Ana Ivanovska Deskova, Vladimir Deskov, Jovan Ivanovski

Constructing the City of Solidarity: Alfred Roth's Elementary School in Skopje

Modernity, Education, Elementary school, Alfred Roth

/Abstract

In 1963, Skopje suffered an earthquake of catastrophic proportions that left the city reduced to rubble. What followed was a case of immense international solidarity. For more than a decade, aid came in abundance from both sides of the Iron Curtain. In a short but intense period of approximately 15 years, the city underwent a process of reconstruction that entirely changed its appearance and the quality of living. In this context, with a strong belief in the importance of high-quality modern education, the Swiss government donated the design, financed the construction and equipped an exemplary school building, designed by Alfred Roth and named after the renowned Swiss pedagogue Johann Heinrich Pestalozzi.

/Authors

Ana Ivanovska Deskova
Associate Professor, Faculty of Architecture, Ss. Cyril and Methodius University in Skopje - ana_ivanovska@yahoo.com

Holds a PhD from the Faculty of Architecture in Skopje, University "Ss. Cyril and Methodius". Her main research interest is the Modern Architecture in Skopje, in particular, Skopje's post-earthquake renewal. Author of numerous research projects and exhibitions on architecture. One of the authors of the Macedonian national Pavilion at the 2008 and 2014 Venice Biennale of Architecture. Member of the curatorial advisory board of the Museum of Modern Art exhibition – "Toward a Concrete Utopia: Architecture in Yugoslavia, 1948–1980".

Vladimir Deskov
Teaching assistant, School of Architecture and Design, University American College Skopje - deskov@uacs.edu.mk

The focus of his research interest is the city of Skopje and its architecture, and the potentials of architecture as an effective cultural medium and as a tool of modernization. Author of numerous research projects and exhibitions on architecture. One of the authors of the Macedonian national Pavilion at the 2008 and 2014 Venice Biennale of Architecture. Member of the curatorial advisory board of the Museum of Modern Art exhibition – "Toward a Concrete Utopia: Architecture in Yugoslavia, 1948–1980". Currently a PhD candidate at the Faculty of Architecture in Zagreb.

Jovan Ivanovski
Associate Professor, Faculty of Architecture, Ss. Cyril and Methodius University in Skopje - jovanivanovski@gmail.com

Holds a Master of Architecture from Dessau Institute of Architecture and PhD from the Faculty of Architecture in Skopje, University "Ss. Cyril and Methodius". Practiced architecture in offices in Switzerland and Germany. Author of numerous research projects and exhibitions on architecture. One of the authors of the National Pavilion at the 2006, 2008 and curator of the Macedonian national Pavilion on the 2014 Venice Biennale of Architecture. Member of the curatorial advisory board of the Museum of Modern Art exhibition – "Toward a Concrete Utopia: Architecture in Yugoslavia, 1948–1980".

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Skopje, the city of solidarity

In July 1963, the city of Skopje was struck by an earthquake of catastrophic proportions. It took more than 1.000 lives, more than 3.000 people were injured, while 75-80 % of the built stock was either demolished or damaged beyond repair. What followed the unfortunate event was a case of unprecedented international solidarity. More than 80 countries worldwide gave their donations in many different forms – from the most needed immediate supplies, financial aid, different kinds of intellectual help and expertise, all the way to artworks or architectural design.[1] The trauma of the natural disaster became a trigger for radical transformation. In fact, the previously peripheral city of Skopje, suddenly became a place in which international architects and planners worked side by side with professionals from Macedonia and other parts of former Yugoslavia [Fig. 1].

The position and reputation of Yugoslavia on the global political scene as a founder of the Non-Alligned Movement enabled and led towards immense help and guidance by the United Nations.[2] The UN appointed Ernest Weismann (chief executive of the UN's Housing and Town Planning Section, pre-war CIAM member and Le Corbusier's co-worker in the late 1920s) as a Chairperson of the

1 The news about the earthquake spread immediately and much needed help started to arrive, initially in the form of the most needed supplies (shelters, food, sanitary supplies, financial aid, etc). The type of international aid changed its character according to the changing needs of the city. Countries like the USA, United Kingdom, Scandinavian countries, Switzerland and Poland among others donated temporary and/or permanent buildings, most of which are still in use today. New prefabricated residential settlements started to emerge (Kozle, Vlae, Gjorče Petrov, Deksion, Butel etc.), thus expanding the territory of the city. Cfr. Blagoje Popov, Risto Galić et al. eds., *Skopje, grad na solidarnost* (Skopje, city of solidarity) (Skopje: NIP Nova Makedonija, 1975) and *Skopje 26.07-02.08.1964. Sredba na solidarnosta* (Skopje 26 July-02 August 1964. A meeting of solidarity) (Skopje: NIP Nova Makedonija, 1964).

2 Cfr. Vladimir Kulić, Maroje Mrduljaš, and Wolfgang Thaler, eds., *Modernism In-between: The Mediatory Architectures of Socialist Yugoslavia* (Berlin: Jovis, 2012) and Maroje Mrduljaš and Vladimir Kulić, eds., *Unfinished Modernisations: Between Utopia and Pragmatism* (Zagreb: UHA/CCA, 2012).

