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THE BEGINNINGS  
OF THE STYLISTIC AVANT-GARDE  
IN HOUSING ARCHITECTURE  
AND „THE BUILDING CONCRETE”

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POCZĄTKI AWANGARDY  
STYLISTYCZNEJ W ARCHITEKTURZE  
MIESZKANIOWEJ A „BETONOWE TWORZYWO”

Abstract

The ideas of taylorism and fordism reflected also in rapidly developing European countries. In England, Netherlands and Germany emerged a heated debate regarding the relationship between architecture, art and technique in terms of its enhancement, and consequently- of housing popularisation. What was also taken into consideration was the conviction that by creating more architectural patterns and forms it will be possible to propagate new cultural values. The German housing thought (together with the Dutch one) began to evolve the fastest in the world. Designation the ways of popularising housing was partaken among the academic society (*Bauhaus*) as well as professional field (German Craftsmen Association – *Deutscher Werkbund*). The new aesthetic (called avant-garde) was based on the dialectic of the architectural eclecticism from the late 19<sup>th</sup> century and art nouveau (*Jugendstil*) from the early 20<sup>th</sup> century (P. Behrens, W. Gropius, M. van der Rohe). It was also a consequence of the new methods of construction and technologies fascination (mostly the concrete poured in formwork). All of this resulted in the crystallisation of the basic ideas behind the Modern Movement in architecture, predominantly in forming housing structures based on concrete „material”.

*Keywords: Concrete „material”, Betondorp, Kiefhoek, avant-garde trends in the architecture and the art, prefabrication in housing*

Streszczenie

Idea taylorizmu i fordyzmu znalazły odzwierciedlenie również w szybko rozwijających się gospodarczo państwach europejskich. W Anglii, Niderlandach i Niemczech rozgorzała na ich tle dyskusja o relacji między architekturą a sztuką i techniką w aspekcie jej unowocześnienia, a w dalszej kolejności umasowienia mieszkalnictwa. Wyrażono przy tym przekonanie, że za pomocą nowych wzorów architektonicznych będzie można krzewić nowe wzory kultury. Niemiecka myśl mieszkaniowa (a wraz z nią również niderlandzka) zaczęła wówczas ewoluować najszybciej na świecie. Określenie sposobów upowszechnienia mieszkalnictwa podjęto tam w środowisku akademickim (*Bauhaus*) oraz na niwie zawodowej (Niemiecki Związek

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Twórczy – *Deutscher Werkbund*). Nową estetykę (nazwaną awangardową) oparto wówczas na dialektyce architektonicznego eklektyzmu z końca XIX stulecia i architektury secesyjnej (*Jugendstil*) z początku XX stulecia (P. Behrens, W. Gropius, M. van der Rohe). Wyniknęła ona również z fascynacji nowymi technikami budowlanymi i takimi technologiami (przede wszystkim beton wylewany w szalunkach). Wszystko to doprowadziło do wykrystalizowania się podstaw ideowych Ruchu Nowoczesnego w architekturze, a w szczególności koncepcji kształtowania struktury mieszkaniowej opartej na betonowym „tworzywie”.

*Słowa kluczowe: betonowe „tworzywo”, Betondorp, Kiefhoek, prądy awangardowe w sztuce i architekturze, prefabrykacja w mieszkalnictwie*

## **1. Architecture and civil engineering in the late 19<sup>th</sup> century**

At the end of the 19<sup>th</sup> century, in the age of highly developed architectural functionalism, a new phrase has been coined – „historical costume”. The basic building material in housing construction back then was ceramic brick, wood, stone and hot rolled steel. The main way to provide anti-moisture protection was a proper choice of its location and the depth of its foundation. Occasionally and where was necessary, non-absorbent (non-ferrous sheet metal) or hardly-non-absorbent (natural stone) materials were used. They were replaced with bituminous material, to the point of even covering the whole elevations with it (e.g. Medieval urban sprawl in the Netherlands). Rainwater discharge was conducted by constructing a steep roof covered with ceramic slates, shales, zinc plate and, where necessary, a copper one (in the cases where buildings were constructed for the rich investors). All of this fell in line with the craftsmen culture based on centuries of experience and tradition.

