

the ANTI-capsule
prototype the future city

P5 Master graduation project, TU Delft, Faculty of Architecture

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the content of the presentation

- > a bit of research findings

- > aim of the project

- > context of the project

- > scales of the project

- > design principles

 - >> architecture

 - >> BT

 - >> climate

- > recommendations

- > overview

reveal the conditions of the future city

0) starting from the technological revolution >>

1) reveal the changing dynamics of the socio-techno system

(within the global urban context) and which consequences this has on our lifestyle,

2) expose the spatial implications of this socio-techno transformation
on the urban structure of the global city.

important notions used for the research

Technological revolution - all media as extensions of man, enhance speed in one way or the other
(M Castells, 2010; Dehaene & De Cauter, 2008)

Network society - as new socio-technological dynamics (M Castells, 2010; Graham & Marvin, 2002)

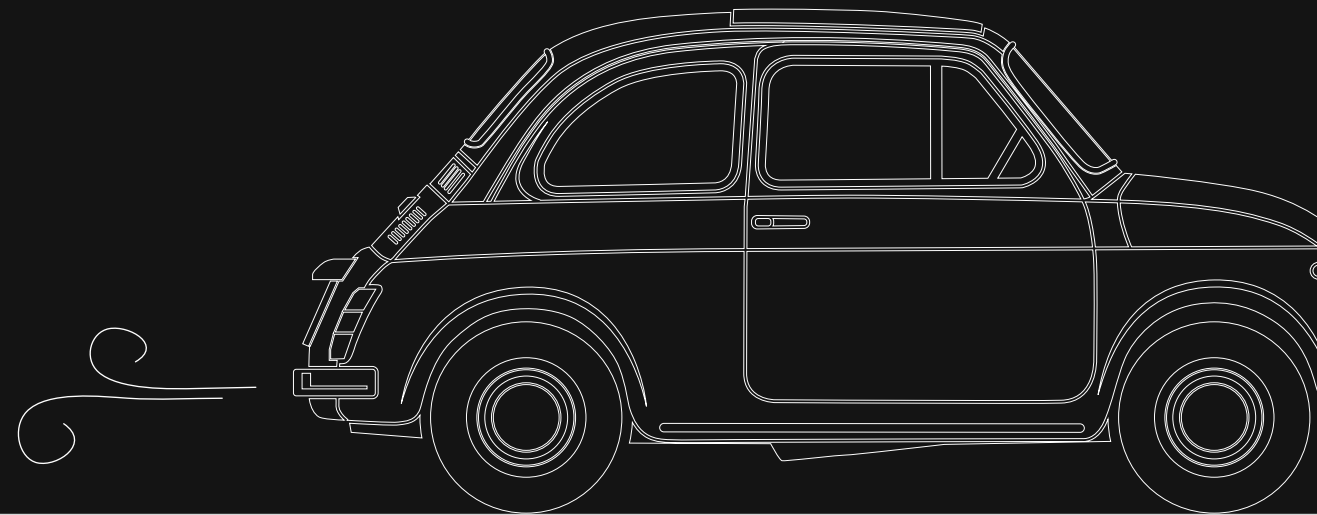
Exclusive networks - how individuals are (dis)connected to others (Allan & Phillipson, 2003)

Capsularity - as new lifestyle (Cauter, 2004)

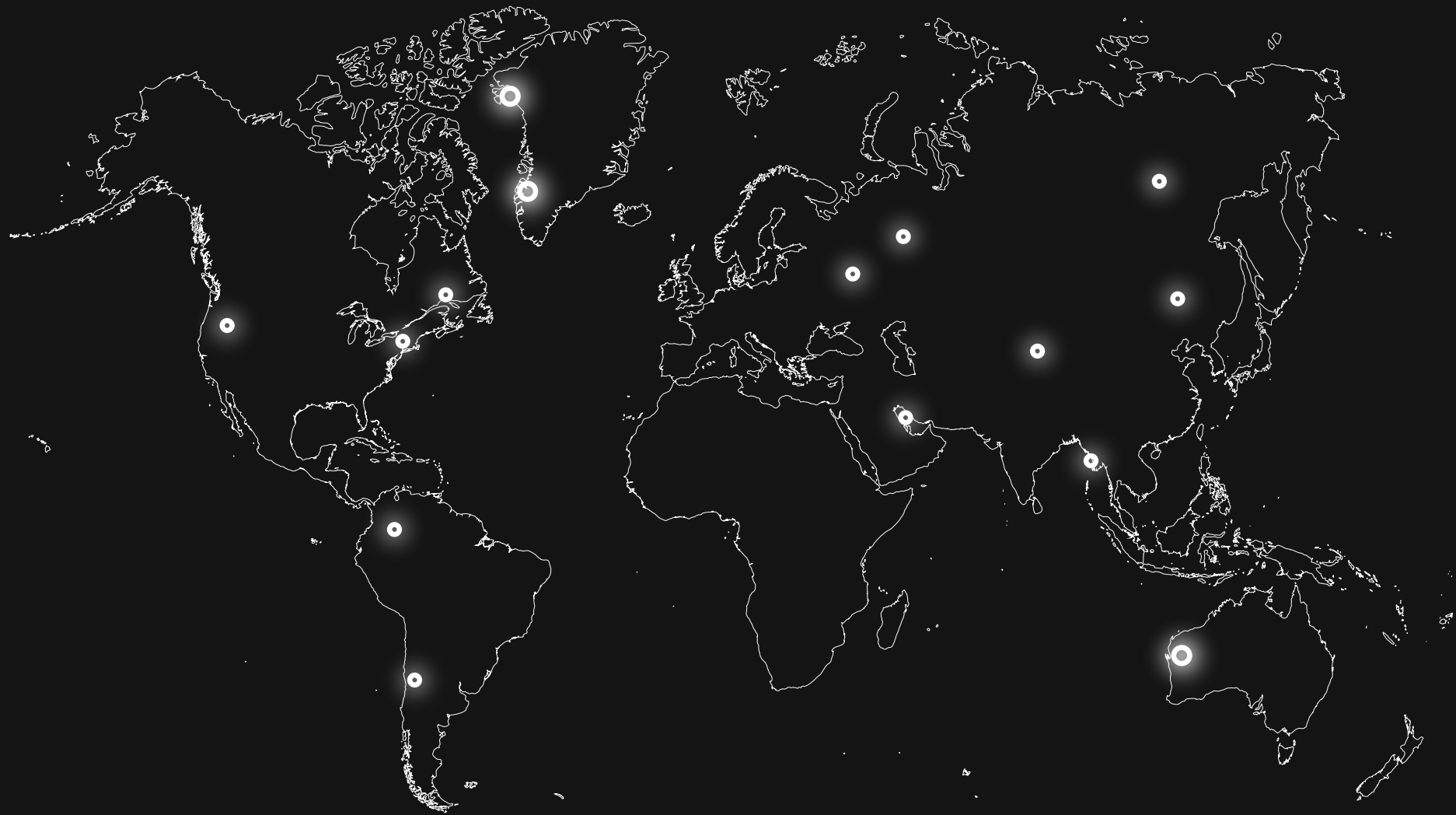
The superblock - as architectural manifestation of capsularity (Avermaete, 2002; Koolhaas, 1995)















technology annihilates *time*
and kills *distance*

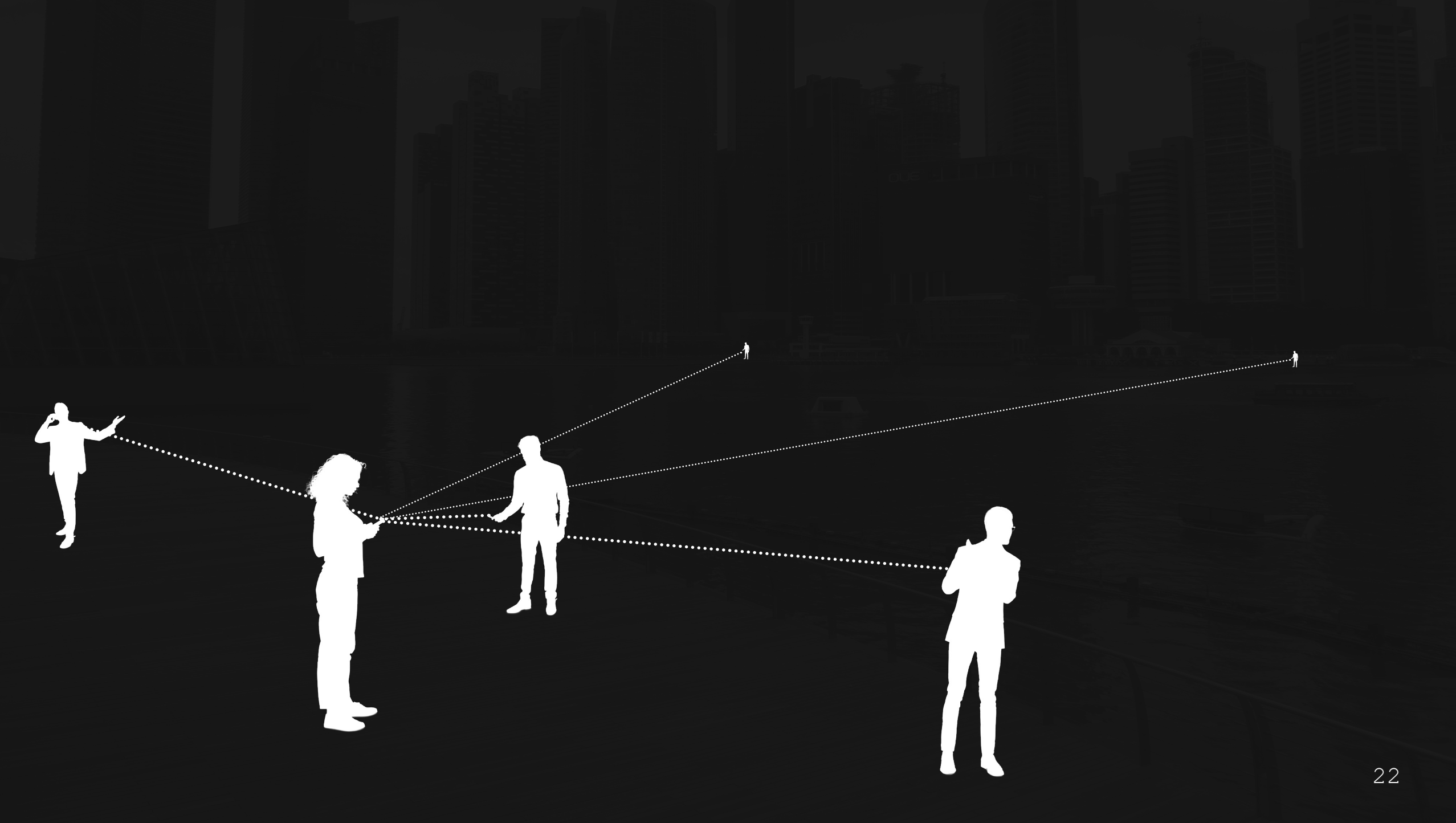


(Allan & Phillipson, 2003; Avermaete, 2002; Cauter, 2012; Graham & Marvin, 2002)







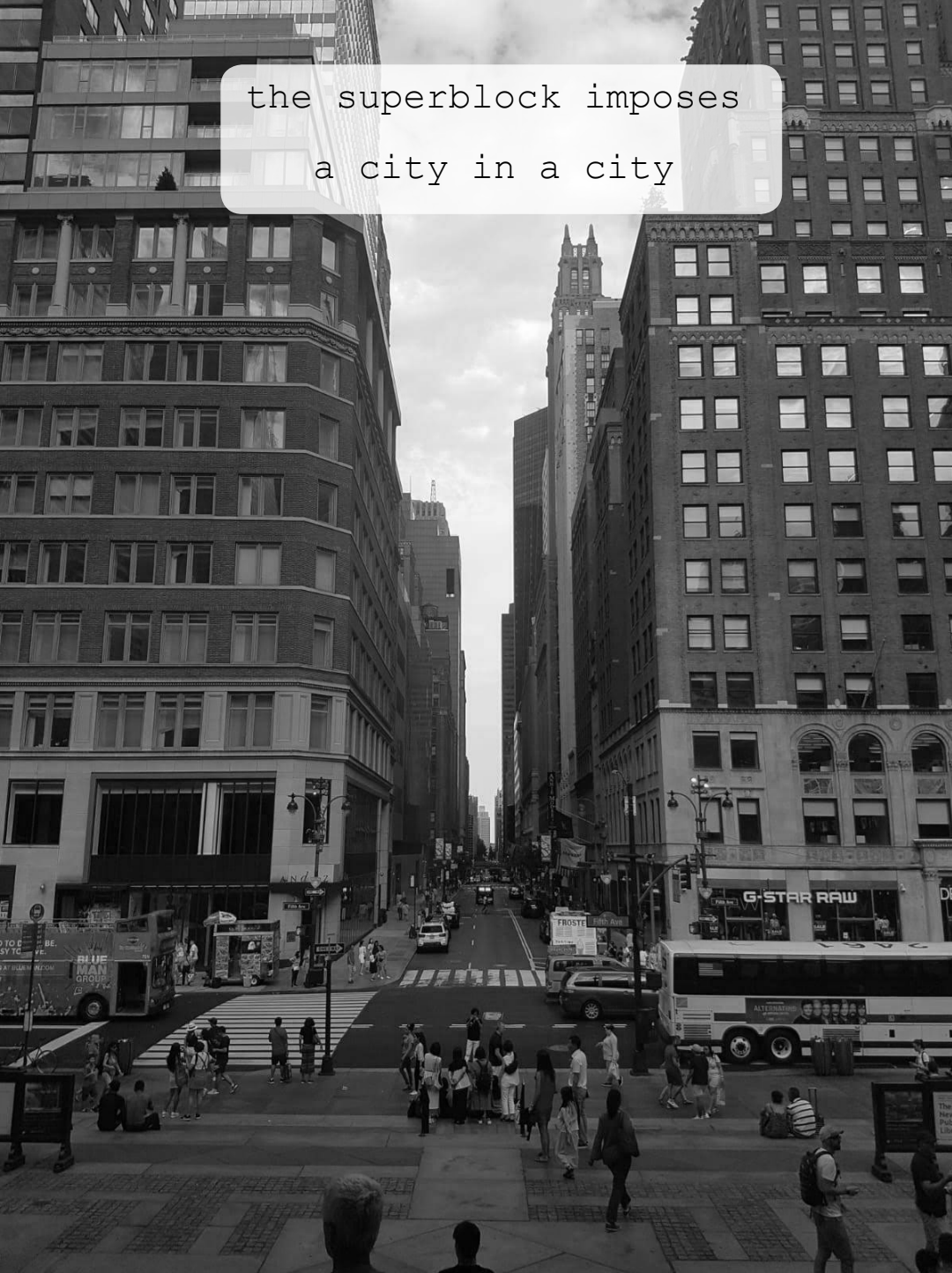








the superblock imposes
a city in a city



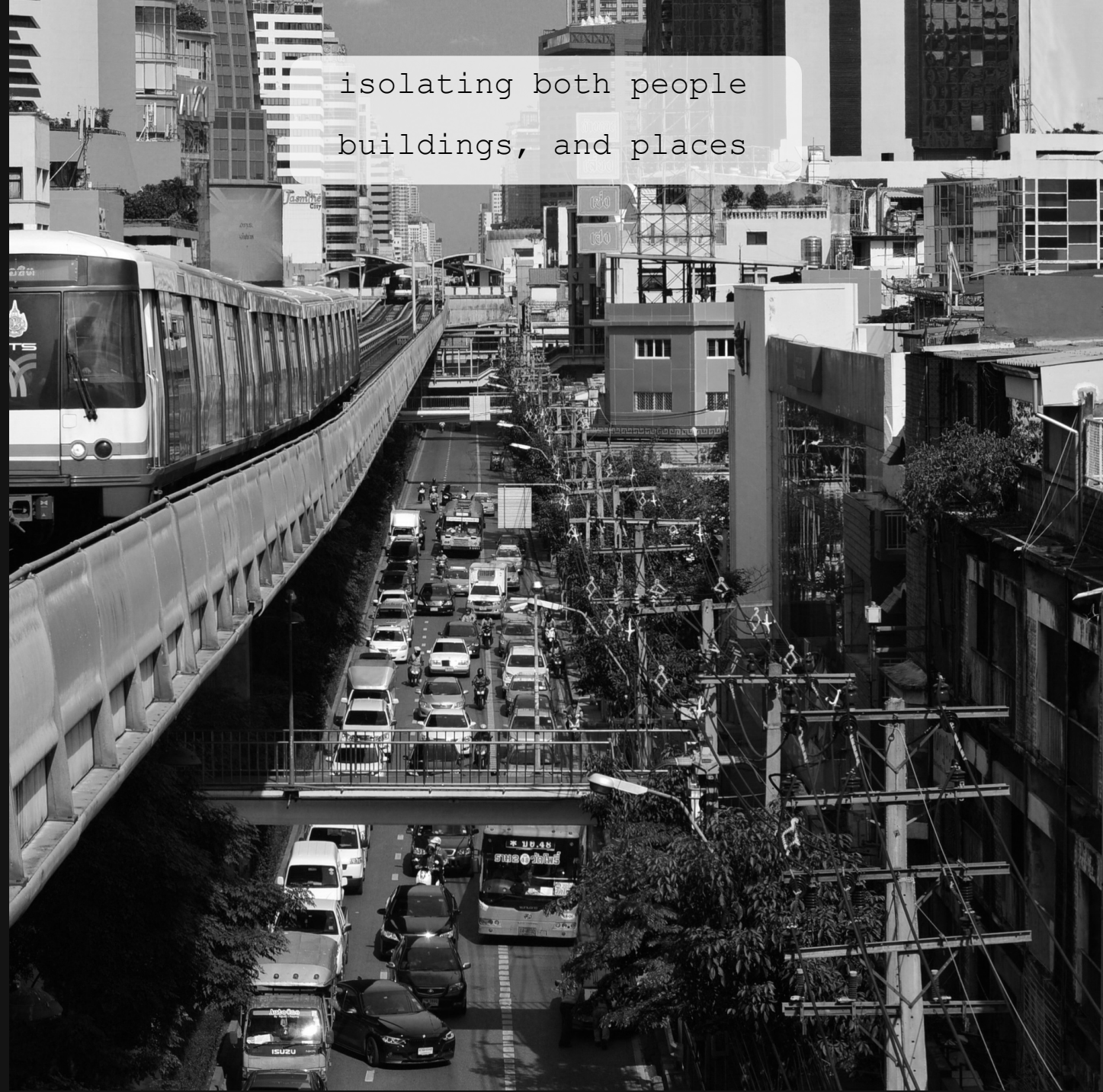
when the superblock is everywhere
the city decentralises



the supportive network
fragmentizes the city



isolating both people
buildings, and places



as a responds we see
privatized 'publicness'



and while simulating our climate
leftover spaces appear



5 manifestations of capsularity

decentralisation

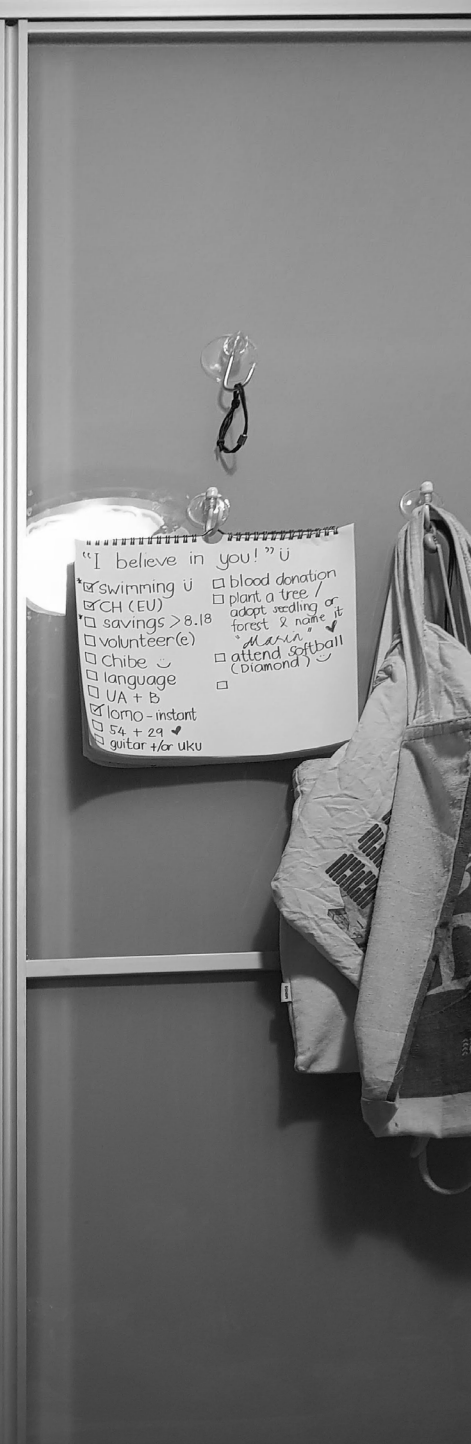
fragmentation

isolation

privatisation

simulation

singapore
as prototype location







aim of the project

decentralisation

fragmentation

isolation

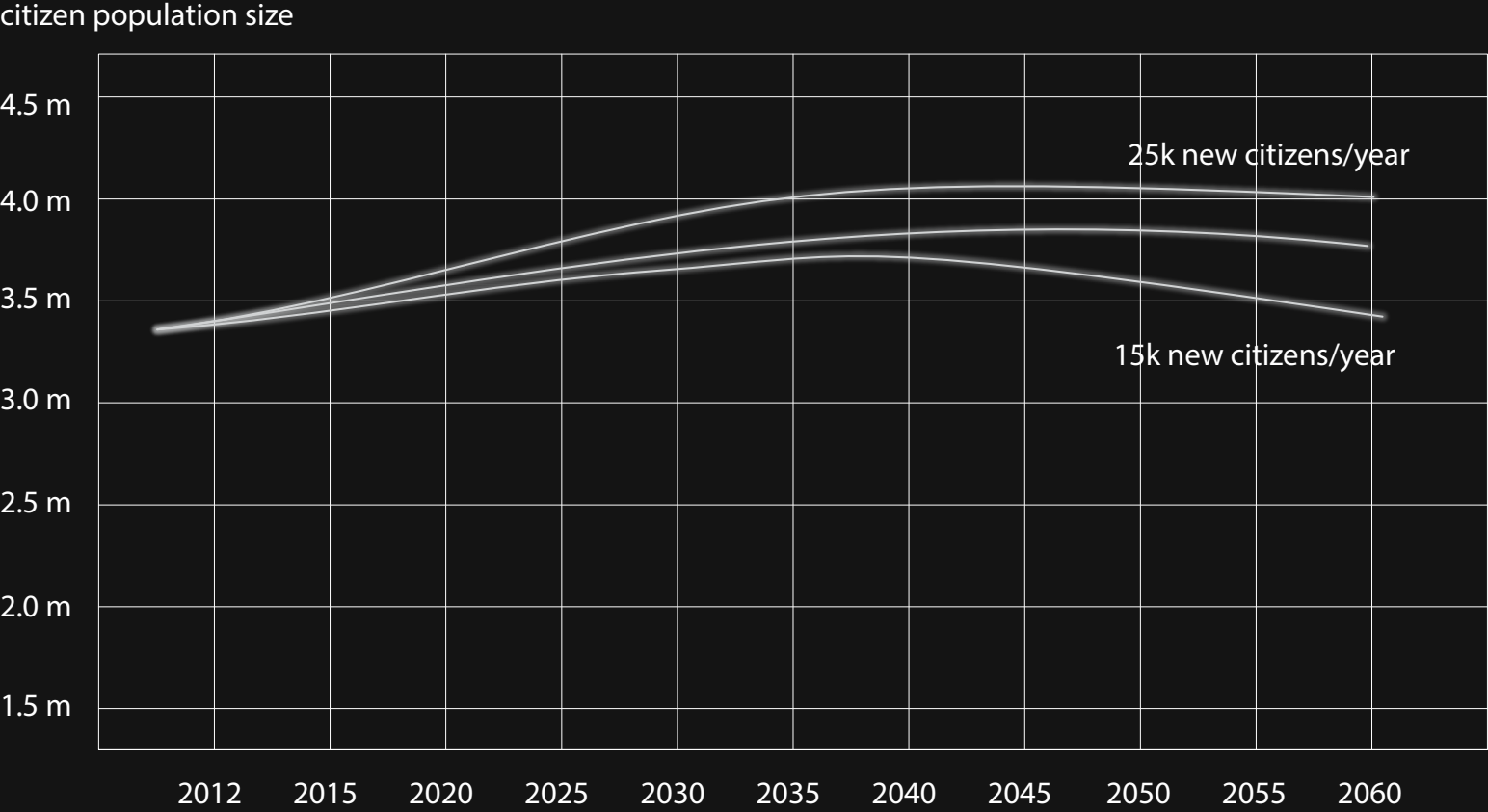
privatisation

simulation

aim of the project

- decentralisation* > create a new sense of centrality by defining urban fragments
- fragmentation* > connect (fragments) as a network
- isolation* > create a gradient of public to private spaces
as new spaces for interaction
- privatisation* > create communal spaces
- simulation* > consider and include externalities (sun, water and wind)

population grow singapore



reclaimed land



reclaimed land



Necessity
Extra value

districts singapore



punngol region







bus + metrostation

program

> dwellings - approximately 76-280 dwellings per block

> hawker center and local shops (7eleven etc.)

> sport facilities

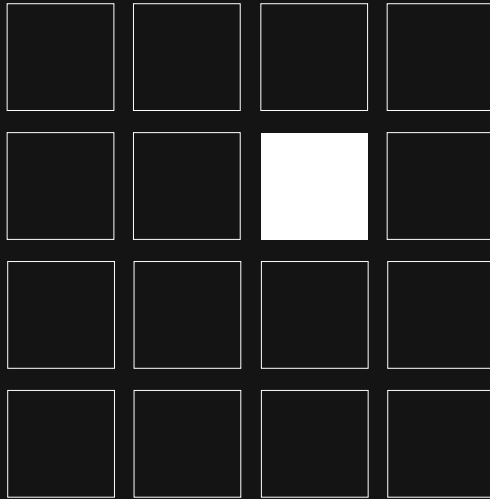
> public space

> communal space

> leisure spaces

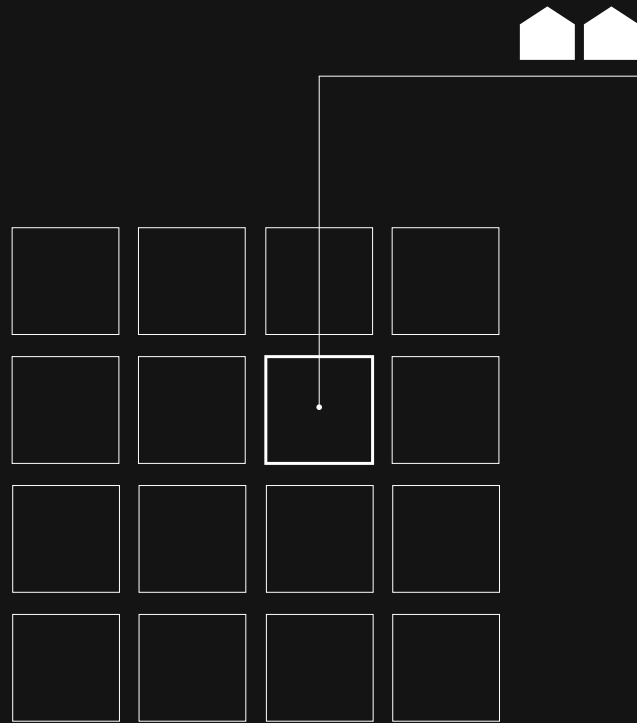
*** expanding program > the design should be able to expand over time*

in order to facilitate changing demands in the future

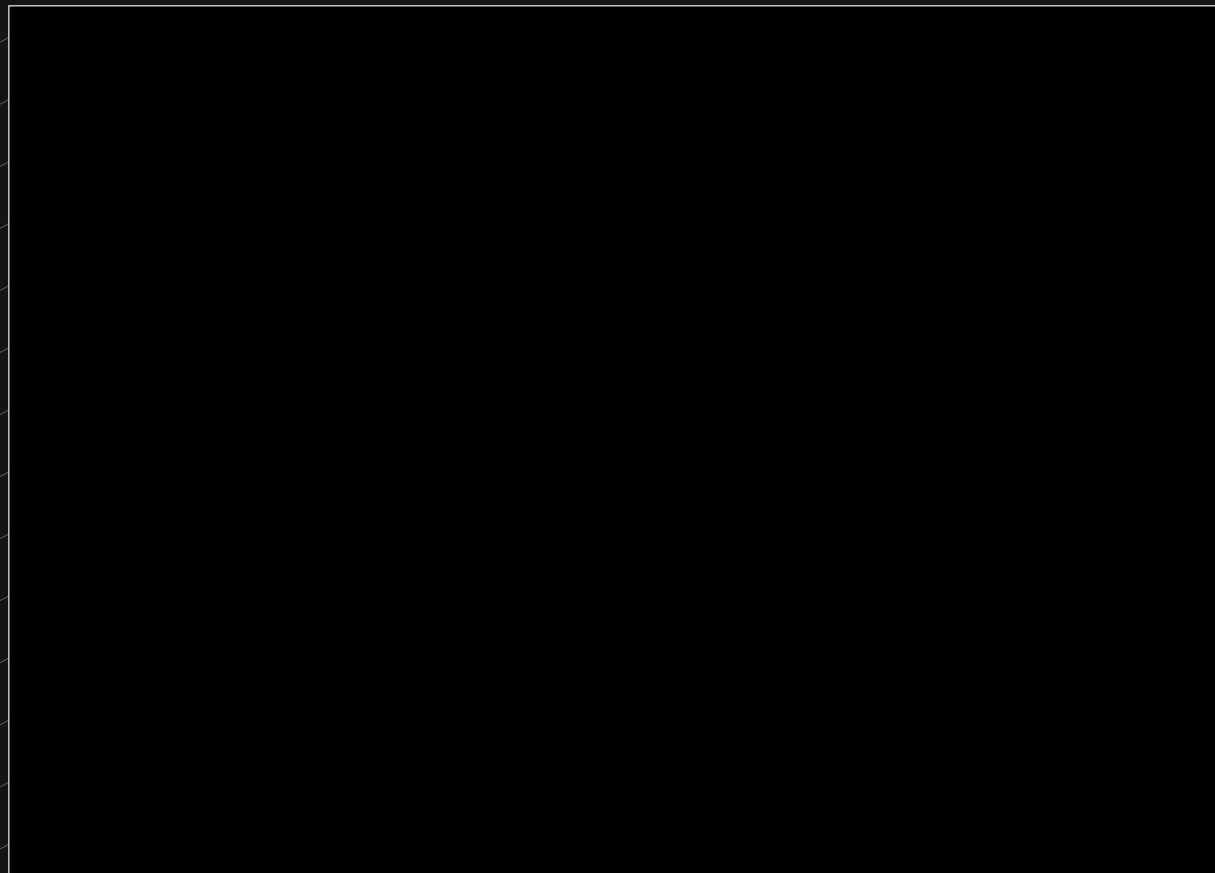


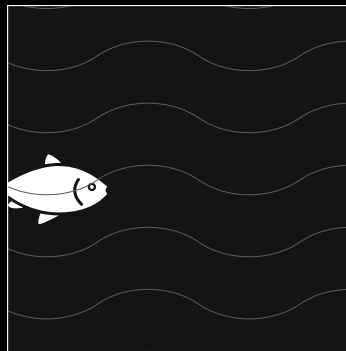
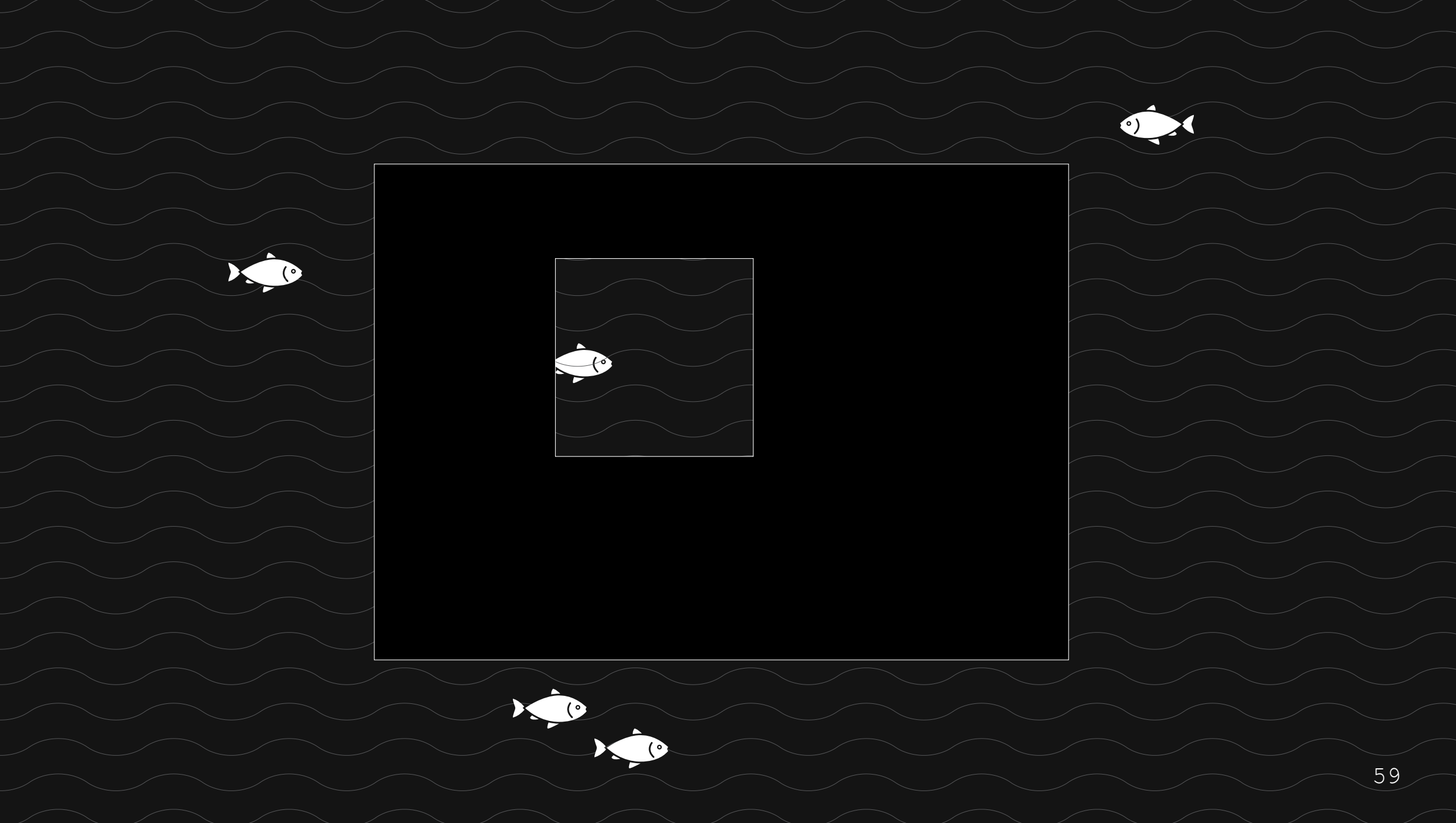
island =

