

# IMPACTS OF TRADITIONAL ARCHITECTURE ON THE USE OF WOOD AS AN ELEMENT OF FACADE COVERING IN SERBIAN CONTEMPORARY ARCHITECTURE

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*The world trend of re-use of wood and wood products as materials for construction and covering of architectural structures is present not only because of the need to meet the aesthetic, artistic and formal requirements or to seek inspiration in the return to the tradition and nature, but also because of its ecological, economic and energetic feasibility. Furthermore, the use of wood fits into contemporary trends of sustainable development and application of modern technical and technological solutions in the production of materials, in order to maintain a connection to nature, environment and tradition. In this study the author focuses on wood and wood products as an element of facade covering on buildings in our country, in order to extend knowledge about possibilities and limitations of their use and create a base for their greater and correct application. The subject of this research is to examine the application of wood and wood products as an element covering the exterior in combination with other materials applied in our traditional and contemporary homes with the emphasis on functional, representational art and the various possibilities of wood. In this study all the factors that affect the application of wood and wood products have been analyzed and the conclusions have been drawn about the manner of their implementation and the types of wood and wood products protection. The development of modern technological solutions in wood processing led to the production of composite materials based on wood that are highly resistant, stable and much longer lasting than wood. Those materials have maintained in an aesthetic sense all the characteristics of wood that make it unique and inimitable. This is why modern facade coating based on wood should be applied as a facade covering in the exterior of modern architectural buildings in Serbia, and the use wood reduced to a minimum.*

**Keywords:** wood, wood-based products, composite materials, modern facade coatings, coating of architectural facilities in Serbia

## INTRODUCTION

Influences and interpretations of traditional architecture elements in the contemporary architectural works in Serbia can be grouped into several categories. What makes popular architecture rich and varied is the diversity of historical phenomena and forms transposable to contemporary architecture in more or less recognizable way.

Various possibilities of interpretation of the motives used in contemporary architecture are developing based on the experiences of traditional folk architecture. These impacts can be classified into two main categories:

- creative procedure,
- creative analytical procedure (Trifunović, 1969).

The creative influence of tradition on contemporary architectural work is reflected in the direct visual recognition of the creative approach, which can be characterized as: formalism, imitation, citation, stylization (Trifunović, 1969).

The analytical creative process relies on the subjective experience of the interpretation of tradition by accepting the past as the criterion. This procedure excludes the past as a cult that should be cherished, and the past experiences transformation in the modern architectural work. The methods applied in this procedure can be characterized as a partial influence of tradition and transposition (Figure 1). The transposition in architecture, in the most abstract form, becomes the best artistic result

that takes the past as the criterion, shows a sense of belonging and attachment, as well as the ability to re-interpret the sensibility of the traditional local architecture in the form of modern sensibility found in the new architectural work (Marić, 2006).



Figure 1. An example of partial impact of the tradition and transposition to the modern architectural work, House Pejović, Povlen, architect Blagota Pešić, 2004. (27<sup>th</sup> Salon of Architecture, 2005)

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As a reflection of the formalism in architectural structures in Serbia today, we can see the simplicity of form - great hipped roofs with emphasized eaves and elements of the wooden structure and flat facades with wood elements as decoration. This type of approach to the finalization of some modern buildings is based on the assessment of qualities of traditional folk architecture and the formal application of these elements in new buildings without the prior analysis of the element itself or its characteristics. The examples of family houses built in the style of traditional architecture by applying the forms and proportions of old buildings, as well as traditional materials, have an impact on the creation of new environments associated with the tradition and the preservation of existing environmental units in which the spirit of tradition is intertwined with the modern spirit.

The connection to the traditional architecture is sometimes expressed by a quote in the architecture, by introducing only a detail or element which represents a connection with the architecture of the past. The introduction of a symbol represents a process that establishes the connection between the modern architecture and the traditional and regional architecture. The application of the symbols of folk architecture - porch, emphasized wooden roof structure, wooden shingle as a roof covering, post and petrail construction on the facade, or wood as a facade lining in the contemporary architectural structures - represents the partial impact of tradition on contemporary architecture (Marić, 2003).

By using stone, wood, brick and S-tile as roofing i.e. original materials typical for the architecture of Serbia as a region, it is possible to emulate a certain style simplifying the form and shape. All this is applied in order to obtain a new work of contemporary architecture in which the stylization procedure modified the old element, but it is consistent enough to be recognizable. There are examples of successful stylization in a large number of vacation homes and public buildings built as original work by excellent architects in Šumadija and the Morava River basin.



