

Local Architectural Identities Within Modernization Context In Southern China


by
Lian Quan Zhen
Bachelor of Arts major in architecture
University of California at Berkeley
Berkeley, CA
June, 1992

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF ARCHITECTURE
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
FEBRUARY 1996


© LIAN QUAN ZHEN 1996. ALL RIGHT RESERVED.

The author hereby grants to M.I.T. permission
to reproduce and to distribute publicly paper and
electronic copies of this thesis document in whole or in part.

Signature of the author


Lian Quan Zhen, Department of Architecture
January 12, 1995

Certified by


Gary Hack
Professor of Urban Design

Accepted by


Ann Pendleton-Jullian

MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

Chairman, Department Committee on Graduate Students

MAR 20 1996

LIBRARIES

CONTENTS

ABSTRACT	3
CHAPTER ONE	4-8
Background.	
CHAPTER 2	9-16
Search for Local Architectural Identity.	
2-A: Vernacular Villages and Houses.	
2-B: The Overseas Chinese Houses and the Watchtowers.	
CHAPTER 3	17-21
New Perspectives.	
CHAPTER 4	22-23
Program.	
CHAPTER 5	24-25
Site.	
CHAPTER 6	26-30
Site Analysis.	
CHAPTER 7	31-40
Master Site Plan and Model.	
7-A. The Garden, Community Center and Kindergarten.	
7-B. The Formal Entrance and Exit.	
7-C. The Market and Parking Garage.	
CHAPTER 8	41-48
Prototype House.	
CHAPTER 9	49
Materials.	
CHAPTER 10	50-51
Conclusion.	
FOOTNOTES, BIBLIOGRAPHY & ILLUSTRATION CREDITS	52-55

Local Architectural Identities Within Modernization Context In Southern China

by Lian Quan Zhen

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE ON JANUARY 12, 1995 IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARCHITECTURE.

Abstract

In the processing of modernization, local architecture identities are diminishing in Kaiping, my home county in Canton Province, China. This thesis is searching for new architectural features that are based on the local climate, social rules, economic strength and modern technologies. New architecture identities should not be the rearrangement of Chinese architectural motifs. In contrast, they are the continuity of the essence of vernacular architecture and new spirits of modernization.

Western modernization in Kaiping brings in the so called "international architecture style." It dominates the county's planning and architectural design. It is no doubt that architectural design reflects the changing times, yet different cultures in different regions and environments are at various presents. Therefore, architecture design should not have only one solution.

Vernacular architecture in Kaiping County has its own characteristics such as the narrow alleys, small courtyards and watchtowers. They are not the same as the courtyard houses in Beijing, nor other regions in the world. Consequently, many factors that had influenced the local vernacular architecture have diminished or changed while the economic reform brings new perspectives in politics, social lives and family rules. Bridging the gap between the past and present in Kaiping's regional architecture is not as simple as copying other countries' architecture.

The project investigates the past, interprets the present and anticipates the near future of Kaiping County architecture. A 200 meter by 250 meter city block next to a vernacular village two miles from the Old County Town is the test site for this approach. It is a housing development project which focuses on the relationships between rural areas and urban, public and private, community and family and environment and inhabitants. Both a master plan and a prototype house will be emphasized in details to examine relevant issues that evoke new local architecture identities.

Thesis Supervisor:

Gary Hack

Title:

Professor of Urban Design

CHAPTER ONE

Background

According to Chinese authority's statistics, the rural constructions throughout the country in 1985 reached a total of 880 million square meters, with an average of 1.1 square meter per capita. The housing development is rapid, particularly in the coastal regions. For example, in Canton Province the average rate was higher, reaching 1.37 square meter per capita. ¹ Features of modern rural settlements are emerging in the suburban districts of various cities. Roads have been straightened and widened; buildings around the roads have been arranged in order; and agricultural fields have been turned into housing and building sites. ²

Urbanization is obvious in Kaiping County, located about 200 miles from Hong Kong. (fig.1 & 2)



Fig.1 Kaiping County location.

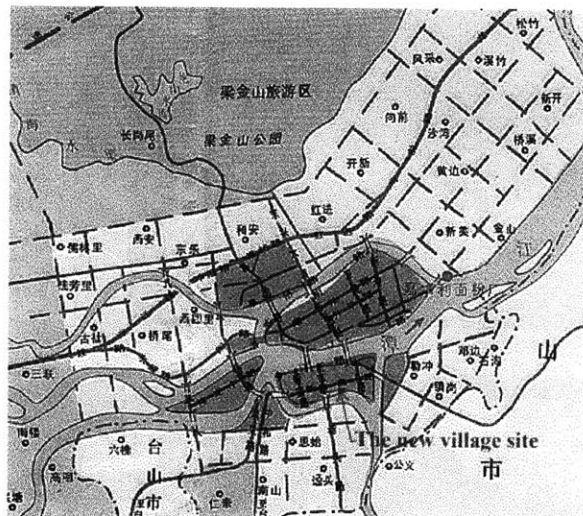


Fig. 2. Deep shape area is the present county town and the grid are is the projection of future development.

In a decade, the county town has expanded about five times more than its original size, becoming a city, and more development is projected. There are 0.6 million people in the county and 15 percent of them live in the town. It is common to see a whole modern city block being developed next to a traditional village in a very short time in the city area. Economical reform provides opportunities for the Chinese to explore and learn from western cultures without a lot of restrictions from the Chinese government. For example, Kaipingnese are able to watch Hong Kong TV freely. Many travel to Hong Kong and South East Asia. In addition, half a million Kaipingnese descendants settle in other countries. They have great influences on their relatives in the county. Western clothes, hair style and automobiles are popular in the County. (fig. 3 & 4)

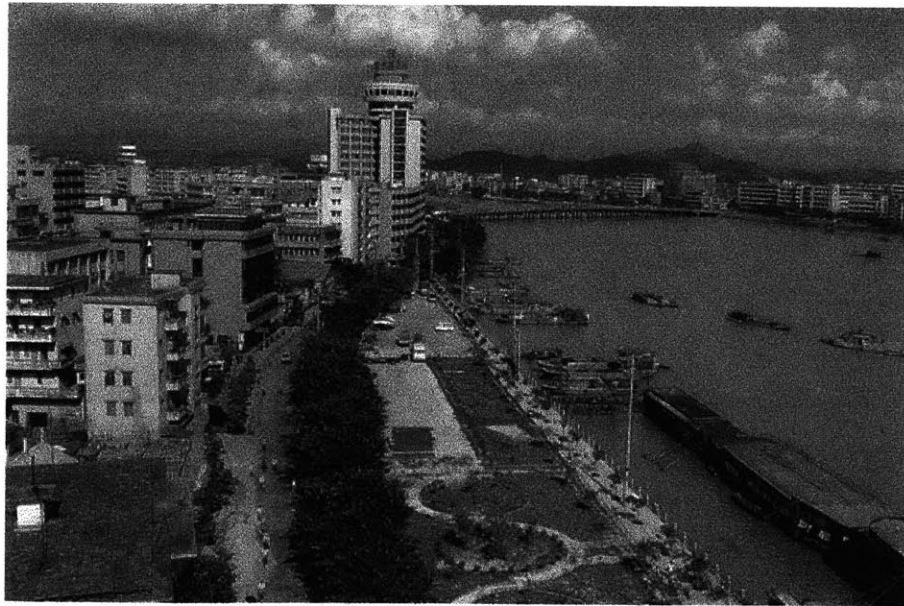


Fig. 3. An aerial view of Kaiping County Town.



Fig. 4. New housing development in the city.

During the last ten years, family income in the county increased ten times.³ With money sent from the overseas Kaipingnese, people in the county are able to build new houses. Some of them build their own houses by themselves, while the others hire local construction teams. There are very few architects' interventions because of the lack of professionally trained architects. People accept western architecture as easily as the jeans, tuxedos and western hair styles. For example, Figure 5 shows a few new houses built recently next to a village where I was born, two miles from the city center. They resemble some houses in California, but there are no courtyards in these houses like the vernacular houses have for lighting, ventilation and ritual events.⁴



Fig. 5. New built houses.

Similarly, some current mass-housing developments are out of local contexts in terms of climate and population density as well as a lack of regional architectural identity. The housing project in figure 6 is called Ching-Yell Garden in Kaiping City. It is an apartment complex with 4 thirty-story and 15 five-story apartments. There is a large open space in the center area. This design scheme reminds one of Le Corbusier's "Millions City," as well as many modern housing projects in western countries. In reality, this is not appropriate to the county. First of all, Kaiping County is about as large an area as Hong Kong and Macao combined, but it only has one tenth of the population of Hong Kong, concentrated mostly in rural areas.⁵ This housing scheme is for higher population density development, not for a city that only has 100,000 people. In fact, 10,000 newly-built apartment units are over supply there. Secondly, Kaiping is located just below the Tropic of Cancer. Hot and humid weather lasts six months out of the year. Therefore, the huge open space in the center, without adequate trees and shading devices such as the arcades in the old town, is uncomfortable for residents to use during the summer, and finally, there are a lack of nicely defined, semi-public spaces that would be the most useful for children. Similar situations are evident in other housing projects. (fig. 7)

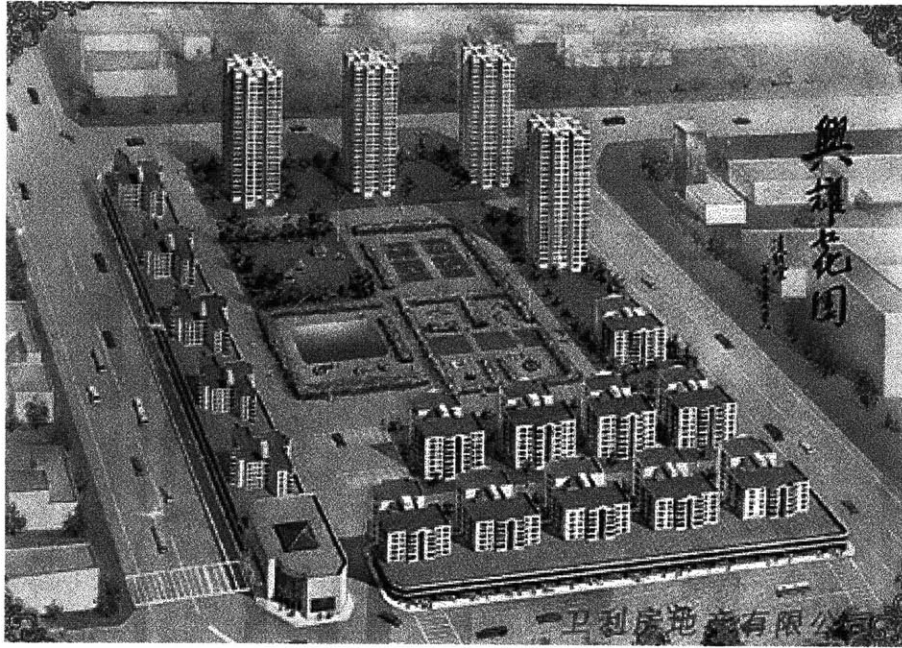


Fig. 6. Ching-Yell Garden.



Fig. 7. Housing projects in the city.

CHAPTER TWO

Searching for Local Architectural Identity

2-A: Vernacular Village and House

What is appropriate housing design for Kaiping County in rapid urbanization is not a simple question. By examining vernacular villages and houses in the county, one can get an idea why local architectural identities emerged, and what should be considered in new development. Starting from Tong Dynasty about 1200 years ago, some northern Chinese migrated to the south. The ancestors of Kaipingnese were among them. When they settled down in Kaiping area, they built their houses together with brothers and relatives. Houses in a village were based on one prototype house, and uniformly built, because it was a symbol of unity and loyalty to a large family. ⁶ A village began with a few houses. After several generations, the small settlement became a big village. When the agricultural land surrounding the village could no longer support the population, a group of young men moved out not far away to start a new village. As generations passed by, many villages were established and together formed a “Shir”, a social structure as a community, led by respected seniors. Usually, there is only one last name for all its members. Each Shir has an elementary school and a big family ritual hall that is located near the center of all the villages. Many different Shir form a county.

The Kaipingnese ancestors modified village plans and courtyard houses that they had carried from the north to adapt to the new environment. The plan in figure 8 depicts a common village in Kaiping. Its main alleys are oriented on the south-east toward north-west axis. ⁸ Houses are very close to each other, especially in east-west direction. The major alleys are about seven feet wide, parallel to the wind direction in summer. In the front of the village, there is a fish pond, and in some cases a stream or a river. During the

summer, winds blow from the south-west passing on the surface of the water into the shaded alleys. Even though there is no wind outside of the village, temperature and pressure differences between the narrow alleys and earth surface, indoor and outdoor areas, and rooms and courtyards still create breeze. In addition, the shaded alleys are not only for moving through, but also for villagers to congregate in. At lunch and dinner time, villagers sit on the steps in front of their doors in the alleys. While they are eating, they talk to each other about their children, farming works and share other topics of everyday life. (fig. 9)

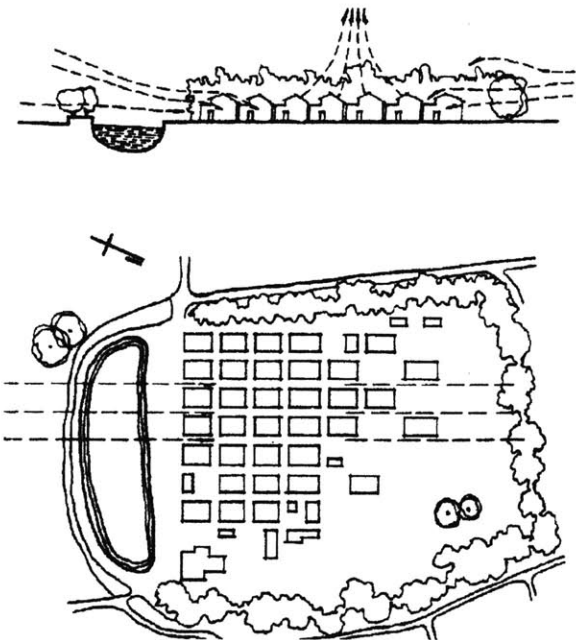


Fig. 8. A vernacular village plan.



Fig. 9. An alley in my old village.

