

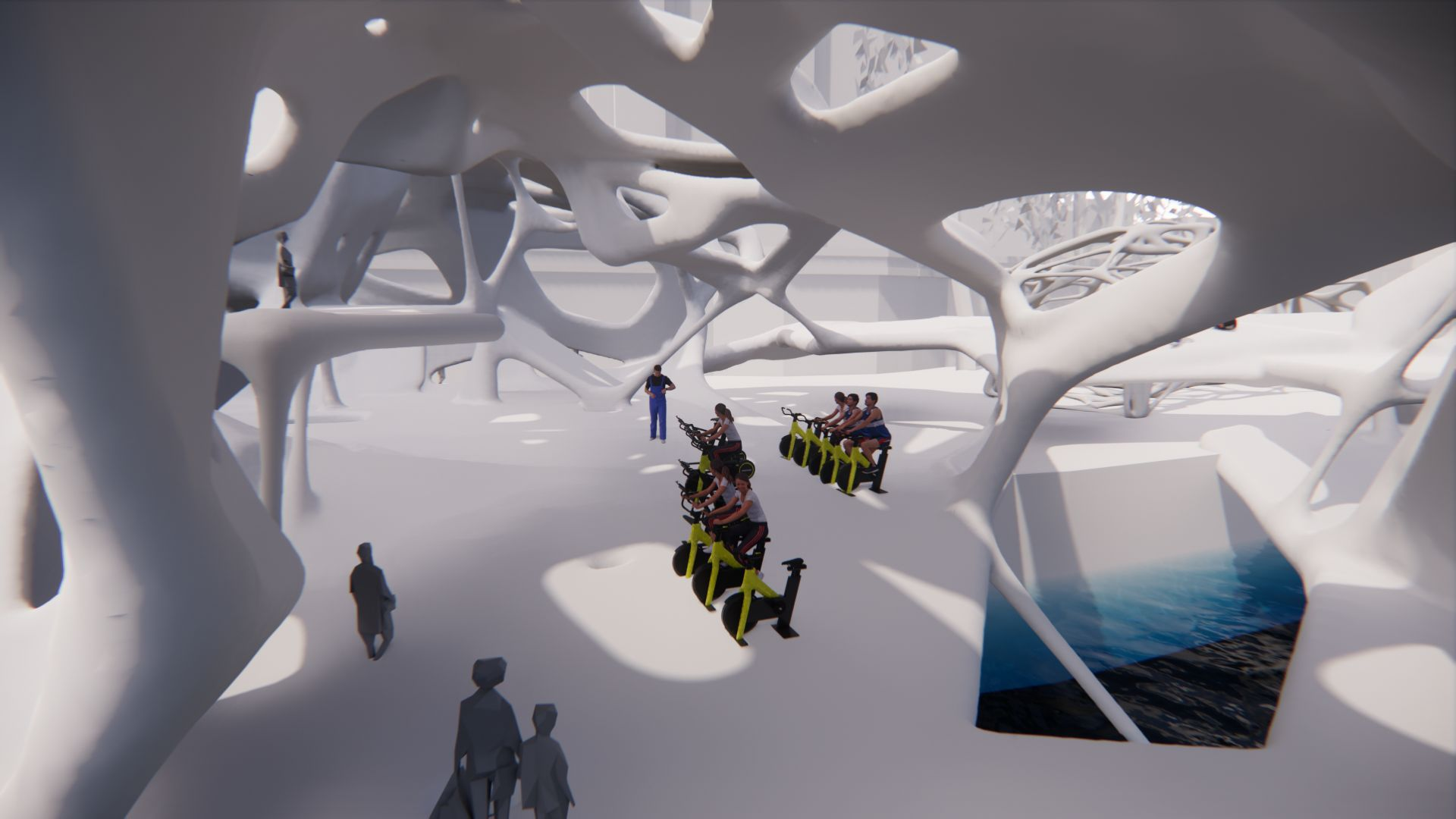
PARIS 2024

A cyclist's reinterpretation of movement at
the Olympic Games



P4

Emma Chris Avramiea
Robotic Lab+ ExploreLab



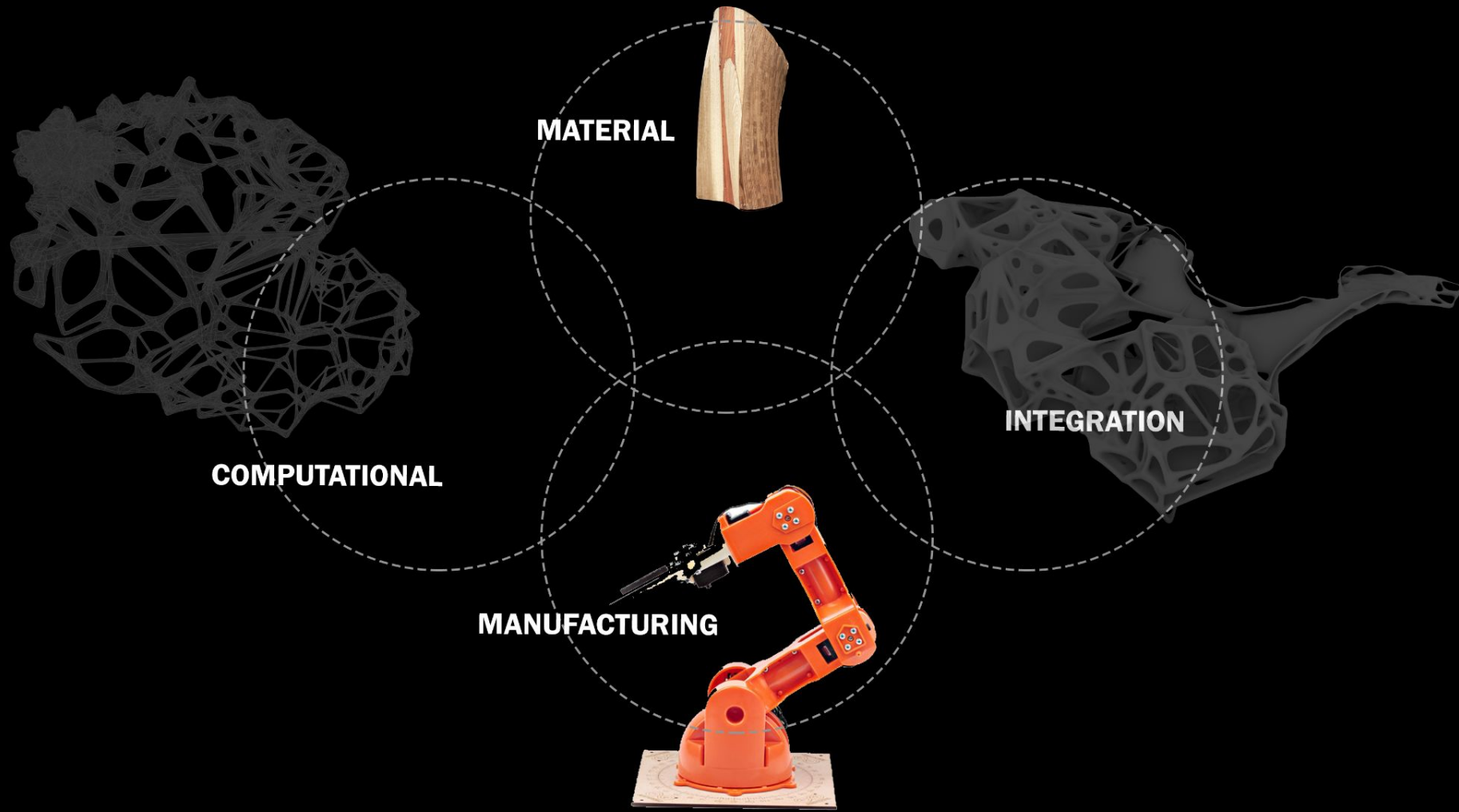
develop the computational design tools
for a dynamic and continuous space

explore robotic practices to support
material up-cycling

create the architectural space for a
new paradigm in sports participation

GOAL





‘Without gravity a dome would be flat.

Where would be the excitement in designing a flat structure?

No gravity, no fun!’

I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

IV. MATERIALIZATION

V. STRUCTURAL STABILITY

VI. REFLECTION

I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

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VI. REFLECTION

urban sprawl



Quote 2

Urban Development for the Rio Olympics
Source: The Wall Street Journal

temporary



A wide-angle, high-angle photograph of a large, empty stadium under construction. The stadium features multiple tiers of white seating, which are currently unoccupied. The central floor area is a mix of concrete and dirt, with some construction materials and equipment scattered around. The stadium's structure is supported by several large, white columns. The lighting is bright, likely from overhead stadium lights, creating a high-contrast scene. The overall atmosphere is one of a massive, yet unfinished, architectural project.

white elephants

**The
Guardian**

Rio's Olympic Venues, 6 months on
Source: The Guardian

new physicality



CYCLISTE 13

- 1 Van Aves Gap
- 2 Haesen 258 m
- 3 Roche 19 m
- 4 De Gendt 25 m
- 5 Stuyven 600 m
- 6 Everspoel 2 m

ELAPSED 00:40:42 28.8 km

REMAINING 2.2 km 00:03:05

kcal 1134 km/h 48.7 rpm 98 watts 518 erg OFF cadence 0 slope 0.9% -2.0%

MORE VIDEOS

56:57 / 1:18:53

GCN SUBSCRIBE

CC BY YouTube

VIRTUAL TOUR OF FLANDERS LIVESTREAM - LOCKDOWN EDITION



SUBSCRIBE ON YOUTUBE



BY CYCLINGTIPS

APRIL 5, 2020

I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

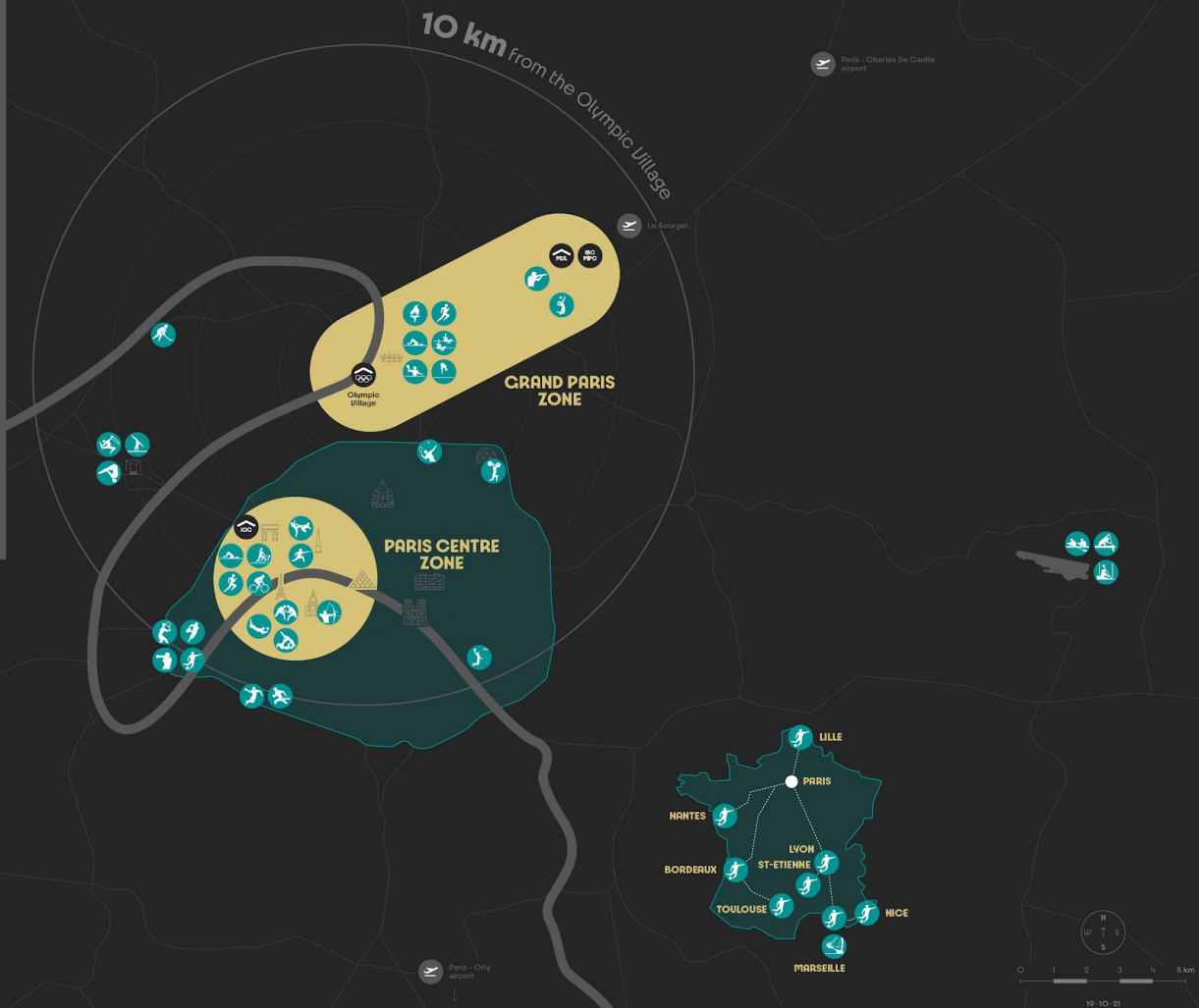
IV. MATERIALIZATION

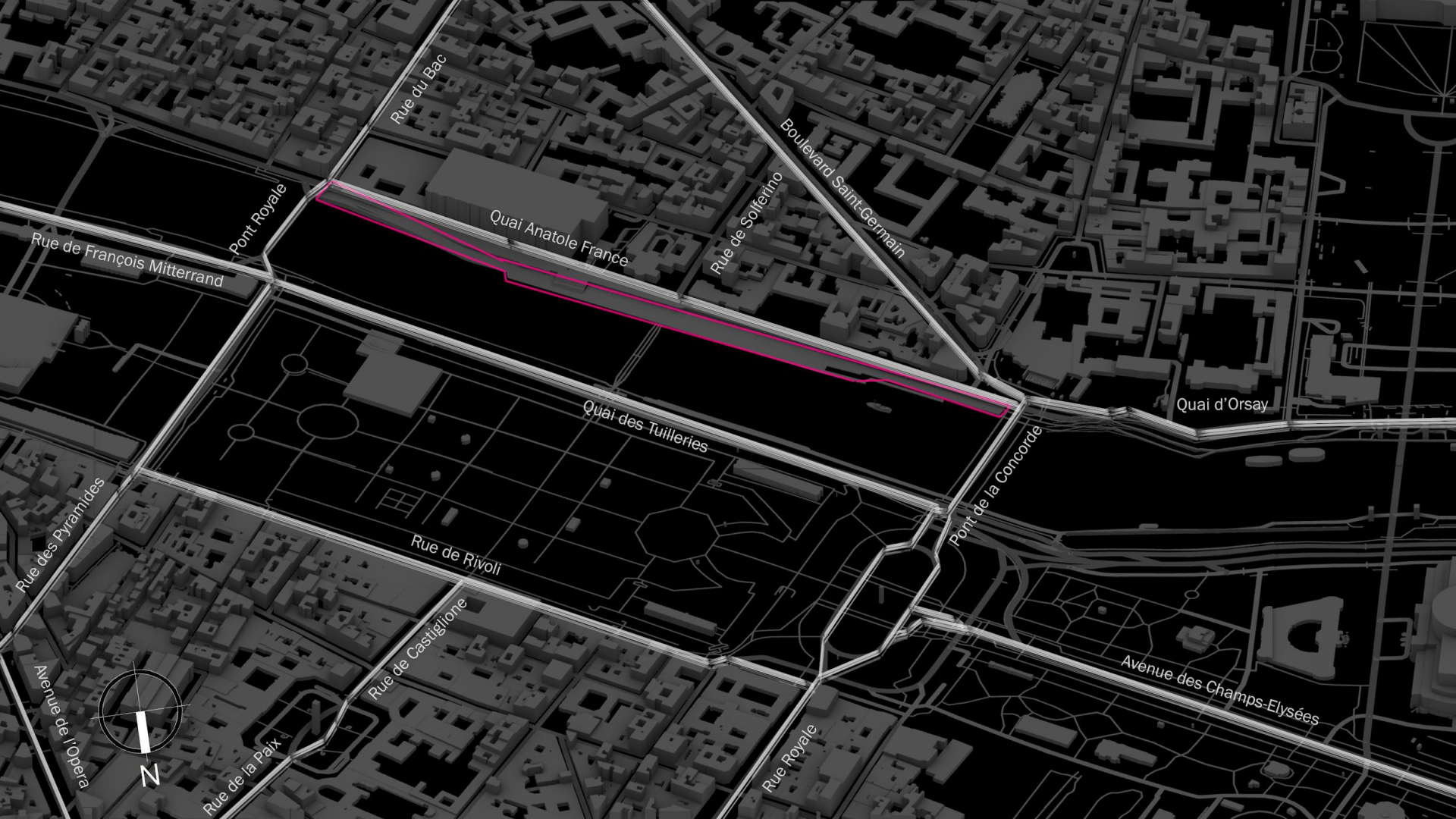
V. STRUCTURAL STABILITY

VI. REFLECTION

PARIS 2024 OLYMPIC VENUE MASTER PLAN

Aquatics Centre #1	<ul style="list-style-type: none"> Aquatics (Swimming) Aquatics (Water-polo) 	Parc des Princes	<ul style="list-style-type: none"> Football
Aquatics Centre #2	<ul style="list-style-type: none"> Aquatics (Frisco Swimming) Aquatics (Diving) Aquatics (Water-polo) 	Roland-Garros Stadium	<ul style="list-style-type: none"> Tennis Boxing
Champs-de-Mars Arena	<ul style="list-style-type: none"> Judo Wrestling 	Saint-Quentin-en-Yvelines BVM Stadium	<ul style="list-style-type: none"> Cycling (BMX Race)
Château de Versailles	<ul style="list-style-type: none"> Equestrian (Dressage/Equestrian) Modern Pentathlon 	Saint-Quentin-en-Yvelines Velodrome	<ul style="list-style-type: none"> Cycling (Track) Modern Pentathlon (Fencing)
East Paris Arena	<ul style="list-style-type: none"> Basketball 	Shooting Range	<ul style="list-style-type: none"> Shooting
Eiffel Tower Stadium	<ul style="list-style-type: none"> Uttleyball (Beach) 	South Paris Arena #1	<ul style="list-style-type: none"> Handball
Blancourt Hill	<ul style="list-style-type: none"> Cycling (Mountain Bike) 	South Paris Arena #2	<ul style="list-style-type: none"> Table tennis
Grand Palais	<ul style="list-style-type: none"> Fencing Taekwondo 	Stade de France	<ul style="list-style-type: none"> Rugby Football (Stadium)
Jean-Bouin Stadium	<ul style="list-style-type: none"> Rugby 	Vélodrome de France	<ul style="list-style-type: none"> Cycling (Stadium/Sprint)
La Chapelle Arena	<ul style="list-style-type: none"> Badminton 	Viel-du-Piano Stadium	<ul style="list-style-type: none"> Hockey
La Défense Arena	<ul style="list-style-type: none"> Gymnastics (Artistic/Rhythmic/Trampoline) 	Zenith Arena	<ul style="list-style-type: none"> Weightlifting
Le Bourget Arena	<ul style="list-style-type: none"> Volleyball 	Bordeaux Stadium	<ul style="list-style-type: none"> Football
Le Golf National	<ul style="list-style-type: none"> Golf 	Lille Stadium	<ul style="list-style-type: none"> Football
Le Pont d'Iéna	<ul style="list-style-type: none"> Roquiatics (Marathon Swimming) Roquiatics (Marathon, Race Walk) Traction Cycling (Road) 	Lyon Stadium	<ul style="list-style-type: none"> Football
Les Invalides	<ul style="list-style-type: none"> Rowing 	Marseille Marina	<ul style="list-style-type: none"> Sailing
Olympic Stadium	<ul style="list-style-type: none"> Athletics Ceremonies 	Marseille Stadium	<ul style="list-style-type: none"> Football
		Nantes Stadium	<ul style="list-style-type: none"> Football
		Nice Stadium	<ul style="list-style-type: none"> Football
		Saint-Etienne Stadium	<ul style="list-style-type: none"> Football
		Toulouse Stadium	<ul style="list-style-type: none"> Football





Rue du Bac

Boulevard Saint-Germain

Pont Royal

Rue de François Mitterrand

Quai Anatole France

Rue de Solferino

Quai d'Orsay

Quai des Tuilleries

Pont de la Concorde

Rue de Rivoli

Avenue des Champs-Élysées

Rue des Pyramides

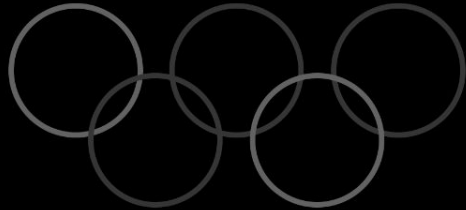
Rue de Castiglione

Rue Royale

Avenue de l'Opéra

Rue de la Paix





UBAN NETWORK



Skating store

Musée d'Orsay

Proposed Cycling

Cycling path



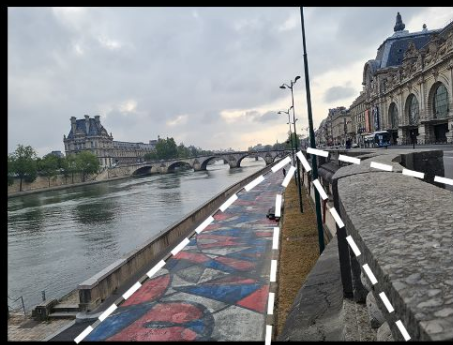
















PARIS SEINE

GRAND PALAIS
Centre de la Chimie
MUSEE DES MINERALS

I. CONTEXT

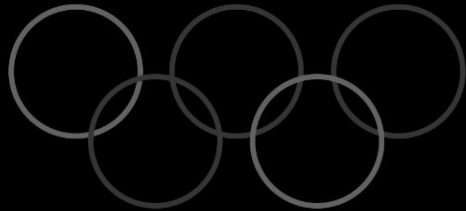
II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

IV. MATERIALIZATION

V. STRUCTURAL STABILITY

VI. REFLECTION



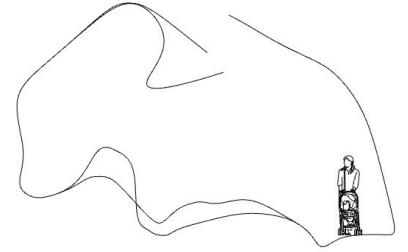
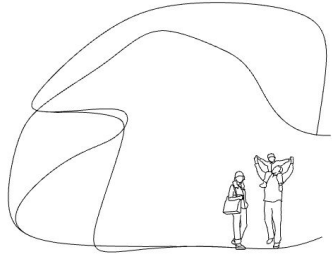
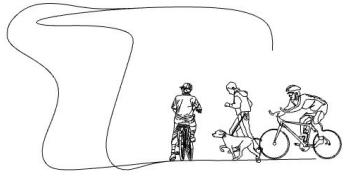
**ARCHITECTURAL
EXPRESSION**



dynamic

AEDAS Hengqin International Financial Center

Photo by Terrance Zhang



Architectural Cross-section - conceptual

continuous



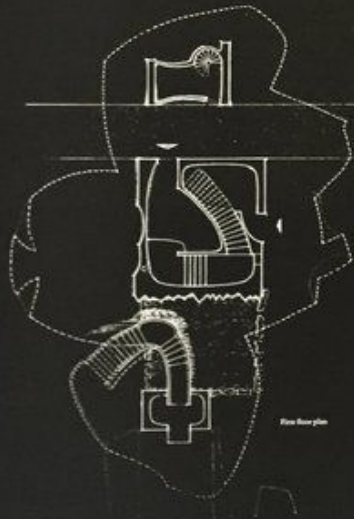
North elevation



West elevation



South elevation



Five floor plan



Ground floor plan



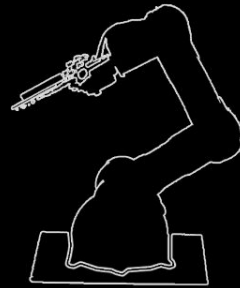
East elevation

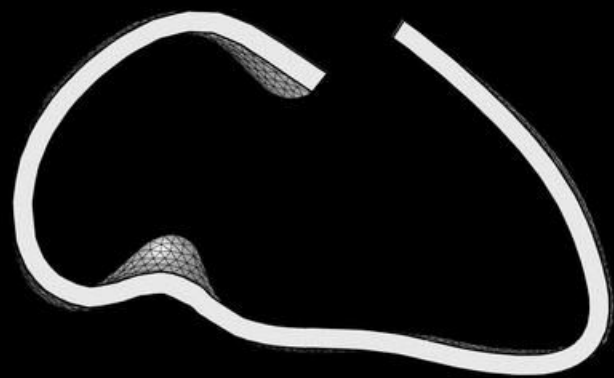


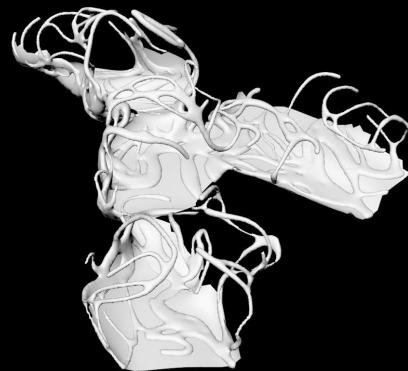
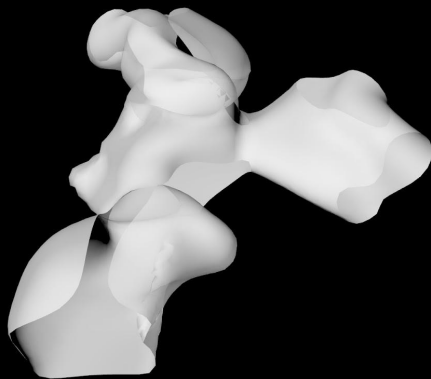
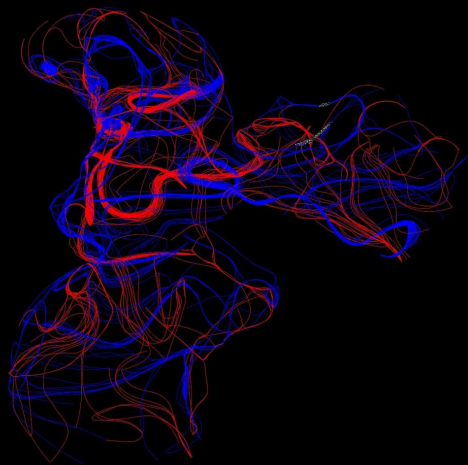
Division plan

robotic manufacturing
computation
optimization

WORKSHOP

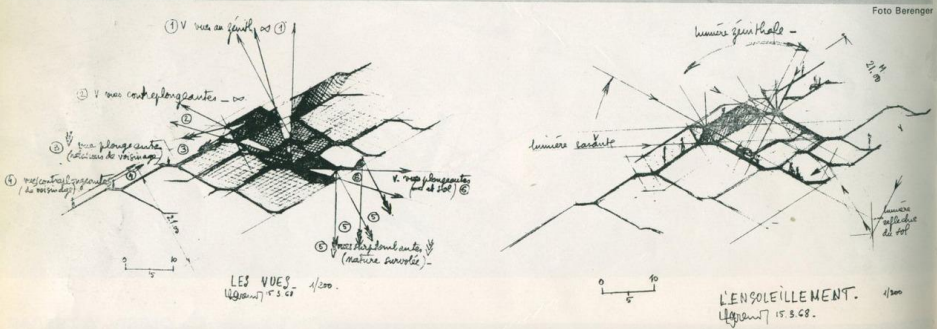
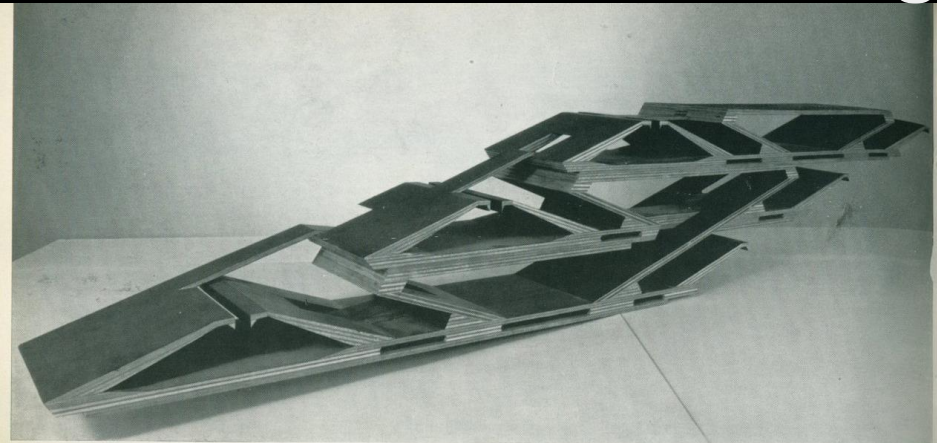






