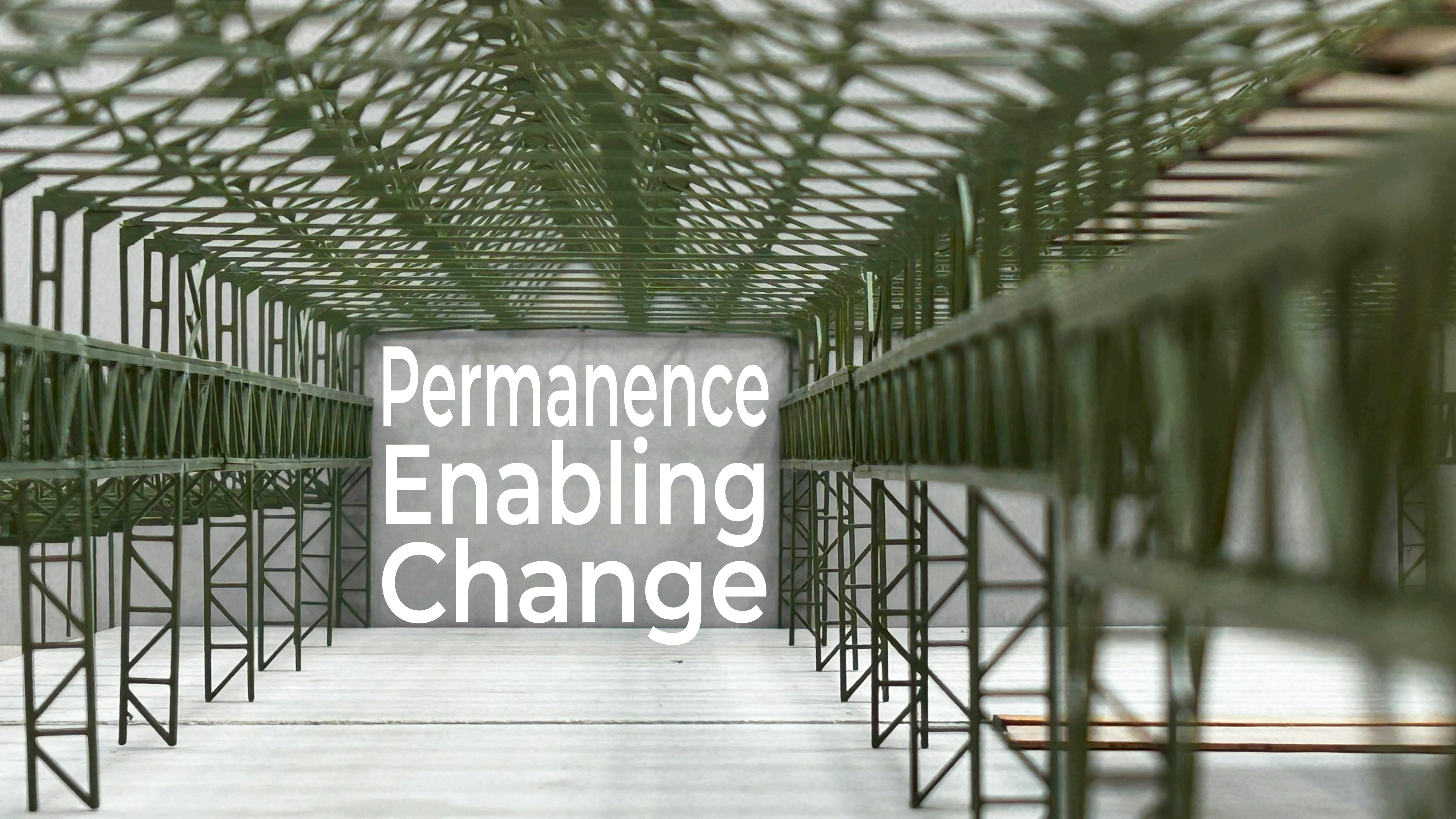


A photograph of a long, covered walkway or bridge. The structure is made of a green metal lattice roof supported by concrete pillars. The walkway recedes into the distance, creating a strong sense of perspective. The ground is a light-colored concrete or stone. The overall tone is muted and architectural.

Permanence Enabling Change

“Lets stop trying to predict the future.”

-Jonathan Teicher, 2014

A Rigid Framework

1850

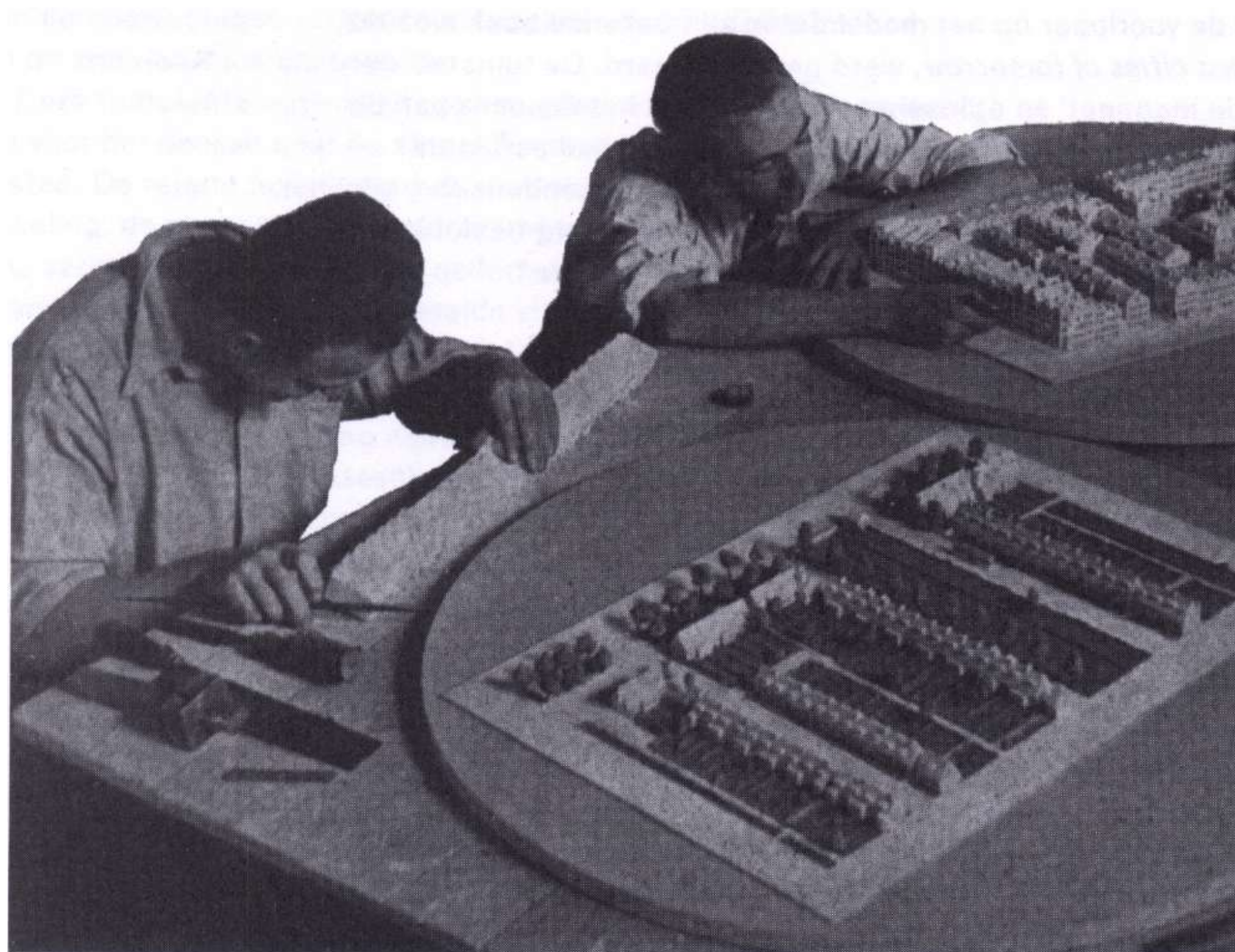
1860

1870

1880

1890

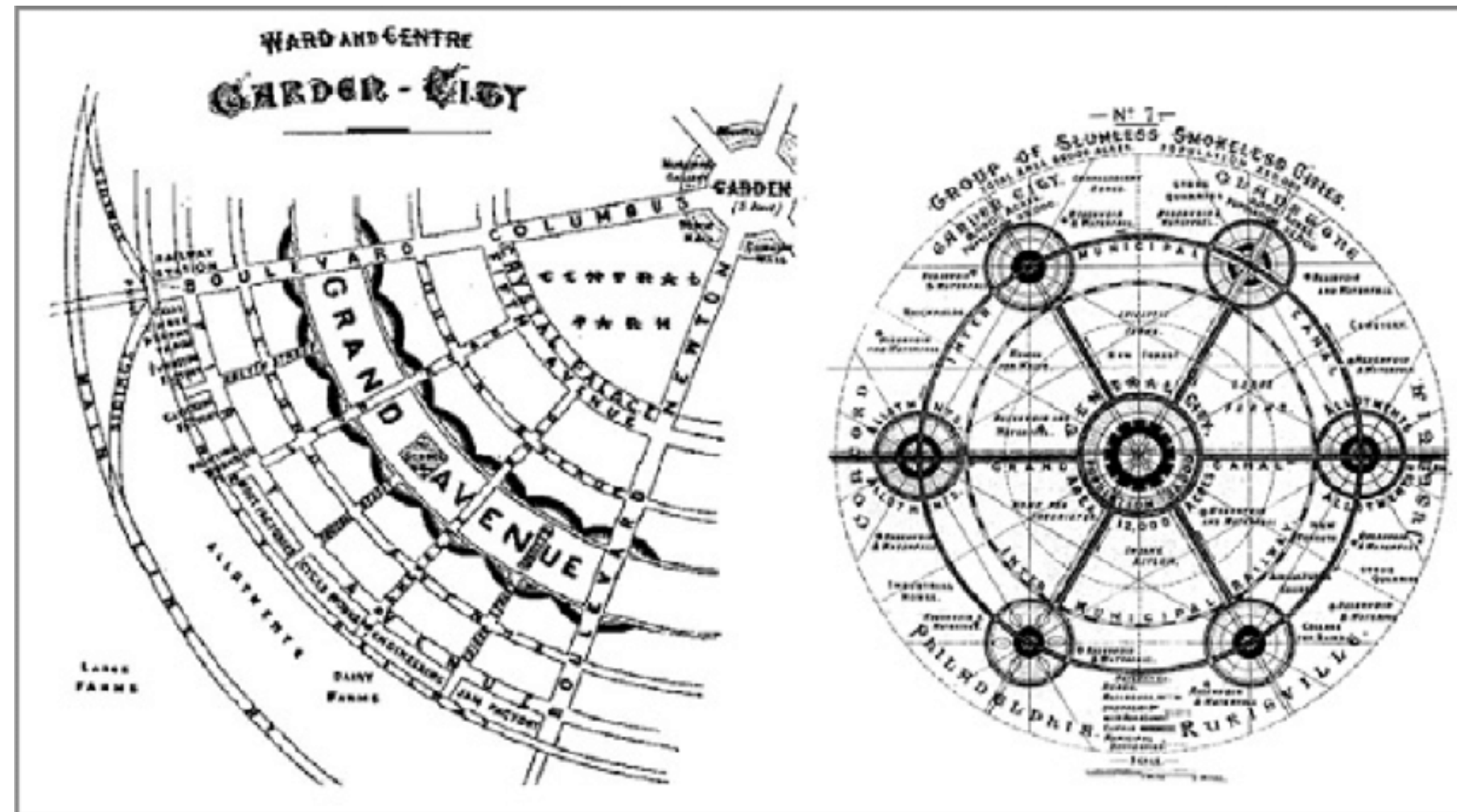
1900



Sinds het midden van de negentiende eeuw staan de begrippen massa en woningbouw direct met elkaar in verband. In Engeland en later in Duitsland bouwden progressieve industriëlen rond 1850 nieuwe woonwijken naast de fabriekscomplexen, buiten de hoge bevolkingsconcentraties van de stad. Zij hielden hiermee de prijsbepaling van de woningen, maar ook de mobiliteit en strijdbaarheid van de arbeiders in de hand. Tegelijkertijd boden deze nederzettingen een goede bescherming tegen epidemieën, smog en de zogenaamde 'sociale ziekten'. Huisvesting van de fabrieksarbeider werd een strategisch, politiek instrument om sociale conflicten te voorkomen en de produktiviteit te verhogen. Deze nederzettingen groeiden echter op den duur uit tot volledige fabriekssteden, met dezelfde condities die men had willen vermijden.

Het ontstaan van de moderne maatschappijvorm en het industriële tijdperk ging gepaard met een explosieve groei van de westerse metropolen. Tussen 1870 en 1900 verdubbelde bijvoorbeeld de bevolking van de Duitse steden. **De industriële revolutie opende het technisch perspectief op standaardisatie en massaproductie. De arbeidersbewegingen zetten de standaard voor politieke invloed van de anonieme mensenmassa.**

Deze turbulente ontwikkelingen zorgden voor totaal nieuwe condities voor het denken over de stedelijke samenleving en de vorm van de stad. De relatie tussen stad en platteland, de schaal van stadsontwikkeling, de economische onderbouwing maar ook de architectonische verschijningsvorm van de nederzettingen vormden de aanleiding tot vooral ideologisch tegengestelde visies. Huisvesting van de nieuwe arbeidersmassa speelde echter telkens een cruciale rol. De stedelijke massa was ontstaan.



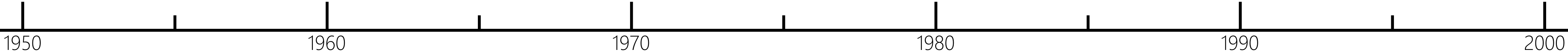
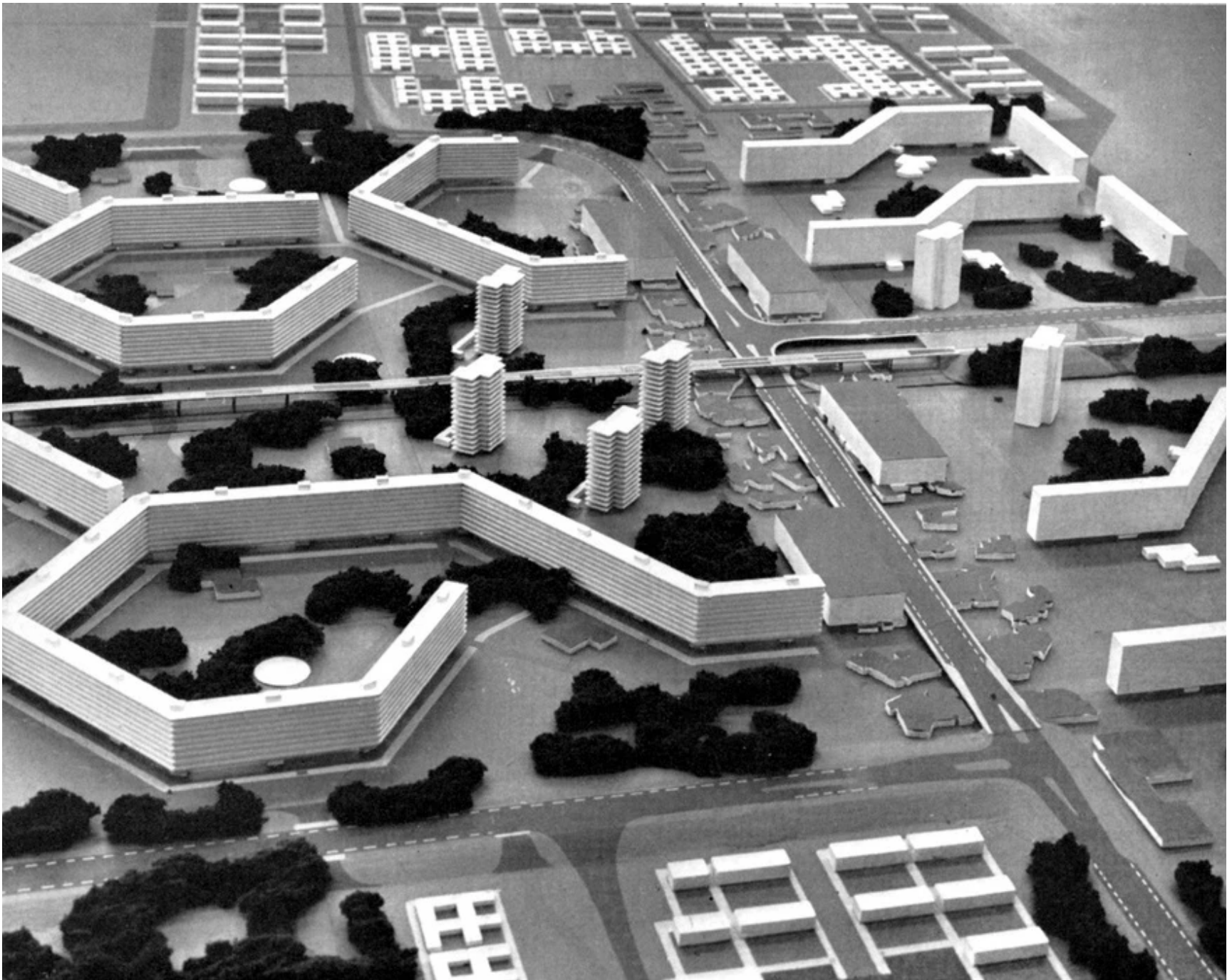
Rond de eeuwwisseling plaatste Sitte het begrip 'gemeenschap' als ideologische tegenhanger tegenover de realistische stedelijke ontwikkelingen; de rationalisering van de stedelijke economie en de anonimiteit van de massa's in de metropool. Zijn romantische visie op de architectuur van de stad – later ironisch veroordeeld door Le Corbusier – verbeeldde een hang naar de dorpsgemeenschap. Hij poogde de pittoreske architectuur een nieuwe plaats te geven binnen de processen van stedelijke groei.

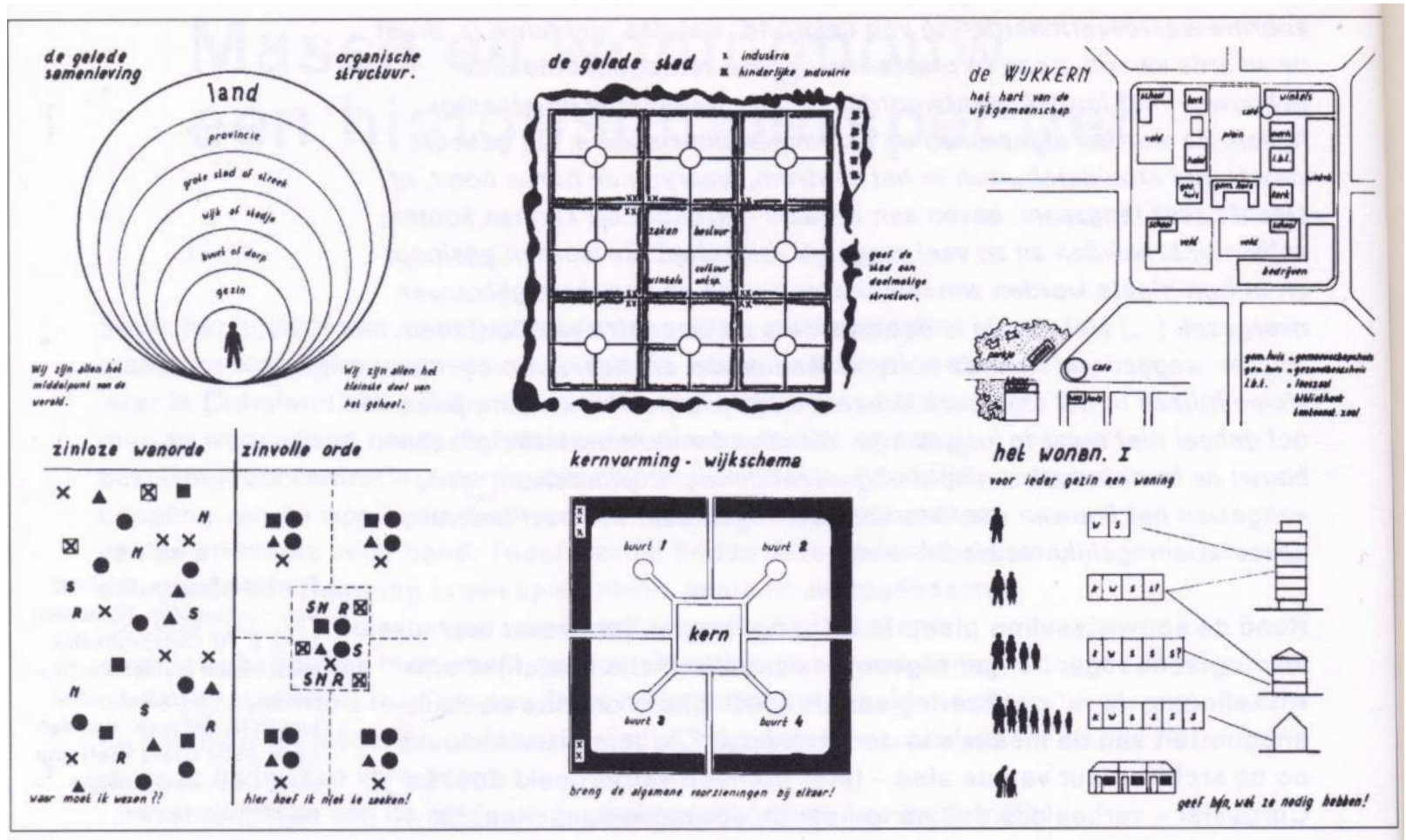
Later verschenen meer analytische benaderingen van de stadsontwikkelingen en nieuwe stadsmodellen. Howard ontwikkelde in 1898 de voorloper op het model dat in zijn bekende boek uit 1902, *Garden cities of tomorrow*, werd gepresenteerd. De tuinstad 'derde magneet' en oplossing gelanceerd in het dilemma van de keuze tussen stad en platteland. Het voorstel had een sterk schematisch karakter, waarin echter zowel in economische, sociale, als stedenbouwkundige zin een brede onderbouwing besloten lag. De stedelijke massa werd een planologisch gegeven.

