

A COMPARATIVE STUDY ON THE SPATIAL PATTERNS OF CHINESE ROW HOUSES IN COLONIAL CITIES IN THE EARLY 20th CENTURY

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ABSTRACT

This paper aims at finding the diversities of morphological features of the urban housing complex and their transformations built around early 20th century in Qingdao, Tianjin, Shanghai, Wuhan, and Guangzhou the five colonial cities of China. These housing estates are successful past attempts at procuring change-ready buildings to live in and hence a valuable asset from which the current people can derive benefit especially in today's context of economic globalization. The paper firstly introduces a general background of these houses by focusing on their evolution and the current status. Then it introduces the representative cases selected from these cities on the spatial characters of typical unit layout. Based a systematic morphological framework, the paper compares characteristics of these housing estates in different spatial levels. It concluded that the diversity of row housing in different cities were largely credit to the traditional house patterns in the contexts.

Keywords: Row house, locality, morphological pattern.

INTRODUCTION

The early 20th century, i.e., from 1900 to the beginning of the War of Resistance against Japan (1937), marks the boom period for early urban housing development in China, especially in the early colonial cities, which played an important role in Chinese modern culture, economy, and politics. (Yang, 1993; Lü et al., 2001) During this period, rapid changes occurred in these cities with the influence from the Western powers. On one hand, the urban population has been greatly increased since many farmers came to cities to make a living, which pushed up the price of land and housing. On the other hand, transforming in family size and lifestyle led to changes in the layout and arrangement of housing. Family size was getting smaller and the multi-generation structure of family was broken down. Because of the changes in family size and the rapid increase in land cost caused by population growth, there arose the demand for compact and convenient small-size units instead of large ones. (Wang and Chen, 1987; Yang, 1993; Lü et al., 2001)

Chinese row houses are a new and unique type of urban housing that resulted from the specific historical background and evolved along with the development of the society. They are mass houses for ordinary people and play a major part in forming the urban fabric of a city. A physical environment that fully expresses the historical background of an area is an important asset to any healthy and expanding society in an advanced level of civilization. (Cozen, 1981). These housing estates are storehouses of previous experiments in creating living environments and hence a valuable asset from which society can benefit. Furthermore, different types of row houses often are indicative of their locality in terms of spatial characteristics and reveal the continuity of the local typological process. Currently, however, most scholars have only investigated row houses from a single background (Li et al., 2008; Liang, 2006; Lin, 2001; Wang and Chen, 1987), thereby forfeiting the opportunity to identify what pertains to that particular localized building culture, what distinguishes it from other cultures, and intrinsic characteristics originating from that locale.

This paper will comparatively analyze the representative row houses in different regions of China with various geographic, cultural, and socio-economic backgrounds: Qingdao and Tianjin located in the North China, Shanghai and Wuhan in the central east China, Guangzhou and Hong Kong in the South China. These cities have experienced a colonial modern history, yet they are the central and most significant cities simultaneously facing the strong pressures of development now. Additionally, this paper will discuss their distinguishing and location-adaptive features and identify the inherent rules that were maintained in the evolution of Chinese row houses, which could benefit housing proposals for future designs.

METHODOLOGY

The forms created in one period are different from those created in another, and similar types have been grouped together over time, thereby giving rise to distinct morphological periods (Whitehand and Carr, 2001). These groupings are fundamental to the understanding of how a new type of housing generated and developed over time. Every period defined a different meaning for the concept of a house. In any case, when we look beyond the differences, we see a significant continuity among analogous objects that are as easily discernable as the differences, which is the essence of the typological process. Moreover, it is a model of the history of the city based on the notion that history is a system of spatiotemporal individuations that are discernable through the process of their formation (Carniggia, 1979). Gu and Whitehand (2008) suggested that the concept of the typological process is a useful means for extending the study of residential buildings beyond the recognition of individual types; additionally, it stimulates hypothesis testing that can provide a basis for a more general developmental framework within which descriptive categories of buildings can be placed.

In the historic investigation of the cases, this research first selected the more representative cases which are from different regions of China to provide a more comprehensive base for comparison. The main considerations that influence the choice of specific examples are as follows:

- Their significance in the history of Chinese row houses,
- The representation of a certain type of row houses in their locale, and
- The availability of adequately documented archives.