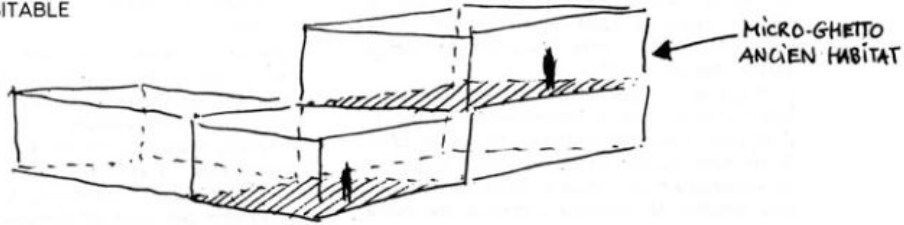
Structural Optimization

engaging

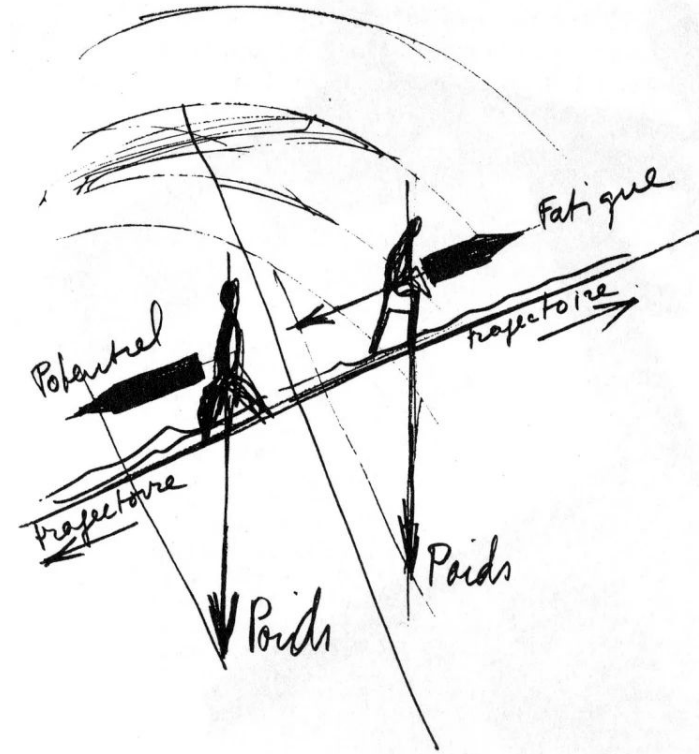
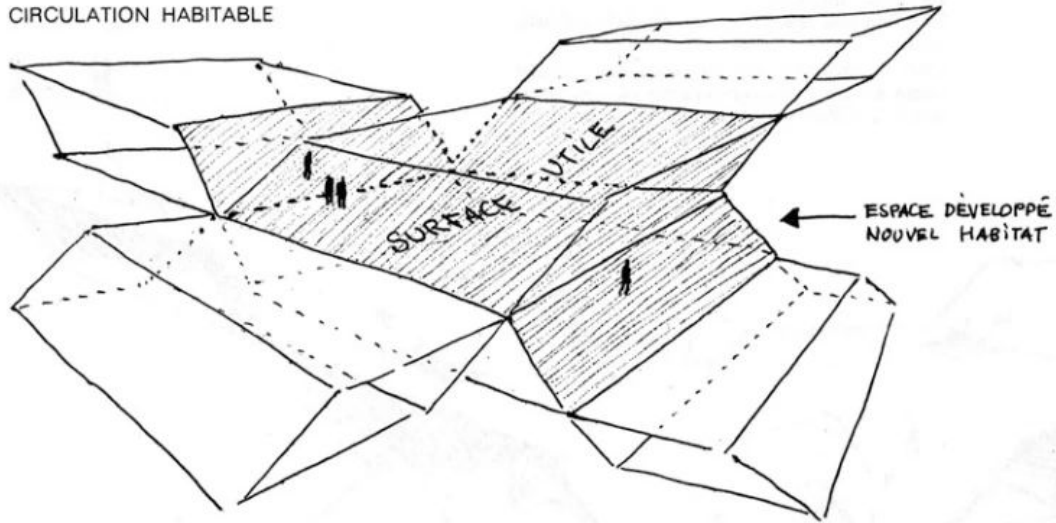


Zaha Hadid - Pierres Vives

STATION HABITABLE



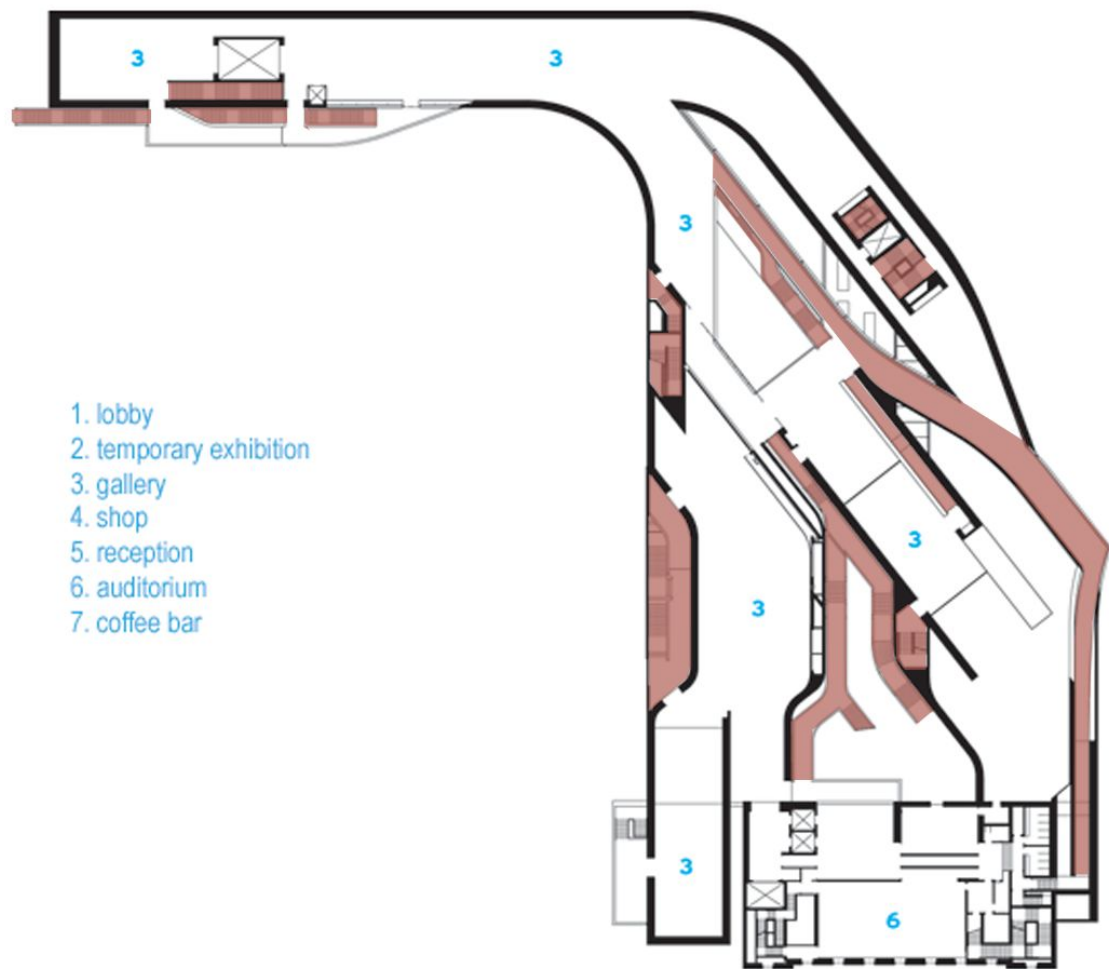
CIRCULATION HABITABLE



Claude Parent - The oblique function - tilting the ground - challenging verticality - the wall becomes experientiable



Zaha Hadid - Maxxi Museum



1. lobby
2. temporary exhibition
3. gallery
4. shop
5. reception
6. auditorium
7. coffee bar

SECOND FLOOR



Coop Himmelb(l)au - BMW bridge

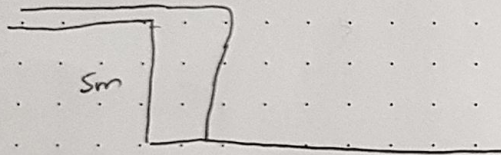


dynamic ground

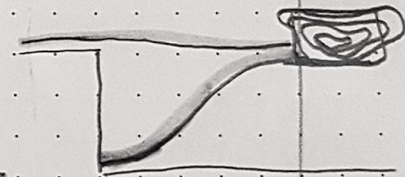
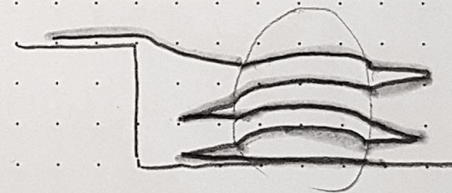
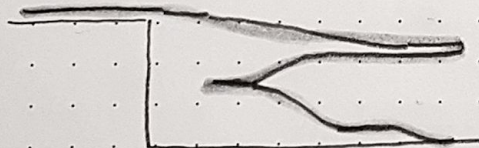
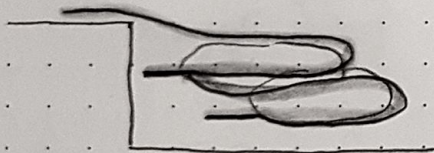
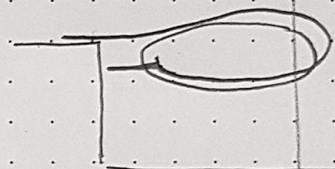
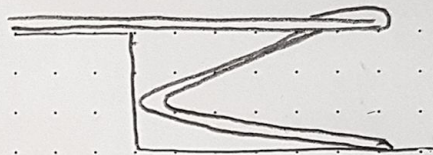




SANAA - Rolex Learning Center



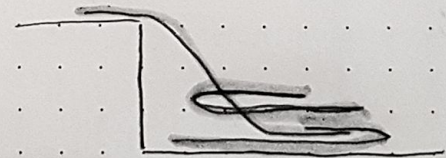
Sm



ramp along architecture

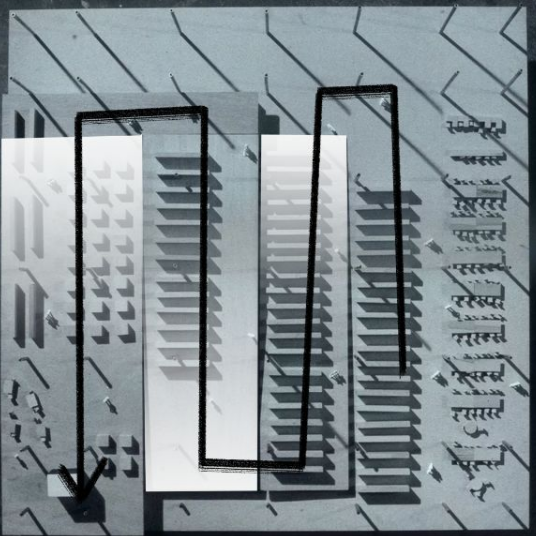
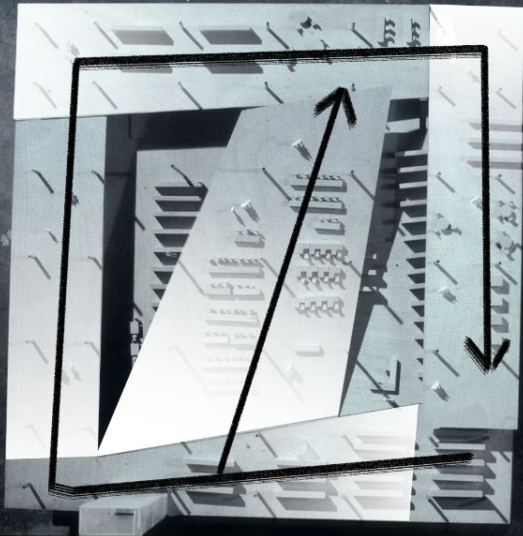


ramp on top of archit.



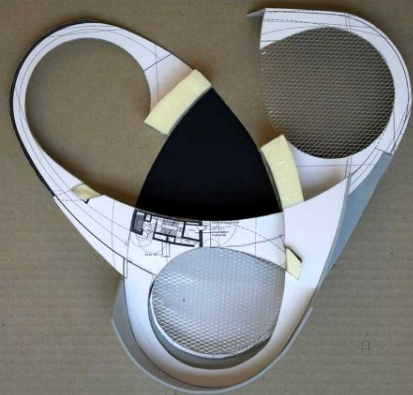
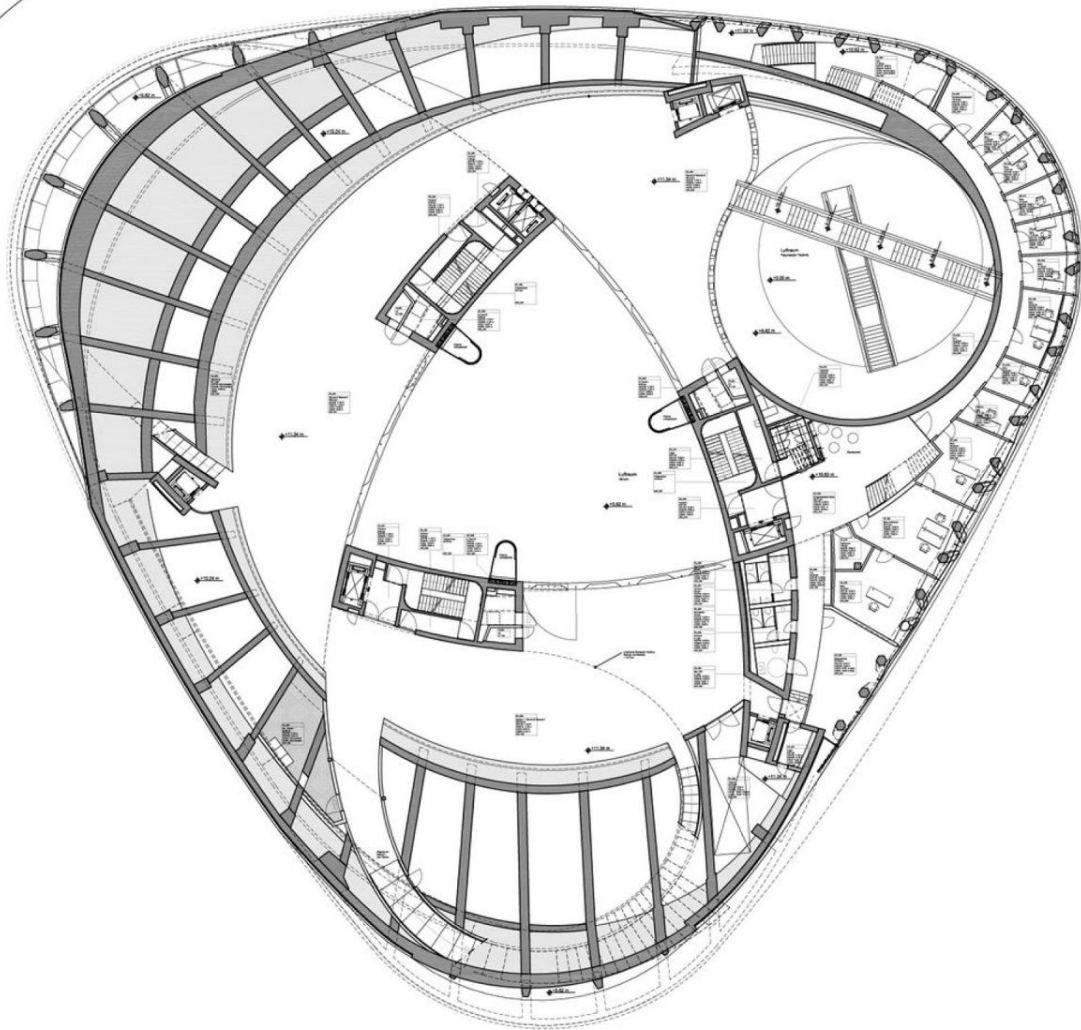
maxxi

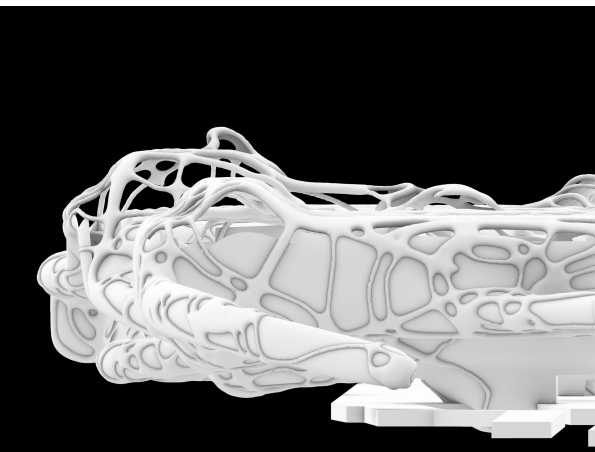




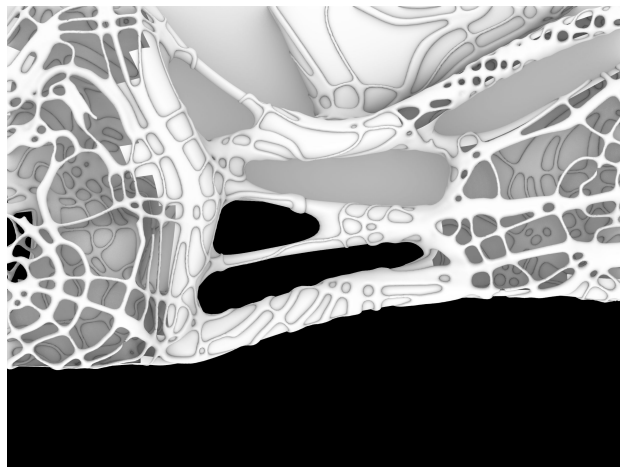


Mercedes Museum, UN Studio

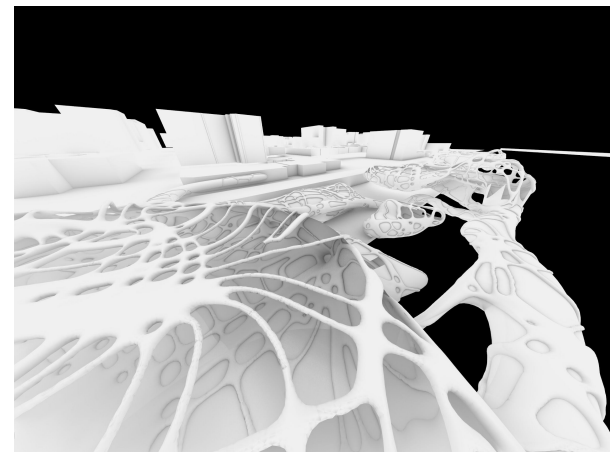




Expressive of Urban Multisensorial Experiences



Localized/optimal transition gradient



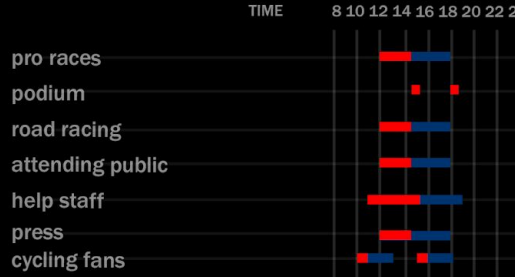
Materially Efficient

Patterns of Materiality and Formal Language

DATA DRIVEN APPROACH



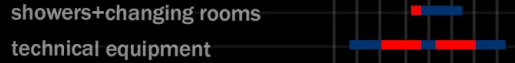
I. ROAD RACING



II. BMX CYCLING



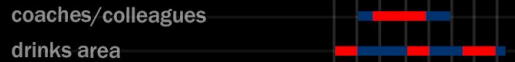
III. TECHNICAL SPACES



IV. AMATEUR CYCLISTS



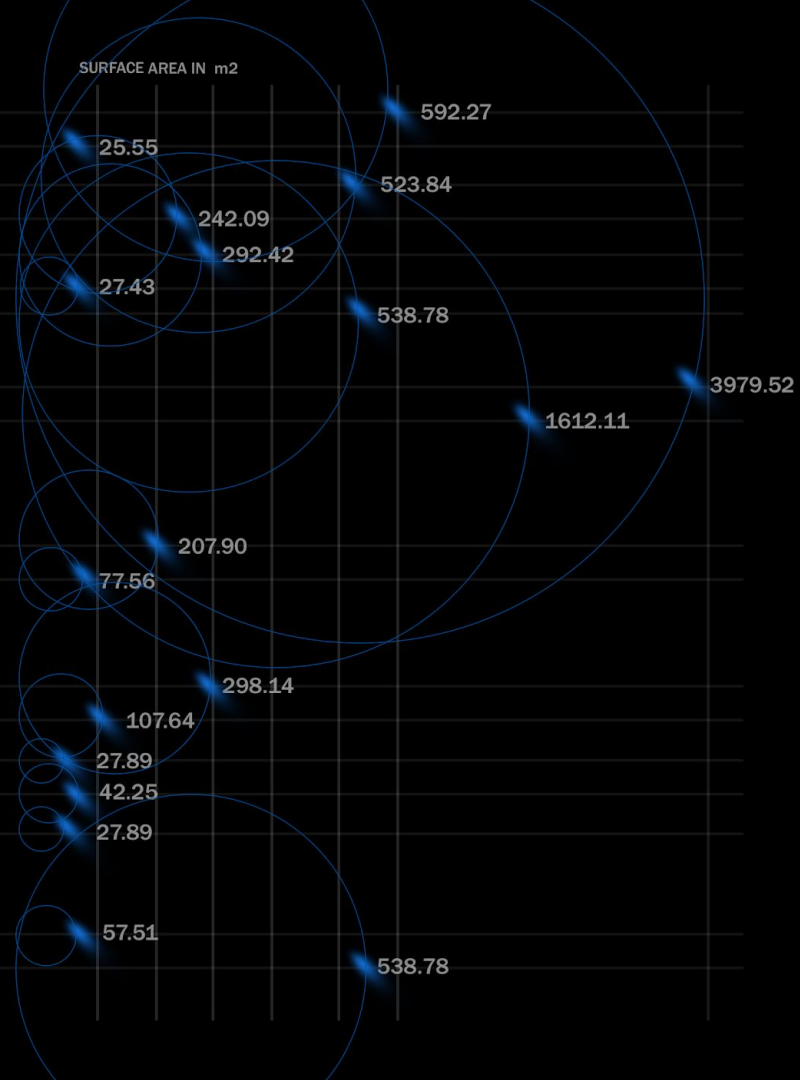
V. PUBLIC



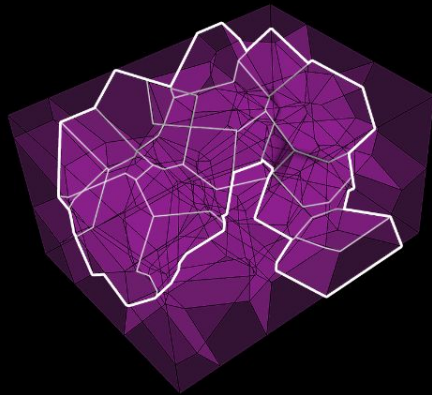
TIME 8 10 12 14 16 18 20 22 24

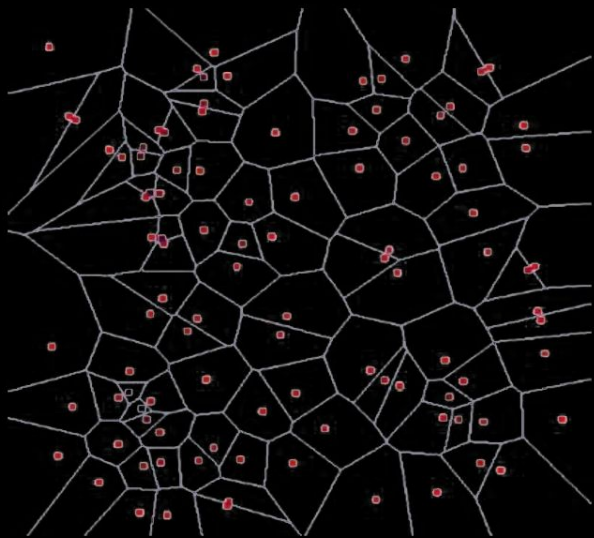
min max

SURFACE AREA IN m²

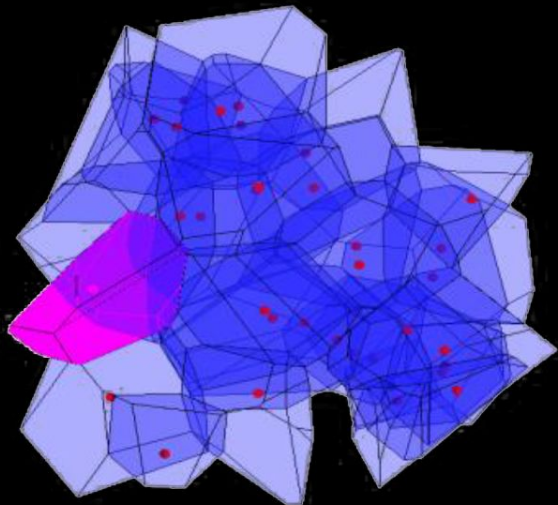


COMPUTATIONAL TOOLS

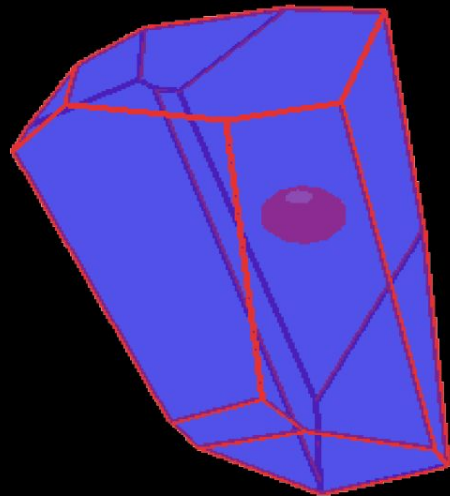




a.
point cloud generating 2d voronoi
edges as lines



b.
3d voronoi with surfaces and lines
as edges

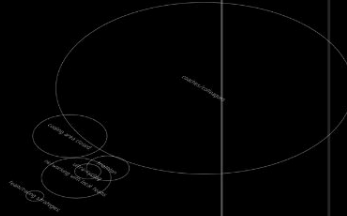


c.
unique cell

PARAMETERS FAMILY EVOLUTION

surface per user

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1**
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1



number of users. floors height

- 20
- 200
- 15**
- 30
- 7
- 30



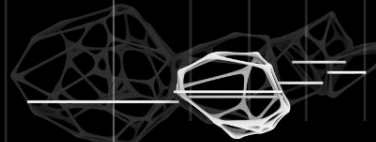
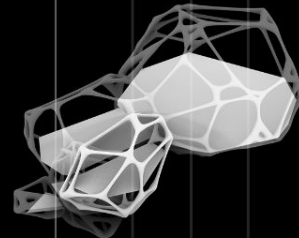
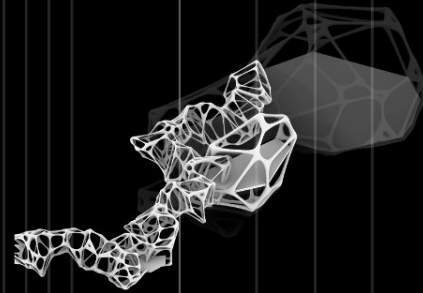
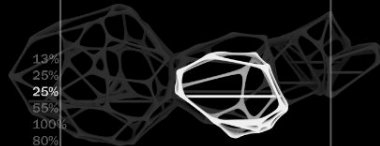
total surface

