Wood as a Material of Traditional Manor Building: Problems of Restoration, Conservation and Reconstruction

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Abstract. In the article, the co-authors analyze the reconstruction and restoration of pieces of wooden architecture, primarily, mansions and parks of the 18th and 19th centuries, located in the south-west of the Russian capital. The co-authors are convinced that the application of timber as the construction and finishing material is the key feature of these wooden monuments, or former mansions of the Russian feudal nobility, park pavilions, country houses owned by famous businessmen and artists in the days of the industrial revolution, in the late 19th – early 20th century. Wood is the source of numerous problems that accompany preservation, and in some cases, reconstruction and restoration of these construction facilities. Problems consist in the choice of materials used to reproduce missing fragments of buildings and the assessment of authenticity of a facility or its elements in case of its complete or partial destruction. The co-authors employed such methods, as the analysis of architectural history sources and comparative historical research. The co-authors offer expert reviews made by contemporary Russian restorers and civil activists, willing to have architectural monuments preserved and mansions and parks restored. The project is theoretically and practically relevant, as it generalizes information on pieces of wooden architecture and their restoration in the Russian Federation.

1. Introduction
Timber is widely regarded as one of the most widely spread construction materials in the world. In Russia, whose timber resources seem inexhaustible even today, timber is the most affordable construction material. If we address the statistical data, we will find out that the Russian Federation owns 25% of the world’s supply of timber, although the country does not use this advantage to the full. For example, in 2019, 16 of 19 million cubic meters of domestically produced timber were exported, while mere 3.7 million cubic meters were used inside the country [1]. The timber, used as a principal construction resource, is unique and universal. Isn’t it the reason for its being the No. 1 material in production activities, day-to-day living, and a source of culture? Architects and builders of the past were attracted by its colour, texture, strength, flexibility, and acoustic qualities of each wood species. It is likely that this is the reason why wooden buildings and structures remain an integral element of the historical built environment in many European and Asian cities. Even today they serve as a natural cultural framework of historical centres of small and mid-sized towns; timber is widely spread in rural construction (Figure 1 and Figure 2). More often than not researchers emphasize the point that ancient Russia’s geographical position and historical context facilitated the development of wooden architecture, establishment of its traditions and emergence of talented domestic builders [2].
Timber has obvious disadvantages: it may rot, it may be destructed by fungi and insects (for example, by the wood engraver, wood fretter, furniture beetle and many others.) It is noteworthy that timber is also destroyable by 130 species of plant-eating insects (Figure 3). Many wooden structures are destroyed by fires. In the 21st century, these emergencies can destroy even the most carefully protected and internationally valued buildings and structures (namely, the Church of Ascension in Kondopoga, Karelia).

The Russian capital has many architectural monuments made of wood. Timber is often used in combination with stone and other natural materials, such as gypsum, marble and tuff, not to mention wood as a finishing material; wood is the most popular material used in interior design. Even now wood is the best material in terms of variety and beauty. Some wood species (for example, bamboo, oak tree, hornbeam) are used by the most advanced hi-tech and bio-tech industries. Contemporary architects employ timber as a construction material. Hence, they don’t do it as often as we’d like them to. By using timber, builders and urban planners of the 21st century solve the problem of biosphere compatible urban areas. In this context, restoration of any item of architectural heritage, including monuments of wooden architecture, assumes a supplementary function, that is, the generation of biosphere compatible spaces, as well as the maintenance and preservation of ethnic and cultural identities of urban areas. In this work, we are going to analyze some of the general problems of restoration of wooden structures, as well as the problems of wood as a construction material and
difficulties that accompany the preservation and restoration of wooden buildings. The practical restoration of manors and parks in the so-called New Moscow will serve as an example.

General provisions that are listed above enable us to formulate the goals and objectives of this research. Its goal is to identify the norms that govern the work performed by restorers, employees of museums in terms of restoration, reconstruction and protection of pieces of architecture and interior design, if they are made of versatile species of wood. Another issue considered in this article is the choice of material made by a restorer reconstructing destroyed elements of architectural monuments.

2. Materials and methods

Russian and international legislative acts setting restoration procedures for items of cultural heritage, serve as the source material. International acts and the federal legislation governing the protection of items of cultural heritage, standard process documentation applicable to any work performed in respect of pieces of wooden architecture encompass the legal framework of this research project. It is vitally important to analyze the restoration rules and procedures that assure the accuracy of reconstruction or restoration (reproduction) of cultural heritage items, as well as restoration/reconstruction reports made by experts in wooden architecture.

3. Results

The restoration of cultural heritage pursues a wide range of goals. Restorers must use solely authentic materials, that were initially used by architects, sculptors, or artists, who created an architectural masterpiece or a monumental architectural object, who painted the walls of a structure, designed its interior, made a mosaic, etc. In the course of restoration it is vitally important to preserve the aesthetic impact produced by a monument on its admirers. A piece of architectural heritage should produce the same impression on any present-day visitor who finds himself in a museum or other institution of culture, as far as it’s possible. Any piece of architecture should make any architectural space more comfortable. How can this problem be solved, if authentic materials cannot preserve the colour scheme and integrity of an architectural composition? The co-authors cannot solve this problem in a small article. However they have the right to ask this question and offer their viewpoint on this problem.

