ADAPTIVE MODERNITY IN TIMES OF SCARCITY

Urban Housing in Maoist China

Yimei Zhang

ABSTRACT: Urban housing built between 1949 and the commercialization of the housing market in the 1980s in China has gained increasing attention from architectural historians and conservationists. Once colloquially dismissed as 'old, dilapidated, and small' during China's rapid urban renewal, these housing projects are now being reconsidered for their heritage values amid growing criticism of large-scale demolitions. However, the preservation of these buildings faces significant challenges due to their outdated floor plans, concerns over structural stability, limited research, and the absence of a shared framework for value assessment. This paper traces the historical evolution of urban housing construction in China from the 1950s to the 1980s, drawing on a range of sources, including academic journal articles, as well as official guidelines and reports. It argues that, while early housing planning in the 1950s was heavily influenced by the Soviet system that emphasized standardized design and industrialized construction, Chinese housing practices made ongoing, incremental adaptations to address technological constraints, material shortages, and regional differences. As a result, instead of aiming for a perfect solution to modern living, designers worked with imperfect solutions using available resources during a time of scarcity. Unlike the ideology-driven, standardized mass housing often associated with Soviet-influenced countries, China's housing projects from the 1950s to the 1980s exhibit a more localized, organic response to both social and material conditions. The paper contends that this adaptive approach to housing design during this period is essential for understanding the challenges in evaluating these housing legacies today.

KEYWORDS: welfare housing, modern architecture, China, scarcity

INTRODUCTION: The evolution of housing under the planned economy in China offers a unique perspective on the diverse trajectories of Modernism. The welfare housing system was established in the 1950s and lasted until the housing reform in the 1980s. For more than three decades, housing was provided by state-owned enterprises as a welfare benefit to their employees, using land and funding allocated by the central and local governments.

The planning, design, and construction of housing in Maoist China does not fit in the historiography of Western Modernism, which often revolves around the visionary ideas of prominent architects, whose ideas were sanctified, disseminated, and further developed by their disciples across the globe. At the same time, it also diverges from the dominant narrative of socialist Modernism, frequently characterized as a counterpoint to Western Modernism, as defined by absolute state authority and central planning. In fact, China began to forge its own path even before the Sino-Soviet split in 1958, demonstrating remarkable diversity and adaptability to local conditions within the constraints of design and construction.

This article seeks to theorize the development of the Chinese welfare housing system as an adaptive process shaped by the logic of scarcity. The extreme shortage in material, technology, and financial resources fundamentally changed the design profession. The primary objective was not to create an ideal modern living environment, but rather to find the most economically and technologically feasible solutions, albeit imperfect most of the time. The paper argues that the expertise developed in maximizing the use of limited resources to design and construct 'imperfectly' should also be recognized as a legitimate contribution to the modernist tradition.

SCARCITY LOGIC

Jeremy Till differentiates between two types of scarcities: one, defined by Nicholas Xenos as the universal condition of the modern world, invented by capitalism and

consumerism; the other, as a socio-material condition also constructed by geopolitics (Till, 2014). The extreme scarcity China faced after independence belongs to the latter category. It was a historical inheritance, exacerbated by the war and political turmoil. It was also structurally created by the planned economic system, and geo-politically influenced by the projected image of an ideal modern socialist society (Lu, 2011).

In housing design, scarcity first imposed a hierarchy of spatial priorities. Housing, as a site of 'consumption', was relegated to secondary importance compared to spaces of 'production'. Consequently, surplus space, comfort, and decorative features were labeled as 'waste'. Key economic indicators, such as the usable area ratio, construction cost per square meter, and the consumption of concrete and steel, became critical metrics for assessing the feasibility of designs. This scarcity logic was formalized in the architectural design principle proposed in the 1950s: "utility, economy, if possible, beauty" (Lyu et al., 2003, p. 131). As a result, the Soviet standard of 9 square meters per person was deemed excessive and reduced to 4 square meters per person, or 18 square meters per household. These quotas remained largely unchanged until 1973, when the State Construction Committee doubled them to 34-37 square meters (Lyu et al., 2003).

