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RESEARCH ARTICLE

A Unit of Homemaking: The Prefabricated Panel and Domestic Architecture in the Late Soviet Union

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This article investigates the role of an iconic Soviet material — the concrete prefabricated panel — in the making of late-Soviet urban residential architecture. The dominance of the prefabricated panel became possible due to the economic system that sustained its production and use, yet the same economic context also drove the architectural profession and the construction industry into stagnation in the 1970s and 1980s. With the help of archival and legal materials, interviews collected in Kyiv and Lviv, Ukraine, professional magazines, and through the object-based history of this basic material unit, this paper reconsiders the traditional notion of professional designers' dominant role in architectural decision-making, and highlights economic and institutional inertia in the creation of late-Soviet residential architecture.

The prefabricated panel was first introduced to the USSR at the beginning of Khrushchev's ambitious and far-reaching housing campaign of the late 1950s to solve a severe housing crisis with cheap and fast experimental construction. In the 1950s and '60s, the prefabricated panel propelled innovation in the production of ordinary architecture, as well as changes in the architectural profession. However, over the next couple of decades it became the main building block in the system, one that both hampered and heavily limited residential design practices and the resulting built environment. After the dissolution of the USSR, prefabricated panels ceased to be the primary determinant in apartment building, yet panel buildings remained, once again indicating the persistence of a material building block over the political or economic system that enabled its creation.

Introduction

The story of Soviet mass housing architecture is usually told within the context of the socialist political system. The image, captured in birds-eye photographs, of monotonous, uniform, 5-, 9-, and 12-storey buildings spreading seemingly endlessly throughout Soviet neighborhoods has become practically synonymous with late Soviet-style socialism when it comes to architecture and planning. Yet prefabricated mass housing is not synonymous with socialism or communism *per se*. Besides the political system, besides the never-ending Soviet housing shortages, and besides Khrushchev's famous promise to deliver an individual apartment to every family, the architecture of Soviet mass housing was determined by the relationship between architectural institutions, the assembly and construction material production industries, and most important of all, the Soviet economic structure. This article argues that the magnificent scale of Soviet concrete prefabrication was the result of not only the ideology of the communist state but also of the mechanisms and networks of a planned economy and institutional bureaucracy. This was also the same planned economy that drove the architectural profession and construction industry to stagnation in the 1970s and 1980s.

Unlike the occasional famous gimmicks of Soviet visionary and built architecture, such as the Palace of the Soviets or the Third International, mass housing was not a single, inhumane endeavor, but a multi-layered, bureaucratic, lethargic, perpetual machine that nevertheless kept both itself and the USSR's housing supply going. Therefore, this article shifts focus away from the large-scale socialist politics of mass housing and onto the complex history and context that made it possible. To do so, it centers its inquiry on the iconic material unit of Soviet mass housing production — the prefabricated concrete panel.

While neither prefabricated nor panel housing was ever a uniquely Soviet phenomenon, the USSR is a perfect site to study the rise and stagnation of prefabricated concrete panel housing in the 20th century. Although 'some forms of prefabrication have been known since antiquity', prefabrication *en masse* started as an experiment, became a driving force in architectural and engineering innovation in the late 19th century, and went global in the 20th (Urban 2012: 9). Engineers and architects around the world, including Le Corbusier and Frank Lloyd Wright, experimented with cheap, uniform residential construction to house growing urban populations. In the USSR, early experiments with prefabrication took place during the first decade after the 1917 Bolshevik Revolution. However, in the context of War Communism and an economy

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geared toward military production, these experiments remained sporadic and did not go beyond constructing several buildings (Davies, Harrison, and Wheatcroft 1994: 48–56). The main developments in prefabrication began in the 1950s, when the political priorities of the Soviet leadership shifted to mass housing construction to remedy the chronic Soviet housing crisis that had persisted since the 1917 Bolshevik Revolution (Ilic and Smith 2009: 27–30). The concrete panel was destined to become the material and method for this mass housing campaign.

Existing research on this subject is sparse. Therefore, for this study the bureaucratic and economic mechanisms that determined the characteristics of prefabricated panel housing were extracted from primary archival sources and supplemented by interviews with architectural professionals. These interviews helped bridge the gaps between state-level directives and case-by-case correspondence between local and state-wide institutions. Although the interviewees remain anonymous, they, like most architects before the collapse of the USSR, worked at state project institutes and were therefore familiar with institutional mechanisms and procedures. These institutions included Kyiv Zonal Scientific and Research Institute of Experimental Design [KyivZNDIEP], KyivProekt, and GiproTsyvil'prombud [GiproGrazhdanpromstroi during the Soviet years.] Archival correspondence, decrees, and miscellaneous construction-related documents were studied in the collections of the State Central Authorities and Administrations Archive in Kyiv [Tsentral'nyi derzhavniy arkhiv vyshchykh organiv vlady ta upravlinnia Ukrainy] and Lviv Oblast's State Archive [Desrzhavnyi Oblastnyi arkhiv L'vivs'koi oblasti]. Together with state-wide Soviet building codes, this data comprised a comprehensive picture of the system of prefabricated housing production and its mechanisms and processes at state, republic, and local levels.

While this study's primary chronological focus is the late 1970s and 1980s, the investigation is part of a much longer history. To effectively show the interconnections that determined the state of residential architecture and the architectural profession in the late-Soviet period, each thematic segment of this paper touches on a different period of the history of Soviet prefabrication, from the beginning of the mass housing campaign in the 1950s through the high-volume, small-apartment production of the 1960s to advances in apartment typology in the 1970s and early 1980s, and, finally, to the stagnation of prefabricated panel housing construction in the late 1980s and 1990s.

The Housing Campaign

In 1957, Nikita Khrushchev, general secretary of the Communist Party, announced a grandiose housing campaign that was supposed to deliver an apartment to every family (Varga-Harris 2015: 2). The most famous exam-ple of the earliest apartment building designs, the K-7 panel series developed by architect Vitaliy Lagutenko, went into mass prefabrication and construction after this announcement (Ogorodnikova 2018). By 1961, K-7s were produced at Moscow House-Building Factory No. 1 (DSK No.1), using several pre-existing concrete factories (Ogorodnikova 2018). Similar to earlier examples of mass housing prefabrication in other Eastern Bloc countries, Czechoslovakia in particular, these early apartment series were a synthesis of science and industry (Zarecor 2011: 15). Based on engineering, economic, and sociological research performed in central research institutes, these early projects were referred to as experiments and were later reproduced throughout the Soviet Union (*Zhilishch-noe stroitel'stvo* 1967 (7): 5). After K-7 there were many other series, some more successful than others, but the emphasis on serial rather than individual construction remained constant until the collapse of the USSR in 1991 (**Figures 1** and **2**).

The precast concrete panel became an official weapon in this Soviet fight against a housing shortage. In 1954 — three

Figure 1: Prefabricated panel construction in 1961 and 1964, Darnytsia neighborhood, Kyiv, Ukraine. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G.S. Pshenychnogo.

Figure 2: Prefabricated panel construction in 1961 and 1964, Darnytsia neighborhood, Kyiv, Ukraine. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G.S. Pshenychnogo.

years before this landmark housing manifesto — the Central Committee and Cabinet of Ministers had already issued a decree, 'About the Development of Production of Composite Reinforced Concrete Structures', that imposed the use of reinforced precast concrete wherever possible (Baikov 1980: 5). The decree specified that using composite reinforced concrete construction was necessary to save metal widely used elsewhere in industrial construction. In residential construction, the use of composite reinforced concrete was supposed to prevent frequent repairs; the decree cites the common practice of constructing ceilings from wood as inefficient, because such ceilings and roof structures need frequent maintenance.[1]

In the USSR, there were no private contractors. Only the state and its institutions had the right to design and build multi-unit housing. This meant that in most multi-unit construction, which dominated Soviet cities, prefabricated concrete panels and blocks became an enforced construction method and material. With this new method, the volume of residential construction increased to unprecedented levels: in the first decade of the mass housing campaign (1956–1965), 13 million apartments were built (Varga-Harris 2015: 2).

