GREEN BUILDING DESIGN

300 H STREET NE WASHINGTON DC

Wei Yao

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Architecture

Paul Emmons,Chair

Jaan Holt

Marcia Feuerstein

December 17th,2009
National Capital Region,Virginia

Keywords: green, architecture, urban

GREEN BUILDING DESIGN

300 H STREET NE WASHIONGTON DC

Wei Yao

Abstract

How to understand the concept of GREEN in an architectural perspective is the aim of my thesis. Aside from the basic concepts of sustainable building design, such as climate responsive layout, natural systems from daylight to fresh air providing a superior environment for the occupants as well as a better long-term contribution to the surrounding urban environment, more emphasis has been put on the understanding of GREEN from the historical and cultural perspective. Based on the inspirations from an in-depth typological research of the town house and its development in the history and its respondence to the nature environment and urban contexture, a set of comprehensive GREEN design strategies have been developed in this thesis work.

Figure 1. Model Detail of the Sky Village

Dedication

Dedicated to Mom & Dad

Acknowledgement

Working on this thesis has been a journey of rebirth in my life. I am grateful to my mentors, friends and family that have supported me along the journey.

I would like to thank Professor Jaan Holt especially, who not only provided me guidance and instruction on my thesis work with his boundless knowledge, but also continuouly gave me warm encouragement to my work and study at school.

I am very grateful for the help from my committee chair, Dr. Paul Emmons, whose great insight and perspective were critical to each step of the development of my work.

I would also like thank my instructor, Dr. Marcia Feuerstein for her enlightening ideas and many warm encouragements and concerns.

Along this journey I owe a special gratitude to my parents who gave me their self-less support from my hometown.

Many thanks to Qian, with his support and encouragement, many difficult times of my work have turned into beautiful memories.

Also thanks to my friends, Dafang, Rachel.There are so many joyable and painful time we have spent together.

Without your support, I can not be where I am right now.

List of Figures

1. Model detail of Sky Village (pp.ii)
2. Site map in urban contexture (pp.2)
3. Site Model(pp3)
4. Rails of the Union Stationl (pp3)
5. View from the bridge to the H street NEl (pp3)
6. View from the bridge to the H street NE 2 (pp3)
7. View from the bridge to the H street NE 3 (pp3)
8. View from the west to the site (pp3)
9. Intersection of H street and 3rd street (pp3)
10. Intersection of H street and 3rd street (pp3)
11. Two temporary buildings (pp3)
12. View to the block center (pp3)
13. View from the east to the site (pp3)
14. Site map (pp4)
15. Sanborn map (pp4)
All Sanborn maps copyrighted © 2001 by The Sanborn Map Company, Sanborn Library, LLC.
16. Sanborn map 1928 (pp4)
All Sanborn maps copyrighted © 2001 by The Sanborn Map Company, Sanborn Library, LLC.
17. Baist map 1913 (pp4)
http://www.loc.gov/index.html
18. Site map 1959 (pp4)
19. Baist map 1921 (pp4)
http://www.loc.gov/index.html
20. Analysis of the existing buildings on site (pp5)
21. Analysis of the wind of the site (pp6)
22. Dominate wind in summer and winter across the site (pp6)
23. Air circulation through the typical town house (pp7)
24. Diagram of wind circulation whenever there is one building, two buildings, buildings with landscape (pp7)
25. Shading analysis of the existing buildings in different time of July 1st (pp7)
26. Micro climate diagram of the site (pp12)
27. Diagrams of the green features of the existing buildings on site (pp8)
28. Public/private featrue of typical town house (pp9)
29. Louisburg Square, Boston, MA 1848 (pp9)
Holl, Steven. (1982) Rural & urban house types in North America. New York: Pamphlet Architecture
30. New Orleans blocks plan with shotgun, double shotguns (pp9) Holl, Steven. (1982) Rural & urban house types in North America. New York: Pamphlet Architecture
31. Ceder Avenue, Philadelphia, PA (pp9) Holl, Steven. (1982) Rural & urban house types in North America. New York: Pamphlet Architecture
32. Waverly Street, Philadelphia, PA (pp9) Holl, Steven. (1982) Rural & urban house types in North America. New York: Pamphlet Architecture
33. Gordon Block, Savannah, GA (pp9)Holl, Steven. (1982) Rural & urban house types in North America. New York: Pamphlet Architecture
34. Public/private space arrangment vertically of the typical town house (pp9)
35. Typology research of town house and apartment (pp10)
36. Study model-the retail space on the stree floor and the sunken plaza (pp11)
37. Study model-the typical living unit (pp11)
38. Study model-the mixed use project combined with channels full of sunlight, nature light and fresh air (pp12)
39. Study model-the typical living unit combined with live and work spaces (pp12)
40. Study model-mixed use (pp12)
41. Study model-View from H street(pp12)
42. Site Plan (pp13)
43. Model study of typology (pp14)
44. Diagram of typology research (pp14)
45. Prototype of town housing (pp15)
46. Prototype of live/work housing (pp15)
47. Prototype of collective apartment (pp15)
48. Prototype of sky village (pp16)
49. Sunlight analysis (pp16)
50. Rain water recycle system (pp17)
51.Btu/SF Accummulation (regenrated by Autodesk Revit Architecture) (pp17)
52. Massing study (pp17)
53. Eco-system analysis (pp17)
54. Green-system analysis (pp17)
55. Site Plan (pp18)
56. Live/work unit (pp19)
57. 3D Models of Live/work unit (pp19)
58. Collective apartment (pp2z0)
59. 3 D modle of collective apartment (pp20)
60. Collective apartment level 3 plan (pp20)
61. 3D model of street view house (pp21)
62. Street view house plan (pp21)
63. Town house plan (pp22)
64. 3D model of town house (pp22)
65. Hotel level 1 plan (pp23)
66. Hotel level 2 plan (pp23)
67. Hotel level 4 plan (PP23)
68. 3D model of hotel (pp23)
69. Stree view from west (pp24)
70. Stree view from east (pp24)
71. Site plan (pp25)
72. Level 2 plan (pp26)
73. Level 3 plan (pp26)
74. Level 6-12 plans (pp27)
75. Level 4 plan (pp28)
76. Level B1 plan (pp28)
77. Section A (pp29)
78. Section B (pp29)
79. Section D(pp29)
80. Section C(pp29)
81. East elevation (pp30)
82. South elevation (pp30)
83. West elevation (pp30)
84. North elevation (pp30)
85. Detail Section of sunken plaza (pp31)
86. Sunken plaza plan (pp31)
87. Section of sunken plaza plan (pp31)
88. Main entrance rendering (pp32)
89. Atrium rendering (pp32)
90. Model birdview from south west (pp33)
91. Model birdview from north (pp33)
92. Model birdview from south east (pp33)
93. View of the north elevation (pp34)
94. View of the live/work unit and the skyvillage (pp34)
95. Shadow casted by the north facade on H street (pp34)
96. Street view of the windows of the sky village (pp35)
97. View of the main entrance (pp35)
98. View of the north window of the sky village (pp35)
99. View of the north facade of the hotel (pp35)
100. Roof level of the sky village (pp36)
101. View of the stair paths of the sky village 1 (pp36)
102. View of the stair paths of the sky village 2 (pp36)
103. View of the stair paths of the sky village 3 (pp36)
104. East view of the sky village tower (pp37)
105. North facade of the building (pp37)
106. Roof level of the sky village tower (pp37)
107. Re-designed north elevation (pp38)

Contents

Abstract	ii
Dedication	iii
Acknowledgements	iv
List of Figures	v
Introduction	1
Research on Green Design Concept	5
Concept Generation Phase One	9
Concept Development Phase Two	14
Final Proposed Design	24
Redesign of North Elevation along H street	38
Bibliography	39
VITA	40

Introduction

This is a green building. This is a green building in the city. It provides the attempt of how to understanding the green building in an architecture way. Versatile of public activity and dwelling needs have been researched and redeveloped in the green building design based on the understanding of traditional town house urban contexture and typology features. Retail, office, culture spaces are organized with a series of green spaces consist of green roof gardens, terraces, sunken plazas and water systems.

Figure 2. Site map in urban contexture

The site of my thesis is located at the intersection of H street and 3rd street.
It is within five minutes walking distance from Union Station and it has the typical town house based urban contexture mixed use on H street: residential and commercial.

H street is one of the most popular commercial destination of DC since the 1920s'. Similar to many other commercial regions in the city center, the once flourished street life has gradually wiped out of people's living.
Now the street is experiening the regeneration, which includes the construction of the street car, small scale of renovation of the retail spaces along the street and culture facilities, most importantly, people begin to have the confidence of the street development and moving back again.
There will be large scale of regeneration project above the bridge, which give my project a broad mixed use urban contexture. And how to realize a transformation of large scale project above the bridge to the relatively small projects on the H street will be one of the focus of my project.

