



Mykola Orlenko\*

 orcid.org/0000-0002-4154-2856

Ivan Buzin\*\*

 orcid.org/0000-0003-2104-0290

## Stylistic peculiarities, features of the use of building materials and structures in buildings of the latter half of the nineteenth century and the early twentieth century, and methods for their restoration (evidence from Ukraine)

### Cechy stylowe i charakterystyka wykorzystania materiałów i konstrukcji budynków z drugiej połowy XIX i początku XX wieku, oraz metody ich restauracji (przykłady z Ukrainy)

**Key words:** restoration, period of multi-stylishness, stylistic features, Ukraine

**Słowa kluczowe:** restauracja, okres różnorodności stylów, cechy stylowe, Ukraina

#### INTRODUCTION

The period of the latter half of the nineteenth century and the early twentieth century is the epoch of the multi-stylishness, namely the epoch of historicism-eclecticism and Secession, which originated in Ukraine at the beginning of the twentieth century. Since the second half of the nineteenth century, a great creative freedom appeared to replace the clearly regulated traditions of the Classicist style and Empire, that resulted in the emergence of pseudo-Gothic, pseudo-Renaissance, pseudo-Russian and even pseudo-Mauritanian buildings. There were certain restrictions concerning religious buildings: churches and cathedrals are most often built in pseudo-Byzantine or pseudo-Russian styles, whereas in public and especially residential buildings, traditions of many styles of the past were creatively rethought. At the same time, it should be noted that these were precisely pseudo-styles, since the architects of the era of historicism-eclecticism did

not strive for stylistic purity and freely combined the characteristic elements of several styles at once. In cases where the author of the building was a famous master, the object looked harmonious, in other cases there could be only one window or entrance from, for instance, Gothic style in the house, and the whole facade was a traditional private house in the so-called “Brick” style.

There were certain peculiarities in the application of building materials and structures from the second half of the nineteenth century until the first decades of the twentieth century. Understanding this specificity is a prerequisite for the implementation of restoration measures at the monuments of the era of historicism, eclecticism, and Art Nouveau.

#### TYPES OF FOUNDATIONS

Restoration problems in one way or another concern the preservation of the balance of the “footing-founda-

\* Doctor of Architecture, Professor, Honorary President of Ukrrestavratiia Corporation

\*\* graduate student, Kyiv National University of Construction and Architecture, Assistant to the President of Ukrrestavratiia Corporation,

\* *dr architektury, profesor, prezydent Korporacji Ukrrestavratiia*

\*\* *student studiów doktoranckich, Kijowski Uniwersytet Budownictwa i Architektury, asystent prezidenta Korporacji Ukrrestavratiia*

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tion – building” system, the loss of which leads to its emergency state. At all periods, except for the beginning of the twentieth century, strip and pier footings were used. In the second half of the nineteenth century there were foundations made of over burned bricks or of limestone and rubble concrete (stone, brick) foundations. At the beginning of the twentieth century with the invention of the pile system, besides the strip foundations made of limestone, of over burned bricks and rubble concrete foundations, the foundations of bored piles were used. Thus, we can conclude that the most significant changes in the development of the “footing-foundation” system occurred at the beginning of the twentieth century, and in other periods, already existing foundation systems were practically spread and improved. Yes, this includes limestone and sandstone foundations, rubble concrete foundations, and footings for wooden and stone buildings made of oak logs. Some types of foundations – like the foundation of the “opus mixtum” type – disappeared after the Tatar-Mongol invasion, some – like foundations made of over burned bricks – emerged only in the seventeenth century. At the end of the nineteenth and at the beginning of the twentieth century, a combination of strip and pile foundations was introduced (“House with Chimaeras”, the Roman Catholic Church of Saint Nicholas in Kyiv) Fig. 1.

It is very important to have information which concerns binders and masonry mortars that correspond to a particular period and a certain type of masonry. In the nineteenth – twentieth centuries, the laying of yellow brick foundations is made with the use of lime mortar and lime mortar with powdered bricks.

The walls could be made of yellow bricks of different sizes with the use of the limestone mortar (all floors except the basement, “House with Chimaeras” at 10 Bankova Street, 1901–1903) [14, p. 366], the lime-sand mortar (Mariiivskyi Palace, 1748–1868) [2, p. 158, 14, p. 366], the lime-cement and the cement-sand mortar), lime-cement-sand (the National Philharmonic of Ukraine, 1882) and cement mortar (the basement of “House with Chimaeras” at 10 Bankova Street, 1901–1903).

There are the following combinations of combined walls: half brick work masonry made of brick and wood with the use of the lime mortar and lime mortar with powdered bricks (the 19<sup>th</sup>–20<sup>th</sup> centuries).

In the building of the National Philharmonic of Ukraine (formerly the Merchant’s Assembly Club, 1882), the facade was originally unpainted, the front masonry was made from Kyiv clay yellow brick with brick decor of feather-edged brick with the use of the lime-sand and lime-cement-sand mortar; later the facade was painted [4, p. 3].