This housing campaign was not simply the cumulative result of systematic social pressures, but also the outcome of an individual political stance taken by Khrushchev, who became the general secretary of the Communist Party in 1953. Before assuming the highest post in the USSR, between 1934 and 1938 and again between 1949 and 1953, he was the secretary of the Moscow Regional and Moscow City Committees of the Communist Party. In those roles, both before and after World War II, he invested much time and effort into industrializing construction and reforming its institutional hierarchy (Tompson 2016: 99). In the mid-1930s, he called for the abolition of small house-building enterprises and administrations and the creation of large house-building trusts to improve housing quality. In Khrushchev's view, this shift to larger organizations would facilitate hierarchical central planning guidance over housing construction (Tompson 2016: 40). In addition, Khrushchev himself had been a proponent of industrial production for construction materials. Davies and Ilic offer a detailed overview of the Communist Party conference on questions of construction industry held in 1935, where Khrushchev was a central speaker:

> Khrushchev insisted that building materials and components — including bricks, doors, flooring and baths — should in turn be produced by specialized factories, attached either to the commissariats or to their building trusts, or to a specialized commissariat responsible for this production. Narkomles, the People's Commissariat of the Timber Industry, for example, should produce all components manufactured from timber (Davies and Ilic 2011: 206).

While this quote focuses on Khrushchev's personal views on the future of Soviet construction, this interest in prefabrication and concrete was never merely Khrushchev's personal idiosyncrasy. The system of five-year plans — the roadmap for the Soviet planned economy — had been targeted toward industrialization and industrial production since the very first five-year plan, laid out in 1928 (Davies 1994: 136–157). Furthermore, as Adrian Forty pointed out in *Concrete and Culture*, 'In the Soviet bloc, it was the economic incentive to create surpluses to fund the armaments program that was primarily responsible for the widespread use of concrete' (Forty 2012: 164). Although it took a shift in industrial production priorities, from heavy engineering and armaments to civil construction and consumer goods, it would be no exaggeration to state that, within the Soviet economic model, industrial prefabrication of housing was a natural solution awaiting the right time and circumstances to happen.

The Industry

The hierarchy of institutions responsible for prefabricated construction consisted of Gosstroi SSR (Meuser and Zadorin 2015: 14–15), which approved projects developed at the Central Scientific and Research Project Institute of Residential and Public Buildings [Tsentral'nyi nauchno-issledovatel'skiy proektniy institut zhylikh i obshchestvennykh zdaniy, or TsNIIEP] in Moscow. In later decades, this relationship was further extended to include several republican design institutions similar to TsNIIEP that were

responsible for climate- and region-specific designs, as well as state-wide designs (Kyiv, Tbilisi, and others). Upon approval from Gosstroi and inclusion into republican ministry plans, projects developed by design institutions went into prefabricated element production and construction with the local house-building factories or combines — Domostroitel'nyi kombinat (DSK), Sel'skiy stroitel'nyi kombinat (SSK) in rural locations, or different construction trusts subordinated to local ministries (**Figures 3** and **4**). Construction trusts assumed the role of construction client. Trusts were large associations of industrial enterprises, first established as part of the New Economic Policy (NEP) in the 1920s. Originally, they were relatively independent in their decision making. They decided what to manufacture, where to sell, and how to use the income left over after making fixed payments to the state budget (Shmelev and Popov 1990: 9). When the NEP was wrapped up in 1928, trusts lost their independent decision-making capacity, but remained the dominant industrial associations used in the planned economy.

Figure 3: *Domostroitel'nyi kombinat* No. 1 (Ukr. *Domobudivel'nyi kombinat* No. 1) in the 1960s, Kyiv, Ukraine. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G. S. Pshenychnogo.

Figure 4: *Domostroitel'nyi kombinat* No. 1 (Ukr. *Domobudivel'nyi kombinat* No. 1) in the 1960s, Kyiv, Ukraine. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G. S. Pshenychnogo.

Before the transition to industrial methods of housing construction under Khrushchev, the construction industry appeared chaotic and backward in many ways. In the 1920s and '30s labor was unskilled and seasonal, building was performed by many often short-lived trusts and other organizations, and the supply of materials was not consistent (Davies and Ilic 2011: 202–205). In 1935, to address problems with the industry's lack of coordination, Khrushchev, in his role as the secretary of the Moscow city and regional committee of the Communist party, advocated for creating specialized, lasting construction trusts — under the governance of ministries that had previously performed construction using their own labor force and resources — and argued that building materials should be produced industrially (Davies and Ilic 2011: 206). The future of housing construction is already visible in this 1935 position, with its emphasis on industrial prefabrication and reliance on specialized construction trusts and administrations to realize it. In the 1950s, Khrushchev continued pushing this agenda. In 1954, dozens of construction trusts and other contractors became consolidated under the newly created Glavmosstroi (the Moscow Construction Board) (Davies and Ilic 2011: 206). Similar consolidation took place in other urban centers; in fact, umbrella structures similar to Glavmosstroi sometimes persisted longer than the Soviet Union itself. For instance, between 1955 and 1992, large portions of residential construction in Kyiv were formally commissioned by the trust-governing administration called Golovkyivbud [abbr. for the Main Kyiv Administration for Construction], later renamed Golovkyivmis'kbud [abbr. for the Main Kyiv Administration for Construction]. According to Soviet statistics, in the 1970s Golovkyivmis'kbud and its trusts were solely responsible for more than half of construction and assembly services (TsDAVO VU Ukrainy Fond R-2, Opis' 13, Delo 939: 178–179). Like other administrations, this organization was originally created for easier governing and communication between existing construction trusts and contractors, but by the mid-1970s its structure had become hierarchically complex enough to create problems, rather than solve them.

During the late 1970s and '80s, various problems emerged due to this complexity of construction hierarchies. For instance, in 1976, the Council of Ministers of the Ukrainian SSR reviewed problems with housing construction originating from the status of DSKs as subcontractors of the trusts in the structure of Golovkyivmis'kbud (TsDAVO VU Ukrainy Fond R-2, Opis' 13, Delo 939: 178–179). At the time, this large trust included six subsidiary enterprises working as contractors in residential construction and two DSKs that were primarily responsible for housing. In the late USSR, these DSKs served as subcontractors to subsidiary trusts. This caused multiple practical problems. It was difficult to resolve emerging issues between DSKs and 'single clients'[2] — executive committees of City Councils or enterprises of ministries, such as the Construction Ministry of Ukrainian SSR, or institutions, such as specialized committees, administrations, or bureaus. Trust interests had priority over DSK interests. The result was slow construction performance by DSKs, because of untimely preparation of engineering infrastructure and buildings, construction sites, and budget and design paperwork by the trusts (TsDAVO VU Ukrainy Fond R-2, Opis' 13, Delo 939: 178–179). This happened because trust performance indexes were independent from DSK-performed jobs, hence there were no repercussions for trusts even if they sabotaged DSKs by their tardiness (TsDAVO VU Ukrainy Fond R-2, Opis' 13, Delo 939: 178–179). In other words, although industrial prefabrication was prioritized as a construction method, DSK performance was often complicated and hindered because of client/contractor/subcontractor, hierarchy-derived misconduct by the construction trusts.

