PERPETUAL CITY

illustrator Rhino Grasshopper Photoshop After Effect

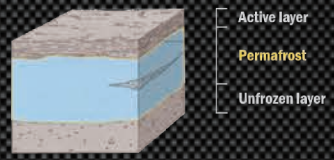
Global Event

Extreme climate

Permafrost melting

Artic circle

Permafrost range



The crisis of permafrost melting appears in the extremely cold regions of the earth.

Introduction

As a result of global warming, the sea level has risen and the glaciers has melted. This phenomenon may cause the collapse of Norilsk, Russia after several years, and the local residents will have no place to live.
Facing the disappearing homeland, how does a city reveal its appearance ?

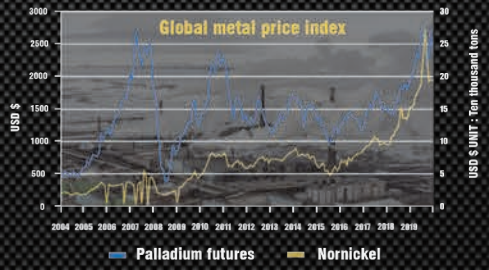
Location

Russia

Northernmost city

Norilsk

Industrail city



WGS84 69° 20′ 0″ N , 88° 13′ 0″ E

The nickel deposits of Norilsk are the largest nickel-palladium deposits in the world.

Design

The concept of my design is discussing different strategies of design by utilizing various years, and illustrating what the appearance of the city will be in the next 30 years. Among them, I use the year of 2035 as the boundary to discuss design methods of various characteristics.
In the forepart(2020-2035), I take the advantage of the industrial city's characteristic to construct 3 drawings. As for the last part(2035-2050), I add the parameterization into 3D software to derive the appearance of the city.

Design Strategy

Industrial City 2030

1. Underground factory

The underground factory releases more space on the ground and makes industrial pollution disappear .

2. Greenhouse

The greenhouse gives residents a place to rest, and gives the locals a green environment .

3. Pipeline

Factory pipelines running through the buildings preserve heat in the room, which is required by the greenhouse .

4. Suspension system

The truss supports structure of the houses , avoid accelerating the weight of the house thawing of frozen soil .

Floating City 2032

5. Structure

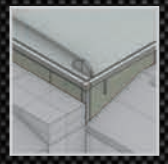
The structure is deeper into the ice layer, making the structure more stable .

6. Hydraulic device

The pole-built device under the remaining space controls the water flow and buoyancy, keeping the houses in balance .

7. Float chamber

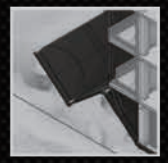
The buoyancy replaces the structural pillars and use buoyancy to prop the houses up .



8. Service core

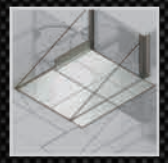
Movable leisure space (up and down) connects to the service core of the houses .

Mechanical City 2034



9. Floating road

Build a folding buoyancy device on the second floor, which can be flattened as the road .

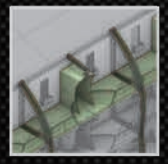


10. Platform

The service core builds an extensible platform to allow people to communicate between houses .