- 40
- 100
- 15**
- 105
- 7
- 30



visual porosity

- 13%
- 25%
- 25%**
- 55%
- 100%
- 80%



city proximity spots

- Not relevant
- Waterfront
- Waterfront**
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

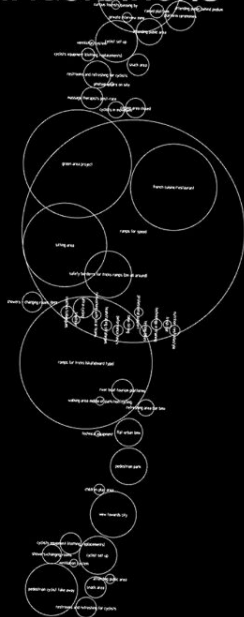
function activity

- coaches/colleagues
- cooling area closed
- triathlon**
- ultra-cycling
- networking local teams
- team/racing strategies

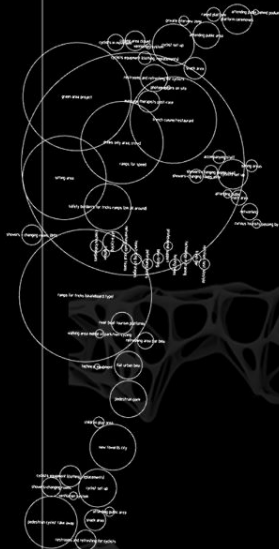
height of function

- 1.17
- 2.25
- 2.25**
- 4.95
- 9
- 7.2

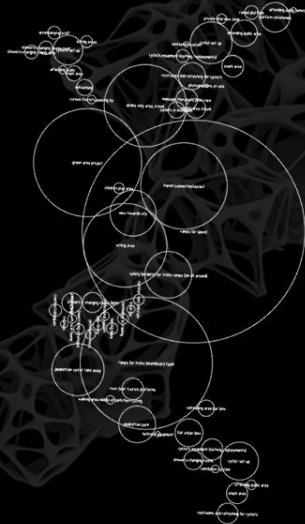
PROGRAM CONFIGURATIONS



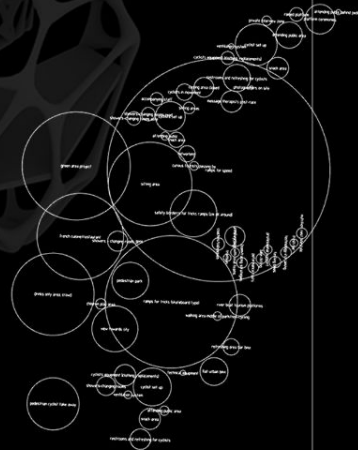
v1_racing to leisure gradient



v2_river suspension



v3_racing nuclea polarization

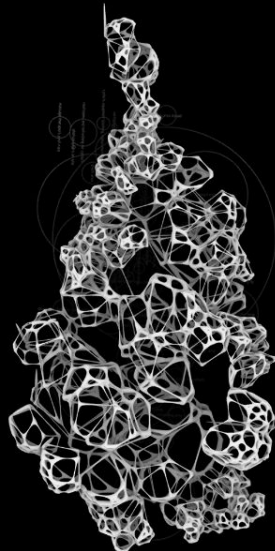
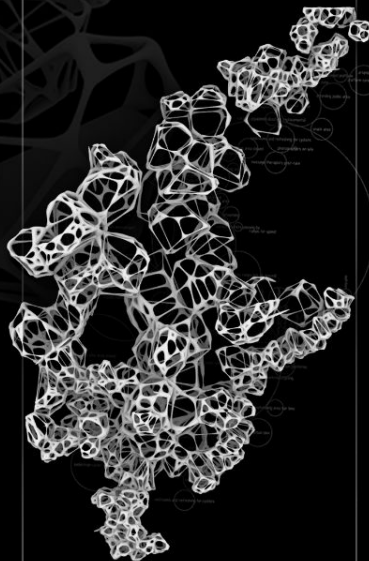
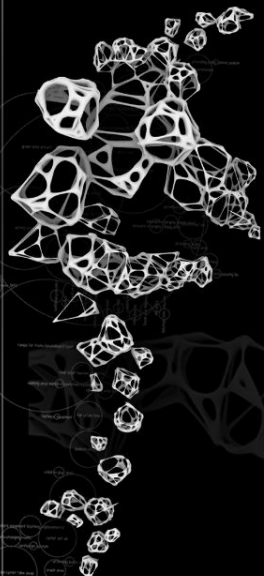
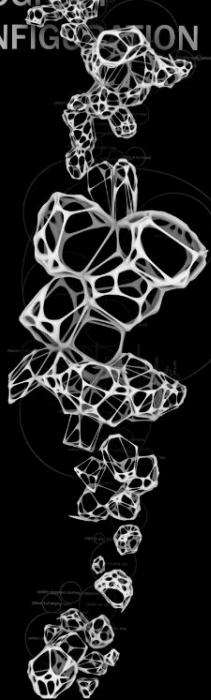


v4_racing nuclea polarization

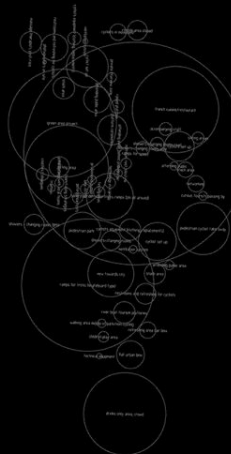
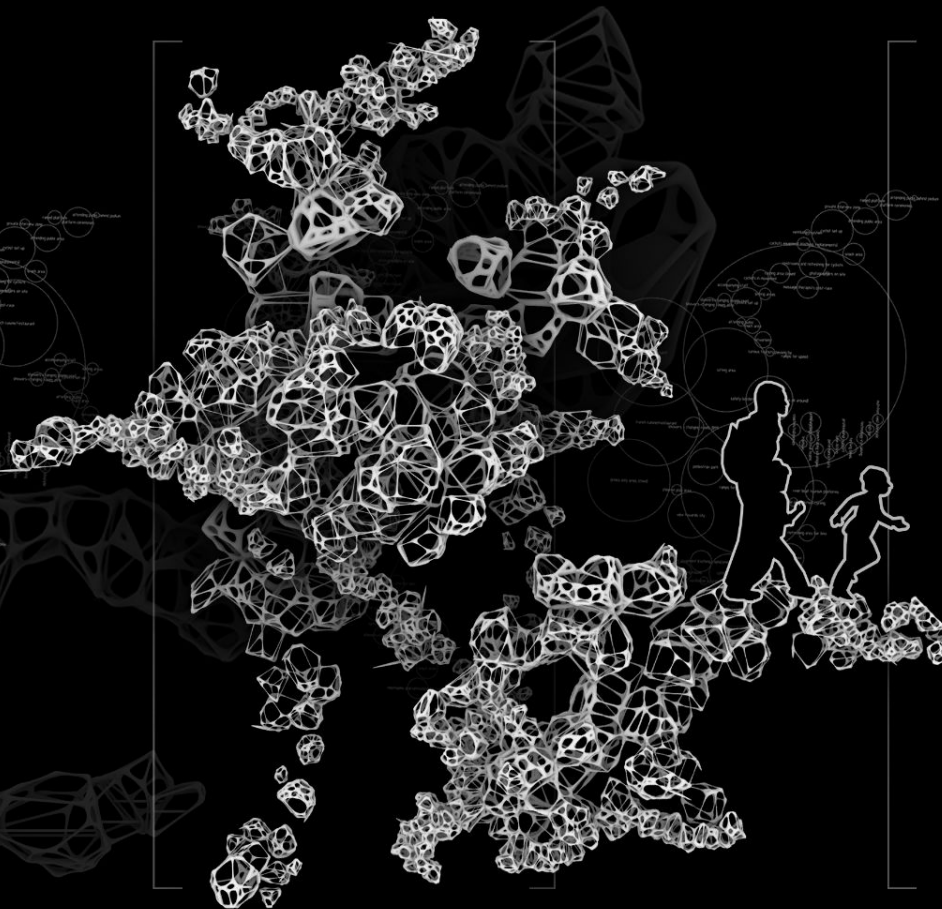
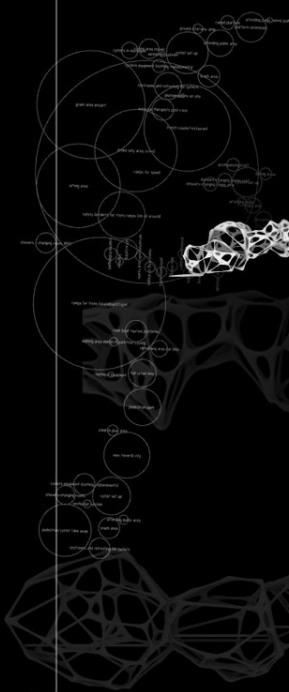
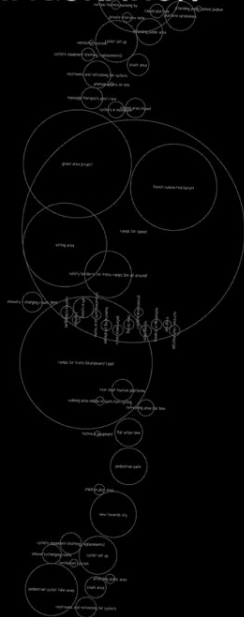


v5_radiant stacked intensities

PROGRAM
CONFIGURATION



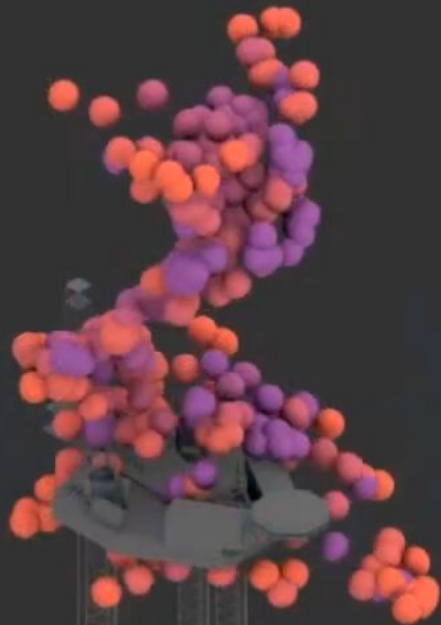
PROGRAM CONFIGURATION



agent based modeling
BB C
ABM 4
var 4

functions

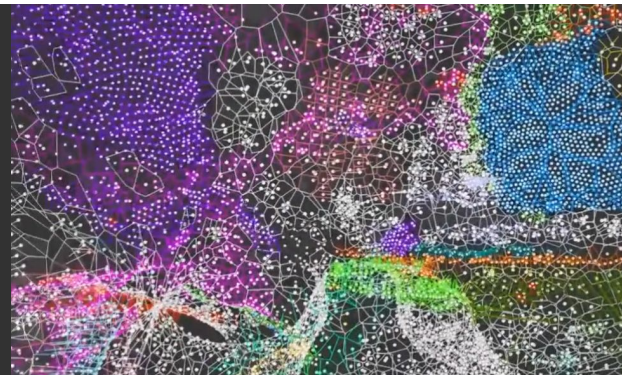
- living
- work
- leisure
- nature
- food
- energy



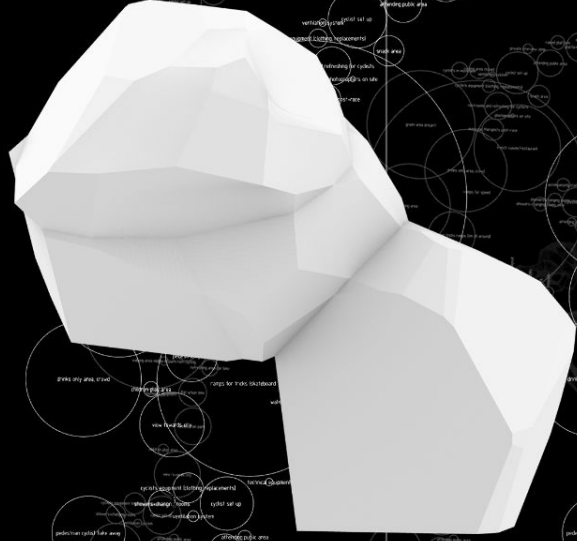
agent based modeling

volume swarm

10^6



MATERIALIZATION



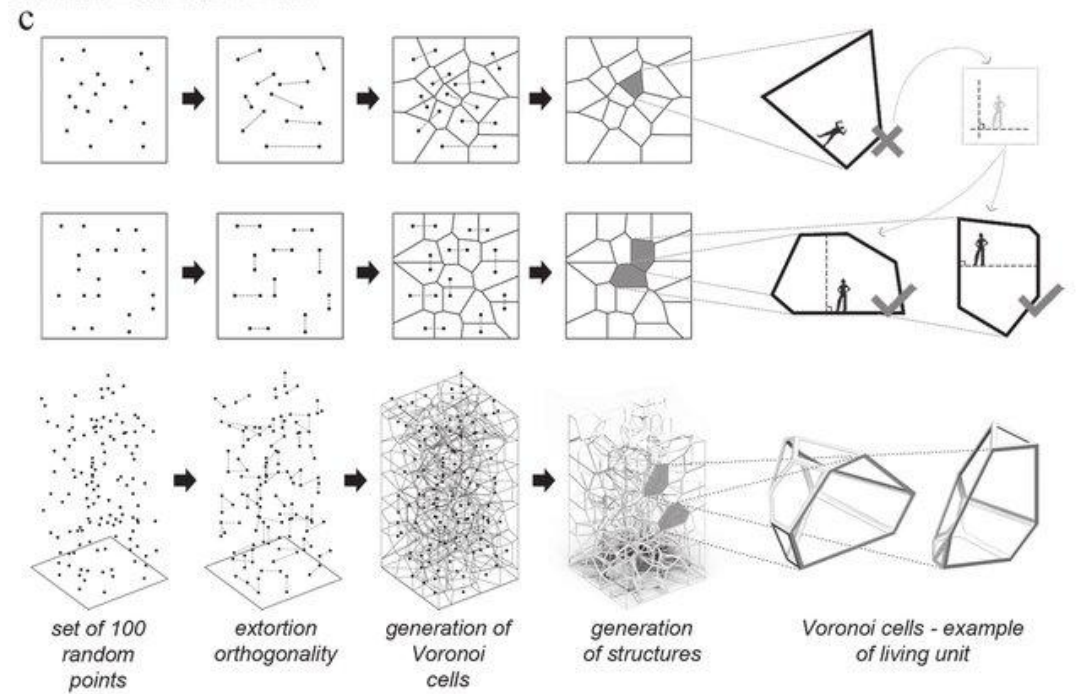
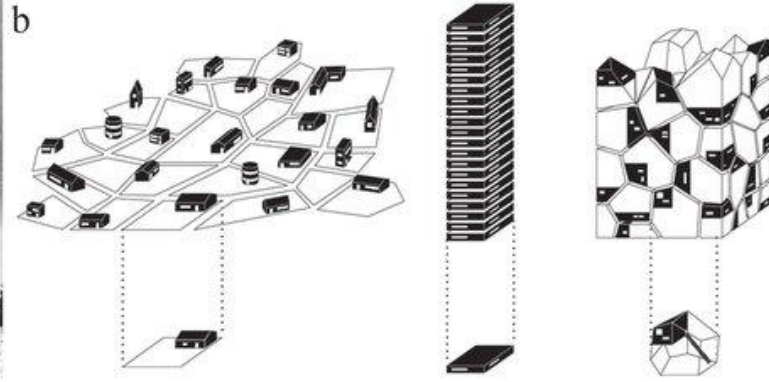
Base Volume

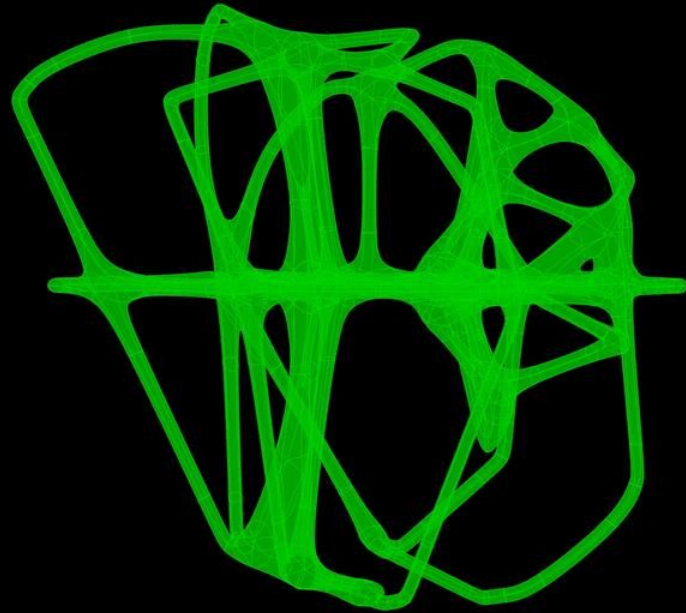


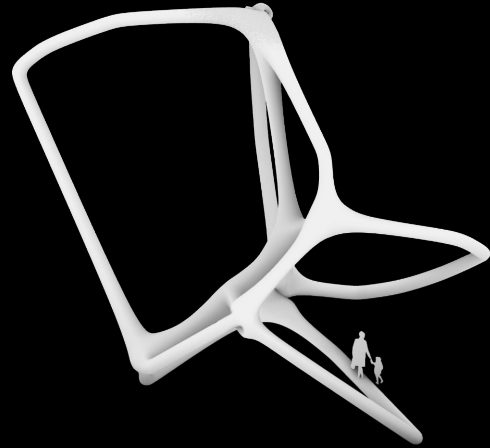
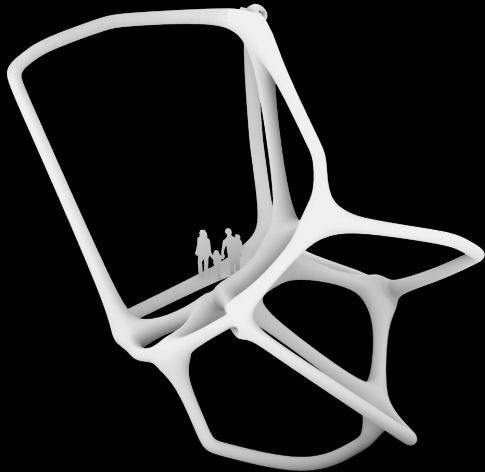
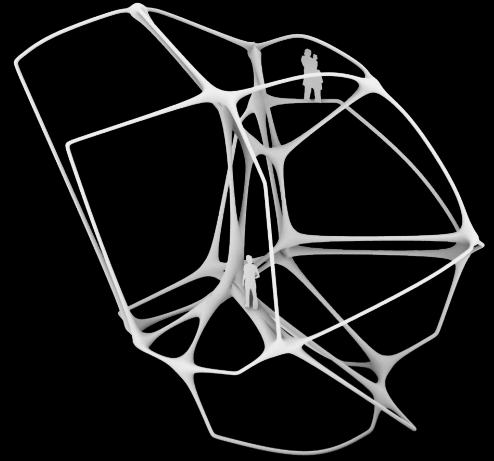
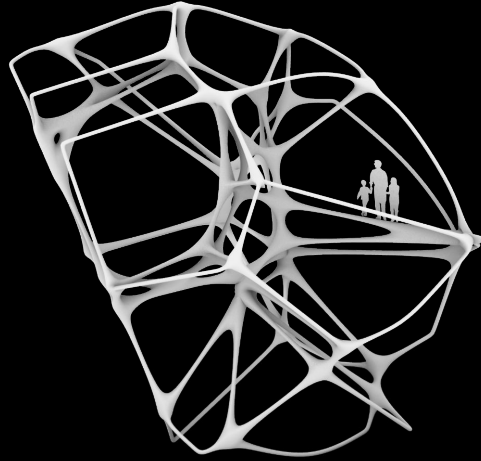
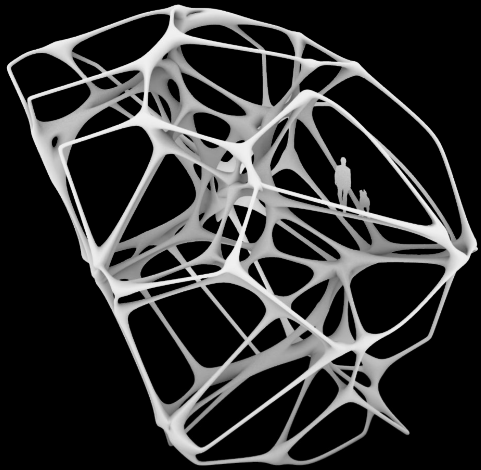
Compression Regions

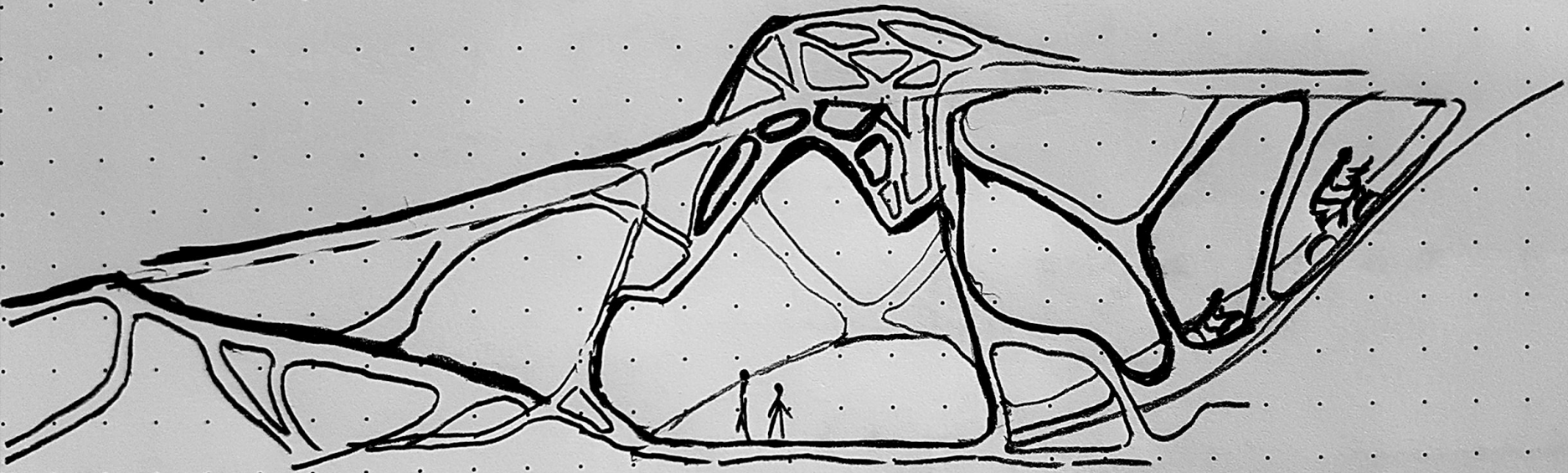


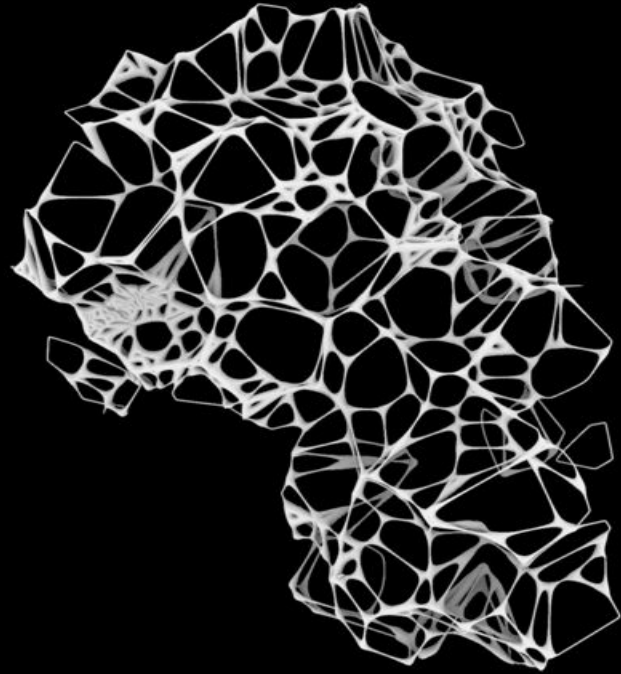
Materialization











ARCHITECTURAL PROPOSAL

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m²

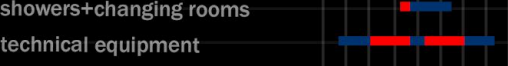
I. ROAD RACING



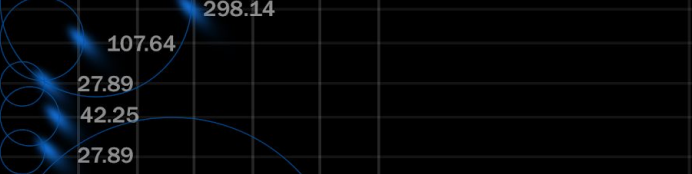
II. BMX CYCLING



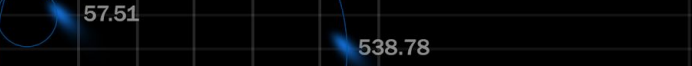
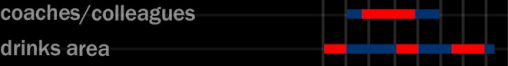
III. TECHNICAL SPACES



