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Modernism and Mobilization: From Viktor Sokolsky's Economic Principle to the Narkomfin Building

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Influential before the revolution of 1917, the work of the now-forgotten Russian imperial military architect Viktor Sokolsky (1869–1913) on the efficiency of construction continued to be studied in the aftermath of the revolution. An analysis of its influence reveals how modern architecture converged with military history, blurring the established historiographic boundaries between the radical and the regressive. Among the projects that developed Sokolsky's intentions is Moisei Ginzburg's Narkomfin building in Moscow (1928–1930). The genealogy of this modernist icon reveals its roots in a typology well developed in imperial military architecture: the barracks. This example demonstrates that the emergence of modern, mass, warfare led to an elaboration of the principles of modernist, mass architecture with its ethos of hygiene, efficiency, and economy.

Keywords: Viktor Sokolsky; Alexander Rozenberg; thermal performance; barracks; Narkomfin; Moisei Ginzburg; typification; hygiene; rationalization

In the late 1920s, the Soviet constructivist architect Moisei Ginzburg famously redefined architecture as 'the social condenser', a radical political project of forging new, collective, subjectivity by organizing everyday life. This notion and its translation into built form through his experimental Narkomfin apartment block in Moscow (1928–1930) today occupy a prominent place within the canon of 'avant-garde' architecture (see Murawski 2017; Udovički-Selb 2016; Cramer and Zalivako 2013). This article suggests reframing this canon and blurring the established boundaries between the radical and the regressive by uncovering how the histories of scarcity, efficiency, climate, and social reform converged with military history within early modernism. It explores early-20th-century developments in military construction theory, in particular the design of military barracks, a topic of special importance in the years between the Russo-Japanese War (1904–1905) and the beginning of the First World War. Forgotten today, the calculations on the efficiency of construction devised by the imperial military architect Viktor Alexandrovich Sokolsky (1869–1913) continued to be studied by Russian architects in the aftermath of the revolution of 1917 and exerted a seminal influence upon their way of thinking. The genealogy the Narkomfin building reveals its roots in a typology well developed in imperial military architecture: the barracks, a key preoccupation of Sokolsky. To put it differently, the emergence of modern, mass, warfare led to an elaboration of the principles of modernist, mass architecture with its ethos of efficiency, economy, and hygiene. What enabled the continuous relevance of military principles in Russian architecture was the condition of material scarcity sustained by a series of social mobilizations that continued to shake the country after Sokolsky's death in 1913 — mobilizations for the First World War (1914–1918), the revolution, the civil war (1918–1921), and the subseqent period of industrialization (1929–1941). Scarcity made architects continuously ponder upon the same question: how to build more, and better, for less (Crawford 1914).

The Economic Principle

The monumental scale of the housing crisis in Russia during the decade preceding the First World War and the unprecedented ambition of design and theoretical solutions that were offered in response required organization and resources that remained unavailable to private investors. Architects and policy makers agreed that these concerns could be addressed only on the national scale. As Sokolsky argued in 1912, workers' housing is of great importance not only for society but also for the state because 'the degeneration of large masses of people … is a death threat to the entire nation' (Sokol'skii 1912: iv).[1] Whereas private investors, Sokolsky observed, are confined by their own limited lifespan and by their inevitable search for profit, the government is able to devise and implement long-term solutions in the interest of the

nation. Although the Russian government had done little to solve the housing problem by that time, it possessed valuable experience, Sokolsky believed, in the construction of military settlements, fortresses, and hospitals during the 19th century, particularly in newly acquired or otherwise vulnerable territories, such as Poland, the Caucasus, Central Asia, and southern Siberia.[2] This experience, he argued, could be applied to the construction of housing for workers. Moreover, the construction of military barracks could in turn be improved and rationalized alongside the development of workers' housing.

An officer of the Russian imperial army, Sokolsky was well informed about the needs of the military complex.[3] Beginning in 1898, he taught 'construction art' at his alma mater, St. Nicolas Academy in St. Petersburg, where he was appointed adjunct professor ('professor extraordinarius') in 1911. His books, *Printsipy ekonomichnosti i ikh vyrazhenie v sovremennom stroitel'stve* [The Principles of Economy and Their Manifestation in Contemporary Construction] (1910); *Printsipy ekonomichnosti v stroitel'nom dele* [The Principles of Economy in Construction] (1912a); and *Proektirovanie zdanii, preimushchestvenno nebol'shikh voinskikh* [The Design of Buildings, Primarily Small Military Ones] (1912b), were all conceived both as textbooks for his students as well as independent theoretical treatises in the field of military architecture and workers' housing.[4] An officer, a nobleman, and a devout Orthodox Christian (while teaching at St. Nicolas Academy, he was also the church warden of the academy's Church of Saints Peter and Paul), Sokolsky was conservative in his personal, political, and aesthetic choices. Yet his vision of architecture was hardly traditional. As Sokolsky confessed, his work had few precedents in architectural theory and rather relied on the emergent studies of hygiene and on literature about military construction (Sokol'skii 1912: 14).[5] In its pragmatism, functionalism, minimalism, its concern (even though bourgeois and paternalistic) for the poor, and its preoccupation with large-scale problems, Sokolsky's work pioneered what would soon become the axioms of architectural modernism, injecting it with the ethos of military mobilization. As the engineering approach of the French *École polytechnique* was in many ways more consequential for the later development of architecture than the academism of the *École des beaux arts*, so the military ethos of efficiency promoted at the military engineering academy in St. Petersburg continued to affect Soviet architecture long after it rejected imperial neoclassicism.

The question of military housing in Russia had become pressing due to a reform of a recruitment order in 1874, which advanced modern, universal, and relatively short-term, male conscription. While earlier recruits had served for 25 years and were thus housed with families in military settlements (which differed little from villages for civilians), the new army, serving for a shorter time, required a new type of housing — the

barracks. This type addressed a different, all-male and transitory, type of community. 'We are on the verge of a giant military barracks construction, which is badly needed', Sokolsky professed (Sokol'skii 1912a: iv). While such housing was built at a new scale in terms of number of buildings, the quality of construction was noticeably poor. Often hastily built, the new barracks were log structures that, unlike older barracks, were not plastered or decorated. Moreover, they often lacked sewage disposal, which was available only where a larger urban sewage network existed (Tytskii 2014: 55). The modernization of the barracks, lagging far behind the hygienic standards, outlook, and amenities of their Western counterparts, was, for Sokolsky, not a philanthropic but a military task. Yet this task was closely connected with the housing problem, and the affinity between the two types of architecture was multi-layered. Military and civilian residential construction, Sokolsky believed, could be put toward the same end. An expansion of the settler colonization of Siberia, for instance, possessed a strategic function: increasing the defensibility of Russia's eastern borders (Sokol'skii 1912s: iv). Indeed, the Russo-Japanese War, which Russia lost in 1905, a traumatic surprise for Russian society, was caused by the territorial claims of the rival empires in Manchuria and Korea; in the years that followed, Siberia was quickly colonized by a Slavic population. The colonization was enabled by the agrarian reform of 1906, which encouraged peasants, struggling with the lack of arable land at home, to relocate to ostensibly 'virgin' Asian territories (Rogachevskaya 2002: 149).[6] Most importantly, the construction of military barracks and workers' housing was subordinated to the same rationale: spending resources wisely (erecting the maximum number of square meters for the available budget) while ensuring that the buildings are well built, durable, functional, and provided necessary and sufficient levels of hygiene and comfort.