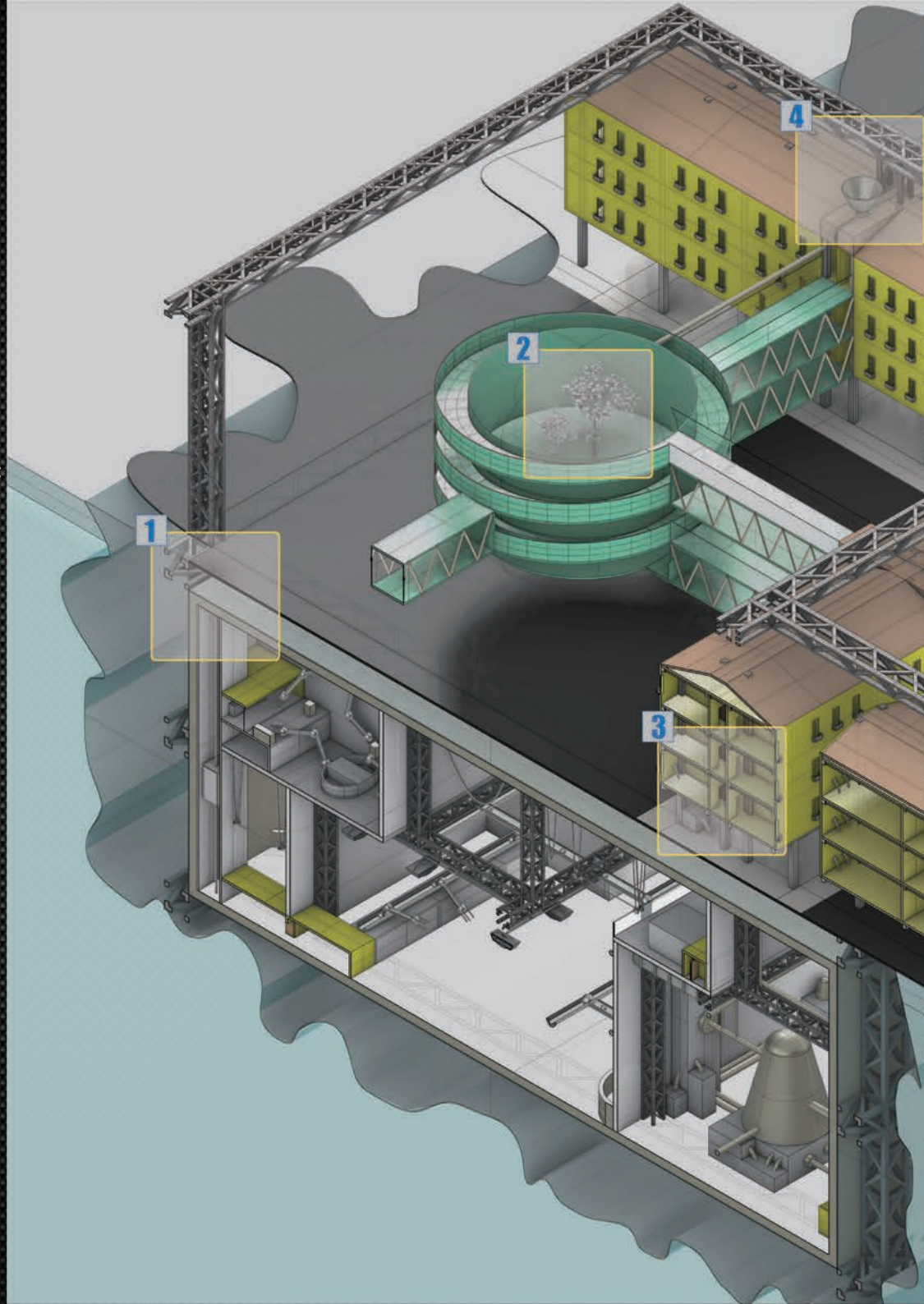
11. Vehicle

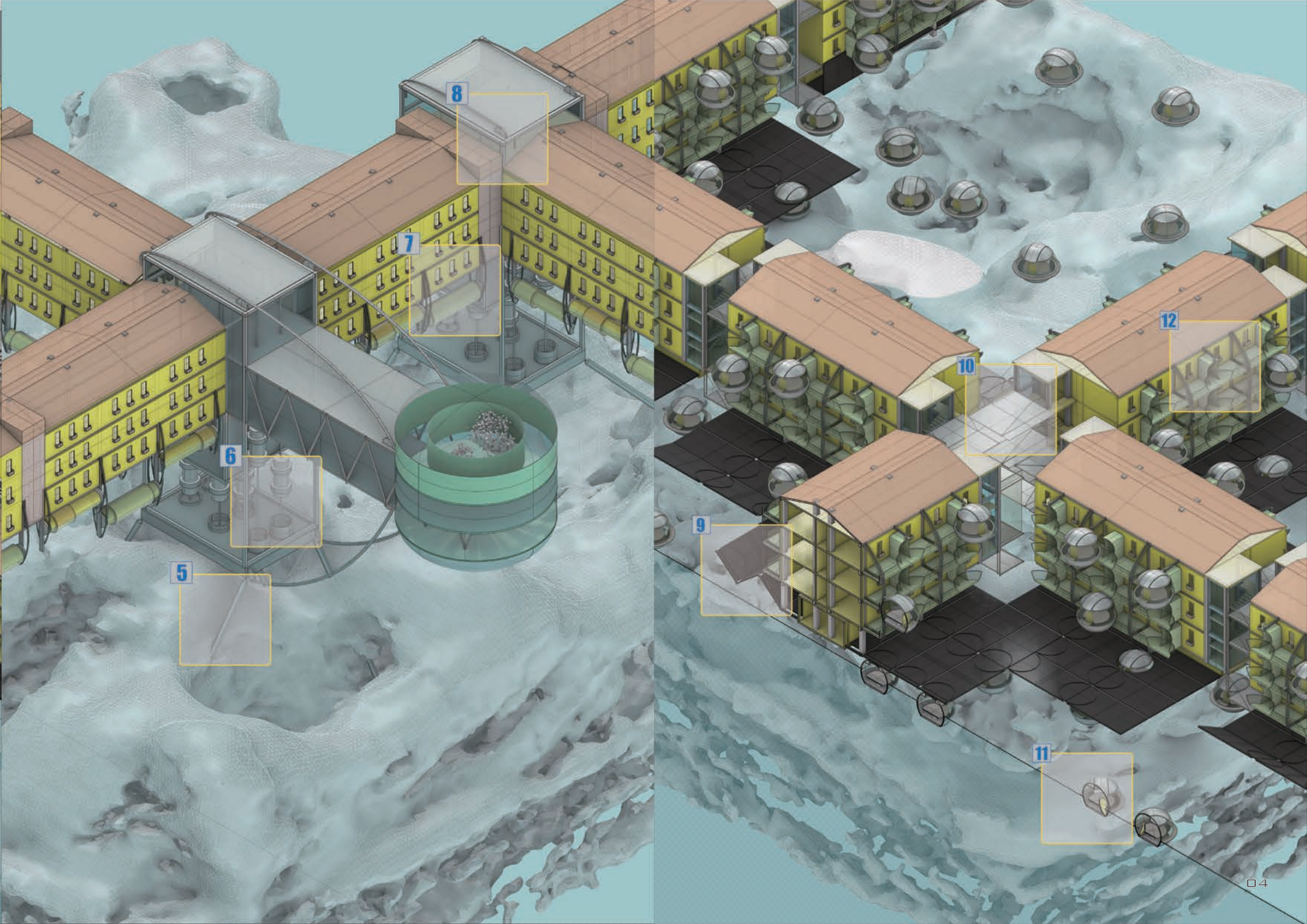
The personal vehicle can be used as a transportation when placed on the surface of the water .