Stelt u zich eens voor, geachte lezer, een gebied met een oppervlakte van 2400 ha, dat thans nog geheel agrarisch is en op de vrije markt is gekocht voor £ 40 per 4000 m², dus totaal £ 240.000. We stellen ons voor dat het geld voor de aankoop is bijeengebracht met hypotheekbrieven met een rente, gemiddeld niet hoger dan 4%. Het terrein met opstallen staat op naam van vier mannen die een verantwoordelijke positie bekleden, mannen wier rechtschapenheid en eerlijkheid algemeen erkend worden. Zij beheren het, in de eerste plaats als zekerheid voor de houders van de pandbrieven en in de tweede plaats voor de mensen van

Figure 3. (Source: Sulsters, W. (1994). Massa en woningbouw: Een historisch perspectief. OASE)







Het planningsproces van de volkshuisvesting had bestuurlijke en stedenbouwkundige instrumenten nodig om aan de politieke beloftes van de sociaal-democratische samenleving te kunnen voldoen. De stedelijke programma's werden volgens de dogma's van de CIAM uiteengerafeld in homogene, monofunctionele onderdelen; een vorm van decompositie van de stad om haar beheersbaar te maken. De afzonderlijke delen vormden de basis voor een rationele organisatie van de stad, waarin ruimtelijk en functioneel homogene onderdelen binnen een totaalplan geïsoleerd van elkaar werden gerealiseerd. In ontzagwekkende, legale planningsprocedures werd de architectuur van de stad gereduceerd tot een politiek en economisch haalbaar produkt. De organisatie van de bevolkingsmobiliteit en infrastructuur was van doorslaggevend belang in de planopzet. Een gerationaliseerde planningsmethode ging samen met grootschalige, geïndustrialiseerde systeembouw; het stedelijk 'montageproces' van Hilberseimers *Grossstadt* in praktijk gebracht. Het ultieme voorbeeld is natuurlijk de planning en realisatie van de Bijlmermeer in Amsterdam-Zuidoost. De wijk vormt een grotesk monument voor deze vorm van centrale planning uit de periode van hoogconjunctuur van de nationale economie.

De overheid nam de taak van de volkshuisvesting op zich en bouwde tevens een verfijnd netwerk van sociale voorzieningen op binnen een cultus van economische vooruitgang. De stedeling werd slechts zijdelings gerepresenteerd in kwantitatieve eenheden zoals woningbezetting, woningdichtheid en wijkomvang. De stadsbewoner werd genummerd en verzorgd.

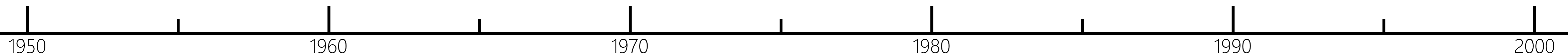
De stadsspoorlijnen bedienen het gehele gebied zodanig, dat alle



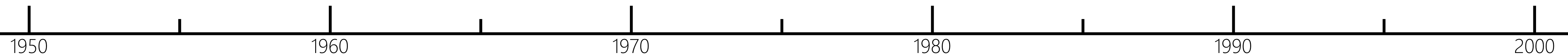
In het algemeen werden de taken die de overheid uitvoerde te aanzien van het maatschappelijk verkeer gezien als inbreuk op het private leven van het individu. De vertrouwensbasis voor politiek en planning ging daarmee grotendeels verloren. De anonieme gebrui dwong invloed af in het proces van stadsplanning en -ontwerp. De karakteristieke 'stedelijkheid' van de bestaande historische stad werd opnieuw als uitgangspunt gesteld in de stadsvernieuwingsoperaties van de jaren zeventig. De stadsbewoner kreeg een stem inspraak.

Het is voor architecten blijkbaar moeilijk om zich voor te stellen dat bouwwerken kunnen ontstaan zonder hun optreden. Nog moeilijker het om te begrijpen dat door de eeuwen heen miljoenen zich gehuisd hebben zonder tussenkomst van architecten, en dat de resultaten geven van een naar tijd en plaats optimaal bereikbare harmonie tussen mens en materiële omgeving. Is men eenmaal over deze schok heen, dan wordt de situatie duidelijk. Huisvesting is een sociaal proces en technisch-organisatorische in de tweede plaats. De architect, opgevoerd in de gedachte dat hij moet bepalen hoe alles eruit moet zien, geprecupeerd met de gedachte aan het zelfstandige bouwwerk-als-werkstuk heeft de illusie gehad dat huisvesting een kwestie van ontwerpen was. Nu niet een ontwerpen van een bouwwerk, maar van heel veel, en nu steeds wordt gewerkt onder deze dwanggedachte. Het resultaat is op zijn best architectuur. Nimmer huisvesting in de oorspronkelijke zin (...) Een woning is geen ding dat je ontwerpen kan. Een woning is een daad.⁵

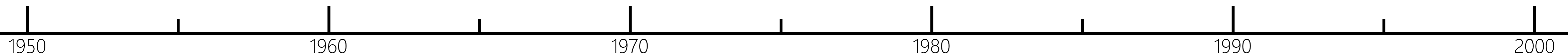
**People change,
Society changes,
Cities change,**



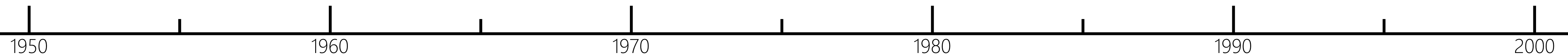
Everything changes.



Lets stop trying to predict the future



and start designing for change.



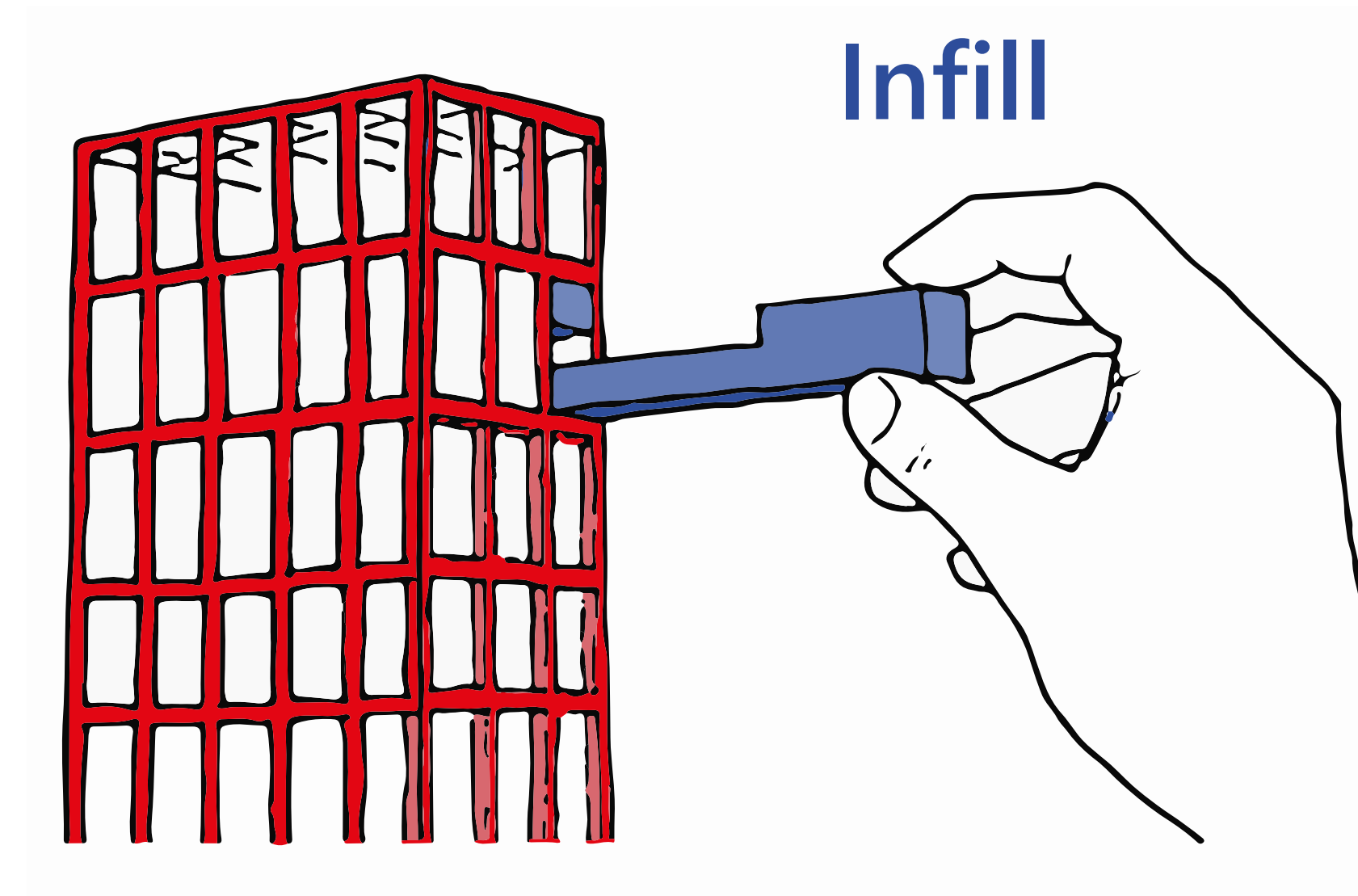
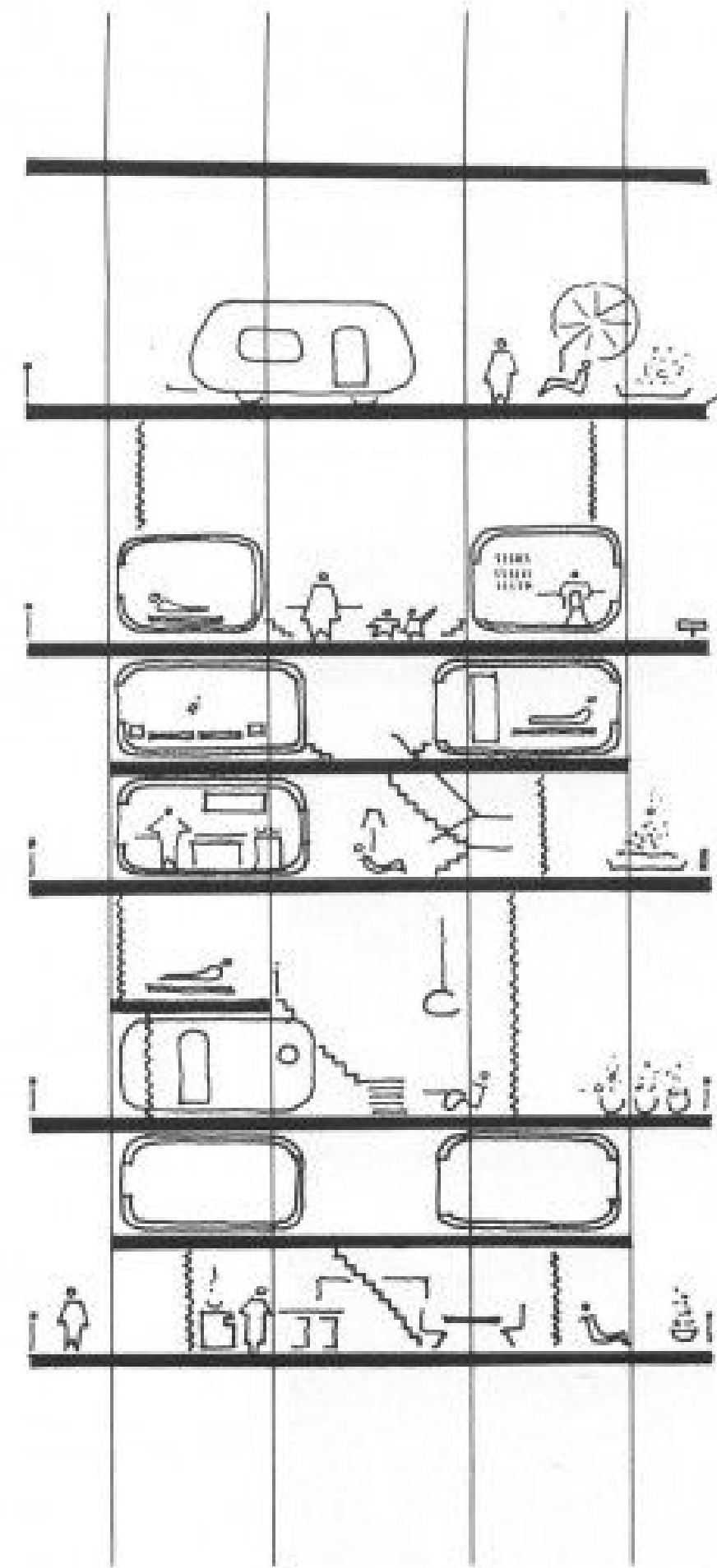
Towards An Open Framework



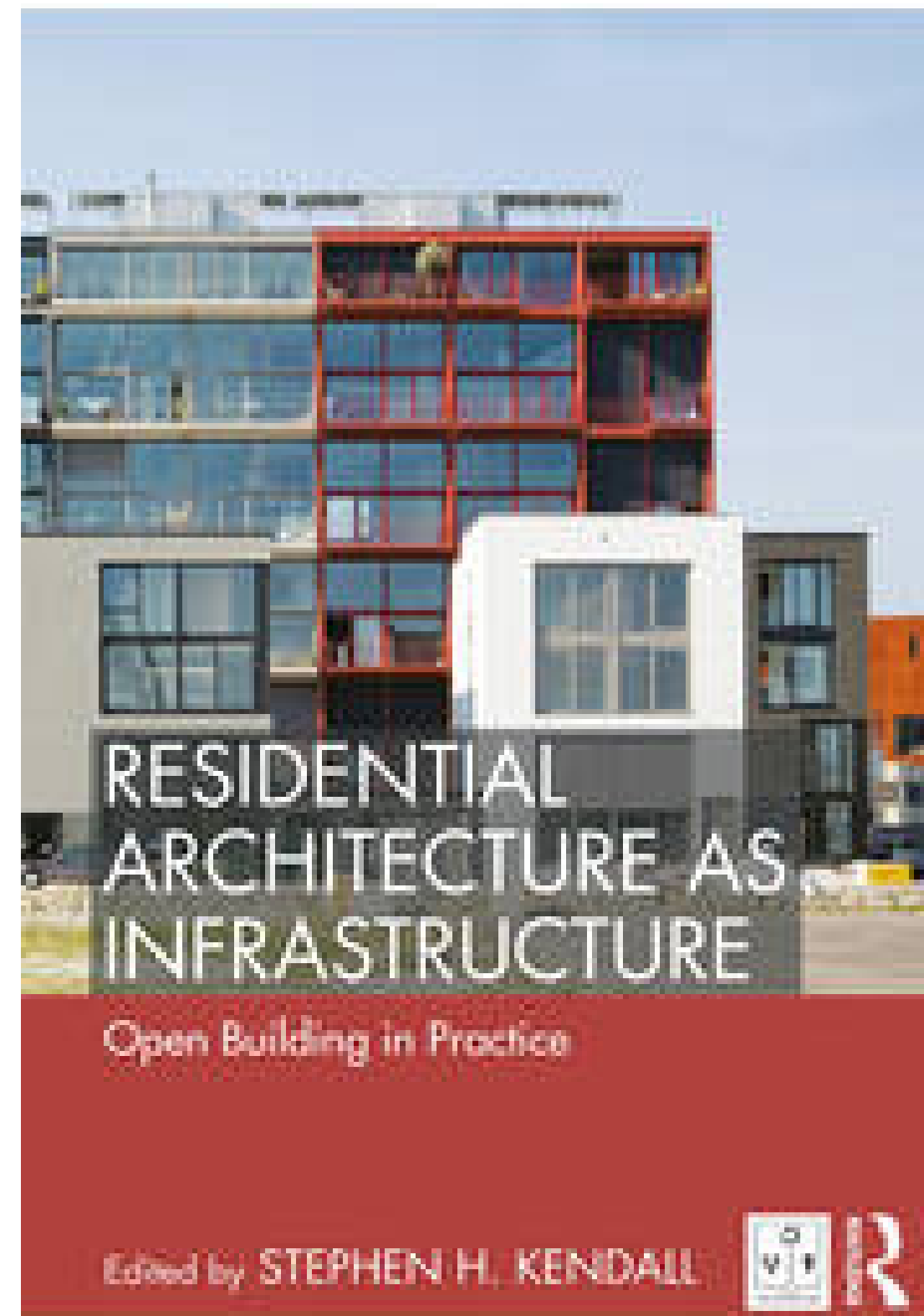
Research about Open Building

Research question

Which Open Building strategies from existing case studies have been successfully applied and provide a solid foundation for architectural design based on the principles of Open Building?



Support



Design criteria for Open Building

Support

1. The Support provides sufficient capacity. Which means it allows for a variety of layouts, flexible reconfiguration of unit boundaries and accommodating varying functions.

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Infill

4. The infill is compatible with the Support
5. The infill can independently be assembled, adjusted or disassembled

Support

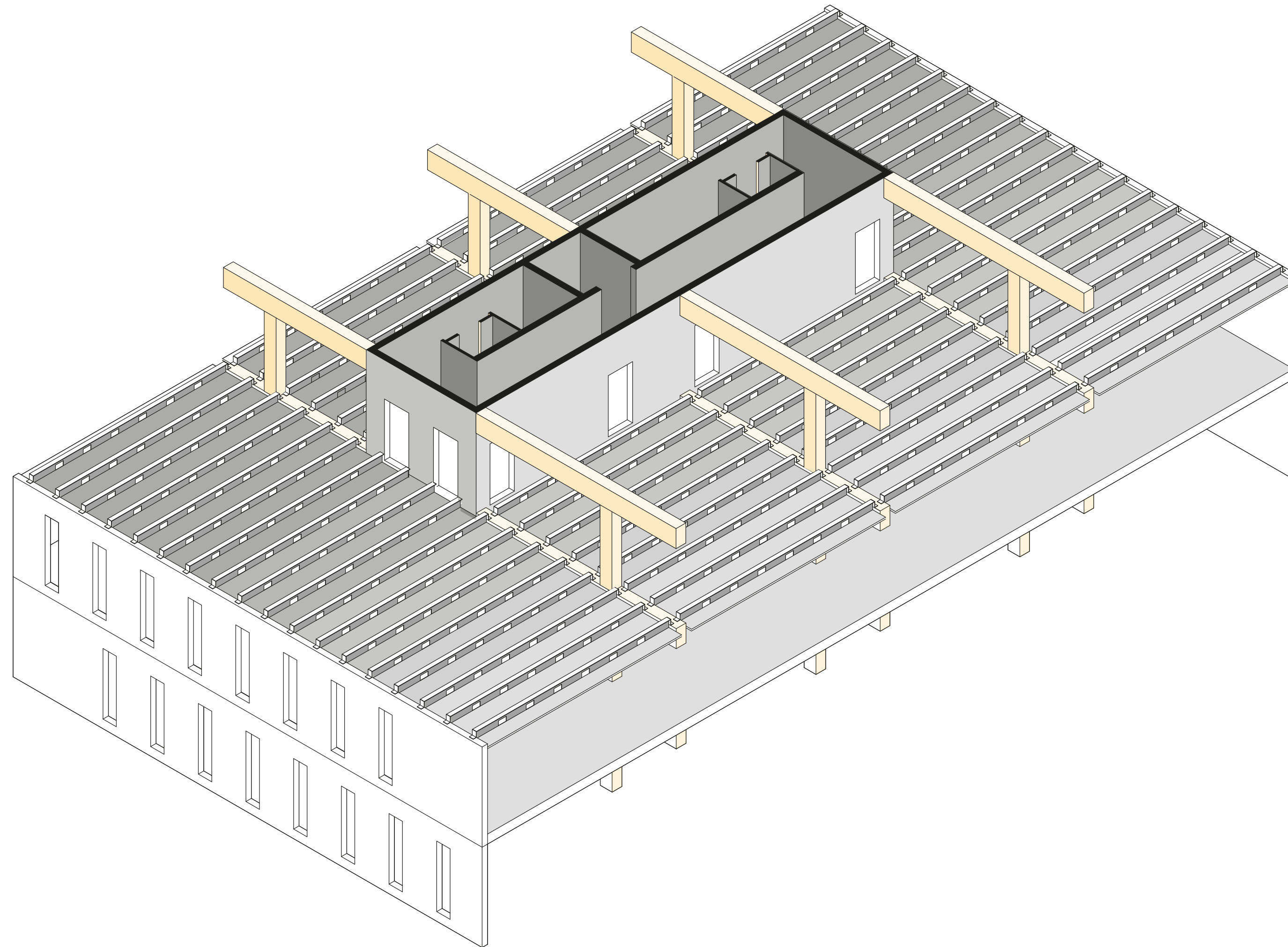
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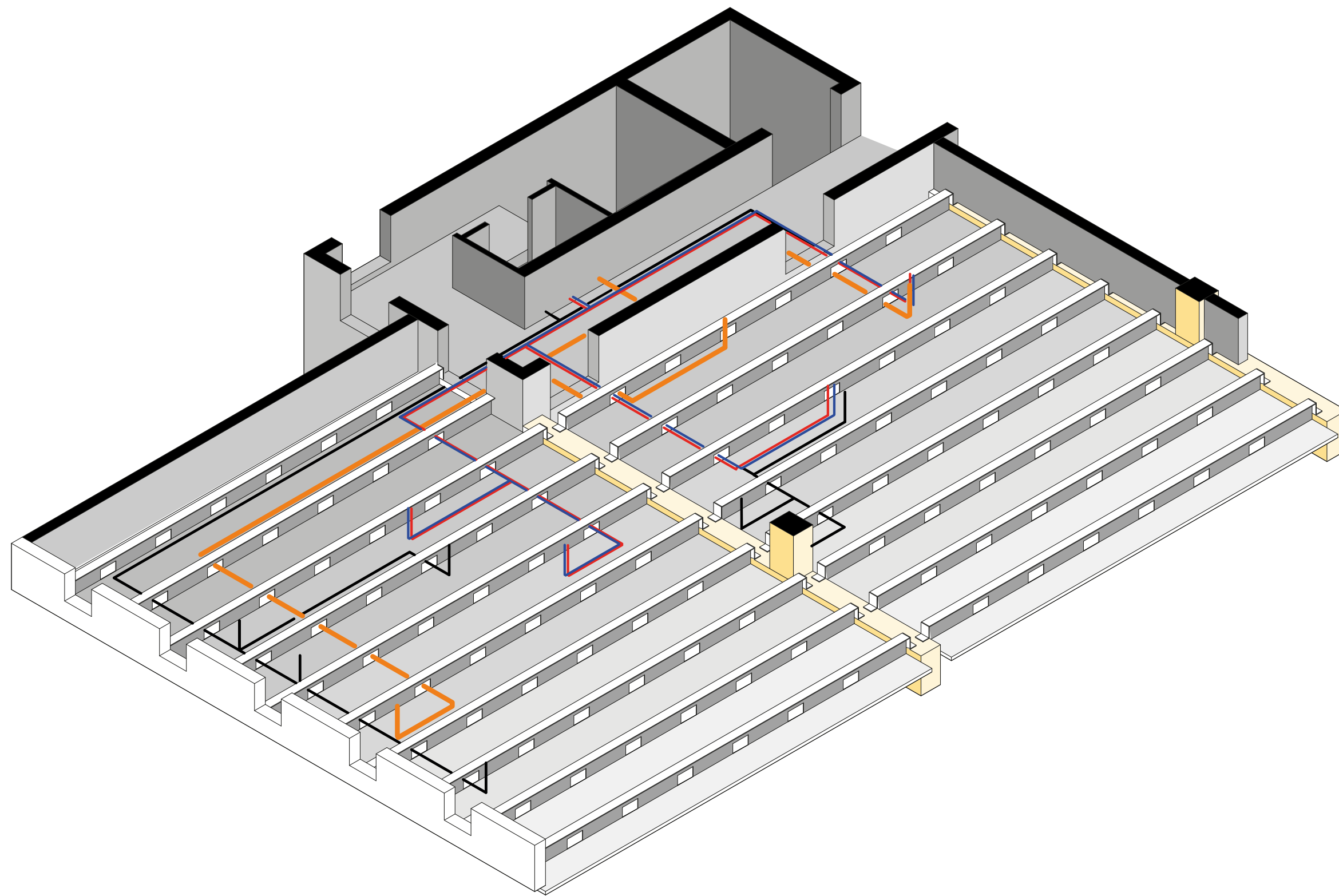
4. The infill is compatible with the Support
5. The infill can independently be assembled, adjusted or disassembled
6. The façade is part of the adaptable infill