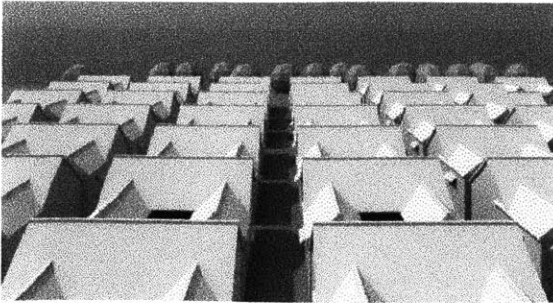


Fig. 10. Shadow on the alleys at 5 p.m., 22, May.

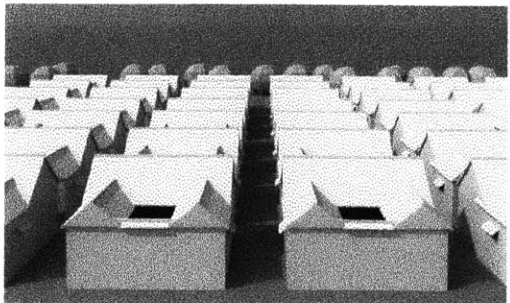


Fig. 11. Shadow on the alleys at 5 p.m., 22, September.

Two computer simulations on the alley's daylight in a traditional village indicates the alleys are in shade during the summer afternoons. (fig. 10 &11)

In addition to alleys, there are two other social gathering places in a village. They are underneath the big tropical trees located on both east and west sides toward the front of the village. The two trees and gates indicate entrance and exit of the village. In afternoon and evening, villagers gather underneath the trees informally: while the adults are having conversations, playing Chinese Chess and smoking, the kids run around chasing each other. Sometimes the trees became sacred as an altar and, the villagers claim the trees as their protectors.(fig. 12)



Fig. 12 The entrance gate and the big tree of my old village.
Another tree on the left near the bottom indicates the exit.

Besides the thoughtful layout for traditional villages, vernacular houses have their own characteristics. Figure 13 is a typical rural house plan from Kaiping Country. It is a small version of the courtyard house due to the limitation of agricultural land and fast-growing population. The house is organized in three rectangular parts. The center part has a

family room and a courtyard that is much smaller than the courtyards in northern China. The other two parts on both left and right are bedrooms, dining rooms and kitchens. The house has two entrances that are located at the dining rooms. A stove and a dining table are the first things to appear when one enters the house. Historically, the contribution of agricultural lands was unequal, so that food was a major issue in everyday life. The plan layout of the house allowed one entering the doors to see a cooking stove and a table with food that indicated the luck and happiness of a family.

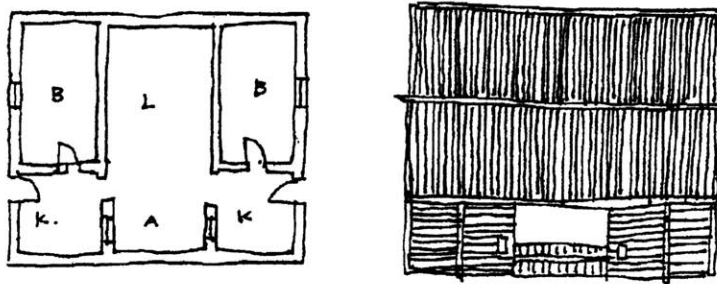


Fig. 13. Typical vernacular house floor and roof plan from Kaiping.

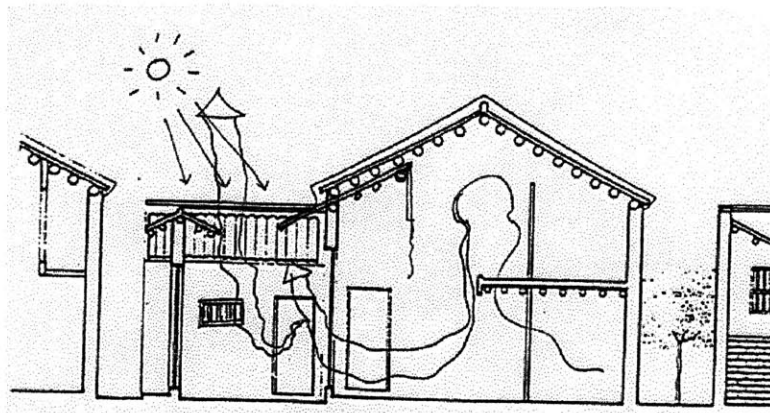


Fig. 14. This diagram indicates the wind circulating from the alley to the house.

Social activities such as gathering, weddings and funerals take place in the center part, the living room. Obviously, the house is small for a big family when the children grow up. After the eldest son married, he and his wife and children then live in one side

occupying one bedroom and one dining room with a kitchen, while his parents live on the other side. They share the family room. In case of having several brothers, a family will add on more similar space as this to house them. The small courtyard opens to the sky for lighting, ventilation, and offering sacrifice to heaven spirits. It can be closed when it rains. During the summer, winds blow from the alleys through the entrance door and into the houses, then come out from the courtyard. This natural ventilation and cooling method creates a comfortable living environment. 9 (Fig. 14)

2-B: The Overseas Chinese House and the Watchtowers

During last 150 years, many Kaipingnese migrated to western countries and South Asia. They are called Overseas Chinese. Some of them made their fortunes in the countries where they settled. 10 They either returned, or sent money back to Kaiping to build new houses and buildings. The architectural design of these houses and buildings was the combination of architectural features from both the Chinese and the countries to which they migrated. It was a vernacular interpretation of a different cultures' architecture. Nevertheless, it has created special architectural forms that are found only in the Kaiping region in China. (fig. 15)



Fig. 15. Leeyan, a house and garden in Kaiping County.

One typical example is the Overseas Chinese house. Their plans are based on the vernacular houses. Figure 16 is a common one. It is 10 x 10.6 meters in two levels.

Similar to the traditional houses, it is organized into three parts. The center part is a family room with an atrium, a smaller version of the courtyard. The other two parts are the kitchen and bedrooms. A stair at the back side of the family room connects two floors. On the second floor above the atrium area, there is a terrace with openings on its wall. These openings allow sun light to shine into the house through the atrium. There are large windows on the wall that separates the second floor and the terrace. They open or close according to weather conditions. Their main function is to bring light and wind into the inner part of the house.

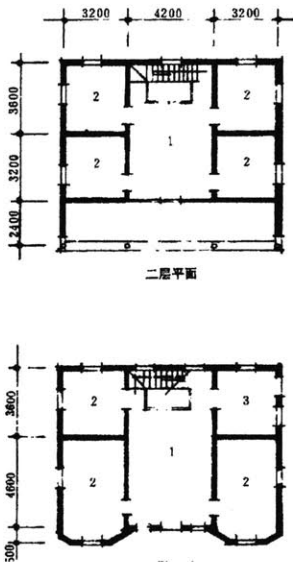


Fig. 16. An Overseas Chinese House plan.



Fig. 17 An Overseas Chinese Village.

Similar to many houses in vernacular villages, many Overseas Chinese houses were built uniformly to form a village. These villages are referred to as an Overseas Chinese Village. Figure 17 shows an Overseas Chinese Village with a Watchtower at the end. The houses are lined up in front of this village.

Another example of western architectural influences in Kaiping area is the Watchtowers. These towers are in plane area around the city.(fig. 18 & 19) Their original purpose was

to forestall armed robbers breaking into the villages. People armed themselves to guard their villages during the night, inside of Watchtowers. Obviously, the architectural forms of the Watchtowers are heavily borrowed from western architecture. They are 4-6 floor reinforced concrete buildings with square plans. Due to the defense reason, smaller windows are arranged on the bottom floors and larger on the upper floors. Roofs are in a



Fig. 18. Watchtower.

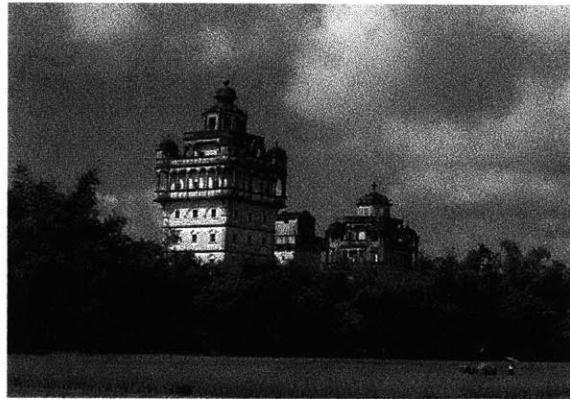


Fig. 19. Three Watchtowers.

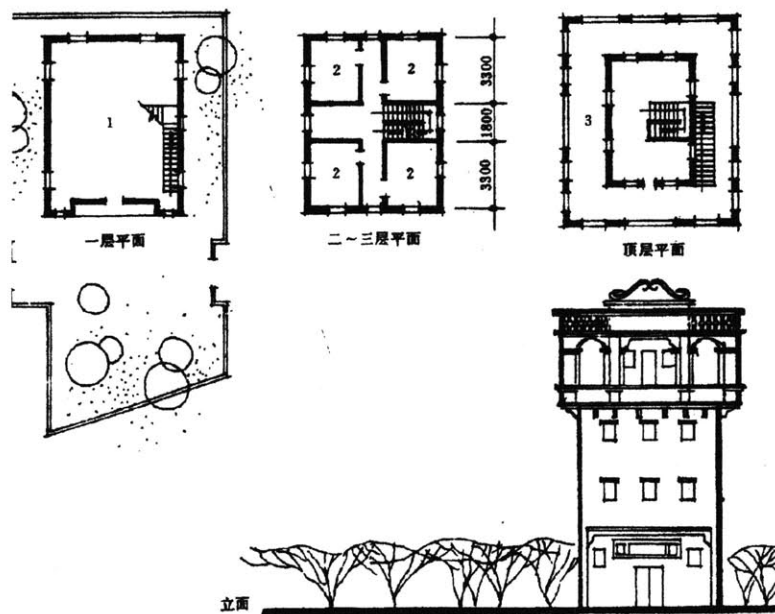


Fig. 20. Plans and elevation of a Watchtower.

variety of shapes from flat to dome and pitch. In some cases, there are smaller corner rooms with gun fighting windows.(fig. 20) These towers mimic the fortress structures and architecture of Mediterranean countries. They did not only serve their functions well, but also provided special architectural characteristics to these villages.

Along with the two big tropical trees at the entrances and exits of villages in Kaiping County, the watch towers are marks of villages from a far distance. ¹¹ After 1949 when the Communists took over the country, there was no need to guard the villages. Consequently many Watchtowers have been turned into storage buildings or houses. In 1990, Kaiping County officially announced the watchtowers to be important historical local architecture. ¹²

CHAPTER 3

New Perspectives

When the town is expanding into a city, each village that has been included in the city planning becomes a city block. Urbanization brings us many questions, such as how to accommodate bicycle and automobile traffic? what type of new houses will be sophisticated for residents and adequate for a growing population? how can open spaces be redefined, and what will be needed to create new communities? There should be answers to these in city planning and architecture design.

Obviously, traditional villages were not planned for motorcycles and cars because no one owned such automobiles. Now many people ride motorcycles instead of bicycles, and only a few are able to own cars. A lot of motorcycle owners used their vehicles as caps taking customers. Most companies own trucks, vans and cars. This greatly changes the road patterns: they are wider, straighter and in various size. In addition, the population has grown three to four times in the last half century. As a result, there is great demand for new, sophisticated houses. This brings mass-housing projects that are designed and constructed by local developers or those in Hong Kong. Some of these projects are the size of a city block. Ching-Yell Garden, the one which was mentioned in Chapter 2, is an example. They are very different from the way vernacular villages were built. On one hand, building villages were the works of brothers and relatives.¹³ On the other, the housing projects' finance, design, construction and sale involve many different people.

When people move into these housing projects, they do not know their neighbors. The close relationship that they experienced in traditional villages has vanished. They cannot communicate with each other as easily, because the new housing designs discourage

communication between individuals and families. For instance, there may be front yards but there are no small open spaces that can be shared between several families. An alley in vernacular villages links families together, while a monster boulevard is separates individuals. (fig. 21)



Fig. 21. New city block in the city.

Changing within family structure are also obvious. Traditionally, the concept of a large family living together was highly valued. In a three or four generation family, the oldest generation had the most power, from finance to politics, over the younger. This is no longer the case in many families in the county. Young people, including women, have more education, and are able to be financially independent from their parents. When they get married, they want to raise their families without too much interference from their parents. On the other hand, seniors have more activities to enjoy, such as doing exercises, joining painting and calligraphy classes, and watching television and movies. They want more time for themselves, besides taking care of grandchildren and preparing meals, the jobs they spent most of their time on before. Fortunately, the tradition of looking after older parents remains strong. ¹⁴

Open spaces in villages are different from open spaces in the city. They are located at the perimeters, especially in front of vernacular villages. For example, the spaces at both formal entrance and exit areas are for gathering, social and spiritual events. They have altars, trees, gates and stone benches. These open spaces are neither formally designed, nor well tended. (fig. 22 & 23)

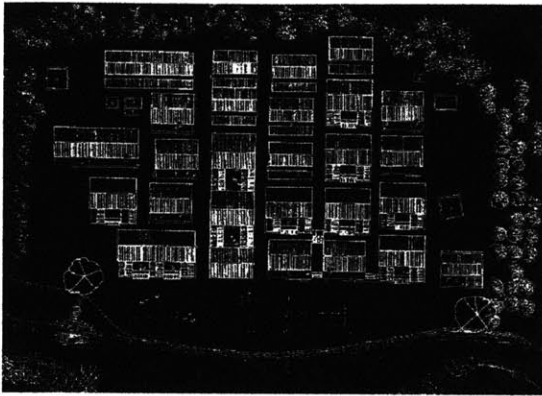


Fig. 22. A typical village plan. Two big trees on both east and west indicate formal entrance and exit. Spaces underneath them are for villagers to gather together.

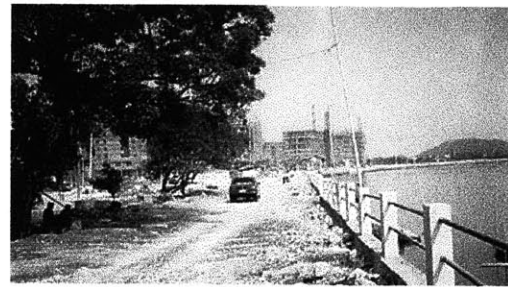


Fig. 23. Several villagers are sitting under the big tree in the exit of my old village. Tonjang River is on the right.

In contrast, public gardens in Kaiping City are places for people to gather together. These gardens are traditionally designed. (fig. 24 & 25)



Fig. 24. A riverfront view from the city.



Fig. 25. A garden in the city.

