

# CUTTING EDGE

ELINE STUBERT

| P5 | July 12th 2018 |





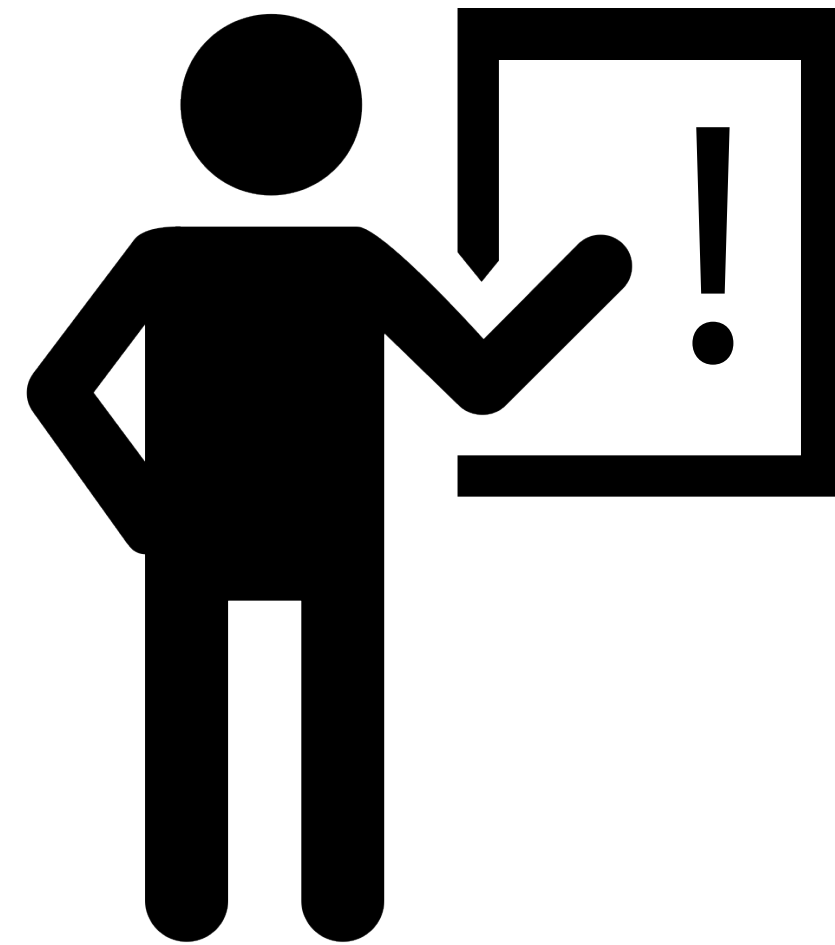
# DEVELOPMENTS

## 1. SPORT PERCEPTION



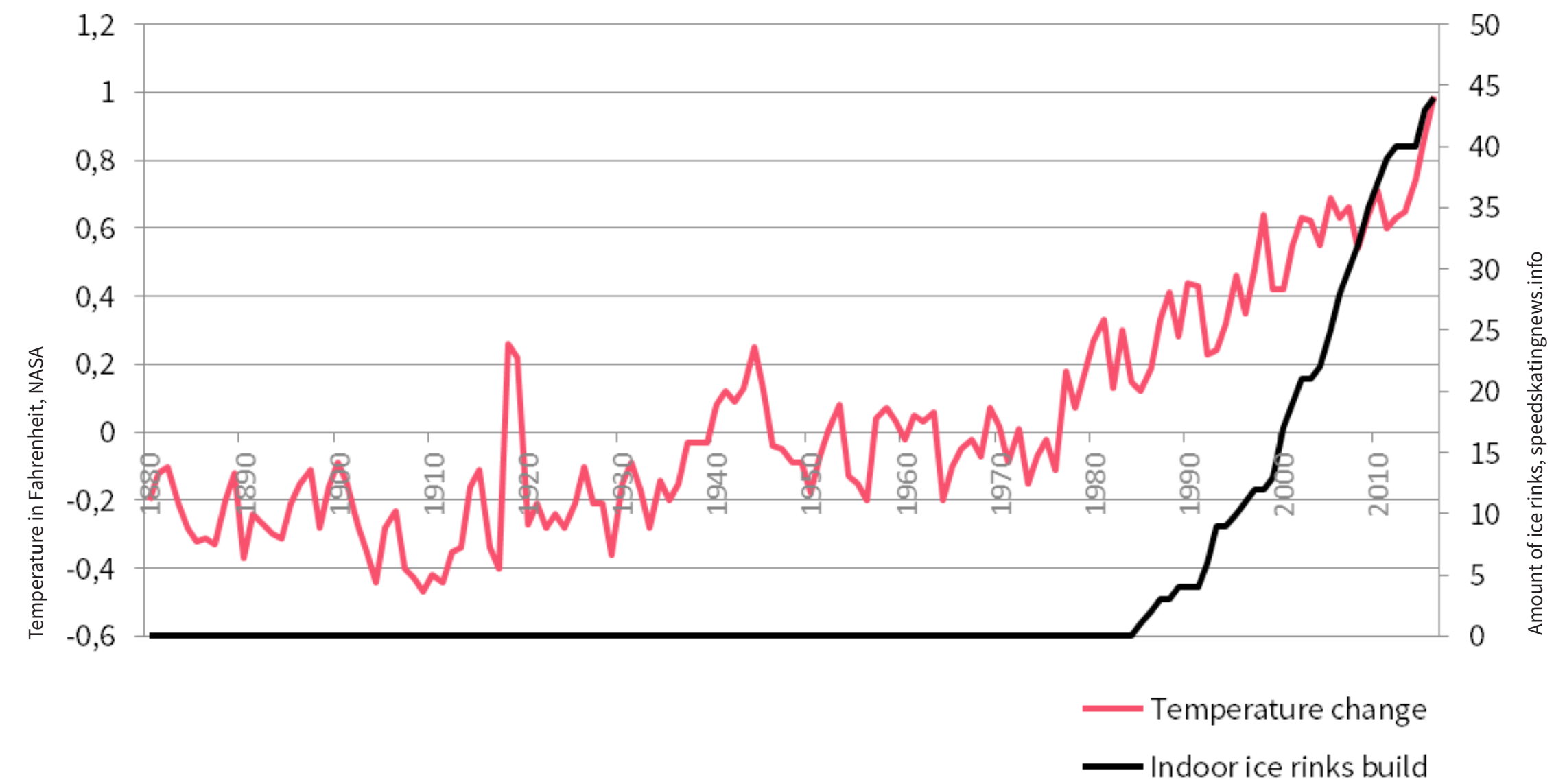
# DEVELOPMENTS

CRITICAL SPORTERS



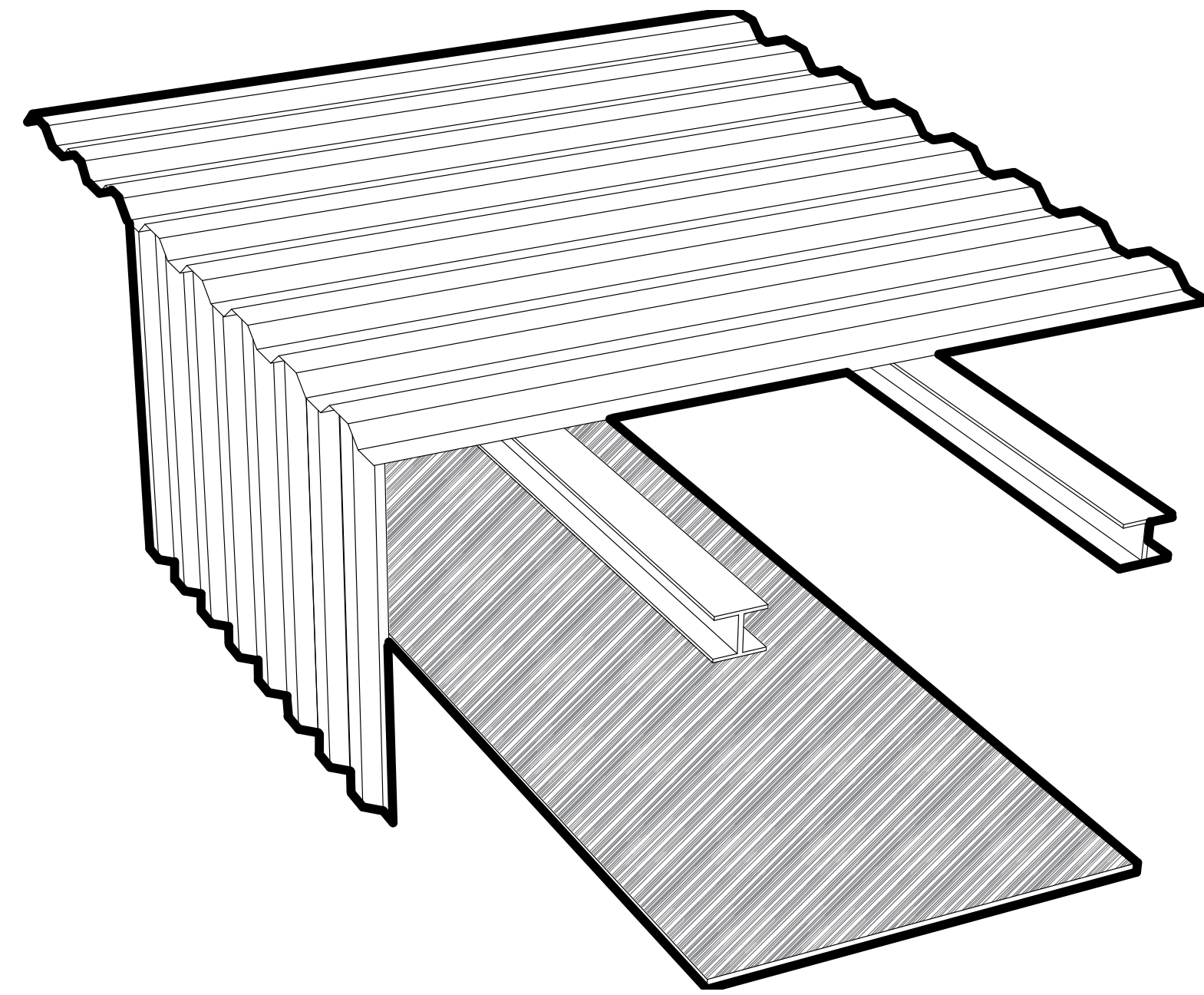
# DEVELOPMENTS

## 2. TRANSITION TOWARDS THE INDOORS



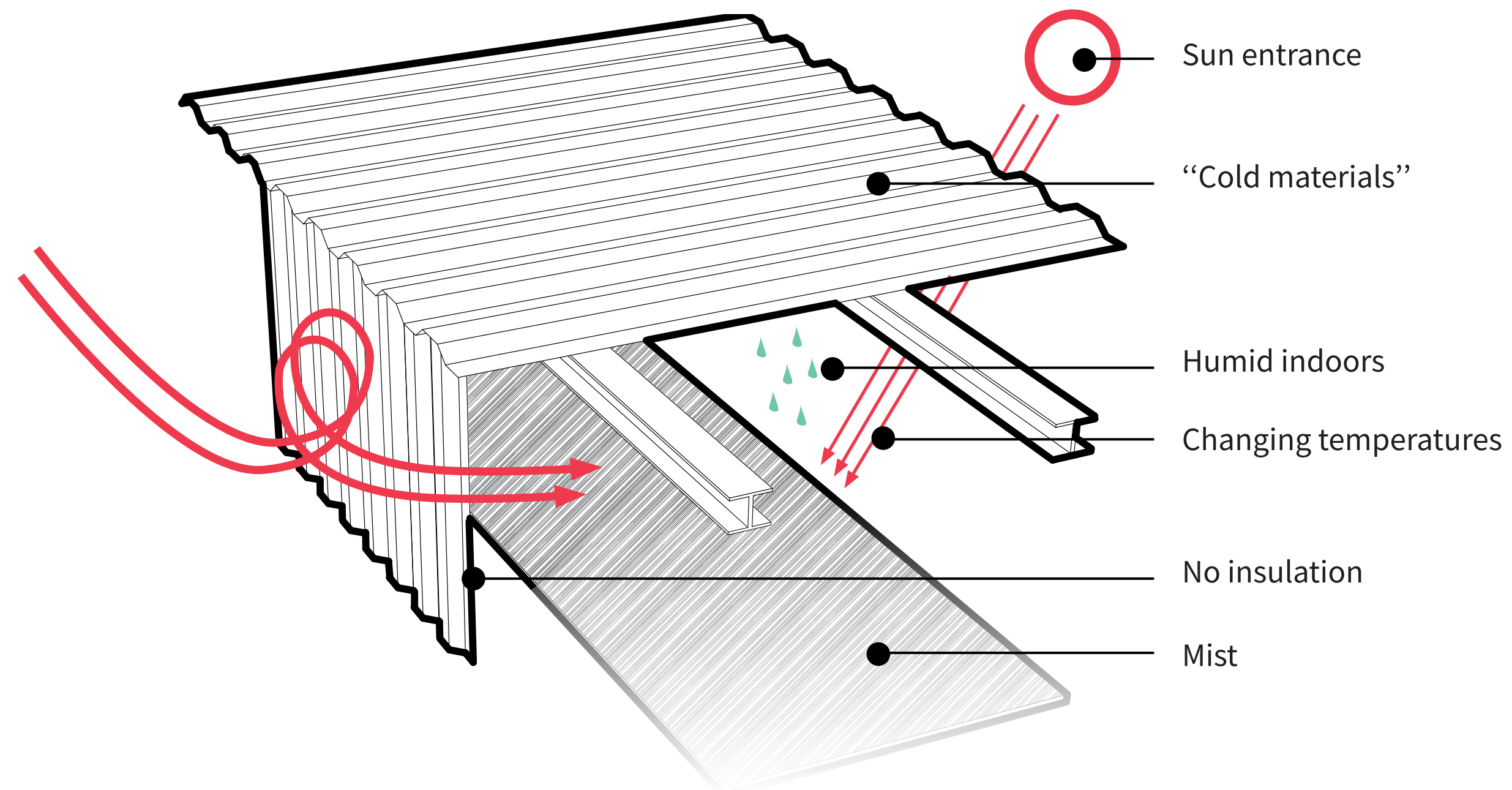
# DEVELOPMENTS

## 2. TRANSITION TOWARDS INDOORS



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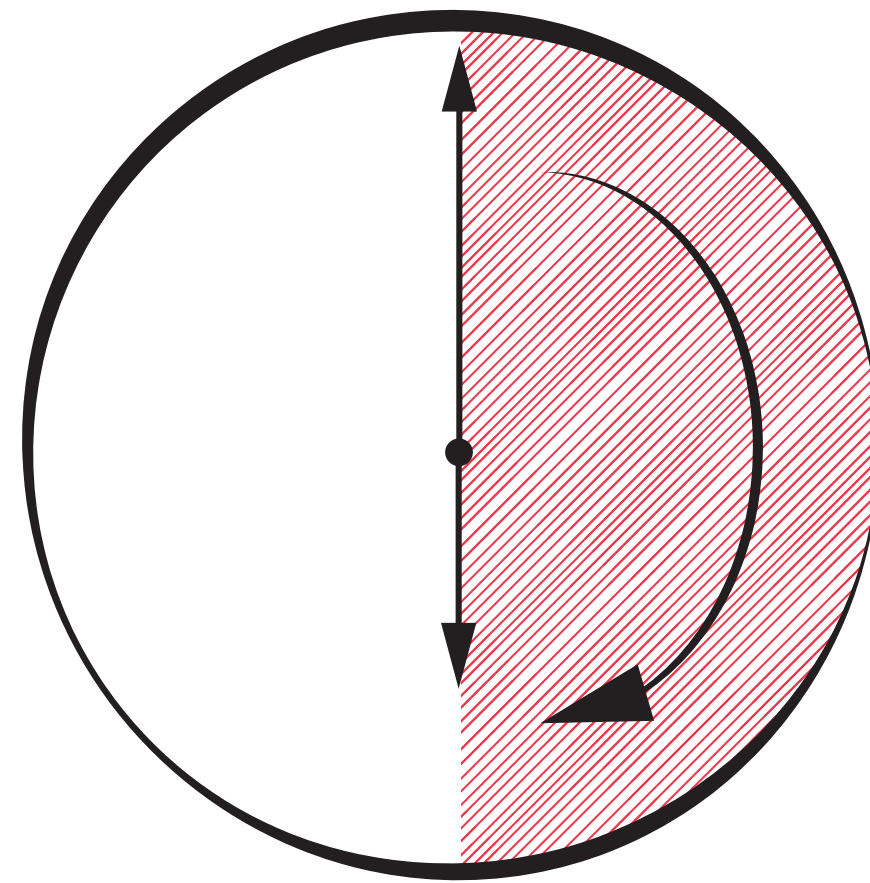
Het is nu heel erg blauw,  
het lijkt wel een ruimteschip...

NOS.nl

Reputation of 'cold' appearance

# DEVELOPMENTS

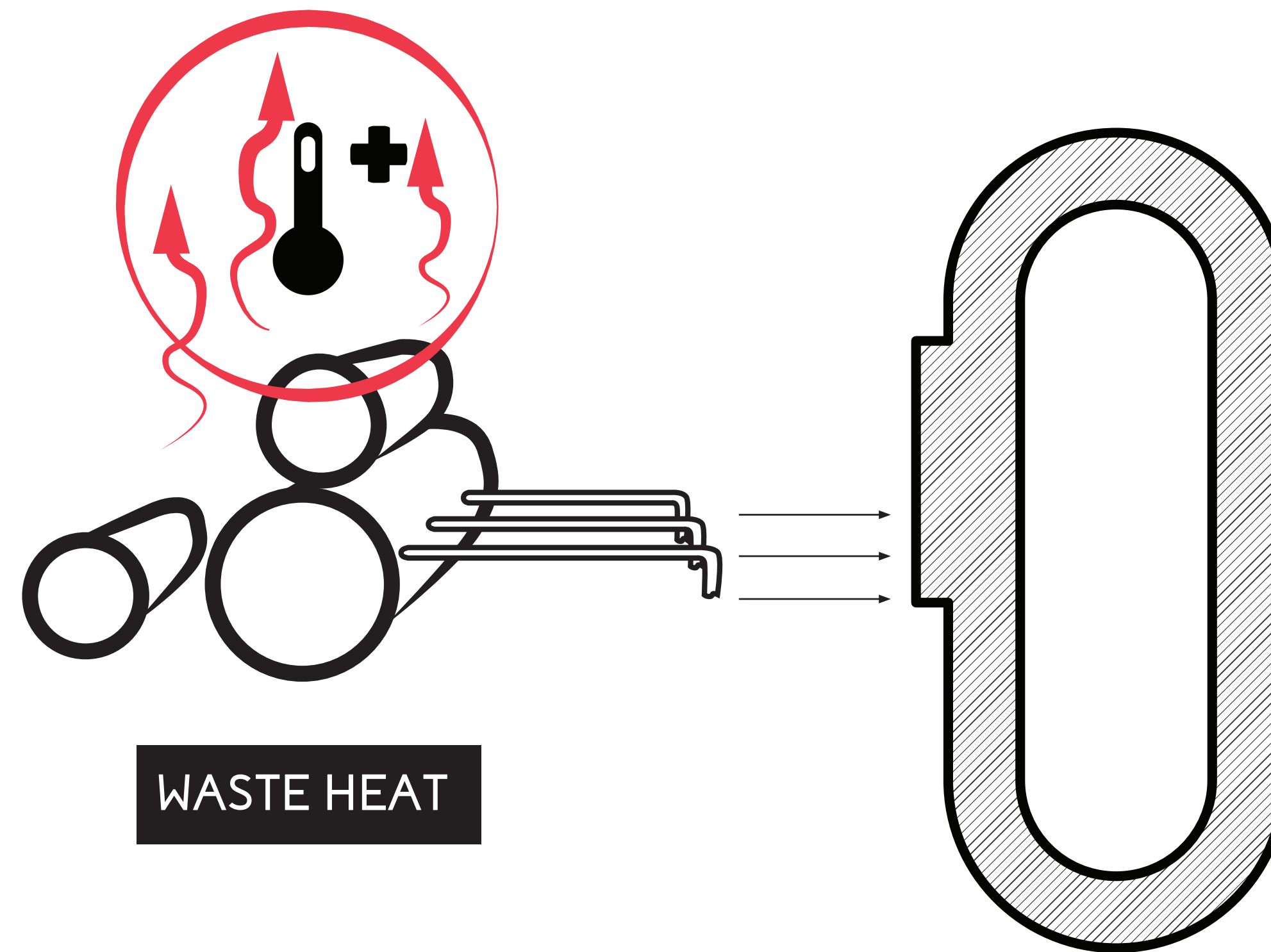
## 3. SEASON SPECIFIC BUILDING

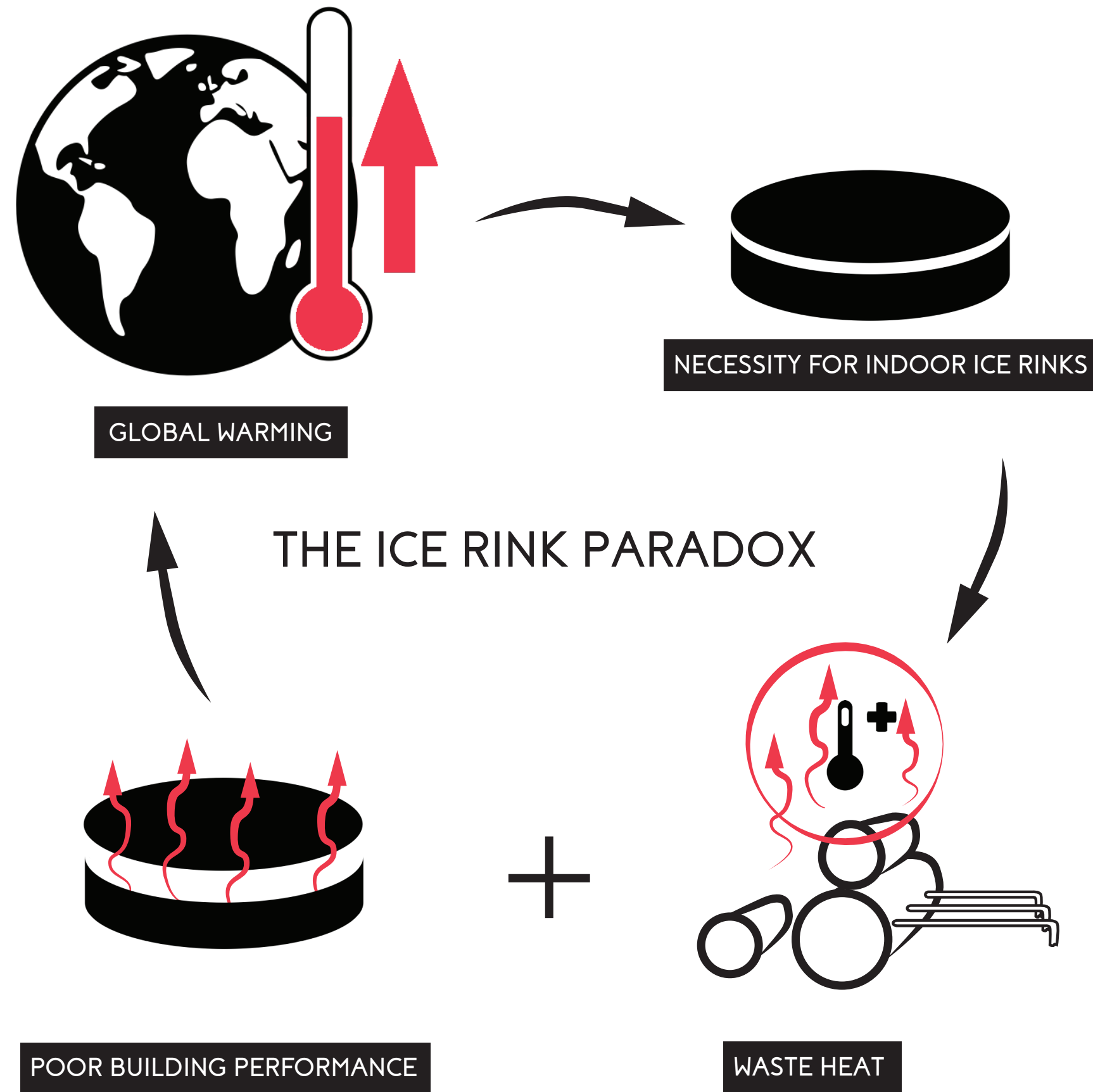


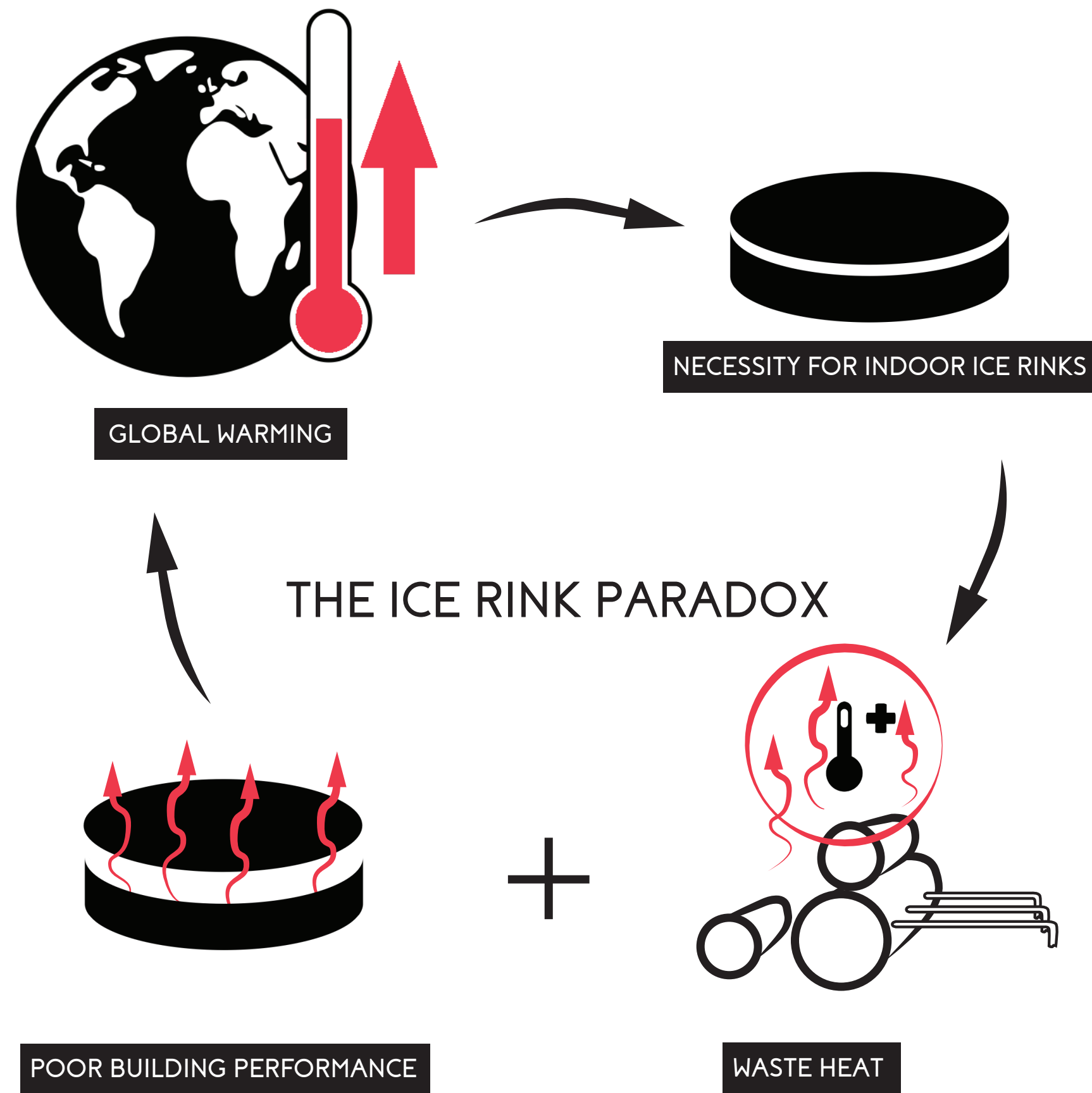
New building typology → Season specific

# DEVELOPMENTS

## 4. PRODUCTION WASTE HEAT



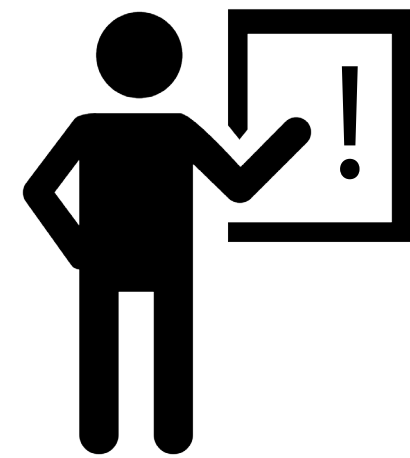




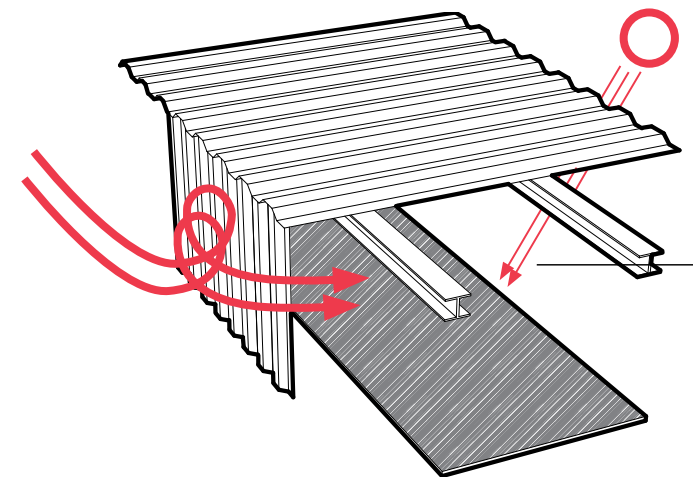
An ice rink emphasizes its reason to exist.

# PROBLEM STATEMENT

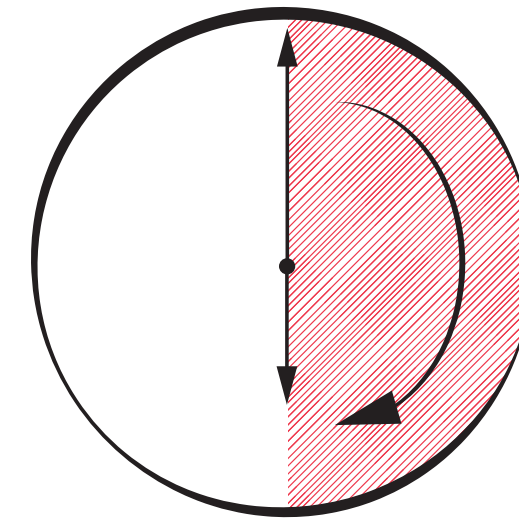
## SUMMARY



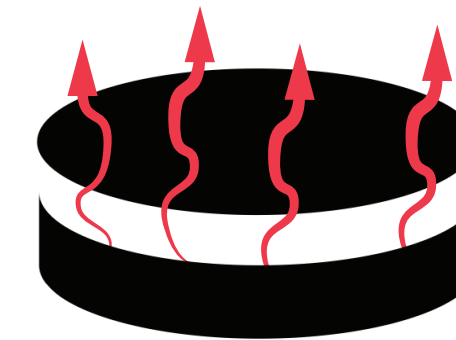
**DEMANDING SPORTERS**



**BAD BUILDING REPUTATION**



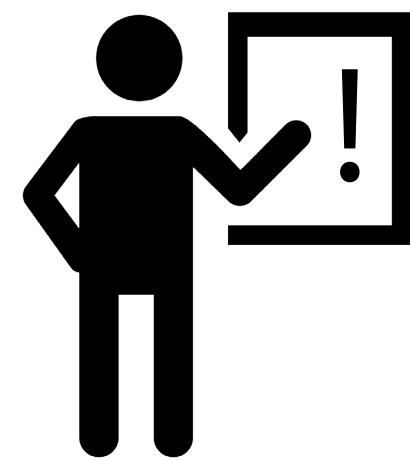
**LOW BUILDING OCCUPATION**



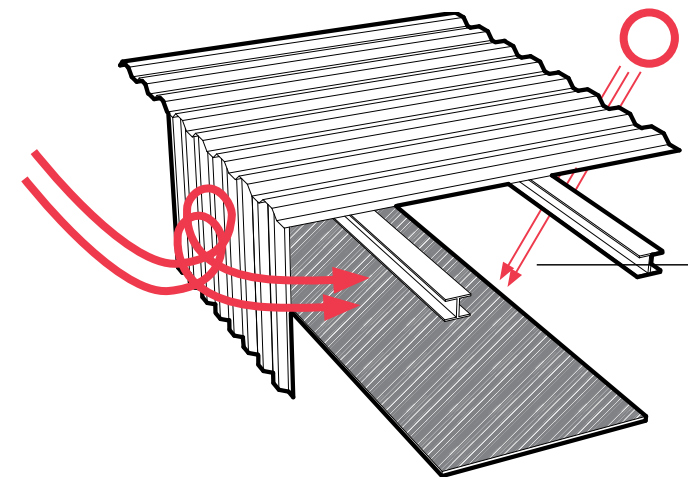
**POOR BUILDING PERFORMANCE**

# PROBLEM STATEMENT

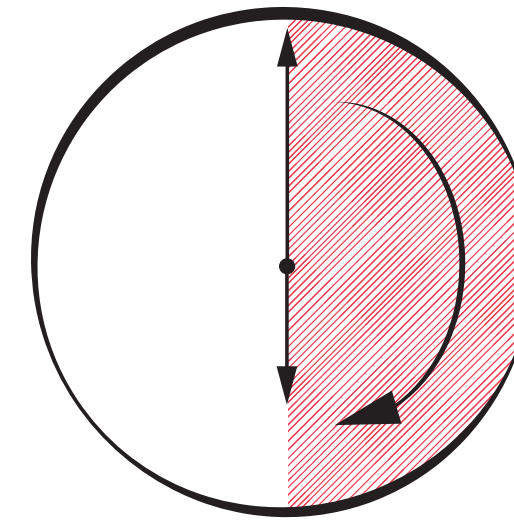
## SUMMARY



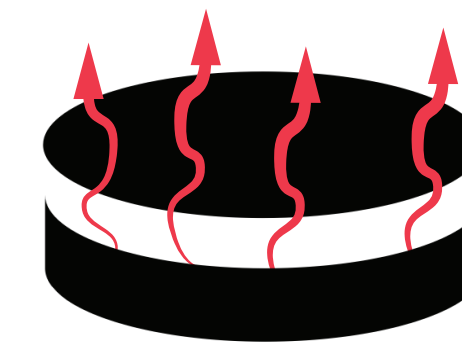
**DEMANDING SPORTERS**



**BAD BUILDING REPUTATION**



**LOW BUILDING OCCUPATION**



**POOR BUILDING PERFORMANCE**

How to make an ice rink (energy) efficient?

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## **CONCLUSION**

REFLECTION

RESEARCH

# RESEARCH

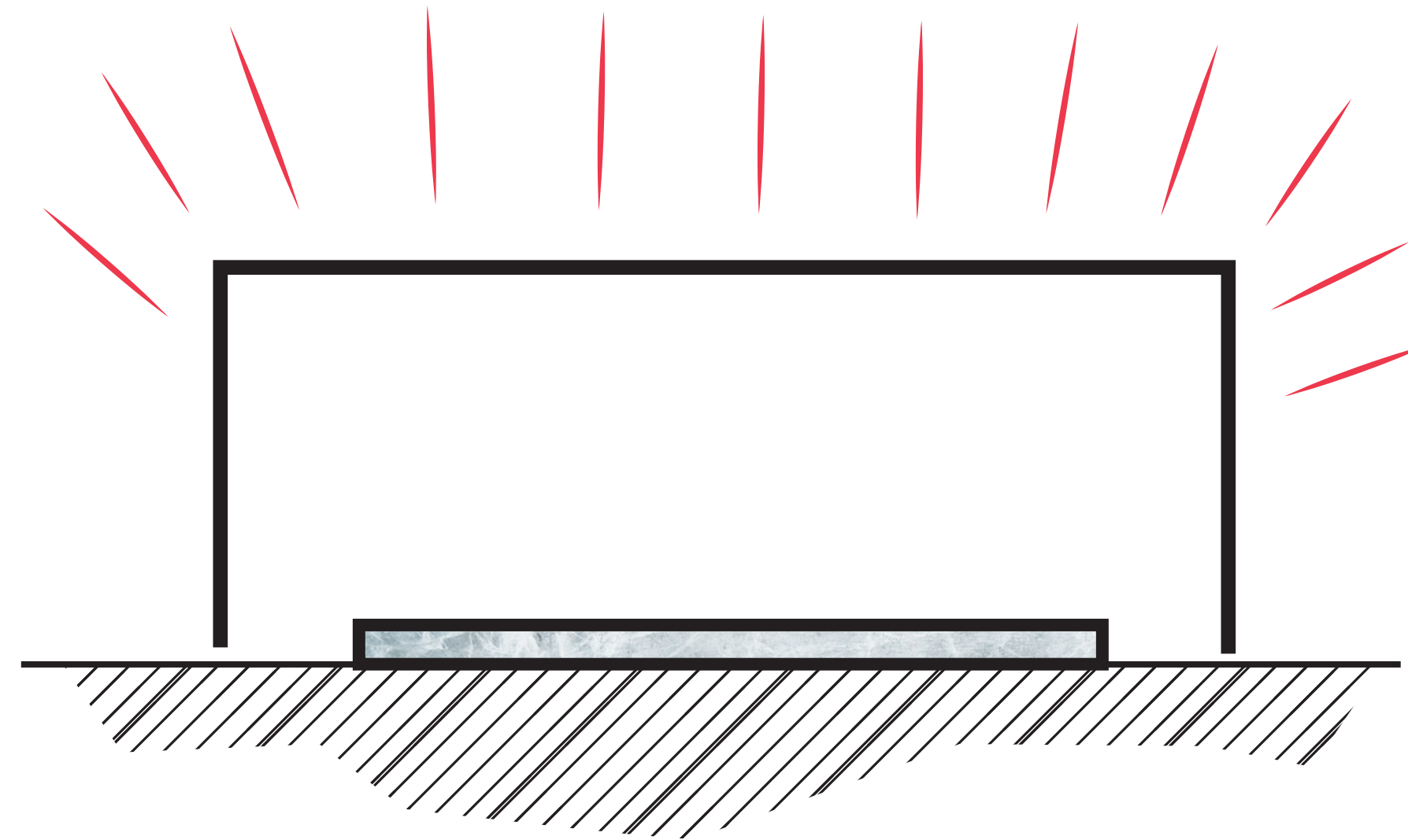
MAIN QUESTION

How to integrate energy-saving architectural instruments towards a holistic energy neutral ice rink design.

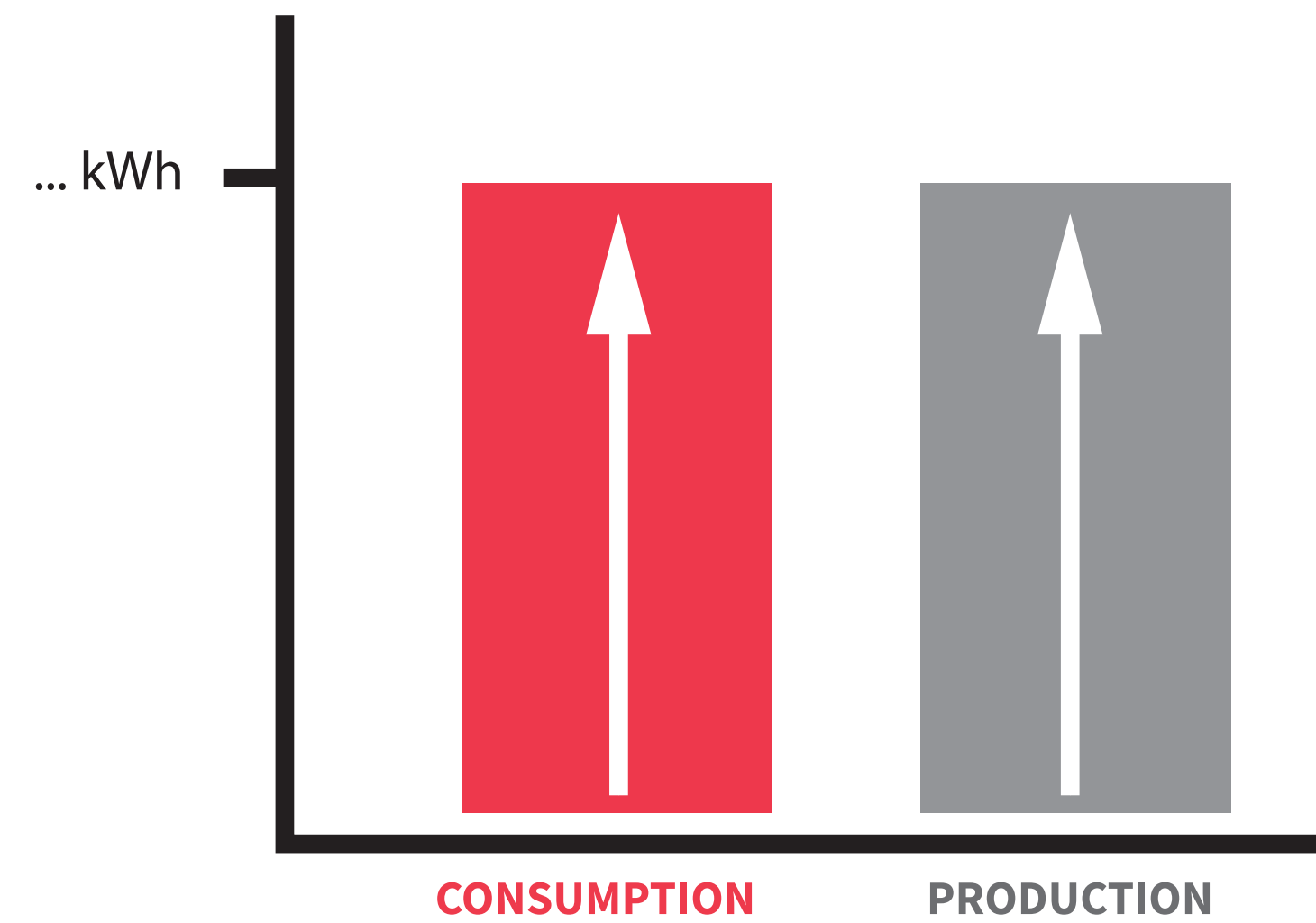
# RESEARCH

MAIN QUESTION

How to integrate energy-saving architectural instruments towards a holistic energy neutral ice rink design.

