

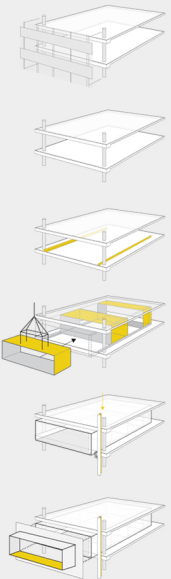


# converting office space

using modular prefab architecture to convert vacant office buildings

■ MSc graduation presentation | F.P. Koornneef

date + Friday 13th of April  
time + 15.45  
location + Lecture hall B  
Faculty of Architecture - Julianalaan 134, Delft



# overview

- + introduction
- + research findings
- + concept development
- + design project
- + summary

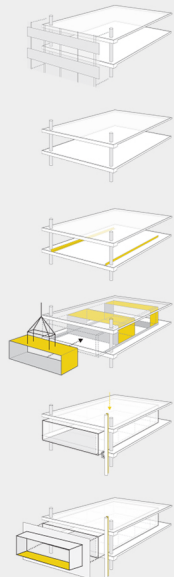


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48.195.000 m<sup>2</sup> total office space



6.795.000 m<sup>2</sup> vacant  
48.195.000 m<sup>2</sup> total office space



no more future demand for 1 out of 10 buildings

**6.795.000 m<sup>2</sup>** vacant

**48.195.000 m<sup>2</sup>** total office space



negative effects on direct environment



property depreciation



waste of usable space



further exploitation?





further exploitation?  
renovation?



further exploitation?

renovation?

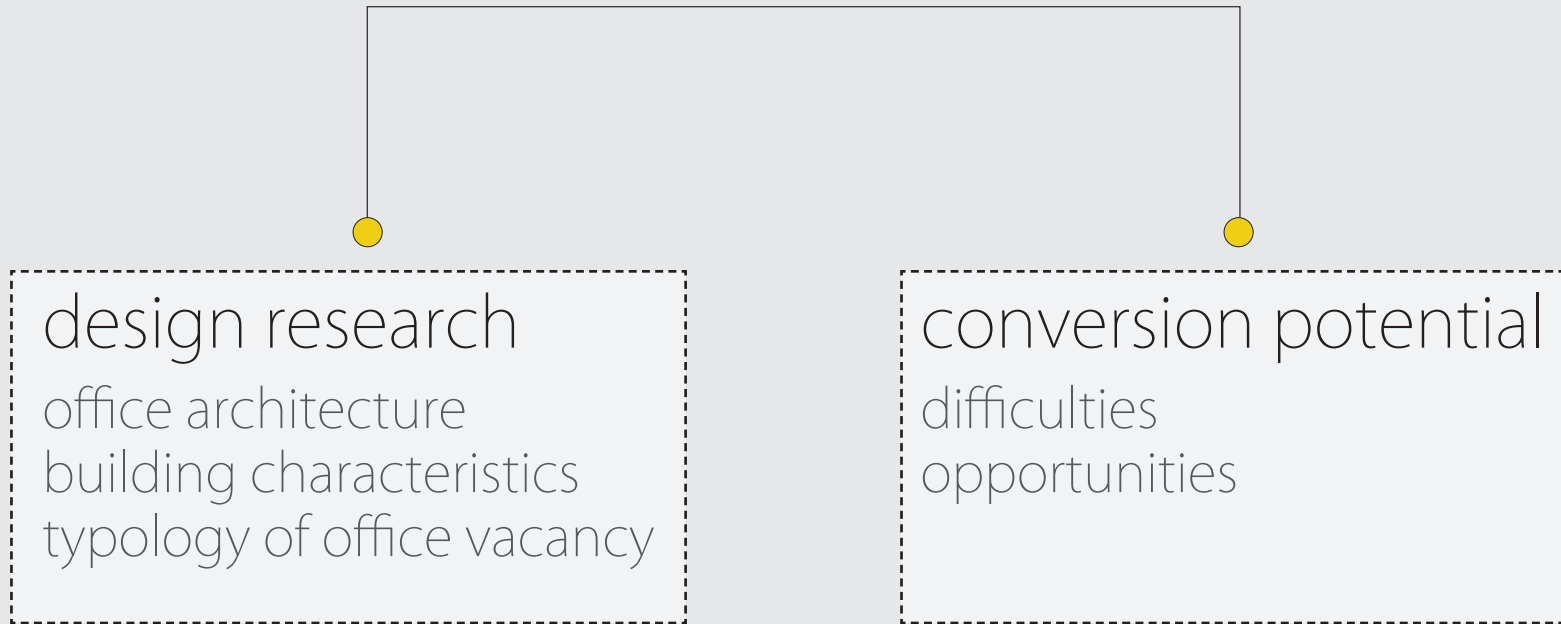
demolishment?



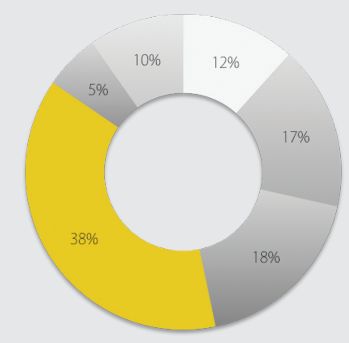
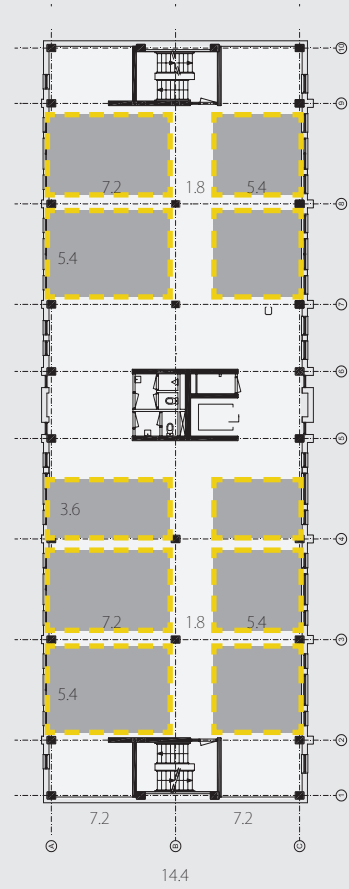
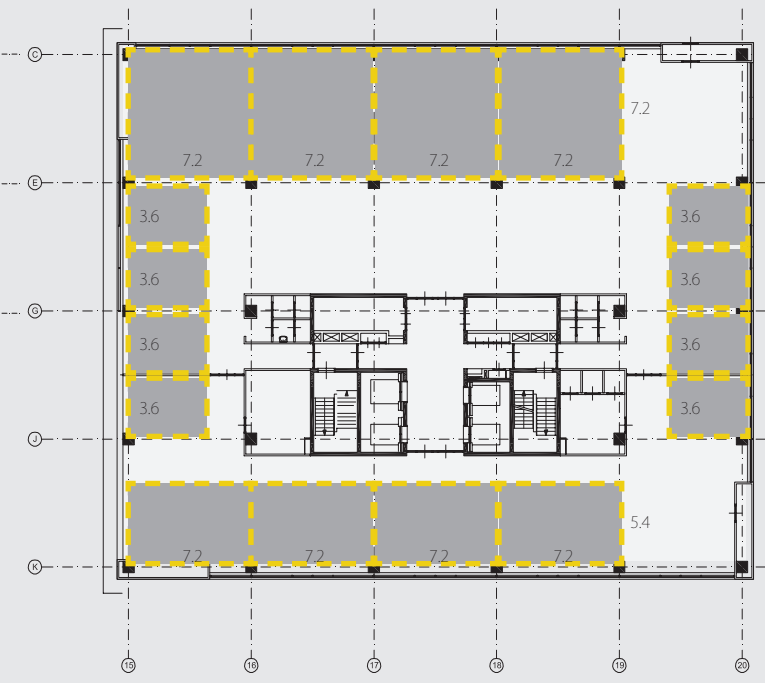
conversion?

# ■ research findings

by means of design, what  
can the architect contribute  
to make conversion projects  
more feasible on a large scale?

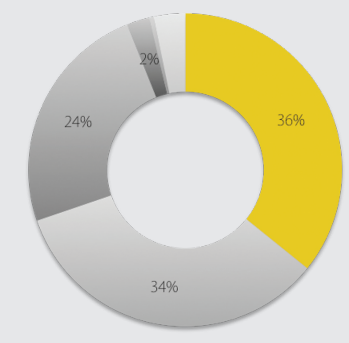


# design of research



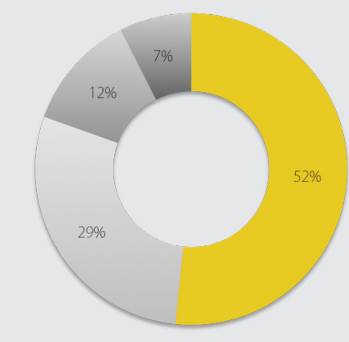
Grid columns (parallel to façade)

- < 5.4 m
- = 5.4 m
- = 5.4 - 7.2 m
- = 7.2 m
- = > 7.2 m
- unknown



Construction type

- concrete slab slabs
- precast concrete panel floor slab
- hollow core slab
- beam supported
- cassette slab
- unknown



Façade type

- concrete elements (load-bearing)
- glazing (curtain-wall)
- masonry (load-bearing)
- closed elements (curtain-wall)

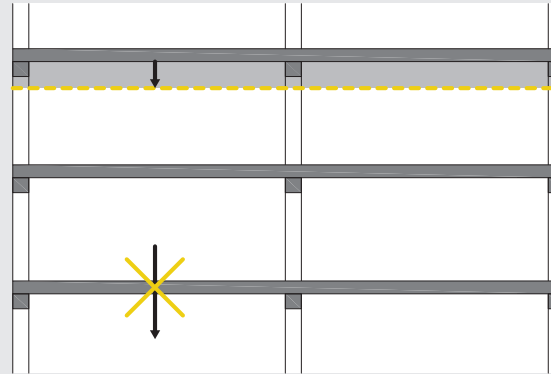
# design research

## office façades



- > façade physically outdated
- > unattractive for converted function
- > closed curtain-wall system

## construction as obstruction



- > load-bearing beams: lower ceilings
- > steel reinforcement restricts floor openings
- > not sufficient sound insulation

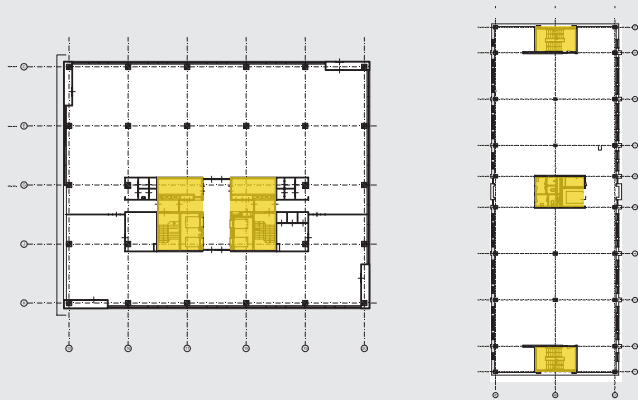
## conversion costs



- > façade and inner walls
- > not sufficient knowledge
- > high risks / unexpected costs

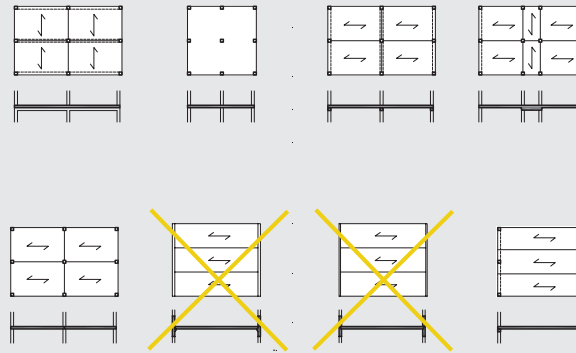
conversion potential + difficulties

## standard office dimensions



- > rectangular shaped building
- > grid size: 5.4 or 7.2 meters (basis 1.8 m)

## basic building structure

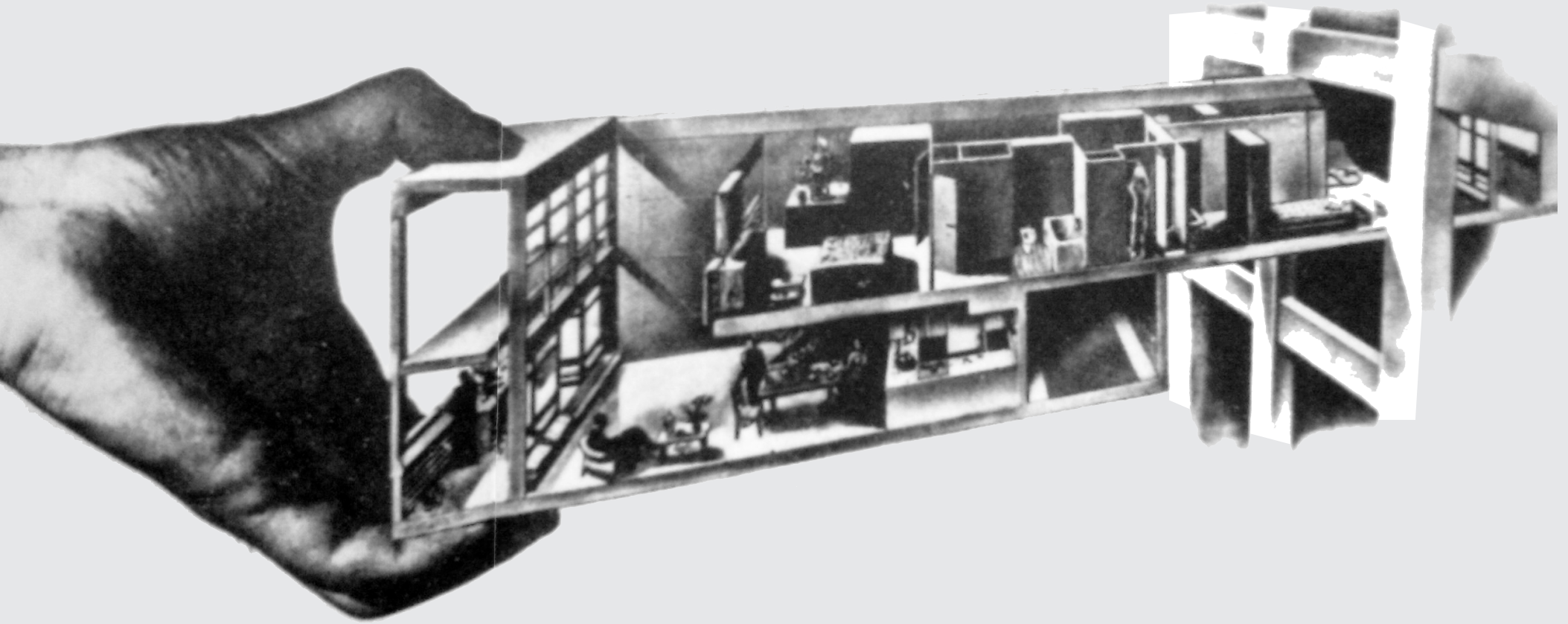


- > over-dimensioned (300-500 kg/m<sup>2</sup>)
- > open floor plan + vertical transport

conversion potential + opportunities

the architect could contribute if he would use the standardization in office design to devise smart systems, realizing the difficulties, but working with the opportunities the office building offers.

## conclusion

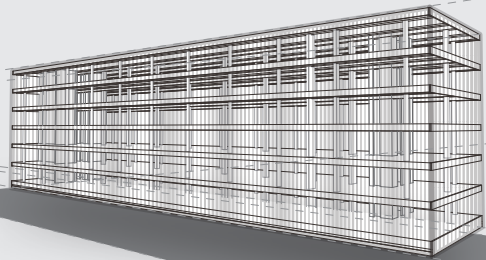


office structure as a support for prefab

recommendation

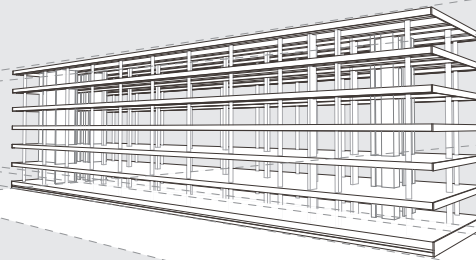
# ■ concept development

vacant office building



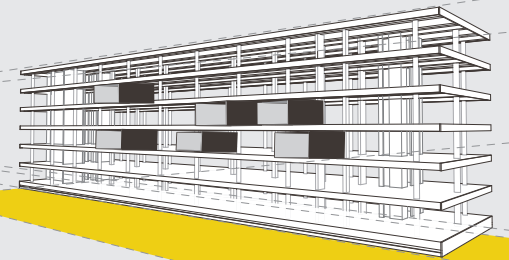
1

prepare as support



2

deploy prefab units



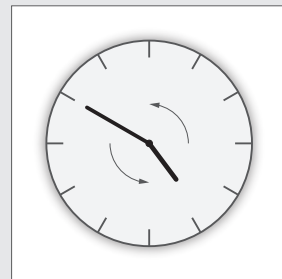
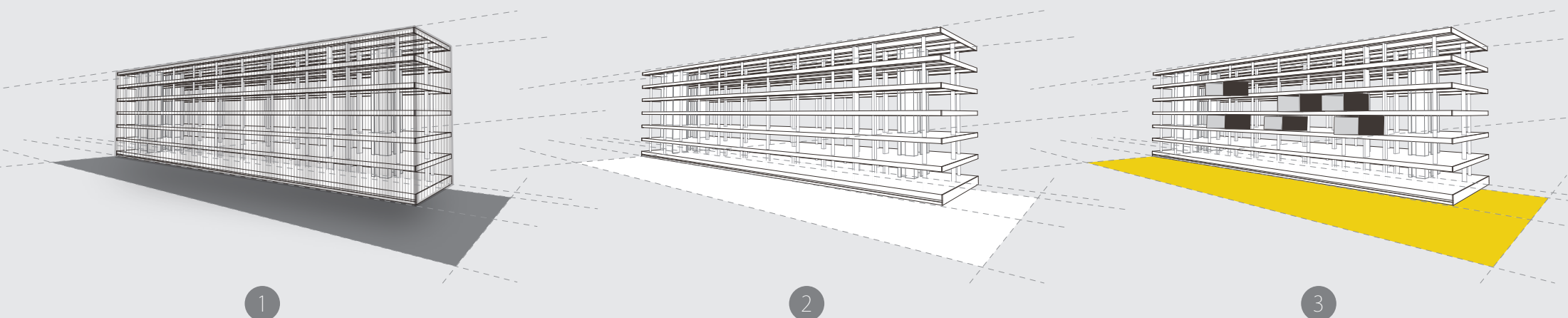
3

