Tarab_طرب

GROUP 5

Earthy - 2020

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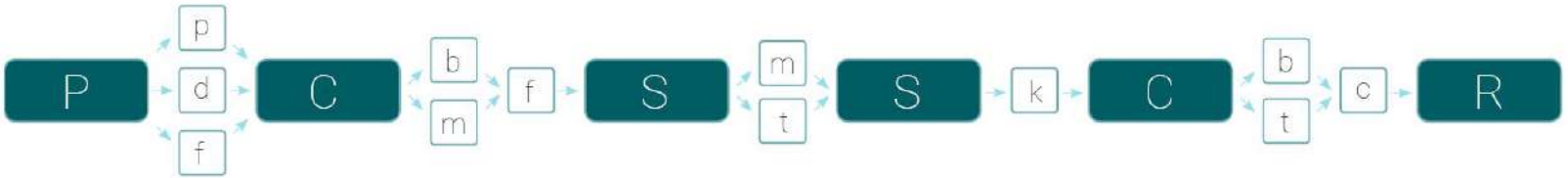
29-10-2020

Structure of presentation



Programming
Problem statement
Design vision
Flowchart

Configuring
Bubble diagram
Metro diagram
Floorplan

Shaping
Meshing
Tessellation

Structuring
Karamba analysis

Constructing
Brick measurements
Tools
Constructing

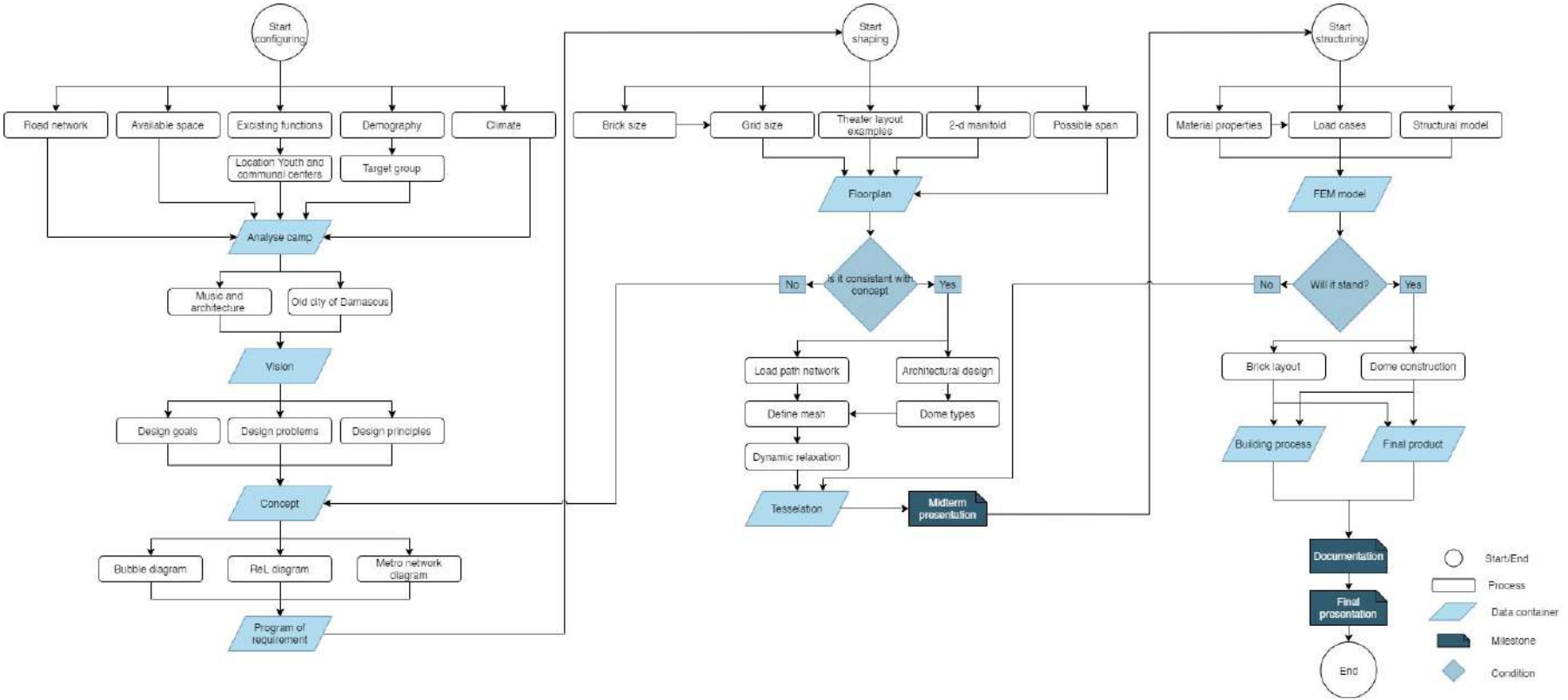
Reflection

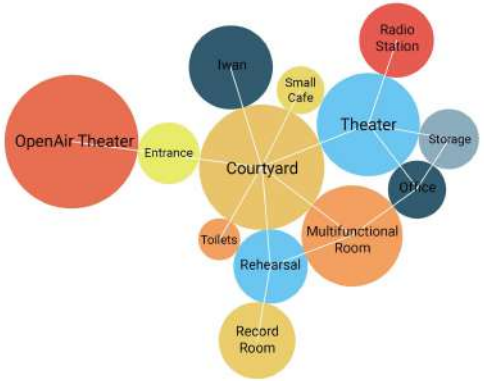
Problem statement

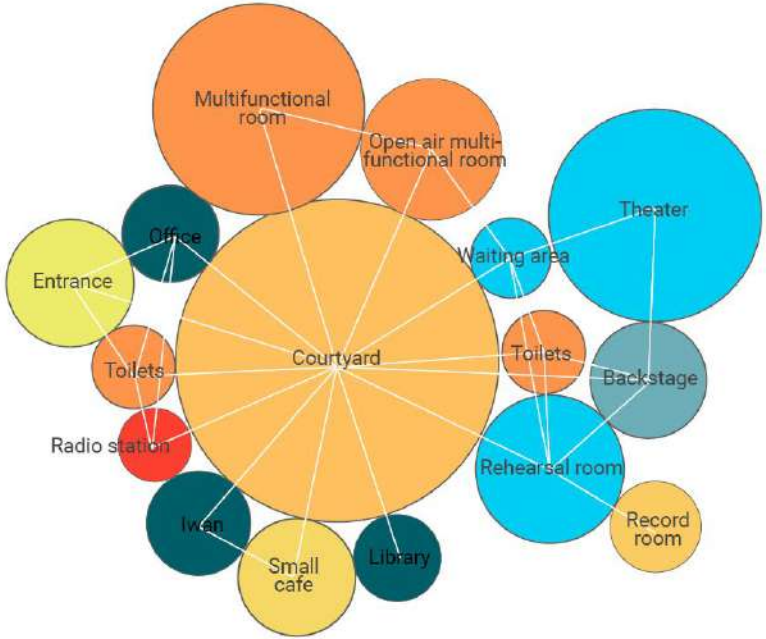
“The Za’atari refugee camp is in size and numbers a city, but not in its functions.”

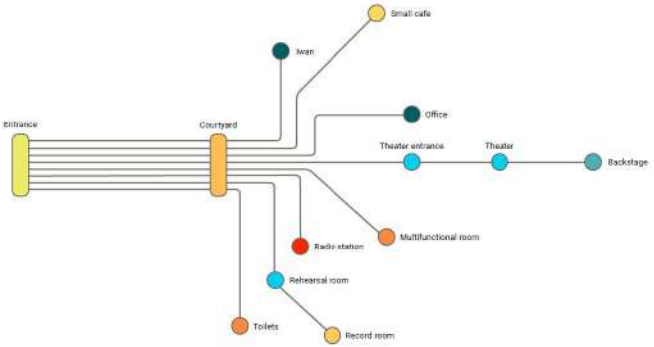
Design vision

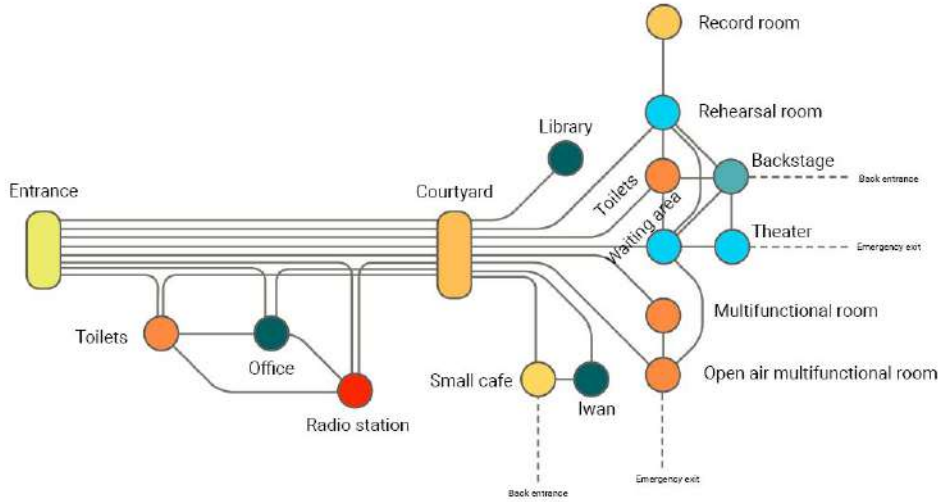
“Design a safe place for people to enjoy musical and cultural activity, so the Za’atari refugee camp becomes a more livable and enjoyable place”


Start configuring
Road network
Available space
Existing functions
Demography
Climate
Location Youth and communal centers
Target group
Analyse camp
Music and architecture
Old city of Damascus
Vision
Design goals
Design problems
Design principles
Concept
Bubble diagram
ReL diagram
Metro network diagram
Program of requirement
Start shaping
Brick size
Grid size
Theater layout examples
2-d manifold
Possible span
Floorplan
Is it consistant with concept
No
Yes
Load path network
Architectural design
Define mesh
Dome types
Dynamic relaxation
Tesselation
Midterm presentation
Start structuring
Material properties
Load cases
Structural model
FEM model
Will it stand?
No
Yes
Brick layout
Dome construction
Building process
Final product
Documentation
Final presentation
End
Start/End
Process
Data container
Milestone
Condition

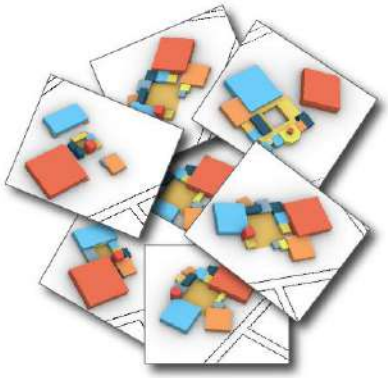

Radio Station
Iwan
Small Cafe
OpenAir Theater
Entrance
Courtyard
Theater
Storage
Office
Toilets
Multifunctional Room
Rehearsal
Record Room


Multifunctional room
Open air multi-functional room
Theater
Office
Waiting area
Entrance
Courtyard
Toilets
Toilets
Backstage
Radio station
Rehearsal room
Record room
Iwan
Small cafe
Library

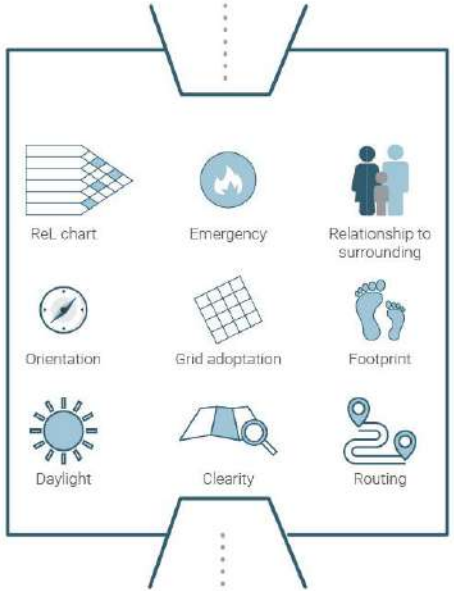

Small cafe
Iwan
Office
Entrance
Courtyard
Theater entrance
Theater
Backstage
Multifunctional room
Radio station
Rehearsal room
Toilets
Record room


Record room
Rehearsal room
Library
Backstage
Back entrance
Entrance
Courtyard
Toilets
Waiting area
Theater
Emergency exit
Multifunctional room
Toilets
Office
Small cafe
Iwan
Open air multifunctional room
Radio station
Back entrance
Emergency exit

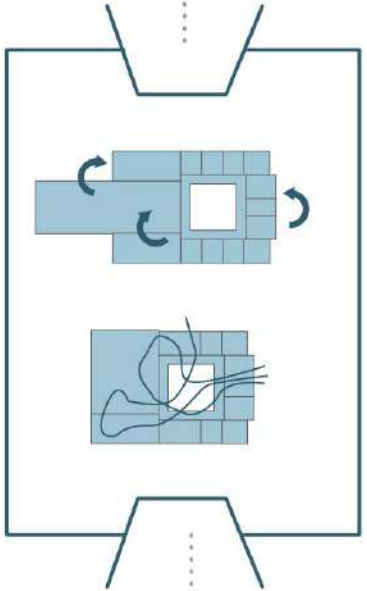
Set of manually and computationally created floorplans



