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TRUTH, HALF-TRUTH, UNTRUTH – THE STRATEGIES OF PREFABRICATED ARCHITECTURE DESIGN

PRAWA, PÓŁPRAWDA, NIEPRAWDA – O STRATEGIACH PROJEKTOWANIA ARCHITEKTURY PREFABRYKOWANEJ

Abstract

Prefabrication in architecture is characterized by repeatability, modularity, and a rather strictly defined construction grid. When analyzing prefabricated buildings, a different approach of designers to exposing the technology in the architectural form can be seen. While some of them show the truth about the construction method, others decide to hide it under the facade cladding and decoration. The text analyses design strategies in the context of the truth and the lie of architecture. The conclusions are an attempt to answer the question of whether, and if so to what extent, prefabricated technology can determine the architectural expression of the building.

Keywords: prefab, prefabricated architecture, offsite architecture

Streszczenie

Prefabrykacja w architekturze ma w swoją „naturę” wpisane powtarzalność, modularność oraz dość ściśle zdefiniowaną siatkę konstrukcyjną. Analizując budynki prefabrykowane, można zauważyć zróżnicowane podejście projektantów do eksponowania technologii w architekturze obiektu. Część z nich ukazuje prawdę o sposobie budowy, inni decydują się ukryć ją pod warstwą fasadowej scenografii. Tekst analizuje odmienne strategie projektowe. Wnioski są próbą odpowiedzi na pytanie, czy – i jeżeli tak, to w jakim stopniu – prefabrykacja może determinować wyraz architektoniczny obiektu.

Słowa kluczowe: prefabrykacja, architektura prefabrykowana

1. INTRODUCTION

Prefab is not an end in itself. It only has value if it can get the results it needs to – if more people end up with well-designed, well-made houses than can currently get them.¹

The reflection on the truth and lie of architecture in the context of prefabrication should be started with its definition. Although it seems simple and intuitive, according to the current state of research, it covers a whole range of technologies and solutions going far beyond the commonly associated in Poland concrete large panel system (so-called large-plate) or

¹ *Design + Education: Moulding the Next Prefab Generation*, interview with Matthew Aitchison, <http://built-offsite.com.au/emag/issue-02/design-education-moulding-next-prefab-generation/> (access: 15.06.2020).

wooden prefabrication identified with CLT technology (almost absent in Poland). Prefabricated architecture is defined as building constructed by assembling on-site pre-manufactured components, assuming that “a large part, albeit difficult to precisely quantify, of the fabrication labor takes place under controlled conditions in the industrial plant.”² In a way of simplification, prefabricated buildings can be divided into three categories depending on the type of construction (although there are also hybrid technologies – combining selected features of listed or less standard solutions). Prefabricated technologies include:

- Kits of ready-made elements enabling the erection of a complete building (usually a single-family one – kit homes). Well known examples of such projects are Walter Gropius's Copper Houses (Kupferhäuser) and his slightly later concept of the Packaged House designed in cooperation with Konrad Wachsmann within the General Panel Corporation.
- Constructions based on the panel system elements (walls, ceilings), e.g. the “large plate” buildings or buildings constructed using the abovementioned CLT technology.
- Spatial elements (volumetric structures, three-dimensional modules) produced in an industrial plant and put together on the construction site – three-dimensional modules of considerable size, which can be e.g. whole residential units or their sections (rooms). Classic examples of such objects are Habitat 67 from Montreal by Moshe Safdie or Nakagin Capsule Tower from Tokyo by Kisho Kurokawa.

All three of the above-mentioned ways of constructing buildings have appeared in architectural theory and practice from the very beginning of the prefabrication idea and are still present today. Although the origin of prefabricated architecture can be traced back to the 17th century, its proper beginning, especially in Europe, and its intensive development dates back to the 20th century. The industrial revolution and further development of mass production resulted in standardized products. Their quality was satisfactory, and the price could be significantly lower than the cost of custom-made goods, produced in small quantities, and with traditional, craftsmanship methods.

That is why from the very beginning of the prefabrication idea's history, architects have seen it and still see as a tool to achieve good quality buildings at a relatively affordable price. Prefabrication “promises” the possibility of improving housing conditions, especially for lower-income social groups, thus making housing architecture egalitarian and accessible.