Secondly, for effective comparison, it is necessary to establish a consistent method of analysis using a specific framework for all cases. The methodology framed by Kropf (1993) is implemented in the analysis of the cases. Two modes were carried out in parallel. One is a physical hierarchy-structure analysis that discusses the physical structure of some typical units in light of the components of the rooms, including layout, function, circulation, and facilities. The other is a chronological comparative analysis that focuses on how the housings have evolved through time. We will choose two typical cases in each city in the chronological way and compare them to find the how the housings evolved. The relationship with the local traditional housing will also be examined.

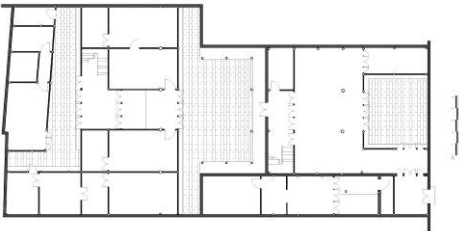
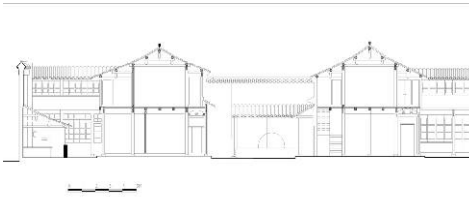

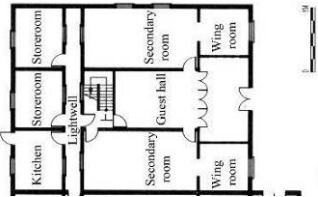



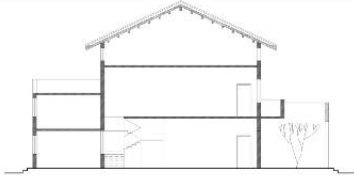

Finally, the evolution of these cases will identify the relationship between the Chinese row houses and traditional housings. Additionally, the similarities and difference between these row houses with various backgrounds will find their distinguishing and location-adaptive features and identify the inherent rules that were maintained in the evolution of Chinese row houses, which could benefit housing proposals for future designs.

Analysis of housing patterns in six cities

Case 1: From Jiangnan House to Shanghai Lilong.

Shanghai is located at the midpoint of China's eastern coast and sits at the mouth of the Yangze River, which supplies a spacious and strong backdrop. The region represents one of the strongest cultures in China and is famous for its water town houses and gardens. It was opened as a treaty port in 1842, and foreign countries were permitted to found each of their foreign settlements individually. The construction and enlargement of these areas accelerated Shanghai's urbanization. The city witnessed the birth of modern industry, commerce, and architecture and was the largest colonial city in China in the 1930's. Lilong housing, which is dominant in this region, demonstrated the unique urbanization and commercialization of Shanghai.

Table 1. House transformation in Shanghai

<p>Local traditional house</p>			
<p>Ground Floor Plan (Redraw based on Chen,2003)</p>	<p>Section (same with plan)</p>	<p>Photo</p>	
<p>Early Row house</p>			
<p>Ground Floor Plan (Redraw based on Cao,2004)</p>	<p>Section (Redraw based on Wang&Chen,1987)</p>	<p>Photo (Field survey)</p>	
<p>Later Row house</p>			
<p>Ground Floor Plan (Redraw based on Lü et al., 2001)</p>	<p>Section</p>	<p>Photo(Field survey)</p>	

Lilong housing was constructed for a long period of time in Shanghai. From the 1860s to the 1910s, the type of old shi-ku-men or lilong housing was the prevailing type. This kind of lilong housing was originally designed for middle-class Chinese families; thus, the plan reflected the traditional lifestyle of the Chinese people. Lilong housing was characterized by its fairly large size, strong central axis, and situating all rooms to face an inward courtyard. Although this kind of lilong house is more compact, the basic spatial layout still shares a lot of significant similarities with that of traditional housing in Jiangnan (Table1)

