# skintegration

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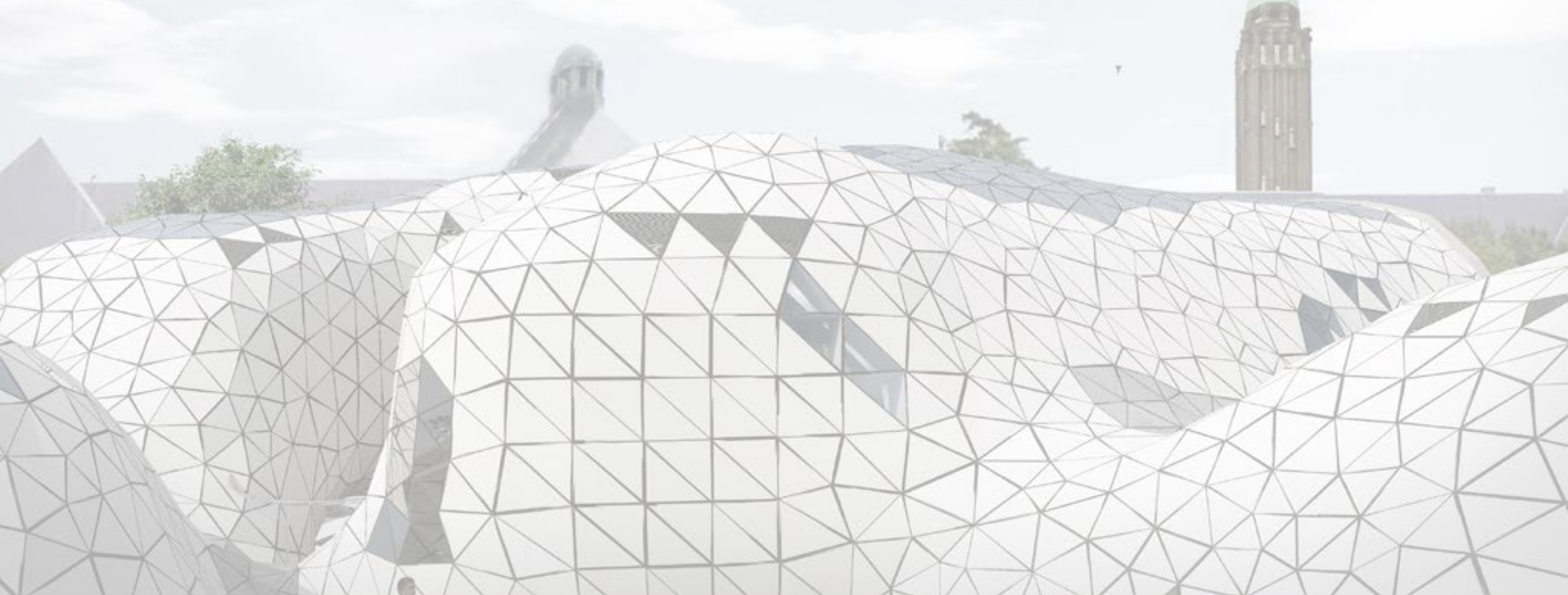
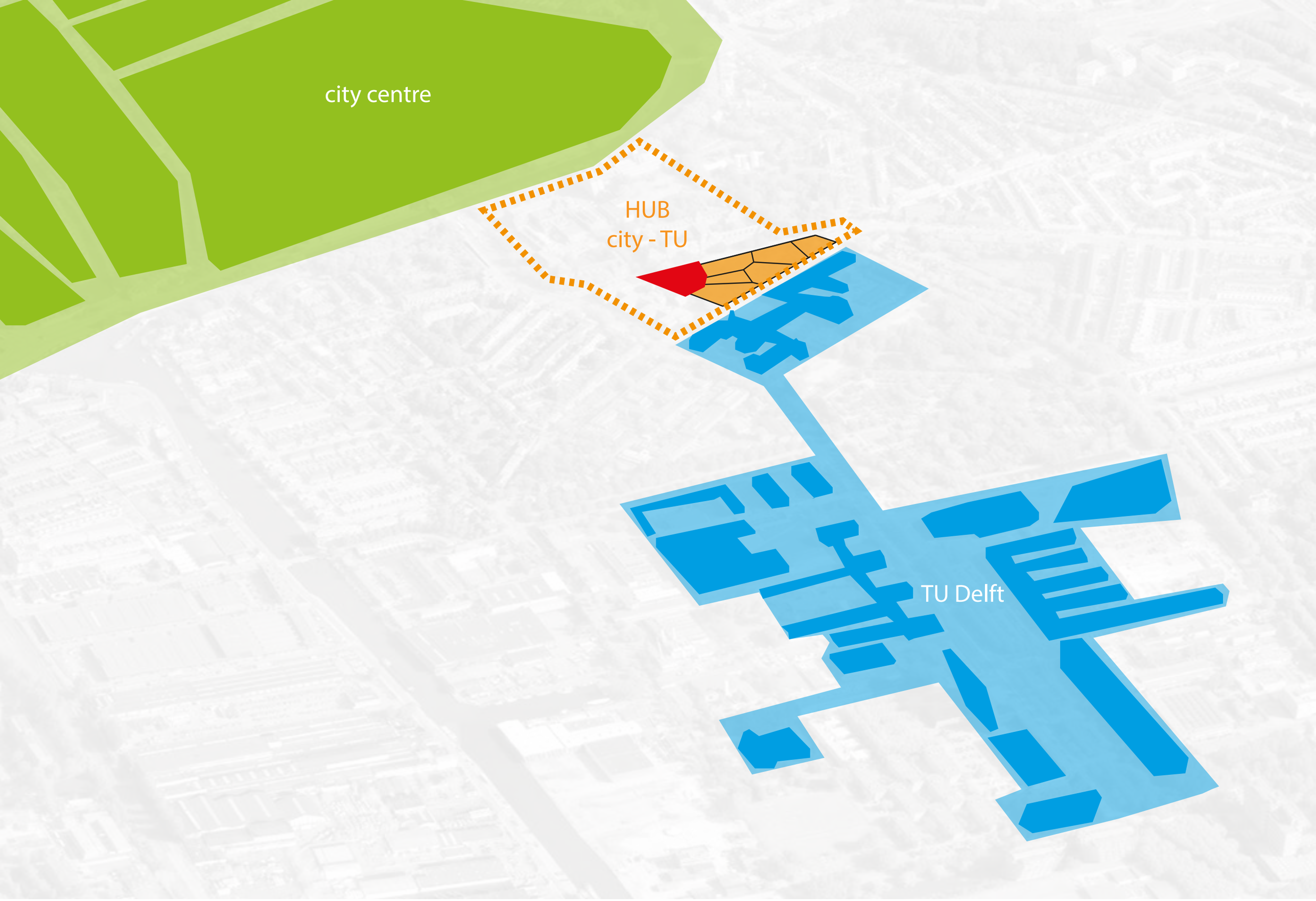
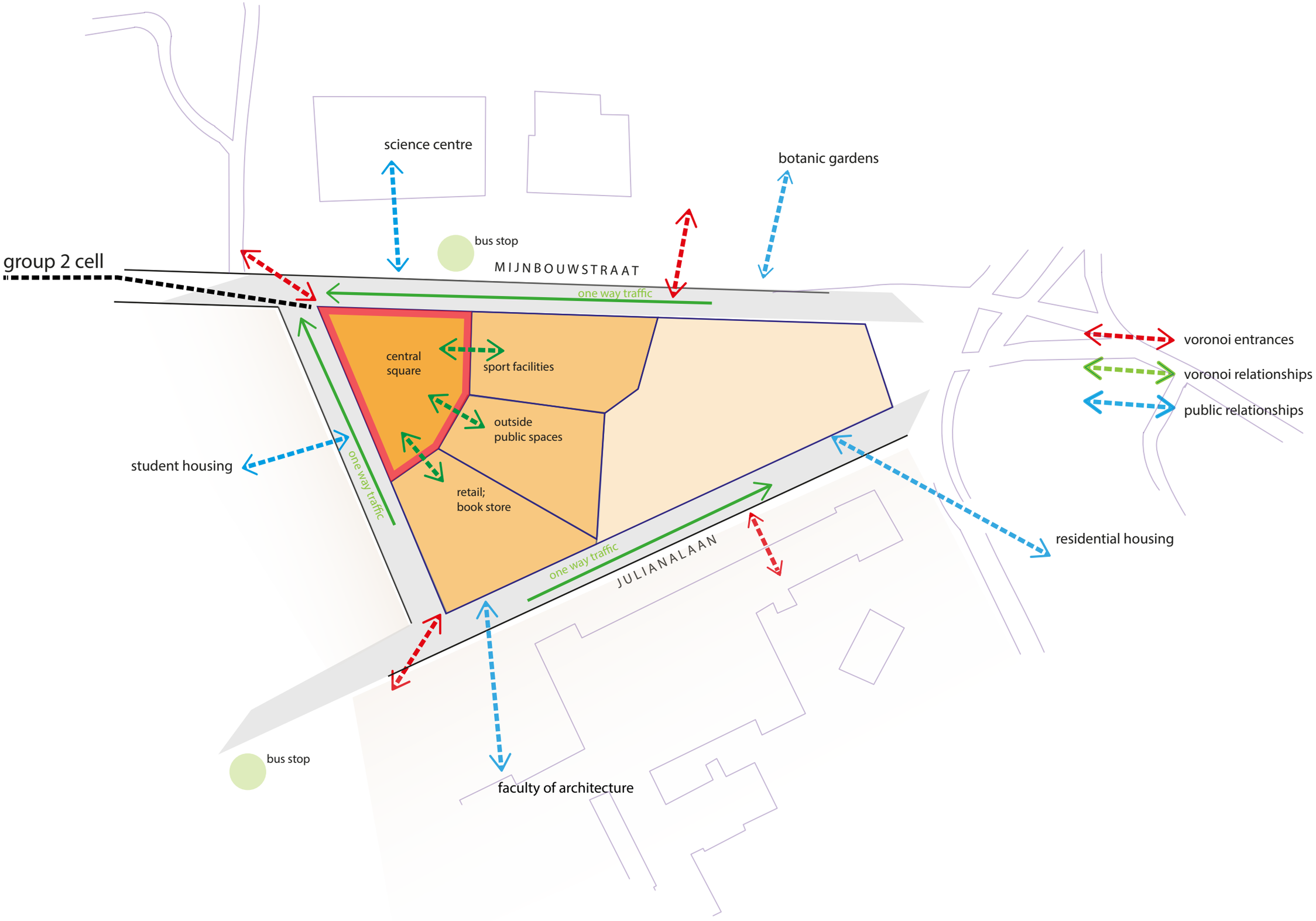
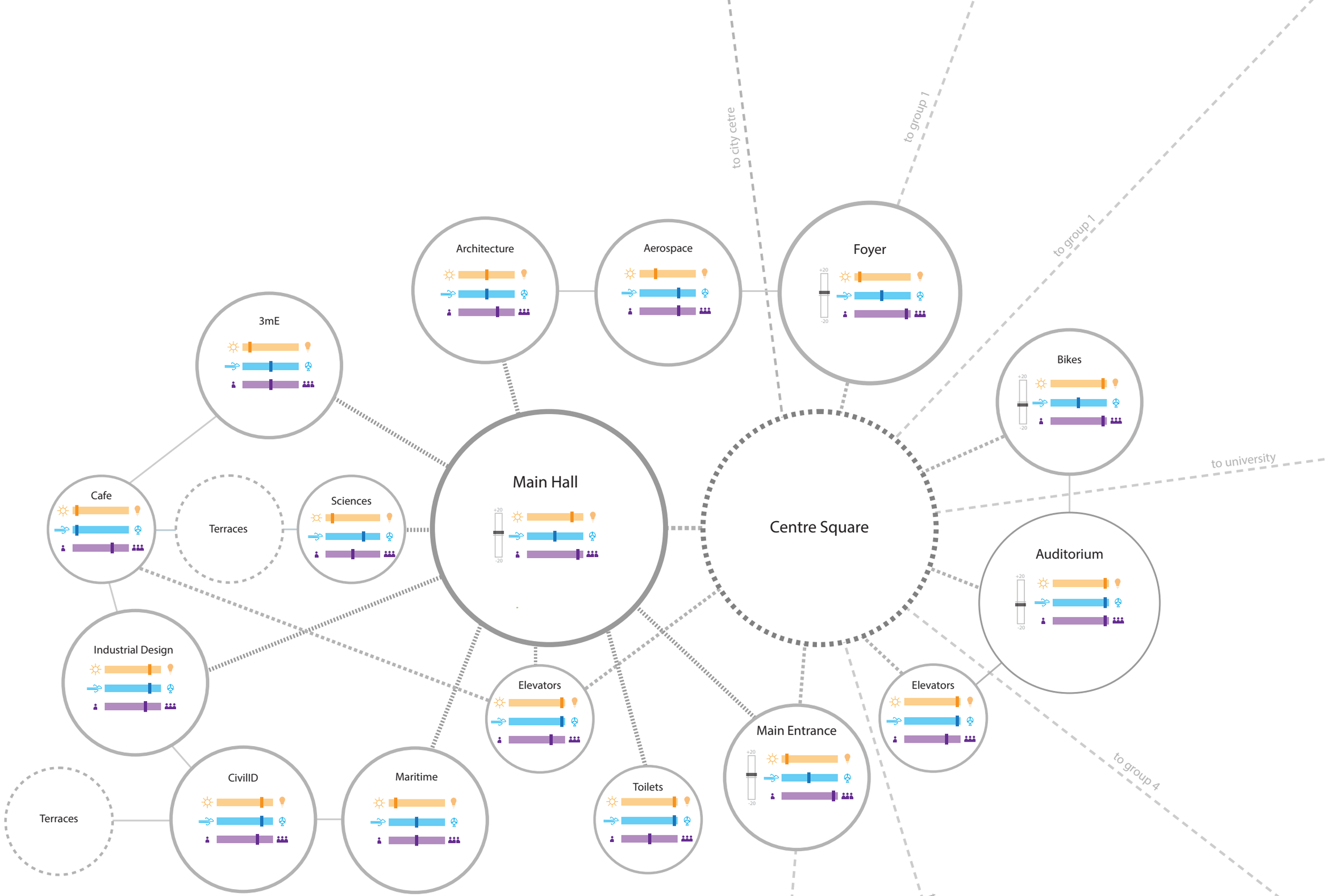
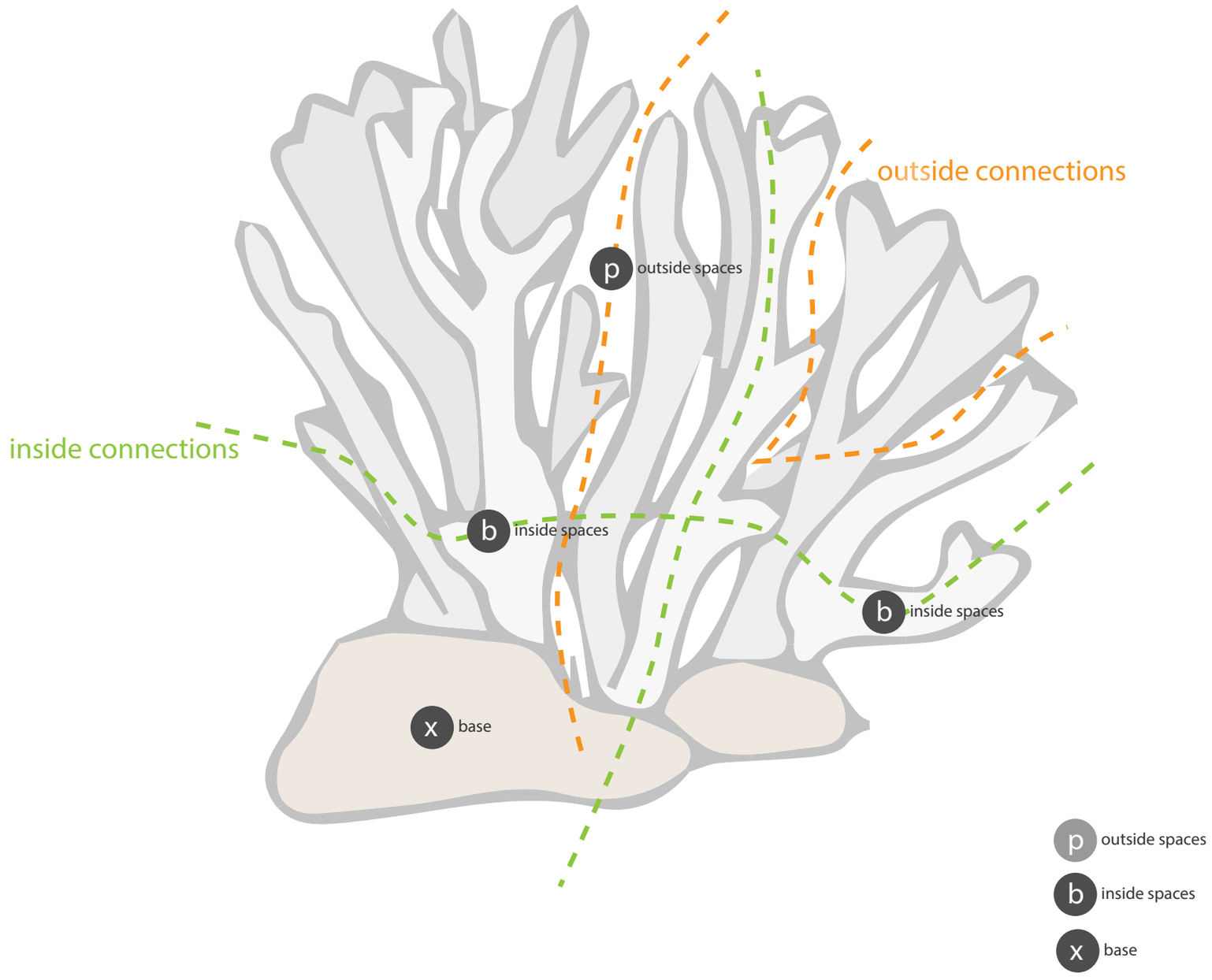
TU Delft Hyperbody Msc1 - Final Review - Group 2
January 2014




city centre
HUB
city - TU
TU Delft


science centre
botanic gardens
bus stop
group 2 cell
MIJNBOUWSTRAAT
one way traffic
central square
sport facilities
outside public spaces
retail; book store
student housing
one way traffic
one way traffic
JULIANALAAN
residential housing
voronoi entrances
voronoi relationships
public relationships
bus stop
faculty of architecture


to city cetre
to group 1
to group 1
to university
to group 4
to city cetre
to group 3
Architecture
Aerospace
Foyer
3mE
Bikes
Cafe
Terraces
Sciences
Main Hall
Centre Square
Auditorium
Industrial Design
Elevators
Elevators
Main Entrance
Terraces
CivilID
Maritime
Toilets


outside connections
p outside spaces
inside connections
b inside spaces
b inside spaces
x base
p outside spaces
b inside spaces
x base

## Build up space
inside

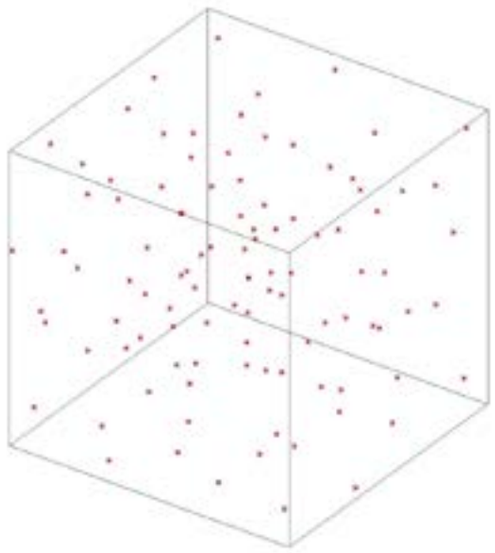
b inside spaces

Aditorium
Foyer
Main-Epo
Bicycle parking
Exhibitions
Elevator shaft
Toilets

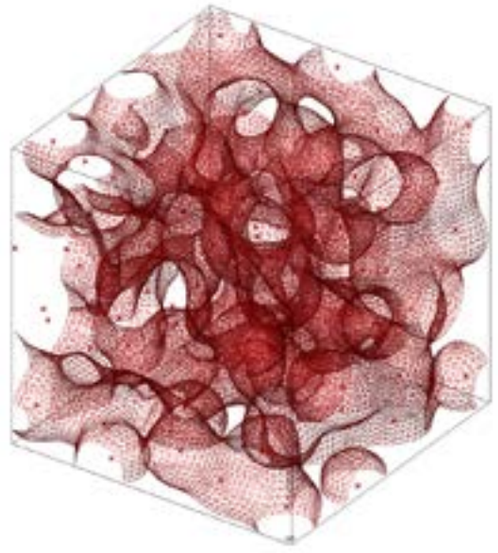
## Open space
outside

p outside spaces

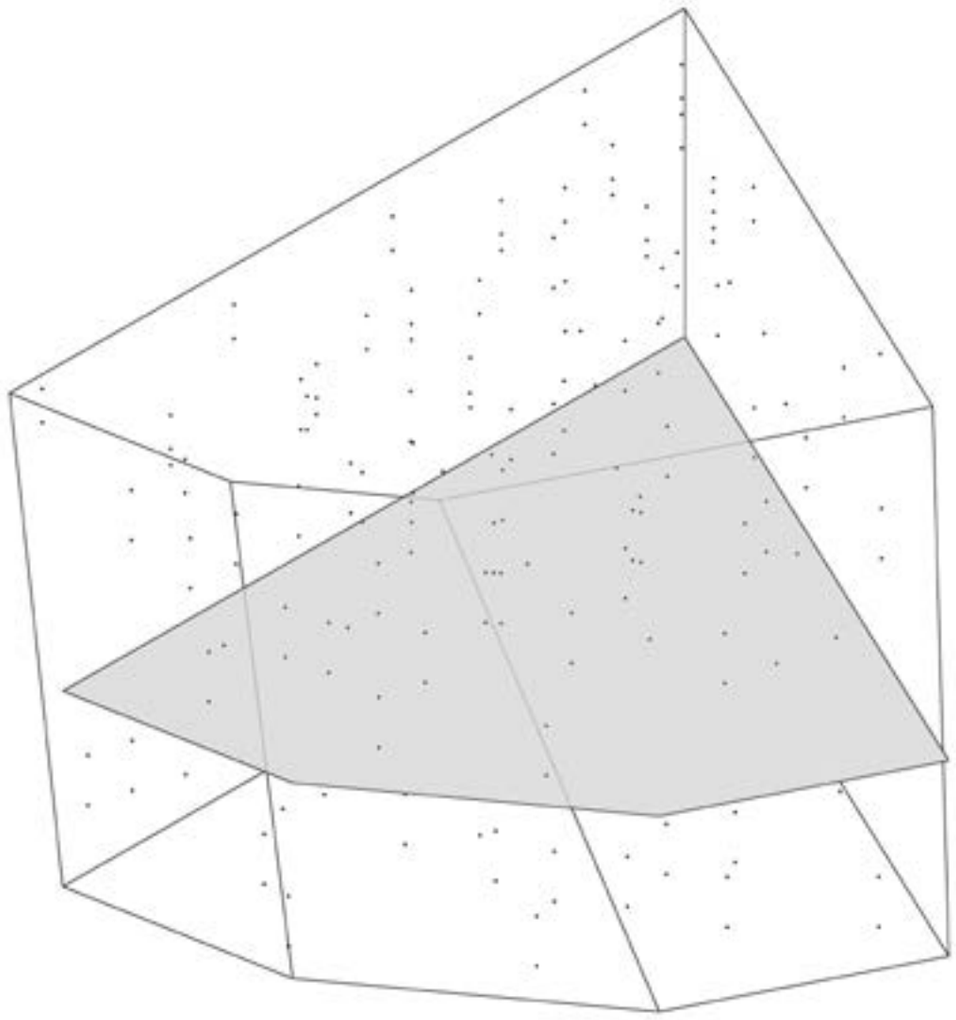
Cafe terraces
Entrances to Voronoi
Gardens
Congregation Space