# conversion concept

vacant office building

prepare as support

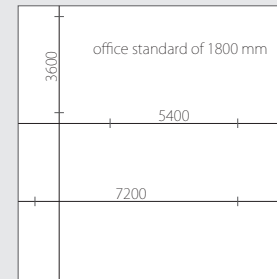
deploy prefab units



time efficient

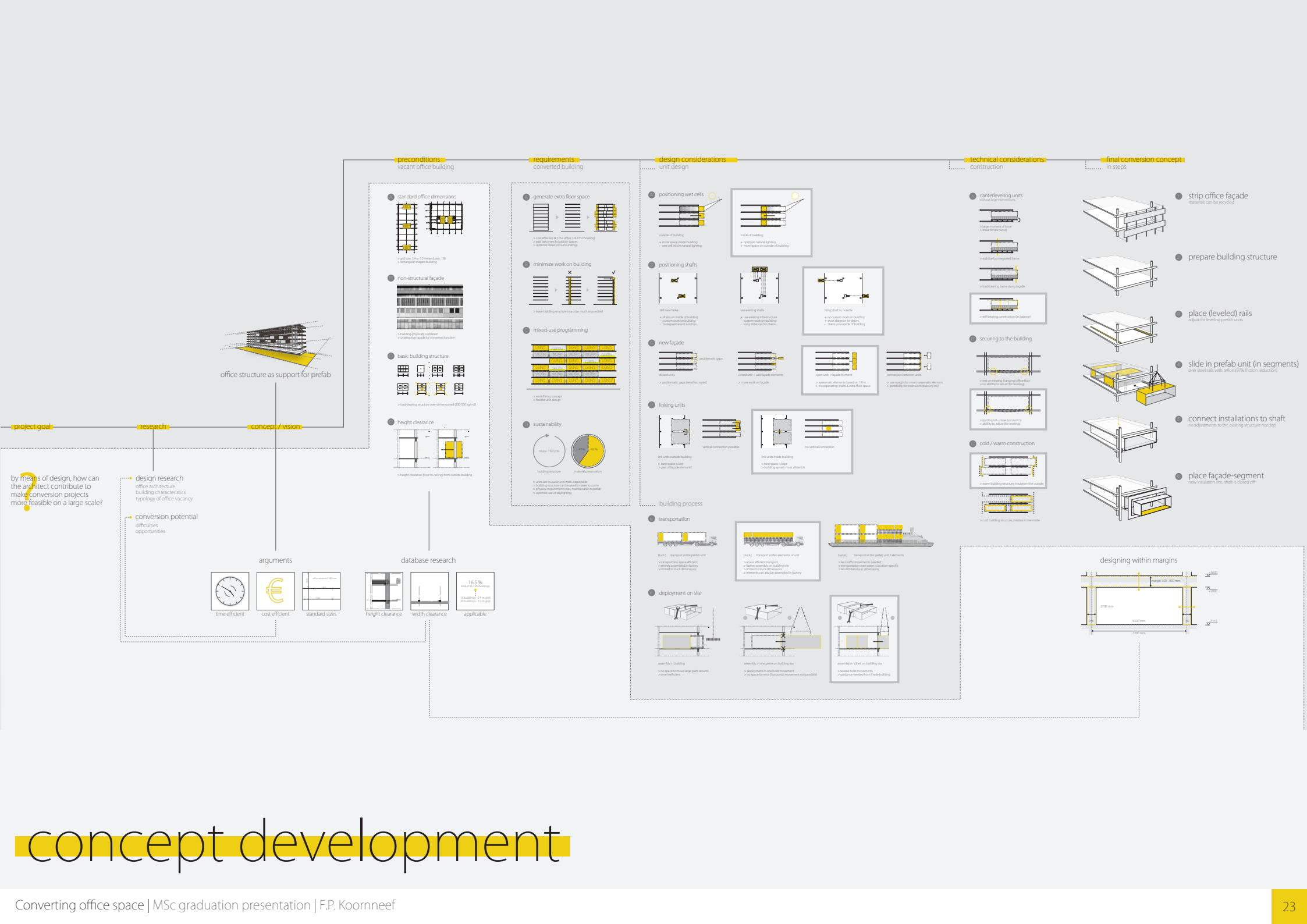


cost efficient



standard sizes

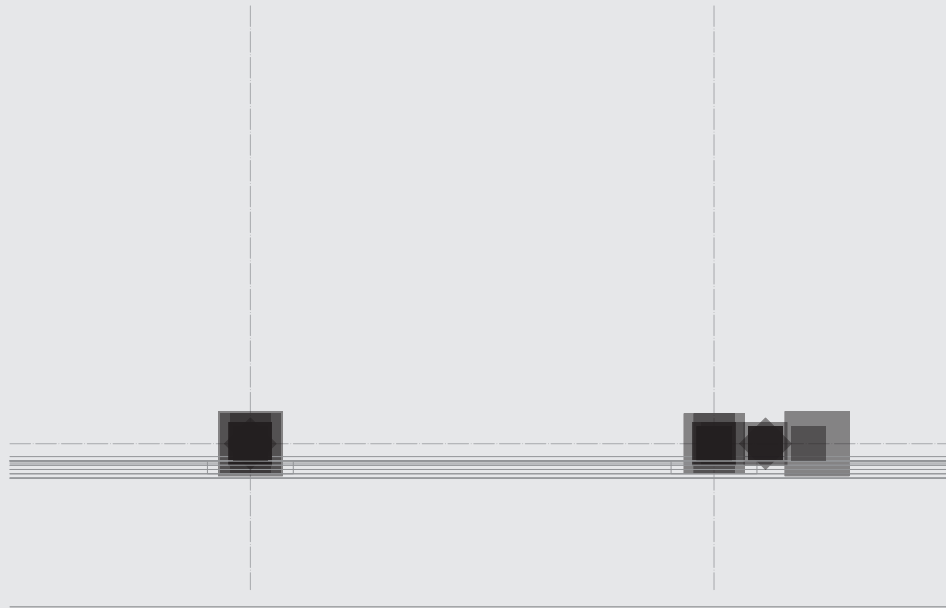
# conversion concept



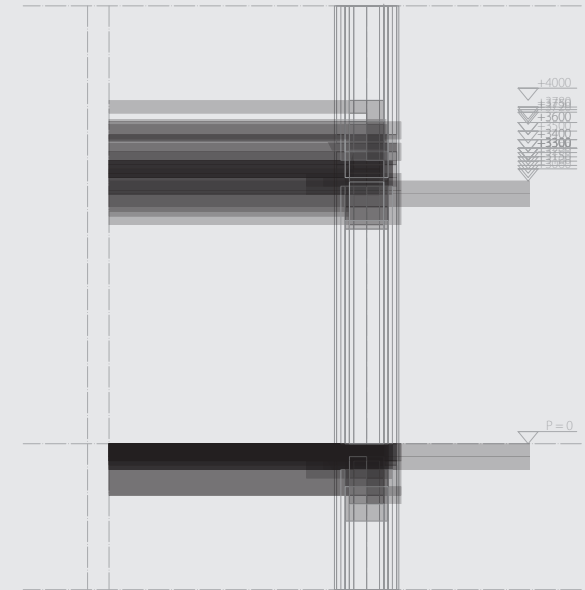


# additional research

grid - 5.4 meter

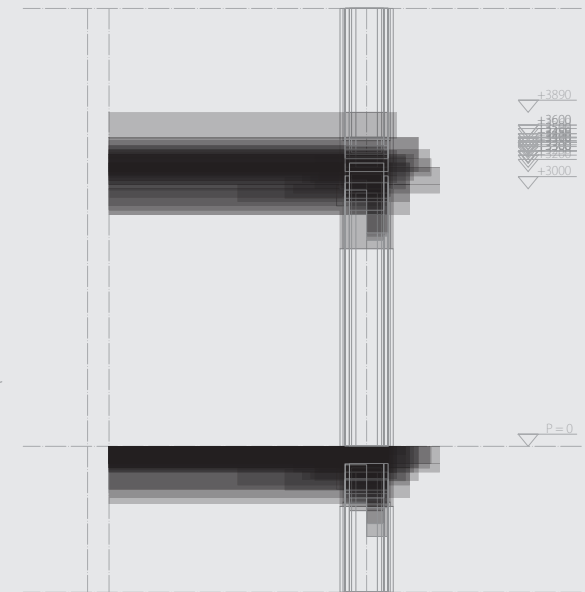
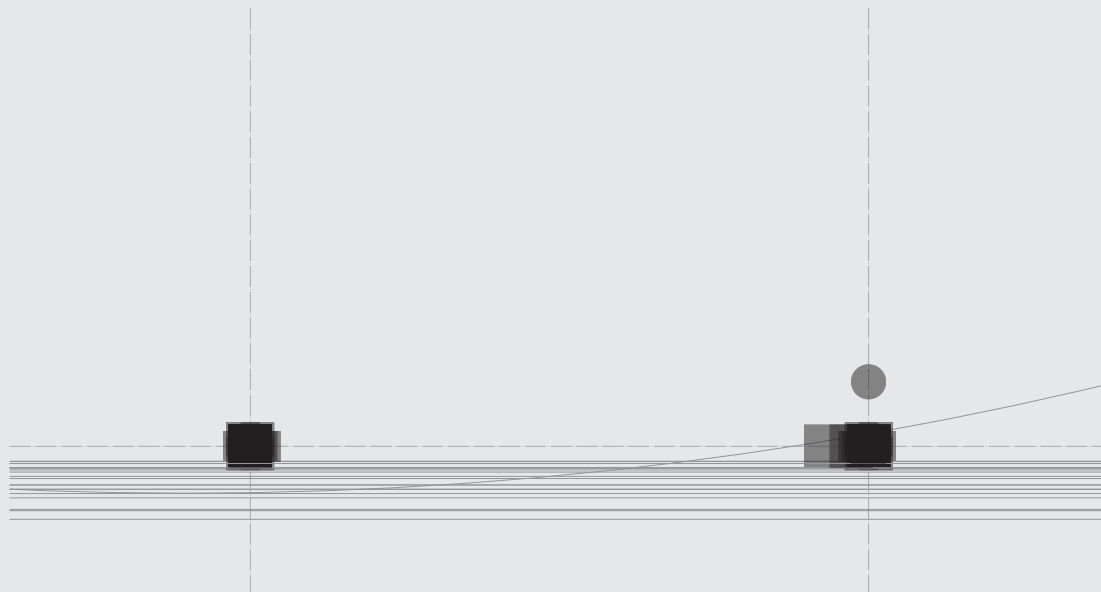


plan

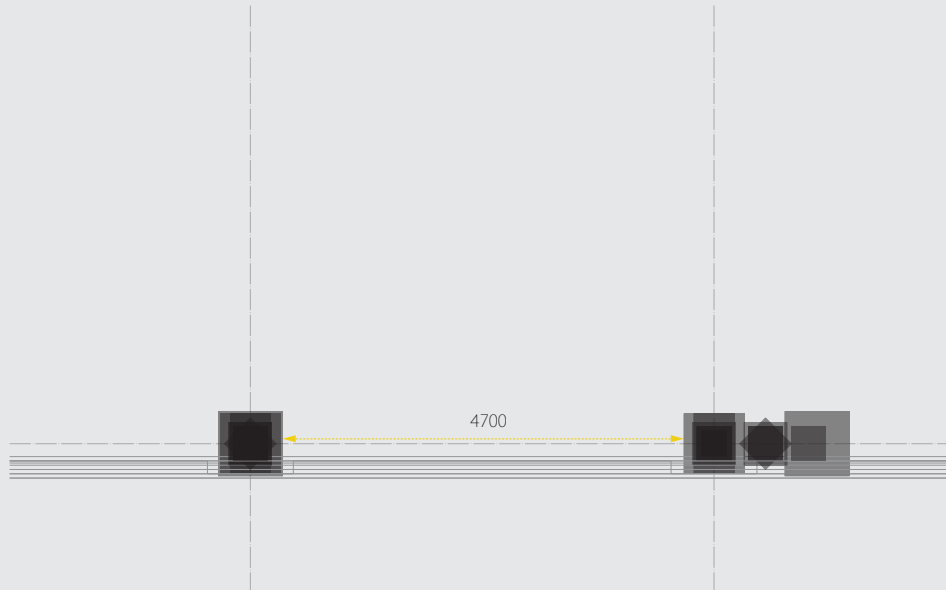


cross section

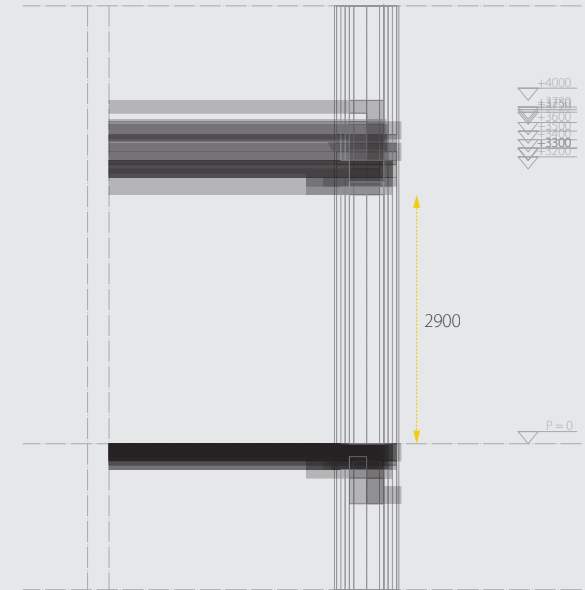
grid - 7.2 meter



grid - 5.4 meter

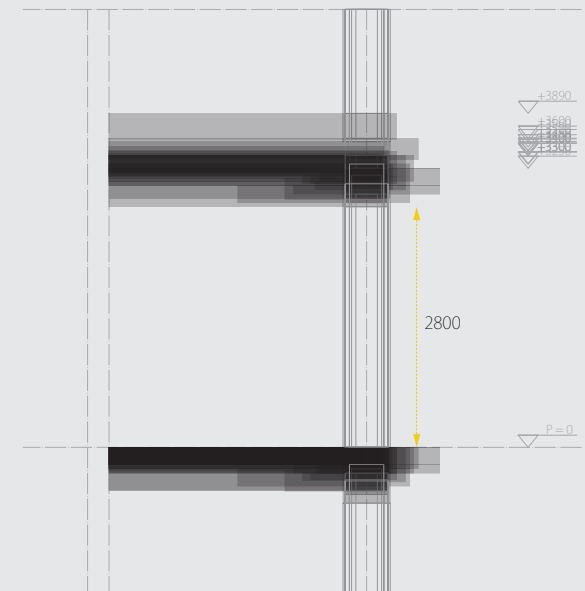
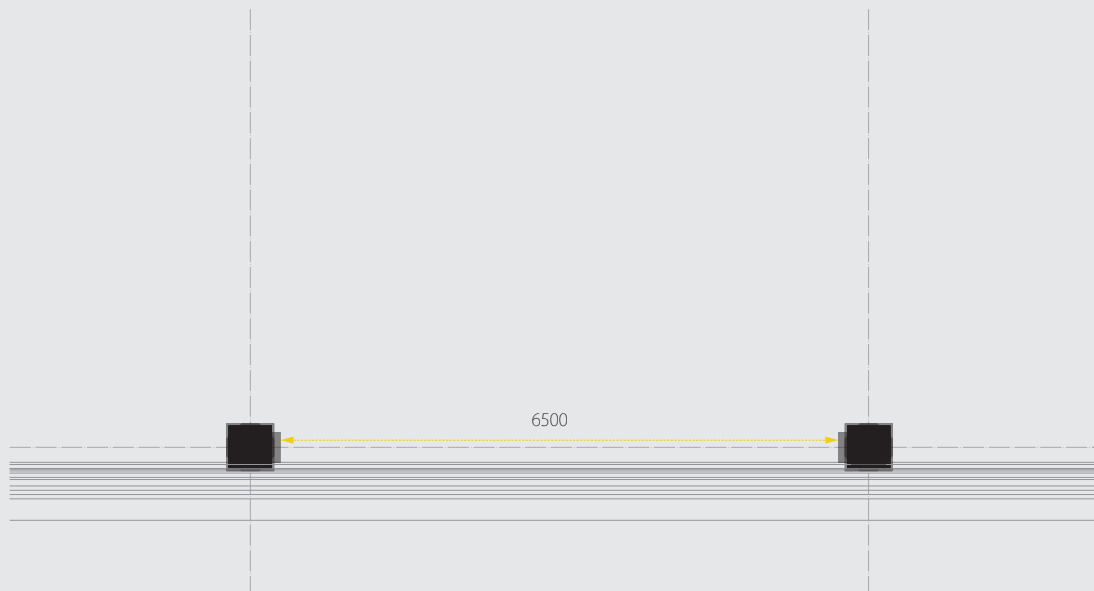


plan



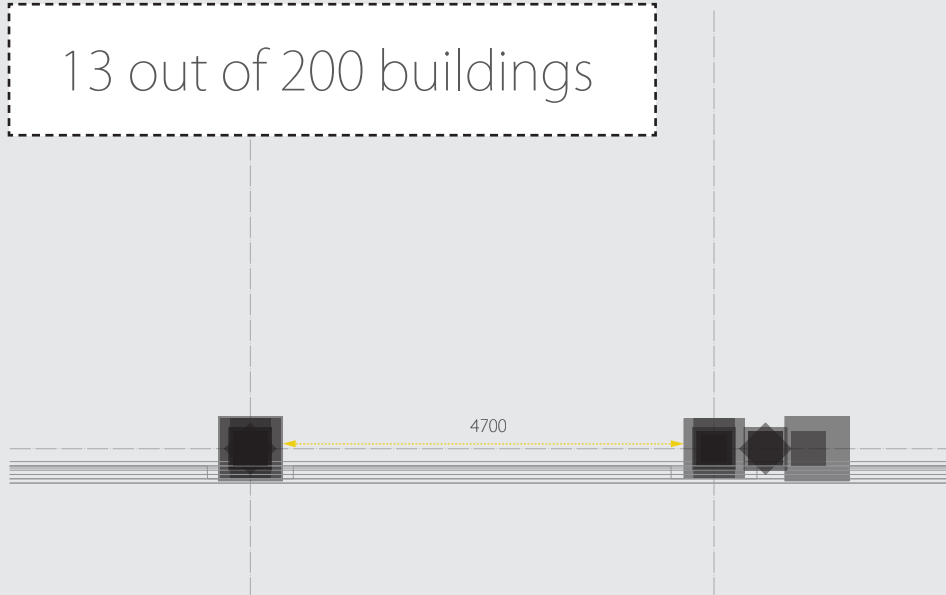
cross section

grid - 7.2 meter

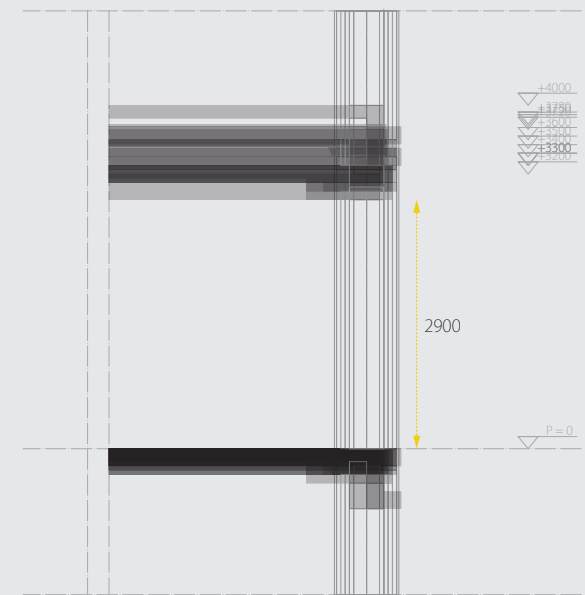


13 out of 200 buildings

grid - 5.4 meter



plan

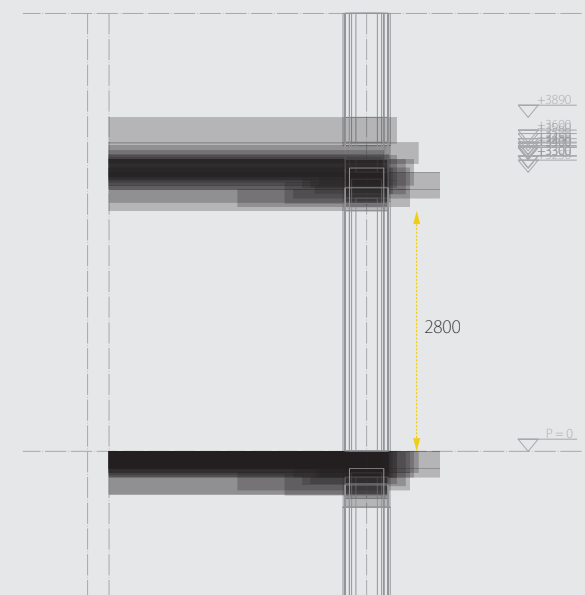
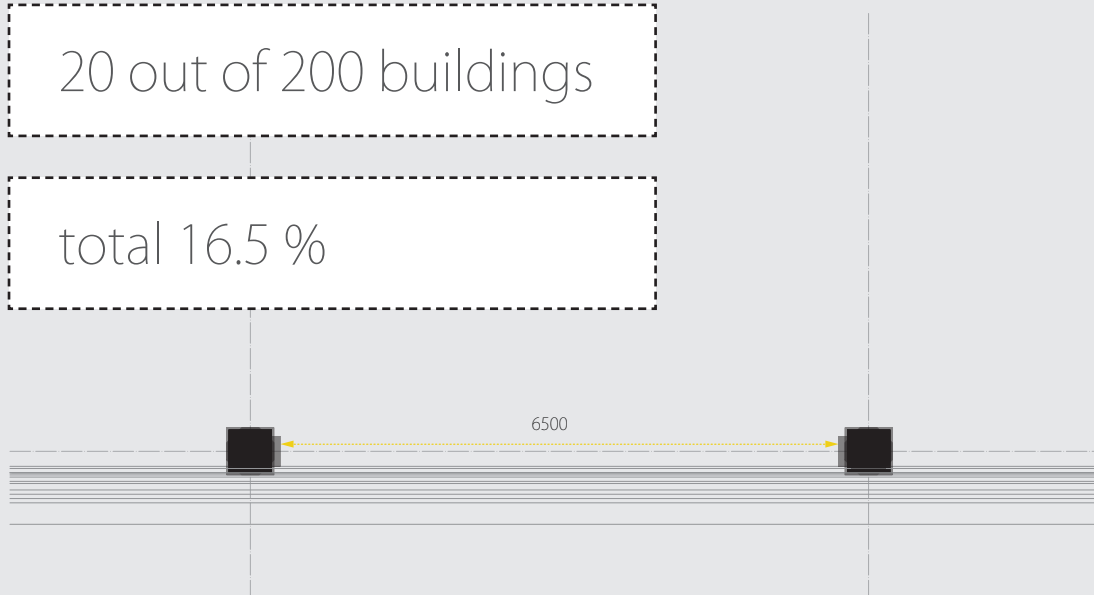


