INTERNATIONAL JOURNAL OF CONSERVATION SCIENCE
ISSN: 2067-533X Volume 16, Special Issue, 2025: 739-752 www.ijcs.ro
DOI: 10. 36868/IJCS.2025.si.25

# RESTORATION OF HISTORICAL BUILDINGS WITH THE FORMATION OF SPA-COMPLEXES FOR REHABILITATION IN THE HISTORICAL URBAN ENVIRONMENT

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***Abstract***

*The article addresses the pressing issue of adapting historical heritage to modern needs, focusing on the integration of contemporary SPA-complexes into historical buildings and within the context of a multi-temporal historical city. Particular attention is paid to preserving the authenticity of the environment while meeting modern comfort requirements. The study examines contemporary trends in the design and arrangement of SPA-complexes, including the use of natural materials, integration with the surrounding environment and the application of energy-efficient technologies. The article emphasizes the preservation of historical buildings during their restoration and adaptation for modern functions. Various approaches to integrating SPA-complexes into historical settings are proposed, such as placement within the building's structure, basements, rooftops or as separate extensions. For each approach, advantages, disadvantages and recommendations for preserving the historical value of buildings are discussed. A separate section is devoted to the restoration of SPA-complex interiors. The authors analyze various types of materials used in decoration and methods of their restoration, with a focus on issues related to the impact of moisture and temperature on materials and historical building elements, as well as solutions to these challenges. One of the key propositions is the use of a modular system for the restoration of historical buildings into SPA-complexes. Based on the conducted research, the authors formulate conclusions about the prospects for developing SPA-complexes in historical buildings and offer recommendations.*

***Keywords***: *Restoration of historical buildings; SPA-complexes; Historical environment; Modular system; Cultural heritage; Adaptation to modern requirements; Architectural restoration; Discrete restoration; Restoration materials*

## Introduction

The topic of restoration within the context of reconstructing historical urban environments is relevant from an anthropological perspective, as the concepts of physical and mental health have historically been closely associated with water. Since ancient times, even sacred and spiritual procedures. These practices were shaped by the region's location and religious specifics, as well as the availability of natural water sources, which influenced the

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The topic of water-based body care procedures remains relevant and urgent. Currently, amid the war in Ukraine, there is a dual perception of such facilities in society. Traditionally seen as elitist, SPA-complexes are increasingly recognized as essential for a healthy lifestyle.

Most sports and wellness centers now include SPA facilities such as pools and saunas, whose popularity for recreation and wellness has grown significantly. These facilities are also highly effective for physical and psychological rehabilitation.

In modern technological contexts, public and private SPA-complexes offer diverse services to meet the needs of even the most demanding users. The need for such complexes is becoming increasingly urgent for Ukraine. Historically, such facilities were not typical for Ukraine's urban environments. However, societal demands now necessitate their presence not only in picturesque outskirts but also in city centers, often characterized by historical architecture.

Adapting the historical urban environment to meet modern accessibility and comfort requirements is critical today, particularly given the growing number of individuals with disabilities in Ukraine [1]. This trend highlights the need for SPA facilities within urban centers to provide physical and psychological rehabilitation, alongside better pedestrian accessibility and an expanded network of such facilities in historical city areas.

The popularity of all types of SPA procedures is not only rooted in the desire for relaxation and recovery but also in human genetic memory. Visual, olfactory and tactile sensations act as positive triggers, evoking pleasant emotions, memories and feelings. This is especially important for people whose lifestyles are disconnected from nature and organic materials.

Therefore, the comprehensive introduction of SPA-complexes is both timely and beneficial for Ukrainian cities, even within their historical centers. These areas, typically featuring dense, multi-temporal historical architecture, often require restoration, sanitation and reconstruction. Integrating SPA-complexes into such environments demands individualized approaches and technical specificity.

**Materials and literature analysis**

SPA-centers problem of integrating into historical architectural environments requires a multidisciplinary approach. This includes architectural aspects of planning, volumetric composition and interior design; engineering aspects of modern equipment installation; technological aspects of restoration and reconstruction of entire objects and specific elements; and medical, hygienic and psychological aspects of the impact of SPA functions on visitors. To address this complexity, this study utilizes a comprehensive set of sources and research findings across these directions.