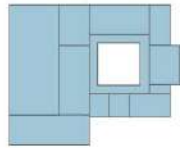
Evaluation

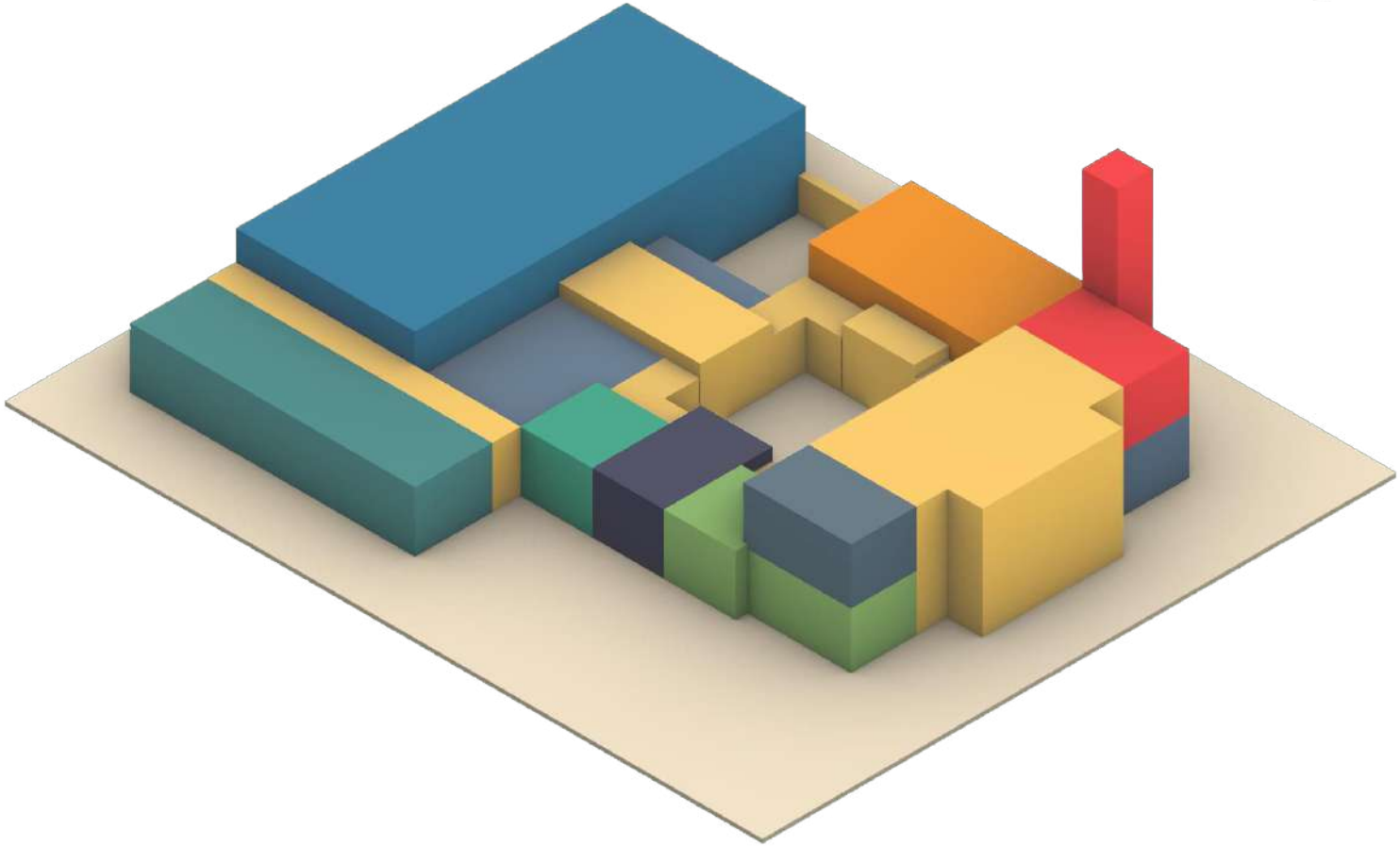


Improve

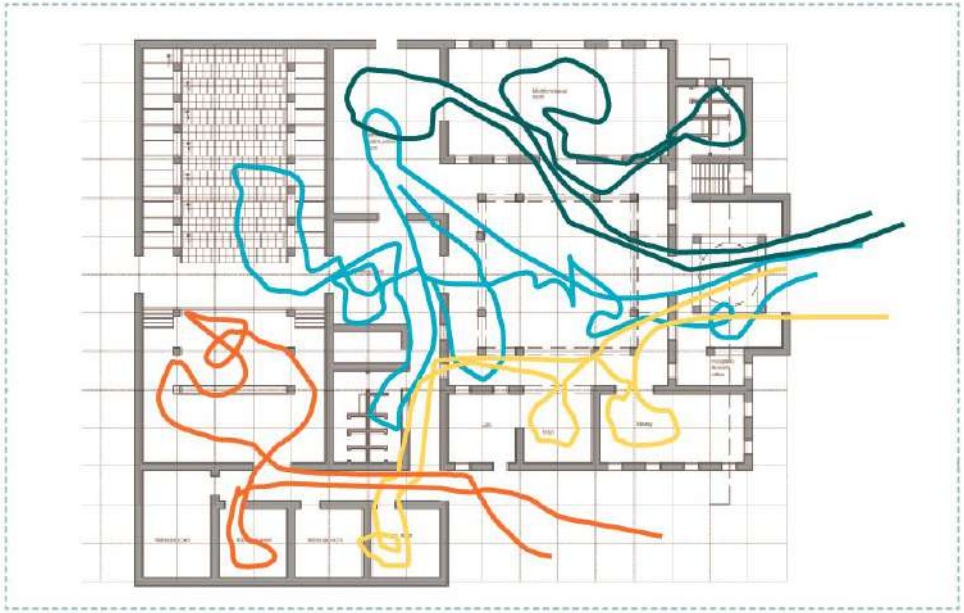


Finalize



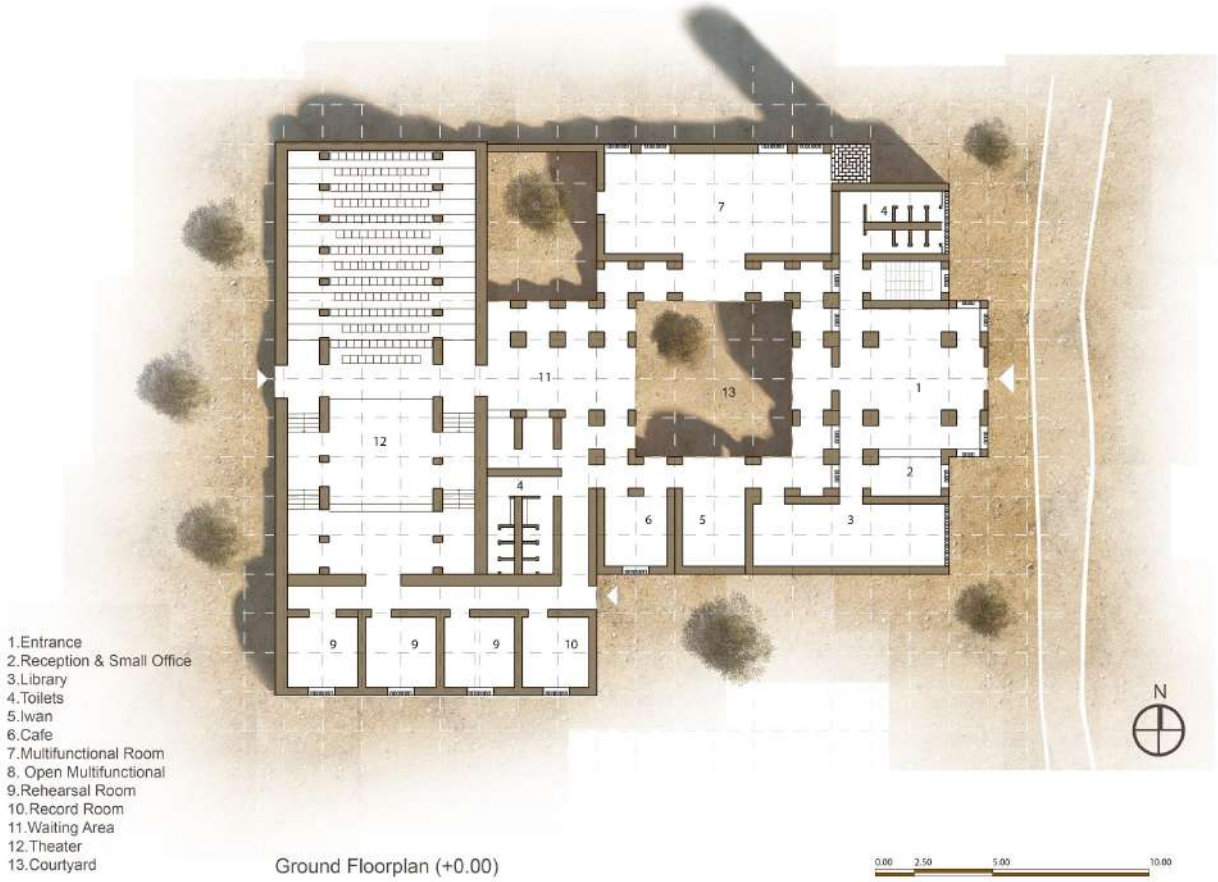


Legend



Legend

- Theater visitor
- Theater performer
- School children
- Band

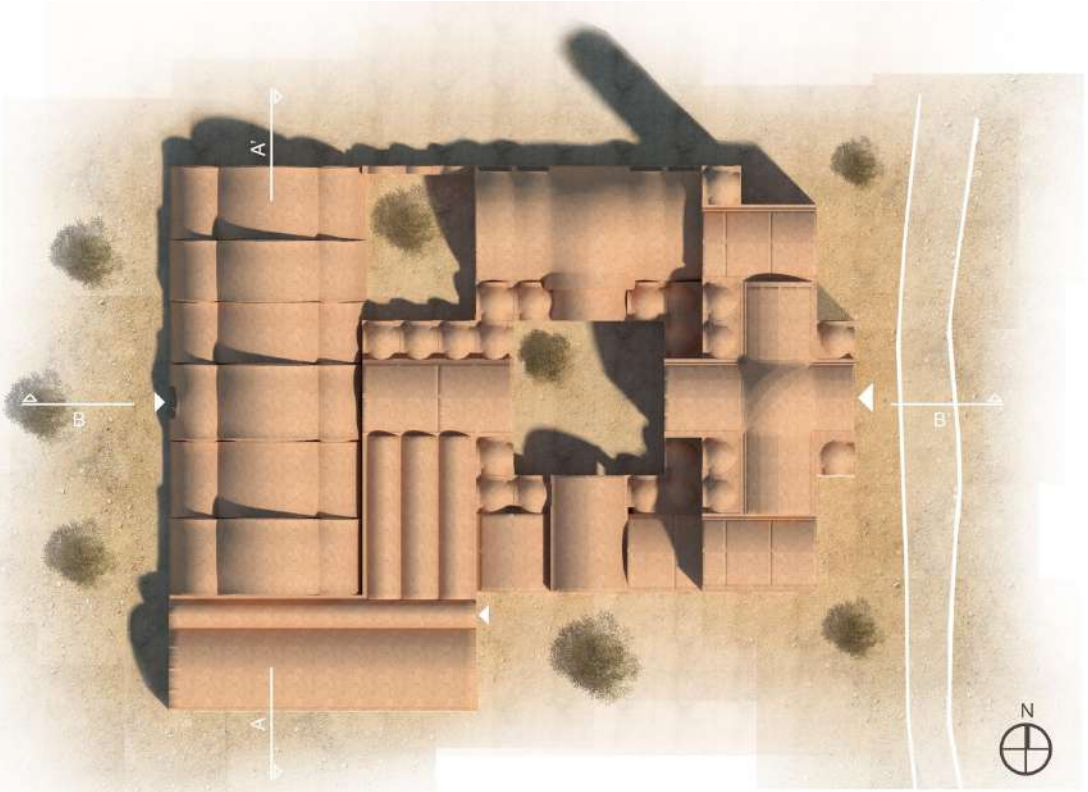


Ground Floorplan (+0.00)

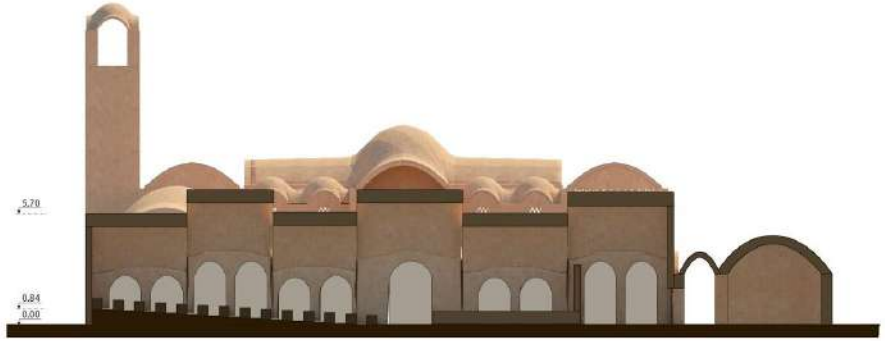
1.Radio Station
2.Office
3.Balcony

1st Floor (+4.00)

0.00 2.50 5.00 10.00

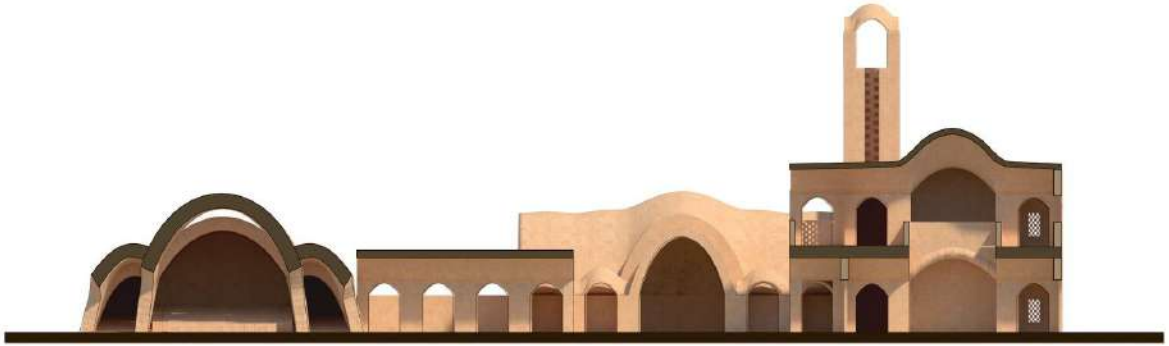


Topographic Plan



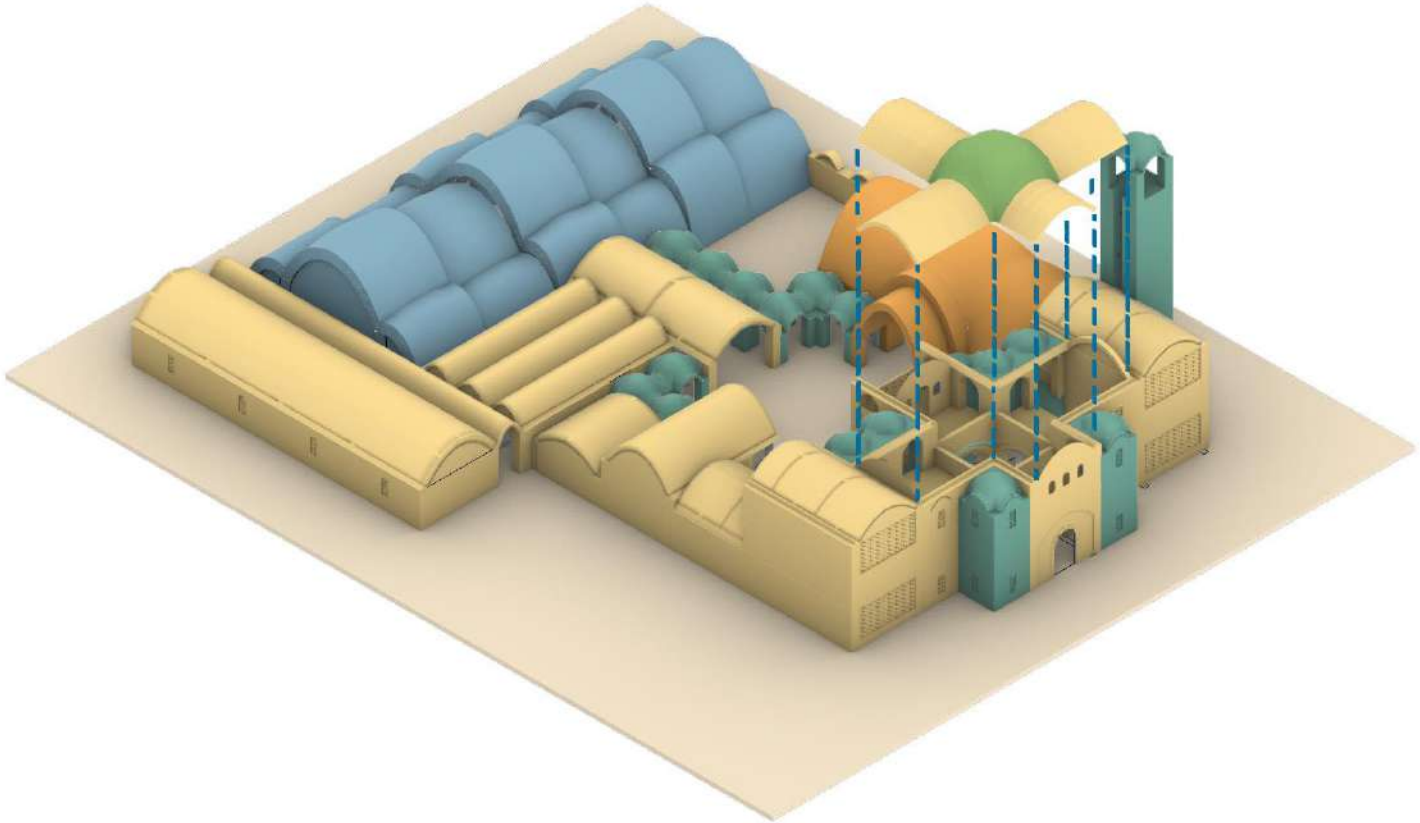
Section A-A'