cross section

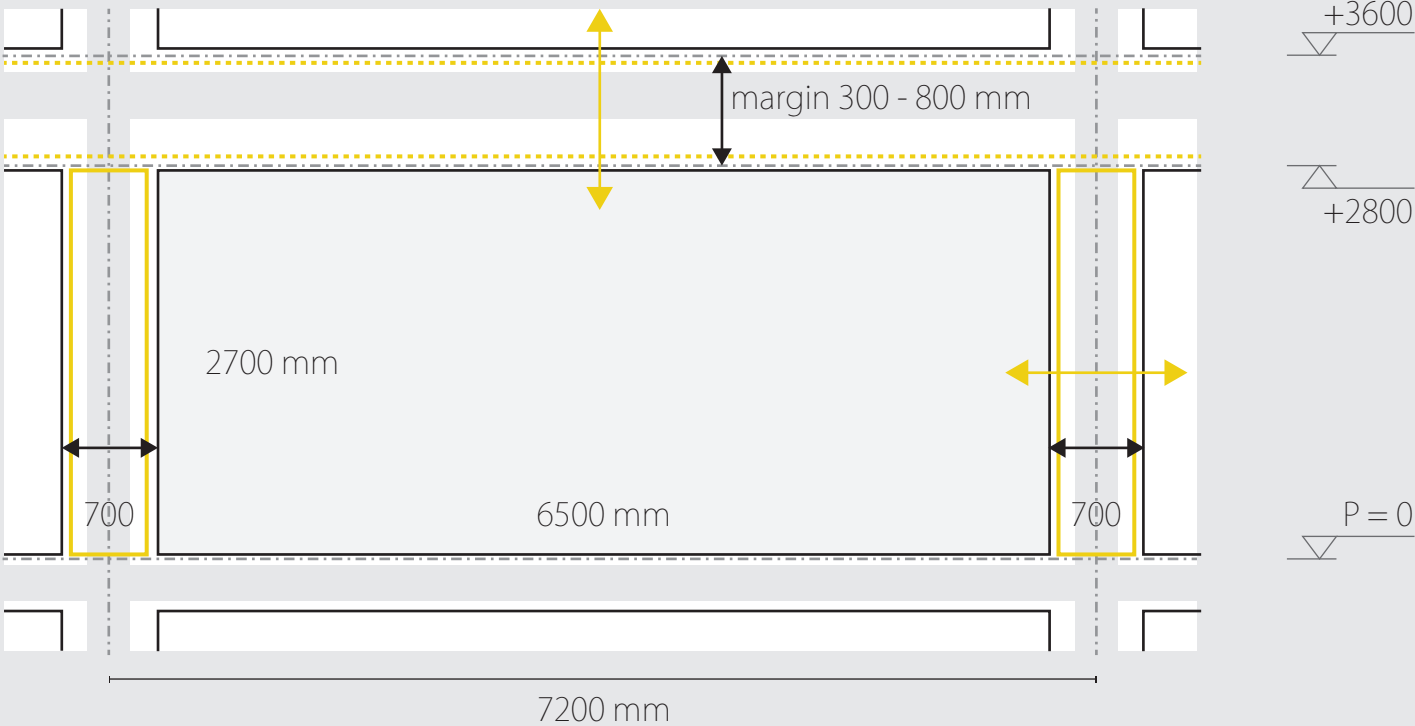
20 out of 200 buildings

total 16.5 %

grid - 7.2 meter



# designing within margins

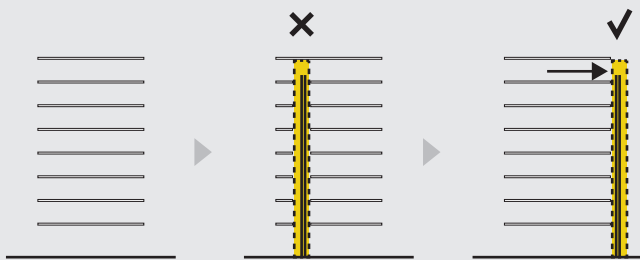


A generate extra floor space



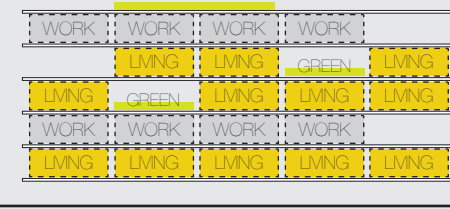
- > cost effective (€ / m<sup>2</sup> office > € / m<sup>2</sup> housing)
- > add balconies & outdoor spaces
- > optimize views on surroundings

B minimize work on building



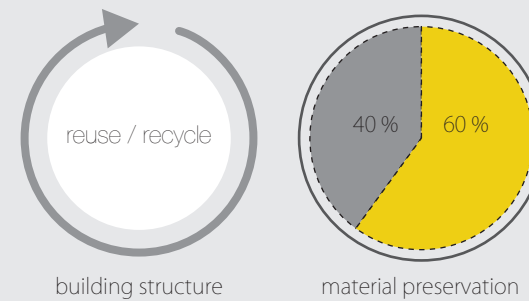
- > leave building structure intact (as much as possible)

C mixed-use programming



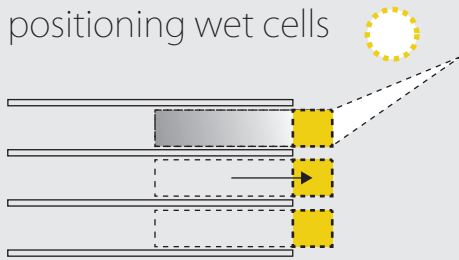
- > work/living concept
- > flexible unit design

D sustainability

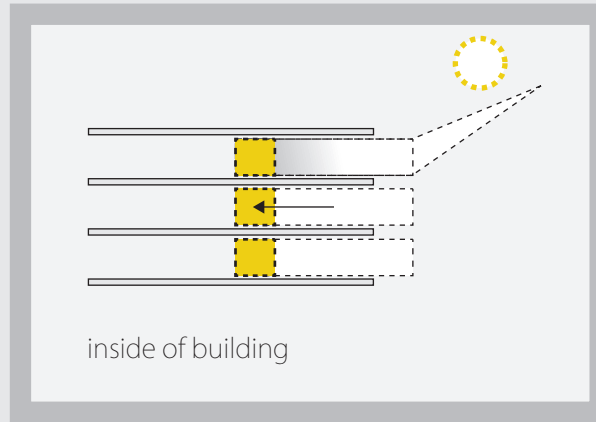


# requirements

A positioning wet cells

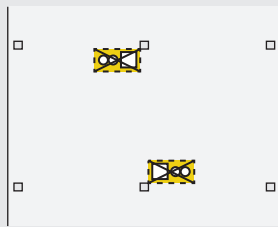


outside of building

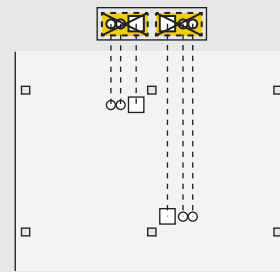


inside of building

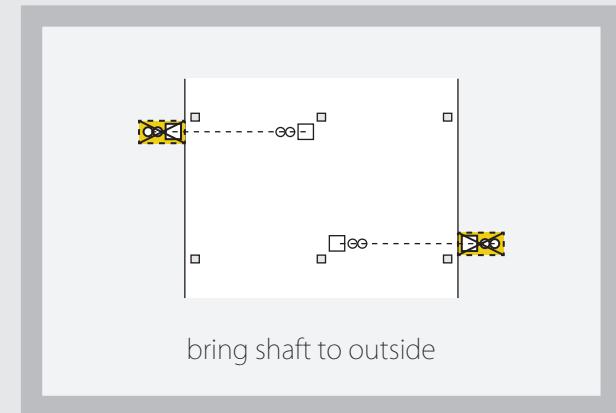
B positioning shafts



drill new holes



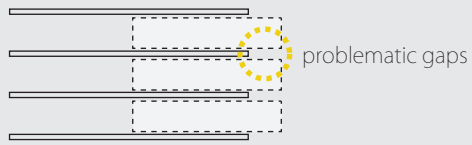
use existing shafts



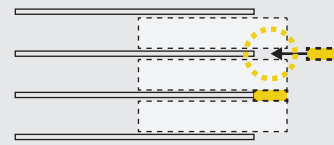
bring shaft to outside

# design considerations

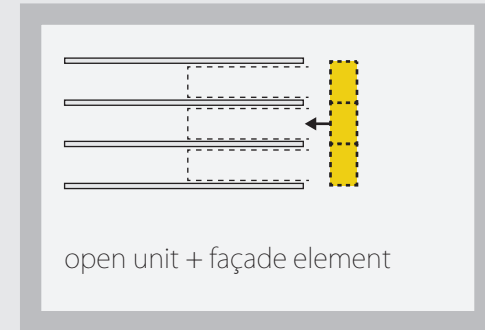
C new façade



closed units

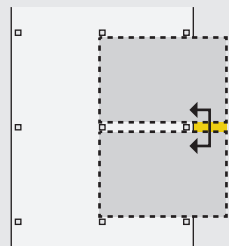


closed unit + add façade elements



open unit + façade element

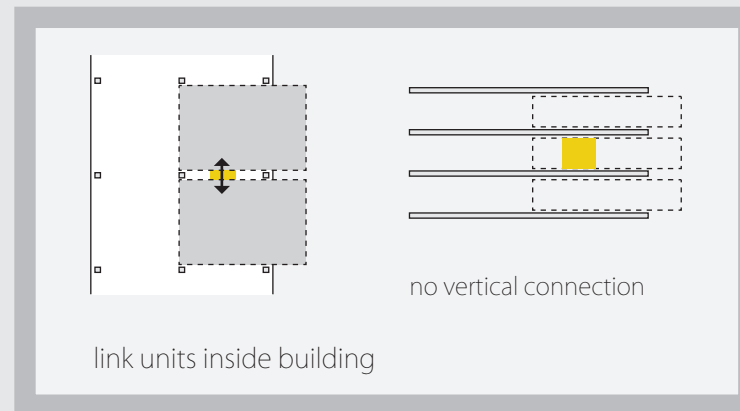
D linking units



link units outside building



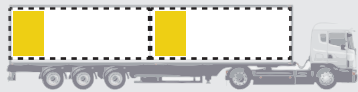
vertical connection possible



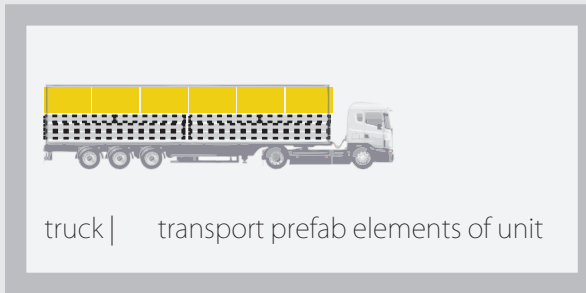
link units inside building

no vertical connection

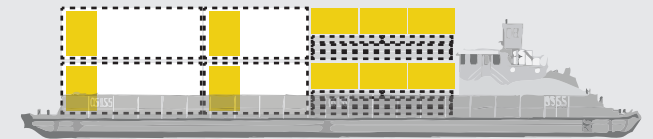
E transportation



truck | transport entire prefab unit

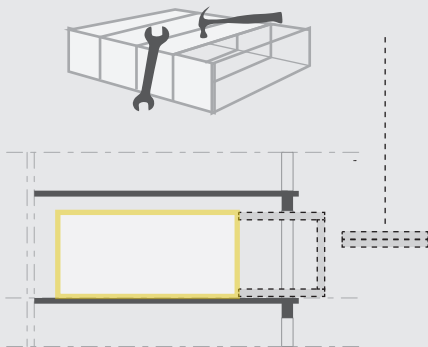


truck | transport prefab elements of unit

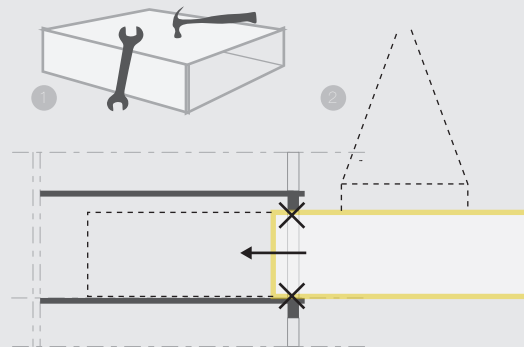


barge | transport entire prefab unit / elements

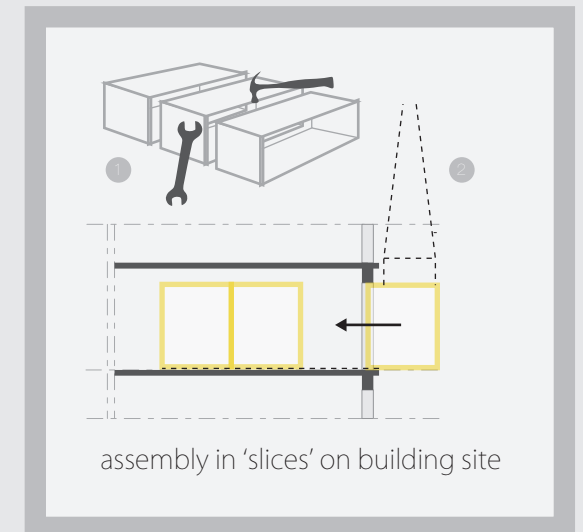
F deployment on site



assembly in building

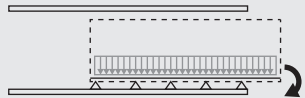


assembly in one piece on building site

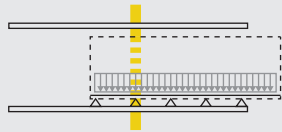


assembly in 'slices' on building site

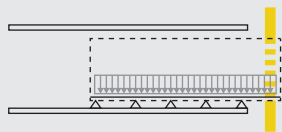
**A** canterlevering units  
without large interventions



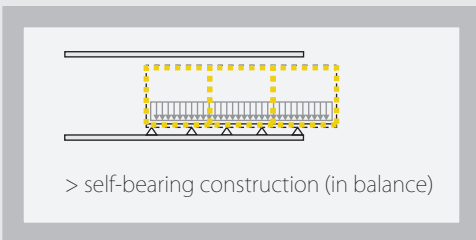
- > large moment of force
- > shear forces (wind)



- > stabilize by integrated frame

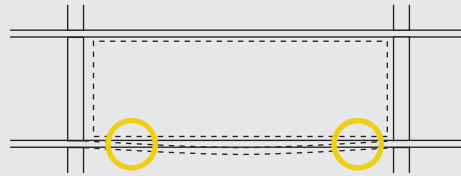


- > load-bearing frame along façade

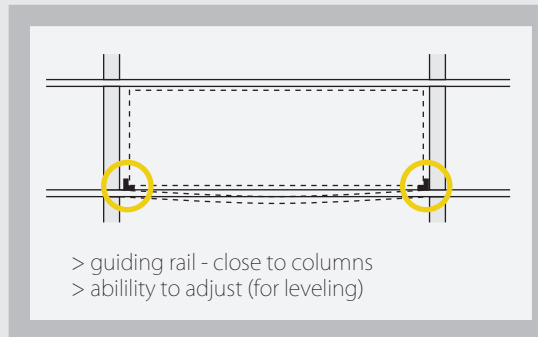


- > self-bearing construction (in balance)

**B** securing to the building

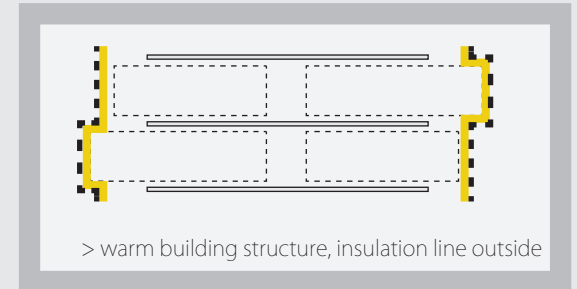


- > rest on existing (hanging) office floor
- > no ability to adjust (for leveling)

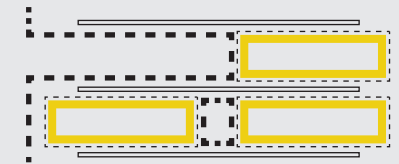


- > guiding rail - close to columns
- > ability to adjust (for leveling)

**C** cold / warm construction

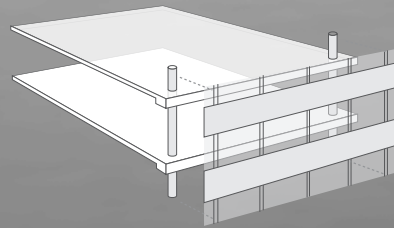


- > warm building structure, insulation line outside

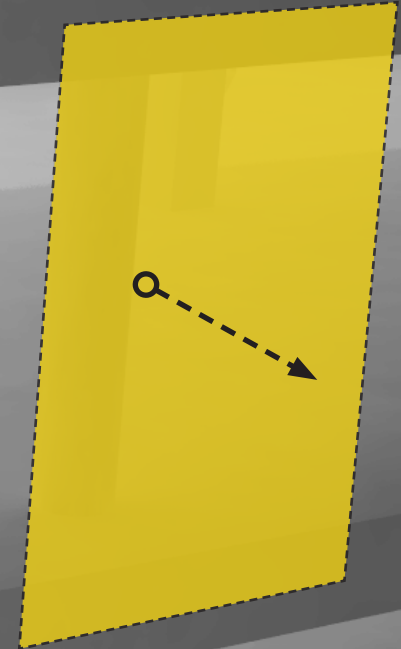


- > cold building structure, insulation line inside

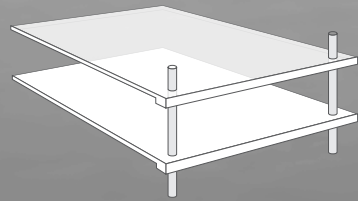
# technical considerations



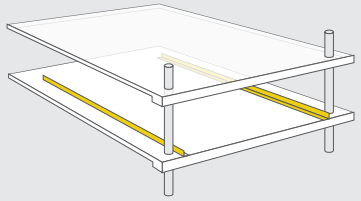
1 strip office façade  
materials can be recycled