Design strategies for Open Building

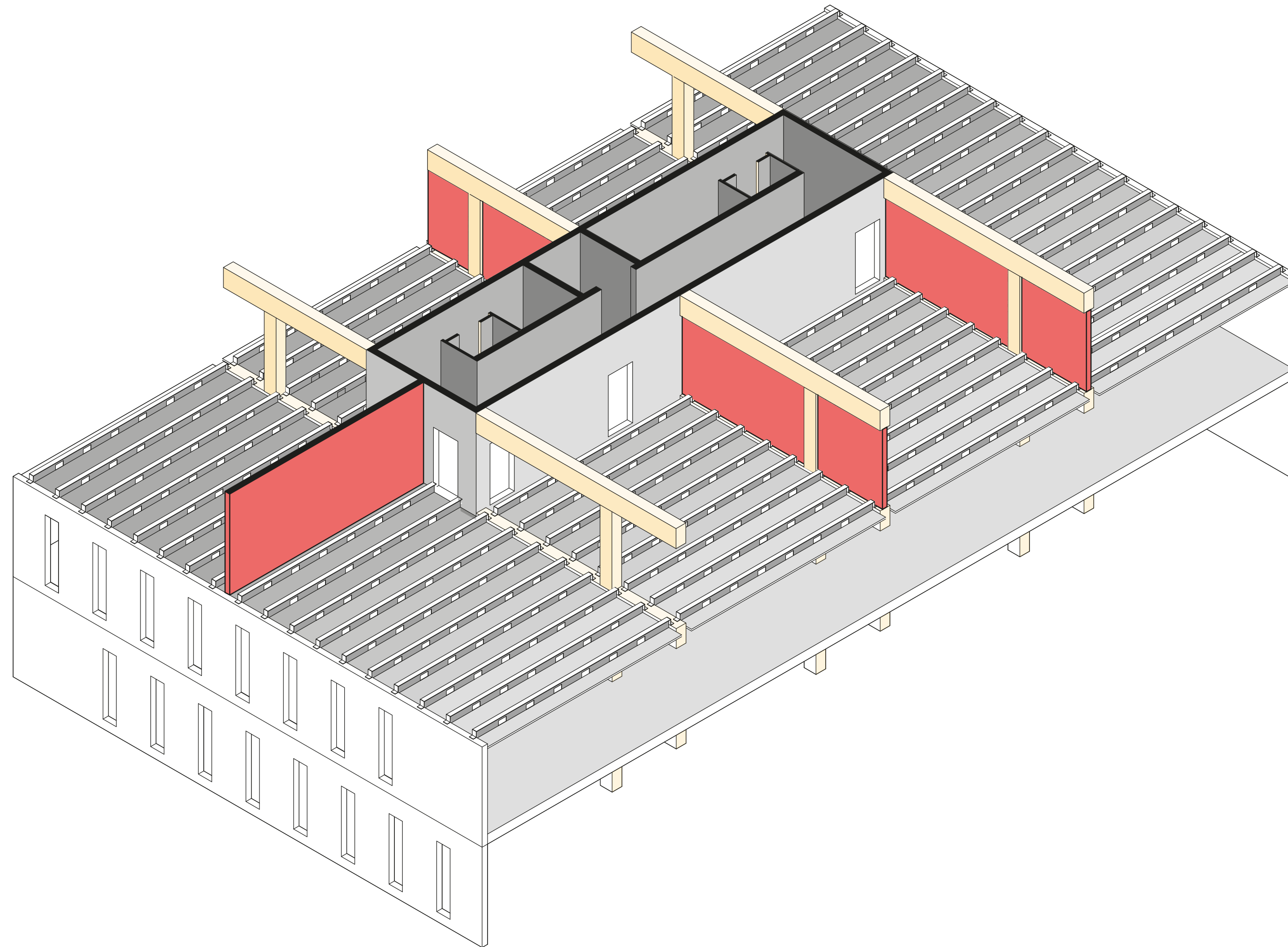
1. Open structural framework



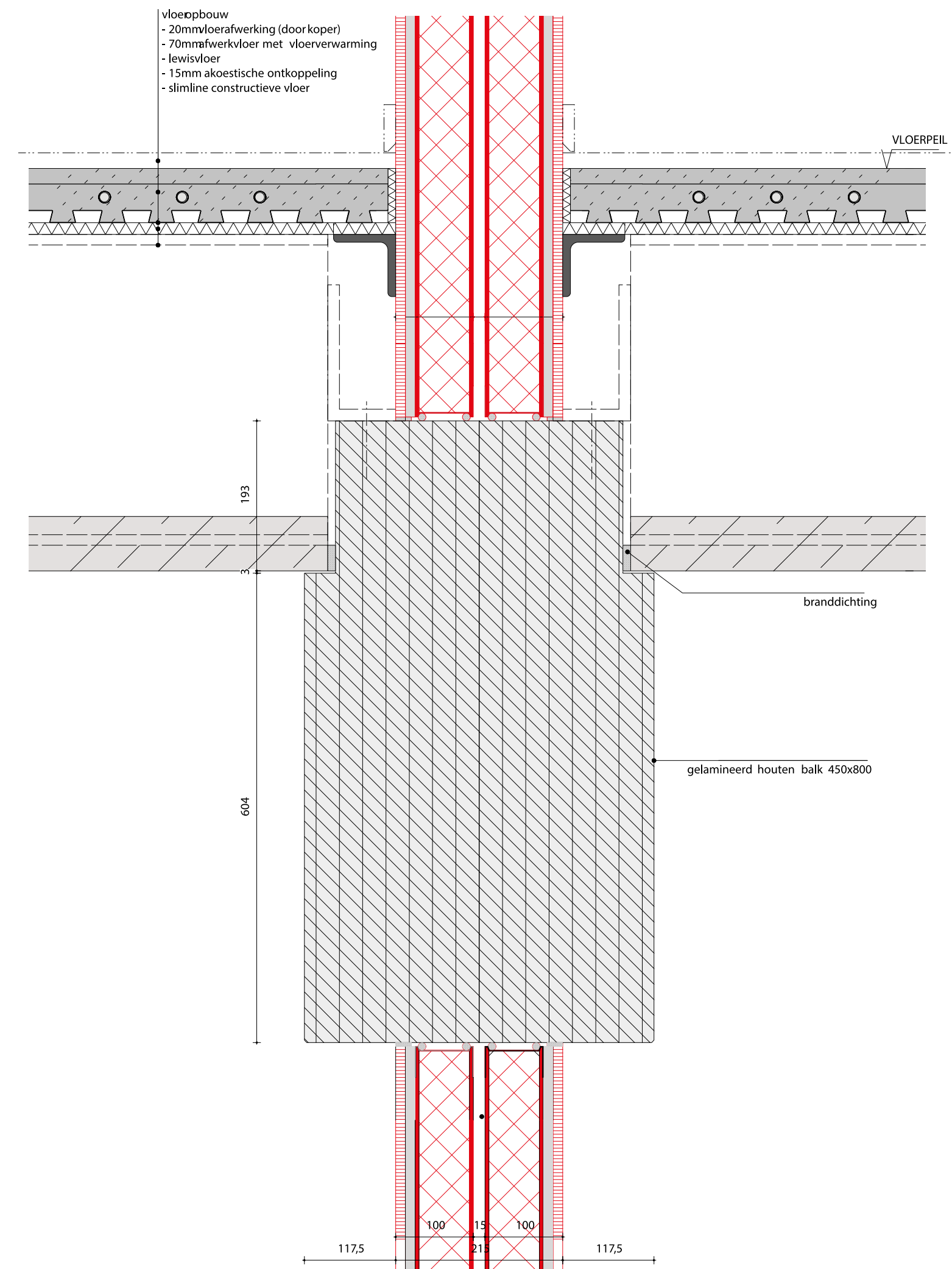
2. Service infrastructure integrated through raised floors and lowered ceilings.