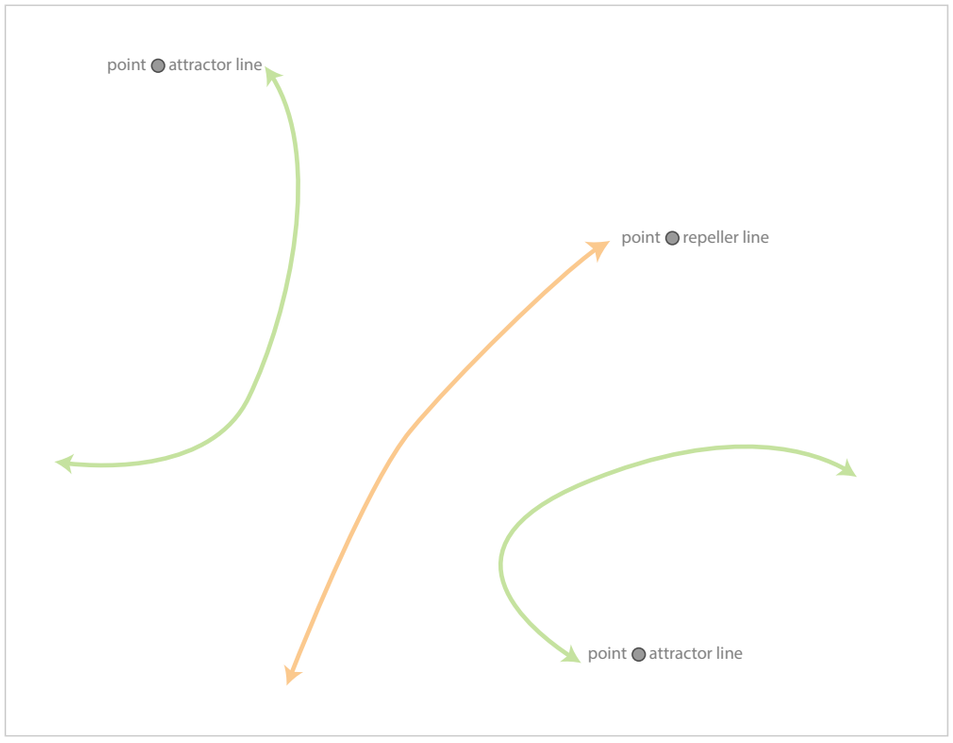
randomly populated points



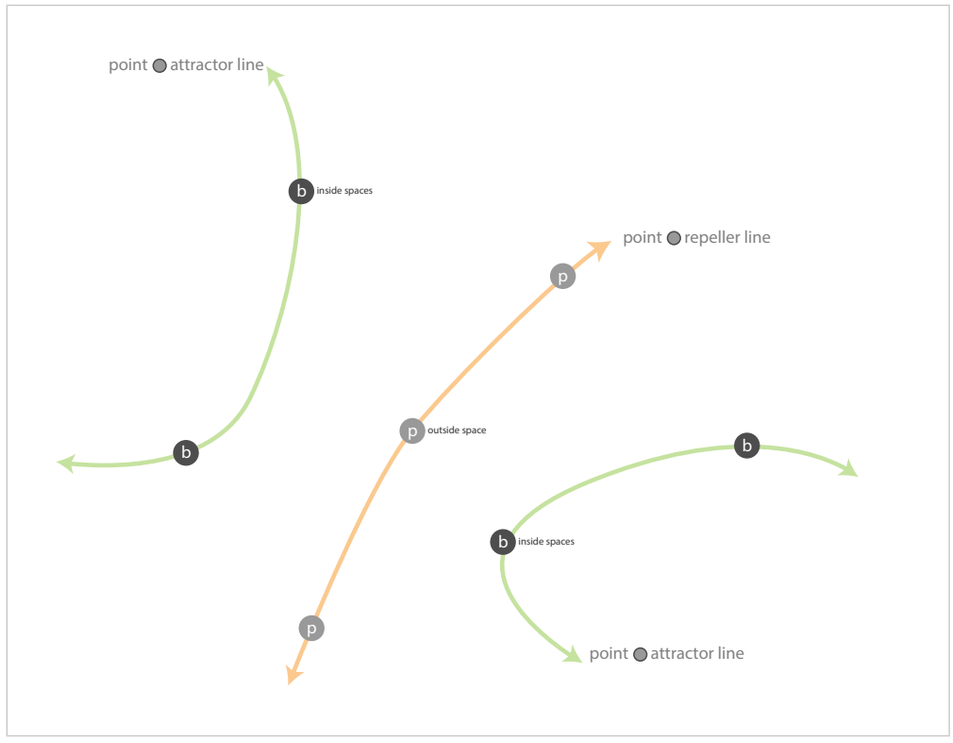
density based iso surface



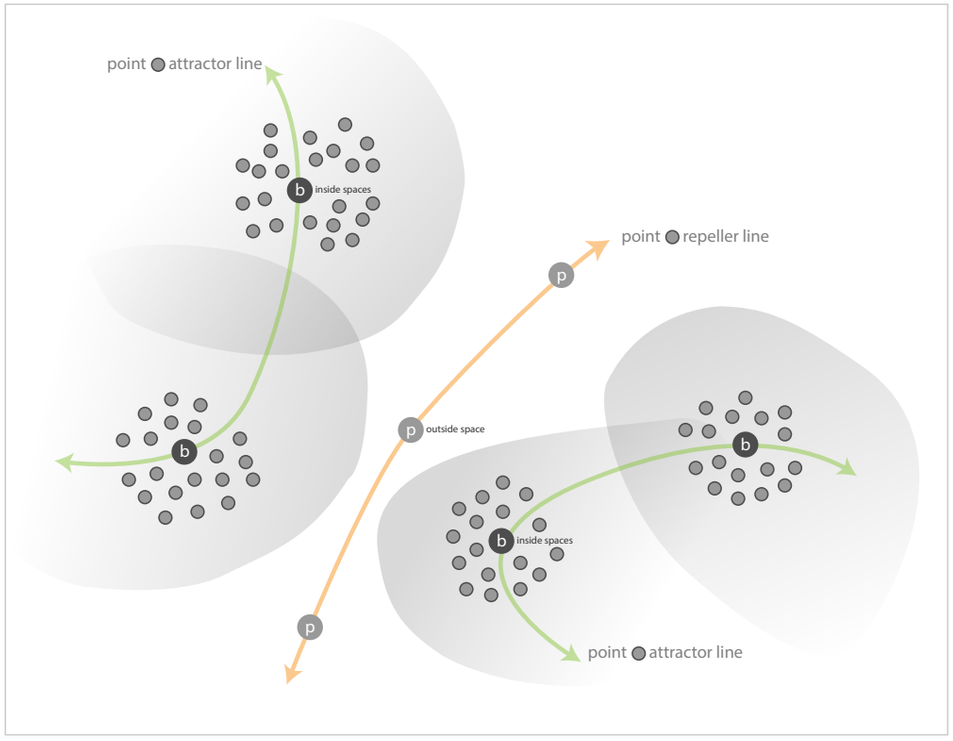
point cloud



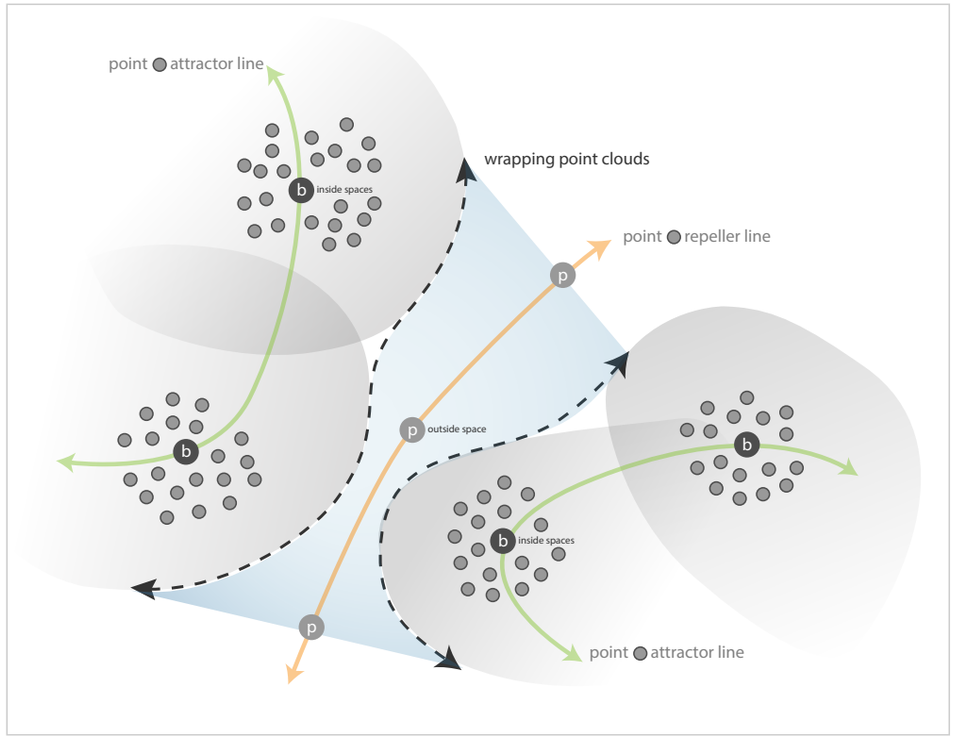

**repeller** and **attractor** lines, represent **outside** and **build up** space




**volume centre points** are added as **extra attractors**

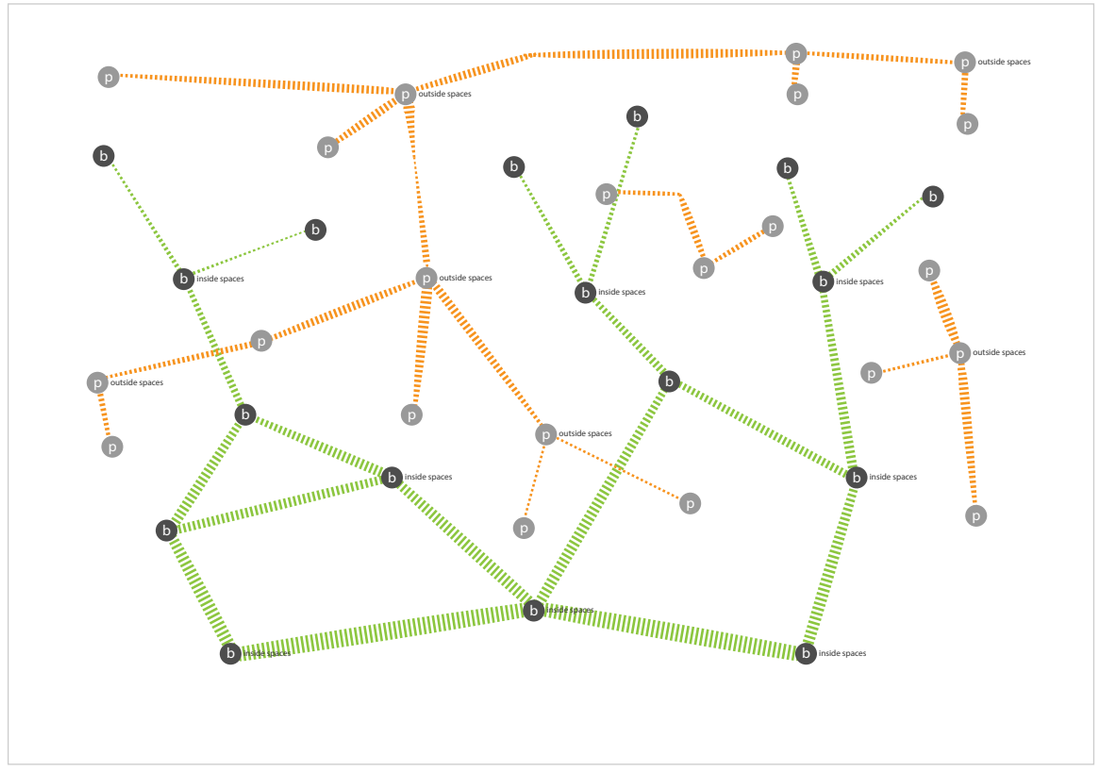



**points will cluster** around volume centre points and form **point clouds**

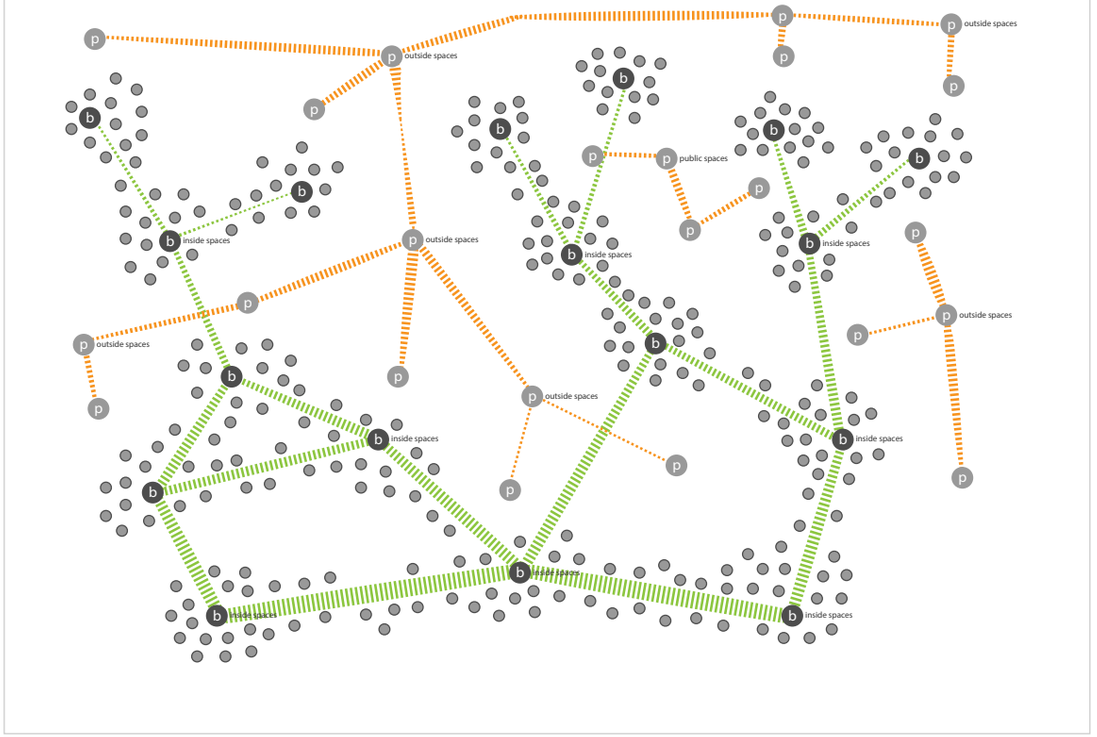



point clouds are **wrapped** to form volumes, volumes are **refined architectually**

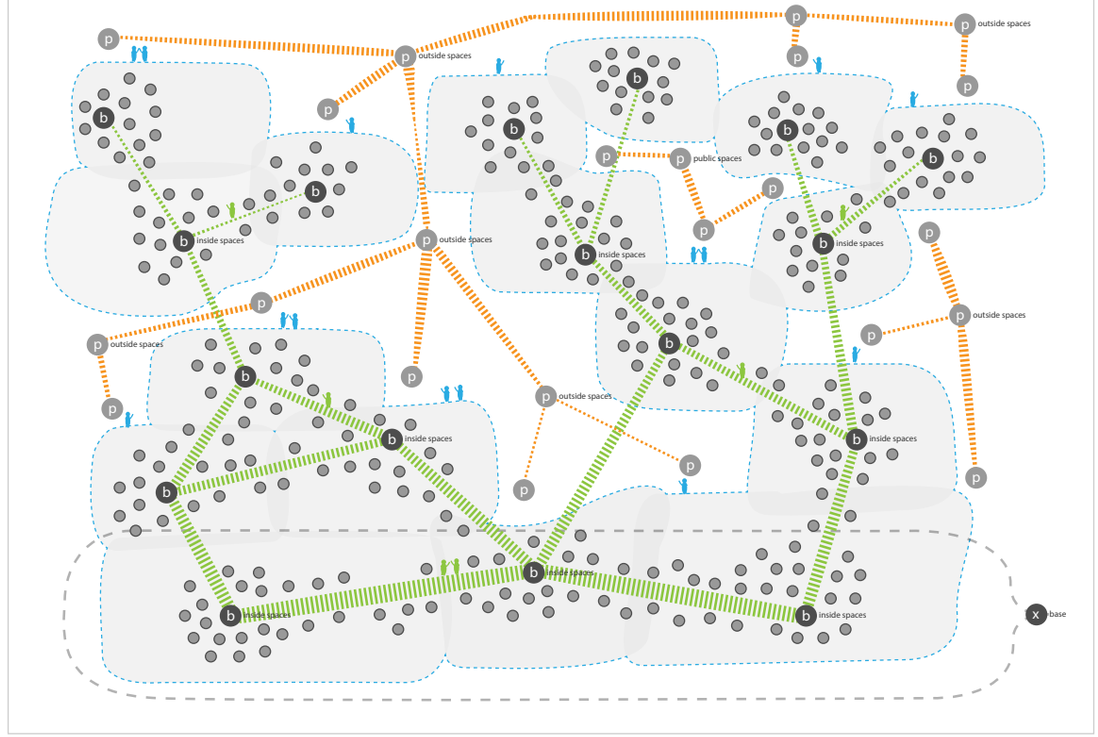
**repeller** and **attractor** lines, represent **outside** and **build up** space



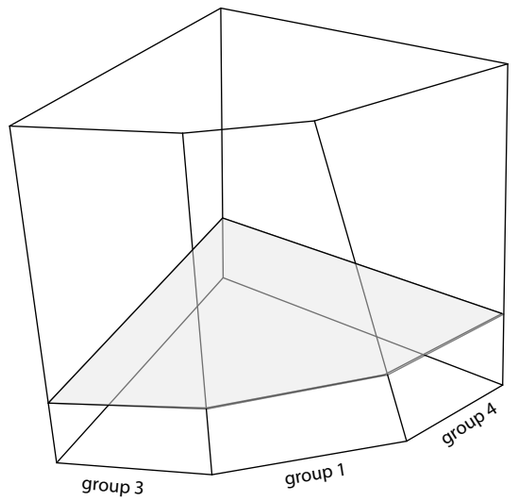

**volume centre points** are added as **extra attractors**

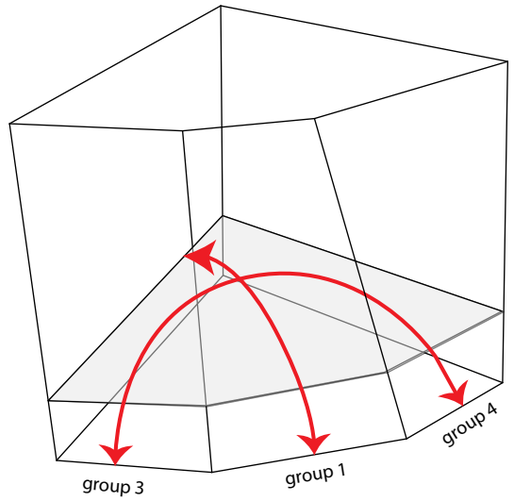


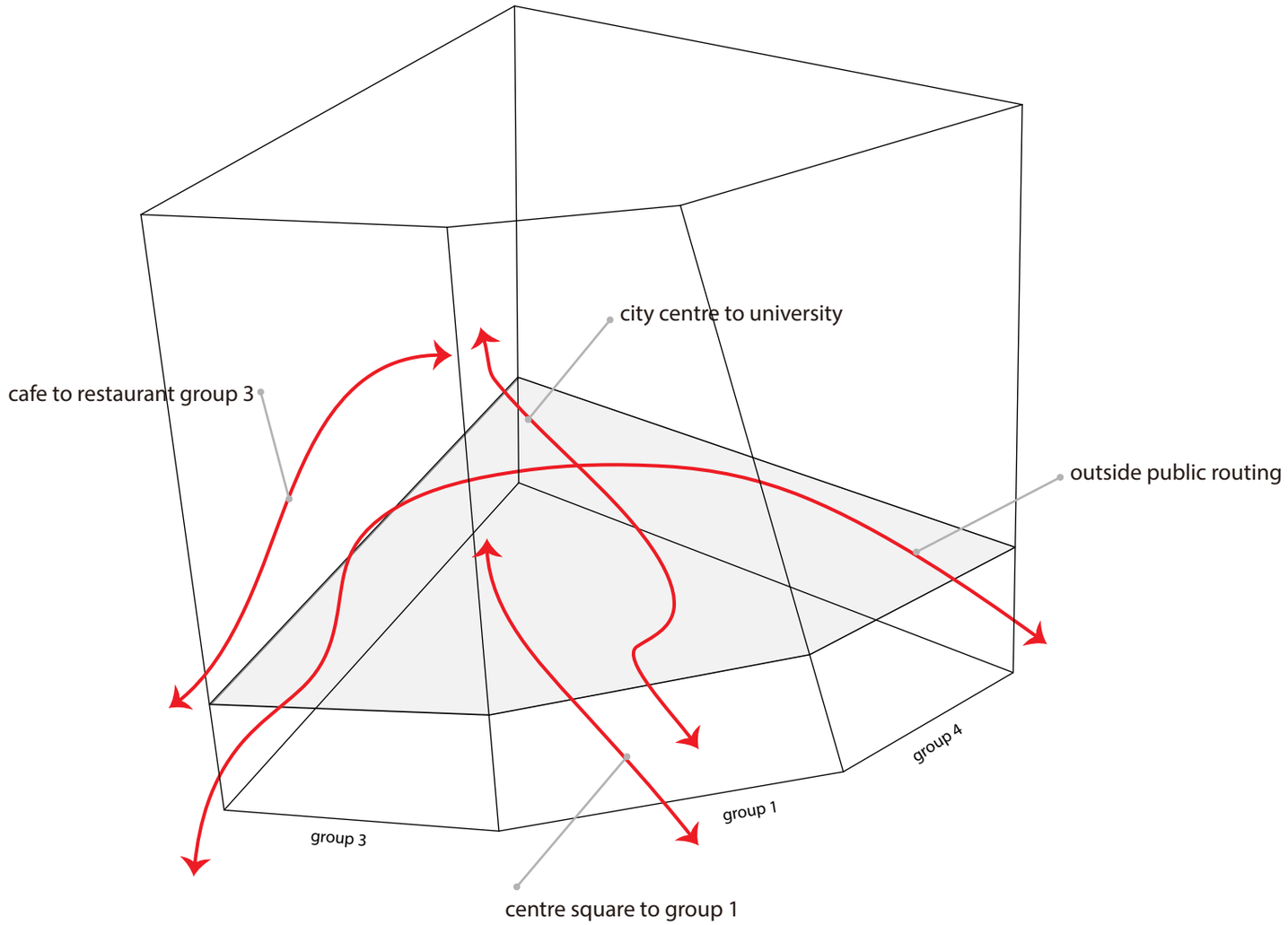

**points will cluster** around attractor lines and volume centre points and form **point clouds**

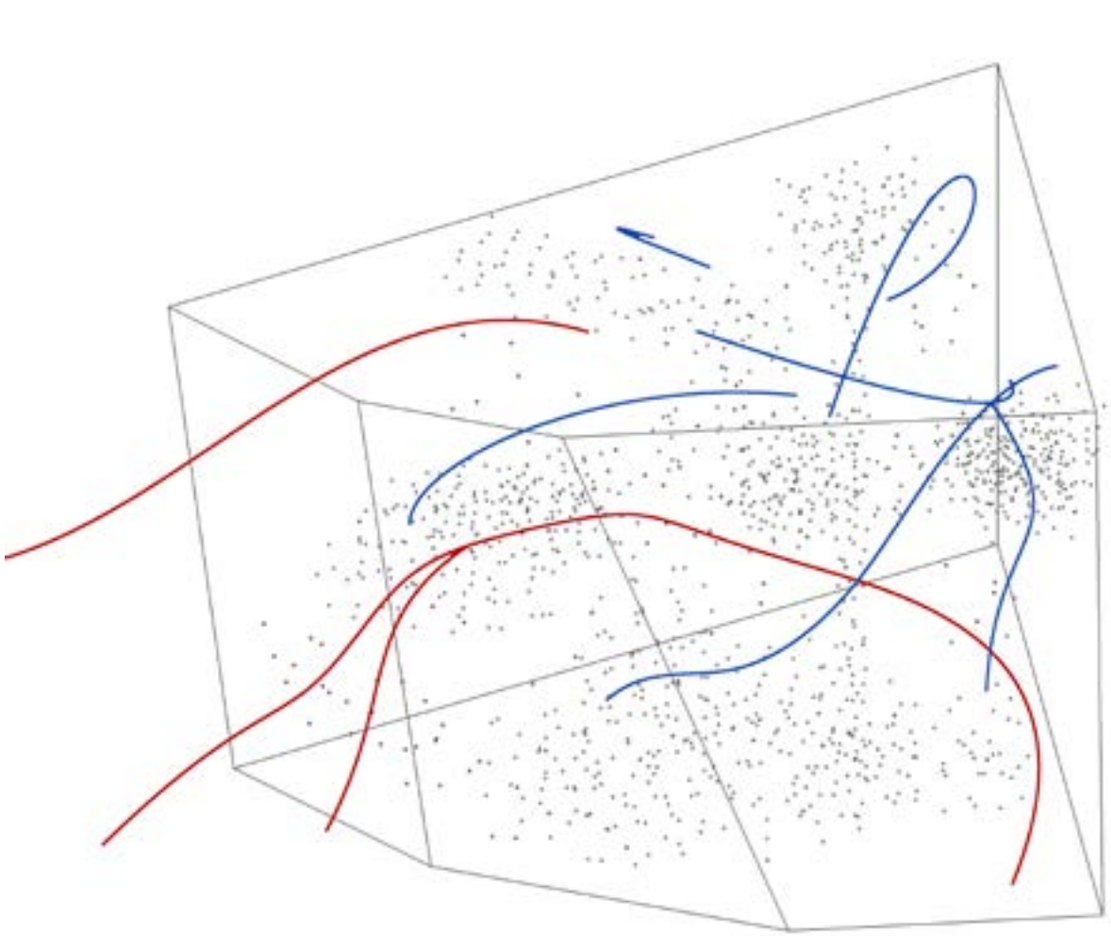



point clouds are **wrapped** to form volumes, volumes are **refined architectually**

