

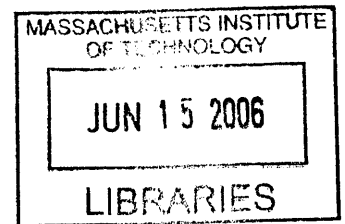
Rethinking Walled Residential Compound in Peripheral Urban China
A guideline for boundary and size design

By

Na Sun

Bachelor of Architecture
Tsinghua University, 2004

Submitted to Department of Architecture in partial fulfillment of the requirements for the degree
of
Master of Science in Architecture Studies
At the
Massachusetts Institute of Technology
June 2006



© 2006 Na Sun. All Rights Reserved

The author hereby grants to MIT permission to reproduce and to distribute publicly paper and electronic copies of this thesis document in whole or in part in any medium now known or hereafter created.

ROTCH

Author:

Na Sun
Department of Architecture
May 24, 2006

Certified by:

Yung Ho Chang
Professor of Architecture
Thesis Supervisor

Accepted by:

Julian Beinart
Professor of Architecture
Chairman of Departmental Committee on Graduate Students

Thesis Reader:

Tunney Lee
Professor of Department of Urban Studies and Planning

Liang Zhao
Lecturer of Department of Urban Studies and Planning

Rethinking Walled Residential Compound in Peripheral Urban China

- A Guideline for Size and Boundary Design

Na Sun

Submitted to the Department of Architecture on May 25th , 2006 in partial fulfillment of the requirements for the degree of Master of Science in Architecture Studies.

Abstract

In the last two decades, with the high speed urbanization, walled residential compound as the typical housing development is being constructed on a large scale in peripheral areas of Chinese cities. Its self-enclosing nature and large scale bring some negative aspects to the city and the community itself, such as traffic congestion, inconvenience of public transportation, lack of street life, redundancy and exclusiveness of public amenities.

However, the existence of enclosing perimeter has its historical context and contemporary causes. Instead of completely rejecting “walled community” as a viable typology, this thesis aims to develop a guideline that can transform the “wall” and to arrive at an optimum semi-walled residential compound typology.

Thesis Supervisor: Yung Ho Chang

Title: Professor of Architecture

Acknowledgement

When I started this thesis, my understanding of walled residential compounds was very shallow, I was lost in the research process, and the final product still needs to be further developed. There is a lot more to learn, but I feel I have come a long way, and I could not have done so without the support of many generous people:

My advisor, Professor Yung Ho Chang. It has been a pleasure working with him. His calm rationality will continue to be an inspiration.

My co-advisor and friend, Liang Zhao. I'm really happy to be his first thesis student.

My reader Professor Tunney Lee. The study is based on his Shanghai housing research workshop.

James Ke. His support means a lot to me.

My studiomates: Leo, Ken, Liz, Lucy and Junsik. You make me not feel alone in this tough semester.

And of course, my parents.

Thanks to you all.

Table of content

Chapter 1 Introduction

- 1.1 Research background
- 1.2 Definition

Chapter 2 Historical Review

- 2.1 Walled City
- 2.2 Courtyard house
- 2.3 Linong
- 2.4 Da Yuan
- 2.5 Xiao Qu
- 2.6 Findings

Chapter 3 Case Studies

- 3.1 Introduction
- 3.2 Analysis
 - 3.2.1 Security
 - 3.2.2 Sense of neighborhood
 - 3.2.3 Living environment
 - 3.2.4 Public amenities
 - 3.2.5 Transportation
- 3.3 Conclusion

Chapter 4 Design

- 4.1 Size design guideline
- 4.2 Boundary design guideline
- 4.4 Proposals for the two cases

Chapter 5 Conclusion

Appendix

Illustration credits

Notes

Bibliography

Chapter 1 Introduction

1.1 Research background

During the last two decades in China, with the high speed of development, the expansion of the city center toward the peripherals has pushed residential domains from the center of cities ever toward the periphery. The dominant form of housing developments is “walled residential compound”. It has come to drastically change and re-define Chinese new urban space.

Walled residential compound is being constructed on a large scale. From 1991 to 2000, 83% of housing developments in Shanghai have been “enclosed” in some fashion. During the same period, there are 54,000 “walled residential compounds” in the province of Guangdong. These complexes in Guangdong took up to 70% of all urban surface area and houses more than 80% of its population.¹

In urban periphery, residential compounds have unique characteristics:

First, they are very large in scale. With current planning regulations in China, distance between major roads is about 700 to 1200 meters.

Usually developers get the permission from local governments to develop entire lots that are surrounded by the major roads. The size of such lots often range above 40 hectares.

Second, they are located in very dynamic environments. “Urban periphery” is moving and changing very fast. Usually, the region of the development is located at the outskirts of the city, next to farmland and undeveloped area. Such areas develop very quickly into semi-urban zones. The methods and spatial controlling devices of housing development communities become outdated within an alarmingly short period of time.

For example, developers usually wall an entire site along major roads and tried to create a self-sufficient isolated island. Considering security issues and ease of management, the pervasive use of fences and walls are understandable. However, as the development to the whole area continues, the self-enclosing and fragmenting nature of walled residential compounds bring some negative effects to the city and residents, such as transportation congestion, reducing urban street life, redundancy and exclusiveness of public facilities, and poor integration with public transportation.

There are many discussions about gated communities in the western world. The standard perception is that they increase privatism and destroy urban fabric, community and cohesion.² Though walled residential compounds and gated communities have many similar problems, this paper analyzed the issue in a Chinese urban context and try to answer these research questions: what are the negative effects that walled residential compounds bring to the city and the residents? What are the main factors raising these problems? What kind of design and management can correct these problems?

1.2 Definition

In its modern form, a walled residential compound is a form of residential community often segregated by major roads and natural boundaries, characterized by a closed perimeter of walls and fences, always containing controlled entrances for pedestrians, bicycles, and automobiles. Walled residential compounds usually consist of small residential streets and include various amenities. For larger communities, it may be possible for residents to stay within the community for most day-to-day activities.

Chapter 2 Historic Review

“Walls, walls and yet again walls form the framework of every Chinese city. They surround it, they divide it into lots and compounds, they mark more than any other structures the basic features of Chinese communities.”³

In many European and American academic publication, “Gated communities” or “walled residential compounds” have often been presented in negative terms, with obvious implication of their effects in intensifying social segregation. They are seen as foreign elements within urban fabrics, destroying neighborliness, cohesion and street life. In China, the phenomenon is not so black and white. Historically speaking, enclosed compound is not a new urban typology in China. Rather, they have been accepted and embraced by the Chinese.

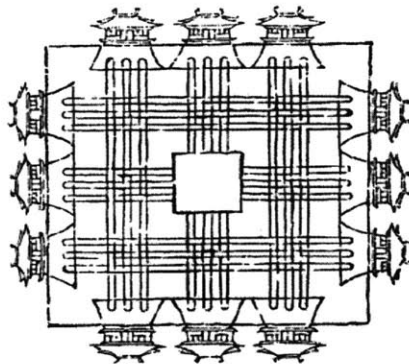
Under this light, enclosed compounds existing in China today are not entirely blind imitations of “western utopia suburban living”. Nor are they an unprecedented social phenomenon. They are in part a transformed version of traditional walled compounds and in part a natural product of current urban development trends.

This thesis attempts to re-think walled compounds in China, hopefully divorcing it from pre-conceived notions of “social wellness” vs. “gated privilege communities”.

In the past the basic unit of the city was the courtyard house (siheyuan), which corresponded to the family; then the basic unit of the city is the compound (dayuan), which corresponds to the danwei or the commercial development. The enclosed compound form and the implications of wall culture have continued in an unbroken historical line.

2.1 The walled city

Walled cities in China can be traced back as far as the fifteenth century BC. The layout from Kaogongji created a regular grid pattern that formed the basic skeleton of the walled city.⁴ The design of all the great historical capitals, from the Chang'an of the Western Han through to Ming and Qing Beijing, were based upon the precepts laid down in the Kaogongji. The residential areas within the city walls were divided into blocks defined by the interlocking grid of avenues. In turn, each block, known variously as li, luli, Or, later, fang- was enclosed by its own walls. In this way the walled city was itself made up of numerous walled residential compounds, which are antecedent to the walled community of modern China.



2.1 Representation of the ideal capital city as described in the Kaogongji

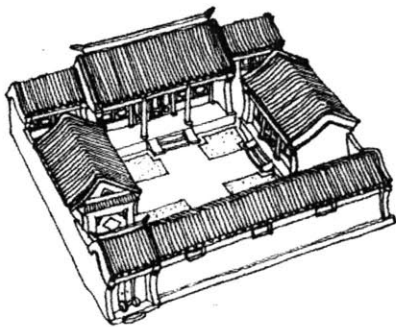


2.2 City wall of Beijing

2.2 The courtyard house

Inward facing, internalized and highly enclosed spaces are strong features of traditional Chinese environments. Enclosure, often achieved through the use of walls, achieve the sense of security demanded by inhabitants.

The archaeological evidence of walled housing complexes dates back to the Zhou period (eleventh century BC). The courtyard-style walled compounds were well established by the Han dynasty (202 BC).⁵ In Andrew Boyd's study of Chinese architectural and urban planning history, he suggests that the basic principles of design were "(a) walled enclosure; (b) axially; (c) north-south orientation; and (d) the courtyard."⁶



2.3 Bird's-eye view of a single courtyard siheyuan



2.4 Inside view of Beijing courtyard house

2.3 Linong

Linong is a particular dwelling form, which has constituted the primary living space in the inner city of Shanghai, where ordinary Shanghainese have conducted their everyday life for more than a century (1870s-1990s). Linong is a community-based alley-centred living form. The word linong, as an abbreviation of linong housing neighborhood, is a rich concept that not only refers to the materiality of this dwelling form, but also to the vivid social life within and around it.

Linongs are enclosed by walls, fence and retail stores. Each individual linong was in fact a relatively closed community. In terms of the neighborhood structure in relation to a larger urban block, the typology “exterior shops and interior housing” was commonly adopted in shikumen neighborhoods. This typology helped to integrate pocket-like houses into fast-modernizing urban environments through a mixed land-use pattern.⁷ The outer shops help to ensure the security and peace of the inner residential neighborhood.



