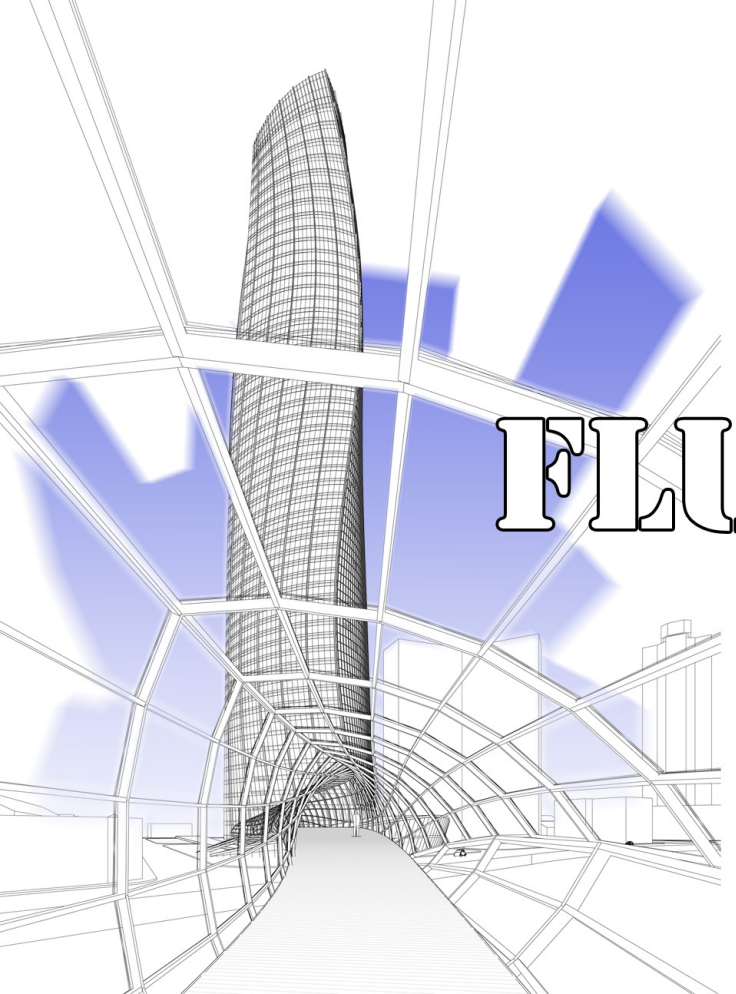


Shanghai **Mixed-use High-rise**

FLUX TOWER

Master Project

College of Architecture

2012 Spring

Ross Wimer Studio

Lei Lei

General Introduction

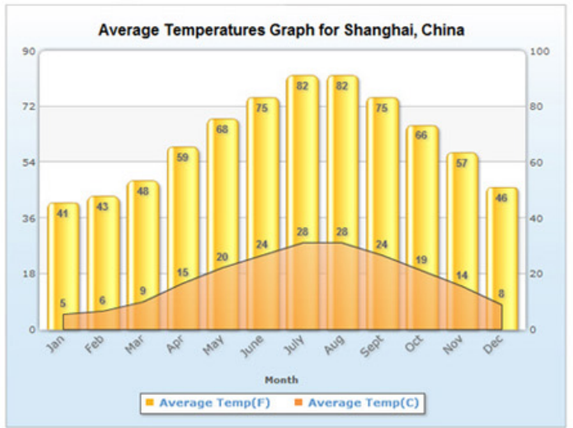
Shanghai sits on the Yangtze River Delta on China's eastern coast, and is roughly equidistant from Beijing and Hong Kong. The municipality as a whole consists of a peninsula between the Yangtze and Hangzhou Bay, mainland China's second-largest island Chongming, and a number of smaller islands. It is bordered on the north and west by Jiangsu Province, on the south by Zhejiang Province, and on the east by the East China Sea. The city proper is bisected by the Huangpu River, a tributary of the Yangtze. The historic center of the city, the Puxi area, is located on the western side of the Huangpu, while the newly developed Pudong, containing the central financial district Lujiazui, was developed on the eastern bank.

Graphic source: www.google.earth

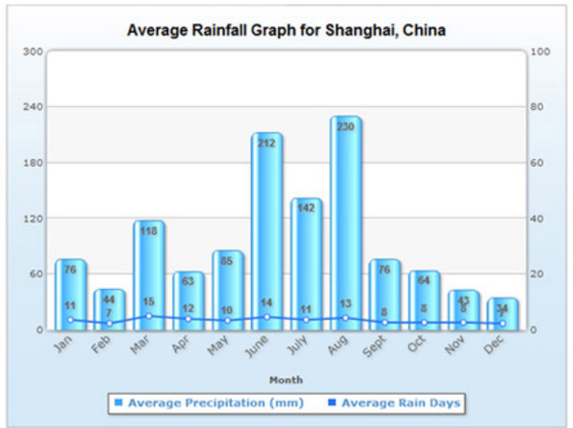
General Introduction

Shanghai has a humid subtropical climate (Köppen Cfa) and experiences four distinct seasons. Winters are chilly and damp, and cold northwesterly winds from Siberia can cause nighttime temperatures to drop below freezing, although most years there are only one or two days of snowfall. Summers are hot and humid, with an average of 8.7 days exceeding 35 °C (95 °F) annually; occasional downpours or freak thunderstorms can be expected. The city is also susceptible to typhoons in summer and the beginning of autumn, none of which in recent years has caused considerable damage. The most pleasant seasons are Spring, although changeable and often rainy, and Autumn, which is generally sunny and dry. The city averages 4.2 °C (39.6 °F) in January and 27.9 °C (82.2 °F) in July, for an annual mean of 16.1 °C (61.0 °F). Shanghai experiences on average 1,878 hours of sunshine per year, with the hottest temperature ever recorded at 40.2 °C (104 °F), and the lowest at −12.1 °C (10 °F).

Annual Temperature



Annual Precipitation



Data Source: http://www.chinaweatherguide.com

Temperature per Day (January 2000 - December 2008)

Jan	Feb	Mar	Apr	May	Jun	
5.4	**7.0**	**11.3**	**16.6**	**21.3**	**25.2**	[°C]
87	90	93	90	96	94	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
29.8	**28.9**	**25.3**	**20.4**	**14.2**	**8.1**	[°C]
93	94	84	88	92	92	Data availability[%]
Averaged Value (January 2000 - December 2008) : **17.8 °C**						

Max. Temperature (January 2000 - December 2008)

Jan	Feb	Mar	Apr	May	Jun	
8.0	**10.0**	**14.8**	**20.4**	**24.8**	**28.2**	[°C]
93	93	96	91	98	97	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
33.0	**31.8**	**28.0**	**23.2**	**17.3**	**10.9**	[°C]
98	96	90	96	97	95	Data availability[%]
Averaged Value (January 2000 - December 2008) : **20.9 °C**						

Min. Temperature (January 2000 - December 2008)

Jan	Feb	Mar	Apr	May	Jun	
2.7	**3.9**	**7.6**	**12.9**	**17.8**	**22.3**	[°C]
92	94	96	96	97	96	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
26.6	**26.1**	**22.7**	**17.6**	**11.0**	**5.1**	[°C]
94	96	84	89	93	95	Data availability[%]
Averaged Value (January 2000 - December 2008) : **14.7 °C**						

Frost Days per Year (January 2000 - December 2008)

Jan	Feb	Mar	Apr	May	Jun	
7.4	**4.5**	**0.7**	**0.0**	**0.0**	**0.0**	[days]
92	94	96	96	97	96	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
0.0	**0.0**	**0.0**	**0.0**	**0.0**	**4.7**	[days]
94	96	84	89	93	95	Data availability[%]
Averaged Value (January 2000 - December 2008) : **17.2 days**						

Every day in a year with the lowest temperature below freezing level (0°C / 32 °F) is called **frost day**.

Days with Precipitation > 0.1mm (January 2000 - December 2008)

Jan	Feb	Mar	Apr	May	Jun	
10.8	**10.7**	**10.4**	**10.7**	**9.9**	**11.8**	[days]
99	99	99	100	100	100	Data availability[%]

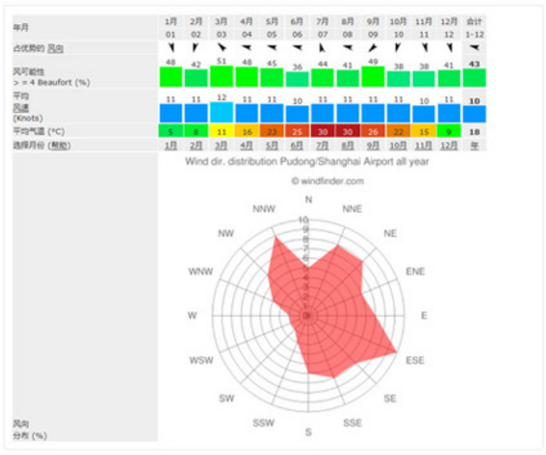
Jul	Aug	Sep	Oct	Nov	Dec	
10.6	**11.4**	**9.4**	**7.5**	**8.5**	**8.8**	[days]
99	99	98	98	99	99	Data availability[%]
Averaged Value (January 2000 - December 2008) : **120.4 days**						

Wind-force per Day (January 2000 - December 2008)

Jan	Feb	Mar	Apr	May	Jun	
11.0	**11.1**	**11.9**	**11.5**	**11.7**	**10.9**	[kph]
100	100	100	99	100	99	Data availability[%]

Jul	Aug	Sep	Oct	Nov	Dec	
11.3	**12.5**	**12.3**	**10.7**	**10.0**	**10.7**	[kph]
99	99	99	98	99	99	Data availability[%]
Averaged Value (January 2000 - December 2008) : **11.3 kph**						

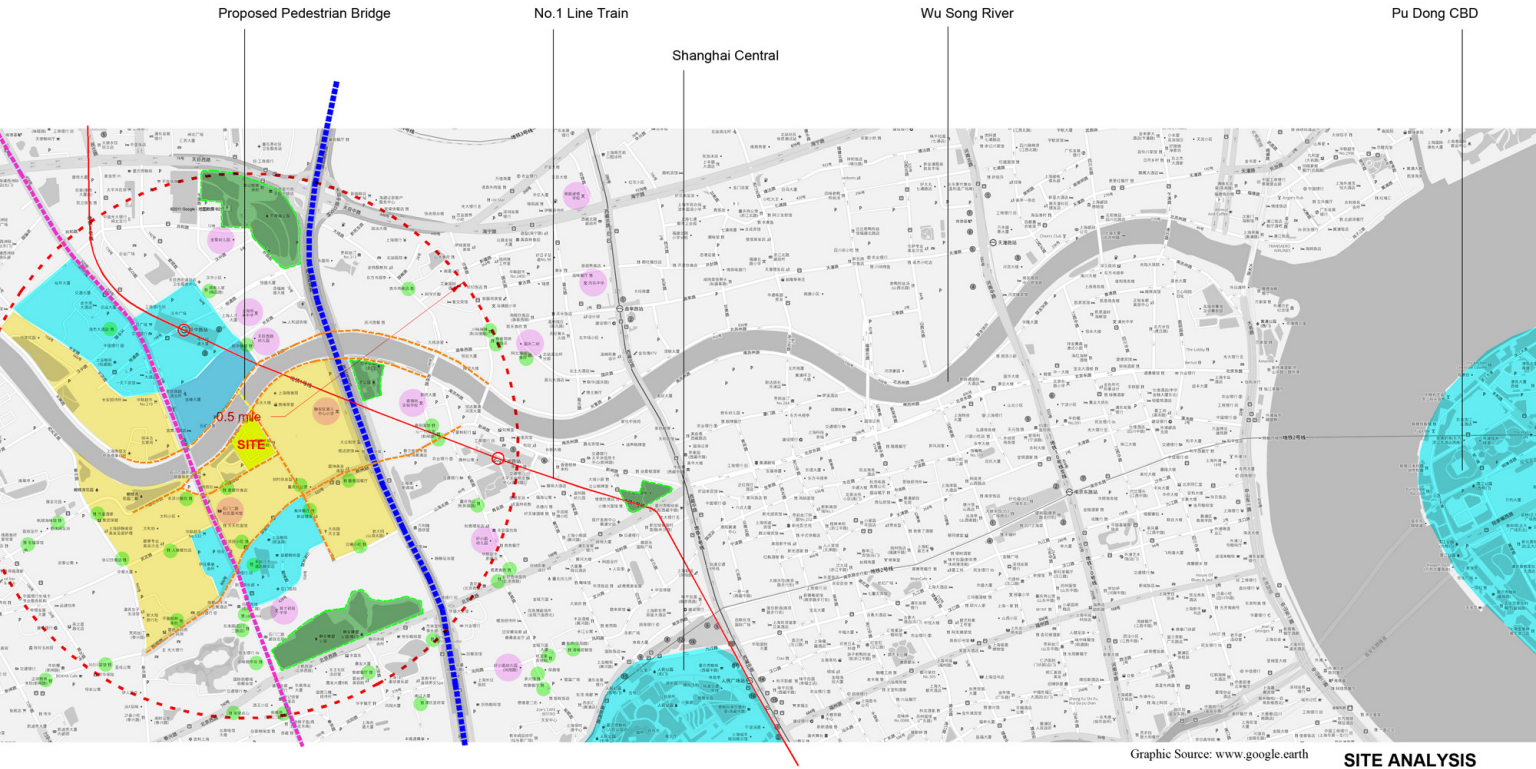
Wind Direction Distribution (2007-2011)