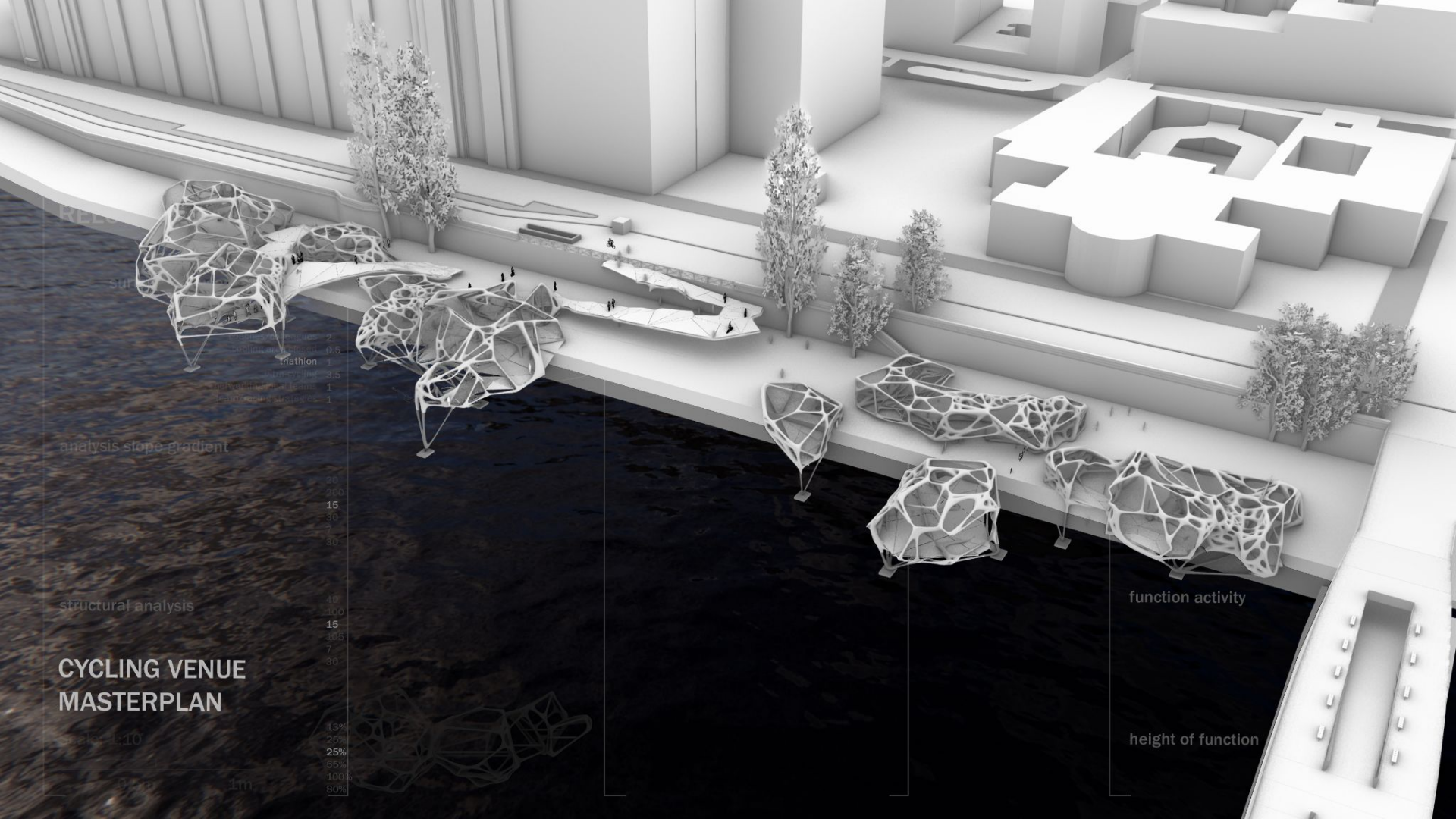
IV. AMATEUR CYCLISTS



V. PUBLIC



min max



RIEL

su

2
0.6
1
3.5
1
1

analysis slope gradient

25
15
10
5
0

structural analysis

15
100
7
30

CYCLING VENUE MASTERPLAN

scale 1:10

13%
25%
25%
55%
100%
80%

function activity

height of function

1m

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

DESIGN FRAGMENT STUDY

surface per user

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

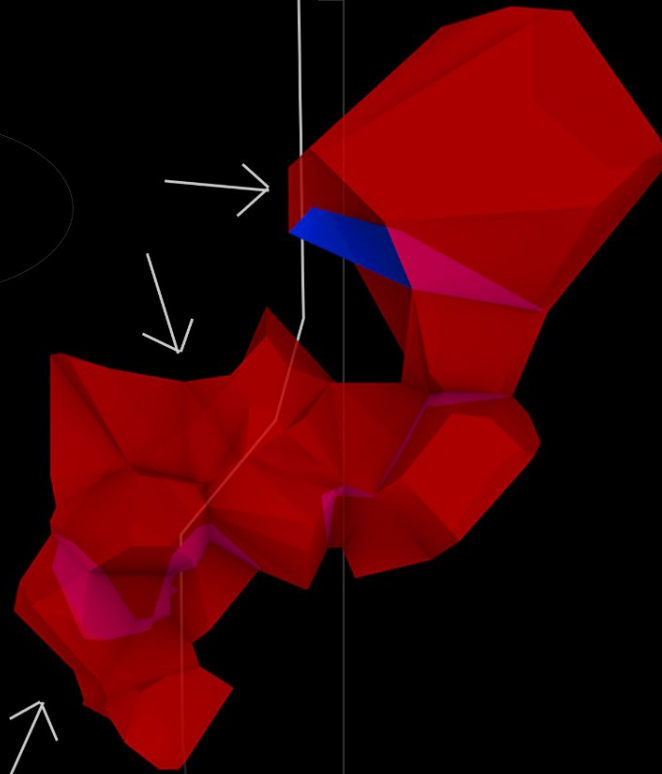
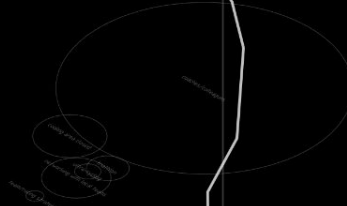
- 20
- 200
- 15
- 30
- 7
- 30

structural analysis

- 40
- 15
- 105
- 7
- 30

voronoi support structure

- 13%
- 25%
- 25%
- 55%
- 100%
- 80%



city proximity spots

- Not relevant
- Waterfront
- Waterfront
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

function activity

- coaches/colleagues
- cooling area closed
- triathlon
- ultra-cycling
- networking local teams
- team/racing strategies

height of function

- 1.17
- 2.25
- 2.25
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

FUNCTIONAL DISTRIBUTION

surface per user

coaches/colleagues 2
cooling area closed 0.5

networking
team

analysis slope gradient

restaurant french cuisine

circulation
space

restroom

snack area

attending
public

cycling events

showers
cyclists

showers

activity spots

cycling
equipment

Not relevant
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

function activity

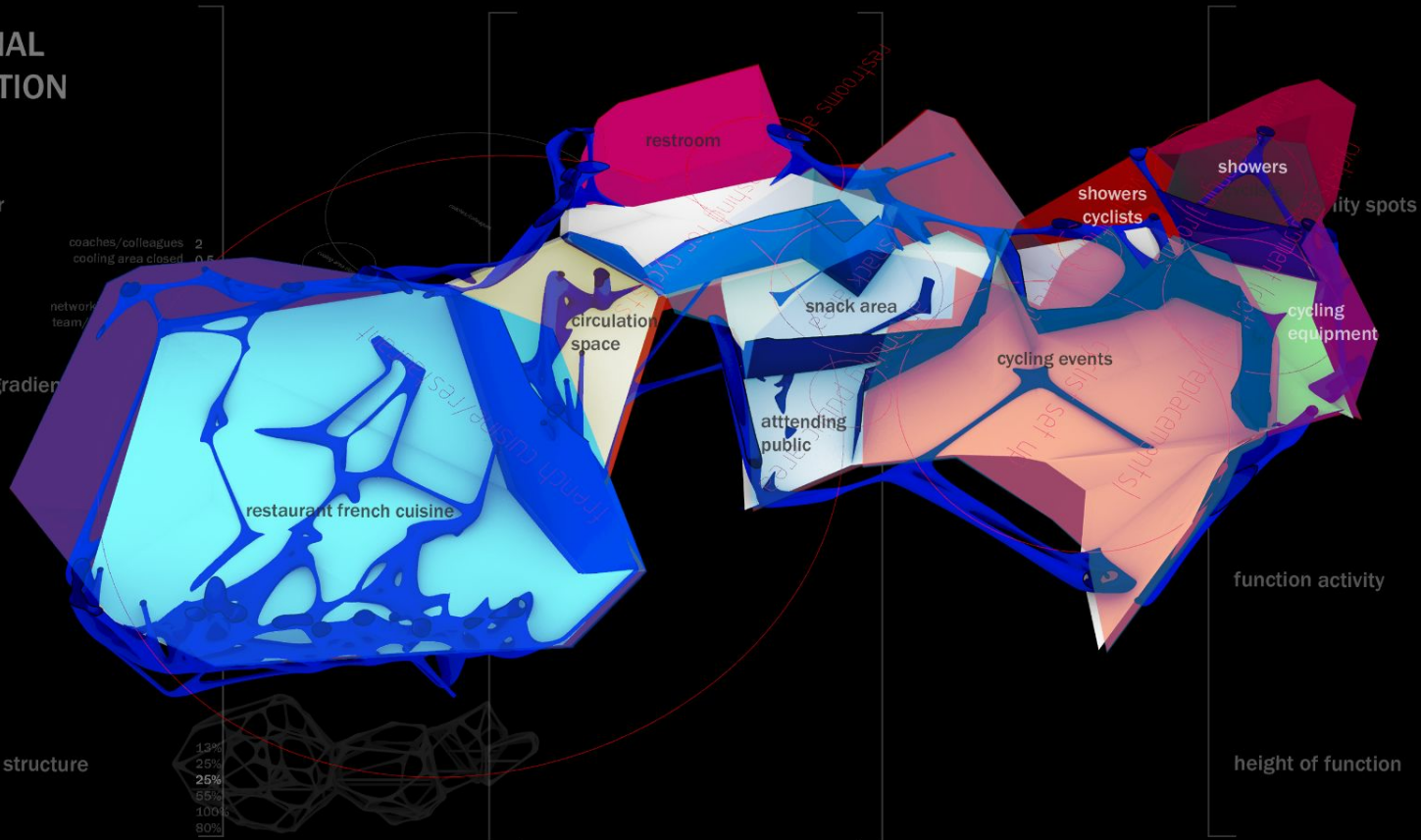
coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

voronoi support structure

13%
25%
25%
65%
100%
80%

height of function

1.17
2.25
2.25
4.95
9
7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m²

SPATIAL NETWORK

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient

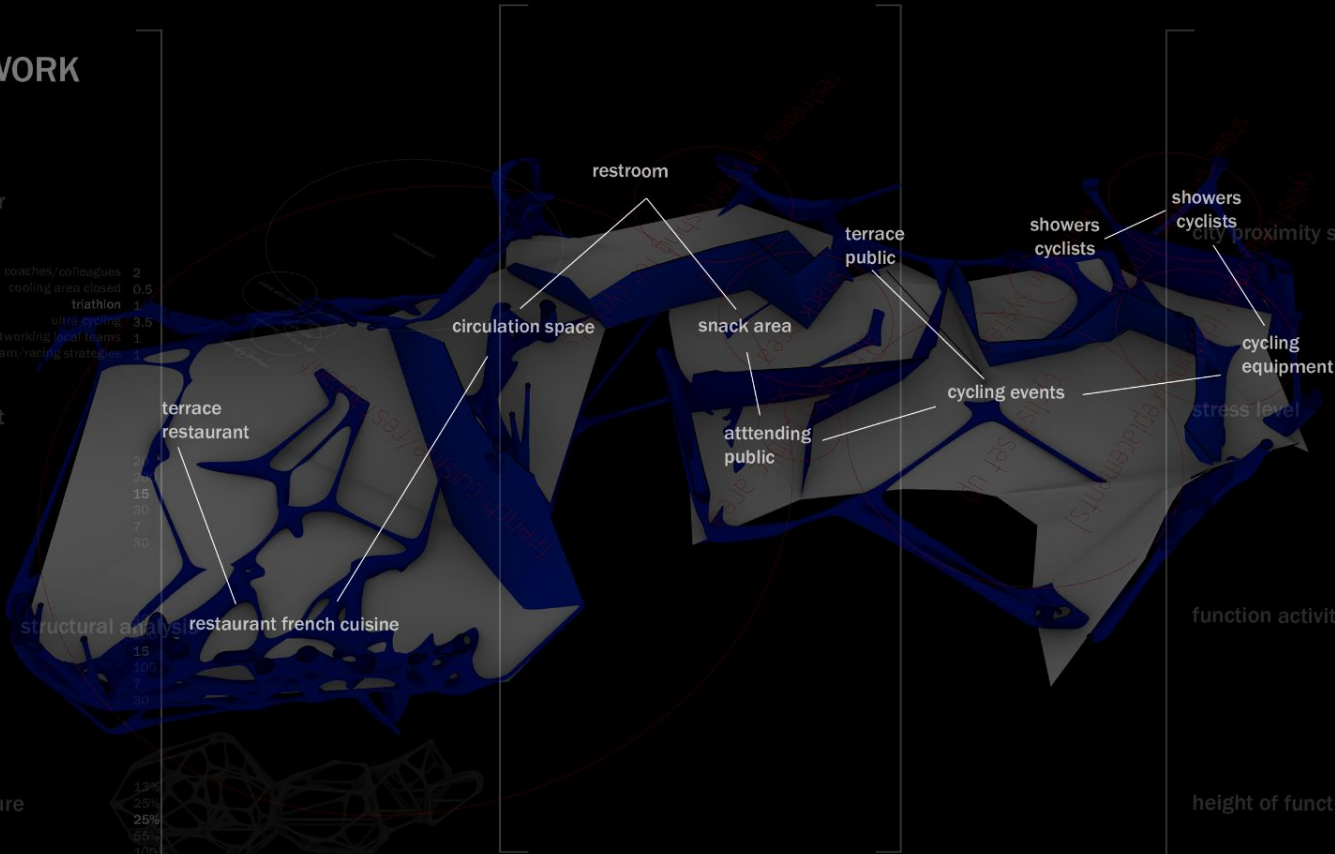
25%
15%
5%
0%
5%
15%
25%

structural analysis

15%
10%
5%
0%
5%
10%
15%

voronoi support structure

13%
25%
25%
65%
100%
80%



restroom

terrace public

showers cyclists

showers cyclists

circulation space

snack area

attending public

cycling events

city proximity spots

cycling equipment

terrace restaurant

restaurant french cuisine

stress level

function activity

height of function

Not relevant
Waterfront
Waterfront
Waterfront
Rue de Solférino
Rue de Solférino

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

1.17
2.25
2.25
4.95
9
7.2



coaches/colleagues 0.5
 triathlon 1
 ultra-cycling 3.5
 networking local teams 1
 team/racing strategies 1

analysis slope gradient

20
 200
 15
 20
 7
 30

structural analysis

40
 100
 15
 105



1.5m

25%
 0.5
 1.0
 0.2

stress level

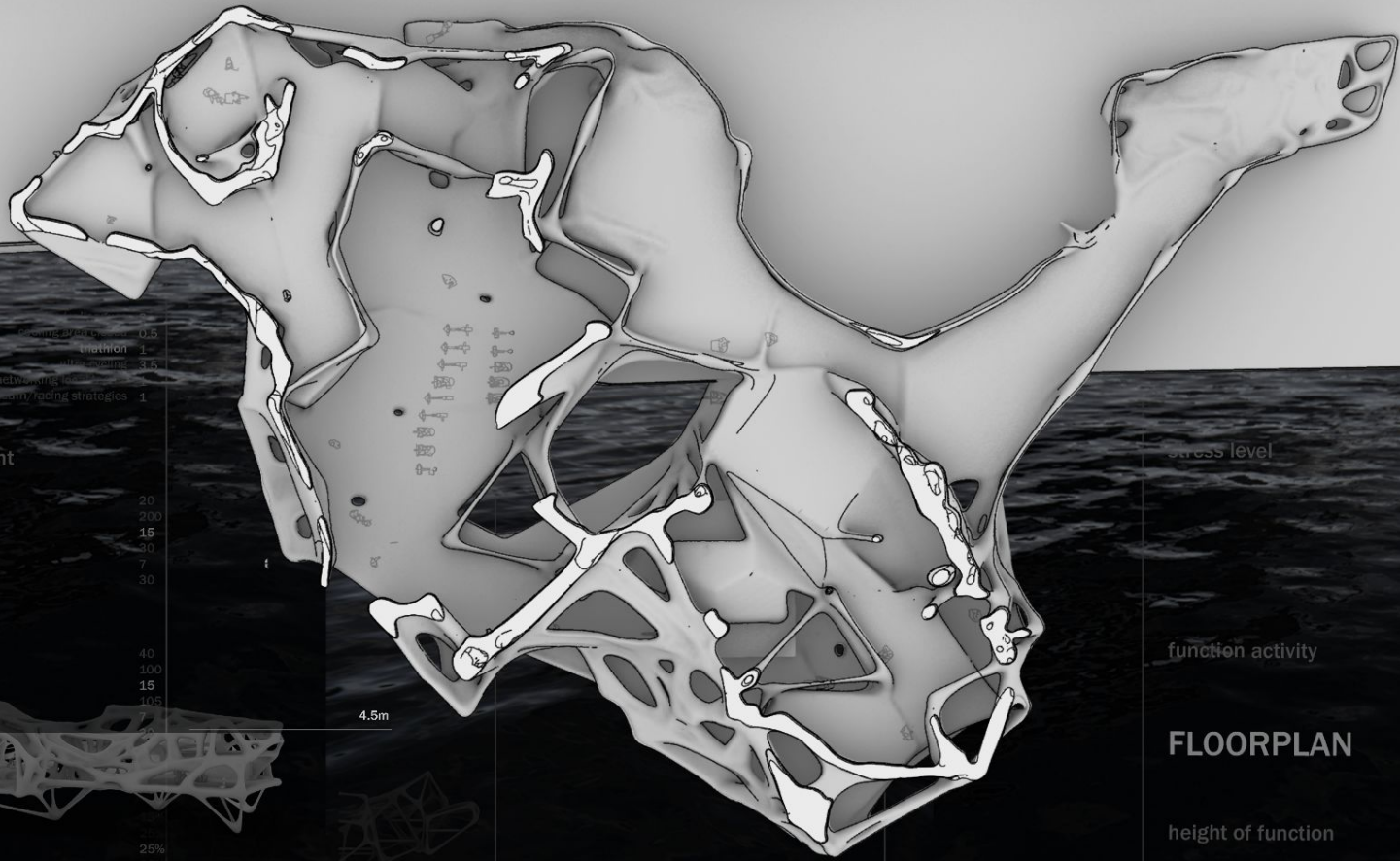
function activity

coaches/colleagues
 cooling area closed
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

FLOORPLAN

height of function

1.17
 2.25
 2.25
 4.95
 9
 7.2



triathlon 0.5
ultra-cycling 1-
networking local teams 3.5
team/racing strategies 1

analysis slope gradient

20
250
15
30
7
30

structural analysis

40
100
15
105



4.5m

stress level

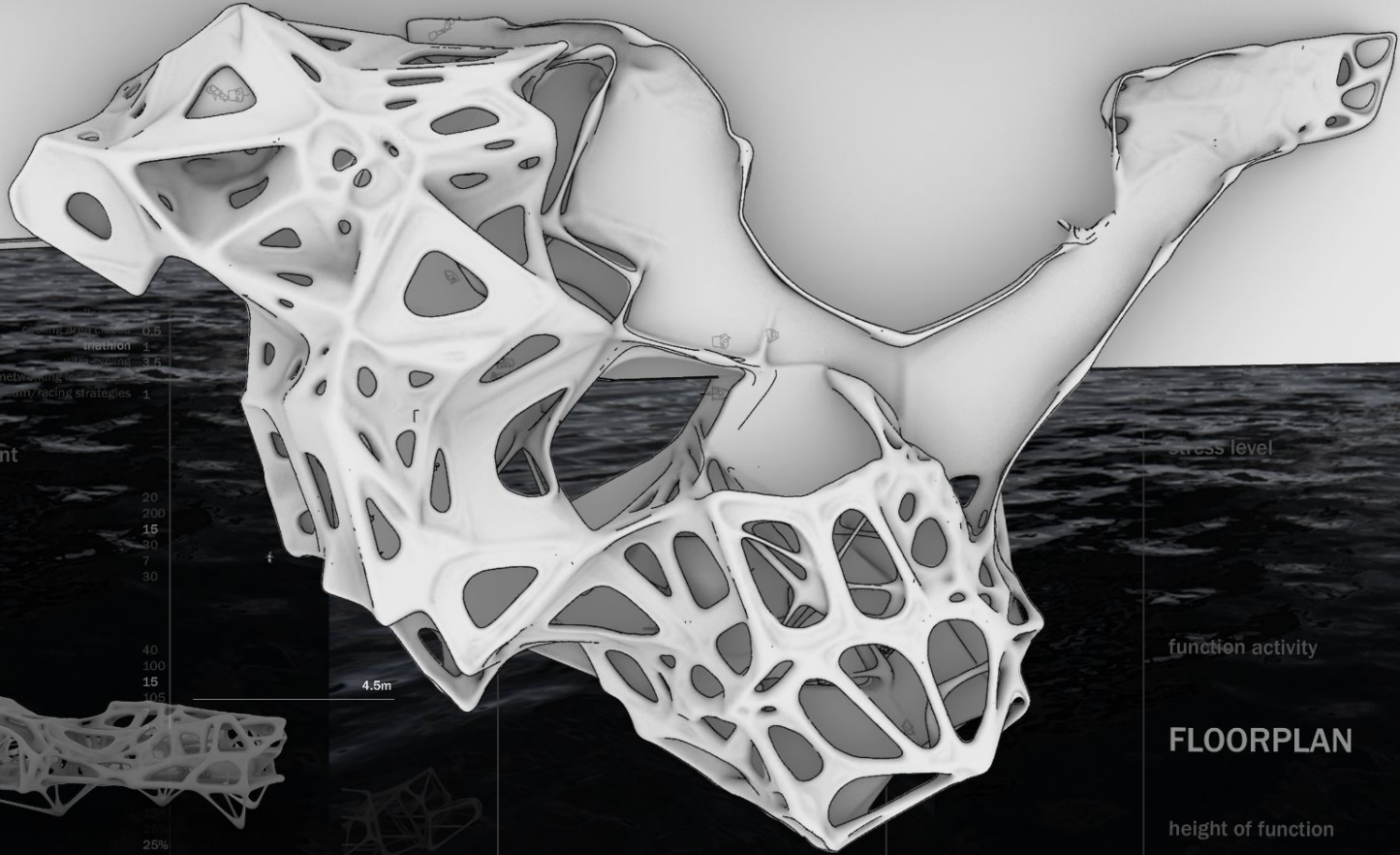
function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

FLOORPLAN

height of function

1.17
2.25
2.25
4.95
9
7.2



0.5
1
3.5
1
1

analysis slope gradient

20
200
15
30
7
30

structural analysis

40
100
15
105

4.5m

stress level

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

FLOORPLAN

height of function

1.17
2.25
2.25
4.95
9
7.2



25%
50%
100%
200%

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m²

CIRCULATION

surface per user

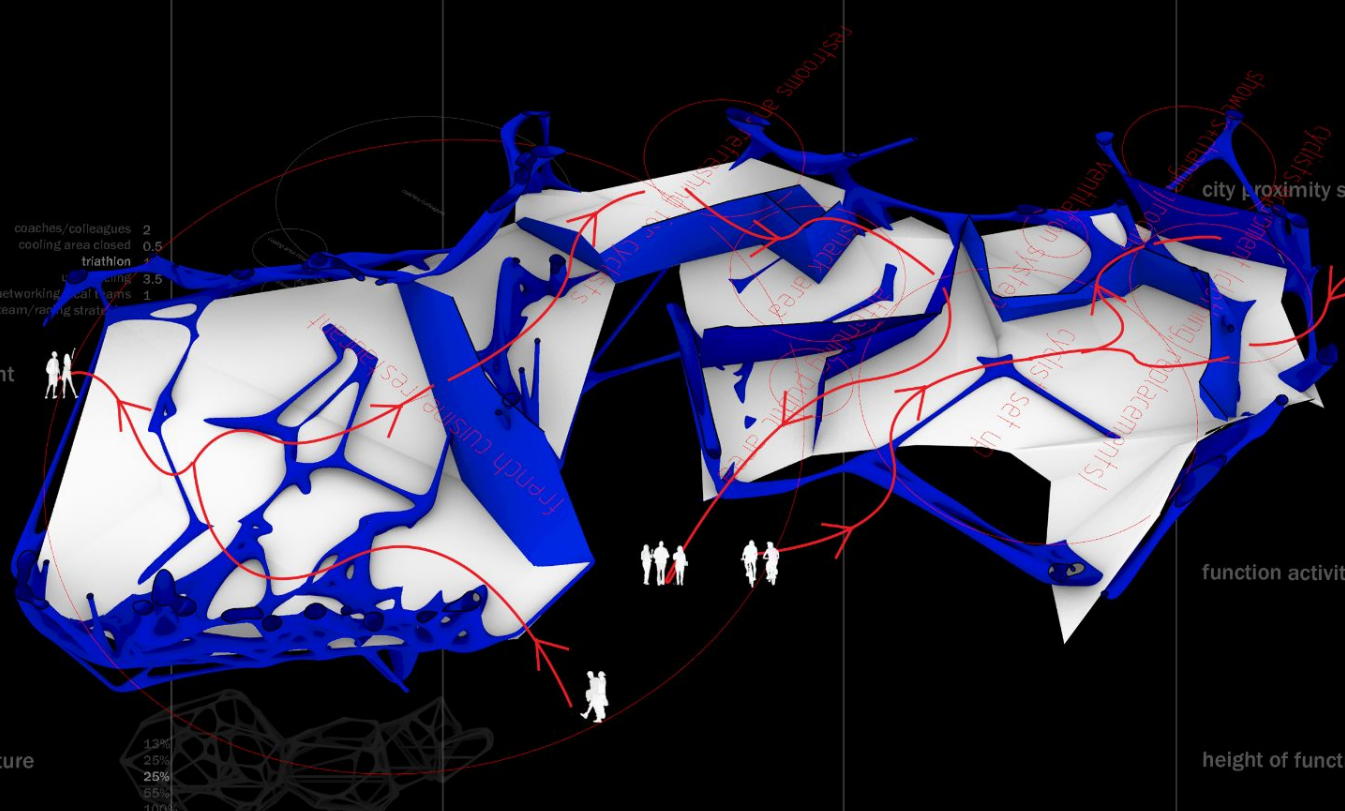
coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient



voronoi support structure

13%
25%
25%
55%
100%
80%



city proximity spots

Not relevant
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

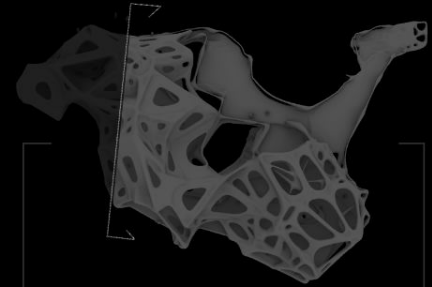
height of function

1.17
2.25
2.25
4.95
9
7.2

TIME 8 10 12 14 16 18 20 22 24

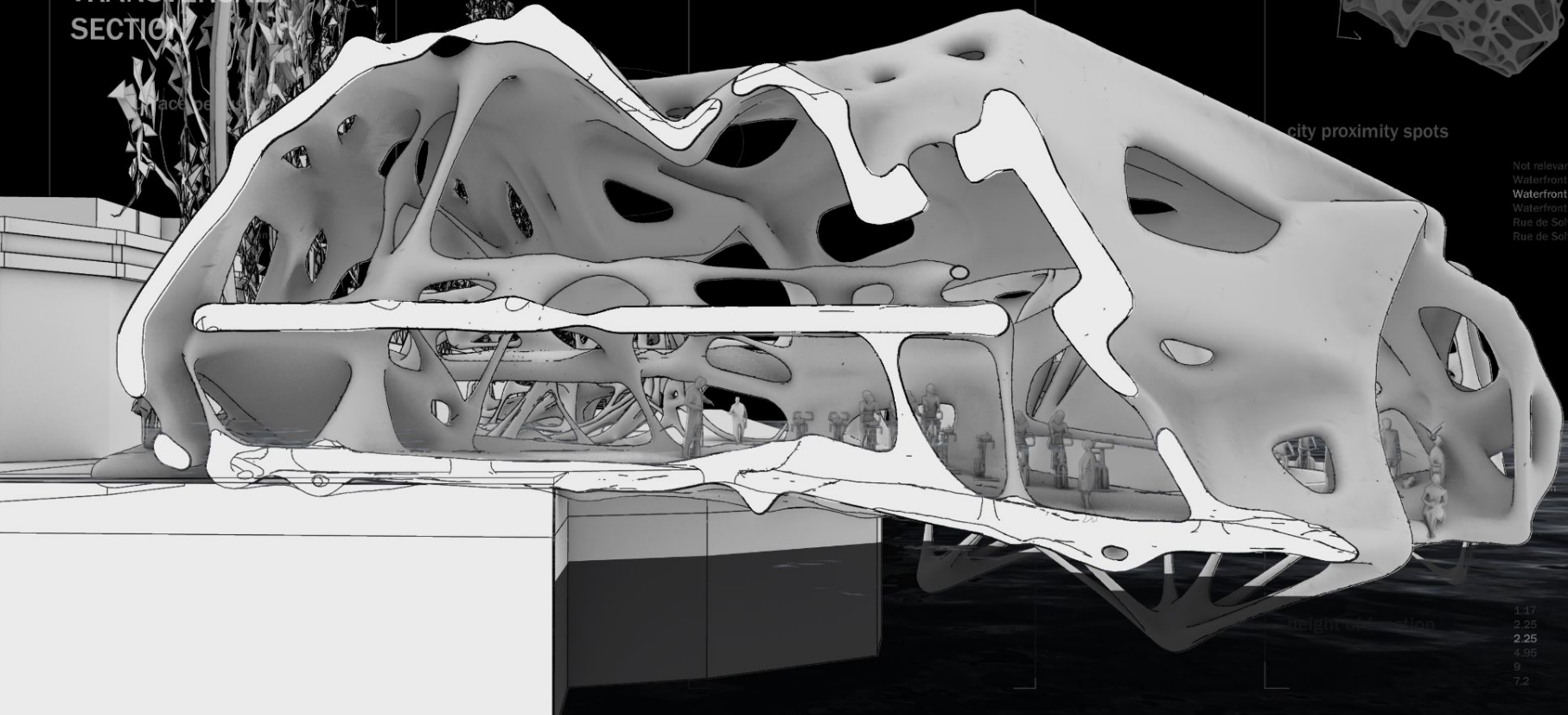
SURFACE AREA IN m²

TRANSVERSAL SECTION



city proximity spots

- Not relevant
- Waterfront
- Waterfront**
- Waterfront
- Rue de Solferino
- Rue de Solferino

