

CUSTOMISATION AND TYPIZATION. TWO FACES OF CONCRETE IN MODERN RESIDENTIAL ARCHITECTURE

INDYWIDUALIZACJA I TYPIZACJA. DWA OBLICZA BETONU W NOWOCZESNEJ ARCHITEKTURZE MIESZKANIOWEJ

Abstract

When outstanding architects of the modern movements in architecture laid the foundations of the new conception of housing, they strove to build them with new materials in all areas.

The author of the l'Esprit Nouveau Pavilion and the Unit is associated with concrete not without a reason. Traditional materials, divisible into repetitive bricks and blocks, did not meet the assumption of measurement with a new recursive scale. The reinforced concrete, while flexing in an extensively formed formwork, took the dimensions of the Modulor pattern. Thus, the trend was born to use concrete to create highly personalised residential buildings, corresponding to the formal and aesthetic assumptions.

The second trend, highlighted in the article, is related to the invention used firstly in Liverpool in the early 1900s by John Alexander Brodie. The concrete prefabrication, mentioned here has gained the value of an innovative architectural technique, among others, in Habitat 67 designed by Moshe Safdi. It also had a terrible impact on the spatial environment, mainly in Eastern Europe in the second half of the 20th century.

The article strives to express the importance of two extremely different streams of concrete used in residential building. It highlights their specific characteristics, important historical precedents and influence on the shaping of architectural theory and education.

Keywords: prefabrication, dwelling, reinforced concrete, modernism

Streszczenie

Kiedy wybitni twórcy ruchu nowoczesnego w architekturze stawiali podwaliny współczesnej koncepcji mieszkalnictwa, dążyli by we wszystkich obszarach budować je z nowego tworzywa.

Autor pawilonu l'Esprit Nouveau i Jednostki kojarzony jest nie bez przyczyny z betonem. Materiały tradycyjne, podzielne na powtarzalne cegły i bloki nie spełniały założenia mierzalności nową rekurencyjną skalą. Żelbet zaś, tężejąc w elastycznie formowanych szalunkach przyjmował gabaryty odnoszone do wzoru Modulora. Tak rodził się pierwszy nurt wykorzy-

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stania betonu do kształtowania silnie zindywidualizowanych, odpowiadających założeniom formalnym i estetycznym budowli mieszkalnych.

Druga tendencja, uwypuklona w artykule wiąże się z wynalazkiem wykorzystanym po raz pierwszy w Liverpoolu przez Johna Alexandra Brodie w początku XX stulecia. Prefabrykacja betonowa, o której tu mowa zyskała walor nowatorskiej techniki architektonicznej, między innymi przez Habitat 67 Moshe Safdiego. Wywarła też fatalny wpływ na środowisko przestrzenne, głównie w Europie Wschodniej w drugiej połowie XX stulecia.

Artykuł dąży do przedstawienia znaczenia dwóch skrajnie różnych nurtów wykorzystania betonu w budownictwie mieszkaniowym. Wskazuje ich cechy specyficzne, istotne historyczne precedensy oraz wpływ na kształtowanie teorii i szkolnictwa architektonicznego.

Słowa kluczowe: prefabrykacja, mieszkanie, żelbet, modernizm

1. Concrete as a medium of implementing modern architecture in housing. New standards in individualised housing

Although Thomas Edison's unprecedented efforts in iron ore refining undertaken in the late nineties of the nineteenth century failed, the inventor did not give up experiments on the development of building technology. In 1899, he founded Edison Portland Cement Company. While concrete was not widely used at the time, Edison managed to start production due to extensive promotion. One of the ways to promote cement was to build and sell cheap concrete houses. The production was launched around 1908. Portland cement was increasingly used as a building material. Edison and his team were working to improve the concrete mix, as well as to design reusable steel molds for wall pouring. By 1910, Edison produced two experimental buildings – a gardener's house and a garage, and then passed patented solution for further use. Although the technology was noticed by the philanthropist Henry Phipps, who proposed using concrete prefabrication to address housing problems in New York, the plans remained unrealised for organisational reasons.