2.5 Plan of Taipingqiao area in Shanghai.

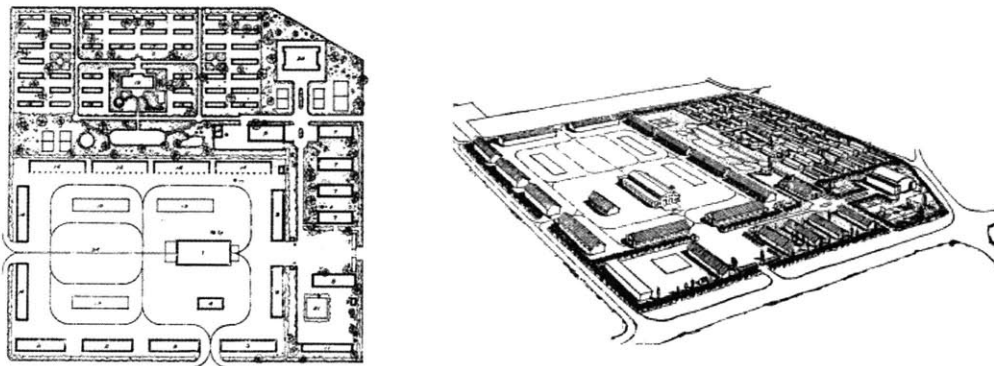


2.6 Shanghai Linong

2.4 Danwei compound

Danwei (work unit) emerged after 1949. It is a generic term referring to the socialist workplace and the activities it encompasses. The Chinese Communist Party organized the city through the workplace. It touched nearly every aspect of a Chinese worker's life: it provided employment and housing, meal provision and bath houses, child care and early schooling, medical treatment and welfare services, political study and party membership, marriage and divorce, policing and security.

The most prominent architectural feature of the danwei is undoubtedly the high enclosing wall that surrounds it.⁸ Encircling walls provide members with protection and a collective identity. Major buildings are ordered along axes. The alignment of buildings symbolizes the centrality of the party and productive labor. Work and living spaces are standardized. Uniformity conveys an egalitarian ethic.



2.7 and 2.8 Aerial view and plan for a motorized tractor repair station in suburban Beijing

2.5 Xiaoqu

Xiaoqu (small district) is the basic spatial unit of the residential development after 1980s. In many ways it resembles danwei residential compounds. It is a planned neighborhood where housing is integrated with communal facilities like kindergartens, clinics, restaurants, convenience shops, sports facilities, and communications infrastructure. All constituencies fall under the control of a professional property management company. Most xiaoqu have some kind of barrier-walls or fence, and many have security guards monitoring entrée points.



2.9 Model of Holiday Town Xiaoqu



2.10 Xiaoqu in Shanghai

2.6 Findings

Throughout China's history, walls have been widely utilized to demarcate urban and residential space. Courtyard house, linong housing neighborhood, danwei compound, modern xiaoqu are various manifestations of a similar cultural theme. Enclosed space and internal space often are related to a sense of security and homely comfort. Psychologically, they are "ideal" spatial forms of dwelling for many Chinese.

If we accept the fact that Chinese residence has been walled throughout their history, and the fact that walls represent a deeply imbedded cultural theme of security and comfort, then maybe we can shift the discourse, from one that questions the appropriateness of "wall communities" to one that searches for ways to improve current walled residential compounds.

Chapter 3 Case Studies

3.1 Introduction

The research analysis consists of case studies of two walled residential compounds. The aims of the research are to evaluate positive and negative aspects of this type of housing development, and to identify major causes of negative aspects.

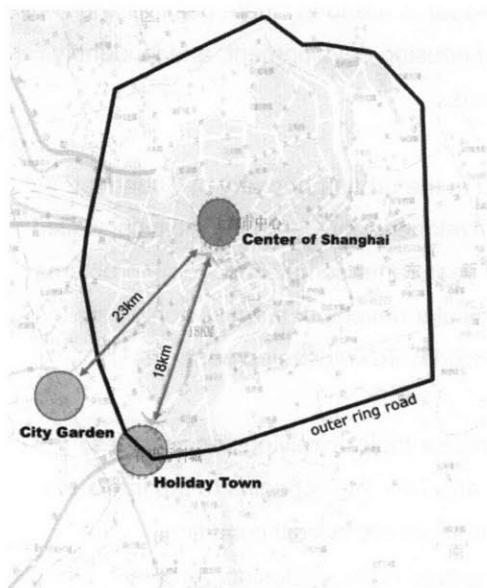
Both developments are located in the urban periphery of Shanghai. They were built by the same developer. City Garden is a typical walled residential compound. Several years after completion, some problems emerged. In this case, the particular developer learned from mistakes and made adjustments in the Holiday Town development.

Walled compound is a very complex topic, involving social issues, economy, real estate markets, etc. This thesis begins to tap into such issues from the indexing and analysis of physical conditions. One main feature of the walled compound is the enclosing perimeter, which separates urban space into internal and external conditions.

The research will analyze internal condition and external condition,

respectively in terms of security, sense of neighborhood, living environment, public amenities and transportation.

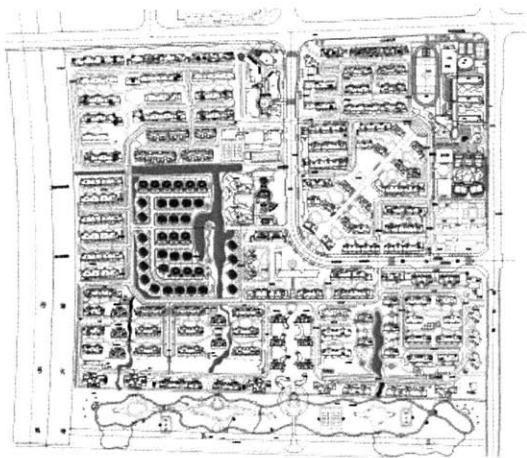
Two research sources are heavily cited in this paper. One is the survey of Shanghai Vanke City Garden, by Tongji University; the other is the survey of Shanghai Vanke Holiday Town, by MIT students.



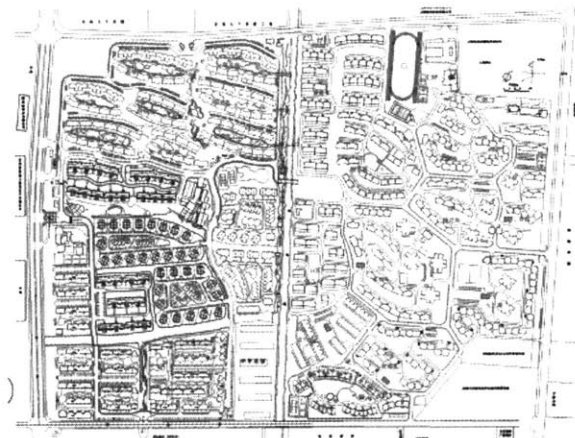
3.1 Location of the 2 case studies

Comparative Data

	Holiday Town	City Garden
Distance from Shanghai city center	18 km	23 km
Total land area	42.3 ha	65.3 ha
Dimensions	750m x 730m	1000m x 780m
Total building area	56.7 ha	72.9 ha
FAR	1.3	1.1
Total housing unit	4239	5400
Population	12717	16327
Unit/Ha	100.2	82.7
Population/Ha	300.6	250.0
Green Space Ratio	36.4%	13.2%
Construction Phasing	5 phases	3 phases
Duration of Phased Construction	2000-2005	1992-2000
Demography	Upper Middle class	Upper Middle class



3.2 Plan of Holiday Town



3.3 Plan of City Garden

3.21 Security

Internal issue

Security is the most important issue of a residential development. It could be achieved in many ways, which can be summarized as physical barrier, technological barrier and manual barrier.

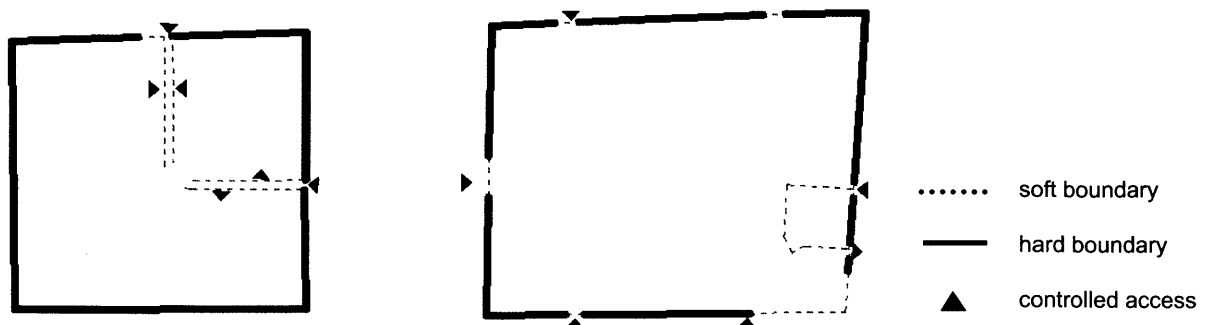
Physical barrier: wall and fence.

Technological barrier: digital surveillance, video camera, automated card entry.

Manual barrier: security guard and neighborhood watch.

All the three kinds of methods are used in the two cases cited above. Physical barriers are the most commonly used method. In some cases, public buildings, such as shops and schools, enclose the community and orientate outwards as a ring of barrier. Technological barriers are used on a small scale, such as the gate of cluster of residential buildings, or at the common entrance hall. Security guard is everywhere in the compound.

The survey shows that less than three crimes took place in Holiday Town last year. From the interview, residents said they felt very safe within the walled community. Some of them believe the security guard to be the most important factor that made them felt safe. Security guards in such communities often know every residence by face and can quickly spot a stranger.



3.4 Diagram of boundary conditions

External issue

The security of the external area mainly relies on manual surveillance.

Jane Jacobs pointed out that, *“Streets and their sidewalks, the main public places of a city are its most vital organs.... To keep the city safe is a fundamental task of a city’s streets and its sidewalks.... There must be eyes upon the street, eyes belonging to those we might call the natural proprietors of the street.... The sidewalk must have users on it fairly continuously, both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers.”*⁹

The public street inside of Holiday Town is example of such spaces. Small shops, bus stations, community center, restaurants, playgrounds, small plazas and office buildings are located along streets. Abundant pedestrian and various activities ensure the safety on the street.

Findings

the walled compounds provide the strong sense of security to the insiders. The enclosed perimeter is one of the important factors that achieve a desirable internal space. External security relies on active street life and neighborhood watch. A well-used city street is more likely to be a safe street. All the three security methods, physical barrier, electronic and manual surveillance, should be used in combination to ensure security.



3.5 Wall-hard boundary



3.6 Fence-hard boundary



3.7 Retail street- soft boundary

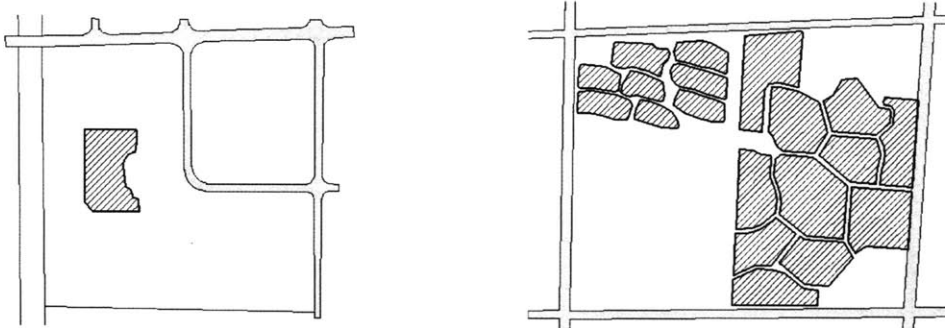
3.22 Sense of neighborhood

Neighborhood

A neighborhood is a geographically localized community located within a larger city or suburb. The residents of a given neighborhood are called neighbors.¹⁰ There are many factors contributing to the feeling of neighborhoodness, social and spatial. Uniform administrative management, neighborhood committee and owner's committees can be listed as social factors. Territoriality, homeliness and common sharing are more attributed as spatial factors. For example, in Holiday Town, the neighborhood committee often organizes activities that bring residents together: Moon festival, art & craft competition, sports and games, etc. This type of activity greatly increases the familiarity factor among residents, and between the management and residents. Spatially, children's playground and the park to the south are the most used public space in the complex. Thus, they became common grounds for the highest level of interaction between residents.

