

THE VITRUVIAN TRIAD ON THE EXAMPLE OF THE PUBLIC FACILITY – HAMBURG ELBPILHARMONIE

TRIADA WITRUWIUSZA NA PRZYKŁADZIE OBIEKTU UŻYTECZNOŚCI PUBLICZNEJ – FILHARMONII W HAMBURGU

Abstract

Durability, utility and beauty are the Vitruvian Triad, which can be described as an ingrained element of the traditions of the architectural community. Passed on for years, they are a kind of myth that takes on a different shape in the hands of various designers throughout history. The old determinants of beauty, such as symmetry, the golden ratio or the *piano nobile* are forgotten, giving way to avant-garde, deconstructivism and modern architecture. Public utility facilities such as the Hamburg Philharmonic should fulfill representative functions, be an icon of their time.

Keywords: architecture and contemporary art, Elbphilharmonie in Hamburg, Vitruvian Triad

Streszczenie

Trwałość, użyteczność i piękno to Triada Witruwiusza, którą można opisać jako zakorzeniony element tradycji społeczności architektów. Przekazywana od lat jest swoistym mitem, który przybiera inny kształt w rękach różnych projektantów na przestrzeni dziejów. Dawne wyznaczniki piękna, jak symetria, złoty podział czy *piano nobile*, odchodzą w niepamięć, ustępując miejsca awangardzie, dekonstruktywizmowi i architekturze nowoczesnej. Obiekty użyteczności publicznej jak Filharmonia w Hamburgu powinny pełnić funkcje reprezentacyjne, być ikoną na miarę swoich czasów.

Słowa kluczowe: architektura i sztuka współczesna, Elbphilharmonie w Hamburg, Triada Witruwiusza

1. ANCIENT TREATY OF VITRUVIUS

De architectura libri decem by ancient engineer Vitruvius, constitute one of the oldest written treatises on the principles of architecture designing, the only fully preserved ancient documents. The text of the books, unfortunately stripped of sketches, survived for centuries thanks to manual rewriting and duplication, especially in the Medieval times. It must have been of great importance and recognition, since over the centuries it was consistently appreciated and popularized. Italian engineer, author of the aforementioned work, with appropriate education for his time and with special recognition for the honesty and integrity of the architect, in the first century BC included in these books a sentence quoted and recognized to this day: *It is the architect's duty that the building he designs should be durable, useful*

and beautiful.¹ Perhaps underestimated in his lifetime, he meticulously referred to his craft, describing the essence of an architect's work. As a citizen of the Roman Empire, he communicates many practical truths about life then. He lists the areas of knowledge that an architect should acquire nowadays. However, it is worth focusing on the three values in which he included the main goal of erecting a building. Italy, as the cradle of civilization development now recognized as universal, processed architectural elements borrowed from the achievements of the Etruscan tribes and the Greek civilization, but also developed many inventions such as an arched ceiling, aqueduct or the introduction of concrete in construction. Their craftsmanship, admired to this day in the preserved examples, was characterized by a high technical level of construction and artistry, as well as excellent construction skills. When in the fifteenth century (Quattrocento in Italian) a document forgotten in the Middle Ages was rediscovered in the monastery library of St. Gallen following ancient patterns returned to the canons of beauty in the next age called *the rebirth*.

2. BACK TO THE CLASSIC ORDER

The Italian Renaissance, after the Romanism and Gothic era, returns to the original guidelines for builders, bringing to life old orders, details, divisions of buildings erected in the times of ancient times, naturally following the development of civilization. The roots of their works are based on the preserved relics from the Antiquity period, including the descriptions of Vitruvius from his Ten Books. The universally gifted artists of the Renaissance era enrich their subsequent works with their own regional interpretation, using their modern ideas. At the center of their work are placed the human life and man's present, real and down-to-earth needs. It is the function in the relation of time and place that imposes further steps. It is also important to create spectacular, ambitious works that break down the existing barriers. Striving for harmony and rhythmic composition, it is recommended to use symmetry, proportions similar to the human body and order in construction. Vitruvius in his work called for the use of modules, divisions on the basis of appropriate proportions, the so-called *eurhythmia*, a literally good rhythm that can be achieved by: *the graceful appearance of the building and the proper juxtaposition of individual parts*.² The golden ratio also alluded to the mathematical introduction of a principle that was considered desirable and beautiful. The term *piano nobile*, the gradation of massiveness and decorativeness in relation to the building level, resulted from the Mediterranean climate. In countries north of the equator, this rule was modified depending on the local needs of the user.³