Methods for strengthening of brickwork masonry are as follows:

1) re-laying of the brickwork of the walls (if the loss of a brick exceeds 1/3 of the thickness of the masonry fragments, with the removal of the destructive parts and the insertion of new fragments of brick, is performed by highly qualified bricklayers). In the presence of stone

dressing, the existing state is consolidated by appropriate engineering and chemical-technological measures (tightening of stone blocks with steel bandings, prosthetics, cavity filling, thorough injection works, etc. (St. Volodymyr Cathedral in Chersonesos) [5, p. 320];

2) creating of the outer casing of “the belt” with steel banding ties, that obstructs the horizontal spread of the masonry, its stratification, eccentric reduction (Bessarabian quarter). The disadvantages of this method for strengthening of the walls of architectural monuments are as follows: the presence of metal bands on the facades or in the interior, the possibility of their corrosion and weakening of bandages, braces; the concentration of loads on brick walls leads to crushing in the places of the banding ties fixing;

3) replacement of the bearing elements of the brickwork walls and partitions with a concrete or frame metal ones (in these cases the old masonry serves as cladding) (“The House with Chimaeras” at 10 Bankova Street; the Dormition Cathedral of the Kyiv-Pechersk Lavra – strengthening the brickwork masonry of the pylon – “reinforced concrete shirt”, Kyiv-Passenger Central Railway Station [6, p. 832];

4) injection of brick or rubble masonry with solutions (cavities in the masonry are filled, joints between the stone or brick are sealed, the destroyed mortar is restored, the allowable force for the construction is increased (The Bell Tower of Saint Sophia’s Cathedral in Kyiv – strengthening the wall of the eastern facade);

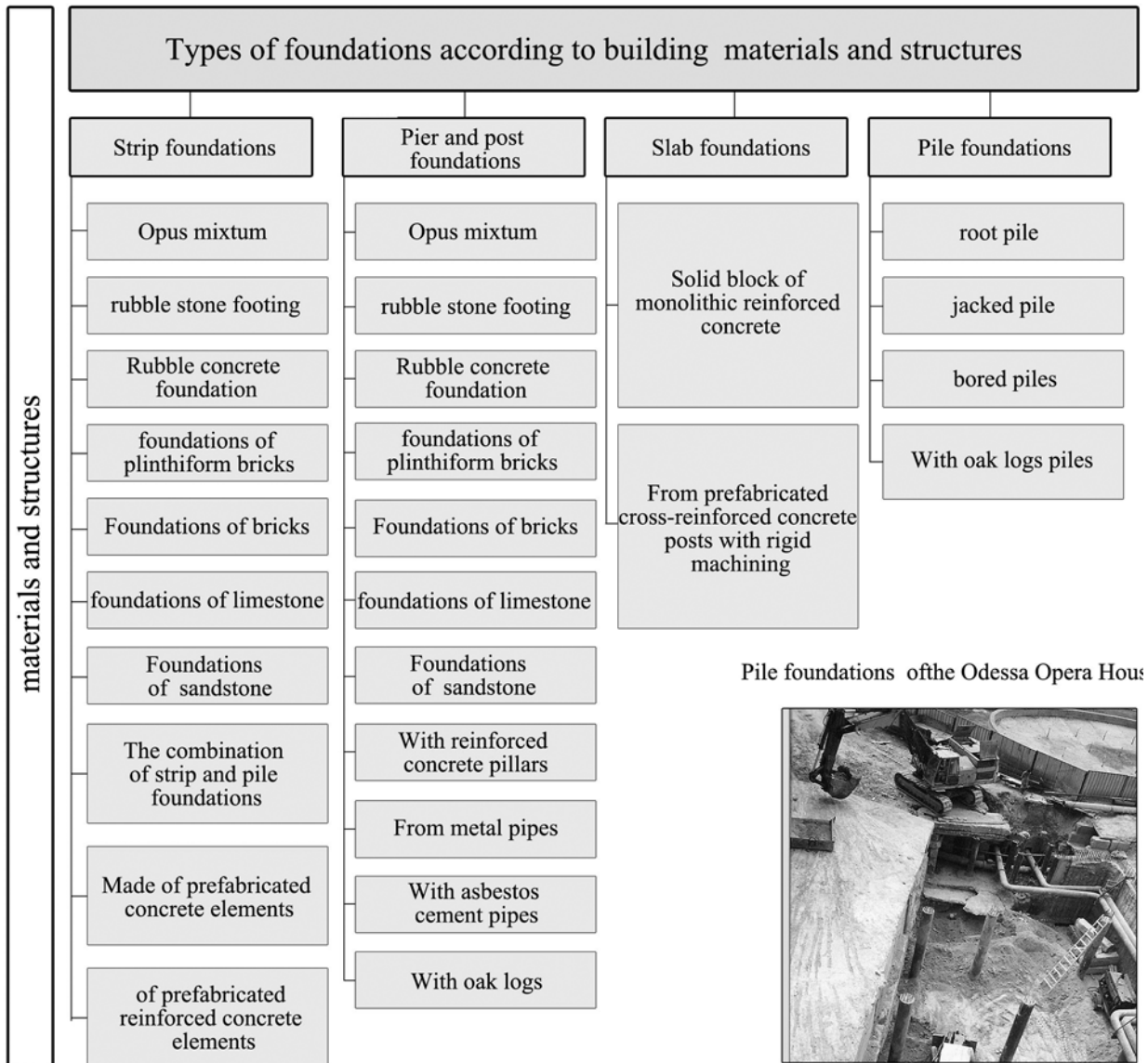
5) Masonry reinforcement or stitching (Italian method “cemented mesh”, “Reticolo cementato”) is carried out to increase the strength and stability of the building, its resistance to tensile forces by grouting steel reinforcing bars into small holes drilled in the wall (The facades of the Bell Tower of Saint Sophia’s Cathedral in Kyiv). At the same time, the permissible efforts on the masonry increase, the structural integrity of the masonry is restored. Steel bars of reinforcement are firmly connected with the masonry in which they are cemented. The volumetric integrity of the reinforcement mesh is ensured by the fact that the reinforcement that enters the masonry overlaps each other. The more damaged the wall, the easier it is to strengthen it with this method;