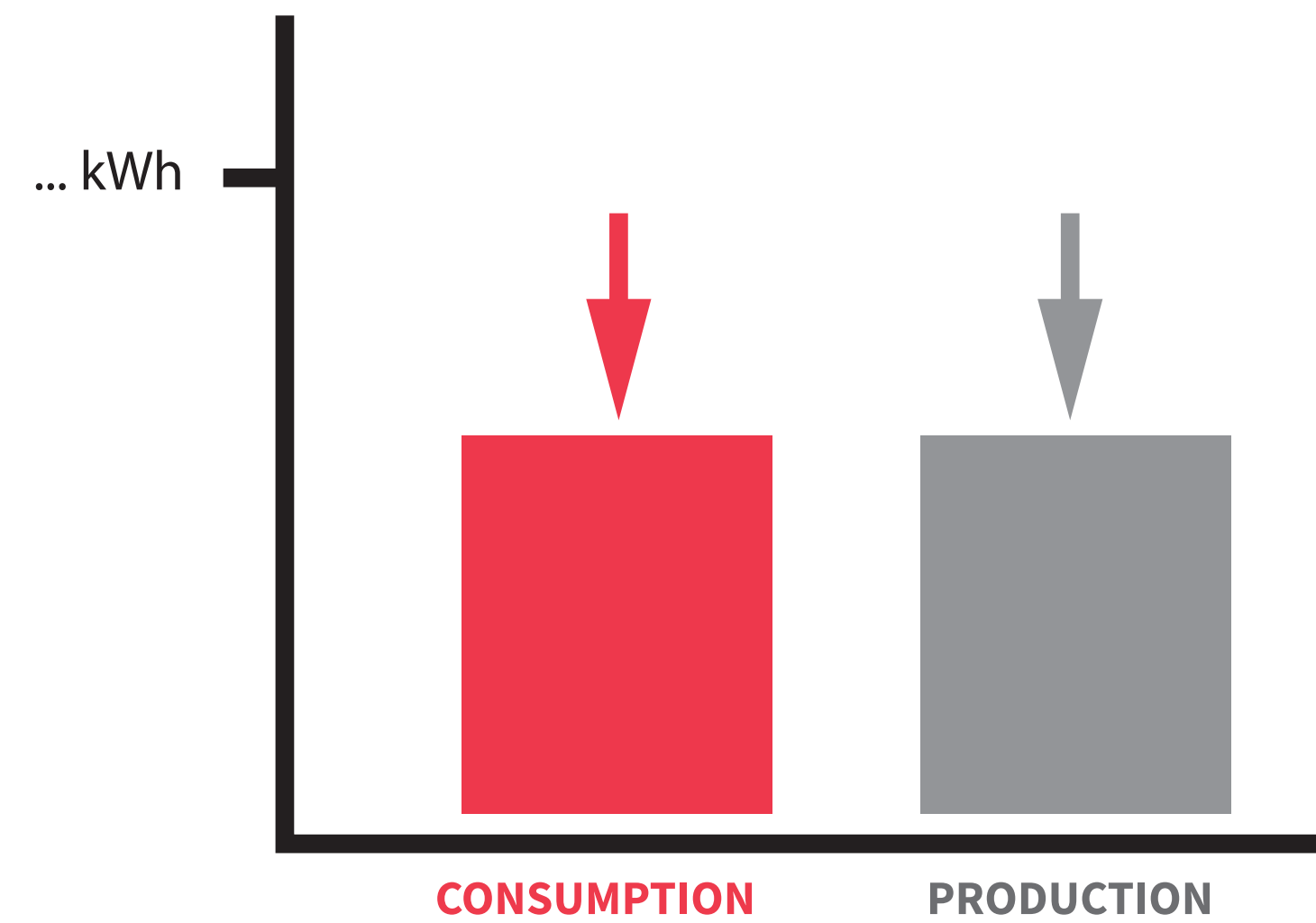


# RESEARCH



What is energy neutral?

# RESEARCH



Strategies to lower energy demand

# RESEARCH

SUB QUESTIONS

WHO MAKE USE OF THE BUILDING?



**QUESTIONNAIRE**

WHAT FUNCTIONS CAN BE APPLIED IN SUMMER?



**CASE STUDIES**

WHICH SPACES ARE REQUIRED IN AN ICE RINK?



**CASE STUDIES**

WHAT ARE THE TECHNICAL REQUIREMENTS?



**INTERVIEWS**

+

**LITERATURE**

# RESEARCH

THREE CATEGORIES



# RESEARCH

THREE CATEGORIES

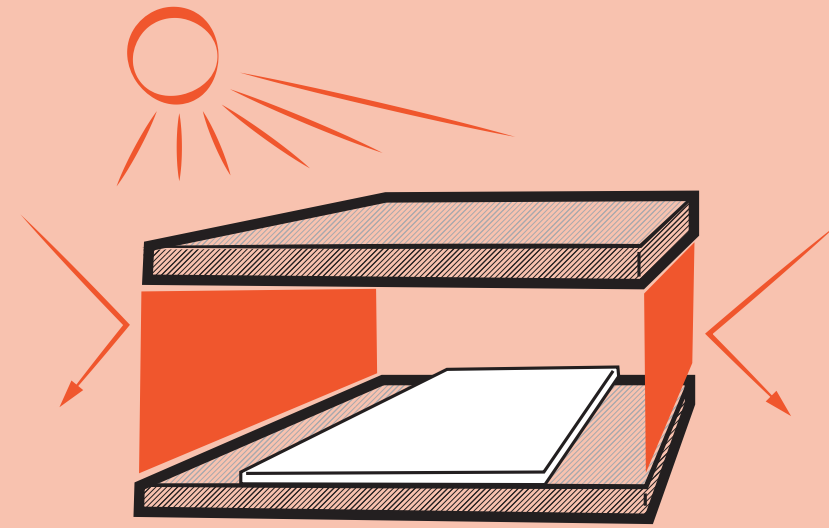


ENERGY EFFICIENCY

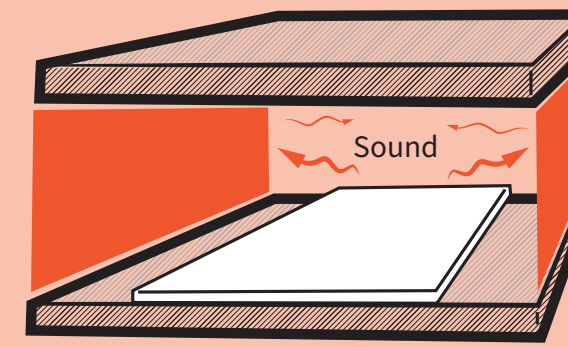
# RESEARCH

## RESULTS

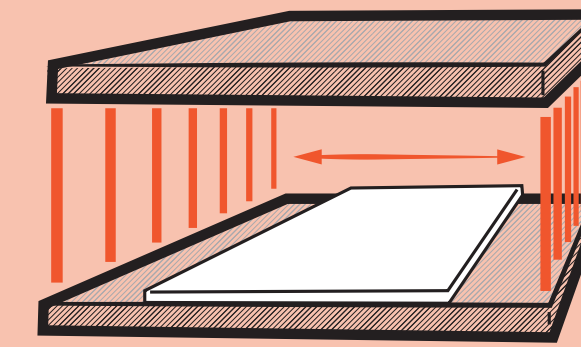
### OPERATION DESIGN



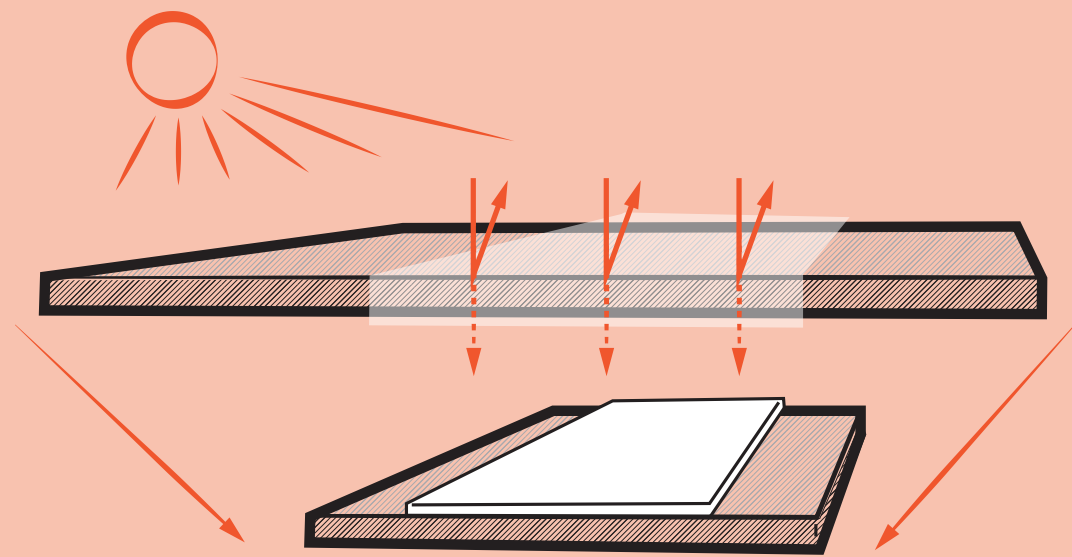
Able to completely block day- and sunlight.



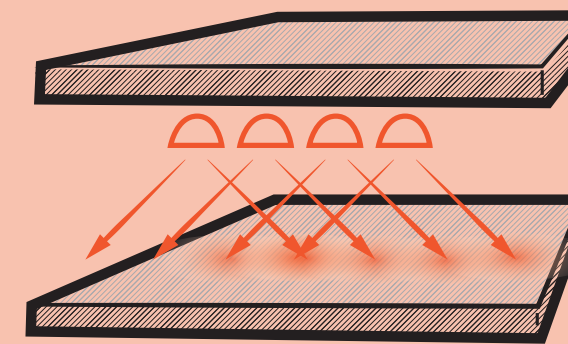
Provide acoustic comfort



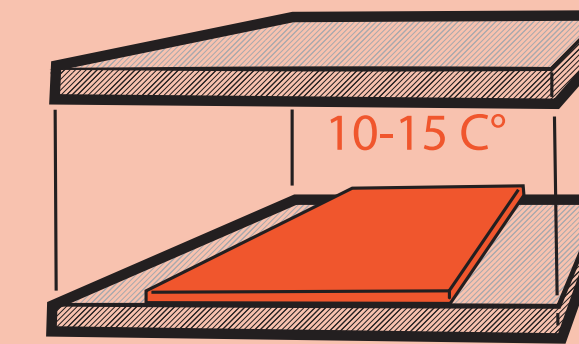
A columnless space



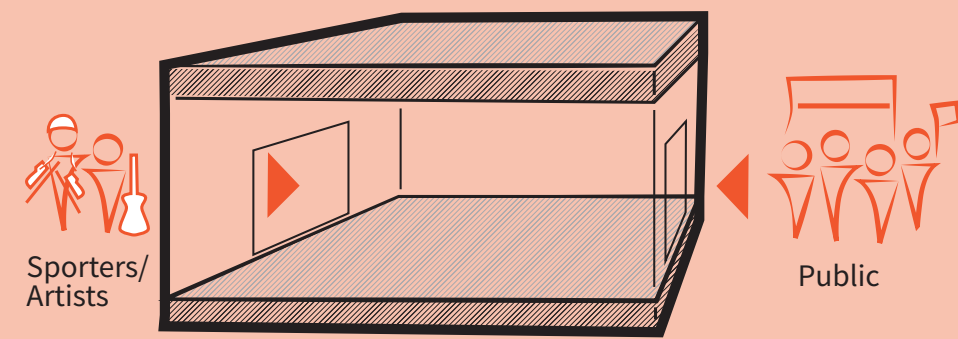
Natural daylight, no direct sunlight



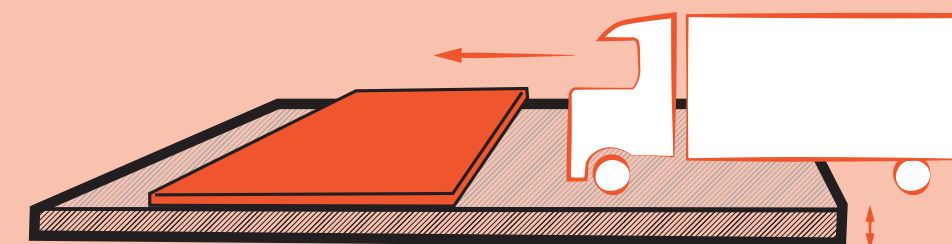
Homogeneous lighting



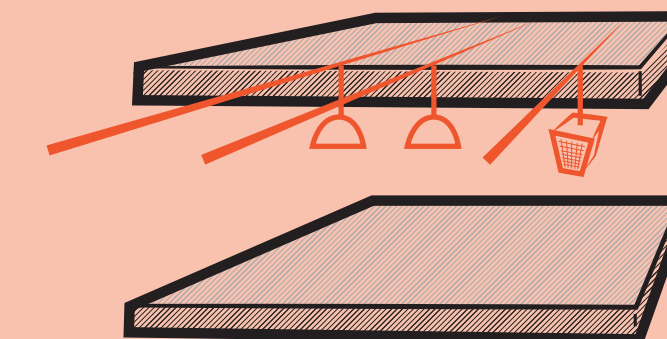
Airtemperature of 10 to 15 degrees.



Separate entrance public / private



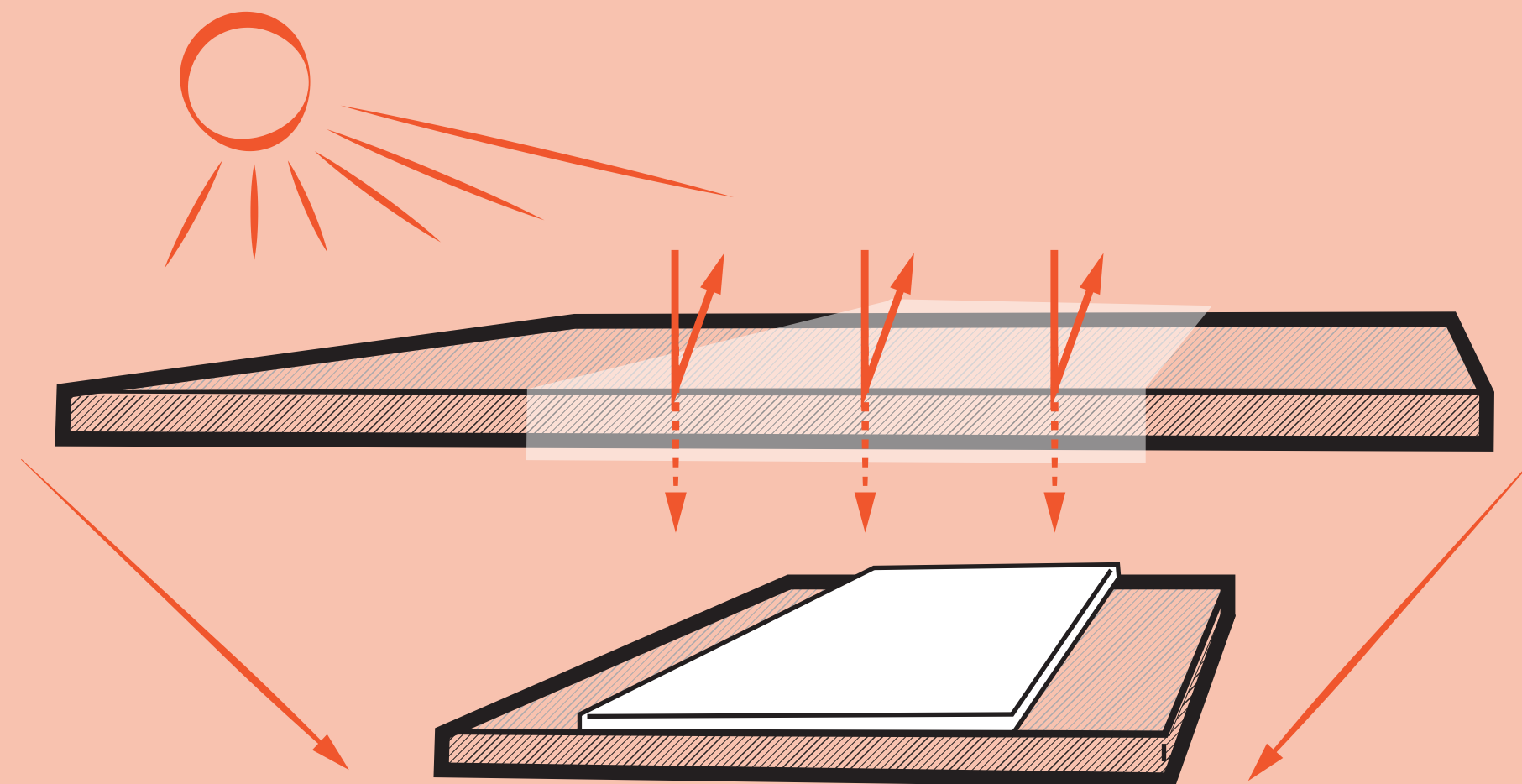
Access trucks



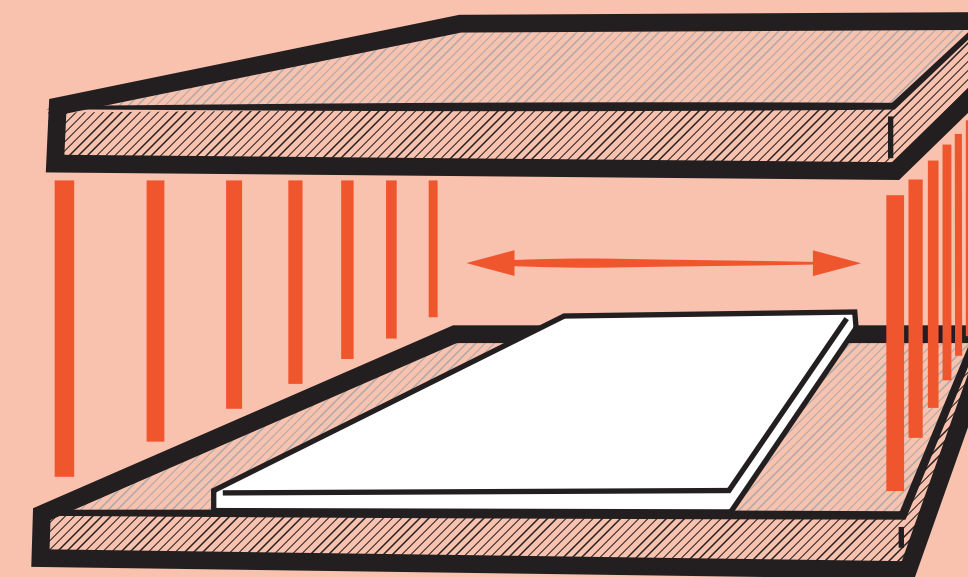
Ceiling can bear light & sound installations

# RESEARCH RESULTS

## OPERATION DESIGN



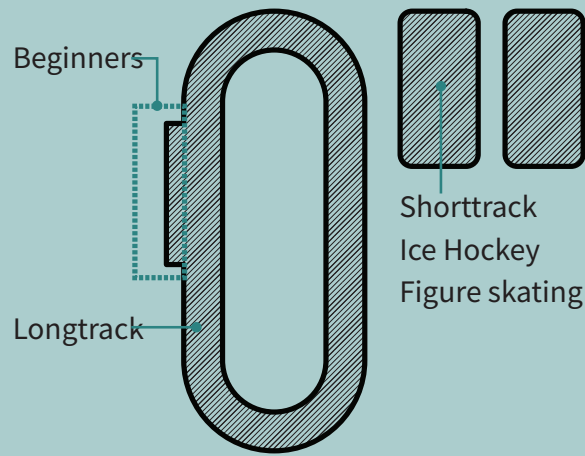
Natural daylight, no direct sunlight



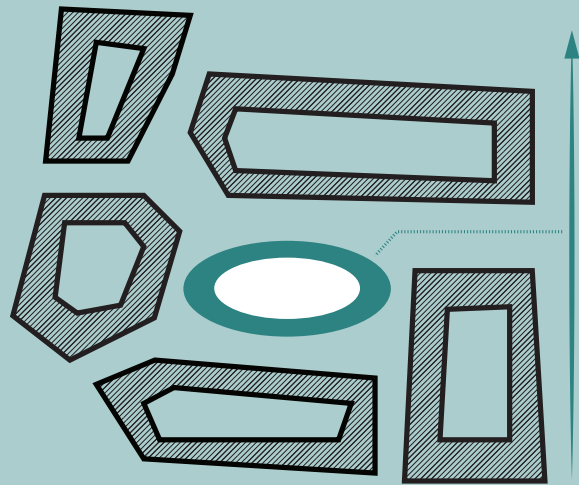
A columnless space

# RESEARCH RESULTS

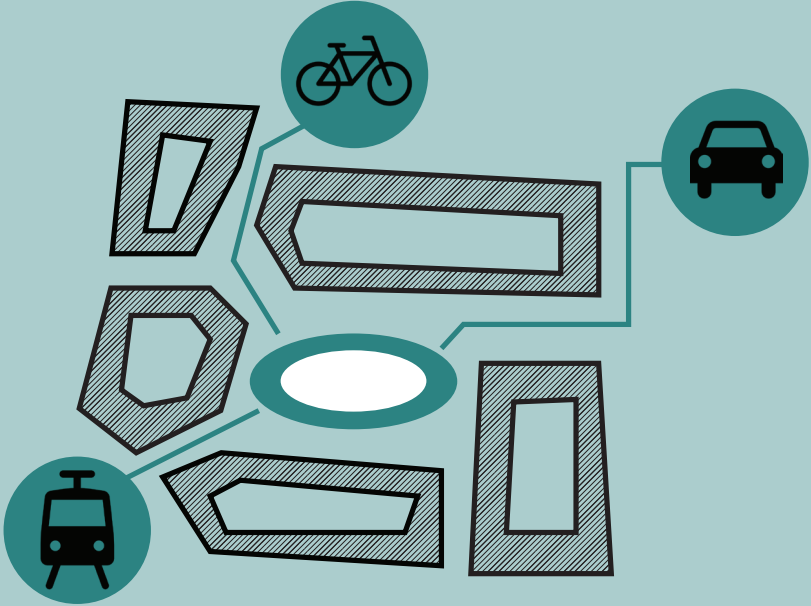
## SPATIAL DESIGN



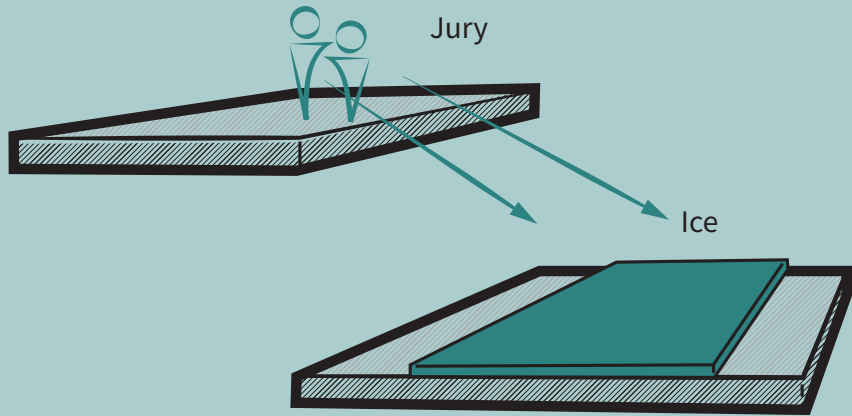
Main program



Integration in urban tissue, close to a motorway.



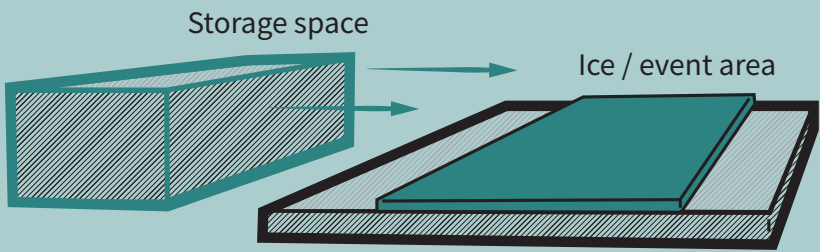
Connected to car roads, public transport and bicycle paths.



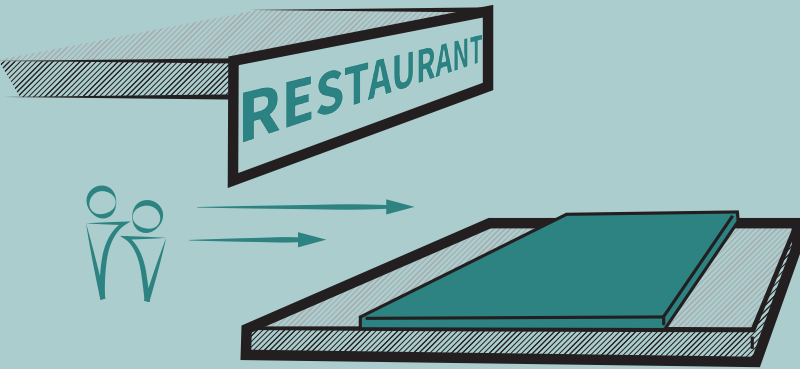
Overlook the ice



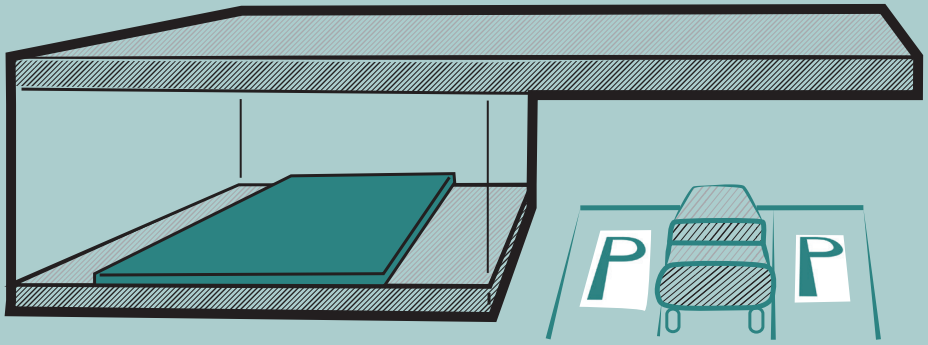
Catering facilities close to event space.



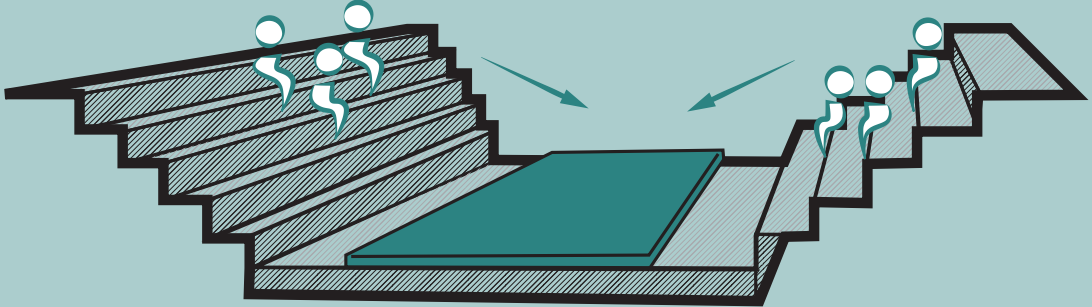
Storage close to the event area.



The restaurant should overlook the ice



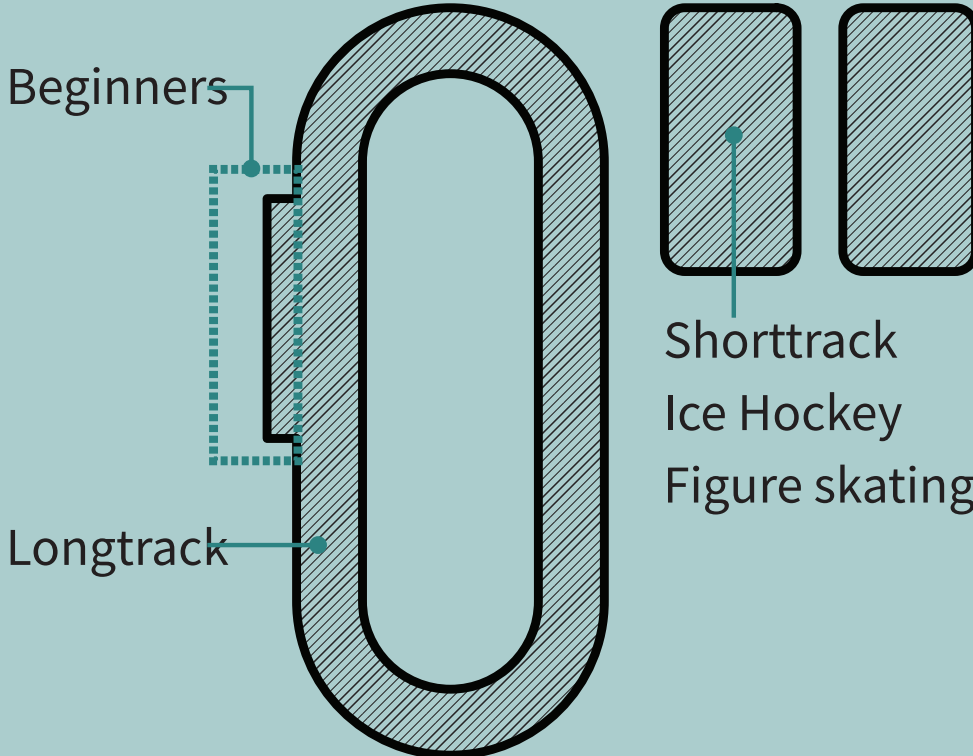
Sufficient parking space in/at building



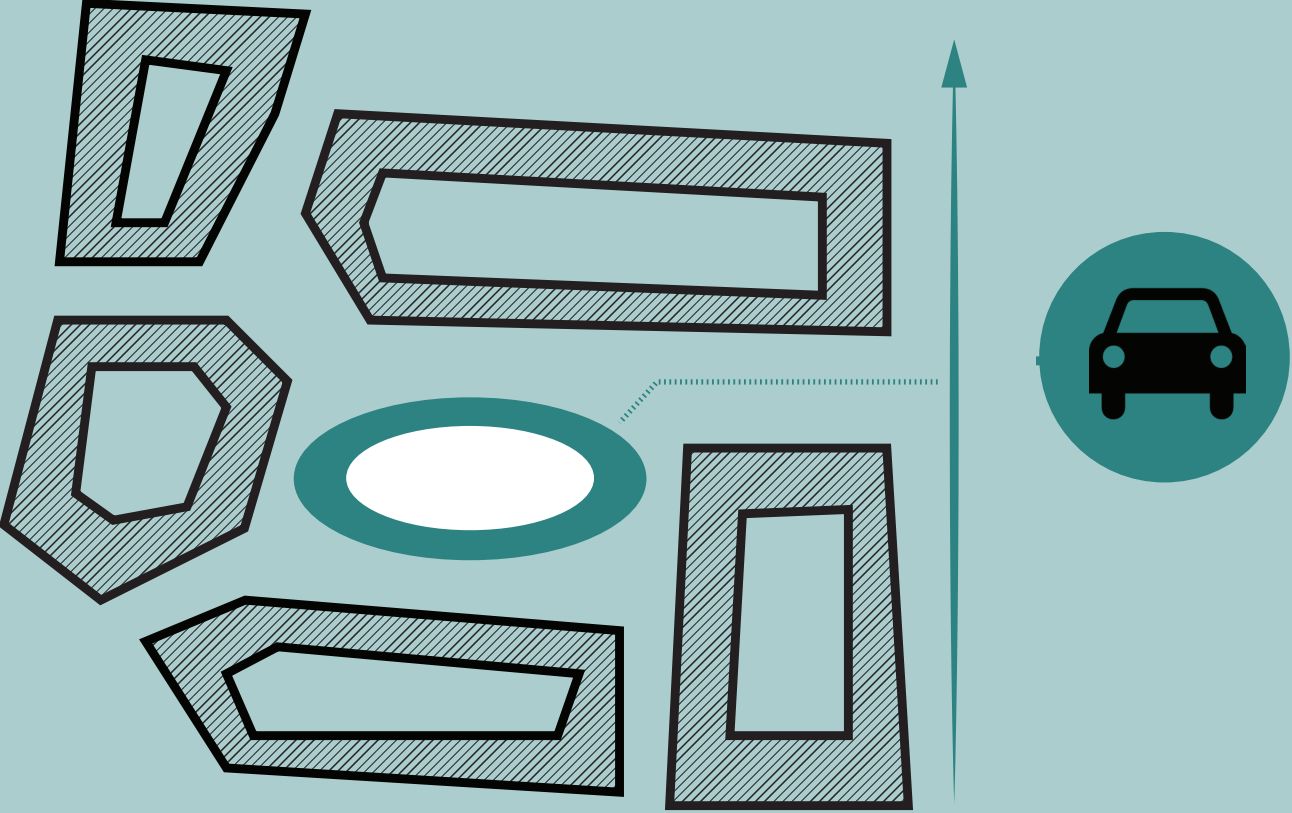
08. The design should provide spectator seats overlooking the event area.

# RESEARCH RESULTS

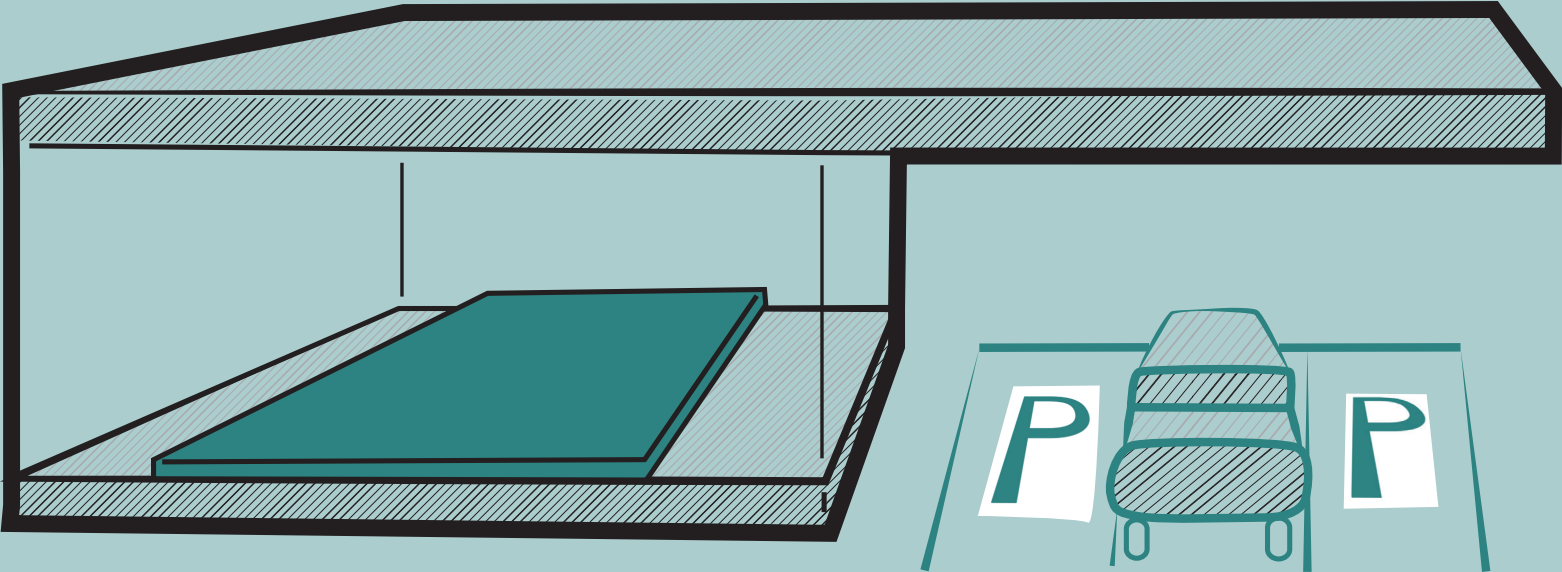
## SPATIAL DESIGN



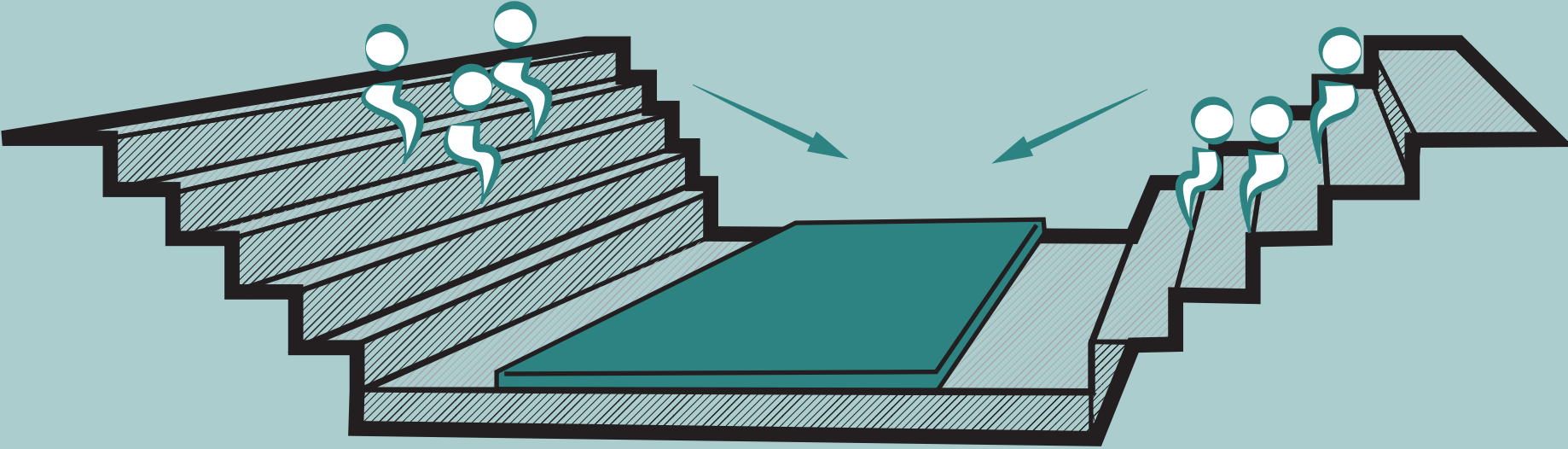
Main program



Close to a motorway.



