Construction of Mixed goods warehouse

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Industrial City on the Bank of Danube River – The Beginnings of Development and Construction of Belgrade Cargo Port

Residents of Belgrade have been conquering the banks of Danube River since the earliest days of its foundation, adjusting them to various uses. It has been recorded that Roman flotilla had a dock on the Danube[1], and later, with the introduction of commercial and cargo transport, the importance of the port in the life of the city gradually increased. As an internationally important waterway, the Danube offered a lot of possibilities for the development of river transport. Thanks to its position on the banks of two rivers and favourable conditions for the development of transport, in its most recent history, Belgrade has had two ports - the main and regulated port on Sava River, downstream from the railway bridge, and a more modest docking area on Danube River, from Nebojša Tower to the Pančevo Bridge. After the end of the First World War, in parallel with the development of industry, the issue of construction of the new port was tightly connected to the growth of the Capital, which became an important commercial and industrial centre of the new state.

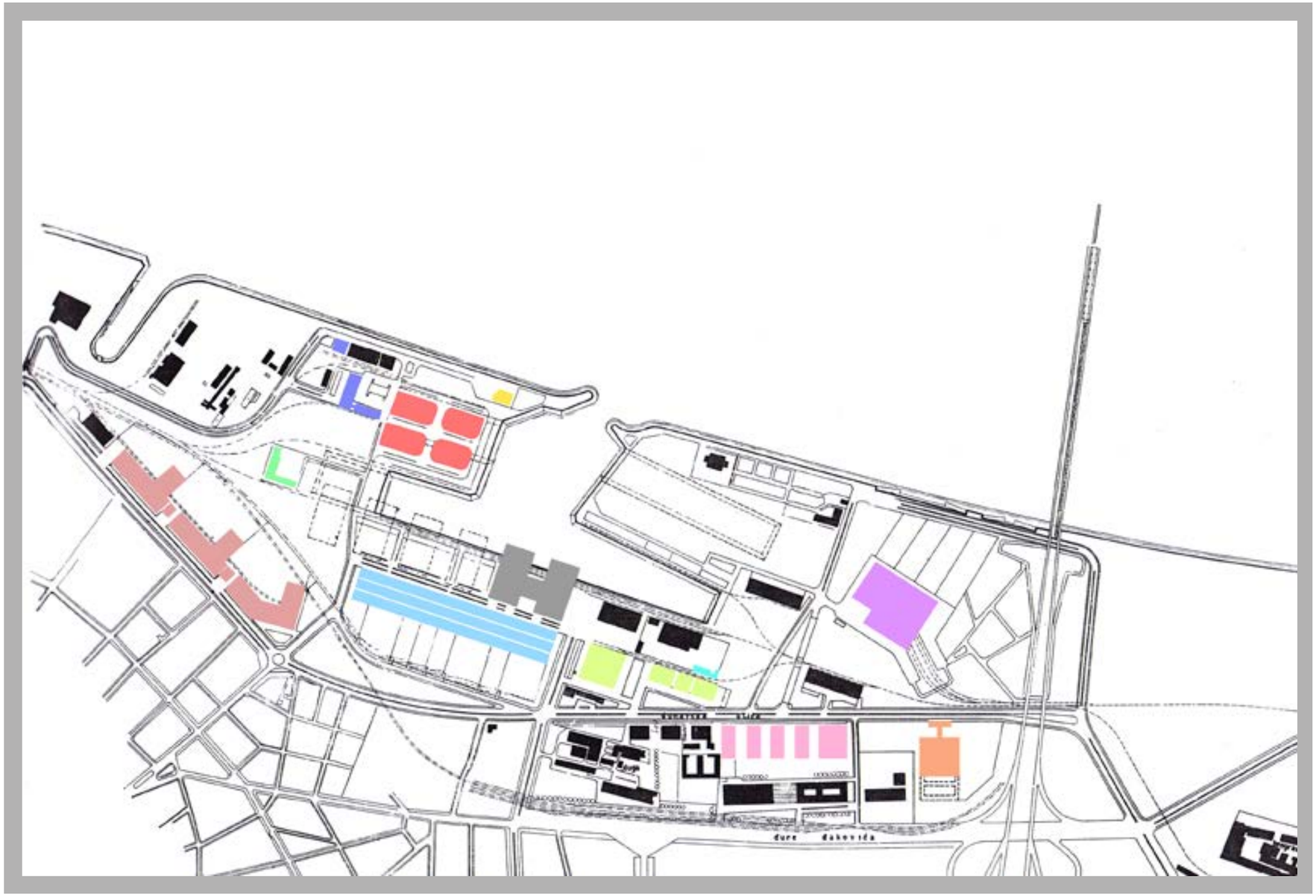
The idea of constructing a new port has been related to the tender for production of Master Plan for development and extension of Belgrade from 1921. The tender programme also included a request for port design.[2] After the tender completion, a section has been formed in order to deal with jetties and ports, while a special board has decided that the main Belgrade port should be constructed on the Danube. Having in mind a construction of a temporary port for the period of ten years, a project for the period 1923-1933 has been produced, but it was never realized.

