

WOODEN STRUCTURES IN KENGO KUMA FACADES

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Abstract: Kengo Kuma (born 1954 in Kanagawa, Japan) is a Japanese architect and professor at the University of Tokyo. Realized a large number of urbarchitectonic structures worldwide, especially in the second decade of this century, emphasizing use of wooden materials in the facades. The examples of buildings in this paper demonstrate an extraordinary lucidity and opting of the designer for continuous use of the natural, environment-friendly material whose texture of wooden elements provides effective esthetic-composition and artisanal-artistic, attractive archisculptural results. The pronounced use of many times repeated timber elements created elegant latticework gigantic, harmonic façade network with new hand-made forms, without using bolts, nails or glue to join them. By using the easily available resource - wooden material, the famous architect's end goal is „effacing” of the already seen architecture, i.e. façade of the new non-standardized and non-stereotypical structures of organically, imaginatively well integrated into the natural environment. Facades created by moving multiplied wooden elements, in a varied rhythm, along the vertical and horizontal lines, evoke a spatial narration, subtle visual sensations, whereby materiality and close rapport with the building tradition is of primary importance. In the paper, the attention is focused on the advanced ecourbarchitecture of “building with wooden material” using the contemporary computer technologies, with new designing artistic and visual approach to the culture of walls in the exterior.

Keywords: wooden elements, façade networks, natural materials, visual sensations, materiality.

1. INTRODUCTION

Ten selected ecourbarchitectonic attractive structures by the famous Japanese architect Kengo Kuma contain innovative designing-engineering and technological-structural solutions in design of façade surfaces using elements of prevalently wooden material. The examples of the skin of public buildings from different parts of the world illustrate the tendency of ever more present creation of elegant, wooden buildings adapted to the users, which are practical, environment-friendly and energy sustainable. The implemented ecourbarchitectonic philosophy is such in which the focus is on the identity and esthetic aspects of modern architecture in wood, cultural context, metabolical strong bonding with nature but also with the archeological history at the microlocation. Spatial latticework compositions of wooden facades are elegantly merging with the cultural-ecological environment, creating a play of light and shadows

and creating a number of attractive esthetic-visual, artistic-visual sensations.

2. EXAMPLES OF WOODEN FACADES FROM THE WORLD OF CONTEMPORARY URBARCHITECTURE

„Together with craftsmen, I want to entirely rethink the way materials are treated. I want to forget about readymade details as much as possible, and instead deal with materials in new, different ways.” Kengo Kuma

For the exhibition „Co-Dividual - Split and Connect/Separate and Come Together”, 2016 in Tokyo, the famous architect Kengo Kuma realized the design of an entry zone with vertical surfaces made of wooden parallelepiped elements. He demonstrated a completely new specific city-building expression of architectonic – designing expression in which the sustainable formation of

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walls is based on the principles of traditional architecture and crafts, on connection between the past and the present. A carefully composed group of small physical structures at the entrance of the exhibition area, ecologically and organically is excellently and discreetly integrated with the natural environment and exhibition visions of the designed exhibition pieces representing houses made of wood [1]. This also fits into the issue of the need to study

the new forms of volumes for the users from different perspectives, and the specific survival strategies with a focus on the prediction of spatial options about the less conflicting living of people in the near future. In the background of this project is the art of subtle connecting of materials from the nature with newly made artifact structures [12,13] (Figure 1).



Figure 1. Entrance of House Vision 2016 Tokyo Exhibition [12,13]

The effective example of a sustainable architectonic design of Kengo Kuma can be construed from the realized design of the museum built on the Yusuhara wooden bridge, in Japan, 2011. Location: Taro-gawa Yusuhara-cho, Takaokagun, Kochi Prefecture. Site Area: 14736.47m². The bridge connects two public buildings with a traffic communication separating them. In addition to the well organized volume of the museum structure with the workshops which accommodate the artists, the environment of the structure with dense vegetation and particularly sensitive structural approach to the building composed of numerous wooden parts are quite indicative. The console structure of the bridge made of cedar timber, is on its lateral sides

transposed from the traditional architecture of Japan and China. With it, it is possible to create buildings structures with long spans and less material use [2]. A new, metabolically architectonic authentically Asian look emerged. The used gluelam wooden material conceptually confirms the outstanding idea about the potential of „constructing buildings using wood”. This urbarchitectonic composition reveals the blend of traditional and contemporary engineering-esthetic expressions of revitalization of local culture buildings and of traditional urban design. It reveals the techniques of construction of structural spatial frames in new technical-technological conditions using the natural materials. [14,15] (Figure 2).