0.00 2.50 5.00 10.00

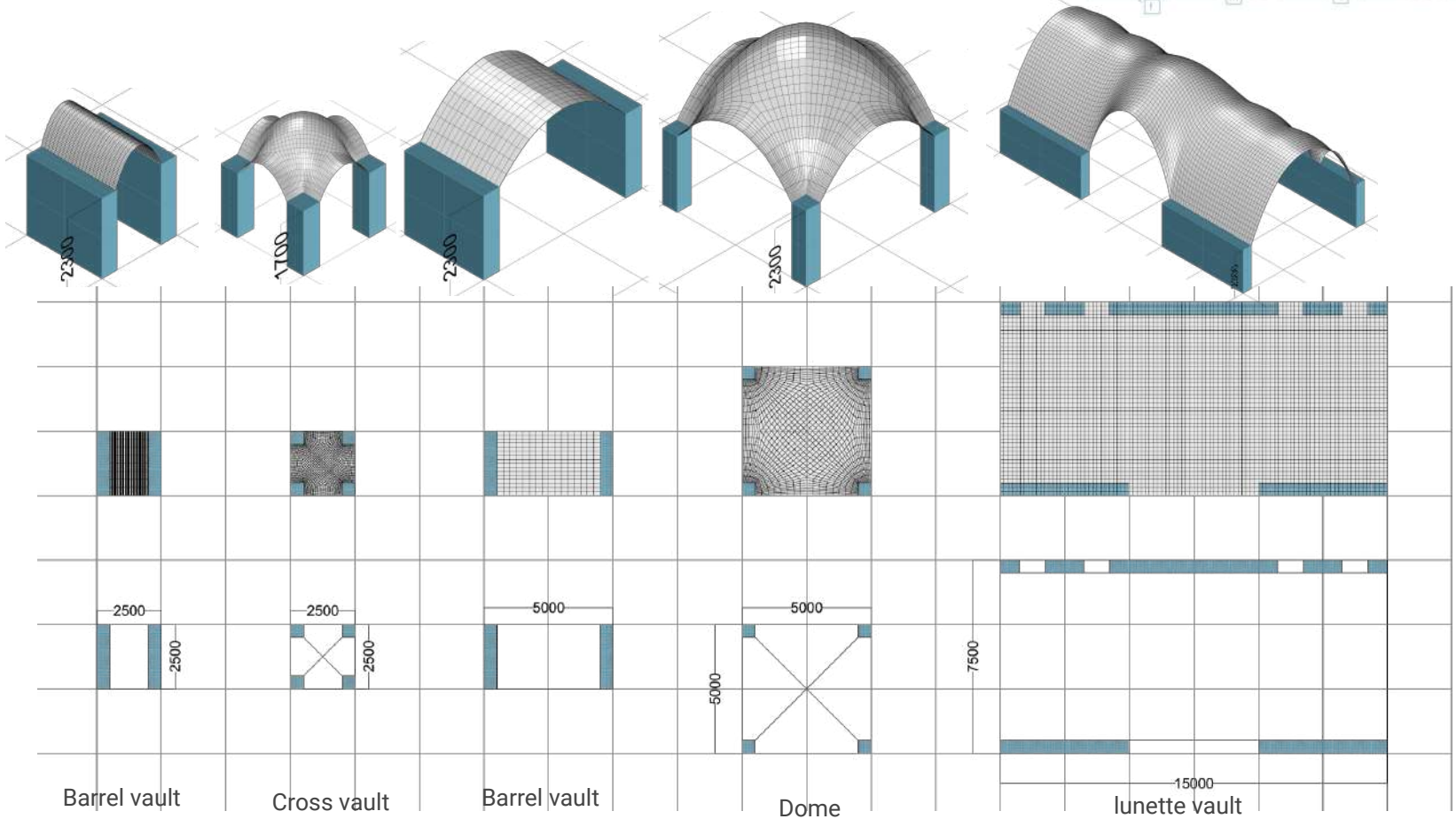


Section B-B'

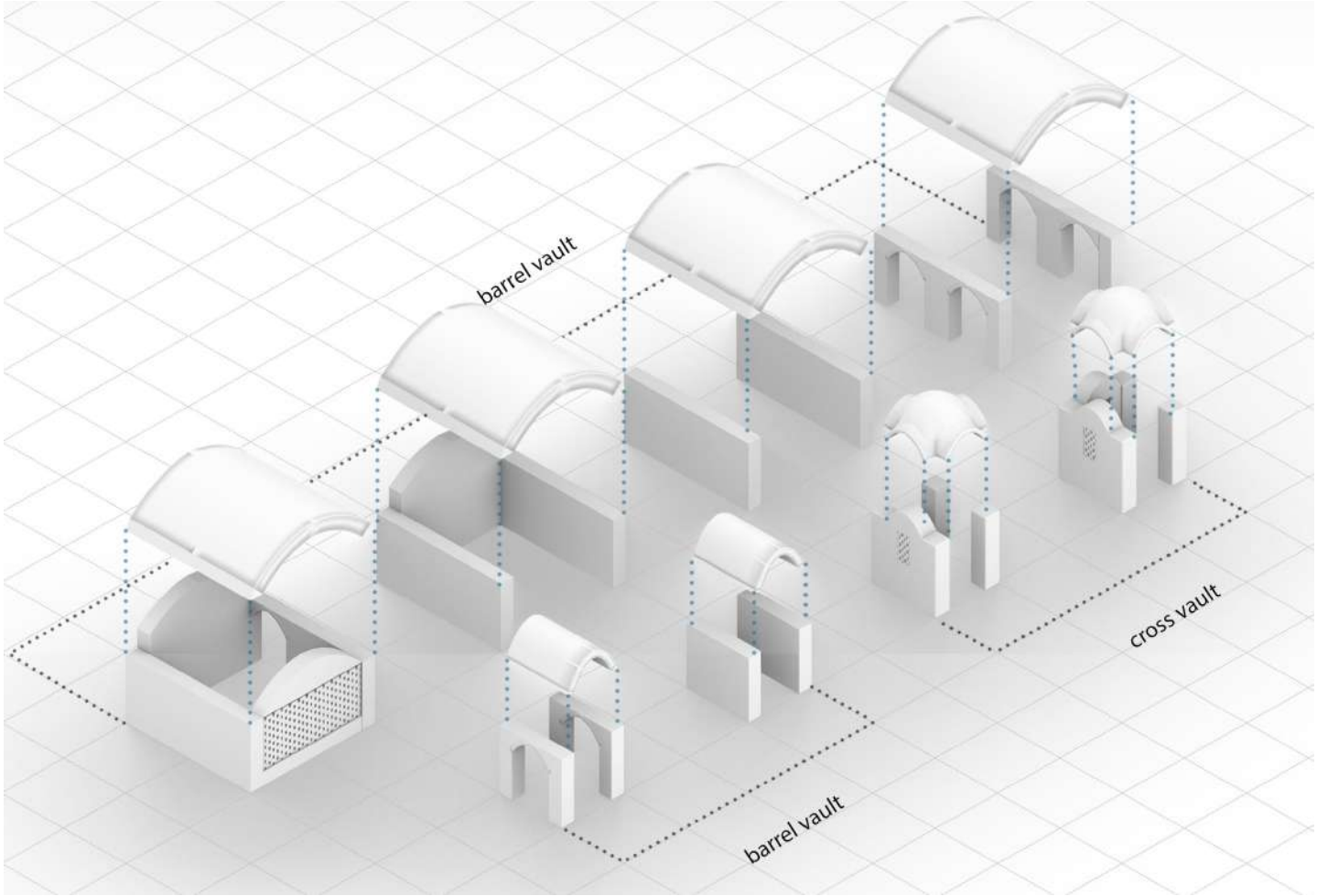
0.00 2.50 5.00 10.00

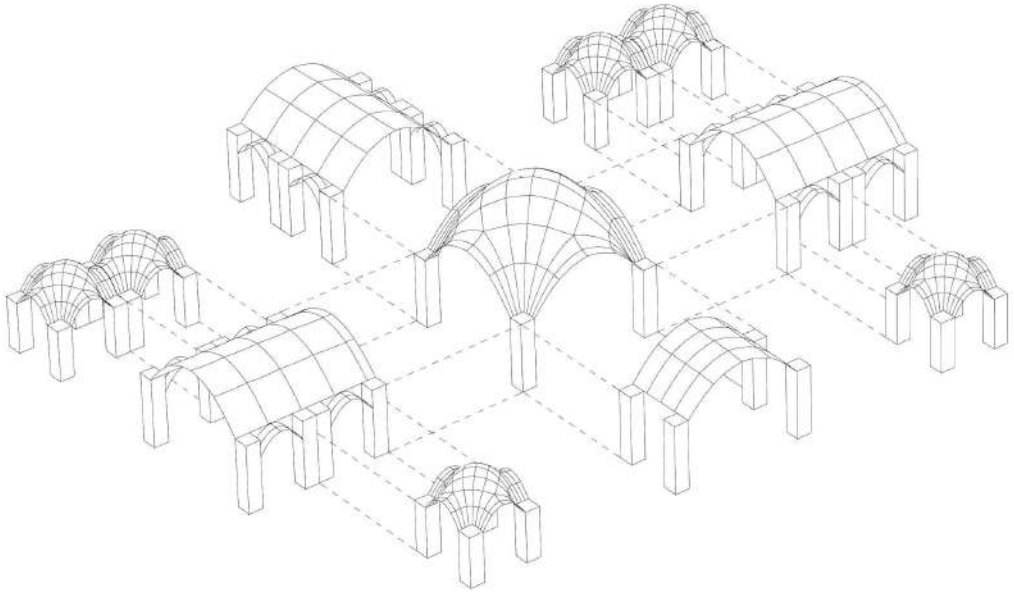


Legend

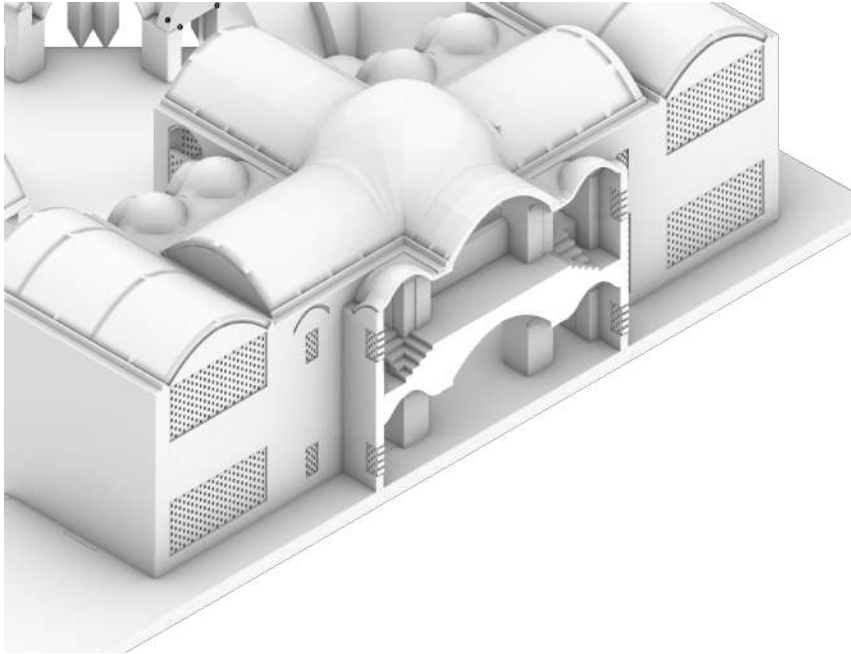


The smallest module is one units (2.5 m * 2.5 m)


barrel vault
cross vault
barrel vault



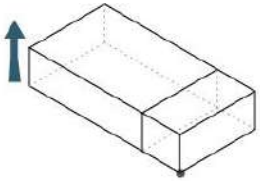
The connection between the entrance dome and the vaults next to it



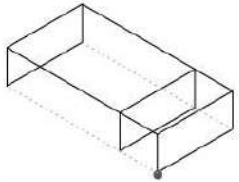
Section in the entrance

1 Base point

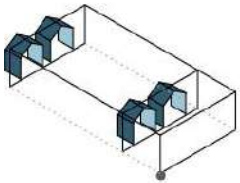
2 Determine dimensions



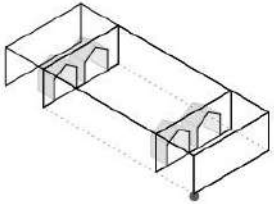
3 Extrude



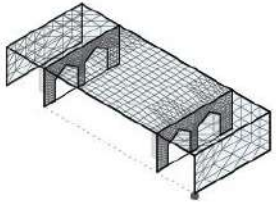
4 Select propper faces



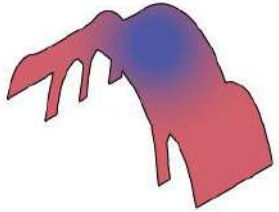
5 Cut doorway openings



6 Mirror doorways



7 Mesh and apply forces



8 Check structural stabillity

Change load case / anchor points if stress is too high.

Legend

Automated

Manual

Parametric

Material properties

Compressive strenght [mpa]	2.10
Tensile strenght [mpa]	0.21
Young's modulus [mpa]	115
Density adobe [kN/m3]	15

Displacement

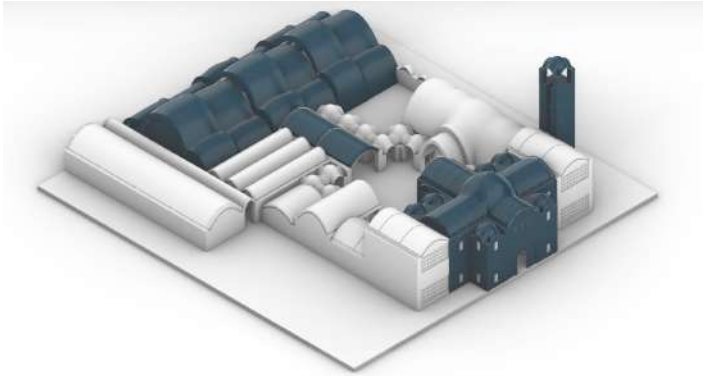
Displacement span	Span*0.0015
Displacement tower	Height/500

Loads

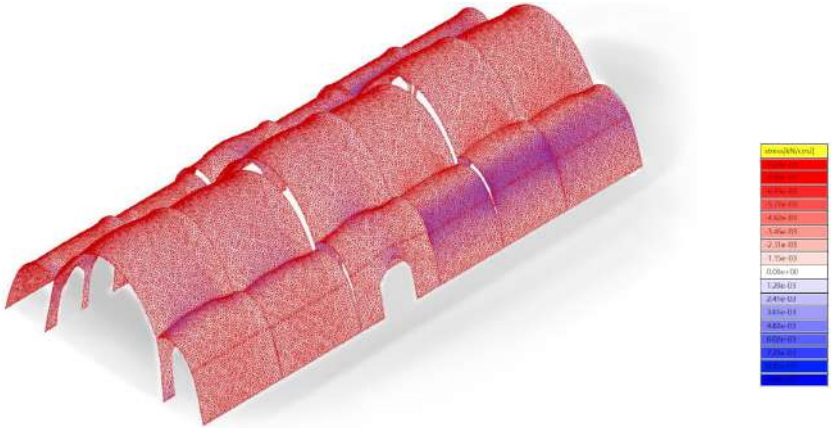
Self-weight [kN/m3]	15
Filling load [kN/m3]	15
Wind load [kN/m2]	2
Live load [kN/m2]	2

