

P5

OPPORTUNITY IN CHAOS

triggering revival of the damaged historic town centres of Italy

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Architectural Engineering | Intecture

Studio 18

P5-Presentation

April 20, 2018

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CONTENT

CONTEXT

ASSIGNMENT

RESEARCH

CONCEPT

DESIGN

REFLECTION

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CONTEXT

ASSIGNMENT

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CONCEPT

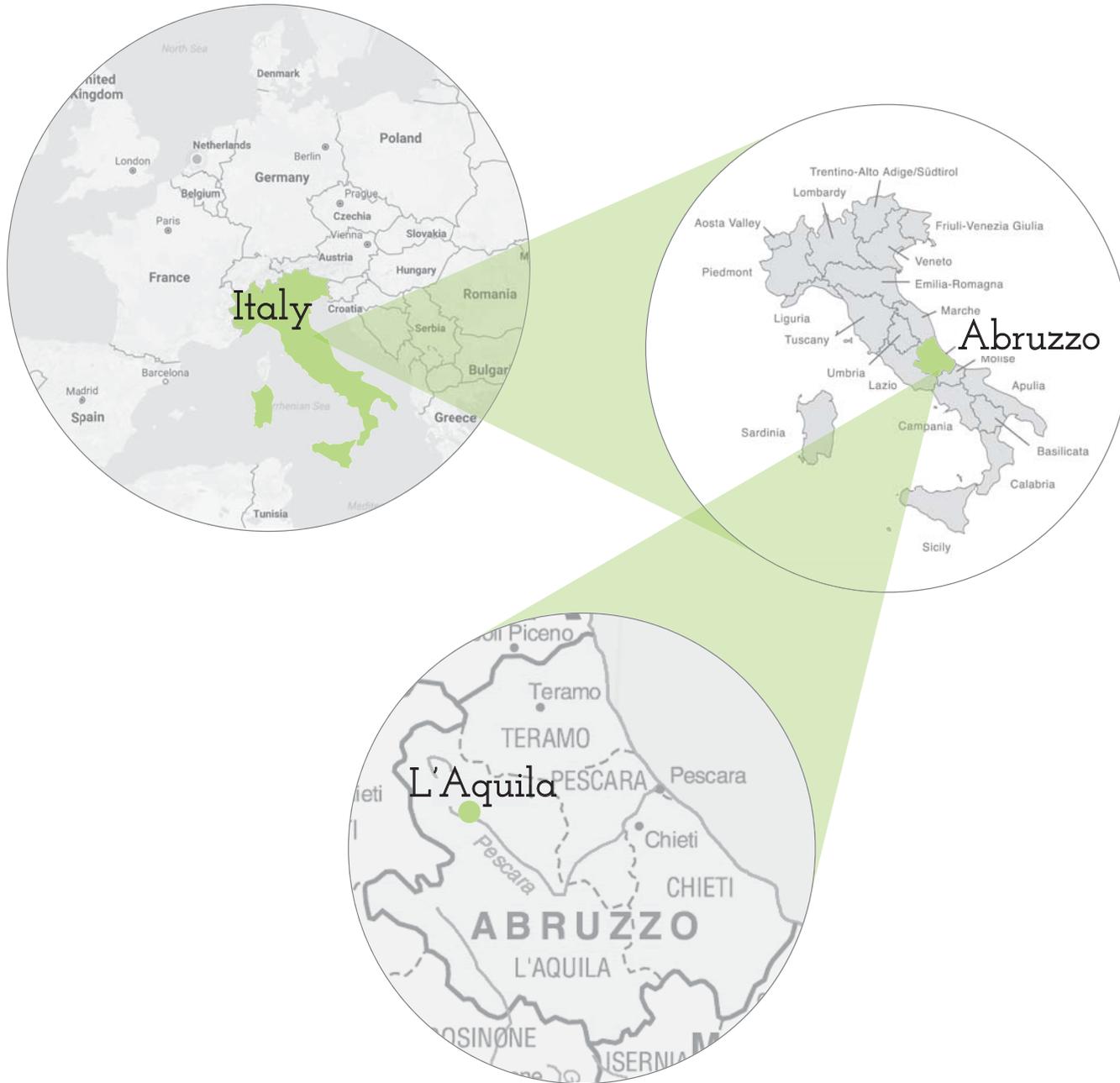
DESIGN

REFLECTION

CONTEXT

LOCATION

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CONTEXT

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L'AQUILA

Inhabitants
70 967 (2013)

Characteristics
university, cultural institutions, ski resorts

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L'AQUILA

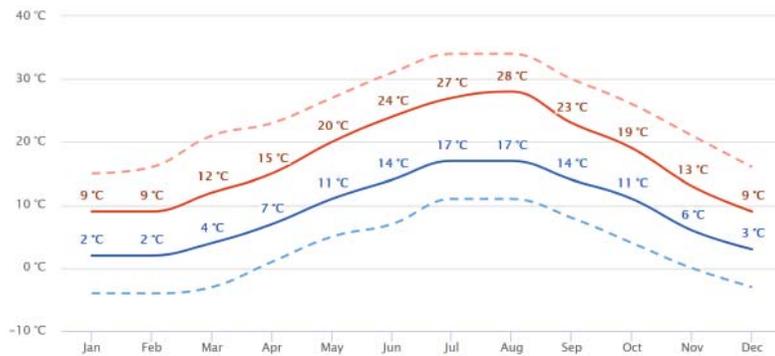
vs.

DELFT

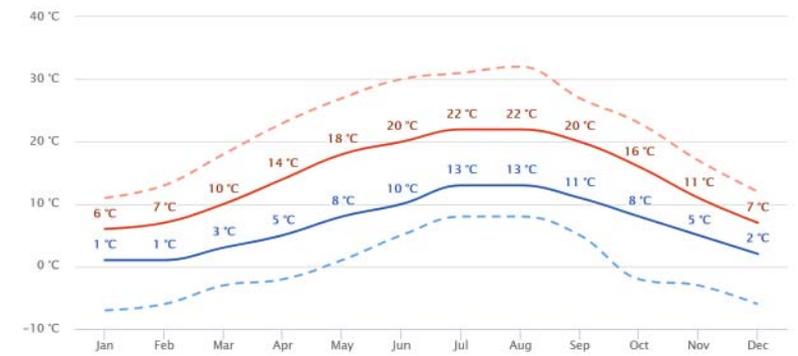
Altitude 693 m
Climate Temperate oceanic climate

Altitude 2 m
Climate Temperate oceanic climate

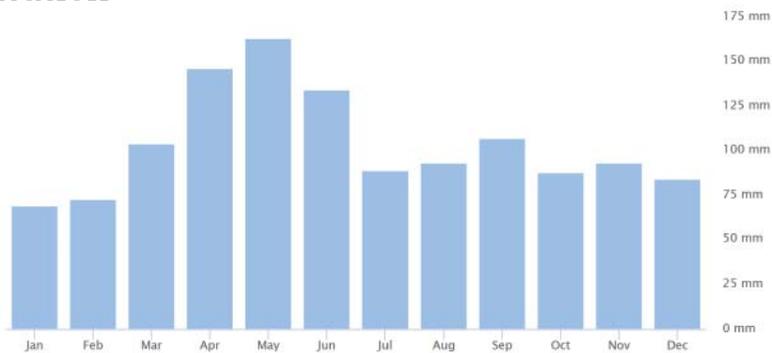
Temperature



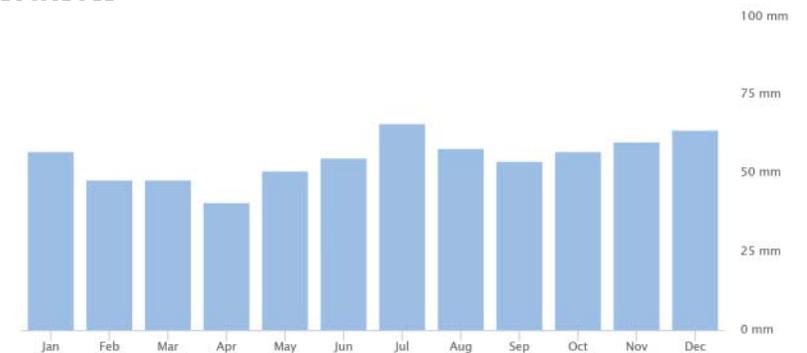
Temperature



Precipitation



Precipitation



Source: <https://www.meteoblue.com/>

CONTEXT

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L'AQUILA EARTHQUAKE

April 6, 2009

A medium-power earthquake occurred, disproportionally heavy damage

Killed	308
Injured	1 500 +
Homeless	65 000 +



Source: <http://www.meteoweb.eu/foto/il-6-aprile-2009-la-scossa-che-devasto-labruzzo-le-foto-che-raccontano-il-dramma/id/662116/>



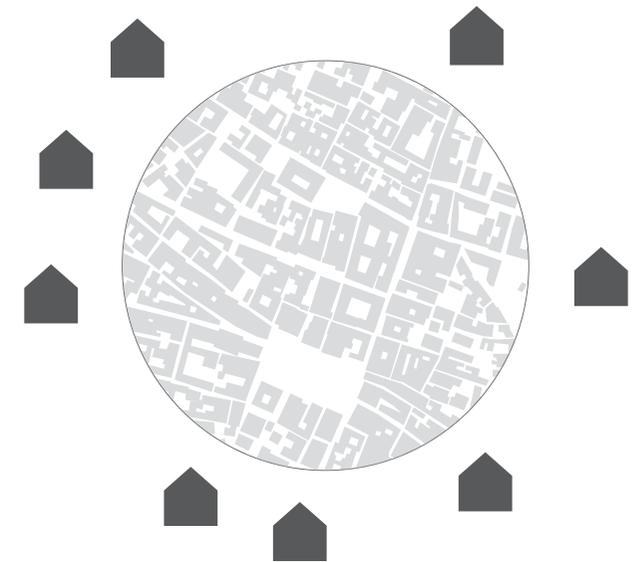
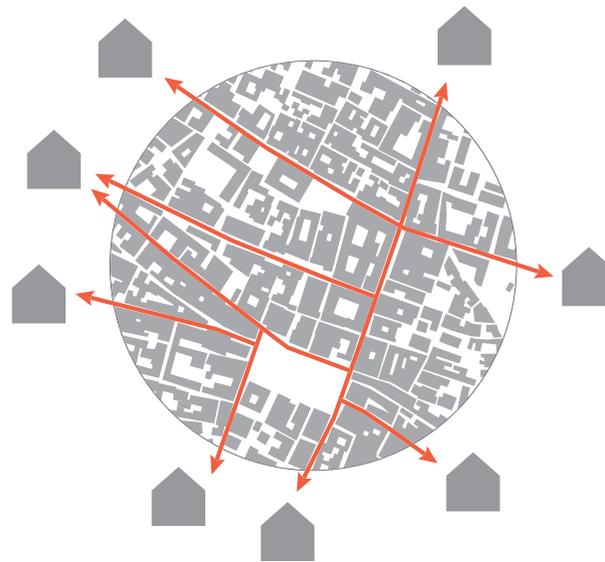
Source: <https://danilo.blog/2017/05/11/aquila-zona-rossa/4/>

CAUSE

Missing element (Alexander, 2010):
local participation

Consequence:
town centre forgotten

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What could have been done instead?

ASSIGNMENT

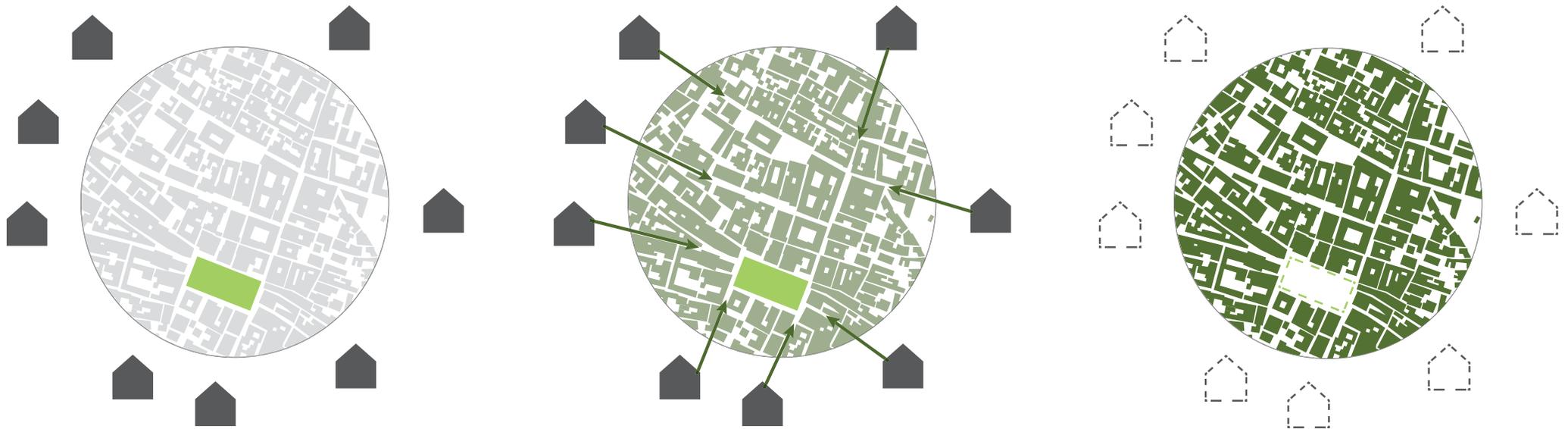
OBJECTIVES

Stimulating all-round participation

Giving back to the people

Maintaining life in the centre

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INTERVENTION

Case study

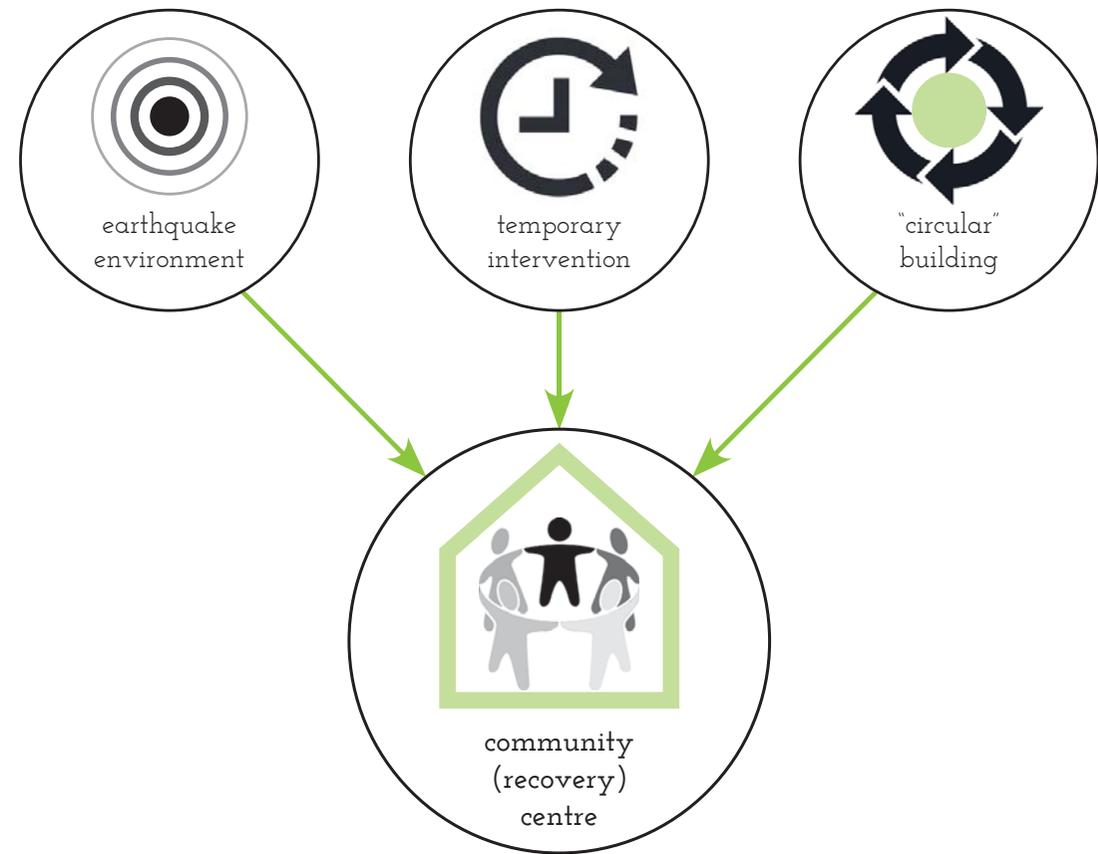
After 1991 Oakland fire: "community development centre" (Olshansky et al., 2005)

Intervention

A temporary and central community (recovery) centre

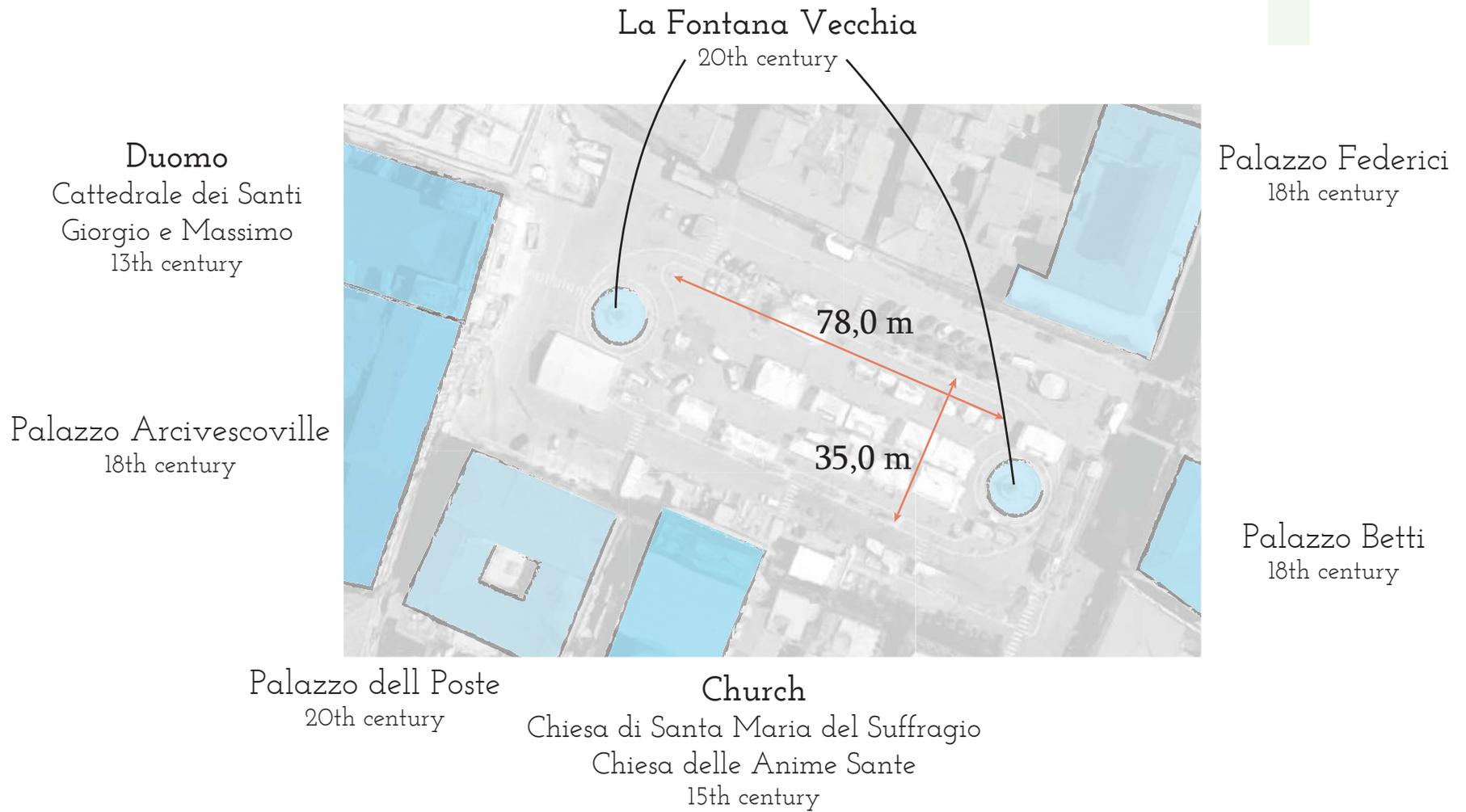
Overall design question

How could a multipurpose, temporary and economically circular community (recovery) centre be designed in the earthquake-damaged historic town centre of L'Aquila, Italy, which will encourage after-earthquake urban revival and which will stimulate participation in the recovery process?



PIAZZA DEL DUOMO

P5



ARCHITECTURE

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- Left Duomo
Cattedrale dei Santi Giorgio e Massimo, 13th century
- Middle Twin fountains
Fontana Vecchia, 20th century (last modification)
- Right Church
Chiesa di Santa Maria del Suffragio Chiesa delle Anime Sante, 15th century



www.wikiwand.com



www.spaziovidio.it



it.wikipedia.org

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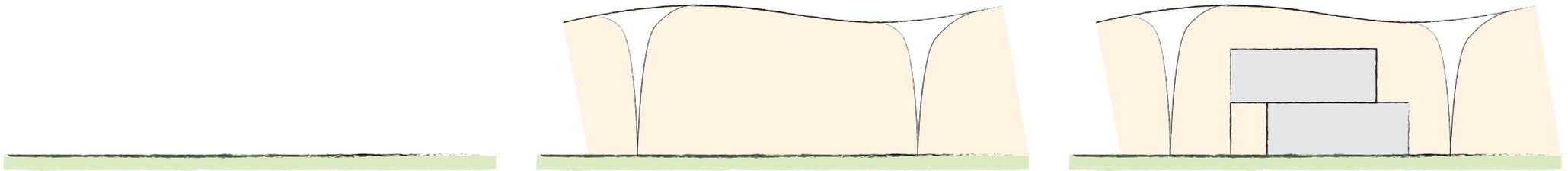
FIRST CONCEPTUAL IDEAS

Flexible design

Light and spacious roofing structure

Independent volumes

P5



Primary material: Timber

Psychological benefits (Rice, 2004; Song & Fei, 2016)

Contrast with surroundings

How to go on from here?

RESEARCH

GOAL

Creating order in the chaos

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Thematic research question

How can a conceptual framework be specified using quantitative analysis for a light and temporary timber roof structure at the Piazza del Duomo in the earthquake-prone city of L'Aquila, Italy?

RESEARCH METHOD

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Quantitative research-by-design

A large amount of models have been compared quantitatively, narrowing it down the best models.

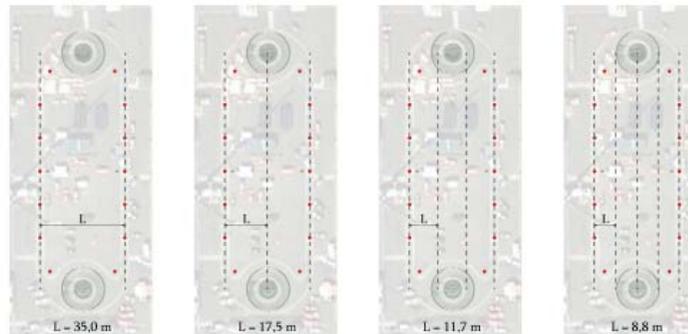
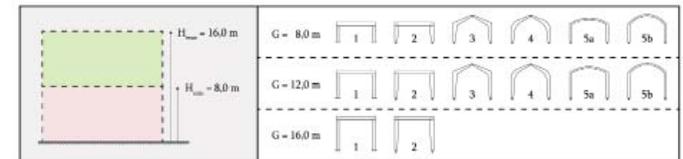
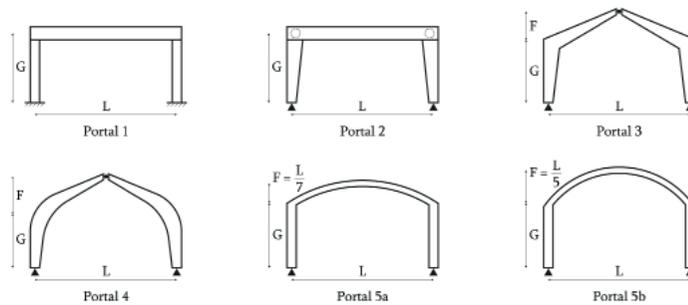
INPUT

- Six portal types
- Four different spans
- Three different core-to-core distances
- Three different column heights
- Rules of thumb



168 models

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CONTEXT

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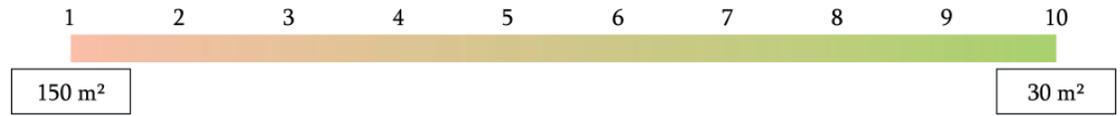
DESIGN

REFLECTION

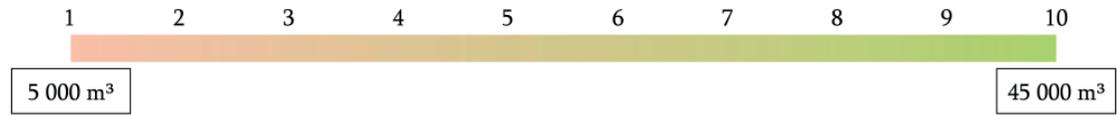
QUANTITATIVE ASSESSMENT

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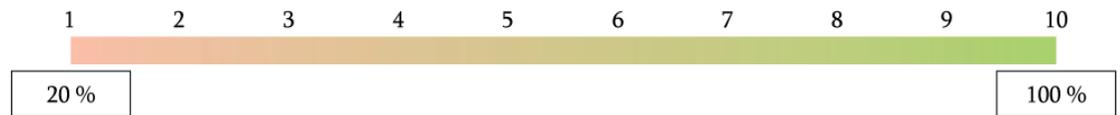
1 Earthquake-safety [m^2]
Measured in area of roof expected to fail in case of collapse of one structural element



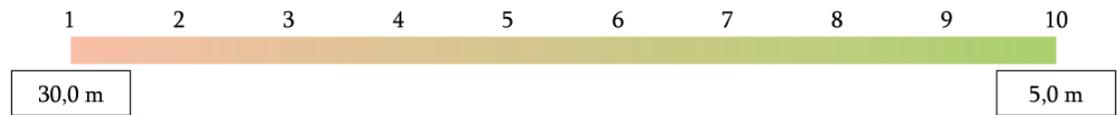
2 Spaciousness [m^3]
Measured in maximum free volume