Figure 2. Yusuhara Wooden Bridge Museum, Kengo Kuma [14,15]

For the unforgettable façade skin of the Sunny Hills sweetshop, in the central part of the housing district Aoyama, Tokyo, Kengo Kuma realized a design of a unique spatial lattice, associated to the

conceptual shape of a wicker basket made of bamboo. By laying the wood elements having dimensions 60x60mm at the angles of 30° and 60°, into a lattice structure, façade network of 297m²,

without using glue and bolts, he facilitated penetration of sunlight into the interior space. This created a free visual communication with the external world without compromising the privacy of the local users. The building is constructed on the inclined terrain. In the immediate vicinity there are buildings with rigid-angled orthogonal physiognomy [3]. The archisculptural approach to designing the

interesting façade helped create a natural, inspiring and relaxing atmosphere for the users. Kengo Kuma states that he wanted a „forest in the urban city center built using the Japanese technique, wood, in a traditional manner. The same building philosophy is present in the interior of the sweetshop where, apart from the floor of renewable cork, all the elements are lined with wooden material [16–18] (Figure 3).



Figure 3. *Sunny Hills by Kengo Kuma. SunnyHills at Minami-Aoyama, 2013 [16–18]*

The design of a new marvelous, multi-purpose six-story building surrounded by the skyscrapers, on Darling square, Sydney, is also the work of art of Kengo Kuma. Location: Sydney, Australia. Material: Wood. Scale: 6 stories. Building Area: 6,680 m². Year: 2019. The library is organized on two floors, and it has a flexible space for seminars and workshops equipped with the latest technology. What is characteristic is the radial form of the building with recognizable appearance and spirally bent bands-strands made of soft wooden material, slightly slanting, 20 km long. They enwrap the façade surface and extend to form a pergola on the ground level. The strands are a visual association of

the silk bug movement. The authors says that it is about „finding new advanced city building - urbarchitectonic ways in understanding the past values” in order to establish a balance between the historical and contemporary values directed towards the future [4]. The designing philosophy lies in finding new, firm connections with the place, nature, culture and history in discovering a dynamic shape in the vibrant center of the city life. The significant structure is a new common center attracting people and idea, offering different functions and activities on the floors. It is a social „hive”, with a façade like a bird nest, creating an oasis in the middle of an urban jungle [19–21] (Figure 4).