3. PRESENT – SYNTHESIS OF ARCHITECTURE AND ART

The Avant-garde, a new movement from the early twentieth century, resigns from an orderly and balanced order. It laid the foundations for new aesthetic expressions, vision and experimentation. Many architects drew inspiration from the art of Futurism, Constructivism or

¹ Vitruvius, *O architekturze ksiąg dziesięć*, PWN, Warszawa 1956, book I, chapter 3, p. 16.

² Vitruvius, *op. cit.*, book I, chapter 2, p. 15.

³ H. Kozakiewicz, S. Kozakiewicz, *Renesans w Polsce*, Arkady, Warszawa 1976, p. 30.

Expressionism. The interest in avant-garde art trends didn't develop until the turn of the twentieth and twenty-first centuries due to the limitations of technological possibilities. As economic development began to favor the global race to push the limits, architects began to draw on a vision of creativity again. It was only years later that it was possible to introduce a form independent of the architectural function, to obtain any expression effect, as long as the investment budget allowed it. A wall did not have to enclose, it might as well be a window to the world. Any dreams from the past could have come true. Unlimited means of expression gives us the joy of designing, but also does not indicate a clear direction for architecture. It all depends on the right decisions of designers or the architectural language they use. The deconstruction implies a complete separation from the historical architectural styles, redefining the architectural space with the rigorous simplicity of the geometric form. Striving for stylistic purism, it rather introduced a distortion of current patterns. A branch of contemporary art, Minimalism, assumes the maximum purification of unnecessary means of expression using the simplest elements. You can reject the details and the strict rules of the stylistic trend, but it is hard not to expect durability, functionality or impressive proportions from architecture. The Vitruvian Triad brings together the essence of this field of art in conjunction with the broadly understood technology, which always remains the overriding goal of designers, regardless of the reference to the means of artistic expression. The works of contemporary architects, including the Herzog & de Meuron group, are often created in close integration with modern art, especially painting and sculpture, but in their expression one can feel the balance of proportions, order and harmony blending perfectly into the surroundings, just like the forms created by forces of nature. Vitruvius wrote in his work that man was born of nature and received from her hands proportions that delight the viewer. The module of the size of individual parts of the body, written in numbers, builds an order of the world that inspires admiration and delights us all. At the same time, the faithful recreation of nature in wall paintings is very approving.

4. MODEL OF THE NEW ICON OF HAMBURG

The group of Swiss architects Jacques Herzog and Pierre de Meuron, winners of the Pritzker Prize in 2001, is known for a very wide range of implementation on a global scale. Architects have extensive experience in designing public spaces in various parts of the world. Their designs usually refer to architectural archetypes and take the form of monumental solids, while taking care of matching the smallest details of the building so that they refer to the main concept and function of the work.

From the beginning of their professional activity, they intertwined architecture with contemporary art, striving for full unity between all artistic forms within the project. They approach each subsequent challenge individually, not limiting themselves to a specific category, style or location. One could say *Sky is the limit* (they are not limited by a single thing). They easily fit into the regional character of buildings, referring to the Postmodernism, Brutalism, Minimalism, as well as introducing the character of the Deconstructivism.⁴

Hamburg, a trading city that dates back to pre-Christian times, has been enriched with a new project icon from the Herzog & de Meuron group, which is very controversial.

⁴ B. Haduch, *Herzog & de Meuron. Architekci (i) artyści*, Architektura & Biznes, 2019, no. 7/8, pp. 76–85.

Contemporary builders, relying on the apparent simplicity of solutions, and paying attention to durability and usability, delight with the timeless beauty based on the idea of *eurhythmia* combined with patterns inherently adequate to the location of the object.