6) replacement of deconstructive and significantly salt effloresced bricks. Capillary moisture and moistening of a stone for more than 5% with saturation of a stone with salts, leads to destruction; humid acids in capillary water and salts of chloride of sodium sulphate, calcium and magnesium crystallize into salt efflorescence;

7) Strengthening of the crumbling bricks by spackling of the external surface of the honeycombed wall and filling of the open joints are performed if the dimensions of the caverns are less than 5 cm. (Mariiivskyi Palace, “House with Chimaeras” at 10 Bankova Street, National Philharmonic of Ukraine (Merchants’ Assembly Club, 1882)) Fig. 2.

For limestone or clay brick walling, a technology for the removing efflorescence from the basement part of the walls to a height of 2–3 meters (The Saint Volodymyr

## Types of foundation of restoration objects by materials and structures



## Types of foundations of restoration objects by periods

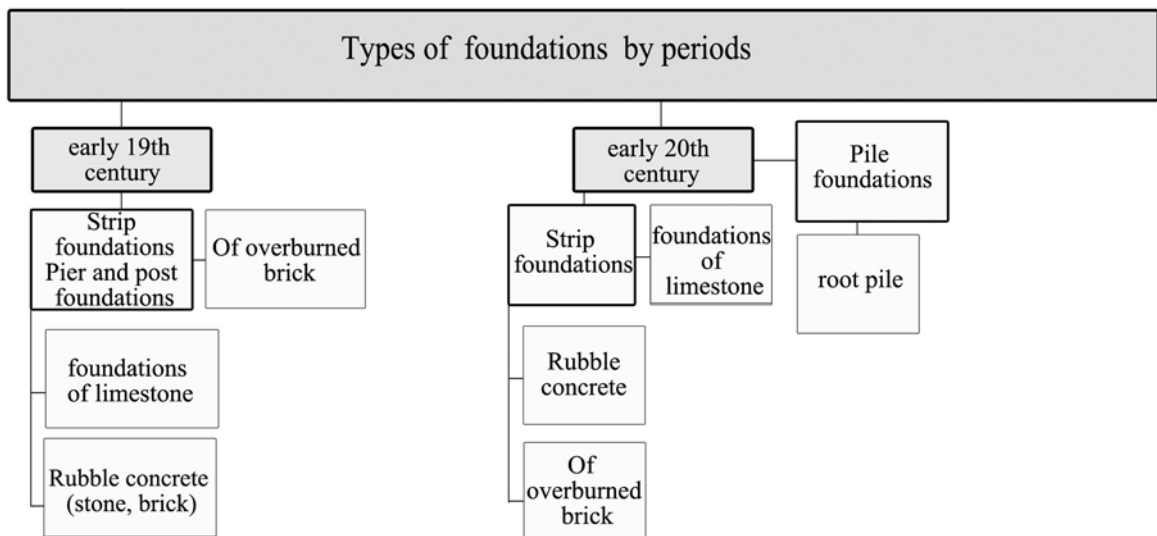


Fig. 1. Types of foundations and methods of their strengthening

Cathedral in Chersonesos Taurica) has been developed. The method of removing of water-soluble salts is based on the application of the action of direct current applied to the electrodes into a capillary-porous masonry system filled with steam solution, and under the action of current the salt solution is displaced from small pores into large draining pores, from which the solution shifts downwards due to gravitational forces. The process of removing efflorescence under the action of electric current occurs throughout the thickness of the masonry, the salt content in the upper rows of the masonry gradually decreases and increases in the lower rows, from where the salts pass into the soil. A condition for completing the desalting process of the whole thickness of masonry is the permissible salt content in the lower part of the wall at a depth of 5–10 cm from the side of the installed anode.

As practice shows, the process of removing efflorescence lasts 2–3 months. These works are usually performed in April–June. After completion of this process, the waterproofing of the walls begins in order to prevent secondary salinization.

