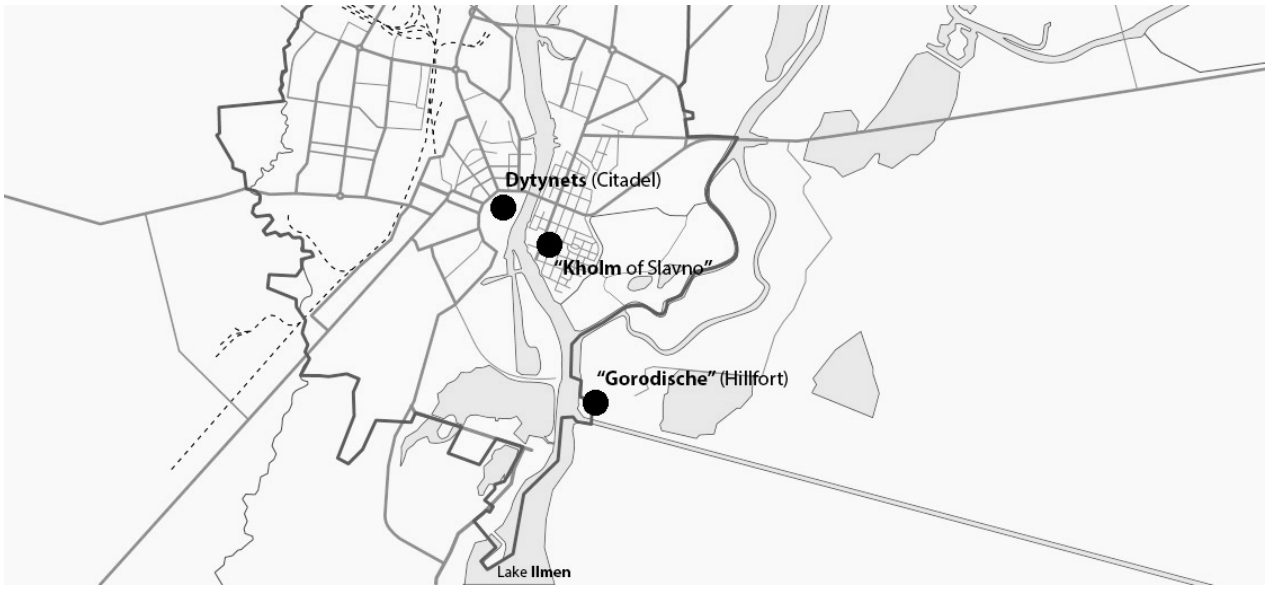

Fig. 1. Dytynets (Citadel), "Kholm of Slavno" and "Gorodische" (Hillfort) on the plan of modern Veliky Novgorod

The **fourth** problem caused by the previous three is associated with Novgorod localization and there is no a clear solution to it. The longstanding attempts to link the annalistic Novgorod with modern Novgorod kremlin (Dytynets) were not confirmed. No local old fortifications were found on the territory of Novgorod. In literature the place name 'Novgorod' was also associated with "Rurikovo Gorodische" (Rurik's Hillfort) and ancient Ladoga. E. Nosov once referred to V. Parkhomenko's scientific concept that challenged the North localization of 'Nemogardas' [5], and supposed that it could be Novgorod-Siversk on the Desna River, Novgorod-Volynskyi on the Sluch River (Zvyagel according to the chronicles) or Small Novgorod on the Dnieper [6]. However, the scholar didnt't consider the recent research, including the one proving the identity of Novgorod from 9–10th centuries chronicles with the hillfort of Volyn type on the River Luga that was later named as Volodymyr (Yu. Dyba). In addition, L. Voytovych identifies Novgorod / Holmgardr with the archaeological complex in Gnyozdovo near Smolensk.

3. Formulation of the article goals

Our goal is to indicate the main contradictions arising from reading historical sources about Novgorod of the 9–10th centuries in the comparison with the results of archaeological research of this city.

4. Presenting of the main material

The aforementioned problems intertwined in a tight knot of contradictions which E. Nosov tries to reconcile. In a concluding part of the analysed publication the author tries to prove that while mentioning Novgorod of 9–10th centuries the chroniclers had in mind the fortified settlement in Gorodyshche tract. He believes this settlement center in the upper reaches of the Volkhov River was developing in several phases: 1) Sloven oldest settlement was called 'Holm-gorod' which transformed into 'Hólmgarđr' in Scandinavian transcoding; 2) in the middle of the 9th century Rurik founded new fortifications on this place, whence has appeared the place name 'Novyi Gorod' ('New City') and the adjacent buildings gradually embraced a wider area; 3) in the middle of the 11th century Volodymyr, son of Yaroslav, established the Dytynets (Citadel) 2 km downstream the Volkhov and later it was named 'Novgorod' while the old abandoned placed got the name 'Gorodyshche'.

The novelty of these suggestions is obvious. In 1990 monograph "Rurikovo Gorodyshche" (Rurik's Hillfort) E. Nosov supported the idea that the name of 'Novyi Gorod' ('New City') emerged in the mid 11th century as opposed to old settlement Gorodyshche, but in the analyzed article the researcher rejects the possibility that chroniclers attributed the recorded events of 9–10th centuries to a new place name that appeared in the second half of the 11th century (the last date should be considered as misprint, because 1044 is mentioned in the chronicle). Now the scientist strongly emphasizes that the name 'Novgorod' was in use before the constraction of Dytynets (Citadel) and before appearance the place name 'Gorodyshche' (Hillfort) (p. 332). Are there reasonable grounds for such a radical change of views?

Proving that a fortified 'Gorodyshche' is the oldest Novgorod according to the chronicle and at the same time is one of the local names that appeared on the later stage of urban development E. Nosov gives long known facts stated in his own previous works: there are no layers older than the third quarter of 10th century on the territory of Novgorod Dytynets (Citadel) and its entire complex was of particular importance in the urban structure only with the adoption of Christianity (p. 332). However, earlier the same arguments gave reason to the author to formulate much more cautiously: "*не думаю, що сейчас можно однозначно решить вопрос о древнейшем наименовании городища*" (*I do not think that now it is possible to resolve definitely the problem of the oldest name of the ancient settlement*) [7]. In the given case the earlier statement is more confident and trustworthy.

Having presented his new considerations, E. Nosov left aside a number of facts that require furter explanation:

First, assuming that the initial fortified settlement on the site of the 'Gorodyshche' was called 'Kholm-gorod', the researcher didn't explain how this hypothetical name correlates with local parallel place name 'Kholm of Slavno' that was first documented in the records in 1134. It is difficult to agree with the possibility of any parallel existence of two nearly identical place names, as well as to believe that the place name was shifted to the settlement 'Slavno' after Rurik had built a new fortification called 'Novgorod' on the old place of 'Kholm-gorod'. The probability that both place names 'Holmgardr' and 'Novgorod' were moved to a new place is too small. We should consider the chronological gap in a hundred years from the time, when according to E. Nosov old name 'Holm' was functioned on 'Gorodyshche' in 60-70-ies of 9th century, to appearance the emergence of ancient layers of 'Slavno' in late 70's of X century, where fixed the place name 'Holm'.

Second, the author does not provide the compelling reasons that might force the Scandinavians and Rurik to name their rebuilt fortifications as Novgorod and not to save already locally assimilated Scandinavian form 'Hólmgarđr' which reinterpreted the traditional local name 'Holm-gorod' and was often recorded in the various Scandinavian sources, at least until the second half of the 14th century. Moreover, even much bigger urban reconstruction and development as for example in Novgorod Dytynets (Citadel) or in Kyiv at times of Volodymyr or Yaroslav did not lead to a change of a city name. The new name was given only to a newly established settlement (city/gorod of Volodymyr, city/gorod of Yaroslav, etc.). Gorodyshche itself was not outstanding by its size and hypothetical numerous changing names were not backed up of the visible urban transformations. Except the desolation which was affected by its name.

Third, while agreeing that the oldest name 'Холмъ-городъ' / 'Hólmgarđr' was well-assimilated in the Scandinavian environment and used to denote a settlement located on the origins of the Volkhov River. But also the name the name 'Νεμογαρδάς' characterised by E. Nosov as habitual Scandinavian (p. 333). This name must be recognized as such located further south, outside the influence of the Scandinavian residents in river Volkhov basin. It is worth recalling that up to the second half of the 10th century the Scandinavians had little focused on the realities of the Middle Dnieper territory and they do not have specific information even about Kyiv.

Fourth, referring to the chronicled legend about the invitation of the Varangians (p. 335) E. Nosov emphasizes the mention of Rurik's arrival to Lake Ilmen, where he founded the city on the Volkhov River that completely topographically corresponds to the location of the modern fortification in Gorodyshche placed 2 km upstream from the 1044 Dytynets (Citadel). But the author avoided mention about the legendary city Slovensk with no less eloquent analogy: "*градъ на новомъ мѣстѣ отъ стараго Словенска по Волхову яко поприще и болѣ, и нарекоша Новъградъ Великій*" (*the city founded on the new place from Slovensk down the Volkhov River was named Veliky Novgorod*) [8]. The reason seems to be simple as a critical number of names borrowed from varying sources is concentrated in one place: 'Slovensk' – 'Холмъ-городъ' / 'Hólmgarđr' – 'Novgorod' – 'Νεμογαρδάς', 'Kholm of Slavno', and that fact could jeopardize the hypothesis.

Fifth, all the chronicled records about the invitation of the Varangians are still legends despite their vivid literary form. The literature clearly indicates that there is practically no information of the northern lands from hte time captured Kyiv by Oleg (882) to the division of lands between the sons of Svyatoslav (970).

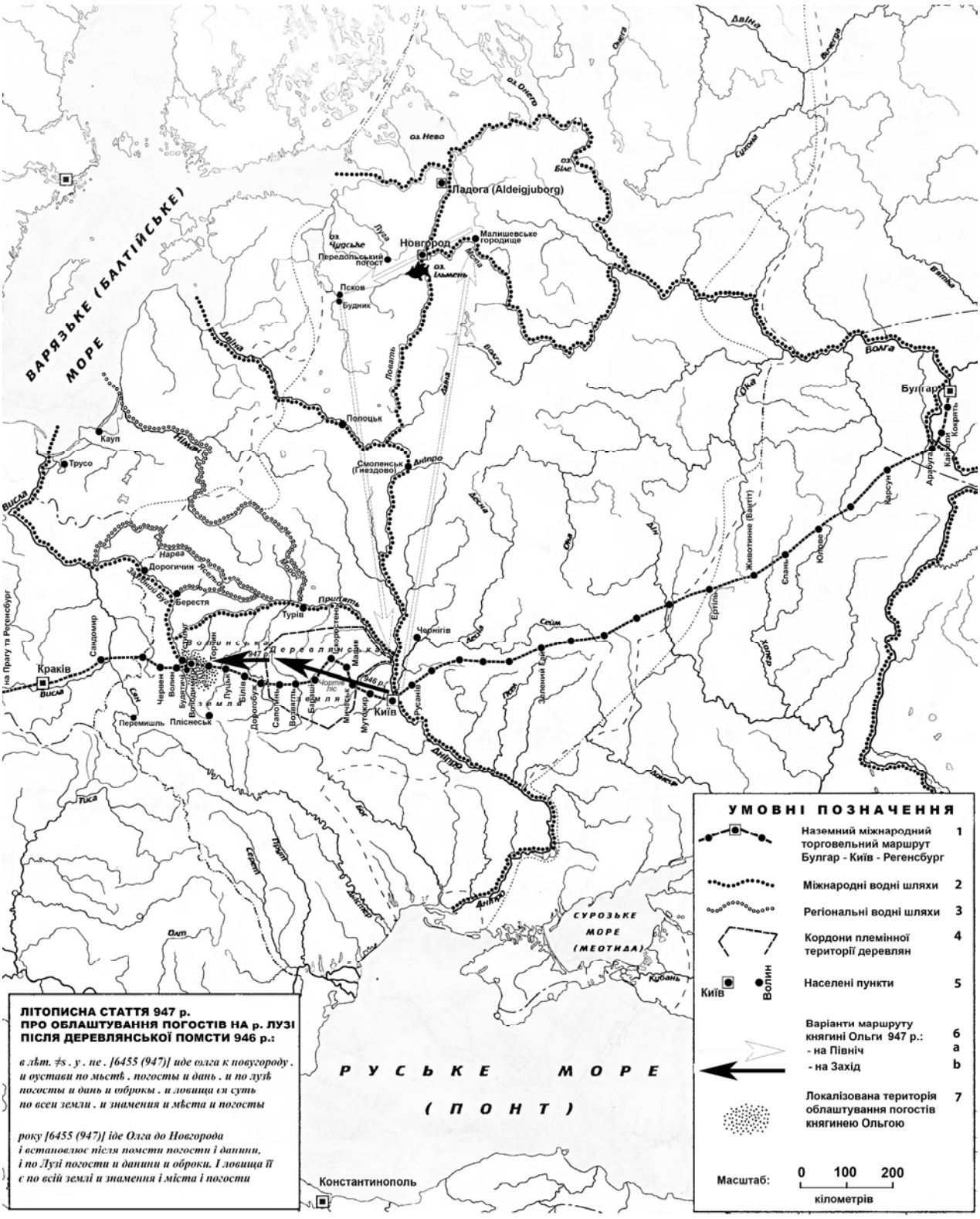

Fig. 1. Variants of the campaign of Princess Olga to Novgorod 947:
1 – international trade route Bulgar-Kiev-Regensburg; 2 – international waterways;
3 – regional waterways; 4 – the boundaries of the tribal territory of the Derevlyans; 5 – settlements, cities;
6 – the options of itinerary Princess Olga's 947 year (a – to the north; b – to the west);
7 – the territory where Princess Olga founded Pogosts

Between these dates Novgorod was mentioned only once in The Tale of Bygone Years in the entry dated 947: "*в лѣ^{m} . ѯѕ . ѵ . йе . [6455 (947)] иде ѠЛга к Новугороду . и оустави по мьстѣ . погосты и дань . и по Лузѣ погосты и дань и wброкы*" [9]. (*In the year 6455 (947) Olga went to Novgorod and founded on the Luga the pogosts and imposed rents and tributes).* Cited events are usually explained by the chronicler as the reforms of Kievan Princess Olga on the northern territories that started after the war in Drevlyanian land in 946 which was started by Princess Olga to revenge for her killed husband. Having punished the Drevlyans ("*по мьстѣ*" / after revenge), Olga went westwards to Novgorod and founded the pogosts (administrative units) on the Luga ("*по Лузѣ*") and imposed rents and tributes. Referring to this record the theory of reasonable probability of early identification Novgorod with the settlement on the Luga River founded in 10th century as Dytynets (Citadel) of the future Volodmyr city was grounded in the book "The Homeland of St. Volodymyr" [10] (Fig. 2).

3. Conclusions

The problem formulated by by V. Parkhomenko relating to the South localization of Novgorod in the chronicle of the IX–X centuries should not be ignored. Hopefully Novgorod scientists will consider this problem in spite of all patriotic feelings and contrary to scientific inertia.

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Юрій Диба

ДО ПРОБЛЕМИ ІНТЕРПРЕТАЦІЇ ІСТОРИЧНИХ СВІДЧЕНЬ ПРО ЛІТОПИСНИЙ 'НОВГОРОД' У IX – X СТОЛІТТЯХ
(зауваження з приводу нової публікації Є. Носова)

Анотація. *Автор розглядає основні проблеми, пов'язані з вирішенням питання про заснування Новгорода на Волхові. Підставою стала нова публікація Євгенія Носова, присвячена питанню початків Новгорода на р. Волхові. Мета цієї публікації – вказати основні протиріччя, що виникають при читанні історичних джерел про Новгород IX–X століть порівняно з результатами археологічних досліджень цього міста. Висловлюючи нові міркування Є. Носов залишив поза увагою низку фактів, які вимагають пояснення: По-перше, допускаючи, що первісне городищенське укріплене поселення слов'ян мало назву 'Холмъ-городъ' новгородський дослідник не пояснив, яким чином ця гіпотетична назва корелюється із топонімом 'Холм' Славенського кінця, перша задокументована згадка про який датується 1134 р. По-друге, автор не наводить достатньо вагомих причин, які б змушували скандинавів Рюрика назвати перебудоване ними городищенське укріплення Новгородом, а не*

зберегти вже вкорінену на місцевому ґрунті скандинавську форму ’Hólmgarđr’. По-третє, погоджуючись з тим, що найстарша назва ’Холмъ-городъ’/’Hólmgarđr’ міцно прижилася в скандинавському середовищі й використовувалася на означення населеного пункту розташованого на витоках Волхова, випадало б назву ’Νεμογαρδάς’ визнати такою, що стосувалася населеного пункту, розташованого значно південніше, за межами впливу скандинавських колоністів Поволхов’я. По-четверте, Є. Носов акцентує увагу на тому, що згадка про прихід Рюрика до Ільменя, де він зрубав город над Волховом, повністю топографічно відповідає місцю розташування сучасного Городища й розташовується 2 км вгору за течією від дитинця 1044 р. Одначе автор уникає згадки про легендарний Словенськ. По-п’яте, літописні оповіді про прикликання варягів, якими б яскравими вони не видавалися, є легендарними. Порушене свого часу В. Пархоменком питання південної локалізації літописного Новгорода IX–X ст. не слід обходити боком. Сподіваюся, звернуть на цю проблему увагу і новгородські науковці, при всіх патріотичних почуттях та всупереч науковій інерції.

Ключові слова: *Новгород, Νεμογαρδάς (Немогардас), Hólmgarđr (Холмгард), Рюрикове городище, локалізація, археологічне датування, заснування міста, найменування, архітектурно-археологічні дослідження.*

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Olena Khorosha, Volodymyr Smoliak

ARCHITECTURAL ENSEMBLE OF THE POTOTSKYI IN TULCHYN, AS THE STANDARD OF CLASSICISM IN EASTERN PODILLIA

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Abstract. A historic and cultural as well as urban panning architectural analysis of the main periods of the prosperity, decline and renovation of the Pototskyi palace in Tulchyn on Vinnitsia area at the end of 18th century have been reviewed in the article. The stylistic features of the palace's architecture have been determined. The influence of early classicism on the formation of the principal aspects of the palace ensemble architecture surrounding has been analyzed. The main artistic and decorative methods as well as the regularities, compositional and spatial solutions to the architecture of palace complex have been revealed.

Key words: palace, architectural monument, early classicism, Pototskyi, ensemble, estate, order, style, wing.

1. Introduction

It is impossible to imagine the development of Ukrainian architecture during a number of centuries without the unique works that are in need of studying and analyzing in a deep and meaningful way. The palace complexes located in Eastern Podillia with their great variety of stylistic solutions constituted a considerable part of the edifices built in the style of classicism – the style approved by the tsar's power that was creating the specific trends of estate architecture development for years.

The social and economic as well as political changes in Ukraine and the period without statehood lasted from the 19th to the late 20th century extremely influenced the condition of the architectural monuments and their preservation. Among the numerous masterpieces of Vinnitsia area a leading position takes up the palace in Tulchyn built in the identities of the exquisite early classicism aped by the architects of Europe and tsar's Russia. The matter is that at the end of the 18th century the map of Europe was redrawn: Russian Empire (which included Slobozhanshchyna, Left-Bank Ukraine and Kyiv) went out to the Black Sea coasts and as result of the 2-nd and 3-rd territorial division of Polish-Lithuanian Commonwealth it also appropriated Volyn and Podillia (Aseev, 2003).

The architecture of European countries was characterized by the development of classicism the swing and grandeur of which was actively spreading towards neighbouring states. Russian Empire and Polish-Lithuanian Commonwealth having the Ukrainian lands under their authority had immediately approved of the aesthetic concept of French classicism.

In Eastern Podillia (the territory of modern Vinnitsia region) which was a part of Polish-Lithuanian Commonwealth an active introduction of classicism happened just in the palace architecture. After all, the Polish magnates did not limit themselves in the scope of building their estates and involved the world architects in the design, that additionally suggested their powerfulness and authority over the mere Ukrainian peasants and a nobility environment as well.

The purpose of this article is a profound analysis of a nation's foremost architectural landmarks – the palace ensemble of Pototskyi family in the city of Tulchyn of Vinnitsia region as a pattern of classicism architecture in Eastern Poldillia. A research subject is the existent palace and the park of the late 18th century.

The main tasks set in this article are to consider the historic aspects of the palace formation from the foundation to its present day partial restoration; to specify the composition and spatial design of the estate; to analyze the architecture and planning peculiarities of the palace in the context of landscape architecture development of different representatives of the early classicism in Vinnitsia; to determine the current conditions state of an edifice conservation.

2. Basic Theory Part

For the realization of the tasks set in the article as well as while processing the material there were used the general scientific and special professional research methods. Among the general scientific methods were the empiric ones (observation, description) and theoretical (historic approach, analysis, system method and the method of generalization). As for special professional methods, they included the method of on-location observation, the method of photo-fixation and the method of morphological analysis. The complex methodology of the research stipulates studying and analyzing the preceding scientific works and sources concerned the subject of the article.

The Tulchyn Palace has not almost been studied in the Ukrainian architecture and none fundamental work dedicated to the history of its construction and development has not been published. To characterize the period of the late 18th century including the period till 50-s of the 19th century there exist only limited information content at our disposal. The incompleteness of research is caused by the loss or stealing the archival documents concerned the construction of the entire ensemble from the fund of Pototskyi family that is preserved in Central State Historical Archives of Ukraine in Kyiv during their lifetime. Despite the considerable number of published historic works related to the history of the palace ensemble in Tulchyn, all these works deal mainly with the history of Tulchyn and the family of Pototskyi but just the history of palace creation and the park foundation are not made clear enough well.

Among the pre-revolutionary publications written in Russian and Polish we should note the woks of Setsinski (1911), Guldman (1901), Ohocki (1857). In the history of contemporary Ukrainian architecture such authors as Malakov (1980), Timofienko (1993), Kolesnik (2007), Lobro (2008), Potupchik (2006) devoted their works to the study of this monument. The most significant and complete works of the Polish authors are the monograph of the doctor Rolle (1864), published in Krakow, a monumental work dedicated to the palaces and farmsteads research in the territory of Polish-Lithuanian Commonwealth by Aftanazy (1996) and the fundamental articles of Jaroszewski (1982).

3. Results and Discussion

The architectural special features of the palace edifices of the early classicism epoch were the grandeur and restraint, the exactness and perfection, the symmetry between the volume and the shape. At the same, time the decorative elements and certain plastic motives, namely, the triangular pediments, pilasters, freezes, garlands of ancient themes were retained.

The main means of the shape harmonization became the rhythmical combinations of the constructive and decorative elements. The major concern of an architect lied in the order (Aseev, 2003), which expressed the scale of the palace and focused on the principal axial central portico, which crowned the entablature. The size of the buildings often accompanied by the side wings, creating the court of honour performed sometimes in the form of rectangle.

Due to the variety of the relief and the ground, the palaces of the early classicism in Eastern Podillia were planned in combination with nature surrounding and, then, were transformed into the palace ensembles. The example of the French and English parks spread out on volumetric-spatial arrangement of the palace amidst the decorative trees and, often, on the banks of the rivers or ponds, amplified with the pavilions, rotundas etc. Therefore, a high stylish level of Pototskyi palace in Tulchyn implementation (where the park and the palace were the integral parts of each other and created their artistic and architectural holistic nature), in turn, originated the early classicism not only in Eastern Podillia, but, generally, in Ukraine.

Since, creation to nowadays, the Pototskyi palace in Tulchyn in Vinnitsia region almost retained its completeness as well as its architectural and decorative adorning, having passed a long way of the

redevelopment, the modification of the functional purpose and the row of restorations. As two hundred years ago, so now, the Tulchyn estate yet impresses the viewers by the skillfully calculated effect of unexpected emergence of a majestic and dimensioned edifice within the low-rise urban construction on the lift of the relief at the entrance of the town, among the thick green plantations (Fig. 1).

The historic preconditions of creating the palace ensemble in Tulchyn trace their roots to the 15th century. Modern Tulchyn is a district center located in the south part of Podillia Plateau, 82 km from the region center of Vinnitsia. The town came into being in the 15th century in the territory that at first constituted the Grand Prince Land Fund of Lithuanian state (Setsinski, 1911). The Polish historians of the 17th century assume that this settlement had the name of Nestervar and was built on the bank of the river Silnitsia. The main and the first mentions of this settlement date back to the early17th century, the time of its belonging to the major Polish magnates Kallinovski by which the castle and a wooden Catholic church were erected (Krzyżanowski, 1862). Due to Zboriv Agreementsigned signed in 1667 Nestervar was added to Cossack regiment of Bratslav Voivodeship, and after Andrusiv agreement signed in 1667 joined Polish-Lithuanian Commonwealth (Guldman, 1901).

Fig. 1. The Pototskyi Palace in the town Tulchyn. Photo by M. Rytus (2017)

In consequence of the long-drawn liberation war of the Ukrainian people against the Polish nobles domination (1648–1654) the Nestervar castle was destroyed finally and the town was burnt down. Polish and then Ukrainian magnates returned to the estates. Uman and Tulchyn passed into the ownership of Stanislav Pototskyi, which died being childless (Aftanazy, 1996). The estate carried over his nephew – the Kyiv voivode Frantsishek Selezy Pototskyi – the "little Rus king", which owned the lands of Podillia province.

In 1775–1776 his son – the count Stanislav Shchesny (Felix) Pototskyi transferred his residence from Khrystonopil (which passed into the ownership of Austro-Hungary after the division of Polish-Lithuanian Commonwealth) to Nestervar and renamed it Tulchyn (Malakov, 1980).

The new owner erects a new "huge" palace instead of the old wooden house, which was radiant with its royal luxury and takes abode there with his wife Josephina Mnishek. The Polish researcher Aftanazy (1996) wrote that Pototskyi firstly settled the deteriorated small town and expanded his possession, having retained the Tulchyn court as an economic and administrative center of his estates (F. 49, 1760–1799). Except for the palace, Shchesny built in the town a row of the cultic structures: in 1779 the Mikholay and Assumption Churches and in 1780 restored the existing but ruined by the Tatars the Dominican Cathedral, which in the miniature resembles the St. Peter's Cathedral in Rome (Potupchik, 2006). In the year of 1805 he built the Roman-Catholic Cathedral of St. Stanislav.

The town as well as the palace were building up according to the name Edict of Stanislav Shchesny Pototskyi and by the hands of the peasants belonged to the Tulchyn estate. The quarries and the brick factory built in Tulchyn provided the construction sites with the building materials (Chubina, 2010).

Apart from the latter, Pototskyi laid out the park, and for this purpose, he delivered one million of pyramidal poplars from Italy, which were planted in the form of the alleys at the entrance to the town and in all the estates of the owner as well (Aftanazy, 1996). In addition to the park Stanislav also founded the forest and caretaking service, skillfully managed agriculture and cultural life of the peasants that promoted the increase of

his authority among the inhabitants. Therefore, after all the placemaking arrangements for his lands and construction of an incredibly beautiful palace, the turbulent life was pulsing through Tulchyn.

Ensemble planning in Tulchyn is empowered with the scheme being typical for the palace and park complexes of the second half of the 18th century (Fig. 1). The tremendous central size was connected with the semicircular galleries and side wings. Considering the date of the edifice (1782), that is, two years before the erection of the similar south façade of the palace in Lazenki (Poland), this palace had risen to a level of the most important monuments of classicism (Rolle, 1864).

The palace is supposed to be built in 1775 or in 1782, depending on the different data. The main problem concerned the authorship determination of the palace ensemble erection as well as the other questions lies in the utter absence of the early sketching of the original primary sources. In the pre-revolutionary monographs about the Tulchyn palace there often are mentioned the names of the architect Lecrua and his co-author known as a famous courtier architect of Pototskyi, the Italian painter Lampi (Krzyżanowski, 1862).The data of the Universal Illustrated Encyclopedia, published in Madrid in 1967 have been of the particular interest for the monument authorship determination. The priority, may be, could be given to the French engineers Francysk Migel Lecrua and Francysk De La Tour. However, the question concerned the Tulchyn palace design authorship has not been solved yet.

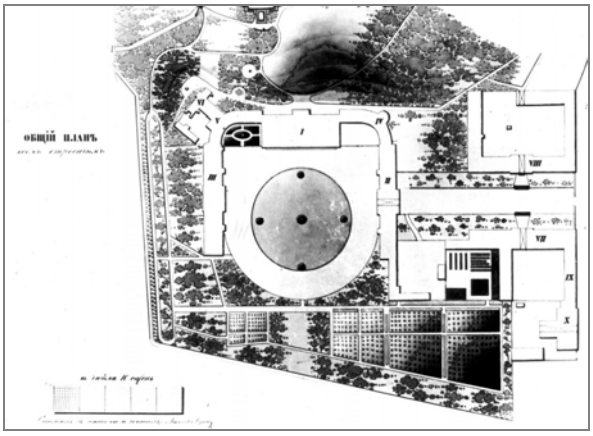

Fig. 2. The plan of the estate.
(Atlas Stroganova M., 1872)

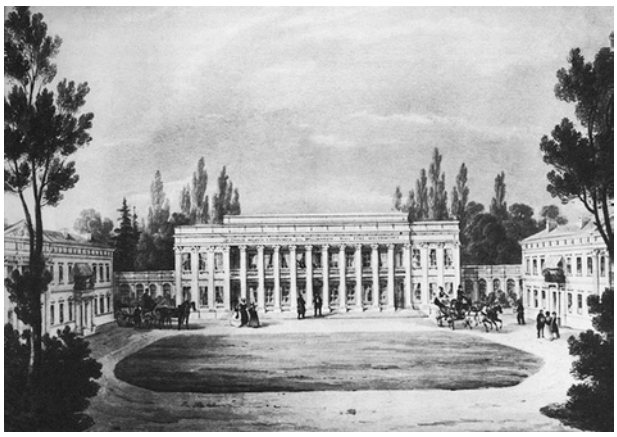

Fig. 3. The palace.
Watercolor by Rikhter, 1835

In Lenin Street in Tulchyn there is another palace built by Shchesny Pototskyi for his wife Josephine, so called the “new” one, which is less by the size and is inferior in architecture and grandeur but, at the same time, is no less well-known (Malakov, 1980). The old and the new palaces were linked by the underground passage with the width that let take a ride of the four horses.

The architectural ensemble in Tulchyn of Vinnitsia region has in its center the two-storey palace and the two wings, which are united with the main building by the arched one-storey galleries (Timofienko, 1993). The court of honor between them has the parameters of 120× 80 m and commands a big round grass lawn in the middle, opened in the south towards the town (Fig. 2). Such way of modelling and designing the lawns one can often see in the contemporary cities, as it is described in the article of the candidate of architecture, professor Petryshyn (2016).

Originally, the straight alley, that changed into the street, connected the palace and the Roman Catholic Church in the center of Tulchyn. It expresses the principal axis of the construction, namely: the palace as the symbol of a leadership power and the church as the symbol of a religious one (Malakov, 1980). The second axis is perpendicular to the first one and intersects the court of honor to the side wings along their central porticos of the Doric order, which are crowned by the triangular pediments (Fig. 3). Just this axis comes to the passage arch in the central part of the right wing and past the road, which runs among the economic buildings and leads to the street. This road served the function of compositional symmetrical axis of the entire service complex: it had the stables to the right and the theatre and the riding-hall to the left.

The architectural composition of the main building is performed on the basics of the rhythmical vertical partition of the facades by the Ionic columns and pilasters. The façade is notable for the showy loggia to the rhythm of the ten Ionic columns, which support the entablature and the parapet. The pilasters of the same order

are present on the side risalits and engird the whole palace. Beneath the parapet of the main façade one can read the inscription: "May always be the dwelling for the free and the virtuous" (Jaroszewski, 1982). The inscription was melted in 1863 into the bells for the Assumption Cathedral. The roof of the main building was covered with the gilded copper, which was being polished during the great solemn events so, that their sparkling was seen several miles from the palace (Potupchik, 2006).

There were the three massive entrance carved doors and the front marble staircase. The middle door was embossed with the gilded blazonry of Pototskyi family. Prior to the 20th century the plastic walls, cornices and insertions made of white and pink marble.