Toward the end of the 1980s, fulfilling plans for house-building factories became increasingly problematic. Despite a degree of economic liberalization through Perestroika reforms (Hanson 2014: 178–239), the supply of materials worsened and reached a point that, in literature on the late Soviet Union, is usually identified as 'deficit'. 'Deficit' was used to refer to any goods that had disappeared from store shelves due to the complications of the planned economy. The history of late-Soviet deficits in consumer goods is well known (Moskoff 1933: 27–86); however, lack of or interrupted supply of basic materials did not end there but spread to industrial manufacturers as well. For instance, toward the end of the Soviet Union, House-Building Factory No. 2 (DSK 2) in Lviv, Ukraine, which was newly built — less than a decade old — complained that it could not 'reach its full production capacity due to disruption in the delivery of inert materials: macadam, sand, gravel, and slag', and lamented the resulting shortage of manufactured elements at their construction sites (TsDAVO VU Ukrainy Fond R-221, Opis' 3, Delo 950: 109).

From a different perspective, when house-building factories finally received paperwork from design and engineering institutions, their performance was complicated by contradictions found in the paperwork itself. DSKs received a documentation package that consisted of standard plans, sections, and electrical and plumbing fixture schemes. They also received documents showing the layouts and types of prefabricated panels designed by the institutional engineers. Together with the resulting buildings, these documents constituted what were called the 'apartment building series' — designs meant for practically unlimited reproduction with only insignificant adjustments at the actual construction site. Different apartment building series contained different types and numbers of prefabricated elements. The number of series that each house-building factory could build was limited by how many types of panel it could cast.

Because of this method of design and construction, as well as the emphasis on affordability and functionality, the resulting apartment buildings looked quite utilitarian. During the first decades of prefabricated construction, popular concerns emerged over the uniformity and visual inexpressiveness of the mass-constructed apartment buildings. In the 1960s, to diversify the look of prefab apartment buildings and the interior organization of the apartments, design institutions started developing a new approach to

mass housing. Rather than giving out blueprints for an entire building, design institutions now produced documents for building sections that could come together in different combinations. This technique became known as the 'block-section method' (**Figures 5** and **6**). Deciding which approved sections to use was left to local house-building factories.

By this time, architectural institutions had developed many block-section series for local institutions to choose from. However, in practice, if one series was successfully

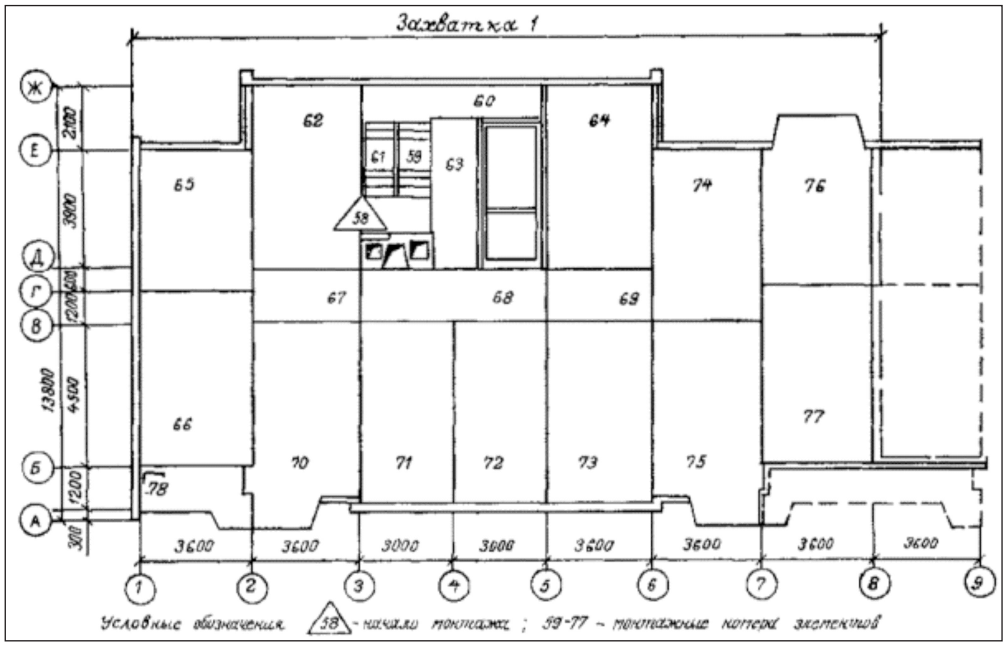


Figure 5: Different sections in the instructions for assembly of a frameless panel building from the unified catalog of elements for the P44 series. From *Instruktsiia po montazhu* (1982: prilozhenie 9 and 11).

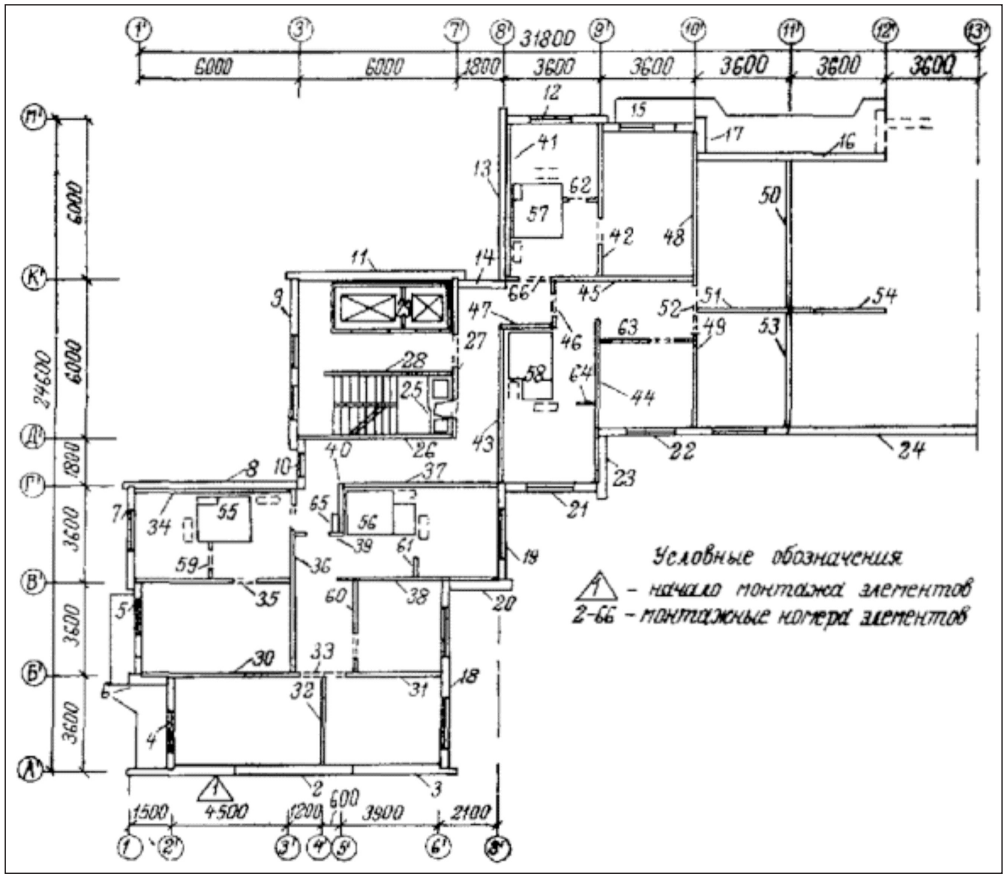


Figure 6: Different sections in the instructions for assembly of a frameless panel building from the unified catalog of elements for the P44 series. From *Instruktsiia po montazhu* (1982: prilozhenie 9 and 11).

mastered by a house-building factory, it signaled to Gosstroi that it was practical to build and that the series was well adjusted to the available industrial supply in the region. Therefore, when other house-building factories in the city or region were choosing which block-section series to bring into production, Gosstroi insisted on choosing those that were already being locally produced. For example, when a feasibility study was done for House-Building Factory No. 2 in Lviv, Ukrainian SSR, in 1980, the ultimate decision was for this new DSK to produce the '84th series [1–528KR-84E series]' which was already being produced at the existing Lviv house-building factory (DALO, Fond R-221, Opis' 2, Sprava 8461: 57). As in many other cases, potential architectural variety was sacrificed in favor of maximizing the use of existing resources, namely, the resource supply and blueprint package for the already proven '84th apartment series' (DALO, Fond R-221, Opis' 2, Sprava 8461: 57).

