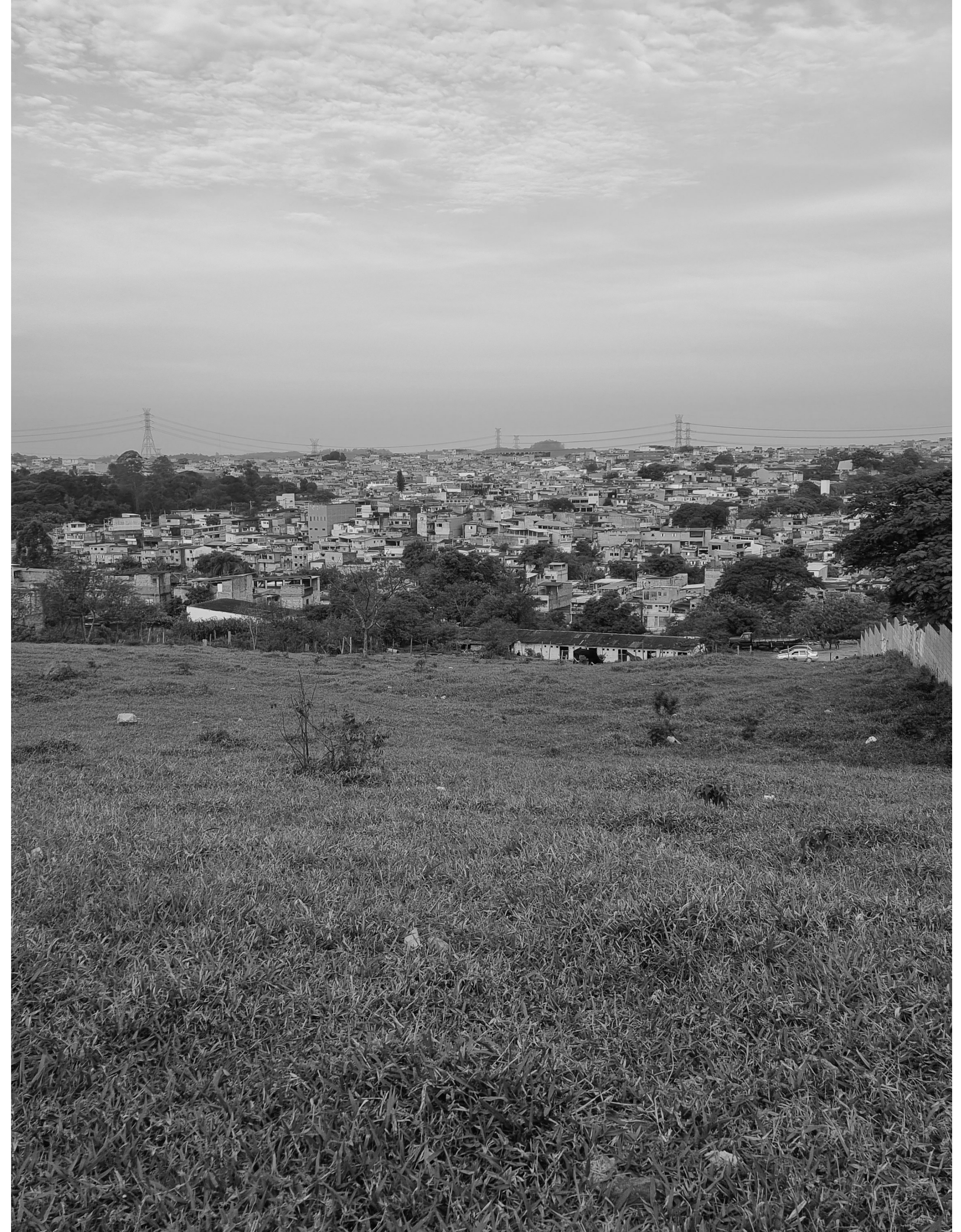


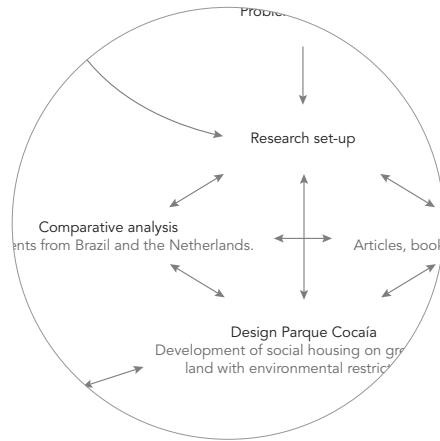
# ARCHITECTURE AND SAFETY

**safe social housing for the inhabitants of the periphery of São Paulo**

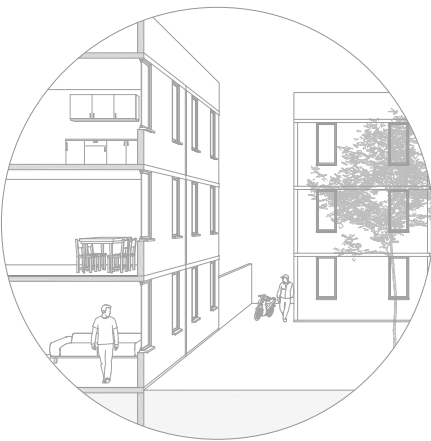
final presentation master thesis Huub Fenten, 06-07-2023



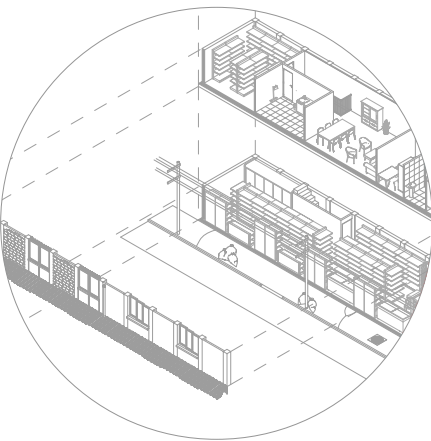
# CONTENT



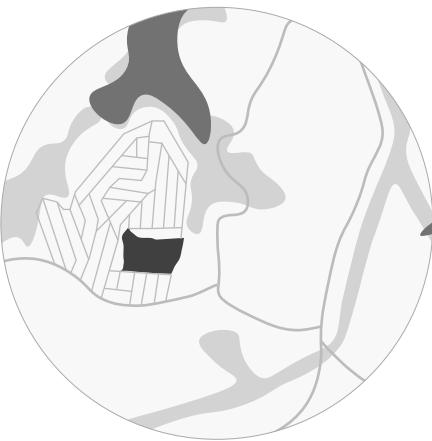
research plan



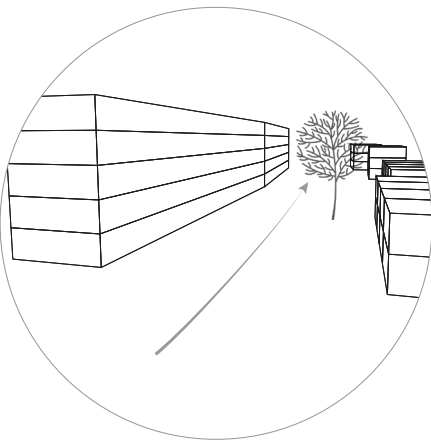
safety catalog



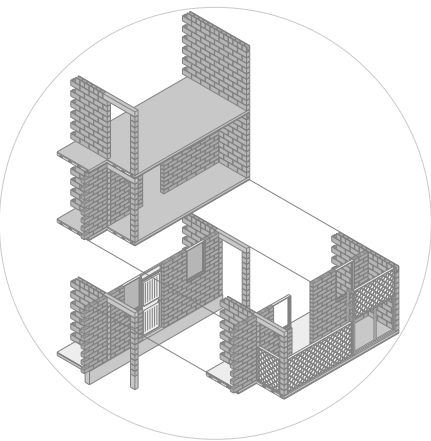
comparative analysis



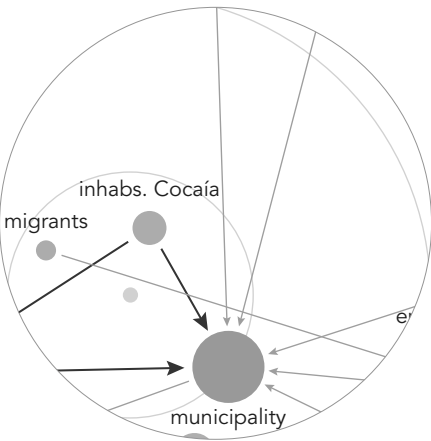
contextual analysis



design Parque Cocaia



building technology



managerial strategy



synthesis



# RESEARCH PLAN

goal: determine what problem the thesis is going to research, why, and how

# INTRODUCTION

click [here](#) to access the problem statement video

sources videos without copyright or not of own production:

1. <https://www.youtube.com/watch?v=kkGSeXydMD4>
2. <https://www.youtube.com/watch?v=IYVkfFcWqclo>
3. [https://www.youtube.com/watch?v=8ii5lFTXh\\_g](https://www.youtube.com/watch?v=8ii5lFTXh_g)
4. [https://www.youtube.com/watch?v=efHZP\\_yvOIO](https://www.youtube.com/watch?v=efHZP_yvOIO)
5. <https://www.youtube.com/watch?v=foT1ol4VClI>
6. United Nations, <https://sdgs.un.org/goals>
7. [https://www.youtube.com/watch?v=xCsu\\_Hlj1gE](https://www.youtube.com/watch?v=xCsu_Hlj1gE)
8. <https://www.youtube.com/watch?v=tUg5XyVzWCO>
9. <https://www.youtube.com/watch?v=2WGPvWPpey8>
10. <https://www.youtube.com/watch?v=mhlqC3gPrg4>
11. <https://www.youtube.com/watch?v=k3pFTIZvdh0>
12. <https://www.youtube.com/watch?v=GnwgrmLyWls>
13. <https://www.youtube.com/watch?v=ymgwaU-M-G4>

sources text video:

1. United Nations. (2022). The Sustainable Development Goals Report 2022.
2. Central Intelligence Agency. (n.d.). Brazil - The World Factbook. The World Factbook. Retrieved November 11, 2022, from <https://www.cia.gov/the-world-factbook/countries/brazil/>
3. United Nations Population Fund (UNFPA). (n.d.). Brazil. World Population Dashboard. Retrieved November 9, 2022, from <https://www.unfpa.org/data/world-population/BR>
4. Marques, E., & Saraiva, C. (2017). Urban integration or reconfigured inequalities? analyzing housing precarity in São Paulo, Brazil. *Habitat International*, 69, 18–26. <https://doi.org/10.1016/j.habitatint.2017.08.004>
5. Worldbank <https://data.worldbank.org/indicator/VC.IHR.PSRC.P5?locations=BR-1W>
6. Prefeitura de São Paulo. (2017, April 26). Habitação. *habitaSAMPÁ*. Retrieved November 16, 2022, from <http://www.habitasampa.inf.br/habitacao/>
7. Fix, M., & Arantes, P. F. (2021). On urban studies in Brazil: The favela, uneven urbanisation and beyond. *Urban Studies*, 59(5), 893–916. <https://doi.org/10.1177/0042098021993360>
8. Pimentel Walker, A. P., & Arquero de Alarcón, M. (2018). The competing social and environmental functions of private urban land: The case of an informal land occupation in São Paulo's south periphery. *Sustainability*, 10(11), 4160–4184. <https://doi.org/10.3390/su10114160>
9. Serapião, F. (2016). Linking the Formal and Informal: Favela urbanisation and Social Housing in São Paulo. *Architectural Design*, 86(3), 70–79. <https://doi.org/10.1002/ad.2048>
10. Pinheiro, R. (2021, January 20). Human Development Index by Neighborhood in Sao Paulo City. Medium. Retrieved November 11, 2022, from [https://medium.com/@r\\_pinheiro/human-development-index-by-neighborhood-in-sao-paulo-city-3320eba2ab81](https://medium.com/@r_pinheiro/human-development-index-by-neighborhood-in-sao-paulo-city-3320eba2ab81)
11. São Paulo Data-Driven EnviroLab. Urban Environment & Social Inclusion Index. (n.d.). Retrieved November 11, 2022, from <https://datadrivenlab.org/urban/cities/sao-paulo/>
12. Lara, F. L. (2019). Boldarini Arquitetos. Nhamerica.
13. Ribeiro, S. C., Daniel, M. N., & Abiko, A. (2016). Zeis maps: Comparing areas to be earmarked exclusively for social housing in São Paulo City. *Land Use Policy*, 58, 445–455. <https://doi.org/10.1016/j.landusepol.2016.08.010>
14. Murray, J., de Castro Cerqueira, D. R., & Kahn, T. (2013). Crime and violence in Brazil: Systematic review of time trends, prevalence rates and risk factors. *Aggression and Violent Behavior*, 18(5), 471–483. <https://doi.org/10.1016/j.avb.2013.07.003>
15. Coy, M. (2006). Gated communities and urban fragmentation in Latin America: The Brazilian experience. *GeoJournal*, 66(1-2), 121–132. <https://doi.org/10.1007/s10708-006-9011-6>
16. Caldeira, T. P. R. (1996). Fortified Enclaves: The New Urban Segregation. *Public Culture*, 8(2), 303–328. <https://doi.org/10.1215/08992363-8-2-303>
17. Andrade, L. H., Wang, Y.-P., Andreoni, S., Silveira, C. M., Alexandrino-Silva, C., Siu, E. R., Nishimura, R., Anthony, J. C., Gattaz, W. F., Kessler, R. C., & Viana, M. C. (2012). Mental disorders in megacities: Findings from the São Paulo Megacity Mental Health Survey, Brazil. *PLoS ONE*, 7(2). <https://doi.org/10.1371/journal.pone.0031879>
18. Gawryszewski, V. P., & Rodrigues, E. M. (2006). The burden of injury in Brazil, 2003. *Sao Paulo Medical Journal*, 124(4), 208–213. <https://doi.org/10.1590/s1516-31802006000400007>

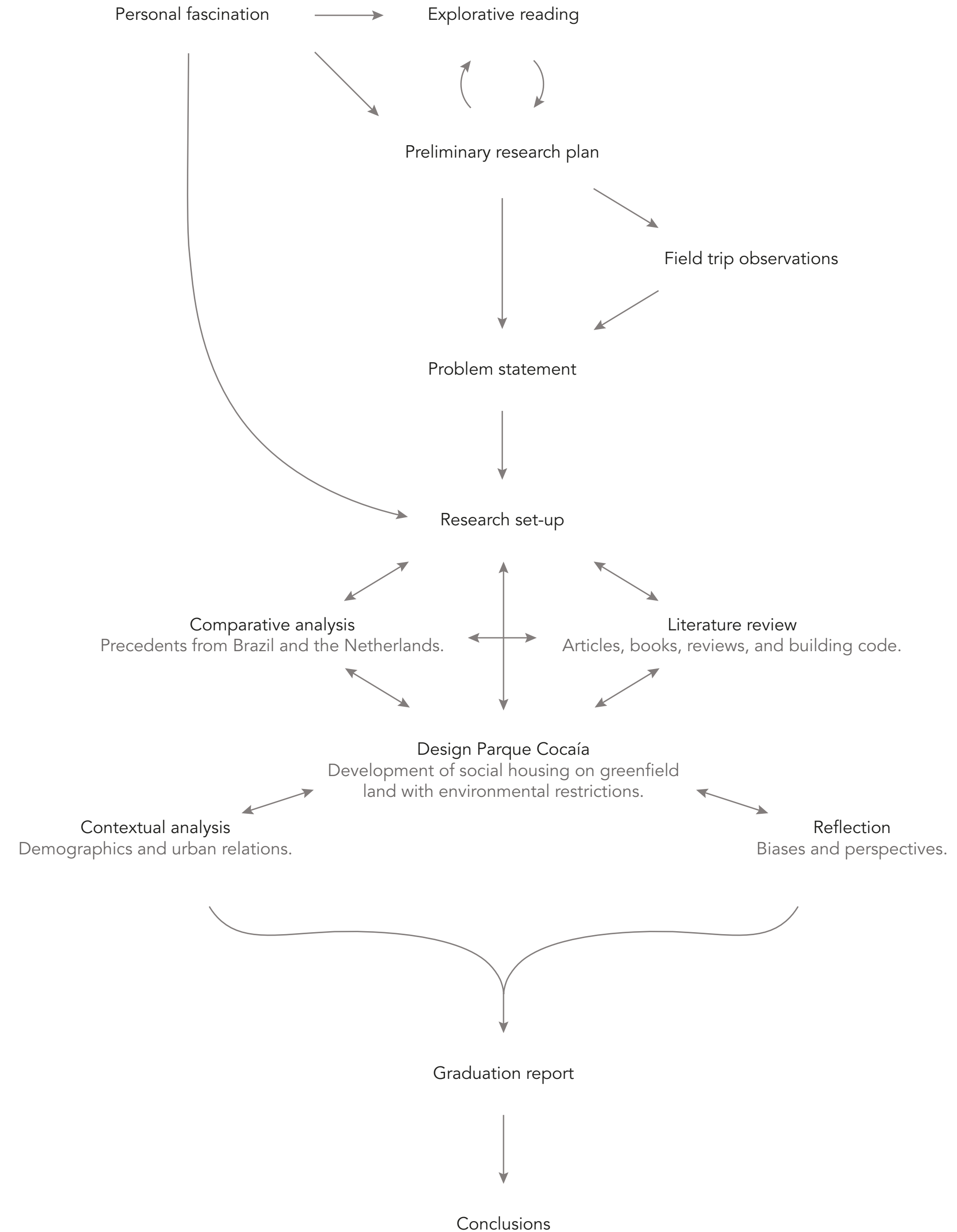
# RESEARCH PLAN

research question:

how can architectural design positively influence safety in the development of social housing in the periphery of São Paulo, taking into account socioeconomic segregation, local building practices, and social equity?

subquestions:

- which architectural interventions have proven to positively influence urban safety?
- what lessons can be learned from the development of housing in São Paulo and the Netherlands on dealing with safety, segregation, and local building practices?
- how does the context of the project site operate and which factors should be taken into account when designing?





# SAFETY INTERVENTIONS CATALOG

goal: find out which interventions have been thought of and proofed already

# SAFETY INTERVENTIONS CATALOG

## introduction

- design of shelter as old as humanity
- Deutinger in the Handbook of Tyranny (2018, p. 85):  
*“Defensive measures adopted by today’s cities mainly target the enemy within. Besides the threat of terrorist attacks, there is a much less violent ‘enemy’ to the city: the ordinary citizen.”*

# SAFETY INTERVENTIONS CATALOG

## introduction

- design of shelter as old as humanity
- Deutinger in the Handbook of Tyranny (2018, p. 85):  
*“Defensive measures adopted by today’s cities mainly target the enemy within. Besides the threat of terrorist attacks, there is a much less violent ‘enemy’ to the city: the ordinary citizen.”*
- unsafety rooted in São Paulo
- alternative for ‘enclavement’ sought
- infinite number of factors influencing the occurring of crime + crime is heterogeneous (Souza Neto, 2019)



# SAFETY INTERVENTIONS CATALOG

## introduction and methodology

- design of shelter as old as humanity
- Deutinger in the Handbook of Tyranny (2018, p. 85):  
*“Defensive measures adopted by today’s cities mainly target the enemy within. Besides the threat of terrorist attacks, there is a much less violent ‘enemy’ to the city: the ordinary citizen.”*
- unsafety rooted in São Paulo
- alternative for ‘enclavement’ sought
- infinite number of factors influencing the occurring of crime + crime is heterogeneous (Souza Neto, 2019)

literature review on  
relationship architectural design and safety



compilation of a catalog of  
design interventions for safety



research by design - implementation  
interventions in Parque Cocaía

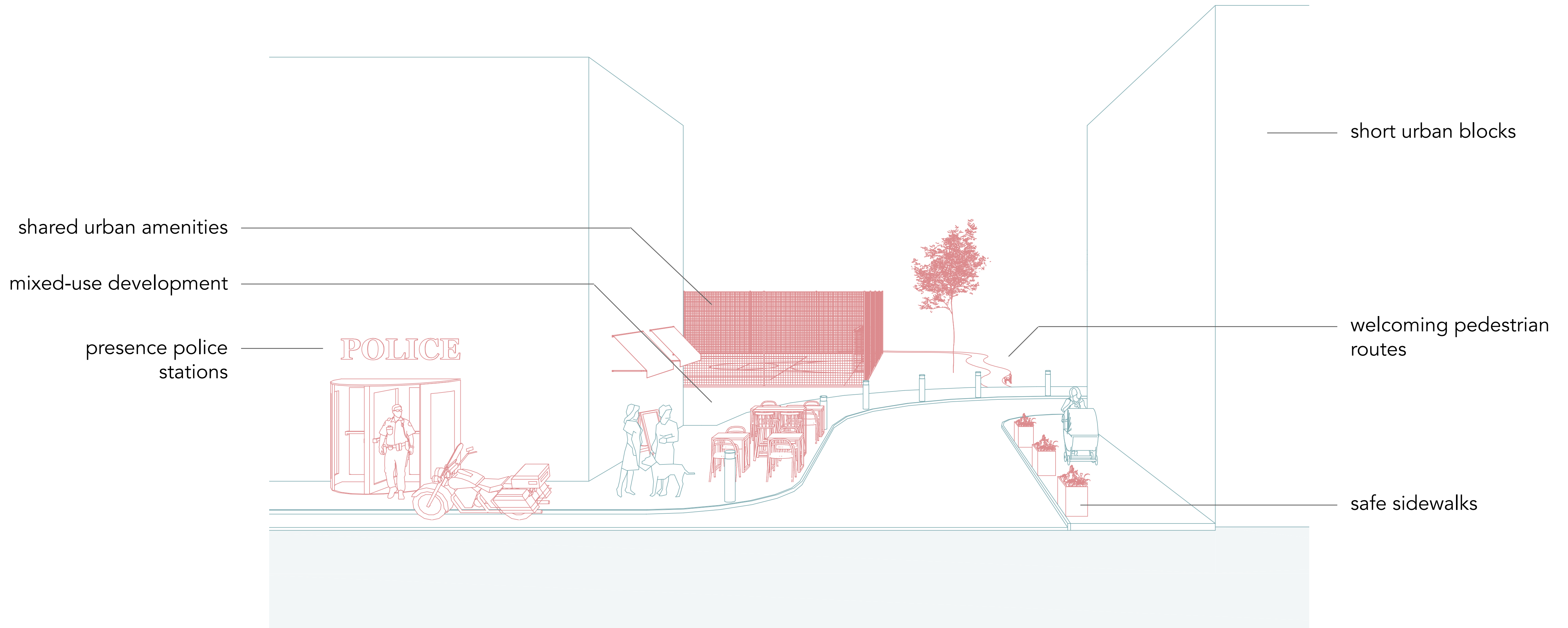
# SAFETY INTERVENTIONS CATALOG

## surveillance public sphere from private sphere



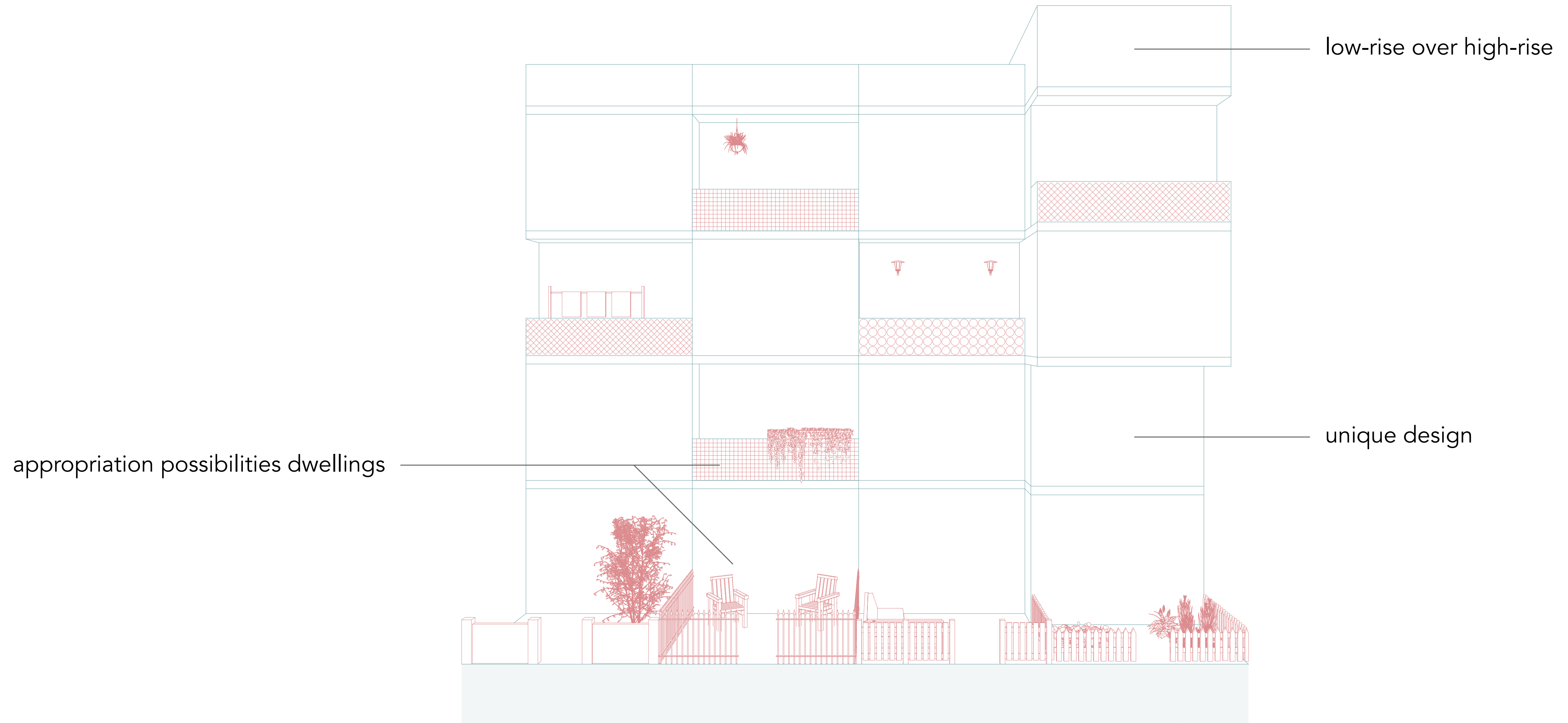
# SAFETY INTERVENTIONS CATALOG

## surveillance public sphere from public sphere



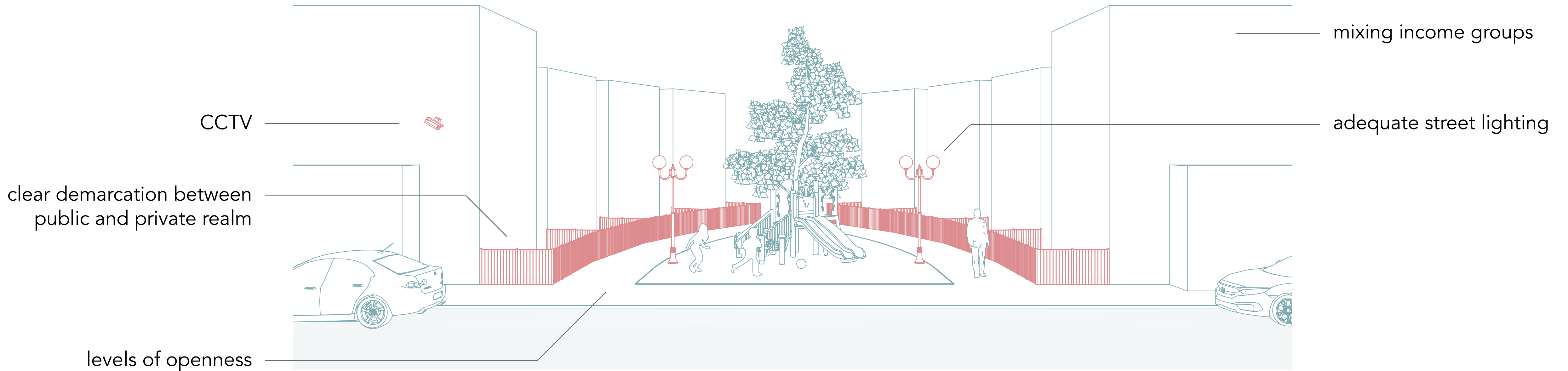
# SAFETY INTERVENTIONS CATALOG

**territoriality created within a community**



# SAFETY INTERVENTIONS CATALOG

## territoriality perceived by an intruder



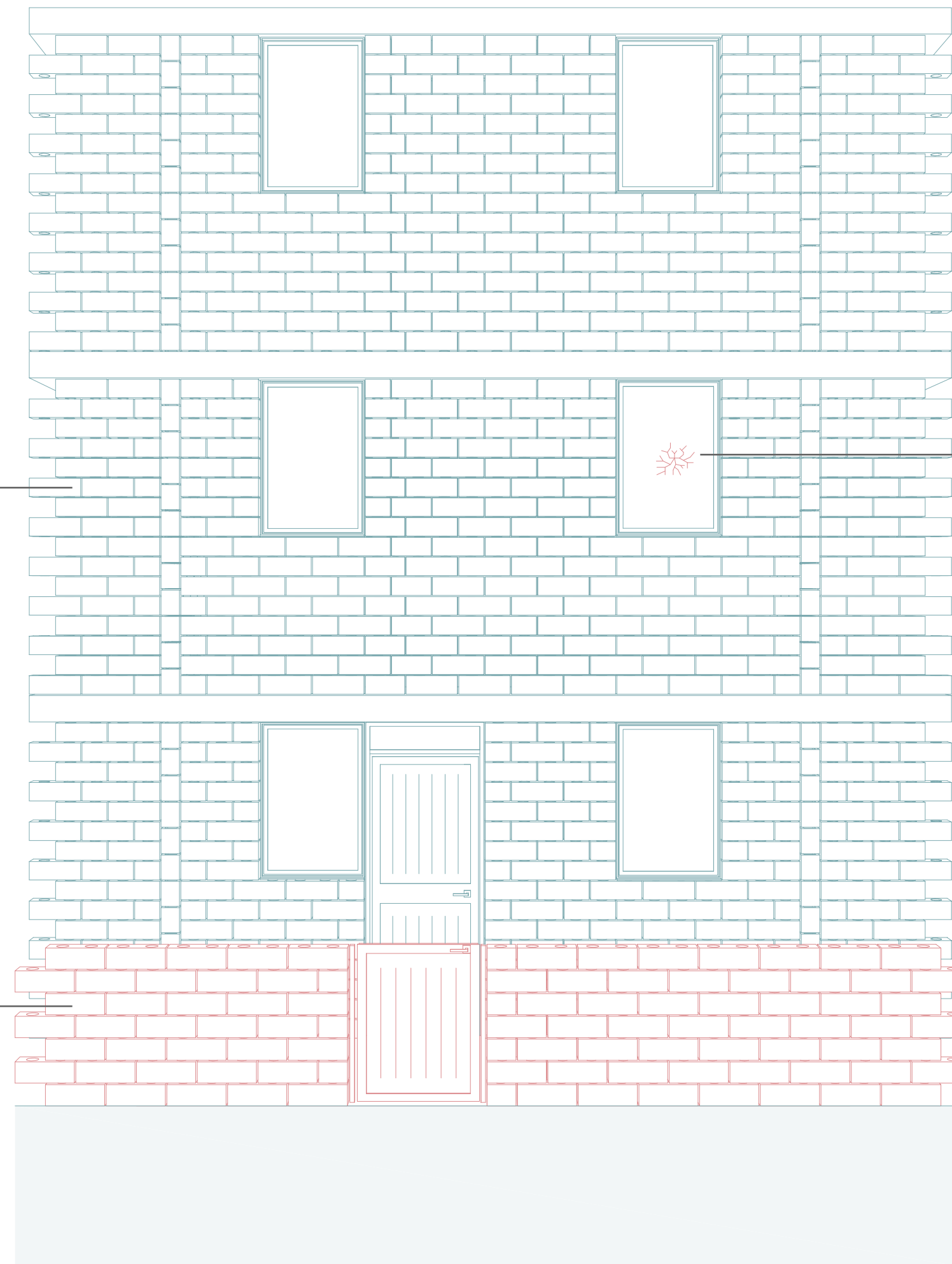
# SAFETY INTERVENTIONS CATALOG

## physical barriers

safe building shapes and materials

well-maintained appearance  
(broken windows theory)

gates, fences, and walls





# COMPARATIVE ANALYSIS

goal: analyse how precedents design for safety and the lifestyle of the user groups

safety



*gated communities  
various architects*



*Amsterdam-Zuid  
Hendrik Petrus Berlage*



*Houten  
various architects*

safety +  
design



*Grajaú  
auto-constructed*



*Chácara do Conde  
JAA Arquitetos*



*Parque Novo Santo Amaro V  
Vigliecca & Associados*



*Gleba A Heliópolis  
Vigliecca & Associados*

design



*Comuna Dom Helder Câmara  
Grupo Usina*



*Jardim Vicentina  
Vigliecca & Associados*



*Conjunto Heliópolis Gleba G  
Vigliecca & Associados*



# KEY TAKE-AWAYS SAFETY

GF contains active functions



shared staircases and elevated walkways for eyes on the street



avoid use fences - segregation



match dimensions buildings and dimensions public space



unity in design but no mass repetition

# KEY TAKE-AWAYS DESIGN

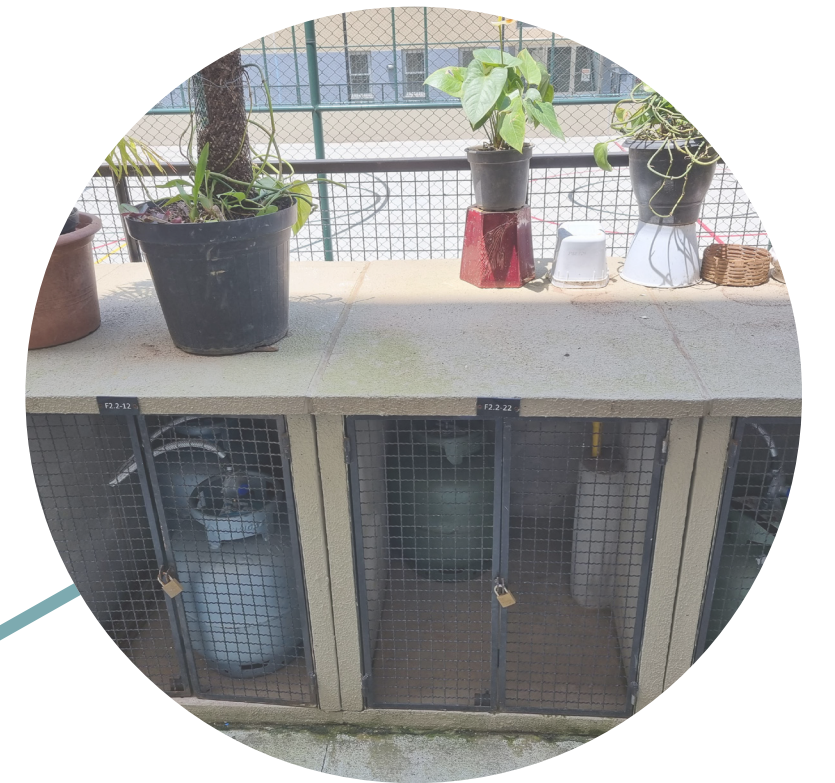
enter in living, private spaces behind



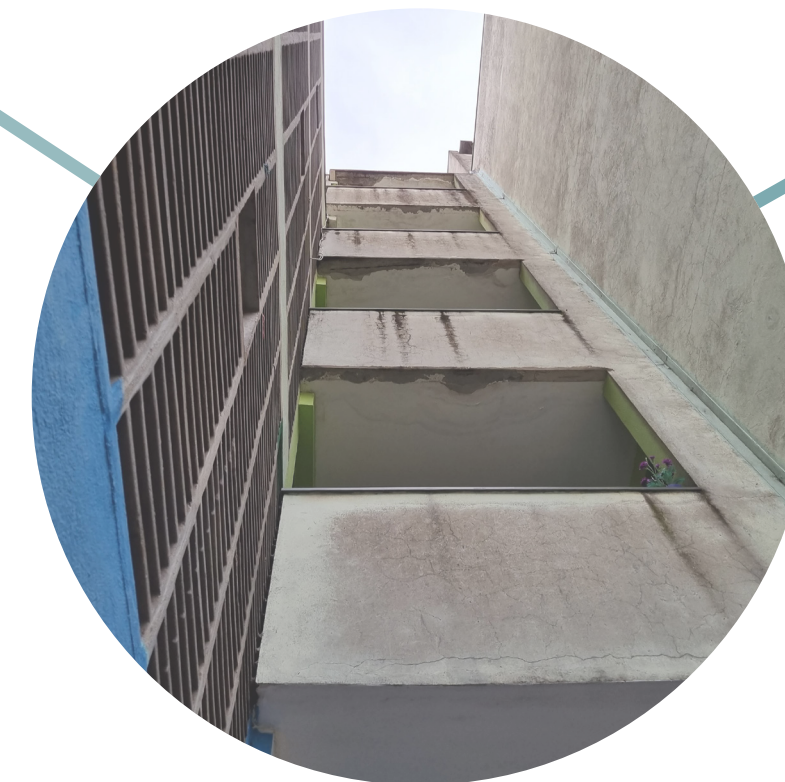
porous facades for continuous ventilation



water cistern and gas tank per dwelling



include small balcony for washing



brickwork, CMUs, and in-situ concrete, clad with stucco to avoid stigma



# CONTEXTUAL ANALYSIS

goal: determine how the context affects the safety and design

# GEOGRAPHICAL

## Brazil

- housing shortage of 7.2m in 2013
- 1b homicides between 1980 and 2010

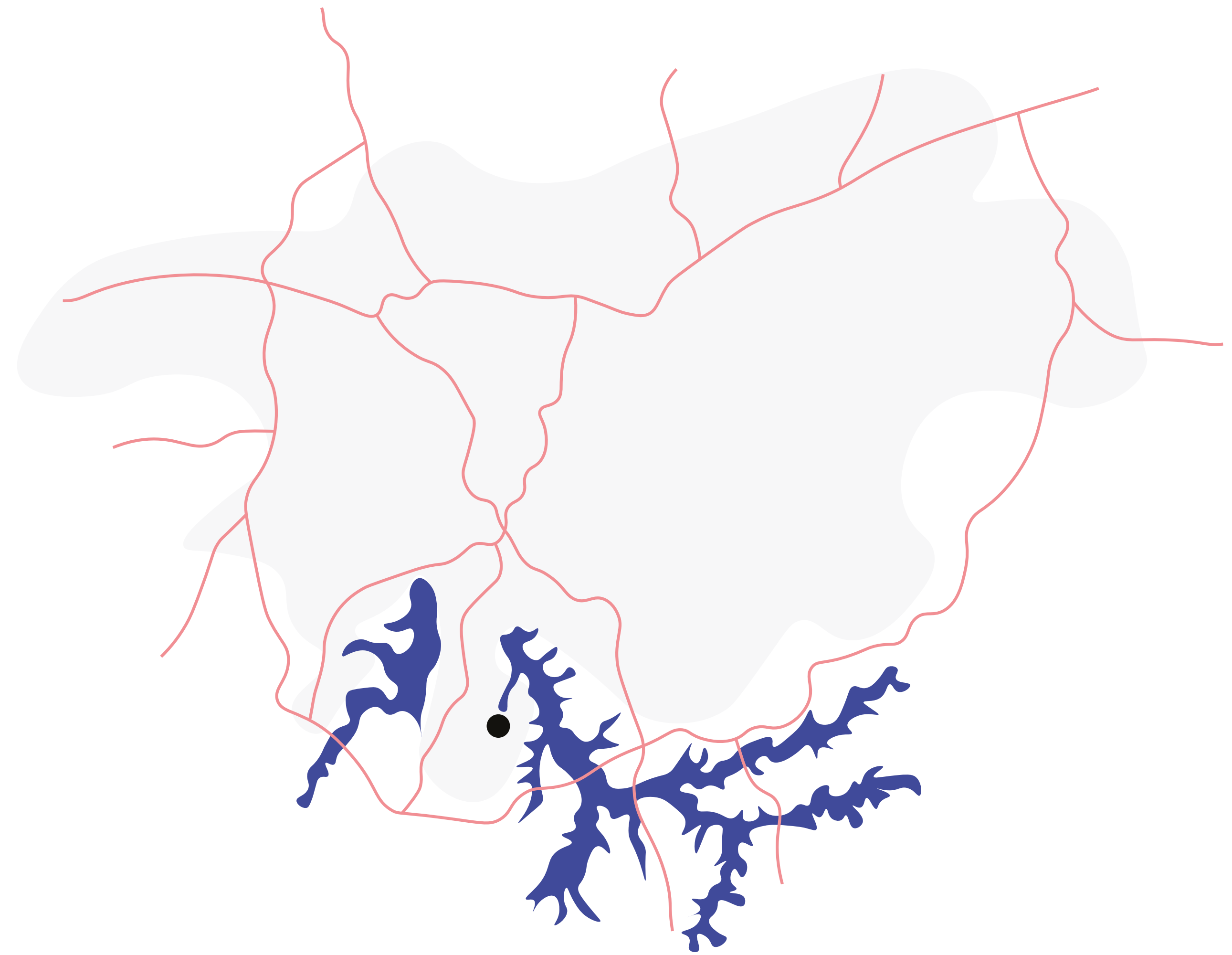


— borders

# GEOGRAPHICAL

## São Paulo

- economic center Brazil at 22.4m inhabitants
- severe housing shortage and enormous inequality, 400,000 slum households
- water supplied by two major reservoirs: Billings and Guarapiranga