Several sources address the reconstruction and restoration of historical urban environments, focusing on the restoration and functional adaptation of interior spaces that can be utilized for SPA-complexes in historical buildings [2, 3, 5, 6, 7, 13, 14, 16, 17, 20, 21, 23, 24, 25, 28, 29, 30].

The specificities of organizing SPA salons, centers and complexes with the implementation of innovative technological solutions are the subject of another group of sources [1, 4, 8, 10, 11, 15, 22].

Aspects of architectural styling, medicine, environmental psychology and human conditions during the use of SPA facilities – applicable to the design of SPA-complexes in historical settings – are explored in relevant sources [9, 12, 18, 19, 26].

Particular sources stand out due to their significant contributions to solving issues related to the organization of SPA-complexes within historical buildings.

Oleg Sleptsov's methodological monograph summarizes theoretical aspects and various methodological approaches to architectural design during the reconstruction of public buildings and complexes in existing historical environments. Drawing on domestic, foreign and the author's own scientific and design experience, this work formulates the components of

historical building reconstruction, including types and techniques, stages and project phasing [2].

Nataliia Mezhenna's dissertation examines the compositional integration of new building facades into historical streets and squares, proposing methodological techniques. The research identifies criteria for harmonizing old and new developments, develops facade design models for new buildings in historical streets and recommends modern lighting possibilities and analyzes polychromy for such facades. It also proposes techniques for incorporating new buildings into multi-temporal ensembles [3].

In her dissertation, N. Lukomska generalizes the historical development and global and Ukrainian experiences in the design, construction and operation of water wellness facilities. The study addresses planning features, spatial composition and the placement of water wellness facilities [4].

In O. Lesyk's article, the conceptual foundations of modern restoration of architectural monuments are identified. The principles of restoring architectural monuments, from replacing destroyed buildings to modern discrete restoration methods, are analyzed. The author provides a comprehensive methodology for research, design, restoration and adaptation of advanced functions [5].

**Results and Discussions**

The terminology of modern SPA-complexes is closely connected with the world history of architecture, particularly ancient, early Christian and medieval, as well as their further development in various countries into complexes with water procedures.

Greek thermae served not only for physical cleansing but also for social interaction. The Greeks recognized the importance of hygiene and health, using natural hot springs for bathing. Baths were often located near stadiums and gymnasiums, serving as places to warm up athletes' muscles before competitions and for relaxation afterward. They were also built near sanctuaries and used by pilgrims for purification before visiting temples.

Roman thermae, also examples of such historical SPA-complexes, were more advanced compared to the Greek ones. They were not merely places for bodily hygiene but real centers of public life. Their layout was carefully designed to ensure maximum comfort, hygiene and aesthetic pleasure.

Several planning principles of thermae became the foundation for modern complexes of a similar nature. The primary principle was a sequence of temperatures, where visitors moved through a series of rooms with gradually increasing temperatures. This route allowed the body to adapt to the heat and avoid sudden changes. This functional solution influenced the general zoning of thermae:

- Apodyterium: a changing room where visitors left their clothes.
- Tepidarium: a warm room with a moderate temperature for relaxation before further procedures.
- Caldarium: a hot room with steam, similar to a modern sauna.
- Frigidarium: a cold room with a pool of cold water for cooling down after hot procedures.
- Palaestra: a hall for physical exercises and sports games.
- Library: a place for reading and leisure.
- Gardens: green areas for walks and relaxation.

The thermae featured central heating, with hypocaust systems – underground channels through which hot air circulated – ensuring even heat distribution throughout the complex. The Romans had an advanced water supply system, providing the thermae with clean water. Complex sewer systems were used for wastewater disposal. These engineering systems influenced architectural characteristics, with the layout of thermae based on principles of

symmetry and harmony. The buildings were lavishly decorated with mosaics, statues and other decorative elements.

Turkish and Iranian hammams emerged under the influence of Roman thermae and Persian public baths. They featured a complex structure with hot, warm and cold rooms. Hammams served not only hygienic but also social and religious functions, acting as places for communication, news exchange and relaxation, playing a significant role in societal life. They often had domed ceilings and marble floors, helping maintain high temperatures. Some still function as tourist attractions, combining elements of traditional Persian architecture.