*Crucial changes in architecture occurred in a moment, when modern technical and social processes forced the need for a new architecture style [...]. This shift happened on the turn of the 19<sup>th</sup> and 20<sup>th</sup> century, when took place the first results of the undermining the form-imitation aesthetic [,] the so-called art nouveau and emerging modernism. The process occurred between 1900 and 1914<sup>1</sup>. Indeed, an emerging at that period wave of contestation of the mostly pauperised society was caused by the lack of access to an increasing quantity of various material goods. The reflection of this disproportion was indubitably the elite character of the then architecture.*

## **2. Premises of avant-garde architecture beginning**

Despite the aftermath of war, economic recession and social disturbances, it was in the Weimar Republic where the ideas of fordism and taylorism were spread the fastest. In the first half of the 20<sup>th</sup> century, the quickest modern architectural thought had been developed right there. Therefore, once more since the establishment of the German Creative Association (*Deutscher Werkbund*) was spearheaded the debate concerned with the relationship between

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<sup>1</sup> A. K. Olszewski, *Nowa forma w architekturze polskiej 1900–1925. Teoria i praktyka*, Wydawnictwo Polskiej Akademii Nauk, Wrocław-Warszawa-Kraków 2002, p. 23.

the architecture, the art and technology. The main issues contemplated were finding a way to modernise housing (together with residential architecture), which could lead to its popularisation, and even using it as a tool for spreading culture. For these reasons, the German housing thought evolved the fastest in the world. However, its mainstream remained moderate and conservative. The reason was the fact that the biggest influence on the development of the German housing thought at that time was in the hands of the designers cumulated around 2 centres with the long architectural tradition- the Munich University of Technology and the Technical School in Stuttgart. The general respect that the designers and simultaneously lecturers from Stuttgart had enjoyed resulted in the school nomination and it received an informal but honourable name of Stuttgart School (German: *Stuttgarter Schule*). The lecturers of this school undertook a close cooperation with the staff of Architecture Faculty of the Delft University of Technology (Dutch: *Technische Hogeschool van Delft*). Despite the fact that those centres have rejected historicism as early as the first half of the 20<sup>th</sup> century, they became a target of Aesopian criticism from the proponents of the „aggressive simplicity and lack of beautifications”<sup>2</sup>.

Different ways of popularising housing were searched also in the academic society, which consisted mostly of left-leaning teaching staff (*Bauhaus*). The newly developed aesthetic was called the „avant-garde”. It was based on the dialectic of the architectural eclecticism of the late 19<sup>th</sup> century and the art nouveau of the early 20<sup>th</sup> century (German: *Jugendstil*). Another reason for the birth of the avant-garde was the fascination of new construction techniques (concrete poured in slip formwork), e.g. *High City Rise* in Berlin (L. Hilberseimer, 1924), as well as the 18th floor buildings in the Berlin district Spandau-Haselhorst (M. Breuer, 1928).

The series of exhibitions of residential projects and their realisations – Stuttgart (1927), Brno (1928), Breslau (1929), Karlsruhe (1929), Neubühl (1931), Wien (1932) and Prague (1932) were a reflection of this fascination.

All of this resulted in the crystallisation of the ideological foundation of the Modern Movement in architecture, including the concepts for shaping monofunctional housing areas and fulfilling it with social criteria.

