

**THE RAĐE KONČAR ELECTRICAL
MACHINERY FACTORY IN ZAGREB.
VIEW OF HALL "D" FROM THE EAST
SIDE DURING CONSTRUCTION**


TOVÁREŇ NA ELEKTRICKÉ STROJE
„RAĐE KONČAR“ V ZÁHREBE.
POHLAD NA HALU „D“ Z VÝCHODNEJ
STRANY POČAS VÝSTAVBY

Source Zdroj : GOMBOŠ, S., 1950a, p.15

The Architectural Heritage of Zagreb's Reinforced-Concrete Industrial buildings after the Second World War and Its Landmark Protection

Architektonické dedičstvo železobetónových priemyselných budov v Záhrebe po druhej svetovej vojne a jeho pamiatková ochrana

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V oblasti Záhrebu vznikli po revolúcii v rokoch 1848 – 1849 významné priemyselné objekty, ako napríklad plynáreň v roku 1862, parný mlyn v roku 1863, ktorý bol po požiari v roku 1906 znovu postavený v roku 1908, a garbiareň v roku 1869. Po zemetrasení v roku 1880 načrtol nový regulačný plán z rokov 1888 – 1889 priemyselné podniky, ktoré začali vznikať v období pred prvou svetovou vojnou, ako tabaková továreň v roku 1882, továreň na kávu v roku 1892, pivovar v roku 1893, papierená a železničná fabrika v roku 1894 a za západnou hranicou mesta tiež tehelná v roku 1885 a cementáreň v roku 1908. V rezidenčných oblastiach Dolného mesta vzniklo množstvo menších tovární zasadených do blokovej urbanistickej štruktúry, ako napríklad fabrika na výrobu cigaretového papiera v roku 1909. Rýchly rozvoj priemyslu spôsobil príliv obyvateľstva do Záhrebu, čo viedlo k tomu, že mesto so svojimi kasárenskými komplexmi a dôstojníckymi bytovkami sa z vojenskej základne habsburskej monarchie premenilo na priemyselné centrum južnoslovenských častí monarchie. Táto premena si vyžiadala stavanie spočiatku nelegálnych chatrčí v Robotníckom údolí [Radnički dol] a neskôr činžiakov na Paromlinskej ulici a inde. Tieto priemyselné budovy možno považovať za siedmu triedu stavebnej typológie súčasnej mestskej zástavby Záhrebu (ďalšími sú radová obytná zástavba, dvojdomy alebo samostatne stojace vily, chatrče, kasárenské komplexy, verejné budovy a kostoly). Zvyčajne boli navrhnuté ako komplexy výrobných a skladovacích hál v závislosti od konkrétneho priemyselného výrobného procesu. Postavené boli z materiálov a konštrukcií, ktoré boli dostatočne lacné, dokázali poskytnúť minimálnu úroveň bezpečnosti a hygieny stanovenú vtedajšími zákonmi a vyznačovali sa minimálnymi estetickými zásahmi. Išlo teda o jednoduchú, obnaženú architektúru, ktorá našla svoje vyjadrenie výlučne v tehlovom murive, dreve alebo veľmi zriedkavo v železobetóne. Administratívne budovy alebo obydlia pre vedúcich pracovníkov tovární sa zvyčajne navrhovali a stavali ako vily. Po prvej svetovej vojne sa začala rozvíjať výstavba priemyselných objektov predovšetkým vo forme rozširovania, prístavieb a dostavieb existujúcich priemyselných objektov, ako napríklad továreň „Gaon“ na Banjavčičevovej ulici alebo papierená „Lipa Mlyn“ na Maksimirskej ulici. Jednou z úplne nových stavieb bola továreň na výrobu meracích prístrojov „Me-Ba“ vo vnútrobloku ulíc Fijanova-Mandrovičeva-Mašičeva-Maksimirska začiatkom tridsiatych rokov 20. storočia, ktorú navrhol uznávaný priekopník

ranej modernej architektúry profesor architekt Drago Ibler ako modernú železobetónovú stavbu.

Po skončení druhej svetovej vojny a následnom vzniku Juhoslovenskej federatívnej ľudovej republiky, nazývanej po roku 1963 Juhoslovenskou socialistickou federatívnou republikou, začala komunistická strana s výstavbou Nového Belehradu, so stavbou betónom dláždenej diaľnice medzi dvoma najľudnatejšími mestami štátu, takzvanej „Diaľnice bratstva a jednoty Belehrad – Záhreb“, a napokon s obsiahlou elektrifikáciou a industrializáciou štátu. Dobré to ilustruje skutočnosť, že federálna vláda mala v rokoch 1945 – 1950 samostatné ministerstvo pre ťažký priemysel. V Chorvátskej ľudovej republike boli v roku 1945 kolektívizovaní architekti a stavební inžinieri, ďalšie podniky vrátane stavebníckych boli znárodnené v roku 1946. Výstavba priemyselných objektov sa začala v roku 1945 v okolí bývalej manufaktúry „Siemens“ v Záhrebe, priliehavo nazvanej „ELEKTRO-Industrija Hrvatske“ [Elektrotechnický priemysel Chorvátska, miestna skratka ELIH], neskôr známej ako „Rade Končar“, ktorú navrhli architekti Stjepan Gomboš a Mladen Kauzlaric. Nasledovali ďalšie komplexy ťažkého priemyslu ako továreň „Jedinstvo“ [Jednota] a továreň na obrábacie stroje „Prvomájaska“ [Prvomájová], ktoré navrhol architekt Milan Tomičić. Začiatkom päťdesiatych rokov navrhol architekt Ivo Vitić továreň na keramické obkladačky „Jugokeramika“ v Pojatne v blízkosti Záhrebu. V Trešnjevke bola postavená pomerne malá zámočnícka dielňa „Radnik“ [Robotník], ktorú navrhol architekt Franjo Bahovec. Budovanie ťažkého priemyslu sa završilo novou tepelnou elektrárnou – teplárnou v Savici, pre ktorú doviezla oceľové konštrukcie firma „Waagner Biro Graz“ z Rakúska. Táto tepláreň mala slúžiť na centrálné vykurovanie nových sídlisk na južnom brehu rieky Sávy, ktoré sa čoskoro začali volať „Nový Záhreb“, vrátane sídliska „Zaprude“.

