

Transformation from Commercial Port to Industrial City

Discussion on Industrial Land-use Planning and Industrial Building Construction in Shanghai (1945-1960)

Lingzhou Li, Nu Peng, Junjie Zhang

* PhD, College of Architecture and Urban Planning, Tongji University, lilingzhou35@tongji.edu.cn ** Professor, College of Architecture and Urban Planning, Tongji University, pengnu@tongji.edu.cn *** Chief Architect, East China Architectural Design Institute, junjie_zhang@ecadi.com

Abstract

This paper compares the four urban plans of Shanghai especially the industrial land-use from 1940s to 1950s, and reveals the changes in the design and construction of industrial buildings with the development mode shifted from spontaneity to the planned. The paper points out that the establishment of socialist political and economic system and the positioning of Shanghai by the national industrialization strategy have completely changed the urban development in Shanghai, which in turn led to the spatial reformation of the industrial location in Shanghai during the transition from light industry to heavy industry in 1953-1957. It also contributes to the large-scale expansion of industrial land and development of suburban industrial areas and industrial satellite towns after 1958 and prompts the transformation of Shanghai into an industrial city. The urban spatial structure of Shanghai also changed from a mono-center structure with the original concession as the core to a poly-center structure with the industrial centers as the core. The adoption of the Soviet standards and norms in industrial buildings, the clear zoning of general layout, and a large number of large-scale, large-span factories have contributed to the important image of the development of heavy industry in Shanghai during this period.

Keywords

Urban Transformation of Shanghai, Industrial Land-use Planning, Construction of Industrial Building, Commercial Port, Industrial City, Urban Planning of Shanghai from 1953 to 1959, the Greater Shanghai Plan

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INTRODUCTION

According to the Industrial Plan drawn up by Dr. Sun Yat sen in 1919, one of his visions for Shanghai’s urban development was to improve the city into a world commercial port.¹ By the 1930s and 1940s, port trade gradually promoted Shanghai to be the largest integrated commercial port city in China and the Far East. However, with the change of China’s regime and the establishment of political and economic system in 1949, Shanghai transformed from a consumption-oriented city based on a commercial port to a production-oriented city led by industrial construction. Furthermore, socialist industrial production became the primary motivation for Shanghai’s urban development.

Shanghai’s industrial layout has also underwent a major adjustments. Before 1949, Shanghai’s main industry was light industry. After 1953, China focused on developing heavy industry in order to build a complete industrial category and industrial system. By the early 1960s, the output value proportion of Shanghai’s heavy industrial production had surpassed light industrial production.

Year	1950	1952	1957	1960	1962
Gross Industrial Production	36.17	68.06	118.51	310.27	150.23
Light Industry (%)	85.8	79.1	70.9	43.7	59.5
Heavy Industry (%)	14.2	20.9	29.1	56.3	40.5

Table 1. Proportion of Light and Heavy Industries in Shanghai’s Total Industrial Output from 1950 to 1962

Before 1949, most industrial buildings were built by entrepreneurs themselves. After joint state-private ownership of individual enterprises, the construction mode of industrial buildings and industrial zones in Shanghai gradually changed from spontaneous construction to overall construction.



Fig. 1. Layout of industrial land-use in the first, second and third version of Greater Shanghai Plan

The urban construction of Shanghai in the 1950s was largely driven by industrial development. The construction of urban industrial zones and industrial satellite cities changed the monocentric urban spatial pattern with the former concession as the core, and formed the prototype of the polycentric structure of modern Shanghai urban space. The industrial land planning and the industrial building construction in this period have witnessed the transformation of Shanghai into a productive city, and also witnessed the remarkable change of urban spatial structure.

CHANGES IN THE LAYOUT OF INDUSTRIAL LAND IN SHANGHAI'S URBAN PLANNING IN THREE STAGES

From 1945 to 1960, Shanghai's urban planning went through three stages, showing the influence of rational planning of Western modernism, the influence of Soviet urban planning ideas and the actual situation of building a productive city. And the layout of industrial land was also adjusted accordingly.