Data Source: http://www.windfinder.com

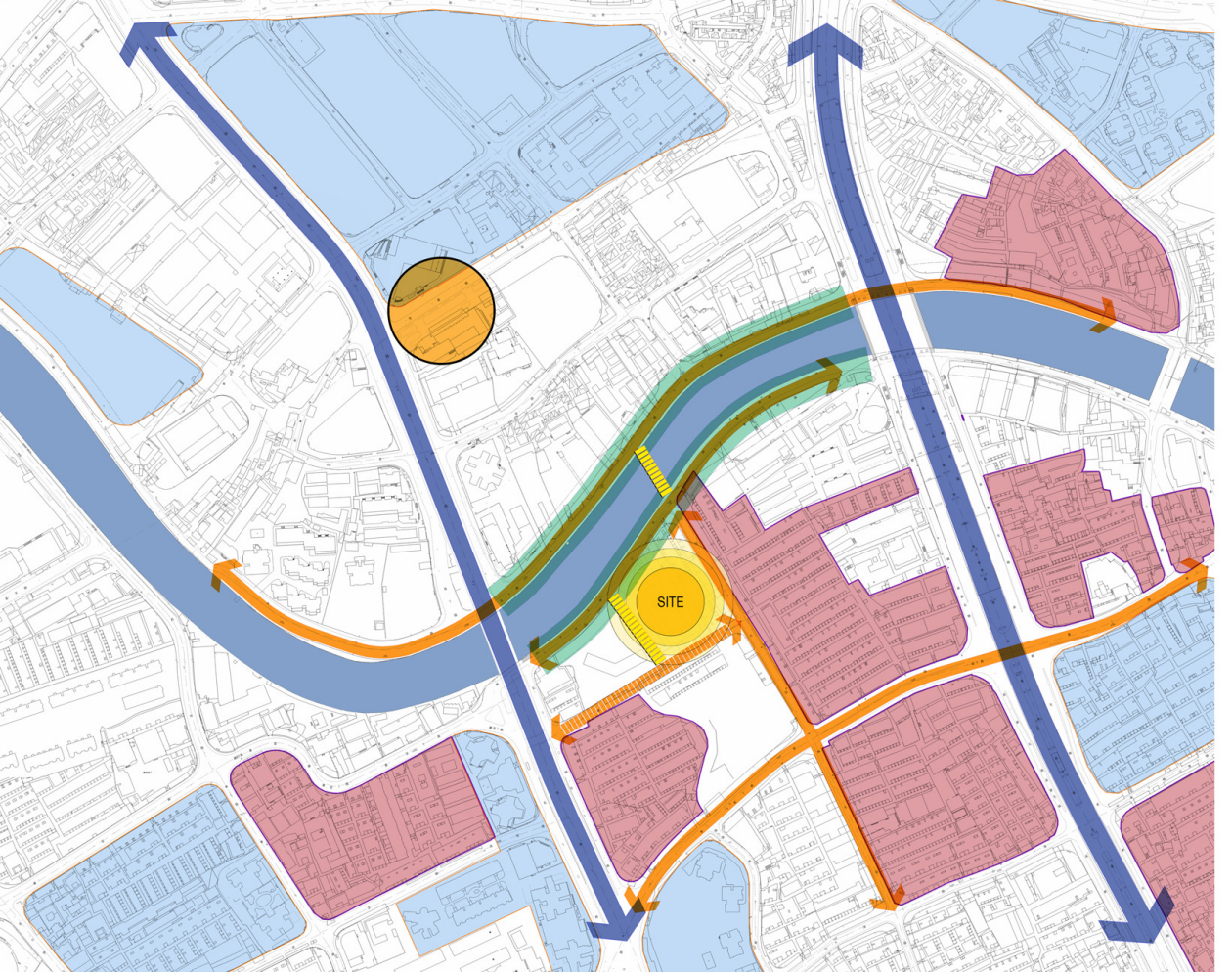
SITE ANALYSIS

Freeway
Main street
Street
Train station
Park / Green space
School / Library
Restaurant
Commercial area
Residential area



Graphic Source: www.google.earth

SITE ANALYSIS



Li Nong

High-rise Group

Major Traffic

Minor Traffic

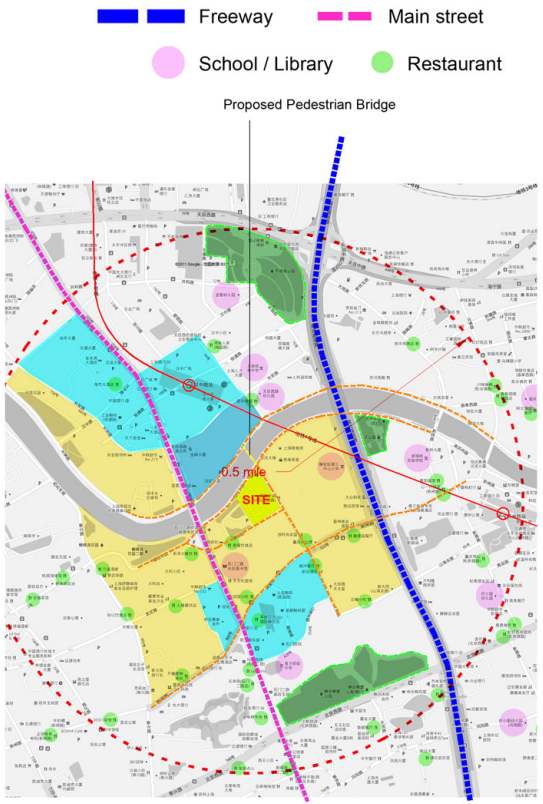
Train Station

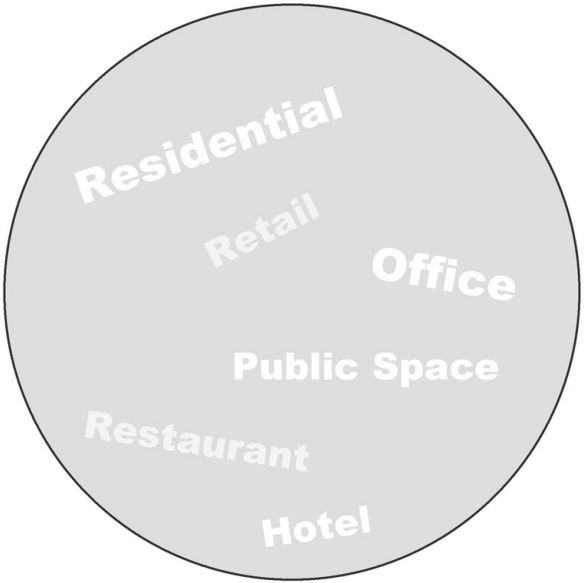
Circulation Proposal

Riverside Development

SITE ANALYSIS

SPACE PROGRAM





Old ———— **New**

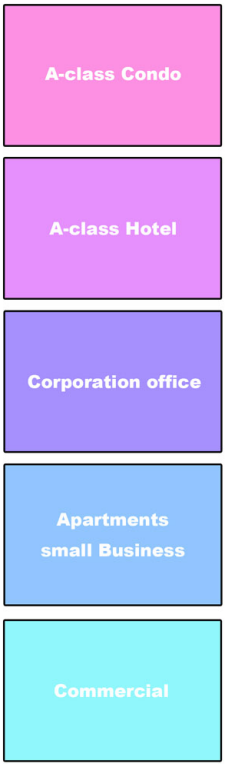
General ———— **High end**

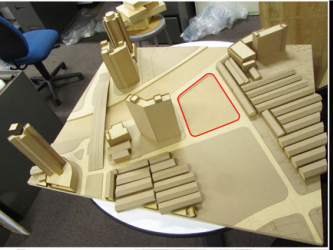
MIXED

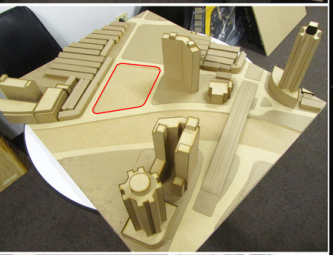
Functions
Users
Activities

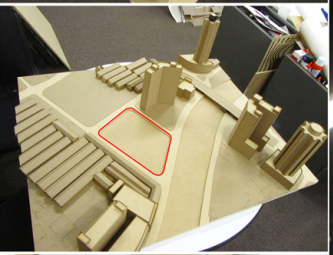
SOCIAL STRUCTURE

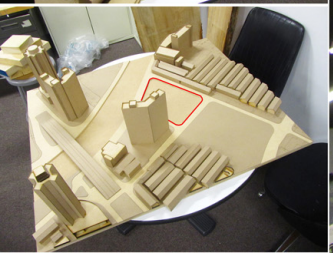
Classes
Interaction
Complementation



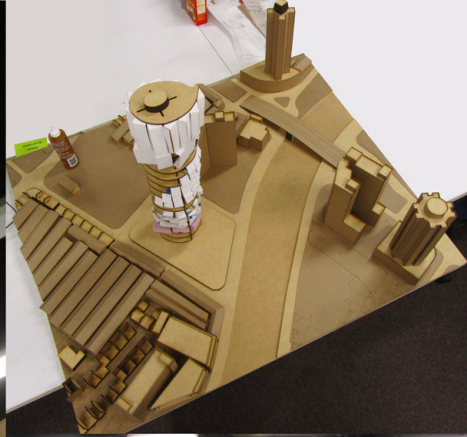




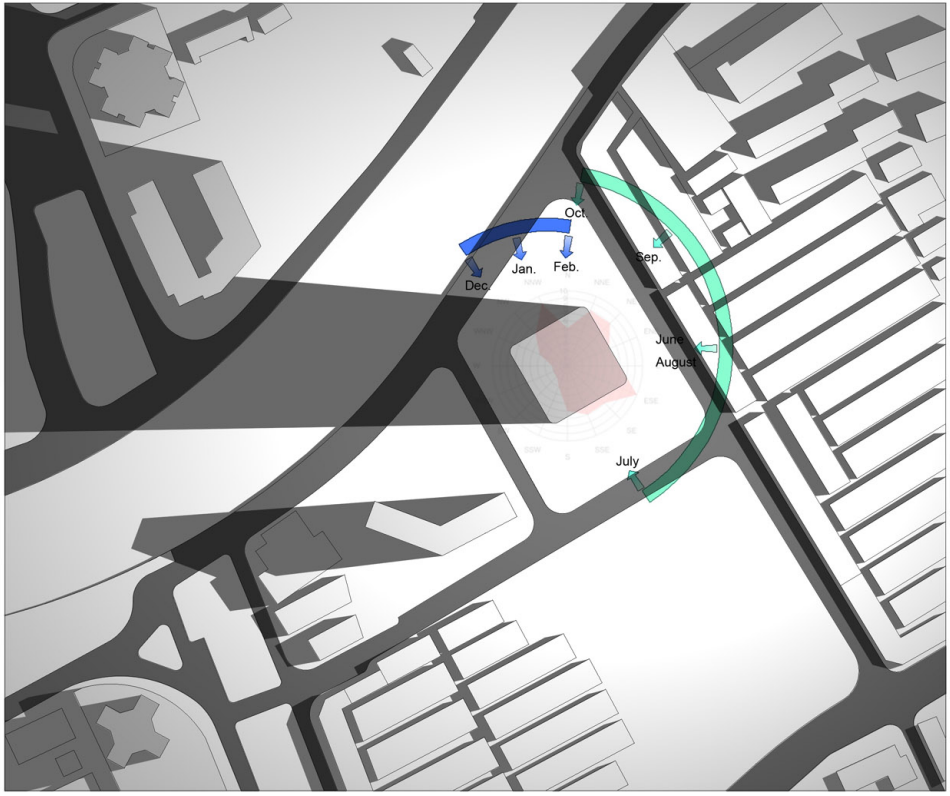


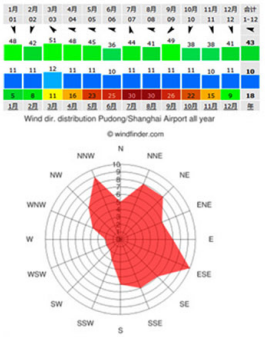


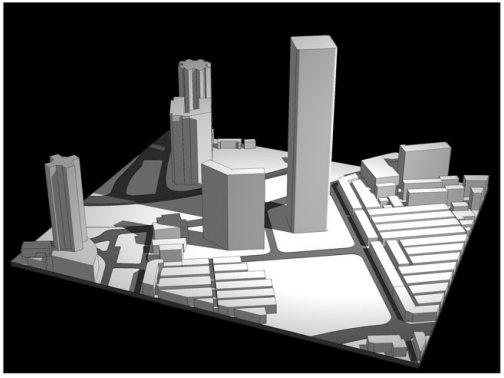

Luxury Condo
A-class Hotel
Corporation Office
Mechanical Floor
Apartment/office
Commercial

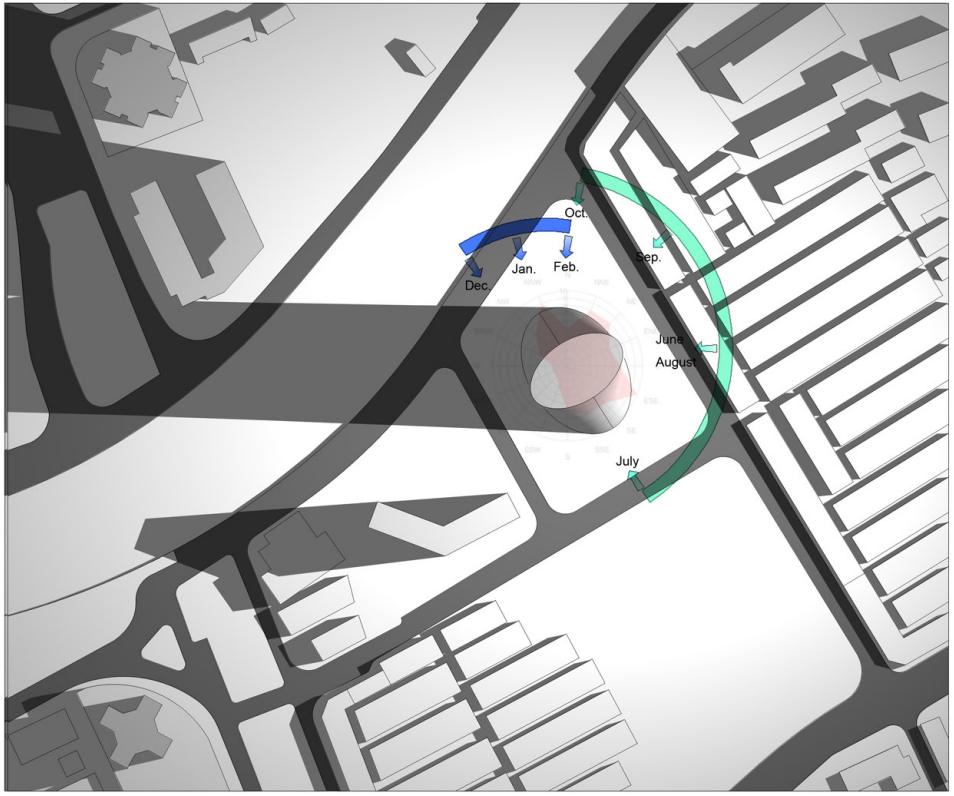


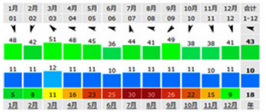
FORM FINDING


Oct.
Dec.
Jan.
Feb.
Sep.
June
August
July

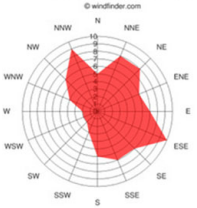

Wind dir. distribution Pudong/Shanghai Airport all year
© windfinder.com
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW

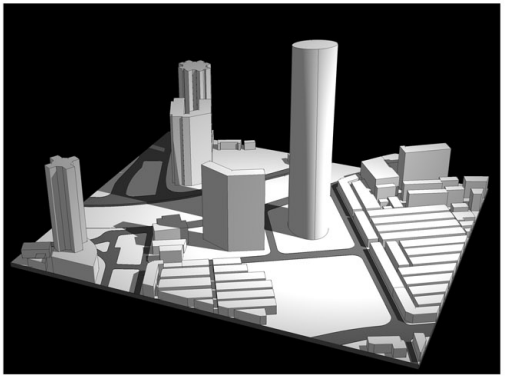


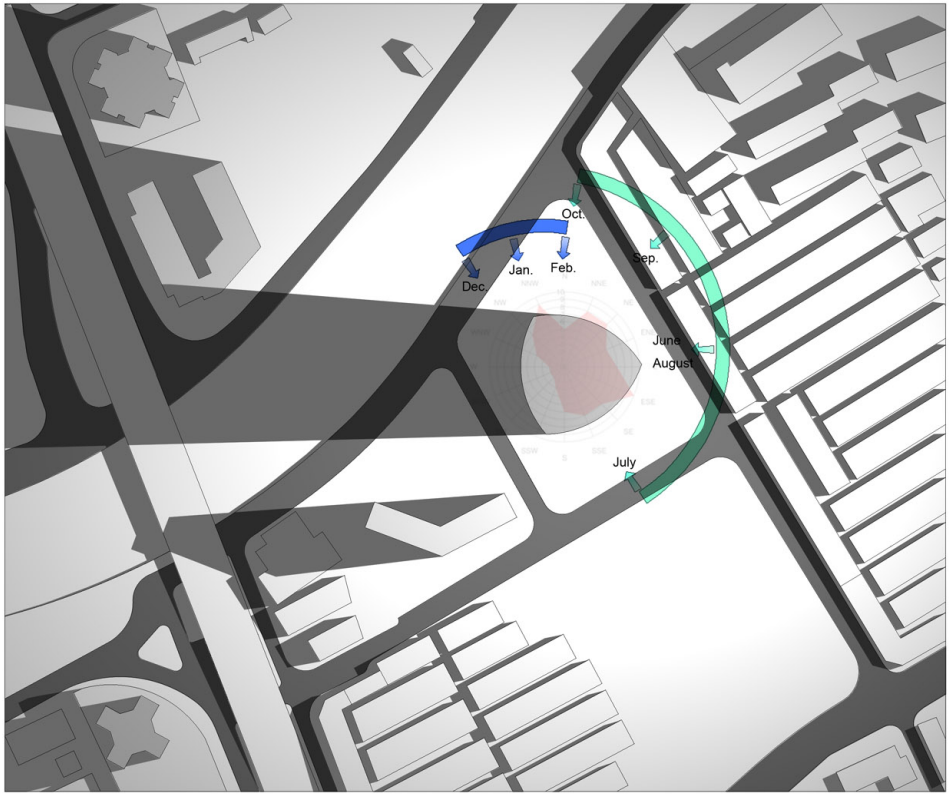


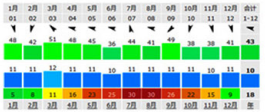


Wind dir. distribution Pudong/Shanghai Airport all year

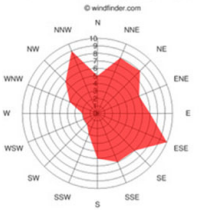


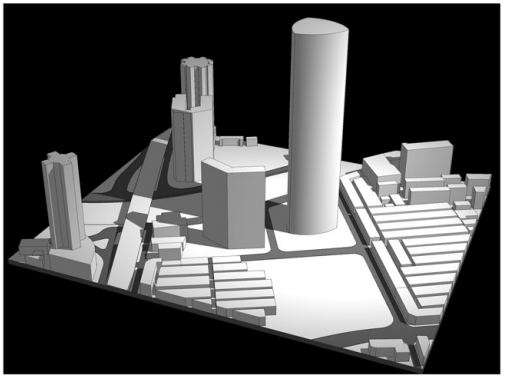


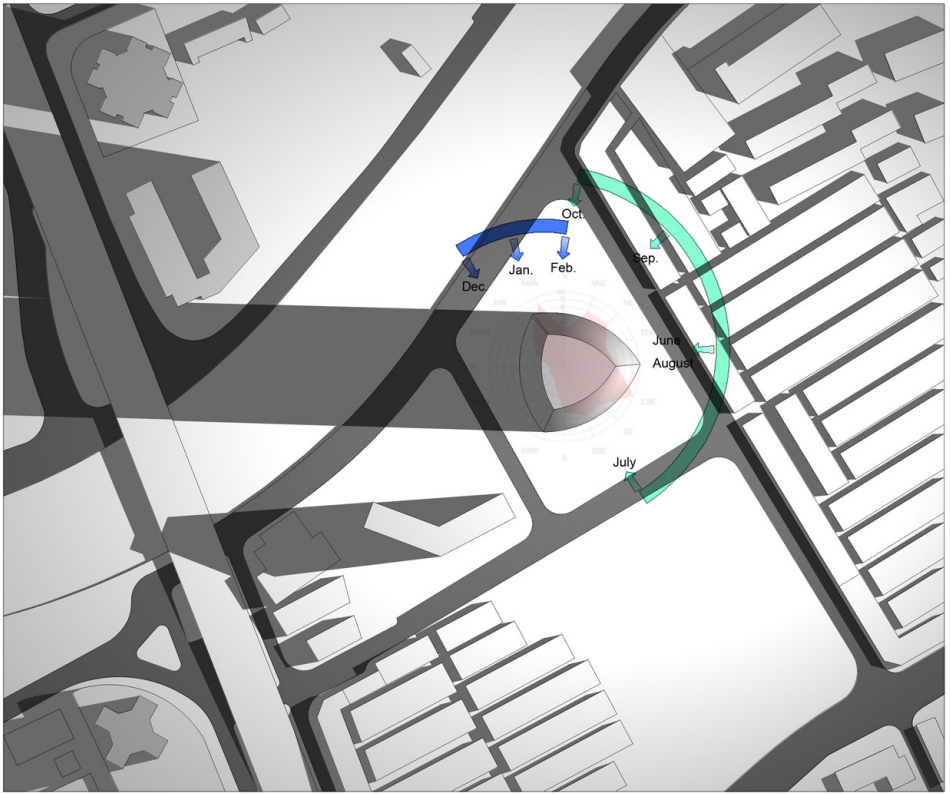


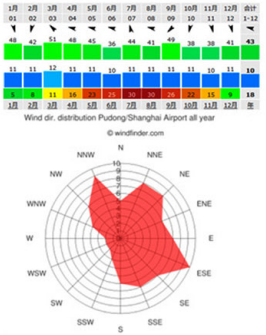


Wind dir. distribution Pudong/Shanghai Airport all year






Oct.
Jan.
Feb.
Dec.
Sep.
June
August
July


1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月 合计
01 02 03 04 05 06 07 08 09 10 11 12 1-12
48 42 51 48 46 36 44 41 49 38 38 41 43
11 11 12 11 11 10 11 11 11 11 10 11 10
5 8 11 16 21 25 25 25 25 22 15 9 10
1月 2月 3月 4月 5月 6月 7月 8月 9月 10月 11月 12月 年
Wind dir. distribution Pudong/Shanghai Airport all year
© windfinder.com
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
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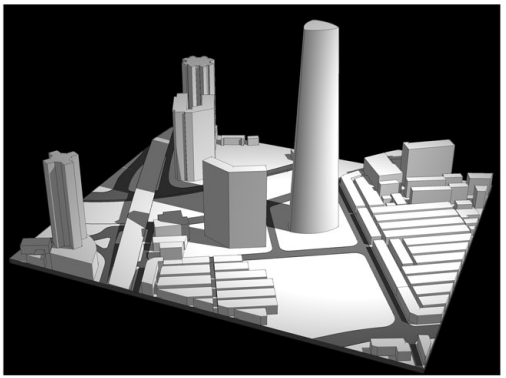
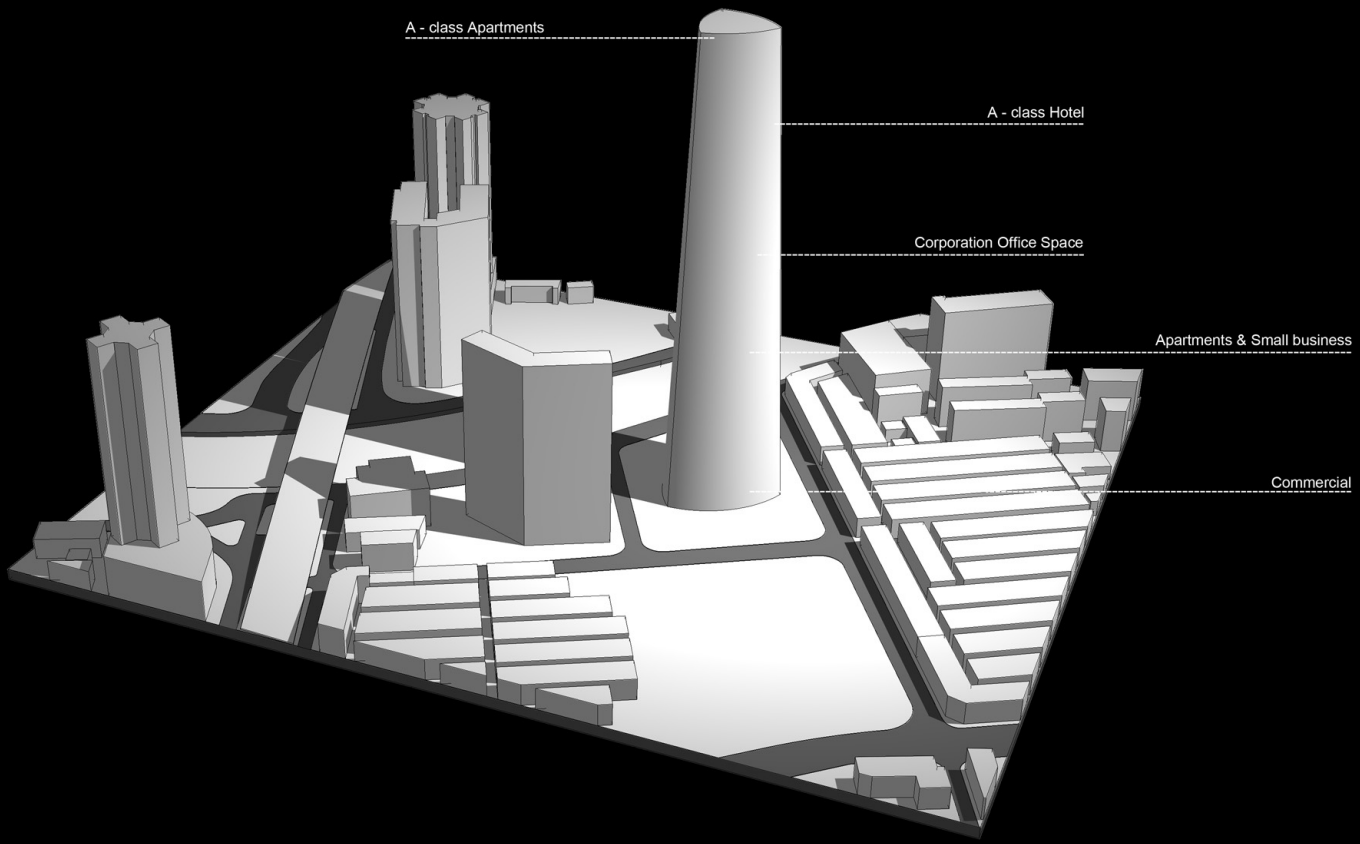
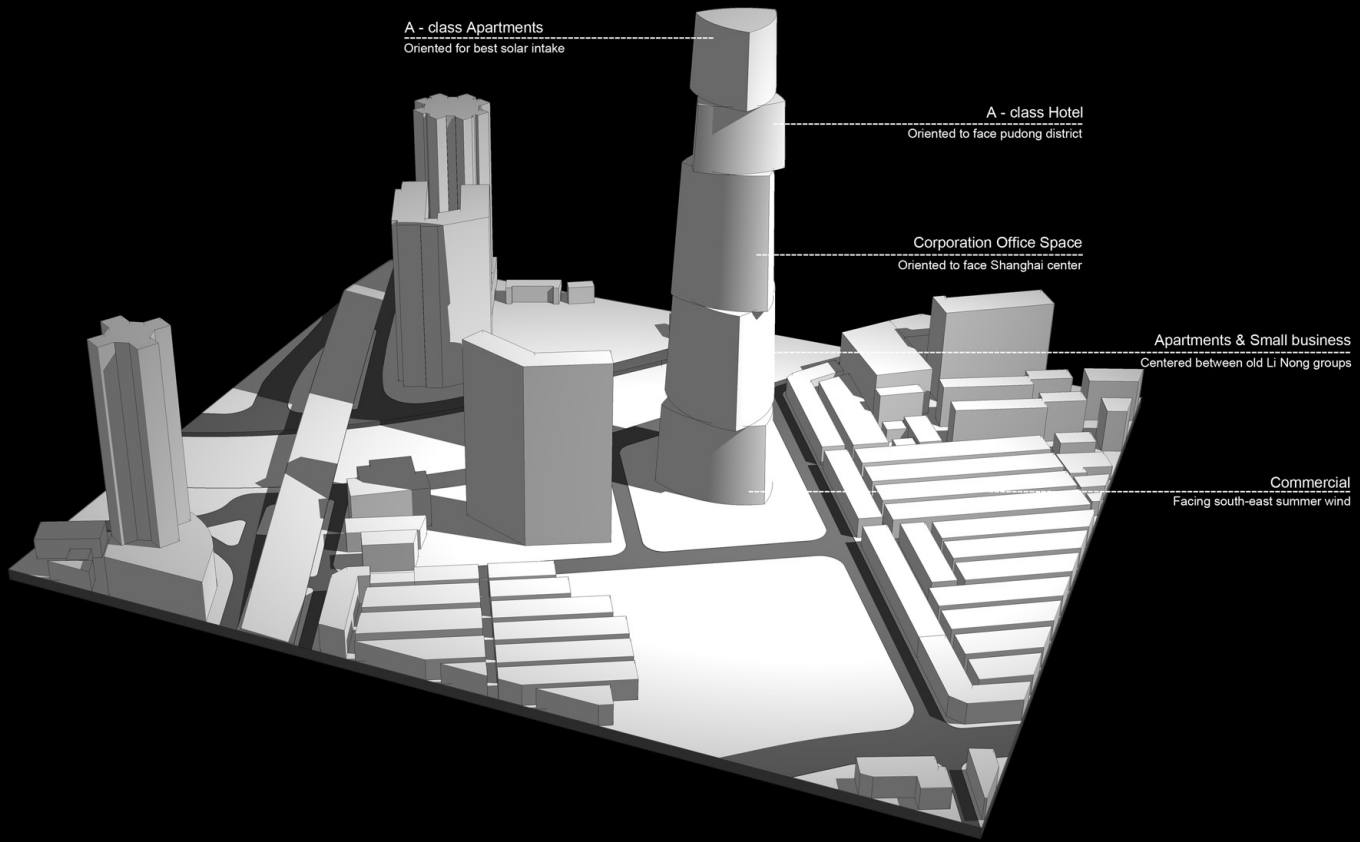
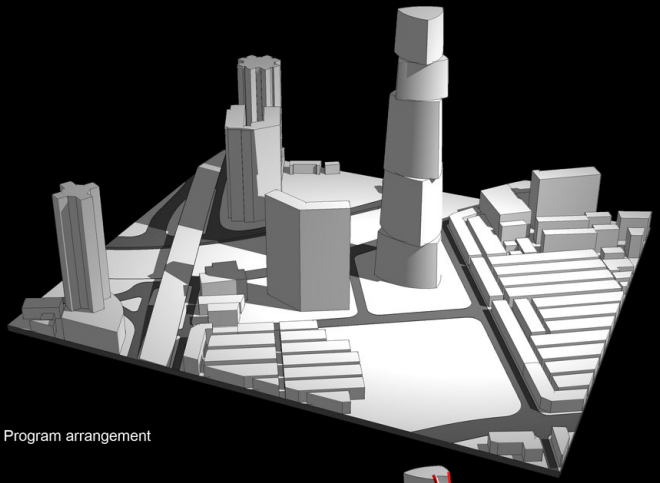
NW
NNW