Pursuant to Federal Law № 73 (mansions in rural areas) [3], monuments located in the New Moscow, namely, detached houses, buildings and structures, groups of buildings and adjacent areas are within the jurisdiction of the Moscow Department of Cultural Heritage.

Researchers draw attention to the large number of mansions and parks located in the vicinity of Moscow, particularly to the south and south-west of its historical centre. These architectural ensembles were developed since the late 17th century. They include such famous parks as Valuevo, Izmalkovo, Klenovo, Ostafyevo, Schapovo, etc. Timber was used to construct the main “focal points” of these mansions. Their frameworks were made of wood, as well. This material was widely spread in civil engineering before the reign of Peter the Great and also when the baroque and classicism were the most popular architectural styles of ecclesiastical architecture.

These mansions have more or less the same history: in the mid-to-late 19th century they were acquired by new owners, major Russian capitalists. For instance, Valuevo was acquired by the Lepeshkins, who owned several factories [4]. However the number of households, who took advantage of the wooden mansions, did not grow much in the days of intensive industrial development and emergence of bourgeoisie as a new social class. The modernist style did not stop using wood. In the early 20th century old mansions were rebuilt and new ones were constructed. Palace-like constructions and more modest country houses of new “masters of the universe” were among them. Meanwhile, industrialists and financiers did not give up using wood as a construction material for their country houses. Mansions owned by the Bergs are considered the masterpiece of the Russian modernist style. Today their condition is rather poor.

After the cataclysm of 1917, ownership rights to numerous pieces of realty were transferred to the Soviet state. Some structures located within the territories of mansions were successfully preserved,
they accommodated convalescence homes and museums. Unfortunately, a major portion of older buildings were destroyed. The material used by the builders was one of the reasons for their destruction.

The process of construction of wooden mansions outside of Moscow that lasted over two centuries, from the early 18th century to the early 20th century, is considered by historians of architecture and landscape architecture as a striking period in the history of the Russian landscape architecture. We’d like to focus on one of its distinctive features that deals with the choice of materials for a mansion. Most frequently builders, who made palaces for mansion owners outside of Moscow, constructed ground floors of masonry materials, including natural stone or bricks. First floors were usually designed as crowns, made of wholesome tree trunks in compliance with wooden architecture technologies. The extensive use of wood enabled builders to reduce the weight of their structures. It was generally believed that the ground floor, if made of stone, prevented the rotting of upper wooden floors and extensions that had no contact with soil. However, as the time progressed, the environmental effect turned more pronounced. The restoration of these structures, made of wood and stone, is a real challenge to be met by the specialists. These mansions were initially built for the countryside area, and today they have found themselves in a megalopolis that has absorbed nearby villages. It is likely that these structures, that are over one hundred years old, can hardly withstand climatic and anthropogenic impacts of the urban environment. Therefore, the process of their restoration is particularly labour consuming, and this fact is implemented in the Russian legislation and regulatory documentation.

Let’s address the restoration of these architectural monuments. This process is governed by GOSTs (All-Russian State Standards), international protocols, and expert opinions. In his report, V.A. Ilyichev, Academician of the Russian Academy of Architecture and Construction Sciences, identified two groups of restoration problems: 1. Failure to produce aesthetic impression; 2. Heterogeneity of restoration works [5].

Research and surveying are to precede any restoration efforts. These works are to be governed by the legal provisions that apply to the due diligence and performance of specialized restoration works aimed at the preservation of items of cultural heritage (monuments of history and culture) accumulated by the peoples of the Russian Federation. Pursuant to the provisions of the Federal law, this package of documents is to comply with the recommendations provided in the collection of restoration rules and procedures [6].

Mansions, designed by the architects hired by the owners of Izmalkovo, Klenovo, Valuevo, etc., had wooden ground floors. The majority of palaces, built in the Moscow Region, were made of coniferous wood species. Therefore, restorers use the same authentic material when reproducing missing elements of structures. Any construction material must comply with Intergovernmental standard GOST 9463-2016 “Coniferous round wood. Specifications” (enacted by the Order issued by the Federal Agency on Technical Regulating and Metrology on September 30, 2016 № 1255-st) [7]. According to this document, any material, used to replace rotten logs, can differ in appearance. Moreover, its texture can be different from the one of the timber produced in the 18th or 19th century.

Let’s provide an example of a restoration feature typical for an item of cultural heritage made of wood. In some cases, wooden elements of architectural monuments have vertical cracks. These cracks hardly affect the strength of a structure, and, in absence of other destructions, these wooden elements are not subject to replacement. Horizontal cracks are more dangerous for architectural monuments. They affect the strength of structural elements and their thermal resistance; moreover, they can serve as “convenient” inlets of fungi that can spread all over the internal layers of wood.