Architektonické dedičstvo priemyselnej architektúry v Záhrebe nebolo nikdy dôkladne preskúmané a náležite chránené. Parný mlyn sa dostal pod pamiatkovú ochranu v roku 1980, ale jeho budova pre prenos elektrickej energie z roku 1908 zhorela v roku 1988, keď bol interiér pozostávajúci z liatinových stĺpov a drevených trámov úplne zničený a zostali len obvodové múry. Aktívna ochrana mala nahradiť železné stĺpy oceľovými a trámy železobetónovými podlahami, a to z dôvodu obrovských nákladov na odliatie nových „starých“ stĺpov a výrobu nových „starých“ trámov. Úradníci pamiatkovej ochrany však vo svojom „čiernobieliom“ pohľade na vec požadovali nákladnú obnovu,

ku ktorej však vzhľadom na politické a ekonomické pomery v Chorvátsku nikdy nedošlo, a tak boli múry ponechané fakticky bez ochrany. V roku 2013 sa čiastočne zrútili a onedlho boli úplne zbúrané. Budova sila z roku 1908, pravdepodobne prvá integrálna železobetónová stavba v Záhrebe, našťastie stále stojí a dúfajme, že nájde adekvátne využitie. Niekedy v roku 1997 pamiatková ochrana neuznala význam prvej skutočne modernej priemyselnej budovy v Záhrebe, ktorú navrhol priekopník modernizmu architekt Drago Ibler, a namiesto toho, aby schválila návrh a výstavbu vysoko cenených loftových bytov vo výrobnéj hale, nechala ju zbúrať. Nasledovali ďalšie demolácie: Lipa-Mlyn a RIS v roku 2006, tucet priemyselných komplexov v štvrti Žitnjak v posledných dvadsiatich rokoch atď. Žiaľ, nedávno boli zbúrané dve modernistické priemyselné budovy: továreň DTR na Krajiškovej ulici z roku 1956 a továrenský komplex Kamensko na rohu ulíc Reljkovičeva a Slovenska z konca šesťdesiatych rokov. Niektoré priemyselné budovy sa podarilo zachrániť, aby sa stali súčasťou obytných komplexov, ako napríklad továreň „Gaon“ na Banjavčičevej ul. alebo „Gorica“ na Heinzelovej ulici. Bohužiaľ, v posledných mesiacoch sa počinajúc veľkou výrobnou halou búra papierenský závod Zlatka Neumanna v časti Žitnjak. Slučkou na krku takmer všetkých týchto priemyselných objektov je lukratívnosť ich polohy s pomerne predimenzovanými vodovodnými potrubiami, kanalizáciou a elektrickými rozvodmi, čo znamená, že potenciálni investori nemusia riešiť problémy s infraštruktúrou pre svoje rezidenčné alebo komerčné projekty.

Priemyselné objekty postavené po druhej svetovej vojne sú dnes jedinečnou pamiatkou rýchlej industrializácie Záhrebu, Chorvátska a Juhoslávie v prvých dvoch desaťročiach socialistickej spoločnosti. V tomto období mala juhoslovanská ekonomika veľmi vysoký pomer rastu hospodárstva a domáceho produktu na obyvateľa. Rozhodnutie strany rozvíjať ťažký

priemysel urobilo zo záhrebskej priemyselnej kotliny s existujúcim ľahkým a spotrebným priemyslom najväčšie priemyselné centrum v Juhoslávii, čo sa čoskoro potvrdilo zriadením továrne na plnenie fliaš „Coca-Coly“ v štvrti Žitnjak koncom šesťdesiatych rokov a výrobou čokolády „Suchard Milka“ so švajčiarskou licenciou v továrni „Kraš“ začiatkom sedemdesiatych rokov. Záhrebská priemyselná oblasť si vyžadovala neustály prílev robotníkov, ktorí zase potrebovali bývanie, čo sa zabezpečilo výstavbou nových modernistických sídlisk v päťdesiatych až sedemdesiatych rokoch. Jedným z nich bolo aj panelové sídlisko „Zaprude“, ktoré ocenil historik architektúry Udo Kultermann vo svojom diele „Neues Bauen in der Welt“, no neskôr ho odsúdil architekt a historik Peter Blake v knihe „Form follows fiasco“. Okrem sémantickej hodnoty disponuje záhrebská priemyselná architektúra z tohto i neskoršieho obdobia konštrukčnými a estetickými hodnotami medzinárodného štýlu v súlade s princípom, že forma nasleduje funkciu, avšak každá stavba oplýva aj flexibilitou, komoditou a trvácnosťou podľa Miesovej, t. j. klasickej architektonickej hierarchie. Výber železobetónu, šikmých striech a trojkľbových oblúkov bol výsledkom tvorivej permutácie príkladov z nemeckých príručiek, ktoré boli v Juhoslávii dostupné pred druhou svetovou vojnou i v období juhoslovanského priateľstva so Západom v čase medzi rozchodom so Stalinom v roku 1948 a zbrataním sa s Chruščovom koncom päťdesiatych rokov, ale tiež nedostatku ocele, ktorý podmienil použitie hrubých betónových výsekov s relatívne malým počtom výstuží. Záhrebská priemyselná architektúra by preto mala byť klasifikovaná ako kultúrne dedičstvo a okamžite zaradená pod pamiatkovú ochranu, pričom výrobné haly by mohli slúžiť či už ako muzeálne centrá, alebo ako sídla startupov v oblasti informatiky. Ďalšie haly, sklady a administratívne budovy by sa mohli prebudovať na hodnotné obytné budovy s loftami.

Introduction

One vitally important reason for scholarly discussion of Zagreb's industrial architecture designed and built in the first decades after Second World War lies in the recent demolitions of modernist industrial buildings built in the enclosed blocks of Zagreb's Lower Town and designed with street fronts, in both cases with the necessary valid demolition approvals. The "Domaća Tvornica Rublja" [Domestic Factory of Apparel, local acronym DTR] in Krajiška ul., built in 1956, was demolished in 2020, being irregularly declared unsatisfactory for office use after the ending of production a decade ago. Another apparel factory in Zagreb, the "Kamensko" factory situated in the block between Reljkovičeva and Slovenska ul., itself erected in the 1960s on the site of a demolished military barracks from the end of the nineteenth century, was torn down in 2021 to make place for an exclusive residential development. At the same time, the properly applied removal of former industrial buildings can certainly be a recommended tool of city renewal. The demolition of the modernist addition from the late 1960s to the "Tobacco Factory" in Jagičeva ul. was probably acceptable, because the enlargement failed to harmonize with the neo-Renaissance factory building from 1882 in Klaičeva and Hochmannova, while creating a windowless front elevation towards Jagičeva alongside the cramped storage tower. Today, the location stands open today with an unobstructed view of the restored main factory building from the rear side, while the demolished tower passed its vertical impulse to the present office building in all-glass Minimalist style.