Sub-neighborhood

Sub-neighborhood is subdivided from a neighborhood. Within a neighborhood, there's high level of interaction of familiarity between residents. "Traditionally, a neighborhood is small enough that the neighbors are all able to know each other. However in practice, neighbors may not know one another very well at all. Villages aren't divided into neighborhoods, because they are already small enough that the villagers can all know each other."



3.8 Diagram of enclosed building groups

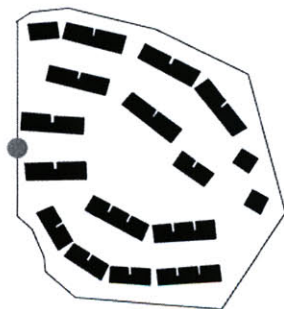
In City Garden, there are 19 housing groups in the compound. Each group is surrounded by neighborhood streets and has its own name. Some groups in the northwest of the development are enclosed by common entrance halls and buildings. Within each group, there are green space, activity field and parking space.

From the survey, most residents are familiar with 3 to 5 other households. These households are largely located within the walled compound, though not necessarily at the immediate surrounding area. This proves that the interactions between residents are not solely dictated by adjacency.

Holiday town hasn't been fully occupied by residents. It's too early to analyze.

Findings

The sense of neighborhood is caused by many factors. Social factors, spatial factors and sharing of common amenities all contribute to a sense of neighborhood. Walled compound generates a strong and clear spatial definition of an organized and secured community. Small scale walled compound, housing cluster and common space tend to foster more intimate environment between residents. Small scale segregation does not affect the overall interaction on a larger scale, within a given community.



3.9 Diagram of one building group in City Garden



3.10 Common entrance hall of the building group

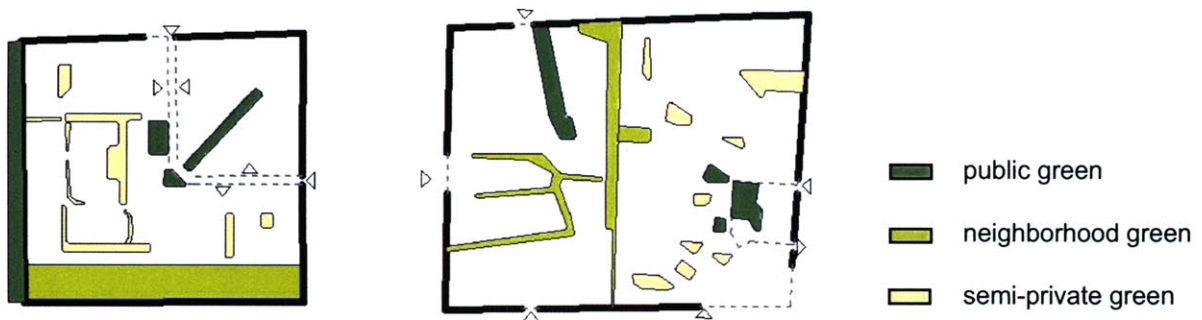
3.23 Living environment

Internal issue:

The survey of City Garden shows that a nice landscape and a serene environment is the second most important reason for that residents choose to live there. Low FAR and high green space ratio are the most attractive features of peripheral housing developments. In Holiday town the green ratio is 36.4%, In City Garden it's 13.2%.

External issue:

The environment outside of the compound is not very pleasant. In most cases, the enclosing perimeter is of a large scale. Only 2 entrances open onto the public street, with a distance of some 700 meters between them. Very little attention is paid to the external space which actually is the public space for the city. All the green space is designed exclusive for the compounds, even at the boundary. In Holiday Town, the park to the south of the development is isolated from the outside city by plants and fence. Though it is next to two public streets, the only access is open to the compound. From the survey, it seems that residents don't really oppose outside users, as long as they do not abuse the common grounds. Most residents actually prefer more human activity within these dedicated parks.



3.11 diagram of green space

Findings:

Serene and nice pedestrian environment is one of most attractive features of walled residential compounds. At the same time, various outdoor spaces are needed by residents: public, semi-public and semi-private. Because of its enclosure, walled communities can easily create an array of successful semi-private spaces. Yet, they do seem to ignore the spatial needs of the city on a larger scale. They achieve very little in any type of spatial and social contribution to the city.



3.12 Semi-private green space



3.13 Development green space



3.14 Space outside of the compound

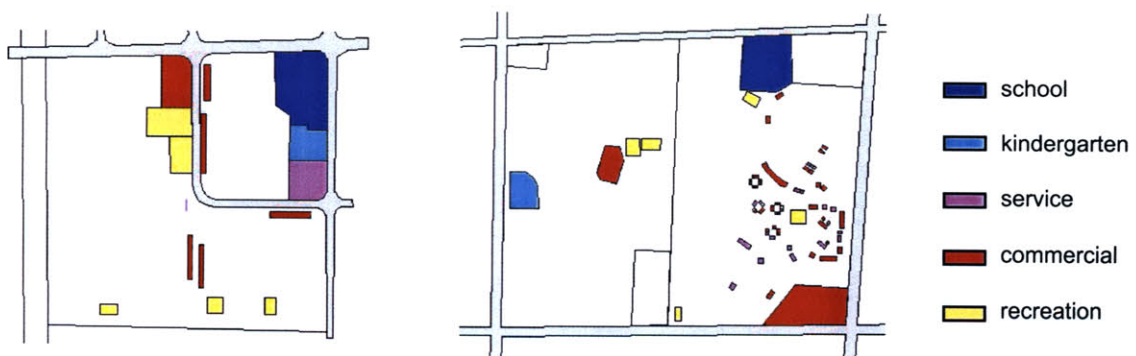
3.24 Public amenities

In terms of service, public amenities are divided into two groups. One group is the dedicated serve that caters to one development; the other group is the shared resources of one amenity by several developments. The former group includes core commercial, recreation and leisure facilities, middle school, restaurants, bars, banks, post office and so on. The latter group includes kindergartens, elementary schools, clinic, small retails, and community council.

In City Garden's case, most of the facilities are inside of the compound. The residents can do shopping; go to school, restaurants and gym without ever stepping out. The developer tried to create a self-sufficient compound with everything in it. This kind of layout has both of internal and external problems:

Internal issue:

The conflict between the enclosure and the commercial interest. At the beginning, the surrounding area was undeveloped, the inside facilities provide convenience for the residents. However, as the regional developing continuous, the commercial center outside of City Garden was developed. Some of the internal commercial establishments lost most of



3.15 diagram of public amenities

their customers. From the interview, young residents indicated that they prefer go shopping in high standard commercial centers rather than at the stores within the compound. The survey shows that the ratio of daily shopping inside to outside is roughly 1:5.

External issue:

The redundancy of similar facilities. Because of the exclusiveness of the public amenities, similar support system is not shared among different housing compounds, or between the compound and the adjacent urban inhabitants.

In City Garden's case, the developer was aware of the problems of the former development and opened the central street to allow public facilities along it exposed to both insiders and outsiders.

Findings:

The confliction of the enclosure and the commerce and the redundancy of similar facilities are two main problems of the public amenities of walled compounds. The facilities serving several developments should be located at the boundary of the compounds and open to public streets.



3.16 Community club is open to outsiders in Holiday Town



3.17 Public amenities surround the central public street in Holiday Town

3.25 Transportation

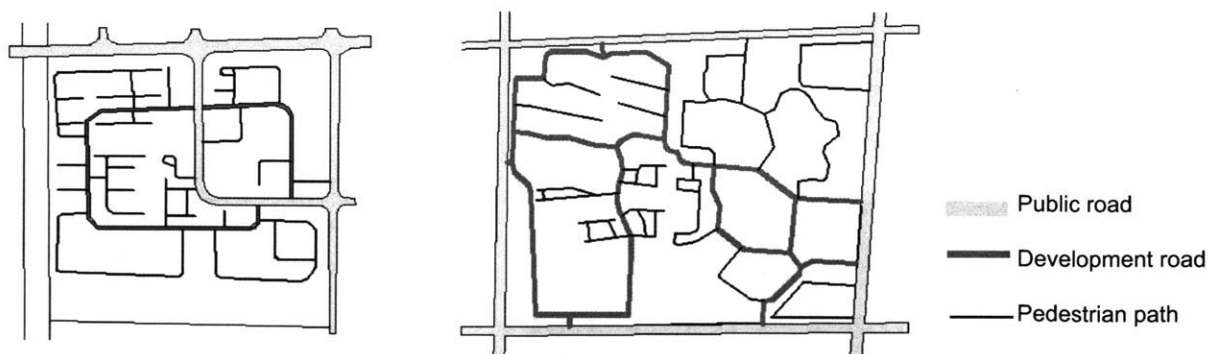
Internal issue:

Inconvenience of public means of transportation.

Buses and Taxis are not allowed to use the development streets. That brings the inconvenience to the residents inside the compound. In City Garden, the problem is obvious, while in Holiday Town, the problem is solved by import a public street to the center of the development.

External issue:

A city's road system, in order to be efficient, requires major avenues, as well as small tertiary streets. These two type of passage work together as a network to facilitate traffic flow. Large scale walled compounds become "tumors" in this network, making a regular and dense frequency of streets more difficult to achieve. Future city development requires that walled compounds be kept minimal in its scale. Roads which pass through such compounds should also be open and accessible. Certain cases from the west seem to dictate that a "community" should not exceed 50,000 sq. meters. Theoretically speaking,



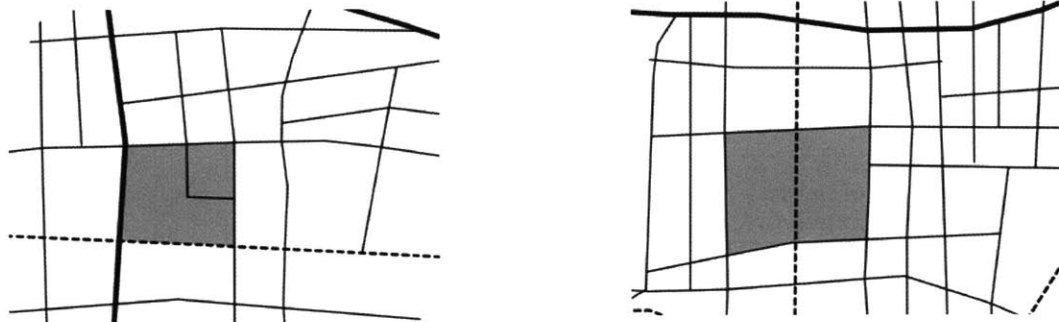
3.18 diagram of road system in the compounds

opening “communities” to the city could be advantageous. Of course, the methodology of management should drastically change once a community is opening. The management and sharing of amenities becomes more of a social and public concern.