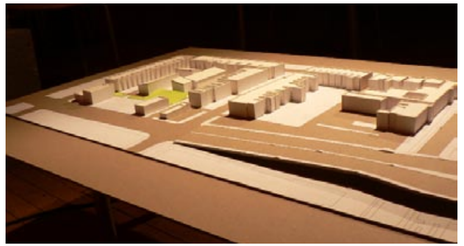


Figure 3. Site Model

Figure 4. Rails of the Union Station

Figure 5. View from the bridge to the H street NE

Figure 6. View from the bridge to the H street NE 2

Figure 7. View from the bridge to the H street NE 3

Figure 8. View from the west to the site

Figure 9. Intersection of H street and 3rd street

Figure 10. Intersection of H street and 3rd street

Figure 11. Two temporary buildings

Figure 12. View to the block center

Figure 13. View from the east to the site

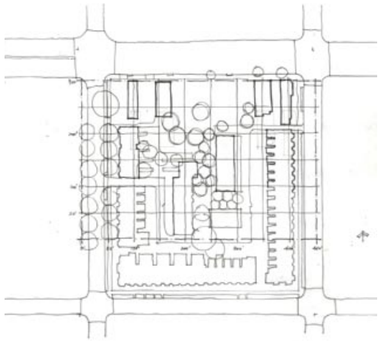


Figure 14. Site map

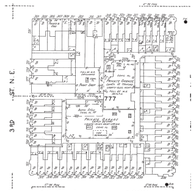


Figure 15. Sanborn map 1928

http://sanborn.umi.com/

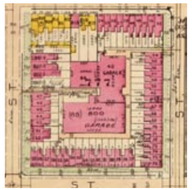


Figure 16. Baist map 1913

http://www.loc.gov/index.html

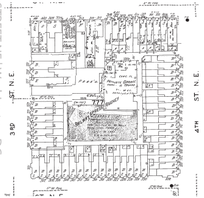


Figure 17. Sanborn map 1959

http://sanborn.umi.com/

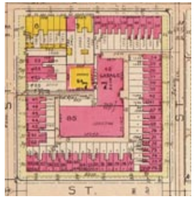


Figure 18. Baist map 1921

http://www.loc.gov/index.html

The site is located in the east gateway of the street, it is the first block of the street. This makes my thesis project the landmark of the entire H street NE.
The site also experinces the sensitive transformation from the larger scale of urban contexture like Union Station to the smaller ones, the 3-4 stories town house along the entire H street.

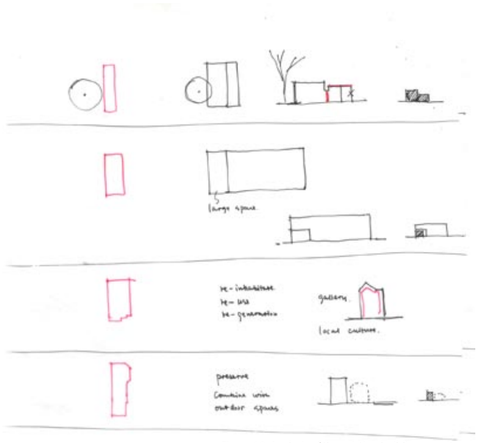


Figure 19. Analysis of the existing buildings on site

There are five buildings in the site. Two of them are temporary house which will be removed from in my design. The other three are town house and in well condition. The vacant spaces between these three existing building are in two different scales, one is a typical 6-7 bay of town house space, the other is one typical town house space.

Research on Green Design Concept

How to understand the green concept. Does it mean that green is only the substitution of the sun energy, fresh air and natural light? Of course, these are all counted in green design. But there should be the spirit of green design from ARCHITECTURE perspective.

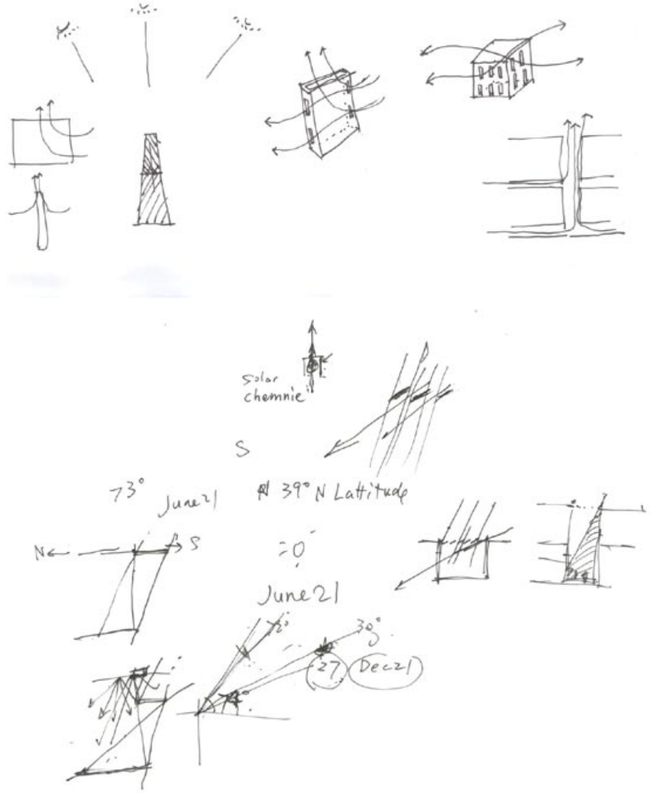


Figure 20. Analysis of the sun light and air circulation

Sun angle will changed during different time of the day and different days through four seasons.
During summer, shading space of the building should be created. Measures such as louver on the window, shading panel above the window can be adopted.
In winter, the warm sunlight can be one of the major nature heating resources of the building.
In traditional town houses the nature ventilation is mainly depends on the windows of the front and back wall of the building. Usually, the south facing windows are not big enough to let the fresh air in. And the vertical ventilation is not good enough.

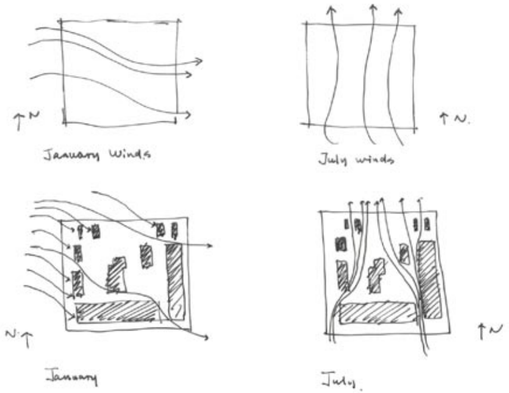
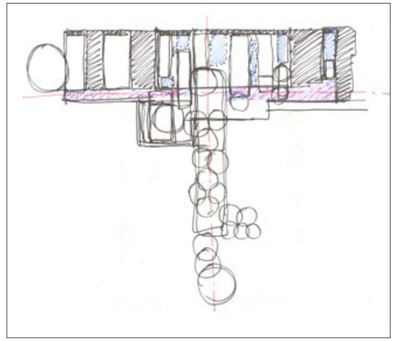


Figure 21. Analysis of the wind of the site

Aa far as my site. I analysized the wind in winter and summer seasons. During the winter time, the dominate wind direction in DC is north west . In the summer times, the dominate winter direction is South-North.
The wind pass through the existing buildings on the site. In this process, the wind flow has slightly grouped or changed, no matter in the strengh or the speed.
The north south axis of existing buildings let the summer wind penetratation easily, which made me have a clearer understanding of the wind on the site.



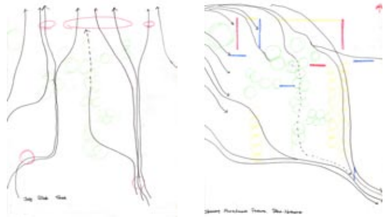
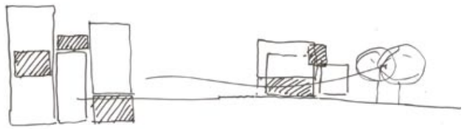


Figure 22. Dominate wind in summer and winter across the site

The trees on the site also has the impact of the wind on the site. The wind speed has been slowed by the trees.



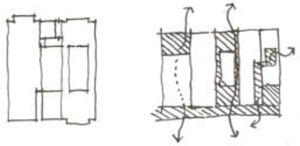


Figure 23. Air circulation through the typical town house(above)

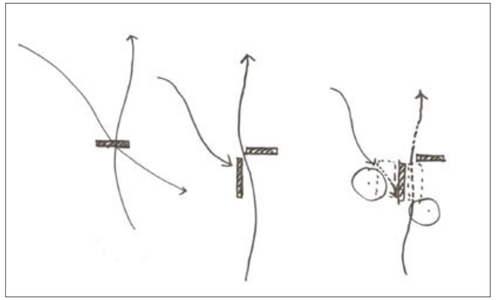
The shadow parts of the diagram are the open and pubic space of the town house, such as court yards or the back yards. The air flow through the open space of the town house can promote the nature circulation of the building.

Figure 24. Diagram of wind circulation whenever there is one building, two buildings, buildings with landscape. (opposite above)

For one building, the only way for wind penetration is the openings on the buildings, such as the windows on the front and back walls of the town houses.

For two buildings which has the perpendicular space relation, except from the openings on the buildings, the wind path can also be the space between the two buildings.

Buildings with landscape can moderate the negative impact of the wind in winter time.