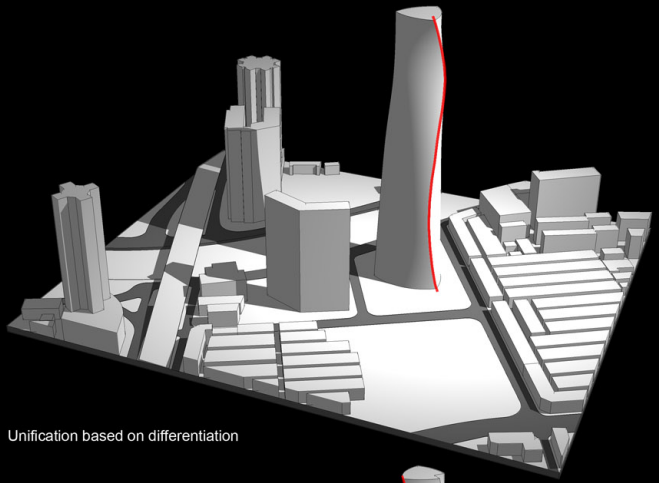

A - class Apartments
A - class Hotel
Corporation Office Space
Apartments & Small business
Commercial


A - class Apartments
Oriented for best solar intake
A - class Hotel
Oriented to face pudong district
Corporation Office Space
Oriented to face Shanghai center
Apartments & Small business
Centered between old Li Nong groups
Commercial
Facing south-east summer wind

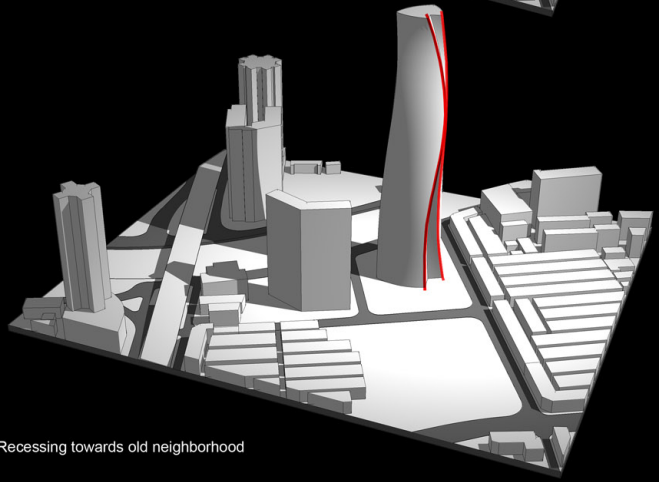

0.2 Miles to Train Station
Corporation Office Oriented to Shanghai Central
A-class Hotel Oriented to Pudong District -- 2.2 Miles
Map Source: http://www.edushi.com