While these extreme quotas restricted architectural possibilities, they also demanded solutions tailored to local circumstances and urgent needs. A significant enabler of such adaptive responses was the decentralization of housing design and construction under the *danwei* system, in which each state-owned enterprise was responsible for providing housing, infrastructure, schools, and other amenities for its workers within a designated plot of land. This system not only produced an urban landscape of numerous 'microcosms', but also fostered contingent and context-specific approaches to housing design and construction.

In 1959, the delegation of standardized design to local housing authorities further enhanced the trend. Recognizing the impracticality of enforcing uniform designs across China's vast and diverse territory, the State Ministry of Construction limited its role to drafting quotas and guidelines. Local design institutions were empowered to modify and adapt these standards to accommodate regional climates, lifestyles, and demographics.

Scarcity created not merely a condition to be endured, but also shaped a sense of agency to search for solutions outside of the existing framework and beyond Western knowledge. Designers were encouraged to explore alternative designs, materials, and construction methods for housing construction. In 1964, the central government launched the 'Design Revolution Movement of the Masses', calling for a 'reform of the wall systems'. During this campaign, the pursuit of local, practical knowledge and feasible construction methods that minimized concrete use and required lower levels of industrialization was actively encouraged as a means of modernization independent from Western paradigms.

The following sections will illustrate how design, material selection, and construction methods were constantly adapted in the welfare housing system.

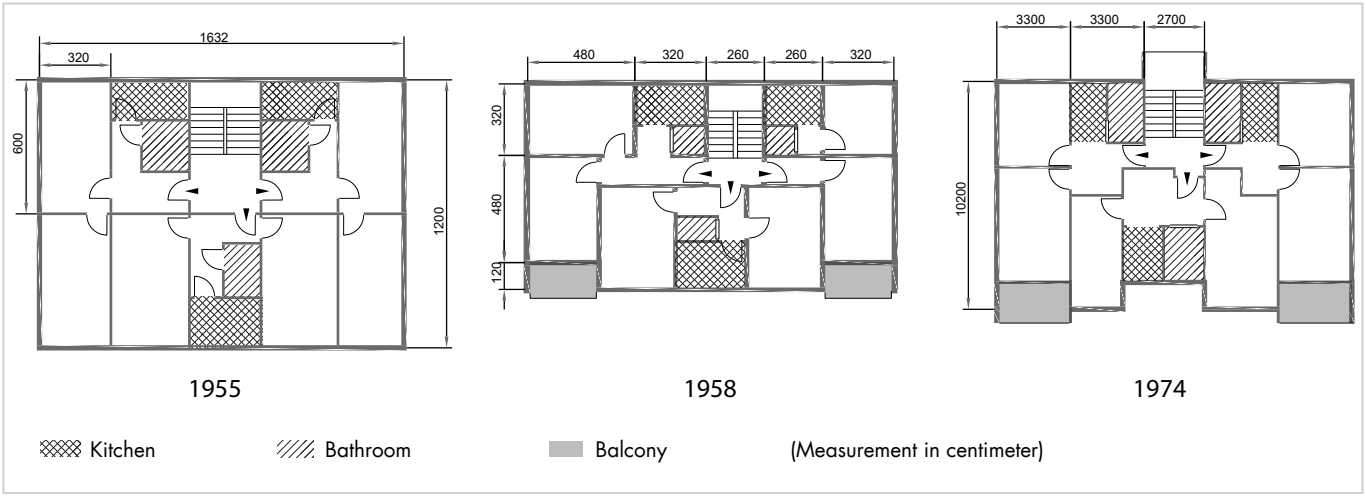
DESIGN: VARIATIONS OF STANDARDIZED PLANS

In the late 1950s, as the Soviet model of housing design began to falter, the search for alternative approaches to housing design became a central topic in Chinese architectural discourse. A series of design competitions and symposiums was organized at both local and national levels to solicit innovative housing solutions.