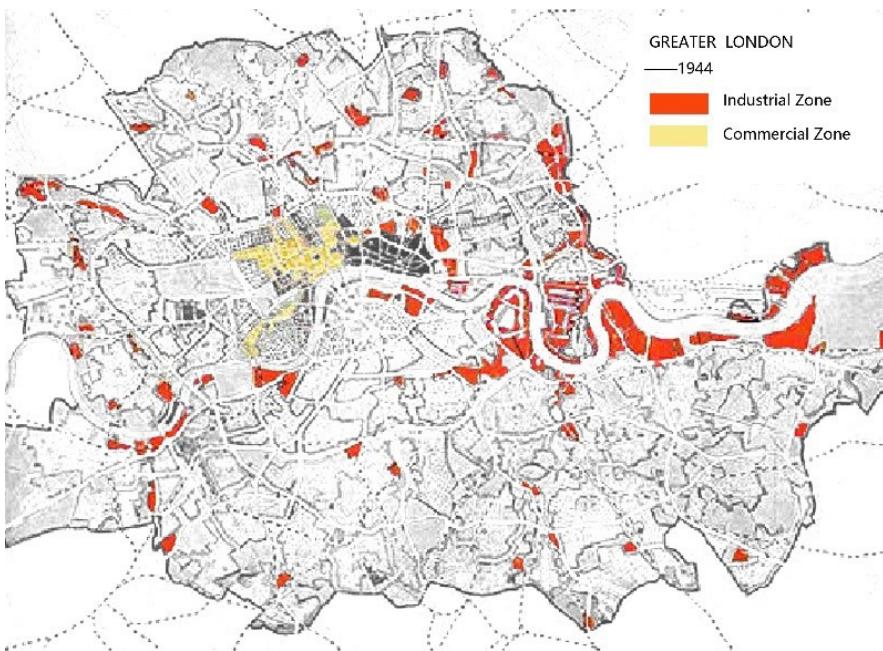


Fig. 2. Layout of planned Industrial Land in Greater London Plan

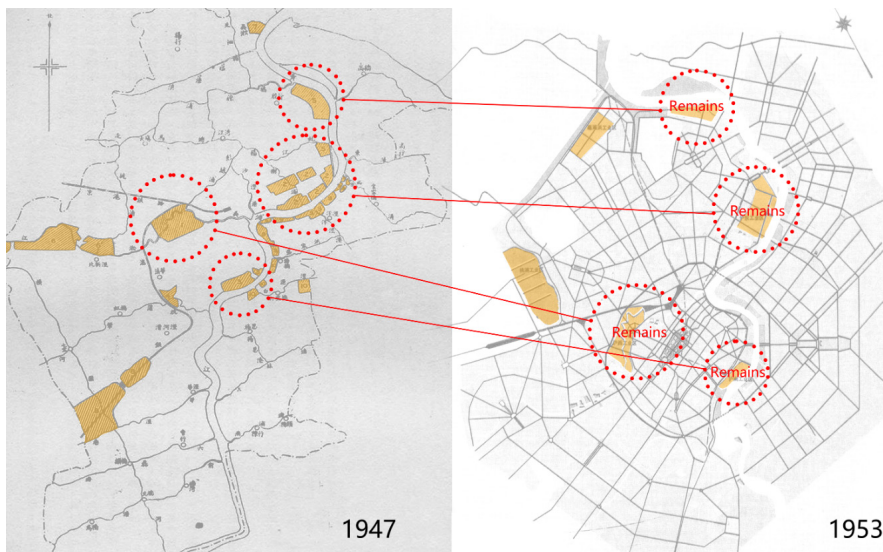


Fig. 3. Continuity of industrial zone planning between the Shanghai Master Plan 1953 and the Greater Shanghai Plan

2.1 INDUSTRIAL LAND-USE BEING ARRANGED ALONG TRANSPORTATION ROUTES: THE GREATER SHANGHAI PLAN

From 1946 to 1949, the government of the Republic of China formulated the “Greater Shanghai Plan”, which was clearly influenced by the rational planning of western modernism. The principle of expansion arrangement of industrial land was adopted, with the original central area of the city as the core and expanding outward along transportation routes. This was similar to the Greater London Plan, which was recently completed at that time. In the city center, the industrial land-use plan of the Greater Shanghai Plan rationally integrated the original industrial land use. Three concentrated industrial clusters were planned along the two routes of Suzhou River and Huangpu River.²

2.2 INTEGRATION AND SUBTLE CHANGE OF INDUSTRIAL LAND: THE SHANGHAI MASTER PLAN 1953

In 1952, under the guidance of the Soviet expert Mu Xin, Shanghai reformulated the “Shanghai Master Plan 1953”, which reflected the Soviet experience. At this stage, urban planning was highly dependent on the orders of the national authorities.³

Compared with the Greater Shanghai Plan in 1946, the layout of industrial land-use planning in 1953 has not significantly been adjusted, but the lifestyle changed. Daily life began to serve industrial production. The plan considered that the residential areas can be surrounded around the industrial zones. It redefining the relationship between living and production in Shanghai.⁴

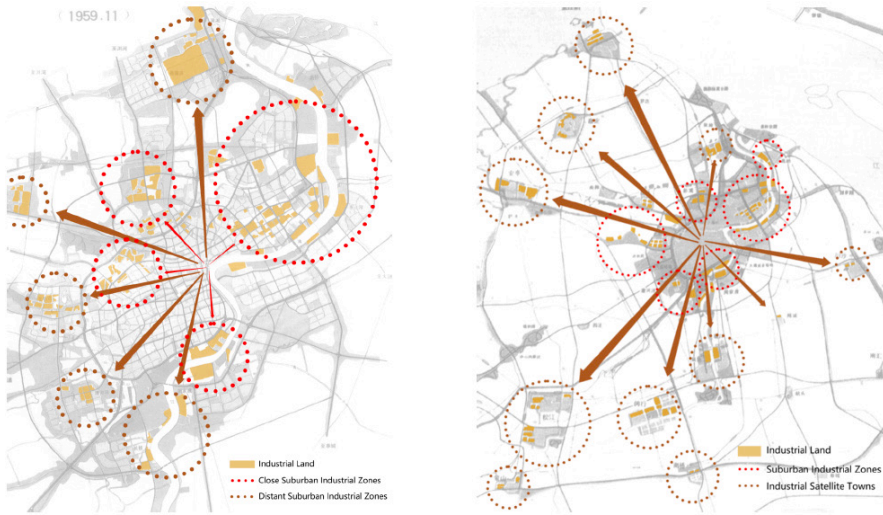


Fig. 4. Diagram of industrial city of Shanghai superimposed on the Shanghai Master Plan 1959.

Fig. 5. Diagram of industrial city of Shanghai superimposed on Shanghai Regional Planning 1959

2.3 THE FORMATION OF A COMPLETE SYSTEM OF INDUSTRIAL LAND-USE STRUCTURE: THE DRAFT OF THE RECENT PLAN 1956-1967 AND THE 1959 SHANGHAI URBAN MASTER PLAN

In 1956, the Soviet-influenced “Shanghai Master Plan 1953” was criticized, and the “Draft of the Recent Plan 1956-1967” and the “Shanghai Master Plan 1959” conceived a polycentric urban structure with several major industrial zones as the core, based on the actual urban construction of Shanghai, and both long-term goals and short-term needs were considered.