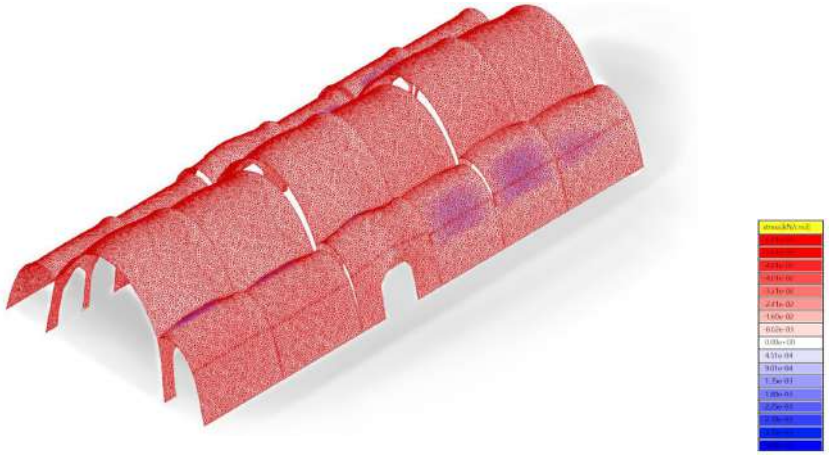
Safety factors

Permanent, unfavorable	1.2
Permanent, favorable	0.9
Variable	1.5

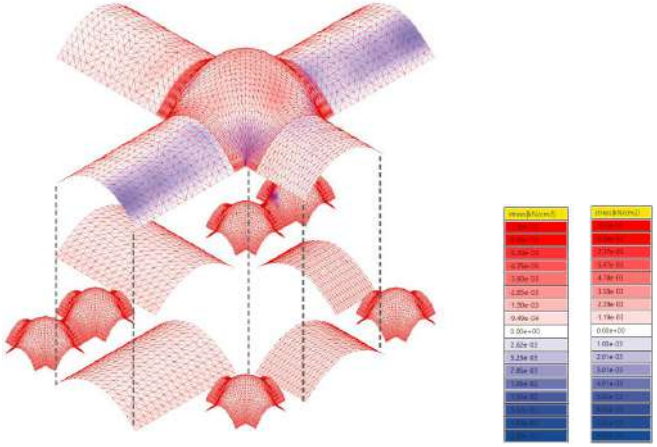


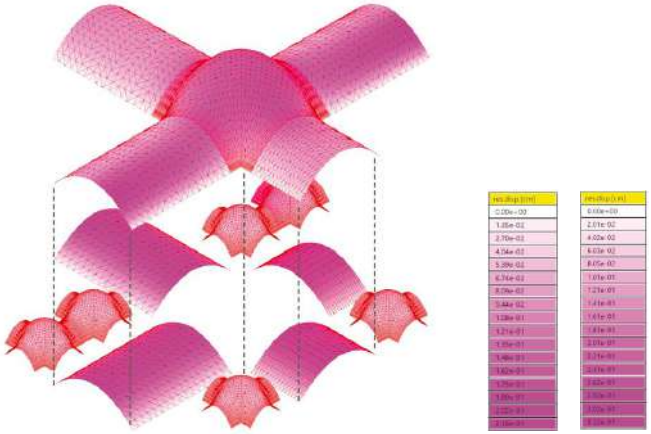
	Allowable	Peak
Compressive strenght [mpa]	2.10	0.64
Tensile strenght [mpa]	0.21	0.10
Displacement [mm]	11.25	10.60
Cross section thickness [mm]	875	

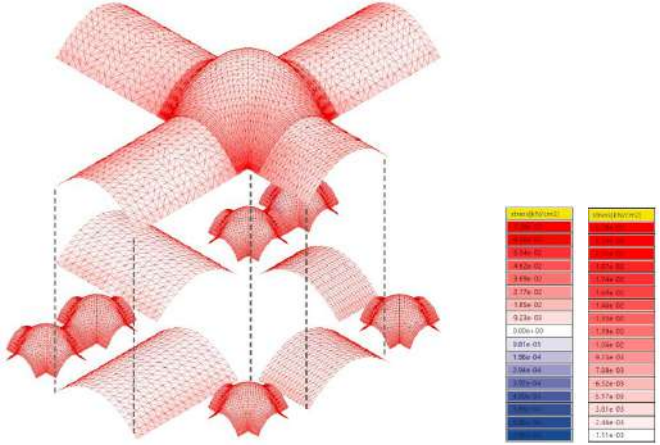




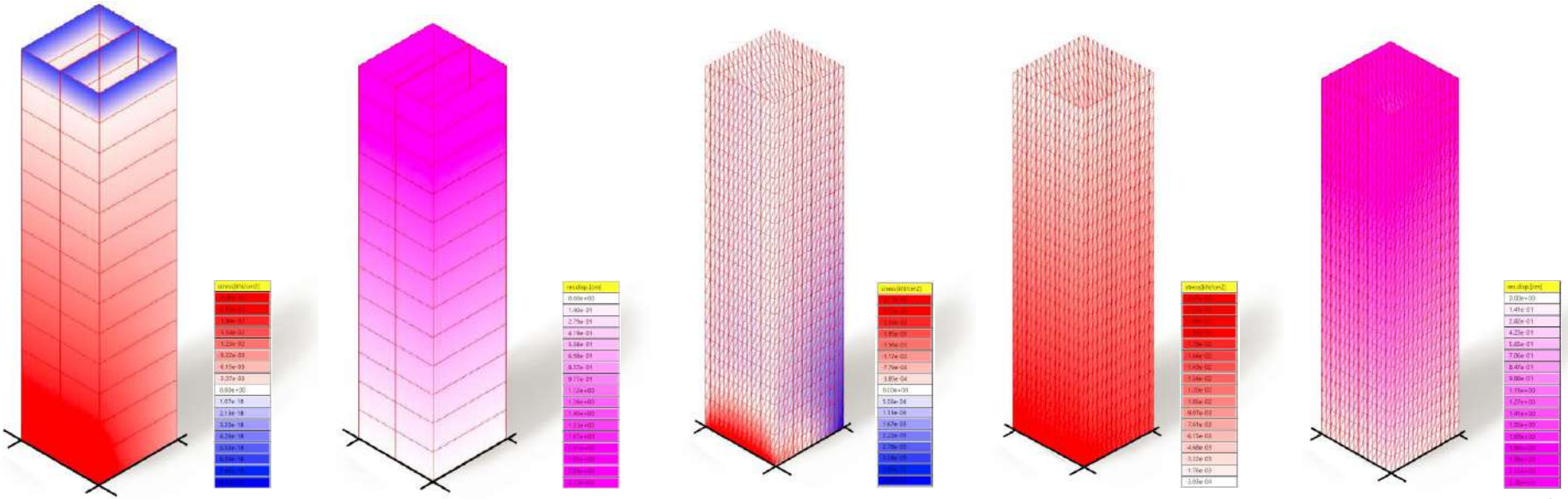
	Allowable	Peak 1st floor	Peak 2th floor
Compressive strenght [mpa]	2.10	0.74	0.23
Tensile strenght [mpa]	0.21	0.21	0.08
Displacement [mm]	7.50	2.16	3.22
Cross section thickness [mm]		500	250

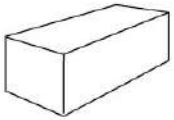


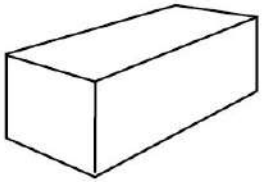


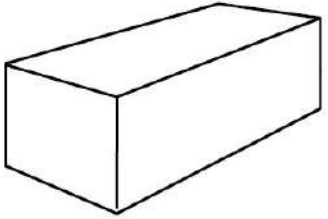


	Allowable	Beam	Tube
Compressive strenght [mpa]	2.10	0.25	0.28
Tensile strenght [mpa]	0.21	$8.53e^{-18}$	0.09
Displacement [mm]	24.0	22.3	22.6
Height [m]		12	12









Benefits:
Lighter +
Easy to lift by hand +
Fluent arches +
Dries more efficient – less possible cracks +

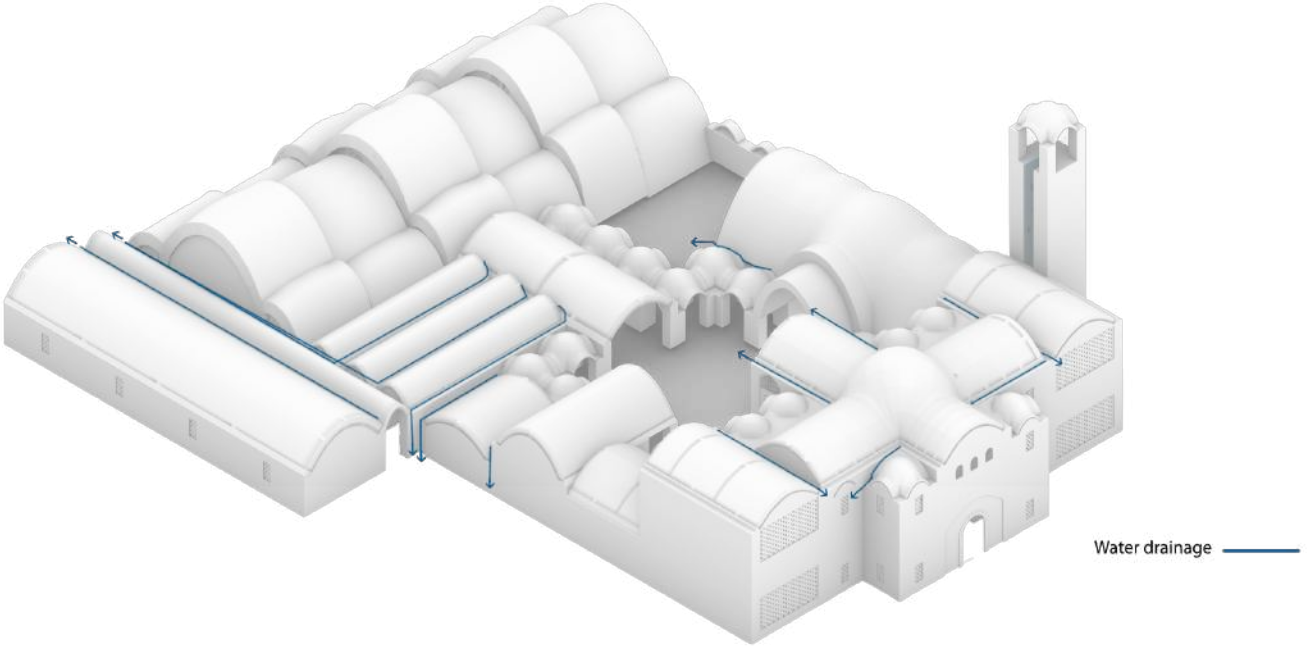
Disadvantages:
More bricks needed -
Less stability -
More mortar – more possible cracks and leakages -
Does not fit the grid size – problems with windows, doors -

Benefits:
+ Less bricks needed
+ More stability
+ Less mortar – less possible leakage – less possible cracks

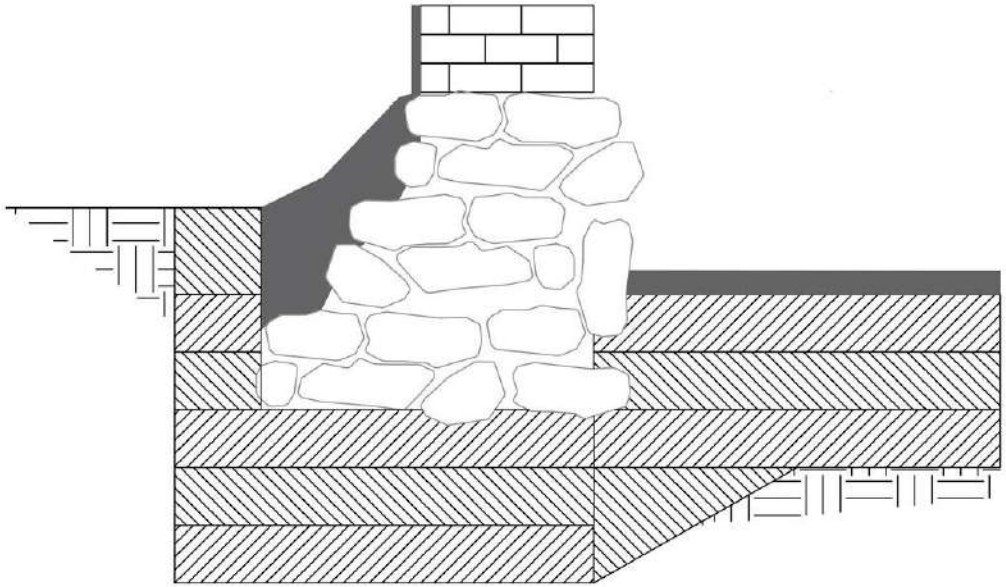
Disadvantages:
- Heavier
- Less convenient to lift by hand
- Does not fit the grid size – problems with windows, doors
- Dries less efficient – possible cracks
- Less fluent arches

	Length [mm]	Width [mm]	Height [mm]
Brick size wall	250	125	100
Brick size vault	250	125	125
Brick size tower	400	200	150

	Clay [%]	Fine sand [%]	Coarse sand [%]	Water [%]	Additive
Brick properties	30	30	40	10	Straw
Plaster properties	10	55	30	10	Straw + animal fat


Water drainage

	Sand	Clay	Straw	Animal fat	Rope	Metal sheet	Tent pole	Aluminium pole	Water tank (slice)	Tire	Crate	Container
												
Application	Sand Foundation Flooring Bricks Mortar Coating	Foundation Flooring Bricks Mortar Coating	Flooring Bricks	Coating	Compass method Pulley system	Cross vault	Cross vault	Cross vault	Arched win-dow Door	Arched win-dow	To reach height	To reach height
Source	On site	Creek 1km west of the camp site	Creek 1km west of the camp site	Chickens inside the camp	UNHCR tents	In the camp	In the camp	Fences surrounding the camp	In the camp	In the camp	In the camp	In the camp



