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Review paper I Прегледни научни рад
DOI 10.7251/STP2215448C
ISSN 2566-4484

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ARCHITECTURE AND TECHNOLOGIES AT THE TURN OF THE CENTURY: UNDERSTANDING AND TRANSLATION OF HISTORICAL MATERIAL

Abstract

21st century architecture, in line with the rapid development of technology, could be read through many different architectural expressions and movements in just the first two decades, but they all aim the same - sustainability and energy efficiency. The decade-long process of building the Faculty of Architecture and Civil Engineering in Banja Luka has been presented and tested several times from various aspects of architectural technologies, with energy tasks for the future and response to such targeted requirements. In this paper, the focus is on its roots in conceptual (post) modern architecture in order to understanding and translating the historical material of the ideology of expressive High Tech architecture, all in the context in which this new Faculty building is being created.

Keywords: High Tech architecture, new Faculty building, understanding of historical material

АРХИТЕКТУРА И ТЕХНОЛОГИЈЕ НА ПРЕЛАСКУ ВИЈЕКА: РАЗУМИЈЕВАЊЕ И ПРЕВОД ИСТОРИЈСКОГ МАТЕРИЈАЛА

Сажетак

Архитектура 21. вијека, у складу са убрзаним развојем технологије, у само прве двије деценије могла би се ишчитати кроз различите архитектонске изразе и правце, али сви они дијеле исти задатак - одрживост и енергетску ефикасност. Деценијски процес изградње Архитектонско-грађевинског факултета у Бањој Луци више пута је представљен и тестиран са различитих аспеката архитектонских технологија, са енергетским задацима за будућност и одговором на овако циљане захтјеве. У овом раду фокус је на њеним коренима у концептуалној (пост)модерној архитектури у циљу разумијевања и превода историјског материјала идеологије експресивне High Tech архитектуре а све у контексу у ком ова нова зграда настаје.

Кључне ријечи: High Tech, нова зграда Факултета, разумијевање историјског материјала

1. INTRODUCTION – THE THIRD ARCHITECTURE

High Tech architecture is also known as ‘late modernism’ or ‘structural expressionism’, and as architectural style is the one that incorporates elements from new high-tech industries and advanced construction techniques into building design. It was developed in the 1970s, originally in Britain, and utilised advanced technology and new building materials creating a recognizable image of understanding the idea of high-tech architecture. High Tech is not only expressive of technology, its forms are technically accomplished, as in the case of the Georges Pompidou Center in Paris (1971–77), the first High Tech building to receive worldwide recognition, just like the Eiffel Tower, the Pompidou has become an iconic landmark symbolizing modernity's celebration of the machine. However, also like the Eiffel Tower, it received much criticism from the academy in its day, despite its immense popularity with the public. [1]

Exploring such avant-garde and experimental architecture, the role of technology and materials in contemporary architecture, utopian spatial models, issues of continuity and evolution in contemporary architecture and, in parallel, working on architectural projects and publishing essays on urbanity, urban culture and architecture, Radović formulated his views on architecture and its social and cultural role and set new boundaries in the rethinking of architectural creativity [2]. According to him "third architecture" architecture takes into account: natural, logical, internal and variable function; technology as a means, not an end, with a careful understanding of new possibilities without subjugation and slavery; history through the understanding and transformation of historical material into completely new harmony, without which there is neither a true vision of history nor a true sense of the present of architecture; nationally as taking the most important and lasting from the regional situation and its context; internationally, so that from the experience of the world and others, the general, the common, the universal, the lasting and the precious are sought; the form obtained through the painstaking search for meaning and splendor in architecture; as well as humanism and user participation in order to establish a real, equal, known and eternal dialogue between construction and those who enable and want it [3].