The idea of the necessity of constructing a port in Belgrade that marked the beginning of the 20th century, was finally realized after the Second World War. Due to the sudden economic and commercial development of the entire country

1 Branko Maksimović, *Problemi urbanizma* (Belgrade: G. Kon, 1932), 92.

2 Branko Maksimović, "Pitanje beogradskog pristaništa", *Politika*, 22.05.1930: 9; Maksimović, *Problemi urbanizma*, 97-99.

Layout plan of the Belgrade Port



- Warehouses for construction materials
- Port workshop
- Silo and mill
- Warehouse for metal goods
- Open warehouses
- Branch office
- Foodstuff warehouses
- Administrative building
- Consumer goods warehouses
- Open market “Beograd”
- Garage
- Main halls

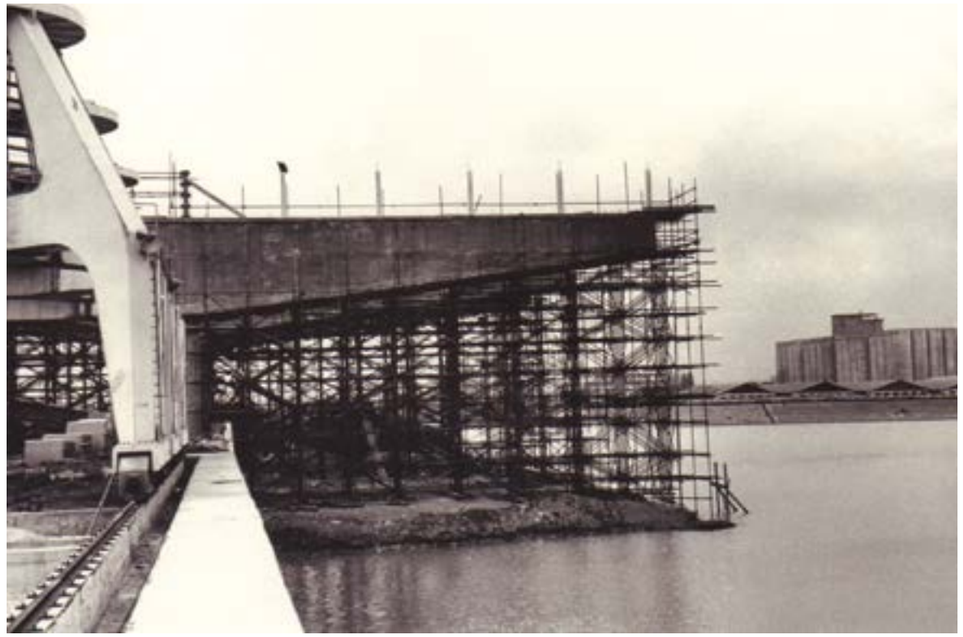
and Belgrade, which, as the capital, grew as a commercial centre and an important transport hub, the lack of modern cargo port and the shortage of the storage space in the city, became increasingly more prominent.[3] In accordance with its position and the amount of traffic, Belgrade became a centre of river transportation and the most important shipping centre of international proportions in the former Yugoslavia.[4]