They feature Chinese pavilions, small bridges, ponds, lakes, miniature mountains and curve stone paved paths. Wherever one turns on a path, one has another nice view. Even though open spaces are different in many ways between villages and the city, they have one thing in common. They do not express man's power, but rather emphasize the harmony between man and nature. Housing projects in the city usually have open spaces near the center, but are not as well-thought out as the city gardens. The garden and swimming pool space in the Ching-Yell Garden project in Chapter One is a typical example.

Great changes also happen on a smaller scale. The village where I was born and raised is a good example. When I left China ten years ago, it had about 30 families and each family owned one or two vernacular houses. Villagers were farmers. The natural setting was beautiful. A line of 200-years-old tropical trees grew about 20 meters in front of first roll houses. They expanded their branches and roots into the Tunjang River. On the left side of the village, there was a small spring that separated the village and the rice field. In addition, there were two fish ponds on both the right and rear sides. (fig. 26)



Fig. 26. This picture depicts the trees in front of my village 10 years ago.



Fig. 27. This is the present view. The trees are cut down in order to build this river front boulevard, the Sheening Road.

Today, my neighbors are no longer working on the rice field. They are either employees in factories and stores, or self-employed as small businessman. Most of them have renovated their traditional homes. Some have built new houses. One even constructed a

six-story building as house and office. The spring is land fill, changing into a street. Those two-hundred-year old trees were cut down in order to build a “modern” river front, the Sheening Road. (Fig. 27) Job hunters from other areas of Kaiping County and outside Canton provinces are settling down in Kaiping City, renting houses from local people.

Kaiping City planning and housing development, consequently, cast in a new perspective. They should adapt logic from traditional planning and development while focusing on the present situations and projecting for future needs. Besides climatically sensitive vernacular architecture, the change of social structures, a rapid growing population, automobile traffic and economic strength will be stressed in this thesis’ project. Hopefully, it will create new local architectural identities.

CHAPTER 4

Program

It is important to note that this thesis is not searching for symbols of local architectural identities such as what is depicted in figures 28, 29, and 30. ¹⁵ On the contrary, it is searching for what is suitable to the present and the near future of Kaiping City planning and housing development.

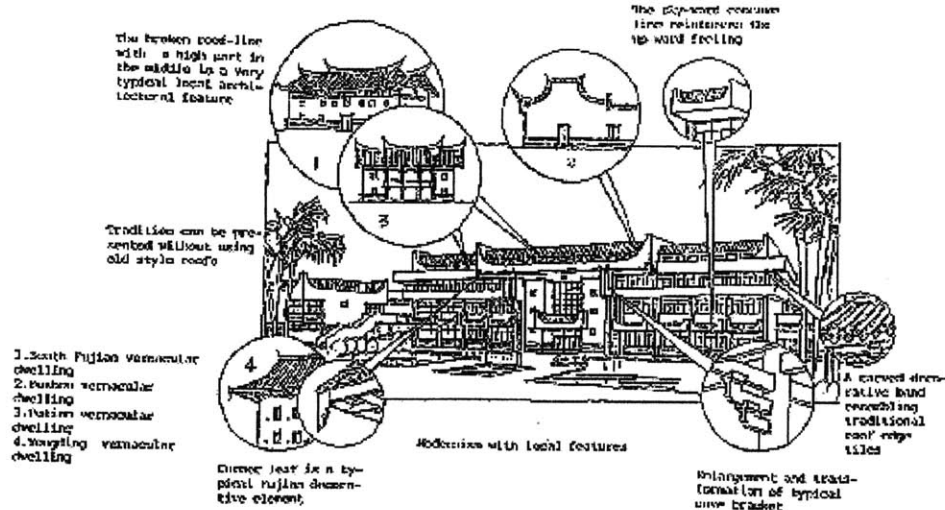


Fig. 28. "Presenting Local Features in New Architecture" by a senior architect in China.

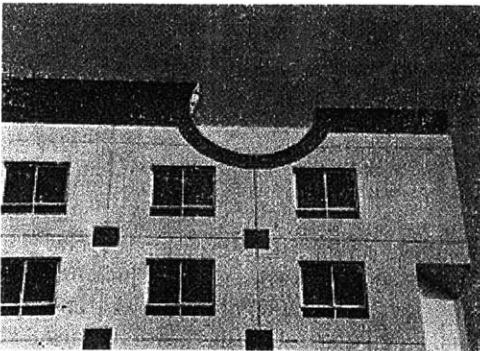


Fig. 29. A project by the same architect above.



Fig. 30. A project in Kaiping City.

The thesis project seeks to develop a housing scheme occupying a full city block, similar to the size of a typical village. It is assumed to be similar to one of the housing projects from developers. The program will include the following:

1. Develop an 200 x 250 meter city block for housing with mixed-use buildings at perimeters. Its FAR (floor area ratio) is 2, compare to 0.4, the FAR of the village next to the site.
2. One garden located near the center of the block connecting to a kindergarten and a community center.
3. Streets are for local traffic.
4. Bicycle, motorcycle and car parking are provided.
5. Mixed-use buildings are at the perimeters of the block, with arcades on the ground floor.
6. Formal entrance and exit are on east and west sides.
7. A market, with both indoor and outdoor areas combined with a parking garage, is near the perimeters of the block.
8. There are three hundred family units, including studios. This is five times more units than the village. Each family has 2-4 members.
9. Apartment size is about 80-100 square meters, and studios are about 30 square meters.
All studios are on ground floor.
10. The apartments are not higher than four floors.
11. Smaller open spaces, such as courtyards, are shared between families.

CHAPTER 5

The Site

The site is located next to the village where I grew up, two miles from the old town. Originally, it was part of a big rice field. During the last decade, the rice field was sold in parcels for real estate development, since this area is included in the city planning. Land owners are building office buildings, houses and mixed-used buildings. This lot is 200x250 meters, and is level. There are two major boulevards on both the south and north. The one on the south, is named Sheening Road. It is 25 meters wide, next to the Tonjinang River. The one on the north, named Sinchung Road, is 20 meters wide. In addition, there are two smaller streets on both the east and west, each 15 meters wide. These roads are newly planned and still under construction. Tonjiang River is a fresh water river. It is about one hundred meters wide. (fig. 31)

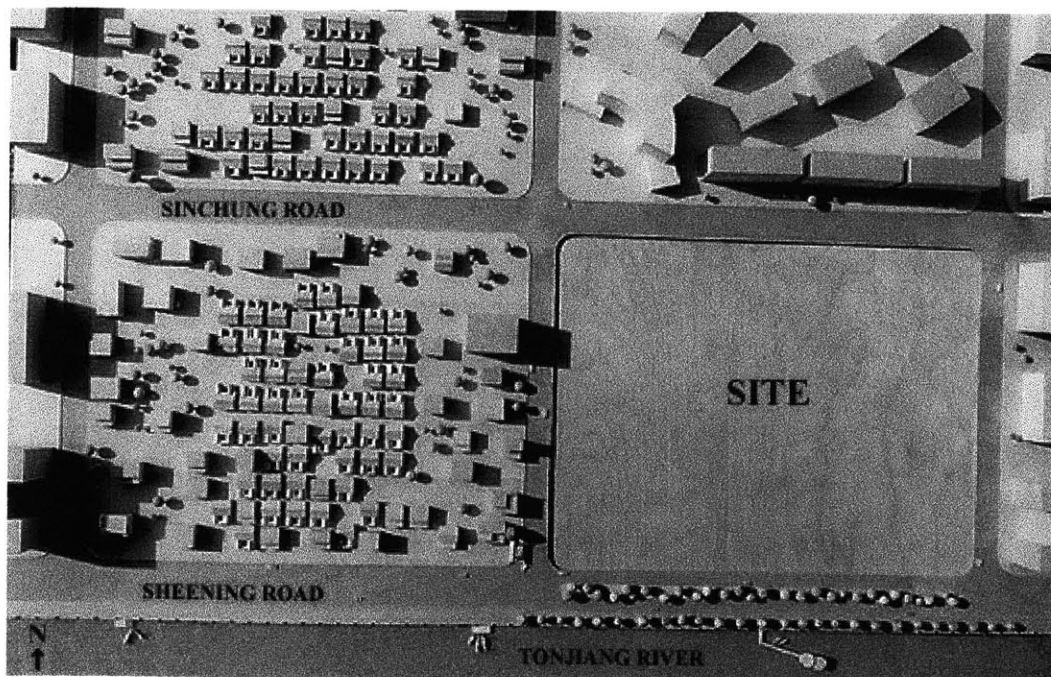


Fig. 31. The site.

Kaiping County is just below the Tropic of Cancer. It has a long summer season, from May to early December. During this period, the average temperature is 80 to 100 degrees Fahrenheit. The hottest months are July, August and September. In addition, it is humid and moist. Ground water level is about one meter below earth surface. It was common for people to dig wells to obtain water before the city water supply system extended into the villages fifteen years ago.

CHAPTER 6

Site Analysis

The Kaiping City plan is arranged with a grid system for major boulevards and streets. It seems reasonable to follow it when planning this city block. However, after I carefully analyzed the village and the site, I found that there is another way to arrange the streets that is more logical according to the local climate. It will form special street patterns, attractive spaces and interesting buildings.

First of all, it is important to investigate the planning of the village next to the site. (fig. 31)



Fig. 31. The village next to the site.

This village is facing true south, the same as the site. Its alleys are two meters wide, and run from south to north. This layout allows the alleys to catch shadows during summer afternoons, and to carry winds that blow from south-east to north-west. In addition, every

family's entrance door is facing the alleys. People believe that evil is from the north, death is on the west, happiness is in the south and life comes from the east. As a result, they avoid north entrances, and always build or use other houses' walls in front of their west facing doors.

Secondly, I studied the profile angle and bearing of the sun from July to September. The result shows that if I move the streets from facing truth south, as the village does, to 20 degrees toward east, I will almost eliminate sunlight shining into south-facing windows and doors. It means that the heat gain from direct sunshine is reduced. At the same time, the streets and alleys are still primarily facing south. (fig. 32) In fact, some villages in Kaiping County are organized in this manner. Figure 8 in Chapter Two is an example.

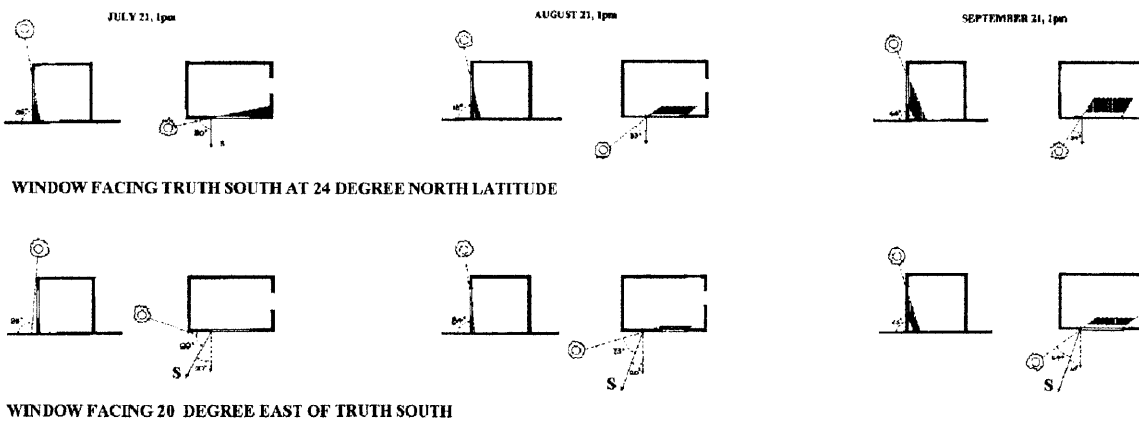


Fig. 32. Study on profile angle and bearing of the sun from July to September.

Comprehensively, there should be streets that will accommodate the moving traffic for cars, motorcycles and bikes, while the alleys are mainly for pedestrians and wind movement. How wide and what shape will the streets and alleys should be? They should not be the same as the streets in Boston or New York, because the differences in climate and traffic conditions. In this project's site planning, pedestrians, bicycles and

motorcycles are major factors in comparison to cars at the present time. In the near future, cars will take over most of the traffic, such as what happened in cities in Taiwan. Streets and alleys should suit the current situation, yet prepare for the near future that may come as soon as 20 years (the time it took Taiwan to be in its present traffic situation was about 20 years).

The streets on the site, is finally layout with 12 meters in width from curb to curb: two meters for bicycles, another two meter for planting island and the rest of eight meters for cars and motorcycles. (fig. 33 and 34) Cars and motorcycles can park on one side.

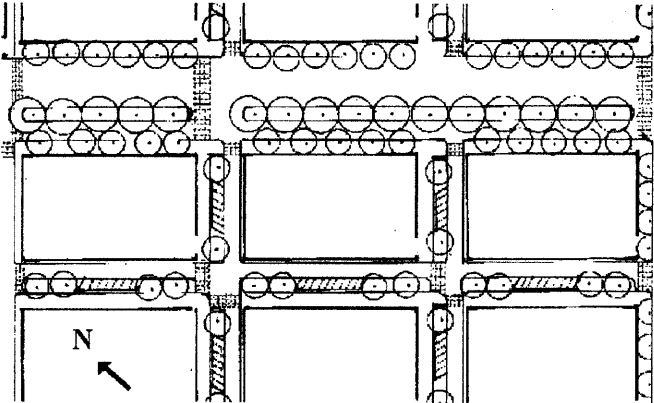


Fig. 33. Typical street and alley plan.



Fig. 34. Typical street section.

Pedestrian sidewalks are two meters wide on both the west and north sides and one and half meters wide on east and south. Residents are encouraged to walk primarily on the west side, under shadows created by buildings, and on the north side, protected by the trees. Bicycle lanes are next to sidewalks on both the west and north side of the streets, so that bike riders are in shadow most of the time. This arrangement is similar for all streets, except the one on east side of the garden, because it is meant to give special order to this center part of the community.

Second to the major streets, there are alleys which are six meters wide. Two meters are for sidewalks located on both the north and west sides, like the order in streets. Pedestrians walking on these sidewalks are shaded by buildings and trees. It is also convenient for them to enter southern-facing entrances of each building from the north sidewalk. Next to the pedestrian sidewalk is a two-meter planting island. It has bicycle and motorcycle parking spaces. The rest of the two meters is a traffic lane for motorcycles and bicycles. (fig. 35) This idea of setting bicycle riders apart from cars and motorcycles on streets and separating the pedestrians from motorcycles and bikes in alleys provides maximum safety to the residents.