In this paper, although it inevitably covers more or less other issues set by Radović, the focus is on one question for the “third architecture” - understanding and transformation of historical material into completely new harmony, peculiarly when it comes to new possibilities offered by the accelerated development of architectural technologies. Expressive High tech architecture from the end of the last century marked architectural technologies as the basic motif in contemporary architecture and has its descendants today. The physical and ideological characteristics of high-tech architecture can be defined in the simplest way through the characteristic materials metal and glass, through the alleged adherence to a strict code of honesty in expression, with the idea of industrial production and through strongly emphasized flexibility of use [4]. Question is to what extent have the physical and ideological characteristics survived in these fifty years and in what form do we have them today on the example of the new building of the Faculty of Architecture, Civil Engineering and Geodesy in Banja Luka. The paper is structured, and the above example is analyzed, according to Davis' presentation of High Tech architecture through Function and space flexibility, Materials and (re)construction and Mass production and/or project development, as transmitted and processed by Radović himself, and an additional chapters preface Context and for conclusion Installation systems and why invisible. And as the ultimate goal for this research but for the autrors architecture also, could be sad by Radović again as *the search for an integral city of integral people of the integral world, in new social relations, in new material conditions and new artistic categories* [2].

2. CONTEXT

High Tech was not just about prefabricated frameworks and canopies but about integrating all aspects of design—concept, program and construction, as well as urban, social and cultural contexts—at the highest levels of design thinking and project coordination. [1] As the most basic definition High-Tech is a style that rejects traditional methods and aims to develop construction techniques beyond time without forming any associations with past styles. The style aims to control the urban context instead of harmonization with the environment and to create design solutions in a way that gives the feeling that the buildings are not yet completed. In this movement, conventional heavy and bulky monolithic construction systems were rejected; the aim is to transfer the developments in the industry to the building production process. High Tech buildings are characterized as lightweight, flexible and easy-to-build buildings that are renewable, flexible to keep pace with changing conditions, and are built using removable methods. When examining over the

most famous buildings of architects called High Tech fives, (Figure 1) Soyluk concluded that not all and always meet all the criteria defined as characteristic of High Tech architecture [5].

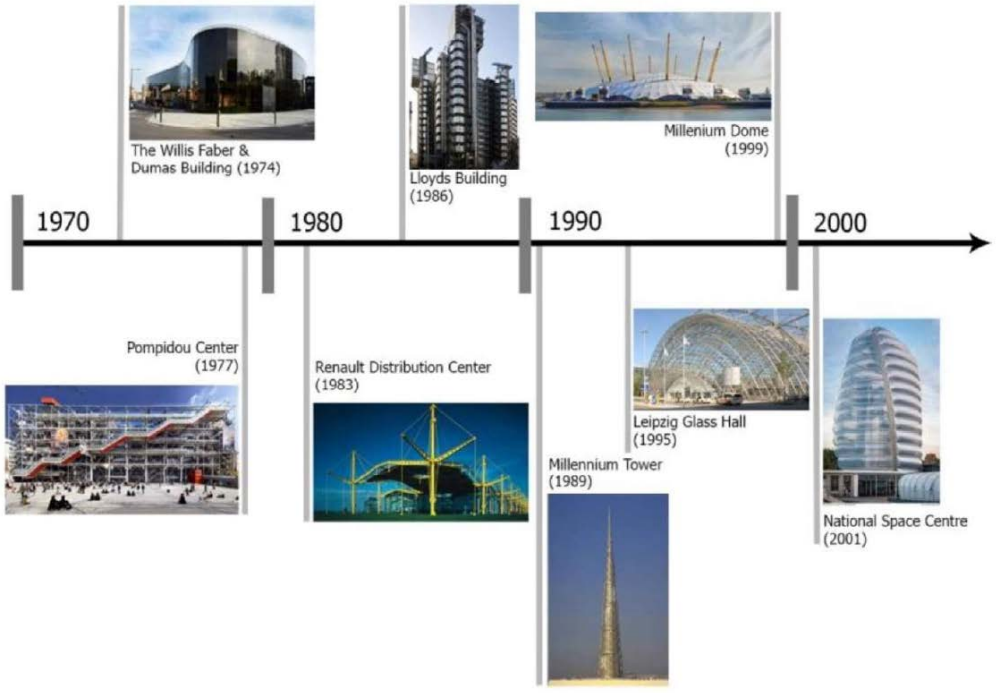

Figure 1. *Timeline of High-Tech Building. According to Soyluk Evaluation just one of these buildings is 100 % High Tech, yet last one meets the specified criteria by 60% [5]*

High Tech architecture moved forward soon which is generally characterized by simplification of form and an absence of applied decoration. Moreover than this, with efforts to reconcile the principles underlying architectural design not only with rapid technological advancement, but also with the modernization of the society, early modern architecture began at the turn of the 20th century. It would take the form of numerous movements, schools of design, and architectural styles, also some in tension with one another. As the result of fast developing technics and technologies on construction field during the period in between 1980's and 2015's, architects started to give attention to concept more than context.