### 3. The universal architectural material

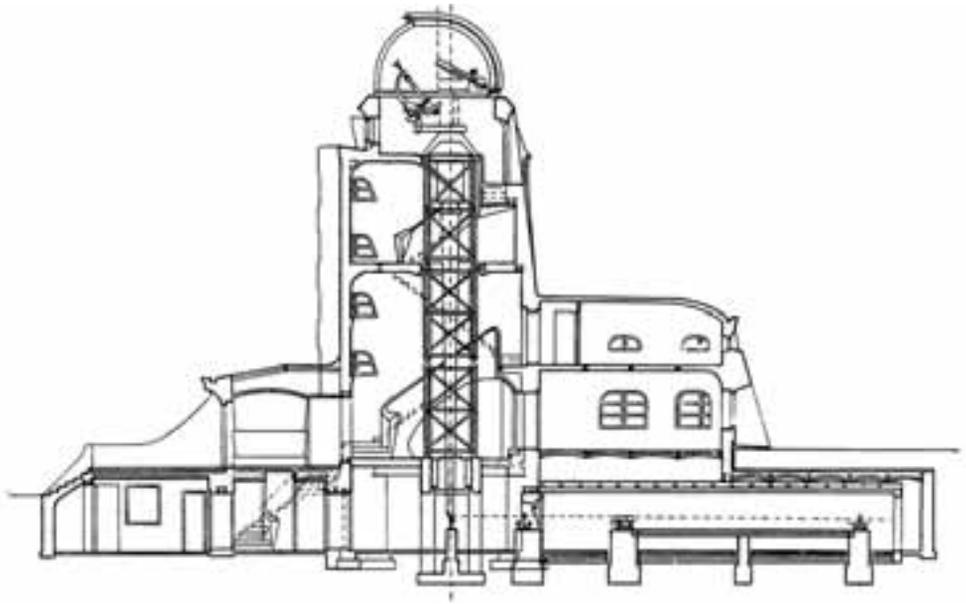
The avant-garde architects put great hopes in the widespread use of concrete and the industrialisation of housing, the subsequent decrease of its cost and its popularisation – *Many architects were very interested in concrete, but to begin with few of them succeeded in building in this material. Oud's early work was also built in brick and stuccoed. After his monumental brick blocks in the Rotterdam districts of Spangen and Tussendijken, Oud designed white housing in Hook of Holland and in the Kiefhoek in Rotterdam South. On the basis of this, he was asked in 1926 to design a block of dwellings fort he international model suburb Weissenhofsiedlung in Stuttgart. There Oud could use concrete for the first time*<sup>3</sup>.

So strong was the pursue of the stylistic emancipation of the avant-garde artists that they did not hesitate even to imitate the techniques and technologies proper for construction, in

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<sup>2</sup> A. Daniels, *Beton totalny*, Forum nr 6, Warszawa 2010, p. 49.

<sup>3</sup> H. Ibelings, *20th Century Architecture in the Netherlands*, NAi Publisher, Rotterdam 1995, p. 40.



III. 1. Astronomical Observatory in Potsdam. Source: [2]



III. 2. Shelter made from turf. Drenthe province (1936). Source: [6]

order to evoke in the observant a sense of uniformity of shape (concrete and reinforced concrete). A perfect example that was built according to the traditional technique (instead of the monolithic one) Rietveld's House in Utrecht (G. T. Rietveld, 1923–1924) and the Astronomical Observatory in Potsdam (E. Mendelsohn, 1921) (ill. 1).

The avant-garde stylistic in the inter-war period constituted – [...] *generally a small percent of the overall architectural output*<sup>4</sup>. It was by no means a result of counteraction from the producers' lobby, nor the professional ostracism, but the civil one (excluding the occasional „excesses” of the extraordinarily rich members of society). Therefore, the only thing that could ensure the survival of the avant-garde aesthetic in architecture, and in particular its popularisation was the economic factor. The possible ways of achieving this goal were considered to be the industrialisation of construction techniques and the widespread use of concrete. It seemed that the most favourable conditions for this occurred in the inter-war period in the Netherlands.

#### **4. The experimental enterprises in european housing shown on example of the netherlands**

The housing conditions for the European population in the 19<sup>th</sup> century could be hardly described as humanitarian (even adhering to the meaning of the word „humanitarian” at that time). The situation in the well-developed Netherlands, which was famous for its dynamic construction movement, was no exception. The Napoleonic occupation of the Netherlands' provinces resulted in their economic collapse. Such state of affairs lasted from the 19<sup>th</sup> century up until the first two decades of the 20<sup>th</sup> century. The most serious case prevailed in the agricultural regions (North Brabant and Zeeland). The pauperisation of the rural communities resulted in the massive migration to the dynamically developing seaport cities – Amsterdam (North Netherlands) and Rotterdam (South Netherlands). The overwhelming majority of these migrants settled down in the primitive households in the suburban areas (dug-outs and shelters). At the end of the 19<sup>th</sup> century above households encompassed vast territories and they became the epidemiological and social hazards (ill. 2).

*In 1899, the Amsterdam census showed that the average dwelling occupancy was five persons and that almost 60 percent of the dwellings consisted of not more than two rooms. One of the most common types in this major group was the back-to-back dwelling [...]*<sup>5</sup>.