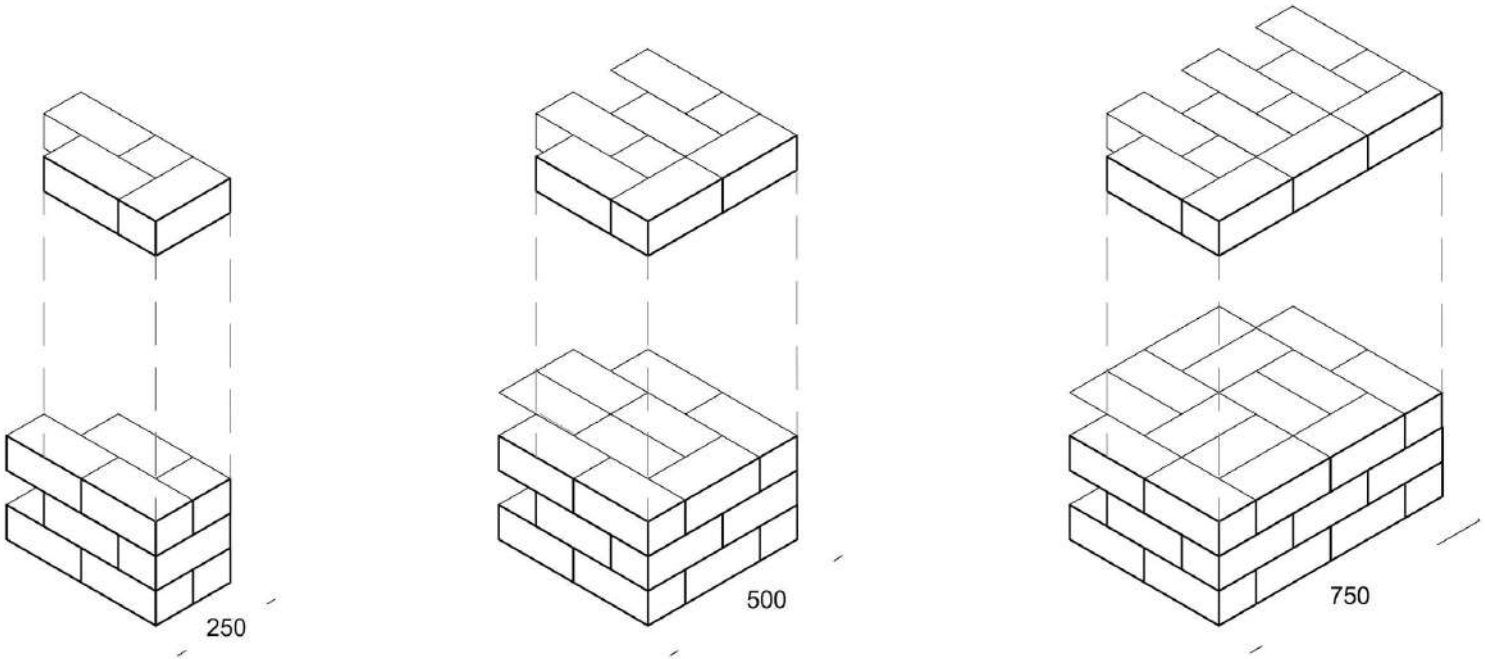
Adobe

Rock stones

Plaster

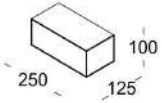
Animal fat
Chopped straw
Clay
Sand

Rammed earth


250
500
750

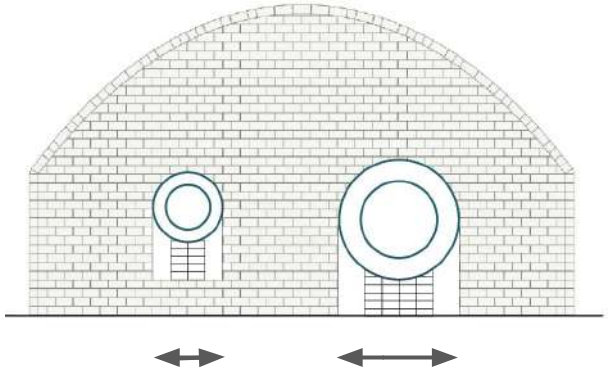
Water tank

Tire

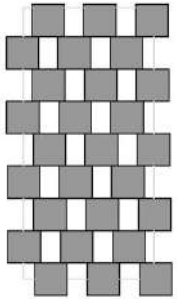


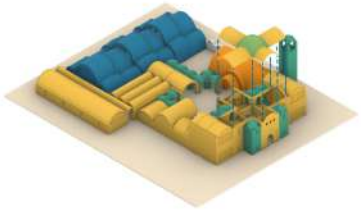
Arched window

Door



Mashrabiya

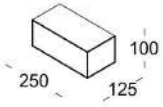


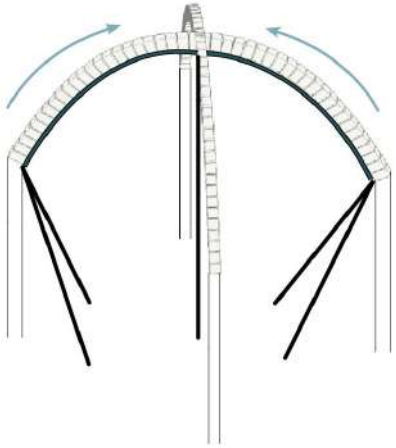


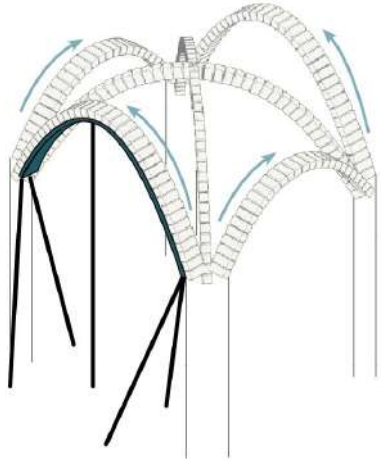
Aluminium - pipes

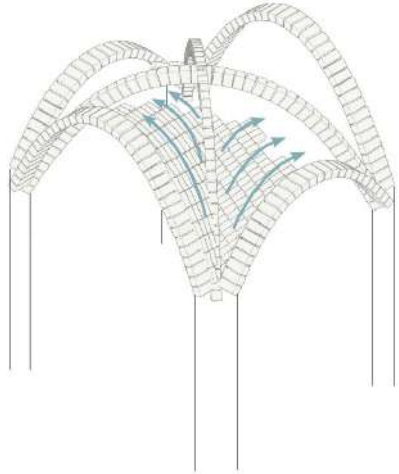
Metal sheet

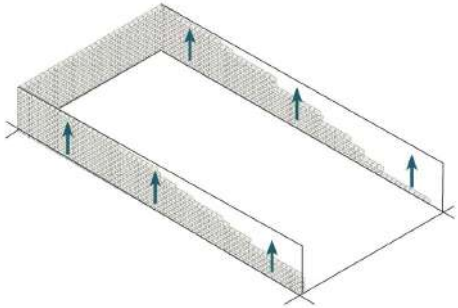
Tent pole

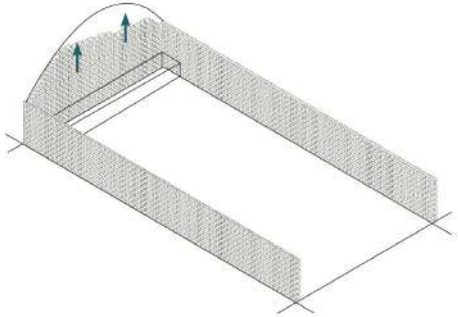


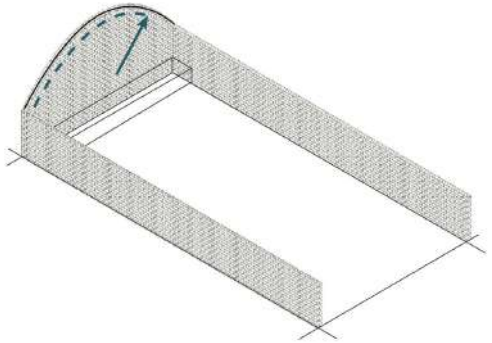


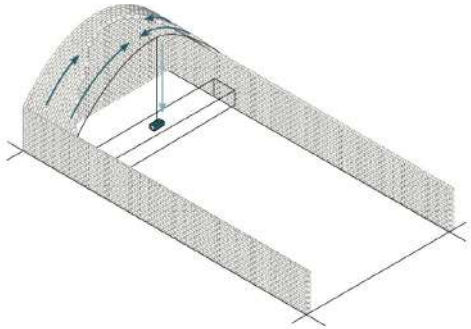


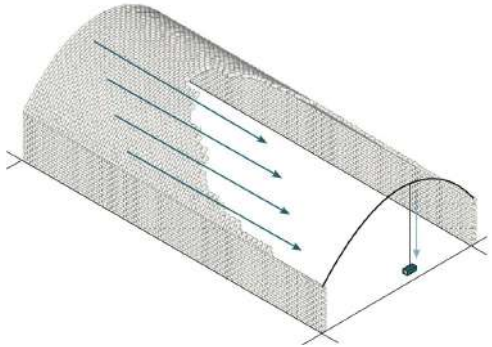


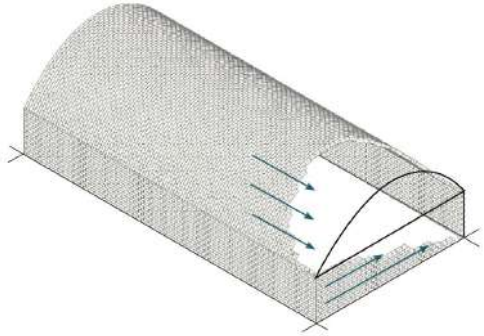


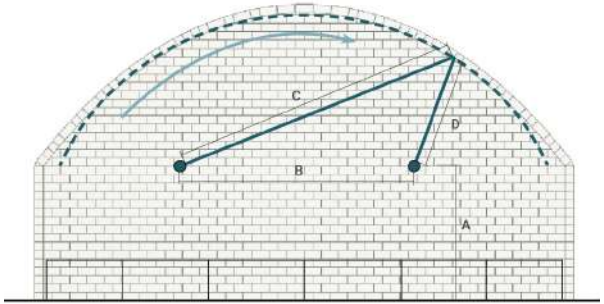




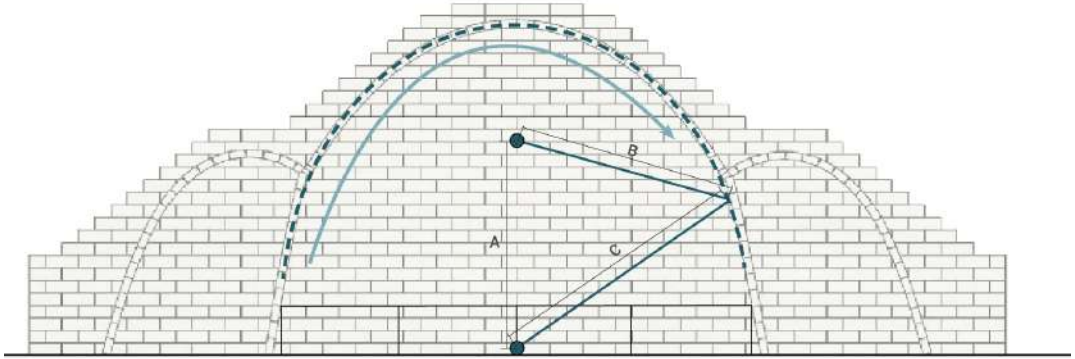




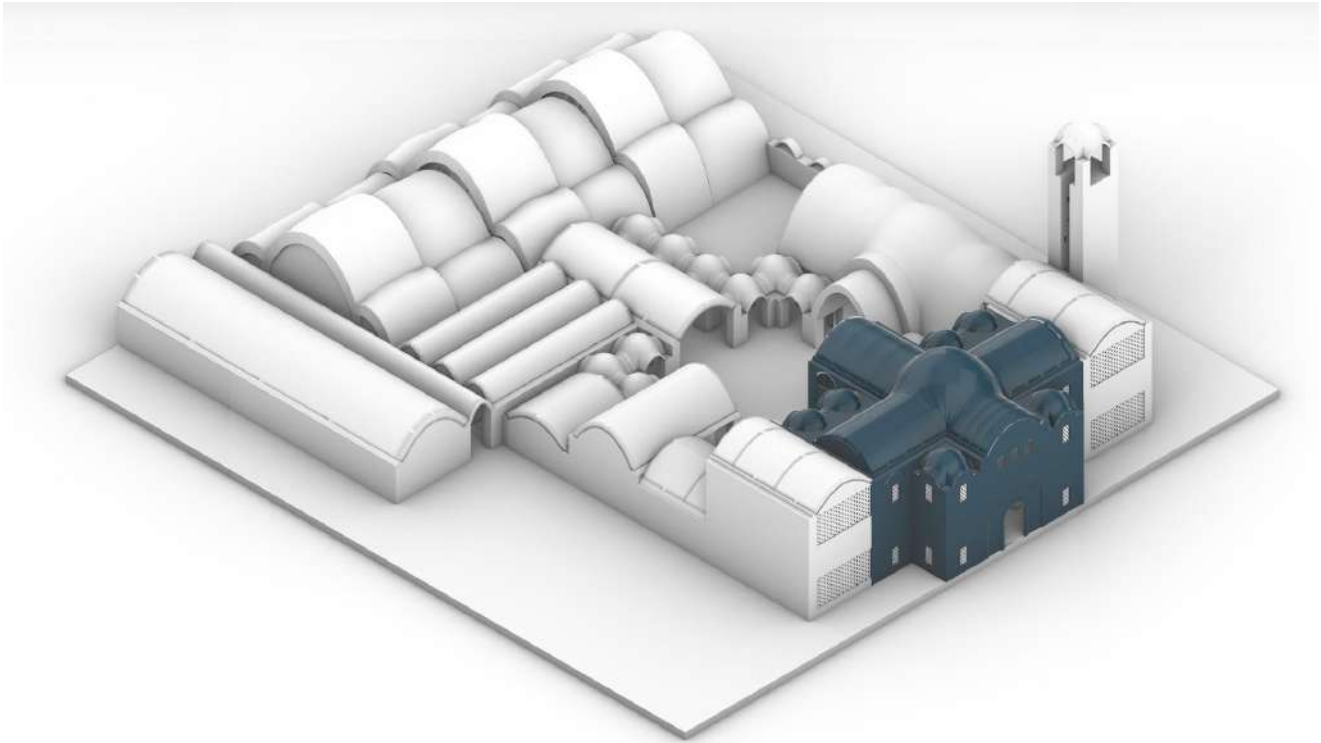


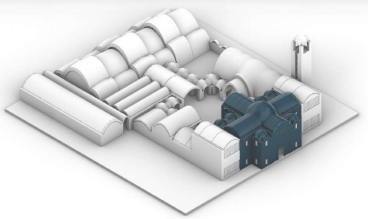


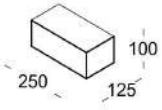
Barrel vault

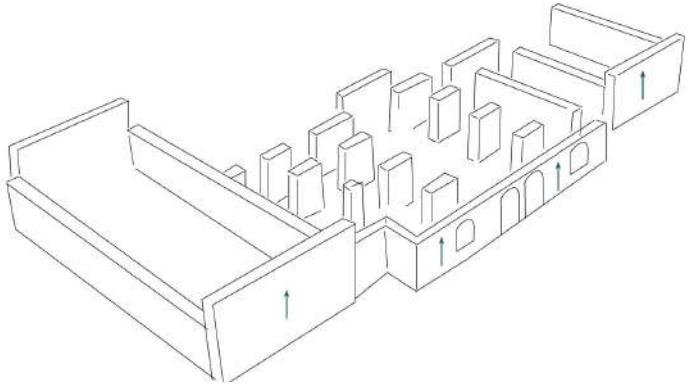


Nubian vault

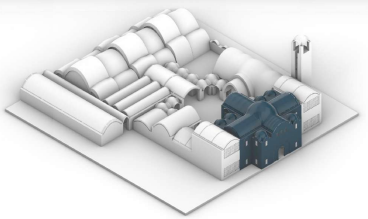


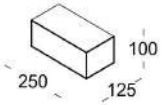



100
250
125




3,5 m

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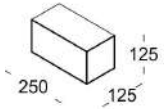
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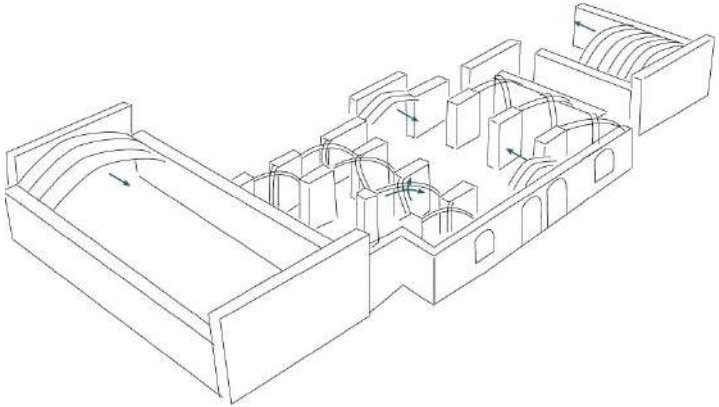
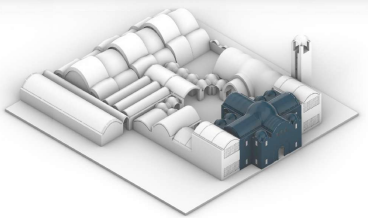