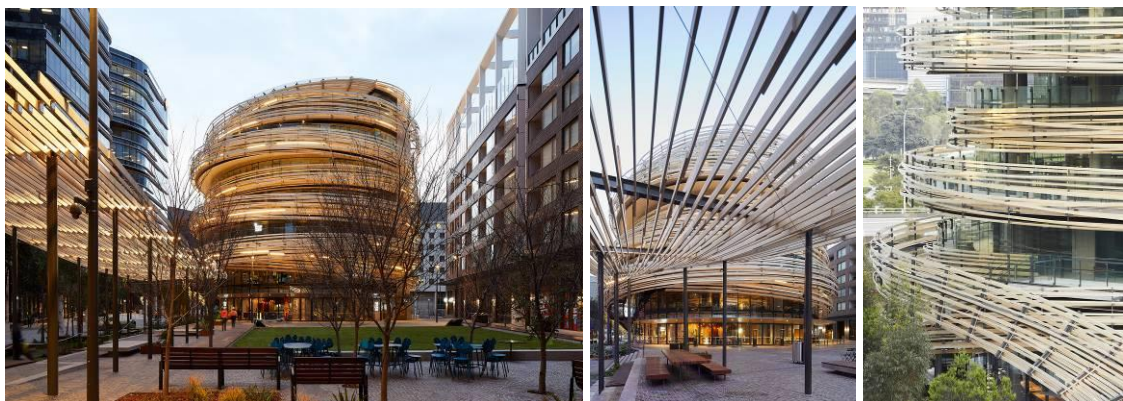


Figure 4. *The Darling Exchange Library & Market, Sydney [19–21]*

Thousands of strip boards made of cedar was used by Kengo Kuma to design façade planes of the building of Daiwa Ubiquitous Computing Research Center - 2709.53m², in the Hongo campus of the University of Tokyo. Many times seen conventional facades with hard materials are not present here, and instead of them, a soft wooden, lightweight, rhythmical membrane is formed above the terrain level which is suggestively countering the orthogonal prefabricated compositions of the buildings in the environment. What can be observed is the multi-layered idea about the environmental approach of the designer with a clear tendency to establish order, scope, proportion, balance, complexity and beauty which brings about a more

palpable urbarchitecture with newly-exhibited artistic-esthetic and cultural values. The image of the building is dynamic [5]. The impression on the undulating, suspended façade surfaces and the spatial culture based on forms from the nature is additionally augmented by the open penetrations, public passages on the ground level. The openings accentuated the flow of light and circulation of air, and intensified user communication, and the covered plaza is a central place for gathering. Particularly well designed is the unique material cladding of the face using wooden strips, with the ceiling section and vertical planes in the covered zone, emphasizing the sensation of openness [22–24] (Figure 5).

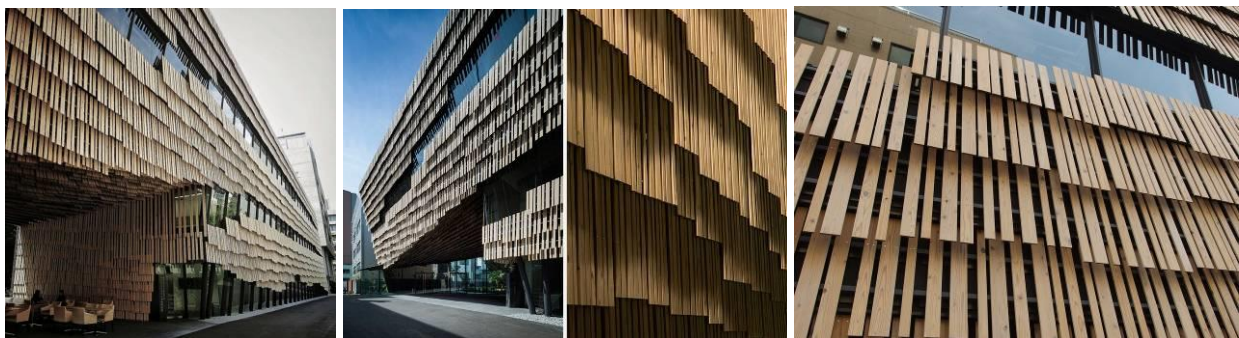


Figure 5. Daiwa Ubiquitous Computing Research Building, Tokyo, 2014 [22–24]

The Japanese house (in Sao Paolo, on the Avenida Paulista, was created in 2018 at the initiative of the Japanese government, and it works in Brazil as a cultural-business center, small cultural embassy. Area: 2244.0m². The building contains a combined concept in which art, technology and business are in the focus of creating a vision of contemporary Japan. What is indicative is urbarchitecture of the building with the dominant, attractively designed façade curtain made of wooden material - hinoki, typical Japanese cypress (Kiso hinoki cypress), of different dimensions of elements, in a vertical and horizontal layout with irregular

inclination. The idea for the façade design was created according to the style used for the Buddhist temples mixed with the Brazilian cobogo, latticework building style originating from the northern city of Recife. Wooden façade elements form a specific brise-soleil for which the designer claims that it should be invoking the atmosphere of the forest created in the large urban agglomeration [6]. The façade was firstly constructed in Japan, then it was dismantled, transported to Sao Paolo and reassembled by the Japanese builders [25–27] (Figure 6).