The Economy

Soviet industries, including residential prefabrication and construction, operated in a centrally planned economy. *The MIT Dictionary of Modern Economics* defines a planned economy as a system in which economic goals — production, 'obligatory input and output targets' — are 'generated by vertical signals from an administrative hierarchical' [planning] body, rather than by the market (Pearce 1992: 332). This general definition reflects the system of Soviet planning, headed by the Central Committee of the Communist Party. The next body in the hierarchy was Gosplan [State Planning Committee of the USSR], which delivered its general plans to Gosbank [State Bank of the USSR], Gosstroi [State Committee for Construction of the USSR], republican ministries, *glavki* (*glavnyie komitety* meaning 'main administrations'), and major institutions (Hanson 2014: 9). These, in turn, delivered the detailed plans to producers: project institutes, DSKs, and construction trusts. All producers, including architects, factory workers, and construction teams, were primarily concerned with meeting 'targets set by planners' that detailed the number of blueprint packages for architects, concrete panels for factories, and finished buildings for construction trusts (Hanson 2014: 9). Each design institution, DSK, or construction trust was told what to produce, how to do it, how much of the product had to be produced, and where, and how much supply had to be received from other producers (Hanson 2014: 14). The major theoretical principle behind the Soviet planning system suggested that all available resources, namely 'labor, material, and production capacities' had to be fully used for production at all times (Hanson 2014: 15). This principle of economic governance applied to residential construction no less than to other industries; in fact, it was this theoretical principle that led late-Soviet central planning organs to always insist on using existing industrial facilities first.

This approach derived production rates from available resources rather than from demand, and often resulted in consumer shortages. Housing was no exception. Throughout Soviet history the population's housing needs were never close to being fully satisfied, not even during Khrushchev's construction boom. In the last Soviet decades (1970s and '80s), amidst continual housing shortages, housing was often underfunded. Local institutions and housing committees appealed to Gosplan and Gosbank to increase funds. The Soviet term for such a funding increase was to 'expand the limits', where 'limits' meant the maximum permissible construction cost for new or continuing projects. In other words, production, consumption, and price plans issued by planning institutions were always undermined by reality. The mechanisms for altering five-year and annual plans along the way were built into the Soviet system. And so was the phrase 'as an exception' [*v vide iskliucheniia*] that organizations and individuals used to routinely appeal to planning institutions for more money or resources. For instance, when in 1983 Goskino [State Committee for Cinematography] and Gosteleradio [State Committee for Television and Radio] petitioned to increase the regular funding they received for housing construction to house Cinematographic Union members, Gosplan refused to satisfy the demand (TsDAVO Ukrainy Fond R-2, Opis' 14, Delo 6664: 57–58). At the same time, Gosplan agreed to plan the construction of two apartment buildings for Goskino in Kyiv and Odesa, and one apartment building for Gosteleradio in Kyiv 'as an exception' and 'as a one-time assistance' (TsDAVO Ukrainy Fond R-2, Opis' 14, Delo 6664: 57–58).

Toward the end of Soviet rule and after the beginning of Perestroika in 1985, in the context of worsening deficits and interrupted supply, 'as an exception' documents acquired a nearly comical hands-on governance character. For instance:

> Due to the substantial shortage of wall construction materials, the executive committee of the regional Council of people's deputies asks to leave 200 thousand units of cored bricks —the reserve of Gosplan of the USSR for the second quarter of 1988 — in the region. (DALO Fond R-221, Opis' 3, Sprava 549: 107)

Documents such as this indicate the extent of supply chaos in construction that emerged within the Soviet planned economy toward the end of its existence, which was only exacerbated by the economic liberalization elements of Gorbachev's Perestroika (Moscoff 1993: 27).

By the last Soviet decades, 'exceptions' and 'single-time assistance' — the language of top-down, circumstantial decision-making — became omnipresent in communication between planning institutions and housing commissioners and recipients. However, the economy of mass housing construction had not always been that way. On the contrary, the beginning of the mass housing campaign in the 1950s was all about simplifying and streamlining governance. The early period of prefabricated mass housing construction under Khrushchev was characterized by structural economic reforms meant, among other things, to decentralize and simplify construction decision-making to some degree. The 1957 reform relocated construction control from branch ministries (which were left with planning assignments) to territorial *sovnarkhozy* (Councils of

the People's Economy). However, this reform did not alter the major preexisting principle of the Soviet economy: producers themselves received no individual decision-making power as to what, how much, and how to produce (Hanson 2014: 59). The next attempt at economic decentralization happened in 1965. This reform, devised by Alexei Kosygin under early, not yet reactionary, Brezhnev rule, indeed meant to partially relocate decision-making power to producers. It aimed to encourage production by linking wages to profitability, by wholesale price revision and wholesale trading (rather than centrally controlled supply), and by re-establishing USSR- and republic-level ministries which would then be responsible for less heavy-handed planning (Hanson 2014: 103). However, this reform was never fully realized. Although the ministries were re-established, no changes took place beyond that: plans continued being hierarchically prescribed from above, based on the data received from below. Plans were also frequently altered and sabotaged through inefficient performance by both high- and low-level institutions.

This meant that the amount of housing to be constructed was determined by central planning institutions, whereas the types of materials and construction methods to be used were determined by existing industrial capacities and top-down preference for prefabricated concrete. In theory, prefabricated concrete panels had a couple of important benefits: production and labor costs for reinforced concrete prefabrication were low compared to other methods (both production and labor-wise), and theoretically such construction methods were faster. However, each of these benefits of prefabrication was undermined by a set of problems. In the economic realm, the most important problem was the lack of investment in technological upgrades that haunted the prefabrication industry in the late-Soviet period, leading to inefficient production and low-quality prefabricated construction materials (Berend 2009: 7–37).

A curious development in the planning mechanism of Soviet institutions happened in the late 1980s. Due to the transition to a Perestroika-style reformed economic model of money exchange between the state and its enterprises, design institutions were allowed to produce architectural and urban planning paperwork above the approved plan, but within the limits of normative salary funds derived from this extra work. In practice, this meant design institutions no longer had to approve any unplanned or extra activity with Gosplan or wait for the petition to be resolved. They could simply take the job from the client, as long as the client paid it within the approved plan of capital investment (TsDAVO VU Ukrainy Fond R-26, Opis' 4, Delo 2774: 32). Unfortunately, we will never know if this innovation would have led to changes in design practice at such institutions, as these transformations happened at a time of supply crisis and only a couple of years before the Soviet Union fell apart.