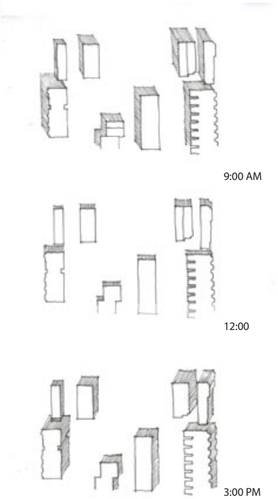


Figure 25. Shading analysis of the existing buildings in different time of July 1st (right)

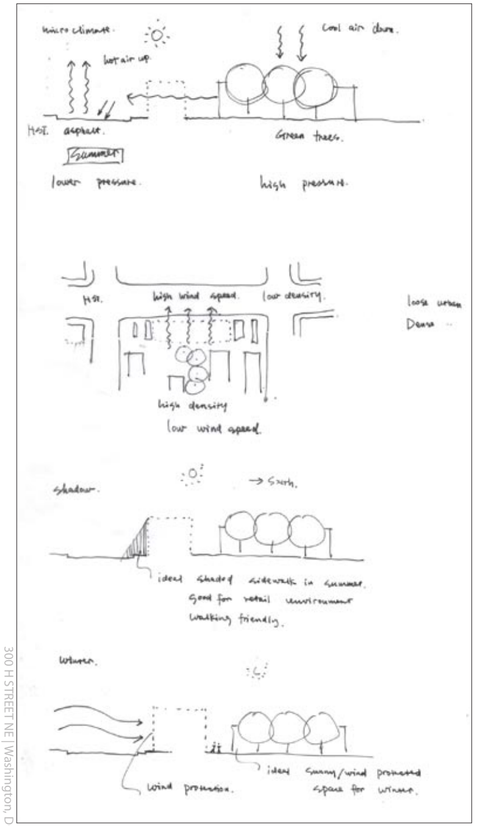


Figure 26. Micro climate diagram of the site

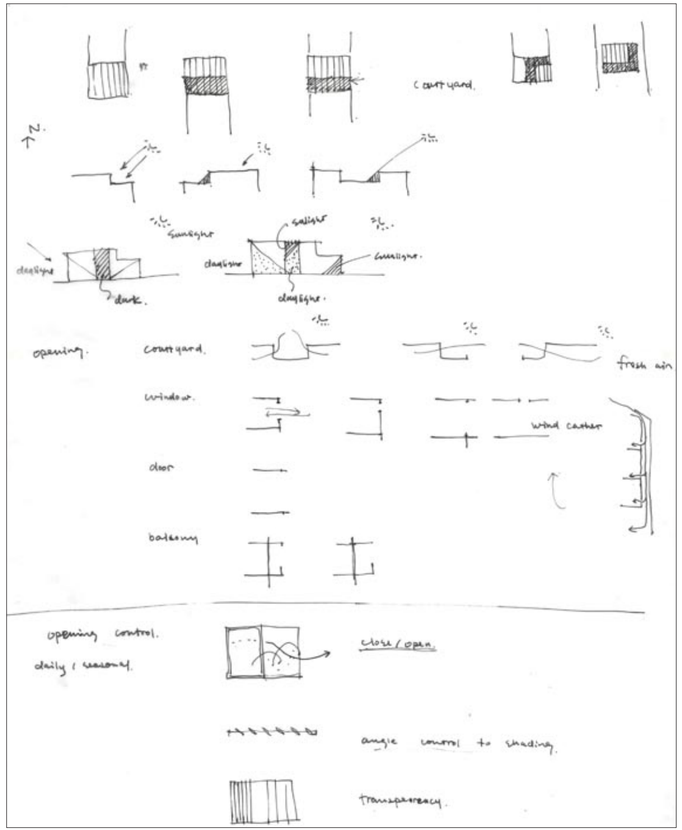


Figure 27. Diagrams of the green features of the existing buildings on site

Concept Generation Phase One

Based on the thorough research of typology of the town house and apartment buildings' overall physical forms, including response to the nature environment, gardens and relationship with streets and blocks, a sustainable strategy focusing on the diversity possibilties of human activities based on urban environment has been developed. This is a city within a building. It provides nearly all kinds of the dwelling needs which is properly when it is located on a once prosperous commercial street and a place located in the five minutes walking distance from a major transit center of the city.

Figure 29. Louisburg Square, Boston, MA 1848 (source Steven Hall 1982, same below)

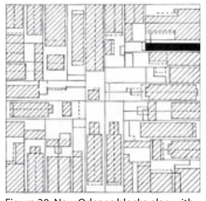


Figure 30. New Orleans blocks plan with shotgun, double shotguns

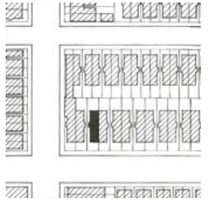


Figure 31. Ceder Avenue, Philadelphia, PA

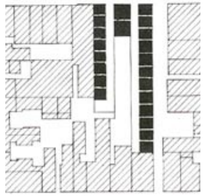


Figure 32. Waverly Street, Philadelphia, PA

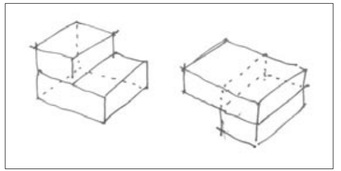


Figure 28. Public/private featrue of typical town house

Figure 33. Gordon Block, Savannah, GA

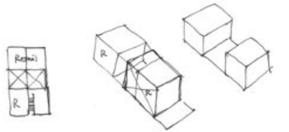


Figure 34. Public/private space arrangment vertically of the typical town house

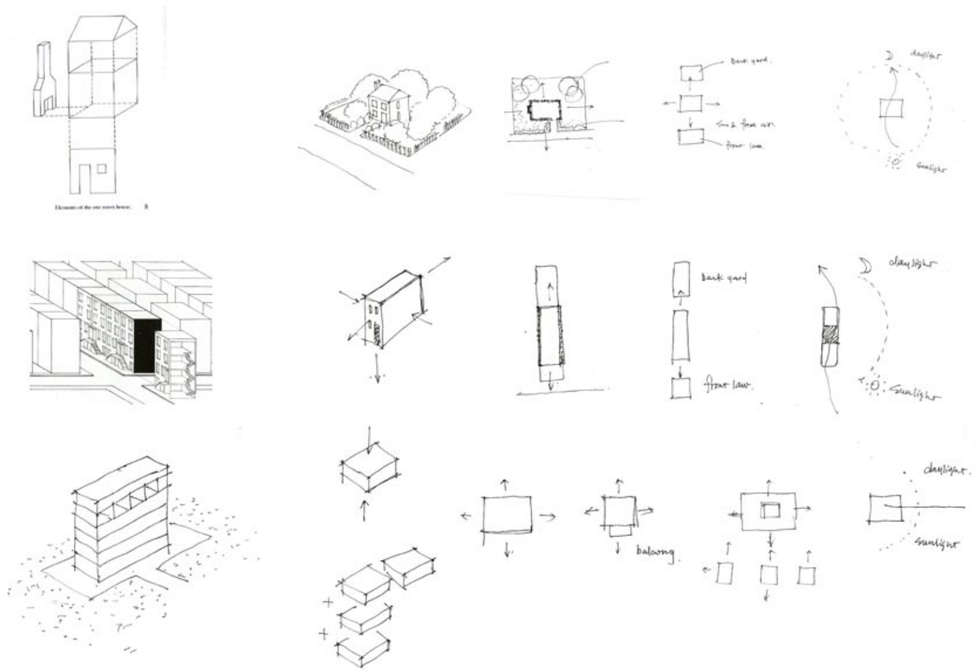


Figure 35. Typology research of town house and apartment

The town house and apartment can be interprated as the urban adaptions of single family house. Within the limited space, town houses and apartments developed horizontally along the street line and vertically.

Sun, wind and light

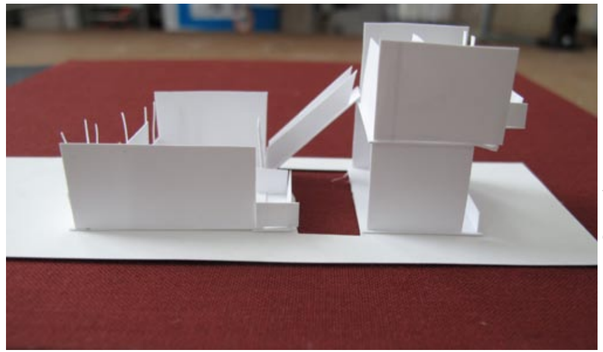
How to bring air, sun light and daylight in my project is the main issue I focused on. Take advantage of the the channels formed by the paralelled walls between the living unit and different shape of openings of the facades, the whole building has become a container for sun, wind and light.

Figure 36. Study model-the retail space on the street floor and the sunken plaza

The ground floor of the building has been freed from the limitation of the traditional parallel walls of the town houses'.

Figure 37. Study model-the typical living unit

A courtyard has been inserted in the middle of the living unit for better nature light and air ventilation conditions of the interior living environment.



