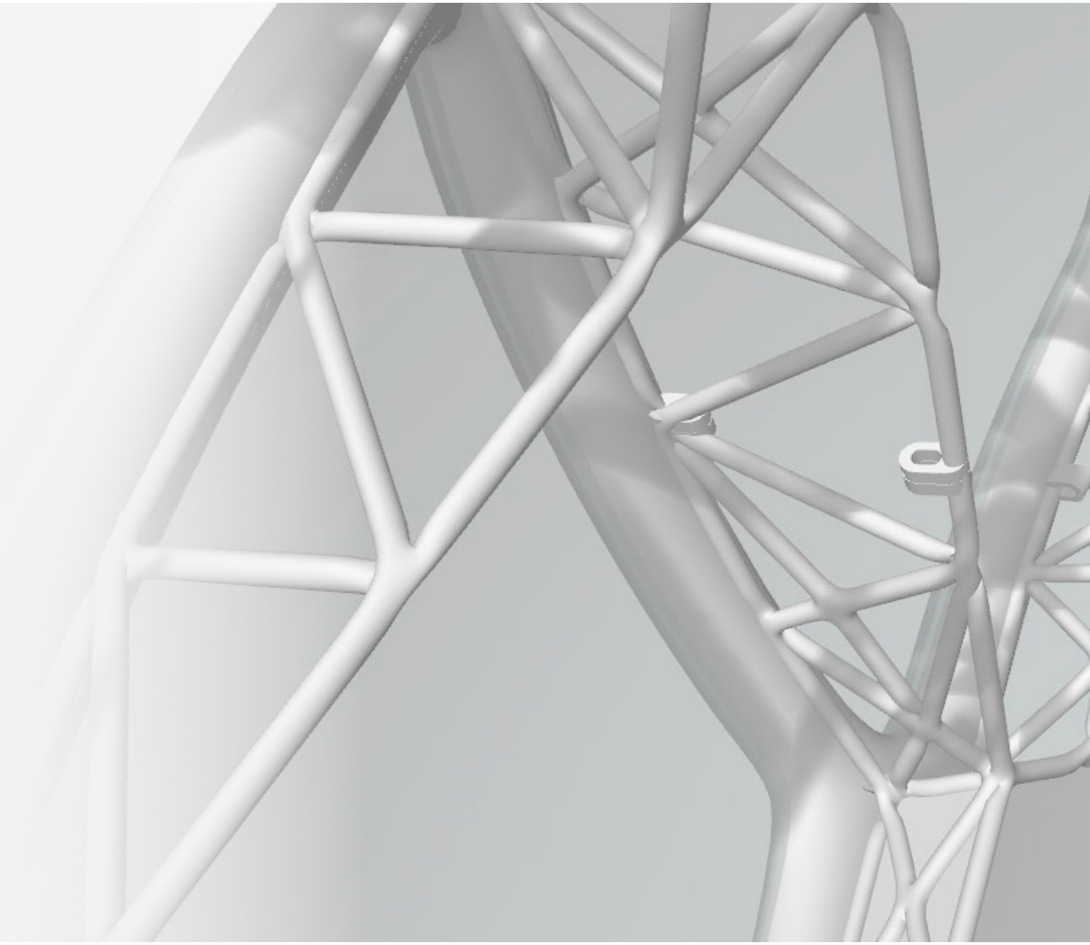
factory of the future

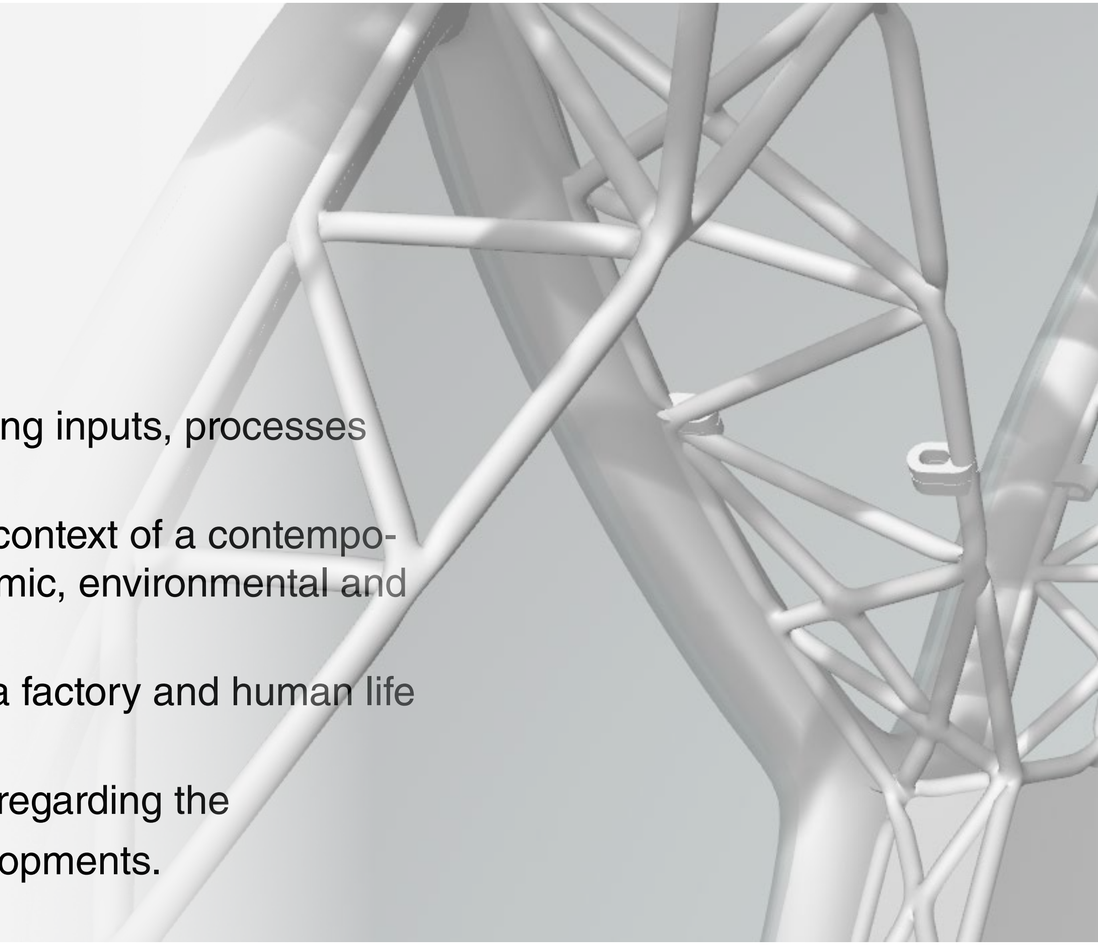
drawing in space

Graduation project by Olav van der Doorn.
P5 Presentation - April 20th 2018

Tutors:
Henriëtte Bier
Sina Mostafavi
Ferry Adema
(Karel Vollers)



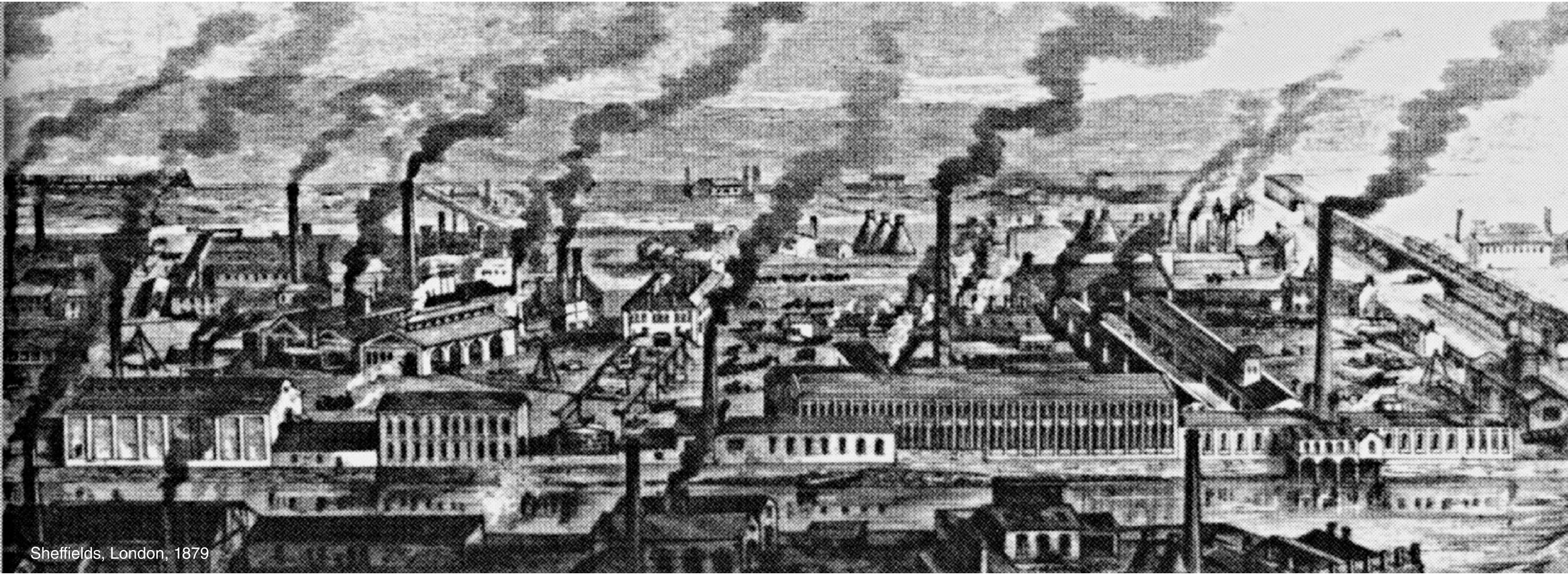
Content



Research aspects:

1. The logic of the factory of the future, regarding inputs, processes and outputs.
2. How a factory can be shaped to fit into the context of a contemporary western urban area, regarding the economic, environmental and spatial aspects.
3. The connection between processes within a factory and human life outside of the factory.
4. Research robotics as a production method regarding the parametric design process and industry developments.

Goals



Sheffields, London, 1879

Concept

factory in the city

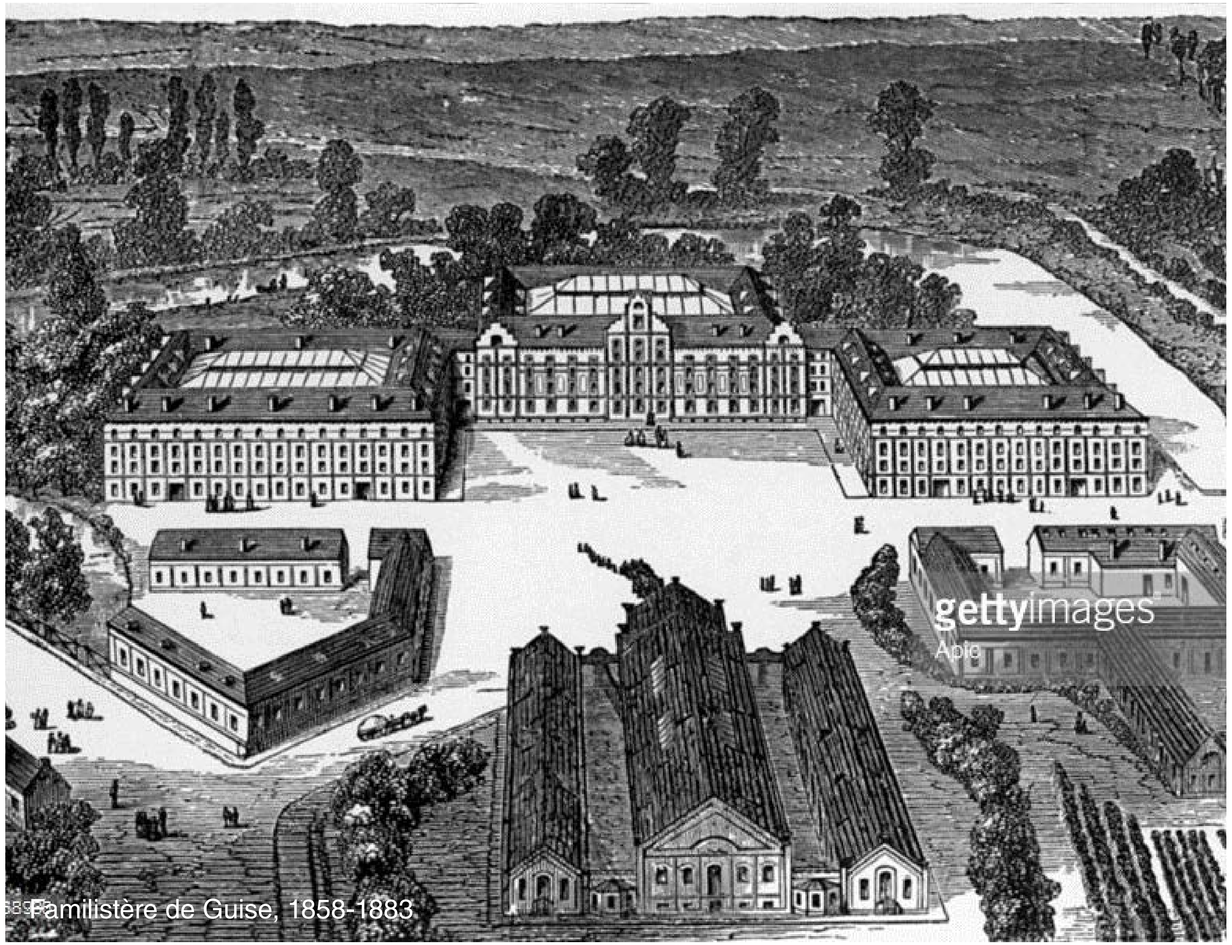
- Heavy pollution from industries

“Industrial sectors should be separated from residential sectors by an area of green open space.”

