



Permacultura

"I belong **here**, at least for a short while."

THE TEAM



Namrata Baruah



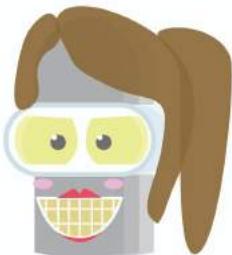
Sofia Kouvela



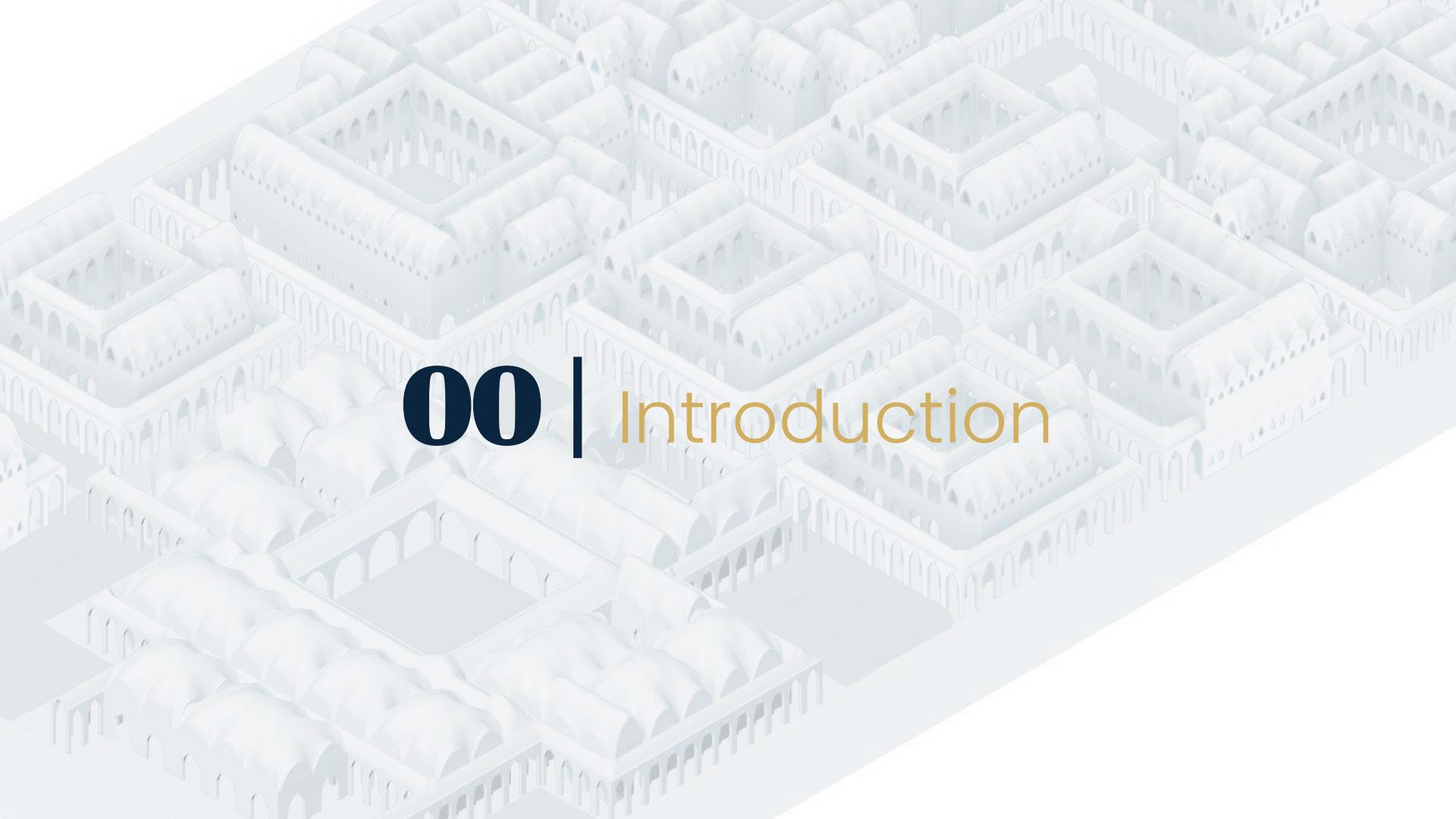
Isidora Matskidou



Solkyu Park

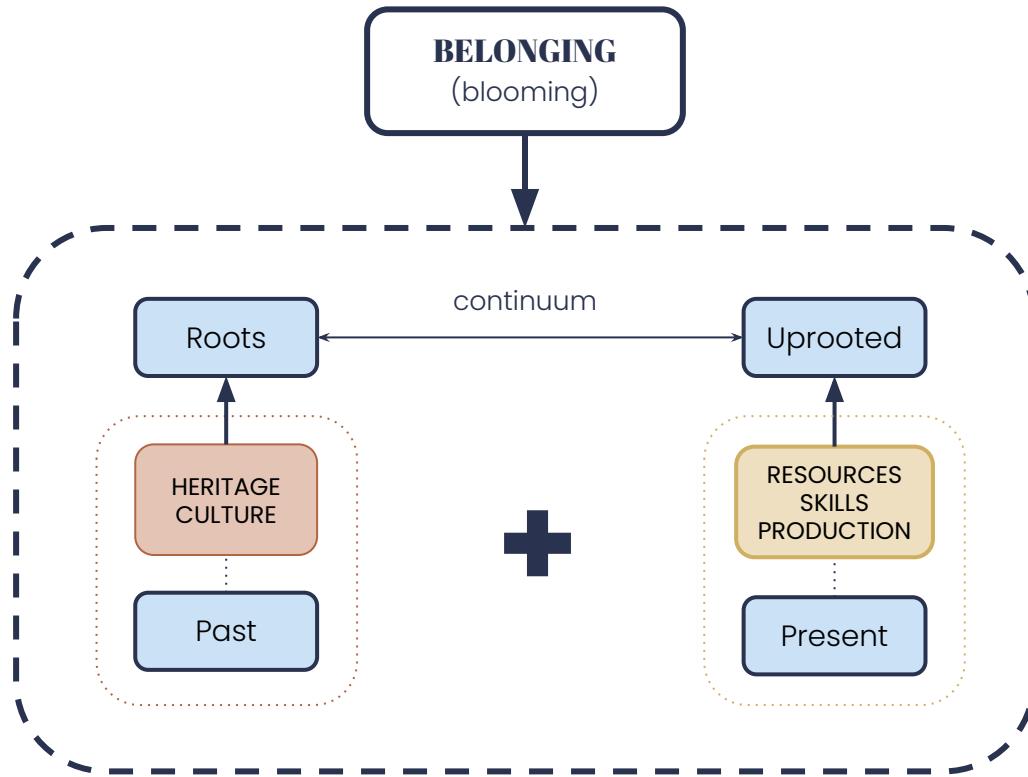


Stella Pavlidou



00 | Introduction

SOCIAL PROBLEM



DESIGN PROBLEMS



- Informal growth of the camp over the years
- Unevenly developed districts
- Poor living conditions that don't cover basic needs
- Overcrowding households without privacy
- Lack of communal spaces
- No feel of a community
- Inexistent architectural identity



- Lack of sufficient employment
- Lack of skills development
- Lack of local production
- Loss of traditional syrian craftsmanship due to movement
- Unbalanced distribution of the camp's commercial activity

DESIGN VISION

Design Blocks of Neighborhoods where **co-housing units**
are mixed with **decentralised makers hubs**



DESIGN PROPOSAL



Aliveness / Production

Develop Decentralised Production Hubs combined with housing units.



Adaptive / Modular

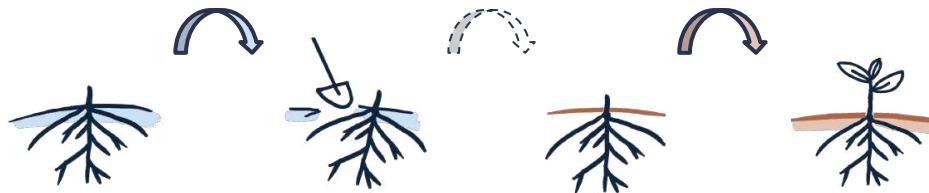
Spaces that can be extended or repurposed organically.

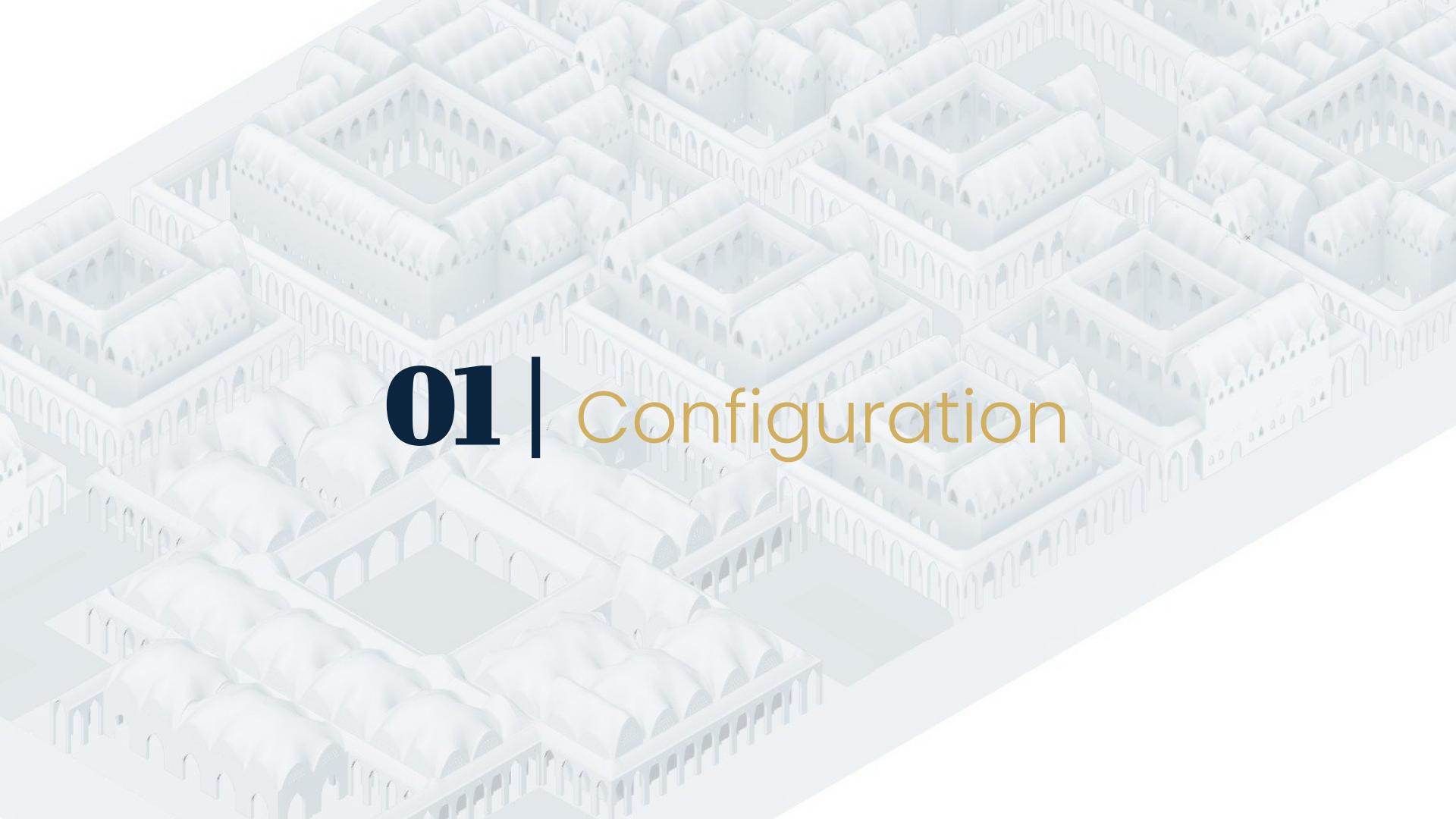


Meaningful Architecture

Design Modular Housing Units with references to familiar architecture.

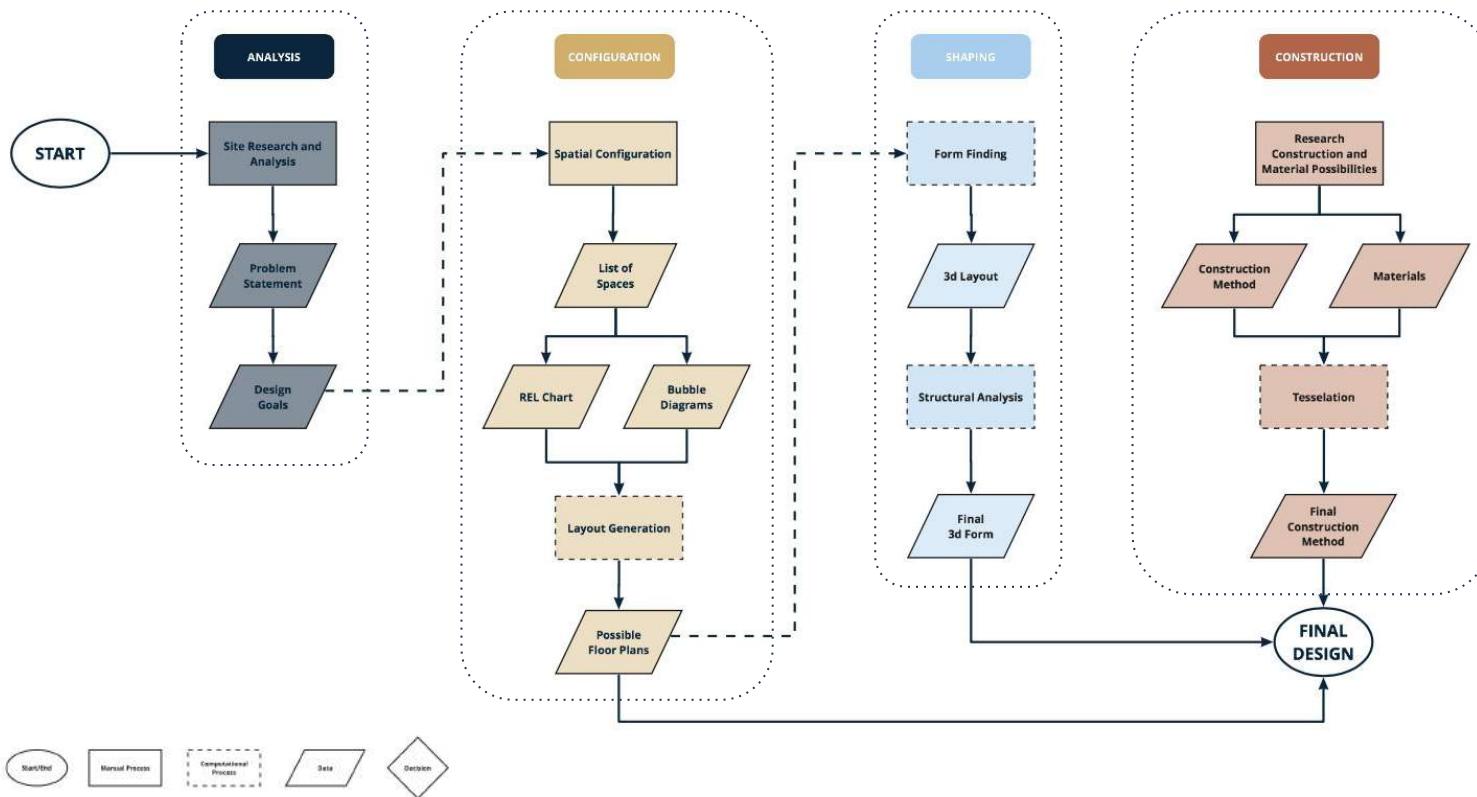
Production Hubs + Housing = Neighbourhoods



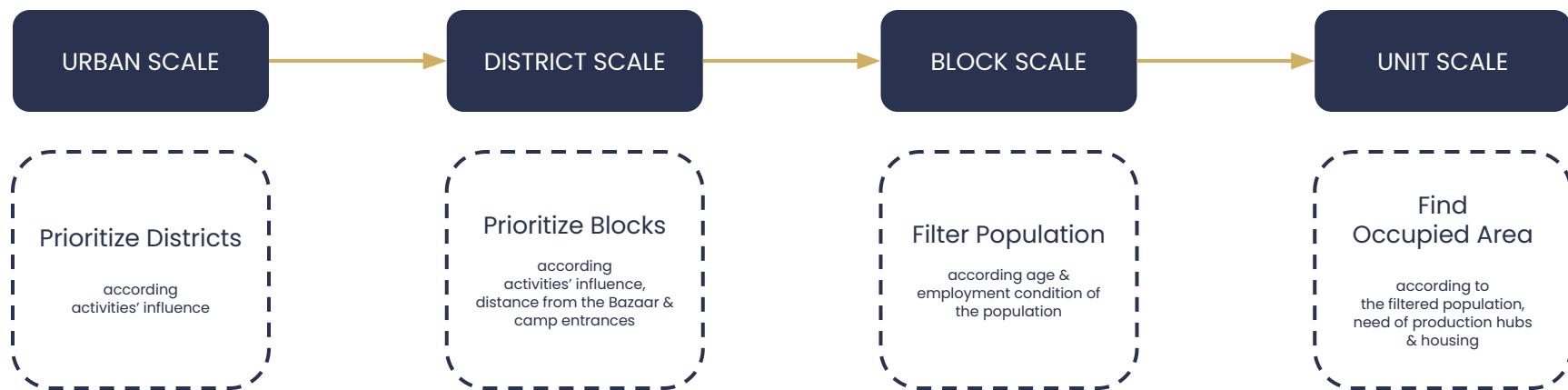


01 | Configuration

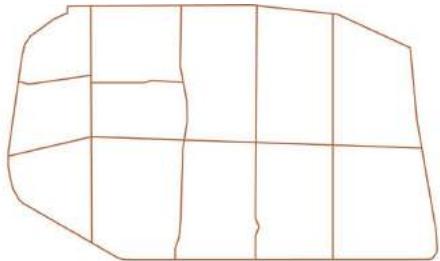
OVERALL FLOWCHART



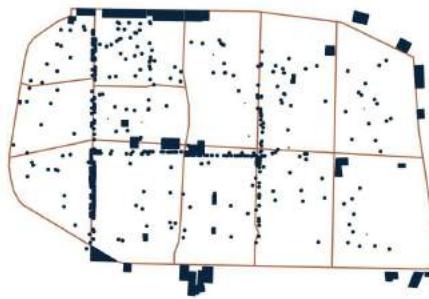
CONFIGURING SITES



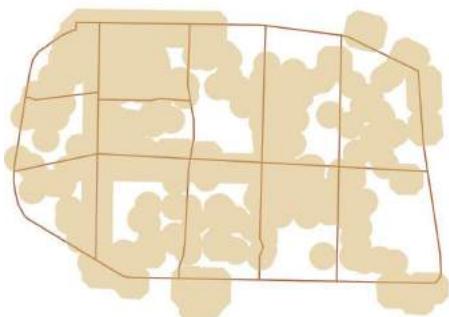
URBAN SCALE | Analysis



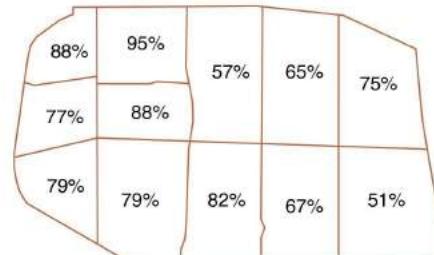
Districts



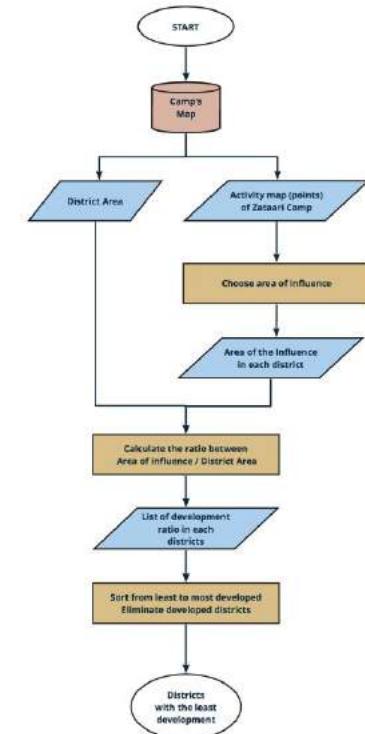
Activity spots



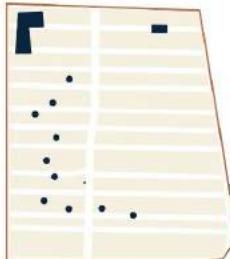
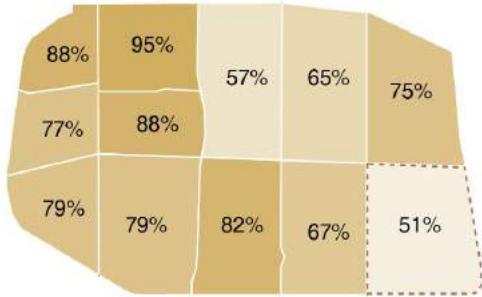
Influence area



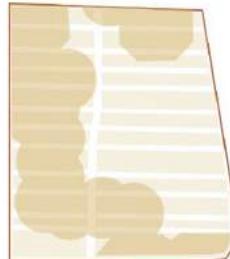
Area of influence / District Area



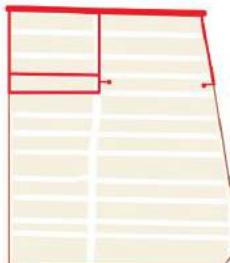
DISTRICT SCALE | Analysis



1. ACTIVITIES



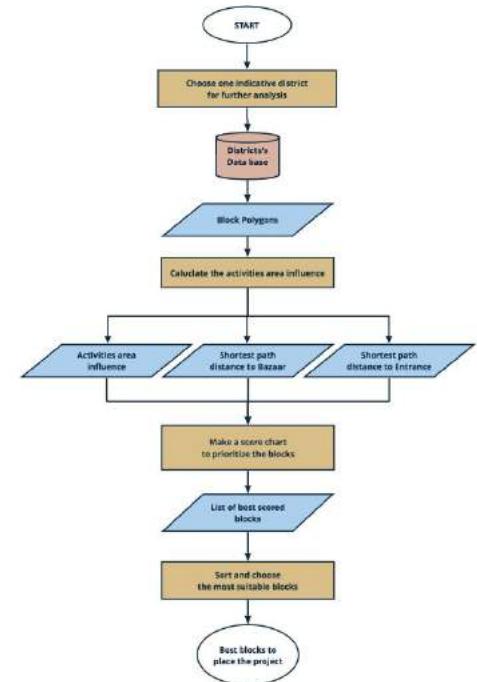
2. INFLUENCE OF ACTIVITIES



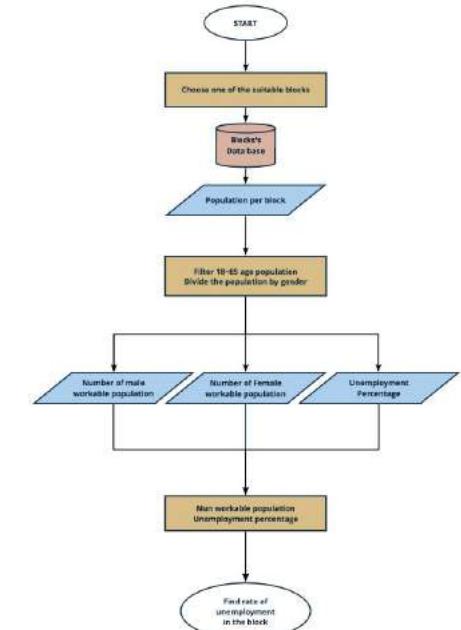
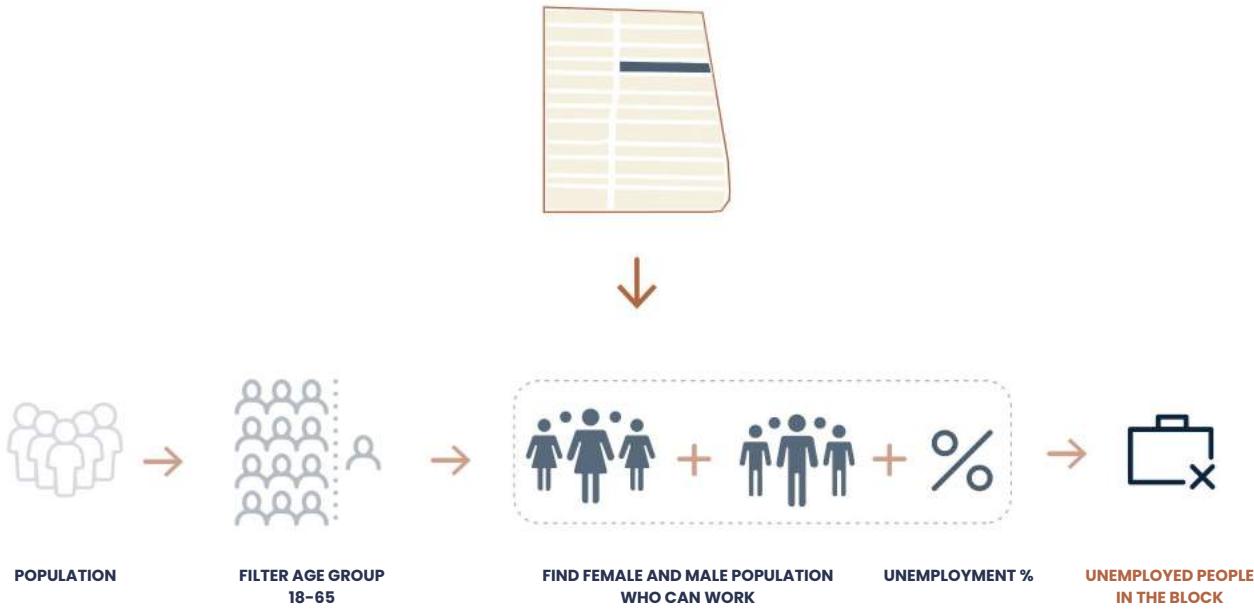
3. SHORTEST PATH TO BAZAAR AND ENTRANCE



4. SELECTION OF THE BLOCK



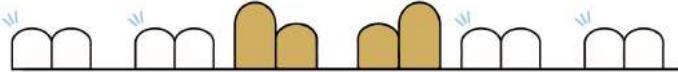
BLOCK SCALE | Analysis



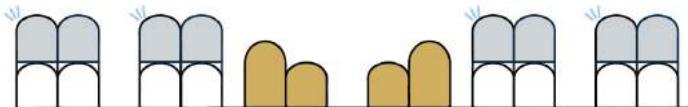
UNIT SCALE | Analysis



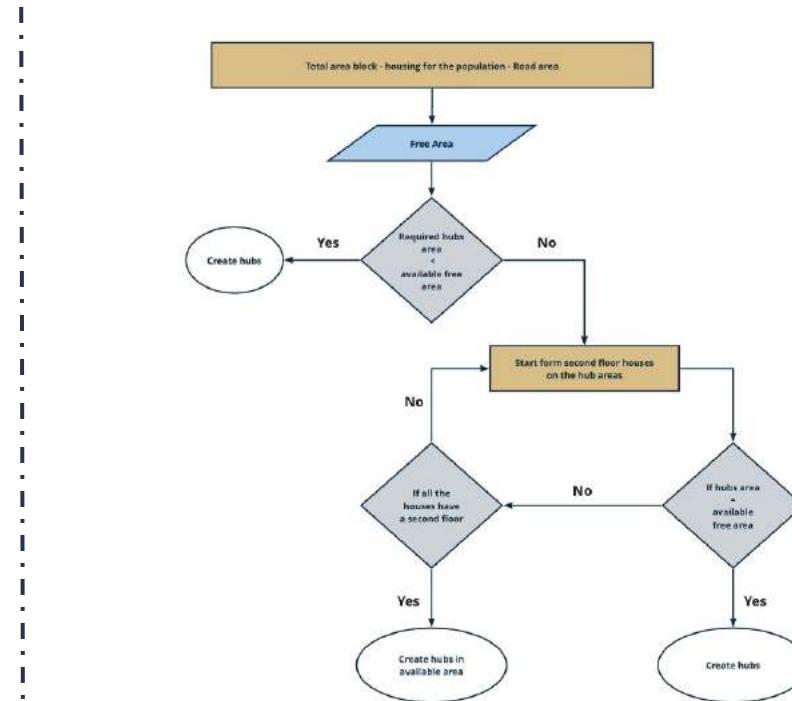
1. Count **needed hub area**



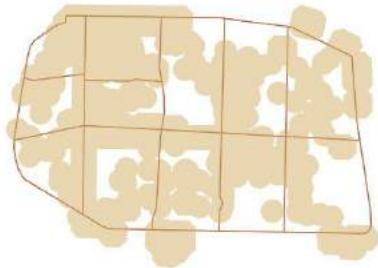
2. Count **houses needed**



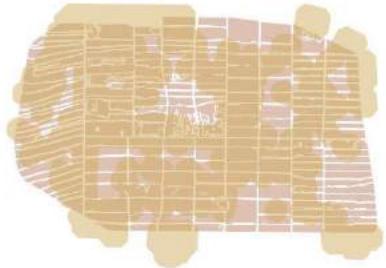
3. Start building **second floors for houses**



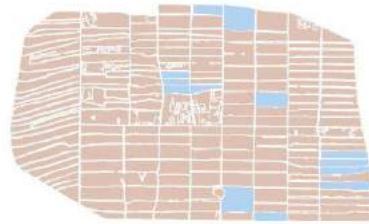
BLOCKS SELECTION | Process Overview



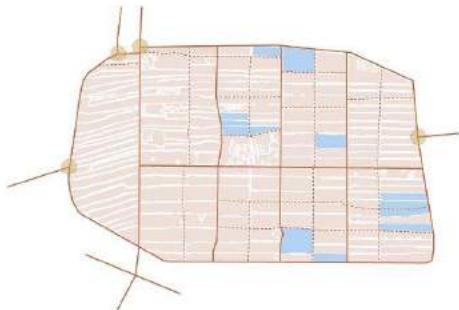
1. Analyse **influence area**



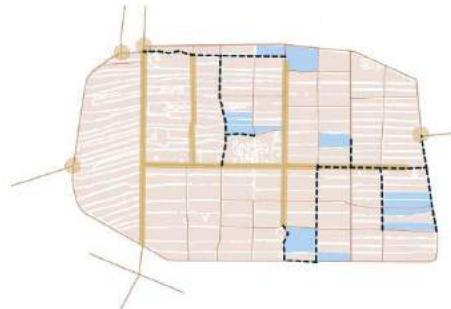
2. Analyse **influence area on blocks**



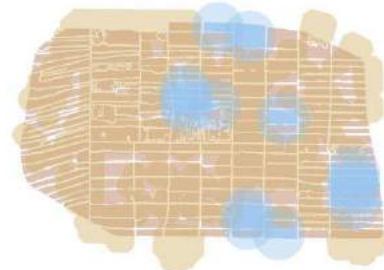
3. Find **least developed blocks**



4. Analyse **connectivity to gates and main roads**



5. Find **connectivity to markets and gates**



6. New **influence area Map of Zaatari**

GAMIFICATION | Goals



A spatial configuration and construction **manual**



Based on **modular** components
that can be connected in a **game-like logic**

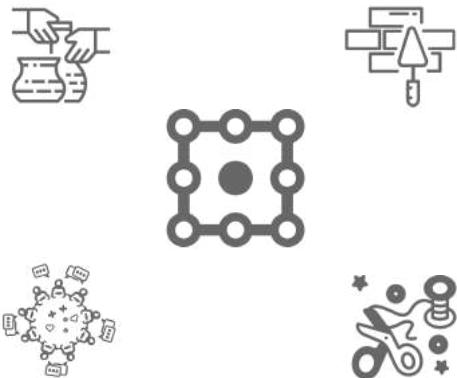


Creating different possible outcomes to cover different needs
based on **population** and **site** criteria

GAMIFICATION | Game Applications

0. Makers Hubs

Small decentralised hubs surrounded by housing, where people who live in the neighborhood are able to find creative employment and training related with brick production, pottery, sculpting and textile making.



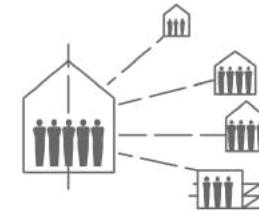
1. Private Housing

Houses that can host one big family at a time, consisting of 6 to 8 people.

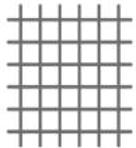


2. Communal Housing

Houses that are capable to host at the same time multiple families of 2-5 people each, by sharing all the communal facilities.