One of the rooms contained a beautiful fireplace made of pink marble (Ohocki, 1857). The palace halls were divided into the staterooms located on the second floor and intended for the official representation and residential ones situated on the ground floor. The furnishing of the interior salons was beautiful, rich and with tasteful European elegance. Prior to, 1863 there was a large art gallery, which contained the works by Raphael, Tizian, Michelangelo and other well-known painters (Chubina, 2010). The room of numismatics as well as the library with more than 10 000 volumes, were of great value too. Polish writer U. Nemtsevych (1848), which visited the palace said that "just the suburbs of this big town testify to its landlord, the excellent roads, bridges and unprecedented in this area plantations, and, of course, a huge park with Italian poplar trees and unknown here pine trees impress the traveler… Furniture, paintings, crystal, bronze, marble could only be brought from distant lands by those landlords that didn't measure their wealth, everything is of luxury splendor and I have never seen such a rich gateway"(Fig. 4).

The lateral buildings of the palace are extremely elongated towards the axis, the facades emphasized by the Doric porticos have the tall triangular pediments and pierced with the arch openings.

The pediment tympanum of the eastern and western wings was filled with a high relief heraldic composition and weapon attributes included ancient torsos wearing the cuirass and the helmet with count crown flanked the weapon and prolonged shields (Fig. 5). The latter contained the monogram of the letters "SP" meaning Stanislav Pototskyi. From the side of accessed road the shield of the tympanum have the family arms: to the left – "Pilawa" of Pototskyi family, to the right the fan of seven ostrich feathers – the arms of the Mnishek family (Lobko, 2008).

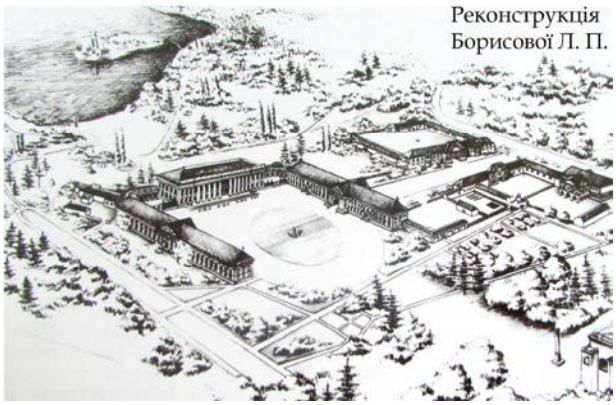

Fig. 4. Estate reconstruction
(Borisova, 1974)

Fig. 5. Main axis palace-cathedral".
(Rytus, 2016)

The problem of sewerage and heating systems in the palace was solved in up-to-date way. The water closets had to be situated in a middle part of the main building as well as in the three places of the wings. The vertical canals joint with the horizontal ones led up to the ground floor of each building under the floor. Further canals connected them with the reservoirs hidden in the ground at the bottom of the garden. The heating was provided due to the canals placed in the inner walls of both floors. Apart from the marble fireplaces, which gave only inconsiderable increase in temperature, some premises of the palace contained the stoves. Several such stoves had been preserved yet to the postwar period (Rolle, 1864).

From the very steps of a park facade, decorated with a classical four-column portico, there set in the glade with the easy slope towards the pond, where a beautiful park had been laid up. The park "Khoroshe" was

one of the masterpieces of gardens and parks design and one of the first patterns of a free landscape composition in Ukraine. According to the most of information sources the name "Khoroshe" or "Khoroshyi" was often met, but one can suppose that such name came as the transformation of a quondam, forgotten first name "La Roche" or "La Rochelle", given by the builder of the park Pierre Lenro (Aftanazy, 1996).

A view of the park one can contemplate in the on-location photo album of the second half of 19th century kept in the department of reproduction of Ukrainian National library by V. Vernadskyi. Landscape English park had the image edge of a natural park with the alleys, the groups of trees and scrubs beautifully arranged in different parts of the park with the majestic trees around, among which the water of an artificial pond gleamed from time to time. As the trees reached, almost, gigantic proportions and later on, wholly eclipsed the palace façade, they had to be cut (Fig. 6). In the middle of the Park, there were canals which divided it into several parts. The graceful wooden bridges joint the islands and the bank. One could get to the island by barge or ferry (Chubina, 2010). There were the several man-made ponds in the park. The artificial decorative structures, such as the alcoves, the copies of marble ancient statues – the works by masters of those times, adorned the park.

Such personalities as the best Polish poet Stanislav Trembetskyi, Italian painter Lampi, famous Polish writer Joseph Krashevskyi and Hungarian composer F. List created their works in Tulchyn. Among the guests of the Tulchyn palace were the Polish King August Ponyatovskyi, Turkish sultan, prince Potyomkin, military leader Suvorov, Russian emperor Alexander II, national Polish heroes Tadeush Kostyushko and Joseph Ponyatovskyi (Aftanazy, 1996).

In 1788, Shchesny Pototskyi left to Italy and Switzerland for a long time (Krzyżanovski, 1862). Being abroad, he attracted his attention to a beauty Greek woman Sophia de Witt. Over the complex social and political situation and his strained relations with Polish King August Ponyatovskyi, Shchesny Pototskyi in his views became in favour of Catherine II and returned to his estate in Tulchyn in 1795, when Podillia lands were the part of Russian Empire. Pototskyi got a divorce from Josephine and got married Sophia Pototska (Kolesnyk, 2007).

A distant cousin of the owner of Tulchyn, Leon Pototskyi (1876), as a child participated in one of the annual family meetings and left his recollections: "Life in Tulchyn proceeded with a royal swing. The house was always crowded… The most intensive period of fashionable life in Tulchyn was always May, as all the relatives and numerous invited guests gathered there for several weeks, since, apart from numerous kin, the landlords of all the surrounding, even from Austria and Prussia came to the estate of Pototskyi…" However, the owner of the estate did not happen to live there for a long time.

The death of Stanislav Pototskyi in 1805 became a beginning of the end of the Pototskyi family. After a while, on 18 October 1807, there was accepted a settlement agreement between the heirs concerned the distribution of the count Stanislav Pototskyi inheritance. In accordance to the agreement, his son Yerzi got the Bratslav Key, but he could not manage the household and even did not want to do it, and therefore, only wasted money, as well as got rid of the lands (Malakov, 1980). In 1809, after the death of Yerzi, the Tulchyn estate was inherited by Mechyslav, the son of Sophia and Stanislav (Rolle, 1964). From 1853 to 1856 the palace was used as a military hospital (Potupchik, 2006).

In 1869, Mechyslav Pototskyi sold the Tulchyn estate Maria, the daughter of his brother Boleslav. At that time, she already assumed the surname of Stroganova. So far as, Maria and her husband, the count Stroganov, chose the Nemyriv to be their main residence, they decided to sell the estate in Tulchyn. For a long time, the palace did not serve a particular function (Lobko, 2008). Since 1892 and up to the revolution it housed the officers' casino (Fig. 7).

Fig. 6. Park. Watercolor.Early 19th century

Fig. 7. Photo of the palace in 1912

In 1911, the palace together with a large garden were changed into the caserns and the officers' sitting of the 76th Kuban infantry regiment (Chubina, 2010).

During the period of 1916–1918, it was carrying out a current renovation of the buildings and since then, for the last decades, no building had not been considerably changed in structure, except the interior alteration, old bulkheads elimination and setting the new ones, etc., (Potupchik, 2006).

After 1918 and up to 1974, the palace was used for the placement of different military units and in 1928, the fire destroyed the top floor. In 1975–1978, the architect L. Borisova developed the project on the palace buildings restoration with the purpose of housing there the city cultural and educational college, which still functions. In 2004, the project on the left wing conservation was developed, in 2005 – the emergency project for a central portico of the eastern wing (Potupchik, 2006). In 2016 – the emergency project for renovation of a central portico of the eastern wing from the street side of the palace were developed, as well The left gallery was destroyed in 2008 and to date no reconstructions concerned it have been implemented.

Stanislav Shchesny left us a unique historic and architecture heritage: the Dendrological park "Sophiyivka", the Tulchyn estate, called "Podillia Versailles", the book collection of a unique value, a great number of religious buildings, etc.

The special features of Tulchyn palace and Park architecture reflected to varying degrees the life, tastes and cultural level of the owners. It was an incomparable art world – the communication environment for artists, writers, philosophers, musicians etc. The singularity of the estate architecture as well as the park and garden art of the Pototskyi family in Tulchyn lied in the development of these masteries in the context of all-European culture and architecture, mirrored the ideological and artistic accordance with the classicistic canons.

The question of a present-day conditions and the restoration of the monument is being highlighted by the journalists of Vinnitsia periodicals in order to attract the Ukrainian society attention to the problems of preservation of the state cultural heritage.

Architectural and cultural system of the early classicism keeping its vitality and gaining momentum, established the steadfast principles of composition solutions just concerned the palace edifices in all the territory of Ukraine and in Eastern Podillia in particular.

The palace ensemble of Pototskyi family in Tulchyn is a monument of nation's foremost architectural landmarks and a brilliant representative of the classicism period among the seigniorial estates constructed in Vinnitsia region. It finds its particular niche, being unique and, at the same time, a benchmark pattern of the early classicism style.

4. Conclution

The article reveals and highlights the question of the palace formation and development as well as its stylistic features and the change of its functional application from the late 18th to early 21st century. Theoretical processing the results of carried on generalized research gives the opportunity to show totally the typical architectural and planning as well as compositional and spatial peculiarities of the development of the Pototskyi palace in Tulchyn inherent the style of the early classicism and its established principles.

The palace and park ensemble was being created like the synthesis of architecture, art and nature and was a real museum, since it housed an invaluable collection of cultural works. Stanislav Shchesny Pototskyi became the creator of social and politic, economic and cultural processes and the founder of traditions and his era trends in Podillia region as well.

It was determined that the style trends used in the architecture of the palace developed according to the succession of all European established tendency of the early classicism accompanied by the specific regional peculiarities.

Prospective further restoration of the palace could attract the tourists coming not only from central Ukraine, but also, from its other parts and promote future revival of entire architectural ensemble "Podillia Versailles", since, the preserved palace of Pototskyi in Tulchyn serves as a creative laboratory for the study and refinement of the stylistic techniques of the era in the practice of modern construction. Therefore, the study and analysis of the past as well as the revival of the lost would become the guarantee of preserving the uniqueness and singularity of Podillia towns and villages, harmonious combination of ancient and modern in them.

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АРХІТЕКТУРНИЙ АНСАМБЛЬ ПОТОЦЬКОГО В ТУЛЬЧИНІ, ЯК ЕТАЛОН ЕПОХИ КЛАСИЦИЗМУ НА СХІДНОМУ

Анотація. *У статті проведено історико-архітектурний аналіз палацово-паркового ансамблю Потоцьких в Тульчині на Вінниччині. Проаналізовано джерельну базу, попередні наукові праці та визначено, що питання дослідження палацово-паркового ансамблю в Тульчині не було розглянуто комплексно для Східного Поділля та в контексті європейського впливу. Доцільно провести подальше вивчення даної пам'ятки архітектури, її декоративних деталей та архітектурних форм, притаманних стилю класицизм.*

Метою статті є дослідження та комплексний аналіз пам'ятки архітектури національного значення – палацово-паркового ансамблю родини Потоцьких у місті Тульчин Вінницької області. У статті розглянуто основні періоди еволюція палацу: забудови, розквіту, занепаду та відновлення, з кінця XVIII століття до сьогодення.

Прослідковано вплив періоду європейського раннього класицизму на формування головних аспектів архітектурного середовища палацового ансамблю. Визначено, що палац Потоцьких у Тульчині є зразком ранньої класицистичної архітектури на Східному Поділлі та відображає суспільно-культурний розвиток даного регіону. Досліджено історичні аспекти становлення палацу та стан збереженості споруди від заснування до сучасної часткової реставрації. Проаналізовано композиційно-просторову схему маєтку та архітектурно-планувальні особливості палацу в контексті розвитку інших представників садибної архітектури раннього класицизму Вінниччини.

Розкрито питання забудови палацу з ідеєю зв'язку будівель "палац-храм", де головні складові знаходились на одній композиційній осі. Прослідковано, що від свого створення та до сьогодення палац Потоцьких майже зберіг свою цілісність та архітектурно-декоративне оздоблення, пройшовши довгий шлях часткових перепланувань та реставрацій.

На основі проведеного дослідження зроблено висновок, що серед чималої кількості садиб на Східному Поділлі, архітектурний ансамбль родини Потоцьких у Тульчині започаткував класицизм у палацовій архітектурі у цьому регіоні та є неповторним і одночасно еталонним зразком раннього класицизму Вінниччини та України загалом.

Ключові слова: *палац, архітектурна пам'ятка, ранній класицизм, Потоцький, ансамбль, маєток, ордер, стиль, флігель.*

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NEW BUILDINGS IN THE HISTORICAL URBAN ENVIRONMENT

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Abstract. This article highlights the contextual approach to the renewal of the historical urban environment as the most complete and delicate one, which allows to comprehensively analyze the historically formed urban situation and to take into account all of its nuances in order to harmoniously add the new building to it. The article shows the principles and techniques, which are used to harmoniously combine the new buildings with the historically formed urban environment. The proposed theoretical statements are examined in detail on the example of the project of renewal and harmonizing the new and old buildings in the historic street ensemble in Chernivtsi (Ukraine).

Key words: renewal, historical urban environment, new house-insertion.

1. Introduction

New buildings and historic urban environment. At first glance, these are diametrically opposed concepts. But this is an erroneous judgment, because these are interdependent and mutually complementary concepts. New buildings become the continuation and revitalization of the old urban buildings and environment, and historical buildings always remain its foundation and wealth. They have formed this environment and now it depends on them what additions can be made to this environment, that is, what new buildings can be in it.

There are different approaches to renewing the historical urban environment [1, 2, 3, 4, 5, 6]. The most complete and delicate is the contextual approach. It allows doing the comprehensive analysis of the existing urban environment, to take into account all its nuances, in order to organically fit the new building into it. It's not just about the existing architecture and urban planning situation, and as well as about the factors under the influence of which they were formed throughout the history of the city, and how these or some other factors affect the modern architectural and urban planning situation in the city. Therefore, the main task of this approach is to take into account all the existing environmental features as much as possible, and that will allow integrating the new building into it maximally harmoniously.

Each time period was characterized by its own special determinants, which were reflected in a specific architecture and organization of urban space. Now their best examples are the historical and cultural heritage of the city. Over time there were changes in the public practices and, accordingly, in the urban sociocultural space. Special layers were formed. Less notable "erased", they replaced by more important for the particular time period. Only the most significant ones have remained. They passed from one time period to another and were supplemented by new signs. Today, the historical urban environment is a definite social spatial temporal formation, in which modern life processes are already taking place. The creation of the new or renewal of the existing urban space is a consequence of the society renewal. New social practices will reflect the new social conceptual determinations. Only the fundamental principles of its organization must remain unchanged [7].

2. Basic Theory Part

The purpose of this article is to show what the new building should look like, that is harmoniously inscribed in the historical urban environment, to reveal the principles and techniques of harmonizing the new building and historically formed. On the concrete example, to demonstrate what needs to be done to make the new building a harmonious addition to the existing ensemble of the historic urban street, to enrich it, to contribute to its sustainable development.

The method of comparative analysis and generalization was applied to determine the principles and techniques of the harmonious adding the new building to the historical urban environment. The proposed projects of the renewal and harmonization of the ensemble of the historic street in Chernivtsi were carried out after in-situ surveys and pre-project analysis. The methods of factor analysis, abstraction and accompanying changes were applied to determine the features of the formation and development of the historic urban environment, proposed for renewal. The analysis of its functional development was carried out. The most typical and sustainable functions for this part of the urban area were identified on its basis. The new functions were defined. They can harmoniously complement the existing ones, bring the new life impulse to the historical urban environment and ensure its sustainable development. The result of the composite analysis of the existing buildings of the street was the decision to create the new accent building-insertion, which would be able to restore its broken integrity. Morphological analysis of the existing buildings made it possible to decide on the correct planning dimensions, volume and new forms for the facades of the new building. They must be subordinated in size, parcels and forms to existing historical buildings. This approach is necessary to preserve the street buildings ensemble. The method of experimental design was used to develop the proposal for entering the new house-insertion in the historic street ensemble.

3. Results and Discussion

So, the historical urban environment in the process of its existence has always undergone certain changes. New buildings have appeared on the sites of the destroyed or outdated ones. In this case, it is very important that these new buildings and the changes that have come along with them do not violate the compositional, planning and spatial features of the historical urban environment, its traditions and at the same time can breathe the new life into it. The new life is a new function that will activate it, a new infrastructure that will improve its quality, new buildings that will complement existing ones and replace the destroyed and, most importantly, people who will be able to fill it and revitalize it [8].

The main principles of renewal of the historical urban environment should be tolerance, continuity and harmonious addition [8]. In this case, it will retain its authenticity, historically formed characteristics, and will get the new development, which is necessary for it at the present time, and thereby ensure its sustainability.

The compliance with the principle of tolerance will allow preserving the dominant importance of the architectural monuments and the valuable historical buildings in the existing urban environment. In this case, the new buildings must be completely subordinated to the existing planning and spatial composition of the historical buildings, to the traditional architecture. There are a number of techniques with which it is possible to reveal the principle of tolerance and harmoniously fit the new building into the historically formed and developed architectural situation. I'll give the examples of the most important ones, in my opinion.

Hidden restoration (Fig. 1) is the example of erecting a new building in the same style as the existing historical buildings. Imitation (Fig. 2), is the technique used to harmonize the new buildings or fragments of the new building with the existing architectural monuments and the valuable historical buildings by introducing in the facades the particulars of the new buildings completely imitating the historical ones.

The principle of continuity allows preserving the unity and integrity of the historical environment. The new buildings are considered as a harmonious continuation of the historic buildings. They get the traditional sizes and shapes that are typical for the buildings in this historical urban environment. The continuity in the shape and angles of the roof slopes, in the detailing of facades for new buildings (Fig. 3). The continuity of new buildings can be provided by styling their facade solutions (Fig. 4).

At the same time, the new building begin to take historical, but simplified, stylized forms of the fronton completion, finishing of the window and door openings, decorative details [9]. Usually, this is the stylization of the characteristic details of the existing architectural monuments or the historical valuable buildings in order to support the existing style direction of the historical urban environment.

Fig. 1. Hidden restoration. Brussels, Belgium. Author photo

Fig. 2. Imitation of the historical forms in the new buildings. Brussels, Belgium. Author photo

Fig. 3. Continuity of sizes and shapes for new buildings. Strasbourg, France. Author photo

Fig. 4. Stylization of the new buildings. Legnica, Poland. Author photo

The principle of harmonious complement is aimed at ensuring the sustainable development of the historical urban environment. The new, added building receives the new forms, but is subordinated to the historical (Fig. 5). The new buildings should be regulated and subordinated to historical buildings by composition, scale, number of stories, forms and parcels of facades. Herewith, it is correct to use regional features in the formation of the volume of the new building (traditional forms of roofs and facade details).

The question of harmonious addition is easily solved if the new building must be located in the line with existing historical buildings. Much more difficult task set before an architect is the one, when the new house-insert must fill an empty corner of the historical street or square. The new building at the same time should not be just an ordinary insert but insert accent. The new hotel building in the historical urban environment of Poznan is very good example of such solution, in my opinion (Fig. 6).

This Hotel PURO, designed by the Polish Bureau ASW Architects, was built in the old Jewish quarter, on the stretch between three narrow streets, near the building of the former "Great Synagogue" of the early 20th century. It is one of the few examples of the modern architecture in the historical environment of Poznan [10]. This building is not only organically fits into the existing historic urban environment, and therefore it is the new high-quality architectural and functional accent.

The result of any competent renewal of the historical urban environment should be a high-quality urban architectural environment for permanent residence and temporary comfortable stay of people, multifunctional, with a developed social infrastructure and public spaces [11].

Fig. 5. The subordination of the new building to the historical ones. Ghent, Belgium. Author photo

Fig. 6. A new accent angle fixation in the historical environment. Poznan, Poland. Photo [12]

In addition, the new buildings would be not only harmoniously integrated into it in their volumes, stories, forms, architecture and functionality, they also must be energy efficient. Energy efficiency and independence from fossil energy sources is one of the main issues in the sustainable urban development strategy.

I want to dwell in detail on the example of the renewal and harmonization of the historical urban environment of Chernovtsy in Ukraine. This is the project of introducing the new building-insertion into the existing ensemble of the historical street in the center of the city, which is based on the contextual approach to the renewal of the historical urban environment.

Chernovtsy was founded in XII century. The city has a rich history of formation and development. Its historical urban environment has absorbed different cultural features and preserved unique monuments of architecture and town planning, in the style features of which the multinational influence is reflected. The urban historical architectural environment was formed on the combination of regional features and transformation the best architectural and construction achievements of the Austro-Hungarian, Romanian, Polish, Czech and Russian cultures to the local conditions. Such cultural diversity greatly enriched and determined the uniqueness of historical urban building. It has received a distinctive feature – the combination of the multinational architectural features in one small area [9].

Kobylianska Street is one of the central streets of the city, mostly pedestrian. Most of its surviving historical buildings date back to the end of the XIX and beginning of the XX centuries and are the monuments to the architecture of Art Nouveau and Constructivism (Fig. 7).

In addition to the residential and public buildings, which now are the monuments of national, regional and local architecture, this street also includes the number of valuable historical and modern buildings. And what is more, it can safely apply the definition of the street ensemble to the considered historical buildings.

In spite of the very high degree of the preservation of the existing historical environment, there are the number of so-called “white spots” in the street, the places, where the historical building has not been preserved, and its territory is not built up, or a temporary structure has been built on it in the form of a single-storey pavilion (Fig. 8). Such places destroy the overall composition of the street, break its holistic perception. The new house-inserts are needed for such places.

And, in this case, it’s necessary to add the new building not just to the historically formed urban environment, but to the street ensemble. This requires the use of additional techniques of harmonizing the historical and new buildings. Let us consider in more detail how this can be done on the example of one project.

This project was carried out within the framework of the international student contest on the sketch-idea of the harmonization of the public space of Chernivtsy historical environment and won the second prize (Fig. 9).

The projected new house-insert is located in the structure of the historically formed quarter, at the intersection of two streets, pedestrian and with transport traffic. Its volume must fix the angle of the quarter.

The project of the new building was aimed at creating the sustainable architectural solution of the historic street renewal, so it was necessary to take into account the existing urban environmental context as much as possible. First of all, it is the existing town-planning situation, according to which this new building is not just an ordinary insert, but the new accent, that fixes the corner. Therefore, its architectural solution should be subordinated to the existing ordinary historical buildings and at the same time be allocated as the new accent of the street, stressing the intersection of two streets and determining the main direction of pedestrian traffic. It should take into account the nature of the surrounding buildings, which was formed under the influence of historical, natural and climatic, regional building and architectural features, social and economic factors, and at the same time it should bring the new life impulse to the existing urban environment.

Fig. 7. The buildings of Kobylianska Street in Chernovtsy, Ukraine. The current situation. Photo [13]

Fig. 8. The view of Kobylianska st. from Armenian str. in Chernovtsy. The current situation. Photo [13]

Fig. 9. The house-insert in Kobylianska str. in Chernivtsy, Ukraine. Project proposal, second prize.
Created by the student of ABS-67, KNUCA Holovatiuk Alina;
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A detailed pre-project analysis was carried out. It allowed compiling a detailed initial database. After analyzing the current situation, the tasks that had to be solved were identified and the strategy for their solution was determined. It's necessary:

– to keep the formed atmosphere of the historical pedestrian multifunctional street, where local residents come to spend their free time, and tourists to see how the city lives; to keep and to maintain the status of the street as the calling city card;

– as delicately as possible to fit the new building into the historically formed existing architectural environment, namely, preserving the historical storeys, the parceling of the facades, the shape of the roof slopes, applying the stylization of historical forms in decoration, traditional materials and the coloristic solution;

– to highlight this building as an accent by arranging the accent corner bay window, and the corner terrace on the attic floor; by organization of the main entrance to the ground public floor of the building on the side of this bay; this entrance will fix the corner;

– to create an attractive space for all age categories people due to its multifunctionality and functional flexibility, transformability, due to inscribed additional objects of social infrastructure, places for active and passive recreation;

– to create the barrier-free space, convenient for movement of different categories of users;

– to preserve and to increase the social value of the existing historical urban environment by its functional addition with the new original functions, which today are not enough on the street.

Here there are many residential buildings with restaurants, cafes, shops and souvenir shops on the ground floor. In addition to the main residential function, the new building will have the object of cultural and cognitive function in its structure, namely, the "Chernivtsy Media Center", which will be located on the ground floor. This means that the new building should enrich the existing urban environment by supplementing it with the cultural function.

Proposed on the first - third and mansard fourth floors, residential apartments are designed for families of 2–4 people, middle-income. There are apartments with the high level of comfort. Visual comfort is achieved by providing the necessary insolation due to the correct orientation of the rooms and the size of the window openings. Acoustic comfort is provided by noise insulation of external and internal walls, ceilings and by using the noise-absorbing insulating glass units SGG climatop acustic in the window openings. Climatic comfort is achieved through the organization of protection from overheating of the premises in the summer through the window openings on the south and south-west facades; due to the thermal insulation of the building on the outer shell without thermal bridges; due to the natural ventilation of the apartments in the off-season and forced ventilation through the recuperator in winter and summer. The proposed thermal insulation will save on building energy consumption for heating its indoor premises in winter and cooling them in summer. This will allow the house to be cost-effective with low maintenance costs.

The building provides for technical rooms and places for communications of engineering equipment. It is possible to use the energy of the sun and earth for the operation of the recuperator and heat exchanger for ventilation; ground-water heat pump for heating and cooling; as well as solar energy for the evening illumination of the facades; for the hot water supply.

As a result of such building construction, the historical urban environment will be functionally enriched and will be supplemented by the new harmonious house with comfortable living conditions. The proposed approach of using energy-efficient technologies, renewable energy sources for the energy supply of the new building and reduction of harmful emissions into the atmosphere will contribute to the sustainable development of the urban environment.

4. Conclusion

Thus, the task of any new building, which is inscribed in the historic urban environment, is to preserve its value and to support its sustainable development. For this, it must become the harmonious

continuation of this environment. To become the harmonious continuation of the historic urban environment the new building must:

– be subordinated to the formed historical character of the surrounding houses, their scales, volumes, number of storeys, parcels of its facades;

– be continuity in form-building, based on a regional context;

– be functional supplement to it, enrich and enliven it, which will lead to the increase of its quality;

– be made of the eco-friendly modern building materials, using energy-saving technologies, which will allow to obtain high indicators for its ecology and energy efficiency and ensure sustainable development of the urban environment.

The principles and techniques, used to fit the new building into the historically formed urban environment, depend on its value and the degree of preservation. As a result, regardless of use of renewal principles and techniques, the historical urban environment must retain its authenticity, historically formed planning, integrity of the voluminous-spatial composition and at the same time get its new currently relevant development. This will ensure its sustainability.

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Нелля Лещенко

НОВІ БУДИНКИ В ІСТОРИЧНОМУ МІСЬКОМУ СЕРЕДОВИЩІ

Анотація. *У статті порушено питання, якими мають бути нові будівлі, що зводяться в історичному міському архітектурному середовищі? Вони повинні бути його гармонійним продовженням і активізувати його, максимально враховувати історично сформовані особливості і одночасно відповідати сучасним вимогам. Виділяється контекстуальний підхід до оновлення історичного міського архітектурного середовища як найбільш делікатний і цілісний, який дозволяє всебічно проаналізувати історично сформовану міську ситуацію, врахувати всі її нюанси, щоб гармонійно вписати в неї нову будівлю. Результатом будь-якого грамотного оновлення повинно стати якісне міське архітектурне середовище для постійного проживання і різнотривалого комфортного перебування в ньому місцевих мешканців і гостей міста. Нові будівлі повинні привнести новий життєвий імпульс в сформоване міське середовище і*

забезпечити його сталий розвиток. У статті показані принципи і прийоми, які використовуються для гармонійного поєднання нових будівель з історично сформованим міським архітектурним середовищем. Дається оцінка значення їх застосування для збереження його сталості. Запропоновані теоретичні викладки докладно розглянуто на прикладі проекту оновлення і гармонізації забудови ансамблю історичної вулиці в місті Чернівцях (Україна). Цей проект був виконаний після проведення передпроекного аналізу, за яким були визначені особливості формування та розвитку запропонованого до оновлення історичного архітектурного міського середовища. Був проведений аналіз його функціонального розвитку для виявлення сталих, найбільш характерних для даної частини міської території функцій. Запропоновані нові функції повинні гармонійно доповнити існуючі, привнести новий життєвий імпульс в історичне міське середовище і забезпечити його сталий розвиток. Результатом проведеного композиційного аналізу існуючої забудови вулиці стало рішення про необхідність зведення нової акцентної будівлі-вставки, яка б змогла відновити її порушену цілісність. Морфологічний аналіз існуючої забудови вулиці дав можливість прийняти рішення щодо коректних планувальних розмірів, об'ємів та нових форм для фасадів нової будівлі. Вони мають бути підпорядковані існуючим історичним будівлям. Такими підхід необхідний для збереження сформованого ансамблю забудови історичної вулиці і забезпечення його сталого розвитку.

Ключові слова: *оновлення, історичне міське середовище, новий будинок-вставка.*

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"LVIV POLYTECHNIC – MOTHER OF TECHNICAL EDUCATION IN POLAND": PROFESSORS AND GRADUATES OF THE LVIV POLYTECHNIC AFTER THE SECOND WORLD WAR

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Abstract. The article presents the area of activity of Polish professors and graduates of the Architecture Department of Lviv Polytechnic after their forced emigration in 1946 from Lviv. Their professional and educational activity under the new social and political conditions was shown. Their contribution to the formation of professional architectural education in Poland in the postwar period was determined.

Key words: Lviv Polytechnic, Poland, architectural school, postwar period

1. Introduction

After the Second World War, as a result of geopolitical changes, Lviv became a part of Soviet Ukraine, and this fact has caused the significant changes in the activity of most state institutions, including the educational ones. Not only the changes in political structure, but the forced mass exodus of ethnic Poles has transformed educational system. Polish scholars moved to Poland and created new vocational centers there. Their contribution is yet to be appreciated, but even now, it is written that Lviv Polytechnic is the mother of Polish technical educational institutions. This was the name given to Polytechnic by the authors of the jubilee book dedicated to Wrocław Polytechnic 50^{th} anniversary. They wrote, "The importance of Lviv Polytechnic for developing technical sciences, for creating Polish academic staff, forming technical staff, developing industry, forming Polish technical terminology, then, twice in 1918 and in 1945, for developing Polish educational institutions, is immense" [1]. These words fully refer also to architects.

2. Analysis of recent researches and publications

Today, the theme of the activity of Polish teachers and scholars, as well as practicing architects, has become the subject of many scientific articles and even books. The materials of the article are based on the analysis and synthesis of information from published sources (mostly Polish authors). But the published materials do not yet form a coherent picture of the influence of the traditions of the Lviv architectural school on the formation of Polish architecture after the Second World War.

The purpose of the article is to show the importance of the professors and architects of the Lviv Polytechnic's Architectural Department for the formation of professional architectural education in Poland in the post-war period.

3. Basic Theory Part

In 1944 after the liberation from fascist invaders the activity of Lviv Polytechnic institute was recommenced, but changed. The postwar changes appeared to be radical and were connected with the mass leaving of the ethnic Poles. On 6 December 1944 p. at the meeting with the Lviv intellectuals Ivan Hrushetsky

the secretary of Lviv Communist party committee informed that the teachers, which want to teach in Polish had to leave and those who remained had to agree with the fact that Lviv became a Soviet city subordinated to Soviet legislation [2]. The staff of Polytechnic was faced with a painful choice: to remain or to leave … The problem was solved almost unanimously, namely, to leave[2]. At the general meeting of the Lviv Polytecnic teachers the decision concerned the moving to Gdansk of a scientific staff with the purpose of its activity continuation at the education establishment under the title Naval Polytechnic was made. However, the Warsaw authorities sent the refusal, as they considered the teachers of Lviv Polytechnic to have to intensify the education not only in Gdansk but in the other Polish towns such as Wroclaw, Hlivitsi, Krakow as well [3].