Fig. 1

Skopje earthquake: The Railway Station (Source: Museum of the City of Skopje)

International Consulting Team in charge of the reconstruction of Skopje. The Polish urbanist Adolf Ciborowski was appointed project manager of the developing Master Plan. He was joined by a team of local and international experts, including Constantinos A. Doxiadis Associates from Greece, Polservice from Poland, Wilbur Smith from United Kingdom etc. In 1965, at an invited international competition jointly organized by the UN and the Yugoslav government, the Japanese architect Kenzo Tange won the majority of the prize for the reconstruction of Skopje's city center.[3] As of 1964, under the auspices of the UN, Skopje was transformed into a field of international cooperation and testing grounds for many late-modern urban and architectural paradigms. The relatively short but intense period of approximately 15 years brought the undoubtedly most powerful architectural segment within Skopje's recent architectural history. The urgency of the post-earthquake condition of Skopje and the specific phenomenon of rapid construction could be compared to the post-World War II situation in many European cities - the need for rational solutions, the use of industrially produced elements and economical construction methods. However, the ambitions of the UN were high – to promote Skopje as an exemplary global city that will outdo the current antagonism and ideological divisions between the two opposing blocks. They coincided with the ambitions of the Yugoslav authorities – to build a (late) modern city, in line with the major contemporary architectural tendencies, at times completely oblivious of the local social, cultural or economic context.

Rebuilding public education: the condition after the earthquake

The earthquake devastated the city to a great extent. Even though the housing fund suffered the greatest damage (150.000 citizens out of 198.000 became homeless), all public buildings suffered a great deal as well. Almost half of the schools (primary or secondary education) were either demolished or with a questionable possibility for repair.[4] The devastation rendered the basic functioning of many institutions questionable. On the other hand, it created a specific opportunity - the ability to make a thorough assessment of the condition and needs, and plan the city - both the residential settlements as well as all the public facilities that accompanied them. All of this by much higher standards than before.

The process of the post-earthquake renewal of Skopje, which lasted until the early 1980s when all the financial funds had been exhausted, greatly improved

3 More information about the process of post-earthquake renewal of Skopje in Derek Senior, *Skopje Resurgent: The Story of a United Nations Special Fund Town Planning Project* (New York: United Nations, 1970) and Ines Tolic, *Dopo il terremoto: la politica della ricostruzione negli anni della Guerra Fredda a Skopje* (After the earthquake. The politics of Skopje reconstruction during the Cold War Era) (Reggio Emilia: Diabasis, 2011).

4 Before the earthquake there were 34 primary schools in Skopje, with over 36.000 students, many of which had been working in adapted buildings, only partially suitable for the purpose. The school network was unevenly distributed and the gravitational radius was often bigger than 600 m. The earthquake destroyed 14 school buildings; only 2 of the remaining buildings had minor damages, whereas the rest required major repairs. Similar was the condition with the network of secondary schools. Out of the 30 secondary schools, 15 were demolished by the earthquake. More about the extent of damages and the condition after the earthquake in *Skopje, urbanistička studija* (Skopje, urban study) (Skopje: Zavod za urbanizam i arhitektura, 1964), 107, 110 and Popov, Galić et al. eds., *Skopje, grad na solidarnost*, 198-201.

the living standard. Apart from housing, one of the priorities was education.[5] Therefore, significant investments were made, mostly provided by the Fund for Renovation and Construction of the city. The construction of educational facilities, with an almost uninterrupted intensity, lasted throughout the whole period of the post-earthquake renewal. In the first decade (1963-73) the number of primary schools grew up to 160 school buildings, with a capacity of approximately 64.000 students. Many of the buildings were prefabricated or had a temporary character. The spatial distribution of the educational facilities was according to the new city plan. The city center and the newly built residential settlements were equipped first, and later, at the end of the 1970s and early 1980s, the construction of new school buildings spread to the outskirts.

The Johann Heinrich Pestalozzi Elementary School

It was very soon after the earthquake that the Swiss government decided to help the affected city with an elementary school. The federation, the cantons and private citizens helped in rising funds for the construction of a school building and, at certain point, 1.6 million Swiss francs were collected. The City of Skopje provided the building plot, as well as the costs in excess of the amount raised. The joint costs reached amount of 3 million francs.

Shortly before World War II, in the times of the economic crisis and the slowdown in the field of social housing, school architecture was one of the central concerns of the Swiss architectural avant-garde. This question gained even more relevance and intensity following the Second World War, due to the global shortage of educational facilities.[6] Having in mind the strong belief in the importance of high-quality education for the development of young individuals, it was of no surprise that the Swiss government decided to donate the design, finance the construction and to a large extent equip an elementary school that would be named after the famous Swiss pedagogue and educational reformer Johann Heinrich Pestalozzi (1746-1827).[7]

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5 Public education as one of the priorities goes in line with the general policy in Yugoslavia after the Second World War. Having in mind the high level of illiteracy (before and immediately after the war) major efforts were directed in the field of education. The condition was different in different parts of Yugoslavia – the percentage of illiteracy was lowest in Slovenia and highest in the regions which had remained longest under Ottoman domination like Macedonia and Bosnia-Hercegovina. As an illustration, before the war, the average percentage of illiteracy in Macedonia was 67.5%; 81.7% of the woman population was illiterate and none of the existing schools were on the native language.
More information in Vera Tomich, *Education in Yugoslavia and the New Reform: The Legal Basis, Organization, Administration and Program of the Secondary Schools* (U.S. Department of Health, Education and Welfare. Bulletin, 1963, No. 20.OE-14089), https://www.eric.ed.gov/?id=ED544059

6 In 1951, the International Union of Architects created the School building commission as a special body that would study the architecture of the educational facilities, chaired by Alfred Roth. By the mid-1950s several exhibitions on the topic were prepared. The reports, studies and recommendations were published by UNESCO and became reference in this field. In July 1957, an International Conference for Public Education was held in Geneva – a joint collaboration of the Bureau International de l'Education and UNESCO. Representatives from more than 70 countries participated the Conference and discussed the present (of the time) and future needs in the field of education and the immediate measures that had to be taken.