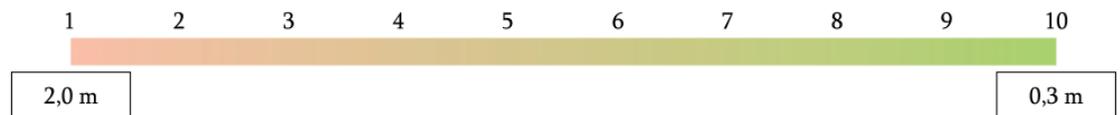
3 Functional flexibility [%]
Measured in maximum free ground area relative to Piazza del Duomo



4 Structural flexibility [m]
Measured in length of beams



5 Structural modesty [m]
Measured in height of beams



Weighting

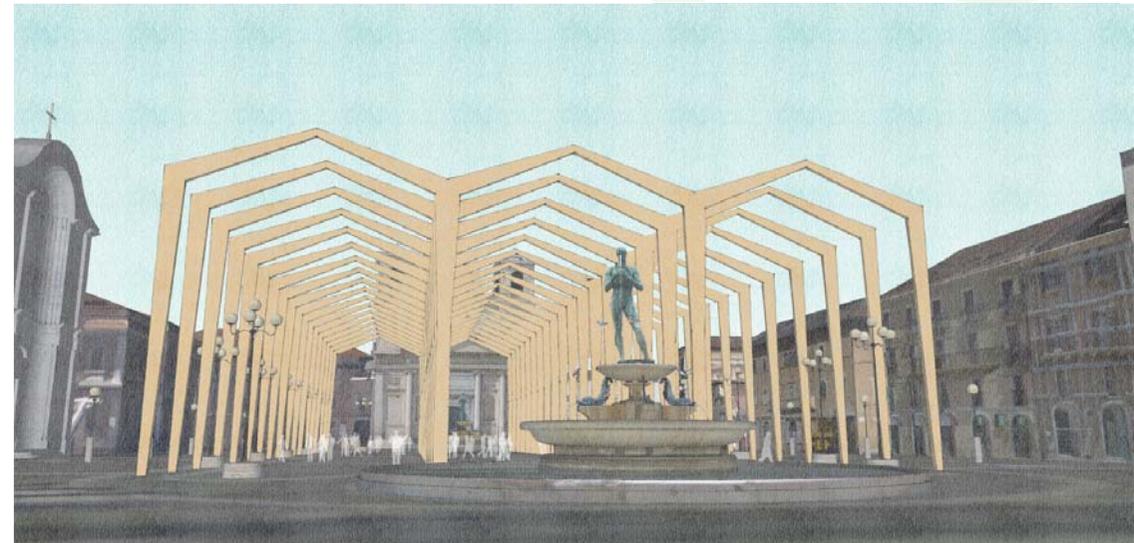
		A	B	C	D	E	F
1	Earthquake-safety	1	5	1	1	1	1
2	Spaciousness	1	1	5	1	1	1
3	Functional flexibility	1	1	1	5	1	1
4	Structural flexibility	1	1	1	1	5	1
5	Structural modesty	1	1	1	1	1	5

RESULTS

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Portal 3 | $G = 12,0 \text{ m}$ | $L = 11,7 \text{ m}$ | c.t.c. = $4,3 \text{ m}$

Advantage: short structural elements



Portal 5a | $G = 12,0 \text{ m}$ | $L = 11,7 \text{ m}$ | c.t.c. = $4,3 \text{ m}$

Advantage: efficient curved shape

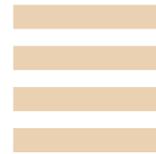


CONCLUSIONS

Curved shape

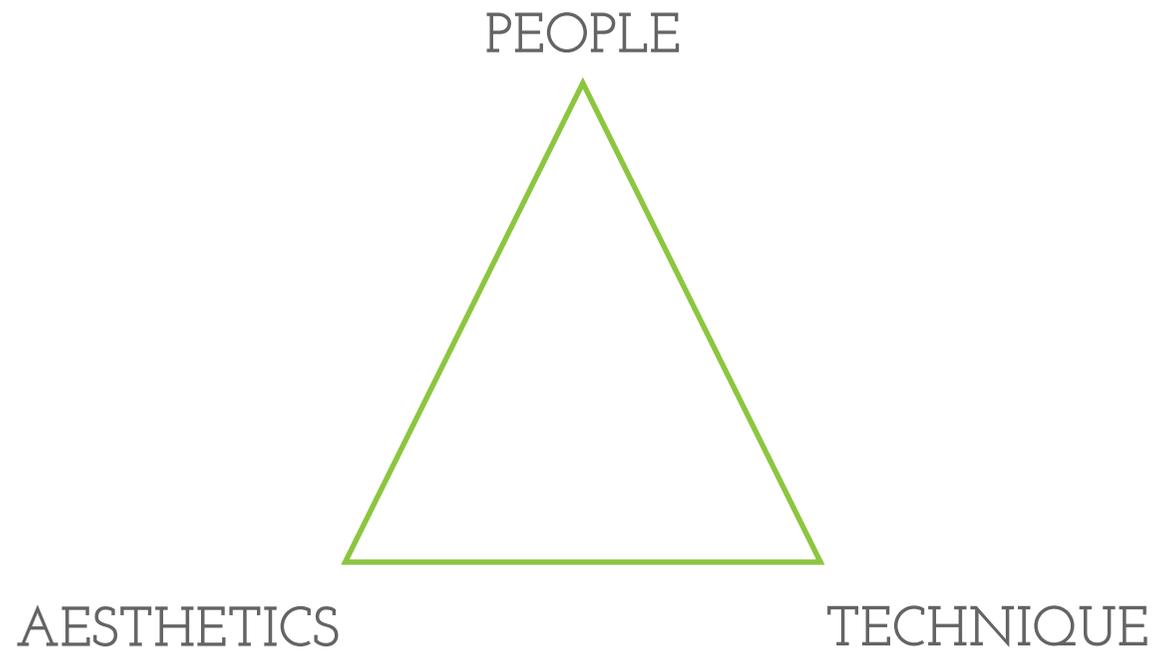


Short and straight timber elements



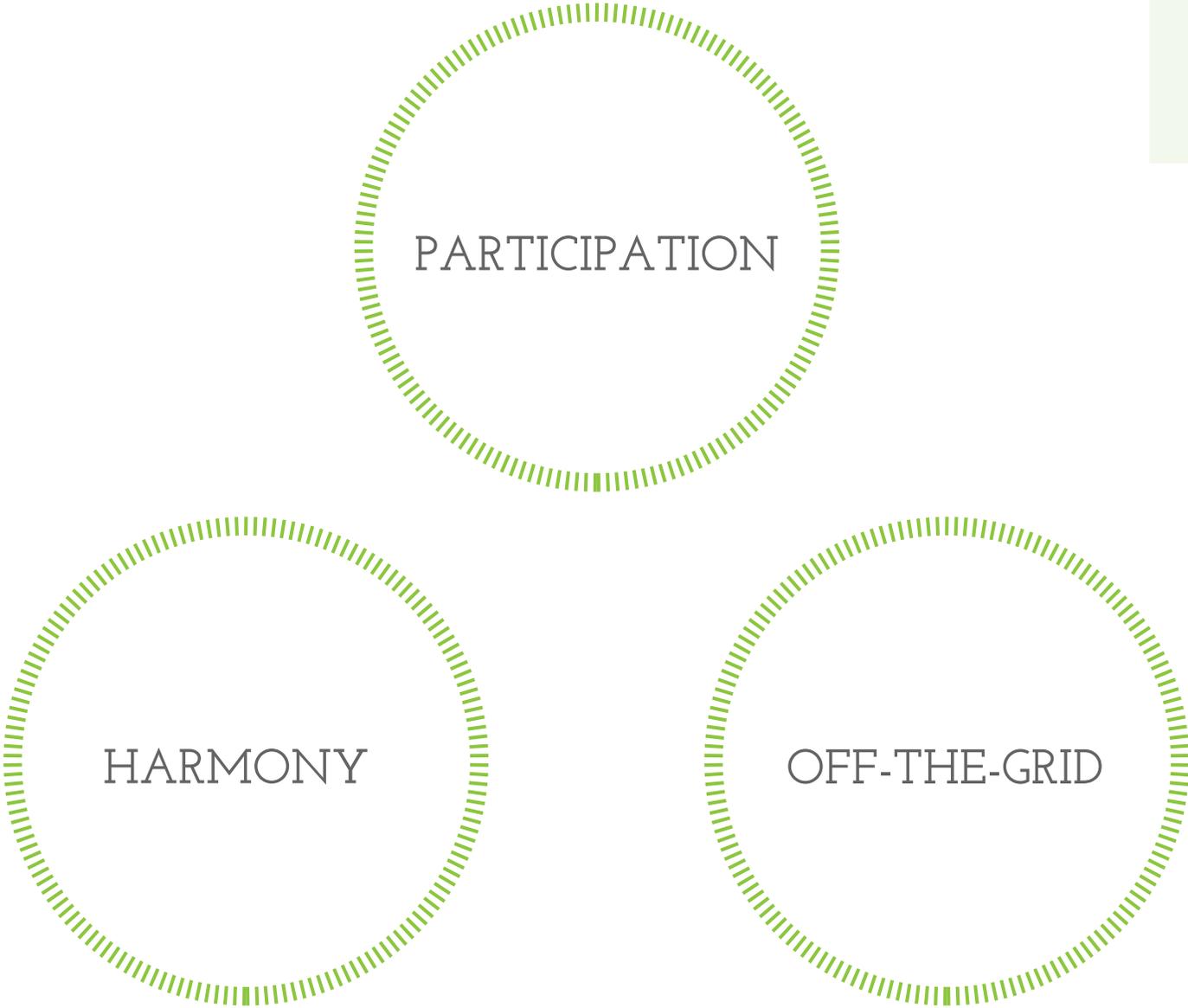
P5

CONCEPT



CORE VALUES

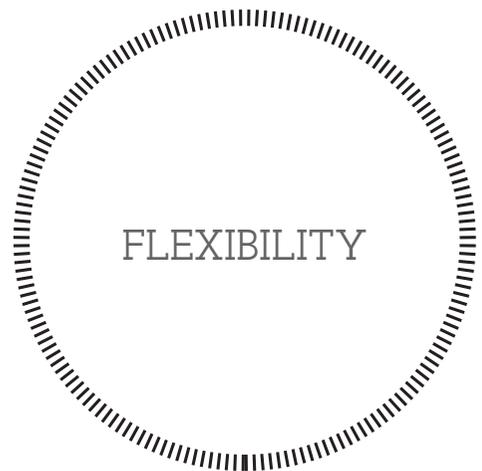
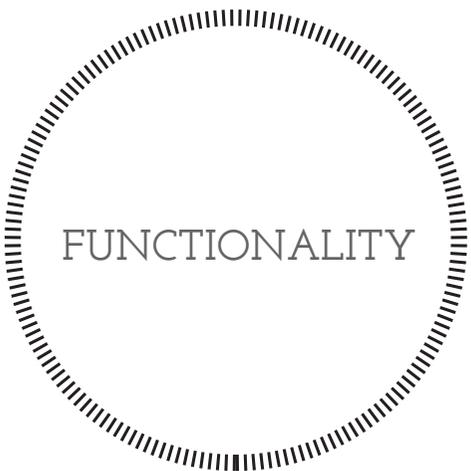
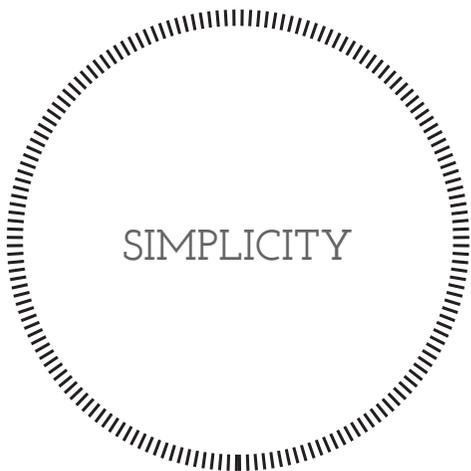
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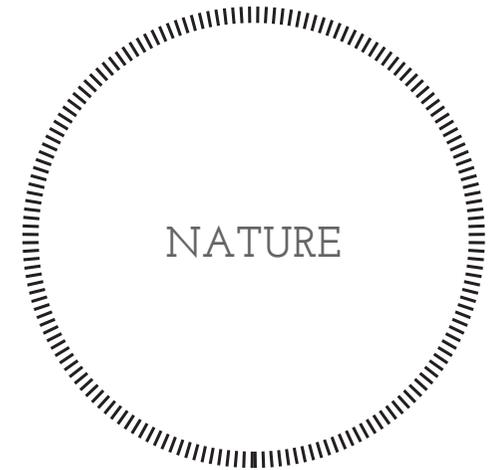


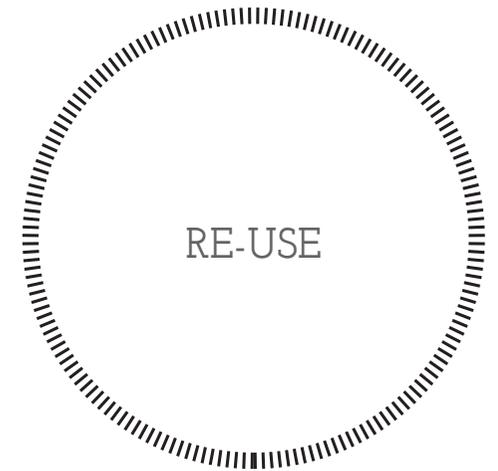
PARTICIPATION

HARMONY

OFF-THE-GRID







PROGRAM

Outside

Market

Terrace

Greenery

Underneath structure

Cultural, social, religious events

Cafeteria

Meeting rooms

Restrooms

Kitchen

Storage

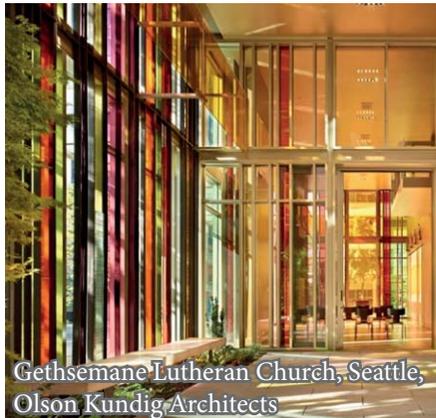
Services

Greenery

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INSPIRATION

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DESIGN PROCESS

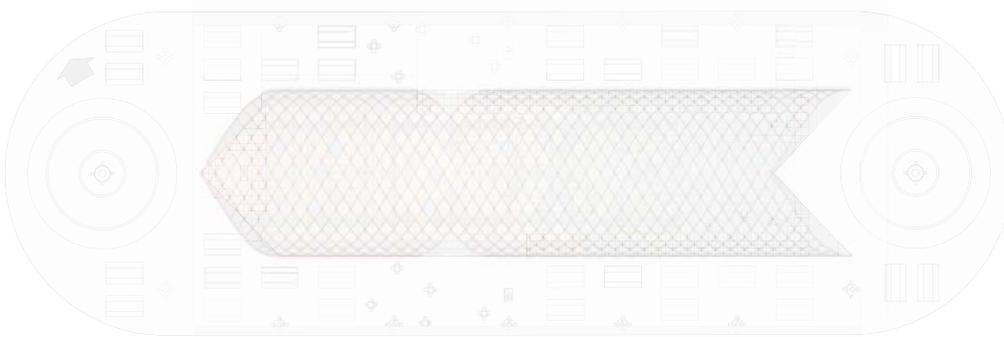
First design (Sep. 2018) | Bottom-Up Method



Second design (Oct. 2018) | Top-Down Method



Third design (Dec. 2018) | Mixed Method Approach (Isidiho & Sabran, 2016)

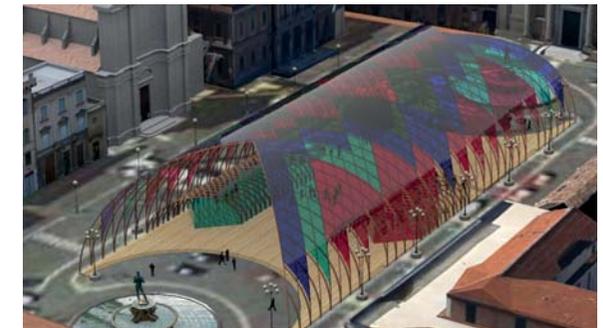


DESIGN PROCESS

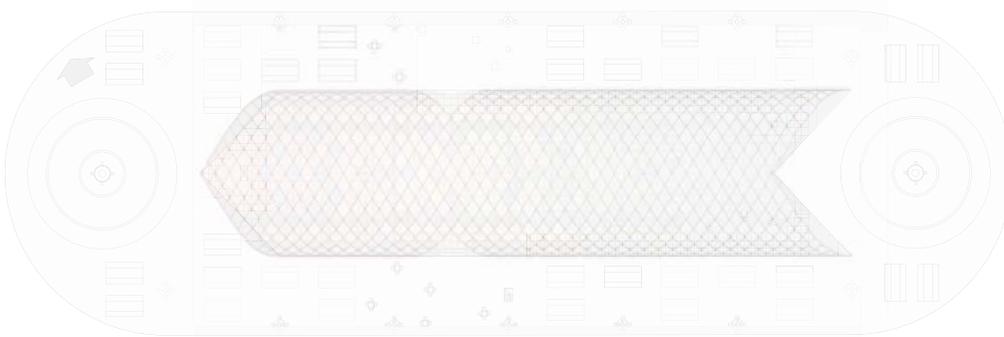
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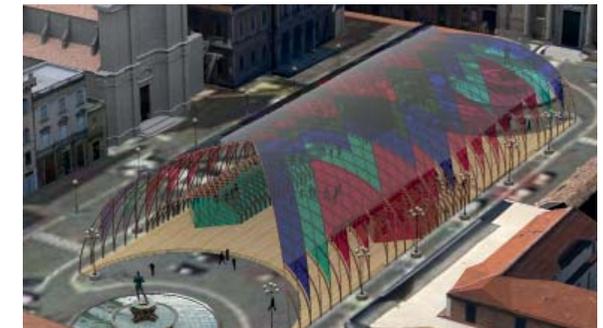


DESIGN PROCESS

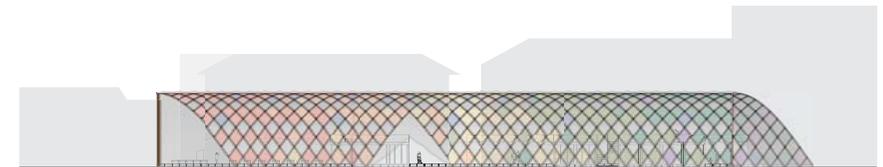
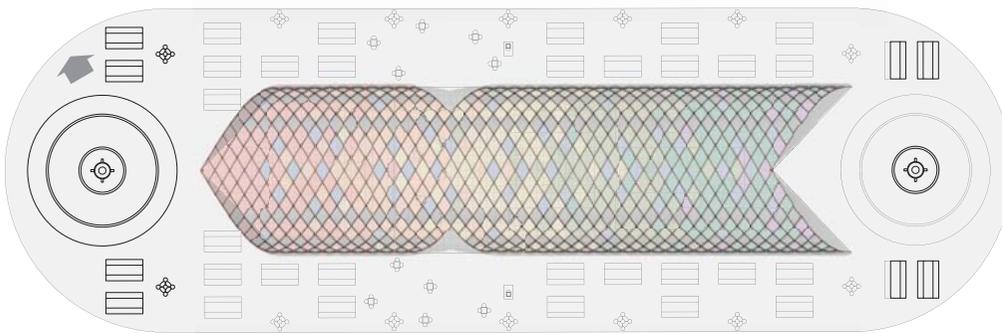
First design (Sep. 2018) | Bottom-Up Method



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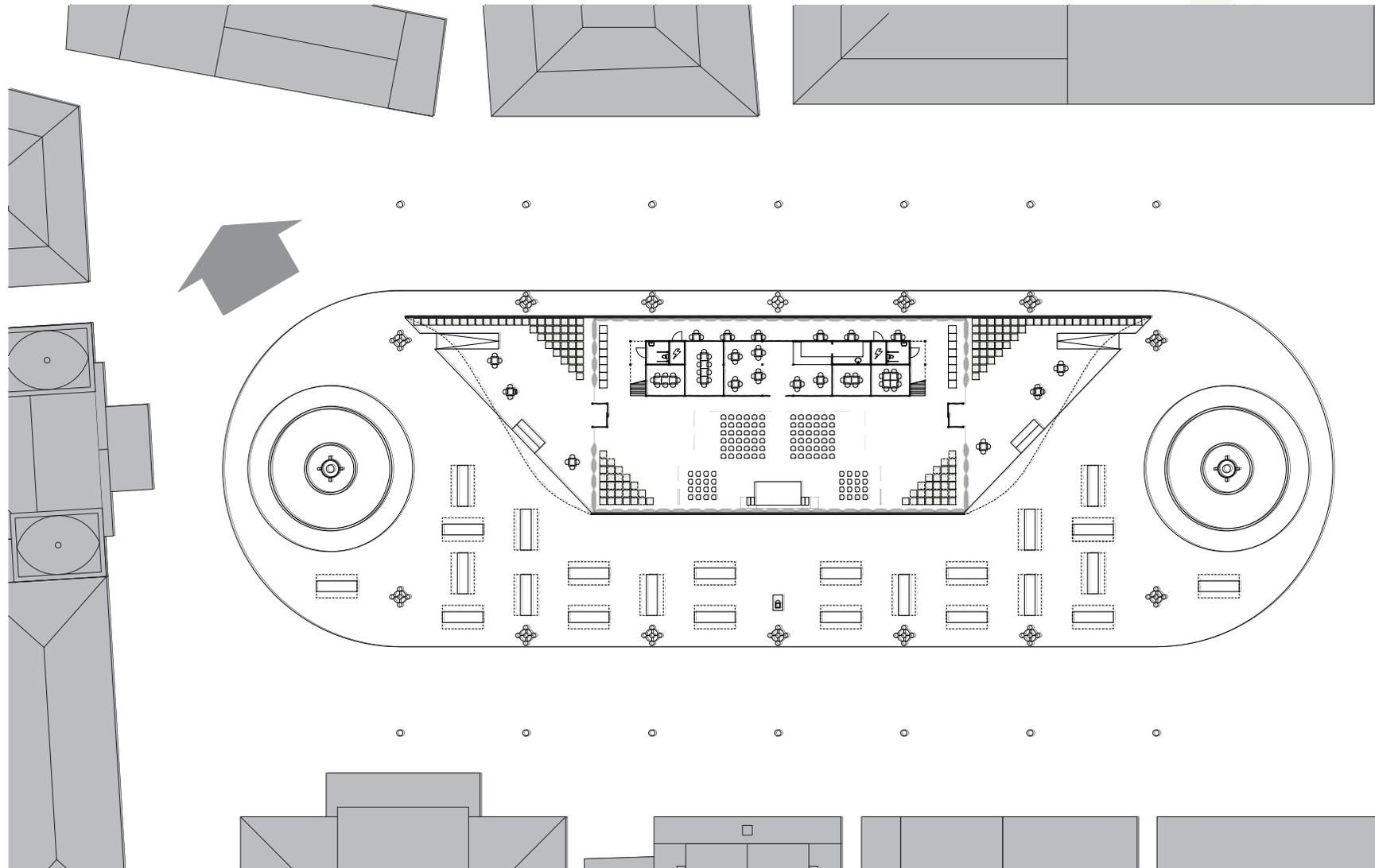
Third design (Dec. 2018) | Mixed Method Approach (Isidiho & Sabran, 2016)



DESIGN | GENERAL DESIGN

SITUATION

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CONTEXT

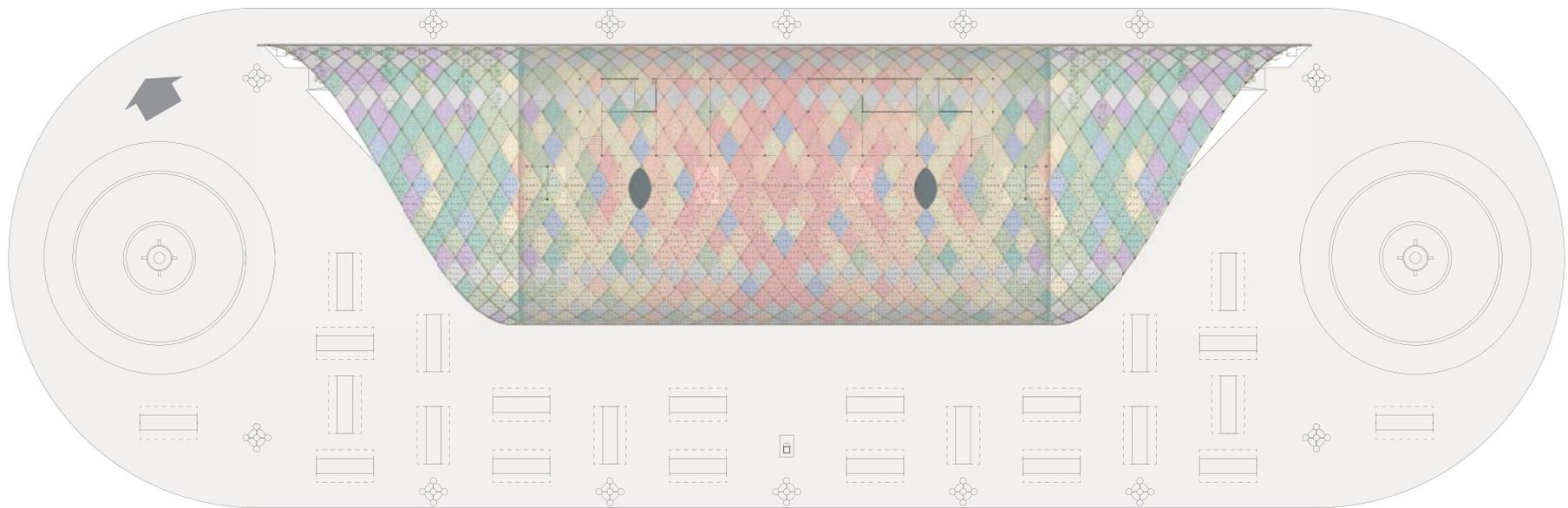
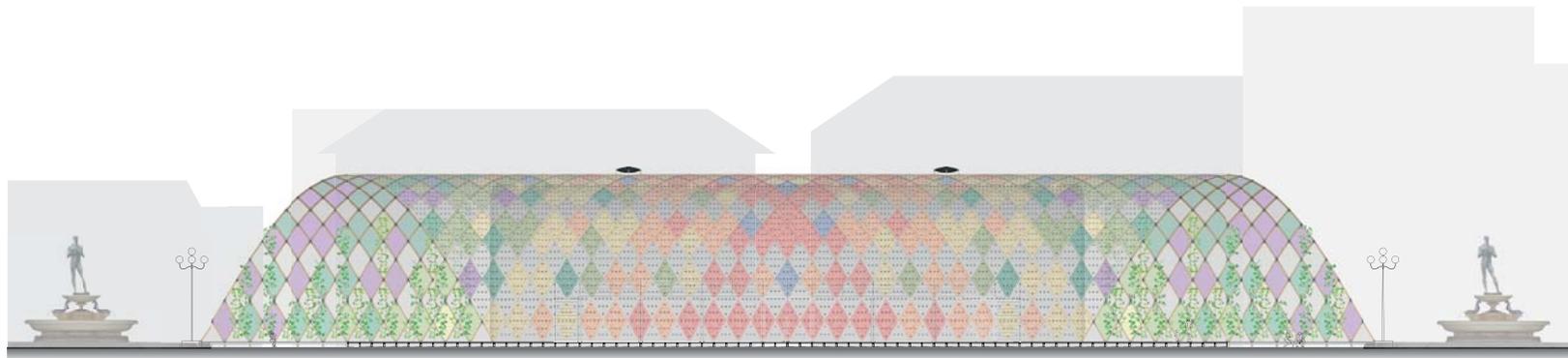
ASSIGNMENT