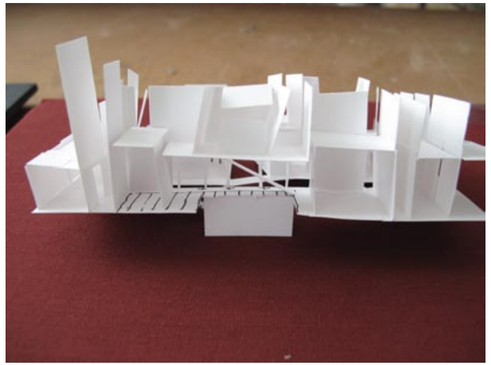


Figure 38. Study model-the mixed use project combined with channels full of sunlight, nature light and fresh air

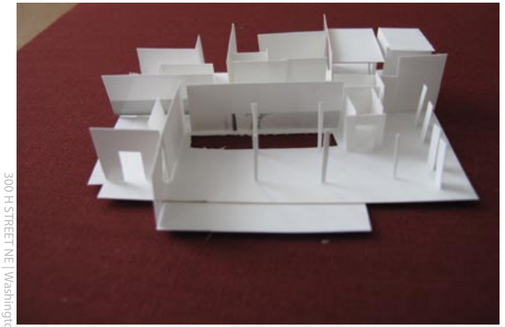


Figure 39. Study model-the typical living unit combined with live and work spaces

The structure of the office space is column structured. The living space is made of walls which is the typical structure architectural features of the town house'.

Figure 40. Study model-mixed use

The strong contrast of the public and private facades of the building comes out of the understanding of the traditional town houses. On one hand, they formed the continuous streetscape out side. On the other hand, they extended the terraces, balconies and backyards for the private life interior.

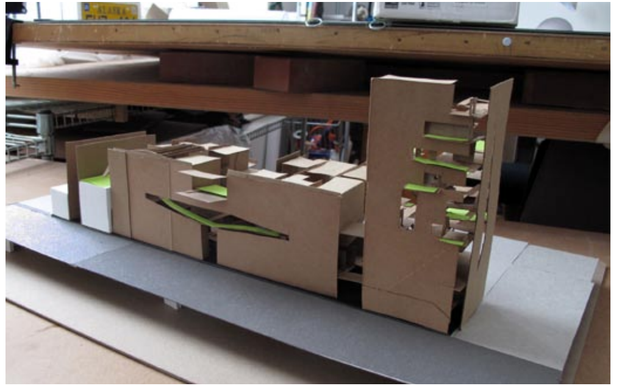


Figure 41. Study model-View from H street

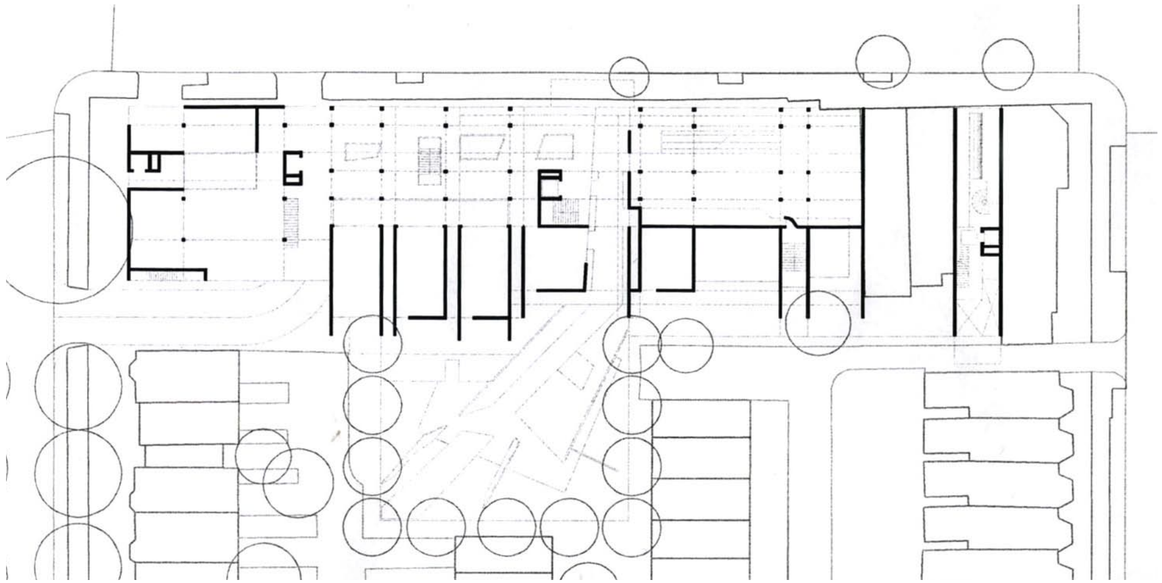


Figure 42. Site Plan 1:500

Concept Development Phase Two

Few building types come with more constrains than town houses. They are tightly enclosed, with somewhat awkward interior arrangements and rooms often piled up vertically. Town houses bear the public and the private spirit at the same time. They belong to the part of the street with uniformed street facades. Also, they have the pleasant private life spaces, terraces, balconies and backyards. They have the feature to be treated as a individual unit and as a group. They form the continuous streetscape and claim the individual property firmly by parallel walls between each unit. Though the town house is a typology of enormous restrictions, it is a laboratory of creative possiblilities within a very limited realm.

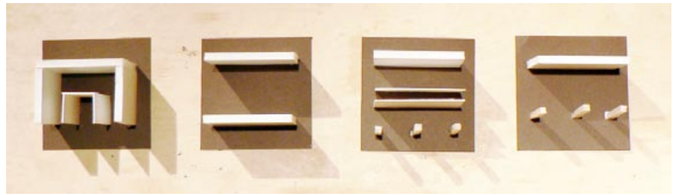


Figure 43. Model study of typology

From left to right: Model research of the structure of sky village, town house, collective apartment, coffee .

All of them are oriented from the traditional townhouse, which are structrued by two parellel partial walls.

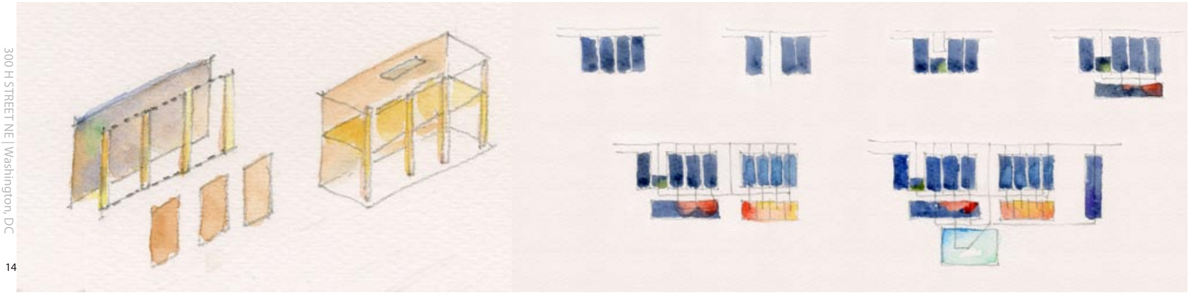


Figure 44. Diagram of typology research

Left diagram shows the prototype research of the tea house. The opening of one of the two traditional parellel partial walls has been maximized. There comes the form of wall-column structure form.

Right diagram shows the secondary circular system of the building. The secondary circular system is consisted of green spaces, gardens and green path way. Following this system, people can not only have a further exploration of the building behind the front facade of the building but also experience the natural interior environment.