7 Johann Heinrich Pestalozzi (1746-1827) was a Swiss social reformer and educator, whose theories laid much of the foundations of the modern education. He believed that the education should be democratic and available to everyone, that every individual has ability to learn and therefore right to education.

The design process started as early as the spring of 1964 and it was awarded to the renowned Swiss architect Alfred Roth (1903-1998).[8] Roth was an architect who throughout his career believed in education as an instrument of both human and social emancipation. At the time, he was teaching at the Technical University of Zürich and had already pursued a career in the field of modern education and school buildings. As early as 1932, at the *Das Kind und seine Schüle* (The Child and his School) exhibition in Zürich, Roth presented his school project where for the first time he introduced the concepts of double-sided lighting, access to indoor staircases instead of corridors, square-shaped classrooms, double-sided ventilation, etc. In 1950 he published the book *The New School - Das Neue Schülhaus - La Nouvelle École*, a pioneering study on school planning and architecture, followed by the 1953 exhibition *The New School* in the Kunstgewerbemuseum in Zürich. The exhibition was based on the same principles as the book: the first part was theoretical and was organized in sections on the communal school planning, the basic pedagogic requirements, the form of the school building, the classroom unit, equipment, rationalization of the construction and art in school. The main part contained examples of school buildings of various pedagogical types and sizes in Switzerland and other countries; and in the hall, a classroom in scale 1:1 was erected and fully equipped.

Given Roth's expertise on educational facilities, it is not a surprise that the Swiss government assigned him the task to designing a school in Skopje. The first agreements between representatives from the City of Skopje and Alfred Roth started already one year after the earthquake, in July 1964. On September 9, 1966, the agreement was officially signed, whereas the construction phase started in 1967 and lasted throughout 1967 and 1968. It was a collaborative effort between the Swiss architect[9] and engineers, the local construction company Beton and the city administration.[10] The school was officially opened on January 12, 1969, the birthday of Pestalozzi, a ceremony attended by high-ranked political figures, among which the Swiss ambassador in Belgrade [Fig. 2].

The building plot of the school is irregular in shape and never reached the full designated area due to unresolved property and legal issues with the neighboring properties. The building plot for the school was assigned by the city of Skopje and coincided with the position of the Elementary School Petar Petrović Njegoš – one of the school buildings demolished in the earthquake. Today, the school is located at n. 3 of Apostol Guslarot Street in Skopje. At its southern and

8 Alfred Roth (1903-1998) was a Swiss architect, member of CIAM and one of the most prominent representatives of the Swiss modern movement. He graduated at the Federal Institute of Technology in Zürich (ETH) at 1926, under the guidance of Karl Moser, who introduced Roth in Le Corbusier's studio. With Le Corbusier, Roth worked on the competition project for the League of Nations Palace in Geneva and later, in 1927 he took under supervision Le Corbusier's houses in Weissenhofsiedlung in Stuttgart. The experience with Le Corbusier put him in touch with the artistic and avant garde community of the pre-World War II Europe. About this period of his life, cfr. Alfred Roth, *Begegnung mit Pionieren* (Beginnings with the Pioneers) (Basel: Birkhäuser, 1973) and Alfred Roth, *Zwei Wöhnhäuser von Le Corbusier und Pierre Jeanneret* (Two houses from Le Corbusier and Pierre Jeanneret) (Stuttgart: Karl Krämer Verlag, 1927).

9 From June 1966 until July 1967, Radomir Lalović, architect from Skopje, worked on the development of the design together with Alfred Roth in his studio in Zürich.

10 Alfred Roth, *The Johann Heinrich Pestalozzi Elementary School*, box 174 (architecture), boxes 175 and 176 (details), in Assembly of Idadija Municipality Fund, Archive of the City of Skopje.

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western side, it is oriented towards streets with low frequency, while on the east and north it borders private properties. The main entrance in the building is at its western side. The school is located in the wider area of the Skopje city center, in the residential settlement Bunjakovec, an important segment of the city built during the 1920s which suffered significant damages in the earthquake.