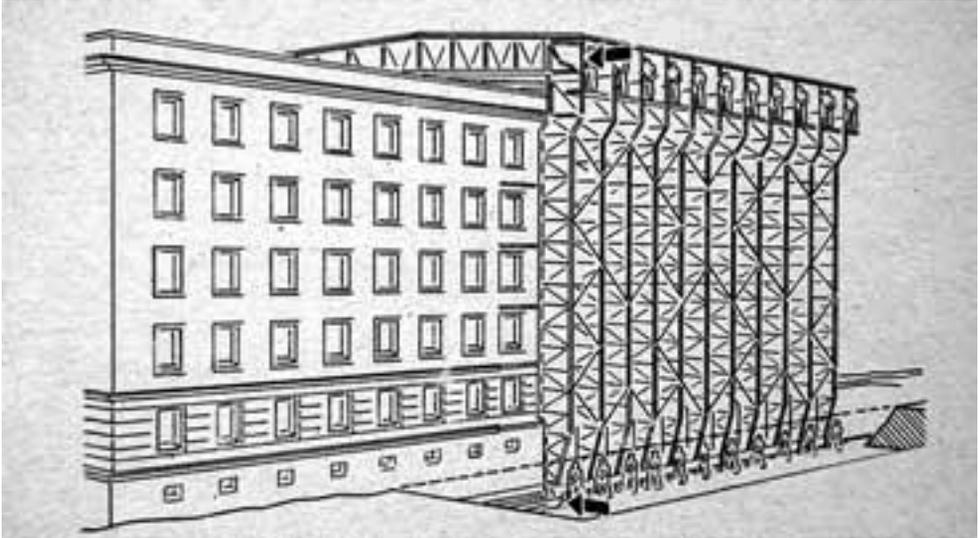
The Netherlands remained unscathed by the I World War. However, a difficult economic situation of the Europe at that period resulted in the collapse of prosperity in this country as well. The rapid rise of construction materials' price was the cause of struggles in Dutch construction industry. Consequentially, the housing industry had collapsed.

In the early 20<sup>th</sup> century in Rotterdam, there was a shortage of at least 10 000 dwellings, which forced the municipal authorities to partake measures in order to decrease the cost of constructing residential buildings.

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<sup>4</sup> A. K. Olszewski, *Nowa forma w architekturze polskiej 1900–1925. Teoria i praktyka*, Wydawnictwo Polskiej Akademii Nauk, Wrocław-Warszawa-Kraków 2002, p. 24.

<sup>5</sup> D. I. Grinberg, *Housing in the Netherlands 1900–1940*, Delft University Press, Rotterdam 1977, p. 28.



III. 3. The machine for houses „production” (E. Neufert, 1943). Source: [11]



III. 4. Kiefhoek residential complex (Rotterdam). Source: [7]

Therefore, the experimental procedures were undertaken, in order to replace the traditional technologies (laid with stone) with the industrialised one (monolithic and prefabricated).

*In Amsterdam [Amsterdam Watergraafsmeer] in the meantime the first large-scale use of concrete in housing was approaching completion: Betondorp, the concrete village, a suburb where eleven different systems of building in concrete were tried [D. Greiner, J. B. Loghem, 1922–1924]. The angular shapes, flat roofs and grey and white painted façades give this neighbourhood a striking appearance which deviates from the usual housing in architecture with brick façades and tile roofs. But Betondorp retained a conventional character as there were made no big spans or projections<sup>6</sup>.*

The Betondorp was the first place in Europe where the large-prefabricated-concrete-panel technology was used. The technology was based on, among others, three-ply external wall elements, installed with a gateway crane, which were operated on rails.

Simultaneously, in the southern parts of Rotterdam, two different experimental residential complexes had been built – de Kossel I (F. G. C. Hulsbosch, 1921–1924) and Stulemijer I (J. M. van Hardeveld, 1921–1925)<sup>7</sup>. That was used in above was a German system of portable formworks (Kossel & Co.). Similar undertakings were also held in other Dutch cities (Den Bosch, Haga, Utrecht).

## **5. Experimental enterprises in housing shown on the example of the other european countries**

In Germany, the first buildings built of large and spatial prefabricated panels arose in the Splanemann residential complex in Berlin-Friedrichsfelde (M. Wagner, 1926–1930). Vertical partitions were made from 7 tone concrete slabs (7.5 x 3.5) formed on the construction site. However, the ceilings basements, walls and carports in these buildings were made in traditional technique. Obligatory use of cranes on the construction site, difficulties related to fabrics installation and the high cost of creating them (almost-artisanal production) had increased the expenditure to such level, that the decision was made to stop any further actions in that area.