Augmenting Vitruvius, Sokolsky thus argued that a building had to be 'purposeful, durable, beautiful and *inexpensive*' (Sokol'skii 1912a: 19; emphasis in original). He defined purposefulness as 'the correspondence of the building to its function', unpacking it as hygiene and 'the comfort of placement and use'. Durability, he believed, was predicated upon 'resilience, firmness, strength, and robustness, i.e. the resistance to external forces, mechanical and chemical actors (weather influences)'. Although Sokolsky thought that beauty was expressed as proportionality and 'the elegance of the outlines', the core of his aesthetics was modernist; beauty was, for him, 'the harmony between external form and its internal content, i.e. construction'. His aesthetics, like his ethics, were minimalist: '*the building in general and its parts should not include anything that exceeds the minimum necessary and sufficient for the satisfaction of the basic laws of construction*' (Sokol'skii 1912a: 19, 22; emphasis in original). Finally, the fourth maxim, inexpensiveness, Sokolsky's own addition to the Vitruvian triad, reflected the challenges of mass construction. Like the other three principles, it was

to be used only in combination with the others. Inexpensiveness, therefore, was not to be conflated with economy — the leading, overarching imperative, which Sokolsky interpreted as the correct balance of the four maxims. Presaging later *Existenzminimum* debates within CIAM, Sokolsky's economic principle of architecture combined the considerations of efficiency in the use of resources with the imperative of meeting scientifically established requirements for hygiene.

While concerned with cost optimization as the necessary principle of mass construction, Sokolsky vehemently argued against cheap and poor-quality construction materials and outdated construction techniques, which, he believed, more aggravated than solved the housing problem, as they forced the poor to endure unnecessary expenses (Sokol'skii 1912a: v). In a spirit that evokes Adolf Loos's contemporaneous juxtaposition of European bourgeois modernity and the 'savagery' of the lower classes of Austrian society, Sokolsky insisted on the imperative character of modernity for the Russian population (Loos 1908). He was particularly contemptuous of widespread solutions that were known as 'economical construction' at the time — construction methods based on earth, adobe, mudbrick, straw, reed fiber, and other locally available preindustrial materials:

> Every day brings projects and descriptions [such as]: 'New method of [constructing] fireproof and least-expensive dwellings', or 'How I built a fireproof barn myself', etc. — these projects are, in essence, the same: clay, straw, and dung in different combinations. … As if this low idea — to build housing of garbage — was indeed appropriate for the greatest people in the world, strong, healthy, and mighty, one that is perfectly able to work and had already erected in different ages of [its] century-long life so many wonderful buildings, and which is today advised to settle in dugouts that resemble the dwellings of primitive savages. …
>
> Only despair over our fate and future can offer the idea of giving the great people a dwelling of earth and dung at the time when its neighbors, who have already developed cultured types of inexpensive buildings and, most importantly, *practical techniques of their realization*, are preoccupied with giving the poorest of their occupants hygiene, comfort, and modest elegance of living in it. (Sokol'skii 1912a: 15–16)

The reason Russian architecture continued to rely on 'primitive' construction materials and techniques was, Sokolsky believed, poor organization. It was thus organization, first and foremost, that Russia had to learn from the West. The Russian construction industry, particularly the production of modern materials, he discovered, demonstrated a surplus value that was far greater than that of its foreign counterparts. Sokolsky defined the surplus value as 'the value that does not result from the amount of labor

immediately expended on the production of the object' and comprised capital gains and the capitalist's profit (Sokol'skii 1912a: 3–4). Unlike labor, it was not normalized because it depended on a range of external factors, including the correlation of supply and demand, market fluctuations, custom tariffs, and more (in this sense, Sokolsky's economic model complicated Marx's, which did not consider such factors). Nevertheless, Sokolsky believed, the surplus value could, and should, be put under control. The percentage of surplus value in the market price of construction brick that was sold in St. Petersburg, Sokolsky calculated, exceeded that in Berlin by 4.6 times because of the poor organization of production and delivery and excessive profits for capitalists (although brick was dismissed as cheap and old-fashioned in the West, it was still considered modern and Western in Russia prior to the First World War) (Sokol'skii 1912a: 6–12).[7] Optimization and modernization rather than reliance on cheap self-help techniques and traditional materials were the ways of economy:

> An *economic building* is not the one that is built of cheapest materials and by using the most primitive methods of work, but the one *the construction of which, starting with the design stage and all the way up to the end, is subordinated to the general principle: the possible minimum of surplus value and of useless so-called overhead costs*. (Sokol'skii 1912a: 18; emphasis in original)

Sokolsky's economic principle was, in other words, a rationalization of investment.

Mobilizing Thickness

A false presumption of universality, Sokolsky continued, was one of the reasons for the failure of cheap pseudo-economic solutions, which were replicated without regard to context. Instead, local climatic, topographic, and economic conditions had to determine the choice of the construction method. The existence of factories or centralized infrastructure systems, for example, would greatly impact construction costs, while humidity and temperature would affect the effectiveness of construction techniques and necessitate different maintenance expenses (Sokol'skii 1912a: 28). Heating — a problem particularly acute in Russia's cold climate — was of primary importance. Just as cheapness, for Sokolsky, was not equal to true economy, thicker walls did not necessarily guarantee rationality in the use of resources. What was instead needed was a consideration of the building's thermal performance and the right balance between the costs of construction and the heating expenses over the years.

To find this balance, Sokolsky first suggested investigating the optimal payback period for a heat-saving construction (such as a second door, a third layer of glass, brick cladding, or insulation with tar paper or felt), which he defined through a

relation of the cost of this construction (C) to the annual savings that it brought (E).[8] Taking the discount rate of 5% (or 1 in 20), and assuming that this rate would remain stable in the future, Sokolsky calculated the payback period as x in the equation $C/E = 20(1.05^x-1)/1.05^x$, the second part of which was simplified to $1-1/1.05^x$. The graph of this function presented a curve, which showed that the maximum payback period (the rising segment of the curve) for a heat-saving construction was fifty years, after which the C/E stagnated (and no additional savings could thus be anticipated) **(Figure 1)**. As the graph demonstrates, this period corresponds to a C/E range of 17–18 — in other words, to make sense financially, the initial investment in a heat-saving construction had to be no more than 17 to 18 times higher than yearly heating savings. The exceptionally long payback horizon of half a century that the graph postulated confirmed Sokolsky's insight that only the government, and not private capital, could support a truly economic construction, situating his work at the roots of centralized planning — the major preoccupation of Soviet architecture in the aftermath of the revolution.

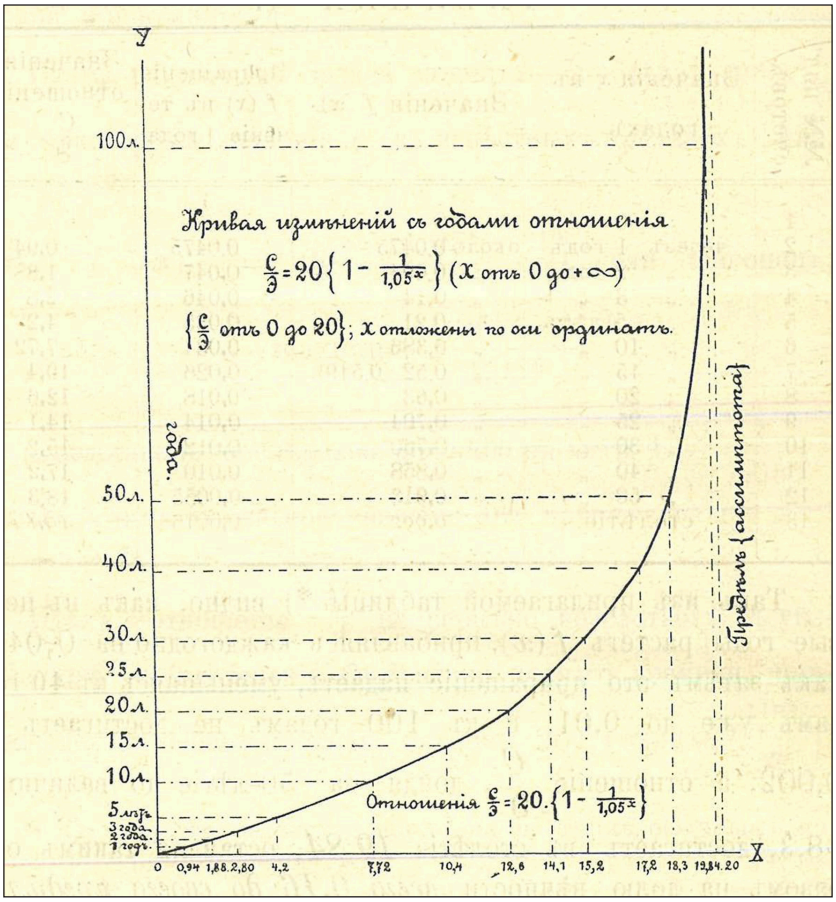

Figure 1: The curve of the annual change of the relationship $C/E = 20(1-1/1.05^x)$. From Sokol'skii (1912a: 40).