First, as previously indicated, the majority of rooms within lilong housing in Shanghai face an inner courtyard, and family activities are generally focused inward with high walls surrounding the home and few windows to the outside. This is typical for Chinese traditional courtyard houses. Second, in terms of the spatial layout, rooms were arranged symmetrically along the main axis, and the house actually offered two courtyards. The front courtyard was surrounded by a guest hall, secondary rooms, and wing rooms, while surplus rooms and the kitchen were open to the back courtyard. One functions as the open space for the family, while the other is very small and functions as a source of ventilation for the rooms. The proportion of the courtyards is quite practical in terms of adjusting the micro-climate of the house. Thirdly, the old lilong housing form also follows a same space sequence that is similar to that of the traditional housing in Jiangnan (i.e., front courtyard-living room - backyard - accessory rooms). Furthermore, the structure and building materials that were used are essentially those that were traditionally used in Jiangnan courtyard housing. In old lilong housing, the rooms facing the front courtyard were separated from the courtyard with a row of down-to-floor lattice windows, which are hinged-connected for easy installation and removing. This is one of the main elements of traditional housing found in Jiangnan.

After the revolution in 1911, due to the changes in family size and the rapid increase in land cost caused by population growth, new units with more compact characteristics became popular. As compared to old shi-ku-men lilong housing, this new form still retained the traditional space sequence in the vertical axis starting from the courtyard, living room to the backyard with the ancillary rooms. The main activities of the family still centered on the courtyard. Additionally, two courtyards were still included in the plan, but they were smaller in size.

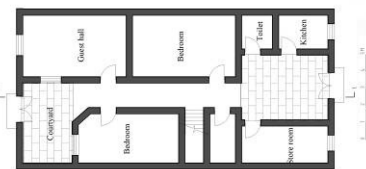
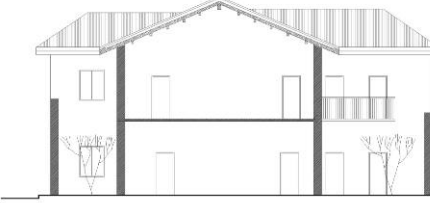

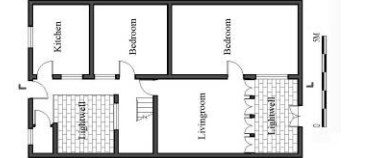


However, some changes were clearly included mostly on the attached rooms in order to adapt to the smaller width and depth. First, the kitchen was connected directly to the living room, while a small backyard was formed longitudinally by reducing the width of the kitchen. Second, the kitchen section was built with two stories, and the upper floor was used as a small bedroom, which was called the Tingzijian (i.e., the pavilion room). The area of the kitchen and tingzijian was small such that the height was reduced; thus, the roof of the tingzijian could be used as a balcony. Structurally, modern elements, such as concrete and trusses, were applied. Plans also became more open

and included more windows and openings to the outside. The heights of the walls in the yards were also reduced. The new lilong housing underwent a series of shifts and gradually became more Westernized and modern.

Case 2: From Shanghai Linong to Wuhan Li-fen housing.

Wuhan is the capital of the Hubei Province in China. The Yangtze River and the Hanshui River divide Wuhan into three parts. It possesses strong economic and regional advantages since it is the center of communications for almost three-fourths of the territories in China, thereby relaying goods, persons, and information. Wuhan reflects deep cultural tolerance with a great number and variety of people coming from different areas. Hankou became an open trading port in 1861, and the British, French, Russians, Japanese, and Germans formed their concessions independently. All of the concessions prospered, and Hankou became one of the industrial centers of modern China.

Table 2. House transformation in Wuhan

<p>Early Row house</p>  <p><i>Ground Floor Plan (Redraw based on Yu and Li, 2009)</i></p>	 <p><i>Section</i></p>	 <p><i>Photo (Field survey)</i></p>
<p>Later row house</p>  <p><i>Ground Floor Plan (Redraw based on Li and Sun, 2008)</i></p>	 <p><i>Section</i></p>	 <p><i>Photo</i></p>