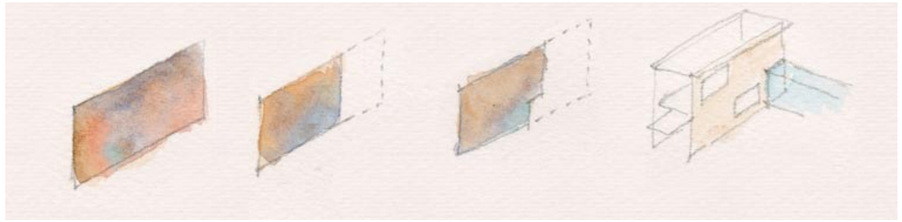


Figure 45. Prototype of town housing

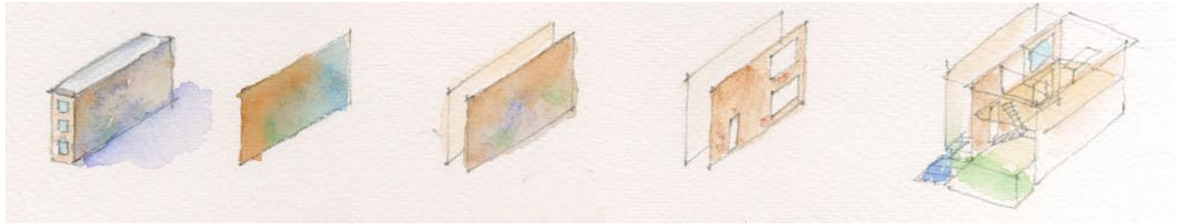


Figure 46. Prototype of live/work housing

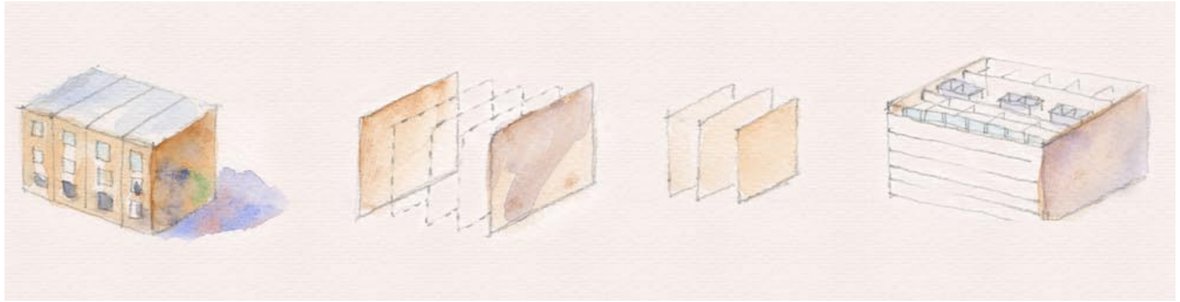


Figure 47. Prototype of collective apartment

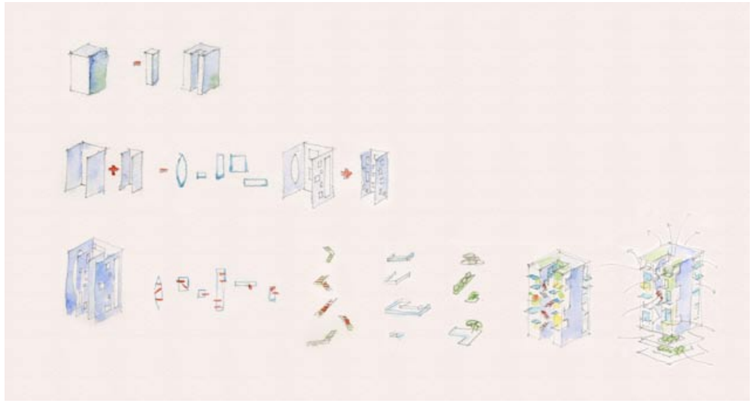


Figure 48. Prototype of sky village

Gardens have become one of the most important streetscape elements of the town house. Different shapes of the gardens with versatile plants, flowers, colors and smells comprised of a vivid life image for people. Piling the gardens and town houses vertically and connecting them via out door stairs and corridors, combined with the channels and openings of the air flows in and out of the building, a beautiful music comes out of the music instrument.

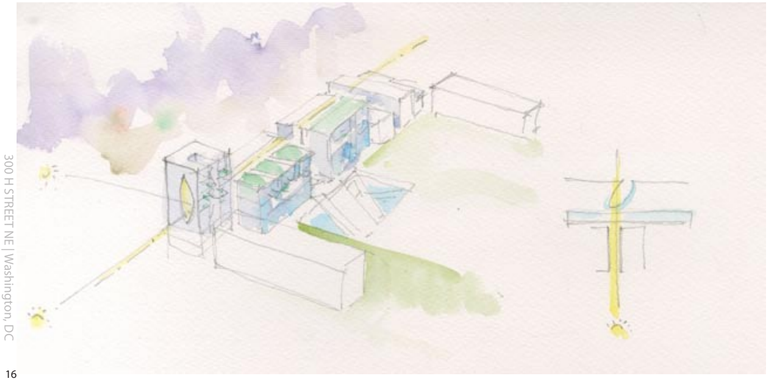


Figure 49. Sunlight analysis

In my design, the light of sun set has been introduced into the building through the big west opening of the tower. Whenever the moments of open/close of the door, there would be light penetrate the tower and form the light axis of the podium.

Figure 50. Rain water recycle system

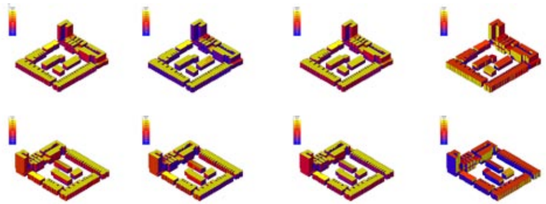


Figure 51.Btu/SF Accummulation (regenrated by Autodesk Revit Architecture)

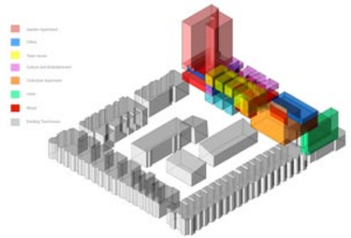


Figure 52. Massing study

This study shows the relationship between the new building and the surrounding buildings. The relatively large scale sky village has been put at the east corner of the project without the negative shadow on the surrounding buildings.

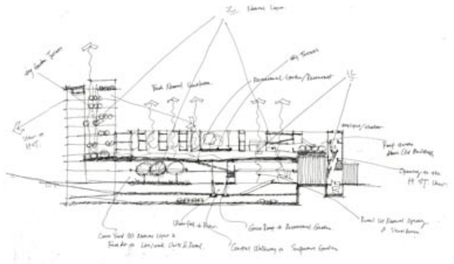


Figure 53. Eco-system analysis

The eco-system comprised of green outdoor spaces, such as roof gardens, terraces, balconies. All of the green plants of the system are coming from native places, they take advantage of the rain water collecting and recycling systems to realise the balance of irragation and maintenance.

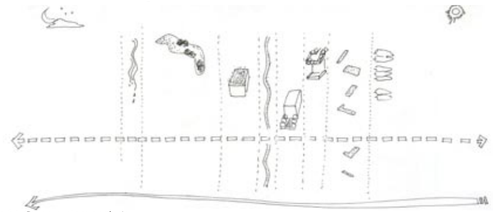


Figure 54. Green-system analysis

The green system of the building is comprised of gardens, roof gardens, green pathways, trees, and green balconies and terraces.

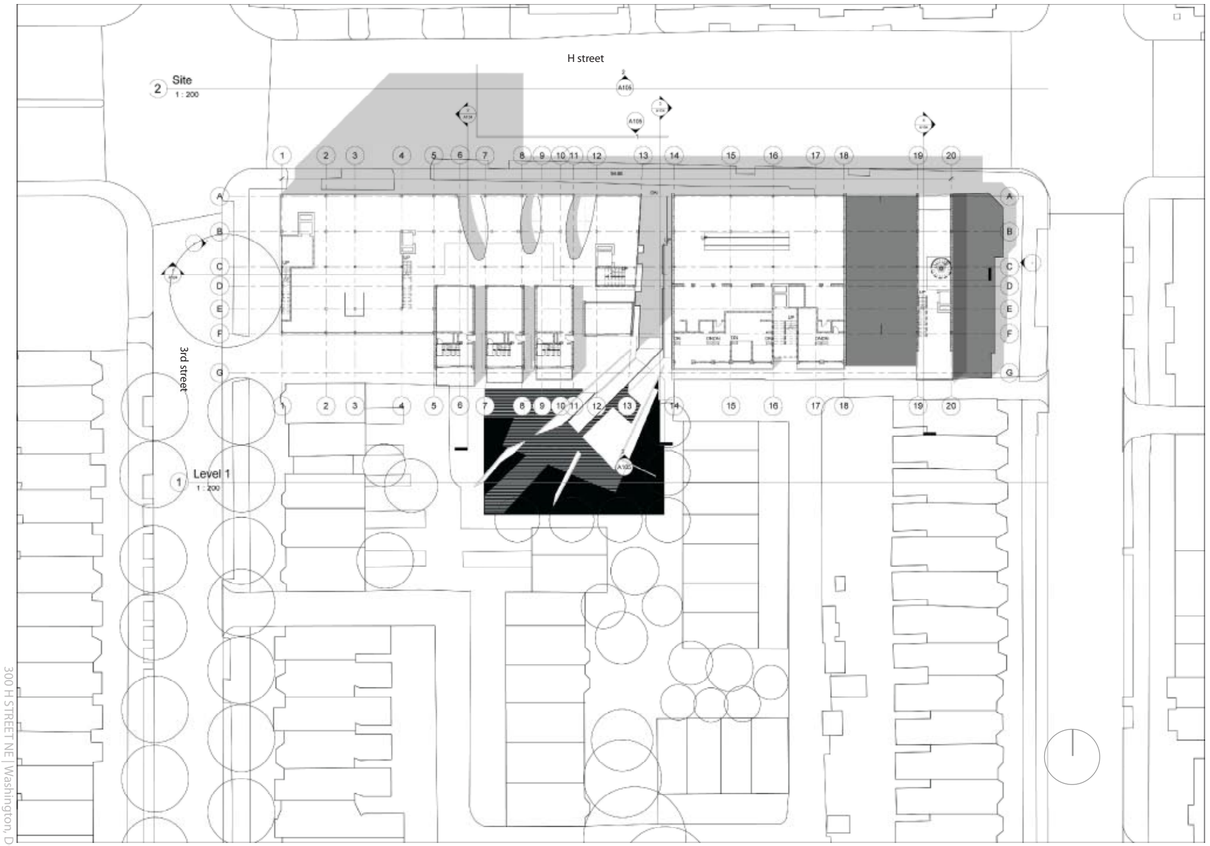
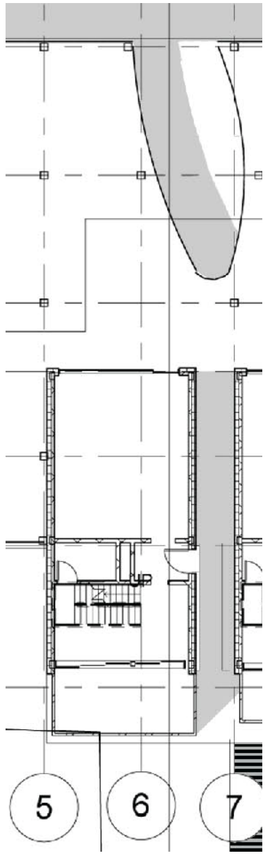
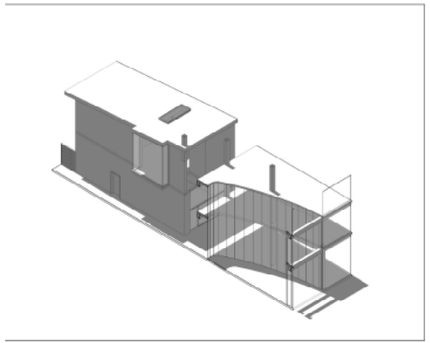
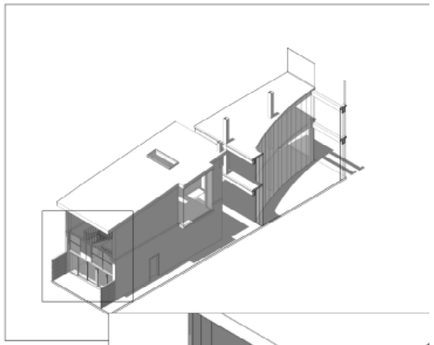