In terms of industrial land-use, the planning of 1953 has many restrictions on industrial construction, new projects needed to be arranged in Wusong and Yunzaobang industrial zones, which were far away from the city center.⁵ While the Draft for 1956-1967 called for the vigorous development of suburban industrial zones. After several years of construction, by 1958, the suburban industrial land tended to be saturated, and distant industrial zones and industrial satellite cities became the focus of industrial zone planning again. This process reflects the complex relationship between long-term planning goals and short-term construction realities.

Through to the “Draft of the Recent Plan 1956-1967” and “Shanghai Master Plan 1959”, Shanghai’s central industrial zones, suburban industrial zones, distant industrial zones and the industrial satellite cities formed a complete and clear structural system of industrial land-use from the center to the periphery.



Fig. 6. Layout of Shanghai's industrial land in 1946

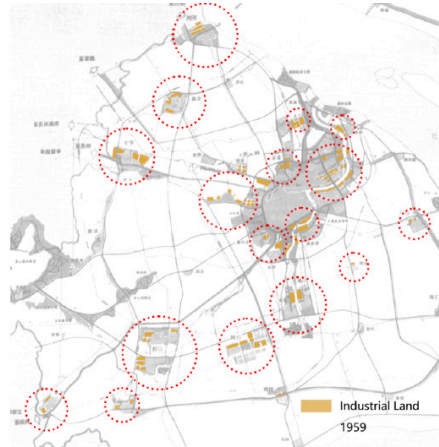


Fig. 7. Layout of Shanghai's industrial land in 1959

2.4 FROM MONOCENTRIC TO POLYCENTRIC OF SHANGHAI'S URBAN SPATIAL SYSTEM: THE IMPACT OF THE CHANGE OF INDUSTRIAL LAND-USE STRUCTURE ON THE CITY

Comparing the urban planning between 1946 and 1959, it can be seen that the industrial zones of the Greater Shanghai Plan in 1946 had the central city as the core and were laid out linearly along the traffic, with industrial production serving the central city; in 1959, the layout of the industrial zones were presented as combination of industrial clusters and living accommodations. These areas forming several urban centers, with urban life serving industrial production. Influenced by the structural system of industrial land layout and the relationship between industrial production and the city structure, the urban spatial structure of Shanghai was also conceived as a multi-center spatial structure, different from a single center with the former concession as the core.

FROM SPONTANEOUS TO ORDERED: THE REAL CONSTRUCTION STATUS OF SHANGHAI INDUSTRIAL ZONE

3.1 SPONTANEOUS CONSTRUCTION: INDUSTRIAL CONSTRUCTION IN SHANGHAI IN THE 1940S

Shanghai's industries first emerged along the Huangpu River and the Suzhou River. According to the "Existing industrial land use in Shanghai" in 1949, it can be seen that a large number of factories in the core of the city covers a small area and is scattered and out of scale. Most of these factories were built by enterprises on their own initiative, which was full of contradictions with the long-term planning of the city, making it difficult to implement the "Greater Shanghai Plan" of 1946.



Fig. 8. Existing industrial land use in Shanghai in 1949

Fig. 9. Locations of factories and industrial land, 1949

3.2 MAINTENANCE, UTILIZATION, AND RENOVATION: SUPPLEMENTARY CONSTRUCTION AND EXPANSION OF INDUSTRIAL BUILDINGS (1953-1955)

After three years of national economic recovery that began in 1949, during 1953-1956, the orientation of Shanghai's industrial development was to expand and reproduce using the original industrial base in order to support industrial construction in the inland city, few new factories were actually built. Factories that being reconstructed, expanded, newly built through consolidations were concentrated in the Huangpu River, along the Suzhou River, Wen Zhao Bang and Taopu Industrial Zone. Most of them were shipbuilding, iron and steel, chemical industry and other types of industries urgently needed by the state.

There were a lot of shipbuilding factories along the Huangpu River with a long history. Since 1953, the factories were merged and expanded, gradually forming a shipbuilding industry pattern dominated by Jiangnan, Hudong, Shangchuan, Zhonghua, Qiuxin, Donghai shipyard and "4805 factory", which was the most important category of industrial construction in Shanghai in the early 1950s.

Take the benefit from water transportation, there were a large number of steel works scattered along the Huangpu River, Suzhou River, and Wen Zhao Bang industrial zone before World War II. Shanghai underwent a restructuring of its steel industry between 1953 and 1956. The original iron mills were merged in 1956 into large steel factories such as Shanghai No.1, No.2, No.3, No.8, No.10 Iron and Steel Works, Asia Iron and Steel Works, and Xinhua Steel Works.⁶

Taopu district was planned as a hazardous industrial zone in 1953, which was an important new industrial zone in the early 1950s. Shanghai Rubber Factory, Taishan Chemical Factory, the Second Pharmaceutical Factory, Taopu Chemical Factory and Shanghai Chemical Industry School were built here one after another.⁷ The industrial pattern of Taopu Industrial zone was basically formed in the early 1950s.