A real exodus started just at the end of spring in 1945. The first group of the former Polytechnic teachers departed from a railway station Peresenkivka to Krakow, Gliwice and Gdansk. Then there was the next group, which went out on October 28 to Krakow, Gliwice, Wroclaw, Poznan and Gdansk. The last group went to Poland in June 1946 [4]. As from 1945 only a professor of Polytechnic architectural department Jan Bahensky and a former teacher Marian Nikodemowicz remained to work at Lviv Polytechnic institute.

Not only the teachers of Architectural department, but the students and the practicing architects moved to Polish People's Republic. In a matter of months there was no ethnic Poles-architects left in Lviv.

The biggest number of staff of the Faculty of Architecture of Lviv Polytechnic, who emigrated to Poland, stayed in Wrocław and Gliwice. Many of them emigrated to Kraków and Gdansk. Witold Szolginia went to Warsaw. In total, 45 people of the academic staff emigrated. Among them, there were those who were already professors, and those who obtained their academic titles working in Poland.

Wrocław became the biggest centre, where immigrants from Lviv stayed. Most of professors stayed there due to the favorable conditions, since almost all buildings of the former educational institutions were kept and there was an opportunity to find the accommodation as well. Among the professors who stayed in Wroclaw Polytechnic were Tadeusz Wróbel, Tadeusz Broniewski, Julian Duchowicz, Kondrat Dyba, Marian Rechorowski, Janusz Szablowski, Andrzej Frydecki, Bronisław Wiktor Tadeusz Brzoza, Kazimiez Ciechanowski, Dobrosław Chajka, Jacek Fuliński, Jerzy Hawrot, Stanisław Mielnicki, Andrzej Rzymkowski, Czesław Wajdzik [5].

T. Wróbel was the one who inspired the creation of the Faculty of Architecture at Wrocław Polytechnic. At first, the Department of Architecture existed within the Construction Faculty, which was eliminated in 1949–1950. Instead, the new faculties were created: the Faculty of Architecture and the Faculty of Engineering. The latter consisted of the two sections – Land and Water. The professors and alumni of Lviv Polytechnic were the organizers of separate departments and became the first lecturers of the Faculty of Architecture.

Tadeusz Stanisław Wróbel (1886–1974) was a prominent architect, urbanist and teacher represented the Lviv architecture school of the inter-war period. Before World War I, he graduated from Lviv Polytechnic. Since 1921 he worked first as an assistant and then as a constructor at the Faculty of Architecture. In 1939 he held the post of the Head of the Department of City Planning at Lviv Polytechnic. During German Occupation he taught City Planning, working at the same time as a construction consultant at Higher Technical Courses opened at the Polytechnic at that time. In October 1945, he moved to Wrocław, where he took part in the foundation of Wrocław Polytechnic. He worked at the Department of Land Construction and after the Faculty of Architecture and Construction had been established, he became its first Dean in 1945–1947. He obtained the title of Professor Extraordinary in 1948 and created the Department of Urban Studies [6].

Tadeusz Andrzej Broniewski herbu Tarnawa (1894–1976) came from Kraków. In 1923–1931, he worked in Lviv Polytechnic. Later he was the Director of the State Construction School in Jarosław. In 1944, he moved from Jarosław to Wrocław Polytechnic. Since 1946 he worked in Wrocław Polytechnic at the Department of the History of Architecture, which had been organized by him. He headed the Department until his retirement in 1964. The contribution of T. Broniewski to the development of Polish theory and history of architecture can hardly be overestimated. His monographs dedicated to the history of Polish and world architecture became classics [7].

Kondrat Dyba (1907–1991) began his studies at the General Faculty of Lviv Polytechnic in 1926. In 1929, he started working as a deputy assistant at the Department of Descriptive Geometry. In 1930, he began studying at the Faculty of Architecture. He survived the War and Occupation in Lviv. In 1944, he moved to Poland. Since 1945 he worked in Wrocław Polytechnic delivering lectures mostly in Descriptive Geometry for the specialties of

[2] In April 1945, 204 Poles worked in the Lviv Polytechnic, while the total number of employees was 272. See: Kalbarczyk S (2011), Czystka na uczelniach. Zagłada polskiego środowiska naukowego we Lwowie po '44, *Biuletyn IPN*, nr 3.

Mathematics and Geodesy, and later for the students of the Faculty of Architecture. He became the author of a new conception in teaching Descriptive Geometry [8].

Marian Rehorowski (1911–1973) was, first and foremost, a famous interior designer. He also studied in Lviv Polytechnic until 1939. After the end of the War, he moved to Wrocław. Because of certain circumstances, he managed to defend his diploma only in 1946 in Kraków Polytechnic. He taught subjects connected with interior and furniture design. More than 70 academic publications were dedicated to this topic.

Tadeusz Brzoza (1911–1985) graduated from the Faculty of Architecture of Lviv Polytechnic in 1939. During World War II, he stayed in Lviv, and, in 1947, he moved to Wrocław. Since that time, his life was connected with Wrocław Polytechnic, where he worked as a deputy professor and as the Head of the Department of Public-Dwelling Buildings Design. Later he headed dwelling buildings design institutions. In 1975, he became the Professor Ordinary [9].

Janusz Szablowski (1909–1982) entered the Faculty of Architecture of Lviv Polytechnic in 1929, and in 1934, he became a junior assistant at the Department of Polish Architecture headed by professor Marian Osiński. He received his diploma only in 1939. Since 1947 he lived in Wrocław, working in Wrocław Polytechnic at the Department of Rural Construction which was headed by the professor Tadeusz Brzoza. At the same time, he worked as a practicing architect and developing the projects of space planning of numerous cities such as Kłodzk, Bielawy, Dusznik, Kudowa, Radków, Nowa Rudф, Lewin Kłodzki, Mysłakowcy and Polanica. He also taught at other faculties of Wrocław Polytechnic. In 1986, he obtained the academic degree of Doctor of Technical Sciences [10].

Andrzej Frydecki (1903–1989) began his studies in Lviv Polytechnic in 1922, and, since 1928 he worked as an assistant and then associate professor at the Departments headed by W. Derdacki and W.Minkiewicz. When the War broke out, he was in Lviv, but in 1943, he had to leave the city because of Nazi persecution. In 1945, he went to Katowice, where he worked as an executive officer and then the director of the City Department in the Regional Board of Directors for space planning. At the same time, starting from 1945, he began to work at the Department of Utilitarian Construction of Wrocław Polytechnic [11].

Professor Dobrosław Chajka (1909–1992) received a diploma in Engineering after graduating from the Faculty of Architecture of Lviv Polytechnic in 1932. Apart from he painted a lot he created lot of designs. In 1945, he settled down in Wrocław, taking the post of a deputy professor and heading the Department of Drawing. Professor D. Chajka took an active part in the reconstruction of destroyed post-war Wrocław [12].

Jerzy Stanisław Hawrot (1911–1962) started his studies at the Faculty of Architecture of Lviv Polytechnic in 1930. He received his diploma in 1939. After German Occupation of Lviv, he moved to Kraków, where he stayed until the end of the War. In 1945, he was invited to Wrocław to help organize Polytechnic. He worked as an associate professor at the Department headed by T. Wróbel, and later at the other departments. In 1950, after he defended his thesis, he became the first Doctor, which obtained this academic degree at the Faculty of Architecture in Wrocław Polytechnic [13]

Stanisław Mielnicki (1898–1969) also studied at the Faculty of Architecture in Lviv Polytechnic. In 1924, he began his work as a lecturer first in Lviv, and then in Katowice, Tarnów and Bytom. After defending his diploma in 1926, he worked as a successful architect. Since 1946 he lived in Wrocław and started working at the Construction Faculty of Wrocław Polytechnic, where he headed the Department of General Construction. In 1949, he obtained the title of Professor Ordinary. He was the Dean of the Faculty of Architecture. In 1957, he moved to Kraków, where he started working at the Construction Faculty of Kraków Polytechnic [14].

The destiny of Bronisław Wiktor (1886–1961) was connected with Lviv Polytechnic as well. He started his studies in Lviv Polytechnic in 1905 at the Faculty of Architecture. At the same time he worked hard as a practicing architect, and in 1913, he began his teaching career at the Department of Architecture Forms. During the inter-war period, he also worked at Lviv Polytechnic and in the State School of Art Craft. In 1946, he had to leave Lviv and moved to Wrocław, where he started his work as an assistant of the Department of Drawing at the Faculty of Architecture. In 1951, he became an associate professor. Apart from his teaching and practical work, he took up painting and graphics [15].

Ewa Cieszyńska-Kazimirowska (1923–1972) started working as an assistant at the Department of Urban Studies headed by the professor T. Wróbel in 1949. She began her studies at the Faculty of Architecture of Lviv

Polytechnic in 1945, and, after the repatriation, she continued studying at the Faculty of Architecture of Kraków Polytechnic. She designed landscapes at the Department of Urban Studies in Wrocław Polytechnic, and, in 1963, she defended her thesis on the topic of landscape organization in Wrocław [16].

The merits of Lviv professors and alumni are genuinely priceless. They promoted creation of an extremely powerful Wrocław architecture school. Their teaching work was described in the book by Zenon Prętczyński "Memories about the professors of the Faculty of Architecture of Wrocław Polytechnic (from the years of studies 1947–1952)" ("Wspomnienia o profesorach Wydziału Architektury Politechniki Wrocławskiej (z lat studiów 1947–1952)") with great love and respect.

The role of Lviv professors in organizing the work of Sląsk Polytechnic was invaluable. Sląsk Polytechnic was the only higher educational institution to be organized from scratch. When it was just founded, it had neither the premises of its own nor the infrastructure. The opening of Polytechnic took place on May 24 1945. There was no separate Faculty of Architecture. Instead, four departments specializing in Architecture worked within the Faculty of Construction Engineering: the Department of Architecture Forms and Design, the Department of General Construction, the Department of Utilitarian Construction, and the Department of Housing Settlements as well. In 1949, the Section of Architecture was created at the Faculty of Construction Engineering. And the Faculty of Architecture was opened only in 1977. Z. Majerski was its first Dean.

W. Derdacki, T. Teodorowicz-Todorowski, J. Duchowicz, Z. Majerski, F. Mauer, Cz. Thullie W. Śmiałowski, W. Buć were among those alumni of the Faculty of Architecture of Lviv Polytechnic, who developed architecture in Gliwice.

Władysław Dominik Derdacki (1882–1951) was also Lviv Polytechnic alumnus of 1907. He worked as a senior assistant at the Faculty of Architecture. Later, together with W. Minkiewicz, he founded a design company "Derdacki i Minkiewicz" in 1911. Since 1914 he was a member of the Examination Board at the Department of Architecture. In 1920, he was appointed Professor Extraordinary, and in 1924 – Professor Ordinary of the Faculty of Architecture in Polytechnic. In 1922–1923 and also in 1927–1930, he was the Dean of the Faculty of Architecture. W. Derdacki left an incredibly rich legacy in Lviv [17]. In 1945–1946, Professor W. Derdacki was the Head of the Department of Construction. Apart from this, he was engaged in an active academic work, researching efficient dwelling houses planning. He published a lot of works in professional journals. Professor was remembered as an incredibly kind person with an exquisite sense of humor, with profound knowledge, which he eagerly passed on to his students [18].

Tadeusz Teodorowicz-Todorowski (1907–2001) belonged to the generation of Lviv architects, who managed to do a lot for inter-war Lviv [19]. After graduating from the Faculty of Architecture of Lviv Polytechnic in 1931, he worked at the Department of Architecture II, headed by W. Minkiewicz, as a senior assistant until 1938. In Lviv, T. Teodorowicz-Todorowski worked a lot on different projectsand took part in architecture contests, where he won first prizes[3]. During German Occupation, T. Teodorowicz-Todorowski worked in Polytechnic, substituting for W. Minkiewicz (who, at that time, was sent to Donbas). He emigrated to Poland with the second wave in summer 1945, intending to settle down in Gdansk. However, Rector of Śląnsk Polytechnic professor Kuczewski persuaded him to stay in Gliwice. From November 1 1945 till 1953, he headed the Department of Housing Settlements at the Faculty of Construction Engineering, teaching architects. In 1970, he obtained the title of Professor Ordinary. He took part in the social life of Gliwice, Kraków, Katowice. In 1977, T. Teodorowicz-Todorowski retired but he did not lose touch with the educational institution.

T. Teodorowicz-Todorowski's architectural legacy is incredibly rich. Following the best traditions of Lviv Polytechnic, he designed the building of Chemistry Faculty Auditorium (1947) and the building of Construction Faculty (1949–1952) for Śląnsk Polytechnic. The architecture of the former building is very close

[3] Unfortunately, one of his most significant works – Missionaries' church in Lviv (III prize in the contest of 1937 and taken into realization) – was not completed. Only the ground floor was built. During the War, according to B. Victor's proposal, the design was a bit changed. However, construction works were not carried out. After the War, monks were evicted. The frame, which had not been completed, was used for the design of a sports hall "Labour Reserves", which now is a building of Lviv Polytechnic.

to the best examples of Lviv inter-war Modernism due to its precise geometric forms and planning solution efficiency. The building is made of dark red brick with ornamented brickwork, which reflected the traditions of local construction. The great building of the Construction Faculty has a different solution. The reduced variant of a classic four-pillar portico, which underlines the significance of the building, stresses the main façade. The building of the City administration in Gliwice (1949) is of a modernistic appearance. In the 1950-s, T. Teodorowicz-Todorowski designed a housing estate in a central part of the city (1954) and a school (1958) in Sosnowiec. Among other objects created for Polytechnic, we can note the reconstruction of the Cinema X (1958), which appeared in the building of the early XX century, and also the buildings of 1970 – Technological pavilion of the Engineering-Sanitary Department in Gliwice (1970), the Faculty of Architecture (1972), the Laboratory of the Construction Faculty (1973). Teodorowicz-Todorowski left many unrealized projects, photographs that were shown in the world exhibitions, scientific articles and in his creative legacy [20].

Julian Duchowicz (1912–1972) and Zygmunt Majerski (1909–1979), the two more personalities who came from Lviv, were also connected with Gliwice Polytechnic [21]. Their co-operation began in Lviv. In 1929–1936 J. Duchowicz studied at the Faculty of Architecture of Lviv Polytechnic, and, during his last year of studying, he worked as a junior and then senior assistant at the Department of Utilitarian Construction. Z. Majerski studied in Lviv Polytechnic in 1927–1934. In 1935–1937, he was a deputy assistant and then junior assistant at the Department of Historic Architecture. Later, in 1938–1939, he was a senior assistant of the Department of Architecture II [22]. Their architectural collaboration started with participation in numerous contests as students. During the War, their paths went separately for some time. Z. Majerski left Lviv during the wartime, and, in 1940–1945, he was even a prisoner in Murnau. After his release, he stayed in Italy, where he designed and built Military Cemetery in Bologna. In 1947 he came back to Gliwice Polytechnic. At that time, J. Duchowicz, who had to leave Lviv in 1945, was already working there. Since that time, they worked together at the Construction Engineering Faculty at the Department of Utilitarian Construction. In 1954, they moved to Wrocław to work at Polytechnic. At first, they were the deputy deans in 1961–1964. Since 1968 J. Duchowicz headed the Institute of Architecture in Wrocław Polytechnic. However, Z. Majerski left Wrocław in 1964 to head the newly established Department of Dwelling Houses and Service Institutions Design at the Faculty of Industrial and General Construction of Sląsk Polytechnic in Gliwice. In 1977, after organizing the Faculty of Architecture, he became its first Dean.

The collaboration of Z. Majerski and J. Duchowicz is a pattern of a great architecture tandem. They participated in many contests, where their designs won first prizes. One of their first realized objects was the Palace of Youth in Katowice (1949–1951)[4]. The architectural solution of the Palace reflects modernistic view of the architects, which had been formed back in Lviv. The solution of the building of the Mining Faculty of Sląsk Polytechnic in Gliwice was more "classical" (1953). The architectural solution of the House of Music and Dance in Zabrz (1957) was interesting by its geometrism and solution efficiency, and it definitely goes back to the heritage of inter-war Modernism. The Theatre in Opole (1965–1975), built later, is distinguished by its extremely modern architectural solution [23].

Franciszek Mauer belonged to the generation of Lviv Polytechnic alumni. He graduated during German Occupation – in 1943. And in October 1945 he was admitted to work at the Department of Architecture Design. However, he decided not to stay in Lviv, and left for Sląsk with the last wave of the repatriation. F.Mauer did not begin teaching in Gliwice Polytechnic straight away. In 1949 he started working at the Department of the History of Architecture in Sląsk Polytechnic as an assistant. After defending his doctoral thesis (1962), he worked as an associate professor. First and foremost, F.Mauer made a name for himself as a renovator of architecture monuments, working from 1972 till 1988 as the Head of the Architecture History and Monuments Restoration group at the Ministry of Education and Science [24].

Czesław Thullie (1888–1976) graduated from the Faculty of Architecture in Lviv Polytechnic in 1911. In a year, he obtained the academic degree of Doctor of Technical Sciences, having defended his thesis "On

[4] The architectural complex together with the Palace was included into the list of monuments on April 13 2010 (registration number – A/301/10).

Renaissance churches in Lviv". At the same time, he studied in Munich, and later in professors Batovski and Bratkowski's private art studio in Lviv. Cz. Thullie was equally successful in many spheres. He was a successful practicing architect, a scientist, and a teacher. In 1945, Cz. Thullie moved to Katowice and took part in organising Sląsk Polytechnic in Gliwice, where, in 1946, he took the post of a professor at the Department of Architecture Forms and Design at the Construction Engineering Faculty. Later he became the Head of this Department and held this post until his retirement. Since 1951, Cz. Thullie also worked on renovating architecture monuments in Katowice City Design. He was a member of the Renovators Board of the Province conservator of architecture monuments in Katowice and Opole. His scientific works focused on architecture monuments conservation, especially in the eastern part of Poland [25].

Władysław Śmiałowski (1898–1973) was also a graduate of the Faculty of Architecture of Lviv Polytechnic. He received his diploma in Engineering in 1927. However, he started working in 1922 as a junior assistant at the Department of General Construction. In 1934, he moved to Warsaw, where he worked on constructing military objects until the outbreak of World War II, supervising the construction of an airfield in Dęblin in 1935–1937. In June 1945, he was directed to organize Sląsk Polytechnic in Gliwice. He participated in organizing the Construction Engineering Faculty, namely the Institution of Building Materials Technology, which he headed until 1946. W. Śmiałowski's career was developing rather quickly. Until 1949 he was a deputy professor and the Head of the Department of General construction. In 1956–1957, he was Dean of the Faculty of Industrial and General Construction. He obtained the title of Professor in 1964. W. Śmiałowski was also one of those who initiated creating the Faculty of Sanitary Engineering and the Institution of Construction Acoustics in Polytechnic. He received numerous awards from different state institutions [26].

Włodzimierz Buć (1909–1969) received a diploma of engineer-architect in 1934. Since 1935 he worked as an assistant at the Department of Architecture I headed by professor J. Bagenski. From 1937 till 1938, W. Buć was working at Construction department of the Postal and Telegraph Administration in Lviv. In 1945 he emigrated to Poland. At that time, he worked hard as a teacher of Polytechnic as well as a private one. In the educational institution, his career started from the post of an associate professor at the Department of Utilitarian Construction, where he taught the Fundamentals of Design. Later he headed the Department of Industrial Architecture and, since 1966, he was the Head of the Architecture section at the Construction Faculty. Apart from teaching, W. Buć worked a lot as a practicing architect, supervising Gliwice department of Katowice City Design (in 1952–1955). In 1955–1958, he was the Chief Architect of Katowice Province. Residential and administrative buildings in many cities of Sląsk were built according to his projects. He also undertook city planning projects [27].

The contribution of the professors and alumni of the Faculty of Architecture of Lviv Polytechnic to the development of architecture school in Sląsk Polytechnic can hardly be overemphasized. They were at the forefront of the architectural school formation. Today's teaching and research work is conducted on the basis of the Lviv architecture school principles. Moreover, Lviv architects contributed a lot to the development of architecture of the post-war Katowice, Gliwice and other cities in Sląsk.

3. Conclusions

The theme of the coverage of the activities of Lviv architects and teachers who were forced to leave Lviv in 1945–1946 is extremely important, multifaceted, in the end, incredibly interesting. In short, it is impossible to cover all aspects, and, in particular, practical activity, the transfer of the traditions of the interwar Lviv modernism to the soil of socialist Poland, as well as the practices of restoration, which was agreed upon during the rebuilding of the destroyed Wroclaw and Gdansk. The methods of organizing educational work, due to which the Polytechnic Sląsk and Gliwice appeared, became important, and the architectural schools in Wroclaw and Gliwice were strengthened. Thus, it can be argued that the activities of the teachers and graduates of the Lviv Polytechnic have created a solid foundation for the formation of architectural education and practice in post-war Poland, but a genuine and comprehensive assessment of their activities is a matter of future scientific research.

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Світлана Лінда, Марія Волошин

“ЛЬВІВСЬКА ПОЛІТЕХНІКА – МАТИ ТЕХНІЧНОЇ ОСВІТИ У ПОЛЬЩІ”: ПРОФЕСОРИ І ВИПУСКНИКИ ЛЬВІВСЬКОЇ ПОЛІТЕХНІКИ ПІСЛЯ ДРУГОЇ СВІТОВОЇ ВІЙНИ

Анотація. *Львівська архітектурна школа, сформована у стінах “Львівської політехніки” починаючи від 1875 р. вважалася однією із найкращих архітектурних шкіл тогочасної Європи. Після геополітичного перекрою карти Європи у 1939 р., а згодом після Другої світової війни доля багатьох архітекторів, життя та творчість яких була пов’язана із Львівською політехнікою, кардинально змінилася. Специфіки ситуації надає той факт, що львівські архітектори змушені були змінити не лише рідне середовище проживання та професійної діяльності, але й переорієнтувати та пристосувати свій традиційний світогляд до нових соціокультурних реалій Польської Народної республіки.*

Повоєнна діяльність цих архітекторів залишається поки що малодослідженою. Фрагментарні розвідки та статті ще не формують цілісної картини впливу традицій львівської архітектурної школи на формування польської архітектури після Другої світової війни. Мета статті – виявити значення випускників та викладачів “Львівської політехніки” для розвитку польської архітектурної освіти у повоєнний час. Їхня діяльність розглядається не лише не у вузькому професійному ракурсі, а з позицій соціальних та суспільних.

У статті наголошено, що діяльність викладачів та випускників Львівської політехніки створили міцний фундамент для формування архітектурної освіти та практики у повоєнній Польщі. Виїхавши до Кракова, Вроцлава, Глівіц, Гданська, вони професійно пропрацювали до кінця свого життя. Багато з них займали керівні посади у різноманітних навчальних закладах архітектурного спрямування та в урядових органах. Важливими стали методи організації навчальної роботи, завдяки якій постала Політехінка Сльонська і Глівіцах та зміцнилися архітектурні школи у Вроцлаві. Оцінка значення діяльності цих архітекторів ще є попереду, а ця стаття – це спроба коротко оглянути їх доробок, пов’язавши його із практикою міжвоєнного Львова, проте всебічна оцінка їхньої діяльності – це справа майбутніх наукових досліджень.

Ключові слова*: Львівська політехніка, Польща, архітектурна школа, післявоєнний період.*

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URBAN SPACE IN THE XXI CENTURY. THE ISSUES OF SCALE AND CHOICE

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Abstract. Having analysed some formative changes of the post-industrial society and practical experience of managing the urban development of a large city, we made an attempt to formulate the strategic principles for the effective definition of the optimal density of urban development in the long-term perspective (until the mid-twenty first century).

Key words: universal pedestrian accessibility, optimal density, “urban villages”.

1. Introduction

The population of the planet is rapidly urbanized (1,6 billion people in 1900, 7,4 billion people in 2017), concentrating around the main planetary centers of gravity, with the pace of this process being the highest for the largest urban agglomerations. The level of urbanization of the planet is 54.9 % of the population of the countries (as of 2017), the growth rate of the urban population makes up 1.84 % (estimate of the trend for 2015–2020) [3, 7, 11].

During the ЧЧ century, the concept of a large city, actually has changed its definition to a vast urbanized territory. With the further growth of the urban population, this definition may keep transforming, which does not necessarily mean territorial expansion, as it may seem at first glance.

This is due to the profound structural changes that have taken place over the past decades of the XX century, associated with the collapse of the industrial system of production, as the main factor in the economic and socio-cultural life of modern society.

2. Basic Theory Part

The reflection of the new socioeconomic system, despite its intensity and a large array of accumulated hypotheses and knowledge, did not create a vision of a new city of the future and concentrated mainly on segmental issues such as the environment, energy conservation, pedestrian accessibility, etc. Often, these individual phenomena, or even the methods of their combination, are represented as the “post-industrial” urbanism itself, although instrumentally all of them are usually designed for implementation through the same centralized mechanisms, financial and economic schemes created by the industrial system [6, 10, 28, 36].

Given the goals of this work, first of all, we are interested in the concept of the exact interpretation of the term “hyper-urbanization”, or other similar definitions that outline the phenomenon of the evolution of large cities of the modern era and their transformation into the super-large ones, with the population of more than 10 million inhabitants.

The basis of the question lies in the interdependence of the process of domination of urban lifestyle and the emergence of hyper cities. In other words, will the unequivocal world trend for the further growth of the

percentage of urban population and its numerical domination in the XXI century, in fact, occur due to, primarily (or predominantly) the development of over-large cities?

3. Results and Discussion

The analysis of the wide range of large urban formations, which in general correspond to the concept of hyper-city (Shanghai, Singapore, San Francisco, Los Angeles, Karachi, Chicago, Delhi, Kinshasa, etc.), proves the formation of a wide variety of living space, and other qualities, which serve as a gravitational field for the accumulation of the population. This is true in both the case of economically prosperous metropolises like Chicago and the case of large centers of the dveloping countries such as the Republic of Congo or Pakistan. Extremely large cities of the both types, give much better opportunities for realizing the existential needs of the individual than any other place in the country.

On the other hand, the structural transformation of the hyper-city, under the influence of post-industrial factors, changes its urban plane in the direction of forming self-sufficient zones of a close, ideally walking proximity, which converts it into a set of specific horizontal or vertical “urban villages” accumulated over the large territory and located next to each other. In this case, the question arises whether for the existence of such self-sufficient entities it is really necessary to include them into the hyper-city structure and what size of the overall structure is sufficient to ensure all levels of choice within each cluster?

Although the strategy of dense agglomeration of “urban villages”, as a new type of an urban plane formation in the post-industrial era, does not exist yet in the form of a generally accepted consensus, but the analysis suggests that there is a general tendency for such a self-organization of settlements. At the same time, the rather spontaneous nature of the emergence and implementation of ideas associated with the system of small self-sufficient housing clusters indicates the procedural differences between modernist models of management and design of the urban environment and horizontal initiatives that arise as a result of the activities of local communities. [3, 17].

It is worth concentrating on the main motivating basis of this type of urban structure, which is easy access to a large selection of life opportunities. In that case, both components of this dichotomy are inversely proportional, which means that the easier accessibility tends to as much choice as possible, and the biggest choice wants to be easiest to access. In this context, the new urbanistic reality forms itself, the process of which does not depend on the environment in which it occurs. In other words, the potential of dichotomy (accessibility-choice) is capable of transforming any already existing urban objectivity, which has developed in previous historical periods as a result of different conditions. The main instrument here is the market response mechanisms for the proposal, which increasingly acquires the structure of the “wide choice” and pushes transforming of the surrounding areas towards the relevant to it ("wide choice”) principle of mixed use [14].

Fig. 1. Marriage at Boryspil Airport, Kyiv [38]

Fig. 2. Market “Pivdennyi”, Lviv [29]

The contrast between the two methodological tendencies can be illustrated by the facts that the society uses some objects with purposes which are not related to the actual functions of the past economic formations, but were erected recently and in accordance with the actual needs of the city. An example of this development could be the use of the Boryspil airport in Kyiv as a hall for wedding ceremonies, which began in 2017 [38] in a

room that was expanded and modernized several years ago, or the experience of spontaneous post-Soviet markets that arose in the middle of 1990 and gradually turned into chaotic, but multi-functional areas such as, for example, the market "Pivdennyi" in Lviv [29]. Given the gradual, rather than the one-time nature of the formation, such structures evolved as a result of an immediate reaction to the constantly changing consumer demand, not limited to some distinguished sectoral frameworks. Therefore, in a sense, they have become the prototypes of mixed use and close access to various types of services from grocery and essential goods to education and sports [34].

In the modern city-planning theory, the fact of diversity in conditions of close concentration (density) is considered one of the main tasks of urban science of the XXI century, as discussed in various publications [12, 13, 16, 19, 20, 25, 30, 32,].

Thus, it can be noted that the contradictions which we are considering, are becoming even more obvious. The theory of the hyper-city of the post-industrial era, stretched for tens of kilometers, contradicts the trend towards the creation of diverse zones of pedestrian accessibility of a universal choice. Given that such zone is associated with such parameters as average walking speed of 4 km / h and the standard acceptable time needed to get to the public transport stop is 15 minutes, it can be assumed that the maximum diameter of such a zone should be 2000 meters [36].

Although due to the diffuse and heterogeneous nature of the contours of cities and the density of the boundary territories, it is difficult to speak about the accuracy of calculations, however, based on these relative values, we can speak of a conditional comparative schematics of existing urban planes with such clusters. For example, even in such a city as Lviv, which does not belong neither to the category of hyper cities, nor to millionaires, there should be about 25 clusters like this. Within the Lviv region, cities which actual size approximately coincides with the size of one cluster, can be, for example, Skole and Turka (however, without taking into account weakly populated peripheral territories).

As for such large cities of our time as Istanbul, the number of "urban villages" of pedestrian accessibility is around 160 there. Whereas in Cairo there are about 180, Mumbai and Rio de Janeiro (without satellites) there are 280, Lagos – 420, and in the area of Great Tokyo – more than 1700. Apparently, these figures are not always proportional to the population, which in some cities is more densely settled than in others: for example, in Istanbul, compared to Rio de Janeiro. In addition, the population can be calculated in correlation to different units of administrative structuring (municipality, prefecture, urban area, comprehension zone, etc.), which do not always express the same concept of the city.

However, the general parameters give an idea of the volume of the transformative perspective that arises when moving from one urban paradigm - modernist to another – post-industrial. Probable transformation, for example, of Tokyo in 1700 self-sufficient "urban villages" raises the question of the reflection of the city as a holistic phenomenon and ways of managing such structures (centralized or dispersed). Though the large size of the hyper-cities isolated some areas there, the pedestrian average traffic network, which covers commuting to work, recreation areas (parks, beaches, spectacles), home and shoping, integrated and combined the life of these areas into a common urban organism, which, consequently, needed centralized management. In the post-industrial community of "urban villages" or cluster of universal pedestrian accessibility which overlaps with the growth of local self-organization and vertical initiatives, it may raise the question of changing the functions of the city administration (since it is too early to talk about its complete disappearance).

Such functions, in particular, may include the maintenance of the operation of common infrastructure networks for all clusters, as well as providing opportunities for a wide variety of living space. Under the current conditions, the first kind of tasks can be attributed, for example, to the centralized supply of quality drinking water, which becomes one of the main values of urban studies of the XXI^{t} century, due to climate change and an increase in the global population. The second is the constant monitoring of the global choice, and transfering of this information to the level of clusters that create a new post-industrial city plane.

These considerations give ground to say that in the presence of such a center, the hyper-city, as a typological structure that involves excessive expansion of the urban system (tens of kilometers) and a population of more than 10 million, is not a compulsory or desirable condition for the existence of a post-industrial settlement. Obviously, such a center makes sense of its existence only if there is a certain structure from many clusters, however, the upper limit of their number does not necessarily have to reach Tokyo or Rio de Janeiro. Of course, this kind of post-industrial city theory can be completed only if the minimum number of "urban villages" is determined.

In this context, it should be noted that the area itself is not yet sufficient to determine the new urban structuring. It is also worthwhile to determine the optimal number of people who can be accommodated on such an area. In this connection, the issue of the category known in modern urban science as “optimal density” or “optimal compactness” comes to the fore. [17, 4, 8, 9, 5, 2, 30].

In all of these studies, density is defined as a necessary condition for reducing pollution (by reducing road traffic), increasing the level of physical health (due to increased pedestrian and cycling movements), social implementation (through communication in small local groups), energy and materials savings (through their sharing by different neighbors), etc.