Finland, Germany and other Northern European countries had different types of procedures. Finnish saunas, known for their dry steam and wooden structures, have been traditional from ancient times to today. They are used for relaxation and health improvement. Saunas are often located near lakes, allowing cooling off in the water after the steam bath. Traditional Finnish saunas in homes, cottages and later in SPA-complexes are an integral part of European culture. Baths and saunas offer various procedures, including therapeutic and relaxation treatments. Over time, traditional steam rooms have been supplemented with pools, massage zones and other functional areas.

Japanese onsen and sento are an essential part of Japanese culture. Onsen use hot water from natural volcanic springs, while sento use artificially heated water. They are important for relaxation and meditation. In Japan, visiting onsen is often associated with ritual purification and rejuvenation. Japanese ofuro also came into modern SPA culture from ancient times, along with numerous hot springs and various baths.

Chinese ritual baths were used for cleansing before religious ceremonies and were part of monasteries and temples. They played a significant role in spiritual life, involving complex body and soul cleansing rituals, integral to religious and social life. Baths in monasteries were used by monks for ritual purification.

Slavic countries had bathing traditions somewhat similar to Finnish ones but with moist steam, often aromatic. The so-called Russian or Rusyn baths featured a steam room with birch twigs used for massage and blood circulation stimulation. The bath had significant social and ritual importance, often located near water bodies for cooling off after the steam room. Examples include traditional Russian baths in villages, still used for family relaxation and health improvement.

Some historical complexes in European, Eastern and Asian countries continue to function today. These represent continuous development, reconstruction and construction throughout different historical periods. Such layering of different eras often defines the specific style of SPA architecture preserved to this day. These complexes are typically found in warm climates or regions with thermal springs.

Ukraine has regions with natural thermal springs in the western oblasts, particularly Zakarpattia. For other parts of the country, such buildings were less typical. Ukrainian traditions of body hygiene differ slightly from the described general Slavic ones, common in northern Eastern Europe, where baths were separate structures. Ukraine's milder climate, shorter winters and abundant water resources allowed their use most of the year. Moreover, it was traditional to dig artificial ponds, maintained in good condition and used communally by villages. In colder seasons, people bathed at home, near the stove, which was lit during the day for cooking. In cities, there were public baths, owned either by municipal authorities or private individuals. These baths were integrated into the city fabric, either as standalone buildings or embedded in public structures. Naturally, the comfort level and functionality of past centuries' baths cannot compare to modern SPAs.

Modern technical capabilities allow the establishment of well-equipped SPA-complexes in city centers or suburban areas. There is also a growing need for such complexes or individual functional SPA zones for health, physical and psychological rehabilitation. This need is especially relevant during societal crises, for psychological and physical recovery

during and after wars and for veterans and civilians who have faced challenging times. In historic city centers, where population density is highest, there is a demand for SPA-complexes in standalone buildings or integrated into existing structures.

The arrangement of SPA-complexes for rehabilitation in the historic urban environment can be systematized according to different principles.

**Classification of SPA-complexes based on their location in historical urban environments** (Fig. 1):

- **In the building itself** – i.e., the SPA-complex or SPA zone does not appear on the façade of the historical building, nor does it impact the sustainable urban environment. This option is the least disruptive to the environment of the historical street or square.

- **In basement/semi-basement spaces** – not highlighted on the façade, but regulations require exits from these zones, ideally with natural lighting, which can be achieved using light wells. Such solutions are possible when a historical building already has similar basement/semi-basement spaces and these are adapted for new functions with reinforcement and partial updates of structures.

- **Roof addition** – does not spoil the silhouette of the building and is not visible from pedestrian or motorist vantage points. This option is positive in terms of restoring the urban environment because it does not affect the visual perception of the street and maintains the external appearance of the building at pedestrian level. However, it may influence the building's silhouette and the street's silhouette, known as the "blue line." Additionally, placing pools on the roof of a historical building may require significant structural reinforcement, which may have both positive and negative consequences. Positive aspects include general strengthening of the building and additional attention to load-bearing structures during operation. Negative aspects involve the intervention in the historical building, which is not pure restoration but involves structural changes to the historical structure.

- **Extension with access from the main building** (adjacent to the historical building or located separately, connected via a ground, above-ground or underground passage). Such an extension can be executed in various stylistic forms:

a) restoring the stylistic features of the building on whose plot the extension is located, restoring or renovating the historical structure according to archival materials with a change in function.

b) in a modern style, to visually separate the historical from the contemporary. This approach is considered harmonious for cities with historical buildings from different periods. Moreover, this principle is recommended by the International Charter for the Conservation and Restoration of Monuments and Sites (the Venice Charter, May 31, 1964).