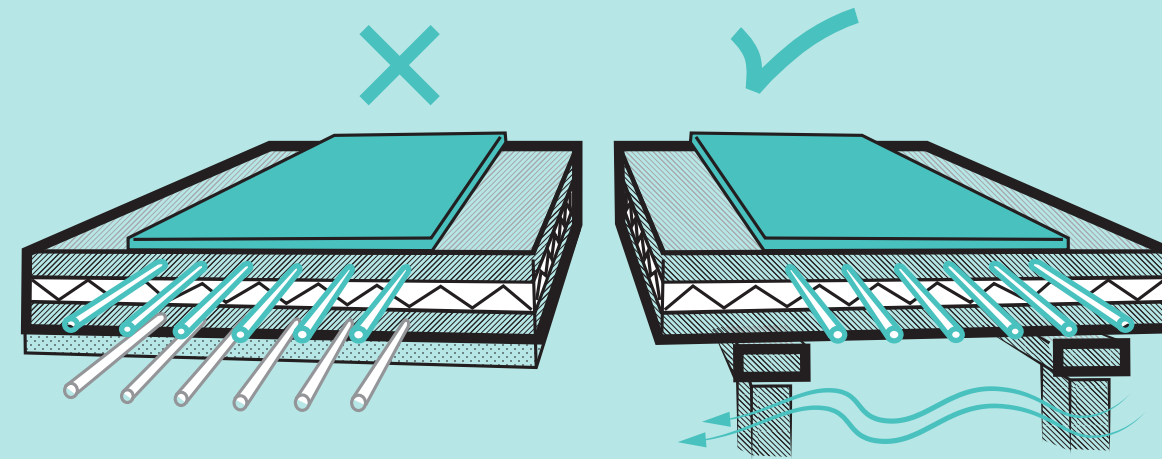
Sufficient parking space in/at building



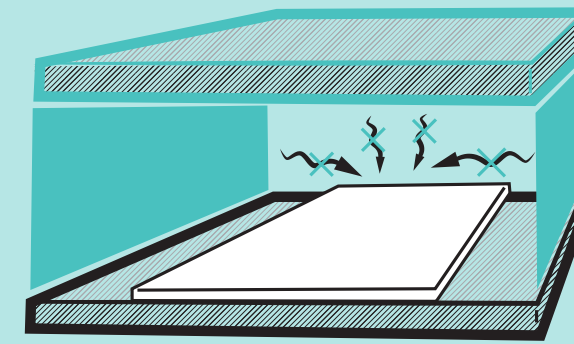
Provides spectator seats

# RESEARCH RESULTS

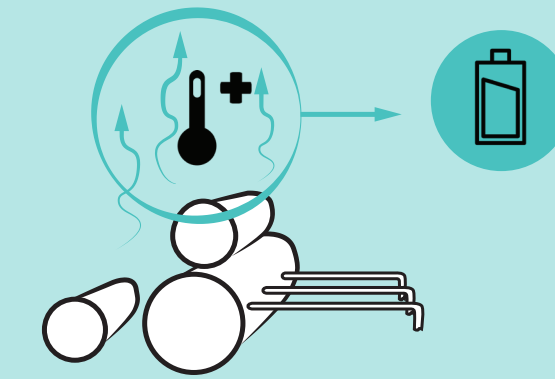
## TECHNICAL DESIGN



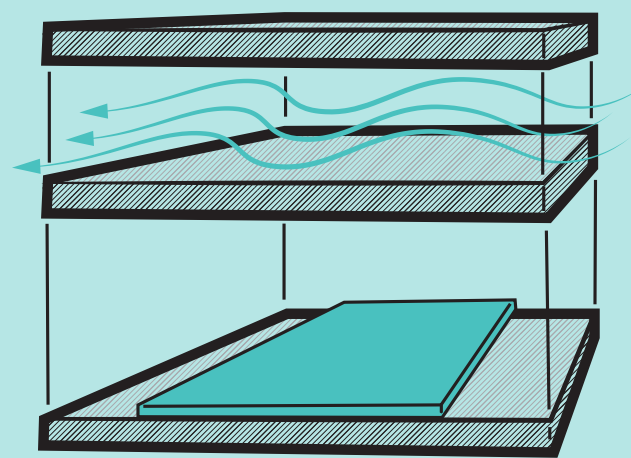
Ventilated elevated foundation



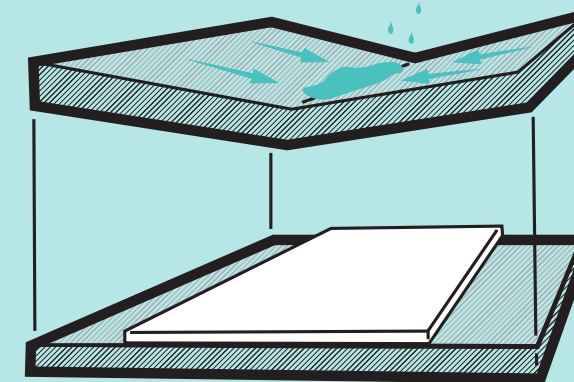
No radiation towards ice



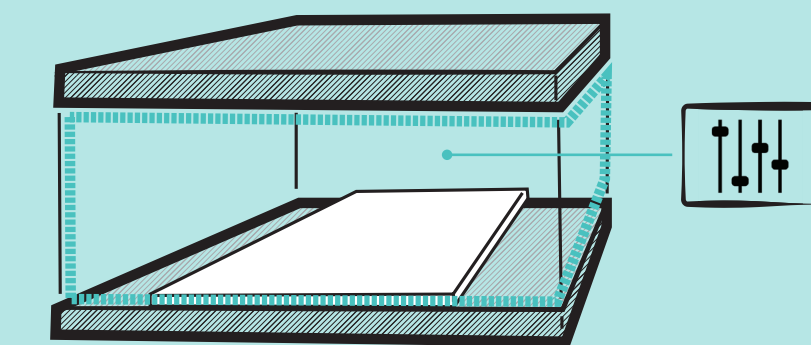
Use waste heat



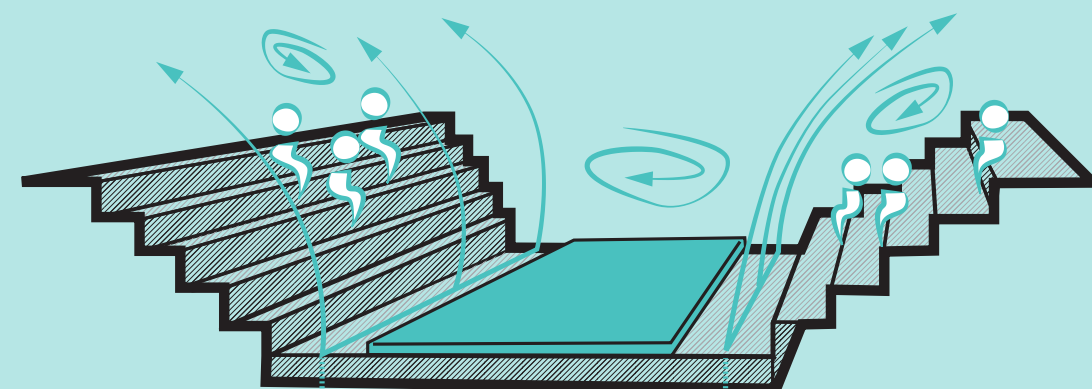
Ventilated roof



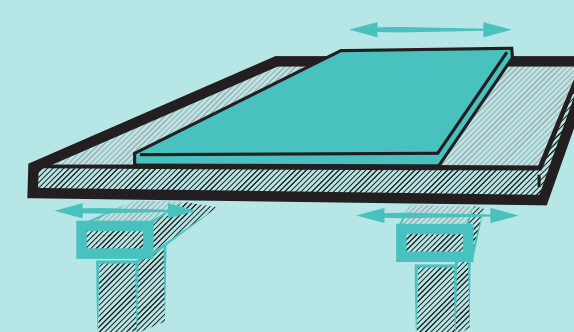
Water collection



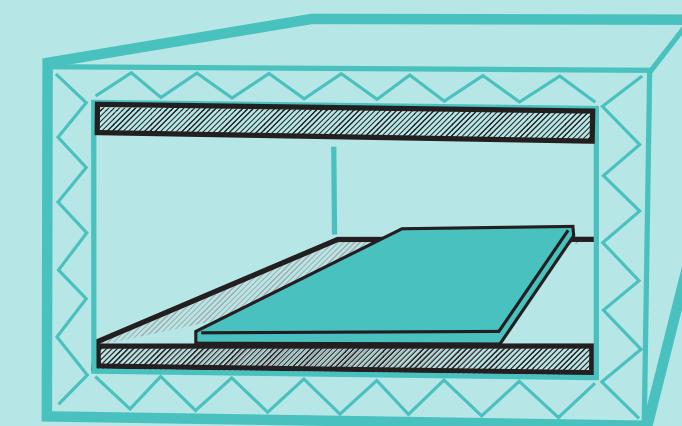
Own micro controllable climate.