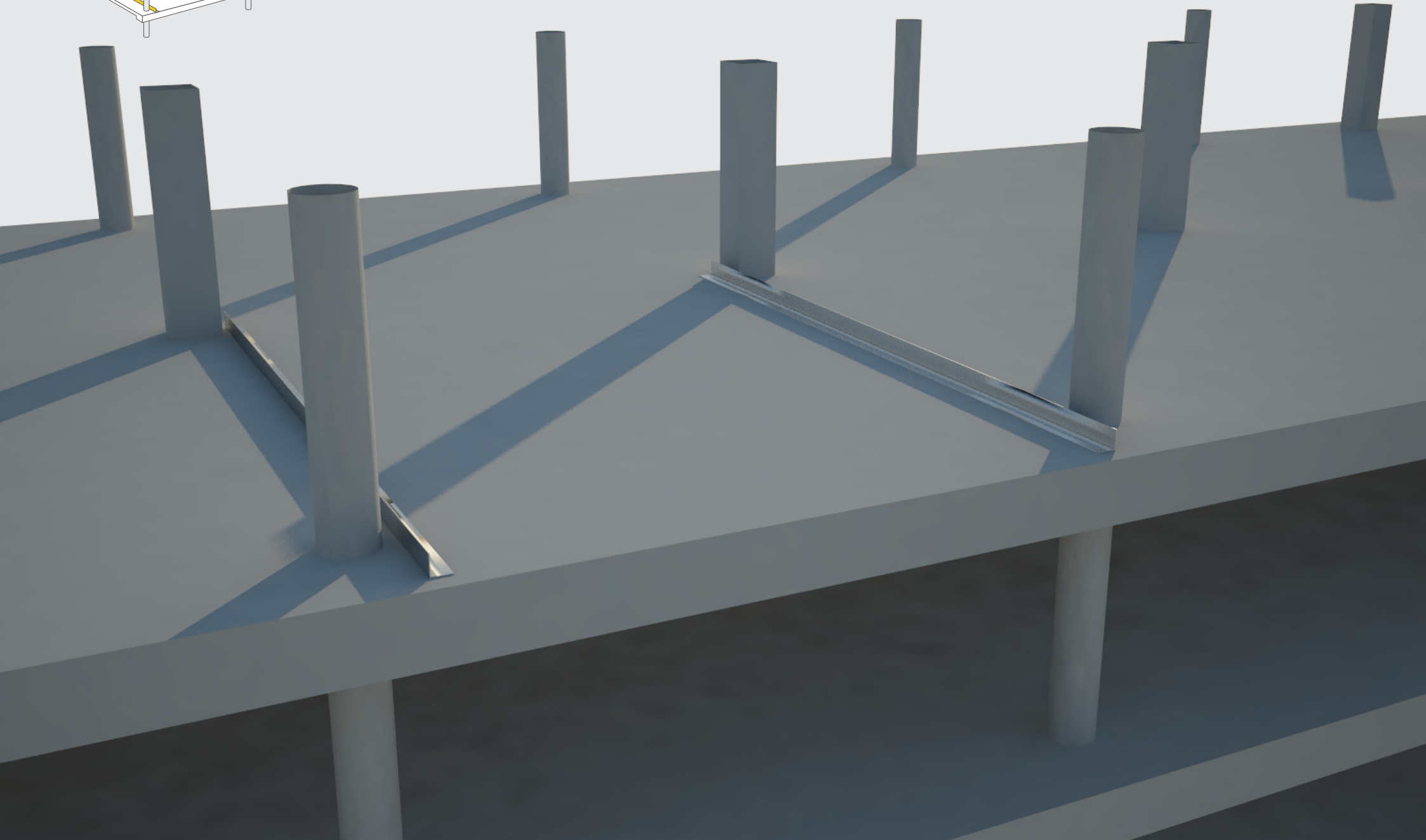
# conversion concept



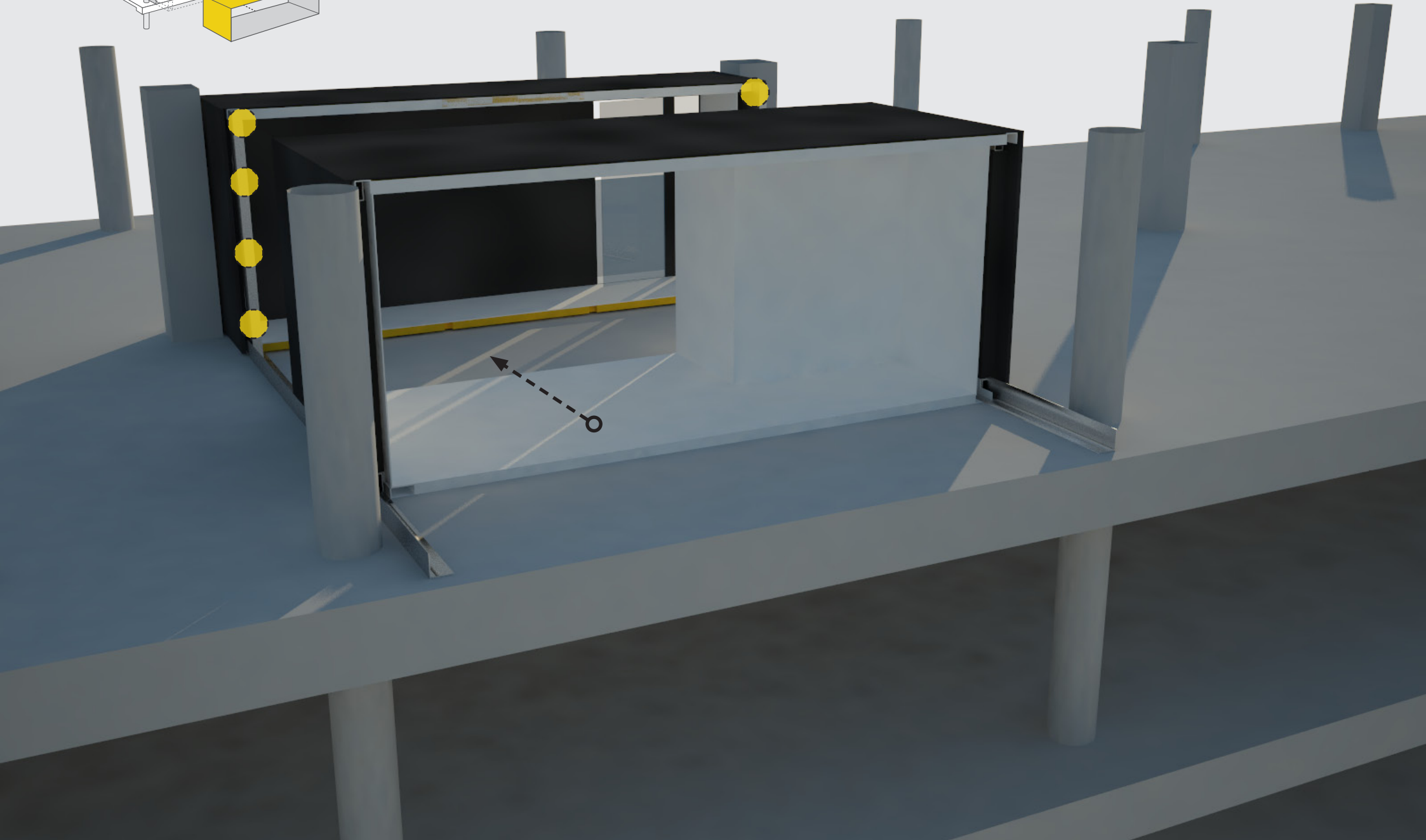
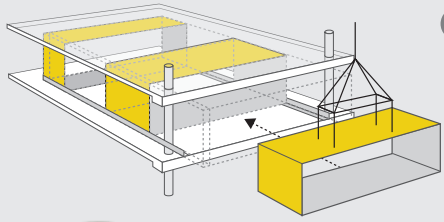
2 prepare building structure



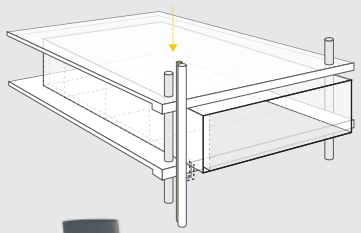
3 place (leveled) rails  
adjust for leveling prefab units



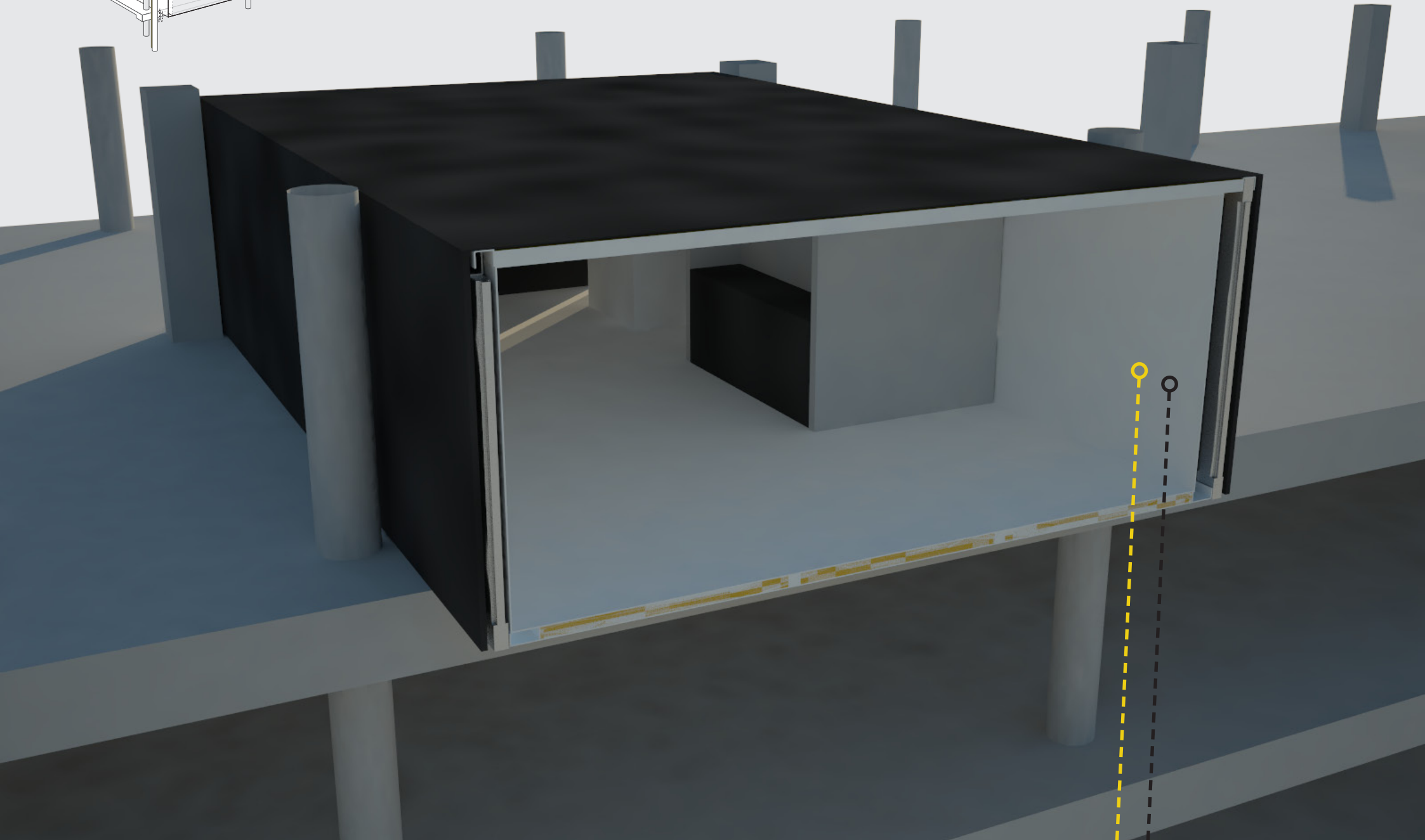
- 4 slide in prefab unit (in segments)  
over steel rails with teflon (97% friction reduction)



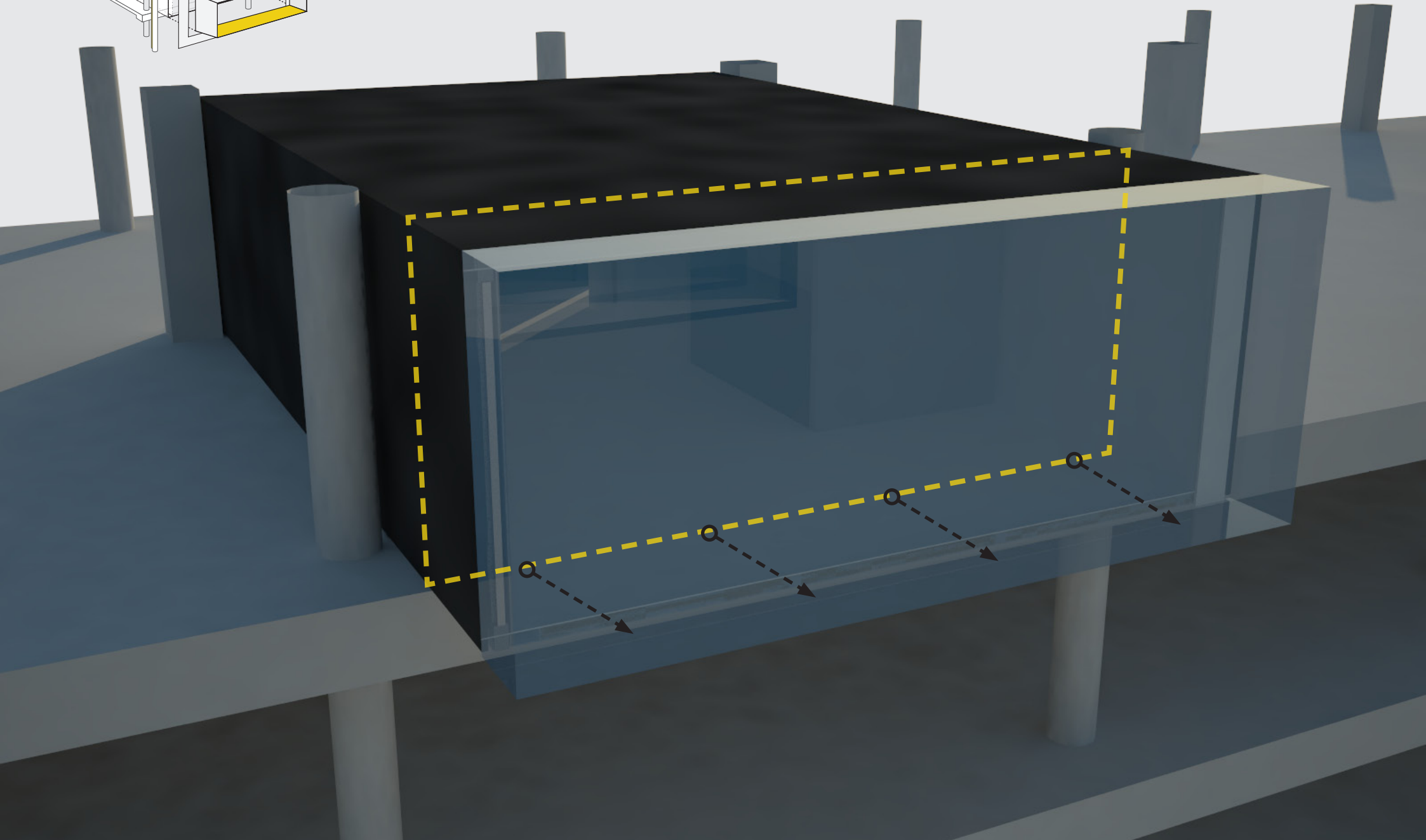
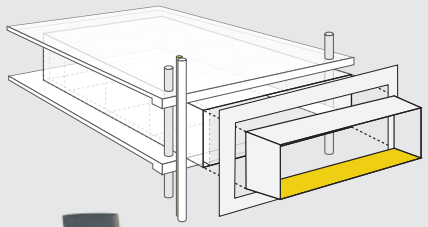




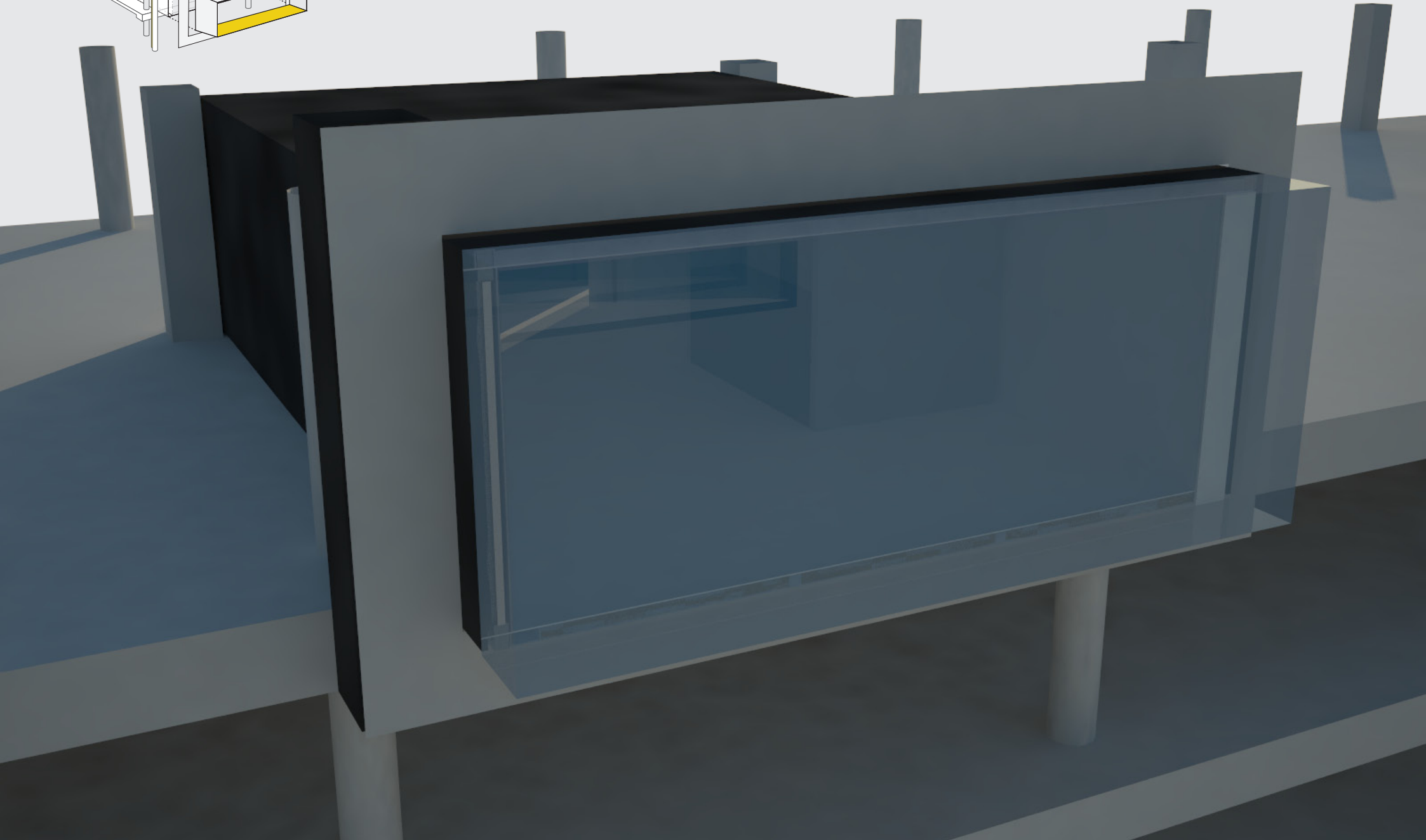
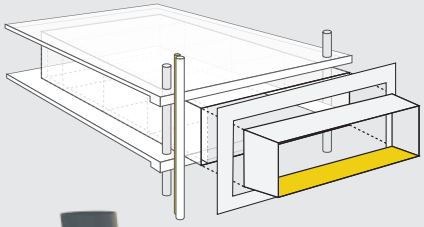
5 connect installations to shaft  
no adjustments to the existing structure needed