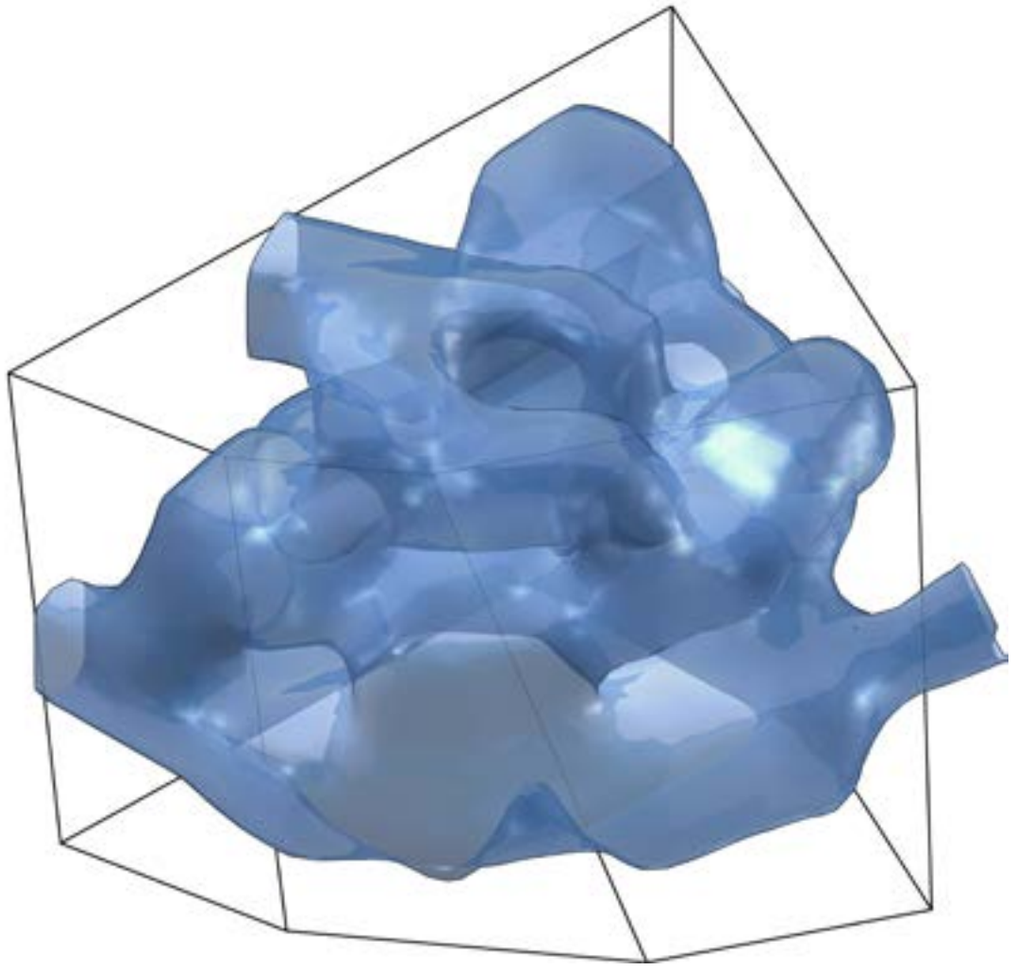

group 3
group 1
group 4


group 3
group 1
group 4


city centre to university
cafe to restaurant group 3
outside public routing
group 3
group 1
group 4
centre square to group 1

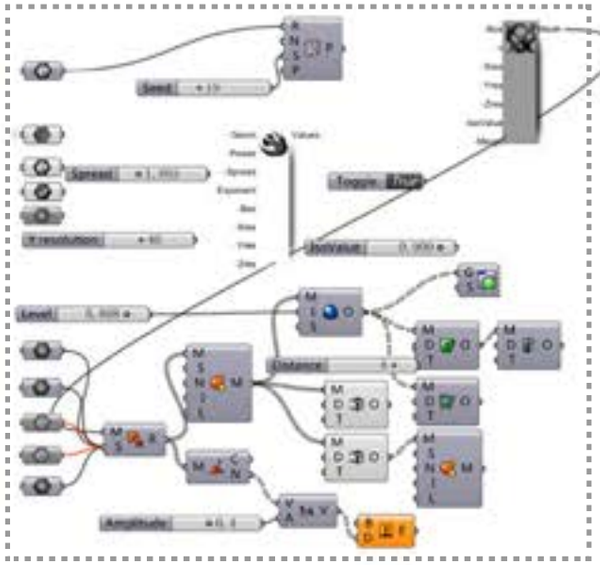


Routes Affect Points' Dense Region

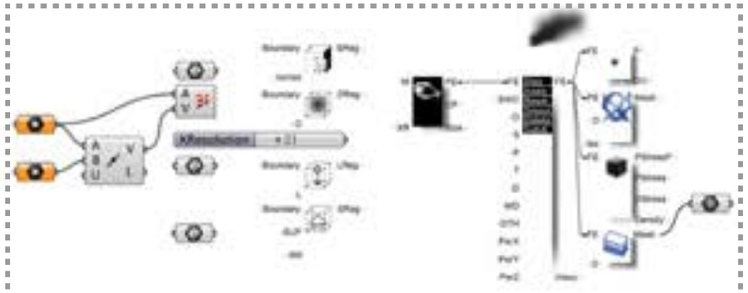


Wrapping Result Based on Points Region

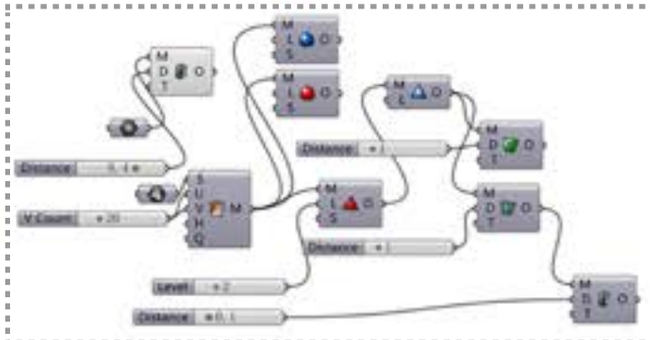
Form Creation



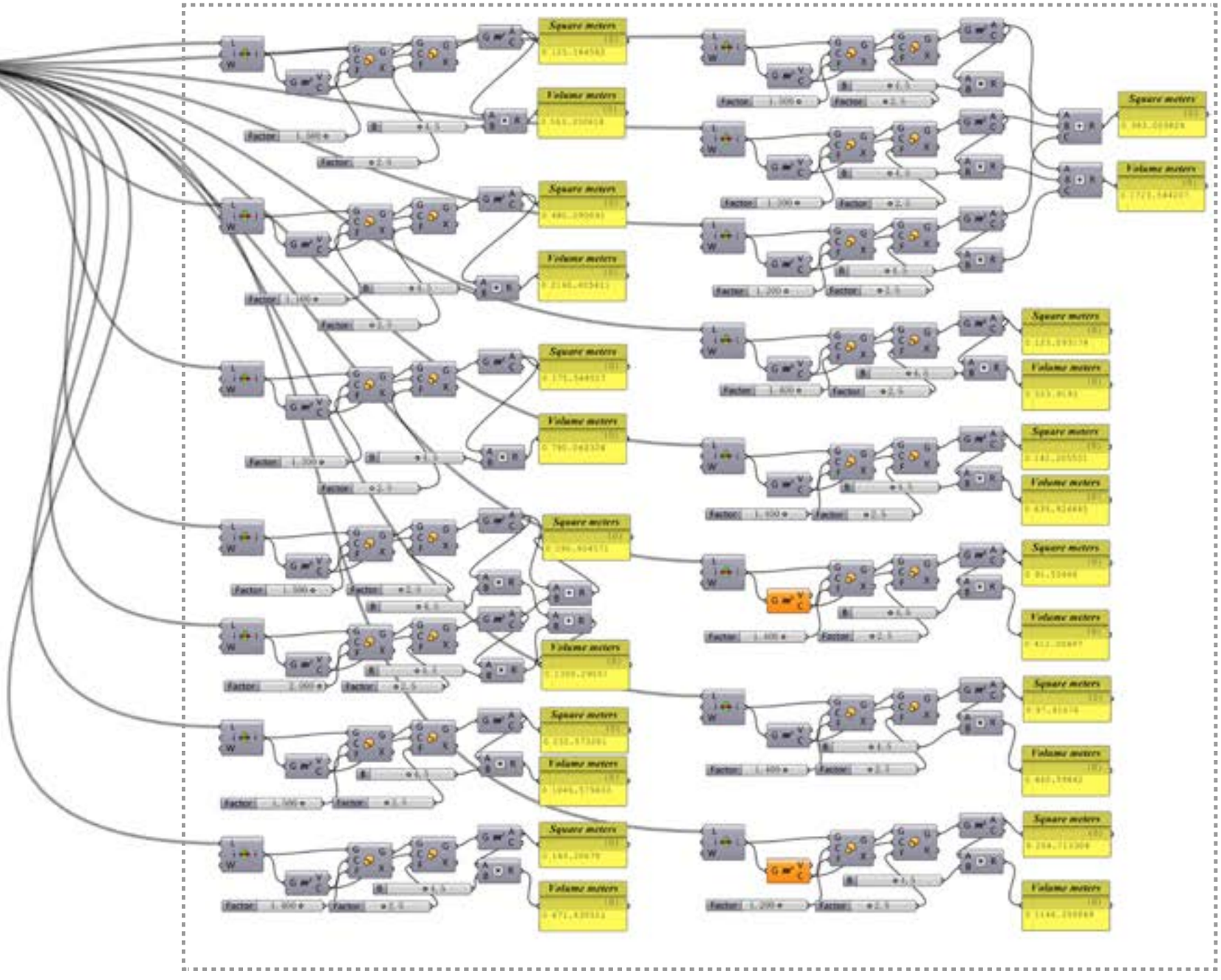
Structure Analysis

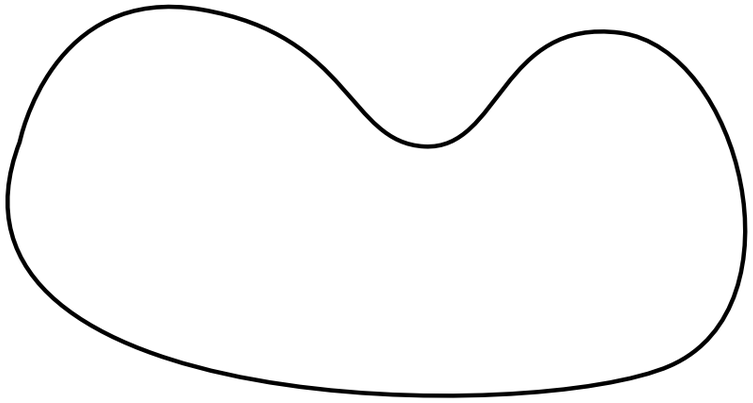


Structure Frame

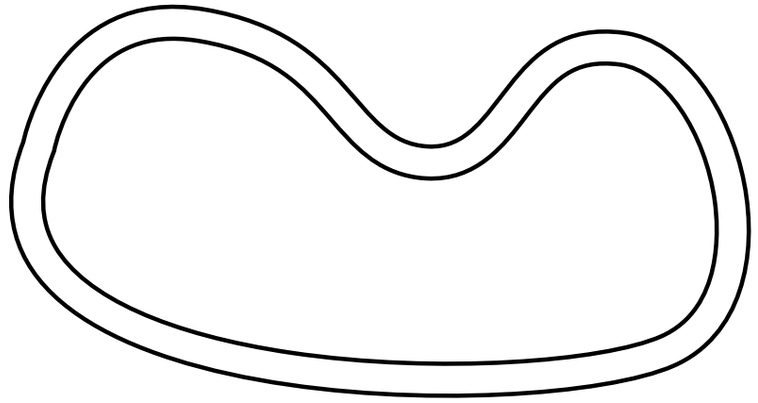


Data and Form Control

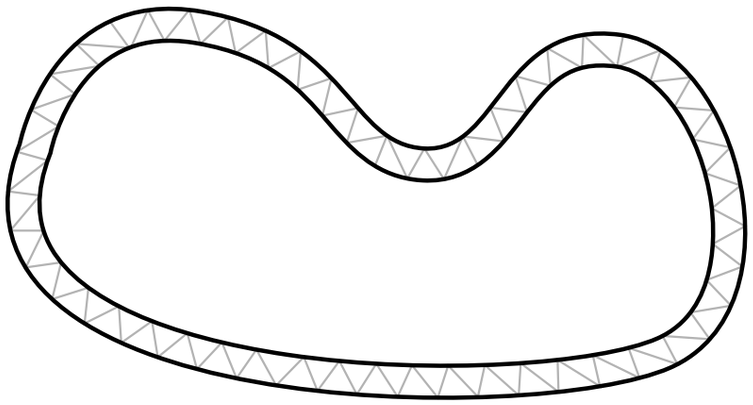




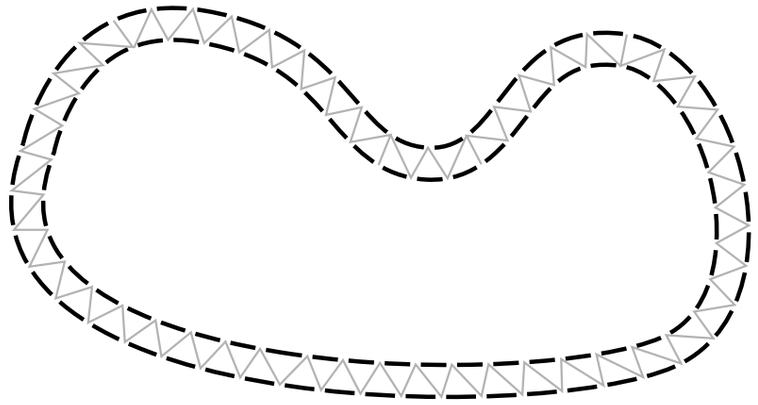
**skin** created by wrapping point clouds



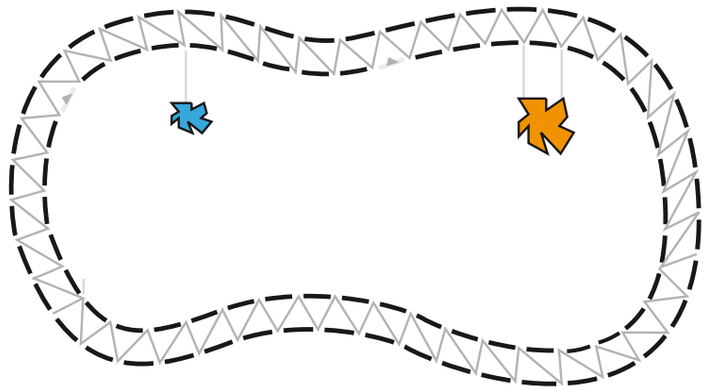
**offset** of skin to create **barrier** between inside & outside



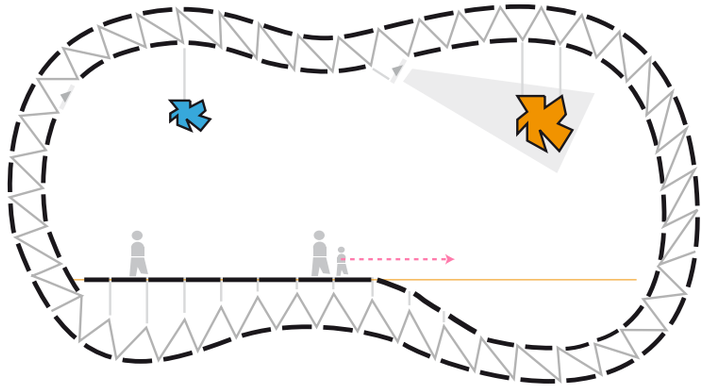
barrier is filled with **space frame construction**



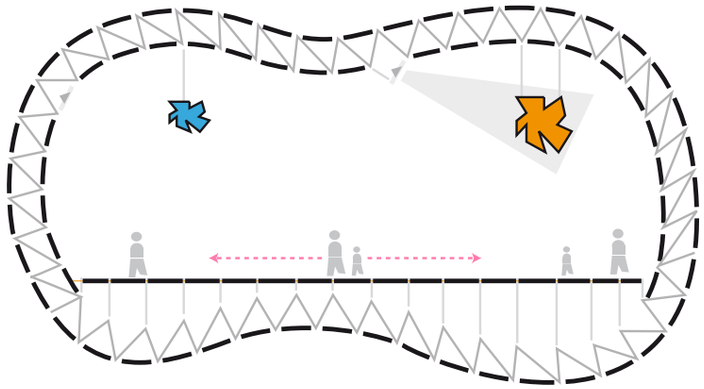
**panels** between space frame nodes create **flexible skin system**



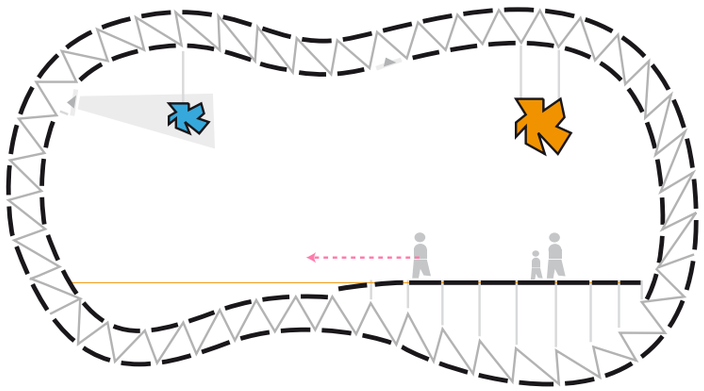
**no visitors** - panels in **original** positon



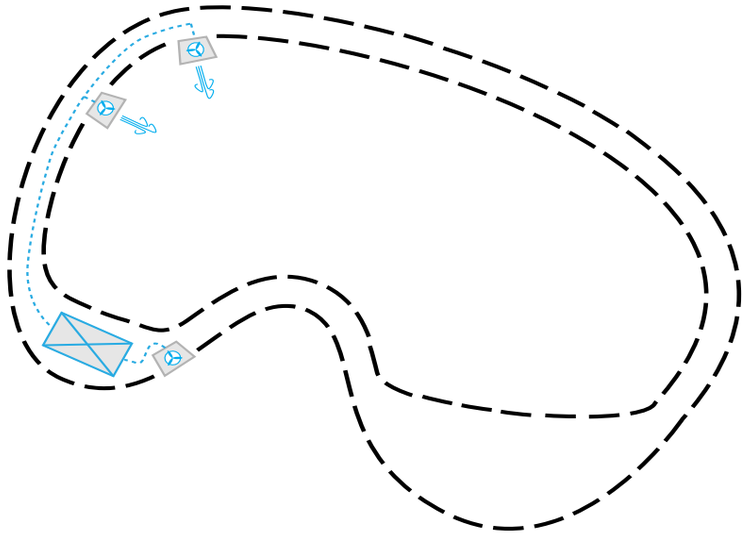
**entering visitors** - Panels move to form **horizontal** floor



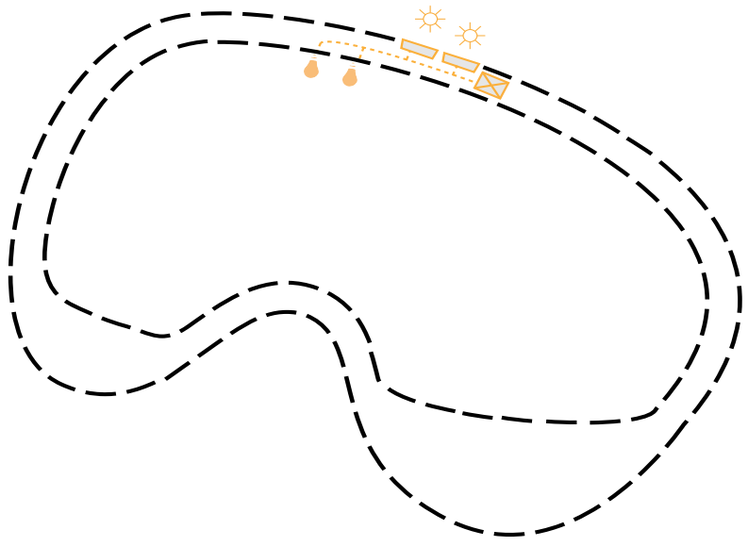
**visitors** - panels in **horizontal** position