RESEARCH

CONCEPT

DESIGN

REFLECTION



BUILD-UP

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CONTEXT

ASSIGNMENT

RESEARCH

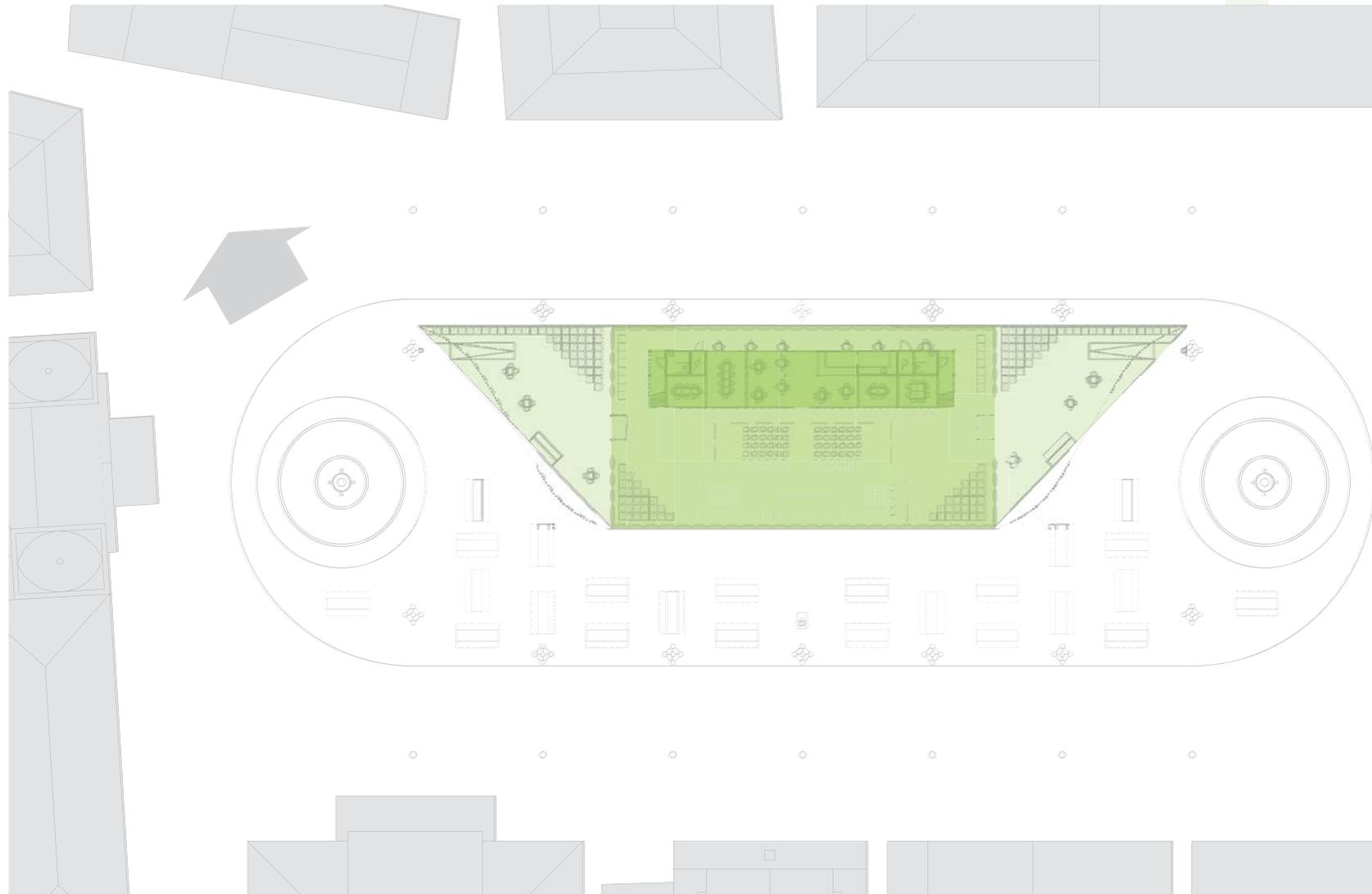
CONCEPT

DESIGN

REFLECTION

ZONING

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CONTEXT

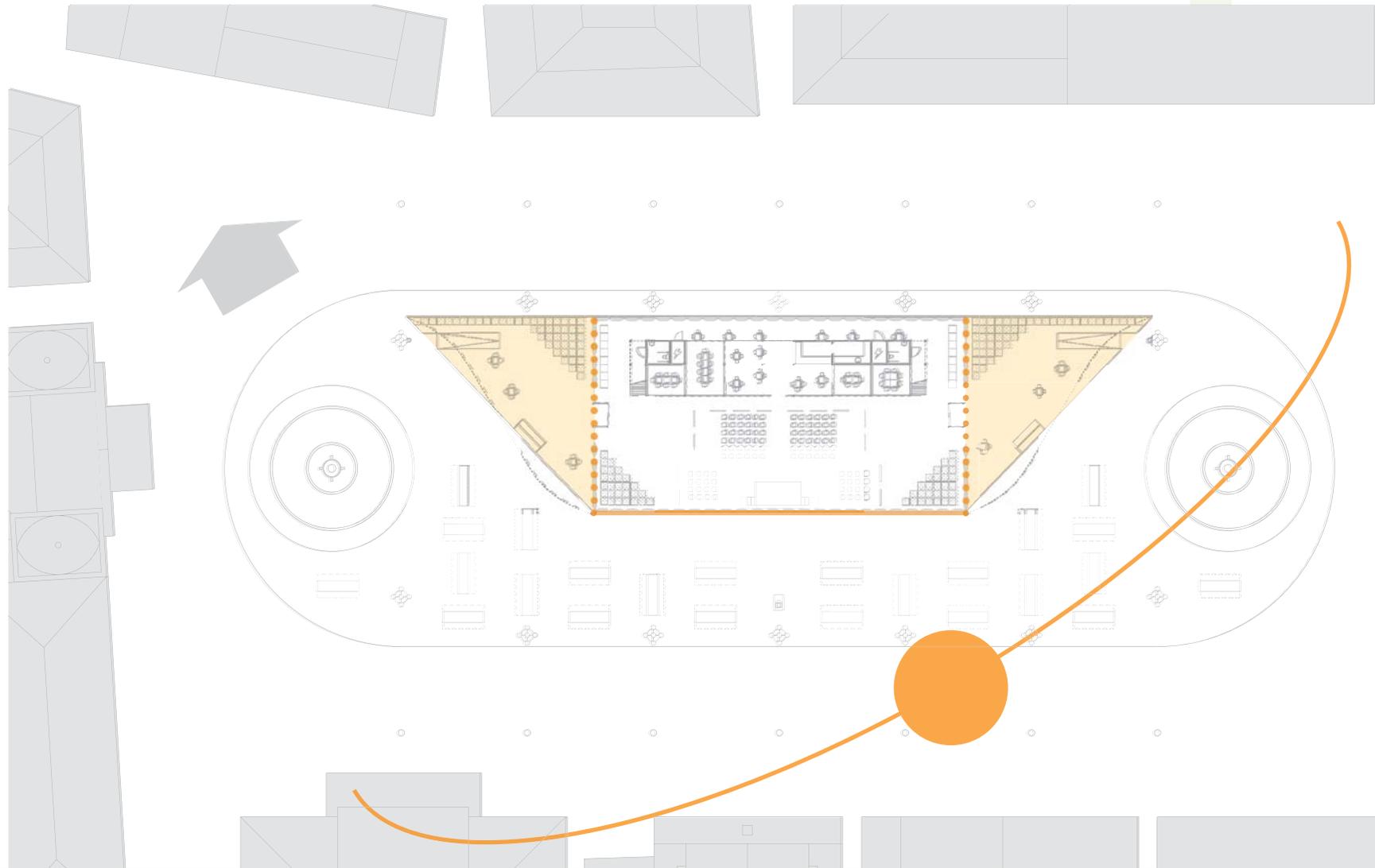
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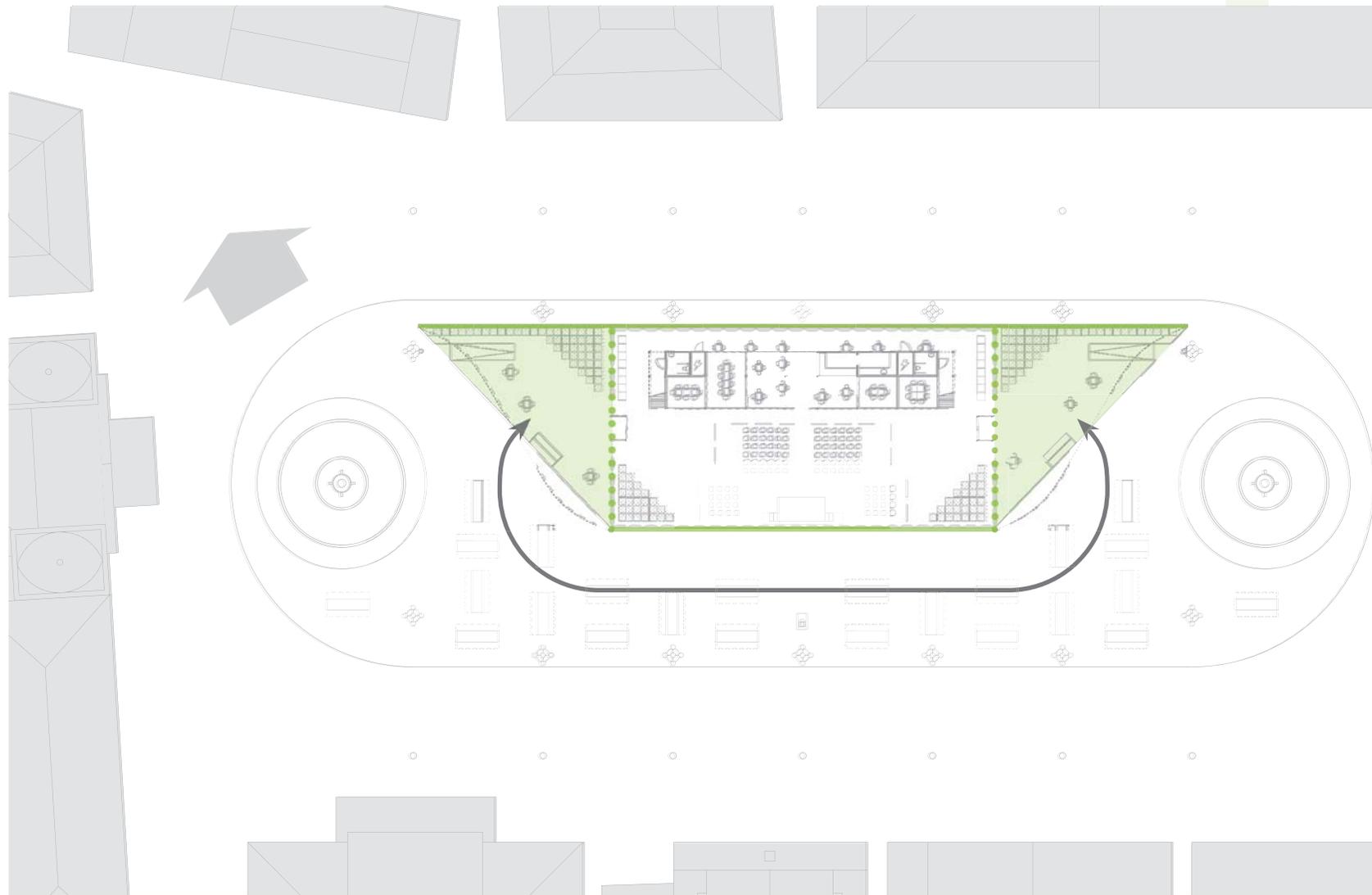
RESEARCH

CONCEPT

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REFLECTION





ENTRANCE



CONTEXT

ASSIGNMENT

RESEARCH

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CONTEXT

ASSIGNMENT

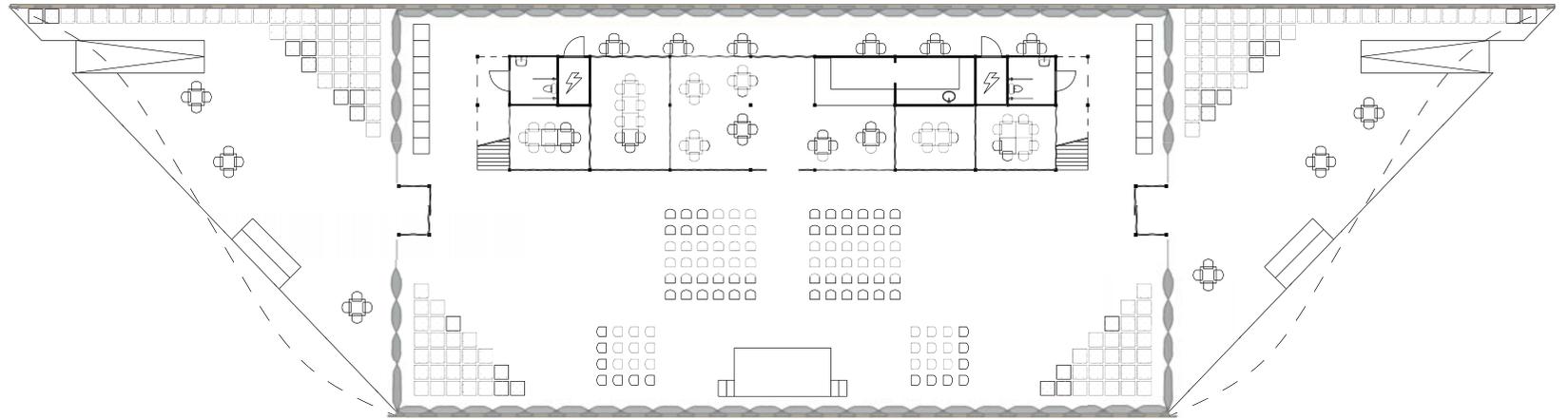
RESEARCH

CONCEPT

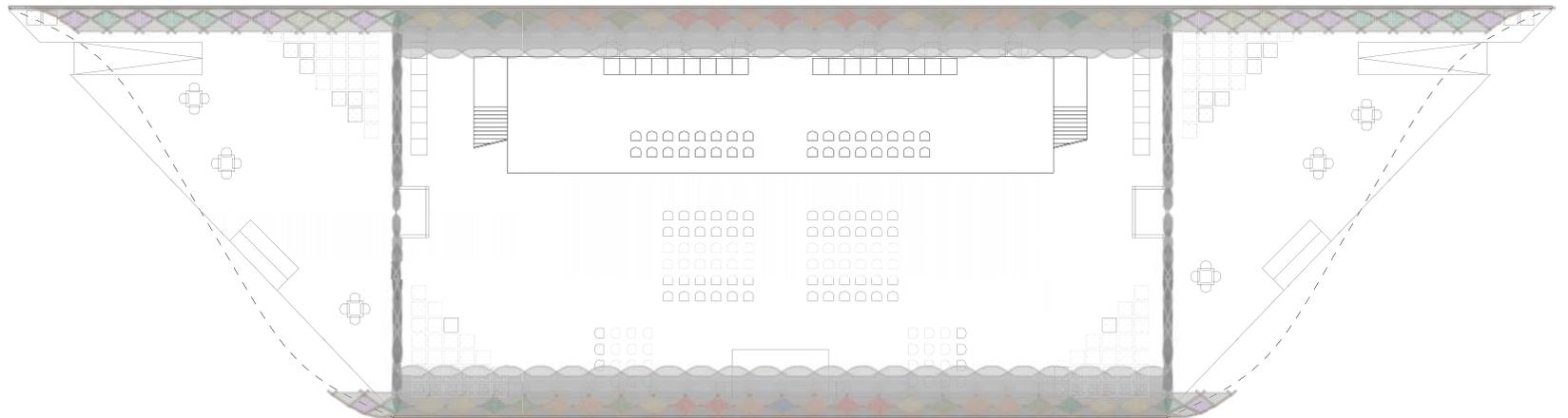
DESIGN

REFLECTION

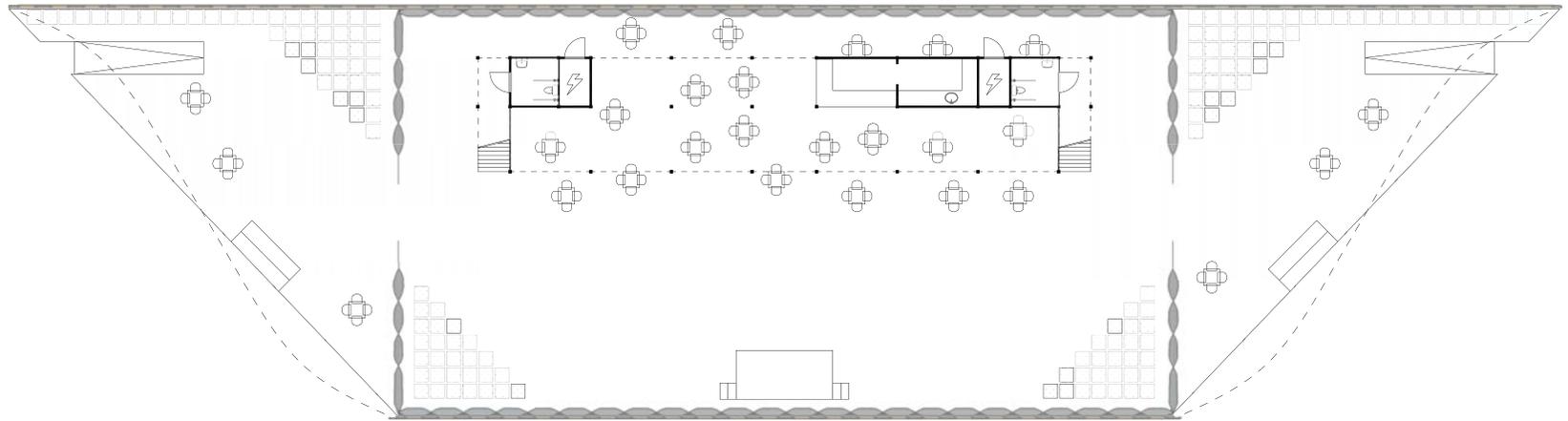
Ground level



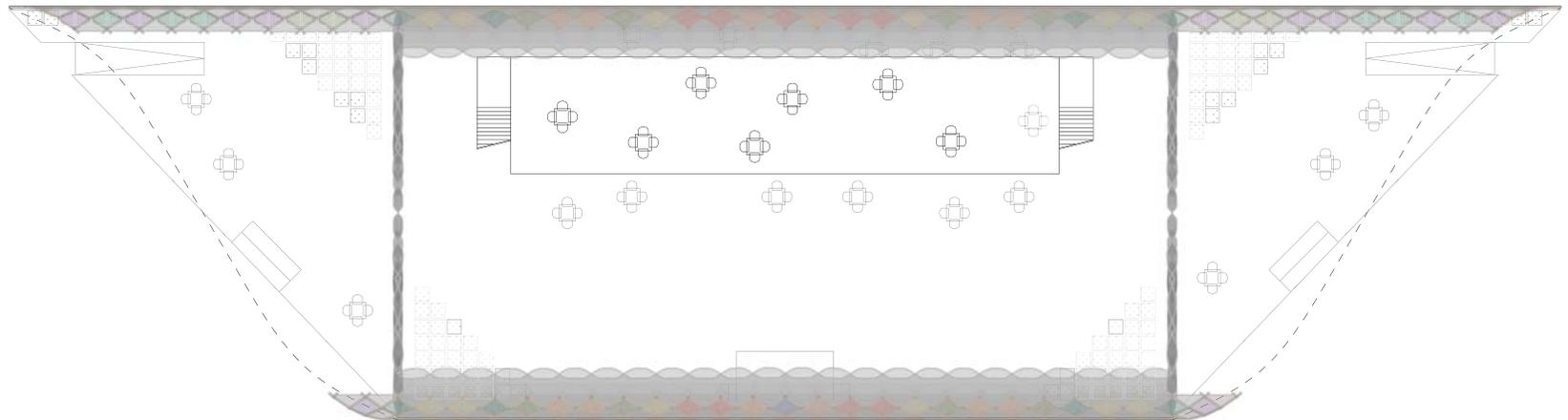
First floor



Ground level



First floor



DESIGN | STRUCTURAL DESIGN

PRINCIPLES

MATERIALISATION

Primary re-used timber & recycled reinforced plastic

Secondary steel

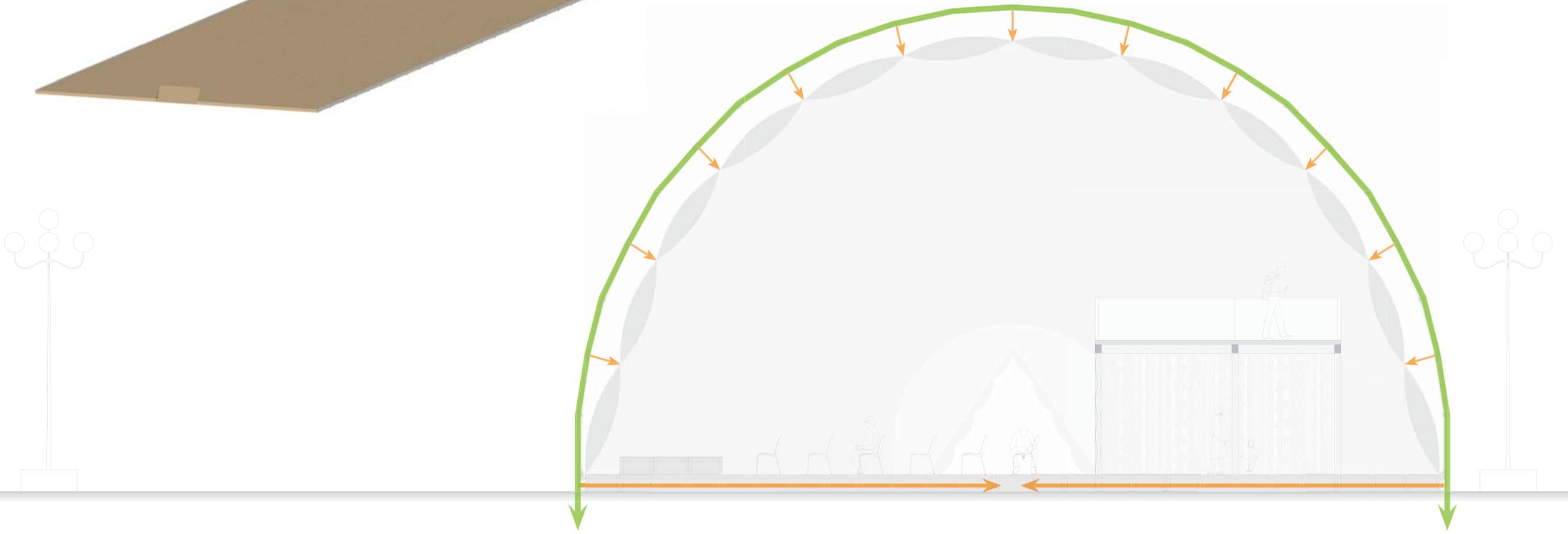
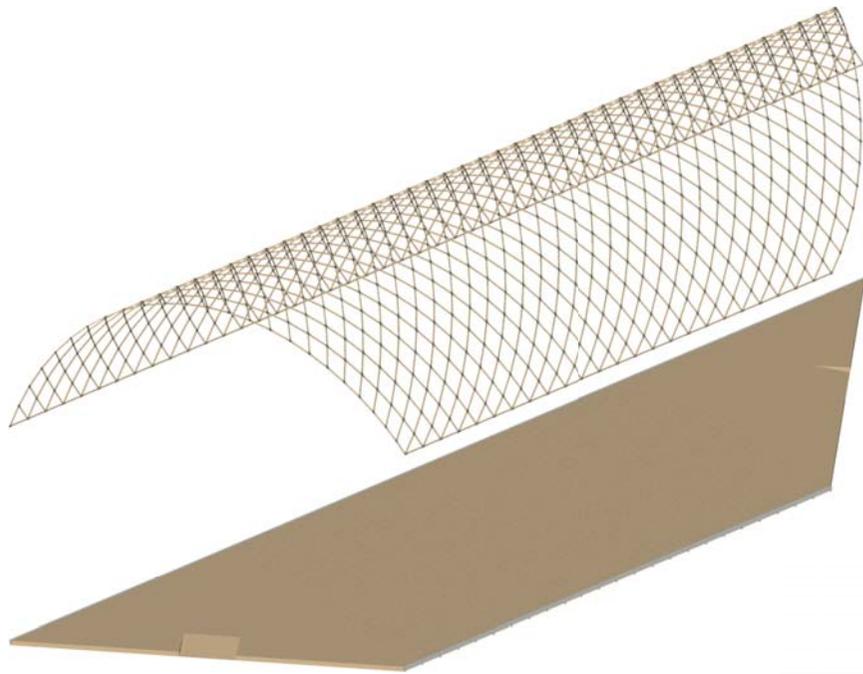
STRUCTURAL SYSTEM