Equipped with his economic method, Sokolsky set out to find pragmatic solutions for optimizing the thermal performance of buildings in St. Petersburg. The first heat-saving construction that he investigated was the optimal width of an outer brick wall, comparing the economic performance of a wall two and a half bricks wide (meaning two bricks placed end to end plus one brick turned to its short side) with that of a wall two bricks wide (Roshfor 1912: 371).[9] Adjusting his calculations for the two-and-a-half-brick-wide wall according to the local climatic and economic conditions, he received a *C/E* of 10.4; this meant, as the graph shows, that the investment would be paid back in 15 years. When correcting his calculations to include additional expenses associated with building thicker walls — additional land, thicker foundations, additional labor, and larger roof, and, most importantly, the cost of the loss of the internal volume of the building — Sokolsky still arrived at a *C/E* below the margin of profitability loss: even the least favorable situation, a one-story building, he calculated, would give a borderline *C/E* of 17.4. The investment into an additional half-brick of the wall's thickness, if compared to a two-brick-wide wall, was thus absolutely efficient in the region (Sokol'skii 1912a: 42). However, testing the possibility of a three-brick-wide wall with the same method, he established that, depending on the building's height and the cost of land, its *C/E* varied between 35 and 38, making such construction uneconomical. A solid brick wall, Sokolsky concluded, had to be exactly two and a half bricks wide.

Moreover, Sokolsky further established that the type of brick — solid or hollow — had a surprising influence on the wall's thermal qualities: not solid but hollow brick proved to be more cold-resistant if it had internal membranes that prevented air from circulating inside the wall (made in the early 20th century, this discovery was consistent with contemporaneous European building practice[10]). With more calculations, he demonstrated that a wall that is one and a half bricks wide and made of hollow brick possesses the same thermal properties as a wall two and a half bricks wide of solid brick. When used correctly, air thus becomes a costless and efficient construction material. Air, indeed, came to play an increasingly greater role in modern architecture, as technologies of climate control were transforming it into 'the environment' (see Banham 1969; Stalder 2010). By focusing on the thermal properties of the wall, Sokolsky's work added another page to this history: neither wall *nor* air alone but a correlation of solids with voids within the wall became the object of his scientific interest.[11] Moreover, plan and structure — function and construction — appeared to him no less closely interrelated than air and wall: 'Economy is a function of all three dimensions of the building and their mutual relationship; depending, separately, on plan and section, it is largely dependent on the most successful coordination of plan and construction' (Sokol'skii 1912b: 17). He quantified this coordination as another

coefficient, the average module of utility, or $M_{u,}$ which was calculated as the relationship between usable internal volume and the exterior volume (Sokol'skii 1912b: 126–127).

A mathematical preoccupation with finding the optimal relationship between varying factors became the hallmark of Sokolsky's approach to economy. Comparing the economic qualities of hollow- and solid-brick construction, he concluded that although the thinner wall of hollow brick increases expense in the construction of floors, the thicker solid-brick wall necessitates a greater construction expense because it requires a larger foundation. But the greatest gain arising from making the wall thinner was the internal volume of the building and hence, a greater M_u. In the subsequent work of Sokolsky and other Russian architects, utility became the ultimate criteria for evaluating architectural solutions, until it emerged, eventually, as the defining principle of such self-proclaimed functionalists of the interwar period as Moisei Ginzburg.

Type and Flexibility

Instead of providing standardized architectural solutions, Sokolsky's books offered readers formulas that could be adapted to various contexts, leading to individual solutions for architectural forms. Sokolsky reimagined the idea of typification, which by then already had a long history in the Russian Empire, where the state had traditionally played an important, albeit primarily regulative, role in architecture. Two legal documents had normalized Russian architecture during the 19th century: *Stroitel'nyi ustav* [The Construction Codex] and *Urochnoe polozhenie* [The Work Regulation], both first published in 1832 and continuously revised. The former codified the administration of construction; types of state, church, and civil buildings; and the planning of cities (including the arrangement of streets, squares, bridges, factories, and private buildings) and villages (Pirozhkova 2008: 71). The *Urochnoe polozhenie*, which was based on a set of norms dating back to 1811, guided the compilation of budgets and the organization and normalizing of the work of employees: as such, it recommended construction methods for all stages of architectural work, from logging wood and excavating the clay for brick to the internal decoration of a building. These documents supplemented the practice of publishing albums of approved typified projects, which had been first introduced in 1714, when Peter the Great ordered that all buildings in the new capital, St. Petersburg, follow one of the few types approved for the social group to which the owner belonged. Becoming more diverse and yet more prescriptive during the reign of Catherine II later in the 18th century, these albums continued to appear throughout the 19th century.

Sokolsky remained skeptical about these sets of typified projects. They were, he thought, confusing for laymen, who were left wondering which of many model types to

choose for their particular ends. The number of types had to be reduced to a minimum, leaving only a few projects remarkable in their 'thoughtfulness and relative ease of implementation' and practical value. Type, for Sokolsky, was not a template, but a 'clearly defined principle, or main idea', to be not copied but rather adapted to the local context:

> The creation of certain all-purpose models or templates is impossible, and all attempts to set prescribed types as the only for the buildings of particular function failed because the very nature of the question does not tolerate the yoke of reductivism and homogeneity. (Sokol'skii 1912a: 115)

Although for Sokolsky (who died before the Soviet revolution), economic construction was a tool for preventing social upheaval, his approach remained in use among post-revolution architects. During the 1920s, it was continued by Alexander Rozenberg (1877–1935), a graduate of the St. Petersburg Institute of Civil Engineers, who by the 1920s had become a professor there. Rozenberg headed the work on the *Spravochnik proizvodstvennykh i stroitel'nykh norm* [Set of Industrial and Construction Norms], a revision of *The Work Regulation*, which attempted to codify materials and work processes — and thus expenses — for different types of structures (see Moskovskoe oblastnoe upravlenie 1929–1931). He warned against 'the ossification of norms', contending that building types responded 'to hundreds and thousands of different kinds of processes of [different] purpose and scale, constantly changing in their organization [in response to] the evolution of life' (Rozenberg 1924: 36). Referring to Sokolsky as one of the few existing precedents for his own method of the normalization of architecture, Rozenberg similarly illustrated his findings with formulas more often than with architectural drawings. His *Obshchaia teoriia proektirovaniia arkhitekturnykh sooruzhenii* [The General Theory of Design of Architectural Structures] (1930) established numerical relationships between architectural coefficients (volume, perimeter, building surface, width of walls, etc.), allowing the architect to determine the building's economic indexes: the norm of main areas *a* (indicating the rationality of the main areas' plan), the coefficient of the breadth of solution *k* (the rationality of the plan of service areas), the coefficient of projectiveness *l* (the rationality of circulation), and the coefficient of constructiveness *m* (the rationality of the size of the building's footprint). The ultimate parameter — the spatial rationality of the building, which is highly similar to Sokolsky's M_u — was calculated based on the comparison of its volume *v* and median ceiling height *h* with the norm *a* and the coefficients *k*, *l*, and *m* (Rozbenberg 1930: 196).