At the same time, the legacy of late industrial urbanism, a characteristic feature of which was the significant growth of suburbs and suburban low-rise buildings, especially in extremely large and hyper cities, makes it difficult for the designers and managers to develop a comprehensive strategy for the transformation of the urban organism, logistics and tools of which are still difficult to imagine. Obviously, the consolidation of space will primarily be due to market mechanisms of the benefits of one style of living over another. However, in the most developed countries in which the industrial phase of development, and consequently the industrial character of urban development, proceeded the longest and most intensively, the existing density level is very low, especially in the cities of North America where it ranges from 1 000 to 2 500 persons per square kilometer [31] (while in Asian cities it ranges from 10.000 to 20.000 per square kilometer).

In such a situation, if we take on the substantiated assertion of the direct dependence of “optimal density” and “optimal constancy”, there is a need not only for the satisfaction of natural demand for living in the middle of the city, but also for the development of mechanisms that would non-violently encourage self-relocating the inhabitants of the late-industrial low-density suburbs back to the central regions. Under these circumstances, there is the problem of the quantitative parameters of “optimal density”, which should be based on the balance between the benefits of compact living and its comfort for each individual resident.

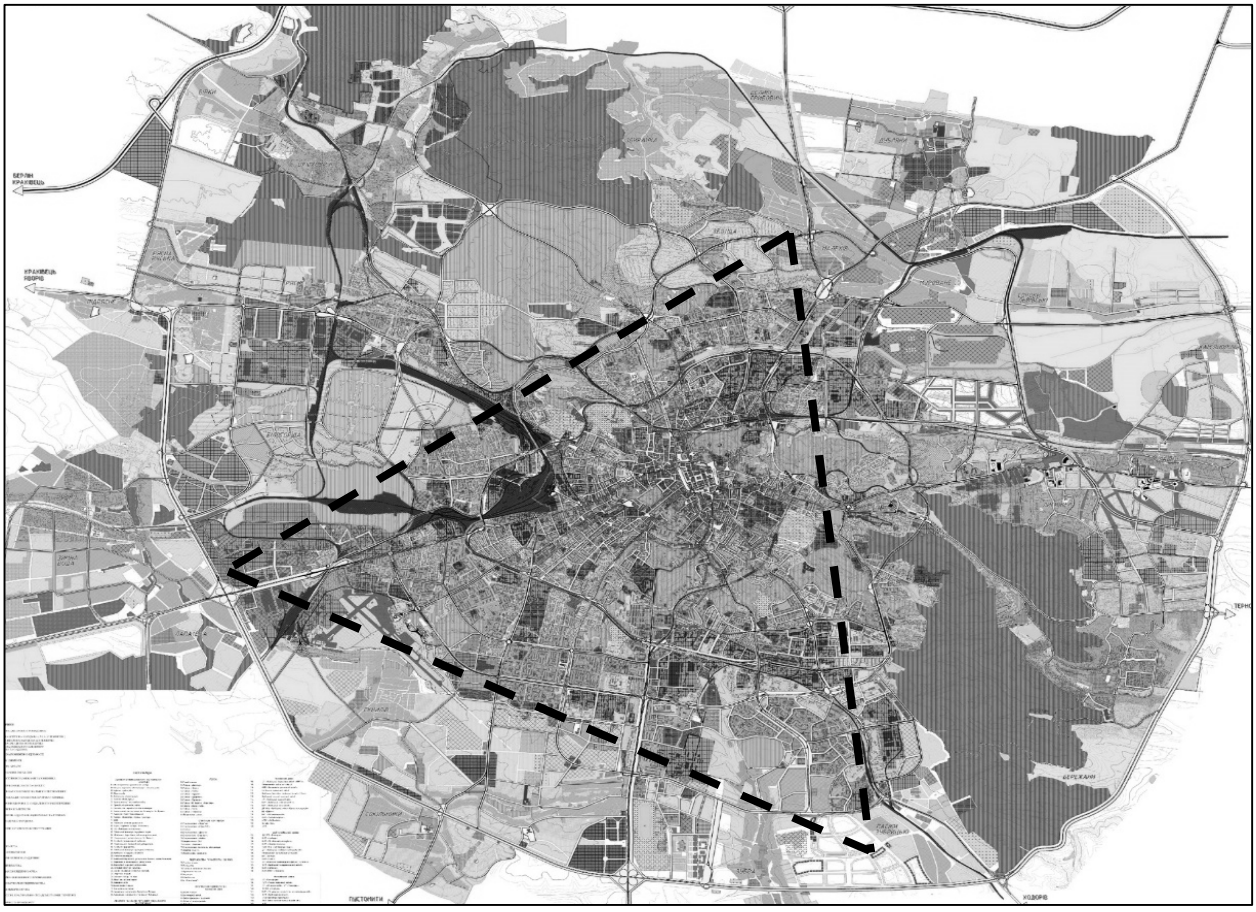

Fig. 3. Triangle the integral urban-residential array of Lviv

Based on the above mentioned, we shall analyze some parameters of Lviv in the context of formation of "optimal density". The area of Lviv is 110.43 square kilometers and the population figures for the year 2017 are 727 968 inhabitants (758 471 with Vynnyky, Rudno, Bryukhovychi) [47], thus it can be assumed that the city can be divided into approximately 35 local residential clusters with a diameter of 2 kilometers . Taking into account the indicators of the area and population, each of these clusters has an average density of 6561.5 people per square kilometer. Such parameters, in general, already correspond to indicators of optimal density (from 5,000 to 10,000 people per square kilometer).

At the same time, official data on the area of the city can not be taken as the final point of reference for such calculations. The administrative boundaries of the city are also the adjoining enclave territories of Ryasne, Rudno, Bryukhovichi and Vinniki, as well as forests (primarily Bryukhovitsky and Vynnykivskyi) and the territory of summer cottages. The dynamics of population changes within the administrative boundaries of Lviv suggests that the process of increasing the number of inhabitants in these suburbs and the reduction of it in the city itself continues. However, this is largely due to the inertia of the late modernist tendency of the outlined strengthening of the middle class, as well as the lack of sufficient proposals for quality housing in the central parts of the city. Further growth of suburban formations, however, no longer has an advantage over the inner-city array, as evidenced by the difference in the value and quality of the newly built dwelling. In fact, as of the end of the 2010s, the whole urbanized array of Lviv is approximately a triangular configuration of urban fabric with vertices facing the West, North and South with sides around 10–12 kilometers. This configuration slightly changes previous calculations. Except for the size of territory and population of Ryasne, the corresponding average density index grows to 7269 square kilometers, and within the framework of the triangle it may reach even up to 12.095 inhabitants (which already exceeds the maximum accepted limits of optimum density). Thus, depending on the method of calculating the territory, the average population per square kilometer is ~ 9700 people. As can be seen from these data, the exact accuracy of calculations of the density of the population of Lviv can not be achieved, but average values are closer to the upper limit of the optimal density of 10 000 inhabitants per 1 km square. According to such averaged picture, the estimated number of clusters should be about 30 units.

Given the relative novelty of raising the question of the interdependence of density and sustainability, it is difficult to talk about absolute figures relative to the desired population of one square kilometer, however, it is possible to give clear indications of when the density clearly ceases to be a blessing and becomes an urban problem. [22, 1, 24]. In particular, it is: a) lack of natural ventilation; b) lack of lighting; c) lack of confidentiality of the inhabitants (for example, the very close location of the windows of neighboring apartments); d) the effect of the "urban heat island" (the increase in the temperature of the air during the warm season in the middle of the city) [26, 39, 35, 34].

The search for an ideal of optimal density was carried out in a number of countries, but the center of the greatest innovations in the development of architectural and technical solutions to such space was Singapore, where there emerged immediately two high-density superblocks with a different planning concept: "Pinnacle" and "Interlace". In both cases, we can talk about a city-developing impulse that offers different ways of building up urban plane on the basis of the principle of "optimal density". The Quarter "Pinnacle" can be seen as a peculiar, transitional form between a typical for a modernist city multi-apartment residential building and planning- related experiments needed to achieve the living space of a wide variety of choices. Instead, Interlace is an attempt to create a fundamentally new typological model of a high density housing complex consisting of pools, green islands, public spaces and recreational areas. Relatively successful solution to a complex project task, which can give an idea of the quantitative indicators of the concept of "optimal density", based on such data as the number of square meters of the total area – 170 000, and the number of inhabitants – slightly more than 2500 (1400 apartments of different types).

Experiments of this kind are characteristic not only for a compact city-country like Singapore, which is lacks land resources. In Canada, there also was an experiment with high-quality dense buildings (False Creek in Vancouver). Unlike complexes in Singapore, "False Creek" occupies a central position in the city planning system of the southern waterfront of the West End. In addition, there they applied a mixed scheme of storey building, which combines different typological scenarios of development.

Fig. 3. Interlace Quarter in Singapore [21]

Fig. 4. "False Creek" district in Vancouver [39]

Based on this kind of practical experience, which showed the limits of the possible achievement of optimal density without loss of quality of residence, a certain consensus was established regarding the indicators of the desirable number of inhabitants resettled per unit area: 100–120 habitats per hectare, primarily in areas adjacent to the major transport routes, or in the end it is possible to bring the maximum figure of 10.000 inhabitants per square kilometer [15, 18, 27, 23].

According to these materials, the strategy of impulse development of a large city, in the conditions of the post-industrial economic structure, among its main tasks, should raise the problem of developing of such a design model of living space that would be able to encourage the settlement of a conventional unit of area defined by a radius of 1 kilometer, with the number of inhabitants, which would equal to about 30,000 people.

Cities like Milan, and especially Barcelona, have population density indicators of one square kilometer similar to those that appear in today's scientific debate around taxonomy of the post-industrial city. In modern studies, Barcelona is given as an example of the organization of a city-planning structure of optimal density, which at the expense of perimeter-quarterly construction with a height of 7–9 floors, at the same time provides both high density and high living comfort of residents who do not suffer from lack of light, ventilation, limited privacy, lack of green and recreational areas [23]. It should be noted that in this case, the highest possible density index of 10.000 inhabitants per square kilometer is taken as the basis.

4. Conclusions

– The perspective of the transformation of urban planes has been formulated in connection with the reduction of the influence of industrial factors of its development instead of which comes the specificity of highly informatized society. Its idea lies in the tendency of transforming the large functional areas of the industrial city into local residential clusters of pedestrian accessibility with a diameter of about 2 km. The aggregate of such clusters of universal pedestrian accessibility ("urban villages"), which overlaps with the growth of local self-organization and vertical initiatives, may be the justification for initiatives to partially review the functions of city management.

– The range of practical issues related to the category of optimal density as the key indicator of the XXI century city has been outlined. Examples of residential quarters such as Kowloon Walled City in Hong Kong, Pinnacle and Interlace in Singapore, False Creek in Vancouver, traced the evolution of individual urban constructions, which show the state of the actual debate around specific indicators of population per unit area . Based on life quality indicators that demonstrate these and other examples, the boundary and desirable indicators of optimal density and spatial patterns of its subjects were noted.

– It has been found that for urban settlements formed as a plane of local clusters of pedestrian accessibility to the possibilities of city choice (the number of goods, services, employment, etc. available in the city), density can be achieved either by the formation of quarterly development of average altitude (8–9 floors),

or combinations of multi-storey buildings with a predominance of high-rise buildings. The quantitative range of optimal density can be considered somewhere within 5,000 to 10,000 inhabitants per square kilometer.

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Андрій Павлів

МІСЬКИЙ ПРОСТІР У XXI СТОЛІТТІ. ПРОБЛЕМИ МАСШТАБУ ТА ВИБОРУ.

Анотація. *Опираючись на аналіз формаційних змін постіндустріального суспільства та практичний досвід управлінням урбаністичним розвитком великого міста, зроблено спробу сформувати стратегічні засади ефективного визначення оптимальної щільності містобудівного розвитку на перспективу до середини XXI століття.*

Поняття великого міста, протягом XX століття фактично змінило свій зміст і стало означати обширну урбанізовану територію. З подальшим зростання міського населення цей зміст може зазнати видозміни, що не обов'язково означає територіальну експансію, як це може видаватись на перший погляд.

Сформульовано перспективу трансформації містобудівної тканини у зв'язку із зменшенням впливу індустріальних факторів її розвитку, на зміну яким приходить специфіка високоінформатизованого суспільства. Вона полягає у тенденції перетворення великих функціональних зон промислового міста на локальні житлові кластери пішохідної доступності діаметром близько 2 км. Сукупність таких кластерів універсальної пішохідної доступності ("міських сіл"), на котру накладається ріст локальної самоорганізації та вертикальних ініціатив, може стати причиною ініціатив із часткового перегляду функцій загальноміського управління.

Окреслено коло практичних питань пов'язаних із категорією оптимальної щільності як ключового показника міста XXI століття. На прикладах таких житлових кварталів як "Kowloon Walled City" у Гонконгу, "Pinnacle" та "Interlace" у Сінгапурі, "False Creek" у Ванкувері та щільно урбанізованих житлових районів м. Львова простежено еволюцію окремих містобудівельних утворень, котрі демонструють стан актуальної дискусії навколо конкретних показників кількості населення на одиницю площі. На основі показників якості життя, котрі демонструють ці та інші приклади, було відзначено граничні та бажані показники оптимальної щільності та просторові моделі її предметизації.

Визначено, що для міського поселення, сформованого як тканина локальних кластерів пішохідної доступності до можливостей міського вибору (кількість благ, послуг, зайнятості тощо які доступні у місті), щільність може досягатись або за рахунок формування квартальної забудови середньої висотності (8–9 поверхів), або комбінаціями різноповерхових будівель із переважанням висотних. Кількісним діапазоном оптимальної щільності можна вважати показники, які коливаються від 5 000 до 10 000 мешканців на квадратний кілометр.

Ключові слова: *універсальна пішохідна доступність, оптимальна щільність, "міські села".*

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TERRITORIAL DISTRIBUTION OF COMPOSITIONAL AND STYLISTIC TYPES OF HOUSES OF THE RAILWAY STATIONS OF HALYCHYNA AND BUKOVYNA

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Abstract. The buildings of the railway stations in external spatial and plastic lineament are investigated, their composition and stylistic types are formulated, as well as the methods of their location on the territory of Halychyna (Galicia) and Bukovyna (Bukovina) in Ukraine are analyzed. Attention is drawn on importance of maintenance of these railway stations as a ponderable inheritance of building culture of these regions.

Key words: compositional and stylistic type, railway station, settlements, passenger building.

1. Introduction

Active construction of the railway stations of Europe started from the middle of the XIXth century in the first turn in the capitals, metropolises, transport knots. This process lasted for nearly one century with interruptions, related to the military operations and political changes. Plenty of railway passenger buildings appeared along railways and near small settlements, covering large territories. In Ukraine these processes took place in a similar way that is why a lot of different railway station buildings are preserved up till now from this approximately centenary epoch. There are many unique railway station buildings on these territories , the other railway stations are constructed according the to the standard projects or their series. This is the characteristic feature not only of the architectural objects but of the certain regions where they are built. The historic railway stations are functioning up till now, they are inimitable and belong to the transport chain as well as to the urban planning, architecture of settlements, besides, they effect the entire originality of the whole regions.

2. Wording of the problem

Buildings of the railway stations at the time of their appearance were of a major transportation and public importance and together with churches, town halls and other buildings formed an important urban planning and architectural core of the settlement. Architecture of railway station buildings has its own visual and spatial properties that makes them distinctive in their regions, and they are also a mark of antiquity. Halychyna (Galicia) and Bukovyna (Bukovina) as historical lands have these interesting public transport objects on their territories that have some similarity and actually our researches are directed there. That is why we need to identify such characteristic railway station buildings and modes of their location on the territory.

3. Analysis of the recent research and publications

There are works concerning the history and expansion of the railway (Hrankin P. E., Lazechko P. V., Syomochkin I. V., Shramko H. I. (1996), Yakunin V. I. (2010) etc.), transport and urban development (Dreval I. V. (2013), Riabova O. V. (2008) etc.), architecture, monument protection and their use (Batyrev V. M. (1988), Radlbeck K. (1981), Choban O. Y. (2013), Yaveyn I. V. (1938) etc.). Several

publications are related to railway station architecture and historic lands of the European countries (Benediuk P. O. (2016), Heinersdorff, R. (2004), Kaiser W. (2011), Vorrath E. (2010), and Kubinszky M. (1988, 2009), Preuß E. (2010) etc.). Composition and stylistics of the individual railway station buildings of Halychyna and Bukovyna are analized in a number of publications (Rotchniak, 2014–2016). When studying architecture of these lands in general, little attention is paid to the actual architecture of the railway station buildings and, in particular, how they are spread in these areas.

4. Formulation of the article goals

Our aim is to identify the characteristic compositional and stylistic types of the buildings of the railway stations and define the ways of their spatial distribution in Halychyna and Bukovyna within the boundaries of the modern Ukraine.

5. Presenting of the main material

The development of construction of the railway stations in is a complex, multifaceted and dynamic process. Under the influence of a large number of factors the public and transport objects of various types, shapes, sizes, ways of combining with other objects and so on are formed (Batyrev, 1988, Radlbeck, 1981, Yaveyn, 1938). Basing on the external spatial and plastic features part of the historic buildings of the railway stations are united into the compositional and stylistic types, named after the characteristic spatial and plastic features or according to the place (direction) of their location. Especial type of buildings can be a number of railway stations, which are built under the same architectural project. There can be, perhaps, several types (series) of projects of one authorship that have visual similarities. These projects were carried out for private railway companies as well as under government order. According to the ownership of this or that railway various stations were designed and built.

Compositional and stylistic types of railway stations in Halychyna and Bukovyna. The works of M. Kubinszky (1988, 2009) present a lot of samples and types of the railway station buildings in Austria and Austria-Hungary. Their analysis is presented in these works as well. In particular, it concerns the period of reigning of the Caesar of Austria. Among the specified objects we see a striking similarity in compositional and stylistic techniques in the construction of the railway stations in various historical crown lands, including Halychyna and Bukovyna. This is especially true for the period of the expansion of state railways from the end of the 19th century to the beginning of the First World War, when typical projects were used for the construction of the railway buildings throughout the monarchy. Small differences in the local execution of the typical projects add specifics to the individual terrain and areas (Fig. 1, 2). Similarly, one can observe the general architectural background of the nature of the railway station buildings in Germany (Preuß, 2010).

Fig. 1. The railway station of Bad Goisern, Oberösterreich. Photo Kubinszky, 1988, p.165.

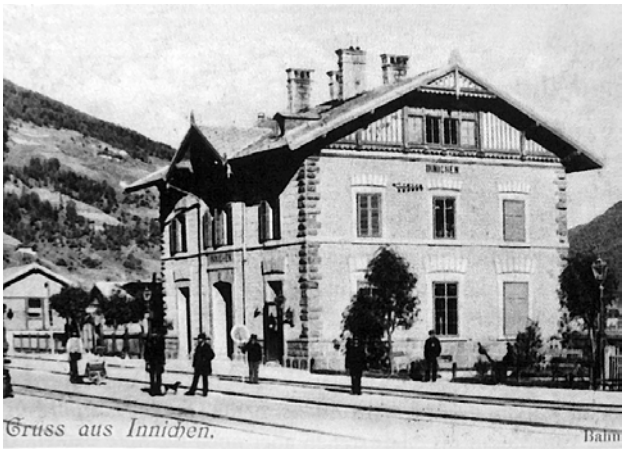

Fig. 2. The railway station of Innichen, Tirol / Südtirol. Photo Kubinszky, 2009, p. 115.

In this area, as the result of the interaction of historical, economic, ideological and other several factors the compositional and stylistic types of buildings of the railway stations were formed (Kubinszky, 2009, Rotchniak, 2014–2016).

Semicircular arched compositional and stylistic type combines a number of specific railway stations of the late classicism with elements of historicism of the mid-nineteenth century. This type was common in this region from the 1860s. By using several model projects with arches and blind arcades in facing of the facades many railway stations were built in Halychyna, of which today 4 are saved – Kolomyia, Korshiv, Stare Selo, Zabolotiv. On the territory of Bukovyna such railway stations are Hlyboka-Bukovynska, Luzhany, Suceava-Nord (Suchava-N.), Velykyi Kuchuriv (Fig. 3, 4). According to the size three different subtypes are distinguished: the largest is railway station Suceava-Nord (Romania), the medium size is railway station in Kolomyia, and the others are mentioned as a small subtype. The large and splendid North railway station in Vienna (Nordbahnhof Wien) probably served as the general compositional and stylistic prototype of those railway stations; the first railway stations of Lviv – the one of the Karl Ludwig Society and the Chernivtsi railway station of the city were constucted in the same style. The railway stations in Stanyslaviv (Ivano-Frankivsk) and Chernivtsi have been built exactly in the same way. They, as well as the oldest Lviv railway stations were dismantled at the turn of the previous centuries to make space for the new construction. Spreading of the architecture of railway stations of such composite form is associated with the activities of the architect and manager of the Galician railways Ludvik Wierzbicki (1834–1912), who studied and worked initially in Vienna (Hrankin P. E., et al., 1996).

Mostyska compositional and stylistic type comprises three saved railway stations Mshana, Mostyska-1, Sudova Vyshnia that were built on the same project. It has the characteristic twin doorways of the parter and windows of the second floor with a original tread of rustic facing of risalit and declivous roofs of single-storey building with the second level in the middle (Fig. 5). Former station in Horodok belonged to the same type (Hrankin P. E., et al., 1996).

Rustic-roofing compositional and stylistic type. The same compositional and stylistic model type with rustic facing and decliovus roofs includes several buildings of railway stations with characteristic s rustic facing of parters, corners of the house and the roof has a clear half-hip form and attic floor is cased with boards. This type of raiway stations include existing railway stations Vorokhta, Hrebeniv, Kopychyntsi, Mykulychyn, Nadvirna, Nepolokivtsi, Sykhiv, Turka, Yasenytsia, Velyki Hlibovychi (destroyed in 2015) and some others (Fig. 6). Mostyska type railway station and railway stations of Rustic-roofing compositional and stylistic type relate to the architecture of national romanticism, which has been by then spread.

Sambir compositional and stylistic type includes four stations Komarno, Rudky, Staryj Sambir, Strilky. It is a longitudinal two-storey block building with an attic level, which is covered with a high declious in four sides roof with distinct symmetrical pointed upward curved pediment with curved baroque-like symmetrical volutes on the side walls. The railway station building Strilky has doubled symmetrical gable from the side of the tracks. In this type of railway stations can be vividly seen “palace-like” style of architecture (Fig. 7).

Fig. 3. The railway station of Vadul Siret (old one).
Author’s Photo, 2013

Fig. 4. Non-existing Wien Nordbahnhof.
Photo Kaiser, W., 2011

Fig. 5. The railway station of Mshana, Halychyna.
Author's Photo, 2013

Fig. 6. The railway station of Hrebeniv, Halychyna.
Author's Photo, 2010

Rava compositional and stylistic type includes four railway stations Hlynske, Dobrosyn, Zashkiv, Kulykiv. Its characteristic feature is high central block across the middle of the building, which is covered by significantly higher roof over one-storey house with an attic. This central unit juts by risalit; roof shape is different (Fig. 8).

Podillia compositional and stylistic type is a two-storey symmetrical building with an attic and characteristic finishing of the corners, window frames and entrance with pilasters. In some places the rustic finishing of the first tier is preserved with round small windows on the triangular gables. Railway stations Bila-Chortkivska, Borshtchiv, Vyhnanka, Vyzhnytsia, Verenchanka, Ivane-Puste, Stafaneshti (Stefanesti), Tovste, Yahilnytsia and some others are built according to this type. External plastic motives of these buildings are very similar with the finishing of the Ternopil castle (Fig. 9).

Bukovyna compositional and stylistic type of the railway stations Banyliv, Ispas, Karapchiv, Kupka, Mezhyrichia, Petrivtsi is based on standard designs for local railway stations of Bukovyna (Hrankin P. E., et al., 1996, p. 51). It reminds one-storey manor house with an attic above the entrance. This type can also be attributed to a more general stylistic direction of national romanticism (Fig. 10).

Soviet-classical compositional and stylistic type reflects the character of so-called "Order oriented" architecture of the mid-twentieth century totalitarian era and the later time. There are the examples of the bigger railway stations of such type as Drohobych, Stryj, Ternopil and smaller ones: Burshtyn, Koniukhiv, Lubyntsi, Mamaivtsi, Mykolaiv-Dnistrovskyj, Skole, Slavske, Shtchyrets etc. These smaller railway stations were built according to standard design (Fig. 11).

"Pavilion" compositional and stylistic type includes small passenger railway station facilities in a form of separate open or half-open pavilions, air sheds or sheds connected with a stone building. Most often they occur at railway platforms of small railway stops (Bortnyky, Bovshiv, Tsutsyliv, serial sheds and pavilions, Fig. 12).

The most of compositional and stylistic types of buildings of railway stations originate with the appearance of railways as such. By the time of the hard times of war, there were significantly more stations built of the mentioned types. After the destruction part of them were not renovated or acquired new forms (Hrankin P. E., et al., 1996). Classical soviet type and Pavilion compositional and stylistic types were developed on the territory of Halychyna and Bukovyna from the middle of the twentieth century.

The common features of all types is the general layout of the buildings of small-sized railway stations along the lines of the manor house. There is a tendency to transverse and longitudinal plan of symmetry of facade design, as well as placing of the main entrance to the passenger hall in the middle of the building and not seldom with a through passage to the platform. Declivous rooftops of the railway stations emphasize the relationship with local housing. Some larger railway stations resemble, by their image, palaces with active usage of plastic decorations. Over time around the railway stations the social and urban centers start to develop that have an impact on the nearby settlements in the specific way (Dreval, 2013, Riabova, 2008, Choban, 2013).

Fig. 7. The railway station of Staryj Sambir, Halychyna. Author's Photo, 2009

Fig. 8. The railway station of Hlynsko, Halychyna. Author's Photo, 2010

Fig. 9. The railway station of Verenchanka, Bukovyna. Author's Photo, 2014

Fig. 10. The railway station of Petrivtsi, Bukovyna. Author's Photo, 2006

Methods of spatial distribution of compositional and stylistic types of railway stations in Halychyna and Bukovyna. Coverage of the territories with railways belongs to the strategic objectives of the state including, in its turn, the care about passenger traffic (Yakunin, 2010). Construction of the passenger railway buildings "binds" the architecture to a particular territory in many ways (Benediuk, 2016, Rotchniak, 2015). There are several ways to accommodate these compositional and stylistic types of the railway station buildings on the territories.

Point method recognizes "one-off" placement of individual railway station buildings throughout the territory and they are especially typical for large in size railway stations Lviv, Ivano-Frankivsk, Ternopil, Chernivtsi that belong to these types partly because they are unrepeatable. Also the slightly smaller, but very expressive railway stations, separately designed and built railway station buildings belong to this type i.e. Vadul-Siret (new), Diliatyn, Drohobych, Zolochiv, Mostyska-2, Morshyn, Nyzhankovychi, Otynia, Sokal, Stryj, Tatariv, Truskavets, Khyriv and some others. These listed railway stations have buildings of very characteristic and expressive architecture of different periods of construction, but their location is not of any consistency.

Linear method displays the placement of the railway stations along certain lines: in such manner the railway stations of the Semicircular arched type (track Lviv – Chernivtsi – Suchava), Mostyska type (stretch of track Mshana – Mostyska-1), Sambir type (stretch of track Komarno – Staryi Sambir) and Rava type (stretch of track Zashkiv – Dobrosyn) are located. In Romania outside the historic Bukovyna a number of such railway station buildings exist of Semicircular arched type on the railway branch from Suchava / Suceava-Burdujeni to Botoşani.

Zonal method is the continuation of spreading of the compositional and stylistic type on the compact territory. In this way the railway station buildings of the Podillia compositional and stylistic type in the southern

part of Ternopil region and northern part of Bukovyna are located. A separate area of distribution has Bukovyna type in Bukovyna.

Disperse method is the "dispersal" of Rustic-roofing, Soviet-classical and Pavilion types throughout Halychyna and Bukovyna. Among mentioned, these types are the most numerous; the first one is on many tracks, particularly in Halychyna, including the territory of historic Halychyna in north-eastern Poland, and the second type is in the rest of Ukraine (Fig. 13). Rustic-roofing compositional and stylistic type occurs as inclusions on the lines Lviv – Chernivtsi (Sykhiv, Velyki Hlibovychi, Nepolokivtsi) as well as on all three tracks of the Trans-Carpathian tracks from Galician side – Lviv – Sianky (Yasenytsia, Turka), Lviv – Beskyd (Hrebeniv, Tukhlia), Ivano-Frankivsk – Voronenka (Bratkivtsi, Tarnovytsia, Nadvirna, Mykulychyn, Vorokhta). Equally there are few examples of them in other areas: Hadynkivtsi, Kopychyntsi in Ternopil region.

Soviet-classical compositional and stylistic type has many subtypes of both projects used for small railway stations and various examples of them are also met on other historical lands of Western Ukraine – Transcarpathia, Volyn, Podillia.

Pavilion type combines architectural and designed buildings of different styles that mostly have no closed technological interiors and are completed by technological serial methods from simple materials. In recent decades, there are in fact increasingly railway passenger facilities that are close to the construction of passenger stops used for other public transport.

Fig. 11. The railway station of Burshtyn, Halychyna.
Author's Photo, 2012

Fig. 12. Passenger building Bovshiv, Halychyna.
Author's Photo, 2012

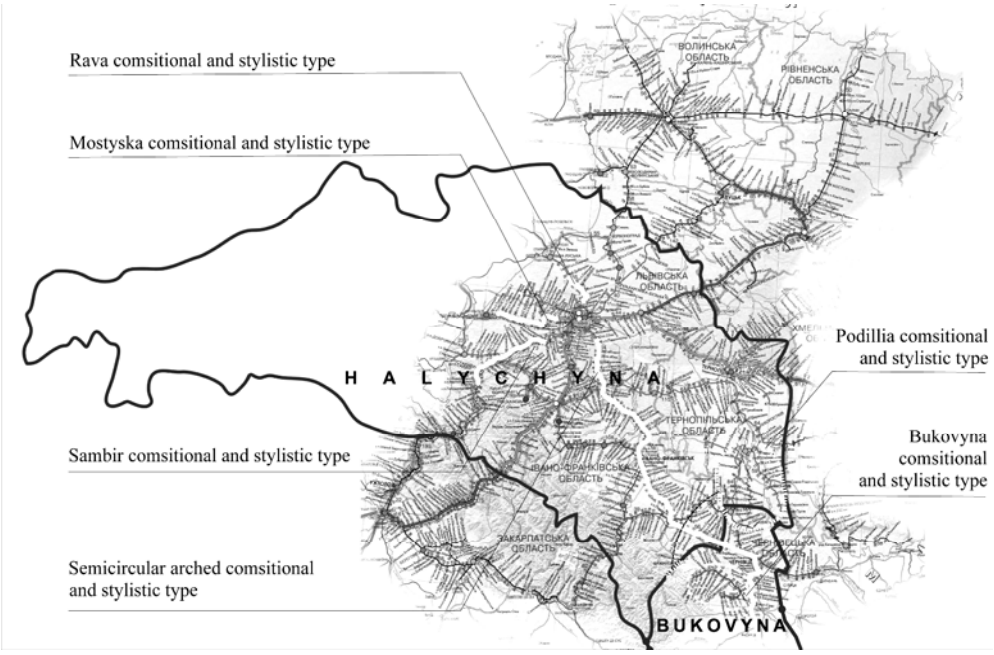

Fig. 13. The map of Lviv railway with linear and zonal methode
(placing of compositional and stylistic types of railway station buildings)

6. Conclusion

1. The most widely used compositional and stylistic types of buildings of railway stations of Halychyna and Bukovyna are discovered and formulated and the ways of their spatial distribution are established i.e. point, linear, zonal and disperse. The general image of small railwaystations resemble symmetrical manor houses, some bigger railway stations are more related with palaces.

2. There are no distinct regularities of dominance of one or another method of distribution of compositional and stylistic types of buildings of the railway stations in Halychyna and Bukovyna. Among to the most diverse compositional and stylistic types of buildings of the railway stations is the railroad Peremyshl / Pzemysl – Lviv – Chernivtsi – Suchava / Suceava, which at the time of the monarchy was the main transport line on the historic Halychyna and Bukovyna territory and the main backbone railway through Lviv .