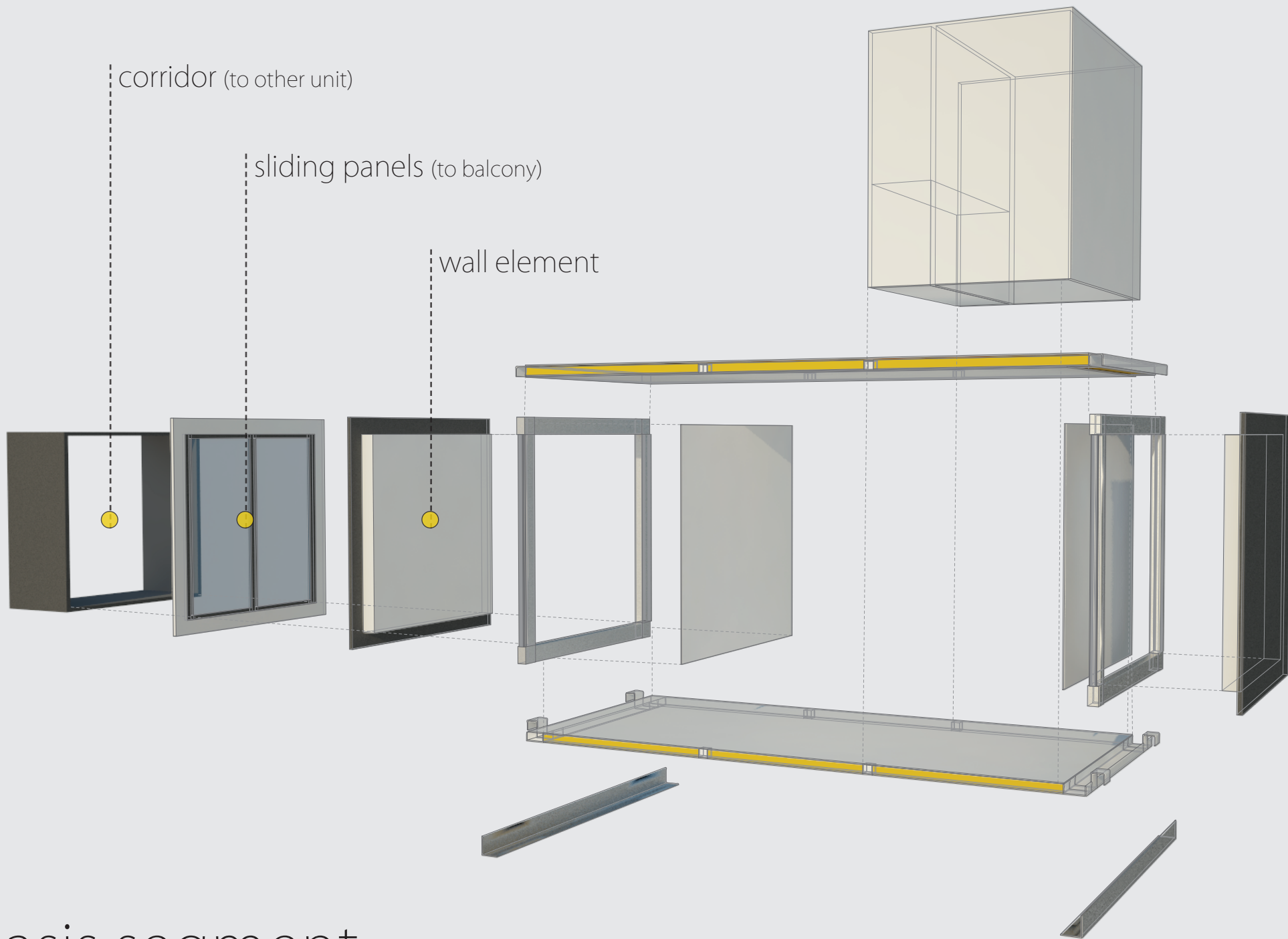


6 place façade-segment  
new insulation line, shaft is closed off

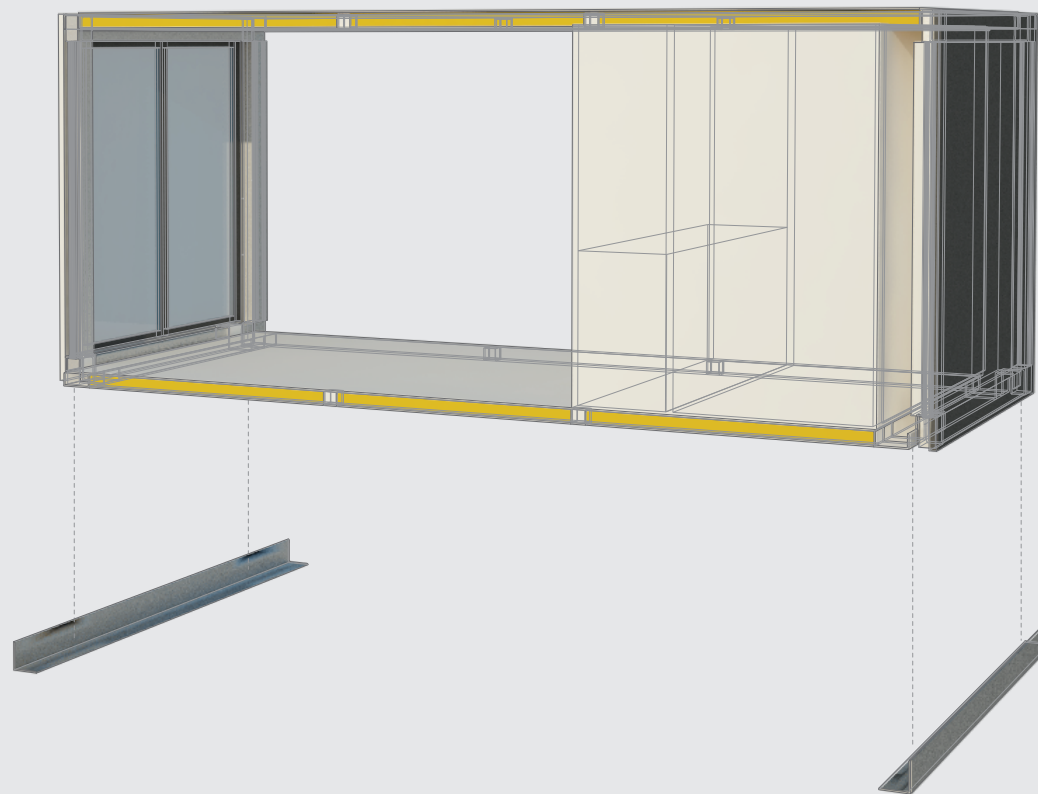
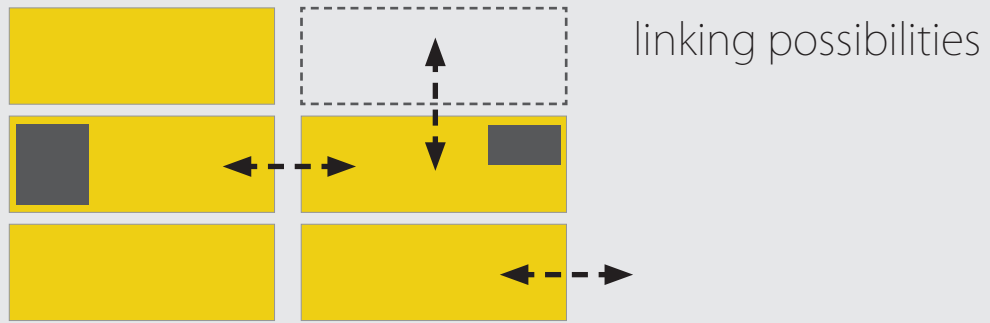


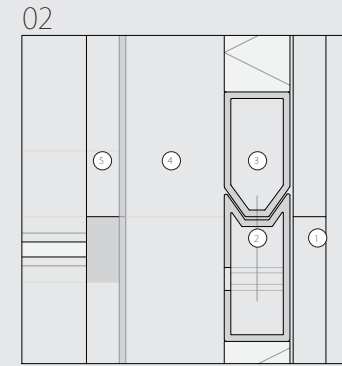
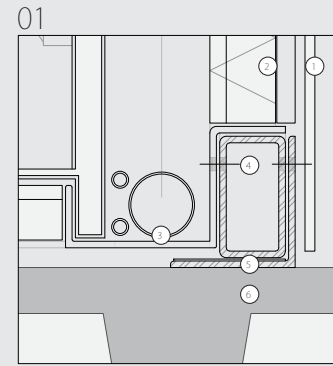
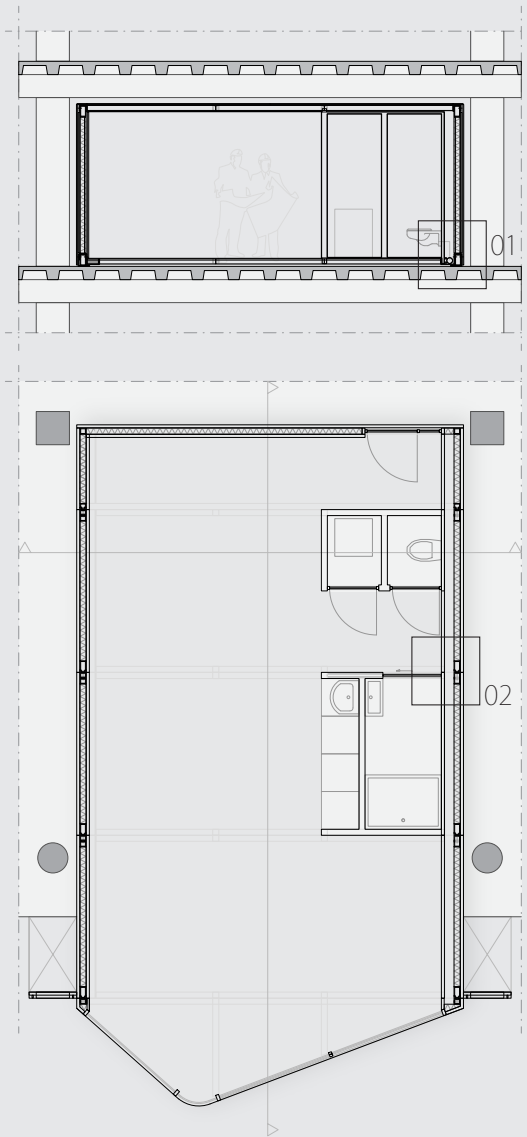
6 place façade-segment  
new insulation line, shaft is closed off



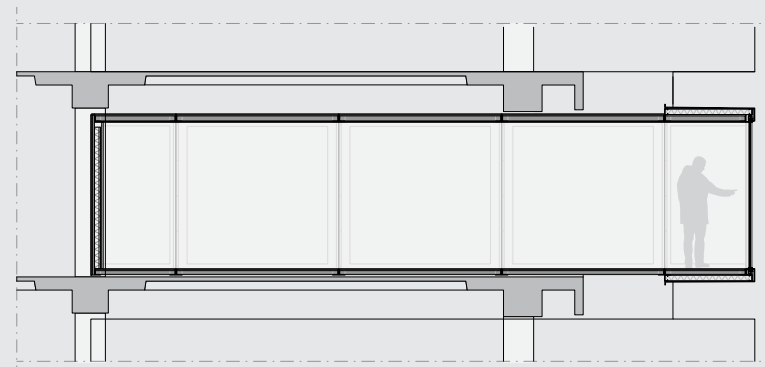


# basis segment

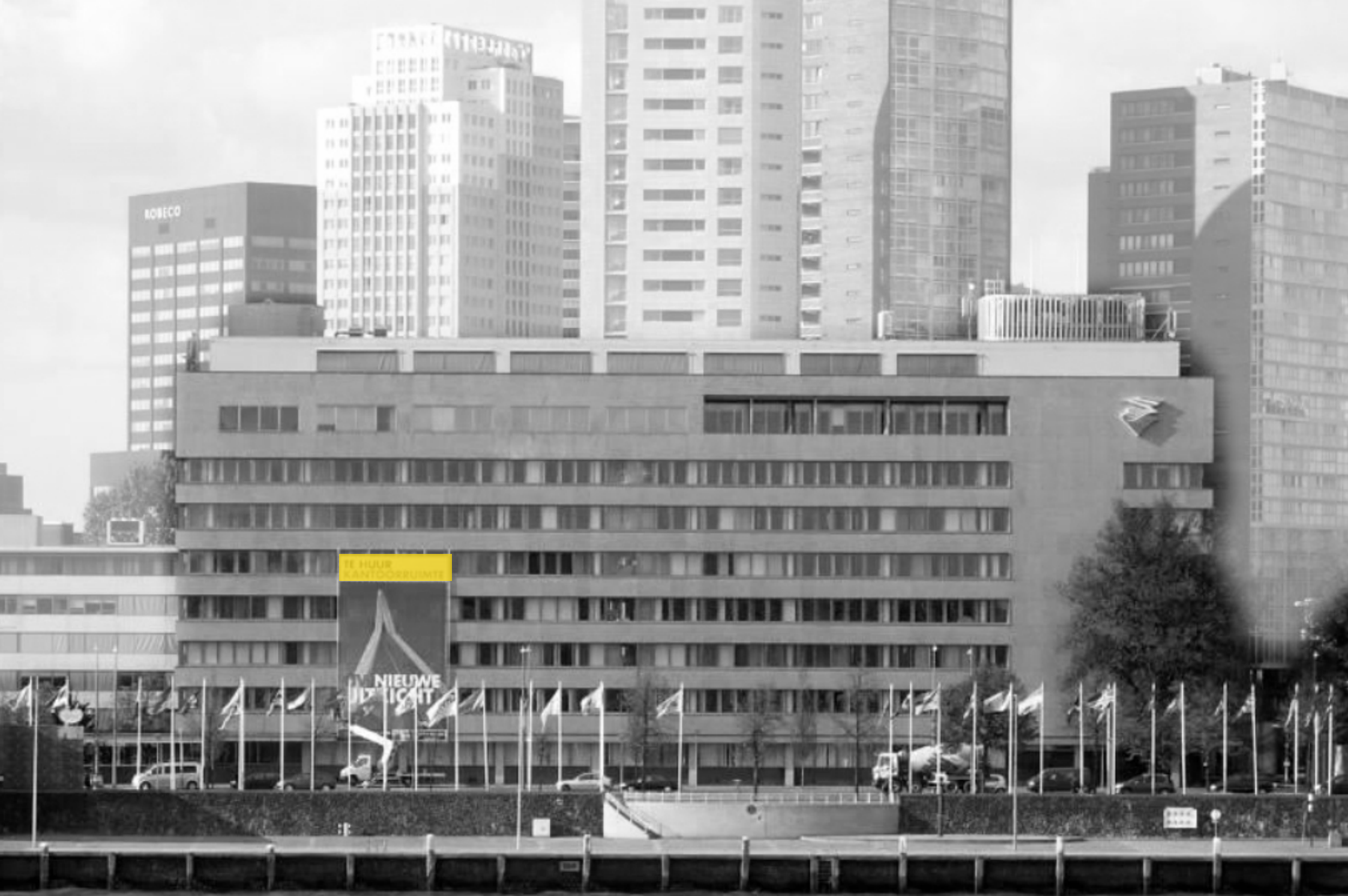




- |                            |                               |                                     |                        |
|----------------------------|-------------------------------|-------------------------------------|------------------------|
| ① composite skin (8 mm)    | ④ steel frame (185 mm)        | ① composite skin (8 mm)             | ④ space for drains     |
| ② sandwich panel (PU foam) | ⑤ steel rails + teflon tape   | ② sandwich panel (PU foam)          | ⑤ wall element (50 mm) |
| ③ space for drains         | ⑥ existing concrete structure | ③ steel frame (185 mm) + insulation |                        |