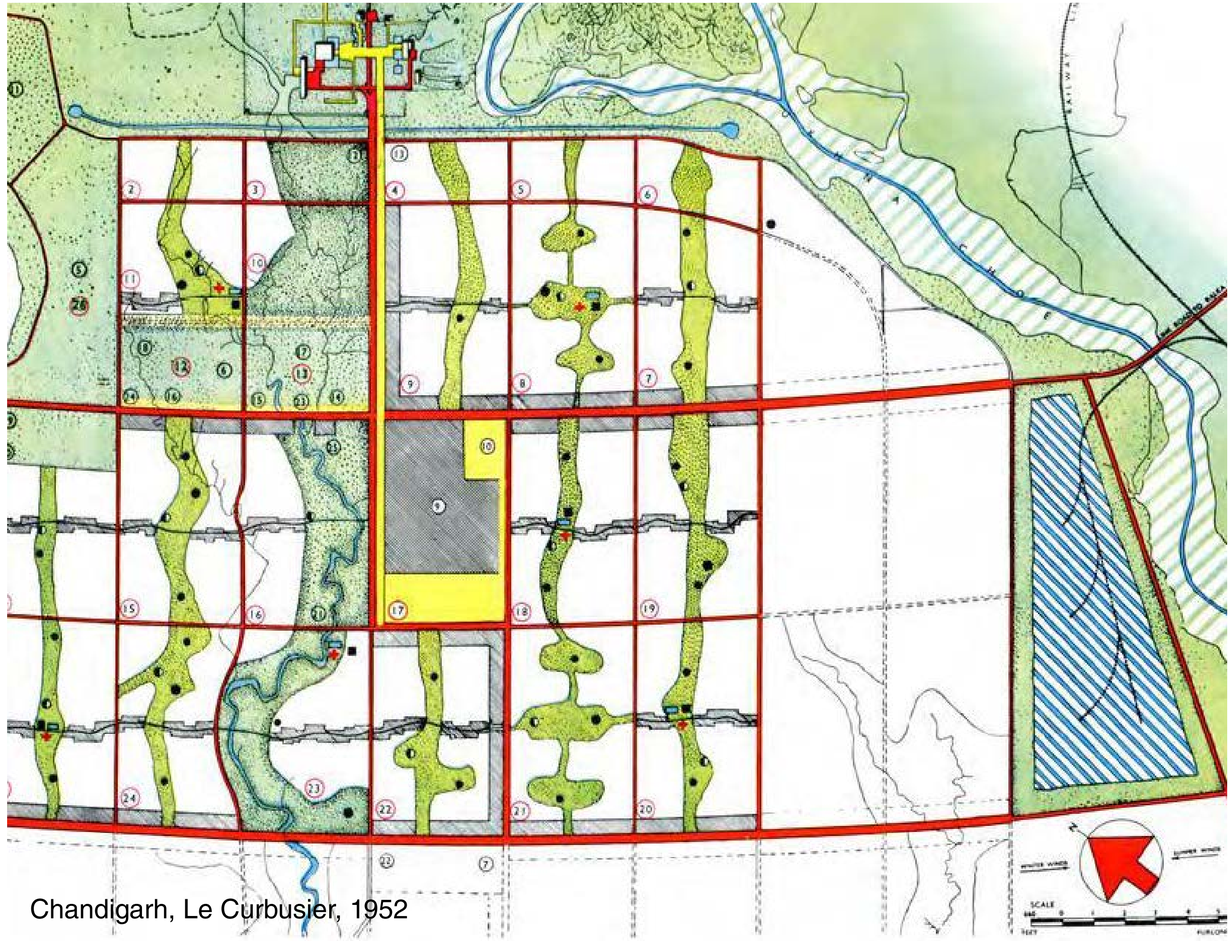
- Athens Charter, CIAM, 1933

Concept

factory in the city



Familistère de Guise, 1858-1883



Chandigarh, Le Curbusier, 1952

Concept

factory in the city

- Functional separation of factories from the city from the 1850's onward

Blockhood Game, Plethora

Concept

network factory

- Mutual dependencies of quantitive and qualitative resources

New Babylon, Constant 1955-1975

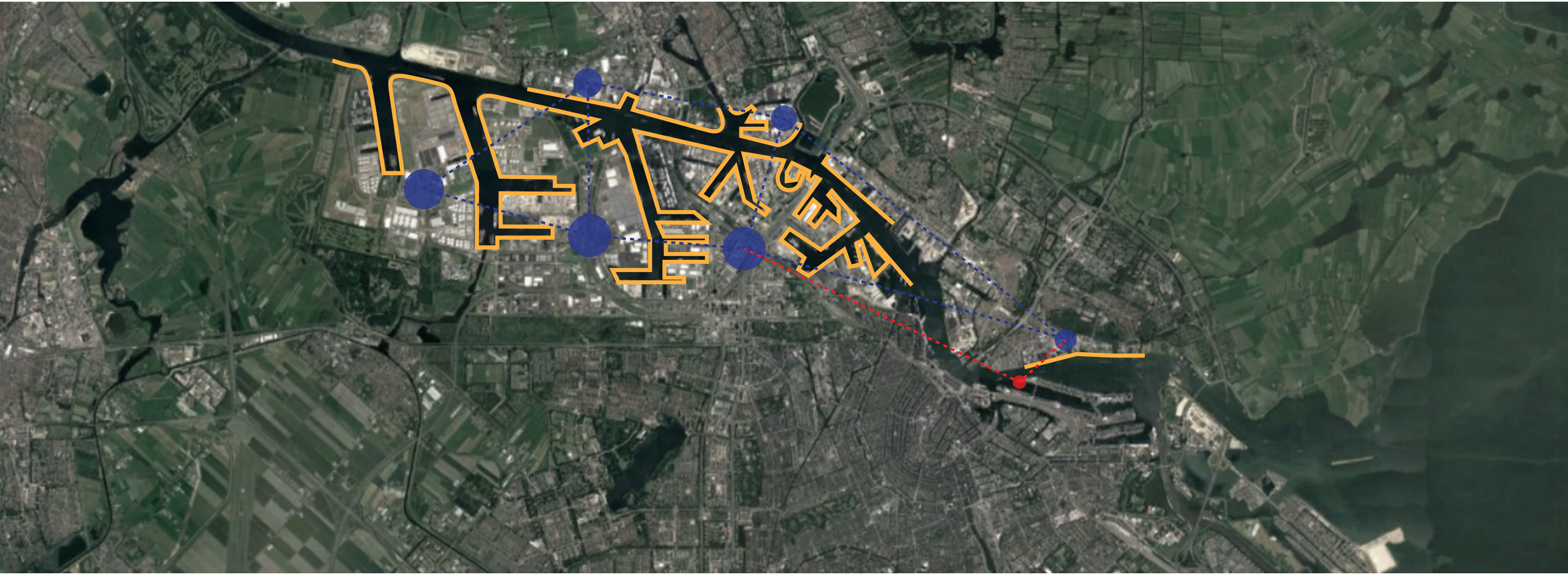
Concept

network factory

- Network structure of city
- Completely automated means of production

Urban

network factory / city



Urban

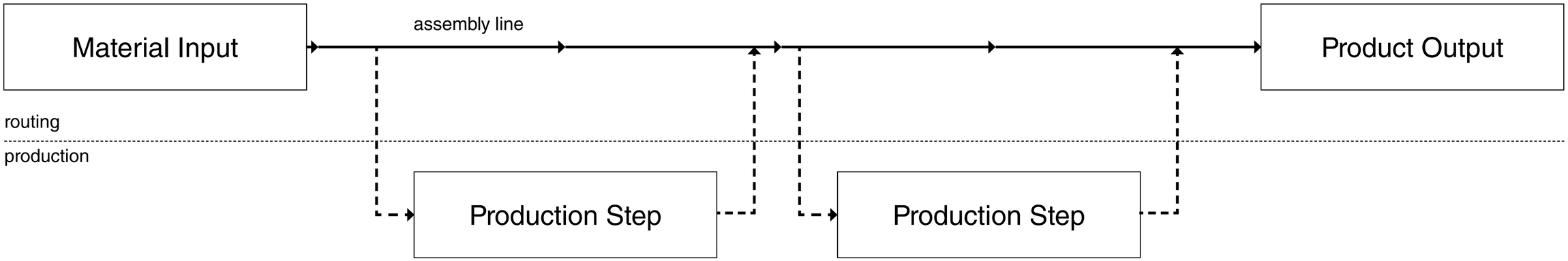
network factory / city

Automated routing in factories

Automated production in factories

Assembly line

routing & production



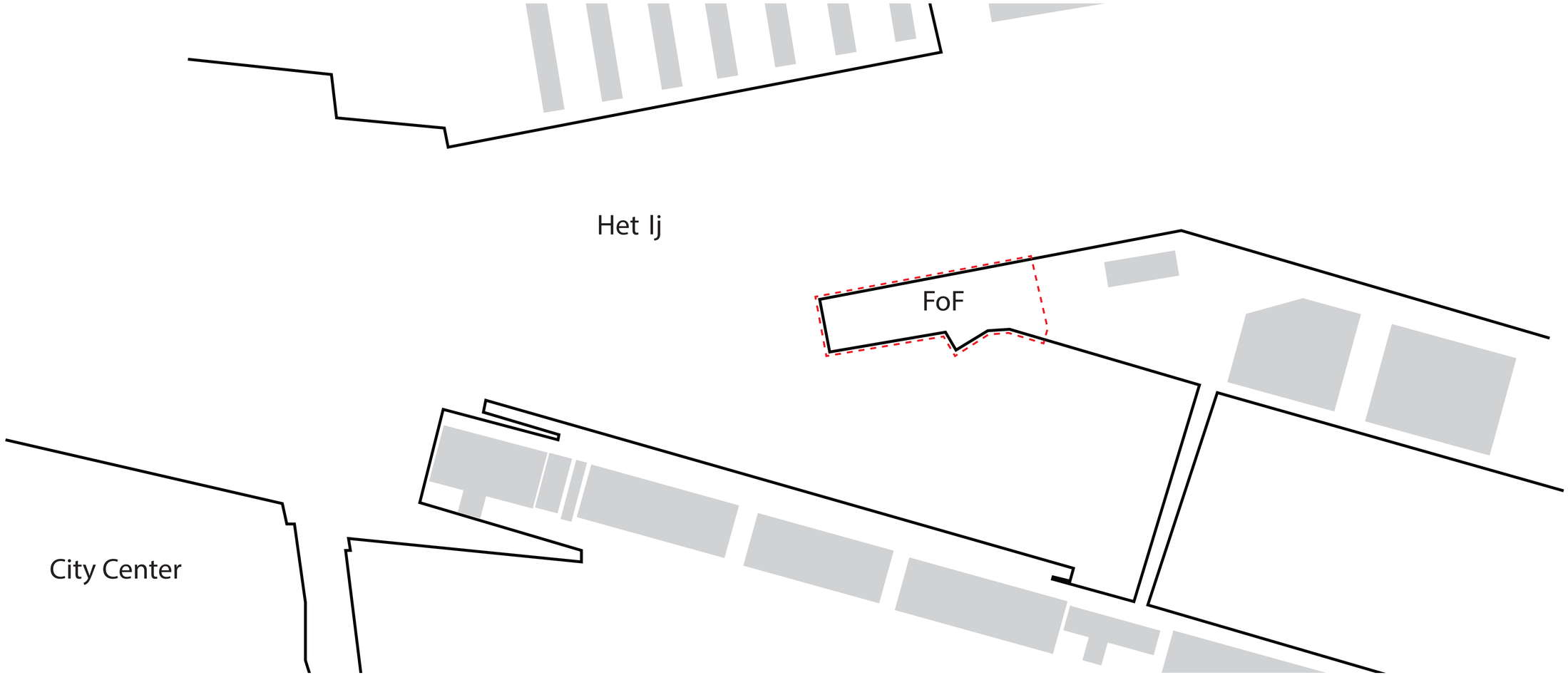
Assembly line
schematic

- Factory is combination of routing of material and production steps.
- Both have a different approach for automation

Context

Java-Eiland, Amsterdam

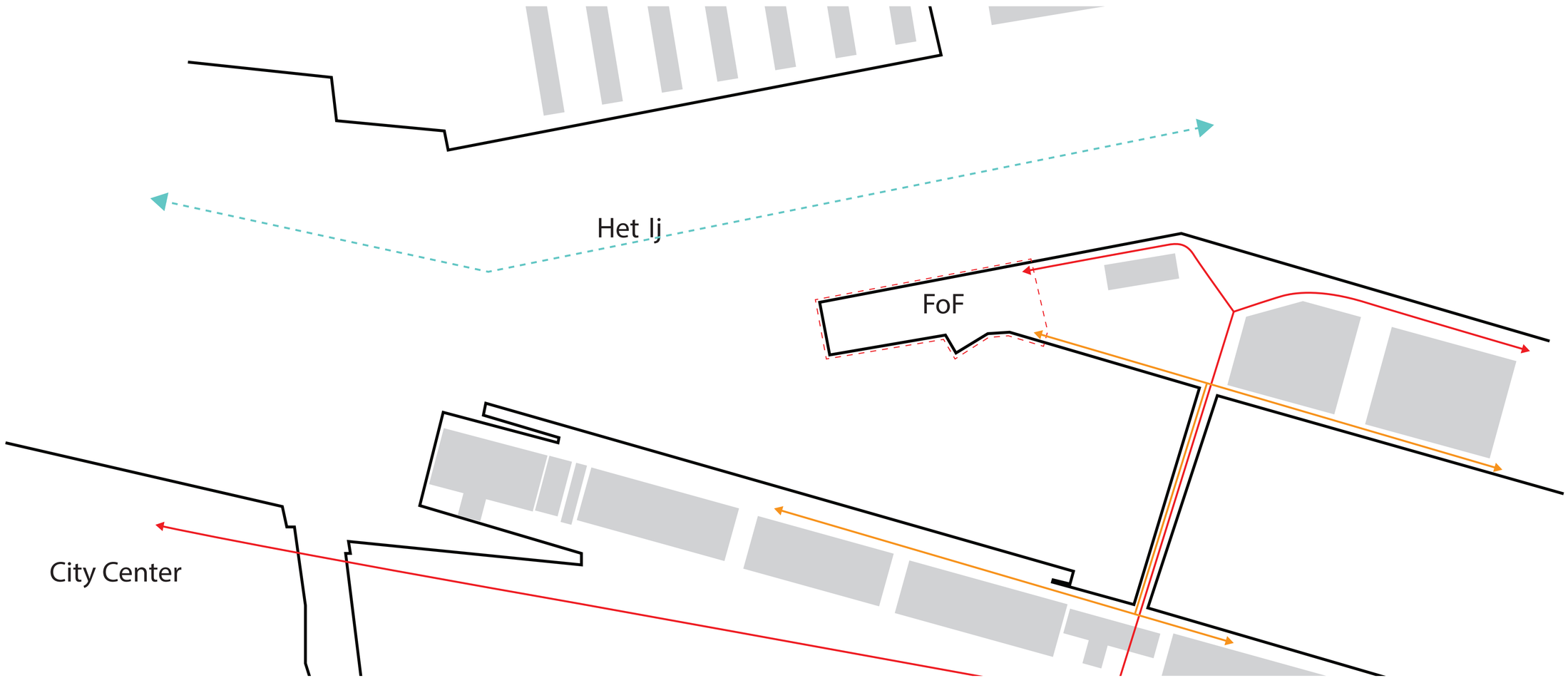
Java-Eiland
- Former industrial area
- Peninsula
- 5m walk to city center



Context

Java-Eiland, Amsterdam

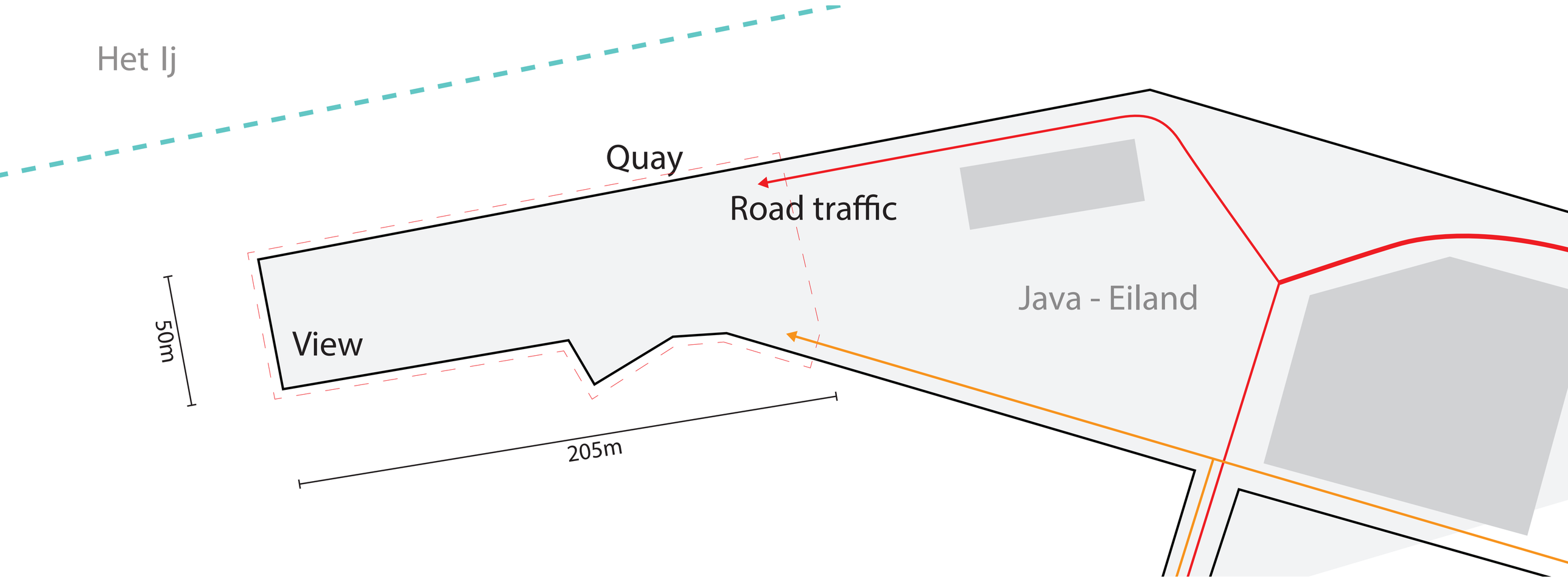
Java-Eiland
- Former industrial area
- Peninsula
- 5m walk to city center



Context

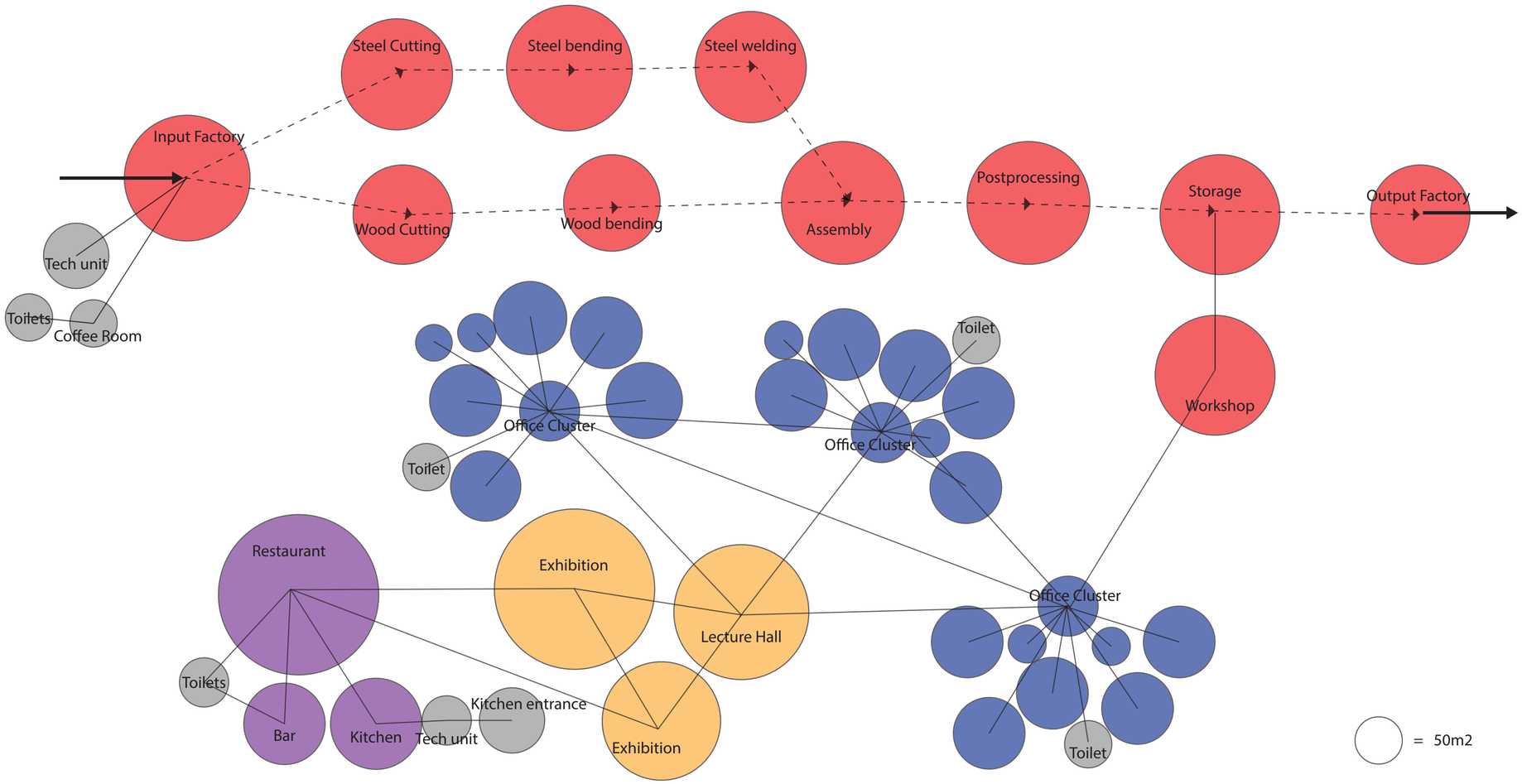
Java-Eiland, Amsterdam

road traffic
pedestrian paths
mayor waterway



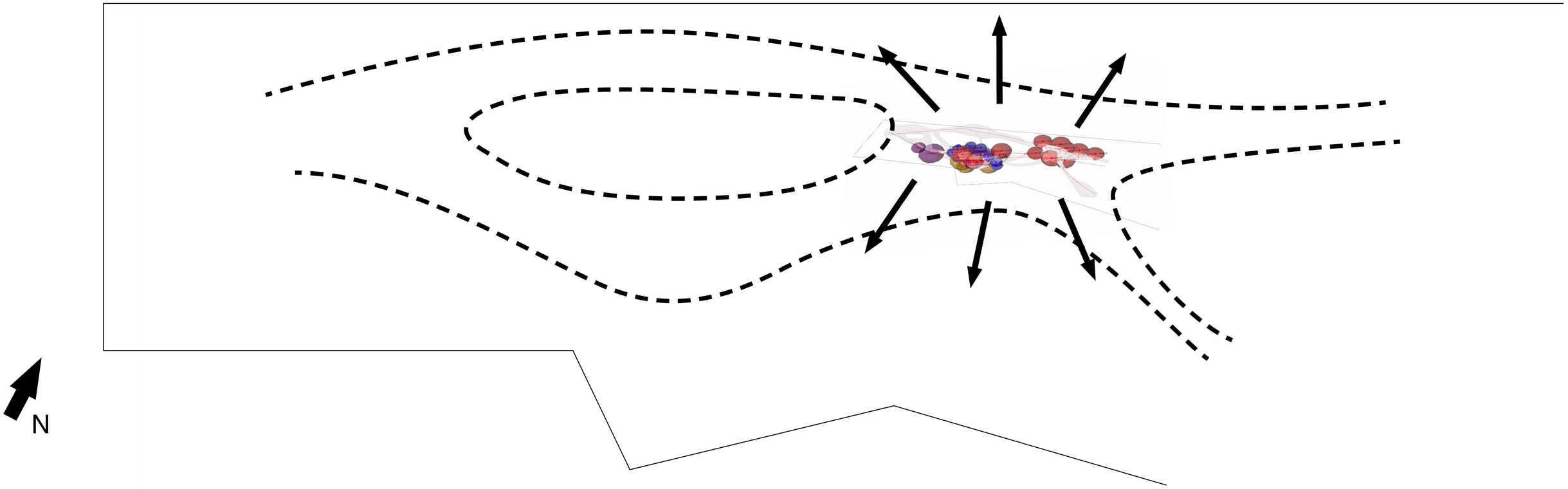
Context

Java-Eiland, Amsterdam



Spatial Layout

functions and connections

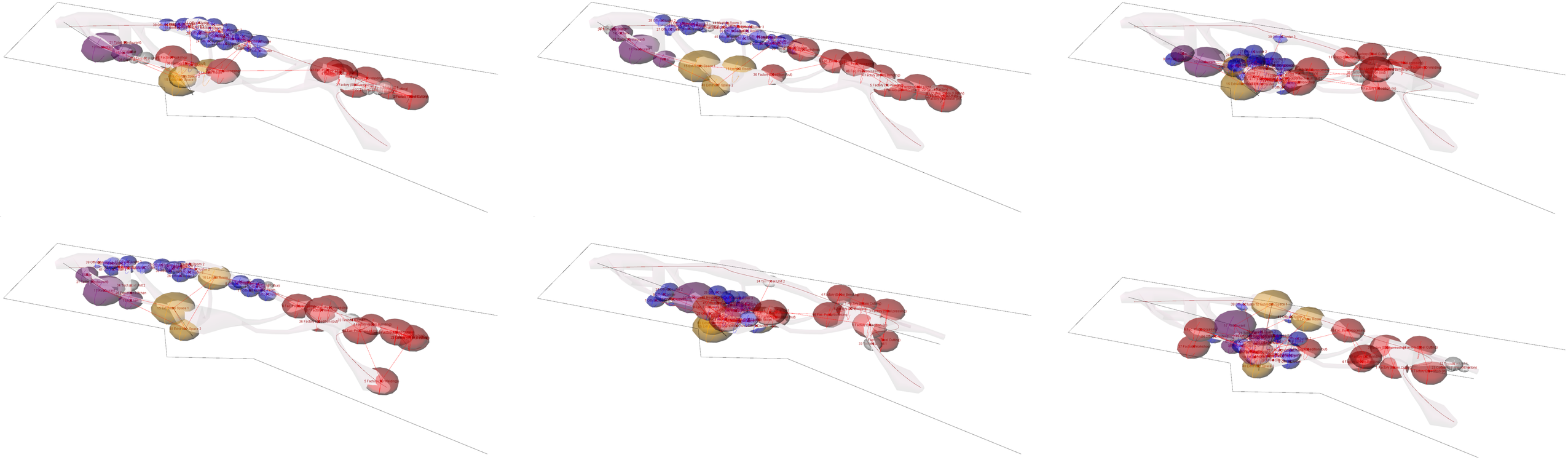


Spatial Layout

space syntax - input

Takes into account:
- Space size
- Connections
- Boundary
- Anchors

- factory
- office
- restaurant / bar
- exhibition / lecture
- other / tech

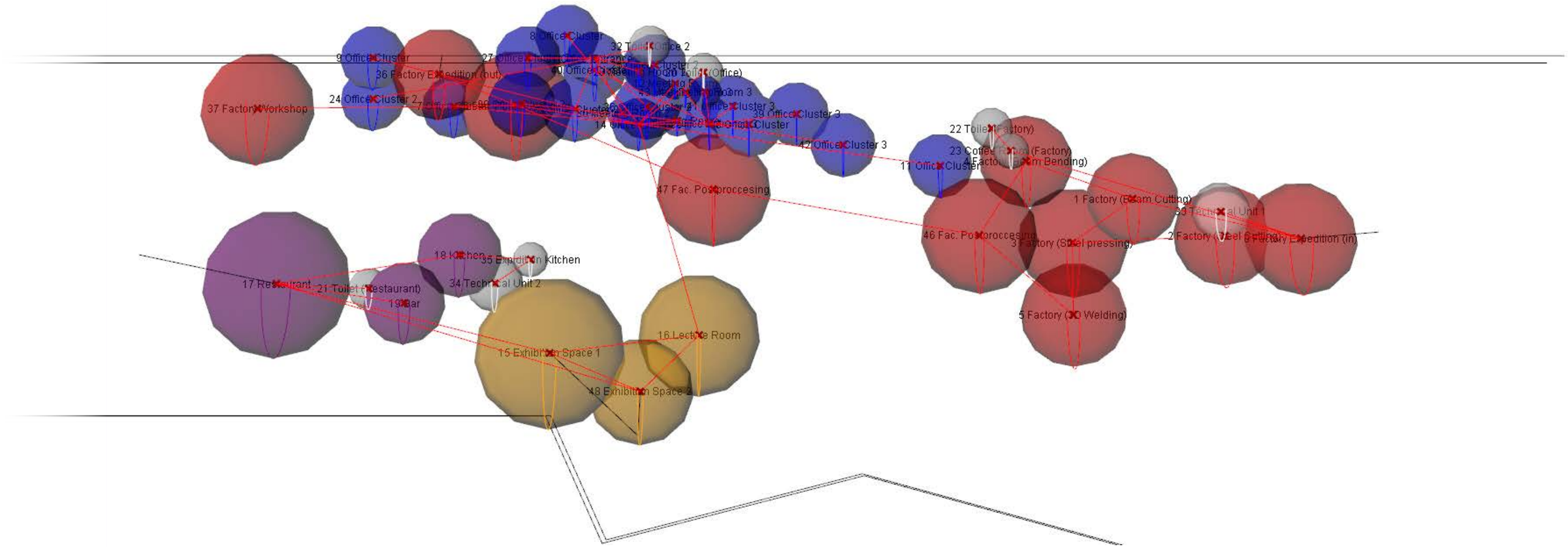


Spatial Layout

space syntax

Steps:
1. Create options
2. Test and save the better options
3. Manual interference