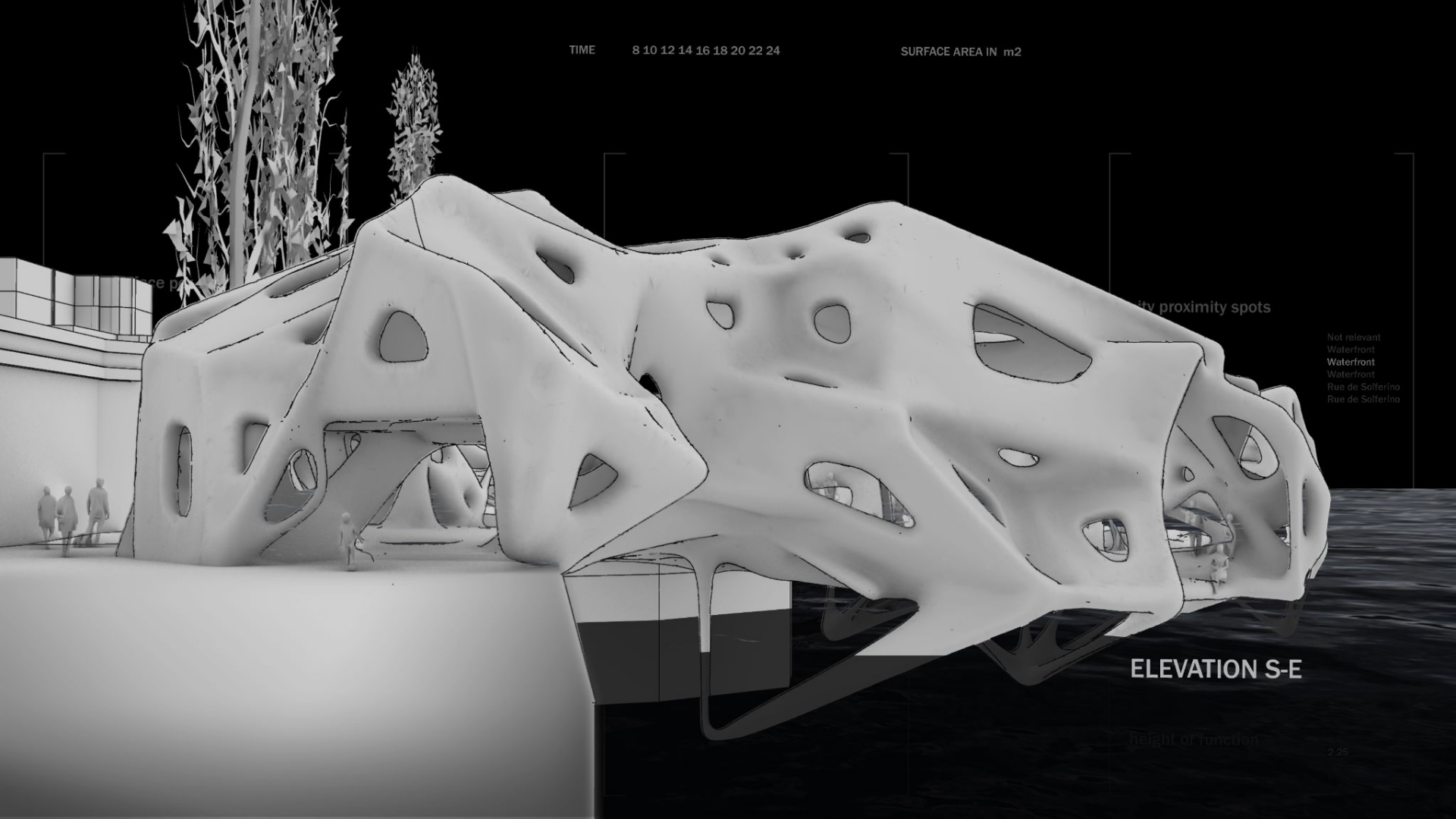


height of section

- 1.17
- 2.25
- 2.25**
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2



city proximity spots

Not relevant
Waterfront
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

ELEVATION S-E

height of function

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m²

TRANSVERSAL SECTION

sun / air user

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- local teams 1
- strategies 1

and

0.80m

8.15m

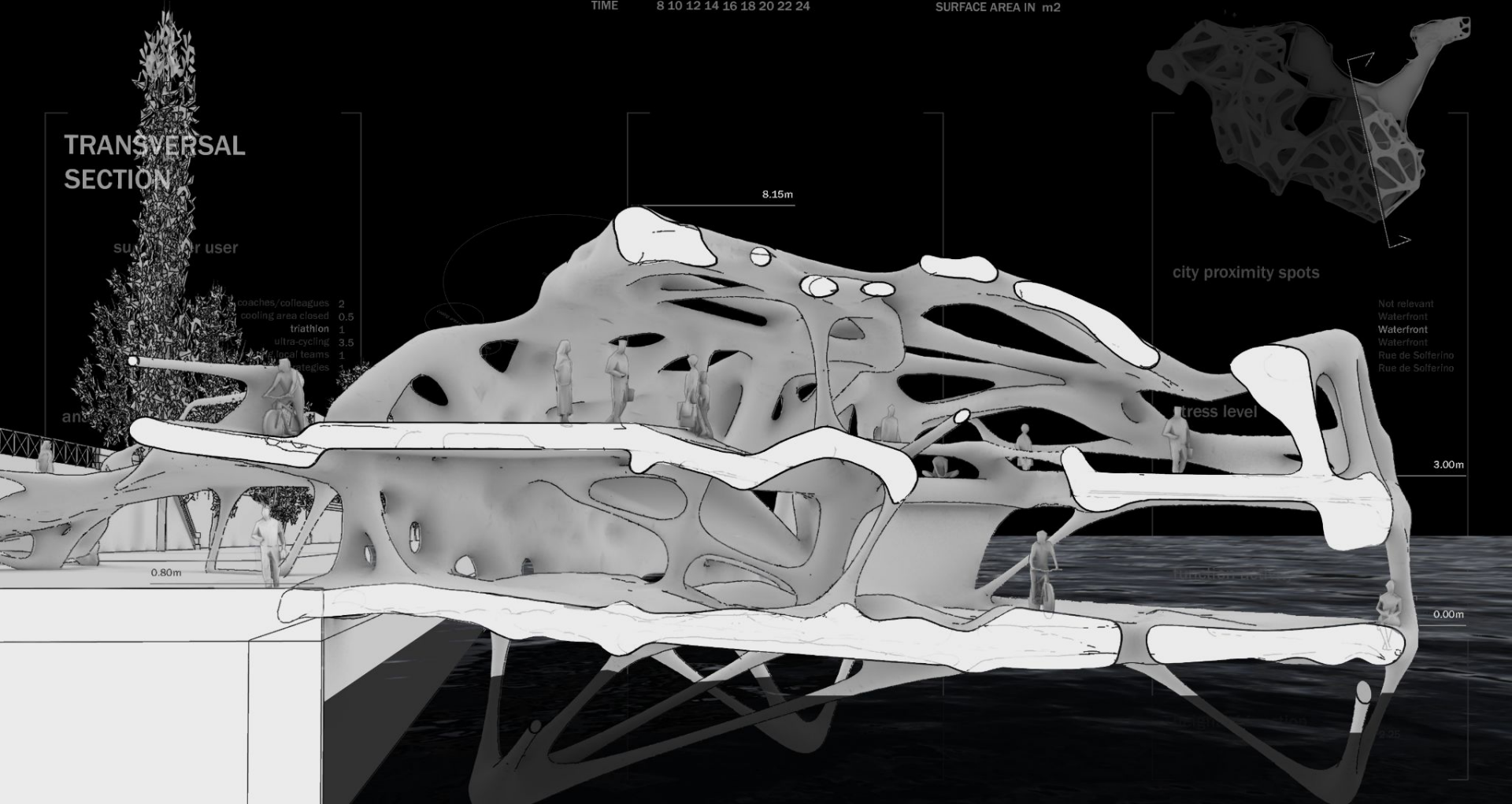
city proximity spots

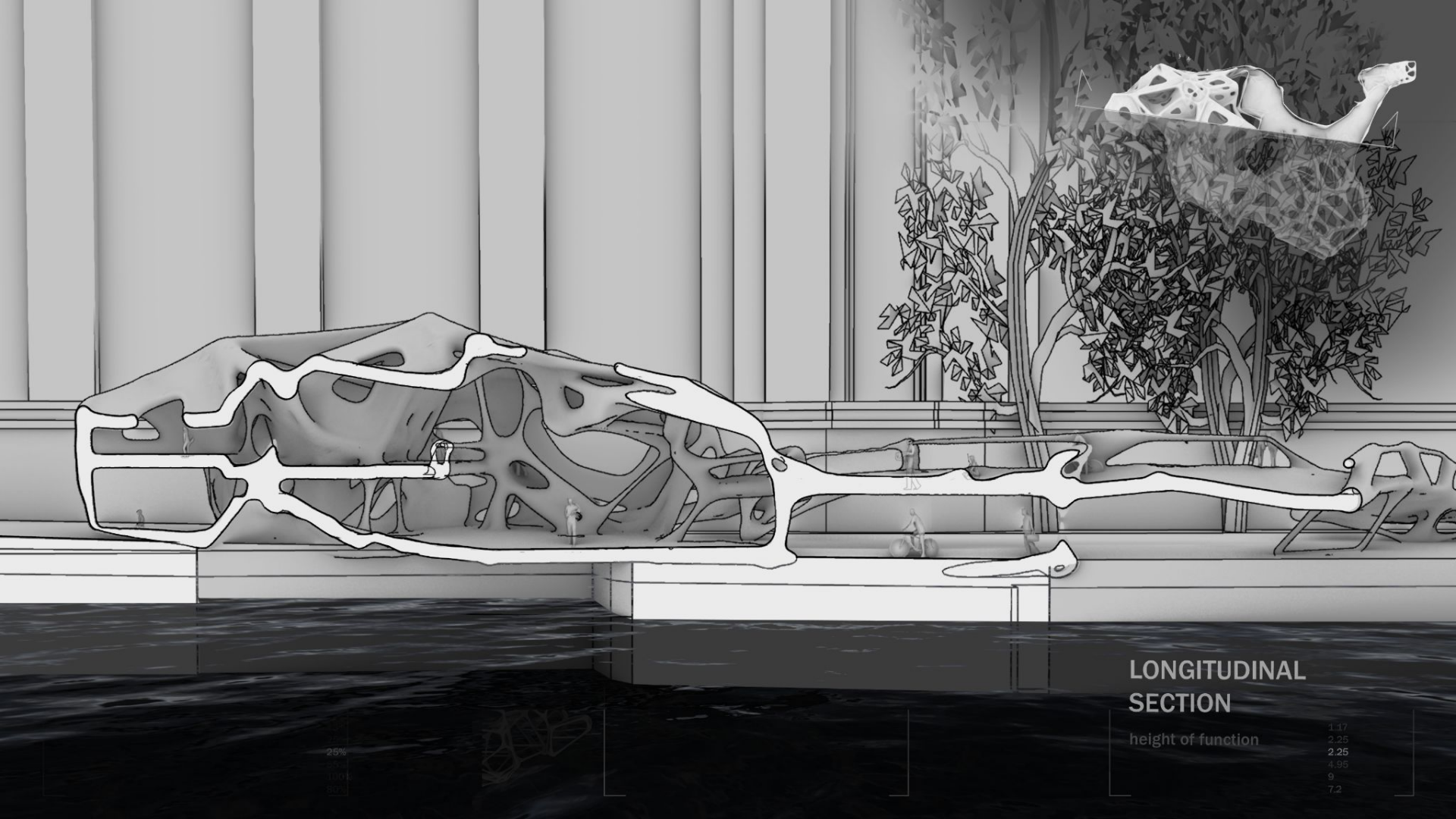
- Not relevant
- Waterfront
- Waterfront
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

3.00m

0.00m



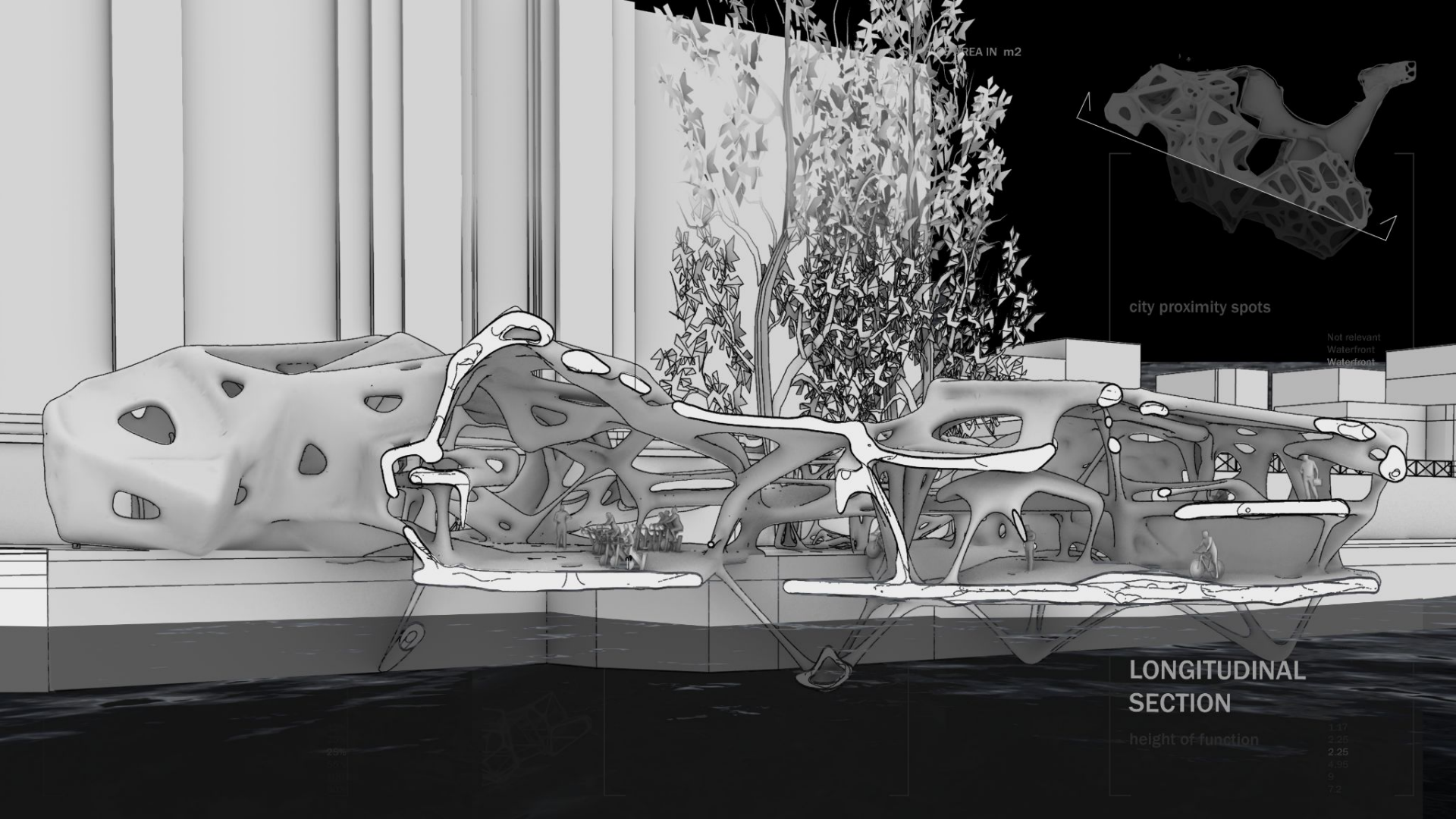


LONGITUDINAL
SECTION

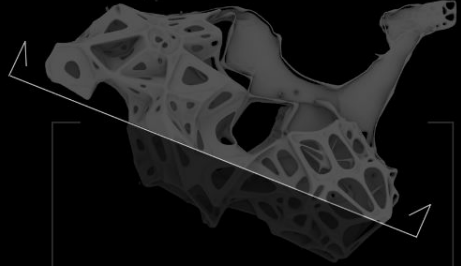
height of function

1.17
2.25
2.25
4.95
9
7.2

25%



AREA IN m2



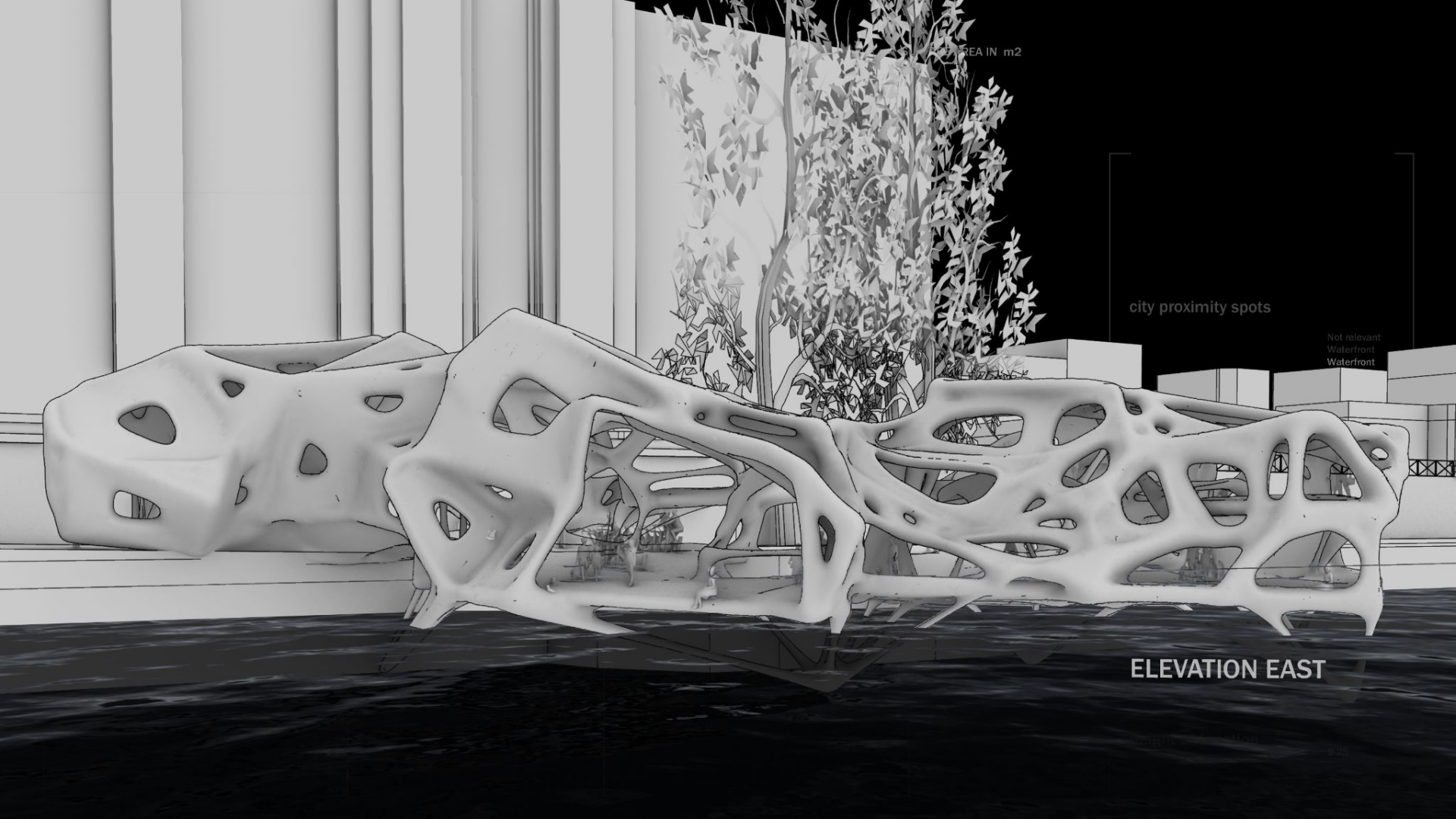
city proximity spots

Not relevant
Waterfront
Waterfront

LONGITUDINAL SECTION

height of function

- 1.37
- 2.25
- 2.25
- 3.05
- 0
- 7.2



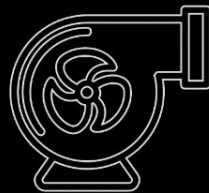
AREA IN m2

city proximity spots

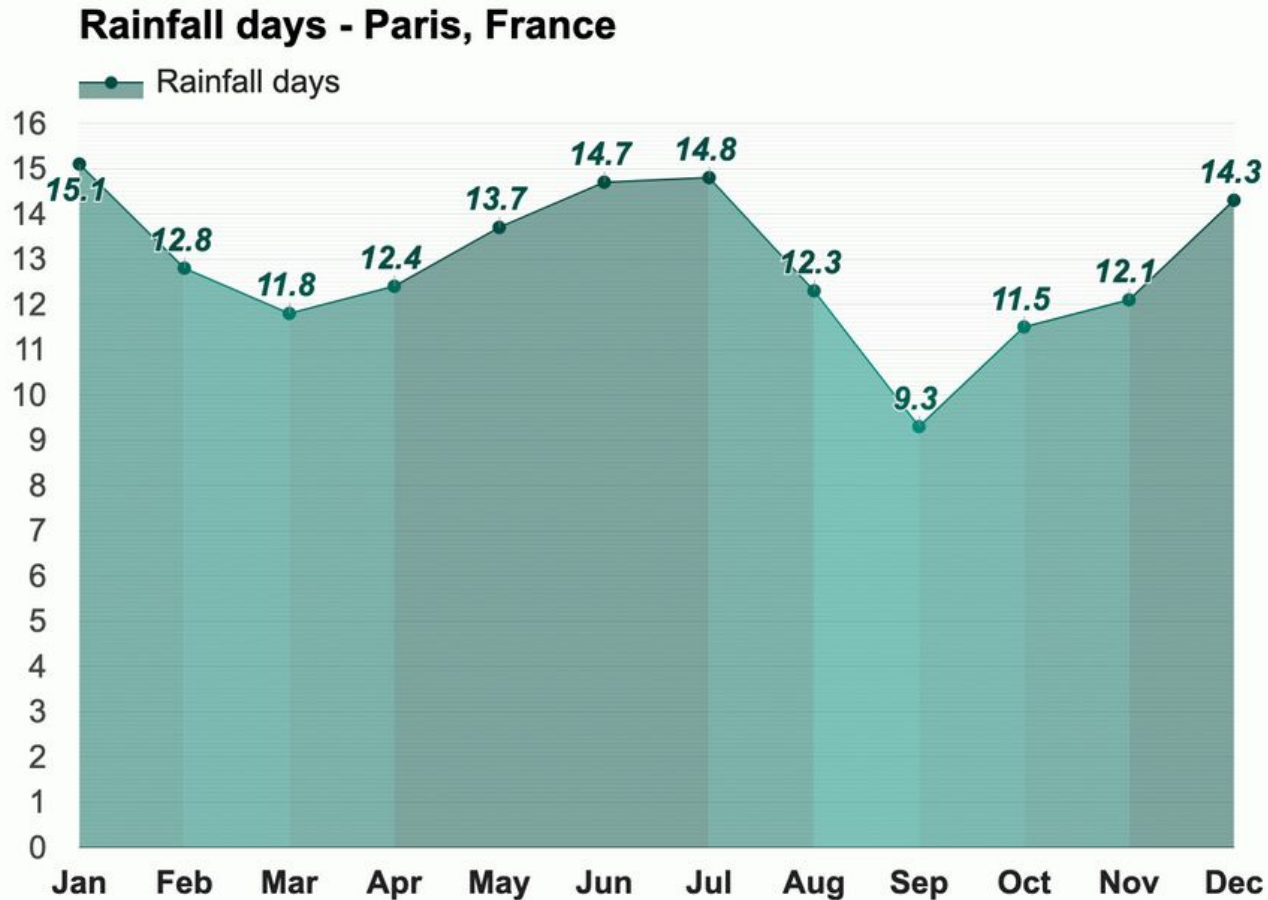
Not relevant
Waterfront
Waterfront

ELEVATION EAST

CLIMATE

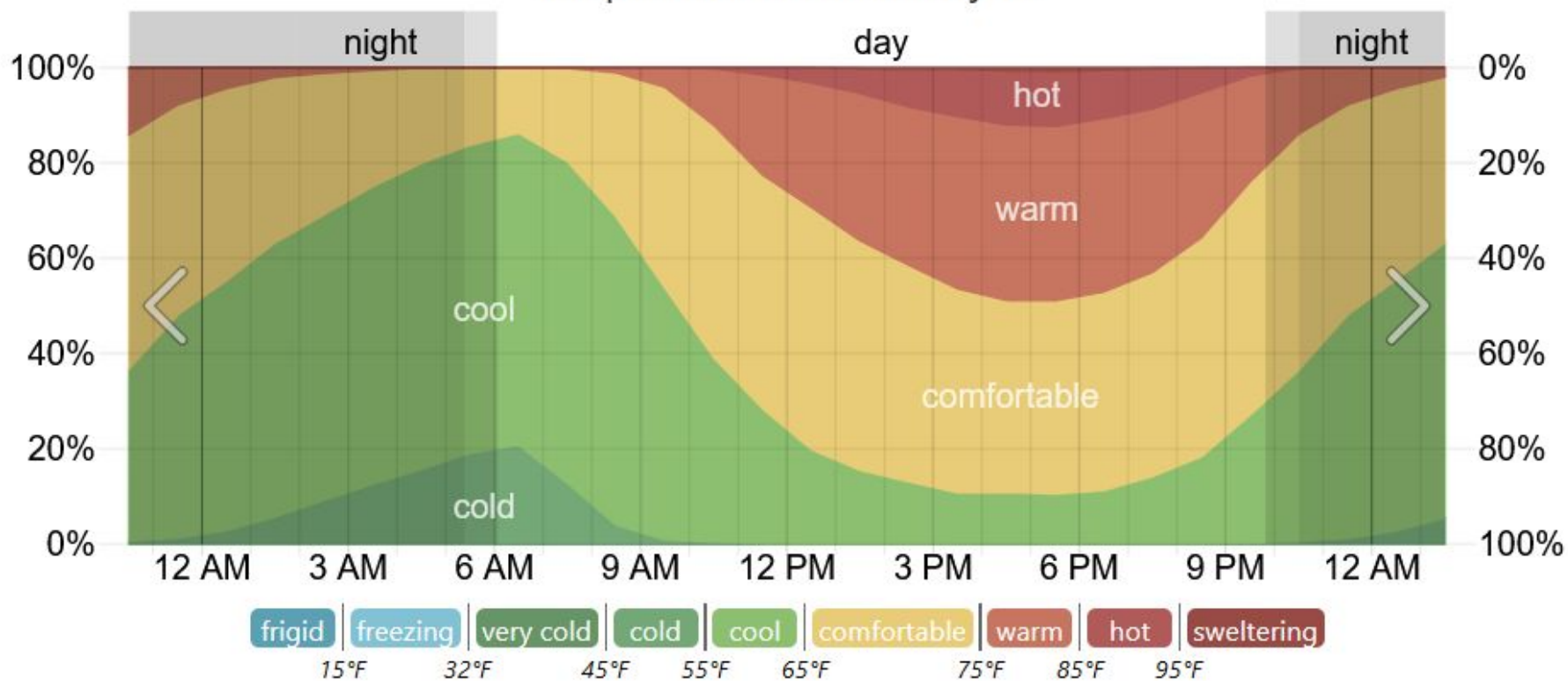


Average rainfall days in July Paris, France



Average rainfall days in July: **14.8 days**

Temperature Bands on July 15



The percentage of time spent in various temperature bands. Civil twilight and night are indicated by shaded overlays.