# ■ design project



TE HUIJER  
NIEUW



NIEUWE  
DIT LICHT

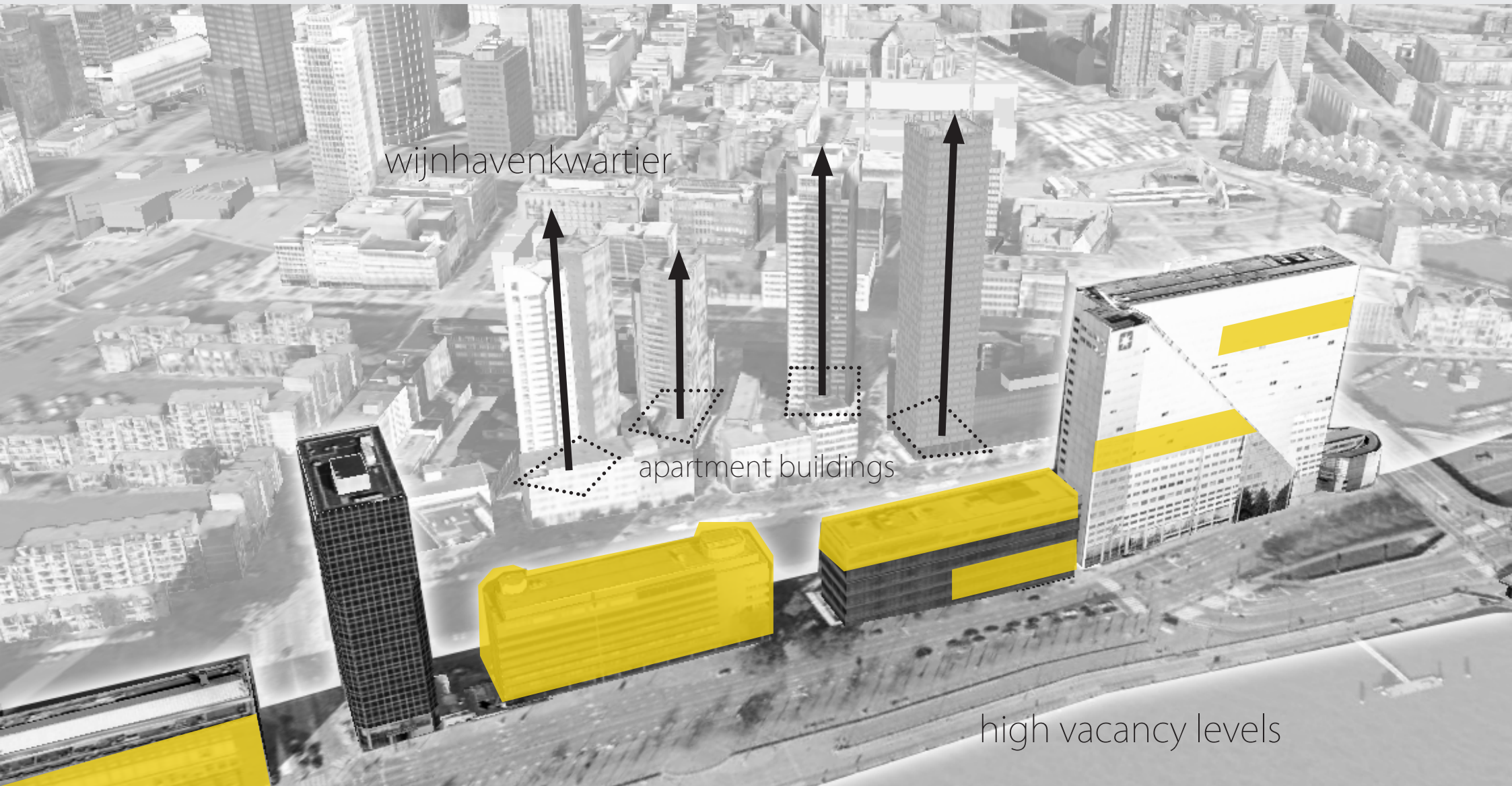


stadsdriehoek

wijnhavenkwartier

zuid-entrepot

kop van zuid



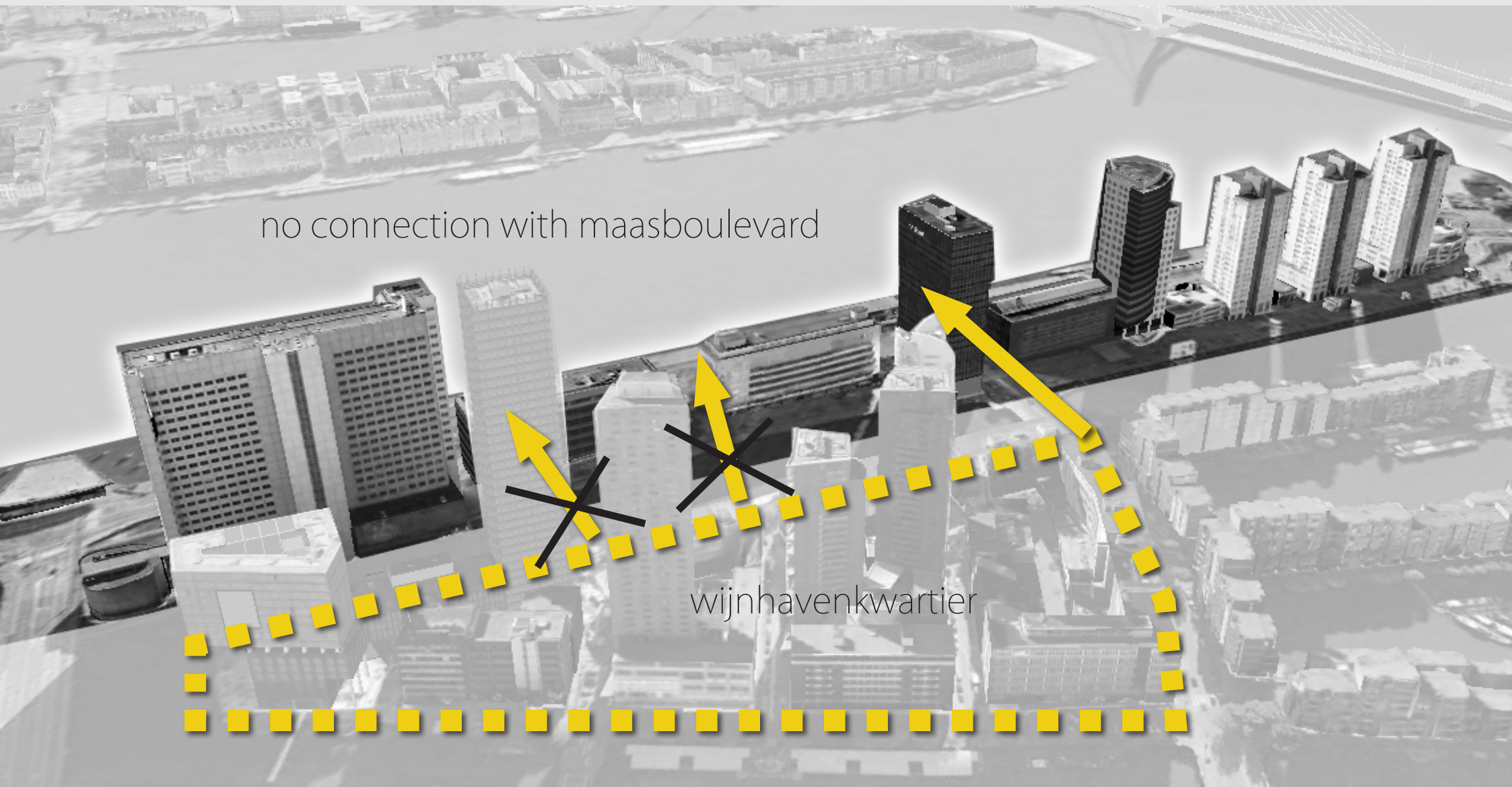
wijnhavenkwartier

apartment buildings

high vacancy levels



wijnhavenkwartier



no connection with maasboulevard

wijnhavenkwartier



year: 1968

energy label: G

10.000 m<sup>2</sup> vvo

inactive plinth

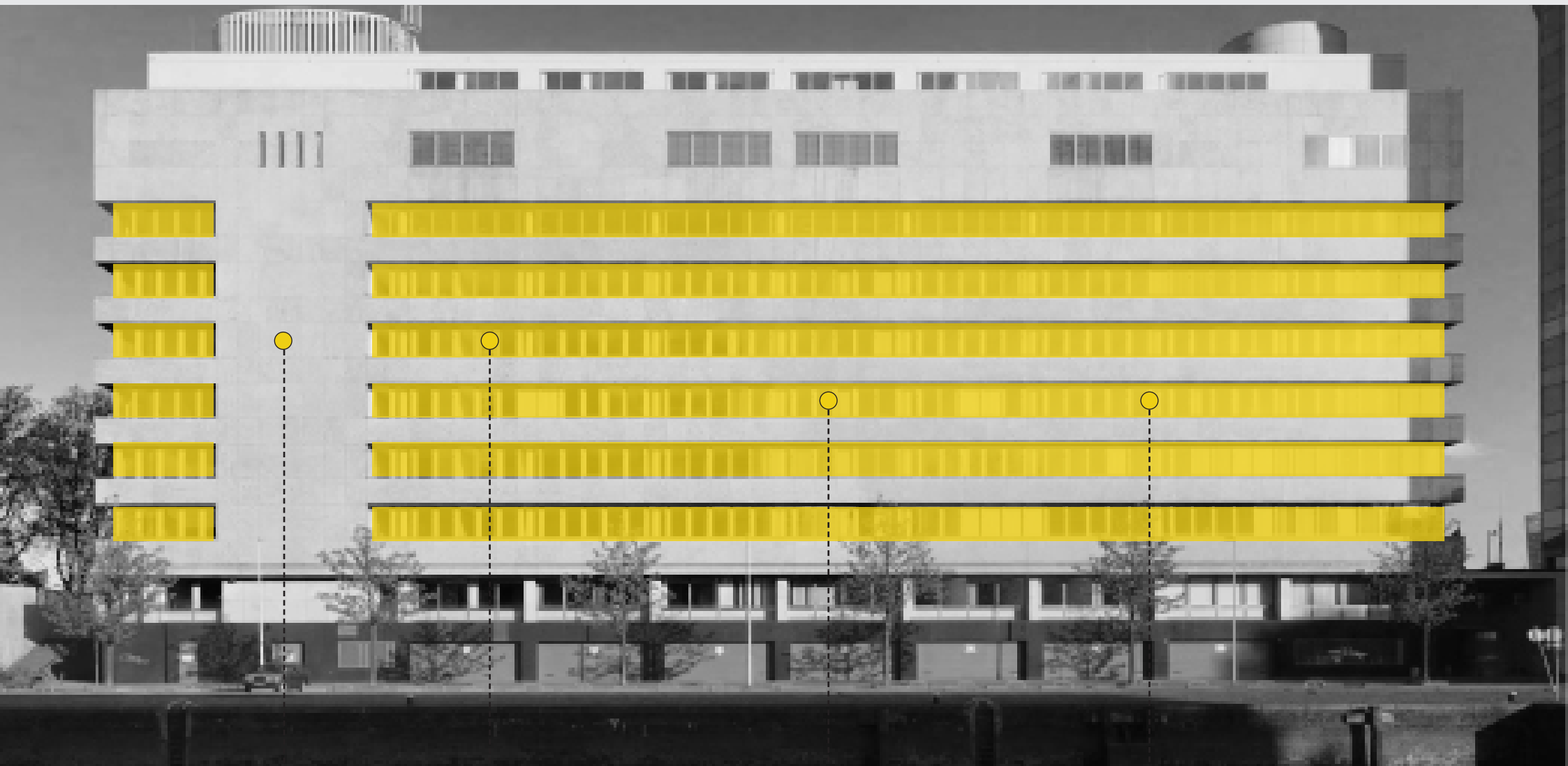


addition two floors

installation floor

no open façade

limited parking (50 pp)

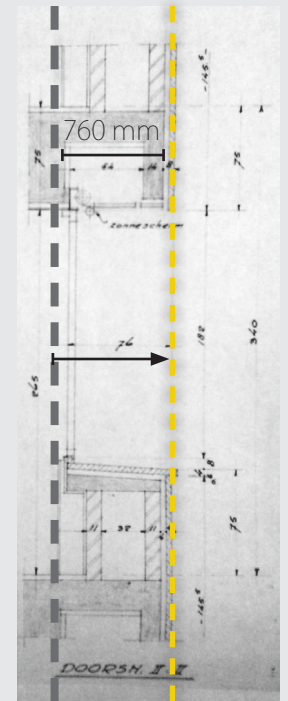
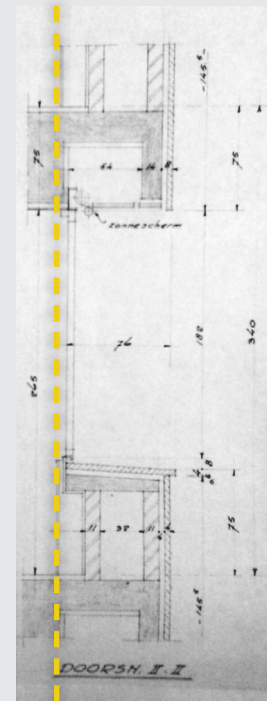
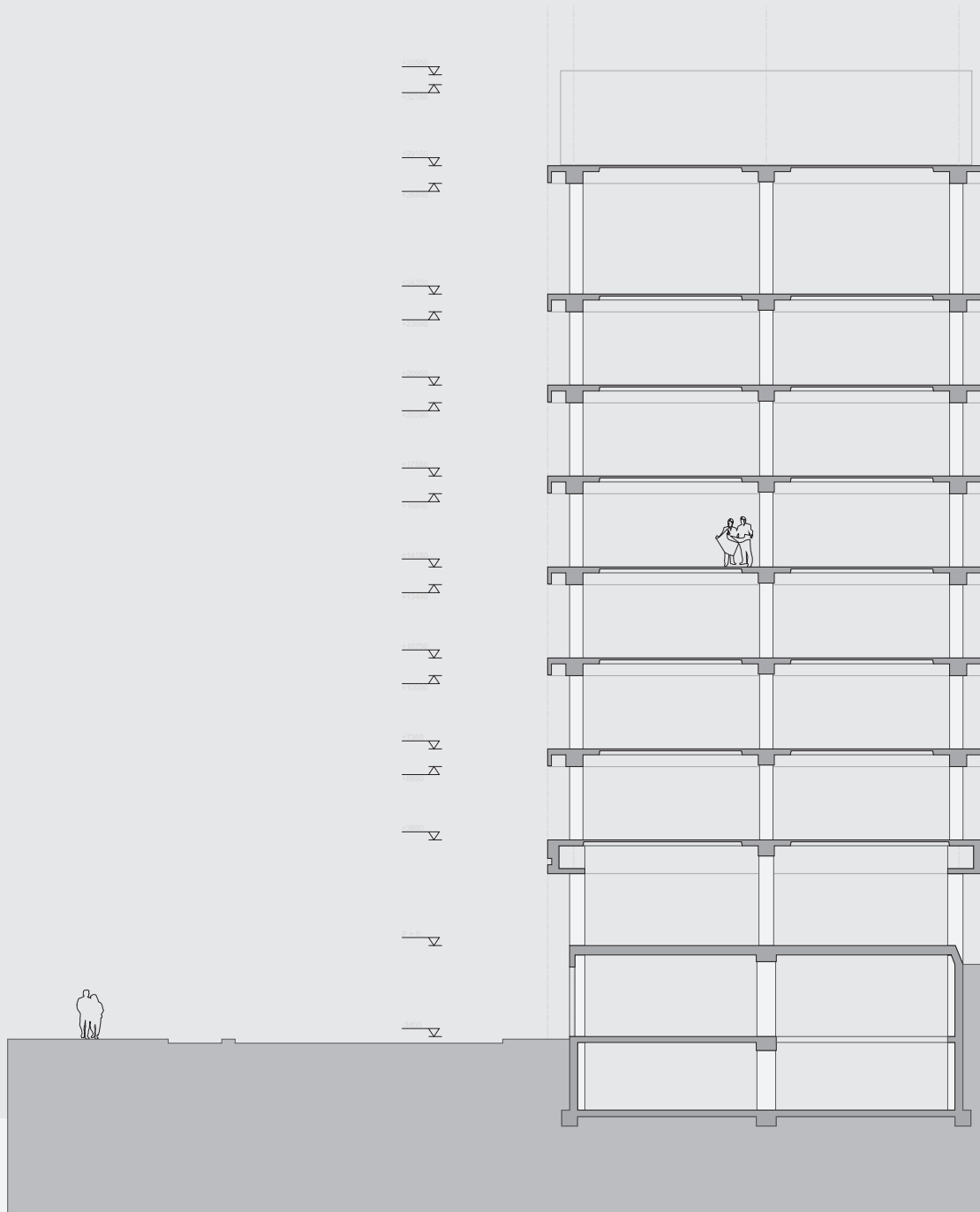


two cores

open floor plan

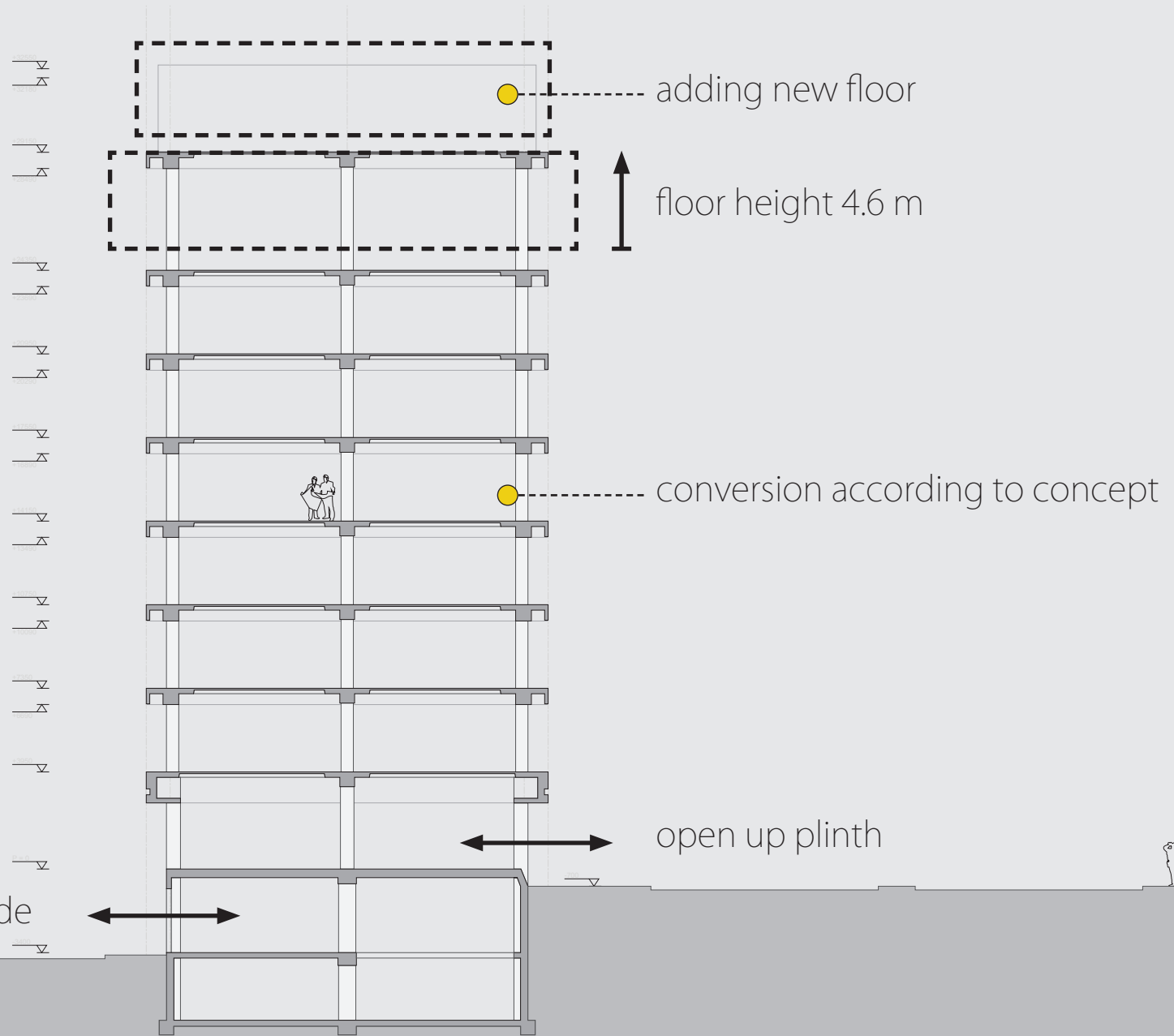
7.2 x 7.2 m grid

height clearance 2800 mm

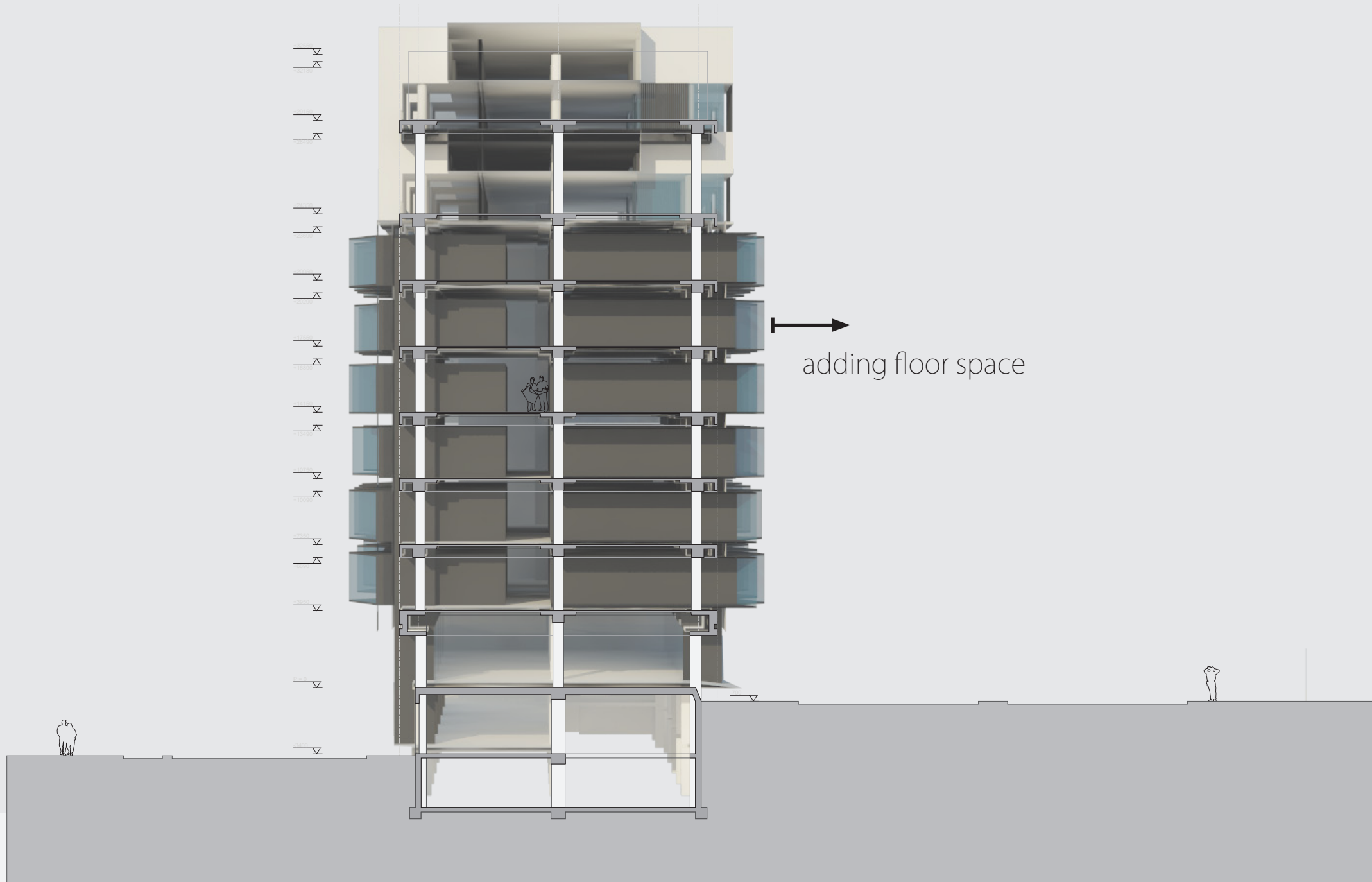


replacement façade

123 m<sup>2</sup> per floor extra  
 (= 12 % extra in total)