At the same time, in Europe, architects attempted to use modern technologies and experimented with steel and concrete. Le Corbusier's sympathy for reinforced concrete emerged already in early design work. After starting to travel across Europe, he worked in Paris in the office of Auguste Perret, a structural rationalist and designer of modern reinforced concrete structures, and then, in 1910 he practised with Peter Behrens in Berlin¹. These experiences certainly influenced long fascination with concrete – its economic efficiency, wide application and adaptability to various solutions, sculptural and structural potential. The concrete's ability to build various shapes and freedom to form surfaces as well as structural efficiency laid the foundations of new quality in architecture and, consequently, helped to formulate Five Points of a New Architecture:

- the Pilotis to raise the building above ground level;

¹ H. A. Brooks, *Le Corbusier's Formative Years: Charles-Edouard Jeanneret at La Chaux-de-Fonds*, University of Chicago Press, 1999.

- the Free Plan;
- the Free Facade;
- the Ribbon Window;
- the Roof Terrace;

Pure realisation of these objectives was Villa Savoye (1928–1931) – a manifesto of new architecture and one of the finest examples of the international style.

The villa was located in a free space, in connection with the landscape, in close relation to the cardinal directions and sunshine. The plan was shaped in correlation with the proportions of the golden ratio. The windows were positioned to frame the exterior and produce specific illumination effects in the interiors. The body of the house is minimalist, raised above the ground, composed as a combination of soft natural forms with simple geometric solids.

In Poland, the Points of Modern Architecture were implemented very successfully by Juliusz Żórawski – one of the most outstanding architects of the inter-war. His work from the outset was characterised by a passion for simplicity and a tendency to rationalise functional and architectural solutions. One of the first residential buildings designed by Żórawski (in co-operation with Zygmunt Plater-Zyberk) was a tenement house at Chocimska Street 25 in Warsaw². Thanks to the functionalistic facade with wide windows, the asymmetrically laid shallow balconies and the entrances to the shops on the ground floor, it looked very modern. However, it was erected in traditional technology, with brick (load-bearing walls) and wood (ceilings). The project of the tenement house at Chocimska Street started a long series of luxury multi-family buildings, in which Żórawski used more and more modern functional solutions as well as the latest technologies. In the years 1935–36, for the entrepreneur Jan Wedel, he designed a corner tenement house at Puławska / Małalińskiego Streets. The impressive, material-diversified block opened up to the spacious inner courtyards through wide bays on the ground floor. This solution was applied thanks to innovative semi-skeleton construction, which allowed to partially release the ground floor, free the plan, to design the independent facade and recreational terrace on the roof. The skeleton of the building was made of welded iron placed on a concrete foundation cushioned with leaded sheets and asbestos.

Another, very progressive Żórawski's achievement was the apartment house for Ciechanów sugar factory at Przyjaciół Avenue 3. The use of skeleton construction in this case also allowed to construct the object meeting Five Points of Modern Architecture. Over the light, overexposed ground floor, supported by columns, there were five glass floors with one- and three-bedroom comfortable apartments with elevators accessible directly through the hall. This seemingly risky solution was fully appreciated by the users and was subsequently applied to the projects of neighbouring buildings. Above the roof of the last storey, there was a characteristic curved reinforced concrete roof concealing the elevator machine hovered parallel to the facade. The sculptural form of the deckhouse, undoubtedly inspired by Le Corbusier, caused criticism as unreasonable. A rounded wall on the ground floor leading to the glassed representative hall, gave lightness to the entire block. It would not be possible to implement these solutions without using modern concrete technology.

² D. Błaszczyk, *Juliusz Żórawski. Przerwane dzieło modernizmu*, Warszawa 2010.

2. Individualisation based on the new system of proportions

Since 1916, in France, there was a growing awareness of the need to build a large number of dwellings. In 1920, a report was published on the situation of housing development, in which authors indicated the need to build as many as 500 thousand of houses in perspective of 10 years. On this basis, the Loucher / Bonnevey (from authors' names) program was launched, which aimed to implement methods of mass production of houses that included typization, industrialisation of production, and reduction of implementation costs³. Le Corbusier inscribed in this tendency, and even surpassed it, designing Maison Dom-Ino in 1914–1915, which was naturally inspired by August Perret's innovative ferro-concrete solutions, and survey to provide a large number of apartments in a short time, in reaction to the destruction of the First World War. Dom-Ino was designed as an open-plan object, destined for serial production. The number of elements was reduced to a minimum: slabs were based on columns located in corners; floors were connected by the stairwell. The Dom-Ino design provided complete independence from the walls that ceased to serve as carriers. This opened up new opportunities for architecture and freed up the plan giving the possibility to free the interior.