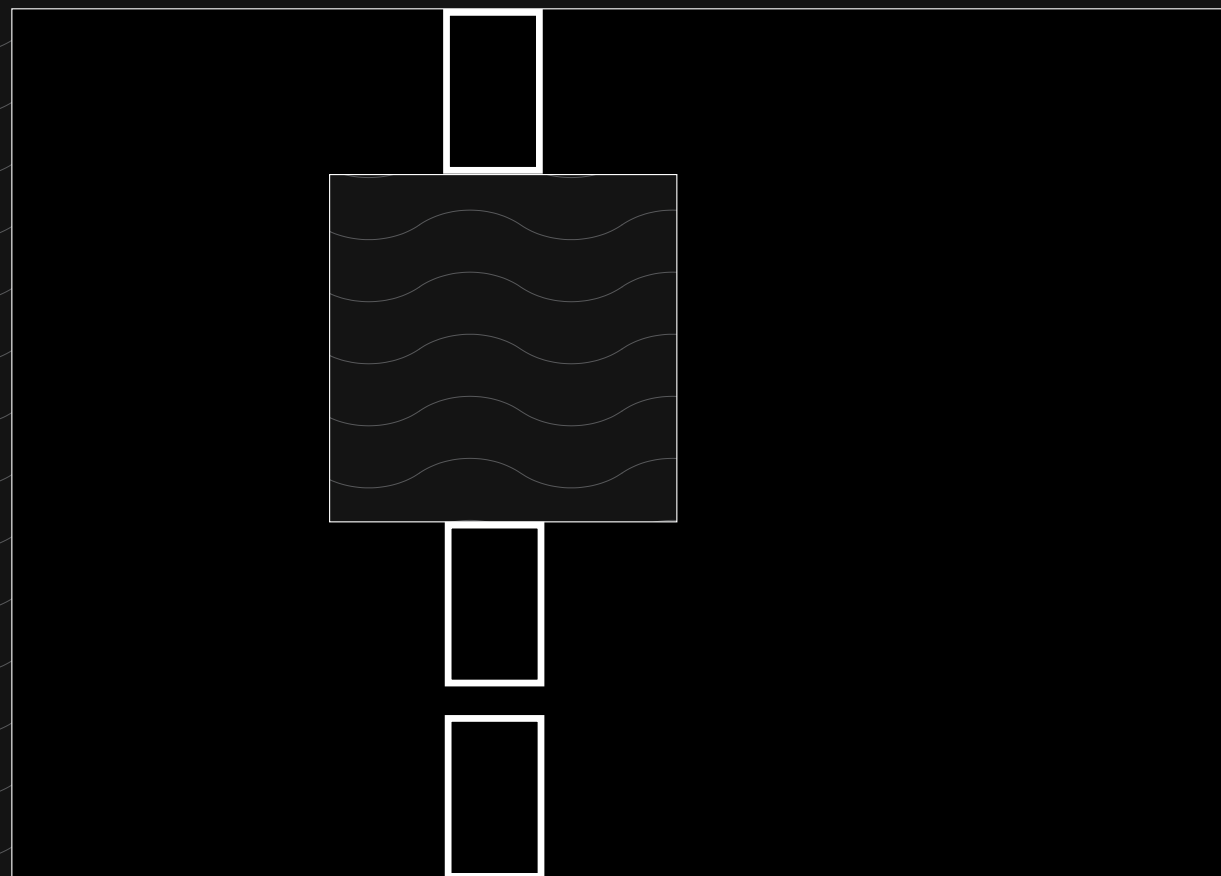
semi-generic system

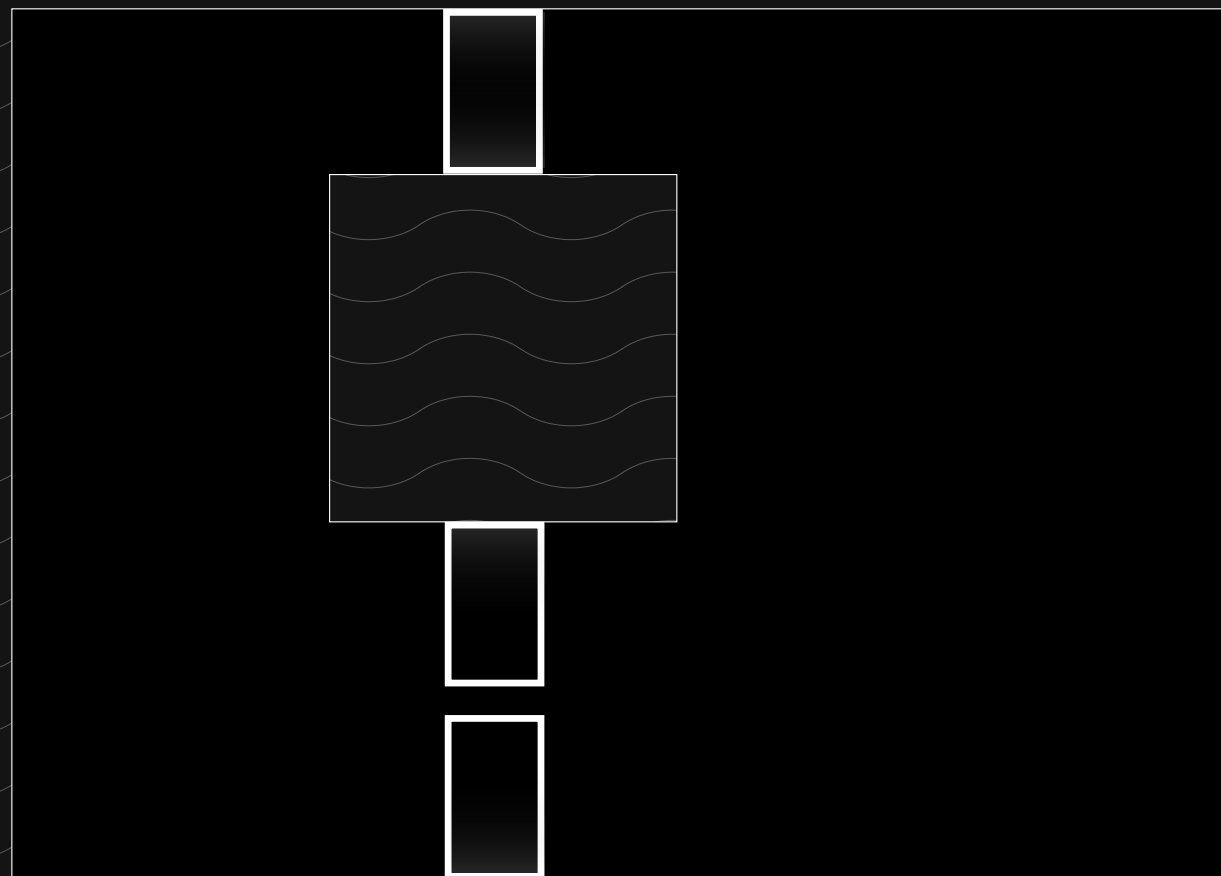


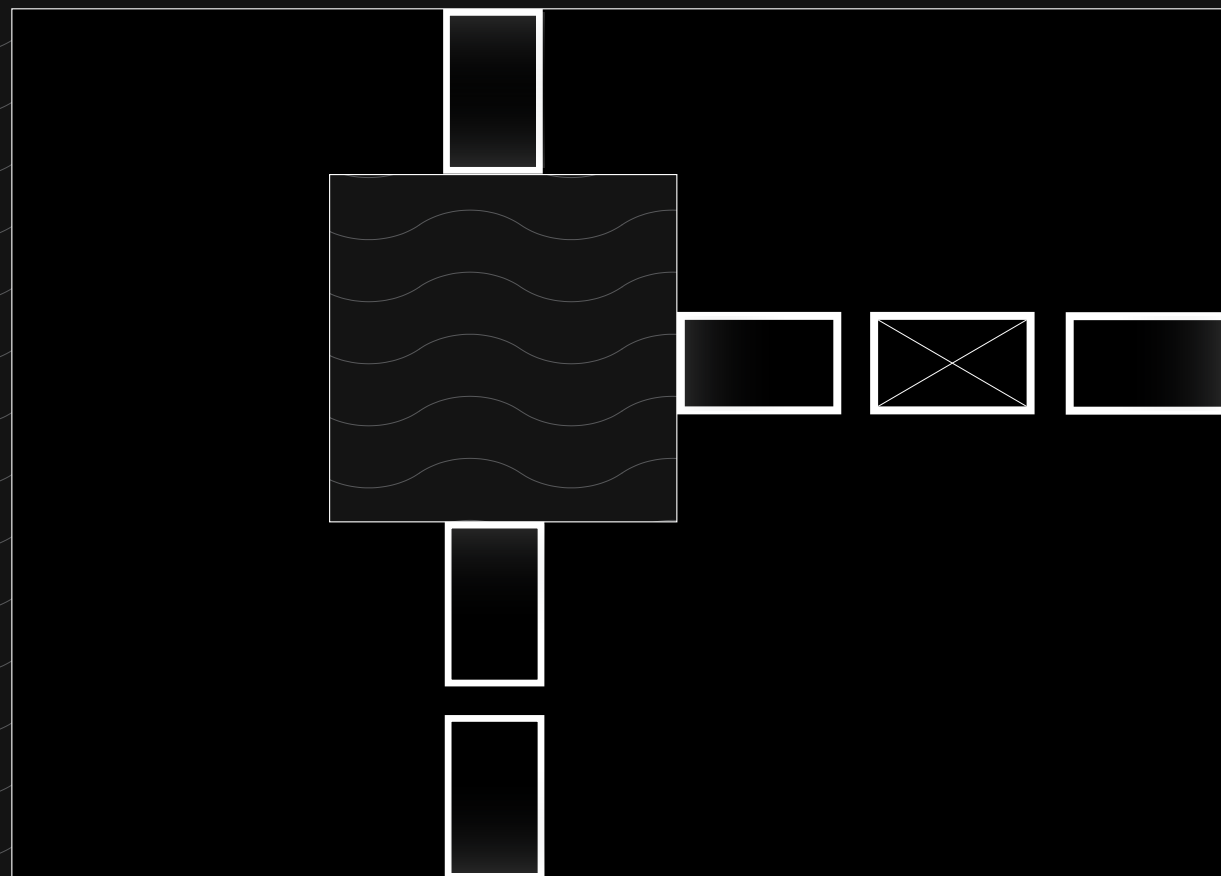
```
program =  
specific system
```

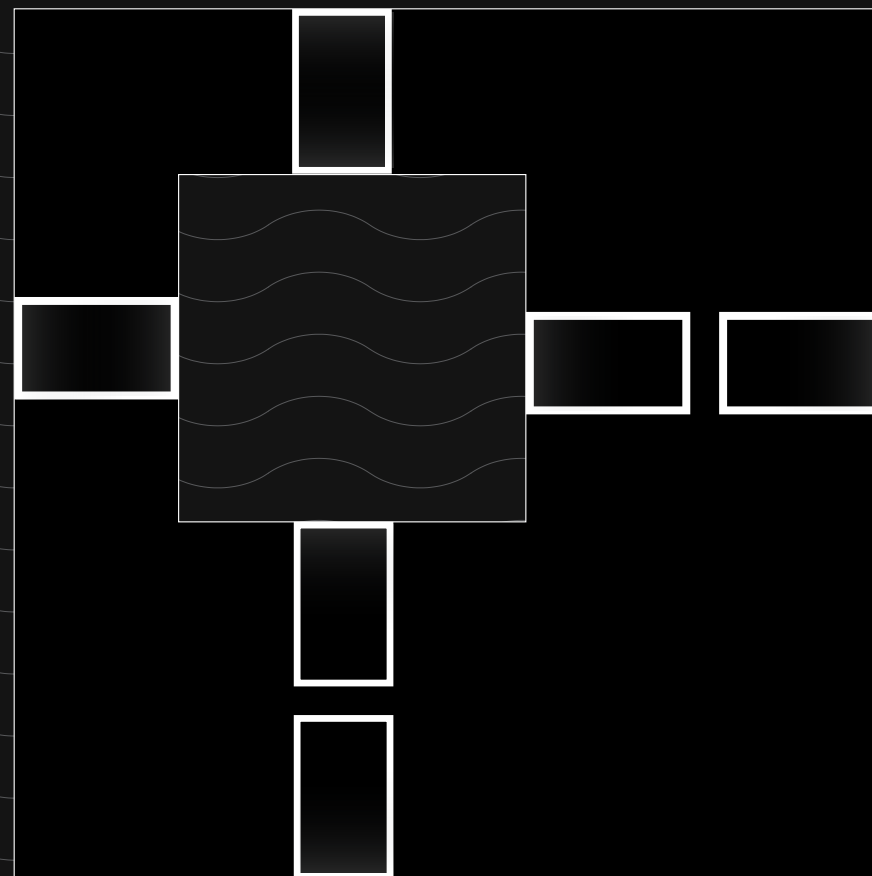



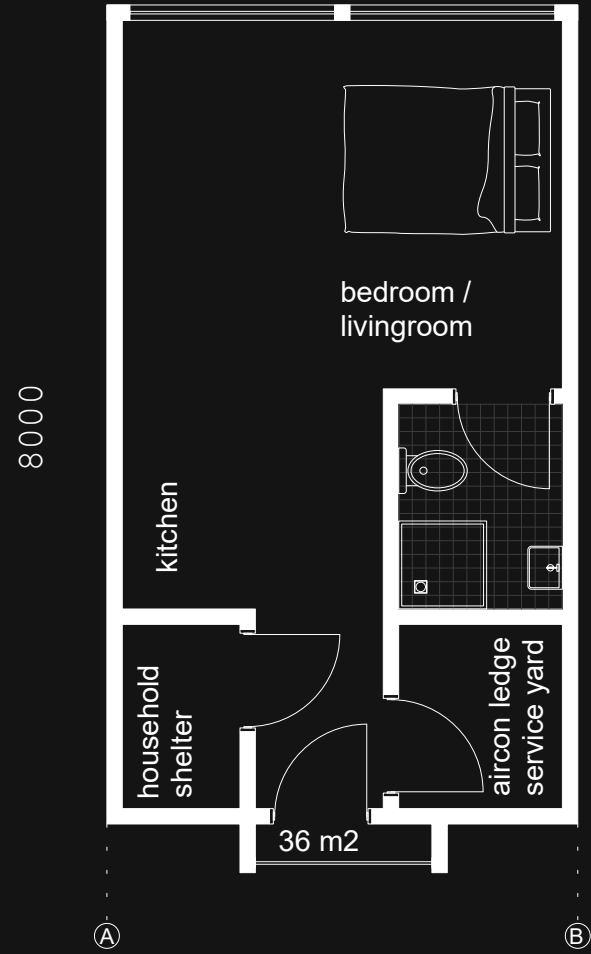


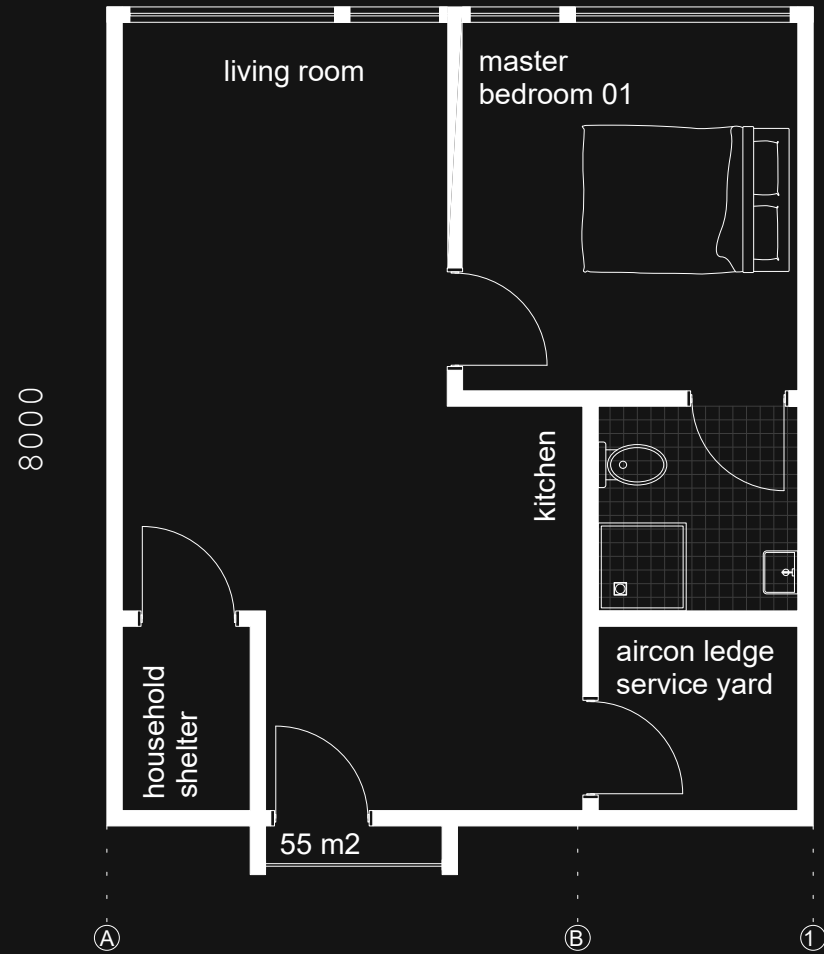


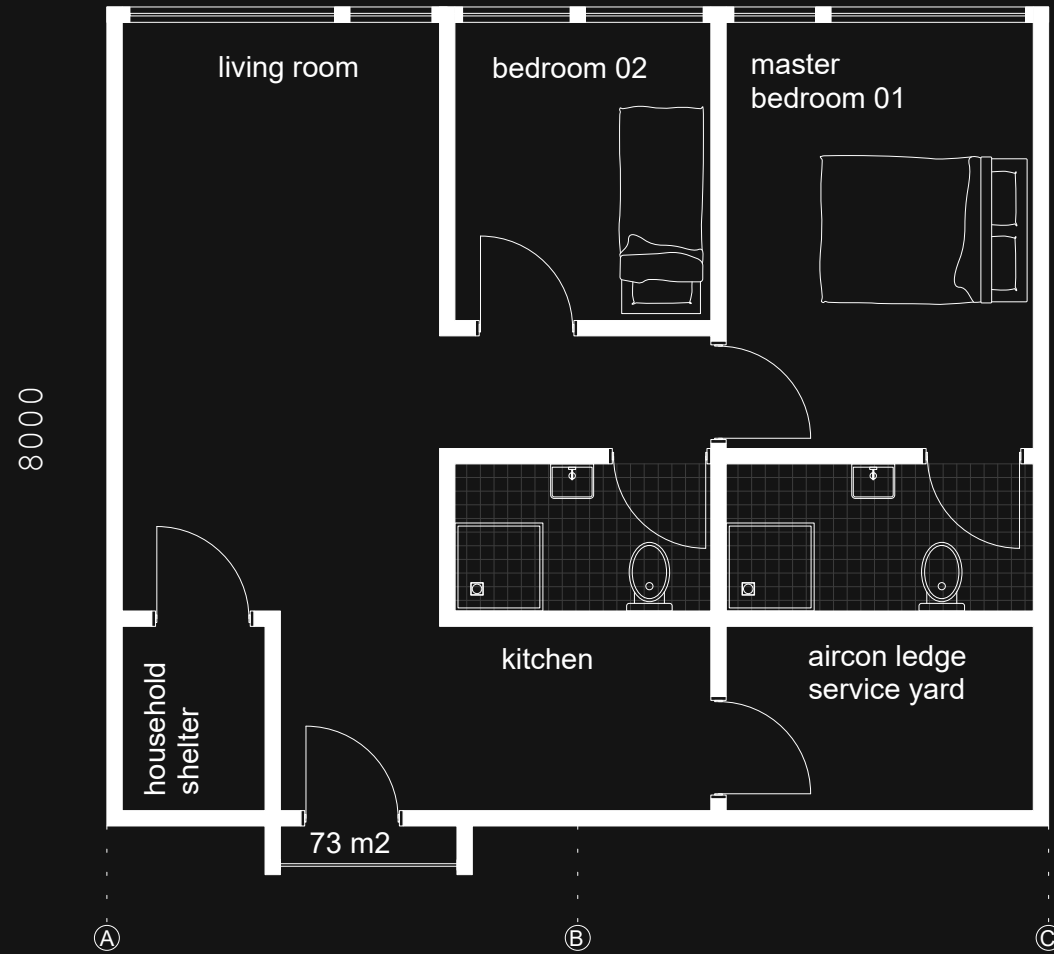




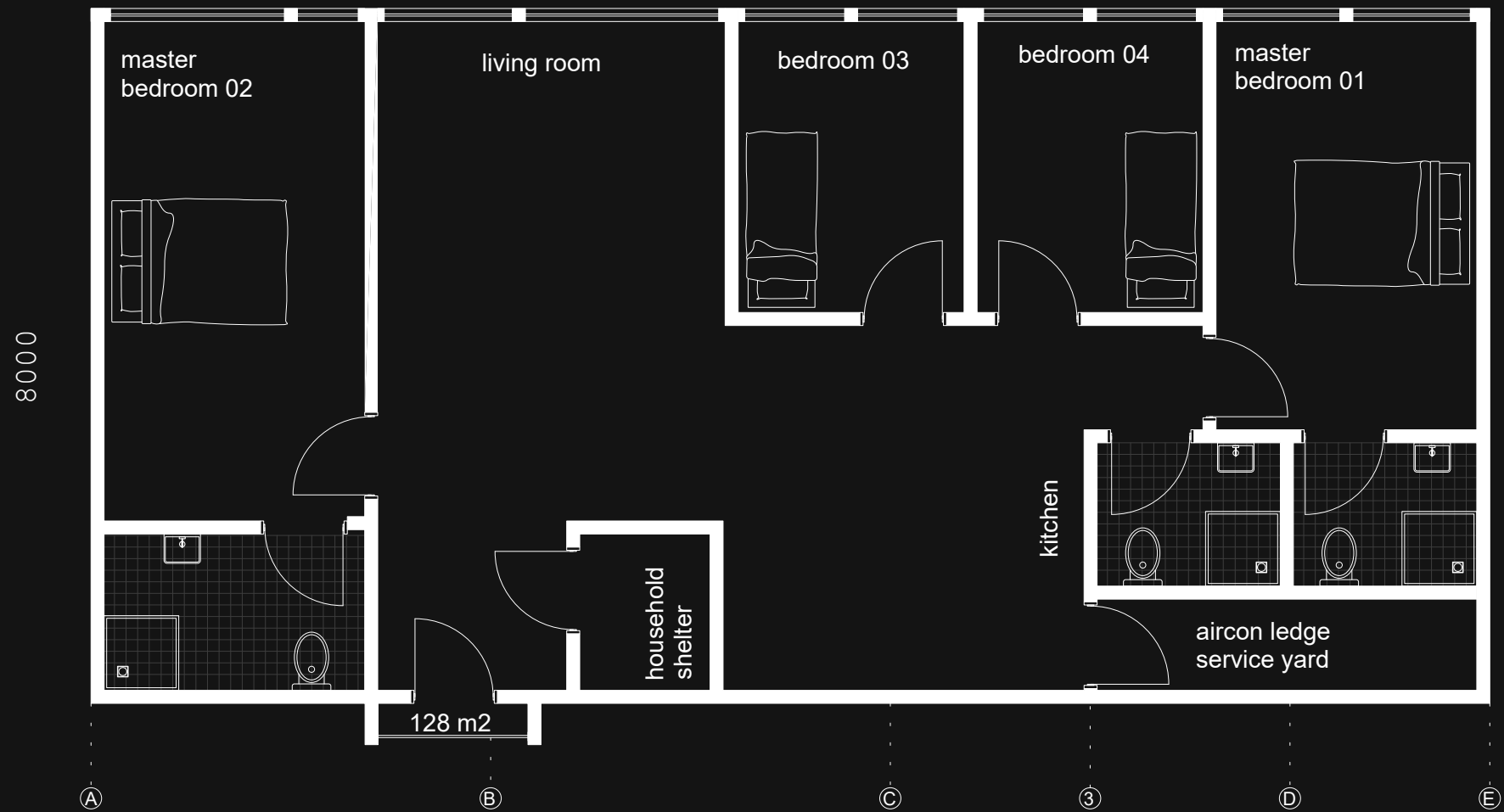






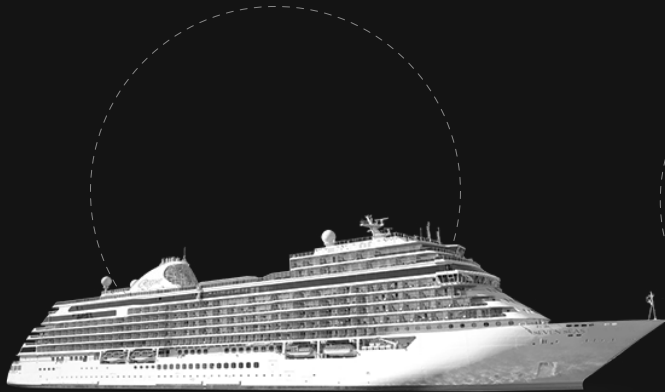






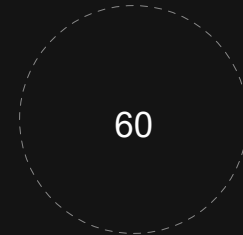
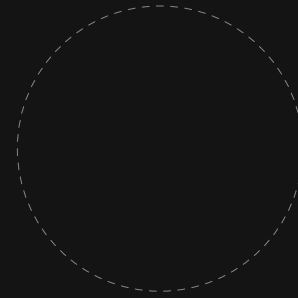
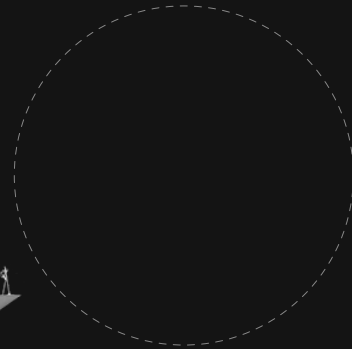
maximum of 7 floors high

dwellings - approximately 76-280 units per block

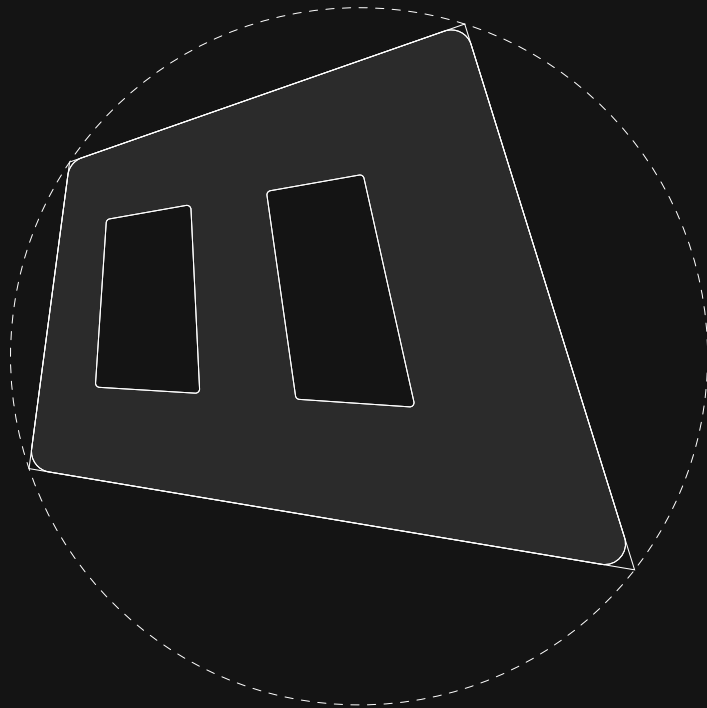


362 m x 47 meter

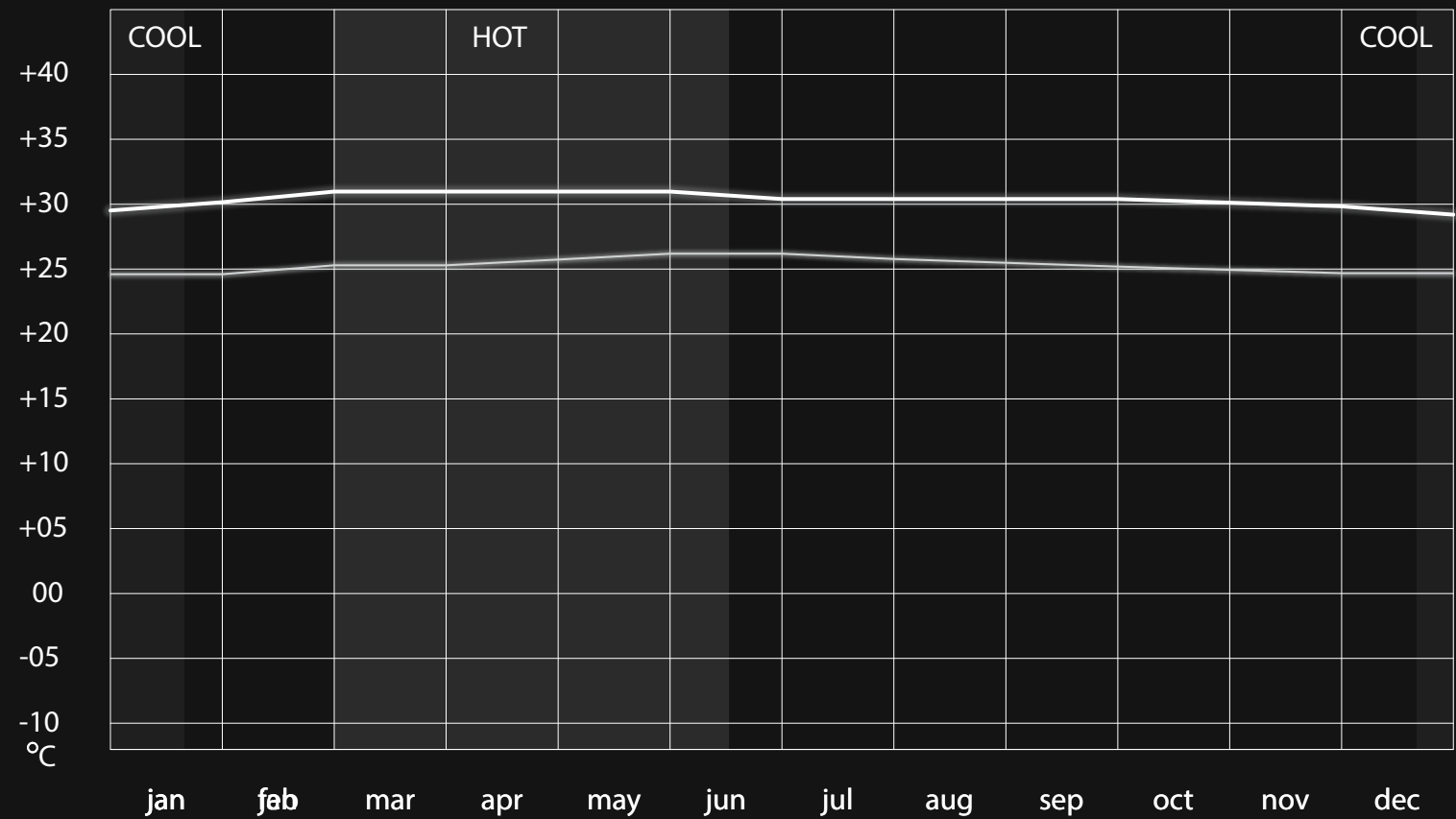
biggest cruiseschip



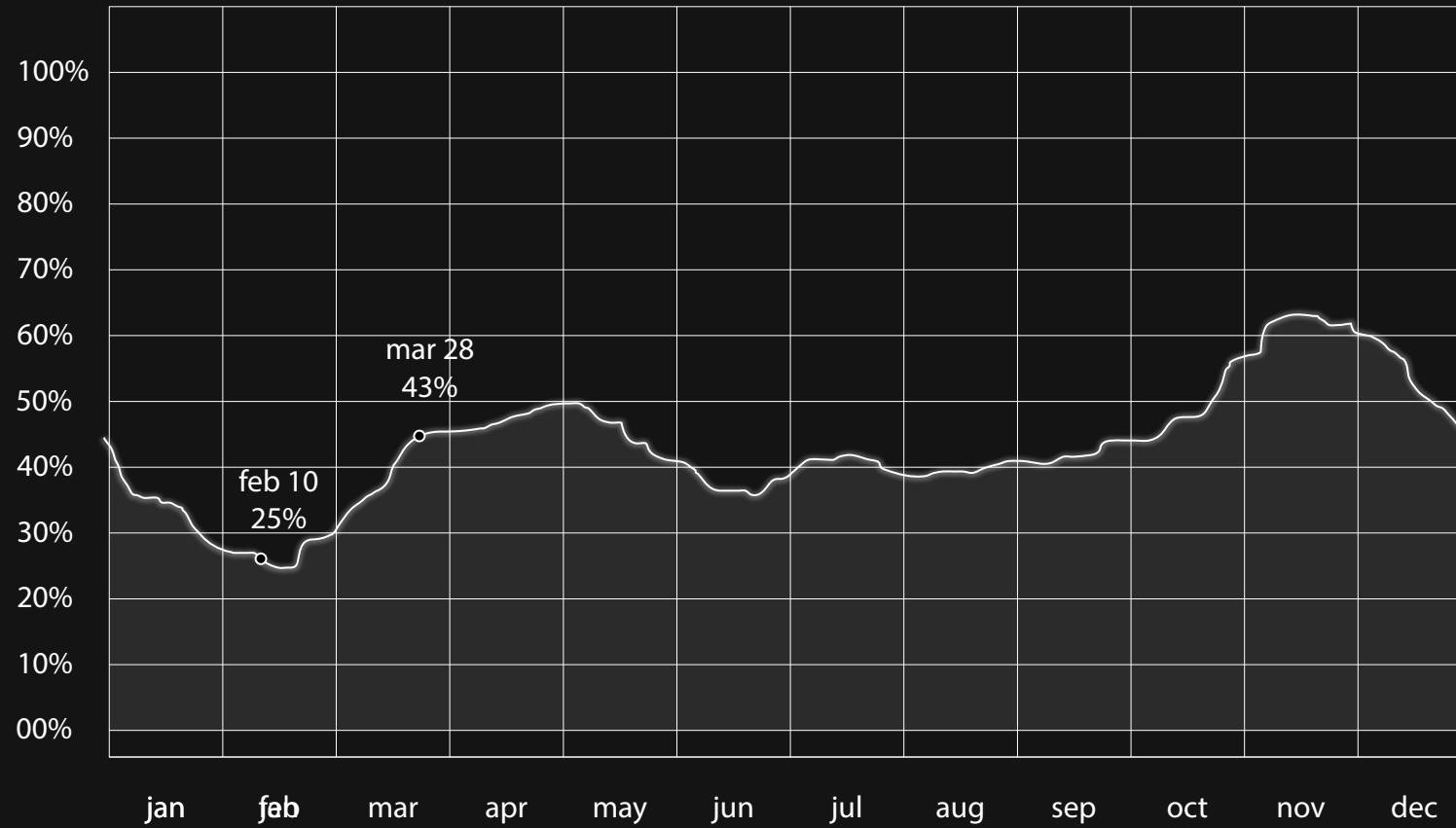
60



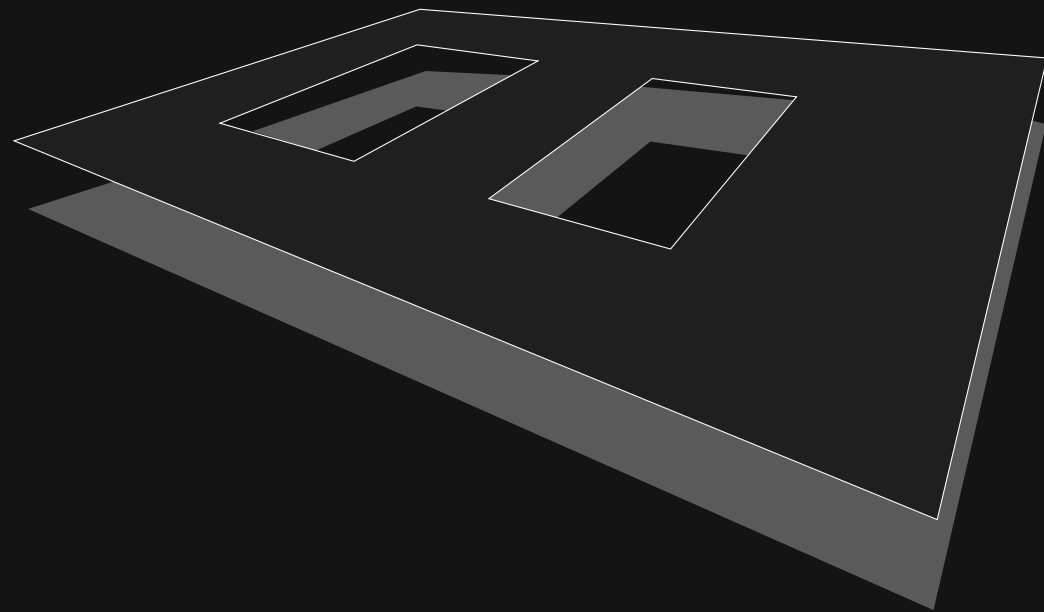
average high and low temperature



daily chance of precipitation

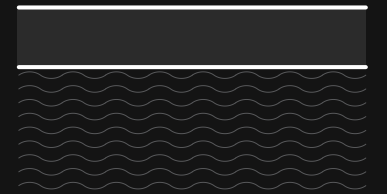
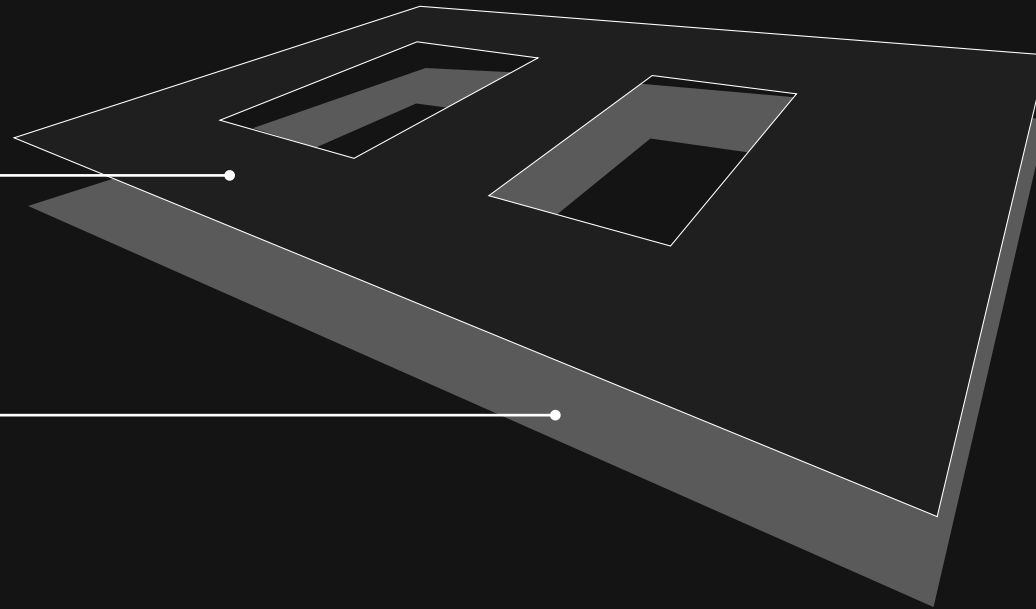


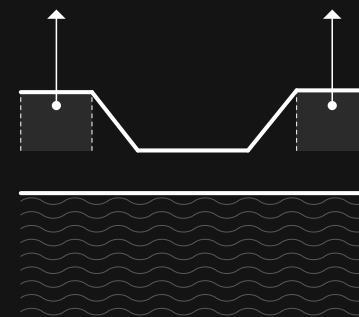
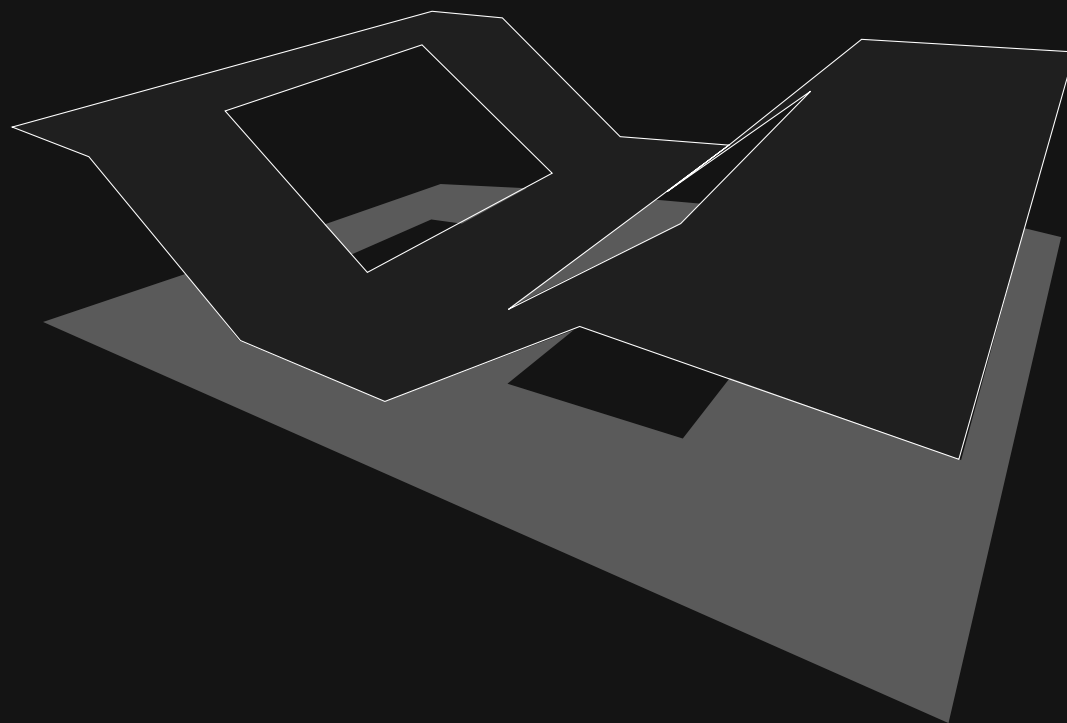


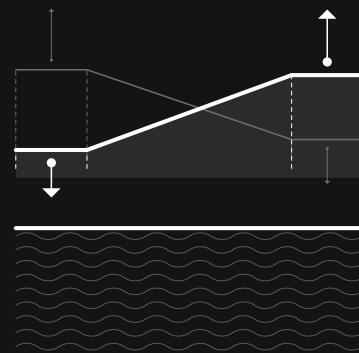
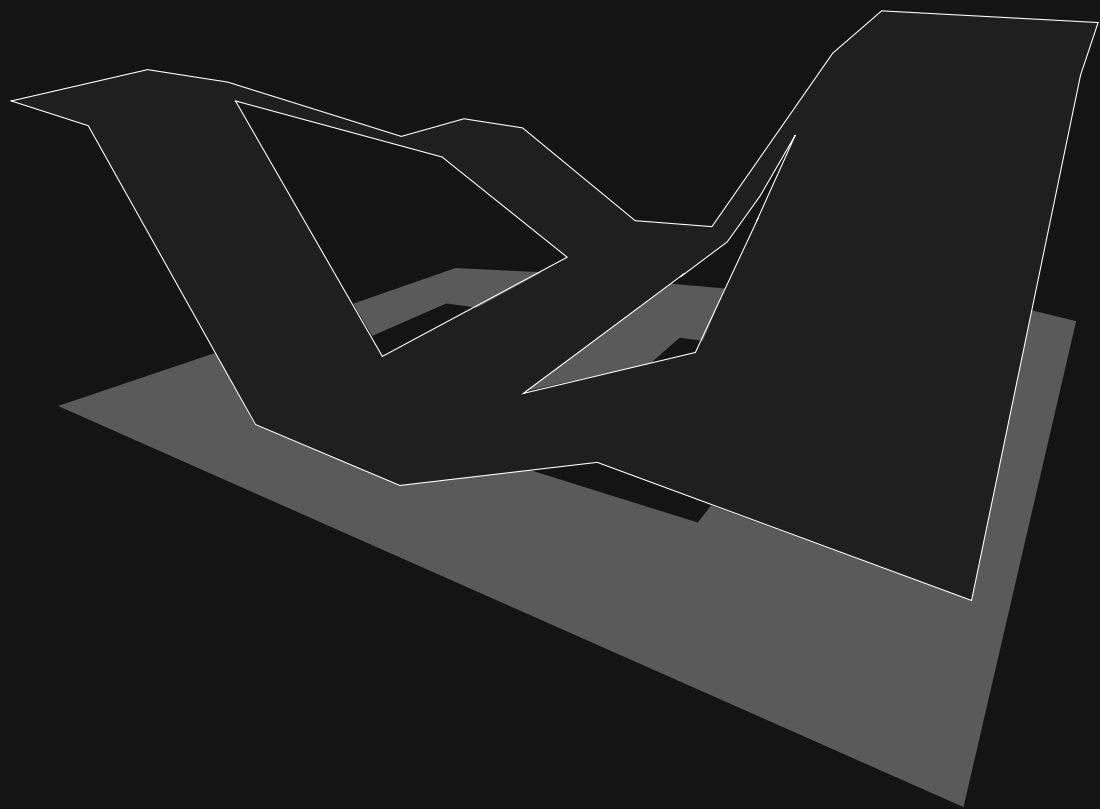


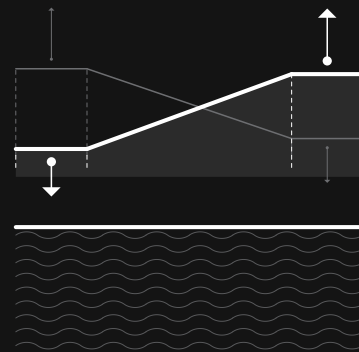
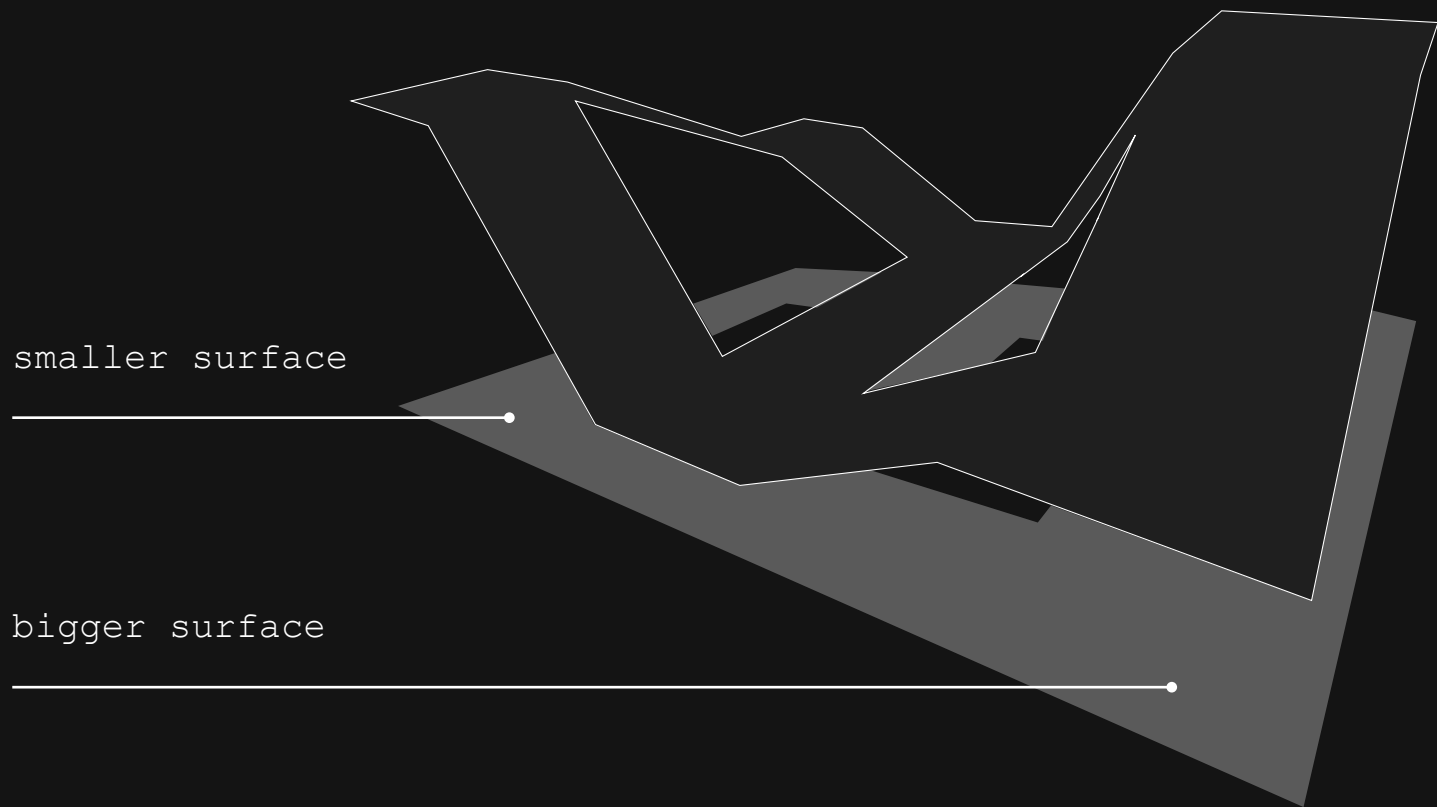
upper level
public layer