Aircurtain: separate airflows



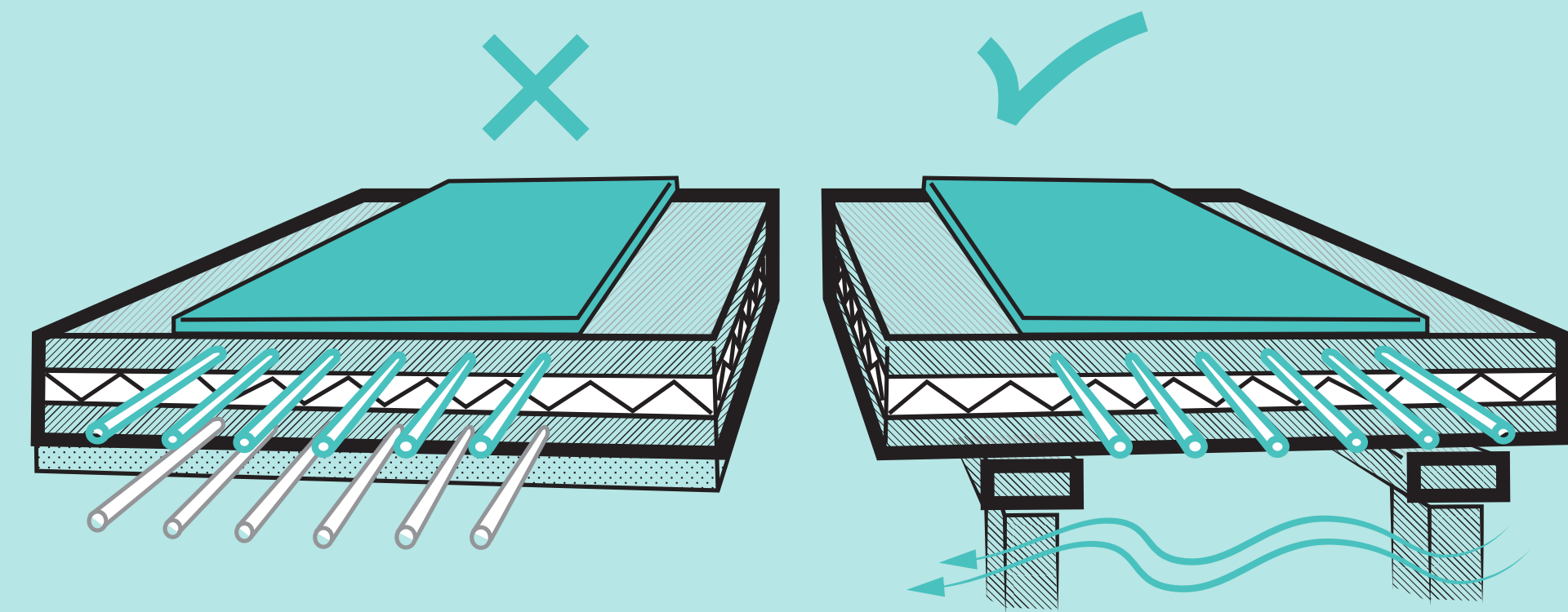
Foundation: Able to expand



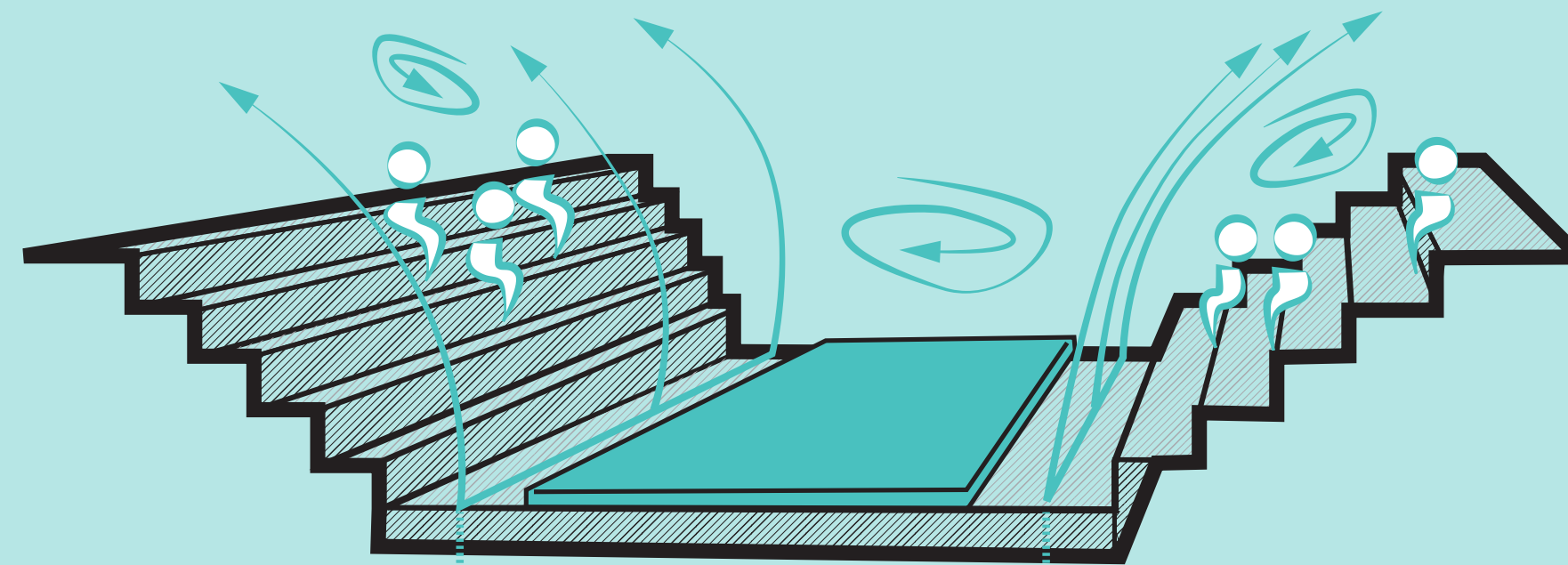
Well insulated

# RESEARCH RESULTS

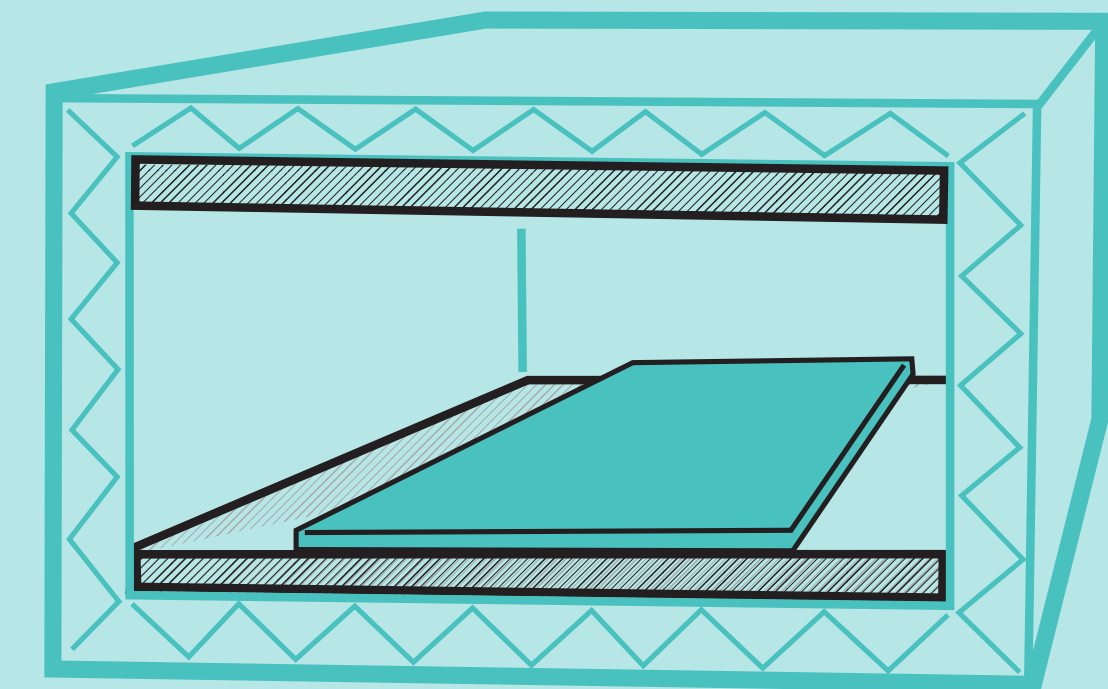
## TECHNICAL DESIGN



Ventilated elevated foundation



Aircurtain: separate airflows



Well insulated



**DESIGN**

# DESIGN ASSIGNMENT

A recreational and competition ice rink in winter



A multifunctional venue in summer



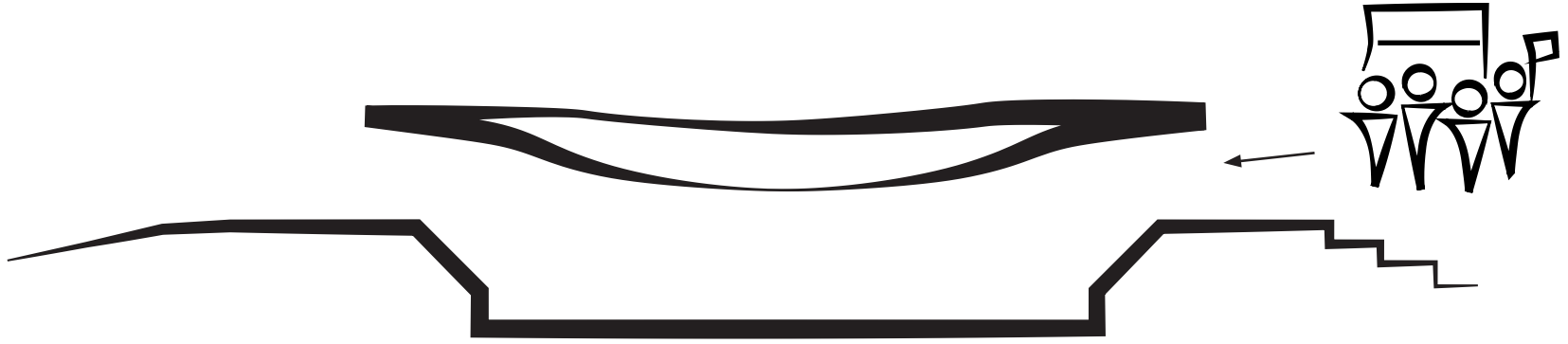
# DESIGN ASSIGNMENT



Recognizable / icon for modern ice skating



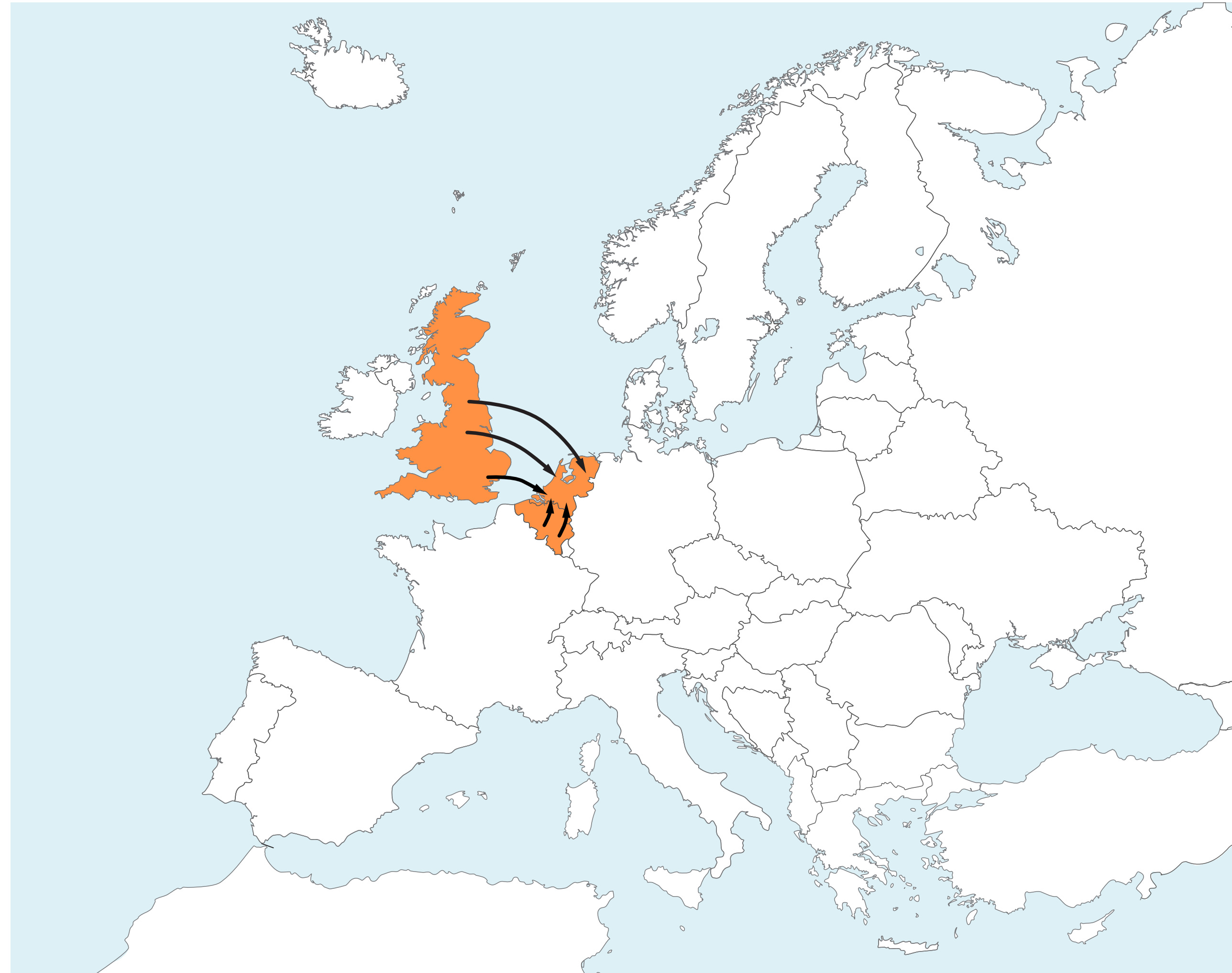
Appearance of natural experience

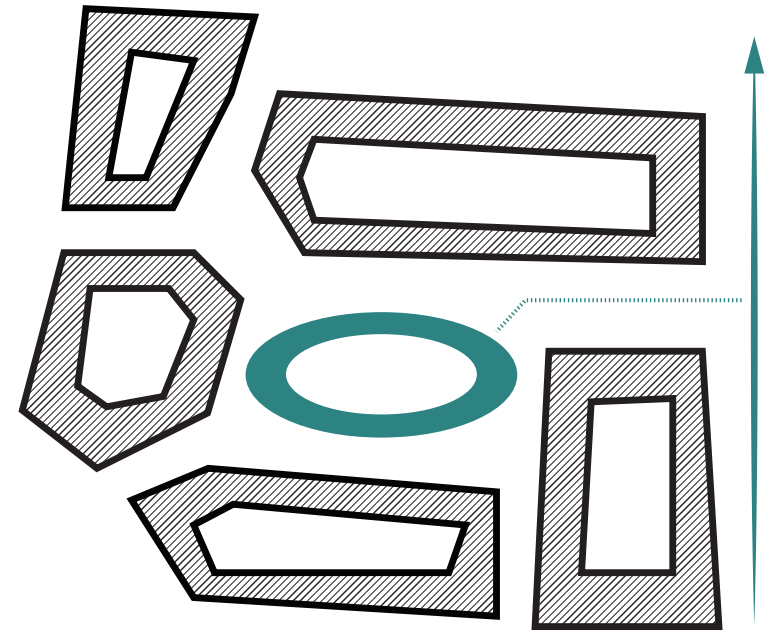


Promoting the sport

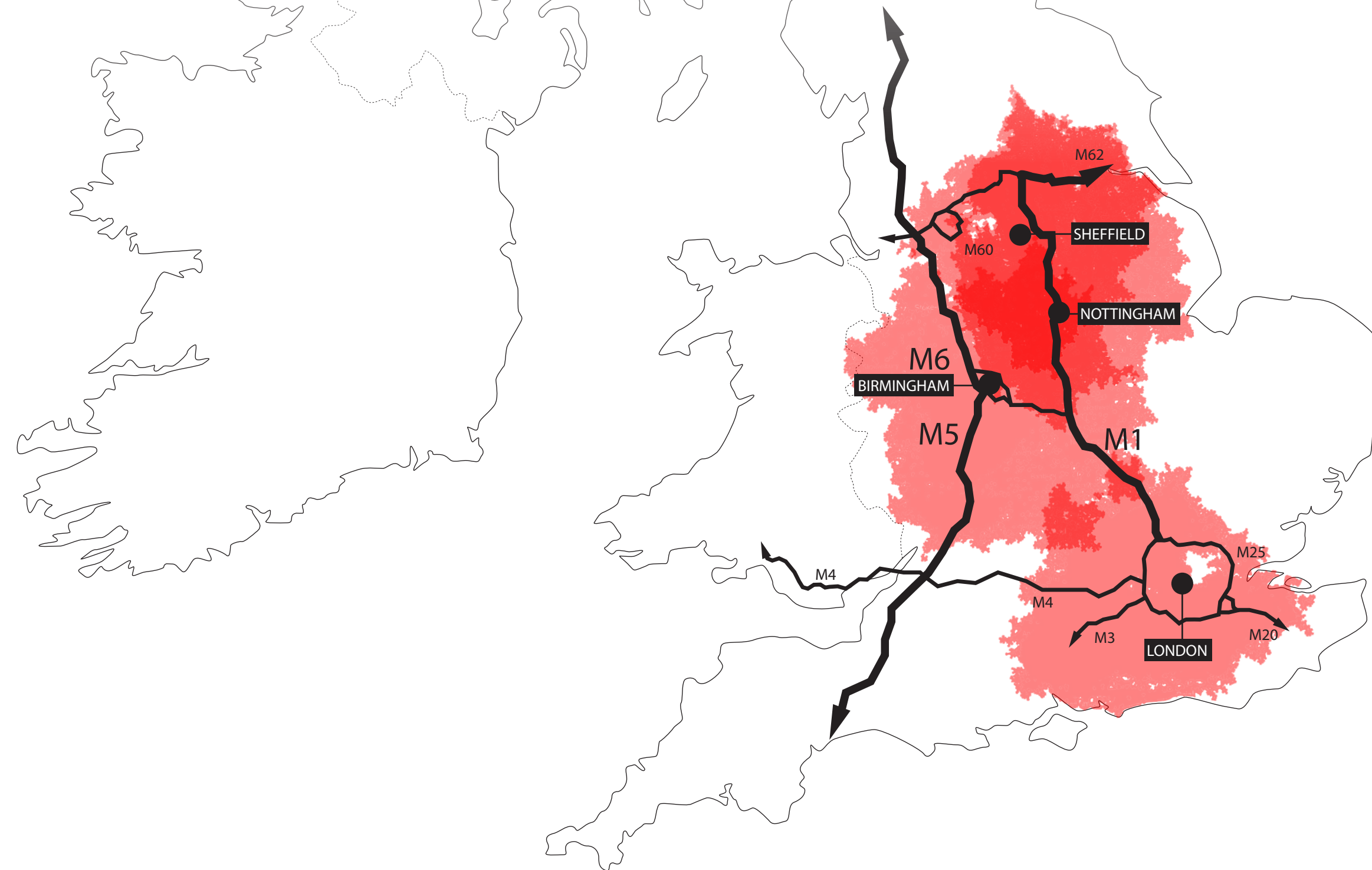
**LOCATION**

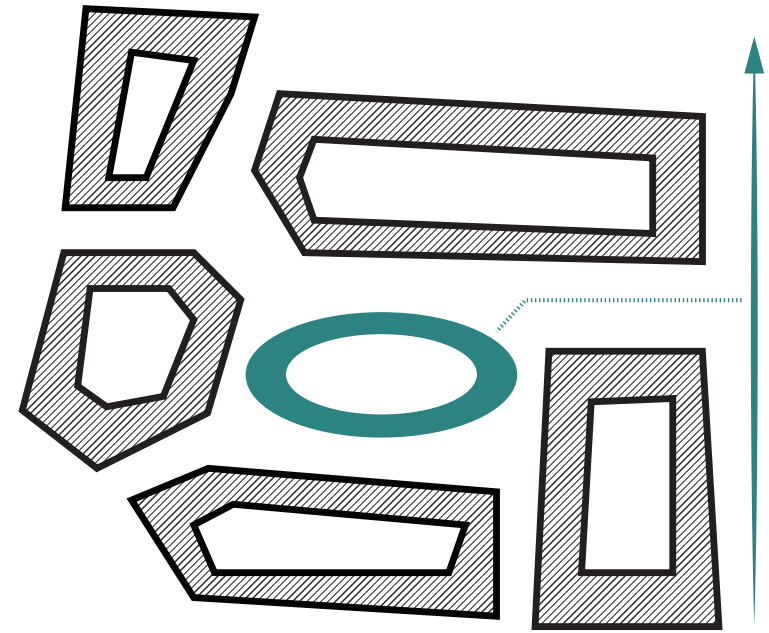
# LOCATION



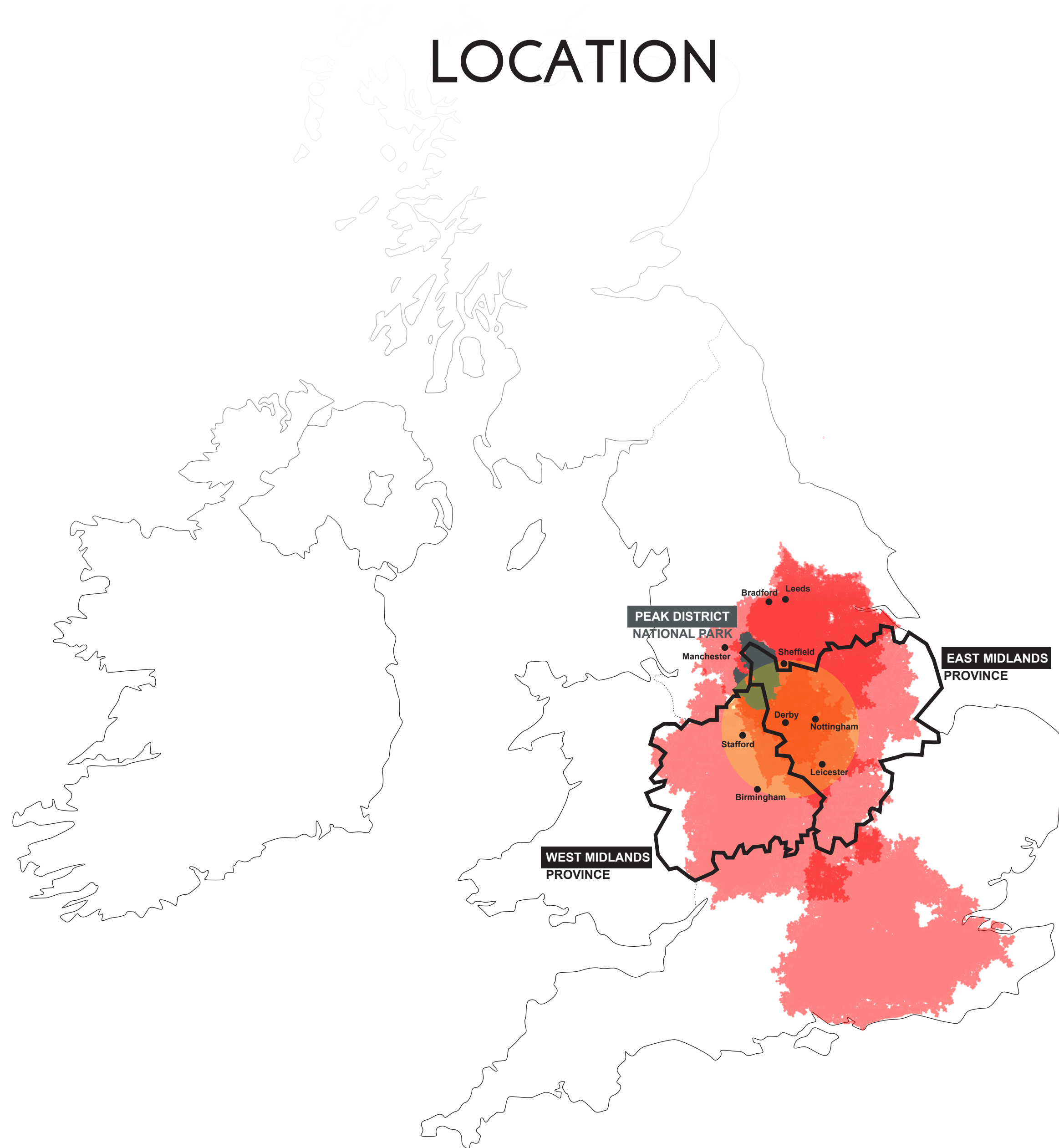


# LOCATION





# LOCATION

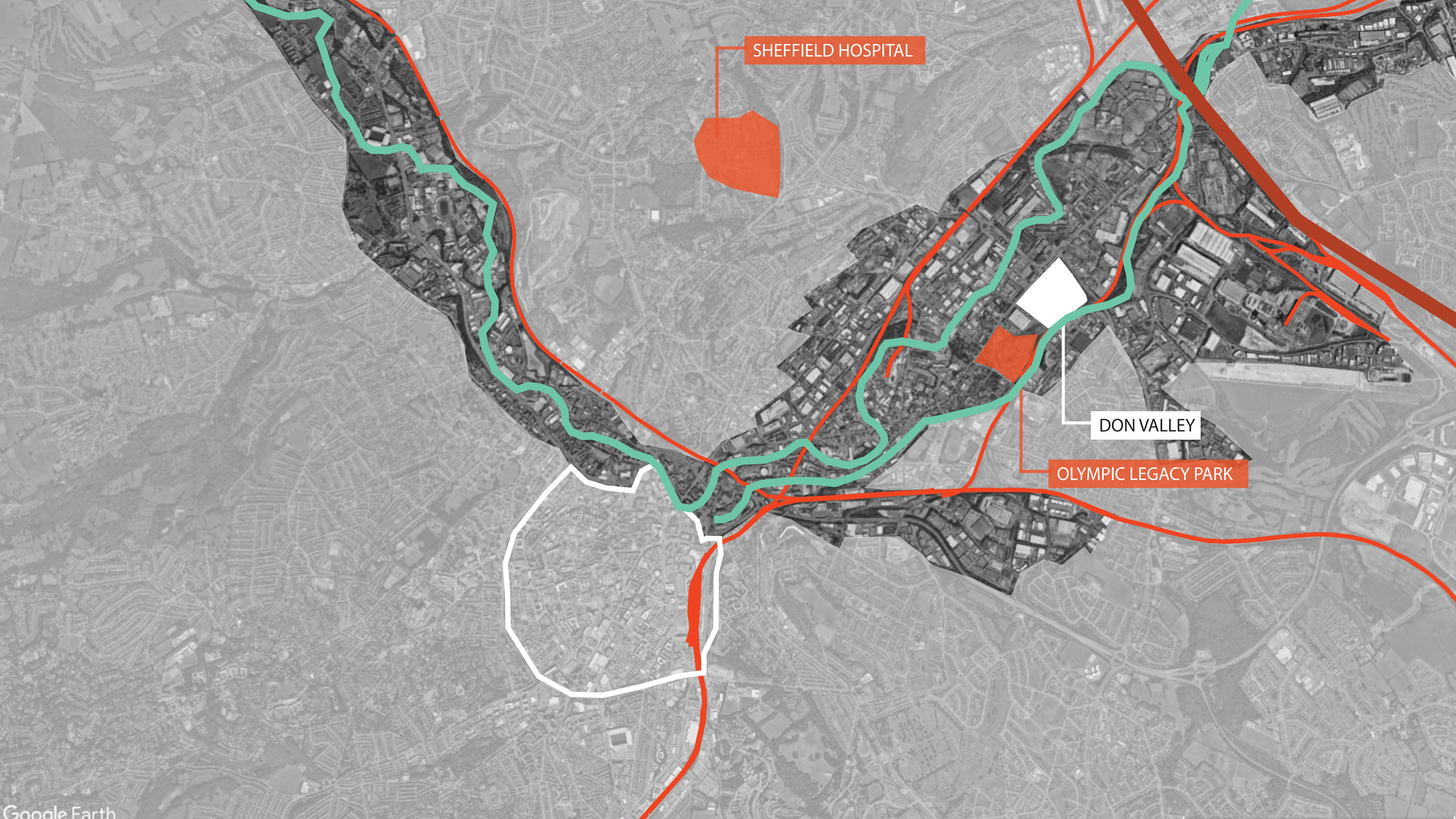




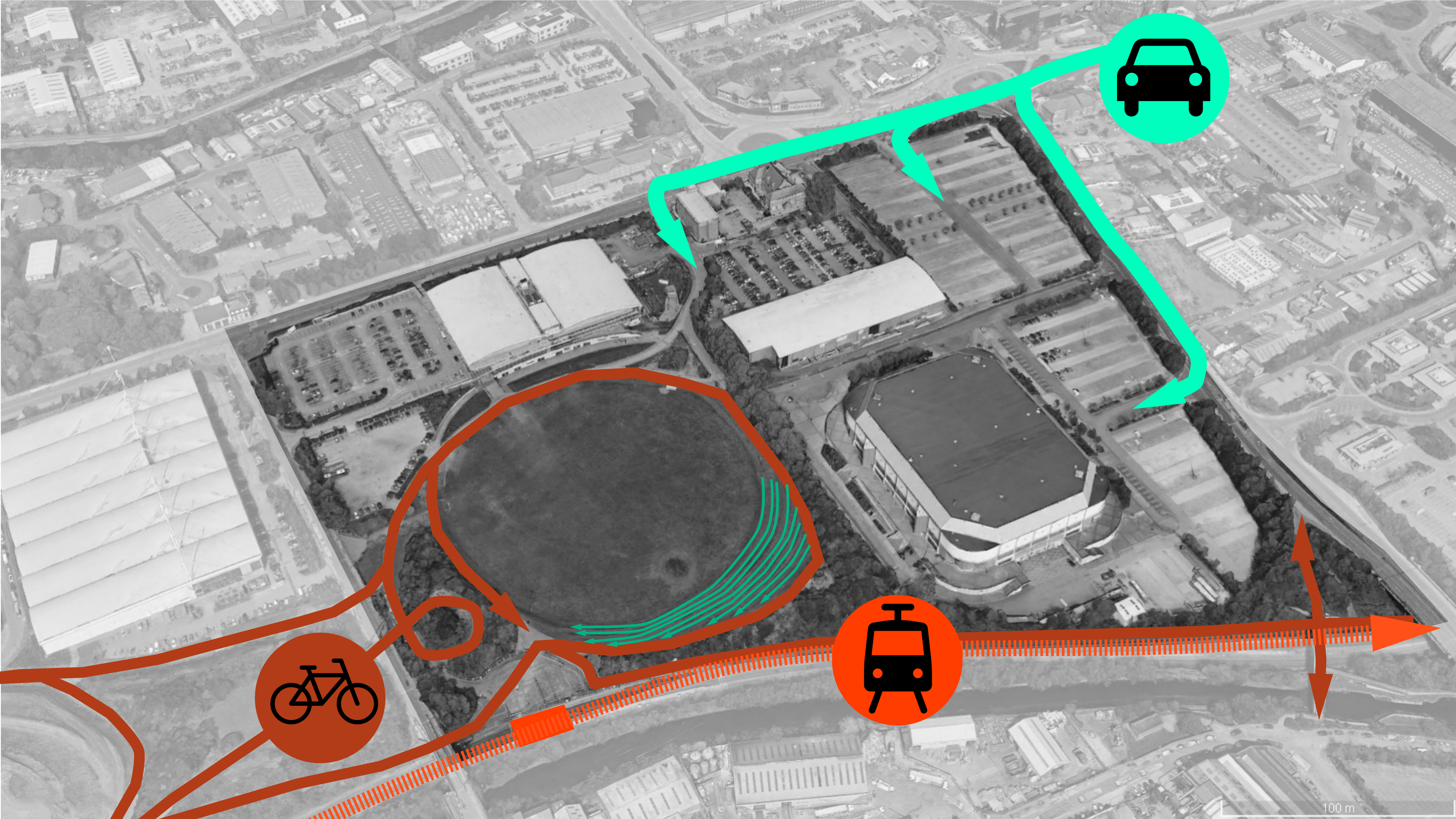
SHEFFIELD HOSPITAL

DON VALLEY

OLYMPIC LEGACY PARK

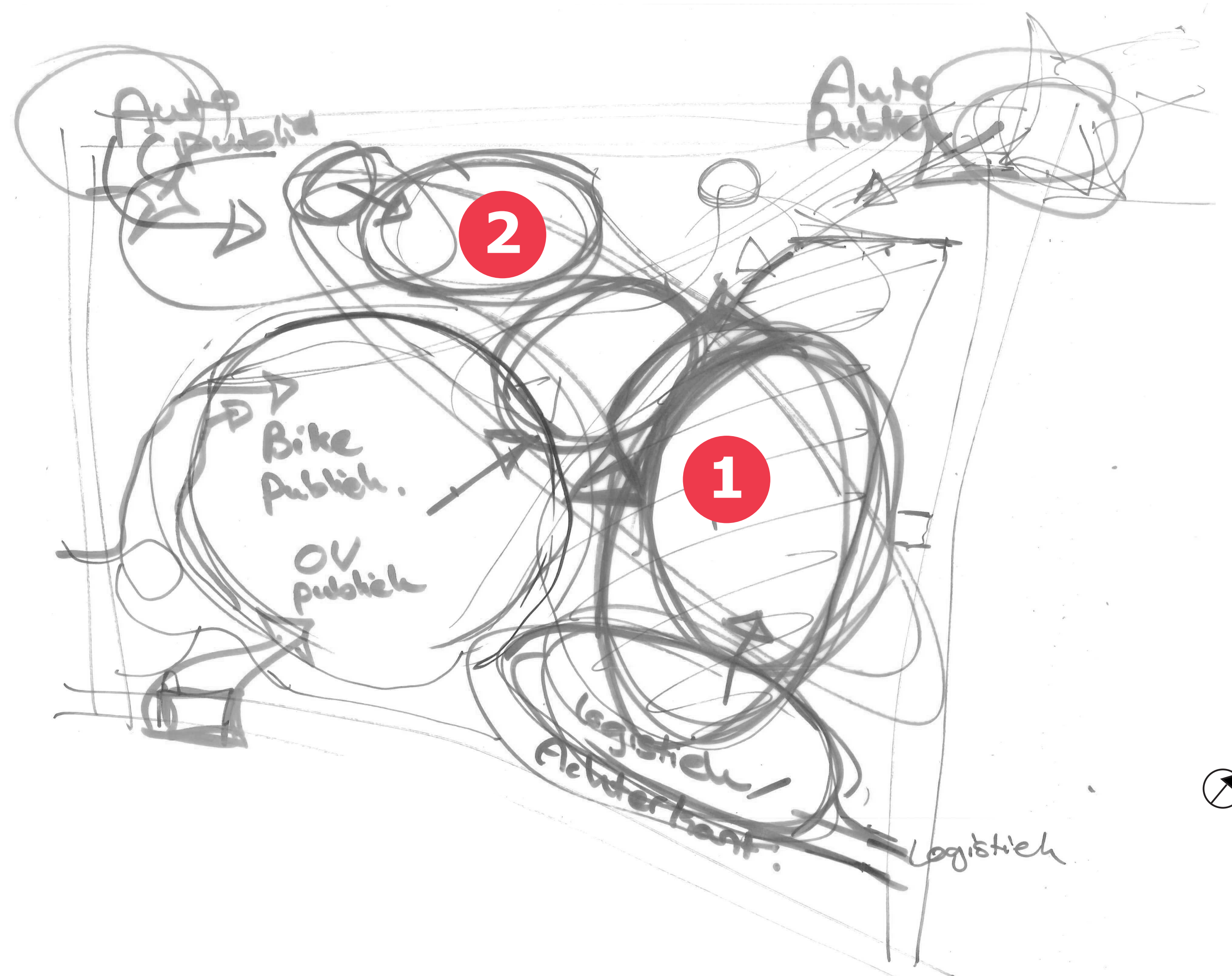


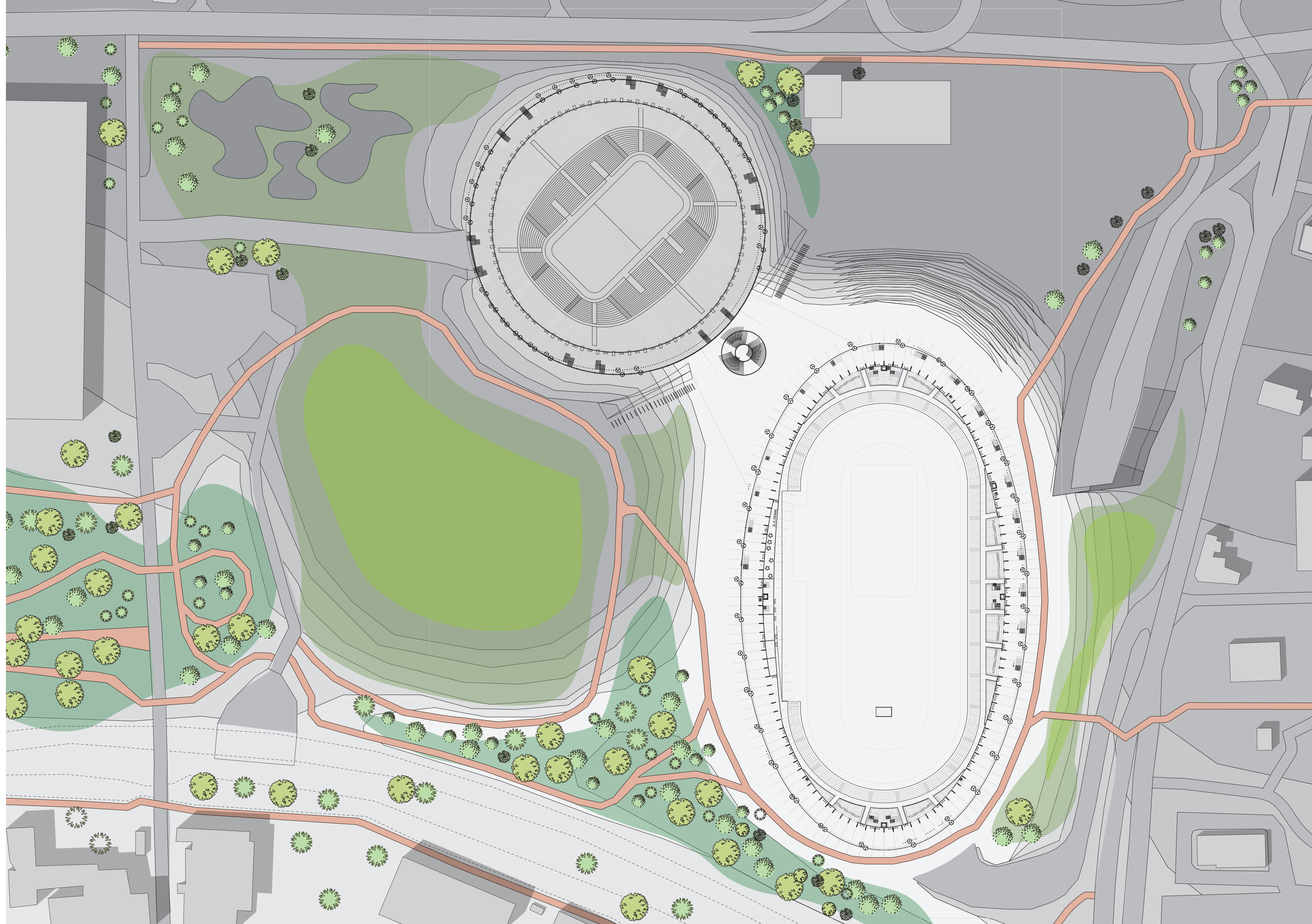


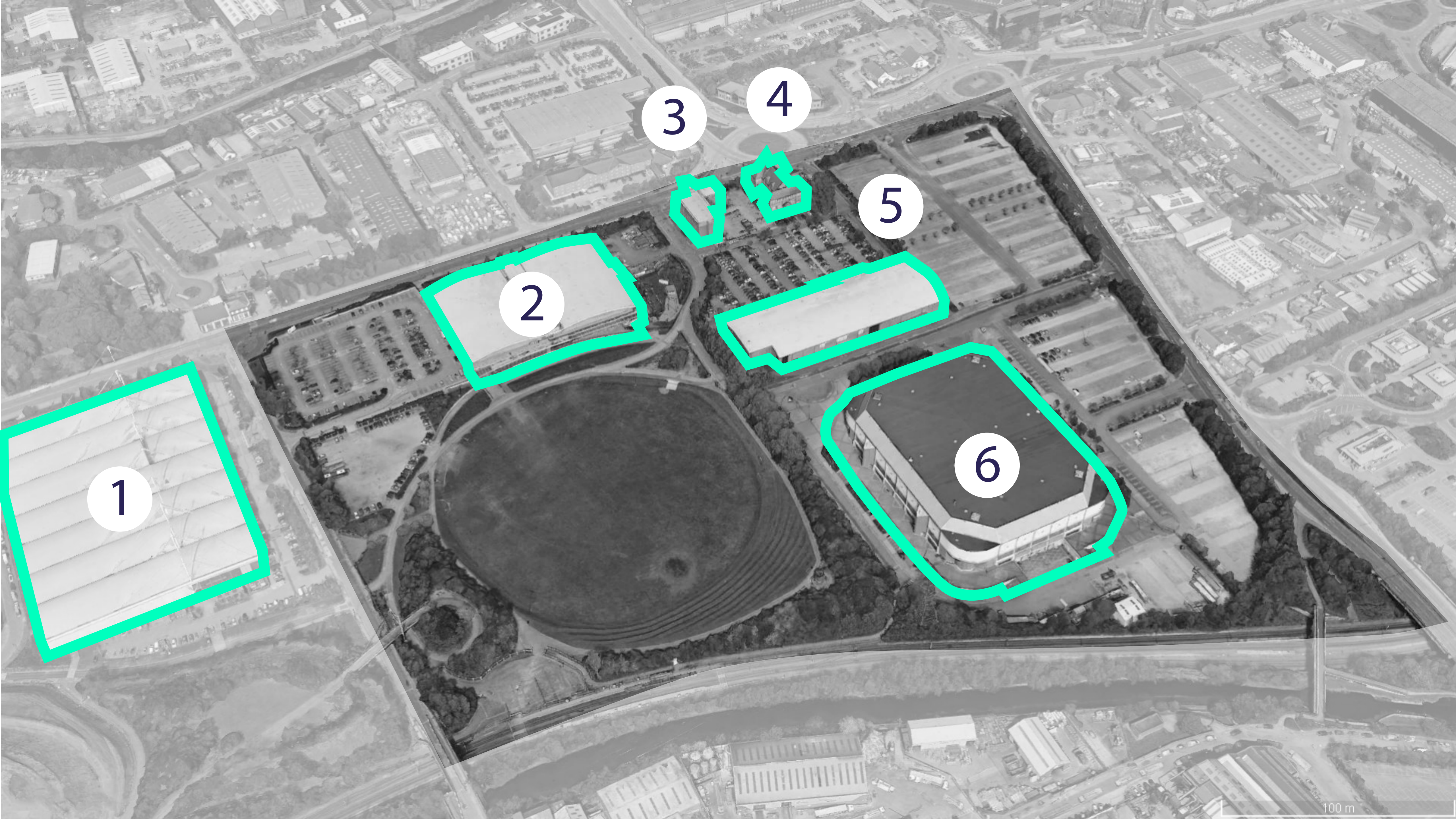


100 m

# URBAN INTEGRATION







1

2

3

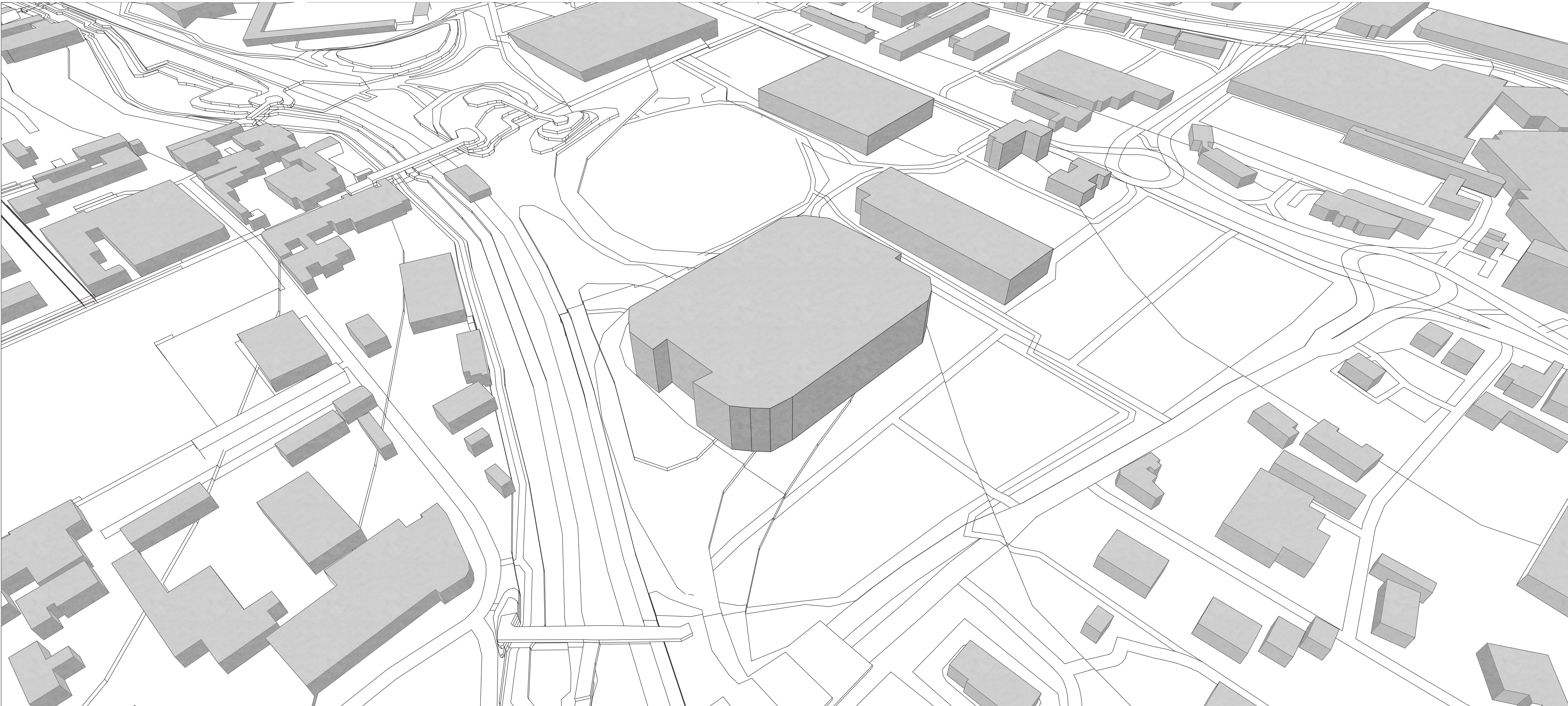
4

5

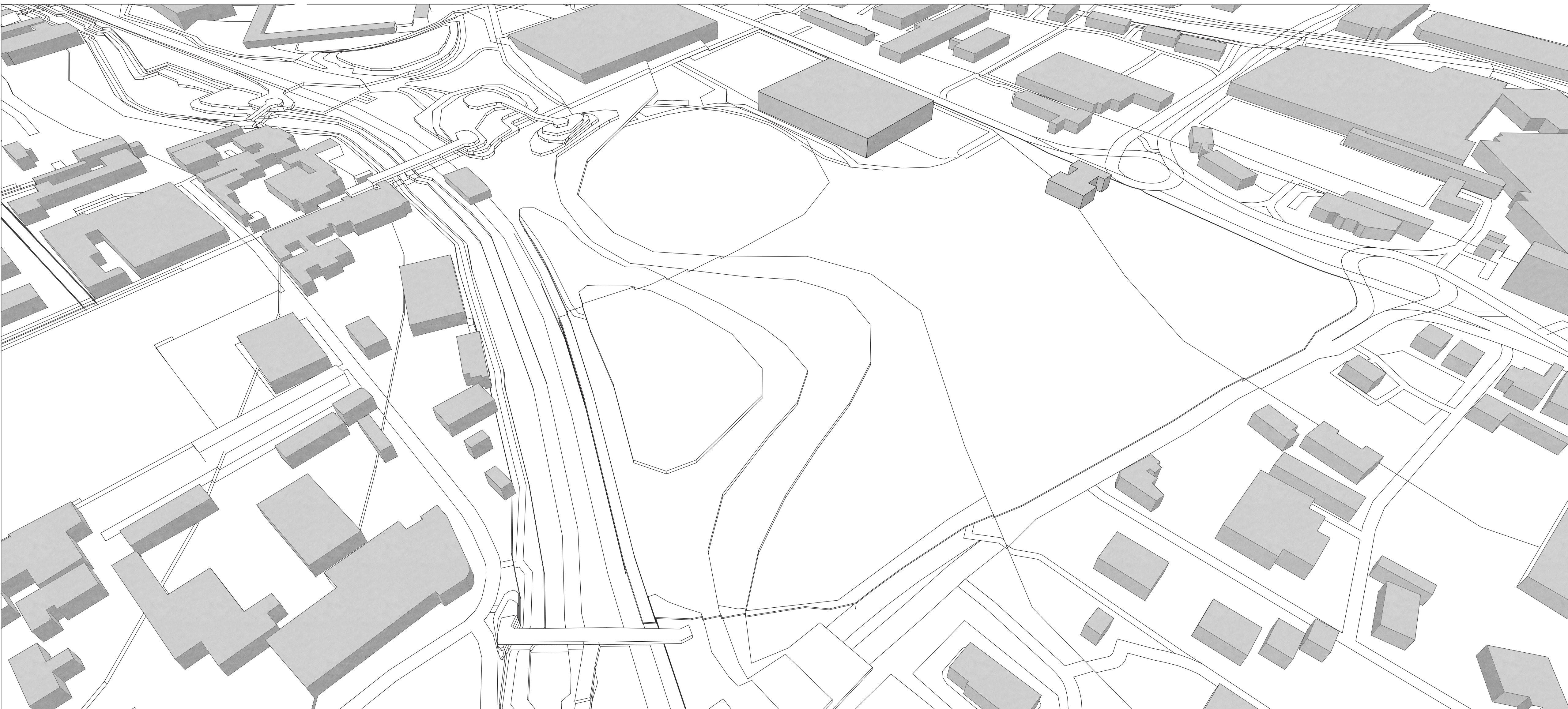
6

100 m

# PHASE O



# PHASE 1



INTRODUCTION

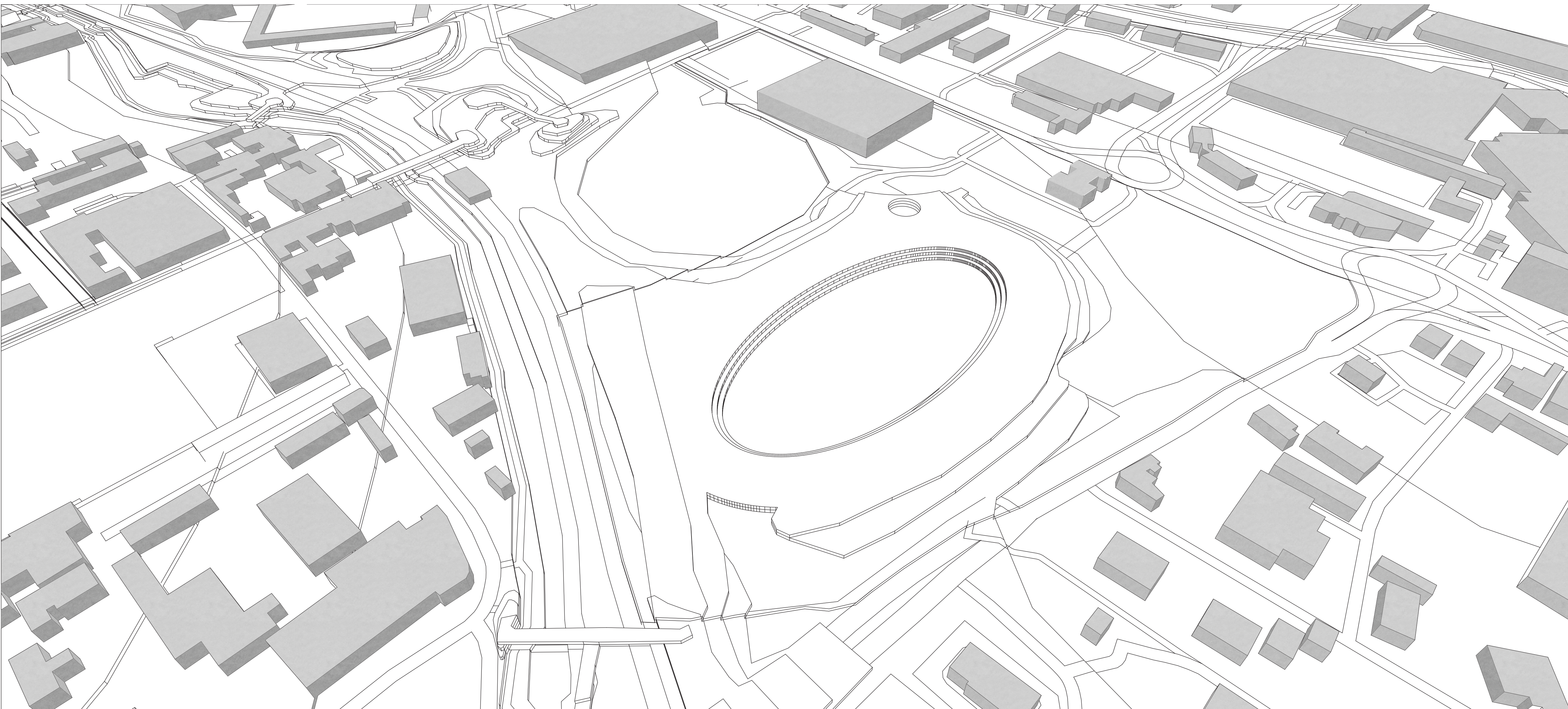
RESEARCH

DESIGN

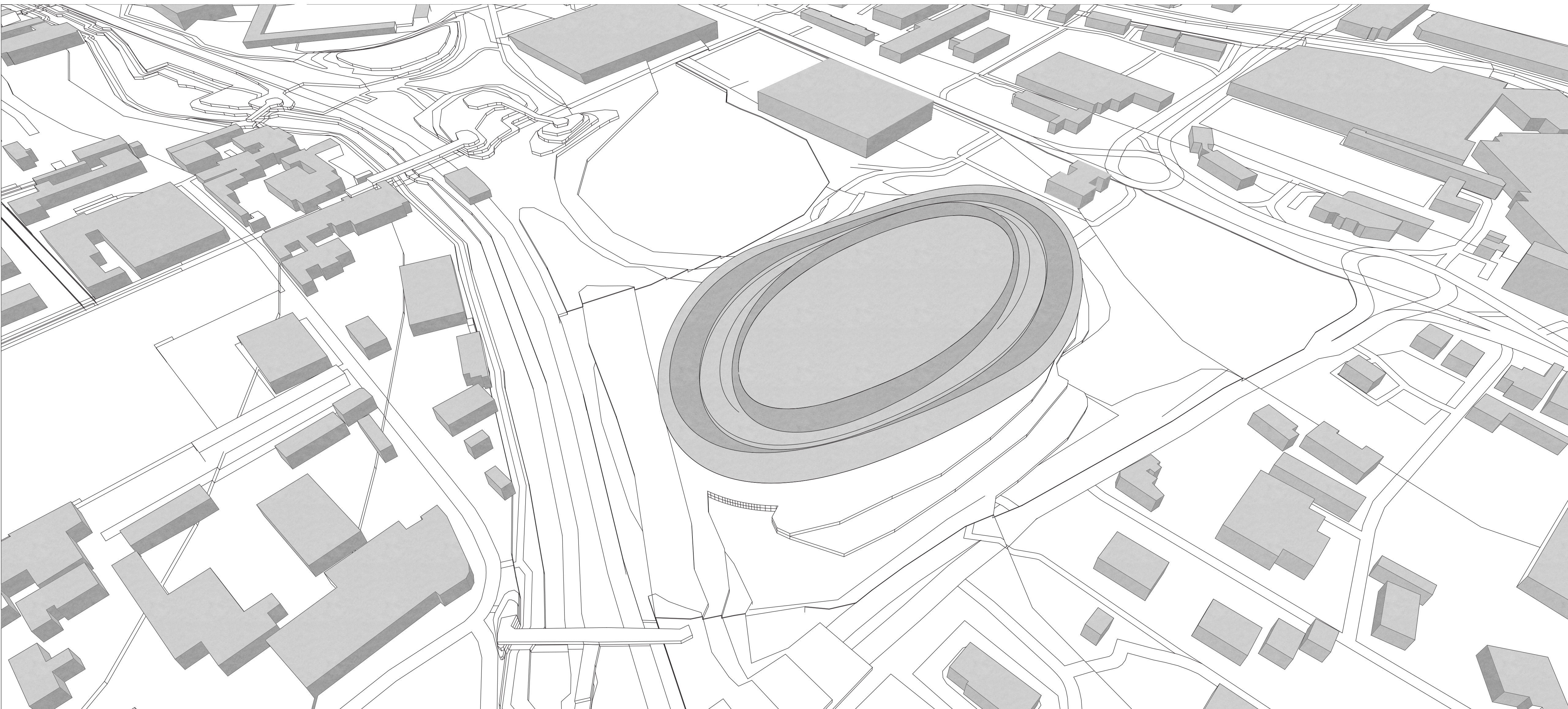
ENERGY

CONCLUSION

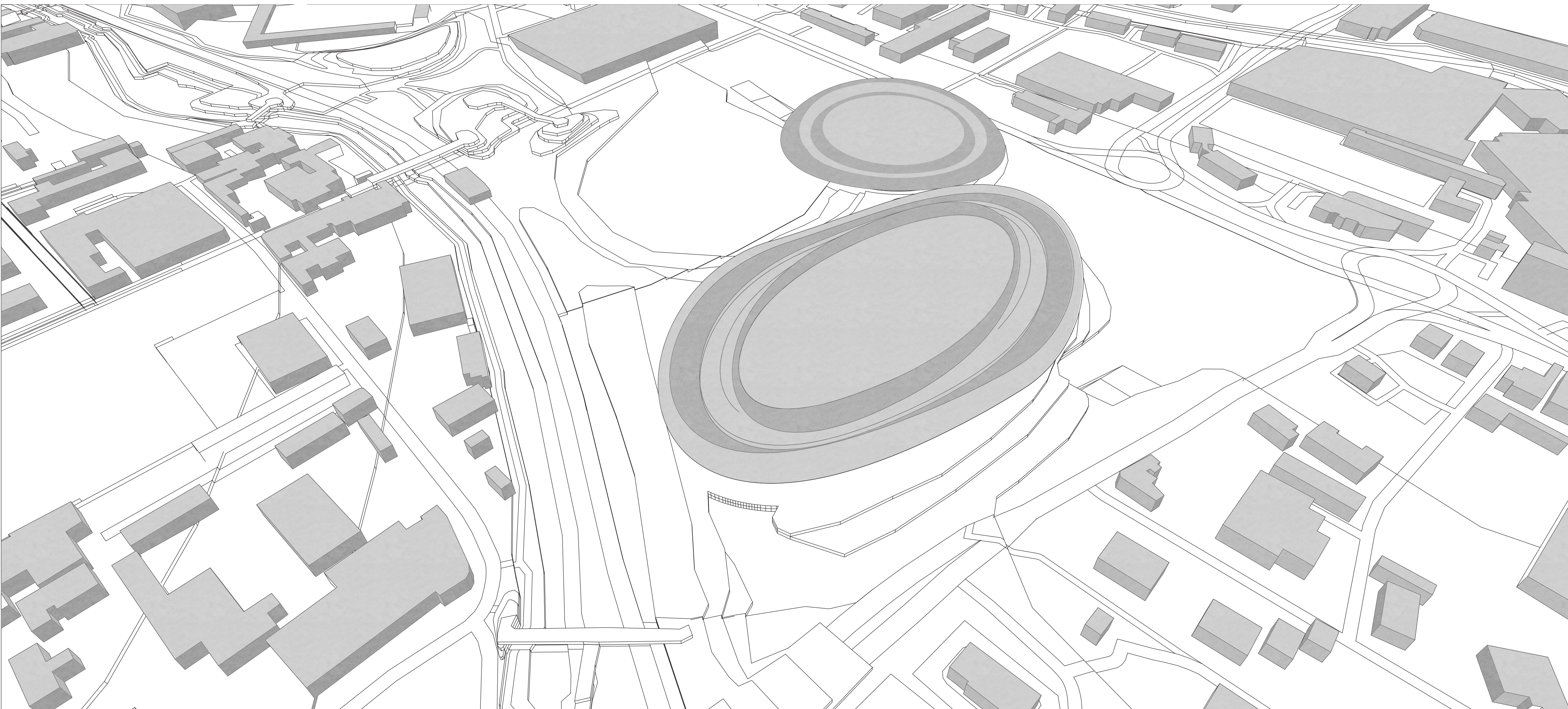
# PHASE 2



# PHASE 3

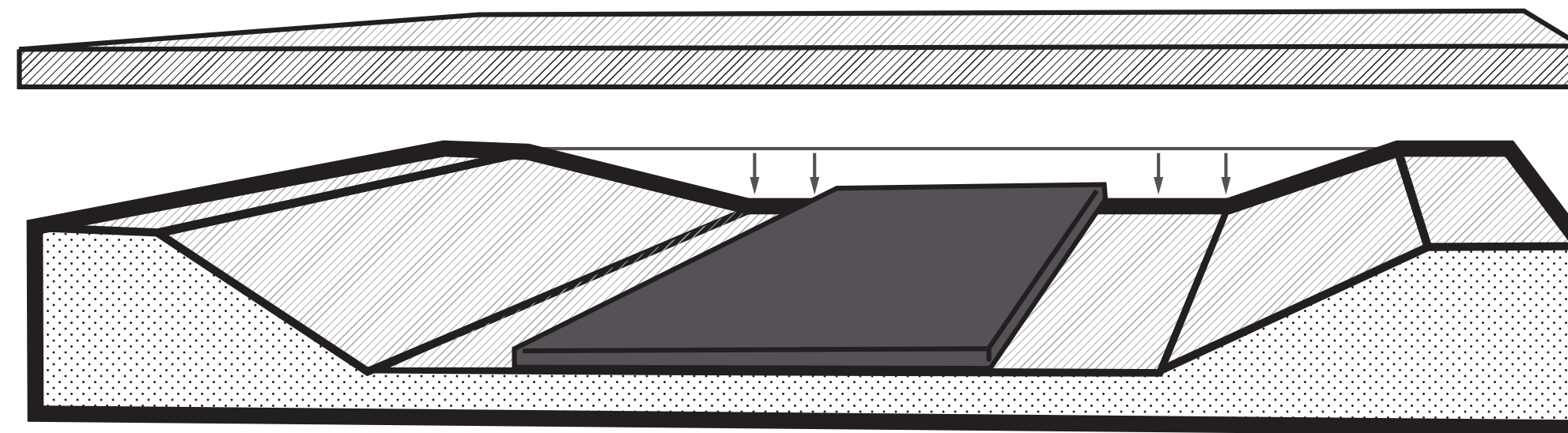


# PHASE 4



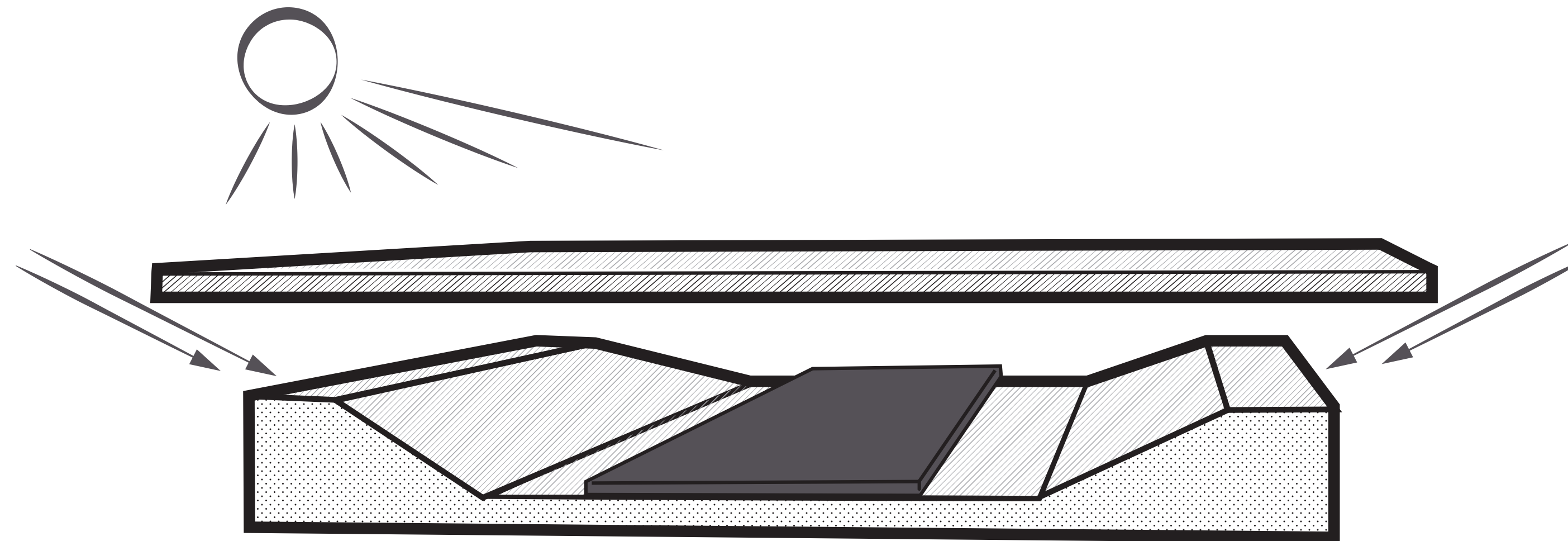
# DETERMINATION FORM

## INSULATING GROUND



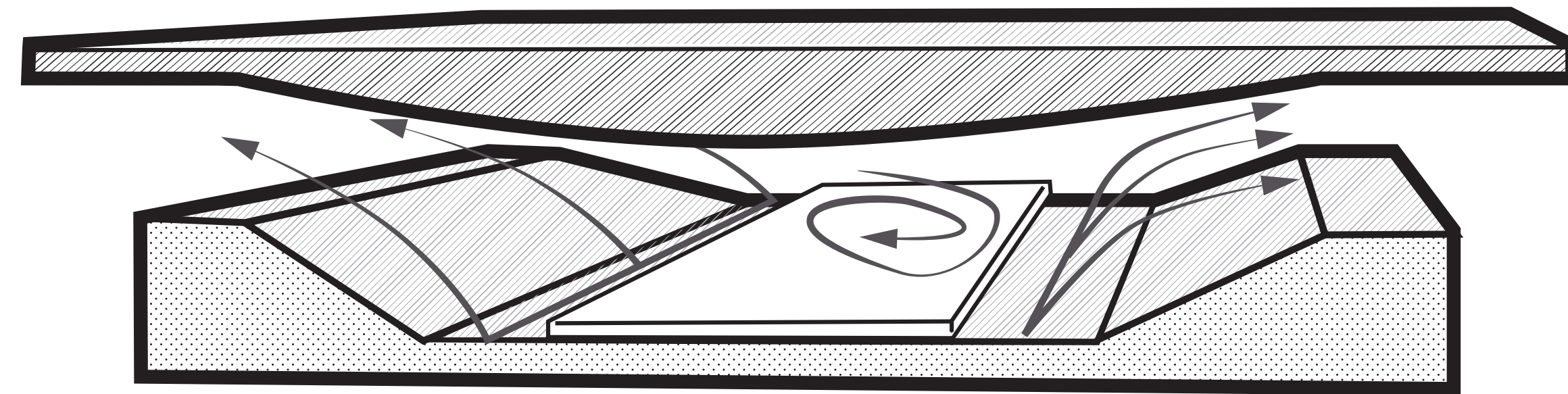
# DETERMINATION FORM

PROTECTION SOLAR RAYS



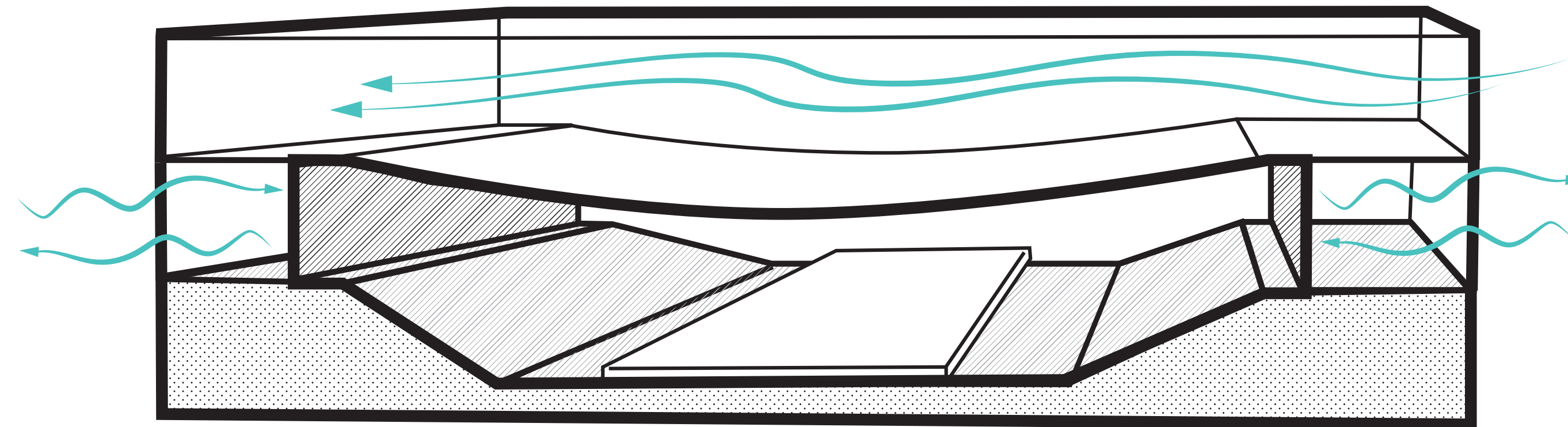
# DETERMINATION FORM

STIMULATE AIRFLOWS



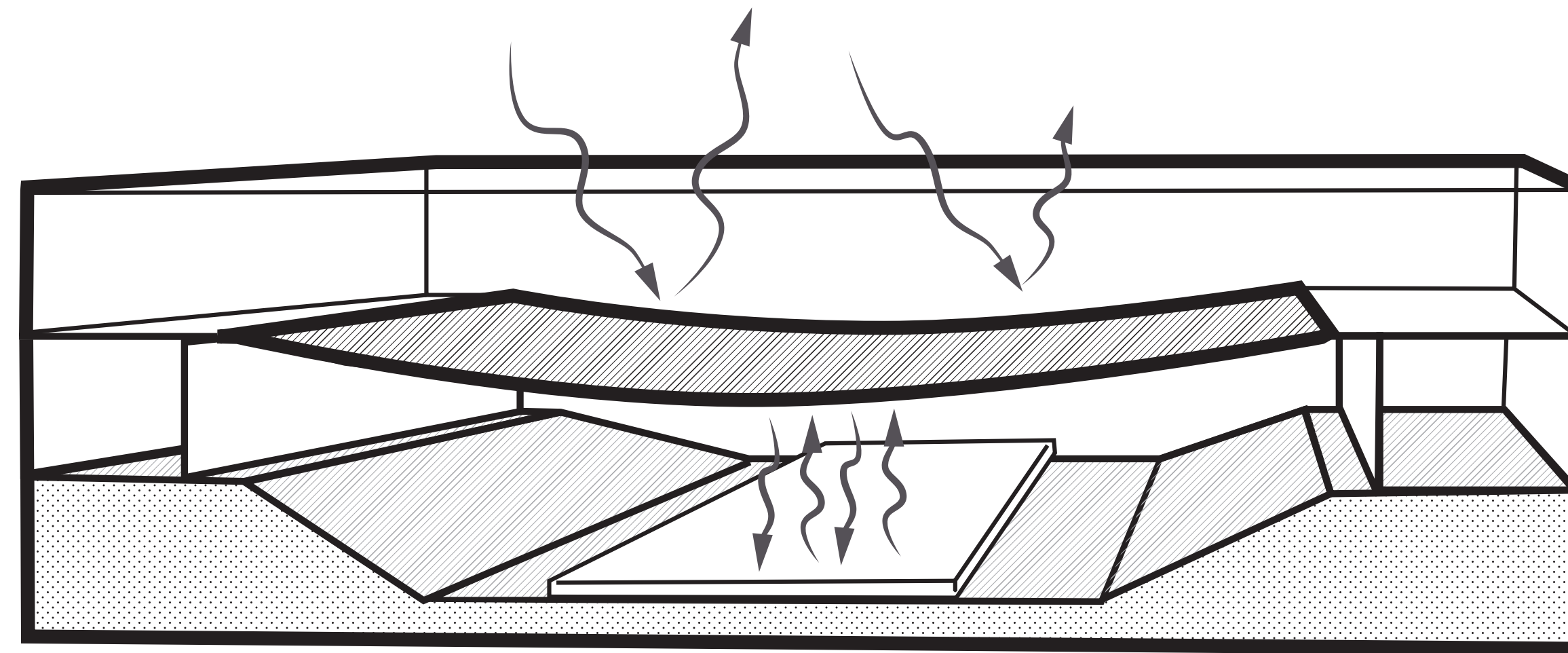
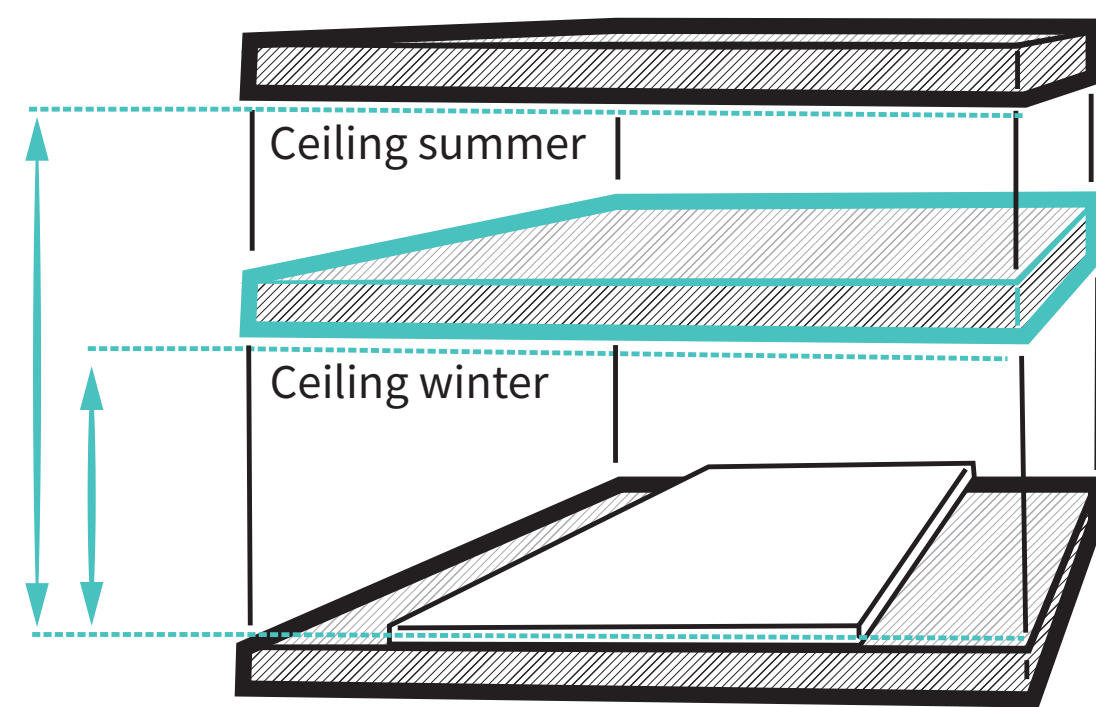
# DETERMINATION FORM

