To the Graduate Council:

I am submitting herewith a thesis written by Chen Li entitled “Reinterpretation of Traditional Chinese Courtyard House.” I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Architecture, with a major in Architecture.

_____
Edgar Stach, Major Professor

We have read this thesis and
recommend its acceptance:

_____
Barbara Klinkhammer

_____
Archana Sharma

_____
Suzanne Wright

Accepted for the Council:

_____
Carolyn R. Hodges
Vice Provost and Dean of the Graduate School

Reinterpretation of Traditional Chinese Courtyard House

A Thesis
Presented for the
Master of Architecture Degree
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Chen Li
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Dedication

This project is dedicated to my family for their unwavering support during the process of this thesis and most especially to my husband whose patience, suport and love kept me going.

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Abstract

The thesis explores the reinterpretation of the spatial, social and cultural values of Chinese traditional courtyard house. I use Colin Rowe's mathematical architecture theory and literal and phenomenal transparency theory to analyze the spatial logics existing in the Chinese courtyard house, as well as the generated social functions and its cultural background. Abstracting the spatial, social and cultural values of the Chinese courtyard house and establishing a modern architectural language with the ideas inherent in the study of Chinese traditional courtyard house is mutually beneficial for contemporary housing design.

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Chapter 1 Thesis Statement

This thesis explores the typology of the Chinese traditional courtyard house. As the basic housing typology of China for thousands of years, courtyard house is harmonized in its architecture design. The courtyard house presents some valuable spatial features which are hard to achieve in other housing types. Enclosure and opening in one is the fundamental principle of this old form of housing. The courtyard as an enclosed garden is open to the occupants of the house but completely closed against the outside world. Starting from this principle, plenty of functional advantages such as sufficient social interaction, a clear spatial division between public and privacy, and a close connection of human and the nature all exist in the Chinese traditional courtyard house.

With the growth of population in cities brought by the modern urbanization, the horizontal development based on the typology of courtyard house, however, is not able to accommodate the growing population density of the modern cities. In addition, there appears a conflict between the conventional housing which is lack of modern facilities and the contemporary living style which is greatly dependent on equipment. Modern high-rise buildings, on the contrary, provide well-equipped housing for more residents, but lose some of the traditional spatial, social, and cultural values. To combine the precious traditional values and the modern architectural technology will be beneficial for contemporary architectural design, especially housing design.

Drawing lessons from traditional housing and applying it in contemporary architecture will be an approach to keep the valuable heritage from ancestors and to improve the modern architectural design techniques simultaneously. Spatial, social and cultural values derived from Chinese courtyard house should be carried on in modern architectural design.

Chapter 2 Framing: Introduction

2.1. The History and Typology of Chinese Courtyard House

The traditional Chinese courtyard house (Siheyuan) is a historical dwelling typology that was commonly found throughout China, most famously in Beijing. The literally translated name “quadrangles” means a courtyard surrounded by four buildings, indicating the basic layout of the courtyard house. (Figure 2.1)

Throughout Chinese history, the courtyard house composition has benn the fundamental pattern used for residences, palaces, temples, monasteries, businesses and government offices in the gridded urban fabric of cities for thousands of years. Archaeological excavations reveal that the tight enclosure of a courtyard within a quadrangular building has been a common core element of Chinese dwelling since the Western Zhou period, between the eleventh and the tenth centuries BC (Knapp, 2000, p31). A sophisticated ground plan fitted within a 45-by-30-meter oblong containing flanking rectangular structures can be seen in an excavated building complex (Figure 2.2) in the city of Xi’an in Shaanxi Province (Knapp, 2000, p31). The excavation is the evidence that the fundamental elements of the courtyard house such as the north-south axis, the quadrangular layout, and the central open spaces which can be identified as courtyards have been dominating in dwelling houses since the ancient age.

A similar courtyard composition (Figure 2.3) is seen on an engraved stone of Han dynasty (206 B.C. – A.D.220) discovered at the Wuliang burial chamber of the Yinan tomb in Shandong (Knapp, 2000, p31). With a reflection of more advanced building materials and technologies, this composition has a clearer layout with most of the important features followed by the courtyard houses in the later countries: the overall composition is in a symmetrical plan with an obvious axis, implying the hierarchical organization of the buildings; the buildings are open to the central courtyard, while solid walls with limited fenestration are facing outside; narrow corridors provide a covered circulation within the complex. The presence of such components as the main hall, the decorated gate, the screen wall, the platform, and the wing chambers further shaped the configuration of later courtyard houses.

Courtyard houses in the later centuries inherited the basic spatial principles, improved with more optimized layout (Figure 2.4). Feudal society was rigidly stratified in China. In order to establish a class society, in Ming and Qing Dynasty (14th-19th century), the governments set up strict regulations for people in different classes on the utilization of colors, components and tectonics in dwelling constructions. For instance, double eave roof and caisson ceiling could only be used in imperial buildings; columns in normal citizens’ houses could not be in red. These regulations, at the same time, were very detailed records and description of the historical courtyard houses. It is documented that the completed typology of the Chinese courtyard house was basi-

cally fixed during that period (Knapp, 2000, p32).

The layout of a courtyard house is in a very simple and rigid order. The four buildings of a courtyard house are normally positioned along the north-south and east-west axes (Figure 2.5). The building positioned to the north and facing the south is considered the main building. The buildings adjoining the main house and facing east and west are the side buildings. The northern, eastern and western buildings are sometimes connected by beautifully decorated pathways. These corridors provide shading, and serve as a transitional space between interior and exterior (Figure 2.6). The building facing north is known as the opposite building. The entrance gate, usually painted vermilion and with copper door knockers on it, is usually at the southeastern corner. There is normally a screen wall inside the gate to protect the owner's privacy from the street. All of the rooms around the courtyard have large windows or doors facing onto the yard and small windows high up on the back wall facing out onto the street. Some houses do not even have back windows. Behind the northern main house, there would often be a separate backside building, the only place where two-story buildings are allowed to be constructed for the traditional courtyard house.

The courtyard in the center of the house is a natural, comfortable, peaceful and private open-air living room where the family members get contact with each other (Figure 2.7). With plants, rocks, and flowers, the courtyard is also a garden.

Some large compounds have two or more such complexes to house extended families (Figure 2.8). The number of courtyard-units was a mark of prosperity and wealth in the ancient times. Large and small, compound and single courtyard houses compose the comprehensive urban texture.

2.2. The Modern Context of Chinese Courtyard House

Although courtyard house was the most significant dwelling typology in history, it started to eclipse in the last century, replaced by multi-level housing estates. The reasons for this dramatic change are as follows.

First of all, the spread-out planning based on the courtyard houses was not able to accommodate the growing population brought by the urbanization of Beijing after 1949 when People's Republic of China was founded by China's Communist Party. In the new socialist regime, as the top rank political center of the nation, Beijing was given all the administrative functions that befit the national capital. In addition, it was also set up as an example of industrial and productive center for all other Chinese cities. In result, Beijing in the post-1949 years experienced a hectic growth of new productive activities accompanied by massive population increases (Sit, 1995, p175). The urban population in Beijing was 2.6 million in 1949, and it grew up to 5.9 million in 1986 (Liu & Li, 1988, p25). Big population (Figure 2.9) demands large-scale housing areas. For many years, however, practically little or no housing was put up while the population kept growing between 1949 and 1976 to Beijing which was already a city of high-density (Figure 2.10) at the time (Yang, 1990, p21).

Such growth of population and the shortage of housing areas indicated a shift of living structure from low-rise to high-rise in Beijing. Before 1949, most of the housing in Beijing was built in the Ming and Qing Dynasties (14^{th}-19^{th} century), largely of the one-storey courtyard house type. In the past, such a spacious courtyard house would be occupied by a single family. During the period of urbanization, however, most remaining courtyard houses were used as mass housing complexes (Figure 2.11). One courtyard house had to host multiple families, with very limited living areas for each. In such situation, building higher to make more living area per unit of building land, became an obvious solution for improving the average living condition and for accommodating more people.

Second, the qualitative living standard was even harder to achieve in the hundreds of years old housing. Most of the courtyard houses were in poor condition (Figure 2.12) and difficult to repair or renovate. No proper maintenance had been possible as a result of the subsidized low-rent system. Dangerous housing (defined as 'less than 25% new') numbered 740 000 structures, with 10.7 million square meters floor area, or 61% of housing inside the city districts around 1949 (Sit, 1995, p.208). Besides, it was impossible for a highly crowded shared house to provide any good living quality. The courtyard shared by four to eight families could barely be called a cozy and soothing garden, but a storage room for all. Since the living conditions in the courtyard houses had been continuously deteriorating, people desired to escape from the old housing.

In addition, there was a conflict between the traditional housing and the modern living style, due to the lack of modern facilities. Since most of the courtyard houses in Beijing were

built before modern technology was invented (Figure 2.13), equipment such as water supply, drainage, piped gas, electricity, or telephone cable was not installed in the old courtyard houses. Any environmental control system such as heating or cooling was not applied. There were even no lavatories in the courtyard houses, but a couple of public rest room located on public streets. People living in traditional courtyard house had to live in a conventional way. They had to use jars or buckets to store water, fire stoves for cooking and oil lamps for lighting. Later, it was found that such needed structures as kitchens and bathrooms were built in the courtyards by the co-living families themselves, in pursuit of a modern life. However, those kinds of structures had destroyed not only the harmonized courtyard but also the urban landscape of the whole city.

For the above reasons, vertical development of residential buildings seems an inevitable tendency. Housing projects have begun to show the features of both high-rise and high density. After the Cultural Revolution, the housing boom in Beijing was unprecedented both in speed and in scale. The floor area of new housing construction from 1981 to 1986 in Beijing equals to the total amount of housing put up in the twenty-six year from 1949 to 1976 (Yang, 1990, p21). The need to build quickly to meet long-held demand and to economize on land had resulted in a rush towards high-rise building design in that period. Different from 1949 when only 17% of all living structures in Beijing rose above one-storey and were mainly 2-3 storeys high (Sit, 1995, p.208), in late 1970s, high-rise blocks exceeding nine-storey formed as much as 30-50% of all buildings. In 1988, the percentage of high-rise buildings in residential districts has even reached about 80% (Liu & Li, 1988, p25).

Courtyard houses were demolished in large scale when the city was under the transformation. Occupants of the old houses moved to the multi-storey apartment buildings which were mostly located in the same area. Having their living conditions improved without having to move far from the familiar area, the residents are quite happy with this migration.

Treatment of the old courtyard houses varies depending on their conditions. Courtyard houses in Beijing totals about 30 million square meters of floor area, 80% of which are concentrated in the four inner city districts: Dongcheng (East City), Xicheng (West City), Chongwen and Xuanwu districts (Yang, 1990, p21). A small portion of the courtyard houses in relatively good quality are to be preserved and renovated, as the preservation of Beijing's cultural and historical heritage and the capital's original cityscape and architectural style (Figure 2.14). In areas where 80-90% of the housing has become dilapidated and the living environment has deteriorated, demolition and redevelopment is the only logical solution. The rest of the courtyard houses were maintained and renovated to be further used (Yang, 1990, p21).

Chapter 3 Analyzing: Situation

3.1. High-rise Buildings: Solution and Problem

As explained in the past chapter, rapid increase of population and a shortage of housing require high-rise residential structure in Beijing (Figure 3.1). Although high-rise buildings had already become a controversial housing form in some western countries, China still accepted it gladly, due to its advantages in land economy. The debate on high-rises, however, soon started when their problems began to appear. The objection mostly pointed to the expensive infrastructure, the bad effects on the traditional cityscape, and the problems of social security. The spatial effects of high-rise apartment buildings on the social interaction in families and communities which are mostly ignored have significantly changed people's lives.

First of all, the layouts of the apartments (Figure 3.2) do not generate as much social interaction as the traditional courtyard house does in the family scale. In a typical two-bedroom apartment, the bedrooms, the living room, and the supplementary rooms such as the kitchen and the bathroom are organized as four blocks, with the primary rooms on the south and the other rooms on the north. A short hallway is used to organize them. Such a layout is economical in area and reasonable in function. However, without a central space like courtyard, people have lost not only an outdoor room for touching the nature but also a space for family communication. Although the living room is supposed to be the shared common space for all family members, it is not as efficient as the courtyard. As a part of the circulation, the courtyard in a traditional courtyard house is a place combining daily routes and the family's living space. The contact between family members happens naturally. In the apartment, on the contrary, the living space is isolated from the traffic as a separate room where the natural contact is missing. The lack of contact in family is getting worse in the recent years. Nowadays, people tend to stay in front of their computers in each bedroom most of the time, rather than around the television in the living room. The bedroom instead of the living room has become the center of the life at home.

In the neighborhood scale, the absence of a public space makes neighbors live without any public contact.

In Jane Jacobs's book "The Death and Life of American Great Cities", she depicts vividly how people on the sidewalks (Figure 3.3) respect and trust each other. As a traditional mix-used street, the side walk has a self surveillant system. It attracts people by its diversity. Meanwhile, the big group of people provides their eyes to protect the street from violation. What makes the defense more effective is that people who participates the procedure of surveillance are also being protected. Under the system of seeing and being seen, it is possible to weave the web of respect and trust. Public contact as well as public security is provided by sidewalk. Sidewalk, different from the deliberately planned gathering places for socializing, is a space for informal public

life. In traditional Chinese dwelling, hutong which is the pedestrian alley works as the sidewalk in which neighbors live harmoniously.

In high-rise buildings, however, such a public space with social function is missing. Early high-rise apartments in Beijing were mostly in the form of slab blocks, having long corridors on each floor to make full use of the elevators. Tower high-rise (Figure 3.4) have become the dominant type in Beijing in recent years, with even more optimized floor plan centered at its traffic core. Both of the types are too condensed (Figure 3.5) to obtain a space for public contact. The self surveillance system certainly does not exist either. Staircase (Figure 3.7) which is the darkest closed space is the place where lots of crimes happen. Security guards are hired to watch the dangerous staircases. Guard rail is installed out of windows to avoid thieves breaking in. Burglar-proof door (Figure 3.6) are selected by most families. Due to the distrust between the residents, such kinds of strategies are applied. The distrust, however, goes deeper because of the strategies. This phenomenon is like a vicious circle which is inevitable in the current housing in China.

Although such problems of high-rises have been realized, the spread of high-rise residential buildings in Chinese cities seems unavoidable. To minimize the disadvantages of high-rises and to create a lively living model in the vertical-developed structure are the challenging tasks in front of contemporary Chinese architects. Today's residents exhibit high demands for sophisticated functions in housing. Instead of only a comfortable shelter from the outside world, home is also a private space for personal activities, a social place for family reunion, the representation of contemporary habitation, as well as a residential unit of the society. Such social and cultural functions require exquisite spatial design. Since the traditional architecture obtains the desired qualities, to borrow the spatial spirit from tradition is an easy and practical approach.

3.2. Contemporary Chinese Housing Projects

There are plenty of modern housing examples which demonstrate some kind of contemplation of traditional Chinese culture. Those projects do display the unique charm of the Chinese architecture to some degree. However, a majority of the projects dealing with Chinese traditions just borrow some segments or symbolic elements from traditional architecture. Although they have achieved a success in real estate, the segments do not fully give expression to Chinese architectural culture. After all, the ultimate goal of architectural design is the creation of space which is the essence of architecture. The reinterpretation of the traditional spaces should be a process of abstracting and distilling the spatial values and then presenting them in the modern architectural language.

Shenzhen Village (Figure 3.8) and Shanghai Mandarin Palace are two examples successfully extracting the Chinese traditional spatial elements.

3.2.1. Shenzhen Village

Shenzhen Village (Figure 3.9), located in Shenzhen (a city next to Hongkong), is famous for its unique style which reminds people traditional dwellings. The housing types of Shenzhen Village range from terrace villas, townhouses, duplex-houses to high-rise apartments.

The literal translation of Shenzhen Village's Chinese name is "The Fifth Garden". The south of China is famous for the four classic gardens from Qing Dynasty. The name "The Fifth Garden" obviously and aggressively implies its application of Chinese tradition. Shenzhen Village does not copy the traditional elements superficially as other projects. Instead, the designer extracts and refines the elements and then creates his own language. None of horse-head wall, saddle roof, or old window is simply utilized in this project, but a traditional quality and atmosphere is still recreated. How does Shenzhen Village successfully achieve this goal?

The planning of the whole neighborhood (Figure 3.10) is studied from rural villages. The contour of a natural settlement without any contrived master planning usually follows the geographical conditions, showing interesting spatial intervals, with its density high in certain places and low in the others. In Shenzhen Village, there is a deliberate abandon of grid, axis, network, or any guide often used for residential planning. The main road and the water divide the village into four clusters, which are oriented along the boundaries of each. The aggregation of the four sub-villages, thus, shows a flexible and natural configuration (Figure 3.11). The cluster with small-sized buildings has a higher density than the one with high-rises. The public buildings, which also appear as a group, along with the water connect the clusters in space, control the spatial rhythm and adjust the space as irregular objects.

Courtyard as an important traditional typology is included in Shenzhen Village. Learned from traditional dwelling, there is a sequence of spaces from the neighborhood, the alley, the big entrance yard, the small front yard to the family courtyard. The architect makes great efforts in emphasizing privacy and territoriality of home and reproducing shared place for neighbors (Figure 3.12) at the same time.