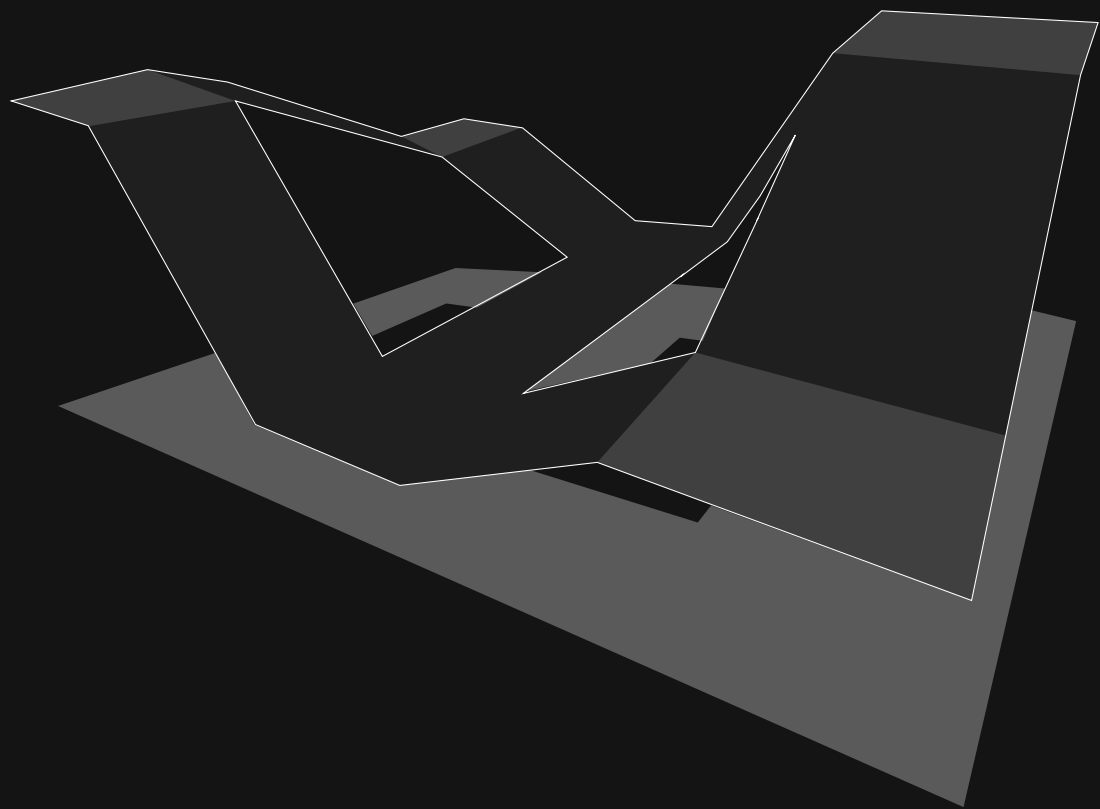
water level
public layer

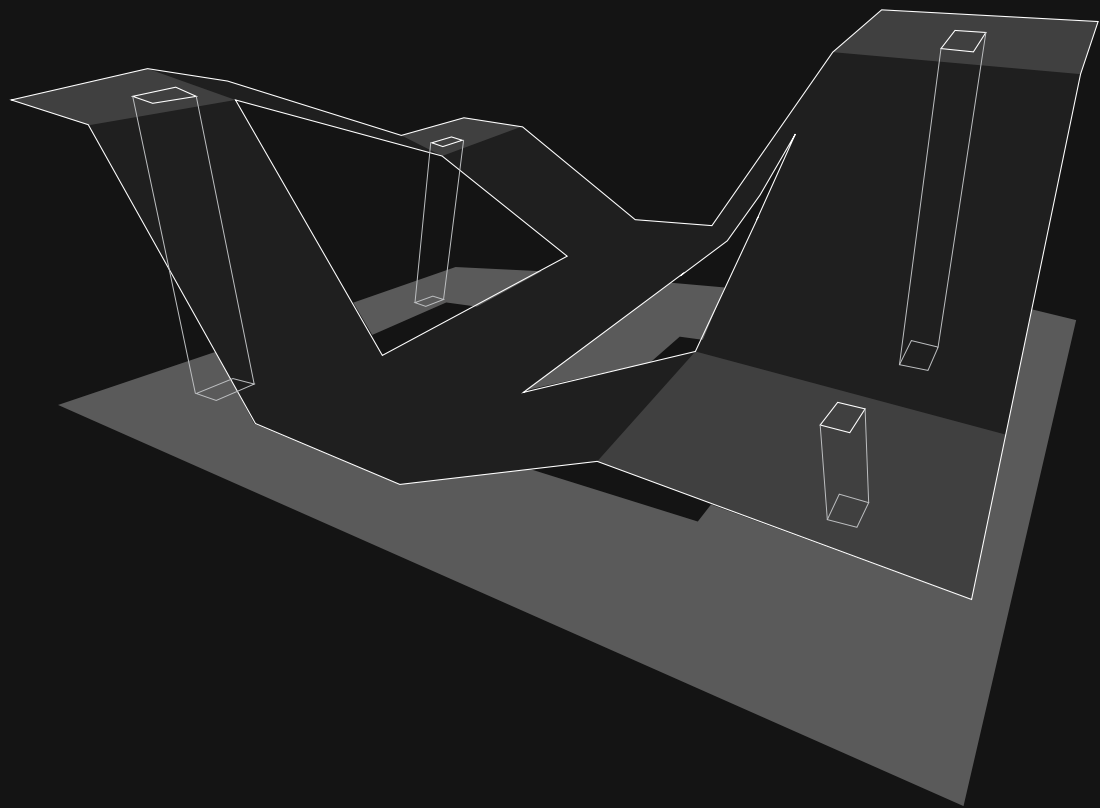




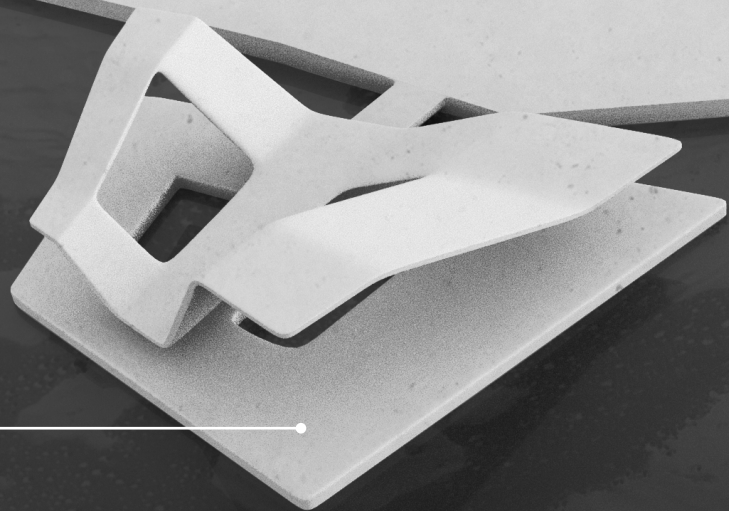


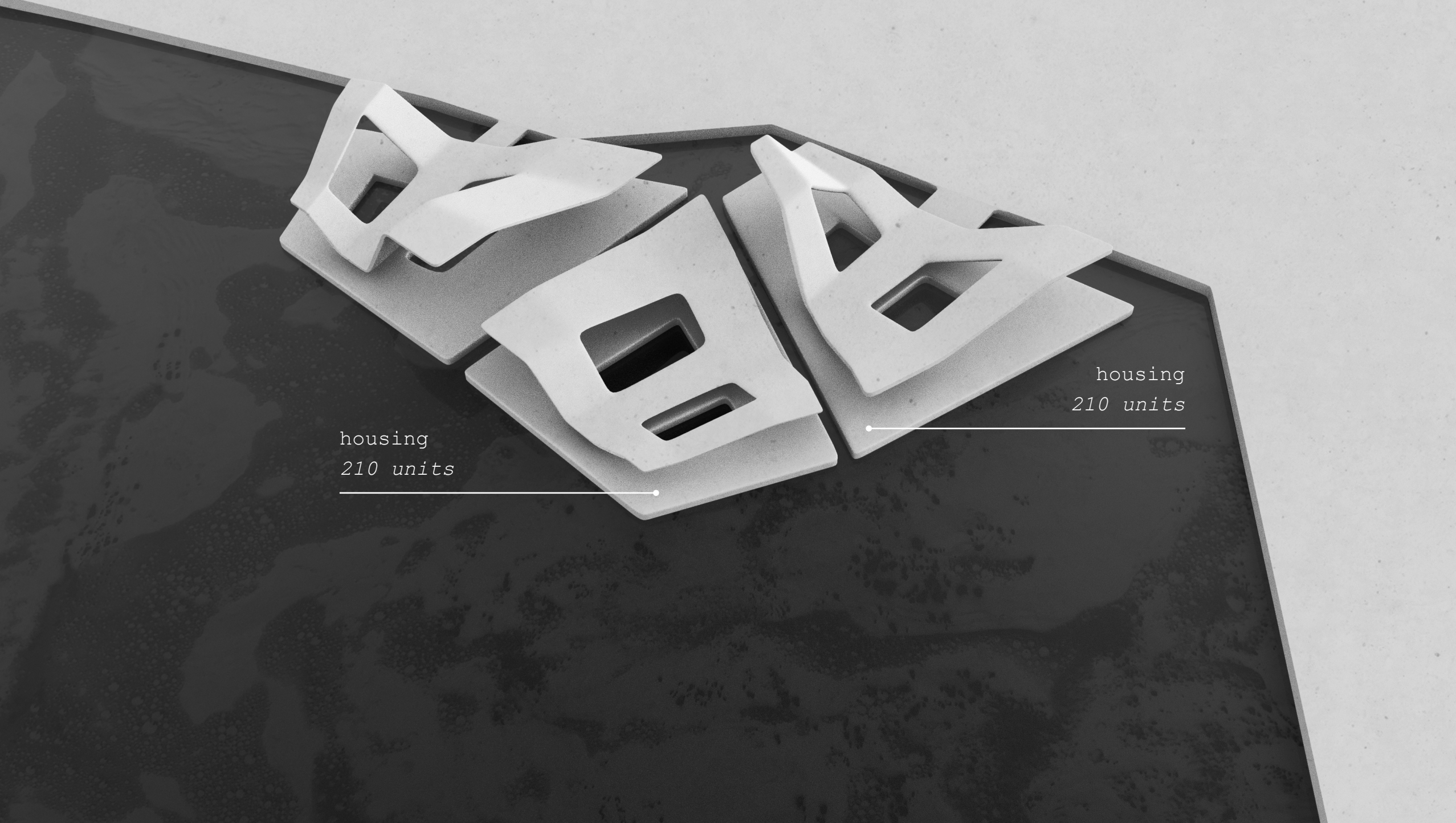






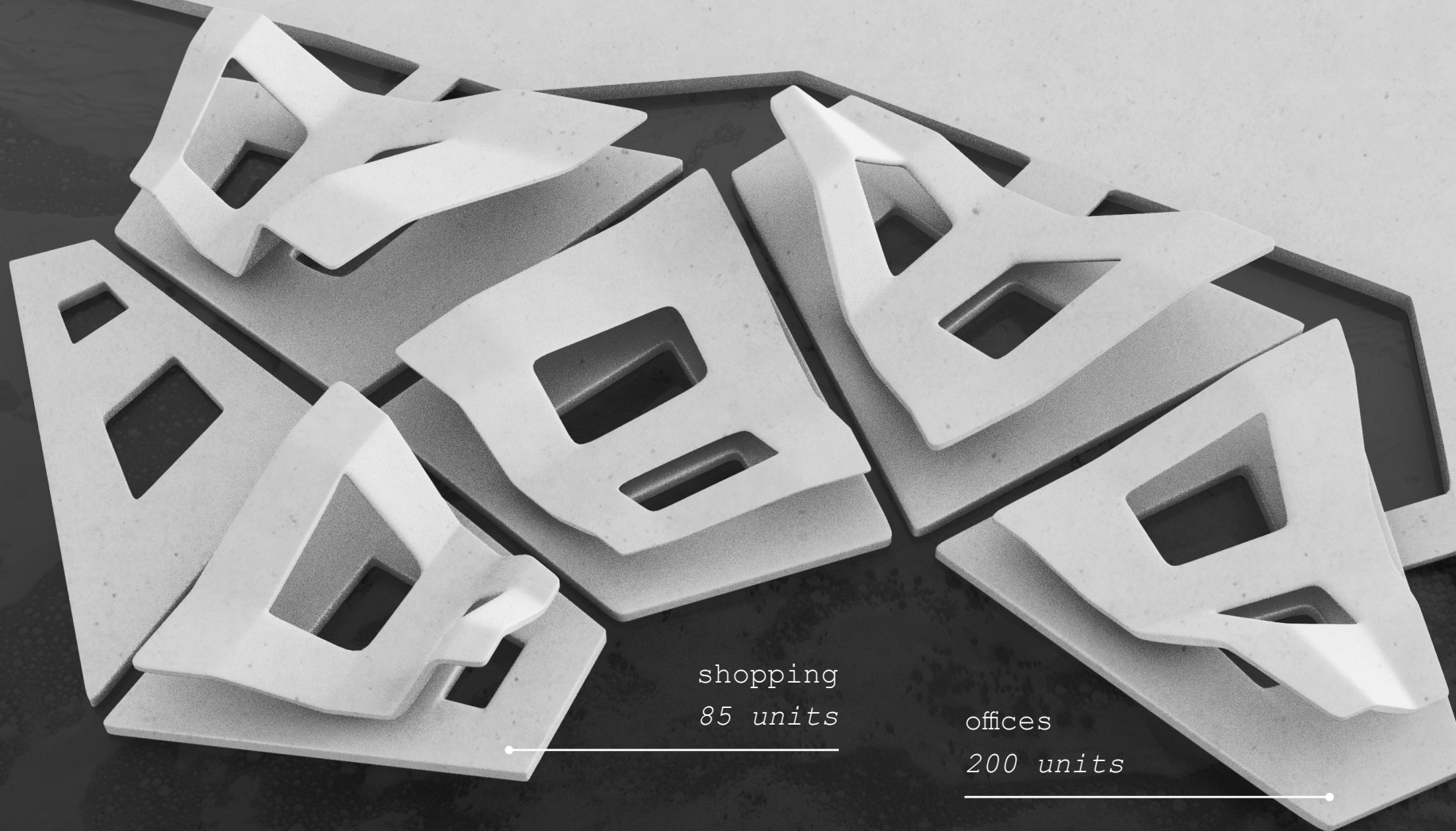
housing
160 units





housing
210 units

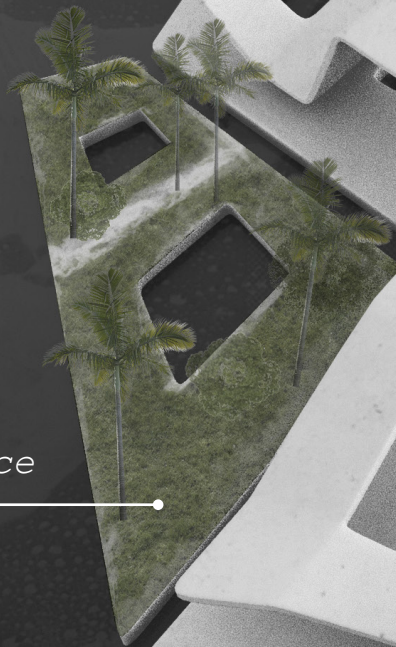
housing
210 units

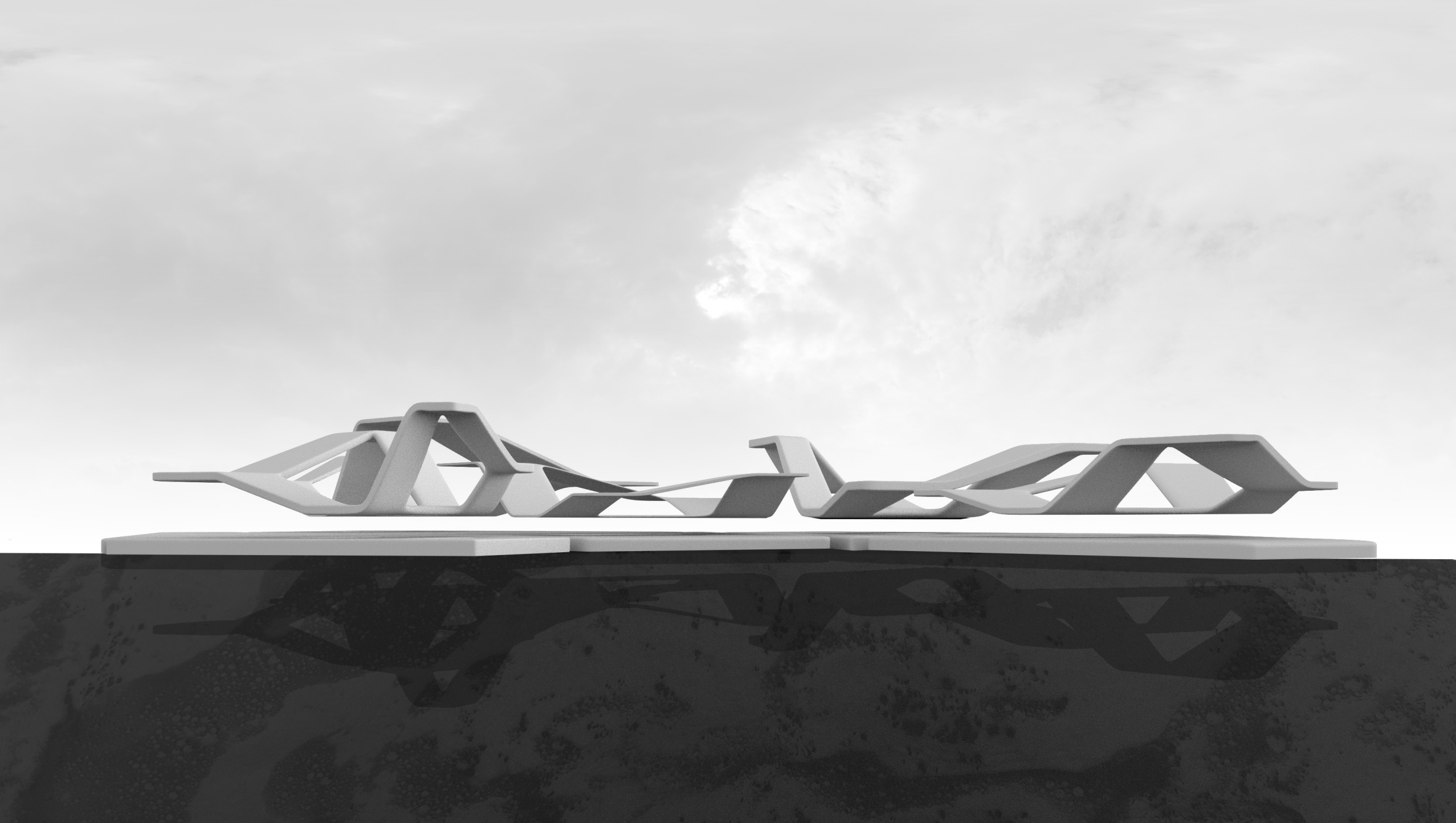


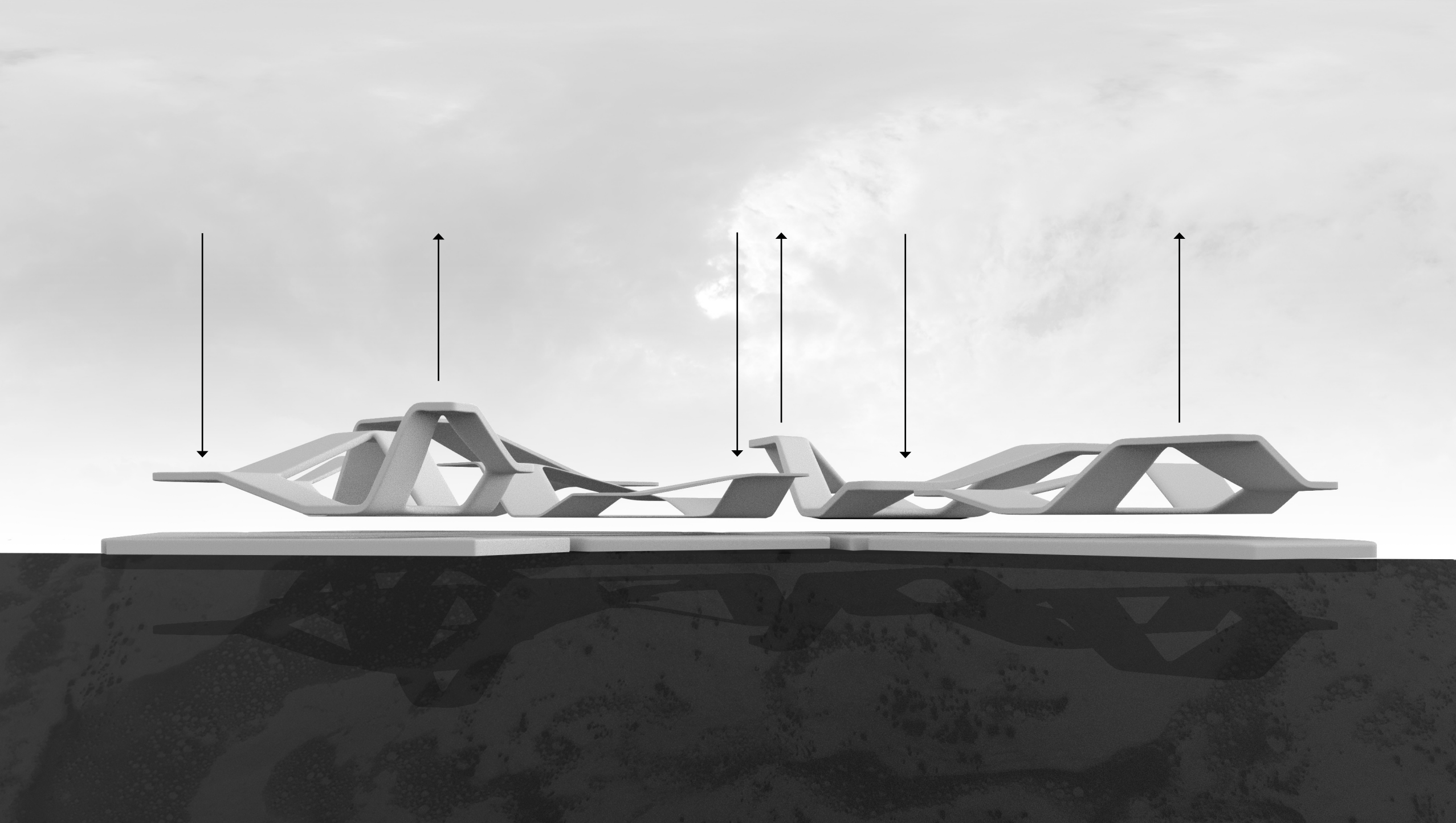
shopping
85 units

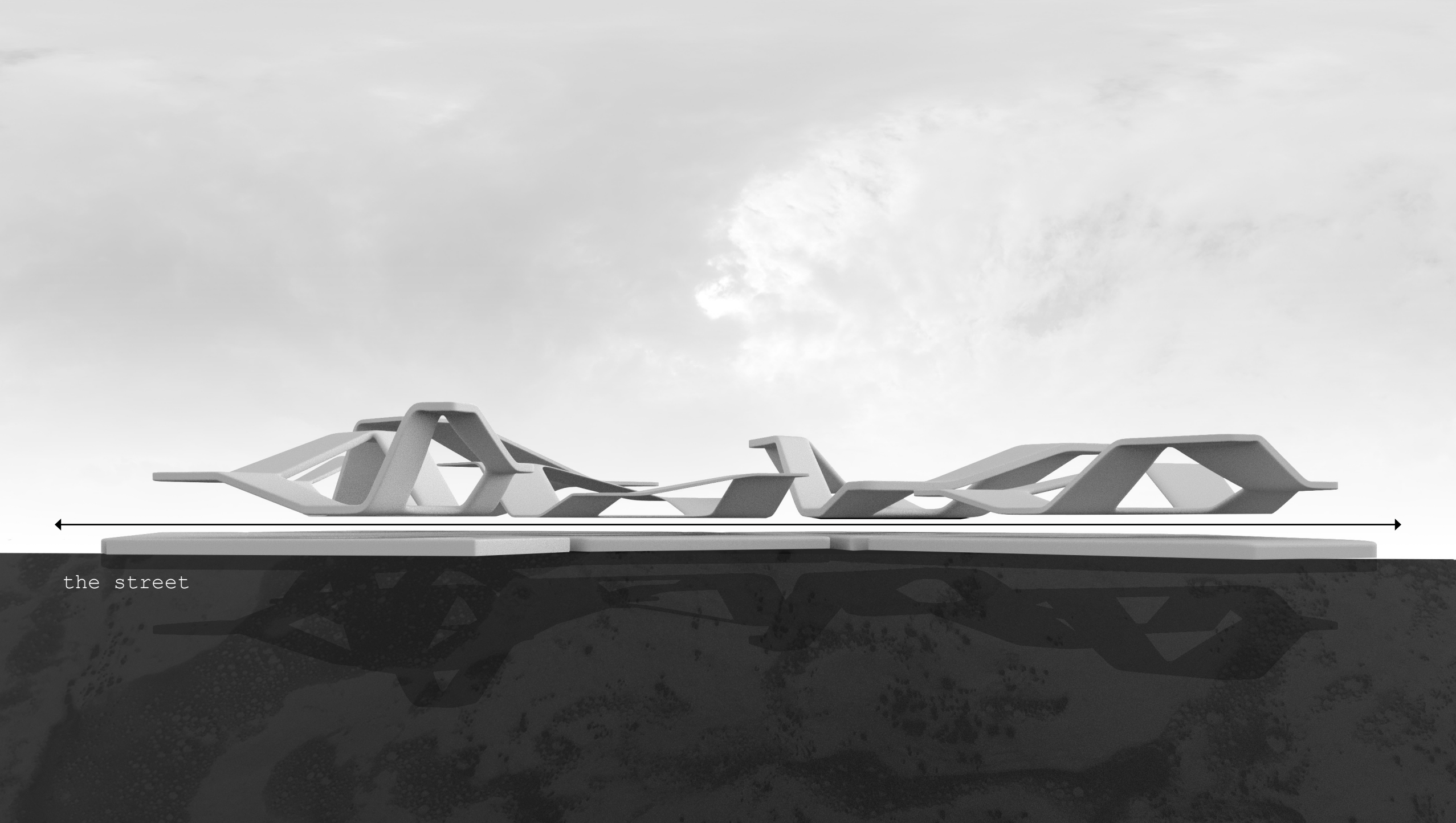
offices
200 units

empty
public space

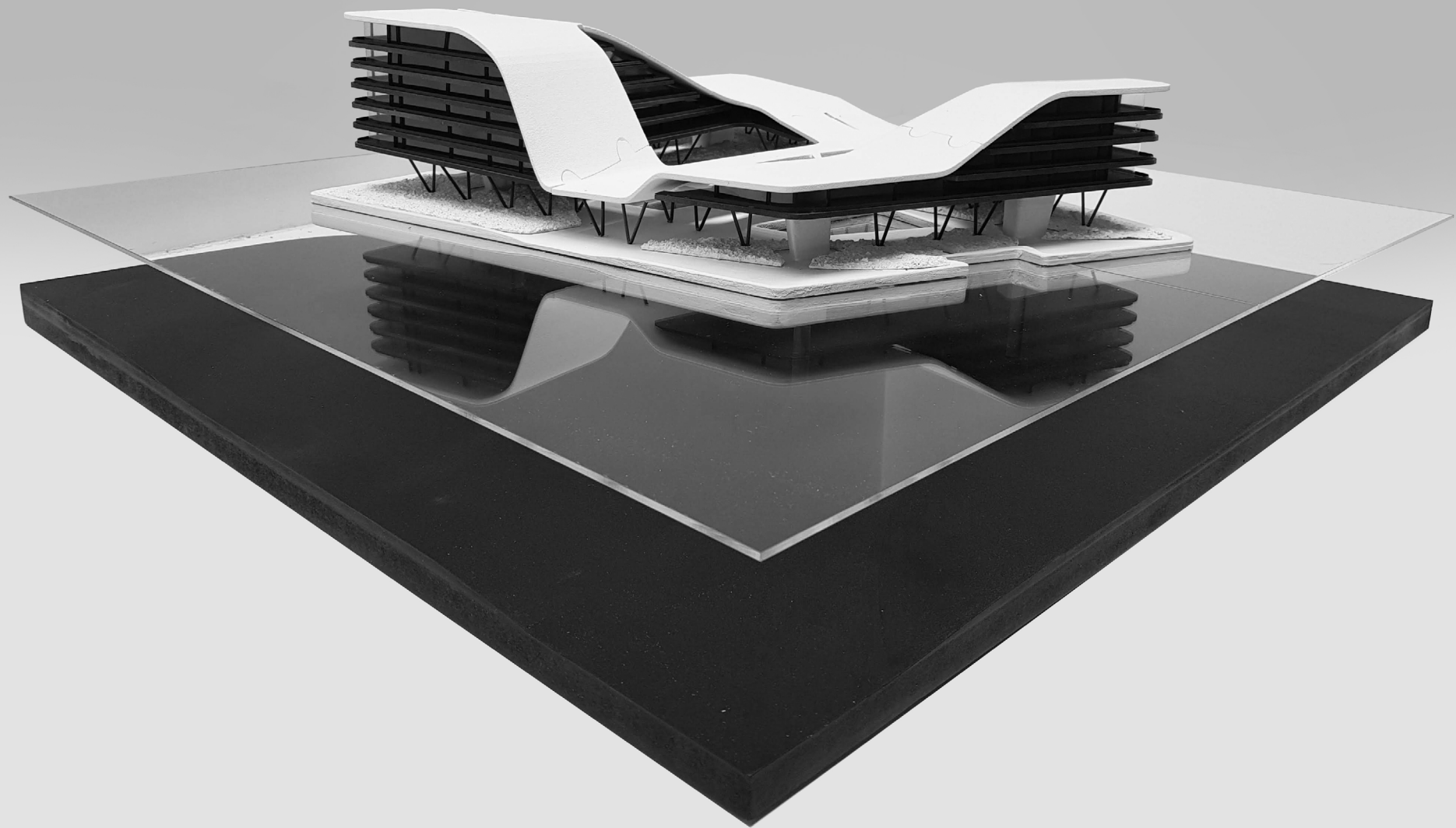


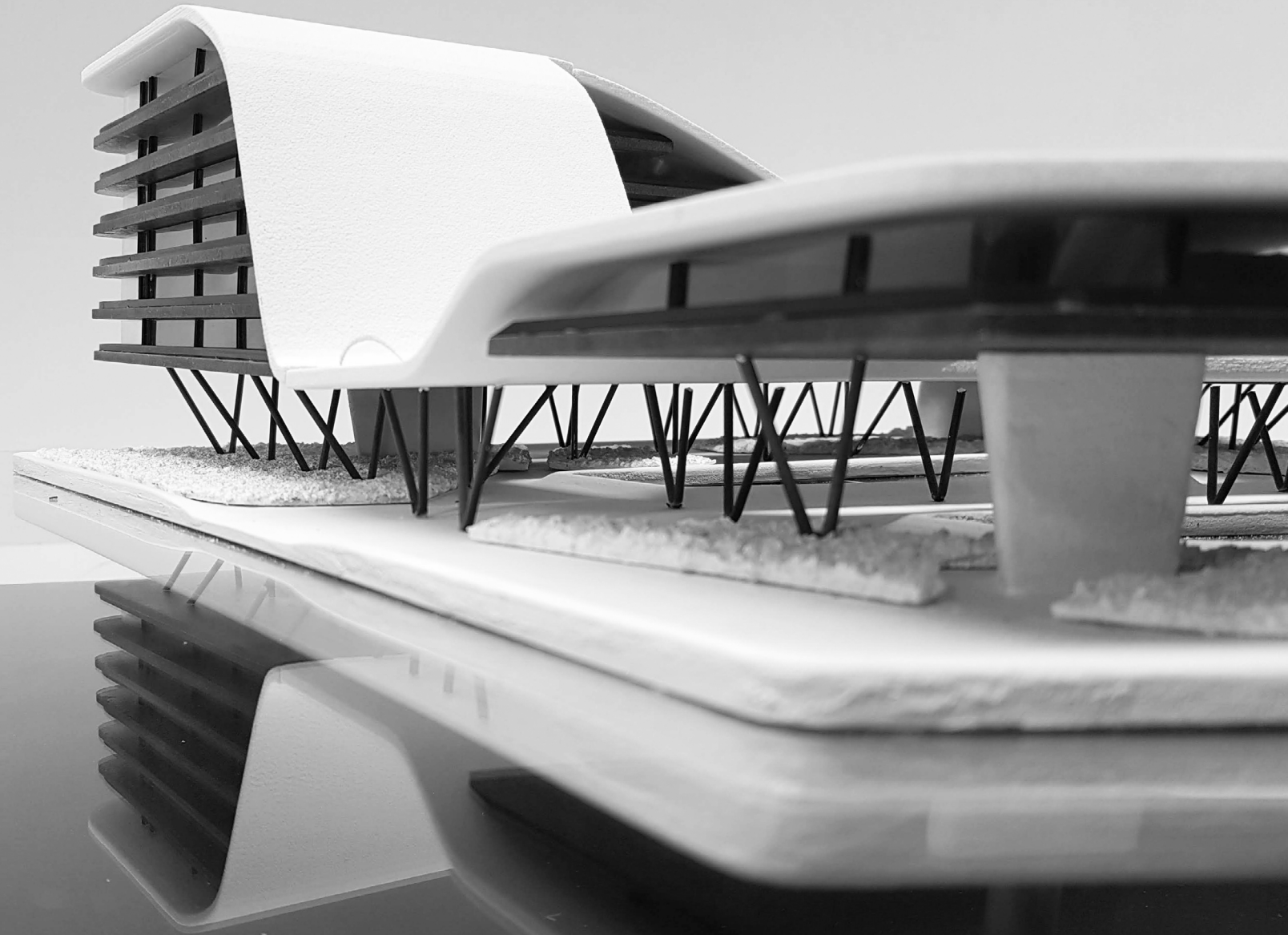


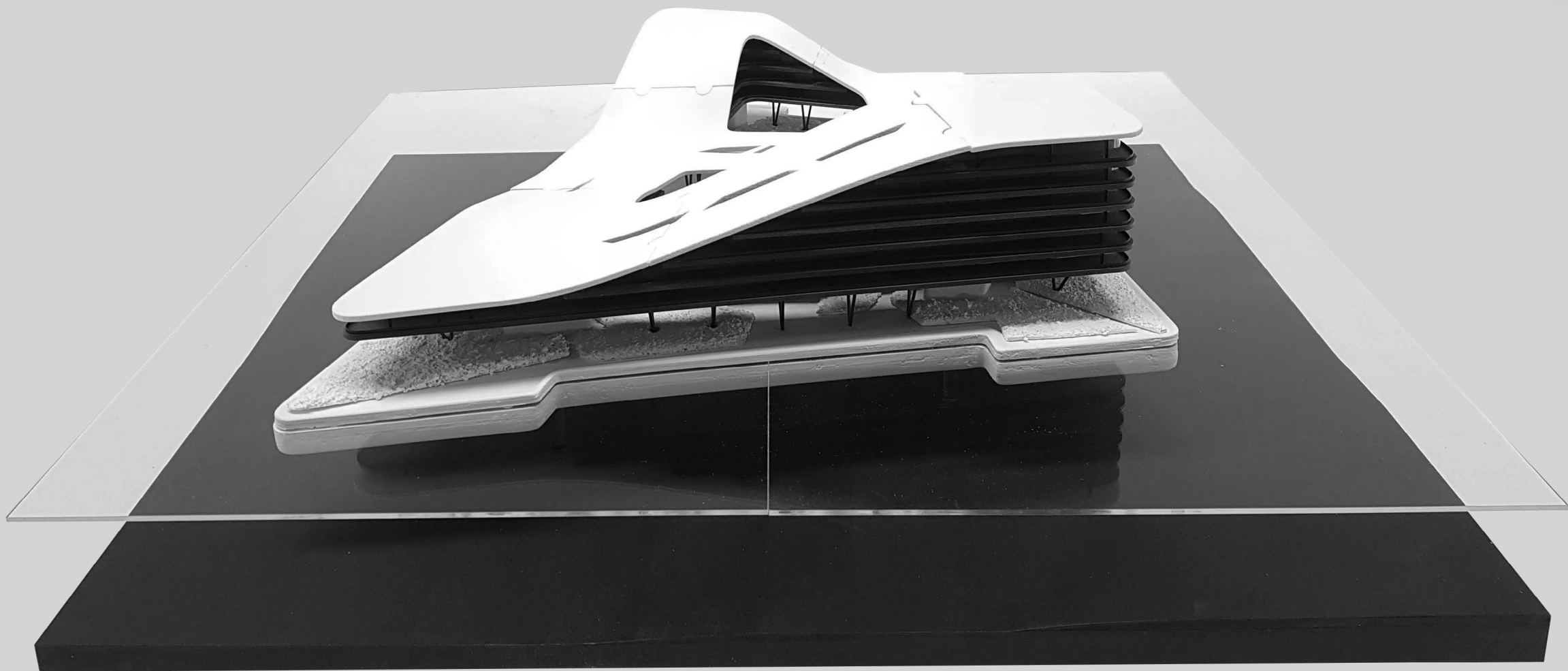




the street



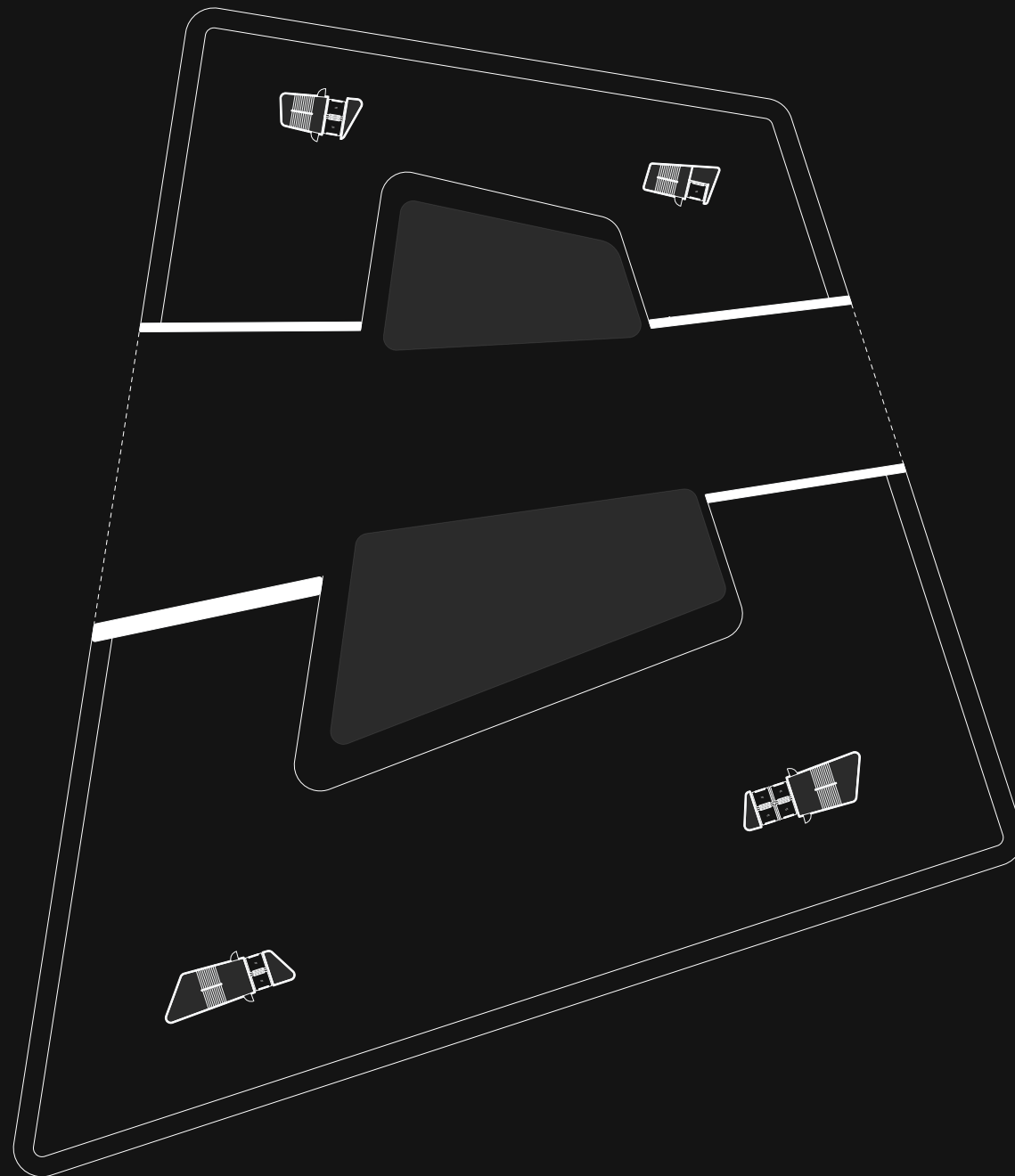


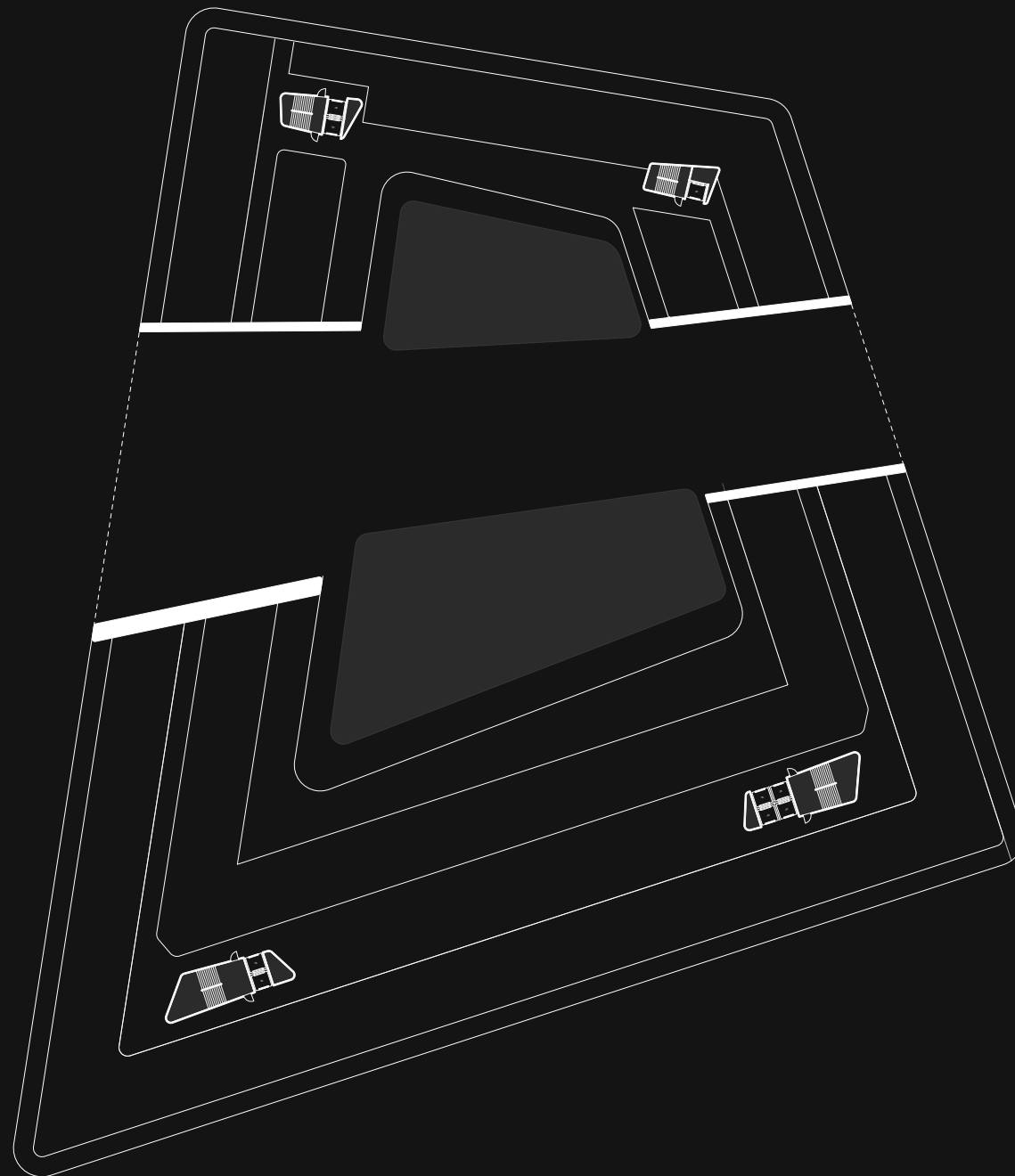


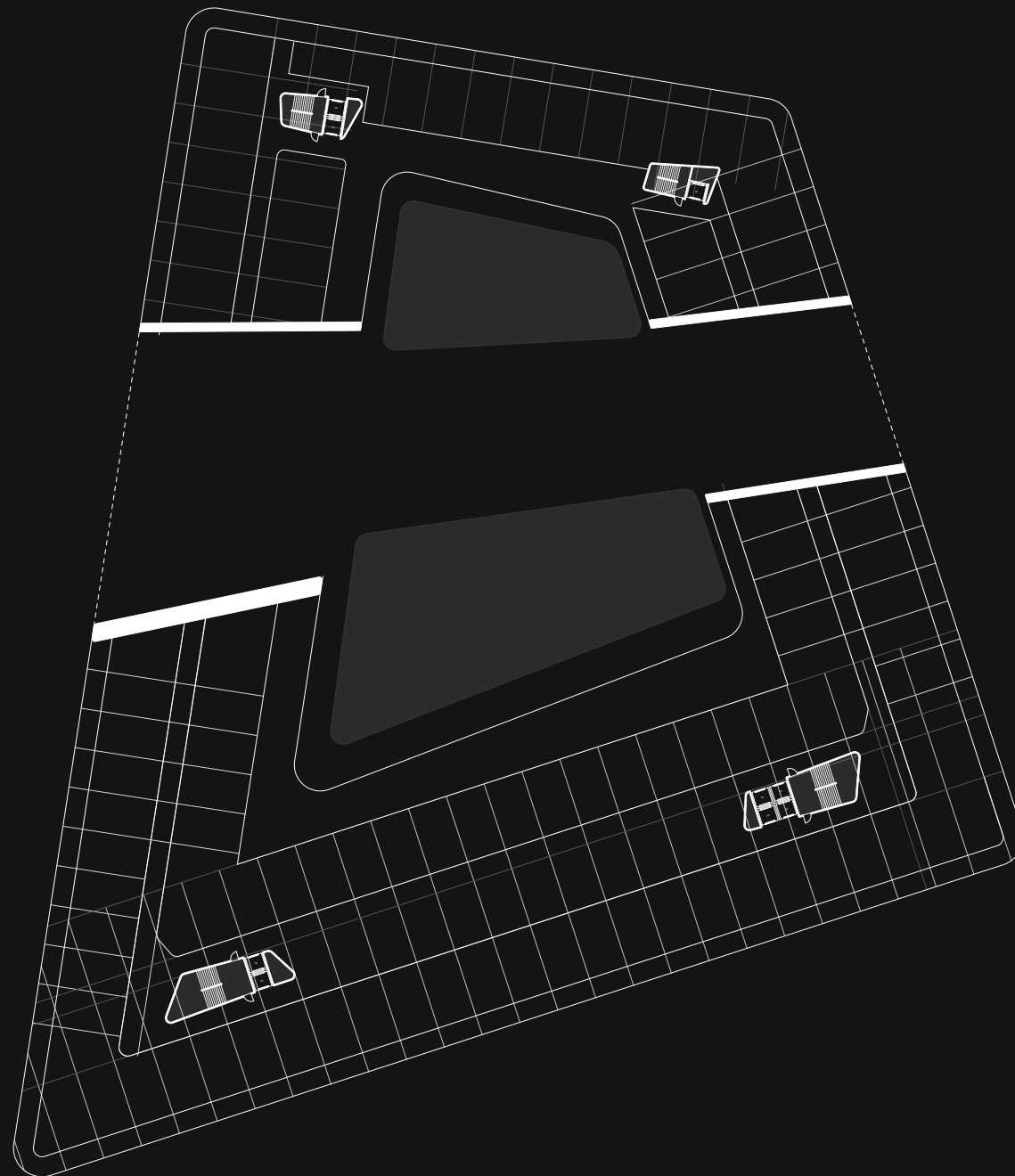






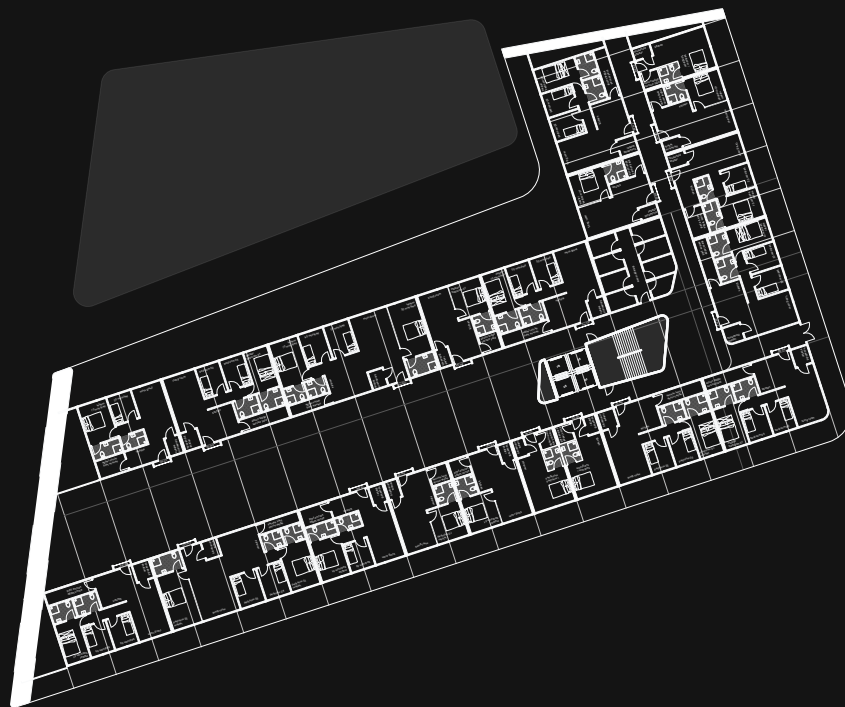
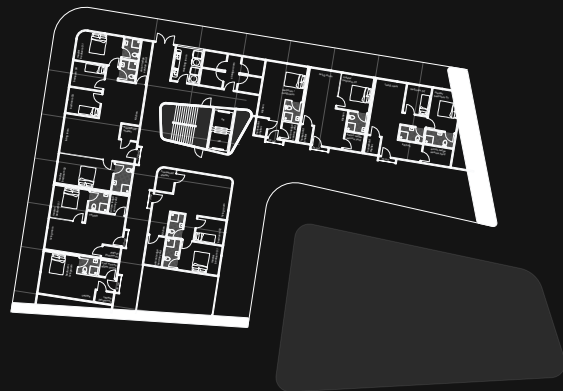


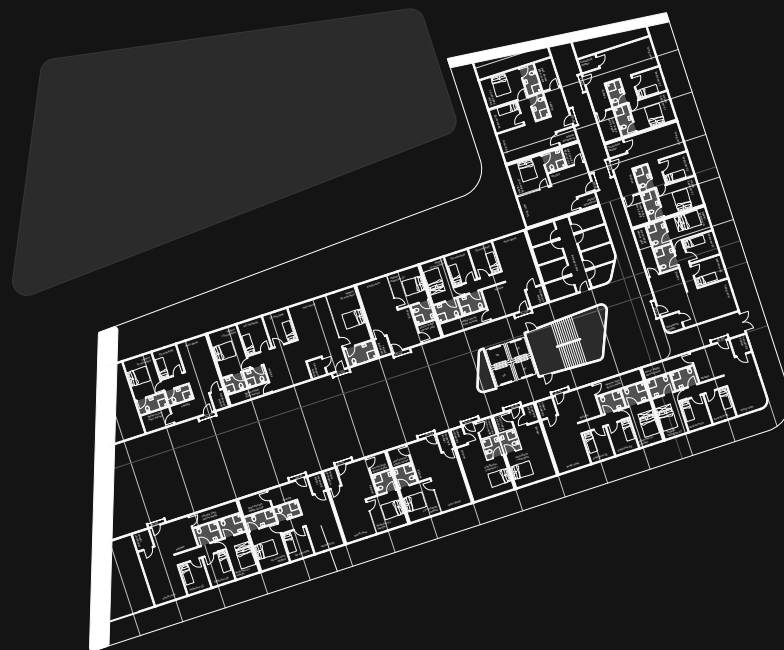
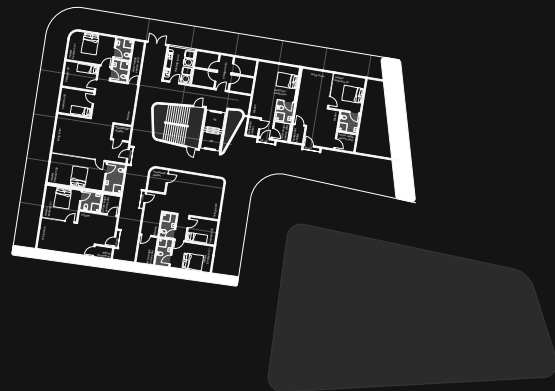