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

LOCAL THERMAL COMFORT REQUIREMENTS

beam

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

- 20
- 250
- 15
- 20
- 5
- 30

structural analysis

- 40
- 100
- 15
- 105
- 7
- 30

- 13%
- 25%
- 25%
- 65%
- 100%
- 80%



21 °C

24 °C

15 °C

city proximity spots

- Not relevant
- Waterfront
- Waterfront
- Waterfront
- Rue de Solferino
- Rue de Solferino

stress level

function activity

- coaches/colleagues
- cooling area closed
- triathlon
- ultra-cycling
- networking local teams
- team/racing strategies

26 °C

- 1.17
- 2.25
- 2.25
- 4.95
- 9
- 7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

VENTILATION CHILLED WATER SYSTEM

beam

coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient

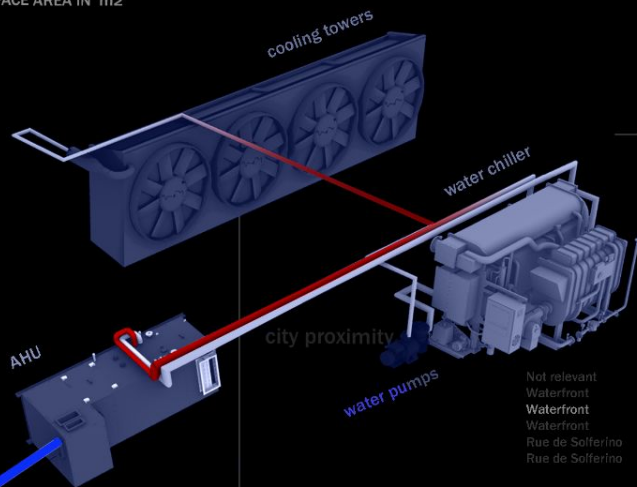
25
250
15
20
5
30

structural analysis

40
15
105
7
30

NODE

13%
25%
25%
65%
100%
80%



city proximity

stress level

function activity

Not relevant
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

BEAM

1.17
2.25
2.25
4.95
9
7.2

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m²

ENERGY PRODUCTION

integrated solar cells

- coaches/colleagues 2
- cooling area closed 0.5
- triathlon 1
- ultra-cycling 3.5
- networking local teams 1
- team/racing strategies 1

analysis slope gradient

- 20
- 250
- 15
- 20
- 5
- 30

structural analysis

- 40
- 100
- 15
- 105
- 7
- 30

24°C

15°C

21°C



10.00m² solar cells = 350MWh

- 1.17
- 2.25
- 4.95
- 9
- 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	
ultra-cycling	
networking local teams	
team/racing strategies	

analysis slope gradient

structural analysis

100
15
105
7
30
13%
25%
25%
65%
100%
80%



proximity spots

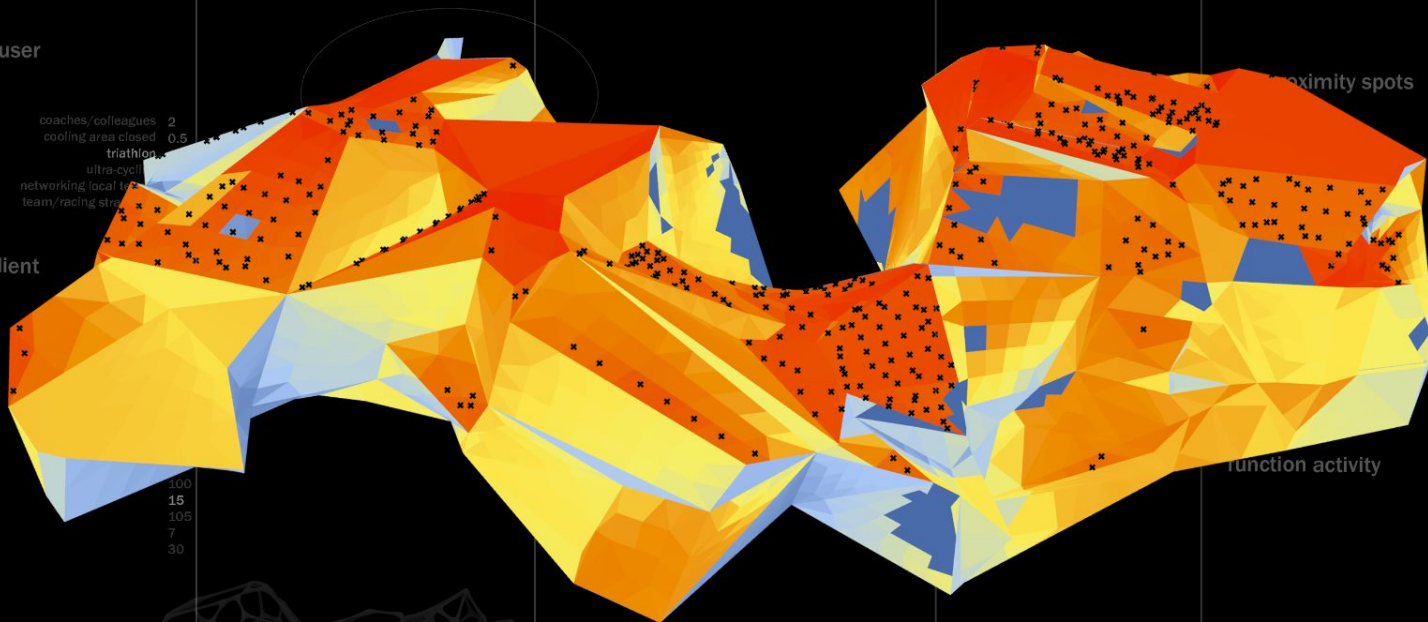
Not relevant
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
2.25
4.95
9
7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	
ultra-cycling	
networking local teams	
team/racing strategies	

analysis slope gradient

structural analysis

100
15
105
7
30
13%
25%
25%
65%
100%
80%



proximity spots

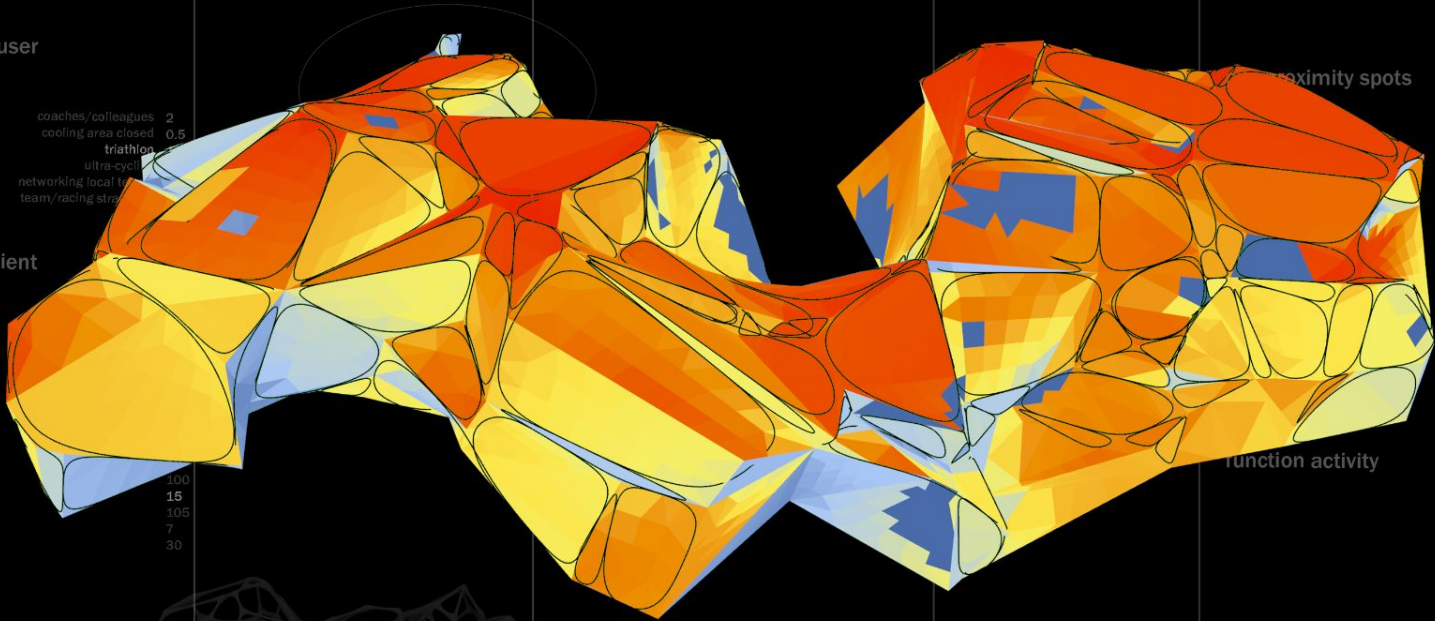
Not relevant
Waterfront
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
2.25
4.95
9
7.2



TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

coaches/colleagues 2
 cooling area closed 0.5
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

analysis slope gradient

structural analysis

100
 15
 105
 7
 30

13%
 25%
 25%
 65%
 100%
 80%



proximity spots

Not relevant
 Waterfront
 Waterfront
 Rue de Solferino
 Rue de Solferino

function activity

coaches/colleagues
 cooling area closed
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

height of function

1.17
 2.25
 2.25
 4.95
 9
 7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	
ultra-cycling	
networking local teams	
team/racing strategies	

analysis slope gradient

structural analysis

100
15
105
7
30



13%
25%
25%
65%
100%
80%

proximity spots

Not relevant
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
2.25
4.95
9
7.2

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

surface per user

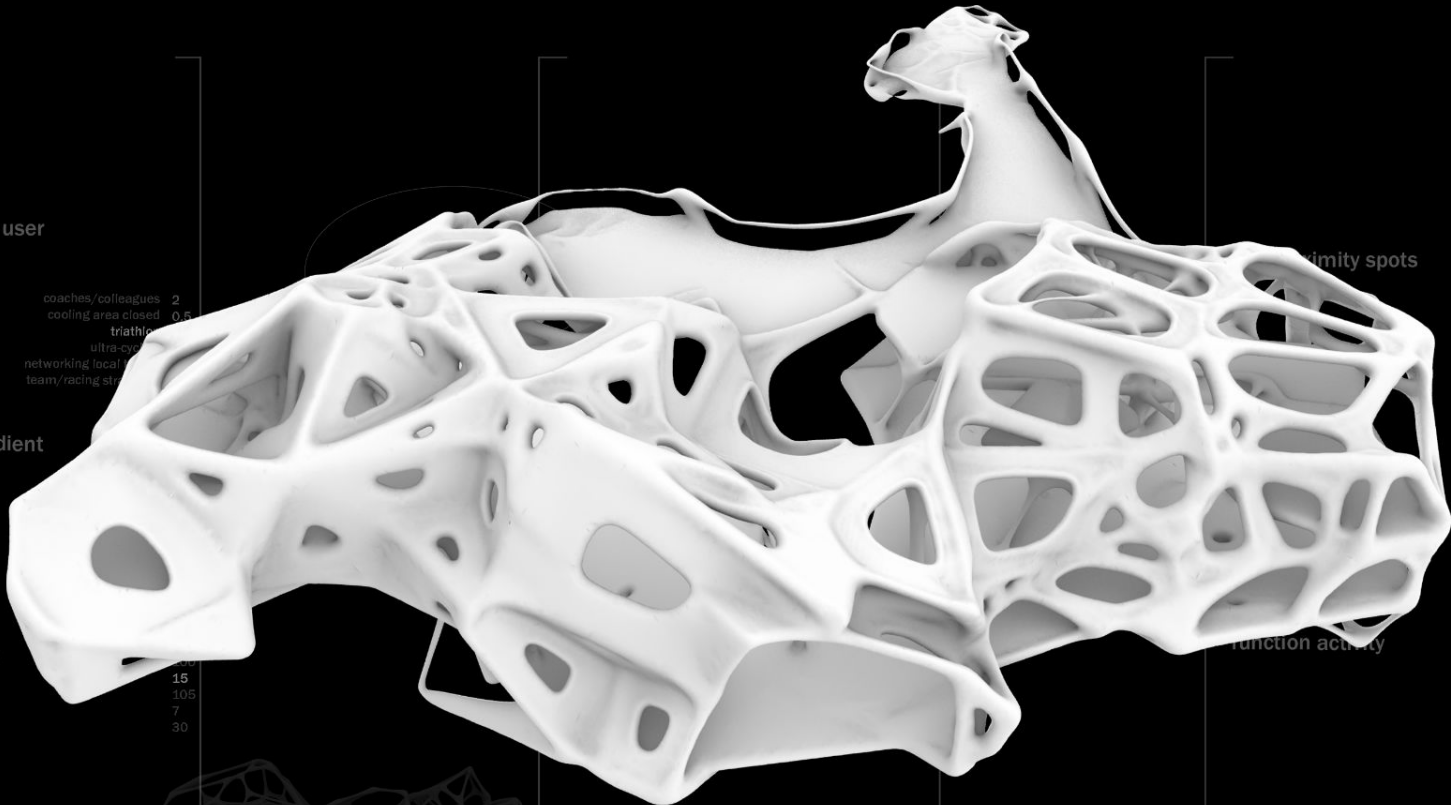
coaches/colleagues 2
 cooling area closed 0.5
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

analysis slope gradient

structural analysis

15
 105
 7
 30

13%
 25%
25%
 65%
 100%
 80%



proximity spots

Not relevant
 Waterfront
Waterfront
 Waterfront
 Rue de Solferino
 Rue de Solferino

function activity

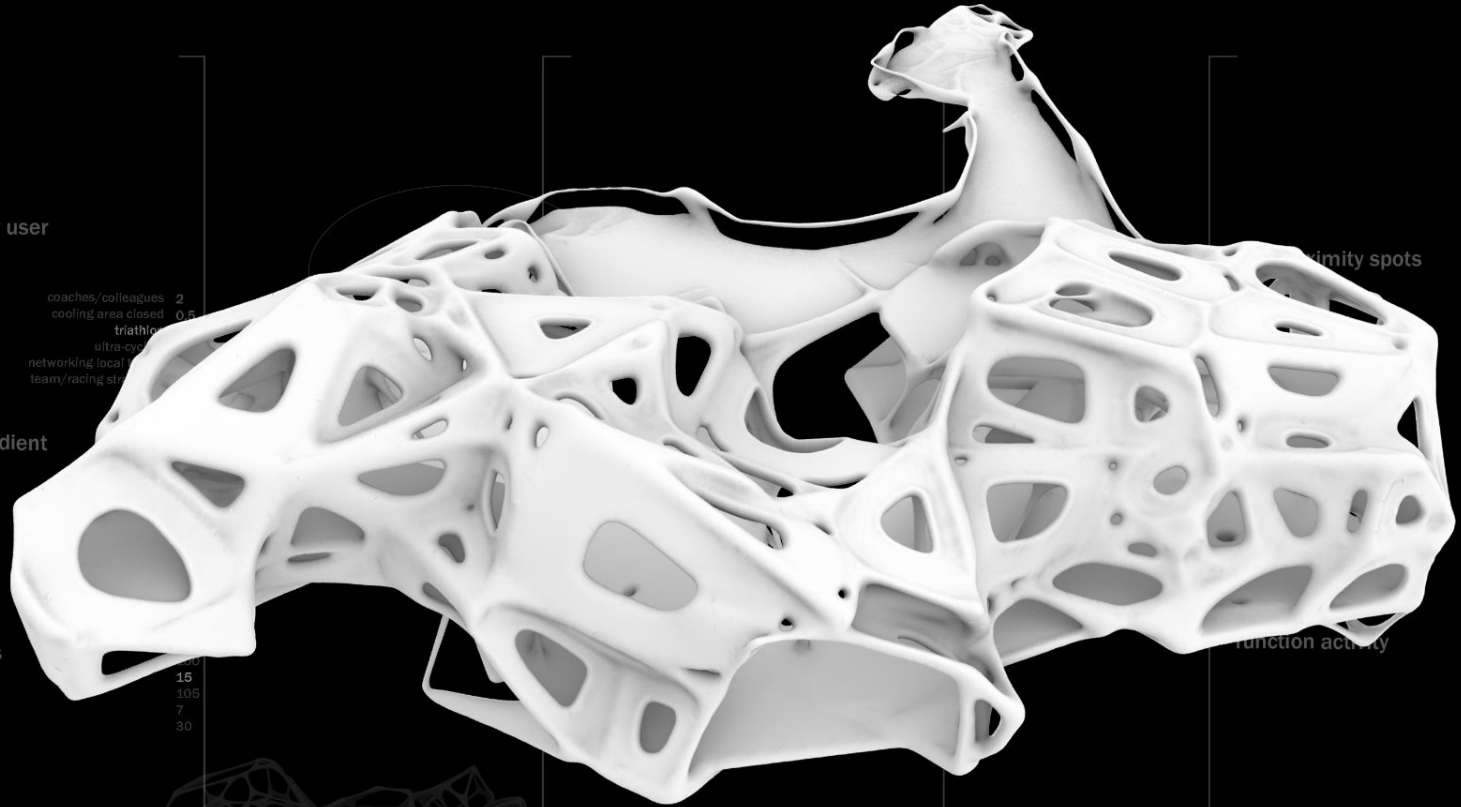
coaches/colleagues
 cooling area closed
triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

height of function

1.17
 2.25
2.25
 4.95
 9
 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2



surface per user

coaches/colleagues 2
 cooling area closed 0.5
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

analysis slope gradient

structural analysis

15
 105
 7
 30



13%
 25%
 25%
 65%
 100%
 80%

proximity spots

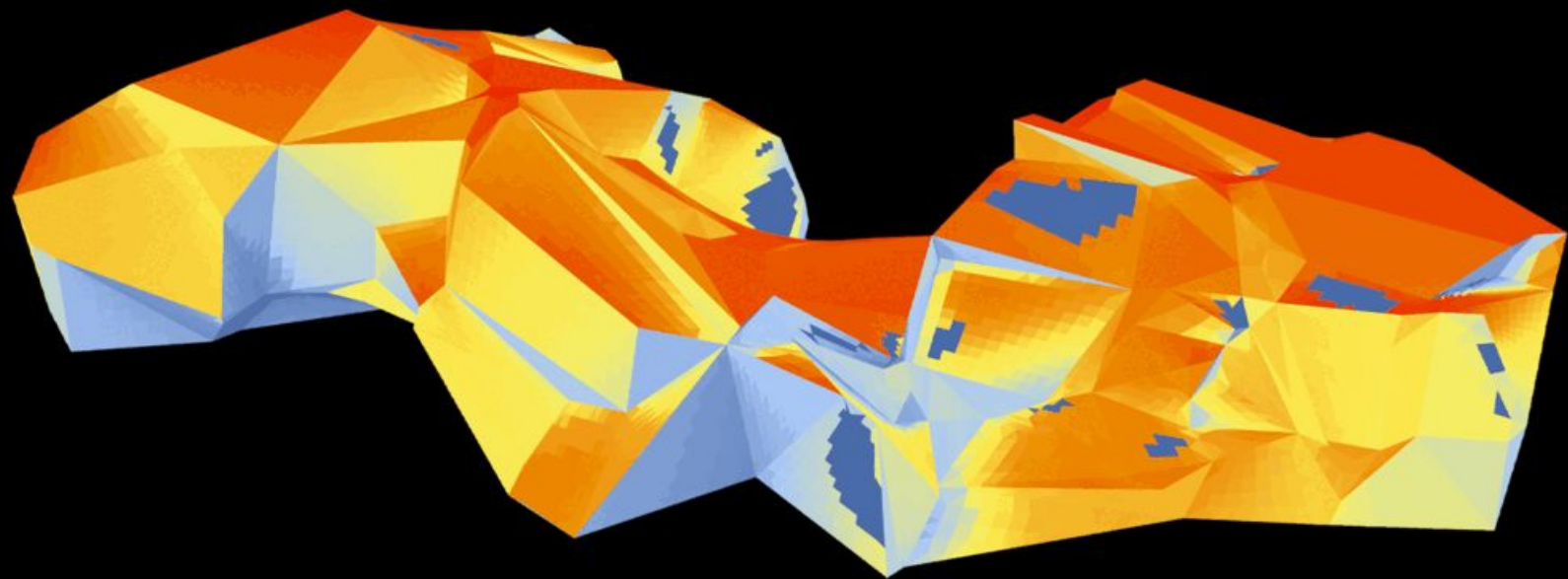
Not relevant
 Waterfront
 Waterfront
 Rue de Solferino
 Rue de Solferino

function activity

coaches/colleagues
 cooling area closed
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

height of function

1.17
 2.25
 2.25
 4.95
 9
 7.2



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

FRAGMENT PANELIZATION

surface per user

waterfront 2
city center 0.5
triatlon 1
urban cycling 2.5
networking local business 1
leisure housing atmosphere 1

analysis slope gradient

30
20
15
10
5
0

structural analysis

30
15
0
-15
-30

voronoi support structure

1.00%
2.00%
20%
50.00%
70.00%
90.00%

city proximity spots

port waterfront
Waterfront
waterfront
Rue de Solférino
Rue de Solférino

stress level

function activity

waterfront, roof, signage
networking, local business
triatlon
urban cycling
networking, local business
leisure housing atmosphere

height of function

1.17
2.20
2.25
4.00
6
7.2

wood is collected from local
commercial and manufacturing
industries

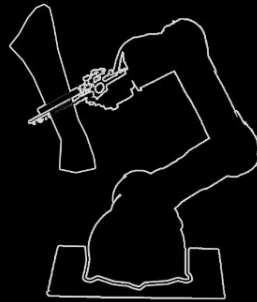
wooden beams milled in industrial
depot setting East of Paris
Vaire sur Marne

milled pieces and construction
components shipped via Marne/Seine
river to site

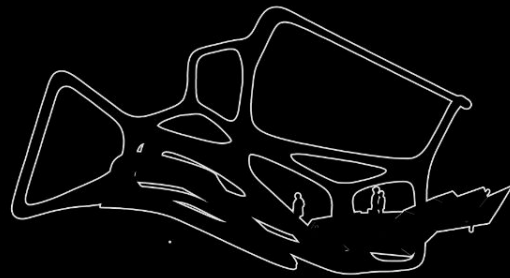
scaffolding for extending the reach of the
robotic arms

on-site assembly with use of robotic arms

LOGISTICS



ASSEMBLY



TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

NODE AND BEAM ELEMENTS

surface per user

coaches/colleagues 2
 cooling area closed 0.5
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies



analysis slope gradient

20
 200
 15
 30
 7
 30



structural analysis

40
 15
 105
 7
 30



13%
 25%
 25%
 65%
 100%
 80%

city proximity spots

Not relevant
 Waterfront
 Waterfront
 Waterfront
 Rue de Solferino
 Rue de Solferino

stress level

function activity

coaches/colleagues
 cooling area closed
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

BEAM

1.17
 2.25
 2.25
 4.95
 9
 7.2

TIME

8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

COMPONENTIAL ASSEMBLY

beam

coaches/colleagues 2
cooling area of road 0.5
triathlon 1
ultra-running 3.5
networking local teams 1
teams/racing strategies 2

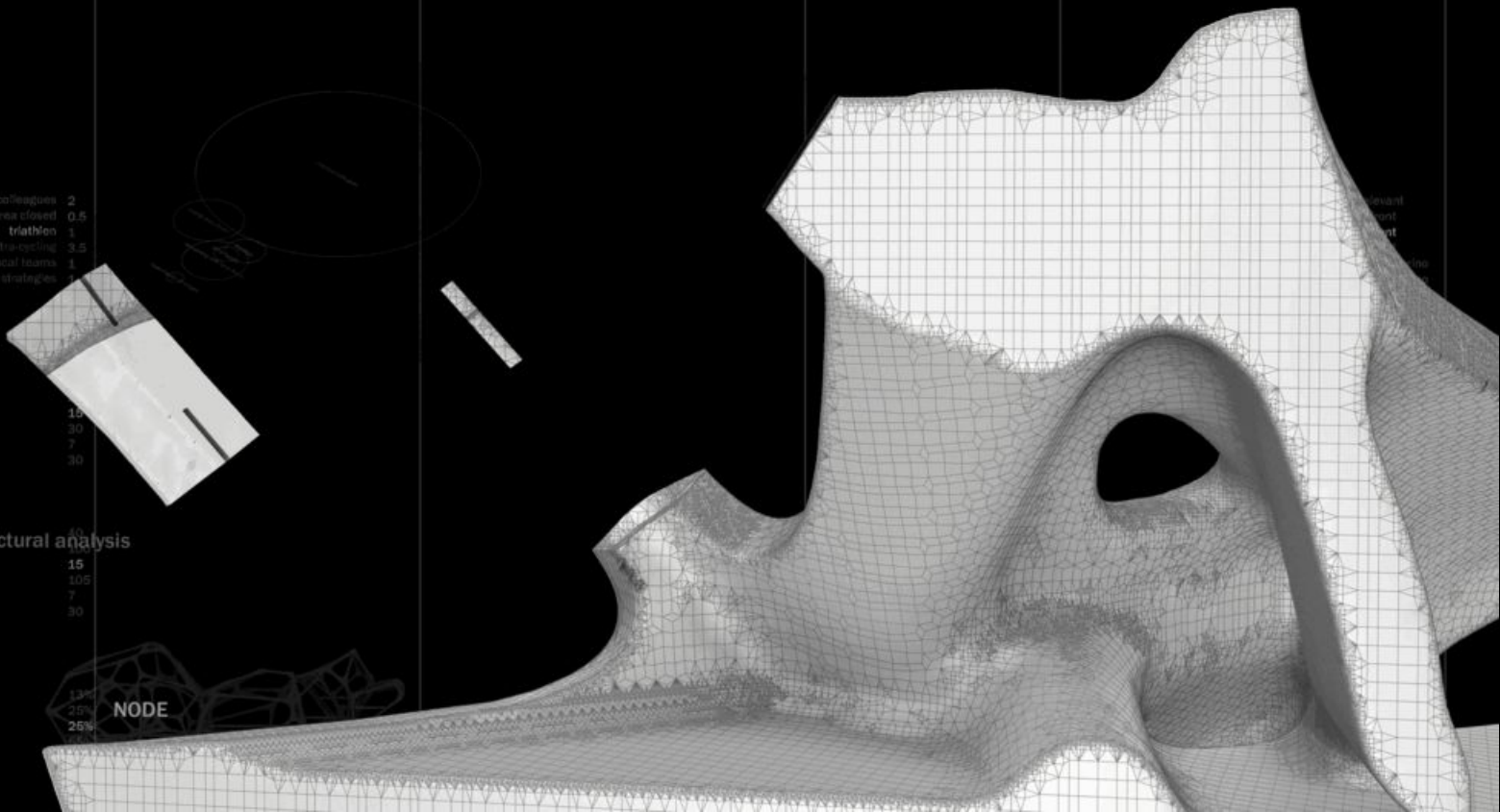
analysis slope gradient

15
30
7
30

structural analysis

15
105
7
30

NODE



TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

BEAM ASSEMBLY

surface per user

coaches/colleagues
 cooling area closed
 triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