## BUFFER ROOF AND RING

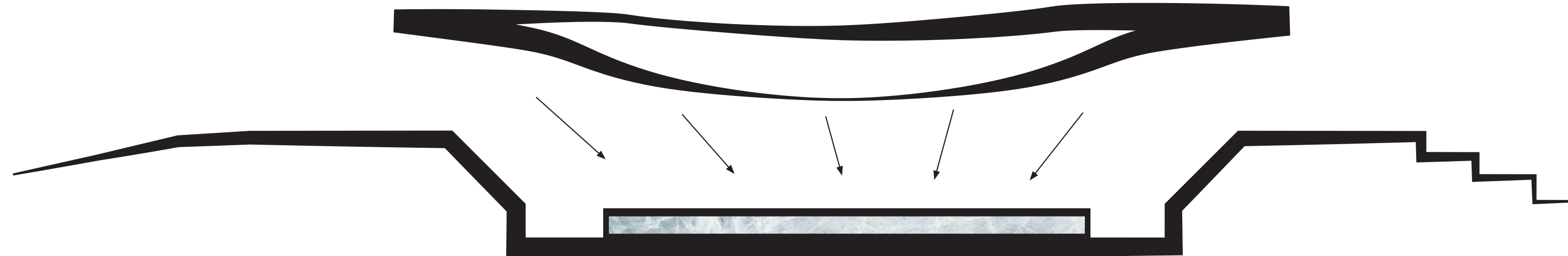


# DETERMINATION FORM

## PROTECTIVE CEILING



# ROOF AS SERVING OBJECT

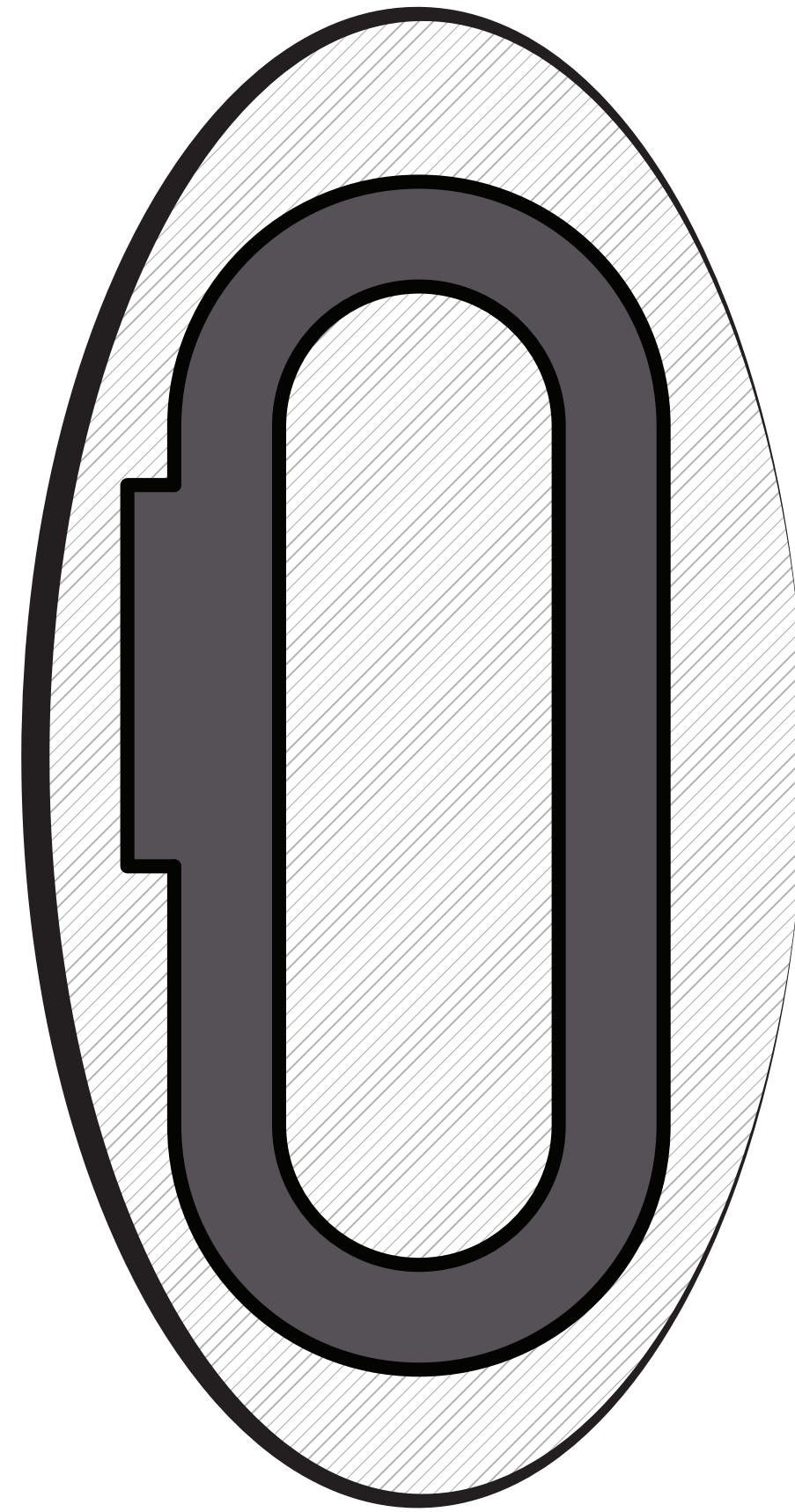


# DETERMINATION FORM

"SKATE MOVEMENT"



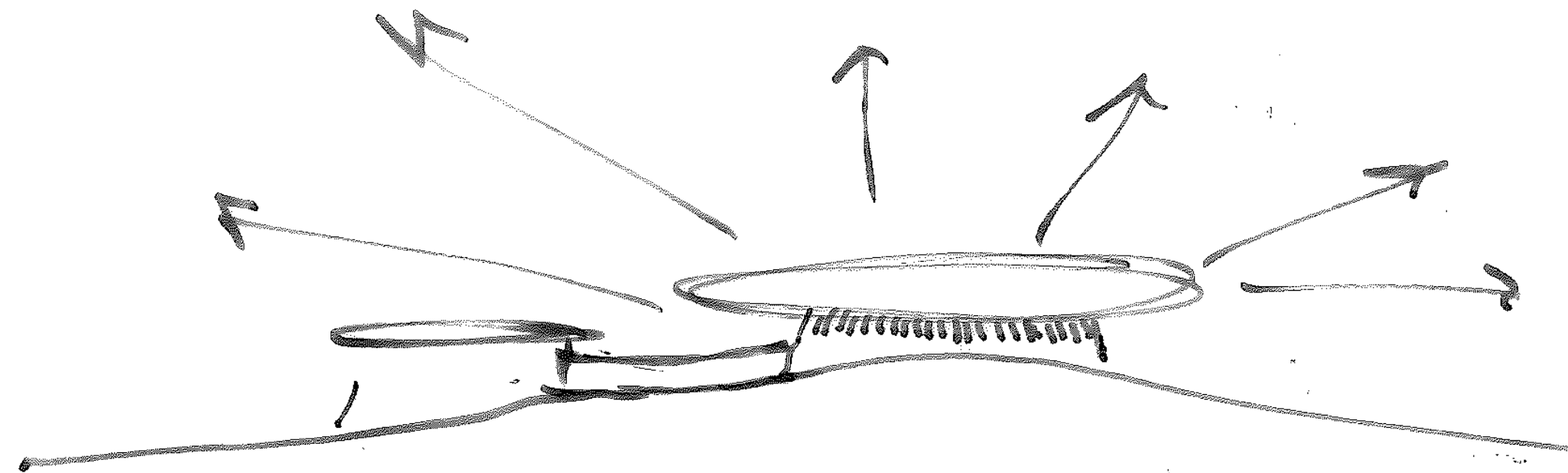
# DETERMINATION FORM



# DETERMINATION FORM

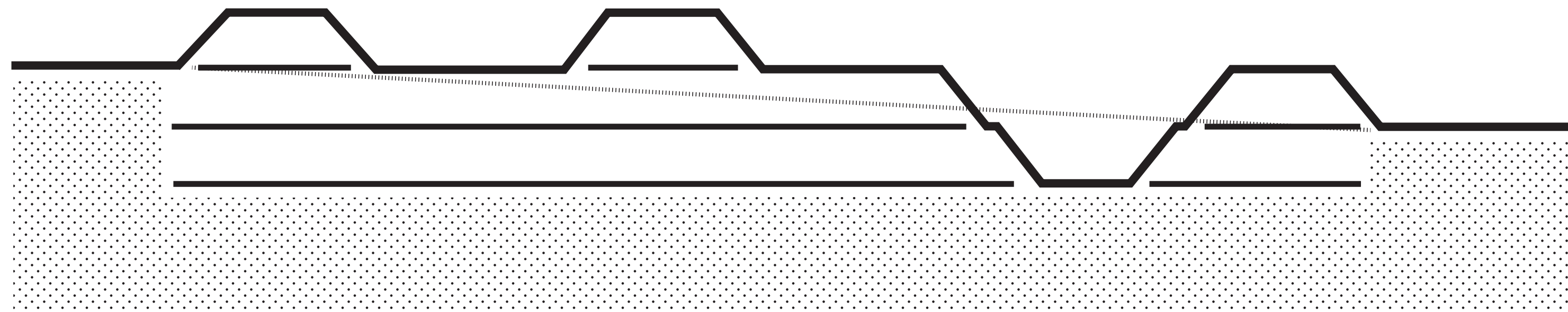


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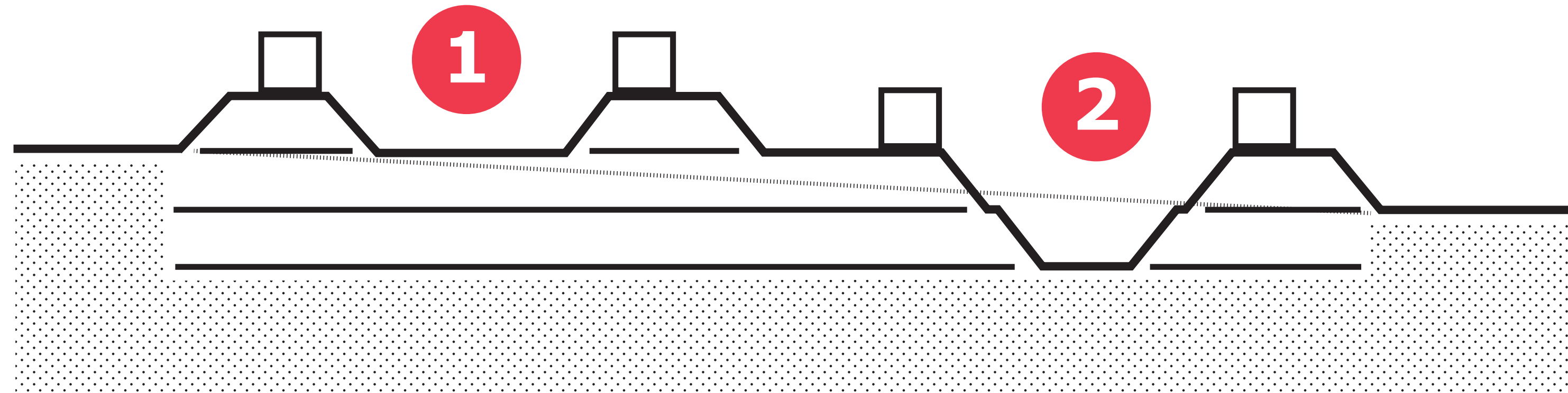


**FOCUS ON 400 METER BUILDING**

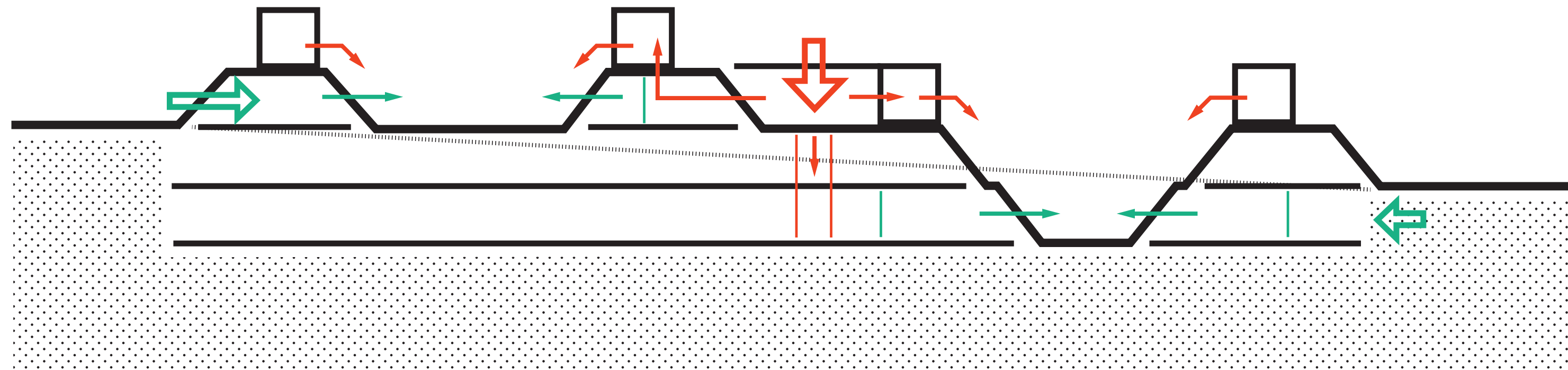
# SPATIAL SET UP



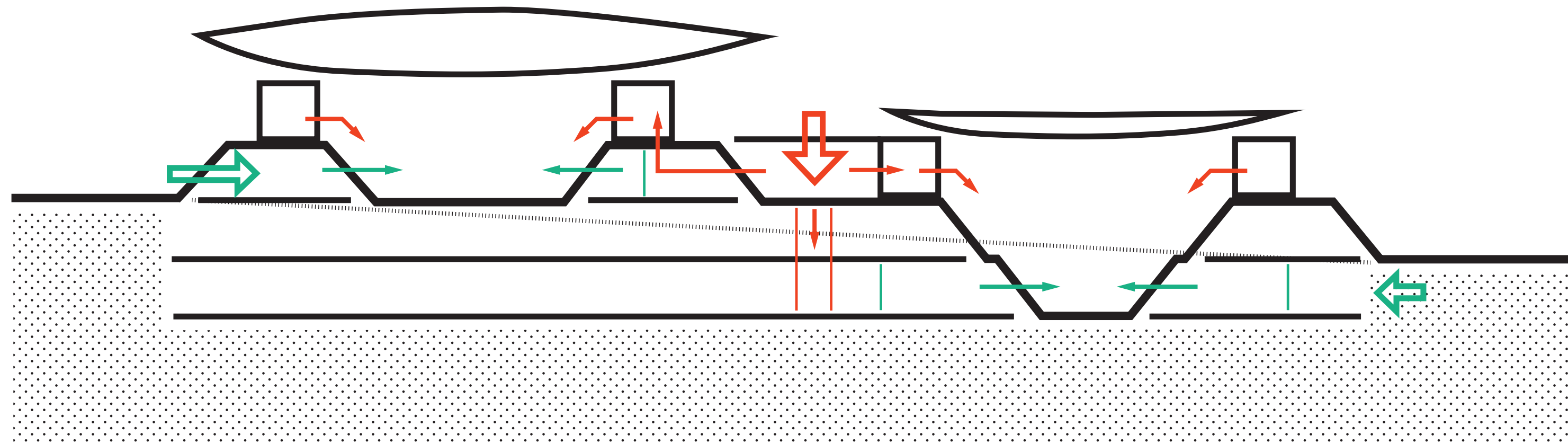
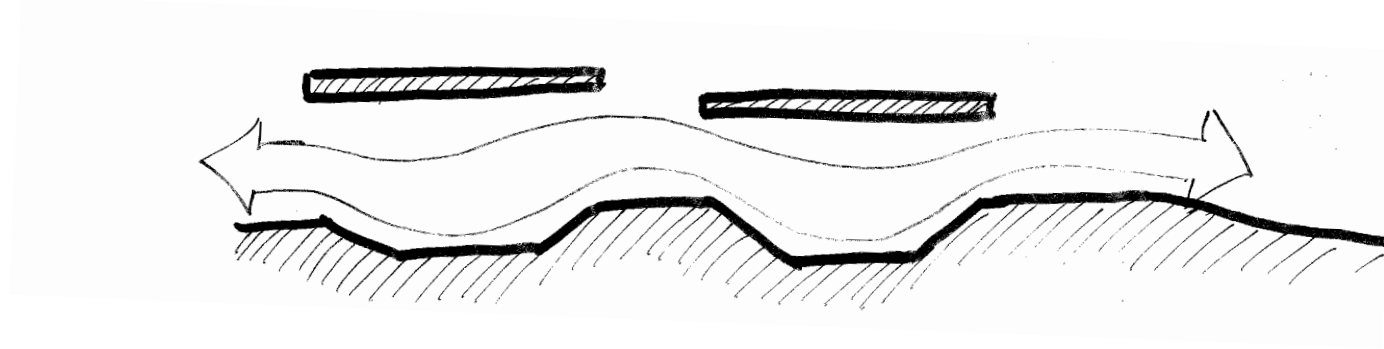
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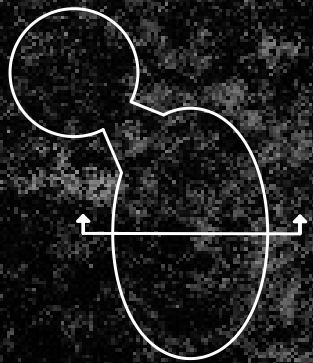
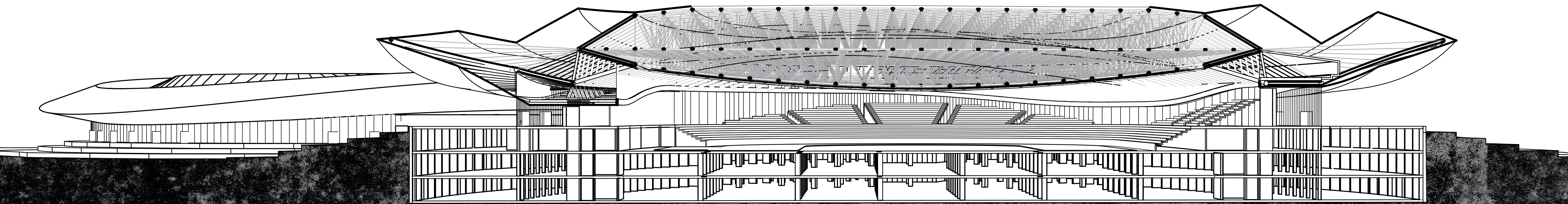
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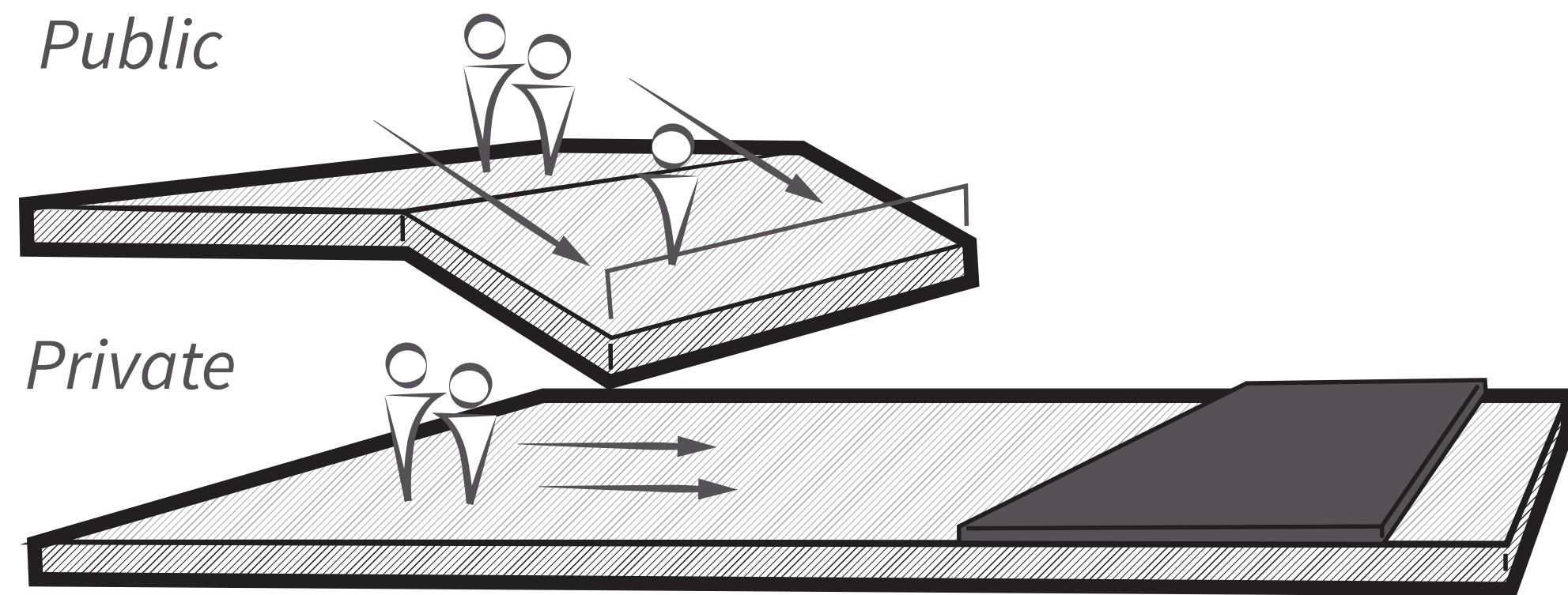
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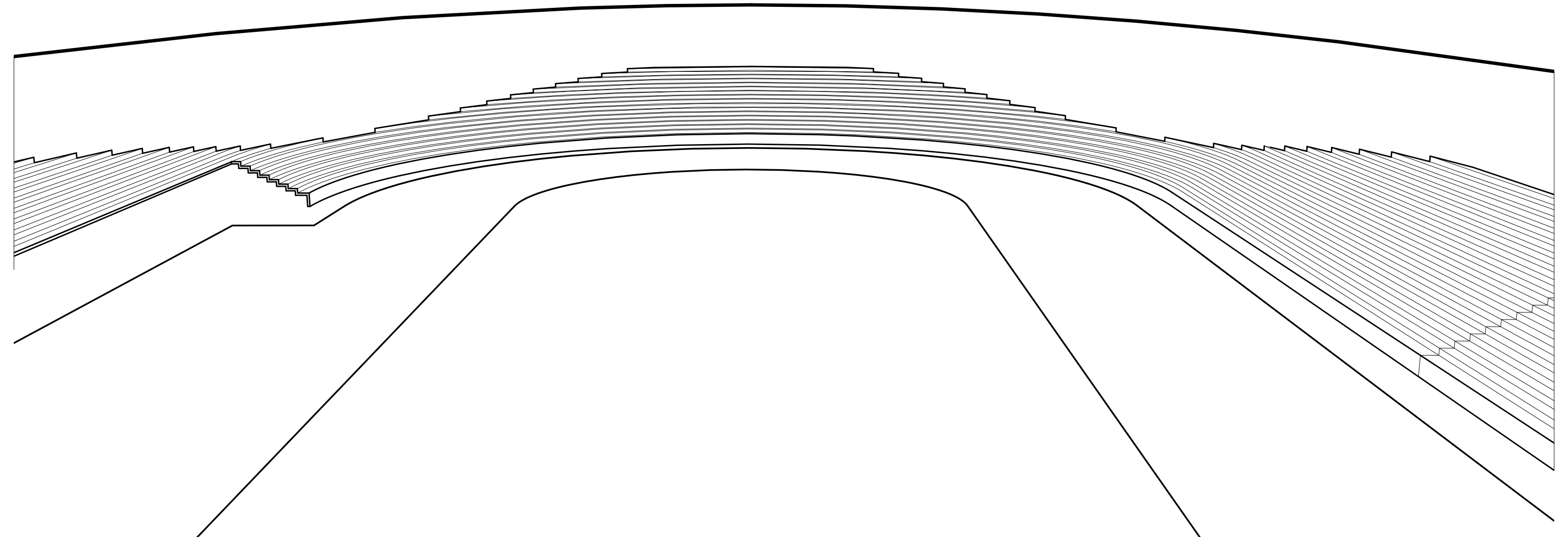
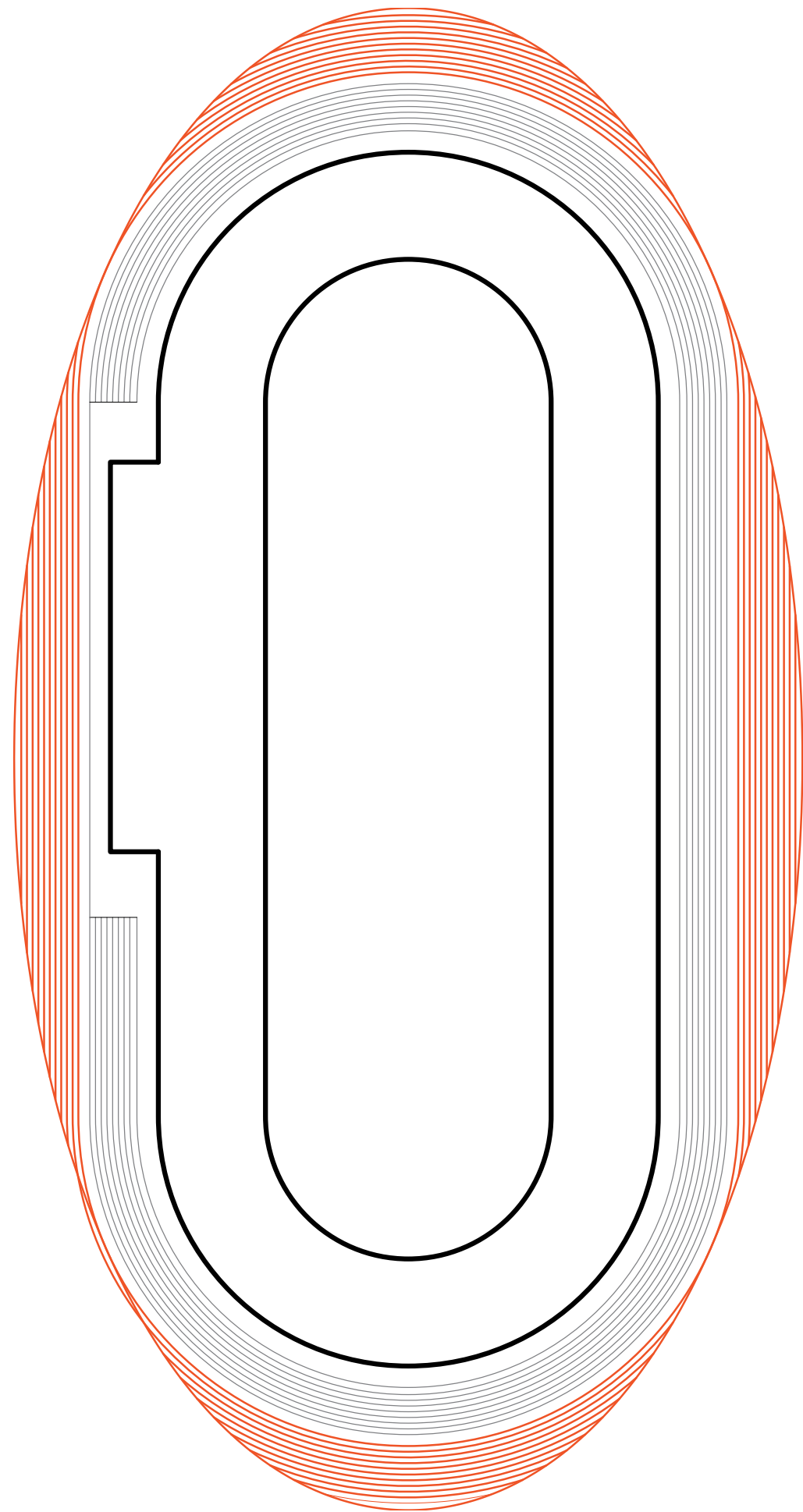
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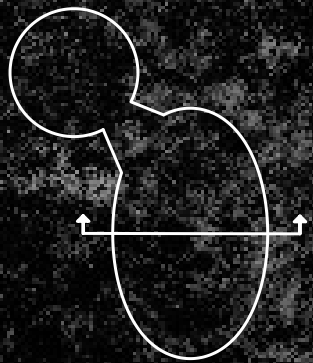
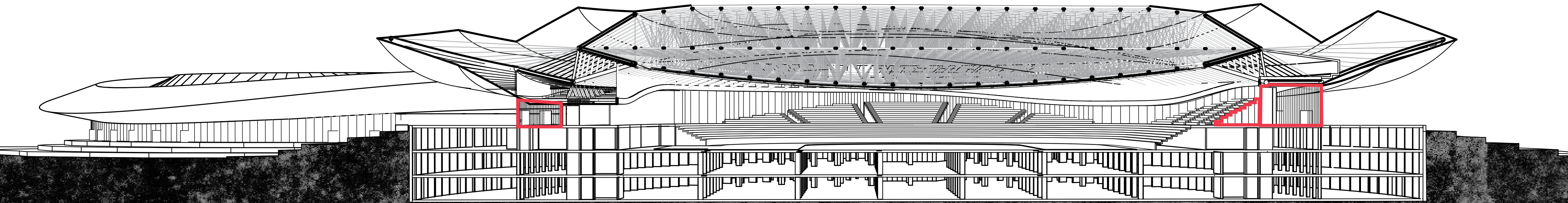
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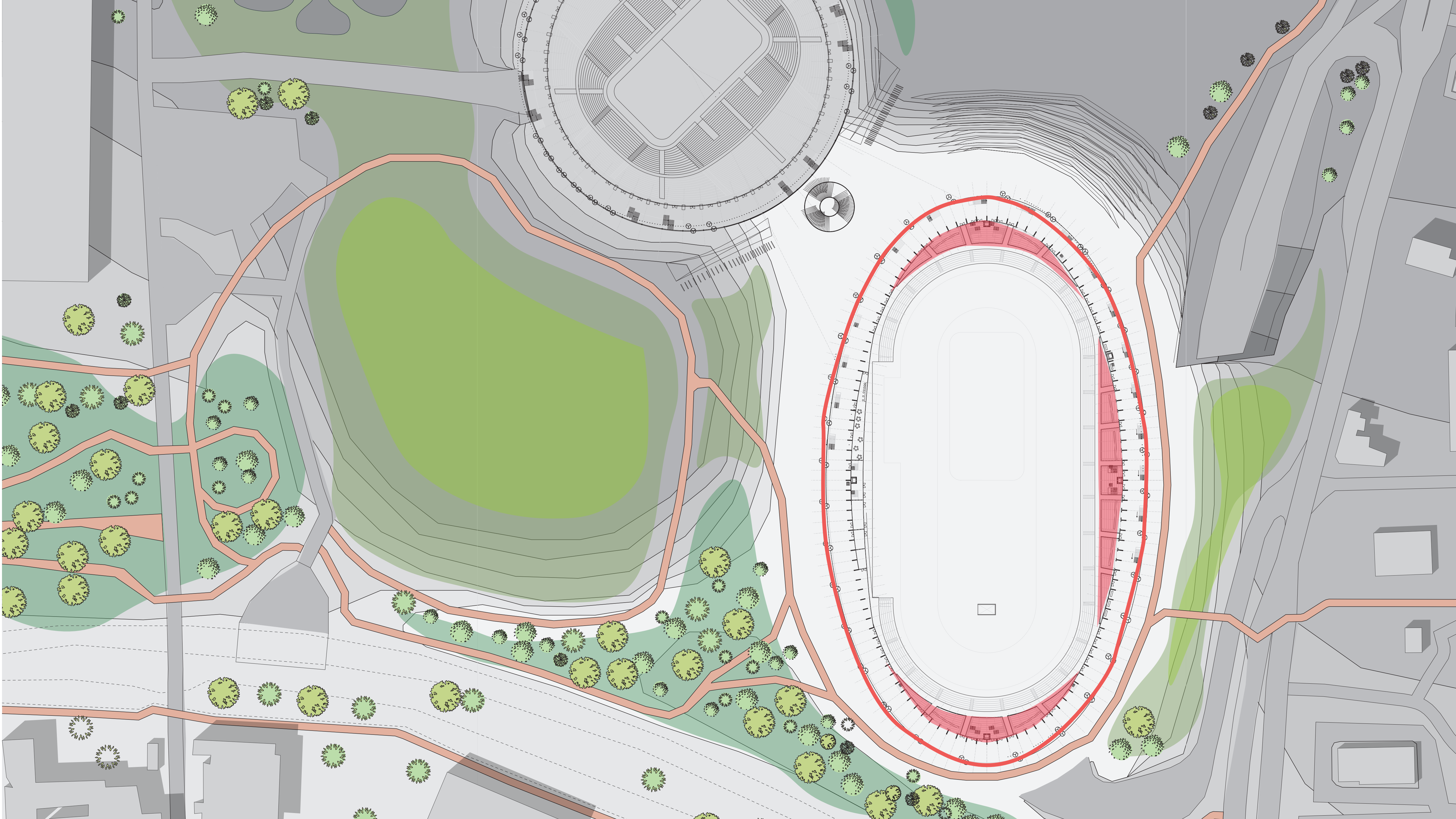


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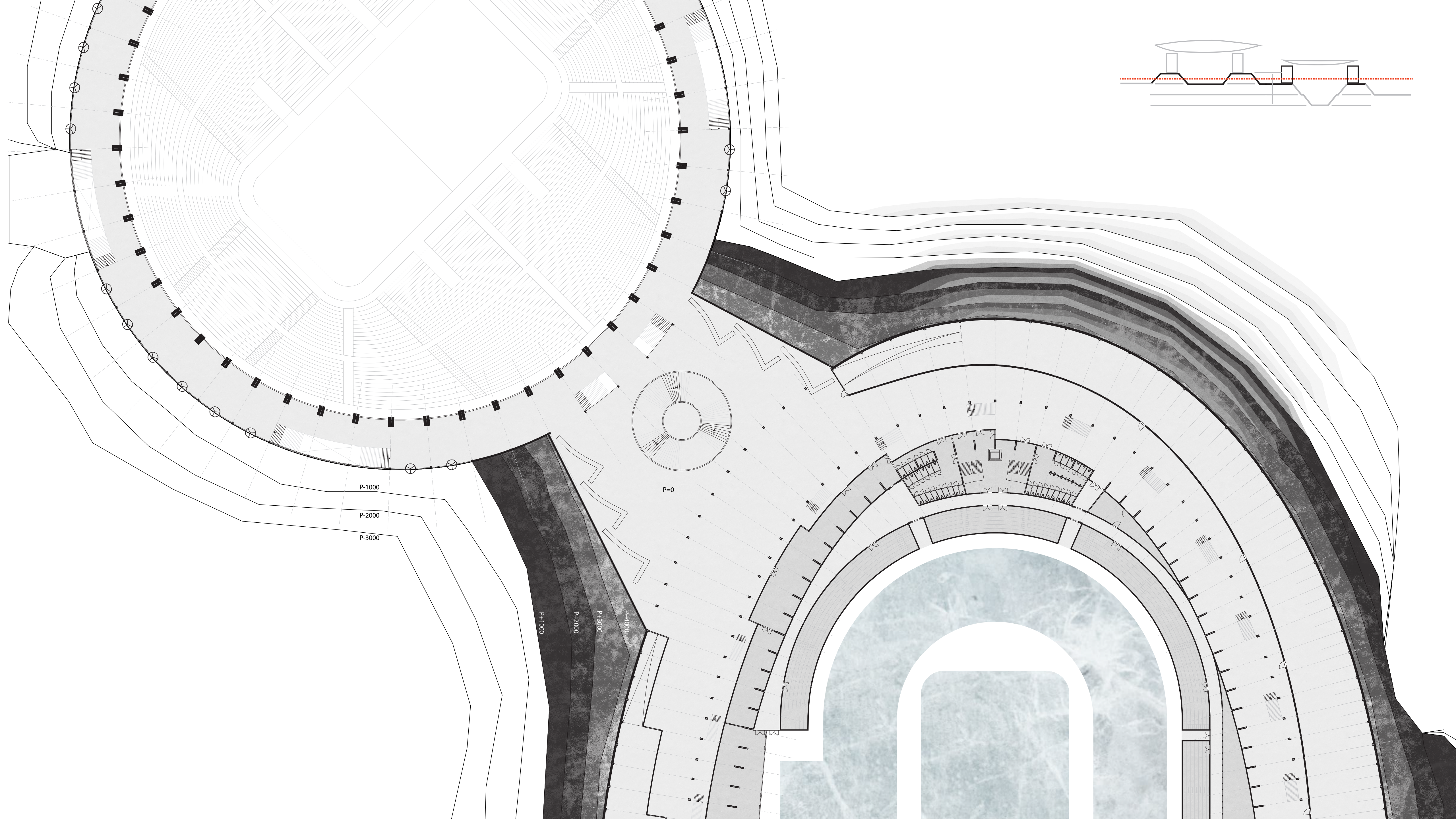
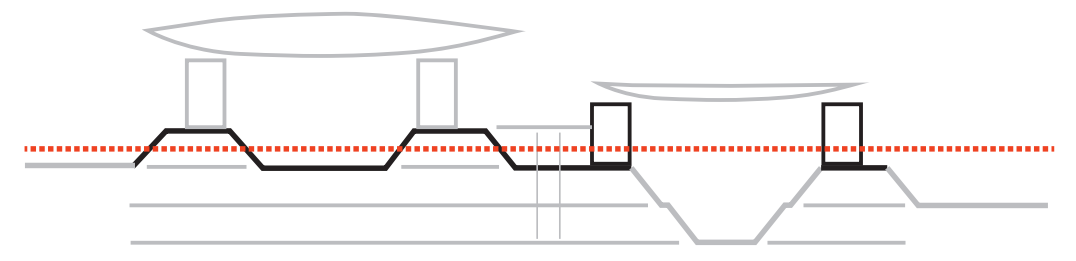
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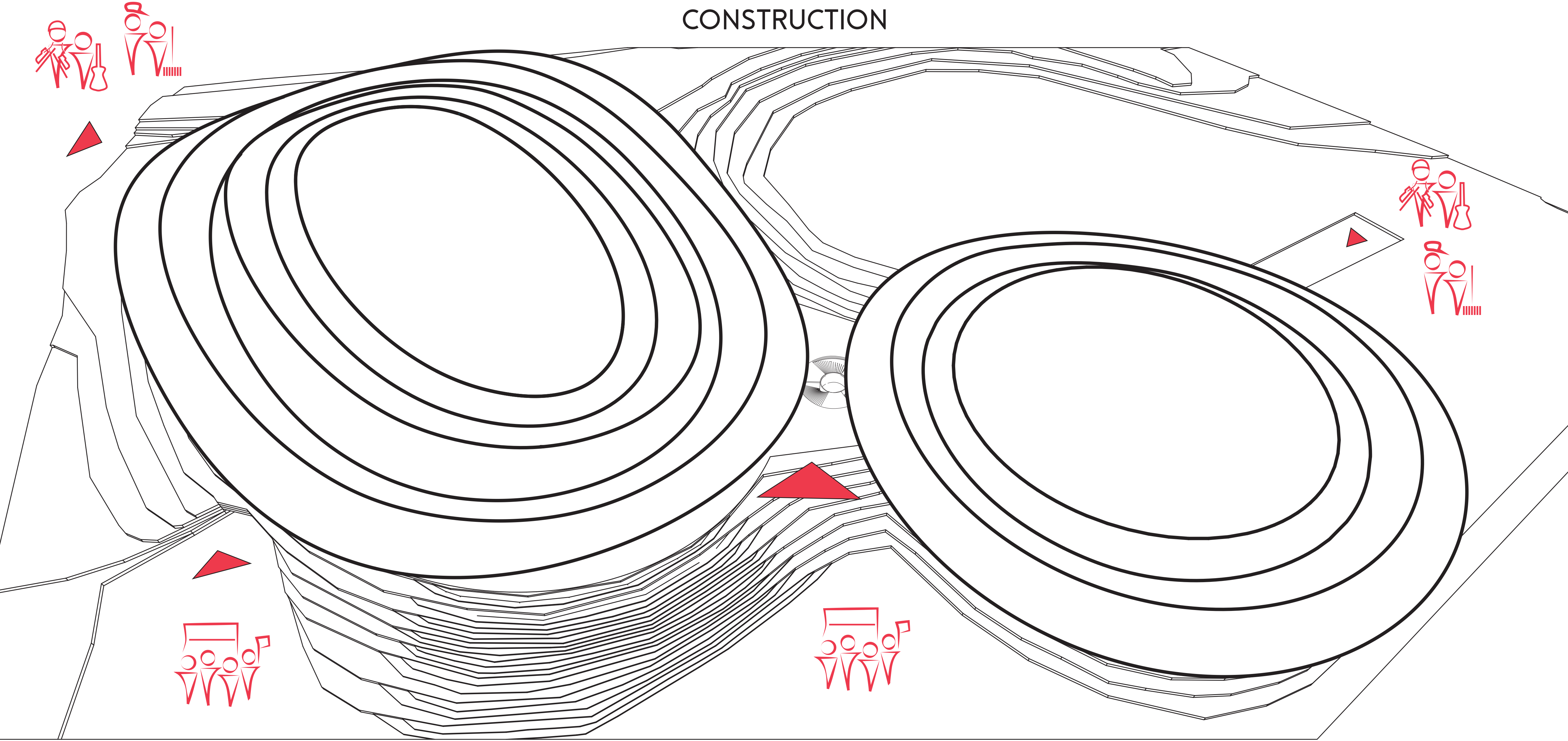