However, the fate of these two modernist garment-industry facilities could have been different if there had been an appropriate and complete catalogue of Zagreb's industrial architecture from the 1850s until the end of the 1980s. Some research had been carried out by the late architectural historian and architect Aleksander Laslo, but he unfortunately lacked the time to finish it, because



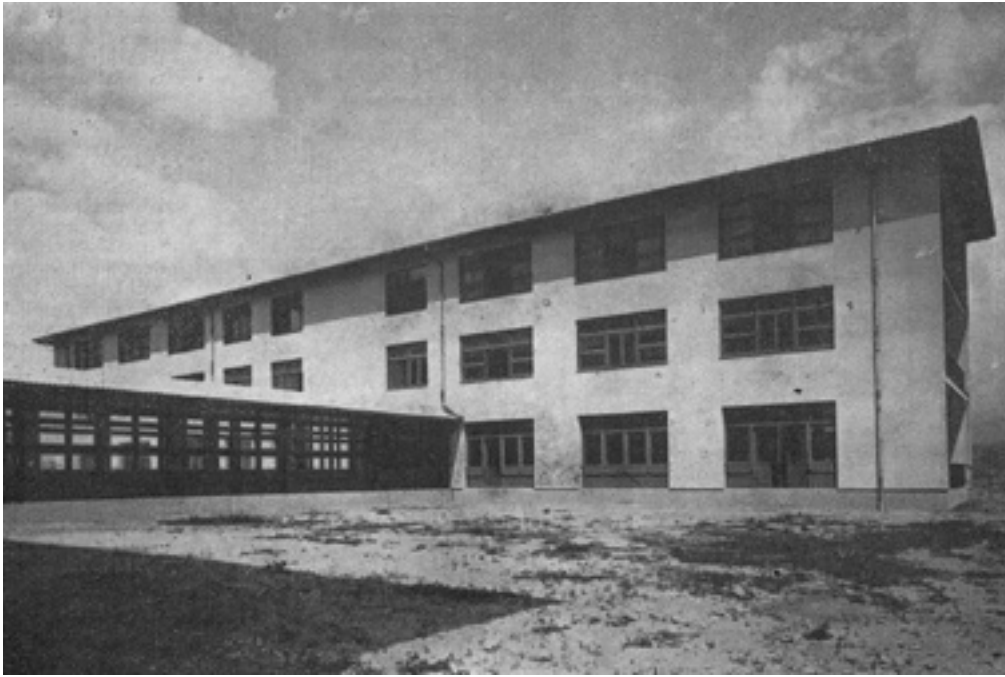
**THE DEMOLITION OF THE FORMER
KAMENSKO FACTORY COMPLEX IN
ZAGREB IN 2021**

DEMOLÁCIA BÝVALÉHO
TOVÁRENSKÉHO KOMPLEXU
„KAMENSKO“ V ZÁHREBE V ROKU
2021

Source Zdroj: Jutarnijlist.hr [online]
2021 [Accessed 9 Sep. 2021]. Available
at: <https://www.jutarnji.hr/vijesti/hrvatska/rusi-se-kultna-zagrebacka-tvornica-doznali-smo-tko-ce-ondje-graditi-stanove-15085940>

his efforts remained unrecognized in the institutions where he was employed from 1995 until his death in 2014. Furthermore, he concentrated on the Gründerzeit industrial and military architecture in Zagreb in the 1850–1918 period and the early Modern Movement from 1919 to 1945, which left little if no resources for the 1945–1971 period and later. On the other hand, recent unpublished research in Modernist architecture in Zagreb demonstrated that the period known as the post-Second World War Modern Movement in Zagreb from 1945–1963 (1971) was aesthetically equal to the celebrated mid-World Wars Modern Movement from 1928–1941 (1945), since the pioneers from the earlier period had become established professionals and teachers in the second, recognized if not necessarily admired by the Communist Party, whose main goal was rapid industrialization of Yugoslavia until 1971 and further. Therefore, the scope of this article is not to make an exhaustive catalogue of Zagreb industrial facilities in the post-Second World War period, but instead a qualitative survey founded on articles about the subject from Yugoslav and Croatian architectural journals and professional periodicals as the primary sources.¹

The city of Zagreb, capital of the People's (after 1963 Socialist) Republic of Croatia as one of the constituents of the Federative People's (after 1963 Socialist) Federative Republic of Yugoslavia, formed part of Socialist Eastern Europe, although subtle differences existed from the USSR and its Warsaw Pact allies. Despite Tito's break with Stalin in 1948 and the consequent orientation of Yugoslav Modern architecture toward western architectural models, a subdued connection persisted with the Soviet Bloc countries, especially with Czechoslovakia. Later, in the 1970s, building industry advertisements from Eastern Bloc flooded Croatian architectural journals, like the Eastern German glass product "Copilit". Due to the nature of Yugoslav federalism, in which Tito personally functioned as the ultimate focal point and arbiter, there was no central institution responsible for the development of industry after 1950; instead the Party loosely yet effectively directed the development through control bodies in every "self-managed" entity, whether a company or an institution. In that way, the demands of heavy industry prevailed in the first two decades, although architects enjoyed a certain sense of freedom to play with Modernistic forms. From 1950 onwards, the holders



ONE OF THE PAVILIONS OF THE DORMITORY OF THE NIKOLA TESLA INDUSTRIAL SCHOOL WITH ITS PORCH

JEDEN Z PAVILÓNOV INTERNÁTU PRIEMYSELNEJ ŠKOLY „NIKOLA TESLA“ S VERANDOU

Source Zdroj: GAJ, L., 1950, p. 49

of economic development gradually became the separate socialist republics until the termination of the so-called “Croatian Spring” in 1971. Consequently, a methodological comparison with similar architectural development, typologies, and landmark protection practices can justifiably be drawn with the lands of former Eastern bloc,² though balanced against the predominant influence of Western architecture after the 1950s.

Typology of industrial architecture until the Second World War

Industrial architecture as a separate building type emerged in the nineteenth century in Great Britain, France, Germany, Austria (later Austria-Hungary) and in the United States of America.³ Beforehand, craft manufacturing existed from antiquity but usually occupied smaller edifices often utilized for another purpose, due to human flexibility and the capability for workforce displacement. The first large-scale production technologies, after millstones from antiquity, were textile looms at the beginning of the seventeenth century. The need to power such machines, along with pumping water from mineshafts, needed greater power than the workforce could ensure, leading James Watt to invent the steam engine in 1776. Soon, steam engines started driving looms, creating the seminal industrial facility in the modern sense. After the end of the Napoleonic Wars, industrial production began to spread, demanding settlement of workers in the vicinity of almost every factory as a result of the rigidity of industry’s production process. Socialist utopists like Charles Fourier or Robert Owen started to plan, design and build progressive worker housing, while Karl Marx and Friedrich Engels scientifically described the desperate living and working conditions of the workforce in England.⁴ Electrical energy, a potential technology from the end of the nineteenth century, became industrially significant only after the Second World War.