This thought Le Corbusier developed in 1925 when, at the International Exhibition of Decorative Arts and Design (l'Exposition internationale des Arts décoratifs et industriels modernes), he presented Pavillon de l'Esprit Nouveau⁴. On this occasion, he formulated provocative assumptions for the modern architecture program. First of all, he openly rejected decorative arts as such, assuming that the architecture encompasses every piece of household equipment, then the street and the house, and also the wider context. He was convinced that by using standardisation for mass production, the industry could create pure forms. Radical transformations in the structure of the building, the freedom of shaping structures possible thanks to the use of concrete and iron, enabled to create a new type of urban dwelling – meeting various expectations and needs. He was thinking of creating comfortable and elegant residential units, practical machines for living, which could be combined into long blocks of urban villas⁵. The pavilion consisted of four levels with a total height of 16 meters. In essence, it was a prototype two-story residential unit, created by merging the form of Maison Citrohan with a characteristic two-storey L-shaped room and a monastery-inspired garden. Illuminated by a bright well of the courtyard, the duplex was built around a “hanging garden”, instead of a traditional balcony. The pavilion was demolished in 1926 and Le Corbusier failed to find financing for its reconstruction.

A manifesto summarising Le Corbusier's multi-year studies on residential architecture was the Unité d'Habitation (1946–1952). The block was built in Marseille shortly after World War II, again as a response to housing shortages in ruined Europe. It provided shelter for a large number of people offering “sun, space and green.” It was built

³ M. Harloe, *The People's Home?: Social Rented Housing in Europe and America*, John Wiley & Sons, 2011.

⁴ A. M. Vogts, *Le Corbusier, the Noble Savage: Toward an Archaeology of Modernism*, MIT Press, 2000.

⁵ S. von Moos, *Le Corbusier: Elements of a Synthesis*, 010 Publishers, 2009.

in accordance with the Five Points of Modern Architecture. Finally, the construction of concrete form-worked with timber planks was used, although originally it was planned to use a steel framework, which was too expensive in post-war times. Originally, the building was equipped with a two-storey service area embracing a grocery store, a beauty salon, small services, etc. Halfway up and on the roof plan recreation areas were planned. The concrete structure of the building plays an important aesthetic role. The patterns formed by wooden shuttering can be treated as a façade ornament that is disciplined by the production process.

Concrete has become a means of realising mass architecture and is widely available, the individual character of which has been built in detail in full compliance with the material properties, colour and freely shaped, though disciplined form.

3. Innovative ideas related to the prefabrication of individual dwelling units and structures

In 1967, a model apartment complex was built for the Montreal World Exhibition, designed by the Israeli-Canadian architect Moshe Safdi. Habitat 67 is widely recognised as one of the most distinguishable and spectacular architectural objects in Montreal. His story began with a diploma thesis prepared at McGill University, which, although controversial, was indicated for further elaboration and subsequent implementation⁶.

The Expo 67 subject was “Man and His World,” a quote taken from Antoine de Saint-Exupéry’s *Terre des Hommes* (“Land of Men,” although published under the title “Wind, Sand and Stars”). Habitat 67 was the thematic pavilion visited by thousands of guests from all over the world and served as the official residence of the delegations visiting Montreal.

The complex consisted of 354 identical, prefabricated concrete forms arranged in different combinations, reaching up to 12 stories high. They created 146 buildings of various sizes and shapes, consisting of up to eight units. Originally, the complex embraced 158 flats, but over time, some were merged into larger units. It was designed in a way that combined the features of intensive urban development with the advantages of detached houses. Equipped with terraces and gardens, it provided fresh air and offered enhanced privacy. It had become an illustration of the new lifestyle of people living in increasingly crowded cities around the world.