The first national housing design competition on Factory Workers' Housing was held in 1957, attracting over 1,200 submissions (Editing Committee of Architectural Journal, 1958). Another important event was the Symposium on Residential Building Standards and the Art of Architecture held in Shanghai in 1959. Presenters from major cities, including Shanghai, Beijing, and Tianjin, advocated for the development of multiple standards to accommodate varying social and climatic conditions, as well as the need for these standards to evolve with socioeconomic development. The symposium reached a consensus on several key principles: designing smaller rooms to accommodate flexible household sizes, providing private kitchens and bathrooms even during the People's Commune Movement when public canteens were widespread, and creating diverse housing typologies to address different needs. Concerns about the monotony of mass housing were also raised by many presenters (Architectural Society of China et al., 1959).

In 1961, the Architectural Society of China held its annual conference in Zhanjiang, focusing again on the topic of housing. Yang Chunmao, the Deputy Minister of Construction and Industry, emphasized the importance of adapting designs to local conditions, establishing reasonable standards, and creating varied housing typologies (Architectural Society of China, 2013). Following this conference, housing design competitions were organized again by local Architectural Societies at provincial and municipal levels in different places.

Analyses of competition submissions and published housing designs from this period reveal two primary strategies for addressing scarcity in design. The first involved further refinement of standardized floor plans. For example, the Municipal Institute of Architectural Design in Beijing developed over 600 housing typologies between 1955 and 1995, illustrating a dynamic process



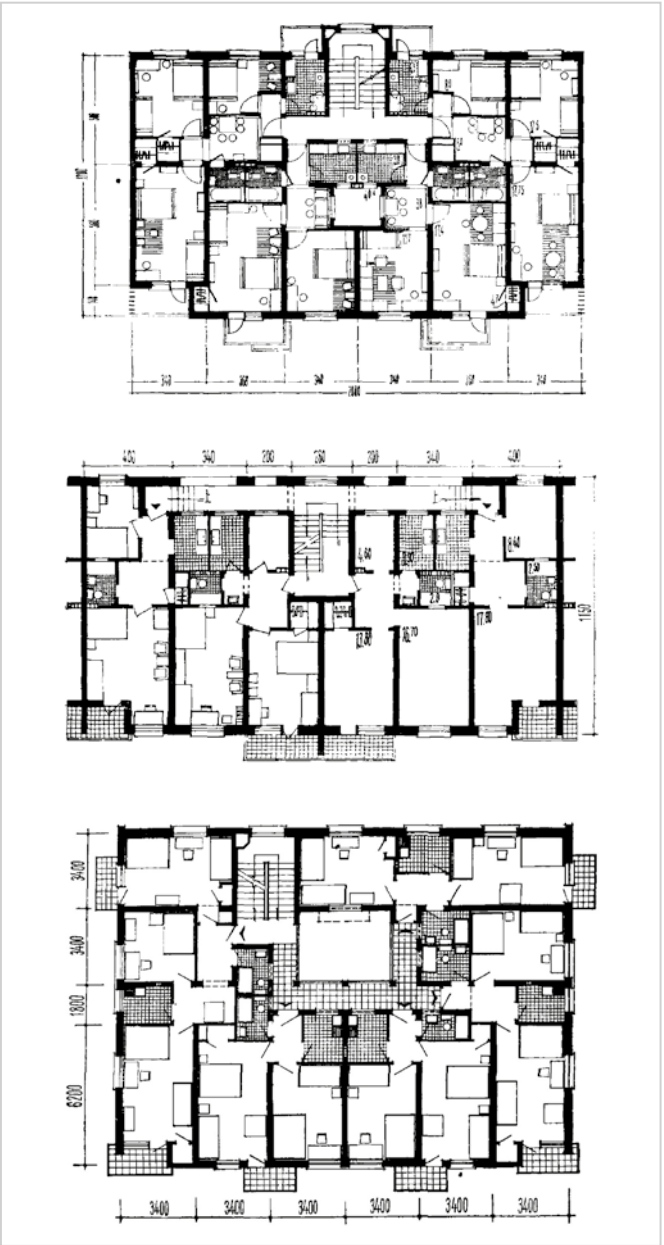
01 Selected standardized designs in Beijing. © Redrawn by the author. Beijing Institute of Architectural Design, 1999, pp. 2-3.