Although it is not known when exactly Rozenberg began his pedagogical activity at the Institute of Civil Engineers, it is likely that Vladimir Vladimirov (1886–1969), who studied at the institute between 1908 and 1917, was among his students. In the

1920s, Vladimirov, who moved to Moscow upon graduating, became a prolific architect associated with the Constructivist movement. In 1928 and 1929, alongside architects Mikhail Barshch, Alexander Pasternak, and Grigory Sum-Shik, he worked at the Section of Typification within the Construction Commission (Stroikom) of the Economic Council of the Russian Republic, headed by Ginzburg, which was tasked with developing the principles of standardized construction. Its work was later continued by the Section of Socialist Settlement of the State Planning Commission (Gosplan) of the Russian Federative Republic (1930). Possibly through Vladimirov, Sokolsky's study of economic functionality of construction, his belief in the necessity of long-term planning, and most immediately, his insistence that typification should not be prescriptive influenced Ginzburg's thinking.

Barracks in the Dystopian Present and the Utopian Future

The political and economic context for Ginzburg's work on typification was provided by the turn to centralized planning and the announcement of the First Five-Year Plan of Economic Development in 1928. The plan prescribed the construction of new industrial centers, particularly in the previously 'underdeveloped' areas in Russia's North and East (which Sokolsky had foreseen as the future centers of housing construction); indeed, over a thousand factories were launched in the country during these years.[12] Because the resources were saved for industrial construction, however, little was left for the construction of housing for people working at the new factories. As historians Mark Meerovich and Elena Bulgakova demonstrated, barracks remained the most commonly built type of mass housing in new industrial cities during the interwar period, composing over 85% of all workers' housing in many of the new cities.[13] Built hastily and with the cheapest materials (reed fiber, plywood, and wooden panels; skeleton construction was commonly preferred to load-bearing walls because it was less expensive), these dwellings could house over a hundred people of the same sex (although mixed barracks for families also existed), with 15 to 20 people sharing one room. Although these barracks presented an improvement upon the workers' living conditions in comparison to the self-constructed dugouts that otherwise often served as housing, they were the opposite of Sokolsky's principle of economy. The Soviets were well aware of the problem, attempting to solve it — in the name of mobilization — by architectural rather than political means.

To this end, the Economic Council under the government of the Russian Federative Republic was entrusted with developing economic coefficients (*koeffitsienty ekonomichnosti*), which regulated the relationship between living and usable areas of an apartment as well as between the surface and the volume of a building (Meerovich 2018: 39).[14] These coefficients played a prominent role in later normative documents

and publications, such as the album *Proekty rabochikh zhilishch* [Projects of Workers' Housing], published in 1929 by the Central Bank of Infrastructure Management and Residential Construction (Tsekombank), which financed and managed the construction of several key First-Five-Year-Plan industrial cities in Siberia and Ukraine (Tsentral'nyi bank 1929).[15] The album was addressed to Tsekombank clients — the managers of factories under construction, whom the authors wanted to inform about the best solutions for hygienic and yet inexpensive workers' housing. The album's editorial board included mostly members of the older generation who had been professionally active in Tsarist Russia, such as architects Ivan Zaporozhets (1884–1952, head) and Petr Antipov (1883–1937) and engineer Vladimir Voyeykov (1873–1948). Vladimirov was responsible for the album's graphics, providing a link between the team and the Ginzburg's Section of Typification at Stroikom.

The album consisted of four sections: urban housing, semi-urban workers' districts (the equivalent of the German *Siedlungen*), communal buildings, and service structures. Each section included several typified solutions. In addition to being presented graphically as plans, sections, facades, and axonometric views, the solutions were supplemented with tables summarizing their economic coefficients and budgets. Whereas construction materials were intentionally cheap, the main line of expense was labor, theorized and detailed with a precision resembling Rozenberg's *Set of Industrial and Construction Norms*.

While the Constructivist architects Victor Vesnin, Leonid Vesnin, and Sergey Chernyshev provided examples of urban dwellings in Moscow, workers' districts were illustrated by simple brick (the 2.5-brick-thick wall was used as the standard) and log houses for one, two, or more families, while the Communal Buildings section presented dormitories and barracks.[16] Whereas smaller projects (such as dormitories for 20 people) illustrated in the album feature central corridors, the plan for a wooden 50-person barracks shows 75-square-meter rooms for 18 people on one side, and wide corridors, lit by daylight, performing the function of living rooms on the other **(Figure 2)**. As the collective housing type of the future, the house-commune, was also included in the Communal Buildings section. The album thus constructed a smooth transition from the simple basic barracks, and the dormitory as its more advanced version, to the house-commune. Inexpensiveness was the primary concern in all of these types, while collectivity emerged, as it were, even in the case of the house-commune, as its byproduct. Summarizing the mobilization logic of the Soviet industrialization-time projects, Meerovich highlighted its disciplinary potential:

> Soviet urban planning of the industrialization period reified, in concrete housing typology and planning structures of socialist cities, the postulates of labor-mobilization and military-mobilization organization of the country's population: the

division of residential districts into barracks villages composed as 'blocks' and 'neighborhoods' enabled a territorial regulation of the workforce. [This regulation] was guided and controlled by territorial organs of the Party and of the Soviets and by factory Party committees, facilitating the control of everyday life, [and] guaranteeing, through employer-led construction and the allocation of housing, the disciplining of the population in relationship to work processes as well as precise accounting for quantity and 'quality' of the residents of settlements, [which] facilitated [their] conscription for labor and military duty. (Meerovich 2018: 76)

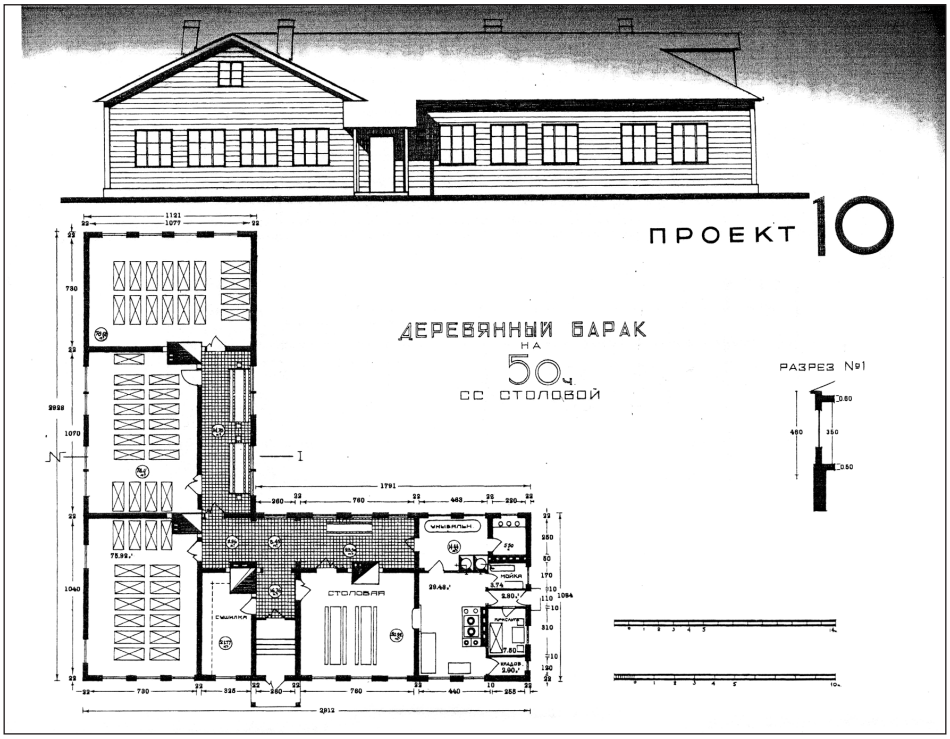

Figure 2: Wooden barracks for 50 people with a dining hall. From Tsentral'nyi bank (1929: 203).