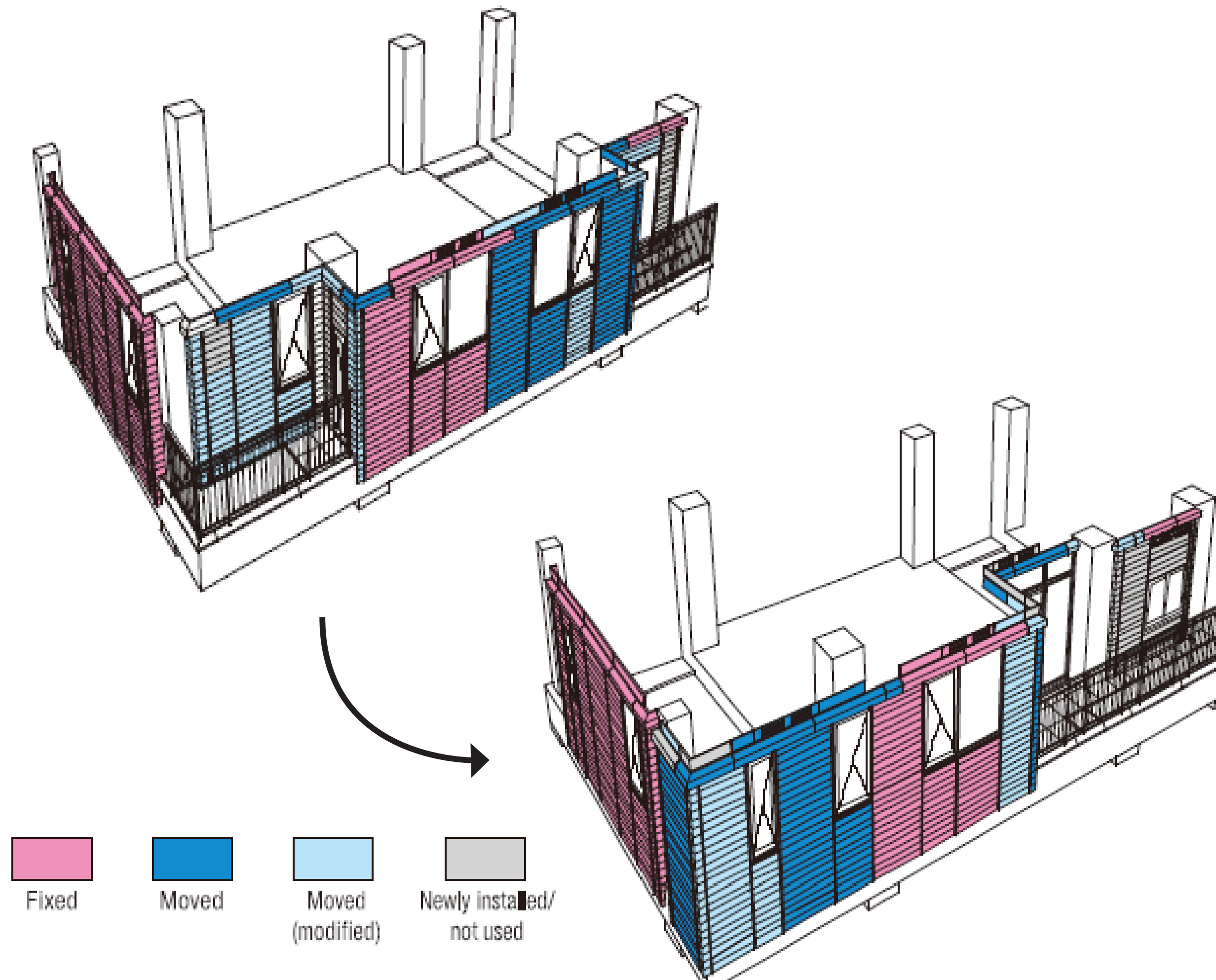
3. Flexible partition systems



4.. Dry assembly of partition systems



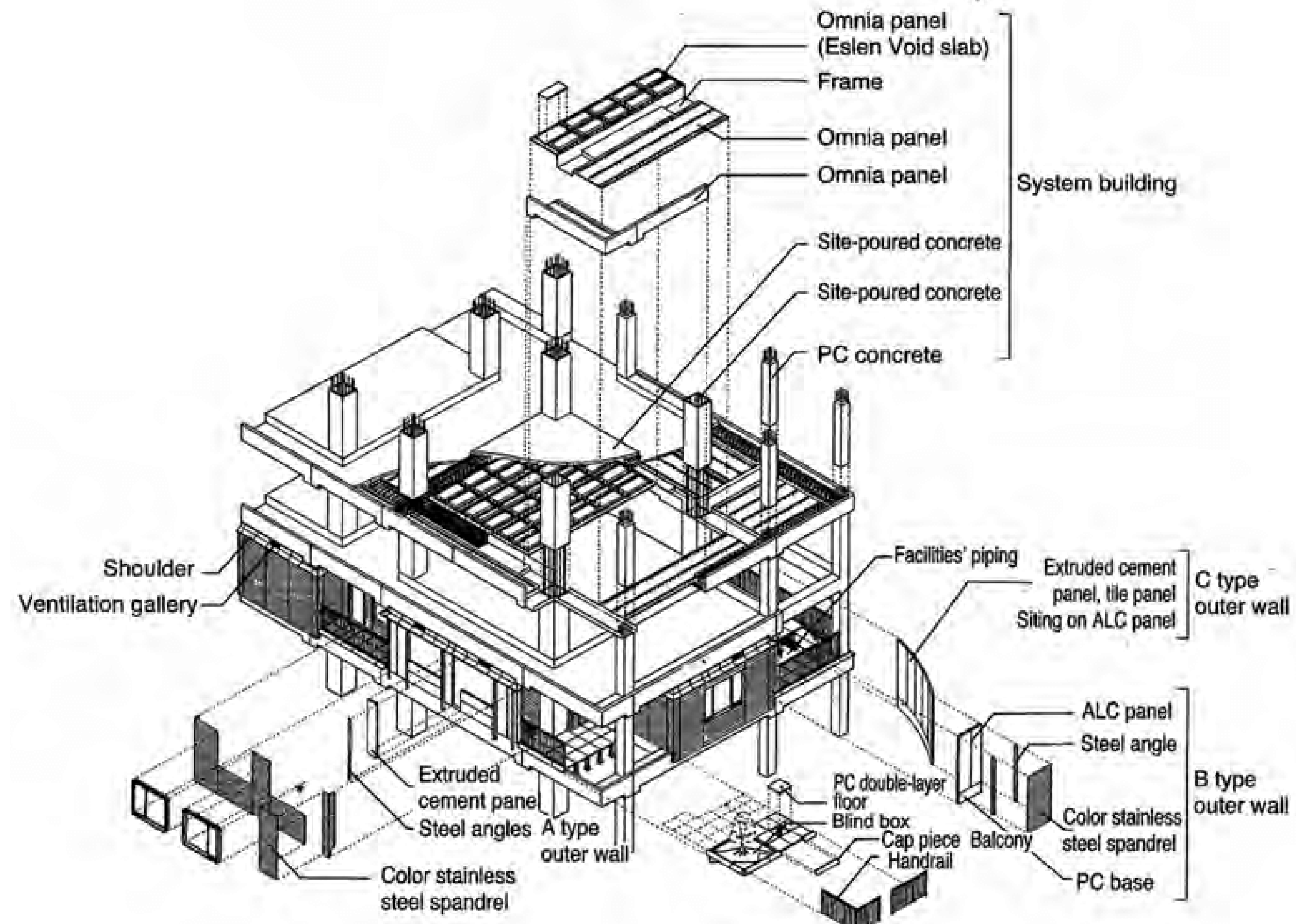
5. Adaptable façades



6. Increased load-bearing strengths



7. Modular gridgrid framework



8. User-driven customization

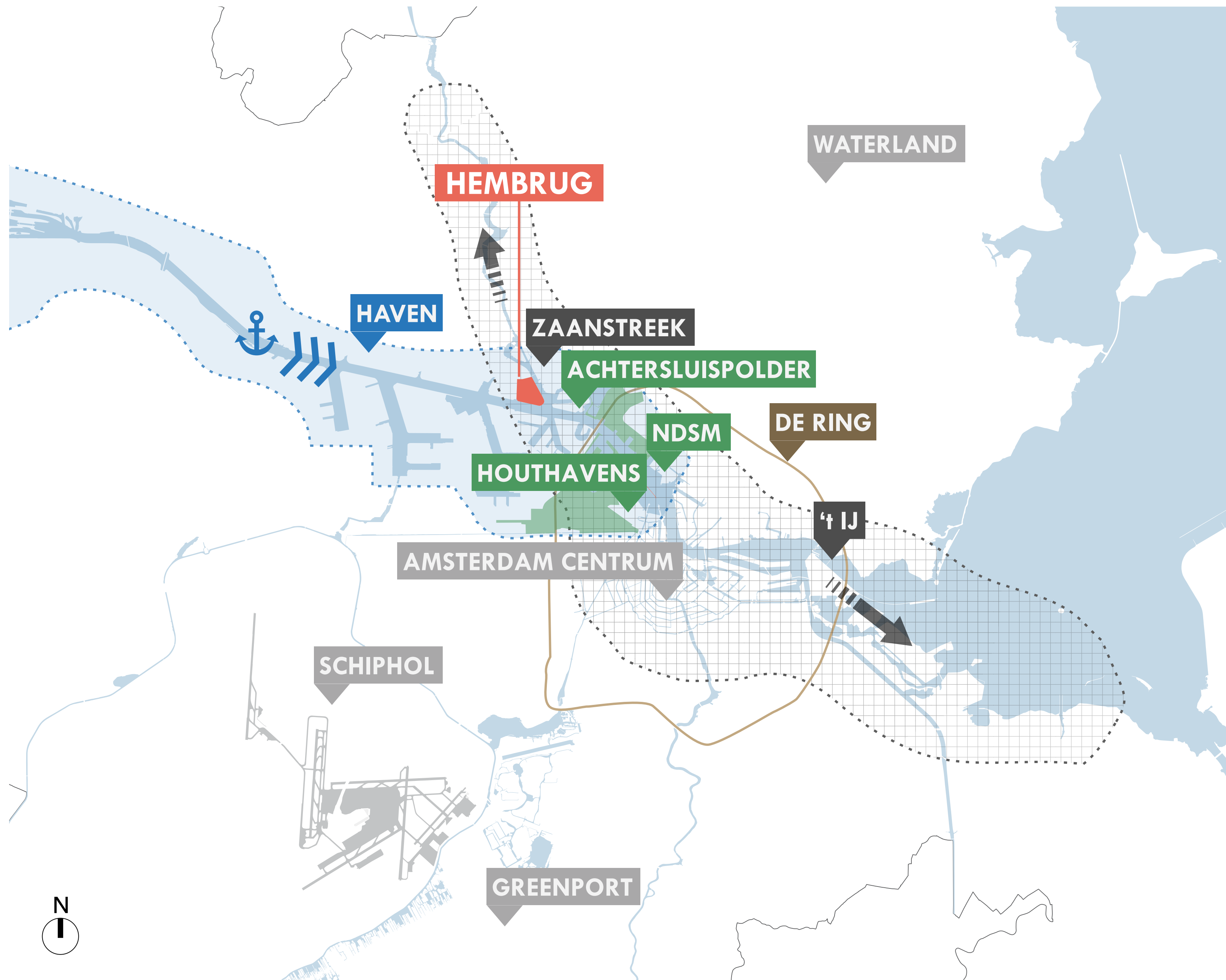


**People change,
Society changes,
Cities change,**

The Design



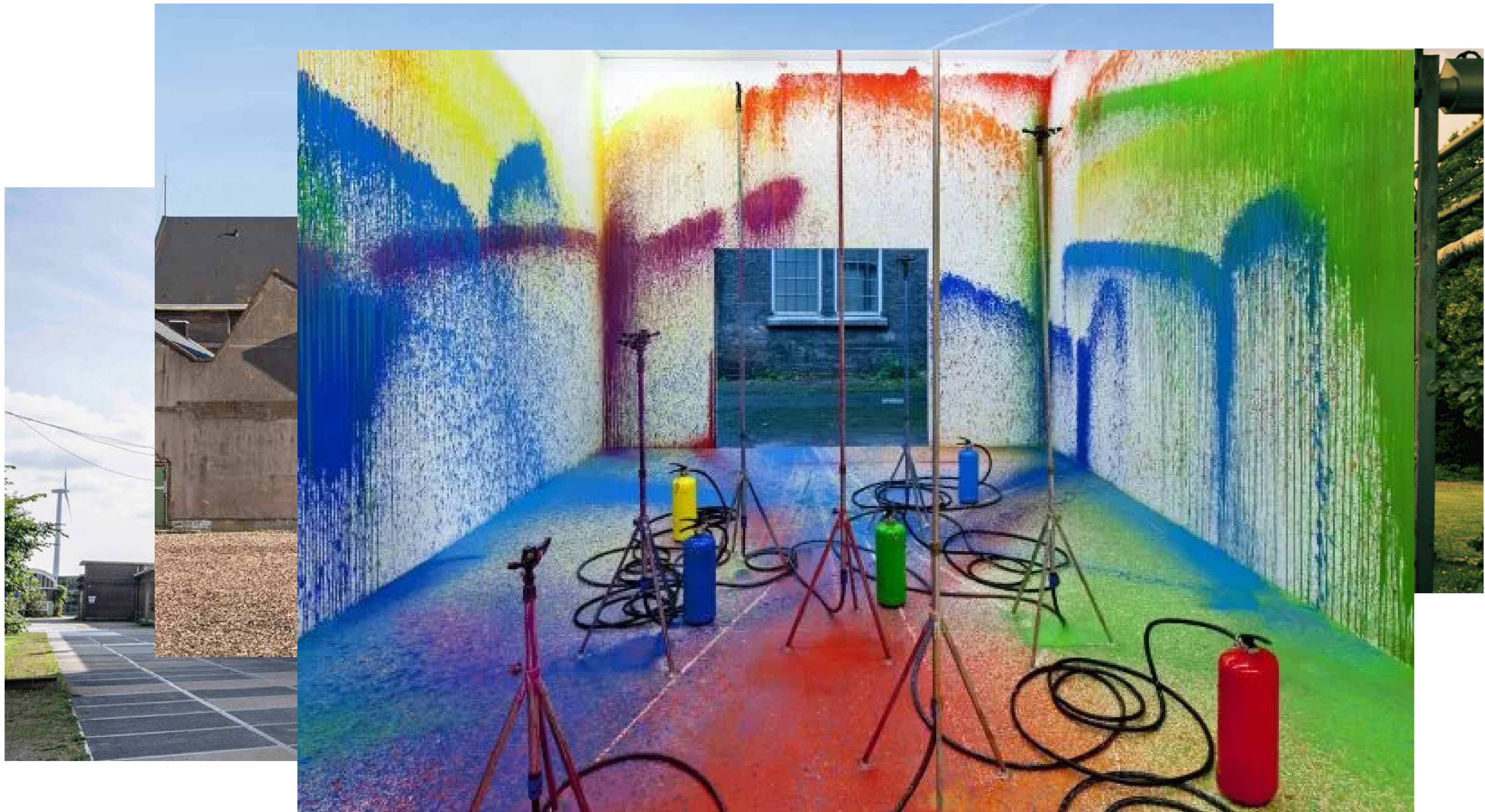
Hembrugterrein



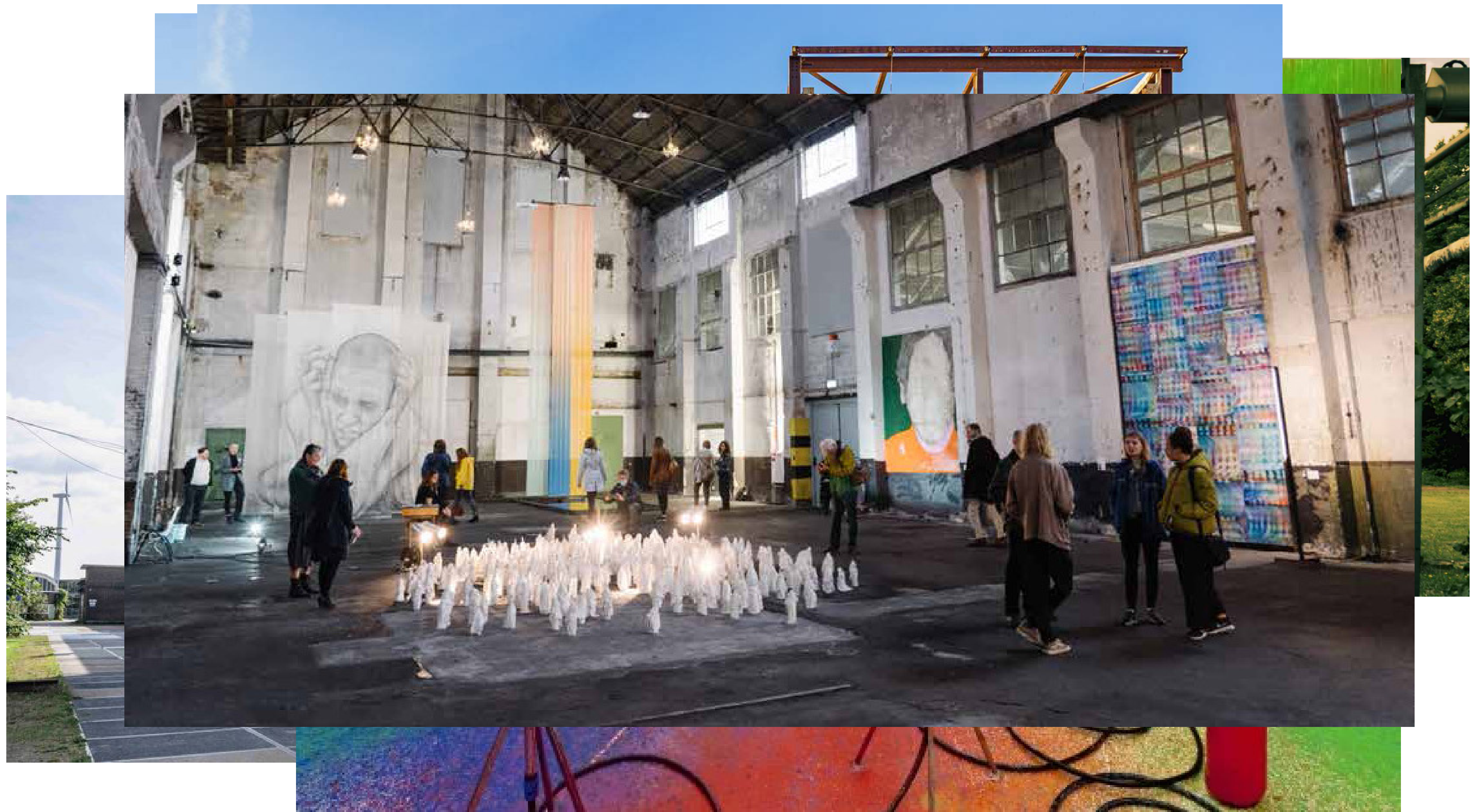








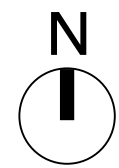








1ha



1ha





1ha



1ha



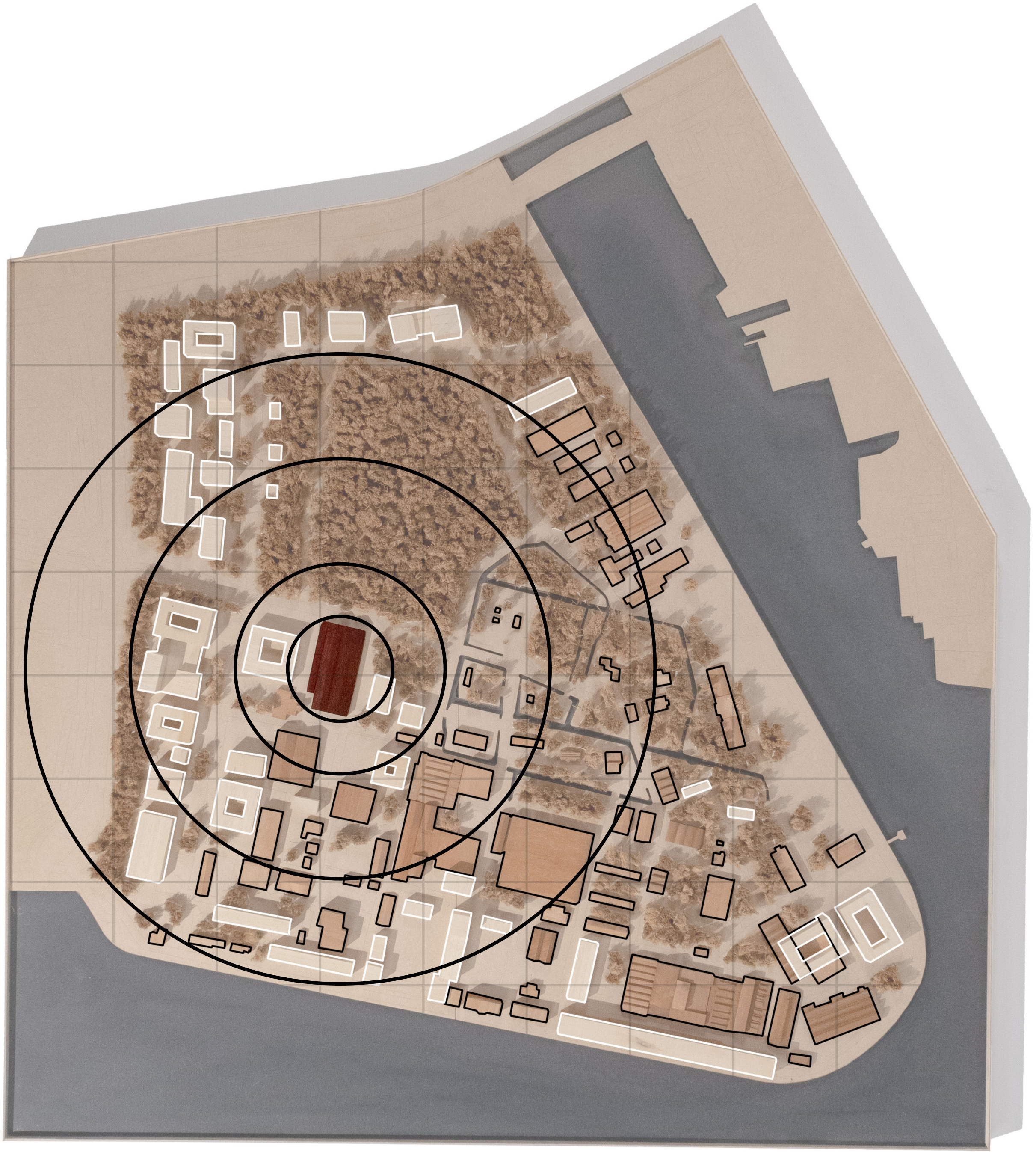
1ha



1ha

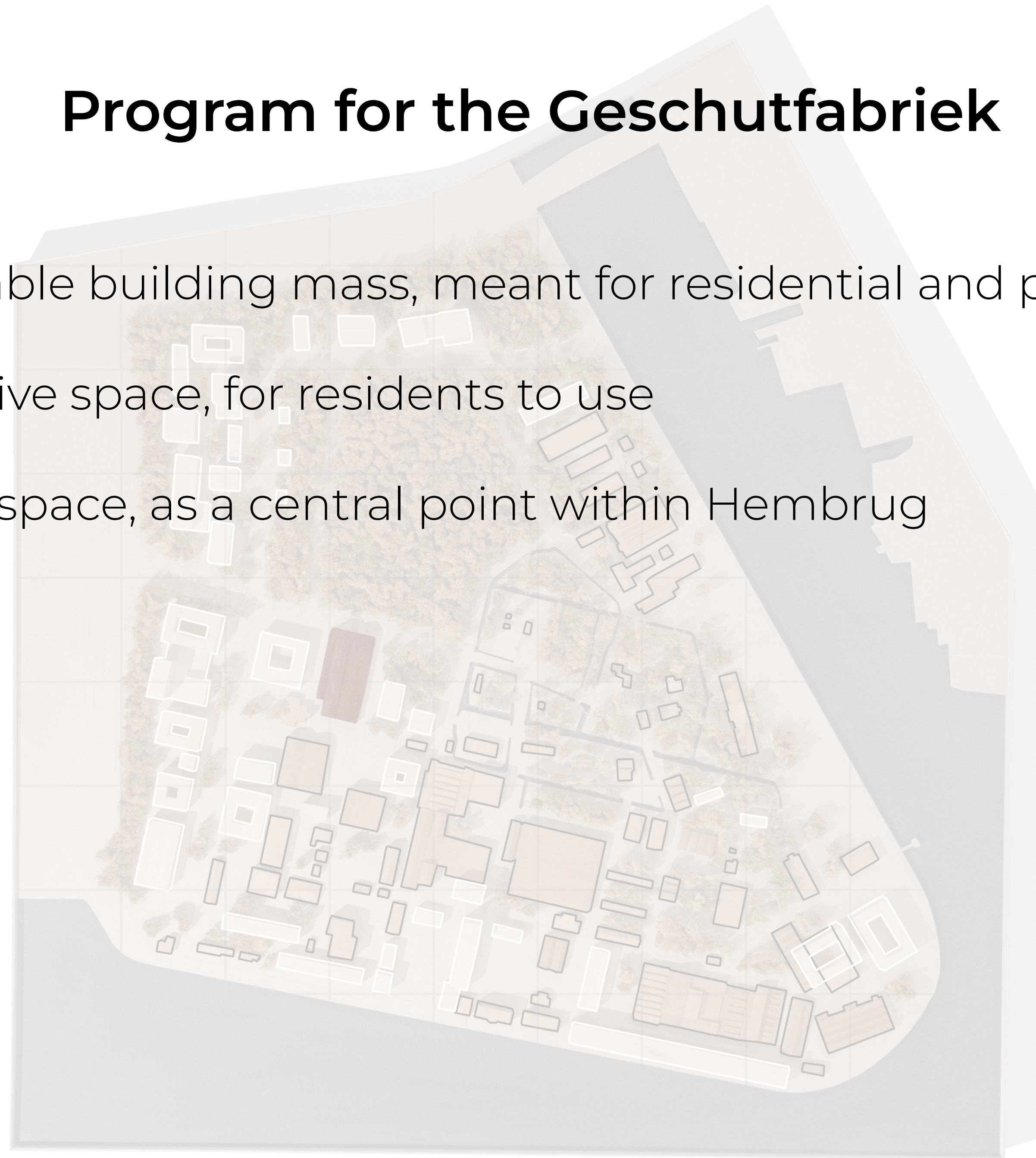


1ha



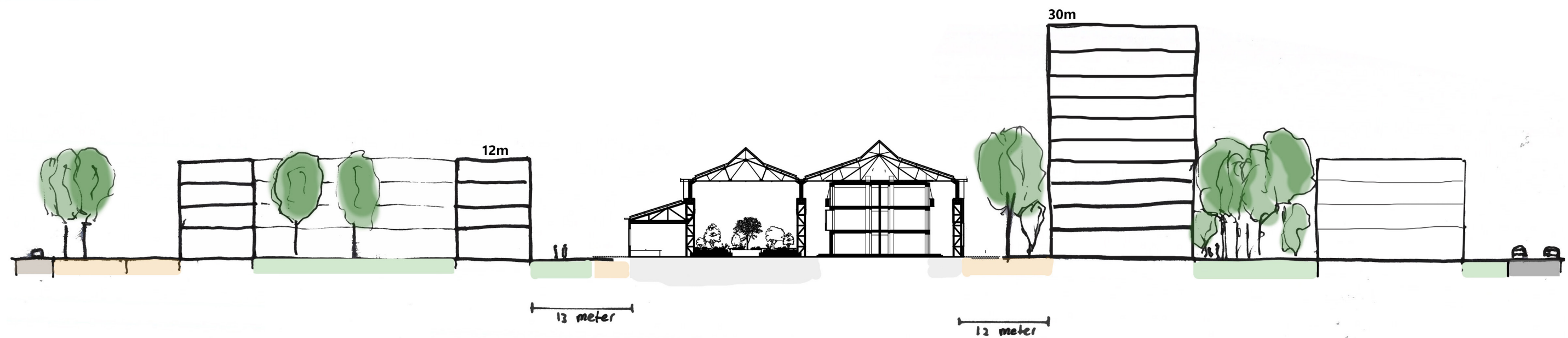
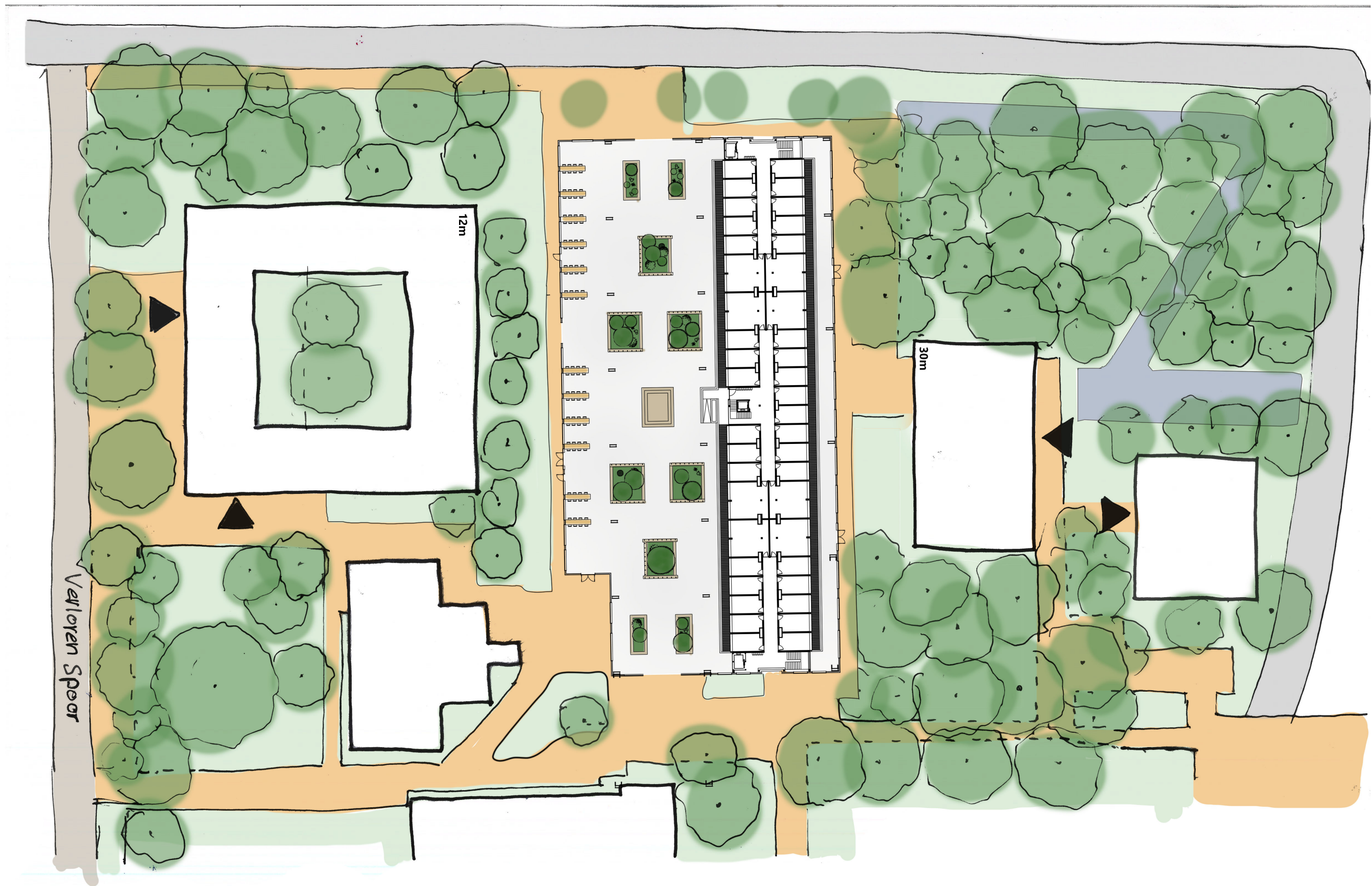
Program for the Geschutfabriek