The spatial quality that new school in Banjaluka strived to achieve is inseparability of the building from its context. A modern city implies public spaces which to a large extent remind of indoor space and vice versa, indoor space loses its intimacy due to development of modern technologies. Traditional division on the outside and inside has no longer meaning except that there is an inversion in the view. [6]

The area where the outside crosses to the inside space is roofed over street and at the same time a continuation of the pedestrian alley of the University City to which it is directly connected. There is high density of spatial overlapping, a dynamic hall full of galleries, bridges, perspectives and niches. This is where the encounter between the old and the new, between the sky and the earth take place. The inside street as the area of possibilities unveils itself to us in its entire height giving us the view into everything that is happening within the xybrid old-new. During the day this area absorbs the light and during the night it reflects it toward its surrounding. This kind of concept enables that other users of the University City become participants of the theatrical happening in the hall of the Faculty even though they are not physically present in the building.

Cultural - historical monuments and inherited architectural structures have to be seen as a live organism and vital space for its beneficiaries. Constant changes in functional use, social and political context and economic development are manifested through spatial interventions. They should have a contemporary language signature while historical authenticity and integrity of the location should not be jeopardized. Once harmonized, the inherited structure and contemporary interventions particularly contribute to the value of the urban space and entire ambience as the old and the new add to their value. There are more and more examples of dealing with spatial co-existence of the different with ever rising consciousness that facilities are never finalized, that they continue to live,

change and adapt to the time. [7] Autors tried to keep the quality and to convey the spirit of the existing but with clear marking of the building with the new layer of meaning as the expression of the current time through the transformation of the existing builidng. The intervention to the 'Tereza' building which included rehabilitation, reconstruction, extension and overbuilding of the existing facility is clearly marked by the dialogue between the old and the new. The aim was to preserve the essential character of the building and to introduce new meaning through transformation in order to accomplish its new functional role and identity.

The existing building with traditional elements of style is connected to the modernly shaped, newly built part of the building. Combination of the old and the new has been offered here as an answer to the aspiration toward acceptance and identification on the part of its new usersstudents. The volume of the newly bulit part of the facility is differentitiated from the existing builidng while the defined heights of storeys are being followed very strictly and transferred to the new part of the facility. Architecture of the new Faculty building has been reduced to the container box whereas only the airy hall, the glass cube, connects the new and the old building and represents the higher quality which makes the building special. The entire concept of the school space is focused to this area in-between the old and the new facility and not to the facilities themsleves. The zone between the two entities, betweeen the interior and the exterior is active and dynamic space of the hall which enables different relations: it captures the outside space, offers vision into the indoor space and opens toward the nature.

One of the most famous facilities where radically experimental approach in morphological manifestation of the overbuilding has been applied is the Opera House in Lyon, France, made in 1986 by Jean Nouvel, the architect in the old urban center which is on the UNESCO list of cultural heritage and reconstruction and extension of the Tate Modern in London by the Herzog & De Meuron Bureau. Completely modern in its design but in low profile is the Carre d'art Museum at Nimes built in 1993 by Norman Foster and overbuilidng of the modern dome on the Reichstag Building in Berlin, in 1999. Very innovative approach has been achieved in extension and decoration of of the interior of the Moritzburg Museum in Halle, Germany by Spanish architects, Fuensanta Nieto and Enrique Sobejano in 2008.