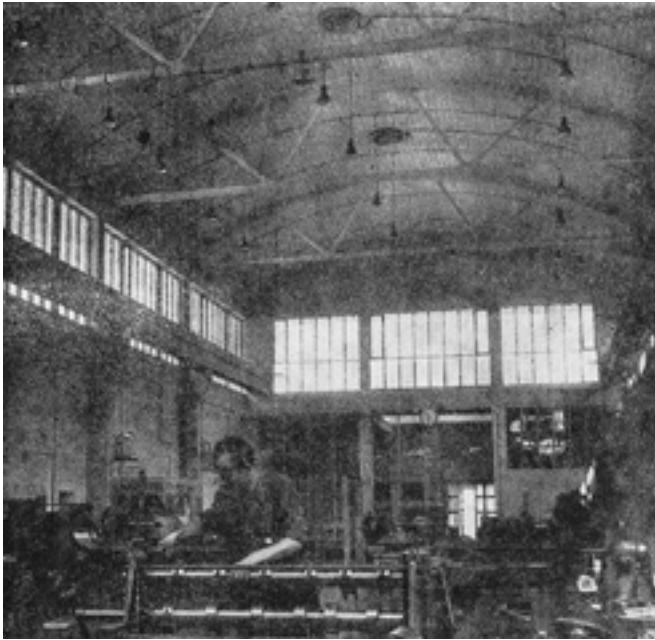
The first World Exhibition in London in 1851 was the seminal event for development of industrial architecture as an independent building type, in which gardener Joseph Paxton erected a gargantuan greenhouse called the “Crystal Palace” entirely of cast-iron beams and glass walls. For the second World Exhibition in Paris in 1855, François Coignet constructed in 1853 the first residential house entirely from reinforced concrete with a flat roof, although his system of structuring rebars was unusual from the perspective of later reinforced concrete science. Later, the famous “Galerie des Machines” was constructed entirely of steel arches by architect Ferdinand Dutert and structural engineer Victor Contamin for the Paris Expo in 1889. Further important large arched or domed halls were the “Palace of Transportation” by Adler and Sullivan for the Chicago Expo in 1893, the hangars of the Paris-Orly airport made of precast concrete in 1923 by the material inventor Eugène Freyssinet, finally the much more recent “Geodome” for the United States pavilion at the

Montreal Expo in 1967 by Buckminster Fuller. Production structures were equally significant, as the Menier chocolate factory in Noisiel-sur-Marne constructed in 1871–1872 being the first iron skeleton structure. Designing the AEG Turbine Hall in Berlin in 1909, Peter Behrens played between classical proportions, entasis and Greek temple architectonic composition with distinctive short and long elevations through the use of reinforced concrete, steel and glass, followed by the proto-Modern shoe-last factory Fagus Werk in Alfeld an der Leine, designed by Walter Gropius and Alfred Meyer in 1911–1913. After the First World War, the most distinctive facilities were the Expressionist hat factory in Luckenwalde by Erich Mendelsohn in 1921–1923, further the first truly Modernist Van Nelle chocolate factory in Rotterdam built in 1925–1931 by architect Leendert van der Vlugt and structural engineer J. G. Wiebenga and finally the Tomáš Bat'a shoe factory in Zlín, Czechoslovakia, built in the 1930s. In the last-mentioned case, its Building No. 21, erected in the period 1936–1938 and colloquially known as the Bat'a Skyscraper, presented a radically new industrial office building design with the CEO's mobile office as an elevator. In its wider significance, the influence of Bat'a on Yugoslav Modern architecture is twofold: first through the Functionalist Bat'a factory with workers' settlement in Borovo, Croatia, and secondly through the design of an office skyscraper at the main square in Zagreb from late 1930s, serving as the impulse for the famous "Neboder" [The Skyscraper] erected at the same location in the late 1950s.

Industrial architecture's building typology soon started to diversify, since industrial facilities were constructed with restricted architectural means to keep the investments of their investors as profitable as possible. In the philosophy of industrial production, the structures were primarily used as a hood to cover the given industrial process under. The beauty of Paxton's, or later Dutert & Contamin's, halls is first of all their size and visual span, to construct the most immense hood for the exhibitions of flowers or machines below. The first artists to consider industrial buildings as an independent architectural problem per se were the architects Behrens and Gropius in 1909, resp. in 1913. On the other hand, if an individual hall or connected group of halls were able to span (or cover) different industrial production if their primary initial function was no longer workable, the investor was luckily not forced to raze obsolete buildings and erect new structures, consequently saving a great amount of the investment. Thus the industrial architecture must be functional per se yet still flexible enough to accommodate even still-unimaginable industrial functions in the future. Architect Ludwig Mies van der Rohe advocated this way of thinking as a central principle when designing office and administrative buildings.

Zagreb industrial architecture in the period 1850 – 1945

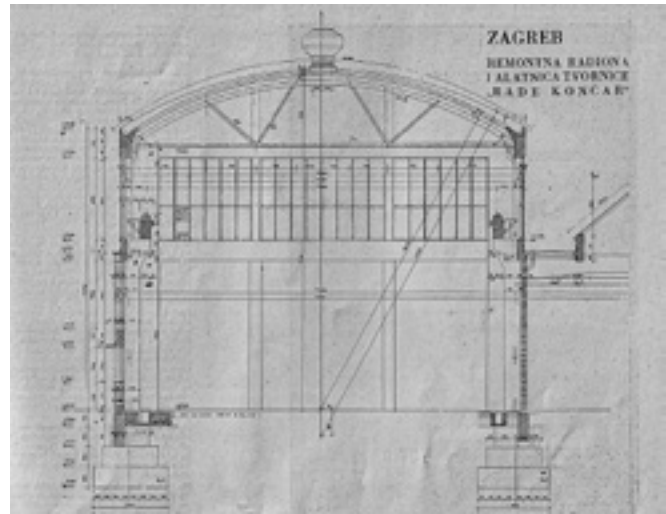
The arrival of railway infrastructure to Zagreb in 1862 was crucial for the rise and development of industrial facilities in the area, since the railway line from Zidani Most intersecting with the Southern Railway line from Vienna to Trieste enabled the importing of industrial products from Austria and Czechia, or from outside the Empire via the port of Trieste. Although this potential was not widely used before the earthquake in 1880, some industrial facilities were built before it, such as the gasworks in 1862, situated in the future city block Hebrangova-Gundulićeva-Žerjavićeva-Mažuranića trg and without any railway connection. A steam-powered gristmill was constructed in 1863 across from the site of the future Hungarian State Railway station but was prone to fires; after burning completely in 1906, it was replaced in 1908 with a new facility containing an advanced reinforced-concrete storage silo. The tannery was opened in 1869 upstream from Kaptol and the Upper Town probably because of the water supply, but consequently far from the railway. These shortcomings obviously stimulated the Regulation Plan from 1888–1889 to anticipate industrial development by setting out two industrial areas, one east of Bauerova ul. to the city limits at the future Heinzelova, and the second west from Vodovodna ul., both with easy connections to the railway. The new tobacco factory was built in 1882,⁵ a coffee factory in 1892, a brewery in 1893, a paper mill and railway workshop in 1894. In addition, a new brickyard was built in Kustošija in 1885 and the new cement factory in Podsused in 1908, both beyond the western city boundary. Many smaller facilities were built in residential areas in the Lower Town, physically integrated into existing closed blocks, like the cigarette paper mill from 1909. Industrial growth spurred an influx of population, consequently transforming the city from a Habsburg military outpost dominated by barracks complexes and officers' residences into the industrial center of the South Slavic regions of the Habsburg Monarchy. Zagreb's industrial buildings were usually planned as complexes of manufacturing and storage halls depending on the specific production process, using materials and