Enclosed “compounds” fragments a city and is a huge roadblock to efficient traffic in a large city. In France, the distance between intersections is kept between 200 to 300 meters. In New York, such distance is regulated to be at 100 to 150 meters. Such a high frequency of roads offer many options and tend to alleviate traffic congestion. Paris handles more than 3 million cars without major traffic problems. As a contrast, in the city of Guangzhou, the normal distance between intersections is 500 to 700 meters, with frequent walled compounds in between. Such a city could really take advantage of roads which pass through wall communities, thus in one stroke both alleviate traffic congestion and increase the commercial value of the affected areas.

Findings:

The enclosure nature brings the inconvenience of public means of transportation. The internal street system poorly integrated with the road system of the city. These compounds, with its density, bring tremendous pressure to adjacent infrastructures, often creating daily traffic congestion.



3.19 diagram of road system outside the compounds

3.3 Conclusion

Size of the enclosed area and boundary condition are two main factors that raise the problems.

The design solutions:

1-Break down the size of compounds.

- Individual “walled” area should be relatively small, to allow urban inhabitants easy and short access to the perimeter, which contain public amenities and retail facing outwards.

2-Inhabit the boundary.

- Redefine the boundary of walled residential compounds. Recreate street life that is rich and varied. Make the boundary contain retail and other amenities for urban inhabitants inside and outside of the complex.

Internal	External	
▪ <i>Safety</i>	▪ <i>Lack of safety, lack of neighborhood watch</i>	Boundary
▪ <i>Sense of community</i>	▪ <i>Vacuum area</i>	Size
▪ <i>Serene environment, nice pedestrian environment</i>	▪ <i>No pedestrian environment.</i>	Boundary
▪ <i>Exclusiveness of public amenity</i>	▪ <i>Lack of public amenity</i>	Boundary
▪ <i>Inconvenience of public means of transportation</i>	▪ <i>Transportation congestion</i>	Size
▪ <i>Lack of street life</i>	▪ <i>Lack of street life</i>	Boundary
		Size

Chapter 4 Design Guideline

Size

Important factors that may limit the size of compounds

1 Internal issue:

1.a Walkable area (Pedestrian sheds):

In a large number of surveys, the acceptable walking distances for most people in ordinary daily situations has been found to be around 400 to 500 meters(1,300 to 1,600 ft.). For children, old people, and disabled people, the acceptable waking distance is often considerably less.¹¹

According to Calthorpe's New Urbanism Design parameter:

"An urban structure based on a walkable, mixed-use neighborhood, will reduce trip lengths. The average radius of development should be within a 5-minute walk or 400 meters in diameter. Those areas within a 10-minute walking distance of the transit stop shall be included only if direct access by Local Street or path can be established without the development of an arterial."¹²

1.b Sense of neighborhood:

Sense of neighborhood base on two aspects: service (shared public facilities) and perception.

Base on service:

In the Chinese Code of urban Residential Areas Planning & Design, there are regulations for the service radius of public facilities. The service radius is based on the population within the service coverage. It's also related to the density of the area. Service radius:

Kindergarten 300m

Elementary school: 500m

Middle school: 1000m

Small commercial: 300m

Base on perception:

From the physiological research, 130-140 meters is the maximum distance for human to recognize other people's profile. So in most of the traditional neighborhoods, the distance between two intersections is about 130-140 meters.¹³

Crucial to determining the acceptable distance in a given situation is not only the actual physical distance, but also to a great extent the experienced distance.

"Acceptable walking distances thus are interplay between the length of street and the quality of the route, both with regard to protection and to stimulation en route."

A stretch of 500 meters (1,600 ft.) viewed as a straight, unprotected, and dull path is experienced as very long and tiring, while the same length can be experienced as a very short distance if the route is perceived in stages."¹⁴

2 External issue:

2.a Distance of bus stops:

A pedestrian oriented neighborhood, transit stations and stops must be easily accessible by foot and clearly identifiable. With the modified grid pattern of traditional neighborhood design, the provision of a transit system is much more efficient. A coordinated transit network would link a number of neighborhoods, with a larger urban centre, and fulfill the goals

of reduced dependence of the automobile, provide an equitable and environmentally friendly mode of transportation.

To encourage the use of transit, the design must ensure that the arrangement of development and streets is such that all potential building sites are within an approximate 400 meters walking distance of a transit stop.¹⁵

2.b Density of street network:

The size of the block affects the density of the street network. The secondary streets' density affects the commercial activities along the street. In the central area of the city where more commercial activity is needed to meet demand, the block size should be relative smaller; while in the peripheral area, the block size should be relative bigger.

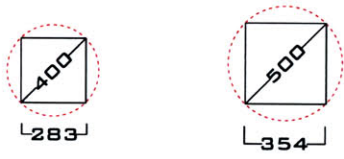
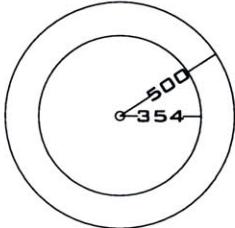

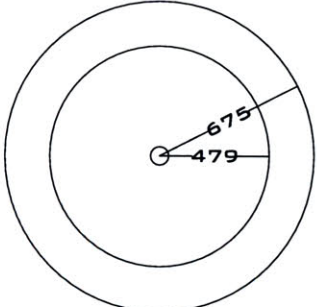
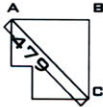
In big Chinese cities, the density of major street is 0.8-1.2km/km², the density of secondary street is 1.2-1.4 km/km², the density of small street is 3-4 km/km².

The size of the walled compound determines the density of street network. Reducing the size of the compounds and increasing the density of small streets help to solve the traffic congestion and adding commercial activities.

Increasing the density of small street will reduce traffic congestion. Short cuts and various route options will alleviate pressure on the main boulevards. One way traffic could also be used to manage traffic flow in an efficient manner. One way routes, controlled by traffic lights, could be a solution. The increase of intersections on such routes doesn't necessarily create problems, on the contrary, they offer more opportunities to divert and distribute traffic. For example, Manhattan's street grid is 100 meter (North - south) times 300 meter (East - West). Mostly all traffic is one-way. Automobile per square kilometer is much higher than Beijing. Yet, due to the density of streets, automobile per kilometer of roads is less than that of Beijing. Traffic congestions are also somewhat better than Beijing's condition.

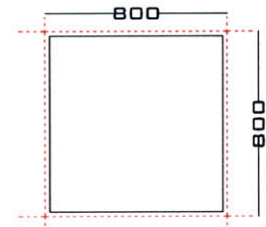
Size Design Guideline

Rules

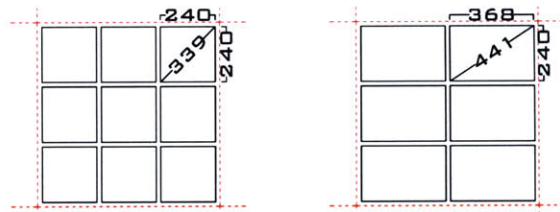
Typical site and facilities standard 800m*800m FAR: 1.2		
category	standard sm/1k people	
	building area	land area
kindergarten	415	600
elementary school	547	1,200
leisure and recreation	367	433
commercial and service	1,308	3,448
green		2,000
1: Comfortable walking distance: 400-500m		
		
2: Facilities service radius		
2.1: Kindergarten service radius: 354m		
 <p>Maximum walking distance for kindergarten is 500m. 354m is the radius to measure 500m walking route</p>  <p>$AB + BC = 500 \text{ M}$ $AC = 354 \text{ M}$</p>		
2.2: Elementary school service radius: 479m		
 <p>Maximum walking distance for kindergarten is 675m. 479m is the radius to measure 675m walking route</p>  <p>$AB + BC = 675 \text{ M}$ $AC = 479 \text{ M}$</p>		

Apply rules to typical site

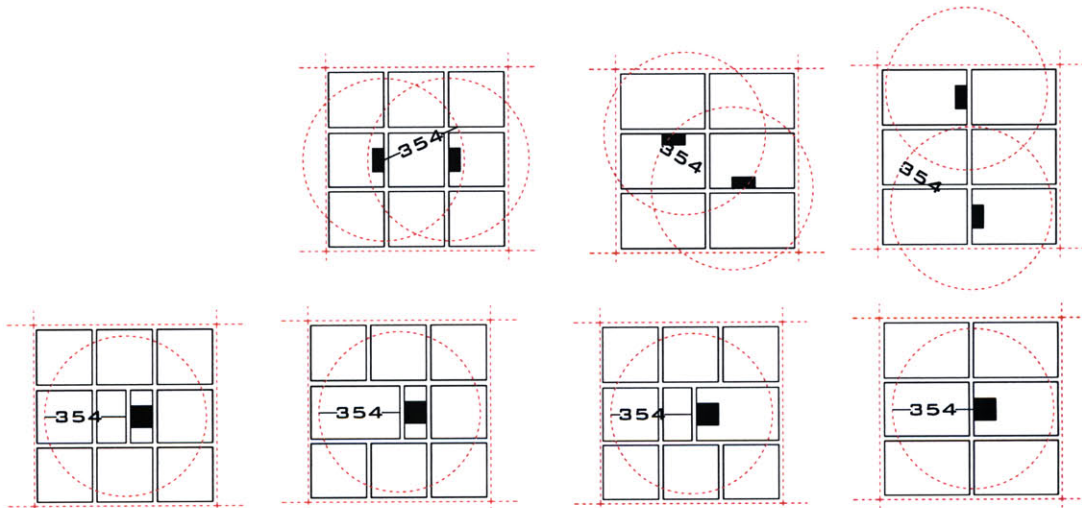
- | | | | |
|---|-------------------------------|---|------------------------------|
|  | kindergarten
9,720 sm |  | recreation
7,014 sm |
|  | school
19,440 sm |  | core commercial
10,000 sm |
|  | service & retail
56,000 sm |  | green
32,400 sm |



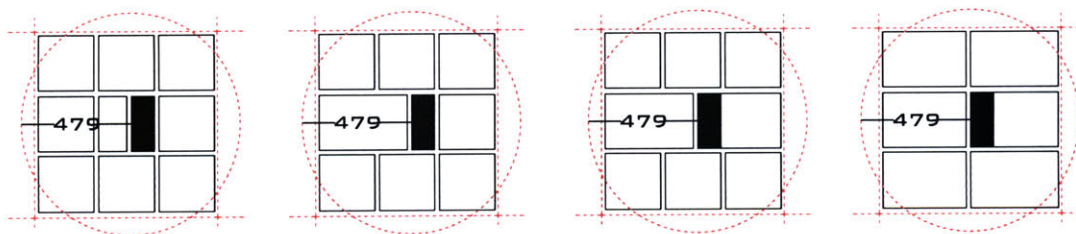
Typical site and required facilities



Divide site by comfortable walking distance



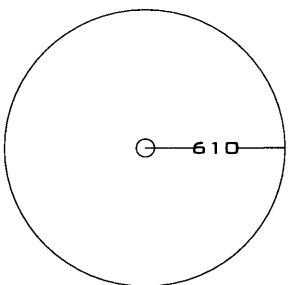
Locate kindergarten by serving radius



Locate middle school by serving radius

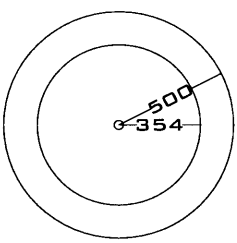
Rules

2.3: Core commercial service radius: 610m

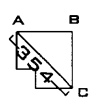


From the core commercial areas over an area that is an average of 2000 feet(610m) in radius represents a 10 minutes walking distance along streets.

