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Eva Vaništa Lazarević, Aleksandra Đukić,
Aleksandra Krstić - Furundžić, Milena Vukmirović

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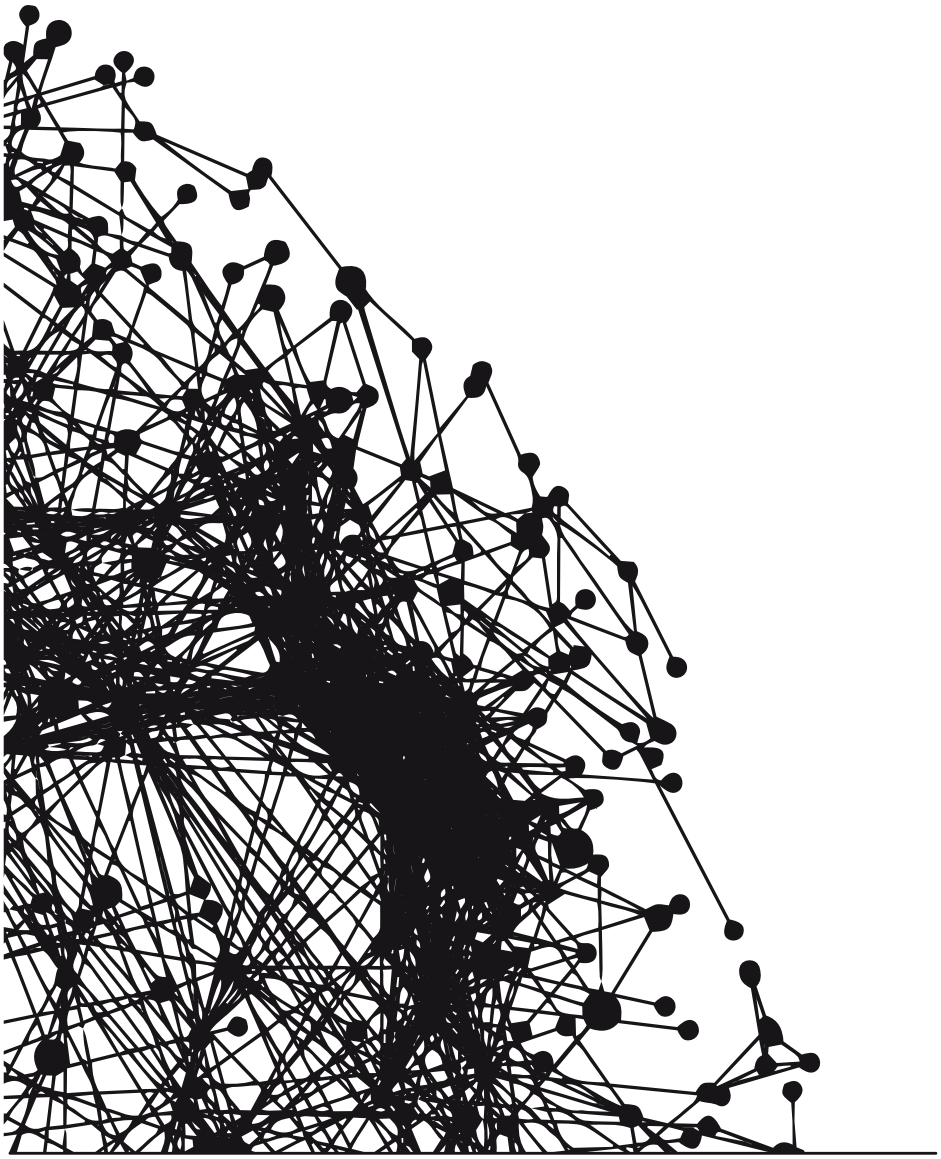

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APPLICATION OF WOOD AS AN ELEMENT OF FACADE CLADDING IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Jelena Ivanović Šekularac
Faculty of Architecture University of Belgrade, Belgrade,Bulevar kralja Aleksandra 73/II, Serbia, e-mail: jelenais@orion.rs

Jasna Čikić Tovarović
Faculty of Architecture University of Belgrade, Belgrade,Bulevar kralja Aleksandra 73/II, Serbia, e-mail: cikic.tovarovic@gmail.com

Nenad Šekularac
Faculty of Architecture University of Belgrade, Belgrade,Bulevar kralja Aleksandra 73/II, Serbia, e-mail: nseki@orion.rs