3. The compositional and stylistic types of railway stations are singled out in the article. Their distribution in Halychyna and Bukovyna demonstrate the development of a common territorial base in the railway station architecture development , which is essential for their protection, conservation and development. They are the basis of the architectural identity of the region, which reflects the complex interweaving of spatial-plastic and figurative factors under the influence of objective and subjective circumstances, their uniqueness and memorability.

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Юрій Рочняк

ТЕРИТОРІАЛЬНЕ ПОШИРЕННЯ КОМПОЗИЦІЙНО-СТИЛІСТИЧНИХ ТИПІВ ЗАЛІЗНИЧНИХ ВОКЗАЛІВ У ГАЛИЧИНІ ТА БУКОВИНІ

Анотація. *Досліджено будинки залізничних вокзалів у зовнішніх просторово-пластичних рисах і сформульовано їхні композиційно-стилістичні типи, а також виявлено способи їхнього розташування територією Галичини та Буковини в Україні. Звертається увага на важливість збереження цих вокзалів як вагомого спадку будівельної культури.*

Ключові слова: *композиційно-стилістичні тип, залізничний вокзал, будинок.*

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GENESIS OF UKRAINIAN WOODEN CHURCH: WORLD CONTEXT AND ORIGINALITY

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Abstract: article gives theoretical summary and new conclusion of Ukrainian wooden church genesis (origins and principles of architectural formation) scientific problem. The investigation results are achieved by the analytic of Ukrainian wooden church's main architecture-genetic characteristics such as its space-composition and shape-construction. This analytic was fulfilled from the global position of worldwide sacral architecture developing review. The scientific results point the authentic, originality and world-cultural significance of Ukrainian wooden church's architectural phenomenon showing the rare case of European Monotheistic temple inclining to the Eastern (Central and South Asian) compositional archetypes of Polytheistic architecture.

Key words: Ukrainian wooden church; genesis, architecture-genetic characteristics, space-composition, shape-construction, world sacral architecture, compositional archetype.

1. Introduction

Genesis of Ukrainian wooden sacral architecture is still a question of discussing. It is evident, that there are no shape-constructive analogies of Ukrainian wooden church in the neighbor countries and all over the world. Exceptions are only churches built by Ukrainians at their historical dwelling regions that due to political reasons finally became the part of neighbor countries[5]. This article is exactly devoted to the Ukrainian wooden church architectural genesis investigation and is based on our doctoral thesis of the same theme [1].

2. Analysis of recent researches and publications

The genesis of Ukrainian wooden church is a problem actively discussed from the beginning of 20th c. At that time there were arose such basic works of this theme like the investigations of M. Dragan, G. Pavlutskiy, J. Strzygovski and others that created a lot of different and mostly contradictory ideas of Ukrainian wooden church genesis deriving it from the source of rural house, Oriental-Aryan constructions, pre-Christian sacral and granaries architecture, European masonry buildings or so and finally could not answer sufficiently to the question. All of these works are topics of great interest having at the same time a lot of weak points but giving a rich base for the investigation of contemporary level.

By the middle of XX century due to Soviet Union unpleasant attitude to the Ukrainian identity researches the question of Ukrainian wooden church genesis almost not arose in the new scientific works but there were appeared a lot of talented names researching some special points or separated questions of this theme such as D. Buxton, V. Chepelyk, T. Gevryk, P. Makushenko, I. Mohytych, T. Lisenko, G. Lohvin, S. Taranuschenko, S. Vergovsliy, P. Yurchenko and others. By the end of 20th – beginning of 21th c. the different aspects of Ukrainian wooden church architecture were elaborated at the works of M. Bevz, V. Vecherskiy, V. Zavada, Y. Ivashko, L. Prybeha, P. Rychkov, V. Slobodyan, M. Syrohman, Y. Taras, O. Harlan and others. Mostly the point of attention of all these researches was focused at typology and restoration problems of Ukrainian wooden churches the same as at some details of regional architectural form's variations. Although it is also can be

[5] For example, we can observe such group of Ukrainian wooden churches of XVII–XVIII centuries in Southern Poland.

pointed there some development of ideas connected with the problem of Ukrainian wooden church source. From this point of view the most interesting are researches of V. Zavada, T. Lisenko, S. Taranuschenko and P. Yurchenko concerning shape-constructive aspect of Ukrainian wooden church genesis.

Generally we can see that for a very long time the architecture of Ukrainian wooden church was not investigated like the complex original phenomenon, mostly examined partly and in a random mosaic way. The same can be concluded for the aspect of Ukrainian wooden church genesis that still remains obscure and requires a new contemporary research. This research is really need to be actualized not only from the position of Ukrainian wooden church phenomenon's national identity and originality analyzing but also from the point of its involvement to the global mondial sacral architecture formation proses.

3. Basic Theory Part

The work gives a theoretical summary and new conclusion of Ukrainian wooden church genesis (origins, evolutional stages and principles of architectural formation) scientific problem. For the solution of the problem there was applied modern international theoretical experience mainly based on Japanese colleagues methods of wooden architecture genesis investigation [2, 3] as well as some original, elaborated spatially for this purpose approaches. The research results are achieved by analyzing of Ukrainian wooden church's formation preconditions and main genetic characteristics of its architecture that were examined from the global point of view of worldwide sacral architecture developing proses. Genetic characteristic of architecture is a new proposed by this investigation term. As the main genetic characteristics are understood the basic space-composition and shape-constructive form of the building, that allows analyzing its origin, evolution, way of formation and so. In the case of Ukrainian wooden church these features are very stable and conservative (at least from 15th c.) and mostly common for all buildings with no connection to their regional shape diversity (Fig. 1). The shape-constructive form of Ukrainian wooden church is mainly based on timber (blockhouse) system with really wide shape-formation potential created with jointing several timber cages in so called Ukrainian three-partial[6] or cross layout structures. Archaic, country border-line regional or late time churches' layouts can be of slight shape diversity, for example as at old Galician churches with two-partial layout. The same as Transcarpathian cross-board churches that having layout different from traditional Ukrainian tree-partial case where the same like entrance dimension nave-part is jointed with smaller altar cage. Another example is nine-caged Novomoskovsk late church. Local and late cases of such phenomenon are evidently the results of neighbor countries building traditions influences (Transcarpathian case) or personal designer's creativity (Novomoskovsk case). But the archaic cases (Galician and so) could be considered like precious witnesses of Ukrainian wooden church's layout formation way.

In our mind it is possible to highlight the two principal churches' composition types that are not connected directly with its layout shape. One of them has single timber tower rising over the central cage accompanied with lower roof-like coverings of the aisles cages (two cases possible – on the base of three-partial or cross layout). The other type consists of separated timber towers rising over all cages (three-partial and cross layouts accordingly produce three-tower and five-tower structures) jointing in the interior only in the ground level of the church. We marked these two structure variations accordingly as ***centric-subordinated*** and ***substantive-combined*** compositional types of Ukrainian wooden church and suppose their different genesis and way of formation (see below). It is also important that in the both cases the Ukrainian wooden church poses clearly centric and tectonic composition. These features also can be considered like typical peculiarities of Ukrainian wooden church architecture (see Fig. 1).

In the same time the specific of Ukrainian local wooden churches diversity is mostly lying inside general compositional traditions and is only superficially modified by local circumstances. The exceptions are Boyko, Lemko and some other churches where the influences of neighbor countries architecture are stronger exactly in the modifying the traditional for Ukrainian church centric composition to the rising of taller framework tower over entrance cage that is close to medieval architectural pattern of Western European (Poland and so) churches. This modified cross-border variation could be provisionally determined like a supplementary ***western-asymmetrical*** compositional type of Ukrainian wooden church (Fig. 1). At the same time Transcarpathian churches are mainly belonging to original Romanian Maramuresh province traditions.

[6] Ukrainian three-partial layout is a lateral joint of three timber cages with bigger one in the center. The timber cage itself also can be not only square or rectangular in its layout but also octagonal, hexagonal or even trapeze (for the aisles cages) shape.

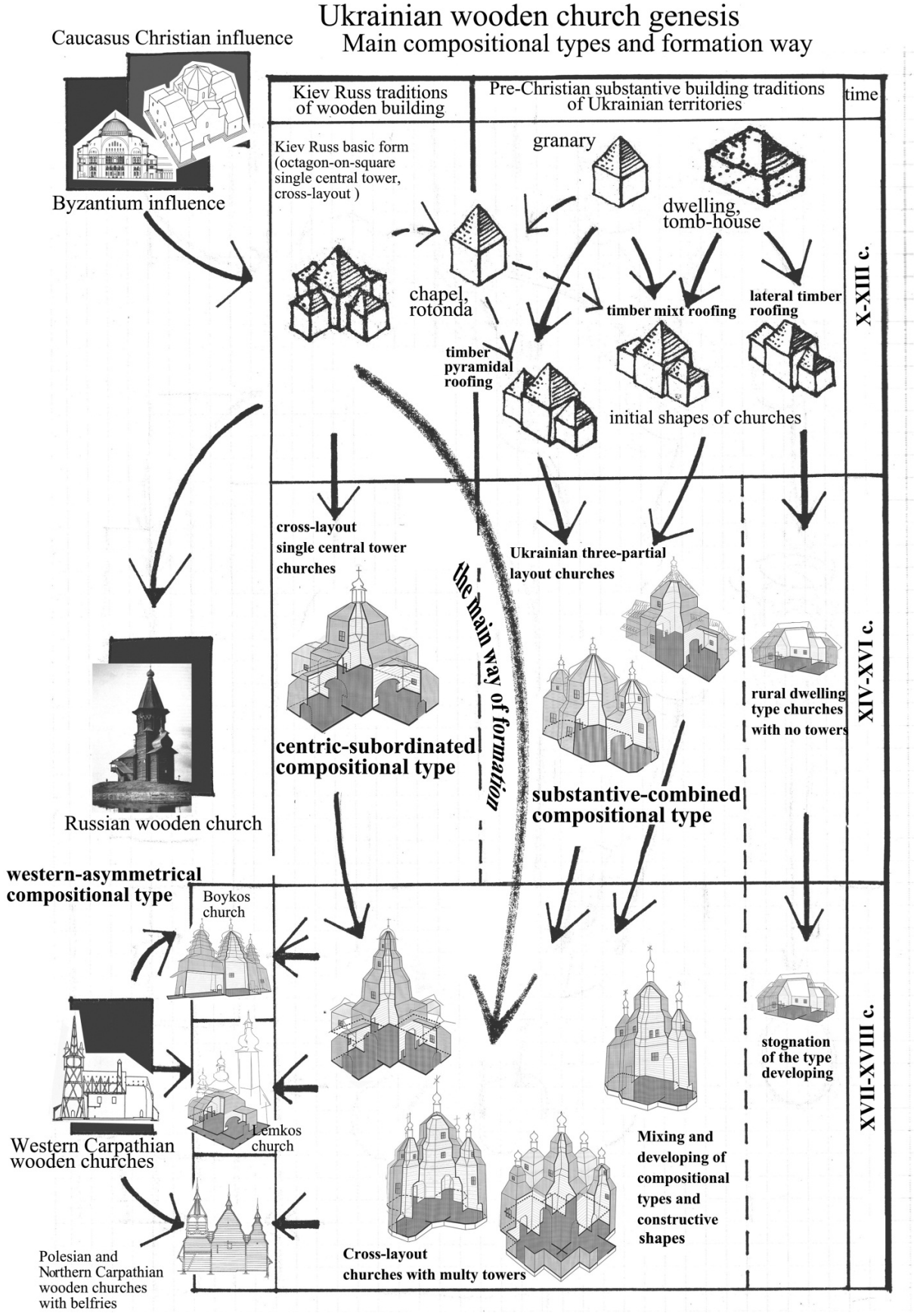

Fig. 1. Genesis of Ukrainian wooden church: main compositional types and the way of formation

The curious case also is Bukovyna churches that probably filled deep influence of peculiar Romanian Bukovina province church architecture.

As it was mentioned above, the base of Ukrainian wooden church construction is a timber cage that is generally common for wooden buildings of this geographic region. But the shape construction of Ukrainian wooden church's timber roofing is an original tower pattern that can be hardly seen at the architecture of Poland, Rumania, Russia or other neighbor countries. The timber tower's structure of Ukrainian wooden church itself is not homogeneous. There could be seen several stable space-constructive shapes of it that are spread all over Ukrainian lands. It is a point that all of them are not need interior horizontal support (beams or so) and can show inner space opened and lightened with windows from the top to the bottom of the building. It became possible because of high timber outwork space-construction systems. Some of them are unique, but some could be observed not only in Ukrainian land but also at the wooden church's architecture of neighbor countries. We could highlight five main types of Ukrainian wooden church tower's space-construction shapes (Fig. 2).

The first shape-constructional type of Ukrainian wooden church's tower is an archaic low lateral timber semi-circle or trapeze raised shape of roofing (Fig. 2). Now it can be observed as aisles coverings of *centric-subordinate* type of church's composition with central tower. It also can be used substantively in rare archaic so called "rural house" churches of Western Ukraine[7].

The second type is archaic simple centric pyramidal timber roofing (Fig. 2).

It has to be noticed that mentioned above two constructive shapes are really simple. But further Ukrainian wooden church tower's constructive shapes are much more elaborated and complicated.

The third type is an unique Ukrainian tower constructive shape called *zalom* (that literary means "a fold") where the timber cage is narrowed with pyramidal inclining covering that is catted at the half and then continued up without inclination (Fig. 2). *Zalom* top structures can be multiplied in vertical dimension several times shaping high and slim, faulty similar with the pagodas towers.

The fourth one is so called *octagon-on-square*. This is a space-constructive shape of a church tower created with the timber octagonal-layout cage that is posted on the timber square-layout cage base forming massive tower usually covered with pyramidal timber top (Fig. 2). This space-constructive shape can be used at Ukrainian church substantively or create the base for *zalom* type. *Octagon-on-square* tower construction also is common for Russian wooden church architecture.

The fifth type is a unique Ukrainian constructive joint of *zalom* and *octagon-on-square* shape that seems to be comparatively recently formed structure (Fig. 2).

Mentioned above five types of timber towers' shape-constructions can be combined freely in Ukrainian wooden churches' composition and are spreading all over Ukrainian territory[8]. But it is evident that their genesis is not homogeny. The first (lateral timber raised roofing) and second (timber pyramid) types are probably sourcing from pre-Christian times presenting the most archaic and primitive constructive shapes that could be considered like the initial archetypical inventions of timber building roofing able to appear substantively anywhere[9] sourcing just from the primitive constructive logic of human. So their presence on certain territory evidently cannot witness about any way of building tradition inheriting. The third (*zalom*), the fourth (*octagon-on-square*) and the fifth (*zalom* and *octagon-on-square* jointing) tower shape construction types are much more complicated and to our conclusion their presence in two different lands or cultures can witness the possibility of mutual influences or building traditions inheriting between them. As at Ukraine we have not wooden churches surviving examples oldest than XV century, it is impossible to determine the genesis priority and the ways of inheriting basing only on temporal analyze of the vestiges. So for resolve the problem of these timber constructive shapes origins we used a quite complicated deduction comparing Ukrainian, Russian, Western Slavic, Romanian and Caucasus shape-constructions of timber coverings. Finally it led us close to understanding the roots and ways of those tower constructive shapes' formation way.

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[7] This old type of lateral timber roofing shape can be easily replaced with rafter roof construction so its presence can be observed only in comparatively old examples of Ukrainian churches.

[8] Nevertheless it is possible to distinguish certain territories with one or another tower constructive shape preferences.

[9] These two initial timber roofing constructive shapes also can be widely observed at Russian, Western Slavic, Romanian, Caucasus, Central Asia and so wooden architecture.

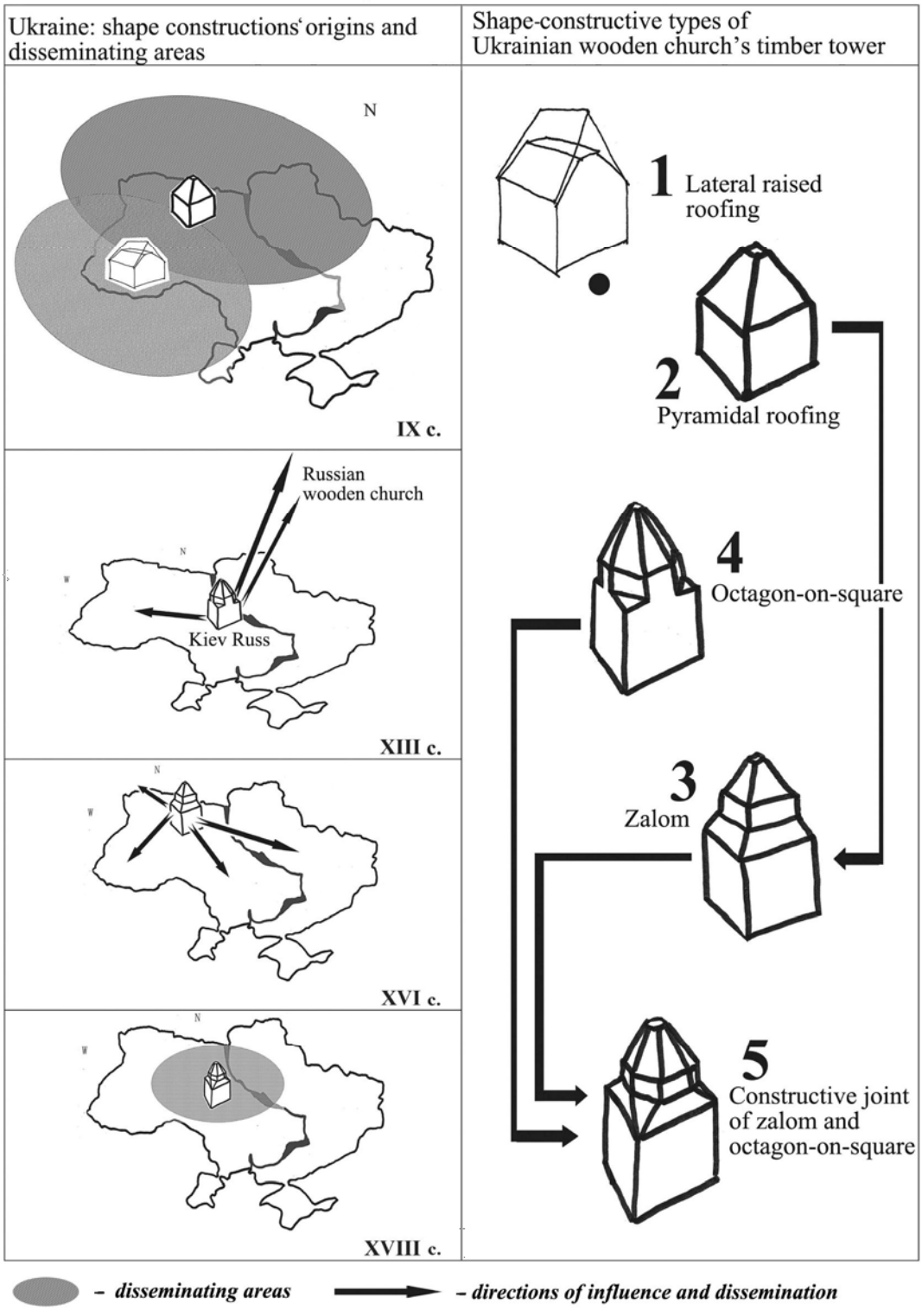

Fig. 2. Shape-constructive types of Ukrainian wooden church timber roofing.

Firstly having in the mind the conjoint history of Ukraine and Russian lands in the time of Kiev Russ we supposed that the constructive shapes common for the both traditions could be formed in Kiev Russ times and those seen only in one certain tradition could be recognized like a result of later independent development having place after Tatar invasion times (XII century) when Ukrainian and Russian cultures had started their separate existence. For example, the forth type of tower construction shape (*octagon-on-square*) can be widely

observed not only at Ukrainian but also at Russian wooden churches (Fig. 3). So we can suppose its relation to building traditions of Kiev Russ times[10]. From the other hand, we are not observing the same constructive shape in Western Slavic wooden architecture nor at the rural architecture of Ukraine and Russia[11] that can lead us to suppose of non-local origin of this element.

At the same time we can meet similar shapes of roofing construction in some Caucasus mountain rural houses[12]. The main room of such partly deepened in the ground dwellings has a fireplace in the center surrounded by square-plan beam-pillar framework serving as the base of an opened to the interior timber pyramidal tower that usually is square or octagonal in layout and has an opening for the fume on its top (Fig. 3). Georgian scholars argue this shape relativity to the Arian Zoroaster temples traditions finally transmitted also to the Caucasus stone Orthodox churches' shape having central octagonal opened into the interior tower, supported by fore pillars of square layout [4]. Further we consider possible to suggest the relativity of Caucasian roofing constructive shape with *octagon-on-square* timber tower space-constructive shape of Ukrainian wooden church, especially meaning the tight relationship of Kiev Russ with Caucasus Christians at that time. So we can finally suppose the *octagon-on-square* tower constructive shape genesis from the masonry architecture of Christian Caucasus church initially having connection with wooden rural roofing and in some meaning returned in Ukrainian land to their original material. So we can assume its non-local roots and X–XII centuries approximative time of formation (Fig. 1).

At the same time, the third type (*zalom*) can't be seen out of the territory of Ukraine[13] and thus may be considered like a unique original Ukrainian type (Fig. 4).

It could be supposed that it raised after Tatars invasion as a phenomenon of pre-Christian local building traditions partial reverse when vanished at Kiev Russ times Paganism building methods spontaneously rebirthed in close to rural traditions provincial church architecture while the center of Kiev Russ State building was moved from the territory of Ukraine to the new capital of Vladimir city (now the territory of Russia). Constructively it could be supposed like the later developing of timber pyramidal roofing (the second type of constructive shape probably sourcing from pre-Christian Slavic architecture) idea by cutting the top and continuing the timber tower erecting on this base. So temporally the appearance of *zalom* constructive shape could be considered between 13th (Tatar invasion time) and 15th centuries when we already could observe iconographic and real *zalom* type towers existence in Ukrainian wooden churches (Fig. 2, 4).

The fifth type (*zalom* and *octagon-on-square* jointing) can be considered like the youngest type of Ukrainian wooden church tower constructive shape (judging from existing examples approximate time of its formation was 17–18th c.) that raised of the third and fourth constructive shape types principles mixing.

The origin and the way of Ukrainian wooden church's formation is a very curious point. Main traditional theories suppose the early roots of Ukrainian multi-tower wooden church in rural dwellings [5] or in granaries [6, 7, 8]. But no one of these two points of view can be now considered finally proved[14].

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[10] The priority of this type spreading on the territories of former Kiev Russ principalities existing longer than Kiev capital (for example on former lands of Galicia principality) also support the credibility of this conclusion.

[11] The matter is that rural building constructions are very conservative and thus preserving (especially in supporting and secondary structures) the most archaic building tendencies of the land. In the case of wooden architecture when the excavation rarely can give some information about covering or roofing, the analysis of rural building's construction is a good way to understand the initial constructive shapes of local architecture.

[12] In Georgia they are named *darbaza*. The similar is *glhatun* for Armenian and *karadam* for Azerbaijan. There are also witnesses of this type dwelling spreading at Central Asia regions.

[13] The exclusion is some neighbor lands of historical habitation of Ukrainians.

[14] In the beginning of XX c. there were also some opinions of Ukrainian wooden church arising from copying the Byzantine type mural churches, as well as thoughts of their relativeness to mural Western Europe, Indian, wooden Scandinavian or

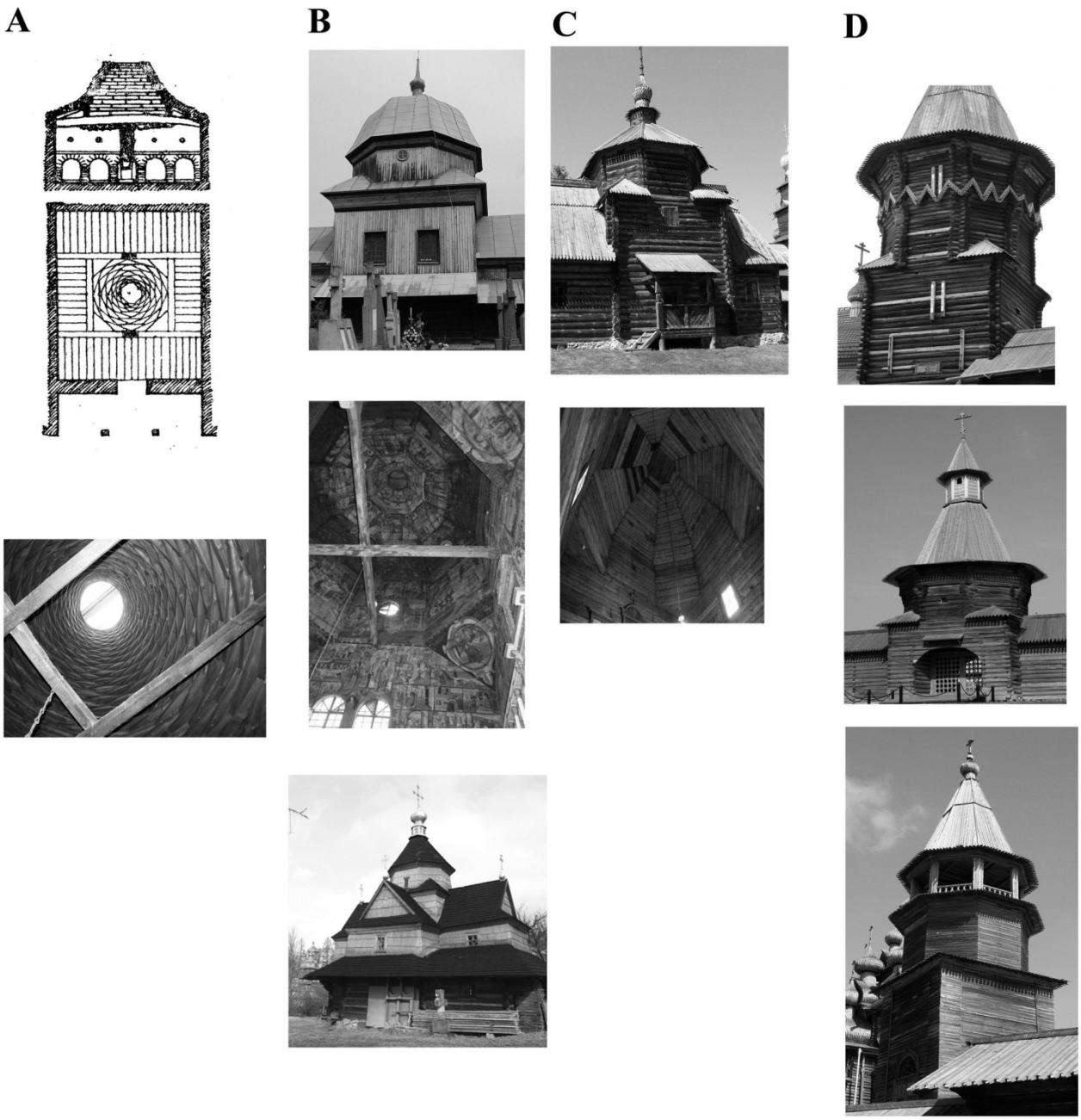

Fig. 3. Octagon-on-square timber tower shape construction. Origins and dissemination.
A. Old Caucasus examples of rural house timber roofing (Georgian darbaza type houses, the drawing is according L. Sumbadze [4]).
B. Examples of old Kiev Russ constructive shape transmission to Ukrainian wooden churches (Jovkwa town's Birth of the Holly Virgin, Drogobych town's St. Yura and Vorohta village's Birth of the Holly Virgin wooden churches, XVIII, XV–XVI, XVII centuried accordingly)
C. Examples of old Kiev Russ constructive shape transmission to Russian wooden church architecture of former principalities lands (Potakino village's Ascension wooden church at Suzdal's Wooden Architecture Open Air Museum, XVIII century)
D. Northern Russian wooden churches' examples (Kondopoga town's Assumption wooden church, Nikolo-Karelsliy monastery entrance fortress wooden church, Kiji Pogost's Transfiguration wooden church's belfry 17–18th cc.)

even Far East sacral architecture. Nevertheless that some of these opinions evidently had a lot of interesting points, till the end of 20th c. they were mostly abandoned by the scholars.

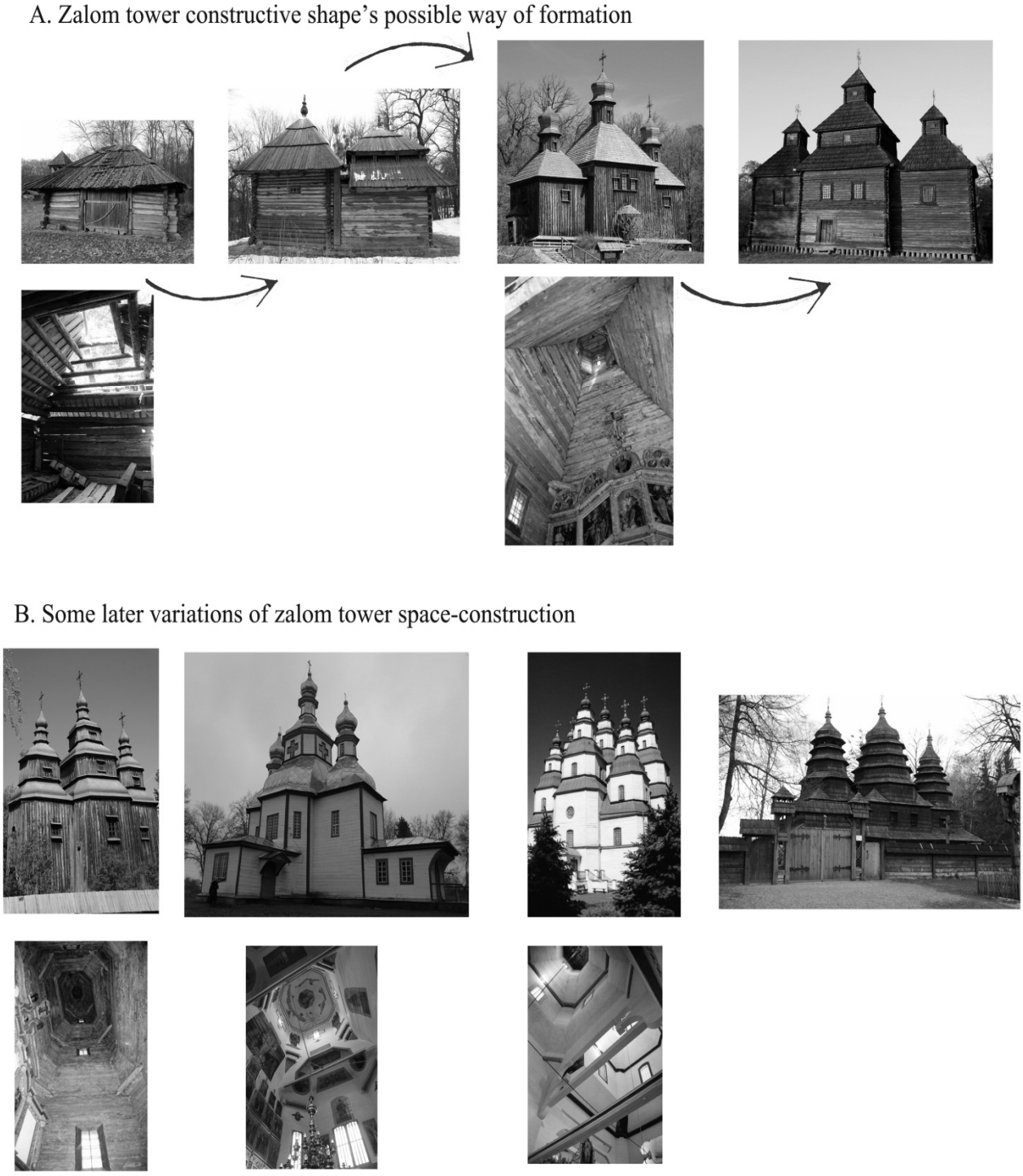

Fig. 4. Zalom timber tower shape construction. Origins and dissemination
A. Zalom tower's constructive shape possible way of formation.
(Left to the right: Polesia land's old pyramidal roofing granary, Klesiv village's chapel of XVII c., Dorohinka village's church of early XVII c., Kisorychi village's church of XVII c., all from the exposition of now at Pyrogovo Rural Architecture Open Air Museum,)
B. Some later variations of zalom tower shape construction.
(Left to the right: Zarubintsy village's church of 18th c., Sinyavka village's church of early XVIII c.; Novomoskovsk town's church of late XVIII c., Kryvka village's Boyko local type church of XVIII c.)