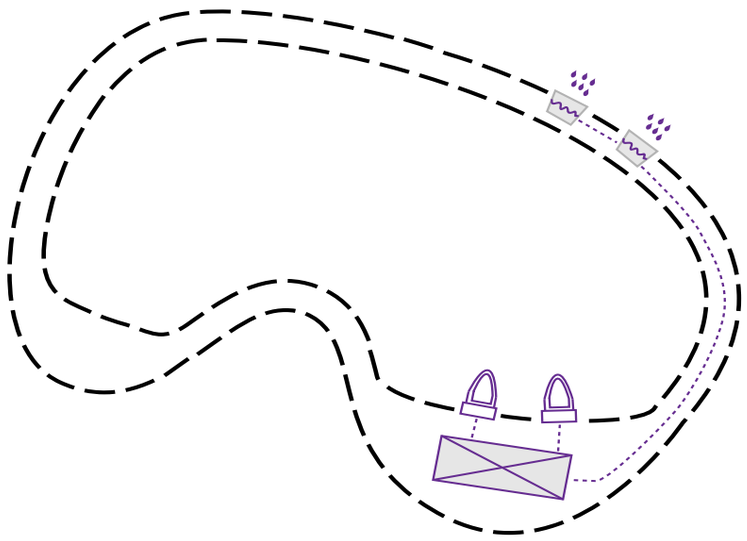
**leaving visitors** - panels move back to **original** position



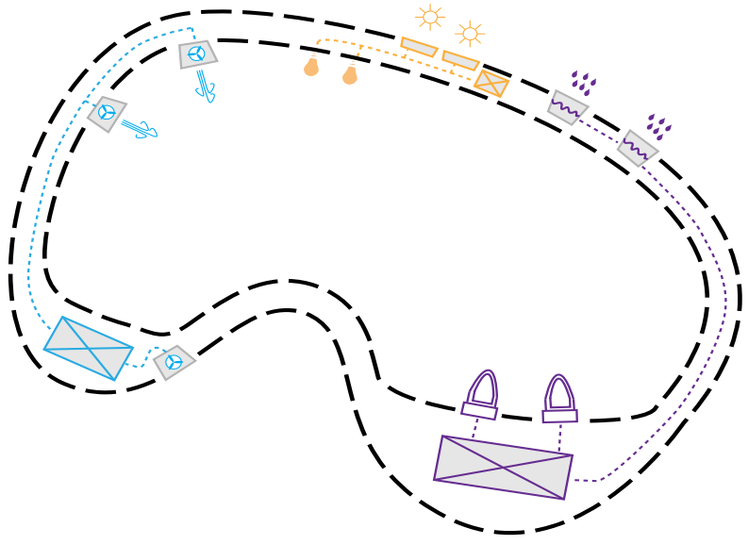
**fresh air** is collected, filtered, and blown into the volumes for **ventilation**



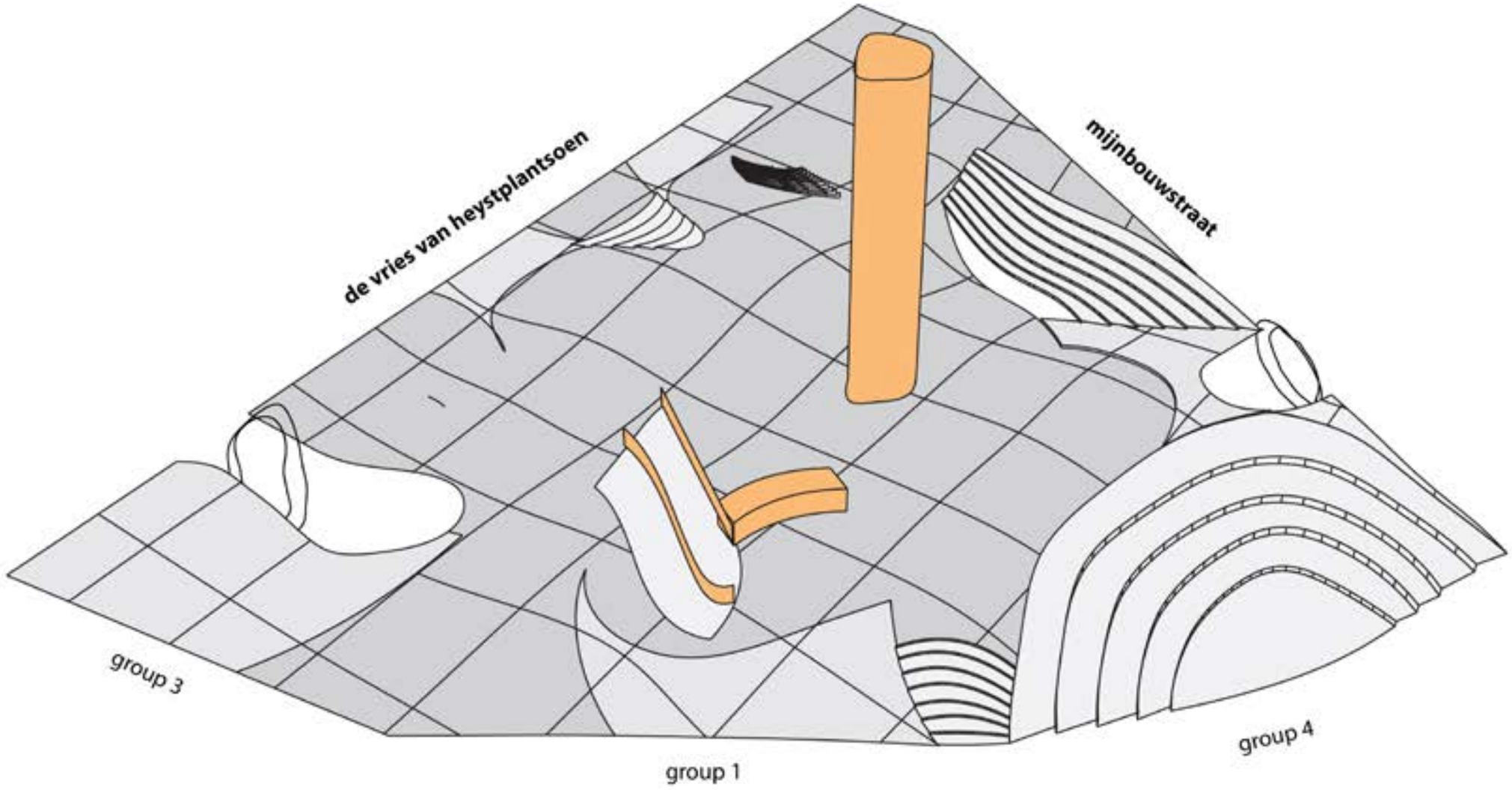
**solar panels** collect energy for **lighting** and **moving panels**

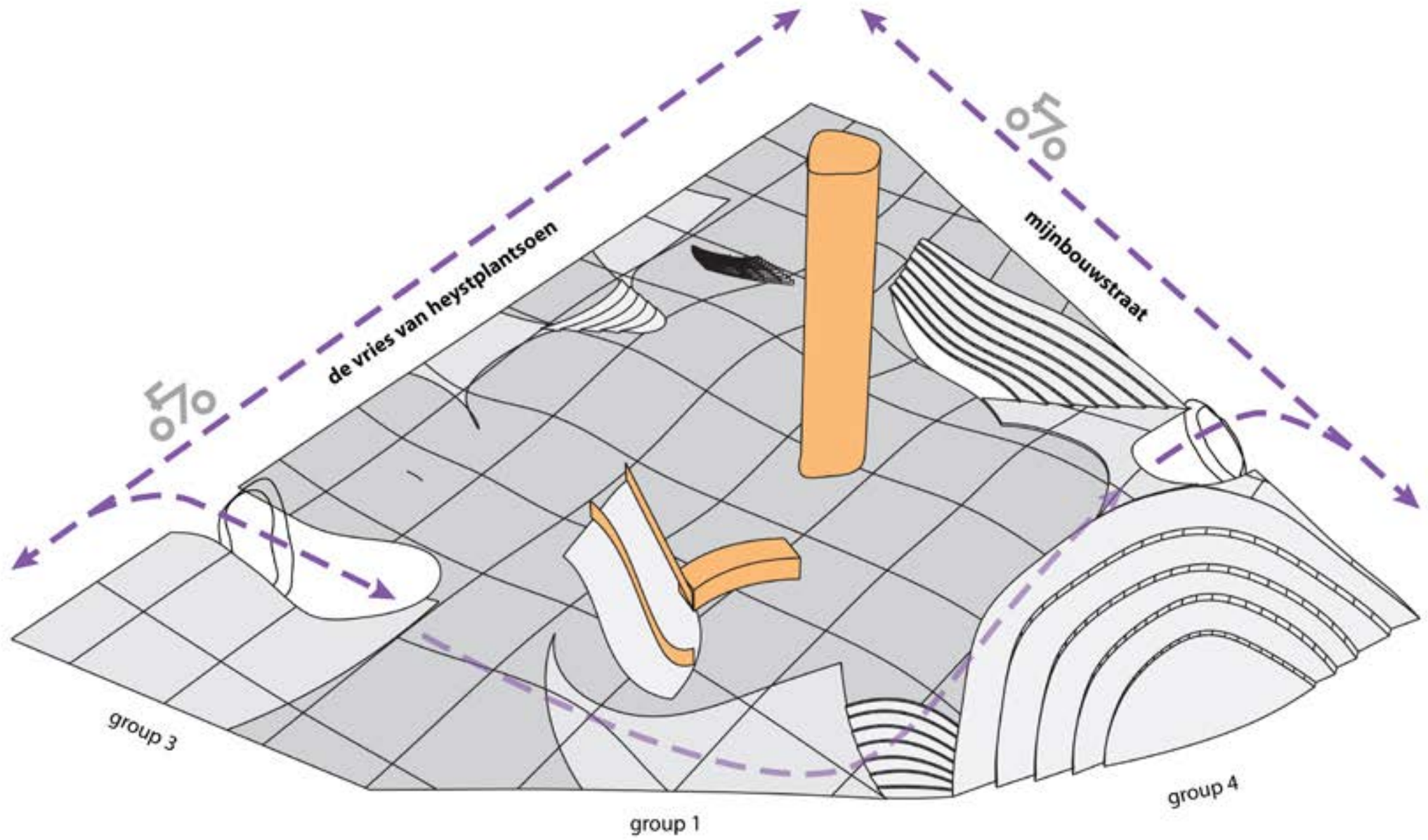


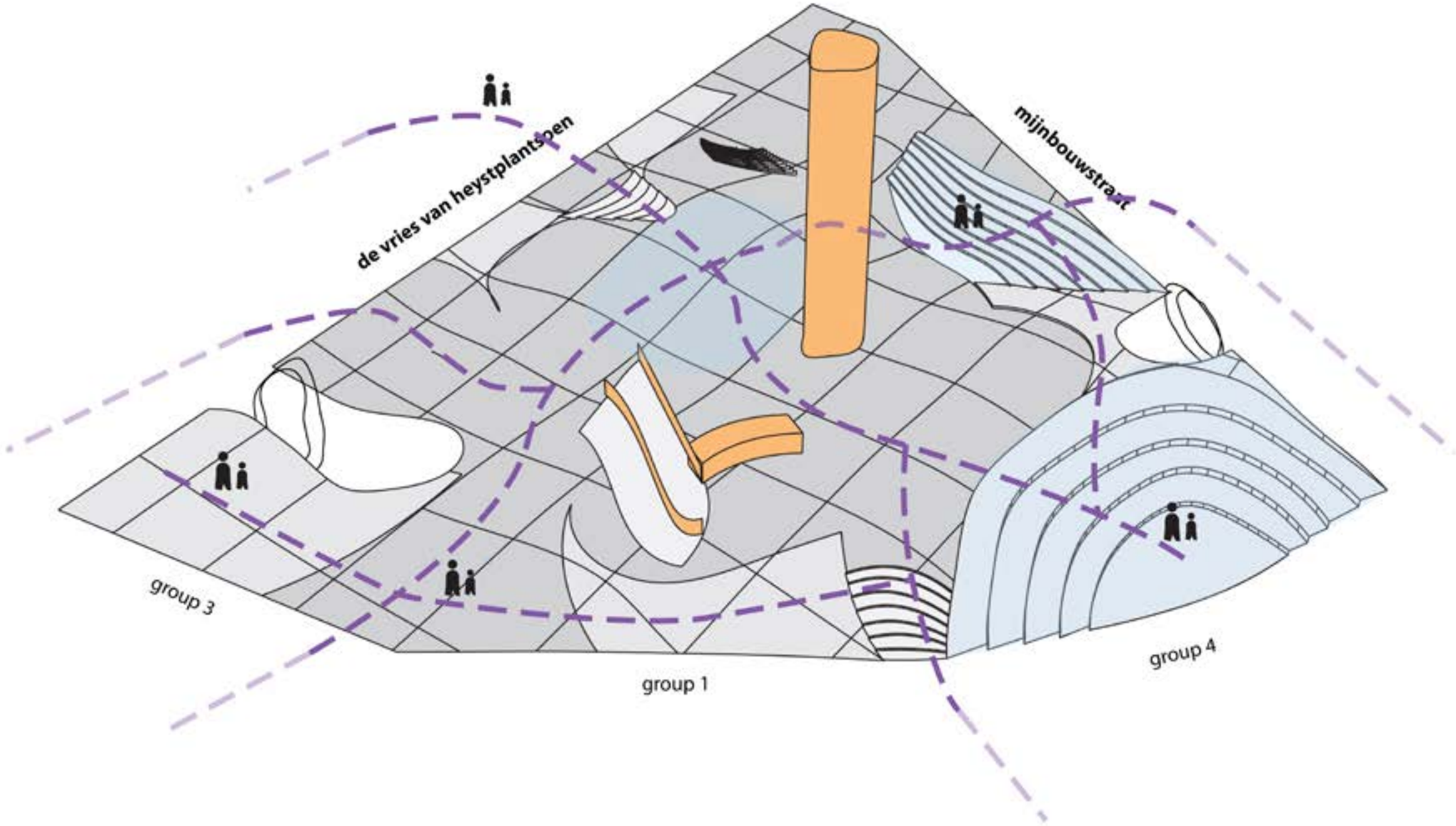
**water** is collected for **toilets** & **wash stands**

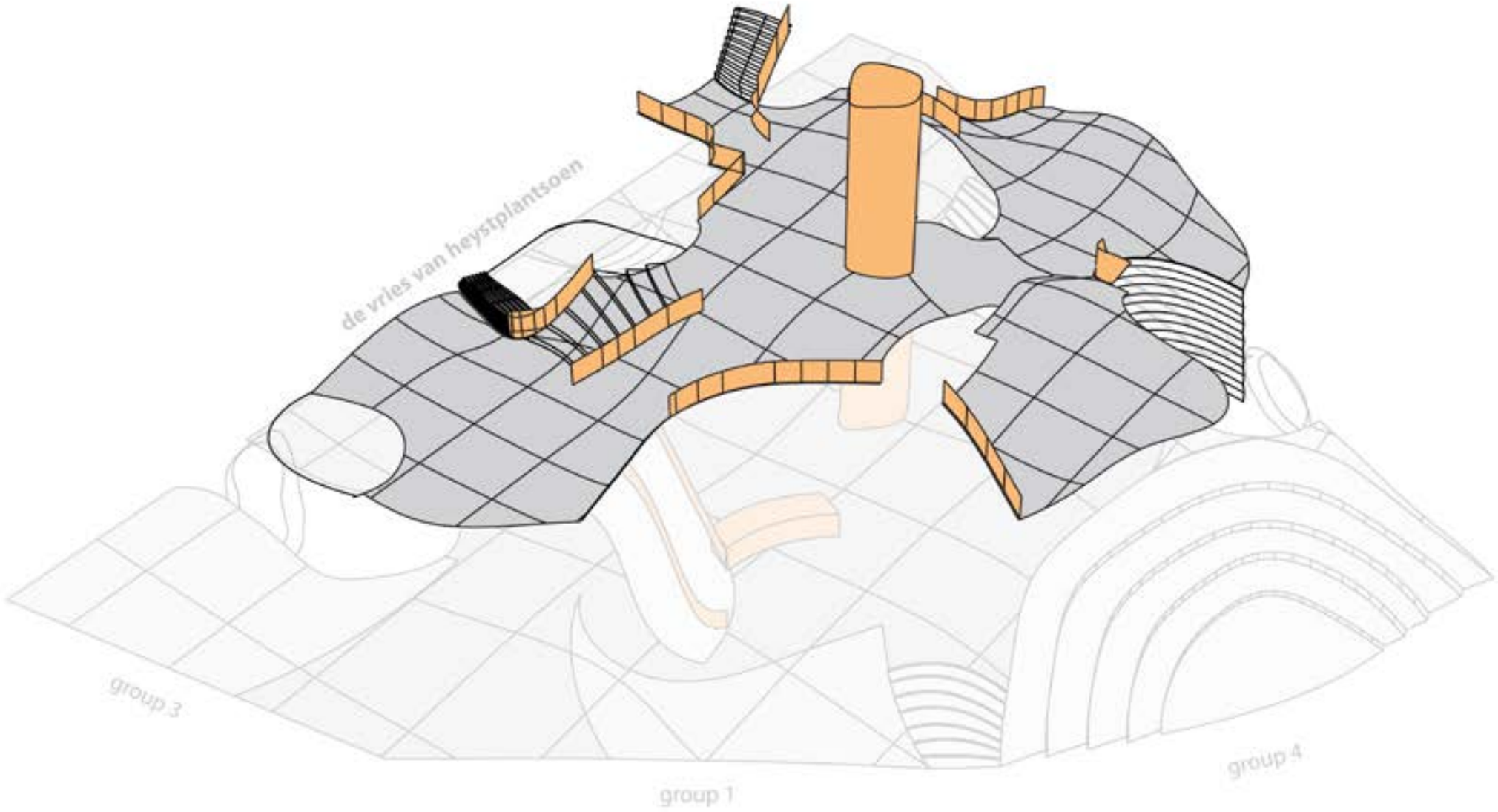


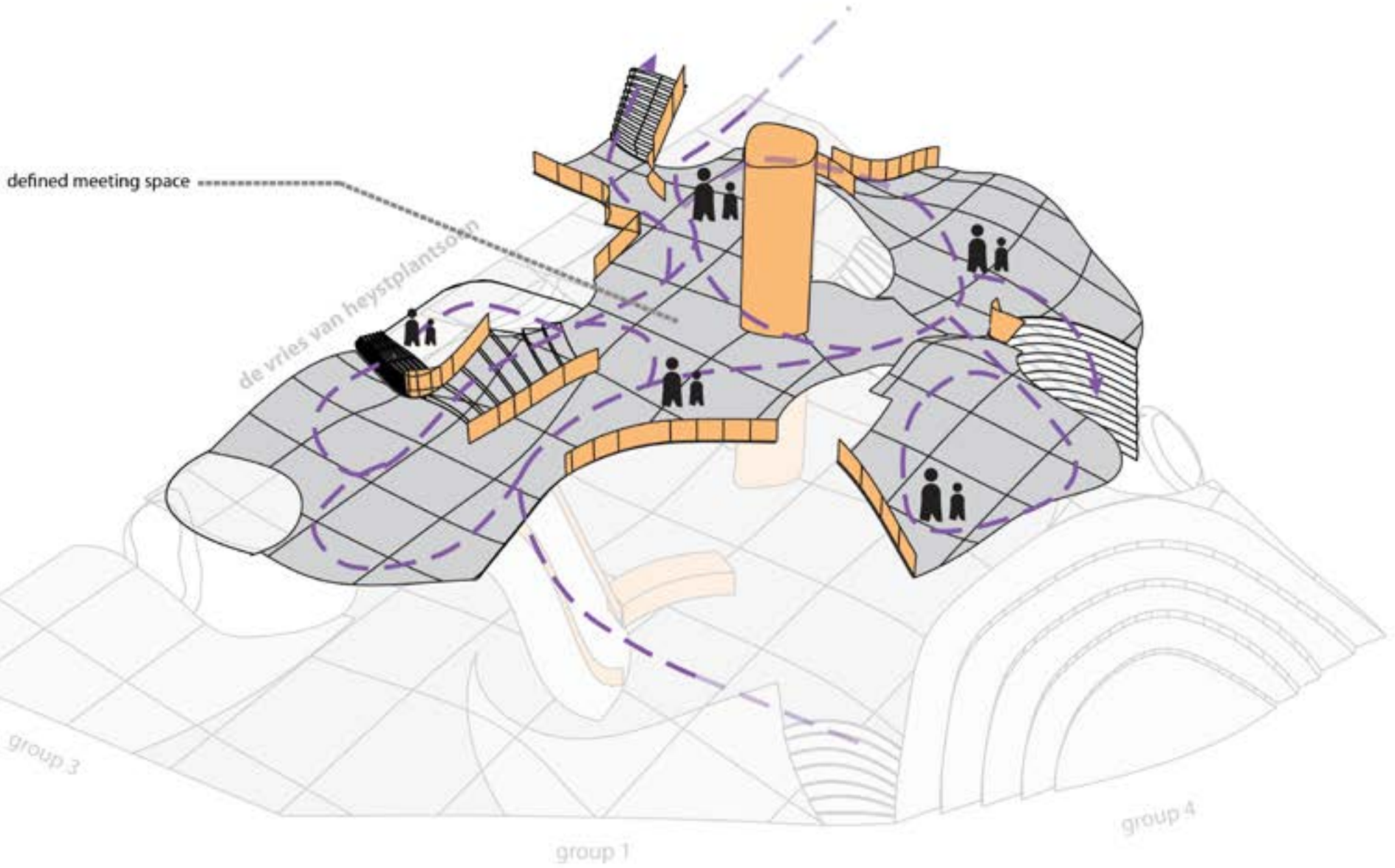
skin serves as **construction**, **interactivity** & **climatic systems**