4.1. CONSTRUCTION AND EXTERNAL BUILDING PARTITIONS – DURABILITY

The structure of the building of the new philharmonic hall in Hamburg was erected on the walls of a brick granary built in the mid-1960s, erected for the purpose of storing mainly cocoa. The assumptions of the storage building, which supposed to carry heavy loads, allowed for the addition of several new floors. From the existing structure, 1,100 out of 1,700 piles were used and an additional 650 were designed. Nevertheless, the entire internal structural system above the foundations was changed for the purposes of the superstructure with subsequent floors. So, everything inside the existing building was removed in 2007, except the original elevation.⁵ Behind the brick walls, a new, relatively simple, skeleton load-bearing system was introduced because of the function of technical and communication facilities. Interestingly, this part is crossed by a mobile ramp over eighty meters long, probably the longest in Europe, leading from the main entrance for visitors, at ground level in a safe area of eight meters above sea level. A simple, spacious tunnel leads to the level below the viewing square, where it changes its direction directly to the entrance to the concert hall in the central part of the public terrace.

Above this *plaza*, the structural system takes a more free layout with the use of round pillars painted in neutral white colour, slipping out from the vertical line in some places. In the new project, the floor plan of the glazed part of the superstructure duplicates the outline of the facade of the former granary. Several fragments were cut out of the cubature from the bottom, to emphasize the entrance to the philharmonic hall and to give a unique character to the representative *piazza*, and from the top, to illuminate the internal parts of the building. A small part of the roof has been adapted to the observation deck plunged into the roofing. But the biggest challenge was to design and build a concert hall with a span of about fifty meters suspended in the central part of the superstructure. For functional reasons, it was decided that it should be attached with steel springs to the reinforced concrete load-bearing system, absorbing sound waves transmitted through solid structural elements. An interesting solution was to hang a canopy levitating above the stage. Both the roof and the main concert hall are made of steel elements. The glass used in complex façade arrangements is designed to withstand strong gusts of wind. A way to protect the roof from aggressive weather conditions was also invented. The outer surface is additionally secured with a mosaic of round anodized aluminum panels and powder coated white.⁶

4.2. FUNCTION – UTILITY

The original assumption of the investment was the introduction of office space in the HafenCity business district for the IT industry which was dynamically developing at the beginning of the twentieth century. The project also included the extension of the riverside granary, using

⁵ M. Lewandowski, *Filharmonia w Hamburgu*, Architektura Murator, 2017, no. 3, p. 96.

⁶ M. Kapłonka, *Elbphi (Filharmonia nad Łabą w Hamburgu)*, Architektura & Biznes, 2017, no. 3, p. 53.

elements after the reconstruction of the original warehouse located in this place during the Second World War. But these plans were abandoned in favor of the concert hall with supplementary functions proposed by the Herzog & de Meuron office.⁷

The brick shell of the building base covers several levels of the internal car park, as well as technology and communication rooms. A place was also found for several multi-purpose rooms for workshops, lectures or micro-concerts in the form of rectangular boxes. The further up, the scale of the music rooms increases. The lower part and the additional superstructure were separated by a gap of more or less one storey height with a large open public space allowing a view of each side of the city. The observation deck proves the additional possibilities of public use of the place. From the level of the *plaza*, or generally accessible public space, we go out of the central part by twisted stairs directly to the *foyer* of the main concert hall intended for 2,100 guests, surrounded by communication corridors. At the entrance to the philharmonic hall, you can also get to the smaller recital hall for five hundred and fifty spectators. As a complement to the functions in the lower eastern part, on the stern side, an exclusive hotel has been designed. Two hundred and fifty hotel rooms, a Spa and a conference center are located on the next fourteen floors. On the other hand, from the front side, compared to the name of the ship's bow, with a higher elevated sharp gable of the glass roof facing the river, there is a residential part with apartments. Both functions are separated by a skylight cut from the top of the body. In architecture, usability can be given in a variety of forms. In the case of *Elbphilharmonie*, the function was given to the shape of the body and twisted stairs evoking associations with a marine shell or *The Eustachian Tube*, that is, the part of the inner ear, which is associated with the organ of the human body responsible for receiving music. The solutions of functions or utility entails consequences in perceiving the end result, broadly understood beauty, also intellectual.

