TOWARDS A VOLUMETRIC CITY

by

Ho Kwan Yip

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Signature of Author: ____________________________

Department of Architecture
January 19, 2012

Certified by: ____________________________

Nader Tehrani
Professor of Architecture
Department Head

Accepted by: ____________________________

Takehiko Nagakura
Associate Professor of Design and Computation
Chair of the Department Committee on Graduate Students
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Department Head  
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Assistant Professor of Architecture  
Reader

Filip Tejchman  
Lecturer of Architecture  
Reader
The Ground is dead. In extremely dense urban areas, single ground do not have the luxury of space to accommodate programmes besides circulation. Other urban components such as elevators, bridges, underground passage are also circulatory oriented. The building mass have grown volumetrically and becomes thicker while the ground remains relatively thin and planar.

In Hong Kong, having its urban density ranking the highest in the world, its grounds have undergone a prolonged struggle for appropriate reinvention. This city of commerce has favored an emergence of hyper-rational logic that permits the realization of some utopian proposals including the Corbusien plan. Such logic has also formed a “Bowl Shape” transverse-section from the mountain to the harbor, brutally revealing the differences in real-estate value across the section.

The thesis takes the opportunity to reinvent a new ground - a datum - which reorganizes the commercial value distribution, reinvents generic typologies and at the same time liberates the natural ground. New cityscapes can be designed above and below the new datum which permit the architecture and architect to reclaim the “dead” ground. The Ground is alive.
The Ground is dead.

The Ground is a datum that we seldom challenge until the density of the city becomes so high that exceeds the capacity of the ground. The ground do not have space to accommodate programmes other than circulation. New typologies are introduced to cope with this extraordinary density. Elevator becomes the vertical ground. Underground and podium levels serve as the sub-connectors between buildings. However, these inventions are subsidiaries and principally affiliated to the existing ground. They cannot perform by just their own existence.

Hong Kong is the city with the highest urban density in the world. While its grounds have undergone a prolong struggle for appropriate reinvention, Hong Kong is city that prioritizes its economical development, resulting in the emergence of a hyper-rational logic that permits the realization of some utopian proposals including the Corbusien plan. This logic has also formed a “Bowl Shape” transverse-section from the mountain to the harbor, brutally revealing the differences in real-estate value across the section.

The thesis attempts to challenge the reliance on a singular primary ground in high-dense urban context. The primary ground defines the level of publicness of the buildings and further determining their internal organization, formal quality and envelop design. This bias has become more generic and restrictive in the urban environment. The building mass have grown volumetrically and becomes thicker while the ground remains relatively thin and planar. This disjunction of thickness results in limiting the organization of the buildings and furthermore the city itself.
The thesis takes the opportunity to reinvent a new ground - a datum - which reorganizes the commercial value distribution, reinvents generic typologies and at the same time liberates the natural ground. New cityscapes can be designed above and below the new datum which permit the architecture and architect to reclaim the “dead” ground.

The Ground is reclaimed.

The Politics of the Ground

Starting from the ancient Greek temple design, architects have been struggled with defining the relationship between ground and architecture. “Plinth” was introduced to resurface the ground for situating the column, statue and monument. Such a ground-related invention is not unique throughout the architectural history. In 1926, “Pilotis” was created by Le Corbusier to display another attitude toward the ground treatment. He proposed the creation of a whole new ground in the form of elevated platform with almost minimal connections to the existing ground in order to help establishing a stronger building figure. In the Radiant City proposal, the “natural ground” was even considered as “the enemy of man” as “dispenser of rheumatism and tuberculosis”. On the other hand, Mies Van der Rohe took an approach which echoed with the ancient Greek temple through introducing “Motif”.

The Ground is reclaimed.
Motif helped to construct the “micro-context” for the building to sit on with the elimination of the trace of heaviness related to the ground. Ground was considered almost as an opposing entity in architecture which separation and reconstruction were favored.