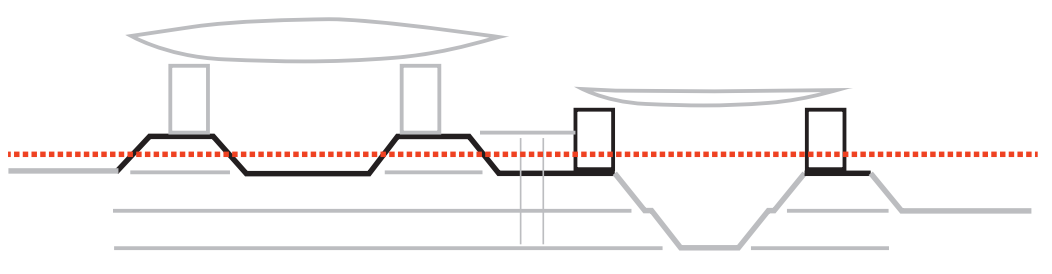
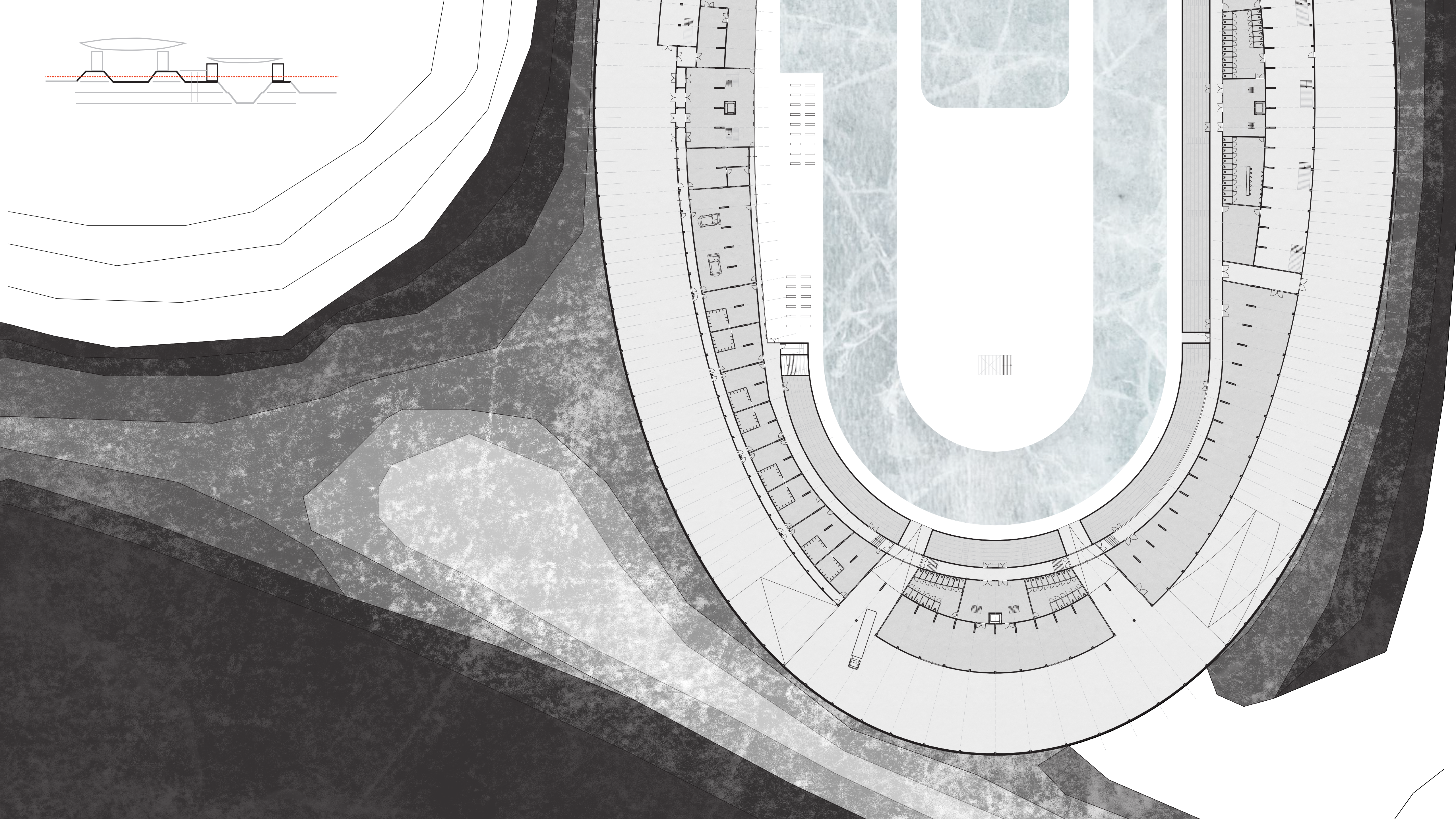
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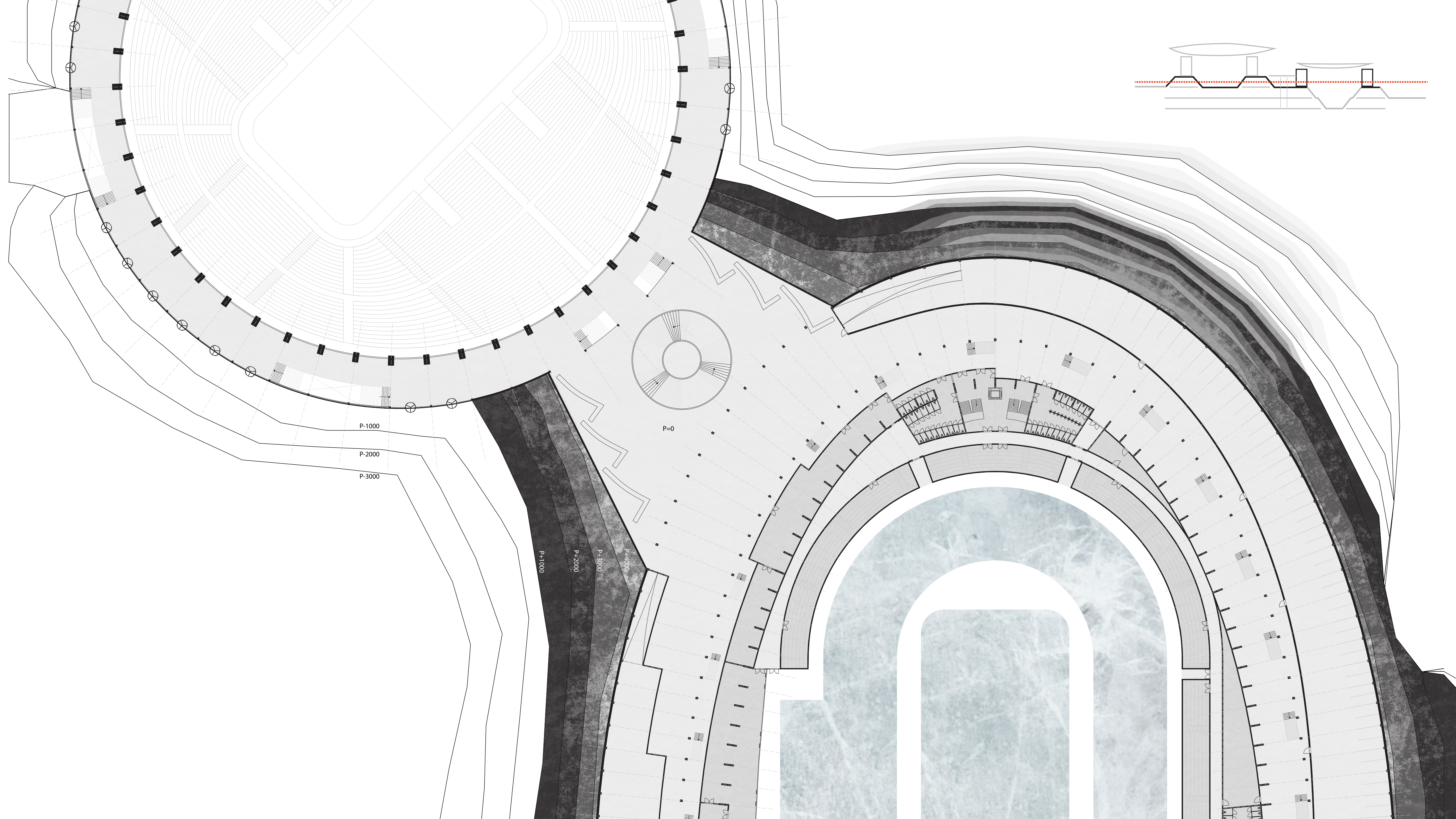
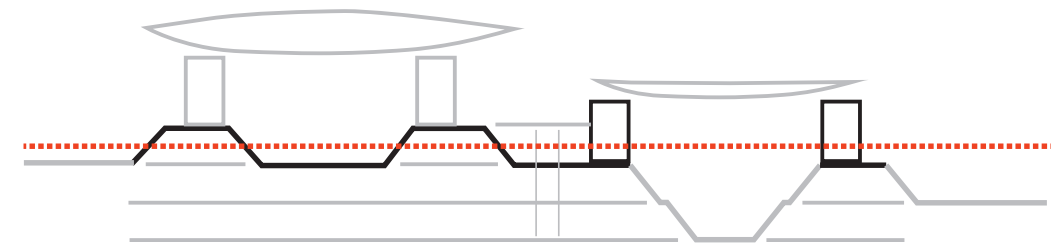




# CONSTRUCTION







P-1000

P-2000

P-3000

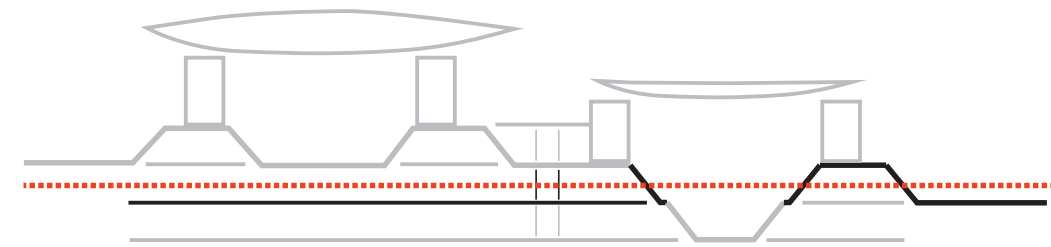
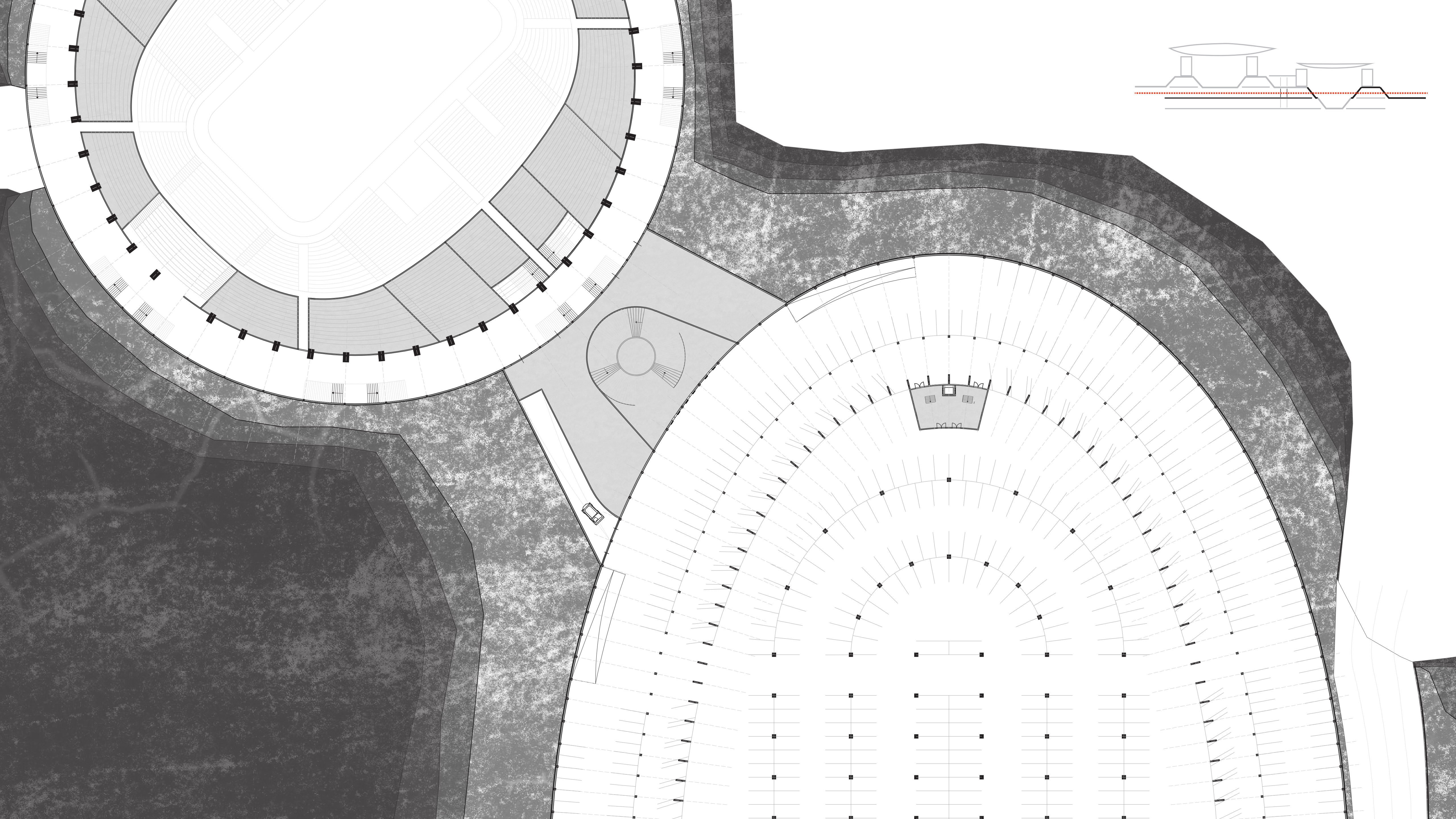
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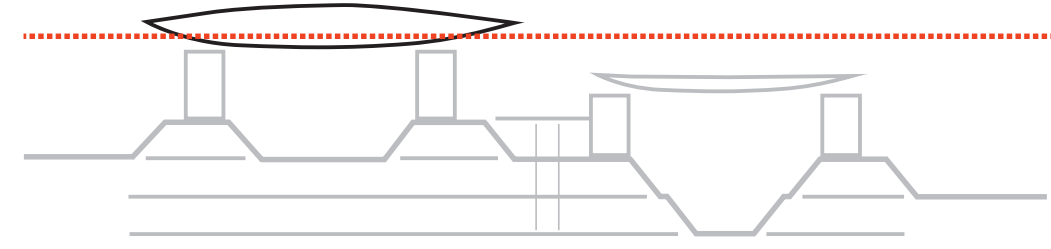
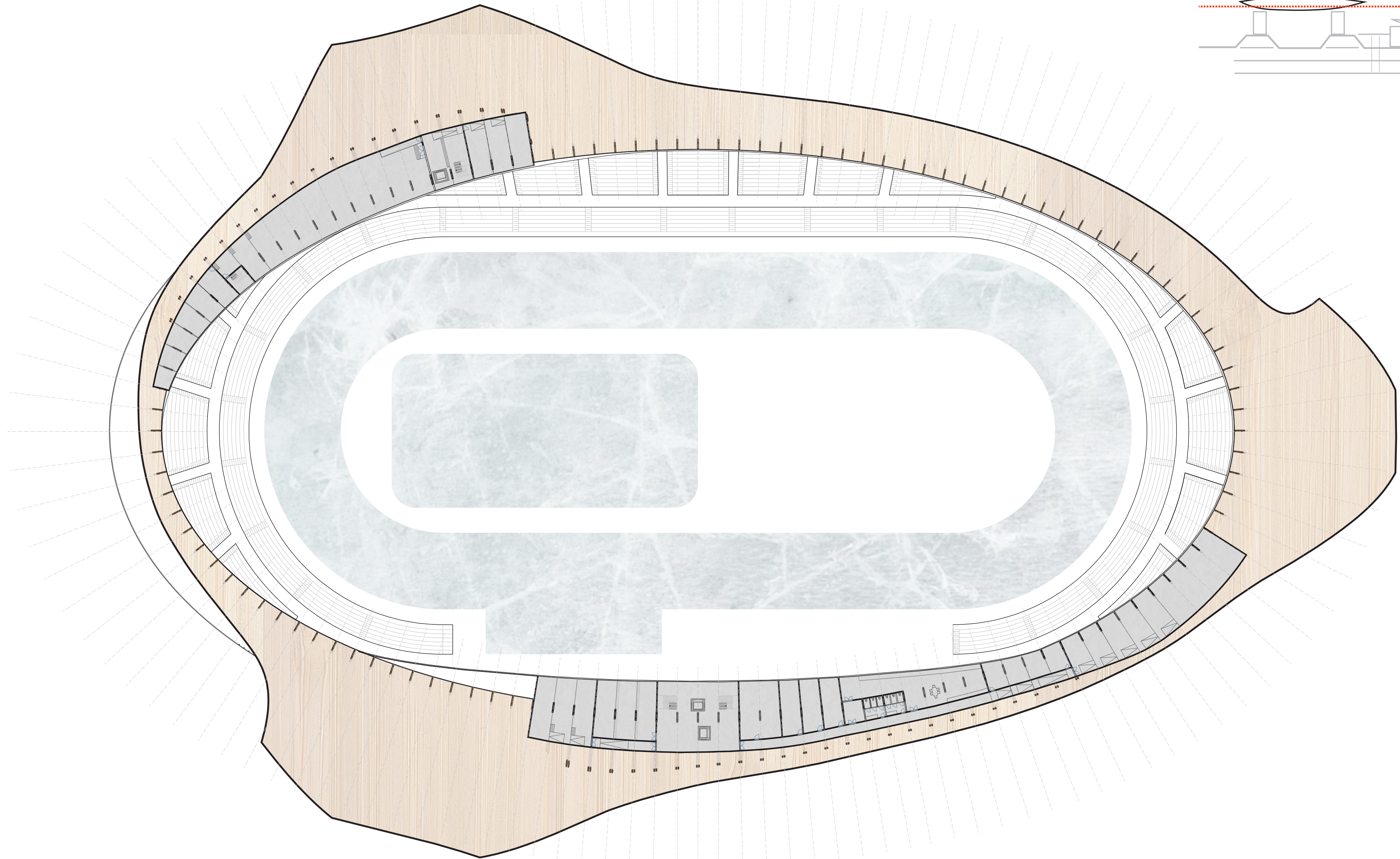
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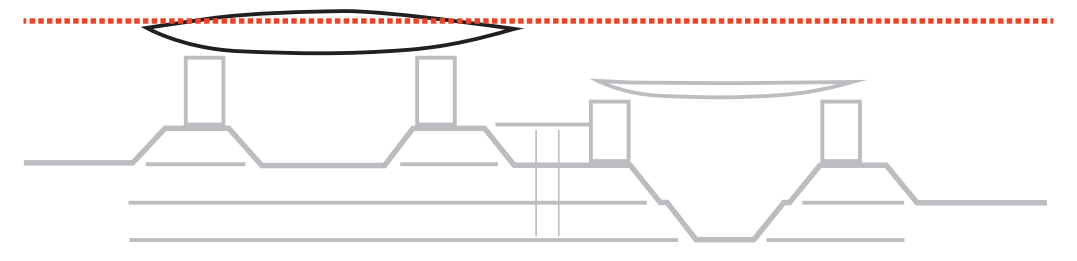
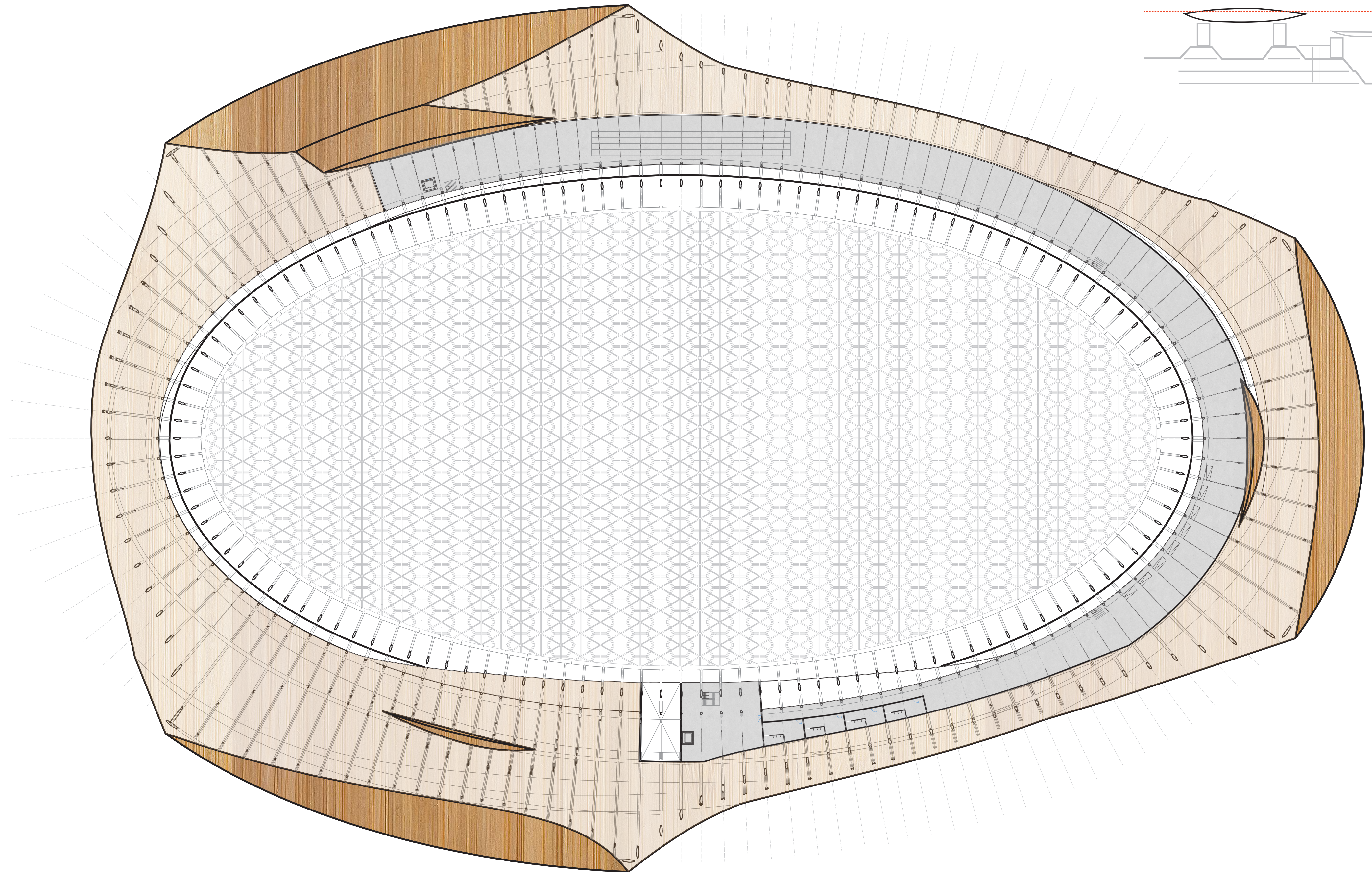
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P-3000

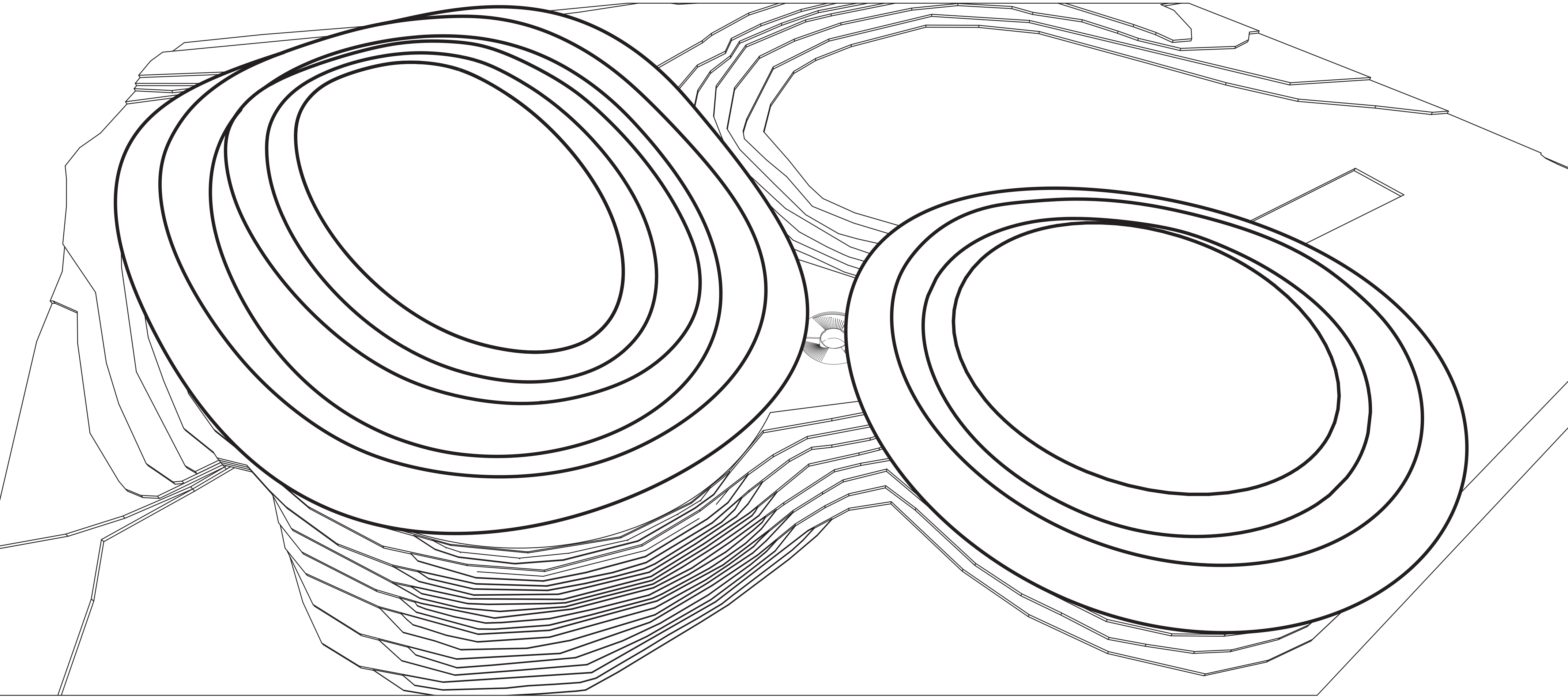
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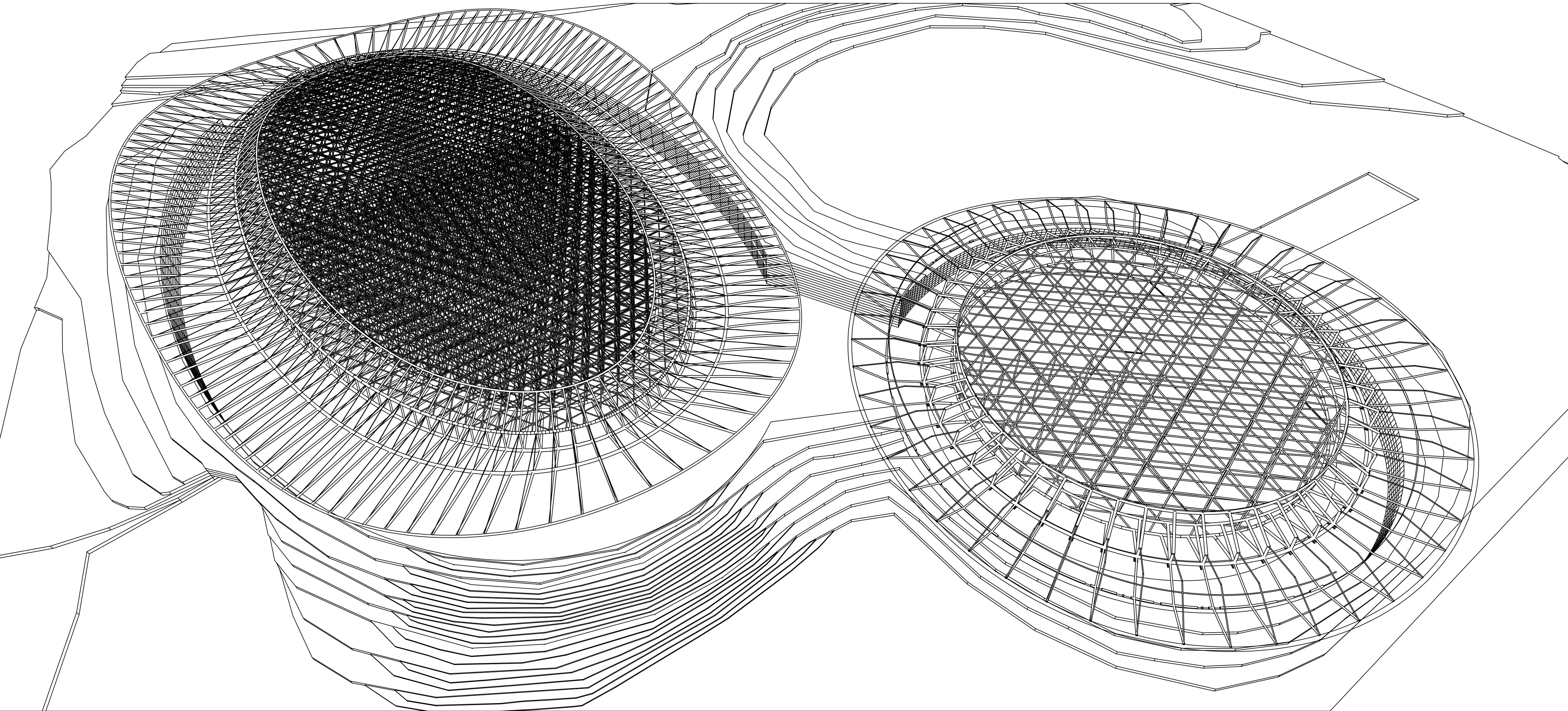