The layout of the li-fen housing units was quite similar to that of the new lilong housing units in Shanghai since it was directly introduced into Wuhan by the developers from Shanghai in the 1910s.(Table 2) Having undergone the process from imitation to producing varieties, li-fen housing has become a harmonious part of the urban environment. The different patterns of this type of housing include three-bay, two-bay, and single-bay widths. Li-fen housing also offers a front and back yard, which serve as a special space to insulate the house from outside disturbances instead of acting as a connective, transitional space between supplementary houses and the main house. Li-fen attaches importance to the full use of the limited amount of land by changing the

courtyard between the wing-room and principal room into a dooryard, which is smaller than courtyard, separating the kitchen from the living area in the backyard. The backyard is used for transition and ventilation. The Tingzujian which is the typical characteristic of the new lilong housing in Shanghai did not appear in li-fen housing, and the back yard of the li-fen housing was a bit larger than that in Shanghai. This may be partly due to the smaller population and the larger hinterland that could provide for housing construction. Since Wuhan is an extremely hot city, li-fen is designed to adapt to the unique climate using good ventilation and sun shading facilities to cool the inside rooms.

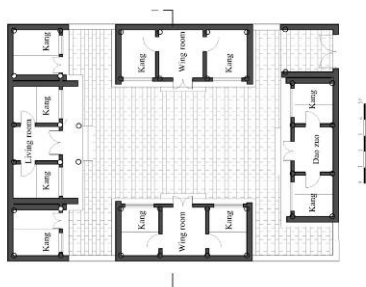
Case 3: From the north courtyard house to Lilong housing in Tianjin and Li-Courtyard in Qingdao.

A. Lilong housing in Tianjin.

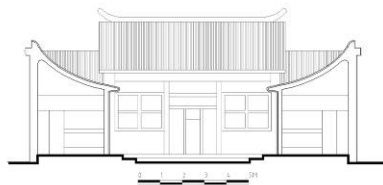
Tianjin, the second largest treaty port in China and the largest city in North China in the early 20th century, is located at the northeast part of the North China Plain west of the Bohai Sea. It is only 137 kilometres southeast of Beijing. Water transport plays a significant role in the economy of Tianjin, and the main urban areas were situated along the rivers, which is different from other traditional Chinese cities. Tianjin was opened as a treaty port in 1860 and was shared by the following nine foreign countries: Italy, Germany, France, Russia, Great Britain, Austria, Japan, and Belgium, all of whom established self-contained concessions along the river front. No systematic and comprehensive city planning was ever implemented since every concession developed individually; as such, the city contains more than one center.

Table 3 House transformation in Tianjin

Local traditional house



*Ground Floor Plan
(Redraw based on Liu, 2007)*

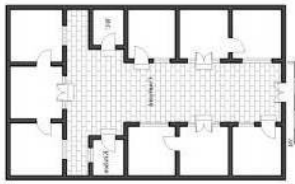


*Section
(same with plan)*



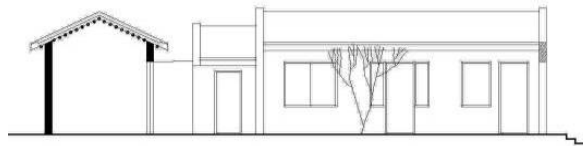
Photo

Early Row house



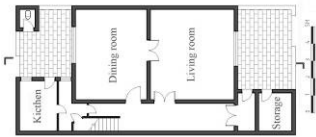
Ground Floor Plan

(Redraw based on Wang & Chen, 1987)



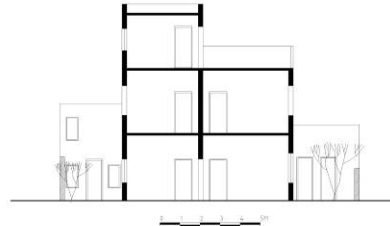
Section

Later Row house



Ground Floor Plan

(Redraw based on Wang & Chen, 1987)



Section (same with plan)



Photo
(Field survey)

A typical unit of the early row house in Tianjin as initiated by Chinese developers is based on a rectangular pattern with a courtyard surrounded by rooms. No distinctive differences can be identified between the rooms in terms of width and depth, but a central axis is still incorporated in the spatial organization, which is also characteristic of a traditional northern courtyard house. However, equal arrangement of the rooms was utilized regardless of their different orientations. Service rooms, such as the kitchen and bathrooms, were located in the courtyard and shared by all the families in the unit. Additionally, a distinctive hierarchical structure of the family organization was not incorporated, which is the characteristic of the traditional northern courtyard housing.