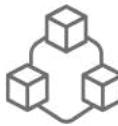


GAMIFICATION | Game Components



0. Tartan Grid

a modular coordination system to create the game module and units



2. Units

combination of more than one modules make the game units



1. Module

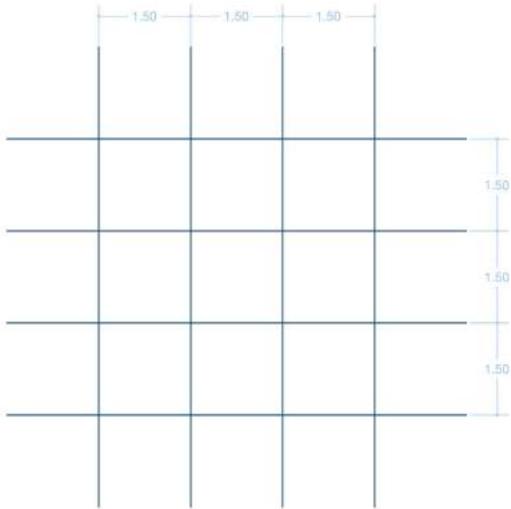
the smallest piece of the game, a rectangle of 1.5 m * 1.5 m



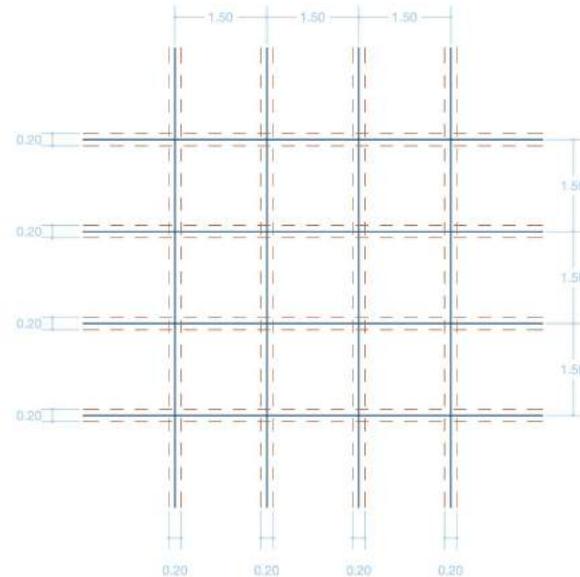
3. Rules of Connection

a set of rules defining which units can be connected together and in what ways

GAMIFICATION | Definition of the Tartan Grid

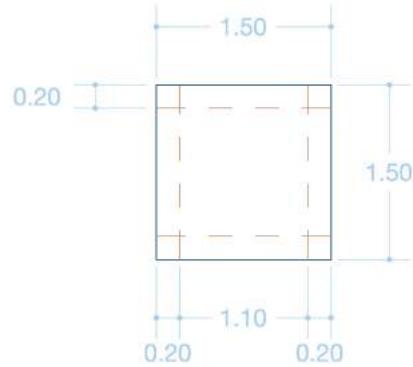


TARTAN GRID

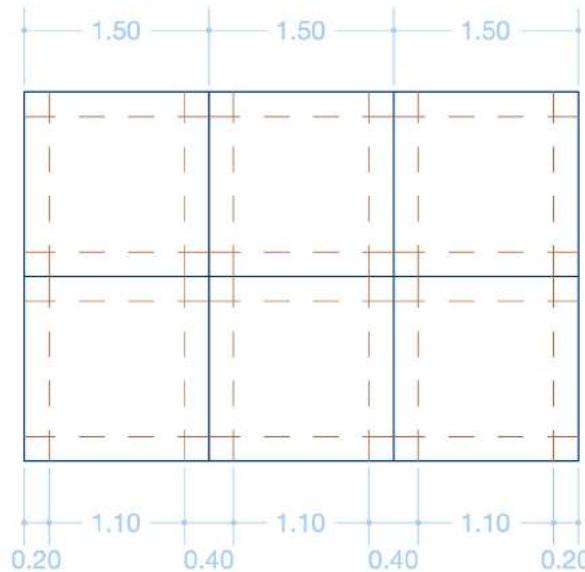


DOUBLE TARTAN GRID

GAMIFICATION | Definition of the Module



1 MODULE



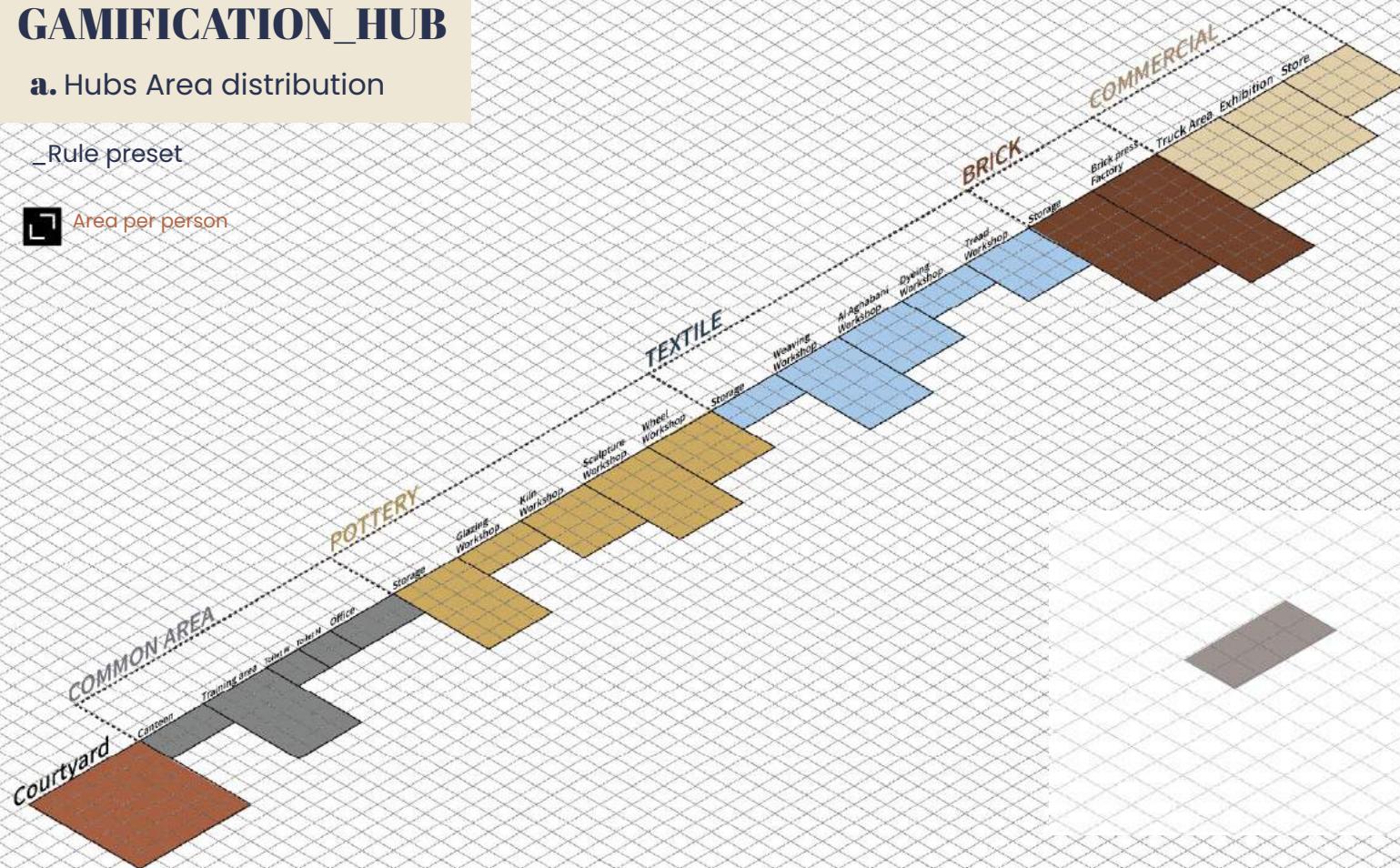
MODULES COMBINED
for the creation of units

GAMIFICATION_HUB

a. Hubs Area distribution

_Rule preset

 Area per person

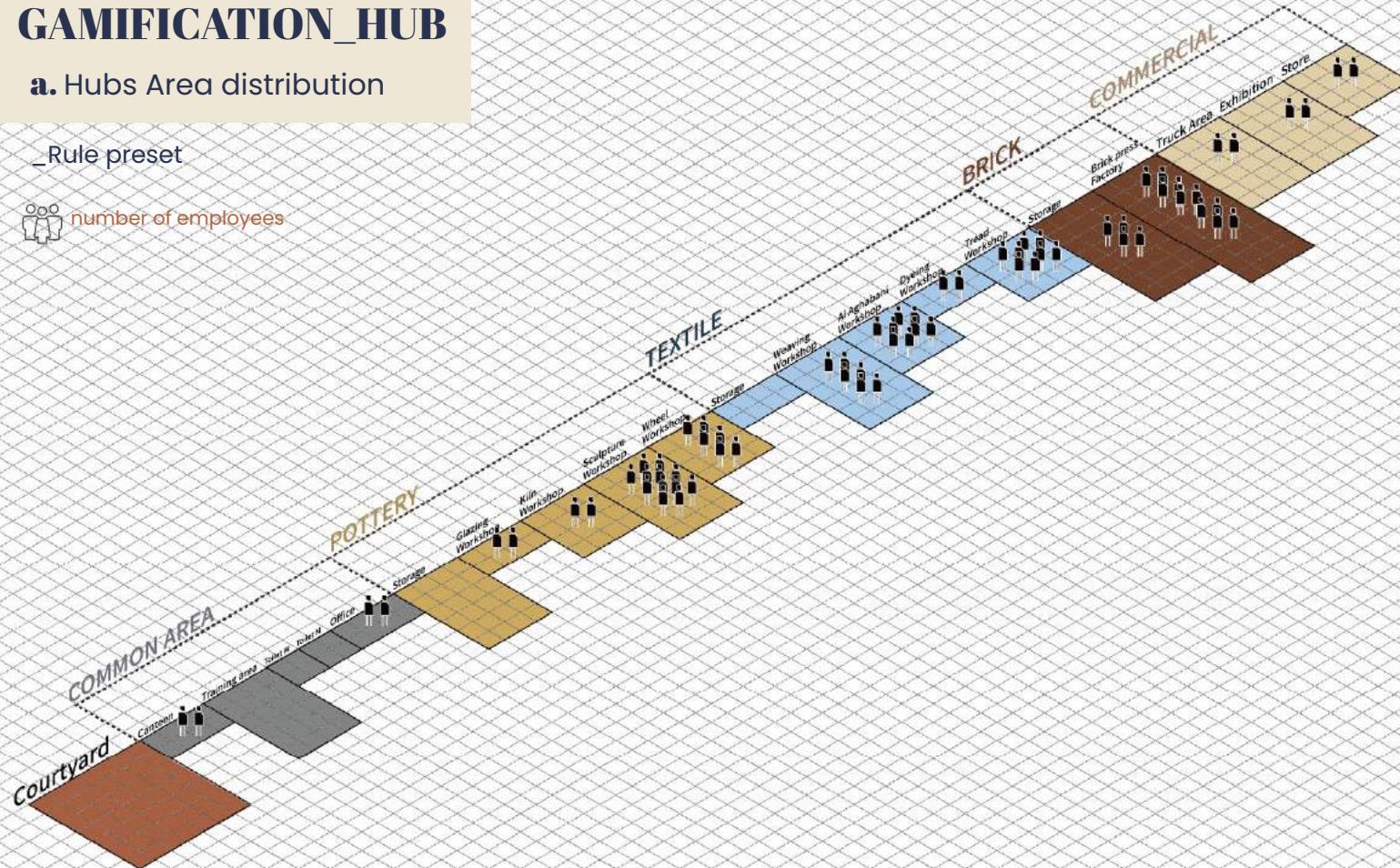


GAMIFICATION_HUB

a. Hubs Area distribution

_Rule preset

number of employees

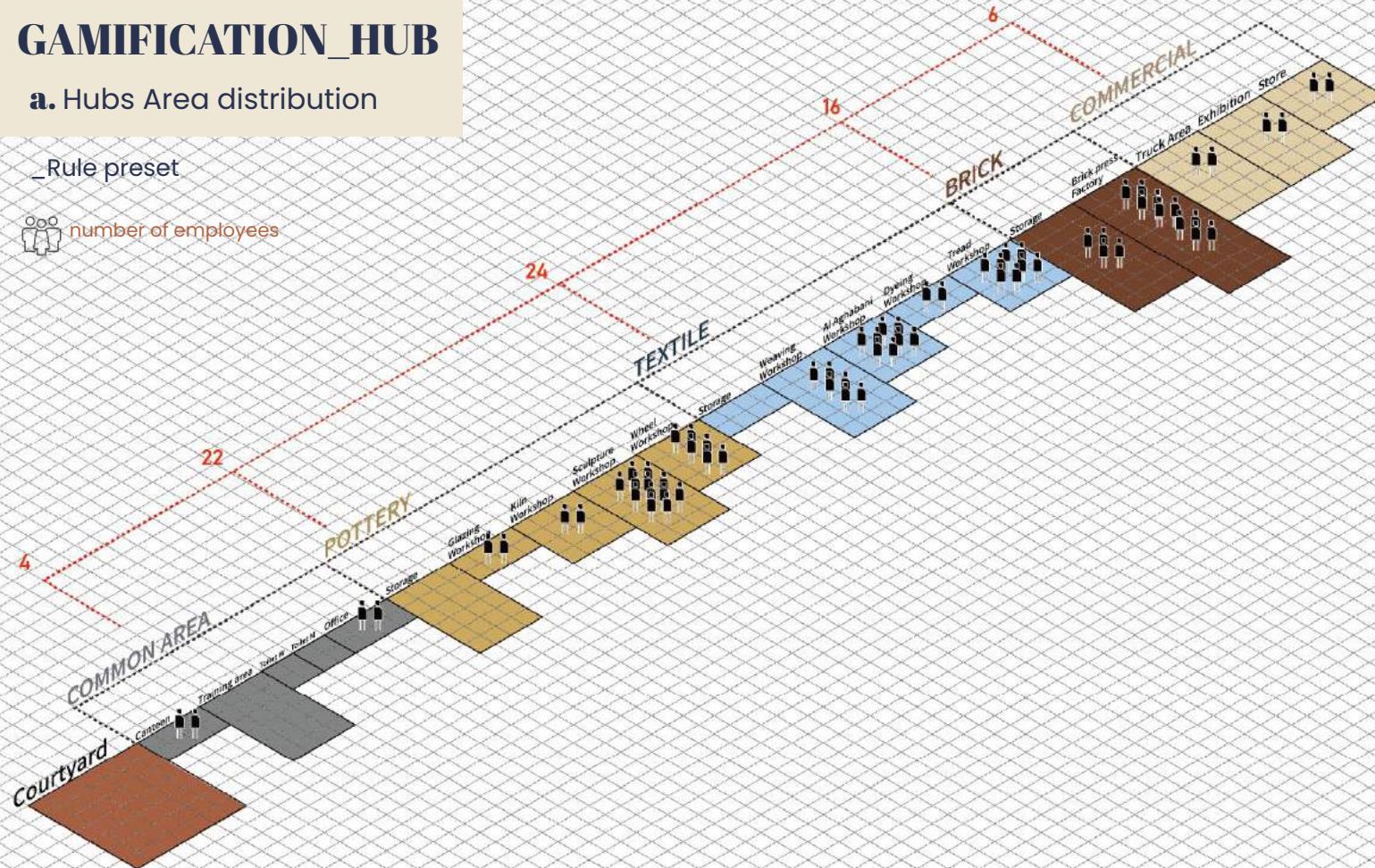


GAMIFICATION_HUB

a. Hubs Area distribution

_Rule preset

number of employees

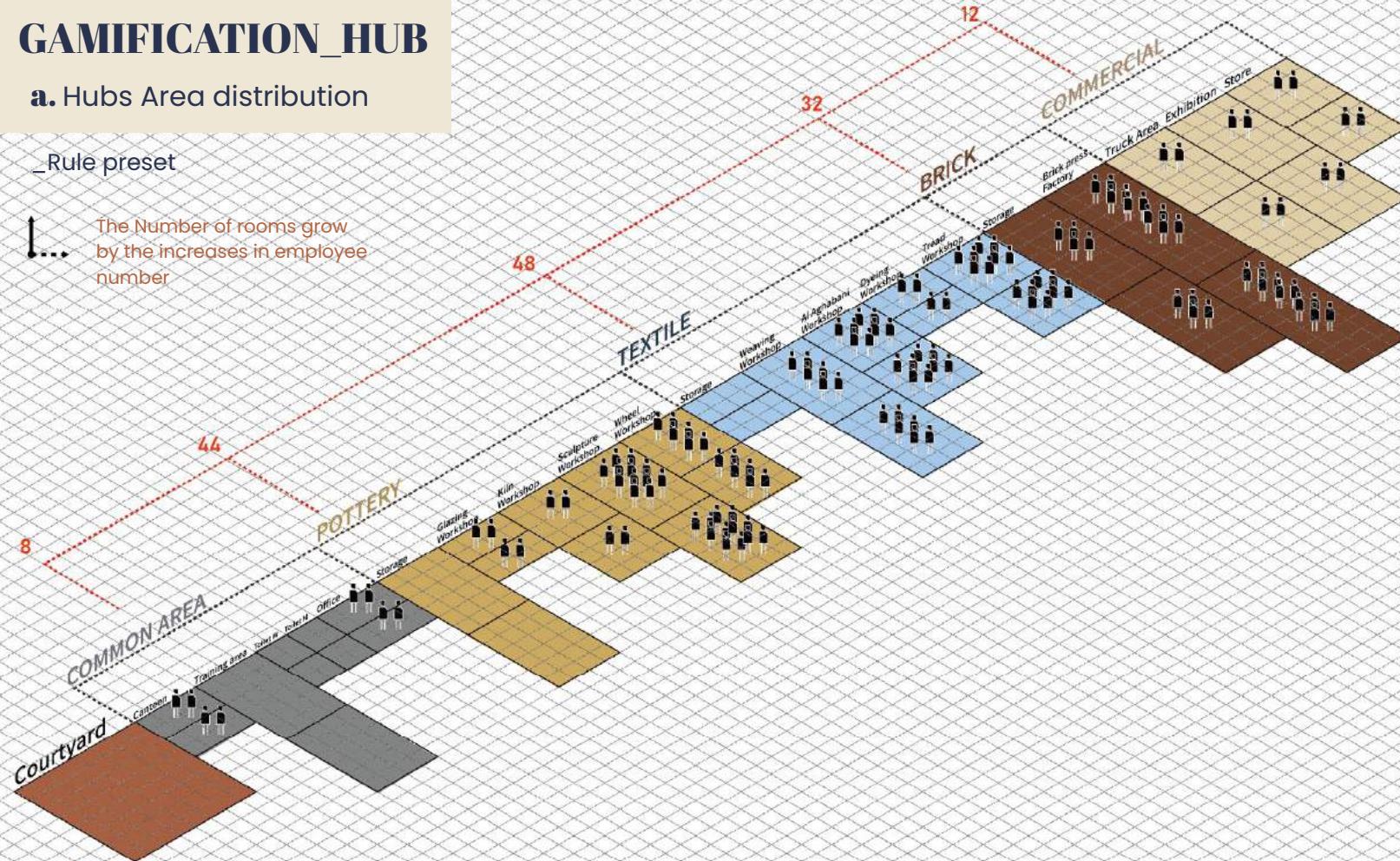


GAMIFICATION_HUB

a. Hubs Area distribution

_Rule preset

|...
The Number of rooms grow
by the increases in employee
number

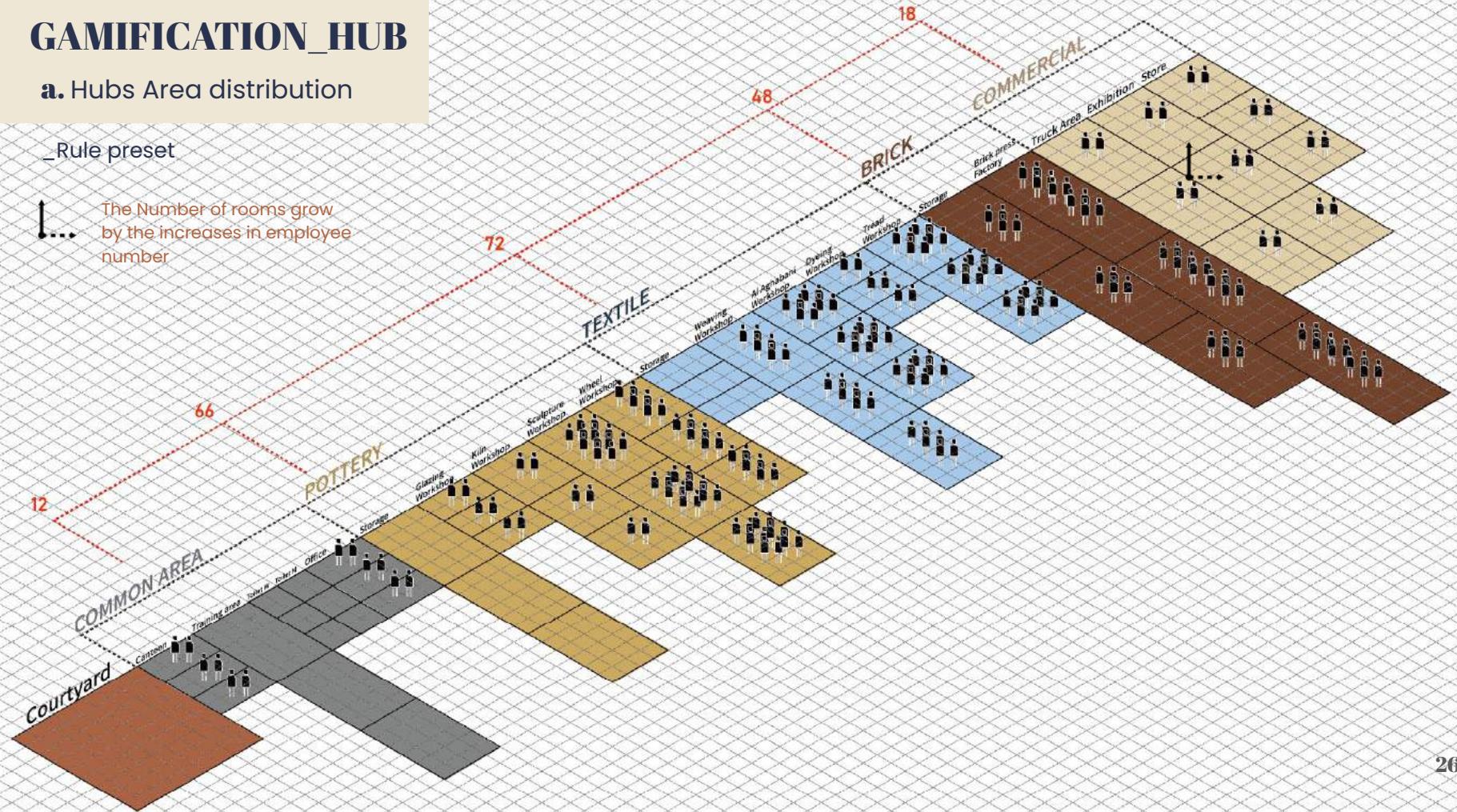


GAMIFICATION_HUB

a. Hubs Area distribution

_Rule preset

... The Number of rooms grow by the increases in employee number

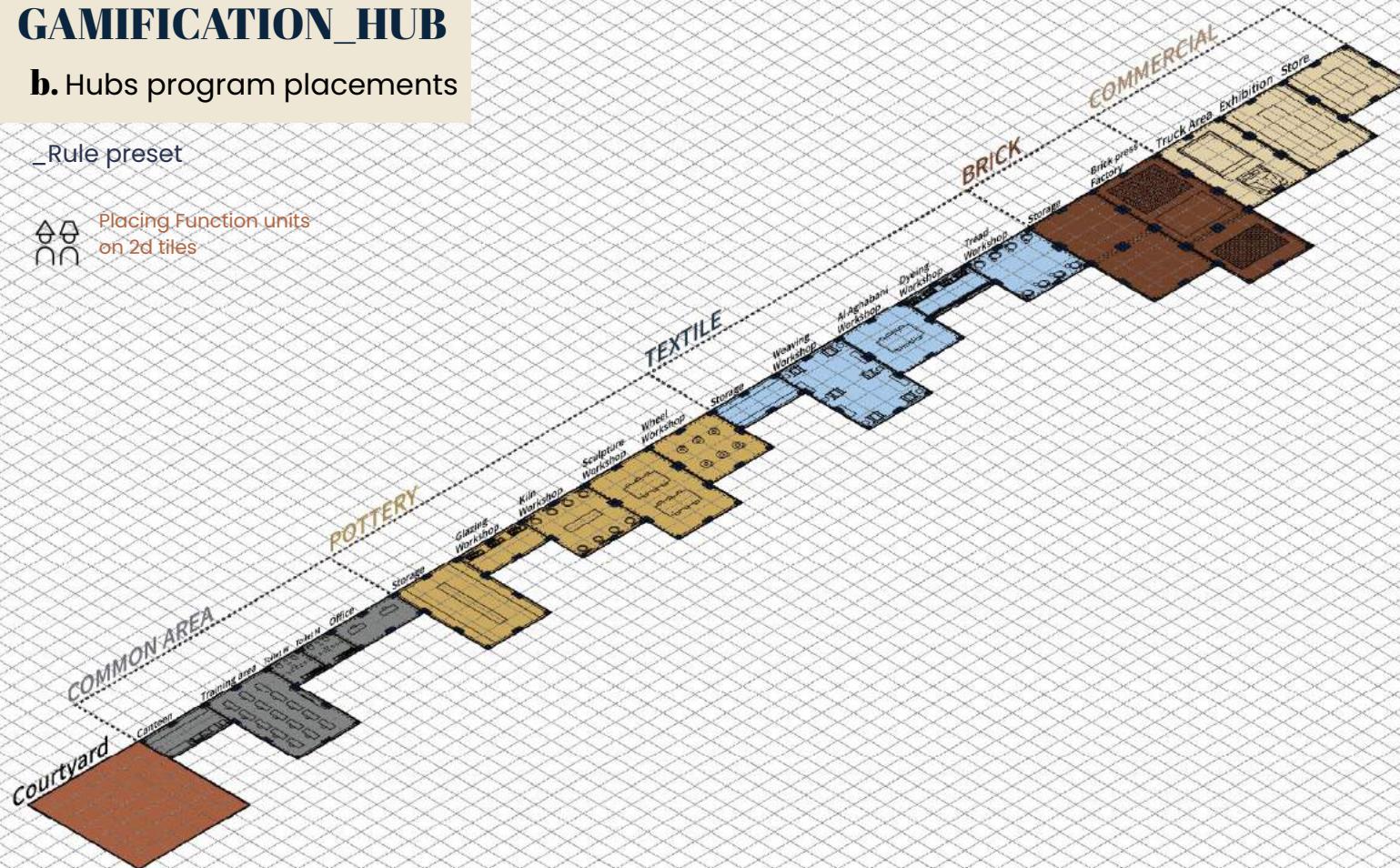


GAMIFICATION_HUB

b. Hubs program placements

_Rule preset

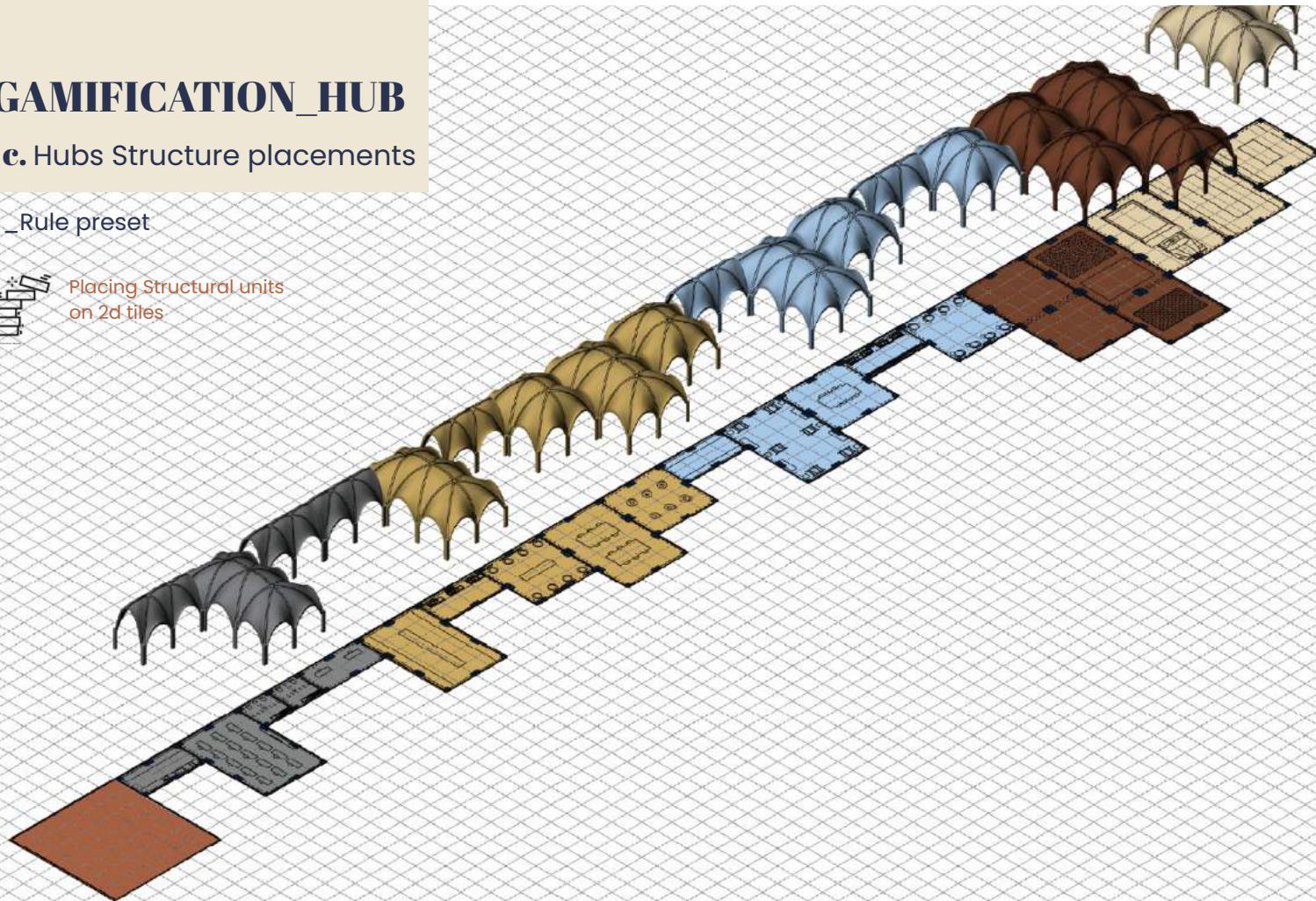
 Placing Function units
on 2d tiles



GAMIFICATION_HUB

c. Hubs Structure placements

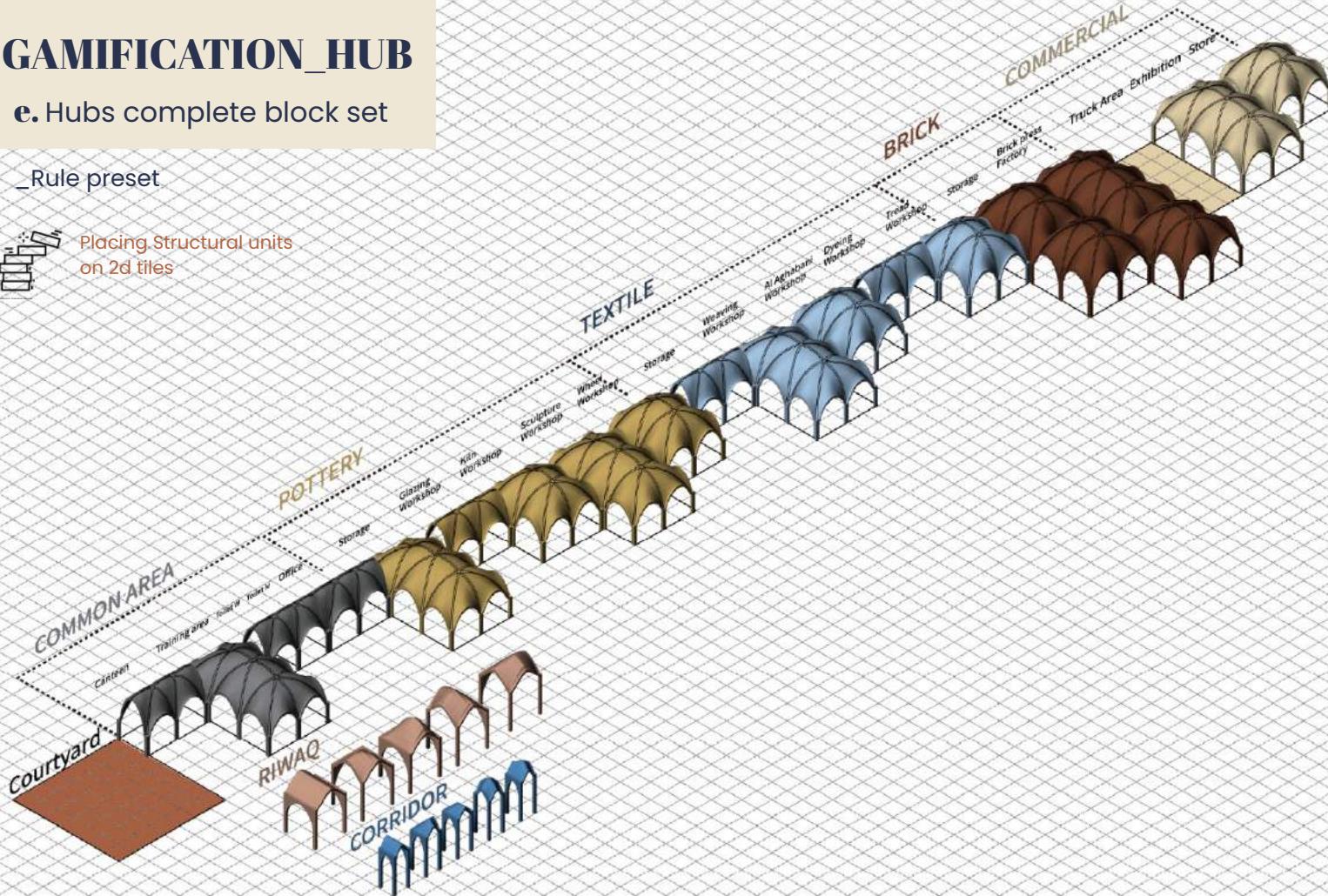
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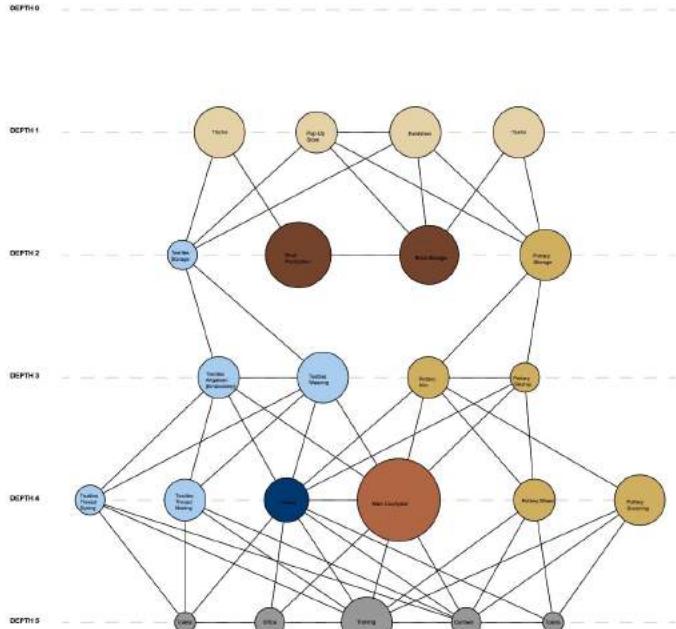
GAMIFICATION_HUB