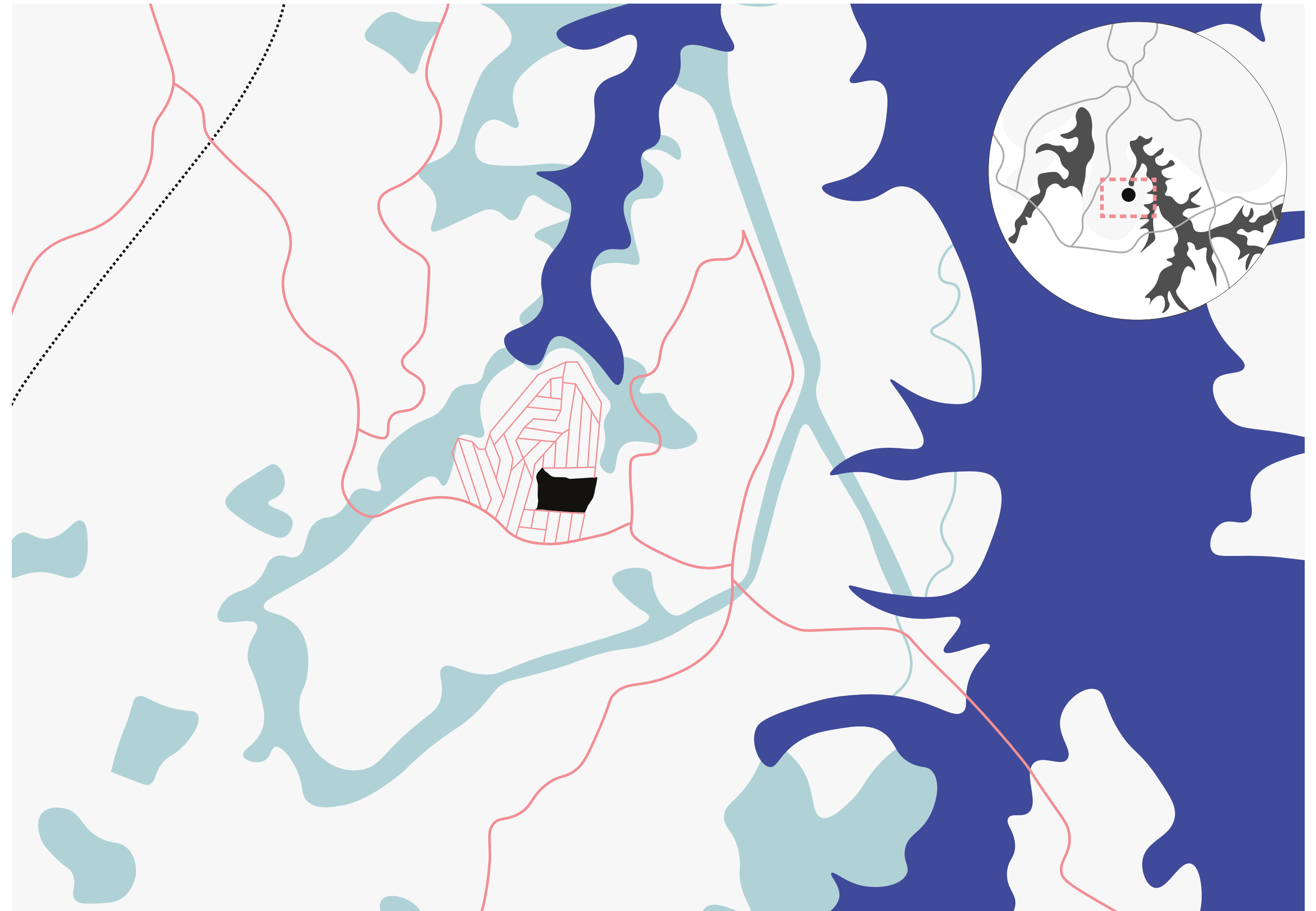


■ water reservoirs   ■ urban tissue   ■ Parque Cocaía   — roads

# GEOGRAPHICAL

## Grajaú

- high-density
- low socioeconomic values
- many settlements
- little public space and urban amenities

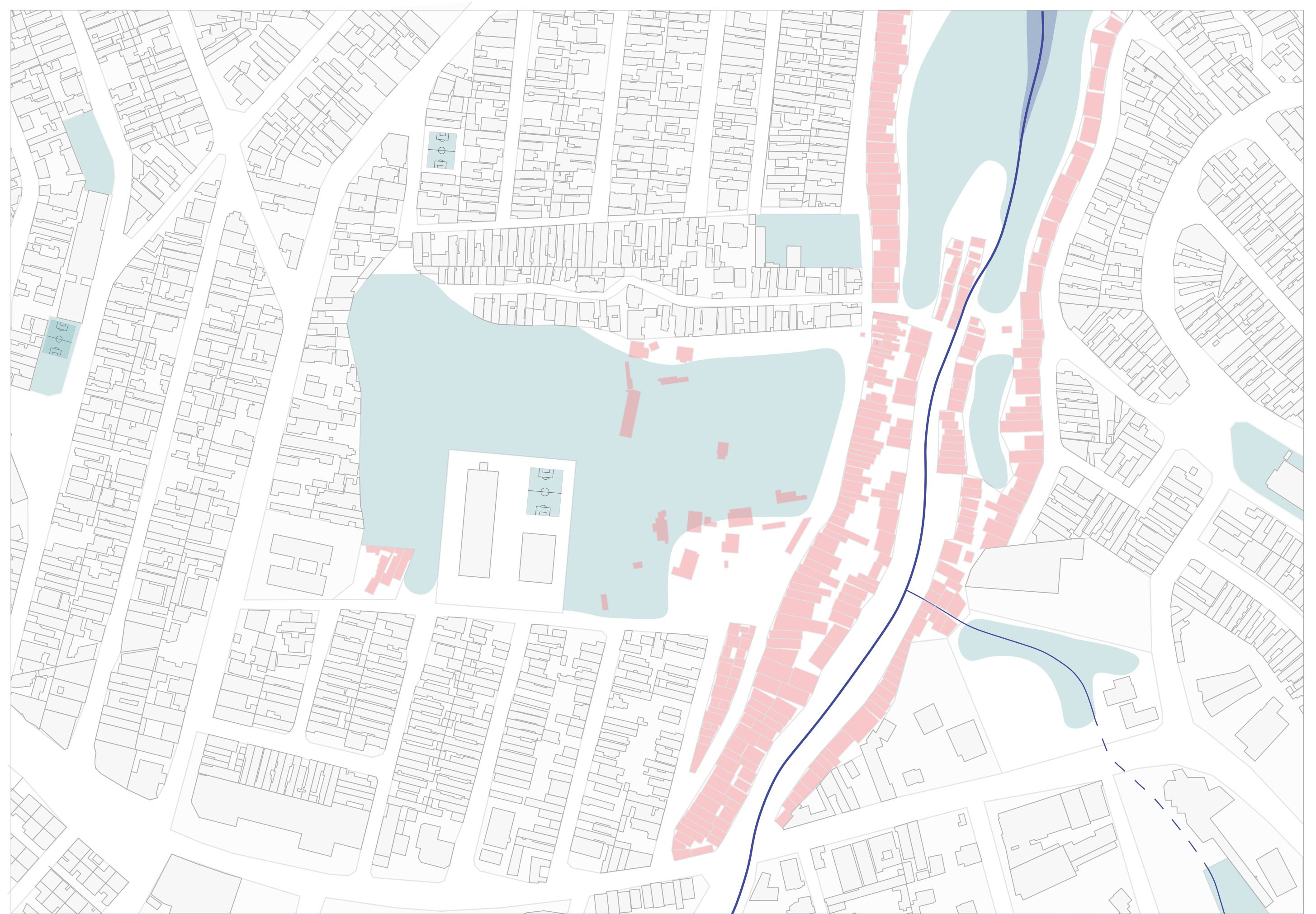


Billings reservoir
  urban green
  Parque Cocaía
  roads
  train tracks

# PROJECT SITE

## Parque Cocaía

- site mostly greenfield, apart from an elementary school
- protected area
- settlements along river banks and on the site



existing building favela urban green water stream

# PROJECT SITE

## Parque Cocaía

- former farm within dense neighborhood
- steep slope towards stream (33m over 370m)
- site forms a hole in urban tissue





# PROJECT SITE

## Parque Cocaía

- well-connected by car and bus
- settlements around site have turned their backs towards the site



# OWN EXPERIENCES UNSAFETY



closed facades  
no eyes on the street



no place for pedestrians  
no sidewalks or cross-overs



unwatched corners



absence public space, green & amenities



disconnection public and private on GF  
garages, walls, iron rasters



long, desolate streets  
little side entrances, little escape routes



poor maintenance  
broken window theory



# DESIGN PARQUE COCAÍÁ

goals: (1) explore how architectural design can make the unsafest spaces of SP more safe and (2) design a new living area for the inhabitants of Grajaú

# FOCUS DESIGN EXPLORATIONS



building types on urban scale



creating max. healthy dwelling density



mixing functions and user groups



a safe streetscape with an identity



floor plans providing eyes on the street

# FOCUS DESIGN EXPLORATIONS



- prevent blind-eyed corners
- short urban blocks
- unique design
- low-rise over high-rise
- levels of openness

building types on urban scale



- pleasant cond. pedestrians
- shared urban amenities
- short urban blocks
- low-rise over high-rise

creating max. healthy dwelling density



- mixed-use development
- shared urban amenities
- mix income groups

mixing functions and user groups



- prevent blind-eyed corners
- urban greenery
- lively sidewalks
- welcoming pedest. routes
- adequate street lighting

a safe streetscape with an identity



- juxtaposition living spaces and public realm
- permeability facades
- demarcation public and private realm

floor plans providing eyes on the street

# PROGRAM OF REQUIREMENTS

## **design brief**

- social housing in Grajaú, São Paulo
- ZEIS 4 area, environmental restrictions
- take into account social, economic, and environmental factors

# PROGRAM OF REQUIREMENTS

## **design brief**

- social housing in Grajaú, São Paulo
- ZEIS 4 area, environmental restrictions
- take into account social, economic, and environmental factors

## **zoning law**

- FSI<2, 1 standard
- >60% HIS 1 dwellings, <20% HMP
- GF+4 allowed without elevator

# PROGRAM OF REQUIREMENTS

## **design brief**

- social housing in Grajaú, São Paulo
- ZEIS 4 area, environmental restrictions
- take into account social, economic, and environmental factors

## **zoning law**

- FSI<2, 1 standard
- >60% HIS 1 dwellings, <20% HMP
- GF+4 allowed without elevator

## **vision**

design a neighborhood which is:

**safe, fostering, affordable, and has an identity**



# PROGRAM OF REQUIREMENTS

## design brief

- social housing in Grajaú, São Paulo
- ZEIS 4 area, environmental restrictions
- take into account social, economic, and environmental factors

## zoning law

- FSI<2, 1 standard
- >60% HIS 1 dwellings, <20% HMP
- GF+4 allowed without elevator

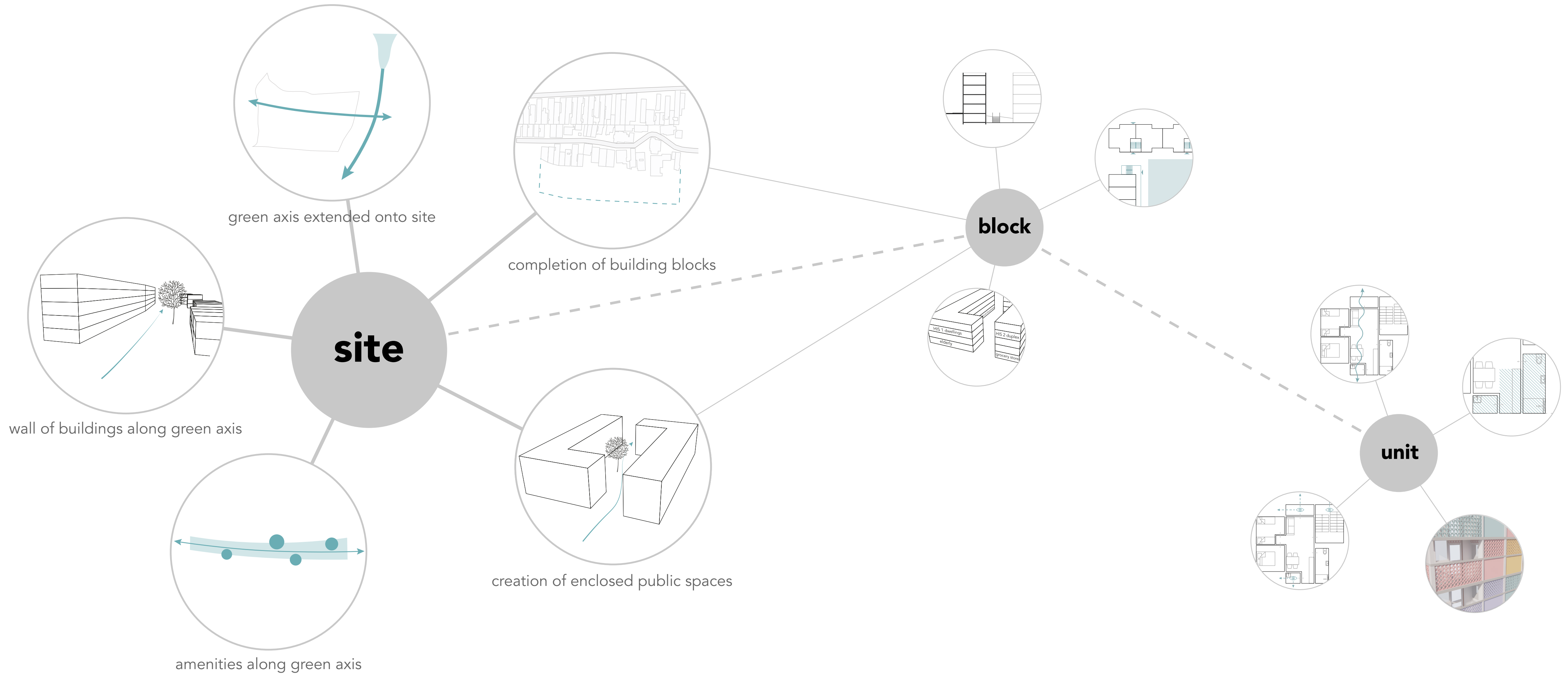
## vision

design a neighborhood which is:  
**safe, fostering, affordable, and has an identity**



# DESIGN CONCEPTS

## Parque Cocaía: safe, affordable, and amenity-rich







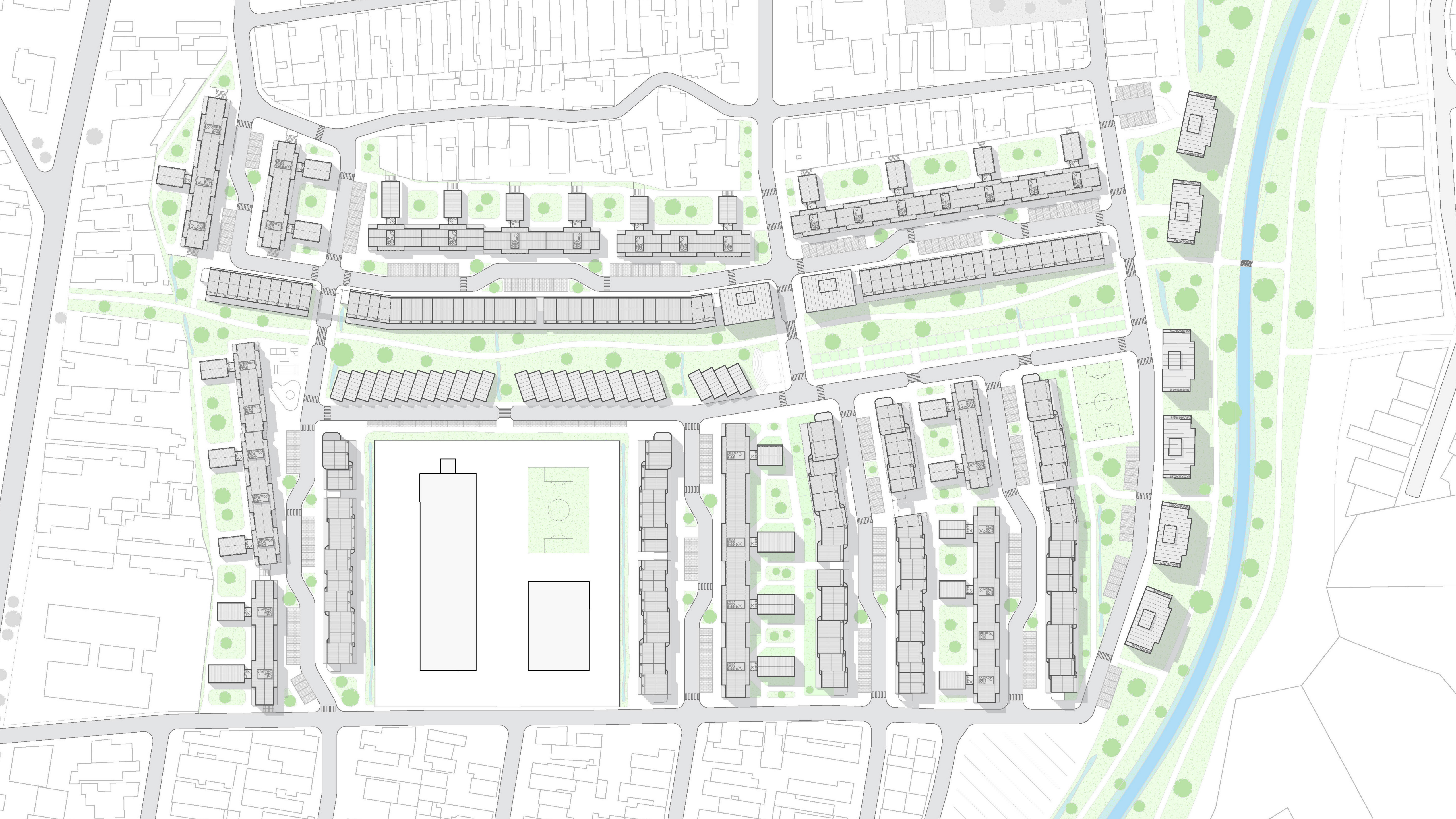


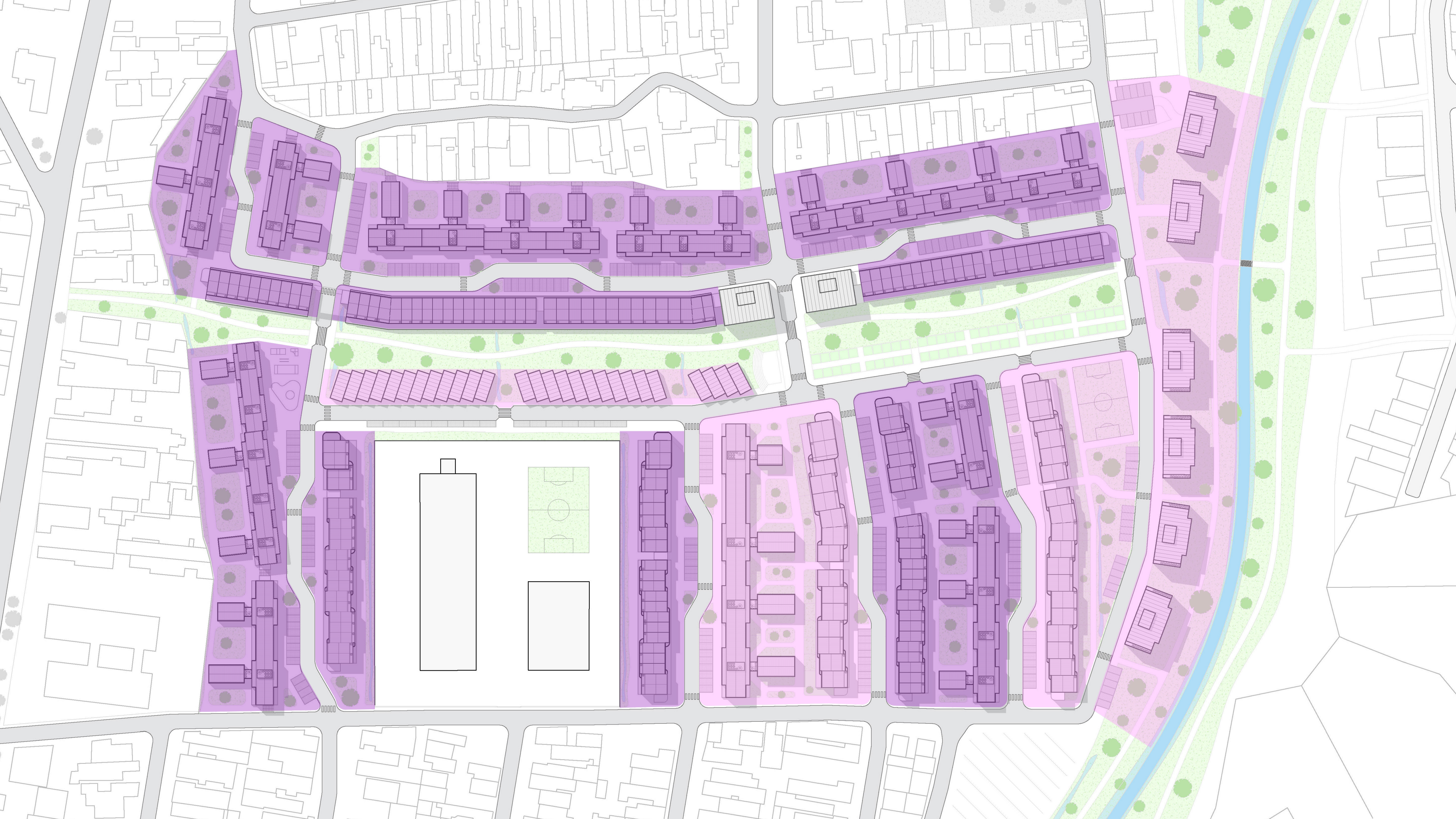








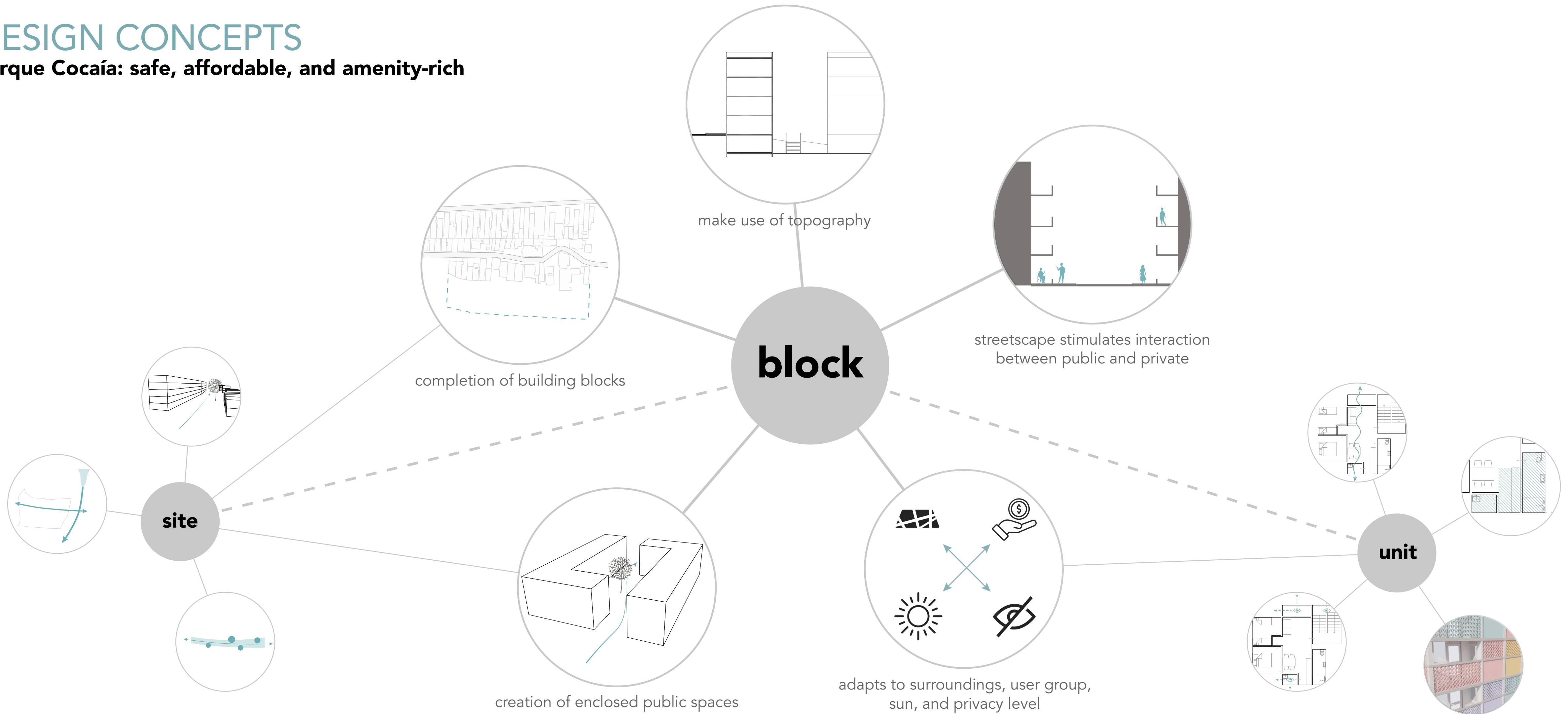






# DESIGN CONCEPTS

**Parque Cocaía: safe, affordable, and amenity-rich**





street lighting and urban furniture

safe place for meeting, playing, and relaxing

appropriation possibilities balconies

watching over space from balcony and living

wide balcony plinth level - claim space

daylight opening souterrain level

section existing settlements - courtyard - courtyard type

balcony railing higher because of privacy

verandah stretching onto sidewalk - create territoriality and increase privacy

classic São Paulo pavement



raised corner indicating transition to green axis

setbacks to prevent monotonous and create shadow

elevated walkway to watch street from

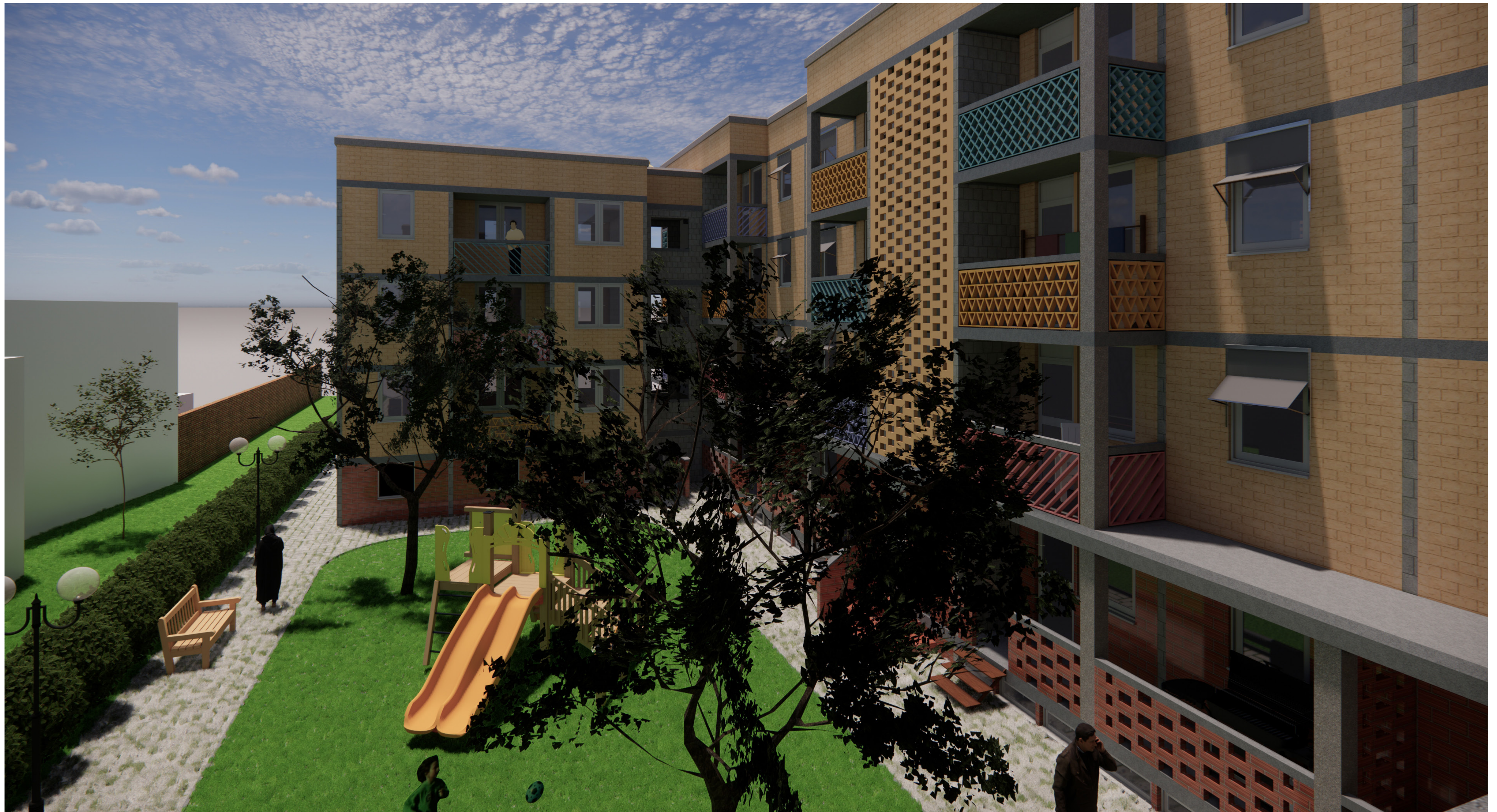
plinth demarcated with overhang - different privacy and functions

front gardens action similar to verandah

safe and inviting conditions pedestrians

section courtyard type - street - slab type















reuse roofing tiles in ceramics



reuse timber beams for pergola and urban furniture



impression design concepts green axis

# COURTYARD BLOCK DESIGN

## ground floor - elderly living + businesses

qualities courtyard (20x47m)

- place for leisure and meeting
- car-free, safe, green, lively

qualities car side block

- place to access and commute
- parking spots, pedestrian crossings, illuminated at night