Pedestrian alleys (Figure 3.13) in Shenzhen Village are only two meters in width, and the walls on both sides are eight meters high. Alleys in this depth-width ratio bring cross ventilation in great extent, so as to make a cool and comfortable place, as well as a feeling of enclosure which exists in traditional hutongs. Tortuous alleys together with all the individual houses they connect compose the whole neighborhood in a natural way, just like an old village.

The application of "wall" is most successful in Shenzhen village. Walls in Chinese architecture are not load-bearing element, which endows walls flexibility in defining spaces. In Shenzhen Village, the white walls with different shapes of openings appear nothing different from the traditional image of "tall wall and small windows" in vision (Figure 3.14), but they are not just a reproduction. All walls are of various functions from protecting privacy to providing shading. The

openings on the walls are not just for visual effect but correspond to the internal needs. The designer even invents a double-wall system in this project. The inner wall is the separation between the interior and exterior, while the outer wall forms a transitional outdoor space shaded from the extremely hot weather in Shenzhen. At the same time, a balance between traditional solid walls and modern functional needs is created by this double-wall system.

Supplementary design elements such as flexible-shaped windows and bamboo forest (Figure 3.15) are also applied in Shenzhen Village to reinterpret tradition. The architect ingeniously uses colors and decoration to represent Chinese culture but not to make them conflict with the modern context.

The slogan “Chinese complex in heart” labeled on this project is the goal of the designer and the developer, but merely denotes a stylistic fashion. In Shenzhen Village, though it brings traditional spatial concepts such as the village, the courtyard and the alley, the integration of tradition is still on the level of symbols. The only difference from other projects is that symbols here are not decorative but aesthetic ones, which seems more profound.

3.2.2 Shanghai Mandarin Palace

Shanghai Mandarin Palace, designed by a famous Hongkong architect Xunqi Yan, is a neighborhood having approximately fifty single family houses. Again, let us start from the original name of Shanghai Mandarin Palace (Figure 3.16) which was “Nine Bays Palace”. There are two implied meanings behind this name. First, in this project, having three bays in width and three bays in depth (Figure 3.17) as a traditional method of spatial organization has been borrowed and suggested by its name. Second, Chinese traditional dwelling is classified by the number of bays it has. The more bays there is, the higher status the owner is. As the most expensive housing property in Shanghai, Shanghai Mandarin Palace uses its name to suggest the wealth and rank of the people living here.

The architect tries to reproduce the quality of the single family houses in the old times as much as possible. In the master planning of the neighborhood (Figure 3.18), a ring road divides the neighborhood into the inner part and the outer one. Inside the road, every four to six houses with their spacious courtyards are designed as one island, surrounded by water and connected to the main road by a vehicular path. There are three such islands interlocking as fingers, making the water an interesting sinuous river rather than a static central lake. At the same time, the houses are isolated from the noisy traffic by the water, kept in a very quiet and private space. The houses outside the ring road are in a relatively higher density but still have independent courtyards. The emphasis of the project is the privacy of each single house, so that there is no much space for public programs.

Compared to Shenzhen Village, Shanghai Mandarin Palace is closer to the modern context. In architectural tectonics, the architect is not afraid to utilize modern materials and skills to shape the old forms. For instance, the roofs copy and even exaggerate the shape of the pitched roof in the traditional Chinese architecture, shading the indoor space. However, instead of a solid slab, the roof made by aluminum tubes is weaved in a unique way, creating a quality of permeation and emptiness by taking advantage of the light (Figure 3.19). Such kind of combination also exists in the metal window frames and the wooden louvers. With an elaborate design, the traditional and modern elements go with each other pretty well.

In summary, Shenzhen village and Shanghai Mandarin Palace both attempt to interpret some traditional values. Instead of literally copying old elements as other customary residential projects, they both reveal a deeper consideration of tradition. Nevertheless, both of the projects have single family house as the dominant housing type, which means they are not affordable by the majority of people. After all, single family house is never the tendency of housing development in China, given the fact that China is an overpopulated country with extremely limited land resource, and a great number of population is still suffering from severe housing shortage. There is a criticized saying that “the architect’s overly aestheticized approach which only serves nobility indicates a crisis of professional ethics” (Zhu, 2006, p42). The two projects discussed

above completely ignore China’s social context. This kind of interpretation of tradition is a kind of opportunism. The deficiency of social interaction as well as the conflict between public contact and privacy in high rise buildings has not even been touched. It is time for Chinese architects to cultivate deeper cultural, social and spatial values of the traditional architecture.

Chapter 4 Supporting: Design Principles

In order to reinterpret the traditional spatial, social and cultural logics in a vertical expression, it is necessary to analyze the traditional Chinese courtyard house first. The spatial, social and cultural values are the core topics in this chapter, with an application of Colin Rowe's theory on the mathematical logic of ideal architecture, historical inheritance, as well as the literal and phenomenal transparency.

4.1. Spatial Values

In Colin Rowe's article of "The Mathematics of the Ideal Villa", he builds up a theoretical bridge between Renaissance and modern architecture. In the analysis of idea villa, Colin Rowe applies the method of "Wolffilinian" in defining typology. Rowe gives a detailed analysis of proportion and geometry as the principle of Palladio's and Le Corbusier's works. In comparing the Villa Foscari at the Malcontenta (Figure 4.1) and the Stein House at Garches (Figure 4.2), Rowe demonstrates their reliance on the common mathematical formula. The essay indicates that the spatial distribution of architecture does not exist on the level of organizing techniques, but the mathematical conception of architecture was the philosophy of architecture both in the age of Renaissance and the twentieth century.

The spatial logic of traditional Chinese courtyard house, just like the western architecture analyzed by Rowe, follows the geometrical keynote as well.

4.1.1 Geometry: Ordering

A courtyard house is a configuration formed by a certain number of rectangular blocks in various sizes and shapes (Figure 4.3). Generally, a courtyard house can be simplified as one solid block with extension to both ends. Further, it can be recognized as blocks with void space, when the courtyards are taken into account. The block is actually composed of several single buildings connected by passages, if more segmentation is applied.

The layout of the buildings (Figure 4.4) is organized in a geometrical rigid order with clear axes which are orthogonal. The space within four columns is recognized as a bay with a certain dimension. The number of the bays (Figure 4.5) determines the scale of the building as well as the social status of the owner. It is interesting that the bays are always in an odd number, in order to have a room in stead of a column at the center of the house. The buildings in the top rated houses which are uncommon in civilian dwelling but always appear in palaces have nine bays, because nine is considered the biggest number in a decimal scale by ancient Chinese. The buildings have a clear contrapuntal relationship, which is an emphasis of the axes.

The strong axial layout of the courtyard house generates a symmetrical plan (Figure 4.6). However, the entrance of the courtyard house breaks the absolute symmetry of the configuration. Thus, the courtyard house is symmetrical as a whole, but the asymmetrical position of certain elements prohibits the stiffness of the plan and creates a sinuous and interesting circulation. In the analysis of Le Corbusier's house at Garches, Colin Rowe says, "(the entrance front) is the central element of the upper story; but then it is also noticeable, in spite of its symmetrical position, that the further development of this element within itself is not symmetrical (Rowe, 1976, p13)." This simultaneous affirmation and denial of the central focus pointed out by Rowe also exists in Chinese courtyard house.

Due to the bay concept discussed above, columns are the dominating elements in defining the fundamental spatial intervals. The space determined by columns, however, is dispersed and equalitarian. Walls, furthermore, strengthen the spatial division and break the equality, then create a series of hierarchical spaces. There are very few walls in a courtyard house, but they play an important role in defining spaces. The more walls there are the more complex the space is (Figure 4.7).

A courtyard house presents a very strong figure and ground relationship. The buildings as the figure (Figure 4.8) are aligned with the boundary of the property, leaving the various shapes facing inward. However, it does not prevent the courtyards to be integral shapes, when they are considered as the figure, thanks to the corridors which help with the configuration. Another feature of the figure and ground is that the buildings as the figure are usually shallow but the courtyards are in the shape close to a square. Chinese traditional architecture always has its bays develop in a longitudinal direction. It is not common to have two rows of bays in one building. The functional reason for this configuration is to ensure the sufficient day lighting the houses need. Surrounded

by slim buildings, the square courtyard is also more usable. Another reason is that the ancient Chinese believed the earth is flat and in square, before human acknowledged that it is a globe. Therefore, they tried to form the outdoor space as close to a perfect square as possible. Functionally, the courtyard instead of the buildings is the center of the family's life, not just because courtyards take up more percentage of the area. Since the buildings are shallow and simplex, without an abstruse indoor space, it is easy for people to turn their attention to the richness of the exterior which is the courtyard (Figure 4.9). Buildings here are mostly the background of the courtyard. Even the display of the interior furniture implies that the courtyard is the center of the house.

The orientation of the rectangular buildings reflects the structure of the family. The buildings in the courtyard house are in a clear hierarchy (Figure 4.10) which is related closely to the direction of the buildings face. In Beijing which is a city in the northern hemisphere, the northern main building receives the most amount of sunlight, thus serving as the living room and bedroom of the head couple of the family who are usually the eldest. The eastern and western side buildings receive less, and then serve as the rooms for children or less important members of the family. The opposite building receives the least sunlight, and usually functions as a kitchen and the servants' dwelling, or storage. The backside building is for unmarried daughters and female servants because they were not allowed direct exposure to the public, so they occupied the most secluded building in the courtyard house.

The outdoor spaces, likewise, are in an obvious order (Figure 4.11). The central courtyard is the core of the family's outdoor life. The yard near the entrance is a combination of the serving courtyard and a transitional space between the public street and the private home. The backyard is the most private place where Chinese gardening is often applied to express the owner's yearning for natural landscape. The three yards in different proportions generate a contrast by their shapes.

To complete the enclosed configuration, there are three kinds of connection between the buildings. The first one is the decorated gate which is the link between the two side buildings as well as the division between the main courtyard and the entrance courtyard. The second is the connecting structure such as a pavilion. The third and the most common one is the corridor which is a transitional space between indoor and outdoor at the same time.

The circulation in the courtyard house (Figure 4.12) goes in a geometrical way as well. Daily traffic happens both in the covered corridors and the uncovered courtyards, composing the two systems of circulation. The covered circulation (Figure 4.13) is around the courtyard, following a circular route. The uncovered one, however, reflects the cruciform axes based on which the courtyard house lays.

The pitched roof (Figure 4.14) as an important character of Chinese architecture adds a different shape to the quadrate courtyard house. Advanced than flat roof, the triangular roof successfully defines the interior space and develops a secured feeling by its shape. The roof also

pulls the building down to the earth, because it generates a bigger triangle, when the ground is considered as one of the lines.

To sum up, the spatial order of the courtyard house is in a strong geometrical rule. In the summary of the comparison of Palladio's and Corbusier's houses in "The Mathematics of the Ideal Villa", Colin Rowe points out, "Geometrically, both architects may be said to have approached something of the Platonic archetype of the ideal villa to which the fantasy of the Virgilian dream might be supposed to relate… For here is set up the conflict between the absolute and the contingent, the abstract and the natural; and the gap between the ideal world and the too human exigencies of realization here receives its most pathetic presentation (Rowe, 1976, p13)." The abstract geometrical ordering symbolizes the ideal spatial structure which is the common rule in both eastern and western world.

4.1.2 Transparency

In Colin Rowe's essay of "Transparency: Literal and Phenomenal", he points out that "optical transparency means a simultaneous perception of different spatial locations (Rowe, 1976, p14)." He enumerates and analyzes some Cubist painting (Figure 4.15) works to distinguish literal and phenomenal transparency, illustrating that "literal transparency tends to be associated with the effect of a translucent object in a deep, naturalistic space; while phenomenal transparency (Figure 4.16) seems to be found when a painter seeks the articulated presentation of frontally aligned objects in a shallow, abstracted space (Rowe, 1976, p166)." In architecture, literal transparency can become a physical fact by applying transparent materials such as glass and by taking advantage of light. Phenomenal transparency, however, usually involves "a contradiction of spatial dimensions (Rowe, 1976, p171)." Colin Rowe compares Gropius's Bauhaus and Le Corbusier's villa at Garches as the examples of literal and phenomenal transparency. "A stratified space defined either by real planes or their imaginary projections…an experience of those conflicts between one space which is explicit and another which is implied (Rowe, 1976, p171)" in the villa at Garches (Figure 4.17) explain the characteristics of phenomenal transparency.

Gyorgy Kepes defines transparency as "two or more figures overlapping one another and each of them claims for itself the common overlapped part…they are able to interpenetrate without an optical destruction of each other…Transparency means a simultaneous perception of different spatial locations (Rowe, 1976, p161)." To explain this definition better, a hypothesized system can be built as a theoretical model. The system has two kinds of spaces A and B, and there is an overlapping area which shows the characteristics of both spaces. We called it space C. The attributes of space C, however, is not a simple combination of space A and space B, because the two kinds of spaces interact each other in the mixture. Thus, space C is the result of this interacting action. Meanwhile, there is also an overlap of space A and C as well as the one of B and C (Figure 4.18). New spaces are generated even further. The model is an infinite system which never stops under the effect of each space.

As an illustration of the theoretical model, the courtyard house does not have any absolute distinction between indoor and outdoor, natural and artificial, closed and open. In stead, a series of spaces overlap on each other, generating a complex model (Figure 4.19). For example, the courtyard as an outdoor space is also an extension of the indoor. Kinds of supposedly indoor behaviors such as dining and meeting often appear in the courtyard. It is not only because of the compact enclosure the surrounding buildings provide, but also because of the spatial permeation from the rooms. As another example, the central hall as the living room of the family which always opens to the courtyard contains some outdoor quality as well. Multiple spaces are sensed simultaneously, and multiple moments exist in the same space.

The feeble separation (Figure 4.20) between indoor and outdoor makes this permeation possible. No solid walls are placed between the courtyard and the rooms. Lattice window

panels having translucent paper on the inside provide variable amounts of light, air, and privacy to the interior space and permeate the warm and intimate atmosphere to the exterior courtyard. Another key element of the spatial permeation is the corridor (Figure 4.21) which is the overlapped space of the indoor and the outdoor. On the one hand, the corridor can be considered part of the interior, owning to the fact that it is shaded by the extended roof and is lifted to the same level with the rooms. On the other hand, the corridor belongs to the exterior, when the doors are closed. This natural transition from one space to another brings the “literal transparency” to the courtyard house, where a “deep and naturalistic space” exists (Rowe, 1976, p166).

To explain phenomenon transparency, Rowe analyzes Le Corbusier’s Palace of the League of Nations (Figure 4.23) as another example besides the villa at Garches. As a comprehensive building, the League of Nations defines a system of striations which is even more evident than the villa at Garches. “A cut, a displacement, and a sliding sideways occur along the line of its minor axis; and, as a figure, it is repeatedly scored through and broken down into a series of lateral references – by trees, by circulations, by the momentum of the buildings themselves (Figure 4.24) – so that finally, by a series of positive and negative implications, the whole area becomes a sort of monumental debate, an argument between a real and deep space and an ideal and shallow one (Rowe, 1976, p175).” The stratifications of the spaces (Figure 4.25), either clearly illustrated or ambiguously implied, are the essence of the phenomenal transparency which presented by the Cubist paintings that Rowe interprets in this essay.

There are spatial stratifications existing in Chinese courtyard house. The layout of a Chinese courtyard house follows a clear north-south axis, but the east-west axis created by the side houses, as well as other lateral elements (Figure 4.26), is a denial of the depth of the complexity. Like the lozenge shape whose major axis passes through Le Corbusier’s League of Nations Project suggests the deep space, the corresponding main house and the opposite one implies the extension of Chinese courtyard house. And just like the dominating axis of the General Assembly Building is cut, displaced and broken down into a series of lateral references by the minor axes, Chinese courtyard house also shows the feature of layers of transverse tension (Figure 4.27).

With open or transparent feature inside, the courtyard house has a clear solid barrier against the outside world. All the buildings have their solid walls (Figure 4.28) with small high windows facing outside. This enclosure is a representation of the secretive and introversive Chinese culture. The enclosed courtyard house is a microcosm of the owner, with the sky and the earth as the abstract nature and the people as well as their activities the artificial ones. Chinese culture and religion attaches great importance to the serenity and safety of inward world, so that space is arranged open to the inside but closed to the outside. Conversely, living in such a space makes the culture introverted.

4.2. Social Values

Social interaction happens inside the family and between the families, with a good protection of privacy (Figure 4.29).

4.2.1 Public and Private

If public means the outside world and private means the family, the courtyard house has a linear sequence of spaces from public to private (Figure 4.30). The opposite building which is adjacent to the street is the place for servants' activities such cooking. Guests need to wait here for the host coming out and inviting him to get in. Unimportant guests are even stopped here. The central courtyard together with the surrounding buildings is where the most of the family members live. This area is relatively private but still open to certain guests. The back building where the unmarried daughter lives is the most private space that only family members have the access. The private degree increases gradually when the space goes deeper.

Among the family members, the model of public and private works as radiant circles (Figure 4.31). The courtyard at the center of the house is the public space open to the whole family. The central hall in the main building ranks the next, followed by the serving rooms. Bedrooms are always very private, especially the back building for the daughters. The family's public activities happen in or around the courtyard. Spaces are on circles with different radius. The longer the radius is, the more private the space is.