- factory
- office
- restaurant / bar
- exhibition / lecture
- other / tech



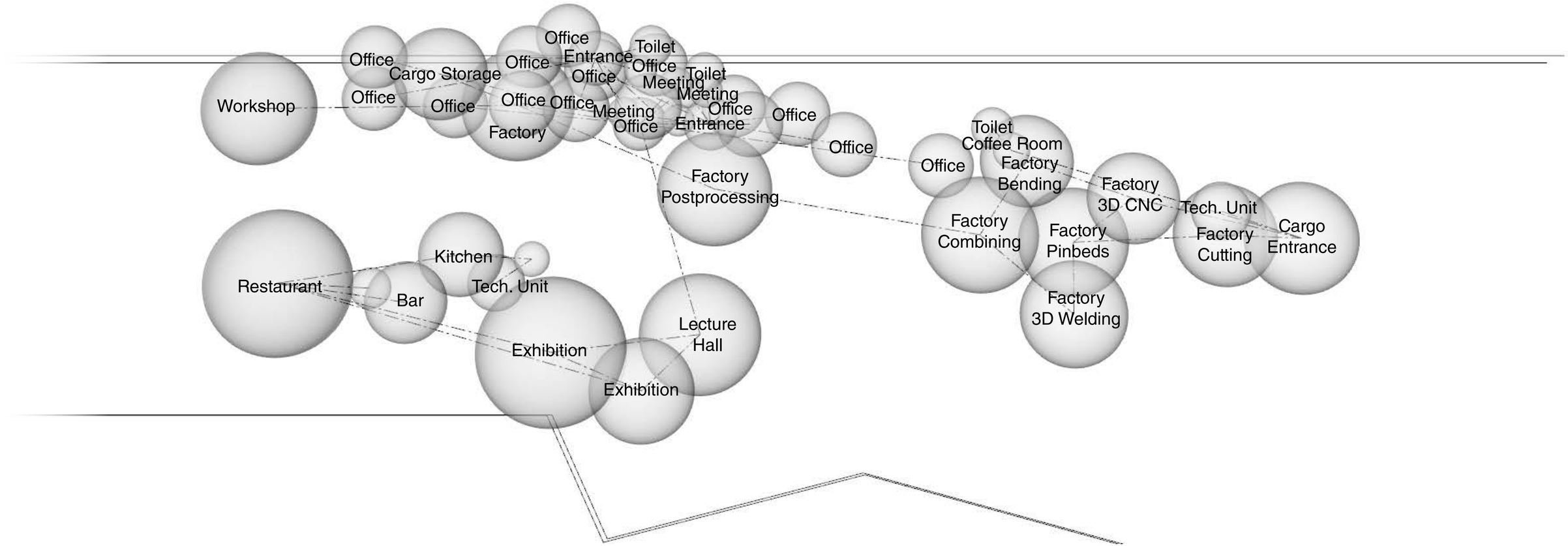
Spatial Layout

space syntax

Steps:

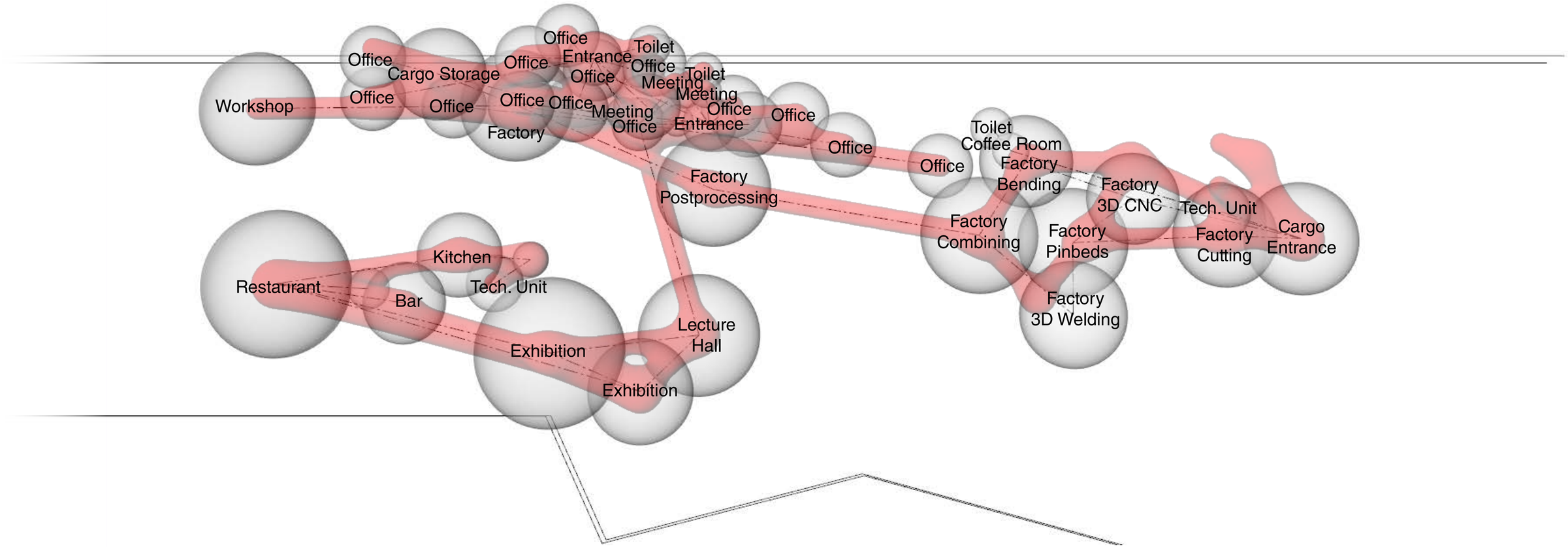
1. Create options
2. Test and save the better options
3. Manual interference

- factory
- office
- restaurant / bar
- exhibition / lecture
- other / tech



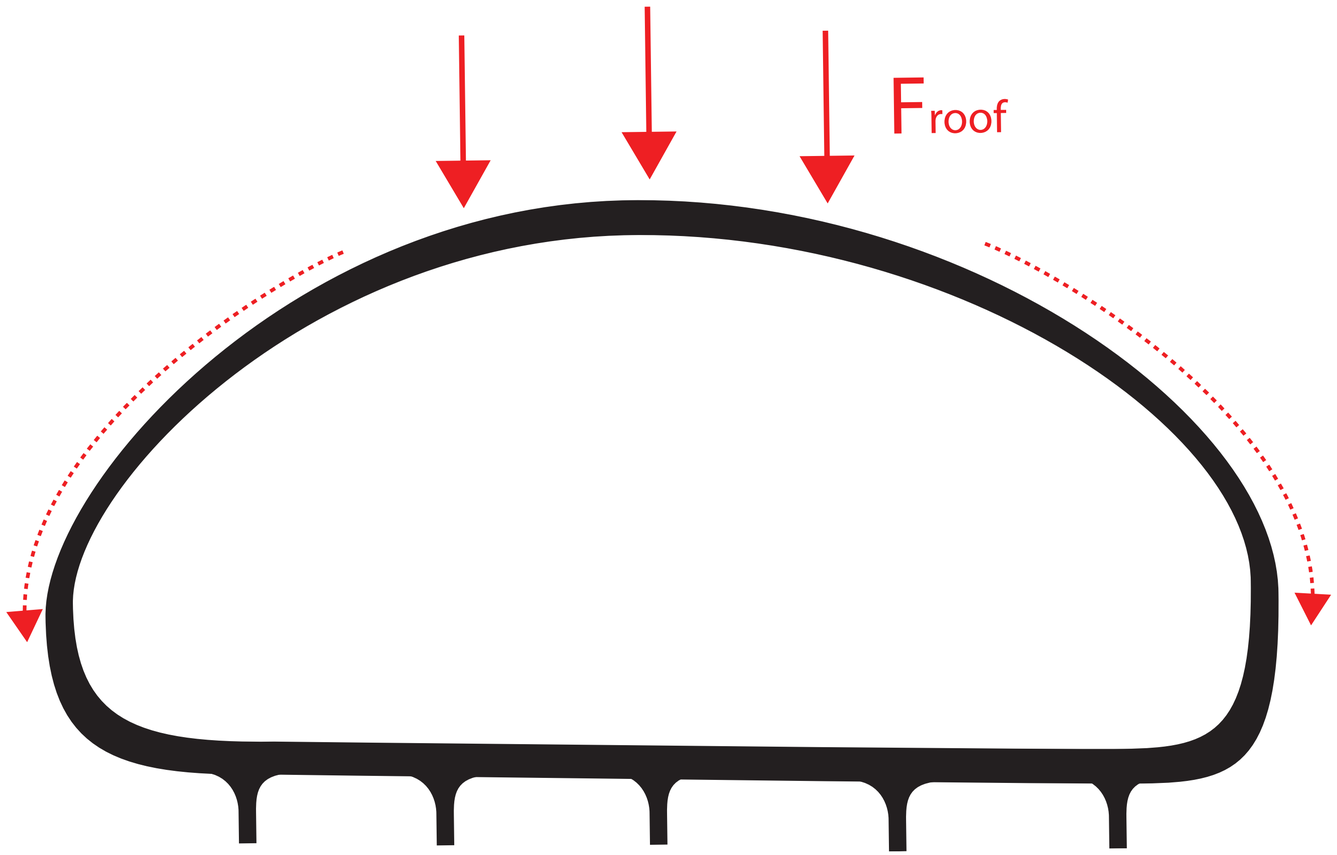
Spatial Layout

space syntax



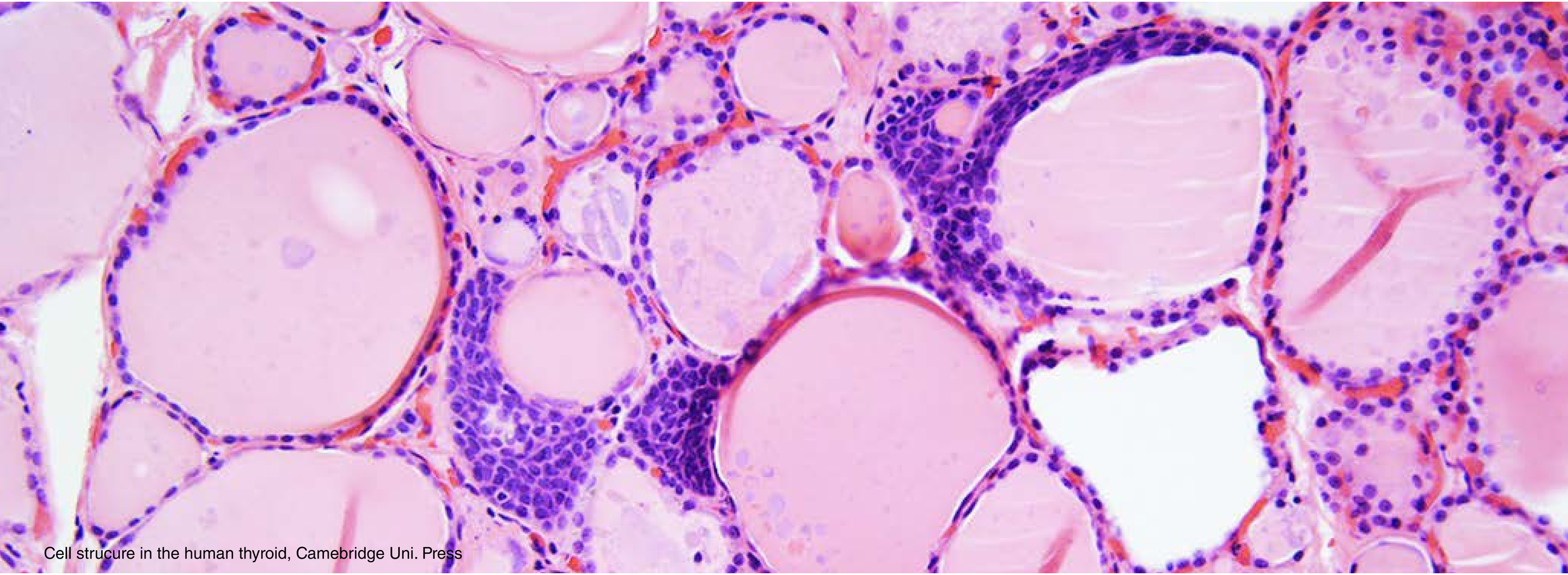
Spatial Layout

internal connections



Spatial Layout

basic shape of spaces

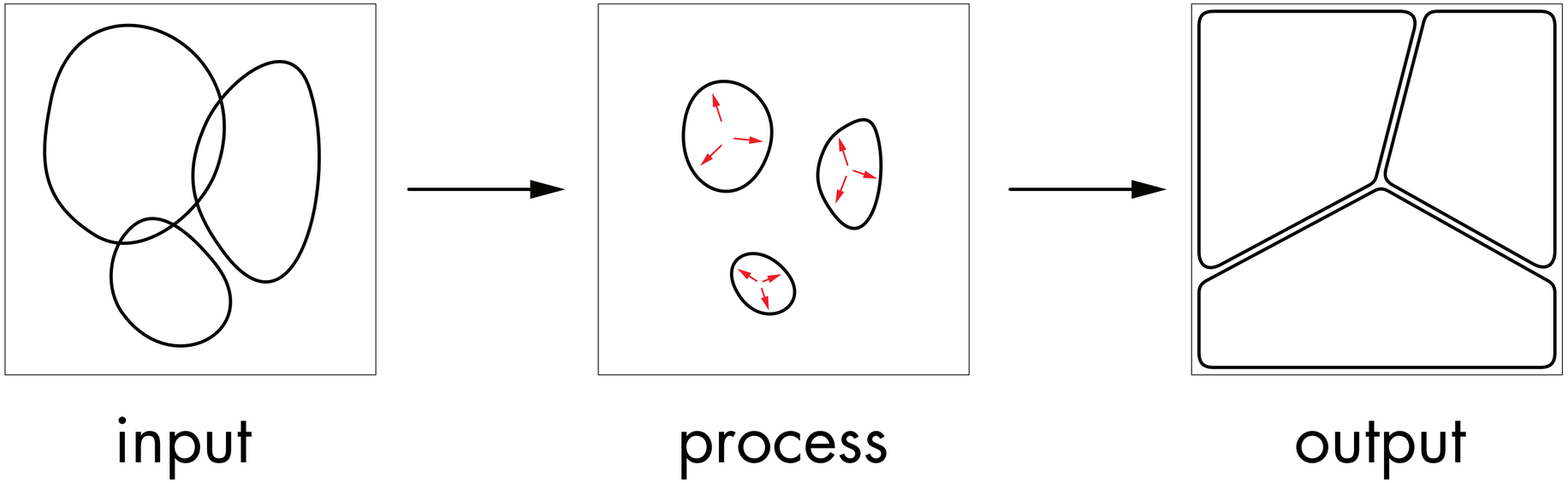


Cell strucure in the human thyroid, Camebridge Uni. Press

Spatial layout

cell structure

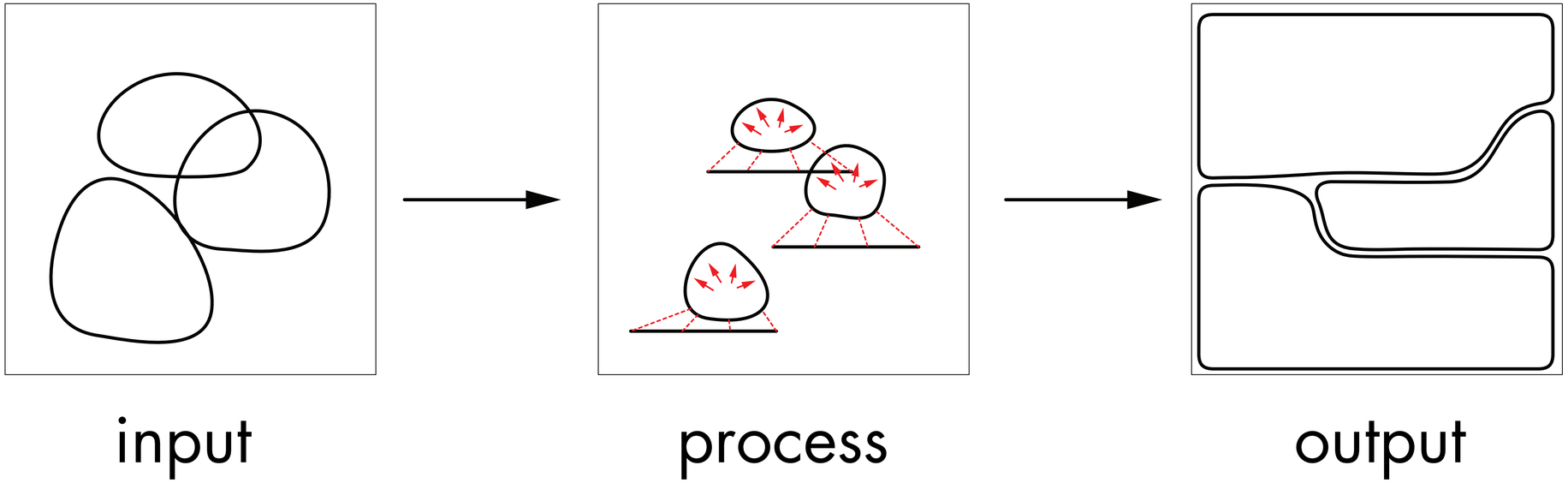
in plan:



Spatial layout

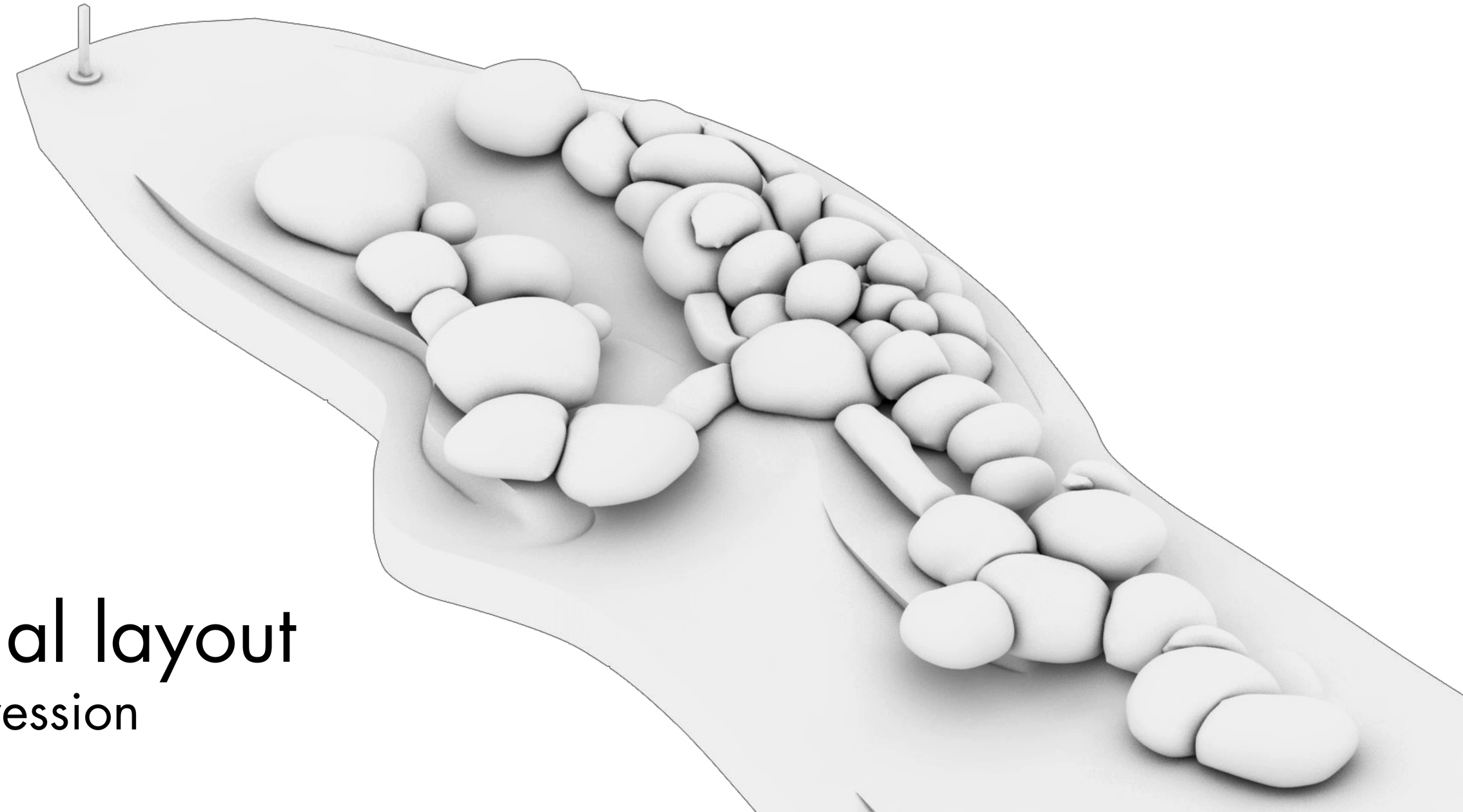
computational approach

in section:



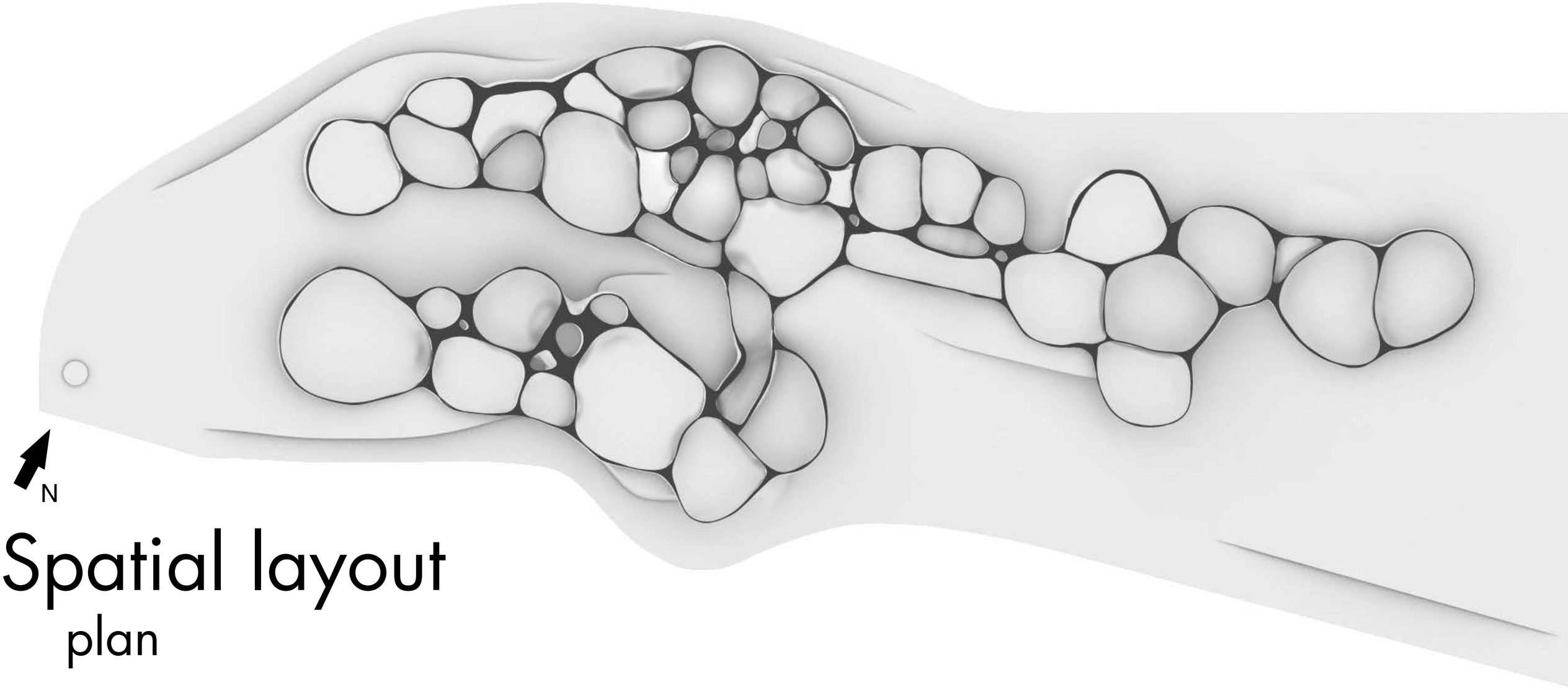
Spatial layout

computational approach



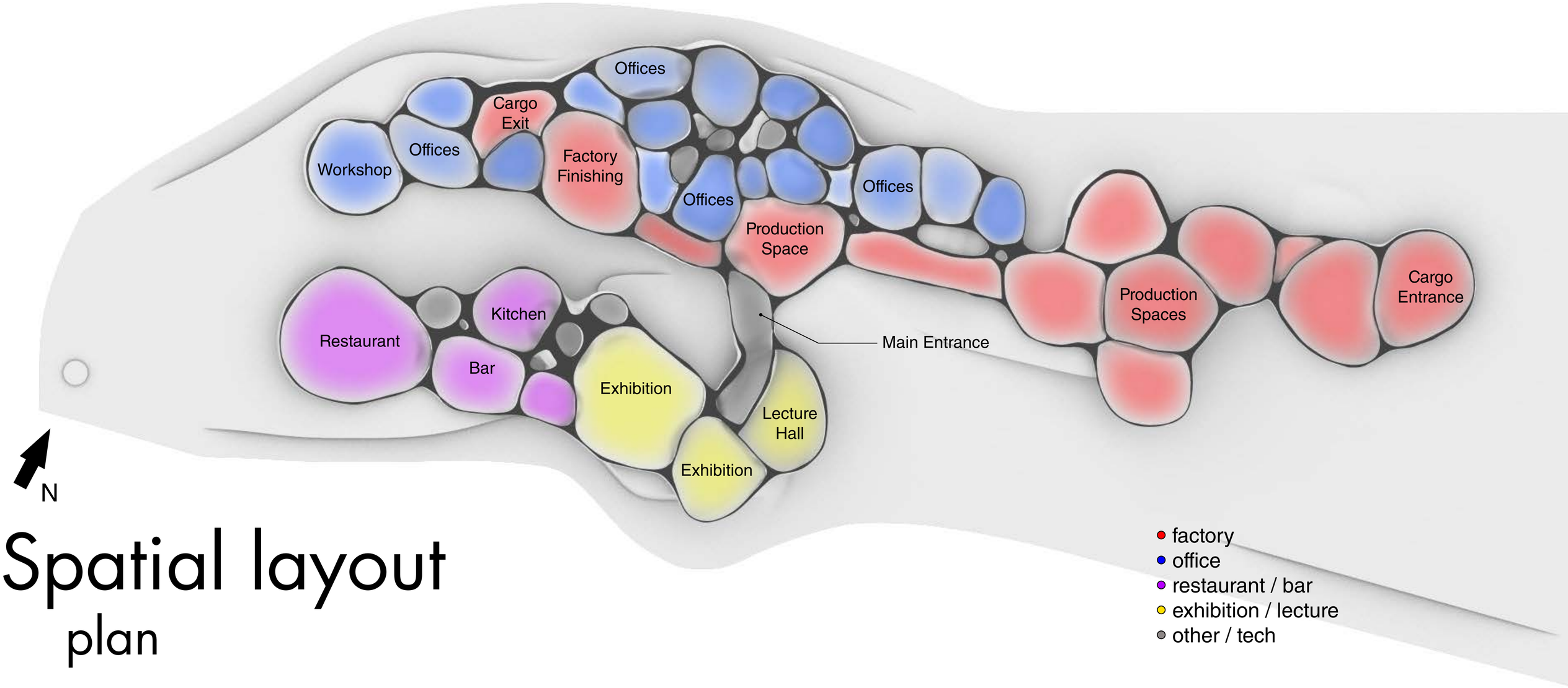
Spatial layout

impression



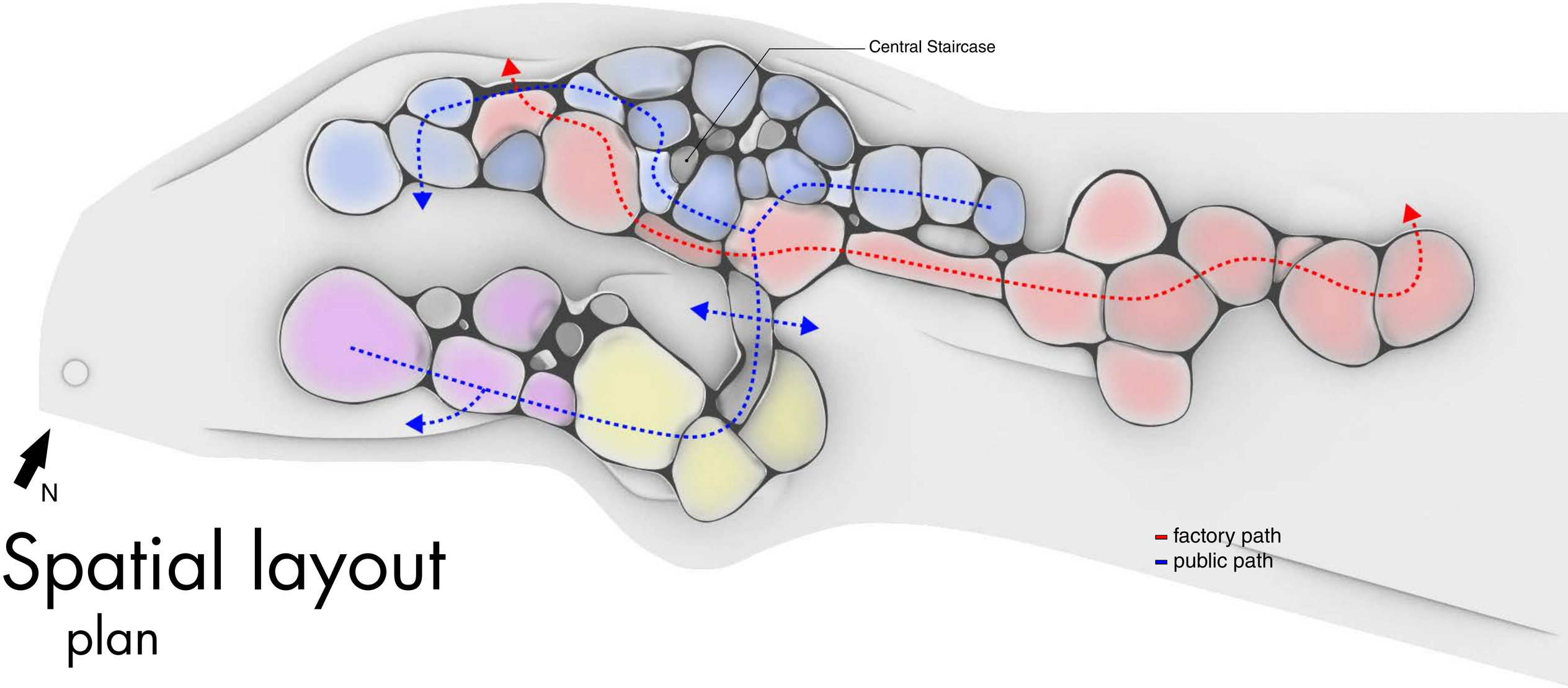
Spatial layout

plan



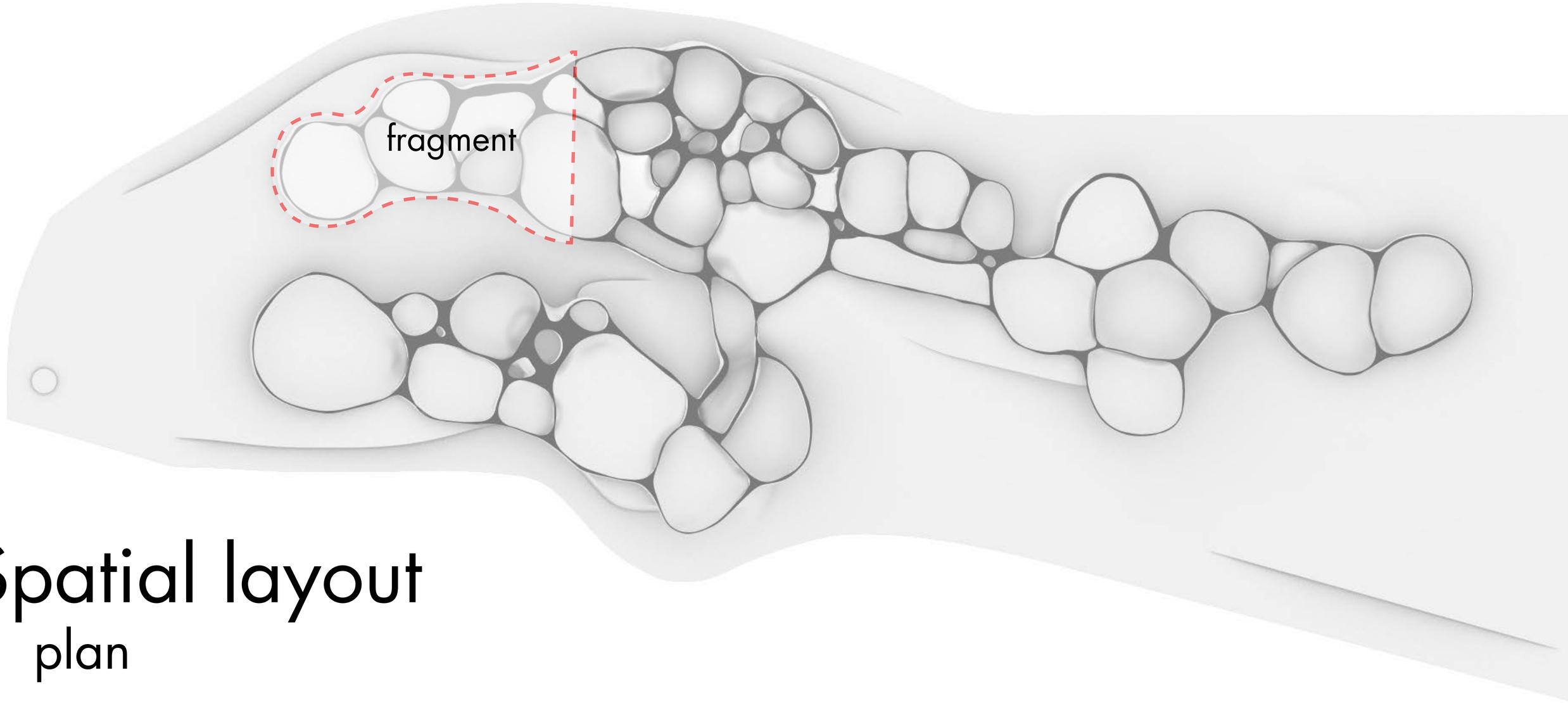
Spatial layout

plan



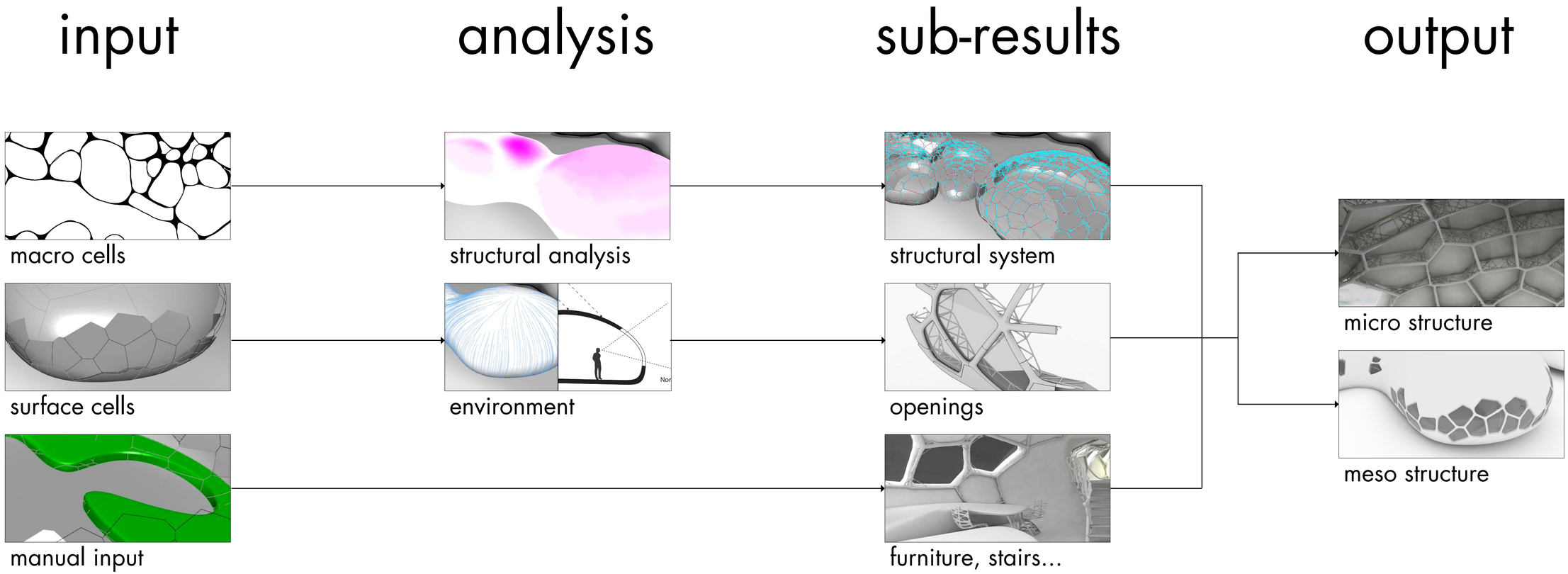
Spatial layout

plan



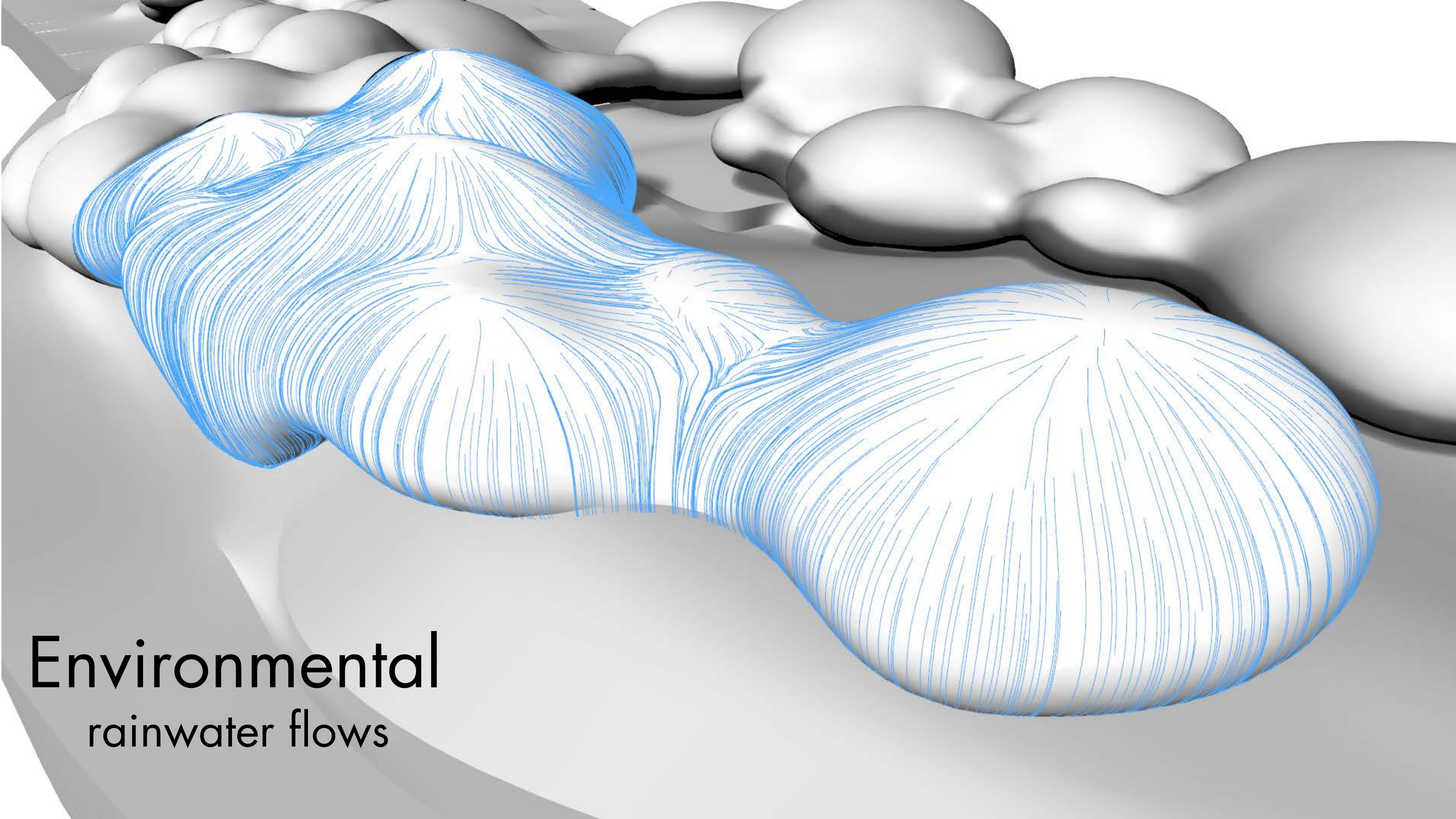
Spatial layout