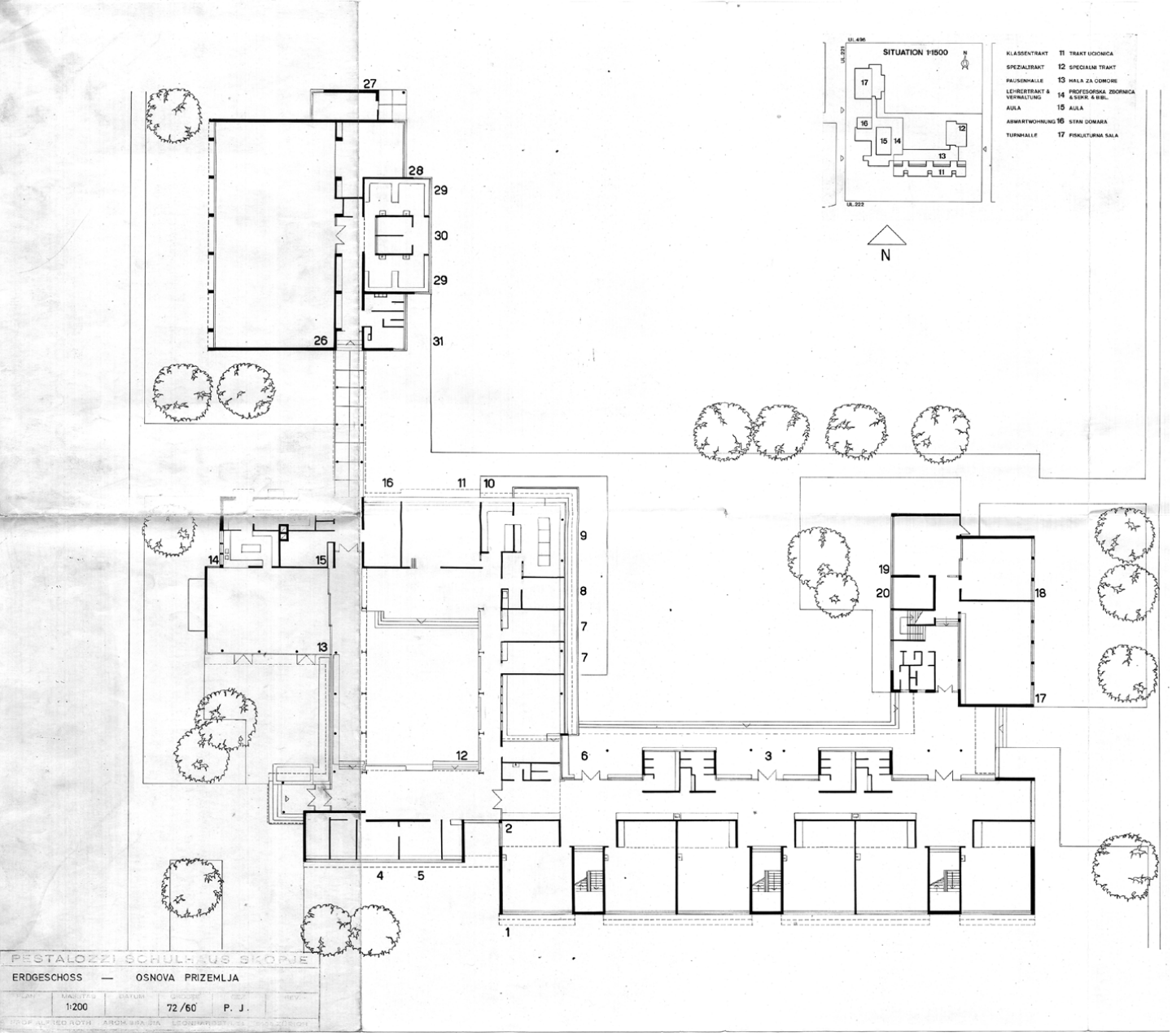
Modern pedagogy principles translated into new spatial organization

Alfred Roth believed that education was an instrument of human and social empowerment. He based his school architecture on the modern principles of education, and it is precisely the principles of Pestalozzi,[11] the great pedagogue and pioneer of modern education, that he incorporated into his schools, thereby shifting the standards for school buildings. With the Johann Heinrich Pestalozzi Elementary School, Alfred Roth introduced his beliefs to Skopje concerning education and an educational facility designed accordingly. Being one of the first public buildings erected in Skopje after the earthquake, Roth's school triggered further research in the field of educational buildings' typology. Moreover, it is important to note that there are very few public buildings of permanent character both designed and fully built in Skopje before the beginning of the 1970s.

11 Pestalozzi strived for education that would build every individual into a healthy, well-developed, complete person, which would be involved and contribute to the society. The school education should be a continuation of the home education; the school and the classroom should provide the same sense of security and intimacy that the child is used to at home; the wider environment should be a vital part of the child's education – these are some of the principles that the Swiss pioneer of modern education set over 200 years ago and are still found valid today. See Alfred Roth, *The New Schoolhouse* (Zürich and Stuttgart: Verlag für Architektur, 1966), 10-12.

Fig. 2

Elementary School Johann Heinrich Pestalozzi, View towards the classrooms (Source: Jovan Popovski, *Skopje 1963-1983* (Skopje: Partizanska knjiga, 1983).)



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Apart from the Archive of the City of Skopje (1966-68), the National Archive (1967-69) and the building for the Communist Party of the Socialist Republic of Macedonia (1968-70), there are only three school buildings with very high architectural quality: Alfred Roth's Johann Heinrich Pestalozzi Elementary School (1967-69), the Mirče Acev Elementary school (1967) by Blagoja Micevski and the Pedagogical High School Nikola Karev (1968-70) by Janko Konstantinov. The last two buildings won in 1967 and 1969 respectively the prestigious award Borba for architectural achievements. Followed by several other school buildings in the early 1970s, they all attempted to introduce new typologies and improve the design of school buildings, leaving behind the linear arrangement of classrooms multiplied along a linear corridor.

Throughout his career Roth tirelessly fought against formalism in architecture, his beliefs and inclination towards functionalism being reflected in his school architecture. According to Roth's understanding, to avoid formalism, the building ought to be a functional response to the pedagogical demands; the design of the building should not serve its own interests, but should derive from the essence - the function it is supposed to satisfy. The internal functioning of

Fig. 3
Elementary School Johann Heinrich Pestalozzi, Ground Floor plan (Source: Archive of the City of Skopje)

the facility ought to be the primary concern, whereas the exterior - its carefully designed visible expression.