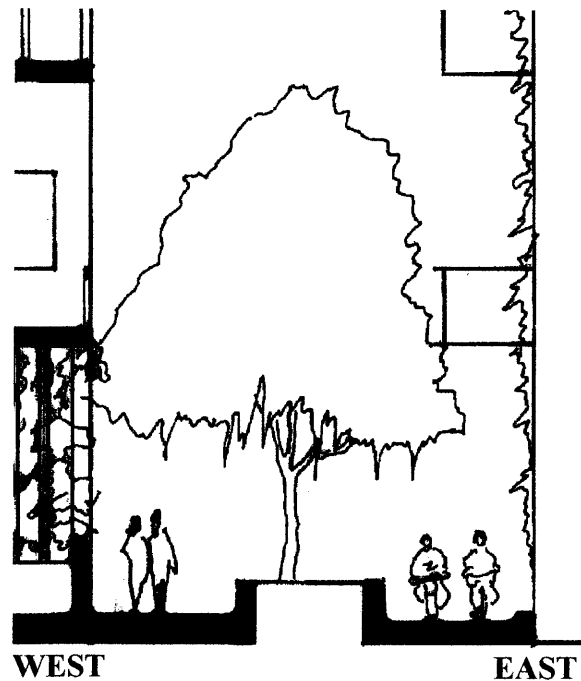


Fig. 35. A typical alley section.

While streets and alleys are getting their shapes, I keep the plan of the prototype house in mind. It is essential to take the benefits from the traditional houses, the courtyard being one of them. Since higher density development than vernacular villages occurs on the site, every family cannot have its own courtyard as families did in the vernacular houses. However, one big courtyard can be shared by the families in the same building, and the

original idea of a courtyard for lighting, ventilation and offering sacrifices to heaven spirits will remain in prototype house.

What is the size of a prototype house? A typical traditional house is about 10 meters by 12 meters, including the courtyard. It houses one to two families. If FAR is 2, the density will be five times greater than the village. That means in the same plan, there are 10 families. In this situation, the courtyard is too small. If it is bigger, it will not only serve what has been mentioned above, but also allows space for kids to play and adults to socialize. Finally, I laid out a 16 meter by 25 meter plan for the prototype house. It has a 4 by 5 meter courtyard in the center, toward the west side. Each houses eleven families. Its entrance is on south, the most preferred entrance side in Chinese houses. A detailed discussion of the prototype house is found in Chapter Eight.

CHAPTER 7

Master Site Plan and Site Model

From the previous analysis, the master site plan has been laid out. The whole site is treated as a large house having a garden as a courtyard near the center. Streets and alleys are in a grid pattern, yet 20 degrees from true south to east. (fig. 36)

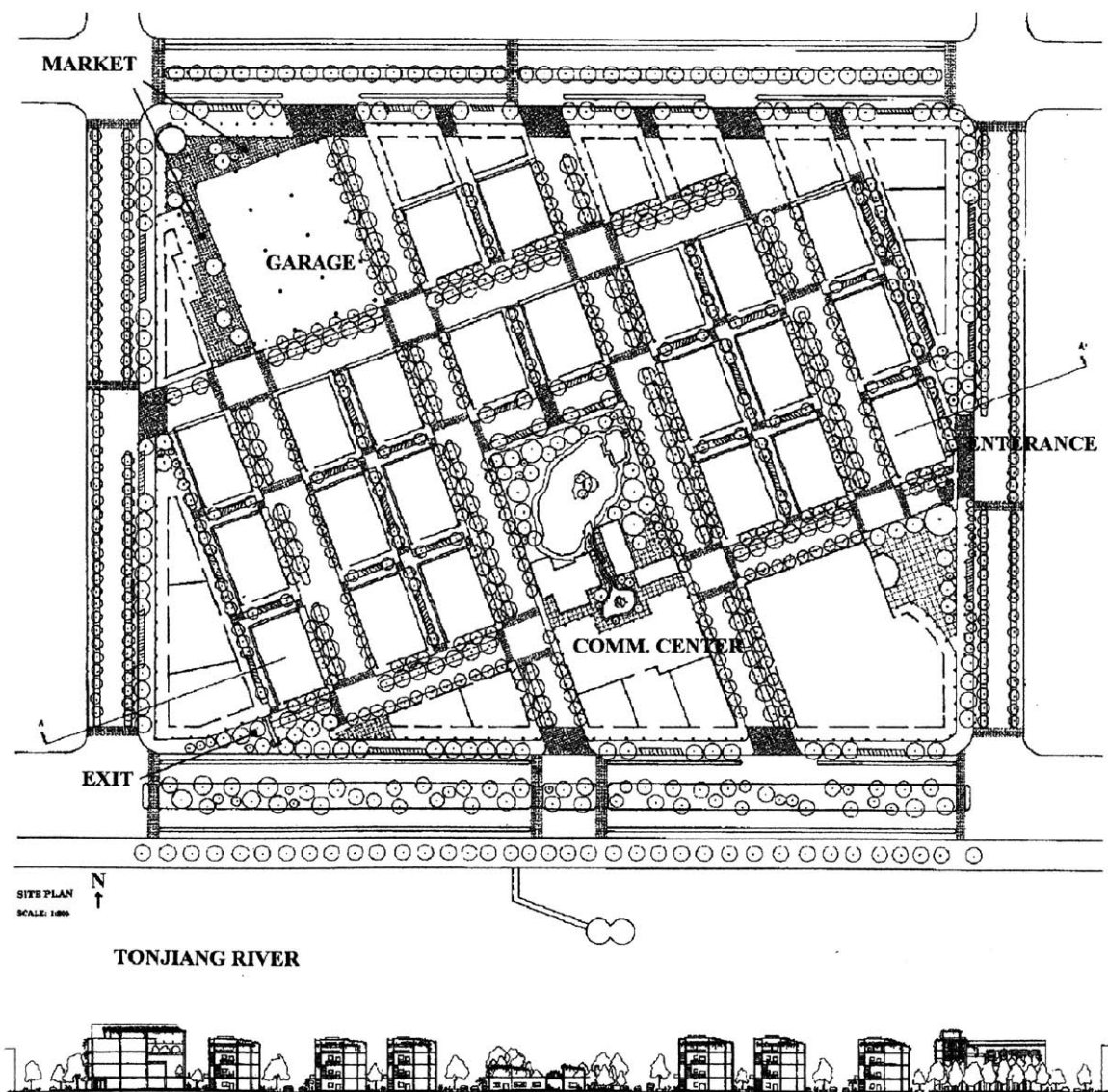


Fig. 36. Site plan, and section.

There are three entrances and three exits for cars. Both formal entrance and exit are located at the east and west sides, on the same street which is closed to traffic at the community center area. A market with indoor and outdoor areas is combined with a parking garage. They are situated at the north-west corner, receiving shoppers from within in the block and outside. All buildings on the perimeters are mixed-use: commercial zones on ground floors and residential zones on upper floors. The kindergarten and community center are next to the garden toward south. A fountain and a small stream link them together. Cars can park on one side of the streets while motorcycles and bikes have special parking areas on the streets and alleys. The streets and alleys are meant to serve local traffic. (fig. 37)

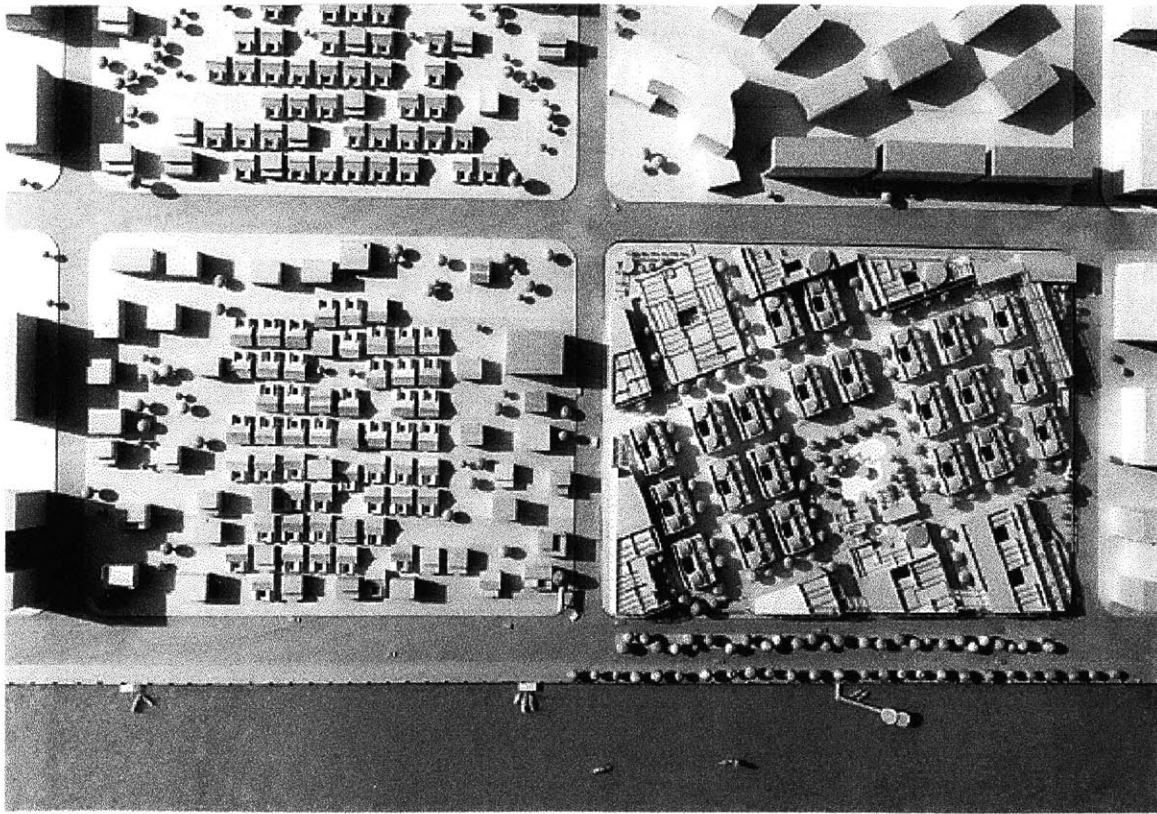


Fig. 37. Site model shows afternoon shading condition.

During summer afternoons, the alleys and west sides of the streets are shaded by both buildings and trees, while the north sides of the streets are under tree shadows. (fig 38) Winds move through the site from south-east to north-west, parallel with those streets and alleys that face 20 degree east of true south. Moreover, due to the temperature and air pressure differences between streets, alleys and courtyards, winds will flow into apartments and studios. (fig. 39)

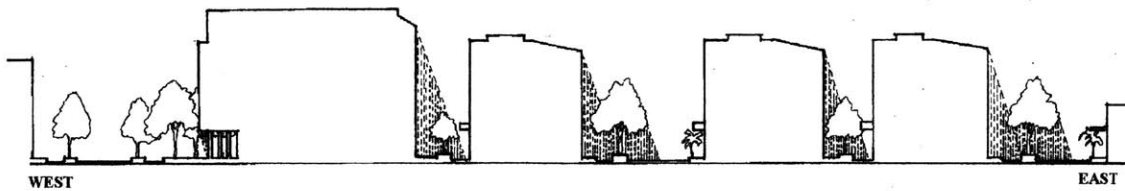


Fig. 38. Streets and alley shading condition at 1 p.m., September 21.

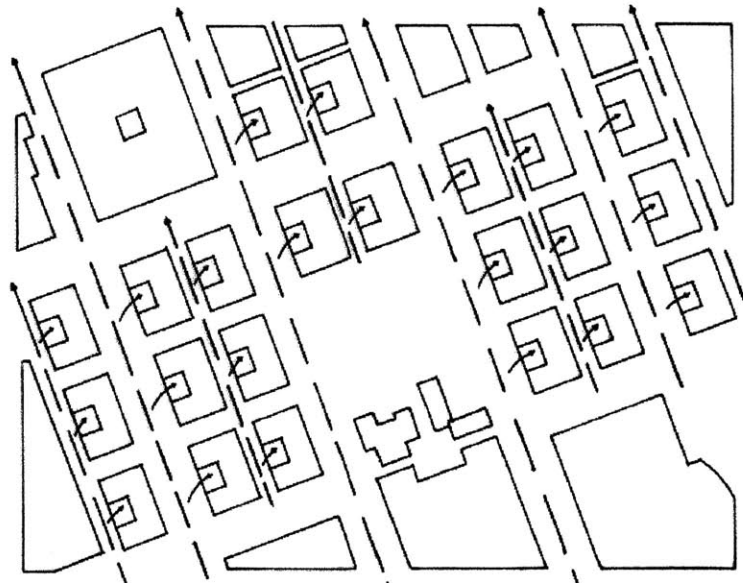


Fig. 39. Winds move through the site.

How to prevent heat gain from sunlight is an important issue. Apartments on the top levels and spaces having south and west facing walls, are vulnerable to direct summer sunlight. For instance, buildings on Sheening Road have beautiful views toward Tonjang

River, but they have mass south-facing walls. To limit heat gain while obtaining views seems challenging. One method to solve this problem is to build some light frames in front of the walls. They hold up plants, such as vines, and act as a screen for sunlight. At the same time, residents can see the views through the frame's openings. (fig. 40)

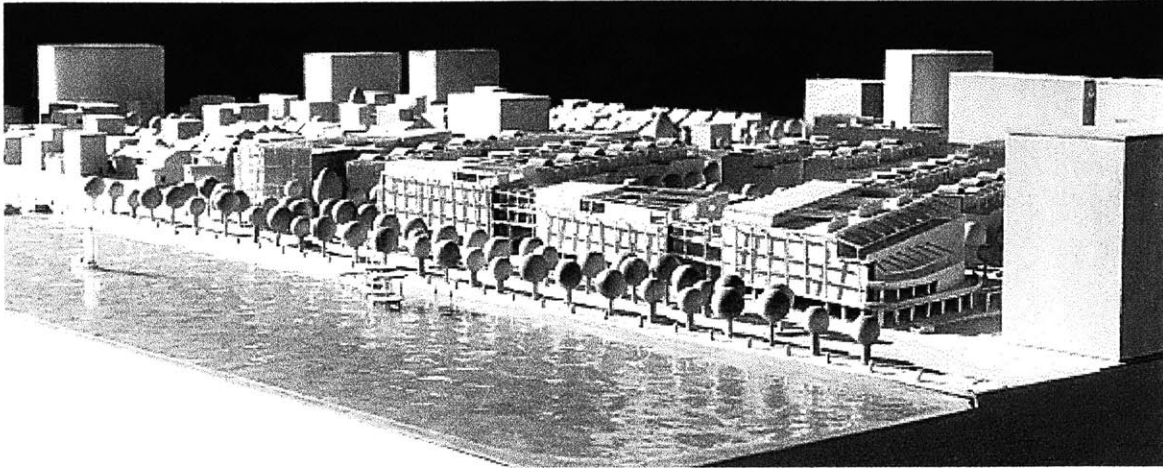


Fig. 40. Light frames in front of south facing walls.