plan



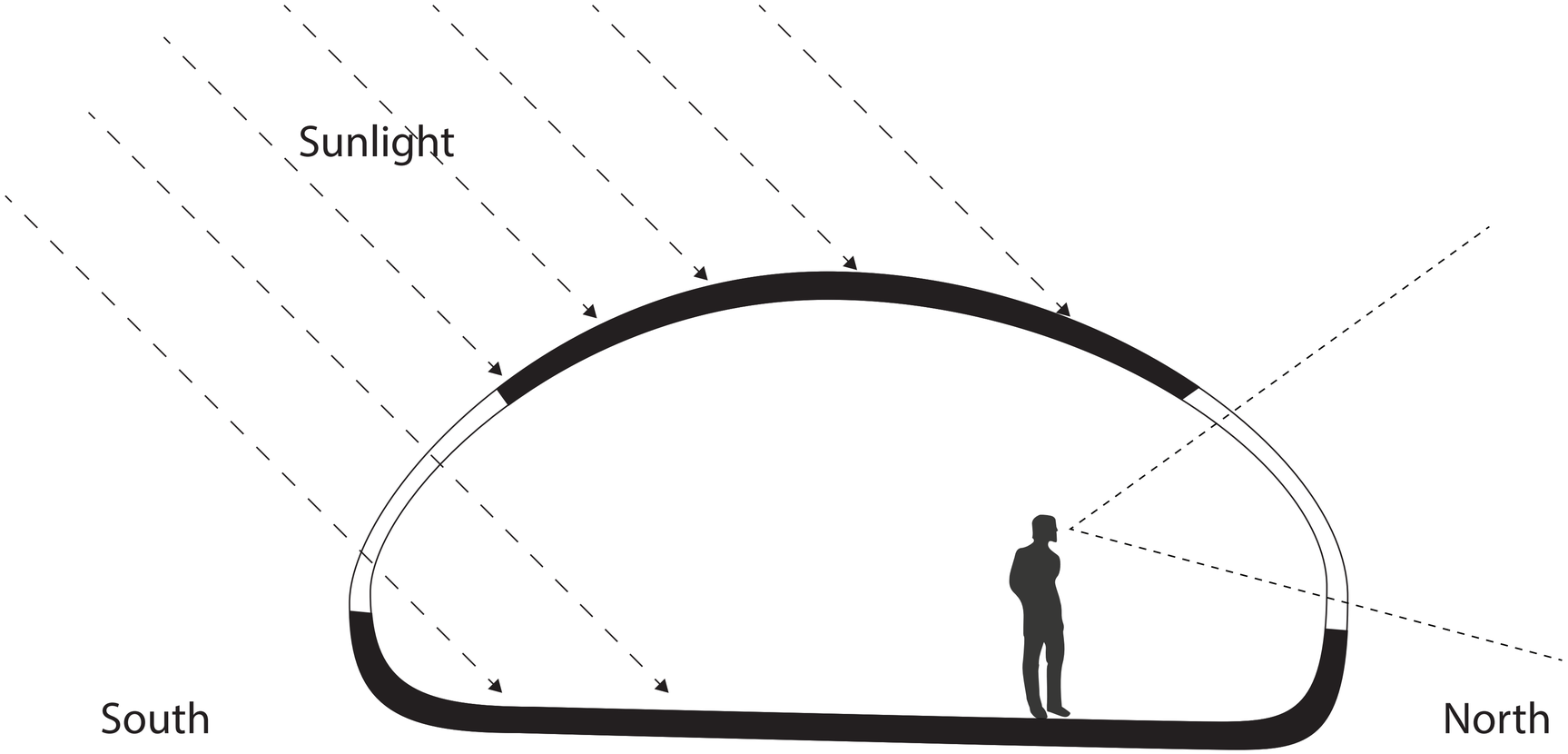
Approach

computational framework



Environmental

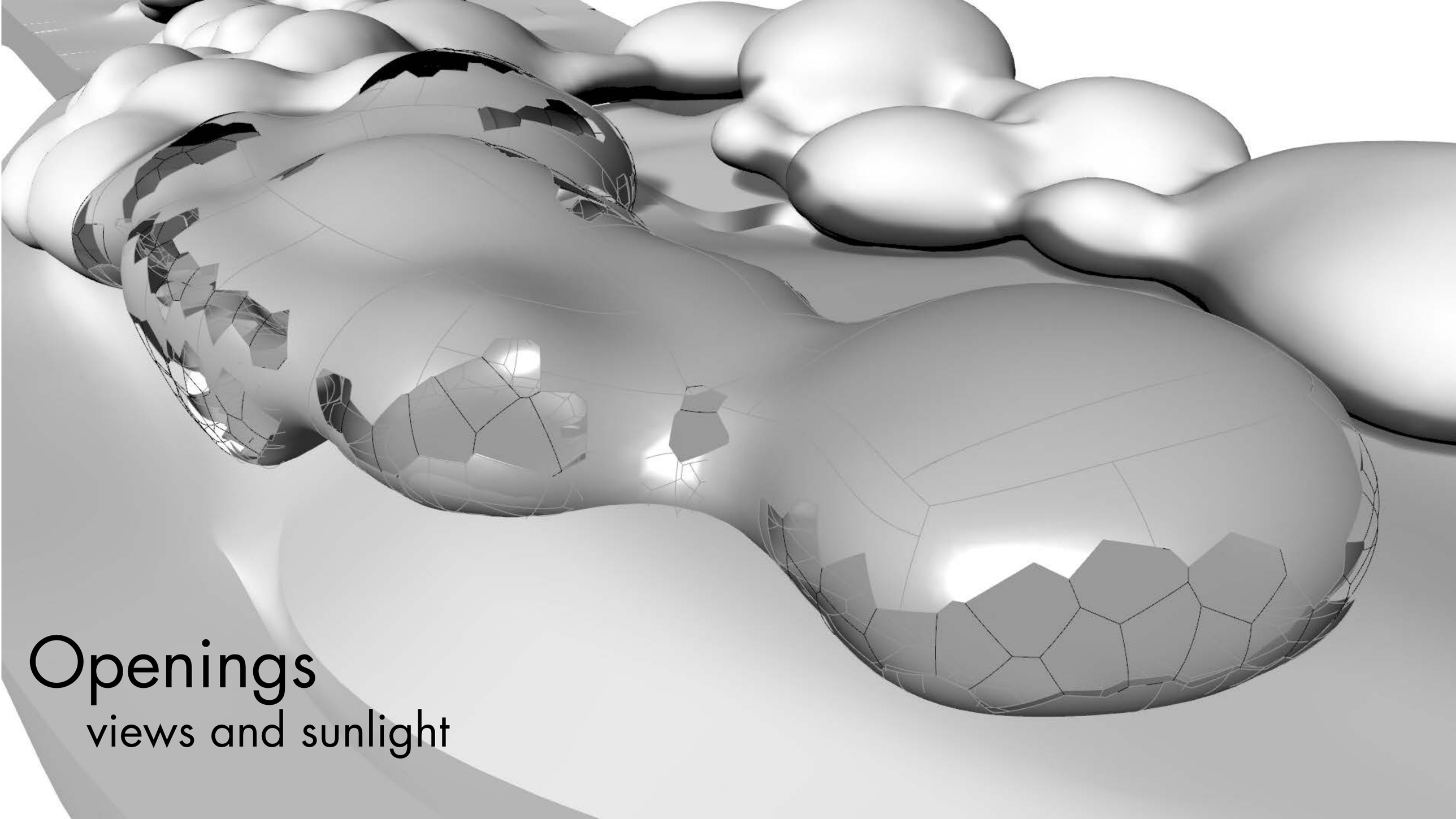
rainwater flows



Openings

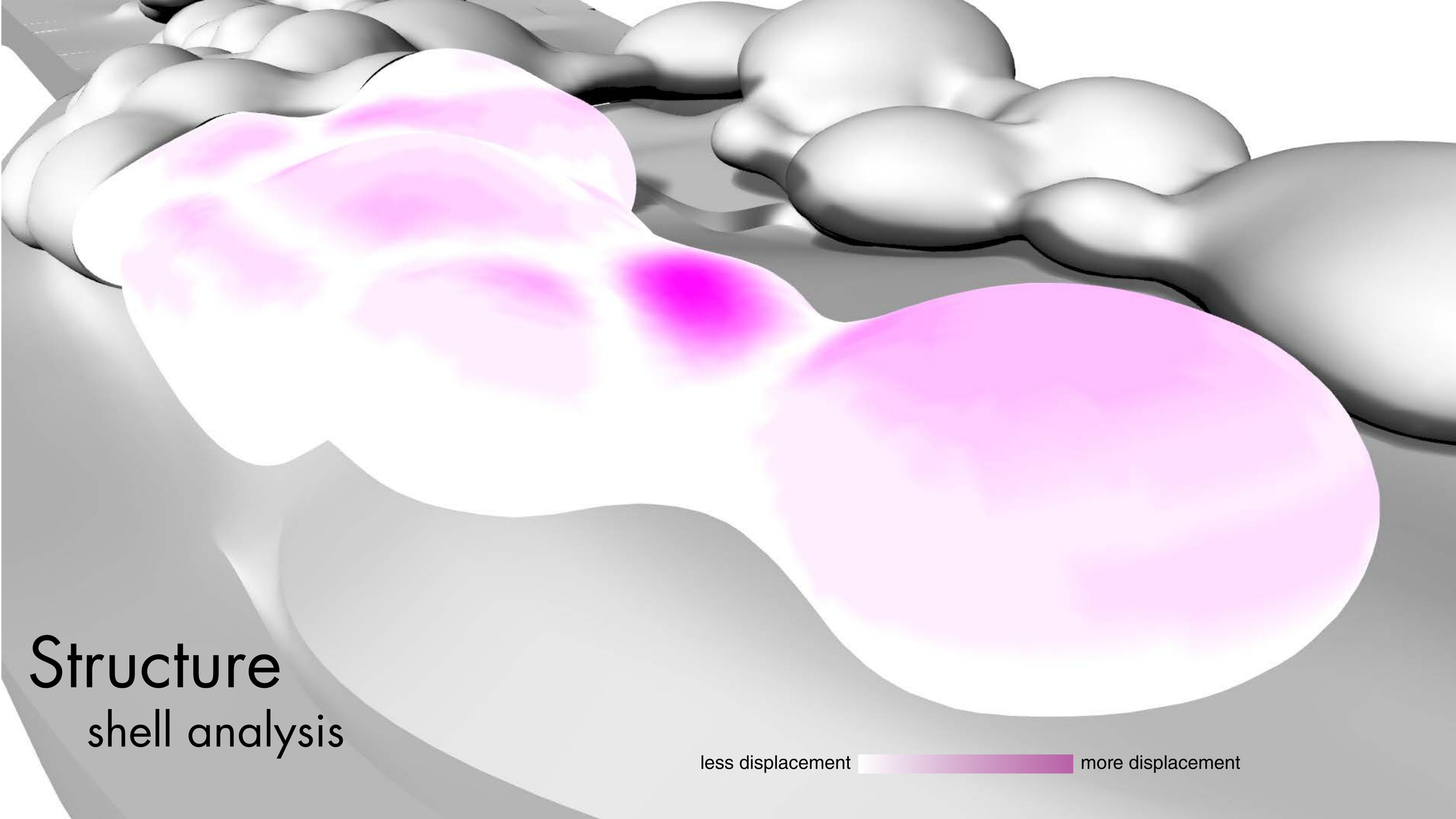
sun orientation and views

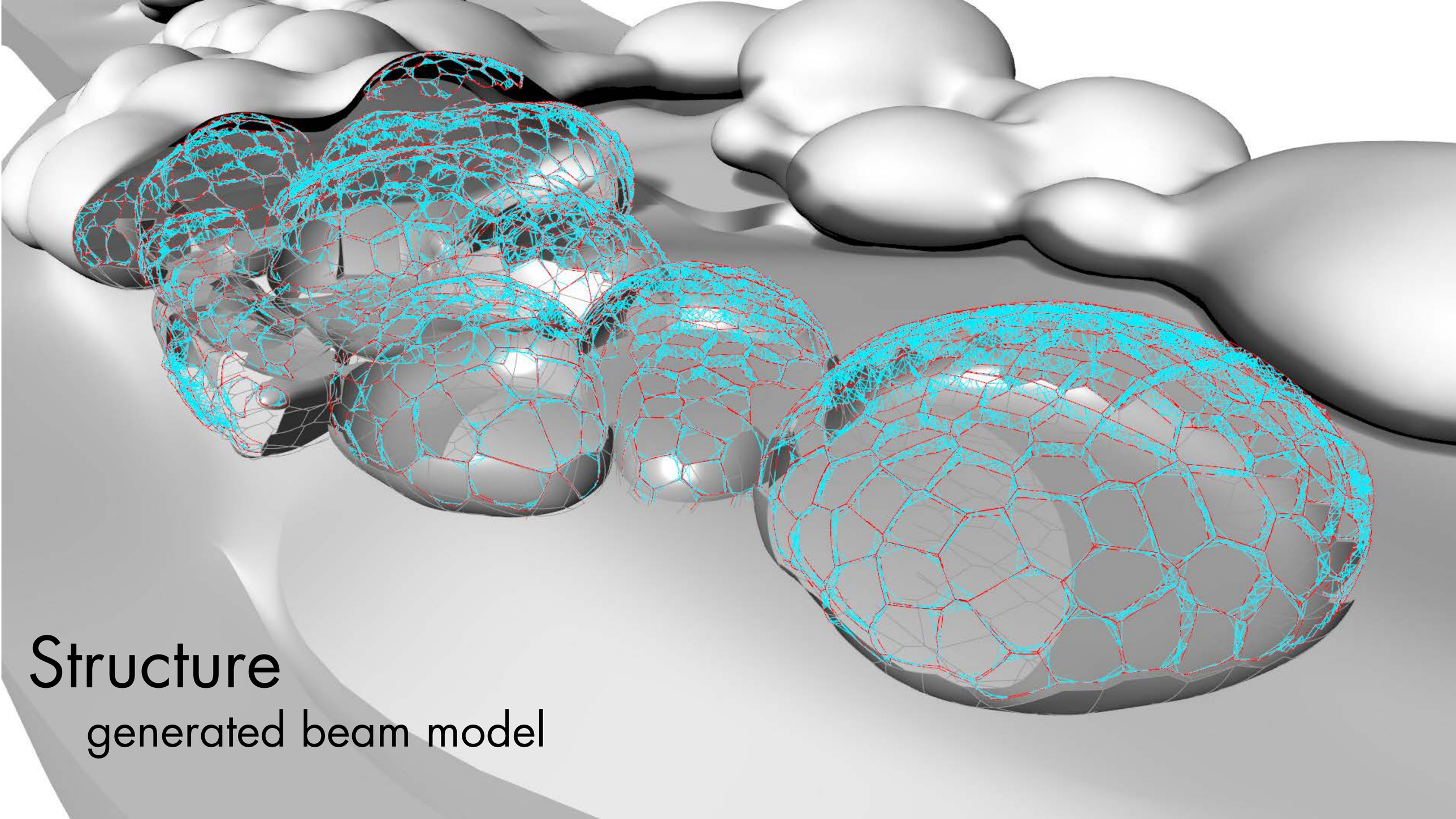
- Both the faces direct opposed to southern sunlight and floor faces are blocked from creating openings.
- Openings for views