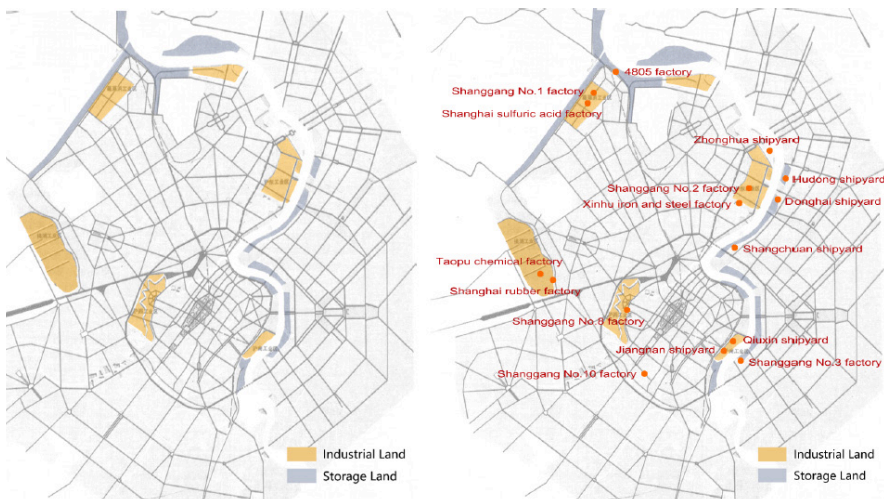


Fig. 10. Industrial land in Shanghai Master Plan 1953

Fig. 11. Locations of large-scale factories of ship, steel and chemical industry from 1953 to 1956, Shanghai

3.3 LARGE SCALE AND RAPID CONSTRUCTION: DISTINCT INDUSTRIAL ZONES ACCORDING TO DIFFERENT INDUSTRIAL CATEGORIES (1956-1960)

Shanghai's real urban transformation and urban-rural structural changes occurred around 1956-1958, Shanghai's industry transformed and developed rapidly with constructing of a large number of factories, gradually forming a structured industrial cluster, including Pengpu and Caohejing suburban industrial zones, Wusong-Yunzaobang and Changqiao suburban industrial zones, as well as Industrial satellite cities such as Minhang, Wujing, Anting, Songjiang.

As China was practicing planned economy and industrial construction, each industrial category was under the management of different national ministries and local government departments, therefore, according to different industrial types and urban region, the construction of industrial enterprises was carried out in a planned manner.

Electric power, electromechanical and chemical industries were the most important types of industrial construction in 1958. They were classified and distributed in Minhang, Wujing industrial satellite city and Pengpu industrial zone. Minhang and Wujing Power plants built in the outer suburb satellite city have become the pioneering projects in the construction of Shanghai's industrial city. The subsequent construction of electromechanical factories and chemical plants has gradually formed Minhang satellite city as the main power station equipment manufacturing, Pengpu industrial zone as the main heavy machinery equipment manufacturing, Anting satellite city as the main automobile manufacturing, Wujing satellite city as the chemical industry. In addition, the shipbuilding industry and steel industry also continued to develop in the late 1950s. Through integration, merger and reconstruction, several large shipyards and steel factories have been formed.