Related to this, the Skopje school building is designed as an ensemble consisted of several different detached segments, each corresponding to its function and the specific pedagogical needs: the three-storey classroom wing, the two-storey special room wing (laboratories), the common room building with an aula and the gymnasium. The main functional units are connected either by closed corridors or open, covered porches. Some of the important aspects of the overall spatial organization include a proper orientation of each segment according to the activity taking place inside, good quantity of sunlight, separation of quiet and loud zones, adjustment of the space to the size of the children, close contact of the classrooms with the open space etc. The disposition of the volumes creates the space for sports ground in the middle of the site, accessible for people from the neighborhood **[Fig. 3]**. All these aspects, starting from the size and disposition of the building plot, the disposition of the school building, the flexibility of the space, the desired characteristics of the class unit (size, orientation etc.) are described in Roth's book The New Schoolhouse.[12]

Children in focus, program and space

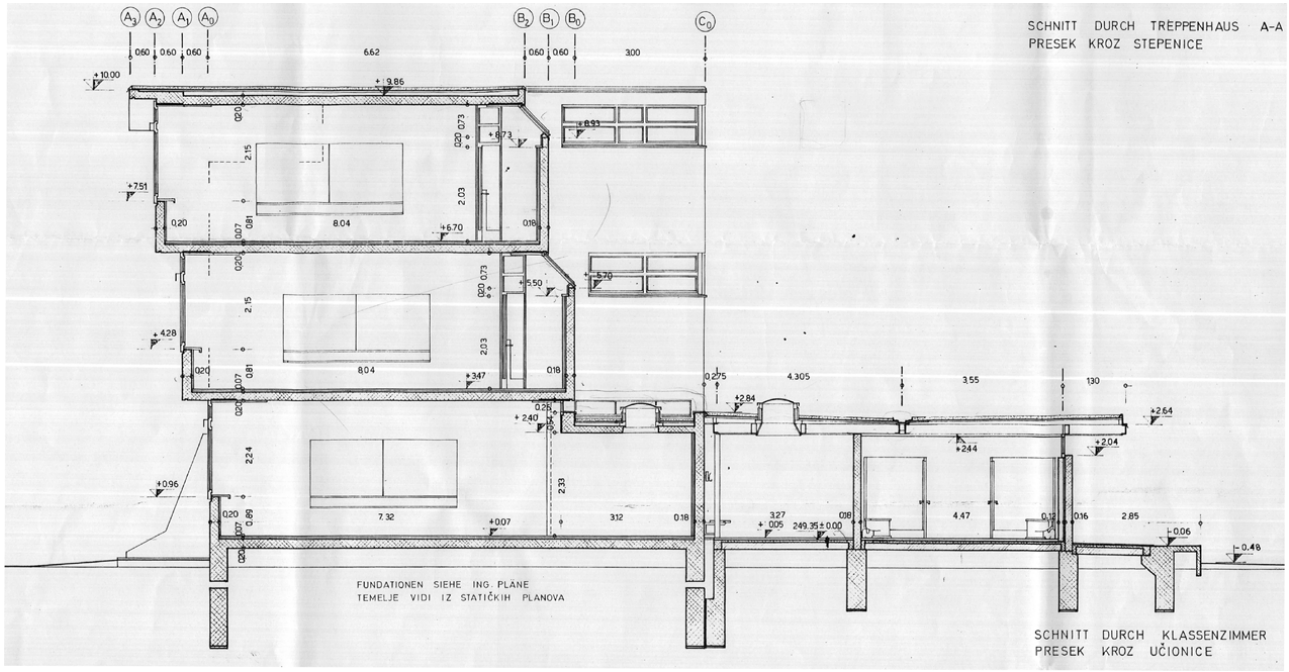
(A.) The Classrooms Wing

The three-story classroom wing is based upon the corridor-less concept of designing school buildings that Alfred Roth introduced as early as 1932.[13] It contains 18 spacious classrooms (8.2x8.2 m), grouped in three groups of two, each with a southern orientation and equal amount of daylight. Each group has a separate staircase (located between two classrooms), a separate entrance and wardrobes, thus avoiding high concentrations of children during the breaks. The main idea of the concept was to eliminate the corridors on the upper levels and to provide the desired double-side lighting and cross-ventilation for the classrooms. The conventional, one-sided light source is considered insufficient. Having in mind the importance of the daylight for children, all the classrooms are oriented towards south; each floor is slightly cantilevered towards south, which enables rear, complementary roof-light from the northern side. This also creates the specific, recognizable profile of the classroom wing **[Fig. 4]**.

According to Roth, the square shaped classroom is better than the rectangle one; it gives larger freedom compared with the long and narrow spaces and enables rational organization and greater flexibility for various configurations, depending on the nature of learning or teaching. Modern education requires maximal differentiation of the space – niches, indentations, and corners;

12 Cfr. Roth, *The New Schoolhouse*.

13 Roth promoted this concept of school building on several occasions: in a competition work from 1932 for a combined elementary and secondary school in Zürich; for the first time implemented at the Holy Spirit Primary School in Berkeley, St. Louis, USA; later in 1961-62 in the Riedhof Schüle in Zürich, and later in Skopje 1965-69. See Alfred Roth, *Alfred Roth: Architect of Continuity* (Zürich: Waser Verlag, 1985), 102



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wherever this is not possible, a larger floor area is needed to compensate for the lack of differentiation and allow flexible teaching.[14] The youngest children need maximum flexibility. Therefore, they are located on the ground floor, in classrooms with an additional hobby alcove and nearest to the schoolyard.

Immediately, from the entrance of the school, it is obvious that the building is intended for children, completely downscaled to their size in the dimensions of the corridors, stairs, entrances etc.