The spatial organization of the courtyard house makes it possible to mix the linear and the circular models (Figure 4.32). The courtyard is simultaneously the transitional space between inside and outside and the public center of the family. The harmonized balance between public and privacy is the co-effect of both models.

Spaces gradually shift from public to private, back to public, in most cases. What indicate this alteration are the gates in various forms. Gates in the courtyard house are the divisions between certain kinds of social relationships. In other words, the gates are more like ethical divisions rather than physical ones. The gate between the entrance and the main courtyard is decorated as the most gorgeous object in the entire house (Figure 4.33), telling the entering person that he is stepping into the core of the family. The open arcades on the both sides of the gate seem to further emphasize that the gate is not a barrier but a symbol. A closed gate sends a psychological message that the space behind the gate is private, even though it does not block people physically.

What is noteworthy is that the separation between public and private spaces, either clear or ambiguous, does not destroy the integrity and the consistency of the entire space. With an emphasis on privacy, Chinese courtyard house is developed in depth, putting the privacy in the deep end. At the same time, the transparency of the spaces discussed in the last section is designed to deny this depth.

4.2.2 Aggregation

Chinese traditional architecture has a feature that a single building is usually simplex, but the aggregation of buildings (Figure 4.34) is full of variability. A courtyard is like a cell which can generate a lively and full-featured organism.

Chinese culture attaches great importance to the joyfulness of the whole family with multiple generations. In that case, an extended family may take up several courtyard-units. There are a variety of ways of combining the courtyard houses within the family. The most common way is to develop the courtyards in series. A sequence of spaces from public to private is created. The deeper the building is the more private it is. The depth of the house was also a measurement of how wealthy the family is in the feudal society. The second type of development is the paralleling one. The courtyard-units, however, are not just put together in parallel, but a contrast between the scale, dimension, proportion and volumes of the units is deliberately formed, implying the principle-dependent relationship between the units. Very wealthy families might apply the third kind of connection which is a mixed type of the two above (Figure 4.35). The hierarchy of spaces is clear and plentiful when other elements such as gardens (Figure 4.36) are put into the composition (Zou & Gao, 2003, p14).

In a neighborhood, the array and combination of families is even more complex due to the complicated urban texture. Hutong is a term that can not be avoided when it comes to the neighborhood scale. Hutong means the alley connecting the families in the narrow sense and the neighborhood made up of alleys and courtyard houses in the broad one. Hutong plays a significant role in the shaping of the whole neighborhood. The common type of connection is to have the courtyard-units separated by walls lie alongside, with their south entrances opening to the hutong (Figure 4.37). Other uncommon connections occur when the limited land forces the hutong lie between two perpendicular or paralleled units. In such cases, the entrances of the families have to be on the side walls, which does not obey the classic layout of the courtyard house (Wu, 2007, p104). The depth of the families determines the distance between the hutongs in some places, while it goes inversely in the others, depending on either the neighborhood planning or the family's development was dominating. In a hutong neighborhood, the regular straight east-west hutongs build up a highly ordered grid system, and the irregular factors such as the width, the direction as well as the diverse connection of the hutongs also provide a variety of different patterns.

The social function of hutong is even more important. Even though hutongs are usually narrow, there are lots of activities happening here everyday.

Public contact happens naturally in hutongs. Like the courtyard in a courtyard house, the hutong is the combination of a daily traffic route and a public space (Figure 4.38). As the only way to access each house, the hutong provides a high probability for neighbors to meet each other. Since hutong is right next to home, the feeling of belonging and safety makes people consider the hutong a part of home. People deliberately extend their life from each courtyard onto the

hutongs. Children skip ropes there, old men play chess there (Figure 4.39), and people even bring teapot out there, drinking tea and sharing it with their neighbors.

Besides the contact, public trust and respect is generated as well, making the neighborhood a harmonized self-protected territory. To achieve this goal, Jane Jacobs had proposed a “sidewalk” theory. The keywords of this theory are “street eye”, “public character” and “informal public life” (Jacobs, 1961, p23) which all exist in hutongs (Figure 4.40).

In a hutong, families with their houses located at the end of hutong spontaneously open some stores (Figure 4.41), taking advantage of the location. The neighborhood is made a small commercial complexity, a grocery in this block, and a barber shop in the next. Not only convenience do those stores provide, but also vitality and safety. The shop owners who are also residents themselves are the “public character” defined by Jane Jacobs. They are “frequently contact with a wide circle of people (Jacobs, 1961, p23)” and in the public life of the neighborhood. It is not difficult for them to distinguish who are the residents here and who are not, so that they earn the most respect and trust. Children who play in the hutong (Figure 4.42) are usually watched by them. They undertake the obligation of guarding the neighborhood. Moreover, the shops give people opportunities to meet and talk to their neighbors more in the hutong. With Hutong becoming a busy public space, the system of respect and trust between all the residents has been built up.

4.3. Cultural Values

Culture has a strong influence on architecture's physical form. As an old-established housing typology, Chinese courtyard house is deeply rooted in traditional Chinese cultural traits. On the other hand, the courtyard house together with its environment is the place where the daily activities of residents and the public contact between neighbors happen. People's folkloric or religious behaviors embody the courtyard house abundant culture values.

The ideology behind the configuration of Chinese traditional courtyard house is controversial. The dominant theory is from the perspective of ethnics and philosophy. Chinese philosophy which is mainly represented by Confucianism and Daoism exists in traditional Chinese courtyard house.

Confucianism has "Rite" as the central philosophy. In traditional ethical conception, the old are superior, and the young are inferior; men are superior, and women are inferior. In space, the middle is superior, and the sides are inferior (Ou, 2005, p123). The geometrically symmetrical configuration of the courtyard house is a physical expression of this ideology. The clear axial layout stresses out the central superiors (Figure 4.43).

Chinese ancient philosophy Daoism believes that the universe is in duality: rational and emotional, artificial and natural, dynamic and static, firm and empty (Xue & Zhu, 1995, p37). The central ideology is the unity of opposites, which means the division of opposites is not definite but ambiguous and the opposites are inter-convertible (Wang & Yue, 2007, p176). In the theory of Ying-yang (Figure 4.44), likewise, Yin and Yang (being and non-being) coexist, inter-restrict and inter-depend, which causes that the traditional spatial distinction is ambiguous. Lao-tzus had ever said: "Clay is fashioned into vessels; but it is on their empty hollowness, that their use depends. The door and windows are cut out (for walls) to form an apartment; but it is on the empty space (within), that its use depends. Therefore what has a (positive) existence serves for profitable adaptation, and what has not that for (actual) usefulness (Laozi, Daodejing, trans. Legge)." This sentence is the evidence that space as a void existence was sensed and taken advantage of by ancient people, equally to positive existence.

The courtyard is the duality of interior and exterior (Figure 4.45); the void and the form; the visible and the invisible, to be and not to be (Blaser, 1996, p29). Literally, the solid and visible building is yang, and the void and invisible courtyard is yin. In fact, the buildings and the courtyard as an entirety of yin and yang are reciprocal and interchangeable. If one is the subject, the other is the object belonging to it. For example, the courtyard is the interior of the house, compared to the outside street; while it is also the exterior relative to the covered indoor space.

Fengshui, a theory about the relationship of building and environment, was guiding all the constructing activities directly or indirectly in Chinese history. The design of Chinese courtyard house follows Fengshui strictly. The selection of the site, the location and the scale of each single

building are all restricted by Fengshui (Wang and Zhang, 2007, p176). Fengshui, though mainly derived from Yi Ching which is always considered a mystic, is scientific in architectural ecology, because it is actually based on thousands of years of construction experience. In the five-element diagram (Figure 4.46), fire positions on the south, indicating the sun is on the south, so that the main building in a courtyard house is facing south. The entrance at the southeast corner is the position of wind in Fengshui theory. In fact, the predominant wind direction in Beijing is just from the southeast (Figure 4.47).

There are many other different discourses explaining the formation of courtyard house, one of which is human body theory (Figure 4.48). The symmetrical layout based on the cross axis is derived from the structure of human body. The centrality of courtyard house represents the heart of body. The enclosing structure implies that human's sense of security is from enclosure (Zhang, Li, 2004, p105). Courtyard house provides such a comfortable and touching feeling due to the unity of architectural layout and body structure. Professor Li Qianlang who is an expert in Chinese dwelling and culture used diagrams to compare courtyard house and human body: the main house is like the head of a man, the side houses are like the arms, and courtyard is like the chest (Dai, 1992, 105). It can not be denied that there is connection between human body structure and courtyard house, but the human body can not explain the whole social, cultural and spatial unity of courtyard house.

Chapter 5 Referencing: Precedents Study

5.1. Raj Rewal, Sheikh Sarai Housing Complex

The Sheikh Sarai Housing Complex in New Delhi has 550 apartments in total. Six different types of units, ranging from 70 square meters to 120 square meters in area, were organized into two distinct clusters, three and four storeys in height (Tyaylor, 1992, p48).

The Sheikh Sarai Housing Complex is a good example of integrating courtyards in a modern community. Courtyard house is common in a lot of cultures, especially in the countries from far-east to Mediterranean. Thus, courtyard house is a significant typology in India which shares a lot of architectural culture with China. In Sheikh Sarai Housing Complex, an important aspect of the design solution is the pattern of interrelated courtyards which are in an intimated scale (Figure 5.1). On the one hand, volumes in various forms and sizes stack on each other, overlapping and interlocking (Figure 5.2). The composition constructed by the massive volumes presents a diversity and complexity of spaces. Courtyards, on the other hand, play the role of organizing the flowing and flexible spaces (Figure 5.3).

Courtyard in this project is a combination of traffic, social interaction and recreation. First of all, a courtyard surrounded by four levels of apartments is the center of those families. Either the ground level entrances or the staircases to the upper levels are accessed from the courtyard. Social interaction happens when this kind of daily traffic occurs. Second, with the open stairs, it is easy for even people living on the top floor to come to the courtyard. In addition, the courtyard with shading and natural ventilation is a pleasant place to stay in a hot area as India. Thus, the courtyard is holding a variety of activities for families (Figure 5.4). Thereby, the communication between them gets promoted. Third, all the courtyards are connected by corridors, which make the fragments of places a united outdoor system. The courtyards evolve from separate points to a linear unity, from non-directional space to a space extending to various directions.

Like a traditional courtyard which is usually described as an outdoor living room, the outdoor pedestrian system composed by courtyards is seemingly inside the buildings, but it is actually open.

Sheikh Sarai Housing Complex successfully separates pedestrian paths from vehicular ones (Figure 5.5). All vehicle traffic occurs on the periphery of the building cluster, while the pedestrian circulation together with all manners of people’s activities happens inside the buildings (Figure 5.6). Thus, a contrast between the drive way and the pedestrian way is built up, with one is broad and mechanic, the other is intimate and lively. Meanwhile, the building complexity has the solid walls facing to the vehicular road, but openings towards the pedestrian courtyard, which further reinforces this contrast and the directivity of the buildings. Again, the courtyards are crucial elements in the pedestrian system, as the important nodes on the walkways. A rhythm of open

and closes is created by repeating the regular patterns (Figure 5.7). Moreover, if people's trace is depicted as from vehicular road, to pedestrian road, then to interior home, the courtyards, as part of the pedestrian system, are also in the transitional layer between the pedestrian and the interior, as well as the one between dynamic and static. Instead of just walking through, people can choose to wander or to stay in the courtyard. Accordingly, a richness of spaces is created.

Besides in community level, there is also space working as courtyard in the family scale (Figure 5.8). Instead of using the customary apartment layout in which living space is a separate room, Raj Rewal makes living room the center of the apartment, with other spaces arranged around it. In order to minimize the defect brought by having too many doors open to the living room, on the one hand, Rewal centralizes the doors as much as possible; on the other hand, he extends the living space and combines it with the outdoor terrace.

The courtyards also have their ecological functions. Surrounded by four-storey buildings, the courtyards have sufficient shading which is important to Indian buildings (Figure 5.9). The architect carefully calculated the sunlight angles and the distance between buildings, to make sure the courtyards are well shaded. At the same time, natural ventilation is provided by the corridors.

5.2. Moshe Safdie, Habitat ‘67

Habitat ’67 (Figure 5.10) is a successful precedent of high density complex and urban development. with the design of Habitat ’67, Safdie introduced his own interpretation of the house: a high density complex composed of three-dimensional prefabricated modules.

Safdie was dissatisfied with both suburbia, which destroyed open space surrounding cities and cut off people’s enjoyment of the amenities of city life, and with the high-rise apartment block (Figure 5.11), which concentrated people on less land. Apartments generally were too small for growing families, and lacked both privacy and outdoor space. He was convinced the later were inadequate as family housing. Habitat ‘67 is Moshe Safdie’s experiment to make a fundamentally better and cheaper housing for the masses. He attempted to make a revolution in the way homes were built - by the industrialization of the building process: essentially factory mass production. He wanted to build a city in the sky, a three-dimensional city and his city would contain not only housing units but also shops and even a school.

In Habitat ’67 Phase I, the modular unit which is called “original scheme” by Safdie is a 5.3m x 11.7m x 3.2m. There were 354 of these units in all. The way the units are put together (Figure 5.12) rather than the variety of forms makes Habitat ‘67, both inside and outside, so unusual (Figure 5.13). The units were arranged to provide fifteen different types of “houses”. These varied from one-bedroom houses (600 sq. feet) to four-bedroom houses (1,700 sq. feet). Each had a private open garden space, 37 x 17 feet. Each man’s roof was another man’s garden. The arrangement of the units provided privacy and the variation in house layouts provides a sense of uniqueness (Morin, 1996, p48).

Habitat ’67 combines the amenities of the urban and suburban dwellings into a single structure (Figure 5.14,15,16). The complex’s plastic covered pedestrian streets connect the apartments with the elevators and parking lots, sheltered from Montreal’s cold window weather.

5.3. Le Corbusier, Unite at Marseille

The unite d' habitation (Figure 5.17), planned immediately after the Second World War and completed on the outskirts of Marseilles in 1952, is a good example of modern residential module (Janson & Krohn, 2007, p7).

Le Corbusier had developed a system in which individual cells can be assembled to provide dwelling types of different sizes. Two variants were presented finally: a two storey apartment of approximately 100 square meters, having its entrance either on the upper level or on the lower level. The two variants interlock in the building's section (Figure 5.18), sharing a communal hallway. Le Corbusier repeated the interlocking unit to make a vertical village in an urban context.

Le Corbusier made all the dimensions relate to each other in a precise ratio derived from a person 1.83 meters tall (Figure 5.19). He hoped to achieve universal harmony by using a precise system of geometrical proportions (Figure 5.20).

The building itself works as a multi-functioned community. Along the interior road on level seven and level eight, there a shipping center and a liquor and drug store (Figure 5.21). There is a laundry and cleaning service, pharmacy, barbershop and a post office. Along the same corridor lies the hotel accommodation and a restaurant snack bar with special service to the apartment (Figure 5.22). The seventeenth and the top level contain a kindergarten and a nursery, from where a ramp leads to a roof garden a small swimming pool for children. Besides the garden and the terrace, the roof contains a gymnasium, an open space for gymnastics, a 300 meter jogging track and a solarium with a snack bar (Figure 5.23) (Janson & Krohn, 2007, p9). With the various public programs, Le Corbusier was announcing that he had found the ideal principle for combining architecture and urban development.

Chapter 6 Locating: Site Analysis

6.1. Context

The project is located in the city of Beijing, a metropolis in northern China and the capital of the People's Republic of China.

Location/geography:

Beijing is situated at the northern tip of the roughly triangular North China Plain (Figure 6.1), which opens to the south and east of the city. The location of Beijing is at 115°20′ to 117°32′ east longitude and 39°23′ to 41°05′ north altitude, the same altitude as Rome, Madrid and Philadelphia (About Beijing). Hebei Province and Tianjin are its close neighbors. The total land area of Beijing is 16,808 square kilometers, among which the mountain area accounts for 62% distributed in its western, northern and northeastern parts, and the plain accounts for 38% distributed in its southern and southeastern parts (Figure 6.2) (About Beijing). The Great Wall of China, which stretches across the northern part of Beijing, made use of this rugged topography to defend against nomadic incursions from the steppes. Major rivers flowing through the city include the Yongding River and the Chaobai River, part of the Hai River system, and flowing in a southerly direction. Beijing is also the northern terminus of the Grand Canal of China which was built across the North China Plain to Hangzhou. Miyun Reservoir, built on the upper reaches of the Chaobai River, is Beijing’s largest reservoir, and crucial to its water supply.

Climate:

Beijing lies in the continental monsoon region in the warm temperature zone (Figure 6.3). The spring and autumn in Beijing are dry and shorter while the summer and winter are relatively longer. October in Beijing is the best season with plenty sunshine, less rain and wind, and fresh air. Yet there is a contrast of temperature between day and night. And the temperature might go down abruptly due to the cold air coming from western Siberia. Thus, it is recommended you change clothes accordingly in time. Generally, the temperature vary from 11C to 23C (about 51.8F 73.4F), with an average of 15F (Figure 6.4) (‘About Beijing’).

Population:

The population of the whole Beijing area was 17.4 million at the end of 2007, with 12 million permanent residents (Xinhua News Agency (2007-12-04)). In 2006, a study by the Beijing Statistics Bureau estimated the total of all people living in Beijing (permanent, temporary, unregistered and others) to be “close to 20 million.” Most of Beijing’s residents belong to the Han Chinese majority. Other ethnic minorities include the Manchu, Hui, and Mongol.