Habitat 67 became one of the main symbols of the Expo and gained worldwide recognition as a “fantastic experiment”⁷ and “architectural miracle.” Its success was based on an interesting attempt to redefine the city dwelling problem and also on the efficient formula of a co-operative structure. However, contrary to Safdi’s expectations, the implementation of the complex did not provoke mechanisms of mass and affordable housing nor launched a trend of prefabricated, modular constructions.

Slightly different approach to the matter was represented by the metabolists. In 1960, during the arrangements for the World Design Conference in Tokyo, a group of young

⁶ B. Bergdoll, P. Christensen, *Home Delivery: Fabricating the Modern Dwelling*, MoMa New York 2008, vol. 1.

⁷ A. Weder, *For Everyone a Garden. The failed dream of Montreal’s Habitat ’67*, *The Walrus*. 5 (1).

architects and designers, including Kiyonori Kikutake, Kisho Kurokawa and Fumihiko Maki, prepared a manifesto in the form of four essays and designs of vast cities floating in the oceans and capsule towers. Based on the Marxist conception of society, they proposed the realisation of utopian hierarchical structures. These ideas remained in the sphere of theoretical considerations, although individual buildings were built, in which the principles of metabolism were implemented. In 1972 in Tokyo, Kisho Kurokawa designed a residential tower built of capsules. It consisted of 140 units attached to two reinforced concrete communication shafts. These were, in fact, remodelled metal transport containers, in which circular windows were cut. Inside they designed the places for sleeping, working and bathroom. It was assumed that the complex was flexible to the changes (housing capsules could be added or subtracted), according to the different needs of the owners and the expectations of users.

4. Residential Megastructures – avant-garde ideas and their implications

In 1958, Yona Friedman published the manifesto: “Mobile architecture”. He described there a new form of mobility – realised not through buildings but in freedom of choice for the inhabitants. According to Friedman, the mobile architecture was the “dwelling decided on by the occupant” by “infrastructures that are neither determined nor determining”. While the classical architect was designing for „the Average Man”, which was in fact only an image and did not exist, the mobile architecture was intended for “mobile society.” The general architectural problem was, according to Friedman, the underestimation of the user’s role. There was a need for another approach to architectural education, which addressed the whole of the society⁸.

The materialisation of this theory was to be a “spatial city” that allowed anyone to develop his own conception of residence. According to this theory, buildings should:

- touch the ground over a minimum area
- be capable of being dismantled and moved
- be alterable as required by the individual occupant.

The ideas of residential megastructures appeared earlier. In 1925, Le Corbusier presented the revolutionary concept of the reconstruction of the centre of Paris, the Voisin Plan. The author considered a new character of the street, which he summed up in a few critical sentences: “The definition of the street which has held good up to the present day is “a roadway that is usually bordered by pavements, narrow or wide as the case may be”. Rising straight up from it are walls of houses, which when seen against the sky-line present a grotesquely jagged silhouette of gables, attics, and zinc chimneys. At the very bottom of this scenic railway lies the street, plunged in eternal twilight. The sky is a remote hope far, far above it. The street is no more than a trench, a deep cleft, a narrow passage. And although we have been accustomed to it for more than a thousand years, our hearts are always oppressed by the constriction of its enclosing walls”.⁹ Le

⁸ M. Wigley, *Constant's New Babylon: The Hyper-architecture of Desire* 010 Publishers, 1998.

⁹ G. Broadbent, *Emerging concepts in urban space design*, London New York 2005.

Corbusier believed that modern engineers could build anything they want using modern technology. Progress in the development of Paris was, however, hampered by the building law of Louis XIV, which set the height of the cornice twenty meters above the ground level. Hence, the desire for a radical change of approach allowing the implementation of a spatial layout, that did not attach buildings to the streets and provided a wealth of open green spaces located between tall buildings. Recurrent, parallel high-rise blocks embraced identical two-storey flats, with deep loggias serving as the backyard gardens. The enclaves of old buildings left between the new structures would create attractive elements of the urban landscape, seen from carefully designed paths and promenades rising and falling between the buildings. Trails for vehicles would function in the form of motorways crossing the city collision free.