Buildings constructed using mass-produced components and in the most possible cost-effective way have gained, especially in Europe, a “utility look”. This kind of aesthetics aspired to be a synonym of modernity. It has been and still is dominated by standardization, repeatability, linearity, and lack of ornaments. Prefab architecture has been designed mainly with a view to its usability rather than its impressive form. The appreciated and respected mastery of an architect in these categories is not the exceptionality of an individual object, but its social dimension and high potential to meet the needs of users and also the possibility of replicating the solution on a wider scale – designing prefabrication systems.

Simplicity, lack of decorations and ornaments are not only dictated by the matter of technological possibilities and savings. They also result from the adopted assumptions, which in turn emerge from the Loos's³ negation of the ornament. They were also and accurately characterized

² A. Tofiluk, *Prefabrykowana architektura mieszkaniowa a zmiany klimatyczne*, Builder, 2020, vol. 24, no. 3, p. 52.

³ A. Loos, *Ornament i zbrodnia* (1910) [in:] A. Loos, *Ornament i zbrodnia. Eseje wybrane*, Centrum Architektury, Warszawa 2013.

by Pevsner.⁴ He wrote that industrially produced prefabricated building materials are an essential substance of modern architecture and that, in practice, this means the complete abandonment of ornaments and decorations. According to Pevsner, mass-produced prefabricated ornamentation is absurd. The charm of ornament is an expression of the direct creative impulse. A decoration for common consumption, which was made not for an individual recipient (customer) but anonymous masses, Pevsner also considered as nonsense.

Formal simplicity is generally accepted in prefabricated multi-family architecture, while at the same time being a design assumption only in part of single-family projects. In the case of “kit homes”, cost optimization is achieved not only through the use of simple, repeatable building elements, but above all through the effect of scale – production of a large number of the same type sets.

Moreover, much more often than in the case of prefabricated multi-family buildings, the client (investor) is private and less anonymous. Therefore, single-family buildings built with the use of prefabricated technologies represent very different aesthetic decisions, from historicizing or vernacular references to modernist and neo-modern approaches. Hence, further considerations focus on multi-family architecture.

The design of prefabricated architecture, in its original assumptions, moves aesthetic issues to the background, which is not equivalent to a lack of care for the architectural expression of the building. Although the repetitiveness of elements may lead to monotony and uniformity, it is also related to the rhythm, order, growth of structures by multiplication of the module, which may give the designer room for creative activity.

The following considerations aim to analyze the design concepts accompanying the construction of prefabricated buildings, define their assumptions, and evaluate the aesthetic consequences in the architectural expression of selected projects.

The choice of examples is based primarily on the intention to show different types of the design approaches. They are not delimited geographically, culturally, or in terms of time. In the case of multi-family prefabricated architecture, the time of creation, place, or cultural context are not particularly decisive factors determining its form. Regardless of the time and place, its origin lies in its utilitarianism and cost-effective optimization and its availability to the potential user.

2. THE TRUTH

After the constructivist Revolution at the Bauhaus, (Walter Gropius) presents proposals for large-scale building elements: entire walls, ceilings, roofs! It would be a mistake to think that this is just a proposal from a man fascinated by the production capacity of the industry. It is also so, but above all, it is an aesthetic attitude. In the description of his system [...] he proclaims the slogans of architectural style resulting in a straight line from production processes because according to Gropius, the standardization of building elements will have a significant impact on the unification of new houses and districts.⁵

⁴ N. Pevsner, *Historia architektury europejskiej*, Arkady, Warszawa 2013.

⁵ J. Wujek, *Mity i utopie architektury XX wieku*, Arkady, Warszawa 1986, p. 158, translated from Polish by the author.

Some of the truest prefabricated projects, in the context of connection between architectural expression and technology, were and sometimes still are, if they have not undergone thermo-modernization, the ones in the twentieth-century large-plate housing estates such as in Berlin's Gropiusstadt (1964–75) or Warsaw's Ursynów Północny (built from the 1970s to early 1990s).

The facade pattern of large-plate buildings in most cases is created by a grid of intersecting straight lines – edges of adjacent panels – filled with rows of rectangular windows and balconies. The building envelope is compact, usually cuboidal, without unnecessary subdivision, which is due to the construction technology, cost optimization, and maximization of floor space.

Simple form and an orthogonal pattern on the facade can be overwhelming especially in the perception of buildings above five stories, particularly if the surrounding objects are also tall and erected in the same large panel system. The scale effect results in extreme repeatability and monotony.

Nevertheless, a smaller scale of buildings, slightly more complicated than a rectangular plan, a varied number of stories, individually designed non-system parts (e.g. balconies), or different colors and textures on the facade elements can give the large-plate architecture an individual character. In combination with friendly neighborhood areas – scale of the open spaces, street furniture, greenery – the evaluation of the estate and also individual buildings can be positive (Ill. 1).