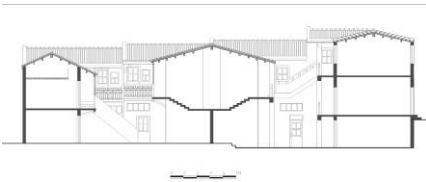

The row house in the concession, which developed greatly due to the booming commerce and increasing population in 1910 to 1937, was more similar to the new lilong housing in Shanghai. The typical unit plan, for example, also contained courtyards both at the front and back of the house, and the basic layout of the rooms were similar to the new lilong housing in Shanghai. However, the courtyards were much bigger in order to access enough sunlight in the climate of Tianjin.

B. Li-courtyard housing in Qingdao.

Qingdao, a coastal hilly city, lies on the coast of the Yellow Sea and on the south portion of the Shandong Peninsula. It is different from Shanghai, Tianjin, and Wuhan since it was founded by Germans and was thus free from the influences of other powers. It does not seem like the typical Chinese city since it was originally planned based on western urban planning theory and considering topographical conditions. Qingdao was once under colonial rule by Germany and Japan. Although the foreign powers politically ruled the cities for only a short period, they exercised extensive control over their colonies, influencing the society, economy, culture, urban planning,

and architecture of these cities in the long term.

Table 4 House transformation in Qingdao

Li-courtyard housing		
 <p><i>Typical Floor Plan(Field survey)</i></p>	 <p><i>Section</i></p>	 <p><i>Photo (Field survey)</i></p>
Later row house		
 <p><i>Typical Floor Plan(Field survey)</i></p>	 <p><i>Section</i></p>	 <p><i>Photo (Field survey)</i></p>

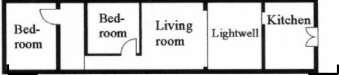
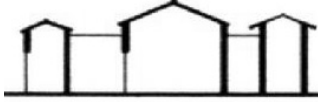

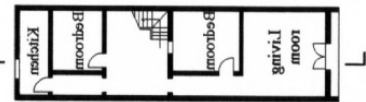
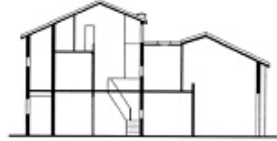

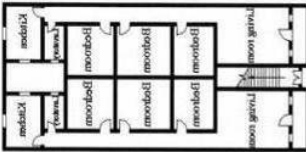




The close and rectangular space pattern of the li-courtyard housing is very similar to the traditional northern courtyard housing of China. Specifically, it involves a compound with rows of rooms built on four sides and an inner courtyard in the center. However, no central axis is included in the spatial organization, and all of the rooms are equally lined up on the outer part along all sides and connected by public corridors that directly face the courtyard. The houses are two or three stories as allowed by the topographical conditions. The first floor is usually directly open to the main road and is rented out as commercial space. The courtyard offers water supplies and toilets, which are shared by all the families. Furthermore, the scale of the li-courtyard housing is much larger in three-dimensions than the traditional northern courtyard housing.

Case 4: From Zhutongwu housing to Qilou housing in Guangzhou.

Guangzhou is the capital of the Guangdong Province, which is located north of the Pearl River Delta. It is the political, economic, and cultural center of the Lingnan region, which is removed from the political and cultural focus of China and thus has its own distinct cultural identity. It is also China's Southern Gateway to the world. Thus, Guangzhou is characterized by a mixture of local and foreign cultural influences. In contrast to most traditional Chinese cities, Guangzhou has focused more on a functionally inclined approach to city building. The traditional Zhutongwu house in Guangzhou also reflects the unique urban context of the city, i.e., a commercial city

with a comb-like urban fabric.

Table 5 House transformation in Guangzhou

<p>Local traditional house</p>			
<p><i>Ground Floor Plan (Gu&Whithand,2008)</i></p>	<p><i>Section</i></p>	<p><i>Photo(Field survey)</i></p>	
<p>Early Row house</p>			
<p><i>Ground Floor Plan (Gu&Whithand,2008)</i></p>	<p><i>Section</i></p>	<p><i>Photo (Field survey)</i></p>	
<p>Later row house</p>			
<p><i>Ground Floor Plan (Gu&Whithand,2008)</i></p>	<p><i>Section</i></p>	<p><i>Photo (Field survey)</i></p>	
<p><i>Ground Floor Plan (Redraw based on Liu,1997)</i></p>			
<p><i>Section</i></p>	<p><i>Photo(Field survey)</i></p>		