The Panel

By the 1970s, the 'block-section method' was a dominant approach to housing construction in the USSR. Unlike the first prefabricated panel buildings, which were designed as a whole and had to be built as such, the block-section method offered more variety and visual relevance through a mix-and-match system of sections that could be combined differently, to meet site-specific needs. Although this change affected the layouts and the appearance of the new Soviet neighborhoods in a big way, the system of design and production for the new housing largely remained the same: architectural institutes continued perfecting existing panels, and local house-building factories produced these panels for the sections and assembled them on site (**Figures 7, 8,** and **9**). A 1972 book on the creation of code norms for elements of apartment plans states that 'the successful development of industrial construction methods requires unification and standardization of the produced articles [prefabricated construction pieces] and typification of buildings [liquidation of diversity] and their details'. Besides unification, standardization, and typification, the chapter calls for normalization: a further step after the typification of buildings and their elements, where the newly created types gain their own nomenclature and become building code elements (Sedov and Khokhlova 1972: 1).

The goal of perfecting the system also remained similar, but with one new component. Unifying element types and negotiating decentralized production was now also

Figure 7: Panel construction in the 1980s: Troeshchina neighborhood of Kyiv, 1983–1984. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G.S. Pshenychnogo.

Figure 8: Panel construction in the 1980s: Troeshchina neighborhood of Kyiv, 1983–1984. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G.S. Pshenychnogo.

Figure 9: Panel construction in the 1980s: Troeshchina neighborhood of Kyiv, 1983–1984. Courtesy of Tsentral'nyi derzhavnyi kinofotofonoarkhiv Ukrainy im. G.S. Pshenychnogo.

supposed to increase the aesthetic appeal of the resulting housing. By the 1980s, diversification of housing types was no longer considered news in professional publications on housing; rather, it was listed as a self-evident parameter for producing quality housing and housing agglomerations.[3]

Although by the 1980s, the need for visual and apartment-type variety in housing was acknowledged, this did not imply every building was the result of an individual design. While the problem of visual variation was to be solved with the help of the block-section method, it was not without its own problems. By the 1980s, design institutes had already developed multiple block-section series, with 20 to 30 different sections available for use in each building. However, each regional house-building factory would only produce a few of these available sections at a

time, due to discrepancies between industrial production and design practices. Arseniy R., an architect who in the late 1970s and 1980s worked on the problems of unification in precast panel construction in Kyiv Zonal Scientific and Research Institute of Experimental Design,[4] explained:

> Within the block-sections of the same apartment series, a variation of panels could have reached 60%. While, for a large factory, taking several block sections into production was not a problem, even a major factory could not afford to produce all 20–30 sections developed at the design institutes; as a result, only several block sections actually went into production and were built.

This understanding was not specific to the KyivZNDIEP or even the Ukrainian SSR. Such issues with the block-section method were pointed out just as much in central union-level institutions. For instance, Lev Ruderman of Moscow's TsNIIEP Zhylishcha [Central Scientific and Research Experimental Project Institute of Housing], in his 1978 article for *Zhilishchnoe Storitel'stvo* magazine, wrote:

> Experience shows that most factories that have successfully transitioned to a new nomenclature of large-panel elements, in practice produce [only] two to three different block-sections. This creates difficulties in solving the entirety of architectural and urban planning tasks and designing the urban environment. (Ruderman 1978: 8)

While institutions expected late-Soviet architects to develop and modify old series to create more comfortable apartments, the panel and the general structural solutions were expected to remain constant. Kimberly Zarecor points out that 'the generation whose careers started around 1960 had few opportunities to challenge a consistent and systemic preference for typified, standardized, and mass-produced buildings' (Zarecor 2014: 259). In this way, architectural institutions were supposed to supply house-building factories with work. Furthermore, among different methods of prefabrication, precast panel prefabrication remained the technique that architects in design institutions were supposed to employ first. In 1973, based on the results of a residential construction survey performed by the Construction Bank of the USSR, Gosplan condemned the 'insufficient use of the capacity of concrete panel construction enterprises [*predpriiatia krupnopanel'nogo domostroieniia*]' and called for the republics' construction ministries and administrations not to allow brick construction until the 'full capacity utilization' of such enterprises.[5] This was followed by a report to the State Planning Committee from the Ministry of Industrial Construction of the Ukrainian SSR, which stated that it had 'banned all the heads of house-building factories from negotiating all new construction with clients in small-piece wall construction materials [meaning bricks and blocks], until all the house-building capacities [that prefabricated panels] were already engaged in production'.[6] As a result of Gosplan's efforts to prioritize panel construction, a new type of document emerged to be used by planning institutions for forming one-year and five-year plans: a certificate showing full utilization of all available panel house-building capacities (DALO Fond R-1315, Opys 1, Sprava 580: 73).

These documents imply that as early as the beginning of the 1970s, almost two decades before the collapse of the USSR and the end of mass housing prefabrication, there had already been a demand for 'small-piece construction' that the state did not approve. This demand has two explanations that address two sets of entrenched problems with Soviet concrete panel prefabrication. First, in the USSR, panel housing was notorious for sound and temperature insulation problems and other quality issues (Kalamees et al., 2011: 978); after the collapse of the USSR many panel building residents addressed the temperature insulation problem by insulating their parts of the buildings without a permit (**Figures 10** and **11**).

Secondly, the system of panel production itself had multiple intractable problems. As early as 1962 a volume on the economics of panel construction noted that factories experienced production issues due to excessive variation in the panels (Zaremba 1962: 135). Nevertheless, the 1972 Congress of the Communist Party of the Soviet Union ordered an 'increase in production of [...] composite reinforced concrete structures and details by 1.2–1.3. times',

Figure 10: Prefabricated panel buildings with individual, user-installed insulation on the façades in Darnytsia (Pivnichno-Brovarskiy massyv) and Voskresenka neighborhoods in Kyiv, Ukraine, current condition. Photos by Kateryna Malaia.

Figure 11: Prefabricated panel buildings with individual, user-installed insulation on the façades in Darnytsia (Pivnichno-Brovarskiy massyv) and Voskresenka neighborhoods in Kyiv, Ukraine, current condition. Photos by Kateryna Malaia.

meaning that design institutions and architects were to supply the factories that produced these panels with even more work (Rubanenko 1981: 58). For architects, increasing the volume of industrial production and responding to the already problematic terms of the prefabrication industry often entailed a further limitation: instead of developing brand new apartment building series (such as P44), architects frequently had to rethink and modify the existing ones. Such was the 1605 series. First built in 1958, during the early days of prefabrication, this panel building continued being modified and built until 1985.[7]