4. Discussion. Wood protection from fungi and wood mold. Fire resistance of wood. Problems and solutions

It is more or less safe to say that restoration and reconstruction of items of architectural heritage have the mission of restoring the missing elements of buildings and preserving the aesthetic impression that was initially produced by the building. It is important to preserve the building as a piece of art. Repairs
and newly inserted elements, added at different times, should not spoil the general impression, produced by a piece of architecture. Any restoration effort has a technological background. A restorer solves such never ending problems of wood, as rotting, fungosity, exposure to the timber beetle, etc. On top of that, he is to take account of effective fire resistance requirements applicable to wooden structures. The effective intergovernmental standard has numerous provisions applicable to the pre-treatment of wood. Pursuant to this standard, wood must be impregnated with protective substances, authorized for use by healthcare authorities. Every raw of products to be impregnated must be placed on special pads. Pad-free impregnation is acceptable if the quality of impregnation is assured. Pursuant to the standard, impregnation of frozen and ice-covered wood is prohibited. Other specific requirements apply to this process. They are listed in the document [7]. A restorer responsible for drafting a reconstruction or restoration design project, is obliged to specify wood treatment methods in the design documentation, and, in some cases, he must have the wood treatment material, used for restoration purposes, tested and approved by the RF Ministry of Culture [8,9,10].

In particular cases wood treatment may darken its colour, thus, making it similar to the colour of the older parts of a wooden building.

Particular requirements are applicable to the fireproofing of a wooden building. The standards, that are effective in the Russian Federation, pre-set the composition of fireproofing substances. Pursuant to the “Collection of restoration rules”, this is the “composition […] that demonstrates pre-set fireproofing efficiency, and it is designated for the fireproofing of different wooden facilities and materials made of wood” [7].

The above-listed provisions can be developed into requirements, pursuant to which a restorer, using all kinds of treatments and methods, must strive for the preservation of the material and the authenticity of a building as an item of cultural heritage. It is important to preserve the authenticity of colors. This is a top-priority challenge to be met by contemporary restorers. Those who are engaged in rescuing architectural monuments, should follow the spirit of the Nara Document on Authenticity (1994). It says: “Conservation of cultural heritage in all its forms and historical periods is rooted in the values attributed to the heritage. <…> Knowledge and understanding of these sources of information, in relation to original and subsequent characteristics of the cultural heritage, and their meaning, is a requisite basis for assessing all aspects of authenticity. <…> All judgements about values attributed to cultural properties as well as the credibility of related information sources may differ from culture to culture, and even within the same culture” [11].

It is essential that the research constituent of a restoration project is inseparable from its restoration or reconstruction constituent, which is based on the regularities of architecture and art. The project documentation contains information about the authenticity of a piece of wooden architecture as the wholesome ensemble and the material of which it is made. The project due diligence contains summarized technical specifications and a brief history of a piece of architecture. The due diligence must have information about national or local architectural features and the techniques that emerged at some stage of development of wooden architecture [12]. Finally, the reproduction of the initial aesthetic impression should not prevent the use of any material that is completely or partially different from the one used by the builders in the past. Naturally, any choice must have a strong research background. In some cases, researchers can take account of the experience accumulated by the restorers of the 19th century, when the use of materials, different from the authentic ones, was authorized for the restoration or reconstruction of elements of ancient monuments. Builders and architects used their creativity to reproduce items of architectural heritage while restoring the “ancient spirit”; they used materials different from the original ones. According to the architectural historian, in the process of restoration, “reproduction of iconography meant preservation of the value of an artwork, treated as an ancient monument.” [13,14] Hence, restorers thought that the form was more important than the material. Back in the 20th century, such was the governing principle of several restoration projects (such as the Church of Christ the Savior in Moscow).
5. Conclusion
In the article, the co-authors have identified the legislative acts that govern the work of a restorer engaged in the restoration and preservation of monuments of wooden architecture in the Moscow Metropolitan Area. They have also analyzed several aspects of restoration of pieces of architecture located in the territory of former countryside mansions in the Moscow Region. The co-authors are convinced that not only wooden buildings and structures are worthy of being studied (there are many of them both in the Moscow Region and in the New Moscow). The monuments, discussed in this article, represent a combination of construction materials. The main buildings of mansions, located in the south-west of the Moscow Region, adhere to the same design principle: their ground or basement floors are made of stone; they have verandas, and their top floors and attics are made of wood. Their frameworks are made of coniferous species of wood (fur trees, pine trees or cedars). They are located at a large distance from one another. They are unique both in terms of their design, which is typically rural or suburban (as we cannot find any party walls in the New Moscow). “Isles” of mansions match the landscape of the megalopolis that has extended its borders, as the construction of mansions was typical for many communities in historical Moscow.

The research has enabled the co-authors to make a conclusion that wood is a user-friendly material widely used in restoration. Like any other construction material, it has strengths and weaknesses. Therefore, in the process of restoring pieces of wooden architecture and particularly their bearing structures, its strengths must be taken advantage of while its weaknesses must be minimized. Authentic materials can be substituted for stronger ones, if the need arises.

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