of experimentation (Residential Design Over 50 Years, 1999). The initial 1955 Type Two design was based on the Soviet Five-Bay Plan, utilizing only 3.2-meter by 6-meter rooms to reduce the number of component types and one staircase serving three apartments per floor. Though this typology has been commonly used due to its simplicity (as seen in standardized designs of 1959, 1962, 1964, 1974, and 1976), designers began modifying and creating new possibilities within the standardized framework. The 1958 design, for instance, shifted wall alignments to create more varied room sizes. The 1974 plan further developed the entrance space to create a proper lobby area [FIGURE 01].

In the 1963 housing design competition held in Beijing, the winning entries introduced further innovations. Submission Nº 21 designs a Six-Bay Plan, which serves four apartments per floor with a single staircase, ensuring cross-ventilation in each unit. Submission Nº 63 is a Corridor Plan that achieves a compact layout with relatively separated apartment entrances, optimizing privacy. Submission Nº 31 is a Small Atrium Plan that incorporates a 13-square-meter atrium to facilitate ventilation while achieving a 55% usable area ratio by positioning the staircase asymmetrically on the side of the plan [FIGURE 02].

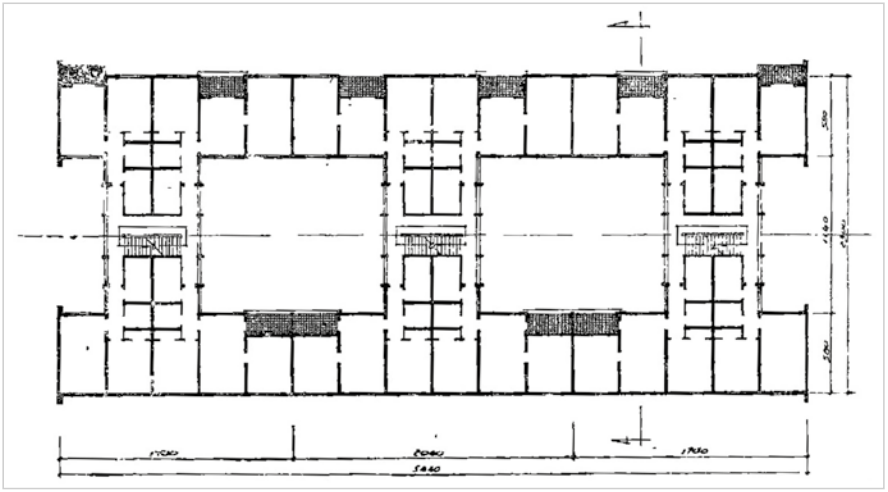
The other strategy uses regional architectural traditions as sources of inspiration. Vernacular architecture, in contrast to the so-called 'inherent Chinese style', later derided as the 'big-roof style', was considered a viable and independent alternative to Western influence.

The big-roof style was rooted in Liang Sicheng's theory of the 'translatability of architecture', which proposed that the structural logic of traditional Chinese architecture could be adapted to modern construction. Liang's approach drew heavily on the Beaux-Arts tradition, emphasizing symmetrical plans, spatial hierarchies, and monumentality (Liang, 2001). However, this style was heavily criticized in 1955 for its "bourgeois aestheticism in the disguise of a national form" and for being a "waste" of scarce materials (Lyu et al., 2003, pp. 131-132).