e. Hubs complete block set

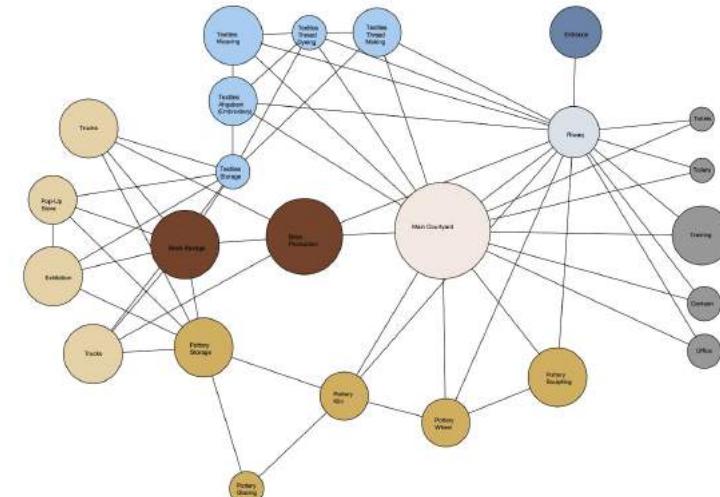
_Rule preset



GAMIFICATION | Configuration of Hubs Units



Depth Diagram



Bubble Diagram

GAME START

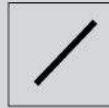


Place Vehicular Roads



Curve

Place Vehicular Roads



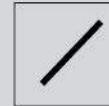
Curve

Place Vehicular Roads



Curve

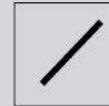
Place Vehicular Roads



Curve

Done

Place Vehicular Roads

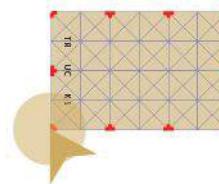


Curve

Done

Place Commercial

Truck area



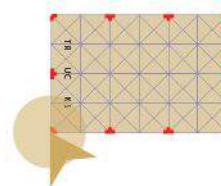
Pick a
Startpoint

Rotate

Done

Place Commercial

Truck area



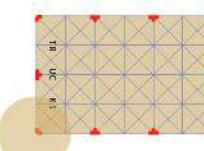
Pick a
Startpoint

Rotate

Done

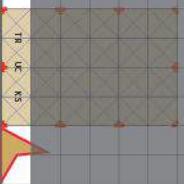
Place Commercial

Truck area



Pick a
Startpoint

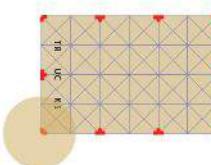
Rotate



Done

Place Commercial

Truck area



Pick a
Startpoint

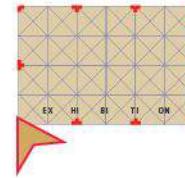
Rotate



Done 

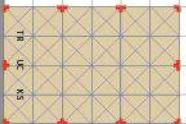
Place Commercial

Exhibition area



Pick a
Startpoint

Rotate



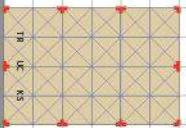
Done

Place Commercial

Exhibition area



Pick a
Startpoint



Done

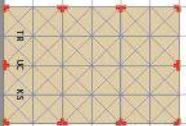
Place Commercial

Exhibition area



Pick a
Startpoint

Rotate



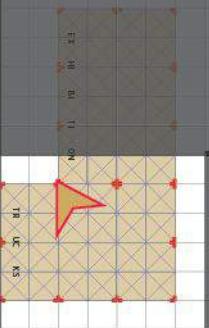
Done

Place Commercial

Exhibition area

Pick a
Startpoint

Rotate



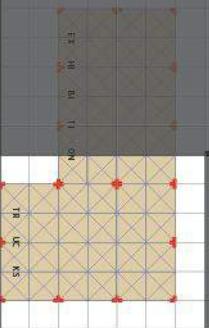
Done

Place Commercial

Exhibition area

Pick a
Startpoint

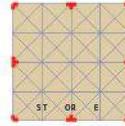
Rotate



Done

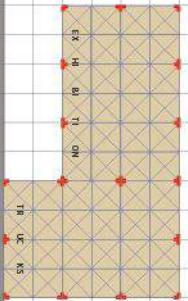
Place Commercial

Store area



Pick a
Startpoint

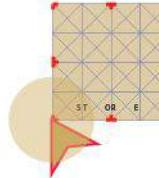
Rotate



Done

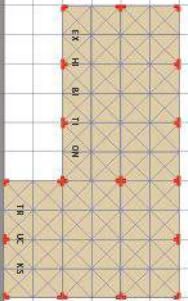
Place Commercial

Store area



Pick a
Startpoint

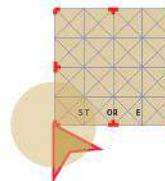
Rotate



Done

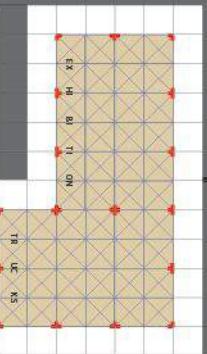
Place Commercial

Store area



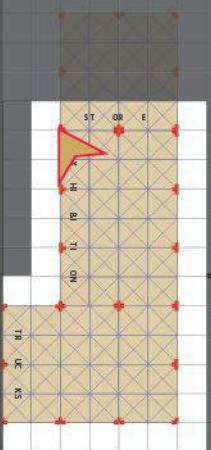
Pick a
Startpoint

Rotate



Done

Place Commercial



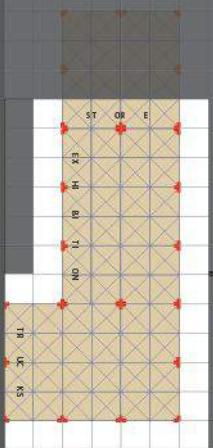
Store area

Pick a
Startpoint

Rotate

Done

Place Commercial



Store area

Pick a
Startpoint

Rotate

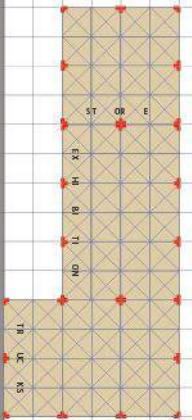
Done 

Complete Commercial

Store area

Click Done

Rotate



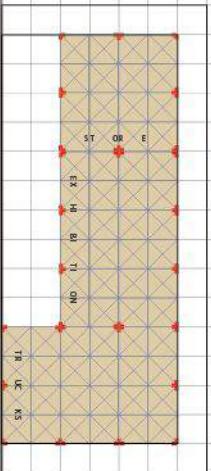
Done

Complete Commercial

Store area

Click Done

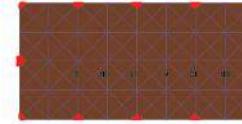
Rotate



Done

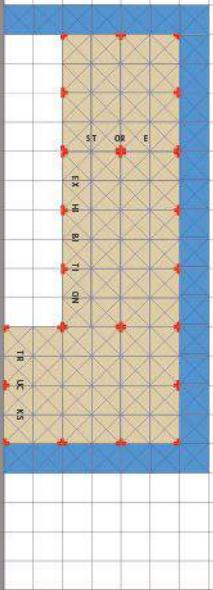
Place Bricks

Brick Storage area



Pick a
Startpoint

Rotate



Done

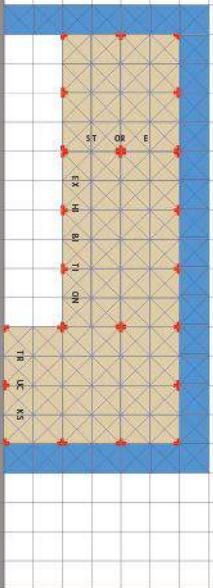
Place Bricks

Brick Storage area



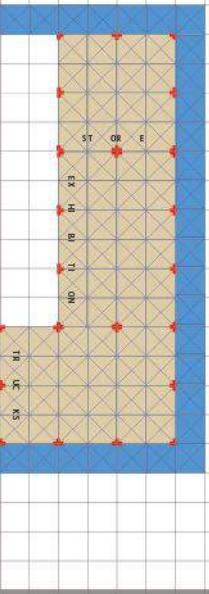
Pick a
Startpoint

Rotate



Done

Place Bricks



Brick Storage area

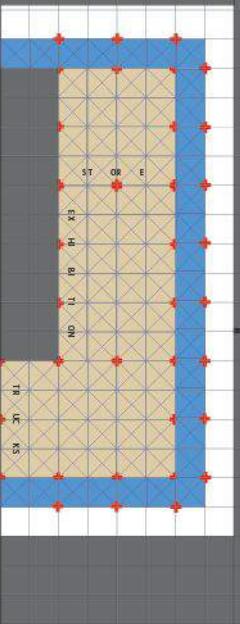


Pick a
Startpoint

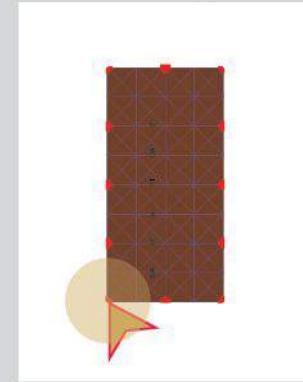
Rotate

Done

Place Bricks



Brick Storage area

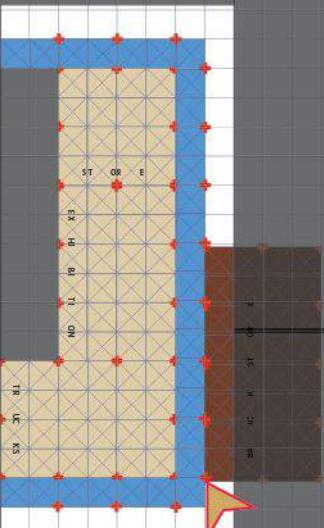


Pick a
Startpoint

Rotate

Done

Place Bricks



Brick Storage area

Pick a
Startpoint

Rotate

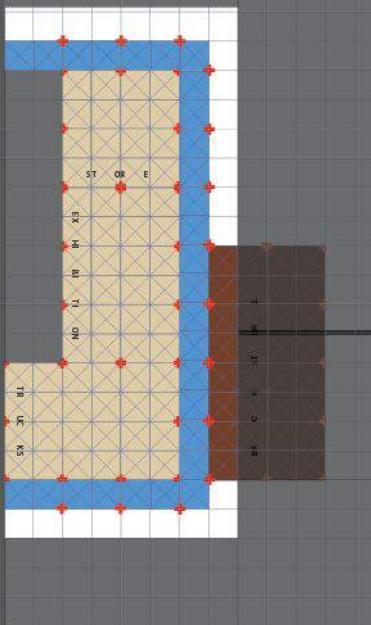
Done

Place Bricks

Brick Storage area

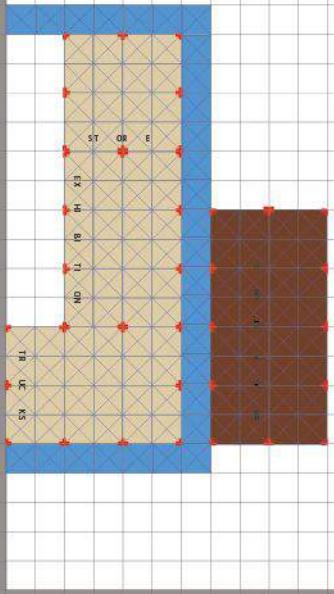
Pick a Startpoint

Rotate

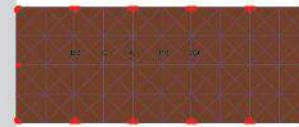