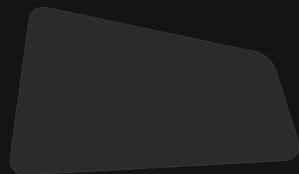


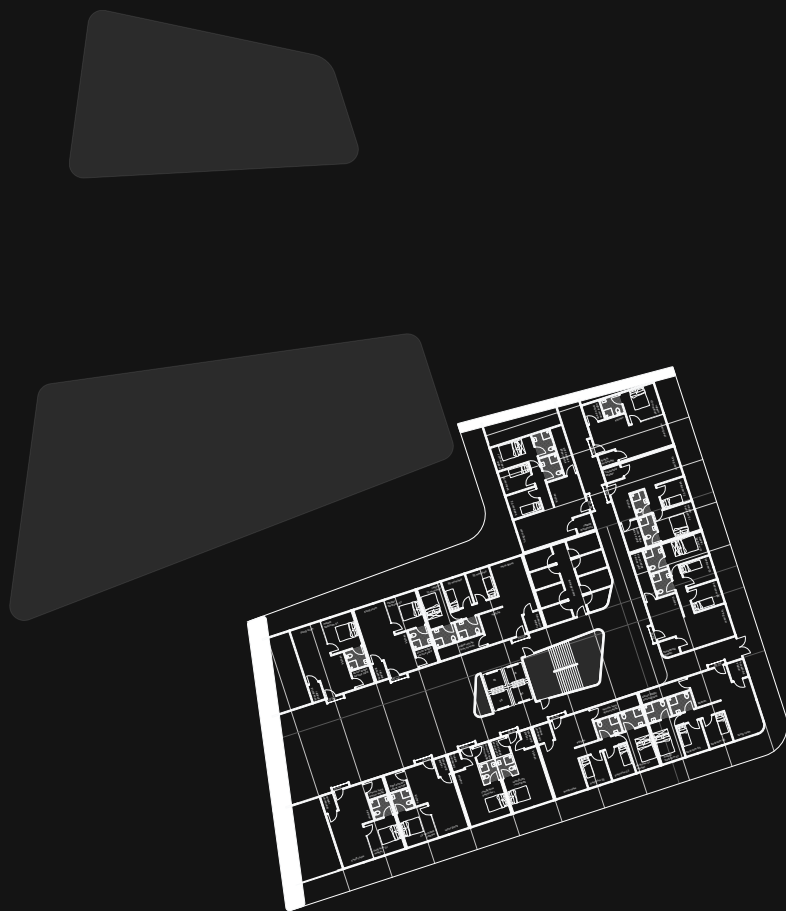


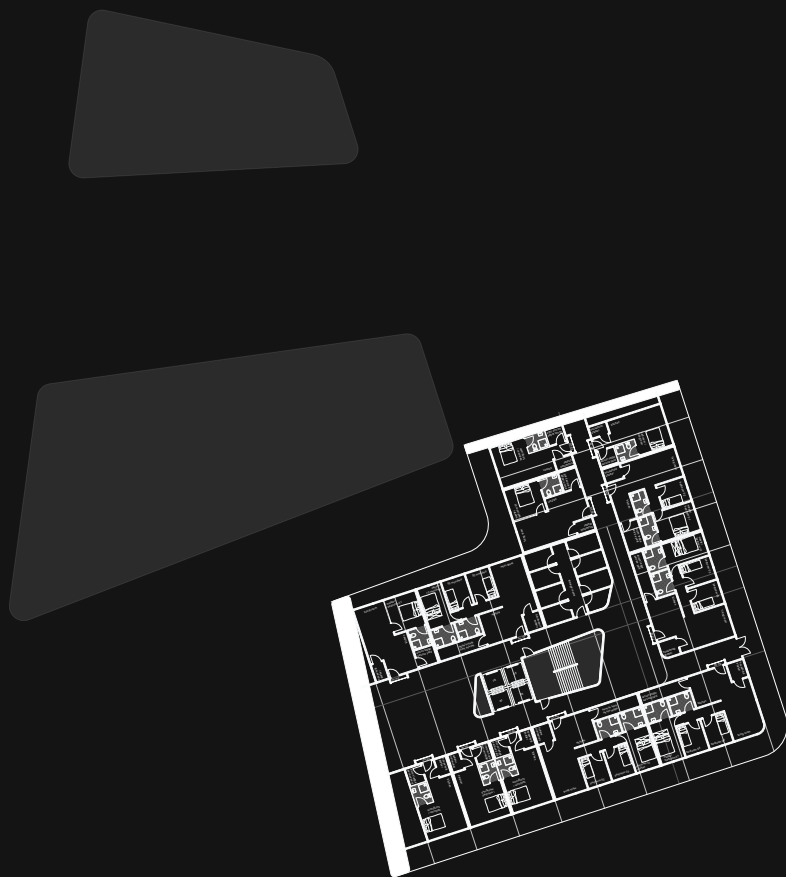






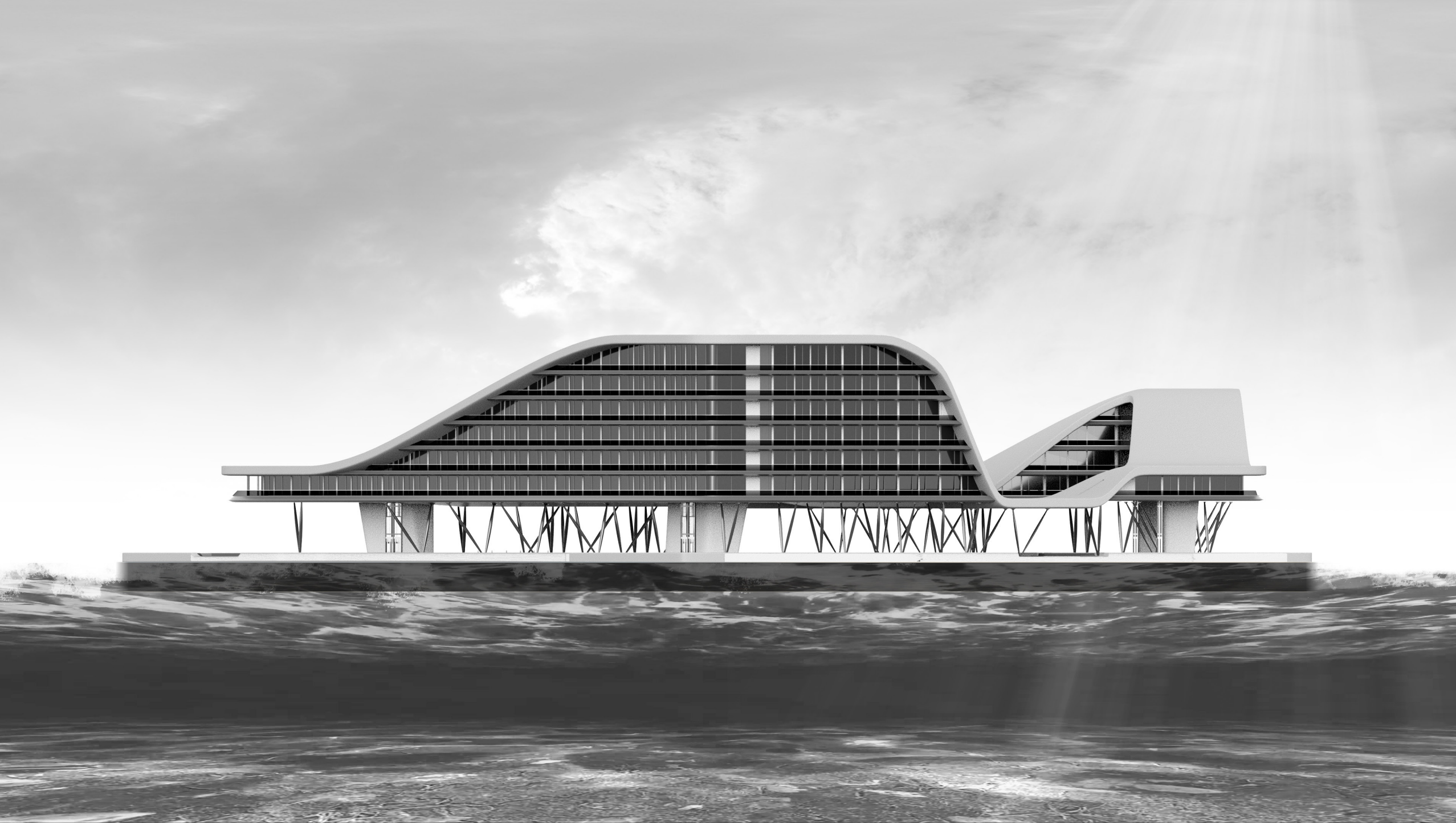


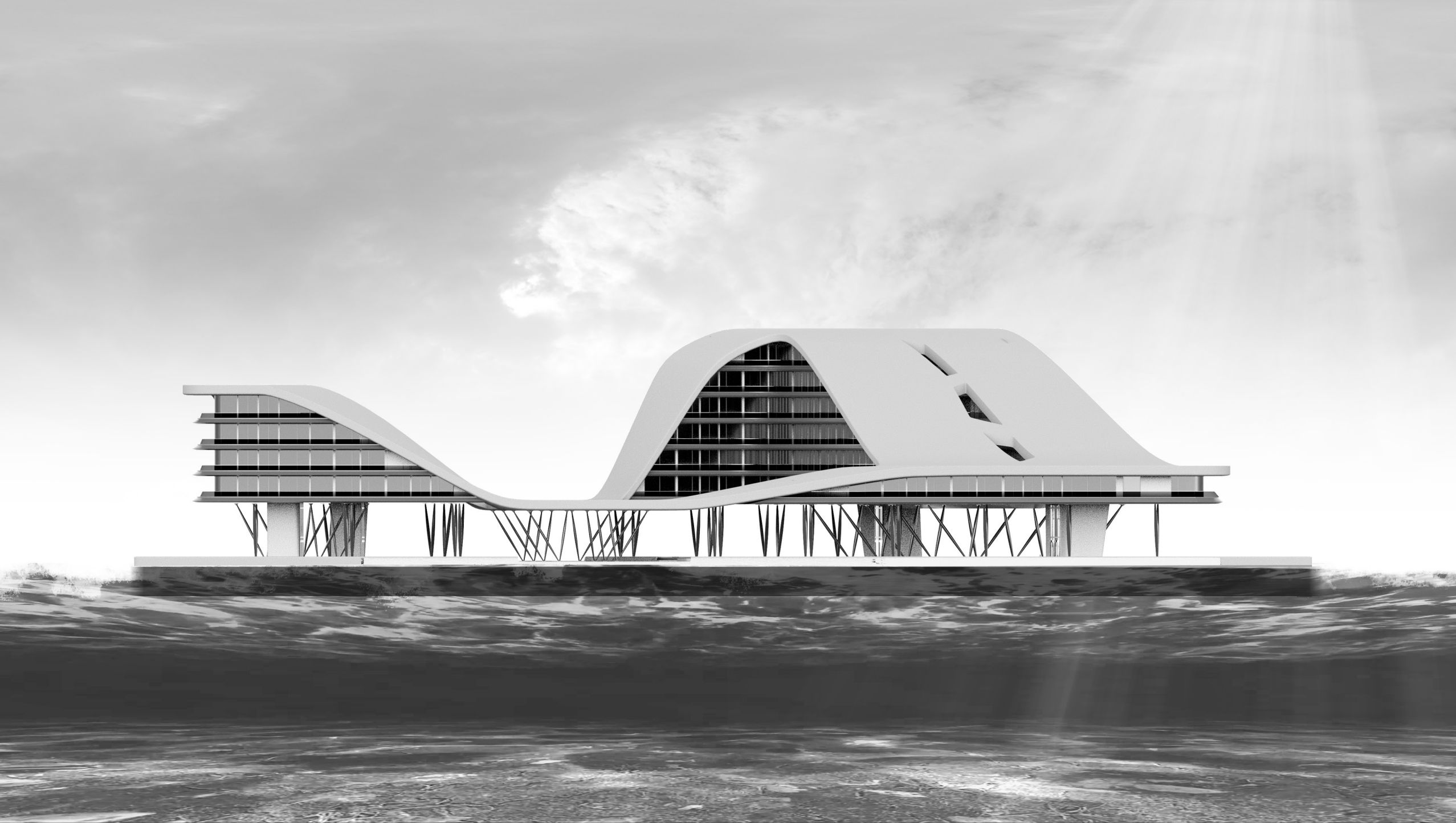


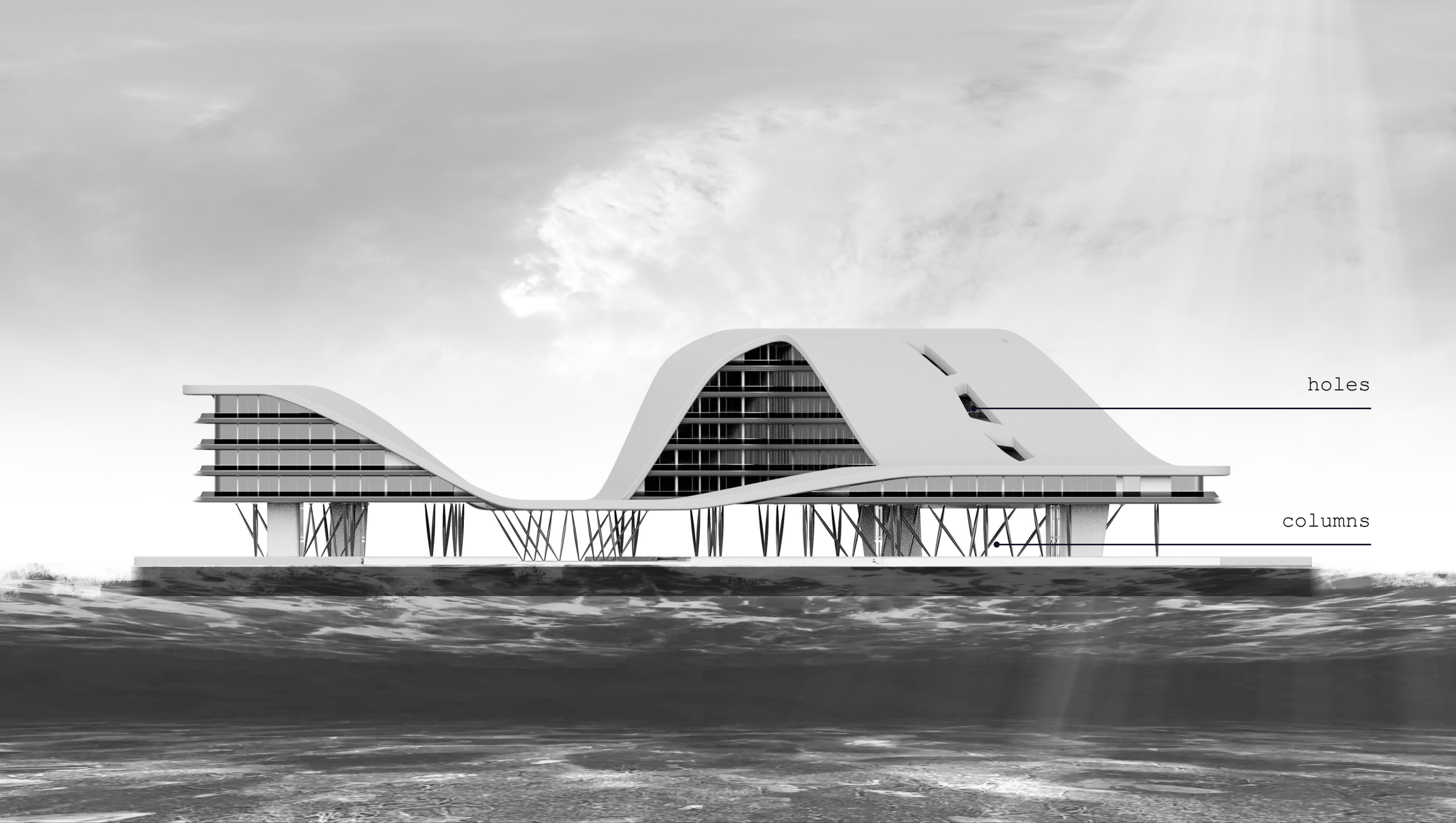






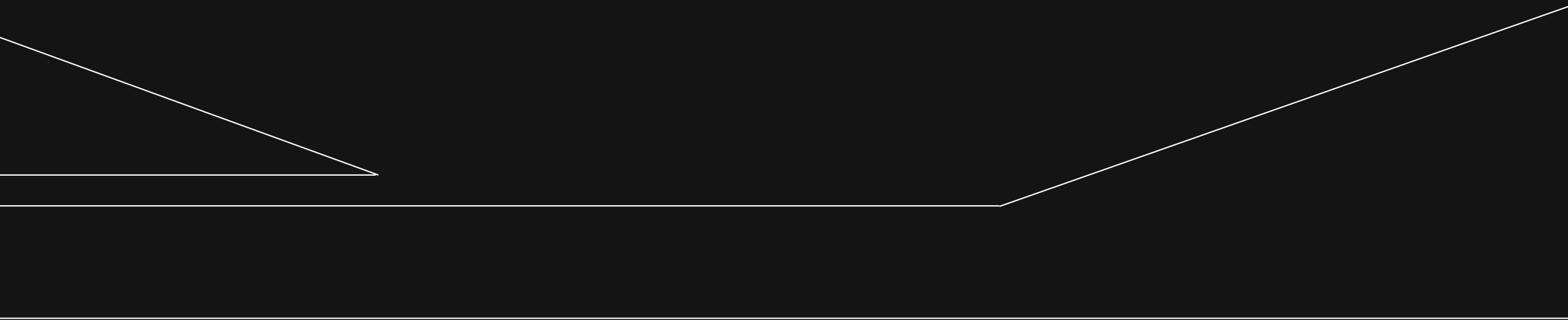


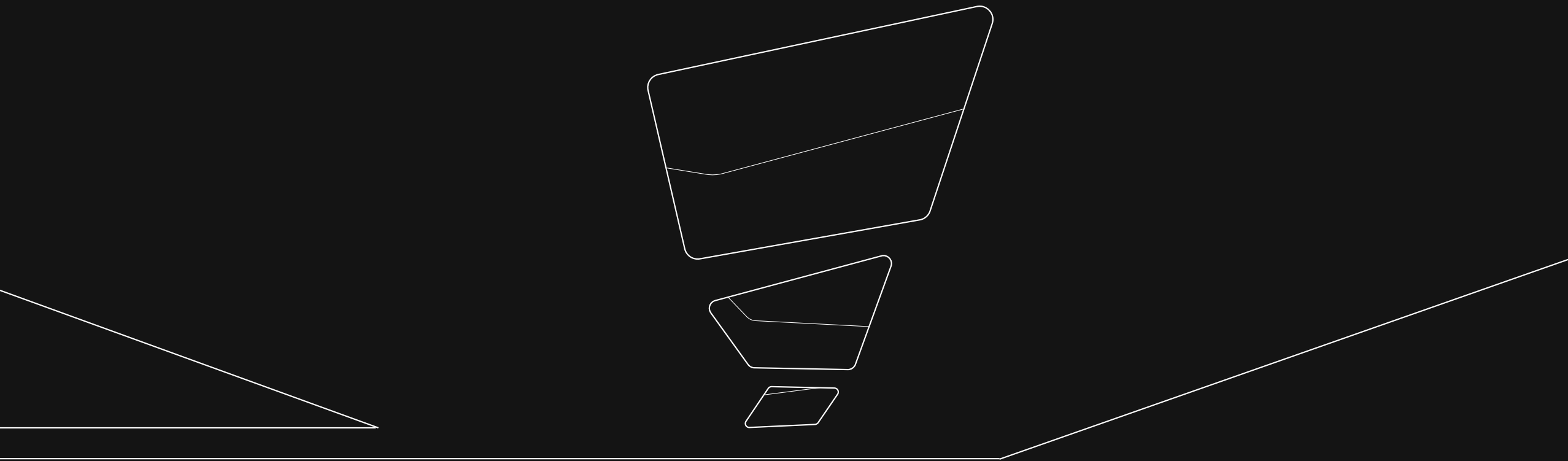


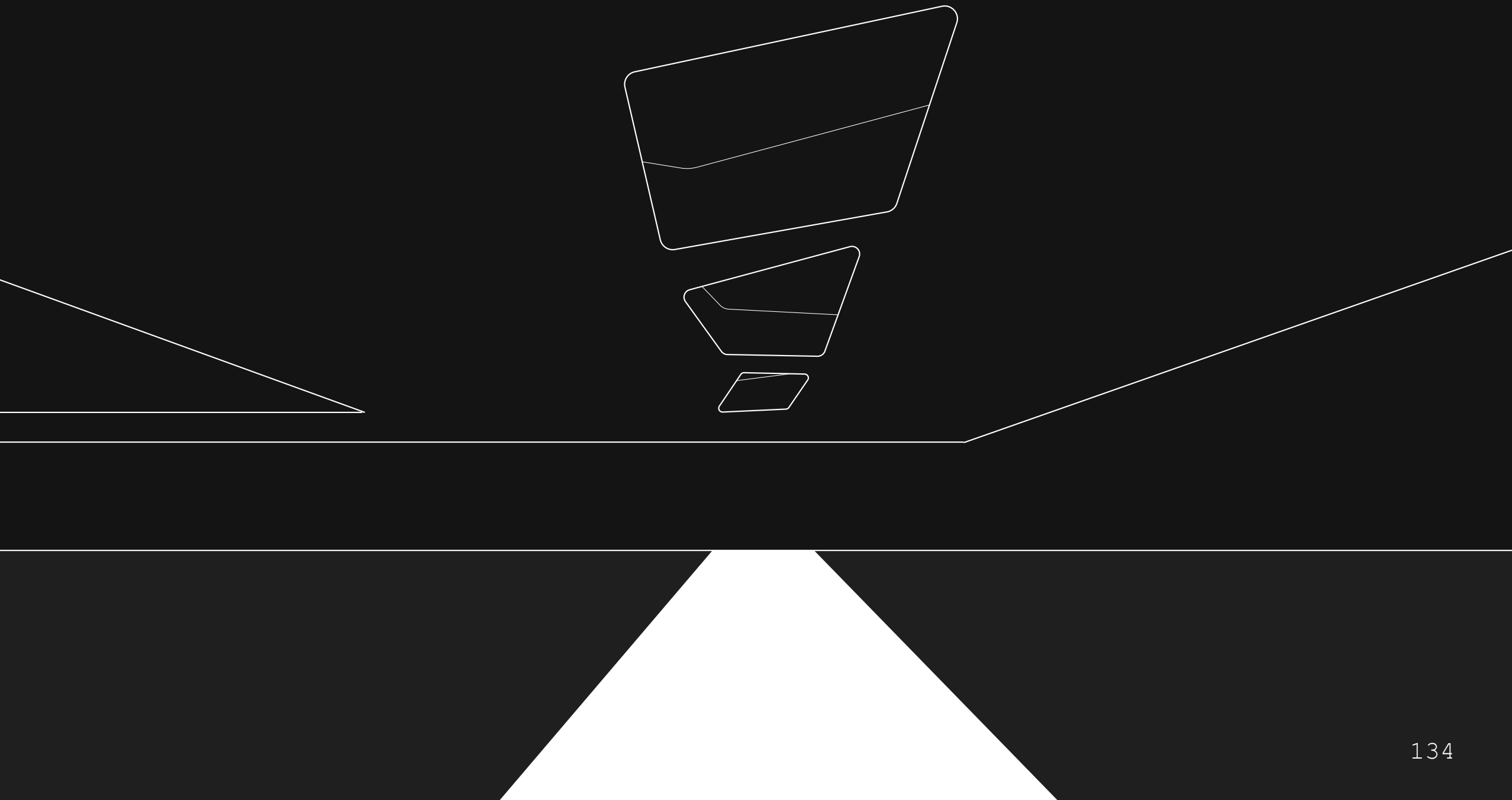


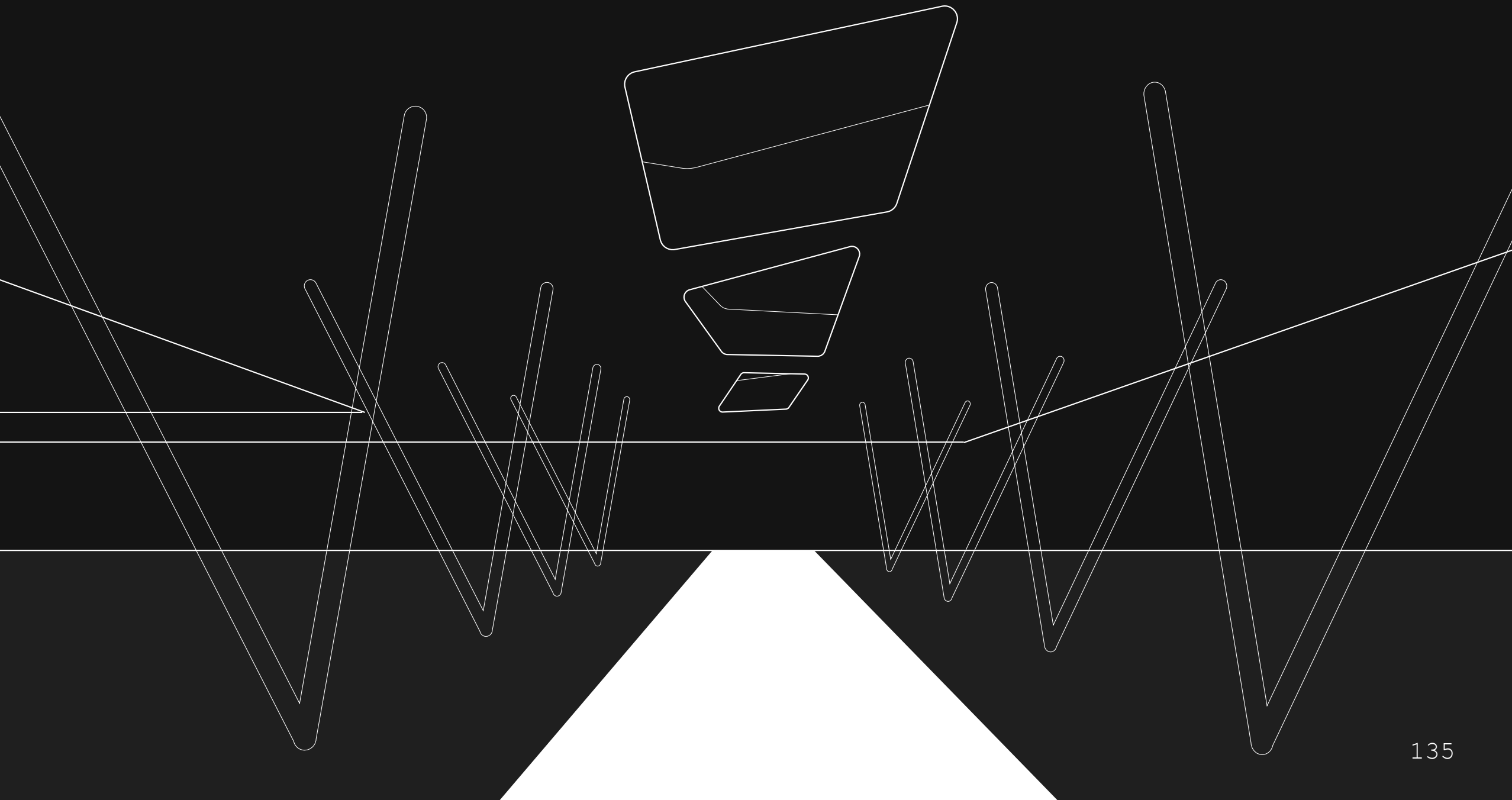
holes

columns



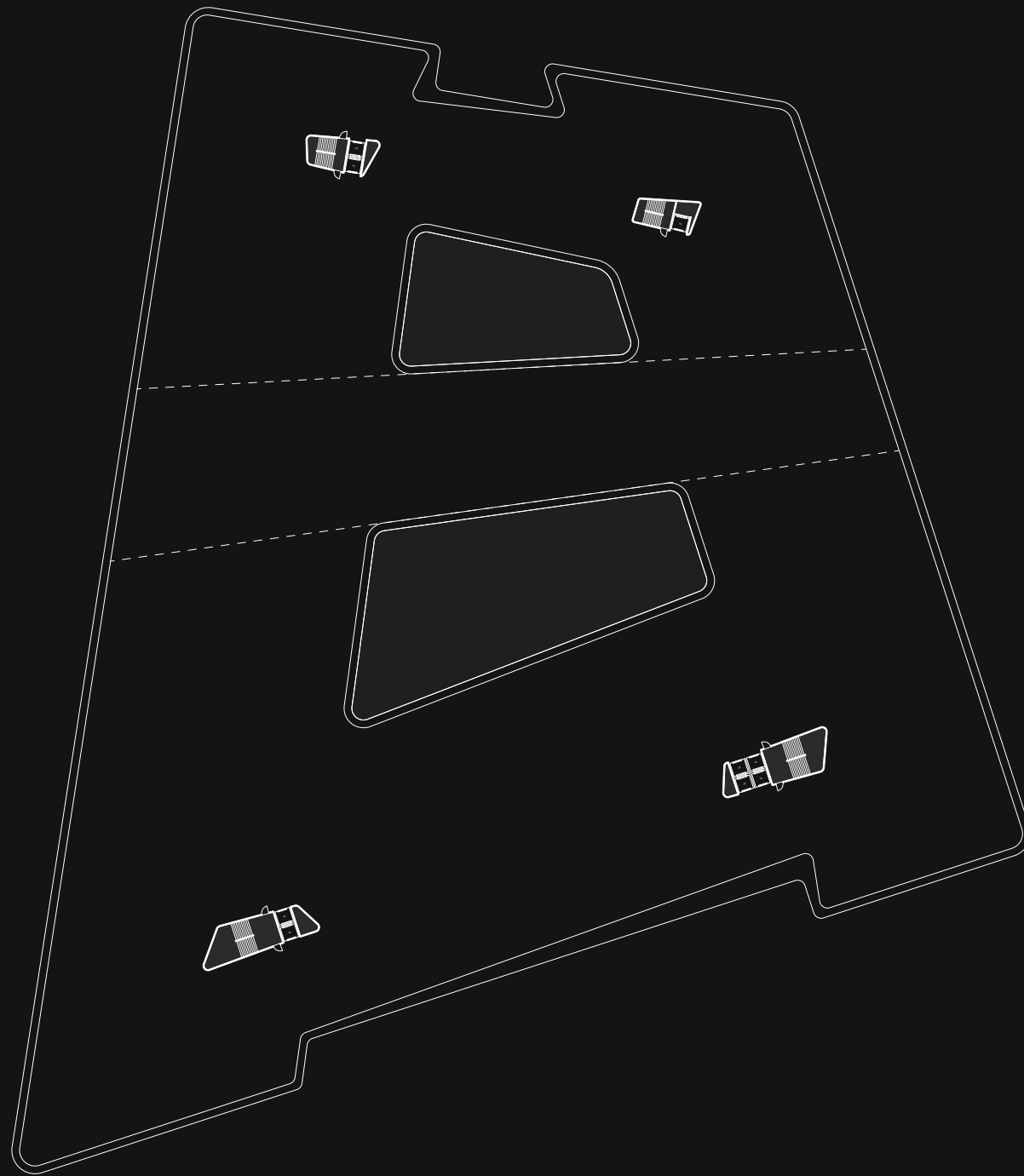


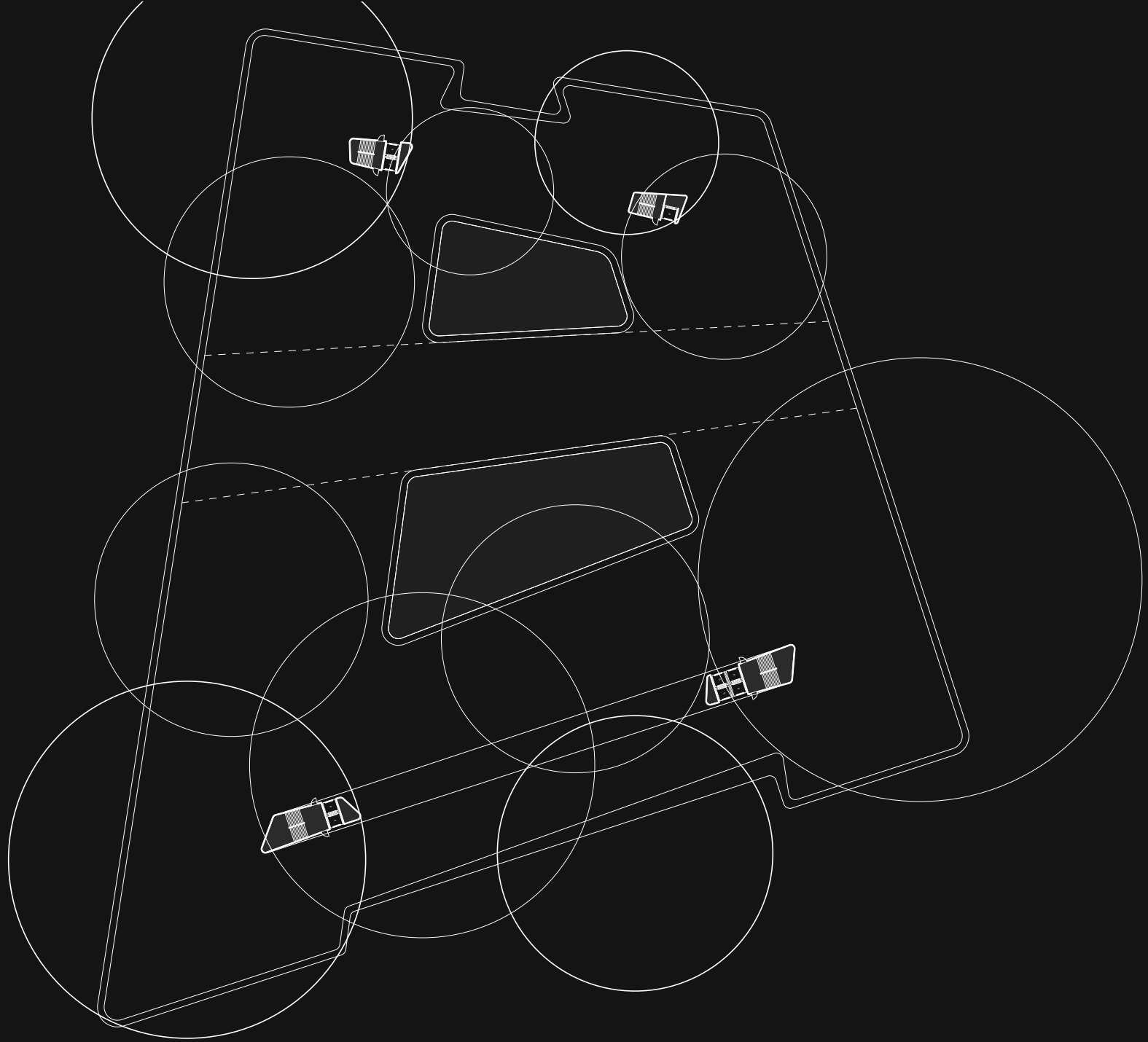


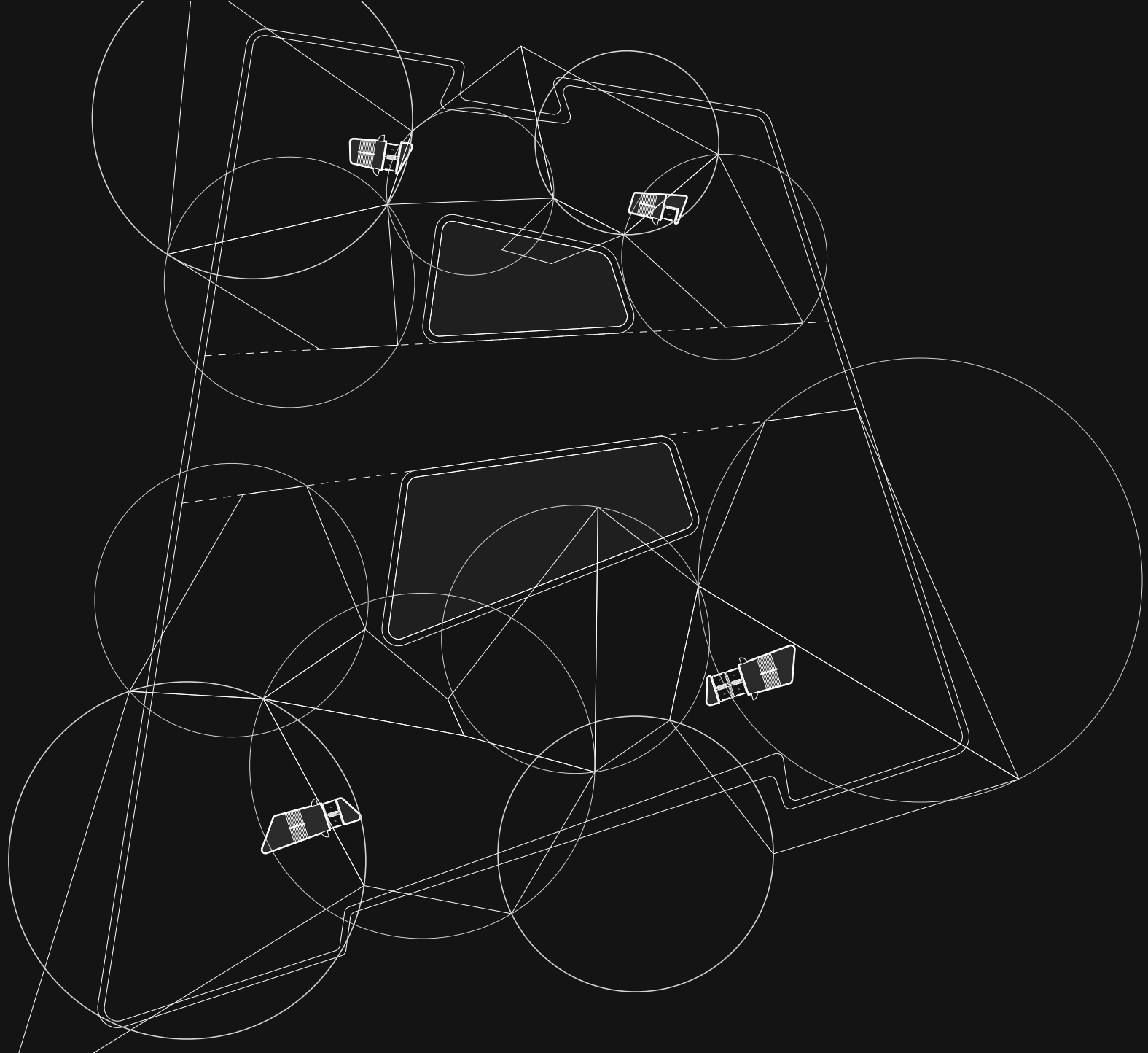


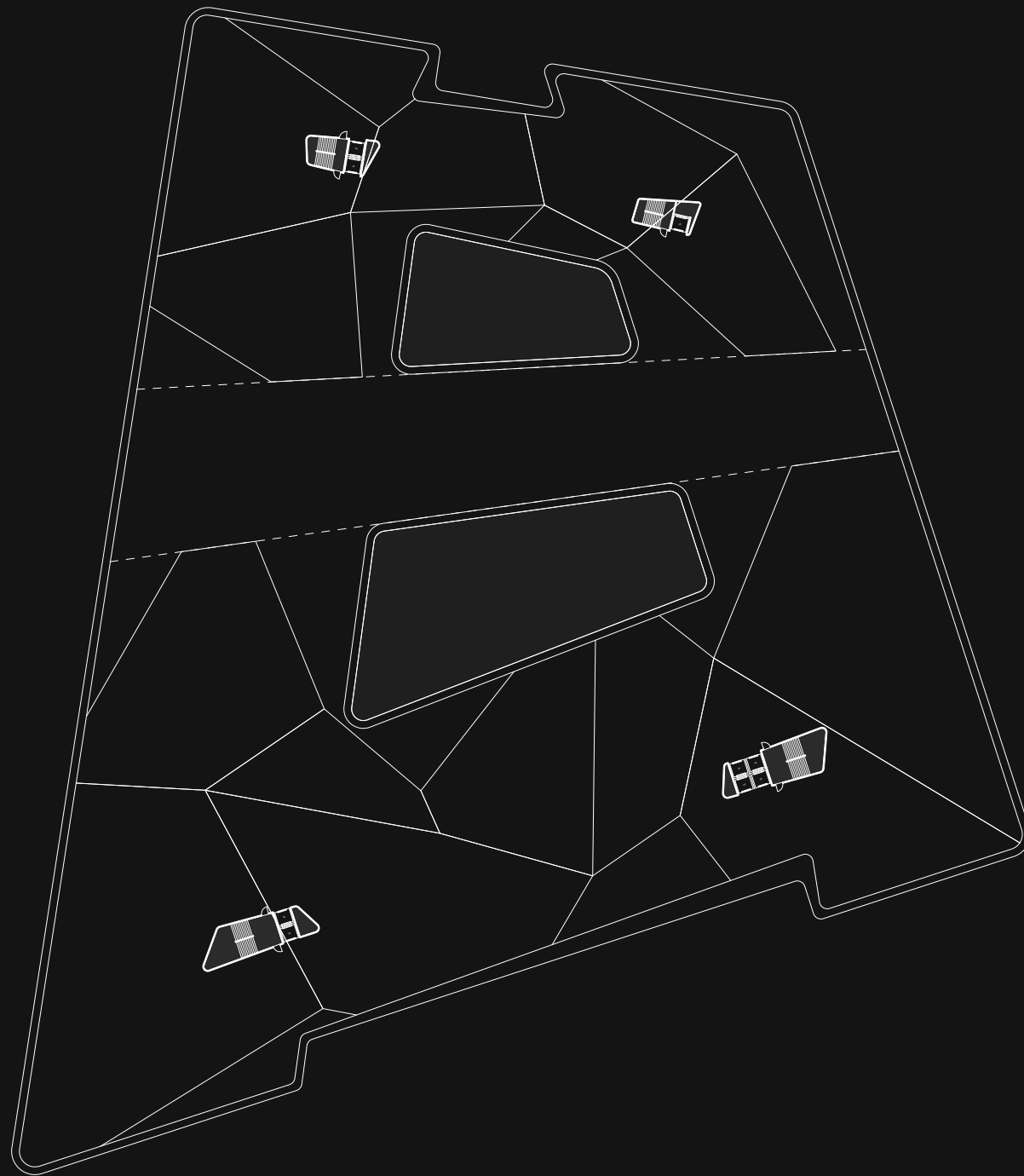


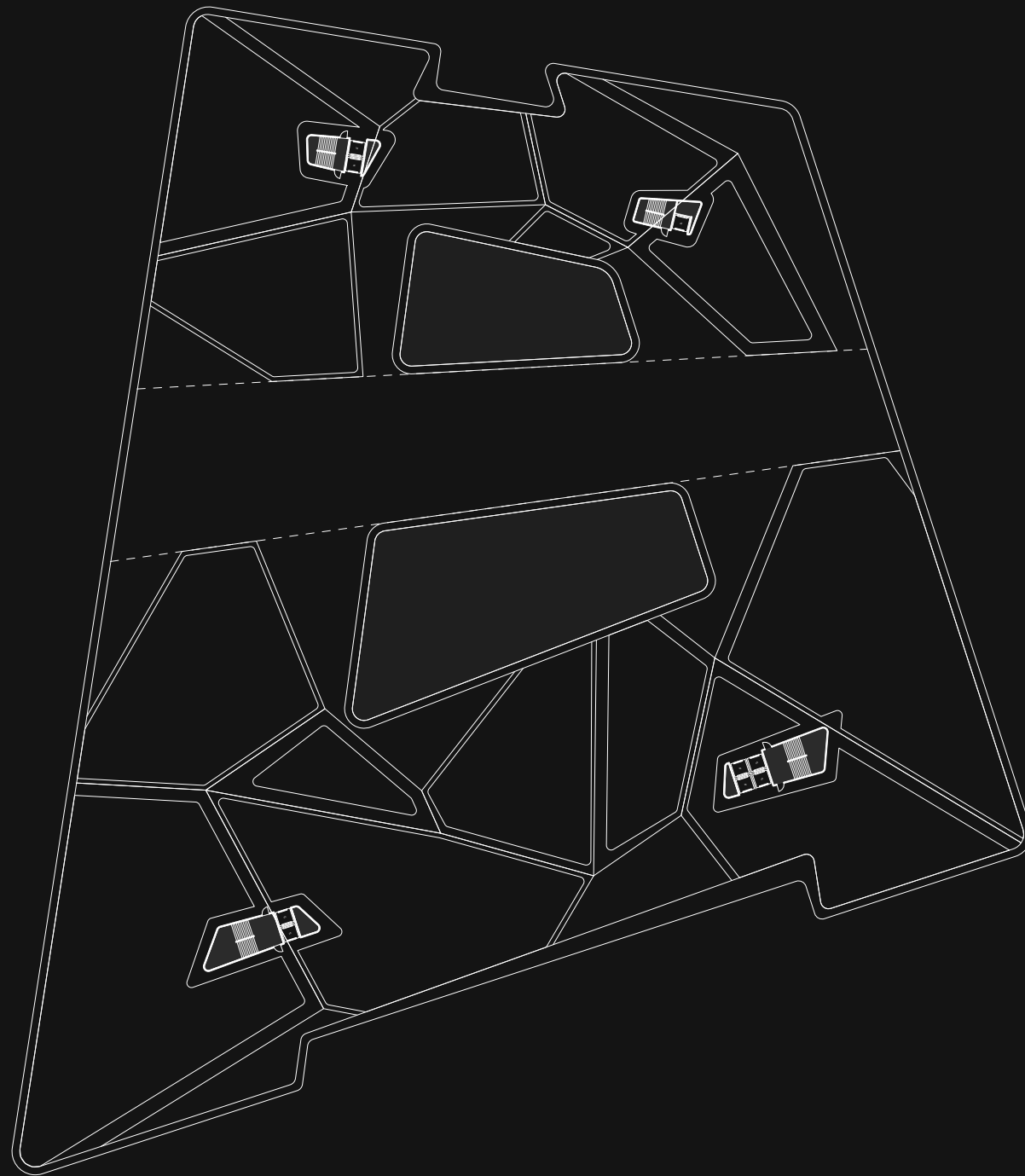


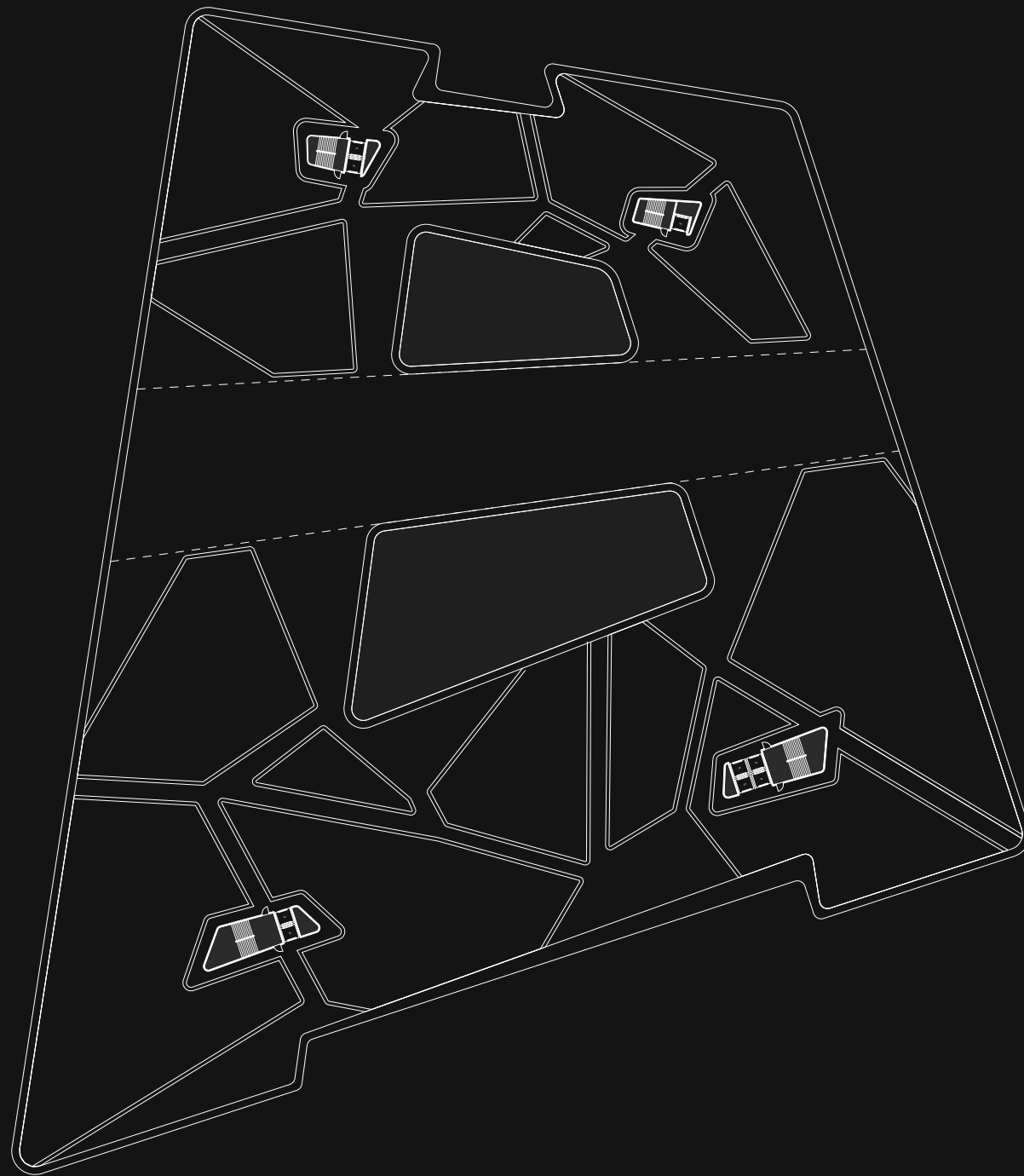


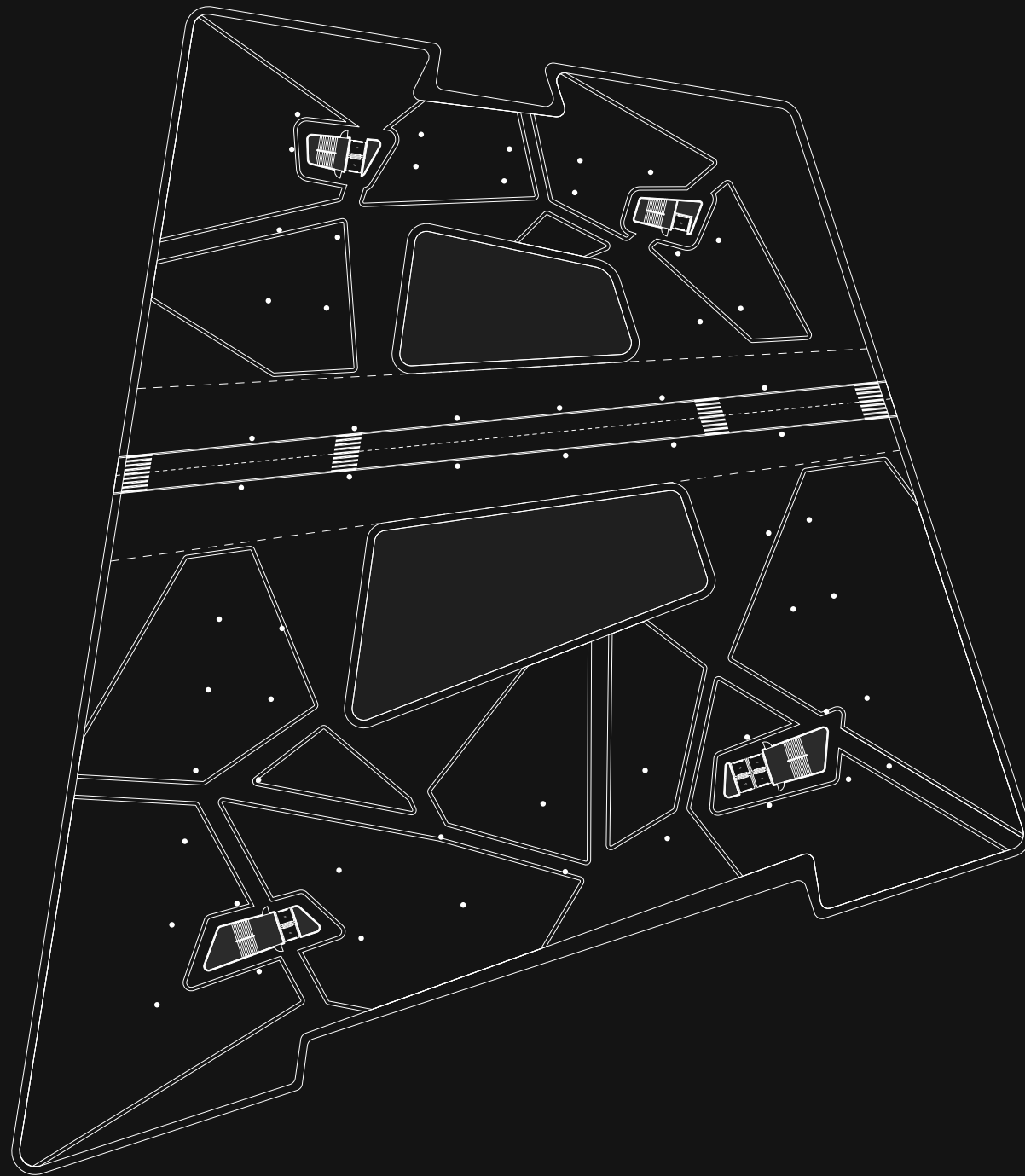