Culture:

Beijing is recognized as the political, educational, and cultural center of the People's Republic of China.

The history of Beijing as a city can be traced back to over 3000 years ago. From 1272 to 1911, Beijing was the capital of Yuan, Ming and Qing Dynasties (About Beijing). After the founding of the People's Republic of China in 1949, Beijing became the capital of new China. Beijing is endowed with valuable cultural heritage by its long history. Its opulent palaces, temples, and huge stone walls and gates, as well as its art treasures have long made the city a centre of culture and art in China.

Planning:

The urban area of Beijing is situated in the south-central part (Figure 6.5) of the municipality and occupies a small but expanding part of the municipality's area (Figure 6.6). It spreads out in bands of concentric ring roads, of which the fifth and outermost (the Sixth Ring Road; the numbering starts from the second ring) passes through several satellite towns. Tian'anmen Square is at the centre of Beijing, and is directly to the south of the Forbidden City, former residence of the emperors of China. Running through central Beijing from east to west is Chang'an Avenue, one of Beijing's main thoroughfares.

Architecture:

Three styles of architecture predominate in urban Beijing. First, the traditional architecture of imperial China (Figure 6.7), perhaps best exemplified by the massive Tian'anmen (Gate of Heavenly Peace), which remains the People's Republic of China's trademark edifice, the Forbidden City, the Imperial Ancestral Temple and the Temple of Heaven. Second, there is what is sometimes referred to as the "Sino-Sov" style (Figure 6.8), built between the 1950s and the 1970s, with structures tending to be boxy, bland, and poorly made. Finally, there are much more modern architectural forms (Figure 6.9) — most noticeably in the area of the Beijing CBD.

Transportation:

As China's second largest city, after Shanghai, Beijing is a major transportation hub (Figure 6.10), with nearly one hundred crossroads, urban ring roads, railways and expressways. It is also the focal point of many international flights to China.

The traffic of Beijing is a mixture of public transportation and private automobile (Figure 6.11). There are four subway or light rail lines covering most area of the city, the rest of which is compensated by buses and taxis. Private cars have been increasing dramatically since 2003 when the prices of cars began to decrease to the line that people can afford. One private owned car per 100 families before 2003 increases to one car per 10 families now in Beijing. In recent years, traffic jams on major Beijing roads have been getting more and more frequent, so the government plans to establish a bigger public transport network (Figure 6.12). This plan includes an

ongoing subway (Figure 6.13) improvement and expansion program with plans to expand underground lines (Figure 6.14) from the current 114 km (about 70 miles) to roughly 481 km (about 300 miles) by 2015 (About Beijing).

6.2. Physical Site

The specific site of the project is located in the residential area of Dongcheng District which is the east zone of the inner city. There are a hundred residential communities in Dongcheng District, some of which are the oldest hutong neighborhoods in Beijing.

The site is in Dongzhimen Area which is surrounded by the northeast Second Ring Road. In history, Dongzhimen Area is a commercial place where all kinds of daily used commodities were sold. Historic architectural or cultural heritage can still be found in this area today, such as the Lama Temple on the northwest of the site and the Dongzhimen Gate on the south east of it. Modern landmarks are built around the Second Ring Road.

The Dongzhimen North Alley along which the site is located has the old hutong neighborhoods on the west and apartment buildings on the east. There comes a contrast between the high-density single-level courtyard houses and the isolated high-rise buildings. Most of the courtyard houses and the high-rise buildings are oriented north-south, with some exceptions along the North Dongzhimen Street. The site is on the east side of the street.

The site is approximately a rectangular block which is 95 meters long and 85 meters wide. Structure inside the site is going to be torn down.

Chapter 7 Forming: Design Solution

7.1. Programs

The project that I would propose would be a multi-use, housing complex incorporating principles of the Chinese courtyard house and hutong into a vertical building complex.

To combine the land efficiency of high-rise buildings and the spatial, social and cultural values of courtyard houses, the proposed project will be a representation of a hutong neighborhood, with modern architectural design and delightful environment. The size of the building will depend on the one of a hutong neighborhood. Some data of existing hutongs are listed below (Li, 2007).

Fifth Hutong Neighborhood

Location: Dongsi Street; Neighborhood area: 0.0135 sq km; Buildings: 269 courtyard houses; Families: 1962; Residents: 4908

Eighth Hutong Neighborhood

Location: Dongsi Street; Neighborhood area: 0.23 sq km; Buildings: 125 courtyard houses; Families: 1046; Residents: 2639

Seventh Hutong Neighborhood

Location: Dongsi Street; Neighborhood area: 0.0154 sq km; Buildings: 241 courtyard houses; Families: 2092; Residents: 5406

A survey of dwelling conditions in Beijing has the following statistics: three-member family accounts for 42.6% of all families. Two-member family ranks the next, taking up 24.9%, followed by four-member and five-member ones. 50.4% of the all the families live in two bedroom apartments, 24.7% live in three-bedroom apartments and 11% live in one bedroom apartments. The survey shows that the three-member nuclear family is the dominating type of family in Beijing, and the two-bedroom apartment is the main housing type of current apartment buildings (Wang, Li & Zhang, 2008).

In the surveyed sample families, 74.1% of them live in apartments smaller than 90 square meters, 15.7% live in ones sizing from 90 to 120 square meters, and 10.3% live in apartments bigger than 120 square meters (Wang, Li & Zhang, 2008). The statistics show that the majority of Beijing's residents are suffering from compact living areas.

According to the data of existing hutongs and dwelling conditions, in the proposed building, the floor area of each family will be around 90 square meters in average, which is an affordable size for normal Beijing citizens and a proper size for families whose average number

of members is three. Bigger and smaller units will be supplementary. There will be around 250 apartment units in the building, with the same scale of a regular hutong neighborhood. The housing floor area is around 25,000 square meters.

The residential planning code of Beijing requires that there should be one kindergarten every 5000-8000 people and one elementary school every 15,000 people. The proposed building will not have its own kindergarten or school but take advantage of the nearby facilities. There will be public amenities in the building shared by all the residents, including shops, groceries, childcare and some recreation area.

Program:

Apartment modules: 90 sqm each

Apartment units: 250

Recreation Area: 1000 sqm

Childcare: 500 sqm

Community spaces: 1000 sqm

Commercial spaces: 500 sqm

7.2. Solution

A traditional hutong neighborhood is a complex with concentrated markets, small shops, schools, and public indoor and outdoor spaces. In the vertical building, the parking, commercial and daycare facilities make up the base of the building. The tower of housing units has two public rooms inserted. The public gardens and retail spaces are boxes over hung from one side of the building, while the private gardens are located on the other side. Alleyways become the horizontal circulation.

The design of each housing unit also follows the spatial logics of the traditional courtyard house, such as following the grid and using geometrical volumes. The volume of a courtyard house is conceived in a subtractive way. It is basically a box with an opening at the center. The housing unit I designed uses an additive method. The central box is the central living space of the family. Bedrooms and other functions are located above this box.

The spatial sequence from public to private is not linear as in the courtyard house, but vertical. Since the unit is a double height space, there is a three-dimensional sequence. The circulation is sinuous, around the edges.

The base of the building covers most of the site, with two courtyards. The vehicular entrance could be put on the north street which is a secondary, less busy street. The two pedestrian entrances are accessed from the main street to the west and the garden. The two residential towers occupy two corners on the base.

The ground level consists of indoor commercial space and outdoor courtyards. Cars go down from the vehicular entrance to the underground parking garage. Pavement directs the flow into the courtyards. Besides the two big shops there are some small specialty stores. The two lobbies of the residential towers are on this level with separate entrances.

The upper level of the base is the daycare program. The classrooms and offices and other functions are along the boundary of the building; a big double height playroom and an indoor playground is adjacent to the courtyard. A ramp leads people on the ground level to the daycare level. Another ramp is for children running from this level to the roof.

The housing starts from the roof of the base. The shorter of the two residential towers has two-bedroom double-height units. Units are on one side of the hallway and garden and retail programs are on the other side. The taller building has single-level two-bedroom units on both sides of the hallway. The units next to the traffic core are single-level one-bedroom units. The big gym for the community is on this level. On the other level, the shorter building has a big public room, and the taller building has more units. A public garden is also here to bring more daylight to the hallway.

The two-bedroom double height unit has living space on the lower level, which is the

central space for family. The functional spaces such as bedrooms, the kitchen, and the garden all are accessed from the central living box. There is a winter garden on the upper level. The single-level two-bedroom unit also has living space at the center and other functions around it.

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Appendix

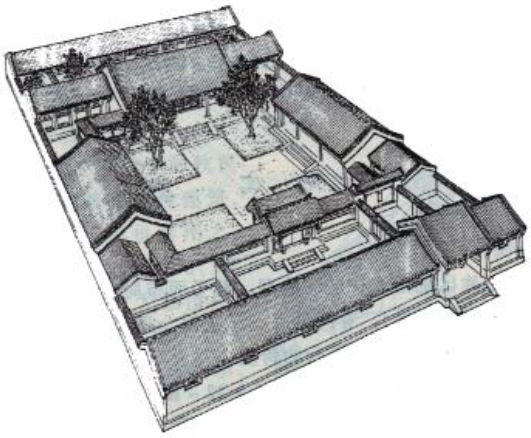


Fig.2.1 a Chinese Courtyard House (*Beijing Siheyuan,* by Ma, Bingjian, 2004)

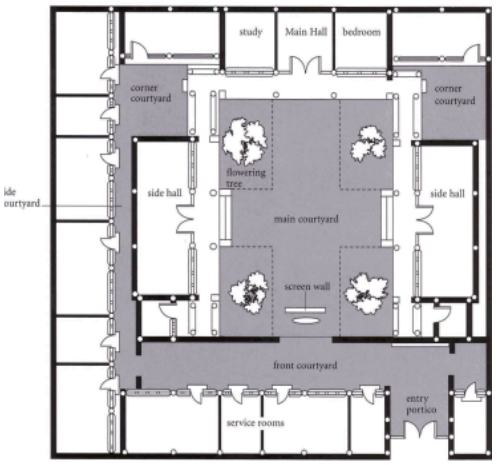


Fig.2.4 the Floor Plan of Mei Lanfang's (a celebrated actor) Residence in Beijing (*Chinese Houses,* by Ronald Knapp, 2005)

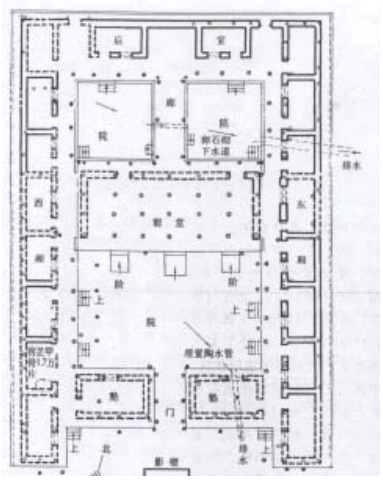


Fig.2.2 the Plan of the Excavated Building Complex (*China's Old Dwellings,* by ronald Knapp, 2000)

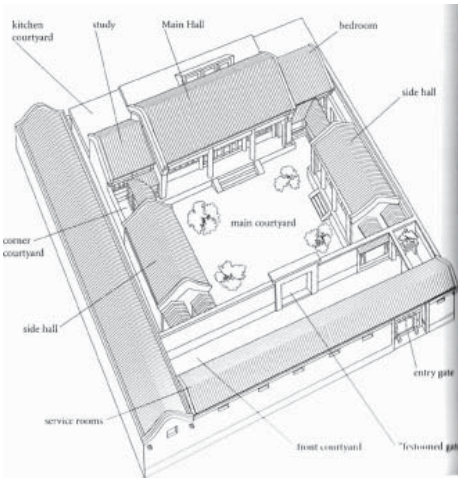


Fig.2.5 the Perspective of Mei Lanfang's (a celebrated actor) Residence in Beijing (*Chinese Houses,* by Ronald Knapp, 2005)

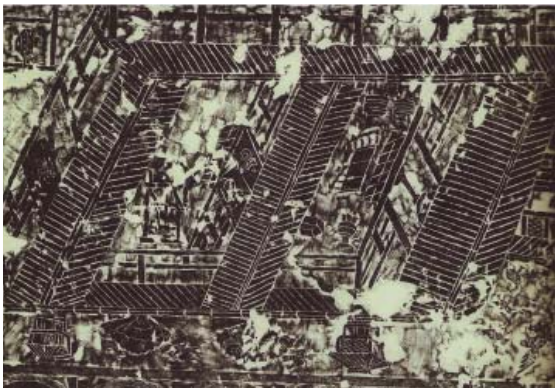


Fig.2.3 a Painting from Han Dynasty Showing an Upper-class Residential Complex (*China's Old Dwellings,* by Ronald Knapp, 2000)

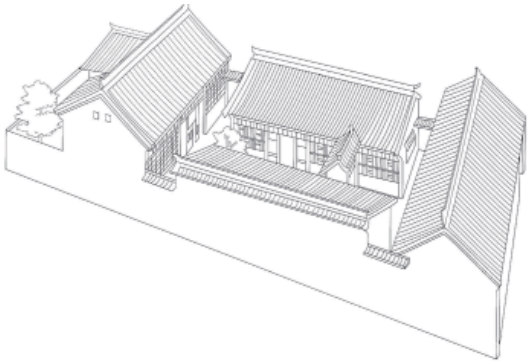


Fig.2.6 the Enclosure of the Courtyard House (*Chinese Houses,* by Ronald Knapp, 2005)

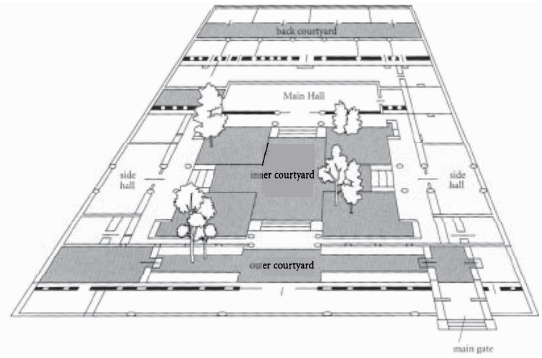


Fig.2.7 the Layout of the Courtyard House (*Chinese Houses,* by Ronald Knapp, 2005)

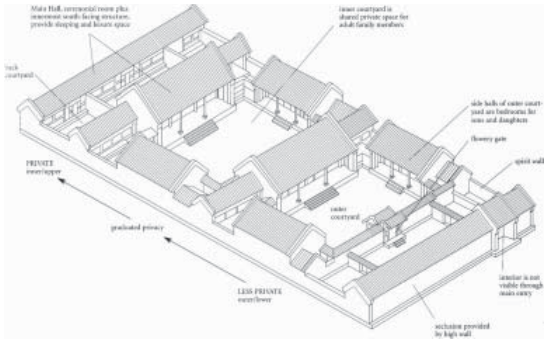


Fig.2.8 Each Building in the Courtyard House (*Chinese Houses,* by Ronald Knapp, 2005)



Fig.2.9 the Big Population in China (http://www.peacehall.com/forum/200803/pic/4501.shtml)



Fig.2.10 the Big Population in China (http://www.peacehall.com/forum/200803/pic/4501.shtml)



Fig.2.11 the Crowded Courtyard (http://wallpaper.pconline.com.cn/group/5766.html)



Fig.2.12 the Crowded Courtyard (http://wallpaper.pconline.com.cn/group/5766.html)



Fig.2.13 the Old Courtyard (*Hofhaus in China Courtyard House*, by Werner Blaser, 1995)

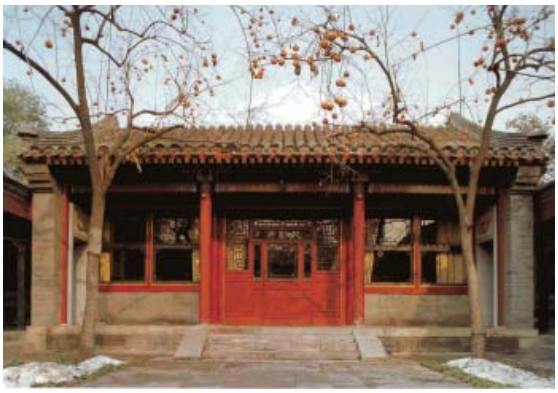


Fig.2.14 Mei Lanfang's (a celebrated actor) Residence is Preserved as a Cultural Heritage (*Chinese Houses,* by Ronald Knapp, 2005)



Fig.3.1 High-rise Housing in Beijing (http://www.panoramio.com/photo)

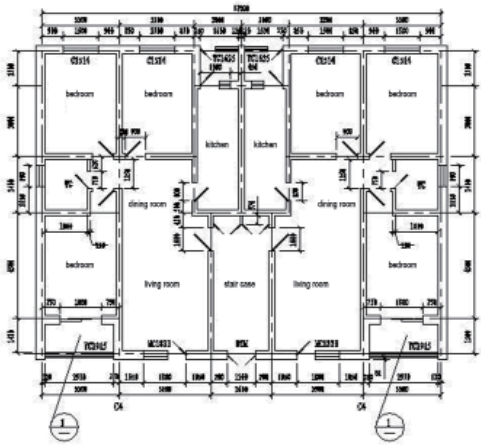


Fig.3.2 Floor Plan of A High-rise Housing Unit (Modern Urban Housing in China 1840-2000, by Lv, Rowe & Zhang, 2001)