Figure 55. Site Plan







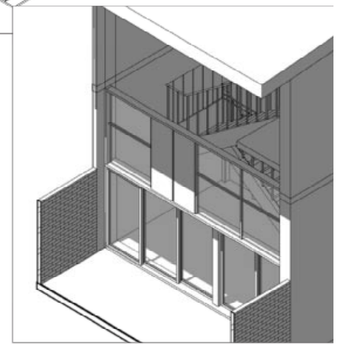


Figure 57. 3D Modes of Live/work unit (above 4)

Aside from the public space in front and the private back yard, there is alleys between each two live/work unit. These alleys not only provide a semi public space belong to the house, but also form a channel for fresh air flow into the atrium of the building.

Figure 56. Live/work unit

Live/work units embodied the essence of adaption of town house in urban contexture. Aside from the compact physical envelope, the flexibility function of the ground floor has become the other most important feature of the town house. The
green feature of the housing is the solar house in the south, which is the dinning room and kitchen of the house. This solar house can absorb solar energy in winter and transfer heat and energy to the interior space of the north and also upstairs to the bedroom.

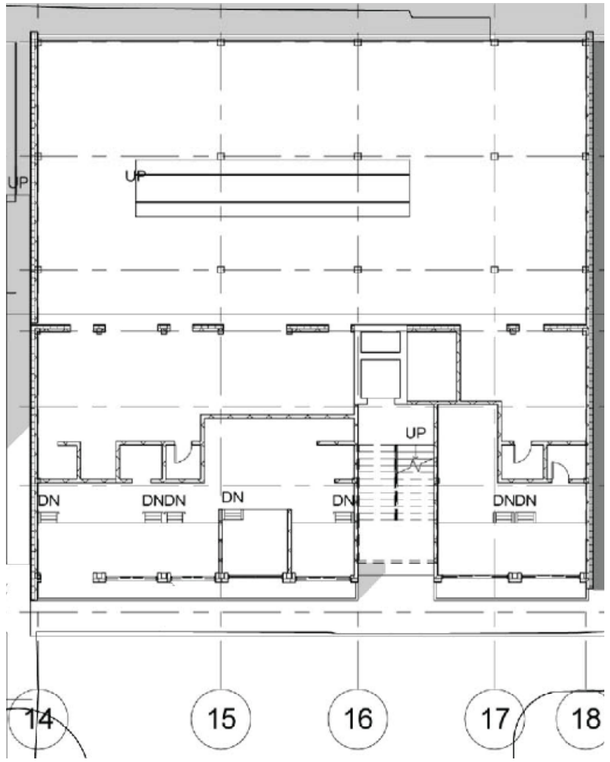


Figure 58. Collective apartment

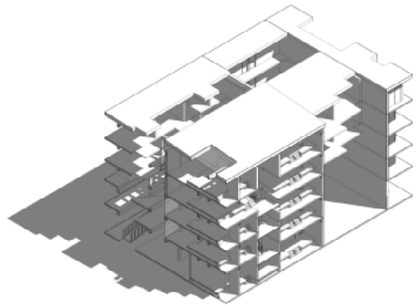


Figure 59. 3 D modle of collective apartment

Collective Apartment meets the needs of young professionals in big metropolitan. Their dwelling requires flexibility between day and night, high efficiency and social life. The green feature of this housing type is its high density and efficiency. According to the living pattern for young professionals and students, the design of the house emphasized on the day/night flexibility. During the day, the bed can be put inside under the space below the closet of the living unit which form a live/work space for occupant. At night, when the bed is pulled out, the live unit become a typical bedroom. In this way, the efficiency of the housing has been improved. The corridor, kitchen and balcony have become the major interior public and communication space for the dwellers.

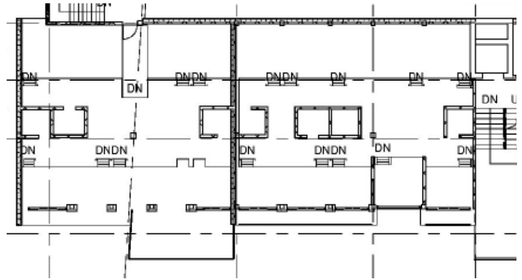


Figure 60. Collective apartment level 3 plan

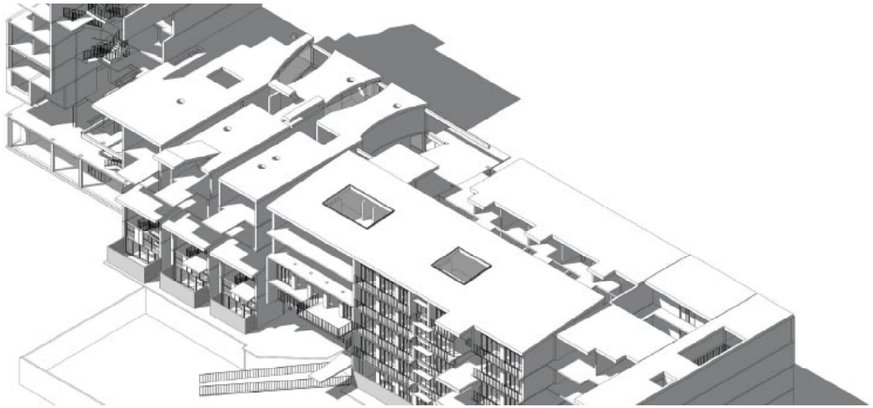


Figure 61. 3D model of street view house

The street view house has been removed in my final design. The design concept lies in the promotion of communication among neighbors. The house is a short depth south facing housing type, which nature light and sun light can be well used. The short depth promoted the ventilation of nature air.

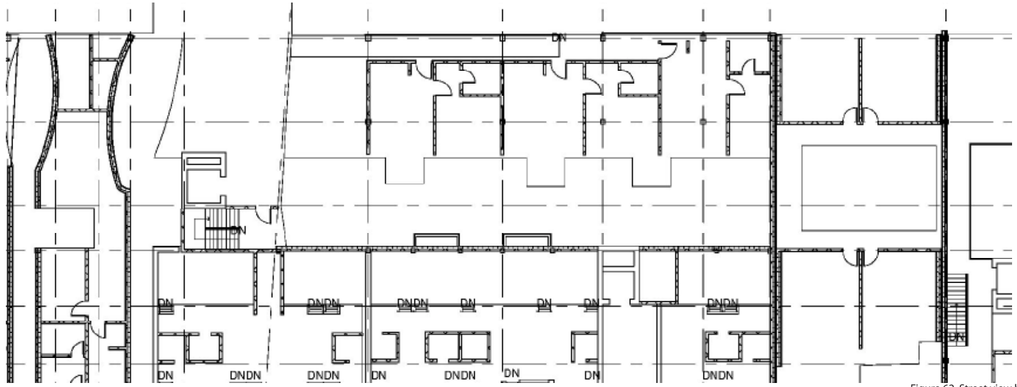


Figure 62. Street view house plan

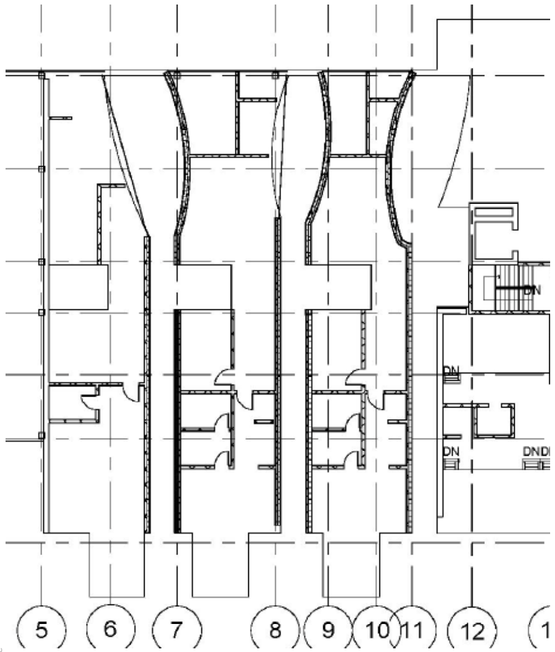


Figure 63. Town house plan

Town houses were elevated from the ground level. Its typology is stemmed from the traditional town house. The improvements lie in the use of natural light, fresh air, the sky court yard and the connection with the street live downstairs. The green feature is mainly about the use sun energy in the south and daylight. The court yard in the middle can facilate the flow of nature air. In the final design, the depth of the house has been shortened to introduce the light and air for the public space of the third level.