3. FUNCTION AND SPACE FLEXIBILITY

In today's world, where technology is at its the golden age, examples of High-Tech buildings are encountered in many different regions in the world over time. However, this movement was basically born and developed in England more than fifty years ago. British architects Richard Rogers, Michael Hopkins, Norman Foster, Nicholas Grimshaw and Ian Ritchie are pioneers of this movement. Fosters' Hong Kong Bank was ground breaking on many fronts, but it was especially innovative in its response to program and its approach to the building industry. Fosters pushed the structure and services out to the perimeter, where they could be exposed on the exterior like the Pompidou. In the Lloyd's of London, Rogers too pushed the structure and services out to the exterior, leaving the middle clear for open work space, local circulation and soaring atriums; and in both cases the rationale for this inversion was flexibility. For Rogers and Foster, flex space was important to any given program because it facilitated changes in how the building would be used over time. If we look at the floor plan, of any High Tech example, we see a completely simple and purified space, usually with an atrium in order to further emphasize the lightness of the interior space (Figure 2), which in the end was the meaning of the complicated exterior (Figure 1). The idea is to free up space and make it flexible and adaptable to different purposes and scenarios. Constant changes in functional use, social and political context and economic development are manifested through spatial interventions. They should have a contemporary language signature while historical authenticity and integrity of the location should not be jeopardized. Once harmonized, the inherited structure and contemporary interventions particularly contribute to the value of the urban space and entire ambience as the old and the new add to their value. There are more and more examples of dealing with spatial co-existence of the different with ever rising consciousness that facilities are never finalized, that they continue to live, change and adapt to the time.

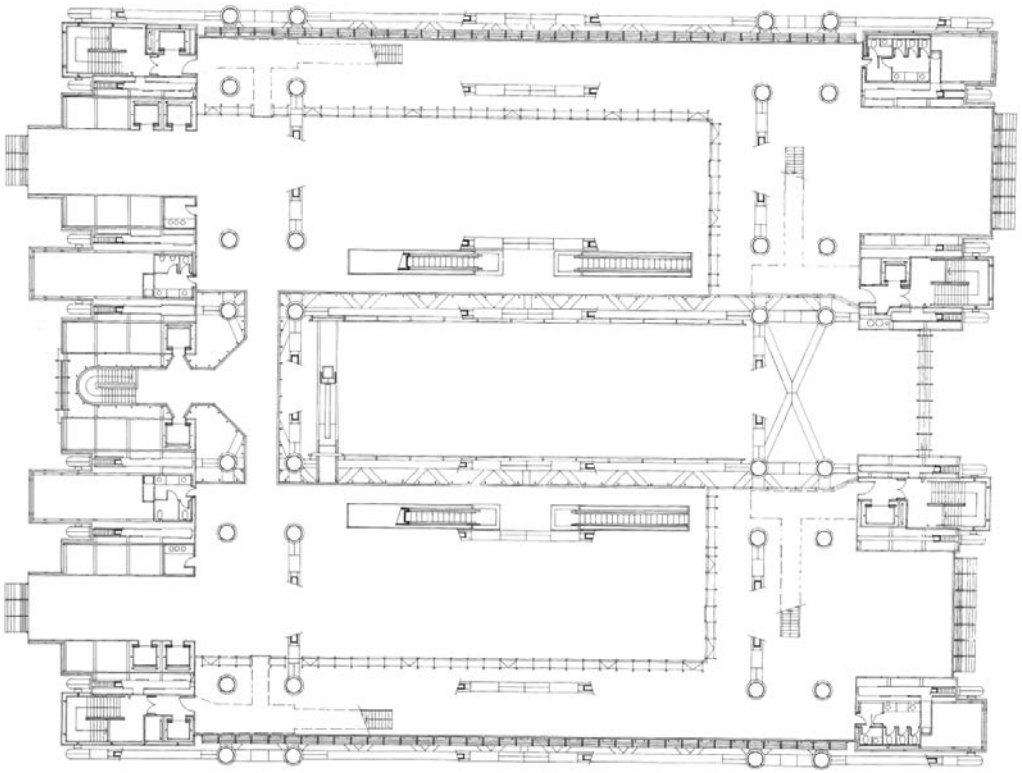

Figure 2. *Foster + Partners, Hong Kong and Shanghai Bank, Hong Kong, China, 1979–86. Atrium plan [1]*