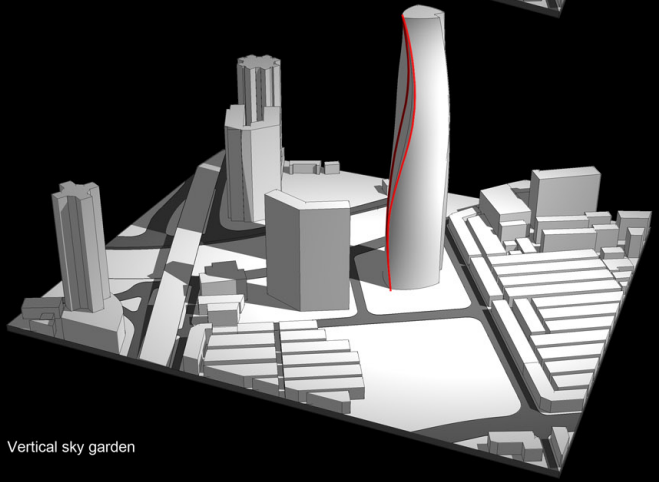
Program arrangement



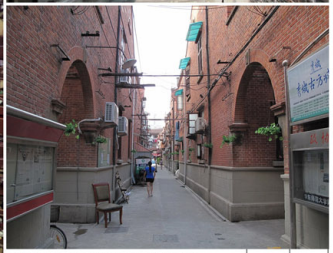
Unification based on differentiation



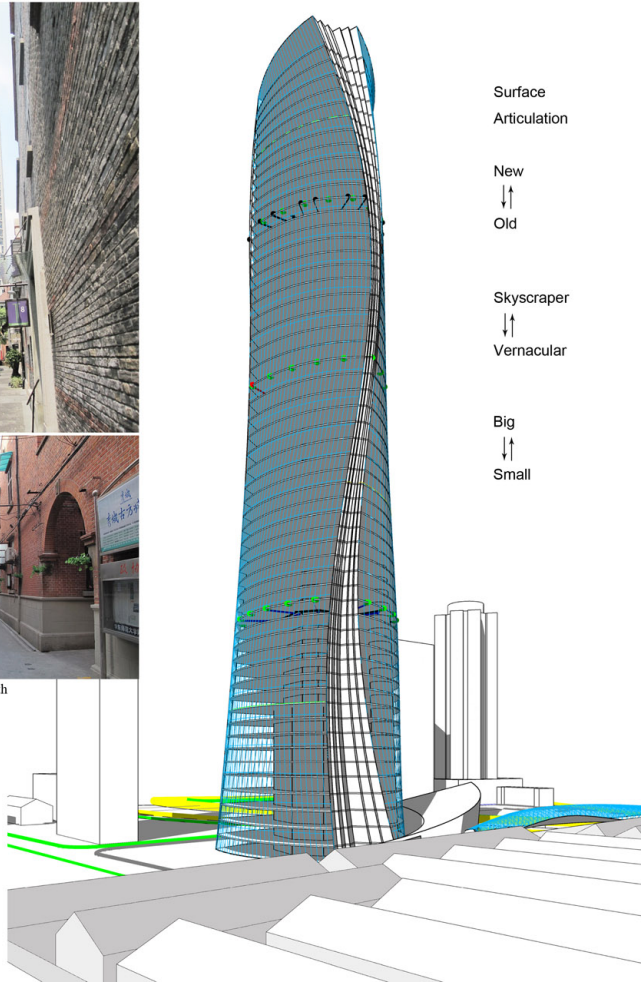
Recessing towards old neighborhood



Vertical sky garden



Photos Source: www.google.earth



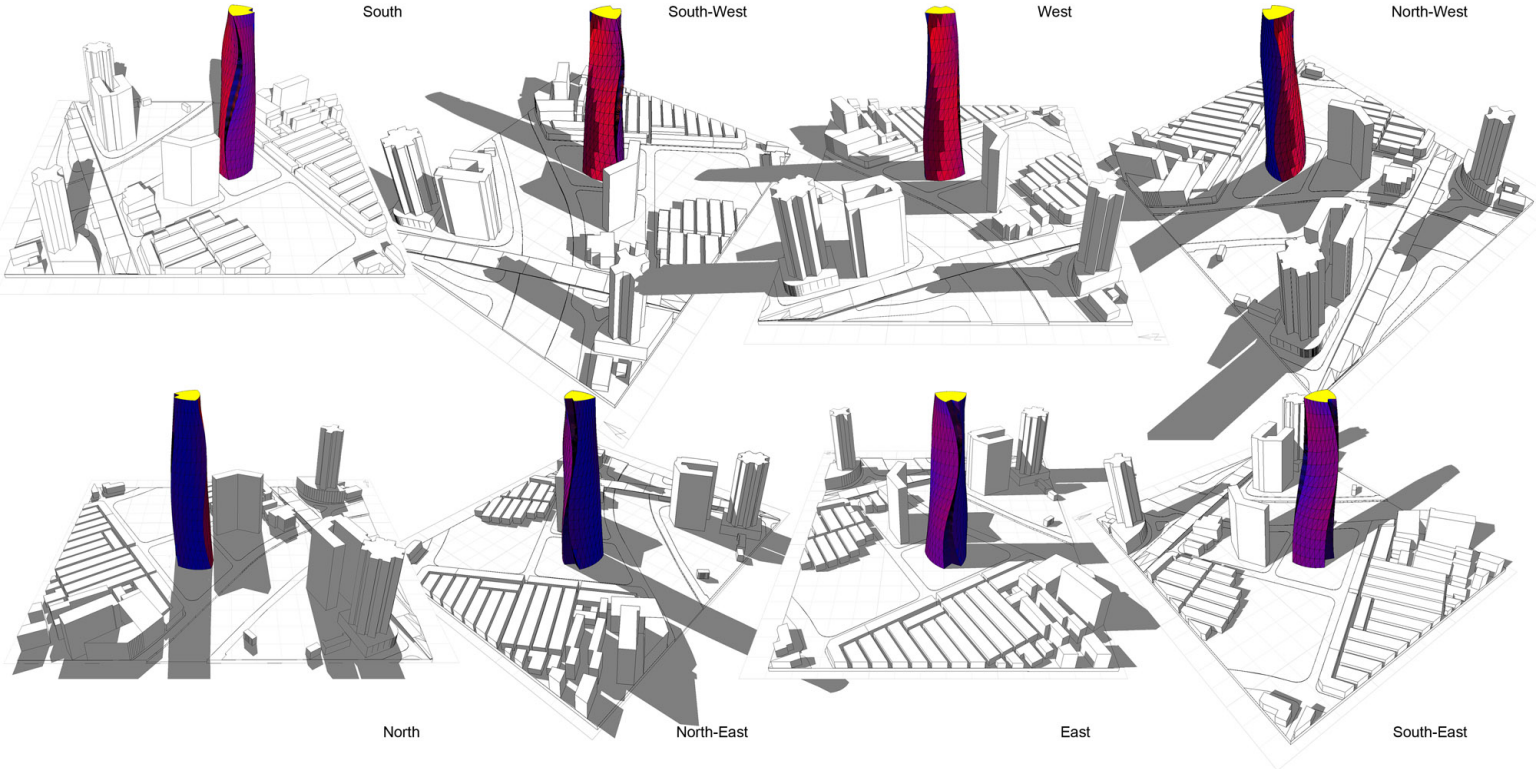
Surface
Articulation

New
↓↑
Old

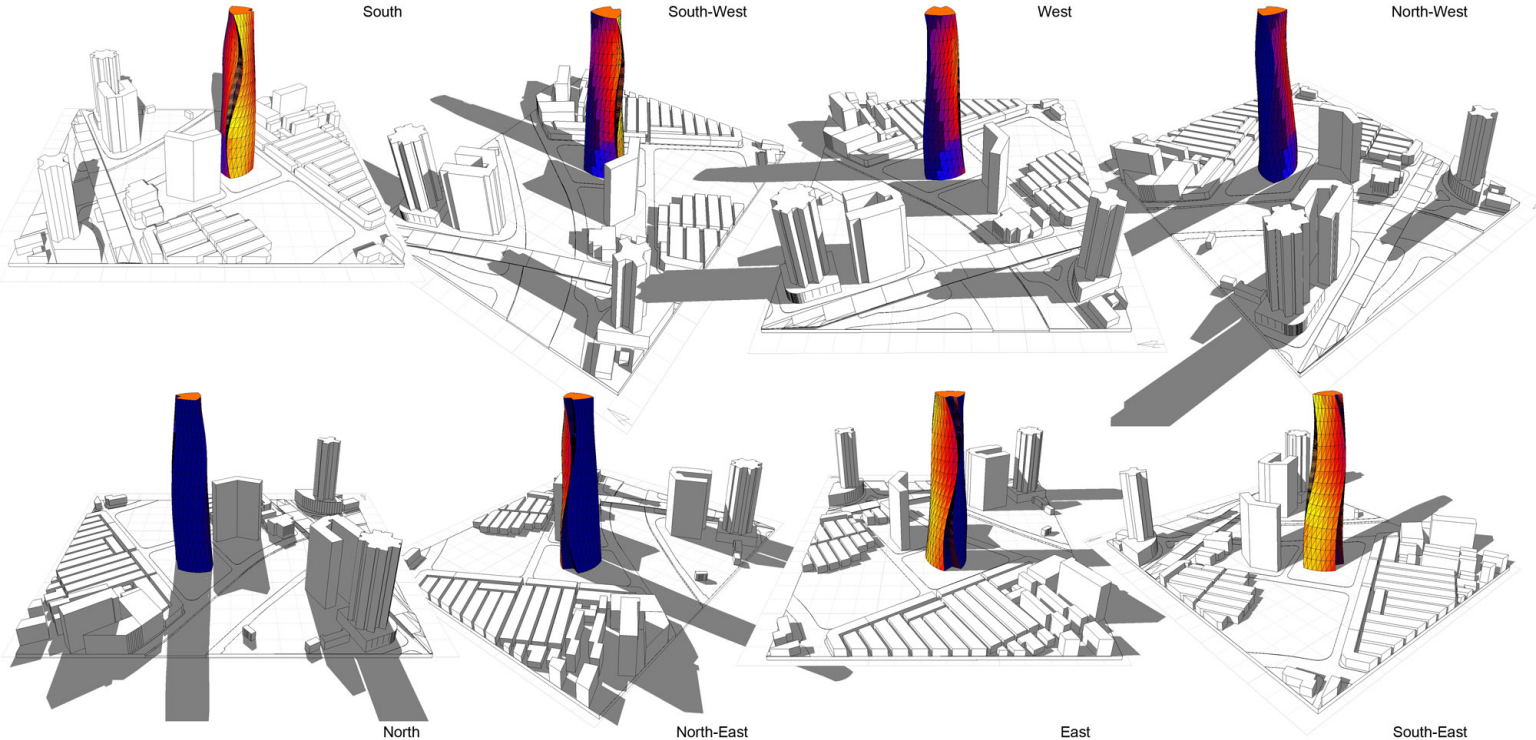
Skyscraper
↓↑
Vernacular

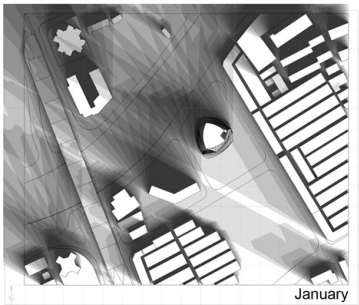
Big
↓↑
Small

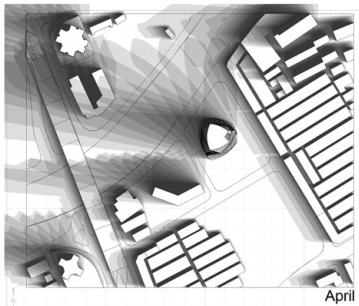
Summer Solar Radiation

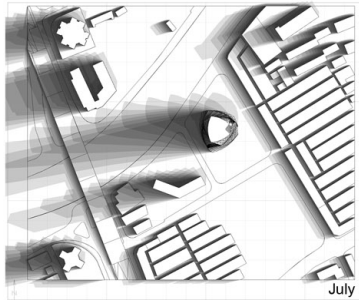


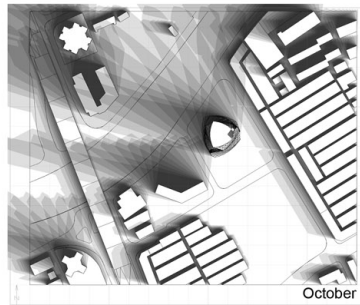
Winter Solar Radiation

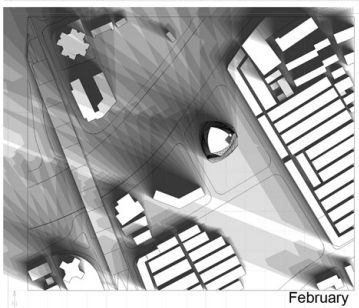


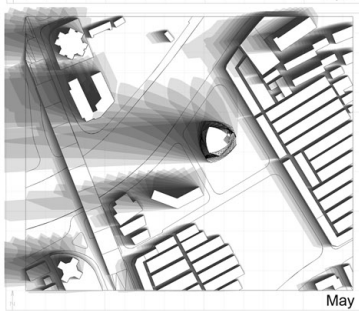


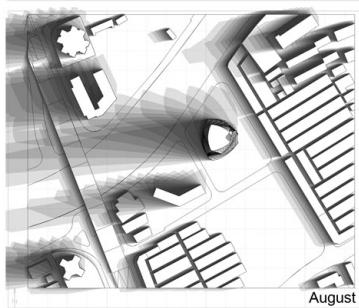


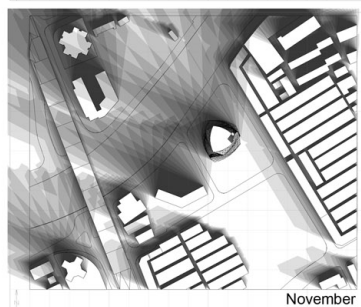


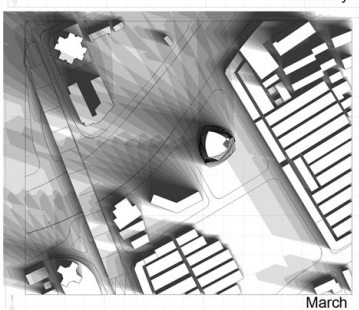


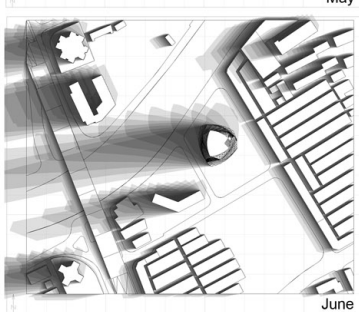


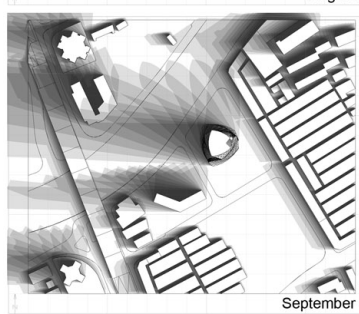


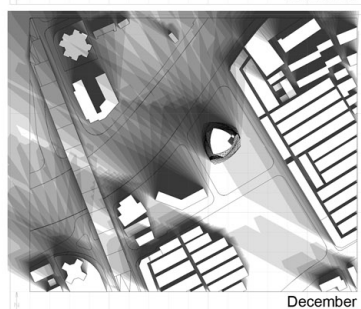




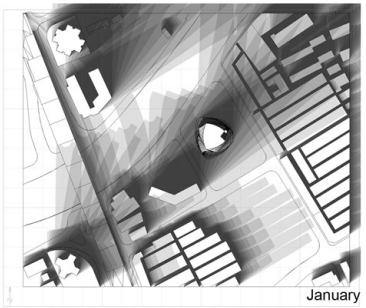


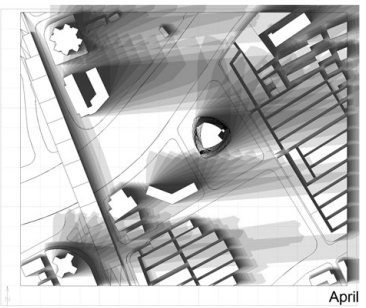


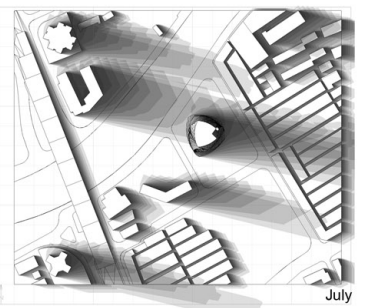


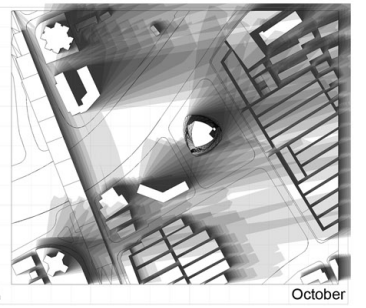