02 Submission No. 21, 63, and 31 of the 1963 Housing Design Competition in Beijing. © Architectural Journal, 1963 (07), pp. 1-5.

Vernacular architecture, on the contrary, represents a tradition of organic settlement planning, flexible floor plan arrangements, adaptability to local materials and climates, as well as reliance on simple, ad-hoc solutions



03 Housing Design of Anhui Province in 1960. © Architectural Journal, 1960 (03), p. 16.

04 Housing Design of Guizhou Province in 1960. © Architectural Journal, 1960 (03), p. 27.

05 Housing Design of Nanning in 1960. © Architectural Journal, 1960 (03), p. 25.

(Xu & Tan, 1961). In the late 1950s, academic discussions on learning from the vernacular began to emerge. For instance, a housing design in Anhui province published in 1960 incorporated courtyards within the units, drawing inspiration from local vernacular architecture [FIGURE 03]. Similarly, in Guizhou province—a predominantly mountainous region—housing designs addressed elevation differences and provided context-specific solutions tailored to the area's geographical conditions [FIGURE 04]. In tropical regions, such as Nanning, designs often incorporated verandas to enhance ventilation, demonstrating sensitivity to the local climate [FIGURE 05].

MATERIAL: SUBSTITUTING CONCRETE

Facing a material shortage, reducing the consumption of steel, concrete, and wood became an important task for designers. Similar to the approach in floor plan design, two approaches can be observed in the search for suitable materials: one drawing from vernacular traditions and the other involving variations on existing materials.

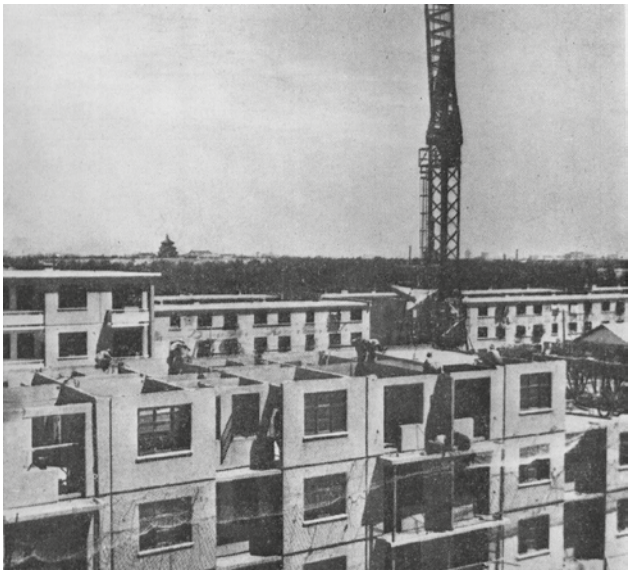
The use of traditional materials to replace 'modern' and 'western' materials was not new to China. Various possibilities have been explored since the introduction of Western-style architecture in the late 19th century. A notable example is the use of bamboo as a substitute for

steel in reinforced concrete, a practice widely adopted in Guangzhou in the early 20th century. This approach arose from the scarcity of locally available steel but also illustrated that the transfer of modern construction knowledge was not a direct copy of Western methods. Instead, it was a process of adapting to local economic conditions, technological constraints, and preexisting knowledge systems (Shu, 2019).

During the 1950s, similar experiments were supported by the government under the 'anti-waste' campaign. Bamboo reinforced concrete again attracted research interest (Sun, 1957). Articles on using fiberglass or reed to replace steel in reinforced concrete (Building Materials Teaching and Research Group, 1959) started to appear. Such efforts were actively promoted as creative solutions to address resource scarcity. Some cases were pushed to extremes, serving more as political propaganda to showcase the superiority of the socialist system than rigorous scientific research. For instance, the 'four no-use' buildings constructed in Harbin in 1961 famously claimed to replace steel, cement, timber, and bricks with alternative materials such as glass wire, ceramic, silicate, and wood shavings (Lyu et al., 2003). However, the structural stability and durability of these new materials were often inadequate, resulting in their very limited application in a small number of experimental projects (Sun, 1952).