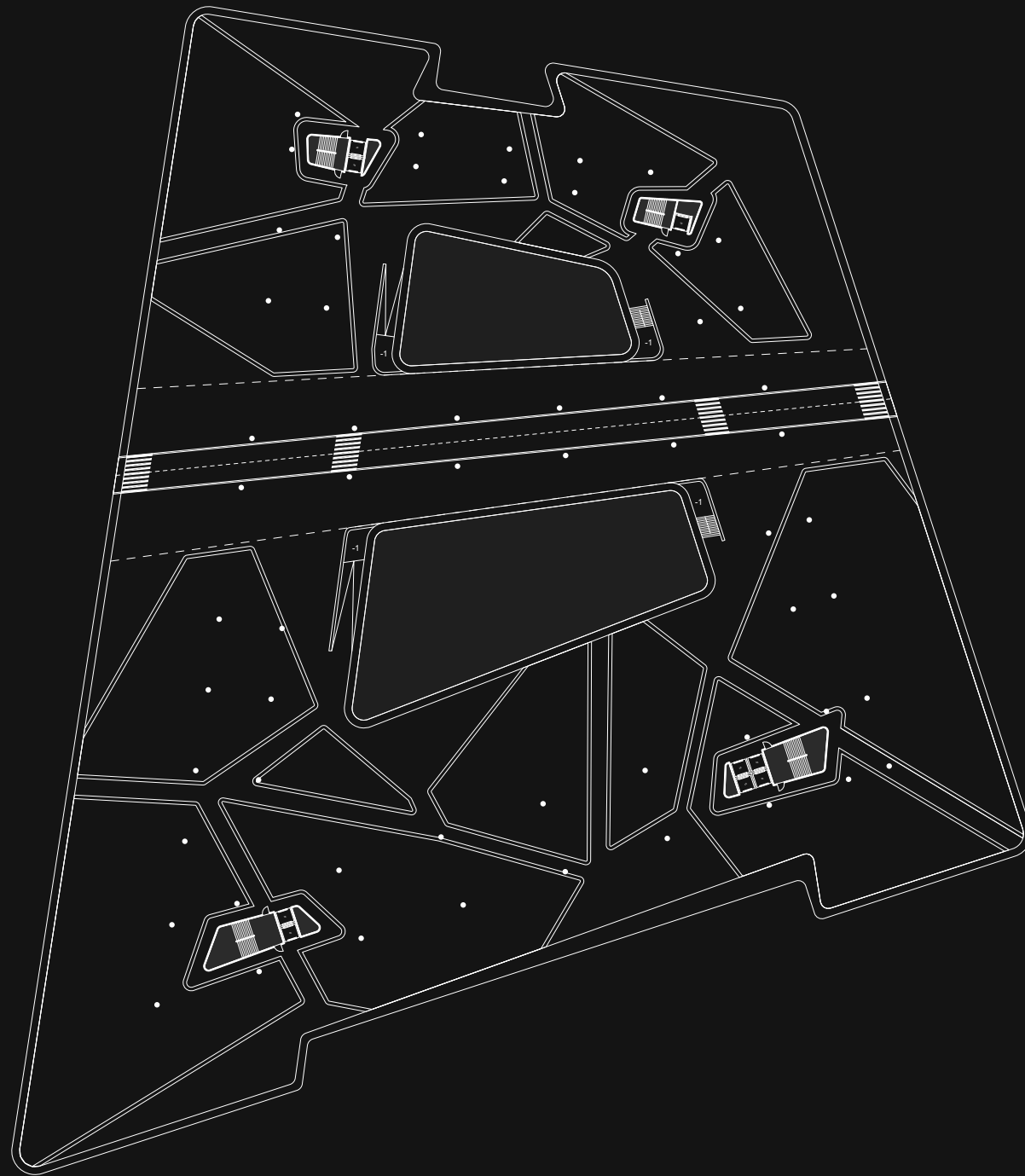


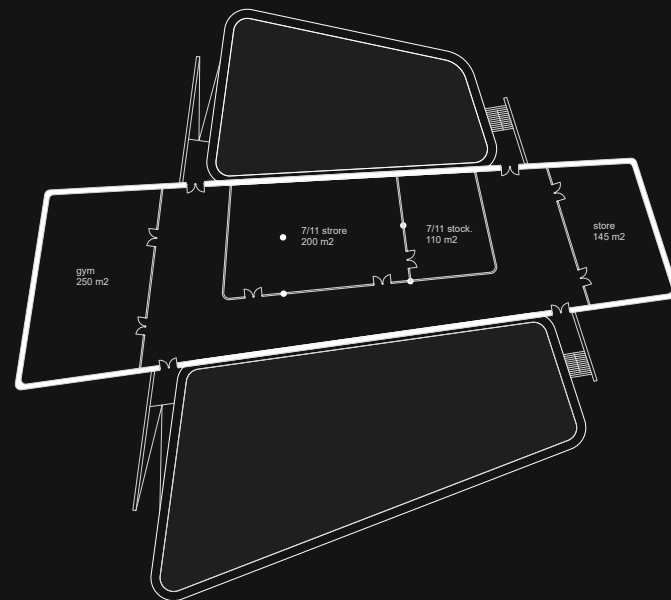


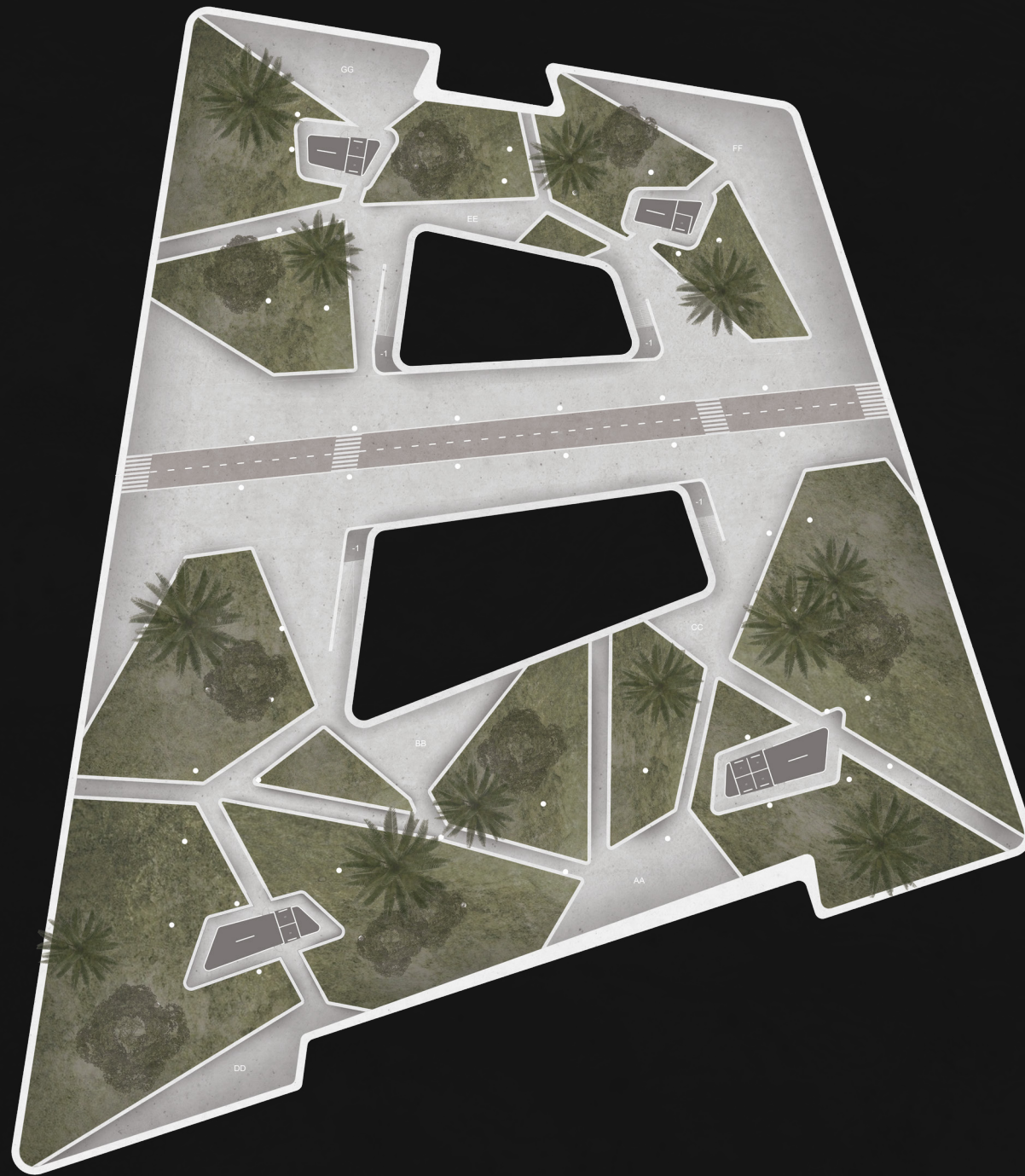












zone a
waterview

zone a

zone B

zone B

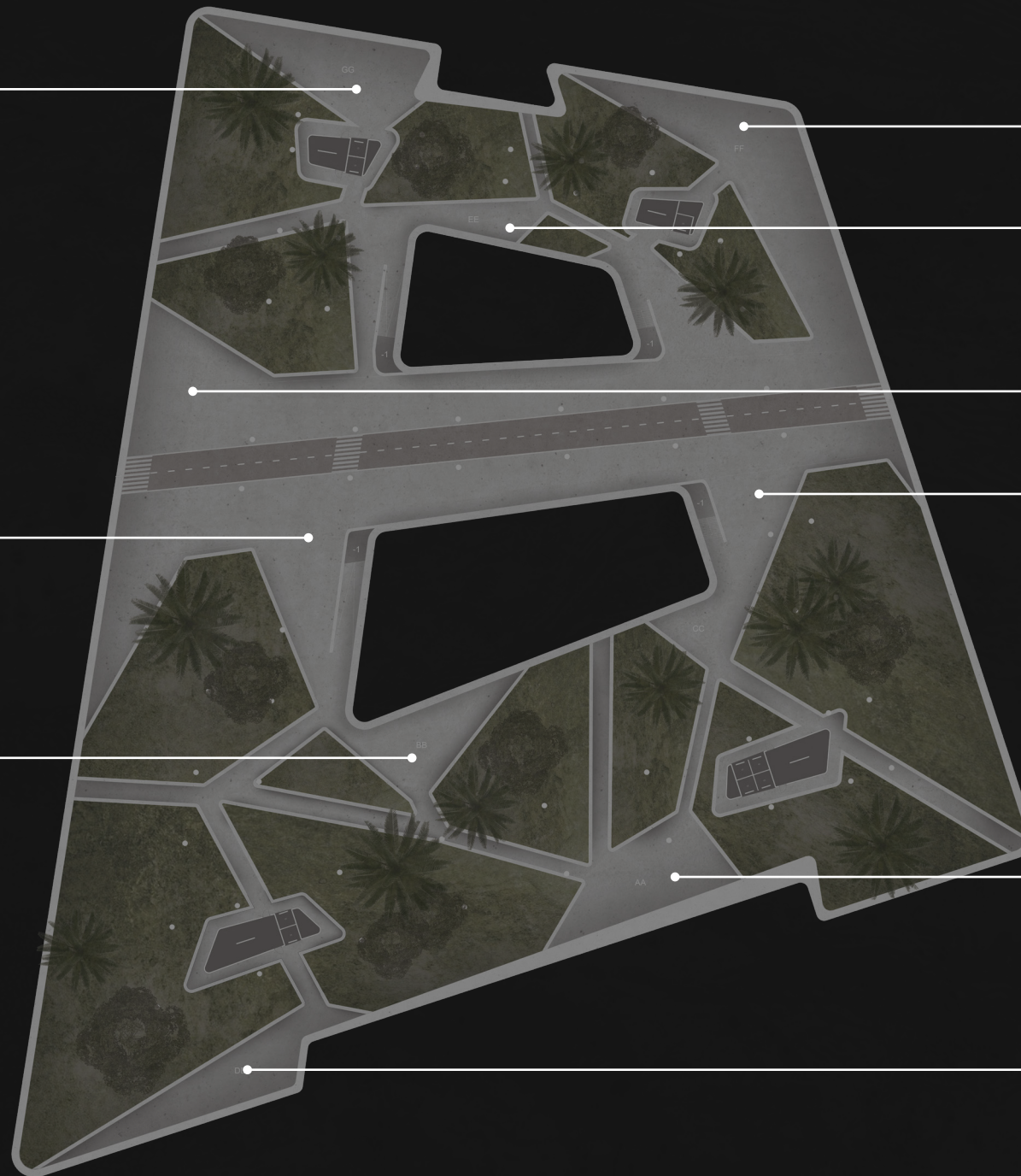
zone b
walk and pause

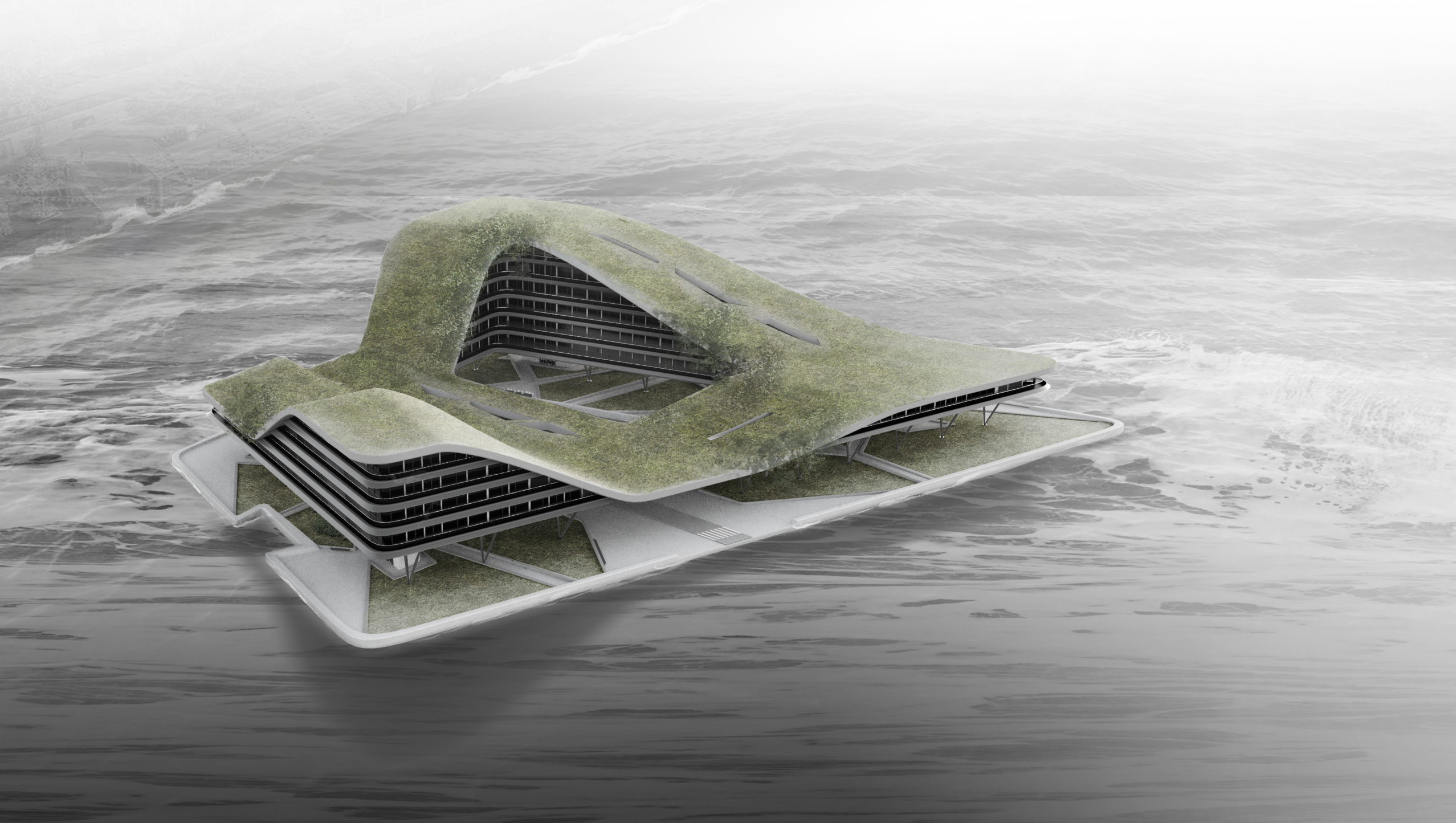
zone B

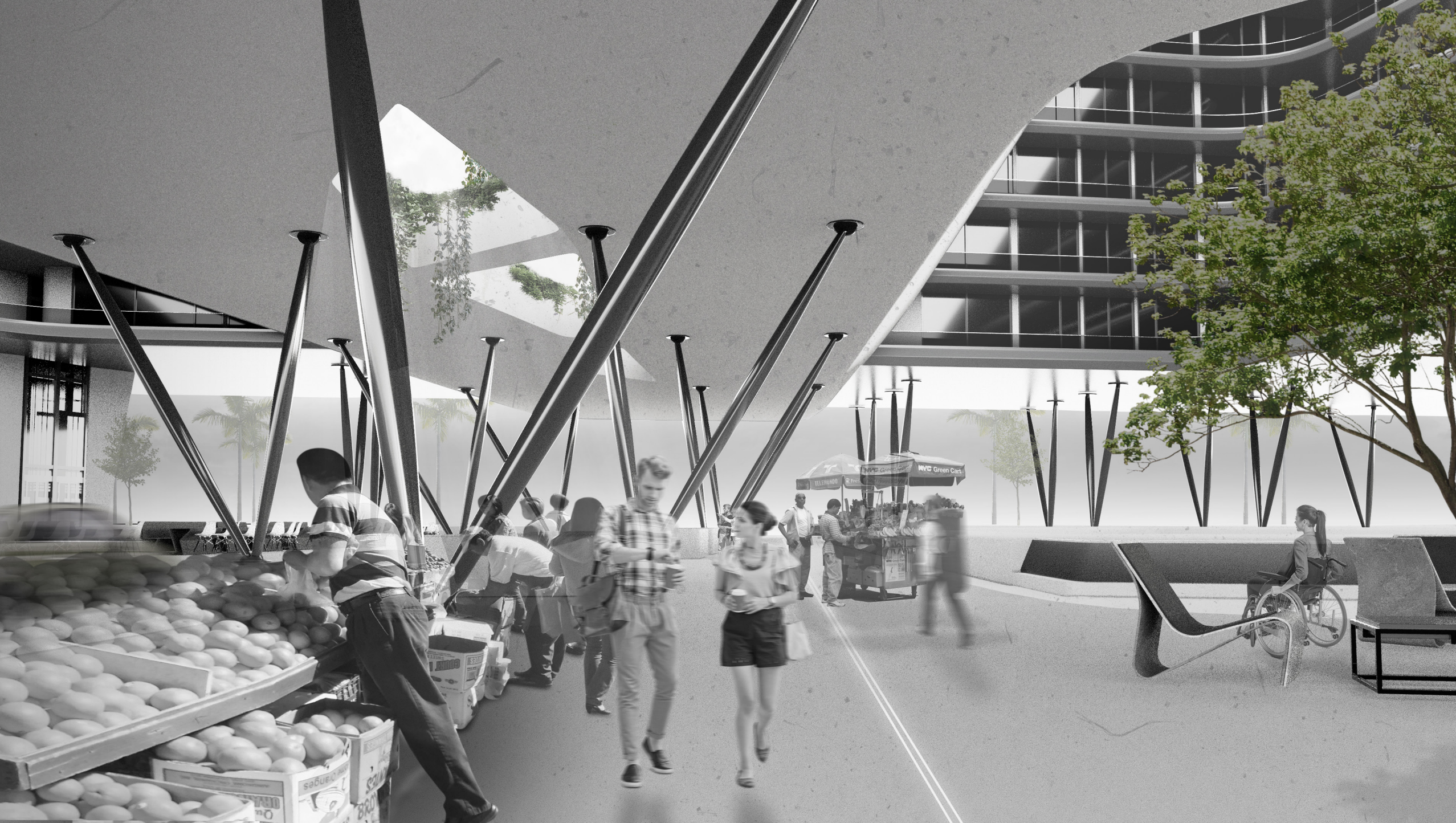
zone c
stay and play

zone a

zone a

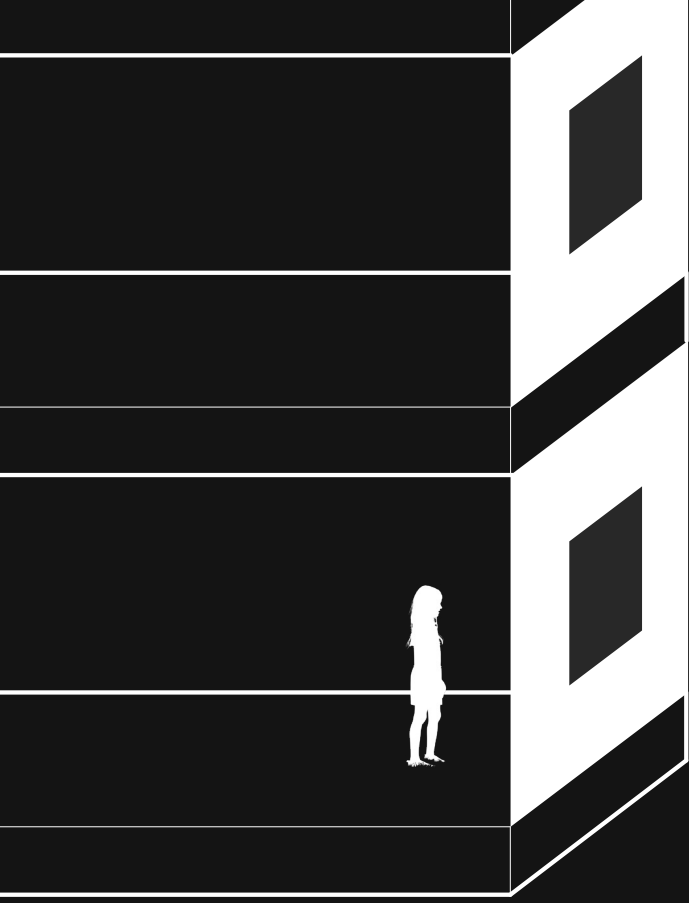




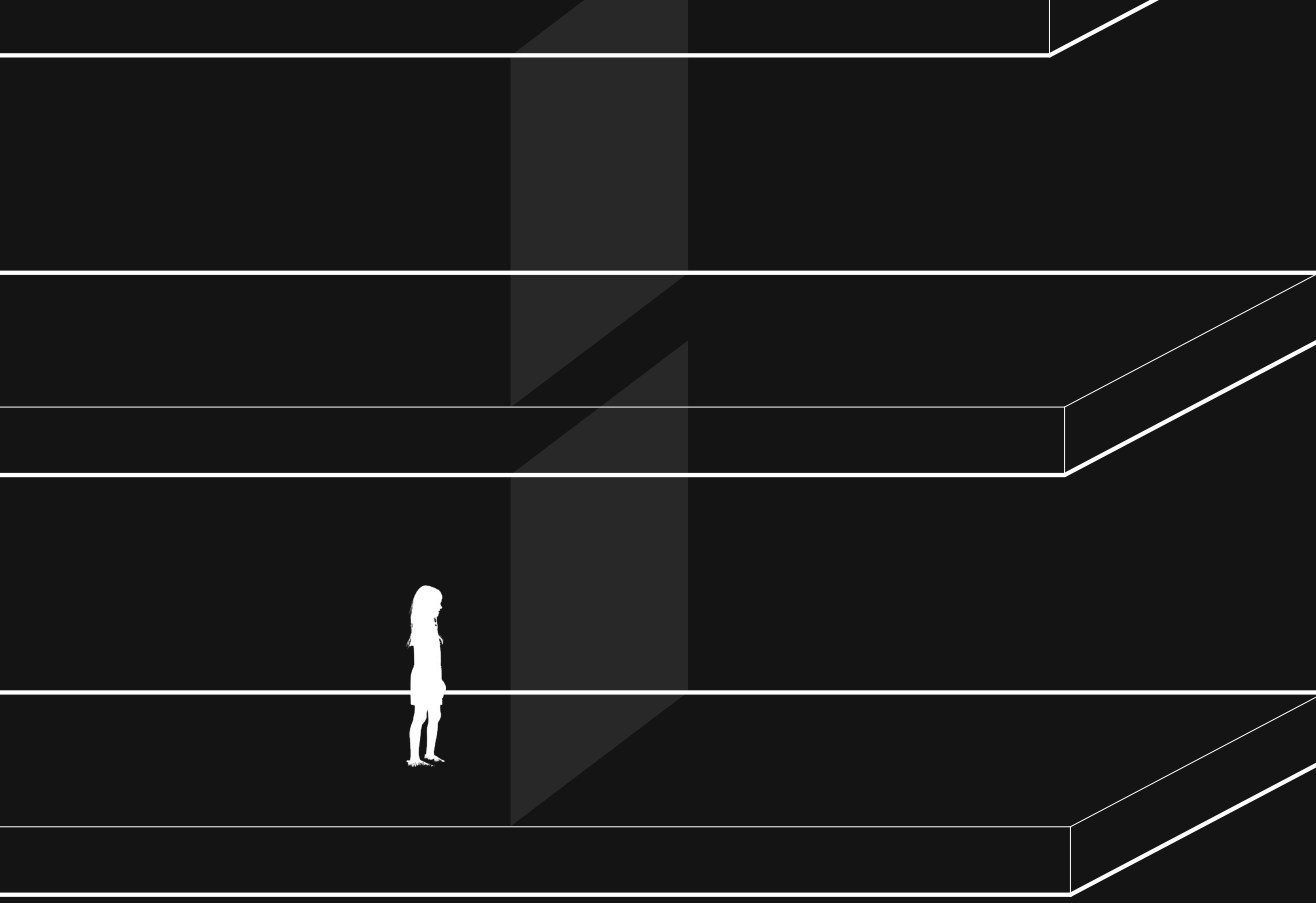






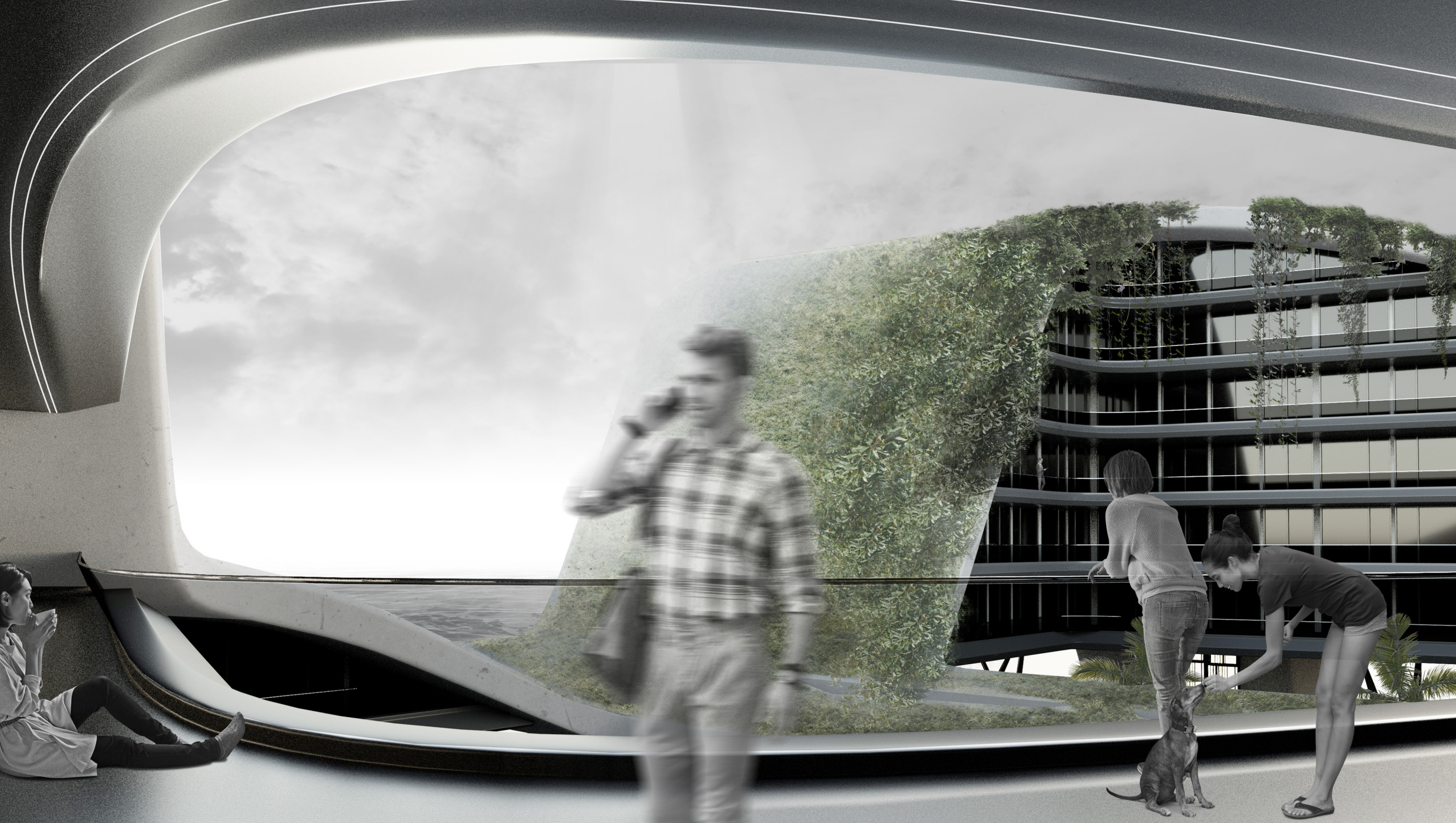


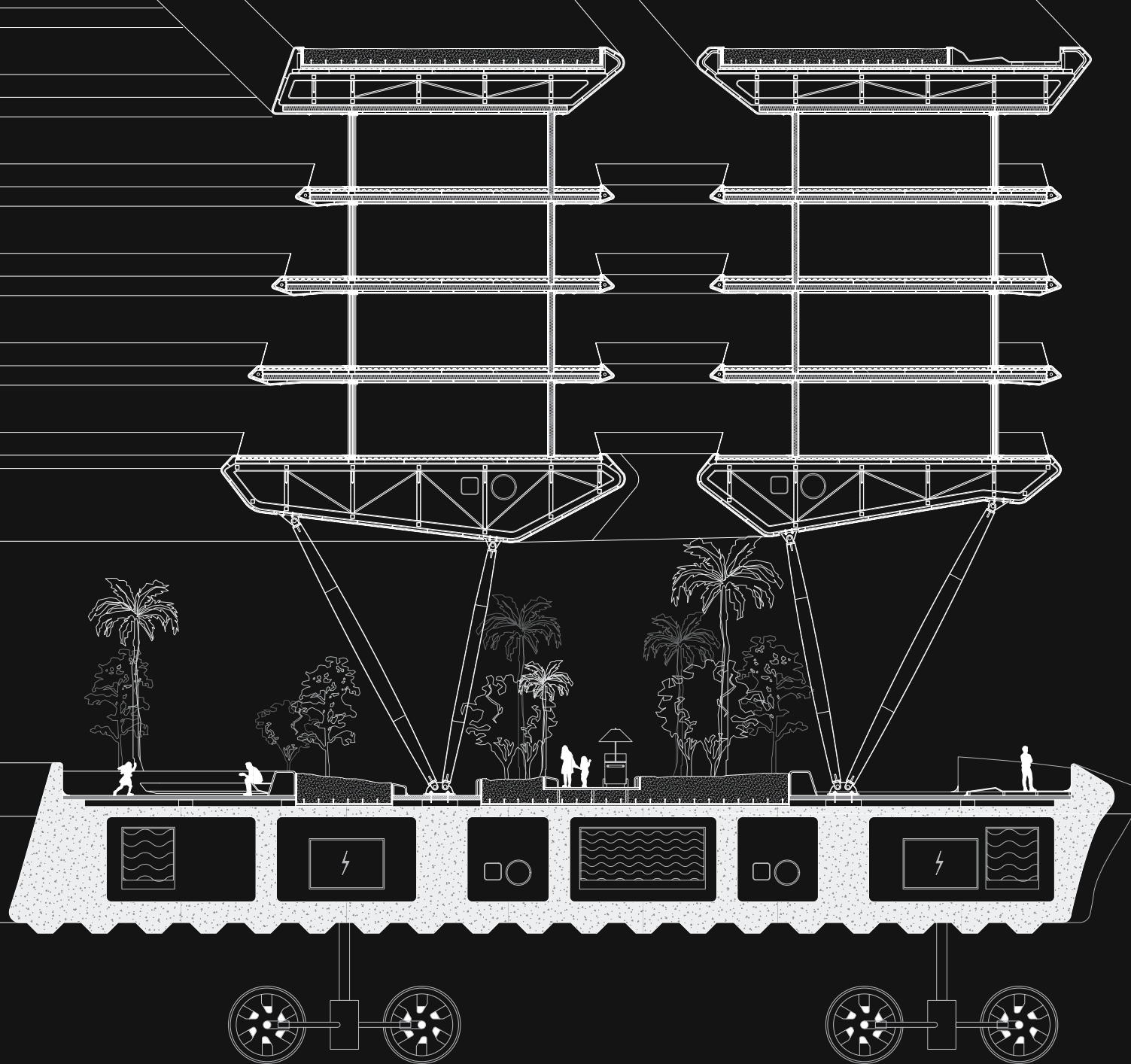
instead of small windows
protection sun

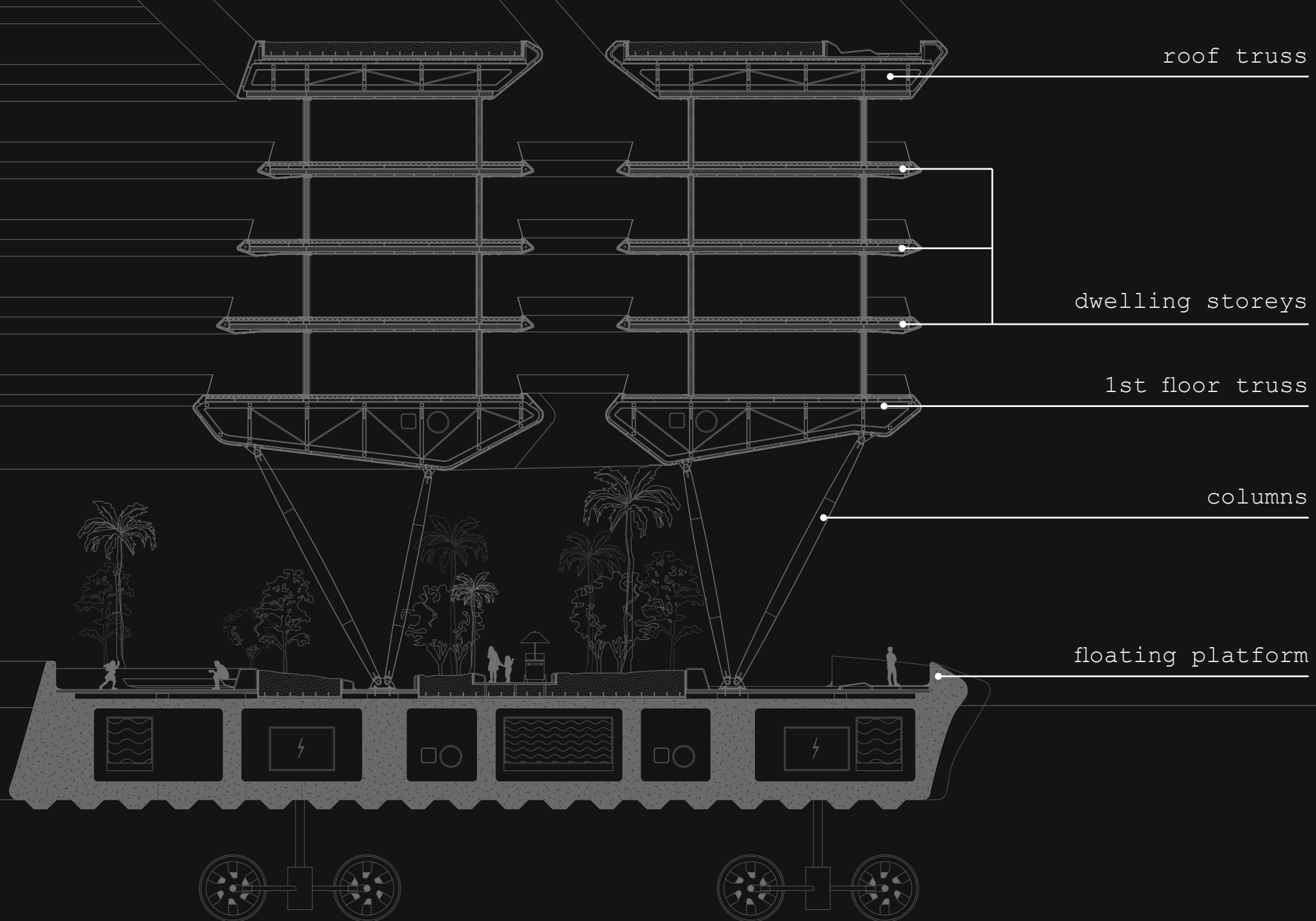


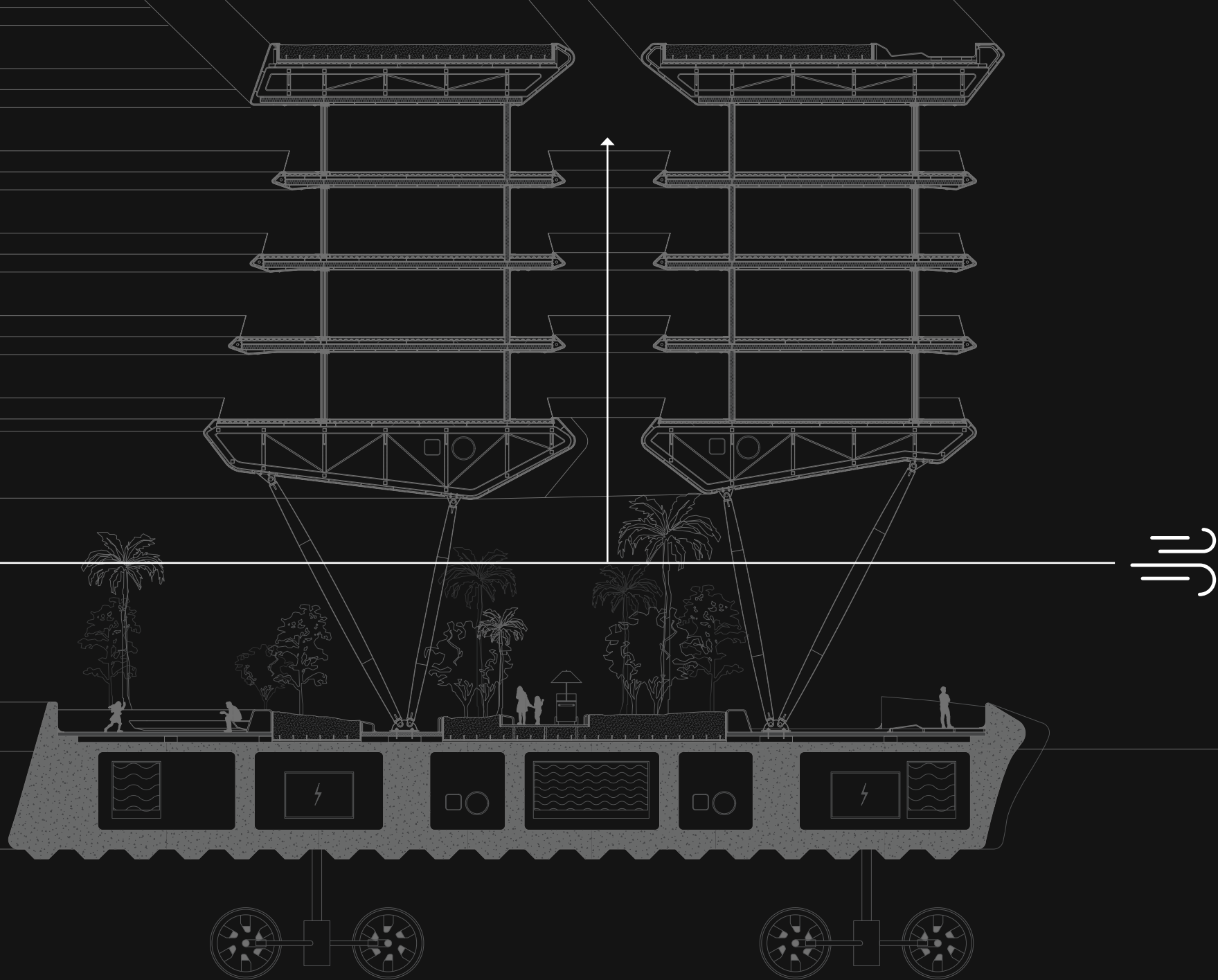
balconies and big windows
protection sun