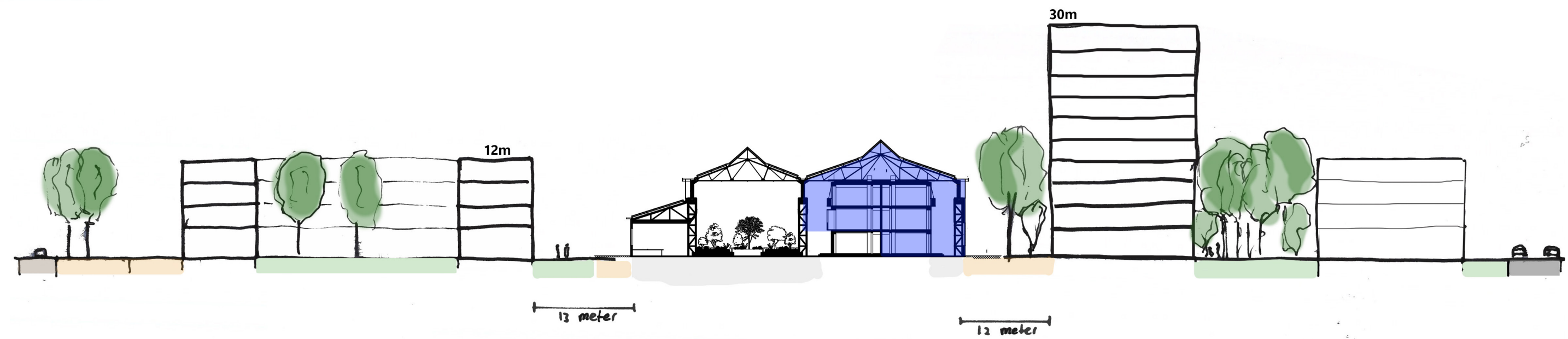
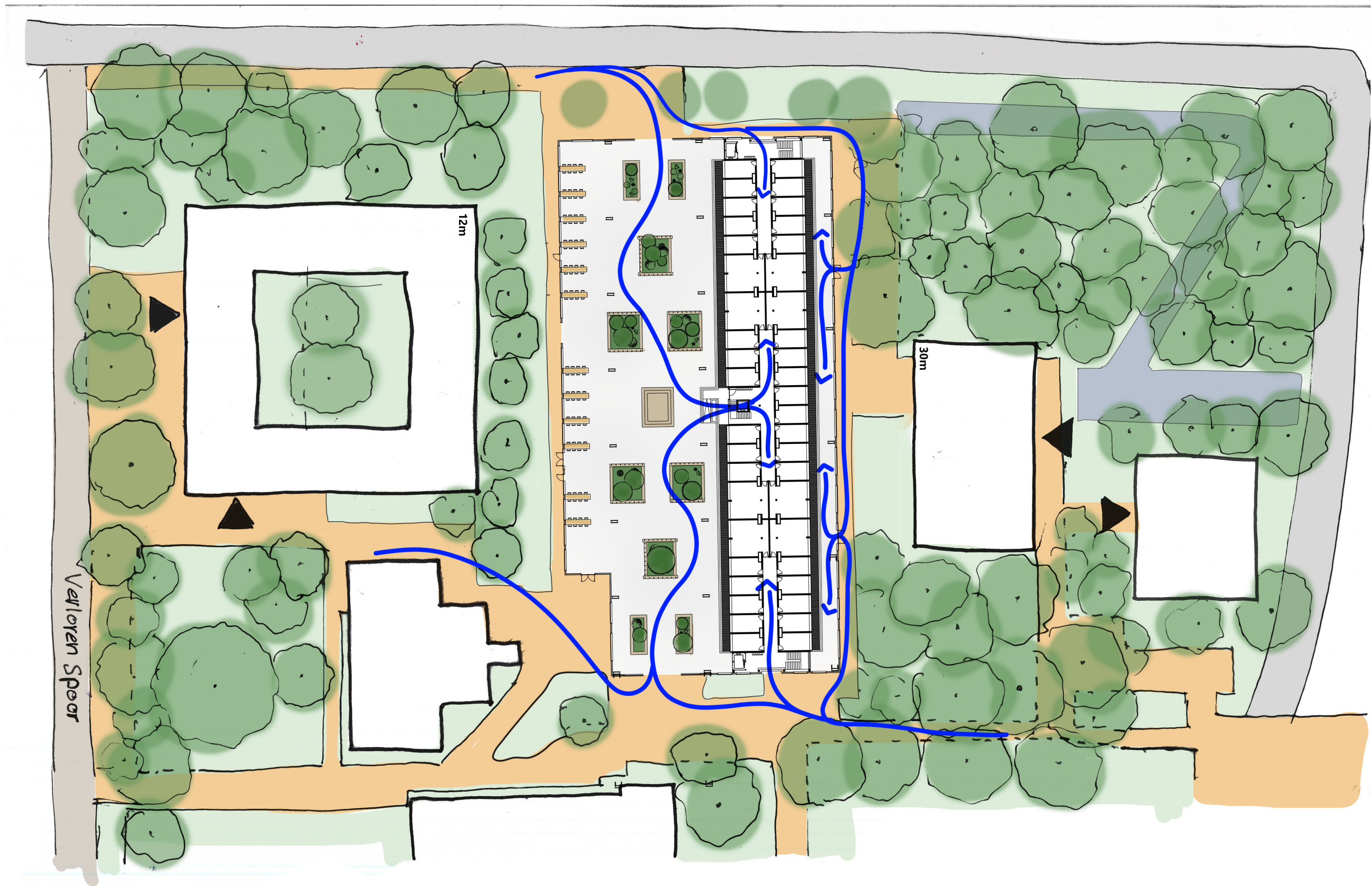
1. Adaptable building mass, meant for residential and public use.
2. Collective space, for residents to use
3. Public space, as a central point within Hembrug

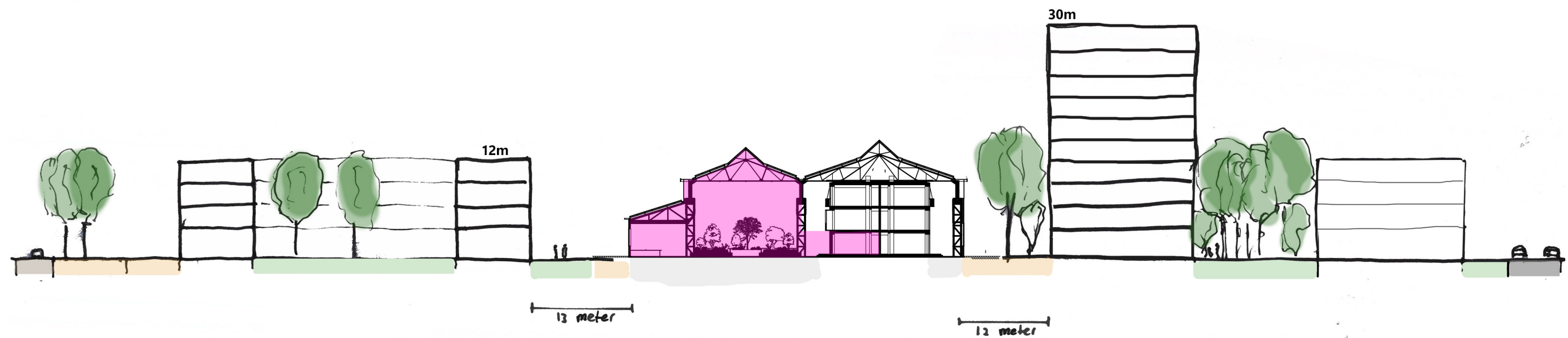
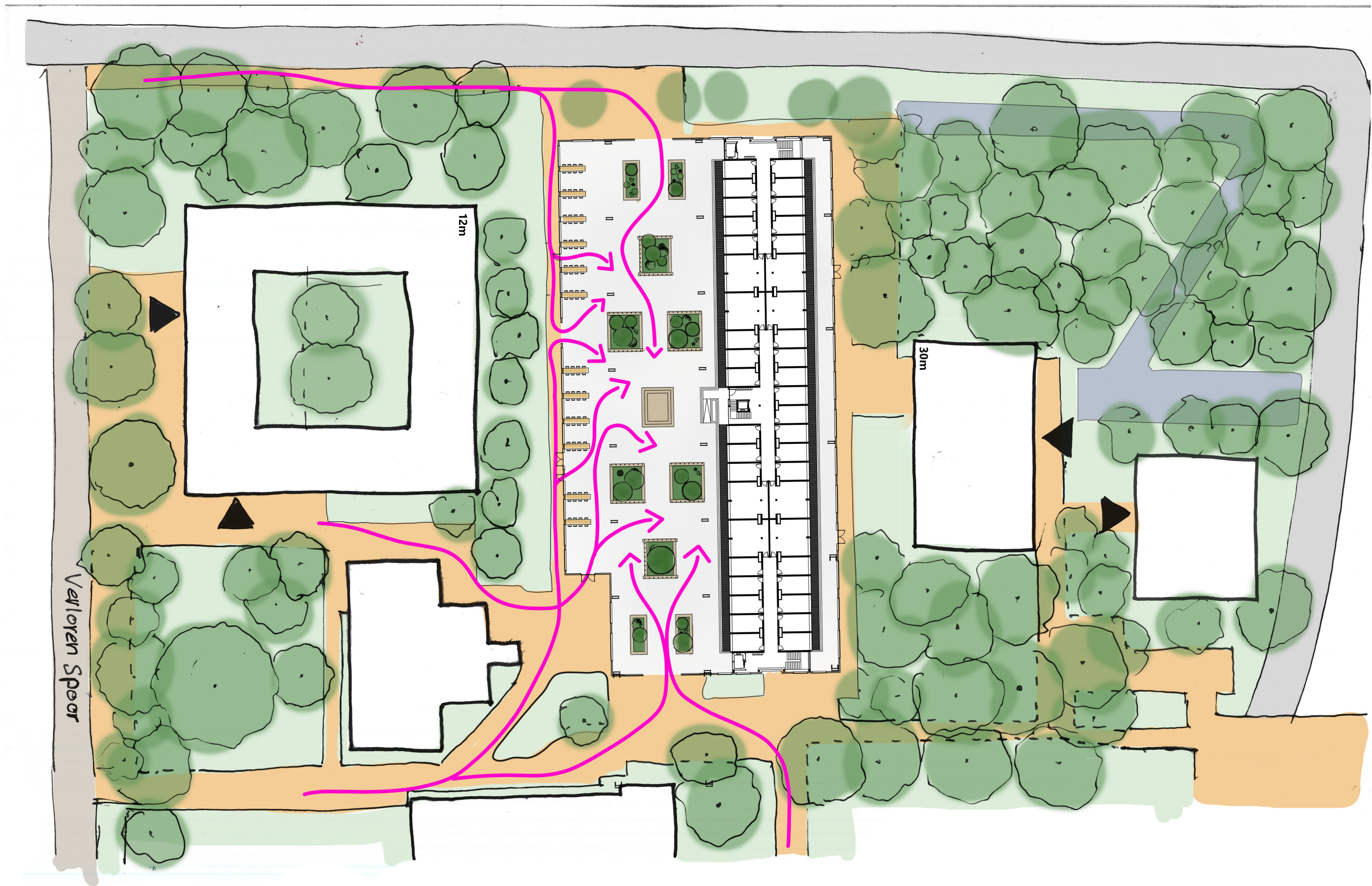


1ha







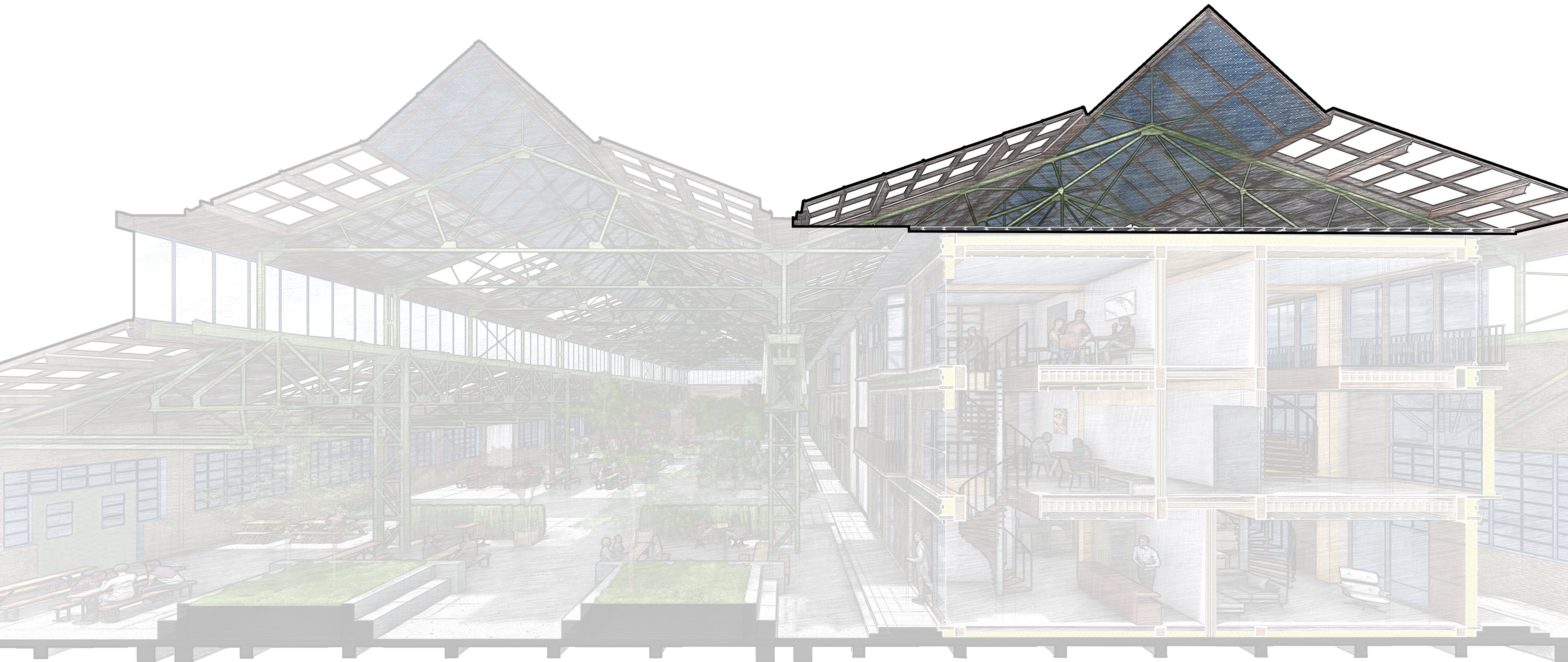




1. Building mass



2. Collective rooftop



3. Geschutplein

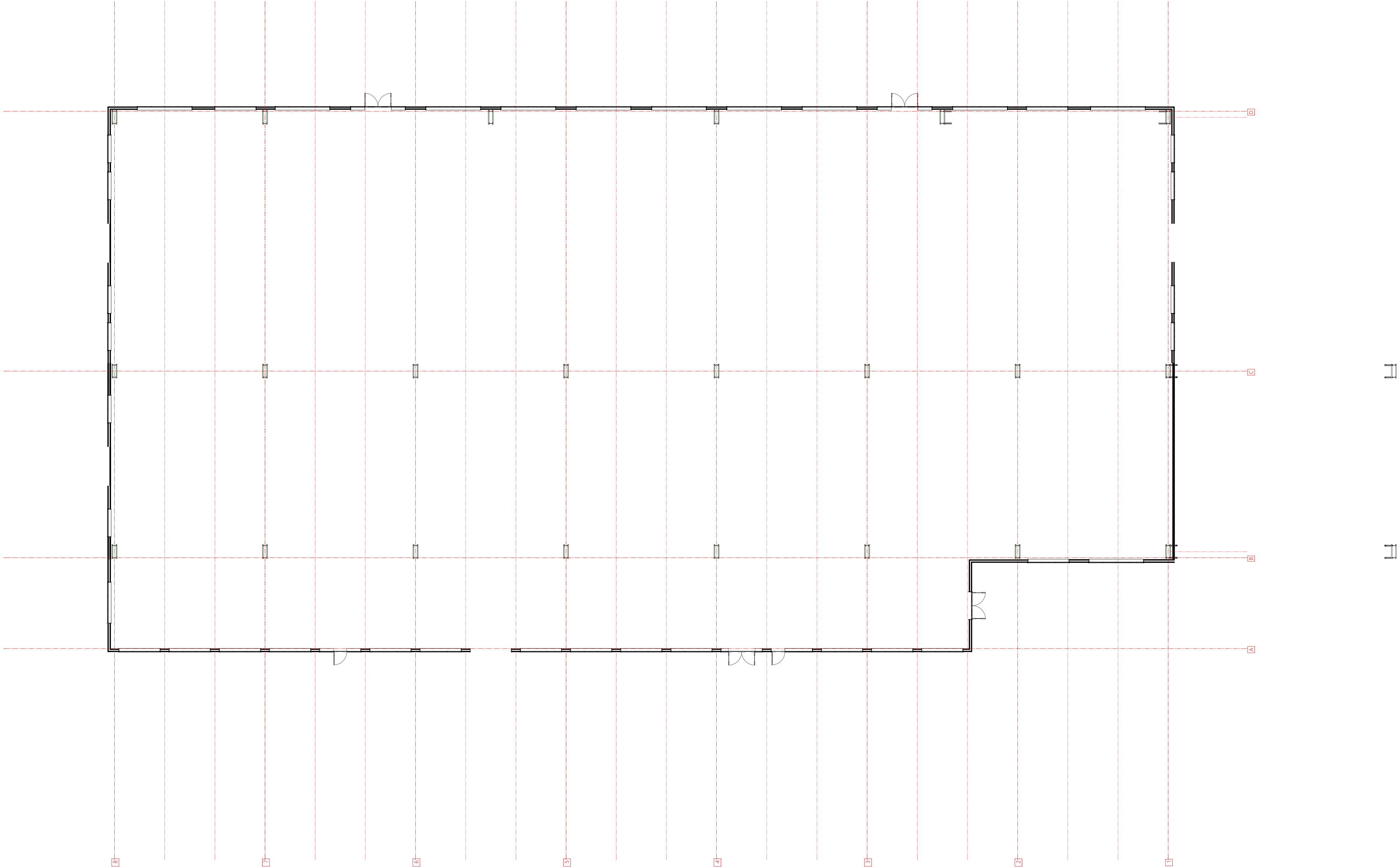


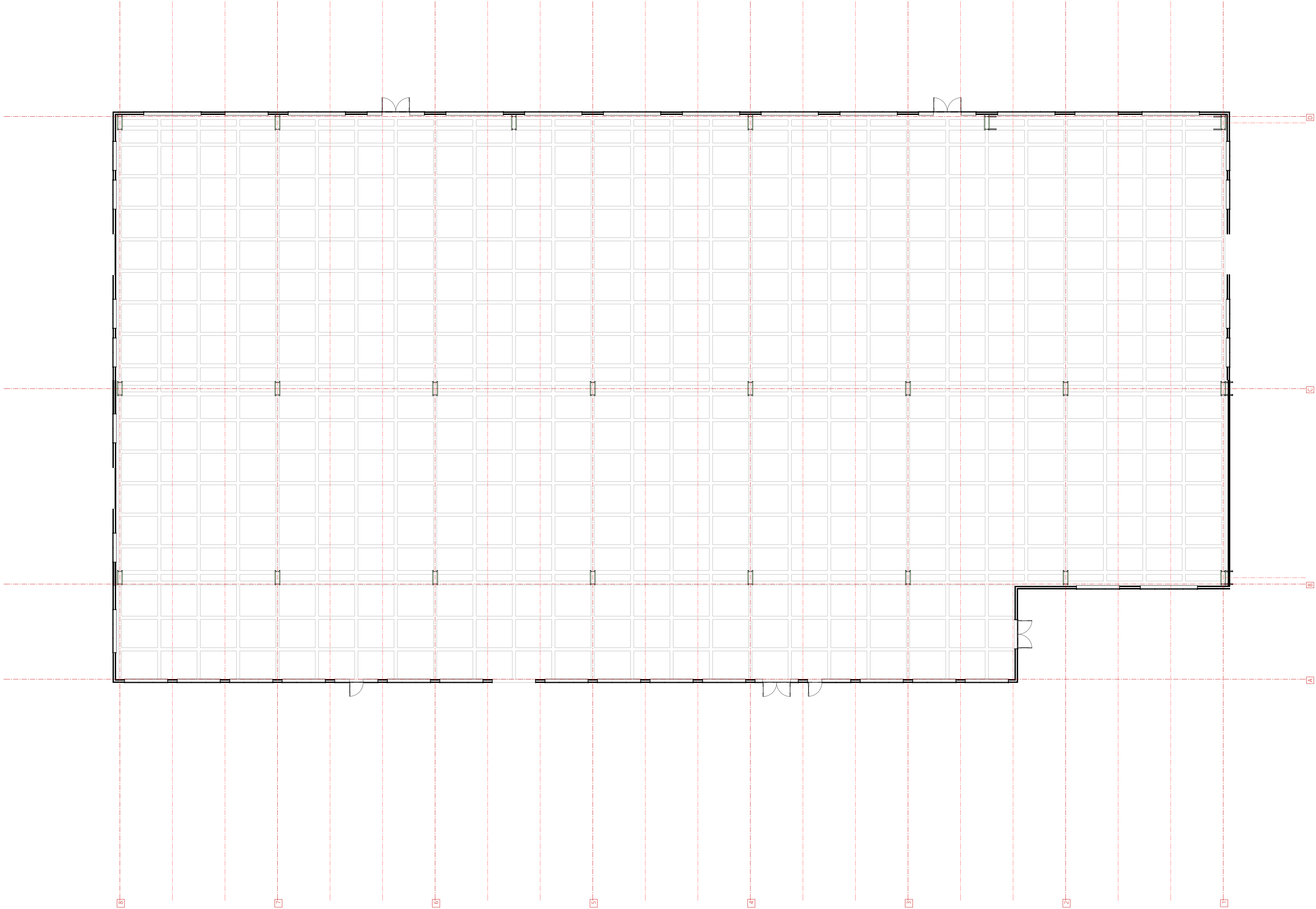
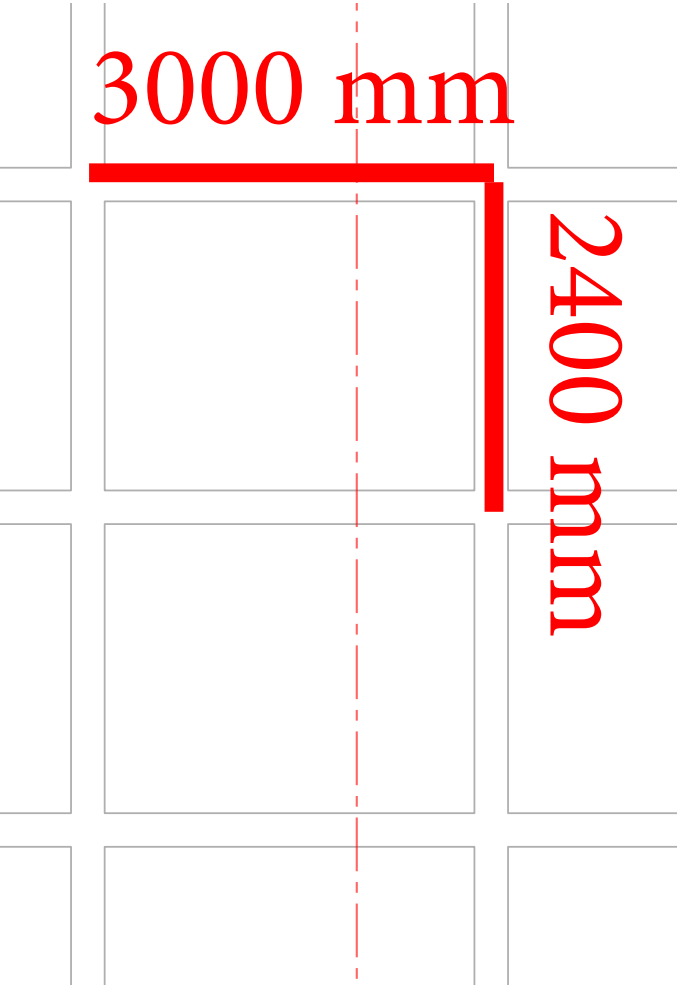
1. Building Mass

