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TECHNOLOGICZNA ESTETYKA WSPÓŁCZESNYCH FASAD

TECHNOLOGICAL AESTHETICS OF MODERN FACADES

Abstract

The beauty of modern architecture and especially its external image, is achieved by various means, but one can venture to say that real beauty is created only in accordance with the current state of technical knowledge. The author specifies elements which characterize contemporary facade solutions, namely: modern, ecological materials, energy-efficient systems of double glass facades, sun shading devices and multimedia technologies, creating desirable features of facades in the modern world, such as dynamics, movement and information transfer. The aesthetical impact of the elements listed above, as well as their utility functions and relationships with the creation of sustainable architecture, was traced on the example of the Museum of Modern Art Building in Bolzano. Remarks and conclusions contained in the paper are based on the research literature and the author's own observations.

Keywords: double skin facades, media facades, sun-shading systems

Streszczenie

Piękno współczesnej architektury, a zwłaszcza jej wizerunku zewnętrznego, osiągnięte jest różnymi środkami, jednak można zaryzykować stwierdzenie, że prawdziwe piękno powstaje tylko w zgodzie z aktualnym stanem rozwoju techniki. Autorka wyróżnia elementy, którymi charakteryzują się współczesne rozwiązania elewacyjne, a mianowicie: nowoczesne, ekologiczne materiały, energooszczędne szklane systemy dwuwarstwowe, systemy osłon przeciwsłonecznych, a także technologie multimedialne nadające fasadom cechy pożądane we współczesnym świecie, takie jak dynamika, ruch, przekaz informacyjny. Siłę oddziaływania estetycznego powyżej wymienionych elementów, a także ich funkcje użytkowe i związki z kształtowaniem architektury zrównoważonego rozwoju prześledzono na przykładzie budynku Muzeum Sztuki Nowoczesnej w Bolzano. Uwagi i wnioski zawarte w artykule sformułowano na podstawie badań literaturowych i obserwacji własnych autorki.

Słowa kluczowe: fasady dwuwarstwowe, fasady medialne, systemy ochrony przeciwsłonecznej

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1. Introduction

The beauty of modern architecture is achieved by diverse means, including daring organic forms created with the support of advanced software, for example, the designs by F. Gehry, Zaha Hadid, Daniel Libeskind, or UN Studio. At the other side of the spectrum there are still designs following the trend of modernism, grounded on the simplicity of form and attempts at obtaining perfect proportions of the solid body. The aesthetic effect is achieved by novel technological solutions, the impact of which may be definitely assessed by contemplating structures of pure simplicity, such as a cube. One of the examples of such buildings is the Museum of Modern Art in Bolzano, the “technological beauty “ of which, involves the use of several elements typical of modern facades, such as:

- new materials,
- double-skin facades,
- sun shading systems,
- multimedia technologies,

The concept of “technological aesthetics” used in the title of this paper is understood as the beauty achieved by conscious application of the potential of modern technologies and the beauty that has a functional dimension shaped by novel means, which at the same time enable explicit classification of the architectural structure at the time of its construction. This beauty is consistent with the Sustainable Development concept. The building of the Museum of Modern Art in Bolzano, seems to be endowed with such qualities.

2. Characteristics of the building

Museion – i.e., The Museum of Modern Art in Bolzano, commissioned in 2008, was the outcome of the international competition proclaimed in 2001 and won by Krüger, Schuberth, Vandreiike (KSV), a design office from Berlin [10].

Due to its specific location, the building is a token of a specific dialogue between the compact historic urban tissue of Bolzano and the modern quarter with its natural environment: the meadows along the Talvera River and the Dolomites. The architecture of the building was to bestow the old city with a new character [9]. The building has the shape of an elongated container (54 m long, 25 m high, 23 m wide) with two glazed walls providing a splendid view of the city and the mountains. Thanks to such a solution, it does not set the boundary between the two environments: the historic and modern surroundings, urbanized and natural space, but to the contrary, merges and intertwines them. Despite the term “container” the Museum is not only a “receptacle for works of art”, but a venue for interdisciplinary events, installations, discussions, debates that inspire and entice creative energy, and last but not least, a leisure site housing permanent and temporary exhibitions, a specialized bookshop, educational laboratories, cafeterias, etc. The entire architectural and urban outlay, apart from the main building, includes a smaller workshop facility for artists and two dynamically curved bridges over the river which complement the entire composition [10, 11].