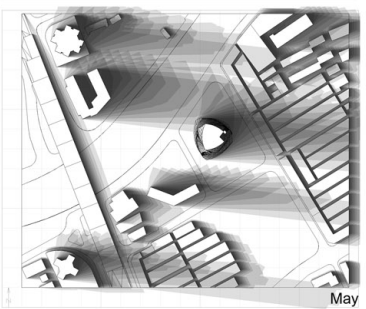
7:00 - 12:00 Morning Shadow Casting Illustration

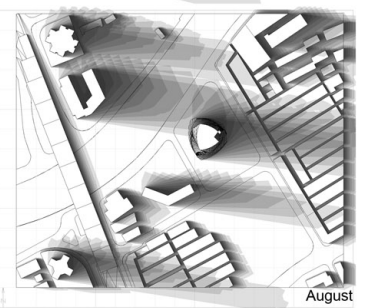


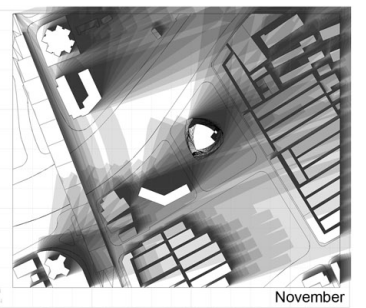


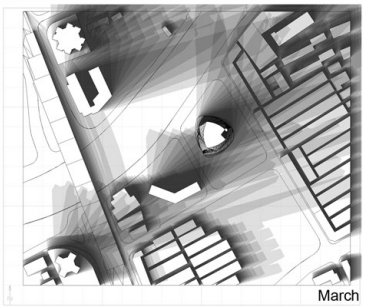


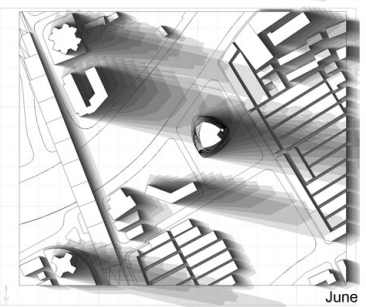


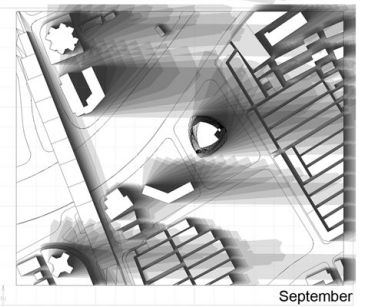




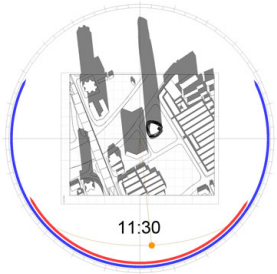


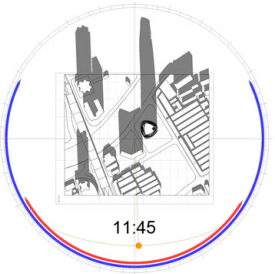


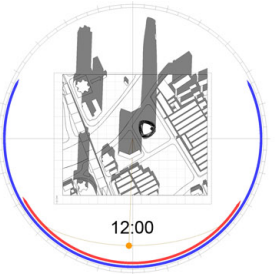


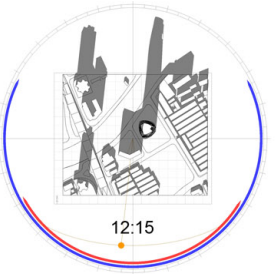


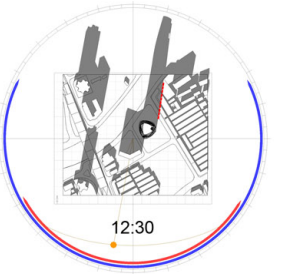
12:00 - 17:00 Afternoon Shadow Casting Illustration

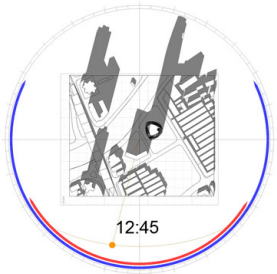


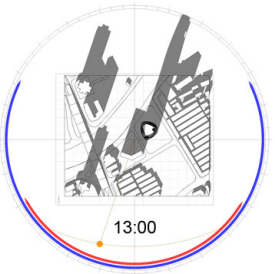


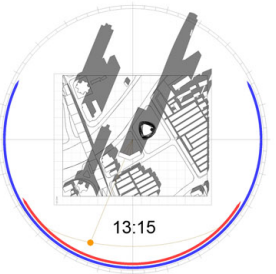


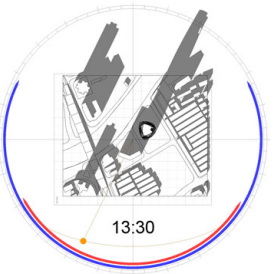


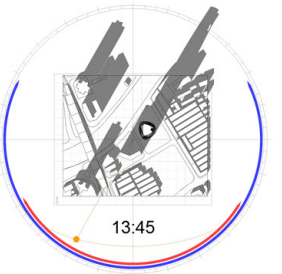


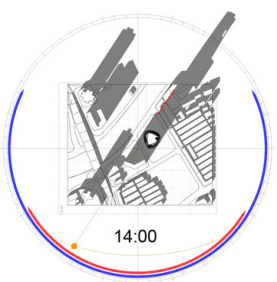


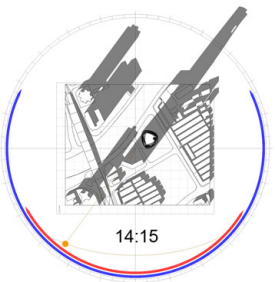


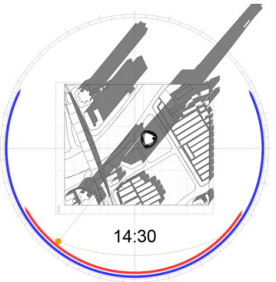


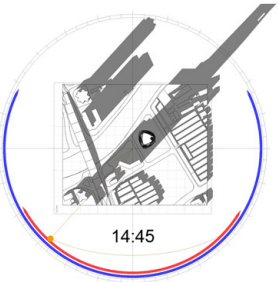


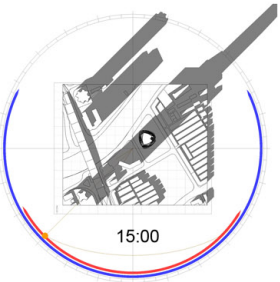




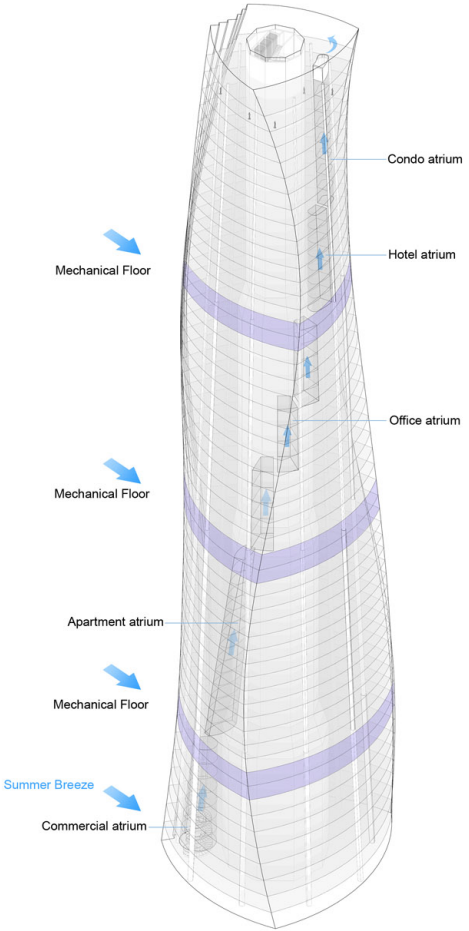








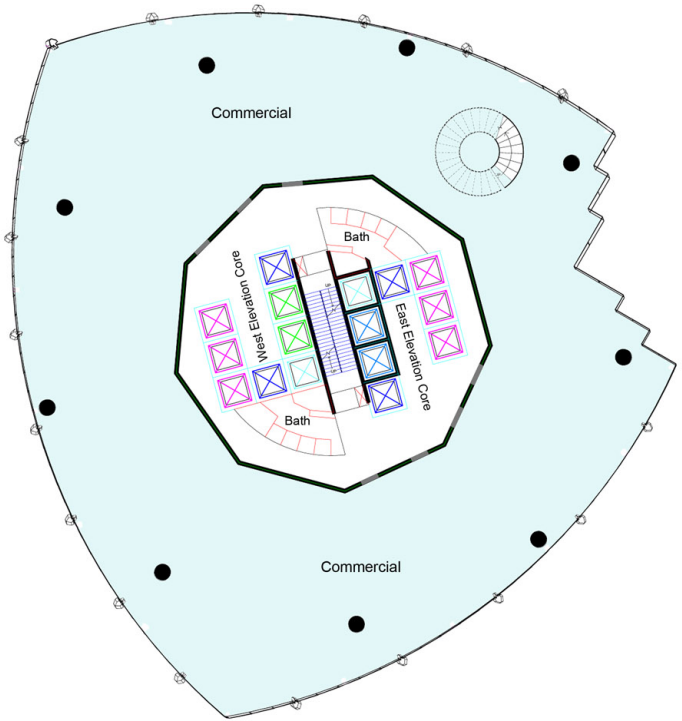
Shadow Study of Winter Solstice For Necessary Sunlight Hour