Abstract

Wood is a natural – environmentally friendly (eco-friendly) material. Wood can be recycled and contemporary architecture buildings use numerous wood-based products obtained by adding certain chemical compounds. The use of wood, as both old and new material, in modern architecture has affected the elements of traditional architecture, as an attempt to change aesthetic, constructive and stimulating effects on the overall concept of architecture. Global trends in wood re-application and wood-based products, as construction and architectural coating material, are present not only because of aesthetic, artistic and design requirements or tradition and nature-based inspiration, but also because wood is known to be eco-friendly and energy-efficient and it adapts to modern trends in sustainable development and applied technology solutions to the production of materials, with the aim of maintaining connection with Nature, environment and tradition. The spirit of regionalism, the application of autochthonous materials and traditional building techniques, as well as methods of particular design situation (on-site construction) are the key to creating original works of authorship. Striving to preserve the regional spirit of architecture is a vital, strategically important element of national expression in architecture, from the perspective of: proper and rational land use, identity and uniqueness protection, formation of quality environment within the natural or built surroundings, energy efficiency and natural resources protection and development of living conditions. This paper presents the examples of wood application and wood-based products as the elements of façade cladding in contemporary architecture of Belgrade.

Keywords: wood, wood-based products, composite materials, modern façade cladding

Introduction

Timber industry development has contributed to the growing interest in wood construction. Both architects and builders have demonstrated a significant commitment to applying wood and wood-based products in contemporary architecture. Modern wood processing technologies offer new composite materials that are extremely stable, resistant and much more durable products than wood itself. Still, when it comes to their aesthetic quality and uniqueness, these products keep all the best characteristics of wood.

Water, air and sunlight cause wood to decay. Our regional climate - long and cold winters with rainy and windy days and hot summers, causes wood to break down. Therefore, constant maintenance and periodical replacement of wooden façade cladding are necessary.

When it comes to function and shape of wood as an element of architectural cladding in Belgrade, it is necessary to apply the wood-based products as the exterior cladding elements, in order to adapt to the requirements of our climate. It is possible to use natural wood for façade cladding of modern Belgrade buildings provided that specific protection measures have been undertaken.

The effect of traditional architecture on contemporary works of architecture

One part of Serbian contemporary architecture deals with affirmation and continual connection with traditional architecture. This is reflected in the protection of architectural heritage, studying the works of national architecture and striving to apply the principles and spirit of traditional architecture to contemporary architecture.

Our own architectural tradition has great potential and can be an everlasting inspiration for architects while trying to explore modern building methods and house forms in order to find the most suitable solutions to be applied to our regions. This statement can be seen as one of potential approaches to the world of contemporary architecture design. Whatever is regarded to be important and suitable in the world of architecture should be applied to the regions of Serbia provided our climate, functional, morphological and economic conditions permit it. It means that our regional building should introduce both modern architecture elements and the most successful and stable elements of our traditional architecture. Our architectural tradition should be inspirational for finding modern building methods and house forms, suitable for our regions.

Nowadays, when architects applies the principles of eco-friendly construction while designing a building that is supposed to be in accordance with its surroundings, they are to use natural materials and apply proper protection measures, in each phase of construction and object exploitation: adequate use of materials depending on its function, material protection, maintenance and replacement for damaged parts [1].

THE APPLICATION OF NATURAL WOOD IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Wood from coniferous and deciduous trees is a natural wood that can be applied as façade cladding for the architectural structures in this region. Coniferous trees are called softwood and are used as construction materials for exterior cladding. Softwood types that can be used for façade cladding are spruce, larch and pine.

Weather factors cause raw, unprotected wood turn grey. However, excessive moisture conditions (humidity) can cause damage to wood such as fungi or unsightly stains. When softwood is not impregnated with protection products, wood surface is unprotected and exposed and natural wood darkening remains visible. Splitting and cracking of wood surface occur in most cases. Subsequent protection of the already built-in wood is recommended – it is a type of total protection.

Softwood, such as veneer, wood wool, sawdust, wood chips and fiber, with the addition of glue or other adhesives, is used for obtaining new composite products that can be façade cladding.

Hardwood comes from deciduous trees (oak-tree, hornbeam, etc.) and is more durable than soft, coniferous wood.

Hardwood is used for windows, door frames and various ways of façade cladding (board cladding). Depending on specific requirements, there are three types of such cladding: vertical, horizontal and diagonal.

Less resistant wood can be previously protected by being impregnated or protected by coating that contains a wood colour, thus preventing darkening. These coatings can be opaque, completely covering both the colour and structure of the wood, or transparent, where both colour and structure are visible. Depending on added pigments, coatings cause wood to obtain different shades.

Hardwood is known to have extraordinary visual characteristics and that is why it is mostly used to make composite products, in which the veneers of the chosen hardwood are dominant.

THE APPLICATION OF THERMO-TREATED WOOD IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Thermo-treated wood products (thermo-wood products) are used for external cladding. In Serbia, ash and hornbeam are exposed to thermo-treatments.