The rural house theory now seemed to be behind the time because of the shortage of scientific proving as well as the absence of churches' examples showing the transmission proses from literal roofing construction of rural house to elaborated centric timberwork towers of Ukrainian wooden church. The theory of granary origin seems much more interesting sowing relationship of Ukrainian wooden church to the centric cowered with pyramidal timber roofing granaries of Northern Ukraine. In the second part of XX century there were found in Polesia region the witnesses of such transmission proses: surviving churches evidently formed with assembling several independent wooden cages of pyramidal roofing (which is exactly the shape of local granary) to the united tree-partial plan churches [8]. But the logic of such transformation still remained not quite clear. We could restore the logic of granaries sacralization using the experience of Japanese architectural history where we can observe certain similarity of wooden architecture formation processes to the Ukrainian case.

Basically wooden architecture in Japan and Ukraine has different structure (framework and timber construction accordingly) but special atmosphere of poetical "beauty of sadness" and "close to nature spirit" of Ukrainian wooden churches is remarkably relative to Japanese aesthetic tradition. Although we have no information about any direct mutual influence between wooden architecture of these two countries, it is natural to suppose that those similar points could be caused by general likeness of culture and initial mentality[15]. Here we can argue to the grate similarity between Japanese Shinto and Ukrainian (Ancient Russ) so called Paganism animistic religion. Both ancient Slavic and Japanese peoples were pantheists who lived depending of the Spirits of nature sheltering in significant landscape's elements such as rivers, mountains, waterfalls, big rocks or old trees. Ancient rites and praying ways of old-time Japanese and Ukrainians were also nearly identical [9, 10]. It is widely known that the shape of Japanese so called ***takayuka*** type storehouse was inherited for primitive Shinto sanctuaries. It seems natural as in that time the unnamed Spirits of fields (patrons of rice harvest) were considered among the principal deities. No wonder that rice storehouses obtained sacral meaning and were worshiped like the places of field Spirits temporal dwellings. Then ***takayuka*** granary structure was adopted for Shinto sanctuaries design [11]. The logic of Ukrainian church genesis from the granary prototype can be explained by the same religious and cultural reasons as in Japan. Just let us turn to the pre-Christian times of Ukrainian history, when crop-deity dwelling also could be imagined in granary [12, 13] that resulted to appearing of small and simple granary-structured pre-Christian sanctuaries and further their constructive shape could be easily adopted as basic form for initial Ukrainian wooden churches.

From the other hand we can't deny completely also the possibility of rural house genesis, but restricting them only for the archaic cases of so called "rural-house" type churches with lateral timber coverings (the first type of roofing constructive shape) preserving in some Galicia lands (Fig. 1). In this situation the logic of rural house sacralization can have several explanations, such as the most simple of the first Christian worships fulfilling in dwellings to the deeper reasons of pre-Christian genesis, for example connected to dwelling's fire-place sacralization as well as to the cult of died people when according to the Slavic traditions the tombs were shaped as small primitive timber houses [14, 15]. And then of course it also can't be neglected the connection of Ukrainian wooden church composition and constructive shape with some Kiev Russ State building traditions inherited from Byzantine and Caucasus Christian sacral architecture (Fig. 1). At least like it was shown above, one of the Ukrainian wooden church's timber tower constructive shape types, so called ***octagon-on-square*** (the fourth type) evidently had the relativity to them[16].

Further we generally analyzed the process of Ukrainian wooden church formation from the temporal-historical point of view and can argue its revolutionary character. In this term we mean not smooth (evolutional) way of developing but existing of some historical brusque turning points of its formation way character. At our mind, this peculiarity was induced by unique geographical and historical circumstances of Ukrainian territory. The starting point is untypical preconditions of Ukrainian wooden church formation at geographical zone of

[15] From the other hand, it is curious that house-shaped clay models (so called ***haniwa***) found in Japanese tomb mounds are similar to the earthen models of houses and temples found during excavations of Trypillian culture flourished in Ukraine in 5400-2700 BC. So we can't deny the possibility of some historical intersection of our nations in the time when wooden architecture was born. Most of it, there are some witness of such possibility minding the fact that in the deep past southern Ukrainian territories belonged to Silk Road lands and so.

[16] In some cases the cross layout of Ukrainian wooden church also can be considered as a result of such heritage, but this question is still not clear completely because of the possibility of independent cross layout formation by subjoining the additional aisles to typical Ukrainian three-partial layout.

timber and framework construction spreading areas border [16], as well as at the border of eastern and western cultures historical intersection. Then the proses of Ukrainian wooden church's architecture formation due to the historical reasons two times changed its main vector. The basic turning points were the compulsory Christian belief spreading at Kiev Russ (X–XI c.) led to the local Paganism and Byzantium Christian building tradition mixing. It is a fact that here ancient religion of Slavic Paganism had great influence to Christian culture including sacral wooden architecture design mostly because of the State politic of new Christian churches erecting on the place of old animistic sanctuaries. The excavations also proved the fact of animistic religion sanctuaries clandestine existing on the territory of Ukraine parallel with Christian worship at least till 14th century [10]. The next turning point of Ukrainian wooden church formation way was Tatar invasion (XIII c.) that led at the territory of Ukraine to the Kiev Russ' State architecture falloff accompanied with the reversion of habitual Paganism building traditions in small rural churches.

Comparing the space-compositional shape of Ukrainian wooden church with basic archetypical compositions of world sacral buildings we also could argue that the coincidence is not homogeneous. Thus, determined above the *centric-subordinated* type of Ukrainian wooden church composition is generally corresponding to the main Central Asia (Caucasus, Iran and so, probably having the roots at Zoroaster tradition[17]) centric composition archetype of temples where central upper space is turned with lower aisles (Fig. 5).

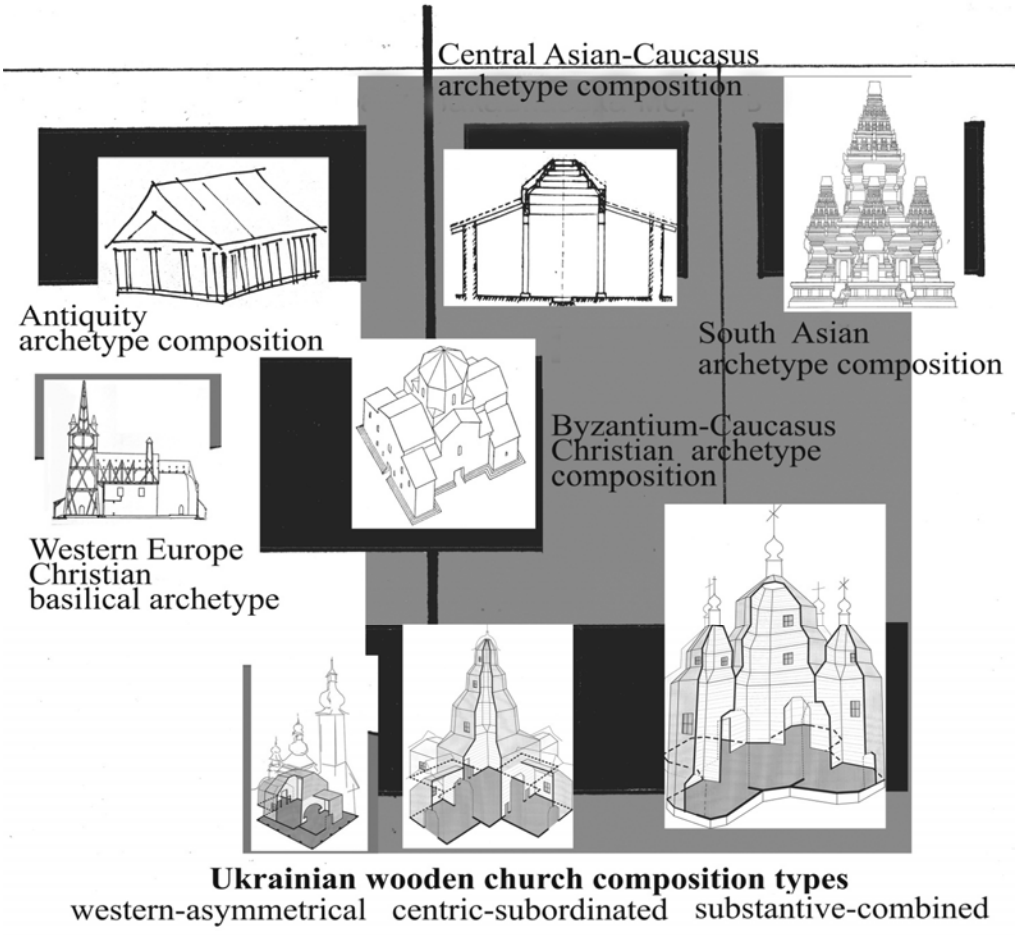

Fig. 5. Main compositional archetypes of world sacral architecture.
The place of Ukrainian wooden church.

It is interesting that this type of Ukrainian wooden church composition examples are mostly spread on the lands of former Russian principalities surviving longer then Kiev capital (for example at former Galicia

[17] It has to be noticed that the Byzantine temple tradition also is mostly inclining to this root.

principality territory[18]) and are tightly connected with ***octagon-on-square*** tower constructive shape mostly used in single central tower and evidently having origins in Kiev Russ and Caucasus sacral architecture traditions. This fact makes us to produce the preliminary idea of ***centric-subordinated*** Ukrainian wooden church type tight connection with Kiev Russ – Caucasus – Central Asia architecture traditions.

At the same time, the ***substantive-combined*** type of Ukrainian wooden church composition is equal to the Southern Asia (Hindu tradition) temple centric combinatory composition archetype combined with several jointed in ground level independent towers that initially could be devoted to the different deities. So we can see here the strong analogies of this type of Ukrainian wooden church composition to the Hindu polytheistic temple composition archetype. Remaining the mentioned above possible way of Ukrainian wooden church formation of several layout units (timber cages of pre-Christian small worship buildings or sacralized granaries) assembling, we can consider this analogy more than veritable. It is also curious that ***substantive-combined*** type of Ukrainian wooden church is predominantly using ***zalom*** constructive shape of multiplied towers that also can witness of it's close to pre-Christian genesis of the combinatory way of formation. Thus it is possible to assume the general inclination of Ukrainian wooden church composition to the Eastern Polytheistic archetypes.

The influence of Western Europe lateral (Antiquity pattern, basilica and so) temple archetype to the Ukrainian wooden church composition is comparatively weak and can be partly seen only at some local diversity shapes of Ukrainian wooden churches situated close to western border-line of Ukraine (Lemkos, Transcarpathian churches and so) and thus filling some traditions of close to Western Europe neighbor countries' (Poland, Romania and so) architecture (Fig. 1, 5).

4. Conclusions

As a result of this work there was elaborated a theory of Ukrainian wooden church genesis that briefly can be described with five basic principles such as: the principle of substantive syncretic genesis; the principle of conservative basic shapes; the principle of structure tectonic and centric; the principle of revolutionary developing character; the principle of combinatory formation way. The substantivity of Ukrainian wooden church genesis means the original formation way of its architecture. The architecture of Ukrainian wooden church has several principal unique traces. The most significant of them is its formation to monotheistic temple by pure polytheistic way of autonomy architecture units combinatory assembling (applicative only to the ***substantive-combined*** type of Ukrainian wooden church composition). The Ukrainian idea of multiplied ***zalom*** shape-construction timber tower's allowing creating high and stable, opened to the interior architectural spaces also is unique. The syncretic genesis of Ukrainian wooden church means an existing of several principally different (pre-Christian and Christian, eastern and western as well) prototypes of its shape-constructive form and space-composition. This is a unique to the Europe example of monotheistic temple ceaselessly keeping the spiritual national traditions from animistic times.

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Шевцова Галина

ГЕНЕЗА УКРАЇНСЬКОЇ ДЕРЕВ'ЯНОЇ ЦЕРКВИ: СВІТОВИЙ КОНТЕКСТ І САМОБУТНІСТЬ

Анотація. *У статті наведено теоретичне узагальнення та нове рішення наукової проблеми генези української дерев'яної церкви (її витоків та принципів архітектурного формування). Наукові результати були досягнуті завдяки аналізу основних архітектурно-генетичних характеристик української дерев'яної церкви, таких як її композиція і просторова конструкція. Аналіз проведено у глобальному річищі огляду розвитку світової сакральної архітектури.*

Основні архітектурно-генетичні характеристики української дерев'яної церкви – її композиція і просторова конструкція є виключно консервативними (сформованими не пізніше XVI ст.) та загальновживаними на українських землях ознаками, що залишаються переважальною основою архітектури українських дерев'яних храмів незалежно від їх часу зведення та місця розташування. Зокрема, простежено генезу п'яти негомогенних за походженням базових типів конструктивно-просторової форми верхів українських дерев'яних церков (підвищений накат, намет, залом, восьмерик на четверику, конструктивне поєднання залому і восьмерика на четверику), що можуть комбінаторно поєднуватися в архітектурі однієї будівлі. Також виявлено два базових типи пов'язаної з інтер'єром просторової композиції українських дерев'яних церков. Ними є центрично-підпорядкований (з одним центральним верхом) та незалежно-комбінований (центрично-симетричний багатоверхий) типи, що кореспондуються з основними архетиповими композиційними моделями східного храмобудівництва: центральноазійською (зороастрійською) та південноазійською (індуїстською) відповідно. Це, у поєднанні з іншими ознаками, свідчить про генетичний зв'язок архітектури української дерев'яної церкви з традиціями культового зодчества східно-політеїстичного типу.

Процес формування української дерев'яної церкви відбувався різкими революційними стрибками, що було обумовлено унікальними географічними, культурними та історичними умовами регіону. Відправною точкою є нетипові передумови формування української дерев'яної культової архітектури в зоні територіального межування світових ареалів каркасного і зрубного дерев'яного будівництва, східних і західних культурних архетипів. Надалі процес формування двічі змінював напрямок. Ключовими зламами характеру розвитку були: примусове поширення християнства на Русі, що призвело до змішування архітектурних традицій місцевого анімізму та візантійського християнства, а також монголо-татарська навала, яка викликала послаблення християнського впливу та зумовила перевагу дохристиянських будівельних традицій. Саме це, вочевидь, ініціювало формування комбінаторної структури і багатоверхість українських дерев'яних церков.

На основі наведеного вище розроблено теорію генези української дерев'яної церкви, яка може бути описана п'ятьма базовими принципами: принципом самостійності і синкретичності генези, консервативності базових форм, тектоніки і центричності структури, комбінаторності шляху формотворення, революційності характеру розвитку. Самостійність генези української дерев'яної церкви розуміється як автентичність її архітектури, що має декілька принципово унікальних рис. Найбільш значущими з них є шлях формування у монотеїстичну будівлю суто політеїстичним шляхом комбінаторного поєднання автономних архітектурних одиниць (є чинним лише для випадку незалежно-комбінованого типу композиції). Також унікальною є ідея багатоступінчатого поєднання зрубних заломів у верхах, що дозволяє створювати високі і стабільно-міцні, відкриті в інтер'єрі тектонічні архітектурні простори. Під синкретичністю генези мається на увазі наявність декількох принципово різних прототипів (дохристиянський і християнський, східний і західний, тощо) її просторово-конструктивної форми і композиції.

Висновки дослідження стверджують автентичність, самобутність і всесвітньо культурне значення архітектурного феномену української дерев'яної церкви, що являє собою рідкісний випадок європейського монотеїстичного храму, який зберігає зв'язок з духовними традиціями нації з анімістичних часів.

Ключові слова: *українська дерев'яна церква, генезис, архітектурно-генетичні характеристики, композиція, просторова конструкція, світова сакральна архітектура, композиційний архетип.*

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METHODS OF TEACHING ARCHITECTURAL ENERGY CONSERVATION IN THE EDUCATIONAL DESIGN

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Abstract. Energy conservation is becoming increasingly more relevant for Ukraine and the world, and architectural education must meet one of the most significant challenges of our time. The article analyzes the existing laws and regulations of our country and points out to the lack of a number of national standards necessary for architectural design. It focuses on the problems of real design and ways to solve them within the framework of architectural training. By expanding the curriculum with specialized subjects, such as "Energy Efficient Architecture", the Institute of Architecture of Lviv Polytechnic National University significantly improves the energy awareness of architects and their responsibility for the energy consumption of the objects they design. The analysis of the basic principles and areas of application of energy-efficient architectural solutions is based on interdisciplinary research. This is the basis of the methodology of teaching the discipline with its theoretical and practical components. The paper describes the key aspects of classes on the theory of architectural energy efficiency to students. The practical part involves using instructional design to develop solutions that can be applied in new buildings, as well as in reconstruction, renovation and modernization of objects of different construction periods. Some examples and description of educational projects related to architectural thermal modernization are provided. The resulting information can be applied not only in instructional design but also in future graduation and competition design projects, as well as in students' research works. The outlined prospects for energy conservation in architecture and ways of development of the subject have a significant potential for improving the professional competence of architecture students. Special attention is given to research work aimed to ensure consistency of the content of education with the current state of the economy, energy consumption, achievements of science and technology. By introducing the above means into architectural training, one can expect significant foreseeable energy conservation effects in real, applied design.

Key words: architecture, energy conservation, energy efficiency, public buildings, instructional design, architecture competitions.

1. Introduction

The rapid growth of energy consumption is fraught with the risks of depletion of fossil energy resources. The risks associated with the use of traditional energy make energy conservation and energy efficiency a relevant area of activity for specialists representing different sectors. Although later than many countries, Ukraine got involved in resolving energy efficiency challenges, which are currently treated as a national security issue. A number of laws have been adopted and approximation of national regulations to European ones has been launched: the Law of Ukraine "On Energy Efficiency of Buildings" (2017), "Thermal Insulation of Buildings. DBN V.2.6 and 31: 2016" (2017) [1; 2; 3] and many others.

The global transition to a more environmentally friendly energy use will certainly have an impact on the labor market. In the field of architecture, competence in designing objects with lower energy consumption makes specialists more competitive. In Ukraine, according to expert estimates the cost of heating residential and public buildings makes up about 40 % of total energy consumption [4]. Therefore, the scope of work to be done is unprecedented. In order for the architect's idea to be the engineer's command consistent with the current requirements, one must be able to design the energy efficiency of his object. By introducing the discipline "Energy-Efficient Architecture" into the curriculum, we have significantly improved the energy awareness of architects and their responsibility for the energy consumption of their designed objects. This is exactly what we had in mind more than a decade ago when developing this subject for students of the specialty "Architecture and Urban Planning" at the Institute of Architecture of Lviv Polytechnic National University [5]. In this article, we will share our positive experience and methods of teaching architectural energy conservation.

2. Literature review

Representatives and heads of leading architectural institutions have repeatedly raised the issue of the quality of architectural education and improving the level of training [6; 7]. The study of the theory of architectural energy conservation and energy efficiency is based on foreign experience as well as on significant domestic endeavors [8; 9; 10]. Today, practicing architects have access to a large number of calculation platforms, simulation programs, and various software for calculating and determining energy efficiency. A lot of attention is given to their analysis and ranking in terms of the level of complexity of tasks [11, 12]. However, in real-life work, this toolkit is applied to its full capacity. The problem should be solved during the instructional design stage, where elementary applied calculations give an idea of physical processes and their interaction, as well as make it possible to predict and assess design solutions.

The aim of the article: to construct a methodology and to monitor the results of the instructional design of energy efficiency in design of architectural thermal modernization of existing buildings.

3. Basic Theory Part

The organization of instructional design is outdated as regards accounting for energy saving architectural measures. This is not only due to the fact that during their studies architecture students (specialists and masters) perform 10-11 (or even up to 15, if the work load is large) architectural projects before carrying out their graduation design project or master's qualification work. The problem lies elsewhere. The Institute of Architecture in Lviv, as well as other architectural higher educational institutions of Ukraine have a discontinuous approach to specialized instructional design. There is no comprehensive semester design project with equal regard to the issue of energy conservation. By integrating such a discipline in the curricula, the following problems can be solved: mastering the basic methods of architectural energy conservation, getting acquainted with thermophysical processes, making elementary calculations and learning to construct simulation models. The teaching methodology combines theoretical and practical parts.

The main student training areas in the theoretical part include:

– informing about the national and global energy situation,

– awareness and knowledge of the contemporary domestic regulatory framework,

– ability to apply regulatory requirements in practice;

– familiarization with the main thermophysical processes;

– ways to design taking into account a potential tightening of requirements in view of the harmonization of Ukrainian regulations with the relevant international or European legislation;

– informing about international good practices and the most successful cases of famous architects.

The teaching methodology primarily focuses on performing energy efficiency projects that combine theoretical knowledge and practical skills. This methodological approach allows us to start from the general

standpoint of energy efficiency and energy conservation through learning to make calculations to energy-efficient architectural solutions.

The practical part is based on the professional competence of 4-year bachelor's degree and 1-year master's degree architecture students within their specialty. They carry out a "Design of an Energy-Efficient Single-Family Residential House" or a calculation work "Architectural Thermal Modernization of a Public Building". The latter mostly focuses on solutions that can be applied in reconstruction, renovation and modernization of objects of different periods of construction.

Stages of practical work include:

– selection of climate indicators;

– field survey of objects;

– elucidation of the architectural or historical value of the object;

– analysis of planning, compositional, and shape-forming solutions from the point of view of energy conservation;

– detection of defects in structures and materials

– measurement and study of the values of microclimatic parameters by temperature zones,

– compiling a list of energy saving measures,

– calculation of transmission heat losses,

– selection of the most effective solutions based on calculations,

– customizing these solutions for the existing building,

– submission of the design project with the subsequent visualization of project solutions.

Next, we will describe a number of calculation works made within the discipline.

4. Results and Discussion

According to legislation, new buildings should be designed in conformity with at least class C requirements. The use of energy conservation techniques for them is clear-cut [1]. However, their integration into already existing facilities (which must undergo "certification of energy efficiency of a building"), including validation of the energy efficiency of solutions, requires much more multidisciplinary research and special educational, scientific, engineering and practical studies. Students could choose from a range of buildings and complexes of different designation: "home school", "kindergarten", and "parents' house". This principle of selecting survey and design objects greatly motivated the authors since they could appreciate the practical value of the proposed measures and, thus, manifested greater responsibility in making decisions and calculations.

The practical application of the methods of teaching architectural thermal modernization will be considered based on the design projects of public buildings and complexes. Most of the projects refer to buildings of educational institutions of the 1970–80s with typical design. It is reasonable to assume that the insights and calculations of architectural thermal modernization measures could also be typical and used in the future for such buildings in different regions of Ukraine. A total of 106 projects have been carried out for 82 buildings in the city of Lviv.

Along with architectural design solutions, the projects offer a number of planning, compositional and shape-forming solutions, taking into account the features of each object. Thus, they implied remodeling, adding extensions and superstructures in the form of auxiliary and training premises, glazed rooms, recreation facilities and greenhouses, for which energy efficiency calculations were also made.

Let us discuss some projects that differ significantly in approaches to execution. Thus, the project of architectural thermal modernization of the building of school No. 99 in Lviv implies reducing transmission heat losses by 60 % due to a number of proposed solutions (Fig. 1).

The project of thermal modernization of the orphanage in Tadzhytska Street in the city of Lviv includes a list of measures to reduce transmission heat loss by 64 % (Fig. 2). It should be noted that most of the projects and calculations had been made before the requirements for thermal insulation of fencing structures were tightened in 2013 and new state building codes were adopted. This means that current energy conservation indicators will now be much higher.

Fig. 1. Project of architectural thermal modernization of the building of school № 99 in the city of Lviv.
Authors: Khomandyak M., Klapchuk Yu., supervised by Shuldan L. O., Associate Professor, Ph.D (from the author's archive)

Fig. 2. Educational project of architectural thermal modernization of the orphanage in Tadzhytska Street in the city of Lviv.
Supervised by: Shuldan L.O., authors: Henda K., Labushevskyi O., Shapovalov E. (from the author's archive)

The techniques for historic buildings were chosen from a wide range of energy conservation measures based on both their maximum efficiency as well as the principle of respect for the architectural image of buildings in the historic area of the city. The measures were developed and calculations were made after a study of the history of the educational institution, its architectural or historical value, survey of the condition of its structures and fittings, observance of the values of microclimatic parameters and revision of the functional feasibility of the current planning pattern. During the examination, flaws and defects were detected, destruction and leak spots were found, necessary remodeling was specified, etc. As a result, it was proposed to carry out measures of thermal renovation of separate parts and fragments of fencing structures together with sanitation and restoration works. The calculation of facade insulation was of a training and hypothetical nature. An example of such research can be the project of thermal modernization of the building of school No. 87 in Lviv (**Fig.** 3). Energy savings with regard to transmission heat loss amount to 58.9 %.

Fig. 3. Project of architectural thermal modernization of the building of school № 87 in the city of Lviv.
Authors: Myndio V. M., Yadlovska O. R., supervised by Shuldan L. O., Associate Professor, Ph.D (from the author's archive)

In real conditions, architects have to take into account and analyze considerably more natural, man-made, anthropogenic factors in the shortest possible time. This encourages the creation and (or) use of relevant databases – climatic, geological, geodesic, statistical, etc. In the analysis of the urban development situation, volumetric, planning and compositional solutions, choice of constructive solutions and materials, analysis of the energy efficiency of this or that option, it is necessary to intensify parametric analysis processes. Contemporary architects are increasingly more often resorting to computer simulation tools in the early stages of designing in search for the most viable solutions for designed objects. To boost energy-efficient architecture in our country, we need national BIM and BEM design standards, approved protocols and principles for verifying digital models. For high-quality energy-efficient design, it is necessary to bring the software in conformity with the state standards and regulatory documents with the support of digital databases of all levels.

However, even today students' experience in using their skills and expertise is implemented in competition projects. For example, they took part in the All-Ukrainian Contest Reset City // Renovation – 2018: Development of Optimal Energy-Efficient Solutions for Reconstruction of Typical Kindergartens and Schools. The competition was announced and organized by the National Union of Architects of Ukraine involving Shuldan L. O., Ph. D, as an expert and jury member. The students also became winners of national screening procedures and participants of the international student contests Designing Multi-Comfort House in Madrid and Dubai of different years, etc.

By stimulating the rapid development of the area of energy efficiency in design, raising awareness of the problems and gradually step by step solving the tasks set with regard to training future specialists, it will be possible to shift the process of the professional training of architects to a higher level.

5. Conclusion and Prospects for Further Research

Energy saving is becoming an increasingly more relevant issue in architectural training. In order for the architect's idea to be the engineer's command consistent with the current requirements, one must be able to design the energy efficiency of his object.

In this regard, the task of architectural education is to develop expertise and ability to improve energy efficiency primarily by architectural means. The theoretical part of the educational discipline "Energy-Efficient Architecture" informs about the modern requirements and principles of energy conservation and gives insights into the relevant fundamental, engineering and technical aspects. The discipline is in line with the scientific specialization of the Department of Architectural Design and Engineering of the Institute of Architecture of Lviv Polytechnic National University – i.e. "Architecture of public and residential buildings, constructions of buildings and structures, quality assessment and monitoring of the architectural environment, issues of energy conservation in the field of architecture". It focuses on instructional design, which in architectural schools should not duplicate energy efficiency measures of other scientific and educational disciplines, concentrating instead on the application of architectural and typological principles of energy conservation based on multidisciplinary research. The ability to apply basic techniques and methods, to make calculations, to make simulation models and to analyze them is put to good use both in instructional design when developing projects of architectural thermal modernization of buildings and in future graduation design projects and students' scientific works.

Research work should ensure the consistency of the content of education with the current state of the economy, use of energy, and achievements of science and technology.

Only by integrating the above-mentioned means into architectural education, can we expect tangible energy saving results in the foreseeable future in real, applied design.

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МЕТОДИКА ВИКЛАДАННЯ АРХІТЕКТУРНОГО ЕНЕРГОЗБЕРЕЖЕННЯ В НАВЧАЛЬНОМУ ПРОЕКТУВАННІ

Анотація. *Актуальність питань енергозбереження для України та світу невпинно зростає і архітектурна освіта має відповідати одному з найважливіших викликів сучасності. У статті проаналізовано наявні в нашій країні закони й норми, а також відзначено відсутність низки необхідних для архітектурного проектування національних стандартів. Розглянуто проблеми реального проектування та шляхи їх вирішення у підготовці архітекторів. Введення в навчальну програму спеціальних дисциплін, таких як "Енергоощадна архітектура" в інституті архітектури Національного університету "Львівська політехніка", значно підвищує енергетичну свідомість архітекторів та їхню відповідальність за рівень енергоспоживання запроектованих ними об'єктів. Аналіз основних засад та напрямів застосування енергоефективних архітектурних рішень базується на міждисциплінарних дослідженнях. Саме це покладено в основу методики викладання навчальної дисципліни з її теоретичною та практичною складовими. Окреслено основні позиції навчання студентів теорії архітектурного енергозбереження. У практичній частині під час навчального проектування відпрацьовуються рішення, що могли би бути застосовані для нових будівель, в умовах реконструкції, реновації і модернізації об'єктів різного періоду зведення. Наведено деякі приклади і опис навчальних проектів архітектурної термомодернізації. Отримані знання знаходять застосування не лише у навчальному проектуванні, а й у подальшому, в дипломному та конкурсному проектуванні, у наукових роботах студентів. Окреслені перспективи енергозбереження в архітектурі та шляхи розвитку дисципліни, що являють собою значний потенціал для підвищення професійної компетенції студентів-архітекторів. Важлива роль належить науковій діяльності, яка має забезпечувати відповідність змісту освіти, сучасному стану економіки та використання енергії, досягненням науки і техніки. Забезпечивши архітектурну освіту названими вище засобами, можна буде очікувати суттєві результати енергозбереження в найближчому майбутньому в реальному, прикладному проектуванні.*

Ключові слова: *архітектура, енергозбереження, енергоефективність, громадські будівлі, навчальне проектування, архітектурні конкурси.*

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SUGGESTIONS ON THE DEVELOPMENT OF HIGHER THEOLOGICAL-HUMANITARIAN INSTITUTIONS ARCHITECTURE IN UKRAINE

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Abstract. The article highlights and analyzes the architectural peculiarities of such a new type of buildings as theological-humanitarian higher educational institutions, distinguishes the major factors that influence their architectural and space planning organization, and outlines suggestions on the development of theological-humanitarian institutions architecture in Ukraine.

Key words: architecture, theological education, humanitarian education, higher educational institutions, university.

1. Introduction

According to Ukrainian legislation and European practice, the contemporary secular education in our country is separated from any religion. Nonetheless, some young people strive to acquire an education that would go in line with the everlasting Ukrainian tradition and the Christian ideology. The tendency is particularly important for the humanitarian education. The needs of those, whose everyday life, education and later on employment are inseparably linked with Christianity, cannot be overlooked. A person should always be capable of making his or her choice. Meanwhile, the contemporary higher education in Ukraine offers school graduates to enter either secular institutions or theological seminaries and academies, which prepare priests. A few positive examples, like the Ukrainian Catholic University in Lviv, do not change the situation significantly. Ukraine desperately needs universities of the new theological-humanitarian type. The establishment of such universities is not limited to a brand-new educational doctrine, a set of relevant educational programs and highly-qualified specialists. Theological-humanitarian educational institutions require special buildings and complexes that would meet the contemporary targets of theological-humanitarian education in Ukraine in terms of its architectural, space planning, aesthetic and ideological characteristics. That way, it will be possible to return to the origins of Ukrainian and, what is more, European education, which during the last decades finds itself under the influence of total secularization. Of course, theological-humanitarian educational institutions should differ from the secular ones in the architecture of their buildings. The development of a specific architecture is a challenging, but, at the same time, interesting and responsible task. The future of our youth and their spiritual, educational and civic progress are at stake. The environment, that surrounds the new generation of Christian humanitarians during their studies, would determine whether the idea of returning to spirituality in education will gain its roots. The article aims to answer the topical questions of theological-humanitarian institutions architecture formation.