Fig.3.3 Sidewalk Depicted by Jane Jacobs (http://www.thisoldworld.com/tow/articles/jacobs/jacobs.html)



Fig.3.4 Modern High-rise Buildings (http://www.archiant.com)



Fig.3.5 Floor Plan of a Modern High-rise Building (http://www.househn.com/web_soulou/show_lp.asp?id=31)



Fig.3.6 Burglarproof Doors and Windows are Installed in Modern High-rise Housing (http://www.dachang.gov.cn/redshow.asp?id=1046)



Fig.3.7 Residents are Cleaning the Flyers Posted in the Dark Staircase (http://www.jgq.gov.cn/info/content.asp?infoId=1375)

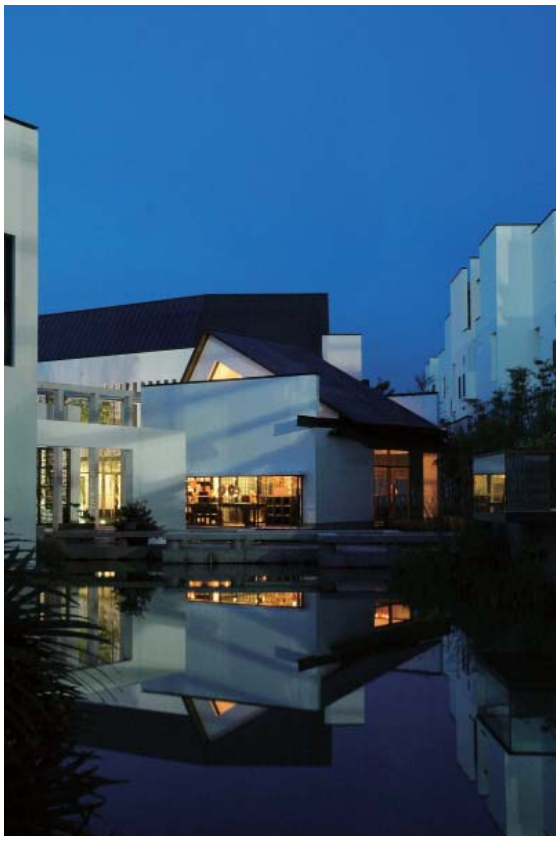


Fig.3.8 Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)



Fig.3.9 Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)

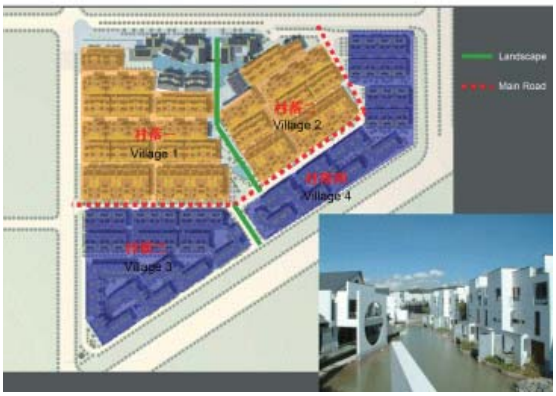


Fig.3.10 Master Planning of Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)



Fig.3.11 Model of Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)



Fig.3.12 Courtyard in Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)



Fig.3.13 Alley in Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)



Fig.3.14 Walls in Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)



Fig.3.15 Shenzhen Village (http://shenzhen.vanke.com/products/city/fifthgarden/index.aspx)

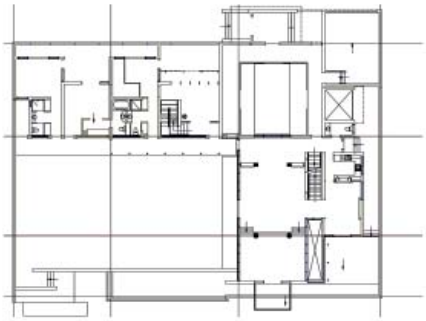


Fig.3.17 Floor Plan of a House in Shanghai Mandarin Palace (http://www.banq.cn)

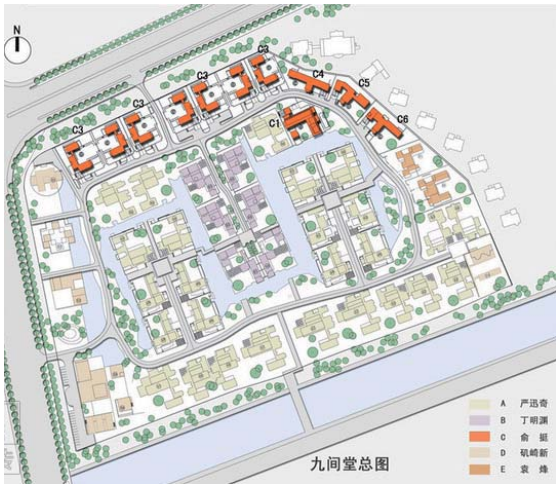


Fig.3.18 Master Planning of Shanghai Mandarin Palace (http://www.banq.cn)



Fig.3.16 Interior of a House in Shanghai Mandarin Palace (http://www.banq.cn)

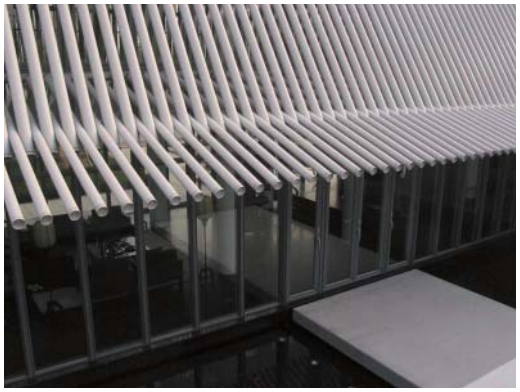


Fig.3.19 Roof Weaved by Aluminum Tubes (http://www.banq.cn)

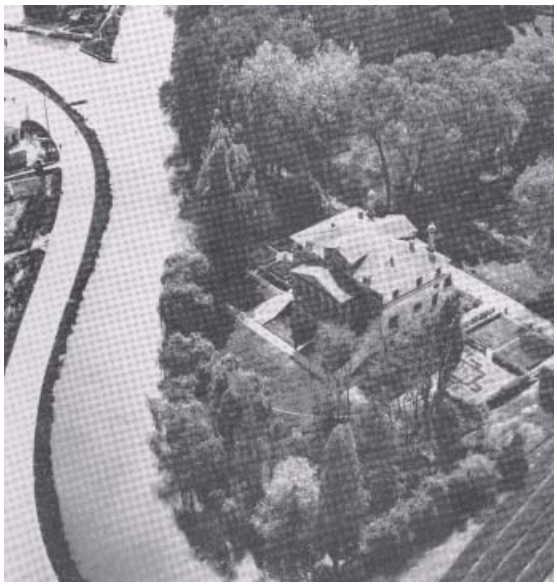


Fig.4.1 Villa Malcontenta (*The Mathematics of the Ideal Villa*, by Colin Rowe, 1976)

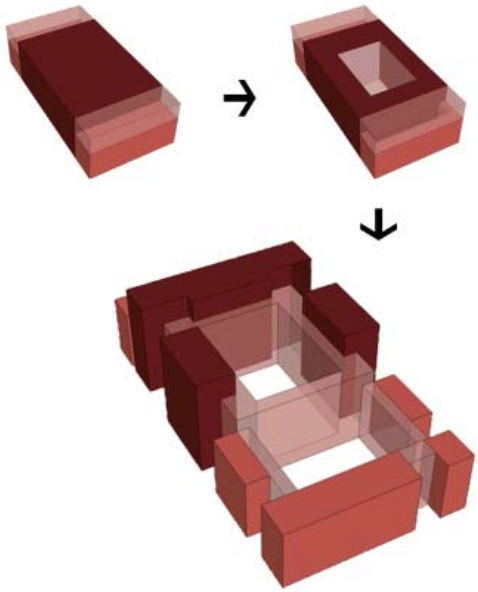


Fig. 4.3 the Geometrical Order of the Courtyard House (Diagram by Author)

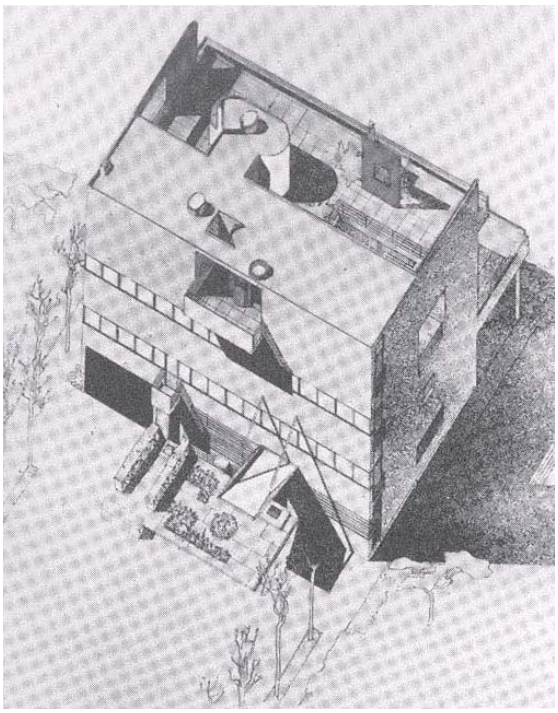


Fig.4.2 Villa Stein (*The Mathematics of the Ideal Villa*, by Colin Rowe, 1976)

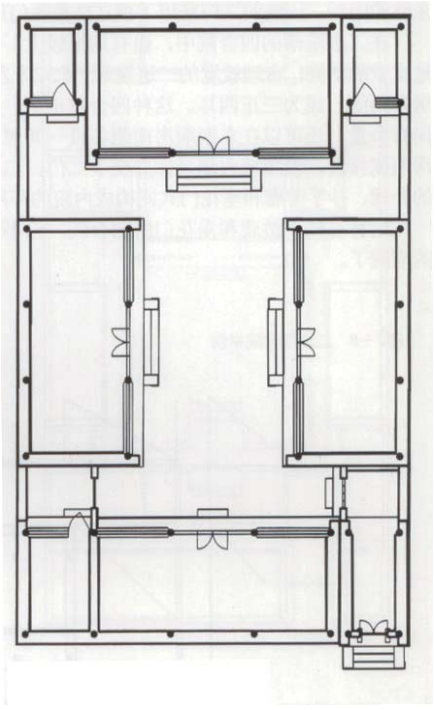


Fig. 4.4 Floor Plan of a Courtyard House (*Beijing Siheyuan,* by Ma, Bingjian, 2004)

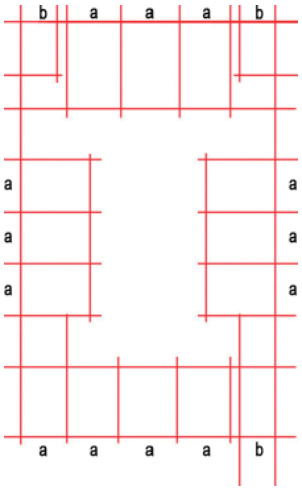


Fig. 4.5 Axes in the Courtyard House (Diagram by Author)

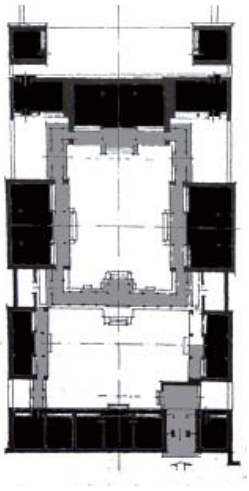


Fig. 4.8 Buildings as the Figure (Diagram by Author)

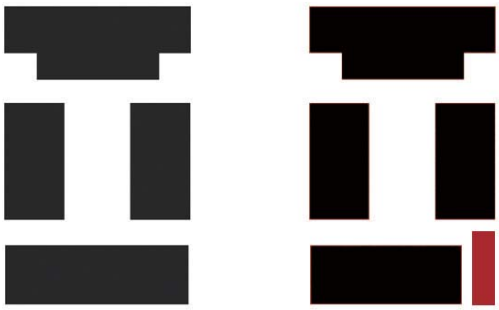


Fig. 4.6 Symmetry and Asymmetry in the Courtyard House (Diagram by Author)

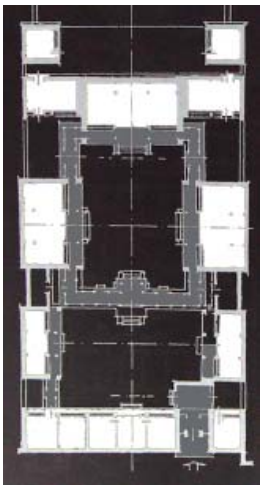


Fig. 4.9 Buildings as the Ground (Diagram by Author)

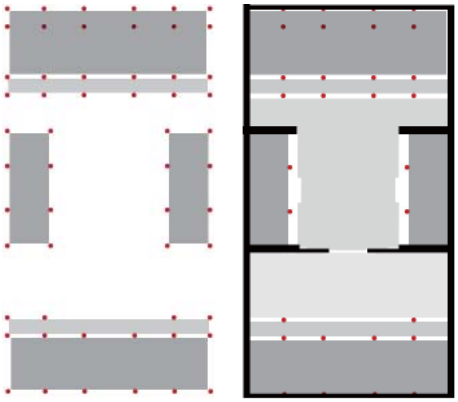


Fig. 4.7 Columns and Walls in Defining Spaces (Diagram by Author)

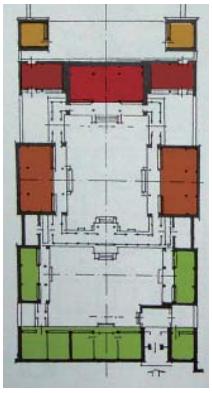


Fig. 4.10 Hierarchy of Buildings (Diagram by Author)

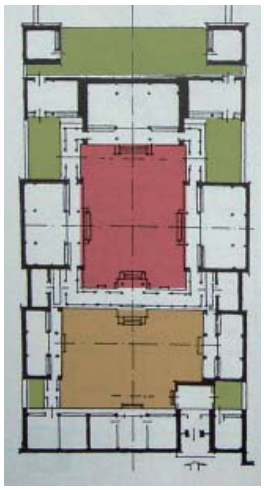


Fig. 4.11 Hierarchy of Outdoor Spaces (Diagram by Author)

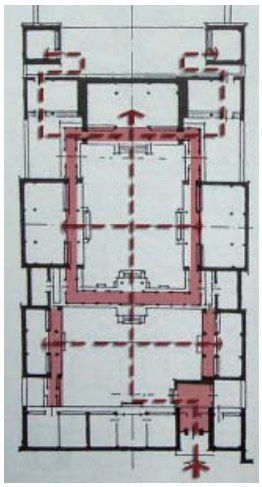


Fig. 4.12 Circulation in the Courtyard House (Diagram by Author)



Fig. 4.13 Connections between Buildings (http://hexun.com/tanggu)

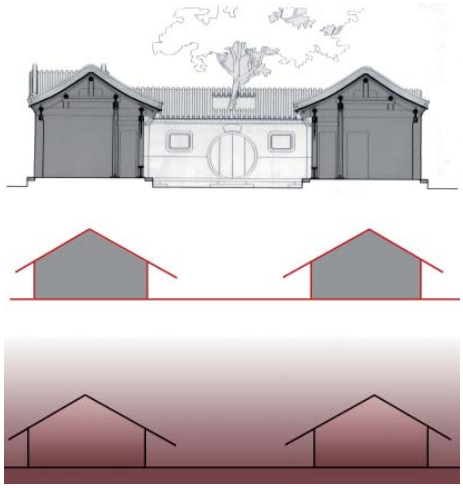


Fig. 4.14 Pitched Roofs in Defining Spaces and in Connecting the Buildings to the Earth (Diagram by author)

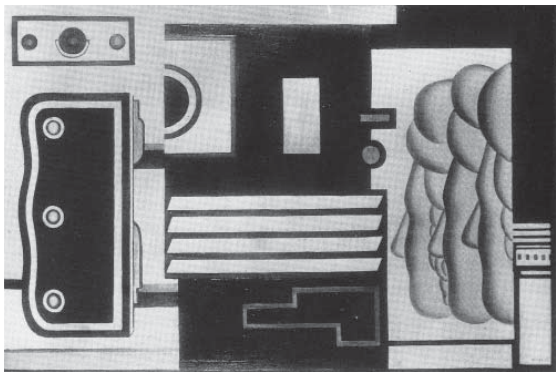


Fig. 4.15 Fernand Leger, Three Faces, 1926 (*Transparency: Literal and Phenomenal*, by Colin Rowe, 1976)

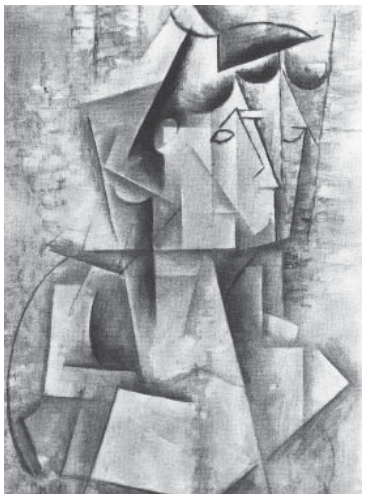


Fig. 4.16 Picasso, L'Arlesienne, 1911-12 (*Transparency: Literal and Phenomenal*, by Colin Rowe, 1976)