Thermo-wood is a thermally-processed wood. Wood processing uses high temperatures (160 -260°C). There are several reasons to explain wood exposure to high temperatures. Thermal treatment increases dimensional stability and resistance, thus contributing to wood durability. High temperatures reduces bending, swelling and shrinkage of wood by 50%, which means that thermally processed wood can be exposed to high moisture levels and direct atmospheric

influences, typical for our climate conditions. Thermally processed wood has lower balanced level of humidity, which means that such wood is extremely resistant to decay fungi.

The colour of wood darkens in the thermal modification process. Depending on the level of temperature the colour ranges from light beige to dark brown. When treated in this way, the colours of domestic wood resemble tropical wood species. Thermally treated wood is an environmentally friendly product that does not contain any harmful substances. This new technology makes thermally treated wood suitable for external use, such as façade cladding, which significantly improves the quality of wood cladding and prolongs its duration. The original look of wood gradually changes but this thermal treatment delays wood decay and aging. The application of this technology and these products means that all unique characteristics and specific aesthetic quality of natural wood remain unchanged.

The application of wood and wood products as façade cladding elements in contemporary architecture of Belgrade

Rarely is wood used for external cladding in contemporary Belgrade architecture. There are only few examples of the buildings having this wood façade cladding. It can be explained by unfavourable climate conditions, humidity, high temperature oscillations and extremely hot summers and harsh, snowy winters. Apart from the mentioned reasons, the effects of solar radiation are harmful for external claddings made of natural wood, and that is why a constant maintenance is required, which means additional financial resources are needed as well.

As a façade cladding, wood is exposed to all external negative effects of our climate conditions. Therefore, wood weathers naturally. The application of natural wood as a façade cladding and leaving it to change, age and decay naturally is the principle of organic architecture [2].

Figure 1. Wood as an element of façade cladding combined with other material (brick, artificial stone): a. Residential building on Milovana Marinkovica Street, b. Residential-business building on Kumanovska street.

Striving to follow global trends in the world of modern architecture, eco-friendly design and modern materials, their combination and application to the latest trends in sustainable development and close connection with Nature and tradition, leads to the application of contemporary technological and technical solutions to the field of design and realization of certain architectural works. (Figure 1).

The contemporary architecture building contains the elements of modern architecture; a part of the façade is made of natural wood as an exterior finish. Wood is combined with painted walls and parts of the façade claddings made of other composite materials – the result is a unique work architecture (Figure 2).

Figure 2. The façade is the mixture of wood and painted walls: a. Multi-family apartment building Kondominijum 41-7, on Velisava Vulovica Street, b. Residential building on Heroja Milana Tepica Street

Wood can only be applied to certain parts of architectural objects, provided suitable protection measures have been undertaken. When it comes to modern construction industry, timber industry products have a great advantage over the application of wood, since the exceptional characteristics of these products compensate for any disadvantage of wood as a material. The application of composite materials instead of natural wood eliminates unfavourable weather conditions and harmful effects of moisture and solar radiation. Composite materials can be applied to a new façade cladding during the reconstruction of a building. Striving to perform façade cladding by applying small-dimensions elements made of natural wood (sawn lumber) initiated the application of composite materials in smaller dimensions. Façade claddings of some Belgrade buildings are made of board-shaped composite materials.

High-quality composite materials that are used for façade cladding and have natural veneer front surface (natural wood) possess extraordinary aesthetic qualities and contribute to uniqueness of wood as a material. This modern cladding performed by composite materials has managed to find its modest place on some contemporary architectural works of Belgrade (Figure 3).

Modern architectural buildings meet the wishes and expectations of their clients in order to provide a comfortable space, fulfill extremely demanding aesthetic requirements and present a high-quality building construction based on knowledge,

skills and abilities of designers, contractors as well as the whole construction industry with high performance and quality of all its products.

Figure 3. Composite material as a façade cladding: a. A building on Jagiceva Street, b. Residential building on Velisava Vulovica Street, c. "Square Nine" hotel at Students' square.

CONCLUSION

The weathering of natural wood is caused by air, water and solar radiation. Natural wood as an element of façade cladding in Belgrade is rarely used because of specific climate conditions of our region. The application of natural wood as an element of façade cladding is possible provided there are constant maintenance and protection measures, in order to meet extremely demanding aesthetic criteria and duration principles. Thermo-treatment cause wood to have improved quality and prolonged duration, and thermally modified wood can be used for external use, such as façade cladding of architectural structures in Belgrade. Based on this research paper results, it can be concluded that there is a need to apply wood-based products – composite materials, to façade cladding of architectural structures in Belgrade.

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