12. Balcony

Build open-plan balconies and slide rails on the building facade .

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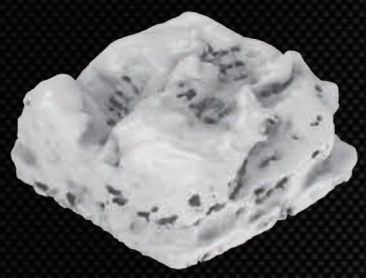
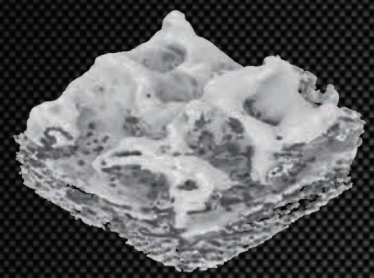
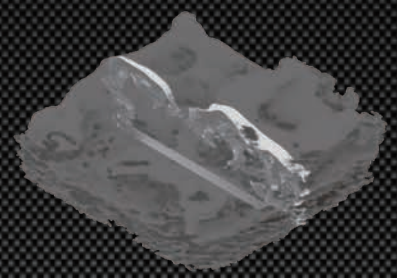
LOGIC DERIVATION

Paraffin Model

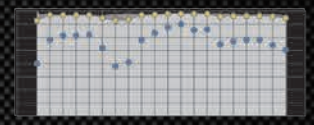




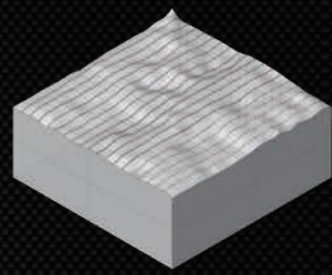
Model Slice

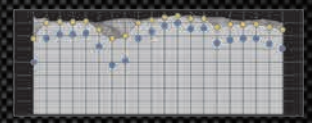


Parametric Topography

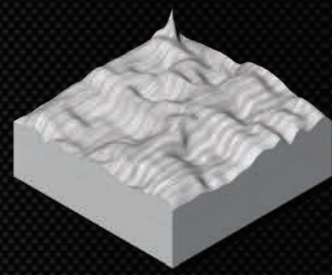


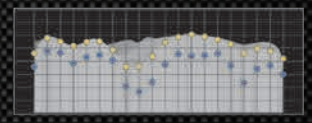
Slider ◇ 5



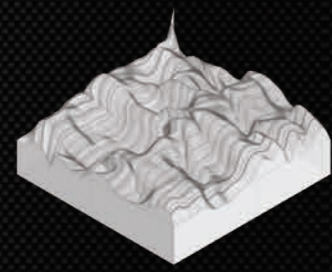


Slider 15 ◇





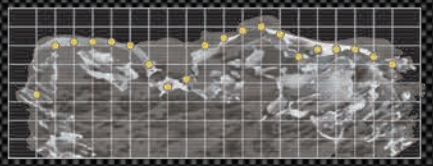
Slider 25 ◇



Slice punctuation

Y1 - Y20

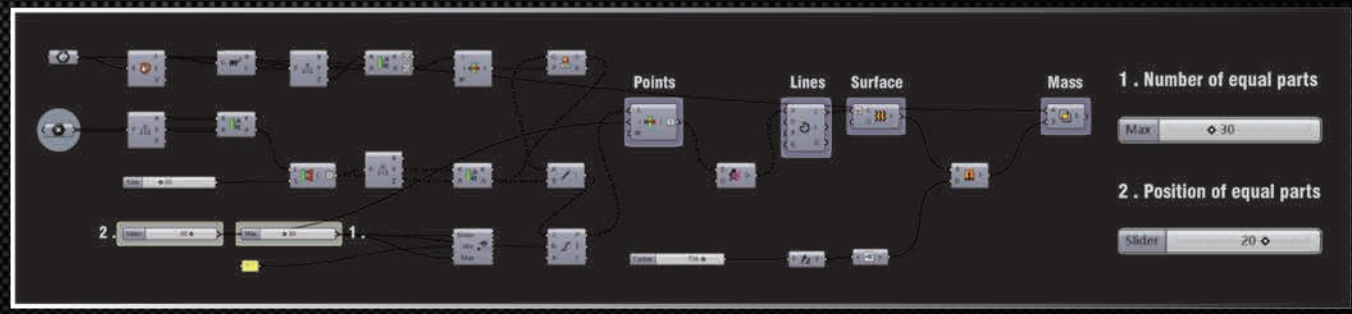
Slice section



Coodrinate

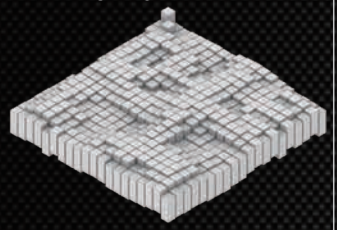
X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Y	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Z (-)	4.6	2.0	1.8	1.8	1.8	3.0	4.2	3.8	2.0	1.6	1.2	1.0	1.4	1.4	2.6	2.2	2.2	2.2	2.6	3.0

Grasshopper (topography)

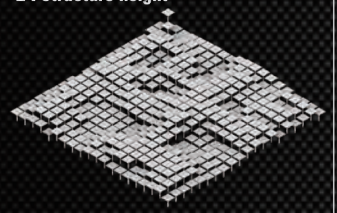


Condition

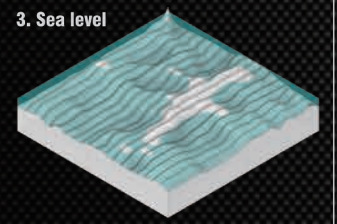
1 . Buildings height



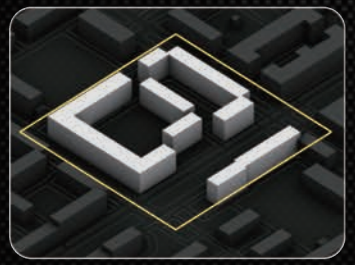
2 . Structure height



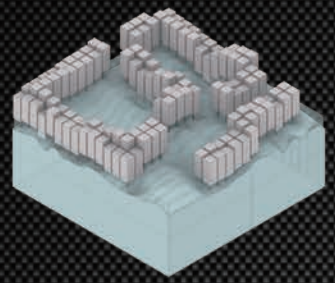
3. Sea level

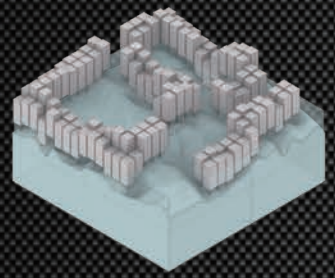


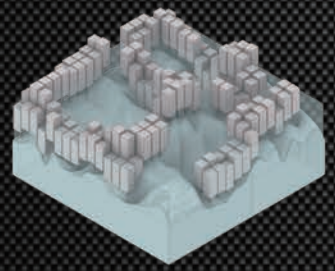
Street profile



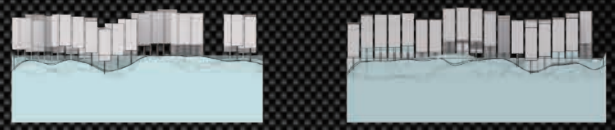
City Appearance





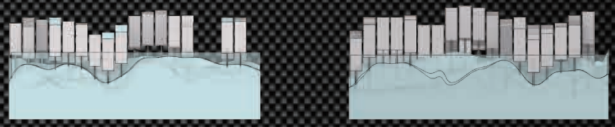


Terrain Filtering (years)



2035+5=2040

Slider 5



2035+15=2050

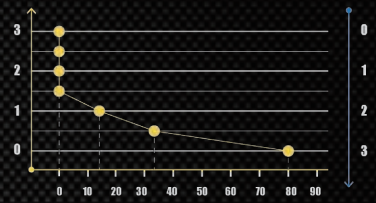
Slider 15

2035+25=2060

Slider 25

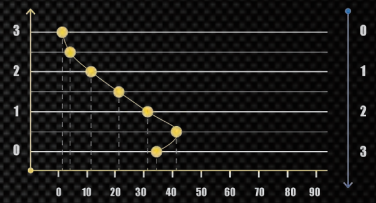
Buildings

Flooded floor 10 % — 80 % Save floor



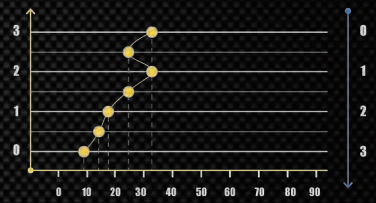
Buildings (totals : 140)