At first glance, there are two most recognizable functional features that connect the new Faculty building with High Tech design. On the one hand, it is the separation of vertical communications, and on the other, flexibility in the organization of the classroom block. (Figure 3) The original, internal vertical communication was moved to the western façade plane of the existing part of the building, leaving vacated space for a more flexible organization. The newly designed staircase thus, in the architectural and constructive sense, represents an independent spatial and design unit. Spatial requirements of the building are defined by the current and the planned number of students and academic courses which take place at three Faculty departments. Having in mind the enrollment policy as well as the variability in the number of students in each department by year, the need to change the number and size of the classrooms themselves was taken into account. Thereby, for being led by the principle which Herman Hertzberger refers to by saying that the task of the architect is not setting of ready-made and perfect solutions but giving possibility to offer the conditions for its upgrading to the beneficiaries and also taking into consideration modern tendencies in academic teaching, there is an intention to improve the conditions for students and professors in the new Faculty building as inspirational laboratory of knowledge. Being aware that there are no given solutions in architecture, the new Faculty building connects seemingly unsolvable tensions in the opposites, searches for the meaning of unclear circumstances in the creative process in our consciousness without the intention to deal with all contradictions at any cost.

The spatial concept of connecting and "reconciling" differences is based on the synthesis of these two cubes with a glazed central hall that extends through all floors in height. The basic design element of the building is the central, covered street, zenithally illuminated, which extends through all floors. There is a high density of spatial overlaps, a dynamic foyer full of galleries, bridges, penetrations, views and niches. This is where the meeting of the old and the new object, the sky and the ground, takes place. The masses of the building are shaped in the simplest possible way, without structural details, except for the sun protection elements which are rhythmic and do not break the unity of the surfaces. Instead of lavish appearance, the requirement of restraint and restraint is respected here. The architectural solution, in a functional sense, naturally imposes the central position of a large amphitheater that defines the basic communication directions within and between buildings. A simple new Faculty building, reduced to only a few design elements, should have the function of a counterpoint in relation to the existing building.