# COURTYARD BLOCK DESIGN

first floor - living



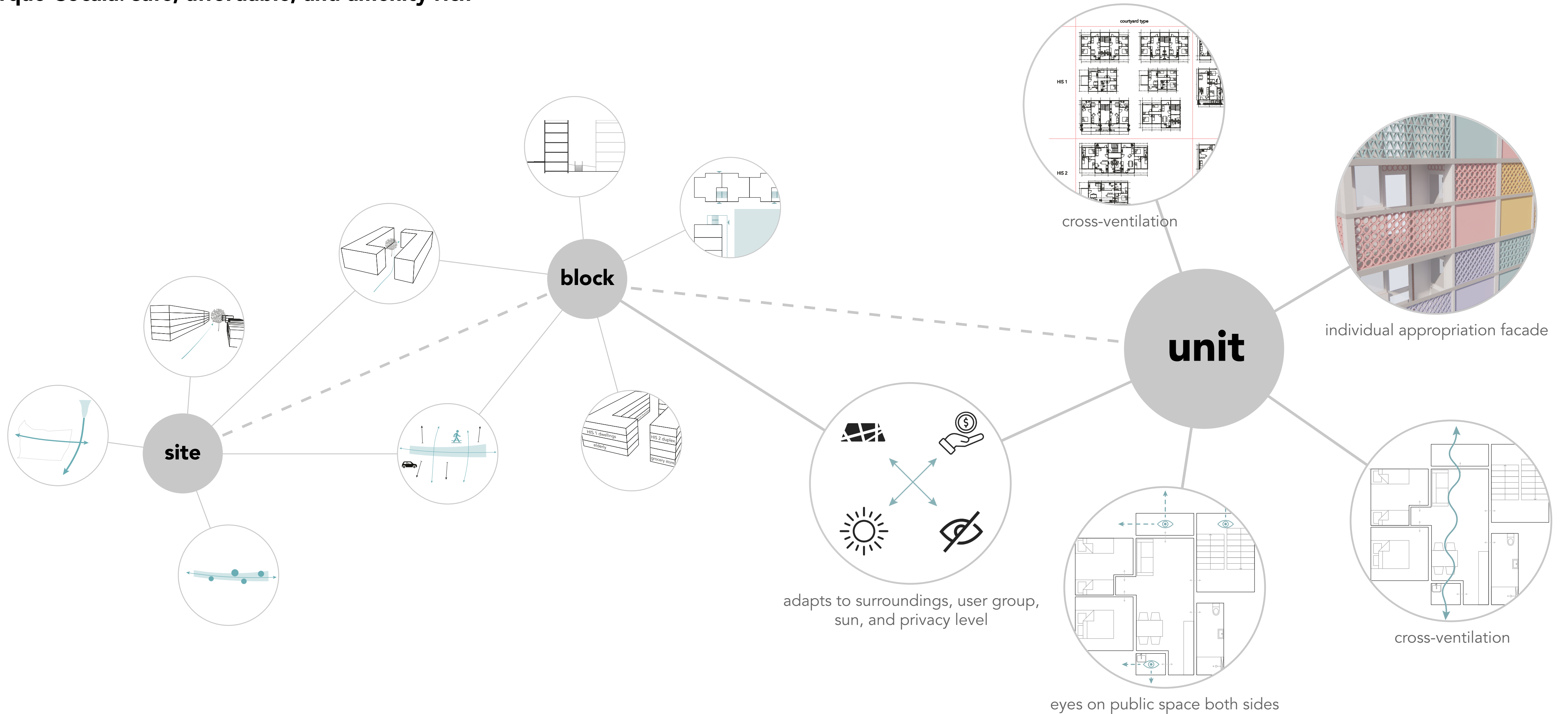
# COURTYARD BLOCK DESIGN

second floor - living



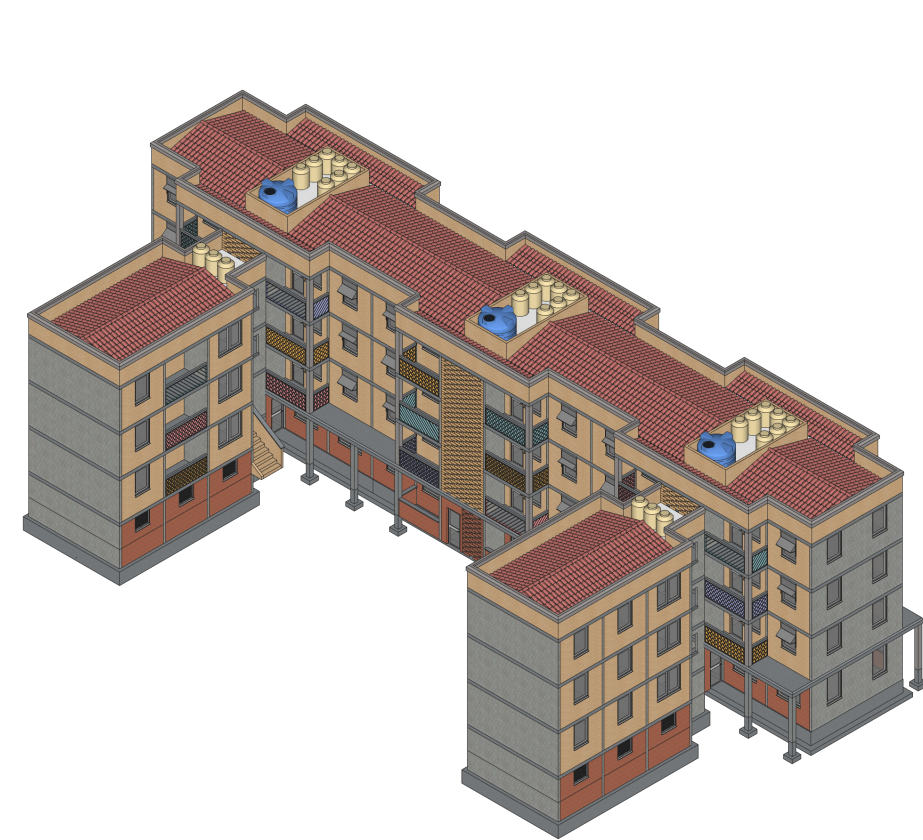
# DESIGN CONCEPTS

Parque Cocaía: safe, affordable, and amenity-rich

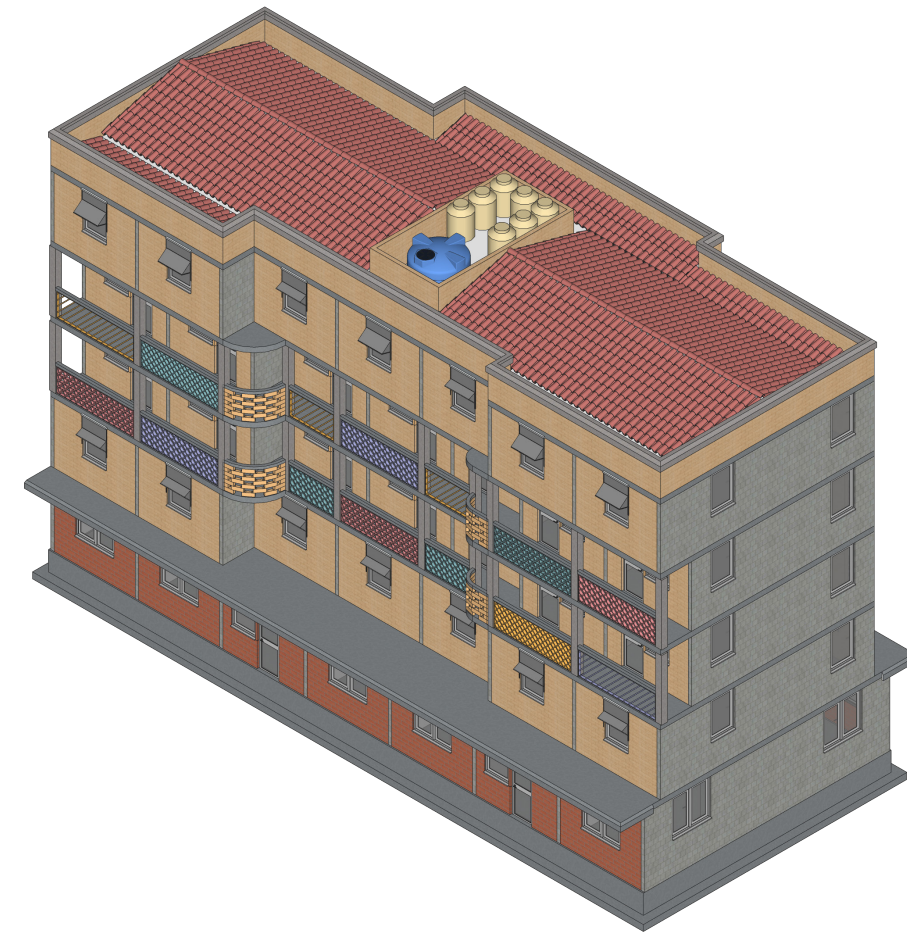




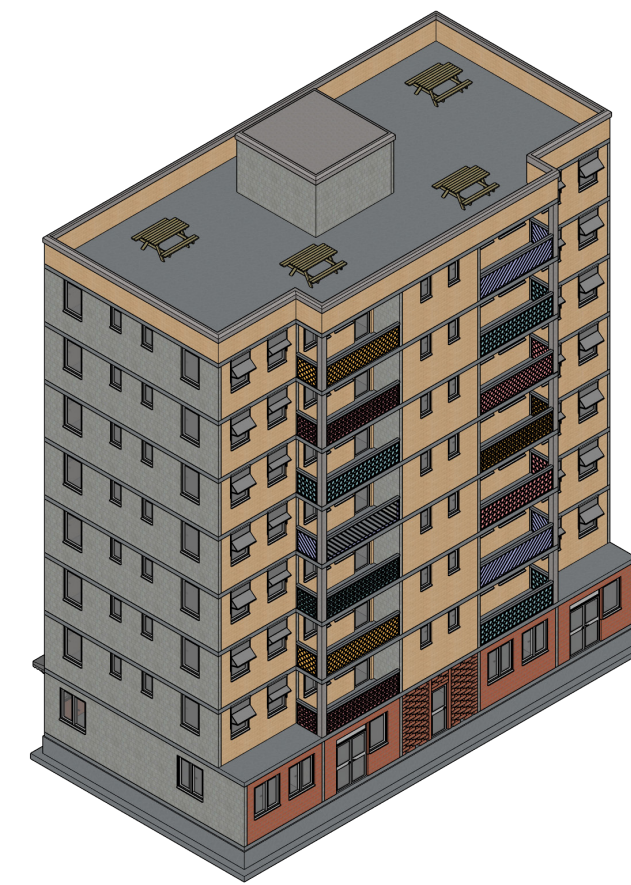
# BUILDING TYPES



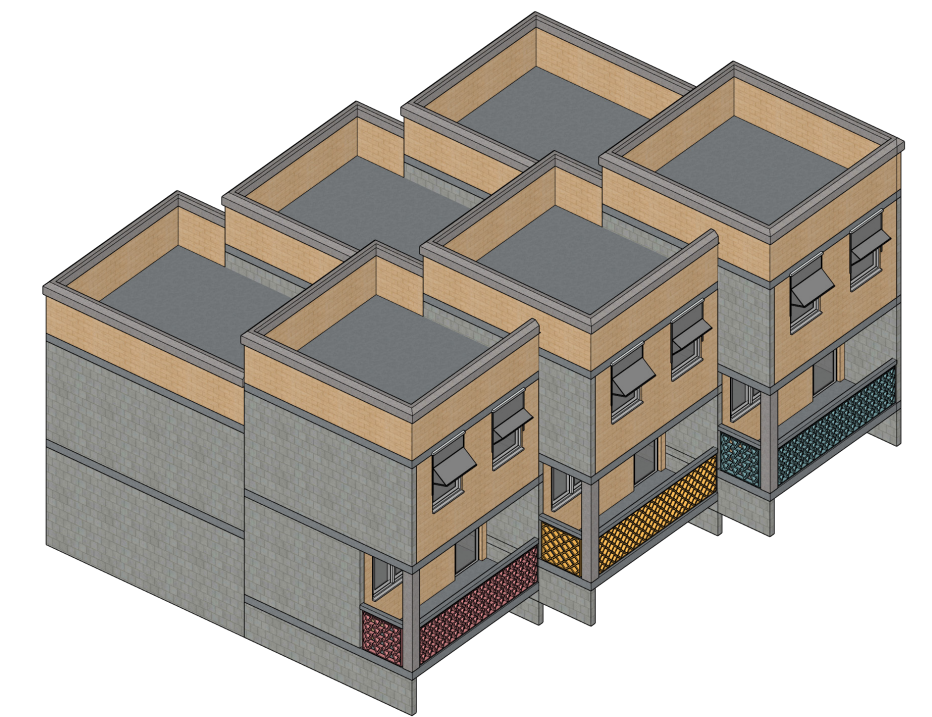
courtyard type



slab type



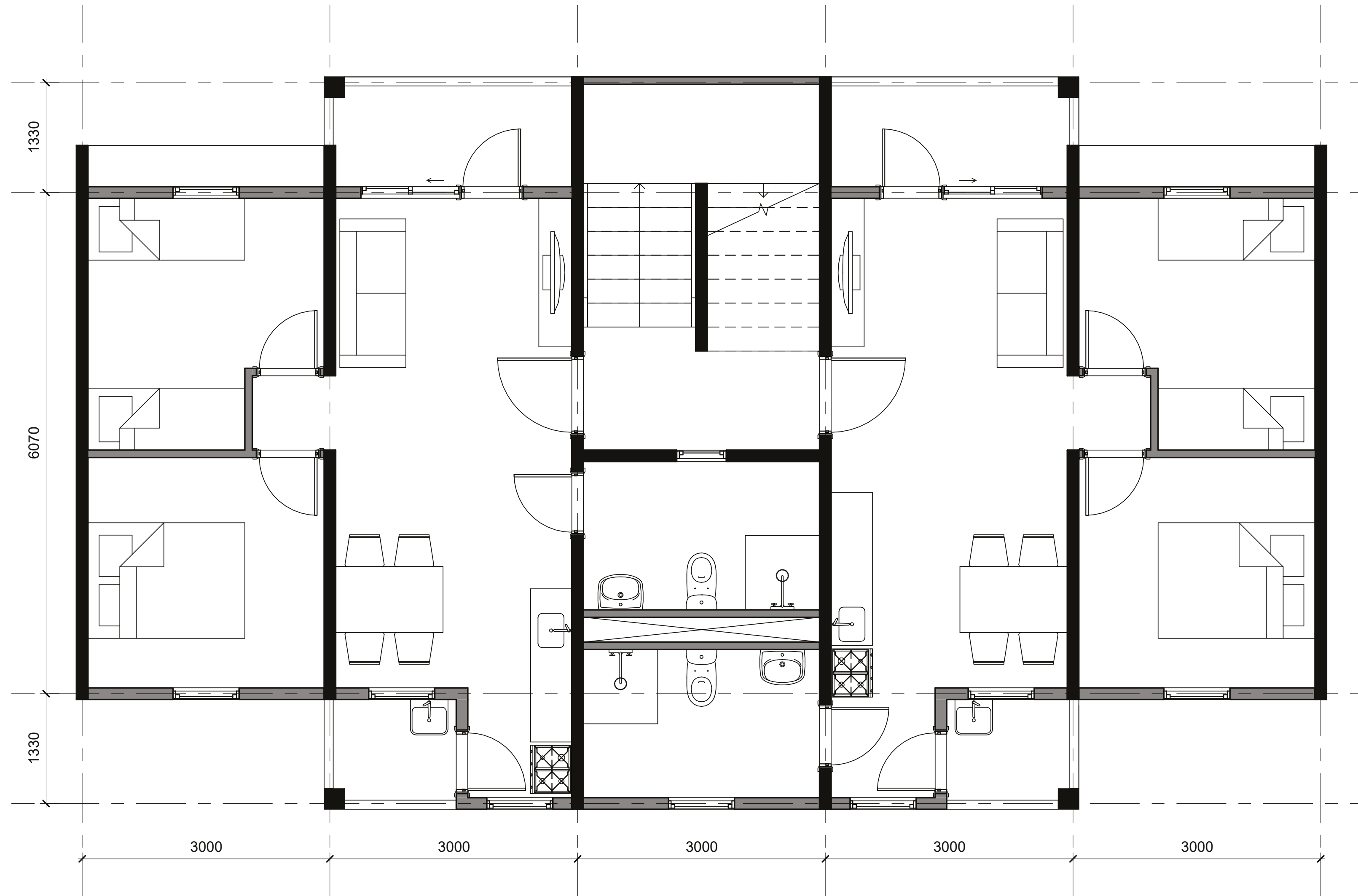
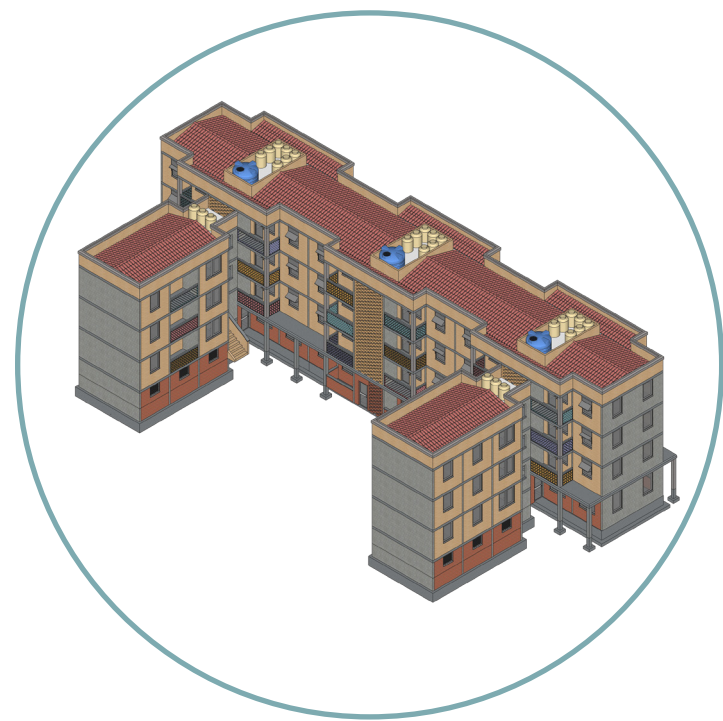
tower/corner type



sobrado type

# COURTYARD TYPE

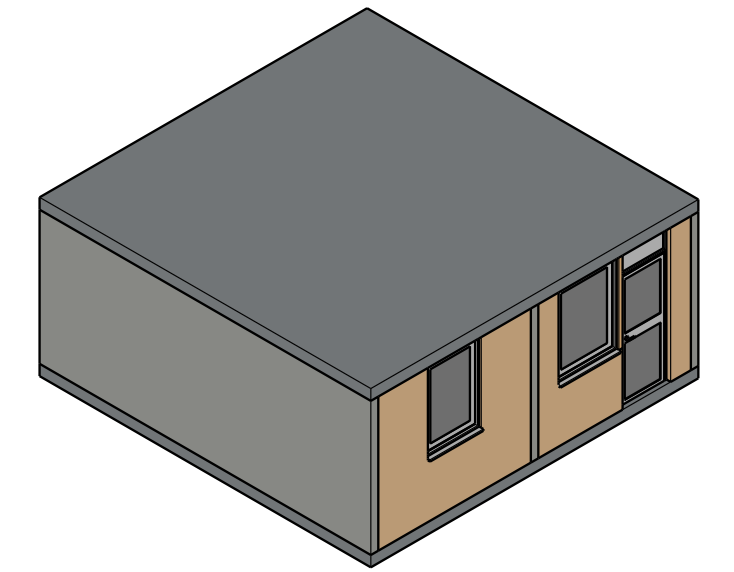
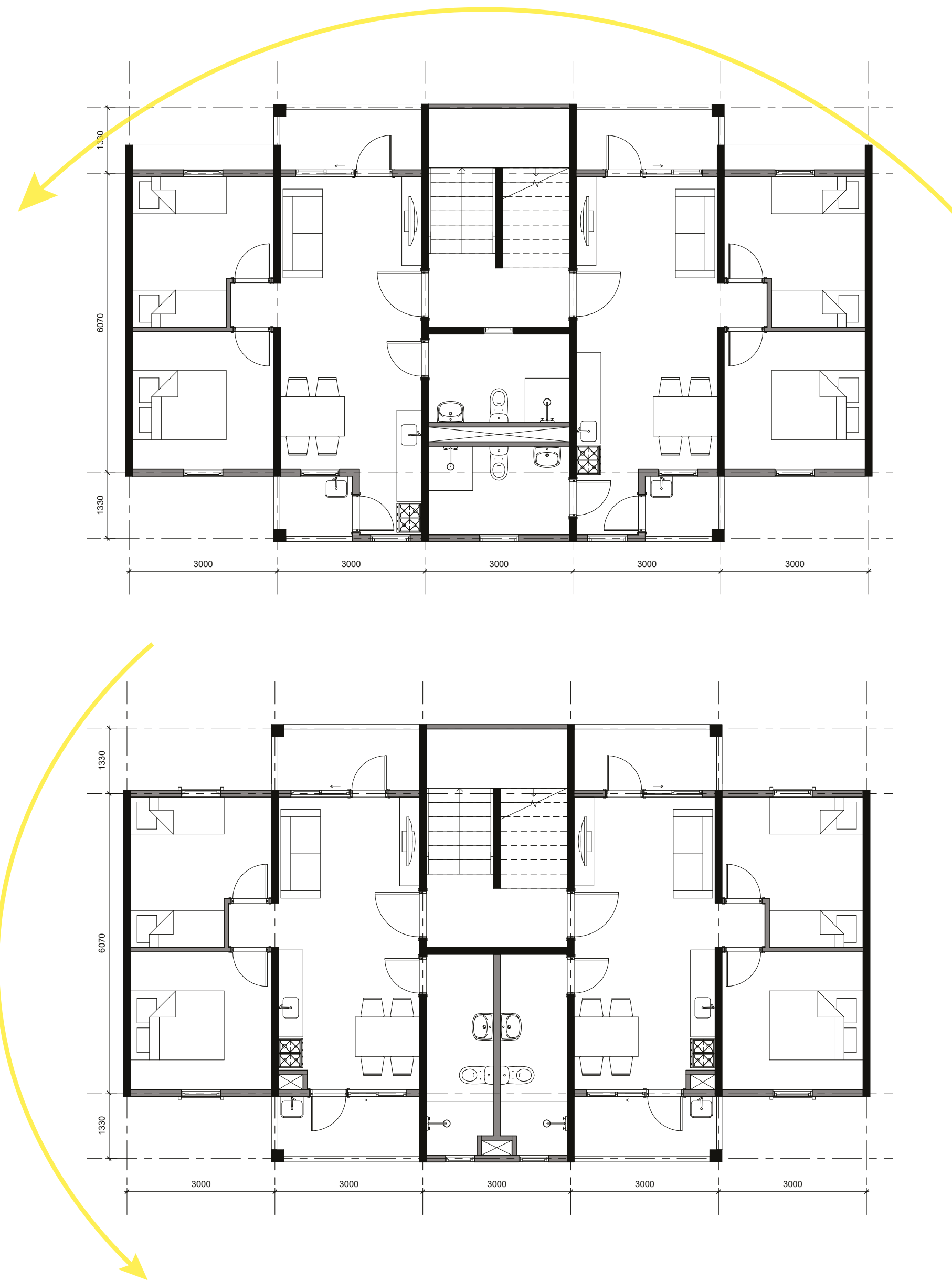
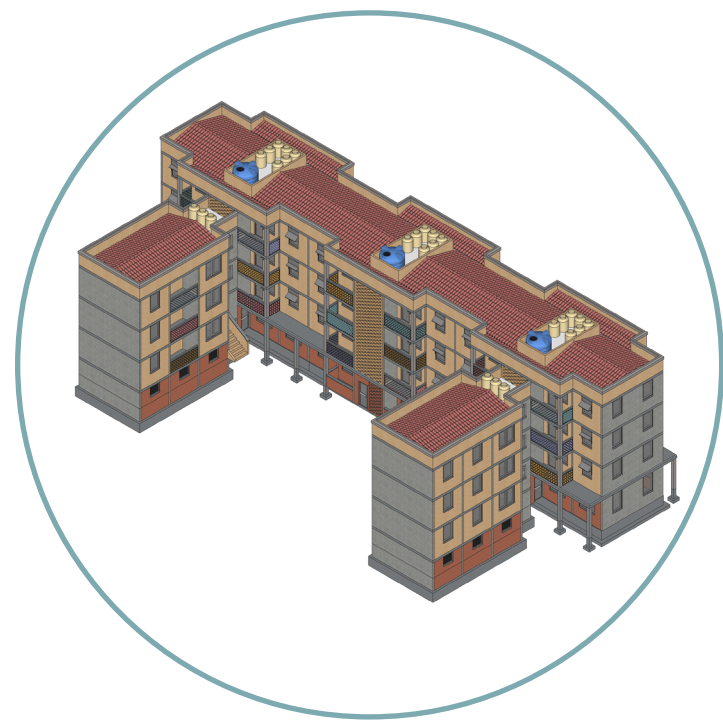
1F-4F, HIS 1, two bedrooms, 52 m<sup>2</sup>



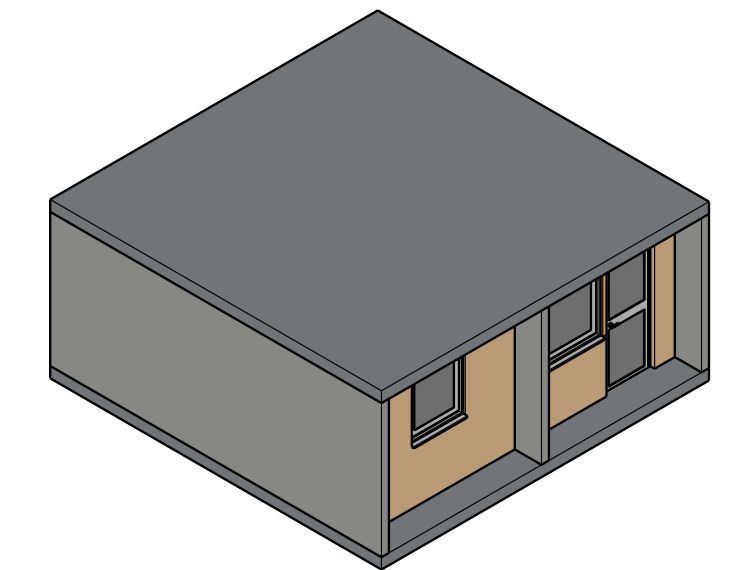
# COURTYARD TYPE

1F-4F, HIS 1, two bedrooms, 52 m<sup>2</sup>

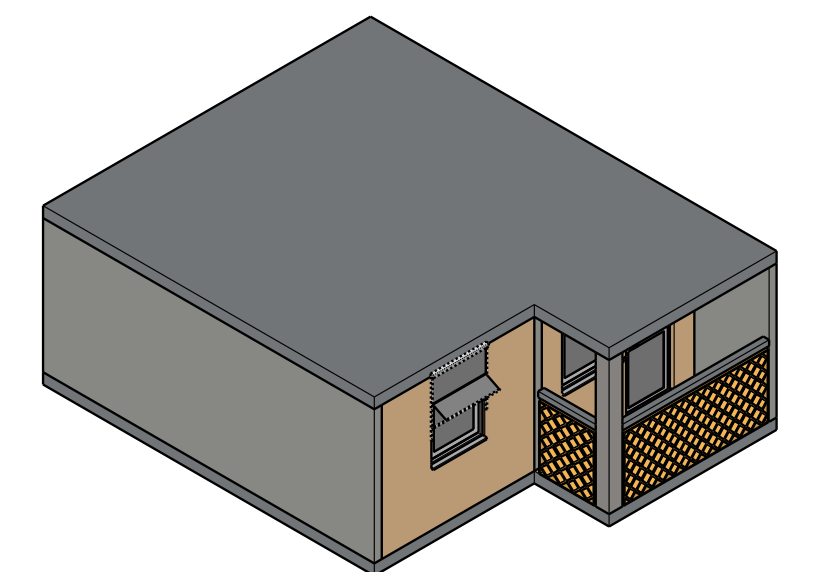
- adapts to solar orientation



south facade



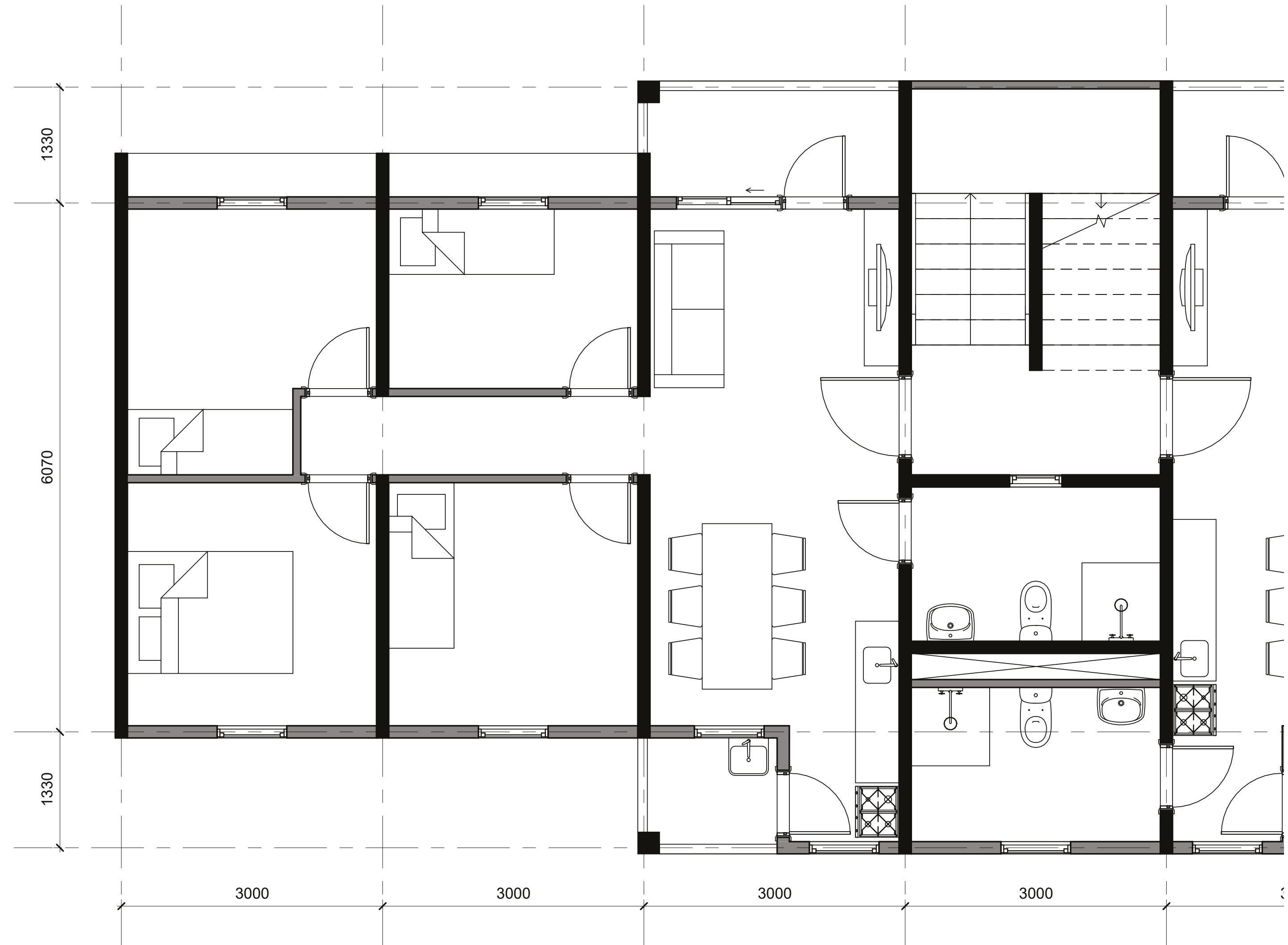
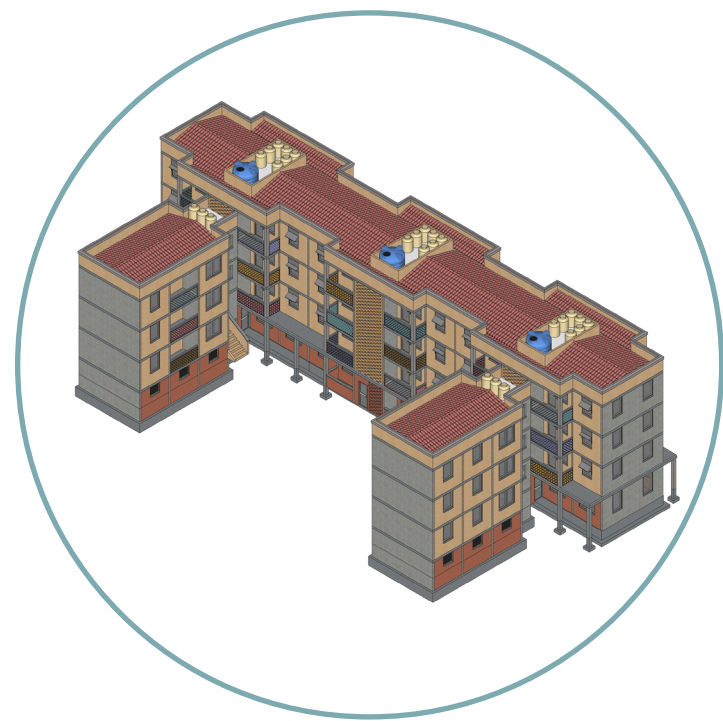
north facade



west/east facade

# COURTYARD TYPE

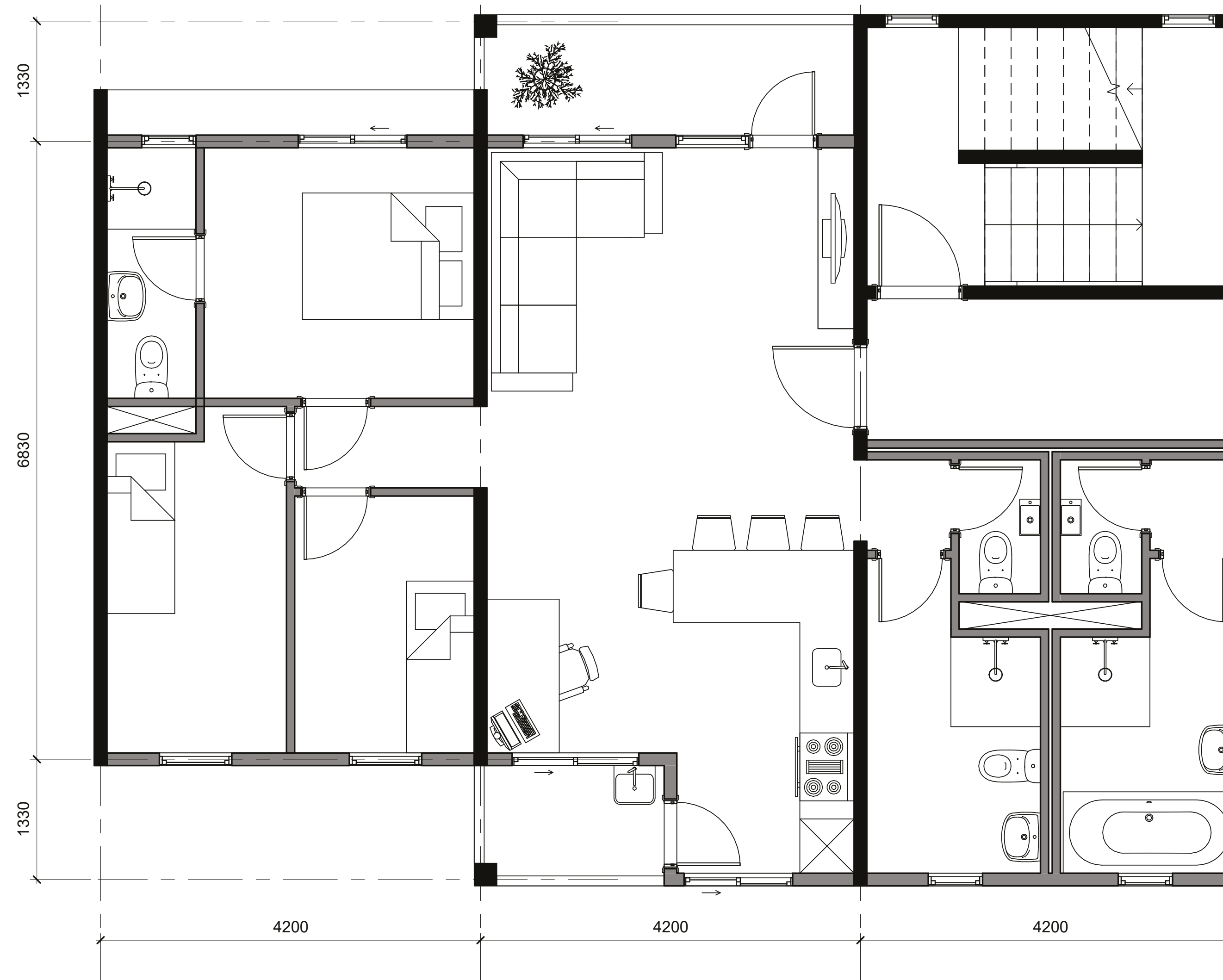
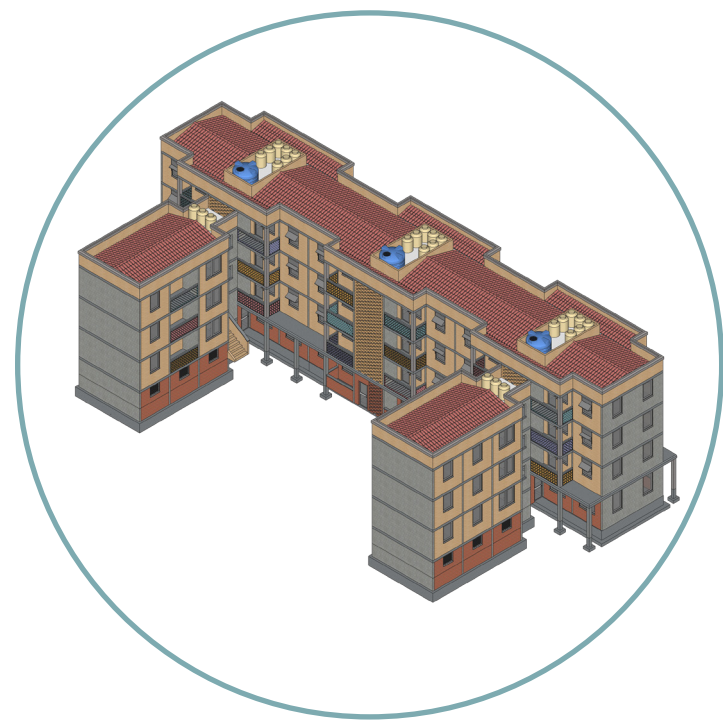
**1F-4F, HIS 1, four bedrooms, 71 m<sup>2</sup>**



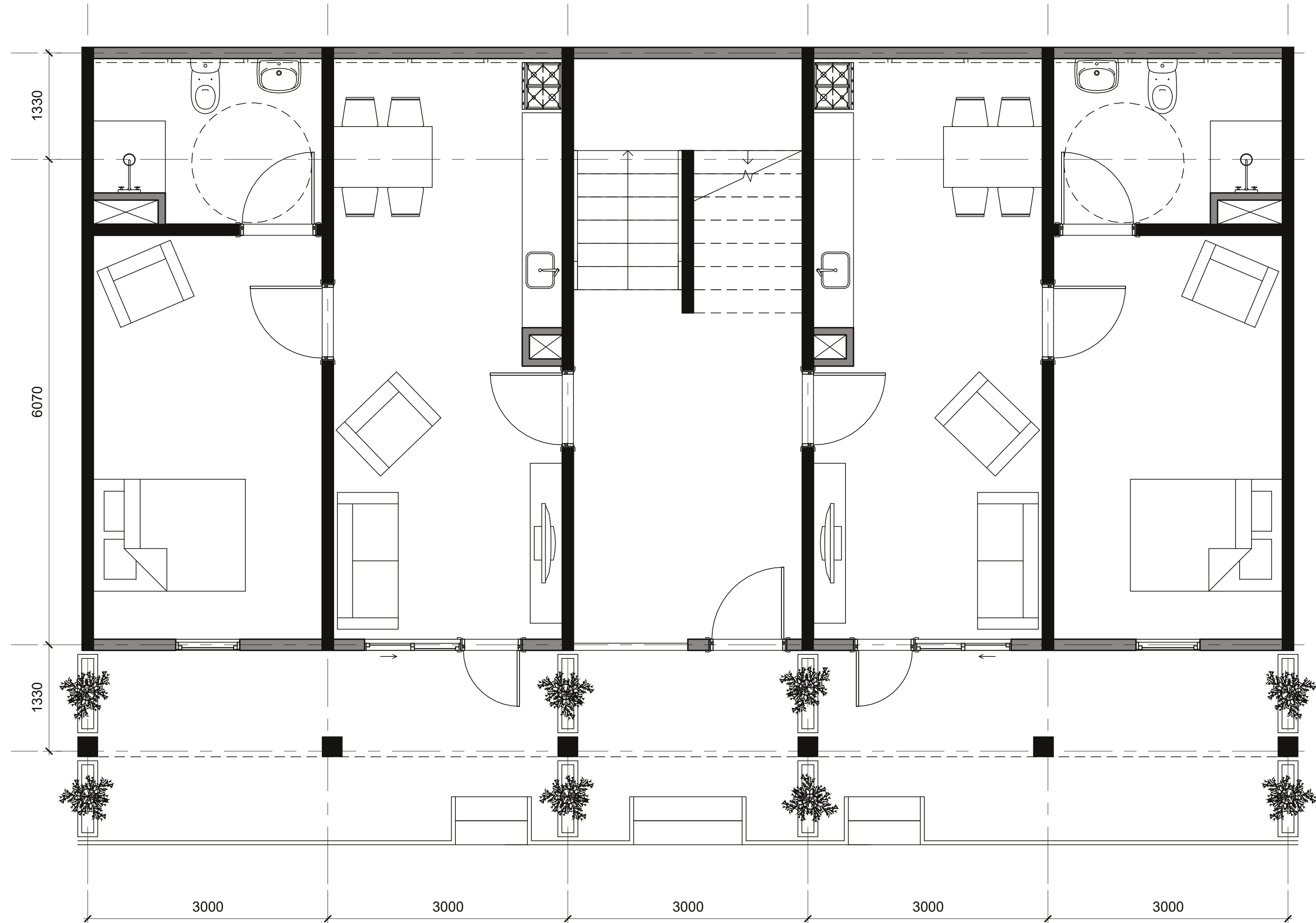
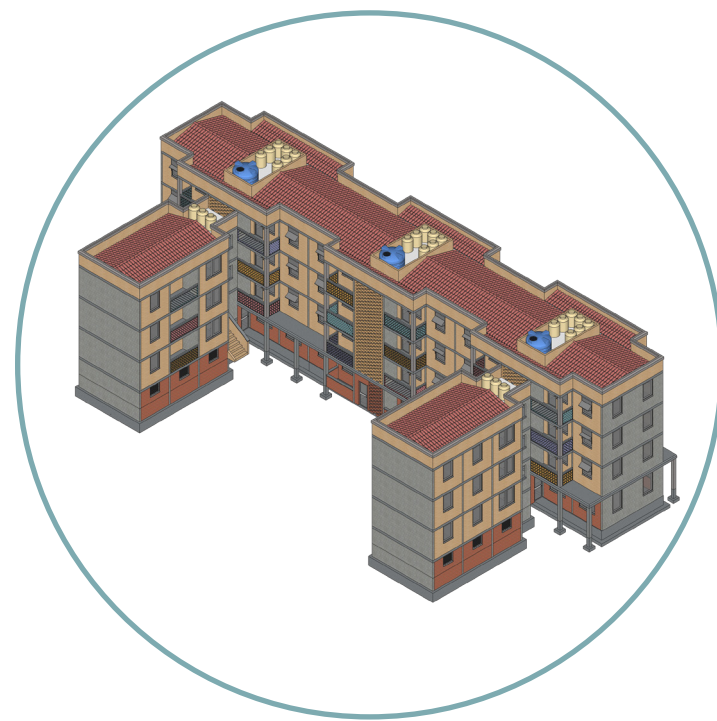
# COURTYARD TYPE