Flooded floor 41 % — 59 % Save floor



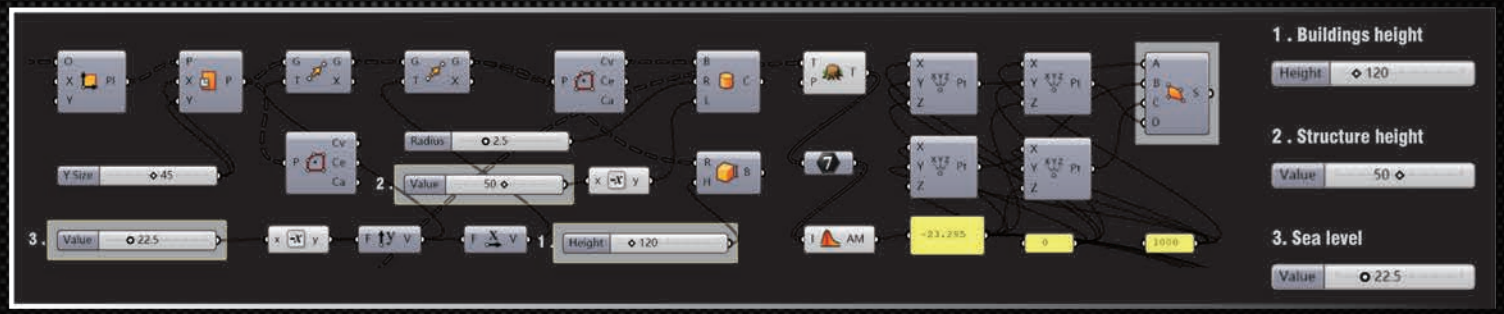
Buildings (totals : 150)

Flooded floor 78% — 22 % Save floor



Buildings (totals : 160)

Grasshopper (topography)



CLUSTER UNITS

Introduction

The suspension structure not only represents that constructions can be changed according to the landform, but also defines that people seems to discover the method of coexisting with the environment in this extreme climate and harsh landform.

PERPETUAL CITY

1. Suspension system

The suspended structure keeps the buildings from being affected by the ground and sea level .

2. Movable cortex

The wall can be free and movable, and the window is changed due to the difference of the height.