Condo atrium
Mechanical Floor
Hotel atrium
Office atrium
Mechanical Floor
Apartment atrium
Mechanical Floor
Summer Breeze
Commercial atrium


55th Floor Condo Atrium


23rd Floor Apartments Atrium

PLANS / SECTION



Typical plan - Commercial Floor

Floor Area - 2100 Sq Meters

Floor Height - 4.2 Meters

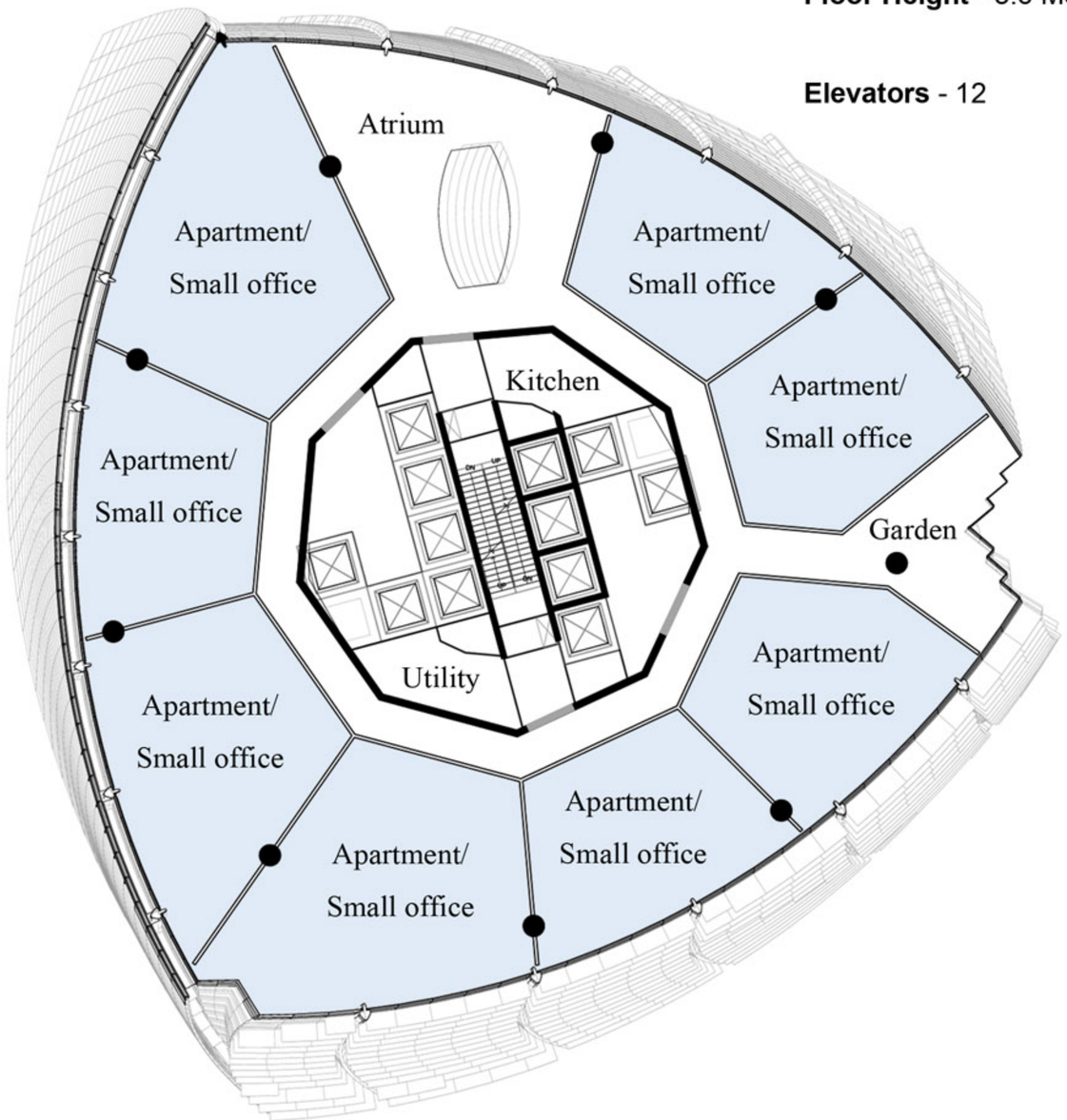
Elevators - 16

Typical plan - Apartment Floor

Floor Area - 1700 Sq Meters

Floor Height - 3.6 Meters

Elevators - 12

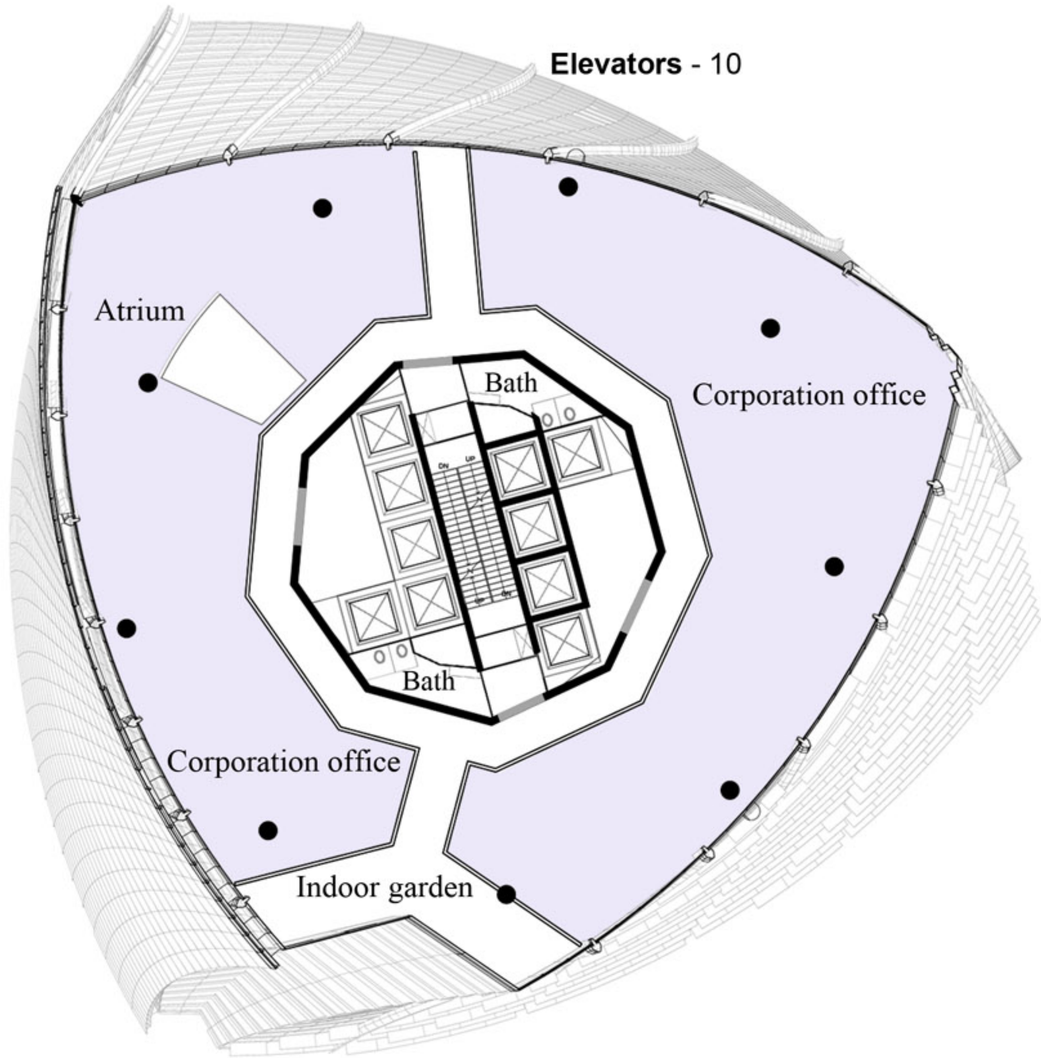


Typical plan - Office Floor

Floor Area - 1300 Sq Meters

Floor Height - 4.2 Meters

Elevators - 10

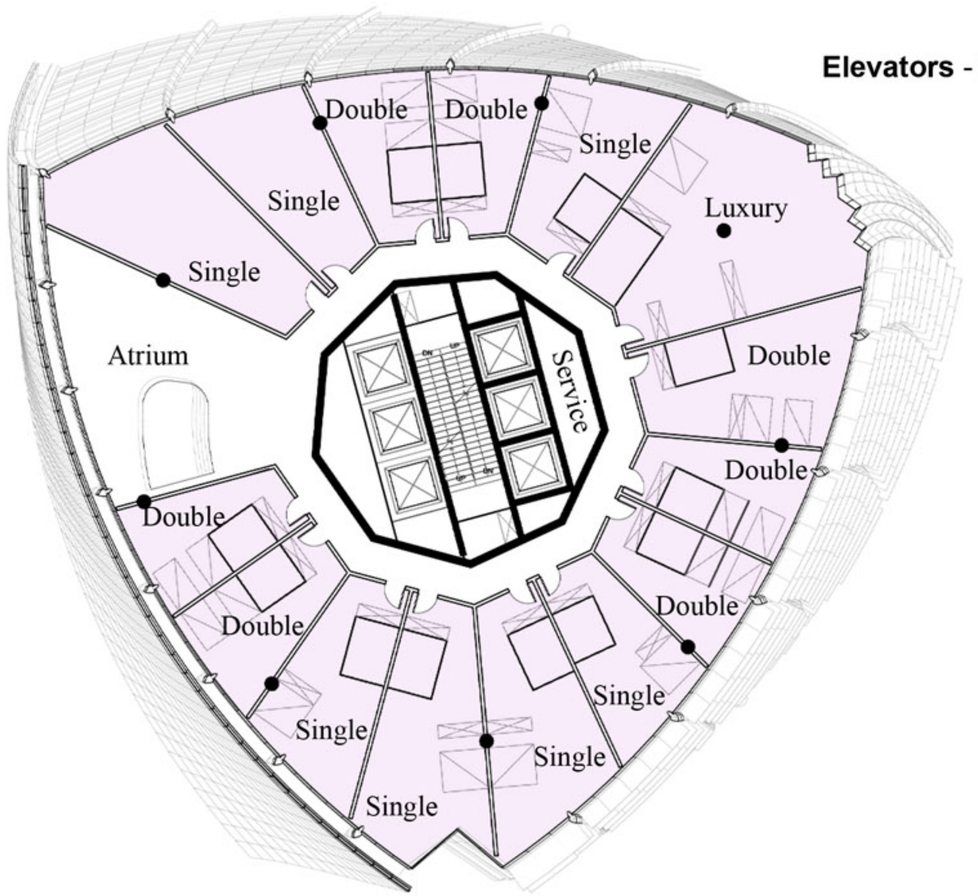


Typical plan - Hotel Floor

Floor Area - 1000 Sq Meters

Floor Height - 3.6 Meters

Elevators - 6

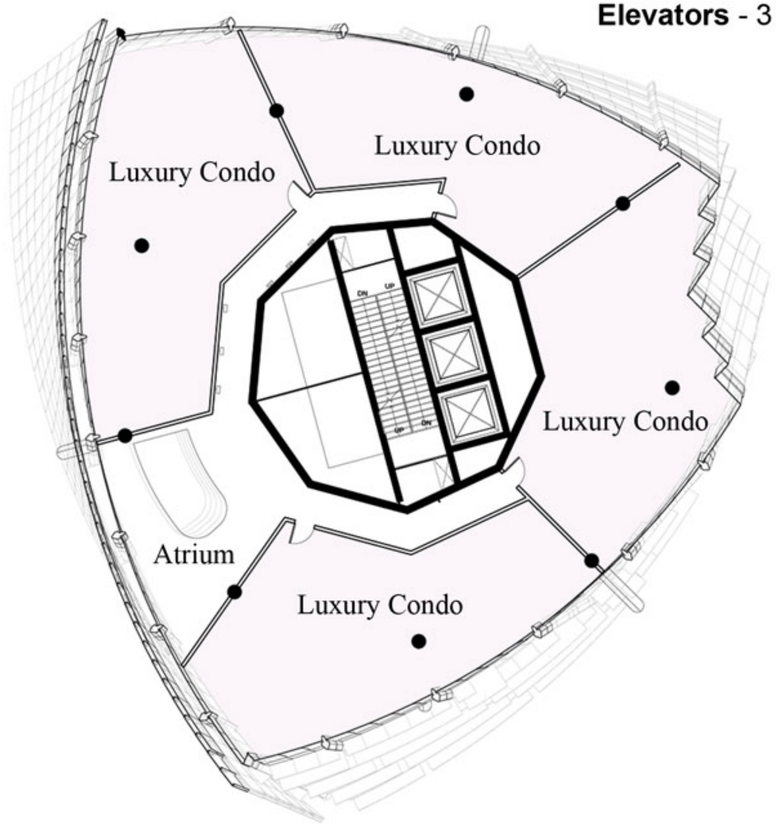


Typical plan - Condo Floor

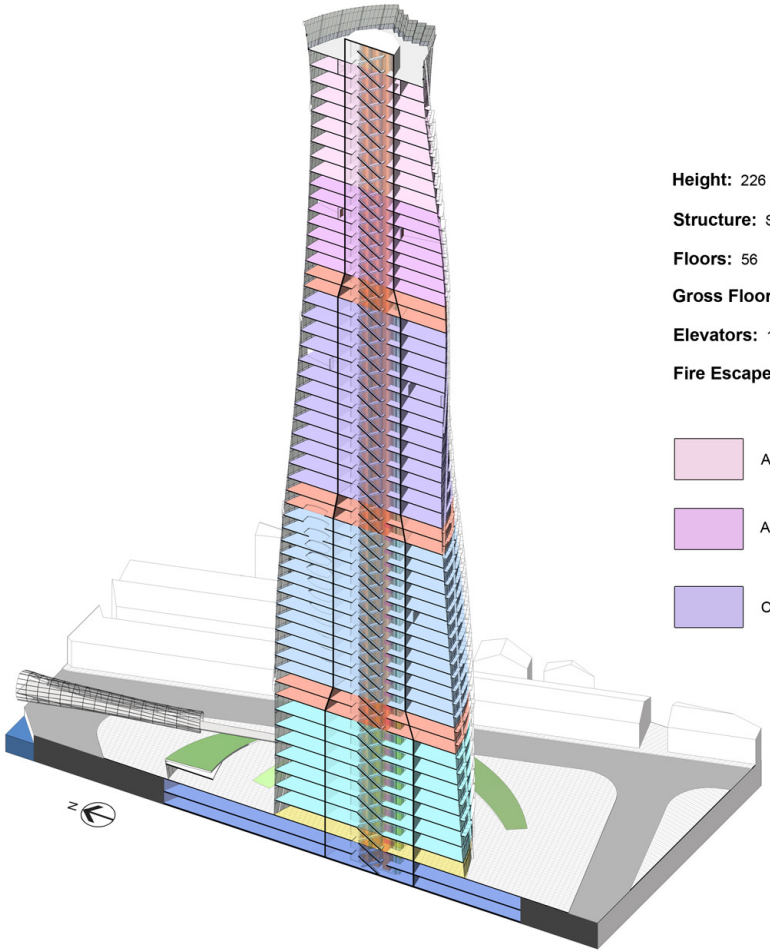
Floor Area - 780 Sq Meters

Floor Height - 4.2 Meters

Elevators - 3



PLANS / SECTION



Height: 226 Meters

Structure: Steel + Reinforce Concrete

Floors: 56

Gross Floor Area: 75000 Sq Meter

Elevators: 15

Fire Escape Stairs: 2

A-Class Condo

A-Class Hotel

Apartment / Small Business

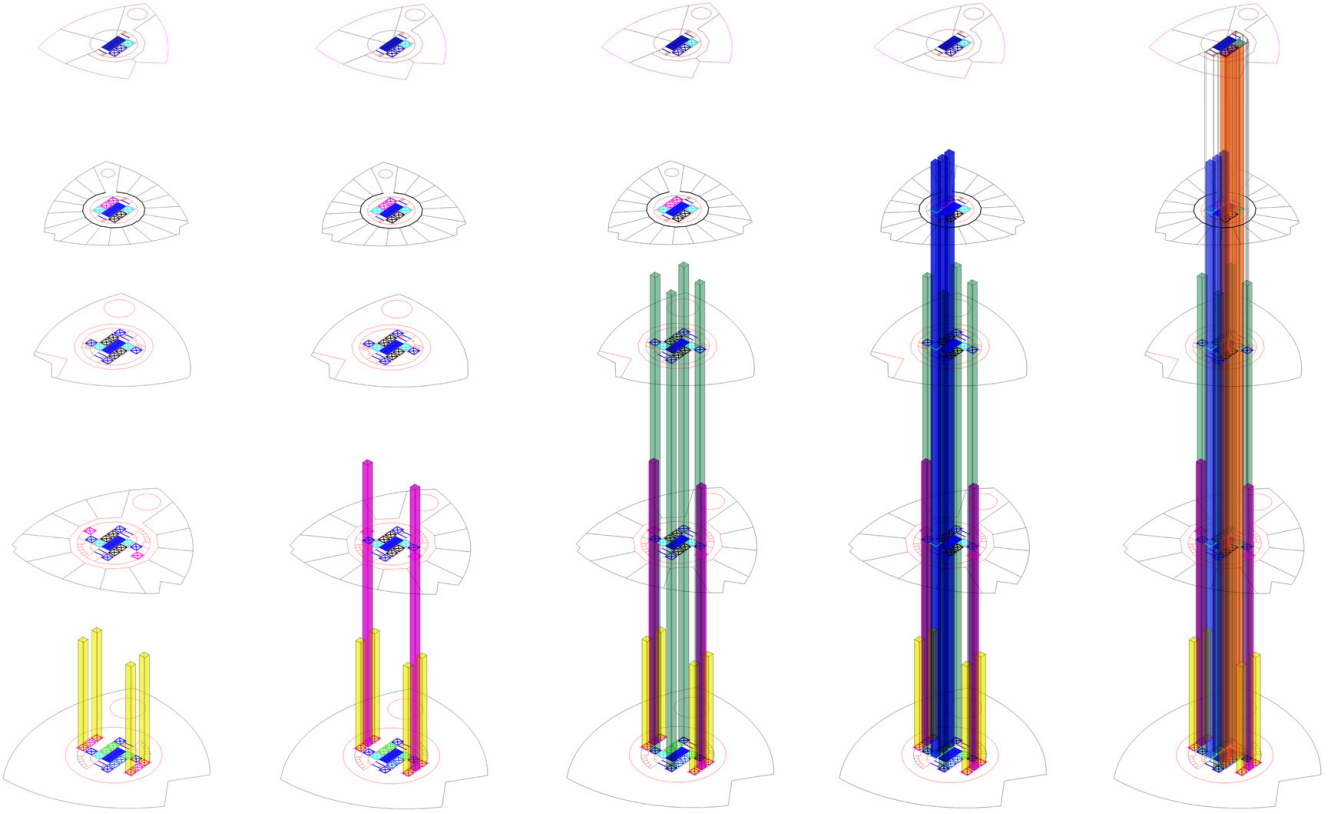
Corporation Office

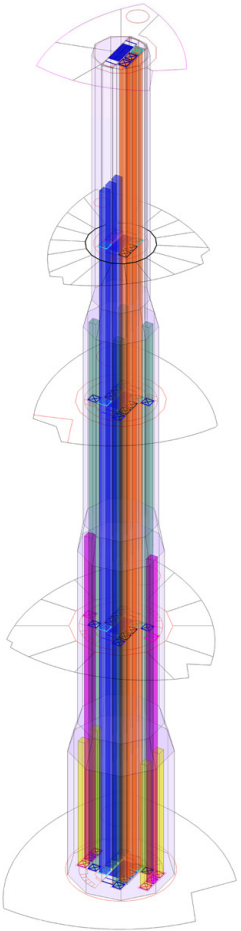
Commercial

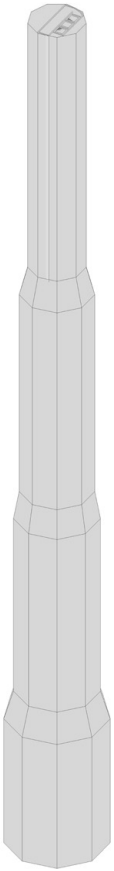
Mechanical Floors

SECTION

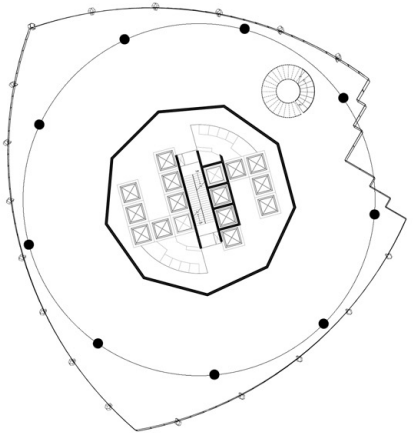
STRUCTURE

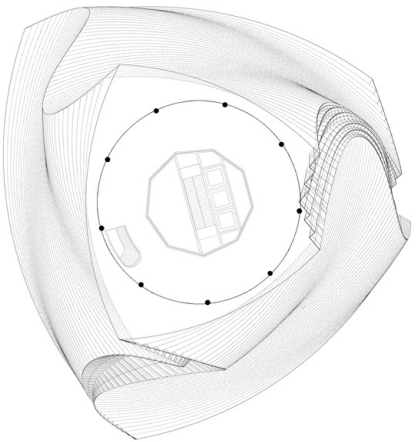


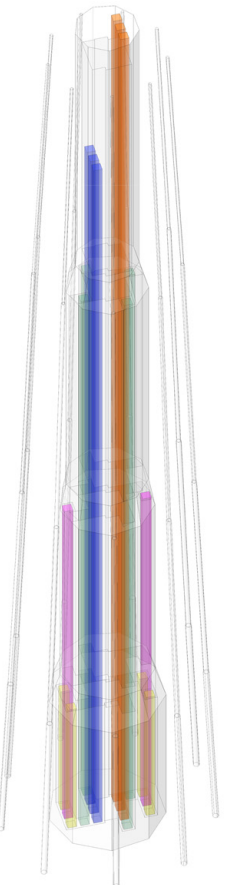


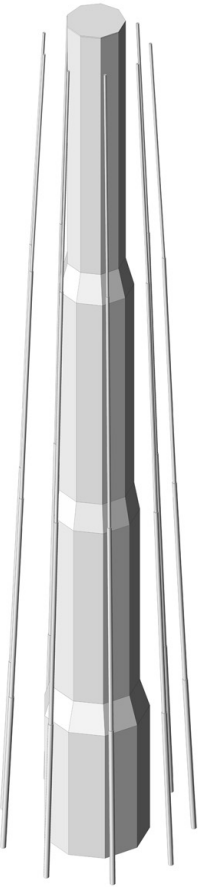



CHAOS



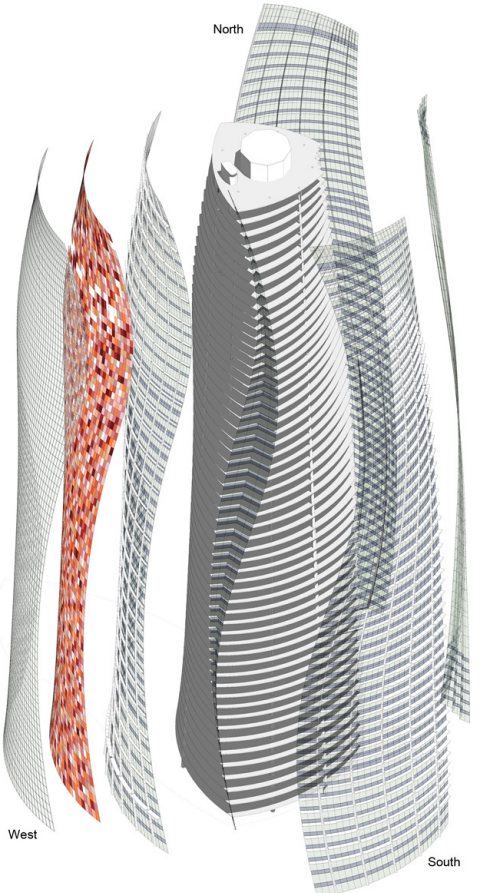






CORE + MEGA COLUMNS

SKIN



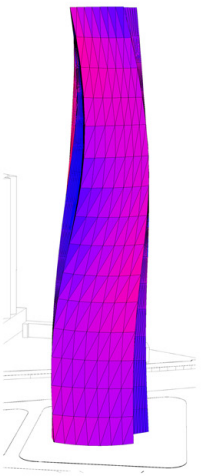
Building Skin Composition

The skin design of the high-rise is mainly shaped by how the building is responding to solar radiation.

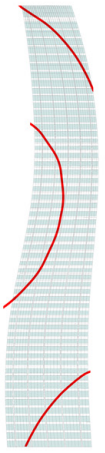
North facade receives the least sunlight throughout a year, thus no sun-shading device required, the principle for skin design is to encourage sunlight intake with max transparency.

South facade receives seasonal solar radiations that varies in times, therefore sun-shanding louvers are installed regarding various locations.

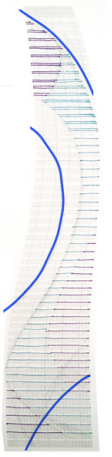
West facade has the most critical condition during summer, so double skin is needed for sun shading and natural ventilation.