Openings

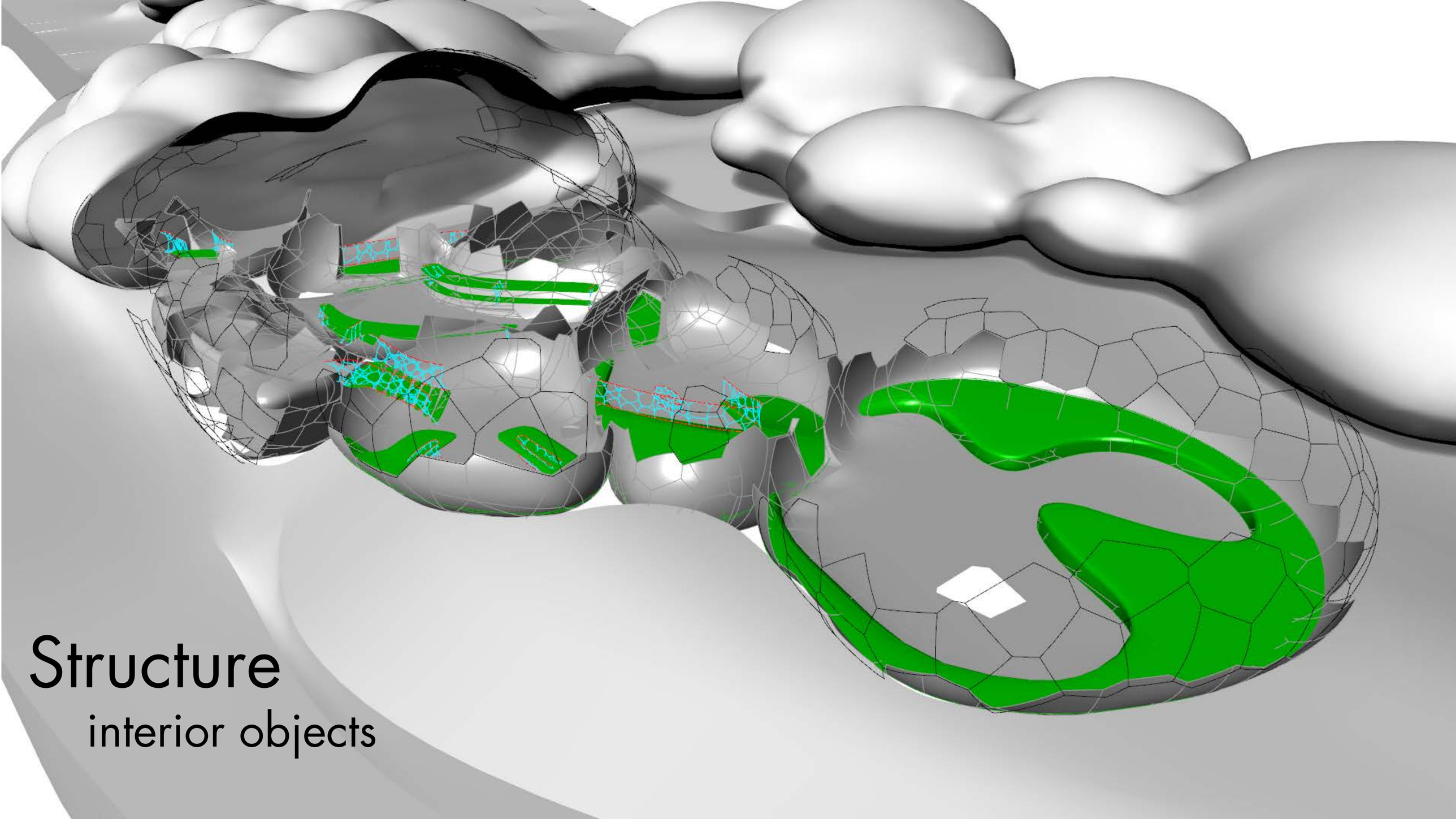
views and sunlight


Structure
shell analysis
less displacement
more displacement



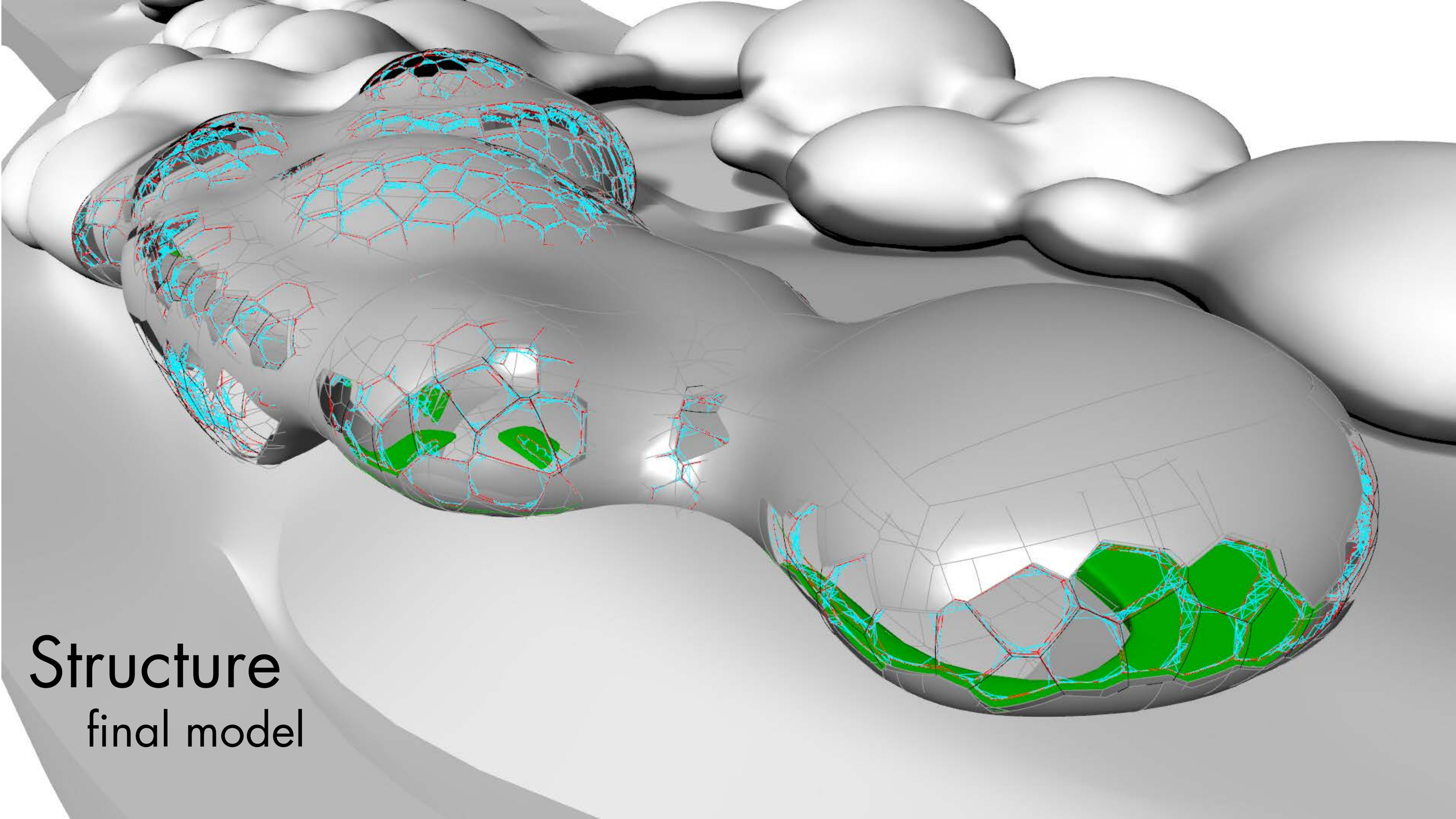
Structure

generated beam model



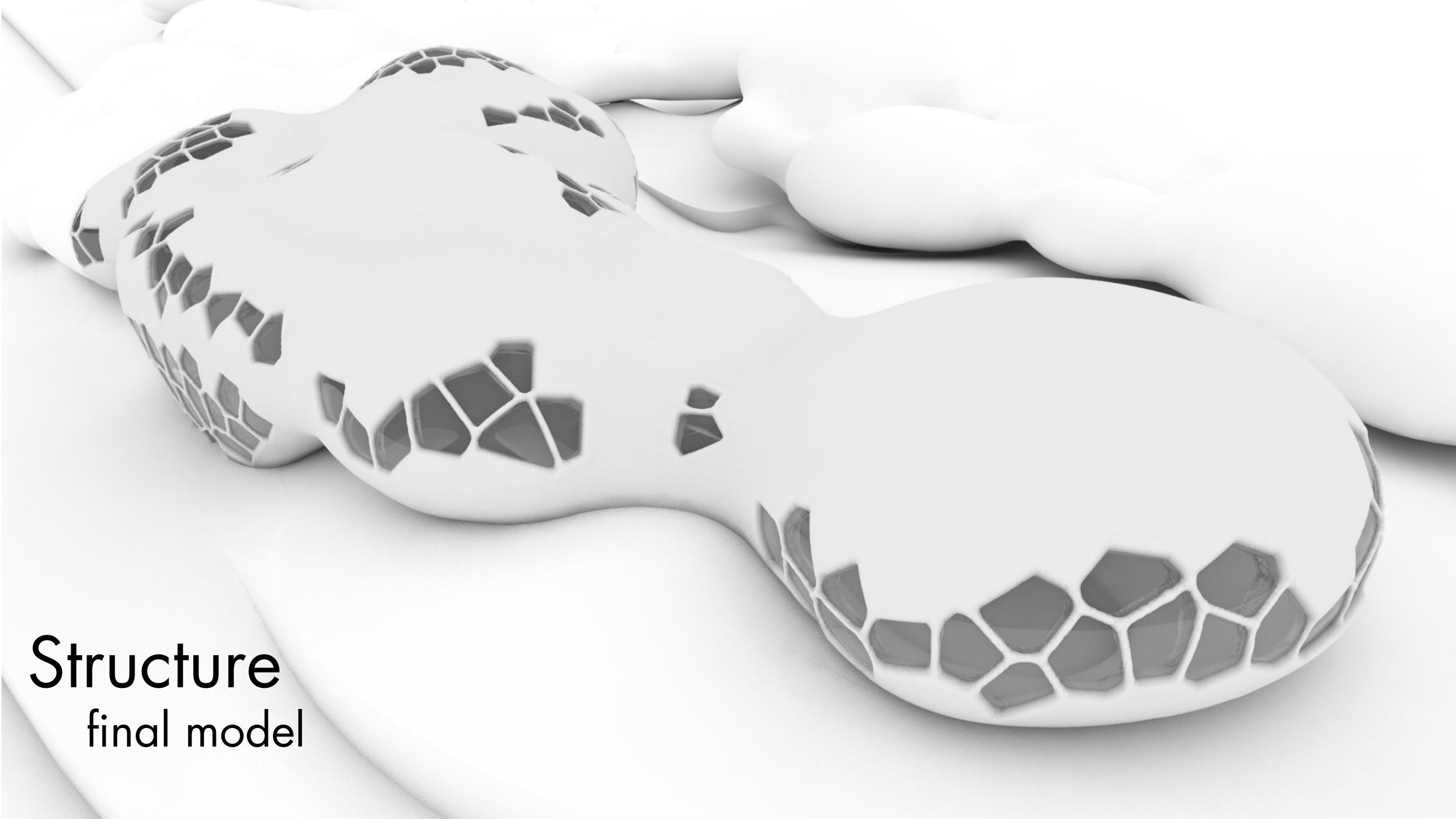
Structure

interior objects



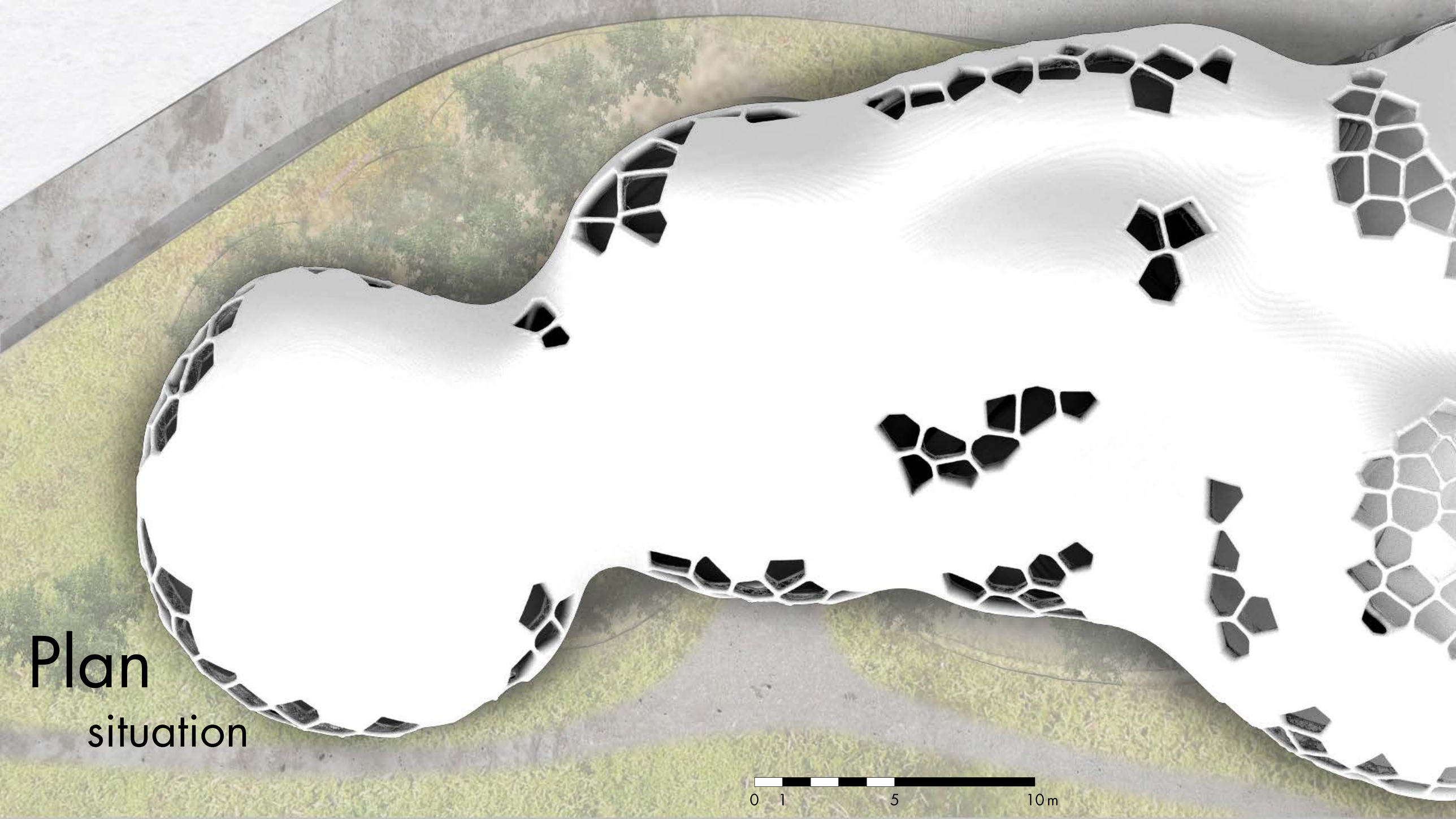
Structure

final model



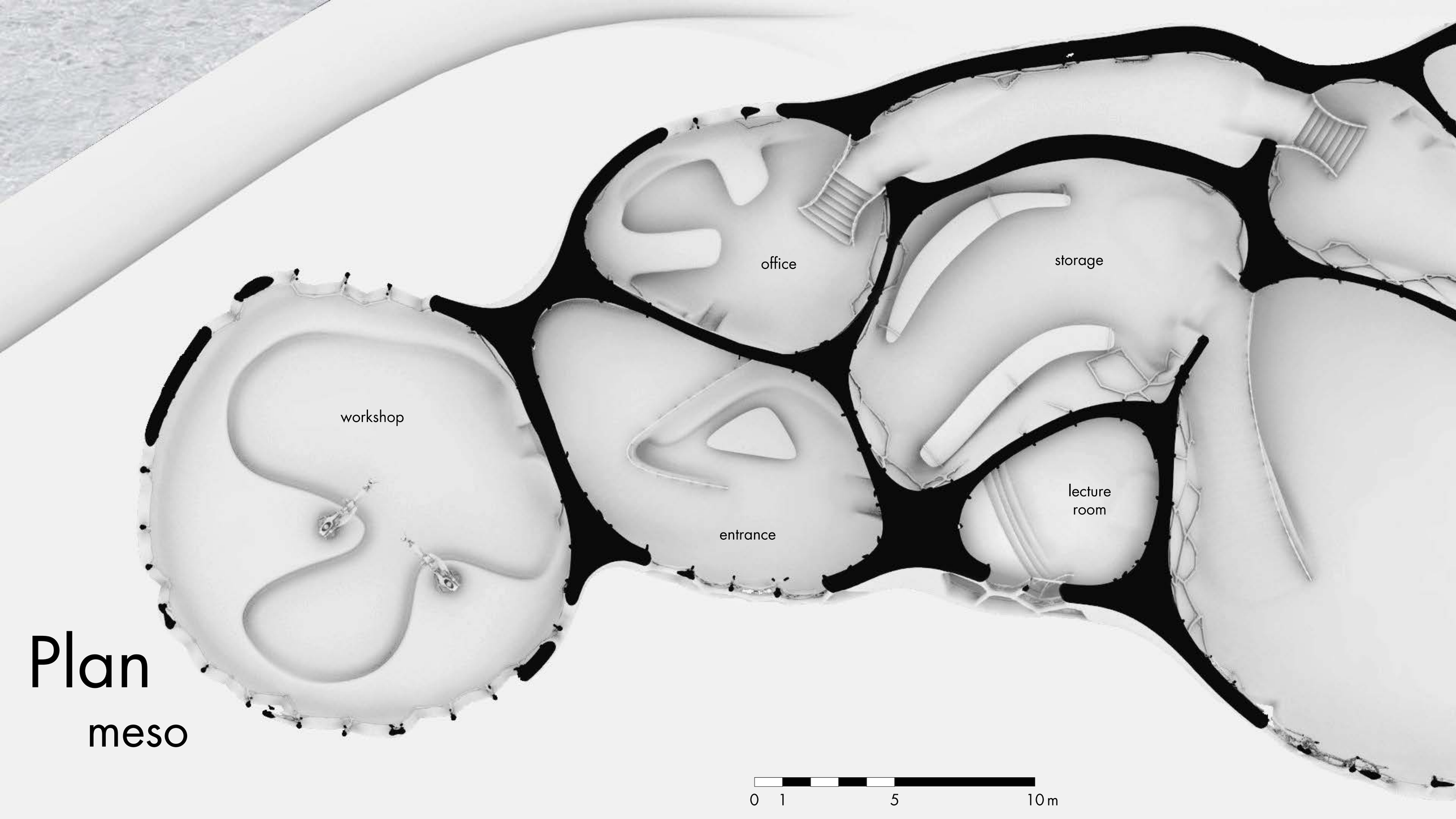
Structure

final model

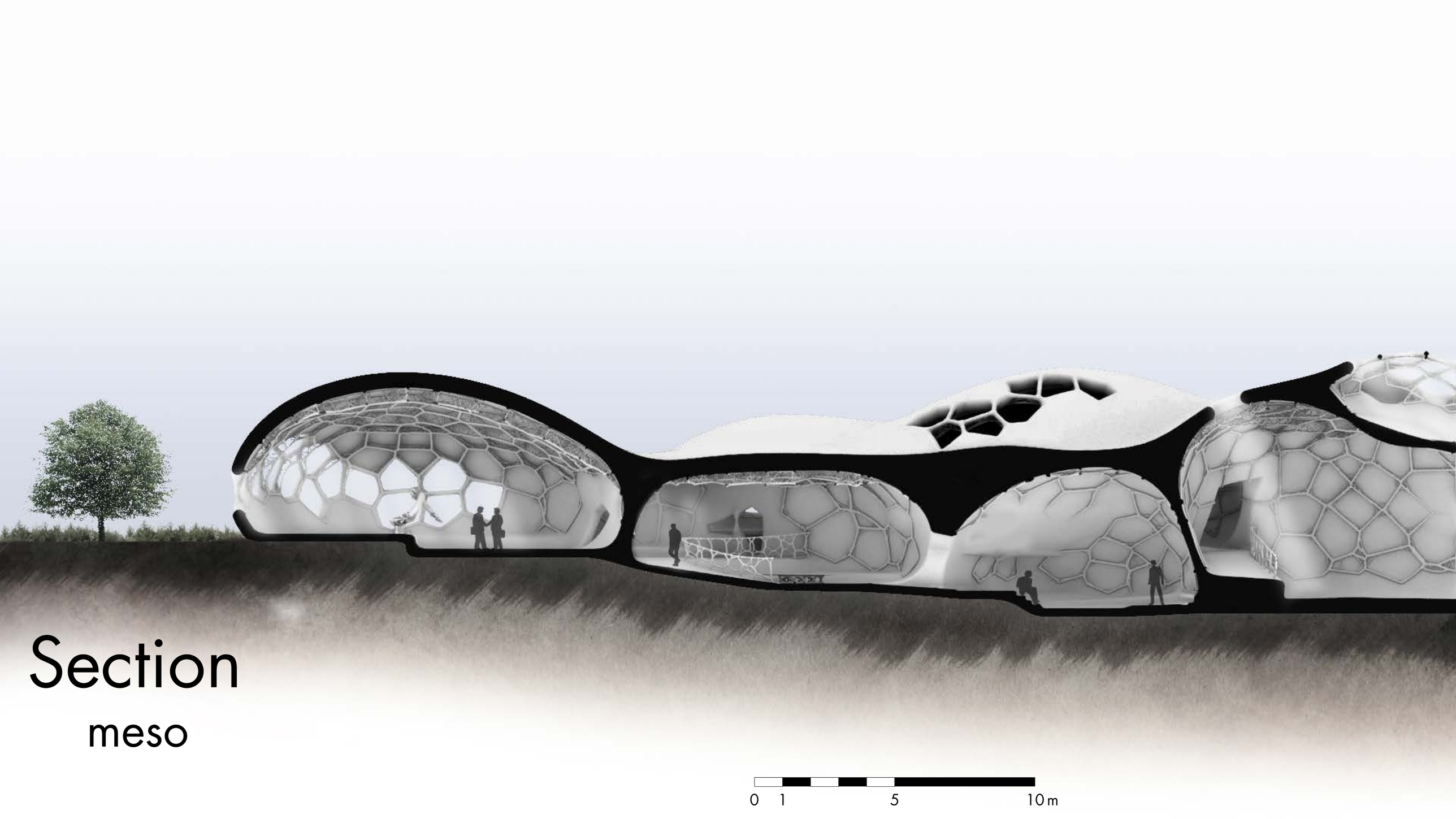


Plan

situation

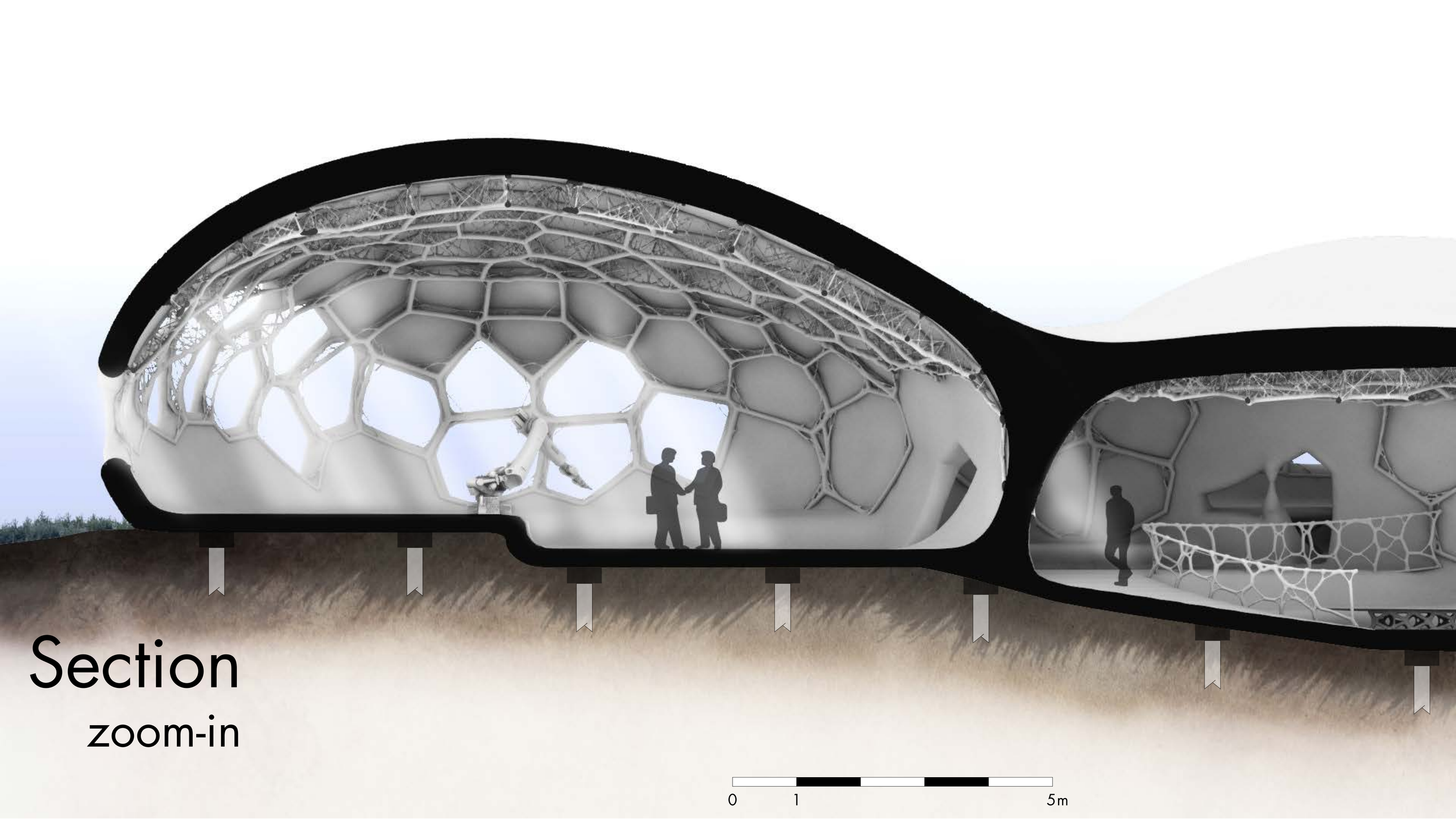


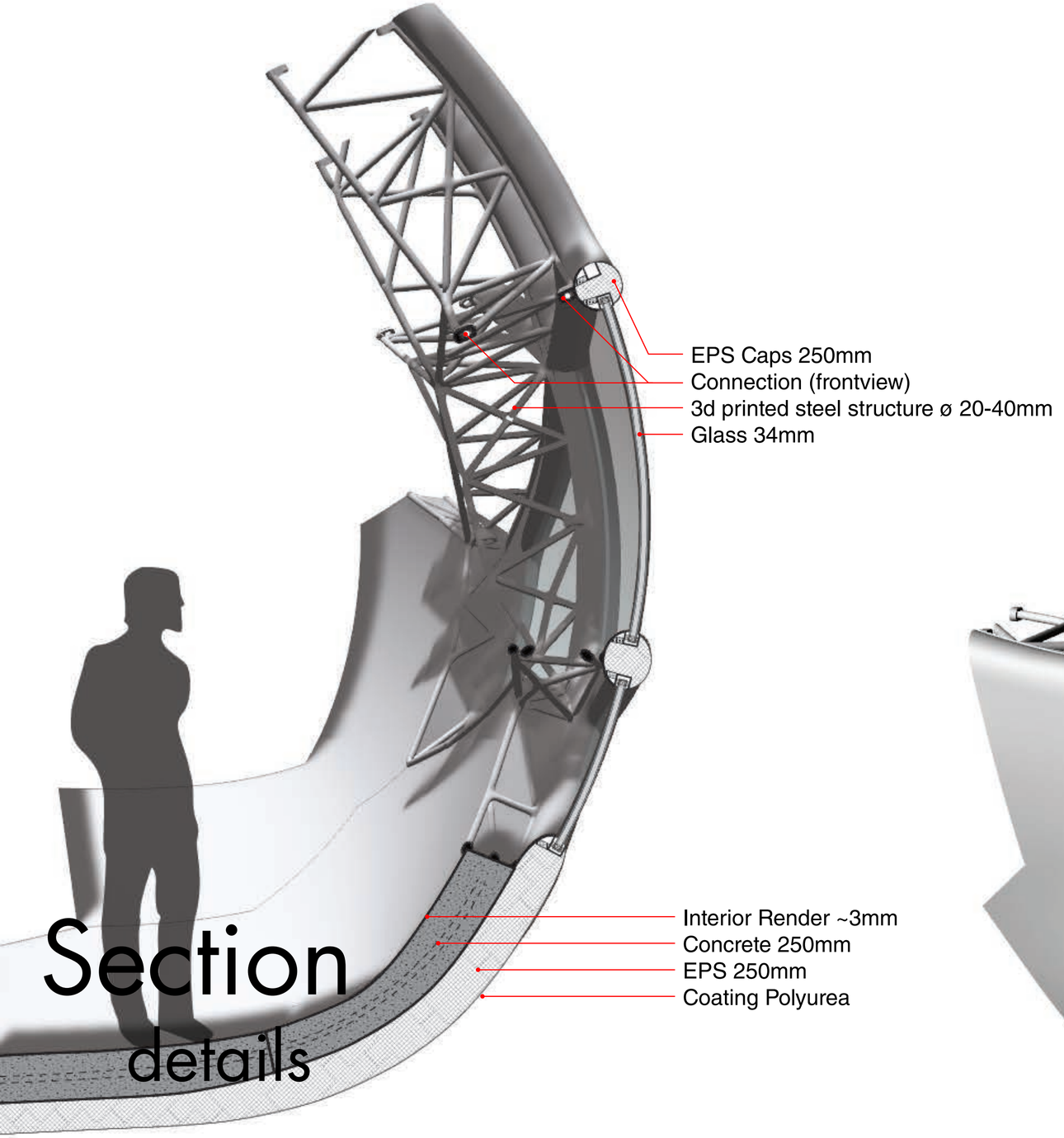
Plan
meso



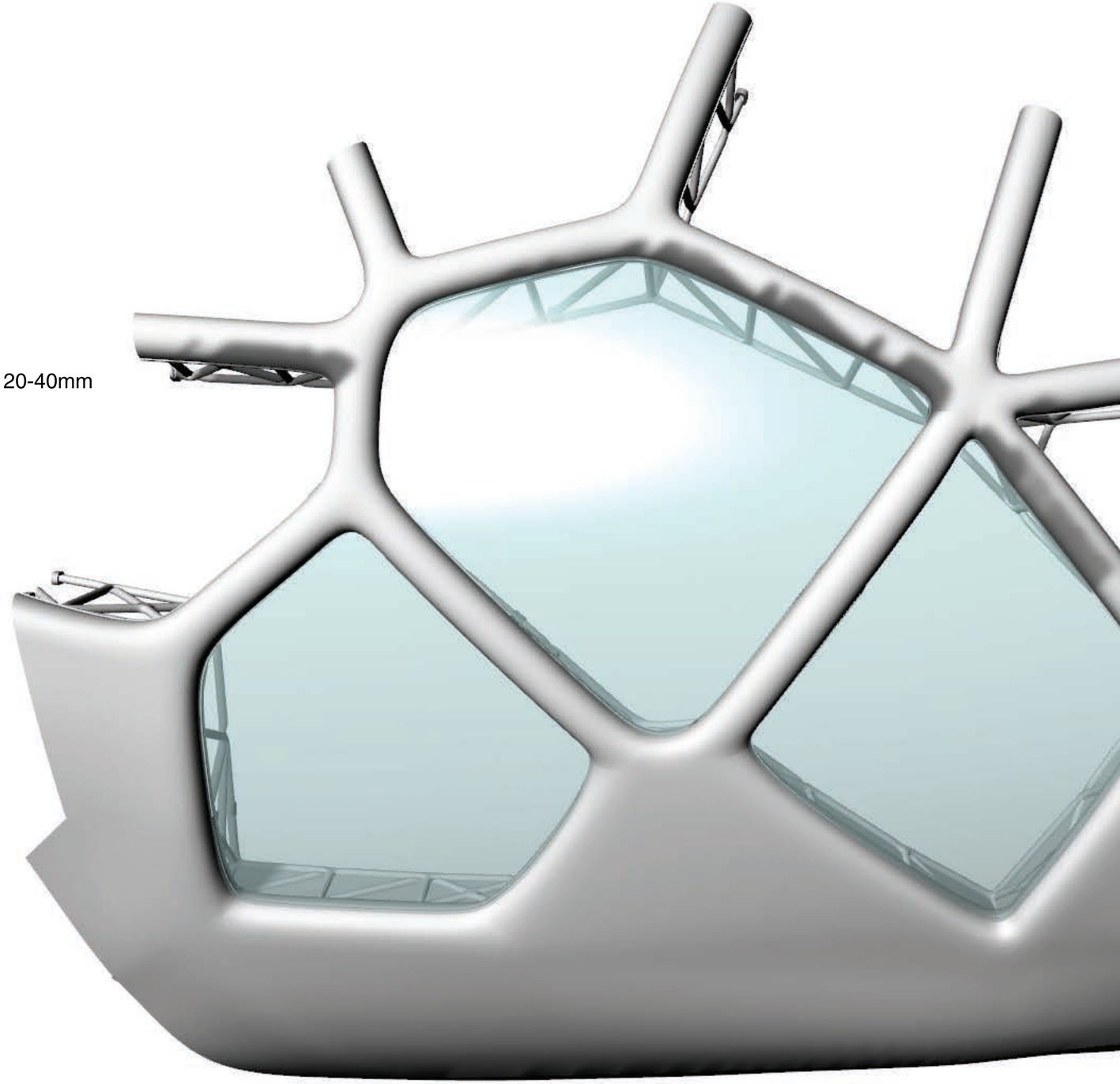
Section

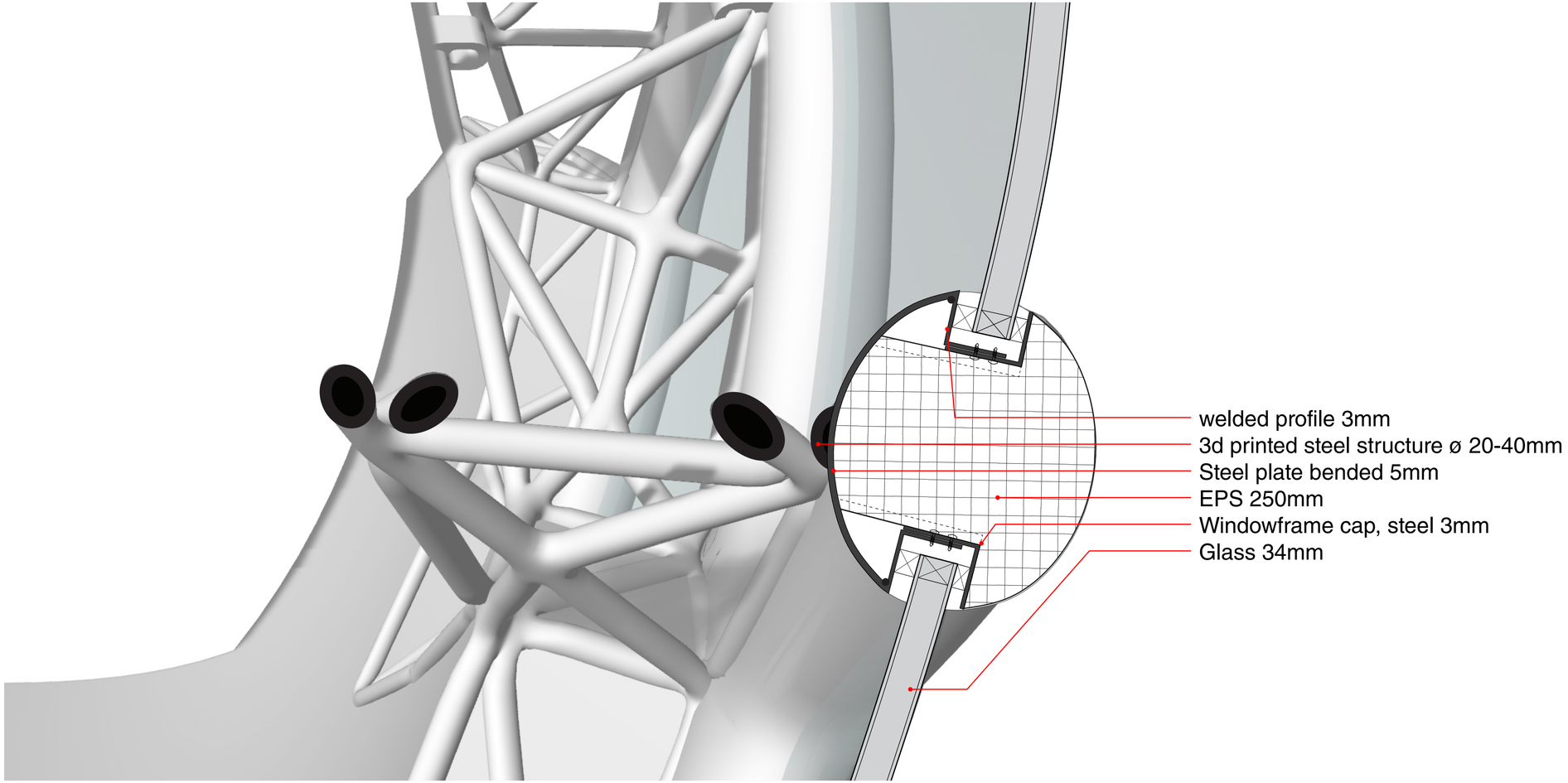