2.4: Bus stop service radius: 354m



Maximum walking distance for kindergarten is 500m. 354m is the radius to measure 500m walking route

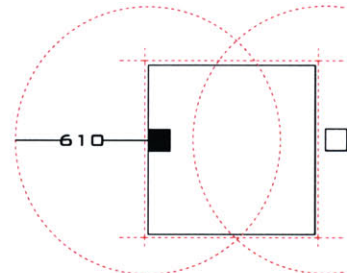
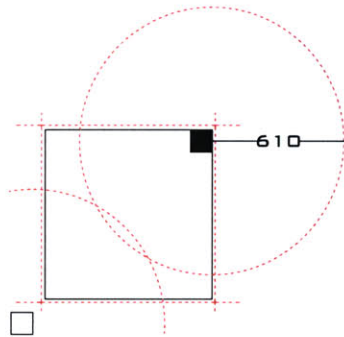


$AB + BC = 500 \text{ M}$
 $AC = 354 \text{ M}$

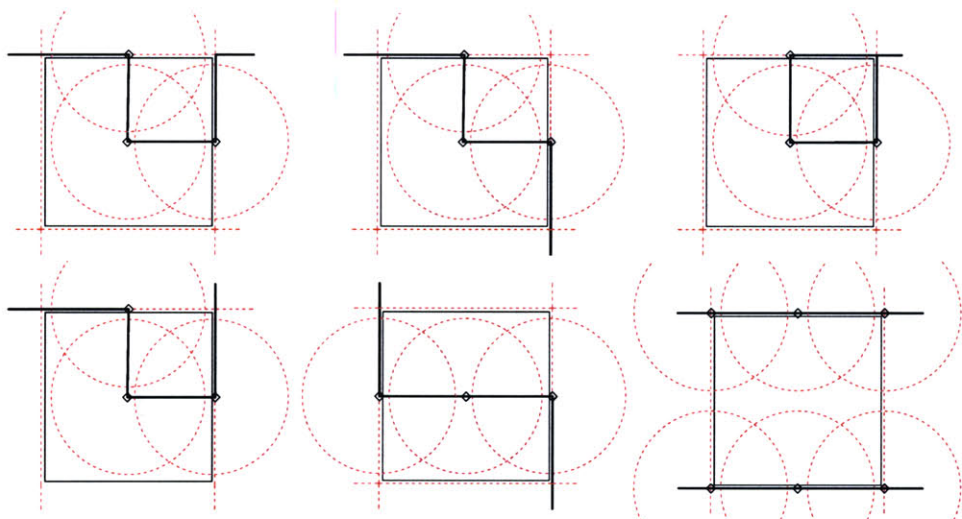
3: Barrier

Barrier includes high way, river, mountain.
Ring road or cul de sac should located in the barrier side.

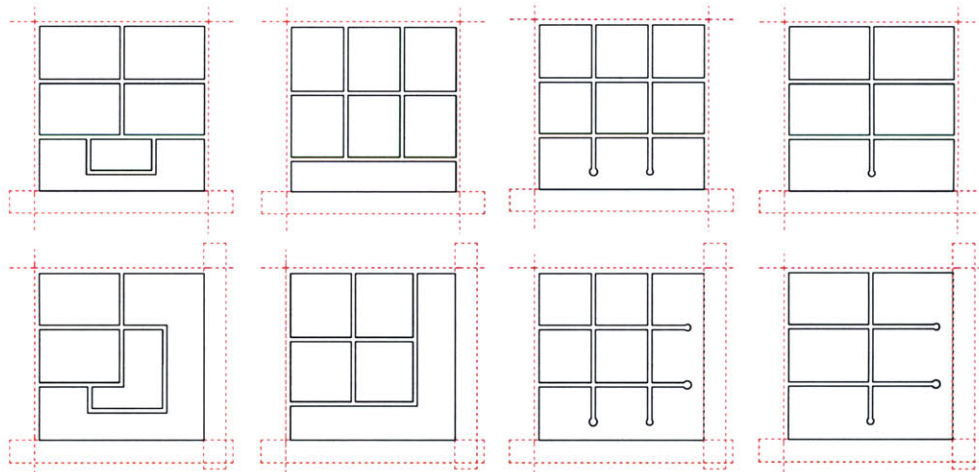
Apply rules to typical site



Locate core commercial by serving radius



Locate bus stops by serving radius



Divide site with the consideration of barrier

Rules of facilities' location

Elementary school

- Service radius 500m
- 1 elementary school in one 800m*800m site
- Entrance should be located on the neighborhood street
- Should be reached within 675m walking distance
- Should be reached without crossing major street
- Should not be located next to the main street
- Should not close to core commercial

Kindergarten

- Service radius 300m
- 2-3 kindergartens in one 800m*800m site has
- Entrance should on the neighborhood street
- Should be reached within a comfortable walking distance(500m)
- Should be reached without crossing major street

Middle school

- Service radius 1000m
- Not every site need to have one
- Serve several neighborhoods
- Located on the boundary of the site
- Entrance should be located on the main street
- Close to bus stop
- Should not close to core commercial

Bus stop

- Usually one or two bus lines reach this kind of developments
- Located on the main street
- If only one bus line. The bus line must go inside of the development
- Should be reached within 500m walking distance

Core commercial

- Service radius 610m (2100ft)
- Not every site need to have one
- Located on the main street
- Close to bus stop
- Should not be close to education facilities

Small commercial

- Service radius 300m
- Located on the neighborhood streets
- Should be reached with in 500m walking distance

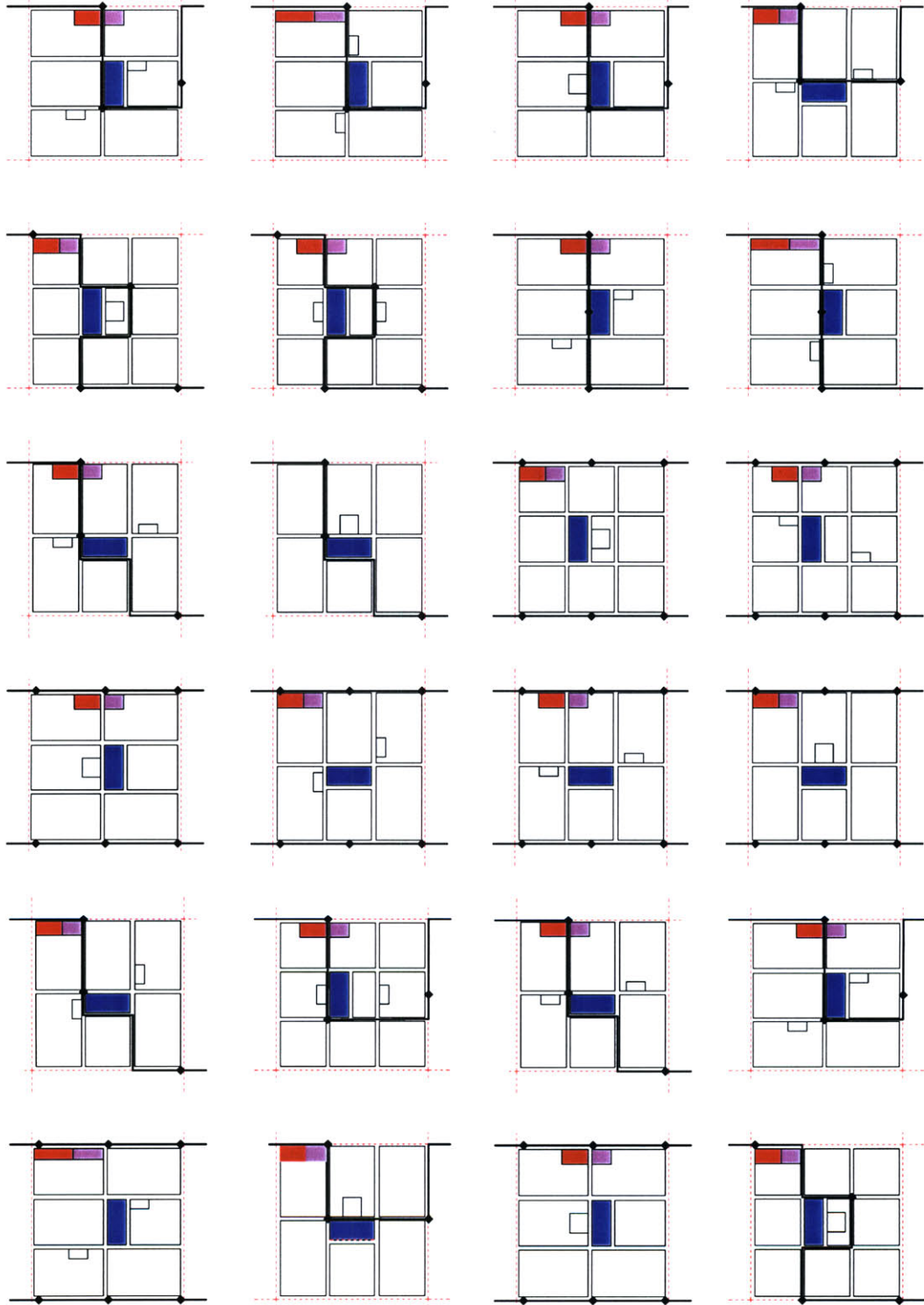
Leisure and recreation

- Located one the edge of the site, next to the main street
- Close to commercial