Done

Place Bricks



Brick Press area

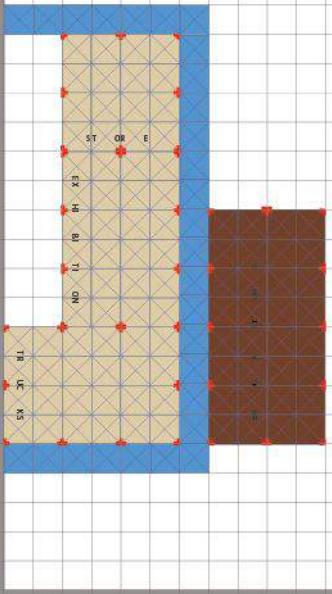


Pick a
Startpoint

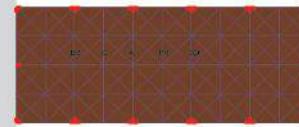
Rotate

Done

Place Bricks



Brick Press area



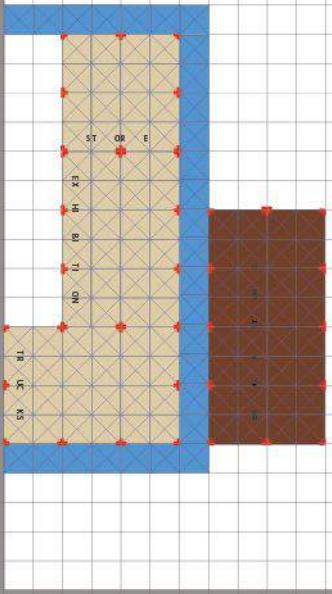
Pick a
Startpoint

Rotate

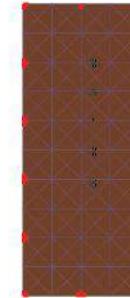


Done

Place Bricks



Brick Press area

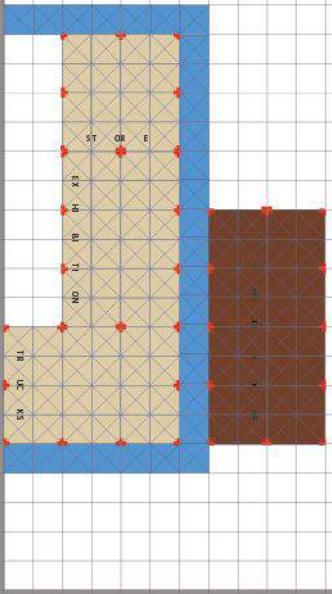


Pick a
Startpoint

Rotate

Done

Place Bricks



Brick Press area

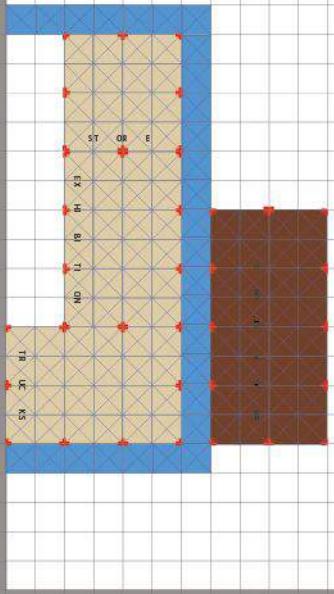


Pick a
Startpoint

Rotate

Done

Place Bricks



Brick Press area



Pick a
Startpoint

Rotate

Done

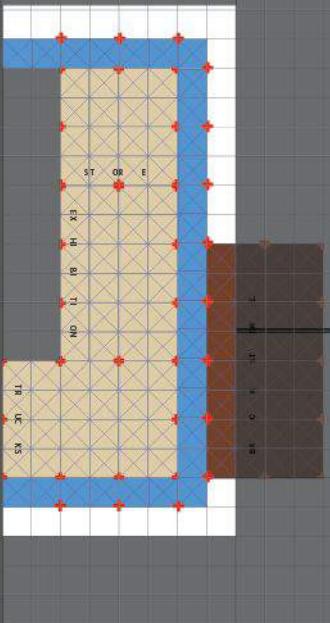
Place Bricks

Brick Press area

Pick a
Startpoint

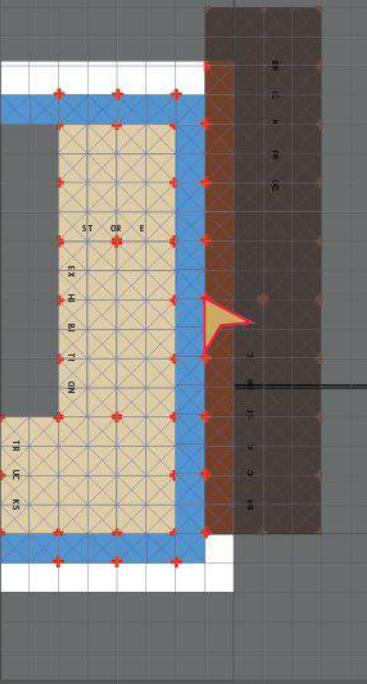


Rotate



Done

Place Bricks



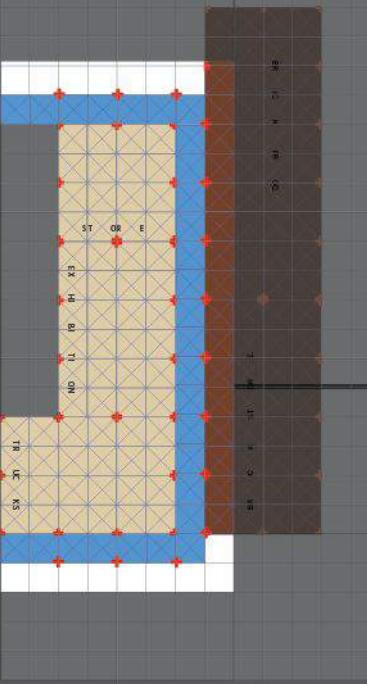
Brick Press area

Pick a
Startpoint

Rotate

Done

Place Bricks

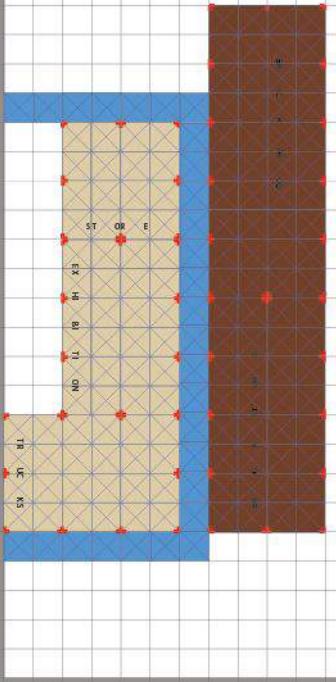


Brick Press area

Pick a
Startpoint

Rotate

Complete Bricks



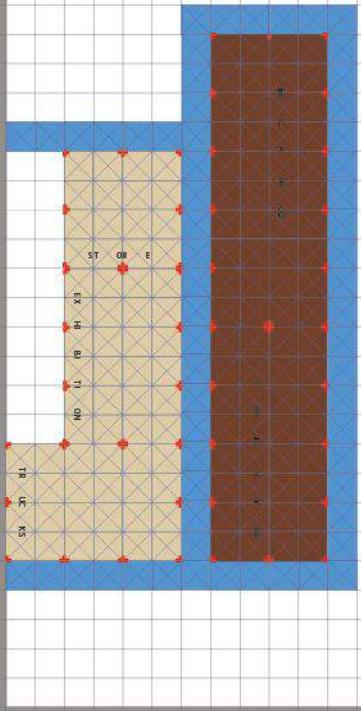
Brick Press area

Press
Done

Rotate



Complete Bricks

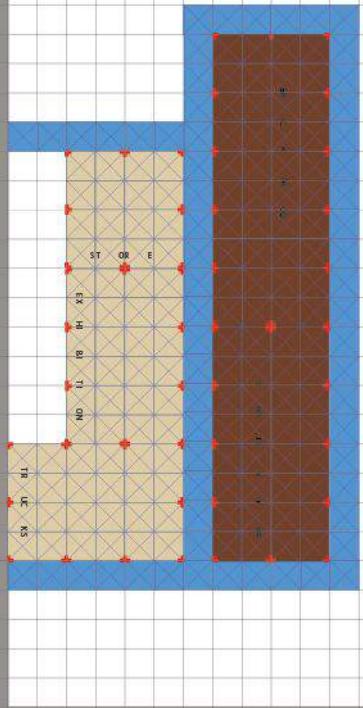


Brick Press area

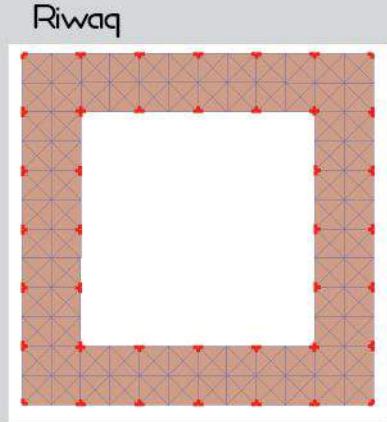
Press
Done

Rotate





Place Riwaq

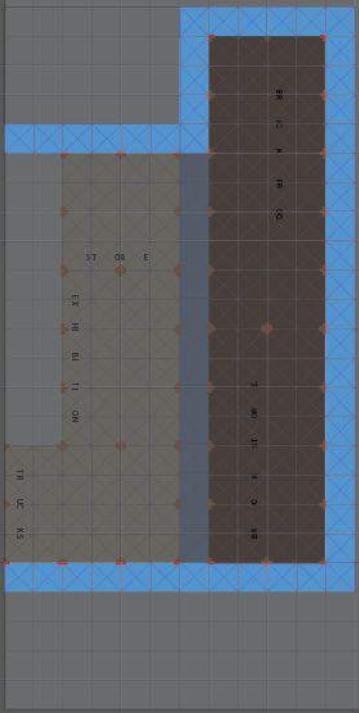


Rotate

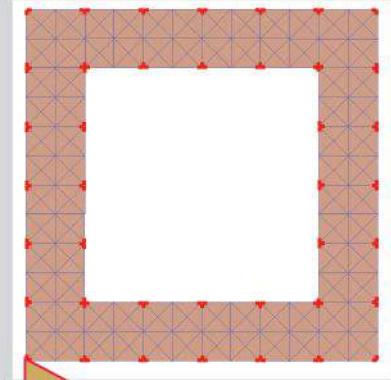
Pick a
Startpoint

Dome

Place Riwaq



Riwaq

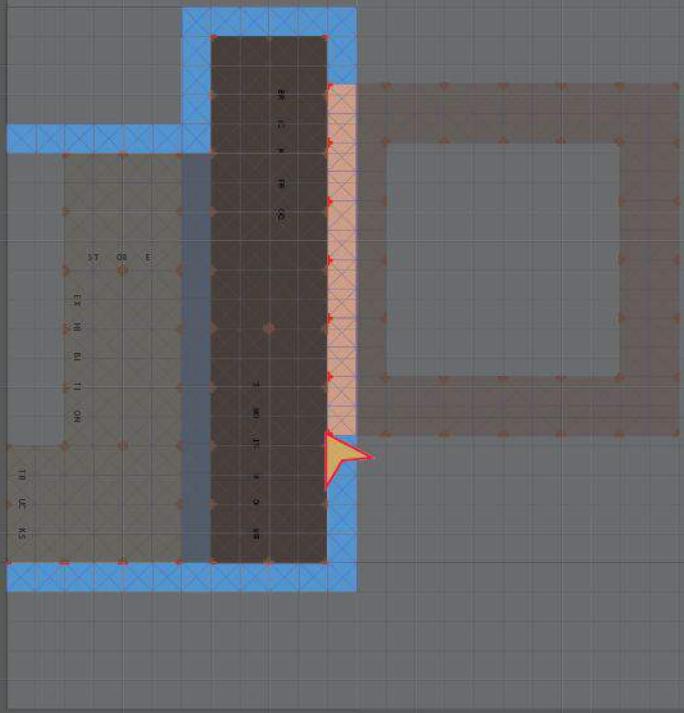


Rotate Pick a
Startpoint

Done

Place Riwaq

Riwaq



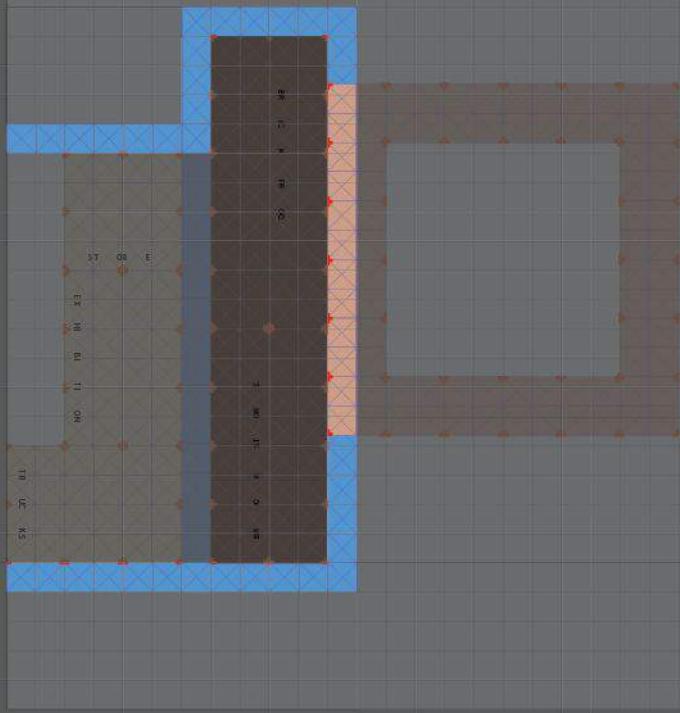
Rotate

Pick a
Startpoint

Done

Place Riwaq

Riwaq

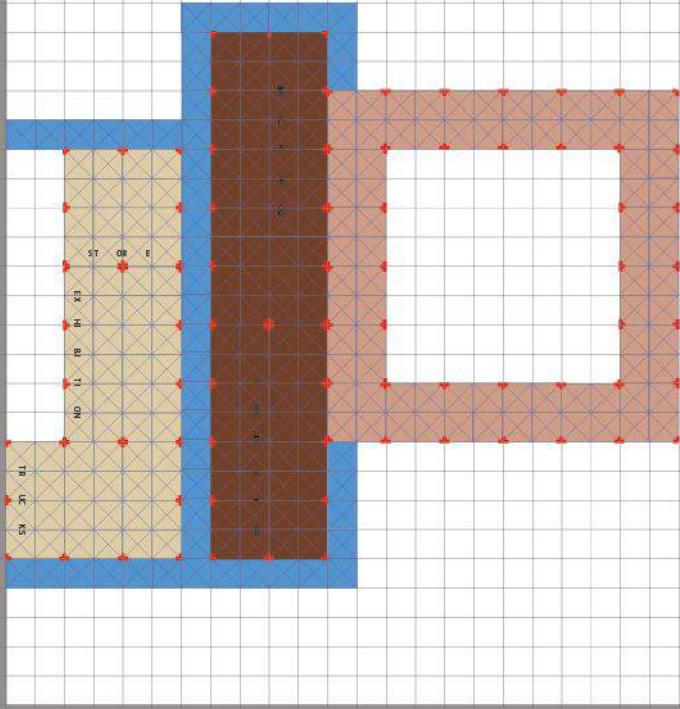


Rotate

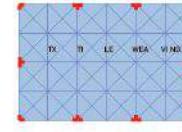
Pick a
Startpoint

Done 

Place Textile



Textile Storage

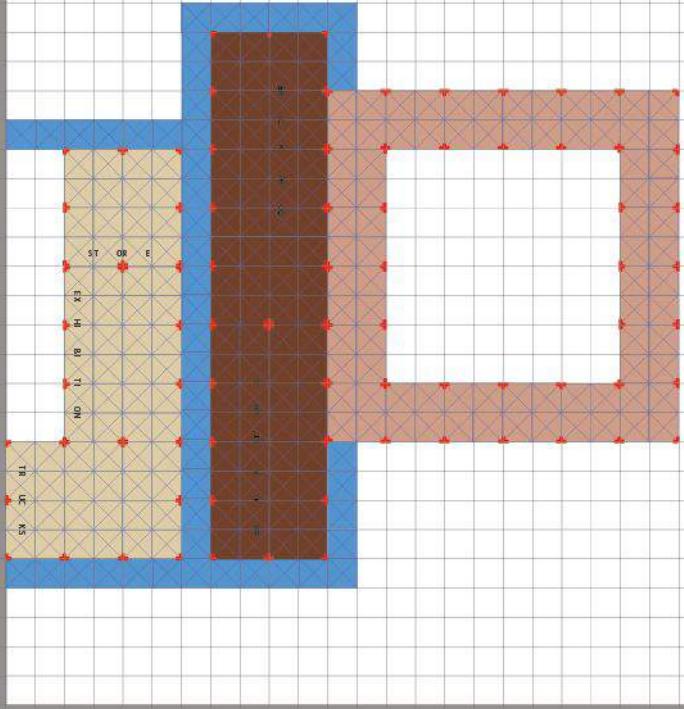


Pick a
Startpoint

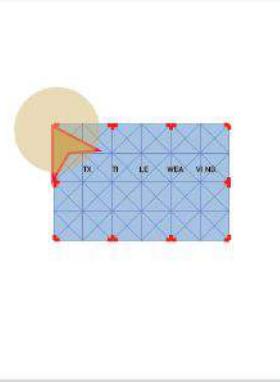
Rotate

Done 

Place Textile



Textile Storage

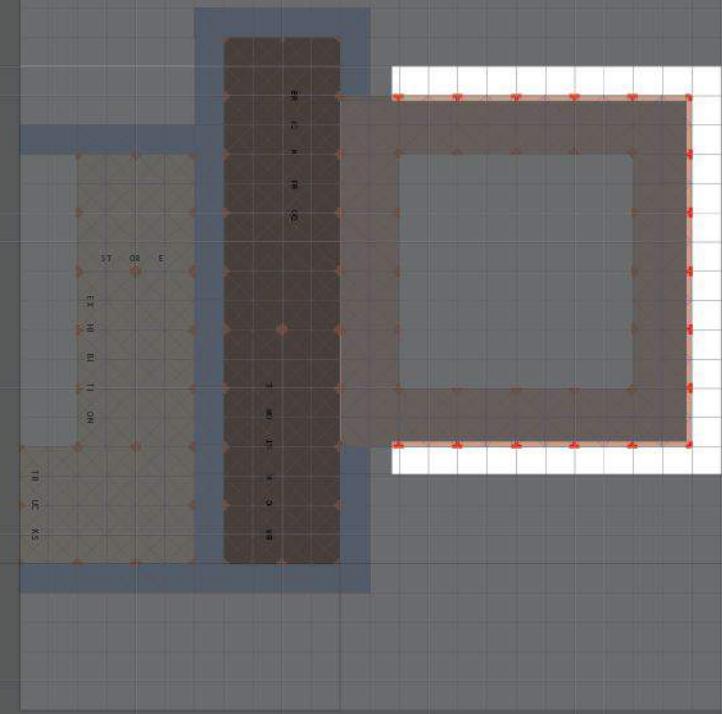


Pick a
Startpoint

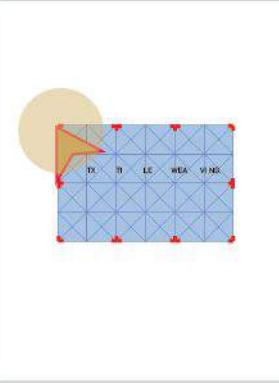
Rotate

Done

Place Textile



Textile Storage

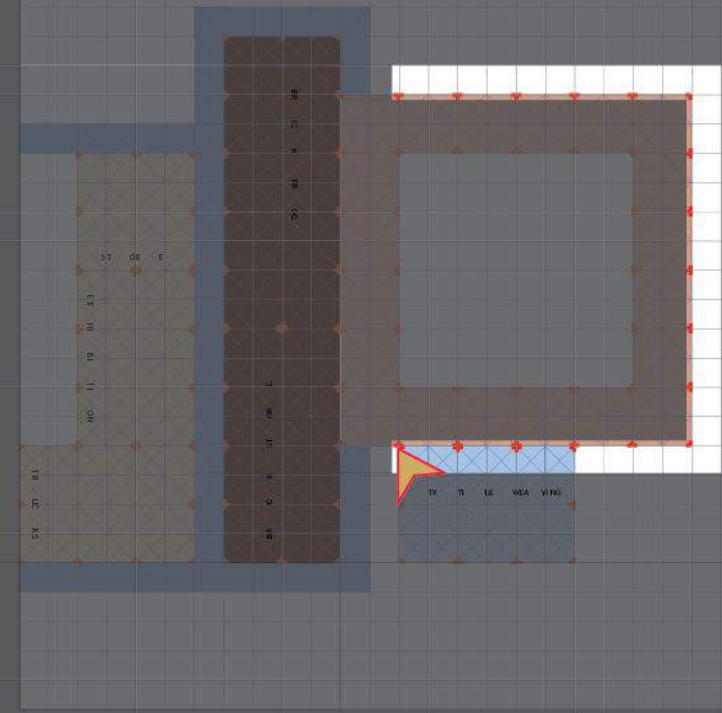


Pick a
Startpoint

Rotate

Done

Place Textile



Textile Storage

Pick a
Startpoint

Rotate

Done

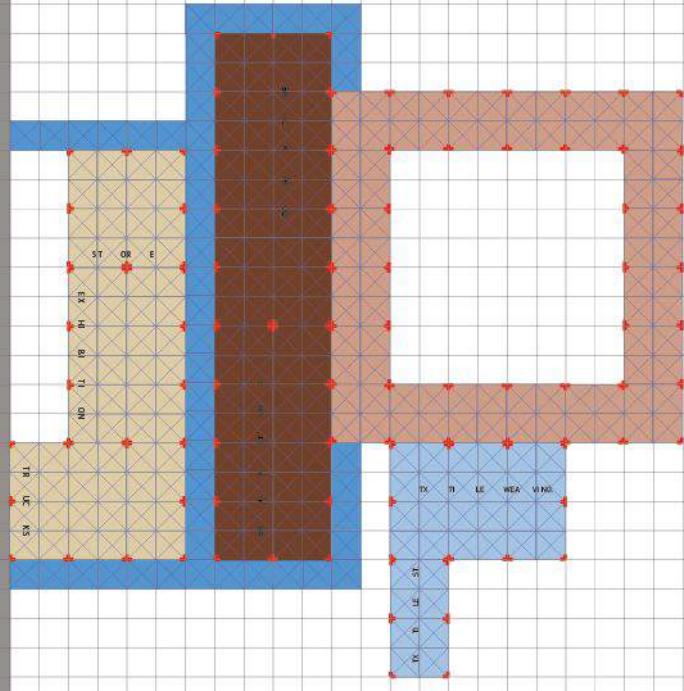
Place Textile

Textile Weaving



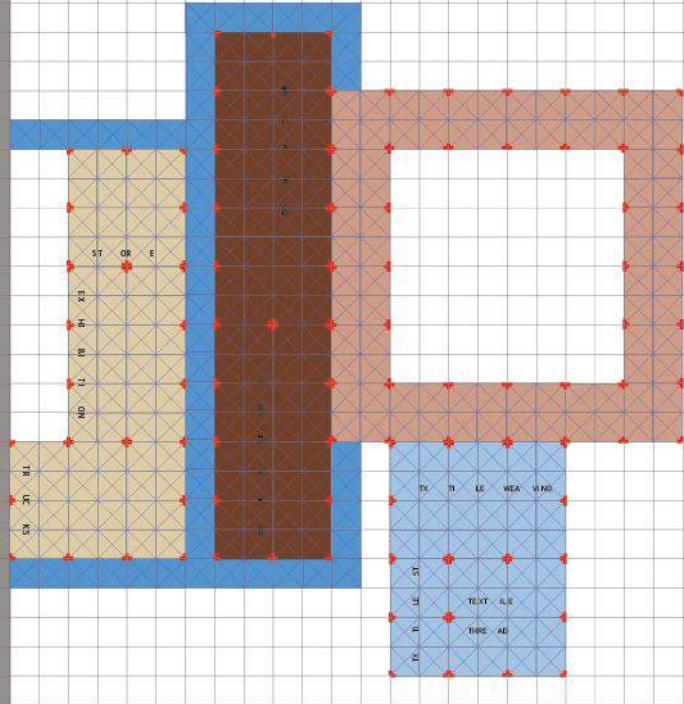
Pick a
Startpoint

Rotate

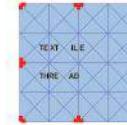


Done

Place Textile



Textile Thread

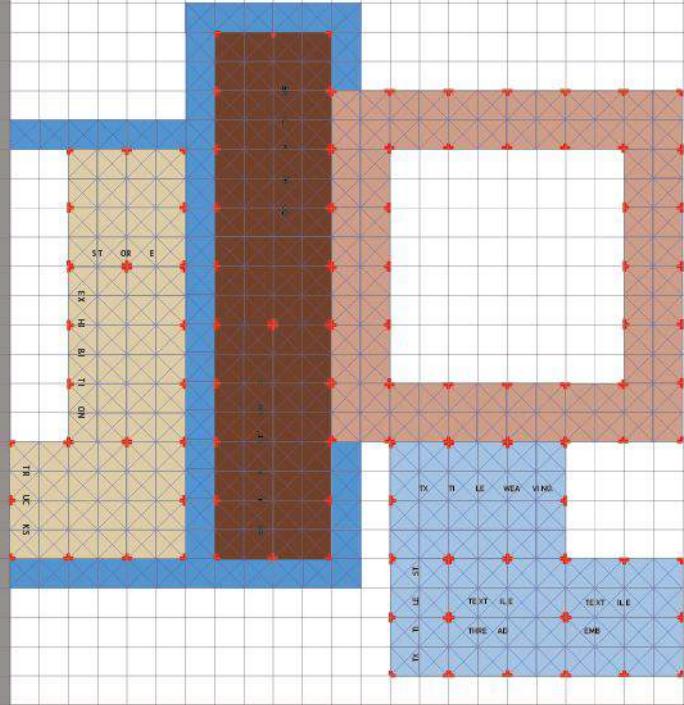


Pick a
Startpoint

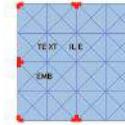
Rotate

Done

Place Textile



Textile Al agabani

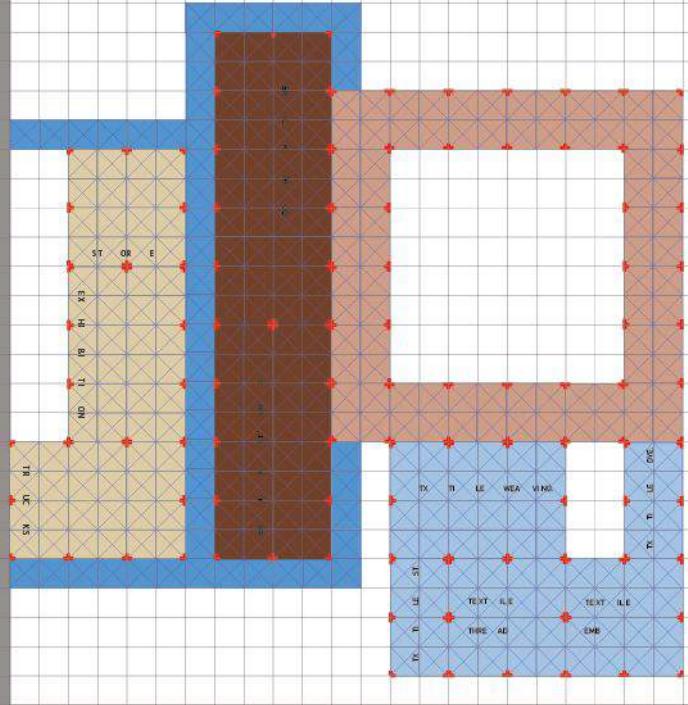


Pick a
Startpoint

Rotate

Done

Place Textile



Textile Dyeing



Pick a
Startpoint

Rotate

Done

Place Textile

Textile Dyeing

Pick a
Startpoint



Rotate

Done

Complete Textile



Textile Dyeing

Press
Done

Rotate

Done

Complete Textile



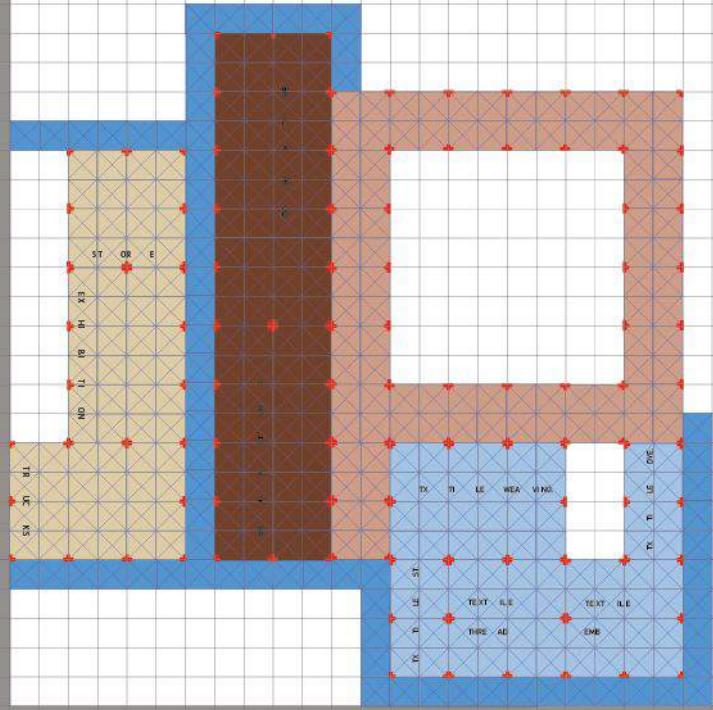
Textile Dyeing

Press
Done

Rotate

Done

Complete Textile



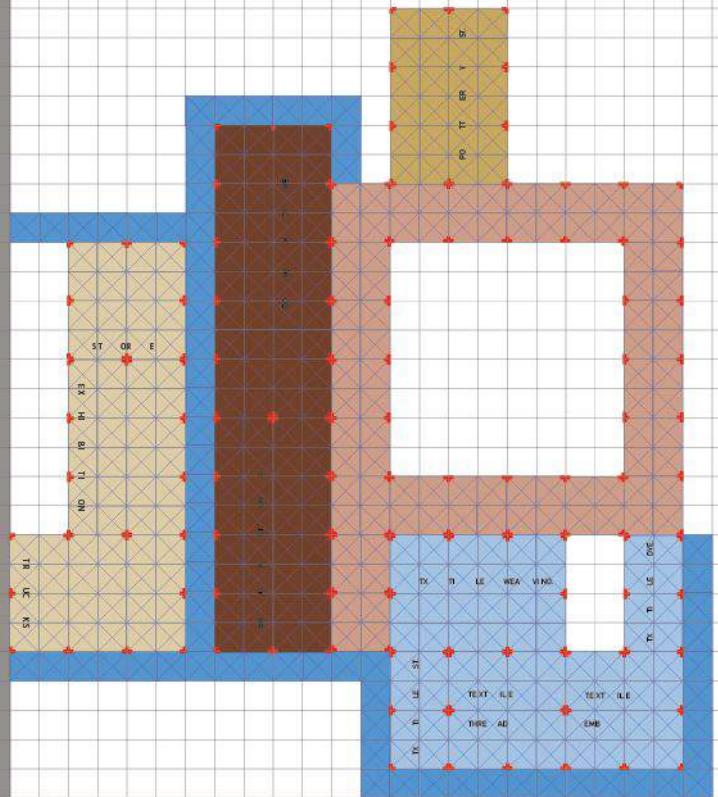
Textile Dyeing

Press
Done

Rotate

Done

Place Pottery

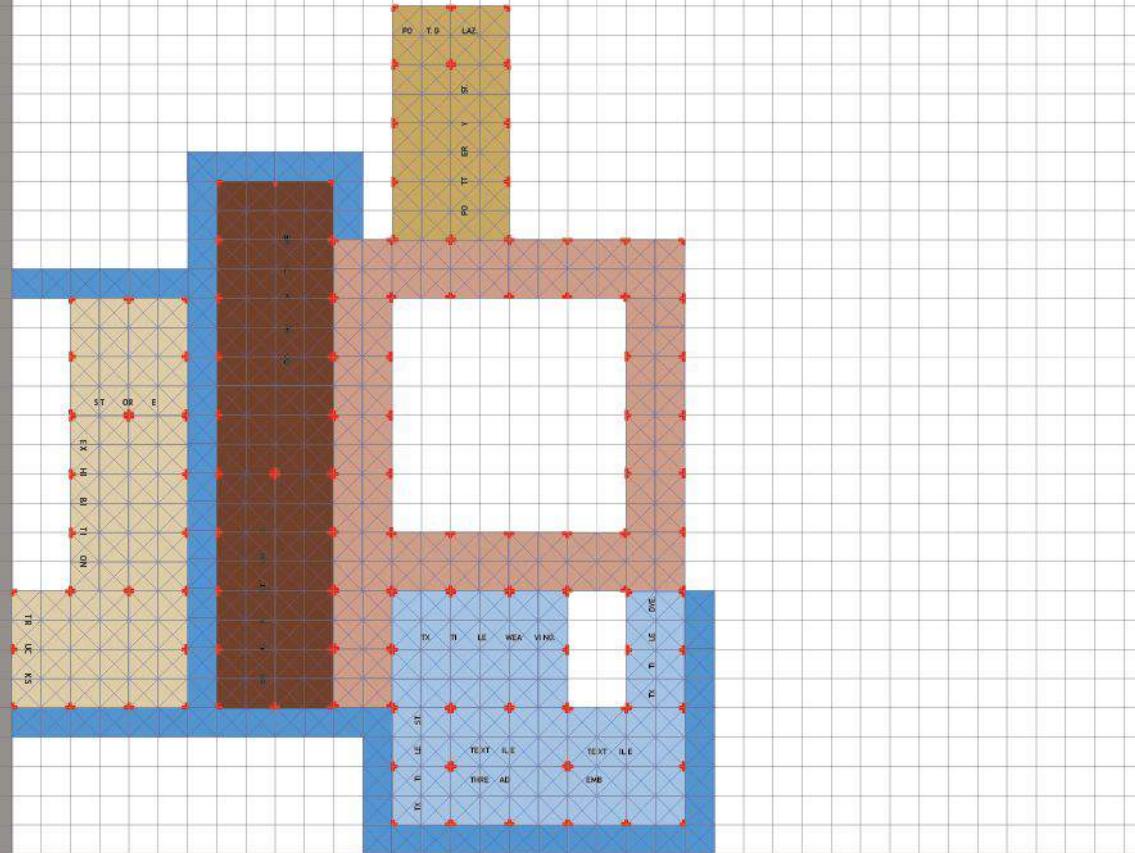


Press
Done

Rotate

Done

Place Pottery

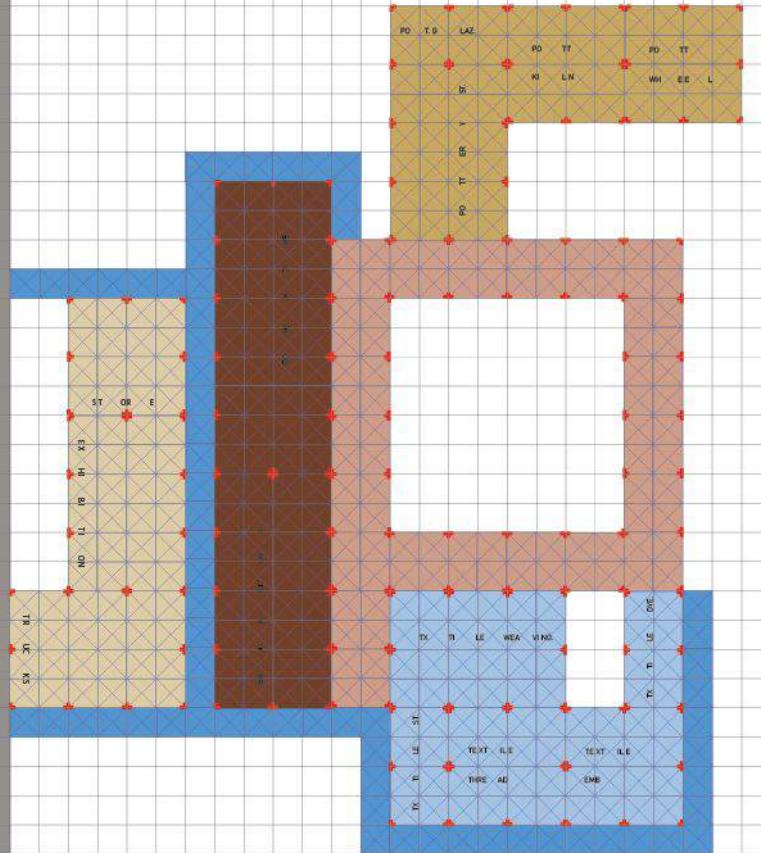


Press
Done

Rotate

A small orange triangle pointing right, indicating completion.