Figure 64. 3D model of town house

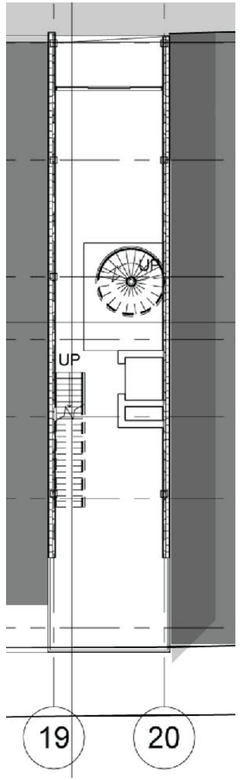


Figure 65. Hotel level 1 plan

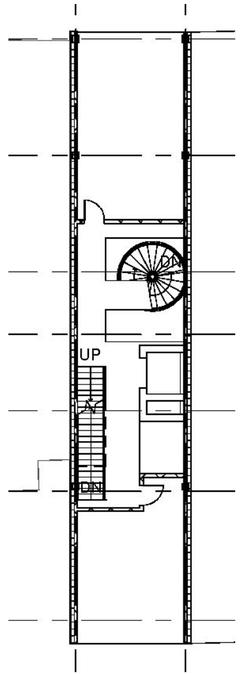
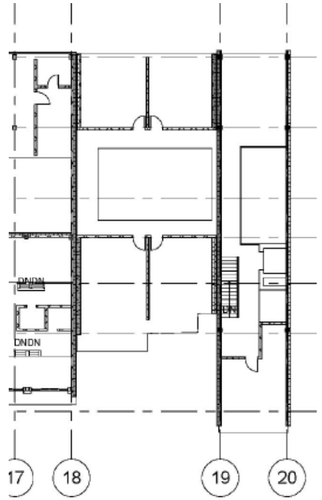


Figure 66. Hotel level 2 plan

Figure 67. Hotel level 4 plan

The green feature of the design is introduce a light atrium in the middel of the building to let in the sun light and fresh air. All the hotel room have been arranged in the two ends of the building.