Using modern techniques to create an easy-to-assemble structure

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GENERAL LOADS

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CONTEXT

ASSIGNMENT

RESEARCH

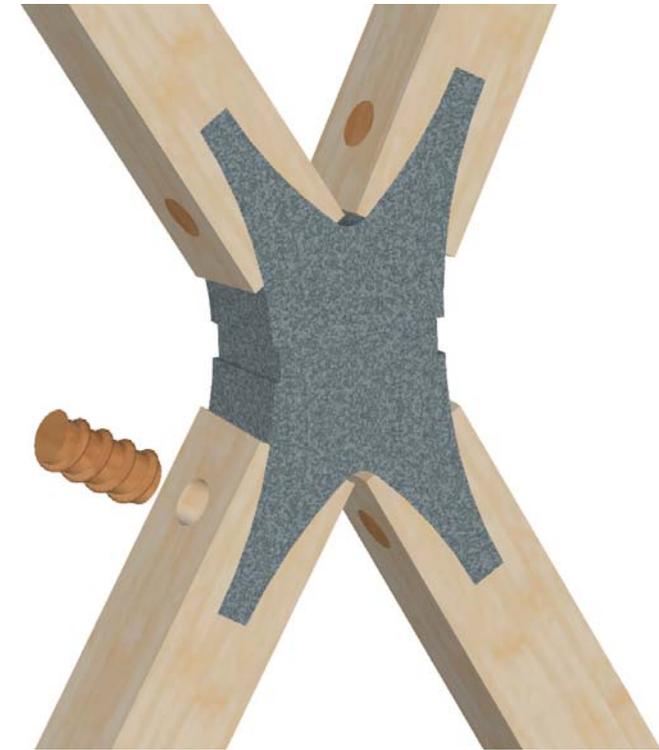
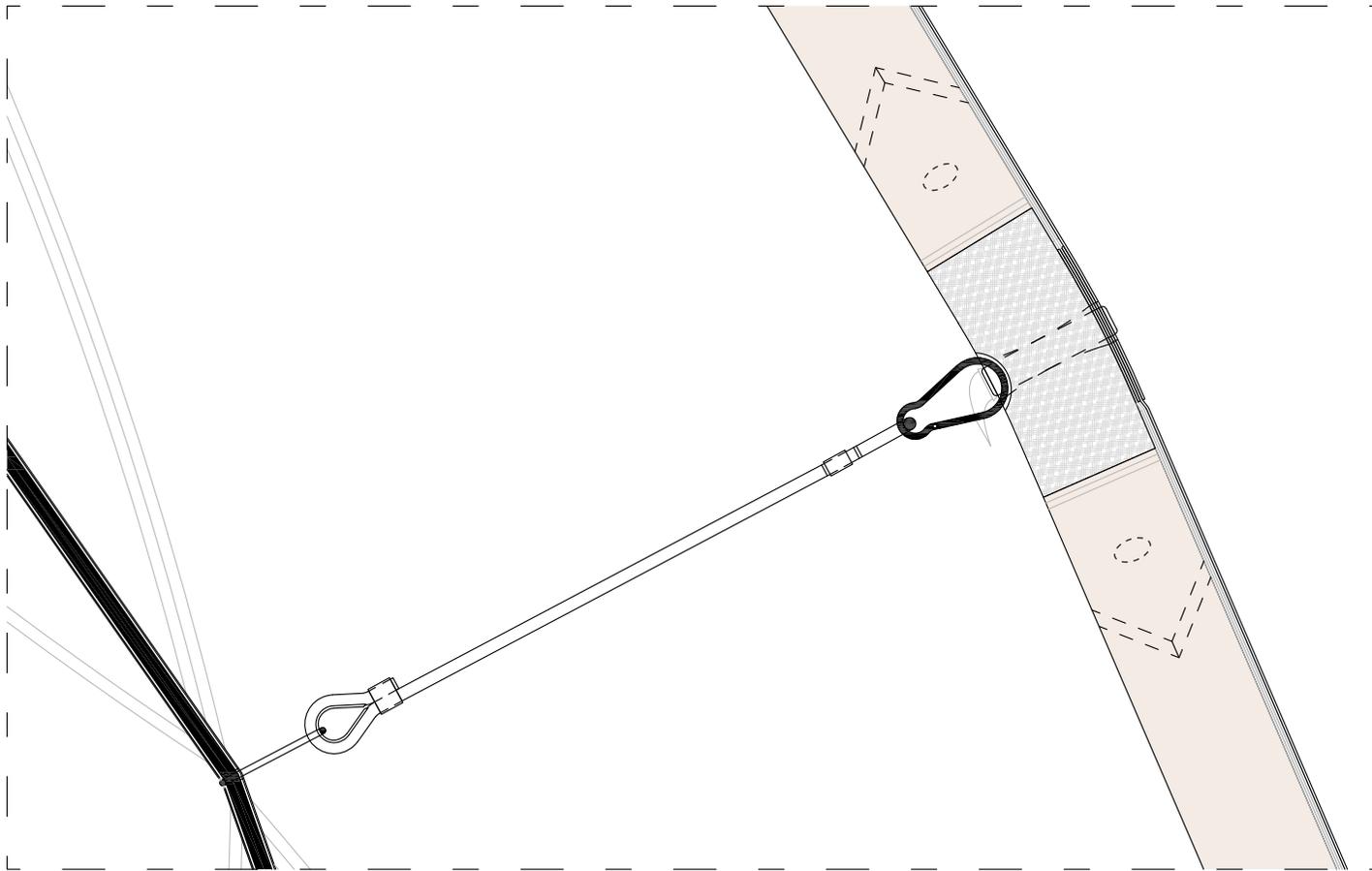
CONCEPT

DESIGN

REFLECTION

STRUCTURAL JOINT | SIDE VIEW

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CONTEXT

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RESEARCH

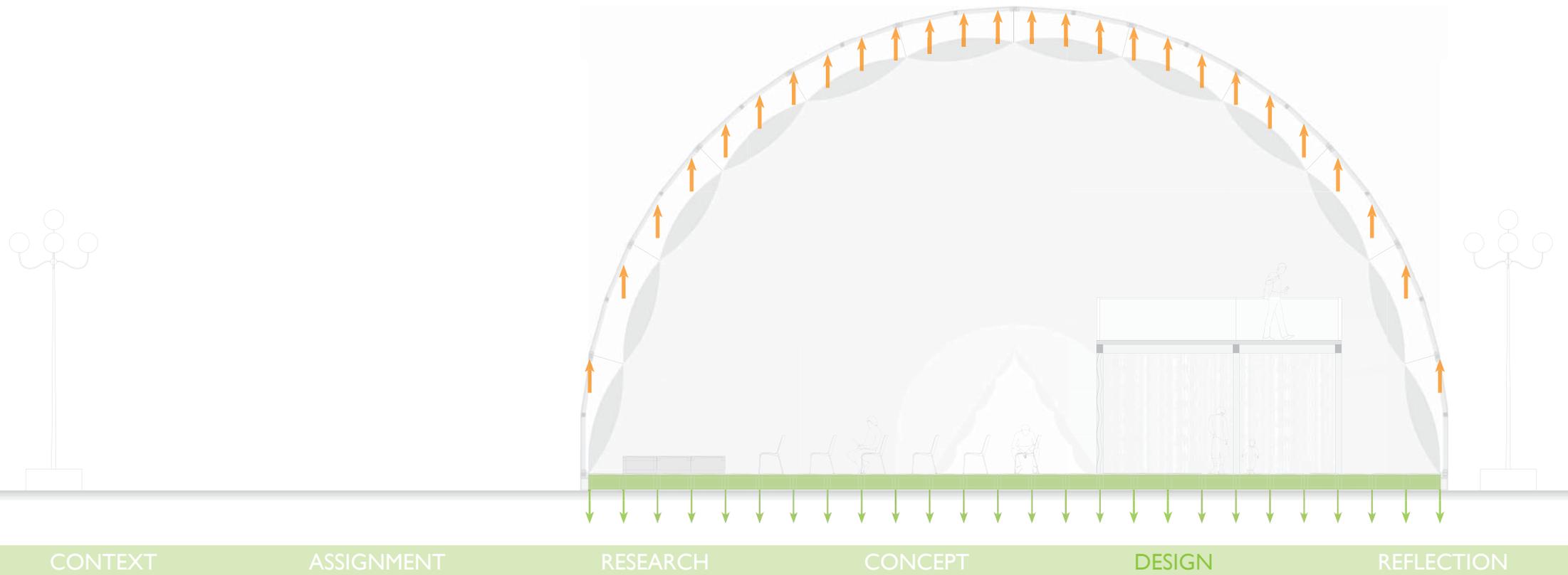
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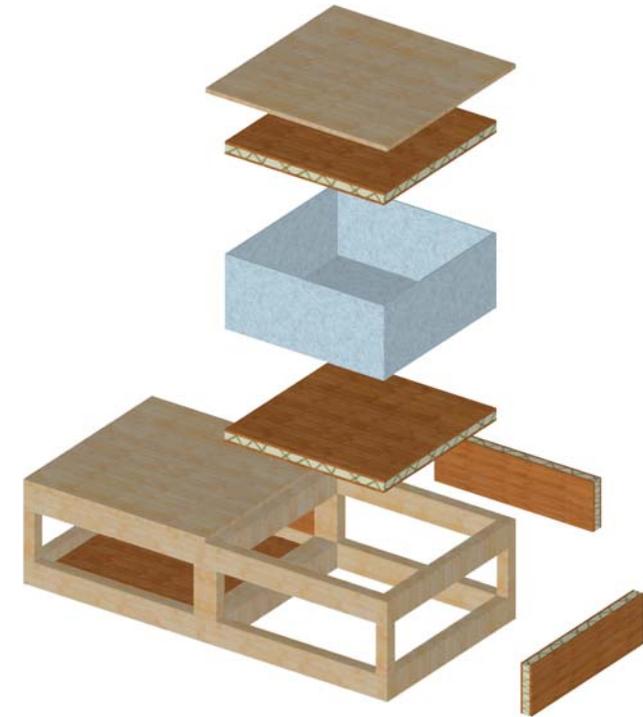
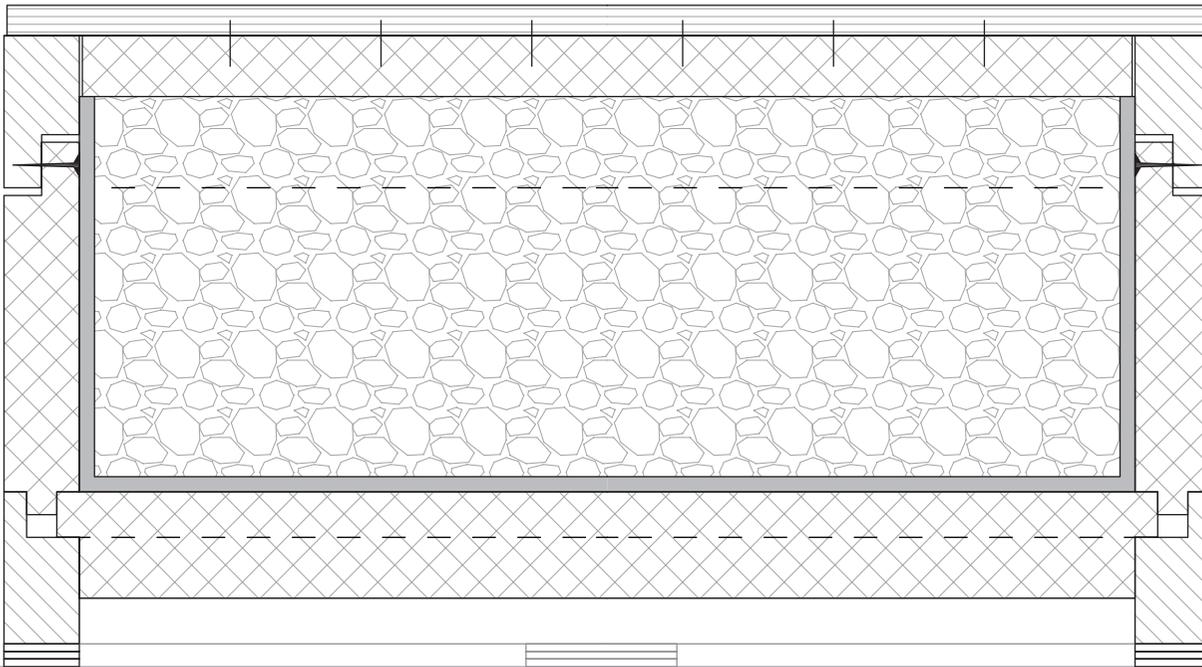
UPLIFTING FORCE

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MODULAR FLOOR | SIDE VIEW

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CONTEXT

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RESEARCH

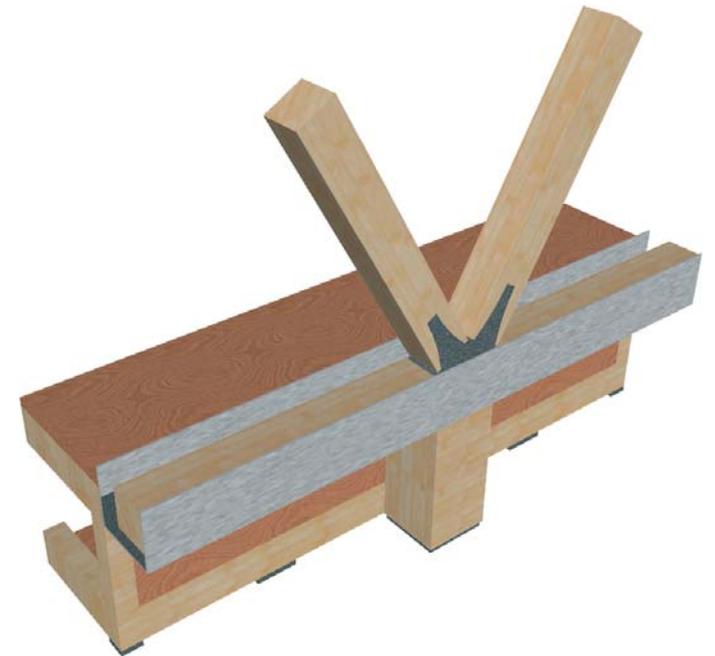
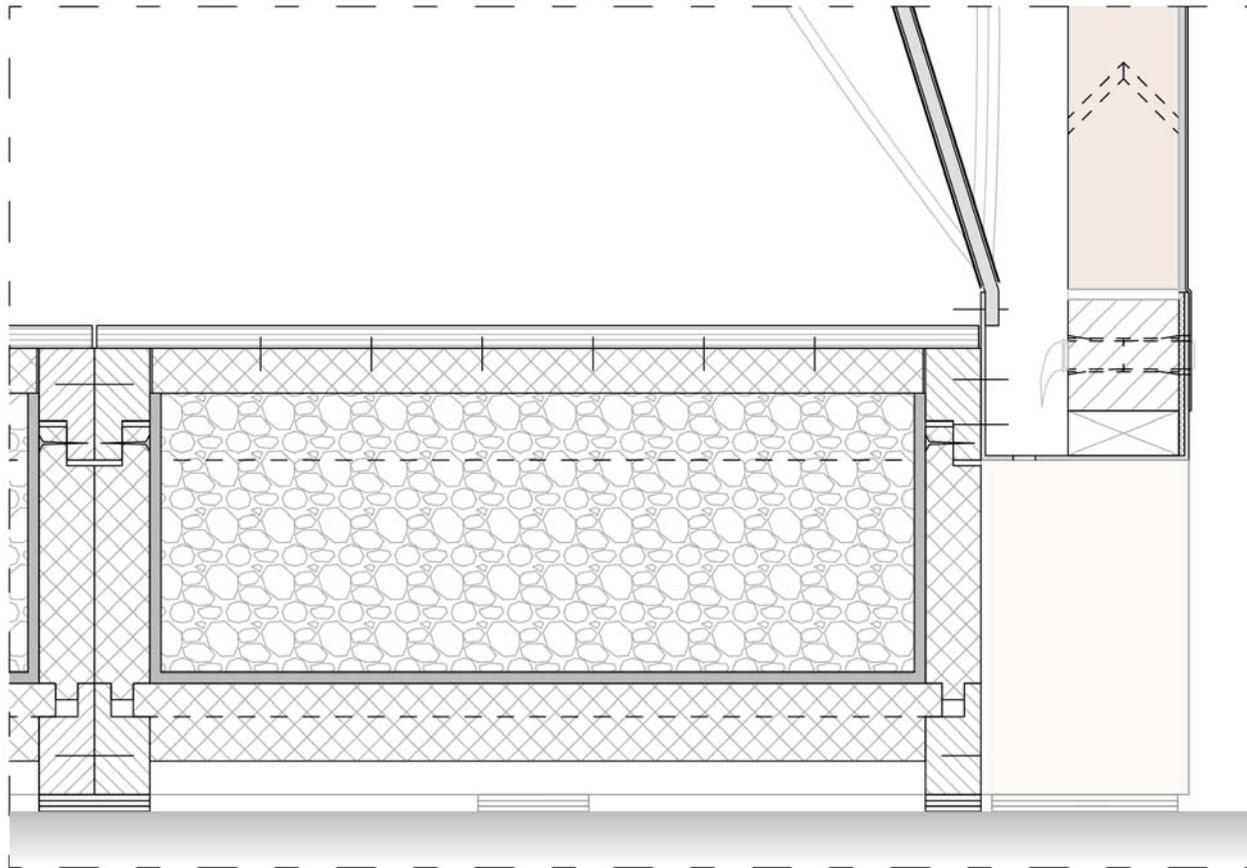
CONCEPT

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CONNECTION DETAIL | SIDE VIEW

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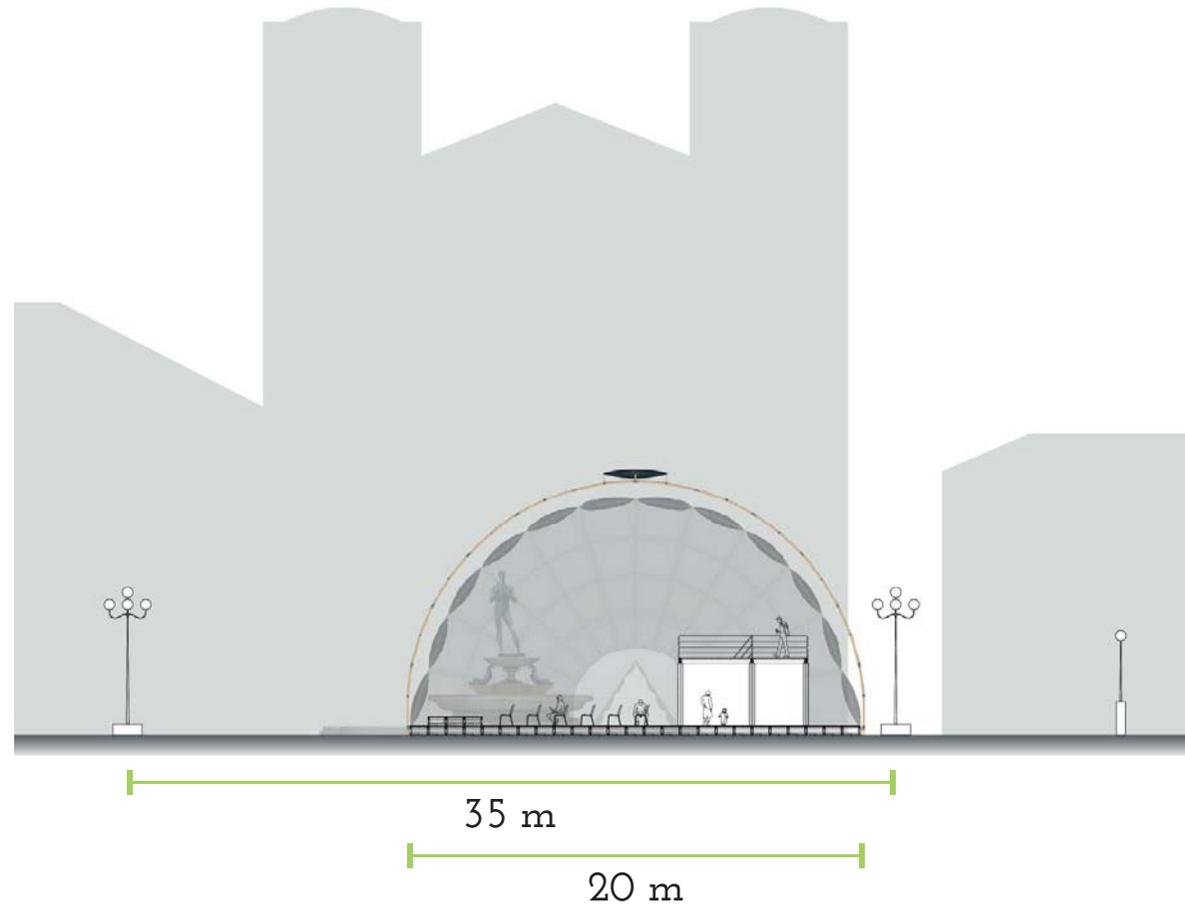


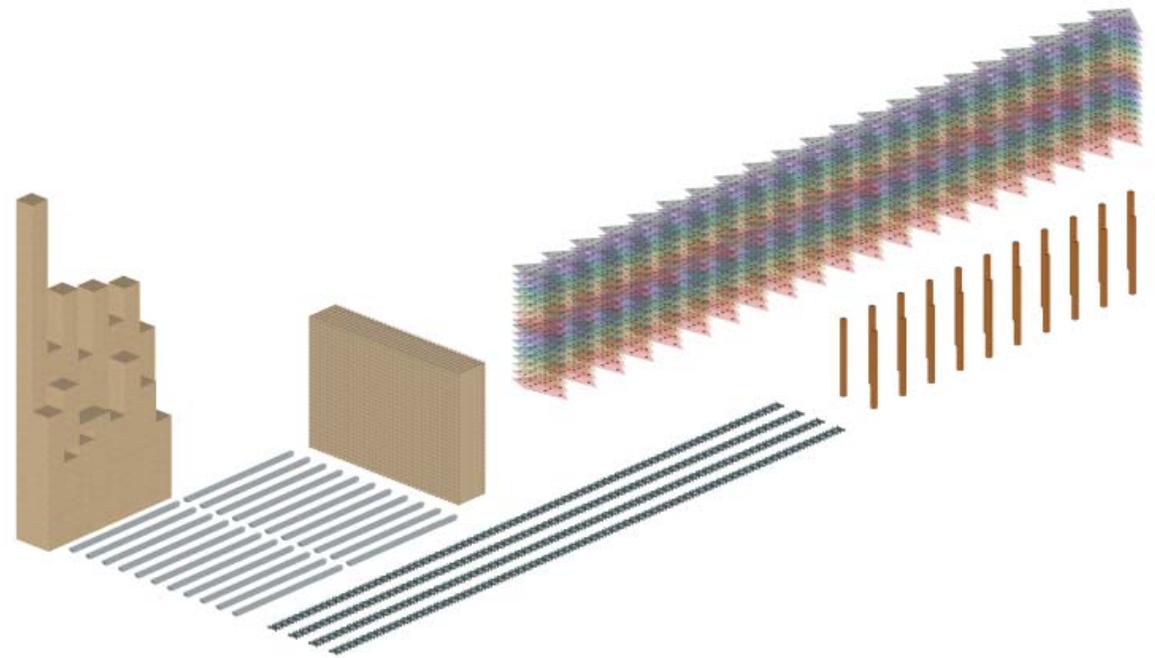
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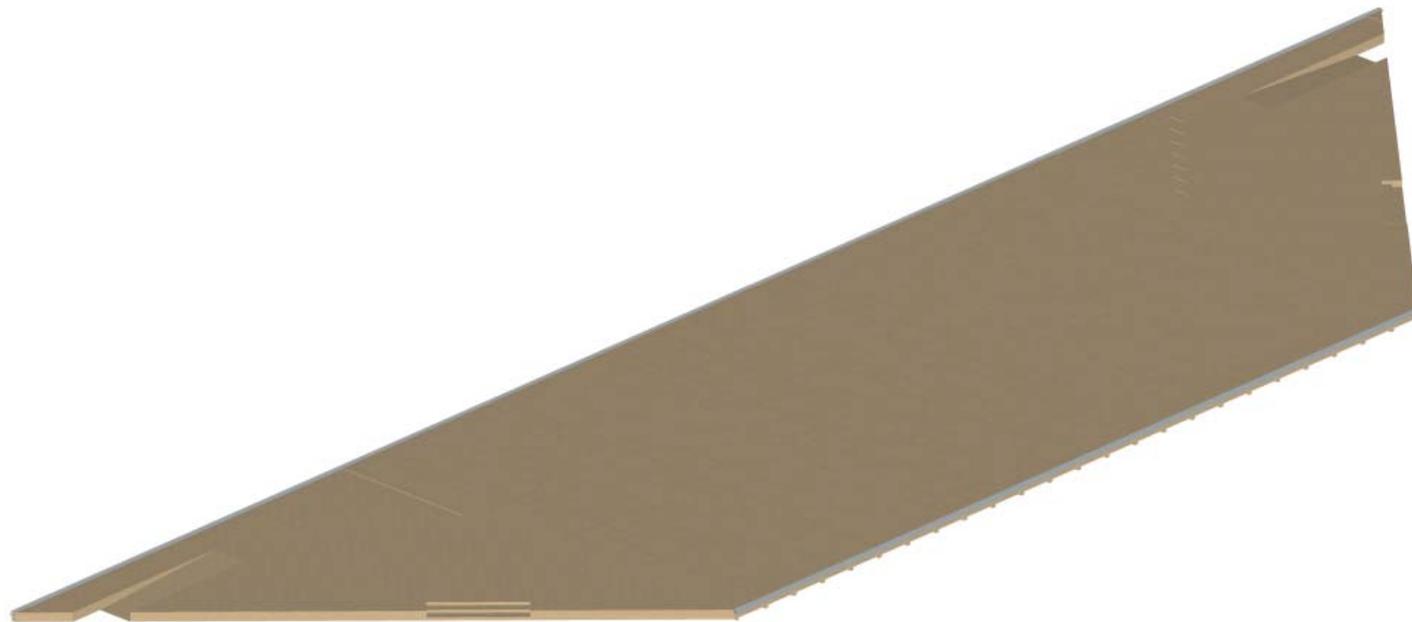
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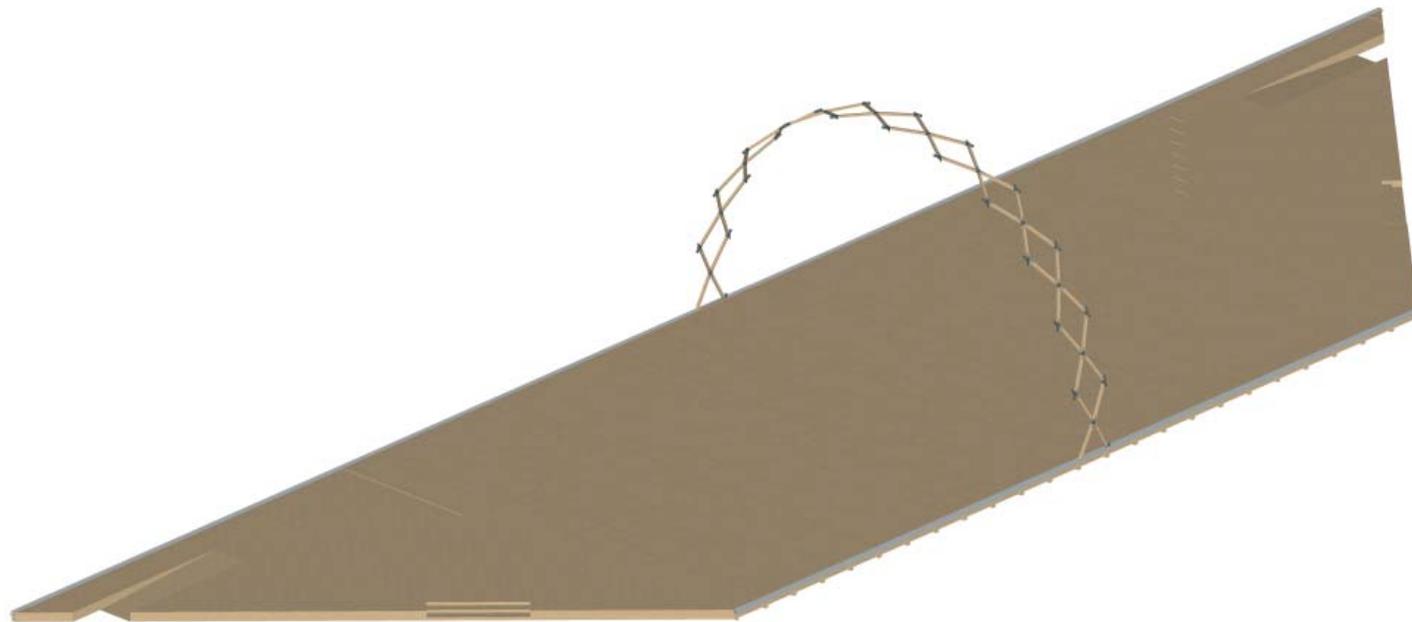