Thanks to its geo-economic position and the total capacity of waterways, Belgrade water transport hub represented an ideal place for establishing a port base, which would serve the inner transport system, as well as the transport system of the entire Danube basin.[5] It was estimated that the construction of Belgrade port, based on its scope and purpose, would play a significant part in the development of not only Belgrade, but the entire country as well.

In order to realize this important project, on March 11, 1957, National Board of the City of Belgrade established a Directorate for construction and development of the Danube riverbanks.[6] The first thing was to solve the issue of location of the internationally important cargo port. After the analysis and studies conducted by numerous competent and professional institutions, as well as social organizations, it was determined that, from urban planning, commercial and transport standpoints, the terrain on the right bank of the Danube, upstream and downstream from Pančevo bridge[7], more precisely, between the thermo power plant and the Pančevo bridge, offers the best conditions. The plan was to build the new port partly on the open Danube riverbank, and partly in the form of a semi-closed basin, and to make it directly connected with the railway and road transport.

The choice of the right Danube bank for the location of the port was a logical step in the development of this part of Belgrade, which formed as one of the first industrial zones from the end of the 19th century until the Second World War.[8] The construction of numerous factories contributed to the development of not only the city economy and the railway nod, but also the urbanization of the entire

3 Sima Miljković, "Beogradsko teretno pristanište na Dunavu", *Arhitektura urbanizam*, 51 (1968): 57.
4 Oliver Minić, "Rečni saobraćaj", *Urbanizam arhitektura*, 1-4 (1951): 99.
5 *Beogradsko teretno pristanište na Dunavu* (Belgrade: 1961), 11.
6 http://www.lukabeograd.com/luka_beograd.html (Retrieved on: 23.10. 2017)
7 *Beogradsko teretno pristanište na Dunavu,* 13.
8 Saša Mihajlov, "Nastanak i razvoj industrijske zone na desnoj obali Dunava u Beogradu od kraja 19. veka do sredine 20. veka" *Nasleđe*, XII (2011): 91 – 116.



Construction of the main halls and the silo

space. As one of the most important industrial zones on the right bank of the Danube, with its outstanding role in the development of industry and transport, the factory complex prepared the field for the construction of the port whose position and shaping became its organic part. In this way, part of the warehouses of the Belgrade port has been built on the land of the former sawmill of the Commercial Bank (1903, 1921), which has been destroyed during the Second World War.[9]

Starting from the fact that the construction of the port is a very difficult and complex task which implies engagement and responsibility of various professional experts, on this occasion, inspired by the collection of photographs kept at the Museum of Science and Technology in Belgrade, we will try to illuminate the beginning of development and construction of the Belgrade port. The photographs that were our starting point in this research, are a part of the material that com-

9 Ibid, 106.

Mixed goods warehouse (1959-1961)

pany KMG (Combine for design and construction and general civil engineering works) "Trudbenik" donated to the Museum in 2015.

Made during the construction of the Belgrade port, due to their authenticity and documentary value, they are considered to be primary sources. Given that, over time, the entire complex went through unplanned changes and upgrades, their value has only increased.

Due to the complexity of the task, the plan was to construct the port in phases, and the end of the first phase has been planned for the end of 1965. The preparation of the entire zone for construction implied backfilling and piling, given that the sandy riverbank was not hard enough to support the enormous constructions. Therefore, conquering the terrain was a special challenge for the builders. The design included construction of accesses, aquatorium, basin, land-based communications, warehouses and storehouses, silos, mill and the main halls. The first zone with the area of 150 ha was intended for the key basin mooring facility and the accompanying facilities and equipment, connecting all types of transport.[10]

10 I would like to use this opportunity to thank the employees of *Luka Beograd* who helped me get a better understanding of the entire complex, as well as its individual facilities.