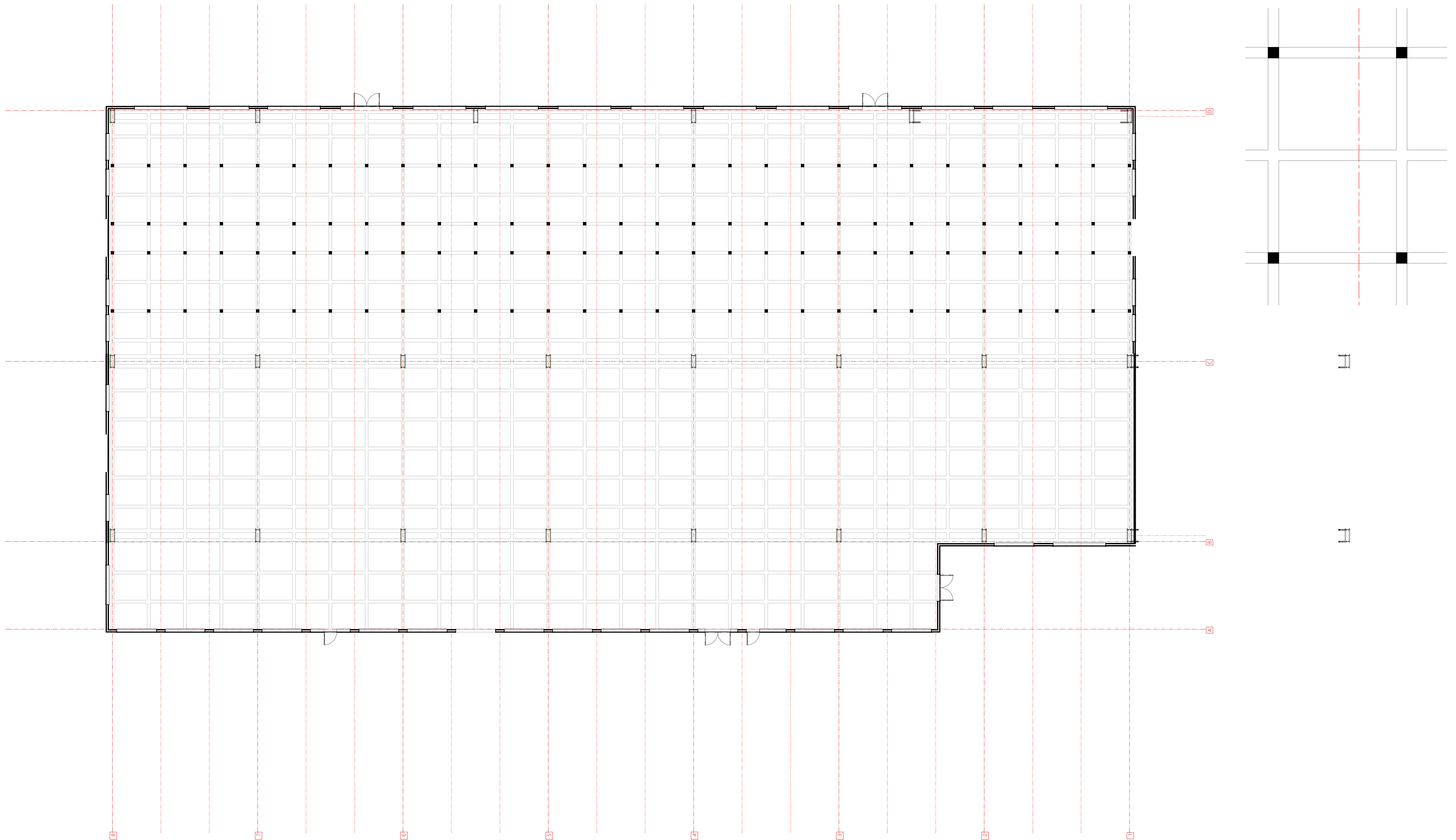


**People change,
Society changes,
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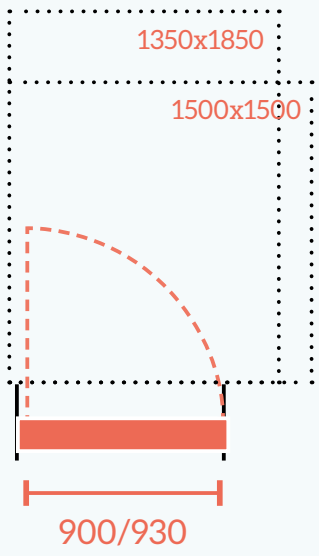


PRODUCT MARKT
COMBINATIES (PMC)

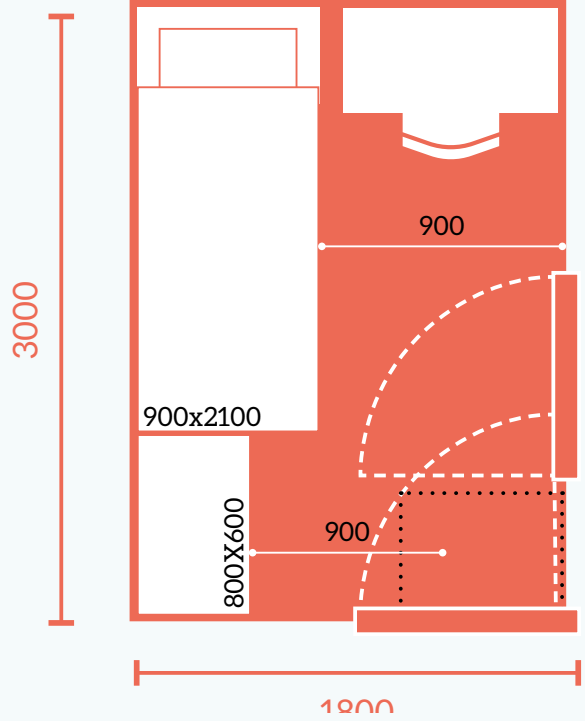
		Grondgebonden	Gestapeld	Tijdelijk	Grondgebonden levensloopbestendig
	Kwaliteits-kortingsgrens	PMC 1	PMC 6 PMC 6 LLB	PMC 11	PMC 16
	Eerste aftoppingsgrens	PMC 2	PMC 7 PMC 7 LLB	PMC 12	
	Tweede aftoppingsgrens	PMC 3	PMC 8	PMC 13	
	Liberalisatiegrens	PMC 4	PMC 9	PMC 14	
	Vrije sector	PMC 5	PMC 10	PMC 15	

PMC	PMC 6 studio concept
Huurniveau	Kwaliteitskortingsgrens
Gebouwtype	Gestapeld
Productkwaliteiten	
Gebruikskwaliteit	
Functionaliteit woning (matjes, verkeersruimte kunnen worden gecombineerd)	• Zithoek voor één- of tweepersoonshuishouden • Pantry • Eethoek voor éénpersoonshuishouden • Slaapkamer • Badkamer • Toilet (in combinatie met de badkamer) • Wasmachine aansluiting
Geadviseerde bandbreedte GO in m² (t.v.m. huurniveaus)	24 -50 (m²)
Geadviseerde beuk / of bouwstelsysteem maat	3,2 – 5,0

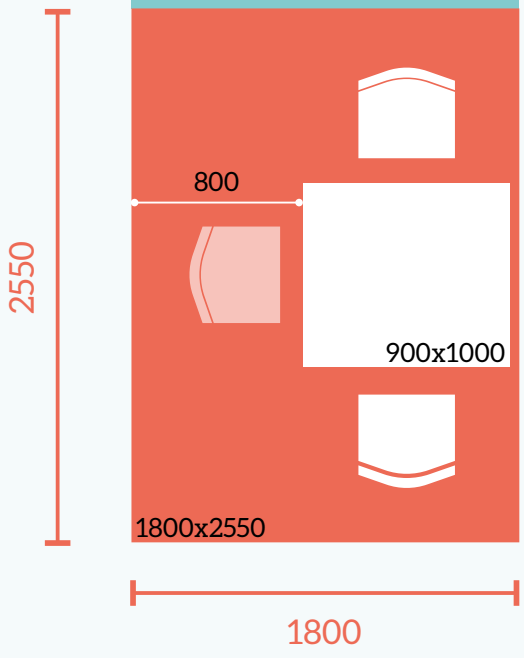
OPSTELRUIMTE
VOORDEUR BINNEN



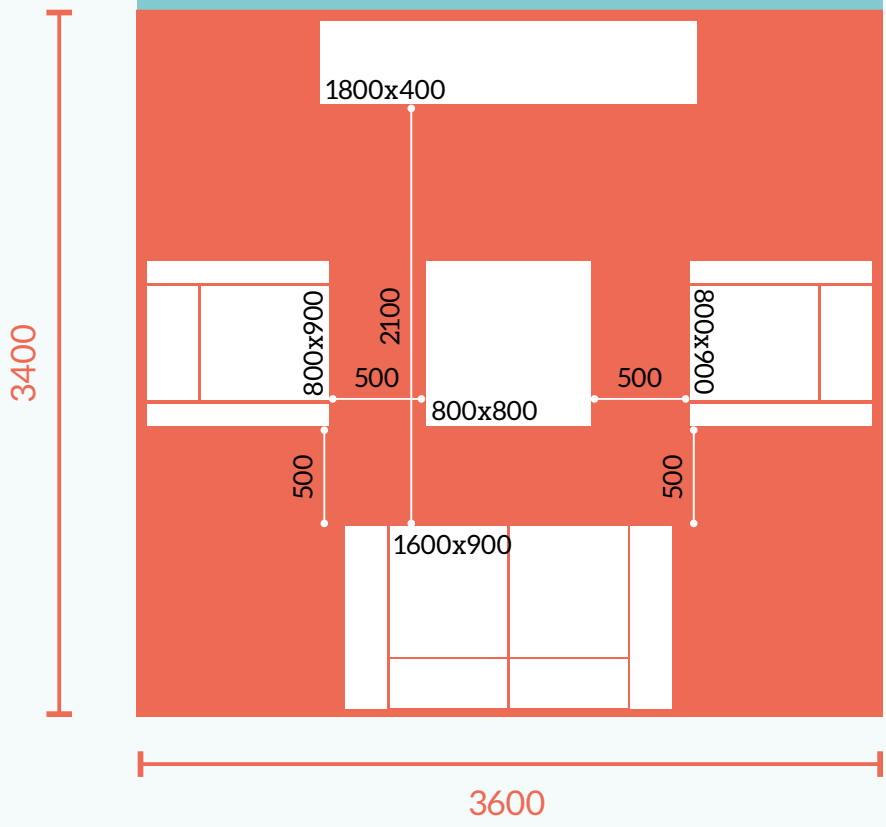
SLAAPKAMER



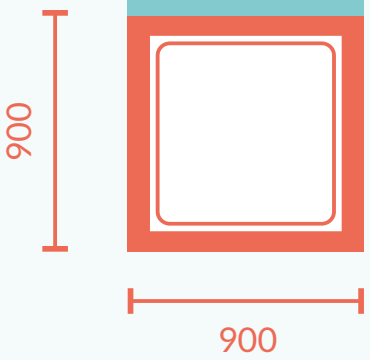
EETHOEK
1 PERSOON



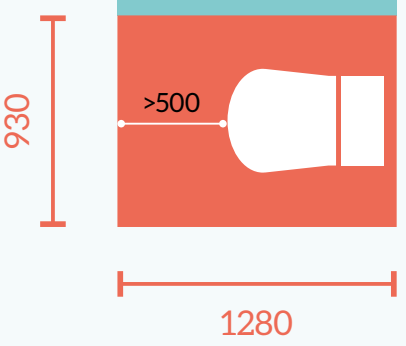
ZITHOEK
(1-2 PERSONEN)