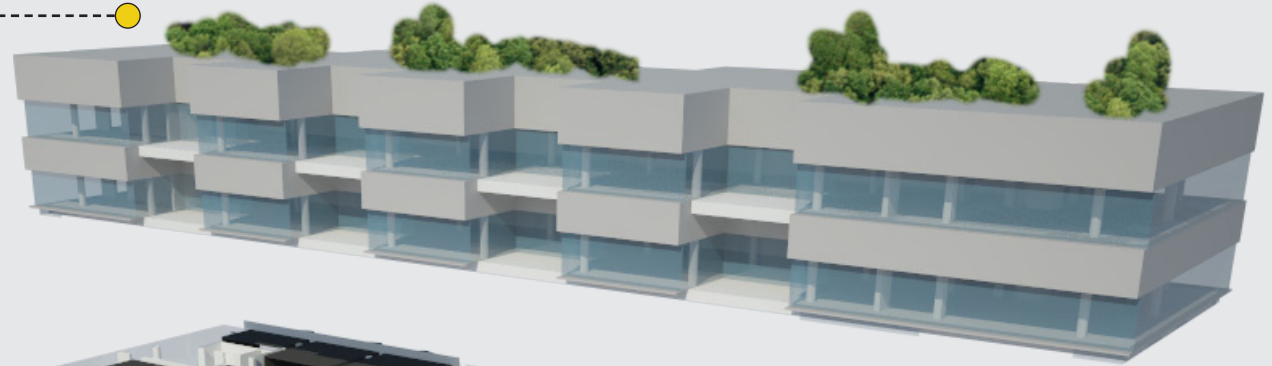
# principles



adding floor space

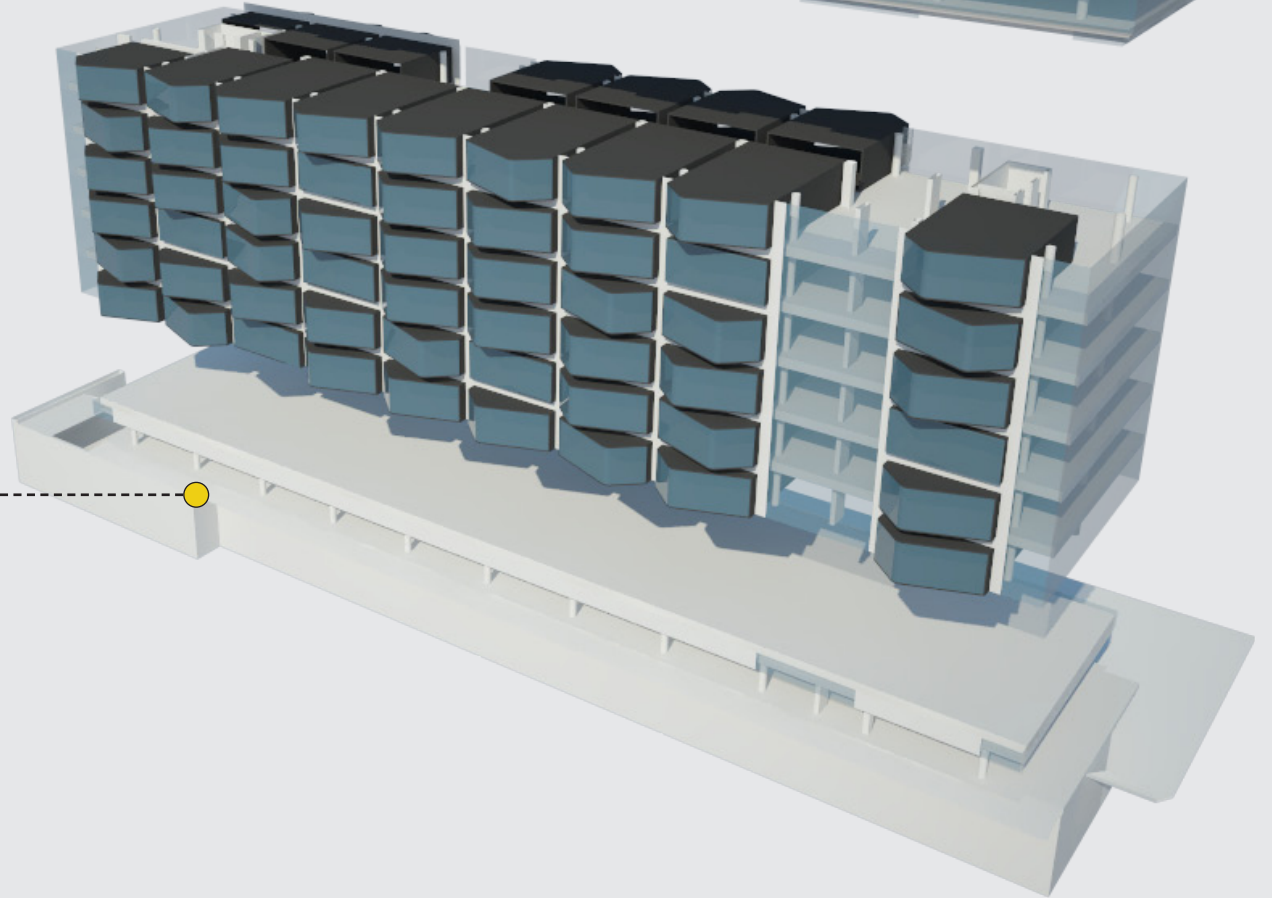
roof garden

new addition large apartments



conversion according to concept

adding amenities in lower spaces

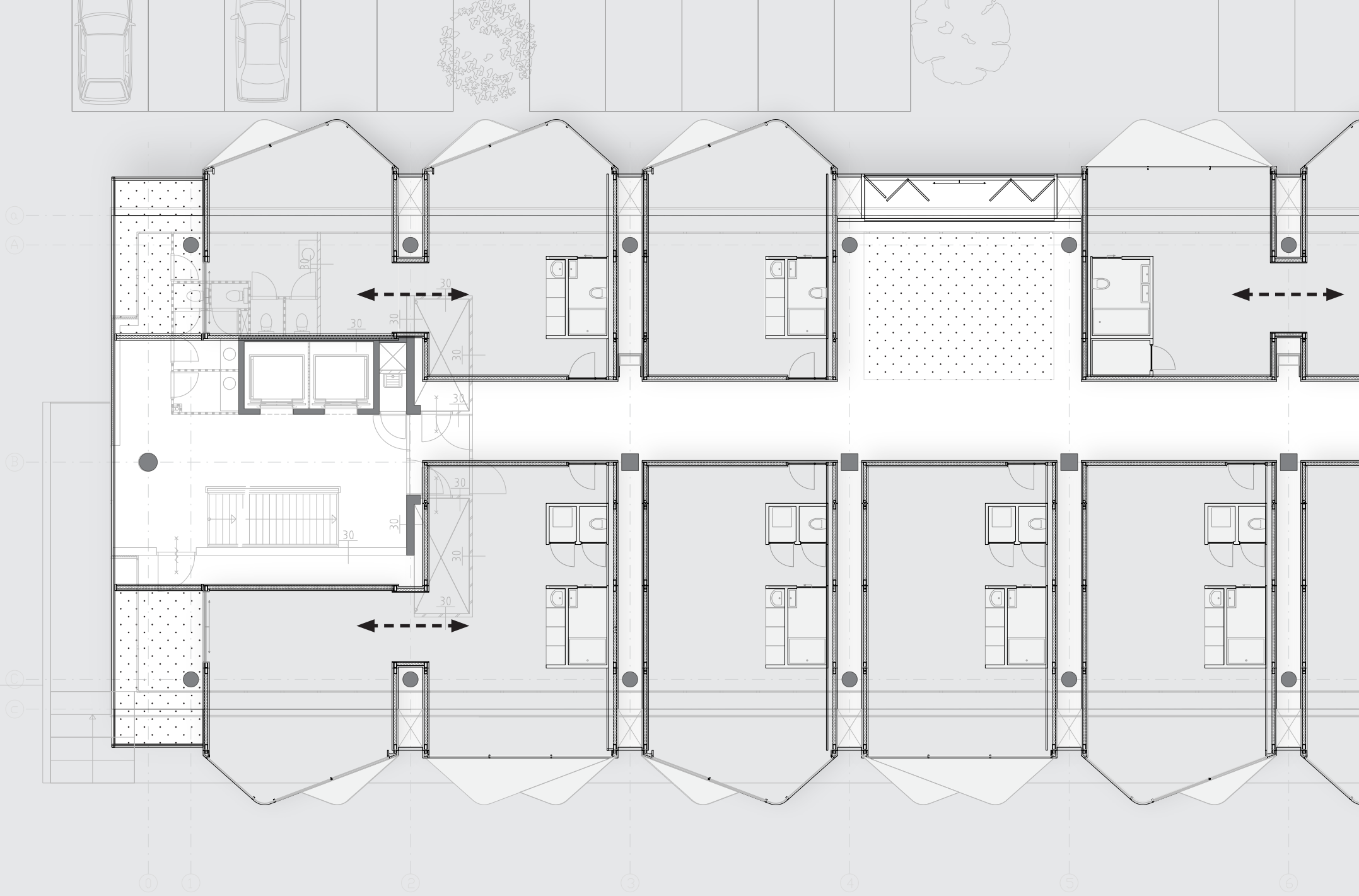




# floor plan



1st - 6th floor | +3950 | + 20950



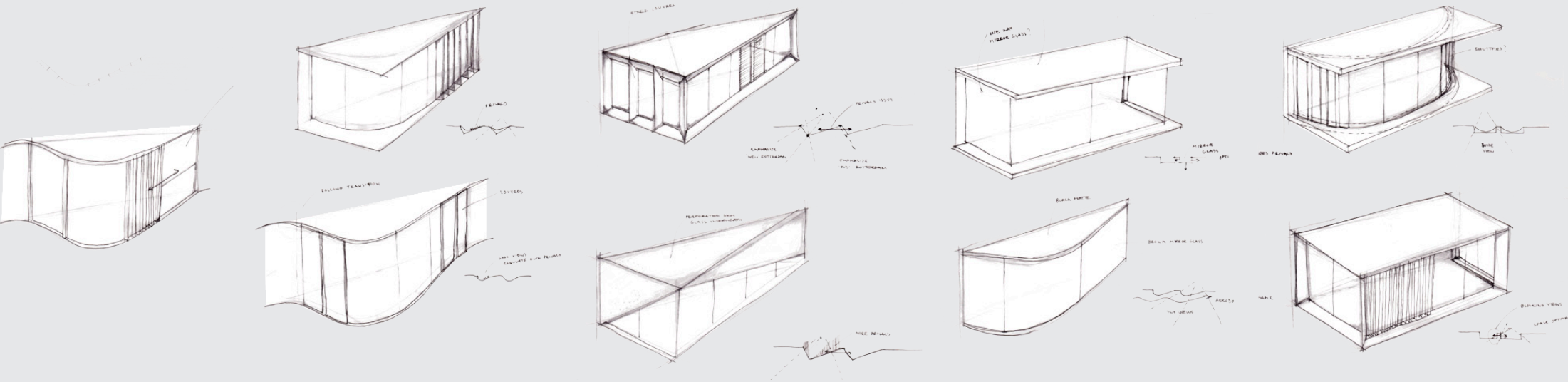








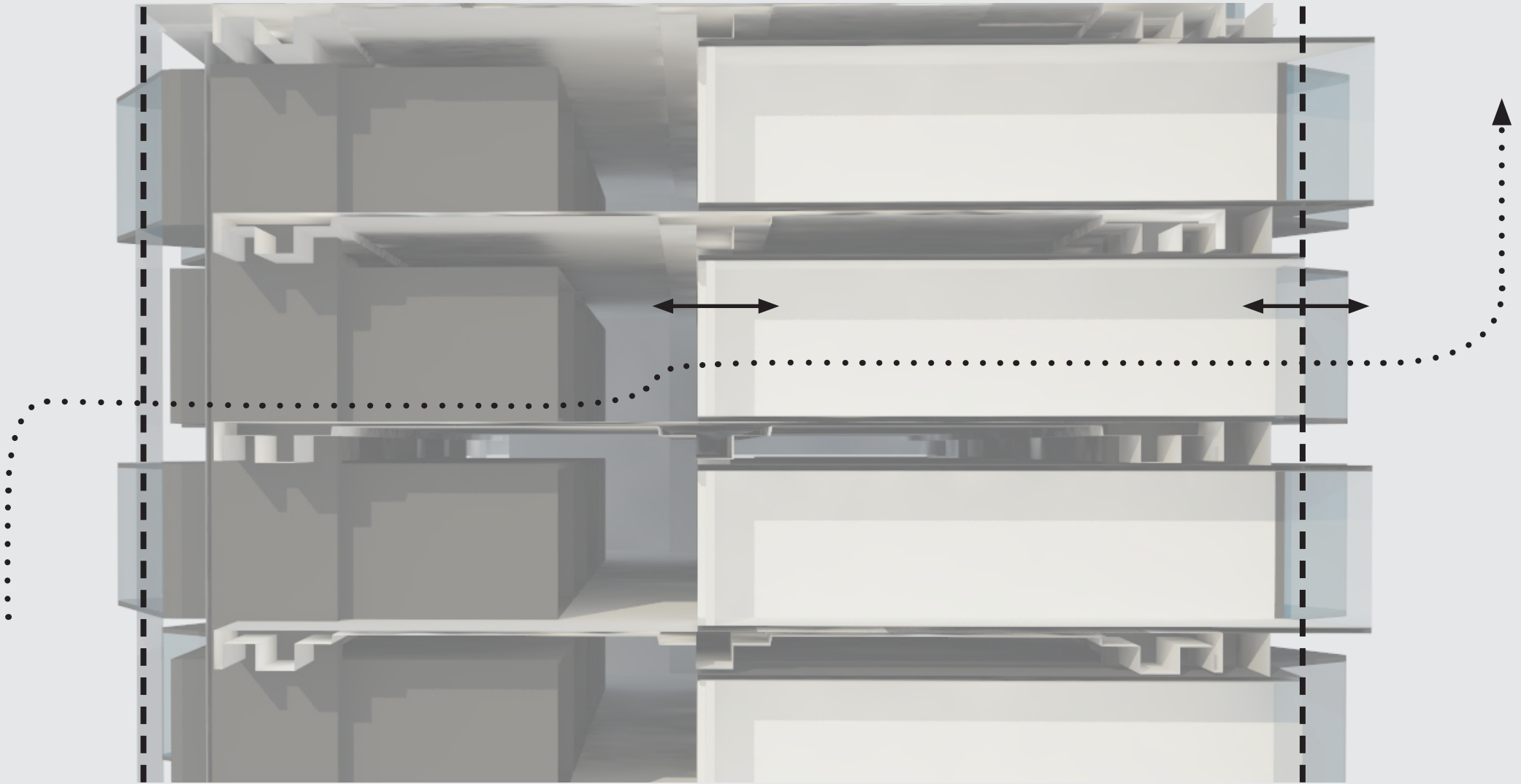




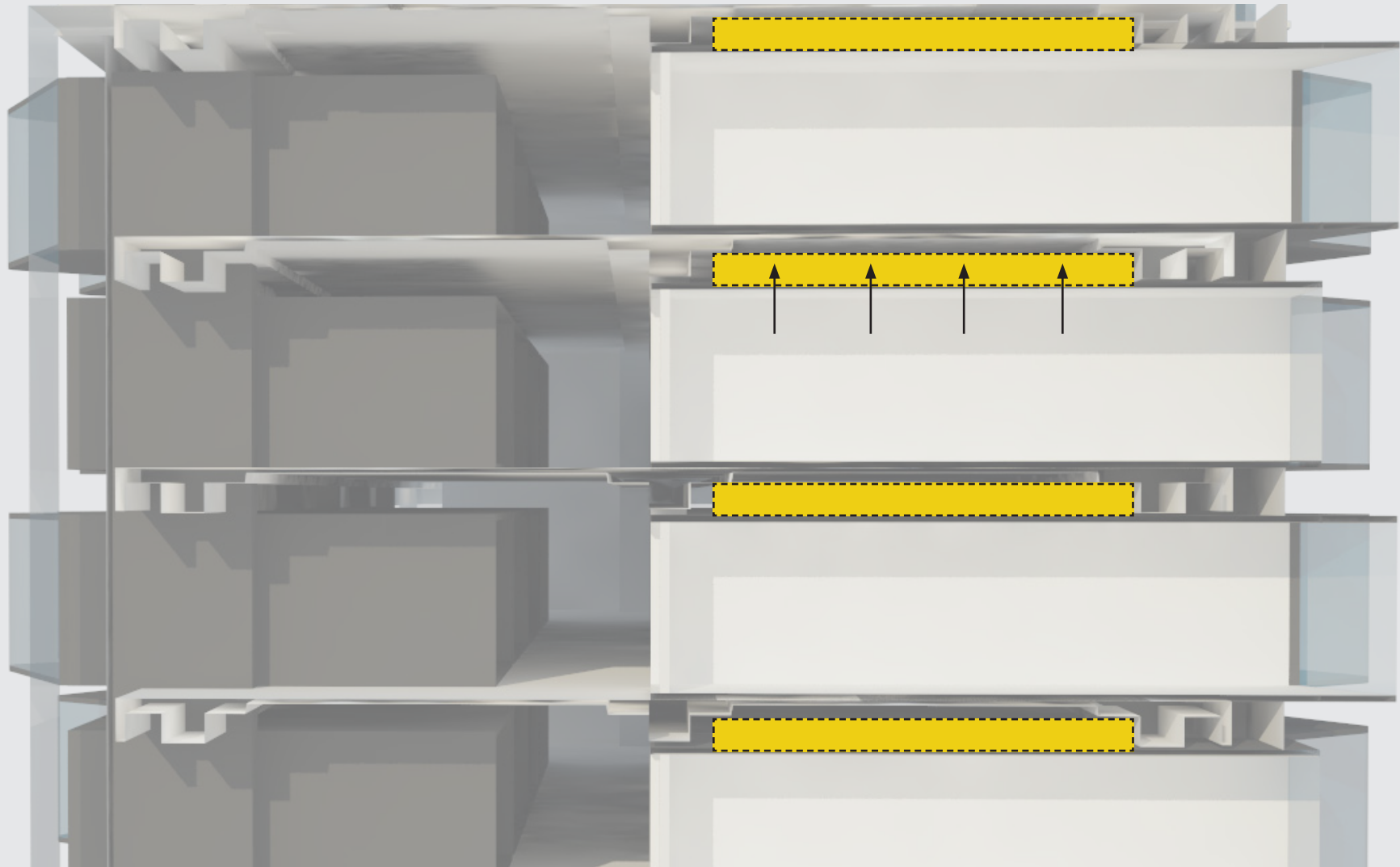