Until 1960s, people started to reconsider the potential of constructing the ground into a habitable condition. It can be a positive space with a distinct relationship with the architecture instead of an empty negative leftover space. Carpenter Center by Le Corbusier in 1962 illustrated such a shift of perspective on the ground. The ramp bisecting the building demonstrated the penetration and integration of the ground open space into the building design. Meanwhile, Oscar Niemeyer dealt with the potential of the ground differently. Instead of treating the ground as an indefinitely continuous flat surface, he tried to give it a precise form which can be explained in the design of Headquarters of French Communist Party. The idea that the ground can be the central subject became even more prevailing in Emilio Ambasz’s design. The ground was utilized as the camouflage for the building to diminish the figure of the architectural object. In the Spatial Retreat House, the ground was converted into a figure through his application of stage design strategy. Peter Eisenman in some respects also tried to develop the figure of the ground but from a very different approach. He was inspired by Colin Rowe, in “Collage City”, argued that the ground of the city “is not a neutral surface but only the topmost stratum of dense layers made up of different historical traces.” Eisenman experimented to reveal these traces embedded in the ground and
employ them as design generation rules. In his IBM Social Housing project, the historic and present contents in the ground were strategically intertwined to formulate the new ground. “The architectural figure of the building gradually disappears as an autonomous object, while the ground, as an archaeological archive, increasingly becomes a figure.” His endeavors to establish new concepts such as “figured ground” and “grounded figure”.

In the 1990s, OMA demonstrated a new interpretation of the ground. Ground as a circulation medium described the sequences to experience the architecture. The concept of continuous ground required the building to have a different organizational logic at the same time opened up new opportunities for the ground to become a programmable surface that became part of the functional spaces. It is hard to neglect the influence of the concept of “function oblique” in understanding the discourse of continuous ground. “The function of the Oblique” was introduced by Paul Virilio and Claude Parent which suggested a new order for the ground. Instead of rigid horizontal and vertical planes, an inclined plane can enhance the instability and “encourage a constant awareness of gravity, bring the body into a tactile relationship with the building”. Movement was facilitated in this circumstance.
INSPIRATION - What’s wrong with the ground?

how does the vertical ground (elevator) change the situation?

how long does it take to travel? what if the ground is just not enough?
INSPIRATION - What’s wrong with the ground?

Mix-used tower suggest the potential of vertical zoning.

How do the new grounds formulate the vertical zoning?
INSPIRATION - Potential of the ground?

Existing ground condition

Proposed ground condition

The natural ground will not be the only connecting medium for the buildings. This will greatly transform the operation of the city.

How will the new ground suggest some new ground typologies?
RESEARCH 1
Learning from the Section

How does architecture meet the ground?
The invention of elevators (1852)
- vertical ground

Heinrich Wölfflin
the ground has to do with a basic “formlessness” which the will, as a vital force, must overcome. The “force of form” is to pull us up from this formless state, against which all of life is the struggle.
Le Corbusier

"artificial sites" in 1933 in the Radiant City, dismisses the "natural ground" as a "dispens-er of rhizomatism and tuberculosis", declares the natural site to be the "enemy of man"

PILOTIS

pilotis are supports such as columns, pillars, or stilts that lift a building above ground or the ground plane. The pilotis (or pier) raise the architectural volume, lighten it, and free a space for circulation under the construction.

MOTIF

eliminates all traces of the heaviness

Claude Parent
Paul Virilio

formed the Architecture Principe group "faucon oblique" a new conceptual module for the production of Urban Commnity, change the existing ground into a different order by making the new city emerge "at an incline" for the old one
**Oscar Niemeyer**

The Function of the Oblique

Oscar Niemeyer gives the ground (normally indistinctly confused) a distinct form, scale & place. Water Pavilions: the ground ultimately becomes a central subject of architectural research.

**Peter Eisenman**

Emancipation of the ground from the status of a foundation for architecture to an architecture in its own right and a space for the analysis of Peter Eisenman. "Oblique" form acquires form of Peter Eisenman. "Oblique" as a method for developing the figure from the ground. The established concept such as figured ground and grounded figure.
RESEARCH 2
Precedent Studies

LE CORBUSIER RAIDANT CITY
ARCHIGRAM PLUG IN CITY
SUPERSTUDIO CONTINUOUS MONUMENT
FRANCISCO MUJICA FUTURE CITY
SPUR THE FUTURE OF ASIAN CITY

THE METROPOLIS OF THE FUTURE
HONG KONG SKYBRIDGE SYSTEM IN CENTRAL
CONSTANT NEW BABYLON

40 41
NEW BABYLON by CONSTANT

RELATIONSHIP WITH THE NATURAL GROUND
OPPONENT: REPLACE THE NATURAL GROUND
STRATEGIES: MINIMAL CONNECTION TO THE GROUND PROBLEMS
WORSEN THE NATURAL GROUND BY CONDITION CASTING SHADOW etc