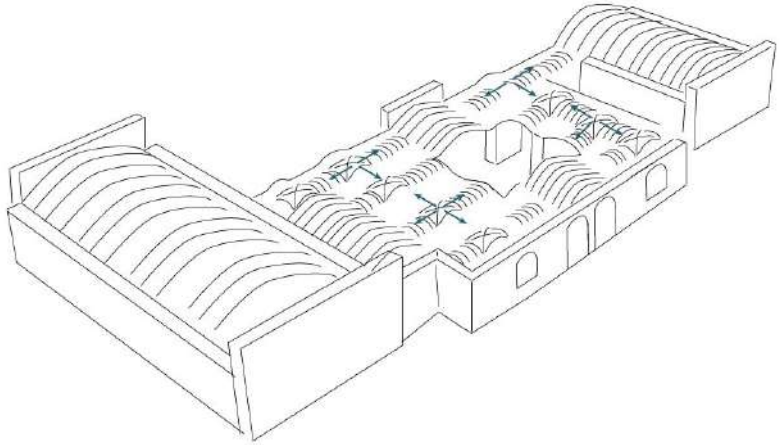

3,9 m

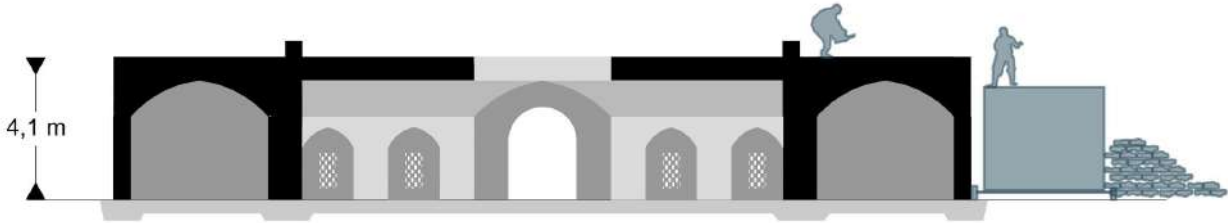


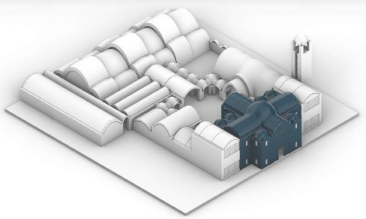
Container

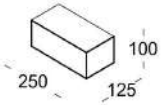
Crates

Sand bags





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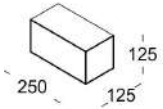
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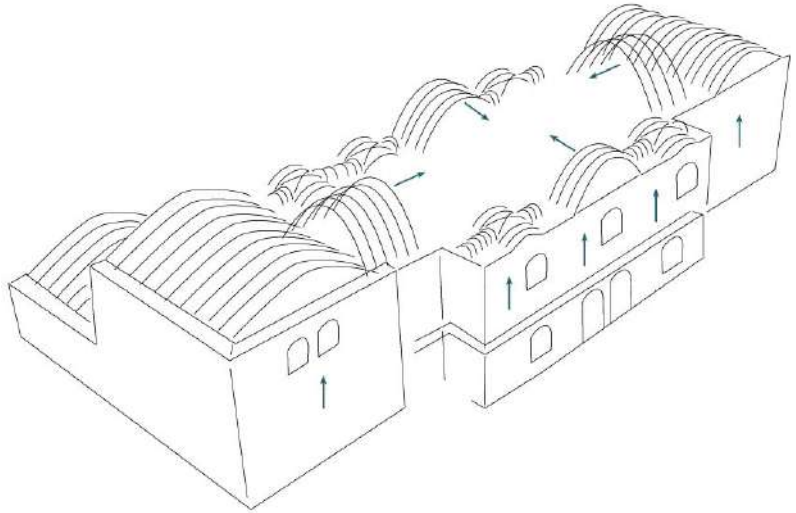
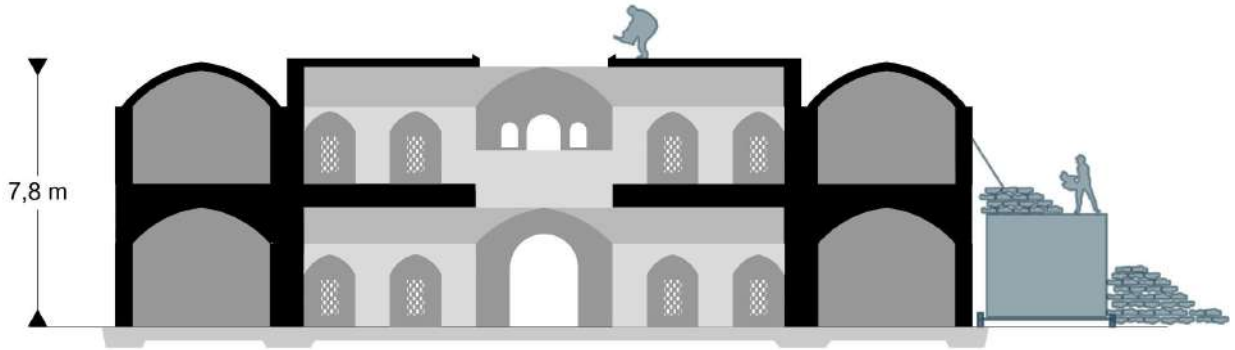
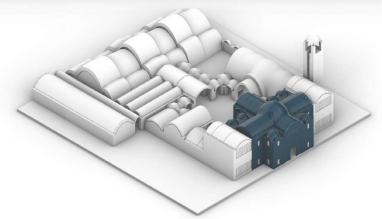
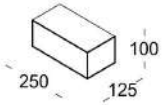



7,8 m

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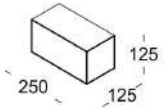
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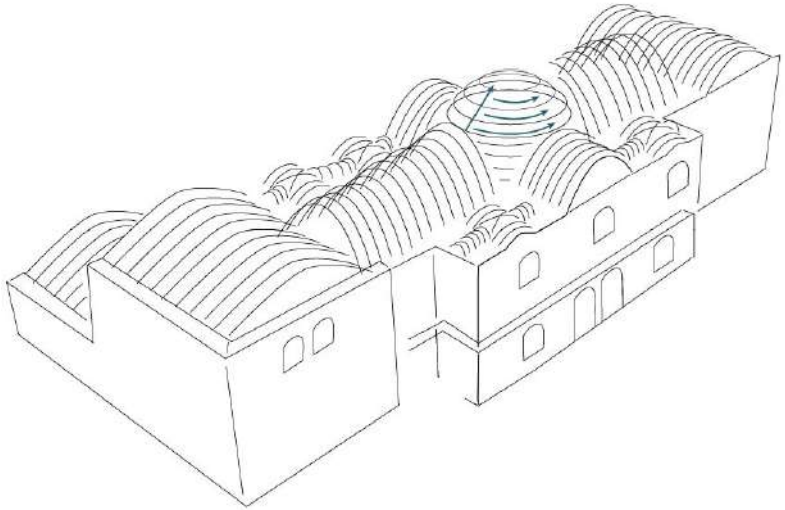
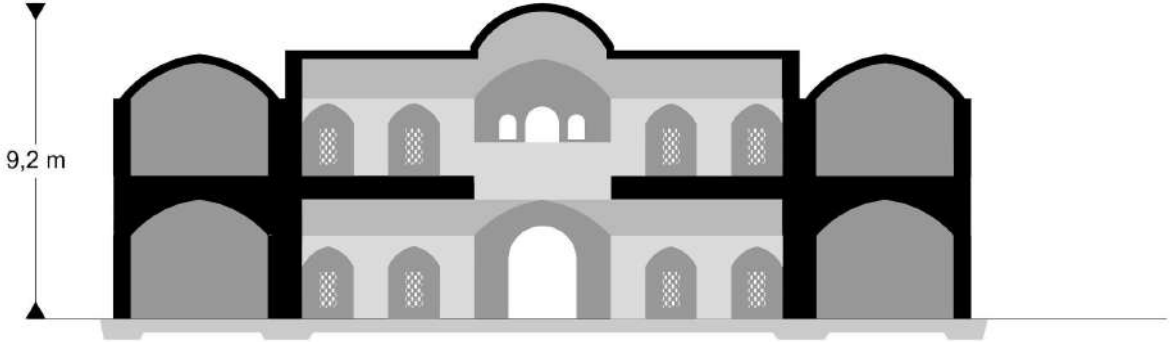
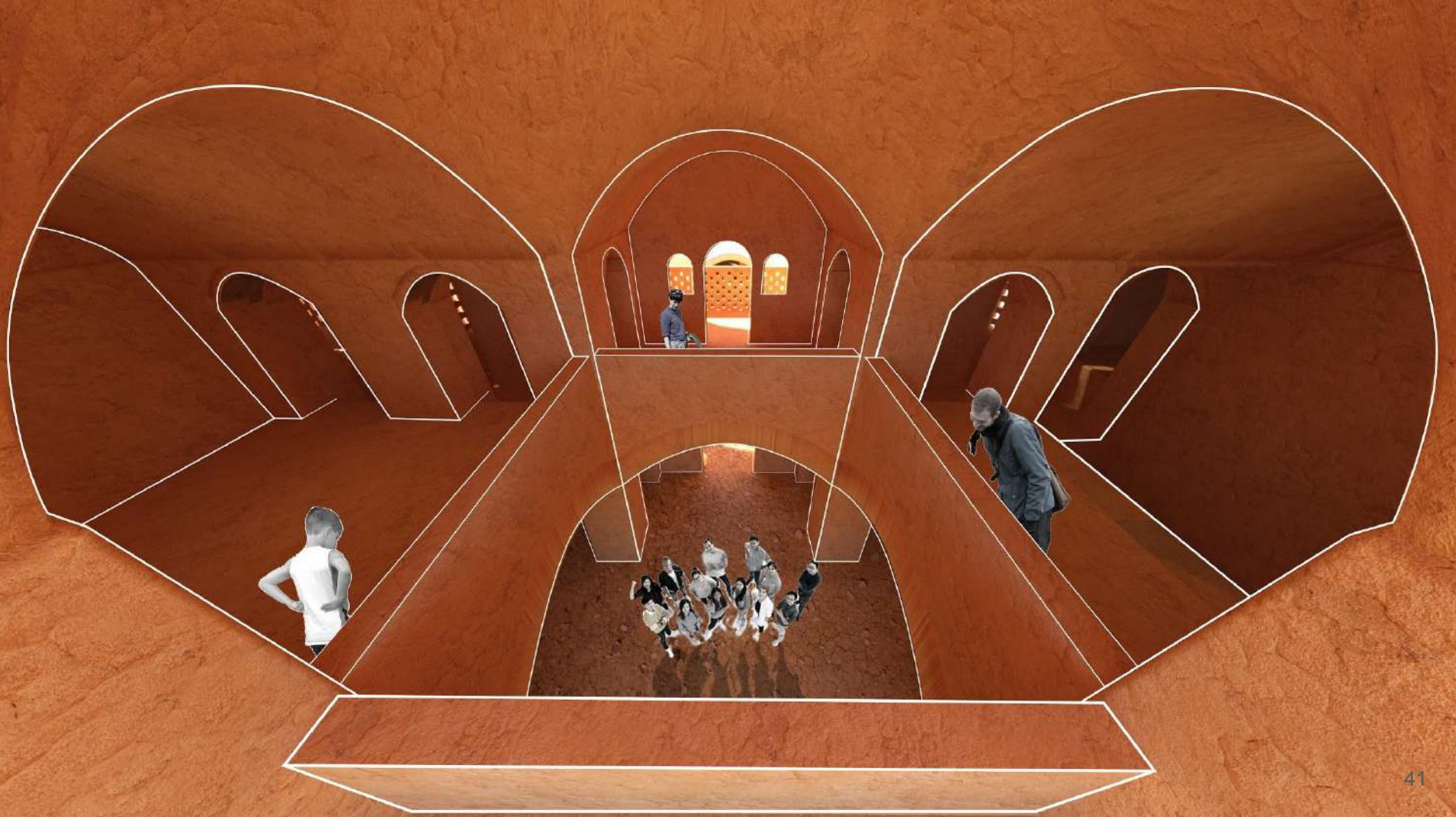
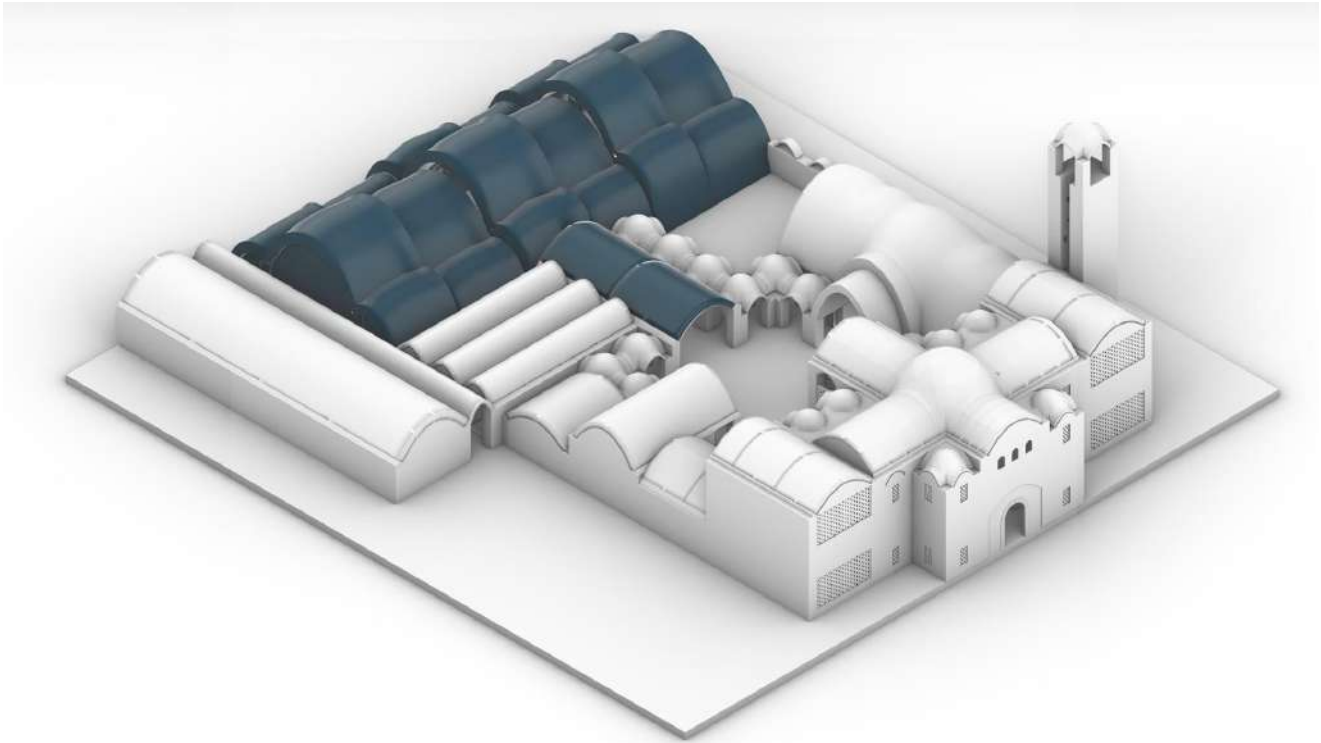
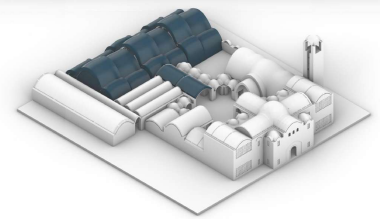
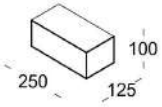



9,2 m





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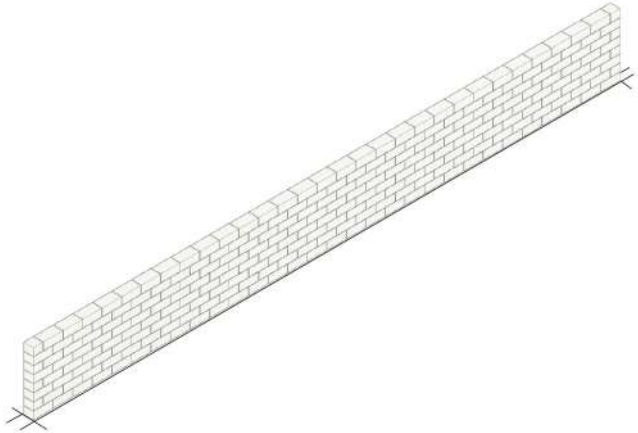
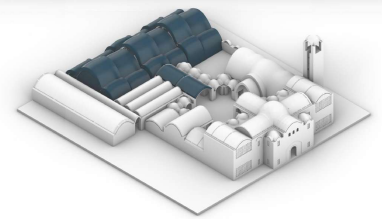
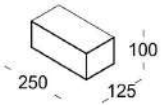
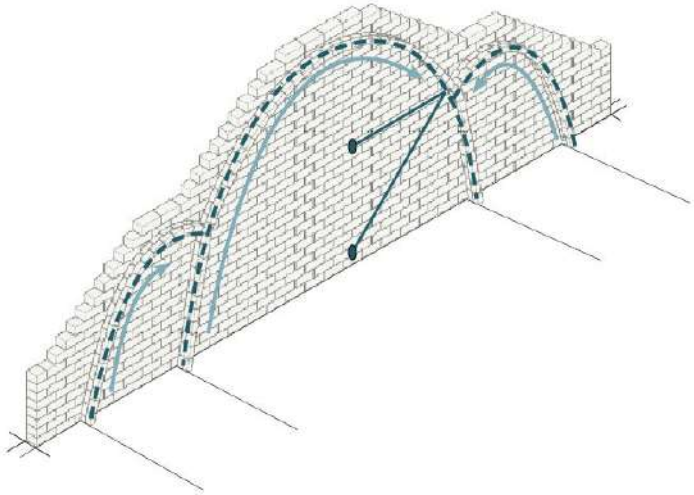