The contemporary concrete large-plate systems are slightly different from their 20th-century predecessors. First of all, the quality of materials and joints of the system elements are much better than before. And in the context of shaping the facade, today's designers can use a much larger palette of materials and colors on the external surfaces.

The truth of technology can provide an interesting effect and co-create valuable architecture. This is proven by the only example of a contemporary large panel building in Warsaw so far – the building at Sprzeczna Street designed by BBGK Architekci from 2016 (Ill. 2).

The facades of the building made of pigmented concrete panels have a color that refers to the brick tenement houses in the district. On the inner side of the quarter and the side elevations, the dark red walls are contrasted by light balcony slabs, darker sections of window frames, and large glazing. The front elevation is dominated by triangular loggias. They are the result of the design process – a “compromise” between the direction of the street frontage and the general shape of the plot in the depth of the quarter, which add variety to the facade by a game of shadow and light. The building on Sprzeczna Street proves that creative interpretation of the technology is possible, although it should be noted that cost optimization was not a dominant assumption.

The large-plate technology determines the form of the building, enclosing it mostly in a simple, cuboidal form, and the Gropiushaus (Ill. 1) or the building on the Sprzeczna street are exceptions to this common principle.

Slightly different shaping possibilities may be offered by the use of spatial elements – volumetric structures. Changing the orientation of the modules, shifting the elements so that they do not create large one-dimensional surfaces, and keeping the spaces between them open allows us to obtain a multidimensional, individual form of the building.

Examples of such designs are the Habitat 67 by Moshe Safdi in Montreal, or the metabolic Nakagin Capsule Tower by Kisho Kurokawa in Tokyo from 1972 (Ill. 3). Habitat 67 consists of 354 concrete modules assembled in different configurations which form 158 apartments. The Japanese residential tower is made up of 140 capsules. Each element was designed as

a separate apartment or office and was intended to be replaceable and could be exchanged for a new one if it was worn out.

Both buildings, apart from the truth about the technology of construction, also demonstrate the logic of interior design by a clear separation of units (residential modules) visible in the facades and form of the tower. In comparison with large panel buildings, the presented examples of modular architecture are much more intriguing and at the same time more true in their story about technology and additionally about the function of the building.

The stiffness of a single module structure allows designing the building by placing individual parts not necessarily one under the other, as it is in the case of floor and wall arrangements in large panel projects. Nevertheless, contemporary buildings based on the juxtaposition of spatial structures, probably due to the optimization of costs and scale of buildings, do not take full advantage of this possibility.

One of the most spectacular examples of recent years in prefabricated modular architecture is the B2 residential tower in New York City, designed by SHoP Architects and completed in 2016 (Ill. 4). The building is part of a larger multifunctional complex Atlantic Yards, which will consist of 14 buildings. Building B2 is the first of three planned residential towers designed as prefabricated. At the time of completion, it was the highest, 16-story modular building in the world. The building has 365 apartments of different sizes, created by 930 cuboidal modules. Half of the apartments are in the group of affordable, subsidized flats.

Originally, the building was designed in a traditional structure, which has been changed to a modular one as a result of cost optimization. The modules brought to the construction site were equipped with facade cladding, bathrooms, some installations, and other interior design elements.

The building consists of three parts with a different number of stories slightly offset from each other. The depth of offset is determined by the size of the modules. The designers have attempted to diversify the facade by introducing slightly different external wall finishes in terms of color (metal cladding in red and shades of grey) and geometry (mirror reflections). Still, the division into individual modules and the message about the construction method remains visible.

3. THE HALF-TRUTH

The visibility of the prefabrication in the architectural expression of a building can be hidden or entirely lost if the design concept includes on-site facade cladding. In this case, the edges of the elements and their interrelationships are covered by the facade material. Depending on the types of used solutions, such projects can be divided into two categories in the context of truth and lie of architecture.

In the first one, despite the cladding, the main features of the prefabricated architecture are still noticeable, the second one “pretends” the traditional way of constructing the building.