THE FUTURE OF ASIAN CITY by SPUR

RELATIONSHIP WITH THE NATURAL GROUND
DIRECT STACKING UP THE NATURAL GROUND
STRATEGIES: EACH LEVEL HAS A SPECIFIC PROGRAM AND TARGETED AUDIENCE
PROBLEMS: MOST OF THE FLOORS ARE TOTALLY UNDERGROUND
HK CENTRAL SKYBRIDGE SYSTEM

RELATIONSHIP WITH THE NATURAL GROUND
SUBSIDARY TO THE NATURAL GROUND

STRATEGIES
LINEAR AND LITTLE CONNECTION TO THE NATURAL GROUND MAINLY FOR CIRCULATION PROBLEMS
PRAGMATIC SOLUTION FOR DIVERSE HUMAN FLOW

PLUG-IN CITY
THE METROPOLIS OF THE FUTURE
FUTURE CITY
THE FUTURE OF ASIAN CITY
CONTINUOUS MONUMENT

DESIGNED BY: SUPERSTUDIO
DATE: 1969
AN ARCHITECTURAL MODEL FOR TOTAL URBANIZATION
LEARNING FROM GROUND STRATIFICATION
WHAT ARE THE GROUNDS THAT NEED TO BE VOLUMETRIC?

CRITERION FOR SITE SELECTION

HIGH DENSITY

27,394 /km²
MANHATTAN

17,140 /km²
TOKYO

130,000 /km²
HK-MONGKOK

256 m²
TORONTO

3972 /km²

370 m²
SHANGHAI

4924 /km²
BOSTON

MULTI-GROUND SITUATION

UNDERGROUND SHOPPING ARCADE

PEDESTRIANIZATION

SKYBRIDGE SYSTEM
ANALYSIS
- CONSTANT "BOWL-SHAPE" SECTION ALONG THE COASTAL DEVELOPMENT
SOLAR ANALYSIS
BUILDING AREA

ZONE A
TOTAL = 72800 m²
OFFICES: 800 m² X 40 floors = 32000 m²
PUBLIC GROUND: 4050 m² X 5 floors = 21250 m²
OFFICES: 2050 m² X 18 floors = 36900 m²
COMMERCIAL: 2050 m² X 4 floors = 8200 m²

ZONE B
TOTAL = 73851 m²
PUBLIC GROUND: 6155 m² X 3 floors = 18465 m²
RESIDENTIAL: 3077 m² X 14 floors = 43081 m²
COMMERCIAL: 3077 m² X 4 floors = 12308 m²

ZONE C
TOTAL = 154800 m²
PUBLIC GROUND: 15480 m² X 3 floors = 46440 m²
RESIDENTIAL: 7740 m² X 5 floors = 77400 m²
COMMERCIAL: 7740 m² X 4 floors = 30960 m²

ZONE D
TOTAL = 70640 m²
PUBLIC GROUND: 8800 m² X 3 floors = 26400 m²
RESIDENTIAL: 4410 m² X 6 floors = 26460 m²
COMMERCIAL: 4410 m² X 5 floors = 22050 m²

TOTAL FLOOR AREA = 372091 m²
PLOT RATIO = 372091 m² / 42300 m² = 1 : 8.8
POPULATION = 31468

BUILT AREA & POPULATION ESTIMATION
**CIRCULATION SCHEDULE**

Round Trip Time (RTT) by up peak model

\[ RTT = 2Ht + S + 1 + t + 2 \]

Where
- RTT = round trip time in seconds
- H = highest call reversal floor
- S = average no. of stops
- t = time to transit 2 adjacent floors at rated speed in seconds
- t = time consumed when making a stop in seconds
- t = passenger transfer time for entering or exiting the lift car in seconds
- P = 0.8 lift car capacity in person