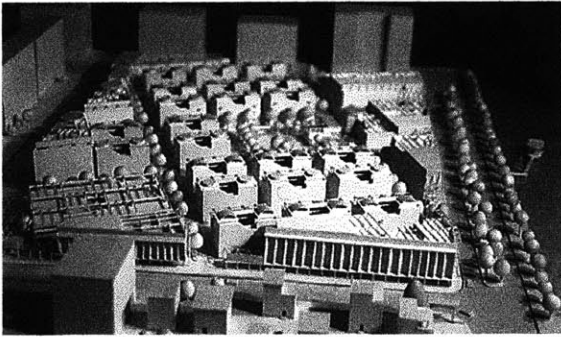


Fig. 41. Shading panels on west facing walls.

With the same concern, vertical shading devices are built in the walls that face west in the mixed-use buildings on the west of the site. (fig. 41) Other west-facing walls have a double wall system. The exterior wall has vertical openings allowing winds and reflected light to get in, while the inner walls bear the loads. Spaces between these two walls are circulation areas. (fig. 42) Likewise, roof tops have different shape water towers and gardens. Water comes from wells in each building. Water towers provide thermal

comfort to the spaces below, and the residents can use the water for washing. Roof gardens have various kinds of trailers that hold up plants. They not only shade the roof tops, but also form outdoor spaces for residents. As a result, there are thermal comfort zones on south, west and top that lap the buildings. This reduces the electricity consumption, and creates natural environments for the residents. (fig. 43)

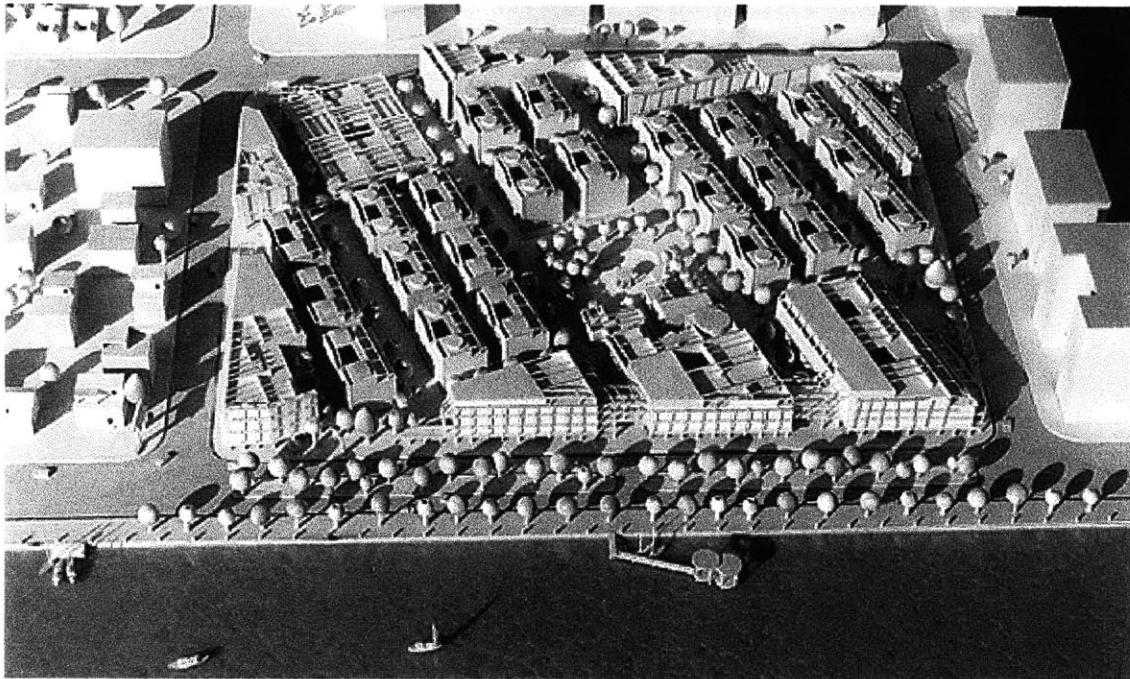


Fig. 42. Double wall system in prototype houses and mixed-use buildings. This picture shows the site model under afternoon sun.

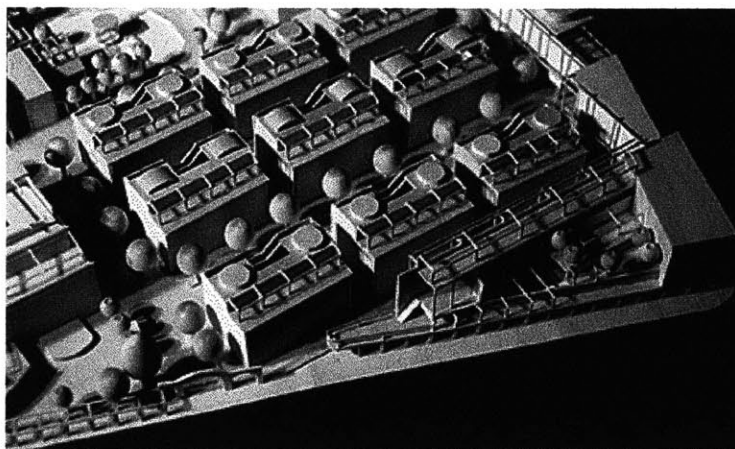


Fig. 43. Water towers and roof gardens on top of the houses and buildings.

7-A: The Garden, Community Center and Kindergarten

The garden is as a courtyard for the whole block. It has a fish pond and many different kinds of semi-tropical trees and flowers. (fig. 44 & 45)

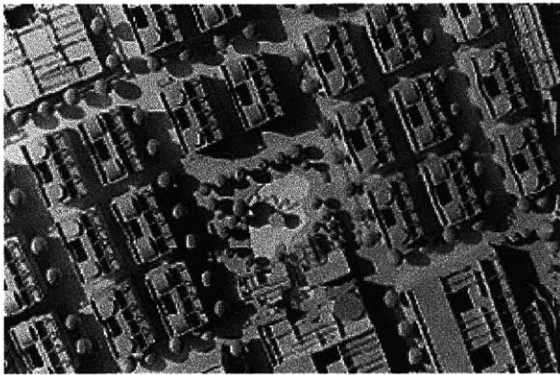


Fig. 44. The garden.

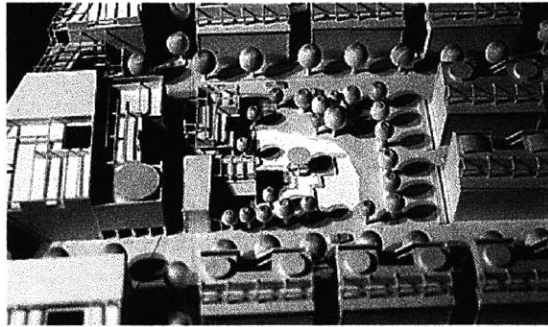


Fig. 45. The community center and kindergarten is on the left.

Near center of the pond, there is a water fountain pavilion. Water drops from its roof edges into the pond. One will feel like staying inside a waterfall when sitting in it during the summer. A typical Chinese garden bridge links the water pavilion to both south and north of the pond. A small stream connects the pond and the community center. If you follow it to the south from the pond, you will walk into the community center's open space, and see a fountain there. Standing near the fountain, you are able to view the entrance gate to the east and the exit gate to the west. A kindergarten is located near the pond next to the community center. Its outdoor area is on north-east corner, shaded by the trees and building. The south part of the community center has an indoor swimming pool and a volleyball court. Tonjiang River is polluted, so it is necessary to provide a swimming facility for the residents. Volleyball is one of the most popular sports in Kaiping County. In fact, several Chinese national volleyball competitions have been held in the county in the last decade. An indoor volleyball court is primary for the residents,

but can also serve national competitions. The idea of combining garden, community center and kindergarten together is to maximize the use of the garden, and to provide pleasant views to children and adults who use the community center. (fig. 46)



fig. 46. A garden view looking from north west toward south west.

7-b: The Formal Entrance and Exit

Similar to the traditional villages, gates are in both formal entrance and exit. Two big trees are near them. The gates and trees are the symbols of a community within in this block, the same as the gates and two big trees found in a vernacular village. At the entrance, pedestrians and automobiles use separate lanes to enter. Upon entering this

gate, you are in an open space with a performing stage. Chinese opera and other outdoor performances can be stayed here. Trailers, unmoveble tables, benches and chairs are for recreation such as Chinese Chess and poker games. (fig. 47 & 48) On the other side, the exit does not allow cars to drive through, except in the case of special events, such as weddings and funerals. An outdoor tea house or cafe and a playground for children are near the gate. Many trees are planted in this area. (fig. 49 & 50)

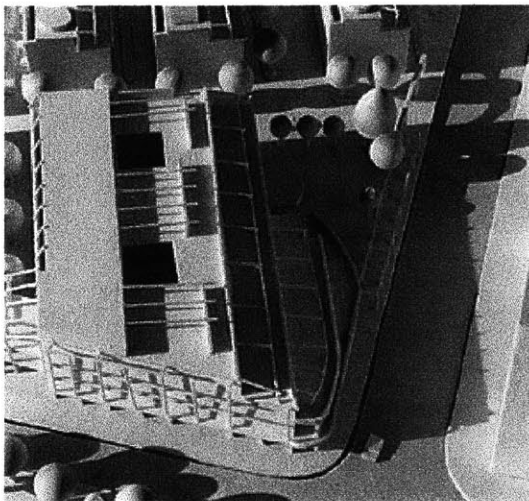


Fig. 47. Formal entrance area.

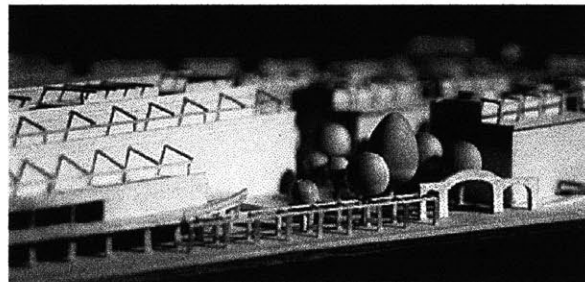


Fig. 48. Entrance gate.

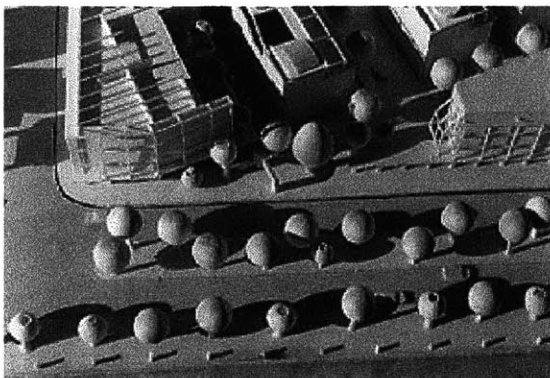


Fig. 49. Exit area.

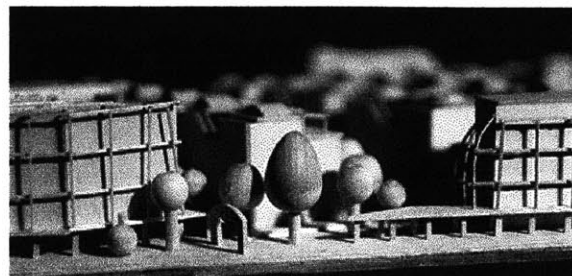


Fig. 50. Exit gate.

7-c: The Market and Parking Garage

A farmers market located two miles from this block in the old town opens twice a week.. As higher density developments keep growing, a market is needed for this neighborhood. One important reason to put the market on the northwest corner is that it will not only serve residents inside the block, but also others who live nearby. (fig. 51 & 52)

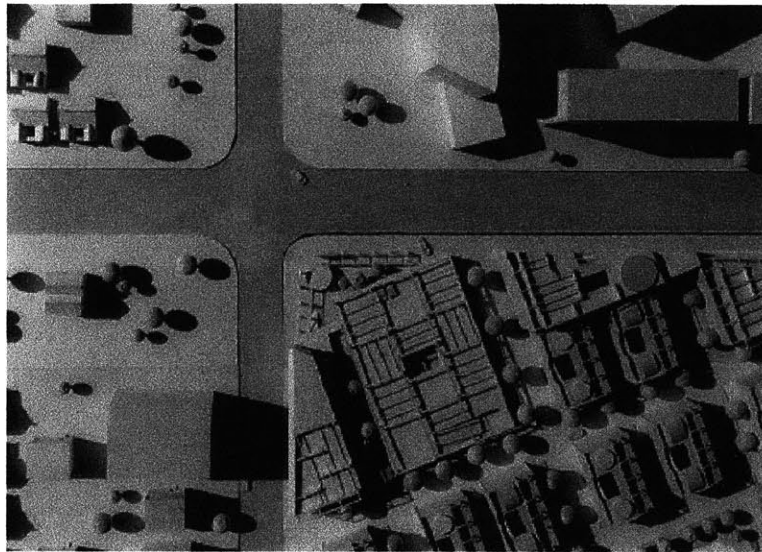


Fig. 51. The market.

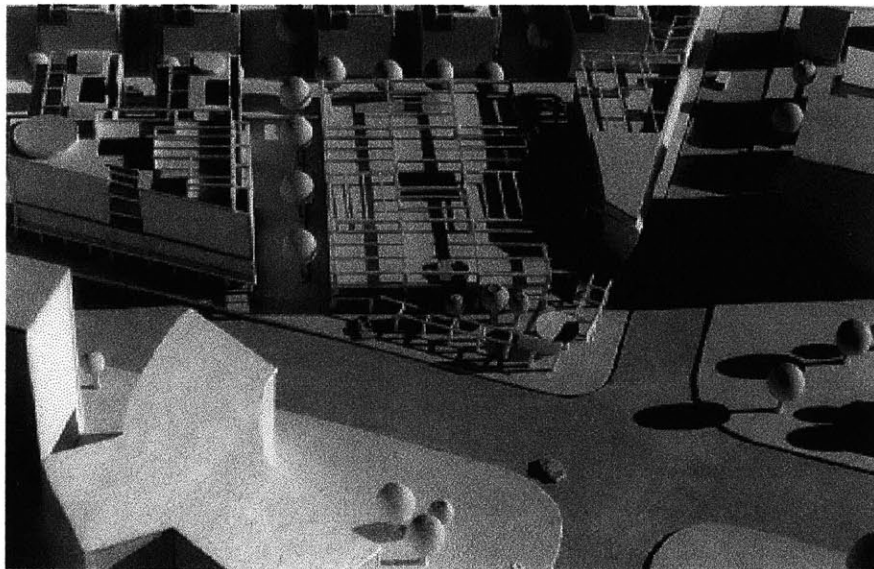


Fig. 52. Market's main entrance is on the corner of the streets.