The restoration of arches includes the injection of cracks in the masonry, the preservation and restoration of the surface of brick masonry, restoration of plaster, the use of weather-resistant facade paints (arched openings of the National Philharmonic of Ukraine).

The restoration of the columns consists of injection of mortar in cracks in the masonry, preservation and restoration of the brick surface of masonries (if the columns are made of brick and plastered and painted), prosthetics of damaged brick or wooden columns, restoring plaster, applying weather-resistant facade paints (K. Rozumovskiy's Palace in Baturyn, Odessa Opera House).

Restoration of balconies provides for the replacement of destroyed concrete slabs, full or fragmentary replacement of plaster and cement sculptures, restoration of cast and forged artistic black metal gratings (restoration of the balconies of the Mariinsky Palace and the National Philharmonic of Ukraine, Kyiv and Odessa Opera Theaters).

There are several types of restoration plaster on the façades:

– the first grade plaster, which is applied using plaster or alabaster grounds installed on the wall surface from a layer of sprinkling, one or several layers of ground cleavage and covering ("House with Chimaeras" at 10 Bankova Street, in Kyiv), Opera Theatres in Kyiv, Odessa and Lviv).

Plaster fixing: injection, partial replacement, reinforcement with dowels from stainless steel (brass or copper) followed by injection, impregnation of the surface layer before painting.

Painting works on the façades of architectural monuments are performed as the final stage of the complex of restoration works. Before the façades painting, a survey of the remains of old coats of paint is carried out, the level of salinization of the masonry and the plaster layer is determined; the restoration of the brickwork and plaster is completed, and the colouristics of the façades is determined for the period of the restoration. If the

original colour spectrum remains the same, the use of modern high-quality facade paints is allowed. Painting of the walls of architectural monuments provides for the preparation of the surface for painting, preparation and application of primer, putty and facade paint (The National Philharmonic of Ukraine, Opera Houses in Kyiv, Odessa and Lviv, Drama Theatre in Chernivtsi).

## TYPES OF CEILINGS AND VAULTS AND METHODS FOR THEIR RESTORATION

Most of the causes of the emergency state of the vaults and ceilings are based on a change in the hydro-geological conditions of the footings and foundations, as evidenced by the emergency condition of the structures of the Odessa Opera Theatre, caused by flooding of its footings and foundations, subsidental phenomena through the bulk soils, karst phenomena; overweight of additional technical equipment of the stage box; errors in the use of the system of strip foundations of various widths and depths for the building of the significant weight, the ineffectiveness of the works on silicatization of footings [13, pp. 191–192] Fig. 1–2.

The auditorium of the former Merchants' Assembly Club (now the National Philharmonic of Ukraine) is covered is covered with a mirror vault on a ceiling border, dissected by rectangular caissons [4, p. 72]. In the Odessa Opera Theatre, the cross vaults are used in the central, western and eastern porticos. All the vaults of the Odessa Theatre were in disrepair, the ceiling of the western portico was in the emergency condition, therefore partial re-laying of the vault was recommended [3, p. 142].

In order to eliminate the emergency state of the cross-dome vaults, a full load alleviation of the vault is used in several ways:

- a) by means of metal beams, with gaps of 5–10 cm between the beams and the vault;
- b) load alleviation of the vault by the method of its reinforcement and concreting;
- c) establishment of the reinforced concrete slab above the roof and adjusting of the vault to it;
- d) unloading of the support contour of the vault from the expansion forces by ring reinforcement and concreting of the support belts with tier reinforcement of the masonry in the middle and 1/3 of the height of the vault.

At the beginning of the twentieth century the concrete vaults of the Monier system were already used in the "House with Chimaeras" at 10 Bankova Street, – above all cellars, stables, laundry, wine cellar, drawing room, lobby, above the driveway into the courtyard and under it.

Flat ceilings made of metal beams are represented by several types:

Type 1 – consists of a metal beam, wooden flooring and wooden overlays for ceiling filing (the 17<sup>th</sup>–19<sup>th</sup> centuries, "House with Chimaeras", National Philharmonic of Ukraine, National Bank of Ukraine, Instytutska Street, the city of Kyiv).

The problems and causes of the destruction of flat ceilings of Type 1 on metal beams are as follows:

- unsatisfactory technical, emergency condition, especially in places of support;
- insufficient bearing capacity, increase, above the norm loading;
- corrosion of the metal bearing beams, deflection of the ceiling itself; restrictions of the terms of suitability for use and operational integrity of the building materials of the ceiling;

To strengthen the metal supporting beams of Type 1, they are replaced if they do not withstand the load on the ceiling and have damages through the full length.

Type 2 – consists of a metal beam of I-bar, twin channels, a rail, a brick cylindrical vault (the 17<sup>th</sup>–19<sup>th</sup> centuries, Odessa and Kyiv Opera Theatres, the National Bank of Ukraine). The ceiling of the foyer of the first floor of the National Philharmonic of Ukraine is made with the use of profiled beams [4, p. 72].