Figure 6. Japan House by Kengo Kuma and FGMF, Sao Paulo is located on Paulista Avenue 52, Brazil [25–27]

The iconic character of the modern Art Museum in the university city of Eskisehir, in northwest Turkey, on the Odunpazari location, on the slope was conceived by Kengo Kuma with a goal to accommodate a large number of exhibits and promote the Turkish art and its cultural contribution. Principle use: Art Museum. Site area: 16,360 m². Total floor area: 3,582 m². The region of central Anatolia famous in wood trade inspired the designer to organically fit by the museum structure into traditional Ottoman houses in the immediate vicinity. The innovative design of the facades of wooden, interlocked laminated beams, laid one over another, connects not only formally the past and present, but rather create a formal coloration-

textural, material-visual patina, connection with old structures made of wooden material. Natural, environmental building material in this climate is very important for the city heritage and comfort in the public space. It provides the additional charm to the pedestrian zone, and attracts people into this ambient [7]. The physical structure of the building is constituted of multiple connected, rotated volumes, creating an archisculptural impression about the microambient space. The location, in terms of historicity and ingenuity, culture and street picturesque quality of Odunpazari was sufficient for creation of the museum which brought a new life into Eskisehir and become a central, attractive place for the visitors [28–30] (Figure 7).



Figure 7. Museum in Eskisehir, Turkey by Kengo Kuma & Associates [28–30]

Besancon Art Centre and Cite de la Musique, on the bank of the river Doubs in Besancon, on an attractive location, is recognizable for its characteristic scenic appearance of checkered facades clad with metal and wooden horizontal panels having dimensions 5000x 2500mm, while the vertical panels have the width of 1625mm by the half of the story height. Site Area: 20.603m². Built area: 11.389m². The winners of the competition for the best conceptual urbarchitectonic design proposed a simple orthogonal volume of the building with a unique roof and subtle integration of the old, existing storage house of 1930 which is redesigned into an exhibition gallery. The fifth façade, the

surface of the emblematic roof contains solar panels, metal panels, vegetation and glass openings for penetration of sunlight into the building interior. This created an interplay of light and shadow on the facades, i.e. on the part of the floor area. On a historically important place, they realized an urbarchitectonic iconic synthesis of culture and architecture, water and light, city and nature [8]. A correlation with the natural environment has been achieved by blurring the border between the interior and the exterior with the excellently conceive two-way visual communication between the wooden panels which provided high level of comfort for the users [31–33] (Figure 8).



Figure 8. Besancon Art Centre and Cite de la Musique by Kengo Kuma and Associates [31–33]

Kengo Kuma got the idea for the design of the GC Prostho Museum Research Center in the town of Kasugai-shi, in Japan from the old japans toy

originating from the Cidori system. Location: KasugaiD-shi, Aichi Prefecture. Total useable surface area: 626.50 m². Lot size: 421.55 m². The

interlocking of timber elements without metal connectors structures the wooden, permeable, parametric, double-layered façade. The elements have dimensions 60mm x 60mm x 200cm or 60mm x 60mm x 400cm, and they generate regular prismatic combinations in the square grid with modular fields of 50cm. The wooden lattice in the cubical network is used for formation of the interior space of the museum. For the statistic stability of the structural system of the façade, testing and analysis were performed, which showed that very large volumes of facades, made by combining wooden

elements, can be organized in this way, emphasizing the esthetic value of the natural material [9]. The entire concrete structure of the museum building is clad in many times reiterated elements on the façade from which the historical relation of the past and the present can be construed. Expressivity of urbarchitectonic, decorative appearance of the building with the cypress wood texture is extremely intensive. Architecture theoreticians say that it is simple and poetical, both in the exterior and interior [34–36] (Figure 9).