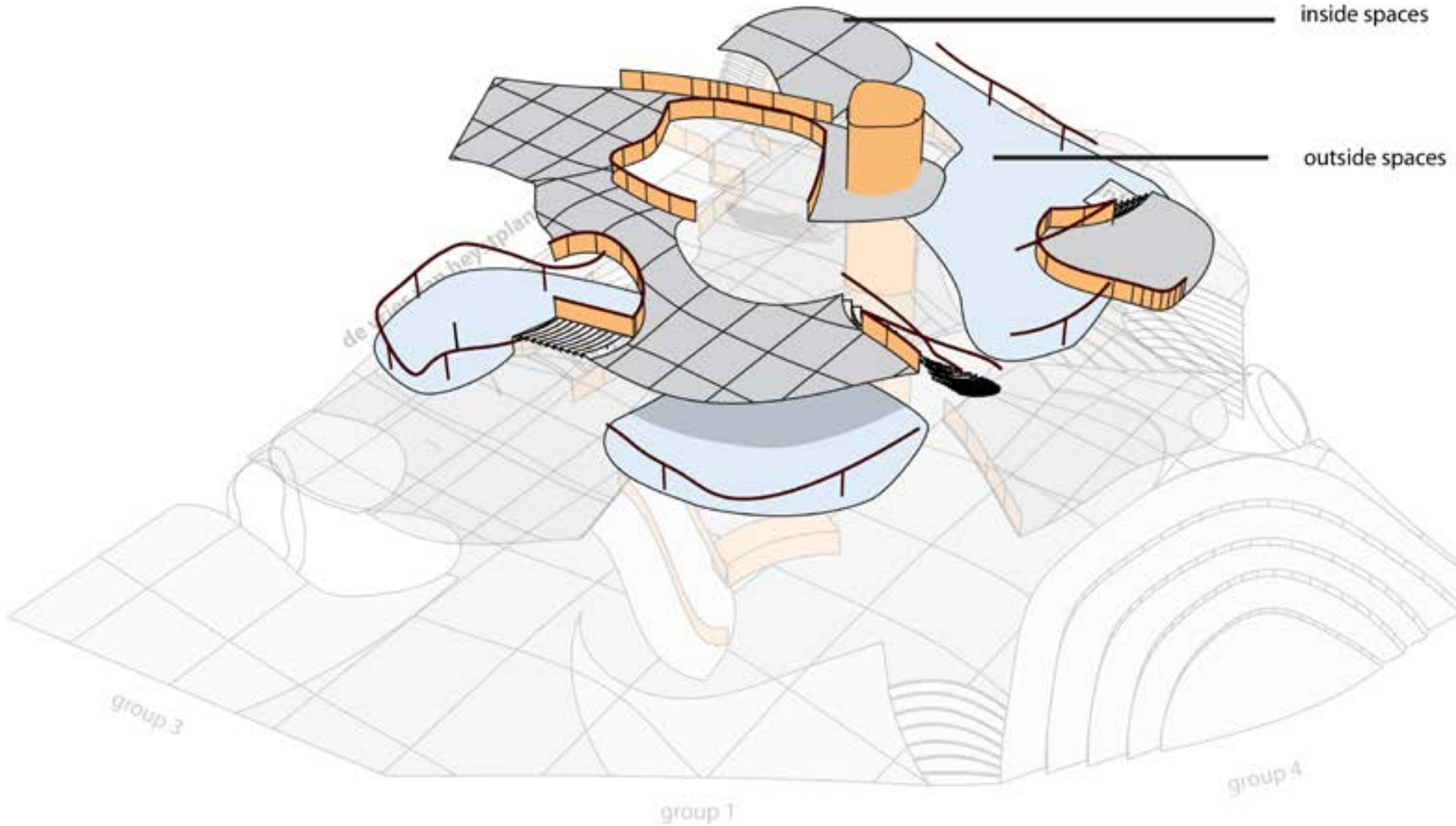

de vries van heystplantsoen
mijnbouwstraat
group 3
group 1
group 4

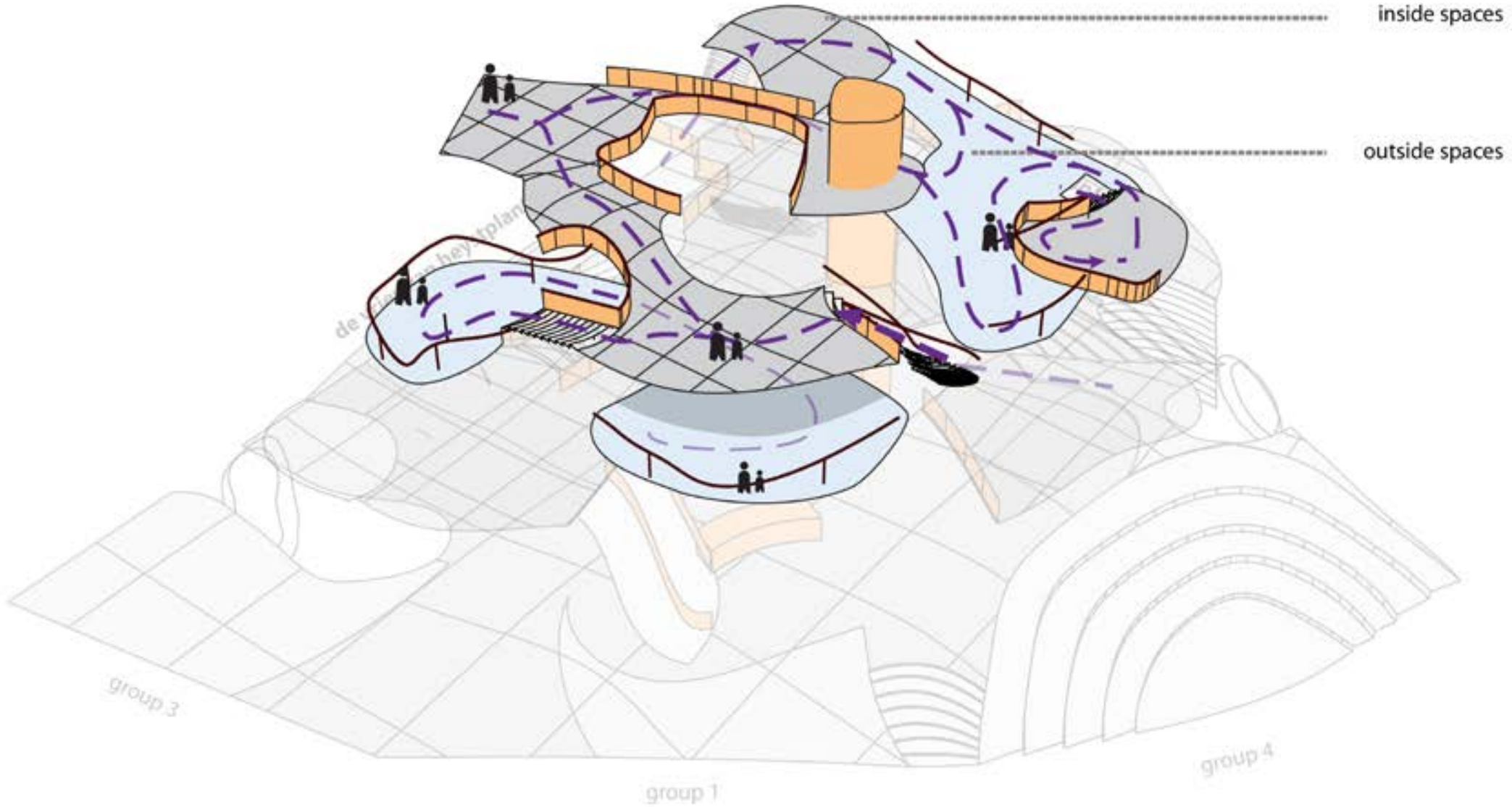

de vries van heystplantsoen
mijnbouwstraat
group 3
group 1
group 4


de vries van heystplantsoen
mijnbouwstraat
group 3
group 1
group 4

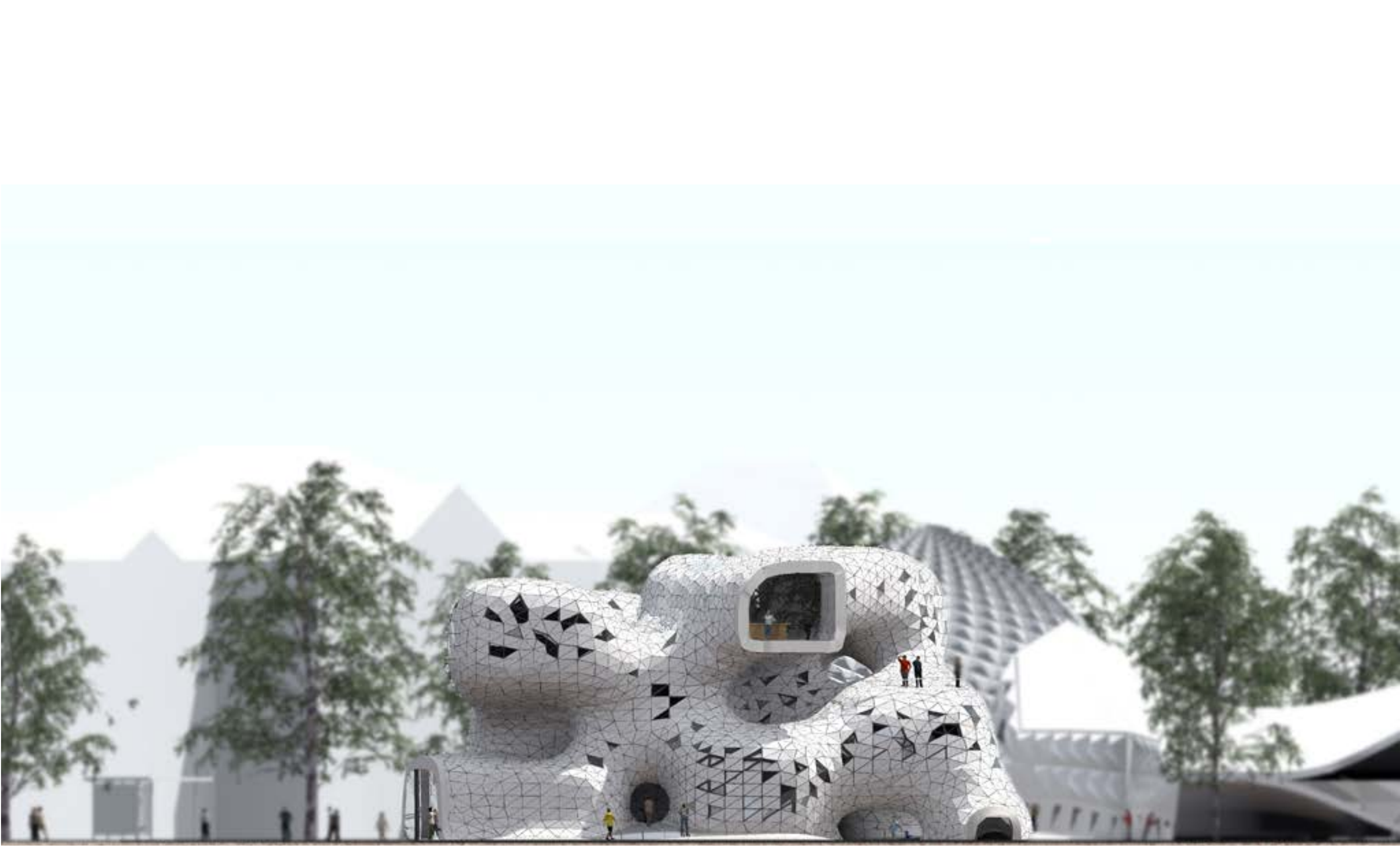

de vries van heystplantsoen
group 3
group 1
group 4

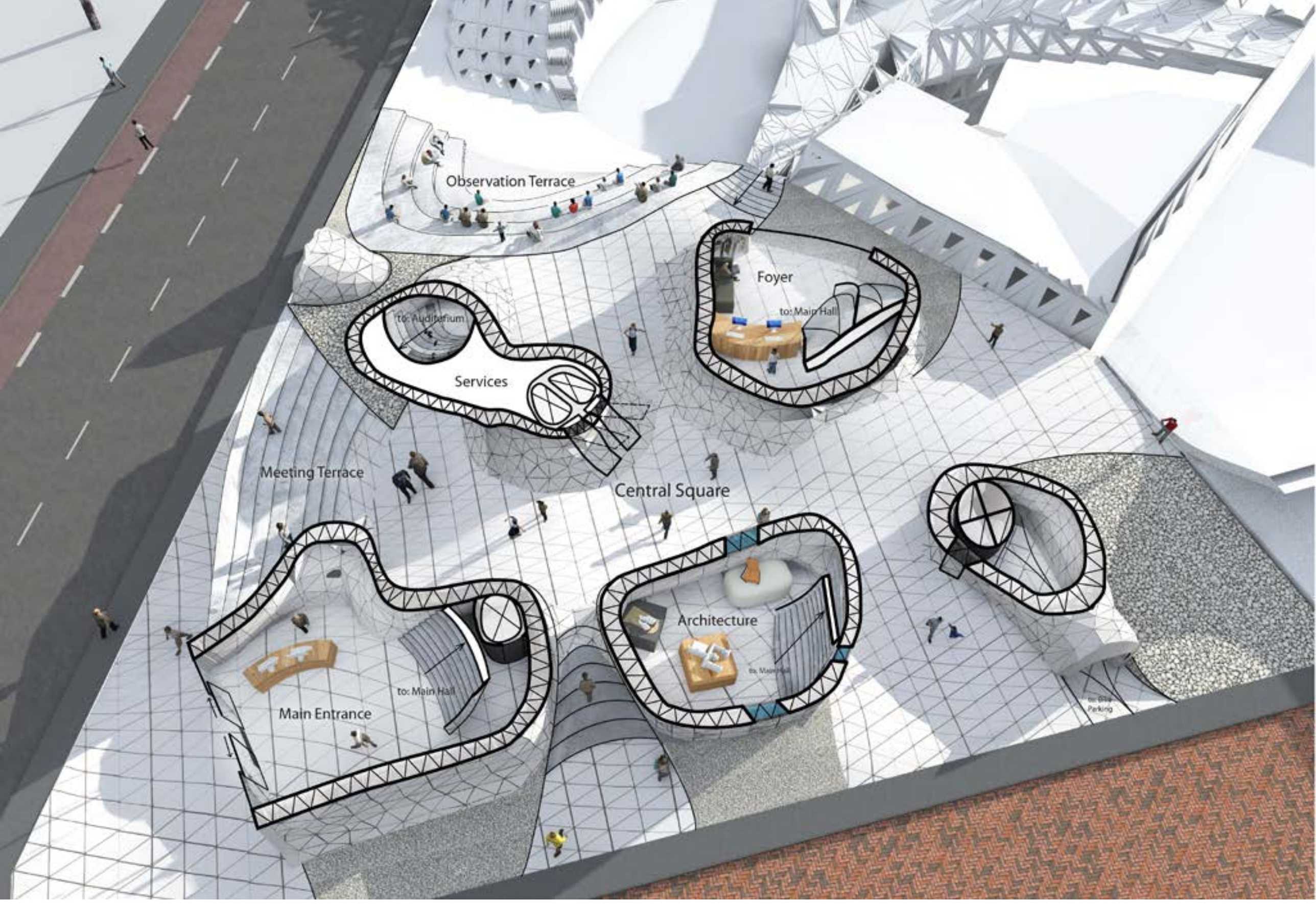

defined meeting space
de vries van heystplantsoen
group 3
group 1
group 4


inside spaces
outside spaces
group 3
group 1
group 4

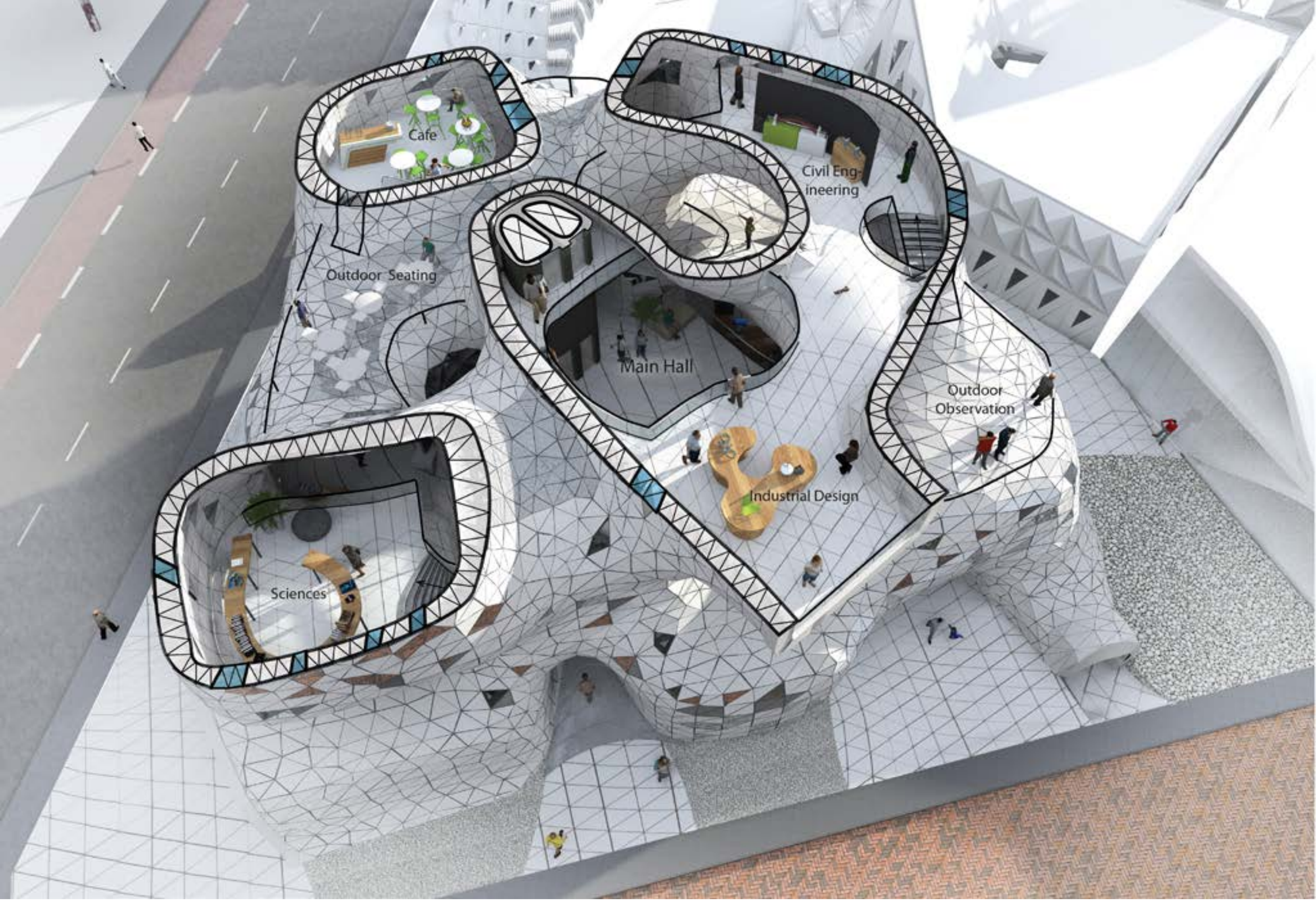

inside spaces
outside spaces
group 3
group 1
group 4

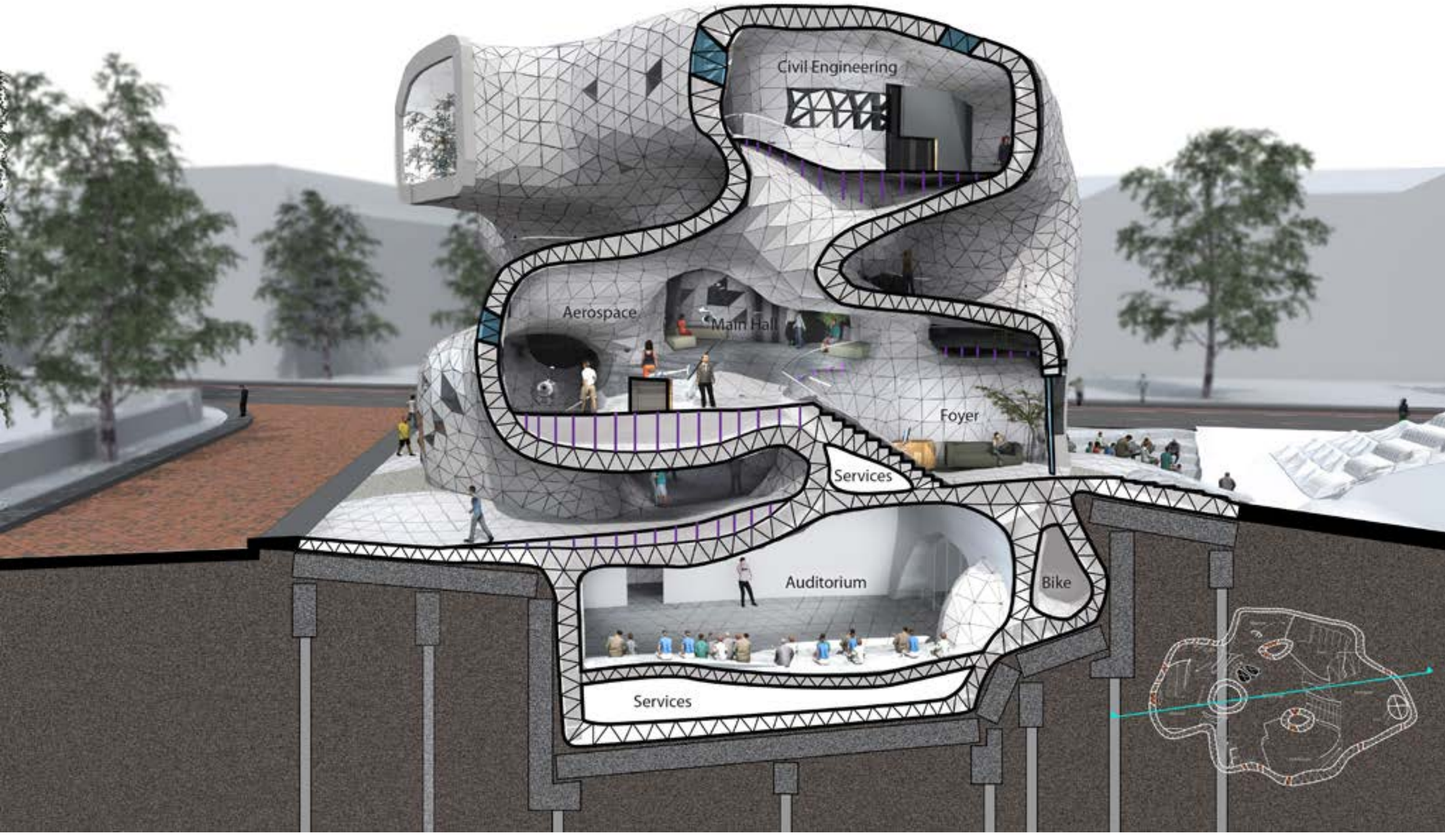

ARCHITECTURE



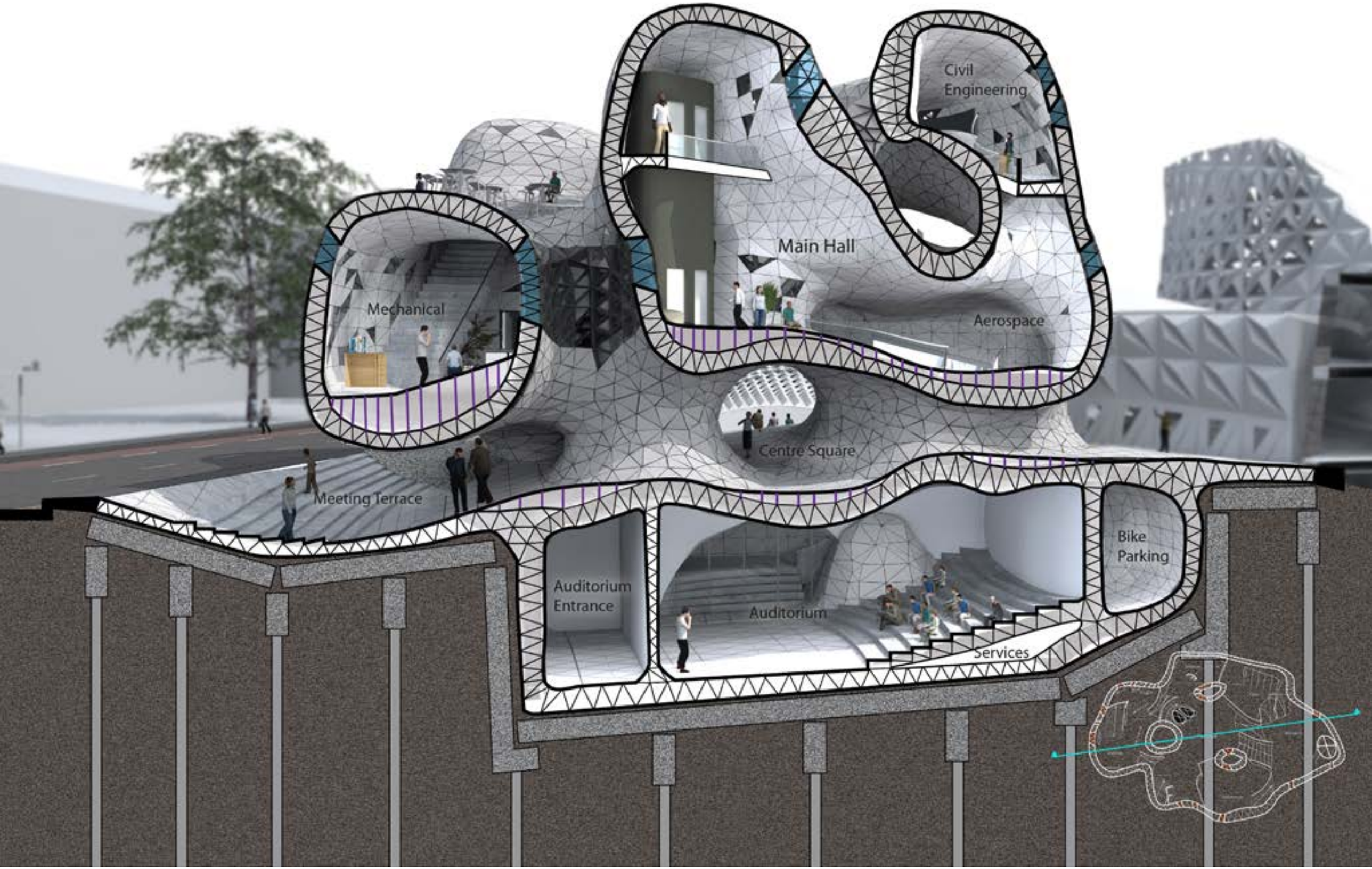

Observation Terrace
Foyer
to: Main Hall
to: Auditorium
Services
Meeting Terrace
Central Square
Architecture
Main Entrance
to: Main Hall