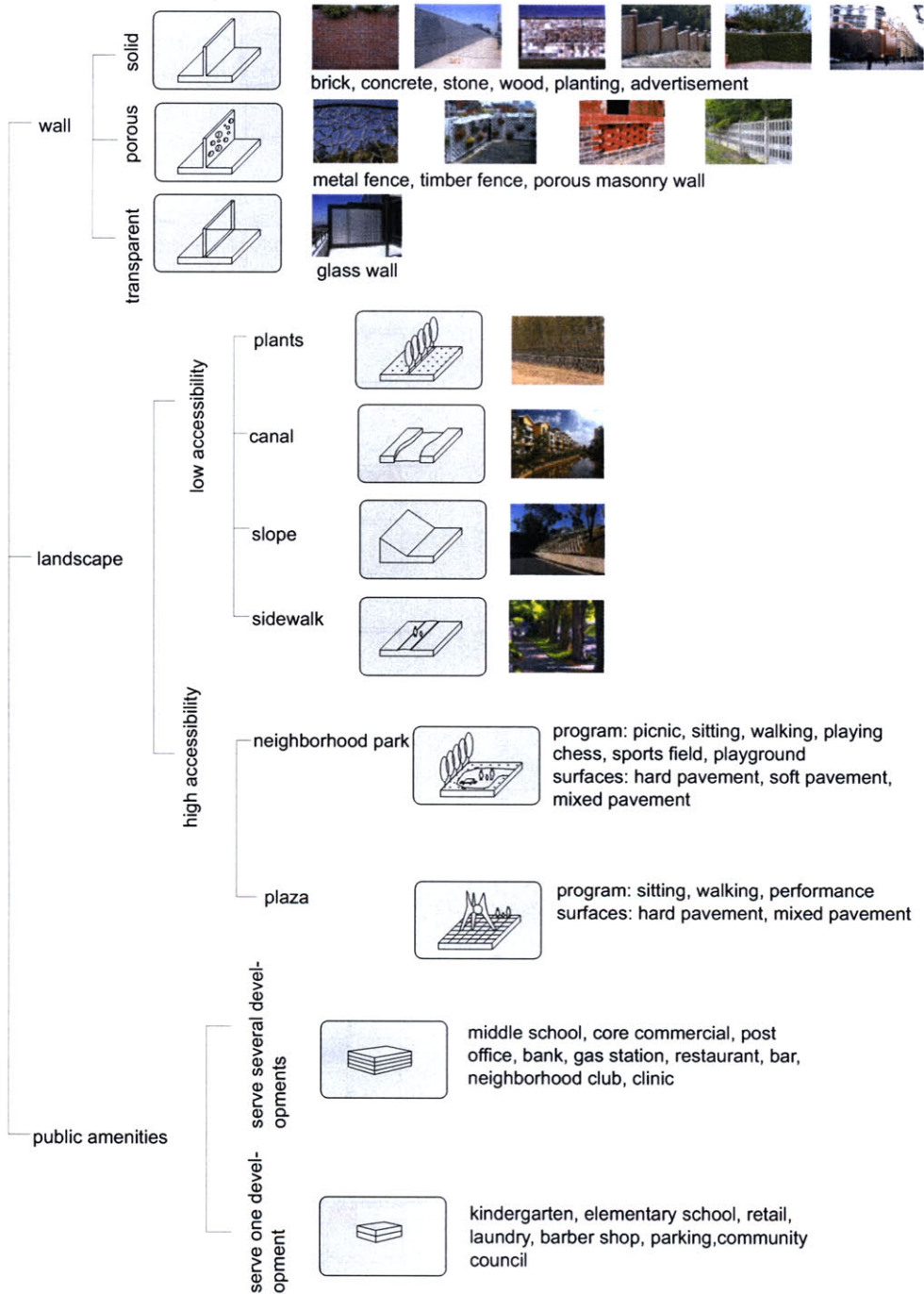
Restaurant, bank, post office, gas station, clinic

- Located on the main streets
- Close to bus stop

Combination of rules in typical site

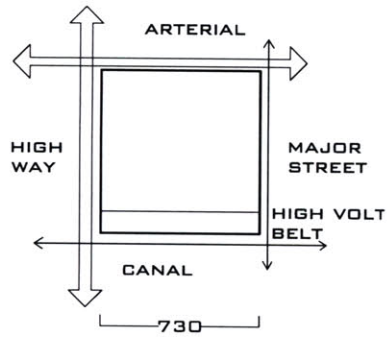


Boundary Design Guideline

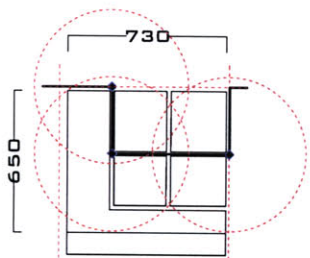


	safety	porosity	accessibility	
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Be use in some outer boundary, keep out of bad external view or noise.
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Be used in most of the boundary. Allow view penetrate. keep safety
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Be used in some special place. e.g. entrance, nice view corridor.
.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Could be use with wall boundary. Dense and high plants could be used individually in inner boundary. Provide shadings of sidewalk. Hide the wall boundary to provide friendly street view.
.....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Could be used as boundary individually. Usually use natural water feature. Some street furniture should be provide along the canal for sitting and chatting.
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	Usually used in the boundary where has natural height difference, or there is some program in the internal side.
.....	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	Only used individually when the security condition is very good. Usually combine with other enclosed perimeters or security guards.
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Semi-public open space. usually located in the center of the development. next to one or two inner streets. could be entered from both the adjacent streets and the walled compound.
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Urban public open space. usually located in the outer boundary. Connect the outer streets and public facilities. Could be entered from both the public facilities and the outer streets.
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Located in the outer streets. Serve several neighborhoods. Open to the outer streets. Don't have access to the compounds.
.....	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	Located in the inner streets. Serve one neighborhood. Open to the inner streets. Most of them don't have access to the compound except some shops and common entrance hall.

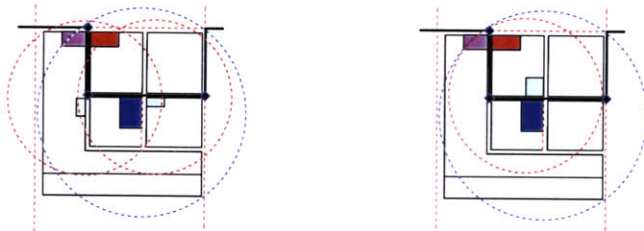
Apply Guideline to Holiday Town



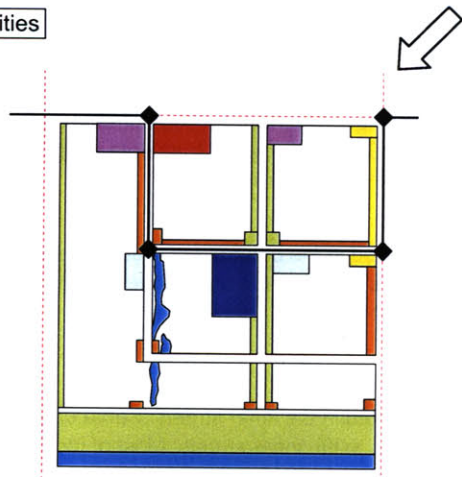
Site



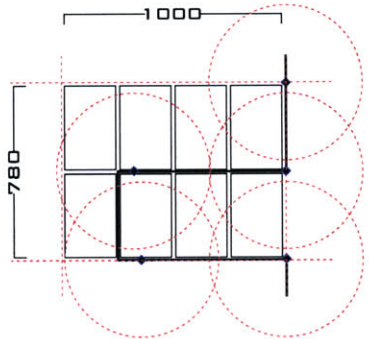
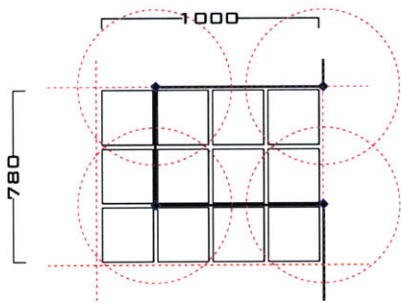
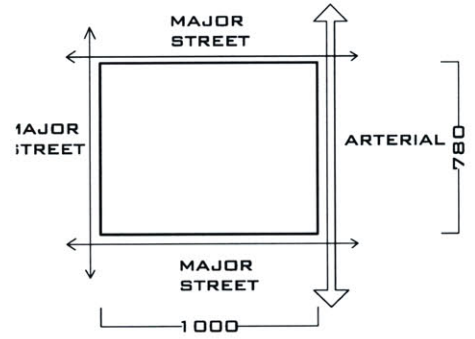
Divide



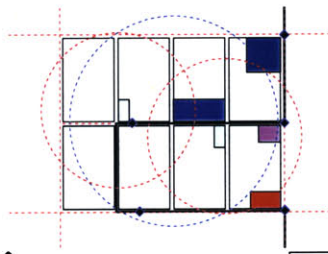
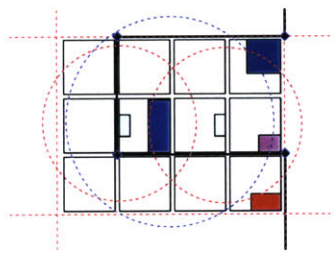
Locate facilities