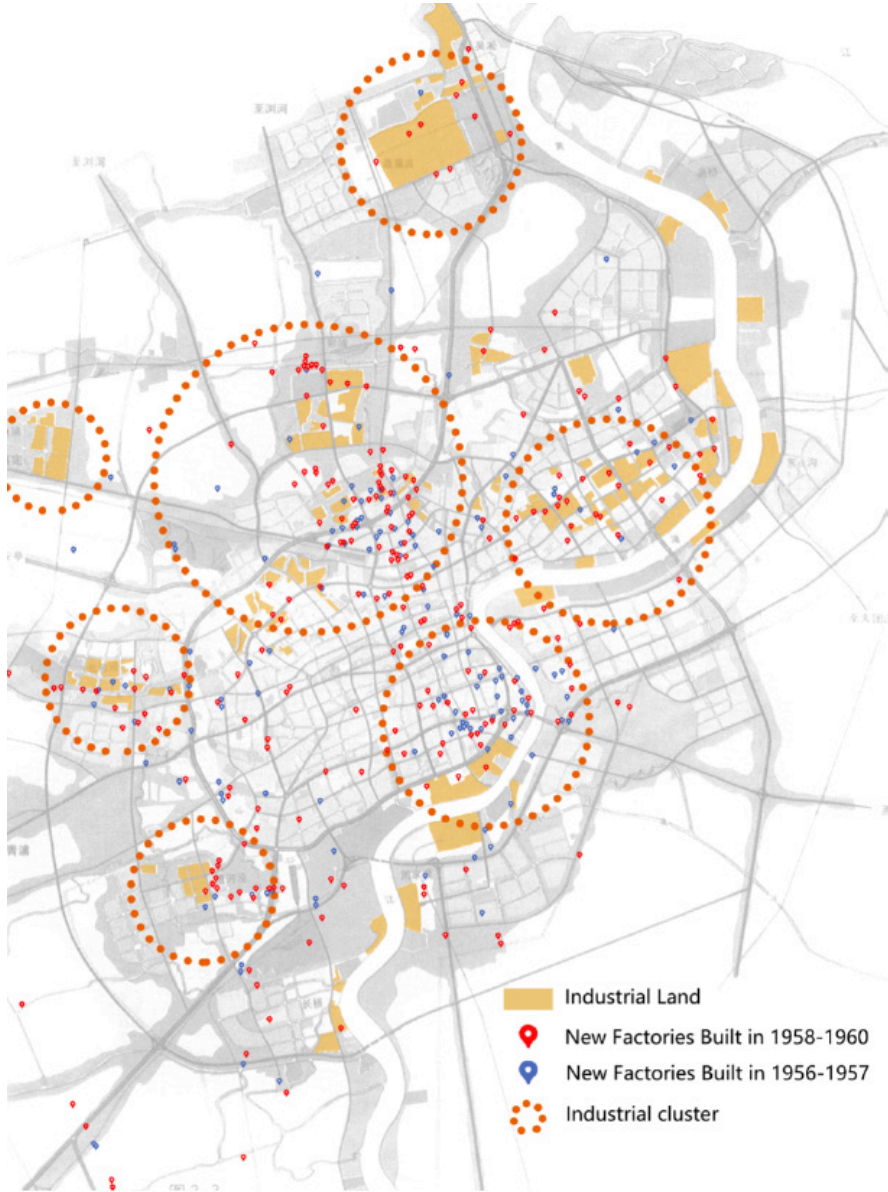


Fig. 12. Large scale factories construction in the late 1950s



Fig. 13. Factories mixed with residential buildings



Fig. 14. Factories divided into several parts



Fig. 15. Factories with high density in the narrow and irregularly-shaped plot of land, 1948

THE CHANGES IN THE DESIGN AND CONSTRUCTION OF INDUSTRIAL BUILDINGS IN SHANGHAI

4.1 INDUSTRIAL BUILDINGS IN SHANGHAI BEFORE 1949

Before 1949, the construction technology of industrial buildings in Shanghai was already relatively mature, with rich building structures and a variety of building styles and forms. However, due to the private ownership of land, high density factories were built on narrow and irregularly shaped plots of land, the general layouts of the factories were disorder, and the lack of land limited the expansion of the factories.⁸ “Shanghai Firm road atlas” compiled in 1947 recorded this situation everywhere.

Since the opening of the city in 1843, Shanghai has been a window for the introduction of Western construction technologies. From the 1920s to the 1940s, construction technologies of modern industrial building had developed in all aspects in Shanghai.⁹ There were abundant building structural types. For examples, Yongan Yarn Factory (1925) and Shanghai brewery plant(1933) were multi and high-rise factory constructed of ordinary steel and concrete, Warehouse of Mifeng Wool Factory (1934) was constructed of steel and concrete buildings with beamless floor coverings, The Turbine Room of Shanghai Electro-Optical Company (1920s-1930s) and the Production workshop of Hualu steel refining plant (1932) were constructed of steel truss and rows structure, Yufeng Cotton Mill (1920s-1930s) was a zigzag plant with steel roof truss, the No. 5 boiler room of Yangshupu Power Turbine Workshop (1939) was a multi-storey steel structure workshop. As they were mainly light industries, the scale of these factories built in this time was not large. It was completely different from the situation in which huge heavy industrial plants were densely built in Shanghai later.

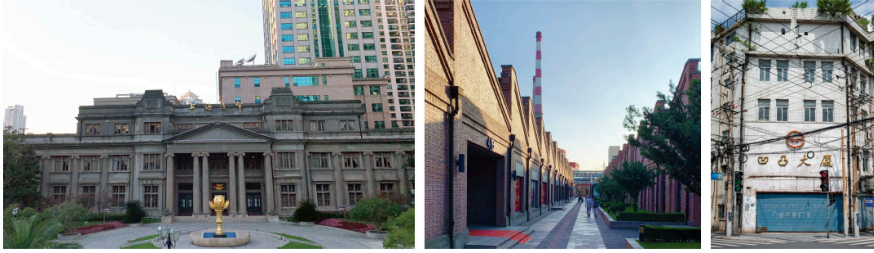


Fig. 16. The former Shanghai Central Mint

Fig. 17. The former Yufeng Cotton Mill

Fig. 18. Tianchu Monosodium Glutamate Factory demolished

From the 1920s to the 1940s, in Shanghai industrial buildings, the Western classical and Art Deco style had not yet ebbed, while the modern style had quietly emerged, and in order to maximize production efficiency, general industrial buildings with simple styles were also built in large numbers. For example, the Shanghai Central Mint (1920) hired Tonghe Foreign Firm to design the building, imitating the neoclassical style of the Philadelphia Mint, and its symmetrical and majestic shape reflected the authority of national capital; the Long Hua Aircraft Shed Factory (1936) and the Nitric Acid Workshop of the Tianli Chemical Factory (1934), which also belonged to national capital, had an all-steel frame full of modern factory characteristics;¹⁰ in addition, a number of Japanese textile factories such as Yufeng Cotton Mill gradually replaced the early British and American textile factories and became the typical of foreign-funded factories in Shanghai during this period, and the buildings of these factories were mostly zigzag workshops with neo-European styles. On the other side, most of the factories built by private capital were gradually cast off the constraints of classical European styles, focusing on practicality.

4.2 DESIGN AND CONSTRUCTION OF INDUSTRIAL BUILDINGS IN SHANGHAI IN THE 1950S

4.2.1 STRUCTURAL ADJUSTMENT OF INDUSTRIAL LAND AND DESIGN OF GENERAL LAYOUT OF FACTORIES

In the 1950s, along with the structural adjustment of the land ownership (from private ownership to state ownership) and the layout of urban industrial land-use. The newly-built large-scale factories in Shanghai were built uniformly in the planned and designated suburban industrial zones, covering sufficient spaces. The general layouts of these factories were no longer chaotic and becoming reasonable. The difference between the factories in the industrial clusters formed before 1949 and factories in the new industrial zones that started to be built around 1960 can be clearly identified in the historical images of Shanghai city maps in the 1970s.