(B.) The special room wing/Laboratories

The two-story wing with laboratories and specialized cabinets is situated on the eastern side of the complex, connected with the classrooms through a covered porch. In this part of the school, Roth literally materializes Pestalozzi's commitment for special education where the children will learn about things through their senses.

The foundation of Pestalozzi's doctrine was that the education of a stable personality should be organic and comprised of three aspects: intellectual (developing the human spirit), physical and moral (raising a confident and responsible person), or, in his words, the development of 'head, heart, and body' should be integrated. If an aspect is missing, the development would be one-sided, and the personality unformed/uncompleted. Therefore, the purpose of education is to release the creative energy of a child; to foster the development of one's inherent abilities through activity, through encouraging manual work and exercises, rather than through exclusively intellectual instructions. The child is no longer

Fig. 4
Elementary School Johann Heinrich Pestalozzi, Section through the classrooms (Source: Archive of the City of Skopje)

14 Cfr. Roth, *The New Schoolhouse*, and Herman Hertzberher, *Space and Learning*. Rotterdam: 010 Publishers, 2008.

a passive object in the hand of the educator, but an independent and active subject expected to actively participate in the educational process.

This special rooms wing is comprised of a drawing atelier and handicraft room (connected to the kitchen) on the ground floor, two workshops for technical education in the basement, and on the upper floor – two natural science classrooms, both with ascending seats, a large chemistry laboratory and a photo laboratory with a dark room and built-in ventilation.

Roth designed these highly equipped laboratories in order to give children the opportunity to have a real, direct contact with the teaching material, especially in the field of natural sciences. He was deeply convinced that words should not stand before personal observation and reflection. Therefore, the classroom/workshop aims to be a space where different experiences are gained and all the senses are involved in the cognitive process. Much of the equipment installed in this part of the school came as a donation from Switzerland – the wooden parts for the two auditoriums, the equipment for the physics laboratory (a gift from the School for Metal workers in Winterthur) and the complete equipment for the chemistry laboratory (gift from the chemical industry from Basel).

(C.) The Ceremonial Hall - Aula

The multi-purpose hall is located centrally and accessed directly from the main school entrance on the west side. The main element in this section is the large aula, adjacent to which is the refectory with an open kitchen. The possibility for a flexible connection between the aula and the refectory creates an auditorium of up to 1.000 seats. The rest of the program in this segment consists of: the school library with two study rooms, the teacher's offices, a small administration, ambulance and the school-keepers apartment **[Fig. 5]**.

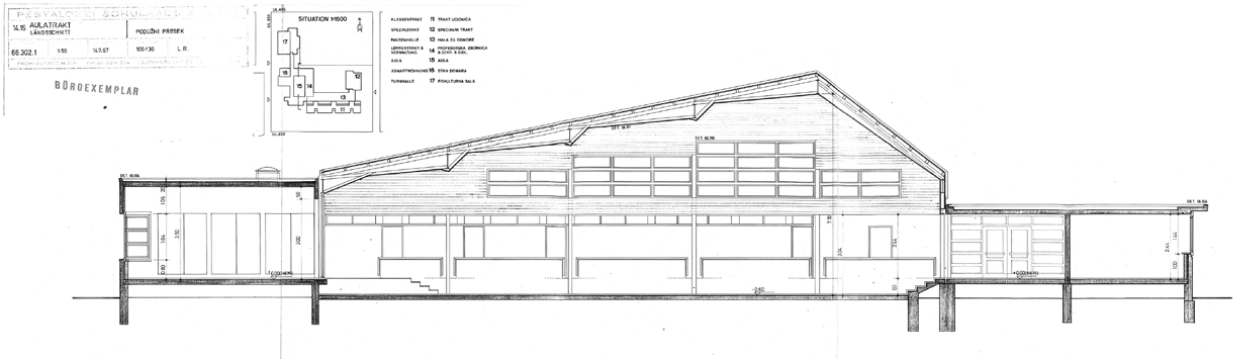

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Fig. 5
Elementary School Johann Heinrich Pestalozzi, Section through the aula (Source: Archive of the City of Skopje)

(D.) The Gymnasium

The Gymnasium is located at the northwest corner of the complex, which through an open, covered passage, is connected to the aula. Besides the gym hall, this part contains the usual auxiliary spaces: dressing rooms, showers, the

prop room and the teacher's office. The gym has been allocated in a separate building in order to allow independent use by the residents of the neighborhood.

(E.) Schoolyard

The disposition of other elements creates a spacious schoolyard in the middle of the site. Given the importance of open space for physical and mental growth, children have the opportunity to interact with nature, with wide areas for play and sports. Although mainly used as a playground (about 1/3 of the total area of the schoolyard is covered by open playgrounds), Roth envisions possible use of the courtyard as an open space for festivities or an open-air classroom [Fig. 6].

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Design, composition and architectural aesthetics

The entire spatial organization of the school is asymmetric and dynamic, due to the division of the program in different volumes, which vary not only by their function, but in the general appearance, structure, elevations etc. Similar as in other buildings divided in parts, one could really comprehend the entire spatial composition only by walking through and around the building.

For Roth, the question of form was not of primary importance, since architecture is not a 'free art', but it is inextricably related with reality and context. The space and the spatial interactions are those which make the basic substance of architecture; and material, construction and form are the means of the design. Hence, the building is ascetically restrictive, in terms of forms and used materials. The idea is conveyed through straight lines, clean surfaces, and use of natural colors of the materials. Color is used as an element of design

Fig. 6
Schoolyard, view towards the aula, 2009 (Authors' Photo)

which emphasizes the basic idea – to provide comfort, to be the background for different happenings.[15] The exterior, mainly in unplastered reinforced concrete, the natural wood, dark grey window-frames create the general picture; color accents are introduced at certain points (yellow, red, blue), both in the interior and on the facade of the building. Inside, the walls are monochromatic, painted neutrally in order to allow the school life to introduce color.