# façade design



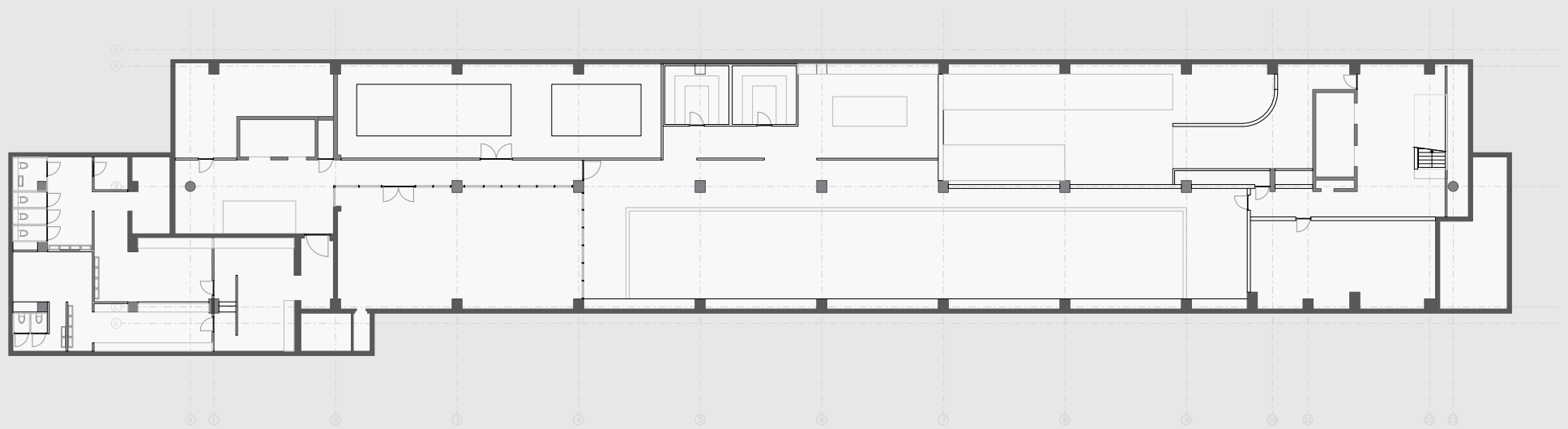




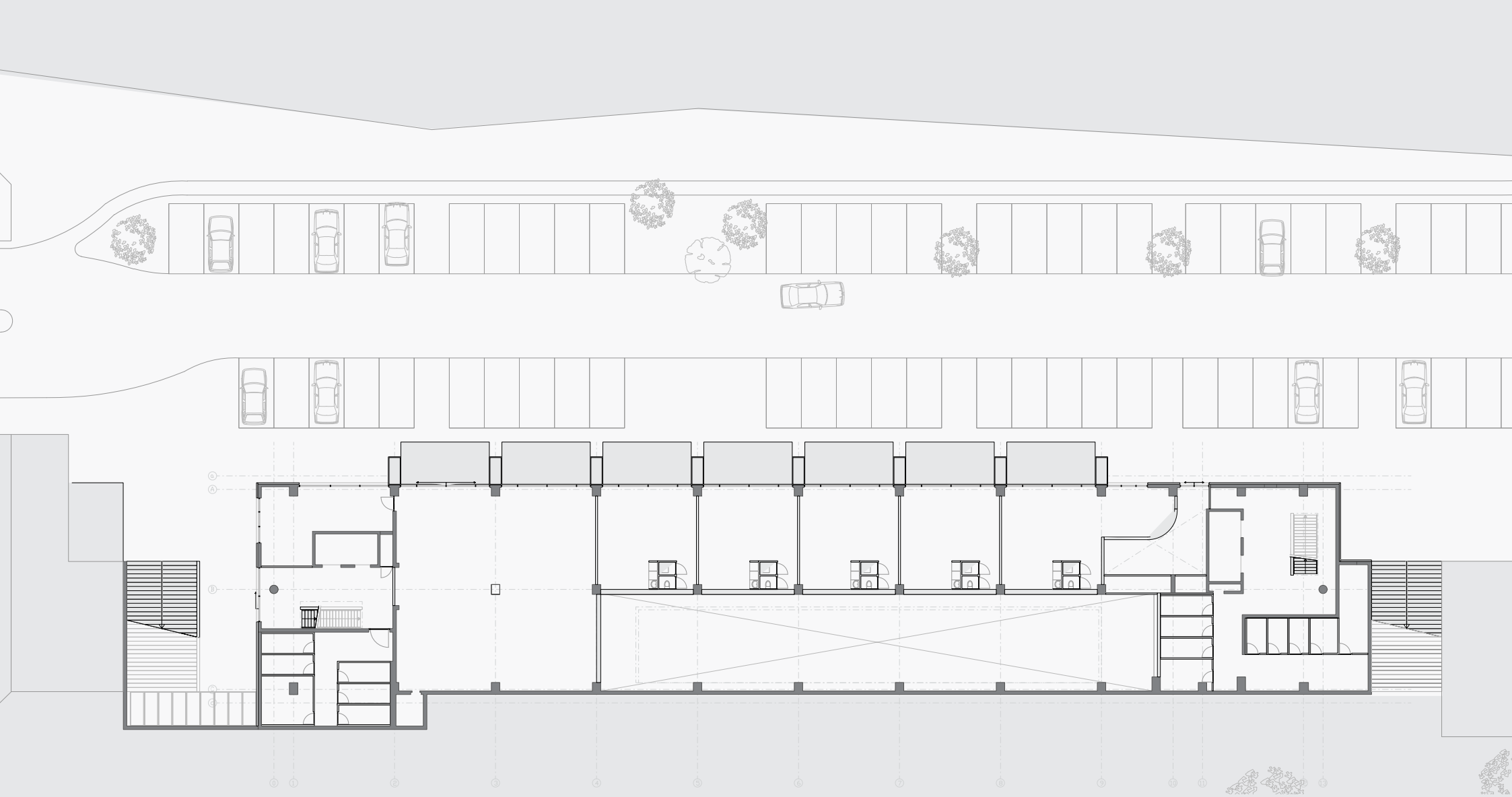
# climate design



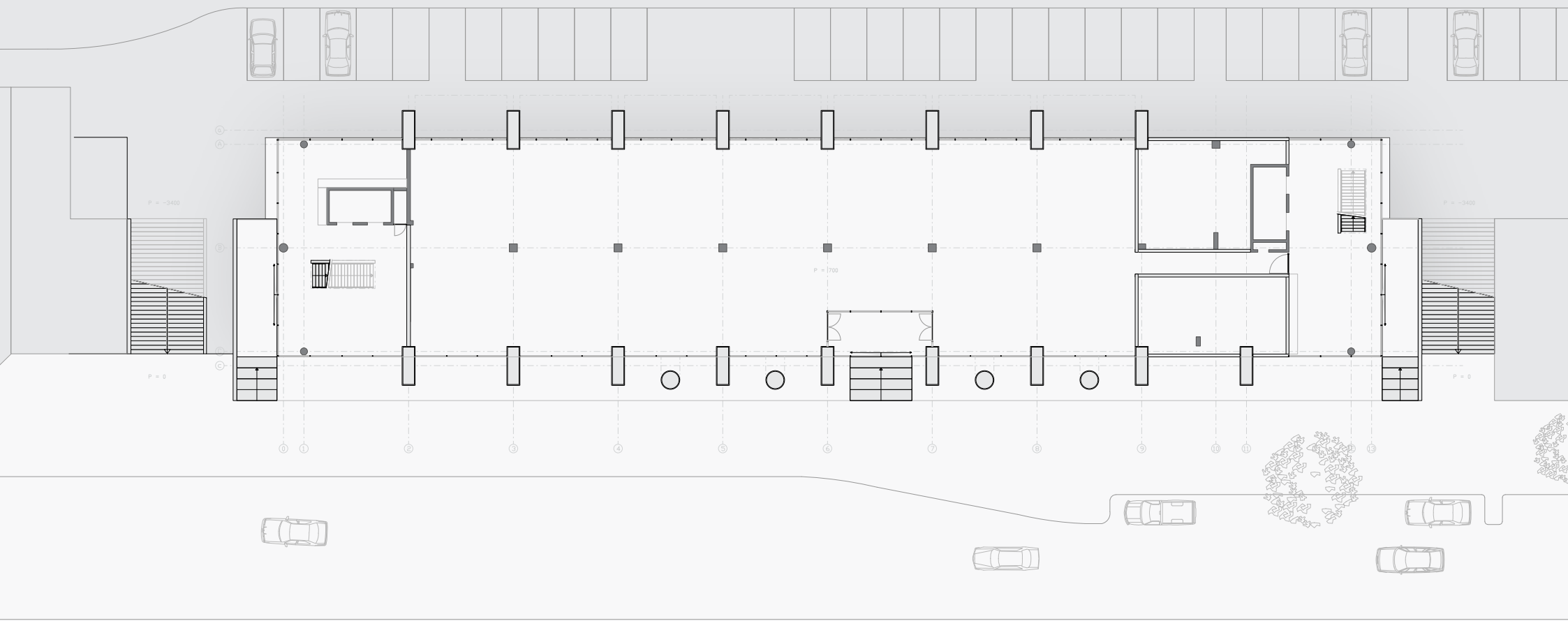
# opportunities



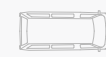
basement plan | - 6150



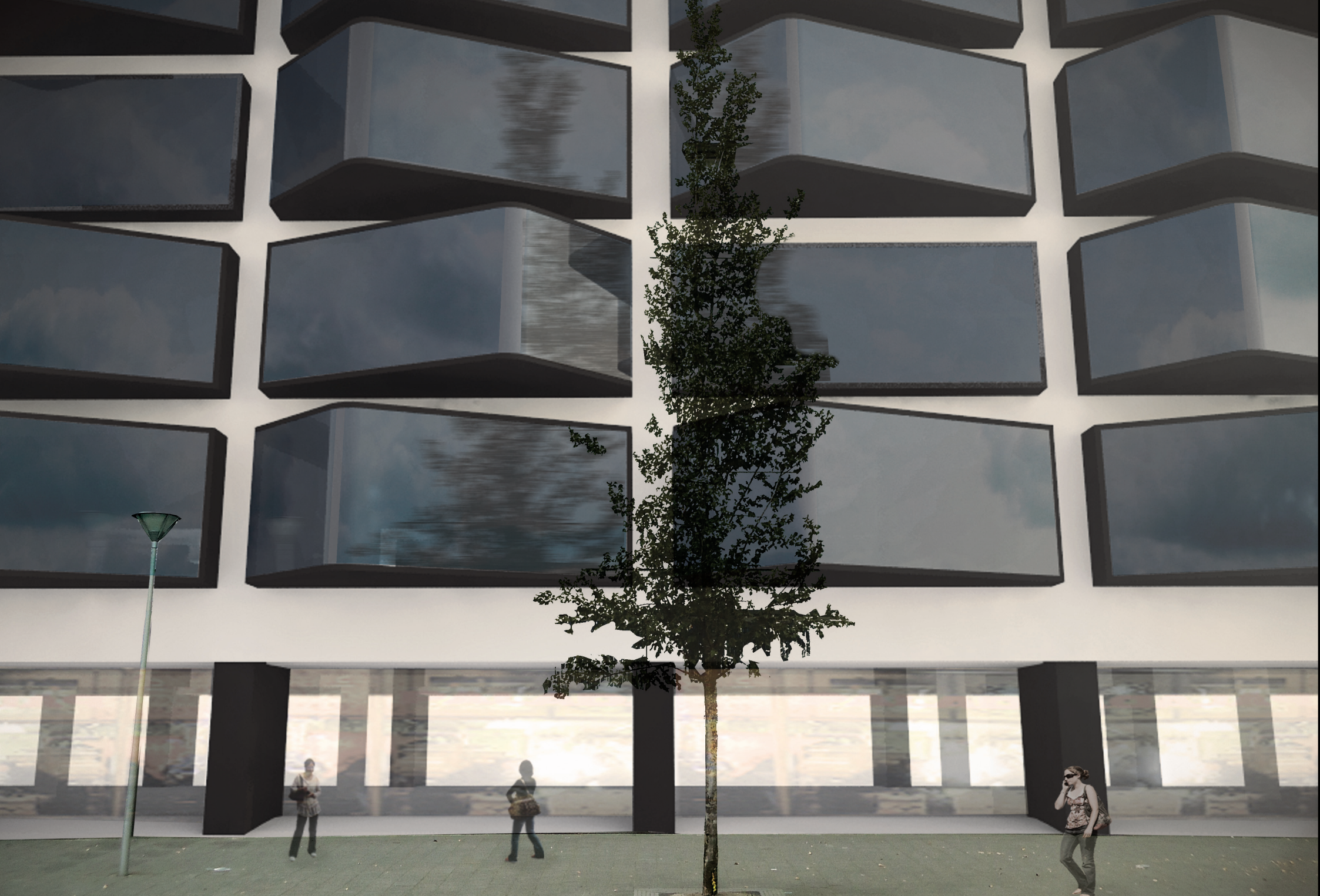
level hertekade | - 3400



level boompjes | + 700





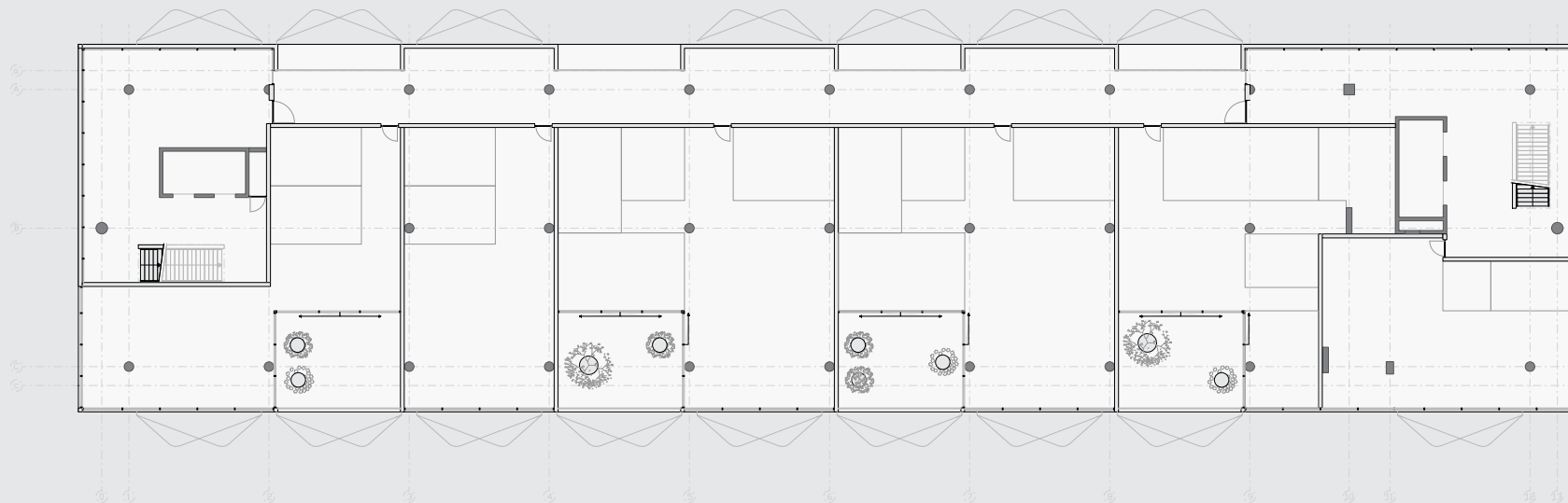




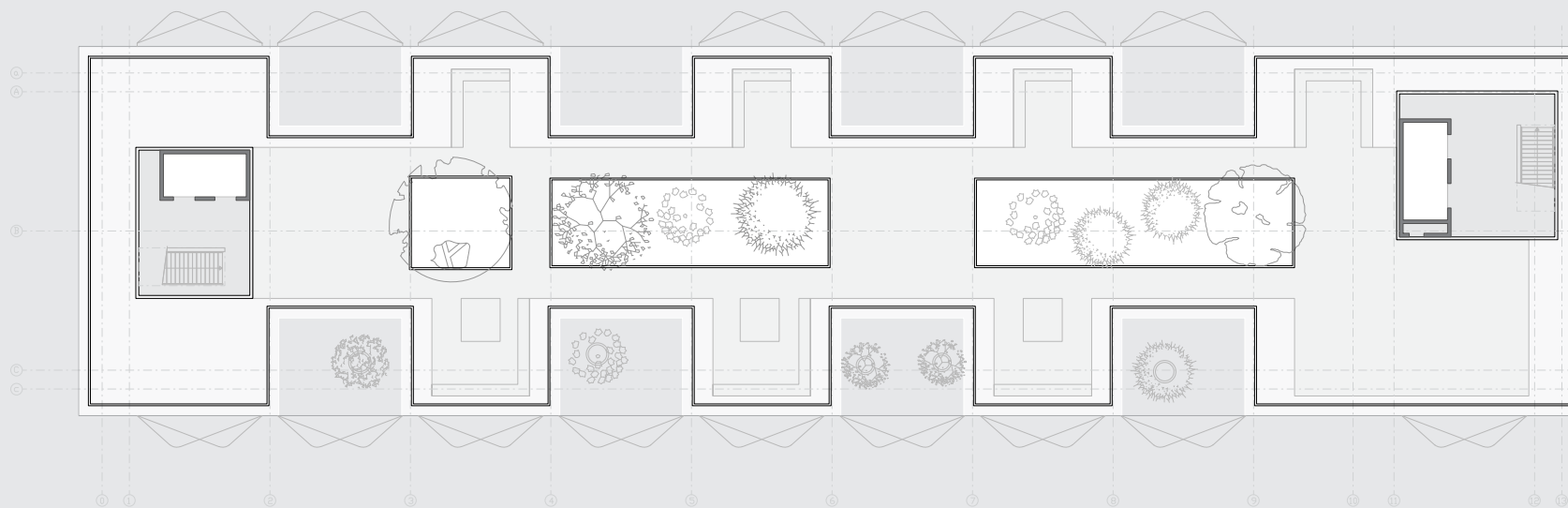








7th & 8th floor | + 23450 | +30150



roofplan | + 33950





# ■ summary