In 1945, Le Corbusier elaborated a reconstruction plan for the city of St-Dié, which was based on the concept of large residential houses located in the green spaces. The project included eight dwelling rectangle units located parallel in open space crossed by pedestrian paths. The concept was rejected and never realised, but the sketches showed the character of the units and the innovative layout of the housing estate. With reference to these plans, Le Corbusier designed the building of the Duval paint factory, destroyed by the Germans. Constructed before the Unit in Marseille, it announced the aesthetic use of the particular rigidity of concrete, expressed functional and material consistency and attracted by colour intensity.

The concepts revealed in the Voisin Plan, St-Dié and later developed in the Cité Radieuse de Marseille were the inspiration for subsequent developments such as the *Za Żelazną Bramą* Estate in Warsaw. In 1961, the Association of Polish architects (SARP) announced a competition for the formation of the western part of the Saxon Axis. It seems that modernist concept proposed by the winning team: Jerzy Czyż, Jan Furman, Andrzej Skopiński was a reaction to the failure of the socialist realism architecture. The authors departed from the rule of placing objects at the border between the street – clearly defined public space -and the garden or yard. Buildings were standing in the open space, having no front and back. The transparent ground-floors connected the green areas, raising the main volume above the ground. The estate was built with the use of one type of apartment house designed on the model of the machine for living. According to the authors' intentions, the high ground floor and mezzanine were designed to provide a service program and self-sufficiency. Eventually, the service function was abandoned. Monolithic reinforced concrete structure enabled to design the functional flats with rational layouts. They built altogether about 220 thousand square-metres of living space located in nineteen sixteen-storey blocks situated parallel, with longer side perpendicular to the Saxon Axis. Restrained use of detail and the severity of the architectural decoration aroused the opposition in Polish reality. The more justified that many of the solutions finally applied were cost-conditioned. The quality of the complex as a whole was adversely affected by the reproducibility and the literal multiplication of units, thus rejecting individualisation of the dwelling place.

With time, the phenomenon of mass production of estates was to reach a scale beyond rational conditioning. In 1959, an urban-architectural competition was organised for the development of land acquired for new development in Gdańsk Przymorze. The idea behind the project was the realisation of functional assumptions for the common accessibility housing co-operatives.

The competition encouraged designers to create the concept of a modern, seaside district of Gdańsk. The winning project of Józef Chmiel and Tadeusz Różański proposed long residential buildings, so-called. wavers. Between 1963 and 1968, 5920 apartments were built, located in 28 buildings. In the first stage there were three and then five eleven-storey prefabricated wavers, of which the longest was 860 m long.

In the typical waver, some of the apartments were accessible directly from the staircase (only about two on the floor), the others were located along open galleries, connecting the adjacent staircases. On the opposite (south) side of the building, there were balconies. Typically, three types of flats were designed: smaller and larger two-room apartments, available from the gallery and four-room – accessible from staircases.

Since the 1960s, prefabricated buildings were commonly built in Poland. Mostly, in terms of spatial quality as well as functional and architectural solutions, they did not offer satisfactory solutions. The reasons lied, among others in the pressure for politically desirable solutions, organisational and economic failures, which led to the degeneration of idealistic conception.

5. Summary. Contemporary tendencies

In contemporary, diverse architectural works, we find inspiration for all ideas improving the human living environment.

In the Parkrand complex designed by MVRDV, small dwellings are grouped into a form, which is integrated into an existing park. The function is distributed in five towers integrated with the patio, which forms a semi-open space, outstretched to the surrounding park. The unconventional shape of the building was inspired by the ideas congenial to traditional modernist architecture.

Bjarke Ingels Group, in December 2016, presented the concept of a multifunctional complex with a total area of over 240,000 square meters in the Los Angeles Art District. The 670 Mesquit project consists of stepped stacked boxes for offices, 250 residential units and two hotels. Located along the river, the complex embraces two interconnected, thirty-story “L” buildings, constructed of open-work concrete cubes with a side of about 14m. The size of the modules allows to customise the interiors of the units to fulfil the needs of future residents, offering a division into floors of varying heights.

The desire to improve the quality of space is manifested both in the traditional categories of city structure (public / private division with clearly defined borders) and in many experimental variants. Prefabrication is generally used to optimise the structure and rationalise the construction process, and the reproducibility of units (residential) is limited by the need of the individual to shape the closest surroundings. Concrete is commonly used as both structural and decorative material.

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