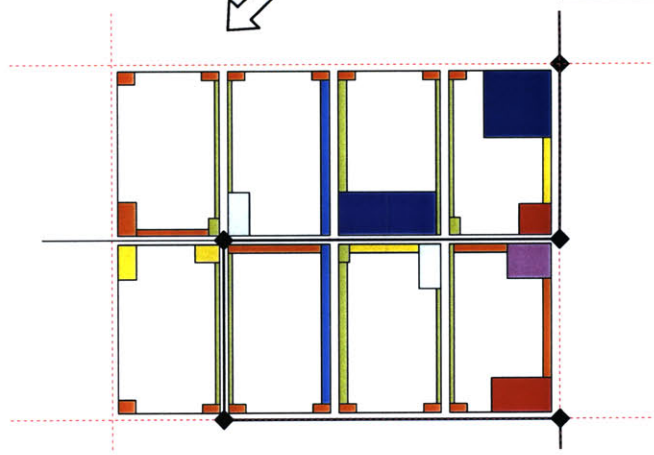
Apply Guideline to City Garden



Site

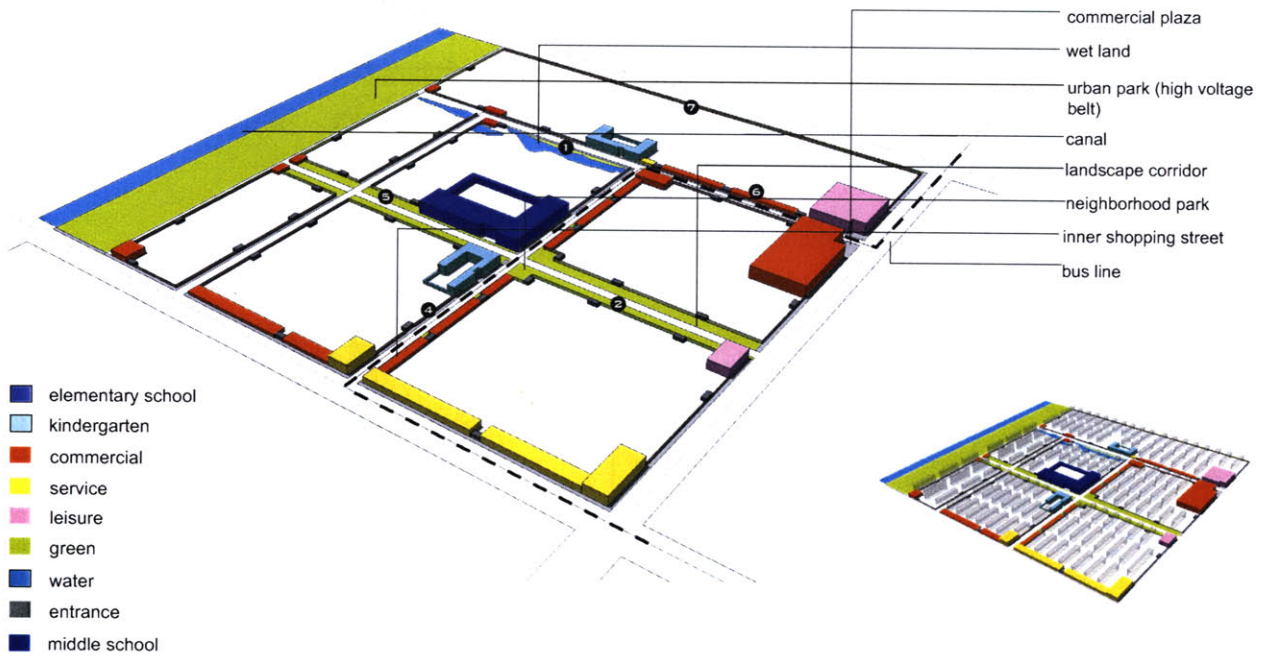


Divide



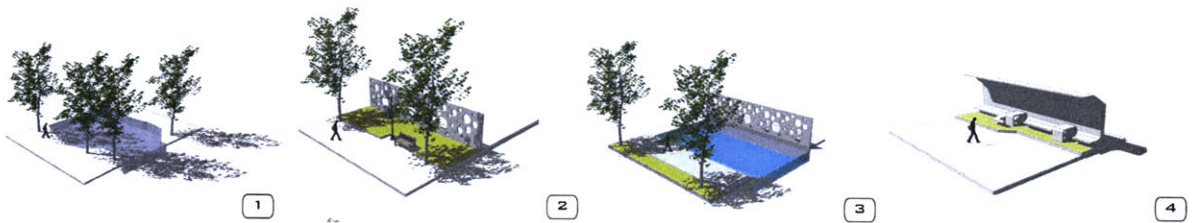
Locate facilities

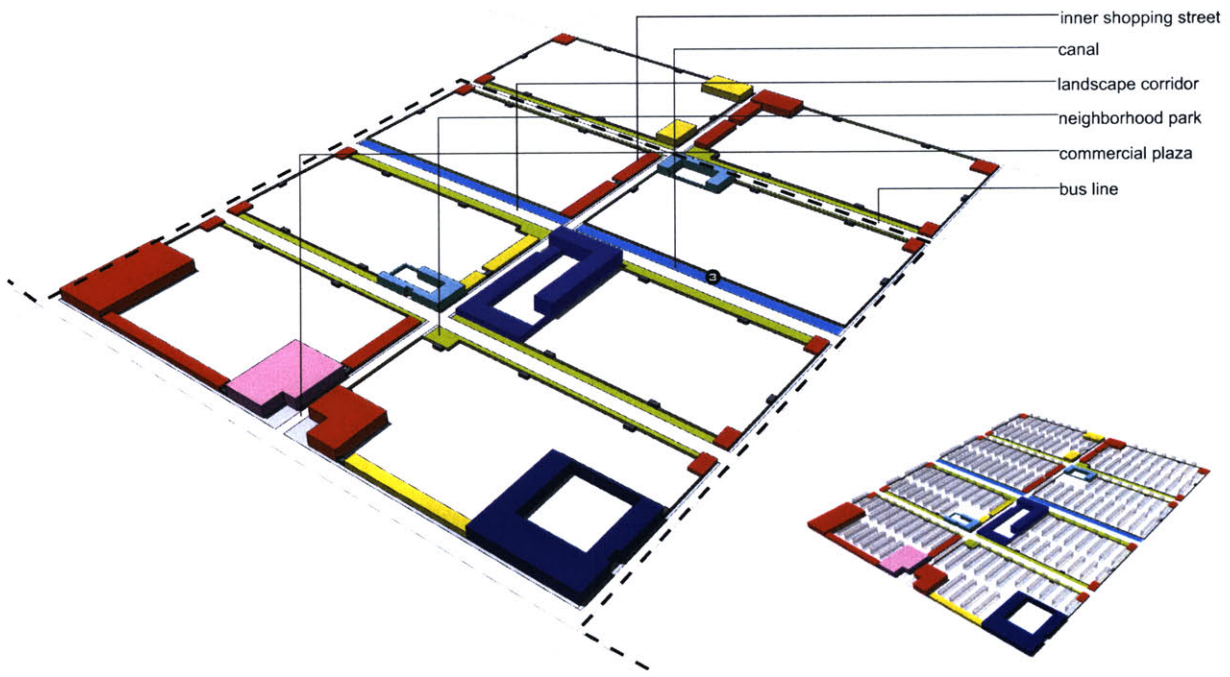
Product: a base of semi-walled residential compound



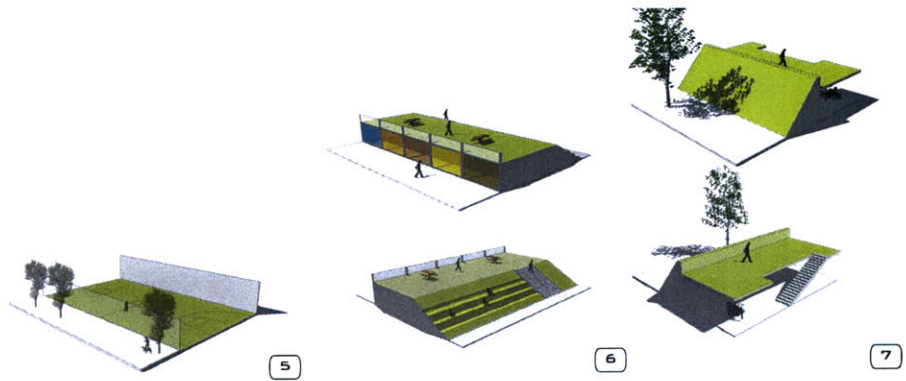
Proposal for Holiday Town

Examples of boundary conditions



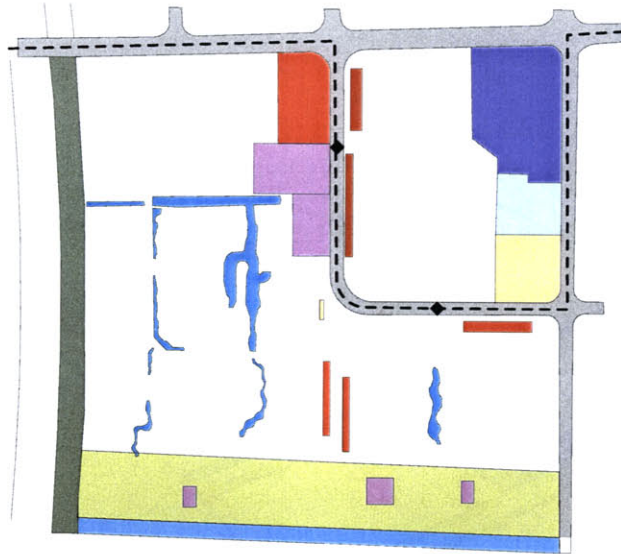


Proposal for Holiday Town



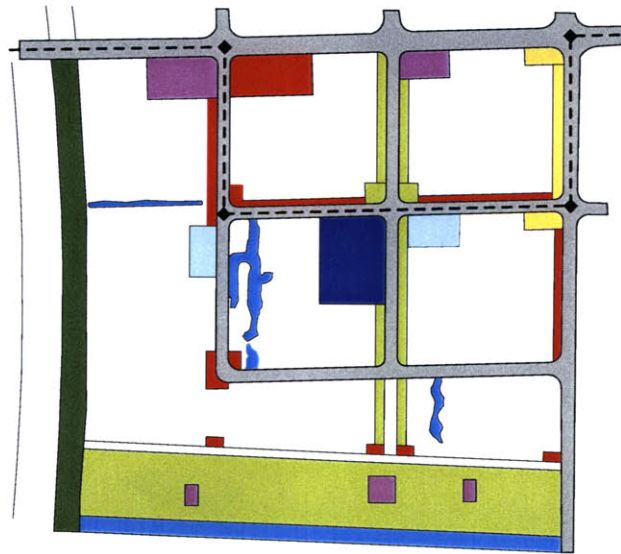
Comparison

Holiday Town



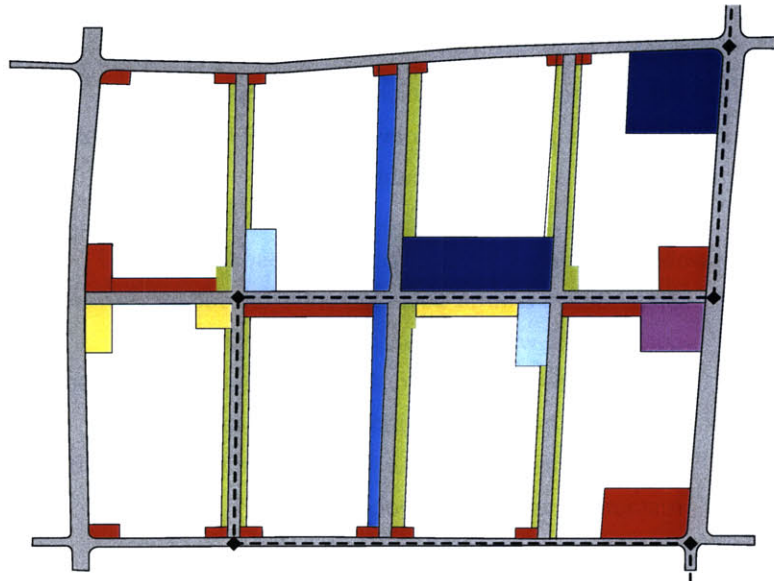
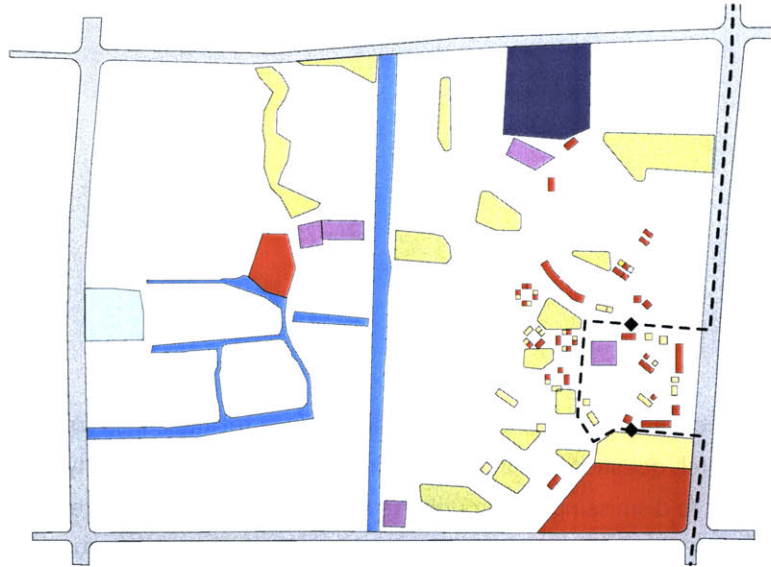
Existing condition

Guideline proposal



■ Elementary school ■ Kindergarten ■ Middle school ■ Commercial

City Garden



Chapter 5 Conclusion

By accepting the “wall” as part of the Chinese residential culture, the research question became how to improve this development typology rather than dismissing it. Through the analysis of two case studies, the problems point to the size and boundary of the compounds. Accordingly, rethinking issues related to size and boundary began to generate a new design guideline.