The matter concerning the prefabrication was also important in the discussion of labour housing in the Soviet Union (1930–1933). In several cities, under a careful supervision of the German architects and civil engineers, a polygon production of high-rise elements using pumice concrete (smelter pumice slag) was started up. These elements were single-layered, external partitions 20 cm thick, plastered on both sides. They were created to replace 46 cm thick, triple-layered walls made of full brick with an air gap. Despite the expectations, the new partition had bigger thermal permeability than the one made of bricks (more than 70%). It resulted in its perpetual sogginess and the loss of thermal properties. The acoustic parameter proved to be equally detrimental. Similar physical properties of the vertical external brick partitions and those made with the industrialised technique could be achieved only by

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<sup>6</sup> H. Ibelings, *20th Century Architecture in the Netherlands*, NAI Publisher, Rotterdam 1995, p. 40–41.

<sup>7</sup> E. van der Hoeven, *De Kiefhoek in 1930*, S. Cusveller (red.), *De Kiefhoek. Een woonwijk in Rotterdam*, V+K Publishing, Laren 1990, p. 70.

the use of prefabricated elements made of pumice concrete, which was almost twice as thick (at least 44 cm).

The effort, partaken by the Western European countries during the inter-war period, in the field of prefabrication of high-rise elements, never survived the experimental phase (Finland, France, Germany).

## **6. Thermal and hygroscopic aspects of building compartments and avant-garde trends in architecture**

The issues related to the thermal resistance of a mixed-structure building compartments (including the reasons behind its dampness and the stress distribution inside) had been known for ages. Therefore, it was impossible to prevent the side effects from occurring inside (loss of attributes). They were visible primarily in places where economic circumstances prevailed over the established construction practice. In the period of avant-garde trends development, they emerged in architecture, among others, during the building process of the Kiefhoek residential complex in Rotterdam (ill. 4). The decision concerning the range of this investment was made by the Housing Department. Unfortunately, its size turned out to be disproportionately larger and the funds that were assigned were insufficient. The cuts, which were undertaken in the wake of this fact, turned out to have considerable consequences. Founding the buildings on pad footings, together with the insulation of flat roofs was abandoned and the width of the internal layer of the curtain wall was reduced. It seems that the part that the opportunism of the creator of this residential complex took, especially the desire to establish his position in Modern Movement in architecture, was substantial. Nearly a year after completing the construction works on the external walls of the buildings appeared wide both- vertical cracks (1 floor) and horizontal one (between 1 and 2 floor). The vertical cracks appeared as a result of the uneven settlement of the building on the non-bearing foundation (peat and partially loamy base). Horizontal cracks, however, were formed as a consequence of thermal stresses occurrence. The origin of it turned out to be the flat roof, which had low thermal resistance. Therefore, brick vertical partitions were shrinking in cold and expanding in warm months.

At the end of 19<sup>th</sup> century, in most European countries, the German solutions were the benchmark in engineering practice. In the 20s and 30s of the next century a triple-layered brick wall (German: *Reichsformat* – 25, 12 and 6,5) with air gap was commonly known and used in Germany (38, 6 and 12). The rate of coefficient of heat transfer this kind of partition (u) was equated to 1. (100% – 1,27). The condensation of the water vapour (dew point) appeared in cold months in the structural part of a wall, near the above-mentioned air gap. In the warm part of the year, this section of a wall was drying out.

The buildings in the Kiefhoek residential complex were built with Friesian brick (Dutch: *Waalforma* – 22, 11 and 5,5). The vertical curtain partition was made from two brick layers of the same width, separated by an air gap (11, 5 and 11), whereas the width of a gable end amounted 1,5 of a brick (22 and 11). The rate of coefficient of heat transfer in the first and the second case surpassed significantly the „model” one (respectively about 62% and 31% higher). On the other hand, the one in the flat roof came out as completely unprofitable (more than 123%). As a consequence of this, the vertical walls were completely and permanently damp and secondarily the accommodation spaces. It was so tedious, that the flats

were incessantly (and unsuccessfully) ventilated by tenants, even in winter. The „flat roof” was in this case based on wooden beams layered with the minimal inclination, covered by beams and felt (3%). Wooden soffit with reed mat were fasten, and then rough casted with lime mortar. Thermal insulation was made from a little air gap widening towards field’ of roof drainage (gutter).