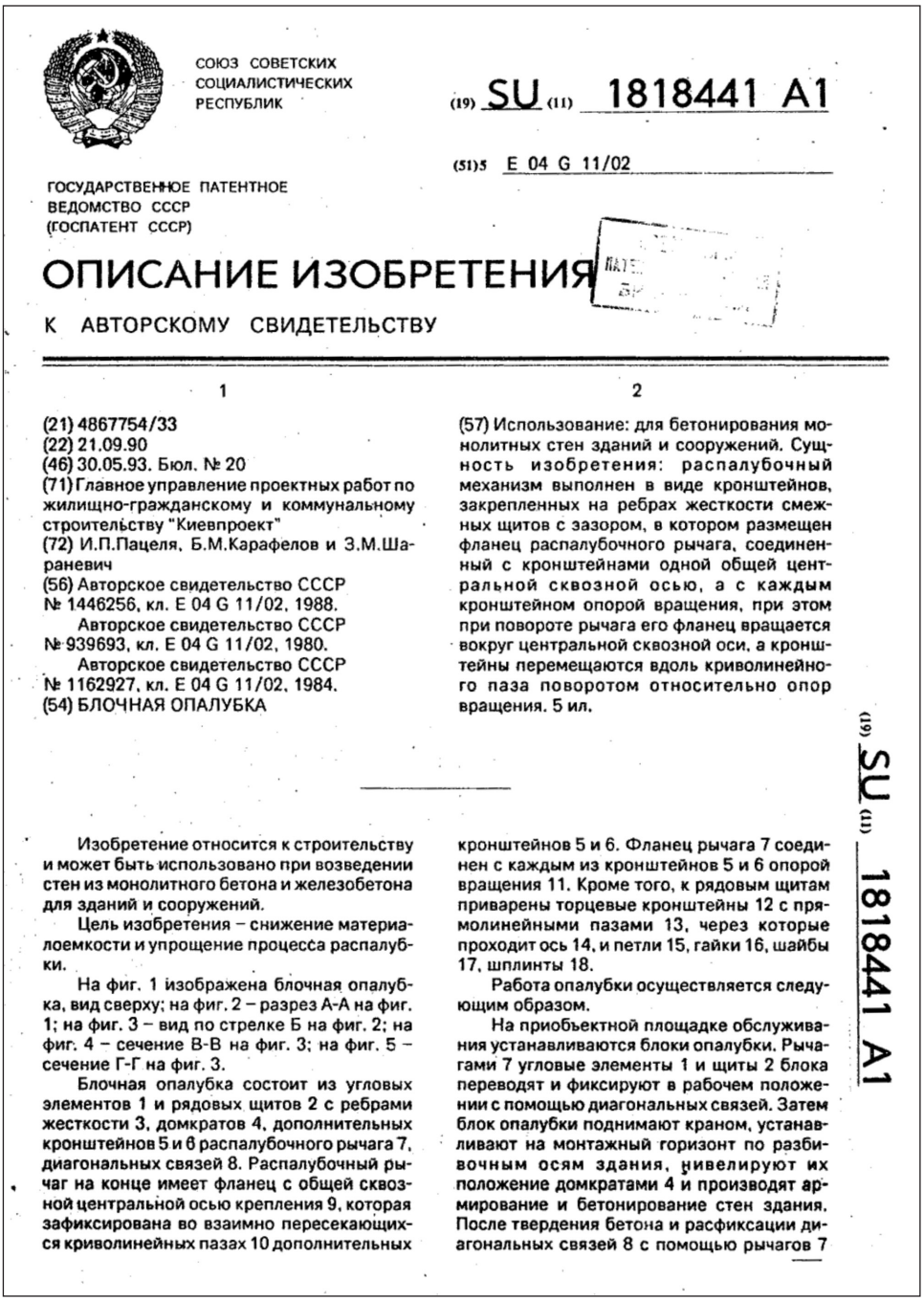
The Architects

In late-Soviet design institutions, architects faced several major constraints: first, they were limited to one method of construction; and second, they were limited by strict Soviet building codes. Unlike codes elsewhere, Soviet building codes determined both the lowest and the highest acceptable dimensions and square footages for apartments, since the majority of housing in the Soviet Union was built by the state and followed the logic of what the rest of the world would have considered social housing.[8]

Besides those who worked on apartment building series, other architects and architectural studios worked on individually designed apartment buildings. Codes, prefabricated panels, and the hierarchy of design institutions presented just as much of an obstacle to them as they did for series designers, particularly when it came to plans and façades for apartment buildings. The obstacles derived from the standard dimensions of the panels used in construction, as well as the limitations of footage determined by the code. Although the amount of space suggested by the code was already rather modest, architects were expected to stick to the lower rather than the upper limit. An architect active in individual apartment building design during the 1980s put it as follows: 'I only ever looked at the building codes to find a way around their limitations' (Iaroslav D.). As an example of working around limitations, he mentioned adding storage and cold storage spaces to the apartments – particularly their kitchens – with the idea that those storage spaces would later be turned into a space to sink the fridge into the wall and enlarge a typically small Soviet kitchen.

In terms of the façade, the issues emerged from the inherent problem of prefabricated panel production for apartment building series. Building façades consisted of panels that were designed to be endlessly reproduced, and even the variation offered by the sectional rather than full building construction method did not solve this problem of sameness. While Soviet architects and the public were clearly aware of the problem of monotonous façades, truly radical criticism of the uniformity of construction and fast-paced experiments meant to solve these problems did not occur until the beginning of Perestroika in 1985. Under the easing of media censorship known as *glasnost*, the architectural journals offered strong criticism of residential and public architecture for the first time since the beginning of the mass housing campaign in the 1950s. In the 1970s, disapproval had centered on the small size and uniformity of the early apartment series. However, in the late 1980s discourse shifted to the stagnation in the construction and design industry as a whole due to its extensive, rather than intensive, development caused by dependence on factories and incompetent centralized organization. In 1989, architect and architectural historian Iurii Bocharov claimed that between 1963 and 1984 this led to the 'rejection of fundamental research and rule of strict and detailed building codes'. Moreover, he stated that the method of constructing housing in endlessly reproducible series by house-building factories in the absence of an architect on site 'led to the breakdown of the unified design practice' and poor quality of buildings (1989: 13).

Following Perestroika, alternative technologies in façade production were introduced. But this hardly constituted a full-scale reform. Monolithic concrete construction was for the most part out of the question, since local construction trusts and factories did not purchase or plan to purchase reusable formwork in the foreseeable future.[9] However, around the beginning of Perestroika, design institutions suggested alternative forms of non-prefabricated construction. For instance, between 1985 and 1987, Kyiv Zonal Scientific and Research Institute of Experimental Design developed and started implementing a unit-panel formwork method for façades. Although with this method floor slabs were still constructed out of prefab panels, the exterior walls were cast on site, allowing for a different 'façade form' (**Figures 12** and **13**) (Sviatoslav M.).



СОЮЗ СОВЕТСКИХ СОЦИАЛИСТИЧЕСКИХ РЕСПУБЛИК

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ГОСУДАРСТВЕННОЕ ПАТЕНТНОЕ ВЕДОМСТВО СССР (ГОСПАТЕНТ СССР)

ОПИСАНИЕ ИЗОБРЕТЕНИЯ

К АВТОРСКОМУ СВИДЕТЕЛЬСТВУ

1

(21) 4867754/33
(22) 21.09.90
(46) 30.05.93. Бюл. № 20
(71) Главное управление проектных работ по жилищно-гражданскому и коммунальному строительству "Киевпроект"
(72) И.П.Пацеля, Б.М.Карафелов и З.М.Шараневич
(56) Авторское свидетельство СССР № 1446256, кл. E 04 G 11/02, 1988.
Авторское свидетельство СССР № 939693, кл. E 04 G 11/02, 1980.
Авторское свидетельство СССР № 1162927, кл. E 04 G 11/02, 1984.
(54) БЛОЧНАЯ ОПАЛУБКА

2

(57) Использование: для бетонирования монолитных стен зданий и сооружений. Сущность изобретения: распалубочный механизм выполнен в виде кронштейнов, закрепленных на ребрах жесткости смежных щитов с зазором, в котором размещен фланец распалубочного рычага, соединенный с кронштейнами одной общей центральной сквозной осью, а с каждым кронштейном опорой вращения, при этом при повороте рычага его фланец вращается вокруг центральной сквозной оси, а кронштейны перемещаются вдоль криволинейного паза поворотом относительно опор вращения. 5 ил.

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Изобретение относится к строительству и может быть использовано при возведении стен из монолитного бетона и железобетона для зданий и сооружений.

Цель изобретения – снижение материалоемкости и упрощение процесса распалубки.

На фиг. 1 изображена блочная опалубка, вид сверху; на фиг. 2 – разрез А-А на фиг. 1; на фиг. 3 – вид по стрелке Б на фиг. 2; на фиг. 4 – сечение В-В на фиг. 3; на фиг. 5 – сечение Г-Г на фиг. 3.