Waiting time < 5 mins
Each car can accommodate 15 people

Types of elevator
- passenger
- observation
- goods
- fireman
- express

**AMOUNT OF ELEVATORS REQUIRED**

**ZONE A**
- OFFICES (private) = 8
- COMMERCIAL (semi-private) = 4
- GROUND (public) = 4

**ZONE B**
- RESIDENTIAL (private) = 4
- COMMERCIAL (semi-private) = 4
- GROUND (public) = 5

**ZONE C**
- RESIDENTIAL (private) = 5
- COMMERCIAL (semi-private) = 5
- GROUND (public) = 5

**ZONE D**
- RESIDENTIAL (private) = 3
- COMMERCIAL (semi-private) = 3
- GROUND (public) = 5
AMOUNT OF ESCALATORS REQUIRED

ZONE A
= 8 pairs

ZONE B
= 12 pairs

ZONE C
= 16 pairs

ZONE D
= 8 pairs

MINIMUM NO. OF STAIRWELL REQUIRED

ZONE A
= 5 stairwells

ZONE B
= 6 stairwells

ZONE C
= 8 stairwells

ZONE D
= 8 pairs
DESIGN
DESIGN EXPERIMENTS

The thesis proceeded through various design experiments testing various circulation strategies, relationships with natural ground, program organizations and private/semi-private/public zoning.

The thesis is an ongoing project investigating the design developments and potentials of the three dimensional urbanism instead of suggesting the best solution for the project.
SCHEME 1.0
This proposal intended to establish a continuous and diffused relationship to the natural ground. Since the project is situated on a sloped site, the RING is elevated on one side to provide pedestrian access while continued with the other to allow vehicle access. Creating no significant urban forms, the RING serves as the public and semi-public space at the same time groups the buildings into several clusters. The loop also defines a public courtyard for each cluster which enhance the formation of community while duplicates the total surface area and entrances for commercial activities.

This proposal suggested almost chaotic circulation strategy indifferent to the existing condition. The RINGS similar in size, form and hierarchy confuse the identity of the whole development and diminish the significance of its urbanistic role - as an demonstration of new urban form which is applicable along the coastal line.
Within the public zone, there are two main types of program which are civic programs and commercial programs. In Hong Kong, commercial spaces are considered to be on the main public spaces since those typical public spaces are not affordable in such a high-density situation. The proposal adopted this phenomenon at the same time capitalized the high potential flow of the commercial program to activate the civic program and furthermore the new ground.
SCHEME 2.0
This proposal attempted to create a clear and strong urban form through the new elevated ground. Since the space between the coastal line and the hill side is always neglected resulting in the common bowl shape sections, this elevated ground provides a new possible solution to active this under-developed space. Bisecting the city vertically unlike the typical zoning plan strategy, it offers a new perspective of the cityscape and links the city much closer to its natural resources (sea and mountain).

Learning from previous scheme, the mat is formed by connecting the rings. It helps to organize the site at the same time grouping the buildings into clusters. The lattices like structure forms easier circulation paths while allows the light to penetrate through the ground. This proposal suggests a very clear circulation strategy speaking to the sloped condition. The flat platform mainly for pedestrians’ circulation supported by the vertical circulation of the building cores. The vehicle circulates mainly on the existing ground which connects to the larger urban fabric. However the ring structure does not suggest a clear definition of the elevated site boundary, it similar to the RING scheme offers a typological design instead of urbanistic proposal.

SCHEME 2.0 - MAT
DESIGN
SCHEME 2.0 MAT

RELATIONSHIP WITH THE EXISTING GROUND

PRIVATE vs SEMI-PRIVATE vs PUBLIC ZONES

URBAN FORM

DESIGN
SCHEME 2.0 MAT > PROGRAMMATIC LAYERINGS

PUBLIC ZONE THE MAT

SEMI-PRIVATE ZONE BUILDINGS ABOVE THE MAT

PRIVATE ZONE TOWERS
DESIGN
SCHEME 2.0 MAT > PERSPECTIVES
This proposal featured the strategy to reinvent the new platform and at the same time design a better micro-climate on the natural ground through allowing more natural sunlight to penetrate through. Meanwhile the figure of the new platform is modified to allow the supporting buildings to receive more light. The scheme is named as a TRAY since it has a new urban role. The tray holds all the public and civic programs unlike the typical urban planning which public programs are placed on the root of the high-rises. The tray redefines the position to locate these programs and reinvent the public/private zoning condition of a high-rise. Since the development is situated on a sloped site, it offers an opportunity to create non-hierarchical ground condition. It allows both grounds to have the primary access meaning direct access for both pedestrians and vehicles. It also propose a new building typology which a building can be subdivided into parts through introduction of grounds in different levels.