REPAIRS WORKSHOP AND TOOL SHOP OF THE RADE KONČAR ELECTRICAL MACHINERY FACTORY IN ZAGREB, INTERIOR OF THE TOOL SHOP

OPRAVOVŇA A NÁSTROJOVŇA TOVÁRNE NA ELEKTRICKÉ STROJE „RADE KONČAR“ V ZÁHREBE, INTERIÉR NÁSTROJOVNE

Source Zdroj: GOMBOŠ, S., 1955b, p. 24



REPAIRS WORKSHOP AND TOOL SHOP OF THE RADE KONČAR ELECTRICAL MACHINERY FACTORY IN ZAGREB, CROSS SECTION OF THE HALL

OPRAVOVŇA A NÁSTROJOVŇA TOVÁRNE NA ELEKTRICKÉ STROJE „RADE KONČAR“ V ZÁHREBE, REZ HALOU

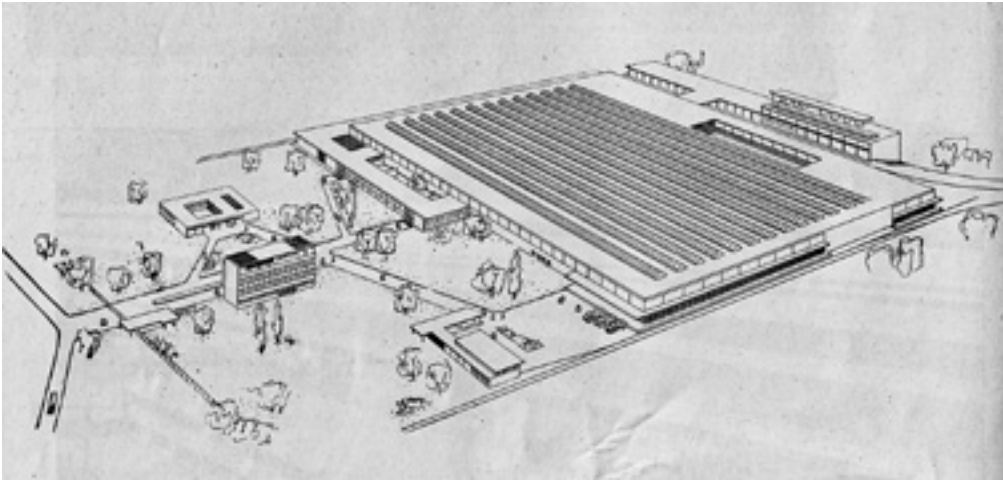
Source Zdroj: GOMBOŠ, S., 1955b, p. 25

structures sufficiently cheap yet providing the minimal levels of security and hygiene stipulated by contemporary laws, rendered with minimal aesthetic interventions, thus a simple and naked architecture which expressed itself preponderantly in brickwork and timbering, or very rarely in reinforced concrete. Administrative buildings or dwellings for factory executives were usually designed and built as villas; by contrast, the constantly growing influx of the working population was accommodated in the first illegally built shanty houses in Radnički dol [Workers' Valley], along with the the first tenement houses in Paromlinska ul. and elsewhere.

After the First World War, the construction of industrial facilities within the city tended to consist of enlargements, additions, and completions of existing industrial facilities, such as the “Gaon” factory in Banjavčičeva ul. or the “Lipa Mill” paper works in Maksimirska ul. Two entirely new constructions were the slaughterhouse built south of the Zagreb-Dugo Selo rail line and west of the newly created Eastern [freight] Railway Station across Heinzlova ul., thus enabling swift transport of cattle between the station and the facility. Designed by the renowned German specialist architect Walter Frese, it was built in the late 1920s and later published in German architectural journals in the early 1930s. Today, it is completely abandoned, and although protected as a landmark, its fate is far from certain. Second, the “Me-Ba” measuring instruments works was constructed in the interior of block Fijanova-Mandrovičeva-Mašičeva-Maksimirska in the early 1930s, designed and conceived by the recognized pioneer of the Early Modern Movement, Professor Drago Ibler, as a modernist reinforced-concrete structure, though later ignored and subsequently demolished at the end of the 1990s.

Zagreb industrial architecture in the period 1945 – 1963

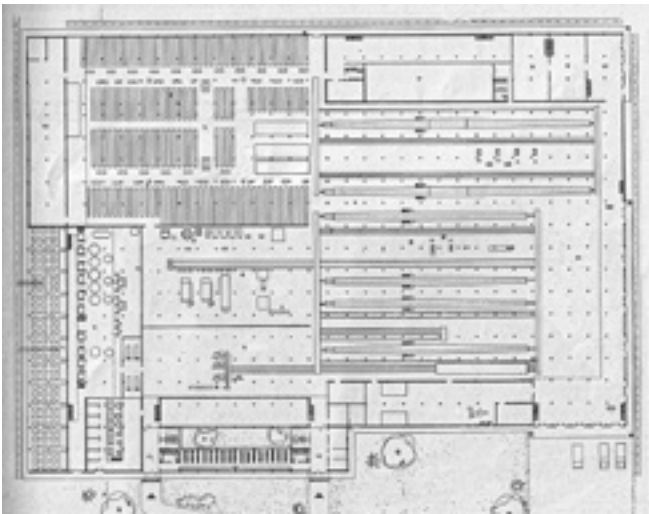
After the end of the Second World War and the collapse of the fascist “Independent State of Croatia” in May 1945, the Communist Party of Yugoslavia decided to organize the country on a federal principle, yet as a socialist power monopoly entirely led by the party officials, as the adjective “Socialist” finally revealed after 1963. The Party collectivized all economical resources in 1946 through the nationalization of companies prescribed at federal level or the abolishment of architectural and engineering chambers on the level of individual republics, as soon happened in the People’s Republic of Croatia. All construction professionals were collectivized at Croatian level already in 1945 and subsequently employed in the “Zemaljsko Građevni Projektini Zavod” [Republic Construction Design Institute, local acronym ZGPZ], located in the old architectural office of Zlatko Neumann in the former Rosinger building in Vlaška ul. 69 in Zagreb. The director of the Institute was architect Branko Tučkorić, a verified Party operative, and after his promotion in Belgrade in 1946 as the Aide