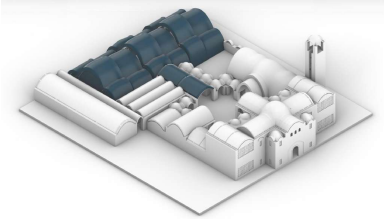


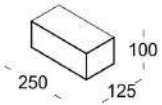


Nubian vault

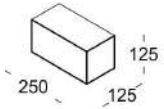
Compass method

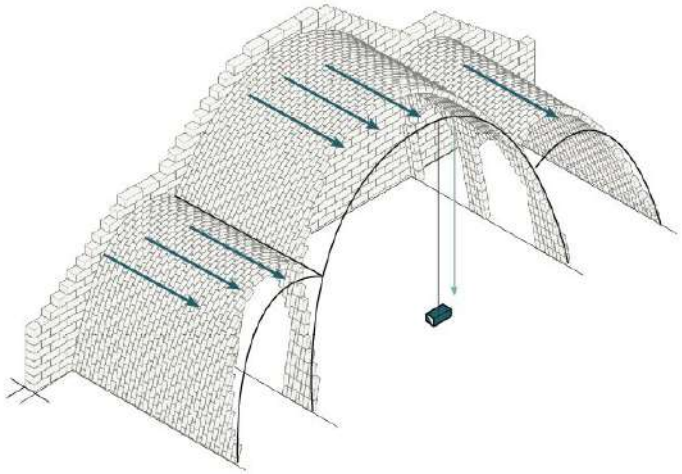


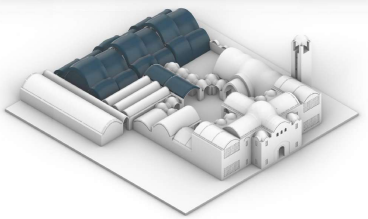


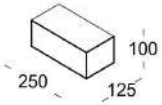


Nubian vault

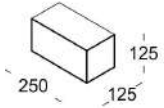


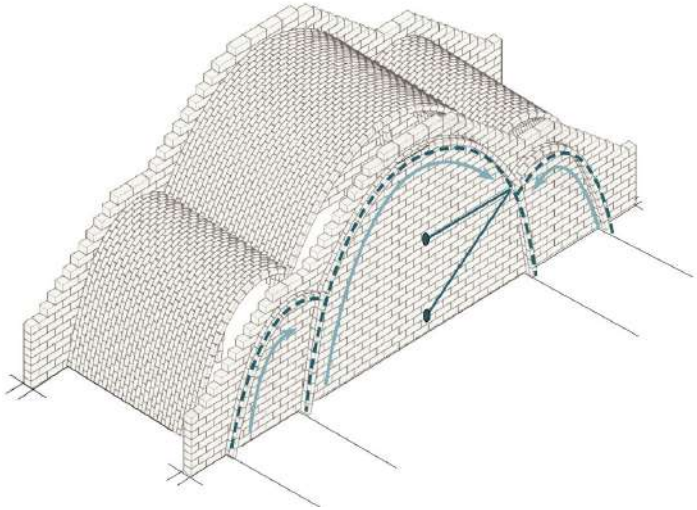


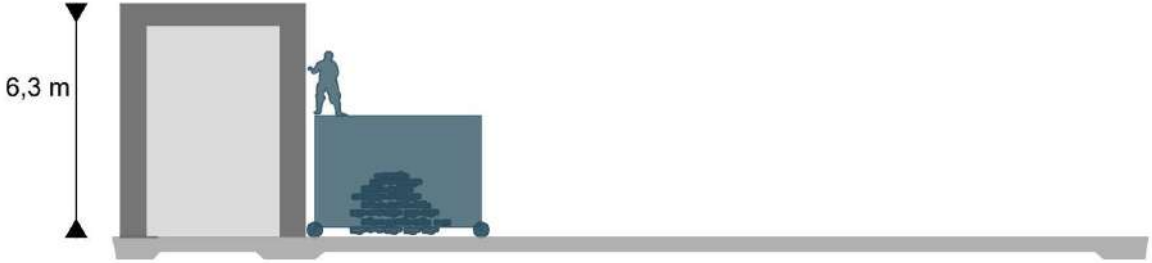


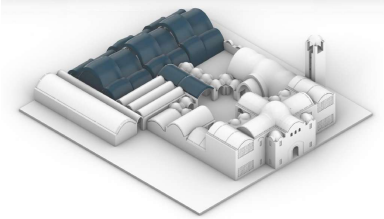


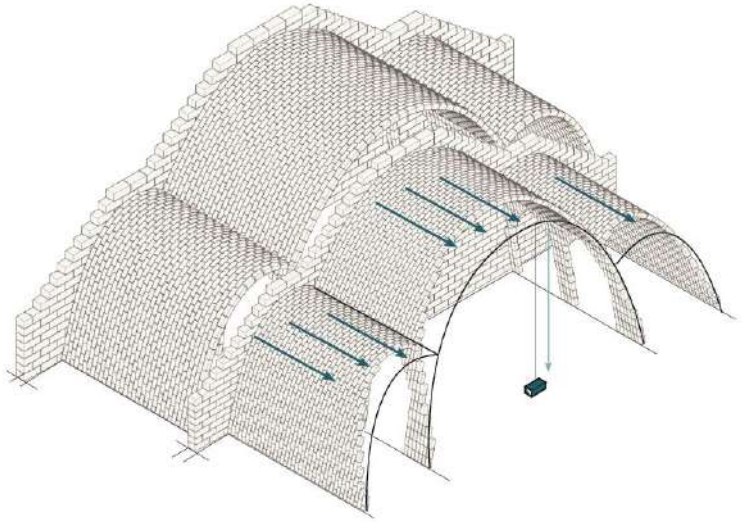
Nubian vault

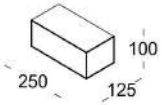




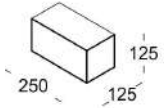


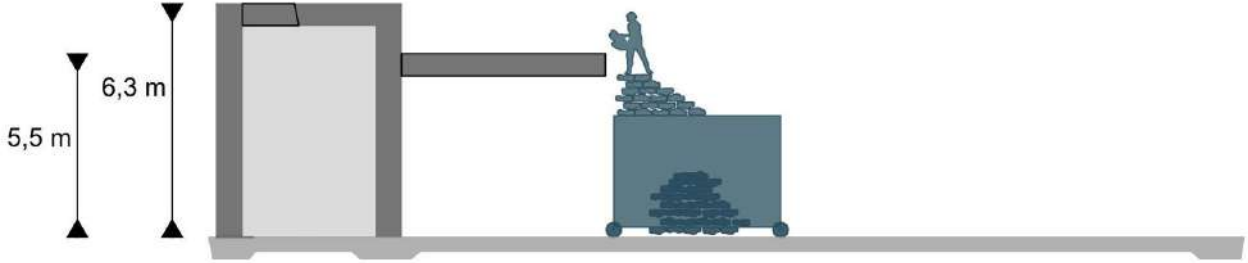


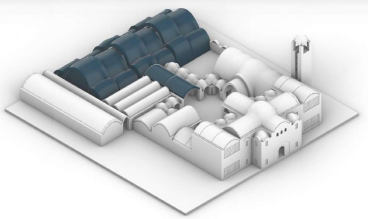


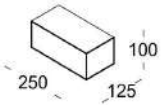


Nubian vault









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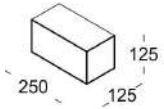

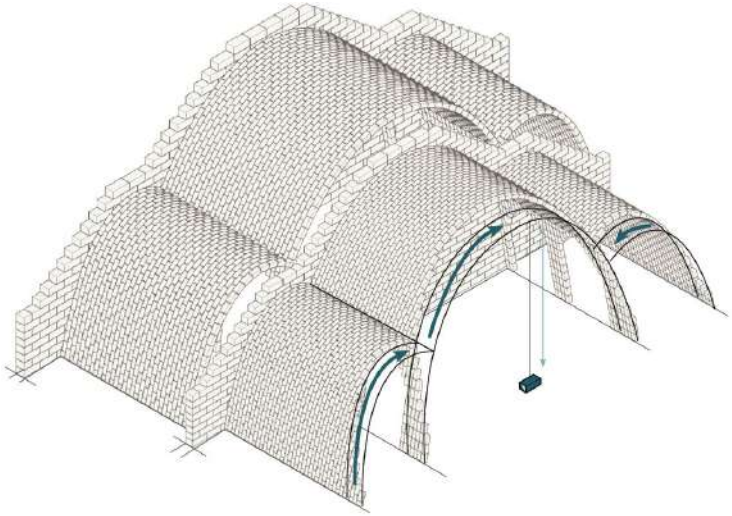

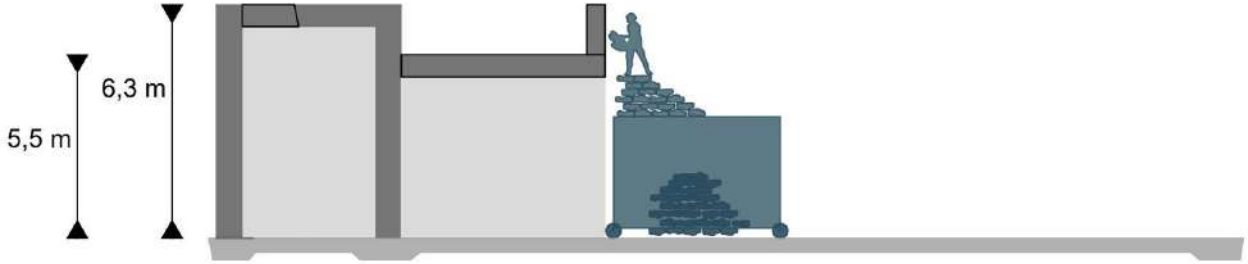

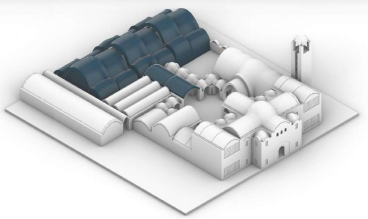

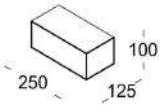

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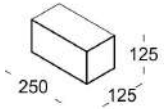

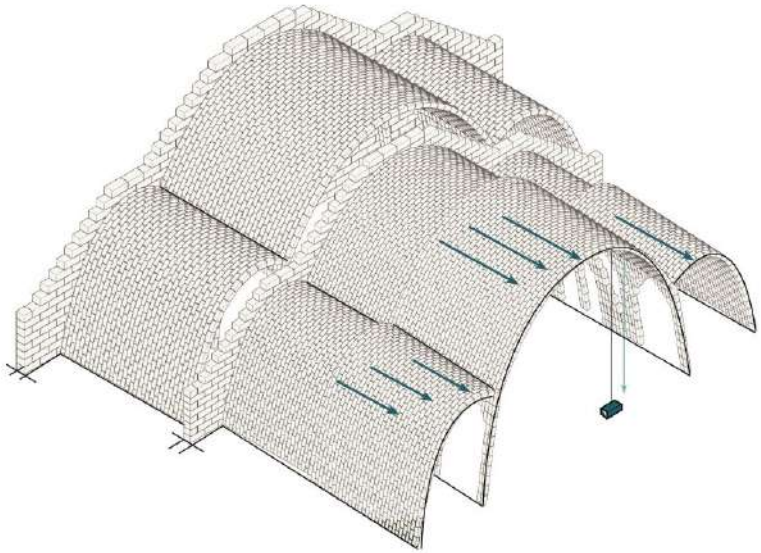

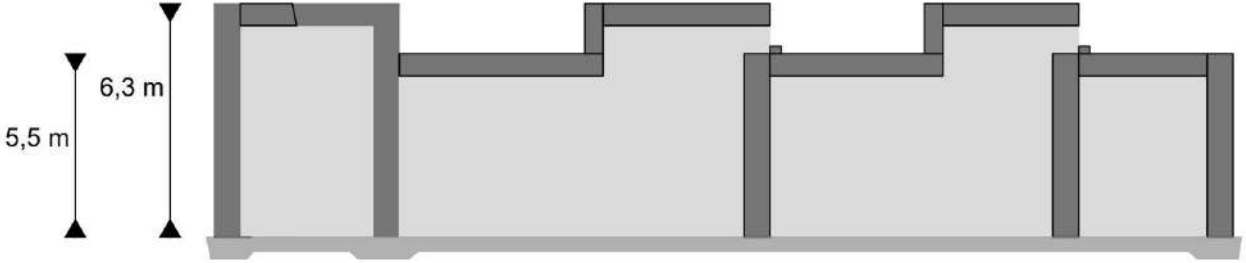

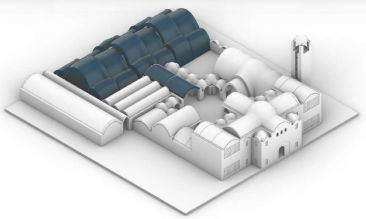

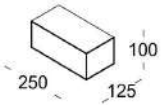

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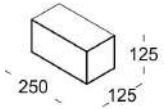