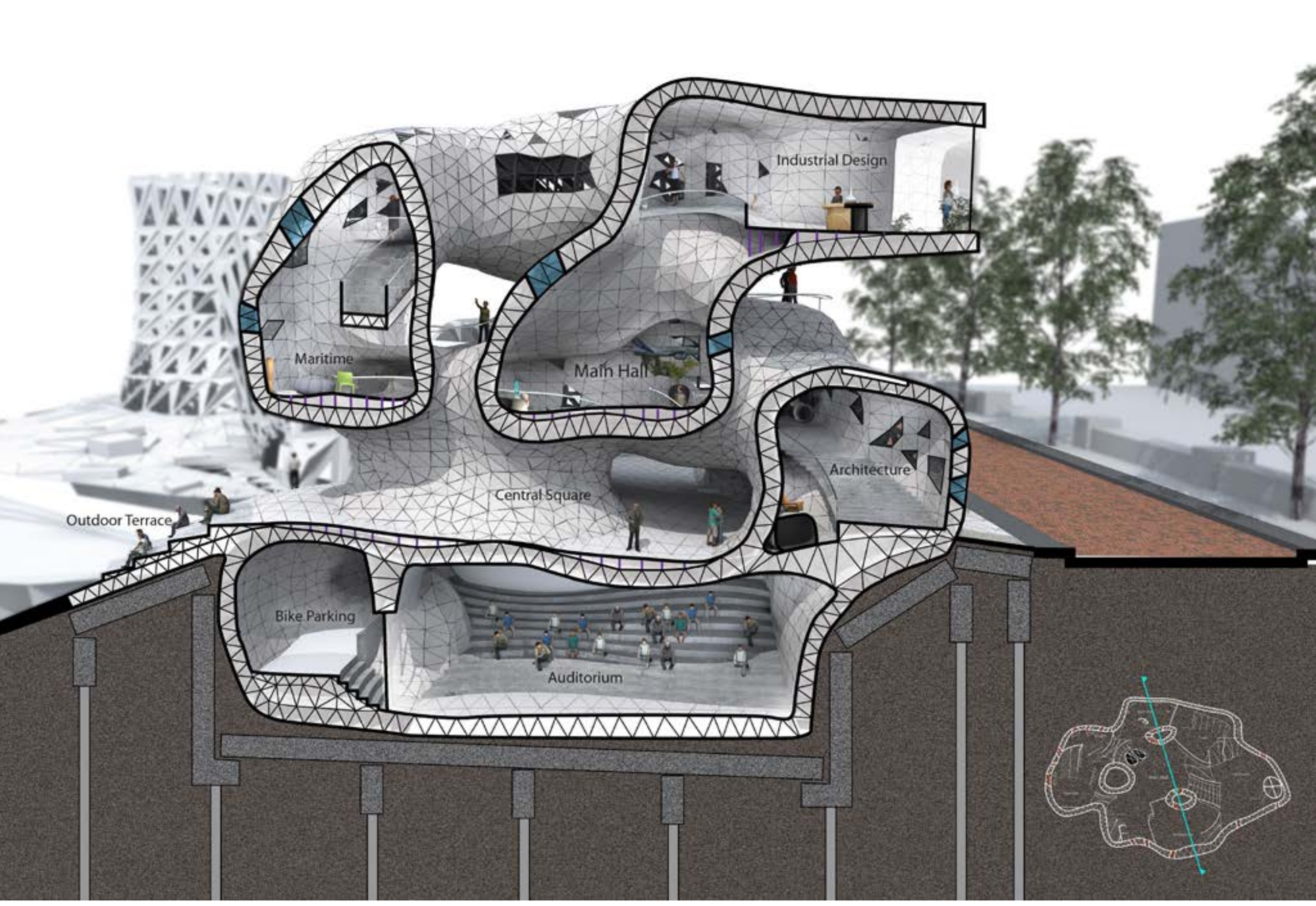

Maritime
Foyer/Office
to: Auditorium
Materials
Main Hall
to: Cafe
Aerospace
Mechanical
to: Main Entrance
to: Sciences
Architecture


Cafe
Outdoor Seating
Civil Engineering
Main Hall
Outdoor Observation
Industrial Design
Sciences


Civil Engineering
Aerospace
Main Hall
Foyer
Services
Auditorium
Bike
Services


Industrial Design
Main Hall
Aerospace
Materials
Centre Square
Meeting Terrace
Bike Parking
Auditorium
Auditorium Entrance
Services


Civil
Engineering
Main Hall
Aerospace
Mechanical
Centre Square
Meeting Terrace
Auditorium
Entrance
Auditorium
Services
Bike
Parking


Industrial Design
Maritime
Main Hall
Architecture
Central Square
Outdoor Terrace
Bike Parking
Auditorium


PV components
Rainwater capturing components


10 am


1 pm


4 pm

PV's rotating according to sun's position

The ventilation is regulated by CO2, pressure & occupancy control monitoring using sensors

Rainwater harvesting

Lighting system regulated by brightness & occupancy control monitoring using sensors

The building encourages the use of the stairs rather than elevators

Highly insulated & airtight envelope. U value: 0.3 m2 K/W

rainwater tank

greywater tank

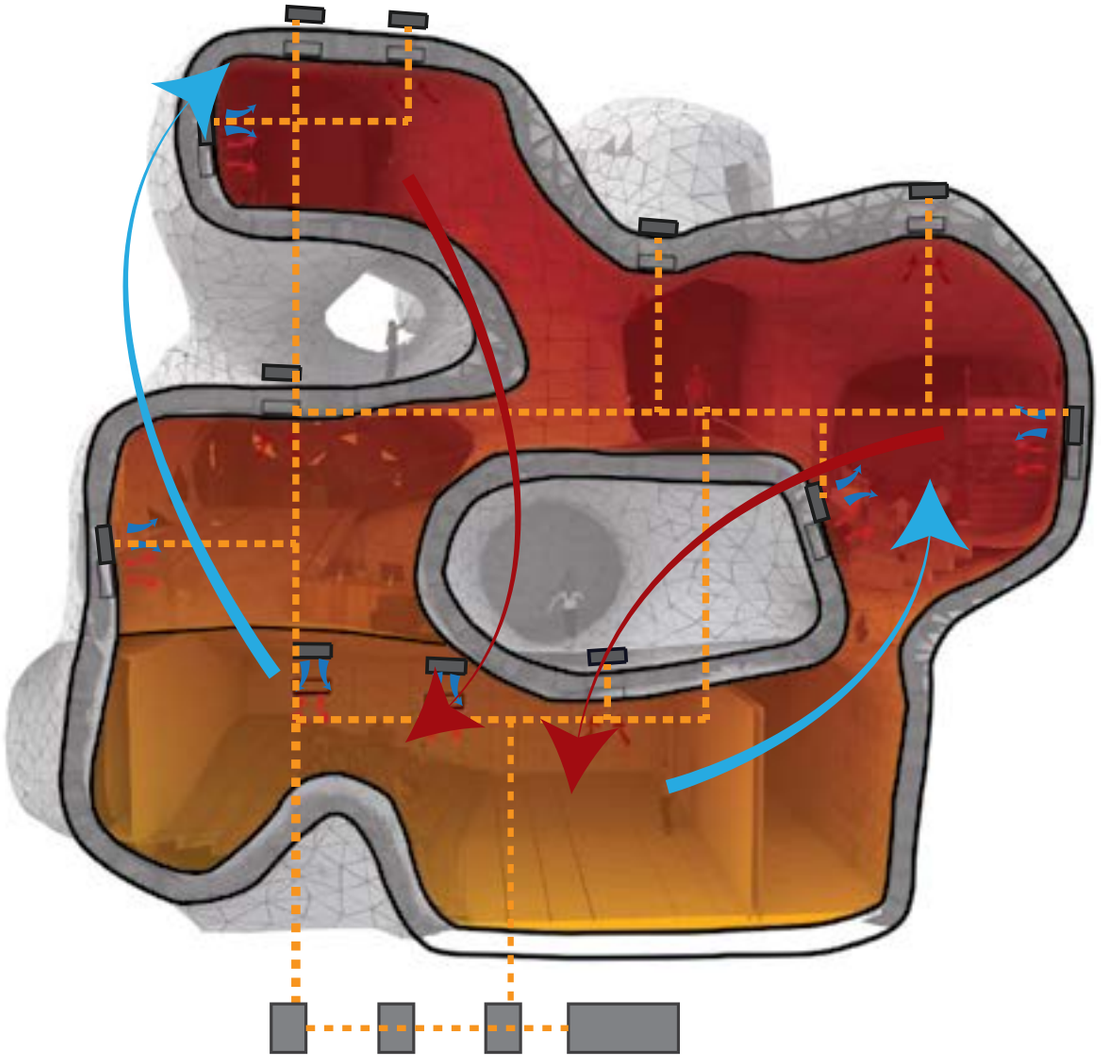
main control of harvesting system

transformer station

boiler

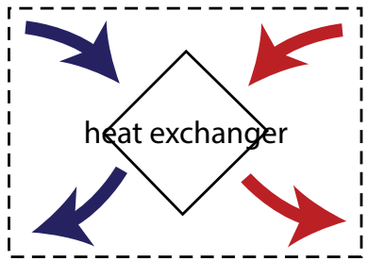
energy recovery air handler

variable refrigerant flow (VRF) heat pump for heating and cooling



## WINTER

Fresh cool outdoor air



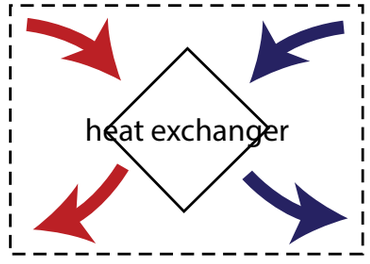

Warm stale air from inside

Stale air to outside

Pre-heated fresh air to inside

## SUMMER

Fresh warm outdoor air




Cool stale air from inside

Stale air to outside

Pre-cooled fresh air to inside

annual electricity consumption **187.000 kWh**

power of array (300m2) **42 kWp**

generated electricity per year **37.559 kWh**

generated light hours per year **1.877.950 h**

avoided CO2 emissions per year **25.165 kg CO2**

avoided CO2 emissions per year **20%**

**511.000 L** annual water consumption

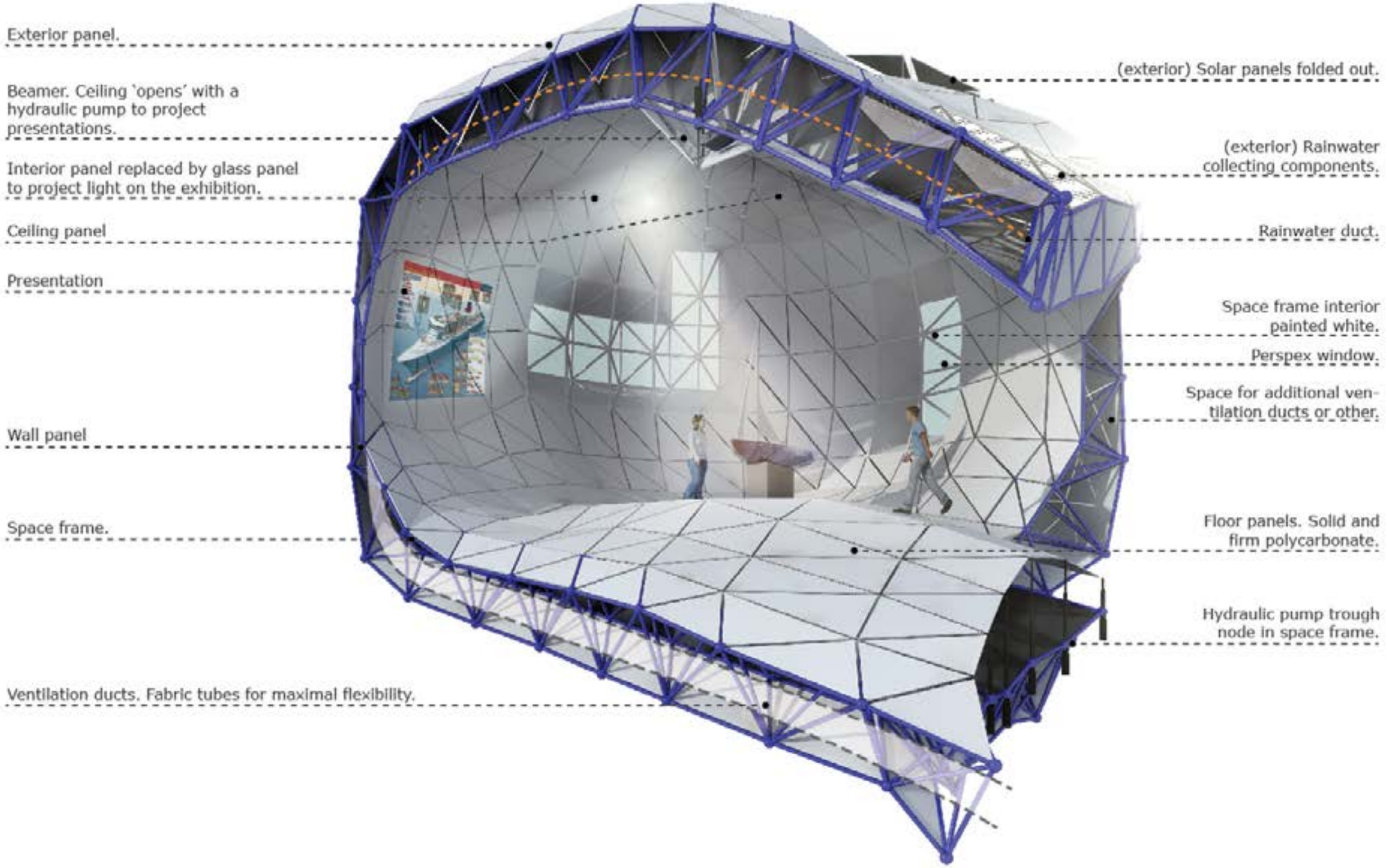
**330 m2** total area of rainwater collectors

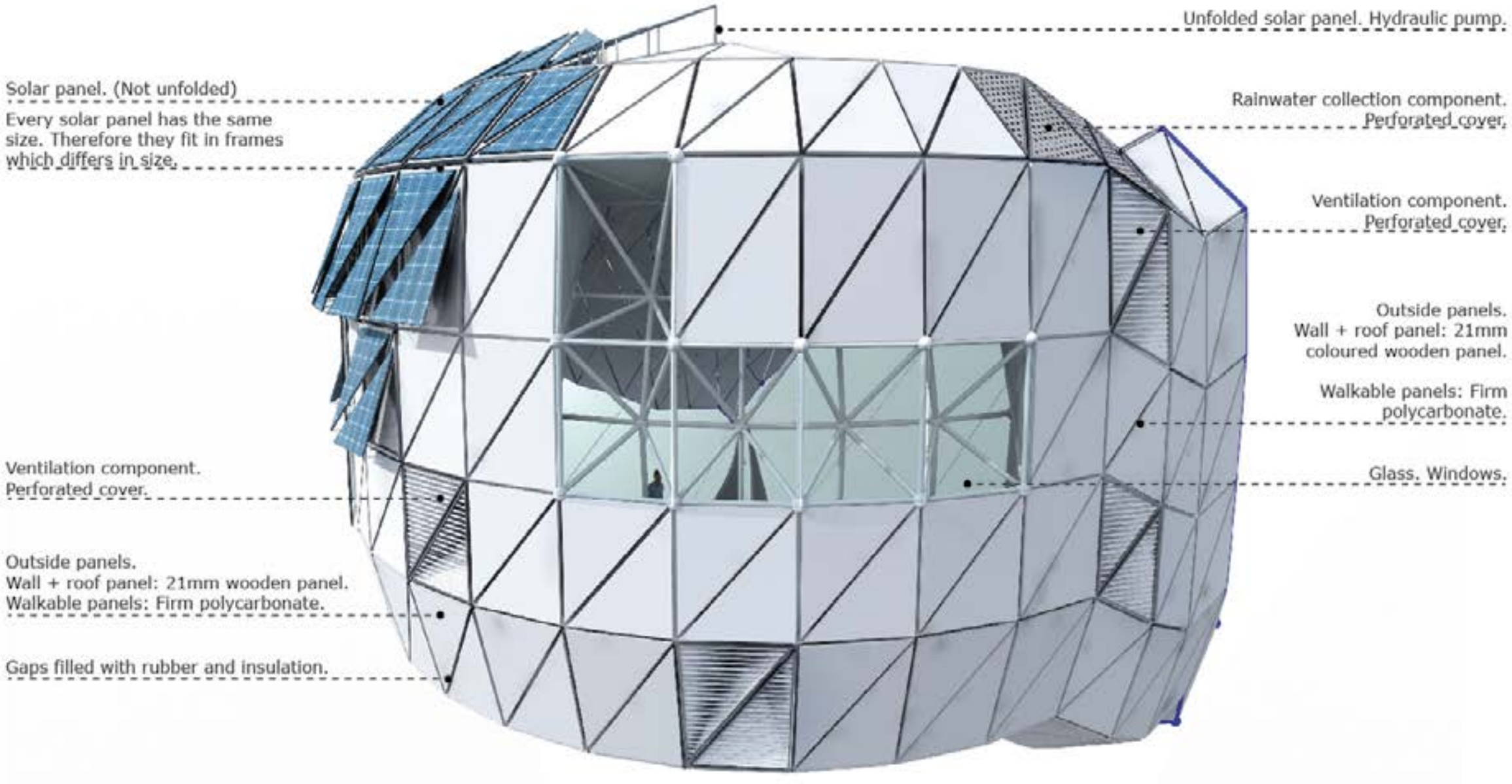
**316.200 L** annual rainwater harvest

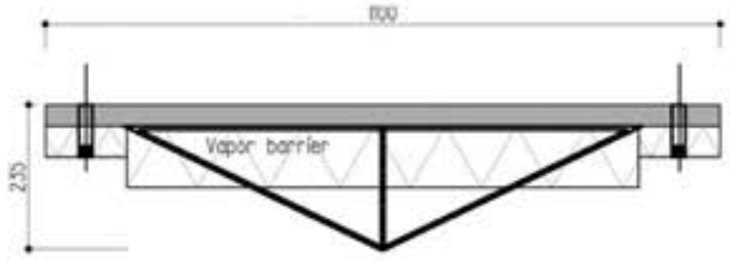
**219.000 L** annual greywater harvest

**535.200 L** total water harvest

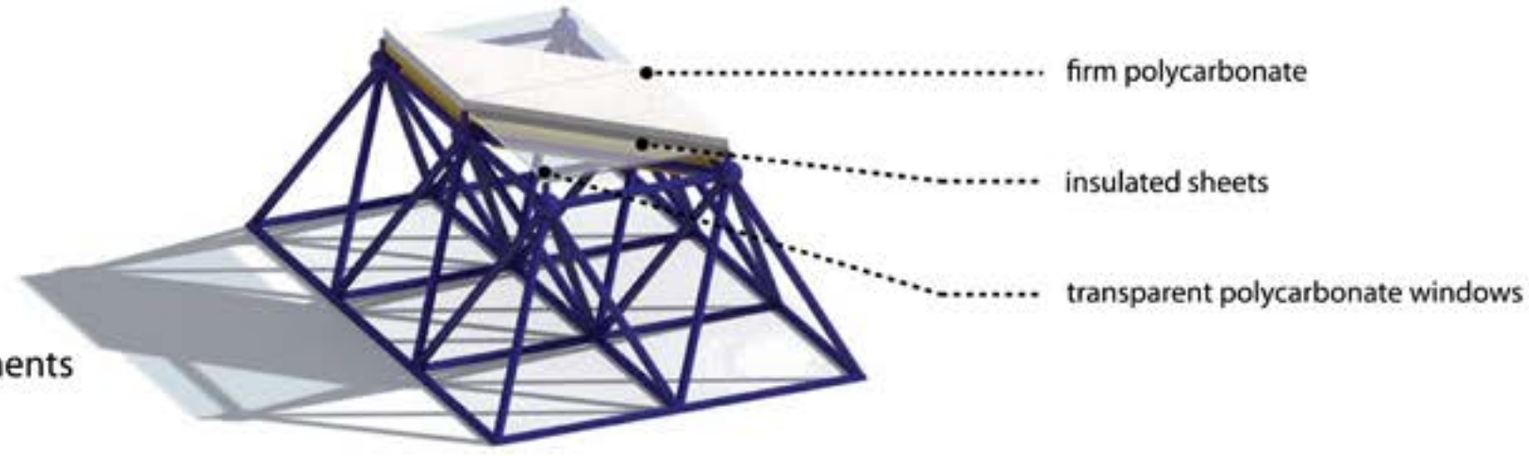
**24.200 L** water annual surplus

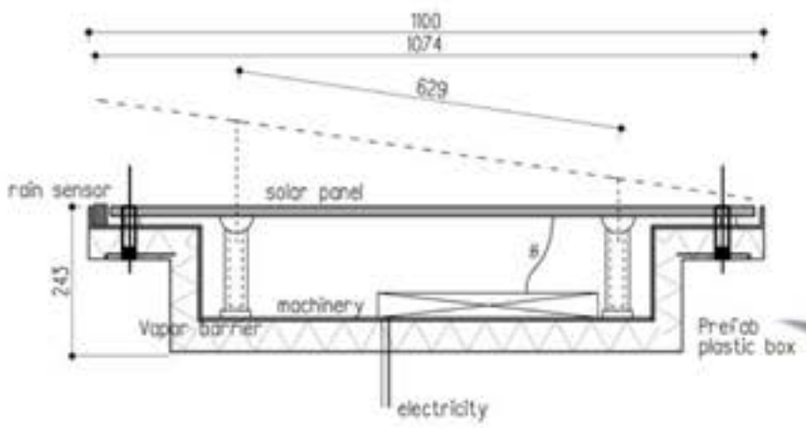

Exterior panel.
Beamer. Ceiling 'opens' with a hydraulic pump to project presentations.
Interior panel replaced by glass panel to project light on the exhibition.
Ceiling panel
Presentation
Wall panel
Space frame.
Ventilation ducts. Fabric tubes for maximal flexibility.
(exterior) Solar panels folded out.
(exterior) Rainwater collecting components.
Rainwater duct.
Space frame interior painted white.
Perspex window.
Space for additional ventilation ducts or other.
Floor panels. Solid and firm polycarbonate.
Hydraulic pump trough node in space frame.