The second approach focused on making cement more economical by incorporating locally available lightweight aggregates to reduce the amount of concrete required. Much of this research was influenced by advancements in other socialist countries. By the early 1960s, for example, the German Democratic Republic was experimenting with using fly ash to produce ceramsite concrete. The Soviet Union and Czechoslovakia also explored the use of industrial waste and natural materials such as slag, brick rubble, and pumice. Building on this knowledge, Chinese researchers conducted extensive testing of various aggregates, yielding promising results. In Beijing, for example, experiments with fly ash, slag, and other industrial byproducts for producing silicate concrete large wall panels began in 1964. By 1974, these panels had been applied in 82 residential buildings, totaling 160,000 square meters. One example of this is the Tiantan Housing Complex in Beijing, with a total floor area of 74,000 square meters. (Editing Committee of Construction Technology, 1975) [FIGURE 06].

In fact, the ability to apply empirical, local knowledge instead of adhering to the scientific doctrines established by Western countries was considered an advantage of the socialist development approach. The Chinese representative at the international conference on concrete held in Leipzig in 1962 concluded that "western scholars research to create formulas", while scientists in the socialist countries research "to solve practical problems". The author further concluded that "the blind faith in doctrines and rules will limit the development of science and technology" (Wu, 1962, p. 173).



06 Construction of Tiantan Housing Complex in Beijing. © Architectural Journal, 1973 (01), p. 32.

CONSTRUCTION: HYBRID SYSTEMS

The prefabricated concrete panel system, widely utilized in the Soviet Union and Western countries after the Second World War, was regarded as the epitome of modern society. Achieving the same level of industrialized housing production has been the goal in China since the 1950s, as evidenced by the State Council's 1956 statement, which proposed 'industrialization', 'standardization', and 'mechanization' of the architectural industry (State Council, 1956). However, the reality was that, by 1970, approximately 90% of residential buildings in China were still constructed using longitudinal load-bearing brick walls with reinforced concrete floors (Huang, 1988).

There were several reasons for the relatively limited application of prefabricated panel systems. The high cost of production was an important factor. Factories that were able to manufacture prefabricated panels required a significant upfront investment; however, frequent design modifications hindered factories from standardizing modules and manufacturing them in sufficient quantities to achieve economies of scale (Zhang, 1983). Additionally, the limited availability of concrete and steel further impeded the development of more advanced systems. Until the 1970s, the Lagutenko panel, developed by Soviet engineer Vitaly Lagutenko in the 1950s, remained the favored system for prefabricated housing projects in China. Its popularity stemmed from its efficient use of materials. With edge ribs to enhance load-bearing capacity, the panels can be exceptionally thin, averaging 7 centimeters in thickness, with the body sections measuring only 2 to 4 centimeters.

While the fully prefabricated concrete panel system was only applied in limited pilot projects, construction methods

that combined the advantages of prefabrication with traditional brick systems emerged during the late 1950s and 1960s and quickly gained wide application. Two prominent examples of these methods are the vibrated brick block system and the silicate block system.