1F-4F, HIS 2, two bedrooms, 80 m<sup>2</sup>

- larger rooms
- fully-equipped kitchen
- two bathrooms, separate toilet
- double walls



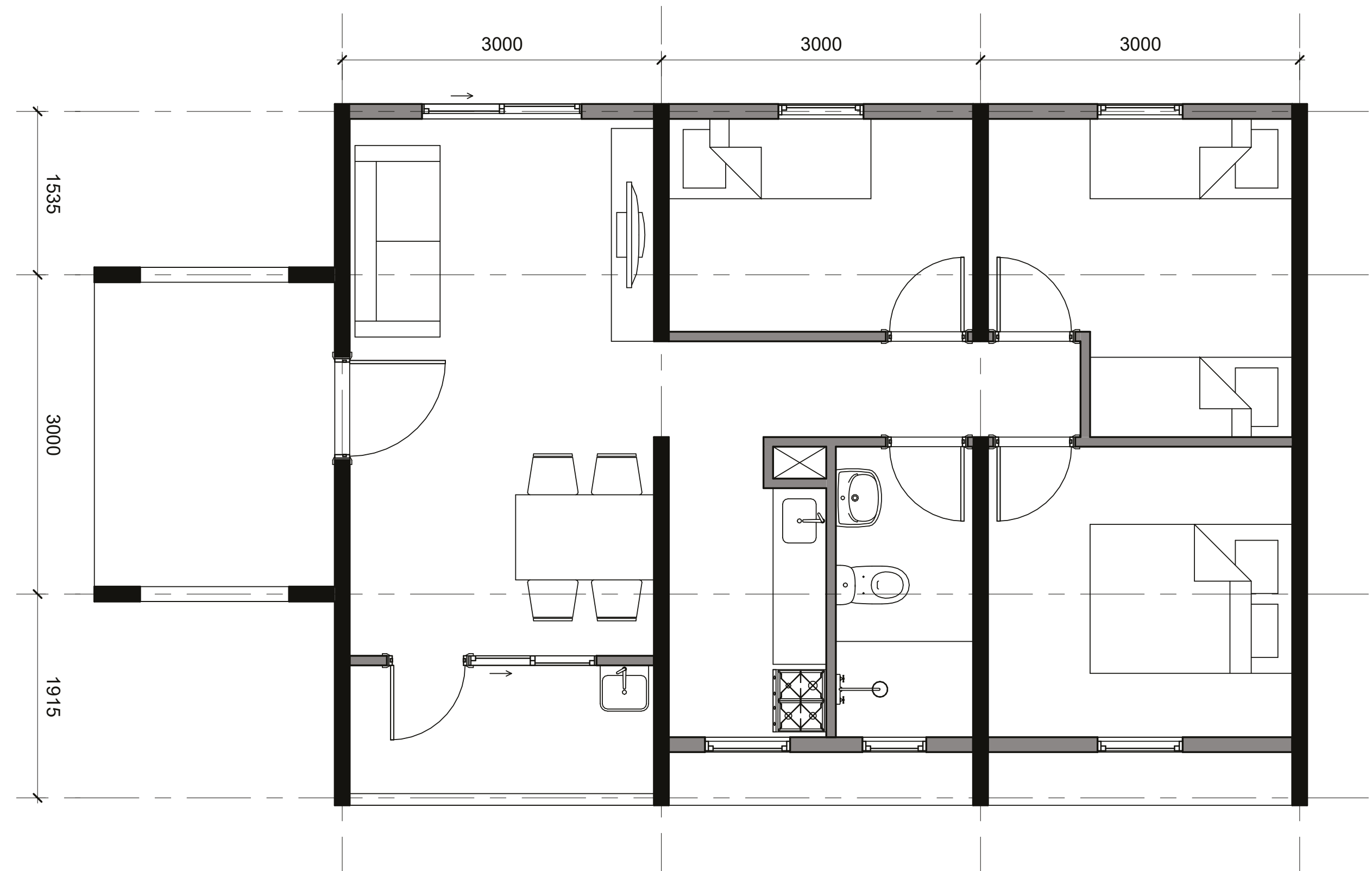
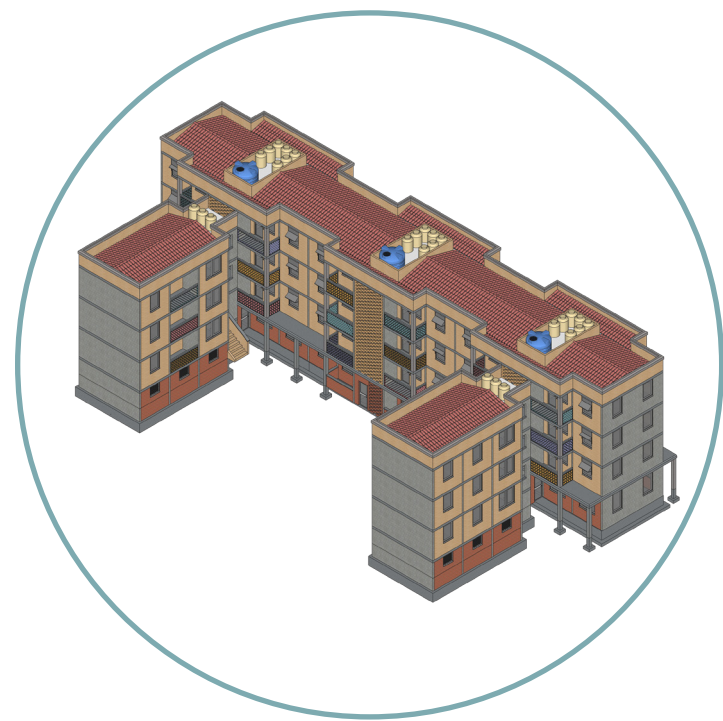
**COURTYARD TYPE**  
**GF, HIS 1, one bedroom, high accessibility, 45 m<sup>2</sup>**



# COURTYARD TYPE (SIDES)

**1F-4F, HIS 1, three bedrooms, 56 m<sup>2</sup>**

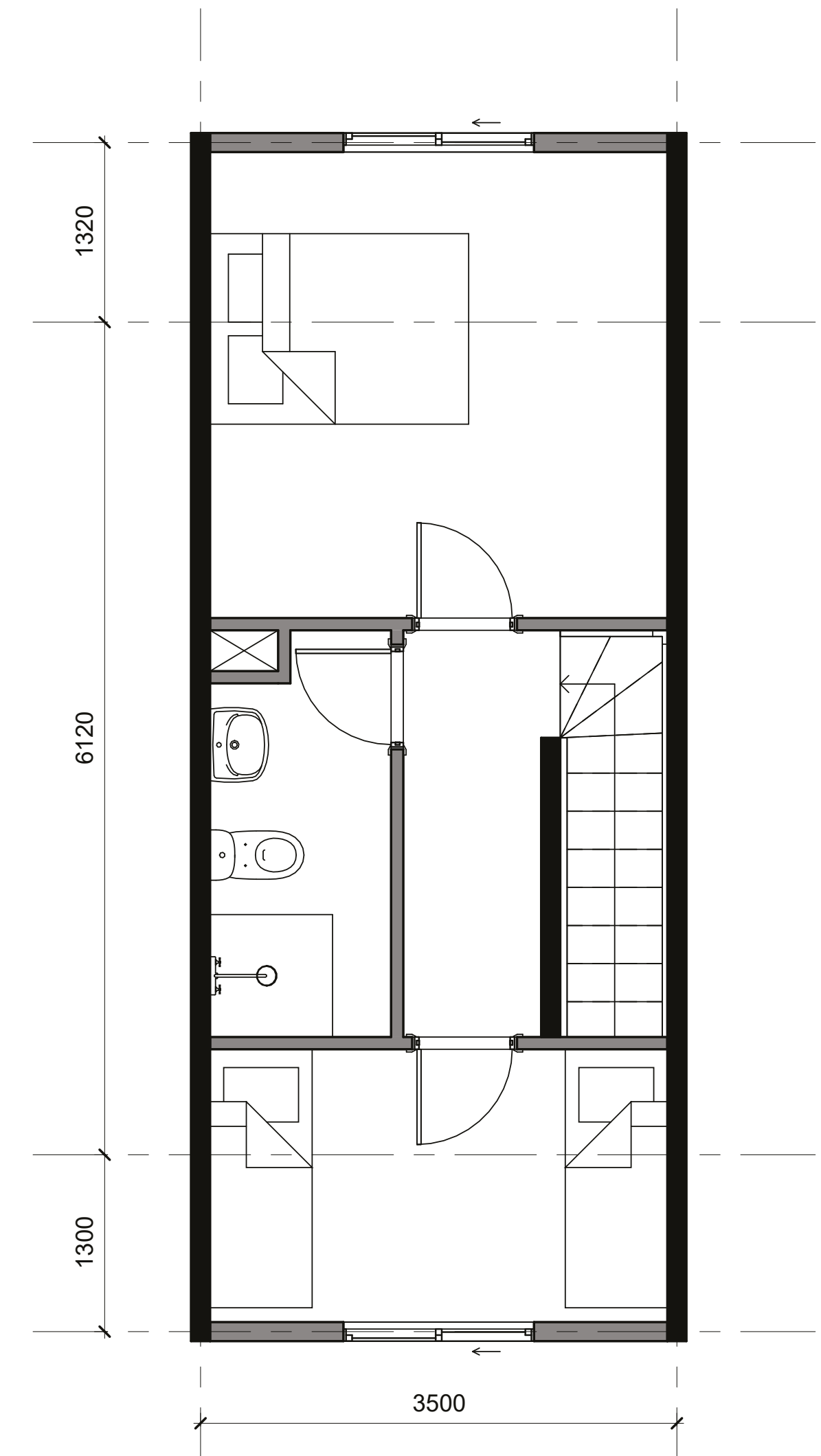
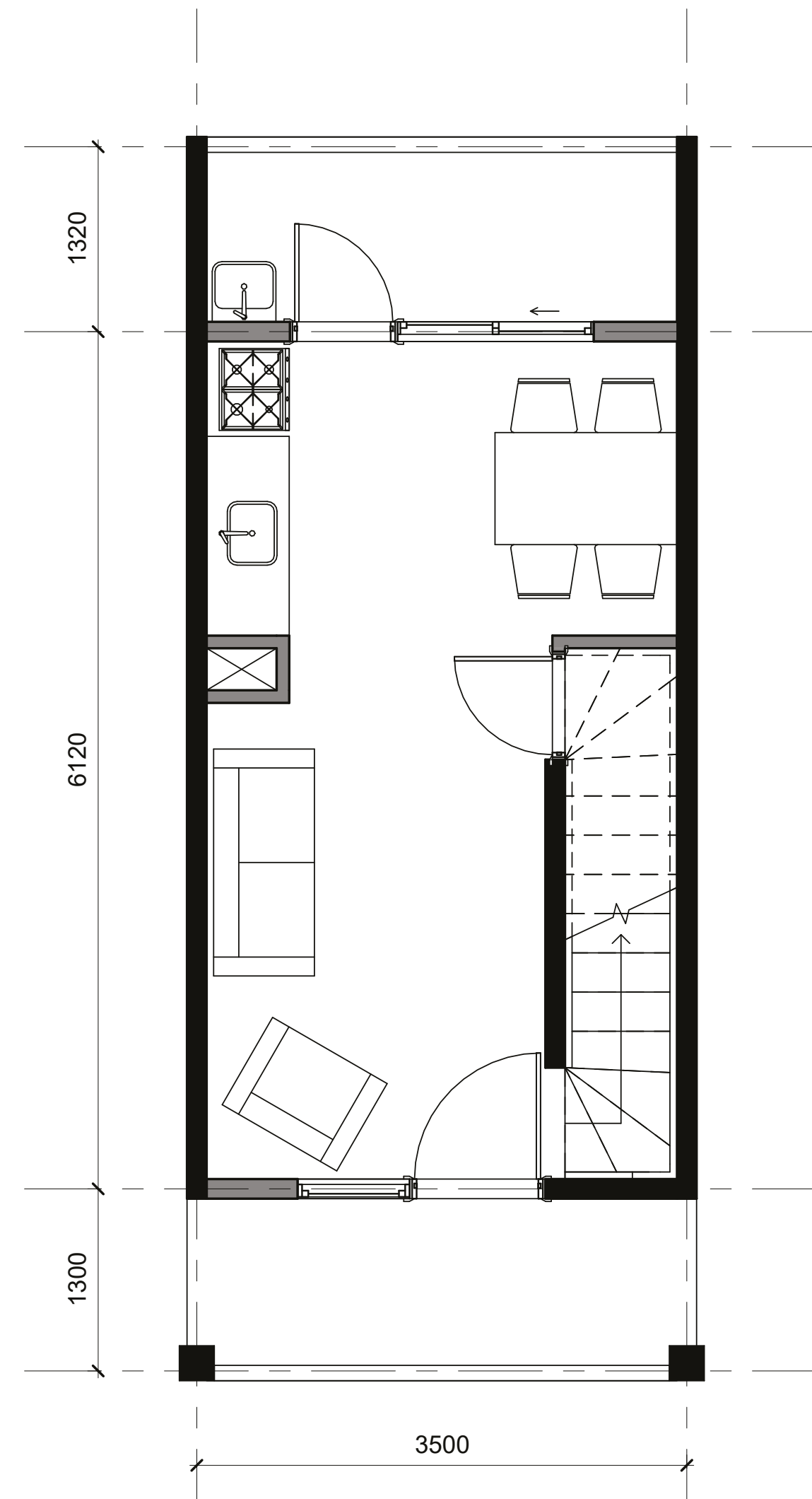
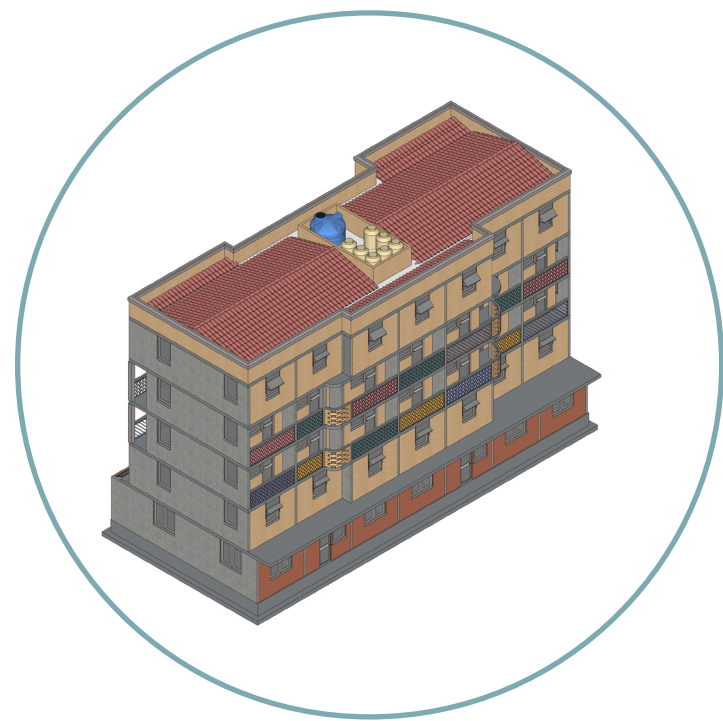
- third bedroom optional



# SLAB TYPE

**1F-4F, HIS 1, two bedrooms, 54 m<sup>2</sup>**

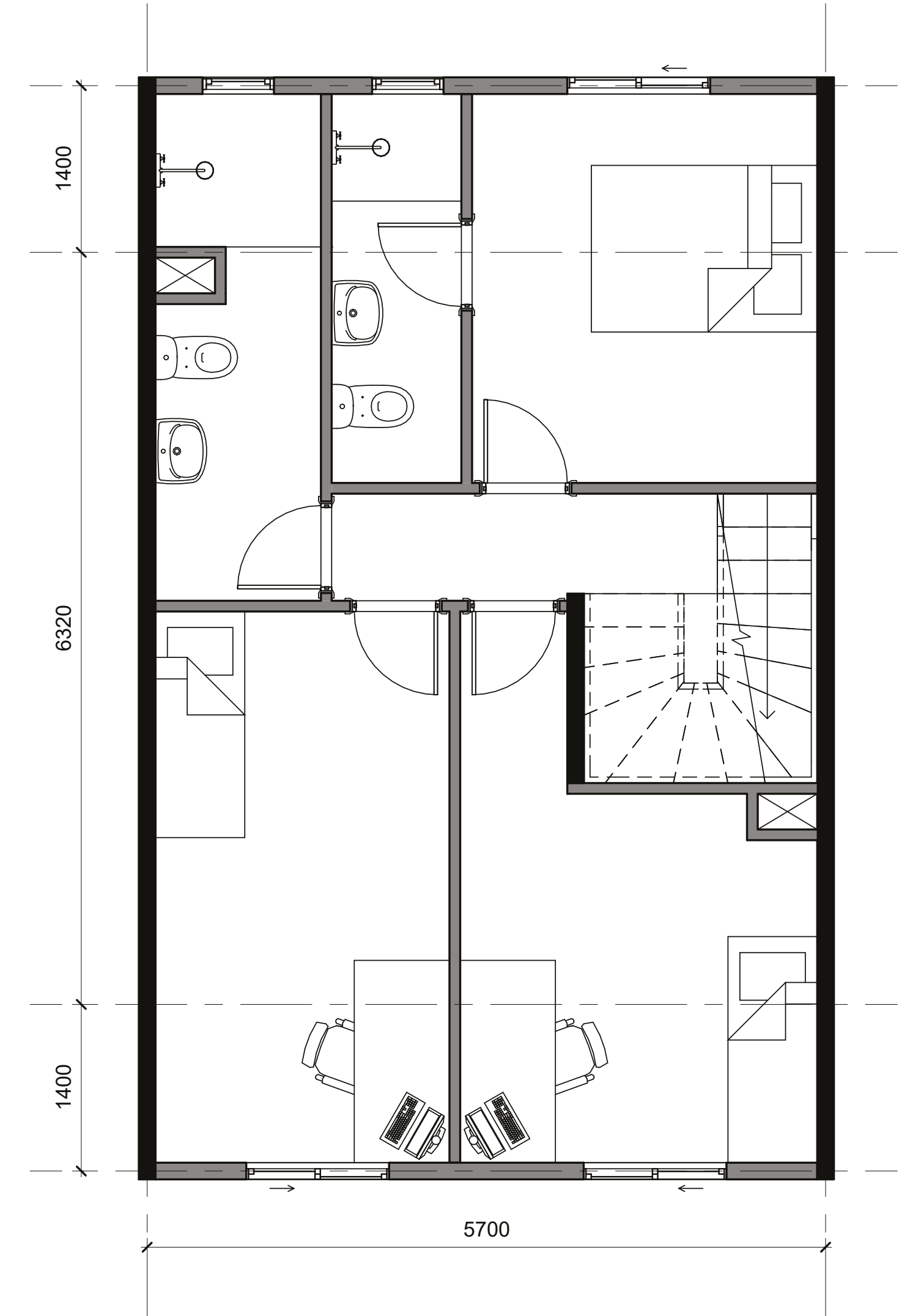
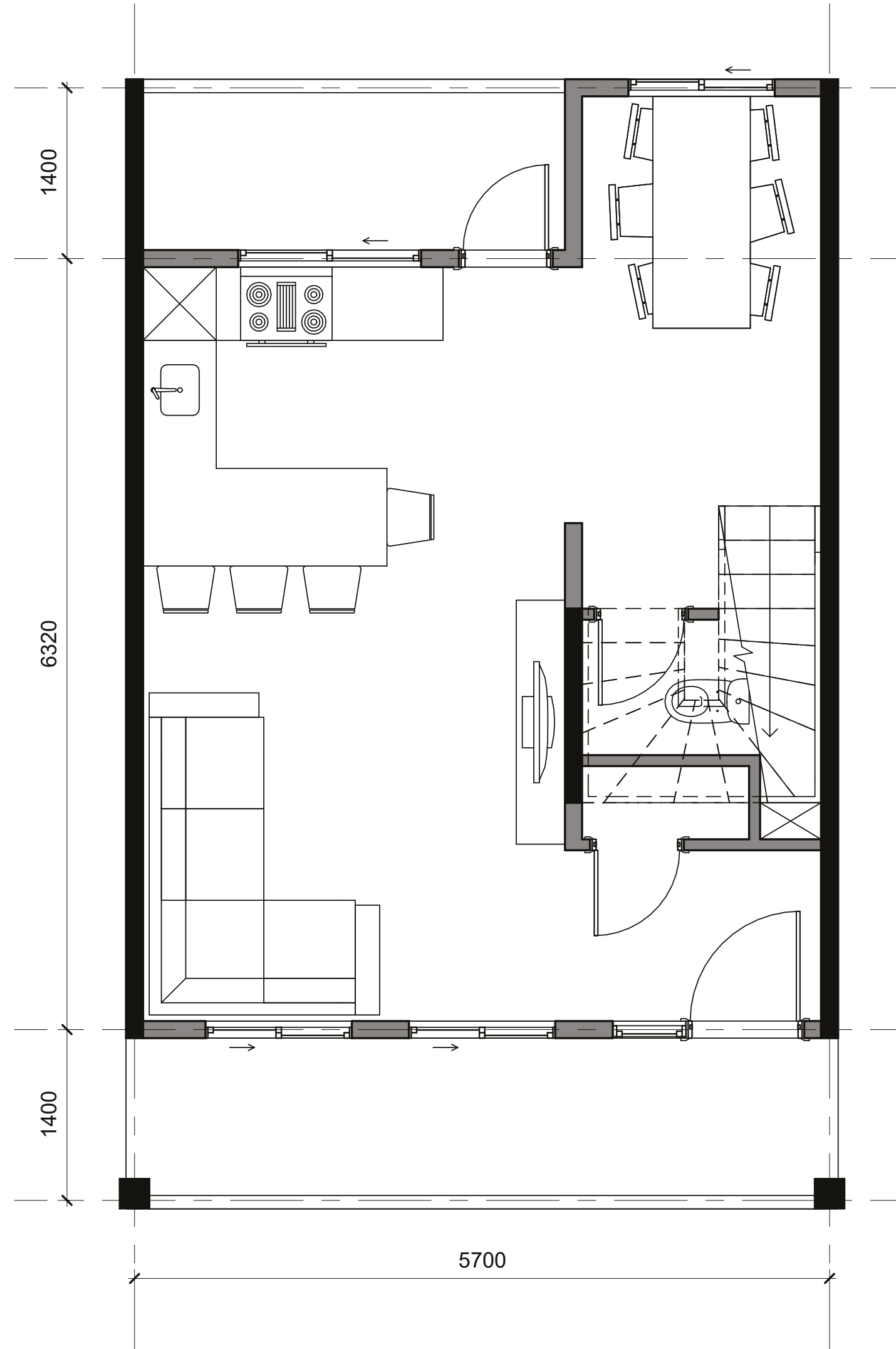
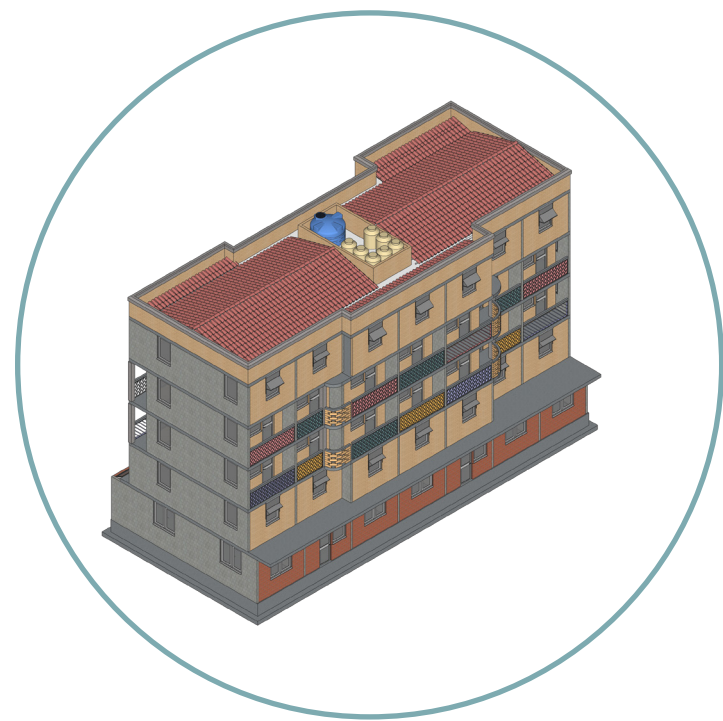
- enter via elevated walkways on 2F and 3F
- GF mixed-use: housing, businesses, shops, and canteens





# SLAB TYPE

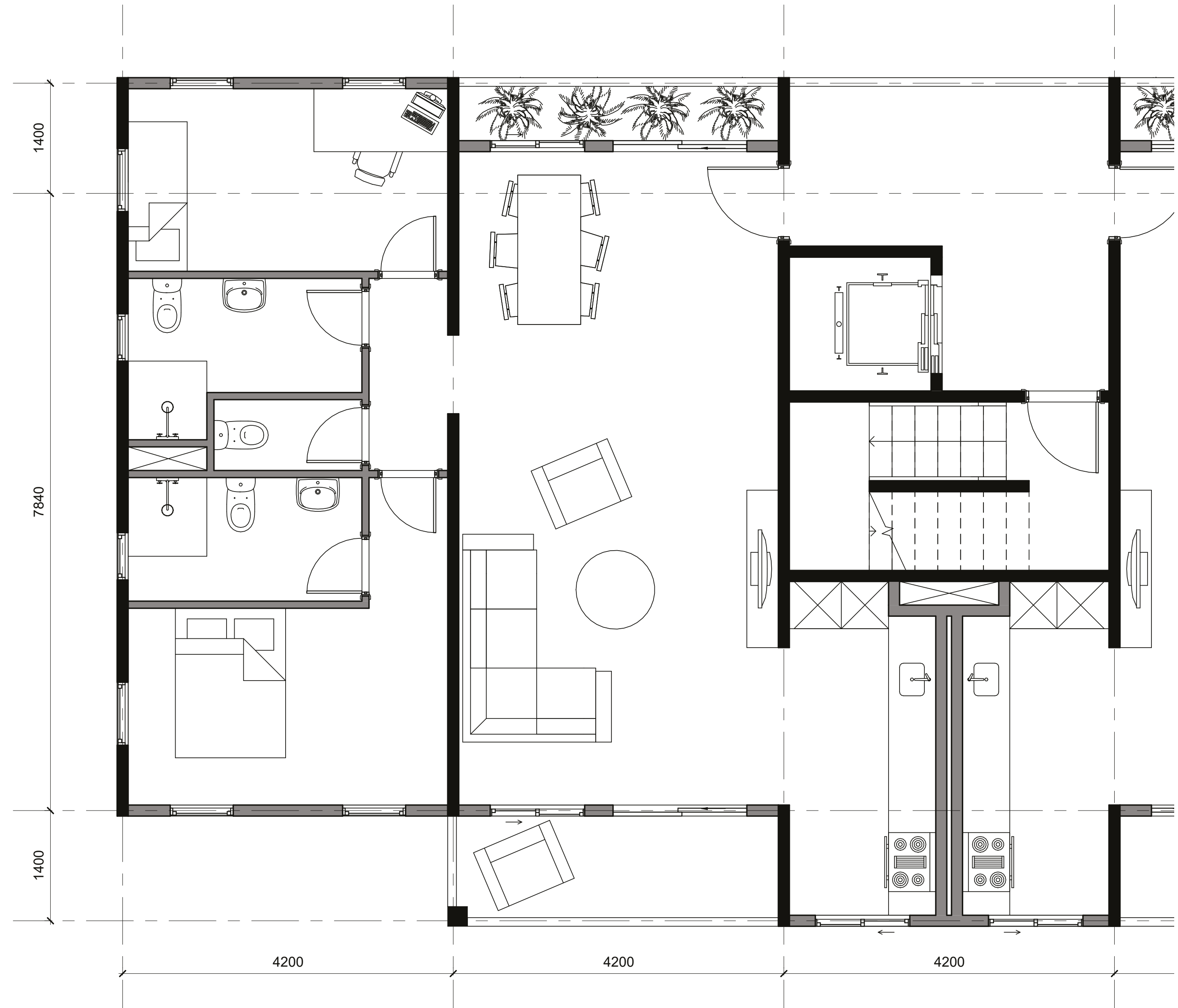
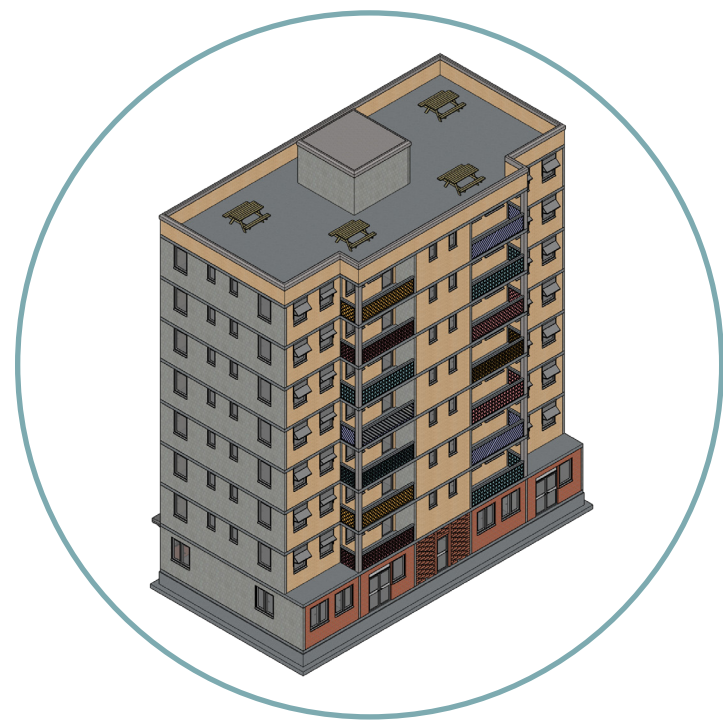
1F-4F, HIS 2, three bedrooms, 90 m<sup>2</sup>



# TOWER TYPE

**1F-8F, HIS 2, two bedrooms, 100m<sup>2</sup>**

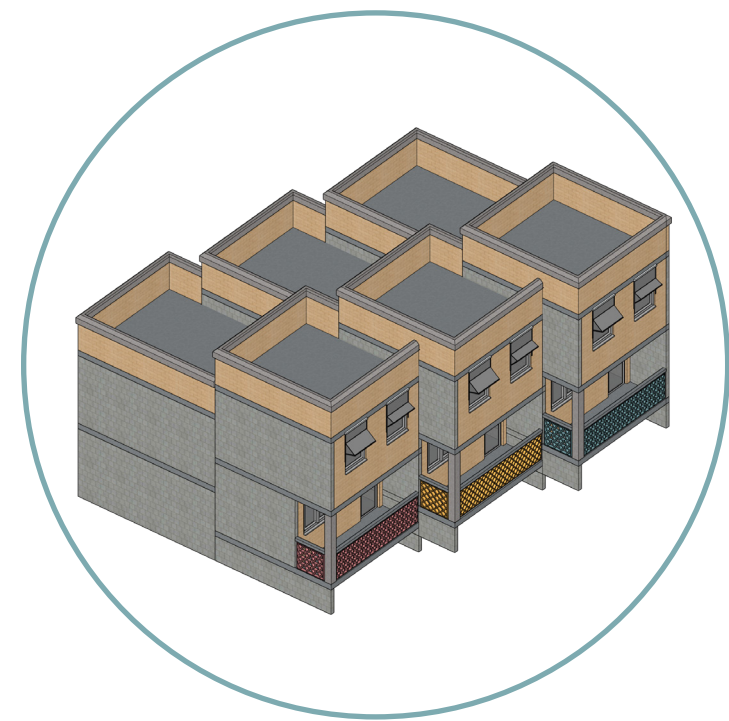
- looking out over the linear park and stream
- equipped with elevator and stairs



# SOBRADO TYPE

**GF, HIS 2, two bedrooms, 114 m<sup>2</sup>**

- along green axis
- split-level raises backside dwelling above ground level green axis
- expansion possibilities