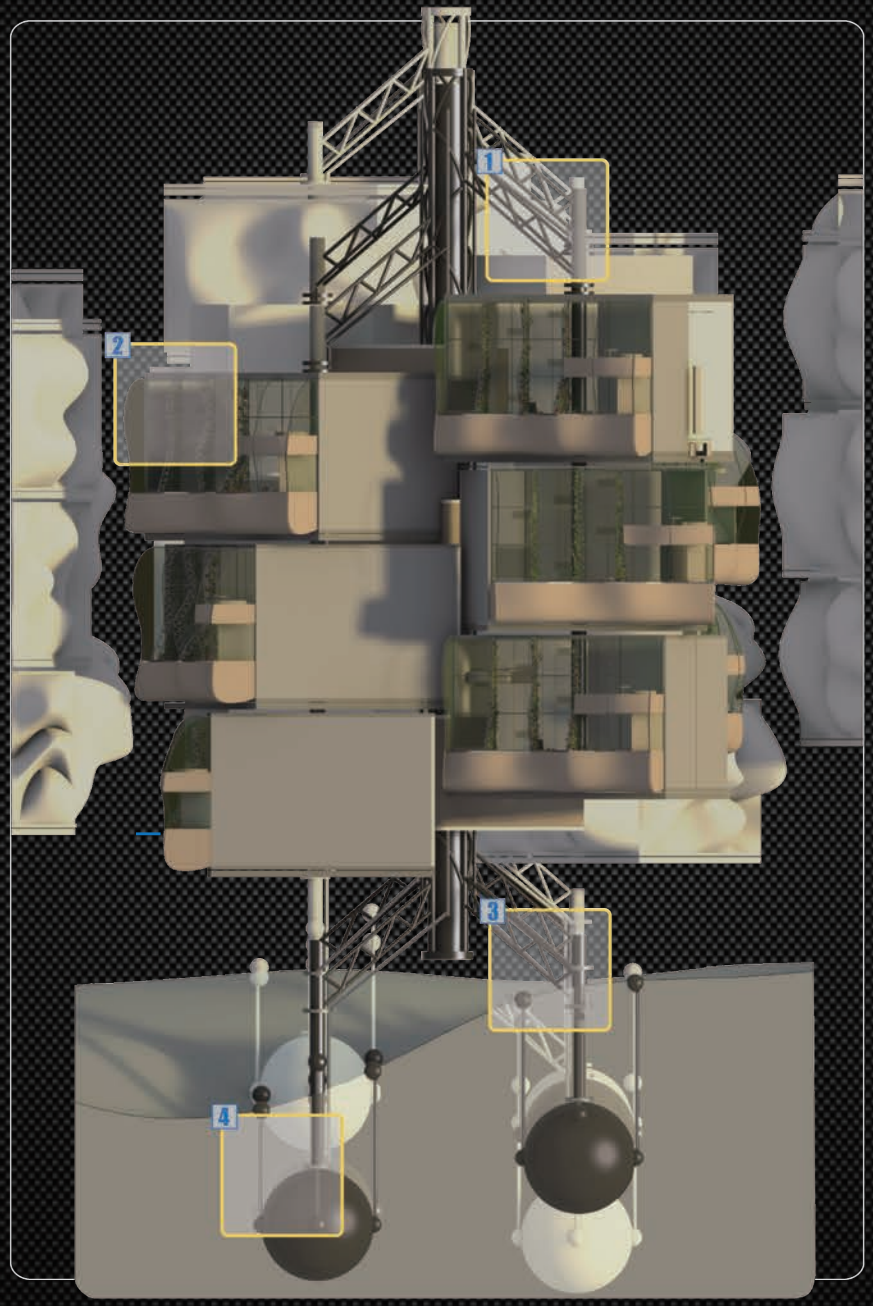
3. Movable structure

Buildings can reflect the changes in the topography affected by the melting of ice .

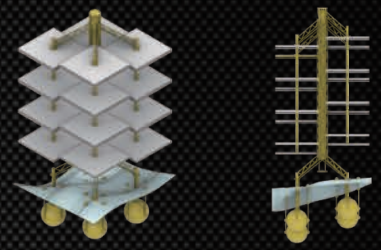
4. Buoyancy system

The buoyancy device mainly uses four balls under the permafrost to balance the buildings