This market has both indoor and outdoor areas. The indoor area is on the ground floor of the parking garage, and the outdoor area is on the street, complete with arcades. There is a tea pavilion with trellis on the corner of the outdoor area. Shopping activities are on the ground level. A staircase leads people up to a second floor outdoor space of the mixed-use building on the west. This space is allocated for restaurants and a rest area. It has a bridge connecting it to the second floor of the garage, the first level which is for car and motorcycle parking. The garage has two floors for parking and each floor's capacity is about 25 cars and 20 motorcycles. This is more than enough for both residential and public parking at present, yet it is designed to be able to accommodate more floors in the future if needed. An open courtyard located in the garage center captures natural light and ventilation for the indoor market. (fig. 53)



Fig. 53. A market view looking from the tea pavilion toward south.

CHAPTER 8

Prototype House

One prototype house is a smaller community compared to the whole block. (fig. 54) Each of them houses 11 families with a total of 30-40 residents. Four studios are on the ground floor. They are primarily for senior citizens who do not want to live with, yet like to be near, their married children. In addition to the three studios, one two-bedroom family unit is on the ground floor, and six apartments are on the second and third floors. (fig. 55) They are for couples who have one or two children. If a three generation family lives in one building, the grandparents can live in a studio while their married son or daughter live in one of the apartments. This is convenient for taking care of each other, while still maintaining privacy. The courtyard is 4 x 6 meters. It is the “soul” of this small community: for natural lighting, ventilation, circulation, social and spiritual events, as well as a playground for children and social space for the adults. Each apartment or studio has its entry and windows opening into the courtyard. (fig. 56 & 57)

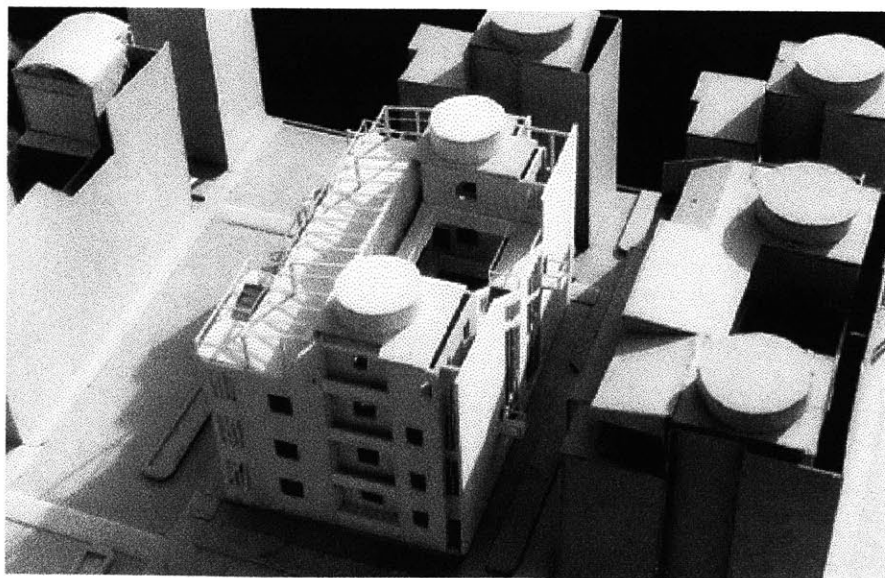
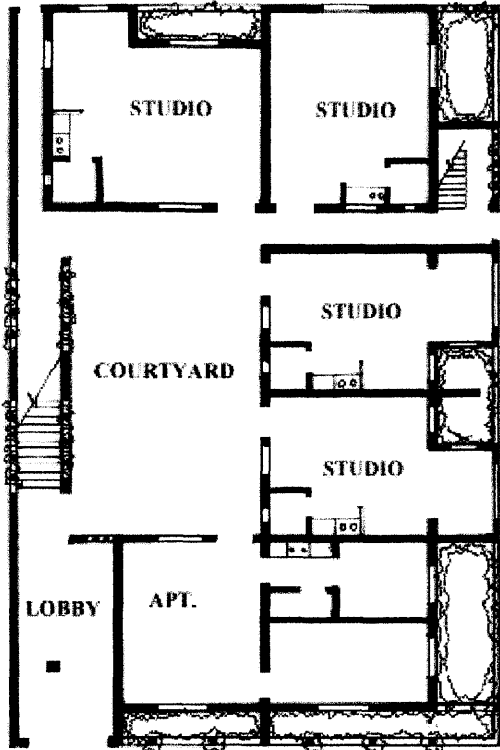
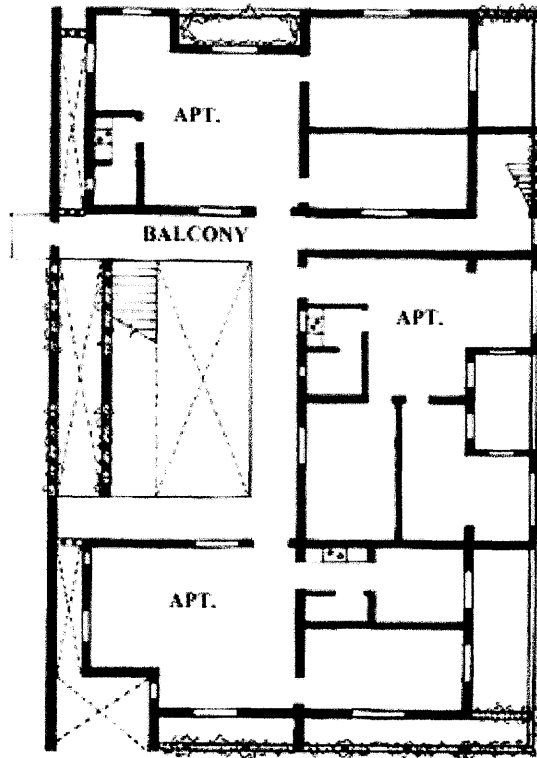


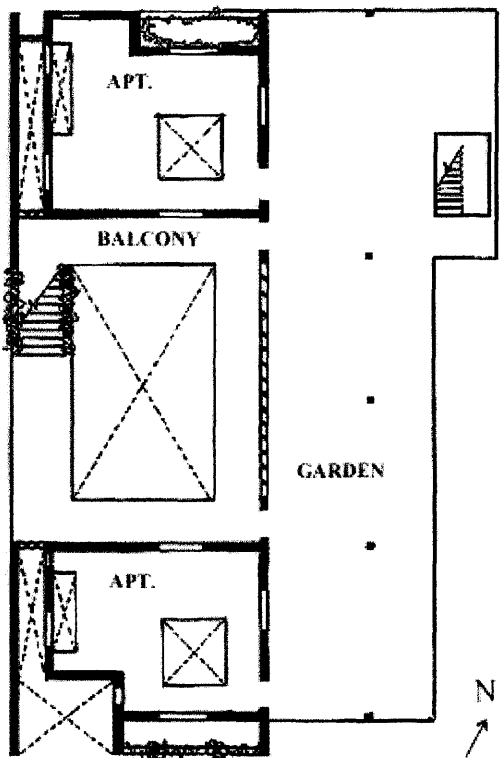
Fig. 54. Prototype house.



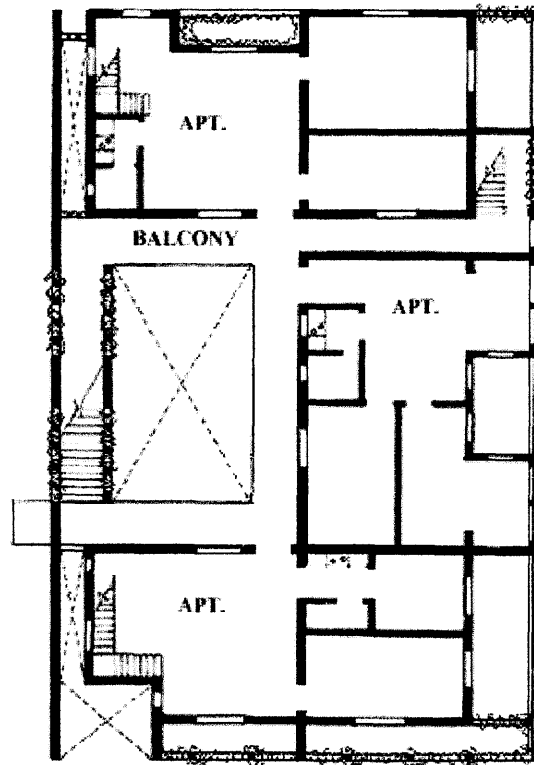
FIRST FLOOR PLAN



SECOND FLOOR PLAN



FOURTH FLOOR PLAN



THIRD FLOOR PLAN

Fig. 55. Floor plans.

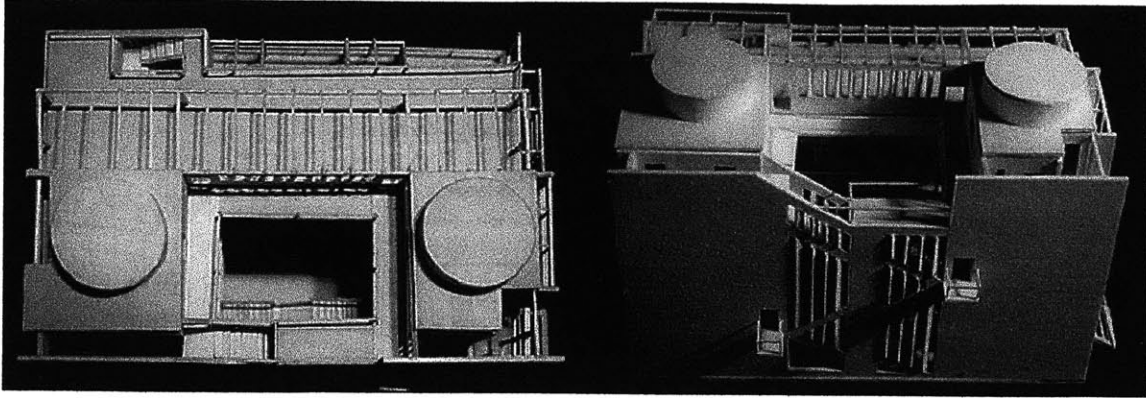


Fig. 56. Courtyard and stair case on west side of the house.

Similar to the buildings at the perimeters, preventing heat gain from direct sunshine is essential to each prototype house. On the west, there are two walls. The exterior wall acts as a screen. Its center part, the courtyard area, has vertical openings which bring light to the lower level of the courtyard. However, each opening has a vertical panel that is set to an angle preventing the summer afternoon sunlight from shining into the stair between the walls and the courtyard. (fig. 57) The south wall of the prototype house is designed with the same method of the southern walls for the buildings on the south of the site: light frames hold up greens as a sun blind at front, one meter from the wall. (fig. 58)

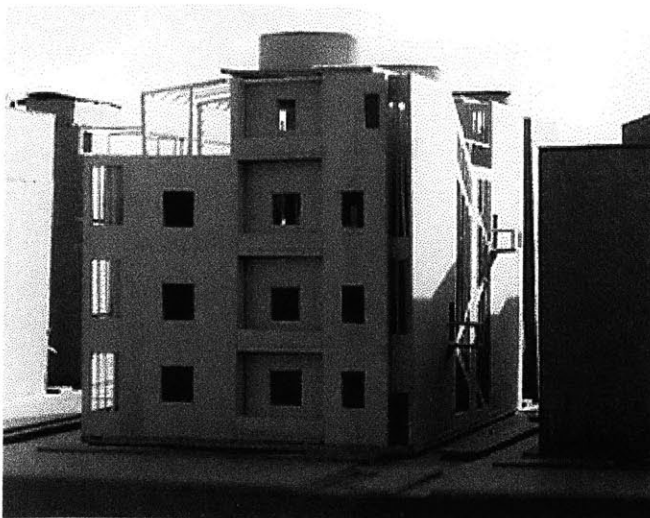


Fig. 57. Afternoon sunlight on the double wall.

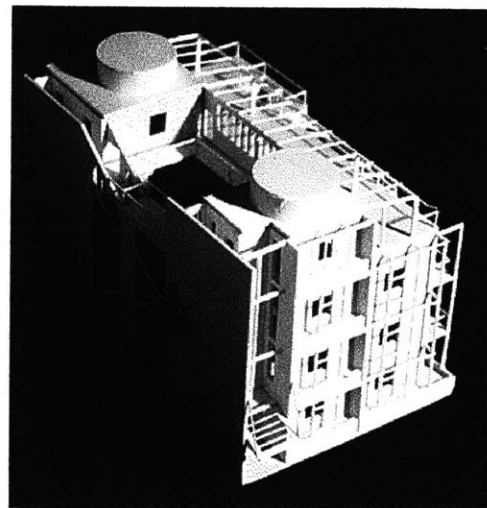


Fig. 58. Light frame structure in front of south wall.

Another critical surface under direct summer sunshine is the roof. Like the roofs of the buildings on the perimeters, each prototype house has two water towers and a roof garden. Water is pumped up from a well that is located in the courtyard. The water towers are on top of the north and south toward the west. Their shapes can be circular or rectangular and are about one meter in depth. During the afternoon, the water is warm, while the spaces underneath remain cool. Residents will use the water for washing. A lack of clean water has been a problem for the city in recent years. Manipulation of well water will help to solve the problem.