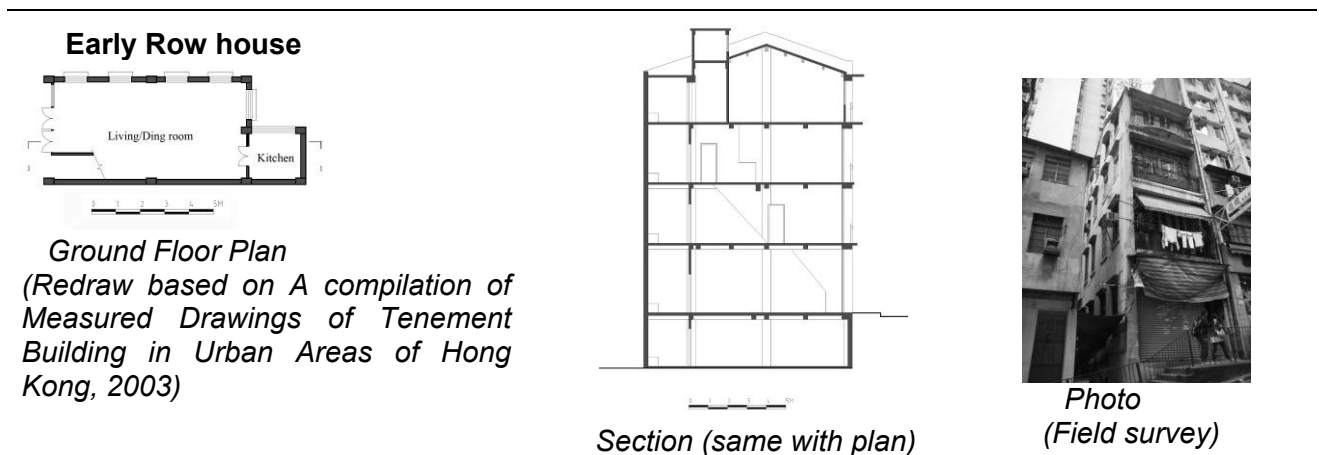
In the late-nineteenth and mid-twentieth centuries, a mixture of indigenous and Western characteristics became widespread in Guangzhou. On one hand, versions of Zhutongwu with two or more stories appeared with the increase of land prices, thereby becoming the major residential building type; on the other hand, Qilou (i.e., colonnaded shop houses), which also have a long rectangular unit plan, began to appear in Guangzhou in the 1910s. They were built on major shopping streets or on frontage roads along the riverside (Gu and Whitehand, 2008). Internally, they were rather similar to Zhutongwu; nevertheless, concrete was frequently used in their construction, and their street façades were predominantly Western. In some cases, a more economical use of the land has been attained by constructing two multi-story Zhutongwu with a shared staircase and courtyard. The staircase and backyard changed from the areas that were used by a single family to shared areas, and the house was constructed with more stories to make the best use of the land. Except the arcade incorporated in the front of the plan of the Qilou, the basic space layout of the

Qilou is the same as the Zhutongwu. However, most grounds floors of Zhutongwus are used for personal residence space, while the ones of the Qilou housings are used for shops or workshops. As compared to other row houses in China, the row houses in Guangzhou were much narrower and developed vertically rather than horizontally, but the basic size of the rooms and the numbers of stories for most houses were still acceptable (Table 5).

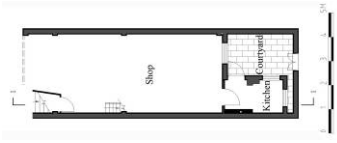
B. Tanglou in Hong Kong.

Hong Kong is located on the south-eastern coast of the East Asia landmass to the east of the Pearl River estuary. Hong Kong has always faced a shortage of land, in particular land that can easily and economically be developed because of the hilly topography and complexity of land transformation. Hong Kong became a British possession and entrepot in 1842 at the end of the First Opium War. The rapid growth in population has compounded the problem. The people in the coastal areas of eastern southern Fujian and eastern Guangdong were exposed to opportunities for business and employment in Hong Kong. The British colonial administrations of Hong Kong welcomed the Chinese immigrants because the newly established colonial territories needed the cheap labour and services, cottage industries, and the trade and investment that the Chinese brought with them. The rapid urban growth forced many residents to live in a compact environment. Tanglou were densely built, which were three to four storeys. Each storey consisted of one long room, a yard (usually occupied by the house keeper) and a tiny kitchen at the back. It is the common building type since 19th century with unique Chinese-Western architectural type in Hong Kong.