Due to saving and stylistical (architectural) experience in avant-garde projects the attic was usually ignored and zinc alloy-plated sheet steel or small hood were built instead (0.5). This kind of roofing shape could not protect its exterior walls from inundation by precipitation. This condition was getting worse in the case of a snowy winter. The lack of an attic was also creating serious danger due to ease of fire spread on built-up roof between residential sections.

The dampness of an external construction partition in „avant-garde” buildings appeared even in places, where the traditional techniques were applied, for instance in Bruchfeldstraße estate in Frankfurt-am-Main. Also, in this case (and similarly to the buildings in Kiefhoek), the negative conditions were due to using the flat roof (incorrect usage of its insulation) above the last residential floor, instead of creating roof void (insulating air gap). Everything mentioned above led to a faster „concrete architecture” degradation.

## 7. The avant-garde dogma in architecture and housing

„Flat rooftop”, understood as roofing a building with flat roof, in the avant-garde architecture grew into an ideological dogma. *Le Corbusier in his own way sums up the results of the international survey* [concerning the „flat rooftops”]: „*the flat rooftop is significantly cheaper and does not require the maintenance*”, because the flat rooftop is nothing other than the realisation of the puristic vision concerning the typical form which embraces all the regions regardless of the climate and economic factor<sup>8</sup>. The situation has not been changing despite the professional opinions and overwhelming criticism coming from various architects of the cubistic and puristic branches – *Herman Muthesius, the co-founder of Werkbund, wrote in 1927: (...) The shape of a cube, which reduces buildings to the simplest geometric forms, plays a major role in the architecture that is promoted these days (...) [...]. Why defending the flat rooftop which is necessary today for formal reasons with the cheapness arguments? The essence of construction based on cubes has nothing to do with practicality*<sup>9</sup>.

The avant-garde housing was characterised by chronic numerous utility nuisances- insufficient thermal and acoustic isolations, moisture, low cubage of the rooms etc. It was for these reasons that the avant-garde housing not only met with social disregard, but even social contempt – [In the Pessac estate near Bordeaux] *A fraction of continuous windows, which assured [...] mutual intermingling of the internal and external spaces, was walled up, [...], various kinds of sheds were build* [similarly to, for example, the Kiefhoek residential complex], *the polychrome faded or was covered with a layer of paint [...], villas, which matched*

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<sup>8</sup> J. Wujek, *Mity i utopie architektury XX wieku*, Arkady, Warszawa 1986, p. 137.

<sup>9</sup> *Ibidem*, p. 137.

*the taste of petit bourgeois, were built in the direct vicinity, and consequently, the whole neighbourhood had degraded*<sup>10</sup>.

Undoubtedly, an important issue connected with the avant-garde housing architecture was its monotony, which stemmed from the repetitiveness of the applied artistic resolutions. The avant-garde architecture seemed to be interesting only if the historical buildings constituted its background.

*The artistic value [...] in the international movement exists when it „borrows” a beautiful act of a young woman, or a castellated architecture of a traditional building*<sup>11</sup>. The attempts to resolve this issue were made, by employing such means as colour contrast and drastic chiaroscuro, in some cases using a range of bright colours, or constructing buildings 3-floor-high. It reached positive results in those cases, where the buildings incorporated only small areas and the complexes of such buildings were scattered.

## 8. SUMMARY

The conception of the avant-garde architecture sanctioned the application of temporary solutions, part of which constituted the concrete as a material. Paradoxically, previously, the use of concrete opened limitless possibilities of artistic creation for the architects, as well as granting them a guarantee for achieving desirable aesthetic and strength parameters – *One of the fundamental myths of modern architecture is the conviction that the development of the modern movement constitutes the inevitable consequence of expression, evoked by the new techniques for construction. [...] It turned out that the material is merely a material, it does not possess any meta-physical properties, and whether it transforms into a granary, Savoye villa or converted into the Ionic column, depends solely on its usage*<sup>12</sup>.

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<sup>10</sup> Syrkus H., *Ku idei osiedla społecznego 1925–1975*, PWN, Warszawa 1976, p. 149.

<sup>11</sup> Wujek J., *Mity i...*, *op.cit.*, p. 137.

<sup>12</sup> *Ibidem*, p. 162.