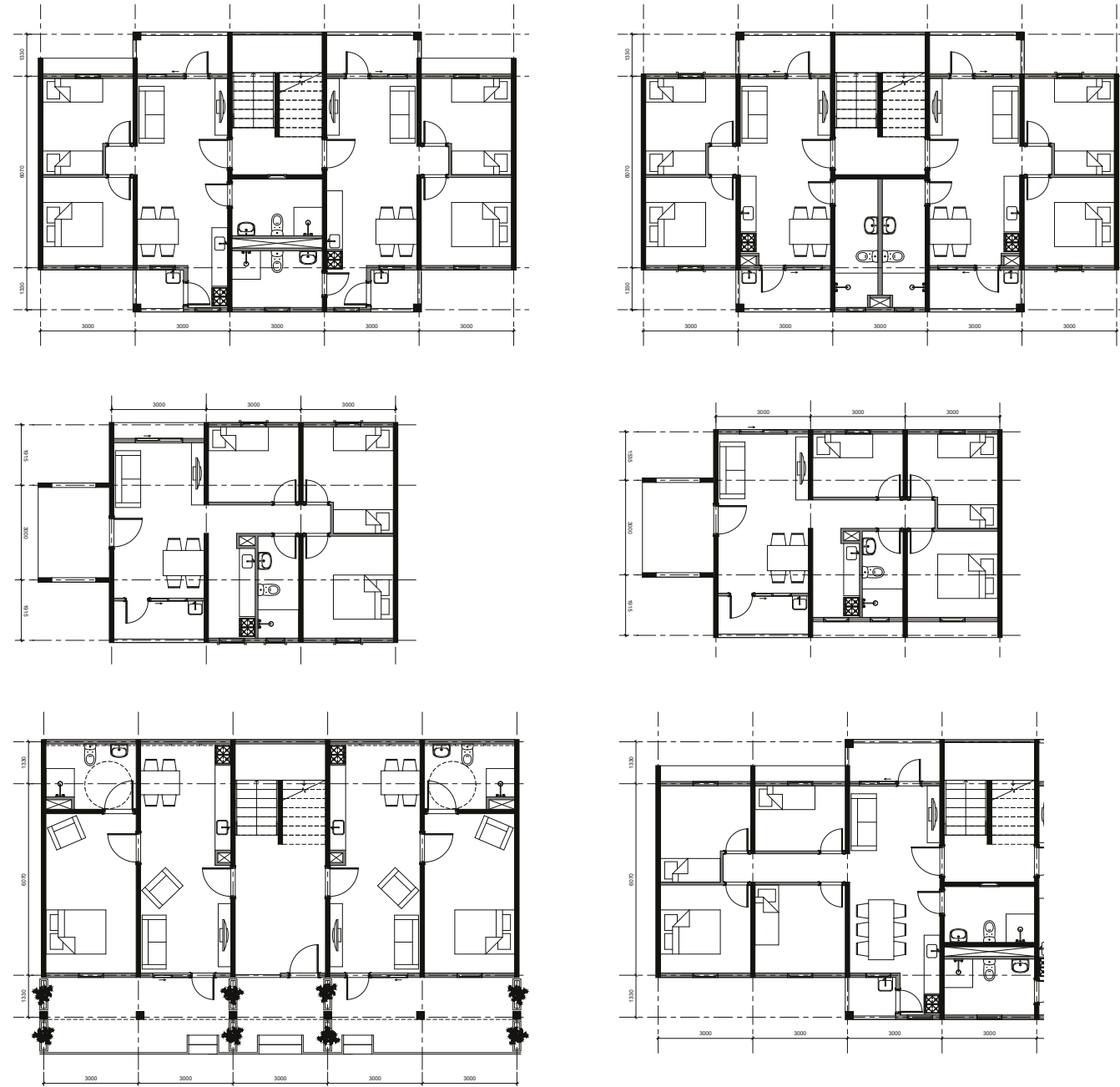
courtyard type

slab type

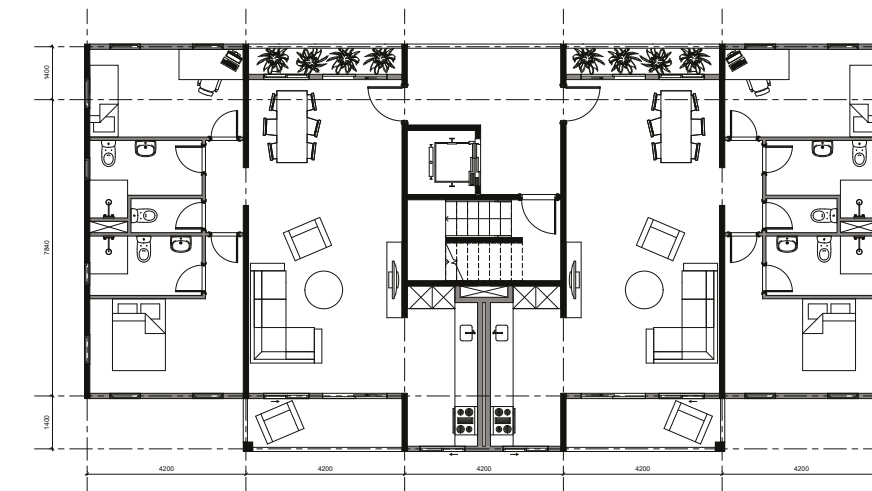
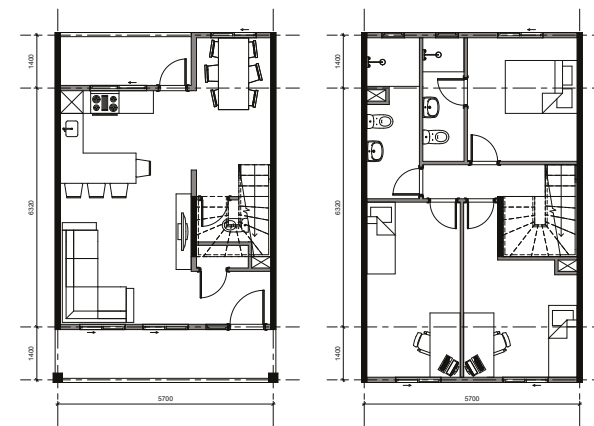
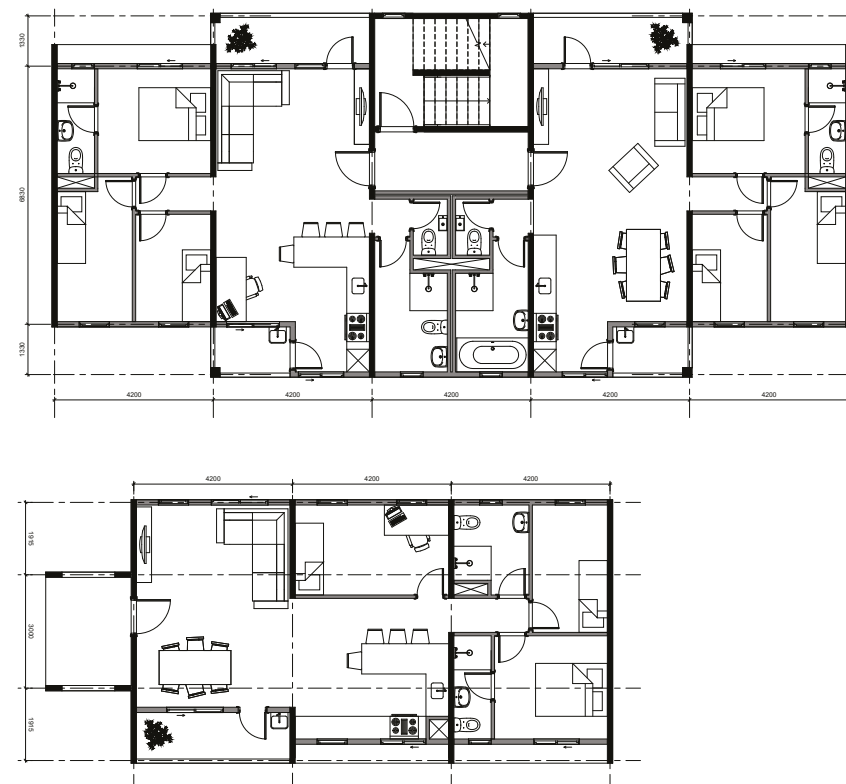
tower type

sobrado type

HIS 1



HIS 2





# BUILDING TECHNOLOGY

goal: determine how it can be built in a efficient and sustainable way

# MATERIALIZATION



structural walls: blocos verdes

- made of clams and shells
- similar properties as CMU
- 50% reduction of sand + cement

# MATERIALIZATION



structural walls: blocos verdes



floors: recycled concrete + EPS

- recycle rate: 20-40%
- EPS further reduces concrete

# MATERIALIZATION



structural walls: blocos verdes



floors: recycled concrete + EPS



non-structural walls: ceramics + compressed earth blocks

- reuse excavated soil
- low environmental impact



# MATERIALIZATION



structural walls: blocos verdes



floors: recycled concrete + EPS



non-structural walls: ceramics + compressed earth blocks



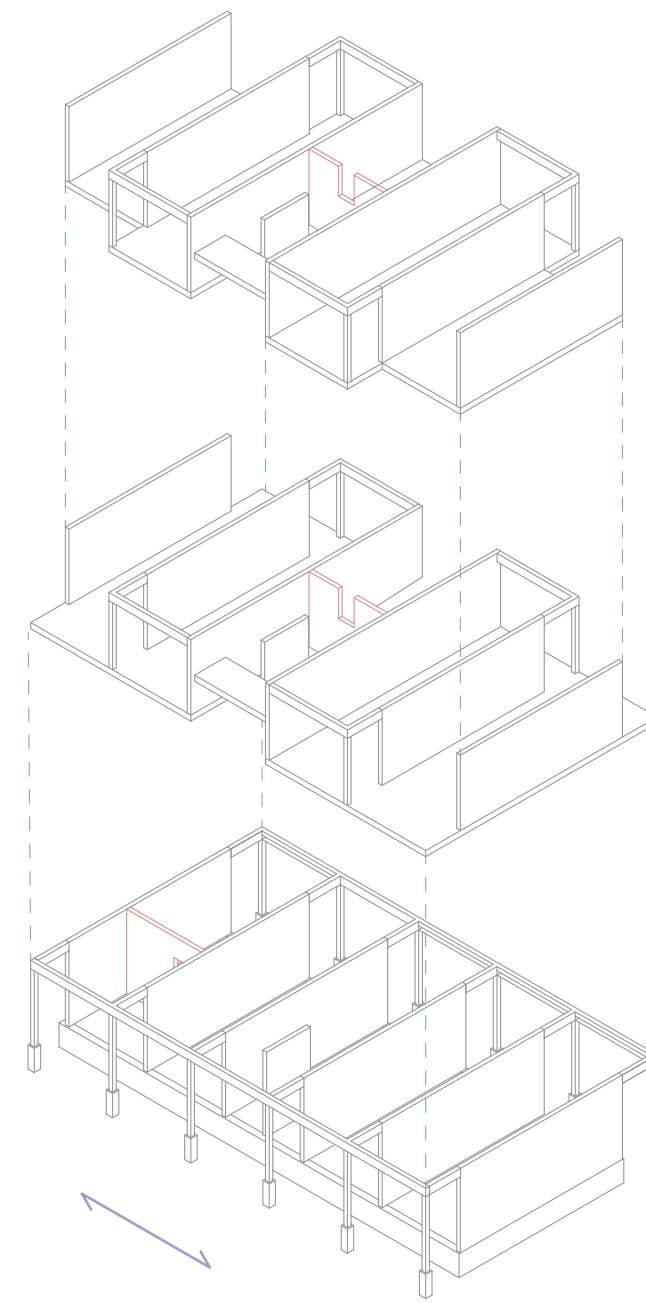
porous facades: Cobogó

- cross-ventilation and shading
- ceramic/concrete/fiber cement

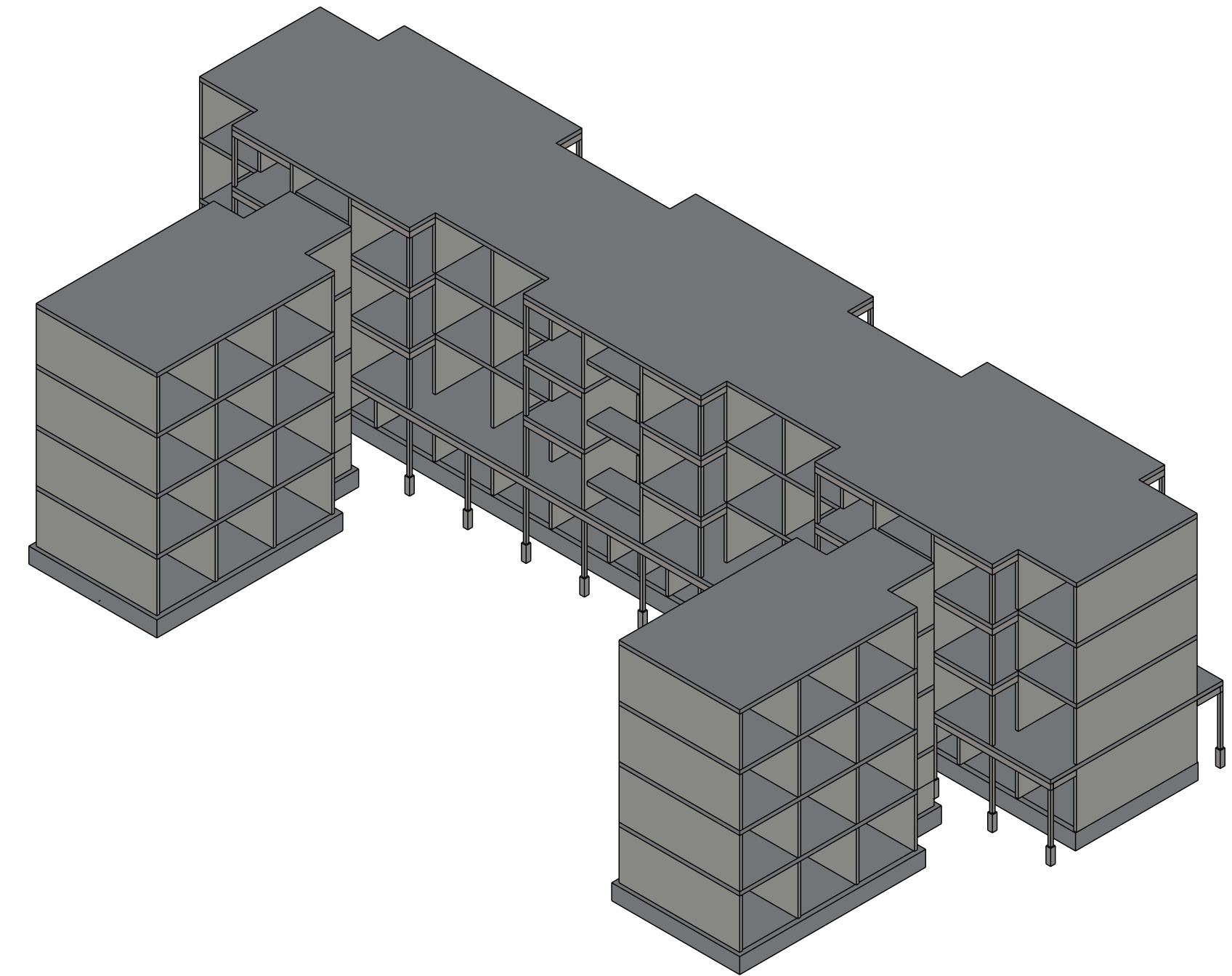
# STRUCTURAL DESIGN

## courtyard type

- parallel load-bearing walls
- stability provided by perpendicular walls



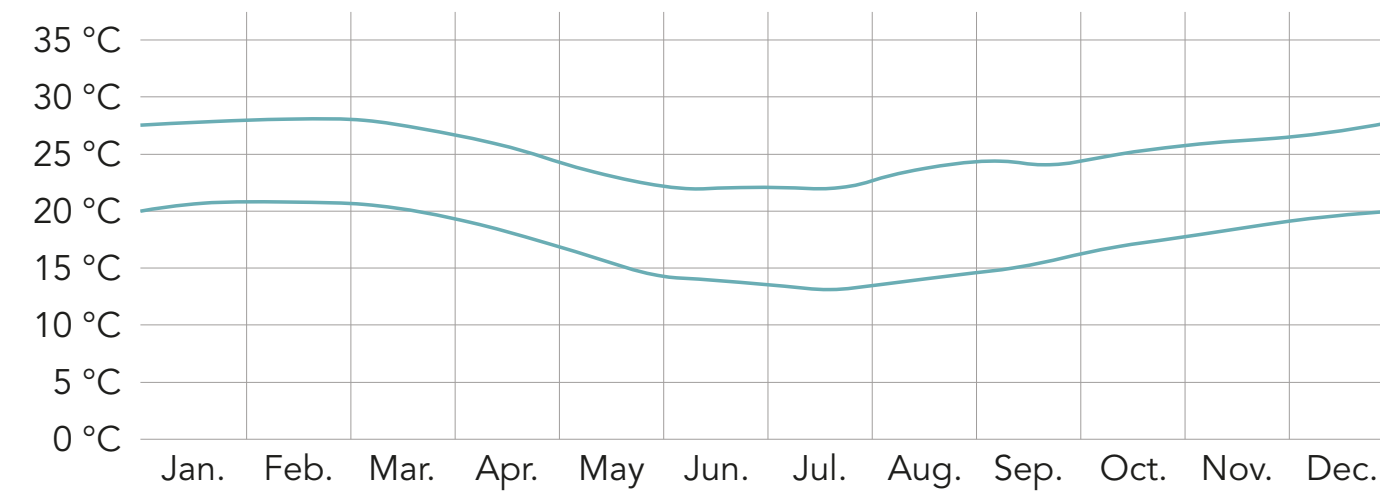
● span direction  
● stability walls



# BUILDING PHYSICS

## temperature - average min. and max. per day

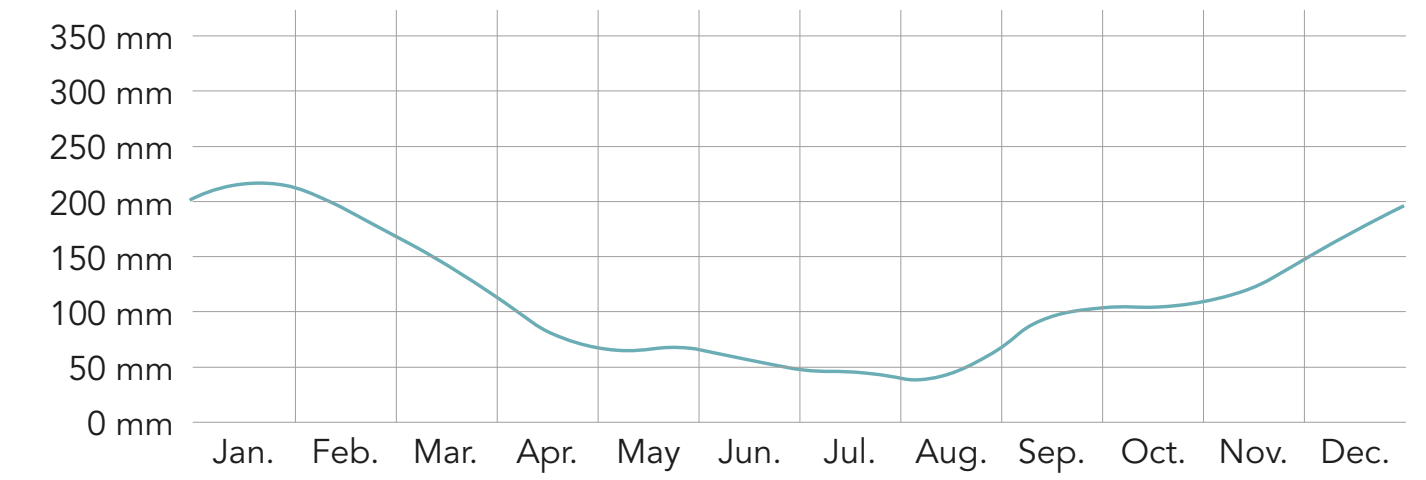
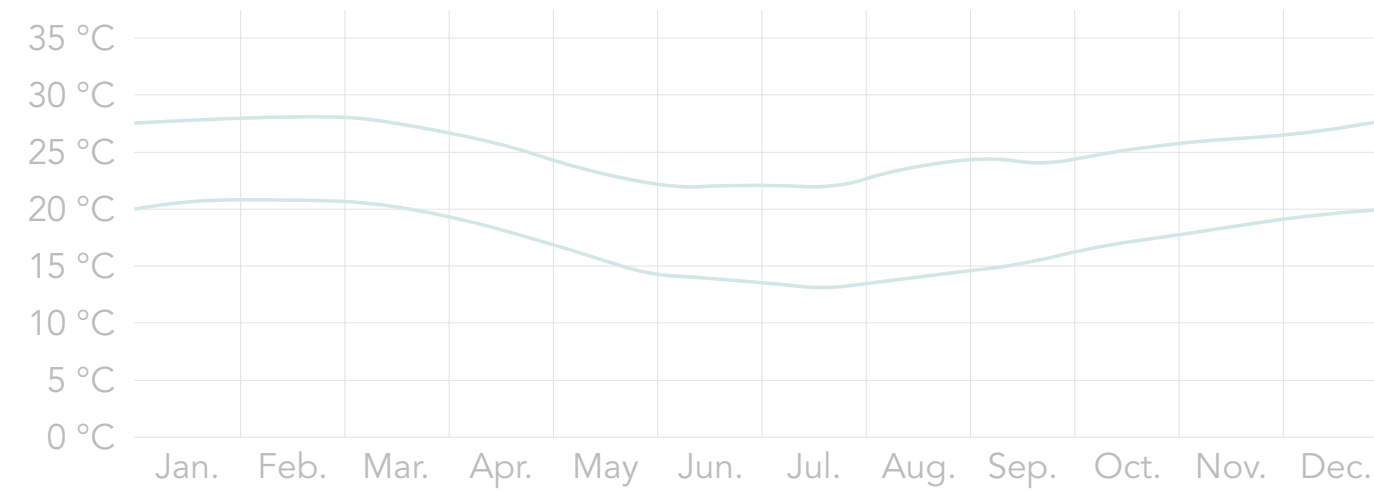
- yearly fluctuation limited, daily fluctation large
  - little insulation needed
  - cool down building at night by ventilation during summer
  - sufficient shading crucial



# BUILDING PHYSICS

## precipitation levels

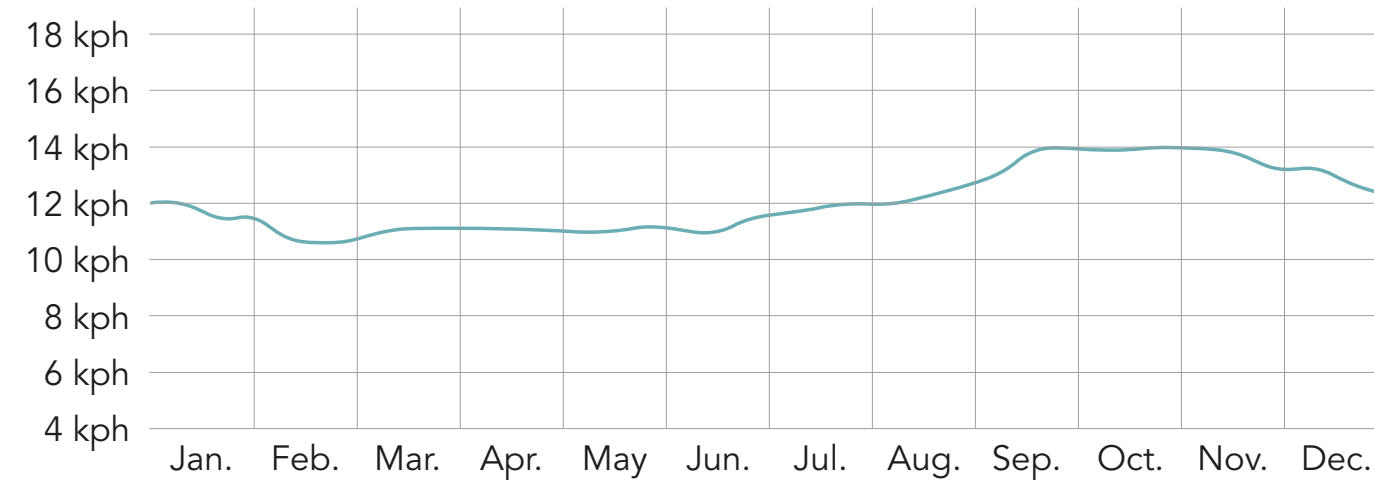
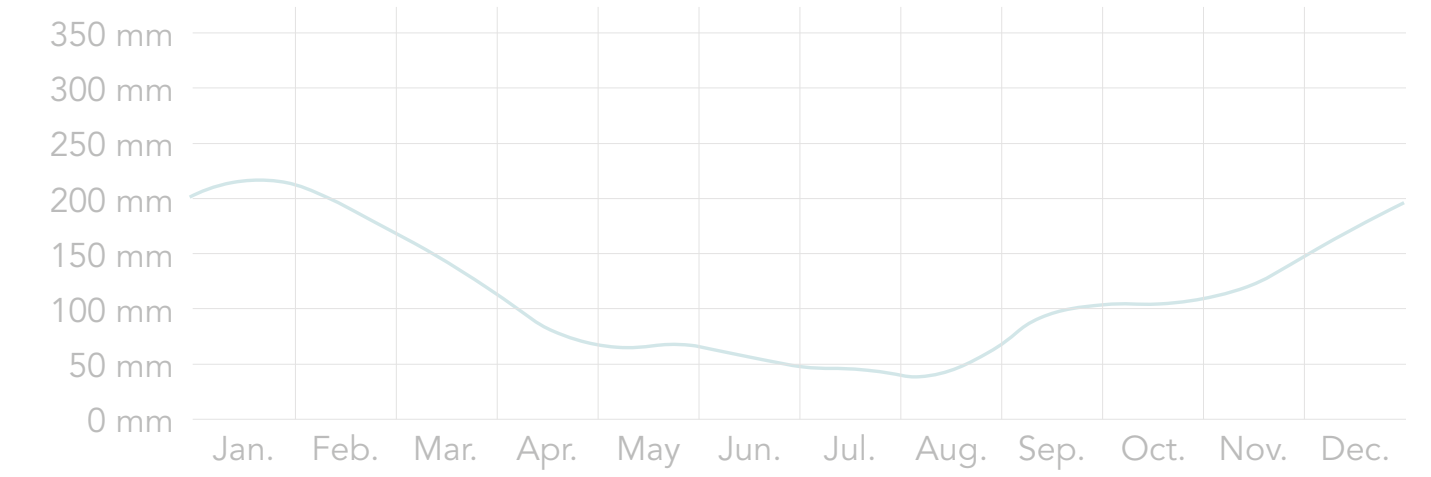
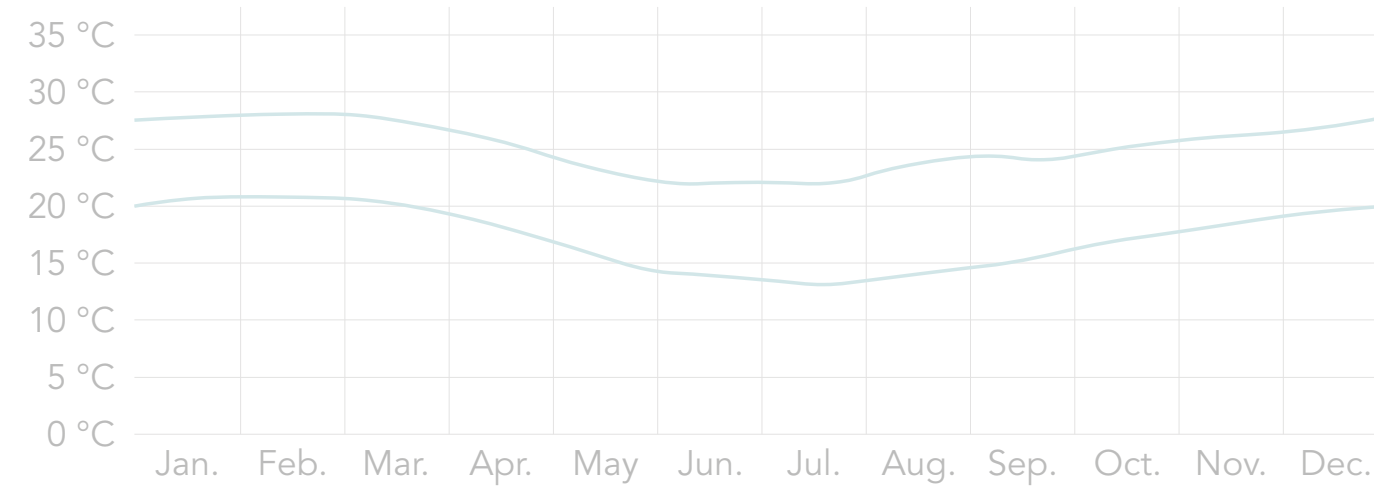
- yearly fluctuation limited, daily fluctation large
- quite some rain all around the year with large peaks
  - buffer rainwater, stimulate drainage subsoil, and flood-proof construction



# BUILDING PHYSICS

## wind speeds

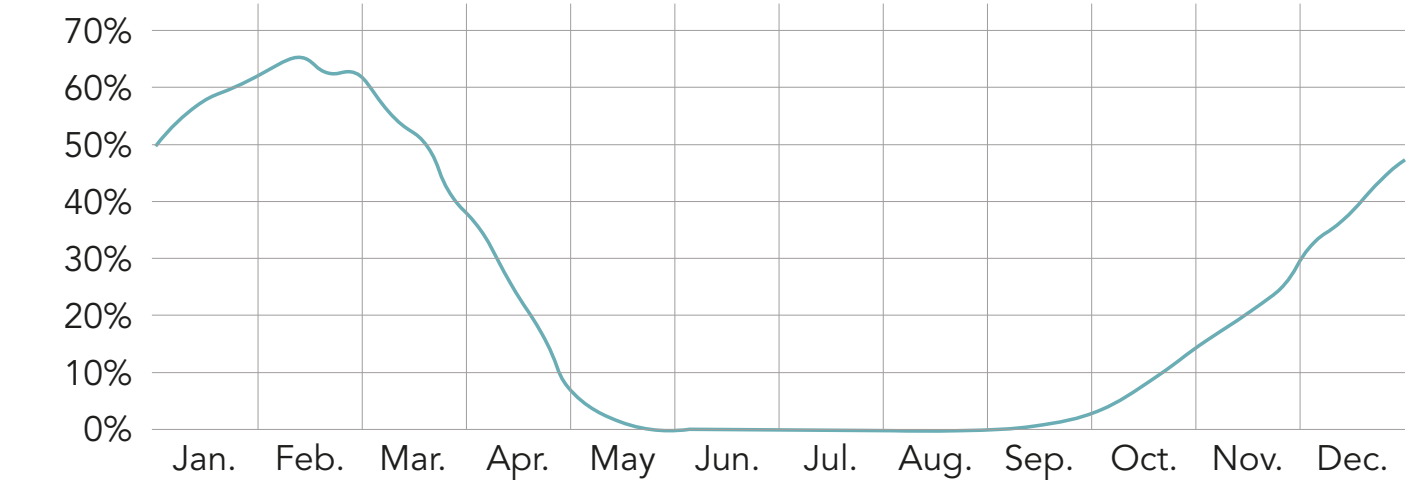
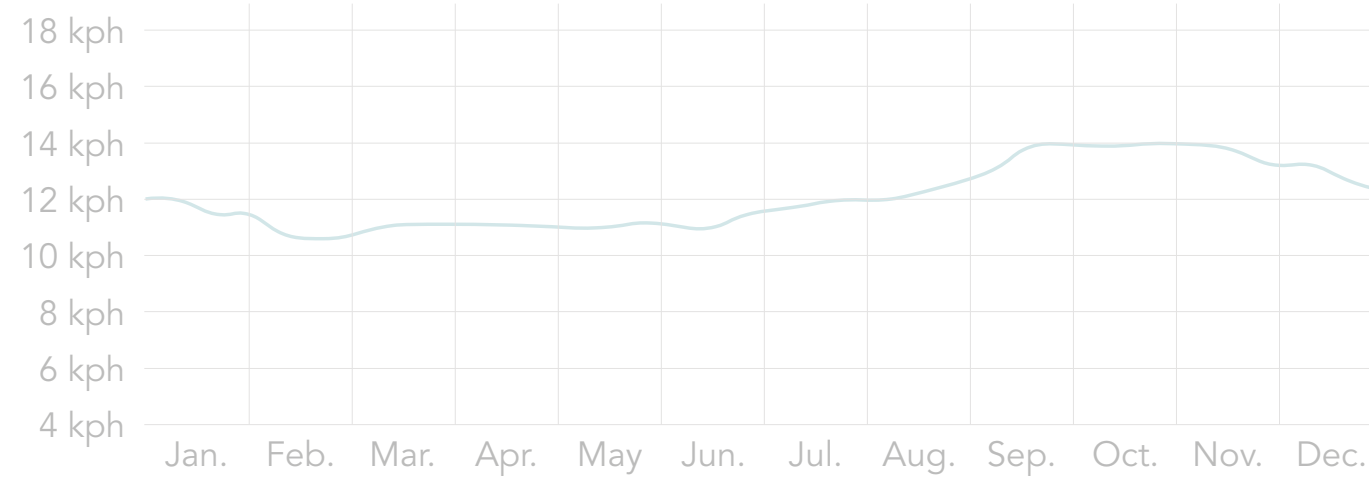
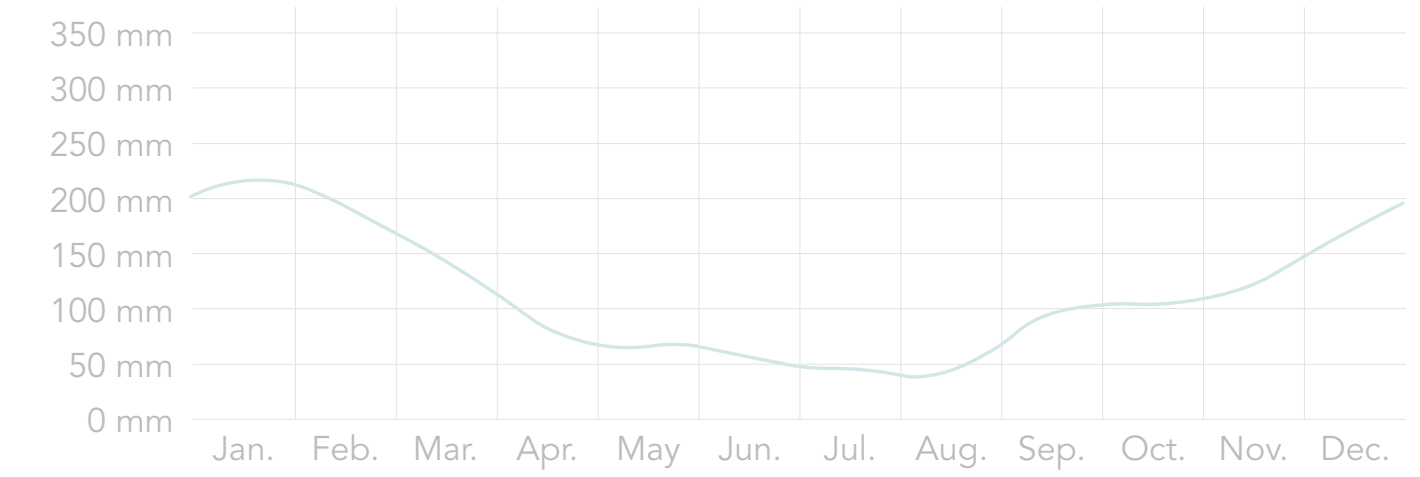
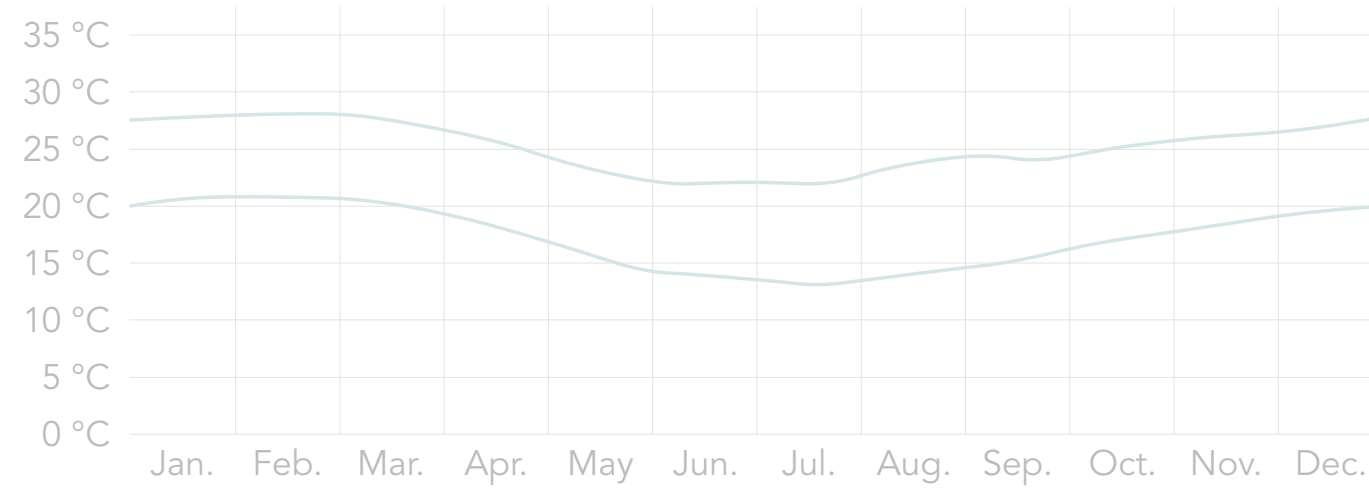
- yearly fluctuation limited, daily fluctation large
- quite some rain all around the year with large peaks
- ongoing wind from the ocean (south-east)
  - improves efficiency cross-ventilation
  - trees clean incoming air and provide shading



# BUILDING PHYSICS

## humidity - chance of being muggy

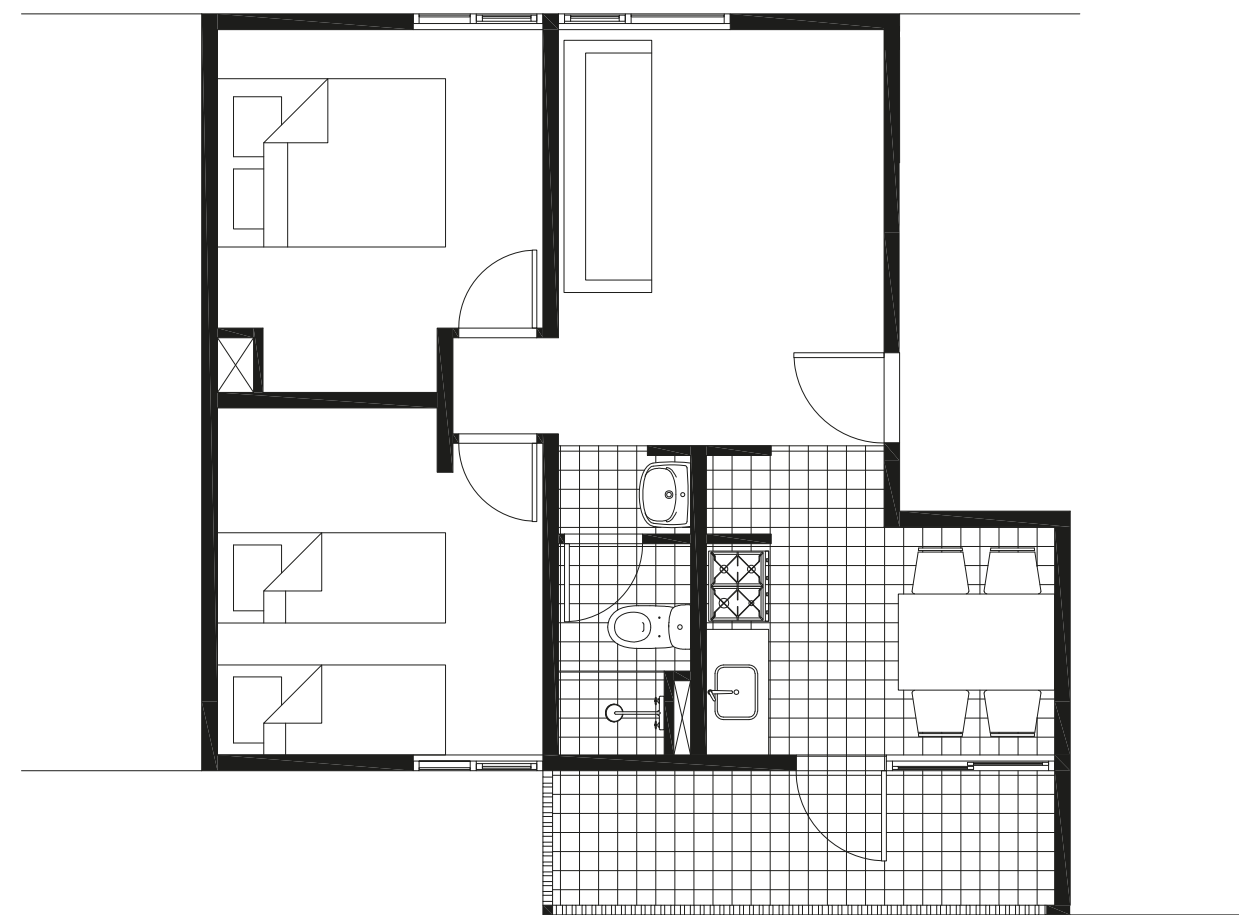
- yearly fluctuation limited, daily fluctation large
- quite some rain all around the year with large peaks
- ongoing wind from the ocean (south-east)
- large fluctuation humidity levels, muggy during summer
  - ventilation possibilities crucial