The floor joists of the second and third tier of the Odessa Opera House subsided by 30 cm as a result of subsidence and destruction of the outer walls.

The problems and causes of flat slab failure on the Type 2 metal beams are similar to Type 1 beams, as well as methods for their reinforcement. Thus, the subsidential phenomena in the footings and foundations of the National Philharmonic led to deformations of the foyer ceiling with vertical displacement of particular sections up to 20–25 cm.

Type 3 – the ceiling with the Klein's slab – consists of bricks, reinforced with rods, which are supported by metal beams flanges of 120–240 mm high (brick vaults on the metal beams of the Odessa Opera Theatre, the National Bank of Ukraine in Kyiv).

Methods to strengthen the Type 3 ceiling include the following measures:

- an increase in the number of metal beams while reducing the spacing of their installation;
- strengthening the ceiling with additional supports;
- change of the scheme of the ceiling work (concreting of the bearing reinforced concrete slab from above, using the ceiling as a formwork);
- reinforcement of the bearing metal beams of the ceiling by metal welding (increasing the cross-sectional area);
- the creation of monolithic reinforced concrete flat or ribbed ceiling on metal beams.

Type 4 – the ceiling of reinforced concrete on the metal beams – consists of a metal beam, concrete and reinforcement (National Philharmonic of Ukraine, part of the ceiling of the Kyrylo Rozumovskiy Palace in Baturyn after the restoration activities of the 1990s). In the building of the National Philharmonic of Ukraine, the ceiling above the basement is made of reinforced concrete and vaulted concrete along steel rolling beams.

The main problems of destruction of the ceiling on metal beams of Type 4 is an unsatisfactory technical emergency condition, insufficient bearing capacity and the need to increase the load on the ceiling.

Considering the different types of ceilings, the problems of their emergency state are different: as a result of deformations of bearing structures, trusses are bended; the plates, attaching trusses to columns, buckle; combined ceilings subside and gaps appear along the line of bolt holes of beams, cracks and chips; corrosion of metal ceiling structures is fixed.

The works on the reinforcement of ceilings are of high priority.

Methods of reinforcement of reinforced concrete ceilings on metal beams include the following:

- an increase in the number of metal beams while reducing the pitch of their installation;
- strengthening the ceiling with additional supports;
- change of the scheme of work of the ceiling (concreting of the bearing reinforced concrete slab from above, using the ceiling as a formwork)
- Creation of armour cement shirts in the vaulted and arched ceilings;
- reinforcement of bearing metal beams of ceiling by metal welding (increasing the cross-sectional area);
- the creation of monolithic reinforced concrete flat or ribbed ceiling on metal beams;
- fixation of cracks in reinforced concrete and metal ceiling with reinforcing rods and grouting.

The methods of strengthening trusses consist in the arrangement of steel supporting posts of the trusses and bracings in two levels of the portal wall and formation of steel stiffeners at the attic level above the spectators' part.

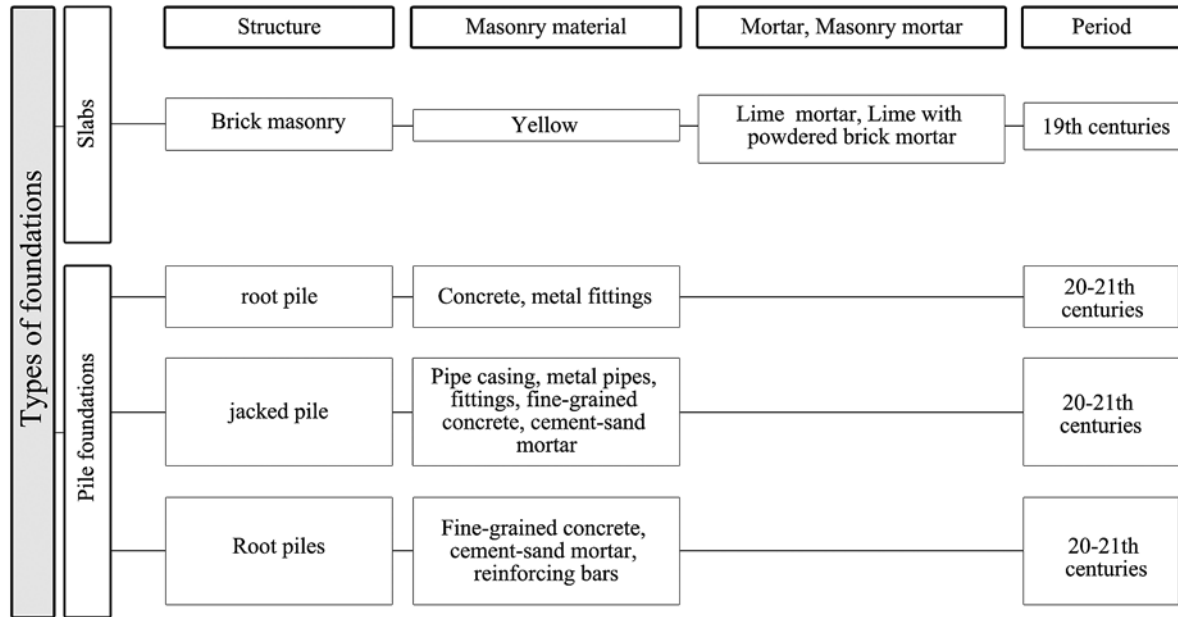
A special feature of spectacular buildings (on the example of the Odessa Opera House) is the simultaneous use of various types of ceilings made of various materials, several types of wooden and complex metal floors can be applied at once – interfloor ceilings – concrete [3, p. 8], attic structures – monolithic ceiling made of reinforced concrete ribbed slab, brick vaults on metal beams, ceilings made of metal flooring on beams filled with the remaining residue of the limestone sawing with lime mortar; monolithic reinforced concrete ceilings; radial trusses of complex configuration of upper ceiling [3, p. 6], large-span supporting structures of ceilings of stage openings of firewall walls; large-span supporting structures of roofing trusses auditorium; the monolithic reinforced brick ceiling in all rooms with water processes; the framed structures of floors of lodges and balconies.