Place Pottery

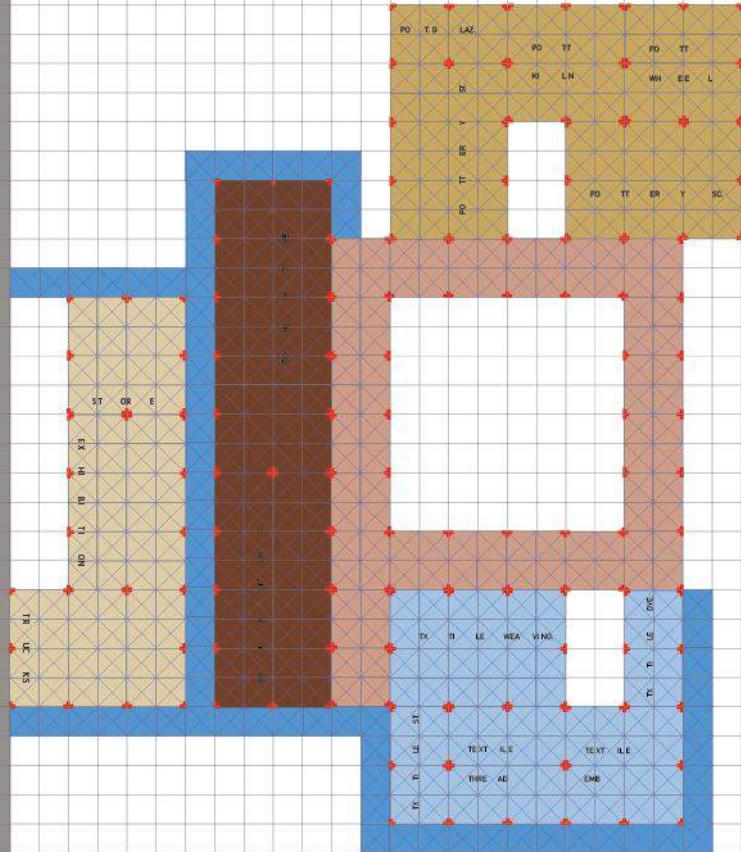


Press
Done

Rotate

Done

Place Pottery

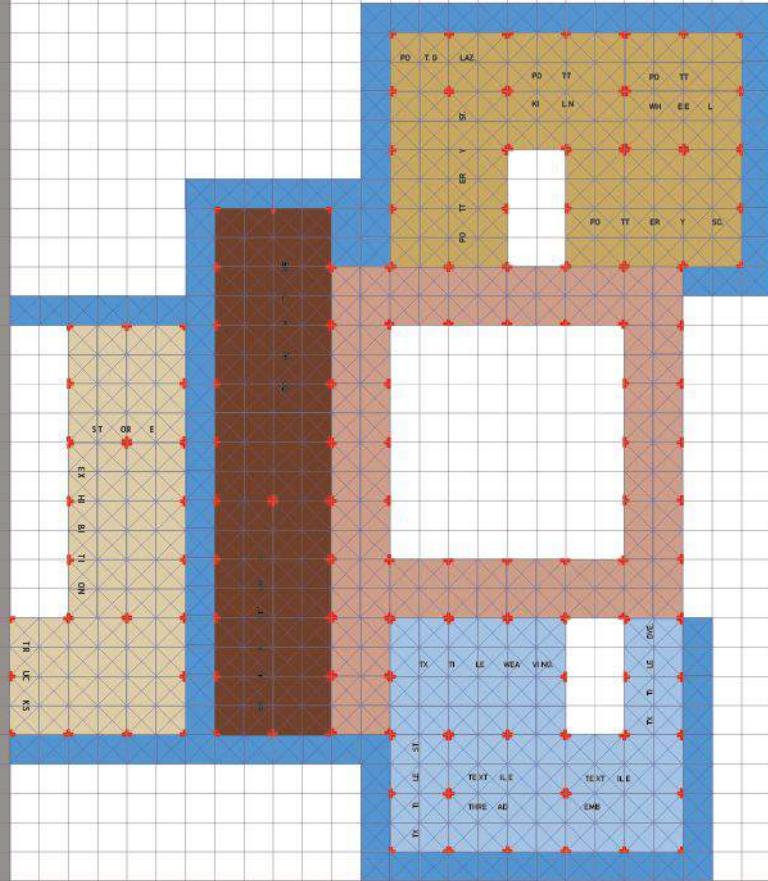


Press
Done

Rotate

Done

Complete Pottery

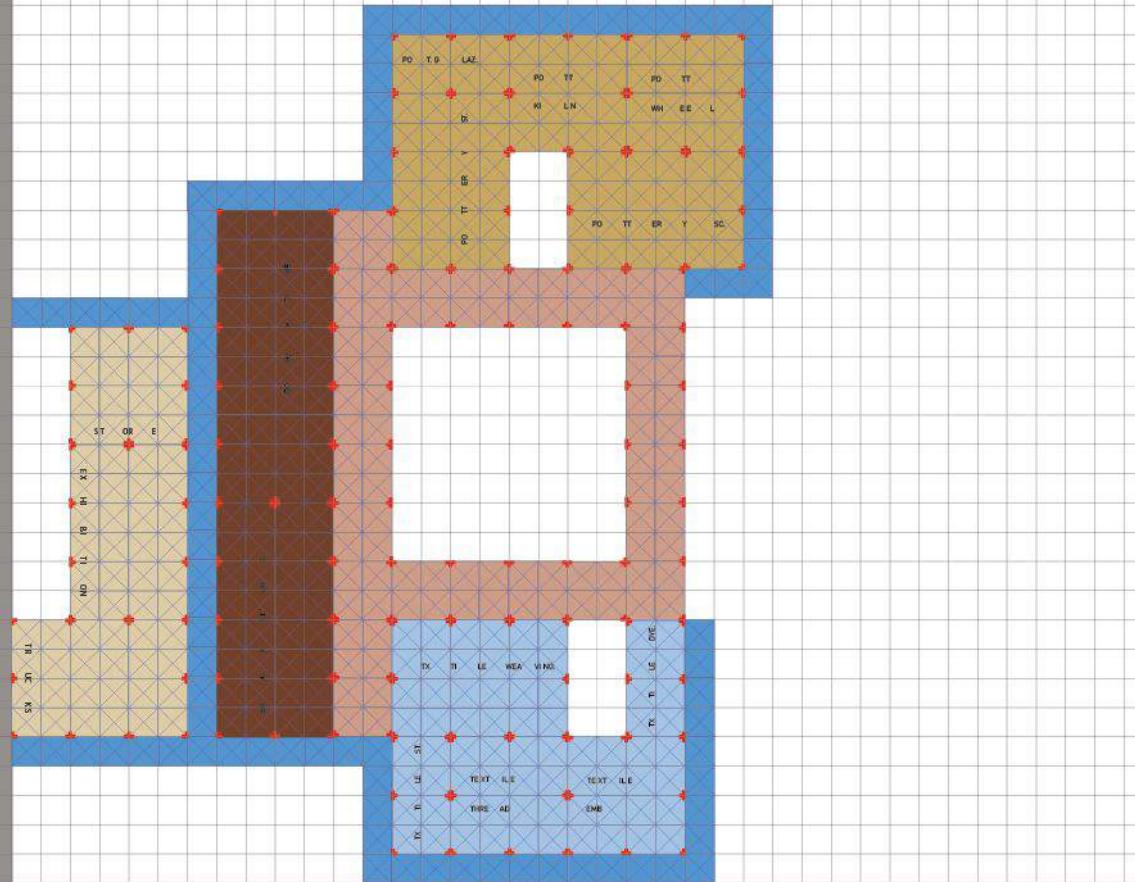


Press
Done

Rotate

Done

Complete Pottery

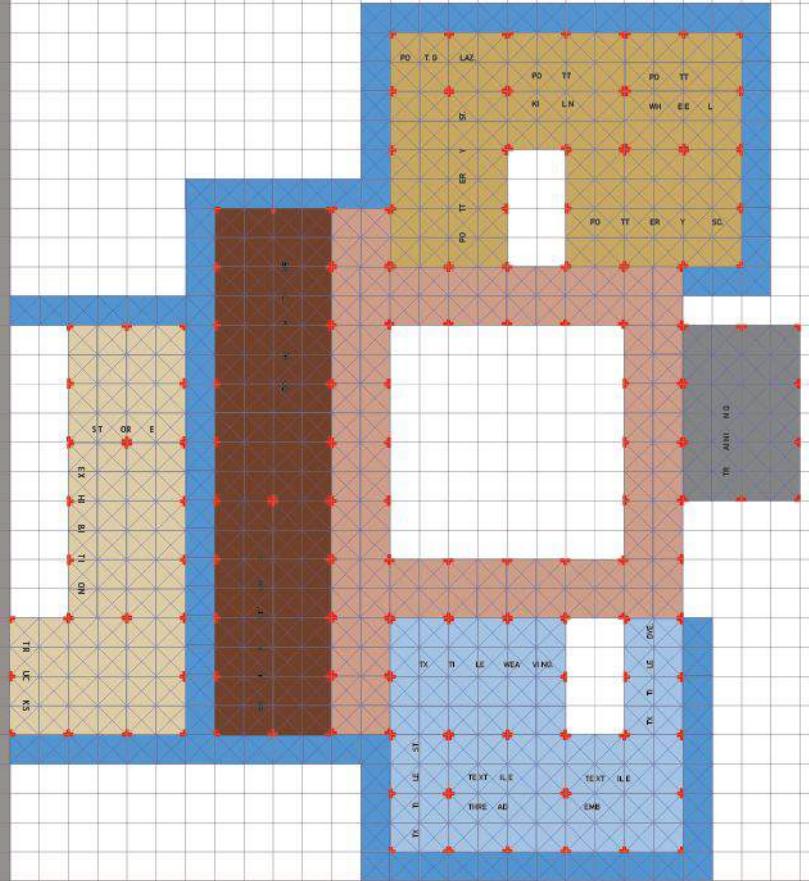


Press
Done

Rotate

Done

Place Communal

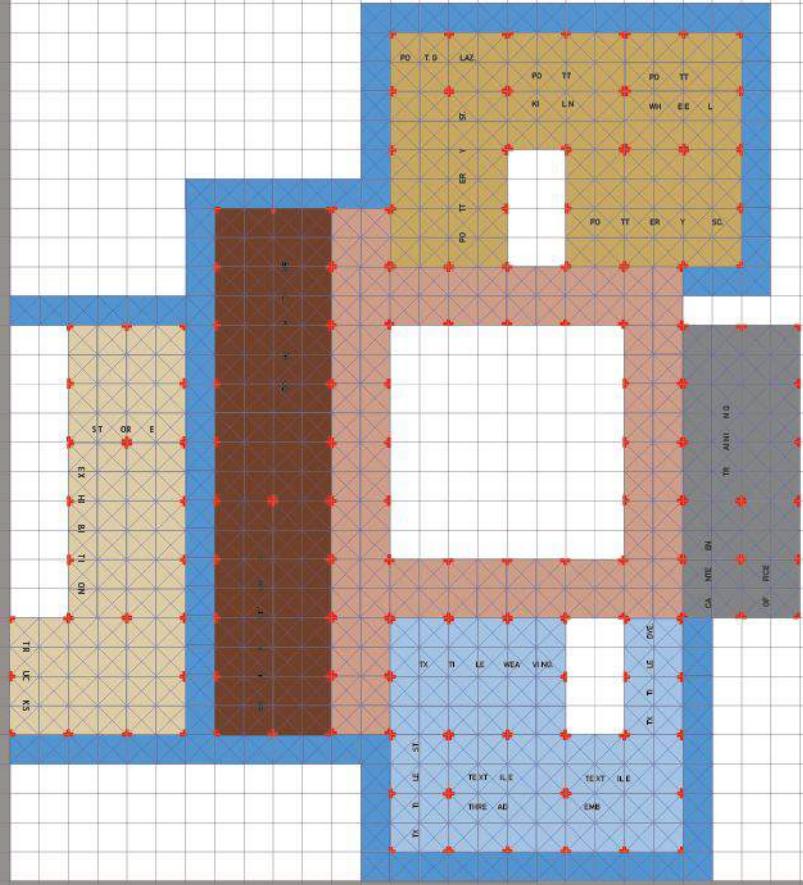


Press
Done

Rotate

Done

Place Communal

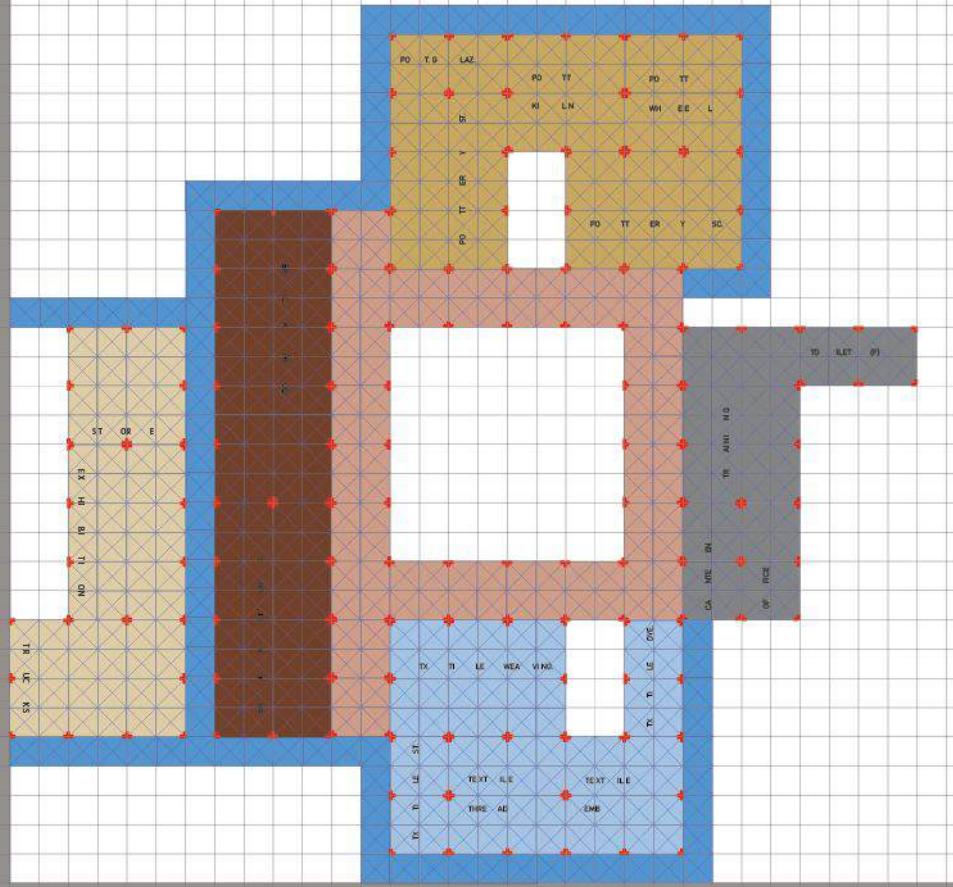


Press
Done

Rotate

Done

Place Communal

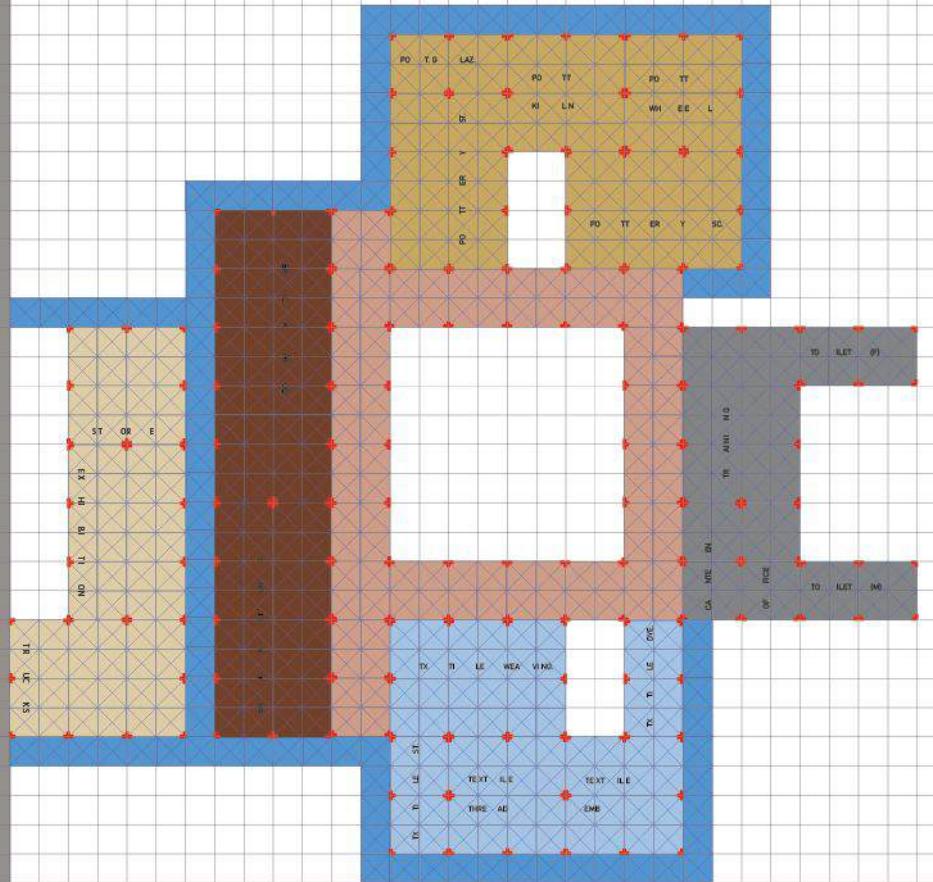


Press
Done

Rotate

Done

Place Communal

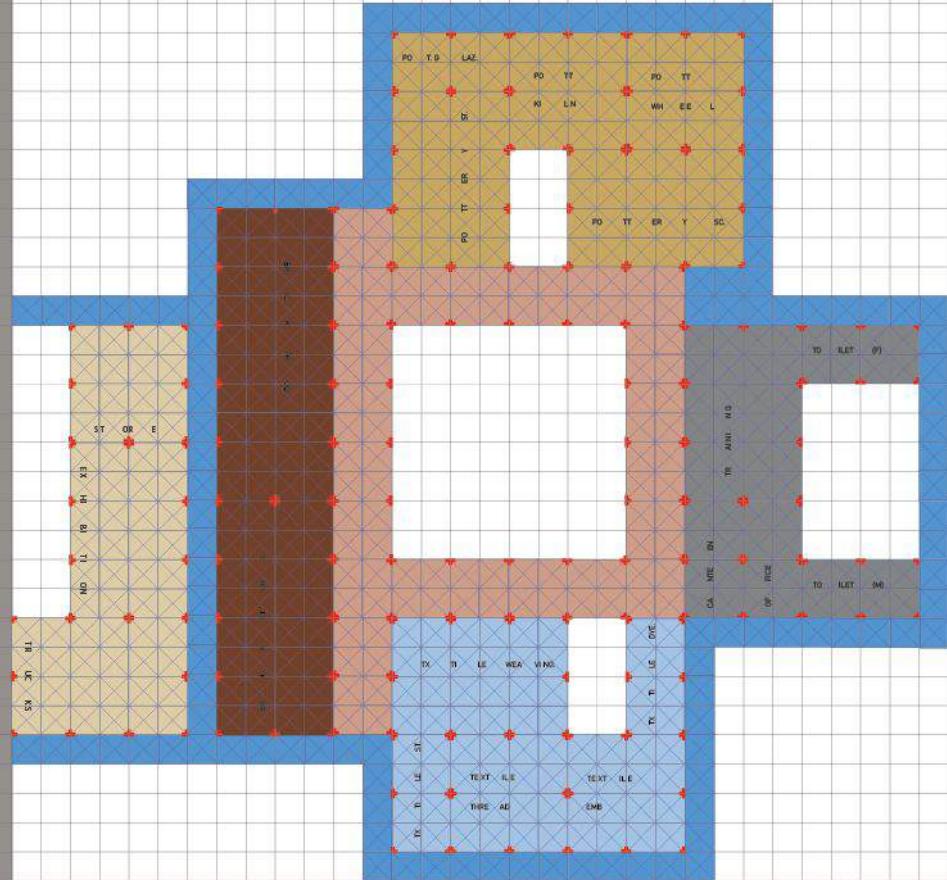


Press
Done

Rotate

Done

Complete Communal

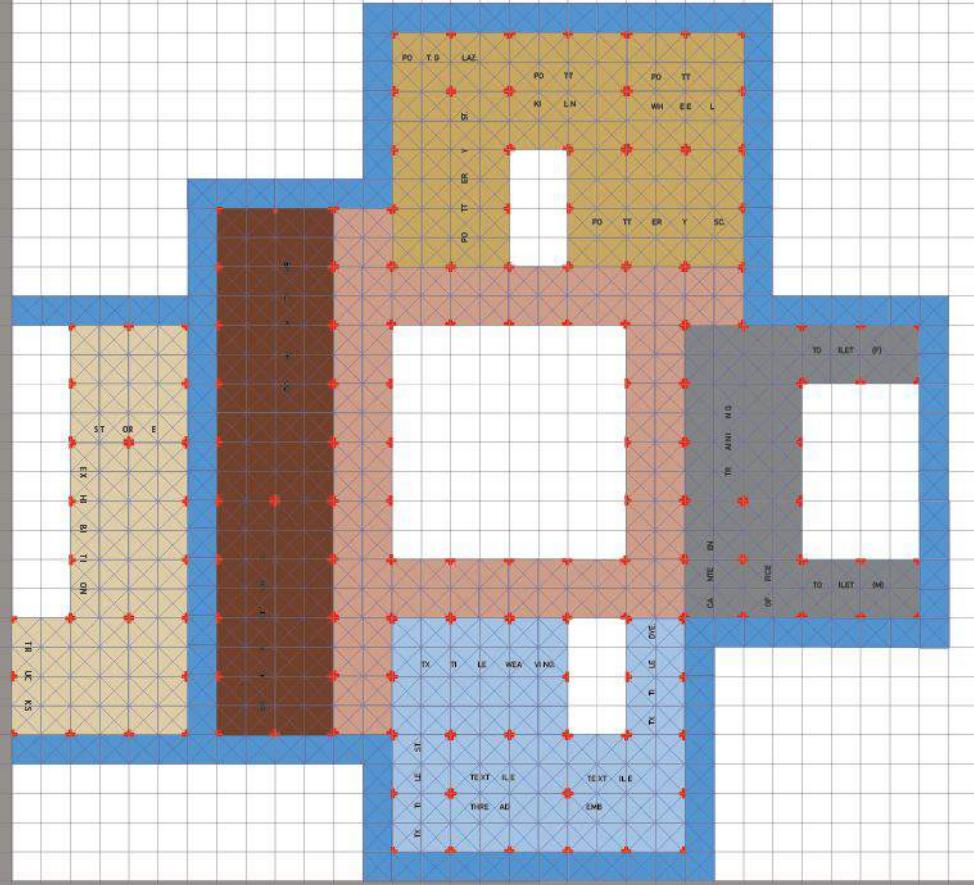


Press
Done

Rotate

Done

Complete Communal

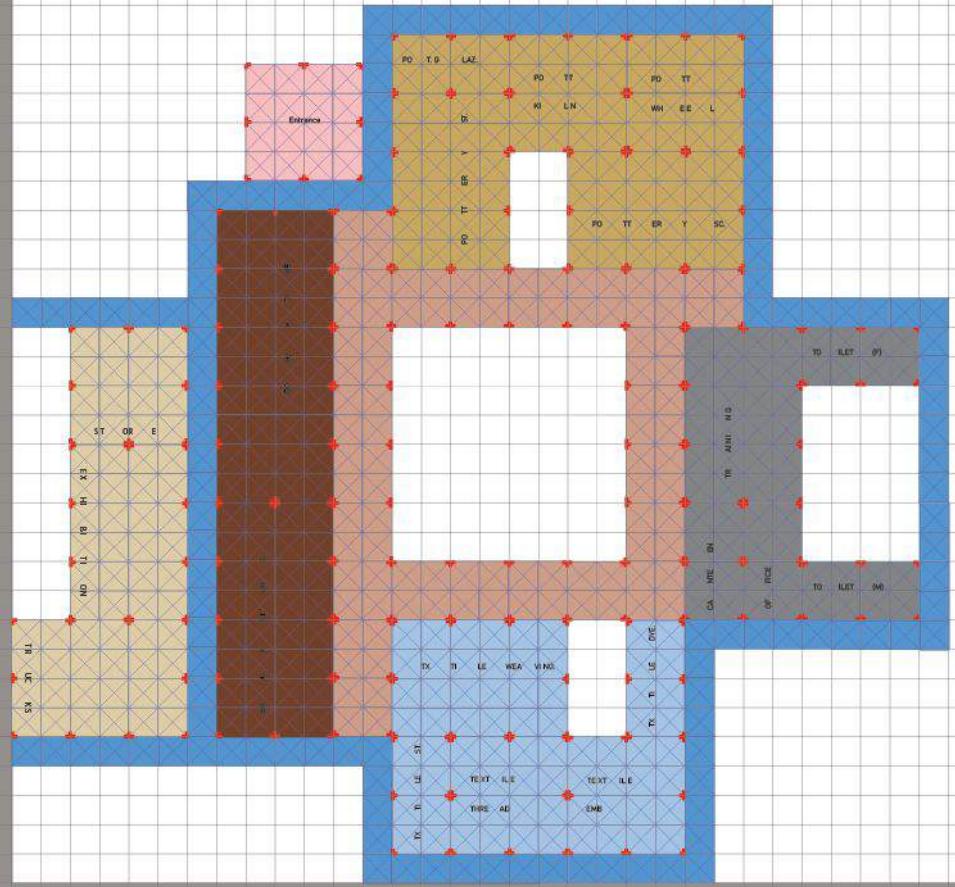


Press
Done

Rotate

Done

Place Entrance

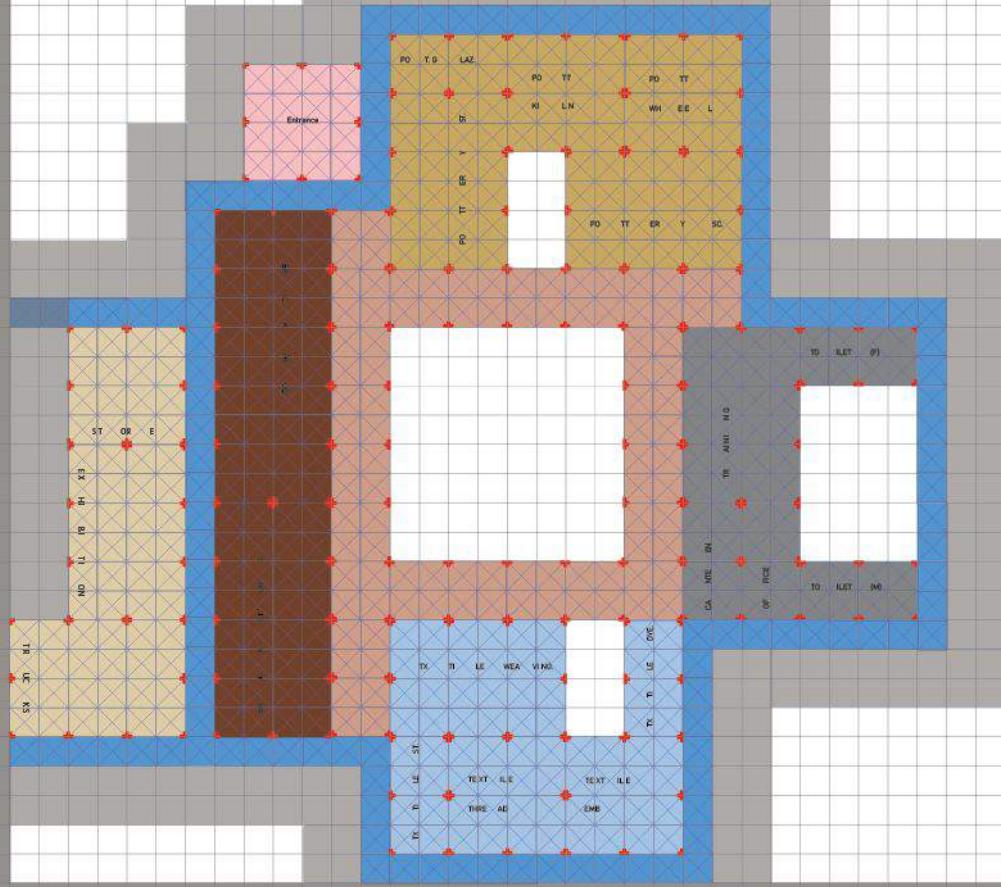


Press
Done

Rotate

Done

Place Road around



Press
Done

Rotate

Done

Place Green area



Press
Done

Rotate

Done

Place Green area

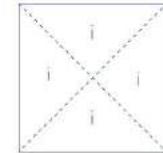


Press
Done

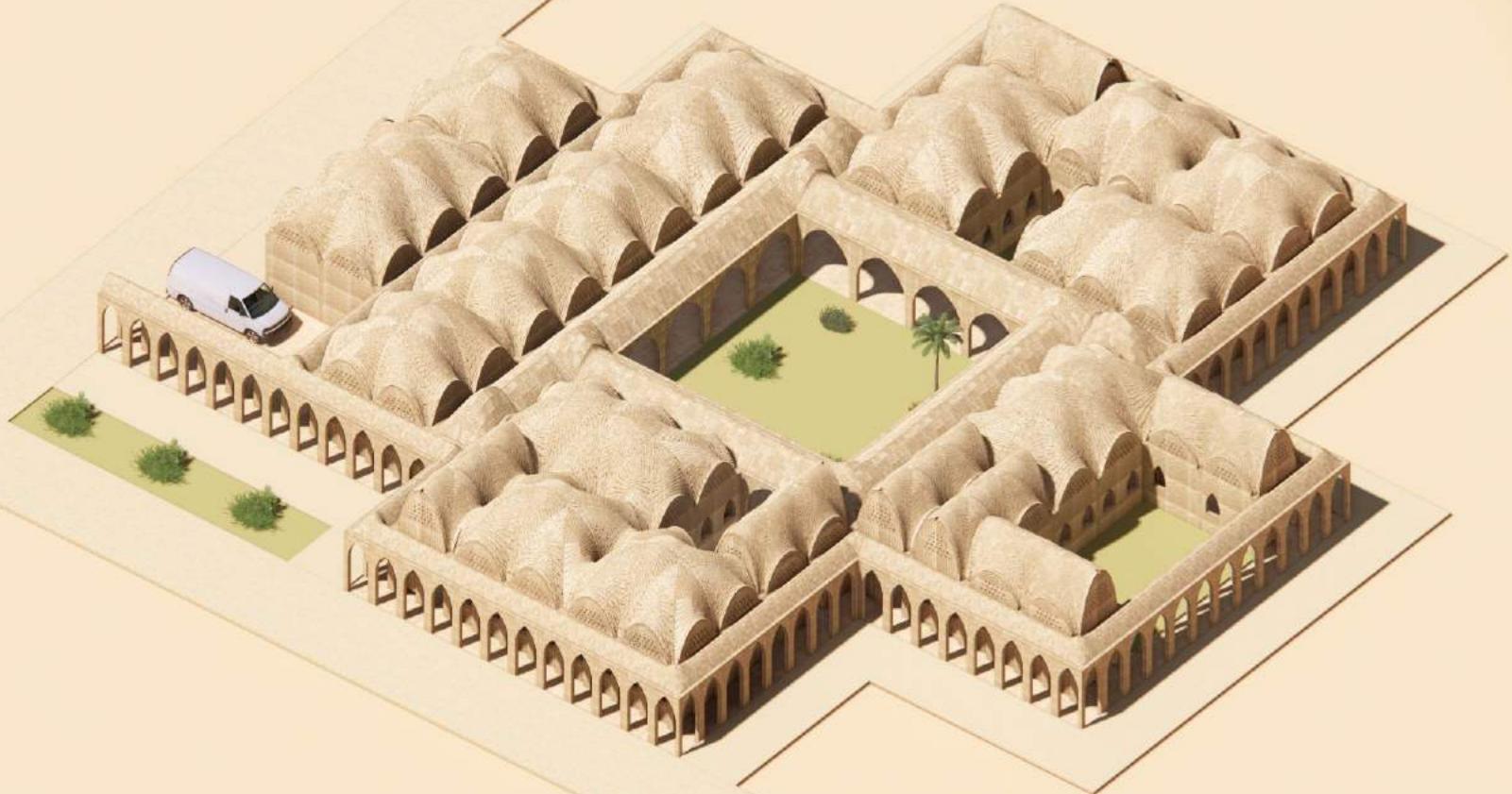
Rotate

Done

GAMIFICATION | Openings of Hubs Units



- A** open connection
- B** closed wall
- C** door
- D** window



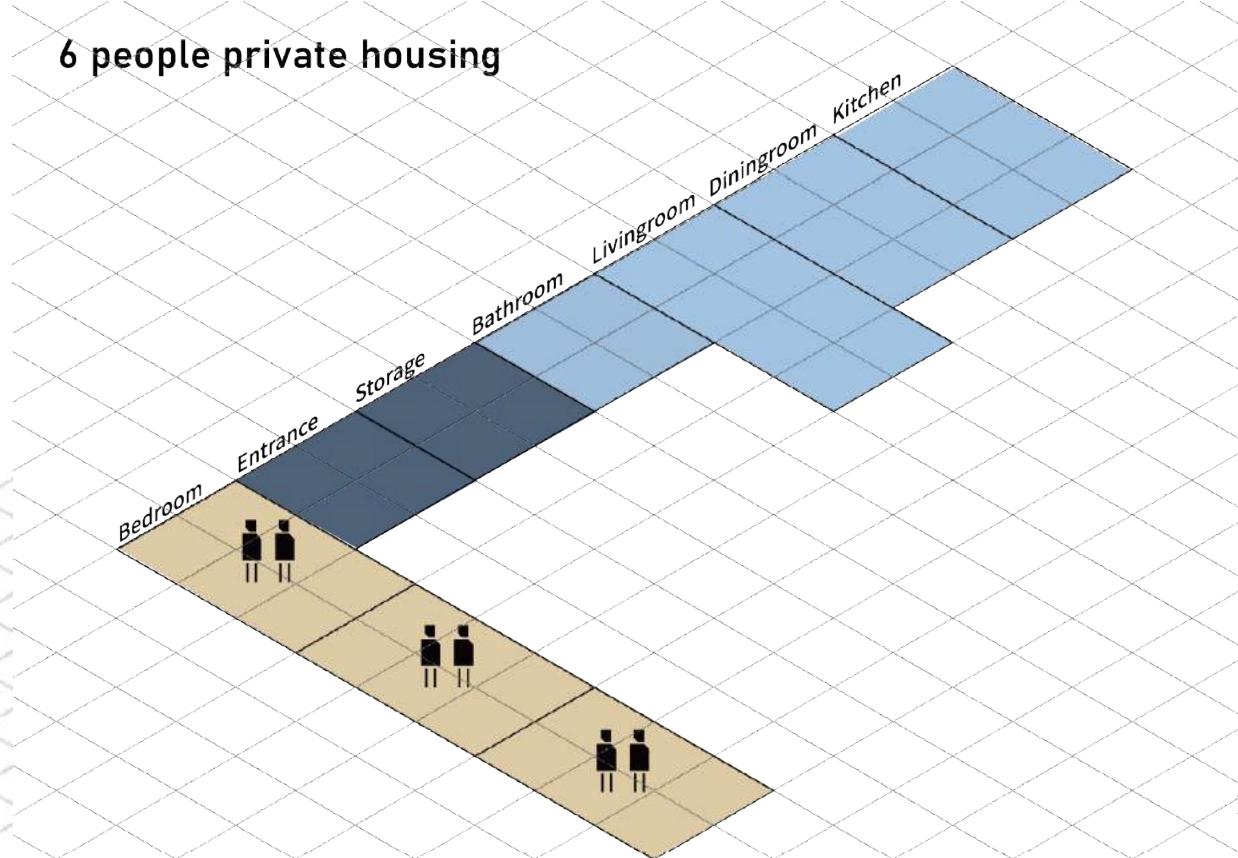
GAMIFICATION

a. Private Houses

_Rule preset

 Area per person

6 people private housing



GAMIFICATION

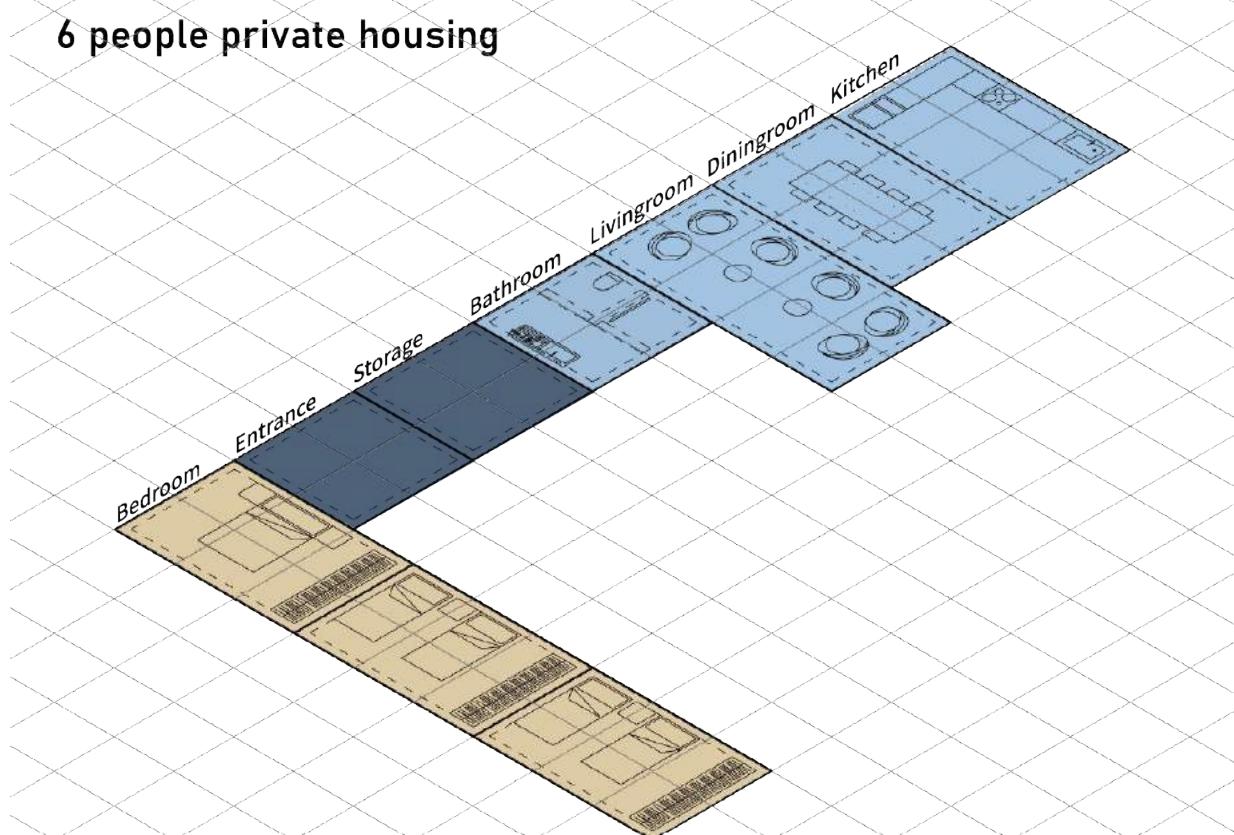
a. Private Houses

_Rule preset



Placing Function units
on 2d tiles

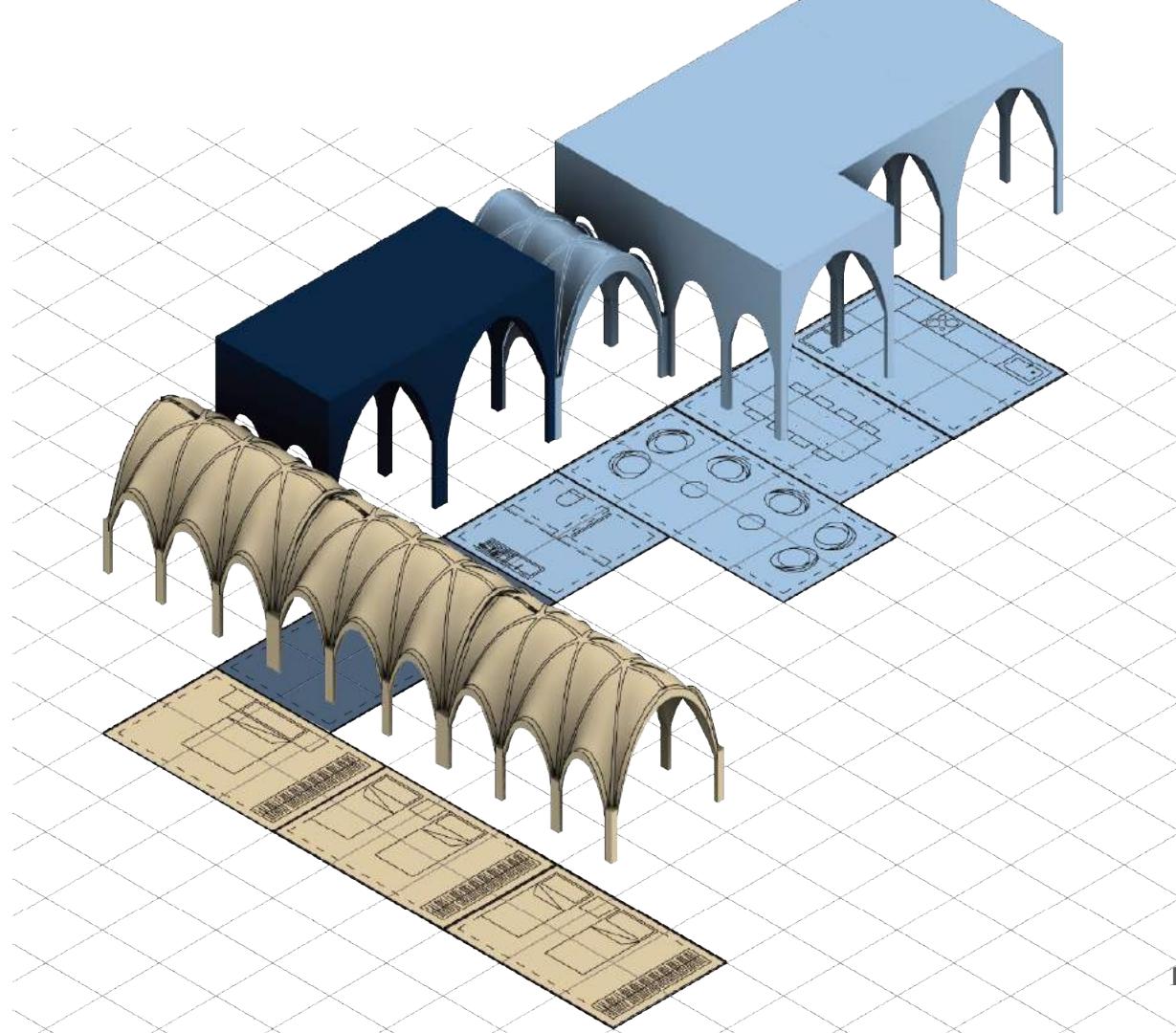
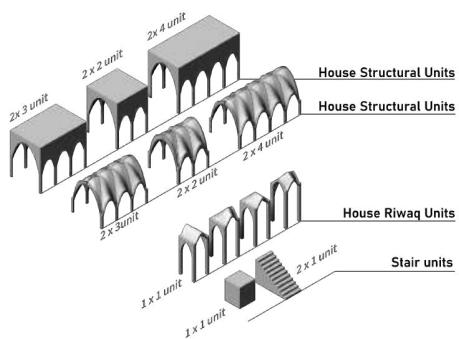
6 people private housing