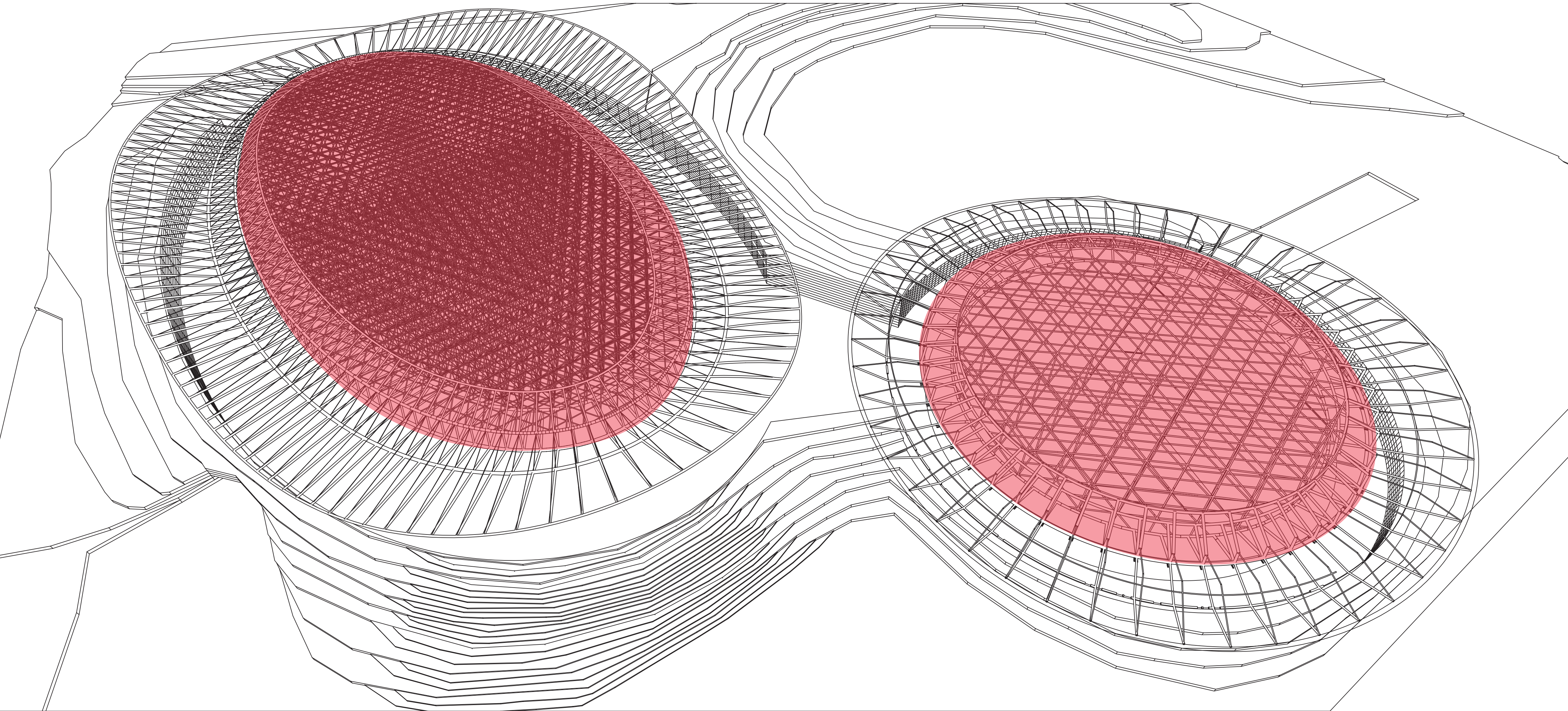
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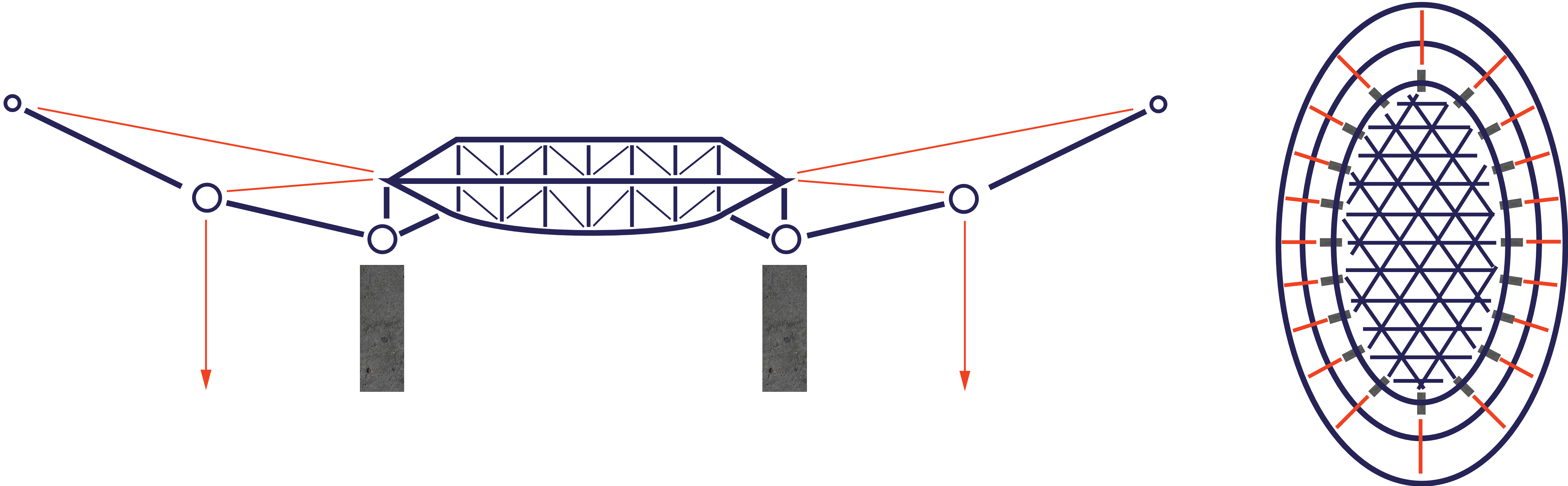
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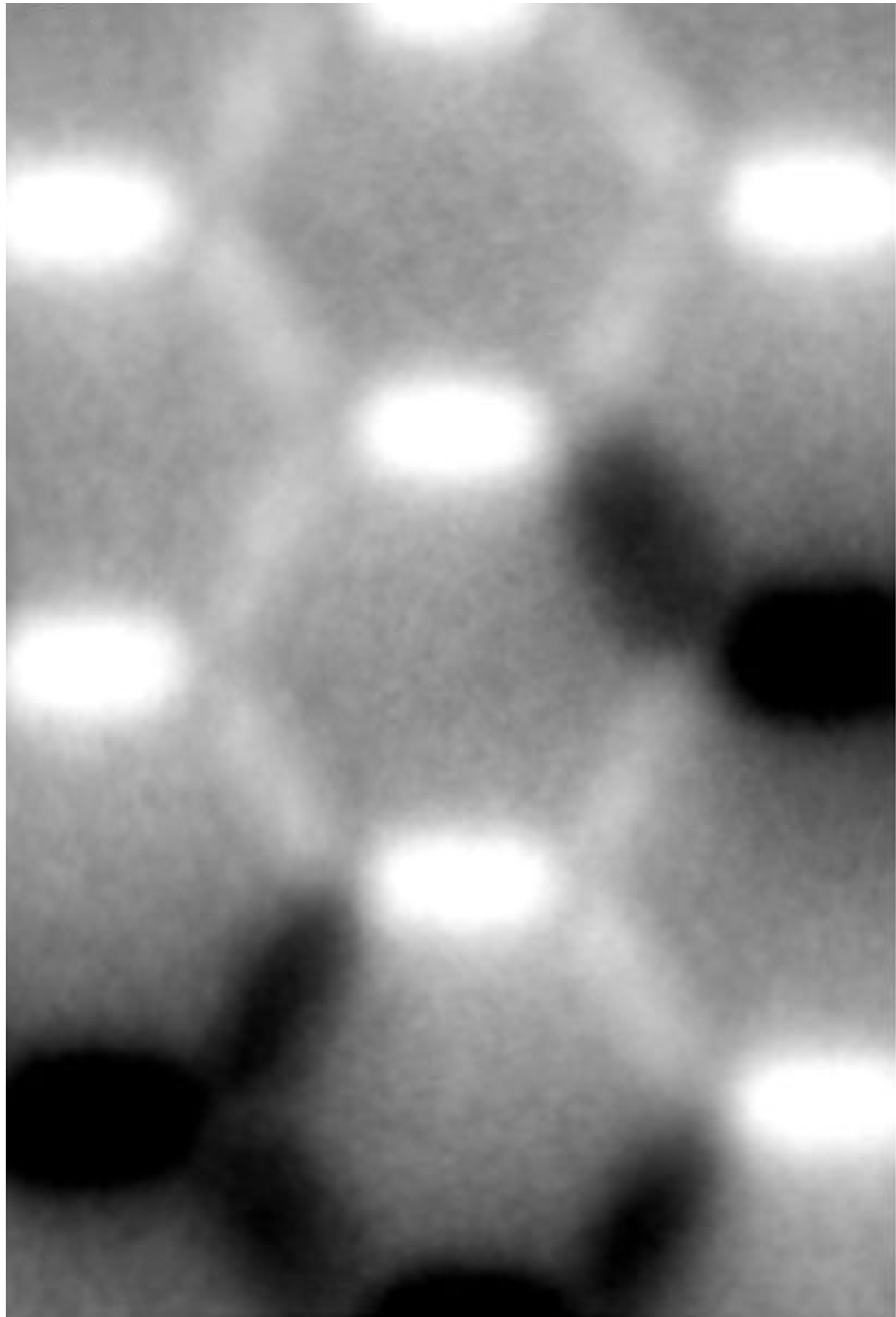
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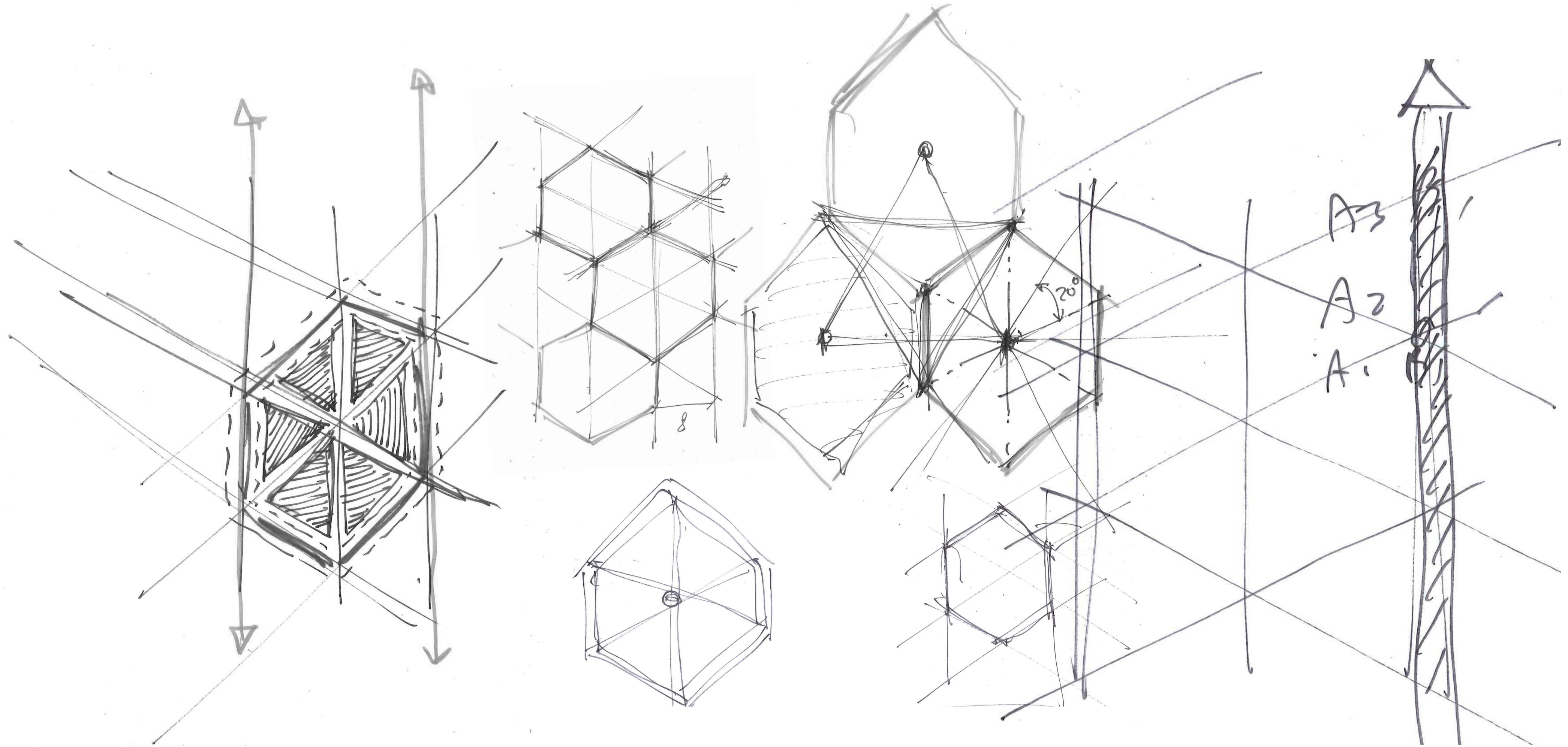
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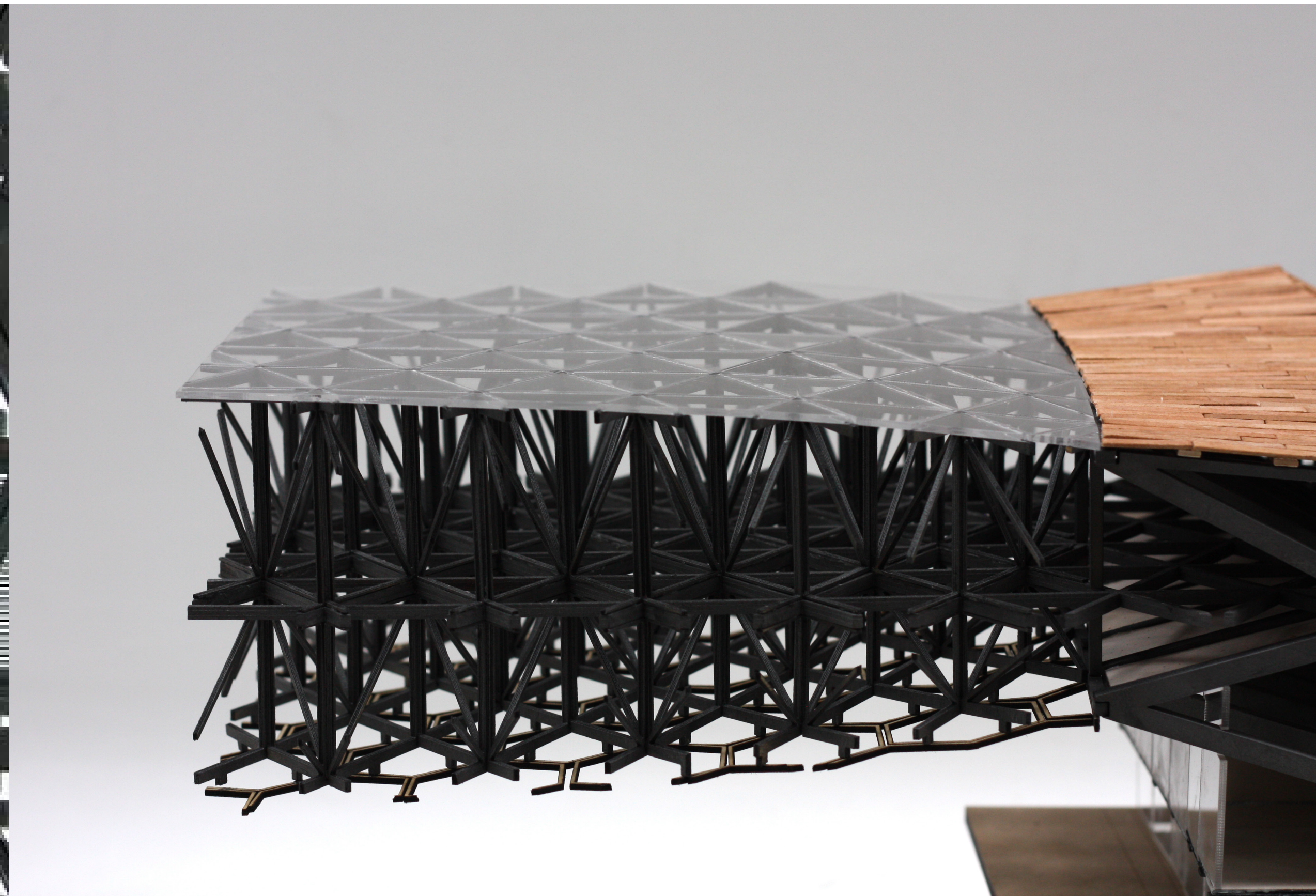
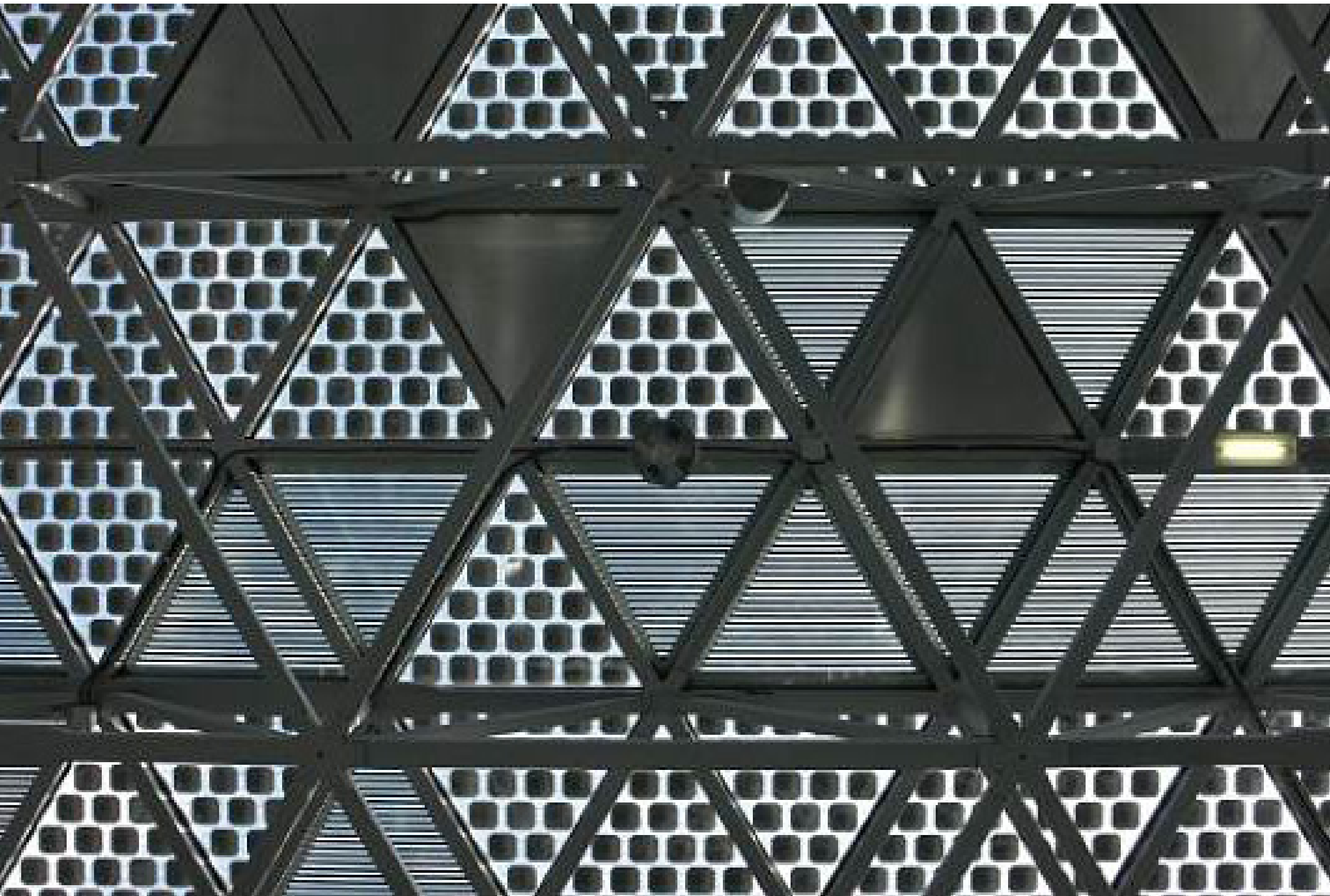
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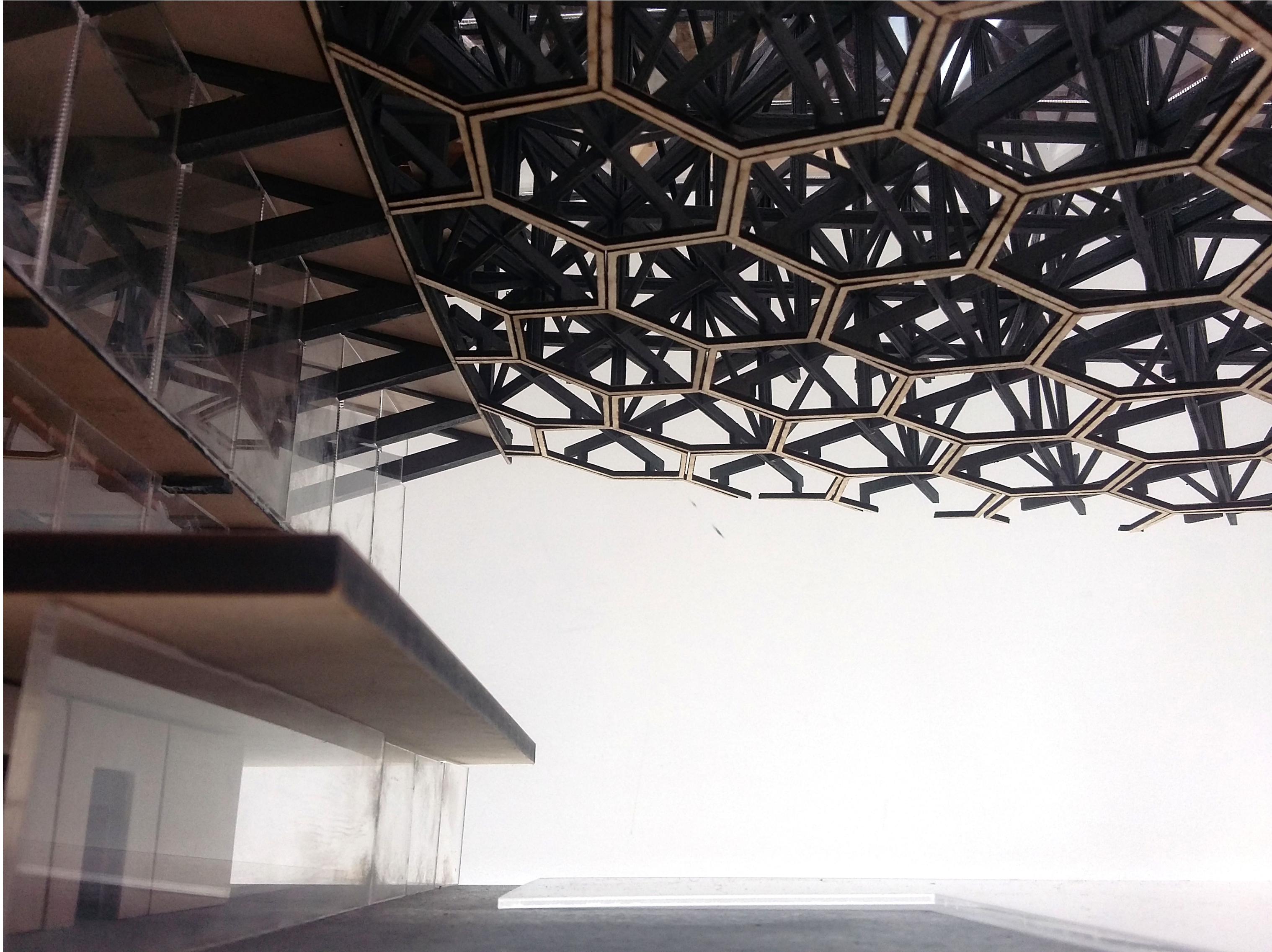
# CONSTRUCTION



# CONSTRUCTION



# CONSTRUCTION

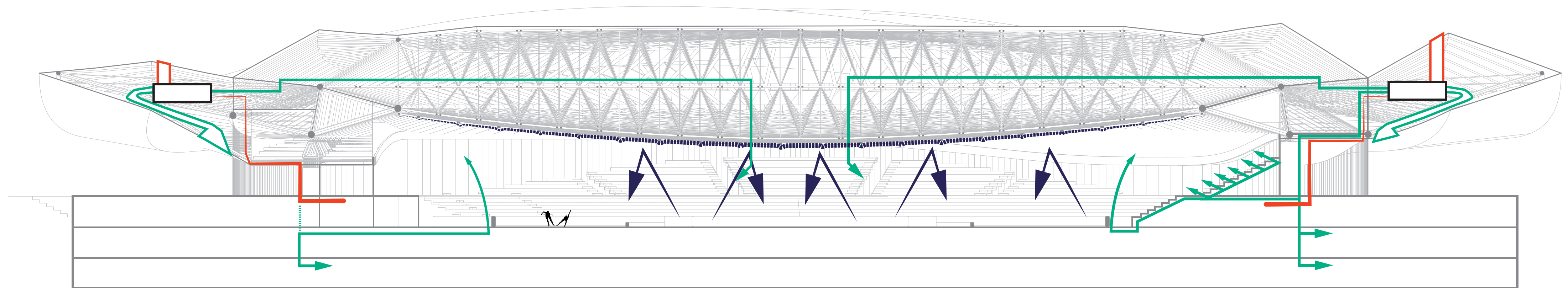


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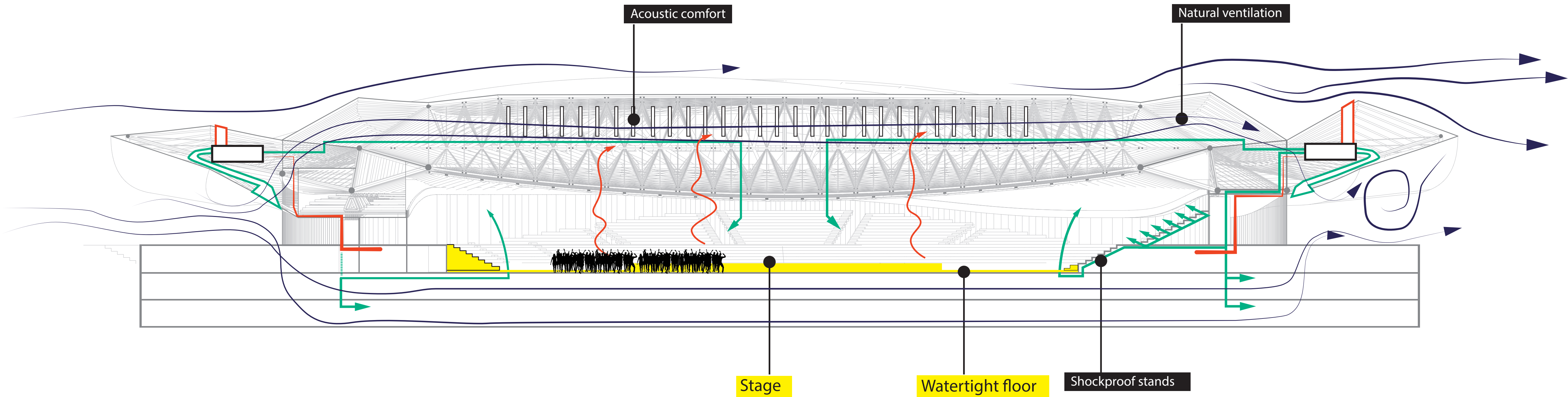
# CLIMATE

WINTER

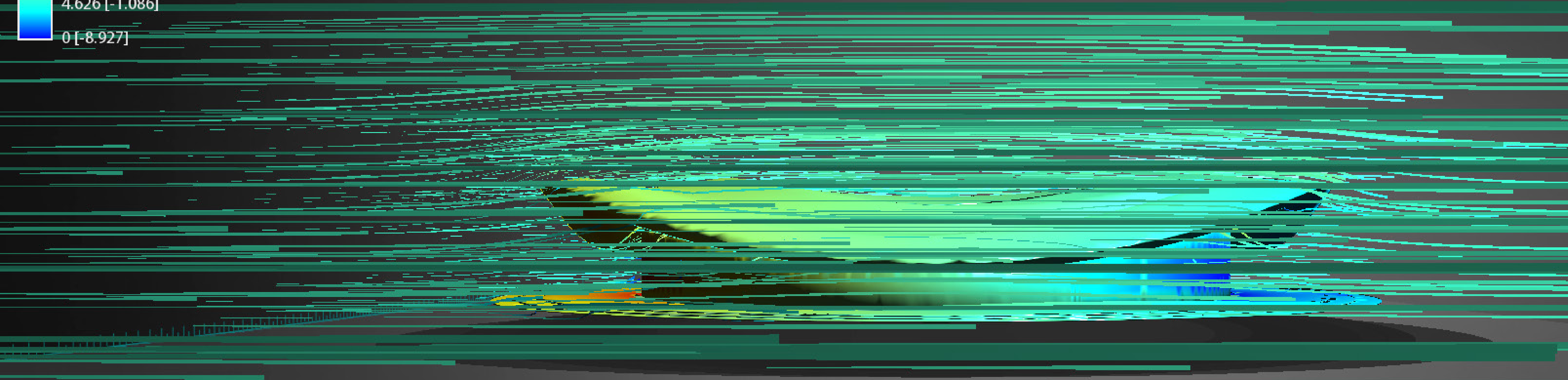
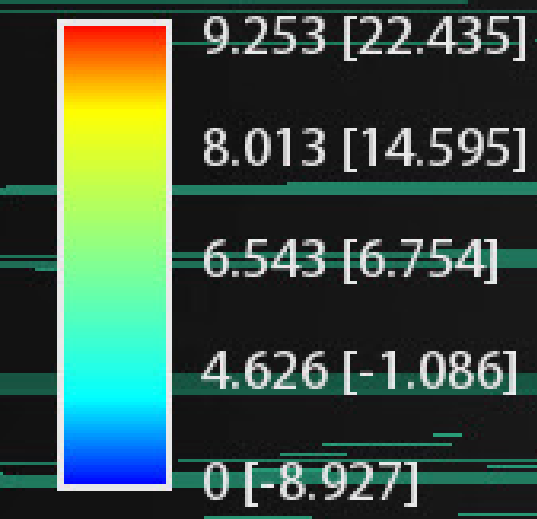


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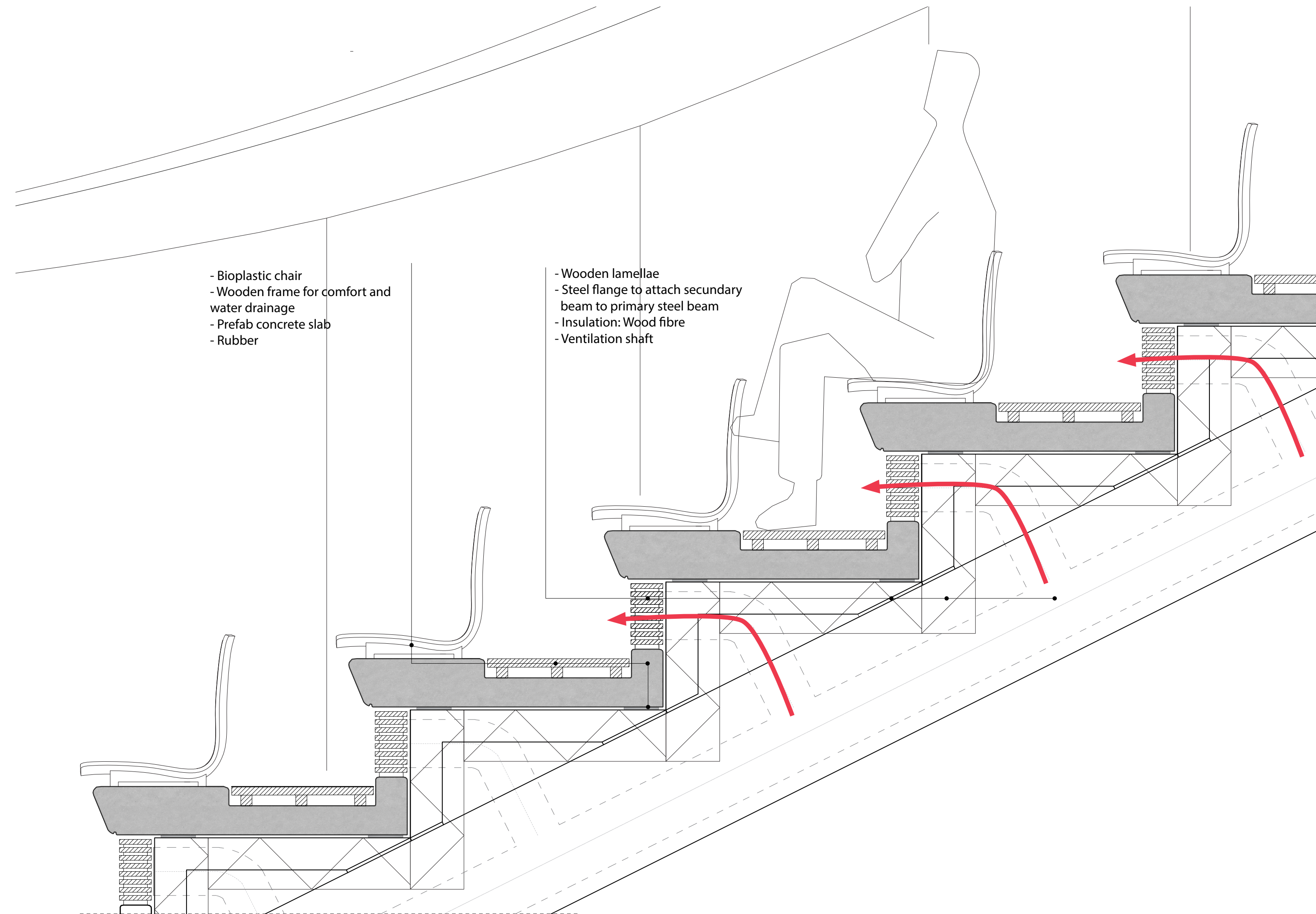
SUMMER



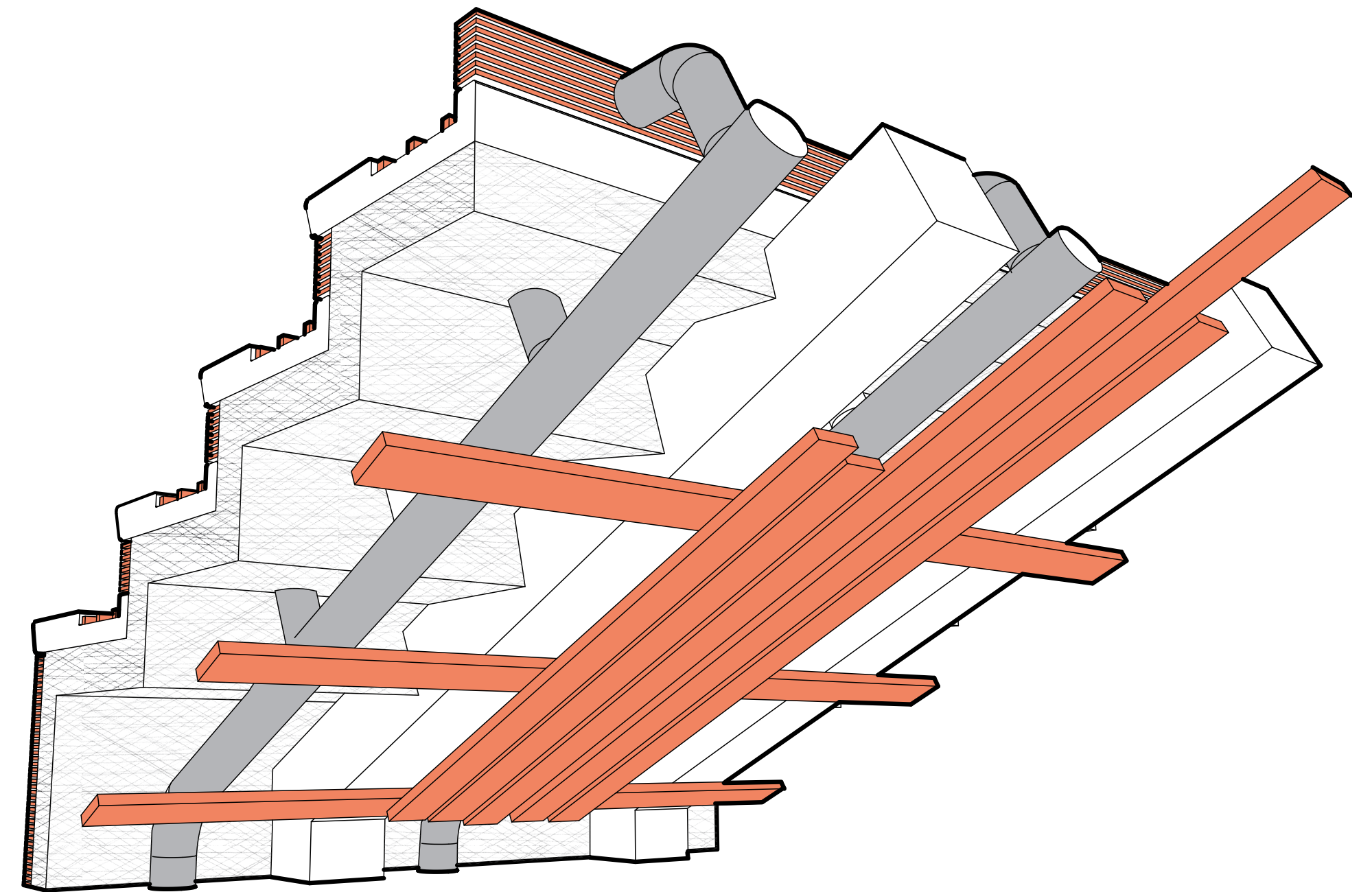
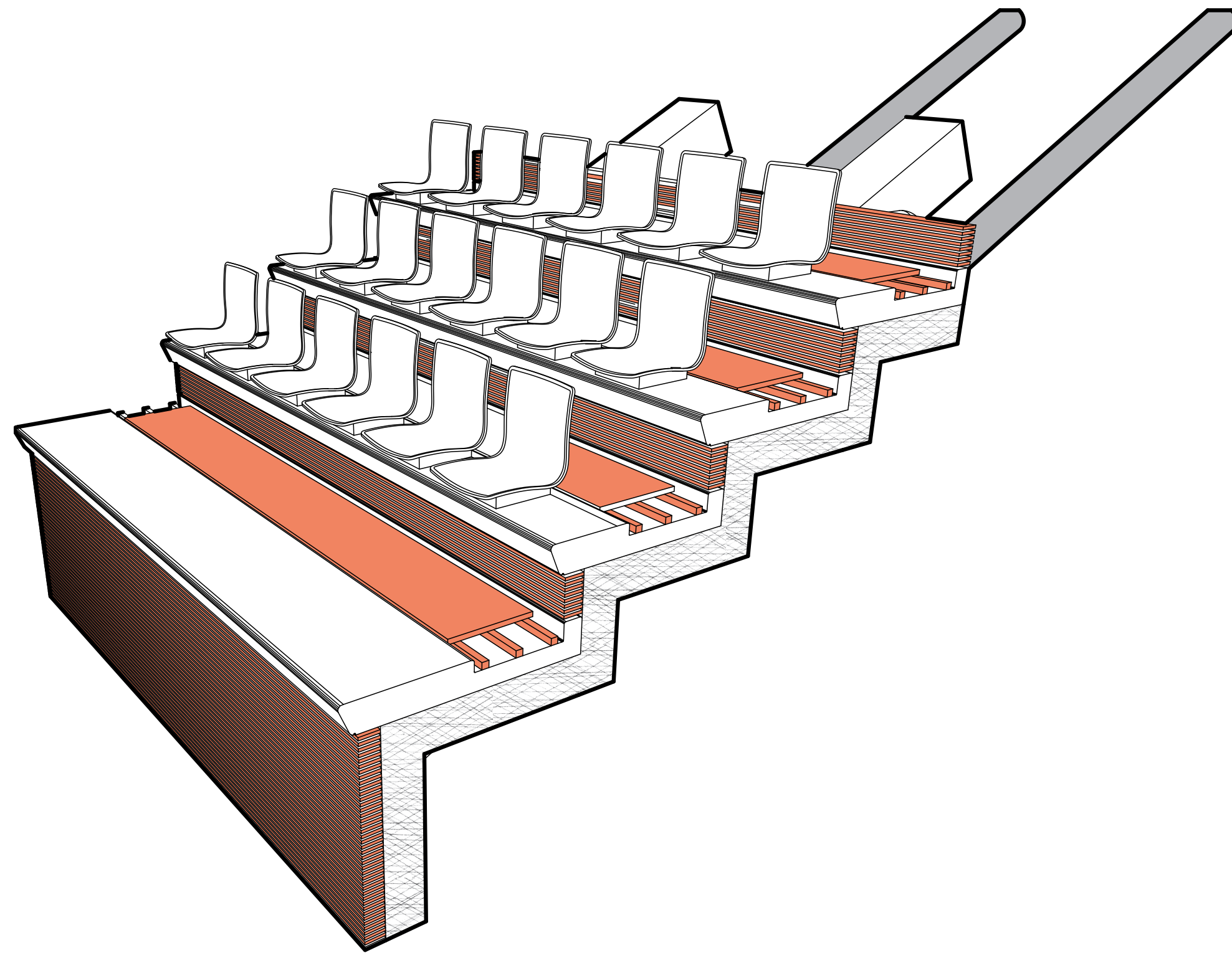
✦ Velocity (m/s) [Pressure (Pa)]



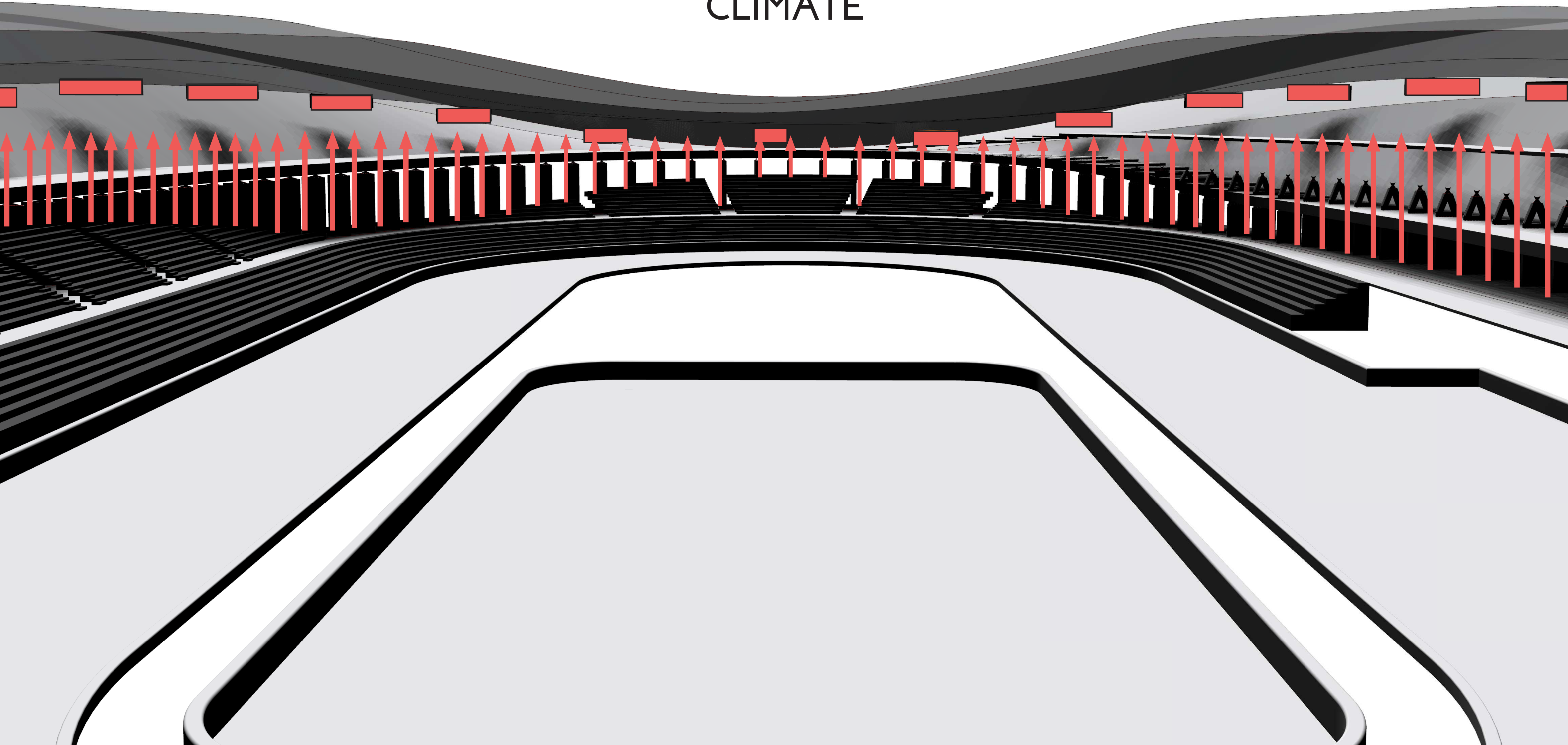
# CLIMATE



# CLIMATE



# CLIMATE



INTRODUCTION

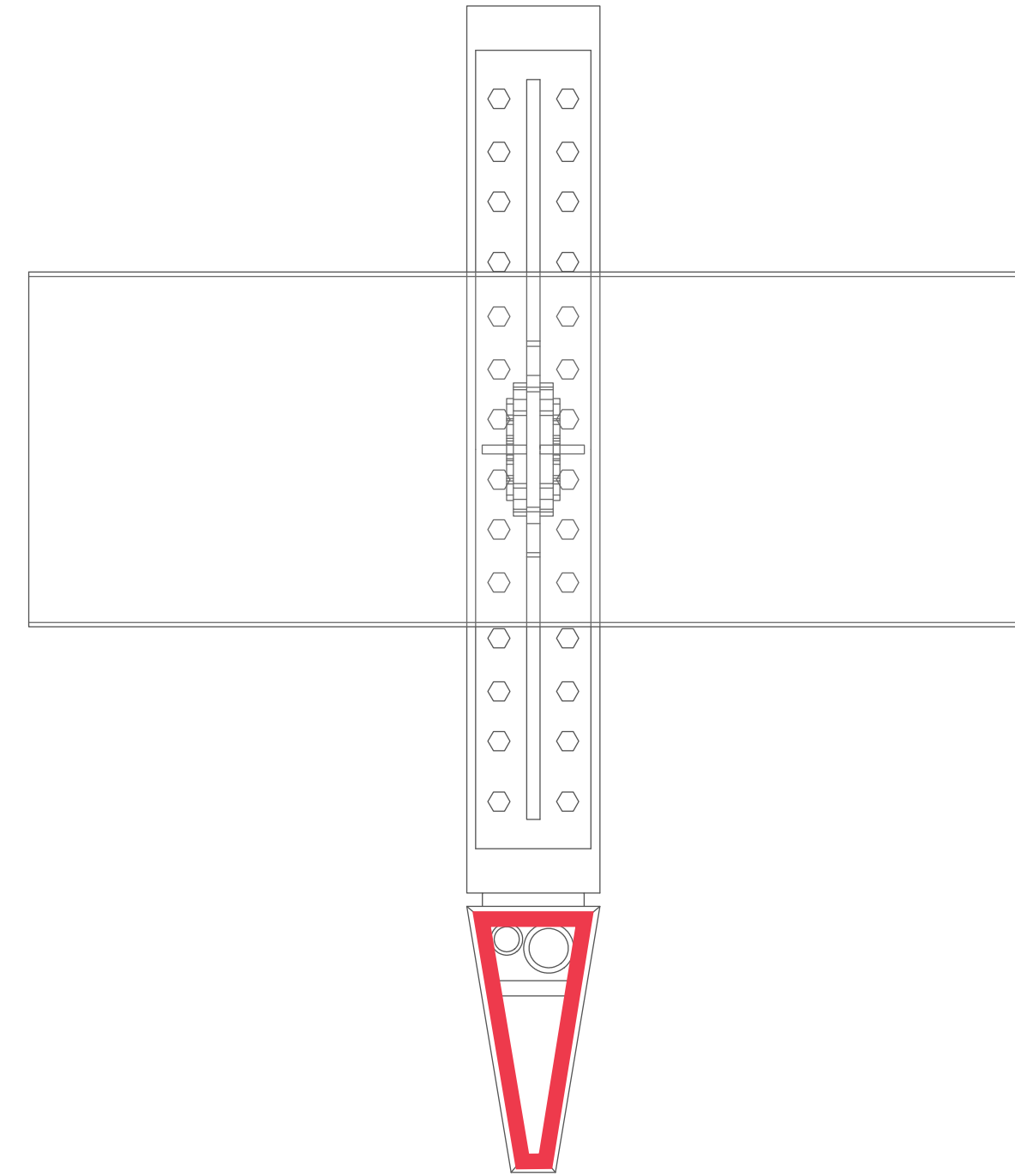
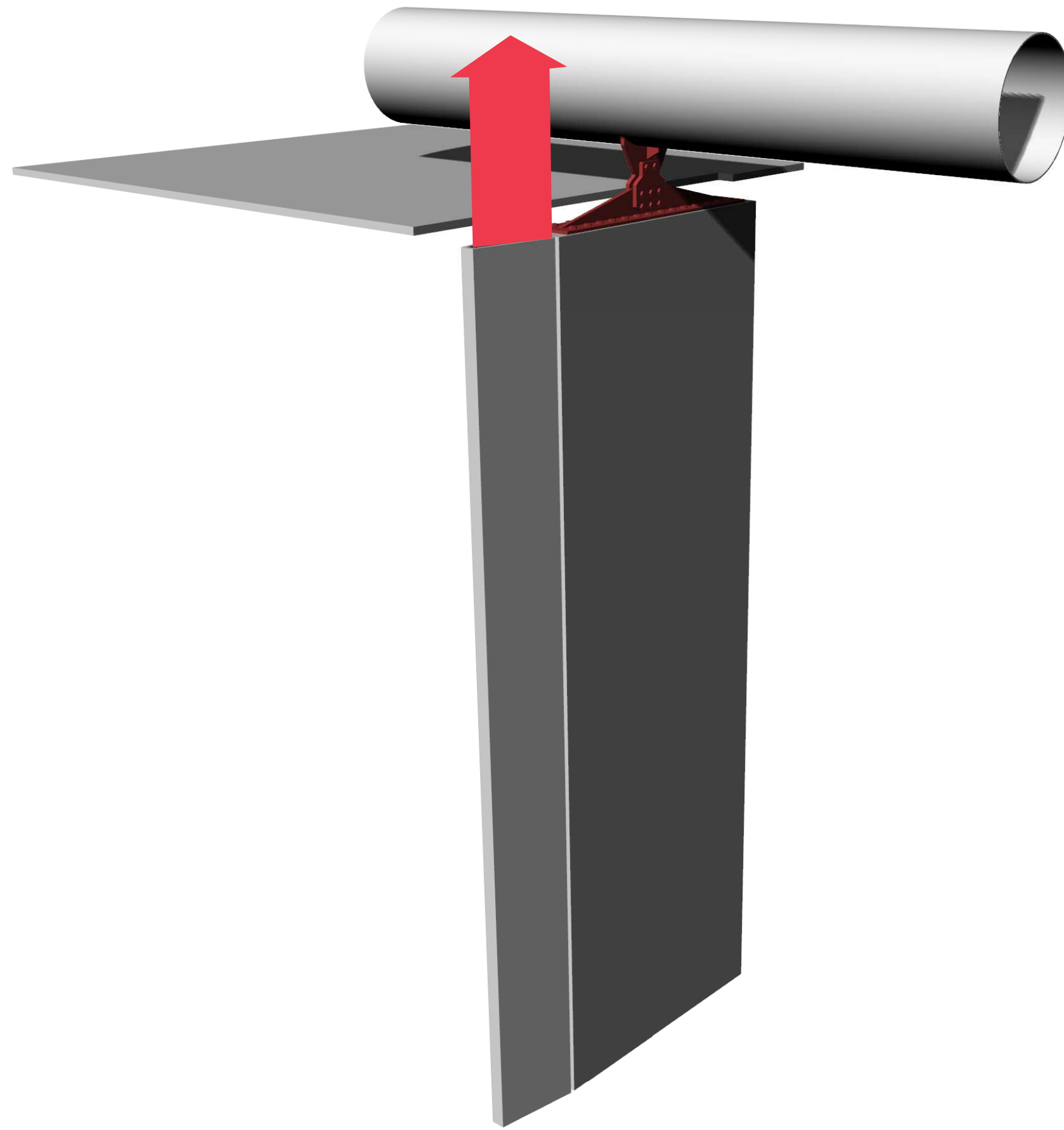
RESEARCH