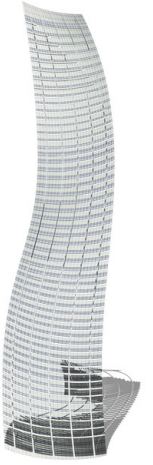
Solar radiation analysis



Generic curtain wall

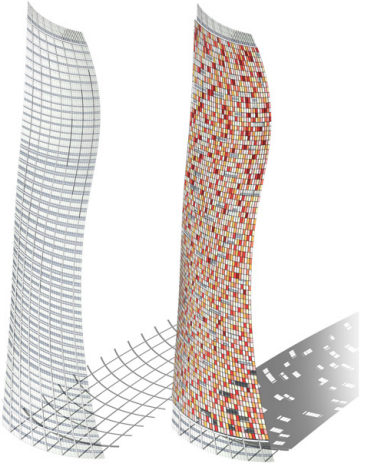


Sun shading devices



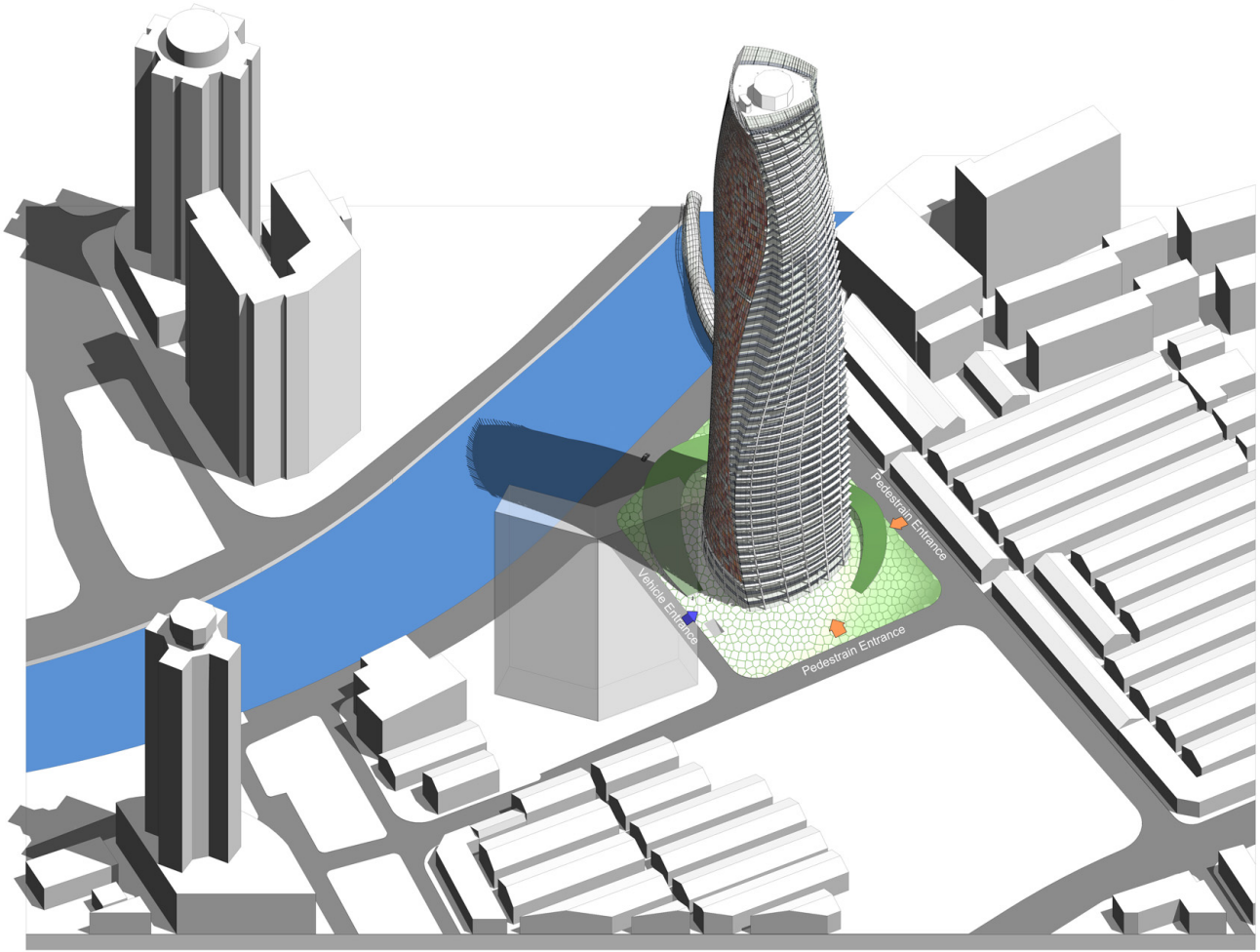
South Facade Development

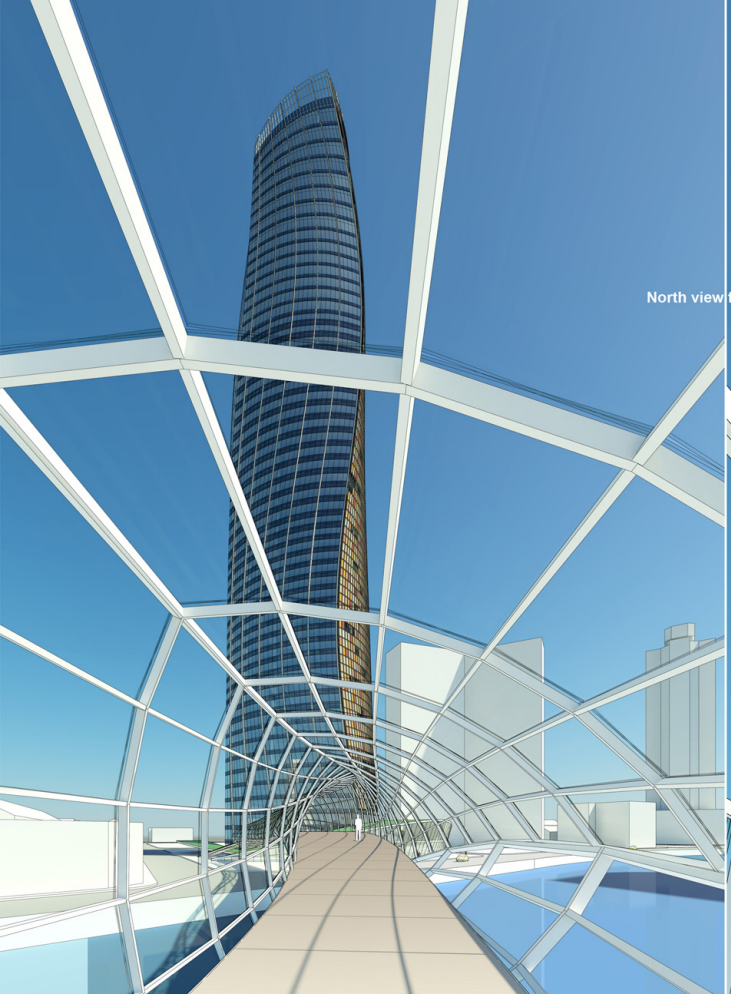
Solar radiation analysis



West Facade Development

ILLUSTRATION

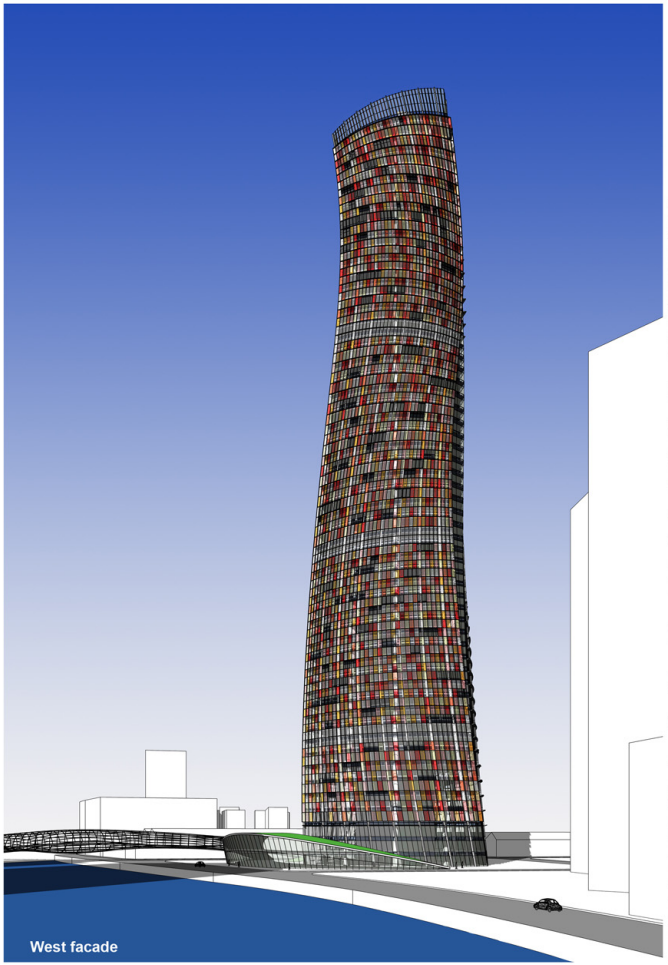

Pedestrain Entrance
Vehicle Entrance
Pedestrain Entrance

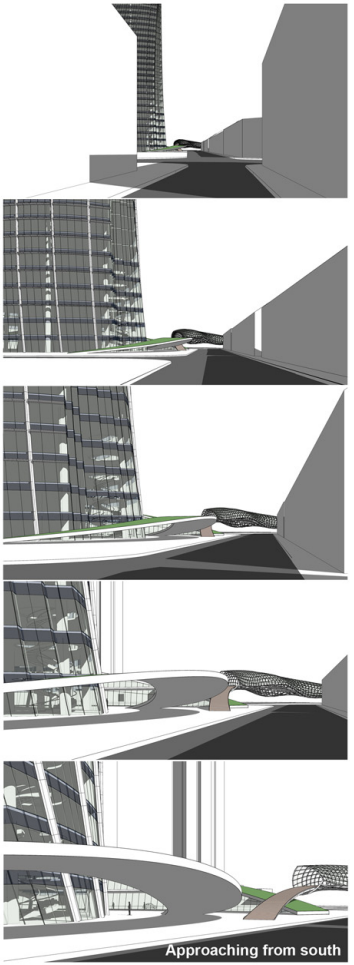


North view from the bridge

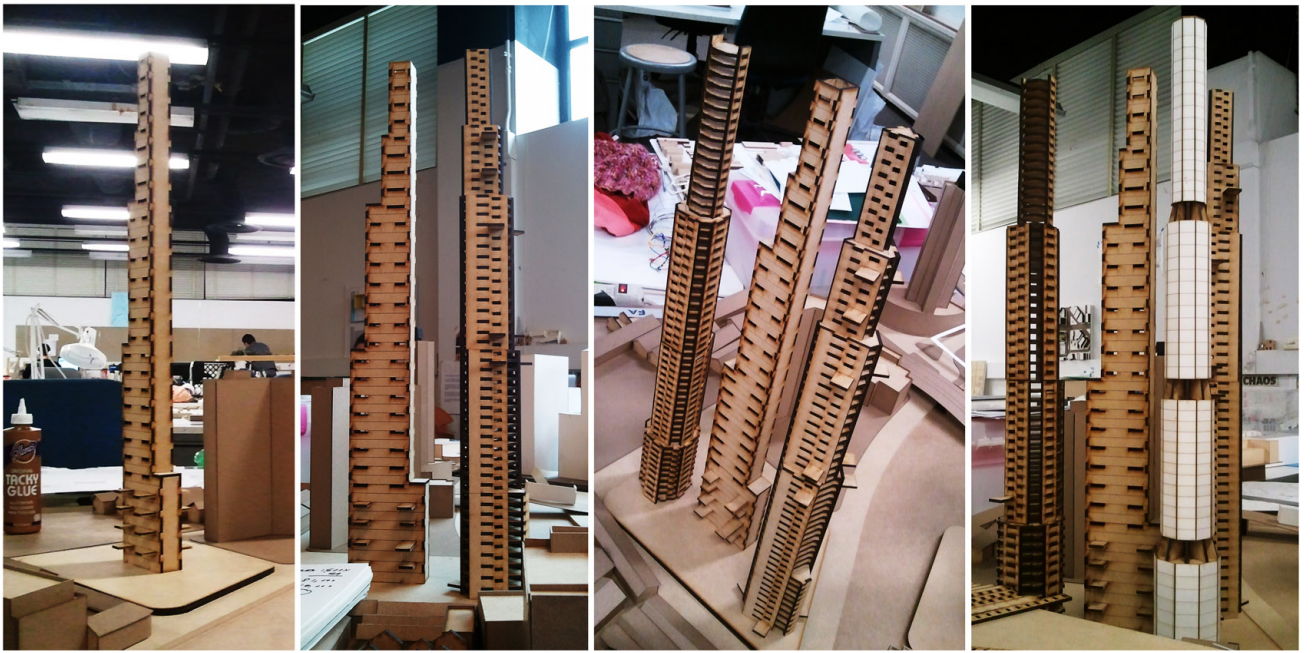
South-east entrance


Linong Alley


West facade


Approaching from south

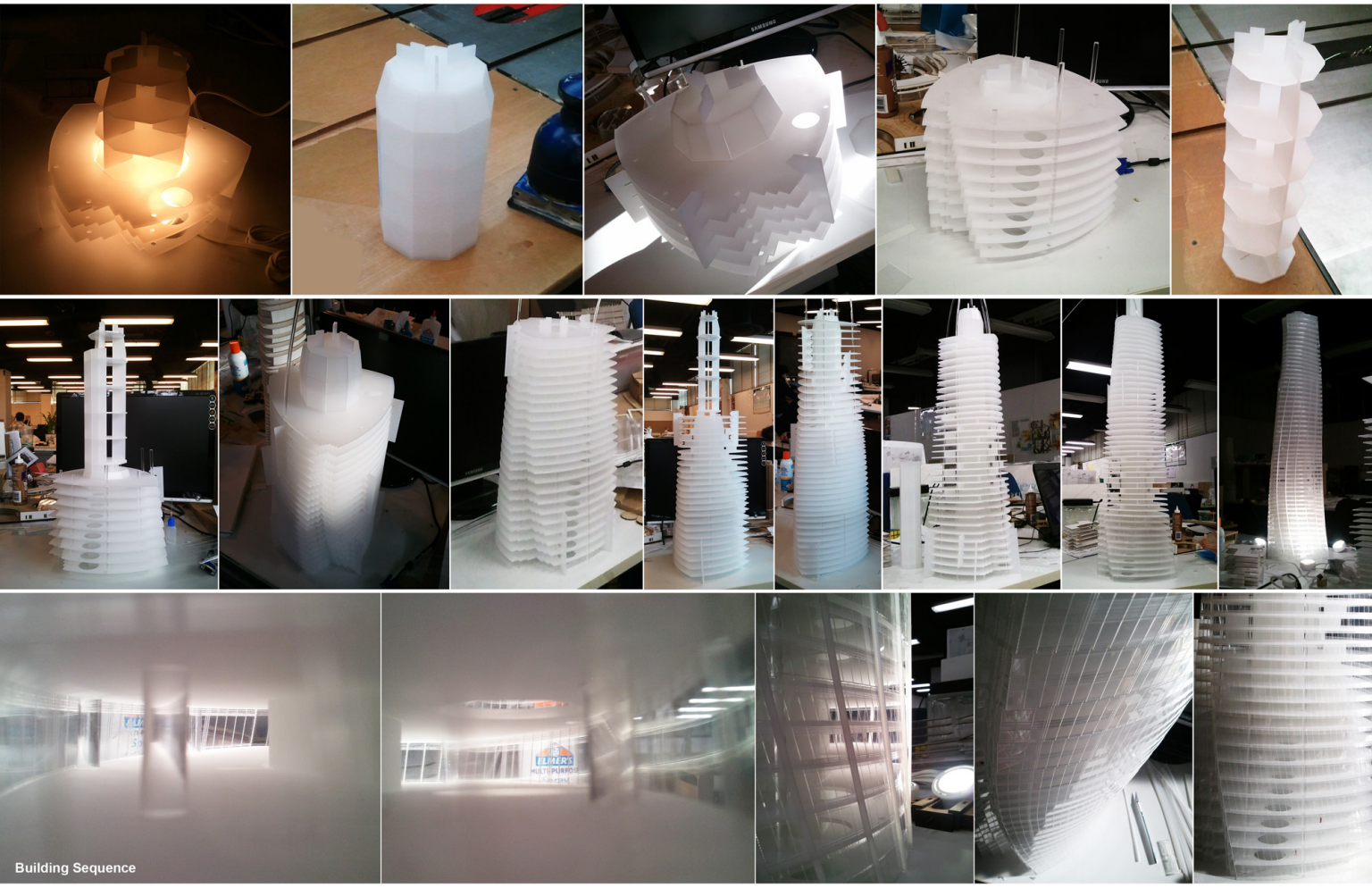
MODELS



Building Core Evolution

Massing Model

Massing on Site


Building Sequence