The structural strategy of this scheme is similar to the previous MAT scheme. The platform is primarily supported by the cores of the surrounding buildings. It creates two conditions, one is a beam condition similar to most of the sky-bridge designs and the other is the cantilever condition. This scheme provides a much stronger urbanistic position and can be understood more easily as one development.
DESIGN
SCHEME 3.0 TRAY > PROGRAMMATIC CLUSTERS

1. PUBLIC PROGRAM ON THE TRAY
2. THE THREE NEW PUBLIC HALLS
3. BUILDINGS THAT SUPPORT AND CIRCULATE FOR NEW CLUSTERS

DESIGN
SCHEME 3.0 TRAY > STRATEGIES

ANCHORING PUBLIC PROGRAMS
- SPORT COMPLEX
- LIBRARY
- THEATRE
- COMMERCIAL CENTRE
- MUSEUM + VIEWING SPOT

FIFTH FACADE

CIRCULATION STRATEGIES
SCHEME 4.0
SCHEME 4.0 - CAP

This proposal attempts to reinvent the new platform which emphasizes the directionality between the mountain and the harbor. A clear axis is introduced between buildings. The axis is thickened to accommodate the major circulation while perform as the main structural element. The thickness of the platform decreases gradually from the axis for both programmatic and structural reasons. The platform extended from the axis forms a bubble-like condition around the buildings. It maximizes the amount of light to reach the buildings and provides a clearer relationship between the buildings and the platform figure.

Similar to previous schemes, this scheme proposes a new typology which reversing the sectional relationship between private and public and the platform will house most of the public program and itself acts as a new public platform and plinth for architects to redefine the suitable ground condition for the public buildings. Compare to the naturally sloped ground, the platform provides a new flat surface which is a relatively scarce ground condition in Hong Kong.
DESIGN
SCHEME 4.0 CAP

RELATIONSHIP WITH THE EXISTING GROUND

PRIVATE vs SEMI-PRIVATE vs PUBLIC ZONES

URBAN FORM
DESIGN
SCHEME 4.0 CAP > PROGRAMMATIC CLUSTERS

public program
- retail, office, hotel, museum, convention hall

public space
- high-traffic circulation, program and activities

residential cores and parking
- mixed-use cores for various activities
- program and parking in the core locations
- design the residential and shared areas

DESIGN
SCHEME 4.0 CAP > PART'S PLAN
DESIGN
SCHEME 4.0 CAP > PERSPECTIVES
FINAL SCHEME
Scheme 5.0 was presented at Thesis Final Defense on December 15, 2012. In contrast with investigating the figure of the platform which is a top to bottom approach, this proposal tried to investigate the potential between scales. The major urbanistic ideas are similar to the previous schemes such as providing a reverse sectional relationship between private and public and forming a new public datum and cityscape for the public while bringing back the harbor and mountain to the heart of the city. However, this proposal is primarily driven by the structural constraints of the development and the micro-climates created for the natural ground.

The grid is modified and manipulated in response to the location of the cores, site boundary, dimensions of the structural elements and the placement of openings. Various structural requirements generates various structural systems from the strongest (deep waffle system) to the moderate (folding system) to the lightest (two-way grid system). These systems also create different conditions for circulation and spatial configuration. Different from previous schemes, this scheme proposes a new building typology which is a cone shape. This typology emphasizes the publicness of the new datum and generates a new zoning strategy for the building. This zoning provides a better profit margin since the higher level has larger floor area. It also offers better living conditions for the inhabitants. The new typology also frees the natural ground from the commercial and programmatic constraints.
STRUCTURAL GRID GENERATION

A) REGULAR GRID

B) ADAPTING TO CORE LOCATIONS

C) ADAPTING TO SITE BOUNDARY

D) ADDITION OF SECONDARY BEAMS
E) ADDITION OF BRACING STRUCTURE

G) CORE LOCATIONS

F) ADDITION OF OPENINGS

H) BRIDES AND CANTELEVERS
STRUCTURAL GRID

A) TWO-WAY SYSTEM

B) DIAGONAL BRACING SYSTEM
BIBLIOGRAPHY


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