GAMIFICATION

a. Private Houses

_Rule preset



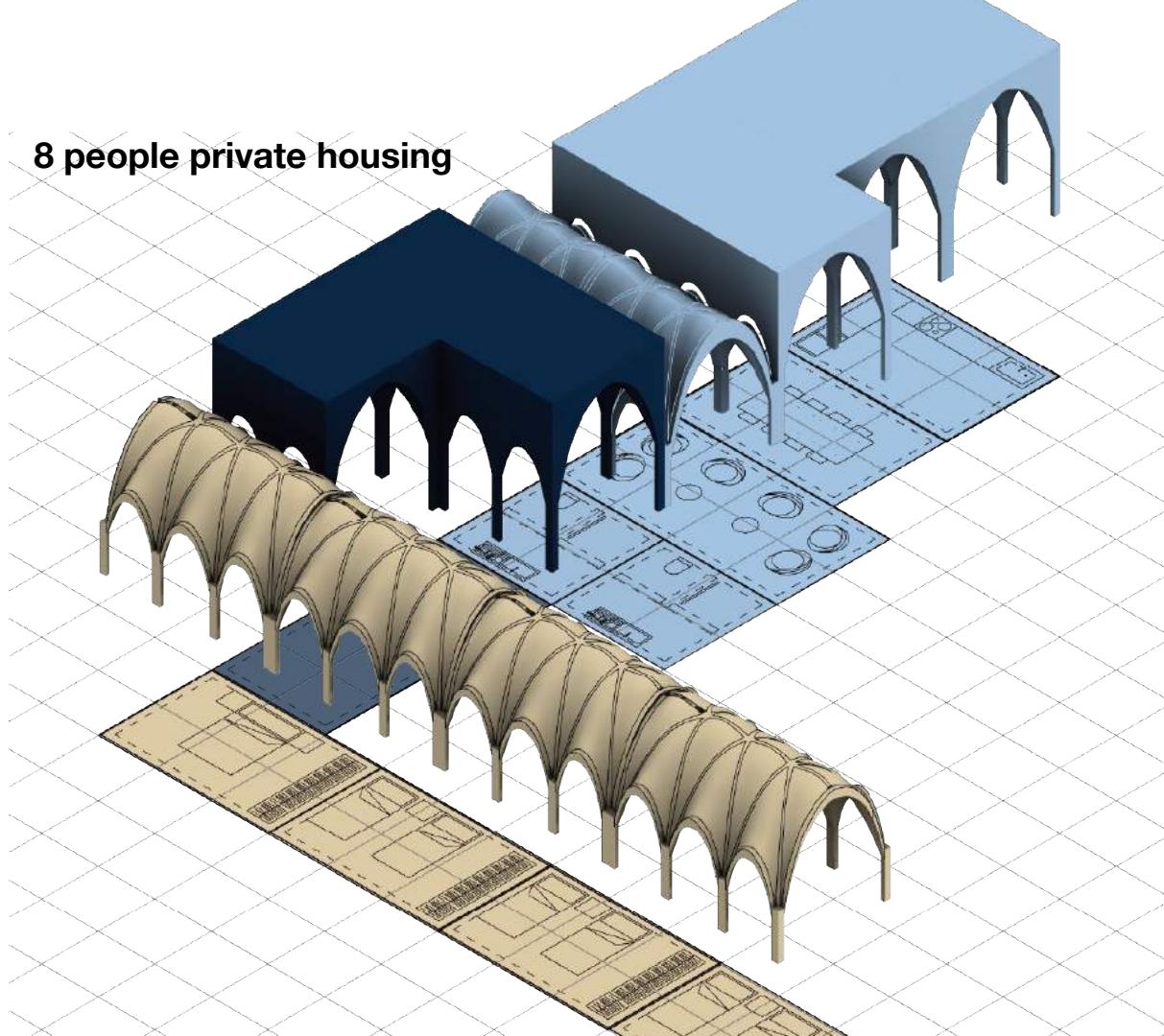
GAMIFICATION

a. Private Houses

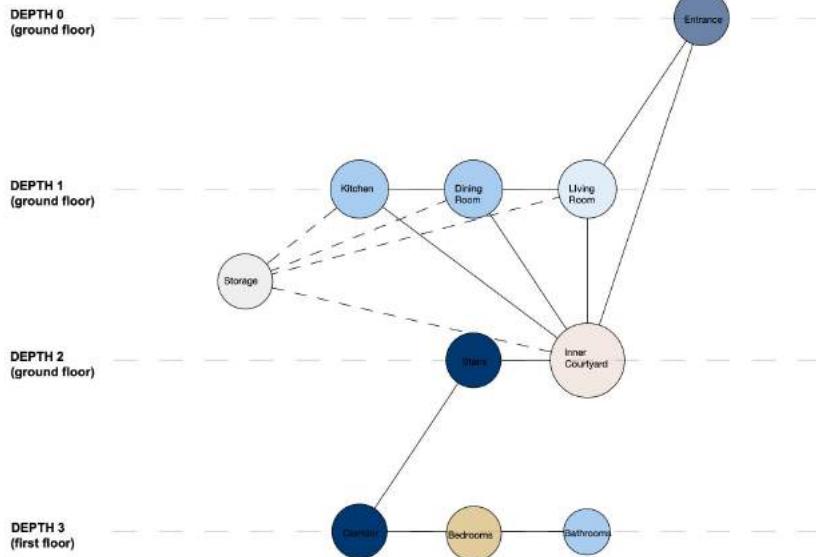
_Rule preset

↑...
The Number of rooms
by the increases in residents
number

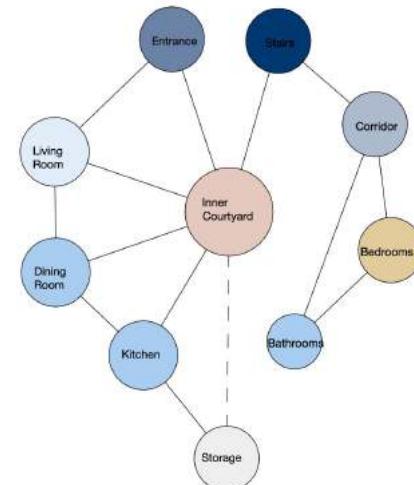
8 people private housing



GAMIFICATION | Configuration of Private Housing



Depth Diagram



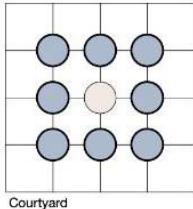
Bubble Diagram

G Connections

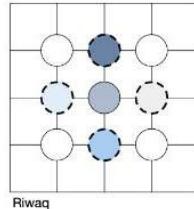
---- always
--- at least one

Private Housing

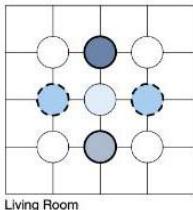
R



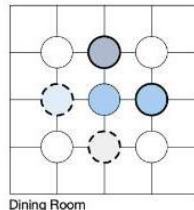
Courtyard



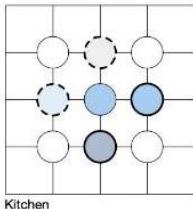
Riwaq



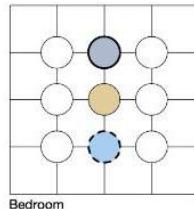
Living Room



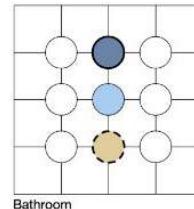
Dining Room



Kitchen

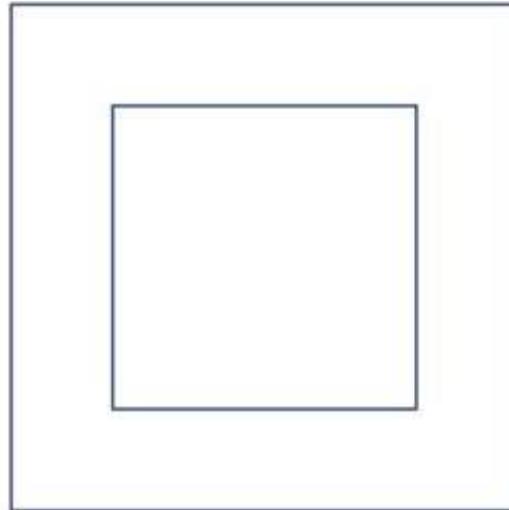


Bedroom



Bathroom

- Courtyard
- Riwaq
- Entrance
- Living Room
- Dining Room
- Kitchen
- Storage
- Bedroom
- Bathroom

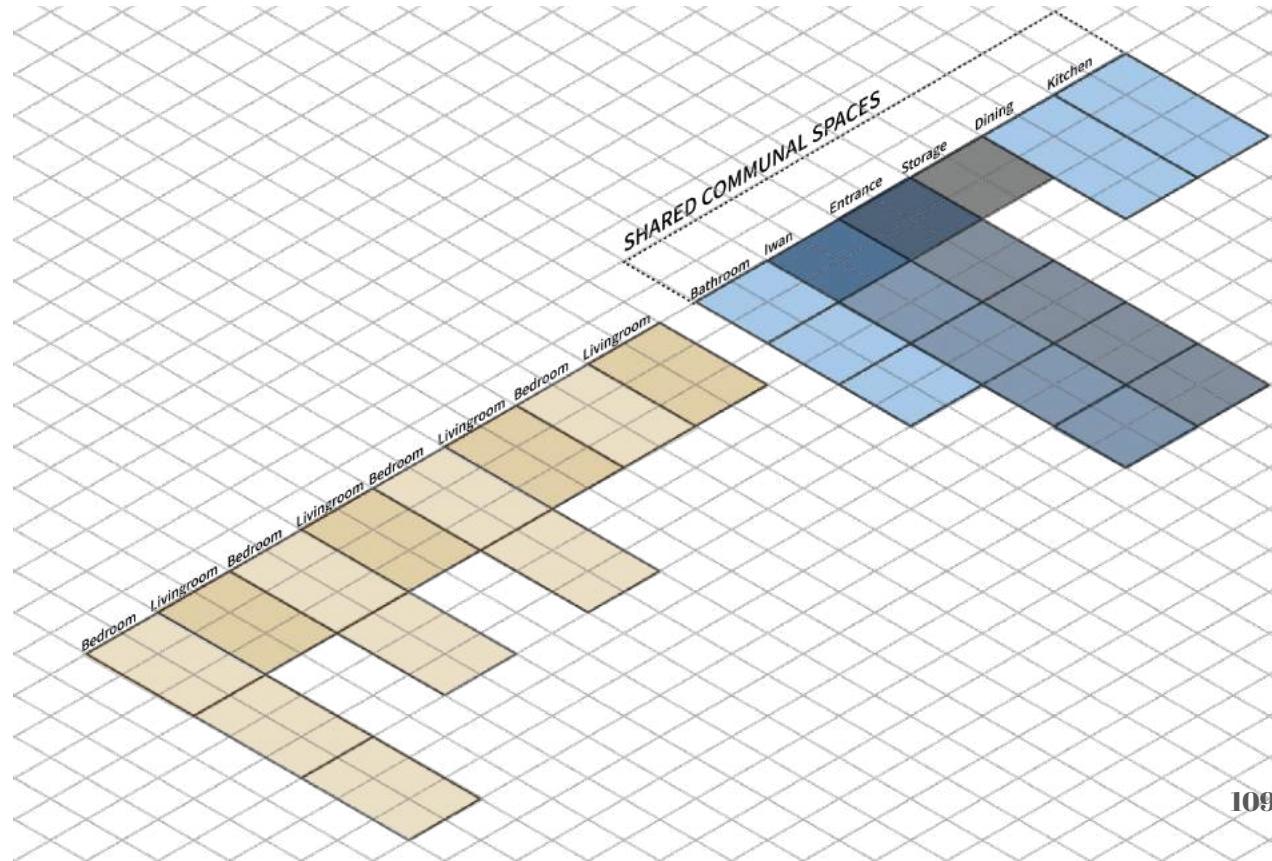


GAMIFICATION

b. Communal Houses

_Rule preset

↑...
The Number of rooms
by the increases in residents
number

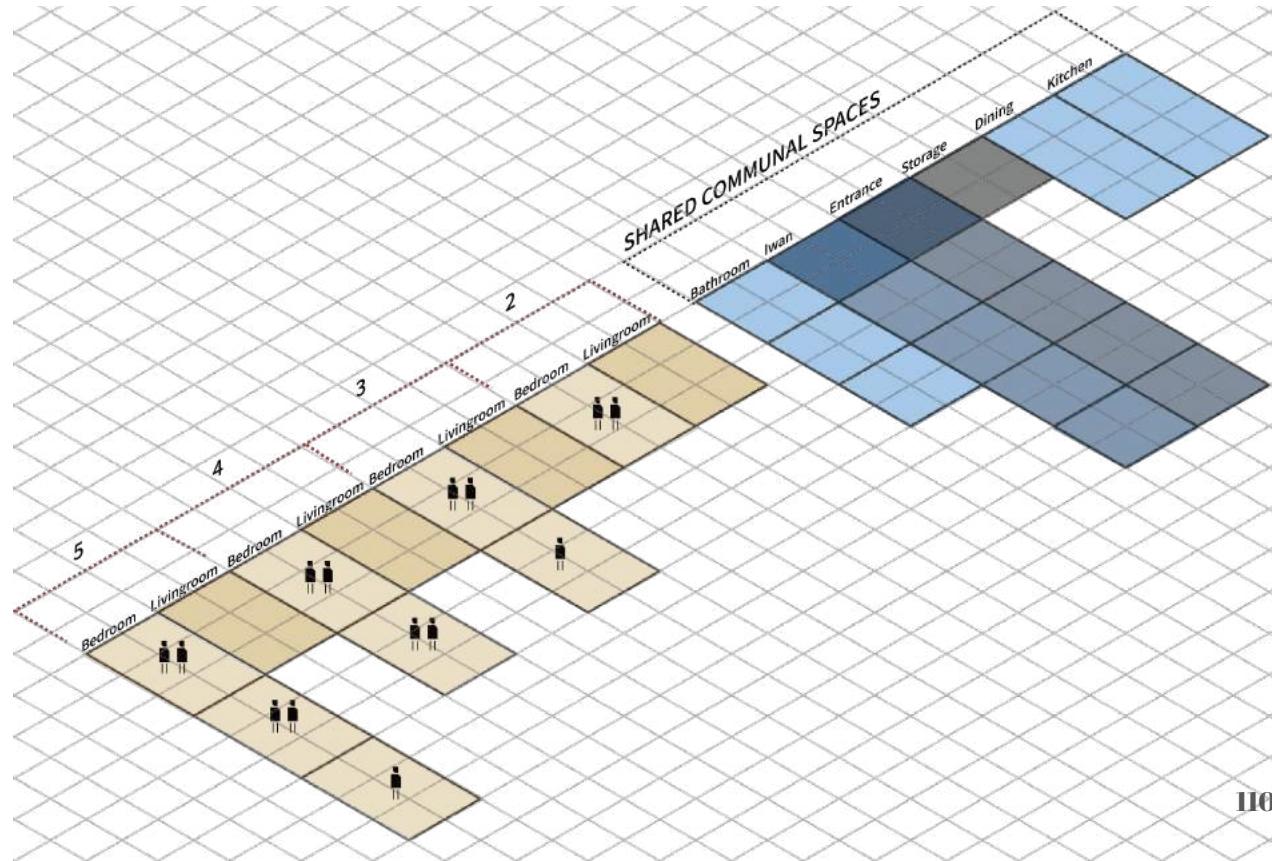


GAMIFICATION

b. Communal Houses

_Rule preset

↑...
The Number of rooms
by the increases in residents
number

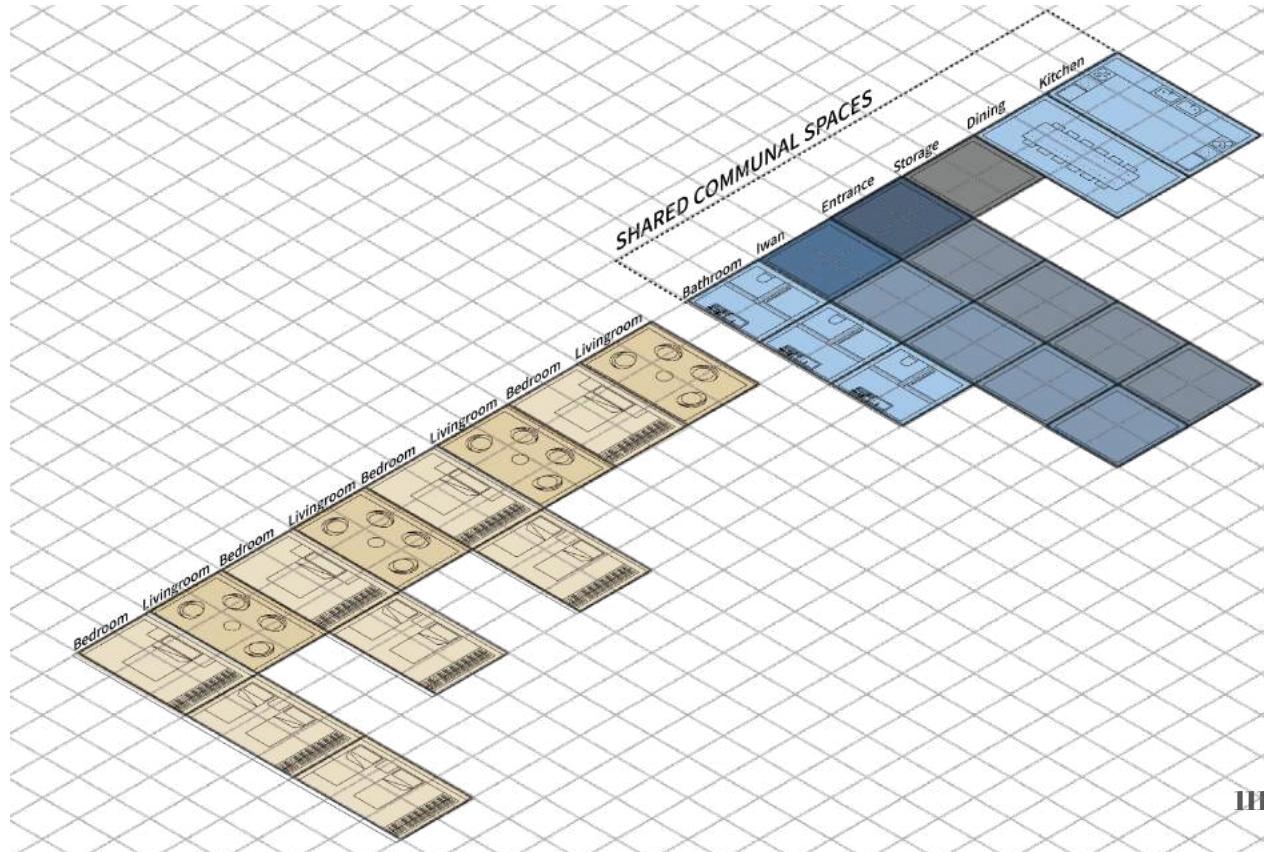


GAMIFICATION

b. Communal Houses

_Rule preset

↑...
The Number of rooms
by the increases in residents
number

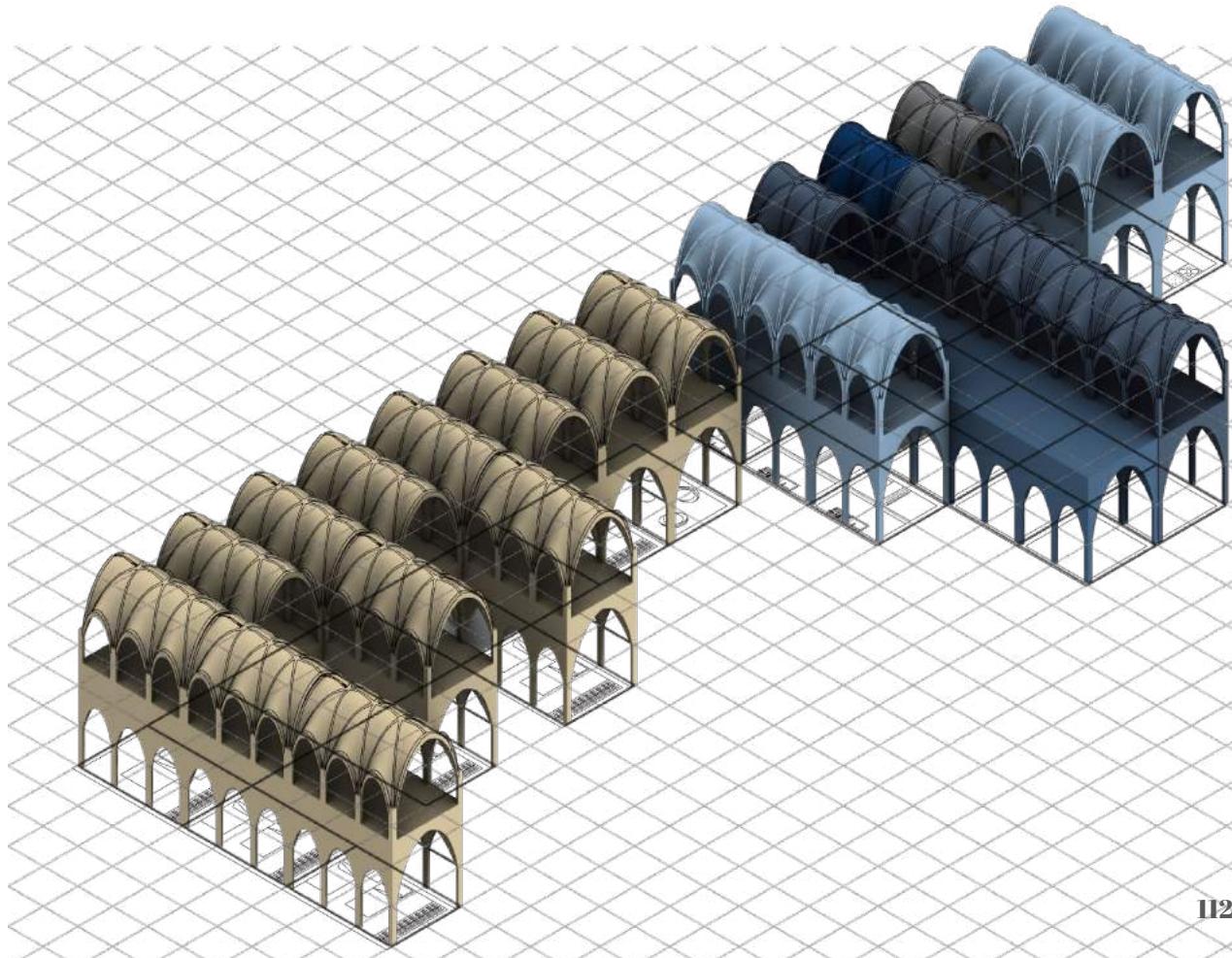


GAMIFICATION

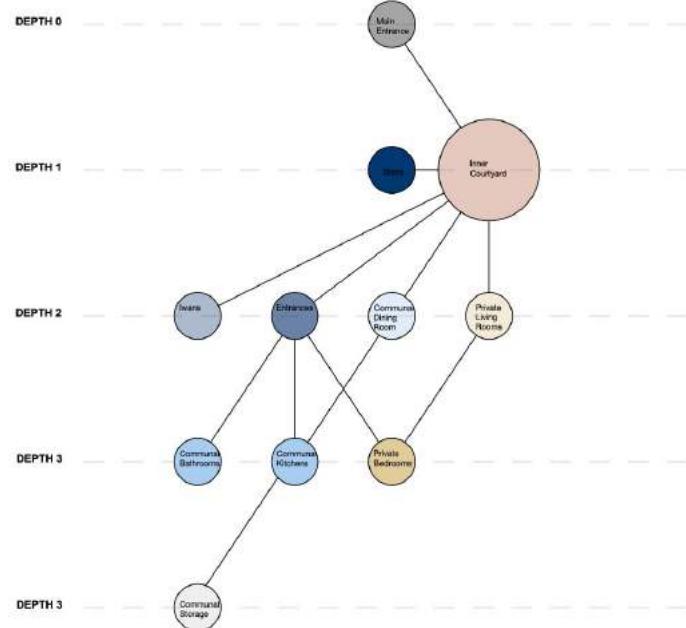
b. Communal Houses

_Rule preset

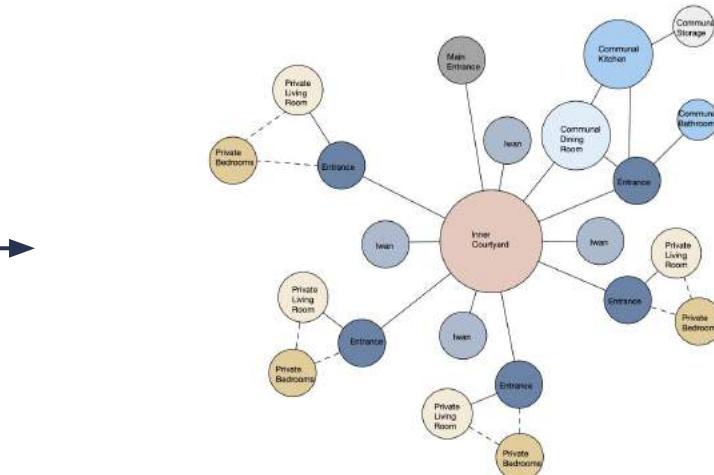
↑...
The Number of rooms
by the increases in residents
number



GAMIFICATION | Configuration of Communal Housing



Depth Diagram



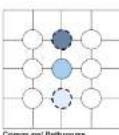
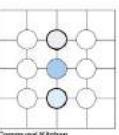
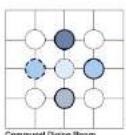
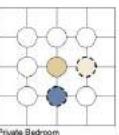
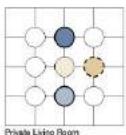
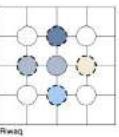
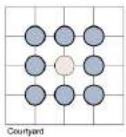
Bubble Diagram

GAMIFICATION | Configuration of Communal Housing

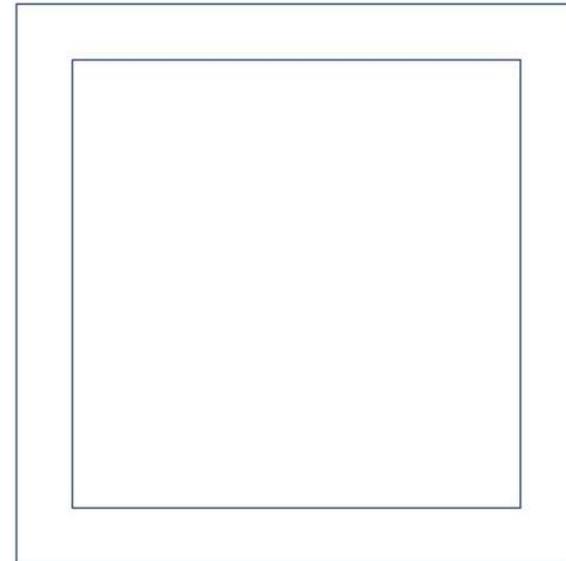
Rules

- Set Boundary
- Courtyard as Starting Point
- Connect Units according to the connection rules

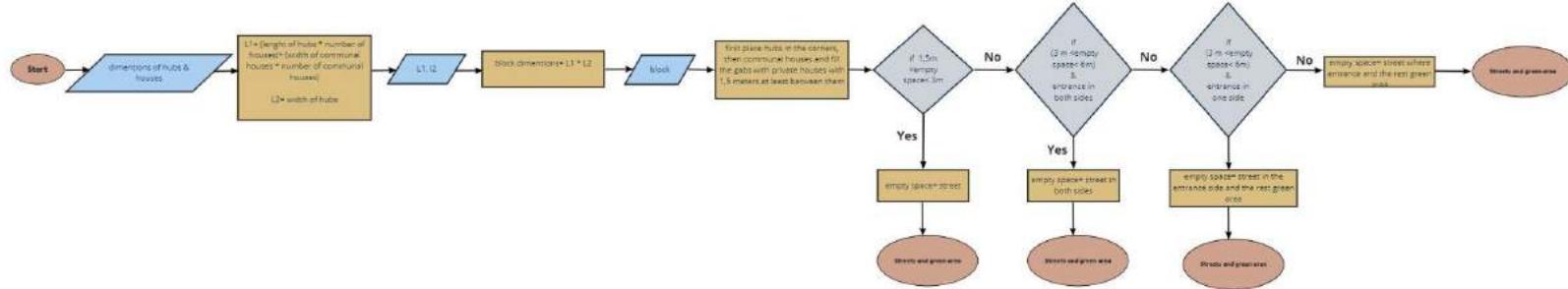
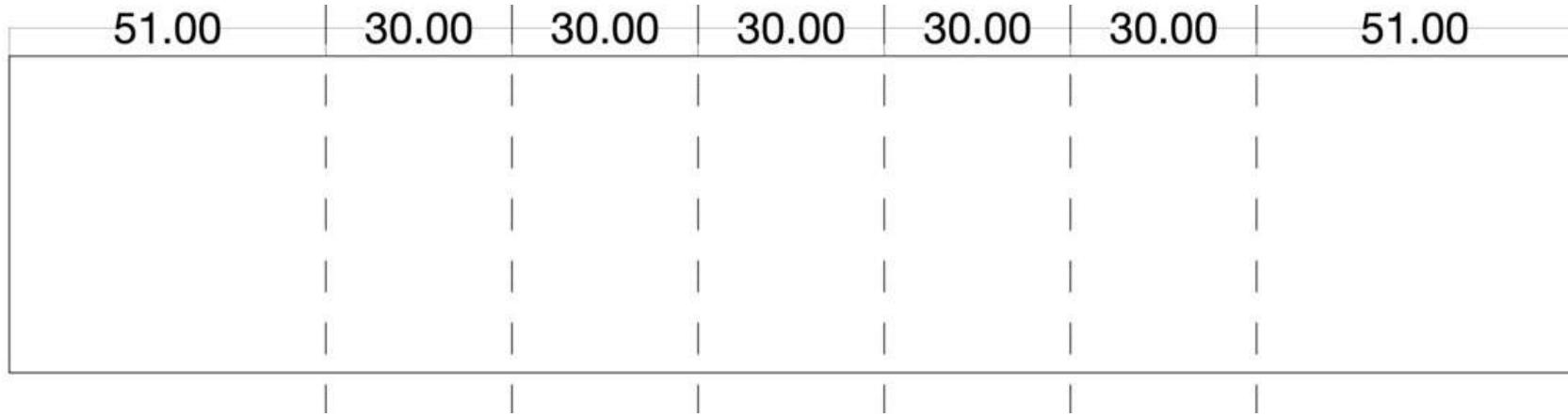
Connections
---- always
--- at least one



- Courtyard
- Riwaq
- Iwan
- Entrances
- Main Entrance
- Communal Dining Rooms
- Communal Bathrooms
- Communal Kitchen
- Communal Storage
- Private Living Rooms
- Private Bedrooms



CONFIGURATION | Block Development

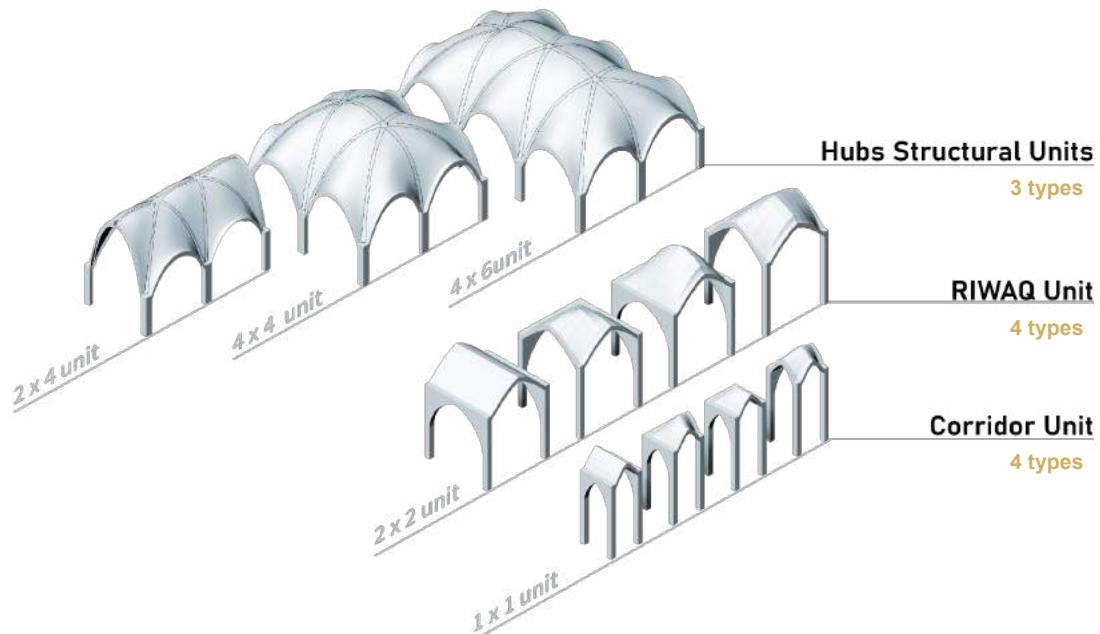




02 | Shaping

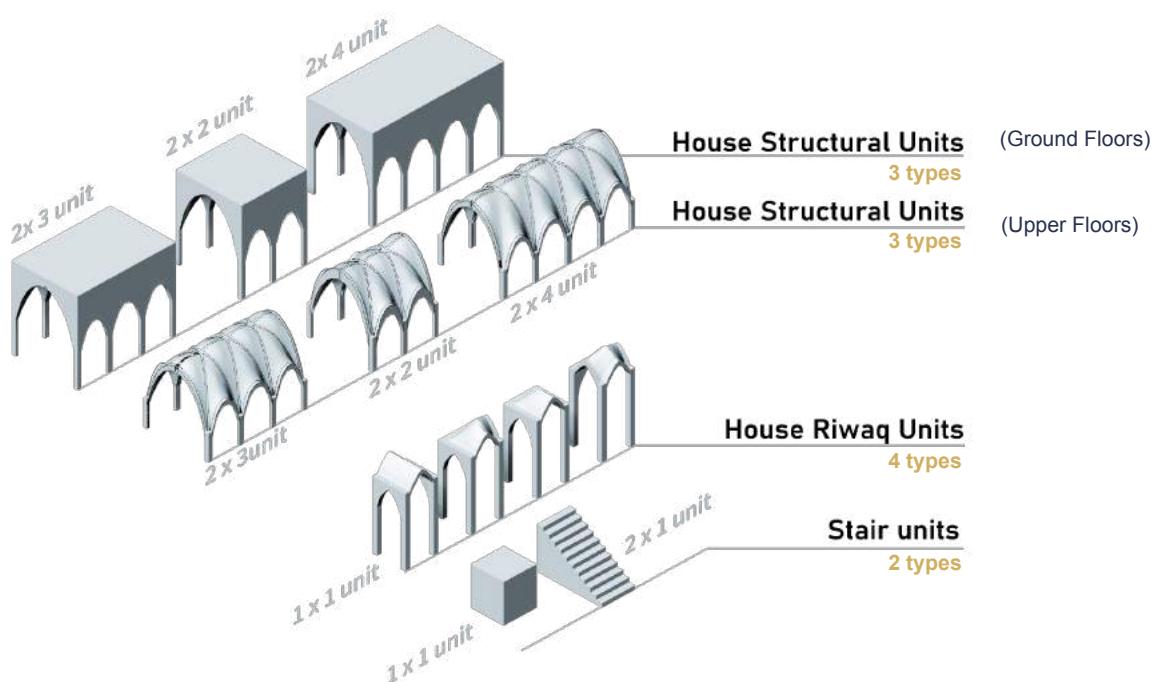
SHAPING | Structural Units

a. Hubs

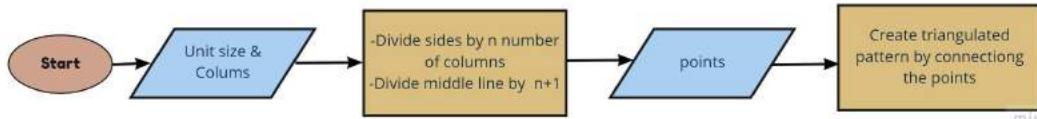
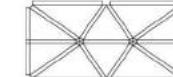
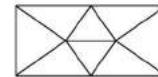
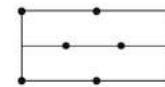
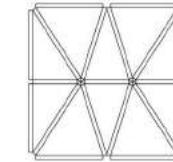
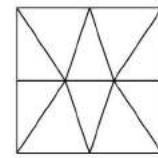
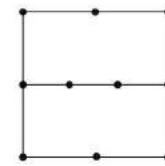
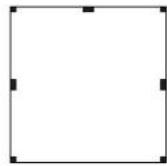
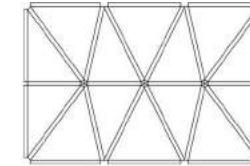
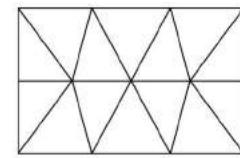
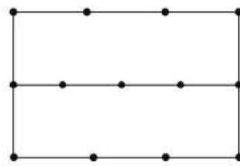
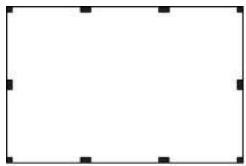