Figure 2. Vacation Home, Mountain Rajac, architect Božidar Petrović, 1979., (Petrović, 1997)

Porches, hipped roofs, deep eaves, wood as an element of the facade cladding, stone as an element of connection with the ground, are recognizable elements of structures built by emulating a certain style or architectural work, resulting from the designer's desire to preserve the original values of folk architecture (Figure 2).

### APPLICATION OF WOOD AND WOOD PRODUCTS IN MODERN ARCHITECTURE IN SERBIA

There is a tendency towards affirmation and realization of the continuity of the national heritage in one part of Serbian contemporary architecture. This is reflected in the protection of architectural heritage, the study of folk architecture and the inclination to transfer the principles and spirit of traditional architecture into the contemporary architectural works. The application of wood in contemporary architecture, as the old - new material, brought about the elements of national creativity as an attempt to introduce a change which has the aesthetic, constructive and stimulating effect on the overall perception and understanding of architecture.

It is possible to achieve an original work of creation by building in the style of regionalism with the use of indigenous materials, building technology and traditional designing methods for a specific situation - on the spot.

The tendency to preserve the regional characteristics of architecture is an important, almost strategically important element of national expression from the viewpoint of the correct and rational use of land, preservation of the identity and particularity, the formation of high-quality environment in the natural or already built scenery, energy saving and conservation of natural resources and improvement of life conditions (Krunić et al, 2009).

In Europe as well as in the world, in addition to the general aspiration to reach universal integration and globalization, the sphere of arts, including architecture, witnesses the regional cultural trends that are being developed as a reaction to general tendencies. Considering the fact that the global trends in architecture are: diversity, variety, particularity and the pursuit of individual, in response to these aspirations in architecture in our country there is interest in regionalism and the inspiration is sought in the folk architecture (Figure 1 and Figure 2).

In many countries of the world in rural areas and areas outside urban centers, the stylization as a creative process of emulating the certain style and the simplification of certain elements or partial abstraction with more or less resemblance to the original style or work,

maintains a constant connection to the traditions and folk architecture.

Our architectural tradition represents a great potential and can be an eternal inspiration for modern architects to find ways of building and designing homes that would be more compatible with the region. This statement can be adopted as one of the possible approaches and we could give it a real significance in the creation of modern architectural works. What is important and good in the world practice should be applied to the extent allowed by climate, functional, morphological and economic conditions in Serbia. We should build in a modern, but different way and successfully follow what is good in our traditional architecture. In our country, there are few modern buildings inspired by traditional architecture. We should not mindlessly copy the architectural tradition with no connection to contemporary trends in architecture. Our architectural tradition, whenever possible, should serve as inspiration to develop modern construction methods and design houses that would best fit in this area. The solution to many problems currently present in the Serbian architecture lies in undertaking efforts to educate the future generations of designers and builders and in taking a more inspiring, creative and modern approach to the implementation of traditional architecture elements in a new and modern way and their successful combination with modern materials.

Today, when an architect designs a building that needs to fit into the environment and conform to the principles of ecological construction, natural materials and appropriate protection measures must be used at every stage of construction and operation of the facility: the appropriate use of material depending on its functions, the protection of materials, maintenance and removal of failed parts.

### Possibilities and limitations of wood application in our modern architecture

The possibilities and limitations of application of wood in our architectural practice are as follows:

- Architectural solution, type of assembly and the position within the architectural assembly condition whether and how the wood will be applied in one facility.
- In comparison to other materials (stone, brick, concrete, metal, glass), wood has a much shorter durability, which limits its application.
- Our climate conditions - cold and long winters, with precipitations and strong wind,

hot summers, with large oscillations of temperature, high humidity and exposure of the materials to solar radiation – have an unfavorable impact on wood and therefore require constant maintenance and occasional replacement of wood as a coating. Wood is the material of limited capacities in terms of durability and in order to extend its life and keep the original appearance one must apply special care, and also consider the application of modern products of wood industry, which in terms of durability and sustainability of the original look have better properties than wood.

- Construction in wood is wrongly associated with the accessory facilities or social housing, which is a big misconception about wood rooted in the understanding of people of this region. The reason for this prejudice is the several-decades-long practice to build accessory and temporary facilities solely of wood.