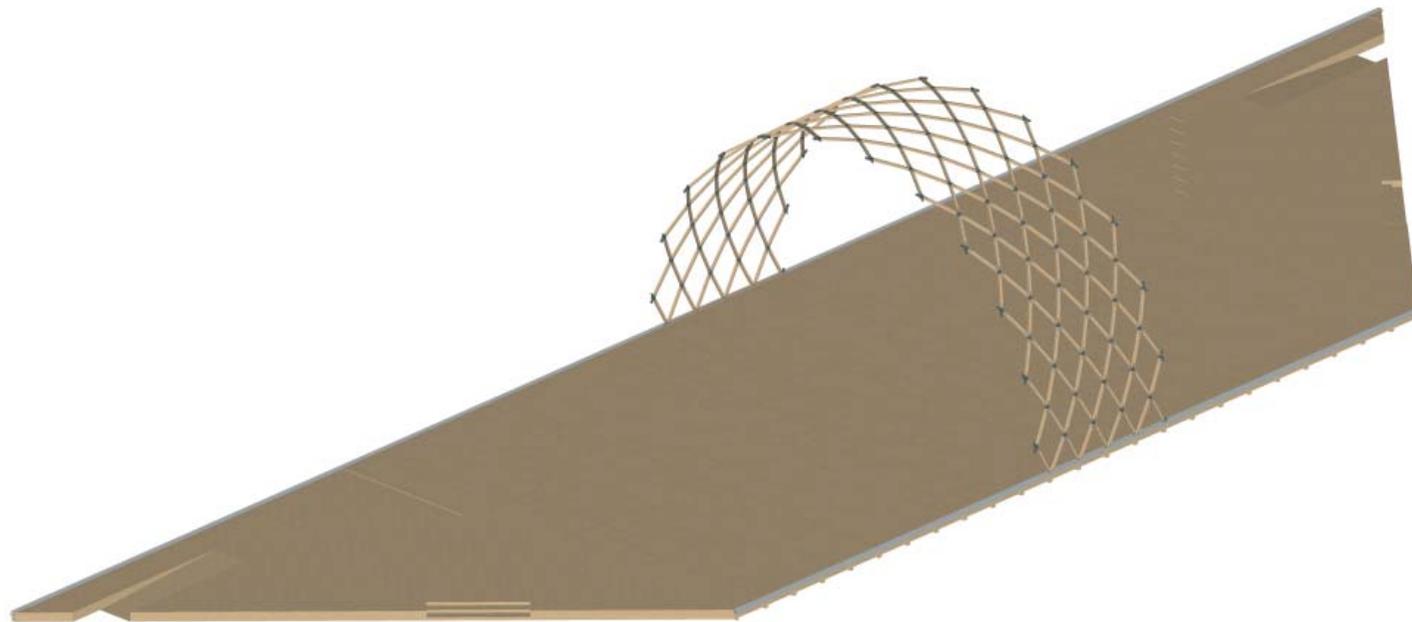
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Section: 10 cm x 10 cm
Weight: 8 kg