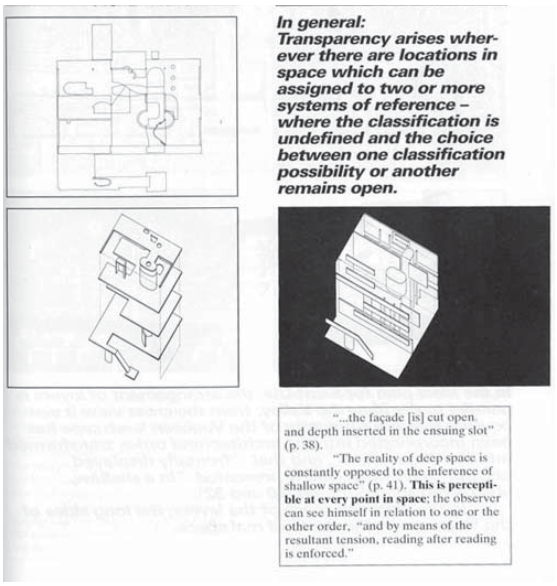


Fig. 4.17 Transparency in the Villa at Garches (*Transparency, With a Commenty by Bernhard Hoesli,* by Colin Rowe, 1976)

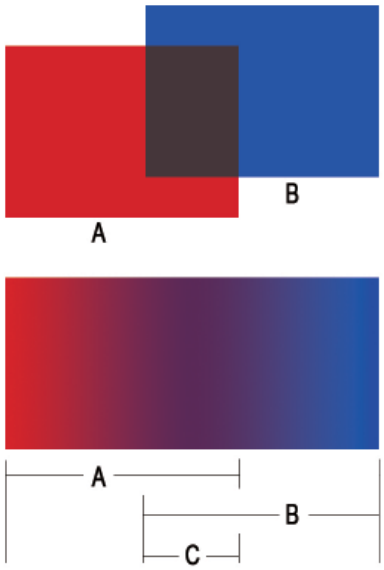


Fig. 4.18 Spatial Transparency (Diagram by Author)

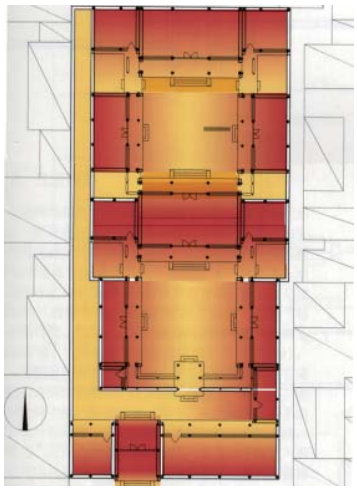


Fig. 4.19 Interior and Exterior Spaces (Diagram by Author)



Fig. 4.20 Feeble Separation between Indoor and Outdoor (*Chinese Houses,* by Ronald Knapp, 2005)



Fig. 4.21 Corridors in the Courtyard House (http://hexun.com/tanggu)

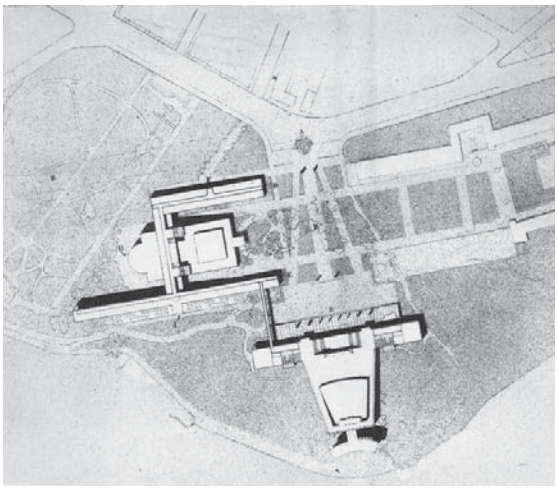


Fig. 4.23 Palace of the League of Nations (*Transparency: Literal and Phenomenonal,* by Colin Rowe, 1976)



Fig. 4.24 Palace of the League of Nations (*Transparency: Literal and Phenomenonal,* by Colin Rowe, 1976)

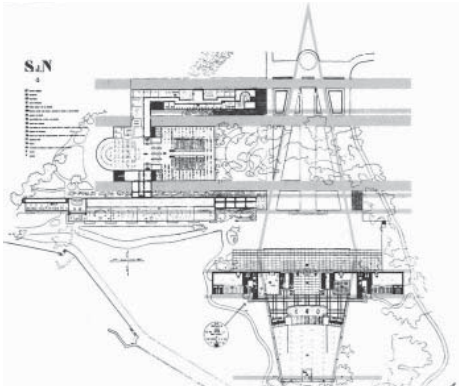


Fig. 4.25 Palace of the League of Nations (*Transparency: Literal and Phenomenonal,* by Colin Rowe, 1976)

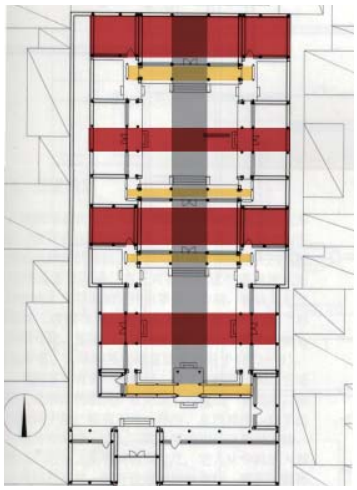


Fig. 4.26 Stratifications in the Courtyard House (Diagram by Author)



Fig. 4.27 Moon Gate as a transverse Tension in the Courtyard House (http://hexun.com/tanggu)

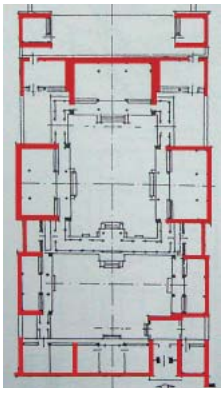


Fig. 4.28 Solid Boundaries in the Courtyard House (Diagram by Author)

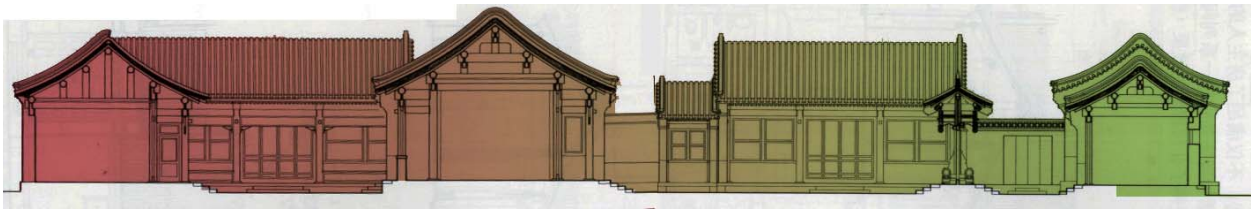


Fig. 4.29 Linear Change from Public to Private in Section (Diagram by Author)

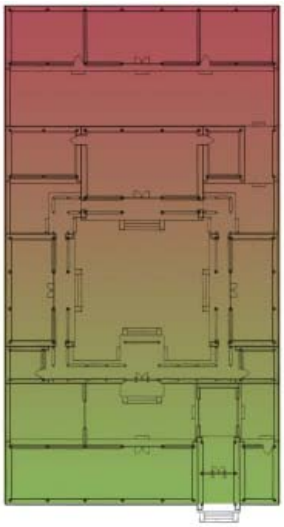


Fig. 4.30 Linear Change from Public to Private (Diagram by Author)

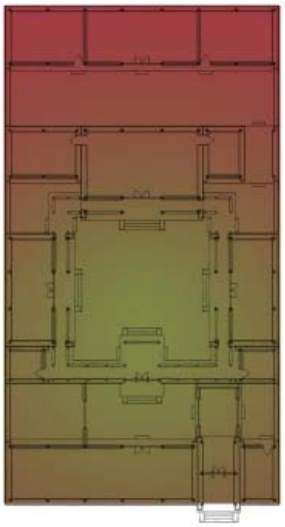


Fig. 4.32 Co-effect of Linear and Radiant Models (Diagram by Author)

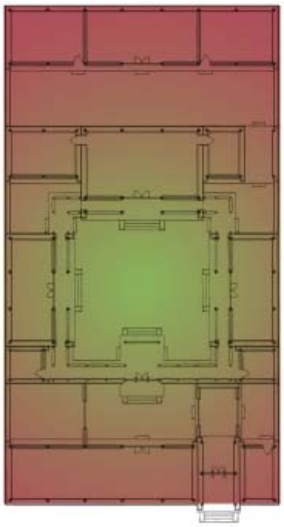


Fig. 4.31 Radiant Change from Public to Private (Diagram by Author)

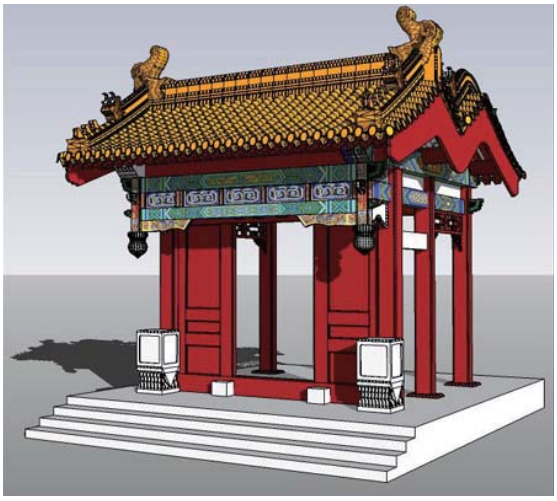


Fig. 4.33 Decorated Gate between the Entrance and the Main Courtyard (Diagram by Author)



Fig. 4.34 Aggregation of Courtyards (*Chinese Houses*, by Ronald Knapp, 2005)

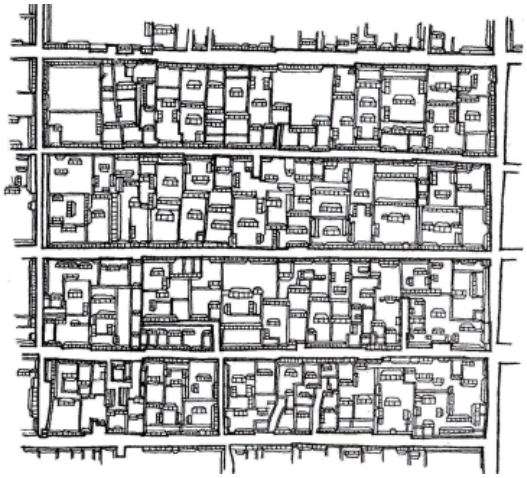


Fig. 4.37 a Hutong Neighborhood with Paralleled Hutongs (*Chinese Houses*, by Ronald Knapp, 2005)

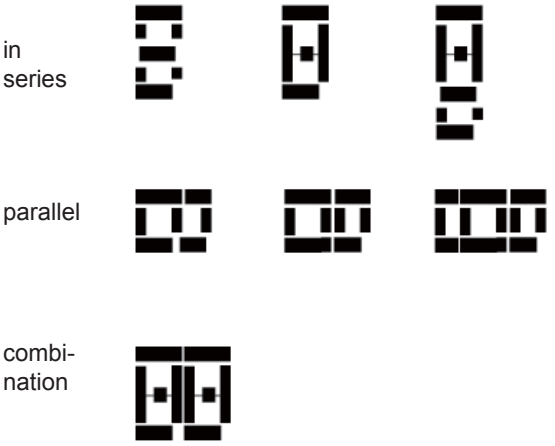


Fig. 4.35 Combinations of Courtyard houses within the Family (Diagram by Author)



Fig. 4.38 Hutong is the Combination of Daily Traffic Route and A Public Space (*Hofhaus in China*, by Werner Blaser, 1995)

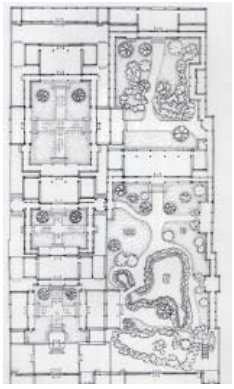


Fig. 4.36 a Combination of Courtyards and Gardens (*Beijing Siheyuan,* by Ma, Bingjian, 2004)



Fig. 4.39 Social Interaction Happens in Hutongs (http://www.godpp.gov.cn/wmzh/2008-07/28/content_13956847.htm)



Fig. 4.40 Social Interaction Happens in Hutongs (http://www.cpanet.cn/ztyz/20jgz/20jgz-jl1.htm)



Fig. 4.41 Corner Shops in a Hutong (http://flickr.com/photos/ylpnotes/2617283459/)

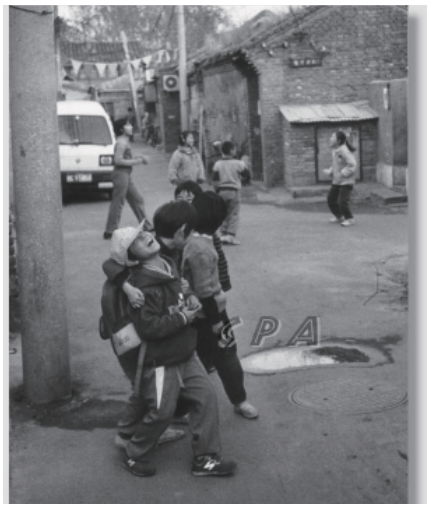


Fig. 4.42 Children are Playing in a Hutong (http://www.cpanet.cn/ztyz/20jgz/20jgz-jl1.htm)



Fig. 4.43 the Symmetrical Layout of the Forbidden City (http://maps.google.com)



Fig. 4.44 Yin-Yang Trigram (*Chinese Houses*, by Ronald Knapp, 2005)



Fig. 4.45 Interior and Exterior (*Chinese Houses*, by Ronald Knapp, 2005)

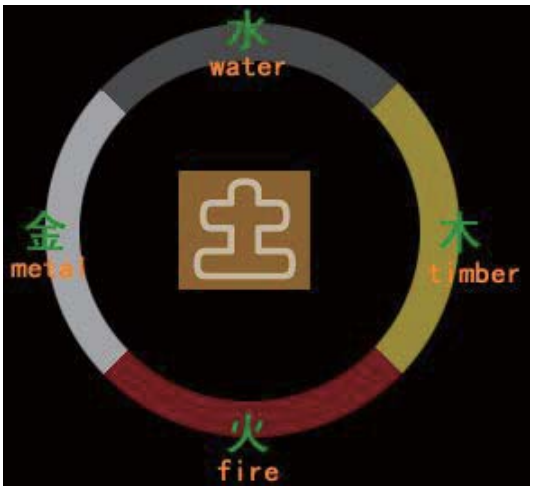


Fig. 4.46 Five Elements in Fengshui (http://cdljp123.blog.163.com/)



Fig. 5.1 the Facade of A Typical Housing Unit in Sheikh Sarai Housing Complex (*Raj Rewal*, by Brian Brace Taylor, 1992)



Fig. 4.47 Building Site in Terms of Good Fengshui (*Chinese Houses*, by Ronald Knapp, 2005)



Fig. 5.2 Volumes in Different Shapes (Diagram by Author)

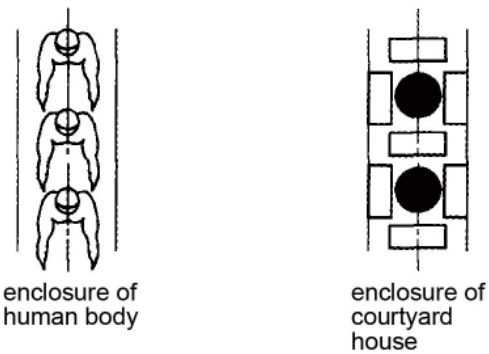


Fig. 4.48 Human Body and Courtyard House (*Emergence M echanism of Traditional Chinese Courtyard House*, by Li, Henan & Zhang, Yukun, 2004)

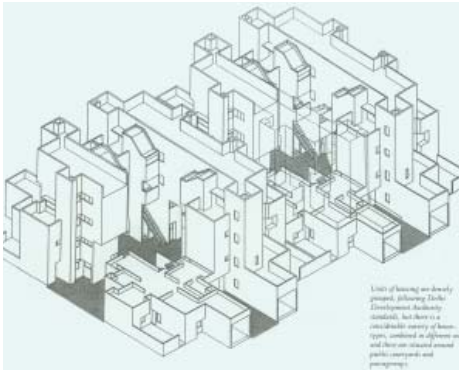


Fig. 5.3 Housing Unites are Combined in Different Ways in Sheikh Sarai Housing Complex, Situated around Public Courtyards and Passageways (*Raj Rewal*, by Brian Brace Taylor, 1992)