- **In a zone not visible from the street**, such as in the inner courtyard. The positive aspect of this option is that the historical building remains untouched, independent of the applied approach in the extension in the inner courtyard. The visual context of the street also remains historical, without interventions. The connection between the buildings is ensured through a ground, above-ground or underground passage, which is also not visible from the street. The new SPA-complex building itself can be constructed according to modern requirements without restrictions on historical stylistics.

However, all of these methods can be considered a form of restoration or rehabilitation of the historical street or square as a whole. That is, the restoration of the historical structure of the street or square itself, the return of its traditional dense urban fabric, which is typical for a historically layered city [3].

In most cases, during the restoration of historical buildings with the installation of SPA-complexes for rehabilitation within the historical city environment, discrete restoration is applied, which is a modern approach to restoration works [5]. This involves adapting the object, adding new or modernizing existing functions, so it is necessary to comprehensively

consider the specific circumstances and requirements of the building, location and social conditions. In some cases, restoration works are carried out as independent isolated processes, while in others, they are combined as parts of a single process. Even in the construction of new buildings or partial renovations, the idea of harmony within the historical city environment remains. The history of the development of most historical cities shows that each era contributed innovative elements to the existing architecture, proving the legitimacy of forming new buildings and the presence of modern stylistics within the system of historical development.

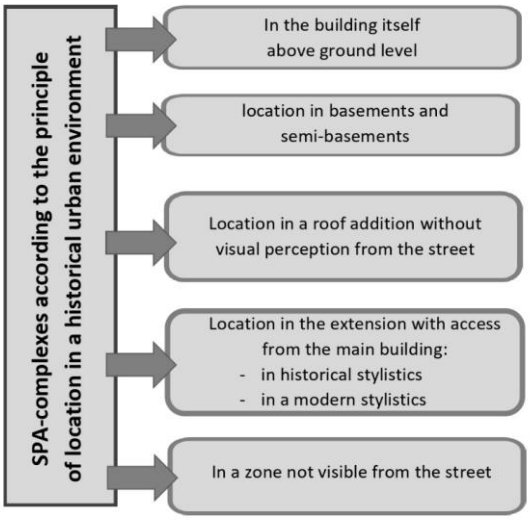


**Fig. 1.** Classification of SPA complexes based on their location in historical urban environments

**SPA-complexes integrated into historical buildings can be classified by different methods of reconstruction and restoration.** This type of restoration of historical buildings with adaptation to modern requirements primarily concerns the planning structure, practically not affecting the façade solutions and does not impact the volume or façade of the historical structure within the stable street or square system (Fig. 2):

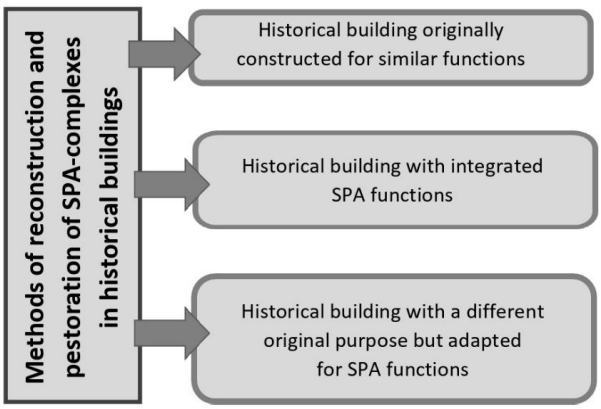


**Fig. 2.** Classification of SPA-complexes implemented in historical buildings according to various methods of reconstruction and restoration

1. Historical buildings originally constructed for similar functions (historical baths, public baths, pools). These objects were typically very popular in countries with natural thermal springs. Specific functions were formed around them and complexes were developed. However, their architecture was not static; technologies advanced and human comfort demands increased, changing the regulatory framework. Therefore, historical buildings constantly evolved with added rooms and functions and more modern technologies were integrated into historical interiors. This is similar to the structure of a historically layered city, where the city lives and develops by combining these historical layers into a unique image.