Figure 9. GC Prostho Museum Research Center, Nagoya, 2010 [34–36]

In his search for the natural materials in ecourbarchitecture, Kengo Kuma in the case of the Eco-luxury Hotel, in Paris on the left bank of the Seine river, produced on one of the most innovative designs of the visually stunning wooden façade. He showed new spectacular, fascinating potentials of the structures made of wooden material and so opened new historical-city building chapter on the outstanding relation of wood and architectonic forms. What is dominating is freshly inspired perspective of historical details and philosophical integration of designed structures with easily

available vegetative structures in nature [10,11]. What is impressive is the designing imaginativeness and original insightful view of the „wooden architecture” in the new light, where the lush garden vegetation with the wooden modular volumes on the facades, stimulate the senses of the users and create lungs of the city in the dense artifact environment. Behind these volumes, there are traditional Parisian balconies, composed with the wooden and metal façade panels. The respectable wooden material has been also used in the treatment interior floor and wall surfaces [37–39] (Figure 10).



Figure 10. Kengo Kuma & Associates Design Eco-luxury Hotel in Paris Featuring Wood and Greenery [37–39]

3. CONCLUSION

It can be concluded that with the wooden material used on the impressive facades of building by the architect Kengo Kuma, the designing frontier in ecourbarchitecture is moved and that reverberations of such thinking on the global building, urbarchitectonic-cultural-historical stage have a great contribution. The doors are open for the new, gradual urban and architectonic development of large proportions, which include observation of nature and of the Japanese culture. In the focus is the natural ambient united with the wooden material, outstandingly improved artistic-esthetic, spiritual-evolutional and nonmaterial guidelines for the architecture of tomorrow. The presented examples are masterpieces of contemporary architecture. They confirm that it is necessary to search for and aspire to new potential of usage of wooden material in the exterior space and to discover its true nature anew. Wood is an exquisite, flexible and esthetically warm, attractive building material. It provides designers with opportunities to develop creative, high quality, innovative and attractive solutions. The inspirational concept with wooden façade designs indicates a philosophy of the environment, of a solid fusion of architecture with natural, locally available materials in the environment that, as Kengo Kuma says, can bring back warmth and tenderness to the architecture. Nowadays, wood is no longer considered obsolete and nostalgic. It is increasingly recognized as the most promising building material for the future. In the last decade of this century, remarkable innovations of new technologies for the advancement of wooden urban architecture have taken place. Definitely, a thoughtful metabolic-harmonic harmony with nature, a close relationship with traditional forms and material textures creates a desirable, environmentally sophisticated, fascinating ambient architecture with wooden materials that will make users feel comfortable. It suggests new views on spatial-artistic concepts where remodeled traditional forms of the past, with exceptional design sensibilities, become part of the present.

The time has come to suppress the finished stereotypical, already seen forms and instead to deal with the materials in new ways, with a different, more creative understanding of their architectural values, always finding a balance between natural and artificial.

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ДРВЕНЕ СТРУКТУРЕ У ФАСАДАМА КЕНГА КУМЕ

Сажетак: Кенго Кума, јапански архитекта, реализовао је велики број урбархитектонских објеката у свету, посебно у другој деценији овог века, акцентујући примену дрвеног материјала на фасадама. Примери објеката у овом раду показују изванредну луцидност и одређеност пројектанта за континуалну употребу природног, еколошког материјала чија текстура дрвених елемената даје ефектне естетско-композиционе и занатско-уметничке, допадљиве архискулпторалне резултате. Наглашеним коришћењем много пута поновљених дрвених елемената створене су елегантне чипкасте циновске, хармоничне фасадне мреже, са новим ручно урађеним облицима, без употребе шрафова, ексера или лепка у спојевима. Применом лако доступног ресурса – дрвеног материјала, славни архитекта је у крајњем циљу имао „брисање” већ виђене архитектуре, односно фасаде нових неконфекционираних и нестереотипних објеката органски, маштовито добро интегрисаних у природно окружење. Фасаде настале померањем мултипликованих дрвених елемената, у различитом ритму, по вертикали и хоризонтали, евоцирају просторну нарацију, суптилне визуелне сензације, при чему је материјалност и блиска веза са градитељском традицијом примарна. У раду је фокусирана пажња ка напредној екоурбархитектури „зидања дрвеним материјалом” уз помоћ савремених компјутерских технологија, са новим дизајнерско-уметничким и ликовним приступом култури зидова у екстеријеру.

Кључне речи: дрвени елементи, фасадне мреже, природни материјали, визуелне сензације, материјалност.



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