Much attention was paid to creating an ideal concert hall for the twenty-first century. Japanese acoustician Yasuhisa Toyota was invited to work on it, with experience covering the realization of the largest concert halls in the world, both in America and Europe. In the acoustic tests, specialists also considered seats in the audience with filling and upholstery of the seats. Architects studied archaic theater forms, including the Shakespearean prototype *The Globe*, in relation to the introduction of a vertical layout. The spatial arrangement of the hall is a vineyard layout, resembling a stadium, with balcony stands flowing smoothly around the stage, where instrument players perform. In this way, the distance of the viewer from the stage was limited to a maximum of thirty meters. The geometry of the interior, composed of various textures, combines organic waves with rickety simple divisions with emphasis on verticals, evoking a staff. In some of the buildings, there are permanently built-in organs, the registers of which are hidden in the sound diffuser on the ceiling. Correct acoustics were achieved by means of specially grooved panels on the walls and ceiling, based on the calculations of the propagation of the sound wave, made of a specially developed gypsum and paper mixture for the purpose of this investment. The result was a sea shell-like texture with very light weight, fire resistance and durability.

4.3. FACADE, ROOF AND REPRESENTATIVE INTERIOR – BEAUTY

The lower part of the façade, adapted from a grocery warehouse closed at the end of the last century, was part of the largest urban complex of granaries in Europe, inscribed on the

⁷ M. Lewandowski, *op. cit.*, p. 96.

UNESCO World Heritage List.⁸ This procedure resulted from the protection of local urban values. It facilitated a better relationship in the context of the adjacent buildings, finished largely with a massive brick texture, varied with rhythmic vertical cuts and a geometric repeating arrangement of small windows measuring half a meter wide and half and a quarter meter high. The lower, preserved part of the former building connects with the levels in the urban tissue, refers to the historical buildings, but in an abstract, more contemporary, simplified and rhythmic way. For these reasons, the designers decided to use its potential.

The form of the Philharmonic Hall refers to the local tradition of North German brick expressionism with the flagship example of the *Chilehaus* erected just after the First World War in order to revive the economy. This huge office building resembling a boat through a curved façade combined with sharp, exposed repeats of heavily hung cornices, has long been considered an icon of Hamburg. The characteristic arches of the arcades on the ground floor and the more accentuated size with two symmetrical columns accentuating the main entrance could have been the inspiration for the terrace part located in the undercut first level of the glass superstructure above the brick part of the new philharmonic hall. As the ground conditions made it difficult to hide from the car parks below the ground, the actual usable ground floor was raised to the level that connects the brick and glass parts. Thanks to this, the body gained a large, publicly accessible observation deck overlooking the surrounding area. In the vicinity, you can see similar superstructure solutions, or continuing the form of brick bases above the local height of the city tissue on the river bank, with the dominant feature at the end of the islands mostly surrounded by water. The ground level and the ground floor of the port buildings are elevated to an ordinate of 8 m above sea level to protect against sea tides. The glass part of the superstructure ends with a sharp, raised top, rises to a height of 110 m and closes the island surrounded on three sides by the Elbe River.

The assumptions of Vitruvius' treatise are based on the search for beauty in proportions and rhythm, in a code written with numbers. We look for this type of harmony in the brick base of the Philharmonic building. However, we cannot say that the building is subject to symmetry. The center of the building is accentuated as the location of the main concert hall with the entrance to the foyer, it is marked by an elevated cut running along a smooth curved line connecting two opposite facades irregularly. Eurhythmia may consist in a symmetry disturbance, but with balancing from one side of the ship to another, so that it would not sink, it may keep a strong composition by the grid of verticals and levels introduced by structural elements.

A man also tries to see a beauty in the nature. Hence the inspiration referring to the location, imitating rough waves on the river, as if caused by wind or loud music.

Biomorphic fluid shapes of new levels dynamically contrast with the calm bottom of the building. Thanks to the light and immaterial structure of glass reflecting sky, as well as irregular forms, it arouses admiration, creates a symbol and associations with the place. In many of their works, architects focus on the metaphorical *skin* of a building, each time looking for new solutions in the form and material used in relation to other forms of art. In the case of the glass part of the superstructure, reference was made to the tradition and craftsmanship of Venetian glass. Each element of the glass façade was developed by Italian specialists. A basic glazing system is made with a module of about four to five meters in width and over three to five meters in height situated similar but scattered in an uneven

⁸ *Ibidem*, p. 91.

rhythm in some parts. Apart from them, the façades feature loggias derived from the Italian Renaissance, and concave balconies with a fluid spatial form. This complex façade layout was checked in a digital spatial model for insolation. At the end of production, the glass was covered with basalt flecks on the surfaces that were to be darkened, and clean, translucent central parts were left at eye level. Moreover, the shape of the viewing openings is shaped into three-dimensional ellipses. Solar protection glass is used, heat-insulating, hot-formed, fixed in aluminum panels with a heat-insulating core. The principle of interior finishing was to unify the surface of the ceiling, walls, stairs and floors.