# BUILDING PHYSICS

## integration in floor plan

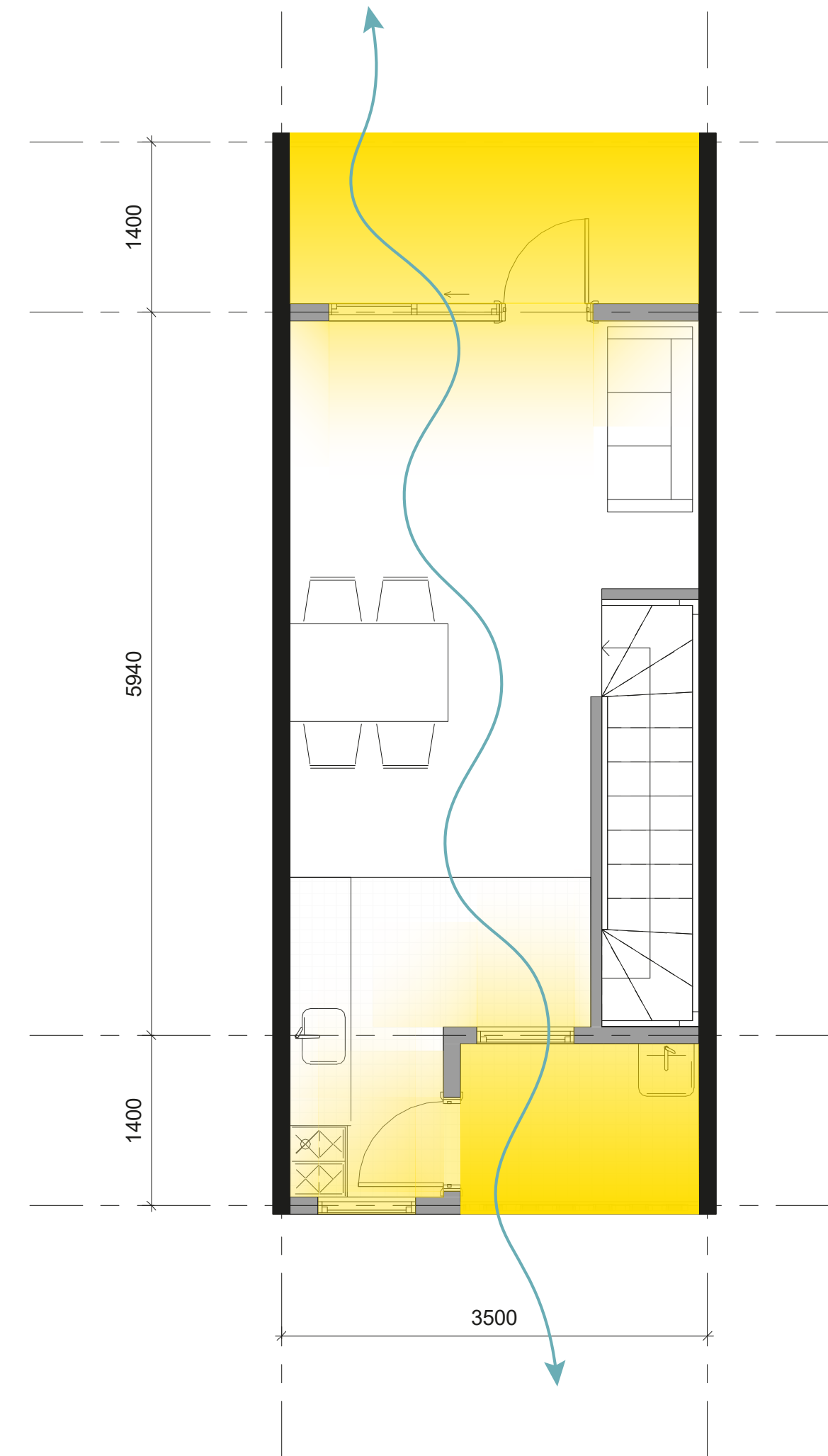
- permeable facade on both sides for cross-ventilation
- balcony and washing space buffer heat gains



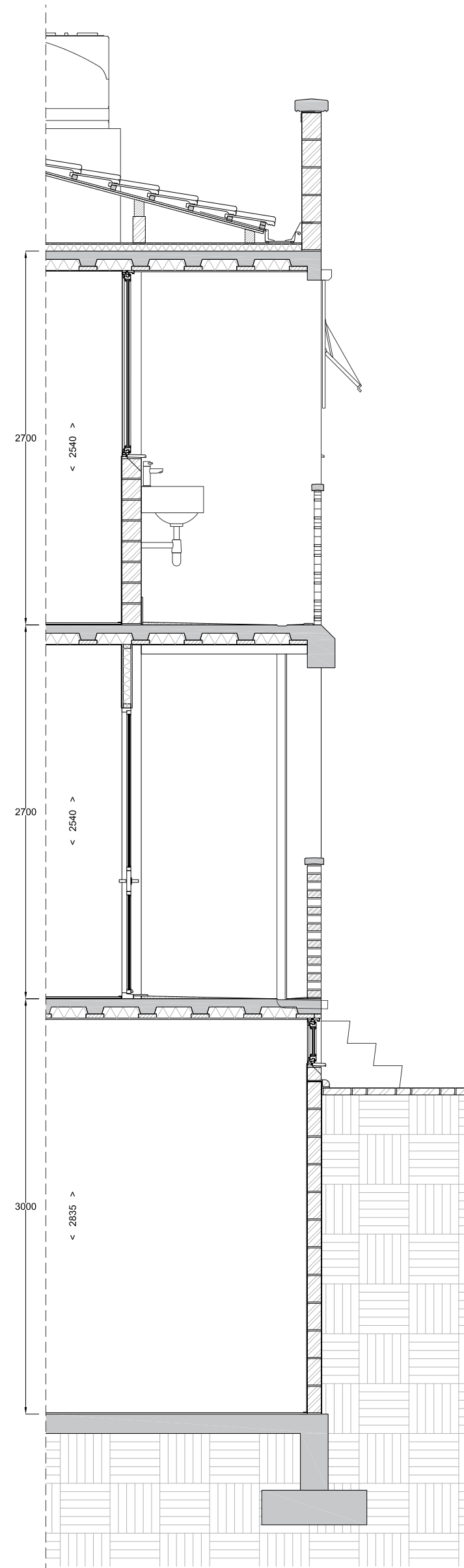
Santo Amaro V



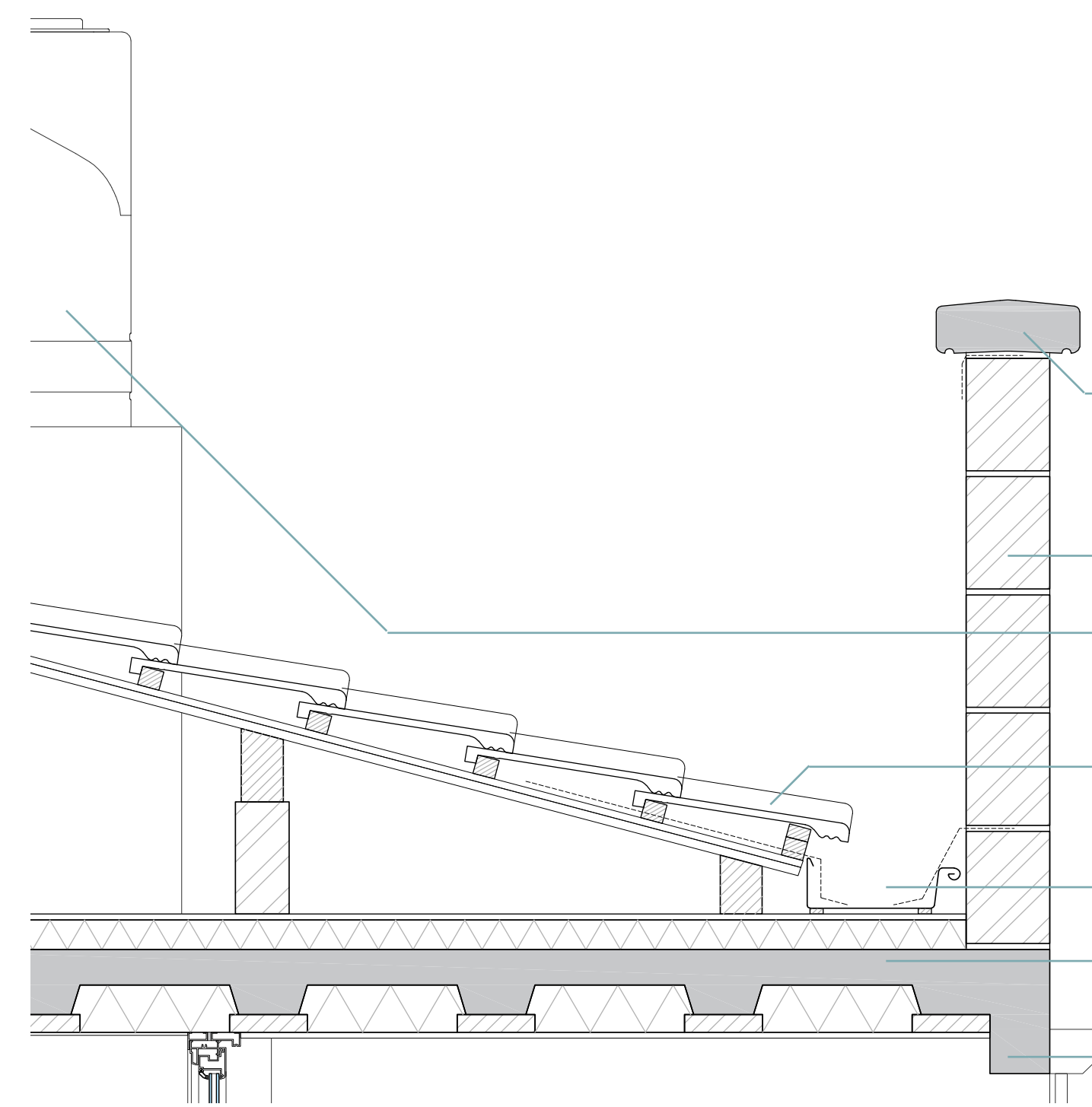
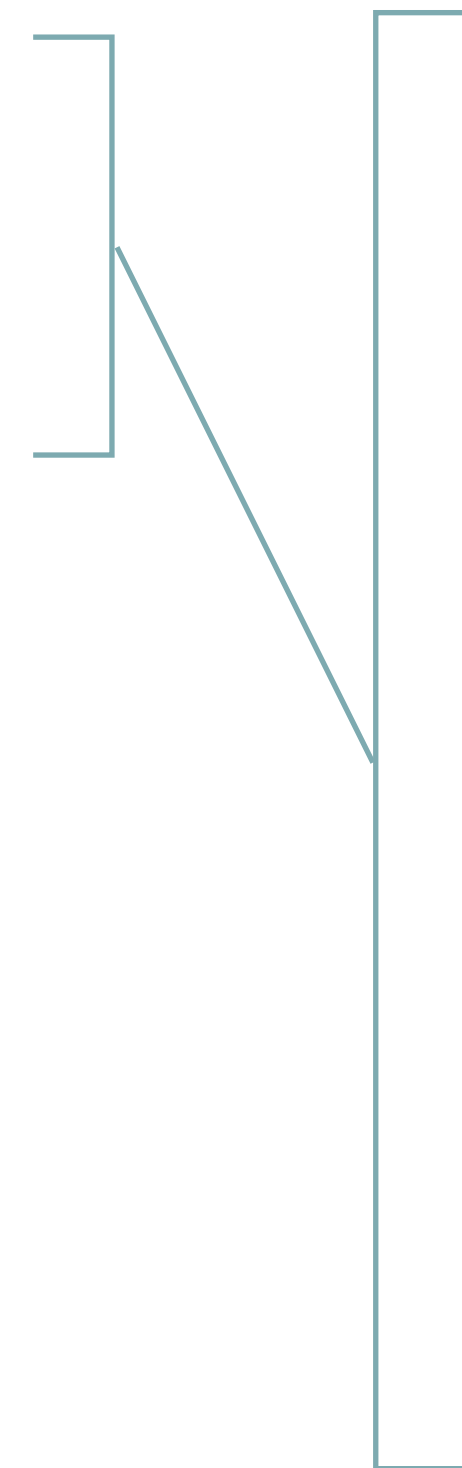
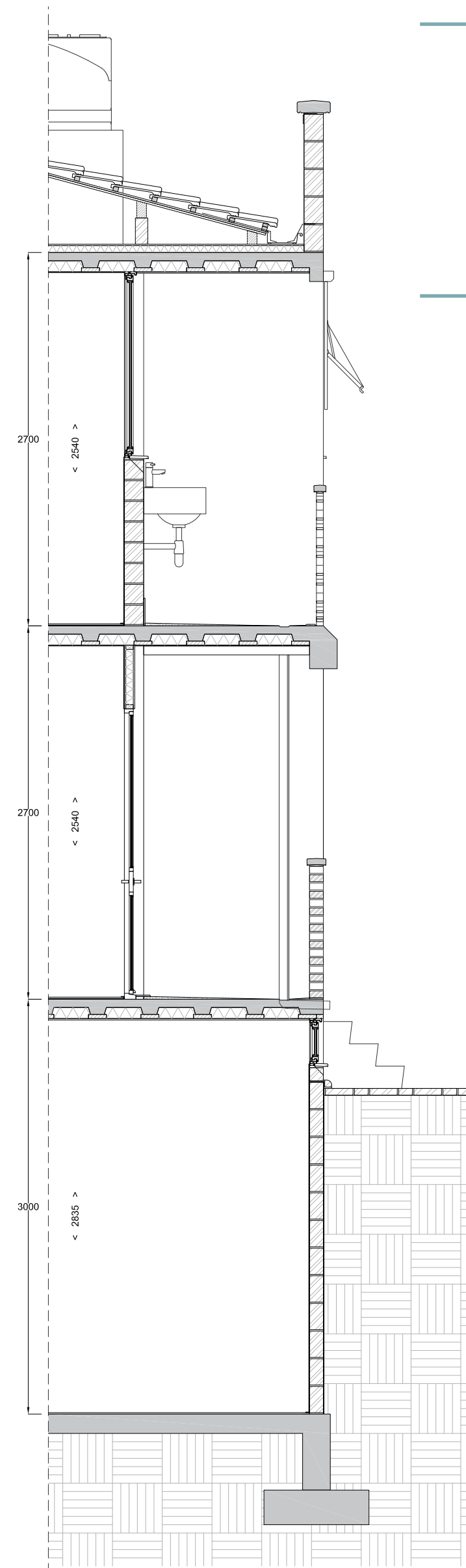
courtyard type



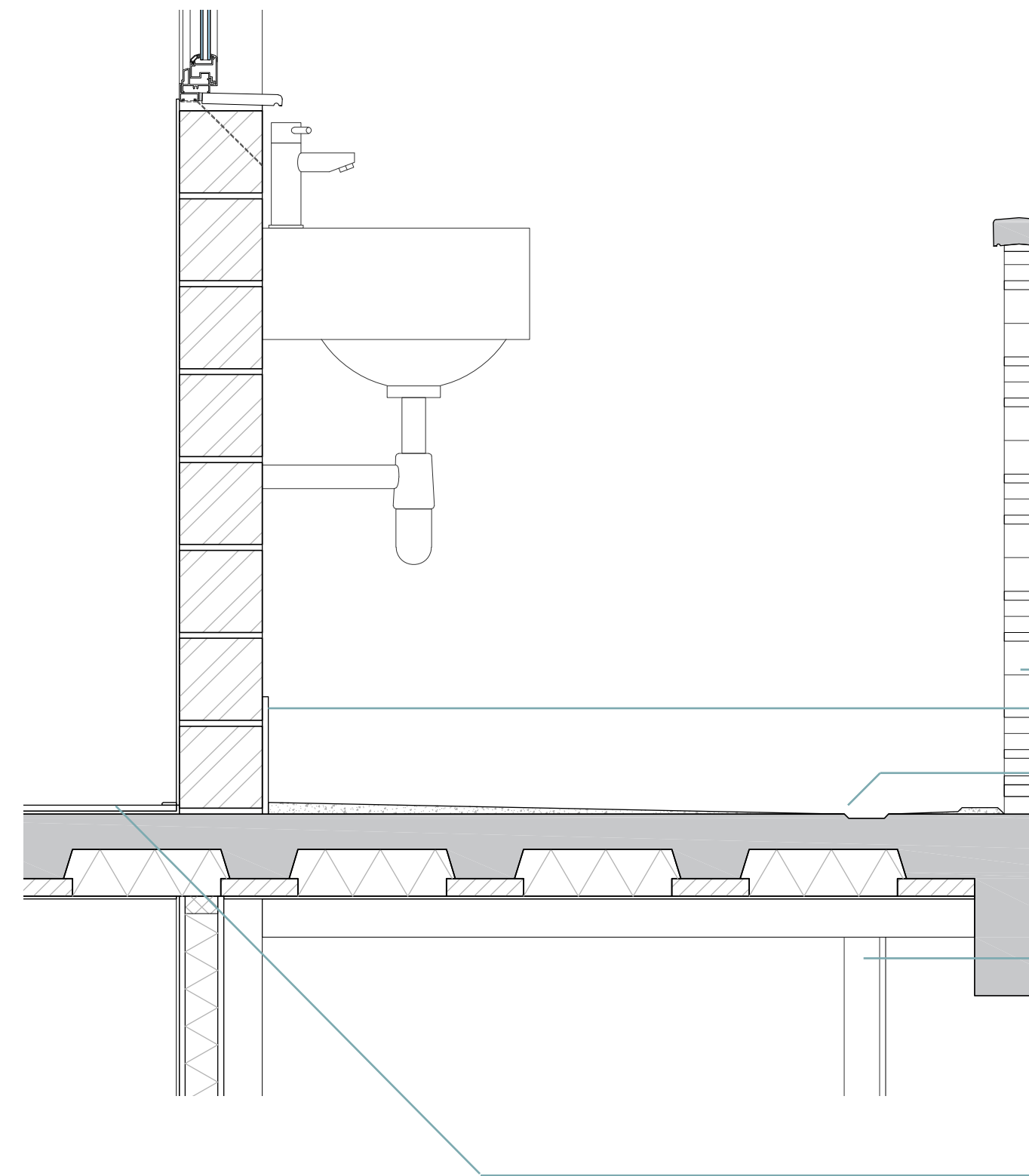
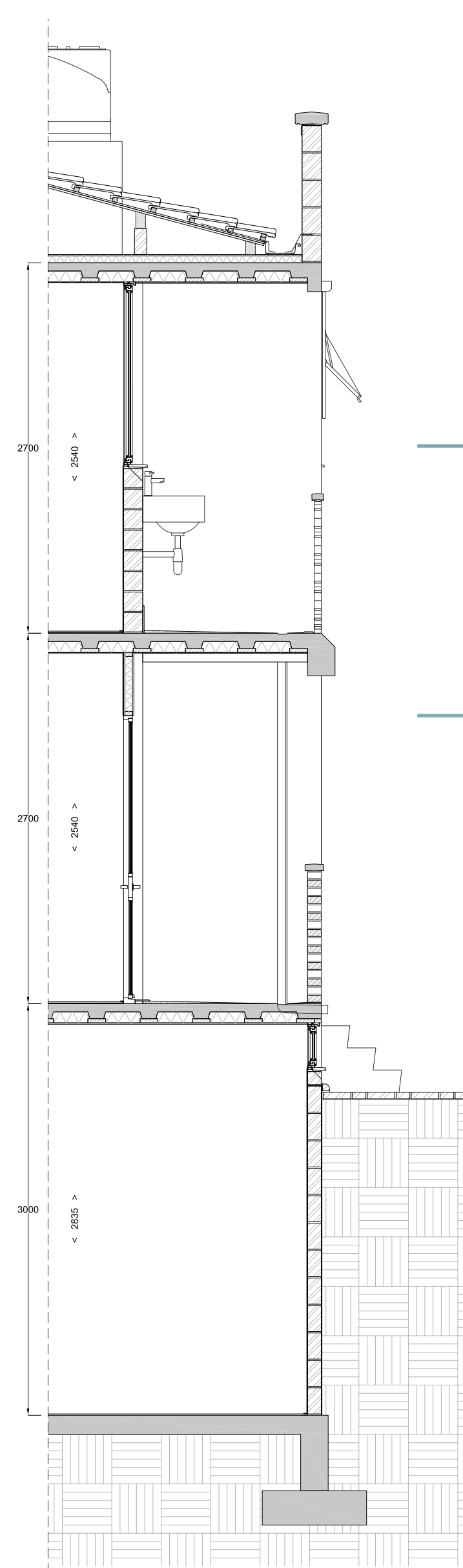
duplex type



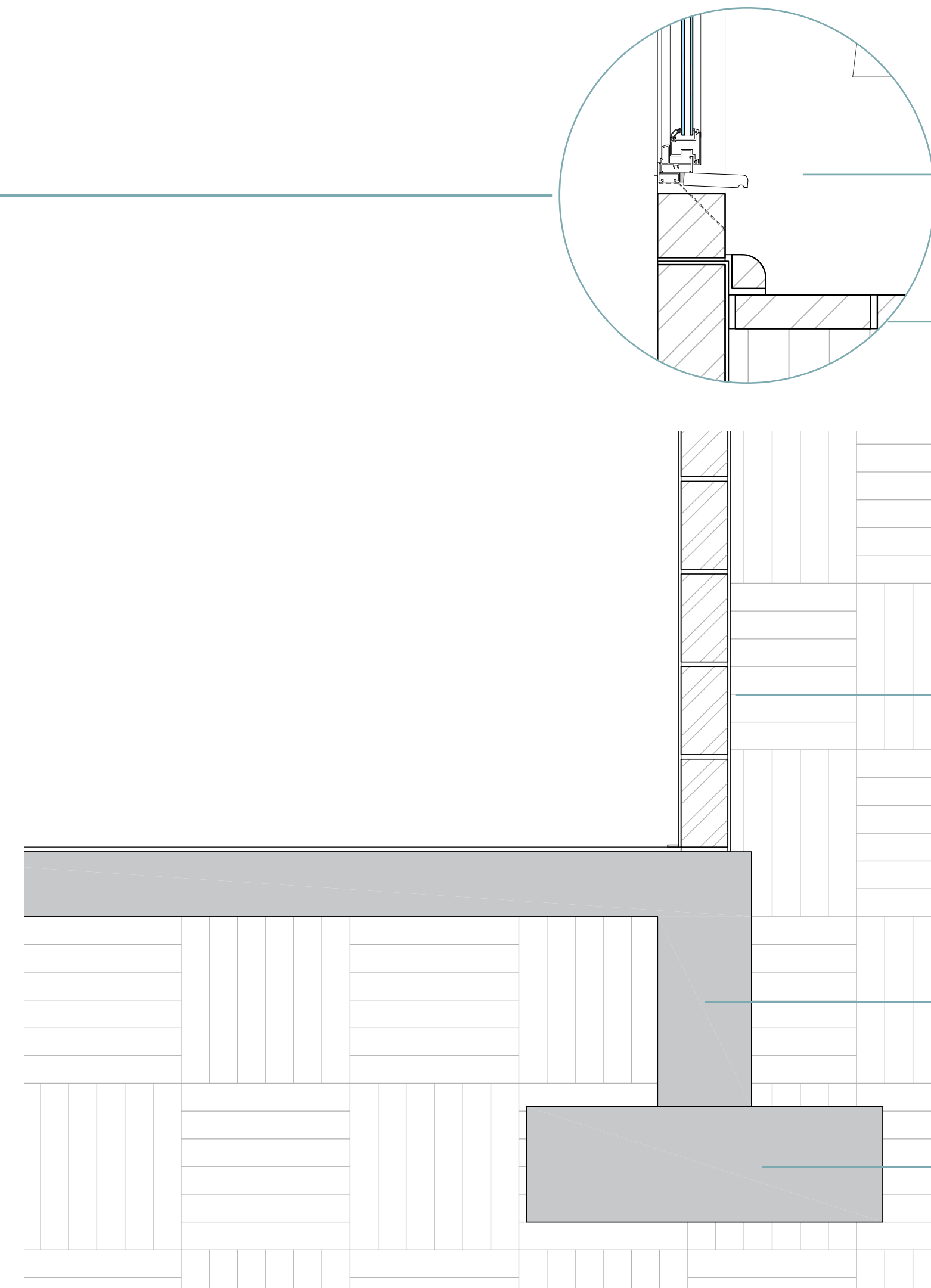
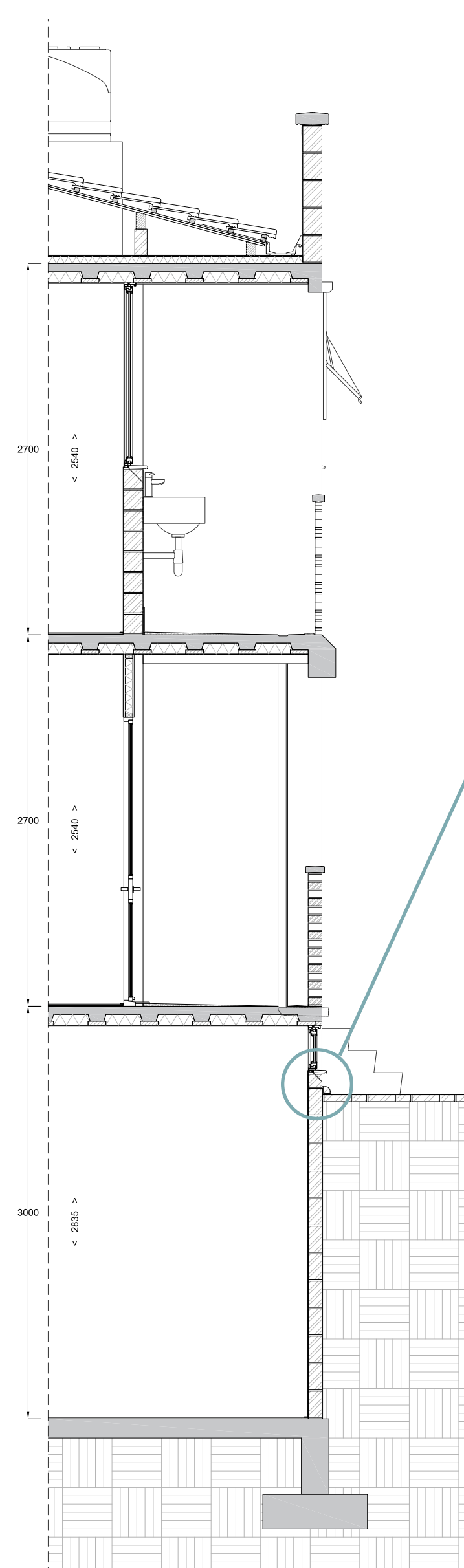




- concrete parapet cover  
matching floors + railings
- CEB parapet
- water cisterns for outage and  
rainwater harvesting
- ceramic roofing tiles
- gutter collecting rainwater
- EPS to reduce heat gain
- insitu concrete + EPS floor



- Cobogó element
- baseboard protecting CEB rainwater drainage balcony
- drainage pipe behind column
- insitu concrete floor and integrated beam balcony
- insulation layer to prevent sound transmission