According to Tsekombank's album (Tsentral'nyi bank 1929), military barracks presented an old type of communal dwelling that had to be updated to reflect new social demands. Unlike its more radical, postrevolutionary versions, which sometimes included the collectivization of all property, the house-commune of the late 1920s was usually interpreted as a building with individual apartments and common service and recreation areas.[17] Described in detail, the model house-commune, labeled 'The House-Commune/Dormitory of the Ministry of Labor for 300 People' in the album, has one- to three-room apartments entered via a corridor lit by daylight **(Figure 3)**. In reality, such apartments were likely shared by several families, each allocated one room (Meerovich 2018: 39). Every apartment has a small bathroom and a gas stove near the front door;

in addition, larger and more comfortable common bathrooms and kitchens are located on every floor. The building is intended to convince its residents of the advantages of a collective lifestyle, making them gradually abandon private kitchens and toilets in favor of free additional living space within the apartments. The ground floor of each building has a common dining hall and a daycare facility; one floor above is a library; the third floor houses a club and a play area for children; the fourth floor offers a sun deck (Tsentral'nyi bank 1929: 179–182).

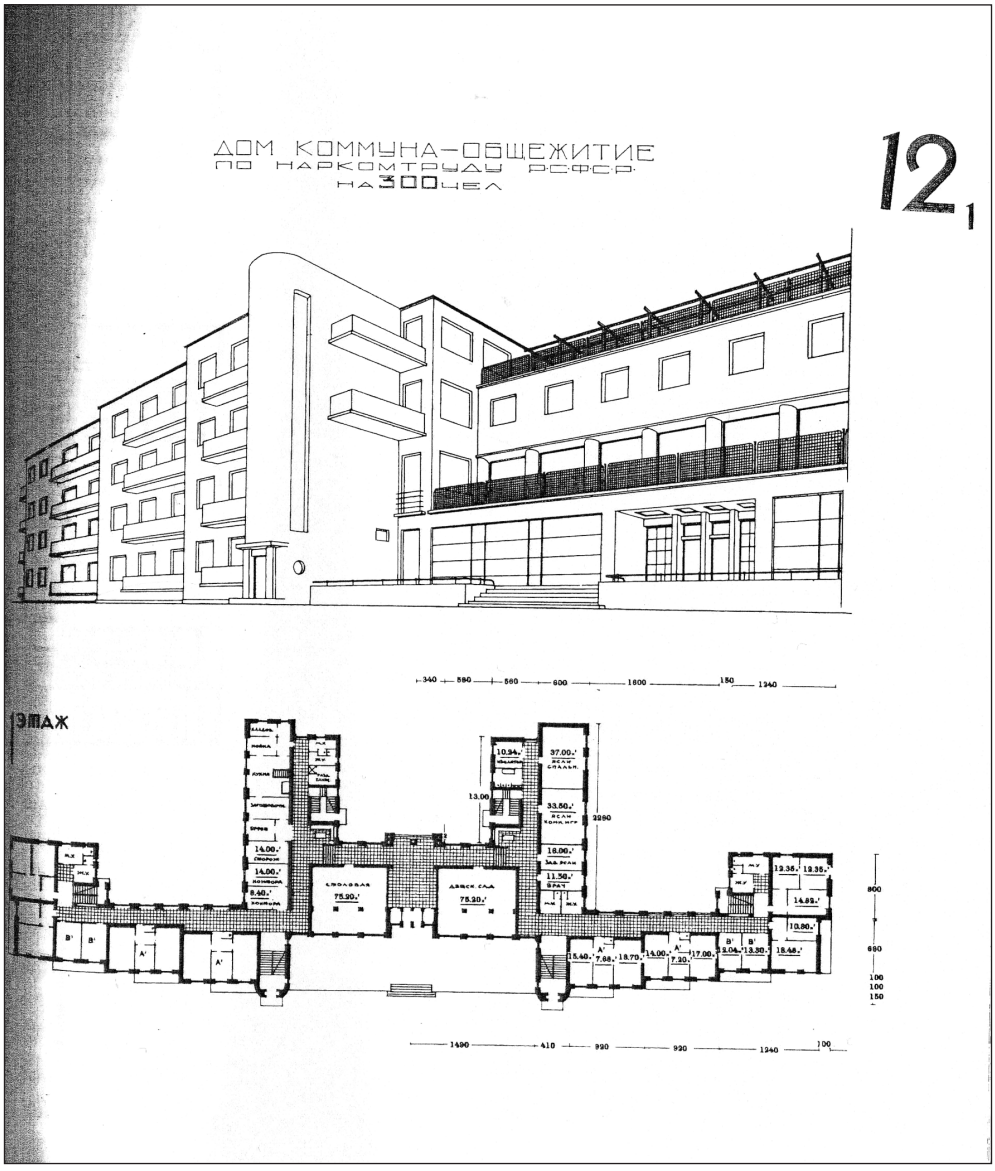

Figure 3: The House-Commune/Dormitory of the Ministry of Labor for 300 People. View and ground floor plan. From the album *Proekty rabochikh zhilishch* [Projects of Workers' Housing] (Tsentral'nyi bank 1929: 207).

According to the Tsekombank album's authors, Ginzburg's Section of Typification under the Construction Commission merely developed their work, although the chronology is difficult to confirm since the two bodies worked simultaneously and most likely in dialog (Tsentral'nyi bank 1929: 183). A product of this dialog, the Narkomfin building, borrowed not only the program for the house-commune but also the military spirit inherent in its barracks roots.

The Narkomfin as Barracks

Whereas the Tskekombank album mostly focused on building types, Ginzuburg's team typified apartments: the Section of Typification's types for apartments of one, one and a half, two, and three rooms could be recombined depending on a particular situation, enhancing the flexibility of architecture.[18] Their most important realized experimental project was the residential block of the Soviet ministry of finance — the Narkomfin, designed and built between 1928 and 1930 by Ginzburg with Ignaty Milinis.[19] The formulaic flexibility of type became a key to its social and geographic mobility, a weapon in modernism's conquest of minds and spaces. Stroikom's typified apartments were recombined, in different configurations, in five other buildings, in Moscow, Sverdlovsk, and Saratov. To facilitate their possible further replication, they could be easily adapted to local conditions: thus, accounting for the fact that by the late 1920s, no more than 20% of Soviet urban areas possessed sewage and centralized gas, Stroikom developed a typified scheme that — like most workers' barracks — had shared earth closets in the common areas **(Figure 4)**.

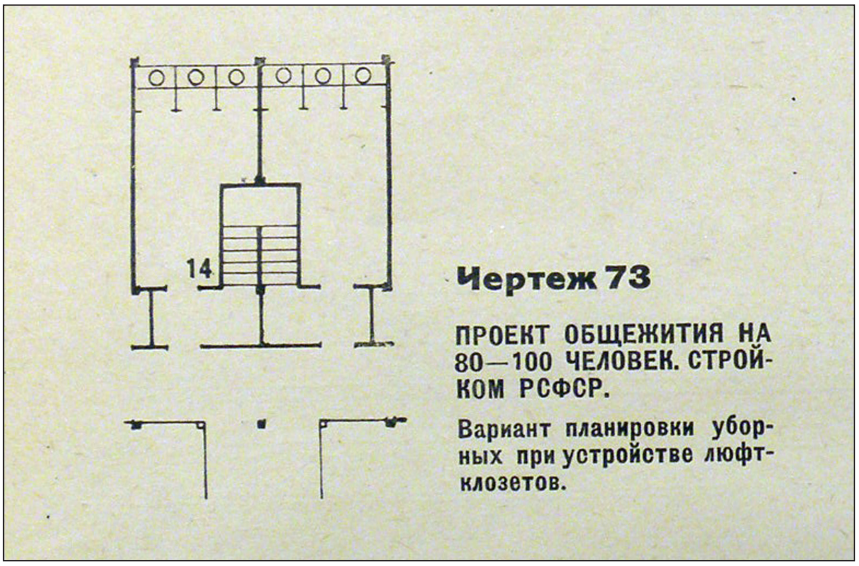

Figure 4: Stroikom RSFSR. Project for a dormitory for 80–100 people. Plan of bathrooms with earth closets. From Vel'man (1929: 61).