In the great civil engineering project such as the port, company KMG "Trudbenik" played an important role.[11] Some of the most important facilities at the port have been built thanks to its experts, cooperation with the Institute for Materials Research and many other institutions and experts. In the context of our research, as previously mentioned, the authentic photographs made at "Trudbenik", which recorded the construction process and the finished buildings, hold a special value.

Design and construction of the port represented a great challenge for the experts from various fields, which they encountered in practice for the first time.[12] The architects who were supposed to provide an urban planning solution for such a demanding complex, faced a very difficult task.

The task has been assigned to architects Uglješa Bogunović and Slobodan Janjić who, together with the associates from the Directorate for construction and development of the Danube riverbanks, in the period from 1958 to 1959 produced an Urban Plan. At the start of their cooperation in realization of important civil engineering projects, the two of them, as a well-coordinated tandem, successfully overcame a number of obstacles and shaped the design of the Industrial City at the Danube riverbanks.[13] The plan of the Directorate, whose Head of the bureau was Uglješa Bogunović, was to finish and put in operation a part of the port each year.[14]

The construction of the port, which began in 1957, marked the first comprehensive regulation of the Danube riverbank on the territory of Belgrade. Thanks to its construction, Belgrade got a modern industrial zone with warehouses, small

11 Federal Civil Engineering Company for Construction of Industrial Buildings "Trudbenik" was founded in 1947. In 1951, with the merging of other companies, Combine for Assembly Construction "Trudbenik" was formed. By constructing numerous buildings in the country and abroad, the experts employed at "Trudbenik" managed to create works that could stand shoulder to shoulder with the top achievements in Europe. KMG "Trudbenik" applied modern systems and technologies, cultivated and developed assembly-type of construction using pre-stressed concrete, with the tendency of introducing modern construction systems. Striving for modern achievements in civil engineering, they closely collaborated with the Institute for Materials Research of Serbia, as one of the first who accepted their inventions. As one of the largest ant the most important civil engineering companies in the country, KMG "Trudbenik" worked on different type of projects, such as: factories, railway tracks, bridges, apartments, commercial buildings etc.

12 Miljković, "Beogradsko teretno pristanište na Dunavu", 58.

13 During their long-time collaboration, Uglješa Bogunović and Slobodan Janjić realized the following project: TV tower on Avala (1960-1966) (they also worked with Milan Krstić, who also worked on the construction of the Belgrade port); Office building of *Politika* daily newspaper (1961-1968); TV tower on Fruška Gora (1973-1974); RTV Serbia complex in Košutnjak (1974-1980) and *Politika* Printing Office in Krnjača (1976-1980).

14 St. Šević, "Pristanište na Dunavu dobija svoj izgled", *Politika*, 18.0 4.1961: 10.

factories, silos, cold storage facility, wholesale market and storehouses.[15] Uglješa Bogunović, who was one of the most engaged authors, testified of the complexity of work on composing various facilities and contents into a single harmonious unit.[16] Various experts dealt with different problems from funding to civil engineering construction, geology and unusual construction solutions, up to bank revetment and hydro technology. According to Bogunović, while solving the complex problems, „it would happen that we spend days troubling ourselves with some technical issue and sometimes we were so close to our goal - good architectural and design results...“[17]

As the Head of the Bureau of the Directorate for construction and development of the Danube riverbanks, in 1959, Uglješa Bogunović published an article in the daily newspaper *Politika*, dedicated to Belgrade port, which testified about his occupation and dedication to this subject.[18] Starting with the analysis of the

Warehouses

15 Ž. Todorović, “Beograd postaje veliko međunarodno pristanište“, *Politika,* 9.03.1959: 5.
16 Uglješa Bogunović, “Milan Krstić u tvoračkom timu“, *Izgradnja*, 8 (1975): 7.
17 Ibid.
18 Uglješa Bogunović, “Beogradsko pristanište“, *Politika,* 4.10.1959: 18.

construction history of Belgrade port, from its establishment to the shaping of its modern form which he took part in, Bogunović noted that the terrain for its construction was weak and poor. Announcing the future works, he states in detail that forty cranes will be placed along the jetties and that the plan includes construction of six reloading halls, various warehouses, silos, market, cold storage facility, revetment and roads, railway tracks, overpasses and transporters.