Radial trusses were attached with plates to the columns. The trusses of the upper ceiling rested on an annular metal I-beam along the top of the wall of the auditorium; the ceiling of the stage cage was made of the beams of a monolithic ribbed slab.

## **SPECIFICITY OF INTERIORS OF THE LATTER HALF OF THE NINETEENTH CENTURY**

Representative interiors of the nineteenth century had the following characteristic features: instead of marble, cement was used in the decoration of the walls; a few gilding was only on the eaves and in some places

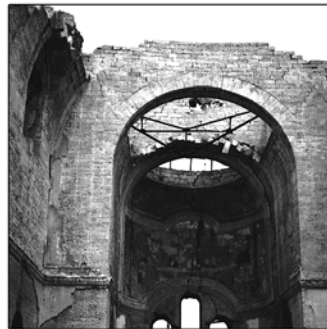
## Types of foundations by building materials and periodization



## Types of walls according to building materials and structures



Coursed masonry of red brick of the 19th century (Mystetskyi Arsenal)

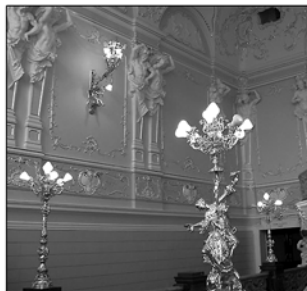


Coursed masonry of yellow brick of the 19th century ( St. Volodymyr's Cathedral in Chersonese)



Coursed brick masonry of the early 20th century (The House with Chimaeras)

## Types of interiors according to historical periods



The interiors of the 19th century (The Odessa Opera House)



The interiors of the early 20th century (The "House with Chimaeras", L. Rodzianko's apartment at 14b Yaroslaviv Val Street)



Fig. 2. Types of foundations, walls and interiors

on the ceilings. After reconstruction, instead of wallpaper, a gentle yellow-brown colour was used, the interiors became much more modest, the walls of particular ceremonial rooms were solved in grey-lilac and blue-white colours, as well as a carpet and furniture [2, p. 67]. Since

the second half of the nineteenth century the floors were covered with Brailovsky lime mortar, in the kitchen there were stone floors, instead of wooden; there was parquet floor in the hall and dining room, in some other rooms there was timber floor or cement floor painted with oil

paint. Subsequently, calorific heating was used instead of heating with stoves.

A special feature of the interiors of the 19<sup>th</sup> century is the transition from the strict traditions of classicism of the first half of the 19<sup>th</sup> century to the multistylishness of the second half of the 19<sup>th</sup> century. A mixture of styles can be clearly seen in the decoration of the auditorium of the Odessa Opera House, where the stylistics of the Viennese Baroque, Italian Renaissance and French Rococo are combined. Thus, the peculiarities of the interiors of this period consist in excessive pomp, the use of sculpture, bas-reliefs, picturesque panels, gilding, openwork metal elements and lighting elements. Restoration technologies envisage the restoration of sculptures, reliefs, ornaments with gilding, oil and tempera wall painting and artistic metal.

The main issues of interiors of the nineteenth century were associated with the appearance of cracks, deformation of structures, slope of floors due to uneven subsidence of foundations, wetting of the footings, emergency condition of stucco decoration, murals, artistic metal, mosaic and parquet floors.

Interiors of the second half of the nineteenth century can be divided into mass (in residential buildings, typical public buildings) and unique (in the most significant public buildings, palaces). In mass interiors, moulded details of eaves and plafond were typical, of mass production. In unique interiors, each element of the interior was designed by renowned architects, artists, sculptors, and carvers, therefore, it is of great artistic and architectural value Fig. 2.

By the degree of complexity of the decoration, the auditorium, the main staircase with the lobbies of unique spectacular buildings exceed Category IV, the stalls lobby, the mezzanine and two tiers belong to Category IV.