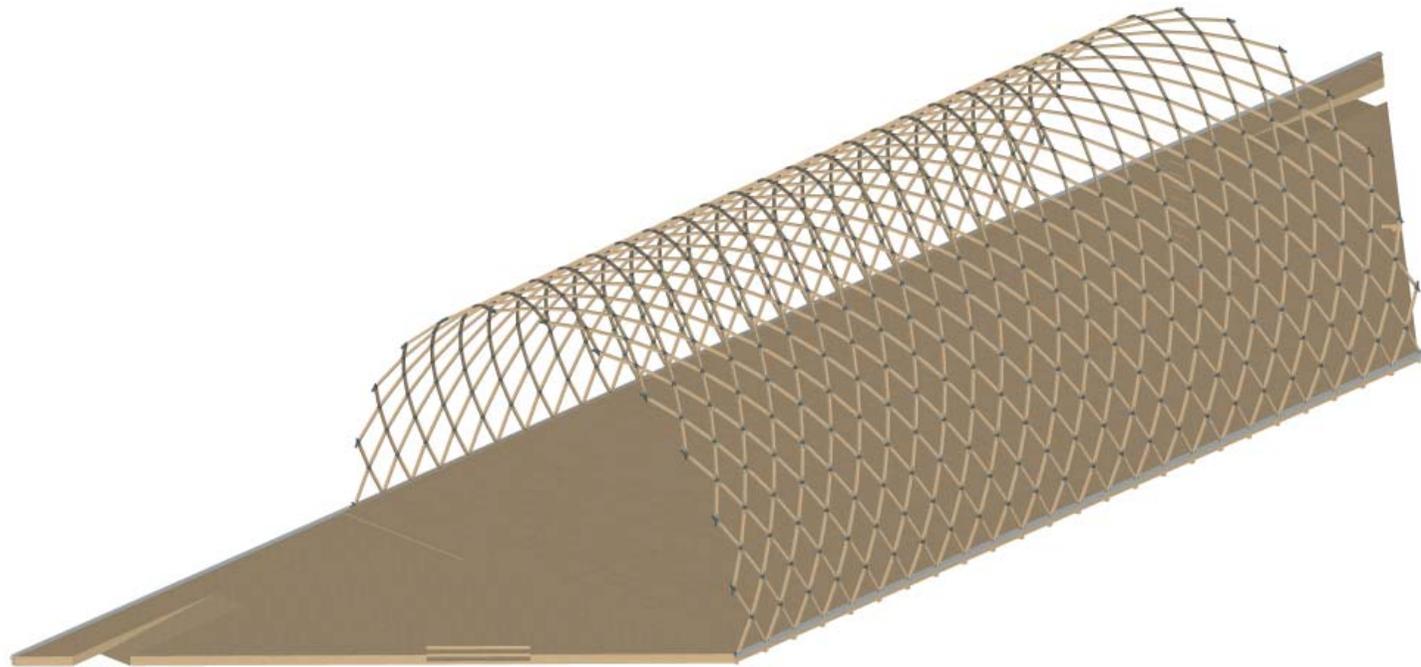


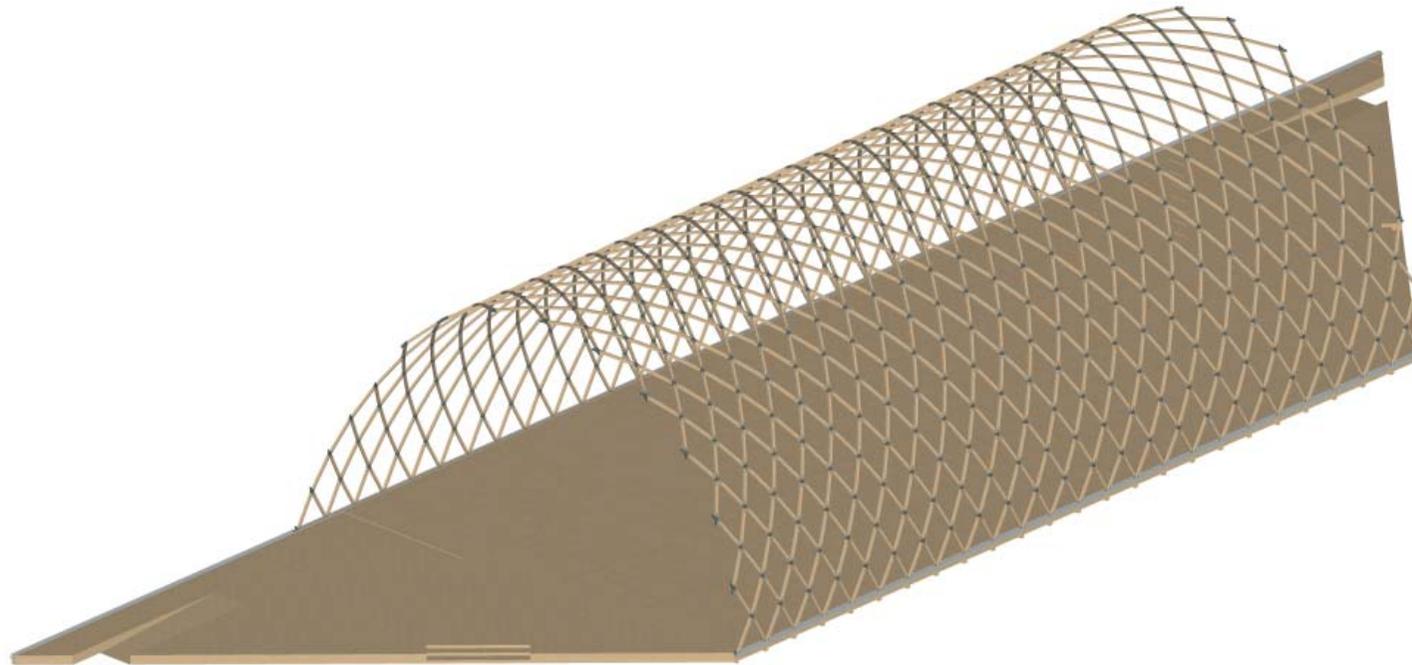


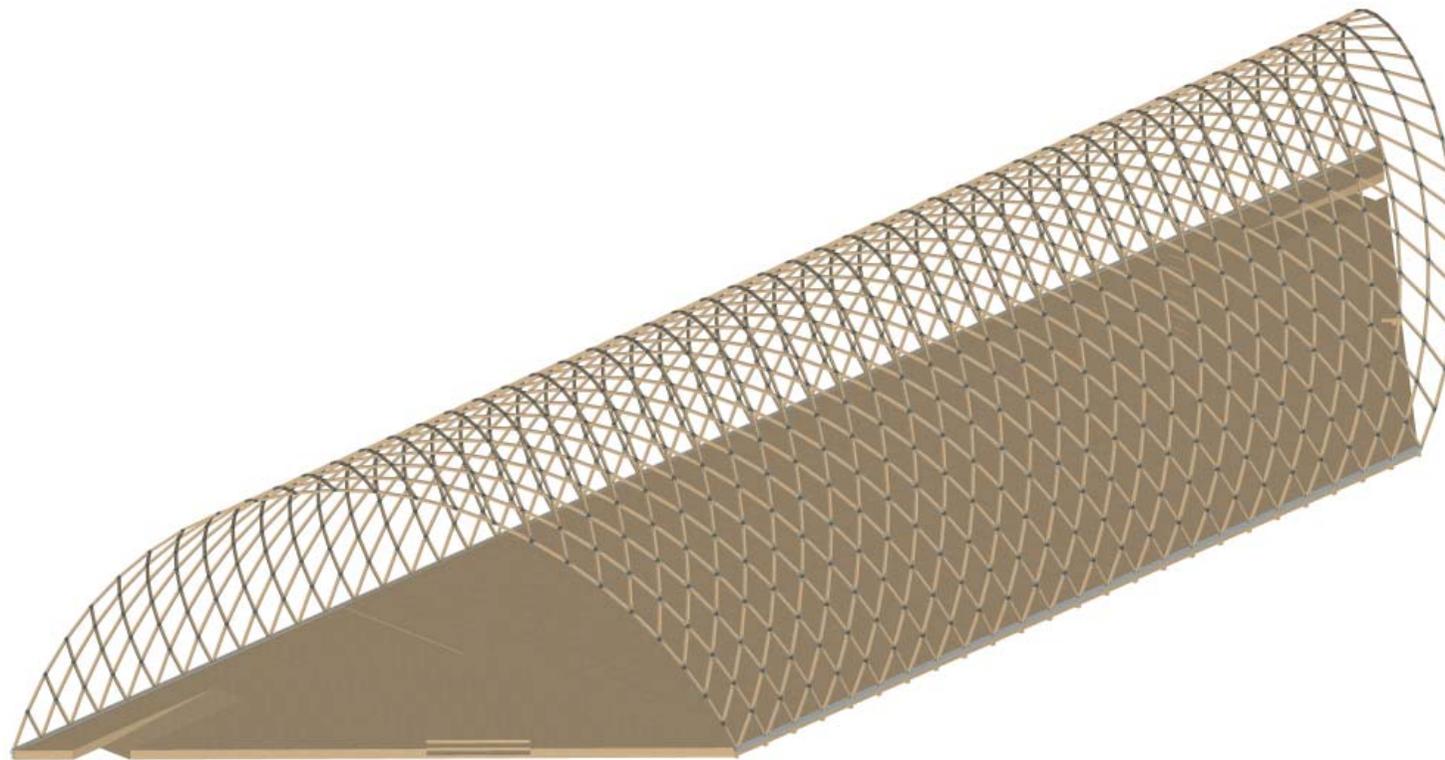


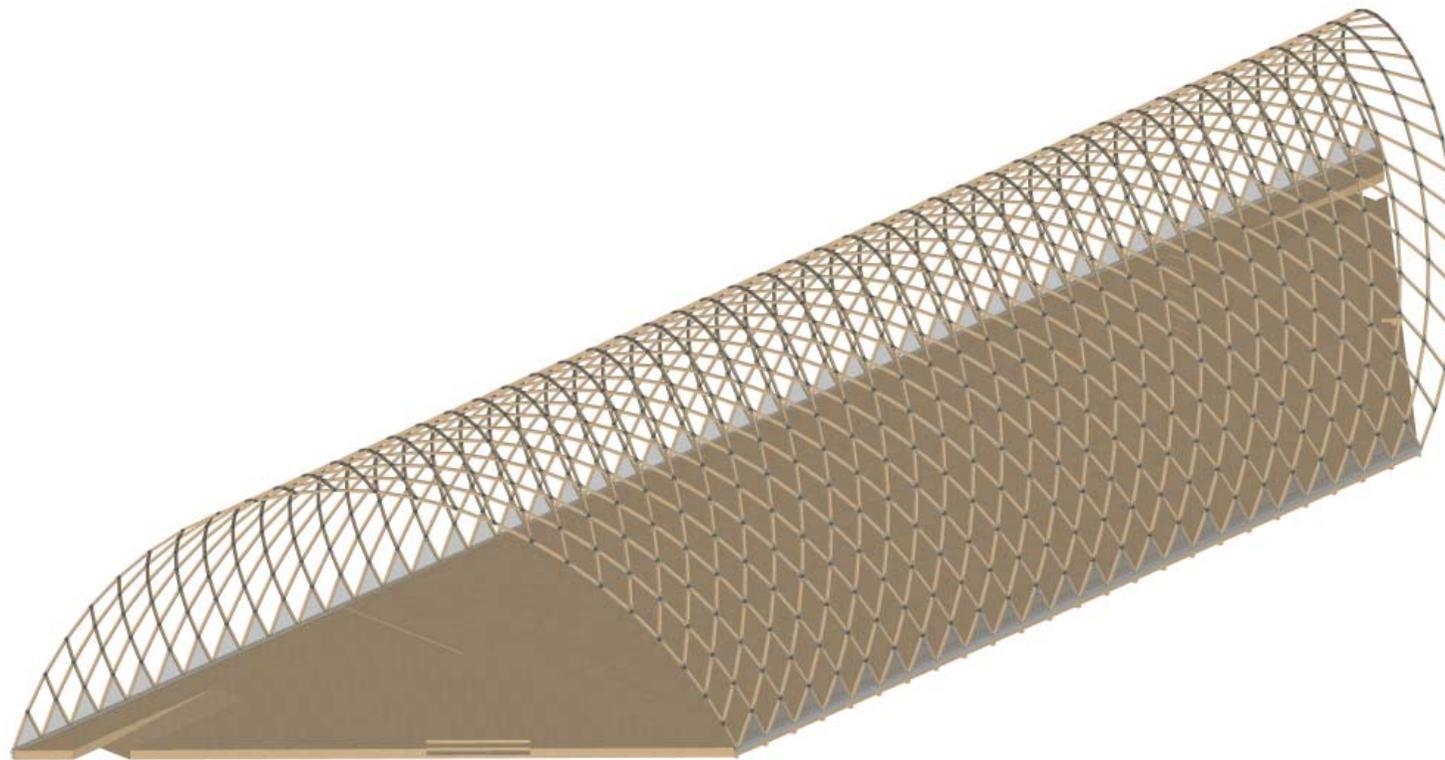


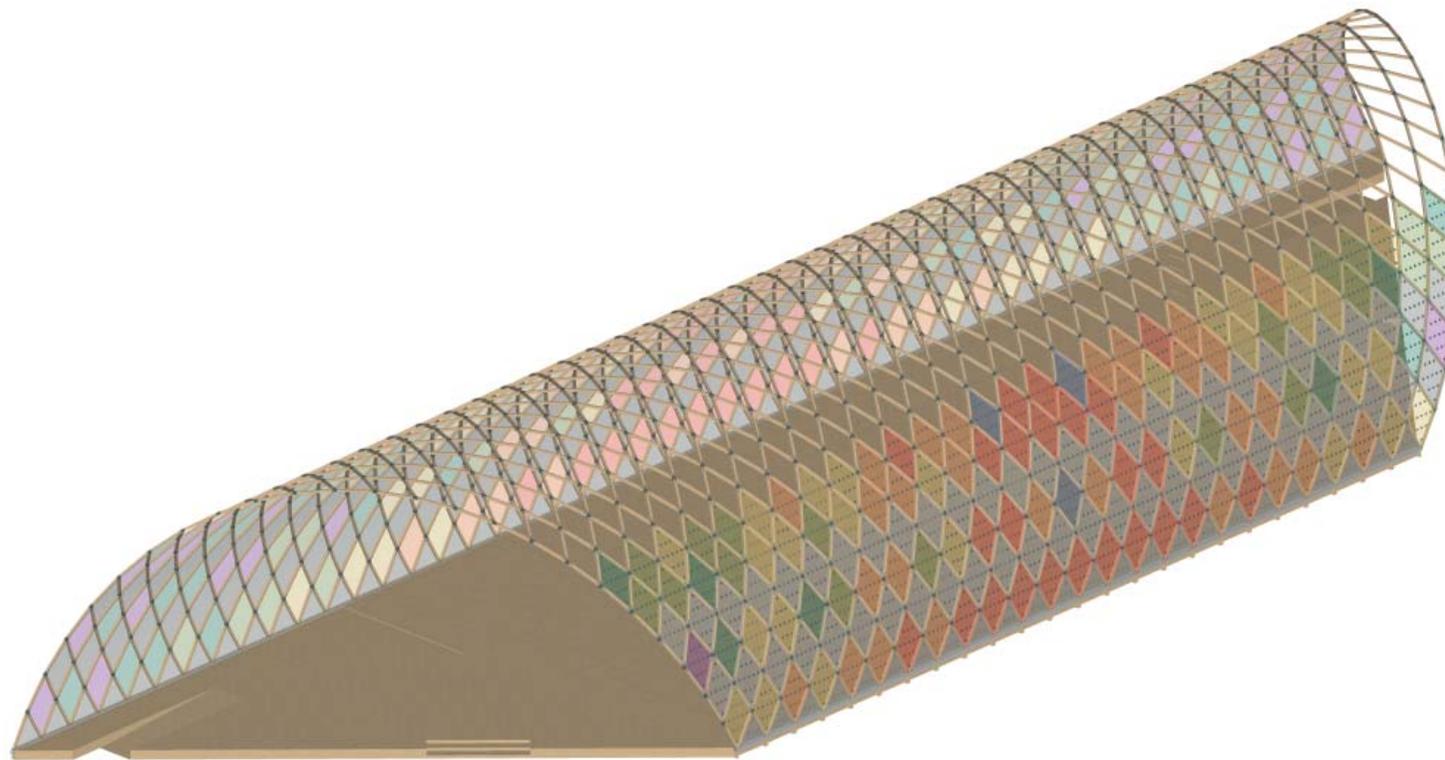


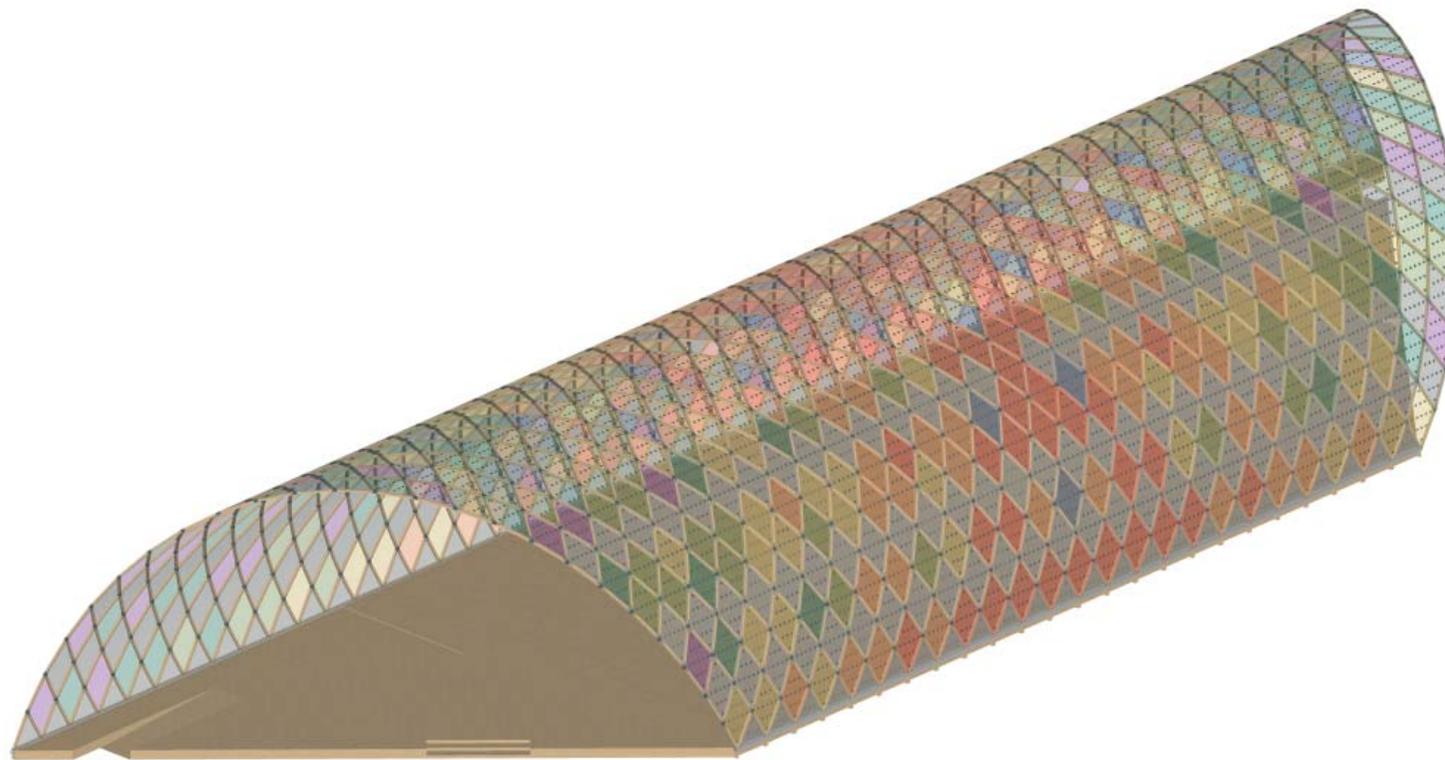


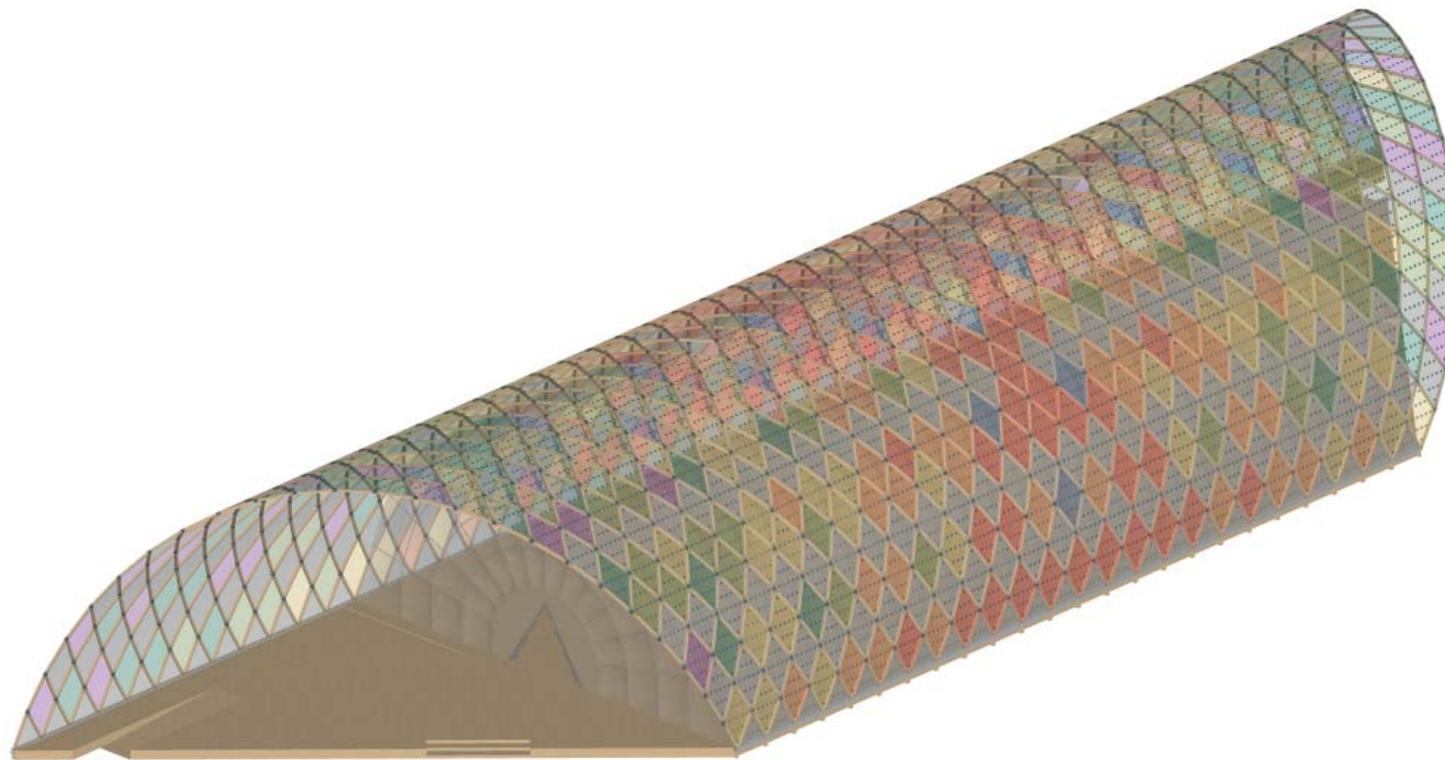


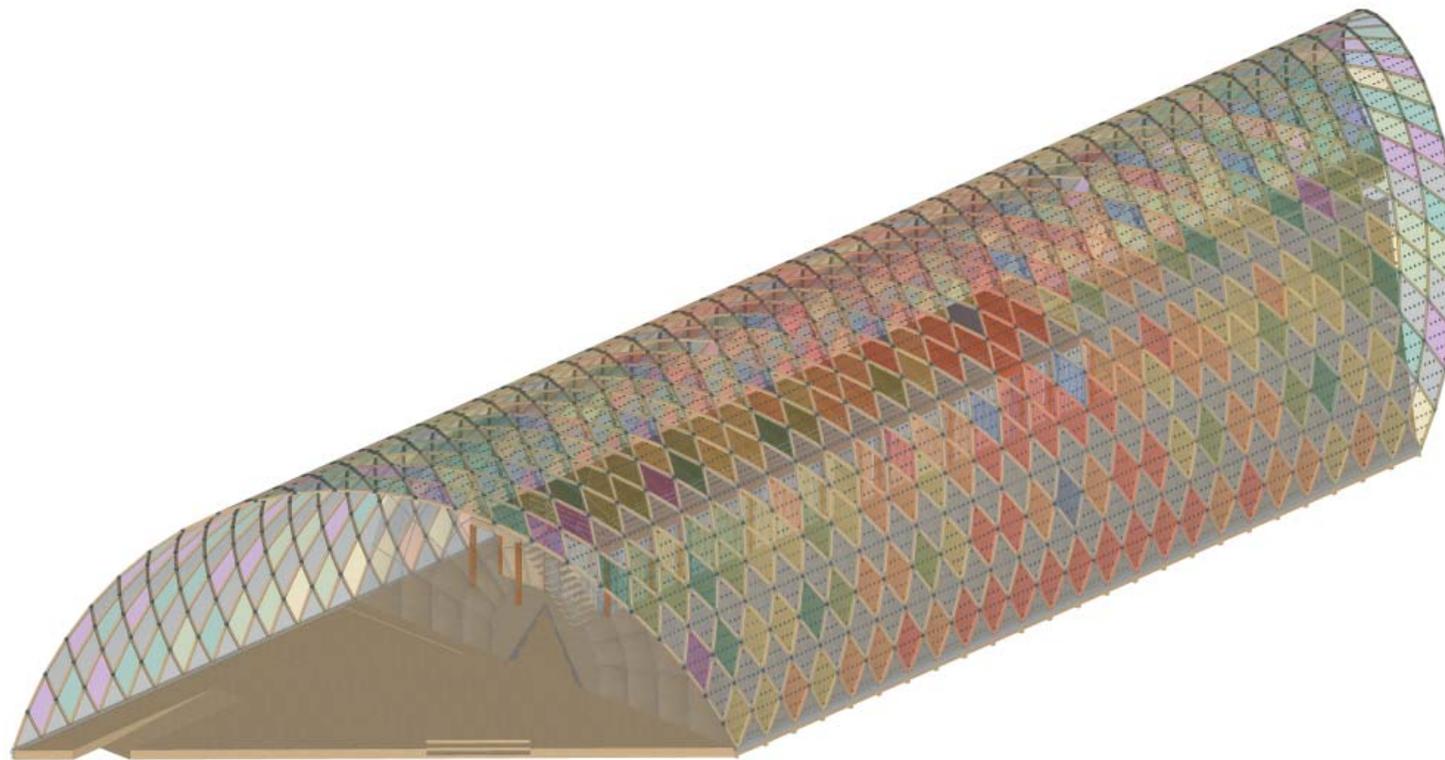


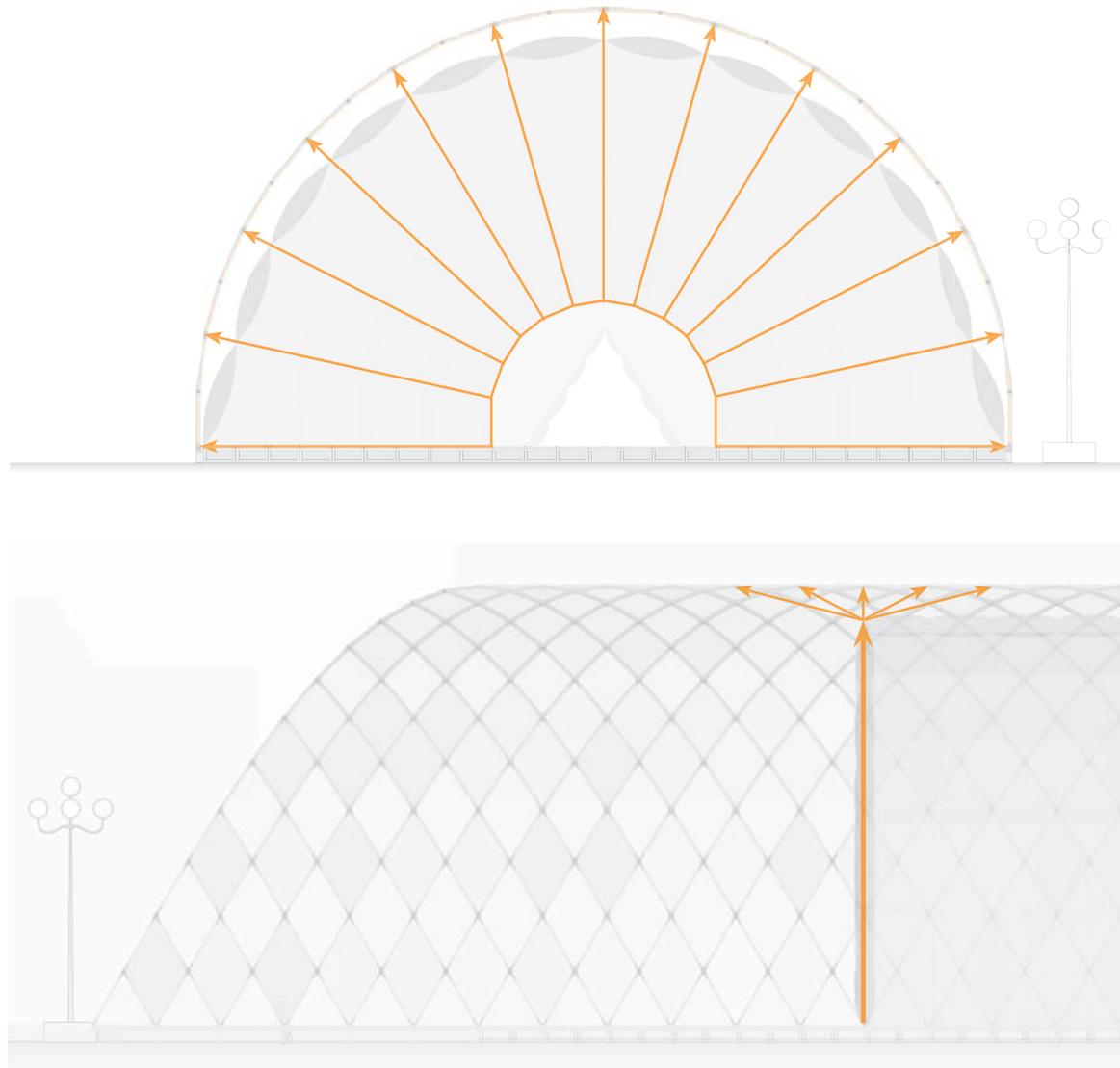


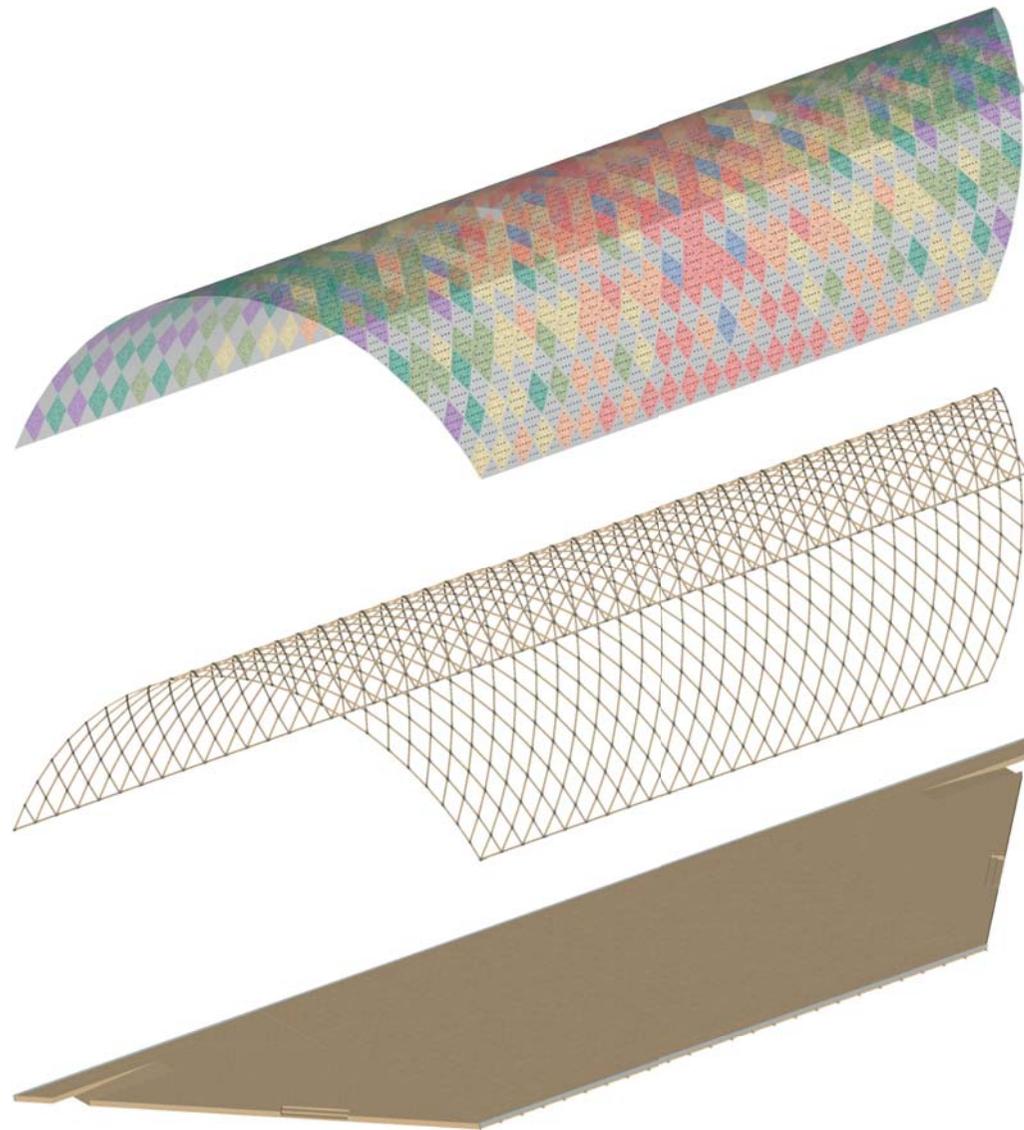




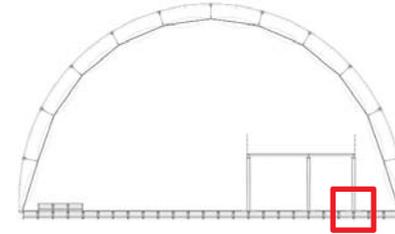
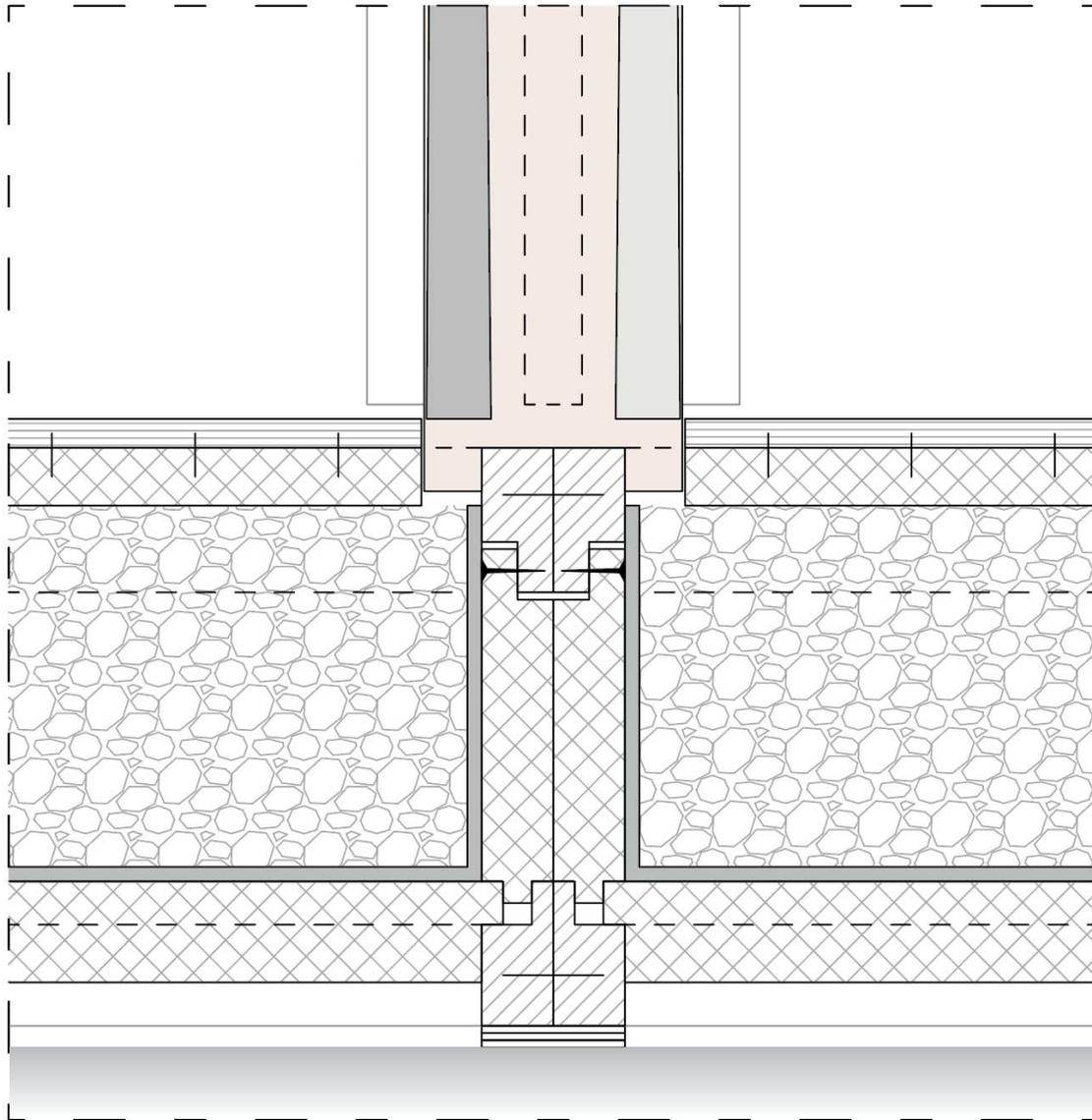




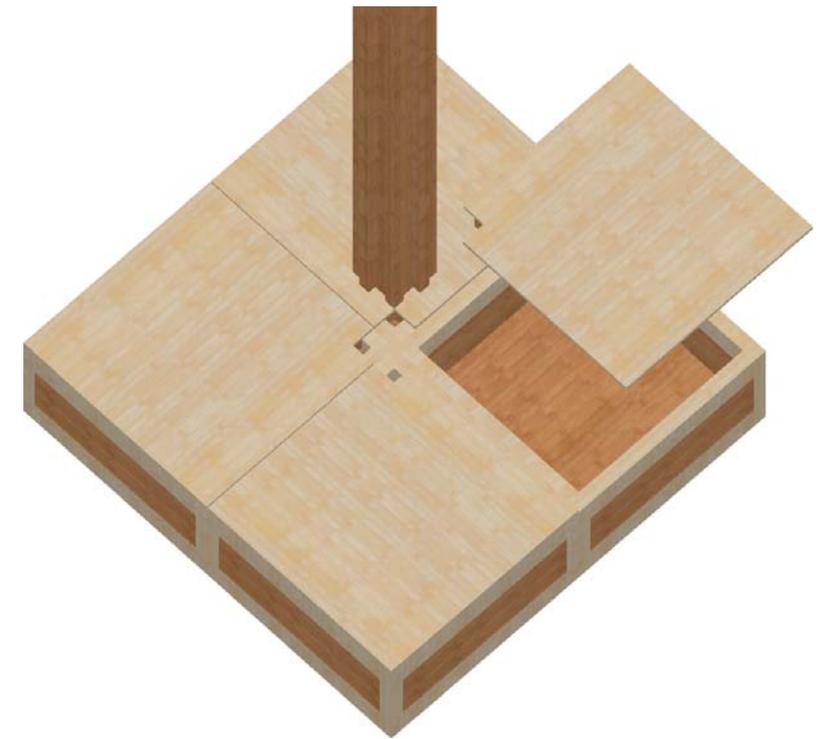




INDOOR STRUCTURE | COLUMNS

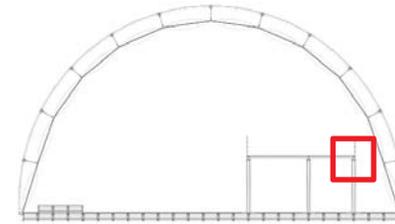
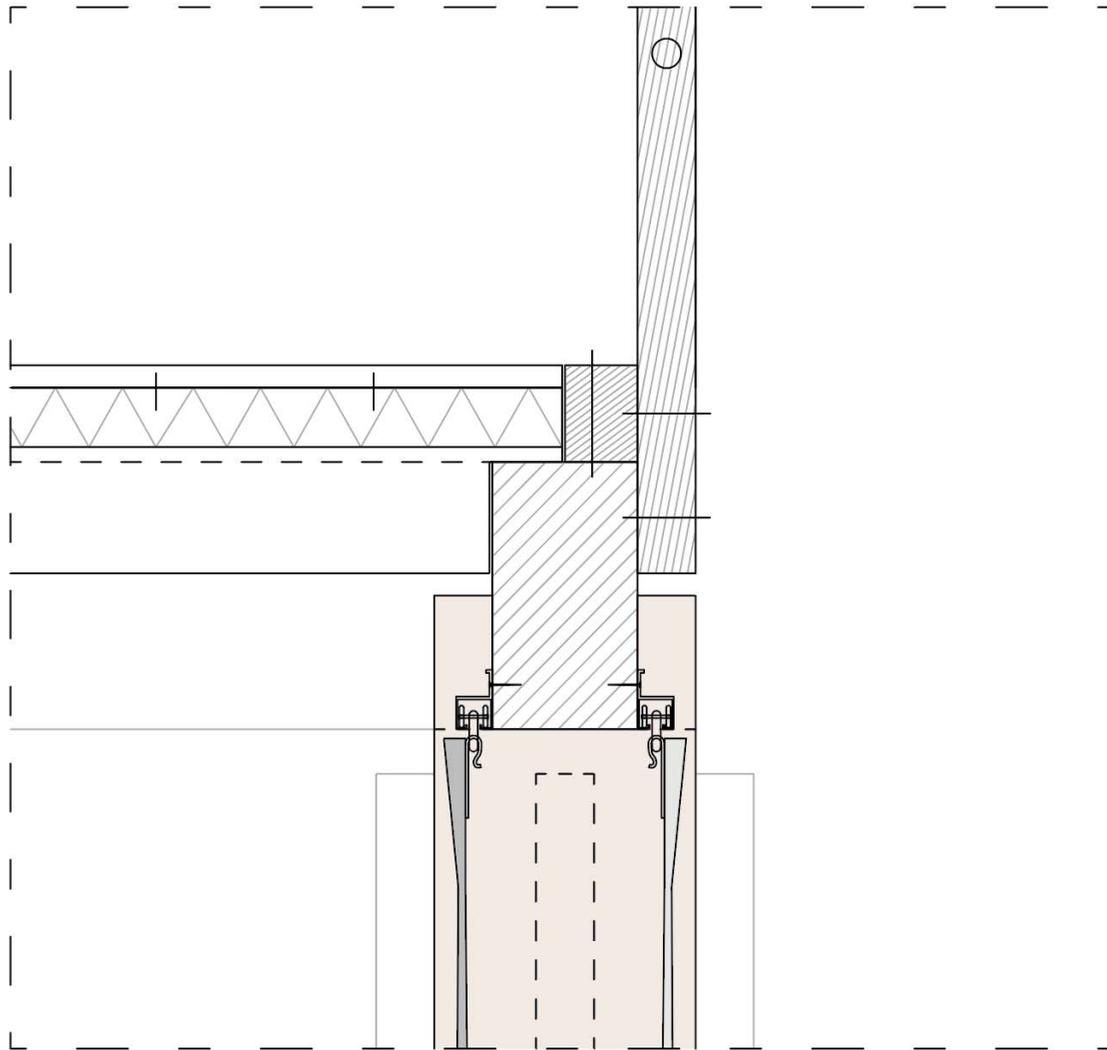