Flexibility also became a tool for the entangled transformation of the building and its residents. Defining the task of architecture as the creation of 'social condensers' (spaces that transform the personality of its user in the same way a mechanical condenser transforms vapor into water), Ginzburg announced the Narkomfin building to be a prototype building 'of a transitional type', which inconspicuously prompted residents accustomed to old, family-based, lifestyles to transition to collective ways of living (Ginzburg 1934: 82–96).[20] The building itself was intended to be transformed as the living conditions and preferences of its residents changed; initially shared, the Narkomfin apartments would over time be occupied by individual families who would gradually abandon individual ways of living in favor of greater collectivization.

Unlike Sokolsky, the architects of the Narkomfin used not brick but an experimental modern construction method — a ferro-concrete skeleton filled with a hollow concrete masonry unit. Yet this method followed Sokolsky's recipe for hollow brick, since the wall was one-and-a-half units wide (in addition, the 6-centimeter distance between the units was filled with slag). Ginzburg justified the new technology by evoking Sokolsky's argument: concrete, he believed, was preferable to other materials because of its high porosity and hence low thermal conductivity (Ginzburg 1934: 98–100). To minimize construction expenses, whenever possible the architects relied on inexpensive, low-quality materials similar to those employed in the construction of barracks: reed fiber for thermal insulation, particle board for flooring, papercrete for internal walls, and peat boards for roof insulation.

The logic of economy sometimes caused Ginzburg, like Sokolsky, to arrive at findings that contradicted conventional ideas about economy. Sokolsky had discovered that larger apartments were more economical than smaller ones because they provided a greater usable space for the same amount of structure (and hence, a greater M_u) and, moreover, were more hygienic because they enabled a better circulation of air. Even though Ginzburg (who was a delegate to CIAM) devised his apartment types in response to the *Existenzminimum* debate and thus strove for the minimum of space, he also sought the maximum of light and air within these constraints. The paradox was eventually solved by arranging each apartment on two levels that merged within the high living room lit by a double row of windows. Since each apartment within the six-story building occupied two floors, two corridors (located on second and fifth floors) were enough to serve all the apartments, freeing living space on the other floors. These wide and well-insulated corridors that stretched along an external wall could be used as social spaces, a stark contrast to the narrow and dark internal corridors common for apartment blocks and praised as one of the Narkomfin's architectural innovations **(Figure 5)**. Evoking Sokolsky's rhetoric of economy and citing the Economic Council's

economic coefficients, Ginzburg proudly described the corridors in his book from 1934, *Zhilishche. Opyt piatiletnei raboty nad problemoi zhilishcha* [Housing: An Experience of Five-Year Work on the Problem of Housing]:

> Due to the specificity of social and everyday-life structure of the residential block it was necessary to replace vertical connections between separate living elements (stairwells) with horizontal arteries — corridors, which connect individual living cells with each other and, most importantly, with the communal center. These corridors, due to their width, their complete insolation with direct light, their architectural treatment etc. had to serve not only artery but also, in part, the space of social gathering.
>
> Common internal or unevenly lit corridors cannot solve this problem. Of a better quality, internal corridors are uneconomical. Our project presented an attempt of a spatial solution in which both problems are solved simultaneously. The corridors are wide, about four meters, evenly lit, and because they are placed only on two of five floors, they not only reduce the usual coefficients in comparison to the stairwell system, but even improve them. (Ginzburg 1934: 84)

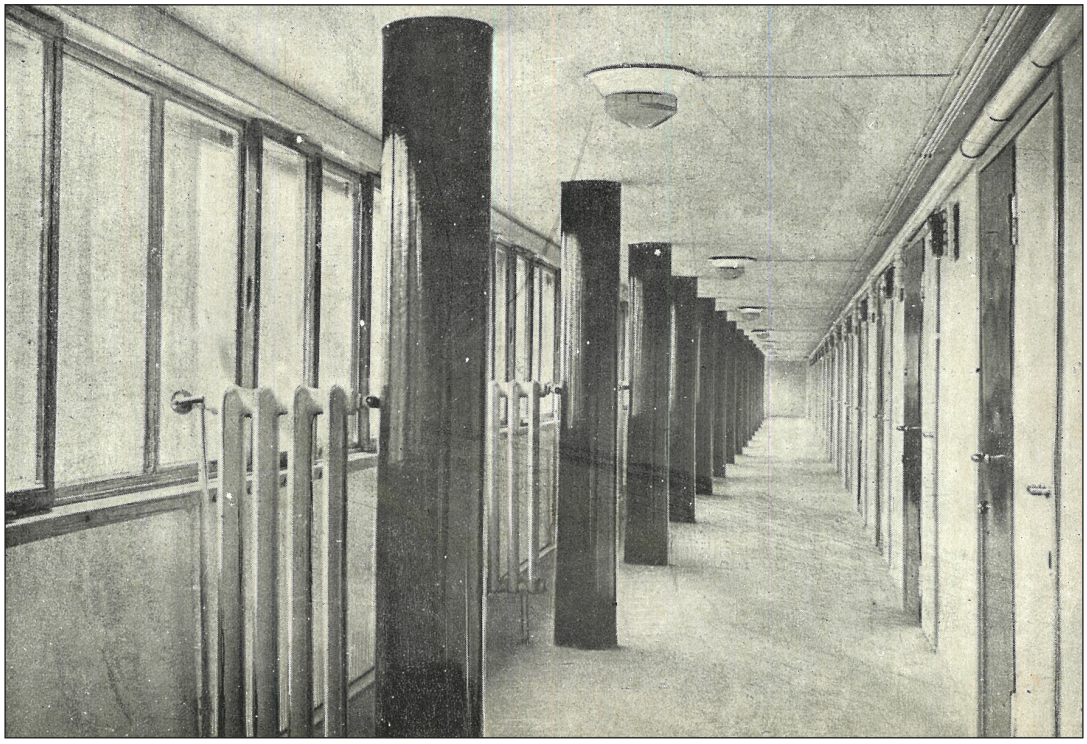

Figure 5: The corridor at the Narkomfin building. From Ginzburg (1934: 91).