The first type of solutions represents, although unintentionally – the design assumptions probably did not provide for such a scenario – many of the 20th-century large-plate buildings. In the new reality of the turn of the century related to energy efficiency, they were given a layer of plastered insulation. There are exceptions to this rule but most of the Polish thermomodernizations lead to the loss of the original facade divisions. Although the thermal insulation does not affect the shape of the object or the arrangement of openings, the truth

about the used technology is blurred (Ill. 5). One of the main disadvantages of many prefabricated buildings – the monotony of the facade – is emphasized. Attempts are also made to overcome it by introducing patterns and different colors of plasters. The effect of these actions is not always positive, especially if the buildings which are a part of a larger design concept are insulated individually, which results in inconsistent colors and architectural expression of the objects located next to each other.⁶

An example of a similar half-truth in the way of constructing a building is Carmel Place – another New York project, no less widely discussed in the architectural media than B2 tower. Carmel Place is also an object composed of volumetric structures.

The building was completed in 2016 according to a design by nARCHITECTS. It consists of 55 modules – micro-apartments.

This project has won the adAPT NYC competition. In 2012, Mayor Michael Bloomberg, confronted with the housing crisis [...], decided to challenge the architectural community and asked how small a micro-apartment could be to live comfortably in. The winning project was to pilot further housing projects. There are both commercial and reduced-rent apartments in the building.⁷

The tall, narrow building is composed of four thin, stepped volumes (Ill. 6). The offsets are designed along the edges of the modules and are a result of their size. The individual parts vary in height and are covered with different shades of grey brick cladding already on site.

It is difficult to decode the structures of the Carmel Place building from the outside, although the form of the block and the simplicity of the facade allows for such associations. The modular concept becomes a bit more clear from a closer distance. The cornices located at the junction of prefabricated elements, invisible from a distance, are noticeable. However, without knowledge of the subject, it is difficult to categorically state how the object was constructed.

4. THE UNTRUTH

Sluseholmen Canal District is a housing estate in Copenhagen, which was established between 2003 and 2009 as a part of the regeneration project for former industrial and port areas. The main designers of the overall concept were Dutch architect Sjoerd Soeters and Danish studio Arkitema.

The Sluseholmen housing estate consisted entirely of city blocks situated on quasi-islands which are crossed by canals. The quarters are developed around the perimeter and have internal courtyards – common spaces. The buildings are 4 to 7 stories high.

⁶ “The last ten years have been a time of intensive thermal insulation of the so-called large-plate blocks of flats. And with the insulation, new plaster facades are being added. [...] From the coast to the mountains, we have a great pastel waving fighting for primacy with great pastel geometric abstraction. Rhombs compete with strokes, triangles with gentle curves. On the facades of the residential towers of Krakow’s Prokocim not very harmoniously, but abundantly green, blue, red and yellow are adjacent. In the Zaspia housing estate in Gdańsk the houses were painted in Christmas trees, and in the Huby housing estate in Wrocław – in red roofs with chimneys.” P. Sarzyński, *Wrzask w Przestrzeni. Dlaczego w Polsce jest tak brzydko?*, Polityka Spółdzielnia Pracy, Warszawa 2012, p. 52, translated from Polish by the author.

⁷ J. Erbel, *Poza własnością. W stronę udanej polityki mieszkaniowej*, Wysoki Zamek, Kraków 2020, p. 195, translated from Polish by the author.

After the master plan was prepared, the residential buildings were designed by the Arkitema and by the Gröning Arkitekter studio. The chosen technology was a concrete large-plate system. In contrast to the described buildings of the 20th century and the one on the Sprzeczna street, the elements selected for the Sluseholmen elevations had only a structural layer produced in the industrial plant. It was decided that to make the facade more interesting and varied, the thermal insulation and especially the facade materials would be installed directly on the construction site according to individual designs. They were to be invented by more than 20 different architectural practices involved in the cooperation.⁸ It is worth mentioning, particularly concerning the truth and the lie of architecture, that not all the invited architects agreed to this kind of collective work. The reason for the decision was the belief that the design of only facades is a negation of the logic (truth?) of the design process.

The elevations of the city blocks were divided into pseudo-parcels “pretending” to be separate tenement houses designed by different architects. It was decided that a completely new housing estate in a post-industrial area should have facades inspired by nineteenth-century Copenhagen tenement houses and buildings erected along canals in Amsterdam. A set of rules concerning acceptable materials, colors, and facade divisions were prepared, and the guidelines had to be followed by the cooperating architects. The aim was to avoid monotony and repetition, to create a variety of frontage sections, and to give them individual character (Ill. 7).

Such a design strategy results in a compact, harmonious development with similar dimensions and proportions that organize the space and are very legible. Different elevations introduce diversity, but also fake divisions into individual “tenements houses.” At the same time, they opposed technology in which the buildings were constructed.