2. Historical building with integrated SPA functions. The historical building retains its original functions, but modernity requires a new level of comfort, improved service and the addition of new functions. This is most common in historical hotels and office buildings. Typically, these hotel complexes and high-end office buildings include a SPA zone. Its size and functional content vary depending on the restoration conditions of the building and represent a necessary compromise between preserving authentic planning decisions and interiors and adapting to modern consumption requirements. The historical building fully retains its functions (hotel, museum, theater etc.) but adds SPA functions for the comfort and physical and psychological rehabilitation of staff. These complexes are typically small, limited in function and used exclusively for internal purposes. The addition of such services also makes these establishments more attractive for employees. Usually, the implementation of such zones does not affect the external appearance of the building or the surrounding environment. Internally, such complexes are located away from public areas, typically in spaces that are not architecturally valuable and their reconstruction and functional changes have occurred repeatedly during the building's history.

3. Historical building with a different original purpose but adapted or partially repurposed for SPA functions. In these cases, restoration works usually already include reconstruction and modernization elements at the project proposal stage. However, if the building or complex is in a historical setting, it is desirable that such interventions be minimal and visually unobtrusive. It is rare for such historical buildings to be fully repurposed into SPA-complexes. This could be one of the functions, often secondary to the primary purpose or part of a multi-functional complex.

**The most practical type of restoration work is fragmentary restoration in SPA interiors of historical buildings** that have a history of use, elements of wear or physical damage from exploitation, often from improper use. Another possible scenario is when the SPA-complex was built, operated for some time and then abandoned or faced a long pause in its use.

Typically, restoration work in SPA areas, besides the aesthetic function and the visual effect of renewal, aims to prevent further degradation of elements of the historical building. Such work must ensure the inertness of the historical structure’s construction in relation to the impact of the often-aggressive environment typical for SPA-complexes. This includes atmospheric and technogenic influences such as steam, aroma diffusion, chlorinated air and ultraviolet light.

For saunas and baths, a characteristic feature of the construction is the integrity of the vapor-proof insulation, preventing steam from penetrating the load-bearing and thermal insulation structures of the sauna and bath and, consequently, the load-bearing structure of the historical building itself.

For Roman baths, hammams, pools and showers, the element preventing moisture penetration into the structural and load-bearing elements of historical buildings is vertical and horizontal waterproofing, such as latex-type coatings. In general, when restoring visible elements of SPA-complexes, particular attention must be paid to the integrity of membrane moisture- and vapor-protective layers under the restored surface areas.

**Three main types of restoration work can be identified for parts of SPA-complexes:**

1. Local surface restoration, without replacing structural elements.

2. Restoration of wall, ceiling, floor and volumetric interior elements, preserving the original appearance.

3. Complete replacement of structural and finishing materials while maintaining the functionality and atmosphere of the SPA object, recreating the visual characteristics of the previous historical interior.

In general, the types of restoration work in specific SPA-complex rooms should be considered and classified based on the type of material, as the face surface – finishes and cladding – usually suffers the most. Typically, materials with low specific weight that are subject to frequent contact with human bodies or their parts experience the greatest wear. Accidental mechanical damage to the material surfaces, such as chips, scratches and peeling, is also quite common during maintenance and use.

For example, one of the most common types of restoration work in a SPA facility, such as a bathhouse or sauna, is the mechanical sanding of horizontal wooden surfaces, such as benches and floor slats. In most cases, the wood being sanded is abachi or "African oak" (a valuable hardwood species, *Triplochiton scleroxylon*, lat., from the Malvaceae family, found in tropical Africa), a material with a low specific gravity of 300-350kg/m³, which does not heat up in saunas or baths. However, this material is quite new; traditional historical baths and saunas usually featured benches and other finishes made of lime, alder or sometimes oak. The traditional material for Northern Europe and Scandinavia was Finnish pine and aspen. It is recommended to carry out such restoration and cleaning work using vibration sanding machines with an attached vacuum cleaner. An example is the process of restoring a curved element from new materials during the restoration of a bench (Fig. 3).