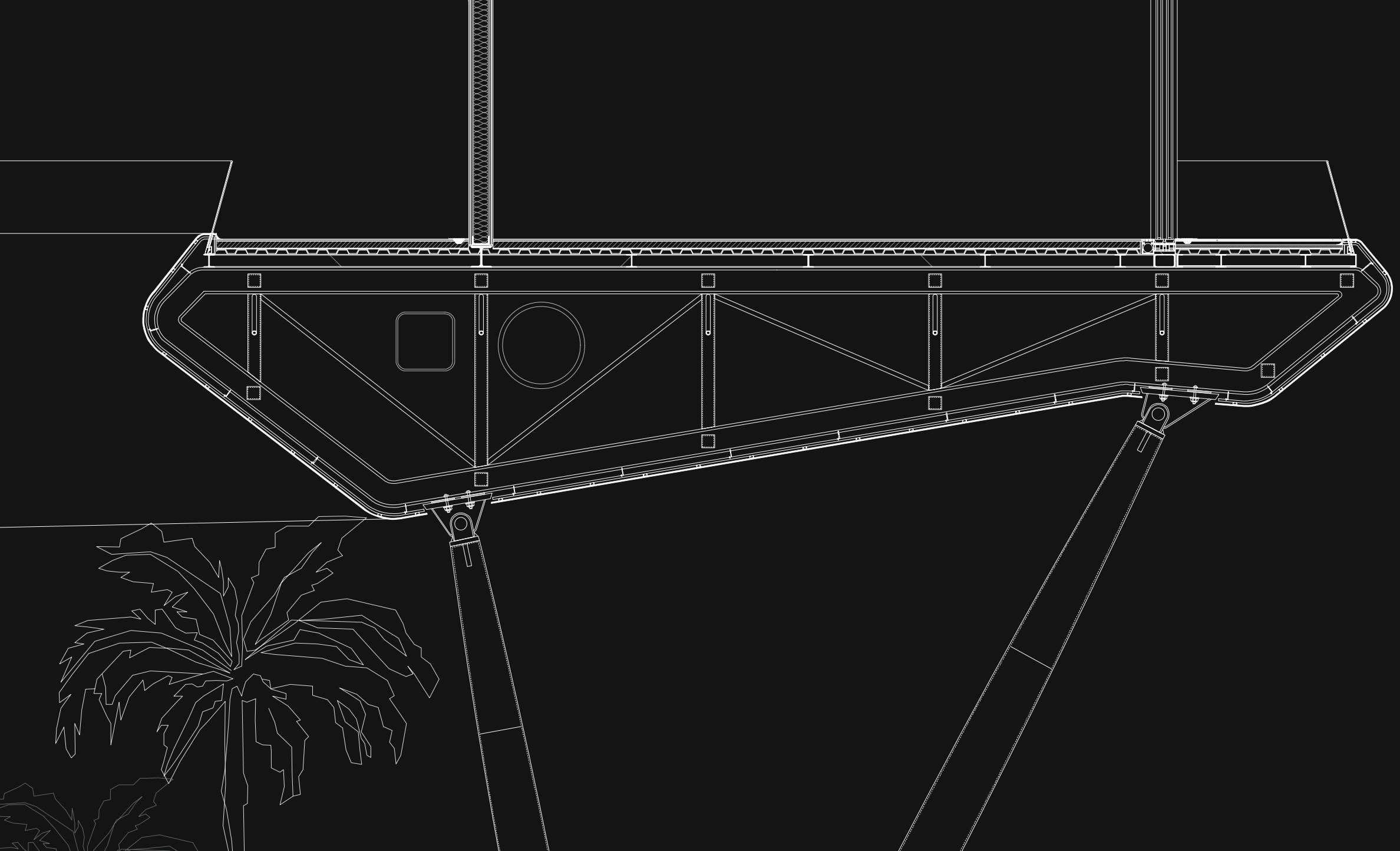


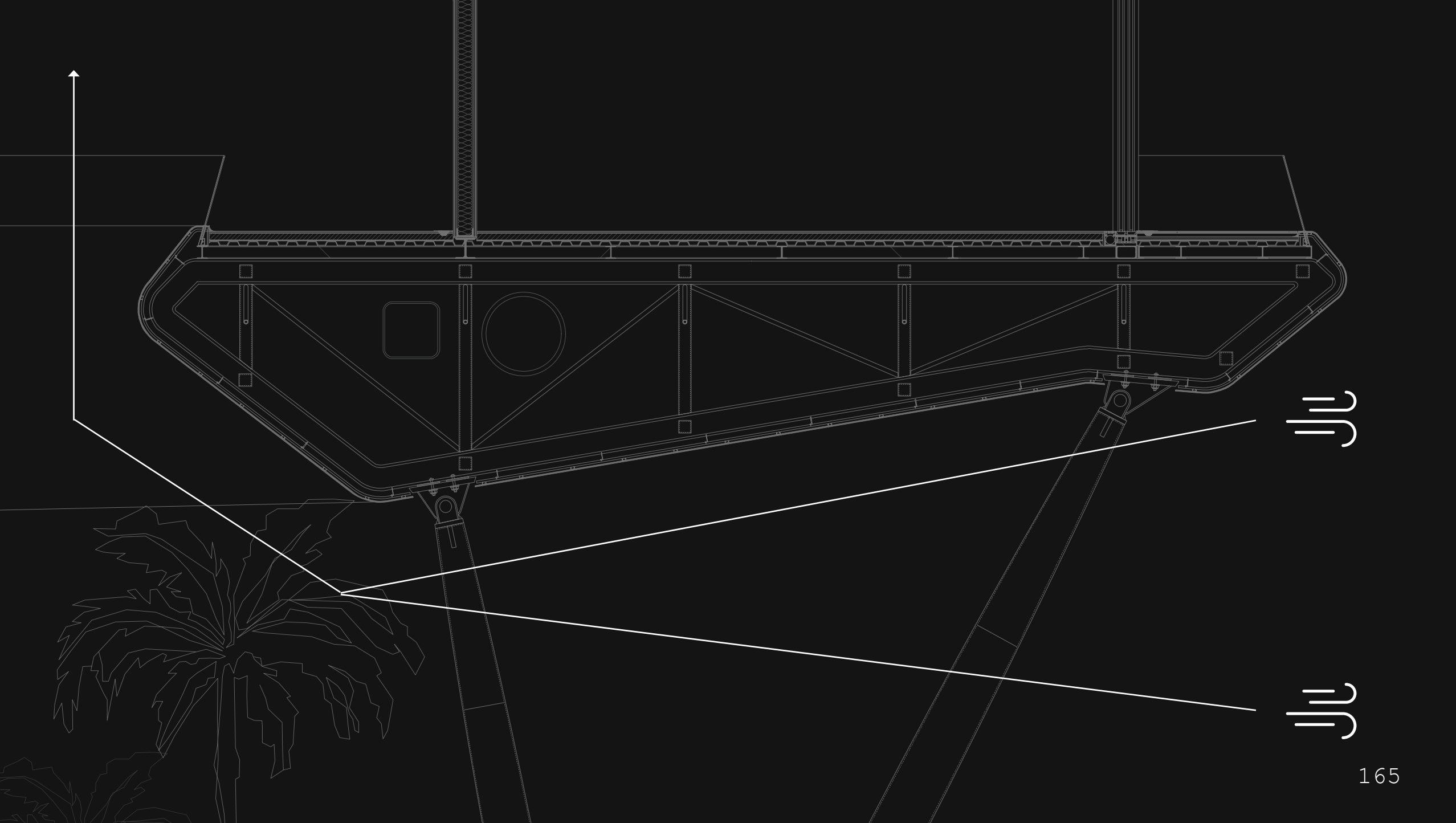


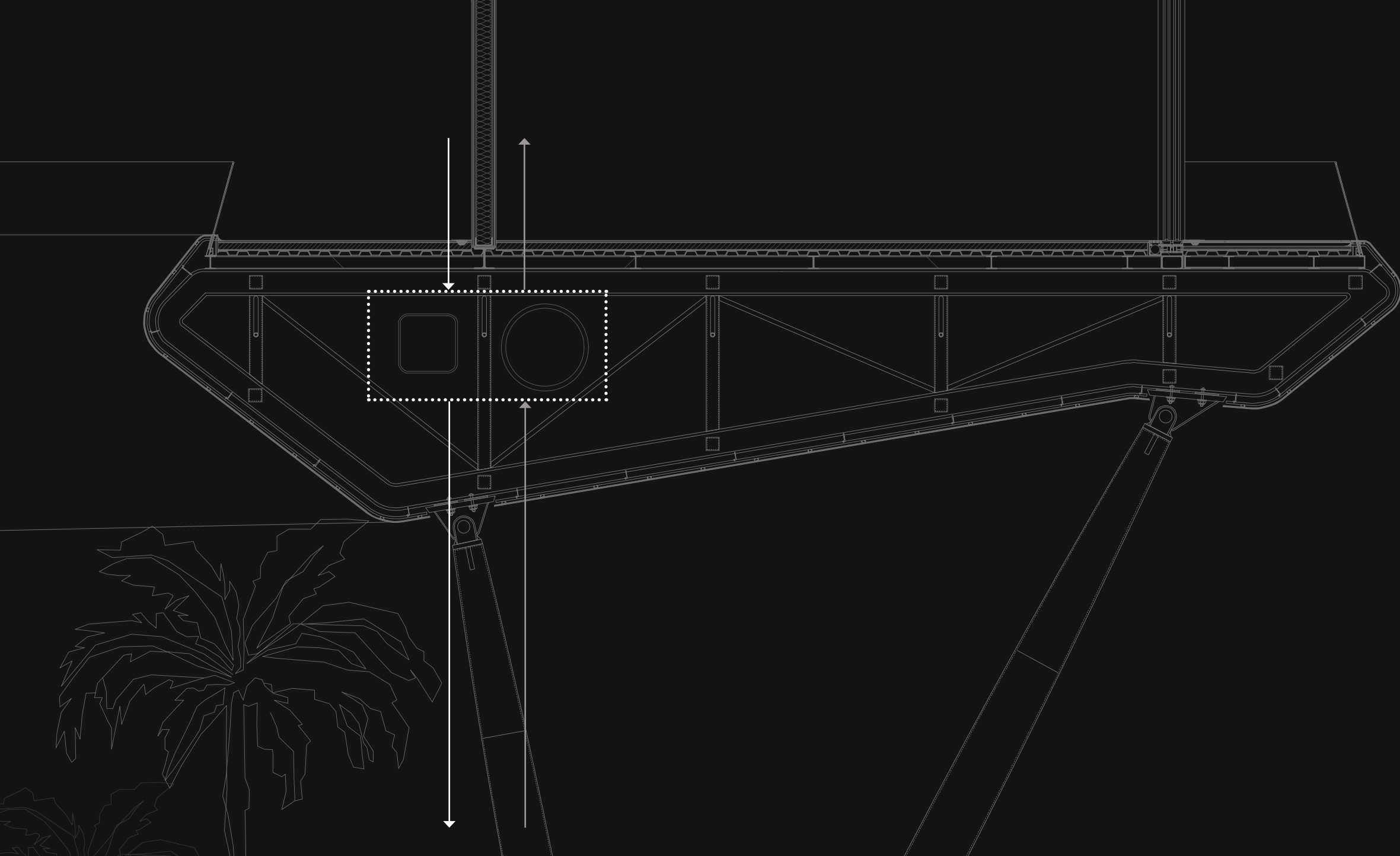


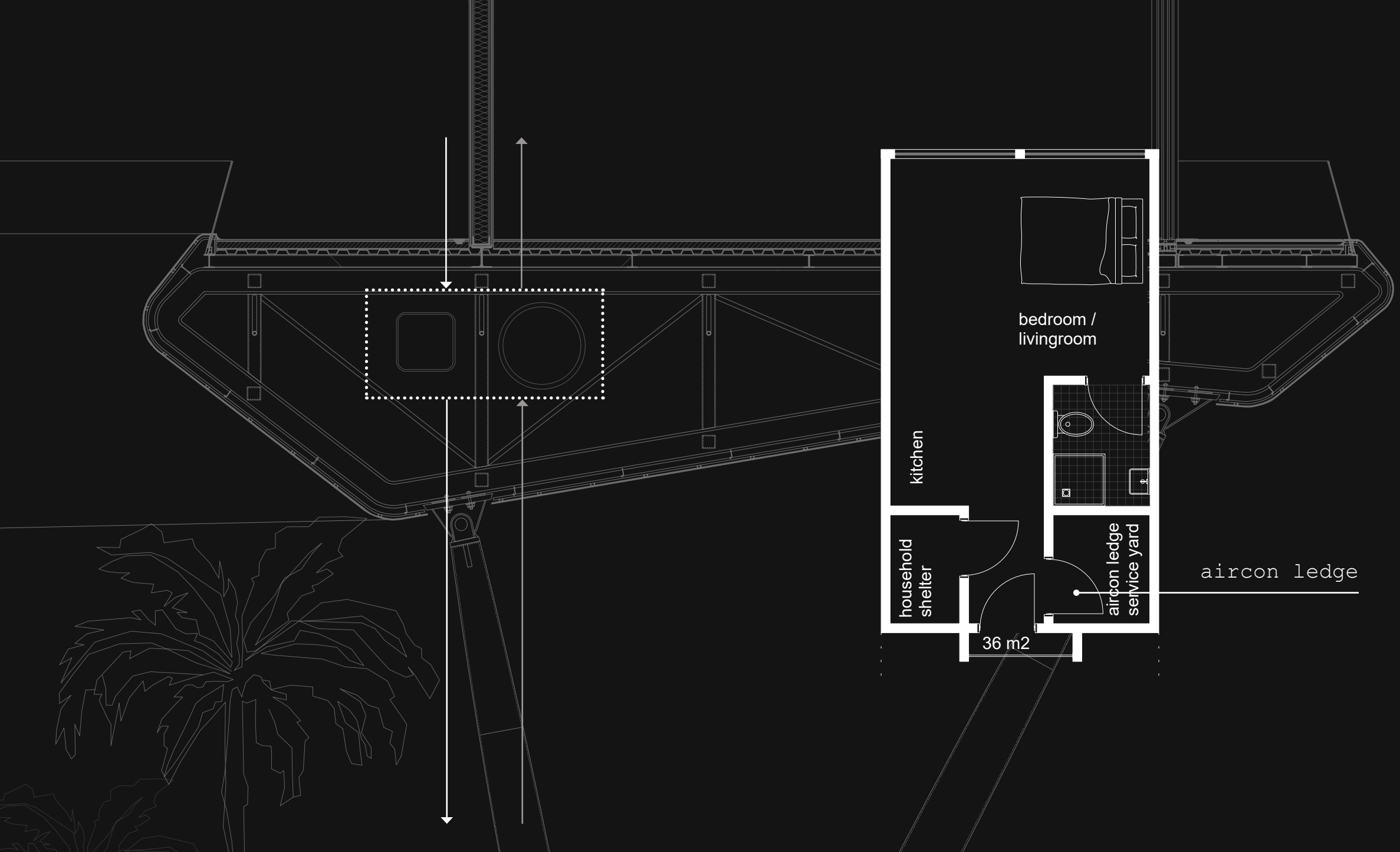


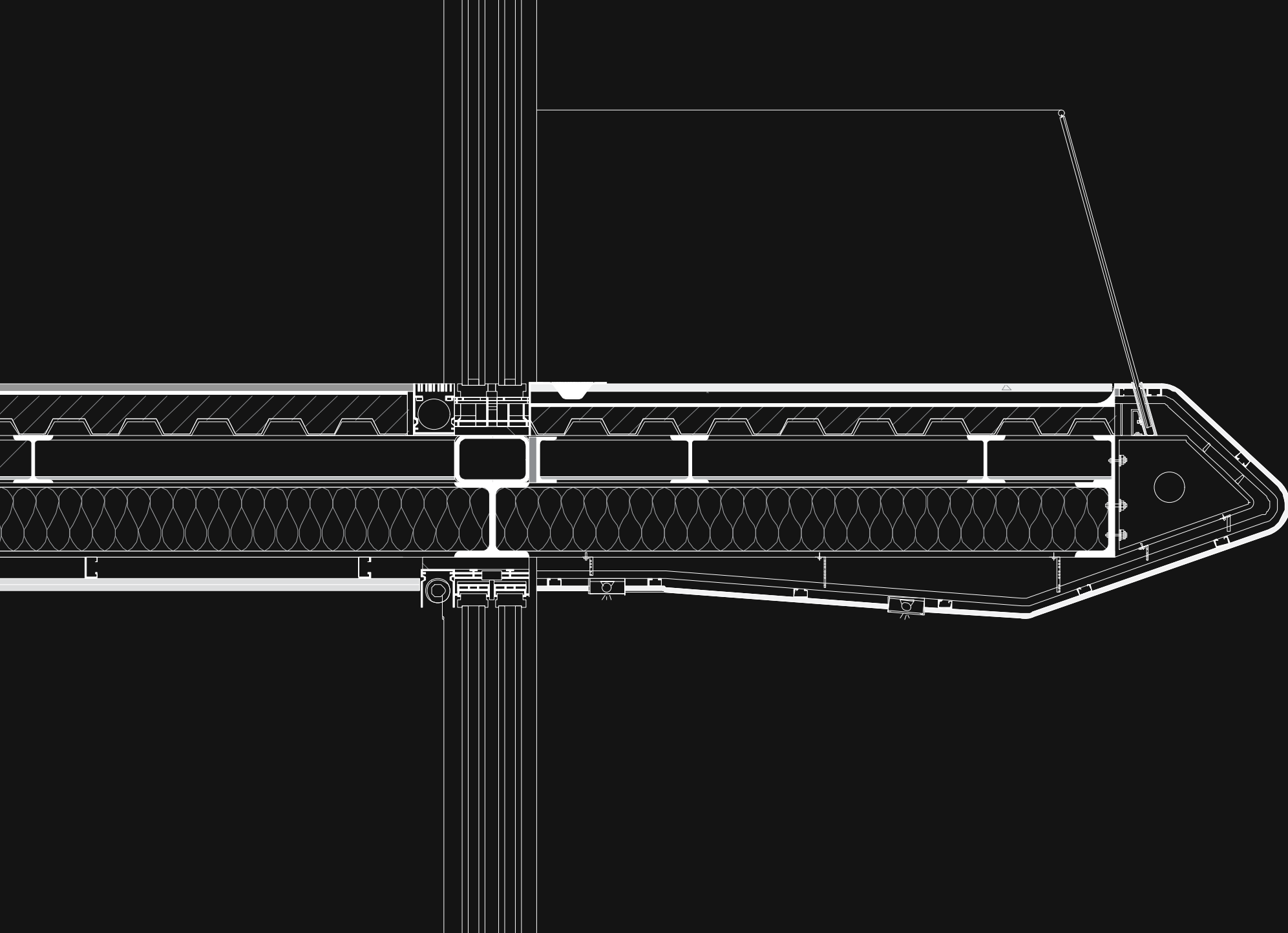


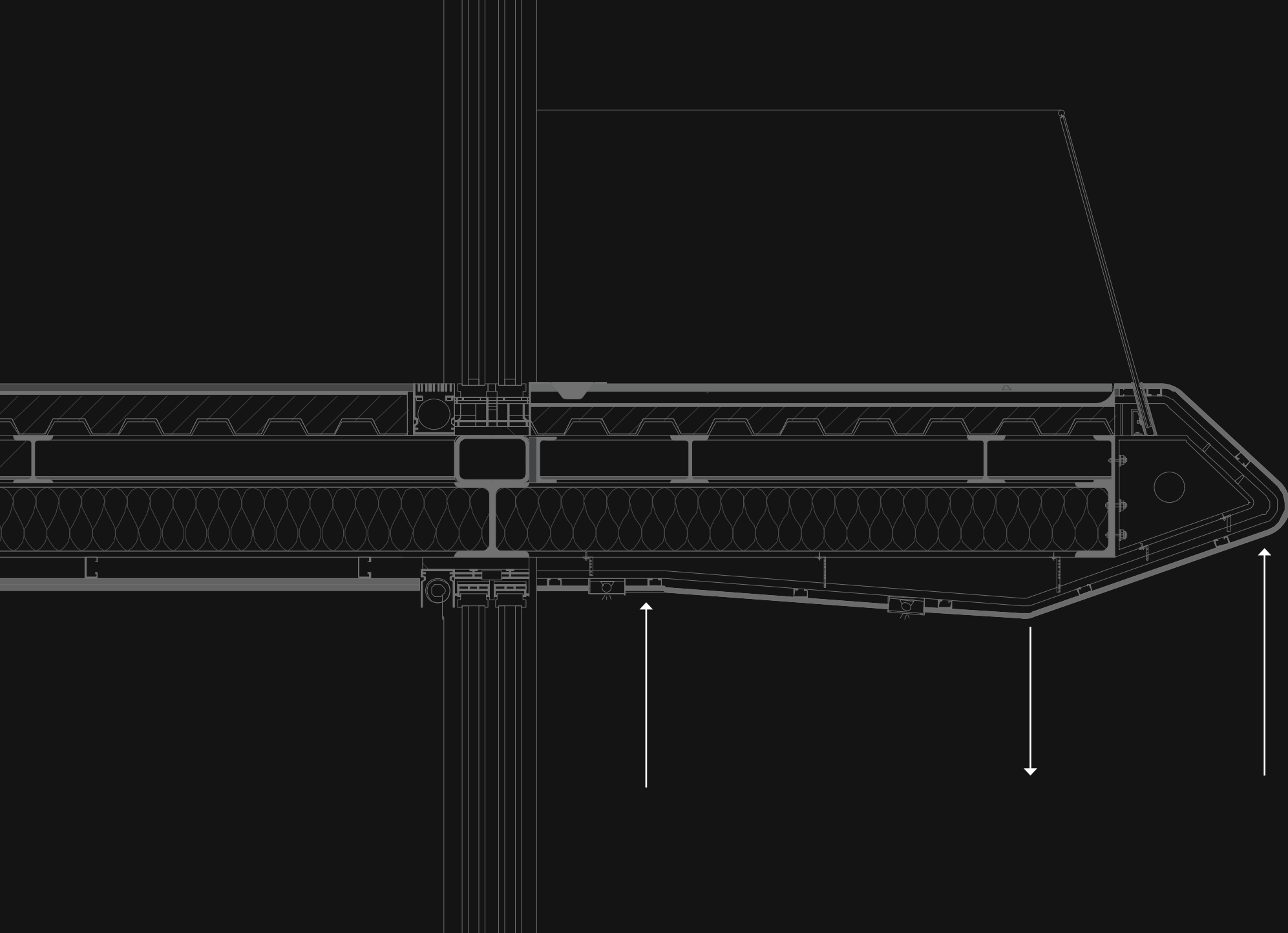


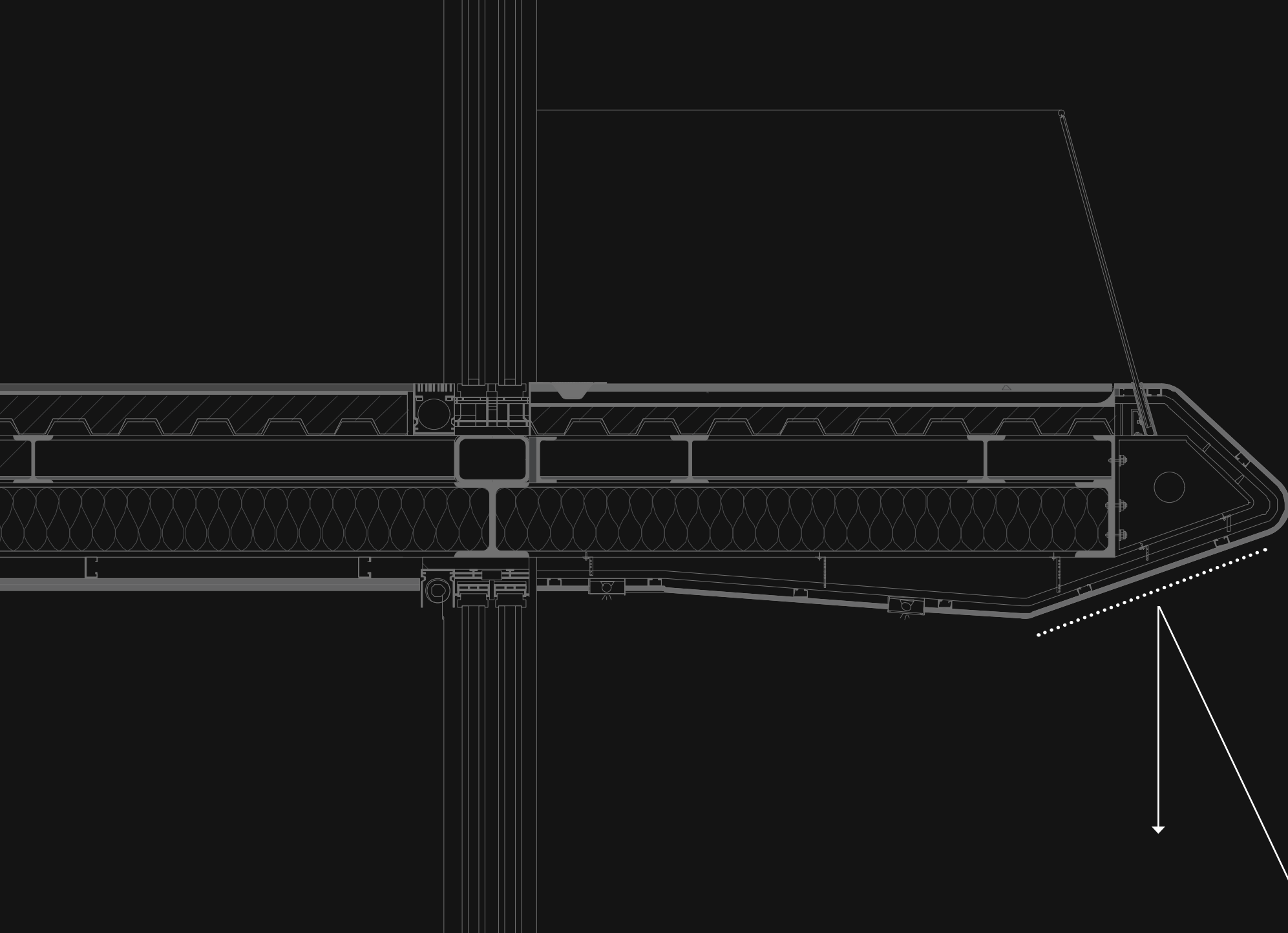


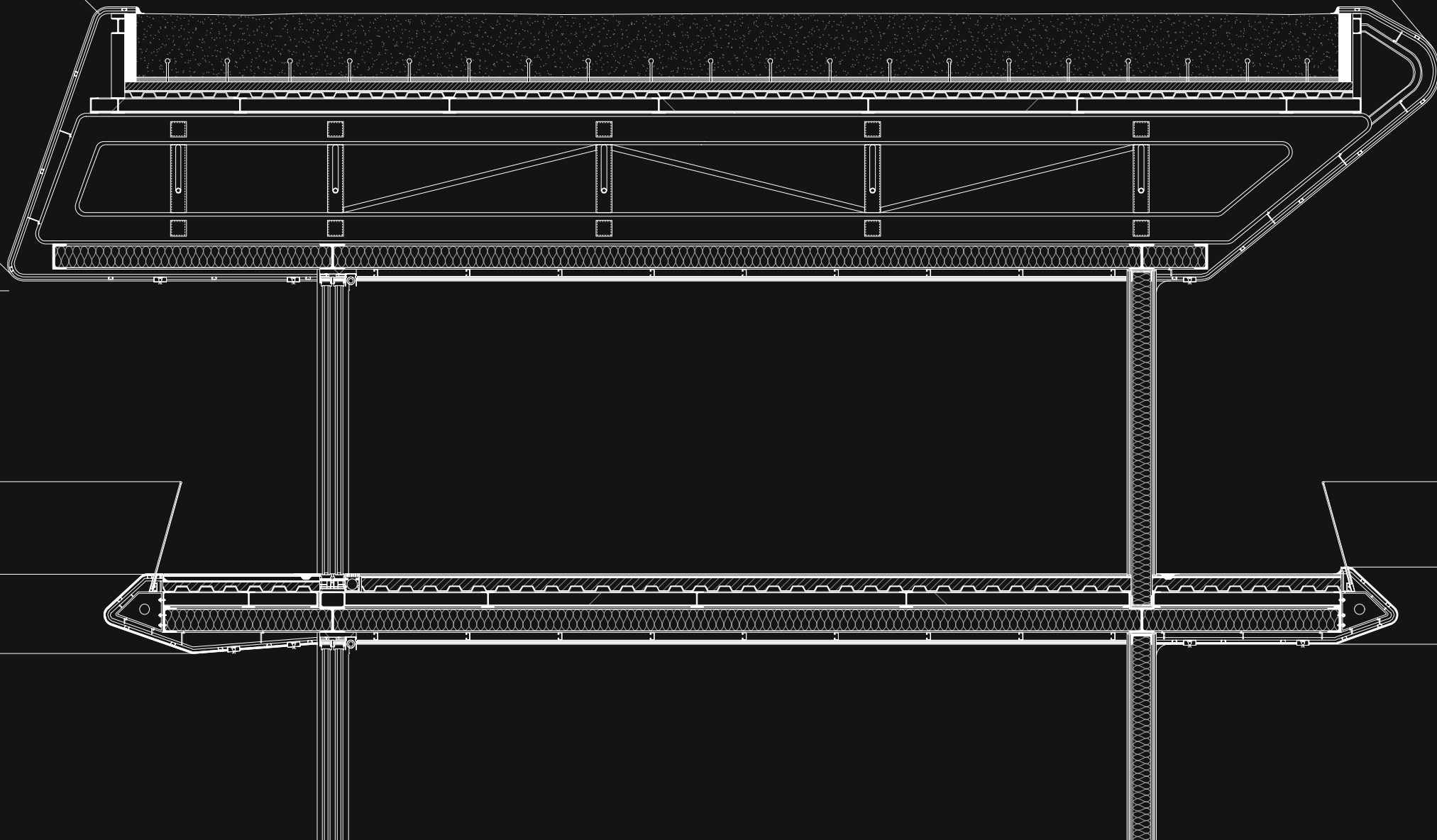


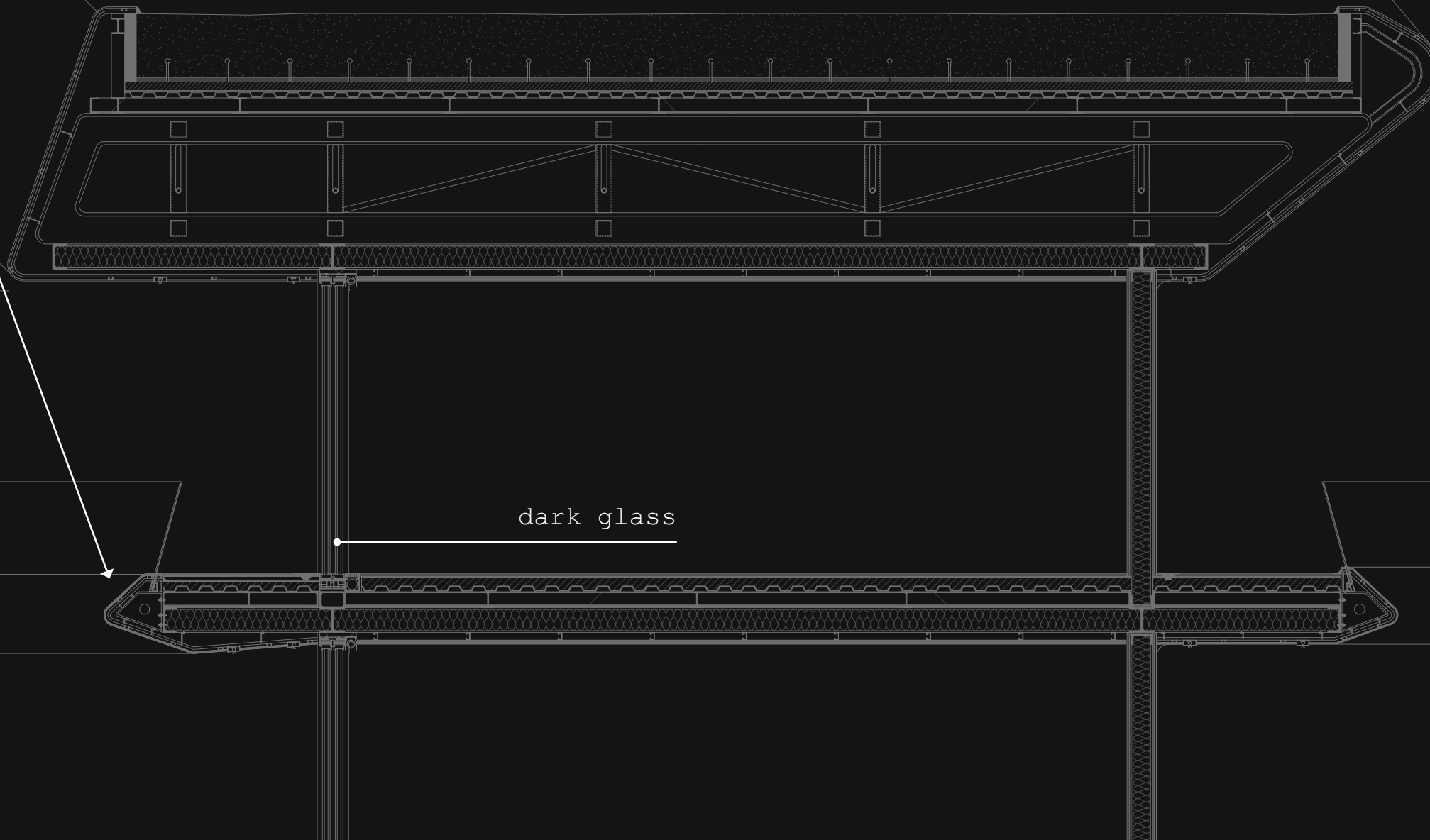




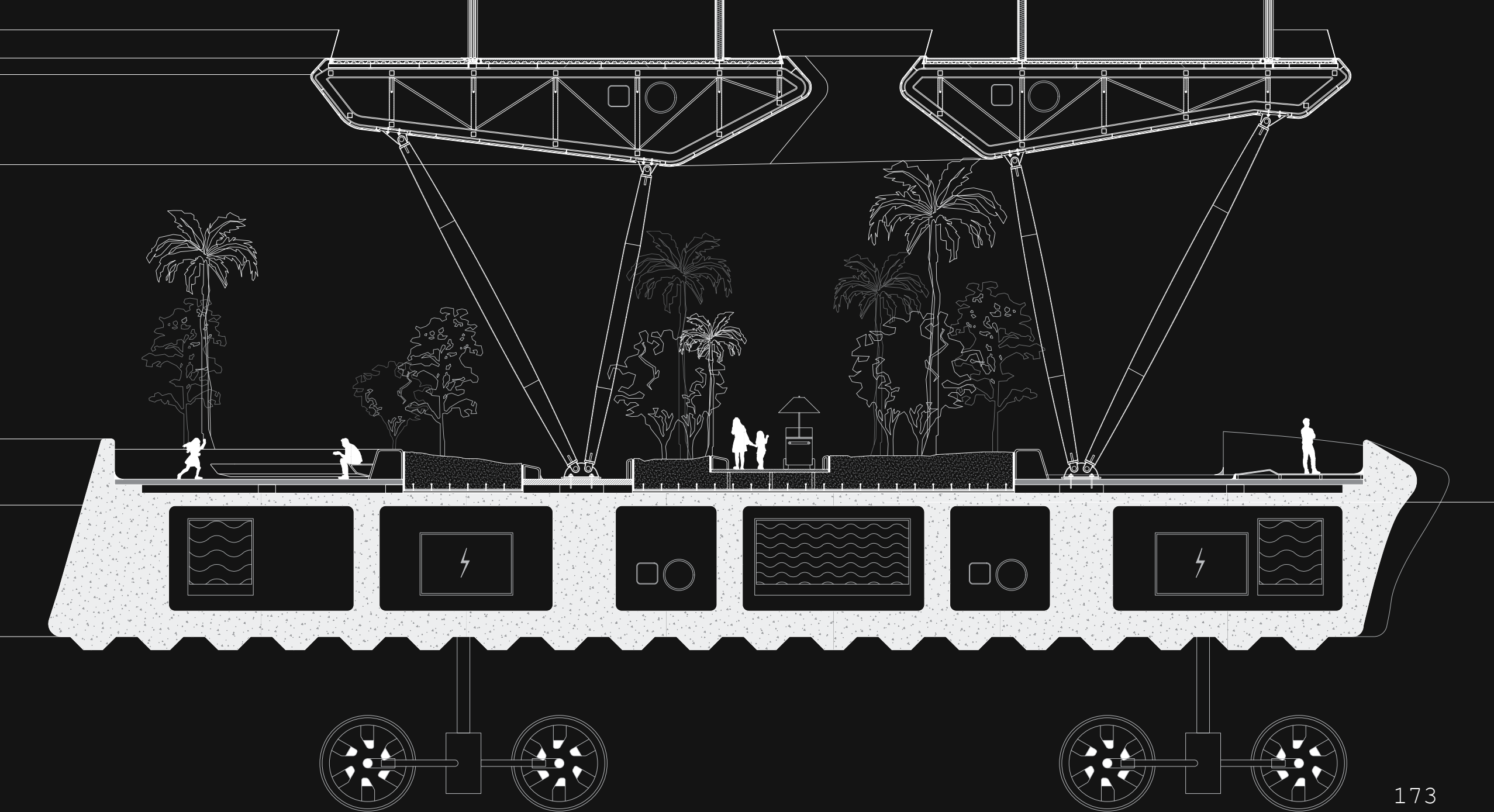






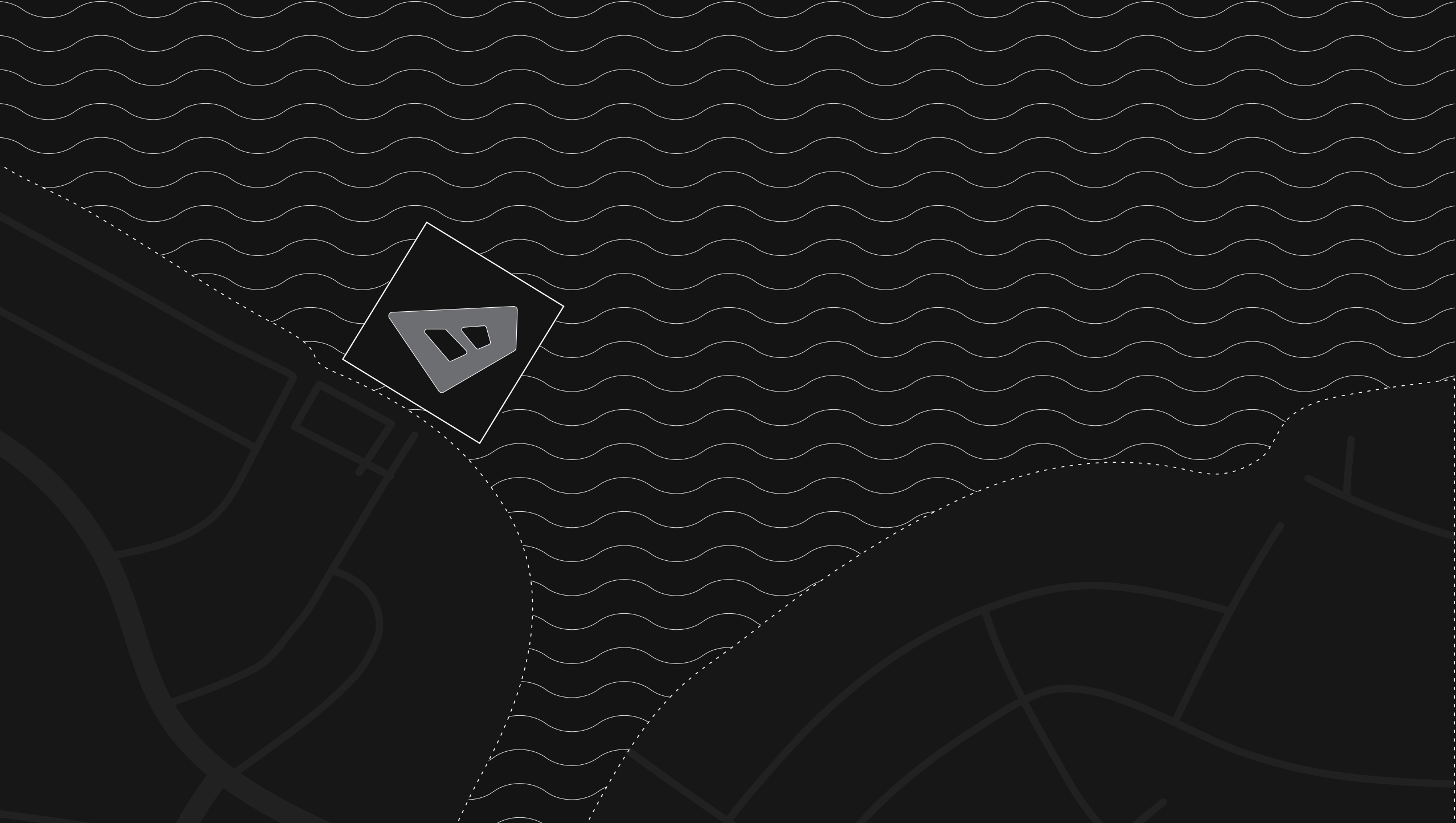


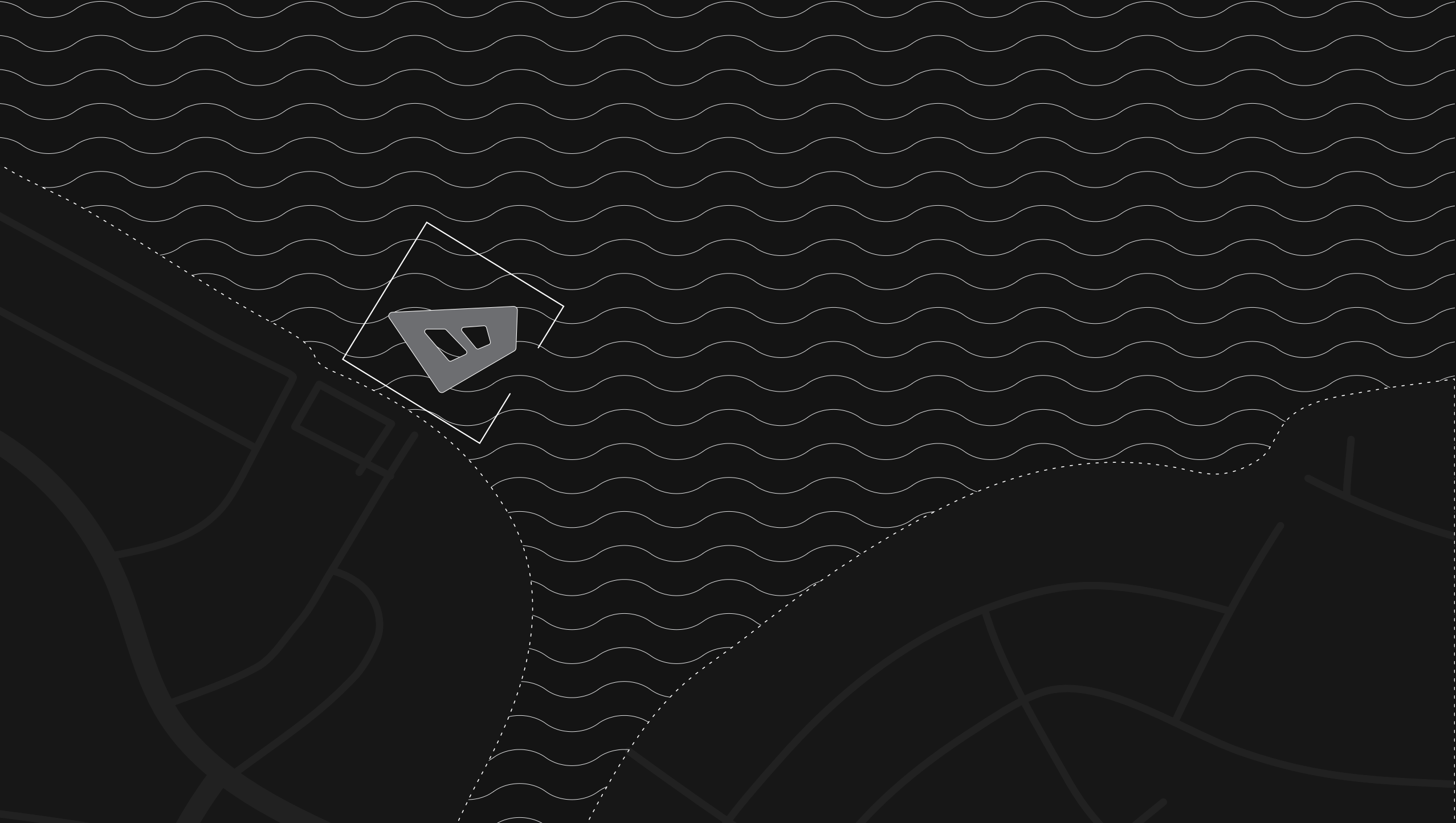
dark glass

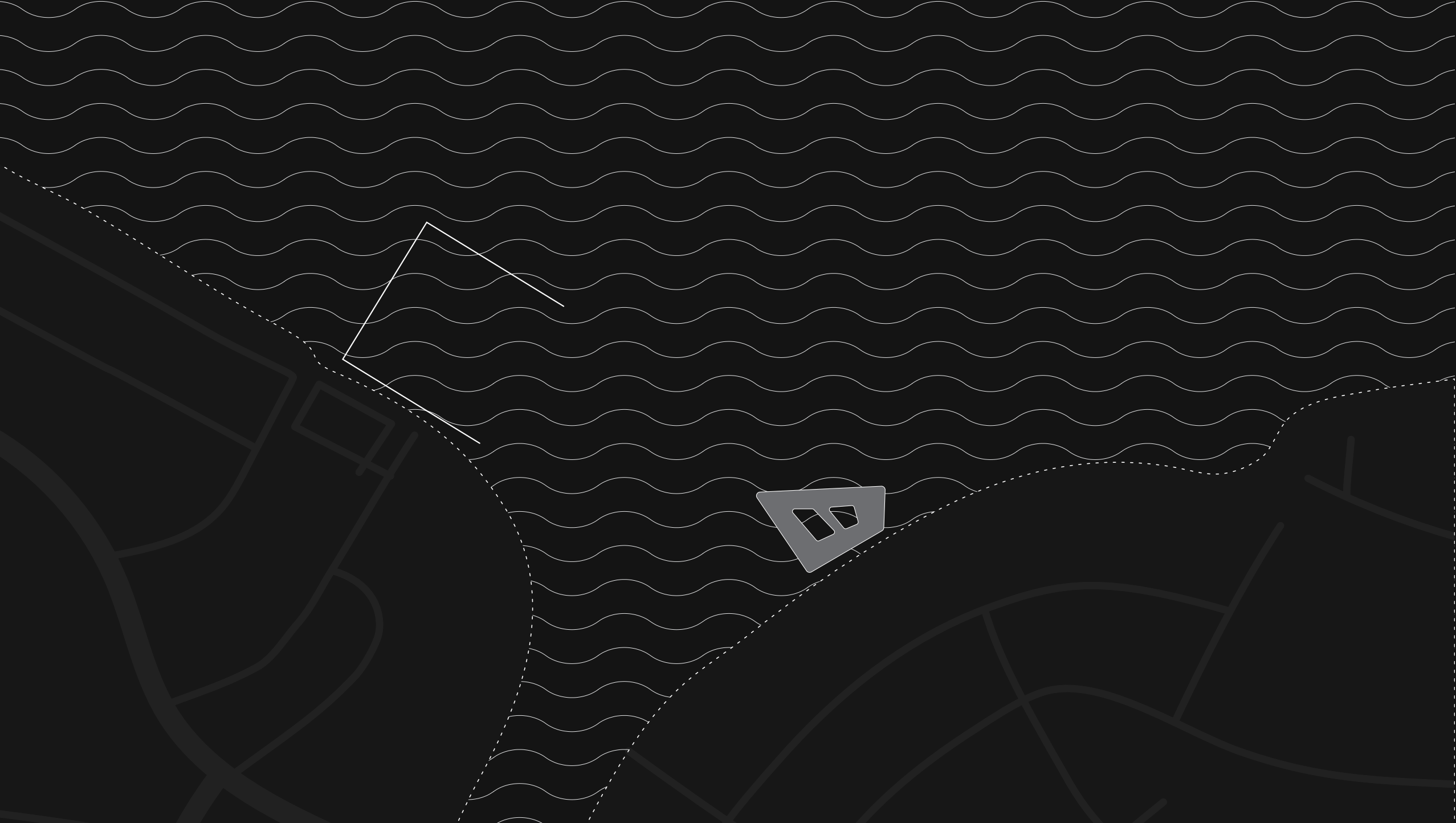


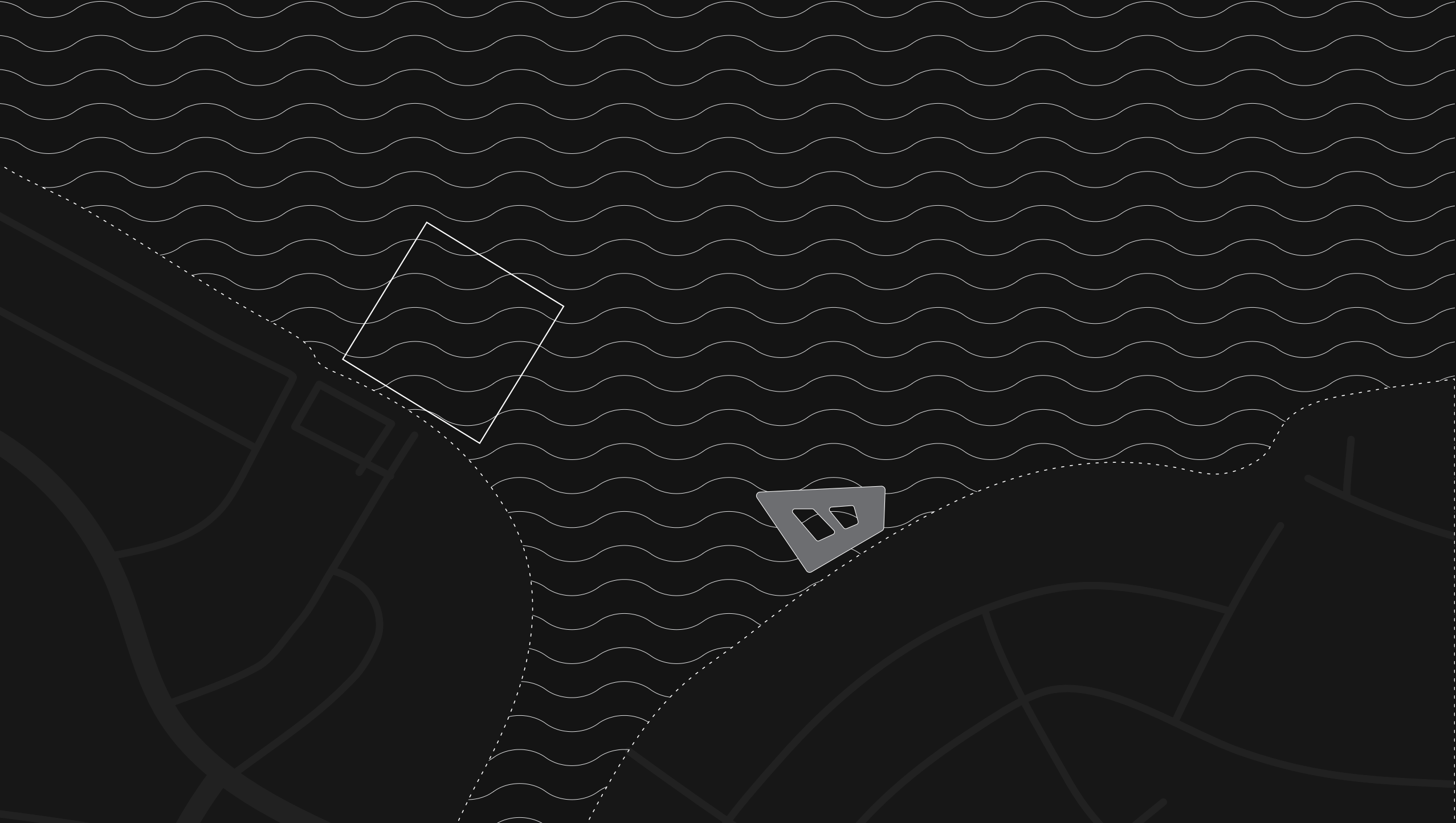




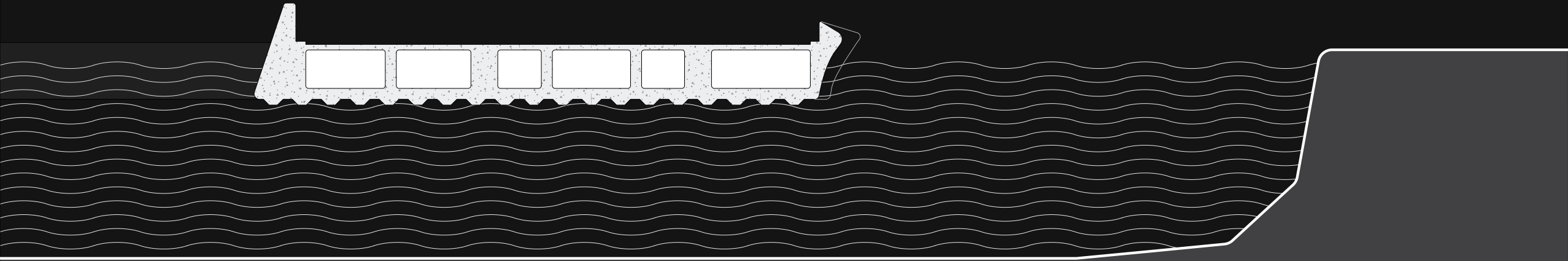




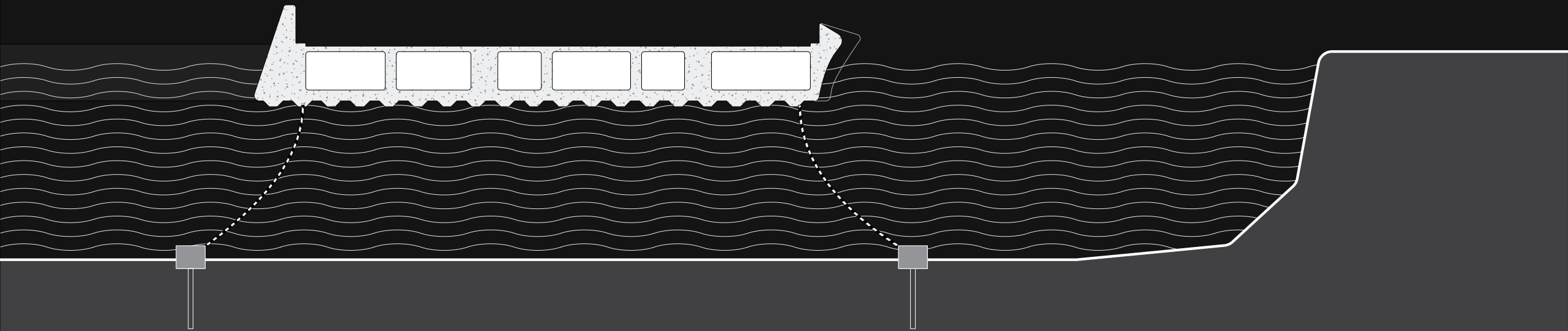




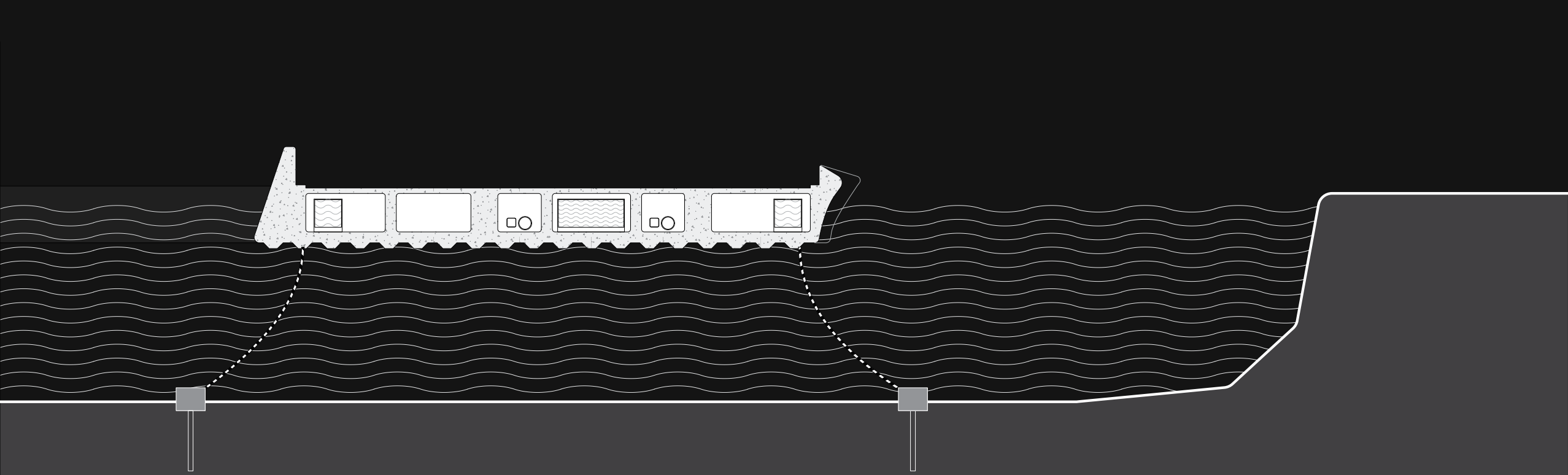
floating structure ribs



cable method



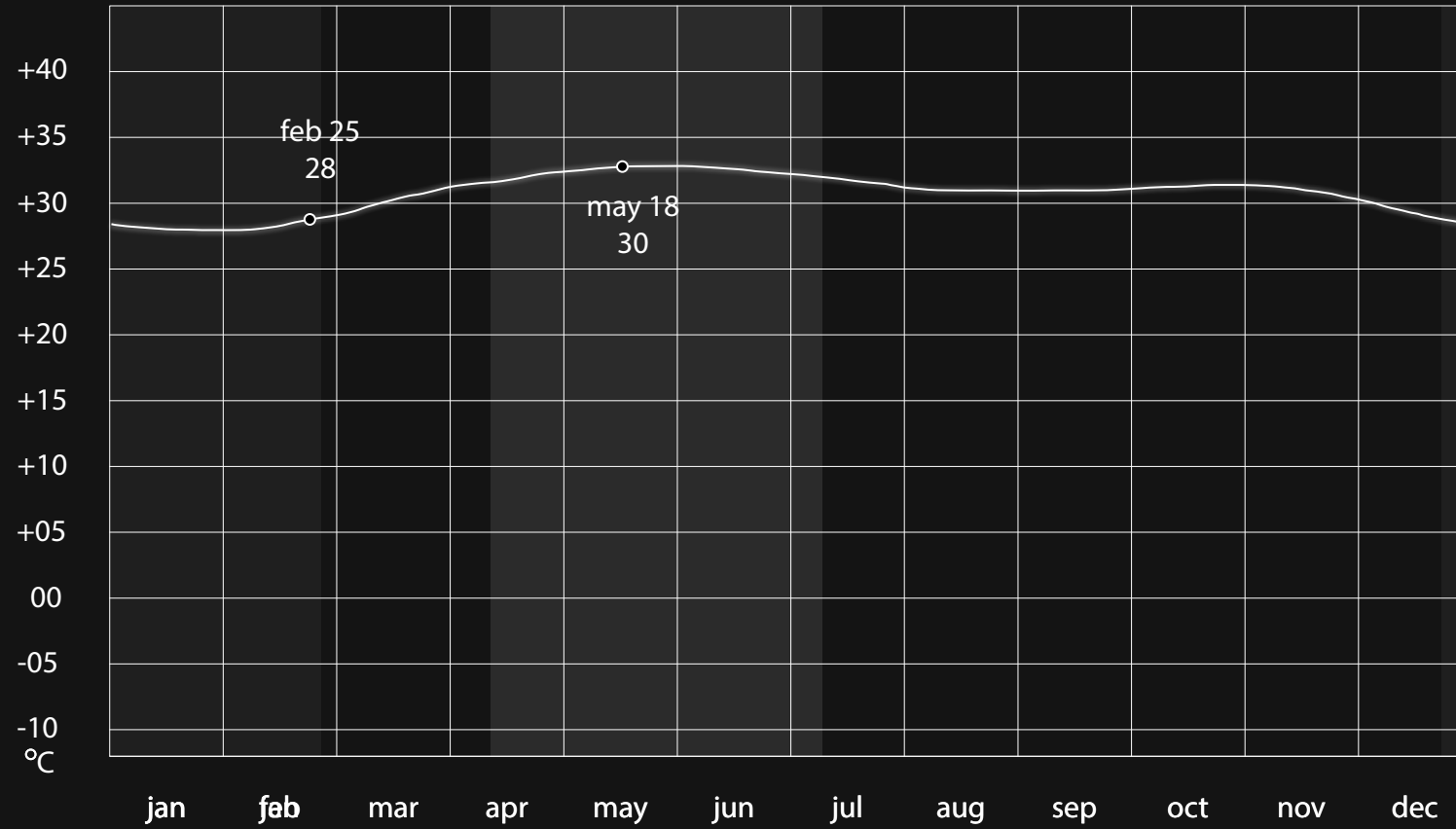
ballast system



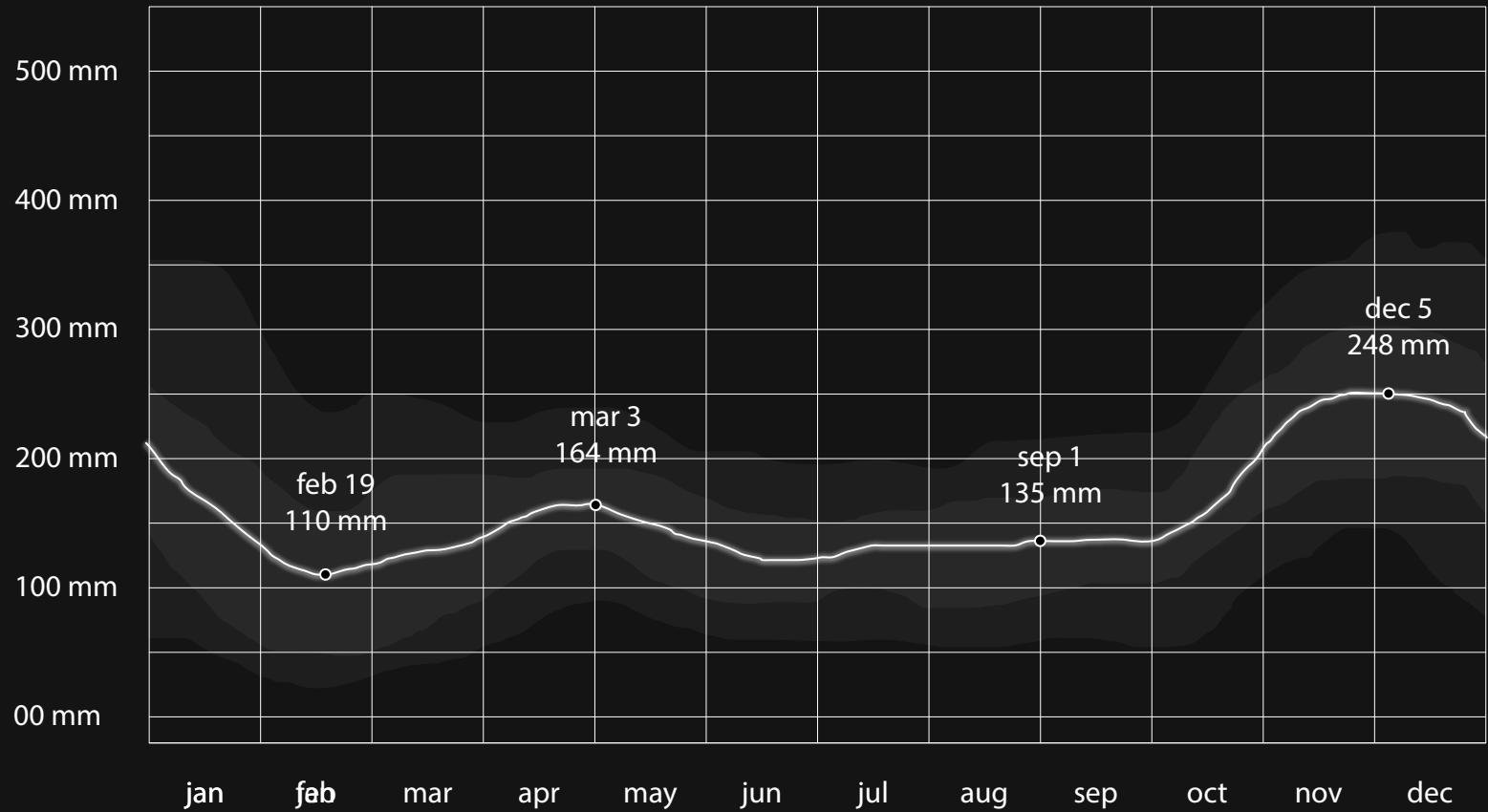
cloud cover categories



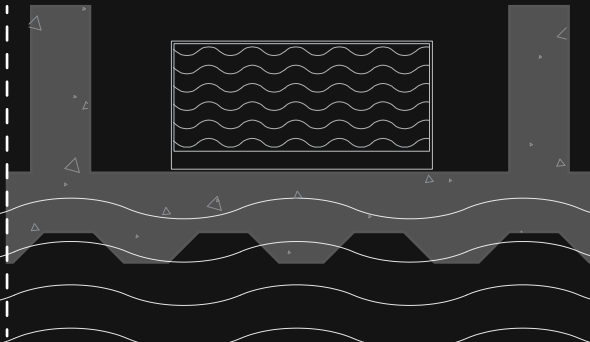
surface water temperature



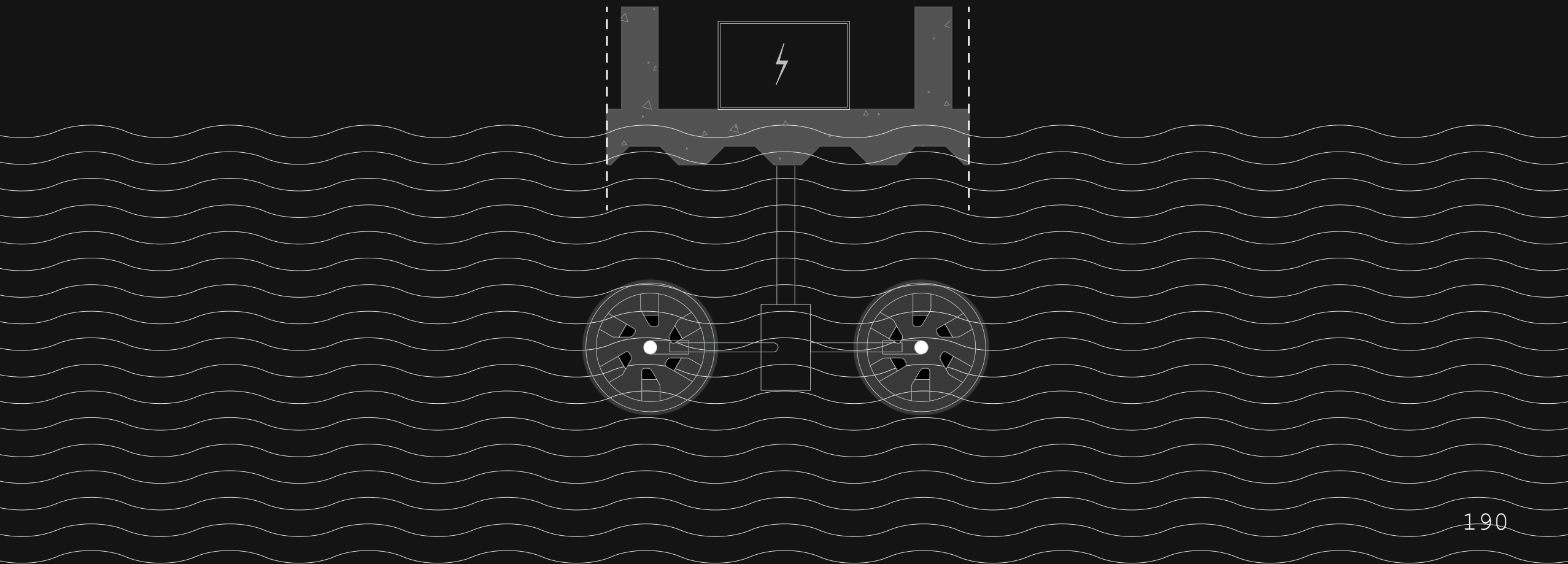
monthly rainfall

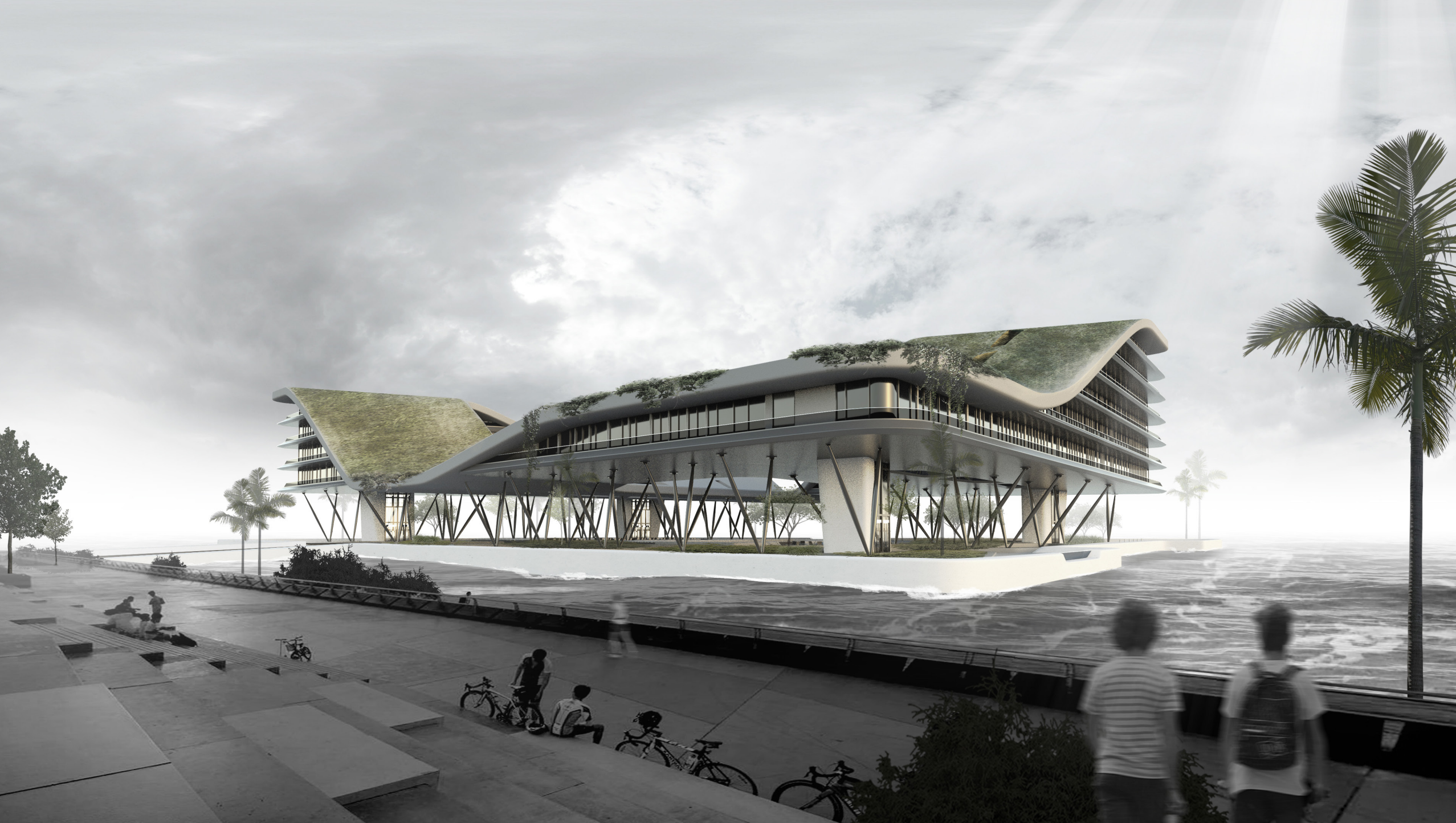


water collection and storage



water flow energy collector





DELFT OUTLOOK

By Christian Jongeneel
October 2018

How to build a million new homes

Last spring, Minister of Foreign Affairs Kaja Ollongren suggested that the Netherlands will need a million new homes by 2030. That sounds like a lot, but it isn't really. The important question is: what types of homes? We mustn't repeat the mistake of building endless series of exactly the same homes, says Prof. Dick van Gameren, Professor of Dwelling at TU Delft.

Dick van Gameren has just returned from India, where he leads a housing design studio for students of KRVA, an architecture degree programme at the University of Mumbai. The Architecture department of the Faculty of Architecture and the Built Environment has formed a partnership with this school and Van Gameren will be visiting there shortly with a group of TU Delft students.



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Australia faces critical housing shortage

THU, APR 07, 2016 - 5:50 AM

TONY CRABB



AUSTRALIA'S population growth is among the strongest and most rapid in the world, resulting in an increasing demand for residential property, retail goods and business

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BREAKING NEWS

- 12:23 AM **Police crack down on drunken Danes riding electric scooters**
- 12:10 AM **BNP takes advantage of Deutsche Bank revamp with equities deal**
- 11:59 PM **US consumer inflation outlook rises for 1st time in 3 months**
- 11:45 PM **Ethiopia to send 50,000 workers to UAE**
- 11:25 PM **US financier Jeffrey Epstein charged with sex trafficking**
- 11:10 PM **Philippine who? Julius Baer surprises with**

How to build a million new homes

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News > World > Europe

The death of Venice: Corrupt officials, mass tourism and soaring property prices have stifled life in the city

In 30 years the city has lost half its fixed population. Now, says Winston Ross, La Serenissima is hellish by day and empty by night

Winston Ross | Thursday 14 May 2015 20:00 | 20 comments

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Australia faces critical housing shortage

© THU APR 05 2016 - 5:00 AM

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Australian commercial real estate is valued at **A\$0.7 trillion**

Sydney will need to build **623,850** homes over the next 20 years

REUTERS/ANDREW HARRIS

15/04/2016

There was an 8.79% increase in Sydney's unit prices in the year ending February 2016

Australian commercial real estate is valued at **A\$0.5 trillion**

15/04/2016

In 2015, offshore investors spent **A\$11 billion** on commercial property

15/04/2016

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12:10 PM British police seize drugs from a car

AUSTRALIA'S population growth is among the strongest and most rapid in the world, resulting in an increasing demand for residential property, retail goods and business

How to build a million new
homes

NYC AFFORDABLE HOUSING NEWS NYC RENTAL MARKET REPORTS

NYC's housing crisis accelerating as low-rent apartment stock declines: report

A new report from Comptroller Scott Stringer reveal that the city's stock of low-rent apartments continue to diminish

By Ameena Walker | Sep 26, 2018, 11:14am EDT

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The death of Venice: Corrupt officials, mass tourism and soaring property have stifled life in the city

lost half its fixed population. Now, says Winston Ross, La Serenissima is in a fight

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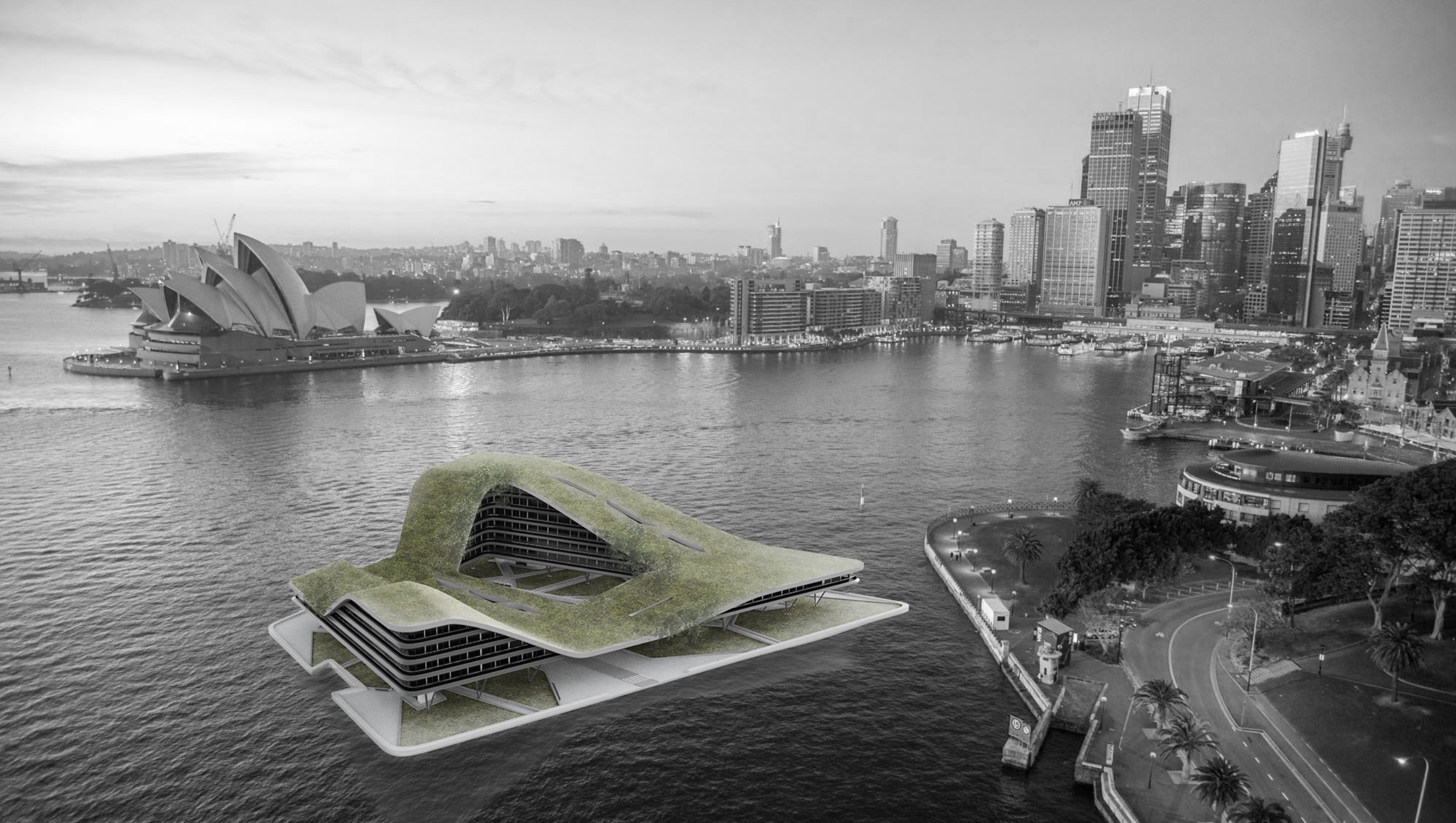
AUSTRALIA'S population growth is among the strongest and most rapid in the world, resulting in an increasing demand for residential property, retail goods and business

10:45 PM Ethiopia to send 50,000 workers to UAE