20
 300
15
 30
 7
 30

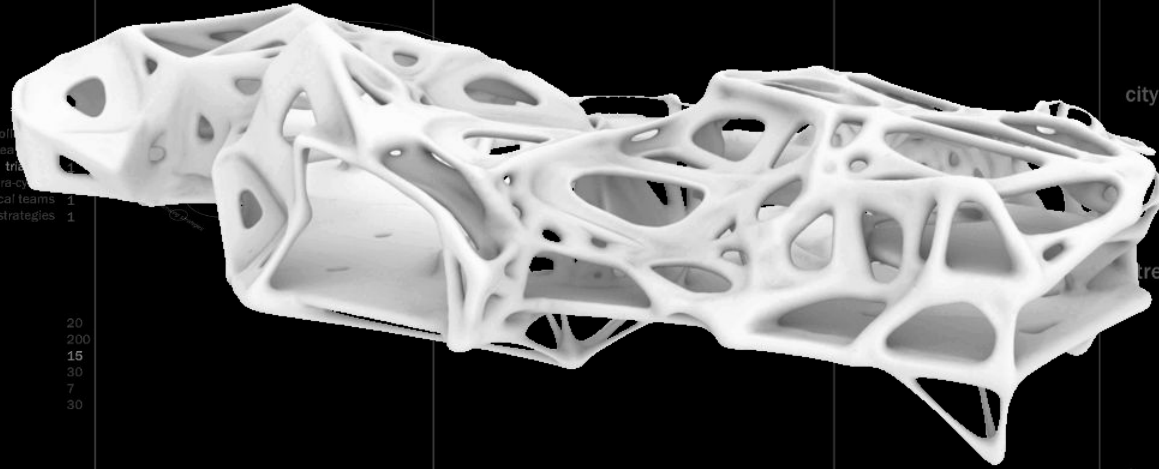
analysis slope gradient

structural analysis

40
 100
15
 105
 7
 30



13%
 25%
25%
 65%
 100%
 80%



city proximity spots

Not relevant
 Waterfront
Waterfront
 Waterfront
 Rue de Solferino
 Rue de Solferino

stress level

function activity

coaches/colleagues
 cooling area closed
triathlon
 ultra-cycling
 networking local teams
 team/racing strategies

height of function

1.17
 2.25
2.25
 4.95
 9
 7.2

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

FRAGMENT PANELIZATION

surface per user

coaches/colleagues	2
cooling area closed	0.5
triatlhon	1
ultra cycling	3.5
networking local teams	1
team/racing strategies	1

analysis slope gradient

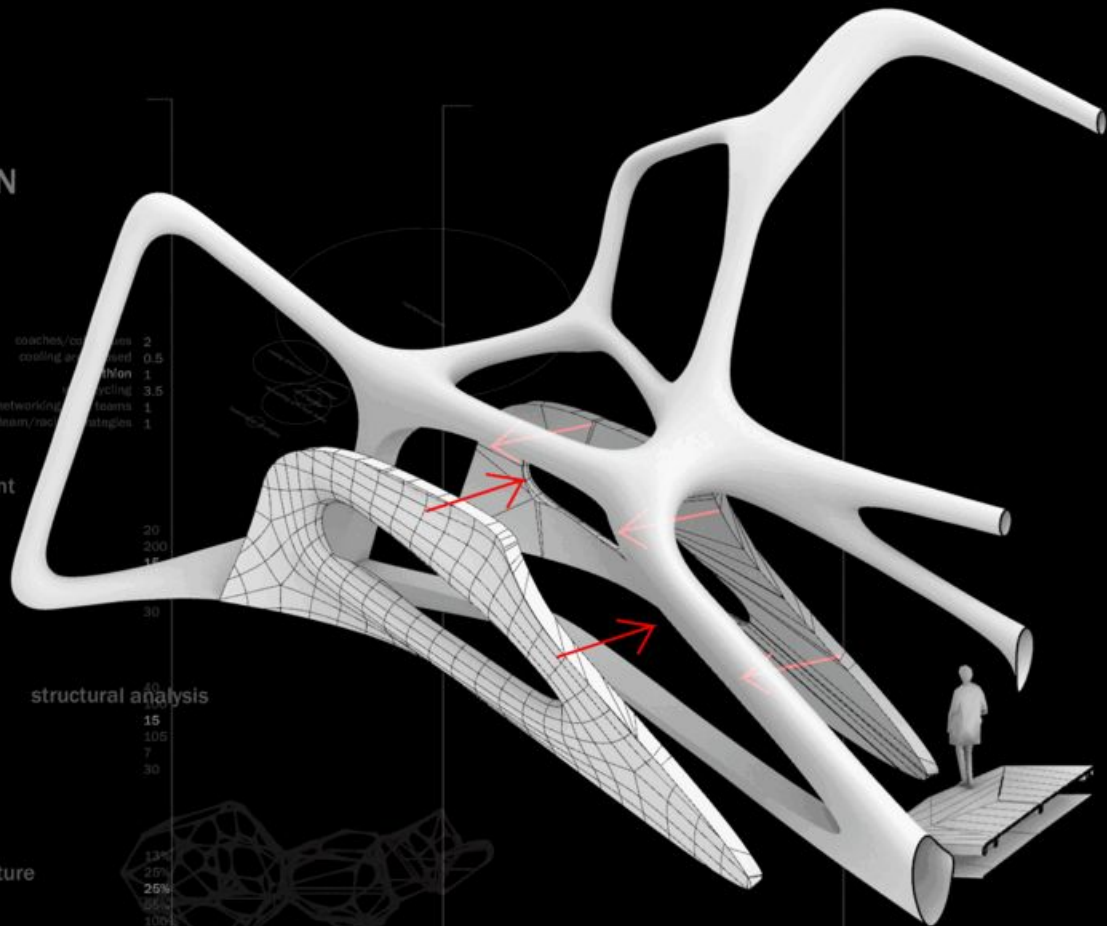
20
300
15
30

structural analysis

40
15
105
7
30

voronoi support structure

13%
26%
25%
56%
100%
80%



city proximity spots

Not relevant
Waterfront
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

stress level

function activity

coaches/colleagues
cooling area closed
triatlhon
ultra cycling
networking local teams
team/racing strategies

height of function

1.17
2.25
2.25
4.95
9
7.2



Wooden Beams Spatial Structure Node

TIME 8 10 12 14 16 18 20 22 24

SURFACE AREA IN m2

DETAIL NODE HORIZONTAL SECTION

- 1. Double glazing
- 2. Wooden panels
- 3. Wood joint bolt
- 4. Rubber gasket
- 5. Wooden joint with metal plate

surface per user

coaches/colleagues	2
cooling area closed	0.5
triathlon	1
ultra-cycling	3.5
networking local teams	1
team/racing strategies	1

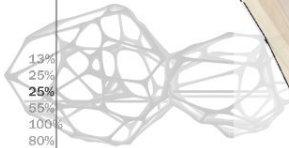
analysis slope gradient

20
200
15
30
7
30

structural analysis

40
15
105
7
30

Scale: 1:10



13%
25%
25%
65%
100%
80%

city proximity spots

Not relevant
Waterfront
Waterfront
Waterfront
Rue de Solferino
Rue de Solferino

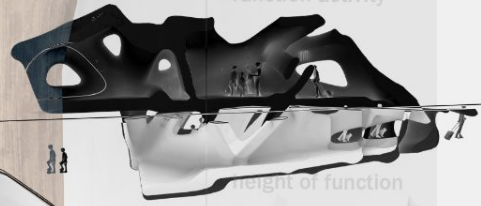
stress level

function activity

coaches/colleagues
cooling area closed
triathlon
ultra-cycling
networking local teams
team/racing strategies

height of function

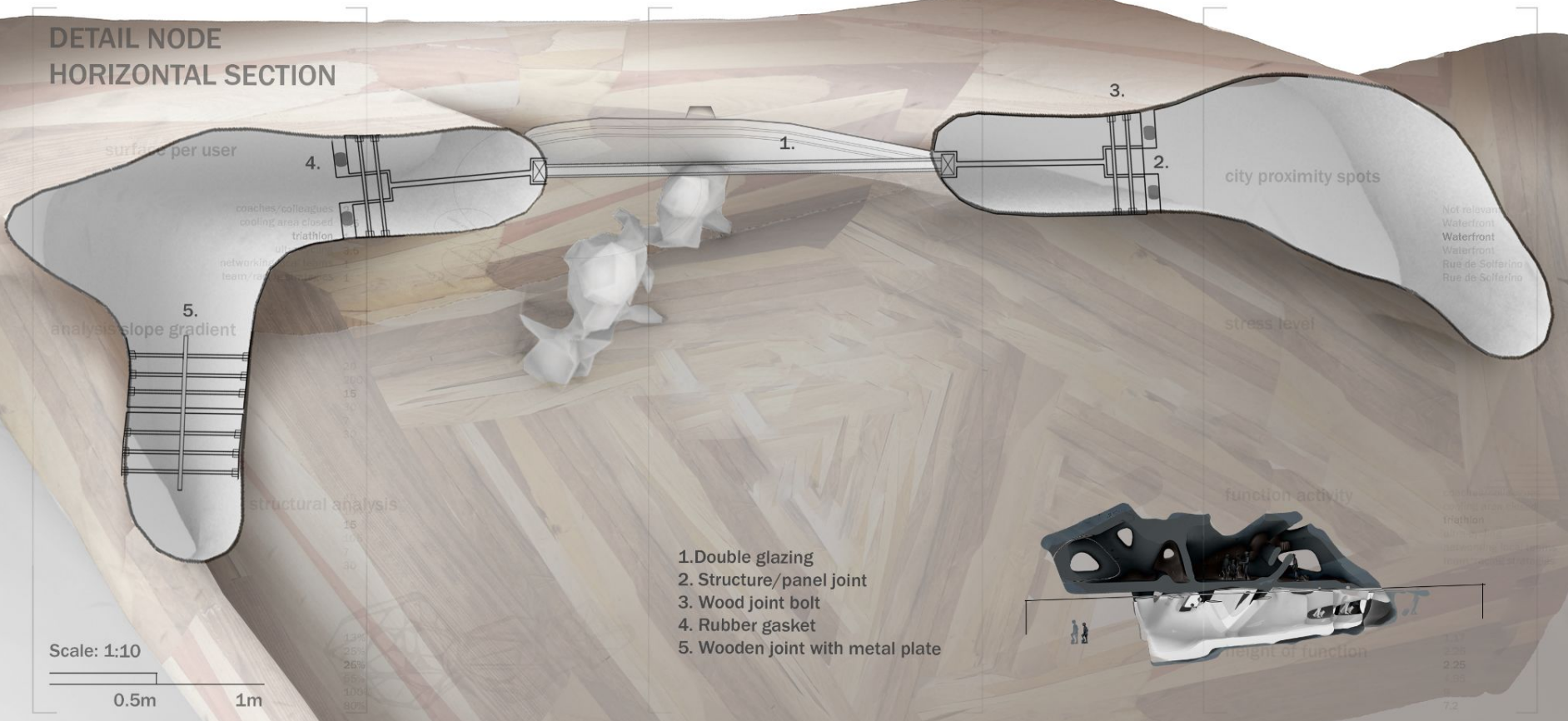
1.17
2.25
2.25
4.95
9
7.2



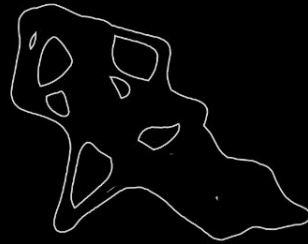
TIME 8 10 12 14 16 18 20 22 24

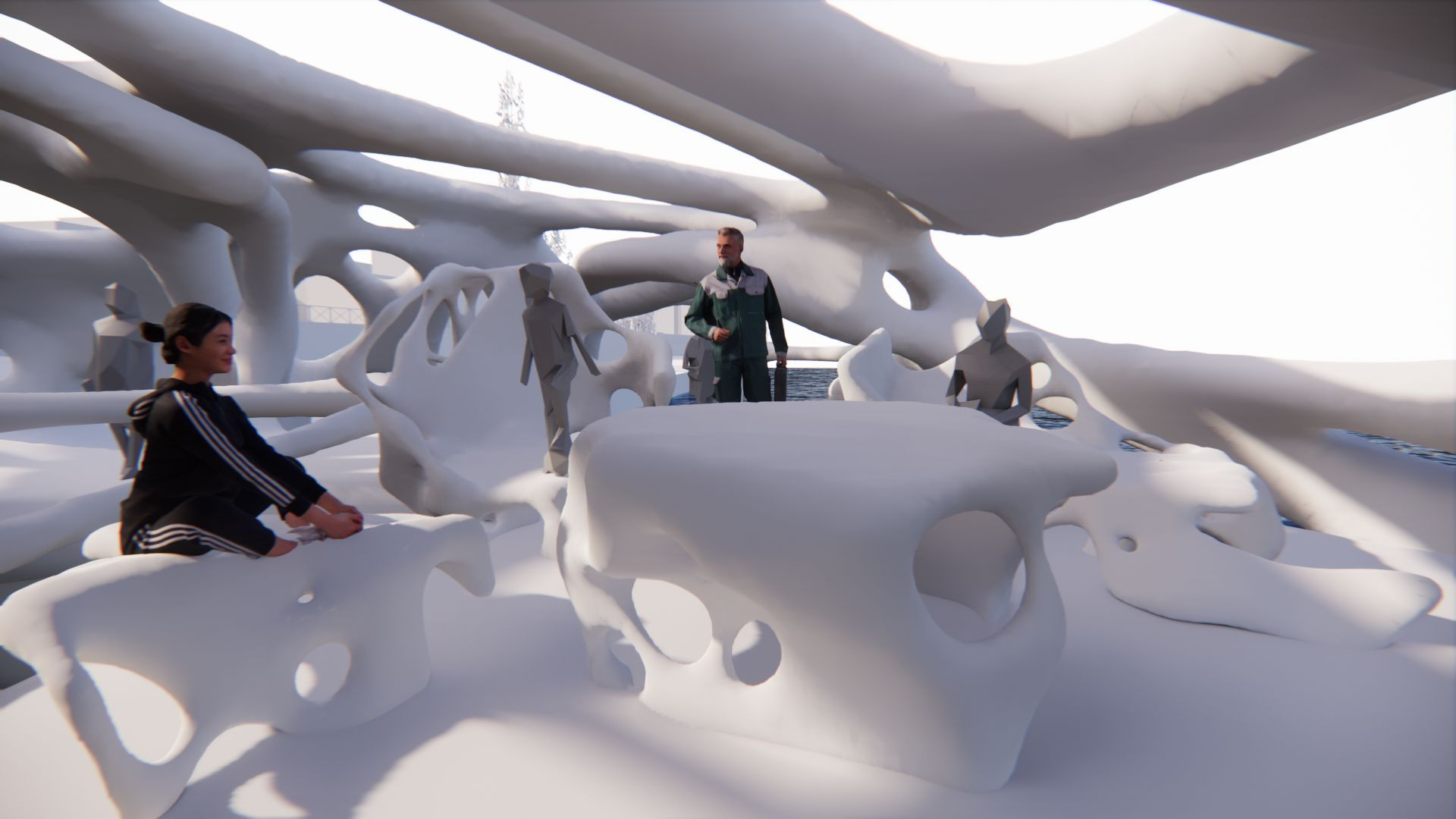
SURFACE AREA IN m2

DETAIL NODE HORIZONTAL SECTION



INTERIOR DESIGN







I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

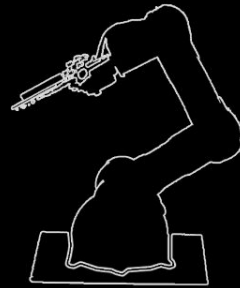
IV. MATERIALIZATION

V. STRUCTURAL STABILITY

VI. REFLECTION

robotic manufacturing
computation
optimization

WORKSHOP





Amsterdam Velodrome



Stacked wood prepared for milling



Robotic Arm



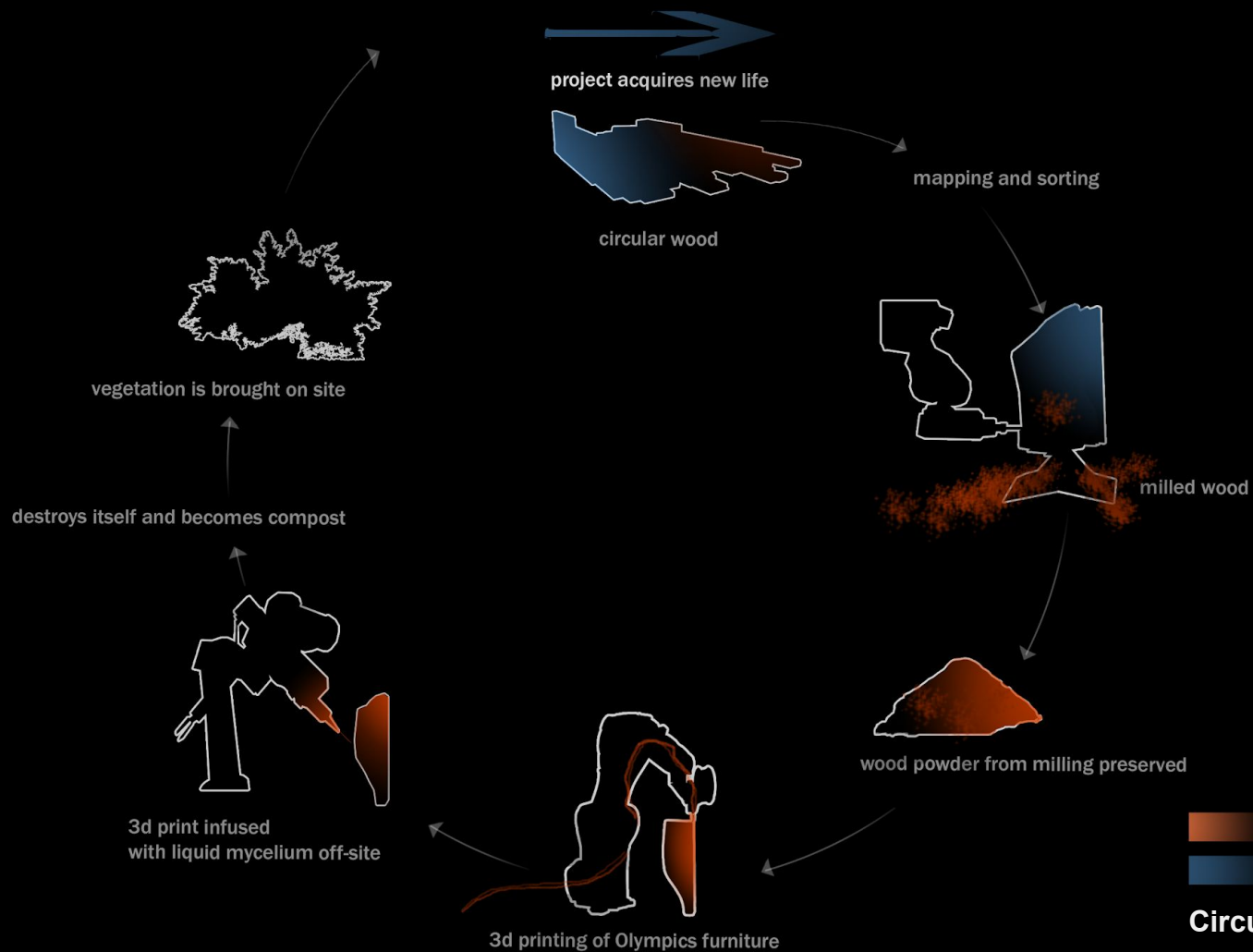
Milled wood



Wood powder

The Material components of Circular Milling





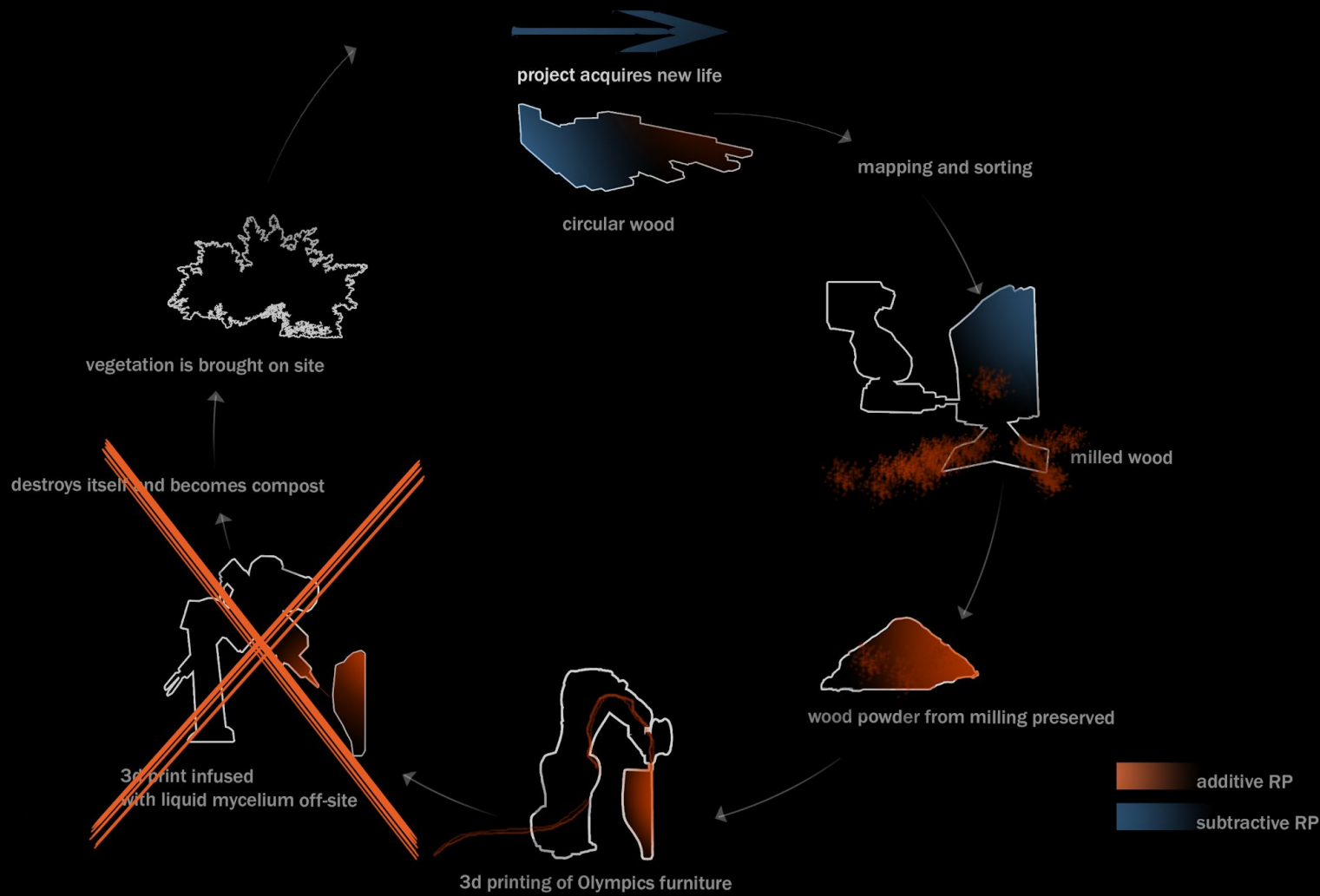
Circularity scheme

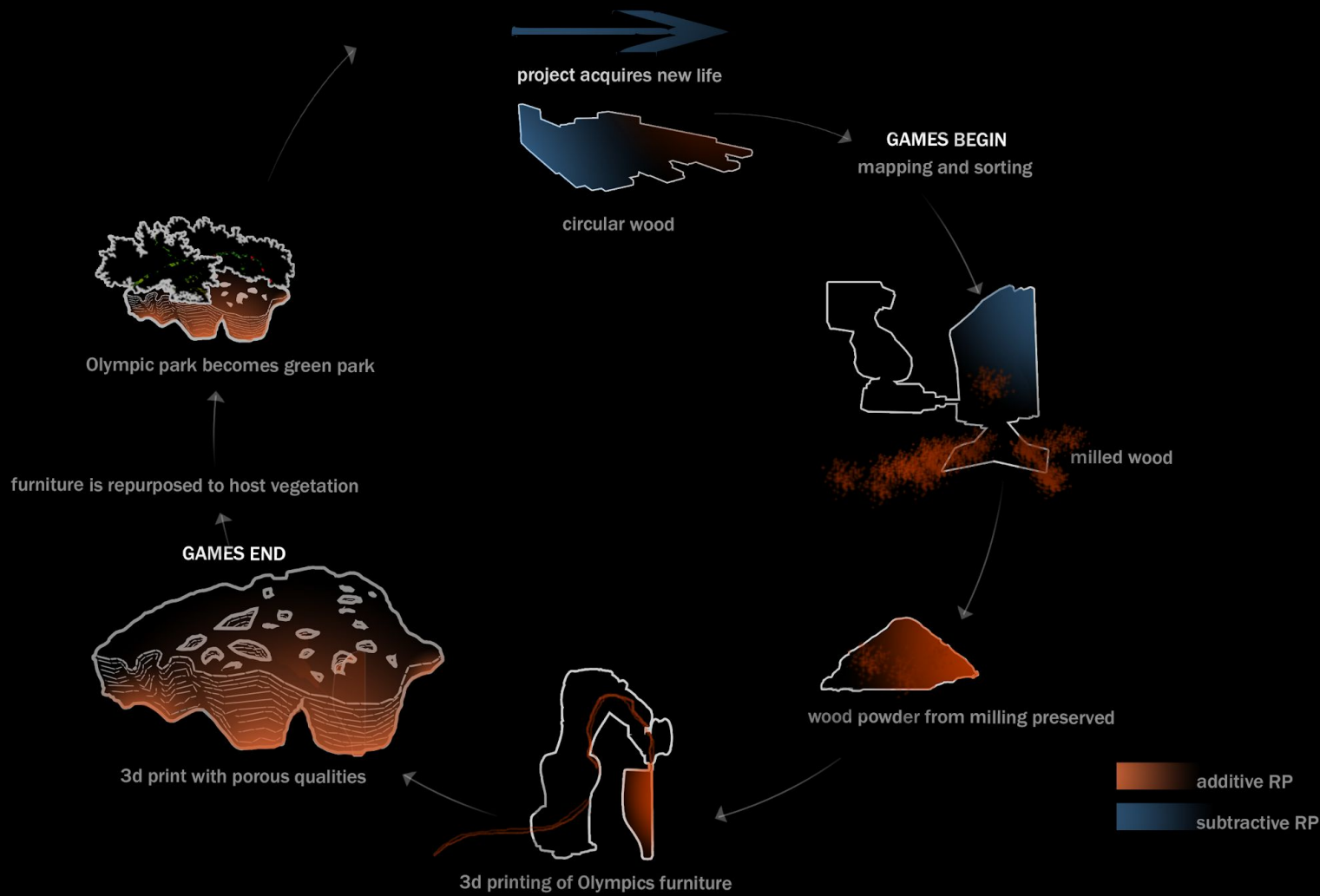


Heterogeneous structure 3d printed with the wood filament

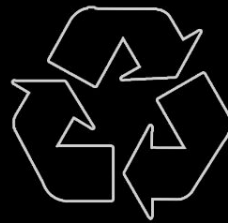


Mycellium is inserted into the form according to previous analysis.