3. New materials

The external image of the Museum of Modern Art in Bolzano is comprised of two types of materials: aluminum and glass. The metal “shell” of the lateral walls and the roof, perfectly discernible from the neighboring mountain range, consists of 4.8 m long and 80 cm wide shining aluminum panels making up a continuous surface with an irregular pattern of slats, which according to the architectural concept of the designers, refer to the chiaroscuro of Ionic columns [11].

The external laminated panels used in the double-skin facades were selected by Vega Systems (North Italian specialists) in cooperation with architects from the Cattivelli Engineering Office, as DuPont™ SentryGlas® 1.52 thick laminate interleaves (spacers, separators). Standard safety glass, produced from polyvinyl butyral (PVB) interlayers would have to be considerably thicker to provide long-term resistance to the power of the winds prevailing in the Bolzano region. In addition, considering the large dimensions of particular panels (width up to 1.75 m, height up to 2.4 m), expensive supporting structures would be required to withstand the load of the panes and the wind power. However, in comparison with traditional PVB materials, the strength of DuPont™ SentryGlas® is one hundred percent greater (for more details – see [5]), while meeting the requirements concerning the safety of use. Accordingly, the properties of the laminate made it possible to construct relatively thin, 25 m high panes, which even in the sections set diagonally above the users’ heads, fulfill the rigid safety requirements and enable good performance of small point slats, supporting the panels in a discreet, but safe manner during high wind power loads. The glazed facades of the building are made of laminated glass compiled in the following sets:

- 12 mm tempered glass, 1.52 mm interlayers, 12 mm thermally strengthened glass in the lower perpendicular parts of the facades,
- two 12 mm thermally strengthened pane surfaces and 1.52 mm interlayers in the upper, diagonally suspended glazed surfaces.

The laminated glass provided with interlayers, renders the performance similar to monolithic glass, even at high temperatures and under direct impact of sunrays. The glazed walls with minimal slats placed at the corners of the glass surfaces highlight the perception of “visual artistry”. Other advantages include high transparency, resistance to yellowing, as well as the stability of the edges (thanks to avoiding delamination at the edges of the surfaces), creating a sense of lightness, which is further emphasized by the prevalence of the white exteriors and interiors. Concave front and rear walls made of laminated safety glass strengthen the transparent nature of the building, inviting or even “drawing in” passersby inside [8, 7, 13].

4. Double-skin facades

According to Niezabitowska E. and Winnicka-Jasłowska D.: “Ecological and Sustainable Development concepts have provided the latest link in the evolution of buildings, giving, nowadays priority to environmental protection, care of users’ needs and cost-efficiency” [3]. This statement may be referred not only to office buildings, but also to all other facilities, including in particular, the intelligent building of the Museum of Modern Art

in Bolzano. The two glazed facades, the eastern and the western, consist of two-layered ventilated parts, separated by a 1 m intermediate cavity, containing a system of movable sun blinds (described in the next section). This interlayer space functions as a ventilation channel; the air is sucked from the top through the covers and directed downwards to the technical rooms located underground. Hence, in order to control the temperature within the facade, the air is supplied to the side of the building that is exposed to the impact of changes in the external environment at given moments. The interior facade is a steel post and beam structure, whereas the external glass facade is literally “suspended” on it by means of slats without any vertical support [11].

5. Sun shading systems

As mentioned above, the ventilated double-skin facades are equipped with movable, mat white sun protection blinds placed in an interlayer space having a double function: to adjust the access of sunlight to the interiors of the art gallery at daytime and to serve as a screen for multimedia projections at night [11].

The sun blinds are divided into sections (each section has 10 blinds) controlled by separate drives and IP address. They may be operated by means of a laptop. It is possible to program different options of the lamellas set-up, depending on the time of the day and the needs of the specific nature of organized exhibitions [6].