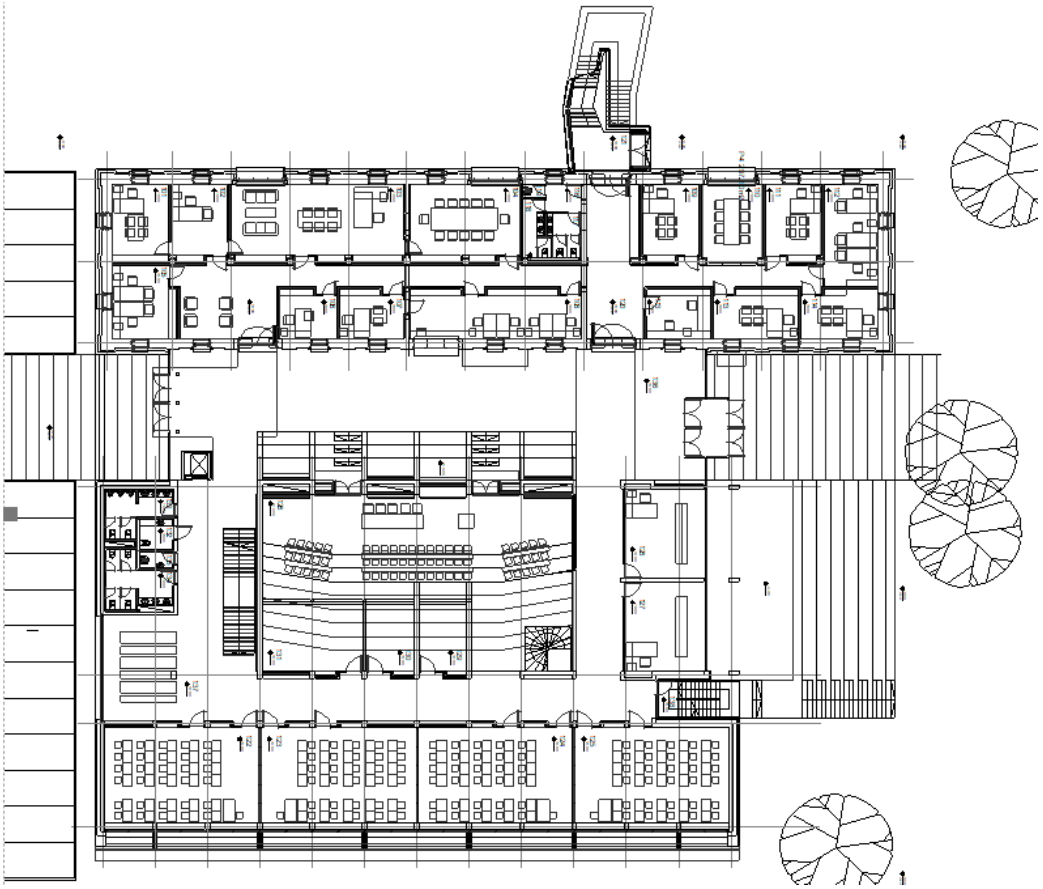

Figure 3. *Ground level plan - vertical communications outside the building in the old part of the building on the left and flexible classroom space in the new part of the building on the right (Photo by author)*

4. MATERIALS AND (RE)CONSTRUCTION

According to Davis, high tech architecture has its beginnings in the Reliance Controls Factory, the middle and Georges-Pompidou Center and a possible end in two masterpieces HSBC building and Lloyd's building [4]. But it would be a mistake to think that high-tech is a relic of the past: today its legacy exists everywhere in the built world. We meet today various elements - muscular steel construction, smooth unyielding leather, intentionally visible pipes and ventilation ducts, make the appearance of the building extremely complicated and it is perfectly clear what stairs are, what elevators are, and which channels are used for installations. Principles and processes that we now take for granted - such as prefabrication, offsite construction, modular design, factory assembly, computer modeling, mechanical efficiency, information technology, portable buildings, and functional and spatial flexibility - all have their origins in high-tech movement. The influence of high-tech can even be traced in the development of materials such as ETFE and the widespread use of hollow structural sections, which we take for granted in construction today.

Spatial needs in the functional organization of the facility required structural elements of larger spans and the application of non-standard formwork systems. A light skeletal steel was chosen for the structural system of the upgraded part of the building, (Figure 4) which was coupled with a thin reinforced concrete slab. This concept of structural upgrade system, including light internal partitions and cladding, did not significantly affect the existing massive structure of the building. A strong contrast between the old and the new part of building and a clear emphasis on their relationship with the use of materials and the choice of construction. All the glory of the inherited idea of the physical appearance of High Tech architecture is visible both outside and inside the building. Artium, which appears almost regularly in the most important examples of High Tech architecture, here stretches along “the street” that connects the old and the new part on all floors in the form of a glass cube of steel construction. If the Pompidou Center is an example that rounded out the ideas of high tech architecture in some revolutionary parts from the aspect of technology - 'inside-out' building with its structural system, mechanical systems, and circulation exposed on the

exterior of the building [10], we can see new Faculty building in “inside-out-inside” or better “out-inside-out” way. This is pecisely because of “the street” set in this way and the importance given to the function and purpose of the building as a “laboratory of knowledge” that communicates in every part with the interior and exterior. (Figure 5)

Figure 4. *Steel construction of the upgraded part of the building / future library (Photo by author)*