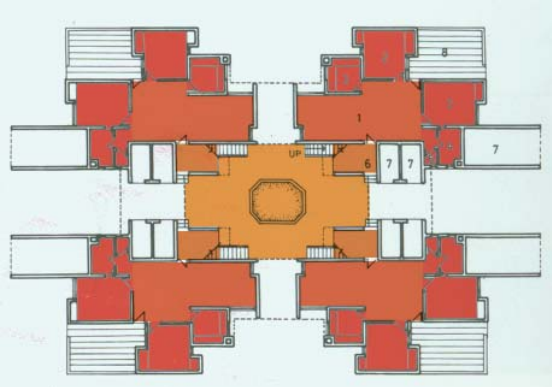


Fig. 5.4 Courtyard as Part of the Living Space (Diagram by Author)

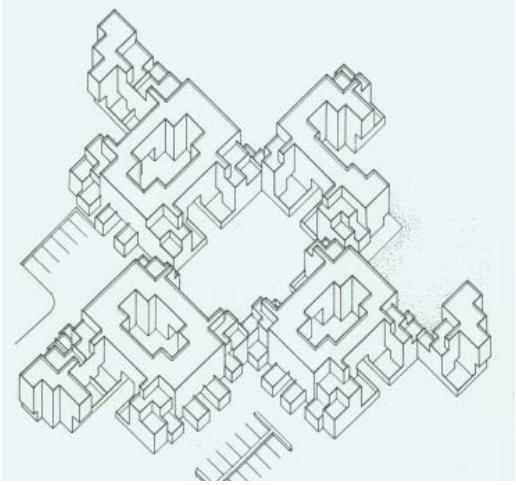


Fig. 5.7 Built-up Volumes of Housing around Courtyards and Paths for Pedestrian Movement (*Raj Rewal*, by Brian Brace Taylor, 1992)

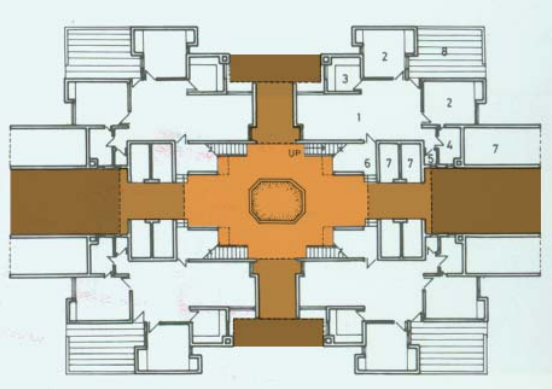


Fig. 5.5 Courtyard as Part of the Outdoor Space (Diagram by Author)

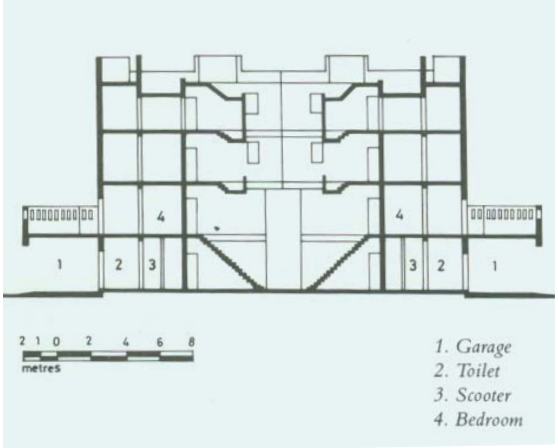


Fig. 5.8 the Section of a Housing Unit (*Raj Rewal*, by Brian Brace Taylor, 1992)

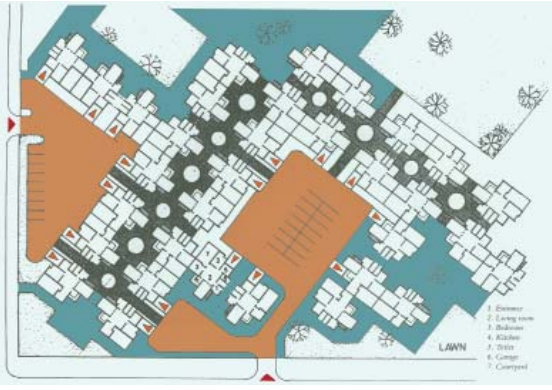


Fig. 5.6 the Separation of the Pedestrian and Vehicular Paths (Diagram by Author)



Fig. 5.9 a High, Narrow Passageway Protects against the Sun, yet Allows in Plenty of Reflected Natural Light (*Raj Rewal*, by Brian Brace Taylor, 1992)



Fig. 5.10 Habitat ‘67 (www.greatbuilding.com)

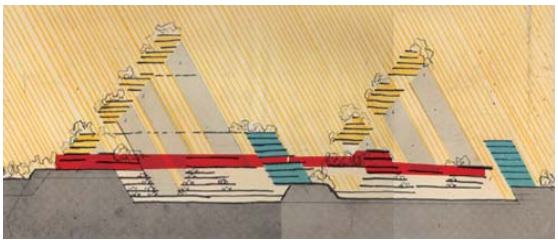


Fig. 5.11 Section Sketch of Habitat ‘67 (www.greatbuilding.com)

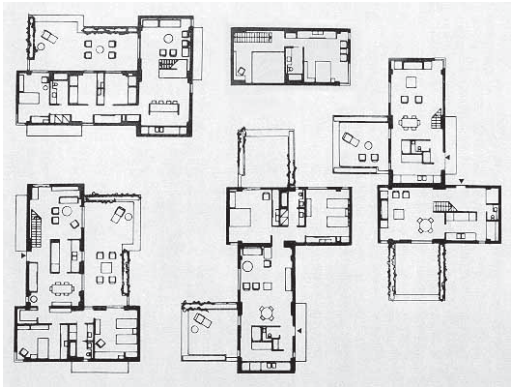


Fig. 5.12 a Variety of Floor Plans (www.greatbuilding.com)



Fig. 5.13 Spatial Organization of One Unit (http://cac.mcgill.ca/safdie/Habitat)



Fig. 5.14 Perspective of Habitat ‘67 (www.greatbuilding.com)

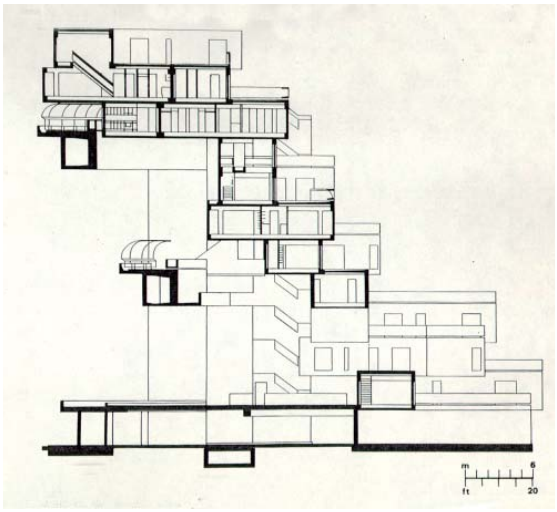


Fig. 5.15 the Section of Habitat ‘67 (www.great-building.com)

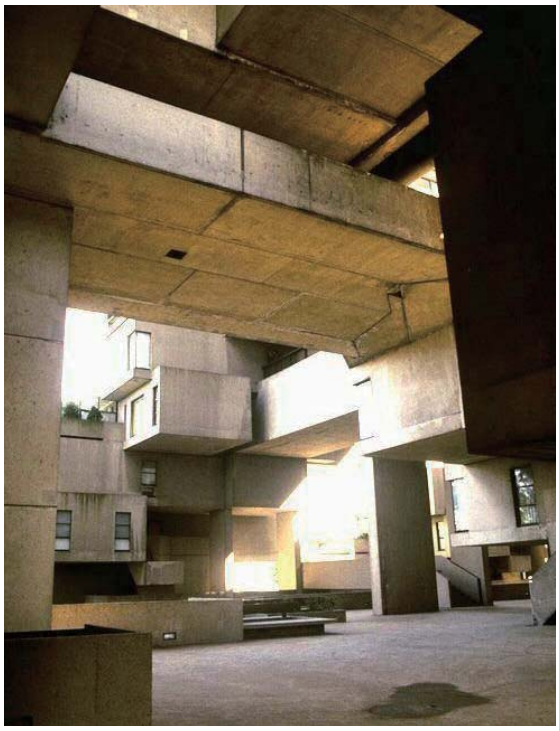


Fig. 5.16 Public Space of Habitat ‘67(www.great-building.com)

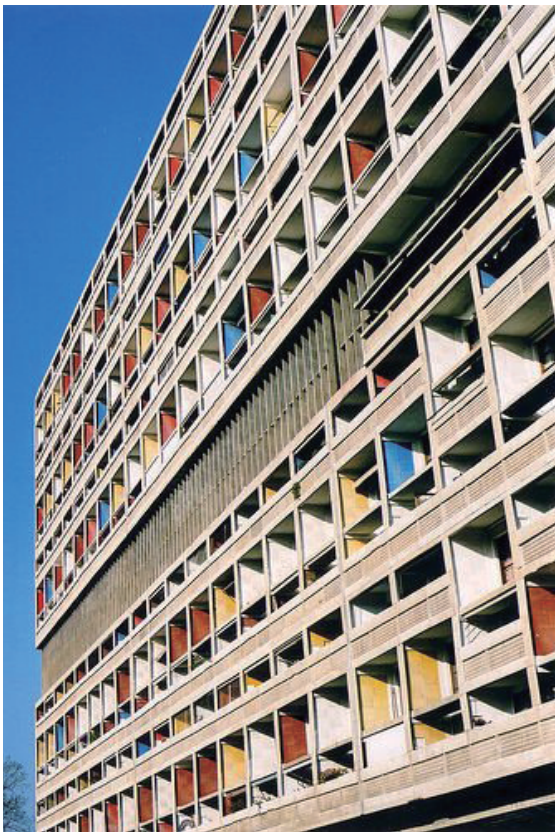


Fig. 5.17 the Facade of Unite (http://www.everystockphoto.com/photo.php?imageId=14699)

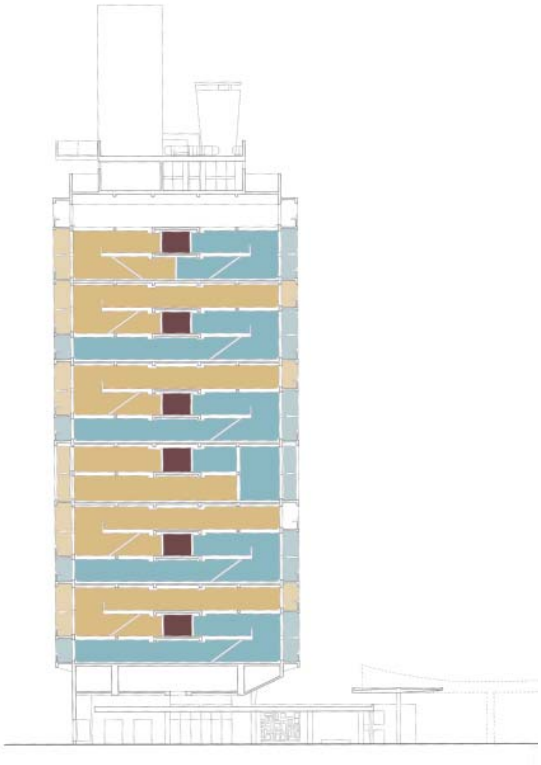


Fig. 5.18 Housing Types in Section (Diagram by Author)



Fig. 5.19 Interior of a Housing Unit (http://www.arcspace.com/architects/corbusier/mam/mam.html)



Fig. 5.20 Figures in Unite (http://www.arcspace.com/architects/corbusier/mam/mam.html)

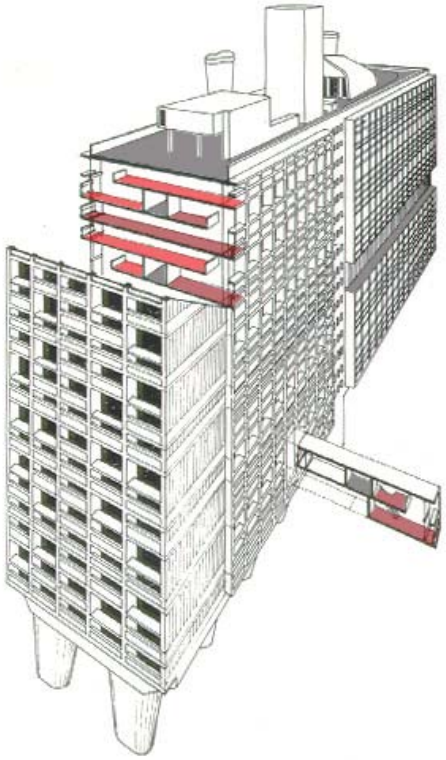


Fig. 5.21 Volumes (http://www.bwk.tue.nl/architectuur/dmw/group4/le%20corbusier%20unite.htm)

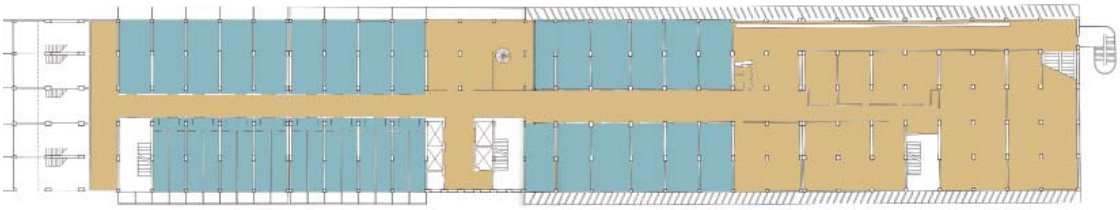


Fig. 5.22 Housing Units (Diagram by Author)

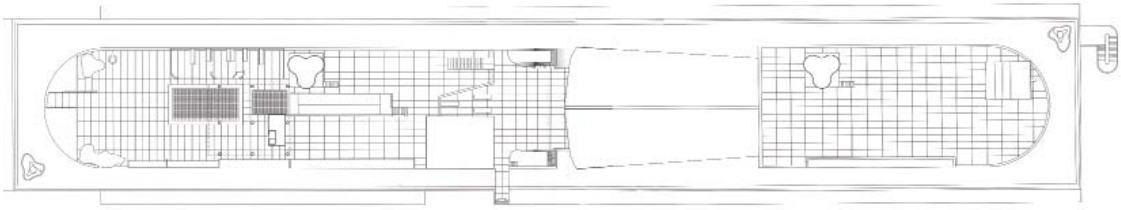


Fig. 5.23 Roof as the Public Space (*Le Corbusier Unite d'habitation, Marseille*, by Alban Janson & Carsten Krohn, 2007)



Fig. 6.1 the Location of China and Beijing (http://www.metafilter.com)



Fig. 6.2 the Geography of Beijing (http://www.urban-habitats.org/v01n01/beijing_full.html)

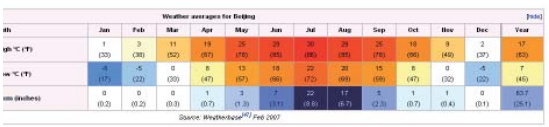


Fig. 6.3 Average Temperature of Beijing ('Weatherbase: Historical Weather for Beijing, China', Weatherbase, 2007)

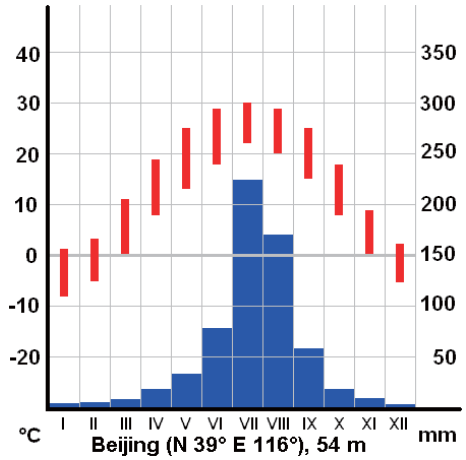


Fig. 6.4 Temperature and Rainfall of Beijing (http://www.bbc.co.uk/weather/world/city_guides/results.shtml)

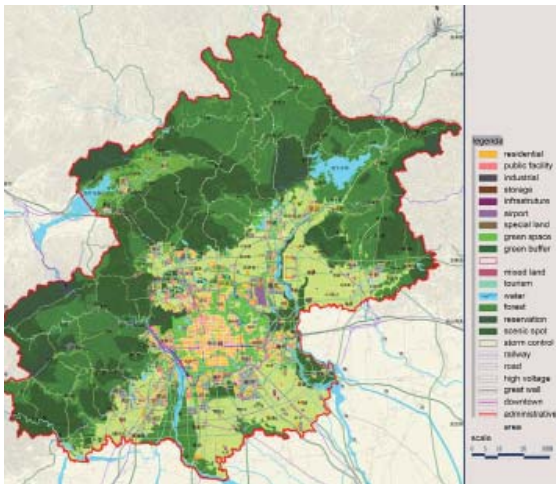


Fig. 6.5 Master Planning of Great Beijing Area (http://bjmsg.focus.cn/msgview/478/1/55253748.html)

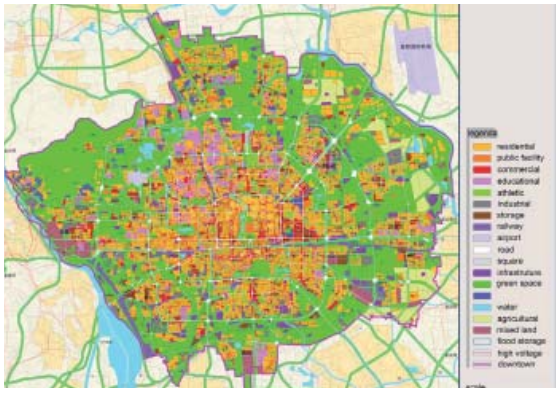


Fig. 6.6 Master Planning of Downtown Beijing(http://bjmsg.focus.cn/msgview/478/1/55253748.html)