DESIGN

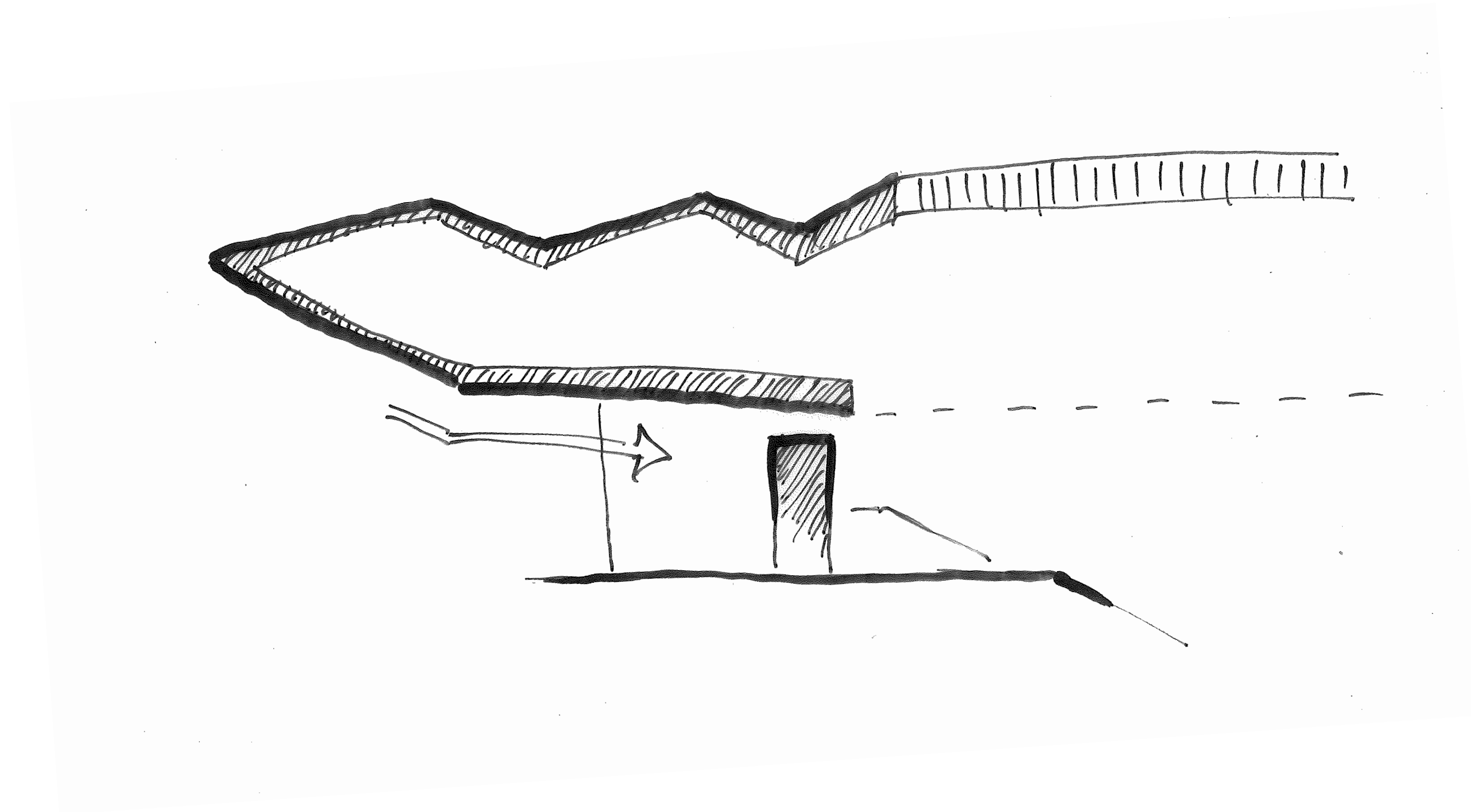
ENERGY

CONCLUSION

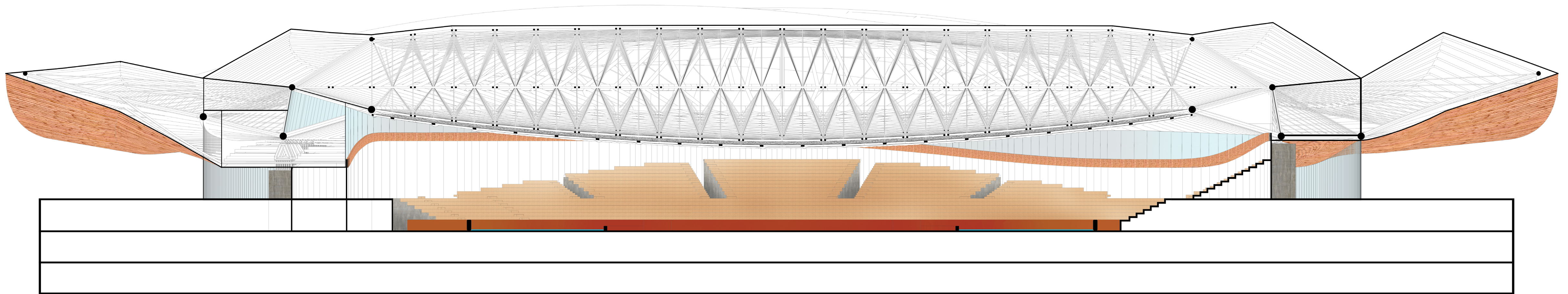
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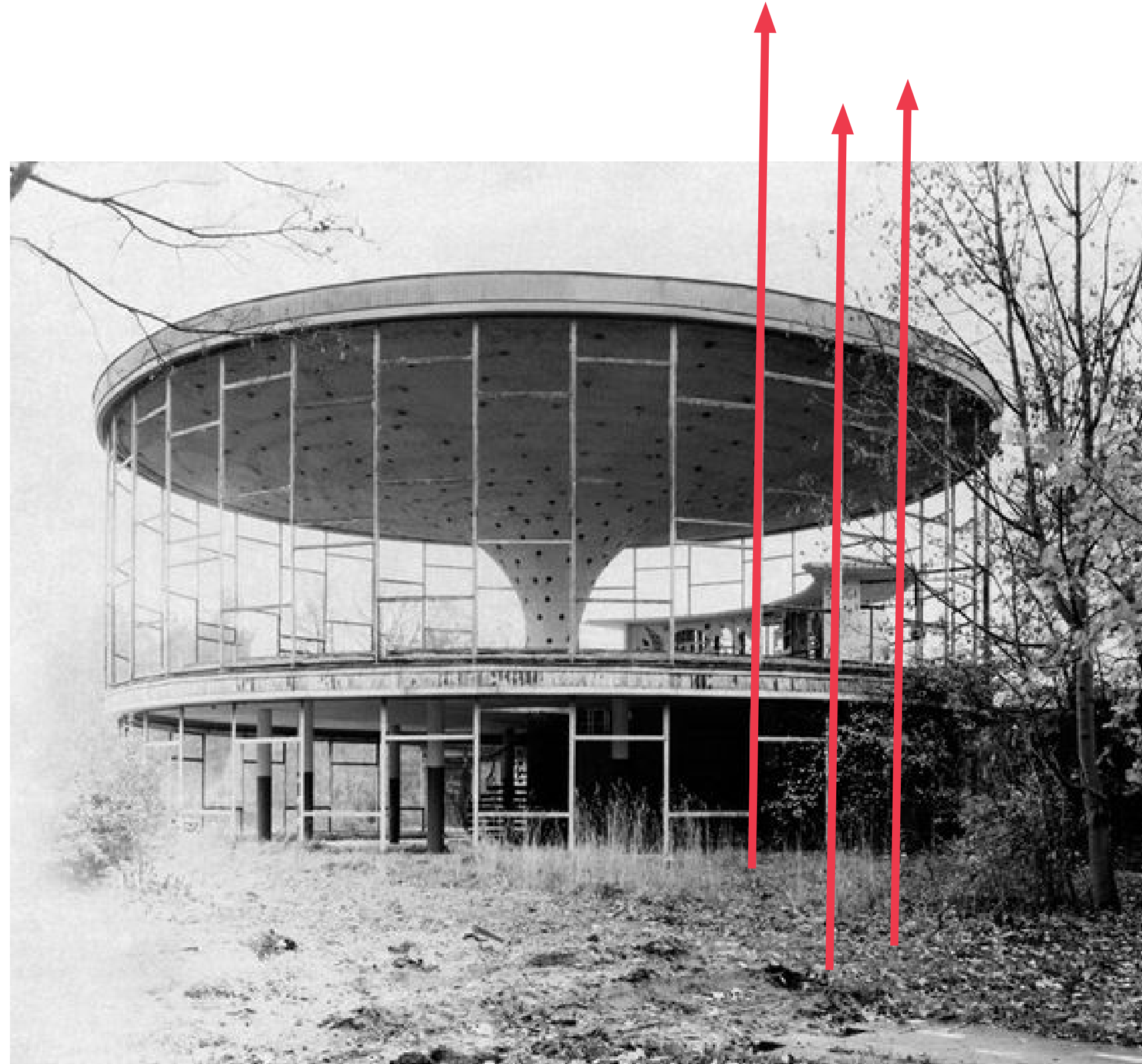
# FACADE CONCEPT



# FACADE CONCEPT



# FACADE












# ENERGY STRATEGY

— CONSUMERS

+ PRODUCERS




ELECTRIC ENERGY

-  Refrigeration plant
-  Lighting
-  Electrical equipment
-  Mechanical ventilation
-  Dehumidifying ventilation
-  Heat pump

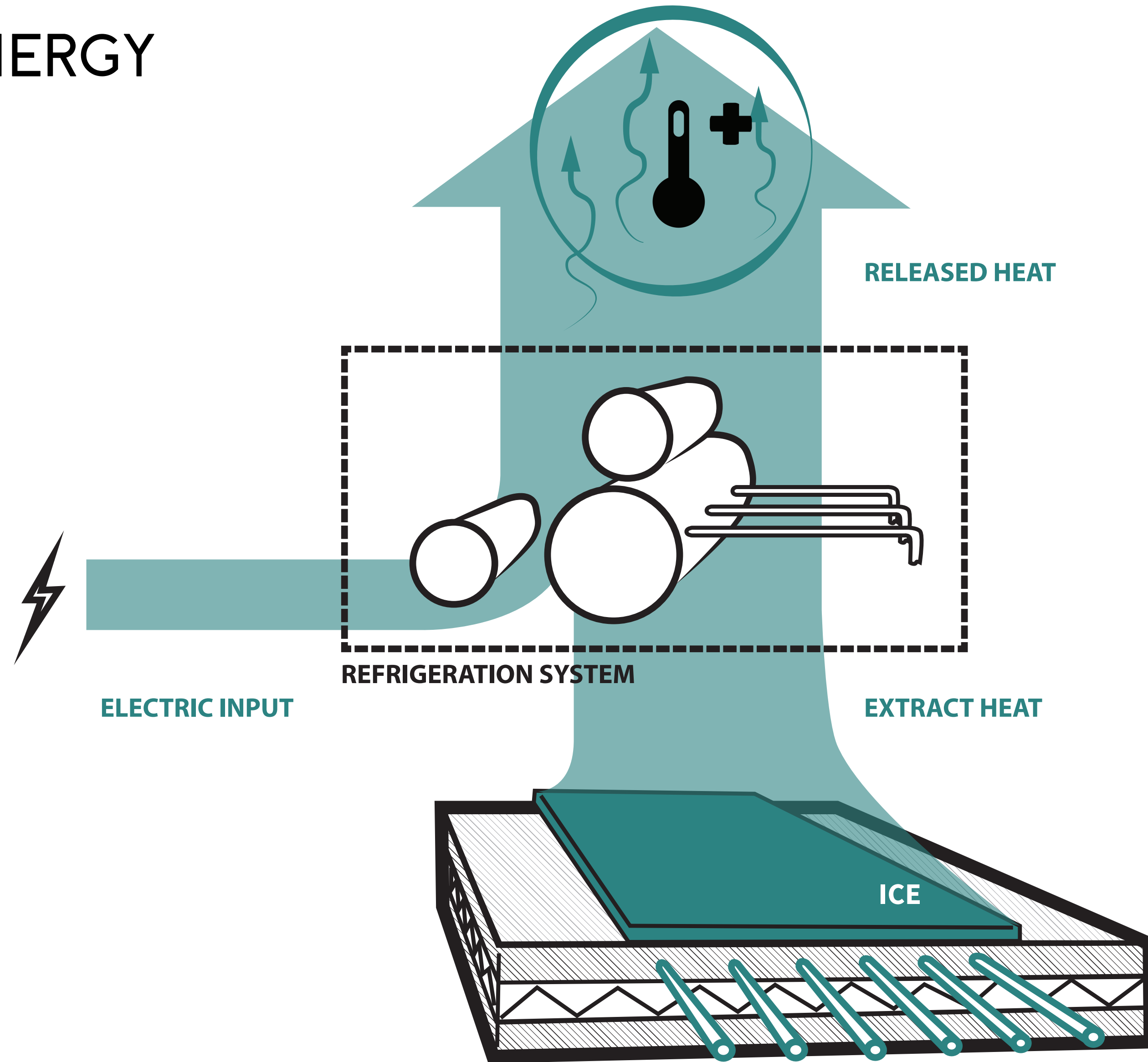
-  Natural ventilation
-  Solar panels

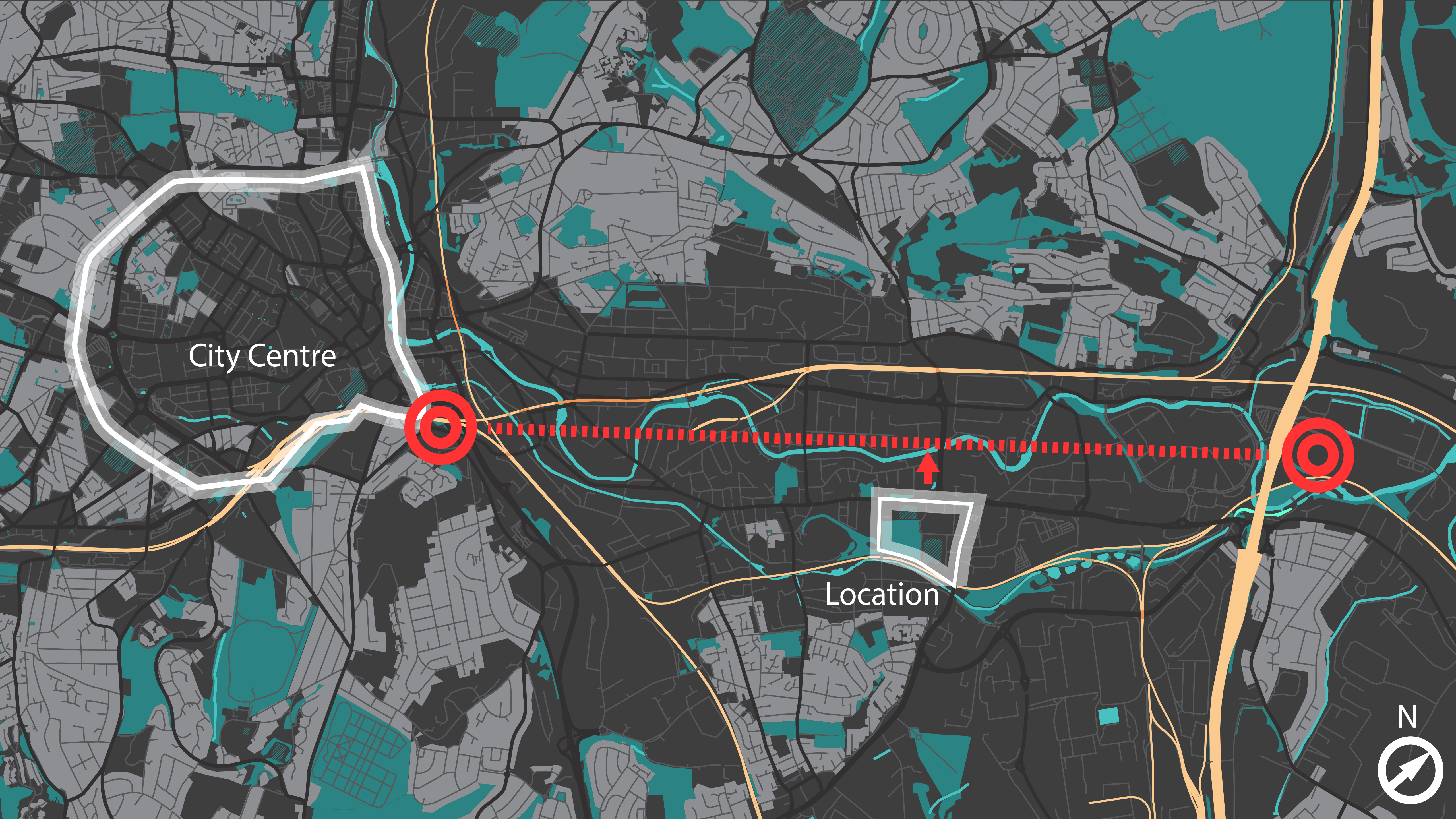
THERMAL ENERGY

-  Floor heating / cooling
-  Heating water
-  Resurfacing water heating
-  Heating air

-  Heat district network
-  Refrigeration plant
-  Geothermal storage

# THERMAL ENERGY

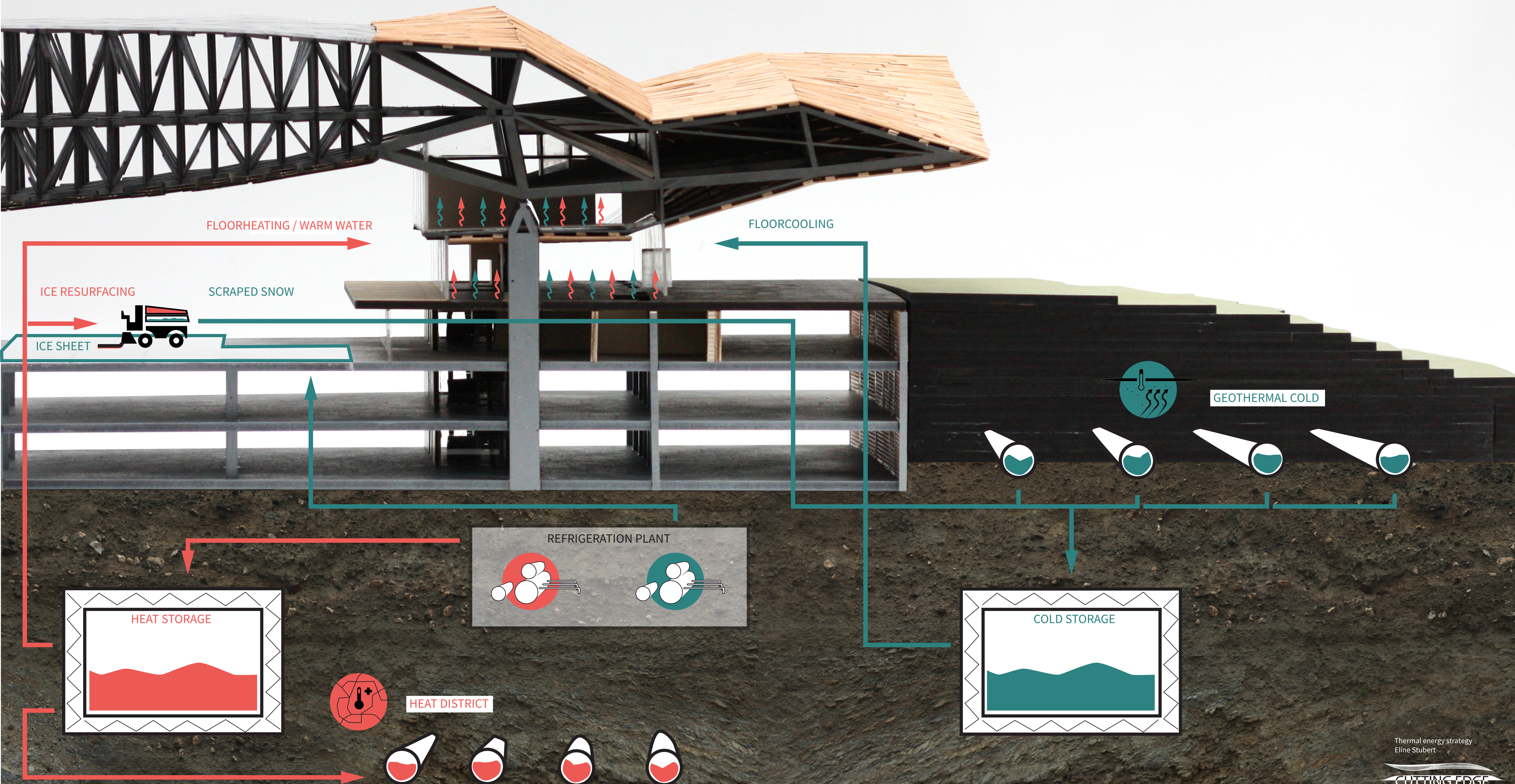




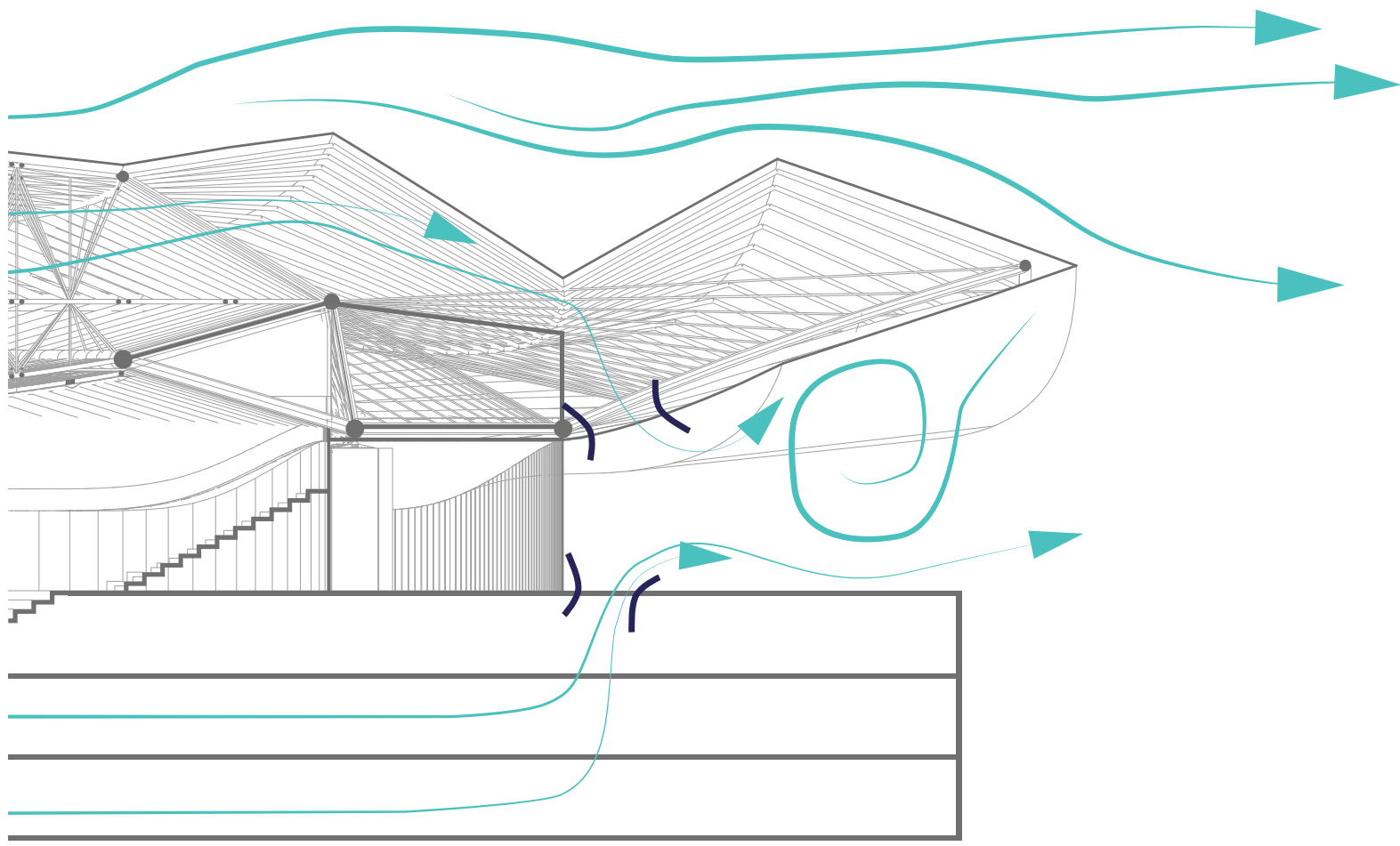
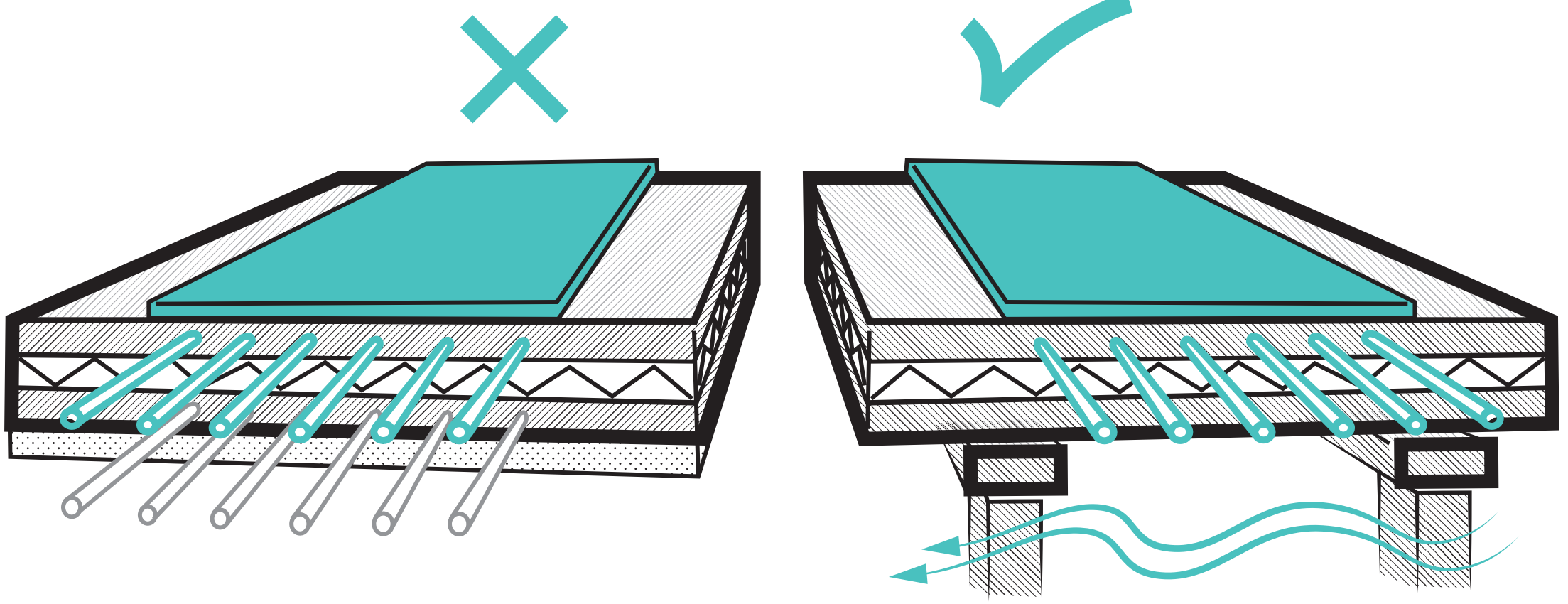
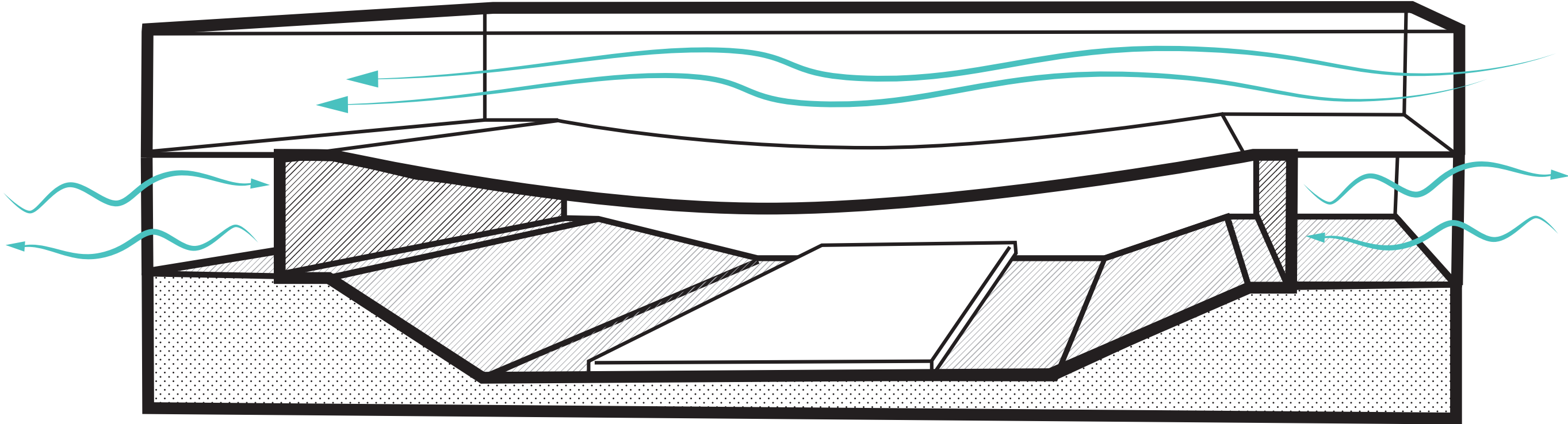
City Centre

Location

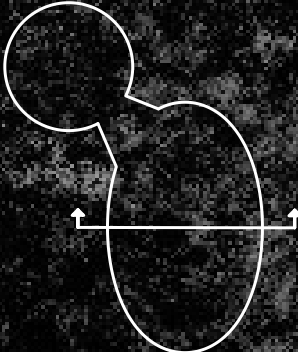
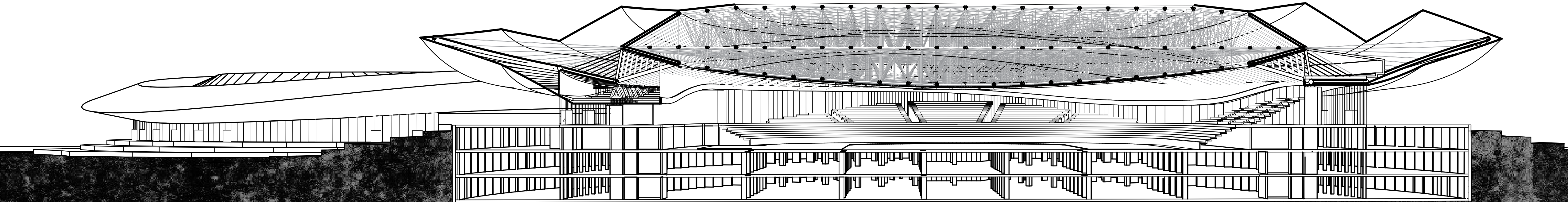
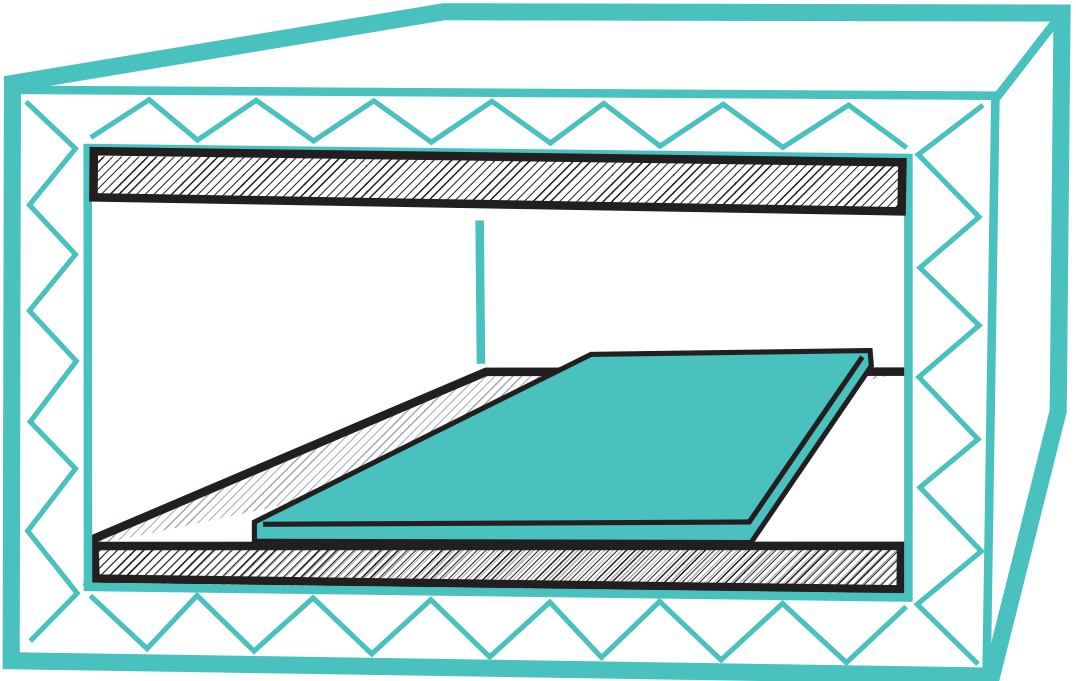




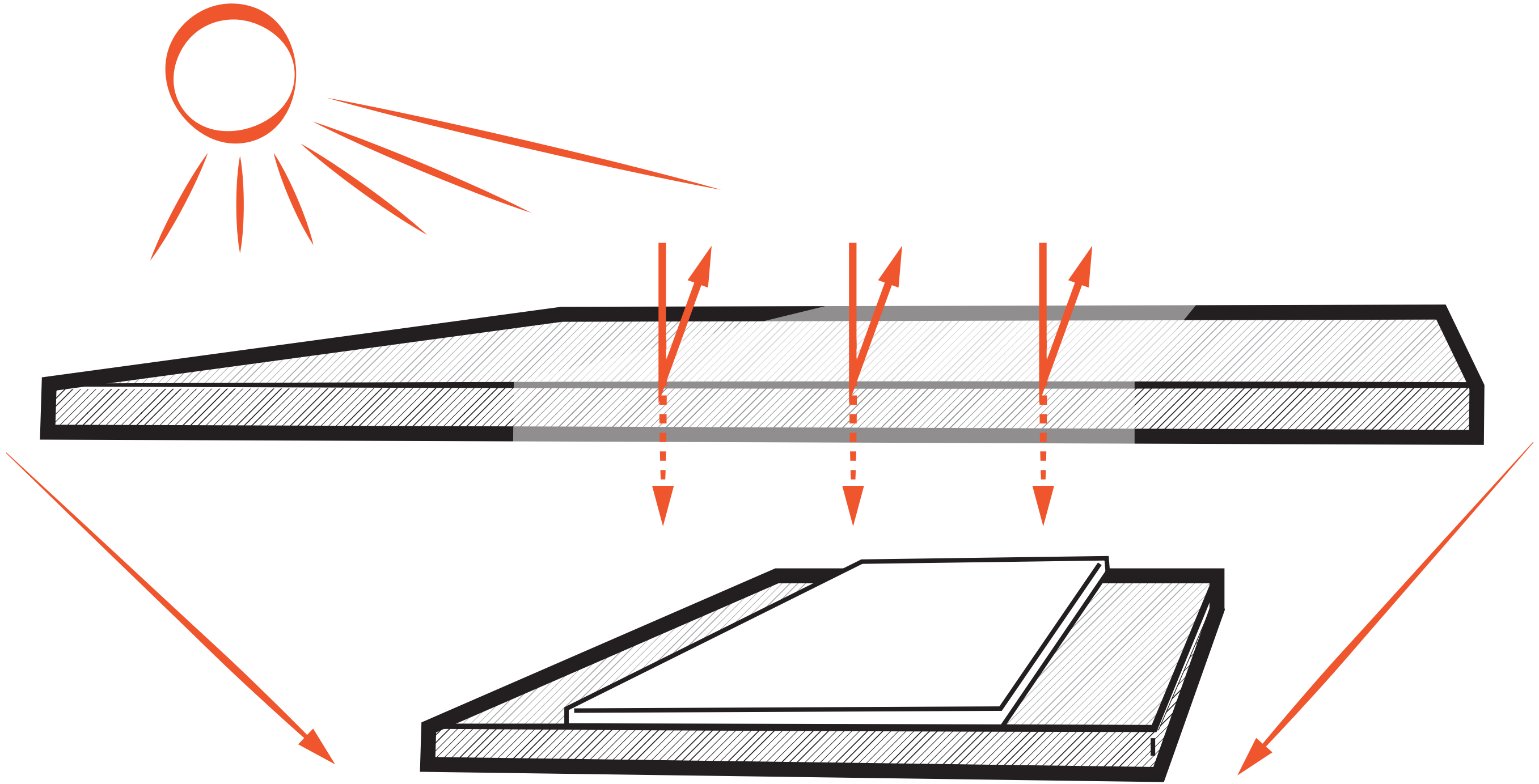
# NATURAL AIRFLOWS



# WELL INSULATED



# MAKING USE OF NATURAL DAYLIGHT



MAKING USE OF NATURAL DAYLIGHT