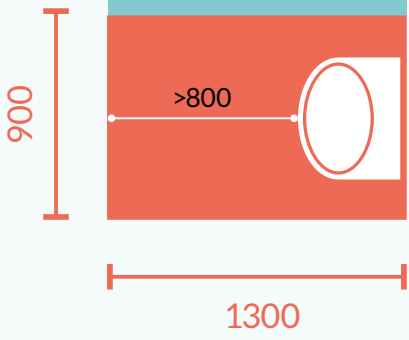
DOUCHE-
HOEK



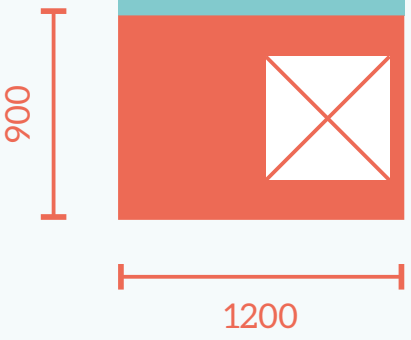
1^E TOILET

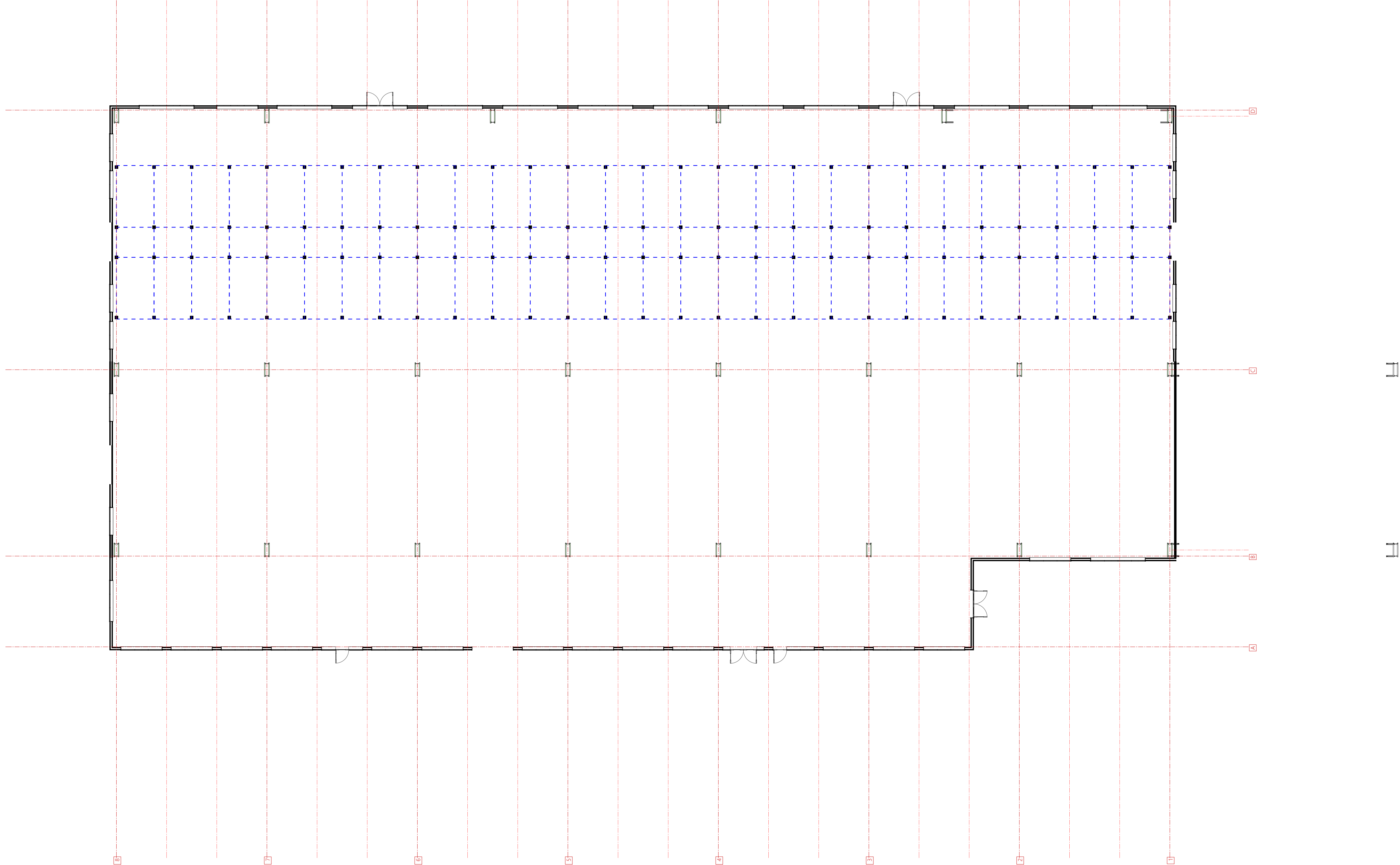


WASTAFEL

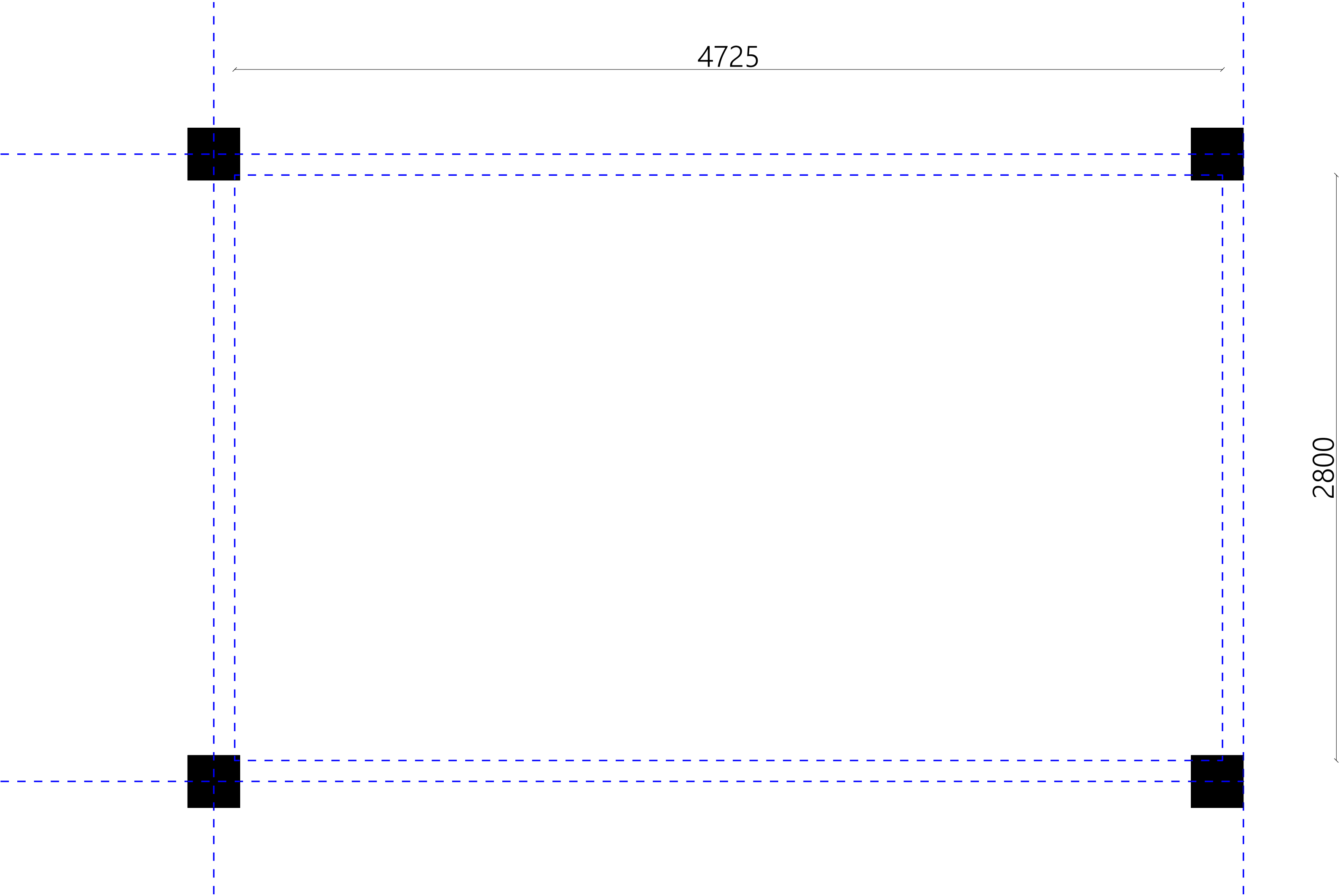


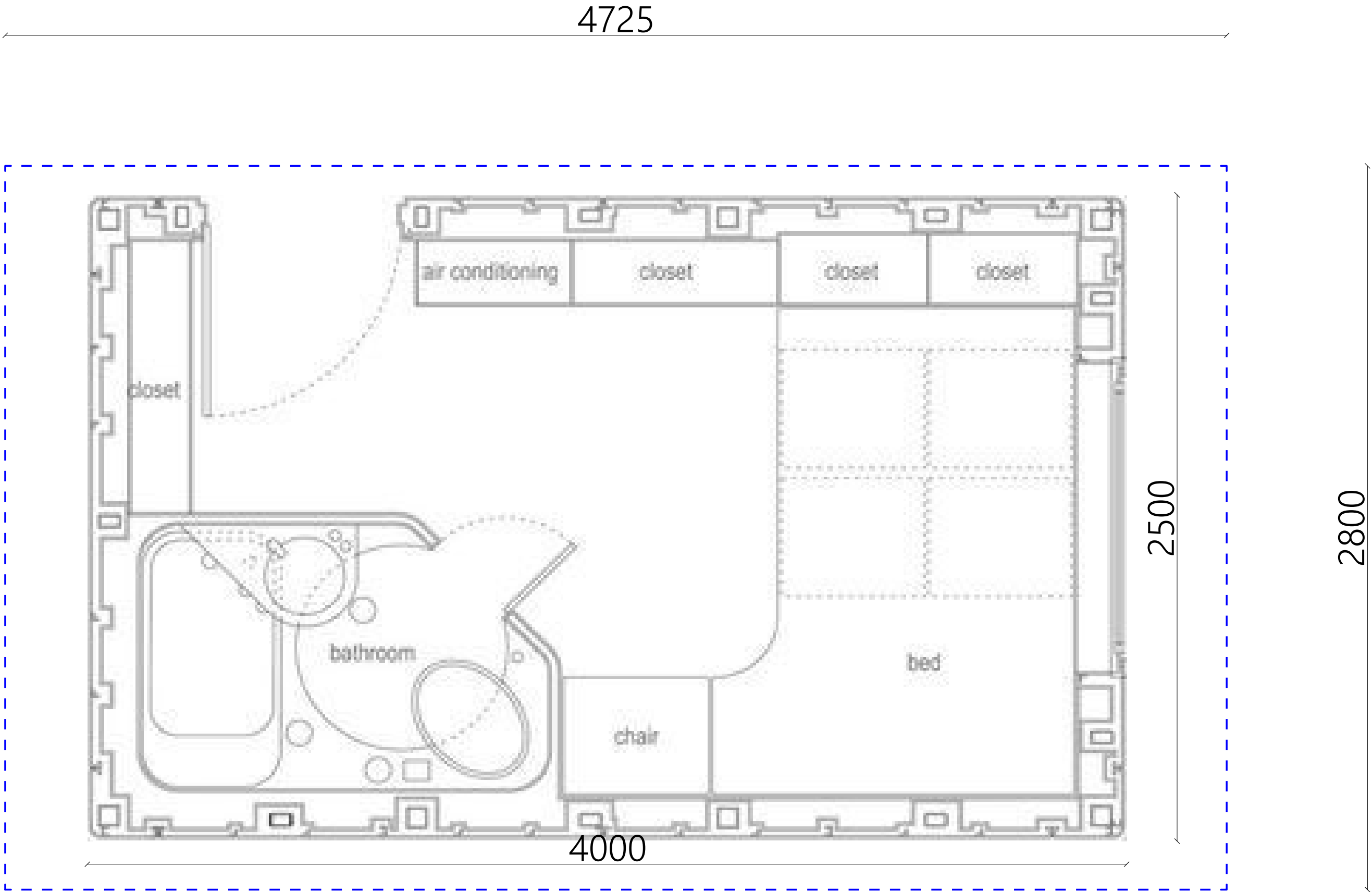
WASMACHINE

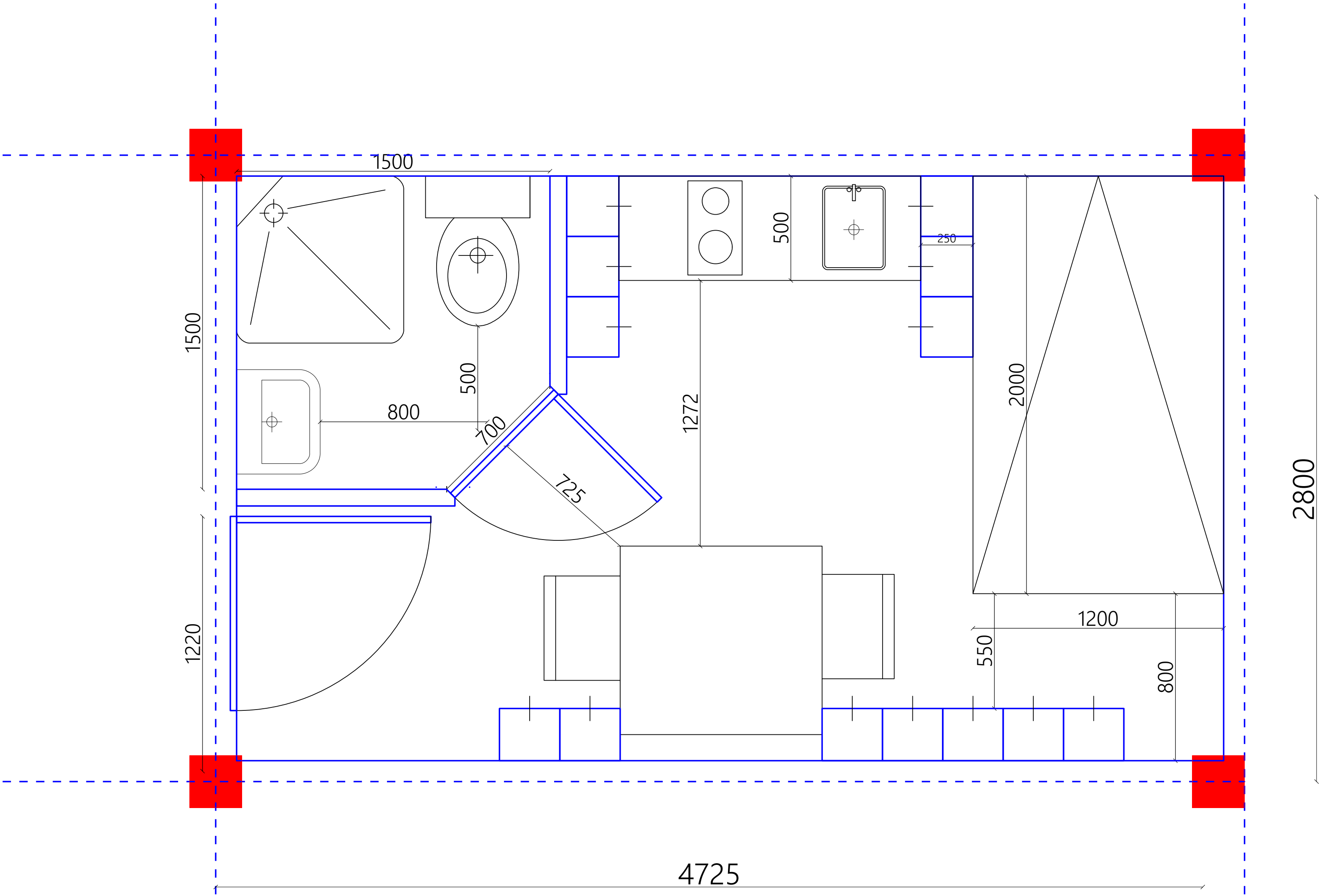


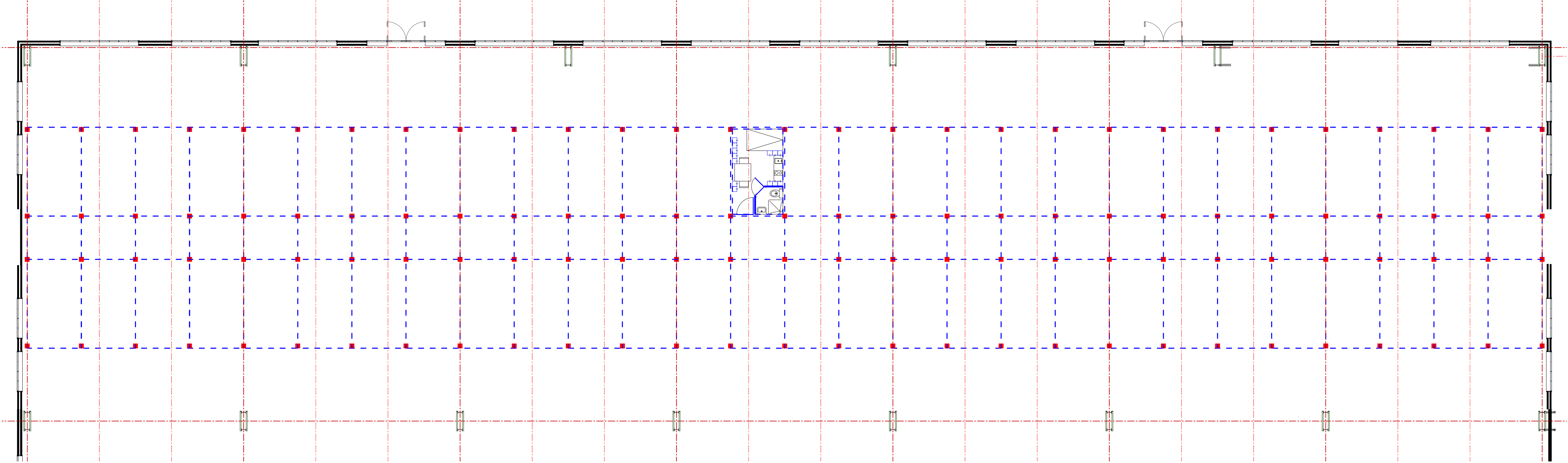


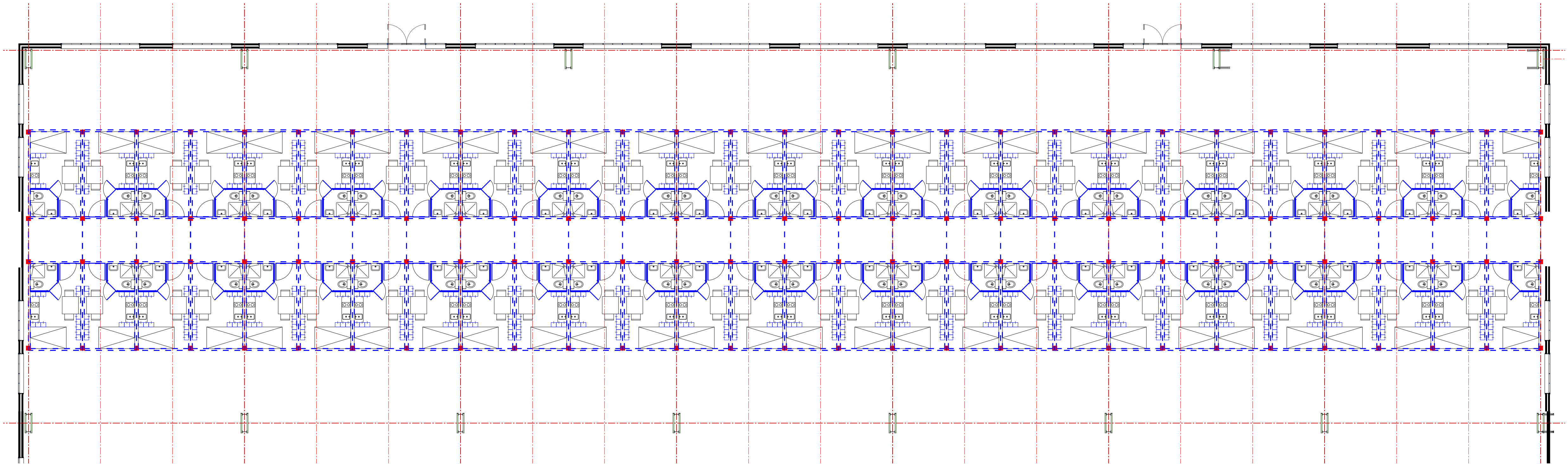


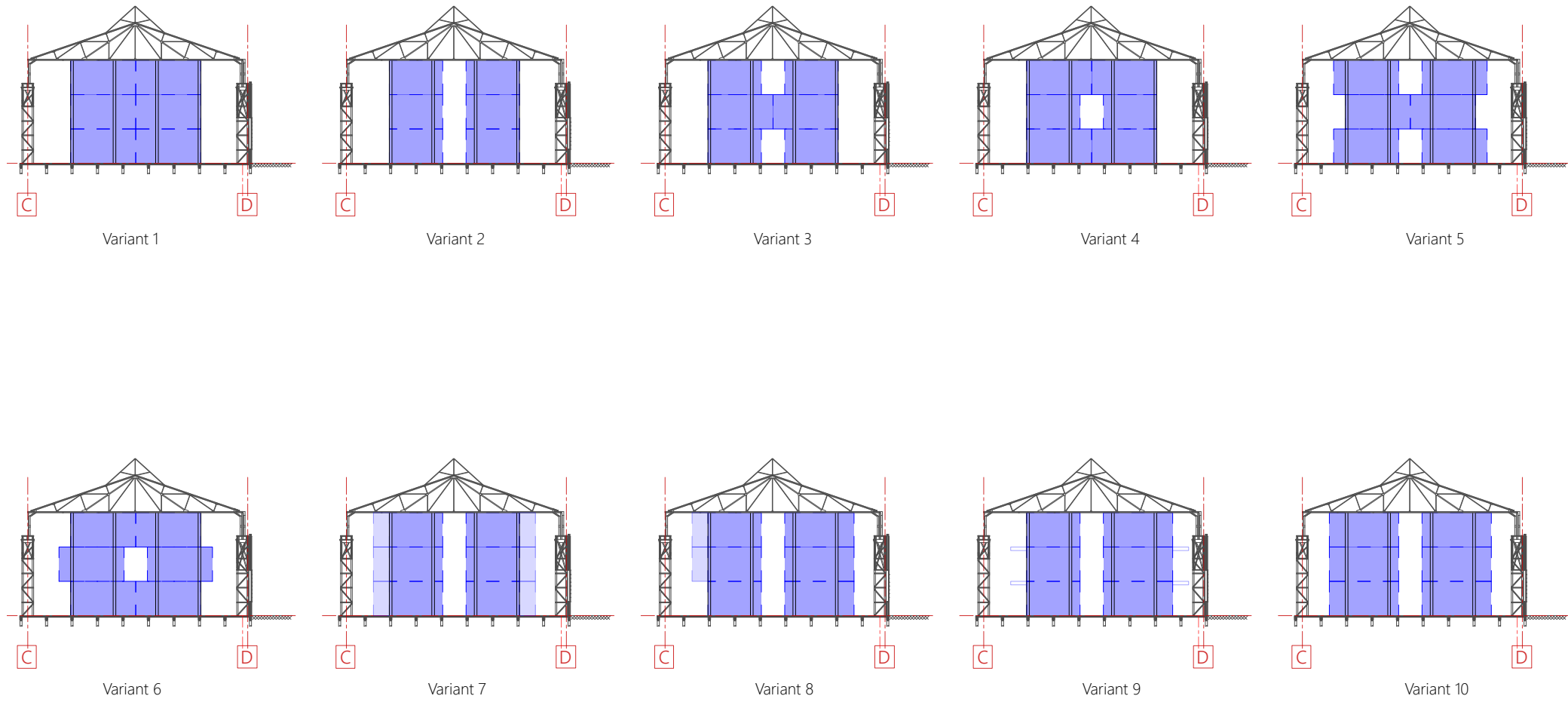
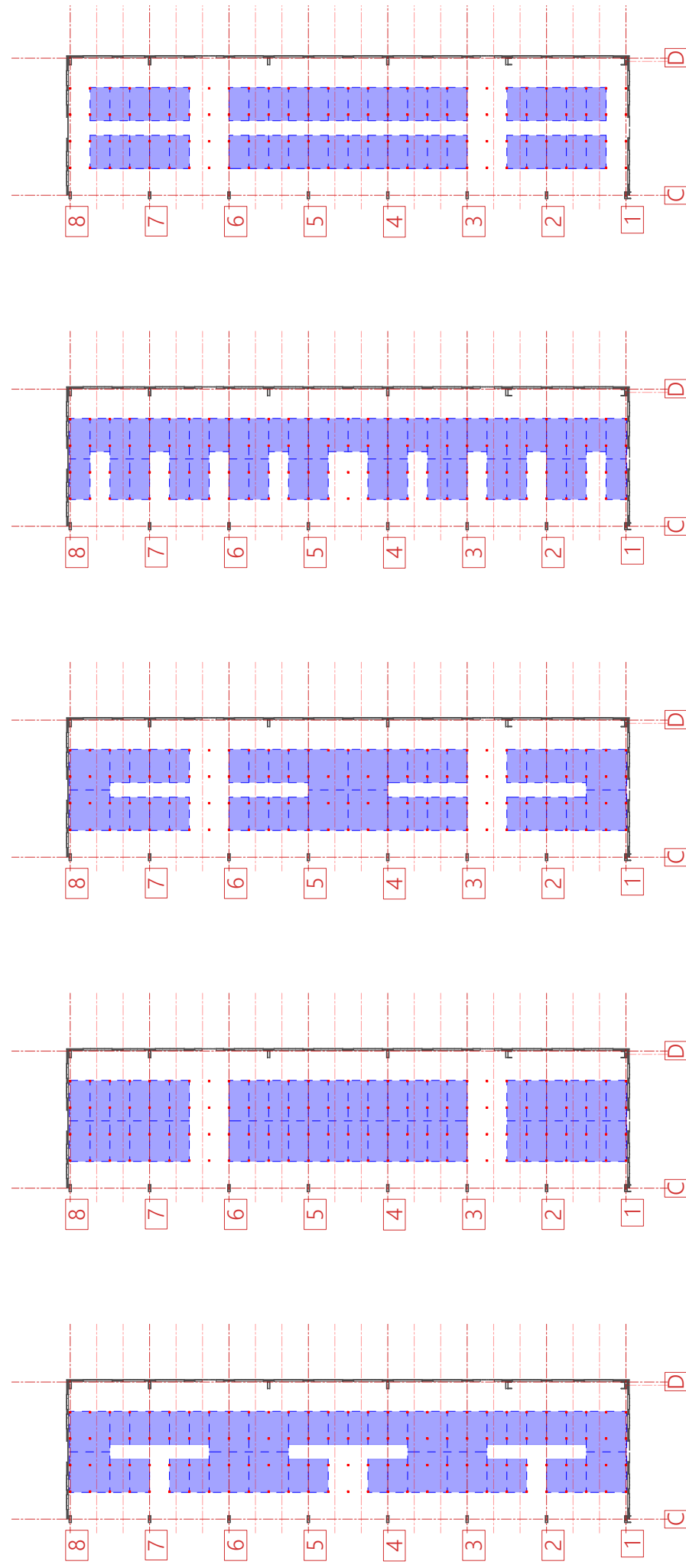
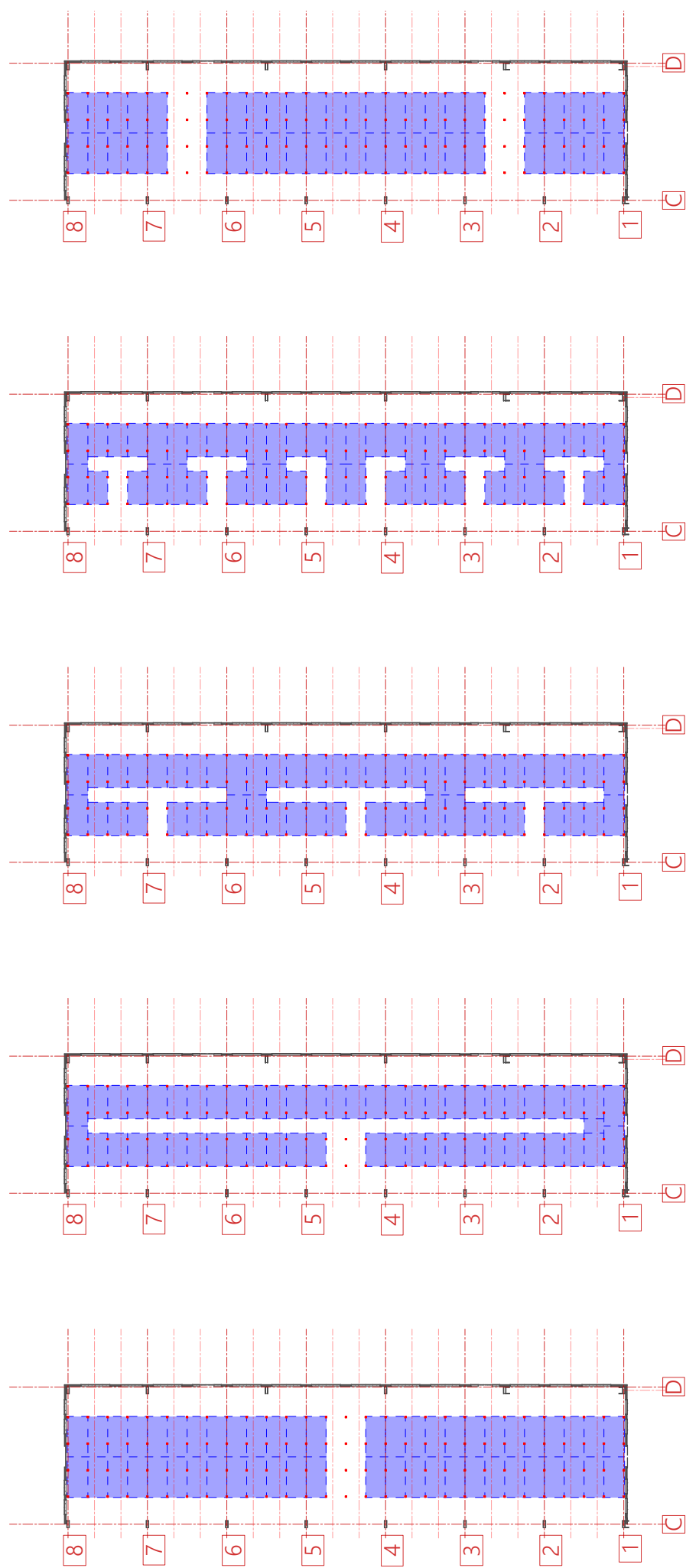