Fig. 19. Factories in industrial zones formed spontaneously before 1949

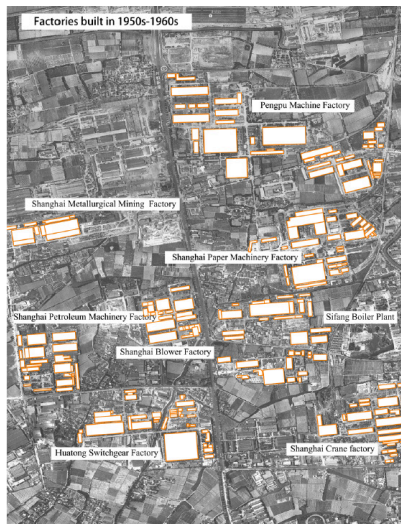


Fig. 20. Factories in new industrial zones constructed around 1960

Located in the Yun Zao Bang Industrial Zone, Shanghai No.1 Iron and Steel Works was a representative large-scale factory built in 1950s. In just a few years, it grew from a small ironworks in the 1940s, with a small land area, to a large steel factory in the late 1950s. In order to form a large-scale production, the general layout of the plant took into account the complex production flow and transportation, and the rudiment of rational planning was formed.

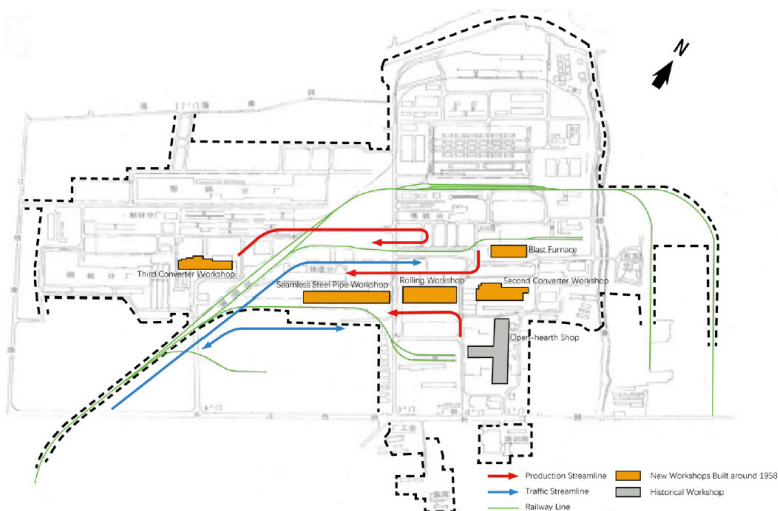


Fig. 21. Site plan of the Shanghai No.1 Iron and Steel Works



Fig. 22. Site plan of the industrial buildings, Pengpu Machine Factory

Fig. 23. Site plan of Huayi Brush Factory and Limin Celluloid Factory that sharing one plot of land

The large-scale construction of this period not only promoted rational exploration of the general plan design of individual factories, but also promoted the interconnection of factories upstream and downstream of the industrial chain in terms of general layout. For example, Shanghai Paper Machinery Factory was the main service provider of Pengpu Machine Factory, and the two factories were only separated by a wall; another example is Huayi Brush Factory and Limin Celluloid Factory in Taopu Industrial Zone, which were sharing one plot of land, and sharing warehouses to strengthen inter-factory collaboration and shorten the production flow line.¹¹

4.2.2 THE ESTABLISHMENT OF BUILDING STANDARDS AND CODES: THE EARLY EXPLORATION OF STANDARDIZATION OF INDUSTRIAL BUILDINGS IN SHANGHAI

In the 1950s, the socialist camp countries began to try to gradually unify the building modulus system to create standardized conditions for international cooperation in building design and construction.¹² At the same time, China began to try to establish unified construction standards. Decision on Strengthening and Developing the Construction Industry released by the State Council of China in 1956 put forward the slogan of industrialize the construction industry for the first time. China's development of building standards and codes in the 1950s was influenced by the Soviet Union deeply, and most of the large industrial buildings in Shanghai built in the 1950s were based on Soviet models and used similar construction methods.

At the end of the 1950s, the relationship between China and the Soviet Union gradually deteriorated, and the various problems arising from the specific practice of building standards and codes originating from the Soviet Union were reflected upon. For example, in order to build standardized steel structure heavy industrial workshop, China decided to adopt the 1955th edition of the Soviet Union's codes directly. Since the differences in climatic conditions and economic aspects between China and the Soviet Union were not considered, the building structure of "heavy roof, fat beams, and fat columns" makes Chinese factories neither applicable, nor economical, nor beautiful.¹³

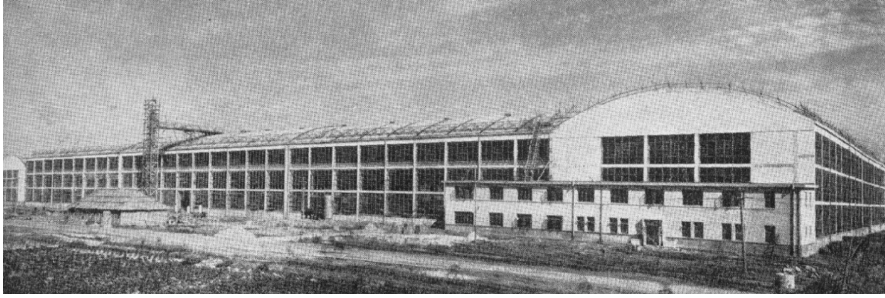


Fig. 24. General view of the metal structure workshop, Shanghai Boiler Plant

4.2.3 THE BOOM IN THE DESIGN AND CONSTRUCTION OF MEGA-SPAN GIANT HEAVY INDUSTRIAL PLANTS

Since the 1950s, the development of heavy industry has been an important guideline for China's industrialization strategy. The development of heavy industry brought about the demand of the placement for large machinery, big equipment and large-sized products, giving rise to a boom in the construction of huge industrial plants with large spans, which reached a climax in 1958. Giant plants became the iconic image of industrial construction at that time.