This corridor was not Ginzburg's invention — it had been used in Tsekombank barracks proposals after Sokolsky had described it and pioneered it in military construction. He gave a detailed account of the evolution of the barracks, from their ostensible birth in the work of Sébastien Le Prestre de Vauban, whose typical barracks building was divided into units by an internal wall, to the complete dissolution of internal divisions in the most modern barrack plans of the French engineer Casimir Tollet, and argued that this evolution was driven by economic and hygienic concerns **(Figure 6)**. In the first stage of this development, openings were made in Vauban's longitudinal internal wall; these openings were subsequently turned into large arches, and the longitudinal internal wall eventually disappeared altogether. While Vauban's barracks had narrow staircases along both long sides of the building, staircases were eliminated on one side to economize space, which, in turn, made people walk up and down the stairs to get from one part of building to another. The introduction of the central corridor solved this problem. Tolerated because of its functionality, this 'long, dark, musty corridor with walls all soaked with miasmas', according to Sokolsky, became a continuing problem in the construction of European barracks (Sokol'skii 1912a: 179, 168). This widespread type, he explained, was the worst of all, not only from a hygienic standpoint but also from an economic one. Considered without staircases, it resulted in a low M_u of 0.5, and when taken without the corridors, only 0.4. Furthermore, to compensate this economic inadequacy, users had to intensify the exploitation of internal space, which led to unsanitary living conditions. Up to 12 beds, Sokolsky observed, were placed in a room of 30 square meters in a barracks of this type, which left one person only 2.5 square meters of space. For Sokolsky, such neglect of elementary hygienic requirements was the opposite of economical: it led to higher expenses in the cleaning and maintenance of the barracks and for the provision of medical aid for its sick residents and possibly even their offspring (Sokol'skii 1912a: 177–178). Replacing the internal corridor by a well-lit side corridor, a newer type of barracks originated in Britain, Germany, and Austro-Hungary, 'luxurious in its [offering of] space, comfort and hygiene': its M_u was 0.52 — greater than that of the least hygienic previous type because of the greater size of rooms. Even when the corridor — 'but the corridor [that is] well-lit and serves a reservoir of fresh air' — was not considered, its M_u was equal to that in the previous scheme (Sokol'skii 1912a: 180). Like the one in the Narkomfin, Sokolsky's corridor was widened to the point that it turned 'into a hall, or replaced the dining room, the study room, the studio, etc'. — the corridor, in other words, '*was to be turned into a walk-through room*' (Sokol'skii 1912a: 147; emphasis in the original).

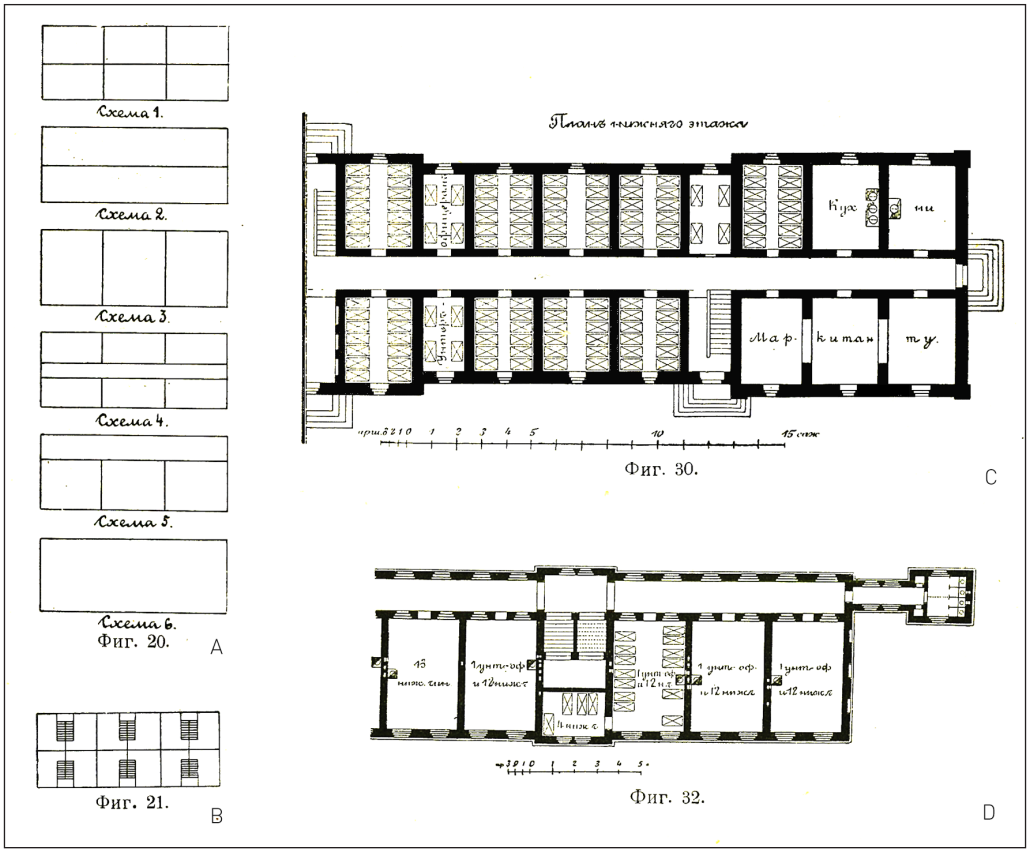

Figure 6: A–D. The evolution of the barracks. Diagrams and plans. From Sokol'skii (1912a: 167, 178, 180).

Ginzburg's team also developed Sokolsky's other proposals, such as a collapsible army bed, in their work on standardized foldable furniture for the Narkomfin. Turn-of-the-century hygienists considered clothing and bed linen the most significant carriers of bacteria, prompting military designers to seek ways of minimizing contact with bed linen during the day and maximizing the distance between beds to promote the circulation of fresh air. While French, Italian, and Spanish barracks had foldable beds that were lifted up against the wall during the day, in Russia it was common to arrange beds in pairs to increase the width of the aisles. Sokolsky synthesized the two types, proposing a bed made of easily cleaned metal tubes (or, in Russia's southern regions of bamboo), which could be folded up in the morning, while protruding legs became hooks for hanging the blanket (Sokol'skii 1912a: 187–188) **(Figure 7)**. El Lissitzky, who was also employed by Stroikom for the Department of Construction Control, where he headed the work on the Narkomfin's interiors, suggested a solution similar to

Sokolsky's: a foldable double bed, this time intended for a couple. Like foreign military and civil prototypes, it collapsed up against the wall, while the bar in the foot section of the bed served to hang clothes at nighttime (Vel'man 1929: 35) **(Figure 8)**.

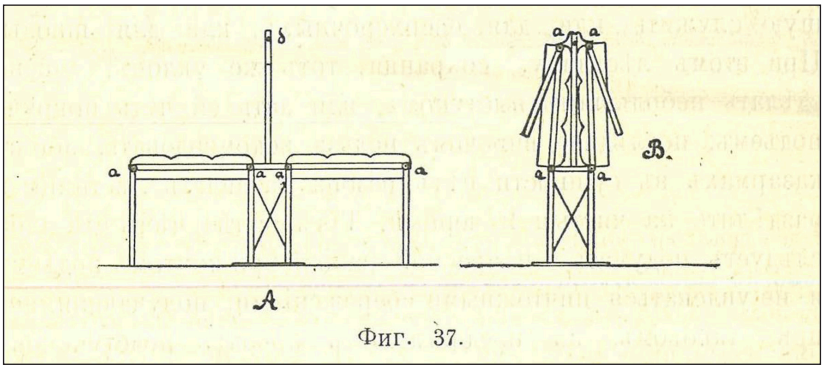

Figure 7: Viktor Sokolsky, diagram of foldable bed. From Sokol'skii (1912a: 188, fig. 37).