- A house of wood must be made in continuity, for wood as a material does not permit the construction in phases, and that requires considerable financial resources. On the other hand, what characterizes the construction in our country is precisely construction in phases, which often lasts for years due to lack of funds. Certain number of our individual family houses never get their final appearance, i.e. facade, because the owner of the facility is incapable to finalize it. In case of building wooden houses, the construction in phases is not possible because the house has to be completed entirely, including the final layer, i.e. a facade has to be complete, and this is the reason why a small number of houses has wood as the final layer.

- Lightness of wood as a material allows the self-construction.

- Wooden construction with its lightness contributes to the economy, especially for facilities that are built in inaccessible places. In case of construction of a wooden facility on an inaccessible site the costs are 40% lower than the cost of construction with concrete structure (Gauzin–Müller, 2004).

- The limitations of the use of wood in this country are also conditioned by the economic factors, since the necessity of ongoing maintenance and possible replacement of dilapidated elements of wooden panels with the help of skilled labor requires financial resources.

- The use of pre-dried timber and prefabricated elements greatly reduces the setup phase of construction and construction costs.

- The installation of wooden construction does not require large machinery, so the noise during the installation is significantly reduced.

- The facility built of wood fits well in the natural environment and achieves the unity between the building and nature.

- Contemporary architectural works built in the urban environment should also contain transposed elements inspired by traditional town home, but presented in a new and contemporary way, using modern materials and wood-based materials.

Based on the above, we can conclude that wood can be applied only in certain parts of the architectural object, with the application of appropriate protection measures and their implementation on an entire facility. The advantage of wood as a material is in its lightness and the possibility to construct without the use of complex machinery. In modern construction, wood industry products have a great advantage over wood since their exceptional features can compensate for all the weaknesses of wood as a building material.

#### **Application of softwood in contemporary architecture in Serbia**

Conifers are softwood and they are used as the building material for the inner and outer lining.

With soft wood the work is easy; it is found in large quantities and is suitable for use in a variety of activities. The types of soft wood that can be used as a facade cladding are: juniper, larch (yew), pine.

Raw, unprotected wood may eventually become grey under the influence of outside air. However, too much humidity and other unsuitable conditions may make it suitable for the development of tree fungi or ugly stains. If soft wood is not impregnated with protective means on time, its external surface remains unprotected and allows the natural tarnishing of wood to remain visible and in most cases ruptures and cracks appear on the outer surface.

Subsequent decay protection of already built-in wood is recommended as a kind of complete protection. The method of application of surface protective means differs from opaque coatings, which hide the color and the structure of wood, to transparent coating materials that allow the wood structure to remain clear and visible, and, depending on the pigments that are added, may or may not dye the wood.

Softwood in the form of veneer, wood wool, sawdust, splinters and fibers, with the addition of glue or other binders is usually used to obtain new composite products. Composite materials with plastic are also produced from softwood, as well as laminated constructions and wooden roof structures.

#### **Application of hardwood in contemporary architecture in Serbia**

Deciduous trees represent hardwood whose largest number of species (oak, hornbeam, etc.) is more lasting than coniferous, softwood.

Raw hardwood has a more universal application than raw softwood. The structure and color of hardwood, visible on the surface, are aesthetically more valuable than the structures and colors of softwood. Therefore hardwood is more often used in visible places, interiors and for furniture covering.

Hardwood and softwood are both widely used in construction: for making windows, door frames, and for different ways of facade cladding with boards, with and without flaps (in touch). This coating may be placed in different ways, depending on the desired effect, as follows: horizontally, vertically or diagonally.

Less resistant timber may be pre-protected by impregnation or may be protected by coating, which contains the paint for wood and thus protects it from tarnishing. These coatings can be opaque and completely cover the colour and structure of the wood; or transparent and leave the color and structure visible. Depending on the added pigments, they dye the wood to a greater or lesser degree.

Hardwood, due to its sometimes extraordinary visual characteristics, is most often used to obtain the products in which the veneers of selected hardwood have a major role.

It is important to emphasize that the application of a certain type of wood depends on its value. Wood with extraordinary aesthetic properties, such as walnut or mahogany, is primarily used for coating the interiors and furniture making because of very high prices. For luxurious works in the interior, the stairs and coating, high-quality types of wood are used: oak, ash, maple, elm and decorative exotic wood as monolithic wood or as laminated wood panels.