2. Basic Theory

During the last decades, the Roman-Catholic Church, which is the most numeric in the Christian world, has been conducting an active policy of rapprochement with the secular society and it has found its reflection in

the Vatican system of theological education. Catholic educational centers are closely integrated with the Western society centers of humanitarian studies. These Christian educational centers (universities) provide theological and humanitarian education for both – future priests and average humanitarian students, who do not intend to link their future with any church institutions. The tendency finds its reflection in architectural and space planning decisions of the Catholic theological educational institutions. One can witness the departure from buildings of a monastery (closed) type and creation of a new more civic image of a Christian university.

The Pontifical Lateran University in Rome is constructed on the basis of a similar ideology, which promotes openness of church through openness of architecture. The architecture of the complex is tempered, ascetic, and, thus, associated with medieval monasteries. Only the entrance block is executed in a more genteel manner with the help of a set of big glass planes (Fig. 1). The big conference room is adjacent to the main studying block on the right side. The university uses the parish temple and the chapel, which are located on the square in front of the main entrance. The most interesting building in the university complex is the newly constructed library (Fig. 2). The library design is a brave attempt to integrate modern architecture with the conservative buildings of a theological educational institution. In their creative search, the architectural bureau King Roselli Architetti exceeded the boundaries of Vatican traditional architecture. The main task of the project was to establish a new principle of library functioning, namely the usage of modern multimedia technologies and materials on digital media carriers and the introduction of an electronic archive. The building has a modernist façade, but it is executed in an ascetic and decent manner, similar to other blocks of the university. It does not fall out of the general building complex and successfully supplements the architectural environment of the theological-humanitarian educational institution. The library repeats the character of the historical building complex in terms of its scale, colour and brickwork, but remains modern in its spirit and shape.

Fig. 1. Main façade with the entrance block [12]

Fig. 2. Library building [13]

Fig. 3. Interior of the university library [14]

Fig. 4. Spiral inter-floor covering of the library [14]

The modern decisions that are observed in the interior design of the new library building reflect the concept of combining traditional theological and modern humanitarian education (Fig. 3). The inter-floor covering is inclined as a spiral around the open light space with the upper lantern (Fig. 4). The vertical light symbolizes faith and knowledge, while the spiral stands for the idea of growing to perfection in the spiritual life and science. The large amount of glass in the library interior symbolizes openness of faith and human interrelations, general democracy of society and Catholic institutions.

While studying the issue of theological and humanitarian educational institutions in the world, we have to mention the Tel Aviv University (TAU). TAU is one of the biggest and most famous higher educational institutions in Israel, which combines theological, humanitarian, exact and medical sciences. The university is located in Tel Aviv. Currently, around 25 thousand students study there. The structure of TAU is constituted by nine faculties: Faculty of Arts, Faculty of Engineering, Faculty of Exact Sciences, Faculty of Humanities, Faculty of Law, Faculty of Life Sciences, Faculty of Management, Faculty of Medicine, and Faculty of Social Sciences. Additionally, in the university there are disciplines related to film industry and television. More than 80 research institutes function at the university, as well as the large library, the astronomical observatory and the botanical garden.

The spiritual foundation of the Tel Aviv University is laid by the sacred buildings, the Cymbalista Synagogue, some museums, the art gallery, the Jewish Heritage Center. The university is proud of its astronomical observatory, which is unique throughout the Middle East. The zoological garden of the university is famous for the largest collection of fauna in the world; and the botanical garden is known for its unique laboratory. The Wiener Library, located in the central university building, is the largest center of anti-Semitic documentation. On the territory of the main university campus, there are sports centers, cafés for students, canteens and a lot of shops. The university has its own center for psychological support. The university music academy constantly conducts music concerts and the local art gallery is always open for visitors. Every two years, the Faculty of Film Industry organizes the International Student Film festival [11].

The Synagogue (1996–1998), as the main sacred building, is located in the center of the educational complex and can be defined as the main dominant of the university campus (Fig. 5). Its project was designed by the famous architect Mario Botta. Most of the complex buildings are modern and embody the brave stylistics of facades and interiors (Fig. 6). The campus territory is beautifully landscaped. The buildings are connected by numerous pedestrian and cycling lanes. There are many places to relax and study in the open air, as well as the stadium, tennis courts and other sports grounds.

Fig. 5. Cymbalista Synagogue (architect M. Botta) [15]

Fig. 6. University academic building [16]

The Tel Aviv University is the typical representative of the Jewish high school, where modern education and science are harmoniously combined with religious groundings; spirituality at this university is an inexhaustible source for the further scientific progress and development of civilization in the society and the country.

Therefore, the contemporary European education suggests and implements the doctrine of returning to the Christian origins through the symbiosis of theological and secular humanitarian education into a brand-new theological educational institution, which can be referred to as theological-humanitarian. The educational conception finds its reflection in the architectural and space planning organization and the stylistics of contemporary Christian educational buildings.

3. Results and Discussion

The first higher educational institution of theological-humanitarian type in Ukraine during the period of its independence is the Ukrainian Catholic University (UCU) in Lviv. The university is the first one during the construction of which the specificity of the theological-humanitarian educational doctrine has been considered. To have a deeper understanding of the ideology, one should recall the words of Lubomyr (Husar), the major archbishop emeritus of the Ukrainian Greek-Catholic church, which were delivered during the inauguration celebrations on the occasion of the Ukrainian Catholic University establishment in 2012: "Unfortunately, nowadays the majority of people are convinced that university is a high school, which gives us certain knowledge, ensures better skills… and temporary material wealth. In short, it allows having a higher income. Nonetheless, a true university – if to understand its underlying idea correctly – looks at a person as a non-timely value and takes into account its dignity, rights and duties… Thus, we talk not only about knowledge or skills of doing something, but about understanding the sense of existence, understanding from where a person comes and where he or she goes, understanding the depth and height that a person can reach – this is the aim and the content of university education… Understanding human existence and everything that surrounds him or her is the wisdom and the true philosophy that can grant each thing its relevant place. It forms a person's attitude to God, to himself, to those who surround him or her. In short, apart from the wisdom and apart from the knowledge of putting everything in the right place, such university education teaches a person the true morality" [2].

Among the higher educational institutions that partially integrate theological and secular education, we can name the Ostroh Academy and the Kyiv-Mohyla Academy. However, no special architecture design projects of the mentioned academy building complexes were executed. The design of the Ostroh Academy and the Kyiv Mohyla Academy architecture was outstretched in time and had no integrated approach [3]. Meanwhile, the project of designing the UCU building complex was preceded by the profound scholarly research of R. Stotsko, a lecturer at the Lviv Polytechnic National University (under the supervision of professor V. Proskuryakov) and the design and construction practice of the architectural company "SENSE-Private Enterprise" (COO – Ye. Datsyshyn; architects – Yu. Horalevych, R. Stotsko, O. Khamar, Yu. Verkhola). They completed the working design of the Lviv Theological Seminary at Khutorivka Street in Lviv (Fig. 1) and a set of educational monastery buildings [4]. The conducted research allowed outlining the major architectural and typological principles of a theological-humanitarian university, established by the Ukrainian Greek-Catholic Church (UGCC). The architecture of the UCU building complex is formed as based on the following principles:

1. The educational structure of a theological-humanitarian university consists of the theological-philosophical (theological-philosophical faculty) and the humanitarian-secular (faculties: philological, historical, law, journalism, etc.) learning directions;
2. The theological and the humanitarian learning directions are mutually integrated and based on the Christian spiritual values; the fact does not exclude the profound study of the other world religions and general human foundations of coexistence;
3. In the urban planning perspective, a theological-humanitarian educational complex inclines to the central part of a metropolis, where libraries, cultural and art institutions and other higher educational establishments are located.
4. In the architectural planning perspective, building blocks of the theological-philosophical faculty and the humanitarian faculty are spatially, visually, architecturally and stylistically divided;
5. The major dominant of a theological-humanitarian educational complex is a temple or a chapel.

6. Apart from the liturgical purpose, a temple (or chapel) performs a spiritual and educational function and, therefore, is designed as a temple-classroom with the corresponding spatial organization and functional equipment for lectures;

7. A theological-humanitarian educational complex should have residential areas for students and guests with the necessary household infrastructure, including food production facilities with a canteen and an outdoor café;

8. The territory of a theological-humanitarian educational complex performs educational and recreational functions and is equipped with everything that is necessary for holding conferences, seminars, scientific exhibitions, festivals, concerts, etc.

The above enlisted characteristics concern a theological-humanitarian university, for which the spiritual component is dominant and which is established by the church institutions. The Ukrainian Catholic University in Lviv belongs to this type. However, the most common can be humanitarian universities with a few Christian disciplines, where the humanitarian education is the major one and the Christian studies serve as a supplement aimed at the formation of a spiritual and moral core of the future humanitarian specialists. This type of theological-humanitarian educational institutions can be referred to as a Christian-humanitarian university and be based on different ideological, educational, and architecture planning principles, which are as follows:

1. Educational structure of a Christian-humanitarian university would not presuppose a separate theological faculty, that conducts trainings for Masters of Theology, but limit itself to teaching separate religious studies disciplines, which are capable of shaping the students' Christian worldview;

2. Christian-humanitarian universities would not substitute the average secular humanitarian educational institutions, but suggest an alternative to the secularized education in Ukraine;

3. The architectural and space planning structure of a Christian-humanitarian university would integrate buildings, facilities and spaces of the spiritual and educational purpose in such a manner that the spiritual component would not be dominant in the general image of an educational institution;

4. From the space planning and stylistic point of view, a chapel (rarely a temple) would supplement the university complex architecture, but would not be dominant in any of the perspectives;

5. A chapel in a Christian-humanitarian university would perform only the ideological and liturgical functions and would not be equipped for conducting classes;

6. Dormitory blocks can be located either on the territory of an educational complex or outside;

7. Development of a food supply network would depend on the number of students and can be limited to the availability of a few cafés;

8. From the urban planning point of view, the spaces of a Christian-humanitarian university would be integrated with the building construction of streets, squares, and the recreational arrangement of the university-based territories.

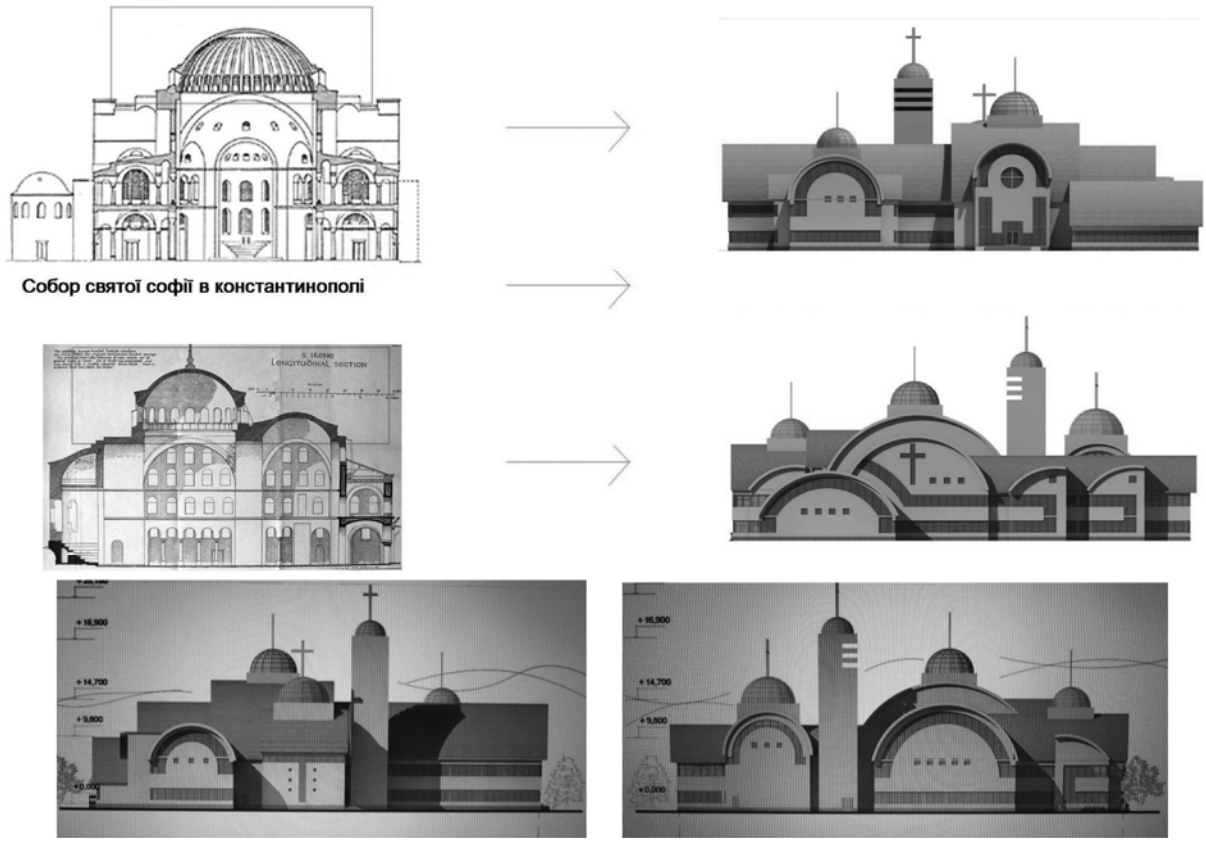
Thus, theological-humanitarian and Christian-humanitarian universities would differ in terms of the profoundness of studying theology, the percentage of humanitarian disciplines and the possibility of preparing priests with master's diploma. Apparently, the architectural image of the two types of universities would differ as well. A theological-humanitarian higher institution would incline to the stylistics of sacred buildings with the pronounced sacred symbolism, while the architecture of Christian-humanitarian universities would be more secular and based on the design decisions peculiar for modern university complexes. However, even such a civic architecture would have the stylistic and construction elements that identify it as an institution supporting and teaching Christian values.

We intend to consider the means of architectural-artistic and spiritual-aesthetic expressiveness used in the process of designing the building complexes of theological-humanitarian higher educational institutions, since this type of universities fully reflects the idea of sacred humanitarian architecture of the higher educational institutions in Ukraine. From the ancient times, the architecture of theological schools has been inseparably connected to the architecture of churches and monasteries. The connection

has, first and foremost, the spiritual and ideological character. A temple or a chapel has always been the major construction in theological seminaries, academies or universities and defined the architectural image and stylistics of the whole educational complex. On the other hand, the educational function belongs to the powerful factors of image formation in any educational institution. A significant contribution to the general image is made by educational buildings, library building, residential areas, food supply units and – in some universities – sports grounds and indoor gyms. Creation of an integral and harmonious architectural image and space planning organization of a modern theological-humanitarian university in Ukraine depends on the following factors: *a) spiritual-ideological; b) functional; c) national-historic; d) natural-climatic; e) economic; and f) resource-technological.*

Spiritual-ideological factor defines the sacred character of design and peculiarities of facilities and space organization within an educational institution: for example, a canonic temple or a chapel, its location with respect to the surrounding educational buildings, an altar position, a tent or dome completion of a temple, a chamber or other sacred buildings, usage of sacred symbols and interior paintings with biblical scenes, etc. [6]. *Functional factor* predetermines the spatial structure of a complex, which would meet the requirements of students in terms of their educational and spiritual life, the façade composition of educational buildings, library and dormitories with the corresponding rhythm of sizes, the size and location of windows, stained glasses, balconies, terraces, etc. Functional factor is considered during the process of designing the courtyards, which are aimed for both recreation and educational and theological events; supplementing the open and closed spaces with the small architectural forms; and gardening. *National-historic factor* is particularly important for designing theological-humanitarian universities in Ukraine. Institutions of theological education in Ukraine have always resided on the spiritual, national and historic background. Customs, traditions and historic heritage are reflected in the artistic image of university buildings in their modernized form [7]. The architectural space planning organization and the choice of architectural-artistic and spiritual-aesthetic means of expressiveness in theological-humanitarian educational institutions depend on the natural-climatic environment. Thus, while designing these institutions in the Western Ukraine, it is required to secure buildings from the large amount of rainfalls and provide an appropriate level of insolation during cloudy and rainy days [10]. These are mainly sloping roofs of complex shapes, covered terraces, galleries, glazed spaces, summer gardens and other architectural elements, that ensure comfort in bad weather. A different climatic situation in the Eastern and Southern Ukraine conditions the usage of other means of architectural expressiveness, such as: light walls with the minimum window area, flat roofs, sun protection constructions, etc. Therefore, *natural-climatic factor* introduces major corrections to the architectural images of theological-humanitarian educational institutions in different regions of Ukraine. The *economic* and *resource-technological factors* are important from the view point of choosing the architectural and building materials that form the modern image of a building, e.g. high-tech and ecological constructions from metal, glass, concrete, and composite materials. Introduction of advanced technologies and materials is useful for an architect who aims to stylize the traditional motives of sacred architecture and ensure the ultra-modern outlook of a building.

As based on the profound research on the enlisted factors, which was conducted in close collaboration between lecturers and students of the Department of Architectural Environment Design (AED) at the Institute of Architecture at the Lviv Polytechnic National University, a range of experimental projects of theological-educational buildings have been designed. These are, for instance, the design of the Christian Theological-Enlightening Center on Stryiska Street in Lviv (authors: Yu. Bartko, professor V. Proskuriakov, associate professor R. Stotsko; Fig. 7); the design of the Theological-Humanitarian Institute building on Stepan Bandera Street in Lviv (authors: D. Kutsan, professor V. Proskuriakov, associate professor R. Stotsko; Fig. 8); and the design of the Theological-Enlightening Center named after Metropolitan Archbishop Andrey in the village of Sknyliv, Pustomyty district, Lviv region (authors: O. Smetaniuk, professor V. Proskurikov, associate professor R. Stotsko; Fig. 9).



a) Main façade. Photo of the author b) Side façade. Photo of the author

Fig. 7. Design project of the Christian Theological-Enlightening Center on Stryiska Street, Lviv

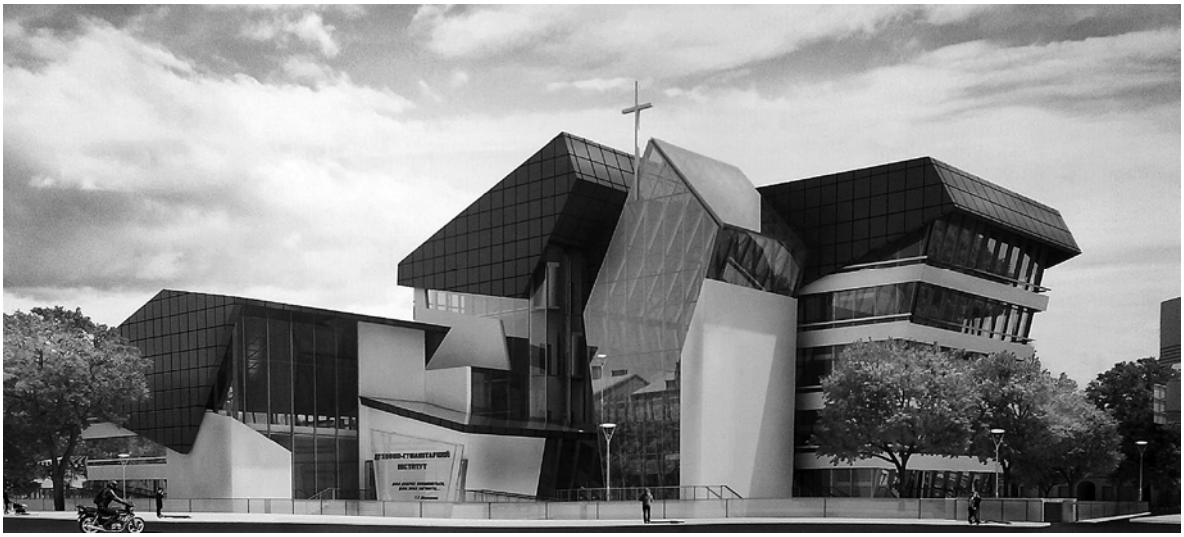


Fig. 8. Design project of the Theological-Humanitarian Institute building on Stepan Bandera Street, Lviv. Photo of the author

These design projects are the reflection of scholarly researches, conducted at the Department of Architectural Environment Design that are entitled “Development of Architectural Typology of Christian Theological and Theological-humanitarian Educational Institutions”. In the nearest future, they can serve as a background for the real life design of the higher theological-humanitarian institutions of the new type, which are necessary for the development of the Ukrainian humanitarian education. Such education is the education of the new generation and resides on the Christian and human moral values.

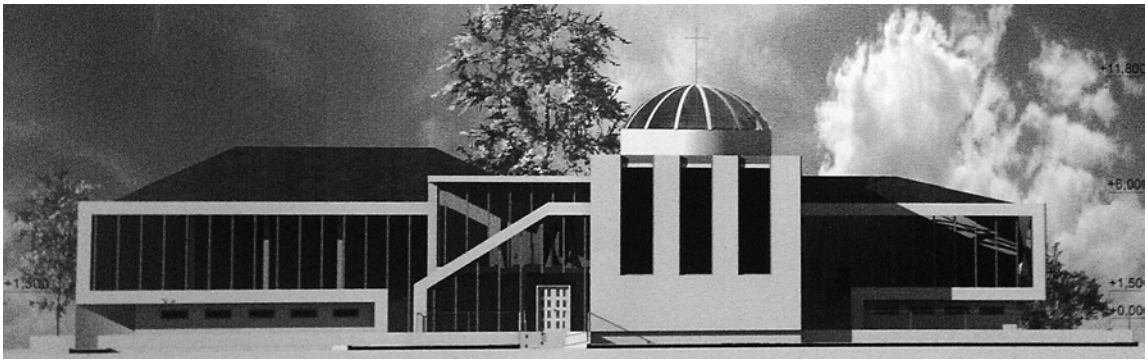


Fig. 9. Design project of the Teological-Enlightening Center named after Metropolitan Archbishop Andrey in the village of Sknyliv. Photo of the author

4. Conclusions

The research on the tendencies of theological education and the development of architectural typology of the Christian educational institutions in the Western Europe and Ukraine highlighted the necessity of differentiating a Christian educational institution of the new type, namely a *theological-humanitarian university*. A theological humanitarian university, in its turn, can be divided into two sub-types: an institution with *theological education* as a dominant one (training of priests and secular persons) and an institution of *humanitarian education* with the introduced theological disciplines (training of humanitarian students only).

The formation of theological-humanitarian university building architecture in Ukraine depends on a range of factors, such as: *a) spiritual-ideological; b) functional; c) national-historic; d) natural-climatic; e) economic; and f) resource-technological.* Having profoundly researched each of the enlisted factors, the Department of Architectural Environment Design (AED) at the Institute of Architecture at the Lviv Polytechnic National University has designed a range of experimental architectural buildings of Christian theological-enlightening centers and theological-humanitarian educational institutions, which can in the future serve as a background for designing similar institutions in Ukraine and, thus, raise the national humanitarian education to a brand-new level, which would meet the challenges of our time.

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Ростислав Стоцько

ПРОПОЗИЦІЇ ЩОДО РОЗВИТКУ АРХІТЕКТУРИ БУДІВЕЛЬ ВИЩИХ ДУХОВНО-ГУМАНІТАРНИХ ОСВІТНІХ ЗАКЛАДІВ В УКРАЇНІ

Анотація. *У статті висвітлено і проаналізовано особливості архітектури будівлі нового типу – духовно-гуманітарного вищого освітнього закладу, визначено основні чинники, які найбільше впливають на архітектурно-планувальну організацію будівель такого типу, викладено пропозиції щодо розвитку архітектури закладів духовно-гуманітарної освіти в Україні.*

Дослідивши тенденції духовної освіти та розвитку архітектурної типології християнських освітніх закладів в Західній Європі та Україні, автор обґрунтовує необхідність виокремлення комплексу будівель християнського вищого навчального закладу в новий тип освітньої будівлі (комплексу будівель), а саме духовно-гуманітарний університет. Духовно-гуманітарний університет, своєю чергою, автор поділяє на два підтипи: заклад з домінуванням духовної освіти (навчання священиків та світських осіб) та заклад гуманітарної освіти з впровадженням духовних дисциплін (навчаються виключно студенти-гуманітарії). У статті досліджено, що на формування архітектури будівель духовно-гуманітарного вищого навчального закладу (університету) в Україні впливає низка чинників, основні з яких: а) духовно-ідеологічний; б) функціональний; в) національно-історичний; г) природно-кліматичний; д) економічний; е) ресурсно-технологічний.

У статті висвітлено приклади практичного застосування пропозицій щодо розвитку архітектури будівель вищих духовно-гуманітарних освітніх закладів шляхом експериментального проектування християнських духовно-просвітницьких центрів та духовно-гуманітарних освітніх закладів на кафедрі дизайну архітектурного середовища Інституту архітектури Національного університету "Львівська політехніка" та зазначено, що створені студентами та викладачами кафедри експериментальні архітектурні проекти в подальшому можуть бути основою для реального проектування подібних закладів в Україні. Автор зазначає, що дані дослідження та їх практична реалізація допоможе піднятися вітчизняній гуманітарній освіті на якісно новий рівень щодо організації навчального процесу шляхом будівництво новітніх комплексів духовно-гуманітарної університетської освіти.

Ключові слова: *архітектура, духовна освіта, гуманітарна освіта, вищі навчальні заклади, університет.*

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THE RESIDENTIAL ARCHITECTURE OF THE CENTRAL PART OF VINNYTSIA IN THE 20's – 30's OF THE 20TH CENTURY

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Abstract. In the article it has been carried out the analysis of formation of Vinnytsia architectural environment in the beginning of the XX century. It is suggested the chronology of residential architecture development in the 20's–30's of the XX century considering architectural and urban-planning as well as the historical and cultural factors.

Key words: urban-planning development, residential architecture, stylistic decision, modernism, classical techniques.

1. Introduction

Nowadays under the global urban-planning changes, which are associated with the implementation of a new development strategy for Vinnytsia, the need for a retrospective analysis of cultural heritage has appeared. The concept of strategic transformation, which includes the transformation of all urban-planning systems, requires the introduction of appropriate measures to preserve and represent the historical and cultural heritage.

An important component of the urban environment as a multifunctional and dynamic structure, is the residential development, which has been formed at different periods of time and has characteristic signs of style belonging. However, Vinnytsia residential architecture of the 20's–30's remains to be poorly explored at present time that leads to the destruction of its authenticity. Therefore, the research and classification of residential architecture of this period will not only preserve the cultural heritage but display it in accordance with the new socio-economic needs of the city as well.

The historical and architectural heritage of Vinnytsia at the interwar period requires careful analysis and comprehensive research, as it is an integral part of the nation trends in the culture development. Therefore, the purpose of the article is to establish the development stages of residential architecture and the definition of style features considering socio-cultural and historical factors.

2. Basic Theory Part

The goal of the article is formulated to apply general scientific methods: empirical and theoretical research; the use of special-scientific methods. Complex methodology provides for the analysis and systematization of the source base. Despite the positive tendency of recent years in the field of cultural heritage research, the architecture of Vinnytsia interwar period still remains poorly explored. However, there is a large number of works devoted to highlighting the formation peculiarities of architectural and urban development theories and avant-garde practices of the 1920's and 1930's both in Ukraine and abroad. In particular, the trends of modernism were investigated by: Ginzburg (1926), Baranov (1975), Aseev (2003), Timofiienko (2003), Cherkes (2016), Linda (2016), Smolenska (2017).

Analysis of the residential architecture development in the central part of Vinnytsia in the 20's–30's of the XX century was conducted on the basis of a number of published issues by such scientists and researchers as Byrulia (1930), Cherleniovskyi (1935), Rekuta (2007), Trukhmanova (2016), there were also investigated the funds of the State Archives of Vinnytsia region.

3. Results and Discussion

The rapid change in political and economic conditions, global social transformations and the restructuring of the entire lifestyles in the 20's–30's of the 20th century led to the seek for new artistic forms and means of reflecting a new Soviet reality. A special role in formation the socio-cultural environment at the interwar period was played by residential housing, which pictured the progressive scientific thought. However, in the first post-revolutionary years, due to the lack of funding, the residential housing departments couldn't create new buildings, or even repair the existing ones.

The first stage at the inter-war period of urban development in Vinnytsia was marked by the aggravation of the housing crisis as a result of the lack of funds, material and technical resources and the significant population increase. So in 1920 the population was more than 37 thousand people, and in 1923 - more than 51 thousand people (Trukhmanova, 2016). The Soviet government managed to partially resolve this problem by nationalization, in accordance with the decree in 1921 "On the annulment of private property for real estate in cities" (Smolenska, 2017). The workers, trade union members and servicemen who took priority of housing provision, created the house-communes with a new lifestyle pattern. However, the dissonance of old forms to the new way of life, forced architects to look for new types of buildings and create new artistic images. The general social requirements and idealistic views of the first years at the interwar period initiated the implementation of drastic ideas in the projects of socialist cities, house-communes, workers' culture palaces. (Tymofiienko ed., 2003)

The implementation of a new economic policy in the 1920's created favorable conditions for the farming management on the principles of a market economy. The partial decentralization of industrial enterprises, the weakening of government pressure on agriculture, and the establishment of trade led to improvement of economic relations and contributed to the effective production. This period was also marked by the development of science and technology. The loyal attitude of the country leadership to international cultural ties allowed Soviet scientists to learn about advanced world technologies and produce innovative ideas in urban planning and architecture (Baranov ed., 1975).

With the beginnings of the NEP in Vinnytsia, the Soviet authorities allowed private construction which reduced the problems in housing. In 1924 the citizens received the permission to build a private housing with an agreement for 30–50 years, which negatively affected the urban-planning situation in general. According to the conclusion of the architect and ethnographer O. Byrulia (1930), the functional zoning of the urban space of the central part of Vinnytsia, in comparison with the pre-revolutionary era, became irrational due to the low development density. In the absence of the general plan of the city, the best area was unreasonably allocated for the construction of single storey residential buildings, which led to an imbalance in the architectural environment of the city. The residential objects stylization of that time had no the significant forms, but it used the simplified classicistic techniques and aspired to self-originality. Due to the lack of technical and material resources, more often the local natural materials were used at construction.

After the ending of the national liberation struggle and the proclamation of Soviet power in Vinnytsia in the early 1920s, the primary task was the restoration and construction of new industrial enterprises. At that time, workers averaged only 11.3 % of the urban population (Trukhmanova, 2016). However, according to the GOELRO plan, in the1920's–1930's, the majority of pre-revolutionary industrial enterprises were restored and new ones were built: the superphosphate plant, the meat processing plant, the state sewing factory, the fruit factory, the steam turbine power plant, etc. (Byrulia, 1930).

The reconstruction of the industrial economy contributed to an increase in the population of Vinnytsia, so if in 1996 there were 56.9 thousand people, then in 1931 there were already 60 thousand people, and in 1939 – more than 93 thousand people (Trukhmanova, 2016). Therefore, at that time, the issue of housing provision to workers and restoring of communal services was of great importance.

The second stage of architectural and urban development began with the emergence of residential cooperatives in the second half of the 20's, with the share participation of members in the financing of construction and further maintenance. At that time there were such cooperatives in the city as the Association of typists and mills, Association of superphosphates, Union of sugar producers, and the Association of employees of the state bank and "Unity". The residential construction in Vinnytsia had the following indicators: 1924–25's – 9 houses, 1925–26's – 71 houses, 1926–27's – 517 houses, 1927–28's – 76 houses (Strilbytskyi, 1927

Almost all cooperatives built 8-flat houses, with the exception of state bankers, who built 9-flat houses and superphosphaters, who erected 12-flat houses. The idea of creating a new Soviet of life required the new decisions in ensuring proper working and rest conditions for workers. Therefore, at that time most of the residential buildings of Vinnytsia had the toilets and bathrooms in separate flats and heating with ordinary

stoves. The exterior of the flats fully corresponds to their interior. As O. Byrulia (1930) noted, in the architecture of newly built residential premises, it is still impossible to find new drastic forms that would distinguish these houses from the old era. The walls of red brick have usual decorations, but small decorations are absent and the facade is free from superfluous complex shapes (Fig. 1).