Unfolded solar panel. Hydraulic pump.
Solar panel. (Not unfolded)
Every solar panel has the same size. Therefore they fit in frames which differs in size.
Rainwater collection component. Perforated cover.
Ventilation component. Perforated cover.
Outside panels. Wall + roof panel: 21mm coloured wooden panel.
Walkable panels: Firm polycarbonate.
Glass. Windows.
Ventilation component. Perforated cover.
Outside panels. Wall + roof panel: 21mm wooden panel. Walkable panels: Firm polycarbonate.
Gaps filled with rubber and insulation.

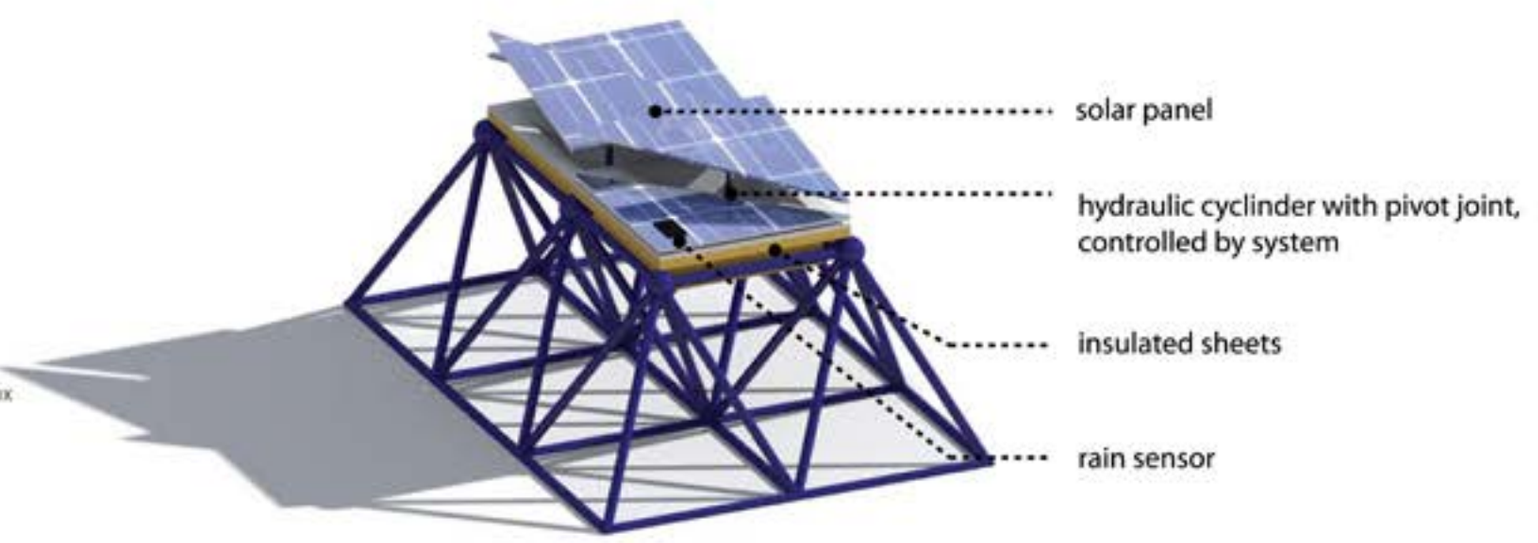


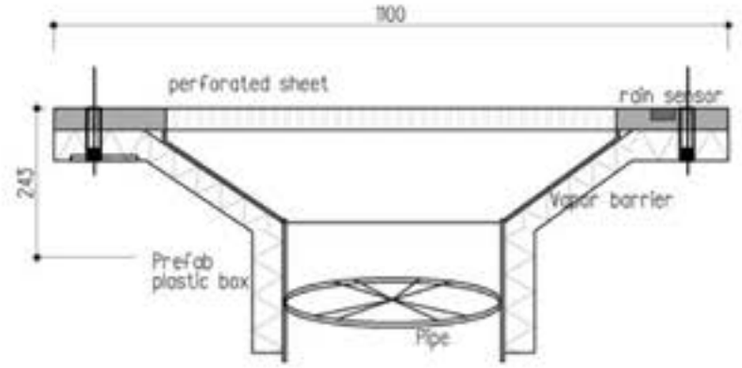

**walkable static** and **exterior window** components



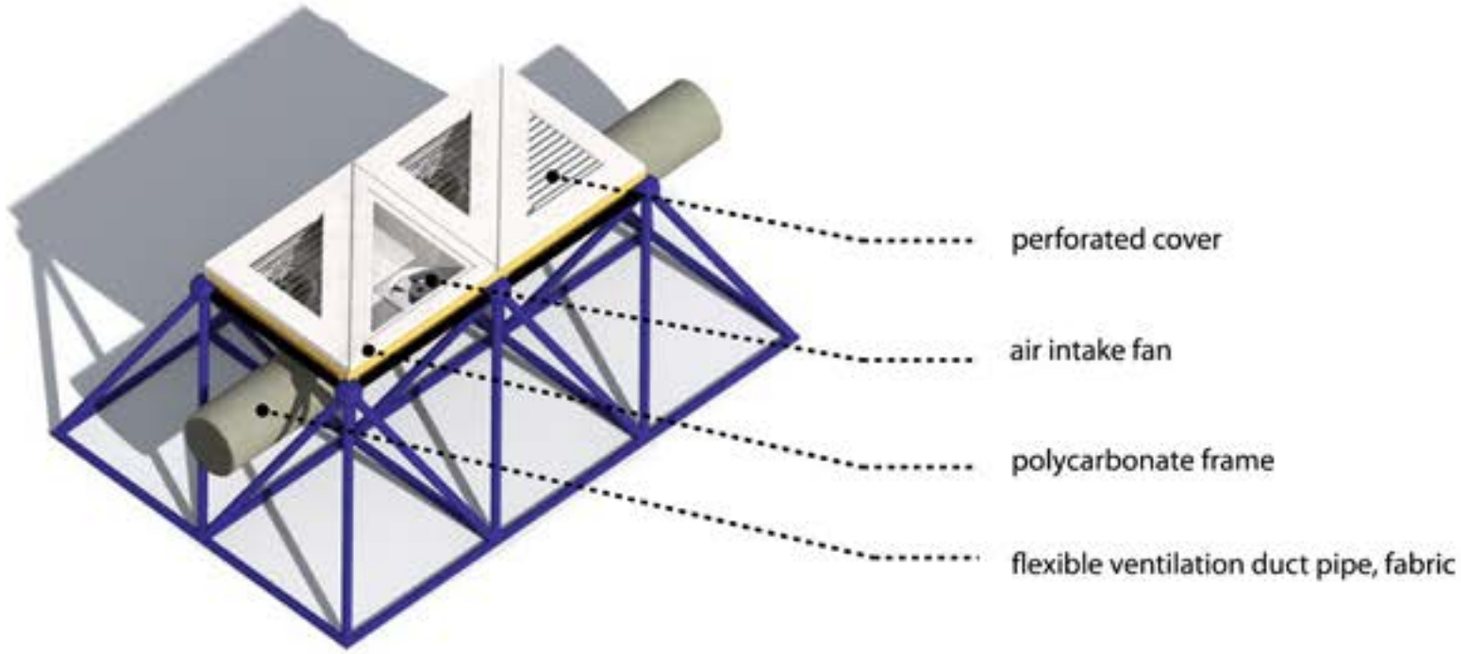



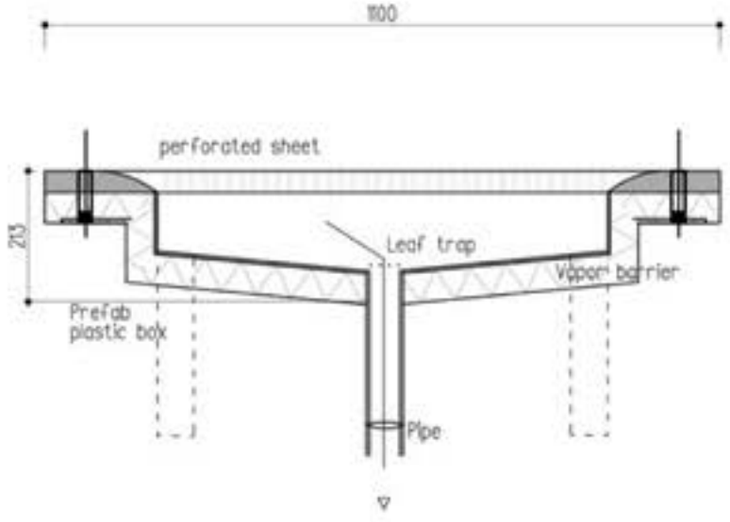

**solar harvesting** components



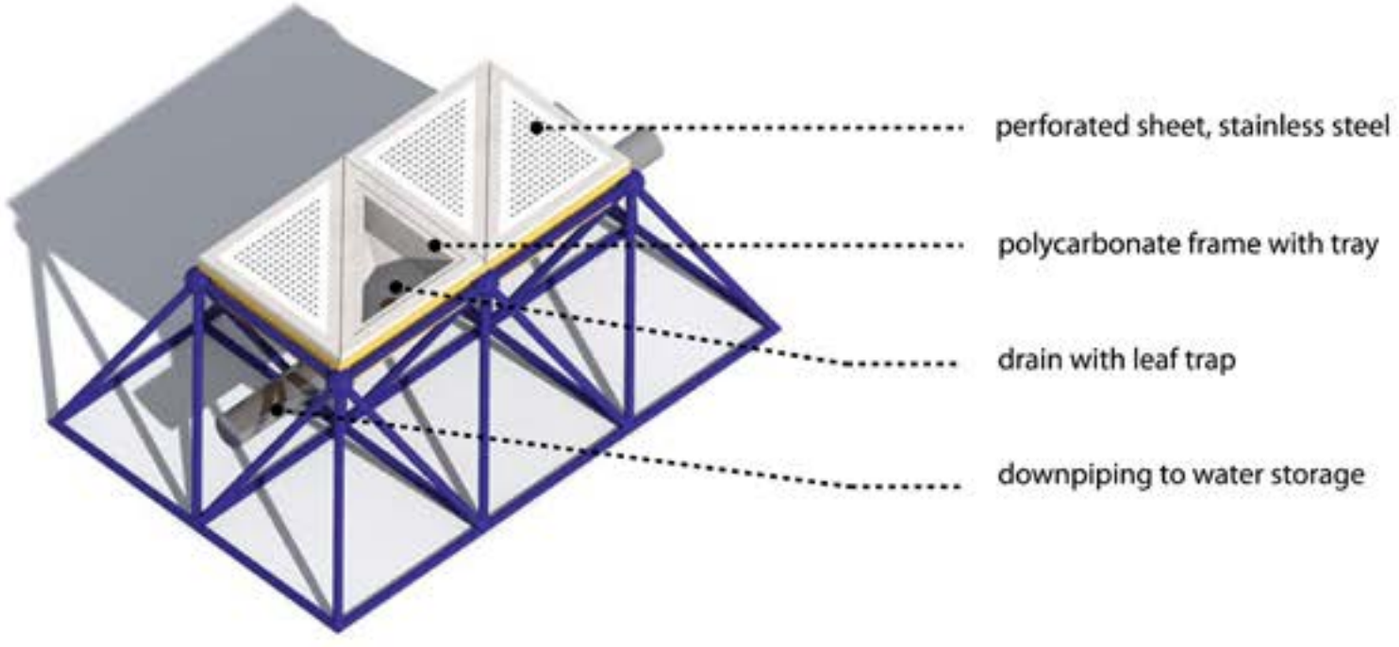



**ventilation** components

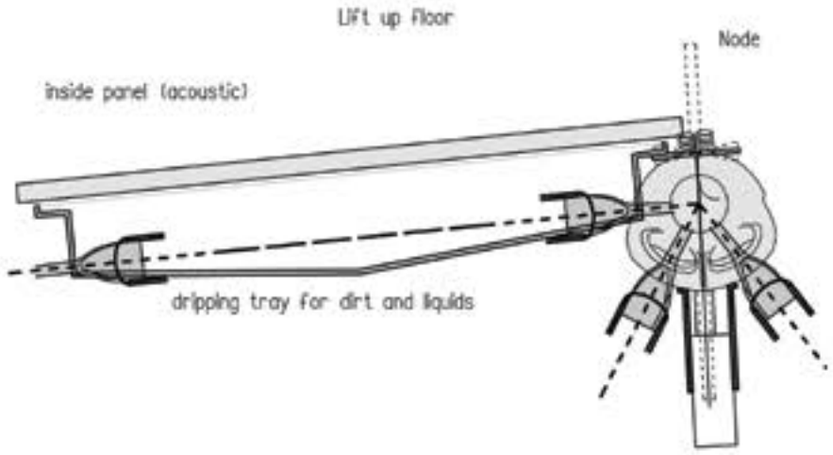


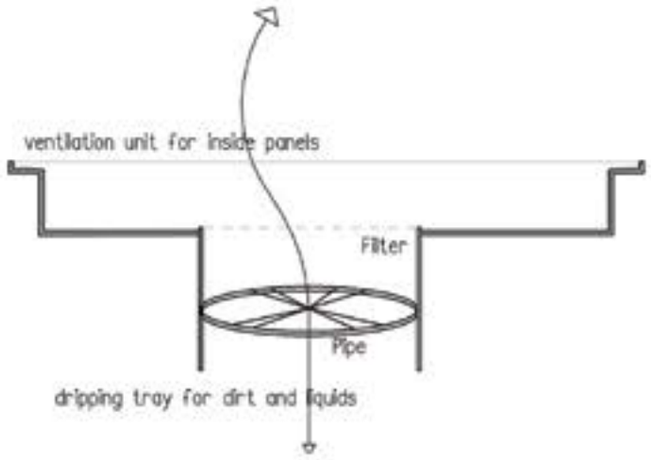



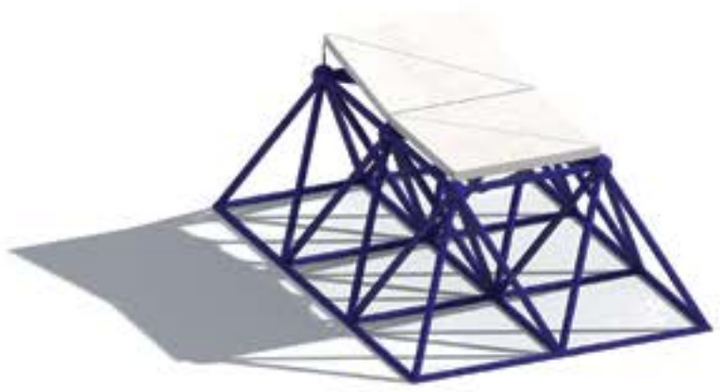

**rainwater harvesting** components



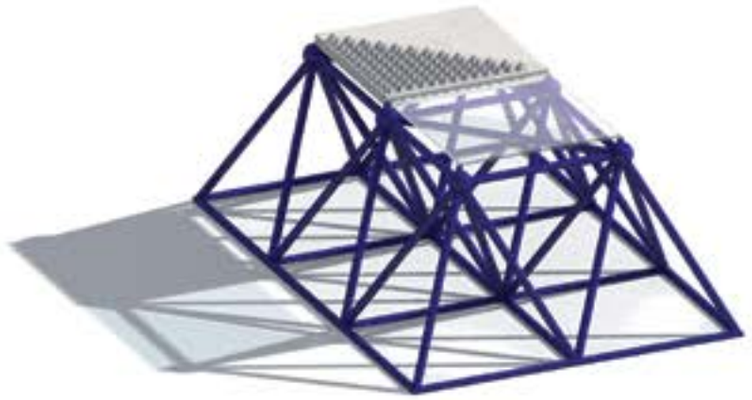

**interior components**



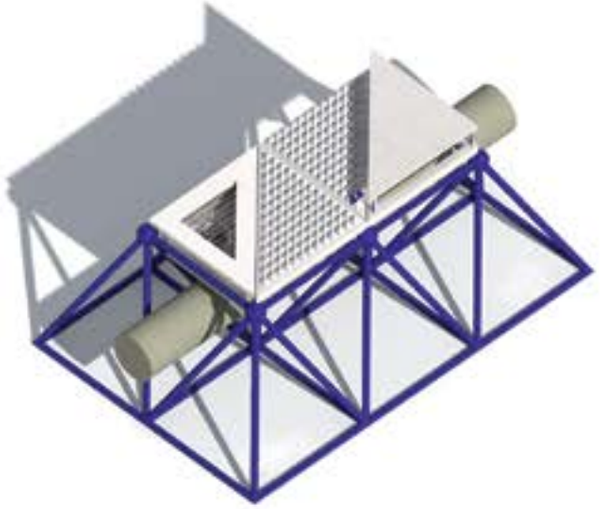



**flooring components**



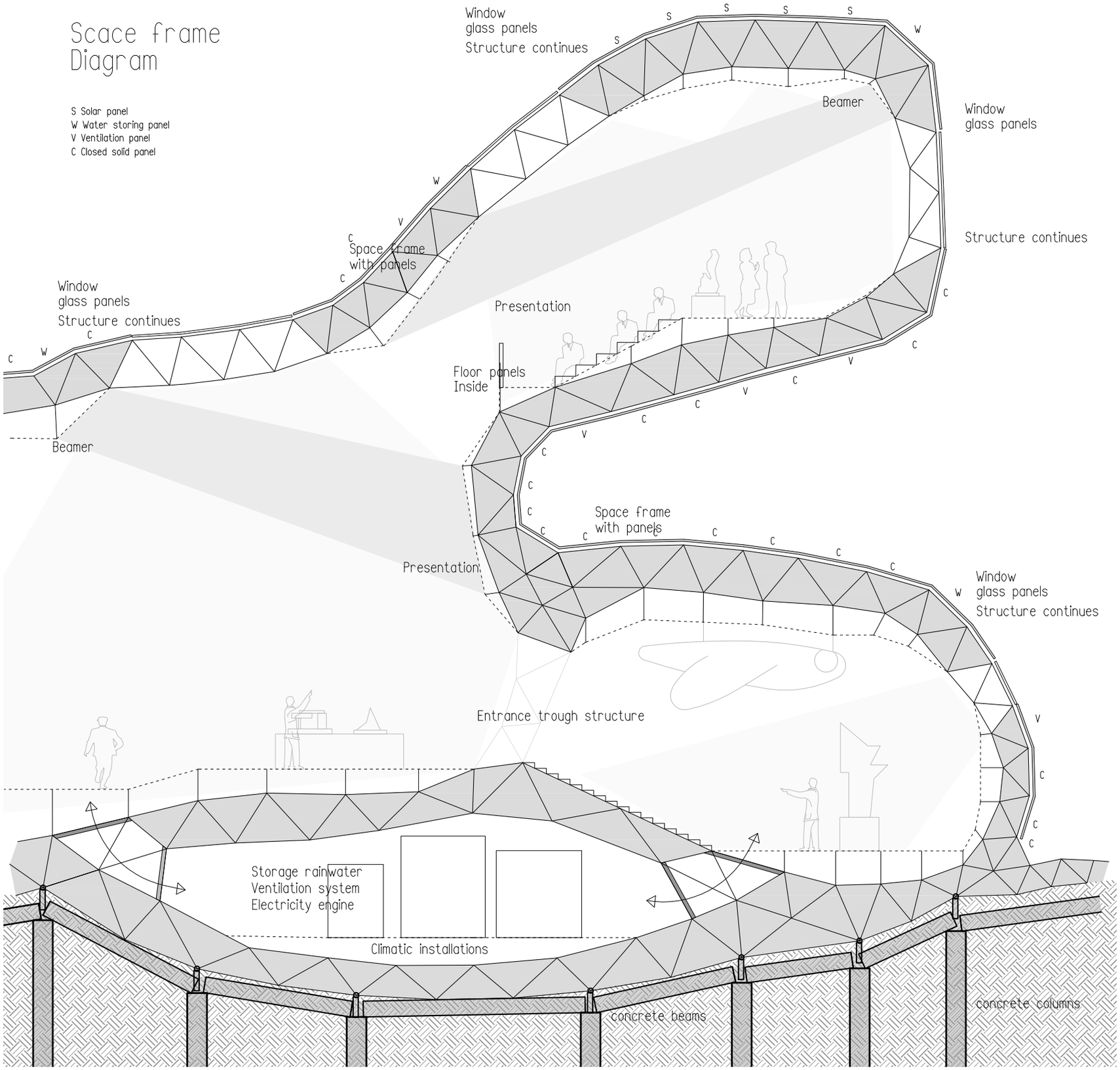
**wall components**

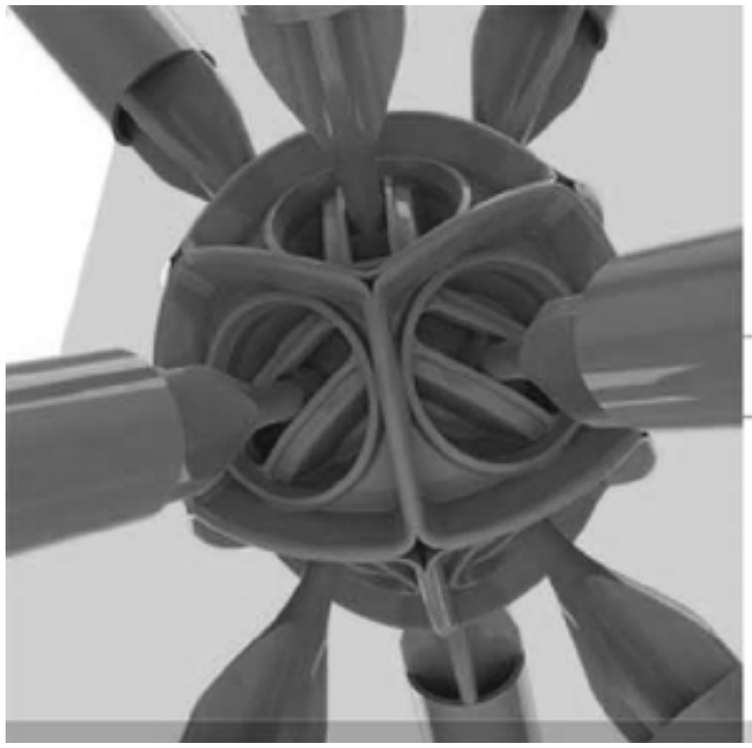


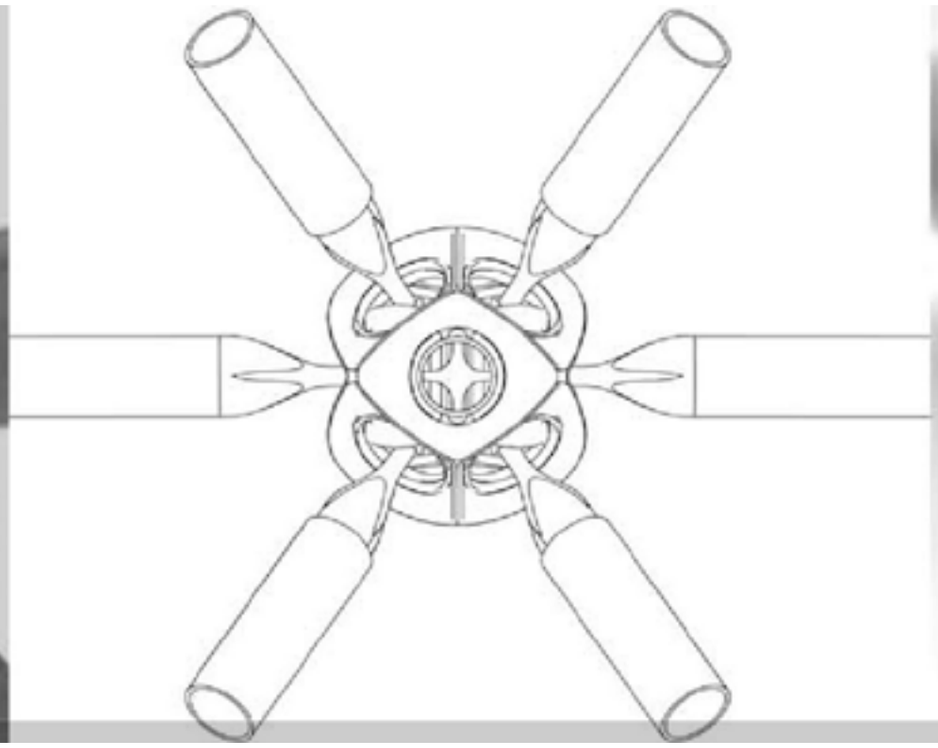
**ceiling components**

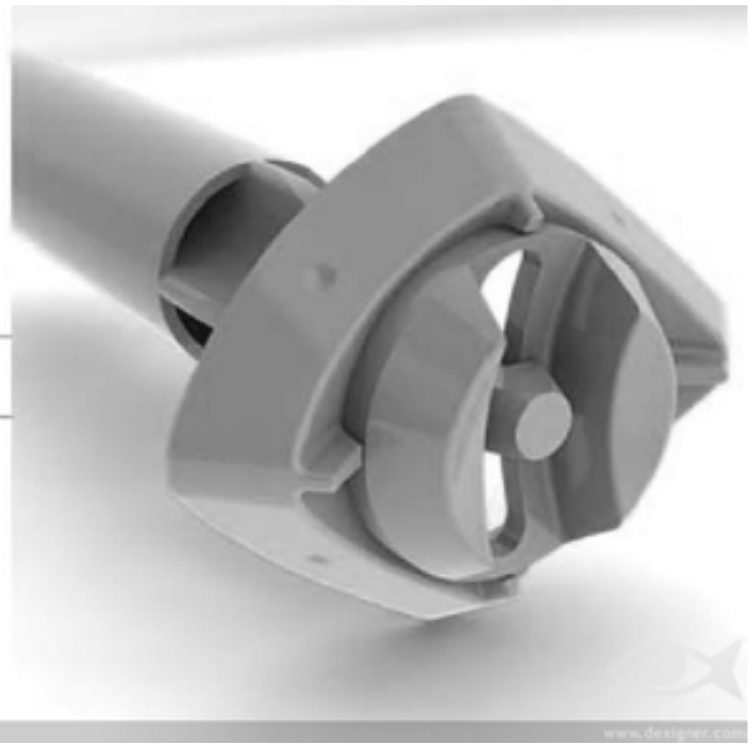
# Scace frame Diagram

S Solar panel
W Water storing panel
V Ventilation panel