In March 1959, in the *Politika* it was stated that the construction has already began.[19] Beside the cold storage facility that was already constructed, the construction of market has begun, the construction of commercial buildings, auction and stock exchange halls has been planned, while the fruit juice factory was already put in operation. Two years later, in 1961, an article in the *Politika* said that two kilometres of the bank between the electric power plant and Pančevo bridge have been covered with concrete blocks.[20] Finishing works have been performed on the silo, a mill has been built nearby, while the completion of the three large warehouses was planned for the end of June 1961.

The intensive construction works continued in the following years, which was testified by an article published in the *Politika* in 1963.[21] Estimating that the Belgrade port is one of the largest construction sites in the country, journalist stated that „...around two thousand workers steal parts of the river riverbed piece by piece and turn it into one of the largest commercial facilities in our country.“[22] By the beginning of 1963, they built a part of the exterior bank, cold storage facility, market and various warehouses, while the introduction of modern mechanical equipment has been planned for that same year, the same as the finishing works on the vertical jetty, railway track, plateau for unloading goods and various roads.[23]

The industrial city that was growing on the right bank of Danube River required engaging experts from various fields. Here, we will give the names of only a part of the large team that worked on its architectural and urban shaping. Beside the architects Uglješa Bogunović and Slobodan Janjić, as well as engineer Milan Krstić, the following architects also participated in the design and construction:

19 Todorović, “Beograd postaje veliko međunarodno pristanište“, 5.
20 Šević, “Pristanište na Dunavu dobija svoj izgled“, 10.
21 M. Maticki, “U pristanište ‘Beograd’ investirano dosad preko četiri i po milijarde dinara“, *Politika,* 26.04.1963: 9.
22 Ibid.
23 Ibid.

Milan Korolija, Radmila Simić, Rista Ljubenko, J. Vučković, Stevan Lambrin i M. Zrnić.

One of the first constructed facilities was the silo that towered over the entire complex.[24] Designer Slobodan Janjić, together with the engineers, including Milan Krstić, strived to find the most expedient technical and economical solution. During the production of reinforced-concrete volumes of circular cross-section, they took special care of adjusting the facilities to the construction system.[25] Specific because of the way the construction and the ground were treated, the silo represented an example of numerous innovations, among which the shallow founding that would later be applied in construction of silos throughout Yugoslavia draws special attention.[26]

Architect Uglješa Bogunović designed a series of warehouses. A warehouse for mixed goods was constructed using a combination of concrete and brick, while the special attention was given to the roof with lanterns that give special dynamics to the entire composition. Bogunović also designed the warehouse "Graneksport" and "Centroprom" as a dual facility connected by ground floor and parts of the first floor.[27] Built using concrete and facade bricks, with solid volumes dominated by horizontal strips of window openings, the warehouse represents a single unit with facilities built during that period at the Belgrade port.

The warehouse for colonial goods "Sava", a work by architects Radmila Simić, Uglješa Bogunović and J. Vućković and a warehouse designed by Stevan Lambrin, also belong to the same concept of facilities built using concrete and bricks, with solid volumes with horizontal window openings, constructed during the same period.[28]

The most monumental and distinguished facilities, mail hall and metal goods warehouse, designed by architect Rista Ljubenko, represented a special challenge.[29]

24 Miljković, "Beogradsko teretno pristanište na Dunavu", 67.

25 "Beogradski silos", *Izgradnja*, 8 (1975): 19.

26 Momir Krstavčević, "Skladište za metalnu robu u radnoj organizaciji luka i skladišta 'Beograd'. In: *40 godina građevinastva Socijalističke Republike Srbije,* Miloš, Jarić, editor-in-chief, (Belgrade: Izgradnja, 1987), 100.