Блочная опалубка состоит из угловых элементов 1 и рядовых щитов 2 с ребрами жесткости 3, домкратов 4, дополнительных кронштейнов 5 и 6 распалубочного рычага 7, диагональных связей 8. Распалубочный рычаг на конце имеет фланец с общей сквозной центральной осью крепления 9, которая зафиксирована во взаимно пересекающихся криволинейных пазах 10 дополнительных кронштейнов 5 и 6. Фланец рычага 7 соединен с каждым из кронштейнов 5 и 6 опорой вращения 11. Кроме того, к рядовым щитам приварены торцевые кронштейны 12 с прямолинейными пазами 13, через которые проходит ось 14, и петли 15, гайки 16, шайбы 17, шплинты 18.

Работа опалубки осуществляется следующим образом.

На приобъектной площадке обслуживания устанавливаются блоки опалубки. Рычагами 7 угловые элементы 1 и щиты 2 блока переводят и фиксируют в рабочем положении с помощью диагональных связей. Затем блок опалубки поднимают краном, устанавливают на монтажный горизонт по разбивочным осям здания, нивелируют их положение домкратами 4 и производят армирование и бетонирование стен здания. После твердения бетона и расфиксации диагональных связей 8 с помощью рычагов 7

Figure 12: KyivProekt patent for the unit-panel formwork method of construction, 1990 ('Opisanie izobreteniia', 1993.).

Despite such experiments introduced by local institutes, state institutions and their speakers held the line and continued arguing for prefabricated panel production. For instance, a 1987 edited volume pointed out the problem with the efficiency of the house-building factories yet claimed that the industrial base for prefabricated construction had grown in the previous five-year plan. Furthermore, this volume suggested 'increasing the quantity and weight of house-building factories in the construction industry, would be a progressive form of construction organization and management' (Karpunin 1987: 5–7). If the Soviet Union and its centralized economy had not fallen apart, the system of industrial prefabricated housing production would likely have continued functioning.

These problems quickly became irrelevant after the USSR fell apart in 1991. The state no longer commissioned housing construction. Architects, in turn, shifted from state and institutional jobs to smaller scale individual commissions. The 1990s witnessed the emergence of a new profession: the interior designer. Before Perestroika, interior design was not a separately recognized specialty, and work that did qualify as interior design happened mostly in public buildings. After 1991, following popular demand for domestic remodeling, many architects shifted to private residential interior design. Oleksiy R., an architect interviewed for this study, who during the late-Soviet era worked at a large architectural project institute in Kyiv, explained his personal transition as follows:

> At our organization [during Soviet times], we had a lot of commissions. To keep up and keep taking in new commissions we had to only work with one segment of the design process, and this segment did not include interior design projects. [We produced] design development, construction documents [*rabochaia dokumentatsia*] and schematic design [*proektnoe predlozhenie*] but we did not see into the organization of the internal space, we did not develop interiors in detail, we just drew some pictures and that was it.

In 1993, despite his lack of previous experience with interior design, Oleksiy R. began taking commissions in expatriate and elite apartment remodeling that paid substantially more than his institutional job. This continued until the beginning of the 2000s, when he was able to transition fully into residential building design with the same institution he had begun working at during the Soviet period.

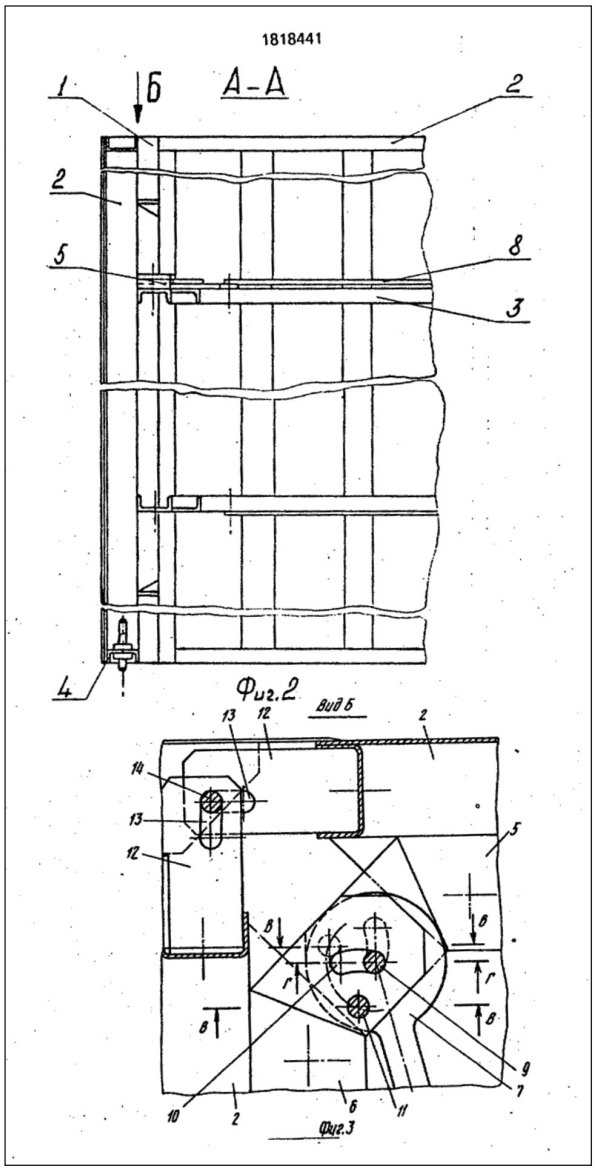

Figure 13: KyivProekt patent for the unit-panel formwork method of construction, 1990 ('Opisanie izobreteniia', 1993.).

Oleksiy R.'s transition back to large-scale projects was not unusual for the profession in general. From the mid-1990s, and especially in the early 2000s after the initial economic shock of the USSR's collapse was over, some of the architects who had earlier shifted to apartment remodeling returned to residential construction, but now under completely different rules. The upper limits of the codes were no longer relevant, as social housing was no longer being built. The object was now prestige and salability, not satisfying strict requirements. An architect active in residential construction, explained: '[the private developers] asked me to make the apartments comfortable, and also, to make them so that they would sell to clients looking for a large apartment' (Iaroslav D.). Such buildings were not constructed out of prefabricated panels; the prefabricated method of construction, with its limited spans and small spaces, could not satisfy the public that was purchasing apartments in the 1990s. Instead, they were constructed out of monolithic concrete and brick that allowed for intricate façades and flexible apartment layouts (**Figures 14** and **15**). Indeed, at least until the relative economic stability after the 1998 financial crisis, housing that was being built in post-Soviet cities was not meant for the average urbanite, but rather for the wealthy, who were able to afford prestigious homes. That is where the money was and where many architects found a source of income in the first years after the collapse of the USSR. The dominance of the prefabricated concrete panel over the architectural profession was over.