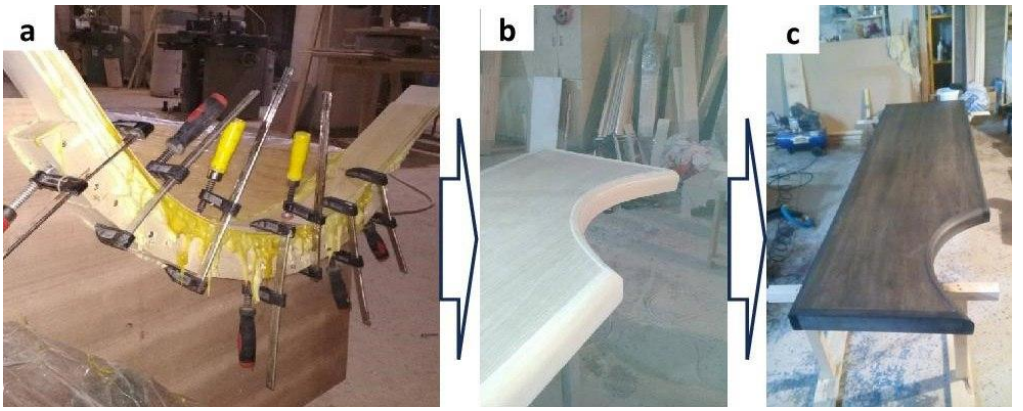


**Fig. 3.** Restoration of a wooden bench outside a historical building (photo by Oleksandr Zhytnyk):
a - Bonding of lamellae to create a curved element. b - Sanded bench after restoration.
c - Painted bench after sanding

With prolonged use of wooden surfaces in Russian bathhouses and saunas with high humidity, areas where vertical and horizontal surfaces intersect tend to absorb moisture, oxidize and develop mold and fungi. Restoration of such areas involves the use of disinfecting and bleaching agents for wood. One example is *Supi Sauna Pesu*, a product by Tikkurilla OY (Finland). It is designed for cleaning shelves, walls, ceilings and floors from various types of contamination. To dissolve lime deposits, a 15% solution is prepared. For bleaching shelves, the product is mixed with water in a 1:1 ratio, applied to the surface and left for 15 minutes, after which it should be thoroughly rinsed with clean water. In cases where this restoration

method is ineffective due to deep wood damage, the only solution is the complete replacement of the affected sections. This ensures that areas damaged by mold, which could pose a threat to human health, are safely eliminated (Fig. 4).

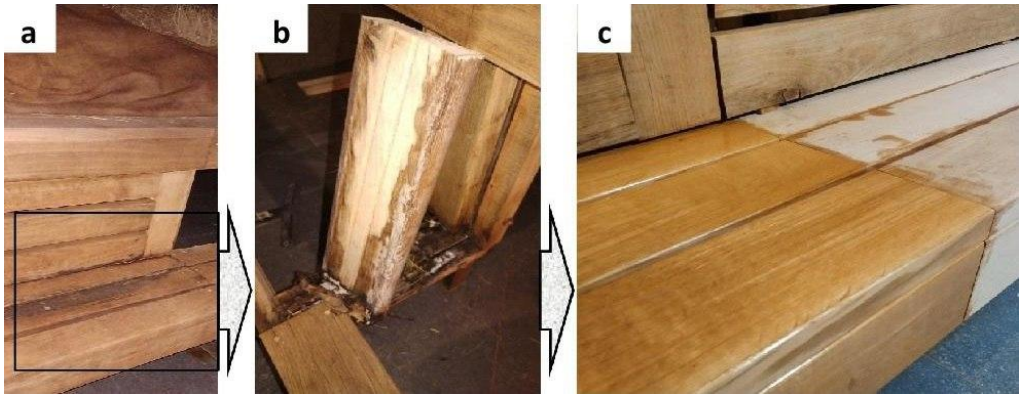


**Fig. 4.** Wooden bench restoration with replacement of wooden elements (photo by Oleksandr Zhytnyk).
a - Exterior view of the damaged bench. b - Identification of defects.
c - Replaced bench elements with protective coating

Marble, a common decorative element in Roman baths and Turkish hammams, is used in both large-format slabs or tiles and mosaics of varying sizes. Although marble is dense and durable, its porous calcium carbonate-based structure makes it particularly susceptible to penetration by acidic and alkaline solutions. During the use of marble tables, benches and loungers, their smooth, polished surfaces, originally prepared during the SPA facility's launch, can be significantly affected by human sweat, accidentally spilled beverages and mechanical damage during maintenance and use. For repairing such damage, special two-component adhesives (polyether- or epoxy-based) are used to bond marble pieces. The restoration process of polished marble surfaces is complex, labor-intensive and costly. It involves the following steps: mechanically cleaning the damaged surface layer, chemical consolidation (crystallization) to strengthen the material and final polishing to restore its original gloss. Due to marble's natural sedimentary composition, neighboring areas often differ in structure and color from the restored sections. Achieving seamless integration can be challenging, even for highly skilled professionals. In many cases, it is difficult to eliminate visible differences in the restoration quality between adjacent sections of the marble surface (Fig. 5).