27 Miljković, "Beogradsko teretno pristanište na Dunavu", 67.

28 Ibid, 57, 67.

29 Ibid.

Metal goods warehouse that still dominates the entire complex, covers a large area, 70x400m, and has a useful area of 55.000 m².[30] The roof construction on one of the largest covered facilities, represents an especially original solution, due to the application of shallow shells in the shape of hyperbolic paraboloids. This was the first example of application of this type of shells made of pre-stressed concrete

Warehouse "Graneksport" and "Centroprom" (1959-196?)

and the Institute for Materials Research did a study on this subject.[31] Based on the construction solution and technical treatment, it was concluded that "according to the amount of material and the achieved construction time, the designed construction is appropriate for covering large storage spaces".[32] Speaking about construction, it was partly made of pre-stressed concrete, while the rest was made out

30 Krstavčević, "Skladište za metalnu robu u radnoj organizaciji luka i skladišta 'Beograd'", 99.

31 Ibid, 100, 102.

32 Ibid, 102.

of classic concrete.[33] On this monumental building, whose shapes are a result of its function, the special decoration are the roof consisting of a series of triangles and the walls made of facade bricks and concrete cribs that are glazed.

The main halls, out of which two, out of the planned six, were built in the first phase, with two separate closed spaces, are located on the bank of the aquatorium. The halls, also called transverse warehouses, are dominated by cantilevers positioned perpendicularly over the vertical central jetty, which hold the cranes that enable direct reloading of goods from the scows,[34] connecting the river transport with road and railway transport. The same as on the metal goods warehouse, the main halls also have a pre-stressed concrete crane paths and roof trusses.[35]

33 *220 godina kombinata za projektovanje i izvođenje montažnih i opštegrađevinskih radova KMG Trudbenik,* Čedo Maleš, editor in chief (Belgrade: Newspaper company “Radnička štampa”, 1967), 27.

34 *Kombinat za projektovanje i izvođenje montažnih i opštegrađevinskih radova KMG Trudbenik Beograd* (Belgrade:BIGZ), 6; Miljković, “Beogradsko teretno pristanište na Dunavu“, 67; Krstavčević, “Skladište za metalnu robu u radnoj organizaciji luka i skladišta ‘Beograd’“, 100.

35 *Kombinat za projektovanje i izvođenje montažnih i opštegrađevinskih radova KMG Trudbenik Beograd,* 19.

Working on one of the largest and the most complex undertakings in the country, the experts from various fields faced various challenges almost every day. In conquering the banks of the Danube and mastering the large areas of the facilities with complex purposes, they strived to establish close cooperation, which is best testified by the memories of architect Uglješa Bogunović in a text dedicated to his collaborator, engineer Milan Krstić. Positively assessing their work together, he wrote: “We haven’t adopted, as it was common, the division of tasks to architectural and constructive section, therefore, we never had any special problems that would be divided in that manner. A good building, in our opinion, is always a result of respect for equal impacts from both domains.“[36]

Thanks to the close cooperation and the modern construction manner, a successful synthesis of functional, constructive and modelling elements has been achieved in the architectural and urban shaping of the Belgrade port. Even

36 Bogunović, “Milan Krstić u tvoračkom timu“, 8.

Warehouse

Metal goods warehouse (1962-1963)

though it was a priority to satisfy the function, the authors strived to satisfy the aesthetic component as well. This is also testified by an article published in the *Politika* in March 1959, which stated that „the designers are trying to make this new area more beautiful", despite the fact that industrial aesthetics hasn't yet been successfully developed in the world.[37] The author of an article also published in *Politika* in October 1961, stated that they tried to ensure that the port buildings are harmonized with the surroundings and that the industrial architecture may largely contribute to the city aesthetics, or in this case, the development of the Danube neighbourhood.[38]