Unit Appearance 2040



Structure

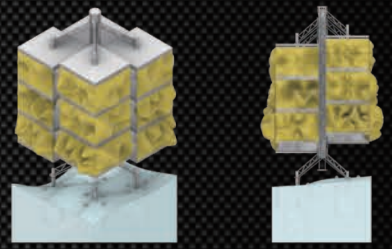


1. Cluster height

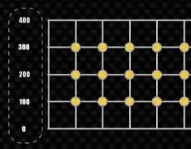
Buoyancy ball

Permafrost sensor

Cortex



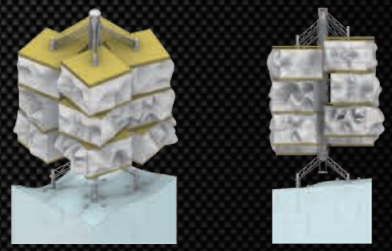
1. Density of points



Control points

Buildings height

Units rotation

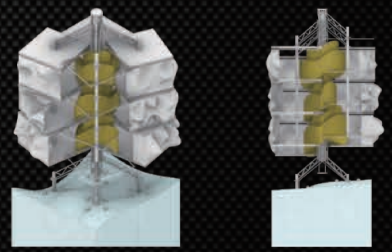


1. Winds direction

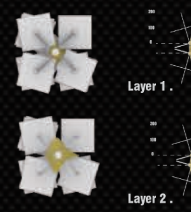
A + B = degree

Range : -20 ~ 20

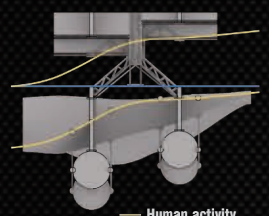
Public space



1. Vertical relationshi

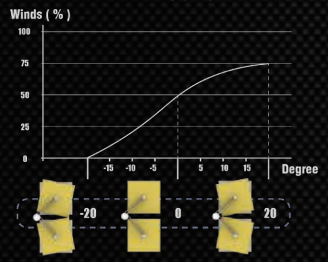


2. Leisure space

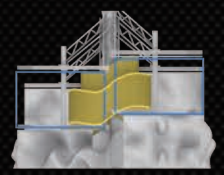