The interiors of the Odessa Opera House are unique interiors of the nineteenth century, where there are various types of monumental and decorative art characteristic of buildings of this period (painting, relief – bas-reliefs, sculpture, stucco decoration, artistic metal, lighting devices – the main chandelier, lamps, candelabra, according to author's sketches) [3, p. 200]. The peculiar feature of this period is the decoration of walls, ceilings, columns, stairs, tiers, lobbies, passages to the lies of spectacular buildings with sculptures of cupids, putti, Atlantes, muses, satyrs, stucco ornaments with gilding.

According to the author's sketch, a theatre curtain was created (the sketch of the curtain of the Odessa Opera Theatre was created by the artist A. Golovin). The most luxurious room of the best opera houses is still the auditorium, where the ceiling can be decorated with tempera or oil painting (the ceiling of the Odessa Opera Theatre is decorated with four paintings by artist F. Leffler based on Shakespeare's works, and in the centre of the ceiling there is a unique large chandelier) [3, p. 200]. In the decoration of staircases used mosaic floors with a pattern, the balustrade of a staircase was made of multicolour artificial hone-stone marble.

However, a mixture of styles, the synthesis of varieties of monumental-decorative art, thanks to the skill of

architects, is perceived harmoniously and makes aesthetic impression.

The main problems of the emergency state of the monumental and decorative setting of the unique spectacular buildings of the second half of the nineteenth century may be associated with the following things:

- with the destructive impact of the emergency condition of the supporting structures on the state of stucco decoration and interiors (deformations of profiles and stucco decoration were observed in the scenic portal of the Odessa Opera Theatre in the places of subsidence of the bearing portal wall, cracks and damage to paint layers were observed on the walls and plafond of the tiers) [3, p. 36];
- with wetting of plafond, walls and decoration, contamination of the paint layer, peeling of the plaster from the base, chips of the decoration of the plafond and corrosion of metal elements, with changes in the relief of the plafond as a result of repairs;
- with the detachment of the paint layer of the painting of the ceiling due to damage to the coating;
- with deformation of the stairs, mosaic and parquet floors, the presence of cracks, chipping and with a change in the original figure [3, p. 39].
- with a change in the original lighting and loss of decorative elements.

The main restoration measures, except for direct measures taken to eliminate deformations of the main architectural and structural systems and interior decoration works, concerned the following:

- clearing and restoration of the stucco decoration of the ceiling of the auditorium, ceilings and walls with the removal of later layers, with the addition of losses, surface out-drawing with the restoration of the original relief;
- clearing the painting of the plafond of the auditorium with the removal of dirt, fixing the paint layer, retouching, antiseptic and covering with a layer of varnish;
- replacement of the mounting of the stucco decoration of the walls and ceilings with the addition of losses and restoration of the original relief by plaster carving [3, p. 52];
- gilding of plaster stucco parts of the ceiling, walls and tiers with gold leaf on the lacquer "Mordan";
- The use of old technologies of finishing with the use of traditional materials to preserve the acoustics of the auditorium;
- restoration according to special templates of cracked steps and their connection with the help of metal strips on pylons, when the ends of the strips are welded to the stepped strings;
- replacement of emergency parquet floors of the auditorium;
- cleaning the surface of the balustrades from layers, injection of mastic in the cracks; grinding and polishing surfaces, restoring the balustrades "under artificial marble" using high-quality plaster;
- production of the stage curtain according to the initial sketch.

## RECREATION OF INTERIORS OF THE BEGINNING OF THE TWENTIETH CENTURY

The interiors of the early twentieth century were notable for the spread of the Art Nouveau style in modelling, metal and ceramic elements, oil and tempera wall paintings, stained glass windows, therefore restoration technologies are aimed at the restoring stucco and painting decorations, stained glass windows, metal elements, heating appliances and floors made according to the author's designs. Like the interiors of the second half of the 19<sup>th</sup> century, the interiors of the beginning of the 20<sup>th</sup> century were widespread, with typical factory-made décor, and the unique ones.

Comprehensive reproduction of interiors should be considered on the examples of the "House with Chimaeras" and the former apartment of the house owner Rodzianko at 14-b Yaroslaviv Val Street, converted into a "Suziria" theatre, which embodies the characteristic features of the interiors of the Art Nouveau era in Kyiv, namely, a large number of lavishly decorated rooms, including the lobby with the original main stairs and sculptures.

Signs of Art Nouveau are in the ceiling of the ceremonial lobby of the "House with Chimaeras", where an enormous colour sprout spread along the edges, original asymmetrical phytomorphic compositions, picturesque plafond; the plafond of Rodzianko's English study with plots on the subject of hunting and plaster stucco decoration; in the designing of the decorated alcove in W. Horodetsky's bedroom; in the wall paintings on a hunting theme on the main staircase of the "House with Chimaeras". The main staircases were lined with white Carrara marble "in the black vein", the black stairs were granite.

Since Art Nouveau in Ukraine was often combined with the layering of other styles, classical caissons could be used in the decoration.

In the unique interiors, plastering was made with vapor-permeable lime-gypsum mortar on brick masonry and wooden partitions ("House with Chimaeras"); plastering with the use of gypsum plaster mortar with a small admixture of lime on shingles; gypsum stucco mouldings of the ceiling coated with boiled linseed oil, putty, bronze paint and varnish (the apartment of L.P. Rodzianko).