Clear spatial definition has been conditioned by location and purpose, with a pronounced tendency to connect function, construction and aesthetics of shaping within the complex, and the tendency to establish a relationship with the immediate surroundings. The simple base pattern conditioned by function has been applied to the multi-storey warehouses with galleries and office spaces. The buildings with solid cubic volumes, clear facade surfaces, simply moulded with horizontal window strips, create a harmonious unit. Simple geometric contours with a uniform rhythm of openings are livened up with the facade bricks that give the facilities a specific decoration and warmth associated with the usual manner of constructing factories by the end of the 19th and beginning of the 20th century.[39]

37 Todorović, "Beograd postaje veliko međunarodno pristanište", 5.

38 B. Knežević, "Nova luka biće druga u zemlji", *Politika,* 30.10.1961: 8.

39 Among the examples of the use of facade bricks on industrial buildings in Serbia, here we will single out only several: Brewery in Pančevo (1722); Foundry in Kragujevac (1853); Tobacco factory in Vranje (1885); Tile factory in Kikinda (1895) and Sugar factory in Zrenjanin (1910-1911).

Construction of the main halls

Main halls with cranes (1962-1963)

The warmth of the bricks has been recognized in the same period by architect Ivan Antić who applied them on the warehouse „Vračar" in Dorćol in Belgrade (1953-1954). These solutions were the best way to created association with the industrial architecture from the past by establishing continuity, while the special features characteristic for the bricks create a specific aesthetic experience.

The source for the use of facade bricks can be found in the building opus of one of the main designers, architect Uglješa Bogunović, who had a special affinity towards natural materials and found inspiration in the construction tradition realizing in a unique manner a link between the past and the modern solutions.[40] Brick walls and construction made of reinforced concrete create a mixed system of massive skeleton construction, which was typical for industrial buildings.[41]

Design and construction of the revetment, as well as the multi-purpose facilities on a specific terrain, represented a great challenge for various experts. Overcoming numerous usual and unforeseen problems was often an inspiration for new solutions, especially in the field of construction and founding. That is why, during the construction of Belgrade port, new solutions have been applied for the first time, which gives the entire complex a special value. Following the modern trends in the field of civil engineering and by closely collaborating with each other, the engineers and architects created solutions that fall within the highest achievements of the European civil engineering in the 20th century.

40 Bogunović also combined traditional and modern on the annex to the restaurant "Two Deers" in Skadarska Street in Belgrade (1968-1972) and the RTB facility in Košutnjak (1974-1980).

41 Branislav Kojić, *Projektovanje privrednih i industrijskih zgrada*, I deo, opšti kurs, (Belgrade: Naučna knjiga, 1950), 25.

In the period when it got its main contours, Belgrade port grew into a unique architectural and urban unit, becoming an important part of the industrial zone on the right bank of the Danube River. Harmonious, interconnected buildings with balanced relationship between horizontals and verticals, with derricks and cranes as an inseparable part of the landscape, gave an important accent to this part of the city, which, up until that point, has been neglected and unused. In parallel with the construction of Novi Beograd, one of the greatest civil engineering feats of that time, Belgrade port contributed to the new appearance of the city.

On the other hand, the importance of the port superseded the field of civil engineering, contributing to the development of the entire economy. Its construction marked the first serious step toward the modern exploitation of the water transport, while Belgrade became a new internationally important river-maritime port.[42] . In this way, Danube, as the main European water way, has been exploited for the first time in the right way, by using the maximum of its capacities, while Belgrade finally got a port that, in accordance with its ideal geographic position and economic significance, it deserved.

42 D. S. J., „ Dunavska pristaništa-morske luke“, *Glasnik jugoslovenskog rečnog brodarstva*, 1.3.(1958): 4; M. B., „Izgradnja teretnog pristaništa u Beogradu“, *Glasnik jugoslovenskog rečnog brodarstva*, 1.1.(1959): 4; R. Radovanović, „Beogradsko teretno pristanište biće od velikog značaja za privredu“, *Glasnik jugoslovenskog rečnog brodarstva*, 29.11.(1959): 3.

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