It is a seemingly nonradical solution to the complex problem. Yet, the resulting guideline generated a new typology of housing development – semi-walled residential compound.

Semi-walled residential compounds have these features:

1. Small Scale: a large development is divided into several small compounds, with each walled at its perimeter.
2. Streets between each small compound are linked to and accessible from the surrounding urban fabric.
3. Activated streets, loaded with public facilities, retail stores, restaurants and green space.

Semi-walled residential compounds have these advantages:

1. To the city: solve the problem of transportation congestion; open common facilities to the public; increase the urban public space and green space. Encourage urban street life.
2. To developers: the convenience of public transportation and proper density of public streets support commercial activities. In transforming fringe developments into active urban neighborhoods, real estate value is raised.
3. To residents: the convenience of public transportation, more options of public facilities, proper street scale and various of street activities bring high quality of urban living experience.

Appendix

- 1 Interview and survey of Holiday Town Shanghai
MIT Shanghai housing research workshop, 2005 Fall.
- 2 Super Community: Report of City Garden Shanghai
Tongji University & Vanke Architecture Research Center, 2004 12.
- 3 Intersections and Blocks per Square Mile for Selected Cities
Allan B. Jacobs, Great Streets. Massachusetts Institute of Technology,
1993.

Intersections and Blocks per Square Mile for Selected Cities
Allan B. Jacobs, Great Streets. Massachusetts Institute of Technology, 1993.

City (and area or date)	Intersections	Blocks	Distances between Intersections (feet)	
			Mean	Median
Venice	1,725* (1,507)	987* (862)		
Ahmedabad	1,447	539		
Tokyo (Nihonbashi)	988	675		
Cairo	894	301		
Old Delhi	833	244		
Seoul	718	496		
Boston (1895)	618* (433)	394* (276)	190	150
Amsterdam	578	305		
Savannah	530	399		
Boston (1955)	508* (356)	342* (240)		
Rome	504	419	198	150-175
Barcelona (Ramblas)	486	330		
London (City)	482* (423)	295* (259)		
Zurich (1985)	425	275		
London (Mayfair)	423	273		
Bologna (center)	423	272	224	300
Paris (Louvre)	418	315	245	200
Boston (1980)	373* (261)	245* (172)	235	300
Portland	370* (351)	318* (302)		
Zurich (1890)	369	243		
Aix-en-Provence	362	233		
Pompeii	347* (151)	246* (167)	224	300
New York (Lower Manhattan)	339* (218)	275* (177)	274	260
Toulouse	331	242		
San Francisco (center)	293* (274)	216* (202)	353	350
Paris (Etoile-Rond-Point)	281	214		
Pittsburgh (center)	277* (143)	197* (124)		
Copenhagen	244	170		
Pittsburgh (Shadyside)	242	188		
Oakland (center)	208	153		
Santa Monica, CA	185	147		
San Francisco (mid-city)	182	137	409	325
New York (Midtown)	181* (159)	166* (146)	423	260
Santa Cruz, CA (center)	179	108		
Los Angeles (center)	171	132	390	360
Barcelona (Paseo de Gracia)	164	138		
San Francisco (Sunset)	161* (131)	130* (106)	461	300
Bologna (Mazzini)	160	88		
Bologna (Corticello)	158	104		
Washington, DC	155	122		
Toulouse-Le-Mirail	146	112		
Irvine, CA (residential area)	119	43		
Walnut Creek, CA (center)	116	64		
Walnut Creek, CA (2.5 m from center)	113	50		
Brasilia	92	47		
Los Angeles (San Fernando area)	81	47		
Irvine, CA (business complex)	15	17	1,290	1,300



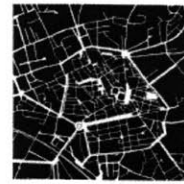
LONDON
THE UNITED KINGDOM



LONDON
THE UNITED KINGDOM



WASHINGTON
USA



SAN FRANCISCO
USA



BONN
GERMANY



PHILADELPHIA
USA



AMSTERDAM
THE NETHERLANDS



AMSTERDAM
THE NETHERLANDS



BATH
ENGLAND



BAR
ITALY



BERLIN
GERMANY



BERLIN
GERMANY



BRATISLAVA
SLOVAKIA



BOSTON
USA



LOS ANGELES
USA



LONDON
THE UNITED KINGDOM



Intersections and Blocks per Square Mile for Selected Cities
Allan B. Jacobs, Great Streets. Massachusetts Institute of Technology, 1993.

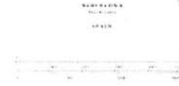
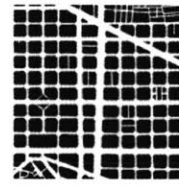
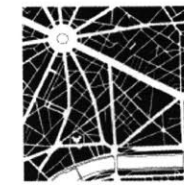
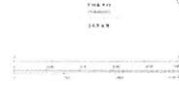


Illustration credit

2.1 Source: Reproduced in Liu Dunzhen, A history of Classical Chinese Architecture (Beijing, Chinese Architecture Industry Press, 1980), 23

2.2 Source: <http://beijing.qianlong.com/3825/2004/09/30/1060@2304266.htm>

2.3 Source: Social space and governance in urban china- the Danwei system from origins to reform. (Stanford, California: Stanford University Press, 2005), 30

2.4 source:Beijing courtyard house. [http:// www.shjtch.com/index1.htm](http://www.shjtch.com/index1.htm)

2.5 Source: Luo Xiaowei, Shanghai Xintiandi (Southeast University, Press, 2004), 23

2.6 Source: <http://www.archives.sh.cn.shcbq/qyrk / 200407050013.htm>

2.7 and 2.8 Source: Ma Haoran, "Design for an Agricultural Motorized Tractor Station in Beijing," Journal of Architecture 8 (1957): 47,52.

2.9 and 2.10 Image by Liang Zhao.

3.2, 3.3 and 3.17 Provide by China Vanke Co.,Ltd.

3.10 Source: Super Community: Report of City Garden Shanghai Tongji University & Vanke Architecture Research Center, 2004 12.

3.1, 3.4 - 3.9, 3.11-3.16, 3.18-3.19 Image by Author

Notes

1. Miao, Pu. Cancer of Urban Life: Problems of Gated Communities in China and Their Solutions (Time + Architecture 2004/5), 46
2. Mark Gottdiener, Ray Hutchison. The new urban sociology (Boulder, Colo. : Westview Press, c2006).
3. Osvald Sirén, Needham 1971, 42-43.
4. David Bray, Social space and governance in urban China: The Danwei system from origins to reform(Stanford, California: Stanford University Press, 2005), 24
5. Wenyi Zhu, Space, symbol, city: a theory of urban design (Beijing: China Architecture Industry Press, 1993), 183
6. Andrew Boyd, Chinese architecture and town planning: 1500 BC-AD 1991 (London: Alec Tiranti, 1962), 49
7. Chun Lan Zhao, From Shikumen to new-style: a rereading of lilong housing in modern Shanghai (The journal of architecture volume 9, spring 2004), 68
8. Bray, Social space and governance in urban China, 144
9. Jane Jacobs, *the death and life of great American cities*(New York: Random house, 1961), 29-30
10. *Wikipedia, the free encyclopedia*, <http://en.wikipedia.org/wiki/Neighborhood>
11. Jan Gehl, *Life Between Building: Using Public Space* (New York: Van Nostrand Reinhold Company, 1987), 139
12. Calthorpe, Peter. *The Next American Metropolis: Ecology, Community and the American Dream*. (The Princeton Architectural Press, 1993), 66

13. Jing Zhang. *A Research of Unit Scale and Revival Condition of Housing Block*. (Zhejiang University,2004), 37
14. Jan Gehl, *Life Between Building*, 139
15. Calthorpe, Peter. *The Next American Metropolis*, 66

Bibliography

Peter Calthorpe, *the next American metropolis: ecology, community, and the American dream*. New York: Princeton Architecture Press, 1993.

Jane Jacobs, *the death and life of great American cities*. New York: Random house, 1961.

Jan Gehl, *Life Between Building: Using Public Space*. New York: Van Nostrand Reinhold Company, 1987.

Milton Keynes Development Corporation, *the Milton Keynes Planning Manual*. Chesterton Consulting, 1992.

Edward J. Blakely and Mary Gail Snyder, *Fortress America: Gated and Walled Communities in the United States*. Cambridge: Lincoln institute of land policy, 1997.

How we think: Vanke's perspective on urban community development, Nanjing: Southwest University Press, 2004.

Breheny, M. *Sustainable Development and Urban Form*, Pion London, 1992

Edited by Lv Junhua, Peter Rowe, and Zhang Jie, *Modern urban housing in China, 1840-2000*, Munich, New York, c2001.

Allan B. Jacobs, *Great Streets*. Massachusetts Institute of Technology, 1993.

John A. Dutton, *New American Urbanism: re-forming the suburban metropolis*. Skira editore, 2000.

Cliff Moughtin with Peter Shirley, *Urban Design Green Dimensions*. Oxford: Architectural Press, 2005.

Sim Van der Ryn & Peter Calthorpe, *A New Design Synthesis for Cities, Suburbs, and Towns: Sustainable Communities*. San Francisco: Sierra Club Books, 1991.

Construction Department of People Republic of China, *National Standard of People Republic of China: Code of urban Residential Areas Planning & Design*, Beijing: Chinese Architecture Industry Press, 2002.

Edited by Robert Fishman, *Michigan Debates on Urbanism volume II: New Urbanism: Peter Calthorpe vs. Lars Lerup*. New York: Distributed Arts Press, 2005.

Miao, Pu. *Cancer of Urban Life: Problems of Gated Communities in China and Their Solutions*. Time + Architecture 2004/5.