The Shanghai Boiler Plant was located in Minhang Industrial Satellite City, and its metal structure workshop was designed according to Soviet building codes with a heavy structure. The workshop was a single-story row-frame structure building, the span of its reinforced concrete combined arch roof reached 30 meters.¹⁴ And it was one of the largest span workshops constructed by steel structure in Shanghai at that time. It is worth noting that, in order to save the cost of foundation, the factory adopted large glass windows, and the shape was light, which forms a sharp contrast with the heavy structure.

Similar to the metal structure workshop of Shanghai Boiler Plant, the heavy casting workshop of Pengpu Machine Factory also adopts reinforced concrete combined arch roof with the maximum span of 24m. The workshop was reasonably designed, and the internal space was arranged according to the production process. The raw materials were brought in from the east side, lifted by crane to the heating platform after melting, and transported by belt to the clean up the work section in the west side after casting.¹⁵ Moreover, the plan design of the workshop has considered the possibility of future expansion at the beginning of construction. In Pengpu Machine Factory, the same construction model was used for the heavy industry workshop built in 1961, which is still visible today with its magnificent roof frame and sturdy concrete pillars.

4.2.4 EXCESSIVE PURSUIT OF SPEED AND EFFICIENCY: QUALITY PROBLEMS OF INDUSTRIAL BUILDINGS

In the Great Leap Forward Social Movement boom of the late 1950s in China, large-scale industrial construction was implemented from the planning level to concrete construction in just a few years, but the excessive pursuit of speed and efficiency also brought problems.

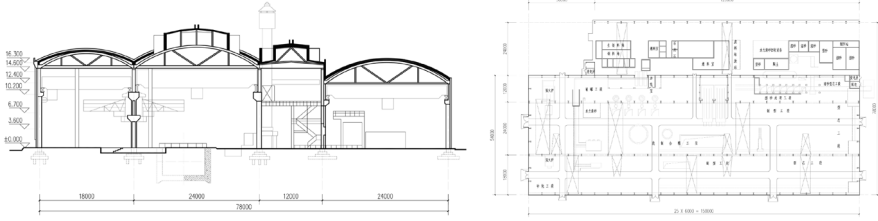


Fig. 25. Section of the Heavy Casting Workshop, Pengpu Machine Factory
Fig. 26. Plan of the Heavy Casting Workshop, Pengpu Machine Factory

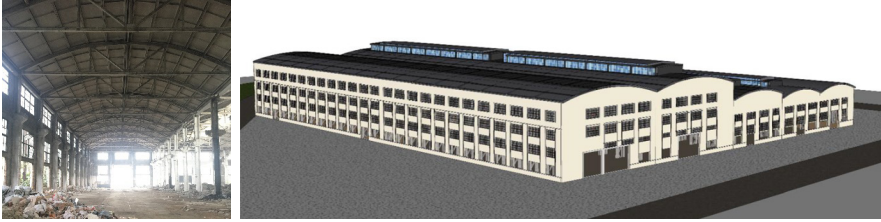


Fig. 27. Interior view of the Heavy Industry Workshop, Pengpu Machine Factory
Fig. 28. Perspective of the Heavy Industry Workshop, Pengpu Machine Factory

A large number of factories were built with excessive savings of materials and time. They carry out design and construction at the same time. That is, the construction started before the design is completed, and the design needed to be completed in the construction process. This construction mode resulted in the low quality of many factories, which had to be refurbished many times in later use. The Minhang Power Factory was a typical example. In order to build the factory “quickly and economically”, the design of the construction plan was started in early August 1958 and the first pile foundation was laid on August 9. However, many piles were broken during the construction. Therefore the main workshop of the factory had to be relocated and rebuilt. The construction of the new workshop started on December 1, and the first unit started to operate after 39 days of construction.¹⁶ In addition, to save materials, the factory was built as a semi-open-air power factory. In fact, in the 1950s, China lacked experience in designing semi-open-air power factory and could not meet the requirements of waterproof, windproof and thermal insulation of the factory. Therefore, after the operation of Minhang Power Plant, accidents occurred frequently. And the factory had to be renovated many times in the 1960s. In addition, the plant layout was not integrated enough, resulting in the visual disorder of the plant.

5. CONCLUSION

The industrial land-use planning, the actual construction of the industrial zones, and the design and construction of industrial buildings are three specific aspects that directly related to the discipline of architecture in the transformation of Shanghai from a comprehensive commercial and port city to an industrial city in the 1950s, which are closely related to the indus-

trial foundation, industrial structure, industrial system, the positioning of Shanghai in China's national industrialization strategy and the change of the political and economic system.

In the Greater Shanghai Plan in 1946, industrial zones were laid out linearly along the traffic, and industrial production served the central city. From 1953 to 1955, industrial construction in Shanghai was slow, and the layout of industrial zones did not show significant changes. However, the relationship between industrial zones and residential zones had changed. Industrial zones were homogeneously surrounded by residential areas, urban life began to serve industrial production. By 1959, Shanghai's urban planning further tried to guide urban life to serve industrial production, lots of industrial clusters were arranged in the city to combine with daily life, forming several urban centers. It is worth noting that the core of these urban centers included the original city center, suburban industrial zones, distant industrial zones and industrial satellite cities, which were designed to support the multi-level urban spatial structure and became the spatial basis of Shanghai's urban expansion in the following decades.