P5



INDOOR STRUCTURE | FIRST FLOOR

P5



CONTEXT

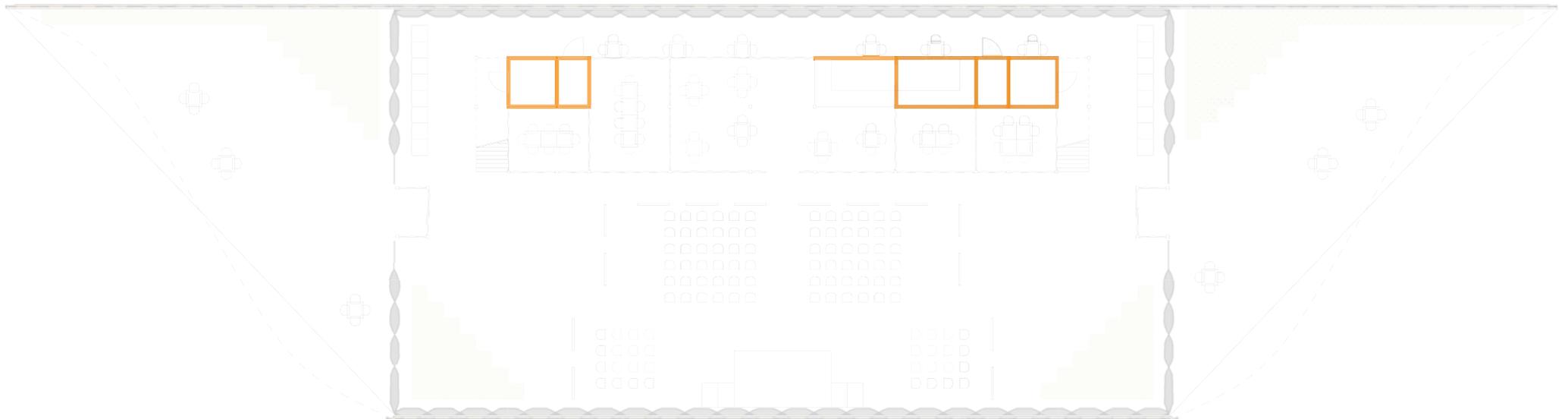
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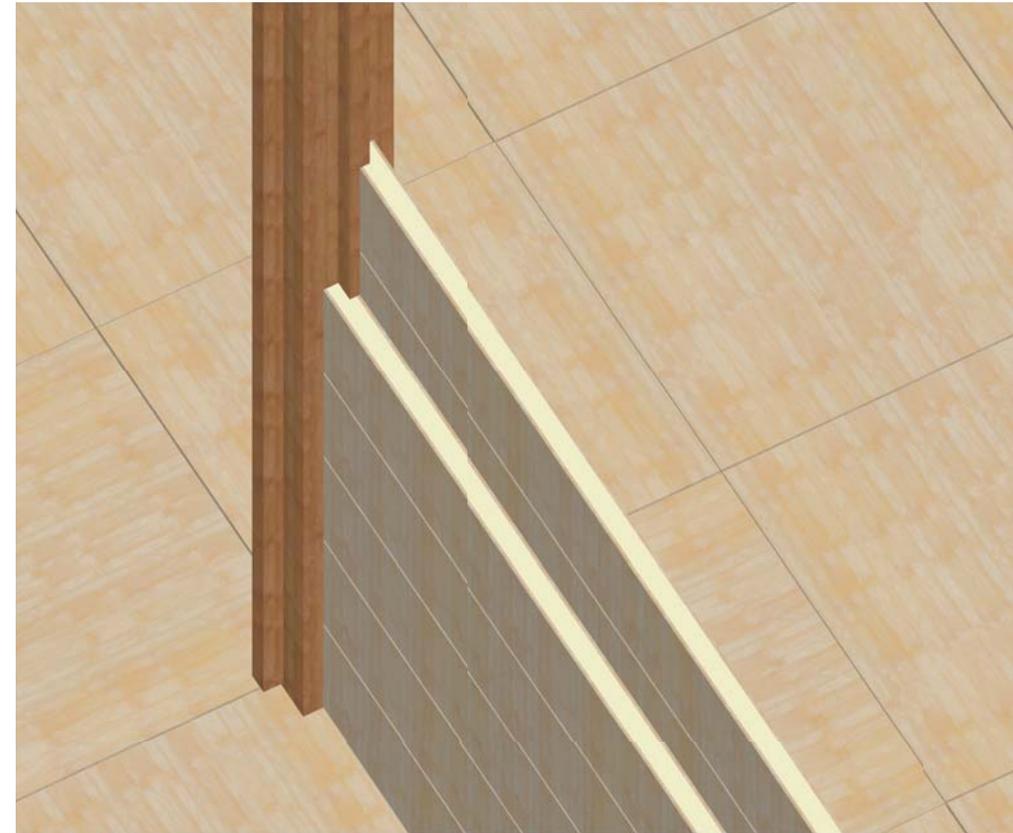
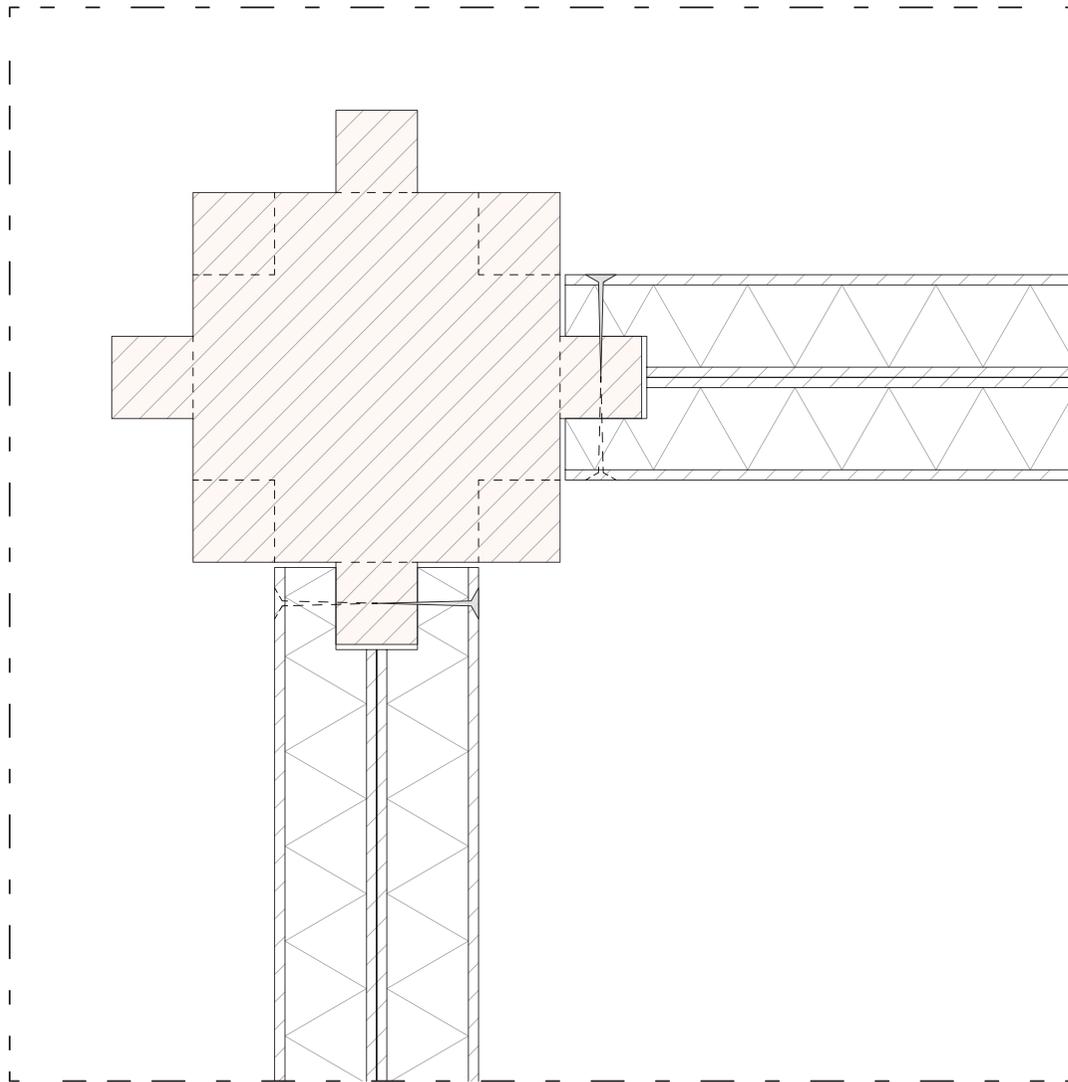
RESEARCH

CONCEPT

DESIGN

REFLECTION

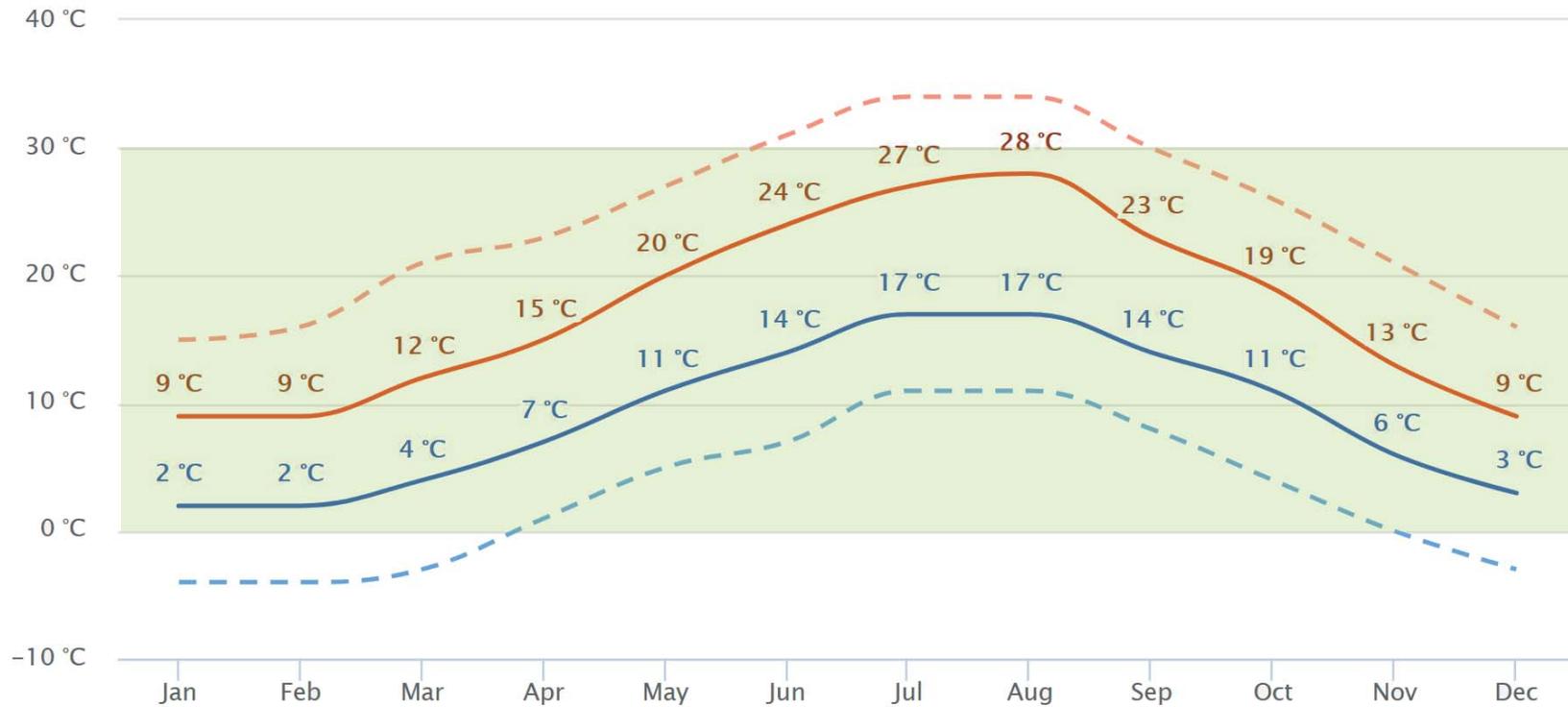


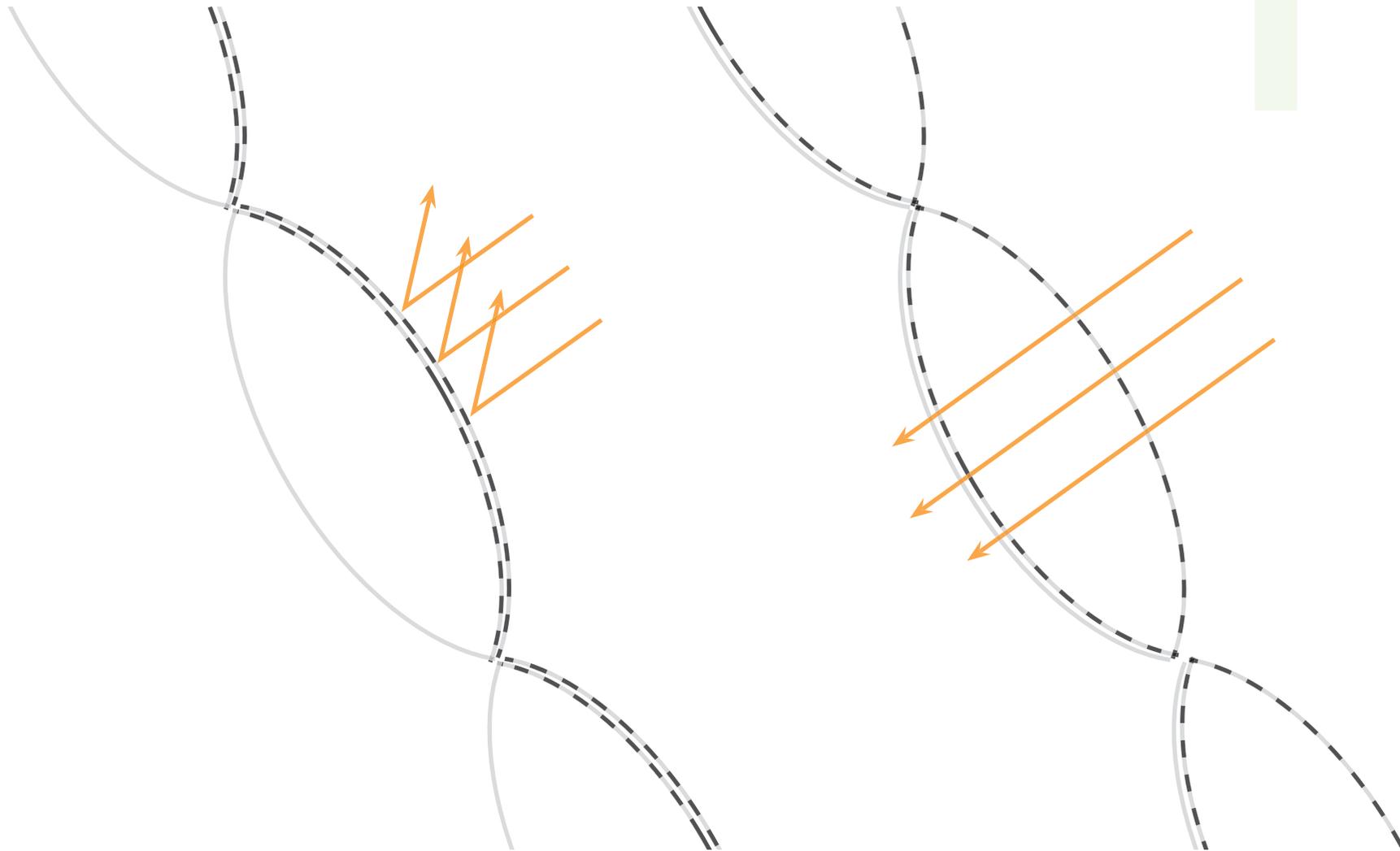


DESIGN | CLIMATE DESIGN

GOAL

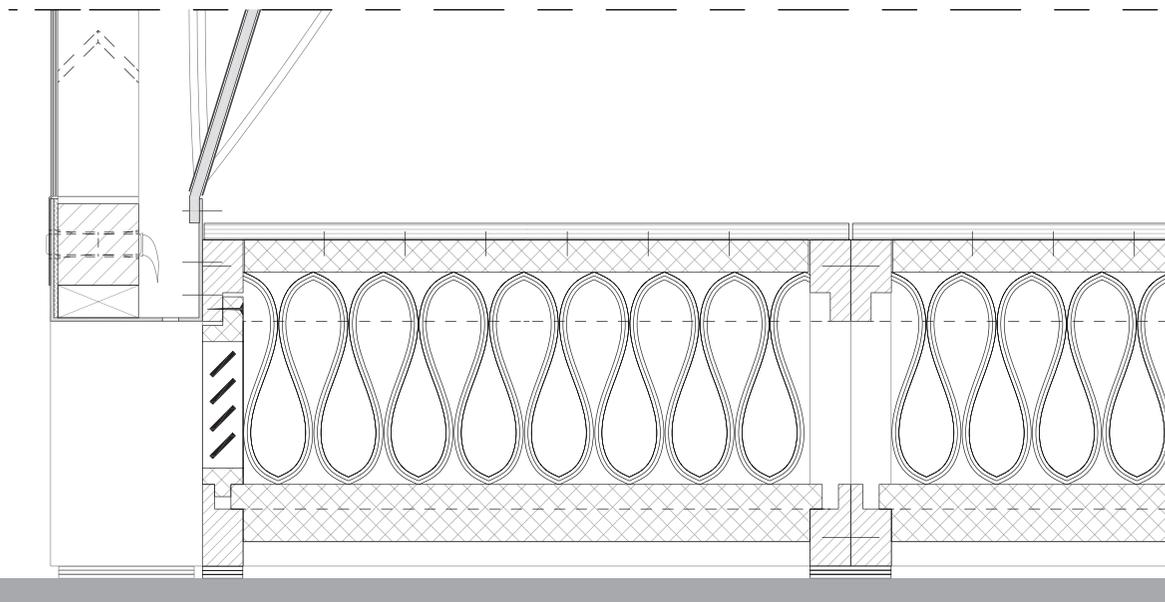
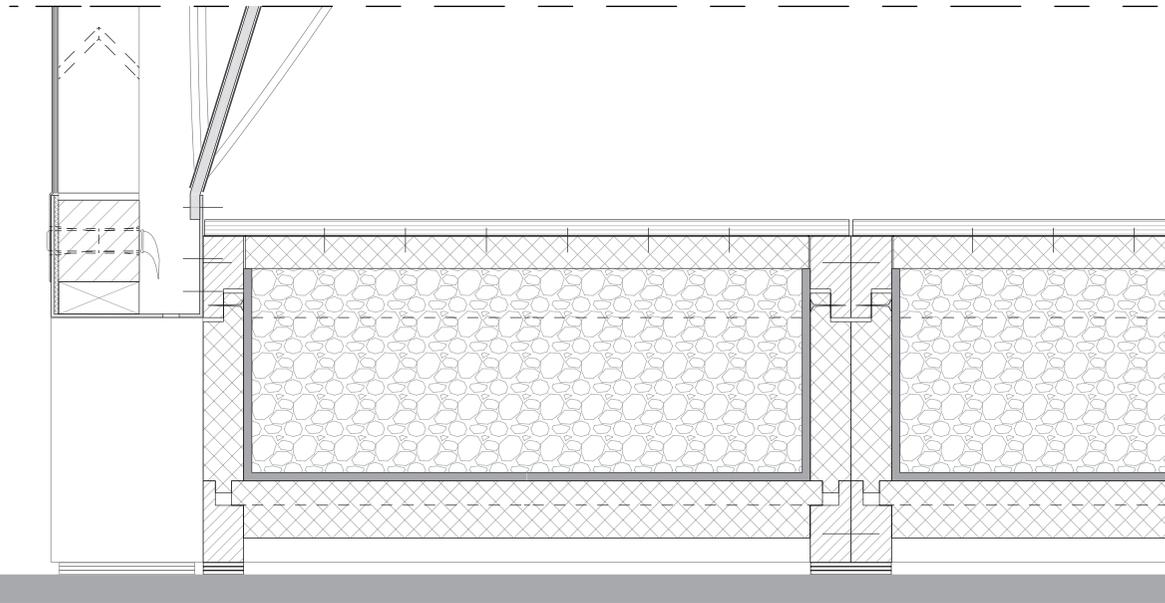
P5





FLOOR INSULATION

P5



CONTEXT

ASSIGNMENT

RESEARCH

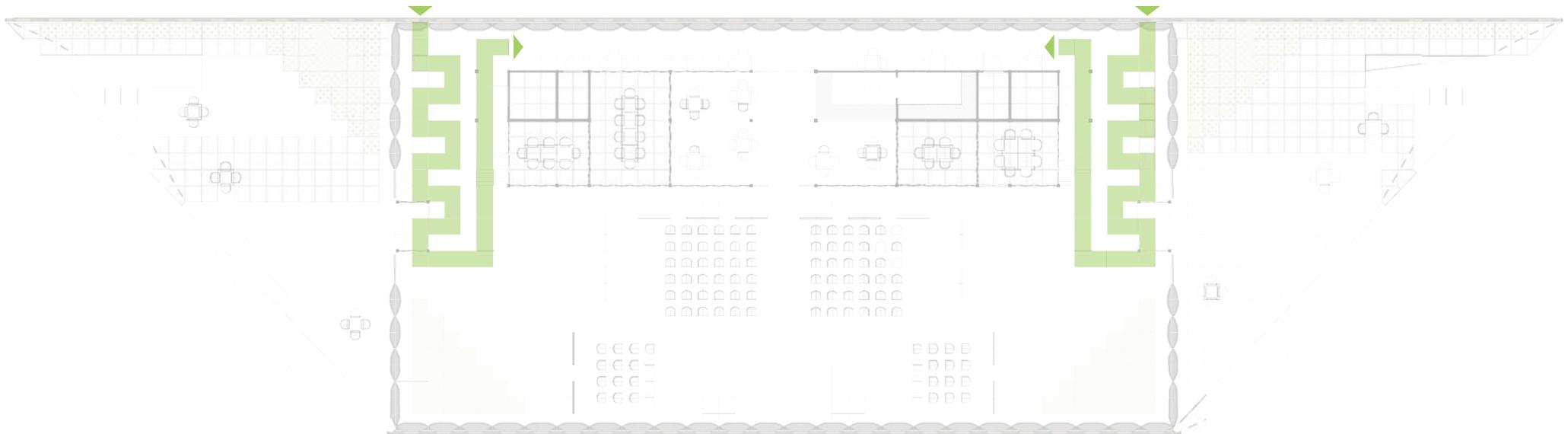
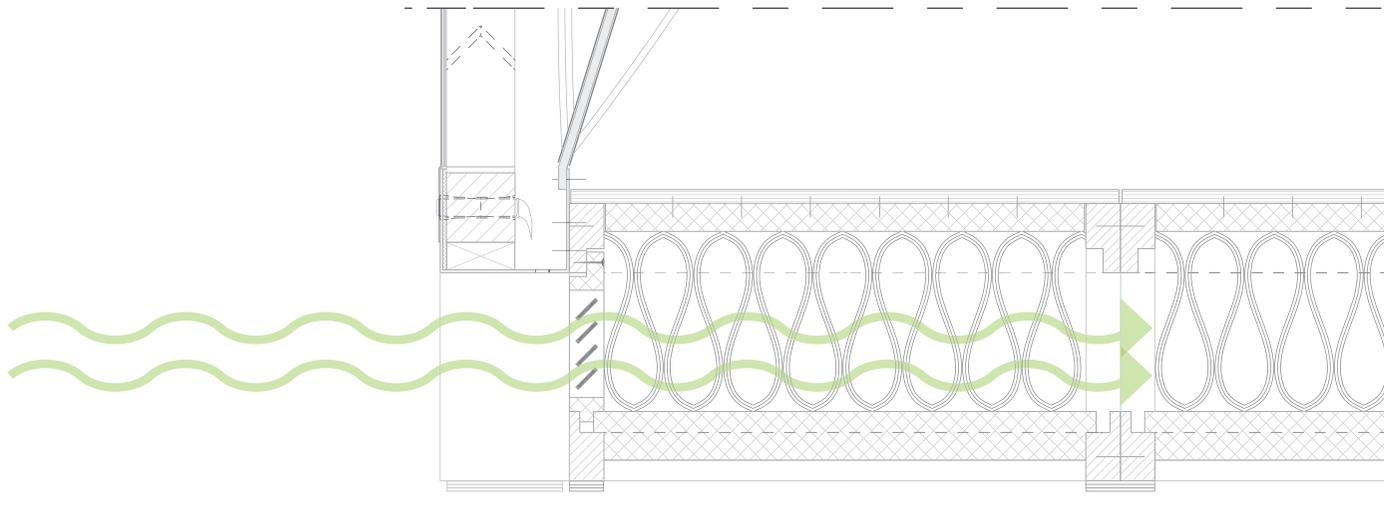
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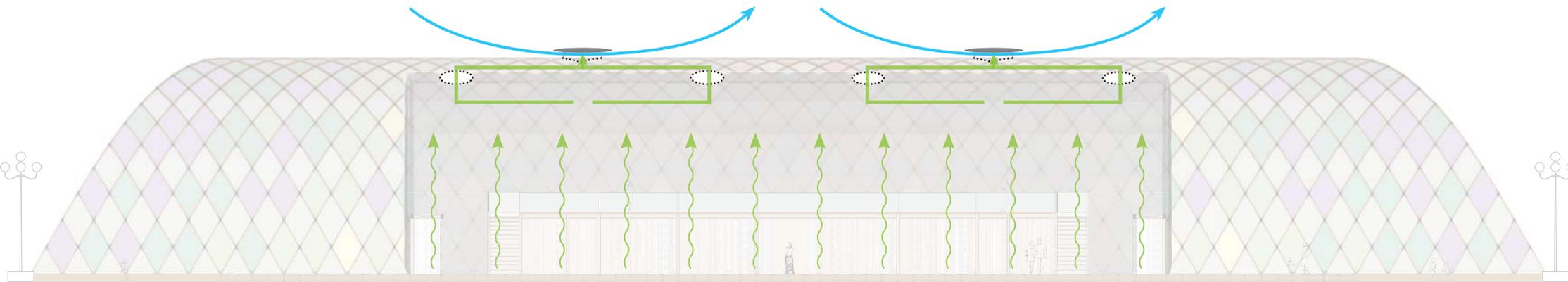
DESIGN