Hence, what we see on the facades of the Copenhagen housing estate is not true, it is the scenery, an impressive but artificially added decoration to the prefabrication which hides behind.

5. CONCLUSION

The above considerations exemplify three different approaches to creating the architectural expression of prefabricated buildings. They are classified as true, half-truths, and untrue.

As the examples illustrated, the utilitarian and decoration-free approach to prefabricated housing architecture co-creates the form of the building, which indicates the technology of its construction. The form of the building and the pattern of the facade tells the story of how it was built – the prefabricated components, their edges and interconnection points are visible and even exposed.

In the context of truth and lie in architecture, this design strategy seems to be what might be described as truth – the truth of the structure, technology, and in many cases also material. It seems to be most consistent with the idea of prefabricated housing architecture and its genesis.

⁸ C.F. Møller, C. Stenberg + C. Holgaard, Cubo, Dissing+Weitling, Force 4, Format Arkitekter, Hvidt & Mølgård, Juul & Frost Arkitekter, Kasper Danielsen Arkitekter, KHR Arkitekter, Kim Utzon Arkitekter, Ladegård Arkitekter, Marie Kaarøe, ONV, Oscar Breyen Groning, Perl & Black Arkitekter, Schmidt, Hammer & Lassen, Soeters Van Eldonk Architekten, Tage Lyneborg, Thora Arkitekter, Vandkunsten, Vilhelm Lauritzen Arkitekter

Nevertheless, contemporary prefabricated construction methods may be also hidden underneath the facade cladding and decorations which are usually installed on site. This may be related to energy efficiency requirements and the covering of buildings with insulation and facade material. They cover the structure by masking the boundaries between the modules. However, aesthetic considerations also appear to be important. The architect's decision to choose such a design strategy may result from a justified concern that has its origins in the experience of 20th-century large-panel housing estates. The repetitiveness of elements on a huge scale resulted in an overwhelming monotony of buildings and entire housing estates.

The half-truth strategy assumes a certain degree of masking of the industrial production technology of the building but within simple and not very extensive means of expression which correspond to the utility, function of the object, and logic of the plans.

Completely losing the character of the prefabricated structure in the building envelope look is an assumption that untruth is an effective way to achieve an attractive architectural expression.

The question remains open which design methodology gives the most interesting solutions in the visual aspect. It is probably a matter of individual tastes and preferences, but for some viewers, the lie of facade design may be the most impressive.

Somewhere in the background of the above considerations and the author's interest in prefabricated architecture, another question comes up. Is the discussion about prefabricated technology in the context of the beauty of a building no longer an abuse in itself and a kind of lie? Prefabrication is perhaps only a technological process and not, as this article (and others) attempted to interpret it, an important part of the design strategy and also an aesthetic issue? Maybe it should be considered that mass production connected with prefabrication is fundamentally contradictory to the individualized approach to design, which is the essence of the architect's work?



III. 1. Large-panel buildings: lower ones in Warsaw's Ursynów Północny in the area of Surowieckiego and Romera Streets, the 16-story one is the Gropiushaus in Berlin (Gropiustadt), co-designed by Walter Gropius



Ill. 2. The building on Sprzeczna Street in Warsaw



Ill. 3. Habitat 67 in Montreal and Nakagin Capsule Tower in Tokyo, source: By Thomas Ledl – Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=61578410>, By Jordy Meow – Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=31395049>



Ill. 4. Residential tower B2, New York, source: <https://upload.wikimedia.org/wikipedia/commons/b/b6/461Dean.jpg>



III. 5. Large plate buildings after thermomodernisation in Ursynów Północny in Warsaw, in the area of Surowieckiego Street



III. 6. Carmel Place, New York, source: [https://www.archdaily.com/799686/see-how-new-yorks-pilot-scheme-of modular-microhouses-was-built/58389716e58ece8337000001-see-how-new-yorks-pilot-scheme-of-modular-microhouse](https://www.archdaily.com/799686/see-how-new-yorks-pilot-scheme-of-modular-microhouses-was-built/58389716e58ece8337000001-see-how-new-yorks-pilot-scheme-of-modular-microhouse)



III. 7. Sluseholmen Canal District, Copenhagen, source: By Payton Chang – <https://www.flickr.com/photos/paytonc/4791324884/sizes/o/in/photostream/>, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=12734577> <https://www.flickr.com/photos/paytonc/4791325622/sizes/o/in/photostream/>, CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=12734515>

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