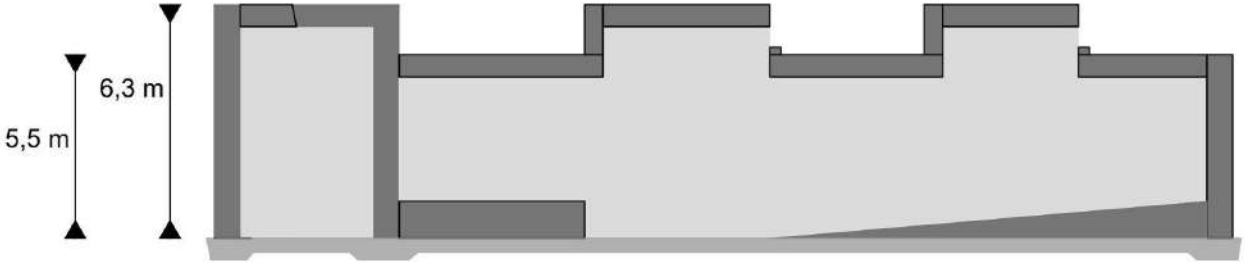

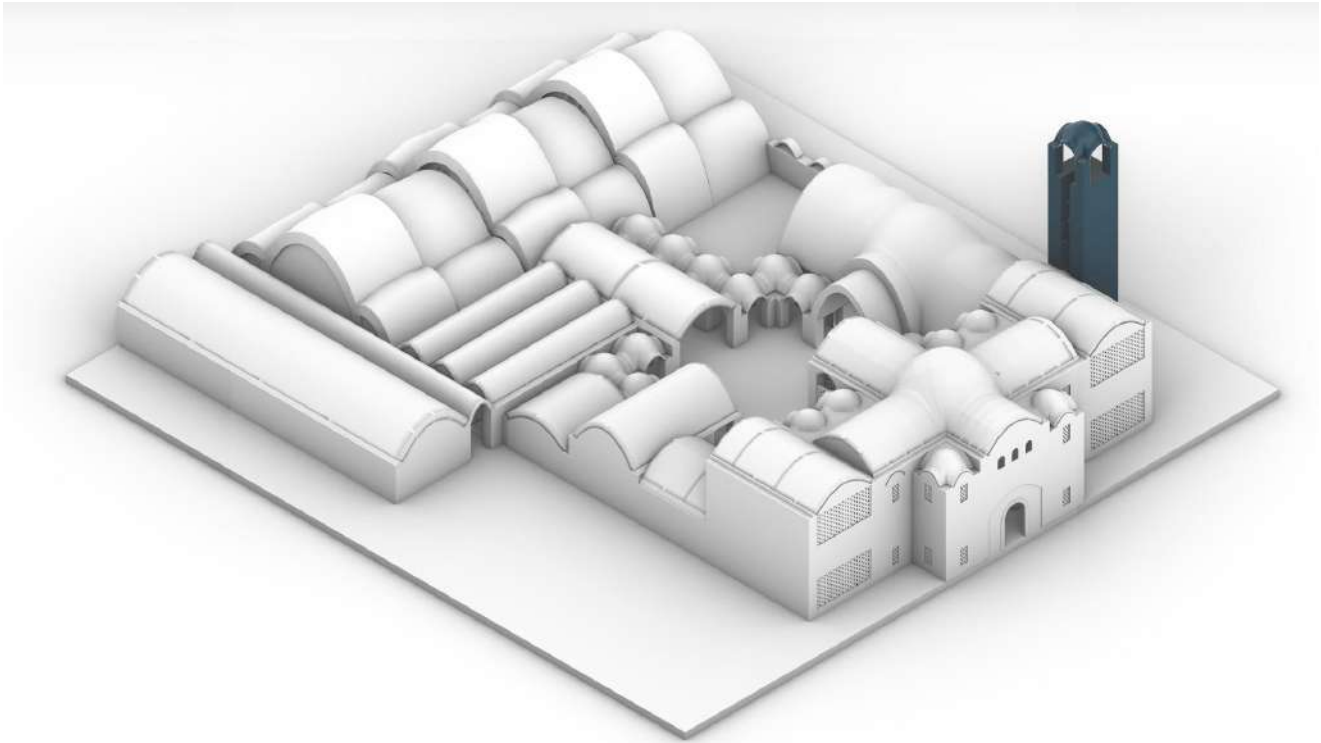

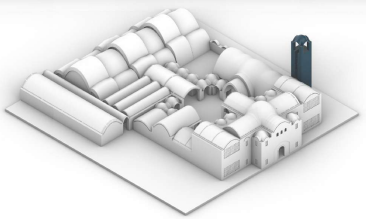

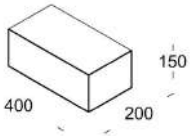
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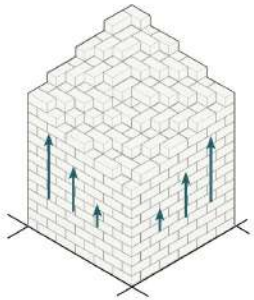
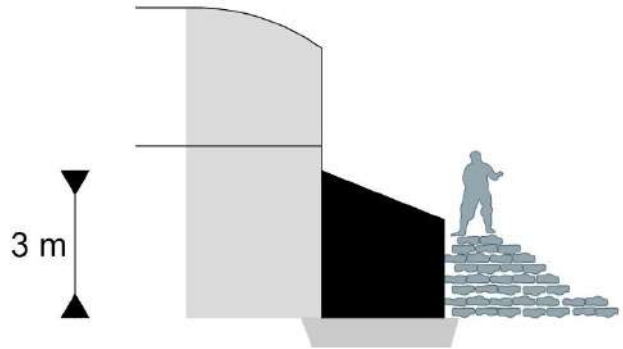
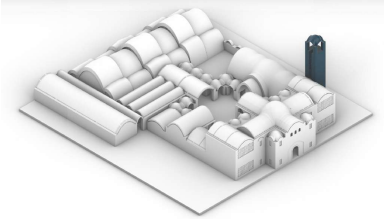
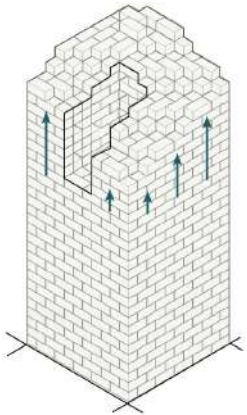
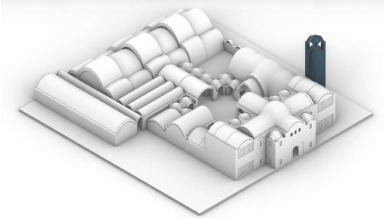


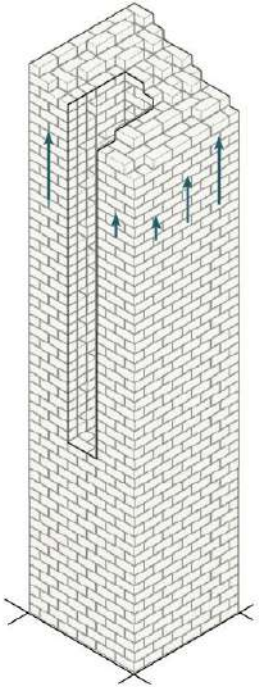

3 m

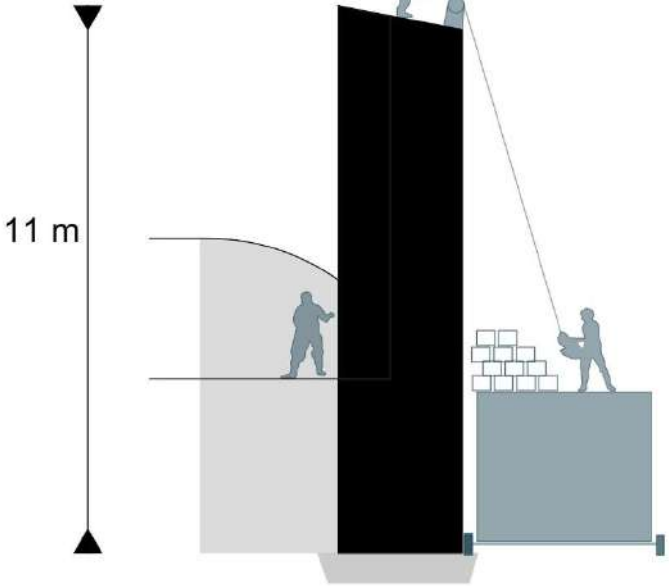




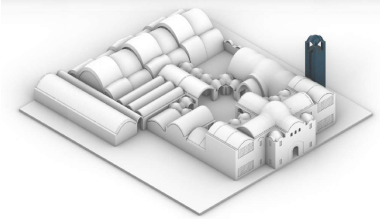

6 m
3,5 m

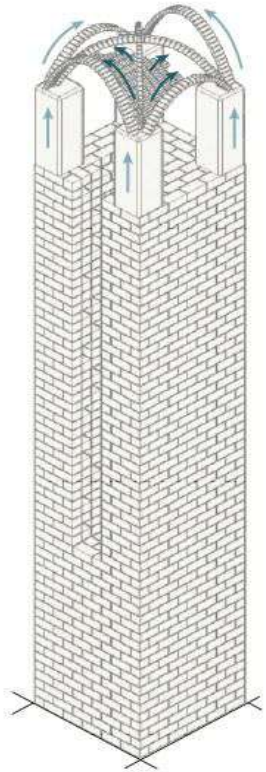


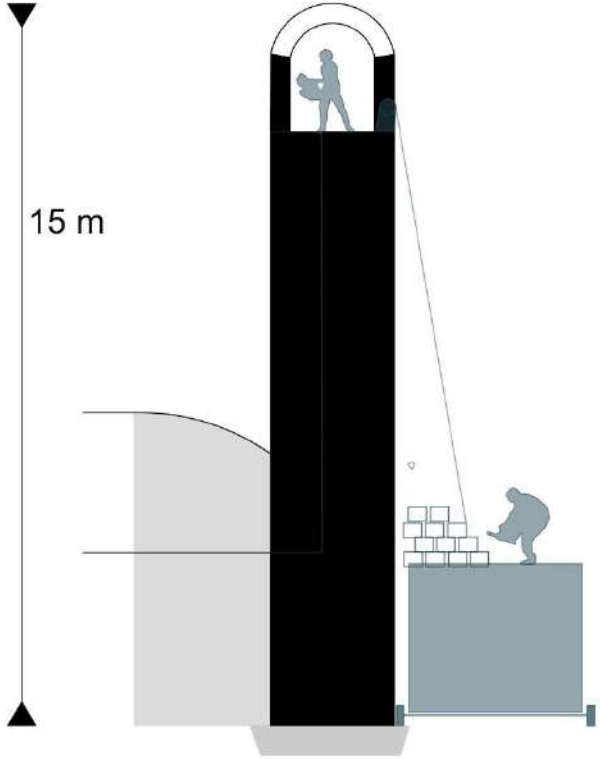



11 m

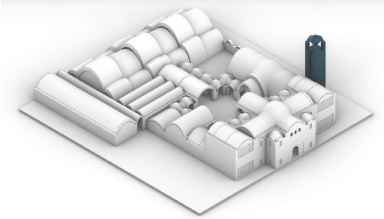

3,5 m

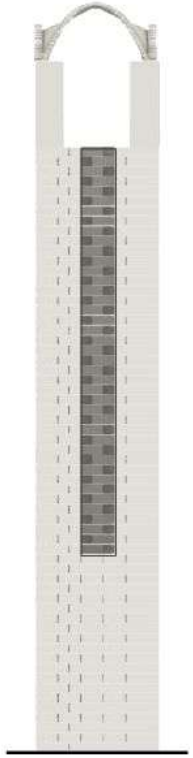





15 m

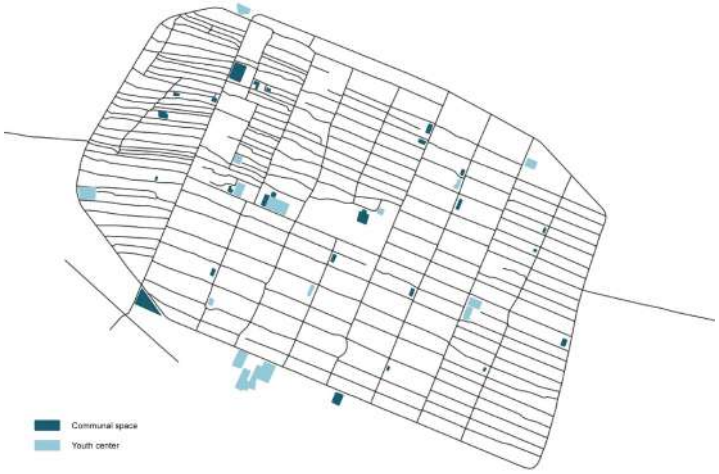

3,5 m

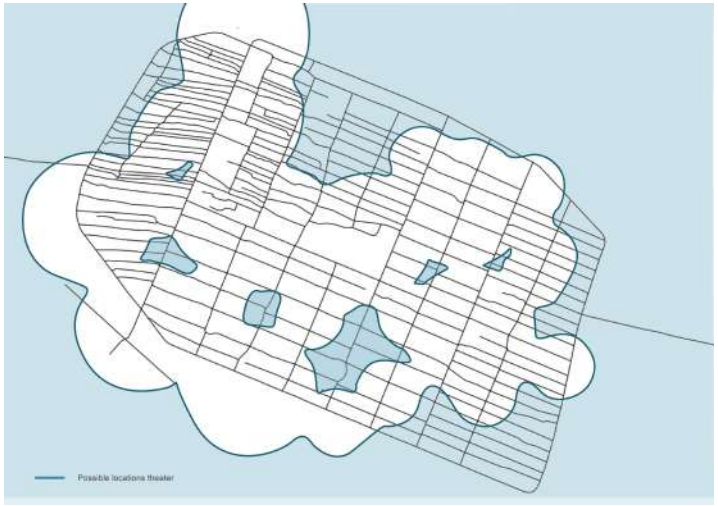


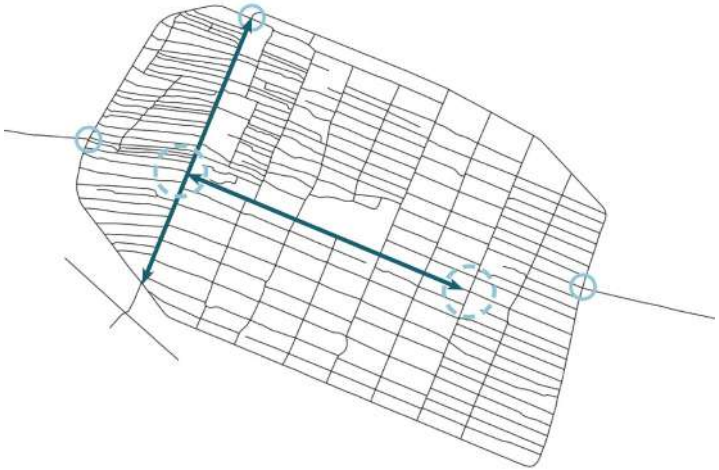


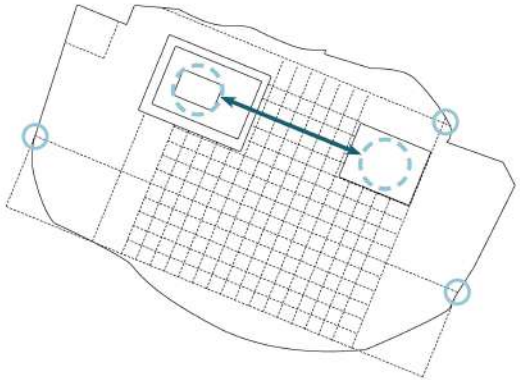
Conclusion

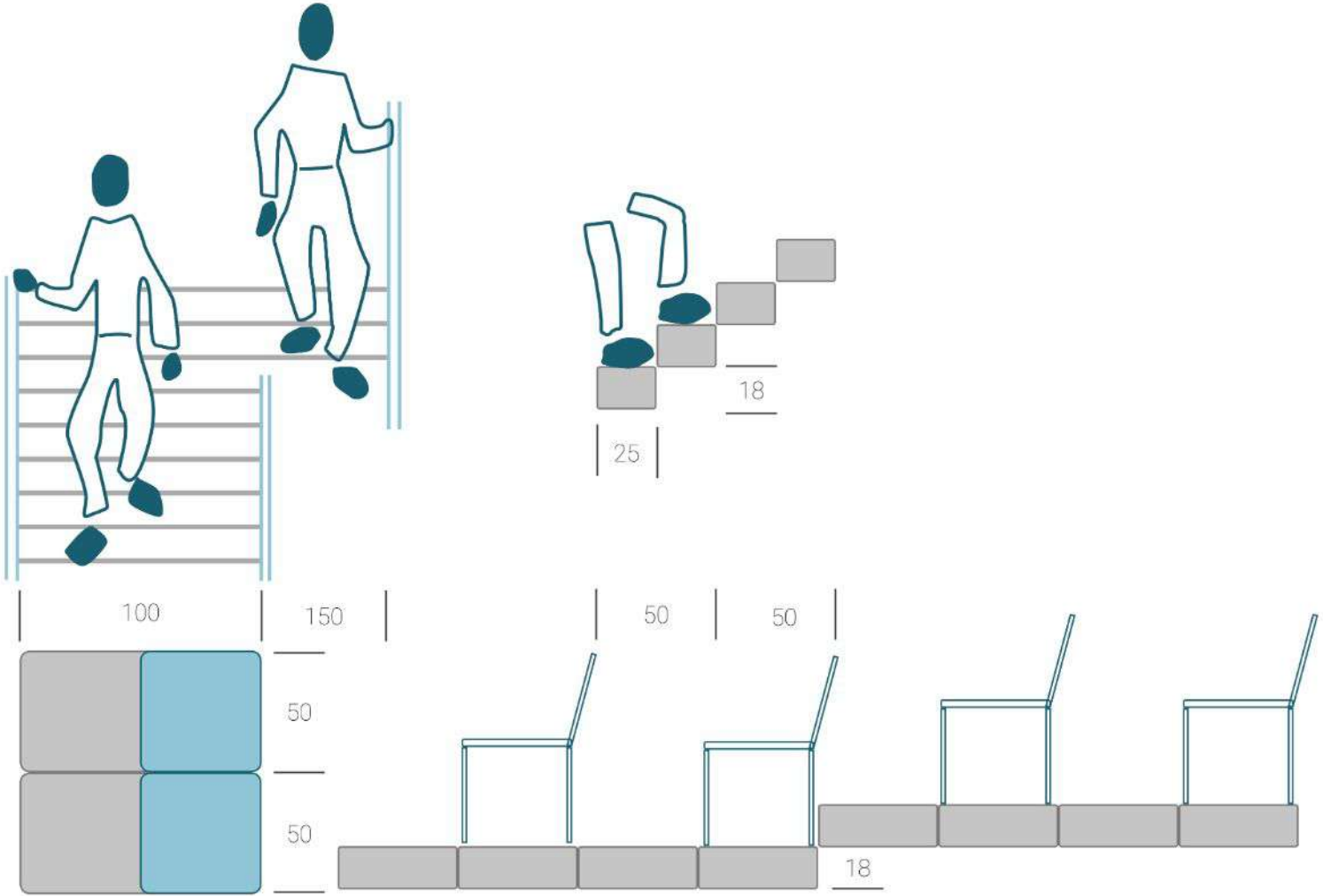
- With this theater, we tried to make a building where people can enjoy music and performances and forget their problems for a moment
- The floorplan is optimized for user experience taking into account the orientation and connection between the spaces
- The shape of the building is based on standard modules, improving the constructability
- The structures are compression based and able to withstand the loads
- Only local materials are used in the construction, making sure this is a building which can be realized


Communal space
Youth center


Possible locations theater






18
25
100
150
50
50
50
50
18

References

materials

Acoustics

- Thick walls insulate better because of their mass
- Minimize the openings at noise sensitive rooms
- Place and orientate the functions such that their sound is not interfering
- Make surfaces rough to minimize reflection