Design and innovation: building materials, structure and technology

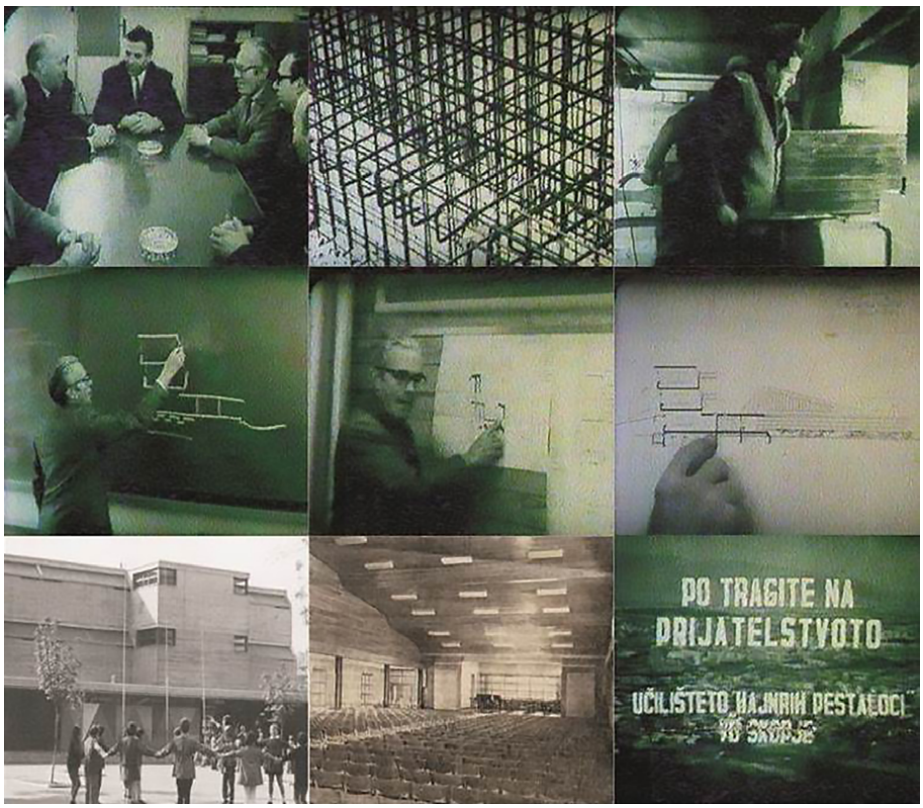
The structure and the materials used in the school fit quite well within the period of building, the second half of the '60s. The dominant building material is reinforced concrete, left unplastered on the outside. The exterior walls are insulated and finished with plastered brick on the inside. Naturally varnished oak wood was commonly used as wall covering in the interior. The ceilings of all activity rooms in their original condition had a partial layer of sound-absorbing sheets, while the floors were covered with terrazzo (corridors, staircases) or linoleum. All the carpentry in the building (doors and windows) was originally wooden; windows were double-sided, wing-to-wing type, with oil-painted wooden frames and inbuilt sun blinds, whereas the doors were often combined with glass.[16] The author's intention, present in other buildings as well, was to maximize the rationality. Using standardized and prefabricated elements, the goal was to create a clean, simple, economical and rational building.

In addition to being up to date with the contemporaneous tendencies in terms of materials, the building has a new seismic structure and a rare, at the time of building pioneering system of foundation. Two different structural systems are dominant in the complex: structural elements from reinforced concrete (in sections A and B - classrooms and laboratories) and steel frames (in sections C and D - the aula and the gymnasium).

The classroom wing is conceived as a completely rigid box, its load-bearing structure entirely made of reinforced concrete. The walls have a hybrid composition – visible reinforced concrete on the outside, thermal insulation and plastered brick on the inner side. What makes this segment of the school unique is the foundation system. For the first time, a full base isolation system was used in the Elementary School Johann Heinrich Pestalozzi to protect the structure from strong earthquakes. The structural engineering part was assigned to K. Hubacher, E. Staundacher and R. Siegenthaler from Zürich. The applied system was developed at the Department of Civil Engineering at the Swiss Federal Institute of Technology and was known as Swiss Full Base Isolation – 3D (FBI-3D)

15 Roth had argued that the problem of color could not be solved simply by providing artists with suitably placed walls for them to paint on. Although in close touch with Le Corbusier's purist aesthetic and Piet Mondrian and the ideas of De Stijl in the avant garde years, Roth's alternative was a third, 'neutral' course. Cfr. *Roth, Alfred Roth: Architect of Continuity*, 15-17

16 Due to the aging and slow but permanent decay of the materials, within the past 50 years, many changes have been done regarding the original materials and equipment.



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System.[17] The whole classroom wing rests upon 54 rubber bearings/cushions (70/70/35 cm), each with load-bearing capacity of 45-50 tons, integrated in a specially designed concrete foundation structure. The main idea behind this experimental system was to extend the predetermined period of oscillation of the building over one second (empirically calculated, the dominant period of oscillation of the Skopje earthquake was 0.1-0.2 sec), thus making the structure almost impervious to stronger earthquakes.[18] These unreinforced rubber bearings have a tolerable horizontal movement so that the weight of the building causes them to bulge sideways (up to 20 cm in both directions towards the fixed, concrete foundation walls). The foundations were covered with thin, removable concrete plates which allow occasional control and repair of the system. It was assumed that during a strong earthquake, the concrete plates would either break or move to allow for the anticipated horizontal movement of the whole structure [Fig. 7].