Unlike urban planning in the 1940s, taking benefit from the top-down urban construction mechanism and the socialist way of resource allocation, the planning intentions of Shanghai in the 1950s were well implemented. This is reflected not only in the spatial adjustment of industrial zones realized in the transformation of Shanghai from light to heavy industry in 1953-1957, but also in the large-scale expansion of industrial land, and the construction of suburban industrial zones and industrial satellite cities after 1958.

At the level of industrial building design and construction, taking benefits from the structural adjustment of urban industrial land in the late 1950s, the general layout of factories was reasonably planned on relatively sufficient land. At the same time, the development of industrial building standards and codes changed the diversity of industrial buildings in Shanghai in the 1940s and before, emphasizing the standardization and industrialization of factory design and construction. While learning from the Soviet experience, spontaneous exploration was undertaken by architects. But due to excessive saving of building materials and construction time, a series of problems appeared. Through centralized mobilization and management, Shanghai has gradually solved the problems and completed the construction of a large-scale industrial zones and supporting living areas in a very short time.

ENDNOTES

1. Guangdong Academy of Social Sciences, Volume 6 of Sun Yat Sen's complete works - Industrial Plan. (Beijing: Zhonghua Book Company, 1985), 15.
2. Shanghai Institute of Urban Planning and Design, Greater Shanghai Plan- Land Use and Zoning Plan. (Shanghai: Tongji University Press, 2014), 62.
3. Hou Li, "Structure and Culture: A Comparative Research on the Evolving Soviet Influence over the Plan - Making in Shanghai and Beijing in the 1950s," Urban Planning Forum 234, no.2 (2015): 113-120.
4. Wu You. "The City of 'Socialist Construction' - the Layout of Industrial Land and the Detailed Design of Factories in Chinese Urban Planning under the Soviet Model in 1950s," Annual National Planning Conference 2018, (2018): 294-304.
5. Wang Xingping, Shi Feng, Zhao Li Yuan. History of Industrial Space Planning and Design in Modern China. (Nanjing: Southeast University Press, 2015), 116-117.
6. Shanghai Iron and Steel Industry Chronicle Compilation Committee, Shanghai Iron and Steel Industry Chronicle. (Shanghai: Shanghai Academy of Social Sciences Press, 2001), 103.
7. Shanghai Chemical Industry Chronicle Compilation Committee, Shanghai Chemical Industry Chroni-

- cle. (Shanghai: Shanghai Academy of Social Sciences Press, 1997), 99.
8. Lou Chenghao, *Centennial Industrial Buildings of Shanghai*, (Shanghai: Tongji University Press, 2017), 46.
 9. Li Haiqing, *Modern transformation of Chinese Architecture*, (Nanjing: Southeast University Press, 2003). 67.
 10. Huang Qi, "Conservation and Reuse of Modern Industrial Buildings in Shanghai." PhD diss., Tongji University (2007), 82-83.
 11. The Third Design Office of Shanghai Civil Building Design Institute, "Design of Shanghai Huayi Brush Factory and Limin Celluloid Factory," *Architectural Journal* 33, No.8 (1958): 20-21
 12. Shi Jiayu, "The problem of international unification of architectural modal systems," *Architectural Journal* 23, No.10 (1957): 61-64.
 13. Shen Zuyan, "The development of the Chinese Code for the Design of Steel Structures," *Journal of Building Structures* No.6 (2010) :1-6.
 14. Ju Peisun, Fu Kejun, "Metal Structure Workshop of a Factory in Shanghai," *Architectural Journal* 44, no.7 (1959): 2.
 15. Xia Weimin. "Introduction to the design of a foundry in Shanghai", *Architectural Journal* 44, No.7 (1959):45-46
 16. Institute of power construction science and technology, "Introduction of the experiment of semi-open-air layout in Minhang Power Plant," *Electric Power* 57, no.21 (1959): 3-9.

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NOTES ON CONTRIBUTORS

Lingzhou Li is the PhD candidate of Tongji University College of Architecture and Urban Planning (CAUP), with interests in history of industrial cities and industrial architecture in modern China. Nu Peng is the full professor of Architectural History and Theory at CAUP, Tongji University, with academic focus on Modern Architectural History in China, and the Deputy Editor-in-chief of *Time+Architecture* Magazine sponsored by Tongji University. Junjie Zhang works for East China Architectural Design Institute (ECADI) as the president and deputy chief architect.

IMAGE SOURCES

- Fig. 1, 2, 3, 4, 5, 6, 7: Author's own
- Fig. 8: Shanghai Institute of Urban Planning and Design. *Review and Prospect: Evolution of Shanghai's urban planning*, (Shanghai: Tongji University Press, 2007).
- Fig. 9, 10, 11, 12: Author's own
- Fig. 13, 14, 15: Shanghai Welfare Business Co., Ltd, *Shanghai Firm Road Atlas*, (Shanghai: Shanghai Welfare Business Press, 1947)
- Fig. 16, 17: Author's own
- Fig. 18: Xu Ming, *The Historical and Cultural Boundary of Nameless Block*, accessed April 1, 2022 https://www.sohu.com/a/337856076_617377
- Fig. 19, 20, 21, 22, 23: Author's own
- Fig. 24: Ju Peisun, Fu Kejun, "Metal Structure Workshop of a Factory in Shanghai," *Architectural Journal* 44,

no.7 (1959): 2.

Fig. 25, 26: Xia Weimin, "Introduction to the design of a foundry in Shanghai", Architectural Journal 44, No.7 (1959):45-46

Fig. 27: Author's own

Fig. 28: Provided by Professor Wang Lin from the School of Design of Shanghai Jiaotong University and Mr. Xue Minghua from Shanghai Anmoji Architectural Planning and Design Co., Ltd