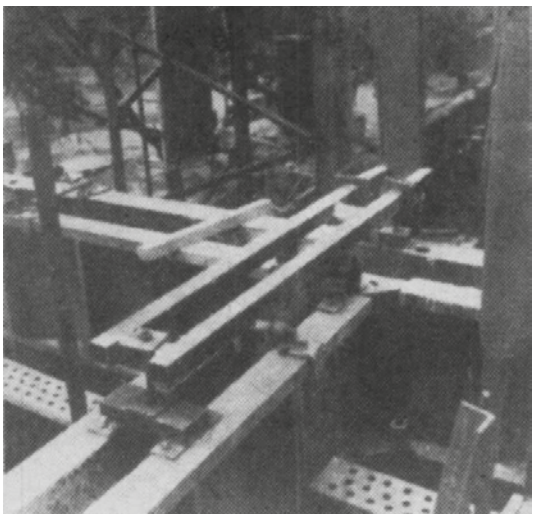
The vibrated brick block system involved combining standard clay bricks with binding materials to form larger blocks through a vibrating mold. This process eliminated air bubbles within the mortar, resulting in blocks that were denser and stronger than traditional hand-laid brick walls. The method required minimal technical expertise, thereby reducing the demand for industrialized equipment, while achieving a level of prefabrication comparable to that of concrete panels. From 1959 to 1966, several housing projects in Beijing, including Longtan, Zuojiazhuang, and Huayuanlu, used this construction system (Beijing Architectural Engineering Research Institute, 1975).

Silicate blocks made with industrial waste provided another alternative to reduce concrete consumption. Shanghai pioneered the research and industrial production of silicate blocks, achieving success by 1963. These blocks were produced using fly ash, slag, and other byproducts from the city's power plants. The materials were mixed with lime gypsum, cast into molds, and cured with saturated steam to produce blocks of roughly the size of over 40 clay bricks (Shanghai Municipal Bureau of Construction and Engineering, 1974) [FIGURE 07].

While both systems represented significant technological advancements tailored to China's specific conditions, they were often viewed as transitional steps toward the adoption of a fully modernized prefabricated industrial system. It was believed that "the trend of development is from longitudinal load-bearing systems to latitudinal load-bearing systems, from brick walls to block walls, and finally to concrete panels" (Industrial and Civil Building Research Laboratory, Academy of Building Science, 1960).

However, the trajectory of housing construction in China was far from linear. While the panel system itself continued to develop at a steady pace, other systems proved to be more economical and suitable for China's industrial level. Especially by the mid-1970s, as the country gradually emerged from the Cultural Revolution, high-rise housing started to develop. Lagutenko panels and the block systems had only been used on 4 to 5-story mid-rise buildings and encountered technological challenges in high-rise buildings. In the 1970s, the formwork system was developed for high-rise housing projects. Steel formworks were used to manufacture cast-in-place concrete walls and floors on-site [FIGURE 08]. It was also common to build the outer wall with the block system to maximize the advantages of both systems and adapt to the level of technology and management. Between 1974 and the 1980s, 2,120,000 square meters of housing were constructed using the formwork system (Chen, 1986).

07 First silicate block building in construction in Shanghai. © Architectural Journal, 1960 (03), p. 3.



08 Steel formwork in construction. © Architectural Journal, 1975 (02), p. 28.

CONCLUSION: RETHINKING THE TRADITION OF MODERNISM

Housing in Maoist China was neither designed with the utmost creativity nor constructed using the most advanced technologies, highest standards, or finest materials. In the modernist tradition that prioritizes architectural aesthetics, spatial quality, material innovation, and technological advancement, it is challenging to reconcile the idea that imperfect design solutions were integral to the history of Modernism. However, the failed experiments, partially labor-intensive construction systems, and imperfect designs should not be viewed merely as transitional stages on the path to modernity but as authentic representations of Modernism itself.

If we accept that adapting to scarcity through local, empirical know-how constitutes a legitimate tradition within Modernism, we gain a critical lens for engaging with the built environment today, particularly in light of the ongoing

climate crisis. The reemergence of discussions on minimizing concrete use in recent years shows the continued relevance of these issues. While it is important to acknowledge that much of the scientific research conducted in the 1950s and 1960s was ideologically driven and may not meet current academic standards, the case of housing in Maoist China invites a reframing of Modernism not as the pursuit of perfection, but as a dynamic process of adaptation to specific material, social, and economic conditions.

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