POST-OLYMPICS











I. CONTEXT

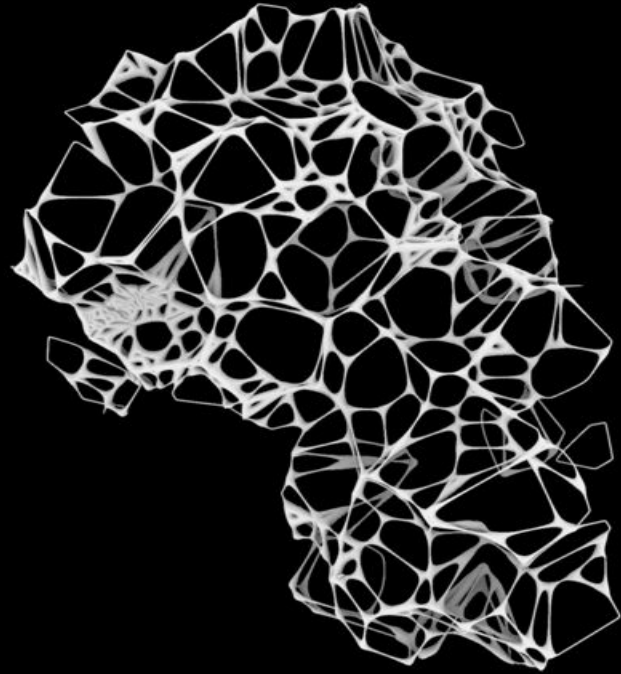
II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

IV. MATERIALIZATION

V. STRUCTURAL STABILITY

VI. REFLECTION



I. CONTEXT

II. ANALYSIS AND URBAN STRATEGY

III. POSITION - ARCHITECTURAL STRATEGY

IV. MATERIALIZATION

V. STRUCTURAL STABILITY

VI. REFLECTION



Stacked wood prepared for milling



Robotic Arm

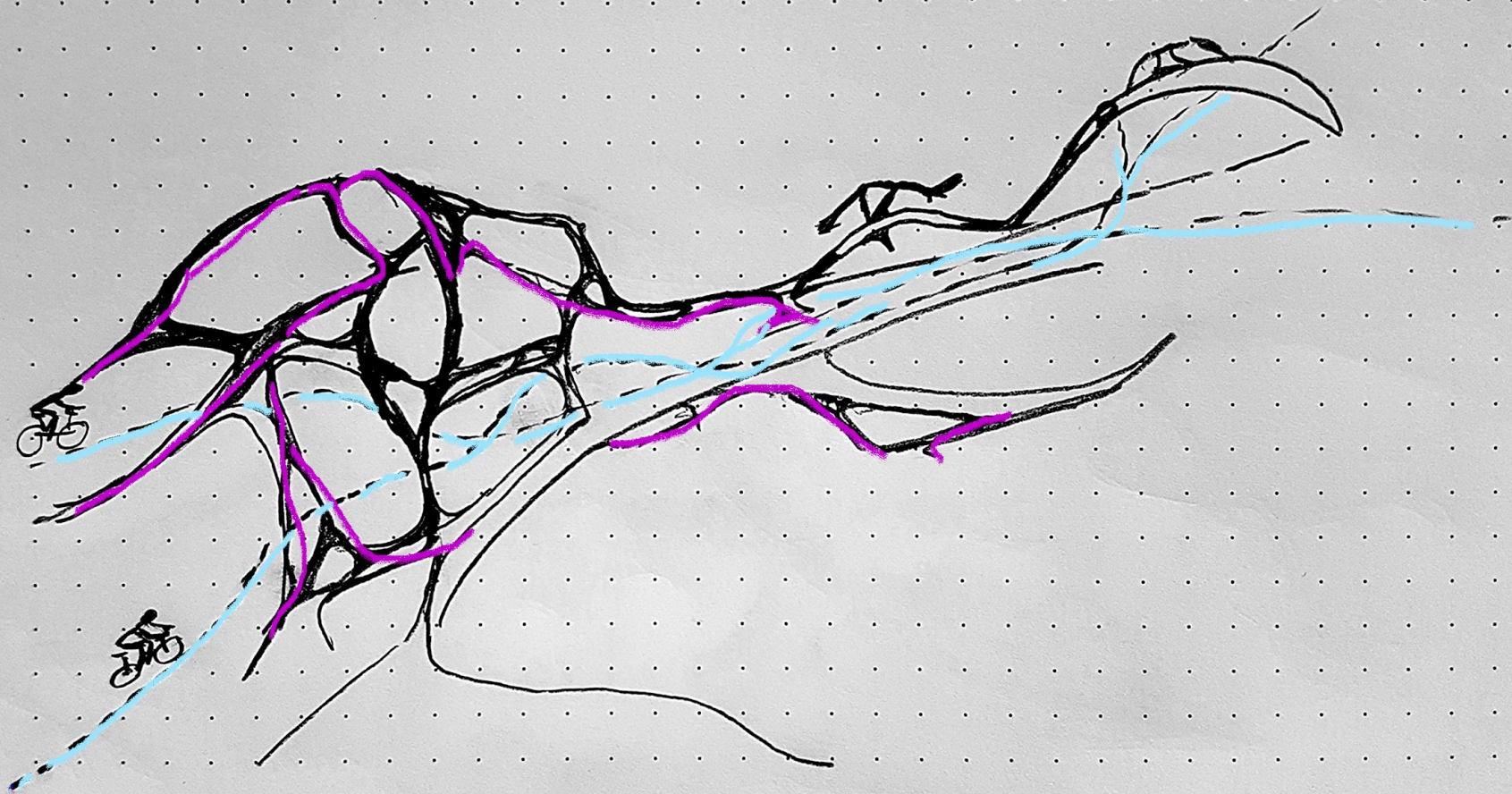


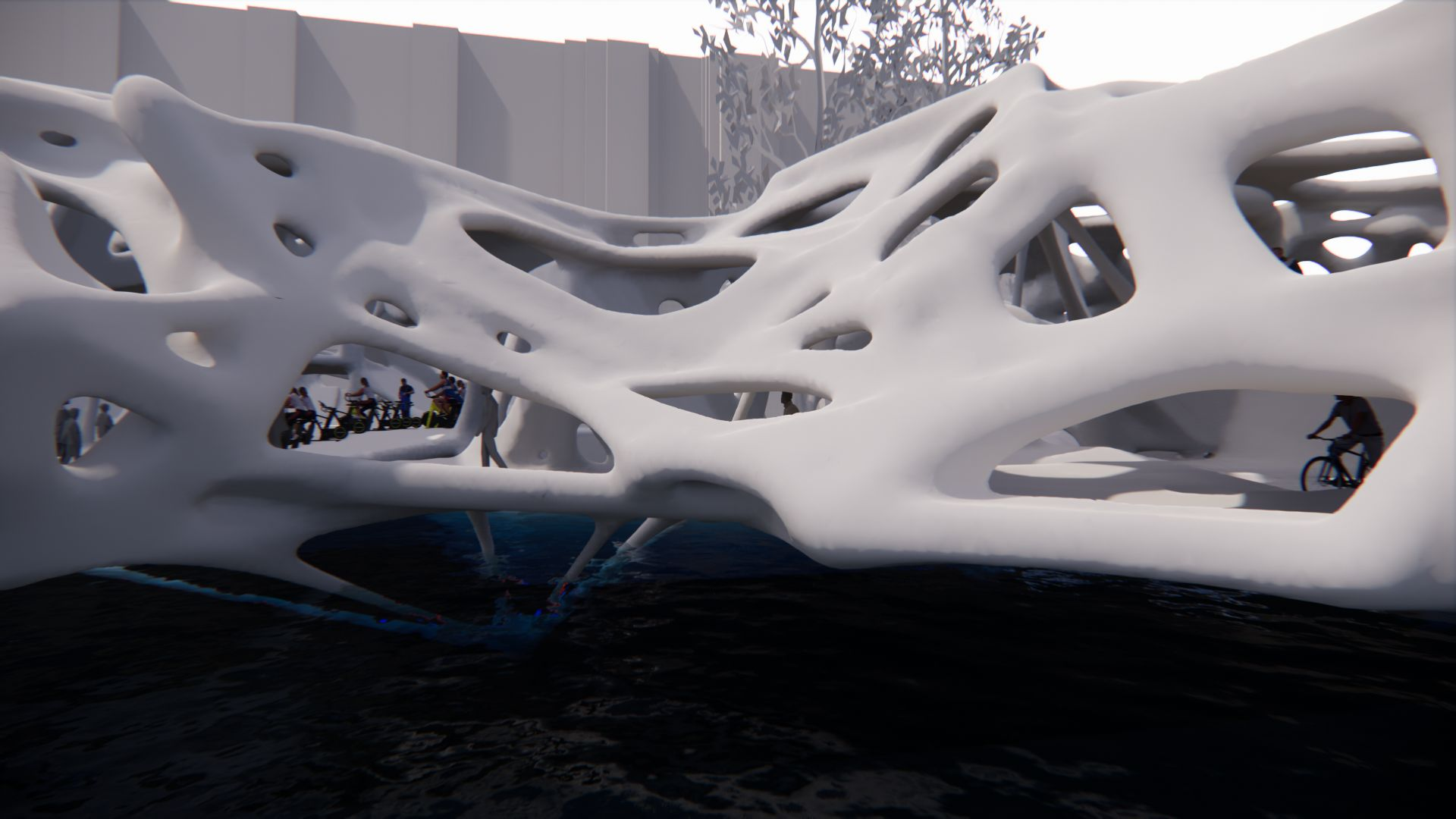
Milled wood



Wood powder

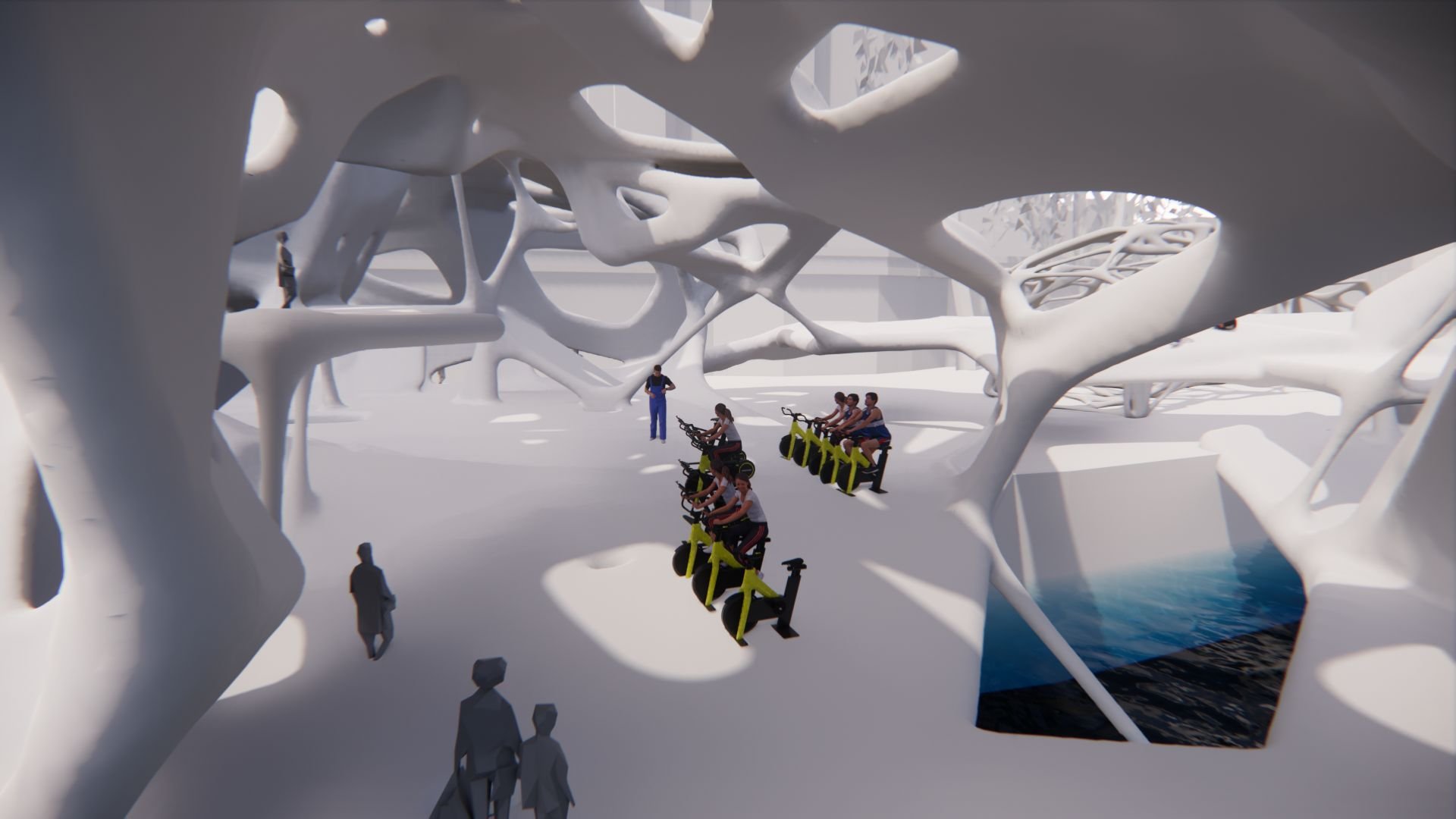
The Material components of Circular Milling

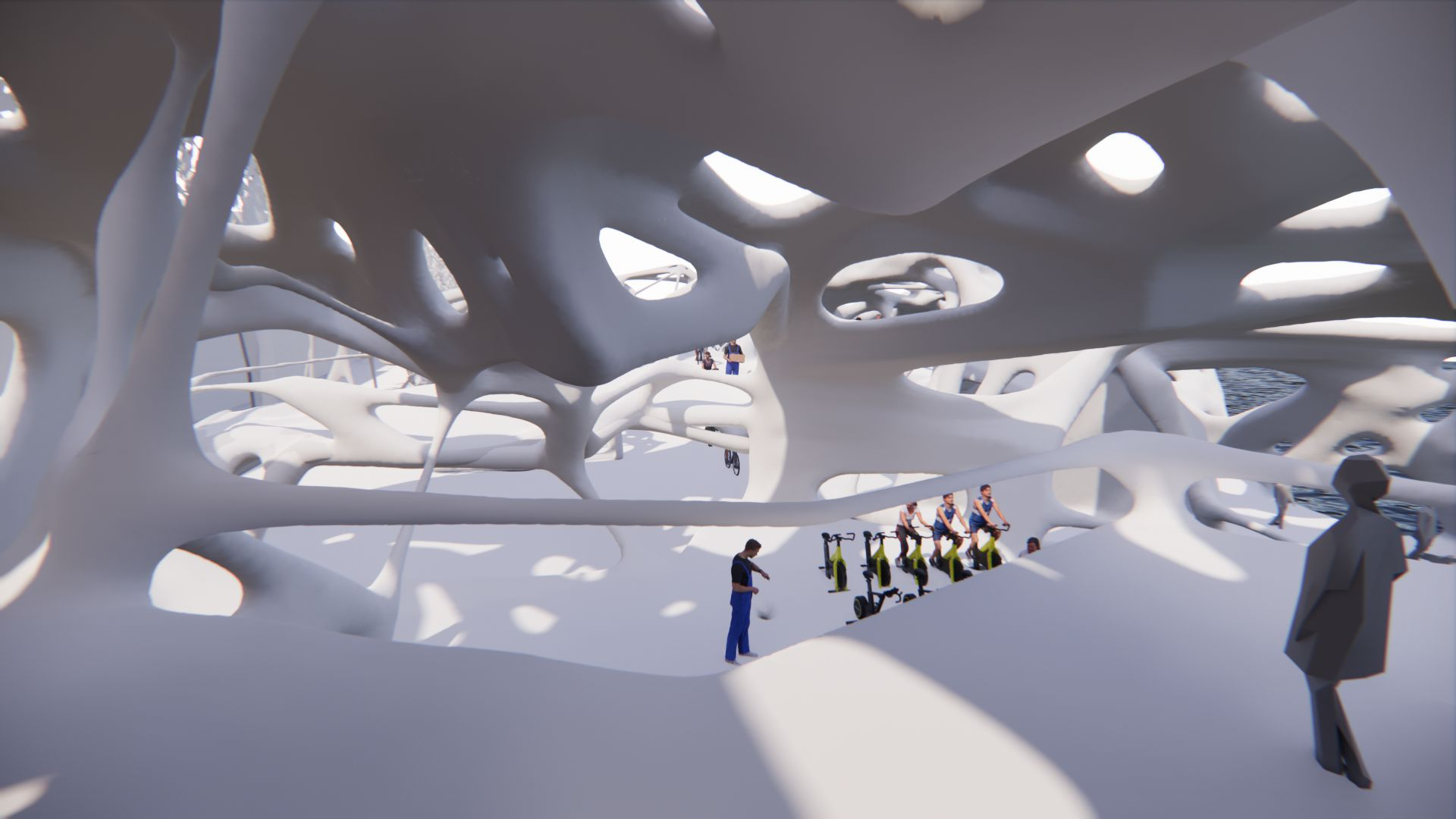




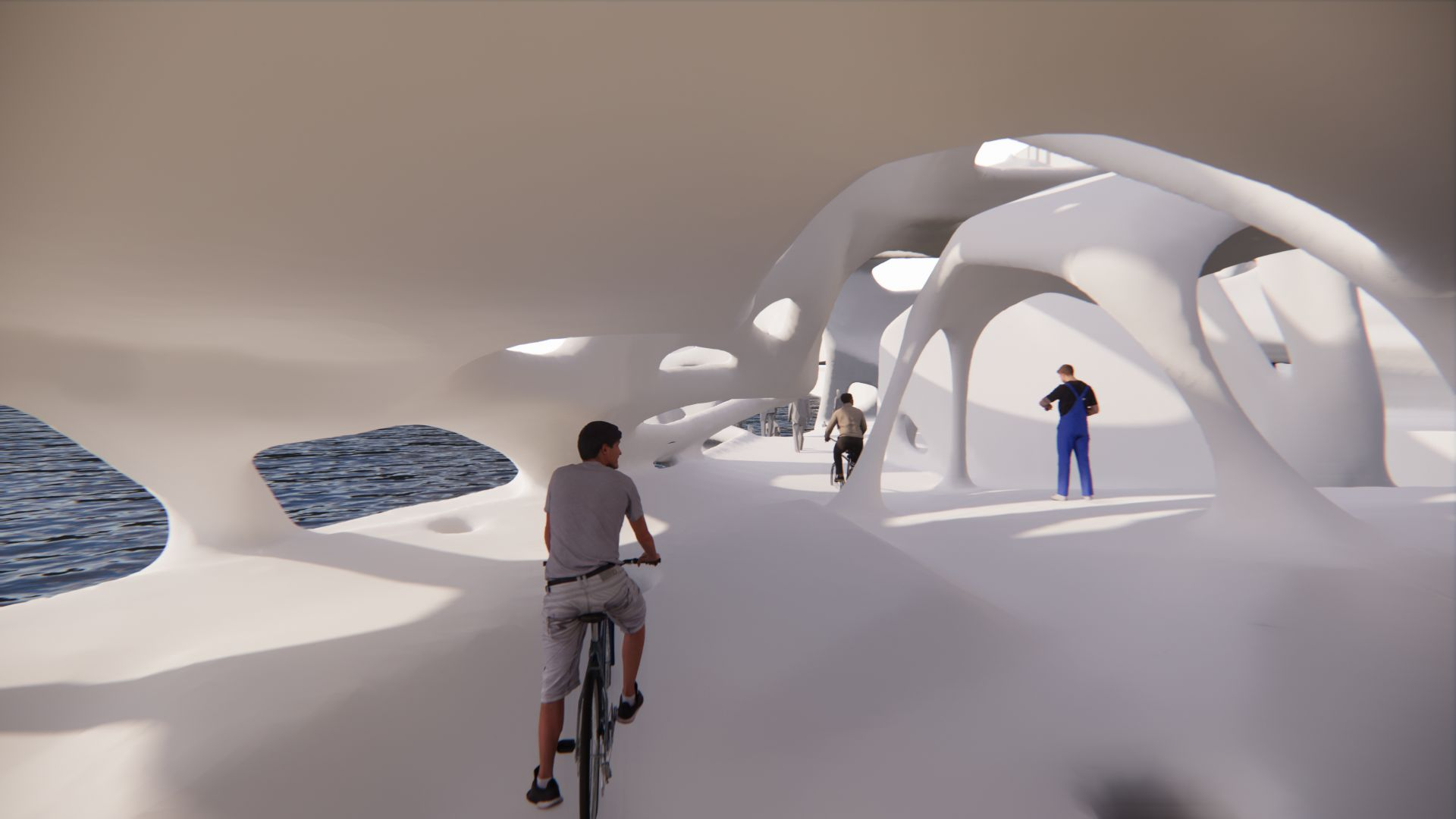
RENDERS

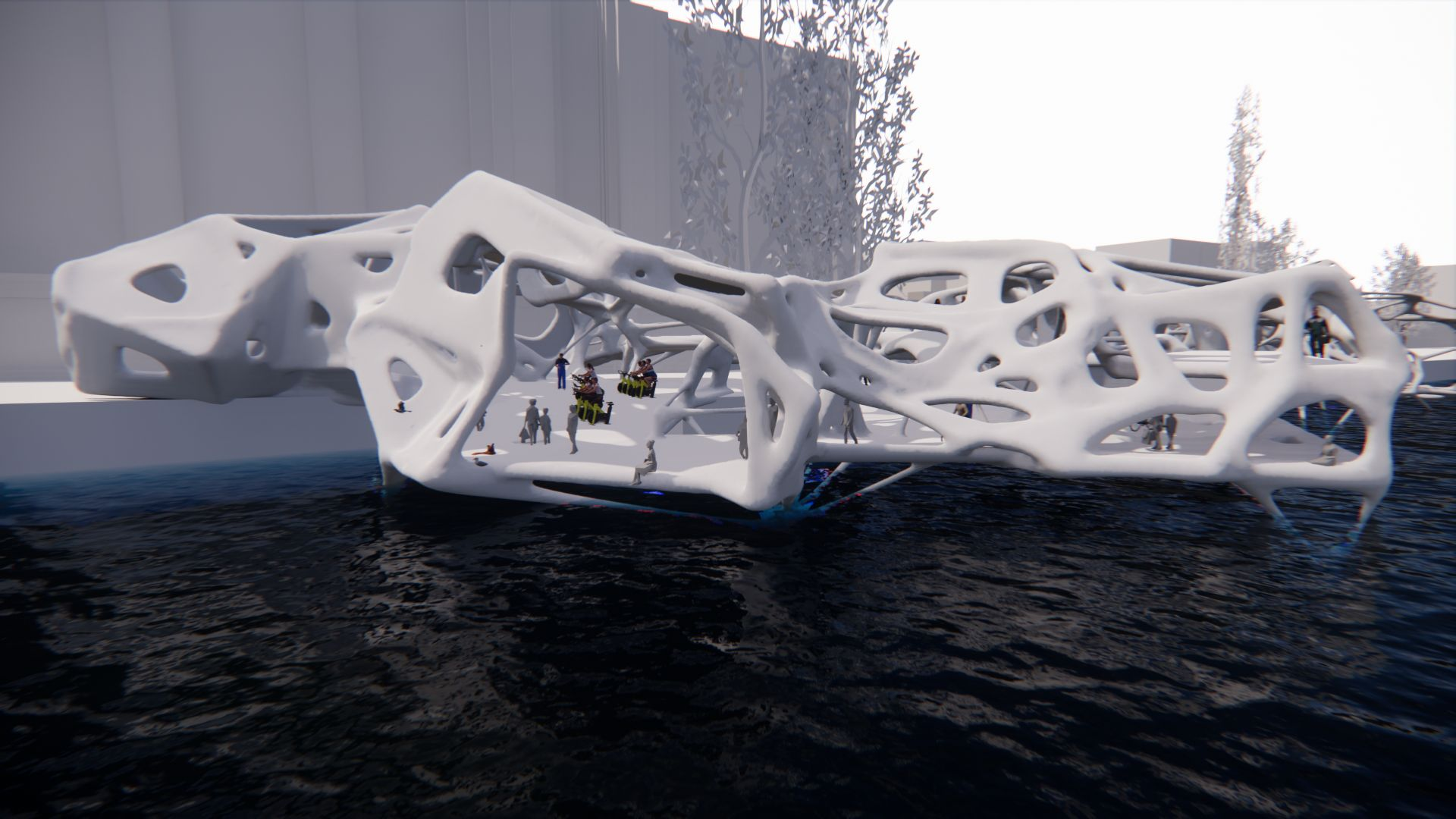


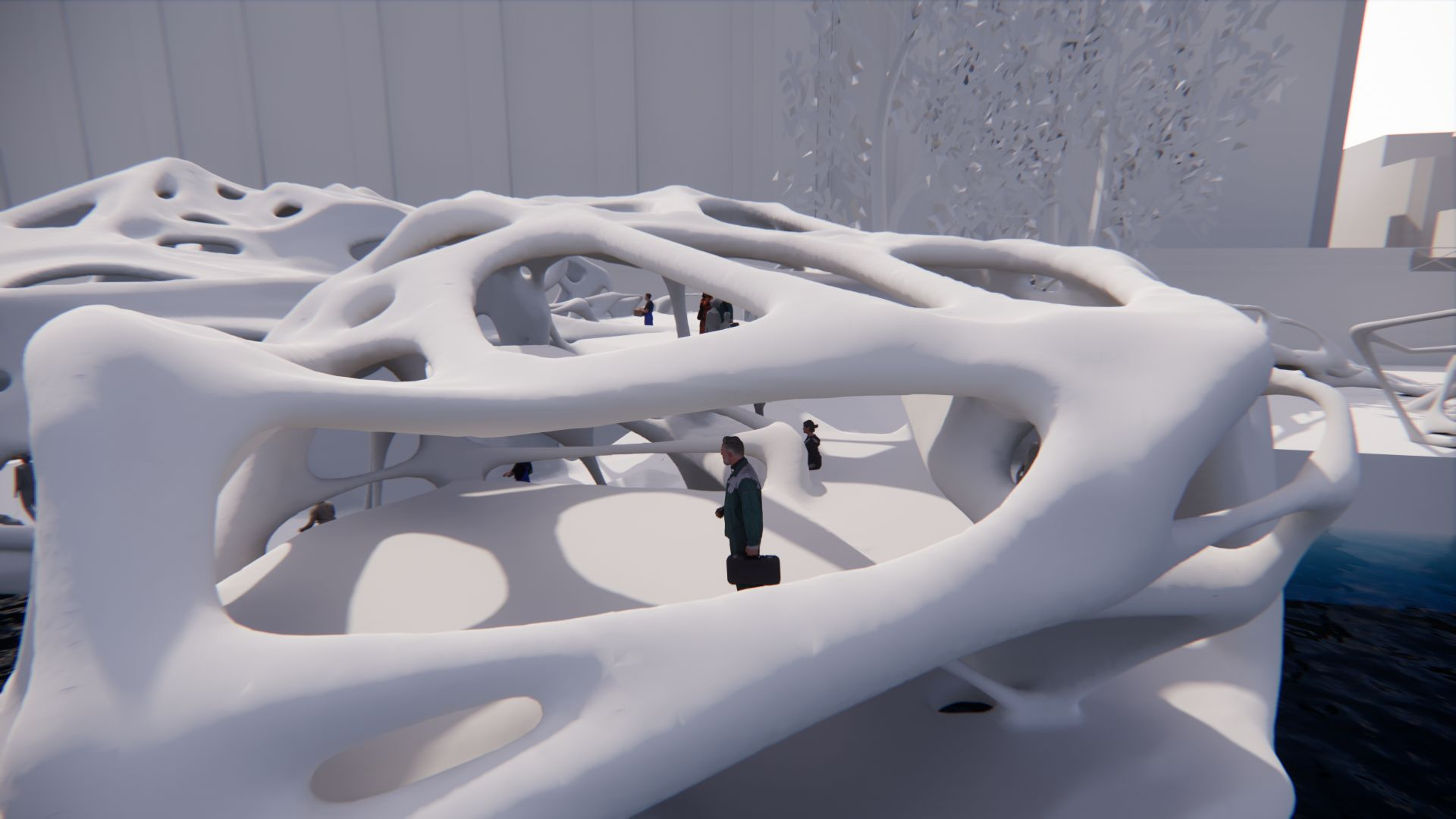














Bike is ready for the Olympics!

Thank you!