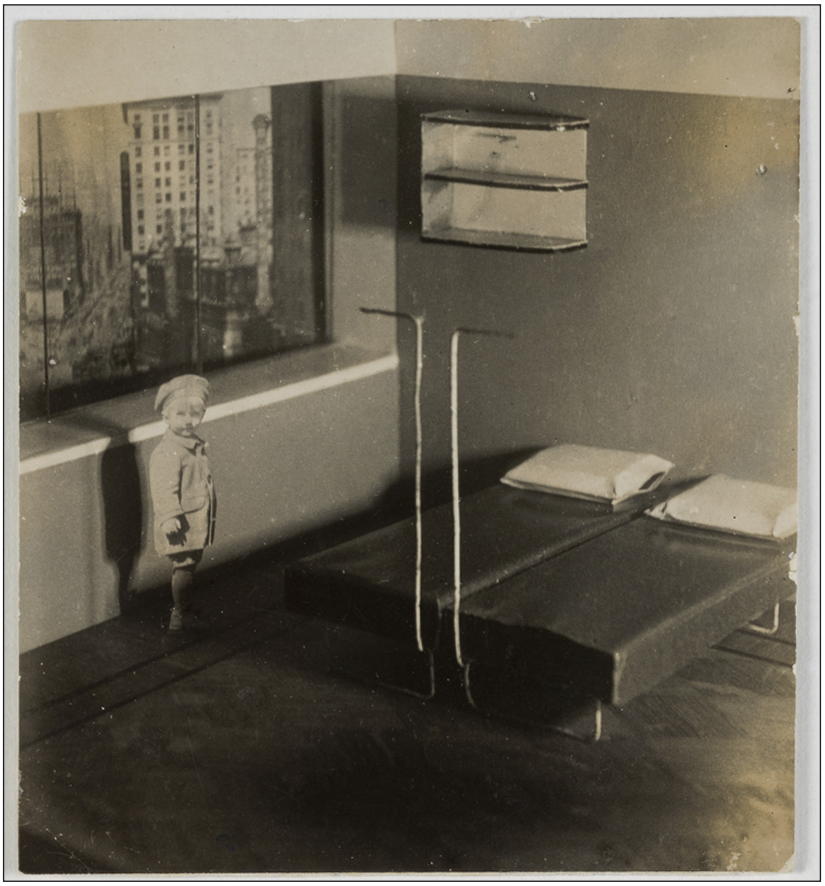

Figure 8: El Lissitzky, furniture design for the Narkomfin. Courtesy State Tretyakov Gallery, Moscow.

Defying his own declared concern with workers housing and underscoring his political conservatism, Sokolsky's plans were predominantly for large, bourgeois apartments — a paradoxical consequence of his conclusion that larger apartments were more economical than smaller ones because they generated more usable space. Ginzburg and Lissitzky ignored these plans only to turn to another architectural solution rooted in Sokolsky's suggestions — not for apartments but for military barracks. Developed in the situation of extreme material scarcity resulting from the mobilization of all available resources for industrialization (which some historians see as the militarization in preparation for the Second World War), Stroikom's model of collectivity was militaristic in origin. The new social structure that came to replace the bourgeois family at the Narkomfin was, in the end, a military unit.

Conclusion

Even though the predictive power of Sokolsky's calculations proved to be minimal, his economic method provides more than a prehistory of standardization. Unpacked as flexibility, efficiency, and the rational use of resources, the principle of economy and its corollary — that long-term planning is indispensable for economic construction — was nurtured by the military logic of mobilization on the eve of the First World War. During the interwar period, these ideas were embraced by such luminaries of modernism as Ginzburg, who applied them to new materials and new social demands. His Narkomfin building was not only a radical social experiment but also a project that responded to the conditions of material scarcity and labor mobilization.

Notes

[1] I use the old transliteration system in the text (Sokolsky, for example), and, to ensure accuracy, the Library of Congress system in citations (Sokol'skii).

[2] European colonialists faced similar challenges, and the origins of standardization were interwoven with European colonialism, as historian Itohan Osayimwese demonstrates in her analysis of the export of German pre-fabricated architecture to Africa (Osayimwese 2017).

[3] Sokolsky was born into a noble family in the Poltava region (Ukraine) and graduated from Poltava Cadet Corps (military academy), in 1885, and subsequently from St. Nicolas Engineering School in St. Petersburg, in 1888. After finishing at the St. Nicholas Engineering Academy, also in St. Petersburg, in 1895, he was soon promoted to captain (1897), colonel (1904), and finally major general.

[4] The books largely overlap in terms of their subject matter and text. The first book, however, provides an analysis of workers' housing (which is absent from the next two books), while two later books apply Sokolsky's principles to the barracks.

[5] Among the few precedents mentioned by Sokolsky are, in Russian, *Sanitarno-stroitel'noe delo* [Sanitation Construction] by Edgar Lundberg (1907) and *Voinskie zdaniia* [Military Buildings] by Viktor Ivanov (1893); and in German, Carl Kersten, *Der Eisenbetonbau: ein Leitfaden für Schule und Praxis* [Reinforced Concrete Construction: Guidelines for Study and Practice] (1906; Russian translation 1908).

[6] Over three million peasants moved to Siberia between 1906 and 1915, although approximately 10% of them returned due to the poor living conditions there.

[7] In Berlin, Sokolsky observed, 4.5 to 5% of interest on the capital was considered good, whereas in Russia this number was above 10% (Sokol'skii 1912a: 13, footnote).

[8] Sokolsky defined E as $m_1 p$, where p is the local price of one thermal unit and m_1 is the number of thermal units saved by the heating-saving construction in one year. The thermal unit price p was calculated with the formula $p = P/kf + p_1$, where P signifies the local price of fuel; k is the energy conversion efficiency of the heating element used in the building; f is the fuel's heat emission, or the number of thermal units emitted per one unit of fuel in one hour; and p_1 is the price of the heating element calculated for a number of years. Furthermore, p_1 was defined as $A:B$, where A is the annual cost for the heating element (considering not only the initial payment but also the costs of its maintenance and insurance), and B is $24mn$, where m is the number of thermal units produced by the heating element in one hour and n is the length of the heating period in the given area. The number of saved thermal units m_1 was defined as $24k\,(t-t_0).n$, where k equals k_1-k_2 (k_1 is the general coefficient of heat emission; k_2 is the same coefficient when a heat-saving construction); t is the average temperature inside the building where the given construction was used; t_0 is the average external temperature during the heating season at the given location); n is the length of the heating period in the given area; and the coefficient 24 refers to the number of hours in a day.

[9] The work regulation of 1912 recommended 2.5-brick-wide walls (Roshfor 1912: 371).

[10] I am thankful to Sophie Hochhäusl for this observation.

[11] The protective and insulation qualities of air would subsequently be explored by other architects, eventually leading British biologist John Bernal (who was as well connected in the Soviet Union as he was among European modernist architects) to suggest, in 1939, that the buildings of the future would use streams of pumped air instead of material walls (Bernal 1949: 196).

[12] Over 1,500 factories were constructed in the Soviet Union during the First Five Year Plan, according to an official source, which also notes a fundamental shift in the location of industry from the European to the Asian part of Russia (Gosudarstvenna planovaia komissia 1933: 48).

[13] According to the authors, by 1933, the barracks comprised 86% of all housing in the city of Nizhniy Tagil (Meerovich and Bulgakova 2019: 78).

[14] Meerovich cites NV Markovnikov, 'Ekonomicheskii analiz tipovykh iacheek gorodskogo mnogoetazhnogo doma', *Stroitel'naia promyshlennost'*, 4 (1928): 293.

[15] I am deeply indebted to Christina Crawford for pointing me to this publication as well as for generously sharing a copy (itself shared by Evgeniya Konysheva) with me.

[16] Another publication, from 1931, that included barracks among other housing types is by EV Luganovskii (1931), which summarizes the work of the temporary government commission, formed in 1929, on residential construction in new industrial cities (Meerovich 2018: 55).

[17] On the concept of the house-commune and its interpretation in Soviet architecture around 1927, see Crawford (2014).

[18] In this respect, Stroikom's plans can be compared to the extendable Vienna cottages by Austrian modernist Margarete Schütte-Lihotzky (who worked in the USSR between 1930 and 1937) (Hochhäusl 2013).

[19] As Crawford (2014) demonstrates, the project incorporated many of the architectural findings of the competition for communal housing conducted by journal *Sovremennaia Arkhitektura* (edited by Ginzburg).

[20] The expression 'social condenser' was introduced by Ginzburg to describe the mission of socialist housing (Redaktsia 1927; Ginzburg 1927; Murawski 2017).

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Competing Interests

The author has no competing interests to declare.

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