2. Cortex controller

2. Air volume

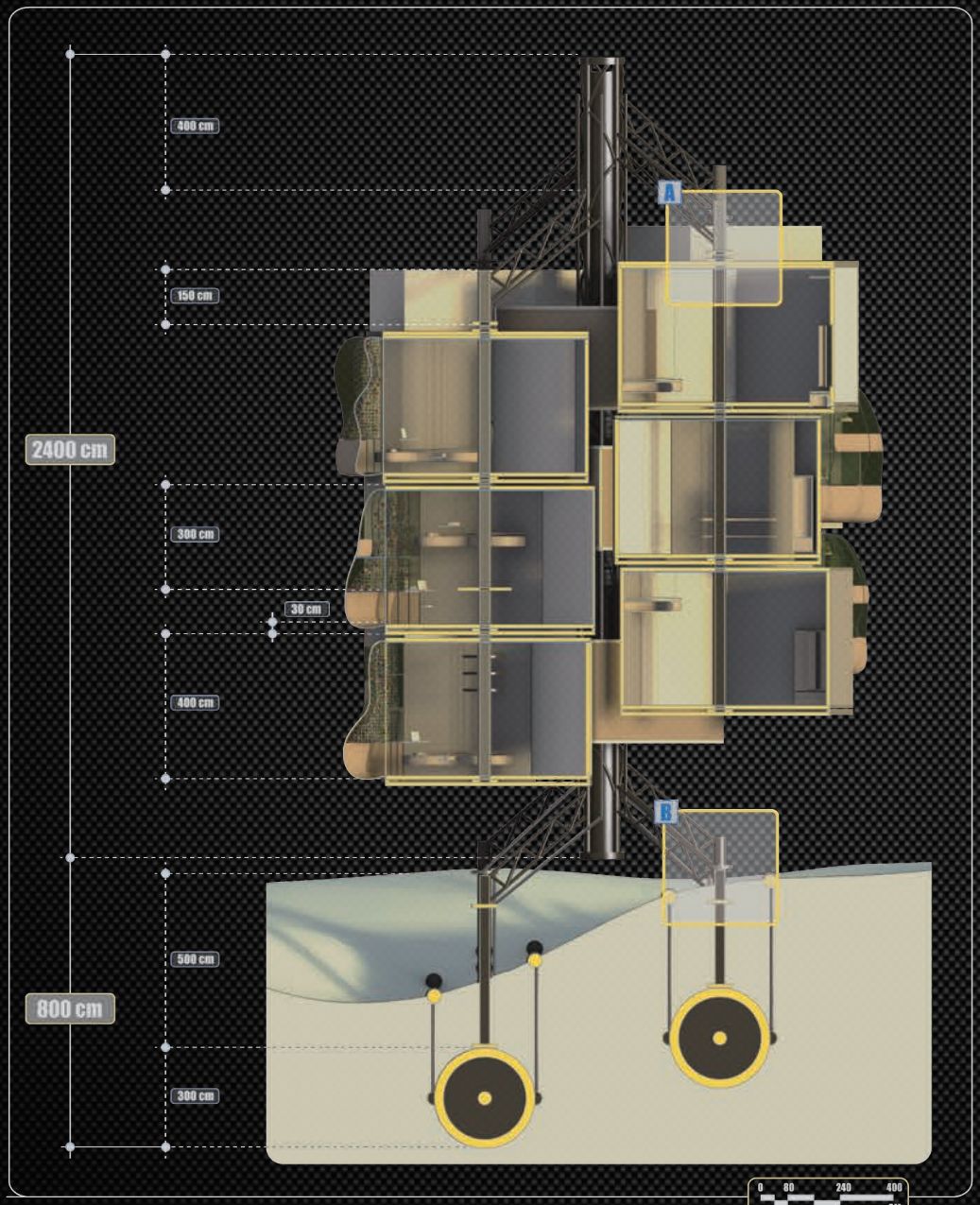


2. Public space

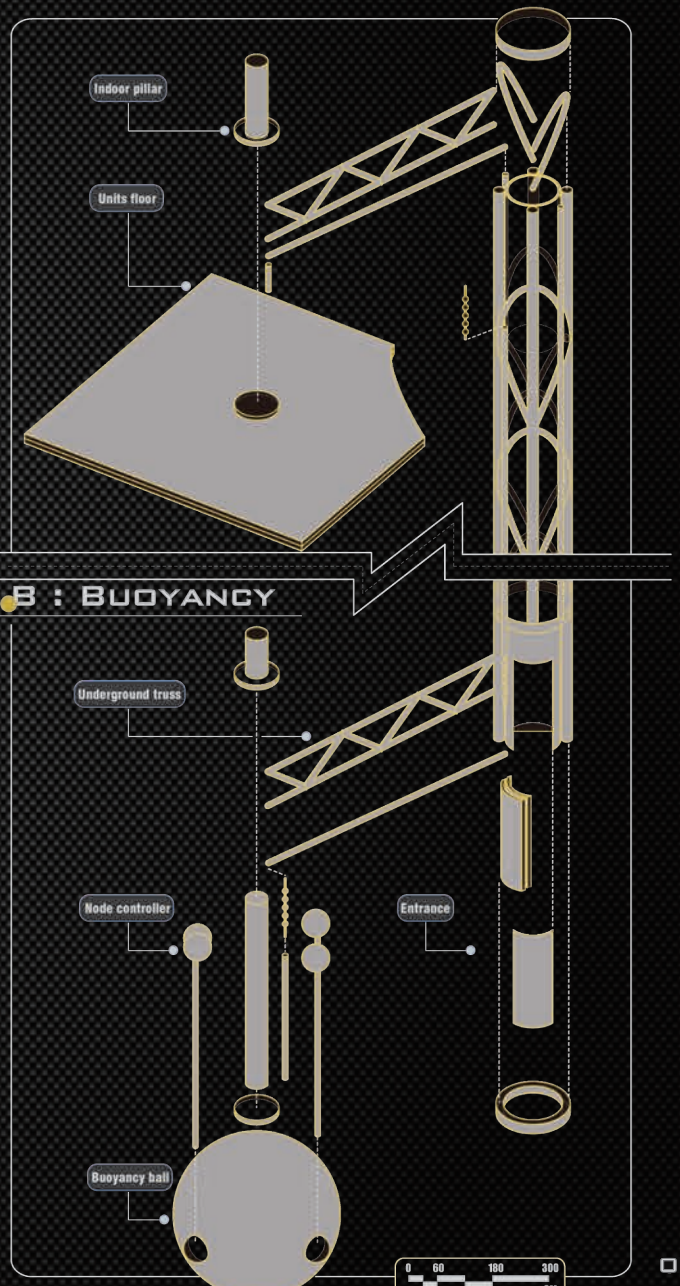


- Vertical channel
- Private space

Structure System 1 : 40



A : Suspension System 1 : 30

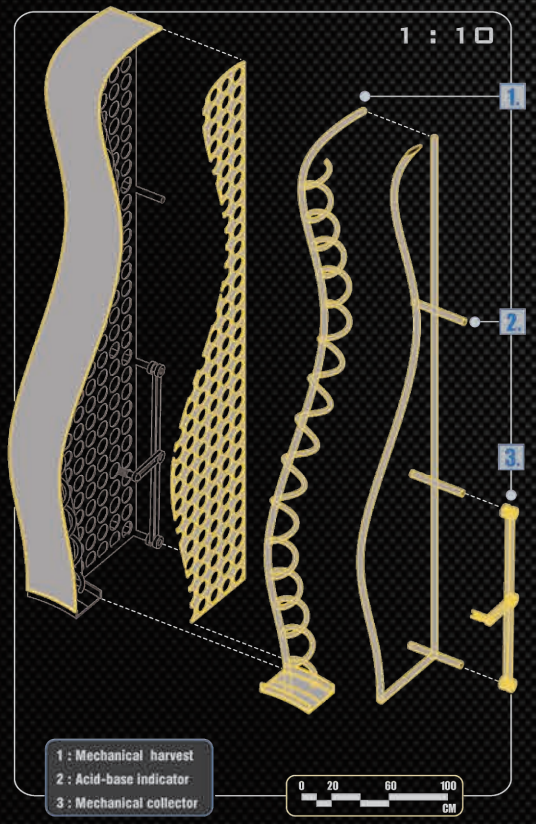


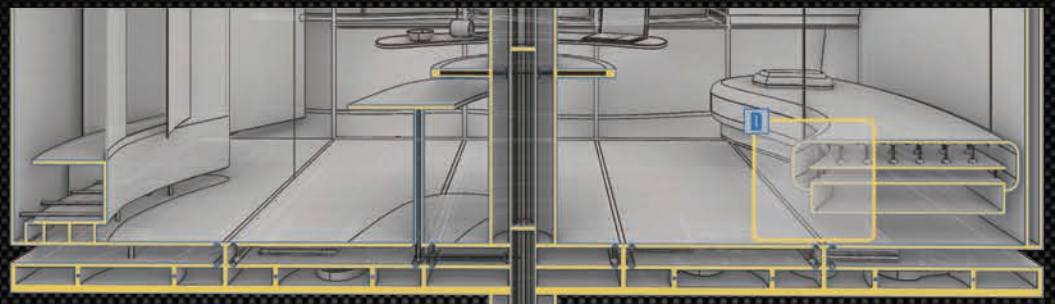
B : Buoyancy

Interior Design

C : Greenhouse Facade

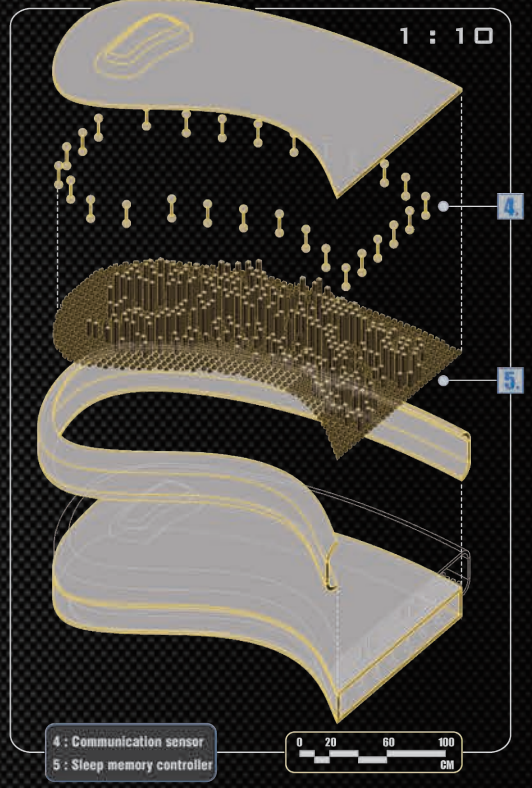
The floors and the walls are not particularly thin in the interior of the construction. Hidden with different machineries and rod devices, all of objects, including the construction to the furnitures, are controlled and recorded by the machineries. As a result of that the units of the house will follow the sunshine to convert the direction, the indoor greenhouse cortex system has developed maturely.





City Appearance

D : Intelligence Bed



As a result of that all the furniture is composed of movable and active mechanical elements, this design can form users' own habits inside the building.

The exploded drawing above has displayed the details of the suspension system. As we can see, the whole system is extensible, processing automatically according to human bodies.

Video Presentation

2030