**THE JUGOKERAMIKA FACTORY
IN POJATNO NEAR ZAGREB,
AXONOMETRY**

TOVÁREŇ „JUGOKERAMIKA“
V POJATNE PRI ZÁHREBE,
AXONOMETRIA

Source Zdroj: VITIĆ, I., 1955, p. 8



**THE JUGOKERAMIKA FACTORY IN
POJATNO NEAR ZAGREB, GROUND
FLOOR PLAN**

TOVÁREŇ „JUGOKERAMIKA“
V POJATNE PRI ZÁHREBE, PŮDORYS
PRÍZEMIA

Source Zdroj: VITIĆ, I., 1955, p. 9



**THE JUGOKERAMIKA FACTORY
IN POJATNO NEAR ZAGREB, HALL
DETAIL**

TOVÁREŇ „JUGOKERAMIKA“
V POJATNE PRI ZÁHREBE, DETAIL
HALY

Source Zdroj: VITIĆ, I., 1955, p. 9

of Federal Secretary of Construction Vlada Zečević, another loyal Party member architect Veljko Kauzlarić, brother of the more renowned architect Mladen Kauzlarić, succeeded him. In the name of proclaimed “Brotherhood and Unity” principle, the party started to build the city of “New Belgrade” as the new capital of the “New Yugoslavia”, unrealistically intended to expand to Albania or even Bulgaria.⁶ Secondary and tertiary construction goals were construction of a railway network, primarily in Bosnia & Herzegovina where the majority of Yugoslav coal and steel ores were located, as the construction of the normal-gauge Brčko-Banovići or Šamac-Sarajevo lines witnessed, along with building the concrete-paved half-motorway between the two most populous cities of the new state, Belgrade and Zagreb, completely based on the German “Reichsautobahn” model (though without grade-separated exits) and officially named the “Motorway of Brotherhood and Unity”. Another important goal was the construction of industry across the whole state territory, from Slovenia to Macedonia. These construction enterprises heavily relied on working brigades, preponderantly on “Youth Working Brigades”, while the professional cadre was taken over from the regimes before 1945.

In the Republic Construction Design Committee, the former architectural partners Stjepan Gomboš and Mladen Kauzlarić started to design and, supported by renowned structural engineers Vladimir Juranović and Otto Werner, build the most important industrial facility in Zagreb, the “EL-ektro-Industrija Hrvatske” [Electro-Industry of Croatia, local acronym ELIH], later known as “Rade Končar” (Image 1), situated on the site of the pre-Second World War “Siemens” manufacture facility westerly of Trešnjevka. From 1945 until 1949, there arose an industrial complex of various production halls, workshops and service facilities. These halls, like the majority of industrial facilities in Zagreb and Croatia in the period 1945–1963, were designed and built using the available German handbooks for industry, hall and reinforced concrete construction, such as Kersten, Neufert or



**THE "JEDINSTVO" [UNITY]
FACTORY IN ZAGREB, INTERIOR OF
THE WORKSHOP HALL**

TOVÁREŇ „JEDINSTVO“ [JEDNOTA]
V ZÁHREBE, INTERIÉR VÝROBNEJ
HALY

Source Zdroj: TOMIČIĆ, M., 1955a, p. 17



**THE "PRVOMAJSKA" [MAY DAY]
MACHINE TOOL FACTORY IN
ZAGREB**

TOVÁREŇ NA OBRÁBACIE STROJE
„PRVOMAJSKA“ [PRVOMÁJOVÁ]
V ZÁHREBE

Source Zdroj: TOMIČIĆ, M., 1955b, p. 21

later Henn.⁷ One material advantage of the new state was the abundance of marl and subsequently Portland cement: combined with gravel from the many Yugoslav rivers, it formed an ideal construction material considering Yugoslavia's workforce, demanding relatively few professionals and many largely unskilled laborers. However, the relative shortage of iron ore and – more significantly – the nonexistent iron and steel industry was only exacerbated by the insufficient railway connections between them.⁸ As a result, the Party, advised by the pre-Second World War professionals, mostly the graduates of German, Czechoslovakian or Austrian technical universities and often state employees of independent Croatia during the war, decided that reinforced concrete would be the predominant building material in the rebuilding of Yugoslav society. To increase further the role of concrete at the expense of steel, they repealed the former Yugoslav concrete regulations from 1936,⁹ replacing them with solutions demanding larger concrete section areas and less rebar, in practice implying rather thick structural elements. This circumstance decidedly influenced the shape of reinforced concrete arches, grids and skeletons in making them more bulky yet conversely more visually monumental.

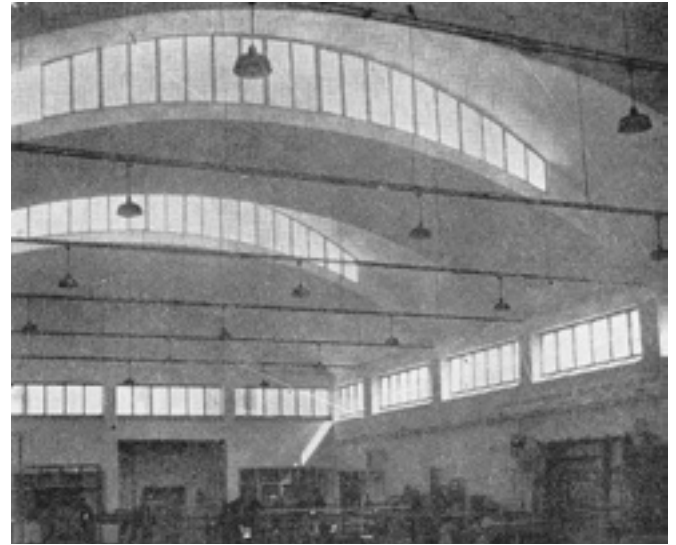
In turn, the construction of reinforced concrete industrial architecture grew in Zagreb and its vicinity. In the early 1950s architect Ivo Vitić designed the ceramic tiles factory in Pojatno near Zaprešić in the vicinity of Zagreb, known as "Jugokeramika".¹⁰ The main production hall was designed with an overhead concrete slab of constant height, supported by columns and provided with triangle-shaped stripes of light integrated into the slab. Other significant heavy industrial facilities in Zagreb were the "Jedinstvo" [Unity] factories, and the machine tool factory "Prvomajska" [May Day], where architect Milan Tomičić played with various types of halls with illumination from above, all structured in reinforced concrete and finished as a derivation of the "Fachwerk" principle, in which concrete structural elements as columns, arches and its structure parts remained visible like the wooden truss elements of traditional half-timbering. One of the most successful examples of the unification of concrete vaulted roofs with appropriate skylights and cubic (clearly pre-Second World War) modernist volumes is the machining workshop "Radnik" [Worker] in Selska ul., designed by architect Franjo Bahovec. Completing this list of industrial facilities in Zagreb from that period could be the thermal electricity and heating plant across the Sava river from the "Zapruđe" residential estate, constructed with steel construction elements imported from the Austrian Wagner Biro Graz steelworks, intended for central heating of all the industry in the surrounding Žitnjak area, or even the furthermore all-new residential estates at its opposite, southerly riverbank of the Sava River soon to be known as "New Zagreb".