6. Media facades

The enclosed metal shell of the elongated lateral walls and of the roof, contrast with the two funnel-shaped light glass facades. Such form would not seem to facilitate the use of the screens displaying films, graphics, photographs and animations customized by design artists for this specific building. Nevertheless, the decision was made to implement such a solution. After sunset, the advanced computer system closes the blinds on the two glazed facades, raises additional curtains used at daytime to shade selected exhibition spaces and activates 36 video projectors located on particular floors [12].

The New building of the Museum of Modern Art in Bolzano utilizes cutting edge audio and visual technologies for the creation of Video Art in urban space. According to the main contractor responsible for the integration of AV system and 3P technology, initially the request formulated by the KSV architects seemed easy: to transform two huge glazed facades of the Museion into multimedia projections screens. However, their architectural form posed a problem, which specifically, was the different angles of the set-up of particular surfaces that constitute the concave funnel-shaped facades. The selection, proper layout and inclination of the projectors enabling even coverage of the facades was a real challenge (for more technical detail, see [6]).

At nighttime the lighted facades dominate the neighboring buildings that fade away in the dark. In the course of testing the assumed technical solutions, a problem of a logistics nature was encountered. As the installation was carried out in April and May, the contractors were forced to wait until dusk to perform the required calibration and tests of the equipment [6].

1



2



3



4



Ill. 1–4. Museum of Modern Art in Bolzano – details of facades (photo by J. Tymkiewicz)

7. Conclusions

The elements combining the facade solutions in the building of the Museum of Modern Art in Bolzano, were presented in the successive sections of the paper, with special focus on some technical and material aspects, their functionality and impact on the aesthetics of the entire building. Some of the discussed features and solutions apply not only to the discussed building, but also should be taken into consideration in shaping the facades of modern public utility buildings, namely:

- **The architectural and urban context**, is a harmonious insertion of the building into the existing urban tissue and/or the natural environment, respect for the cultural values prevailing in a given region, which does not necessarily entail sheer imitation; the discussed building in Bolzano shows a daring and novel approach to the continuity of architecture by erecting among the historic urban structure a simple form that is by no means overshadowed by the formal richness of historic or semi-historic facades of the neighborhood.
- **The simplicity of the external form of the building**, which is a well-proportioned solid and does not stand in any visual competition to subtle technological solutions, does not steal attention from the sometimes detailed façade systems with openwork structure that frequently induce admiration for their visual lightness.
- **Noble materials of the facade**, which similarly to clothing material, shape the elegance of the exterior image of the building endowed with eye-pleasing colors, delicate partitions and texture of the exterior walls (thanks to aluminum panels with funnel-like shape) and perfect quality glass used in the Museion building, reflecting like a mirror, the surrounding landscape; furthermore, the image of the building is subject to change at different times of the day, depending on the weather conditions (for more information on glazed structures, see [1]).
- **Double-skin facades**, make the impression of spaciousness and expose the elements of the supporting structure and technical equipment in the interiors, facilitating their proper performance and contributing to the form as technological details; the decision to implement a double skin facade is very complex, especially in energy-efficiency aspects (you can read more about this problem in [4]).
- **Sun shading systems**, are elements that influence the variability of the form of glazed facades, depending on the time of the day and on the conditions of the external environment, as well as on the current function of the interiors contributing to the explicitly of horizontal partitions and their open or closed character.
- **Multimedia technologies** Although the equipment is installed in the interiors of buildings, their effect is admired in the exterior space; multimedia projections on facades provide direct contact with art in public space on a large scale; such visual media are attention-drawing and evoke continuous interest, shaping the movement, dynamics and changeability of the facades of intelligent buildings (you can see picture of Museion media facade on the website [14]).

These elements pertain to the architecture of Sustainable Development, not only due to their functionality in terms of energy-efficiency, but also due to the presence of people who are the main subject of all activities such as: creation of places that enable the experience of beauty, contact with art and culture, provision of attractive space for leisure, display of novel and innovatory solutions that familiarize the public with modernity in architecture,

creation of “the facades of signs”, landmarks of a given city and tourist attractions that facilitate orientation in the city [4]. All these aspects providing specific education by means of architecture, may exert an impact on the taste of the public and an open attitude towards new, not always commonly accepted aesthetic solutions.

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