The silhouette of the Philharmonic is a vertical accent displayed in the dense buildings of the district. Visible from afar, it is a cultural destination for music and art lovers in general.

4.4. BIM – CONTEMPORARY DESIGN WORK ENVIRONMENT AND THE ECONOMICS OF PROJECT IMPLEMENTATION, HUMAN VS MACHINE

The city authorities of Hamburg were the investor of the Elbe Philharmonic. All execution works were carried out through public tenders. During the construction phase, the planned area increased 1.5 times, from 84,000 m² to 120,000 m². Consequently, the budget has been increased several times. The construction had stoppages, difficulties in functioning due to the location on the river bank, and the initially assumed schedule was significantly extended by six years. Due to the complexity of the project and in order to economically improve the work, a technological support team was set up to develop digital models of elements sent directly to production, such as parts of the glass façade. Similarly, with special machines, plasterboard panels with differentiated grooves were cut out on the basis of a three-dimensional model. The basic work tool was both a 3D and 4D model, which facilitated the coordination of works according to the designated stages in time. The author of the article undertook to model the solid using *Autodesk Revit*. Based on projections and design diagrams, it was possible to recreate the main assumptions of the concept of the facility. The greatest difficulty is delineating the form of a roof consisting of spherical cuts, the centers and diameters of which are ambiguously located in space. The glass viewing lenses that add variety to the glass part of the facade are complicated to recreate. These elements prove the originality and uniqueness of this project and the work put into obtaining it. Thanks to this kind of digital tools, there are practically no limits to the possibilities of project implementation, except for those related to common sense and investment budget. They often affect the durability, usability and beauty of the designed object.

5. CONCLUSION

Vitruvius in his work called for honesty and professional ethics. He put the architect's talent ahead of financial benefits. He criticized the situations requiring the projected investment costs to be exceeded.⁹ These are the unchanging realities of work related to construction. Perhaps exceeding the schedule and the initial costs of the implementation of this unique block requires rebuke, but thanks to the durability, utility and beauty of the building we are

⁹ A. Sadurska, *Witruwiusz i jego dzieło* [in:] Kultura antyczna, p. 4, http://www.wiiv.pl/kulturaanty-czna/eseje/witruwiusz_01.asp (access: 27.05.2021).

only able to enjoy the final effect, which happily ended with the grand opening of the cultural and tourist institution on January 11, 2017. Like the Sydney Opera House, which was also delayed by almost ten years in its implementation, and today is a city icon similarly displayed on the coast. *Elbphilharmonie* breaks the myths of architecture: it introduces a glass façade, where usually objects of this function have solid opaque walls and suggests a concave roof that collects rather than drains water. Through these measures, it introduces a new quality to design patterns for contemporary architecture. Today, architects work with specialists to supplement their knowledge on the project. The icons of architecture pursue the idea of a *total work of art* by experimenting, using contemporary working tools and engaging in cooperation with all artistic forms. But we cannot reject the experience of the original builders. The truths recorded in Vitruvius' treatise *De architectura libri decem* seem to be eternally valid and fundamental in the practice of every builder. Following the example of Vitruvius, we should describe timeless works that have a profound impact on society and architectural craftsmanship. In my opinion, such an example is the new Hamburg Philharmonic Hall – a multi-faceted and unique creation for its time.



III. 1. Top picture – view of the facade of the Hamburg Philharmonic from the side of the Elbe River. Source: <https://www.pikist.com/free-photo-sizls/download/pl> (access: 20.06.2021); below – close-up view of the glass facade and the curved roof. Source: <https://www.pikist.com/free-photo-sizls/download/pl> (access: 20.06.2021).



III. 2. Top picture – virtual 3D model, close-up of a detail of the viewing loggia (Autodesk Revit visualization); below – virtual 3D model – *bow* view from the Elbe River (Autodesk Revit visualization).

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