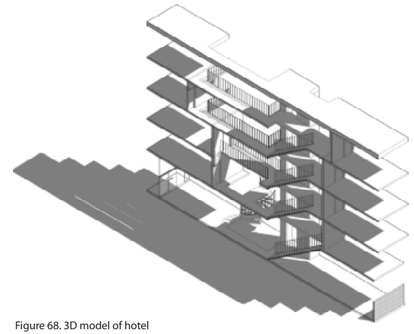


Figure 68. 3D model of hotel

Final Proposed Design

Figure 69. Stree view from east

Figure 70. Stree view from west

Figure 71. Site plan

Figure 72. Level 2 plan

Figure 73. Level 3 plan

Figure 74. Level 6-12 plans

Figure 75. Level 4 plan

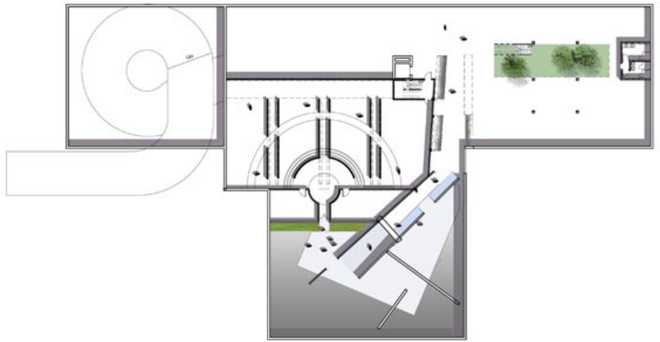


Figure 76. Level B1 plan

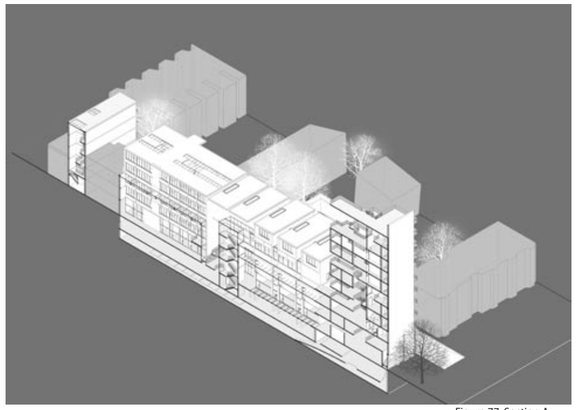


Figure 77. Section A

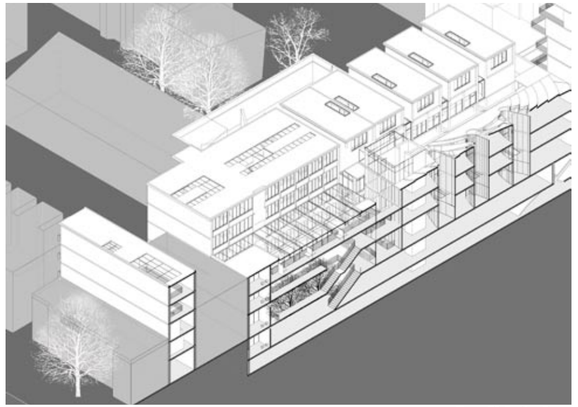


Figure 78. Section B

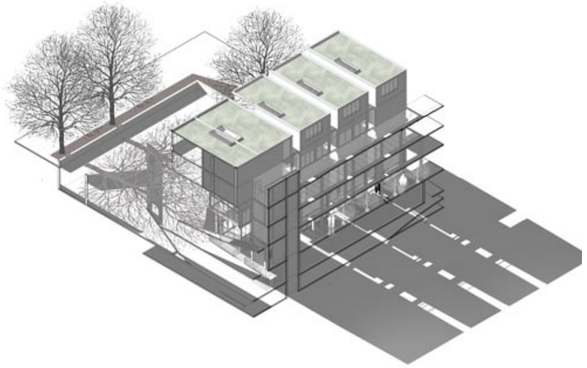


Figure 79. Section D

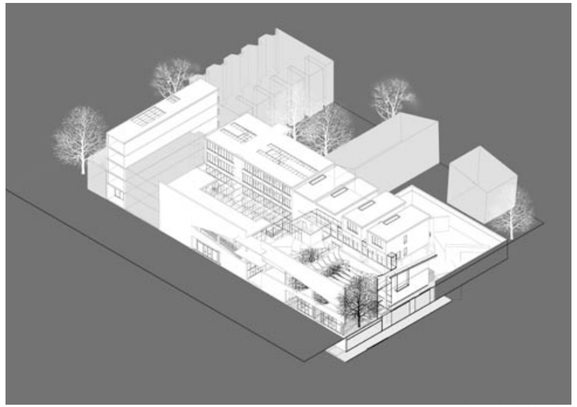


Figure 80. Section C

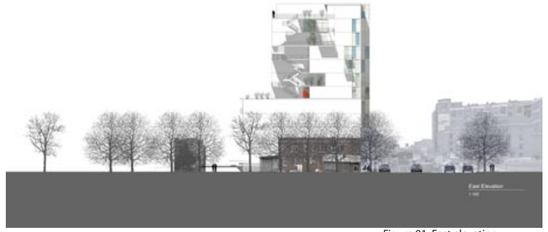


Figure 81. East elevation

Figure 83. West elevation

Figure 82. South elevation

Figure 84. North elevation

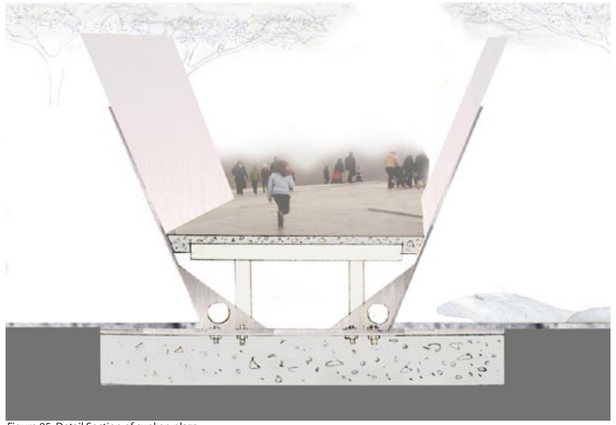


Figure 85. Detail Section of sunken plaza

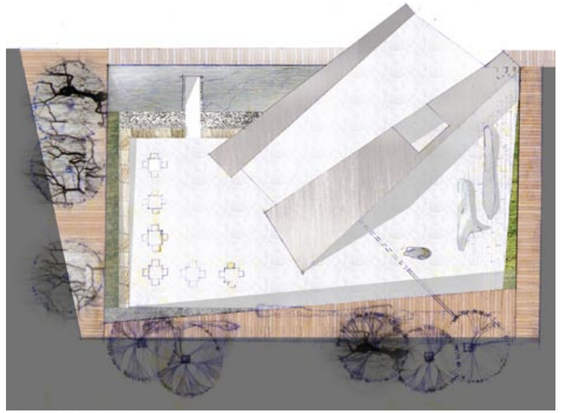


Figure 86. Sunken plaza plan

Figure 87. Section of sunken plaza plan

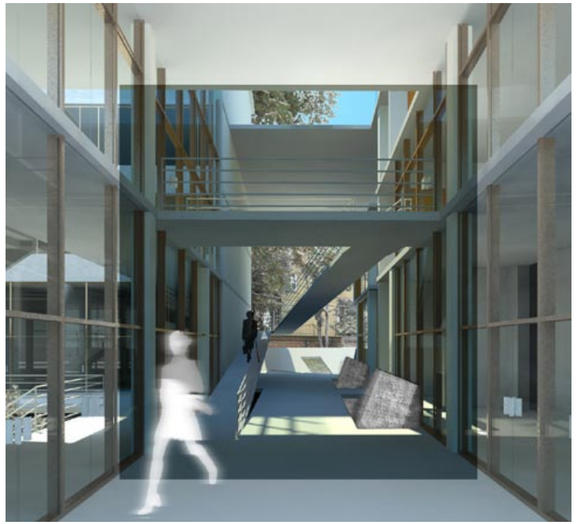


Figure 88. Main entrance rendering

Figure 89. Atrium rendering

Figure 90. Model Birdview from South West

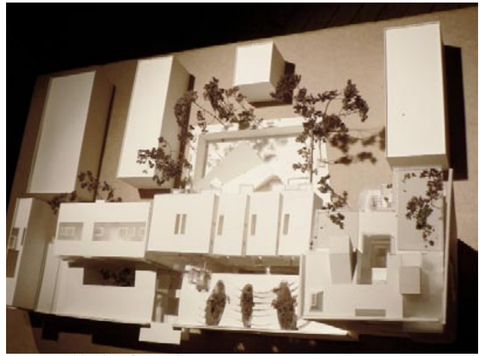


Figure 91 Model Birdview from North

Figure 92 Model Birdview from South East

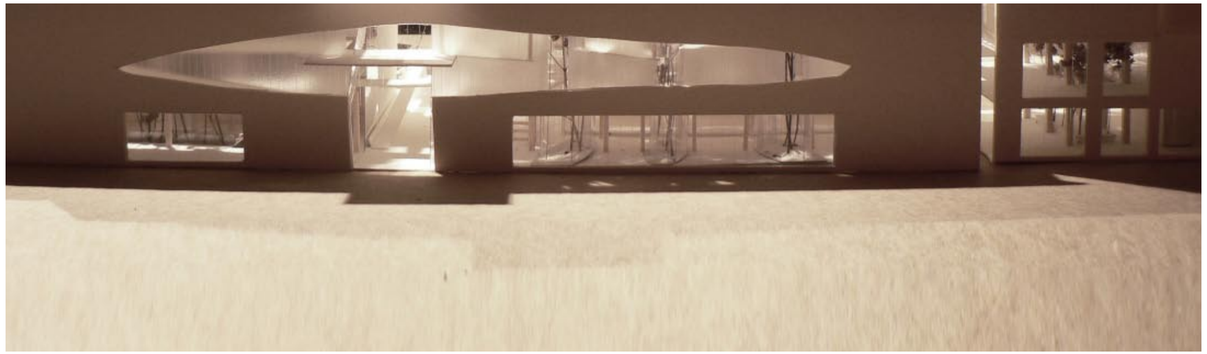


Figure 93. View of the north elevation

Figure 94. View of the live/work unit and the sky village

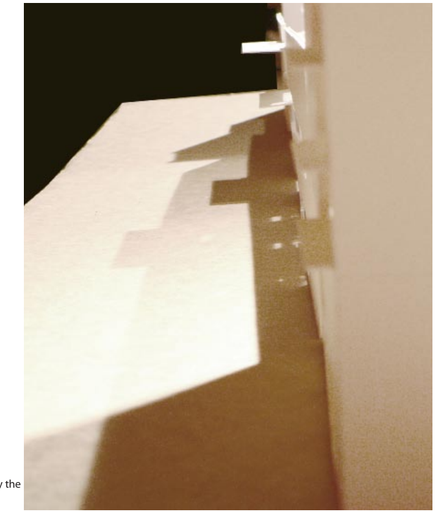


Figure 95. Shadow casted by the north facade on H street

Figure 96. Street view of the windows of the Sky village

Figure 97. View of the main entrance

Figure 98. View of the north windows of the sky village

Figure 99. View of the north facade of the hotel

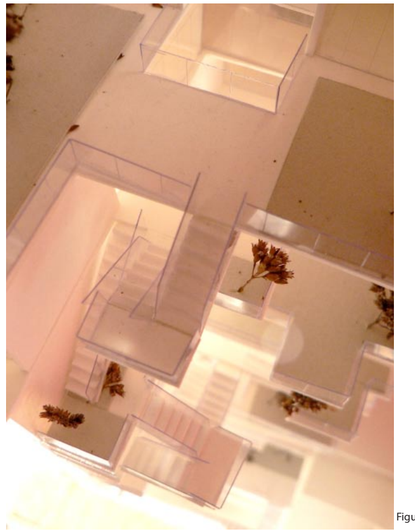


Figure 101. View of the stair paths of the sky village 1

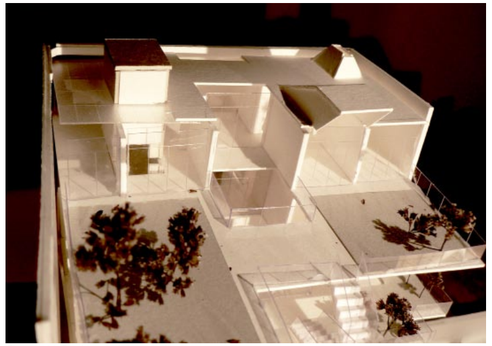


Figure 100. Roof level of the sky village

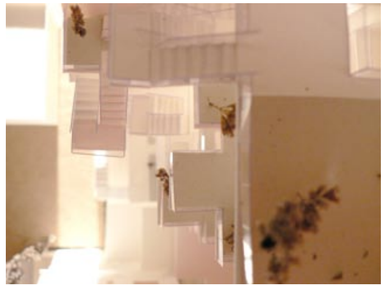


Figure 102. View of the stair paths of the sky village 2

Figure 103. View of the stair paths of the sky village 3

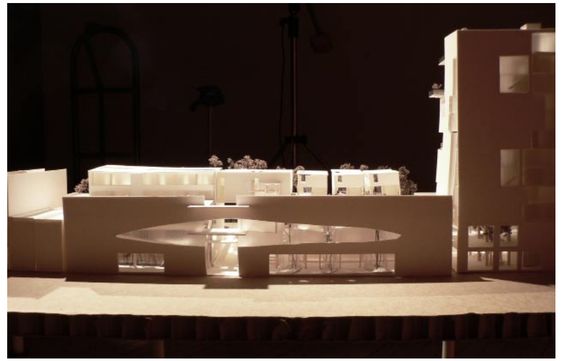


Figure 104 (left) East view of the sky village tower

Figure 105 (above) North facade of the building

Figure 106 (below) Roof level of the sky village tower

Redesign of North Elevation along H street

Figure 107 Re-designed north elevation

In the original design, there is a big horizontal opening in the north elevation. The design concept of this opening is to make people on the street could have a view access to the variety activities inside of the building. Versatility which I thought is the spirit of H street. So I hope this big opening can be a media to embody this spirit.
But there is a conflict between this opening and the small scale of townhouses, which are three to four stories and 5-6 meters width.
So I redesigned the north elevation according to the comments of my committees to establish a harmony and continuous relationship with surrounding urban contexture.
In the design, I divided the north elevation according to a basic 5-6 meters width system. It is a system which combined with mixed-use functions, such as retail, office, culture and entertainment, and also green spaces, such as three full building height gardens and green path way along the office space.
There are two layers of elevation system of the facade. The exterior layer is comprised of translucent glass with tiny holes system, this structure would have the fresh air coming in and out. The interior layer has the rational opening needs for different functions interior.

Bibliography

Brown,G.Z., Mark DeKay. (2001) Sun, wind&light: architectural design strategies. New York: Wiley

Holl, Steven. (1982) Rural & urban house types in North America. New York: Pamphlet Architecture

Gorlin, Alexander. (1999) The new American town house. New York: Rizzoli

Montoya,Michael. (2010) Green building fundamentals: a practical guide to understanding and applying fundamental sustainable construction practices and the LEED green building rating system. Upper Saddle River, N.J.: Prentice Hall

Yudelson, Jerry. (2009) Green building through integrated design. New York: McGraw-Hill

Yudelson, Jerry. (2008) Marketing green building services: strategies for success. Amsterdam; London: Elsevier/ Architectural Press

VITA

WEI YAO

Education

01/2009-12/2009
Master of Architecture, Virginia Polytechnic Institute and State University.

03/2002-11/2005
PhD in Architecture Design and Research, Tong Ji University,

09/1999-03/2002
Master of Architecture, Tong Ji University,

09/1994-09/1999
Bachelor of Engineering in Architecture, Tai Yuan University of Technology.

Professional Experience

02/2006-08/2008 Architect, John Portman & Associates, Shanghai

2006, Watercolor Artist, RTKL, Shanghai (part time)

2003-2004 Project Architect, Shanghai Da De Planning and Architecture Design Co.,Ltd

1999-2003 Architect/Researcher, City Planning Institute, Tong Ji University