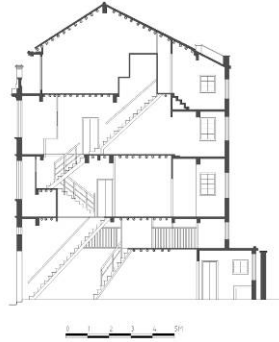
Table 6 House transformation in Hong Kong



Later row house



Ground Floor Plan
(Redraw based on Measured Drawings of Department of HKU Vol.1,1999)



Section(same with plan)



Photo (Field survey)

From the aspect of layout, Tanglou is rather similar to Zhutongwu. The living unit had an elongated shape, with the kitchen located at the back. There is no clear division between living rooms, dining rooms and common spaces. The width of the structure is limited by the maximum usable length of the China fir pole which is used as joists and beams in the construction of these buildings. There are only limited sanitary facilities provided in the building. The ground floor is usually for commerce use and the upper floors are for residence. Although the architecture of early Tong Lau in Hong Kong was broadly similar to those in Southern China, there are noticeable differences due to “European influence and example, but principally to the necessity for economy of space on account of the high price of land and the great cost of preparing level sites for building” (Faure 1997, 34). This means that the local conditions did have an effect in transforming even the early Tong Lau, which featured Western Classical decorative elements and were smaller and more compact.

The development of Tang lou in Hong Kong has a close relationship with the statutory control. The layout of Tanglou didn't change a lot with the development but mostly on the depth, height and some physical features that related to natural lighting and ventilation for the building and the surrounding environment. Ordinances were set successively in 1903 and 1935. First, the back lane or open spaces were regulated in 1903 to allow in lighting and ventilation, as well as for waste disposal. Secondly, the height of Tanglou was controlled to not more than four storeys, or higher than 76 ft (about 23 m) which ensured that the surrounding streets, would receive adequate natural lighting and ventilation. Thirdly, the depth of Tanglou was limited to 40ft (about 12 m) ,which was an attempt to curb the number of under lit and badly ventilated tenement cabins in a long narrow building. (Lee, 2009) The building regulations under Building Ordinance 1935 are essentially a continuation of those introduced in 1903, but with more stringent control. The building height was limited to 3 storeys, unless constructed of fire-resistant materials, and not higher than 5 storeys for domestic. The depth of Tanglou was constrained to 35ft (about 11 m). The shorter building depth than that allowed in the 1903 regulations would further limit the partitioning of dark and badly ventilated tenement cabins or cubicles. Furthermore, adequate light and ventilation should to be provided at every storey on every staircase. This regulation would give the late pre-war Tong Lau its character-defining feature—a naturally lit and

ventilated common staircase. (Lee, 2009)

CONCLUSION

From the analysis of the row houses which were developed from the end of 20th century to 1937, we can find these row houses in the colonial cities have a similar historical socio-economic background. For example, a steadily rising urban population, the different social strata with varied ways of life which resulted in varied types of housing and housing standards, and a general trend towards small-sized families. So these row houses which generated and developed in this historical environment bear a lot of similarities in terms of morphological characteristics:

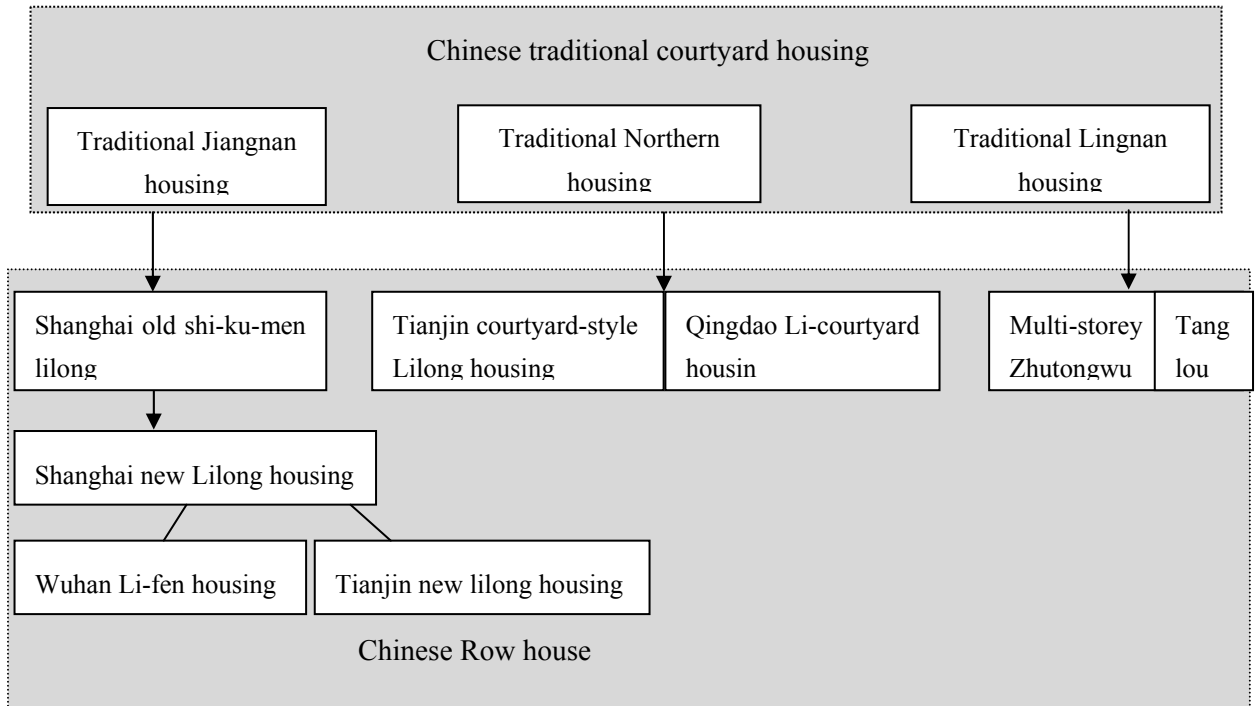
1. The basic layout of the typical unit of each type shares many similarities with local traditional housing. They can be recognized as an outgrowth of the traditional indigenous houses in the typological framework.
2. The row houses became more compact than the traditional ones. As the lot size shrank, the width and depth of the units became smaller and more stories were built to increase the efficient use of the land. Corresponding to this trend was the transformation from ground-related pattern to concentrated pattern of building mass.
3. Besides the spatial and volume evolution, architectural characteristics also changed. Traditional inward-looking character gradually died out, Western open elements prevailed.

However, these row houses still vary a lot since because of their different prevailing city environments and different geographical and cultural conditions. From the comparison of row houses in different cities, we can find the multiple and colorful architectural forms interact with each other:

1. Lilong housing in Shanghai which was developed from traditional Jiangnan housing finally influenced the li-fen houses in Wuhan which is also in the central east China. They have the most similar layout. However, new lilong house in Tianjin also has almost same spatial layout with them. Tianjin is a special case since the row houses in the Chinese district and concessions are different. The courtyard-style house in Chinese district has relationship with the traditional northern courtyard house which will be examined in next point. While new-style lilong housing is similar to later lilong housing in Shanghai. This maybe because they are all in the concessions and inflected by the Western powers.
2. Row houses in Qingdao and Chinese district of Tianjin, which are in the North China, can be recognized that they developed based on the traditional northern courtyard housing but became more compact to meet new demands. However, the dimension of li-courtyard house in Qingdao is much bigger than the counterpart in Tianjin. On one hand, the row houses in these two cities have

similarities since the cities have the similar geographic location and climate. On the other hand, there still some difference in the planning ,such as the size of lot, since Qingdao was planned and governed by German,

3. As the first open city in China, Guangzhou by contrast keeps most of its own traditions and identity. The traditional housing in Guangzhou also influenced the Tanglou in Hong kong .This maybe partly because the immigrants who has brought their concept of housing and also these two cities have the same geographic locations and climate.



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