REFLECTION

VENTILATION | INCOMING AIR

P5

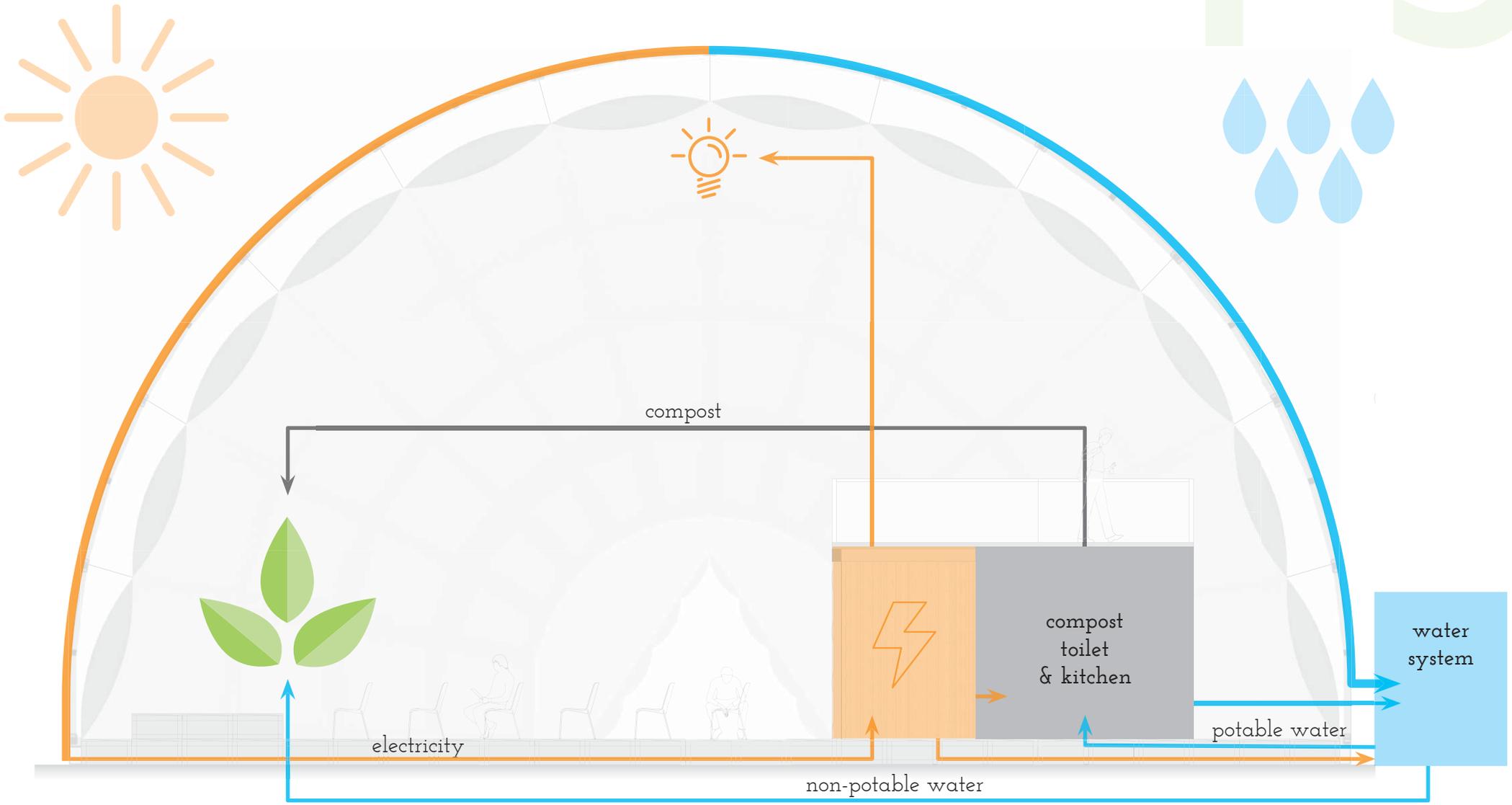




DESIGN | OFF-THE-GRID DESIGN

CIRCULARITY

P5



CONTEXT

ASSIGNMENT

RESEARCH

CONCEPT

DESIGN

REFLECTION



CONTEXT

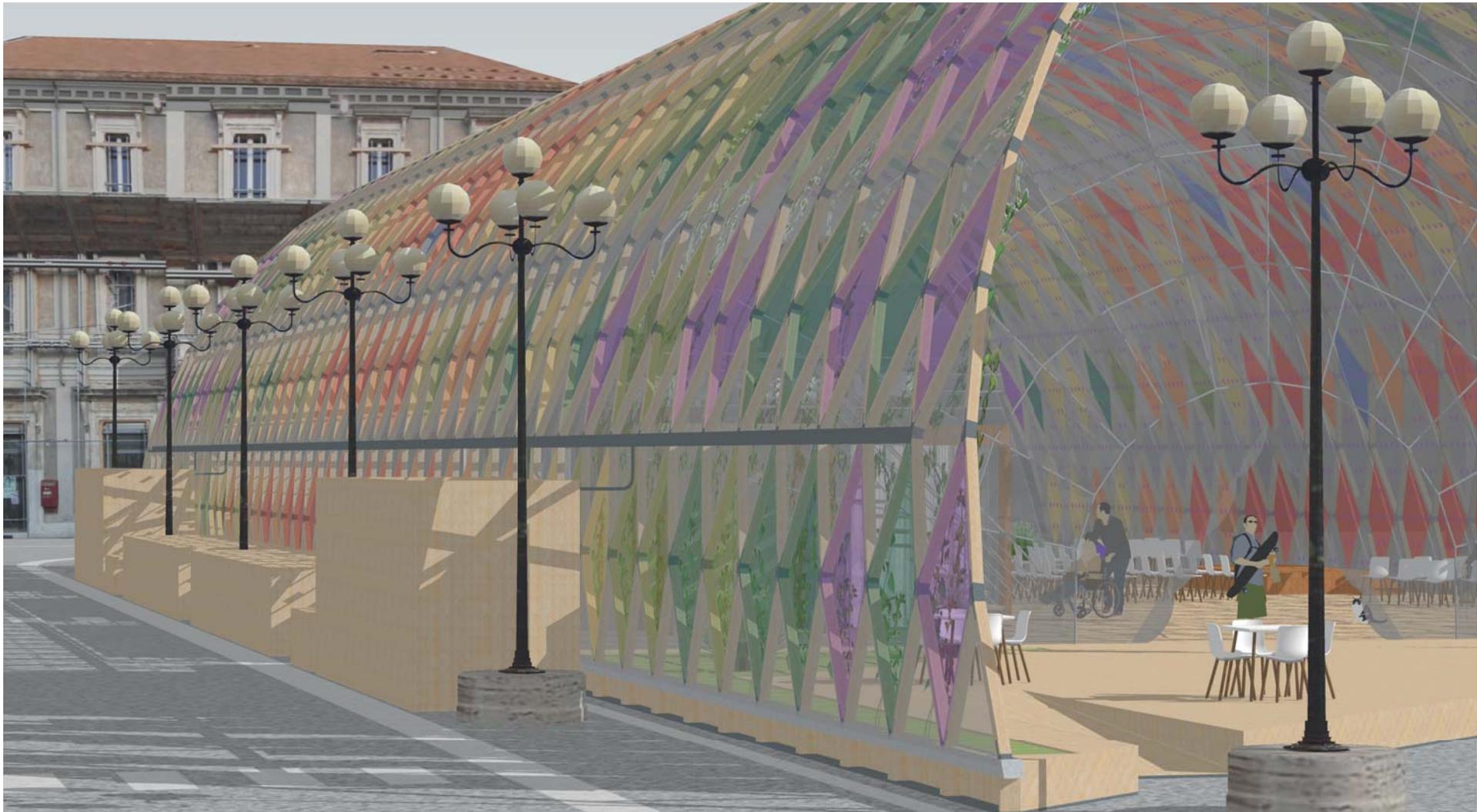
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RESEARCH

CONCEPT

DESIGN

REFLECTION



CONTEXT

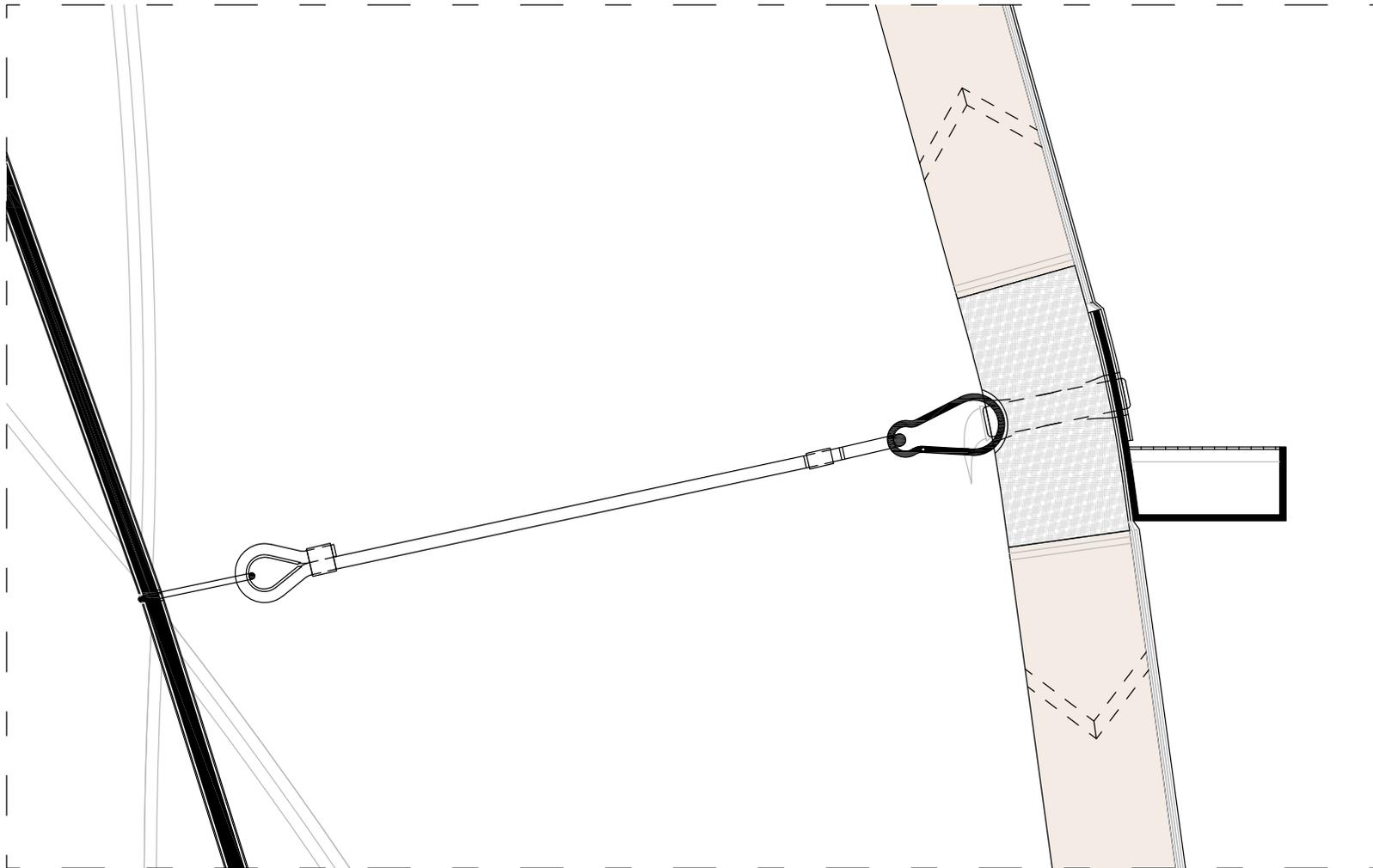
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RESEARCH

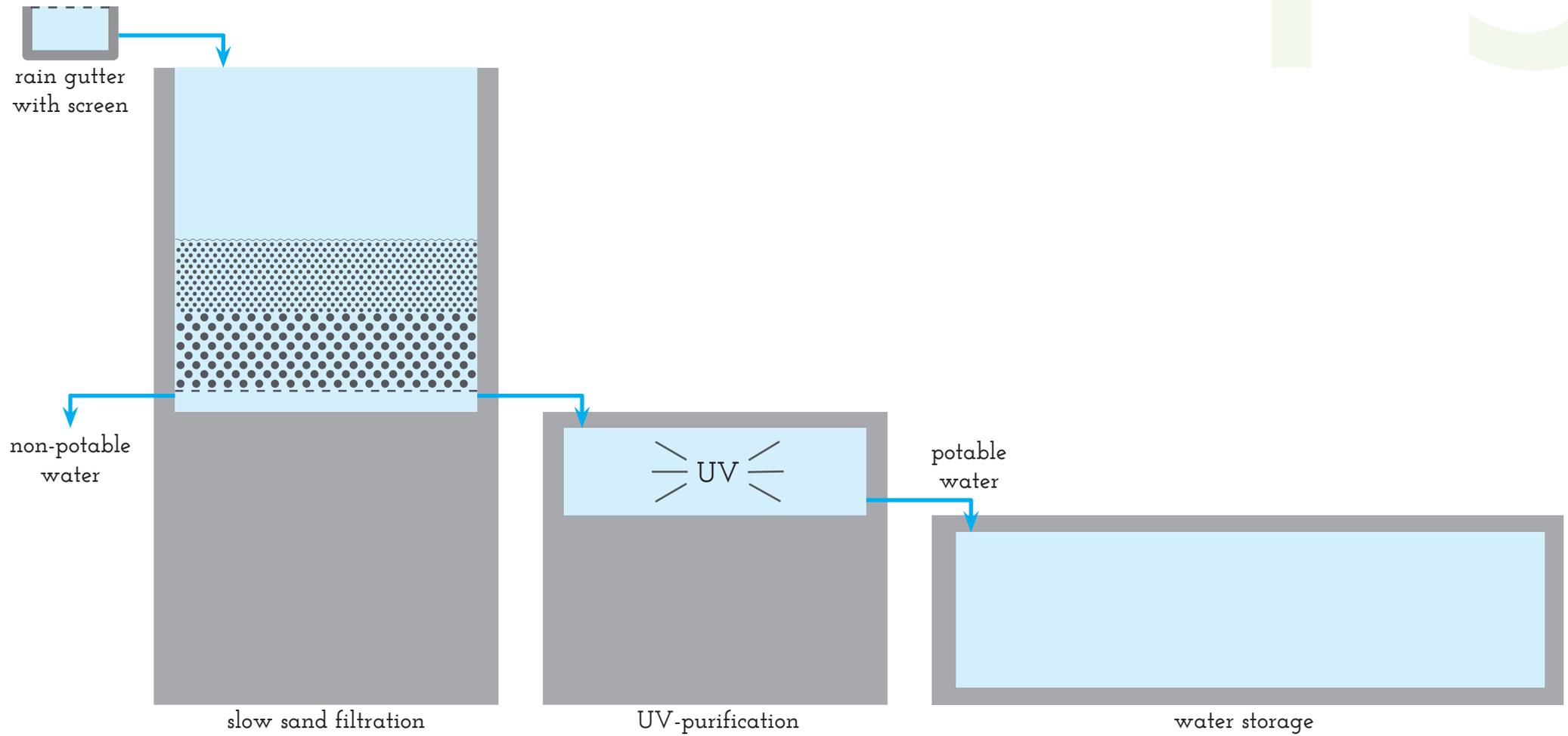
CONCEPT

DESIGN

REFLECTION

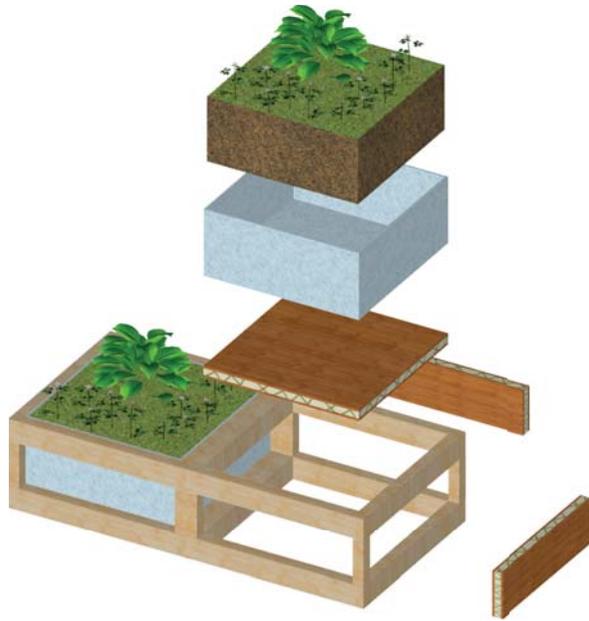


WATER SYSTEM



P5

GREENERY



P5



CONTEXT

ASSIGNMENT

RESEARCH

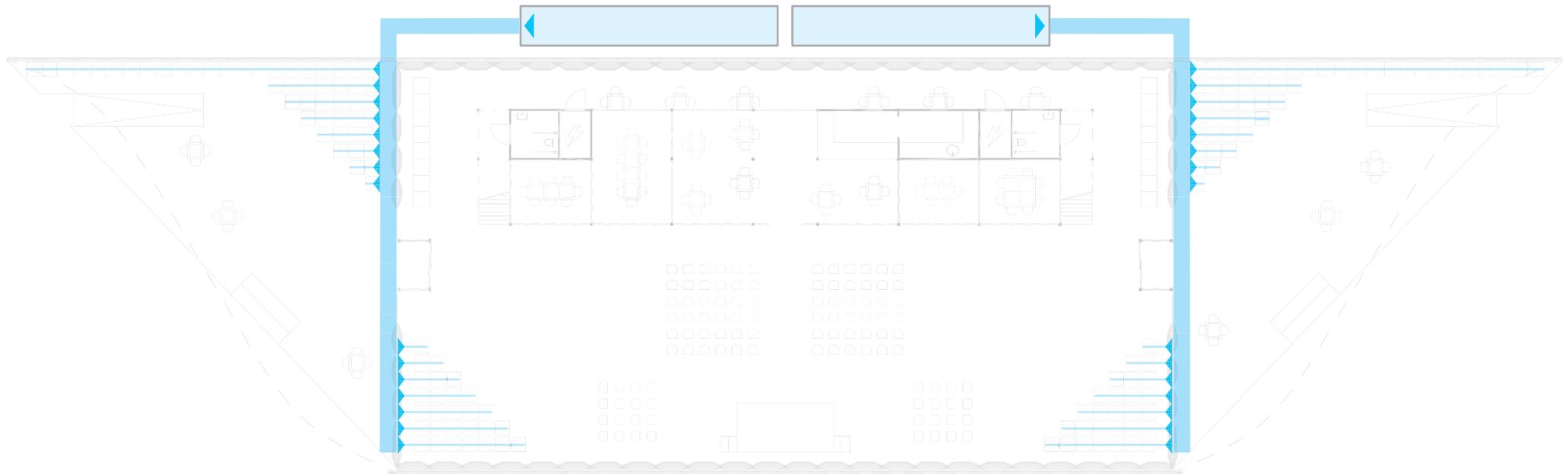
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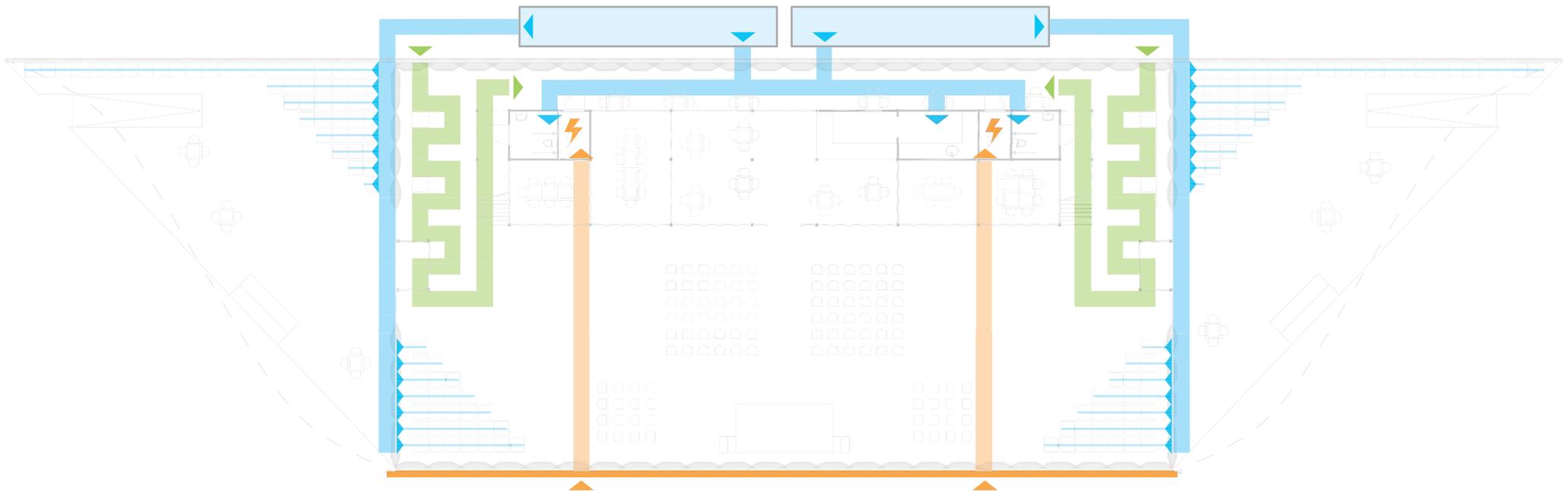
DESIGN

REFLECTION

IRRIGATION SYSTEM

P5





REFLECTION

RESEARCH vs. DESIGN

P5

Research conclusion is still applicable
Curved shape, straight elements

Different set-up than research outcomes
Explicable by turning to a 3D- instead of a 2D-configuration



CONTEXT

ASSIGNMENT

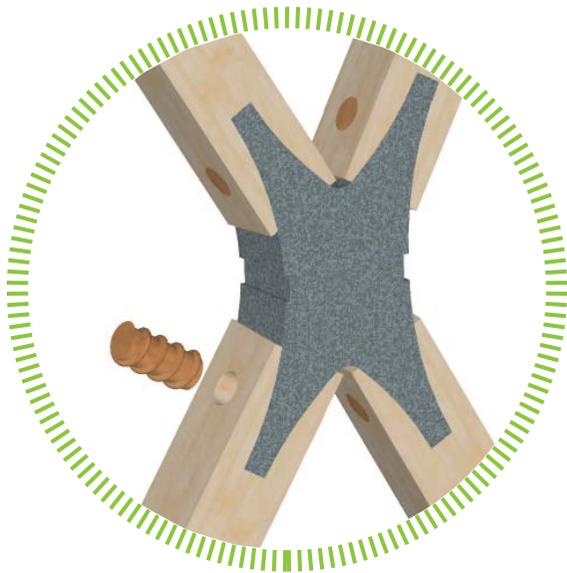
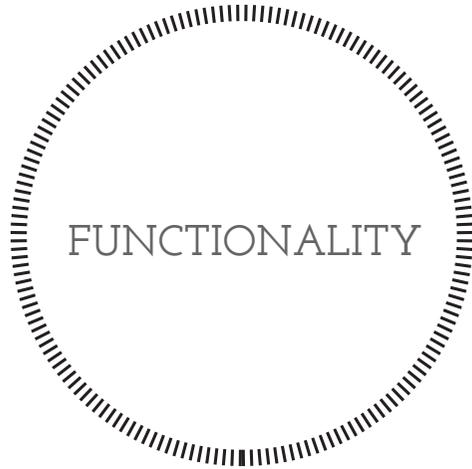
RESEARCH



CONCEPT

DESIGN

REFLECTION



CONTEXT

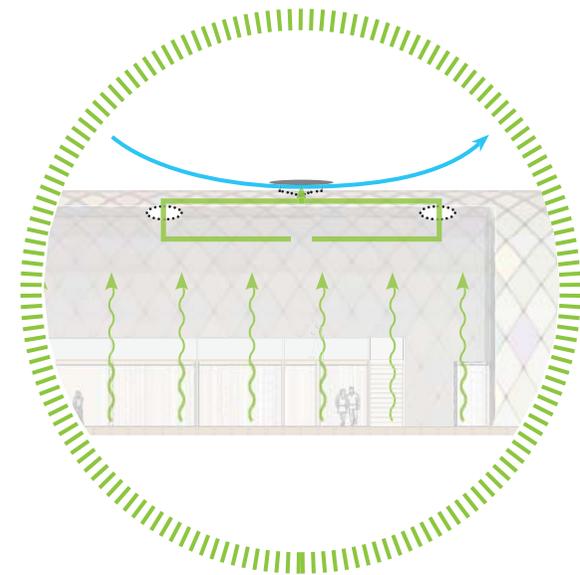
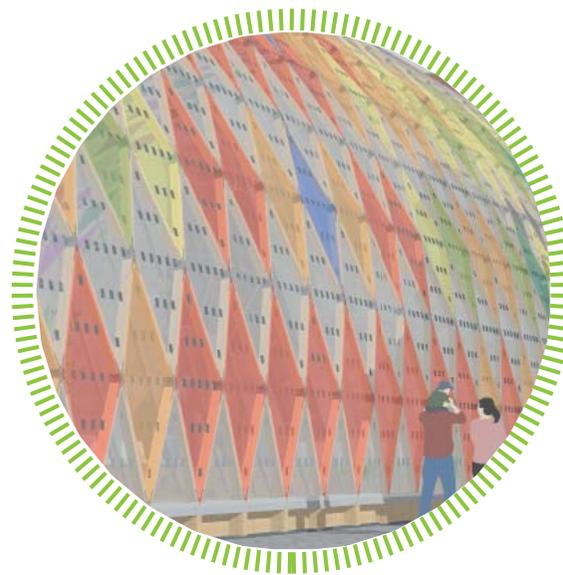
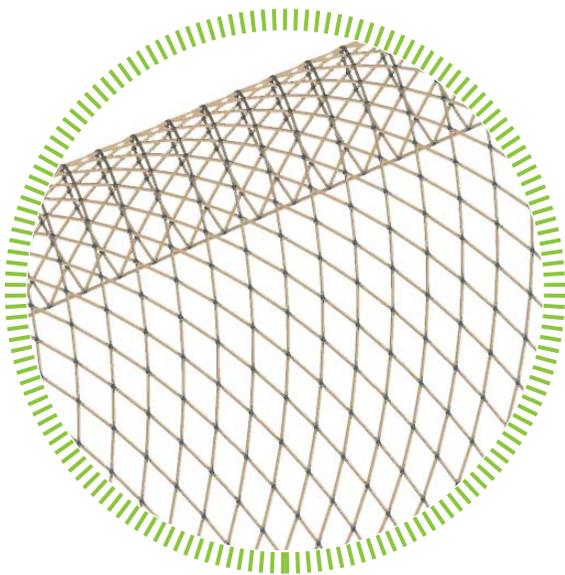
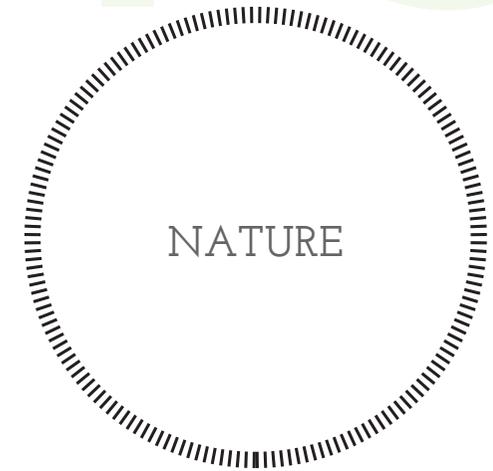
ASSIGNMENT

RESEARCH

CONCEPT

DESIGN

REFLECTION



CONTEXT

ASSIGNMENT

RESEARCH

CONCEPT

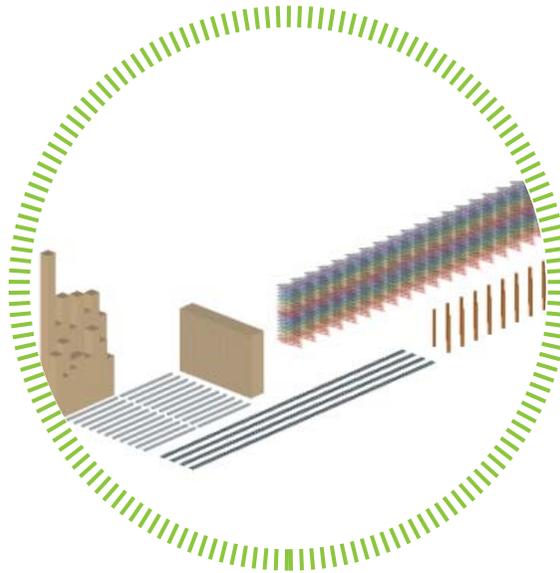
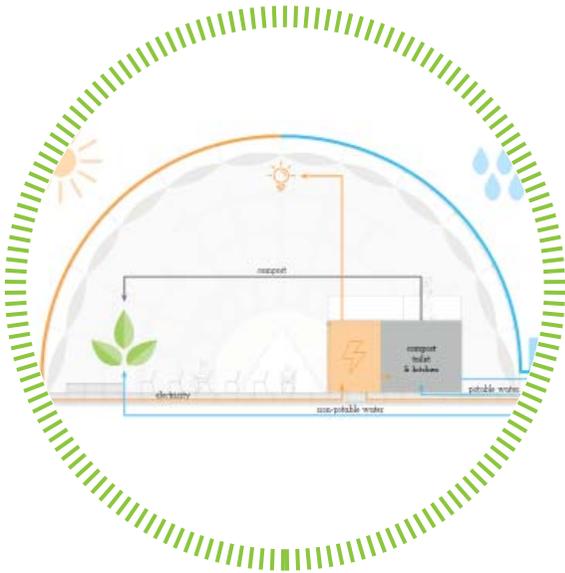
DESIGN

REFLECTION

SELF-SUFFICIENCY

DEMOUNTABILITY

RE-USE





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STRUCTURAL JOINT

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