11:25 PM US financier Jeffrey Epstein charged with sex trafficking

1:00 PM British police have found a new drug





the anti-capsule -
"on its own it is a capsule, but only
because it is a fragment of a network"



Archimedes' principle:

the ***upward buoyant force*** that is exerted on a body immersed in a fluid, is equal to the ***weight*** of the fluid that the body displaces and acts in the upward direction at the center of mass of the displaced fluid.

step 01

> get some numbers in order

storey	wing A m2	wing B m2	total m2
floating storey			11500
roof storey			7500
1	4040	1920	
2	3050	1060	
3	2050	815	
4	2000	570	
5	1250		
6	1175		
dwellinglevels (10)	13565	4365	17930

floating storey (1)		kN/m2		TOTAL kN
areas open to large crowds	5,0	7,0	6,5	
services and installations			0,15	
imposed load	1,5	3,0	2,5	
ceilings			0,15	
allowance movable partitions	0,5	1,2	1,2	
concrete (400 mm thick)			12	
		total	22,5	258750

cars (6 cars of 19 kN) 114

roof storey (1)			
roofs subject to imposed loads	0,4	0,6	1,2
services and installations			0,15
steelwork (medium high building) 6-12 storeys	0,3	0,6	0,45
façade walls and internal finishes	5,0	8,5	5,5
		total	7,3
			54750

KN total	KG
308459,5	31443374

	average min	average max	kN/m2	
dwelling storey (4+6 = 10 total)				
imposed load	1,5	3,0	2,5	
allowance movable partitions	0,5	1,2	1,2	
composite slab	2,8	3,5	3,2	
services and installations			0,15	
ceilings			0,15	
steelwork (medium high building) 6-12 storeys	0,3	0,6	0,45	
façade walls and internal finishes	5,0	8,5	6,5	
		Total	14,15	253709,5

567209,5

temperature	saliniteit	density kg/m3
0°C	0	999,9
0°C	20	1016,1
0°C	35	1028,1
10°C	35	1027
20°C	35	1024,8
30°C	35	1021,7

concrete	2300
steel	7850

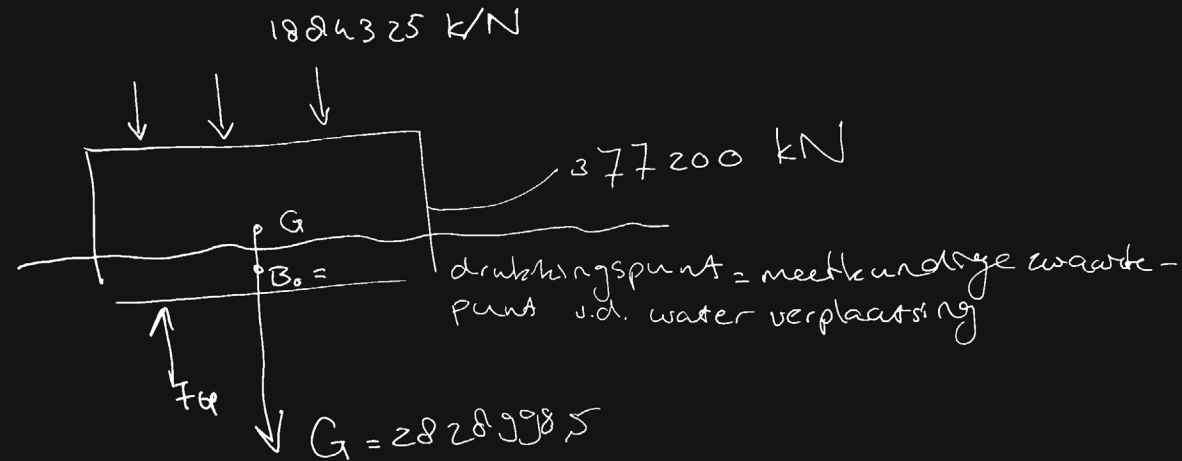
a steel framed structure is up to 30% lighter than the equivalent concrete building

step 02

> calculate the bouyancy force with ONLY the floating platform



$$F_{op} = V_{verplaatste\ stof} \cdot \rho_{(vloerstof)} \cdot g$$



$$\rho \cdot V_{disp} \cdot g - \rho_{concrete} \cdot V_{conc} \cdot g = m_p \cdot g$$

$$B_{water} = W_{concrete} - N_{top} = 0$$

$$m \cdot g = m_{pin} \cdot g + m_{con} \cdot g$$

$$F_{op} = 34500 \cdot 1021,7 \cdot g \cdot 0,81$$

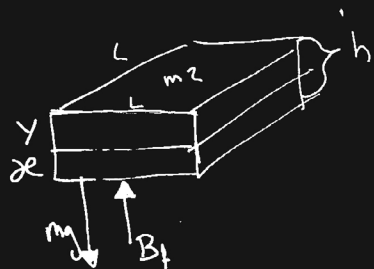
$$\boxed{F_{op} = 34523700 \text{ kN}}$$

density water 1021,7

Buoyancy force

if $\rho_{\text{object}} < \rho_{\text{liquid}}$ the object will float

$$\rho = \frac{m}{V} \Rightarrow m = \rho V$$



if $mg < Bf \Rightarrow \text{floating}$

$x = ?$

$$Bf = \text{Weight displaced liquid} = m \cdot g = \rho V g$$

↖ portion submerged
↘ liquid

$$Bf = W_{\text{object}} = m \cdot g = \rho V g$$

↖ volume object
↘ density object.

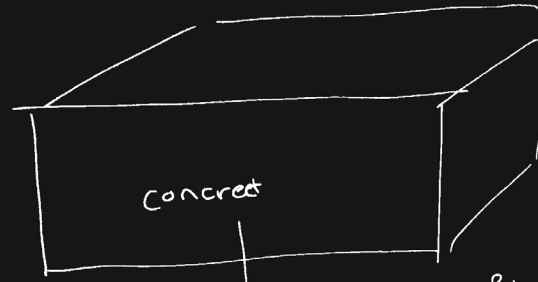
$$Bf = W_{\text{displiq}} = W_{\text{object}}$$

$$\rho_L \cdot V_L \cdot g = \rho_{\text{obj}} \cdot V_{\text{obj}} \cdot g$$

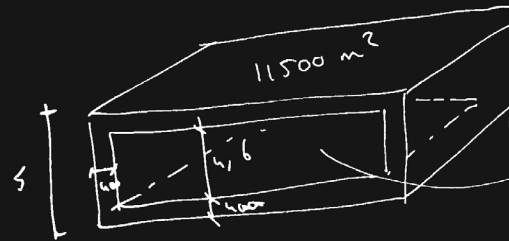
$$\rho_L (L^2 x) = \rho_{\text{obj}} L^2 h$$

$$x = h \left(\frac{\rho_{\text{obj}}}{\rho_L} \right)$$

$$\rho_{\text{liquid}} = 1021,7 \text{ kg/m}^3$$



$$\rho_{\text{concrete}} > \rho_{\text{liquid}} = \underline{\text{no floating}}$$



$$10800 \text{ m}^2 \cdot 4,6 = 49680 \text{ m}^3 \text{ lucht}$$

$$11500 \text{ m}^2 \cdot 5 = 57500 \text{ m}^3 \text{ totaal}$$

$$7820 \text{ m}^3 \text{ concrete}$$

$$V_{\text{concrete}} \cdot \rho + V_{\text{lucht}} \cdot \rho = V_{\text{totaal}} \cdot \rho_{\text{totaal}}$$

$$7820 \cdot \rho_{\text{concrete}} + 49680 \cdot \rho_{\text{lucht}} = 57500 \cdot \rho_{\text{totaal}}$$

$$18768000 + 64236 = 57500 \cdot \rho_{\text{totaal}}$$

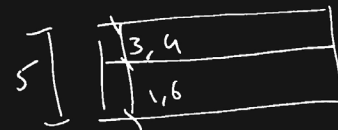
$$\rho_{\text{totaal}} = 327,5$$

$$\rho_L (11500 \cdot x) = \rho_{\text{object}} \cdot V_{\text{object}}$$

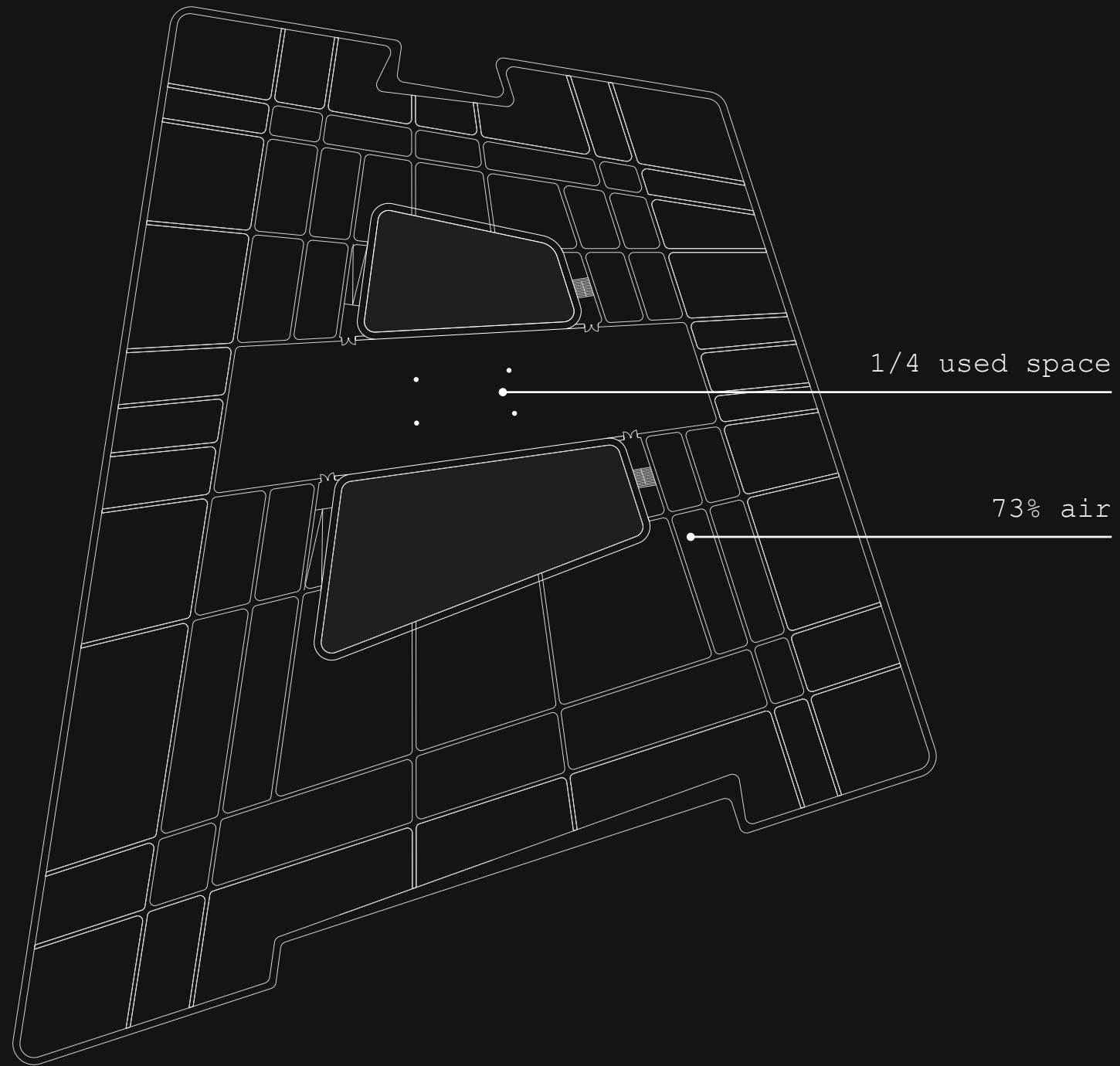
$$x = h \left(\frac{\rho_{\text{object}}}{\rho_{\text{liquid}}} \right)$$

$$x = h \cdot 0,32$$

$$x = 1,6$$

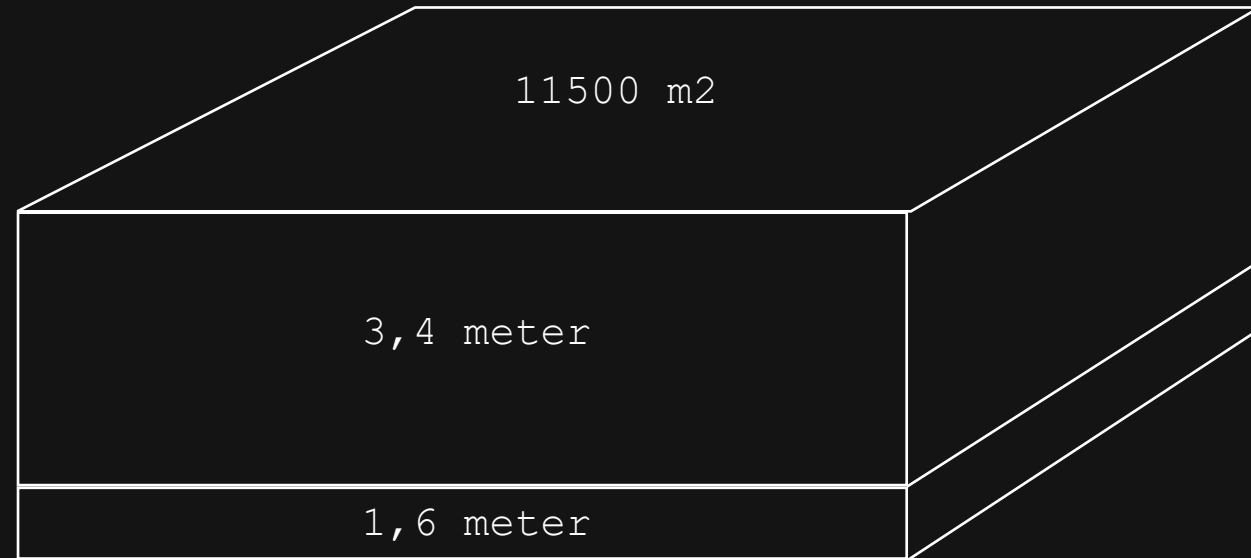


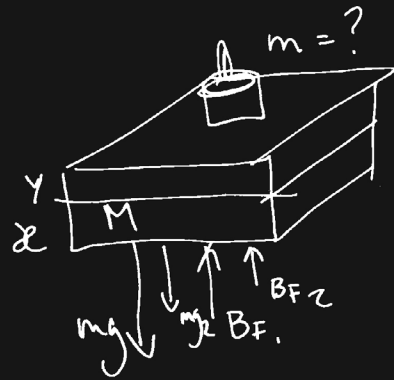
30%!!!



step 02

> calculate how much extra weight the platform can carry without sinking





$$\rho = \frac{m}{V} \Rightarrow m = \rho V$$

$$W_{\text{object}} = mg = B_{Fz} = W_{\text{additional liquid displaced}}$$

$$= mg_{AL}$$

$$= \rho V g_{AL}$$

$$= \rho_L (\Delta V)_{AL} \cdot g$$

$$mg_{\text{object}} = \rho_L (L^2 y)$$

$$m = \rho_L \Delta V_{\text{sub}}$$

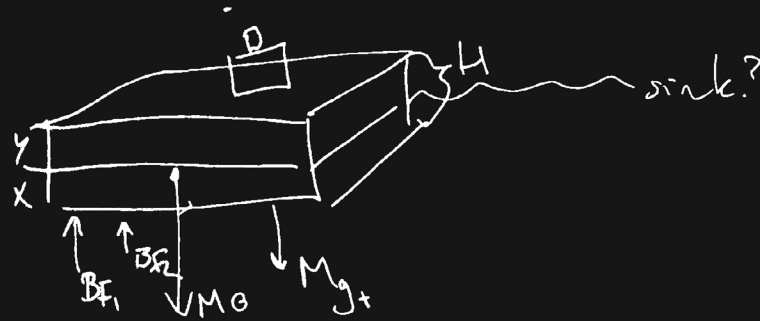
$$m = \rho_L (L^2 y)$$

$$m = \rho_L (11500 \cdot 3,4)$$

$$m = 1021,7 (11300 \cdot 3,4) = 39948470$$

maximum extra weight

$$31443374 \text{ — what we need?}$$



$$\rho_L (11500 \cdot x) = \rho_{\text{object}} \cdot \text{Volume object}$$

$$x = h \cdot \left(\frac{\rho_{\text{object}}}{\rho_{\text{liquid}}} \right)$$

$$x = h \cdot 0,34$$

$$x = 1,6$$

$$m = \rho_L (11500 \cdot 3,4)$$

$$m = (1021,7 (11500 \cdot 3,4)) = 39548470$$

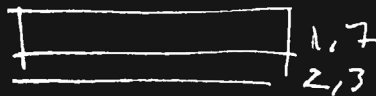
$$m = 1021,7 (11500 \cdot g)$$

$$m = 1021,7 (11500 \cdot 1,7)$$