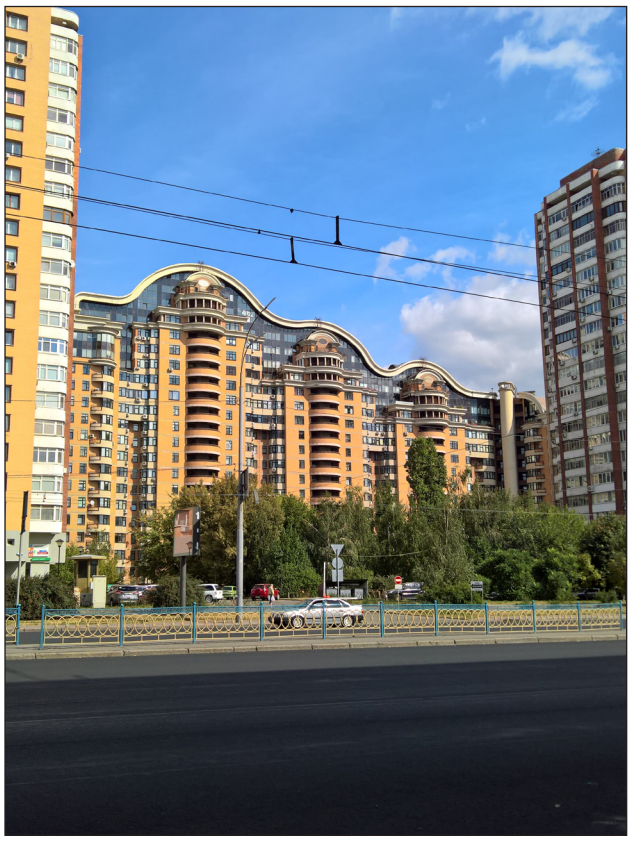

Figure 14: Post-Soviet residential buildings in Pechers'kyi and Shevchenkiv'skyi neighborhoods of Kyiv, Ukraine. Photos by Kateryna Malaia.

Figure 15: Post-Soviet residential buildings in Pechers'kyi and Shevchenkiv'skyi neighborhoods of Kyiv, Ukraine. Photos by Kateryna Malaia.

Figure 16: Prefabricated panel housing today. Photos by Kateryna Malaia.

Conclusion

The late-1950s search for efficient methods in industrial housing construction started as a progressive experiment. However, in the 1970s and 80s, when the method was already established in the Soviet system of a planned economy and prescribed production, the value of radical experimentation decreased tremendously. Instead, came cycles of reproduction, where the architect took a role not unlike that of a vernacular builder: restricted by the already available industrial capacities to produce precast materials. During those decades, success in architectural design was defined not by novelty or suitability to context, but rather by increasing the efficiency of existing elements and methods and supplying factories with work. However, unlike vernacular builders, Soviet architects operated within a system where the most significant constraints were not a result of systematically tested knowledge and resource availability, but rather of poor governance and the inability of the massive yet fragile Soviet economy to sustain efficiency in its industries.

Together, this meant that late-Soviet architectural solutions in urban residential architecture, as well as the practices of the architectural profession, were rarely a result of an individual designer's initiative. Rather, they were determined by the cycles of large-scale industrial production, institutional and bureaucratic procedures of the centralized Soviet economy, and the material centerpiece of these interconnections — a prefabricated concrete panel. This state of the profession, influenced by the peculiarities of the Soviet centralized economy and industrial production, quickly ended after the Soviet system collapsed in 1991

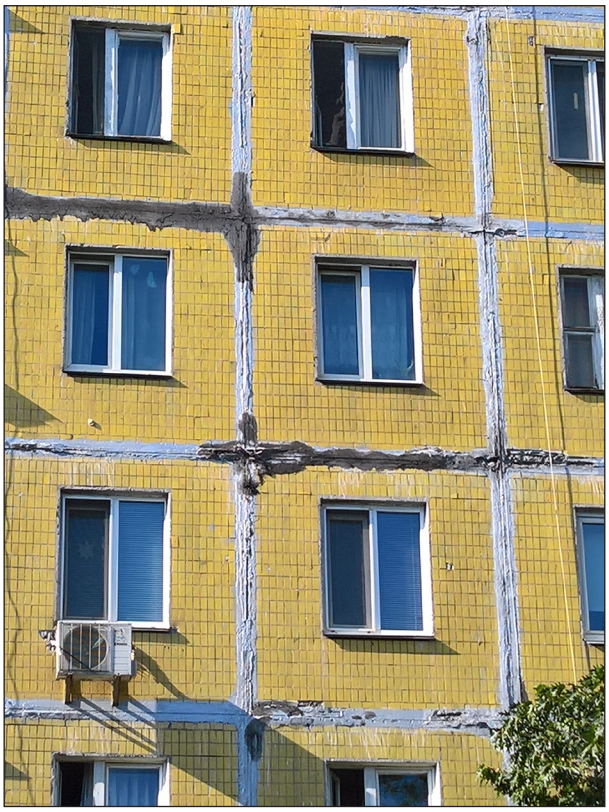

Figure 17: Prefabricated panel housing today. Photos by Kateryna Malaia.

(**Figures 16** and **17**). As a result, architects transitioned to completely different forms of practice, no longer tied to one material unit.

Notes

[1] Postanovleniie TsK KPSS I Soveta Ministrov SSSR ot 19 avgusta 1954 goda, 'O razvitii proizvodstva sbornykh zhelezobetonnykh konstruktsii I detalei dlia stroitel'stva' (Malinin and Korobov 1958: 279).

[2] 'Single client' is a term used in the USSR since 1980 that implies all the construction client functions — developing integrated construction tasks for planning and architectural organizations, ensuring on-time clearing and preparation of construction sites, supervising construction, filing claims if construction was not performed according to arrangements, etc. From "Polozhenie o sluzhbe edinogo zakazchika po stroitel'stvu v gorodakh zhylykh domov, ob'ektov kul'turno-bytovogo naznacheniia i kommunal'nogo khoziaistva" approved by Gosstroi SSR on February 12, 1980.

[3] For instance, a 1981 book on the development of perspectives on Soviet housing construction states that 'currently, housing in our country [USSR] is characterized by the growing amount of housing resources (meaning quantity of homes) and their improving quality, that is accompanied by differentiation (growing diversity) and increasing in accordance with regional, socio-demographic, climatic and urban planning conditions' (Rubanenko 1981: 5).

[4] In the late 1970s and 1980s Kyiv Zonal Scientific and Research Institute of Experimental Design, particularly the Dmitriy Nilovitch Iablonskiy studio, worked on the unification of panel nomenclature, or in other words, decreasing the number of types of prefabricated elements in a given apartment series. In practice this work resulted in apartment series 182, nicknamed Sistema-mobil', which had fewer prefabricated panel types than other series. Due to its fewer panel types, apartment buildings from this series were built at smaller DSK often in small industrial towns, as they did not require a DSK to have enough volume to simultaneously produce hundreds of different prefabricated elements.

[5] 'O zagruzke moshchnostei predpriiatii krupnopanel'nogo domostroeniia', September 3, 1973, TsDAVO VU Ukrainy, Fond R-337, Opis' 26, Delo 677, 108.

[6] 'Doklad Ministerstva promyshlennogo stroitel'stva USSR Zamestiteliy Predsedatelia Gosplana USSR No. 0/05-6187 ot 15 oktiabria 1973go', TsDAVO VU Ukrainy, Fond R-337, Opis' 26, Delo 677, Folder 1, 111.

[7] By 1985 this series was known as 1605-AM/12.

[8] 70% of housing in the late Soviet Union was social housing (Gentile and Tammaru 2006: 1764).

[9] 'Pis'mo Nachal'niku upravleniia zhylishcno-grazhdanskogo stroitel'stva Gosstroia USSR', DALO, Fond R-221, Opys 2, Delo 9964, 21.

Competing Interests

The author has no competing interests to declare.

Author Information

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Interviews

Arseniy R., architect (name of interviewee has been changed), interview with Kateryna Malaia, 2017, Kyiv, Ukraine.

Oleksiy R., architect (name of interviewee has been changed), interview with Kateryna Malaia, 2017, Kyiv, Ukraine.

Iaroslav D., architect (name of interviewee has been changed), interview with Kateryna Malaia, 2017, Kyiv, Ukraine.

Sviatoslav M., architect (name of interviewee has been changed), interview with Kateryna Malaia, 2017, Kyiv, Ukraine.

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