SHAPING | Structural Units

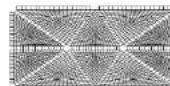
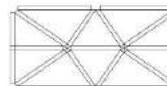
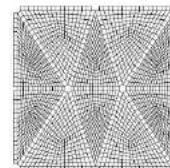
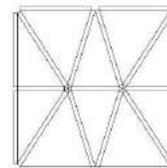
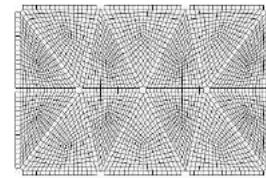
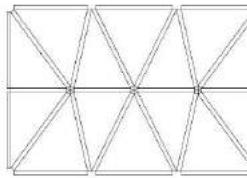
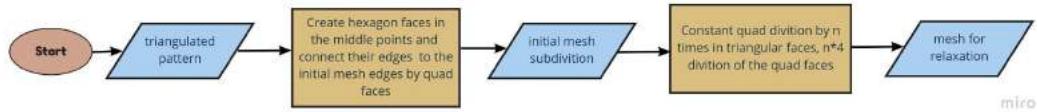
a. Houses



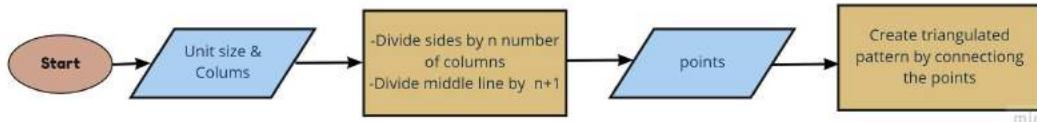
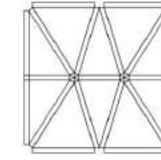
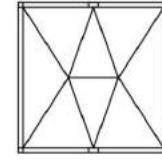
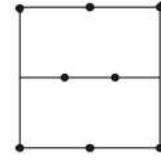
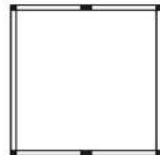
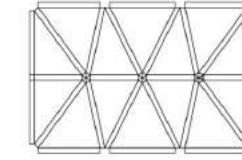
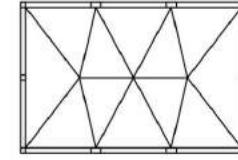
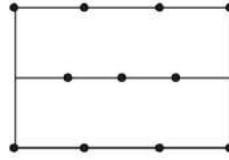
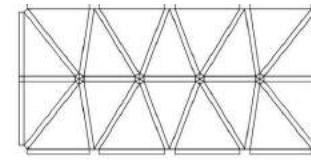
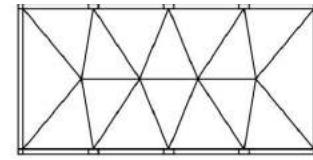
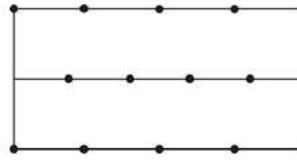
MESH SUBDIVISIONS | Hubs



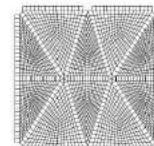
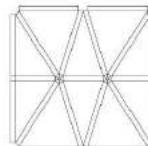
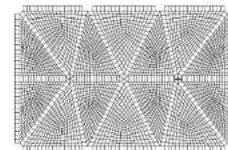
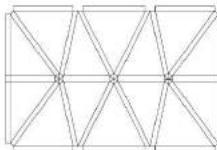
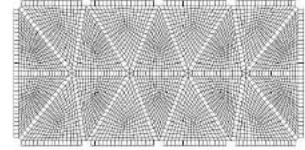
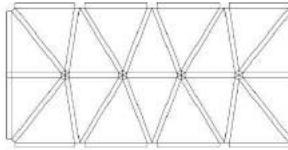
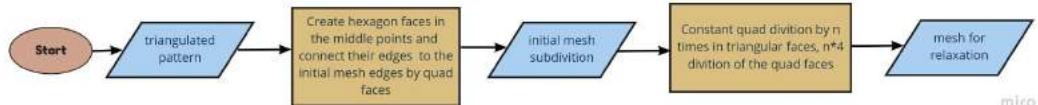
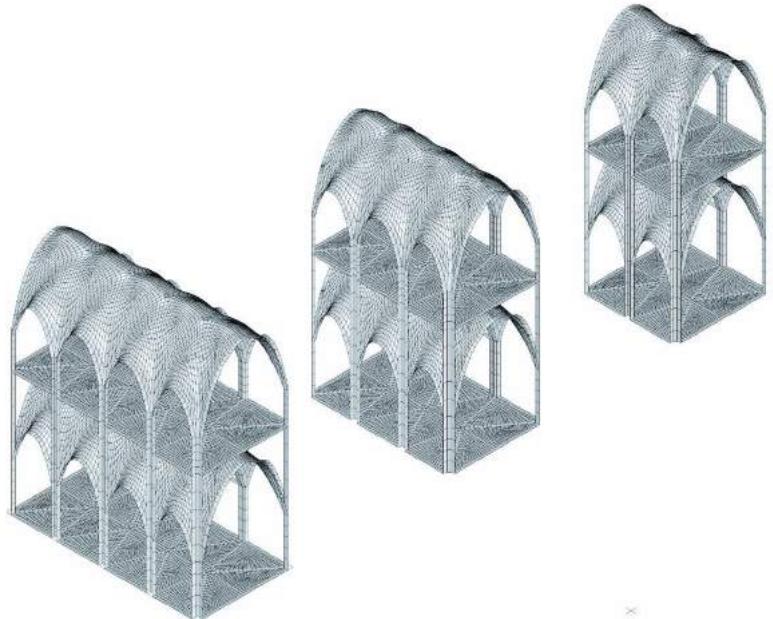
MESH SUBDIVISIONS | Hubs



MESH SUBDIVISIONS | HOUSES



MESH SUBDIVISIONS | Houses



miro

SHAPING | Openings

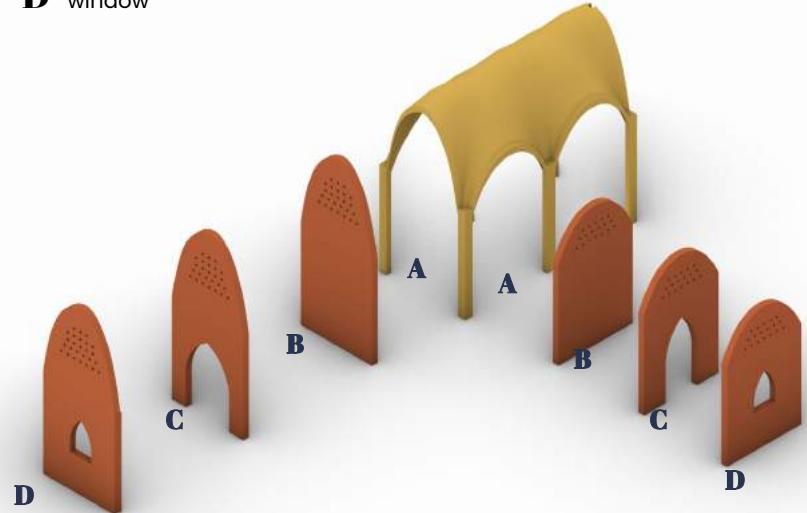
a. Hubs Units

A open connection

B closed wall

C door

D window



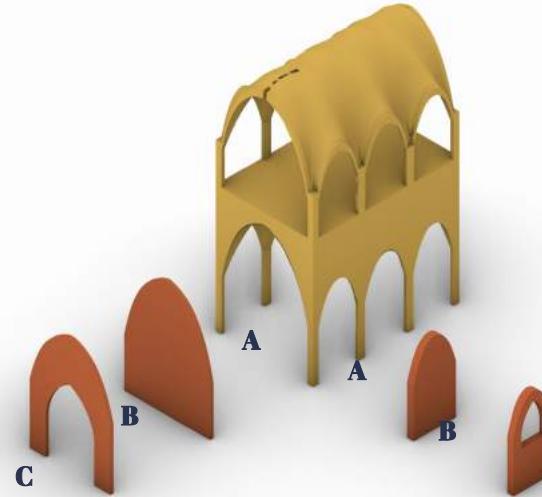
b. Housing Units

A open connection

B closed wall

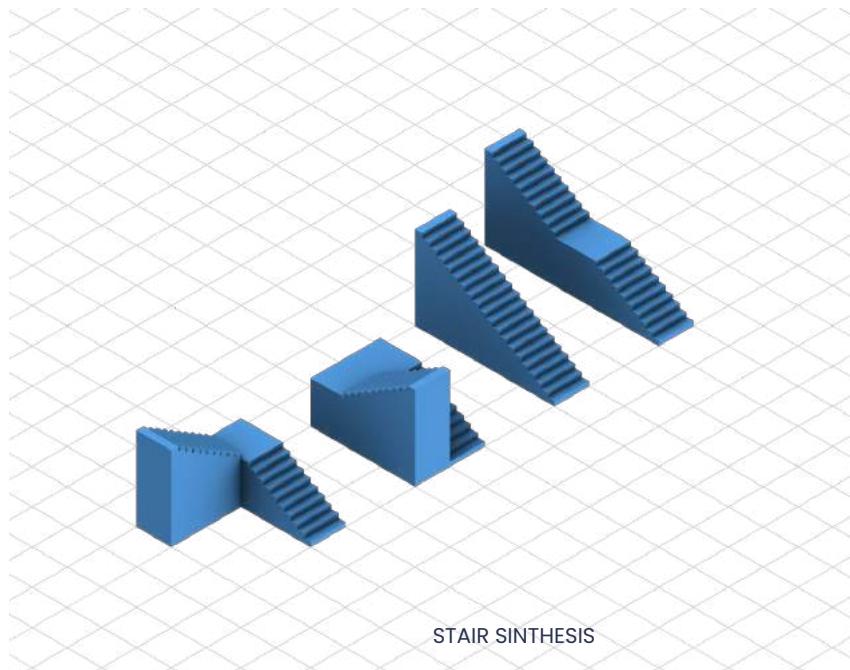
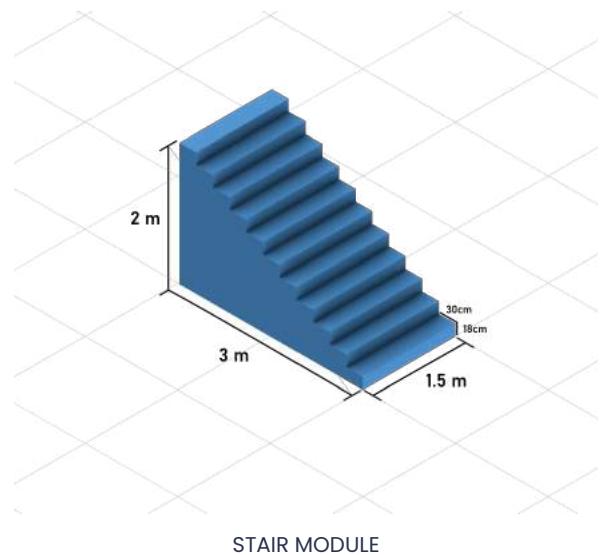
C door

D window



SHAPING | Stair Units

a. Stairs Houses





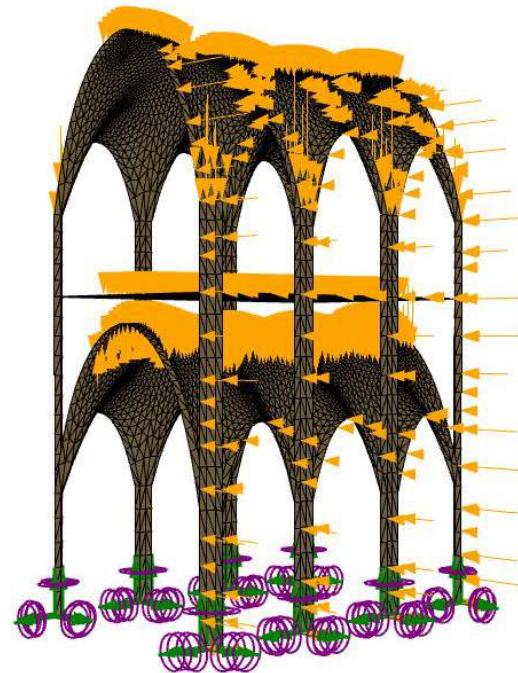
03 | Structuring

STRUCTURAL ANALYSIS | Loads & Materials

Dead Load Cases	Safety Factor
Gravity	1.35
Dead Load for first floor	1.35

Live Load Cases	Safety Factor	Value (kN/m ²)
People (roof)	1.5	1
People (first roof)	1.5	3
Wind load	1.5	1

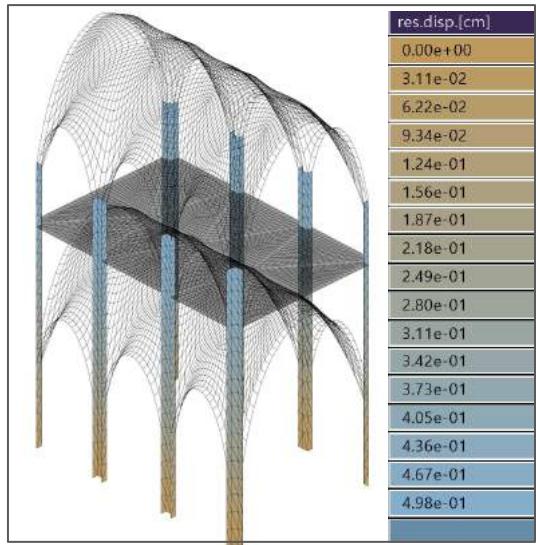
Material Properties (Compressed Stabilised Earth Block)	
Young's Modulus	250 MPa
Density	1700 kg/m ³
Compressive Strength	0,3 kN/cm ²
Tensile Strength	0,03 kN/cm ²



STRUCTURAL ANALYSIS | Thicknesses

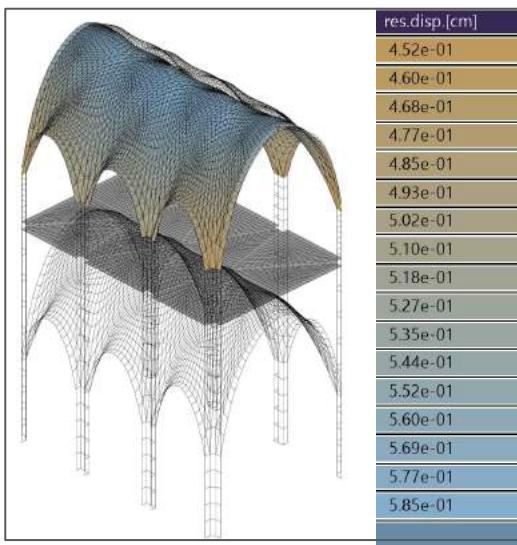


STRUCTURAL ANALYSIS | Displacement



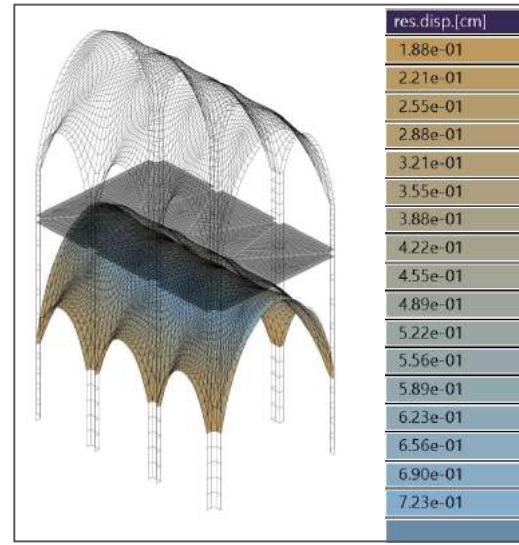
Columns

Max span: 1 m
Deflection limit: 0,5 cm
Max displacement: 0,0498 cm



Roof

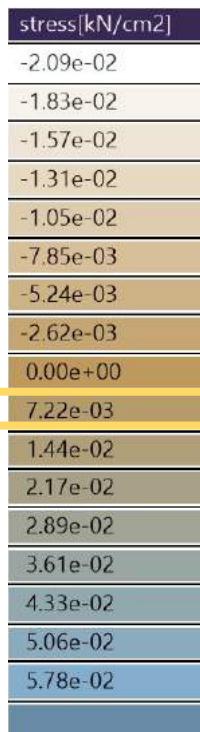
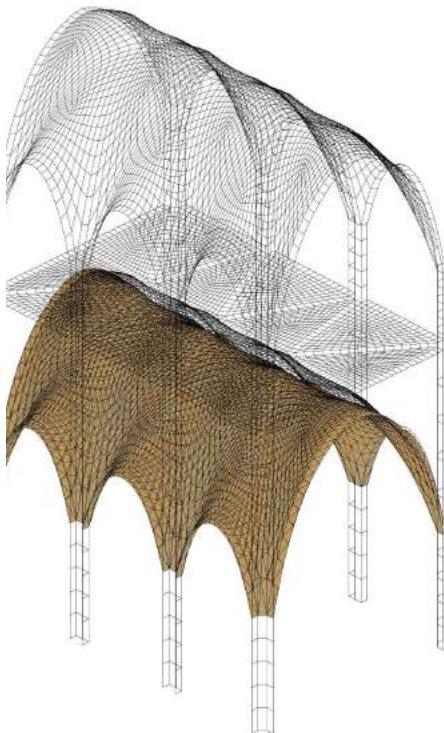
Max span: 1,5 m
Deflection limit: 0,75cm
Maximum displacement: 0,0585 cm



Roof

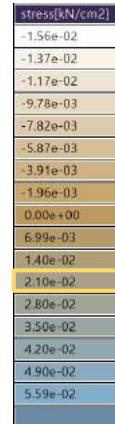
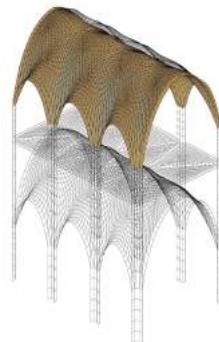
Max span: 1,5 m
Deflection limit: 0,75 cm
maximum displacement: 0,0723 cm

Structural Analysis_Princ. Stress 1



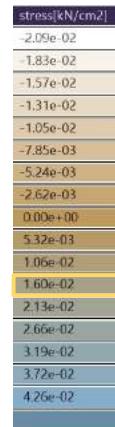
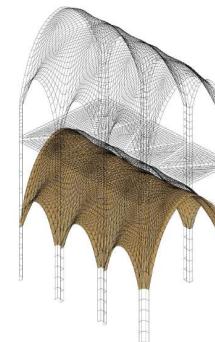
Roof

Max tensile stress 0,021 kN/cm²



First floor roof

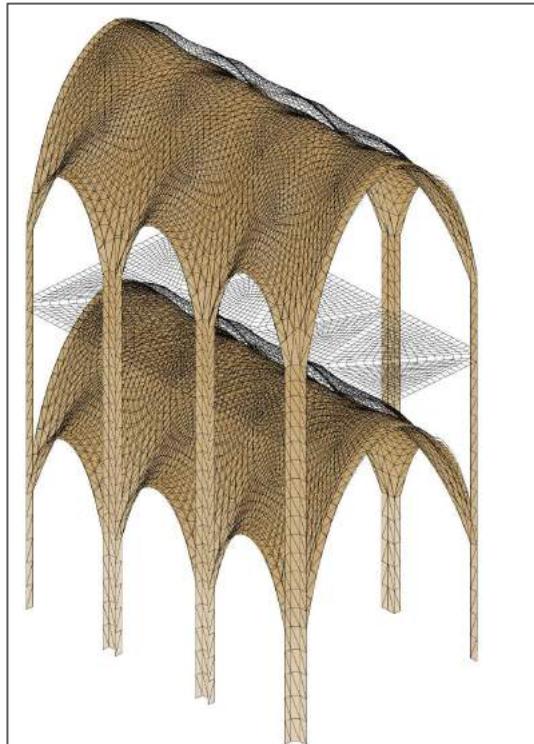
Max tensile stress 0,0144 kN/cm²



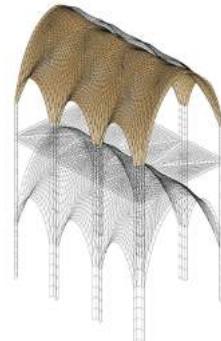
Column

Max tensile stress 0,016 kN/cm²

Structural Analysis_Princ. Stress 2

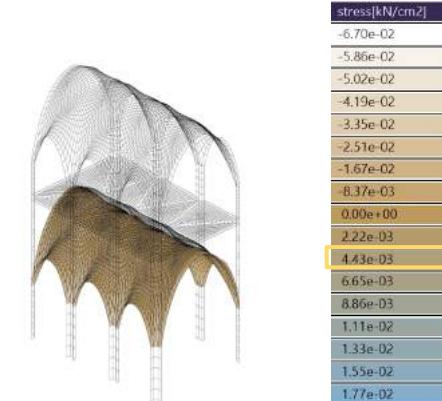


Column
Max tensile stress 0,0312 kN/cm²



Roof
Max tensile stress 0,00277 kN/cm²

stress[kN/cm ²]
-5.86e-02
-5.13e-02
-4.40e-02
-3.66e-02
-2.93e-02
-2.20e-02
-1.47e-02
-7.33e-03
0.00e+00
9.25e-04
1.85e-03
2.77e-03
3.69e-03
4.62e-03
5.54e-03
6.46e-03
7.38e-03



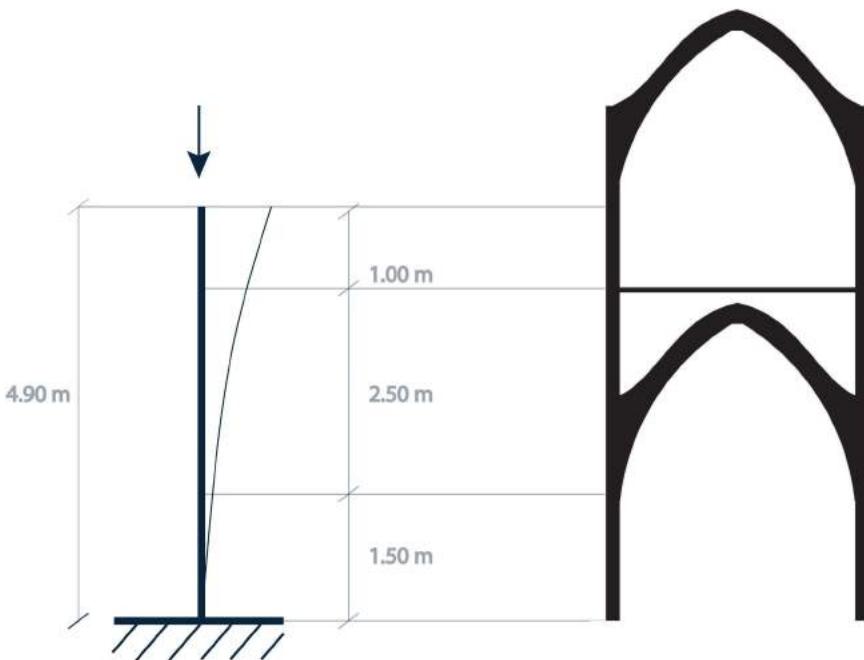
First floor roof
Max tensile stress 0,00443 kN/cm²



stress[kN/cm ²]
-9.61e-02
-9.02e-02
-8.43e-02
-7.84e-02
-7.25e-02
-6.66e-02
-6.07e-02
-5.48e-02
-4.89e-02
-4.30e-02
-3.71e-02
-3.12e-02
-2.53e-02
-1.94e-02
-1.35e-02
-7.59e-03
-1.69e-03

Column
Max tensile stress 0,0312 kN/cm²

Structural Analysis_Buckling

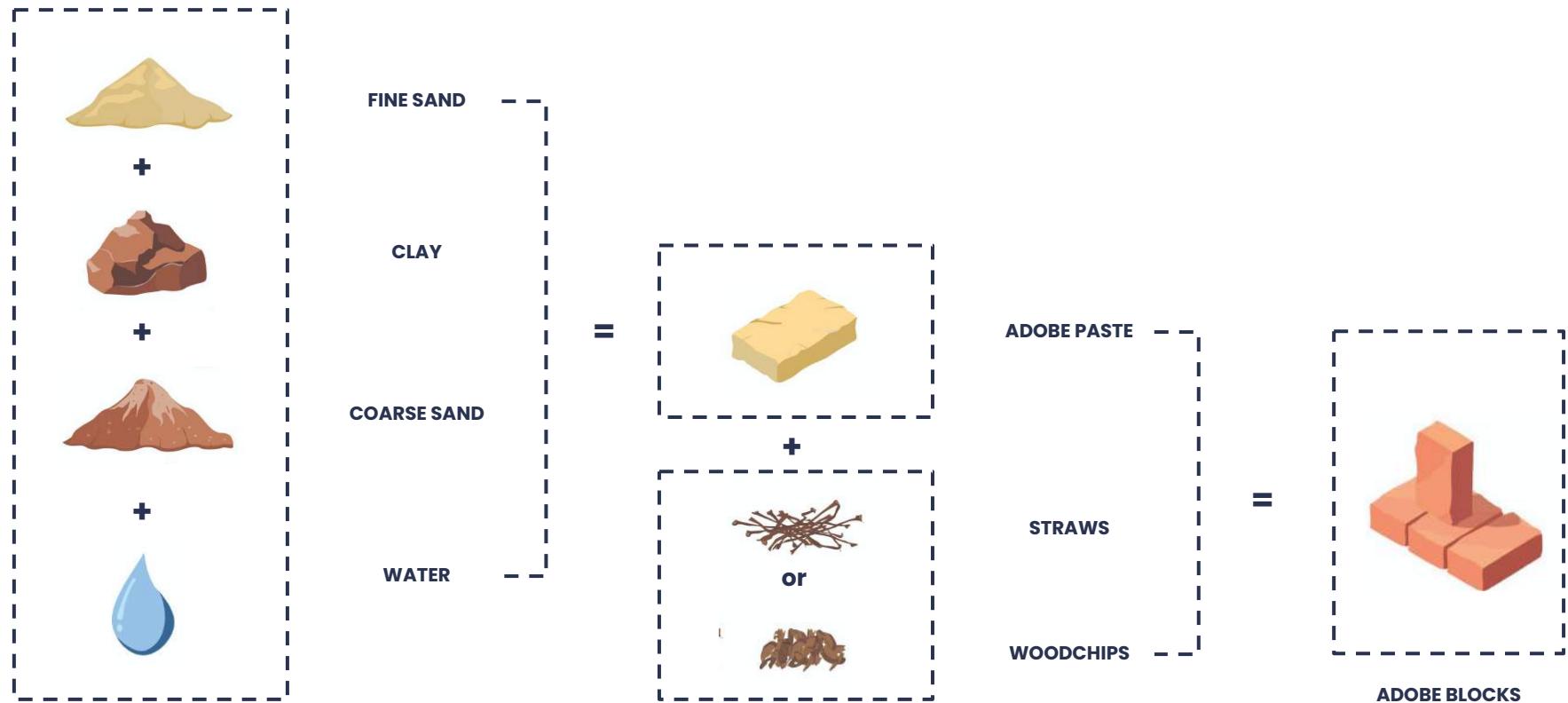


Section area	1,6E+05 mm ²
Young's Modulus	2,50E+02 MPa
Moment of Inertia	2,13E+09 mm ⁴
Length	4,90E+03 mm
P _{cr}	5,48E+01
Maximum Reaction Force	48 kN



04 | Construction

BLOCK COMPOSITION



BLOCK MANUFACTURE



INGREDIENTS

Clay 30%
Fine Sand 30%
Coarse Sand 40%

Reinforcement 2%

MIXTURE

Mix Dry Ingredients

Add Water

Mix them together

MOULD

Choose Mould

Add Mixture

PRESS MACHINE

Dry in the Shadow

Cured for 7 days

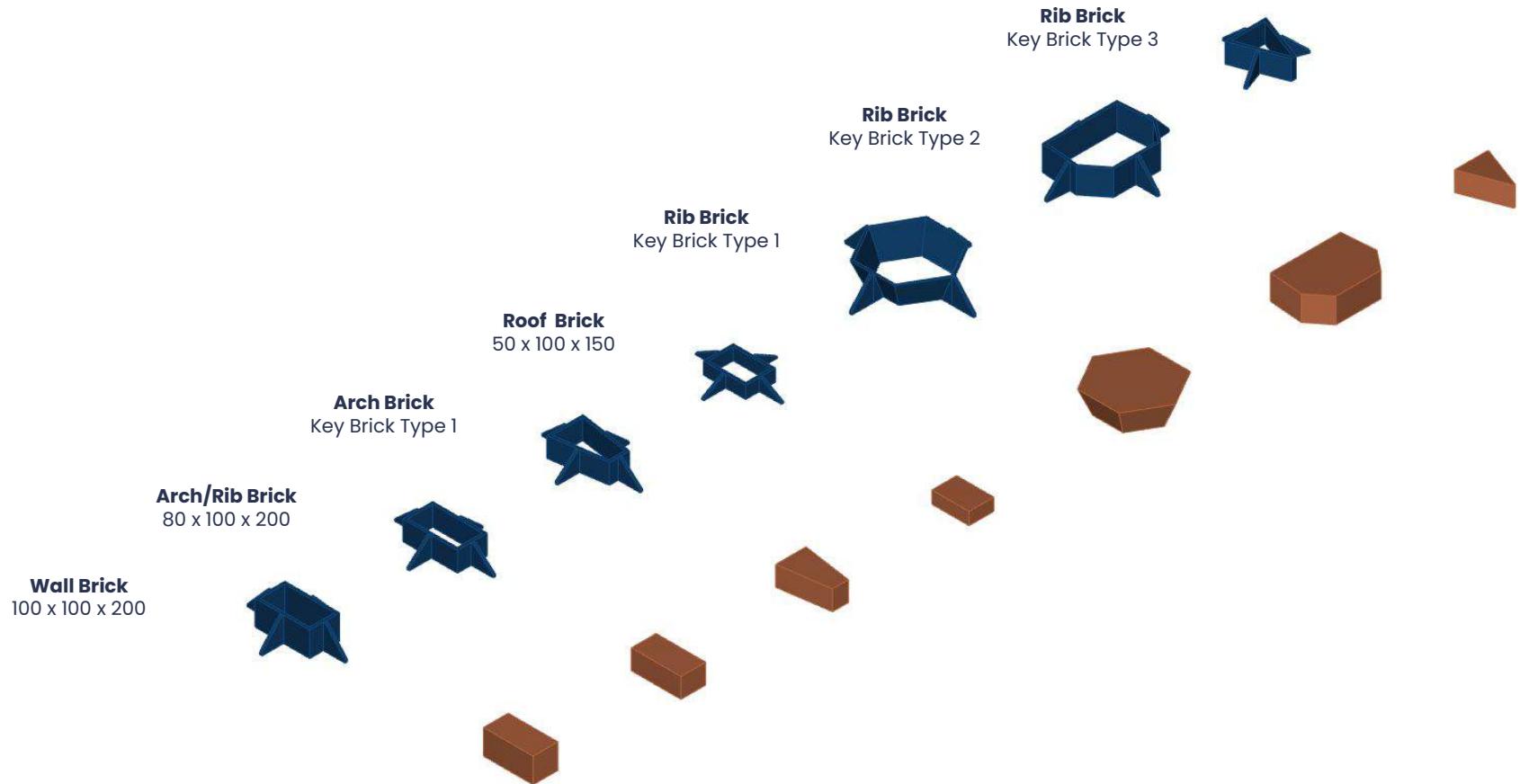
DRYING

Dry in the Sun

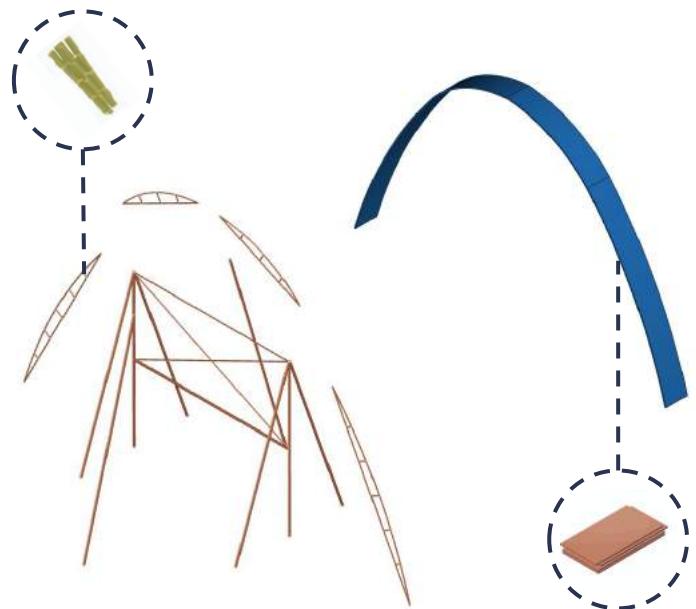
Cured for 30 days

Water 10%
(of the total mixture)