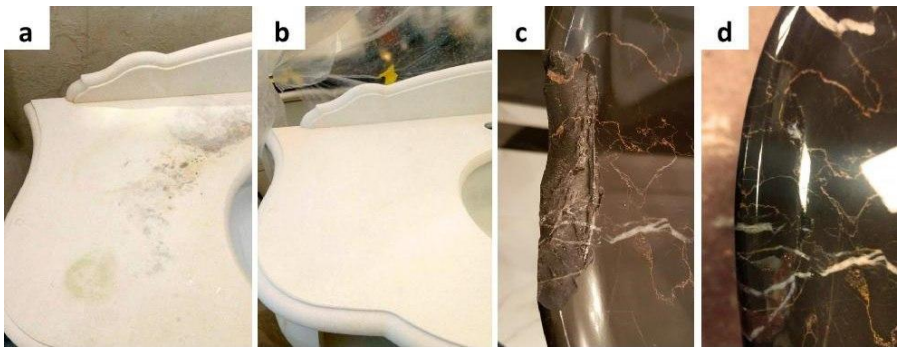


**Fig. 5.** Restoration of marble elements (photo by Oleksandr Zhytnyk).
a - Chemically damaged marble surface. b - Restored marble surface using crystallization and polishing. c - Chip on the edge of a marble countertop. d - Restored marble surface through bonding and polishing

In SPA zones, small-sized elements such as glass or marble mosaics are often subject to restoration. Restoration zones typically arise in areas with high foot traffic. Generally, the thinner and smaller the cladding elements, the more frequently restoration is needed for floors and other surfaces. In addition to dynamic loads caused by walking, these elements are also exposed to impact from hard objects, leading to chips and cracks, particularly in glass mosaics. The correct restoration method for the surfaces mentioned above is to replace the mosaic with a similar one, ensuring the correct color match for the epoxy grout when filling the joints. For example, the process of restoring a mosaic floor in a Turkish bath could involve replacing damaged electrical heating cables (Fig. 6).


**Fig. 6.** Mosaic floor restoration in Turkish bath (photo by Oleksandr Zhytnyk).
a - "Opening" a section of the floor. b - Identifying wear and damage to the underfloor heating cable. c - Restoring the mosaic floor tiling. d - Recovered authenticity of the floor

The ideal effect is achieved by adhering to technological guidelines and using the same manufacturers for mosaics and grouting materials as were used for the original cladding. However, when restoring historic SPA-complexes, there might be situations where the mosaic is authentic, produced long ago and similar production is no longer available. In such cases, a limited number of elements can be manufactured to closely match the original. This approach is recommended when the building and its mosaic elements are of significant architectural and historical value. Another option is to use elements that visually align with the overall style of the object but are distinctly different. This follows the recommendations of the Venice Charter for Restoration (Venice Charter) – to show which elements are authentic and which were added during the restoration.

Combining different restoration methods allows the adaptation of ancient structures for modern needs. Adapting historical buildings in cities is a necessity of the time and allows for the complete restoration of preserved historic buildings, restoration of individual objects in destroyed complexes, conservation of ruined monuments or their reconstruction. As experience shows, in some cases, restoration works are carried out as independent, isolated processes, while in other cases, they combine various restoration types into a single, unified process. This serves as the basis for considering restoration works as discrete. The theory of discrete restoration has become fundamental today, as it comprehensively takes into account the circumstances and requirements for applying various restoration methods [5, 6].

Another method that forms part of discrete restoration is architectural restoration of SPA-complexes based on modular systems: a modern approach to heritage conservation. Modularity was a feature of traditional historical baths, saunas and water complexes

worldwide. Historic urban development also has characteristics of modularity, defined historical proportions and divisions.