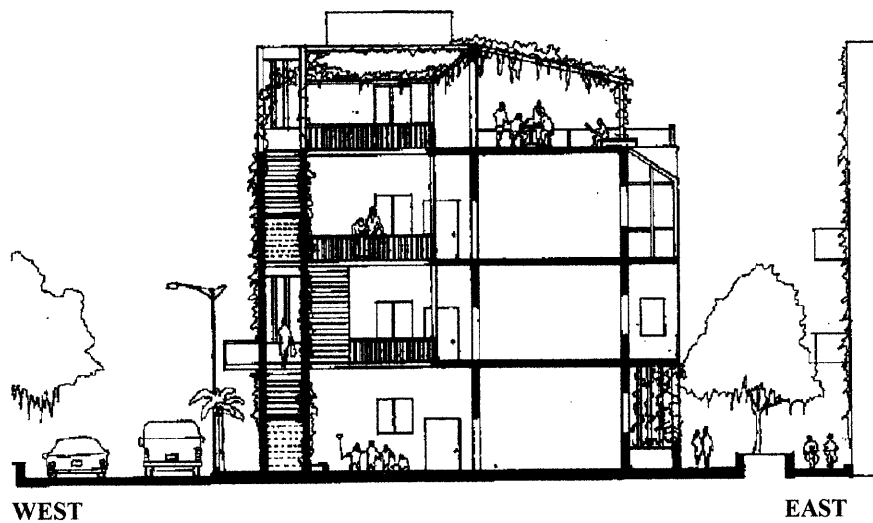


Fig. 59. Section shows the activities in a prototype house.

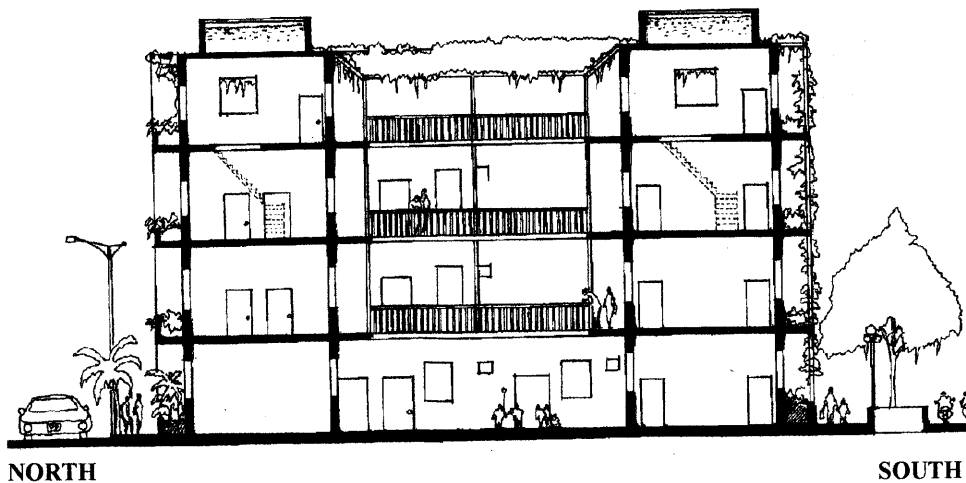


Fig. 60. Section

The other part of the roof is a garden. Greens grow on top of the trellis and flowers are in planters. There are tables, chairs and benches underneath the trellis. The roof garden becomes another outdoor space in a prototype house besides the courtyard. Residents can use it for exercise and gathering. Some of them may sleep there when the temperature is too hot at night. (fig. 59 ,60 & 61)

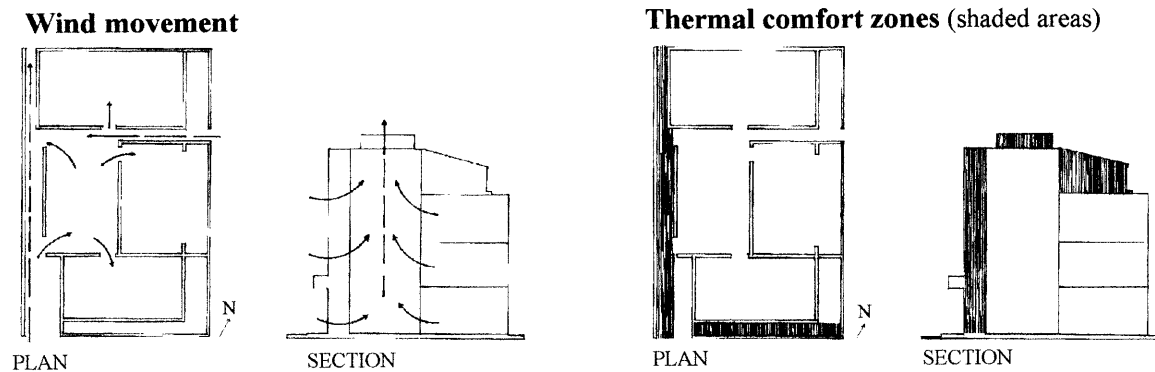


Fig. 61. These are wind movement and thermal comfort zone diagrams of a prototype house.

Let us walk through a prototype house. One enters from the entrance on the south, the corner of the double walls, into a 2.5 x 3 meter receiving area which is open to the sky. In this area, you see the staircase in-between the double walls which leads you up to the second floor on your left. In addition, you can see the courtyard on your right through a screen wall that separates the entrance and the courtyard. Upon entering into the courtyard, you are in a larger space. It is also open to the sky. There is a planter with a seating curb on the bottom of the inner double wall. The covered-well is in this area as well. Three studios and one family apartment are arranged on the ground floor. Their entrances and some windows open to the courtyard. (fig. 62)

If you take the staircase walk to the second floor, you are in a balcony that connects all three apartments on this floor. The balcony extends to the outside of the double wall into

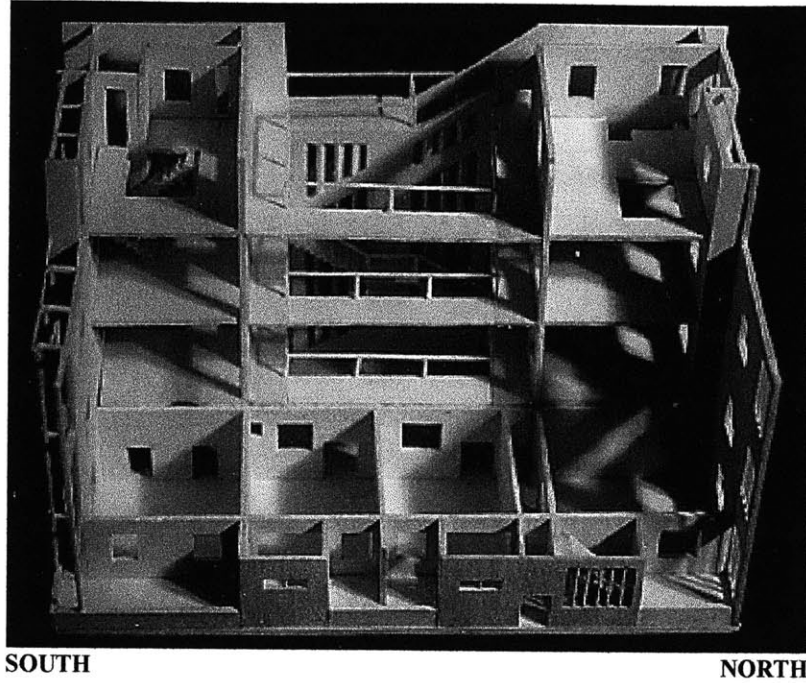


Fig. 62. Section model.

an alley. You can stand there and see the whole alley. The stair leading up to the third floor is on the courtyard side of the inner double wall. While you walk on it, you can see the activities in the courtyard below. (fig. 63)

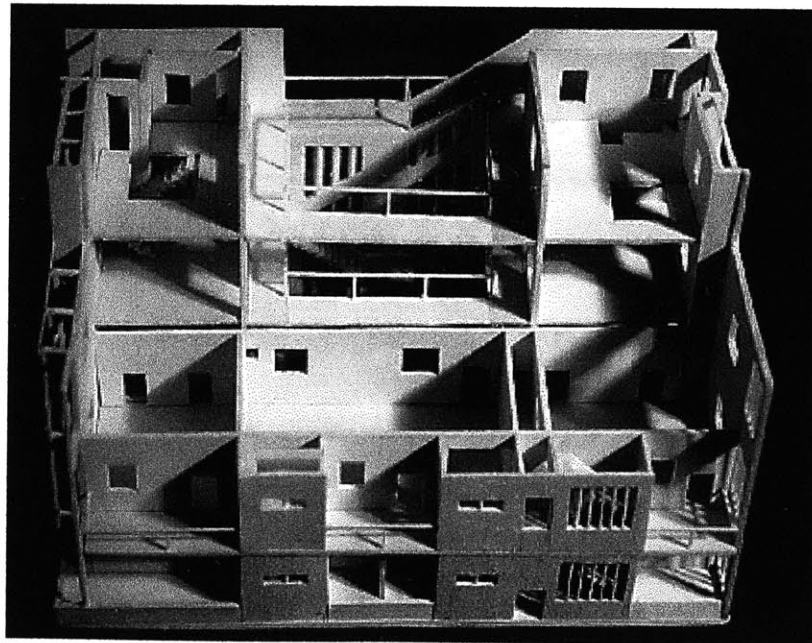


Fig. 63. Section model shows second floor.

Similar to the second floor, a balcony links three apartments to the open space of the courtyard. It extends to the alley, and lets you view the whole alley again from a higher position. The living rooms of both apartments on the south and north side on this floor have second floors underneath the water towers. Finally, you take the staircase between the double walls to the fourth floor balcony. This balcony connects the roof garden on the east. You are able to observe views toward the north, south and east here. (fig. 64)

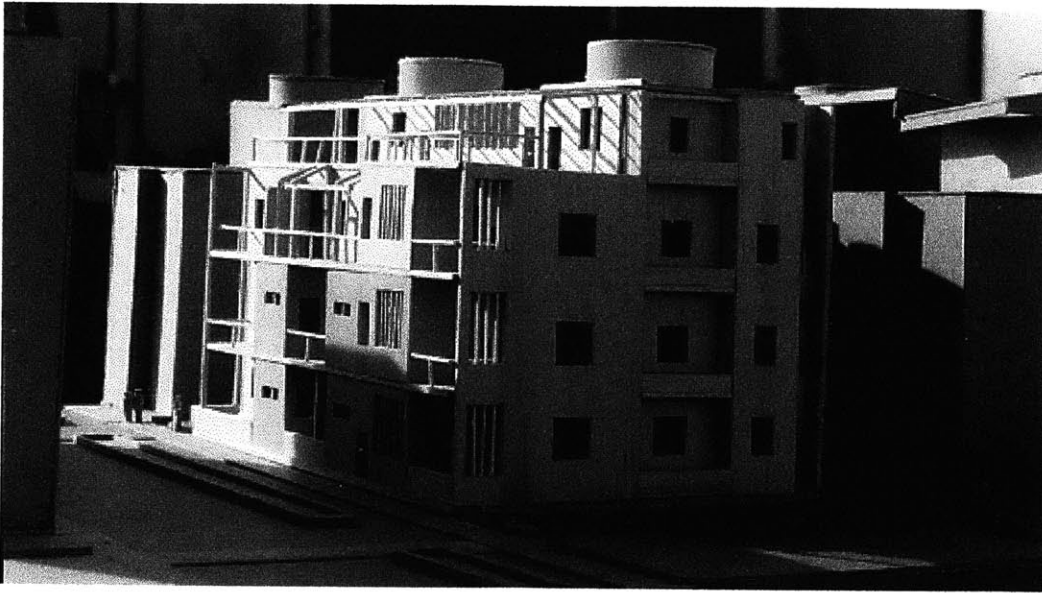


Fig. 64. View from north east. The model is under morning sun. Both roof garden and water towers are shown.

In a prototype house, a secondary staircase primarily for fire escape is situated near the northeast corner. It links to an exit door on the west. The north end of the double wall has another small exit door. Space between the double wall is open at both ends, as well as to the sky. It acts as an alley within in a building: bringing light and wind into the courtyard and each family unit. Each floor in a prototype house is four meters high, except for the top floor, which is three meters high. There are smaller balconies for apartments on the east side. At special locations, such as the two prototype houses on the east side of the garden, the double wall is modified. Unlike the other prototype house having a bland exterior wall on the west side, these two houses have balconies that belong to apartments

on the second and third floors. The balconies have projecting trellis with greens growing on, to forestall summer afternoon sunlight getting into the apartments. Residents, therefore, in these houses are able to obtain garden views as are those who live on the other side of the garden without being exposed to summer afternoon sunlight.

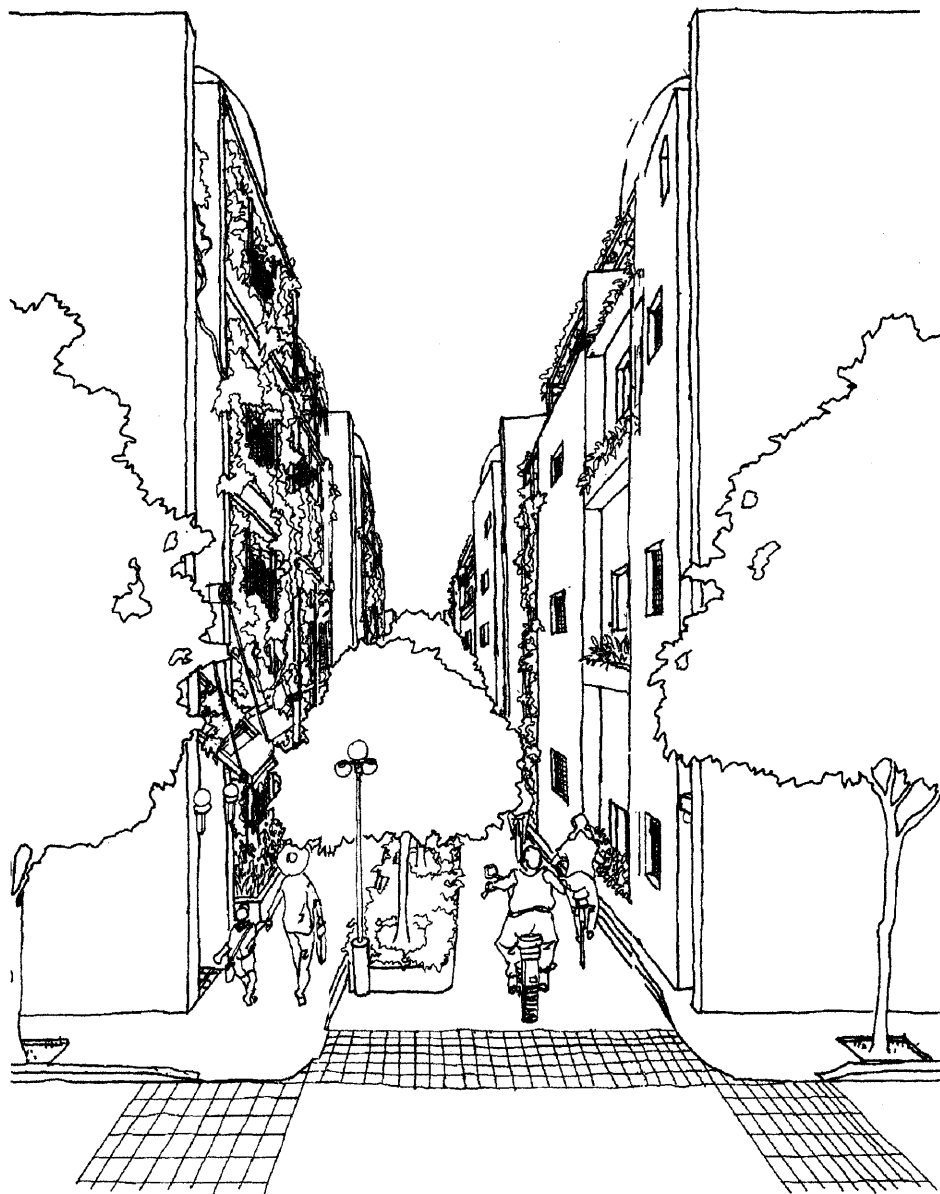


Fig. 65. Perspective view of a typical alley.