**MACHINING WORKSHOP "RADNIK"
[WORKER] IN ZAGREB, VIEW FROM
SELSKA STREET**

ZÁMOČNÍČKA DIELŇA „RADNIK“
[ROBOTNÍK] V ZÁHREBE, POHLAD
ZO SELSKEJ ULICE

Source Zdroj: BAHOVEC, F., 1955, p. 27



**MACHINING WORKSHOP "RADNIK"
[WORKER] IN ZAGREB, WORKSHOP
HALL**

ZÁMOČNÍČKA DIELŇA „RADNIK“
[ROBOTNÍK] V ZÁHREBE, HALA
DIELNE

Source Zdroj: BAHOVEC, F., 1955, p. 27

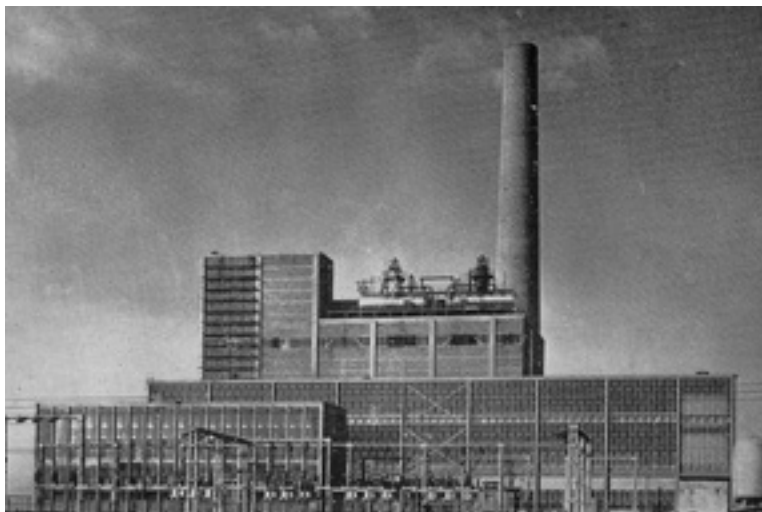
Monument protection of Zagreb industrial architecture and its implications

The architectural heritage of industrial architecture in Zagreb has never been thoroughly researched and appropriately protected, although some enthusiasts, led by the late architectural historian Aleksander Laslo, conducted partial research on the industrial urban fabric and published valuable material. The steam-powered mill was protected in 1980, yet its transmission building from 1908 burned in 1988, while its interior of cast iron columns and wooden beams and floors was entirely demolished, leaving only the exterior walls. Active heritage protection should have involved either the replacement of iron columns with steel ones and wooden beams with reinforced concrete floors, due to the enormous expense of their replacement, or construction of a temporary roof to protect the existing structure underneath from water damage and therefore from degradation of the mortar. Unfortunately, most landmark protection officials in their “black and white” view of the problem demanded expensive restoration, which due to economic circumstances in Croatia never happened, thus effectively leaving the walls unprotected. As a result, they partially collapsed in 2013, and were entirely demolished shortly after. Fortunately, the silo building from 1908, probably the first integral reinforced concrete structure in Zagreb, still stands, hopefully to find an adequate purpose. In the late 1990s, probably in 1997, the landmark protection service failed to recognize the significance of the first truly modernist industrial building in Zagreb, the MEBA factory in Fijanova ul., designed by the pioneering architect Drago Ibler, and allowed its destruction, instead of ensuring the creation of high-value lofts in the production hall. Other demolitions followed, such as the Lipa-Mill in the middle of the 2000s, RIS in the early 2010s, not to mention the many industrial complexes in Žitnjak in the last 20 years among others. Worst of all were two recent demolitions of important Modernist industrial buildings: the “DTR” factory in Krajiška ul. built in 1956 and the “Kamensko” factory complex between Reljkovićevo & Slovenska ul. from the late 1960s. Fortunately, some industrial buildings have been saved to be incorporated into residential complexes, such as the “Gaon” factory in Banjavčičeva ul. or “Gorica” in Heinzlova ul., where Aleksander Laslo coordinated the valorization and immediate reconstruction of the latter. Regrettably, the hope that Zlatko Neumann’s paper mill at Žitnjak would be saved was shattered, as the demolition of the complex started in 2022. The noose around the neck of all industrial facilities in the Zagreb area is the lucrateness of their locations, possessing relatively well-constructed and dense utility networks of water and sewage piping and electrical wiring, allowing potential investors to avoid these costs for their predominantly residential enterprises.

**THERMAL POWER PLANT IN
ZAGREB, VIEW**

TEPELNÁ ELEKTRÁREŇ V ZÁHREBE,
POHLAD

Source Zdroj: TOMIČIĆ, M., 1962, p. 11



Conclusion

The series of industrial facilities built in Zagreb in the first two decades after the Second World War attests to the rapid industrialization of Croatia and Yugoslavia in the seminal period of socialist society, when the Yugoslav economy had a very high growth rate of gross domestic product per capita. Tito's clash with Stalin and subsequent reconciliation with Khrushchev a decade after, combined with permanently good relationships with United States, allowed for the emergence of the Non-Aligned Movement where Yugoslavia effectively transferred Western technology and know-how to the East, as well as onward to the Third World. In these circumstances, the Party, itself revolving around Tito as the supreme arbiter, decided for a gradual decentralization of the political system granting greater authority to the constituent republics in the late 1950s, yet it still controlled all aspects of everyday life through the Communist Party cells that were mandatory in every company or institution. At the same time, the beginning of decentralization in the early 1950s eliminated the federal departments for heavy industry and construction: after this point, only technical regulations and standards for construction were addressed on the federal level, while practical enforcement of industrial development and facility design became transferred to that of the republics. Designers and constructors of industrial facilities were informally encouraged to follow German, English, Swedish, Italian, French, Swiss or American examples as printed in Croatian and Slovenian architectural and construction periodicals during the 1950s or even inherited from earlier German architectural handbooks. In other words, architects retained a certain level of freedom to choose the architectural formulation of industrial facilities, while the prevalent use of reinforced concrete was enforced because of the relative cheapness of the material and ease of the construction process. Considering the strong presence of light and consumer-oriented industry in Zagreb before the Second World War, the Party's decision to develop the complementary heavy industry in the first two decades of socialist economy may have been ideologically rigid, but was also correct from the practical point of view. It transformed the Zagreb industrial basin into the greatest industrial center in Yugoslavia, later confirmed with the appearance of international brand names: the "Coca-Cola" bottling plant at Žitnjak in the late 1960s and the production of Suchard and Milka chocolates under Swiss license at the beginning of the 1970s in the Josip Kraš chocolate factory. Continual growth of industry demanded a constant influx of workers, consequently requiring high numbers of dwellings, which was partially achieved with the construction of new residential estates of modernist character in the 1960s and 1970s.