Problems can be associated with the influence of deformations of architectural and structural systems on the state of the interior décor; the appearance of cracks; wetting of the base, plaster and paint layer; peeling of the plaster from the base and the wooden base structures were damaged by bio destroyers; deforming plaster areas with stucco decoration; loss of part of the mural painting and stucco decoration; cracks, chipped and mechanically damaged marble of the front staircase and figured balustrade made of light gray terrazzo; later paint and plaster layers, which covered the wall painting (wall painting on the hunting theme in the "House with Chimaeras").

## CONCLUSION

Many problems of the emergency state of architectural monuments, including arches and ceilings, are due to the fact that the architects who designed these buildings made some mistakes in the design schemes, and did not understand the need to preserve the static nature of the "footing-foundation-building" system, and the direct connection between the emergence of cracks in the ceilings and vaults and subsidental phenomena in the footings and foundations.

On the example of the constructions of the Odessa Opera House, one can see how over time the design schemes of unique spectacular buildings became more complex, when several types of ceilings were used at the same time in one object. This is evidence that the restoration technology for the elimination of the emergency state of each type of structure may be different, but the main requirement is the maximum preservation of authentic materials and structures. This requires restorers to use technology flexibly in accordance with each task.

A comprehensive survey and reproduction of the interiors of the "House with Chimaeras" and Rodzianko's apartment made it possible to determine those building materials and technologies that were used in the residential interiors at the end of the 19<sup>th</sup> and the early 20<sup>th</sup> centuries:

a) At the beginning of the twentieth century a layer of lime-gypsum-sand mortar (vapor-permeable lime-gypsum of variable composition) plaster mortar was applied on the brickwork, on top of it – a gypsum finishing coat with a thickness of 3–10 mm, emulsion putty and emulsion paint. Lime prevailed in the composition of the plaster mortar on the brickwork; gypsum prevailed on the wooden surfaces. Sometimes the layer of the lime-sand plaster mortar was covered with a lime-gypsum-sand cover, a textured linkcrusta paper, a putty and a paint layer, or old posters were stuck on the lime-gypsum-sand finishing coat and silk wallpapers on them.

b) On the wooden wall frieze, a gray two-layer putty was applied, a layer of varnish, and the stucco details were cast from gypsum, then they were covered with several layers of boiled linseed oil, an emulsion putty with a layer of varnish and a layer of paint.

c) Gypsum mouldings and stucco decoration were covered by impregnation with hot linseed oil, putty and a layer of ground cleavage. Often it was used imitation of wood grained borders or mouldings. Part of the stucco decoration was made not of gypsum, but of a lime-gypsum-sand mortar (sometimes with the addition of gypsum). If the molded parts were made of lime-sand mortar, a levelling layer of a gypsum finishing was applied on it, and then a layer of varnish imitating a natural texture was applied on it. Sculptures and stucco decorations could be molded from the cement-sand mortar. A terrazzo technique was used – a casting of cement mortar with marble aggregate. Stucco decoration were covered with transparent paints for pictorial art. They used decorative wood imitation, marbling, and natural stone imitation, including in the facing panels and fake fireplaces. Oil technology allowed you to create the so-called "alfresco



painted marble.” Fireplaces could also be made from lime-cement-sand mortar, decorated with plaster stucco and painted on top.

d) The practice of arranging the lining of walls with wood, the arrangement of wooden panels was used. Wooden elements were covered with a layer of varnish, wooden mouldings – with a thick layer of putty, on top with a layer of varnish, then with Dutch foil from white metal and paint, and a wooden frieze – with several layers of putty and a layer of varnish. Directly the door was covered with oil putty with painting, a layer of lacquer with gilding, primer, and colorful layers were additionally applied to the laid on pattern.

e) The ceiling is most often plastered with a plaster layer of gypsum mortar with lime additives, a stucco dec-

oration of gypsum covered with boiled linseed oil, with emulsion putty, paint and varnish, was attached on top.

The main restoration activities are as follows:

- elimination of deformations of architectural and constructive systems causing the destruction of monumental-decorative interior designing;
- elimination of moistening and replacement of damaged plaster;
- restoration of stucco decoration and replacement of emergency areas;
- restoration of easel painting of the ceiling;
- restoration of the stairs;
- layer-by-layer disclosure by compresses of paintings from later monochromatic layers and restoration of wall paintings.

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## Abstract

The article describes the period of multi-stylishness in the architecture of buildings of the second half of the 19<sup>th</sup> century – beginning of the 20<sup>th</sup> century, and it is proved that building materials and constructions which were used at that time, determined the current restoration methods.

## Streszczenie

W artykule omówiono okres różnorodności stylów w architekturze budynków z 2. połowy XIX wieku i początku XX wieku, oraz wykazano, że materiały budowlane oraz konstrukcje, które zastosowano w tamtym okresie, wpłynęły na dobór metod ich rewaloryzacji.