$$m = 19574235 \text{ kgf}$$

$$2306098 = \Delta V_{\text{sub}}$$

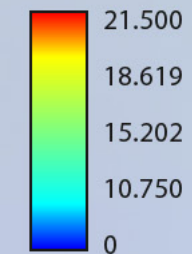
$$W_{\text{object}} = mg = B_{F2} = \text{weight additional liquid displaced.}$$



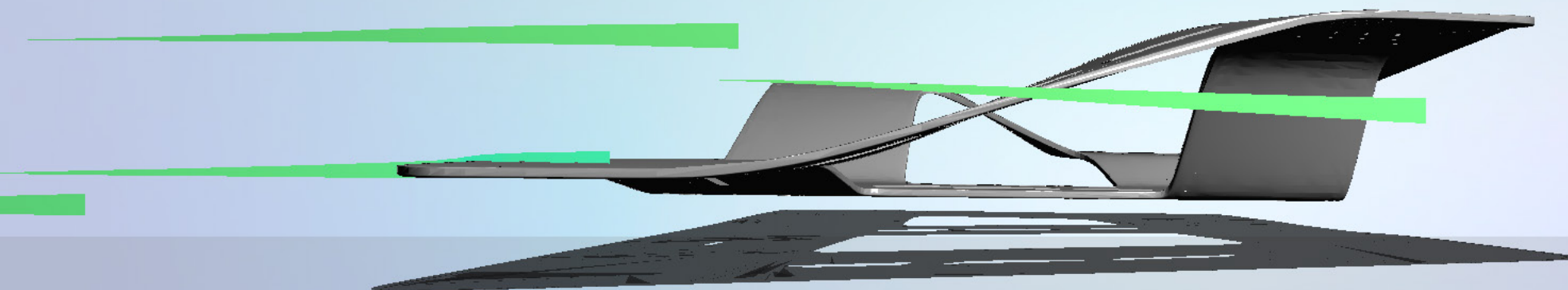
$$\rightarrow 2013780$$

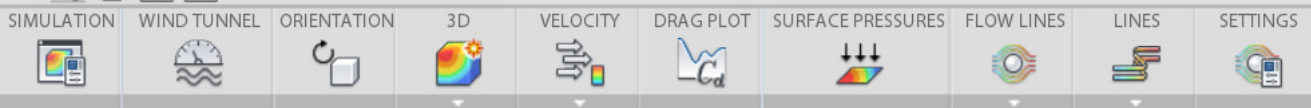


Velocity (m/s)

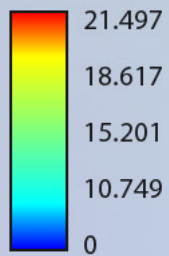


Status: **Transient**
 Analysis: 3D
 Wind Speed: 10.000 (m/s)
 Length: 0.247 (m)
 Width: 0.049 (m)
 Height: 0.077 (m)
 Voxel size: 0.001 (m)

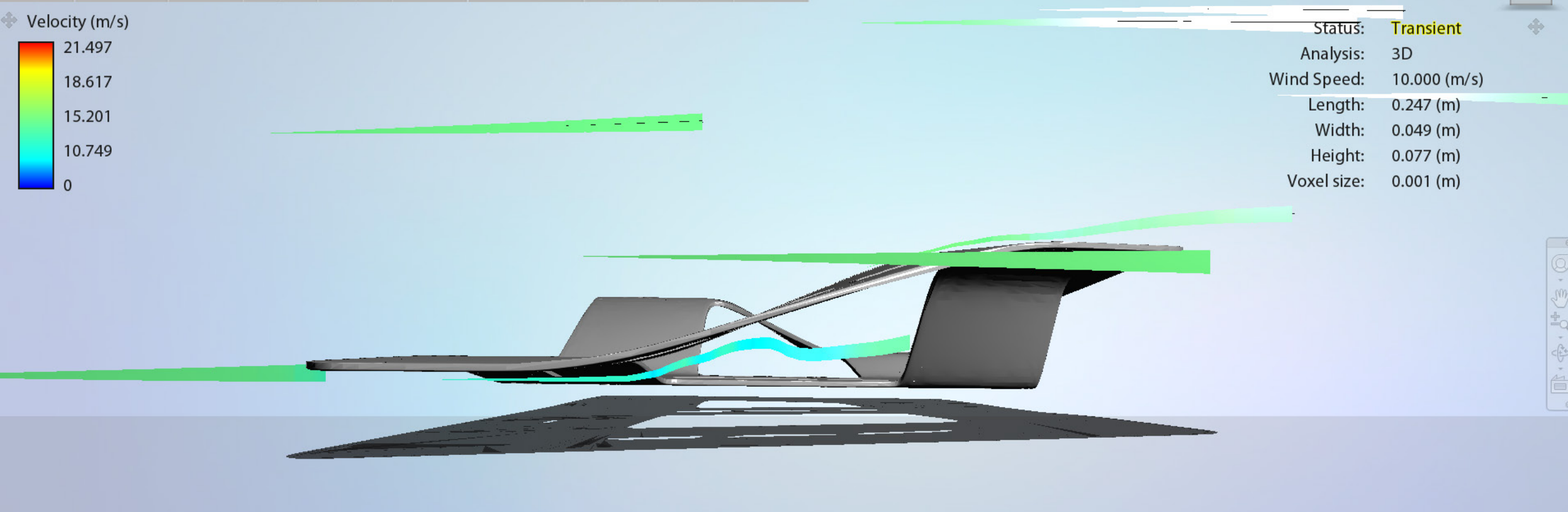


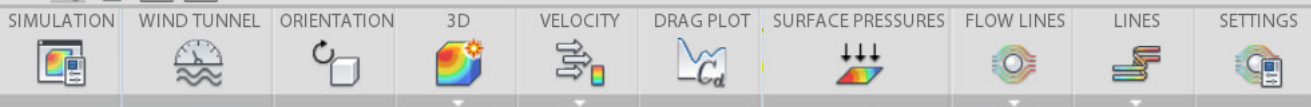


Velocity (m/s)

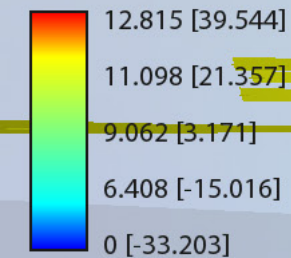


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 Height: 0.077 (m)
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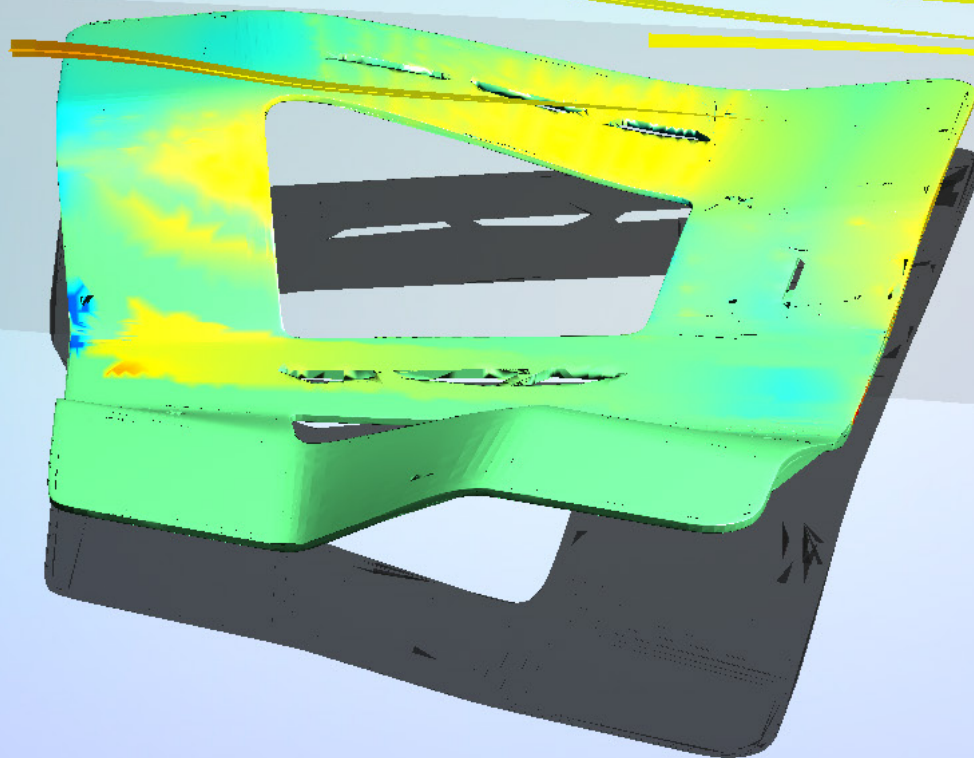




Velocity (m/s) [Pressure (Pa)]



Status: **Transient**
 Analysis: 3D
 Wind Speed: 10.000 (m/s)
 Length: 0.247 (m)
 Width: 0.049 (m)
 Height: 0.077 (m)
 Voxel size: 0.001 (m)



NORTHSHORE PUNGGOL REGION

Punggol region (50ha area)	Nothshore	Field	Matilda
Density	5.700	48.380	47.930

	total	years	yearly growth
Dwelling units	18.000	6	3.000

	units	blocks	stores	available rooms	units/blok	blok/building	units/building
Waterfront I and II 2020	1.700		12	2,3,4,5, 3 gen*	141,7		566,7
Waterfront I	1.832		12 15-25	2,3,4			4
Waterfront II	1.694		14 8-26	2,3,4,5, 3 gen			5

3 gen* = multigenerational living

	1 room	2 rooms	3 rooms	4 rooms	5 rooms	3 gen	total	average	total numbers
HDB type of dwellings	5,1%	8,3%	16,2%	42,2%	22,6%	5,6%	100,0%	-	units 400
Square meters	35	45	72	109	115	120	-	82,666667	total sqare meters 38356,8
Total square meters 100 units	178,5	373,5	1166,4	4599,8	2599	672	9589,2	-	

Price house Singaporean dollars	20.000	28.000	132.000	197.000	354.000	249.000
---------------------------------	--------	--------	---------	---------	---------	---------

	Couple + kids	Couple - kids	Lone parents	Living alone	Other	total
Households arrangements	52,9%	16,6%	7,3%	12,0%	11,2%	100%

REGELS Units

Anti-rules	
anti-decentralisation	i
anti-fragmentation	ii
anti-isolation	iii
anti-privatization	iv
anti-simulation	v

SCALE	anti-rule	rule
-------	-----------	------

Archipelagos

<i>routing and connections</i>	ii, iii	by foot, electical bike and step different routes for optimal connection
--------------------------------	---------	---

supplies (stores etc.)
water
drainage
energy
internet

accomodations

Island

<i>connection points</i>	connect each island 3 types of connections
--------------------------	---

on each circle

<i>public space</i>	direct connectors as public space
---------------------	-----------------------------------

<i>communal place</i>	central low place loops
-----------------------	----------------------------

<i>dwellings</i>	groups of dwellings loops of dwelling streets different types of dwellings
------------------	--

Type	description	pros	cons
Islands	each building located own platform or hull connected with hinged joints	maximum freedom movement	less stability protection needed breakwater
Branch	floating structures exist from several houses or buildings structure connected with hinged or rigid joints	intermediate stability	needs protection breakwater
Bay	semi-large structures connected as one larger structure connections are rigid	bay-like experience very stable	different platforms needed many rigid connections needed
Platform	using large structure as cruise ship or oil platform as one unit	buildingshapes not limited by platform very stable	little water experience exposed to waves

Future growth	
ships	cannot be expanded
raised platform	difficult to expand
breakwater	allows growth but expensive
composite structure	allows gradual growth

Movability	
connections	
resistance	
type of transportation	

Movability

connections

resistance

type of transportation

Material platform structure		cons	
steel	easily shaped and curved high tensile strength and easy to repair or modify	high price, and maintenance	
composites	(carbon-, glass, cellulose, Kevlar ,etc.) and a hardened resin (epoxy, polyester, vinyl ester) durable, no maintenance, lightweight and can be stronger than steel	70 kg/m ² price	
concrete	high-pressure strength but a rather low tensile strength usually reinforced with either steel or fibers for floating structures, non-corrosive reinforcements would help in durability and weight cheap and stable both for salt and sweet water!	600 kg/m ²	Verosement

The floating platform will be designed as a hollow box (caisson). Usually, large concrete caissons are compartmentalized with walls, in order to reinforce the structure. Instead of using walls everywhere, a series of ribs can be placed on the floor of the caisson. The ribs will carry the load of the water pressure to the columns, similar to beams that carry the load of a floor. The voids, in between the ribs, may be used for cables and wiring and fitted with insulation material.