#### **Use of products of thermo-wood in modern architecture in Serbia**

Thermally treated wood products (thermo-wood) are used for exterior cladding. In Serbia, ash and hornbeam are exposed to the procedure of thermal treatment.

The term thermo-wood refers to wood that is thermally treated at temperatures ranging from 160 to 260° C. The exposure of wood to high temperatures is carried out for several reasons. During the thermal treatment the most important thing is to achieve increased dimensional stability and resistance which

significantly increases the durability of the wood. Under the influence of high temperature warping, swelling and pulling in of the wood reduces by 50%, which allows the use of thermally treated wood in conditions of high humidity and direct exposure to atmospherilia, which is typical for our climate areas. Thermally treated wood has a lower moisture equilibrium and therefore it is extremely resistant to the attack of rot fungi. Under the influence of temperature the thermal insulating properties improve, but it is necessary to point out that the hardness of certain types of wood may be reduced by this process.

Depending on the temperature level to which the timber was exposed during this process, its color changes and can vary from light beige to dark brown. Treated in this way, domestic species of wood are similar in color to tropical species. In addition to all the reasons above, the thermal treatment of wood is of particular importance for our country, rich in wood species whose quality is improved by thermal treatment.

Thermally treated wood is a completely ecological product which does not contain substances that may be harmful to the environment. The use of this new technology enabled the use of thermally treated wood not only for the interiors but also for external use, as facade cladding. Thermo-wood is used for the outer coating of porch floors, yards and pool decks (<http://www.sagadrovo.rs/>).

## APPLICATION OF WOOD AND WOOD PRODUCTS AS FACADE COVERINGS IN CONTEMPORARY ARCHITECTURE IN SERBIA

In contemporary Serbian architecture wood is hardly used as the material for the outer coating. There are only few examples of architectural structures in which this type of coating is present. Mountain winter tourist centers: Kopaonik and Zlatibor, where wood is present as facade cladding, are exceptions.



Figure 3. Wood in combination with a full wall carcass as a facade cladding and roofing, Grand Hotel, Kopaonik (<http://www.kopaonik.net/main.php?case=smestaj&leng=ser>)

The stone and wood combination is present in the mountain facilities. The walls of the ground floor are covered with stone, while the facade walls on the floors and big roof inclined planes are covered by wooden lining (Figure 4). Deep eaves lined with wood are the architectural features of buildings in these mountains. Wood applied for the facade and roof covering of buildings represents the organic approach to architecture in Serbia (Figure 5). Covering of roofs, eaves and small roof windows with wood is present at all facilities within the hotel and apartment ski resort of Kopaonik. In Belgrade, there are few examples of setting wood as facade panels. Wood as a facade cladding is exposed to all the negative external influences in our weather conditions which cause its natural aging. These examples of setting the natural wood as a facade covering represent the organic principle in architecture.



Figure 4. The combination of stone and wood as a facade cladding, "Paraglajder" Apartments, Kopaonik (<http://www.kopaonik.net/main.php?case=smestaj&leng=ser>)



Figure 5. Wood applied as a wall, facade and roof covering; organic approach to architecture, Mountain House "Rtanj", architect M. Đorđević, Kopaonik, (<http://www.rtanj.com/wp-content/uploads/2008/10/image025.jpg>)

Following modern international architectural influences, with an aspiration for ecological design and application of modern materials, as well as fitting into the modern trends of sustainable development and connection with

nature and tradition, leads to the application of modern technical and technological solutions in the design and implementation of individual architectural solutions.

The application of wood as a facade covering in the architecture of Serbia, if we exclude the mountainous area, is very rare. The reason for this lies in the features of our climate and the deterioration of the wooden panels under the influence of atmospherilia and solar radiation. Examples of setting timber on the facades are few due to need for permanent protection.

On one of the buildings which is an example of Belgrade modern architecture featuring elements of moderna, there is one part of the facade where natural wood is applied as a final facade cladding. The combination of wood with a painted wall surfaces, as well as other parts of the facade coated with composite materials, is a unique architectural work.