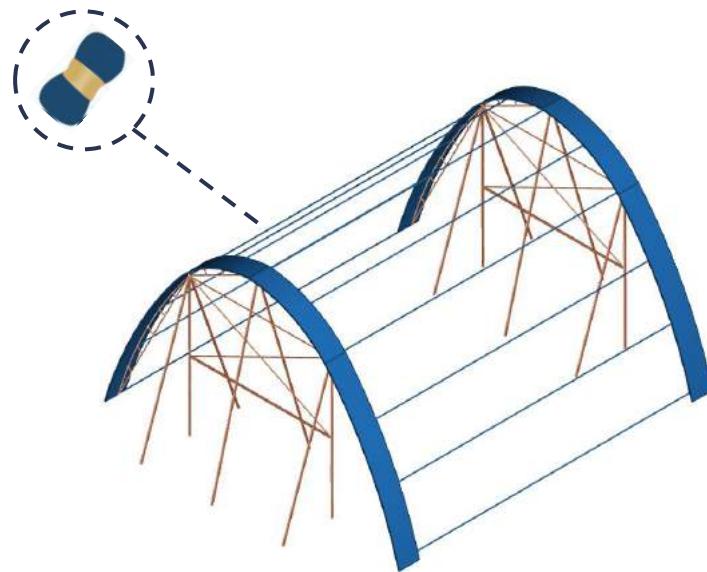
BLOCK TYPES DESIGN



TOOLS & METHOD

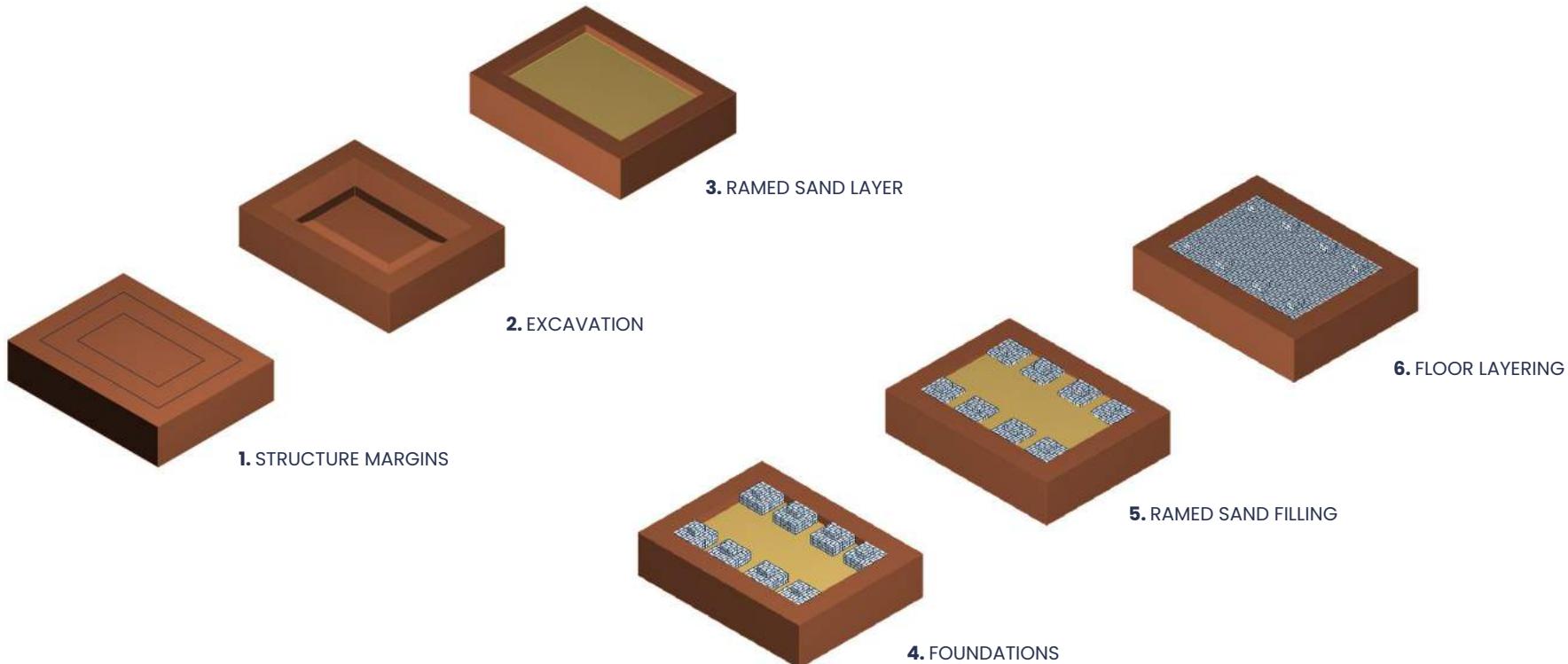


Catenaries Guides for Arches & Ribs

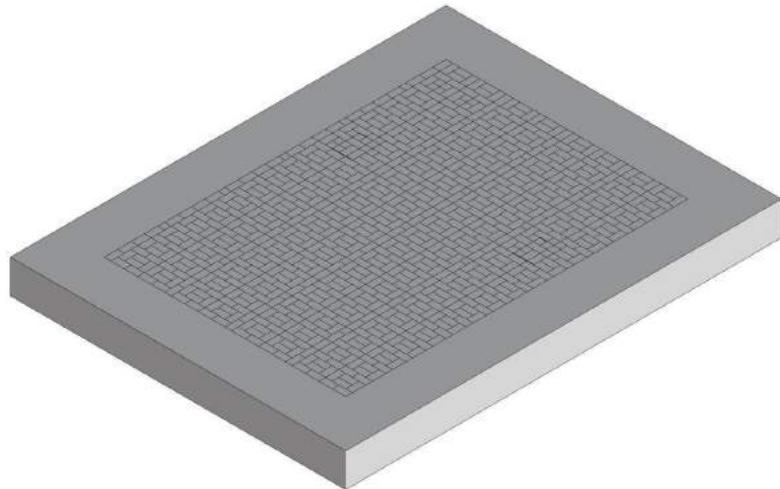


Curvature Guides String for Vaults

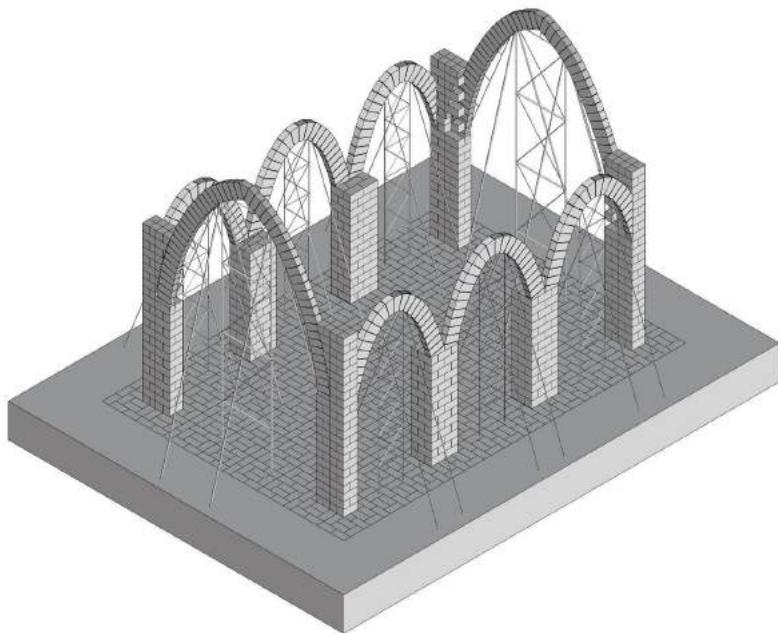
FOUNDATIONS



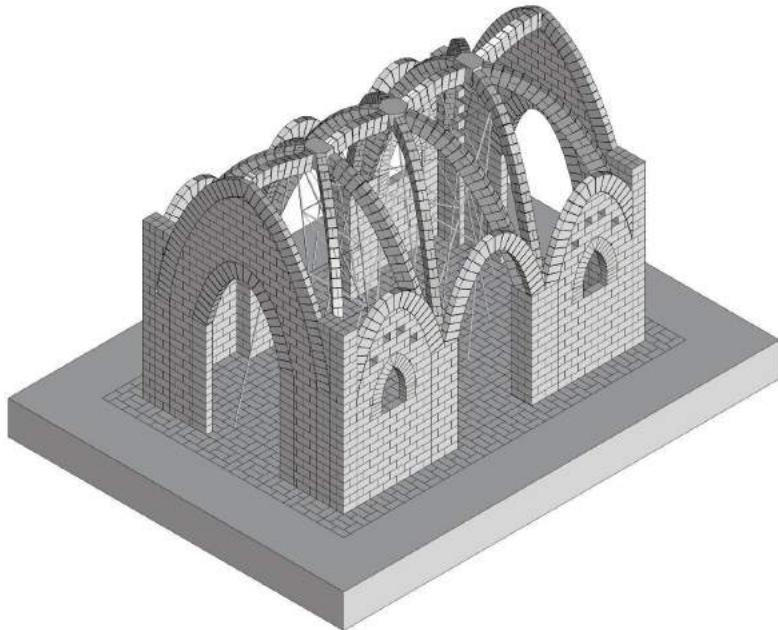
ASSEMBLY ORDER | Single Floor



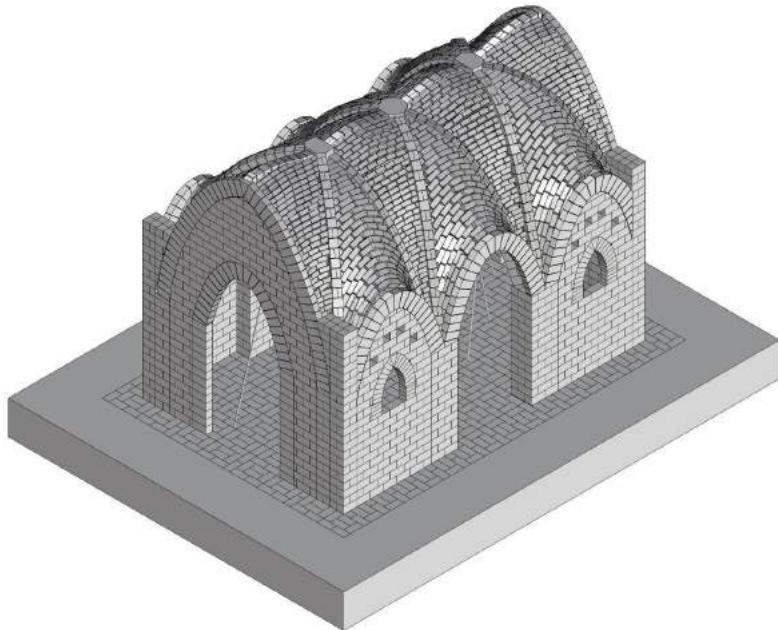
ASSEMBLY ORDER | Single Floor



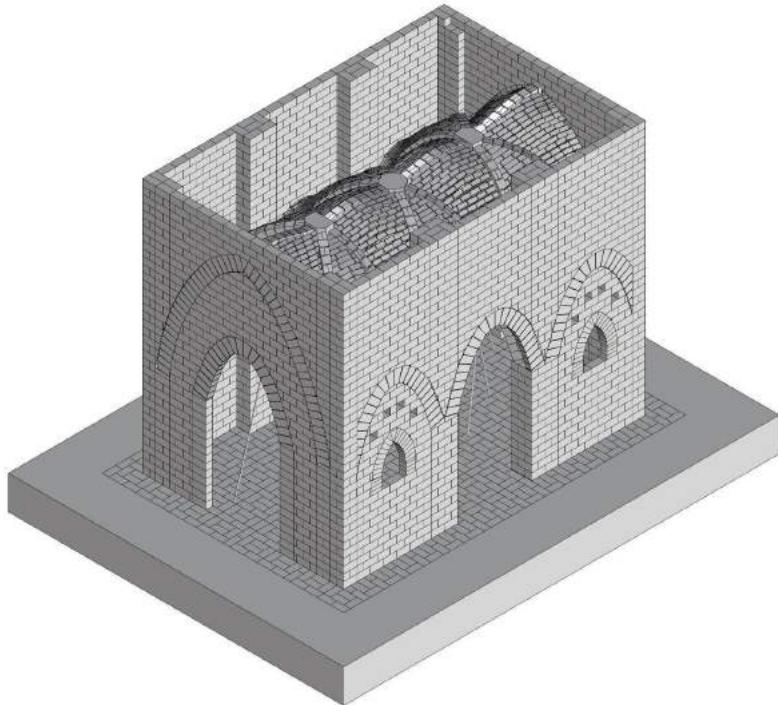
ASSEMBLY ORDER | Single Floor



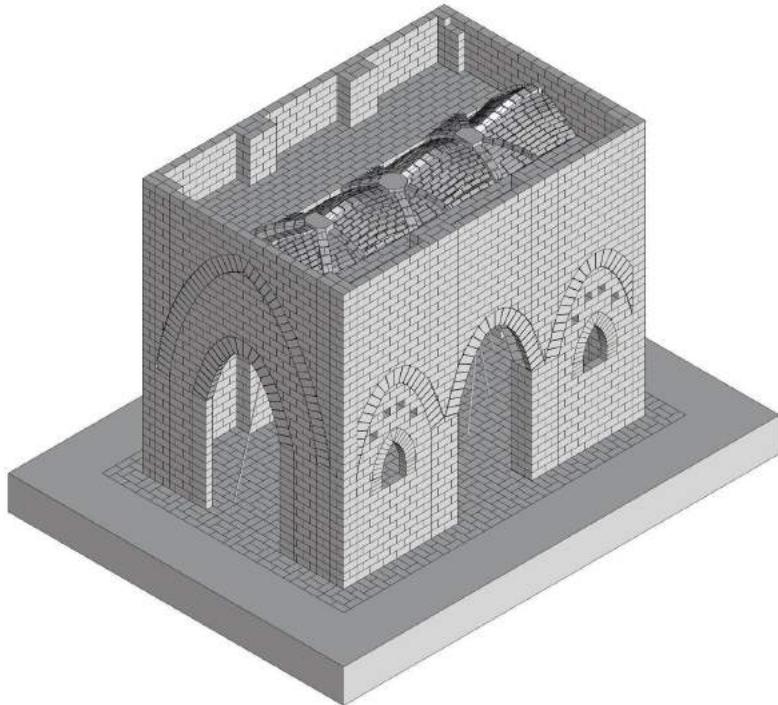
ASSEMBLY ORDER | Single Floor



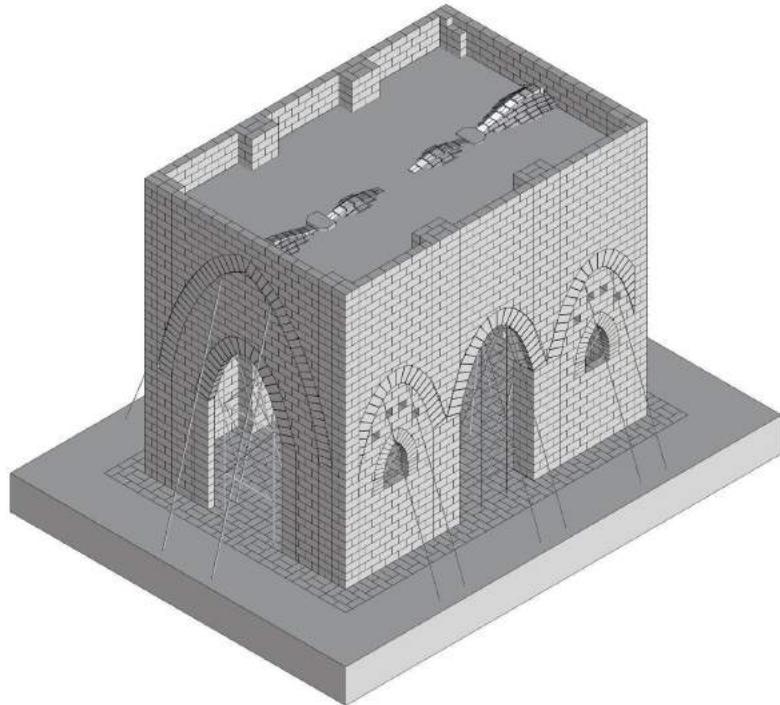
ASSEMBLY ORDER | Single Floor



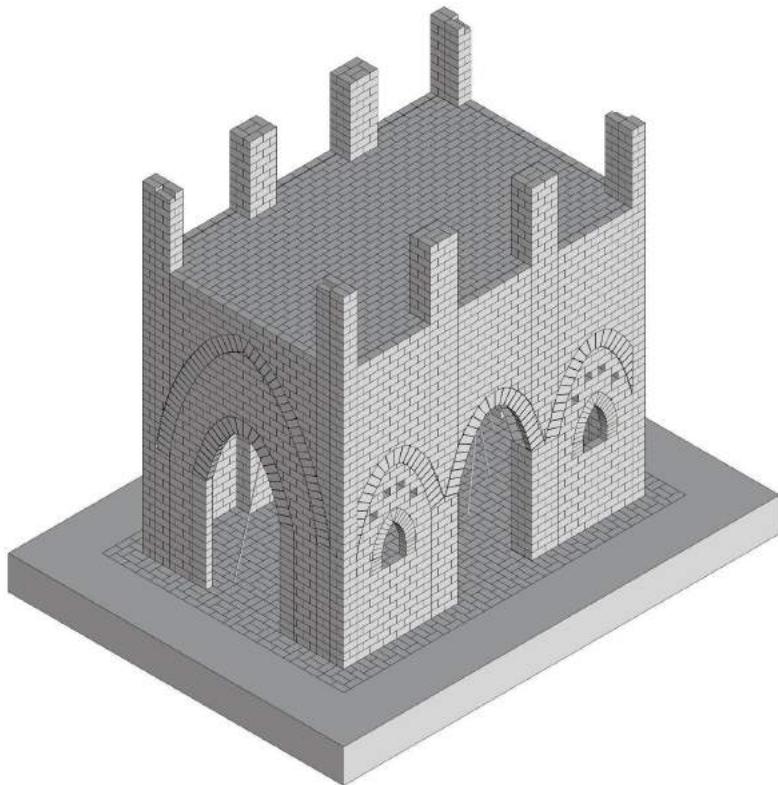
ASSEMBLY ORDER | Single Floor



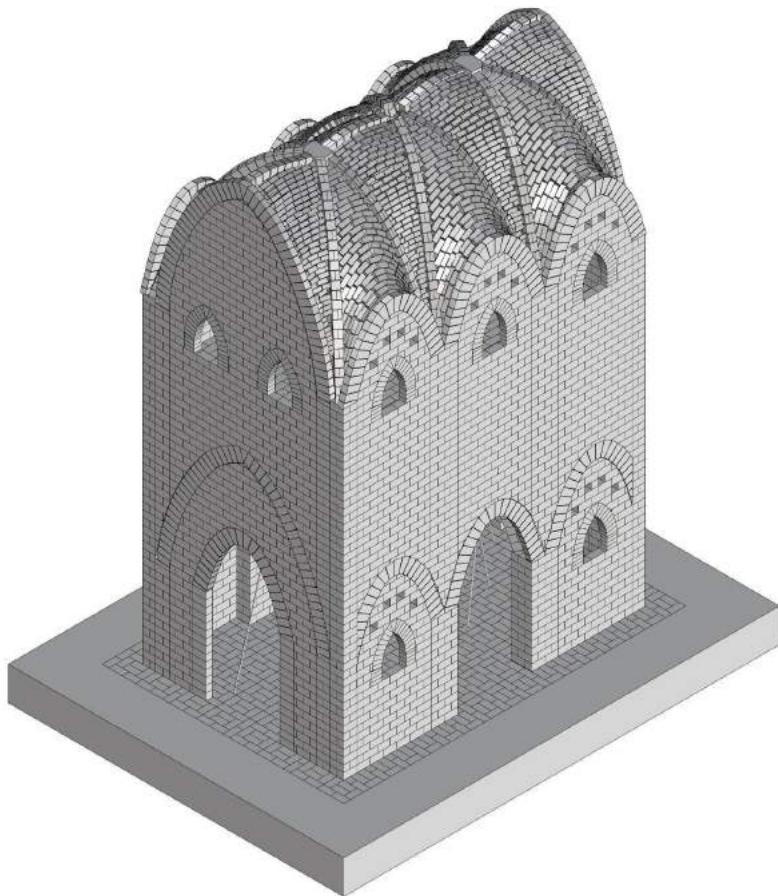
ASSEMBLY ORDER | Single Floor



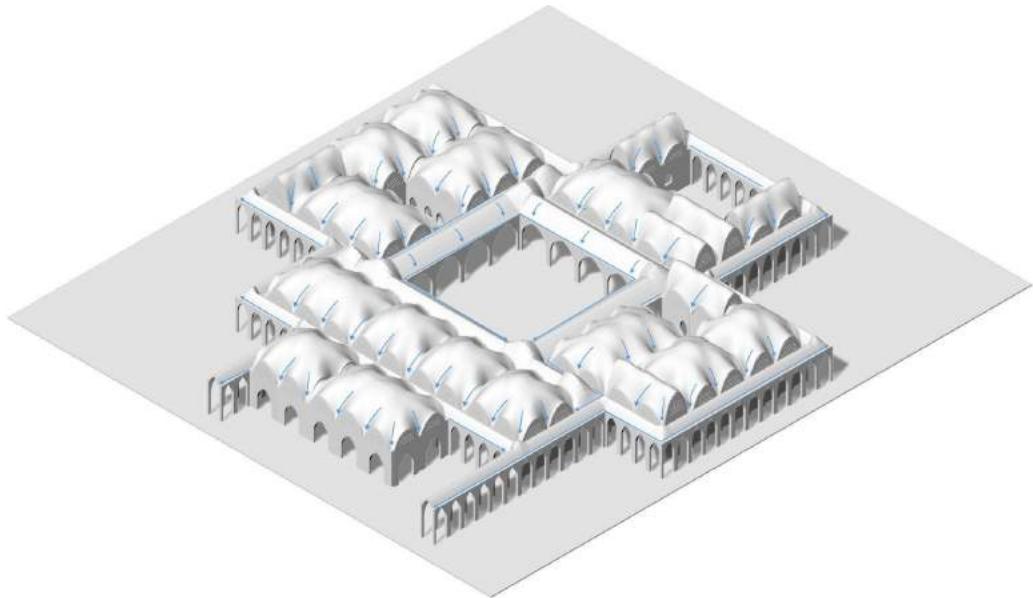
ASSEMBLY ORDER | Single Floor



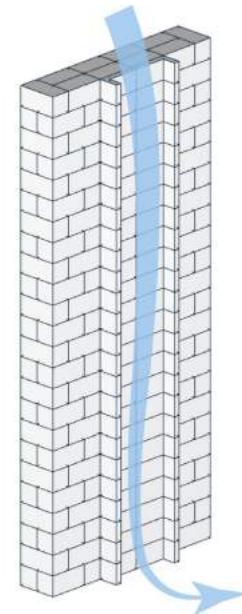
ASSEMBLY ORDER | Single Floor



DETAILS | Drainage



Roofs Gutter System

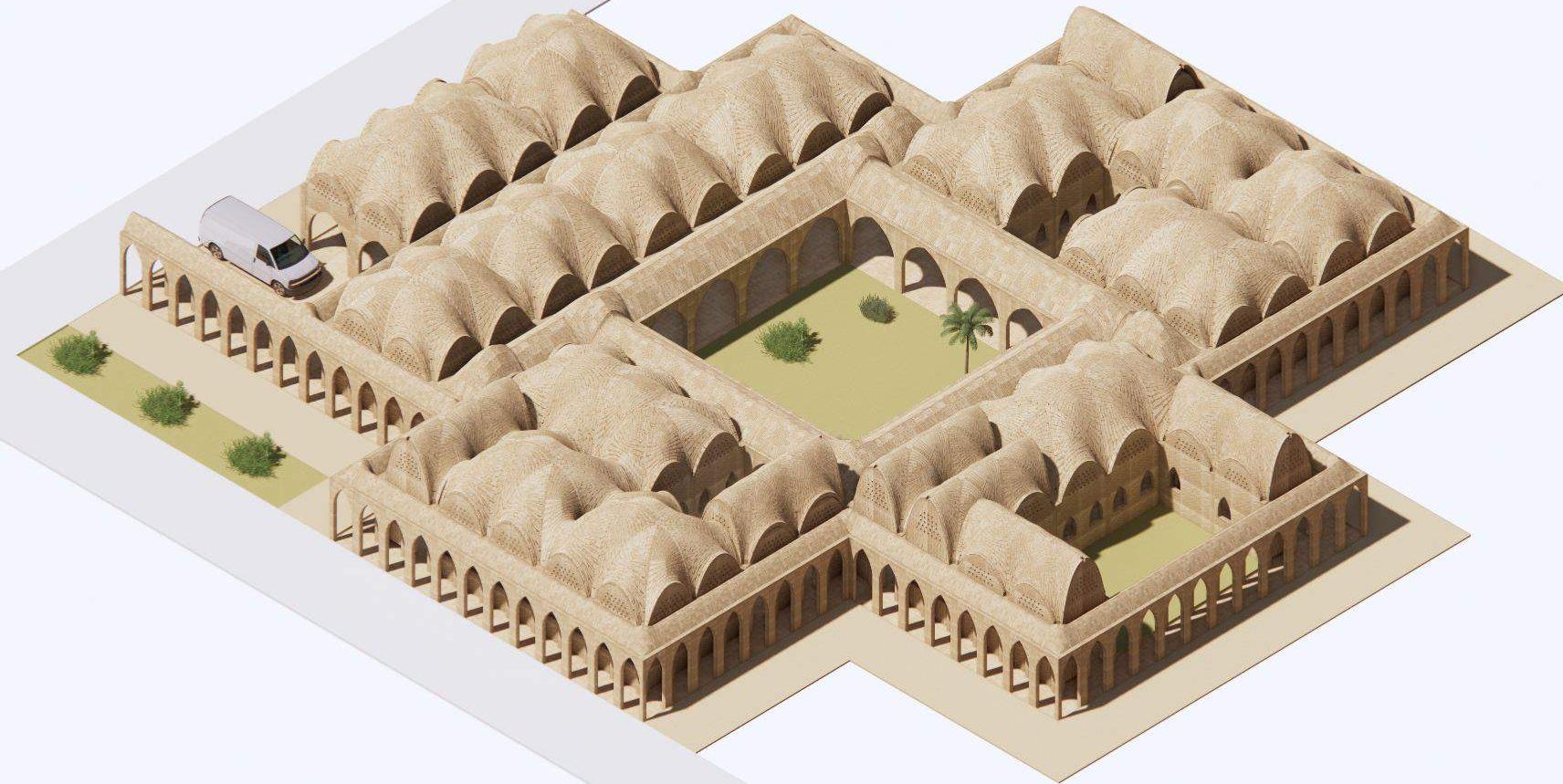


Wall/Column Gutter



05 | Conclusion

CONCLUSION | General Overview of Production Hubs



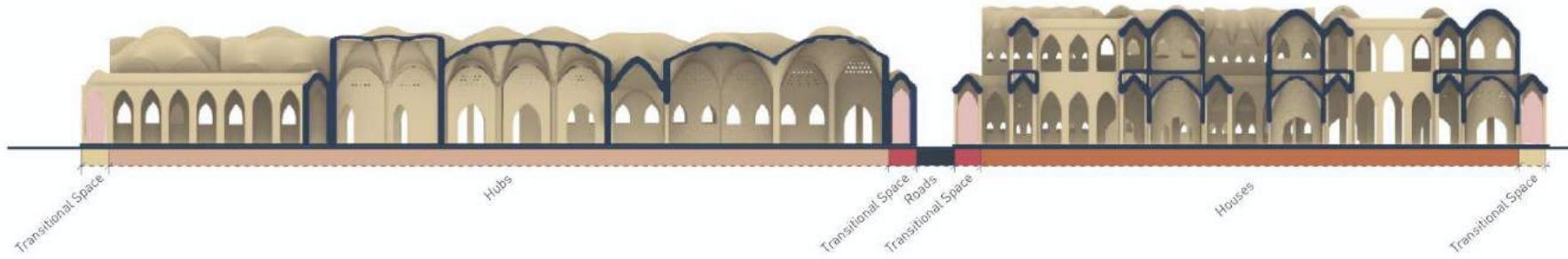
CONCLUSION | Side View



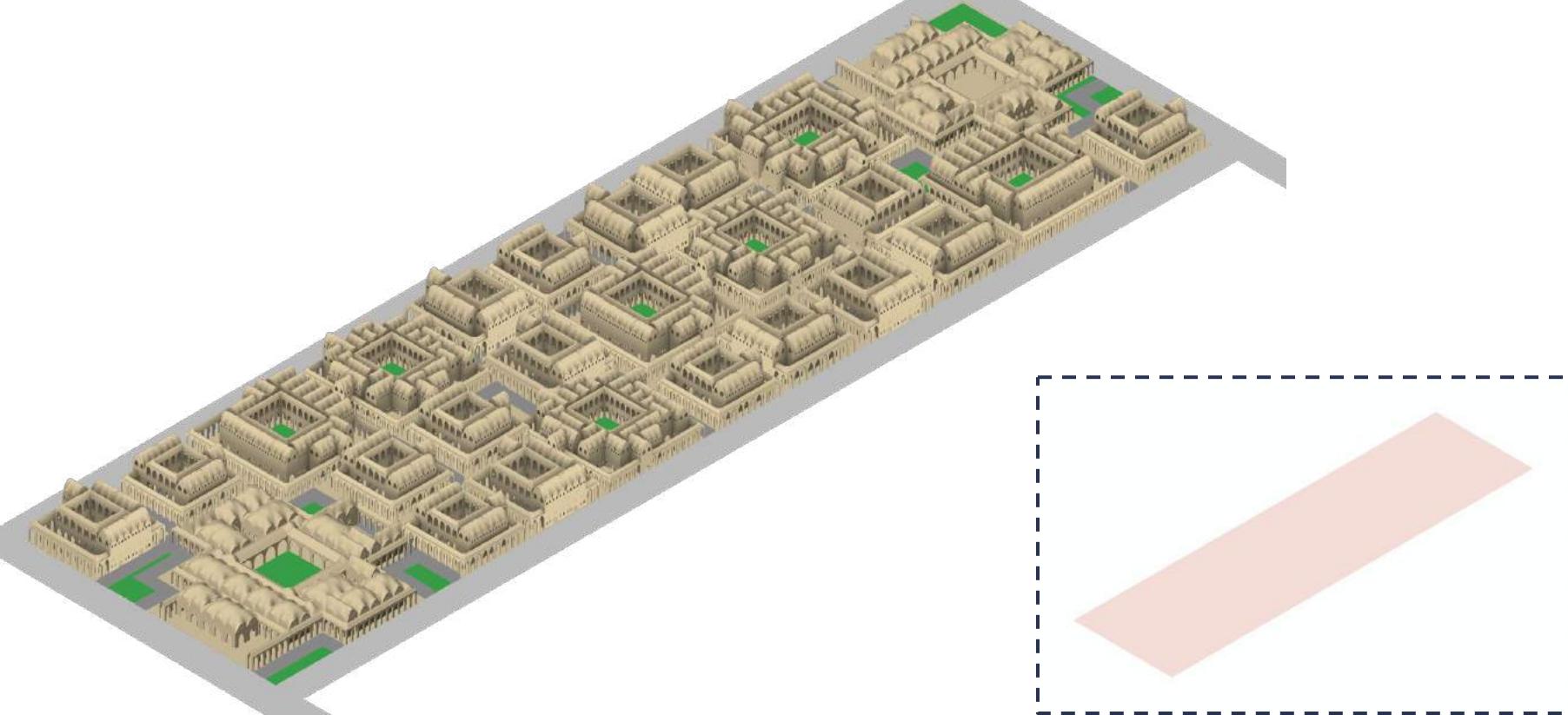
CONCLUSION | Cross Sections



CONCLUSION | Cross Sections Spaces



CONFIGURATION | Block Development



CONCLUSION Final design



CONCLUSION Final design



CONCLUSION Final design



CONCLUSION | Final design



CONCLUSION | Final design





06 | Reflection

REFLECTION | Further Development

Configuration

The Gamification logic can be optimised further to integrate connectivity better.

The approach was manual, the computational approach should be further developed

Structural Analysis

The columns were evaluated as mesh shells by FEA for simplification reasons, but ideally they should be evaluated as beams by taking into account the reaction forces.

Construction

The construction phase is addressed to expert technicians



Thank you!

...the end of final presentation.