PVC window frame souterrain

pavement courtyard

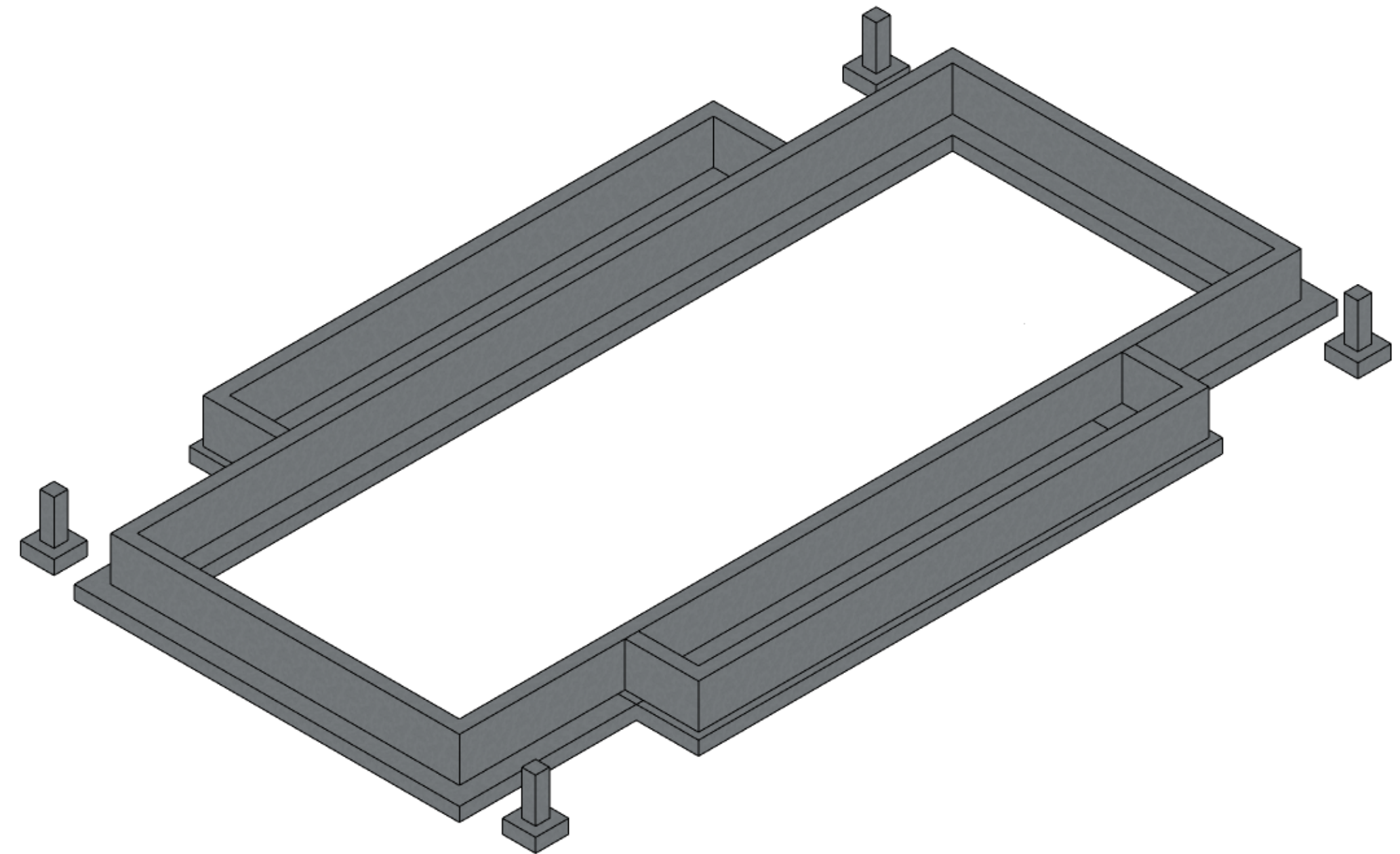
waterproof layer

concrete foundation 33% thicker than CEB wall

foundation on sandy subsoil

# CONSTRUCTION PROCESS

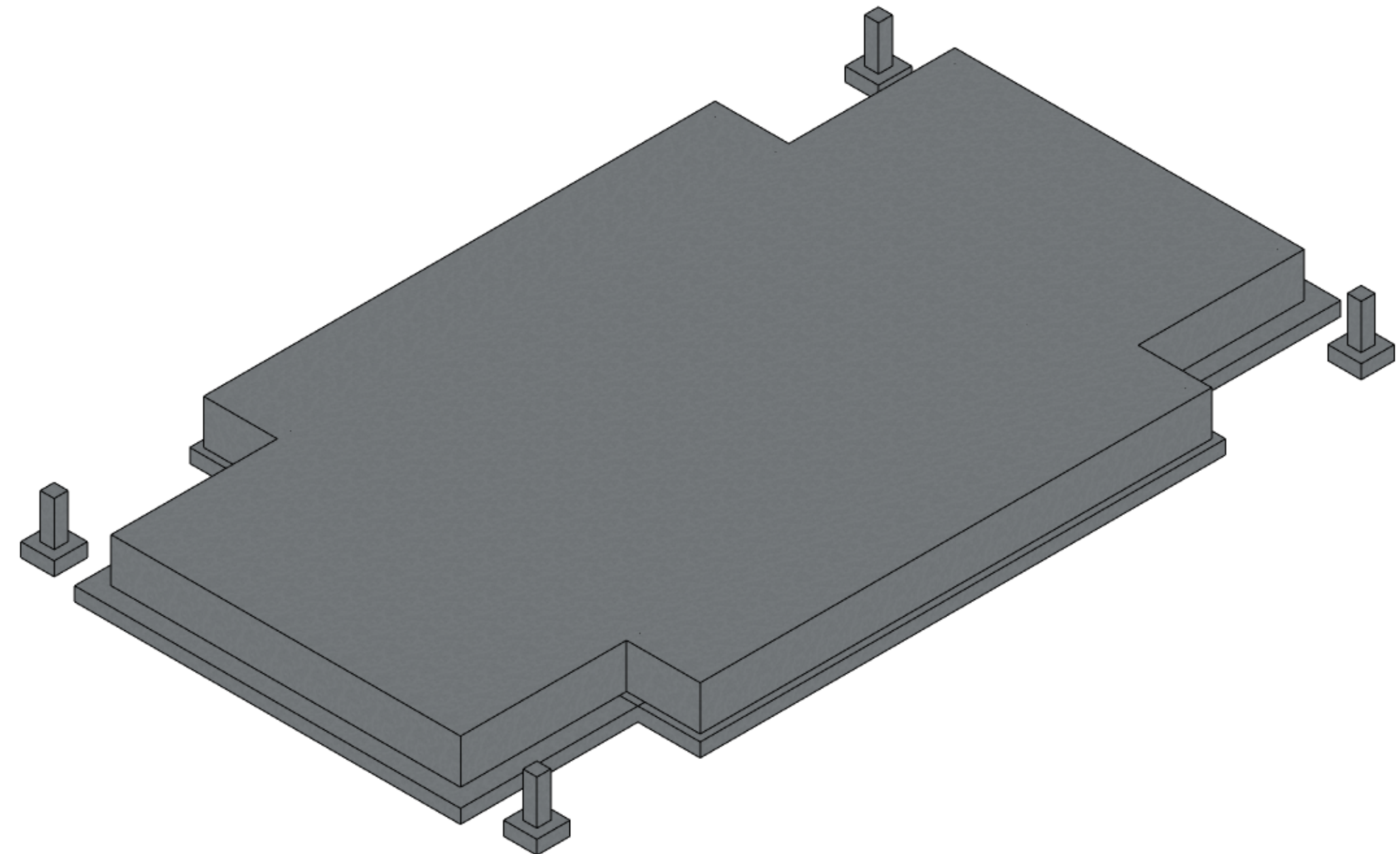
## **pouring foundation**



# CONSTRUCTION PROCESS

## **pouring floor GF**

- waterproof layer applied between foundation and walls



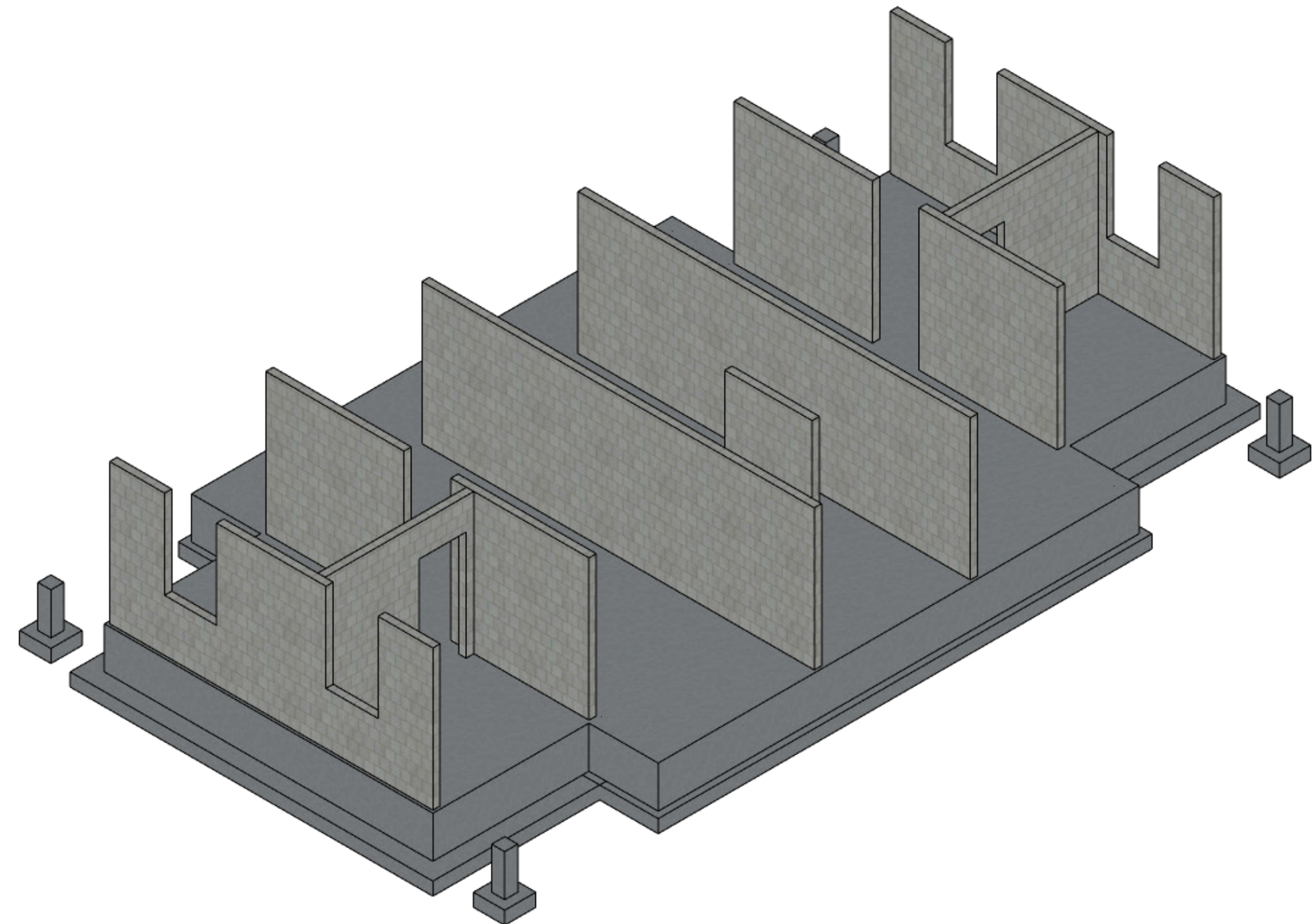
# CONSTRUCTION PROCESS

## load-bearing walls

- stacking blocos verdes

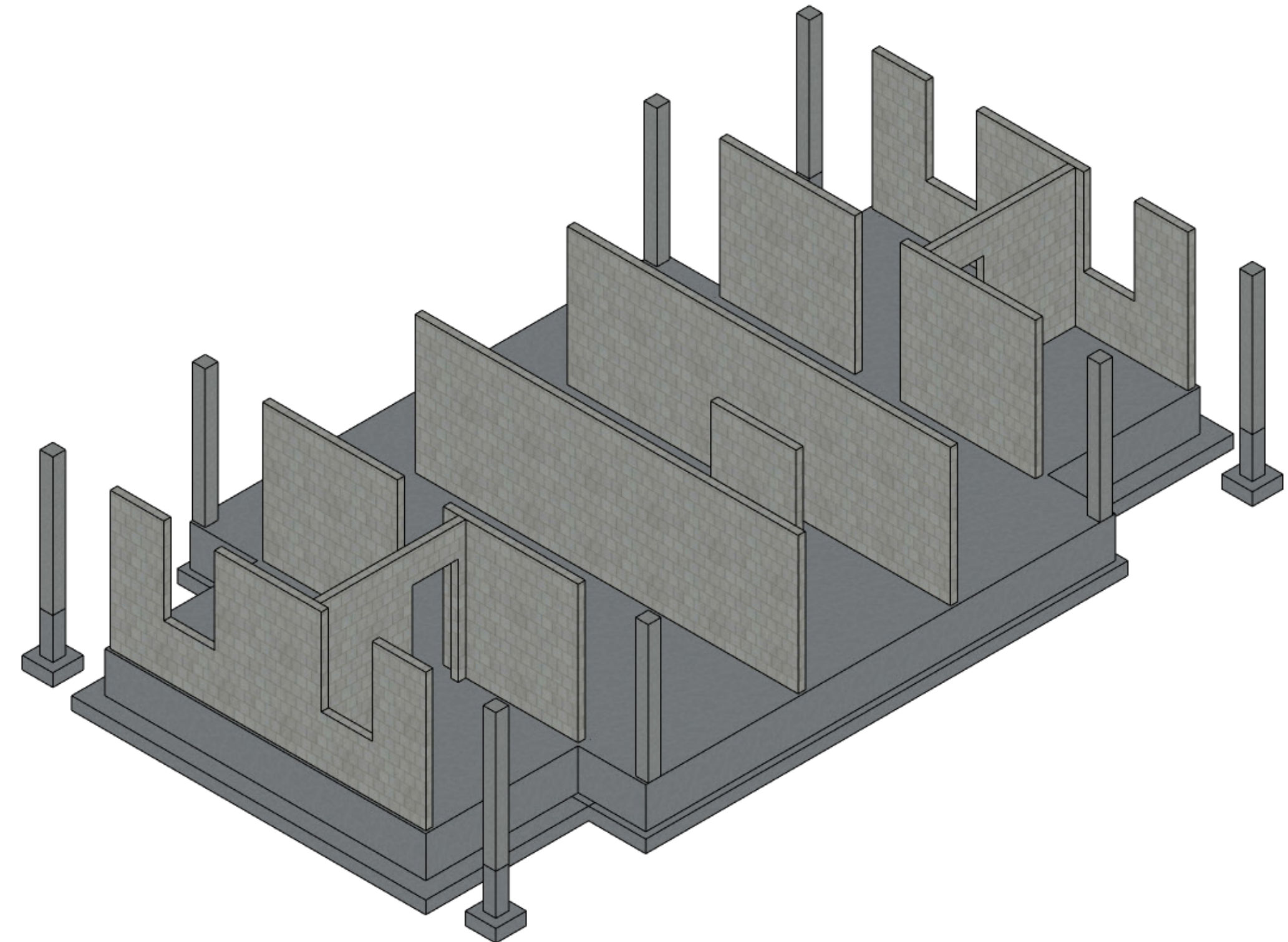


stacking blocos verdes



# CONSTRUCTION PROCESS

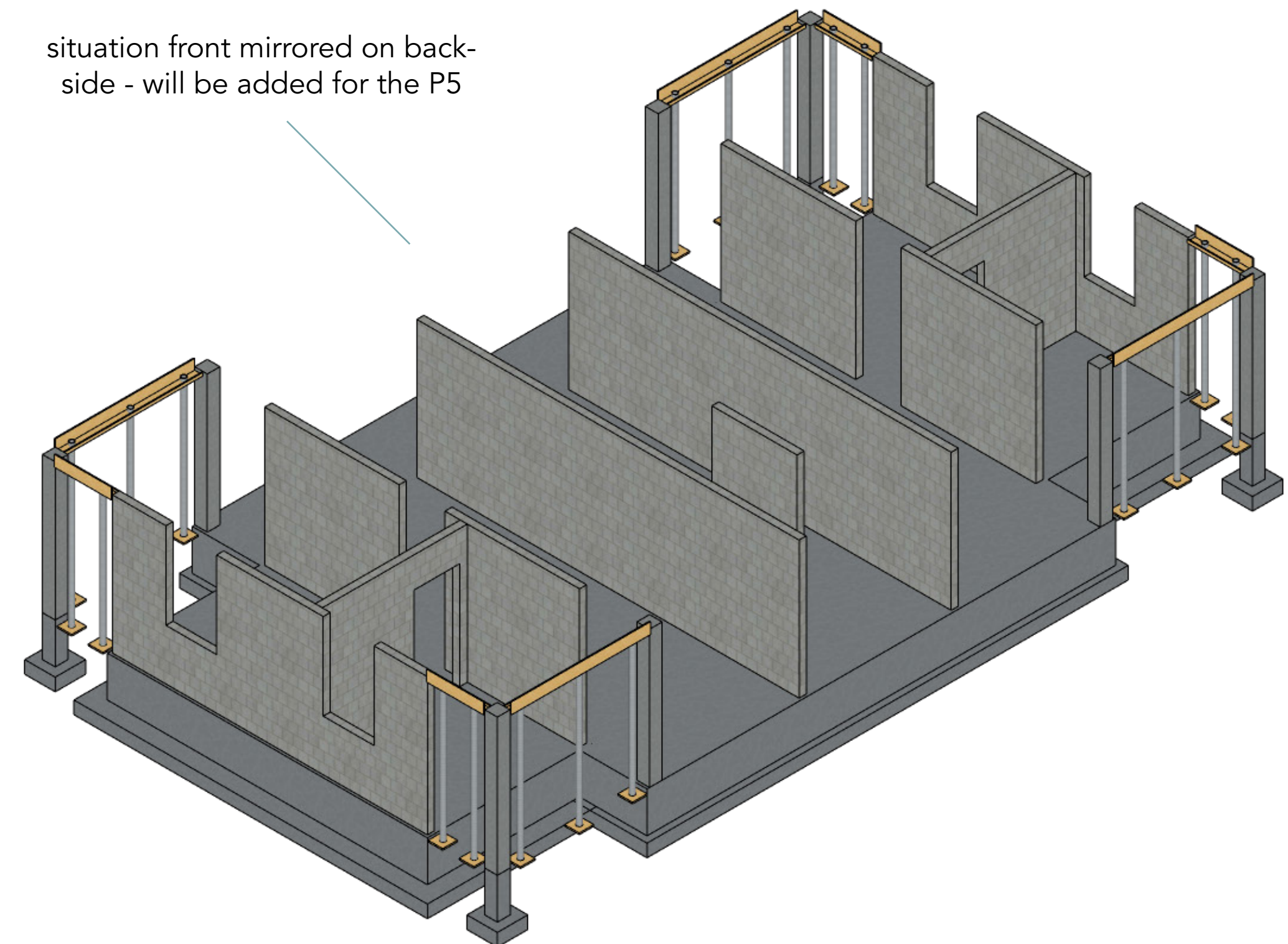
placing prefab concrete columns balconies



# CONSTRUCTION PROCESS

## placing formwork floor beams

- temporary lintels support above openings

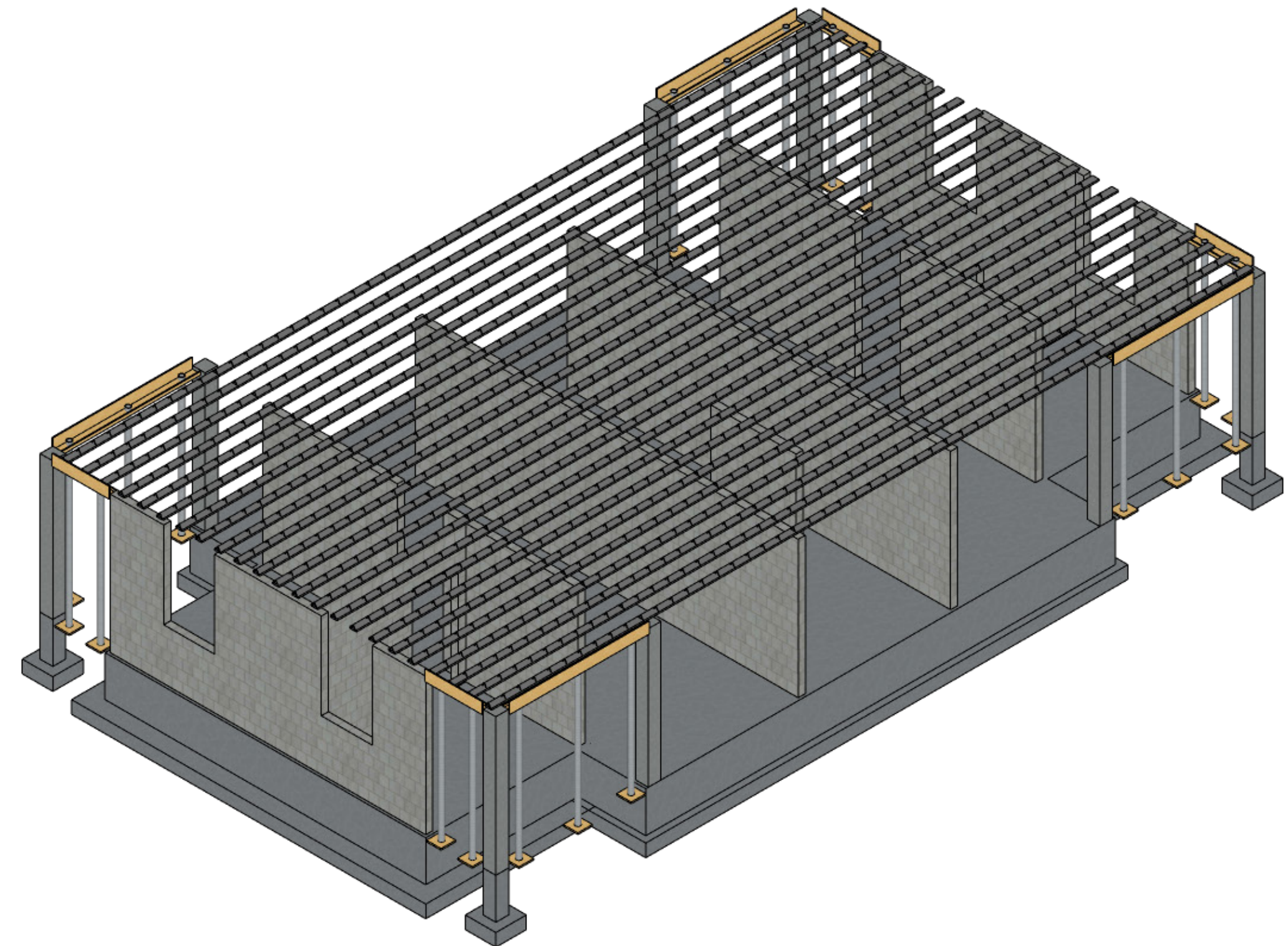




# CONSTRUCTION PROCESS

## placing prefab column slabs

- the floor is later poured on these

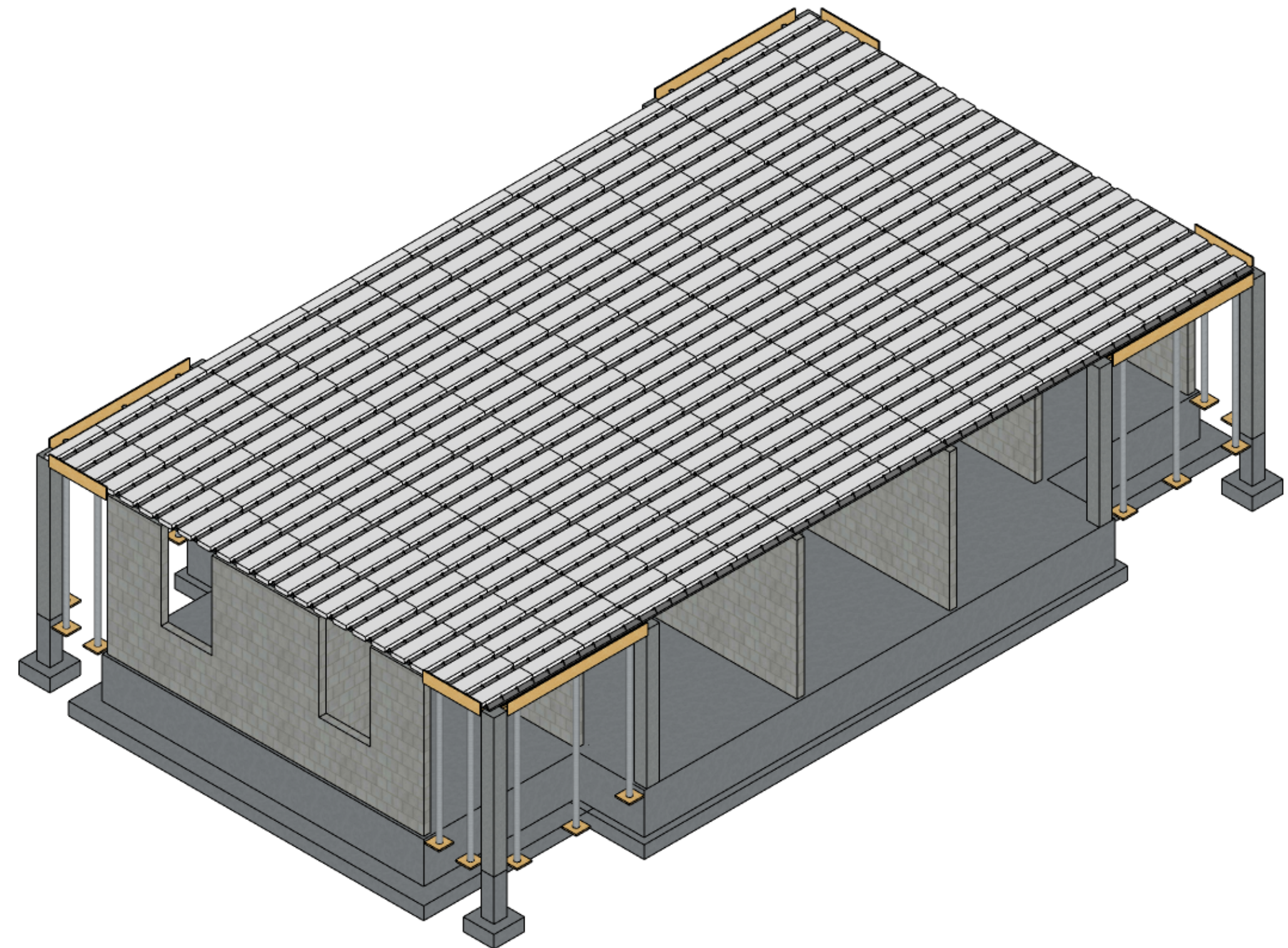


# CONSTRUCTION PROCESS

laying EPS slabs inbetween these



insulation slabs



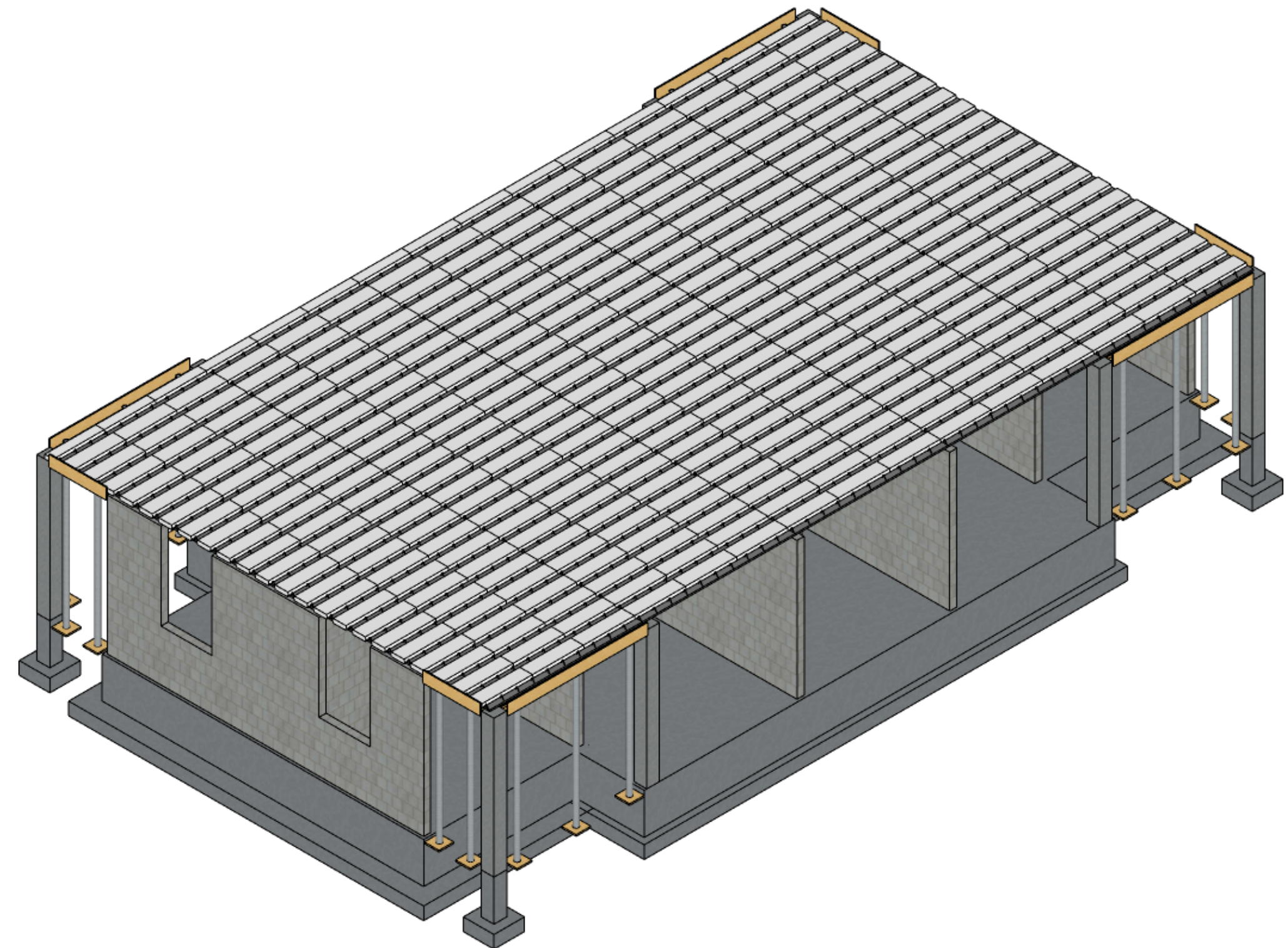
# CONSTRUCTION PROCESS

## installing rebars

- to connect the floors, walls, columns, beams, and both sides of the floor slabs to each other

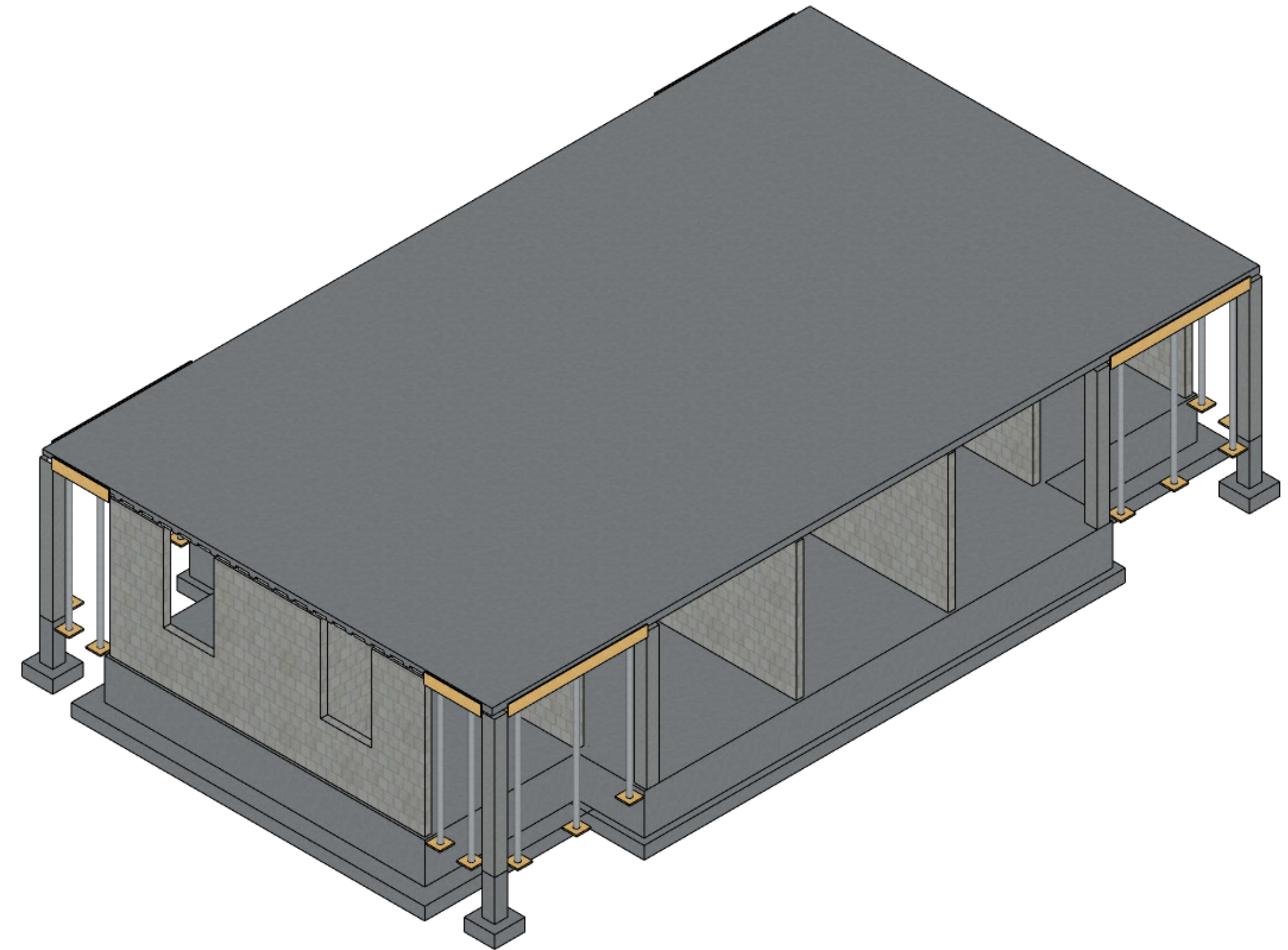


rebars before pouring concrete



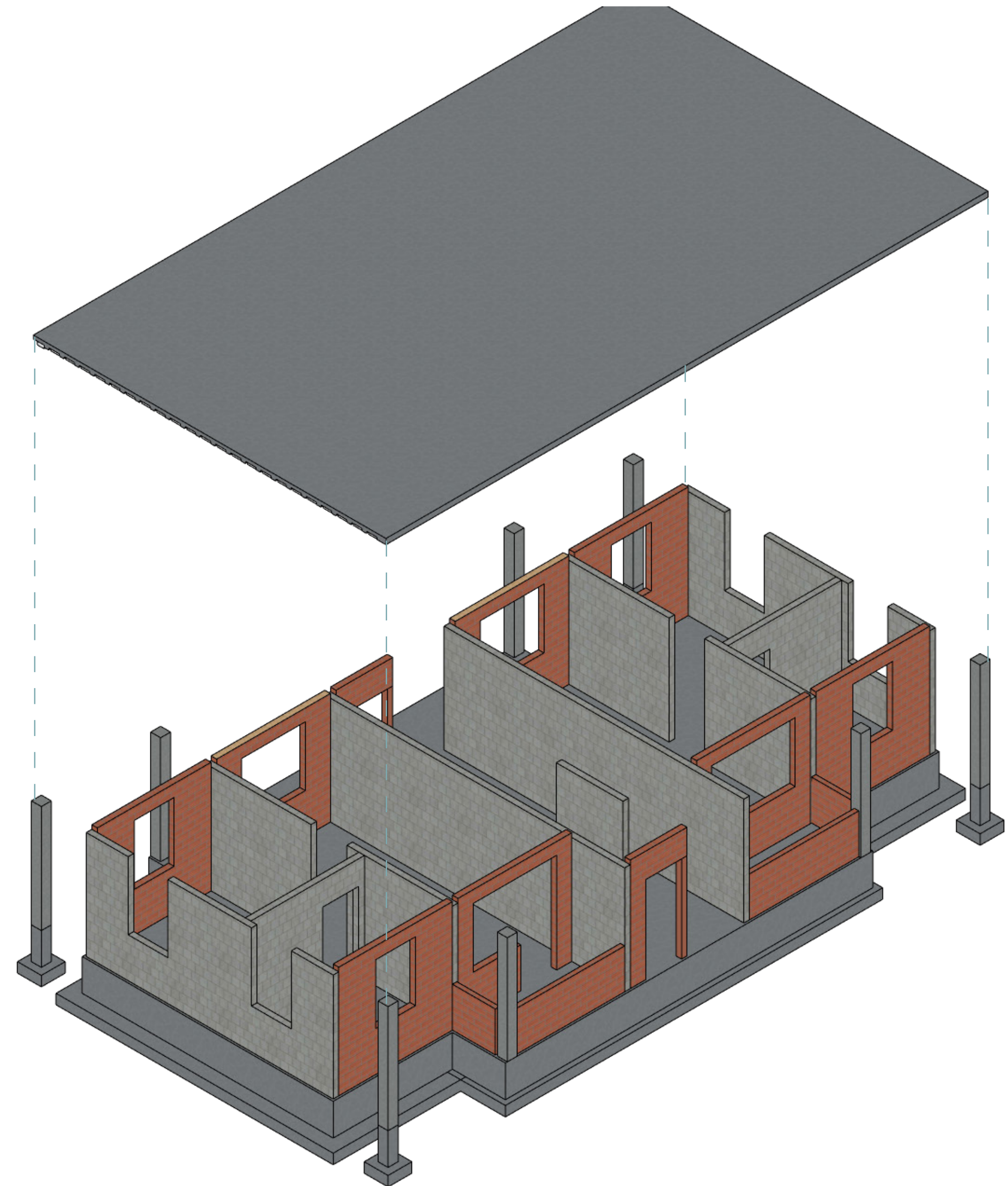
# CONSTRUCTION PROCESS

## **pouring floor 1F**



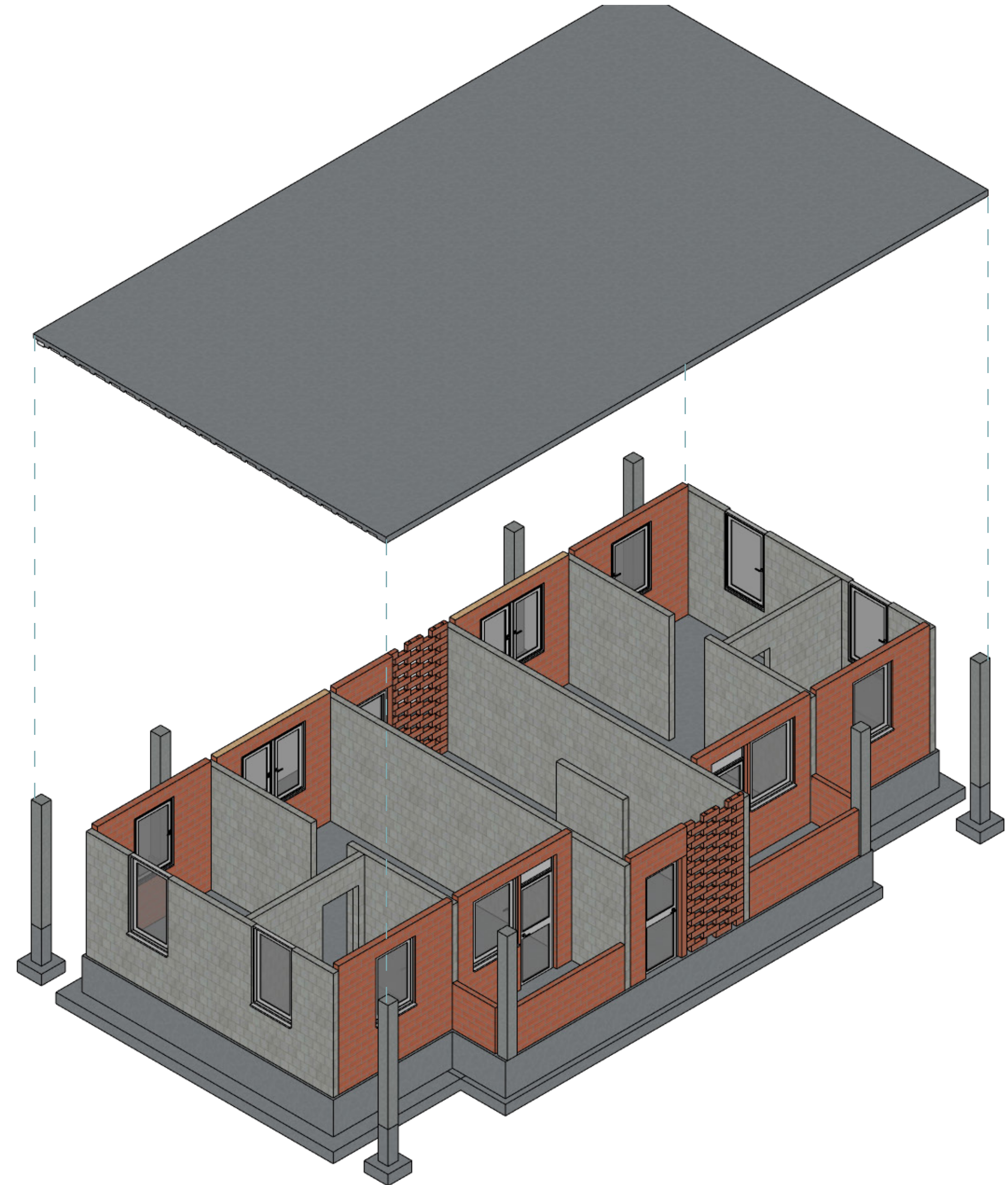
# CONSTRUCTION PROCESS

stacking CEB for non-loadbearing walls



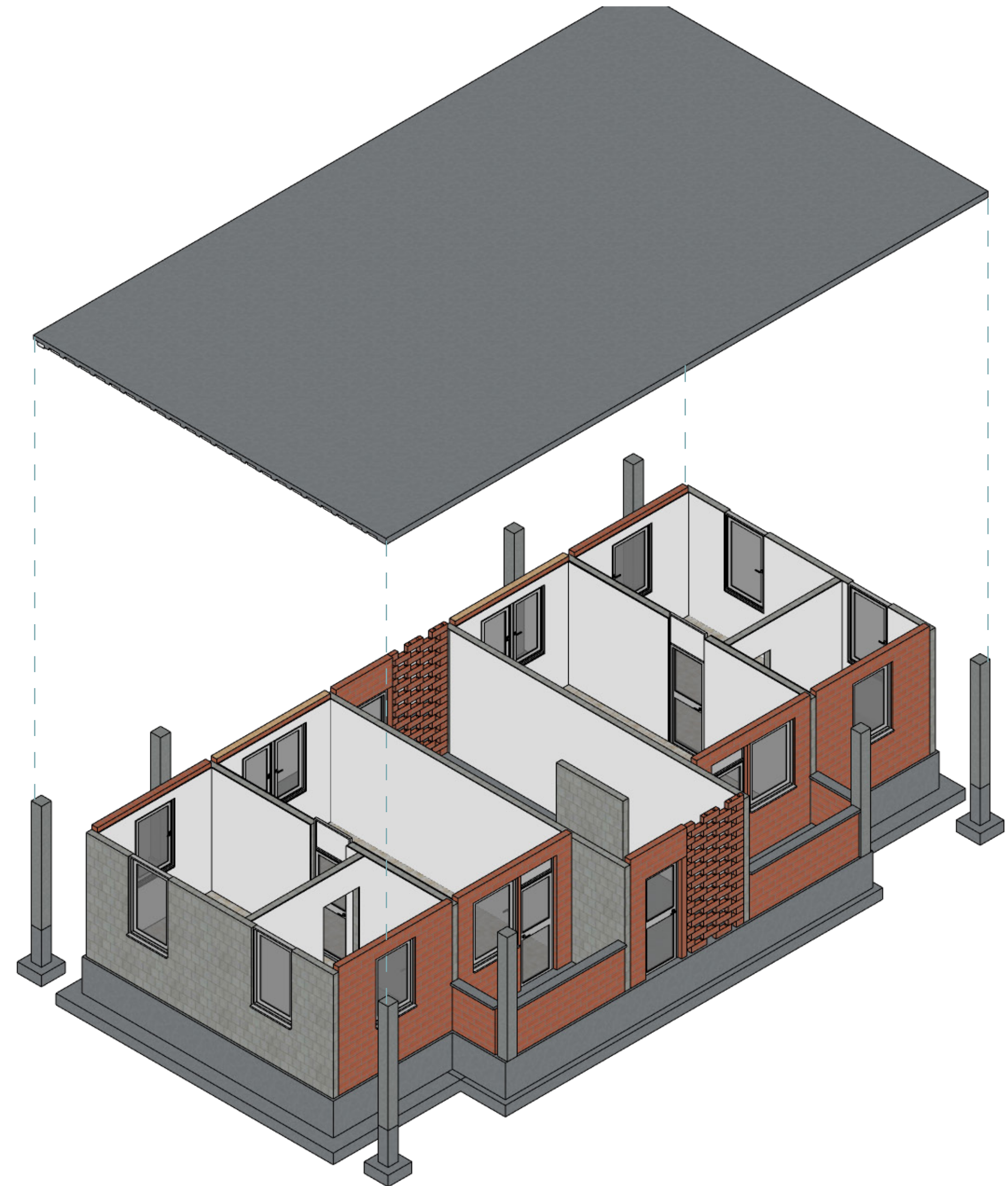
# CONSTRUCTION PROCESS

filling up openings: windows, doors, and Cobogó



# CONSTRUCTION PROCESS

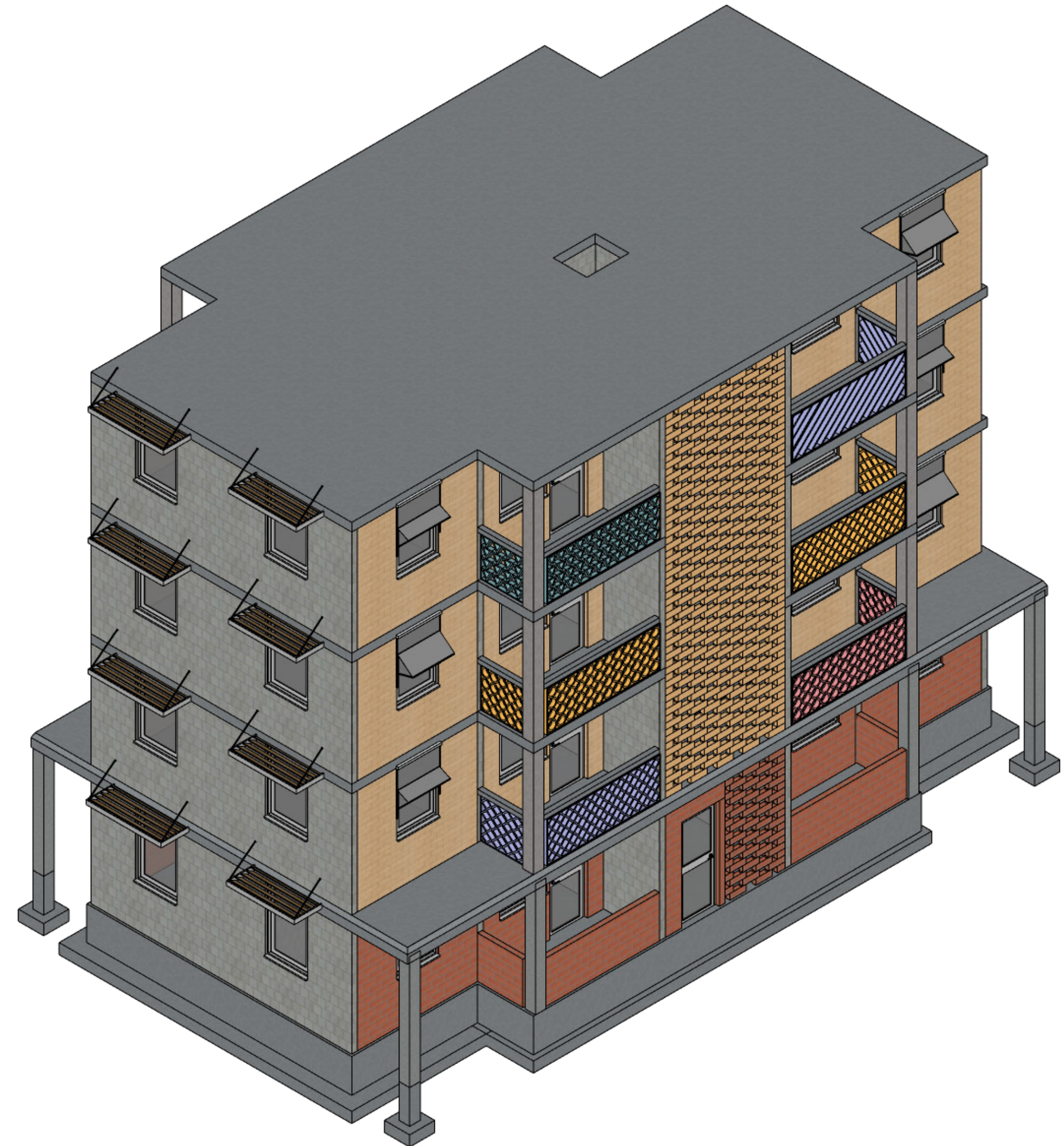
applying finishes



# CONSTRUCTION PROCESS

**repeat for the floors above**

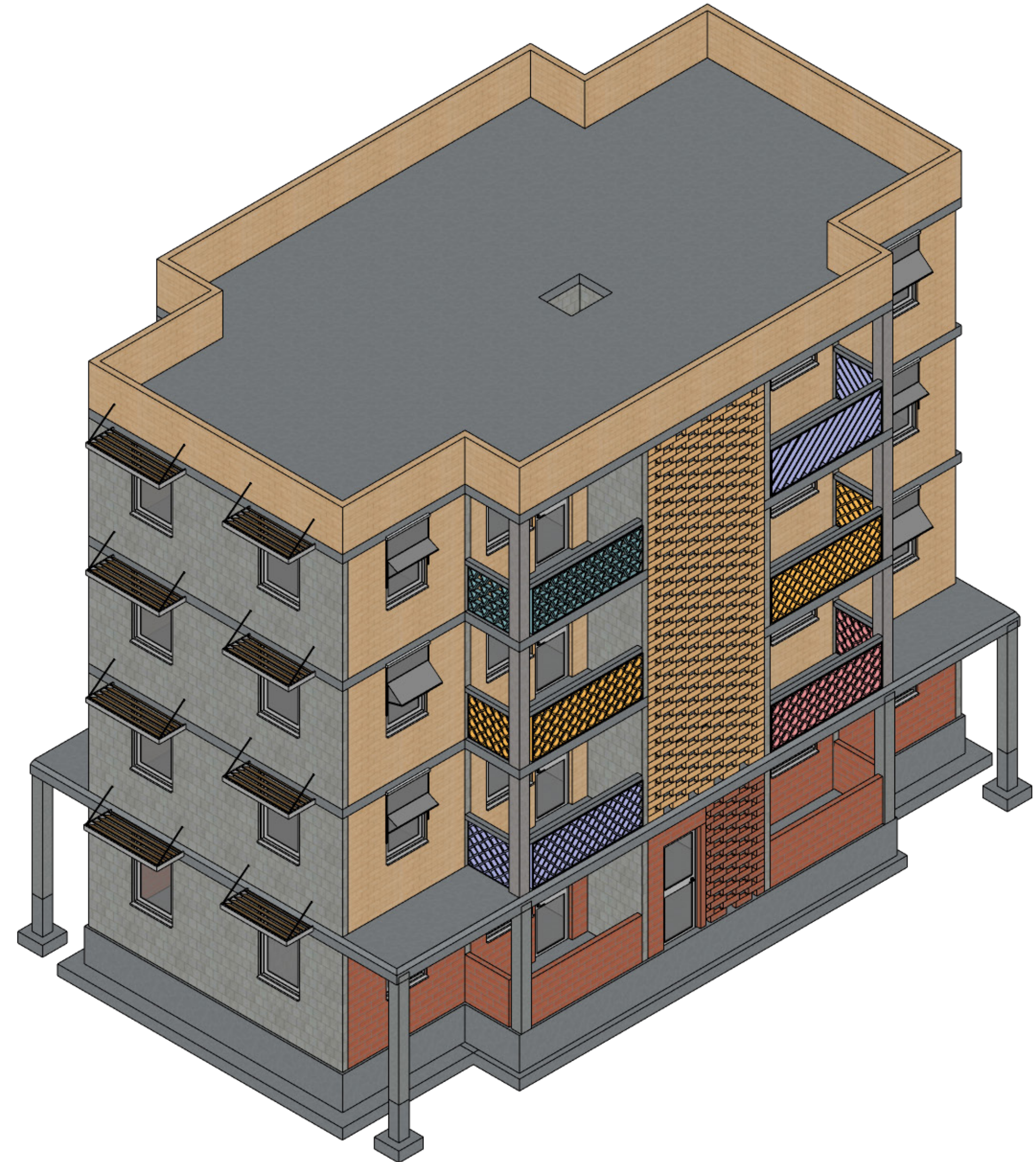
- construction of the next level can start as soon as the structural floor of the level below has been placed