Figure 6. The facade is created as the combination of wood, composite materials and painted wall surfaces. Multi-family residential building "Condominium 41-7", Velisava Vulovića Street, Dedinje, Belgrade, architect Mustafa Musić, 2008., The appearance of the building (<http://www.enterijermagazin.com/index.php/mustafa>)

It is possible to combine wood as an element of facade covering with other materials, brick for example (Figure 7), but also with a simple flat painted wall planes. The example of such a building, of simple lines is given in Figure 8.



Figure 7. The combination of wood and brick as a facade lining, Milovana Marinkovića Street, Voždovac, detail of the building – the tower covered with wood (Ivanović-Šekularac, 2010)



Figure 8. Wooden facade lining in combination with white wall surfaces and details of metal, Residential building in Dedinje, Belgrade, architects Adam D. Miljković, J. Mitrović, 2004. The appearance of the building (Ivanović-Šekularac, 2010)

The examples of completed architectural buildings in Belgrade, with natural wood as an element of facade covering, speak of the possibilities of applying natural wood in order to fulfill the artistic and aesthetic requirements in the materialization of contemporary architectural buildings.

Modern technological solutions provide the possibility to set thermally-treated wood in the places where the wooden cladding is exposed to environmental influences, which greatly improves the characteristics of wood panels and extends their lifetime. Of course, the original appearance of wood changes gradually. However, such thermal treatment delays the aging of wood and thus its physical deterioration. In that way, by using this kind of products, we can keep all the aesthetic features of natural wood that make it unique and unrepeatable. This modern solution affects the aesthetic experience of the architectural object.

The tendency to coat with small elements of natural wood influenced the application of modern coating – a substitute, as the final facade lining (Figure 9). These composite materials can be smaller in size – as elements of sawn timber or they can be bigger – in the form of boards (Figure 10).



Figure 9. Wood as an element of the facade cladding in combination with a facade of artificial stone, Residential building, Kumanovska Street, Belgrade, 2000. Branislav Mitrović, The appearance of the building (Ivanović-Šekularac, 2010)



Figure 10. The combination of composite materials and painted wall surfaces on the facade, Residential building in Gospodara Vučića Street, Street appearance of the building (Ivanović-Šekularac, 2010)

Facade coating with composite materials in the form of boards is represented in the observed objects. What is noticeable is that different types of composite coating appear in our market (Proderna, Parklex, Tespa, Fundermax).

There are high-quality composites applied in facade cladding with a front of natural veneer, or with a layer of real wood and the appropriate protection. These products have excellent aesthetic properties and uniqueness of real wood.



Figure 11. Composite material as a facade cladding in combination with glass and metal on the facade, Building in Jagićeva Street, Belgrade, Street appearance of the building (Ivanović-Šekularac, 2010)

These examples of completed architectural buildings in Belgrade speak of diversity in terms of aesthetic features, as well as the quality of applied composite facade products.



Figure 12. Composite material as a wooden facade cladding in combination with painted facade walls, Apartment building, Velisava Vulovića Street, Dedinje, Belgrade, 2008. The appearance of the building (Ivanović-Šekularac, 2010)



Figure 13. Composite material as a facade cladding, House on two corners, Mihajla Avramovića Street, Dedinje, Belgrade, architects Maša Bratuša and Lav Bratuša, 2006. The street appearance of the building (Ivanović-Šekularac, 2010)



Figure 14. The combination of composite materials as a facade cladding and a large glass surface, Building in Dušana Bogdanovića Street, Belgrade, MetricCo-architectural team, Street appearance of the building (Ivanović-Šekularac, 2010)

In the reconstruction of facilities composite material may be used as a new facade cladding.



Figure 15. An example of reconstruction of the facade by placing the composite material as facade cladding, Building in Aleksandra Stambolijskog Street, Belgrade, Street appearance of the building (Ivanović-Šekularac, 2010)

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## CONCLUSION

Natural wood as a facade cladding in Serbia is not often used. The reasons for such a rare application of natural wood are unfavorable weather conditions, high humidity, large temperature fluctuations and extremely hot summers and cold snowy winters. In addition, it is important to add the effect of solar radiation that adversely affects the outer coverings of natural wood. Therefore their permanent maintenance is necessary, which requires additional financial resources. By using products based on wood and composite materials it is to a certain degree possible to replace natural wood and eliminate the negative impact of weather conditions and effects of humidity and solar radiation. The modern way of coating with composite materials found its modest application in the modern architectural buildings in Serbia.

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