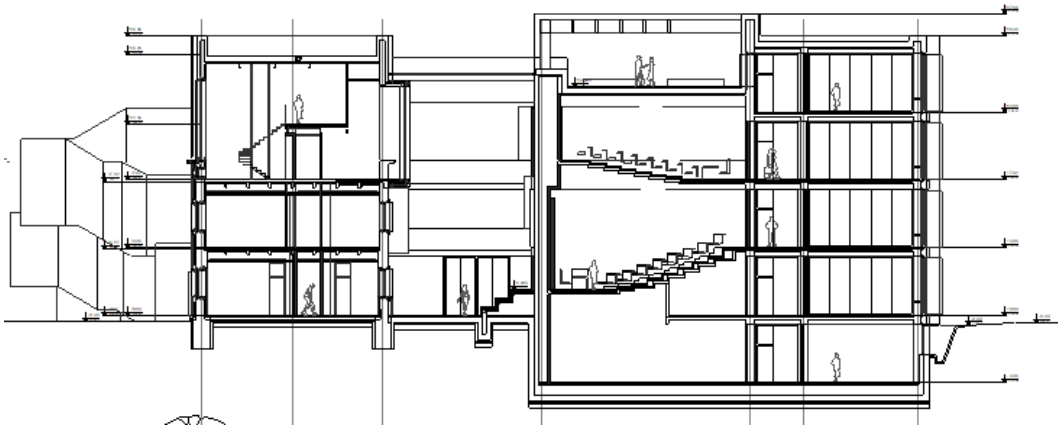

Figure 5. *Cross section - steel structure upgraded last floor in the old part on the left and steel structure with glass roof space between the old and new part of the building (Photo by author)*

Another feature of High Tech - the belief in truth to materials and methods of construction and the faith in technological innovation [1] [4] is seen on the new Faculty building through design and visual characteristics of concrete surfaces. It is required the definition of the manner of installation of mutual joints and the type of formwork systems, with special reference to concreting work interruptions. The design requirement that the basic structural elements be an integral part of the overall design of the space, conditioned additional requirements in terms of technology of concrete structures, the order of concreting, design of formwork and method of reinforcement of structural elements. For each concrete surface, in accordance with its character (regardless of whether it is a surface or line element), the projected role in the spatial and shape characteristics of the building, the type, texture is defined, and a draft of the formwork is given or agreed on the site all in accordance with the capabilities of the contractor.

5. MASS PRODUCTION AND/OR PROJECT DEVELOPMENT

By far the most important modernist trait that High Tech promoted was the desire to produce buildings out of prefabricated components, and because prefabrication takes place off-site in controlled manufacturing conditions, it allows for precision as well as for quick, on-site erection and assembly. Proponents of high-tech architecture, as well as the pioneers of modernism of the 1920s, believe that there is what is called “Zeitgeist” and that architecture has a moral obligation to express it, and according to high tech architects our age resides in advanced technologies [8]. "Une maison est une machine-à-habiter" by Le Corbusier they saw as primitive and far from machine in technological terms, and for them the machine was much more than a metaphor - a source of technology and art. Machines made of light, precisely made components, manufactured in the factory, mobile and quickly assembled on site, from synthetic materials such as metal, glass, plastic were the benchmarks of this architecture. Although intended to celebrate machine, industry and technological development, in one part of High Tech architecture there was resistance to mass-produced building components being used directly and unmodified. Patented and mass-produced components never seemed to reach the high standards of these architects. It was not uncommon for an architect to collaborate with manufacturers in the development of systems and components. The

best example of such cooperation was building Foster's HSBC. All essential elements of the building, including the structural facade, cladding, service modules, floors, ceilings, partitions and furniture, were designed, developed and tested in collaboration between the architect and the manufacturerFoster calls this process "project development" [8], which is actually very rare because a significant part of the budget is financed by investors, and it is certain that only in this way it is possible to raise the level of quality and sophistication of construction technology.

Whereas other formative projects standardized components and relied on non-functional flourishes for aesthetic interest, subsequent and more lucrative commissions facilitated one-of-a-kind buildings, where more and more of the components were prototyped, i.e. designed and tested by the architect in close consultation with the manufacturer, and not just prefabricated from standardized parts into larger assemblies. [4] [1] High Tech integrated prefabrication techniques into the industry to the point of reinventing the way things are made. Here the experience of the Pompidou is pivotal: while the interior is unremarkable in its use of off-the-shelf components, the exterior delights with choice cast-steel details. [1] The focus on details like the gerberettes once again underscores the extent to which engineers were involved not only in manufacturing but in the design process.