meso


Section
zoom-in
0
1
5m

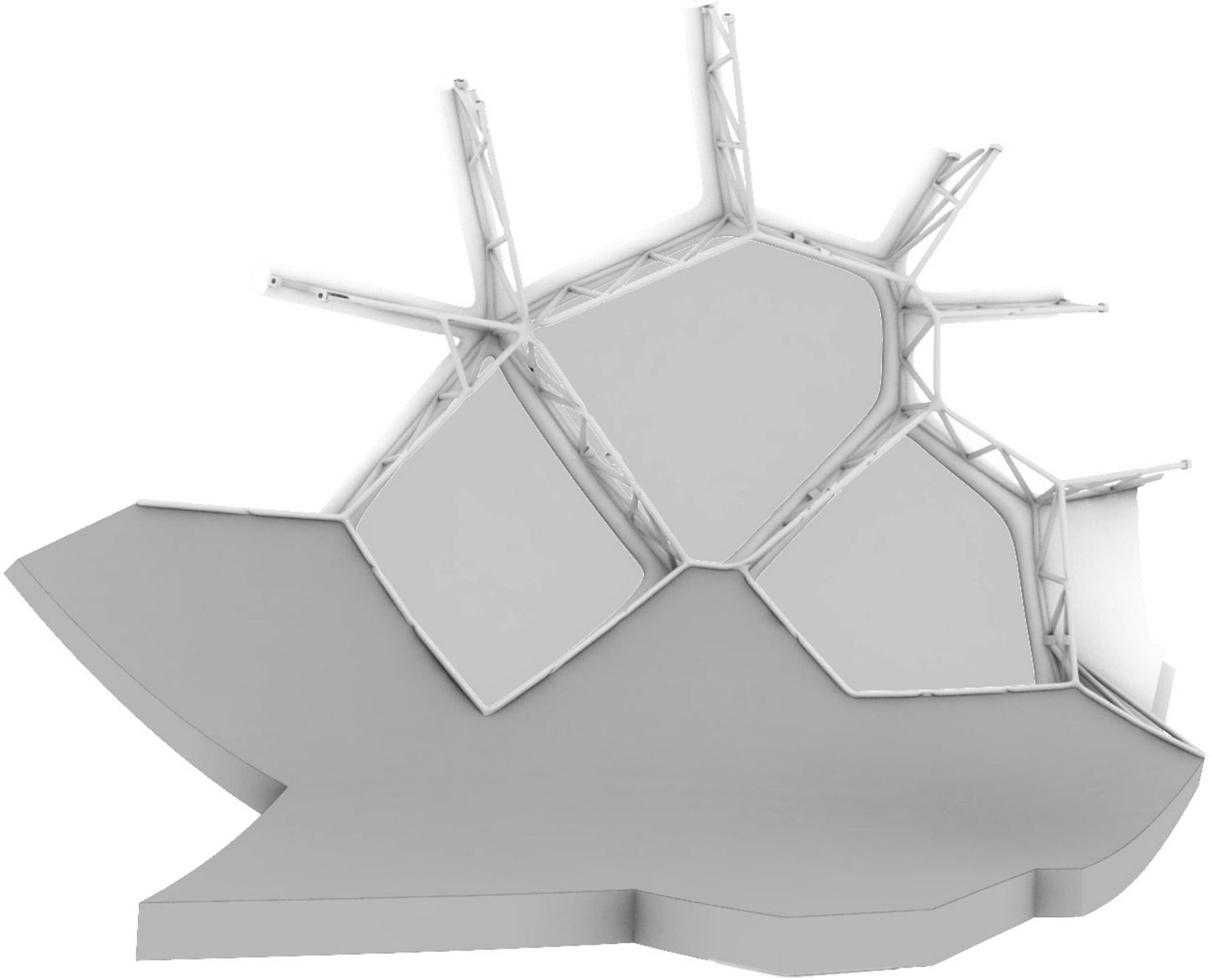


Section
details



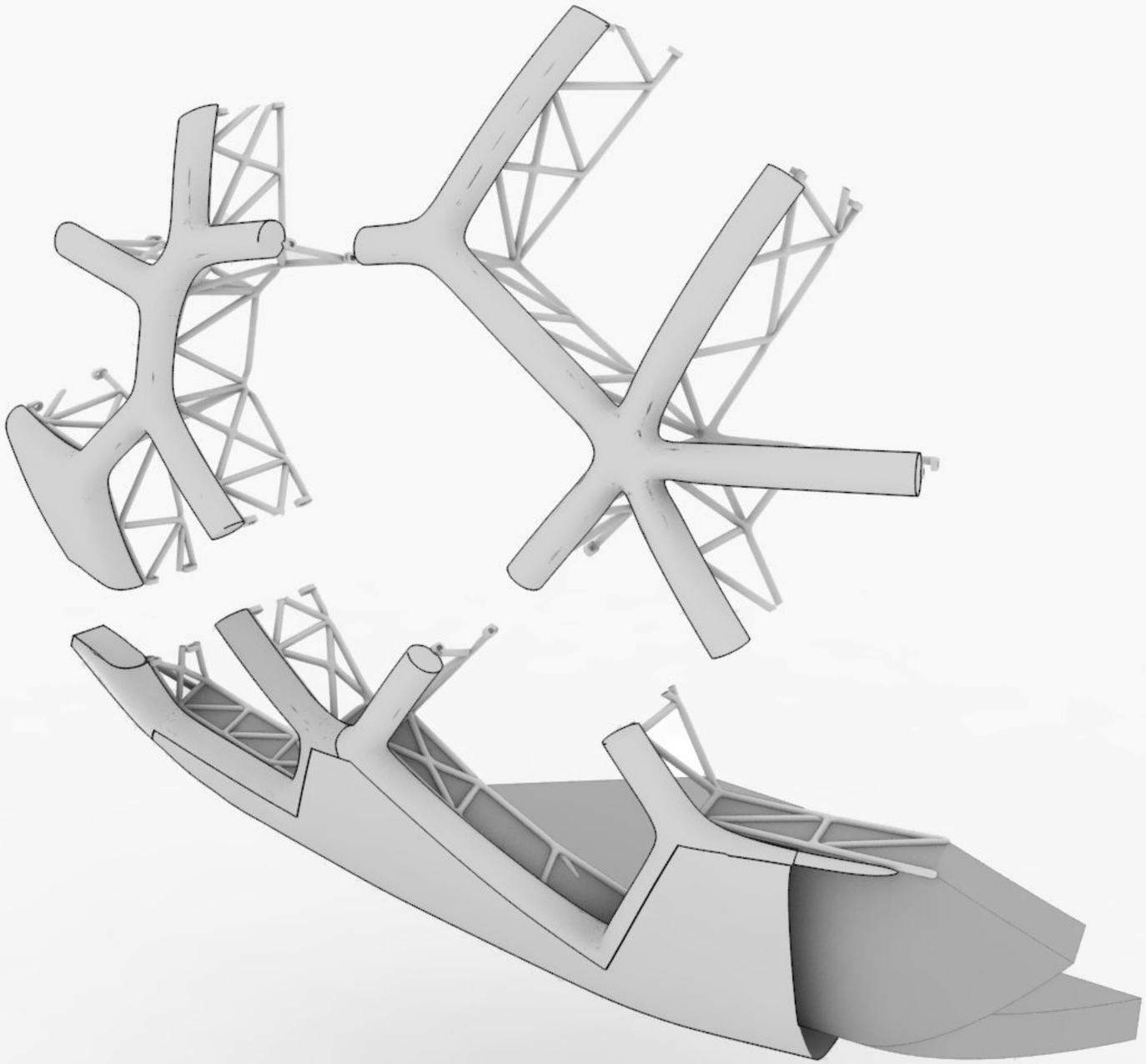


Section
details



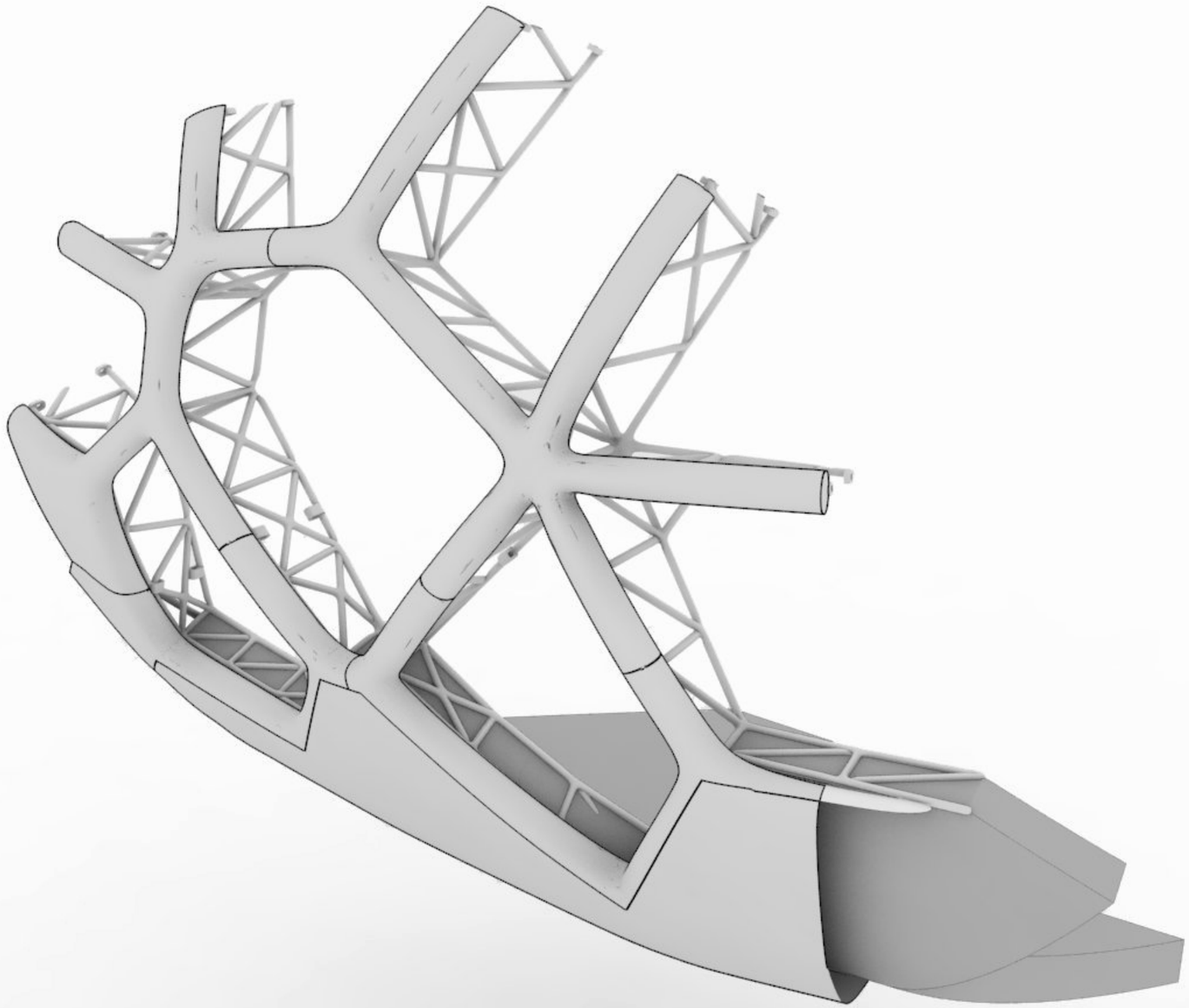
Interior

impression



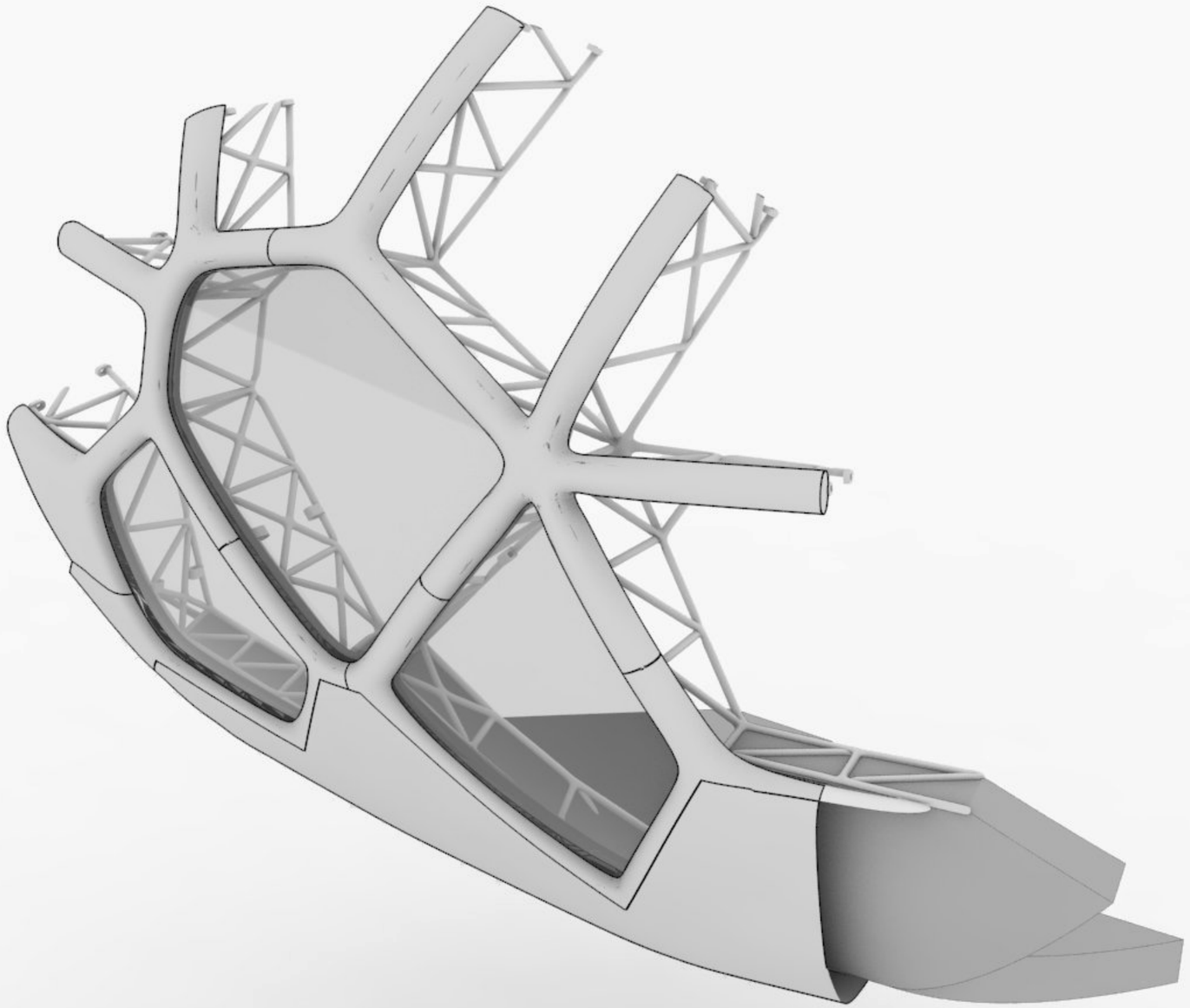
Components

3d build



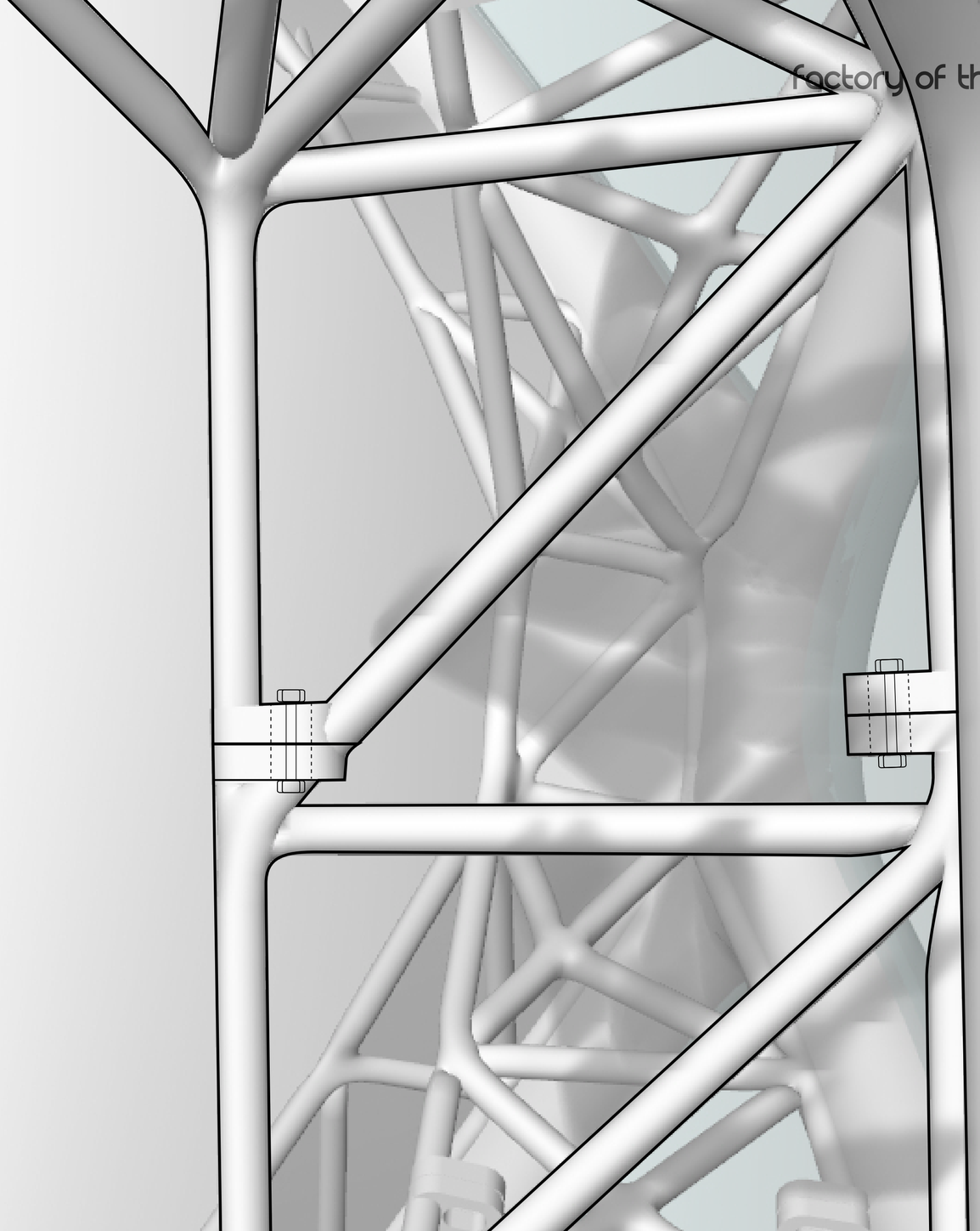
Components

3d build



Components

3d build



Section

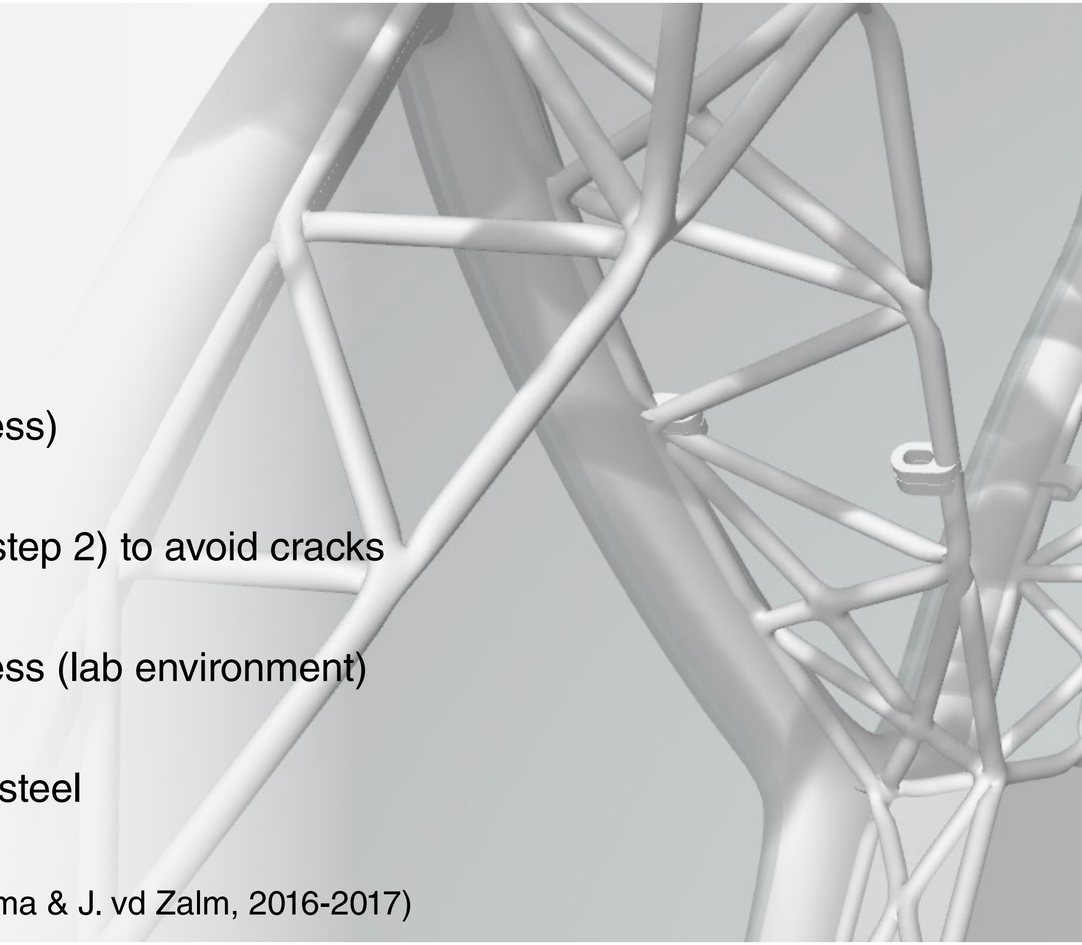
connections

Joris Laarman, Dragon Bench

TU Delft, 3D Printed Stainless Steel Bicycle

References

robotic steel printing

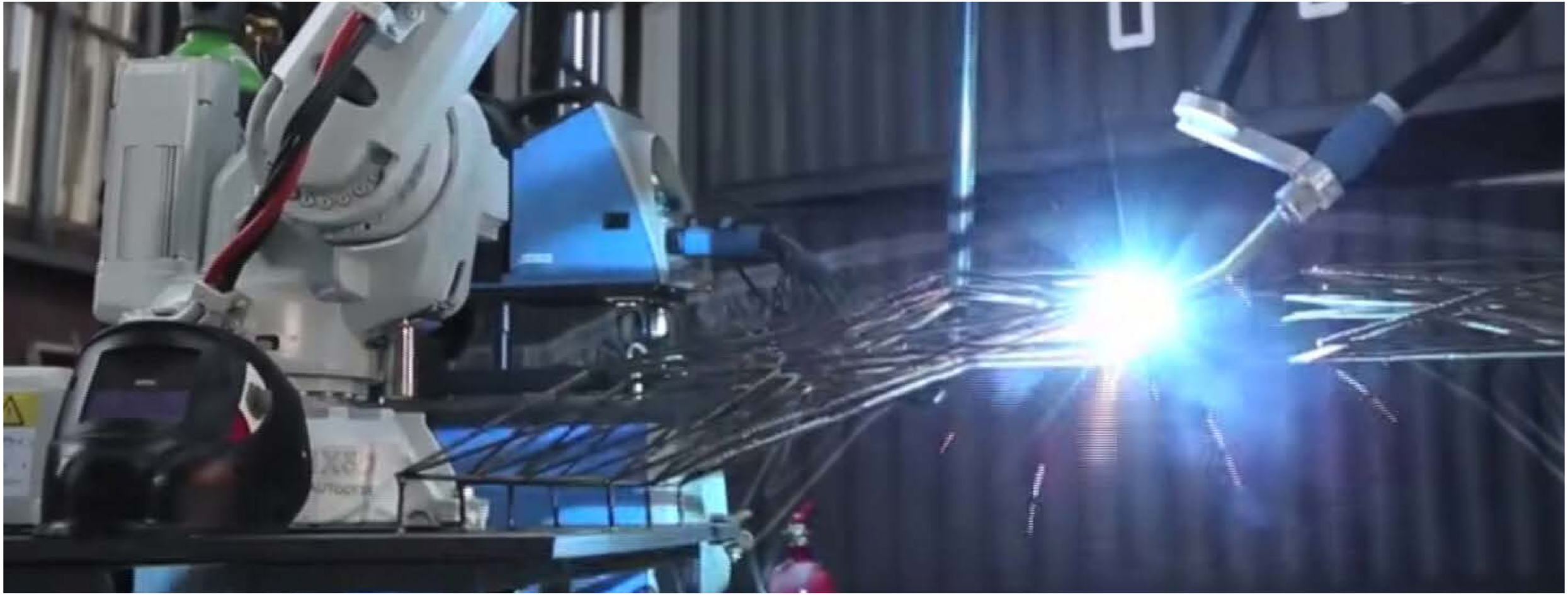


3D printing of steel flanges:

- Printed on a steel surface (integrated in process)
- Combination of printing (step 1) and milling (step 2) to avoid cracks
- Controlled temperatures during printing process (lab environment)
- Material strength is comparable to traditional steel

Ref. (Grad. J. Bergsma & J. vd Zalm, 2016-2017)

Method
production



Production

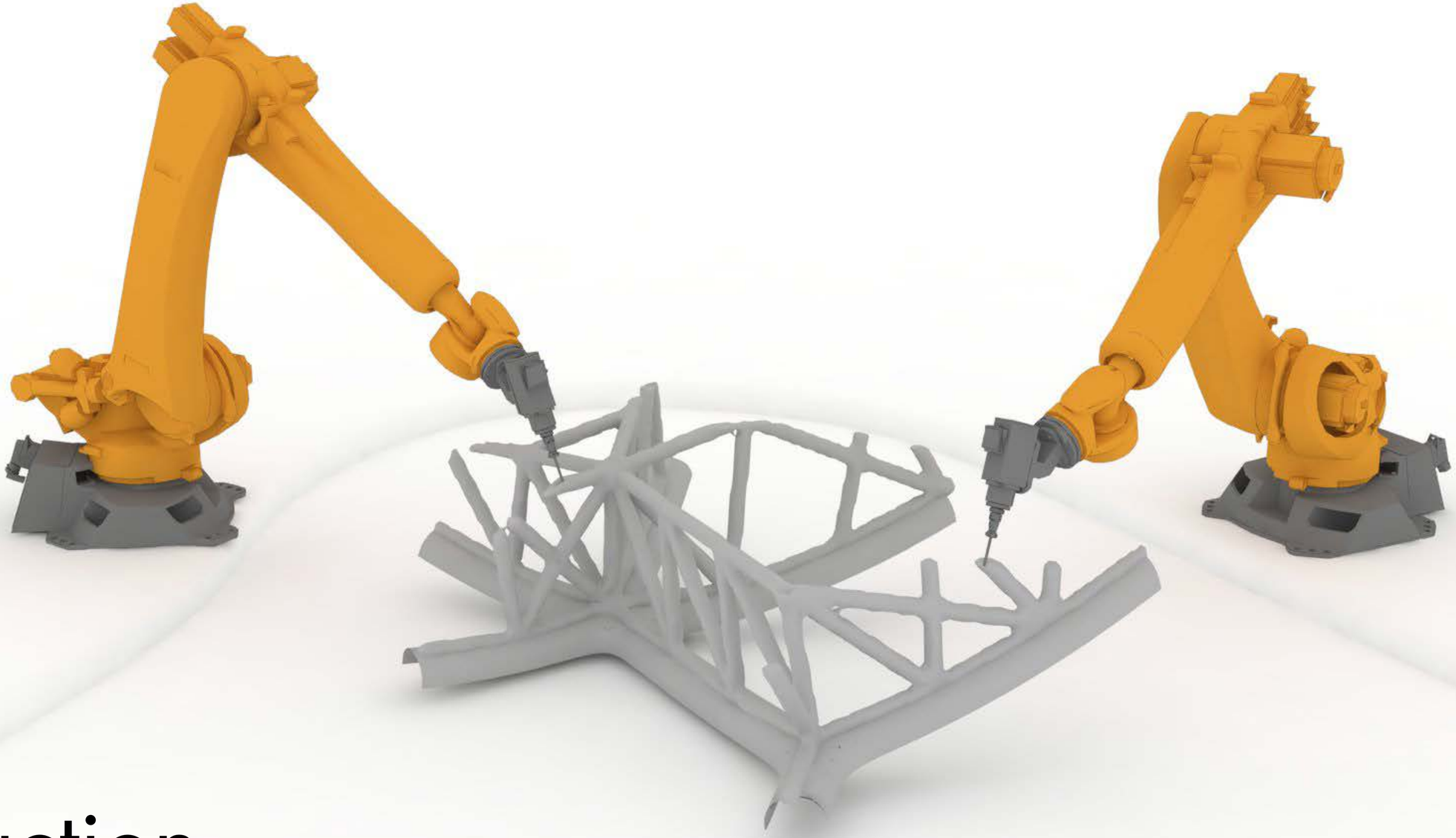
robotic steel printing

Production

steel base plate

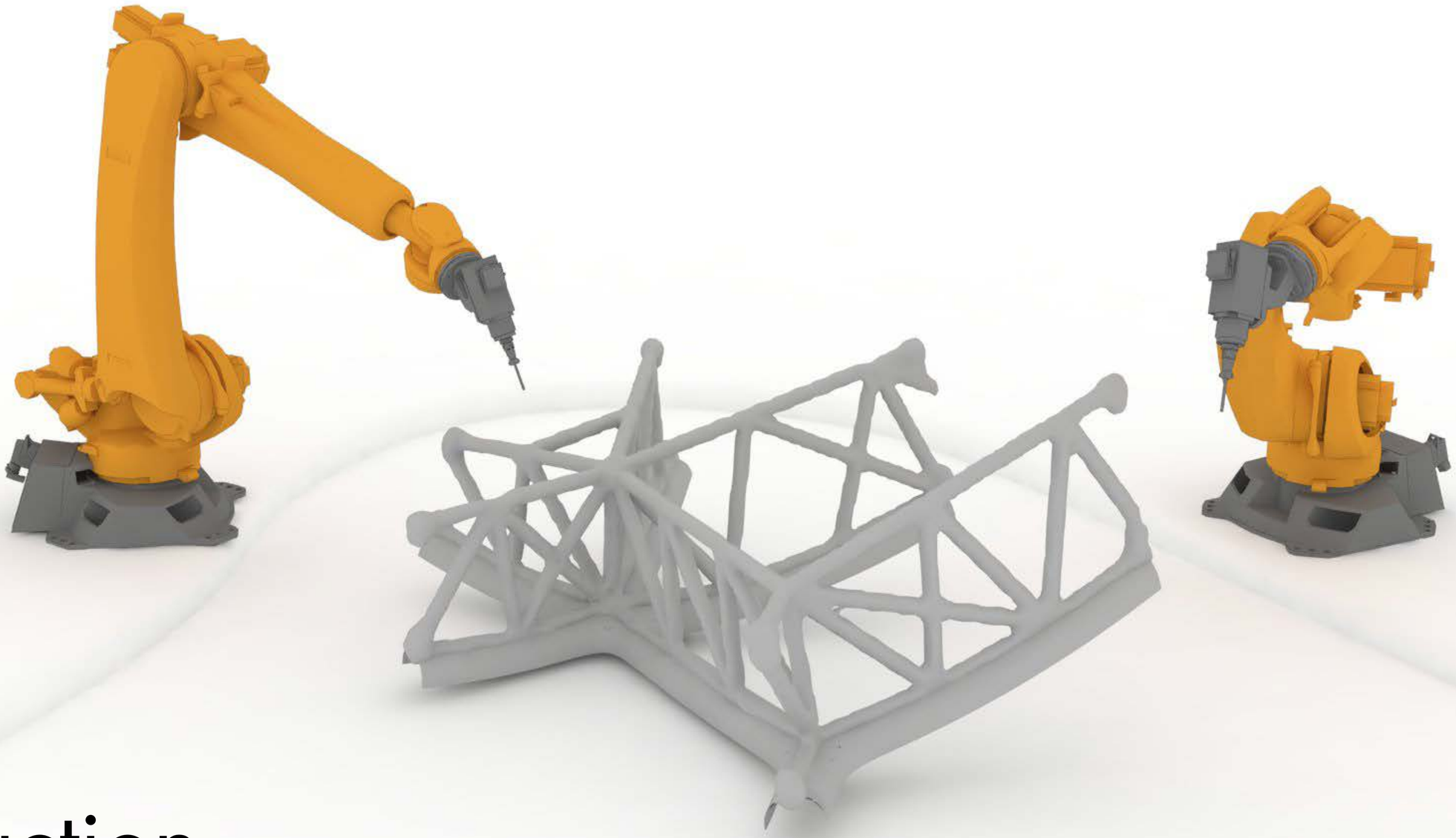
Production

printing on surface



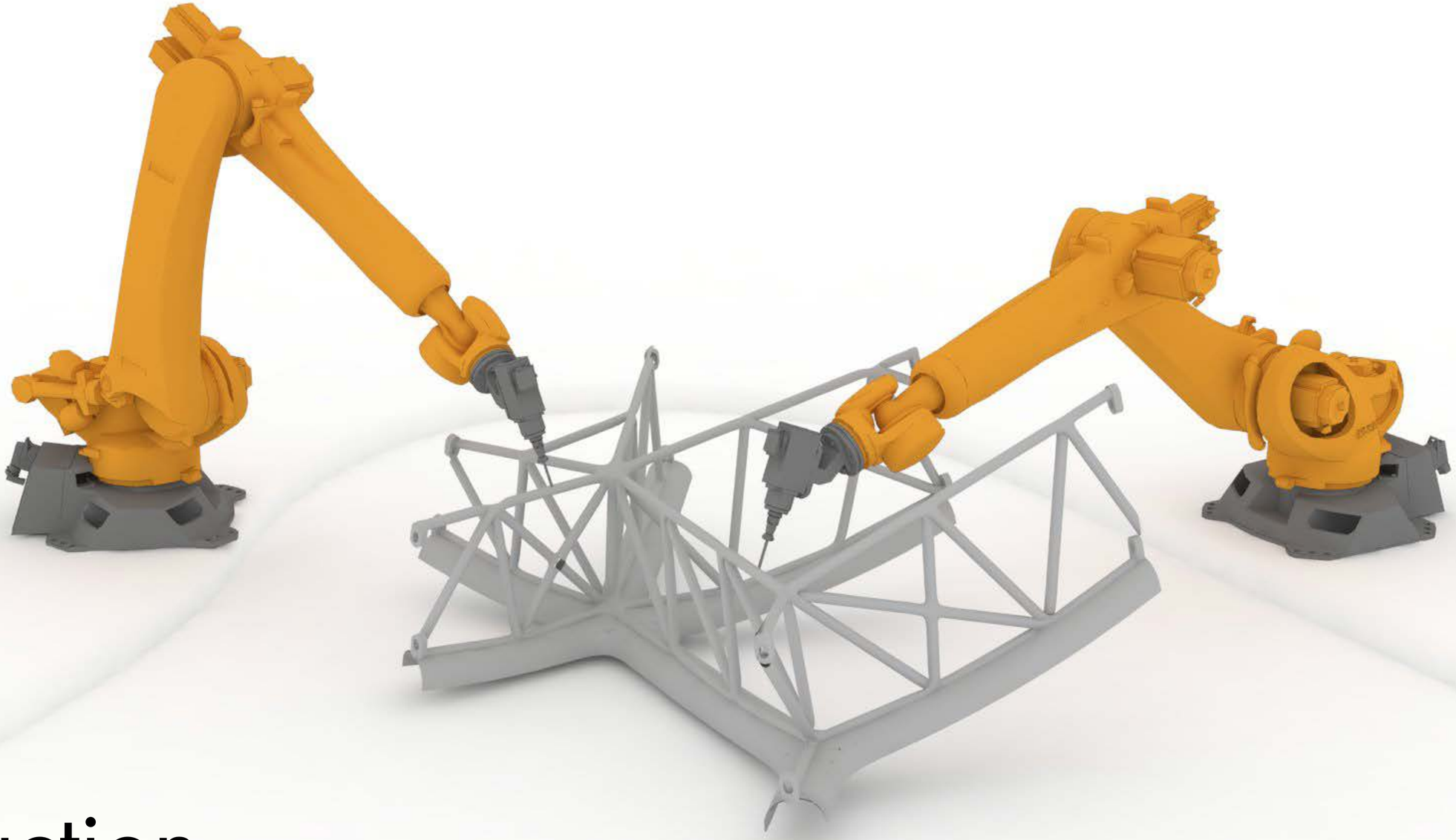
Production

printing process



Production

finished printing



Production

milling of final geometry