In general, in the residential architecture of Vinnytsia, the second stage is followed by stylistic pluralism: along with avant-garde planning, compositional and aesthetic decisions, it is often used classical techniques of expression. But as A. Ginzburg (1926) mentioned, "the dialectical development of life is such that the old is never destroyed by a single blow and the new is never built instantly. When the old has already died, at the same time it still continues to exist by inertia. The new has appeared, but has not yet conquered all areas of life. The working people of the USSR have firmly taken the path of a new life, but millions of peasants and workers continue to live in the old way".

Searching a new shape and content manifests itself in the architecture of two-storey houses in 1st May Street (now Magistratska Street). Deprived of decorative ornaments, the plastered wall of the staircase stands out from the flatness of the facade and creates an accent. However, without new architectural decisions, these houses avoid copying and imitating old styles. The Building of Association of superphosphates on 9th January Street, 2a (now Arch. Artynov Street) is distinguished by large windows and reinforced concrete lintels, but the framing of windows, plastic decoration and gable roof is an imitation of traditional means of expressiveness. (Fig. 2) Because of this, the house gives the impression of an unfinished and shapeless style, but nevertheless it attracts attention by its new form (Byrulia, 1930).

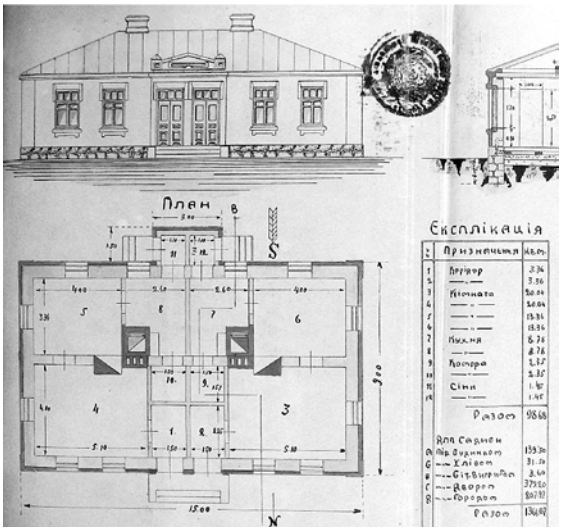

Fig. 1. The project of 2-flat house on 52 Lev Tolstoy Str., Vinnytsia (F. P-968, 1929)

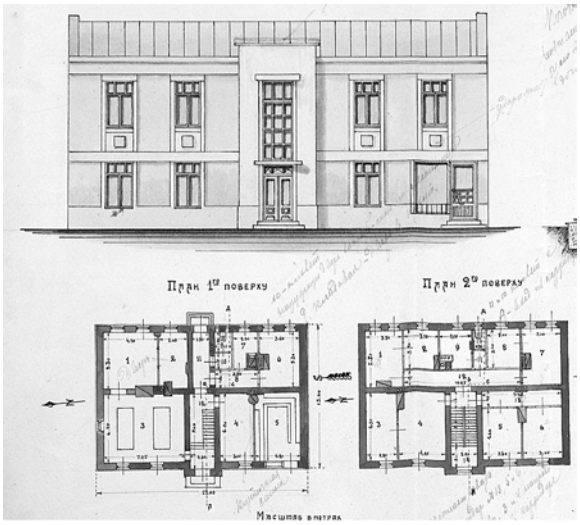

Fig. 2. The project of 4-flat house on, 2a Arch. Artynov Str., Vinnytsia (F. P-968, 1929)

At the end of the 1920's, the influence of national tendencies towards the search for new plastic forms and planning, and depending on the purpose of the building, became more and more significant. Creative associations widely propagated the idea of unification and rationalization of construction resources. The most influential factions at that time were: AMAU (Association of Modern Architects of Ukraine), AUAPA (All-Ukrainian Association of Proletarian Architects) and others (Tymofiienko ed., 2003).

Innovation in the search for methods and means to reproduce the idea of social equality and utilitarianis led to the allocation of two main avant-garde trends in the architecture of the 20's: constructivism and rationalism, which manifested themselves to the full in numerous architectural contests. The creative competition and the opportunity for the practical realization of innovations allowed the creation of buildings in Ukraine that entered the treasury of world architecture (Smolenska, 2017).

During the 1927–1930's, the houses number 14 and 19 were erected in Vinnytsia on 9th January Str. (now Arch. Artynov Str.), the houses number 18 and 42 on Kozytskyi Str. (now Mykola Ovodov Str.), the house at the crossroads of the Kotovskyi Str. and 9th January Str. (now Hrushevskyi Str. and Arch Artynov Str.) and others (Byrulia, 1930). The architecture of these buildings reflected the features of a new style – constructivism.

The largest residential building of that time was a three-storey house of cooperative workers for 56 flats, erected on the corner of Kotsyubynskyi Str. and Lev Tolstoy Str. (now Vladyslav Gorodetskyi Str. and Lev Tolstoy St). (Fig. 3, 4) In the plan it is Г-shaped building, not plastered. The surface appearance corresponds to the functional

requirements, deprived of decoration; only small windows cut the flat forehead of the house. Concrete strips emphasize simple lines and straight corners of the forehead. The organization of internal space has received new features of collectivization of everyday life: on the lower floor there are common furnaces and laundry; baths and showers are arranged in several rooms on separate floors. There are also common children's rooms and red corners (Byrulia, 1930).

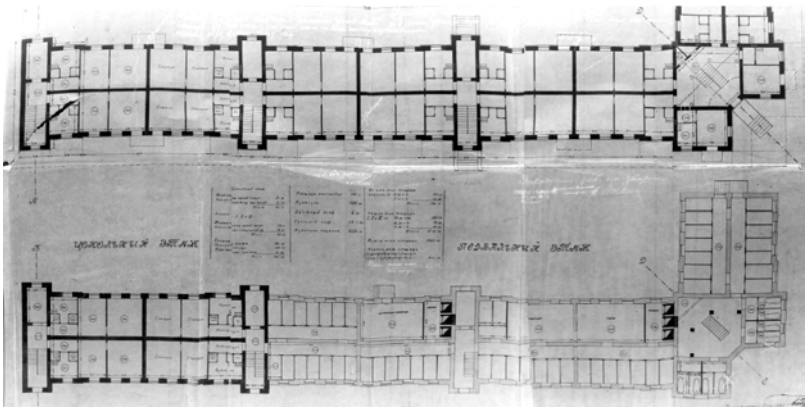

Fig. 3. The projectof 54-flat residential house on 2 Vladyslav Gorodetskyi Str., 5 Lev Tolstoy Str., Vinnytsia (F.P-968, 1929)

Fig. 4. Residential house on 2 Vladyslav Gorodetskyi Str., 5 Lev Tolstoy Str., Vinnytsia (© Subin-Kozhevnikova A. S., 2017)

The third stage of architectural and urban-planning development began with the formation of the Vinnytsia region in 1932 and the moment when the status of the regional center was given to Vinnytsia. Currently, urban space was being actively organized and the communal economy was being rebuilt: the streets were paved with cubes, new highways of water supply and sewage were built, and new tramways were laid on. In 1934 the project of the general plan of Vinnytsia was approved, it was developed by a group of engineers led by architect of Kharkiv branch "Dipromisto" A. D. Gurovich (Vecherskyi ed., 2011). Such streets of the historic center as Lenin Str. (now Soborna Str.) and Dzerzhinskyi Str. (now Teatralna Str.) attained a modern look. According to the new general plan, it was carried out the works on reconstruction of urban space. Thus, on the main line of Vinnytsia – Lenin Str. (now Soborna Str.), the boulevard was eliminated in the 1930's, the neighboring streets were ordered, private estates of low architectural and historical value were replaced with 4 and 5-storey public and residential buildings. At choosing the land sectors within the historical area of the central part of the city, one of the main tasks was the elimination of urban-planning shortcomings of previous years to create an integral volume-spatial composition of the building.

However, in the early 1930's, Vinnytsia was still the most backward among Ukrainian regions in the utilities system. Urban construction at that time did not meet the requirements of the regional center. In 1932 the growth of residential space of new city buildings amounted to only 20 thousand square meters, and the area of the built-in premises of existing buildings - 8 thousand square meters (Trukhmanova, 2016).

For further architectural development the decree "Restructuring of Living Conditions", adopted in May 1930, became a crucial factor, there was mentioned the main mistakes of the predecessors in the formation of a new socialist living conditions. (Baranov, ed., 1975). The ideologists of Soviet culture rejected the avant-garde's achievements and accelerated the transition to decorative art deco (the so-called "Stalinist Empire" or "Socialist Classicism"), aimed at glorifying the grandeur and achievements of the socialist idea (Leontiev, 2010).

The desire of the totalitarian government to control the architectural opinion, led to the disappearance of creative unions and the formation of ideologically directed associations (Vinnytsia Union of proletarian architects). As a consequence, to the architecture of official institutions that formed the face of the city were peculiar solemnity, and to facades – the symmetry and the use of classic warrant systems and details in the trim. A striking example of this stylistic orientation is the five-storey residential building of the executive committee on 81 Lenin Str., (now Soborna Str.), which was built in 1936 by the architect L. O. Cherleniovskyi (Fig. 5) The building is a monument of local significance, which complements the existing historical building development, without creating dissonance with the general perception of the central street development.

The composition of the main facade of a residential building was formed by the rhythmic arrangement of loggias decorated with round columns and arched windows. Stained-glass windows with a semicircular completion were the result of the symbiosis of avant-garde ideas and classical canons. The entrances to the store were provided with a certain geometric rhythm. Loggias on the first floor were emphasized by the risalit. The

passage from the street to the courtyard territory was laid through the arch. The ground floor was separated from upper living floors by horizontal draft.

Fig. 5. The facade. Residential house on 81 Soborna Str., Vinnytsia (Rekuta, 2007)

The architecture of that time is emphasized by the clarity of compositional technique, the laconism of the volumes and the harmony of proportions within the limits of classicism. Among representatives of the classical stylistic trend were: the building of Vinnytsia Regional Library K. A. Timiriazev on 73 Lenin Street (now Soborna Str.); house of the food industry on 70 Lenin Str., (under the project of S. I. Rabin, L. O. Cherleniovskyi and the consultation by P. F. Alyoshyn); the buildings of the medical campus on Pirogov Str.: therapeutic premises – by architect V. M. Jurich, morphological building – by architect R. G. Balaban; the hotel "Chervona Vinnitsa"; the hospital of a regional medical commission, etc.

Built in 1935–37's, the residential buildings of the regional consumer union on Rosie Luxemburg Str. (now V. Stus Str.) and the house of professors on Kotovsky Str. (now Hrushevsky Str.) the author of which was the architect V.M. Yurih ; the residential buildings on Pushkin Str. and on 1st March Str. (now the Magistratska Str.) the author of which was the architect M.B. Binder (Cherleniovskyi and Zoria, 1940).

In general, the style of Soviet architecture at the interwar period underwent a variety of influences. Together with the avant-garde trend that promoted the ideas of functionality and utilitarianism, the tendency towards the revival of classicism remained in the new forms of a totalitarian state.

4. Conclusions

Despite the difficulties of the post-revolutionary period, the 20's–30's of the 20th century were marked by significant scientific and technical and socio-cultural transformations. The architecture of the interwar period is a unique and ambiguous phenomenon, which was determined by the parallel existence of three ideologically opposite directions. Stylistic pluralism allowed forming a new Vinnytsia architectural and urban environment, to create previously unknown types of buildings and structures, to change people's perceptions about comfort, style and quality of life. On the basis of the conducted research it is possible to distinguish three main stages of the development of residential architecture in the central part of Vinnytsia during the interwar period.

The 1st stage (until 1927) – distribution of manor development, the aggravation of the housing crisis, the gradual restoration of the industrial and municipal economy of the city. The beginning of the formation of a new Soviet living conditions and the search for innovative solutions in the formation of the socialist housing architecture;

The 2nd stage (1927–1934 years) – the establishment of housing cooperatives, stylistic pluralism in architecture, the formation of avant-garde trends. It is characterized by large volumes of construction and sustainable development of the industry, which turned the city into an administrative and cultural center of the Eastern Podillya;

The 3rd stage (1934–1940) – approval of the draft general plan of Vinnytsia, streamlining of urban space and reorganization of the communal economy, and the growth of housing construction. The panorama of the city is changing, the expressive silhouettes of the streets become expansive, the plastic facades are enriched, and it is increasingly manifested by the direct connection with traditional forms in the architecture of residential buildings, which form a new urban planning environment.

Thus, the residential architecture in the 20's-30's of the XX century, formed under the influence of technological progress and ideological foundations, left many vivid examples of architecture within the city, in which important events of history and stages of distinctive development of Ukrainian society were captured. Therefore, the key to further harmonious development of the architectural environment of Vinnytsia with preserving the authenticity of the historic area, is the introduction of complex measures on the revitalization of the cultural heritage.

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Альова Субін-Кожевнікова, Володимир Смоляк

ЕТАПИ РОЗВИТКУ ЖИТЛОВОЇ АРХІТЕКТУРИ ЦЕНТРАЛЬНОЇ ЧАСТИНИ МІСТА ВІННИЦІ У 20–30-Х рр. ХХ СТОЛІТТЯ

Анотація. *У статті всебічно досліджено та проаналізовано процес формування архітектурного середовища Вінниці міжвоєнного періоду. Сьогодні однією з найскладніших проблем містобудівного розвитку є проблема адаптації територій історичного центру до умов сучасного міста. Проте пріоритетні завдання в галузі охорони та ревіталізації історичної забудови вимагають чіткого визначення факторів, що вплинули на її створення, правильного розуміння морфологічних особливостей та точної стильової ідентифікації будівель та споруд. Що зумовлює необхідність у визначені етапів розвитку архітектури, з узагальненням стильових особливостей, розглянувши кращі зразки зодчества Вінниці.*

За результатами проведеного дослідження було встановлено, що архітектурно-містобудівний розвиток Вінниці у 20–30-х роки ХХ ст., який вирізнявся високою динамічністю, залежав від багатьох загальнодержавних та регіональних чинників. Радянська архітектура того часу, що формувалась під впливом технічного прогресу та ідеологічних засад, залишила багато яскравих зразків зодчества в межах міста. Перша третина ХХ століття – час сміливих творчих пошуків та запеклої боротьби стильових течій; час проголошення нової естетики простору та форми, що опиралась на нові соціальні реалії, та повернення до класицистичних архітектурних засобів.

Важливою складовою міського середовища, як поліфункціональної та динамічної структури, є житлова забудова, що сформувалась у різні періоди часу та має характерні ознаки стильової приналежності. Проте житлова архітектура Вінниці на сьогодні залишається малодослідженою, що призводить до знищення її автентичності та руйнування характеру забудови цілих кварталів.

У статті запропоновано періодизацію розвитку житлової архітектури у 20–30-х роках ХХ століття, з урахуванням архітектурно-містобудівних та історико-культурних чинників. Архітектура міжвоєнного періоду – явище унікальне та неоднозначне, що визначалось паралельним існуванням трьох ідейно-протилежних напрямків розвитку. Так у Вінниці до середини ХХ ст. відзначається зростання історичних стилів що замінили авангардні течії. Стильовий плюралізм дозволив сформувати нове архітектурно-містобудівне середовище, створити раніше невідомі типи будівель та споруд, змінити уявлення людей про зручність, стиль та якість життя. Також у цей час суттєво змінюється панорама міста. Стають виразними силуети вулиць, збагачується пластика фасадів в архітектурі державних та громадських будівель. Вони формують нове містобудівне середовище.

Ключові слова: *містобудівний розвиток, житлова архітектура, стилістичне вирішення, модернізм, класицистичні засоби.*

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CAD/CAM/CAE-SYSTEMS IN DESIGN OF ARCHITECTURAL ENVIRONMENT

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Abstract. This article is about development prospects of **CAD/CAM/CAE-systems** and the significance of these systems for design of architectural environment. Modern technologies of designing are considered and practical examples of the architectural objects made by means and algorithms of **CAD/CAM/CAE-systems** are reviewed**.**

Key words: architecture, 3D-model, 3D-modelling, 3D-printing, **CAD/CAM/CAE-systems**, virtual reality.

1. Introduction

Every graphic system of 3D-modelling offers its own, often unique, object-building algorithm which is the main distinguishing feature of these systems. Each of these algorithms has been carefully developed and reasonably built; almost any problem can be solved with their help. In other words, the same object can be built in any 3D-modelling system, but in different ways. At the same time each algorithm is oriented to a narrower specialization, has a clearly expressed functional orientation and a large arsenal of opportunities in this segment. CAD/CAM/CAE-systems are the most effective technologies in design of architectural environment. In a general theoretical comprehension of specified question the works of the following researchers were used: K. Ulrich, S. Eppinger, Y. Suhanov, O. Efanov, Y. Bereza and other authors.

2. Basic theoretical section

In the scientific article a systematic approach helped consider the significance of CAD/CAM/CAE-systems, 3D-printing technologies and virtual reality in design of architectural environment has been used. The complex of the general scientific methods (historical-comparative and chronological, the method of terminological analysis) conduced to identify and consider the examples of practical application of specified CAD/CAM/CAE-systems in the architectural activity and design practice of the author.

3. Results and Discussion

CAD-systems (computer-aided design) [1] – computer support of designing. These systems are intended for the solution of design problems and registration of the design documentation. Leading three-dimensional CAD-systems allow implementing a full cycle of preparation and manufacture of difficult industrial products. **CAM-systems** (computer-aided manufacturing) [1] – computer support of manufacturing. These systems are intended for designing of product machining with computerized numerical control unit and issue of programs for unit. The three-dimensional model of a product detail created in CAD-system is used in CAM-systems. **CAE-systems** (computer-aided engineering) [1] – support of engineering calculations. The three-dimensional model of a product detail created in CAD-system is also used in CAE-systems which include engineering analysis as well.

CAD/CAM/CAE-systems occupy special position among other systems and represent the industrial technologies directed to the most important areas of product manufacturing. The impossibility of manufacturing

a difficult high technology production (companions, the ships, planes, tanks, cars, various kinds of machine tools and the industrial equipment, etc.) without CAD/CAM/CAE application is a generally recognized fact. The same situation concerns the architectural constructions and their complexes [2; 3].

One of the lines of CAD development is based on the creation and perfection of software conglomerate primary aimed at complete designing, manufacturing, running and recycling processes of any product. The completeness also includes objects structure designed and manufactured with special equipment as well as management of all technological processes, control of quality, packing, transporting and selling. Thus, CAD/CAM/CAE-systems become more and more universal in application to various design problems, and their computer toolset can be involved in architectural activity.

There is a considerable quantity of systems for architecture, interior design and building. All of them, to some extent, can solve the whole complex of questions connected with human environment: architecture, architectural constructions and architectural visualization; city planning, construction of roads; landscape design; building, including all engineering communications; design of interiors, in particular – public, decoration of premises, etc.

Fig. 1. Gym. First design version

Fig. 2. Gym. Second design version

Fig. 3. Gym. Third design version

The leaders in this sphere are such products as ArchiCAD (Graphisoft company) and AutoCAD (AutoDesk company). The second case is about software for architecture and building (AEC – Architecture, Engineering, Construction) – a complex of special CAD based on AutoCAD. The newest versions of ArchiCAD and Autodesk Architectural Desktop support the intellectual three-dimensional model of a building. However, a mass introduction of new architecture and building technology is hindered with the "inheritance" of two-dimensional files and paper drawings, which cannot be directly used in the intellectual model of building.

As an example of the architectural project designed in ArchiCAD environment, it is possible to consider the author's design decision of a gym for a private home ownership in Konche-Zaspa in Kiev. The total area of the gym is 176,5 sq. meters. Architecturally-planning decision consists of the central input with subsidiary premises and functional zones in the right and left wings of the building. In a central part of the building the sanitary-and-hygienic block is located, which includes the shower, bathrooms and mini-kitchen. In the left wing a gym with training equipment and a childish sports zone is provided. In the right wing the two rooms for visitors are planned. The design of form-building elements is based on a glass and metal combination. In the first design version a glass parallelepiped of a building with faceted structure of a facade is "pierced" with truss-shaped construction made of painted metal (Fig. 1). The second and third design versions are implemented with façade of a volume-spatial structure like a crystal rock. This is an elegant way to enter the gym into a natural landscape of Konche-Zaspa. The differences of these design versions lie in the artistic solution of entrance group, in the second design version the greatness realized as monumental boulder is underlined (Fig. 2). In the third design version the pathetic realized in pyramidal top, integrated into a building "body" is emphasized (Fig. 3). The structure of the entrance group is made of polished stainless steel and visually "disappears" in a surrounding space, and pyramidal top is a composition dominant.

Today the particular interest is represented by the projects on Revit platform. It is a system of a new generation from Autodesk, based on the most advanced concept of "Building Information Model" (BIM). This ideology has incorporated the latest achievements and technologies: as a matter of fact, it is a database and

imaging a design object. Drawing the levels and plans, over-heading and a roof, column and ladders placed in certain places accompanies with automatic data recording of these elements in the general database of the current project. Thus, all the elements of the model – the base, walls, roof, over-headings, windows, doors – are parametrically connected and coordinated. Revit being based on the parametrical core is capable to co-ordinate any changes in automatic mode: no matter, what part of the project is being worked by the user on – the model view, drawing sheet, specification, section, plan etc. It is possible to request all needed information referred to the current project, for example, views, sections, tables etc., which will be generated on the model of a building. Thus, the different ways of representation of database contents are applied.

Among the author's projects designed in the environment of Autodesk Revit, there is a modular set of seats for the architectural environment of Kharkiv. The necessity of the seats creation, which can be used in any city point, has predetermined the universality of the set and application of a modular design principle. The complete set of modular seats assumes some variations: single, double and three-place benches, turning modules for creation of l-shaped, s-shaped, u-shaped and other compositions, flowerbeds and urns, as the additional options of the benches. Each variation of the complete set, despite to the capacity degree consists of the following components: a concrete bearing, base made of stainless steel and bench sitting.

Fig. 4. Modular set of seats. Bus station

The width of a single variation of the modular set is 600 mm, double – 1200 mm, three-place – 1800 mm accordingly. The similar parameters provide convenience of sitting for people with different constitution and clothes when it goes about weather seasons. The depth of sitting is 480 mm, back slope is 15 degrees, height of armrests is 200 mm and all these values correspond to ergonomic requirements. The structure of the modular set of seats includes visible and invisible constructive elements. One of the visible elements of a modular set is concrete bearing with the slots for transportation and installation convenience, as well as centering cones for setting the right position of stainless steel base and fixing it relatively to the concrete bearing. The bearing contains weld-in armature necessary for the connection of bearing and base, and for fastening the bench sitting to the base.

Design of the complete set is based on a modular principle. A variety of components of the modular set allows to create different compositions depending on a district configuration and to add complementary options. It predetermines the universality of the modular set, its possibility to organize small bus station area in a form of narrow double bench (Fig. 4), and large park area with the creation of a big circular composition with the decorative flowerbeds (Fig. 5). Compositional expressiveness of the design solution of this set is based on a proportional combination of rectangular elements. The modular set was developed for the city environment of Kharkiv so the conception solution is close to the constructivism represented in many architectural monuments of our city. And though the conception solution of modular set has the certain lines peculiar to the constructivism, it also has a certain neutrality of shape. So, the application of this set in different city areas, for example, city streets or park-avenues is provided.

The CAD/CAM/CAE-systems are integrated with recent, but more and more popular direction of the 3D-printing generated by means of special printers. The 3D-printers are developed with the system of fast

prototyping (Rapid prototyping, RP) [2] – the technologies of the fast "prototyping", creation of pre-production model or working model of system for demonstration to the customer and control of the realization possibilities [4]. The technology of the 3D-printing gets the increasing popularity in an architectural activity, putting at new level the implementation and production of the separate elements of architectural constructions as well as the whole town-planning. A special cement structure for the 3D-printing, developed by the group of engineers of the British University of Loughborough, allows creating the constructive and decorative elements of various morphological configurations. Layer-wise building-up of enhanced cement structure facilitates a considerable simplification of construction works and the finished concrete products, if necessary, can be updated with painting and decoration [5].

The technology of 3D-printing "Contour Crafting" (author Berok Koshnevits) patented in the USA in 2009, assumes the printing of building structure "on a turn-key basis" in the near future. It means printing bearing structures with installed engineering communications, painted and decorated premises, the elements of the sanitary equipment and so on. The branch of South Californian University specially created by department of NASA is in process of realization of this project. Unlike futuristic "Contour Crafting", 3D-printer WinSun of Shanghai Company Shanghai WinSun Decoration Design Engineering Co is the pragmatic and utilitarian solution. WinSun represents the device with the overall dimensions of 10x40x6 meters, capable to print the house less, than for 24 hours [5], that is, developer's statement. The company portfolio has dozens of architectural and interior projects made with 3D-printing technology, thus, it is possible to assume that in future the 3D-printing will surpass traditional ways of building, and methodological bases of architecture will replenish with new algorithms of projects realization in an architectural activity.

Fig. 5. Modular set of seats. Parkland

As the example of complex object of design and architectural activity made by means of 3D-printing, it is possible to consider the design solution of metal bridge. A prototype presented by the Netherlands Company MX3D in autumn 2015. A distinctive feature of this company lies in its 3D-printing automatic manipulators with the tools for extruding and welding the metal, instead of traditional "boxes for printing", limiting the object overall dimensions. Thus, there is a possibility of free spatial manipulation in the course of creation of the form, its morphological structure and construction of different sizes [5]. For the today technology of the 3D-printing the direction in filling the body-spatial environment becomes more and more popular, passing from experimentally-pilot devices to the industrial complexes focused on industrial technologies of realization of design objects, architecture and town-planning.

The most interesting development prospect of CAD-systems, in an architecture context, is creation and perfection of the centers of a virtual reality for PLM. Product Lifecycle Management – is the process of managing the entire lifecycle of a product from inception, through engineering design and manufacture, to service and disposal of manufactured products [6]. Virtual reality technologies are used in design of complicated system products (aircraft, cars etc.); visualization of complex architectural solutions; planning of urban development (urban planning); that is where the concept development needed, coordination of components and, even, testing (up to reception of virtual operating experience) should be spent long before the stage of a physical prototype creation. The systems of virtual reality (immersion centers, lat. *Immersio* –

immersing) are also used for effective demonstrations to the persons – decision makers: investors, customers, focus groups of experts, etc [7].

By the same principles can be developed architectural designing and modelling, when a special system software: Autodesk Revit, ArchiCAD, Autodesk AutoCAD architecture and other software packages are integrated in VR, thus, there is a possibility of interactive virtual prototyping of cities, areas, buildings and interiors in real scale with the subsequent 3D-visualisation of the design data. A special efficiency of application of VR technology can be shown in the process of adaption of architectural construction/complex with the personified city environment that is one of the main, defining architect's tasks. VR technology allows estimating the designed building from those or other foreshortenings of a district landscape and on the contrary assists in consciousness of the reality from a projected construction.

Thus, the development prospects of CAD/CAM/CAE-systems assume full integration with a virtual reality. In other words, the complete set of the software delivery basically will include "immersion module", with the corresponding equipment (helmets of a virtual reality, 3D-points, gloves with the tactile sensors, special joysticks, etc.). With their help projector can adapt designed object in the corresponding environment. The architect, for example, can "put" the designed building in the urban environment of Kharkiv, in 77, Sumskaya Street, and virtually estimate the real merits and demerits of the exterior walk round of the construction on perimeter, and visit floors and premises of the interior. These technologies are the future of the design process.

The phenomenon of the digital revolution formed the basis for the prevailing majority of innovative developments in various spheres of human life, including architecture and design. These include CAD/CAM/CAE-systems, technologies of 3D-printing and virtual reality, as well as other innovative processes that, in the current globalization and post-industrial economy, are a strategic resource for the development of architecture and design. The variety of these developments and the rapid pace of their implementation determine the necessity to clarify and specify the innovations in the context of interdisciplinary interaction of architecture and design. This process is aimed at the formation of project-methodological base that can integrate such technologies into the profession, apply them as design principles and predict their results.

4. Conclusions

The CAD/CAM/CAE-systems combined with the technologies of 3D-printing and virtual reality open a lot of new design possibilities of creation design ideas and their effective implementation in application to architectural activity and design practice. Given in the scientific article examples, supported with the appropriate theoretical studies, illustrate the convergence of technologies and design achievements from various industrial sectors. The variety of professional software and its rapid development must be mentioned as well, in some cases – the subsequent transformation into the new innovations, in others – the disappearance from the scientific field, both temporary and final. Therefore, further clarification of these processes is necessary, as well as determination of their structural components and formulation of application algorithms in architectural and design practice, which requires theoretical comprehension, scientific analysis, reasoned conclusions and approbation in the design process.

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Наталія Вергунова, Марія Блінова

CAD/CAM/CAE-СИСТЕМИ В ДИЗАЙНІ АРХІТЕКТУРНОГО СЕРЕДОВИЩА

Анотвція. *CAD/CAM/CAE-системи займають особливе положення серед інших систем, оскільки представляють індустріальні технології, безпосередньо спрямовані на найбільш важливі області матеріального виробництва. Сьогодні загальновизнаним фактом є неможливість виготовлення складної наукомісткої продукції (супутників, кораблів, літаків, танків, автомобілів, різних видів верстатів і промислового устаткування і ін.) без застосування CAD/CAM/CAE-систем, не кажучи про архітектурні споруди та їхні комплекси.*

Один із напрямків розвитку CAD/CAM/CAE-систем ґрунтується на створенні і вдосконаленні програмних конгломератів, основне завдання яких полягає в забезпеченні повністю завершеного процесу розробки, виготовлення, експлуатації та утилізації будь-якого об'єкта. Само собою зрозуміло, що до питань завершеності належать розробка конструкції об'єкта і оснащення для його виготовлення, управління всіма технологічними процесами при виробництві об'єкта, контроль його якості, упаковки та транспортування, а також його реалізація. Таким чином, CAD/CAM/CAE-системи стають усе більш універсальними в застосуванні до різних проектних завдань, а наданий ними комп'ютерний інструментарій може бути задіяний в архітектурній діяльності.

Найцікавішою перспективою розвитку CAD/CAM/CAE-систем, в контексті архітектури, є створення і вдосконалення центрів віртуальної реальності для PLM (Product Lifecycle Management). Технології віртуальної реальності використовуються при проектуванні складних системних продуктів (авіація, автомобілі тощо) для візуалізації комплексних архітектурних рішень, при плануванні розвитку міст (urban planning), тобто там, де розроблені концепції, ув'язка компонентів і навіть тестування (аж до отримання віртуального досвіду експлуатації) повинні бути проведені задовго до етапу створення фізичного прототипу.

Отже, особлива ефективність застосування технології VR проявляється в процесі пристосування архітектурної споруди/комплексу з персоніфікованим міським середовищем, що є однією з головних, визначальних завдань проектанта. Це дозволяє оцінити, як сприймається спроектована будівля з тих чи інших ракурсів ландшафту місцевості і навпаки, сприяє усвідомленню дійсності з проектованої споруди.

Ключові слова: *архітектура, 3D-модель, 3D-моделювання, 3D-друк, CAD/CAM/CAE-системи, віртуальна реальність.*

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Book: The author (s) or editor (s), book title or chapter, publisher, city, year.

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Patents: Authors, country and patent number, date of publication

[5] Vaynberg M., Horn H. And Horn R.: Pat. US 6981377, Publ. Oct. 13, 2006.

Conference: author, title of the conference, country, city, year, initial page.

[6] Young C. And Jordan T.: Proceed. 10thAnnual Conference on Engineering, Greece, Patras 2008, 34.

10. **Illustrations** (figures, graphics, photos) must be inserted in the text and be given by separate graphic files as separate objects, suitable for corrections or changes, and which fit the page size. All illustrations should be signed and numbered (if more than one) under the illustrations, with centered alignment, fontsize – 9. Photos and photocopies must be of high quality, suitable for copying.

11. **Tables** should be formatted in Excel for Windows and MS Word. The main table font – 10, heading font – 10,5. Heading is placed in the center of the table with bold font and numbered (if more than one) at the right margin of the table, italics font.

12. **Formulas** should be centred and numbered in parentheses at the right margin.

Units. All data should be given in International System of Units (SI units). If other units used, provide SI equivalents.