After pivotal, high-profile projects, such as the Pompidou, the Hongkong Bank and Lloyd’s, High Tech has continued to explore new forms and build them at a high level of construction by rethinking the terms of professional practice and by creatively integrating design with manufacturing and engineering. Working in this way meant that the design would change and evolve through a process of interdisciplinary exchange; that an idea would invariably morph as more information about some area of expertise came to light. In addition to the pioneers of the movement, there are some others recognized and described as the new generation of this movement such as Tomas Herzog, Helmut C. Schulitz, Jean Nouvel, Van Gerkan Marg, Itsuko Hasegawa, Ken Yeang [6]. The idea of project development was confirmed through integratation of the specialty knowledge of design consultants and manufacturers in what was, a dynamic and unpredictable process. The border of interior and exterior space has been lost, now they are dealing with details with equal attention in the interior, which is far from unremarcable. It’s rooted in the modern tradition, for what compels the high level of integration can be boiled down to a fundamental desire to render the logic of how a building works transparent, light and expressive both inside and outside.

The critical interaction between architecture and technology moved from preoccupation with Modernism’s logic of mass production, functionalism and fixed tectonics to the introduction of flexible, highly interactive and mutable technologies addressing multiple engineering agendas. Through participation in the development of architectural solutions, project and tender documentation and previous construction of the faculty building, the authors of the project solution, together with associates, tried to define the recognizability of the institution and make a personal contribution to the development of architecture and construction in the country. According to Tabb “high-tech architecture” evolved to blend the daring feats of structural engineering and expanded the tectonic vocabulary to include sustainability. [9]

6. CONCLUSION – INSTALLATION SYSTEMS AND WHY IN(-)VISIBLE

There are strong influences of High Tech architecture in this example, which are not visible at first glance, physical and ideological characteristics can be identified by a more detailed analysis of the project. Davis singled out the basic characteristics of high tech architecture in terms of function, mass production, construction, space flexibility and socket strategy. In this paper, the building of Faculty is presented in accordance with these characteristics, for each of them the question of the existence of traces of ideological heritage and if so, in what form and to what extent. It has been concluded that reasons such as increased comfort expectation, environmental sensitivities and concerns of interacting with the urban context are also effective in transforming the High-Tech trend over time. In addition, although the ideals of High Tech architecture come from the past, their goals are definitely forward-looking and capture the technologies of more advanced industries than building construction technology. In this context, architects, engineers and manufacturers worked in close cooperation during the production of this building. It is thought that this interdisciplinary approach will become stronger in the future.

Spatial quality is achieved by connecting the object with the context. The interior of the house loses its intimacy with the development of modern technologies. The traditional division between outside and inside no longer makes sense except that there is an inversion in the view. The authors design the inner street as a space of possibilities reveals itself to us in all its height, giving us a view of everything that is happening within the hybrid old-new. At the same time, the house draws nature from the environment into itself. During the day, this area absorbs light, and during the night, it

reflects it towards its surroundings. This concept allows other users of the University City to become participants in the events in the hall of the Faculty, even though they are not physically present in the building.

In the end, if we return to our question from the beginning of this paper, the question of "third architecture", we can conclude that the way the authors shaped the new school space has a strong influence of High Tech architecture, but only with moderation in the way Radović taught us. Purpose and function are not neglected for the sake of ideology and glory of technological development, on the contrary, education comes to the fore, exits all pores of the building and connects inside and outside, is in constant communication with the campus respecting the context, while maintaining the possibility of space transformation and open plan. In such setting, there is no place for installations and steel on the facade, the life of the inside-out-inside interspace together with the vertical communications shapes the space, but the installations with characteristic materialization still remain visible in the horizontal distribution under the ceilings or wherever possible with protection from harmful external influences that would endanger them. The way technologies are used is not in their emphasis and they are not an ideological goal, but a means to achieve comfort and efficiency. In this paper, an analysis of one object according to Davis' basic characteristics of High Tech architecture is conducted and the only possible conclusion is that there is a strong influence understandable only through Radić's definition of "third architecture". Such an influence exists, but only to the extent that the historical material understands and translates into a completely new harmony of space, which does not make it neither a true vision of history nor a true sense of the present of architecture.

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