CHAPTER 9

Materials

When the vernacular houses were built, reinforced concrete was not popular. People used blue fired bricks for walls, pine tree beams and ceramic tiles for roofs. Starting from the last two decades, reinforced concrete slabs are replacing the wood beams and ceramic tile roof construction because wood is now rare. Also, more people use red fired bricks since blue fired bricks are more expensive. From an economic and a esthetic point of view, this project will chose red fired bricks for walls and reinforced concrete slabs for floors and roofs. The light frame structures that hold up the greens, form the trellis and window frames are pre-cast reinforced concrete, painted white. The red color of the bricks combine with the white color of the frames will mark the strong appearance of the exterior.

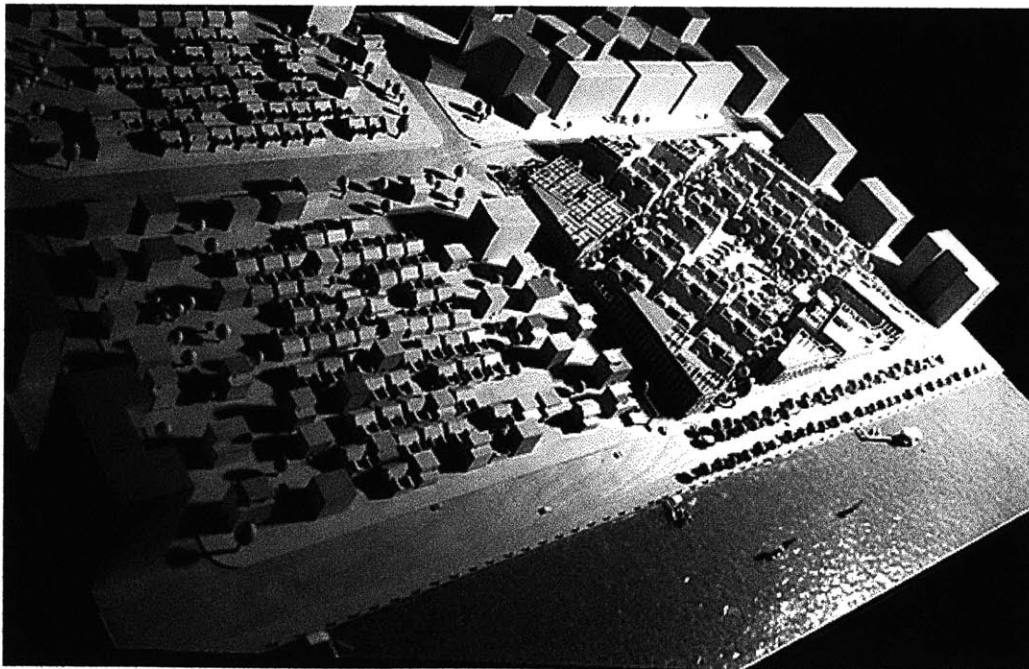


Fig. 66. An aerial view of the site area.

CHAPTER 10

Conclusion

Local architectural identities are changing as time moves on. The changes may take several decades or centuries to unfold. There is no new Watchtower in Kaiping because the social environment required to build them has gone. Similarly, Kaipinese do not copy the vernacular houses any more. They are moving into modern times. They wear jeans and suits, watch Hong Kong television, drive motorcycles and cars, drink imported brandies, smoke foreign cigarettes, and even try McDonald's food. However, they have not changed their language and dialects. They continue celebrating Chinese holidays. Their food is mainly Cantonese. They are still in strong family unification and taking care of the young and the old. Moreover, the climate is still semitropical: strong summer sunlight for five months out of the year, and the winds continually blowing from southeast to northwest most of the year predominate here.

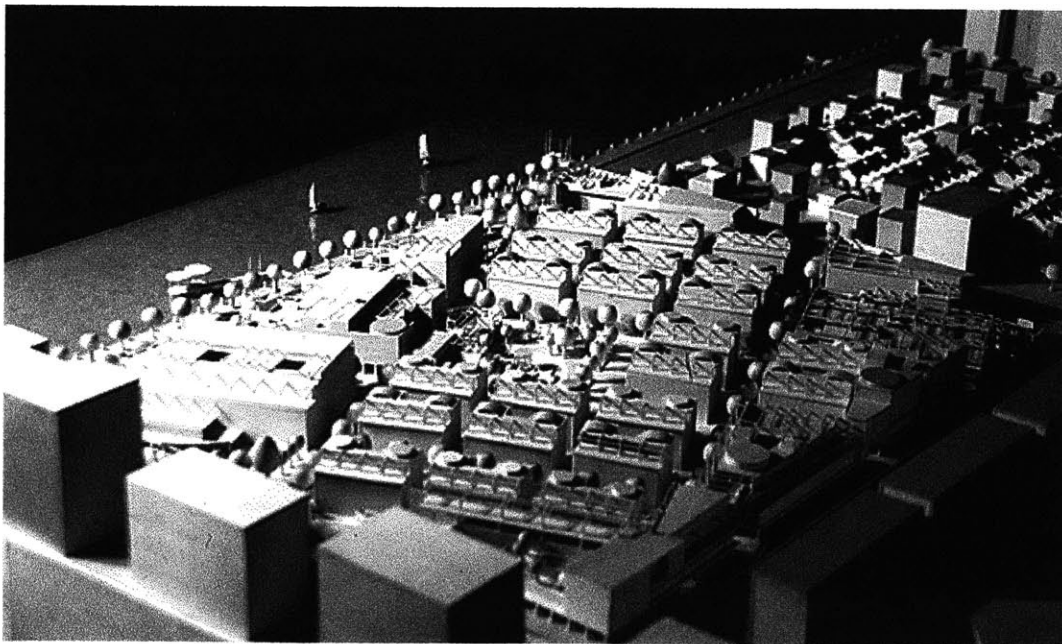


Fig. 67. Another aerial view of the whole site.

This thesis has examined the possibilities of implementing city planning and architectural design for a particular region, Kaiping City. It is possible to define new architectural identities there if the design follows the patterns of Kaiping's past, present and near future. The hierarchy of streets, from small alleys to large boulevard; the different ways of protecting people from direct summer sunlight such as arcades, roof gardens, light frame structures and double walls; the courtyards; the water towers; the gates; the fountain pavilion and the garden are among the features of this project. While some of them are new, others are derived from traditional local architecture, and a few have also been used in other cultures. I believe that these planning and architectural features do not only mimic the essence of the past, but also stress the spirit of modernization. They begin to establish new local architectural identities in Kaiping County.



Fig. 68. Perspective view of the garden area.

HEAVY-SHADED AREAS BENEATH GREEN TREES IN LONG SUMMER,
THE SHADOW OF A TOWER IS FALLING IN THE ADJACENT POND;
CRYSTAL CURTAIN IS SWAYING AGAINST A INCOMING BREEZE,
SELF-FILLED SMALL ROSES SPREAD FRAGRANCE TO THE HALL.

By Kao Pien, Tang Dynasty. Translated by Jaing Ming Lin.

Footnotes:

1. Jin Oubo, Qi Xuan & Zhu Mingliang, "Problems in rural home-building in suburban areas," Building in China, vol. 1, p8-12, China Building Technology Development Center, Beijing, 1988.
2. Niu Weina, "On the way to urbanization," Building in China, vol. 1, p19-21, China Building Technology Development Center, Beijing, 1988.
3. Kuang Quang Xin ed, Kaiping County, a Hometown of Overseas Chinese, p1, Kaiping County, Canton, China, 1990.
4. Kuang Quang Xin ed, Kaiping County, a Hometown of Overseas Chinese, p3, Kaiping County, Canton, China, 1990.
5. Canton Maps Publication Co. & National Land Management Department of Kaiping City, Tourist Map of Kaiping City, Canton Maps Publication Co., Canton, 1993.
6. Yandin Lu and Yangin Wei, Cantonese Vernacular Houses, p1-11, Chinese Building and Construction Industry Press, Beijing, 1990.
7. Yandin Lu and Yangin Wei, Cantonese Vernacular Houses, p13-31, Chinese Building and Construction Industry Press, Beijing, 1990.
8. Ronald G. Knapp, China's Vernacular Architecture: House from the Cultural, p215-220, University of Hawaii Press, Honolulu, Hawaii, 1989.
9. Ronald G. Knapp, China's Vernacular Architecture: House from the Cultural, p200-215, University of Hawaii Press, Honolulu, Hawaii, 1989.
10. Yandin Lu and Yangin Wei, Cantonese Vernacular Houses, p125-145, Chinese Building and Construction Industry Press, Beijing, 1990.
11. Yandin Lu and Yangin Wei, Cantonese Vernacular Houses, p145-150, Chinese Building and Construction Industry Press, Beijing, 1990.
12. Kuang Quang Xin ed, Kaiping County, a Hometown of Overseas Chinese, p4, Kaiping County, Canton, China, 1990.
13. Yandin Lu and Yangin Wei, Cantonese Vernacular Houses, p-5-10, Chinese Building and Construction Industry Press, Beijing, 1990.
14. Sun Huasheng, "Philosophy in the Planning of Urban Residential Districts," Building in China, vol. 2, p18-20, China Building Technology Development Center, Beijing, 1986.
15. Huang Hanmin, "Presenting Local Features in New Architecture," Building in China, vol. 5, p41-45, China Building Technology Development Center, Beijing, 1992.

Bibliography

1. Chian Building Technology Development Center, Building in China 1980-1992 issues.
2. China Building Technology Development Center, China building Selection, 1980-1993 issues.
3. Ronald G. Knapp, China's Traditional Rural Architecture: A Cultural Geography of the Common House, University of Hawaii Press, Honolulu, Hawaii, 1986.
4. Ronald G. Knapp, China's Vernacular Architecture: House from the Cultural, University of Hawaii Press, Honolulu, Hawaii, 1989.
5. Kung Quan Xin ed., Kaiping County, A Hometown of Overseas Chines, Kaiping County, Canton Province, China, 1990.
6. Architecture and Identity: Proceedings of the Regional Seminar in the Series Exploiting Architecture in Islamic Cultures, sponsored by the Aga Khan award for architecture, Malaysia, July 25-27, 1983.
7. Ken Yeang, Tropical Urban Regionalism: Building in a South-East Asian City, Singapore, 1987.
8. Wallace Neff, The Romance of Regional Architecture, 1989.
9. Spyros Amourgis, ed. Critical Regionalism: the Pomona Meeting, 1989.
10. Seminar on architecture and the role of architects in Southern Asia, Participants' Paper, Dhaka, Bangladesh, 1985.
11. Kevin Lynch, What Time Is This Place, the MIT press Cambridge, Massachusetts and London, England, 1972.
12. Gao Yilan, Architecture in New China, Berkeley, Ca, 1987.
13. Mei Wang, The Practice of Architecture in the People's Republic of China Since 1949, MIT Master Architecture thesis, 1976.
14. Institute of the History of Natural Sciences, Chinese Academy of Sciences, History and Development of Ancient Chinese Architecture, Science Press, Beijing, 1986.
15. J. Rogert Jungk, China and the West: Mankind Evolving, Garnstone Press, London, England, 1970.
16. Koji Yagi, ed. Japan, Climate, Space and Concept, Process Architecture, Westfield, N.J., 1981.
17. Mindy Beth Lehrman, Permanence and Change, Architectural Translation from Traditional Japan, MIT Master Architecture thesis, 1982.
18. Yoshiko Ryu, Alternative Housing Designs for Changing Life-Styles in Japan, Japan, 1982.
19. Gestaltung and Redaktion, Functional Architecture: the International Style, 1925-1940, Benedikt Taschen, 1990.
20. Hitchcock, Henry Russell, The International Style, New York, Norton, 1966.
21. Philip Johnson, Writings/Philip Johnson, New York, Oxford University Press, 1979.

22. Rifat Chadirji, Concepts and Influences: Towards a Regional International Architecture, New York, NY., 1973.
23. Kuang Quang Xin ed, Kaiping County, a Hometown of Overseas Chinese, Kaiping County, Canton, China, 1990.
24. Canton Maps Publication Co. & National Land Management Department of Kaiping City, Tourist Map of Kaiping City, Canton Maps Publication Co., Canton, 1993.
25. Yandin Lu and Yangin Wei, Cantonese Vernacular Houses, Chinese Building and Construction Industry Press, Beijing, 1990.
26. N. J. Habraken, Supports: an Alternation for Mass Housing, Praeger publishers, New York and Washington, 1972.

Illustration Credits:

Figures	Sources
1.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 1.
2.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 1.
3.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , cover page.
6.	“Tourist Map of Kaiping City.”
8.	<u>Vernacular Architecture: House from the Cultural</u> , page 208.
14.	<u>Vernacular Architecture: House from the Cultural</u> , page 214.
15.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , Page 11.
16.	<u>Cantonese Vernacular House</u> , page 128.
17.	<u>Cantonese Vernacular House</u> , page 128.
18.	<u>Cantonese Vernacular House</u> , page 142.
19.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 41.
20.	<u>Cantonese Vernacular House</u> , page 143.
21.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 51.
22.	<u>Vernacular Architecture: House from the Cultural</u> , page 218.
24.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 7.
25.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 8.
28.	<u>Building in China</u> , Vol. 5, #2, page 45.
29.	<u>Building in China</u> , Vol. 5, #2, page 43.
30.	<u>Kaiping County, a Hometown of Overseas Chinese</u> , page 4.
*	All other illustrations are from the author.