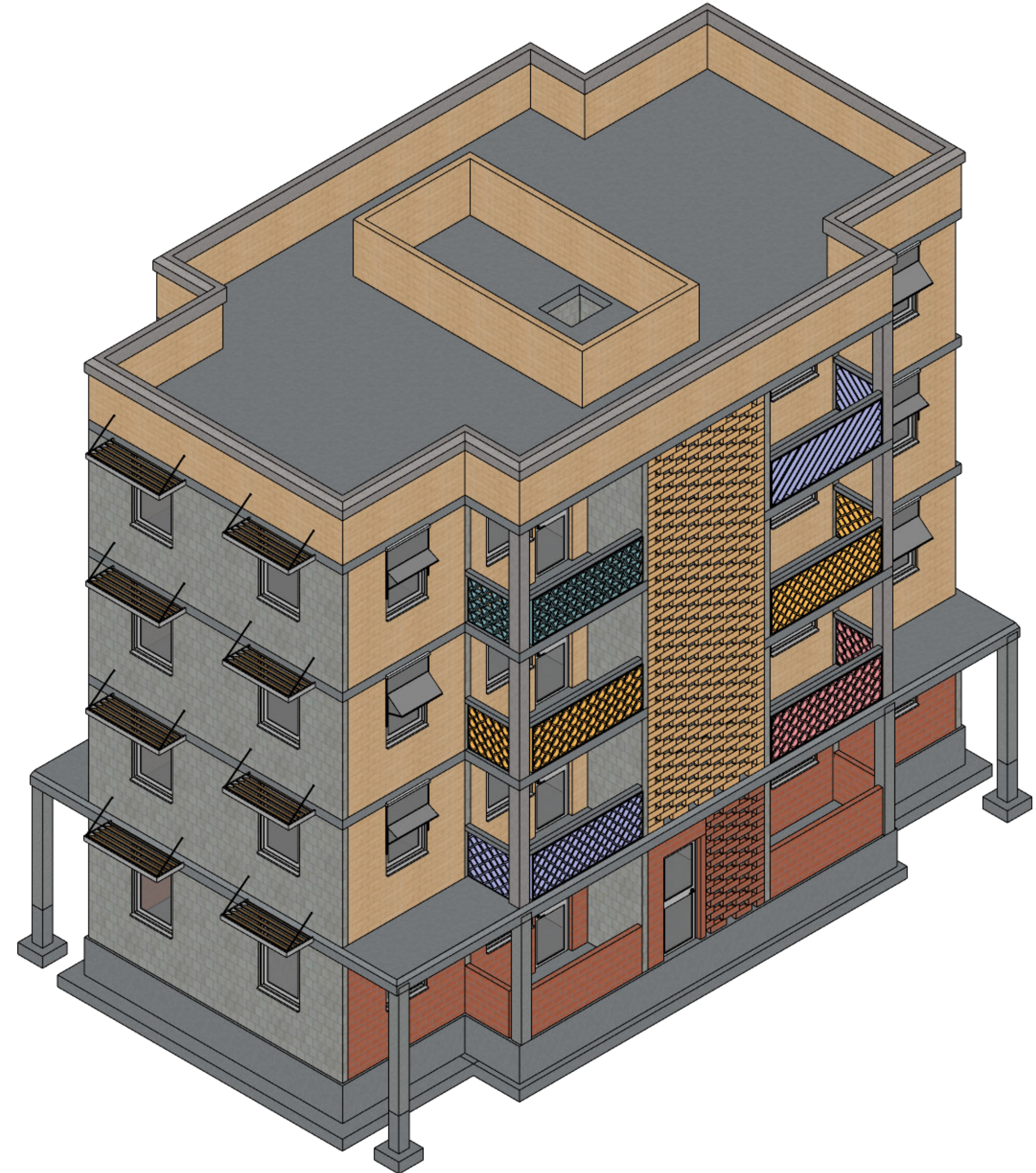
# CONSTRUCTION PROCESS

stacking CEB for parapet



# CONSTRUCTION PROCESS

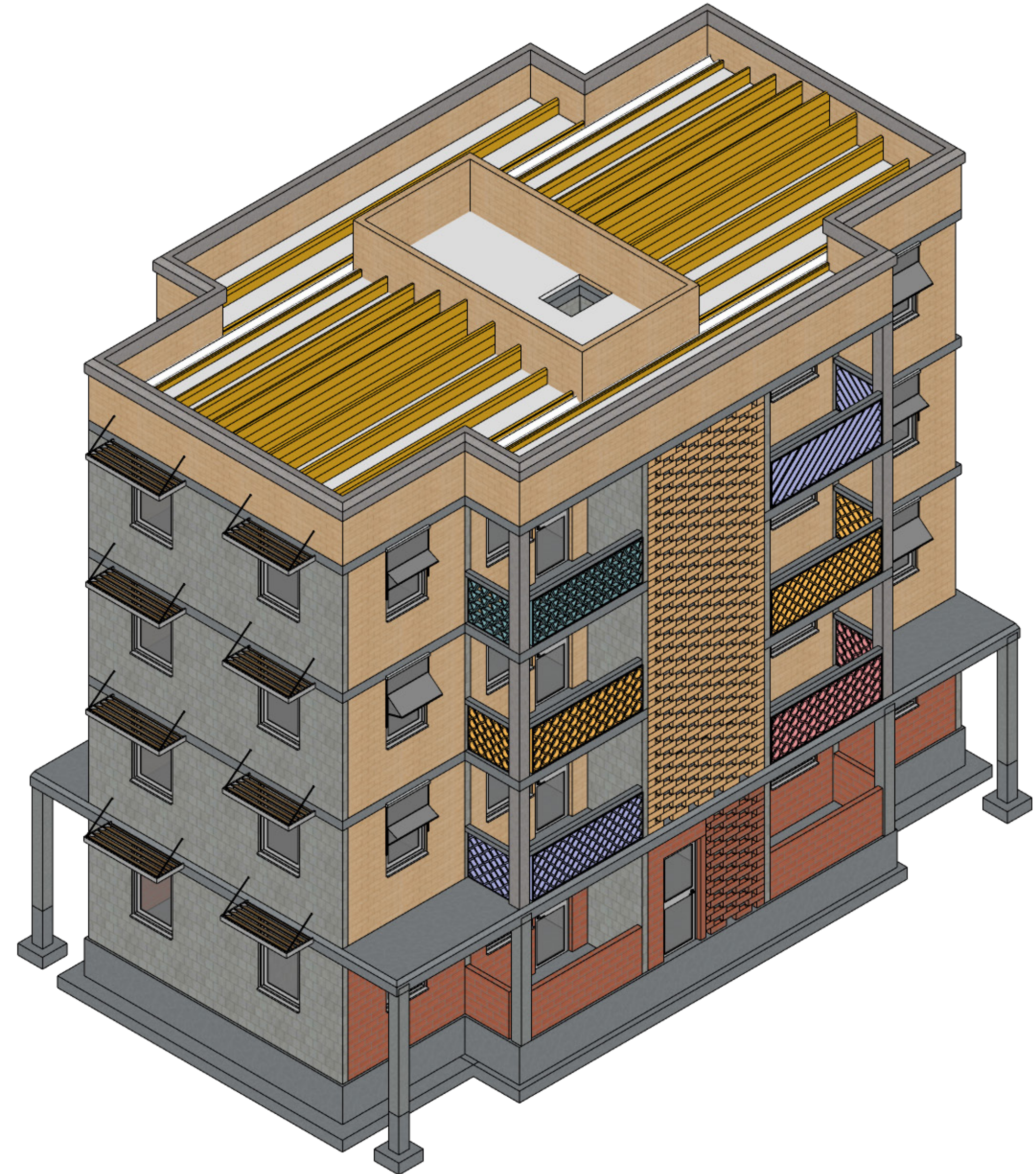
walls around technical area roof



# CONSTRUCTION PROCESS

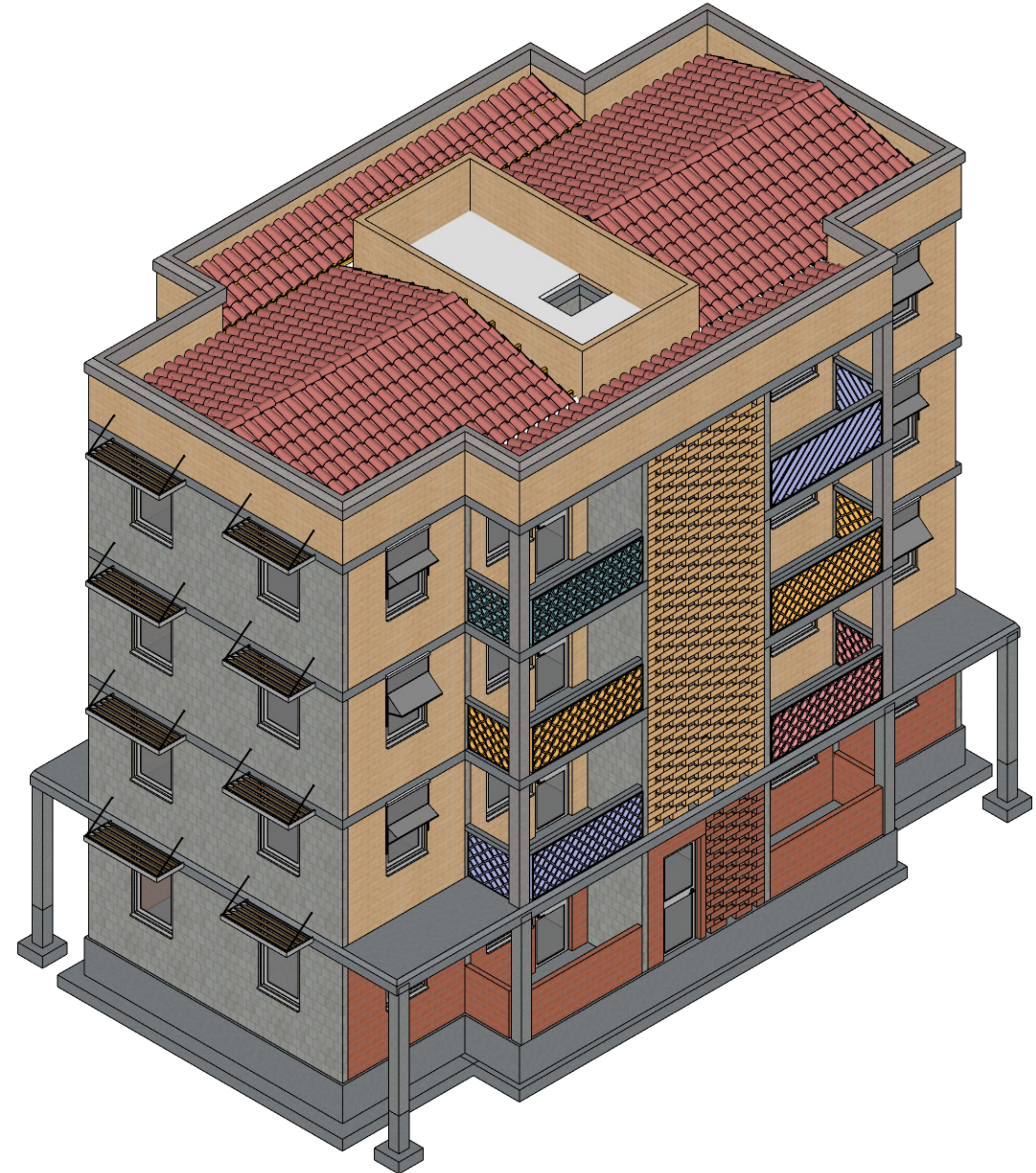
## purlins with EPS in between

- timber beams or CEB support the purlins



# CONSTRUCTION PROCESS

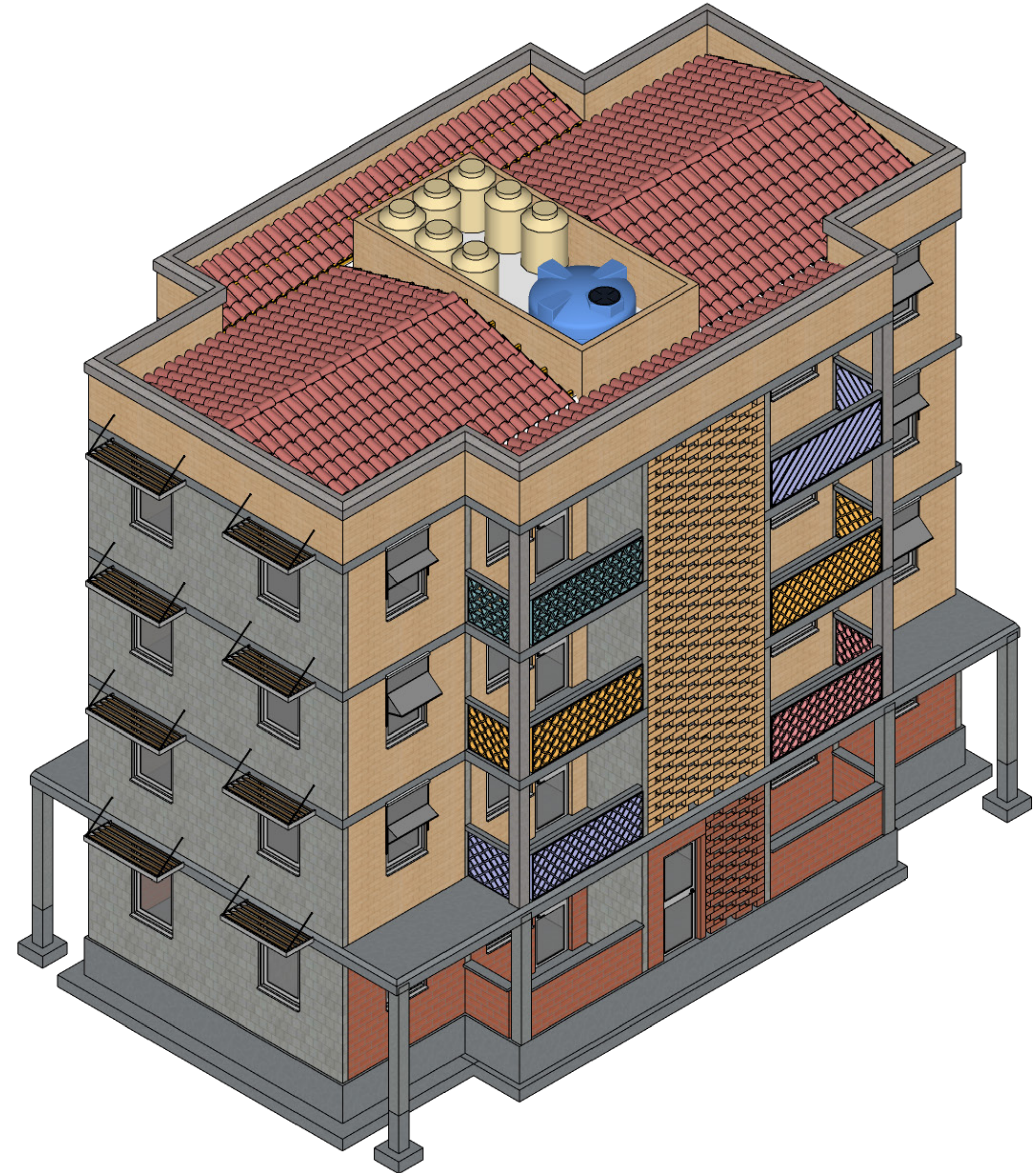
## rafters and roofing tiles



# CONSTRUCTION PROCESS

## place water cisterns on roof

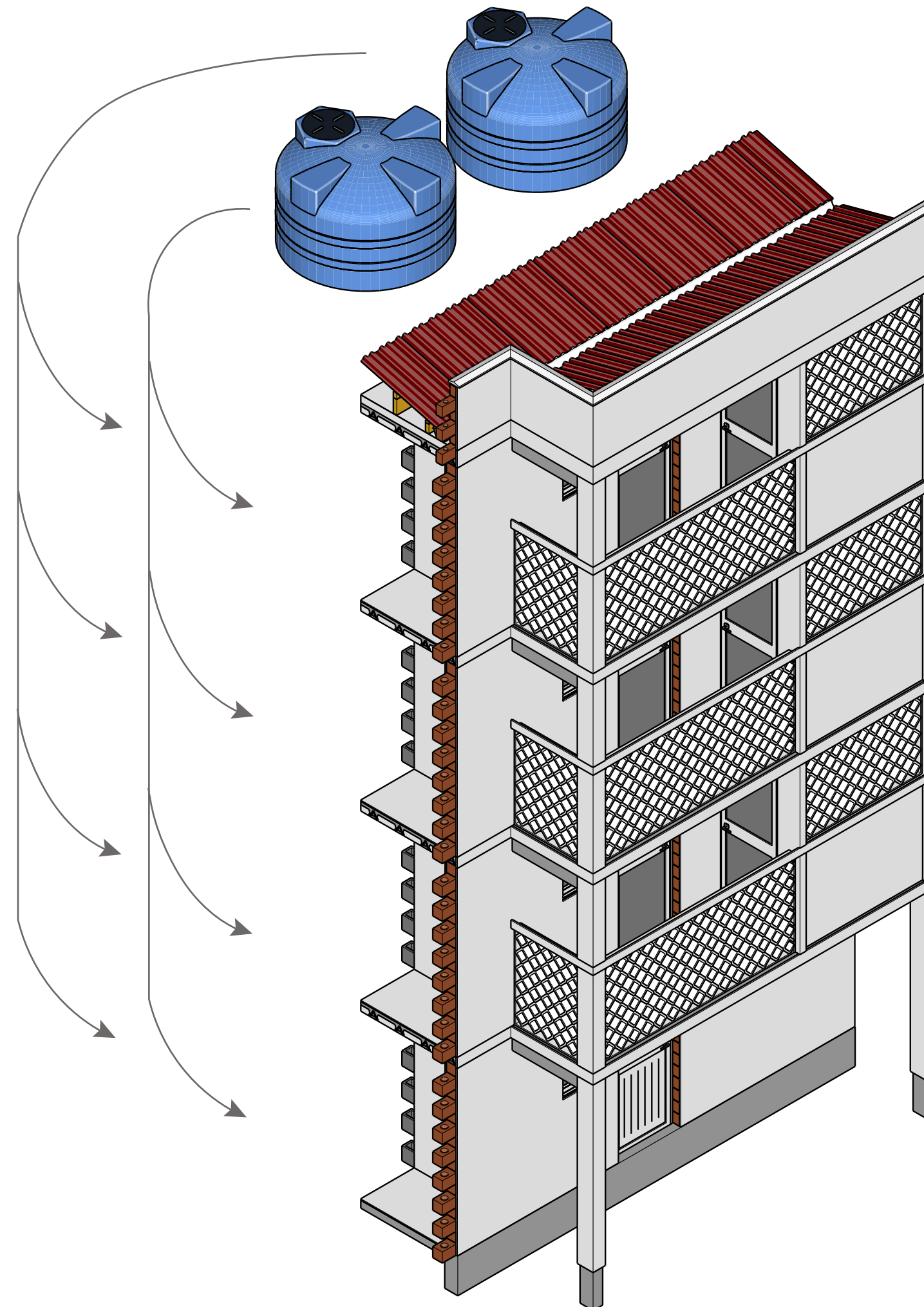
- a hatch in the shared staircase gives access to the technical area of the roof



# WATER MANAGEMENT

## harvesting, flood prevention, and secure supply

- rainwater harvesting
  - collected per shared staircase
  - irrigation crops, flushing toilets, washing
- flood prevention
  - slow down rainwater streaming downhill using ditches
- water security
  - cistern per dwelling for outage





# MANAGERIAL STRATEGY

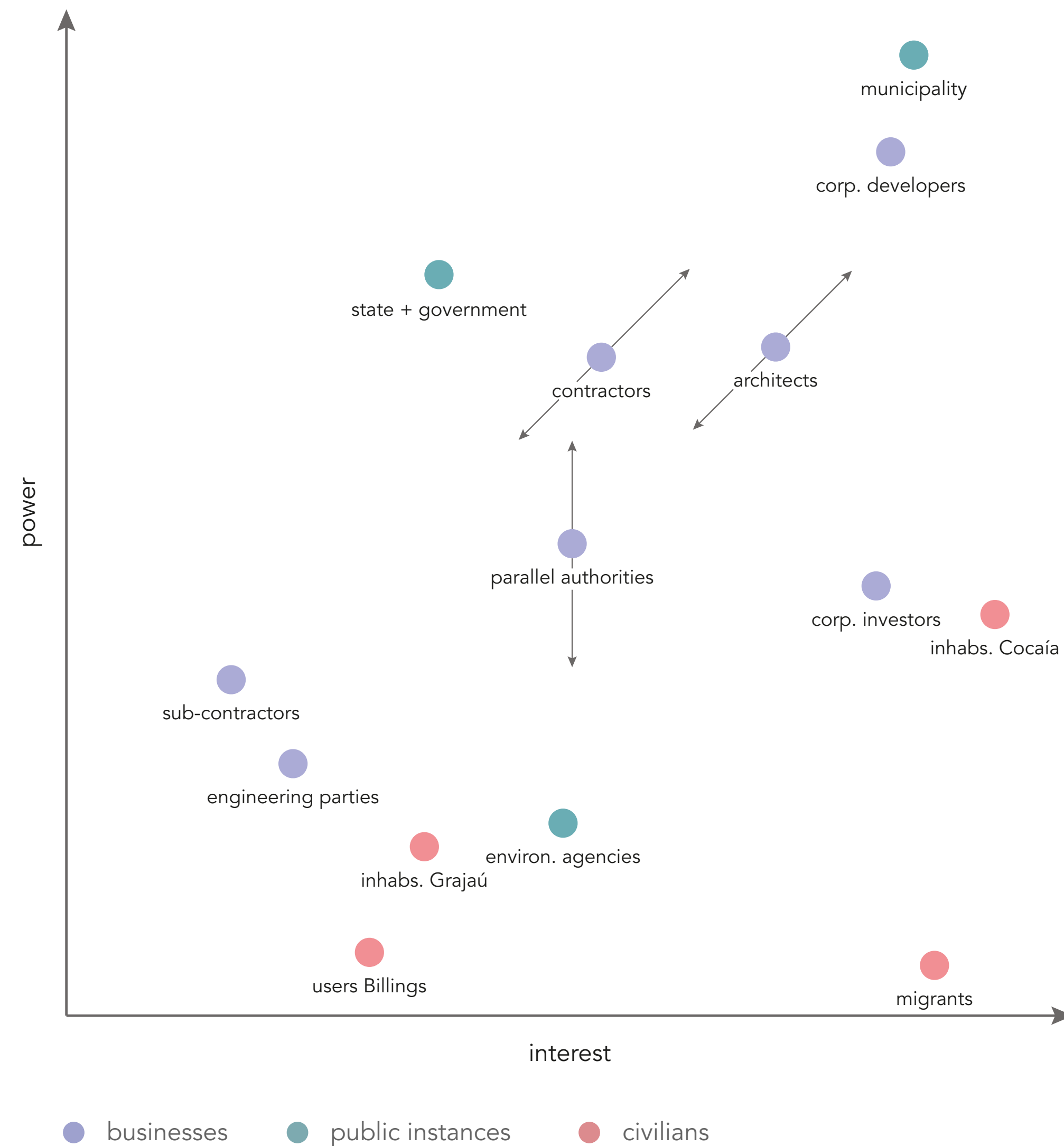
goal: draw up a planning for time, money, and materials

# STAKEHOLDERS

## power-interest matrix

key stakeholders and expectations:

- inhabitants Cocaía, represented by management council
  - gain dwelling ownership
  - receive access to urban facilities and opportunities
  - maintain (and expand) social network
- municipality (developer)
  - reduce housing shortage
  - improve the life of inhabitants of São Paulo
- corporate developer
  - make profit
  - fulfill corporate social responsibility

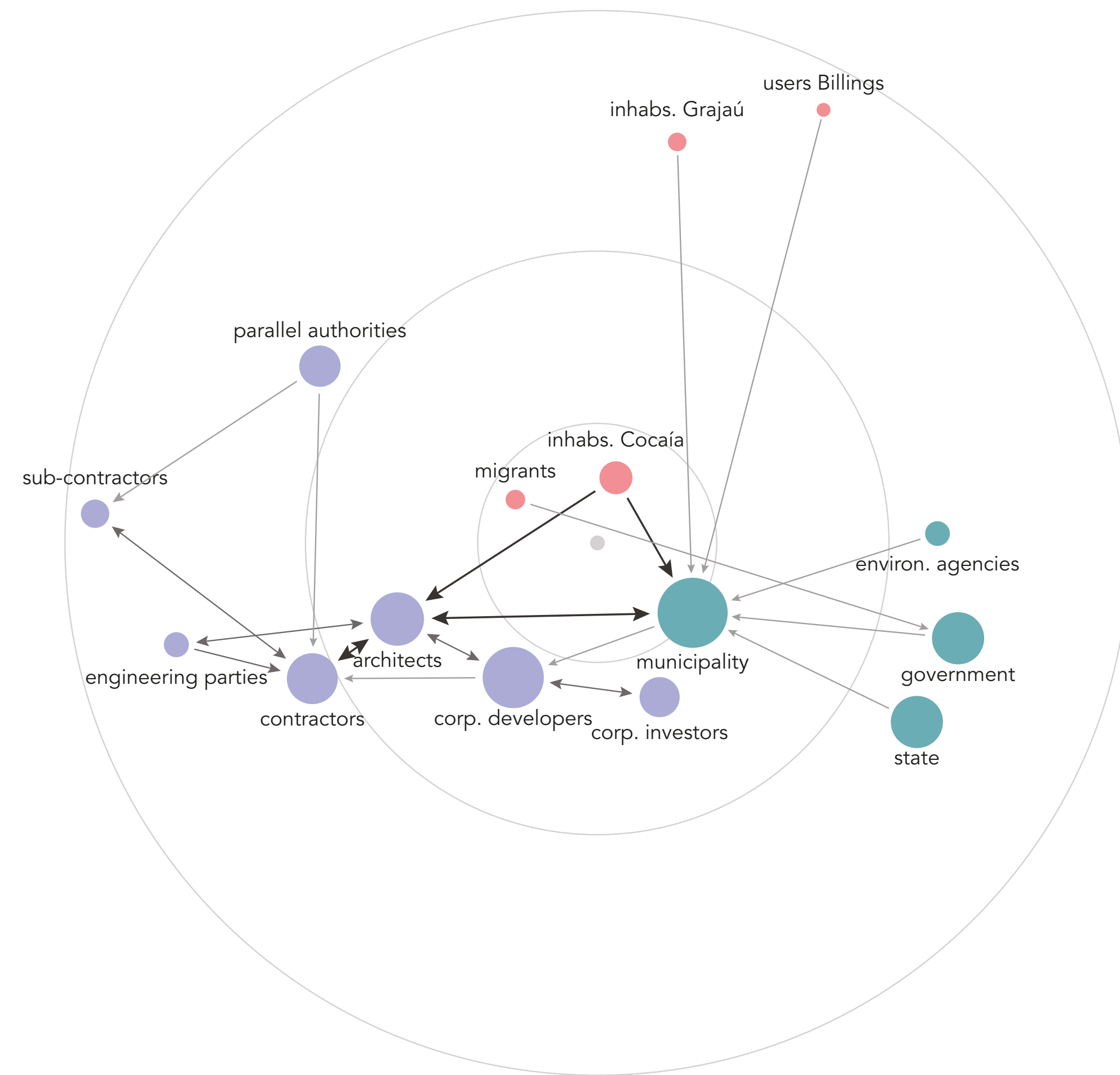




# STAKEHOLDERS

## relations diagram

- the HIS 1 dwellings of the project are funded and developed by the municipality (SEHAB)
  - economies of scale
  - control (price, tenant, maintenance)
- development HMP dwellings put up for sale
  - profit used for cross-subsidization HIS 1 dwellings
  - rules put in place for user groups, dimensions, and design characteristics



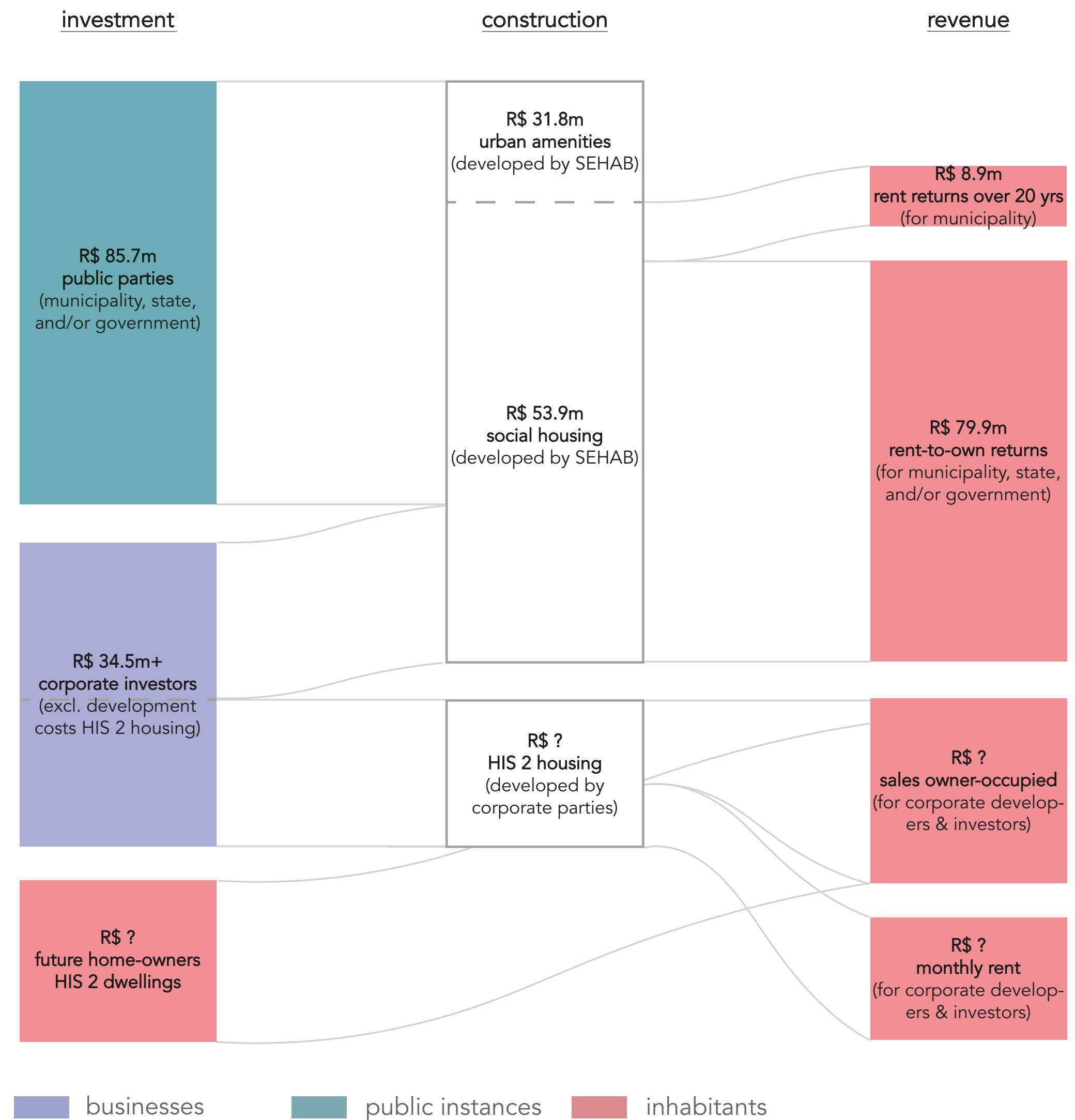
● businesses    ● public instances    ● civilians

*size indicates power, distance to center indicates interest*

# FINANCES

## cash flow diagram

- Cities Alliance UN can be used for technical support
- current average construction cost for social housing: R\$ 1298/m<sup>2</sup>
- social housing rent-to-own, ~20 years of payments
- part rental/emergency housing



# PHASING

## overview

- first complete building blocks
- ease logistics and minimize nuisance



# PHASING

## distribution routes

- first from the west, then south
- green axis as supply route
- two storage points



# PHASING

**starting situation**

- favelas marked in light grey



# PHASING

## phase 0 - prepare construction site

- entrances created



# PHASING

## phase 1 - complete building block



# PHASING

## phase 2 - construct opposite side street

- eviction most precarious settlements





# PHASING

phase 3 - complete urban infrastructure



# PHASING

## phase 4 - sports facilities installed last

- dwellers evicted to create new roads



# PHASING

## phase 5 - construction continues in two streets

- storage building materials has switched from location



# PHASING

## phase 6

- community center is built



# PHASING

phase 7 - eviction completed



# PHASING

phase 8-10



# PHASING

future development





# SYNTHESIS

goal: answer the research question and reflect on the work done



# SYNTHESIS

research question:

how can architectural design positively influence safety in the development of social housing in the periphery of São Paulo, taking into account socioeconomic segregation, local building practices, and social equity?

- catalog of design interventions influencing safety
- overview best-practices social housing São Paulo
- descriptive summary context São Paulo
- elaboration Parque Cocaía
  - urban strategy
  - four types
  - building technical and managerial strategy



# DEVELOPMENT PARQUE COCAÍA

thank you for your attention!