From the aesthetic point of view, Zagreb's industrial architecture from the latter period possesses a definite international semiotic value, represented through a creative transformation of given Western and (significantly less) Eastern architectural role models. It further inherits the semantic, structural, and aesthetic values of the International Style in its premises that form follows function, yet every building has flexibility, utility, and durability in the sense of the Miesian, one might even argue classic, architectural values. The choice of reinforced concrete, shed roofs and three-joint-arches resulted in creative permutations of given German examples from renowned

handbooks, while the relative shortage of steel in the period engendered the use of thick concrete elements with a low proportion of rebars. Conclusively, these manifested values should place these buildings under immediate heritage protection and conservation. Recent theories in architectural heritage enable “thinking out of the box”, where only a few most valued industrial facilities are to be conserved in the original state, while the other, prevailing part could be architecturally reconfigured with design elements of recent architectural production. Production halls could be functionally converted either as exhibition centers or as new IT startup hubs. Other halls, storages and/or administrative buildings could be rearranged as high-value residential buildings containing lofts. Probably an inspiring example could be the creative redesign of the “alte Altonaer Gaswerk” into the “Otto von Bahrenpark” in Hamburg-Altona in Germany.

1 Primary sources in Croatian: AAZZ, 1950. Industrijski objekti prvog petogodišnjeg plana. *Arhitektura*. 4(11–12), pp. 37–39; AAZZ, 1951. Uz međunarodnu izložbu arhitekture u Rabatu. *Arhitektura*. 5(9–12), pp. 84–85; AAZZ, 1955. Izložba građevinarstva: Industrija. Čovjek i prostor. 2(43), p. 6; ANTOLIĆ, Vlado, 1951. Industrijalizacija: naš najteži urbanistički problem. *Arhitektura*. 5(9–12), pp. 52–63; BAHOVEC, Franjo, 1955. Bravarska radionica ‘Radnik’ u Zagrebu. *Arhitektura*. 9(1–2), p. 27; DRAGOMANOVIĆ, Aleksandar, 1955. Vratarnica tvornice TUNT u Sesvetskom Kraljevcu. *Arhitektura*. 9(1–2), p. 2; GAJ, Ljudevit, 1950. Internat industrijske škole ‘Nikola Tesla’ u Zagrebu. *Arhitektura*. 4(1–2), pp. 48–50; GALIĆ, Drago, 1951. Tvornica motorkotača na Žitnjaku u Zagrebu. *Arhitektura*. 5(9–12), pp. 67–70; GOMBOŠ, Stjepan, 1950. Industrijska arhitektura. *Arhitektura*. 4(1–2), pp. 13–19; GOMBOŠ, Stjepan, 1950. Tvornica električnih strojeva ‘Rade Končar’ u Zagrebu. *Arhitektura*. 4(1–2), pp. 20–21; GOMBOŠ, Stjepan, 1950. O projektiranju i realizaciji tvornice ‘Rade Končar’. *Arhitektura*. 4(11–12), pp. 40–41, Correction, *Arhitektura*. 5(5–8), p. 136; GOMBOŠ, Stjepan, 1955. Arhitektonski zadaci u izgradnji industrije u Hrvatskoj. *Arhitektura*. 9(1–2), pp. 16–23; GOMBOŠ, Stjepan, 1955. Remontna radionica i alatnica tvornice električnih strojeva ‘Rade Končar’ u Zagrebu. *Arhitektura*. 9(1–2), pp. 24–25; HAMEL, Mirko, 1962. Termoelektrana Zagreb II. Čovjek i prostor. 7(103), pp. 1–2; HAMEL, Mirko, TOMIČIĆ, Milan, 1962. Nova termoelektrana u Zagrebu. *Arhitektura*. 9(1–2), pp. 10–13; KAUZLARIĆ, Mladen, GOMBOŠ, Stjepan, and ŽULJEVIĆ, Ivo, 1955. ‘Rade Končar’ tvornica električnih strojeva u Zagrebu. *Arhitektura*. 16(1–2), pp. 22–23; KAUZLARIĆ, Veljko et.al., 1950. Kombinat metalne industrije na Žitnjaku u Zagrebu. *Arhitektura*. 4(11–12), pp. 42–43; KAUZLARIĆ, Veljko et.al., 1950. Tvornica hidrauličnih strojeva. *Arhitektura*. 4(11–12), pp. 46–47; MILIĆ, Bruno, 1951. Tvornica ‘Fotokemika’ u Zagrebu. *Arhitektura*. 5(9–12), pp. 64–66; PAVLOVIĆ, Boro, 1969. Zlatko Neumann, učenik i suradnik Adolfa Loosa [Zlatko Neumann, an apprentice and an associate to Adolf Loos]. *Arhitektura*. 23(101), pp. 61–68; STEINMANN,

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in Yugoslavia, 1948–1980. New York: MoMA.

5 As a result, the former State Hospital Building [Landesspitalgebäude für Kronland Kroatien und Slawonien] on today’s Trg Republike Hrvatske (Republic of Croatia Sq.) as the seat of the University of Zagreb.

6 This forceful Yugoslav nationalism can be illustrated with the banners “Trst je naš!” [Trieste is ours!], displayed every public occasion, including international football matches in the period from 1945 up to 1954, when the so-called “Free Territory of Trieste” was finally dissolved and the city reunited with Italy. The urban myth in the 1980s went, when Trieste became a Yugoslav shopping destination: “If Trieste were part of Yugoslavia, we (Yugoslav citizens) would have to go to Mestre (suburbs of Venice) to shopping!”

7 KERSTEN, Carl, 1936; NEUFERT, Ernst, 1943; HENN, Walter, 1955–1966, Band 1–4. Professor Ernst Neufert visited Zagreb and Yugoslavia in 1955, and invited architect Valdemar Balley, then a teaching assistant of Professor Zvonimir Vrkljan, to Germany as the editor of the 20th edition of the “Bauentwurfslehre” in 1956.

8 There were two cement factories in Croatia before 1945, one near Zagreb and another near Split, while the closest steelworks were in Slovenia or Bosnia near city of Zenica, the latter connected to the normal-gauge Yugoslav railway network only with about 200 km of narrow-gauge line.

9 A literal translation of the famous Swiss Reinforced Concrete Regulation from 1935, since a Yugoslav expert and materials scientist, the Zagreb-born Dr Mirko Roš, was the director of the Swiss Federal Laboratories for Materials Science and Technology in the period 1926–1949. Available at: <https://library.ethz.ch/standorte-und-medien/plattformen/kurzportraits/mirko-ro-1879-1962.html>, [Accessed 9 Sep. 2021].