The modular system in SPA-complex restoration, especially for historical settings, is an innovative approach that combines the preservation of the building's historical value with the implementation of modern technologies. This method allows for the restoration or enhancement of existing structures using pre-manufactured modules, significantly accelerating the restoration process and minimizing environmental impact.

**Advantages of the modular system in SPA-complex restoration:**

- Speed of construction: the use of ready-made modules accelerates the restoration process.
- Flexibility: modular systems allow for adaptation to any building features, landscape or historical environment.
- Minimal environmental impact: construction is carried out in controlled conditions, reducing waste and pollution.
- High quality: modules are manufactured in factories or specialized workshops under strict quality standards, ensuring durability.
- Energy efficiency: modern materials and technologies used in the modules can make restored SPA-complexes energy-efficient.
- Maximal preservation of historical elements: the modular system allows the integration of historical elements into the new structure.
- Minimal intervention in the historic building during restoration work: since elements are manufactured remotely, on-site assembly is shortened, minimizing technical intervention, vibrations and the number of specialists involved in the construction.

**Main stages of SPA-complex restoration based on the modular system:**

1. Assessment of building condition: a detailed analysis of existing structures to determine the scope of work.
2. Module design: creating 3D models of modules based on building specifics and client requirements.
3. Module production: manufacturing modules in a factory using modern materials and technologies.
4. Demolition of old structures: removing damaged building elements.
5. Module assembly: assembling modules at the construction site and joining them into a unified structure.
6. Finishing works: completing the restoration with interior and exterior finishing works.

Examples of modular system applications in SPA-complex restoration:

- Restoration of facades: replacing damaged facade panels with new modular elements.
- Creating new rooms: adding new modular blocks to expand the functionality of the SPA-complex.
- Roof restoration: replacing old roofing with new modular construction.
- Building new structures on the territory of a historic complex: constructing new buildings, such as pools, saunas and restaurants, using modular technologies.

The modular system opens new opportunities for SPA-complex restoration, enabling the preservation of the historical value of buildings while creating modern and functional spaces even in a historic urban environment. This approach is promising for the development of tourism infrastructure in historic cities and for preserving cultural heritage.

## Conclusions

The conducted study on the restoration of historic buildings into modern SPA-complexes within the historical urban environment has revealed the relevance of this direction and its significant potential. The tradition of using water for the healing of body and spirit has deep historical roots. Modern society demonstrates a growing interest in a healthy lifestyle and relaxation, which makes the creation of SPA-complexes a relevant task.

The integration of SPA-complexes into historical environments has been examined. Various approaches to placing SPA-complexes in historic buildings were analyzed: within the building structure, in basements, on rooftops or as separate annexes. Each option has its advantages and disadvantages, which must be considered during the design process.

SPA-complexes integrated into historical buildings have been classified according to different methods of reconstruction and restoration: a historic building originally designed for similar functions, a historic building into which SPA functions have been integrated and a historic building that had a different original purpose but has been repurposed. The advantages and disadvantages of these approaches were outlined.

Attention was given to restoration processes in the interiors of SPA-complexes, with a special focus on preserving the authenticity of historical interiors when adapting them for modern functions. Various materials and restoration methods were discussed, as well as issues related to the impact of moisture and temperature on historic building elements.

The modular system was presented as one of the promising approaches to restoration, allowing for quick and effective adaptation of historic buildings to modern functions. This system helps preserve the historical value of buildings, minimizes environmental impact and ensures high quality and efficiency in the work. The flexibility of modular systems allows them to be adapted to any particularities of a historic building, while the energy efficiency of such solutions contributes to reducing operational costs. It was shown that discrete restoration is the most appropriate for historic buildings, as it allows the preservation of authenticity while adapting the object to modern requirements.

The study confirmed that the restoration of historic buildings with the establishment of SPA-complexes is a promising development direction. New approaches to integrating modern functions into historical environments were proposed. Such approaches can be used to preserve cultural heritage and create modern, comfortable recreation and wellness facilities. The issue of preserving authenticity and adapting historical interiors was also considered. The results of the study can be used for the development of restoration projects for historic buildings with SPA complexes and contribute to the development of tourism infrastructure in historic city centers. The obtained data will be valuable for architects, restorers, investors and local government bodies.

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*Received: November 22, 2024*
*Accepted: March 23, 2025*