The earthquake and the extent to which it damaged the city led towards the creation of new awareness and knowledge about earthquake-proof structures.

17 The base isolation system has a long history of development. It is based on the idea that the building could 'float', thus making it almost fully resistant to strong earthquakes. One of the first buildings which followed this experimental concept was Frank Lloyd Wright's Imperial Hotel in Tokyo (1921), using the layer of soft mud as a 'good cushion' that could relieve the earthquake shaking. However, the Pestalozzi school was the first building where laminated and unreinforced rubber bearings were implemented. Later, similar system (GAPEC system) was implemented in a school in the town of Lambesc, near Marseilles (system developed at the Centre National de la Recherche Scientifique in Marseilles). Cfr. Farzad Naeim and James M. Kelly, *Design of Seismic Isolated Structures: From Theory to Practice* (New York: John Wiley and Sons, 1999); Konrad Staudacher, "Protection for structures in extreme earthquakes: Full base isolation (3-D) by the Swiss Seismafloat System," *Nuclear Engineering and Design* 84, no. 3 (February 1985), 343-357 and Nicos Makris, "Seismic isolation: Early history," in *Earthquake Engineering and Structural Dynamics* 48, no. 2 (February 2019), 269-283.

18 Vladimir Simovski, "System for modification and reduction of the seismic and other dynamic forces and isolation of vibrations" (PhD diss., University Ss. Cyril and Methodius in Skopje, 1985).

Fig. 7

Screen captures from the documentary movie *On the Traces of Friendship, Johann Hainrich Pestlozzi School in Skopje*. Directed by Trajče Popov. Vardar Film, 1969.

The system of full base isolation, experimentally implemented on a public building, made this building distinguished, not only locally but internationally as well. This facility is a special contribution of Switzerland to general anti-earthquake research worldwide. Long after the installation, the foundations were regularly tested and maintained by Institute representatives from Zürich. According to the initial approximations, the rubber cushions would have lost their elasticity after 20 years and were to be replaced.[19]

Compared to the classrooms wing, the segment with the laboratories has a regular reinforced concrete structure. The walls have the same composition as in part A, as well as the materials used for the floors and ceilings. Due to the larger spans (approx. 13 m), the segment with the aula is covered with a steel construction. The roof frames have different heights (from 3.40 to 7.80 m), in order to achieve the desired slope. The space between the columns has light infill panels, whereas the roof and large surfaces on the facades were originally covered with asbestos-cement plates, later replaced with fiber-cement cladding panels.

The main structure of the gymnasium hall consists of steel frames. The longer, southern wall was originally covered with asbestos-cement plates (same as in the part with the aula), while on the shorter sides the reinforced concrete wall it remained visible.

Reception of the building and present condition

Since the day of its opening, the school was very well received.[20] Although designed for a smaller number of children (700), at the time of its opening the school had about 900 pupils, and up to 1500 pupils in its most frequent years. Between 1978 and 1988, as a result of the increased number, the school had to operate in three shifts. These large numbers were only partly due to the increased number of children in the municipality, but moreover because of the popularity of the school and the innovations it introduced, both in the spatial arrangement and the teaching process. Following Roth's understanding that the pedagogical process is evolutionary and the building itself is inextricably linked to this development, the school showed great flexibility and potential to adjust to different evolutionary changes occurring in the process of education. Up to this date, with minor interventions and no transformation of the overall spatial structure, it has been able to respond to the changing demands.[21]

19 In one of the most extensive renovation processes conducted since 2008, the Institute of Earthquake Engineering and Engineering Seismology (IZIIS) from Skopje replaced the rubber with neoprene cushions.

20 The school staff speak about the building with special pride, aware of the school building's importance. Valuable information about the building and its functioning was collected in the building and in an interview with the former/retired director of the Pestalozzi school, Mr. Kočo Kostov. The interview took place in 2009, at the time when he was working on a book about the school. His memories, insights and writings were later published. See Kočo Kostov, *Pestalozzi* (Skopje: Ars Lamina, 2014).

21 In the past 50 years, in spite of all the efforts of the school management, the school has not been able to keep up with, and upgrade the original built-in equipment standard. As a result, part of the premises is not used in their full potential. The school needs a thorough assessment of its present condition and future upkeep in order to be able to reach the quality of education that Roth once envisioned.

Since the ‘90s and the breakup of Yugoslavia, Skopje went through another transformation – political, economic, cultural and spatial as well. The scale and the character of construction immediately changed, followed by a process of urban deregulation. Private capital was just emerging and the state was no longer the powerful investor. Within this gap, public interest and public buildings as well were nearly forgotten. Faced with natural ageing of the structure and materials, they also had to face general negligence, at times even open disfavor due to the fact that they were often connected with the previous political system.

Today, nearly 60 years after the earthquake, it seems appropriate (if not belated) to open the question about the values of the building, to make a proper assessment of its condition and to insist upon its future. The proven architectural quality, the great flexibility it has manifested throughout its existence, the intrinsic symbolical value of being connected to the post-earthquake renewal, the influx of knowledge it brought – all ask for better understanding, appreciation and care. The recent global process of re-evaluation of postwar modernism goes in favor of this and other buildings from Skopje’s post-earthquake renewal. Shedding light upon them might be crucial for their spatial and symbolic re-definition, protection form complete devastation and proper use within the contemporary context.

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