Fig. 6.7 Traditional Architecture in Beijing (http://www.chinapictures.org)

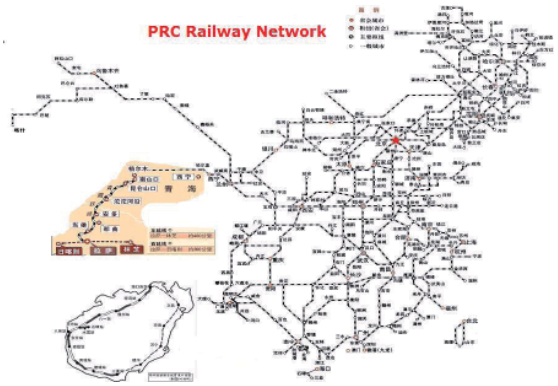


Fig. 6.10 China's Railway Network (http://www.meta-filter.com)



Fig. 6.8 Sino-Sov Architecture in Beijing (http://www.chinapictures.org)



Fig. 6.11 Beijing's Road System (http://www.randomwire.com/2008/04/05/beijing-2008-part-1-a-city-evolves/)



Fig. 6.9 Contemporary Architecture in Beijing (http://www.chinapictures.org)

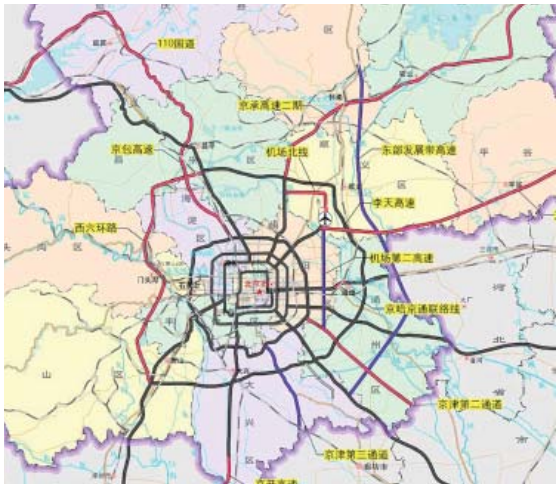


Fig. 6.12 Beijing's Freeway System (http://bjmsg.focus.cn/msgview/478/1/55253748.html)

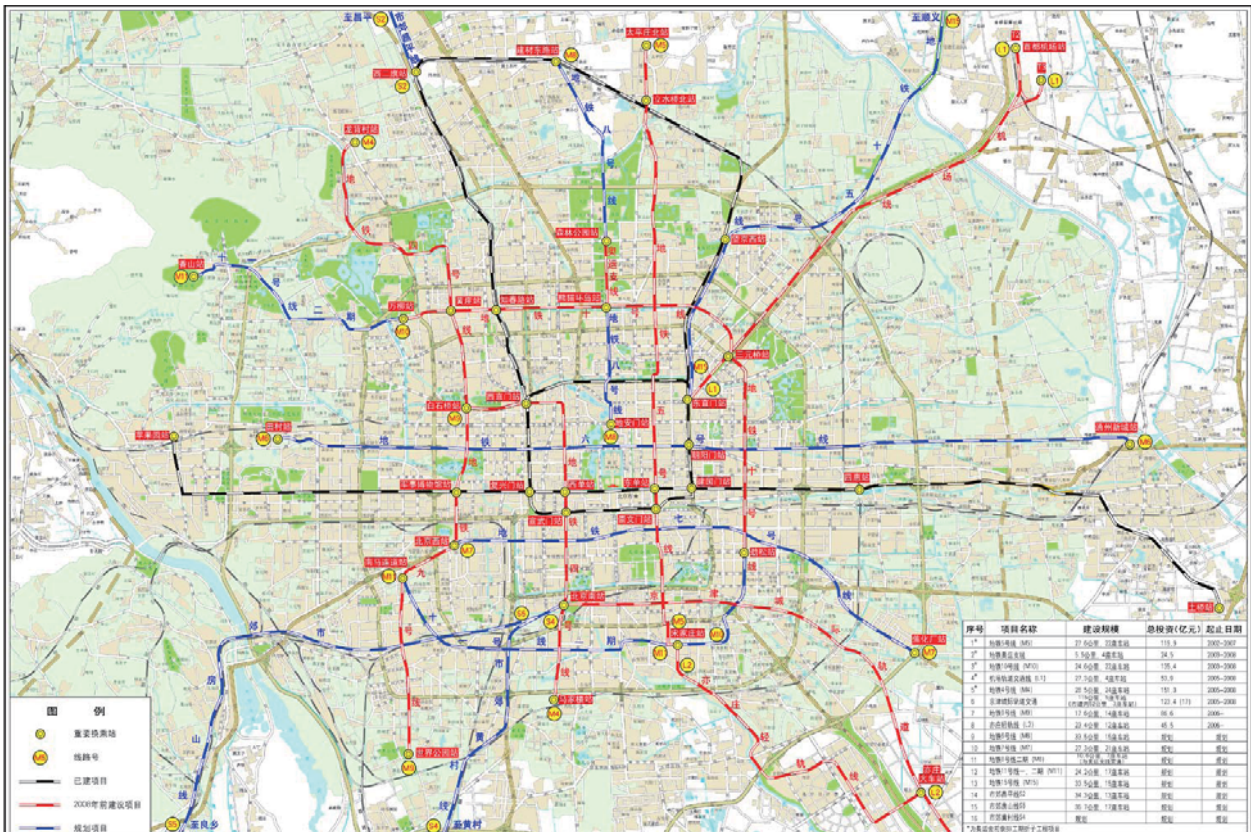


Fig. 6.13 Beijing's Subway System (http://www.randomwire.com/2008/04/05/beijing-2008-part-1-a-city-evolves/)

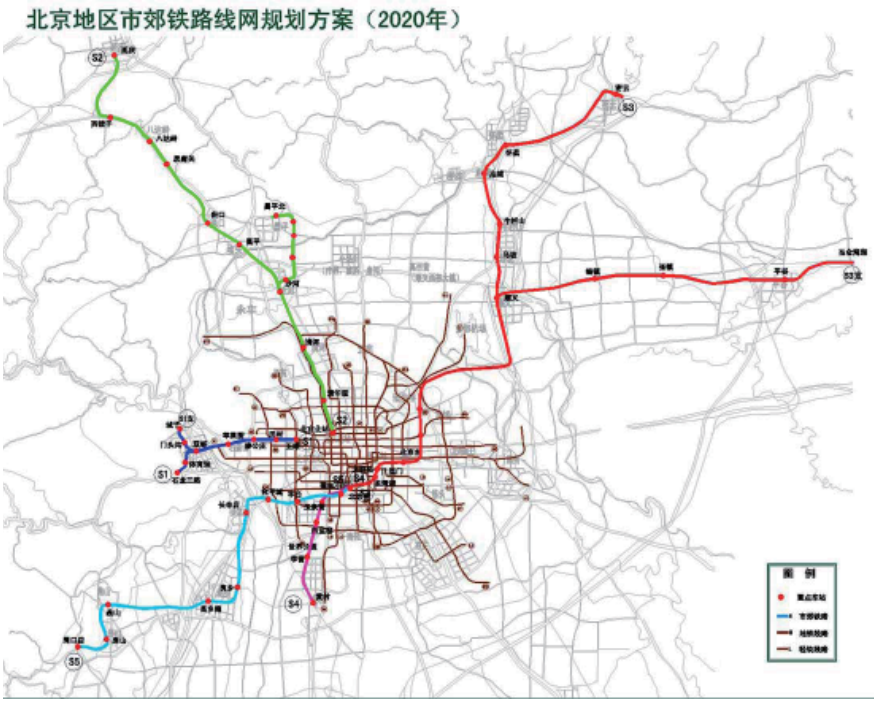


Fig. 6.14 Beijing's Railroad System (http://bjmsg.focus.cn/msgview/478/1/55253748.html)

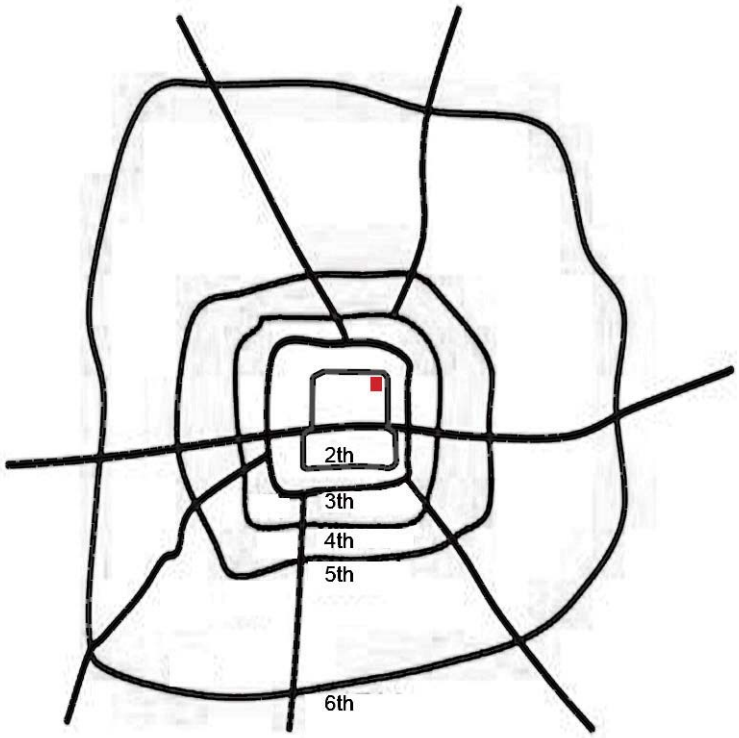


Fig. 6.15 Location of the Site in Beijing (Diagram by Author)

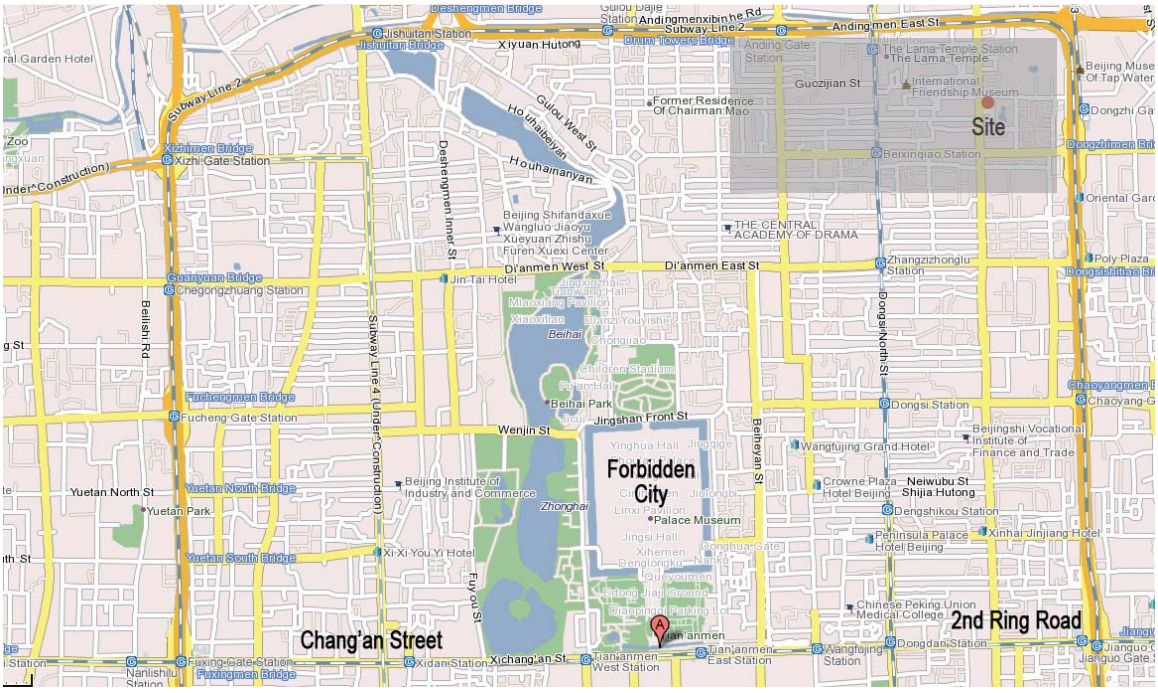


Fig. 6.16 Location of the Site in Downtown Beijing (Diagram by Author)

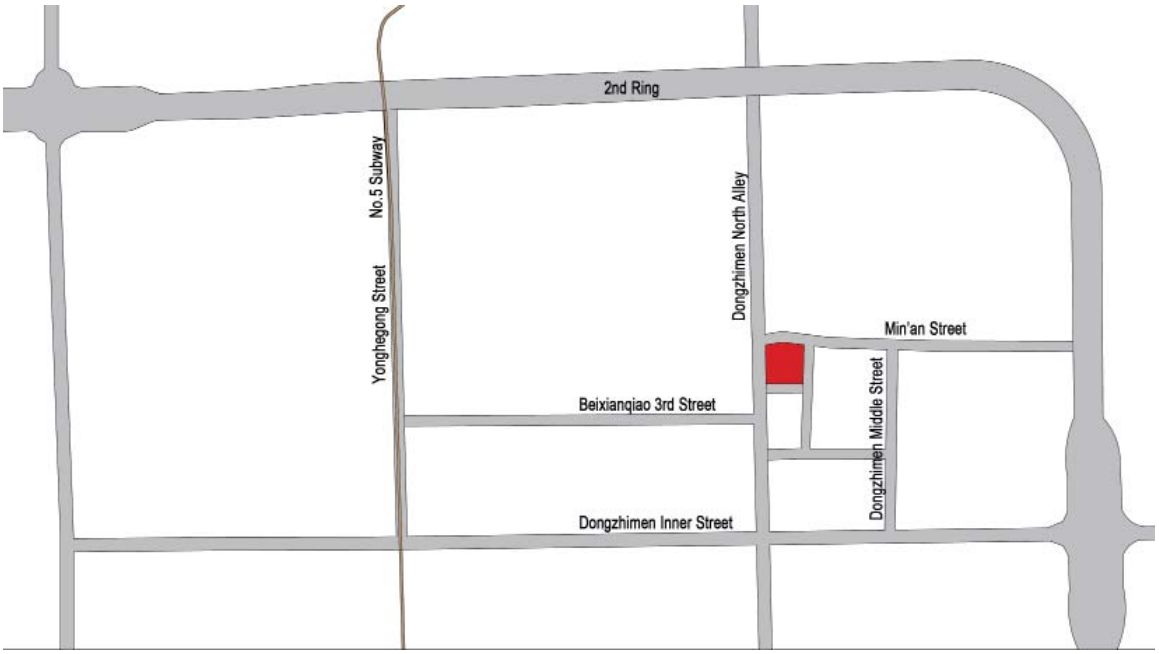


Fig. 6.17 Location of the Site in Dongcheng District (Diagram by Author)



Fig. 6.18 Programs around the Site (Diagram by Author)



Fig. 6.19 Natural Element around the Site (Diagram by Author)



Fig. 6.20 Cultural Element around the Site (Diagram by Author)



Fig. 6.21 Building Texture (Diagram by Author)



Fig. 6.22 Landmarks around the Site (Diagram by Author)



Fig. 6.23 Satellite Photo of the Site (Image Courtesy Google Maps)



Fig. 6.24 the High-rise Buildings' Facades (http://bj.city8.com/)



Fig. 6.25 the Low-rise Buildings' Facades (http://bj.city8.com/)





Fig. 6.26 View A (http://bj.city8.com/)





Fig. 6.27 View B (http://bj.city8.com/)





Fig. 6.28 View C (http://bj.city8.com/)





Fig. 6.29 View D (http://bj.city8.com/)



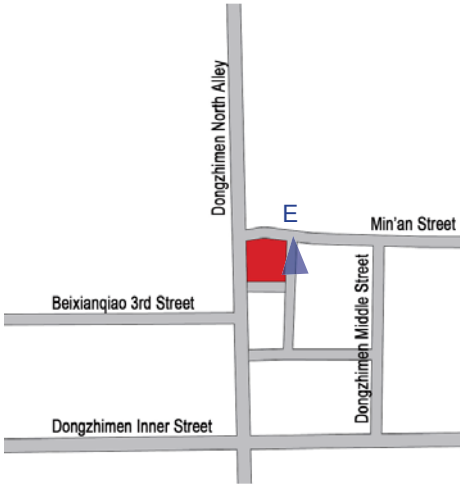


Fig. 6.30 View E (http://bj.city8.com/)





Fig. 6.31 View F (http://bj.city8.com/)

Vita

Chen Li was born and grew up in a city called Langfang in China. Before August 2007, she had been studying architecture in China for years. The move to the United States for graduate school was a deliberate move to understand architecture in a different culture. She is now pursuing the Master of Architecture in the University of Tennessee, Knoxville. Her husband, Yazhou Wang, is a PHD student in the College of Engineering in UT.