C Closed solid panel



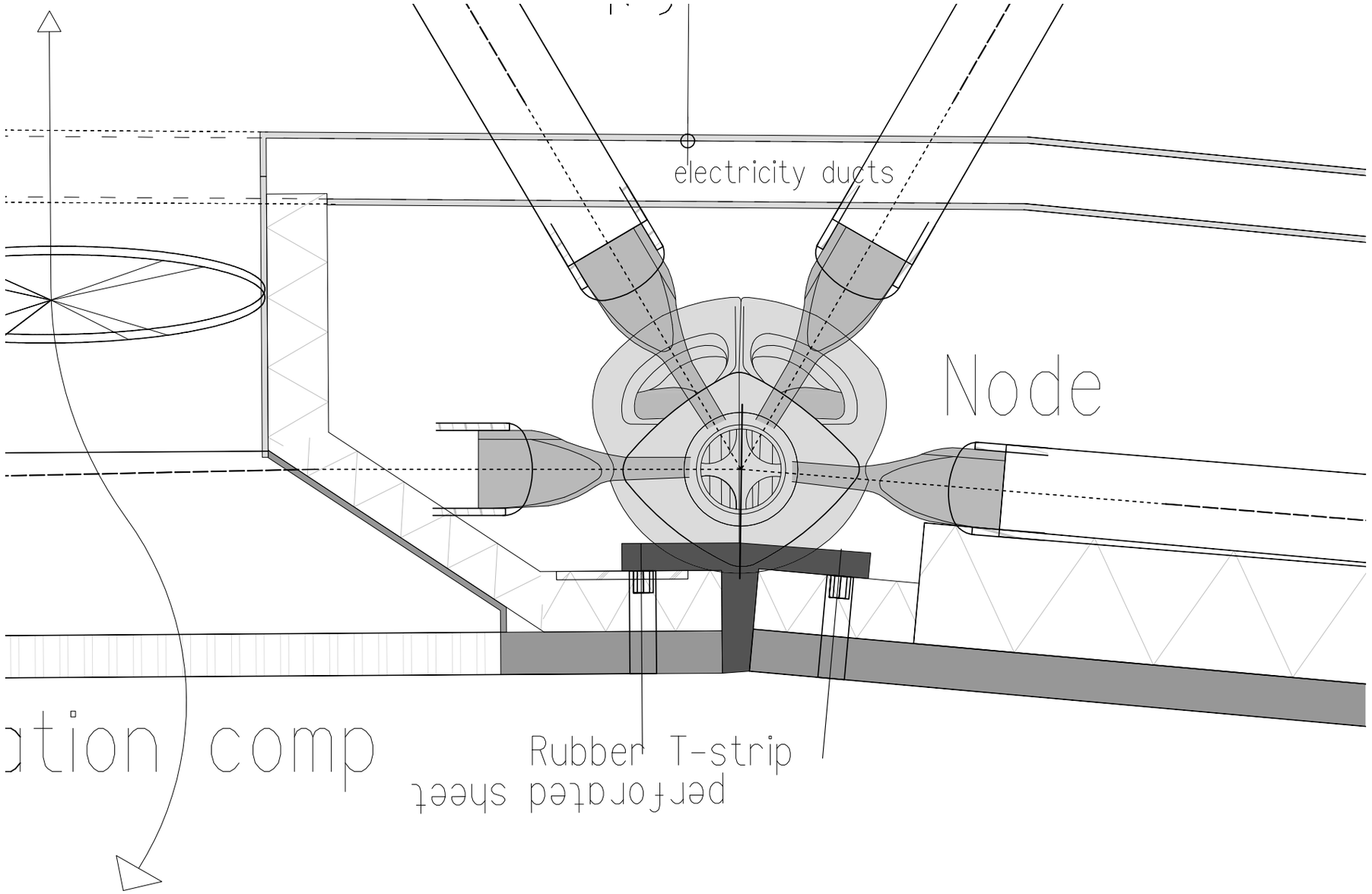


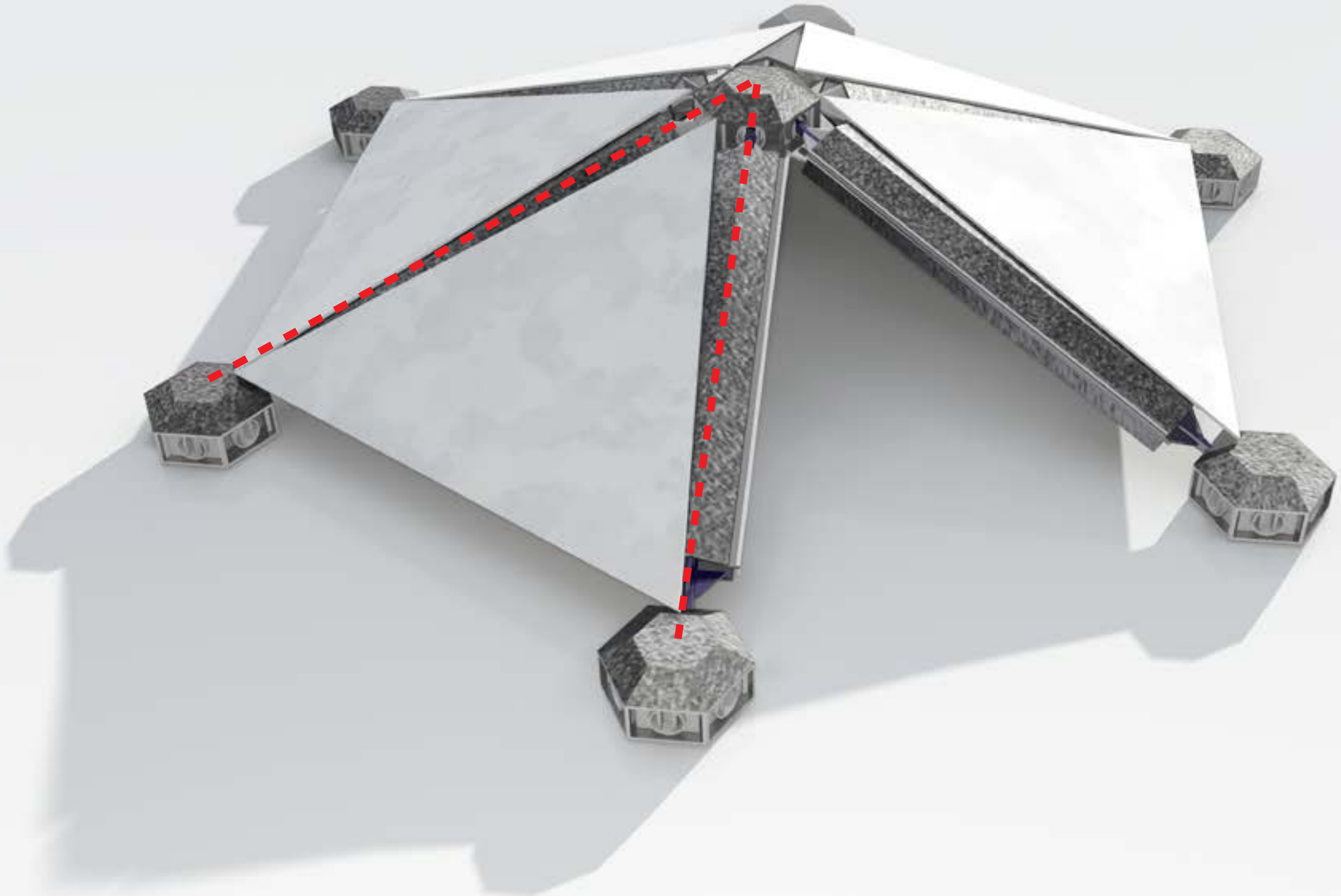


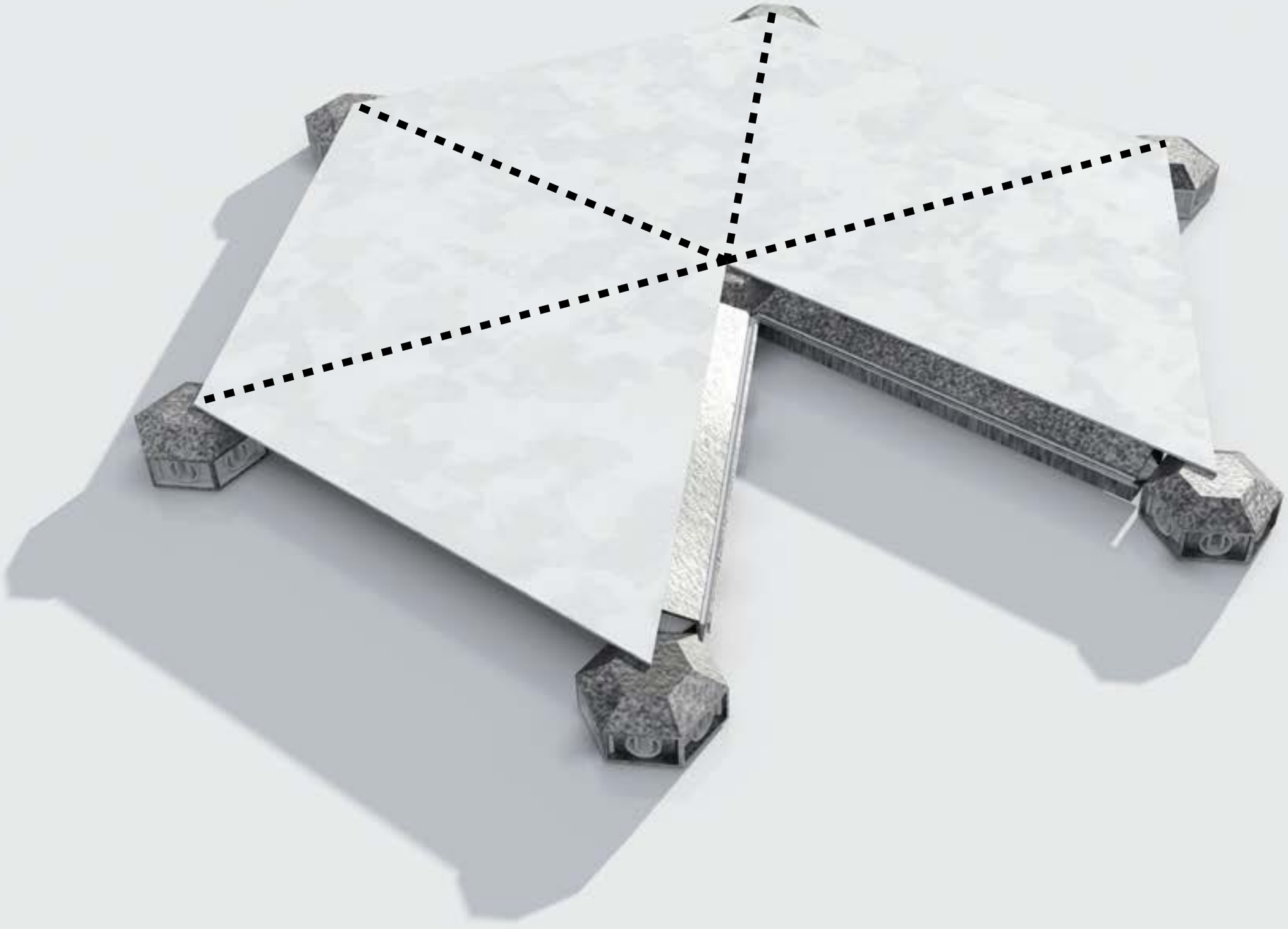


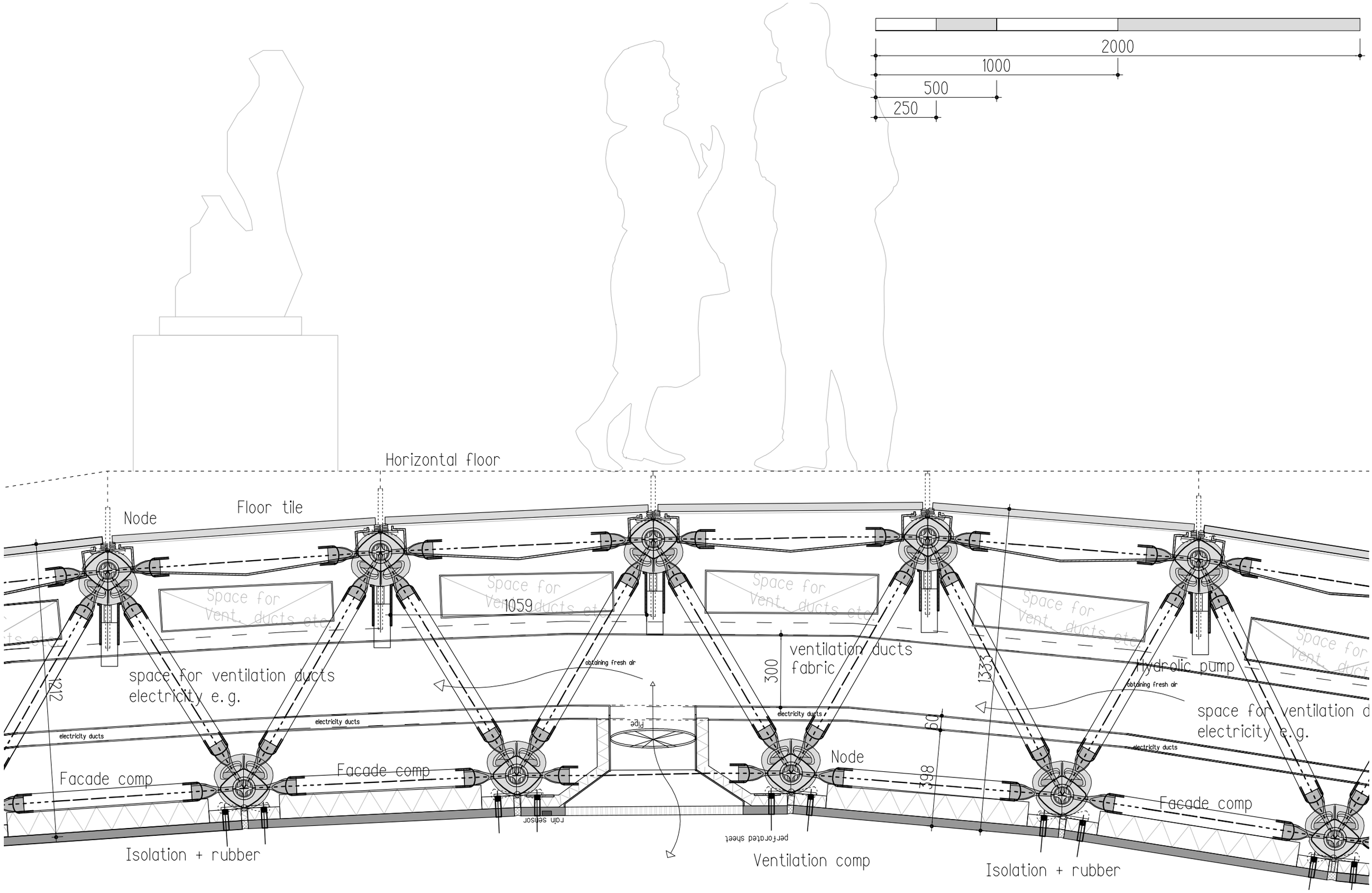


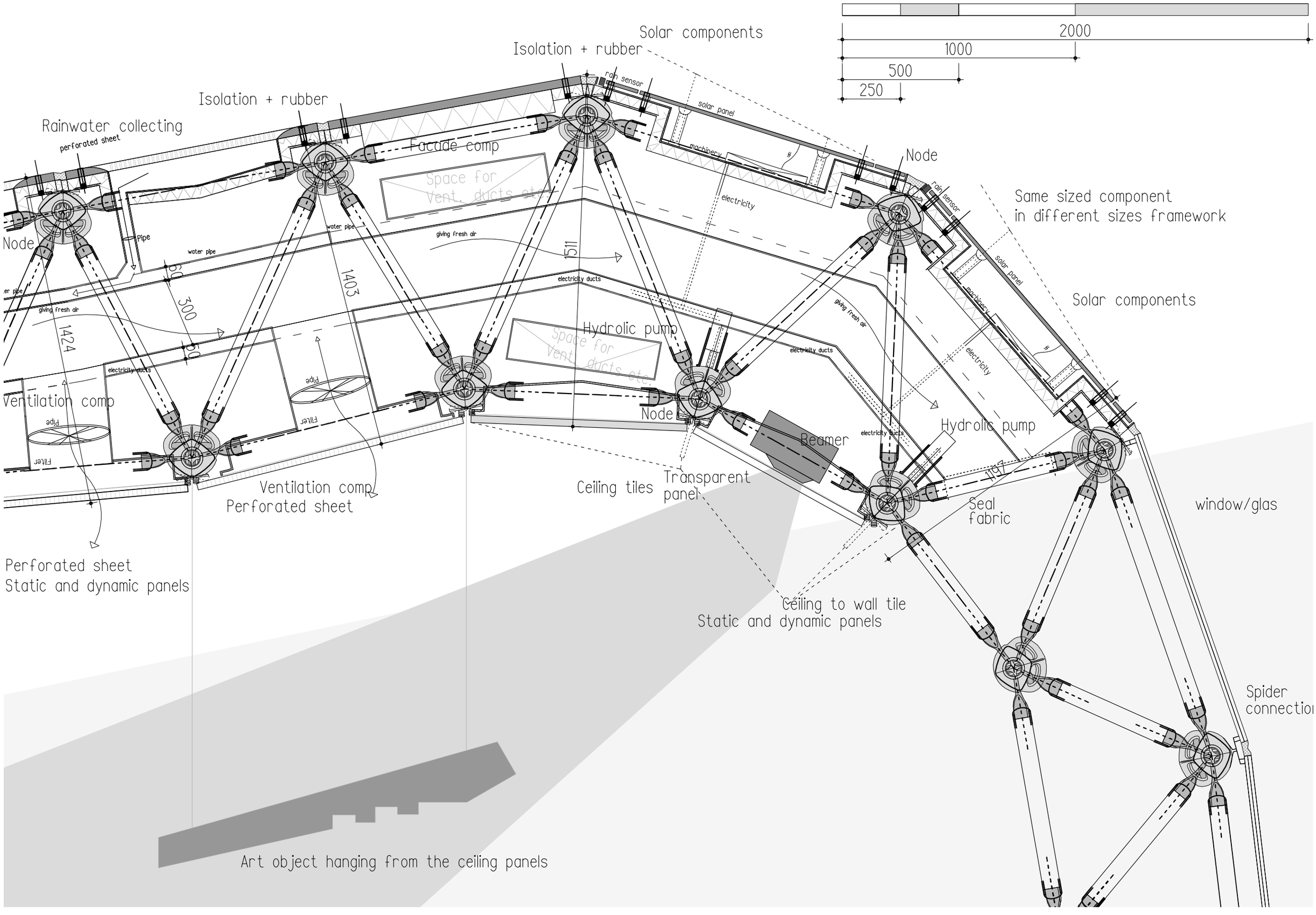
REFERENCE: OCTA.BOT - ALEXIS ROCHAS


electricity ducts
Node
ction comp
Rubber T-strip
perforated sheet






2000
1000
500
250
Horizontal floor
Node
Floor tile
Space for Vent. ducts etc
1059
space for ventilation ducts electricity e.g.
1212
obtaining fresh air
300
ventilation ducts fabric
1333
Hydrolic pump
electricity ducts
Facade comp
Facade comp
Node
60
398
Facade comp
rain sensor
pipe
perforated sheet
Isolation + rubber
Ventilation comp
Isolation + rubber


2000
1000
500
250
Solar components
Isolation + rubber
Isolation + rubber
Rainwater collecting
perforated sheet
Facade comp
Space for
Vent. ducts etc
rain sensor
solar panel
machinery
electricity
Node
Same sized component
in different sizes framework
Node
Pipe
water pipe
water pipe
giving fresh air
1511
1403
300
1424
electricity ducts
Hydrolic pump
Space for
Vent. ducts etc
Solar components
Ventilation comp
Pipe
Filter
Node
Beamer
Hydrolic pump
Ventilation comp
Perforated sheet
Ceiling tiles
Transparent
panel
Seal
fabric
window/glas
Perforated sheet
Static and dynamic panels
Ceiling to wall tile
Static and dynamic panels
Spider
connectio
Art object hanging from the ceiling panels

# skintegration

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## ANIMATION