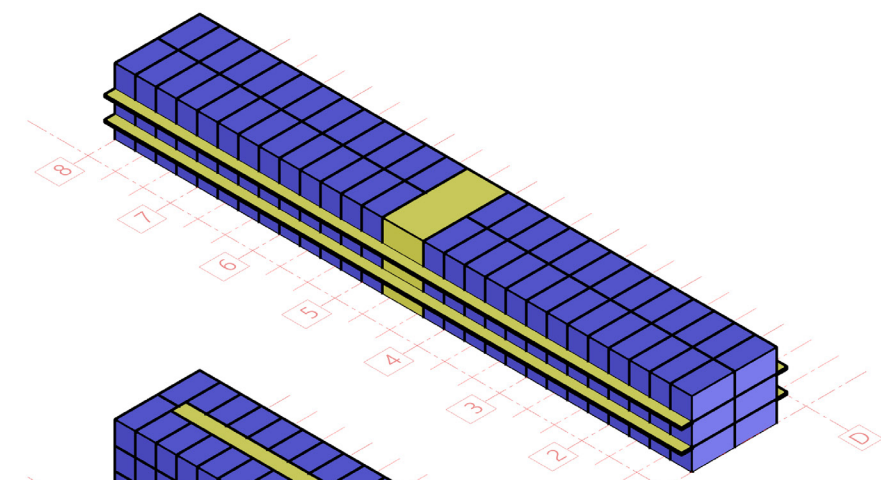




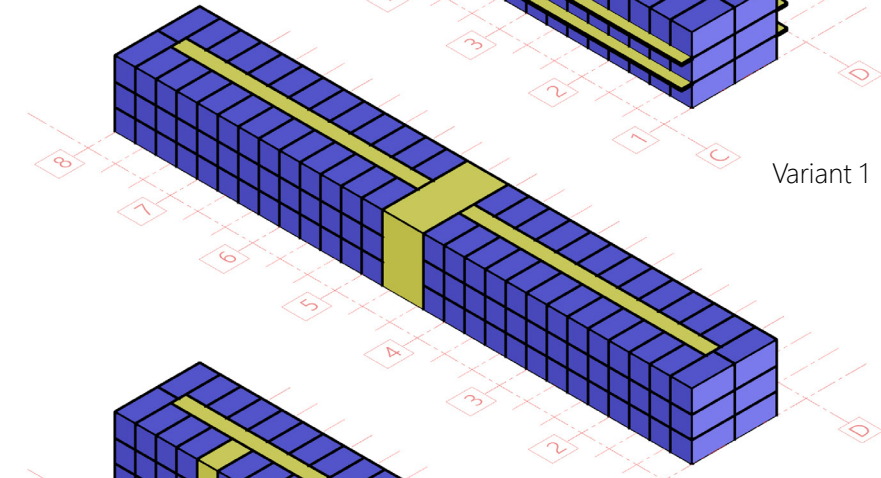




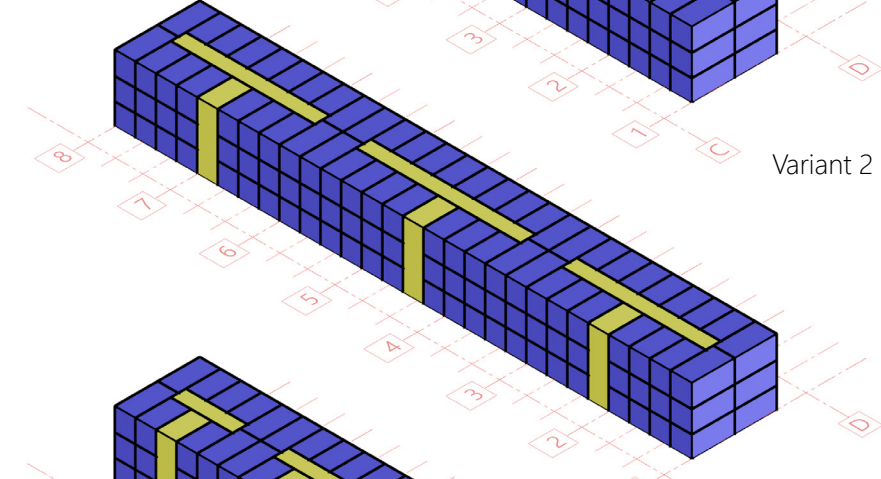




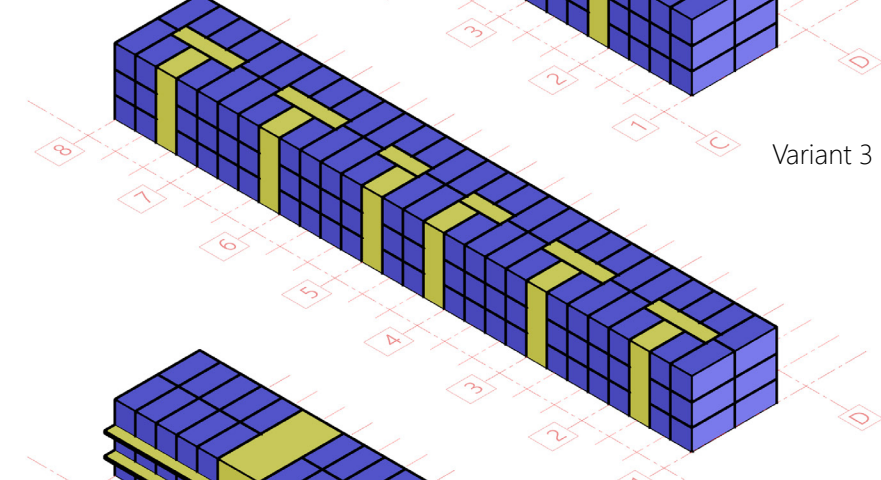
Variant 1



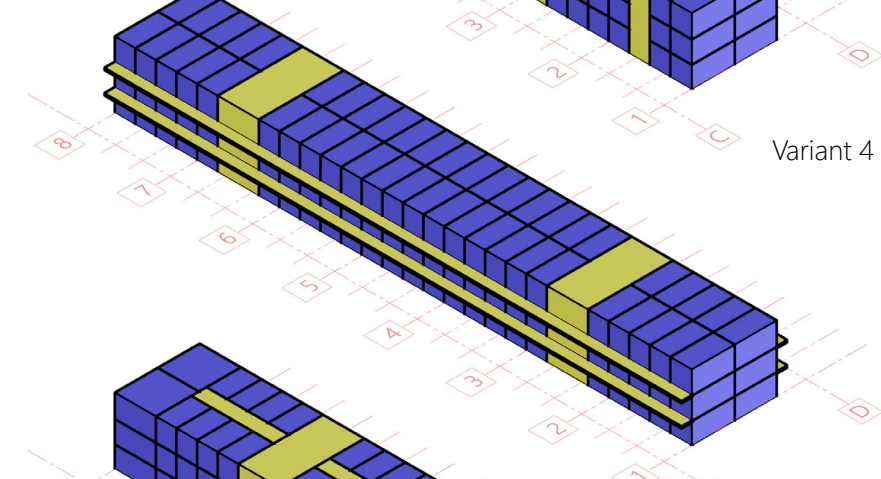
Variant 2



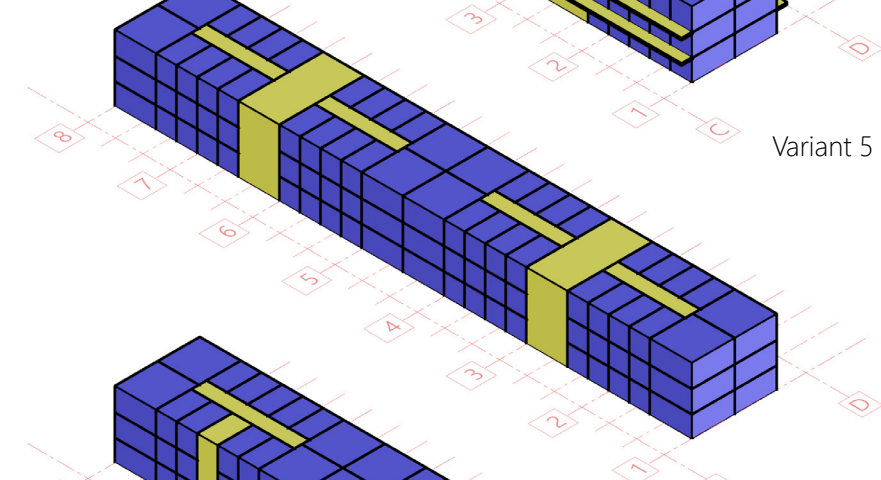
Variant 3



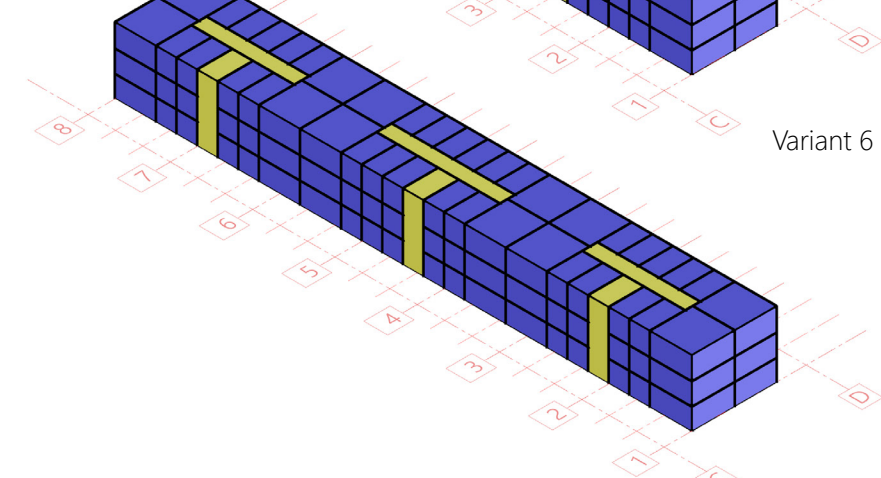
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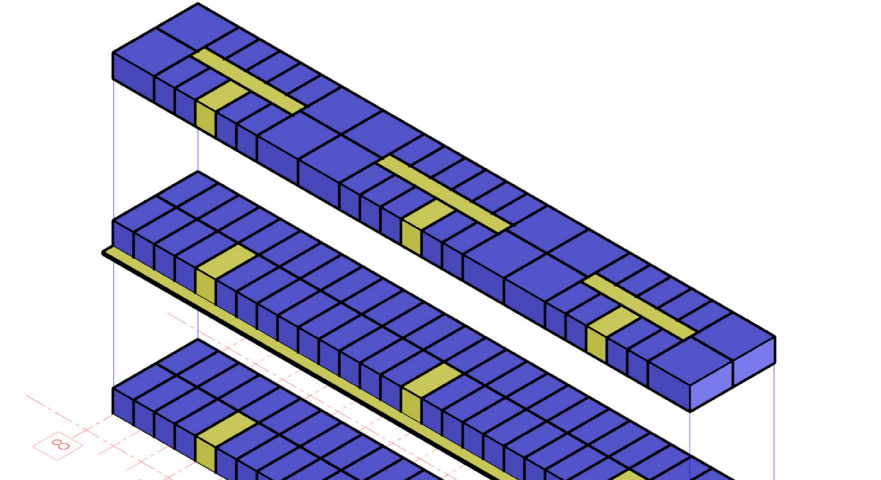
Variant 5



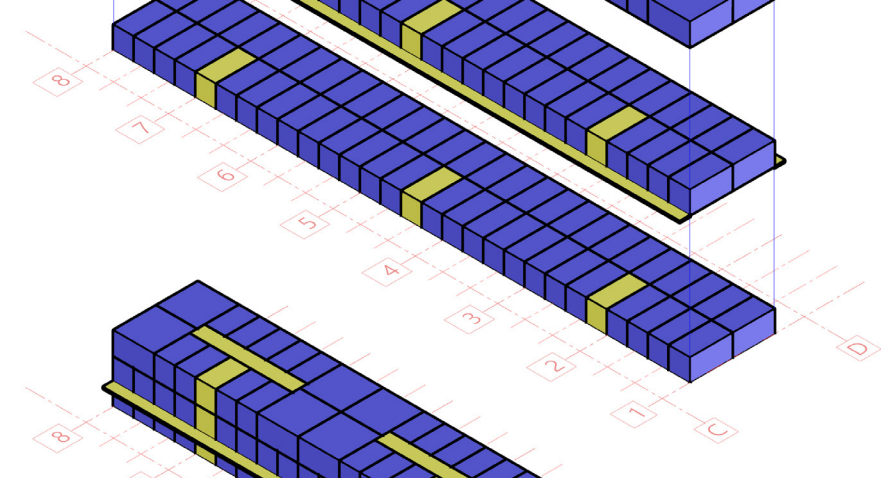
Variant 6



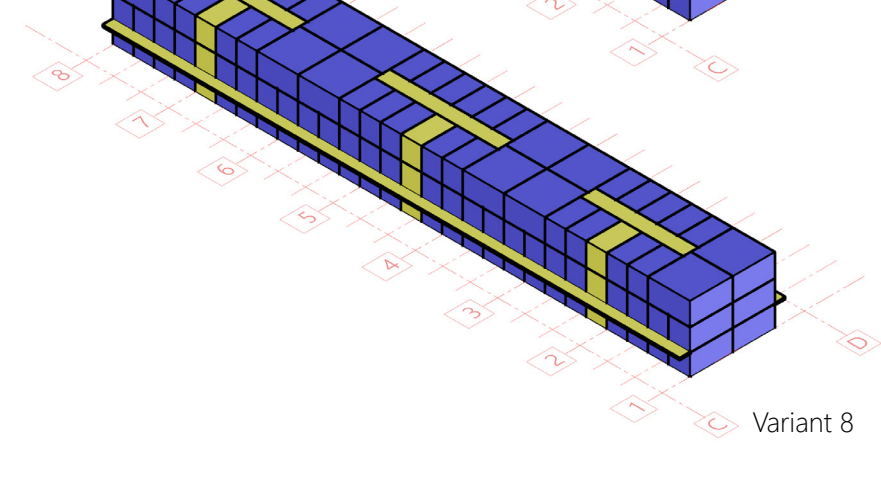
Variant 7



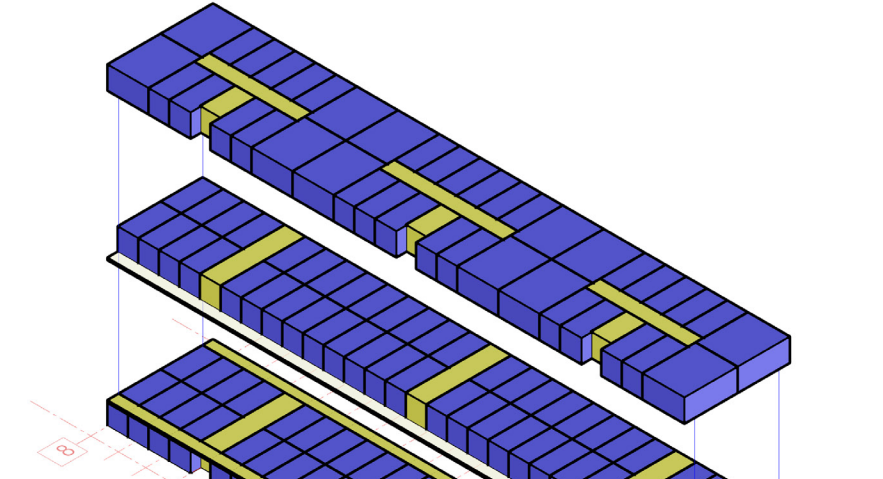
Variant 8



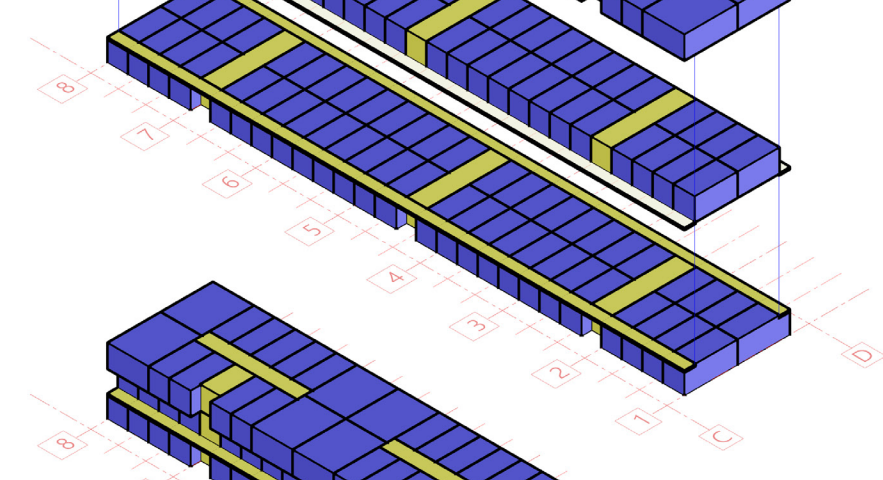
Variant 9



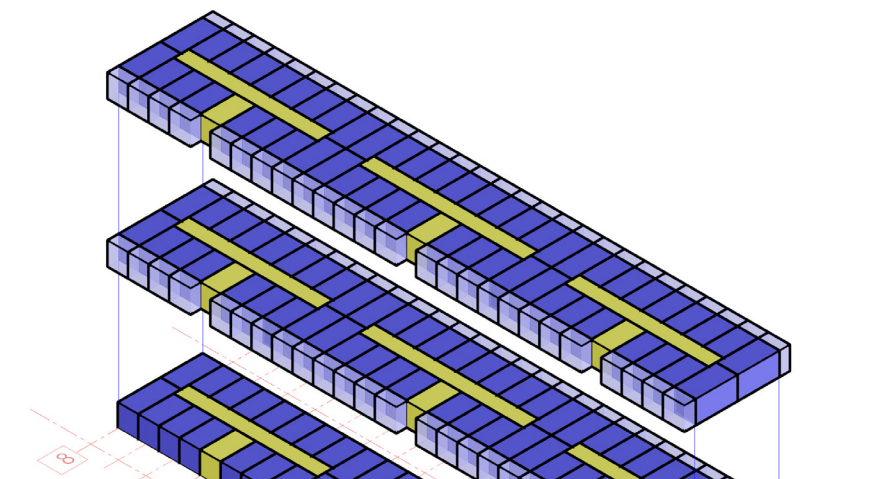
Variant 10



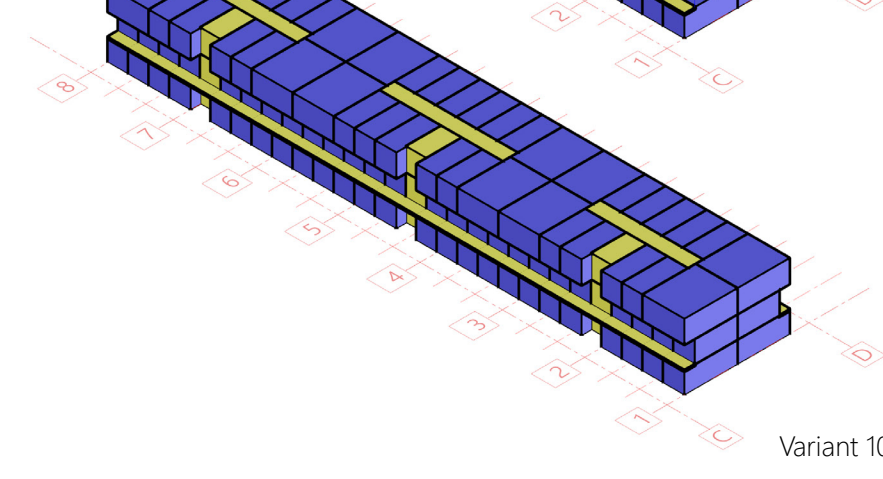
Variant 11



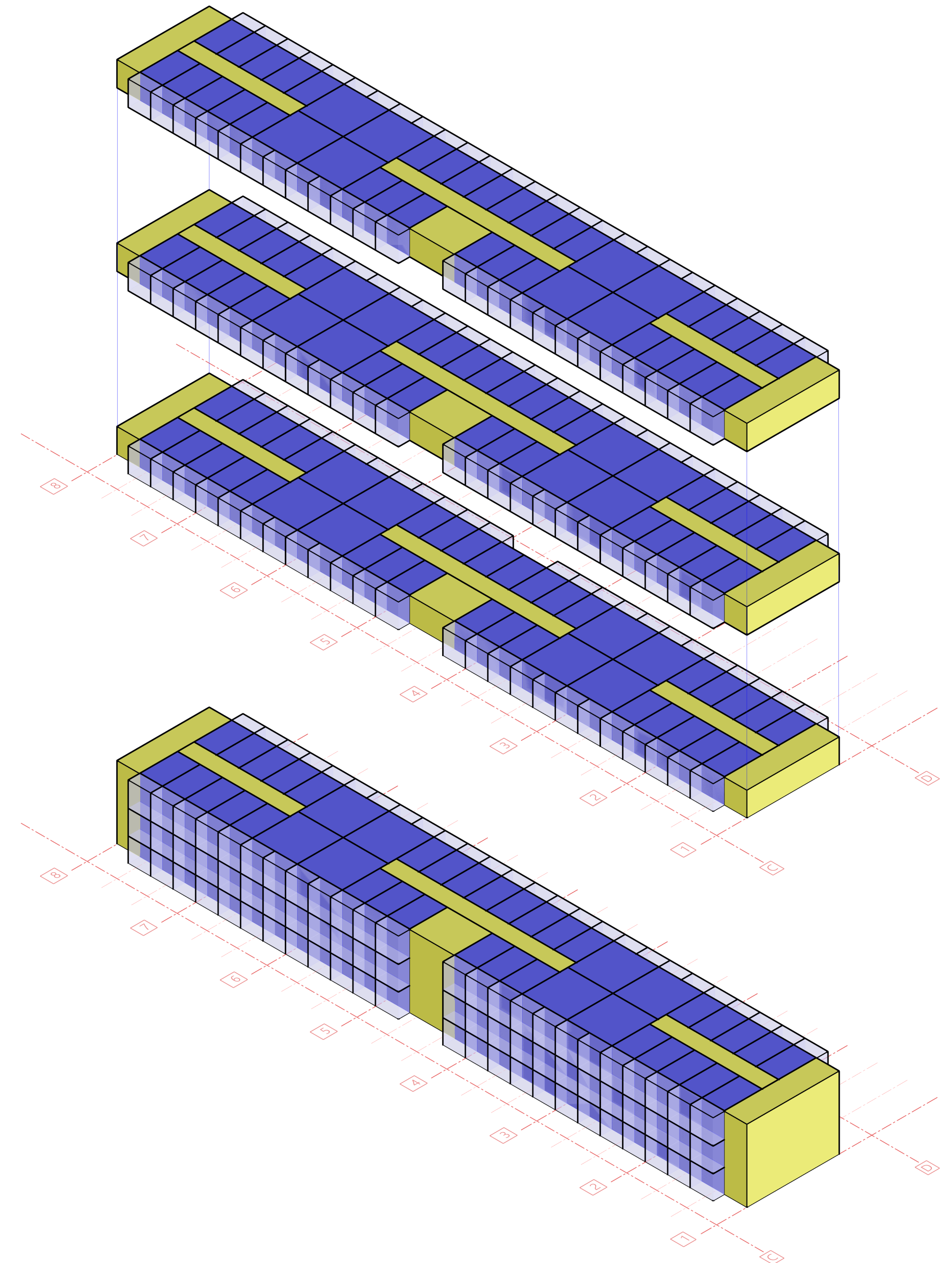
Variant 12



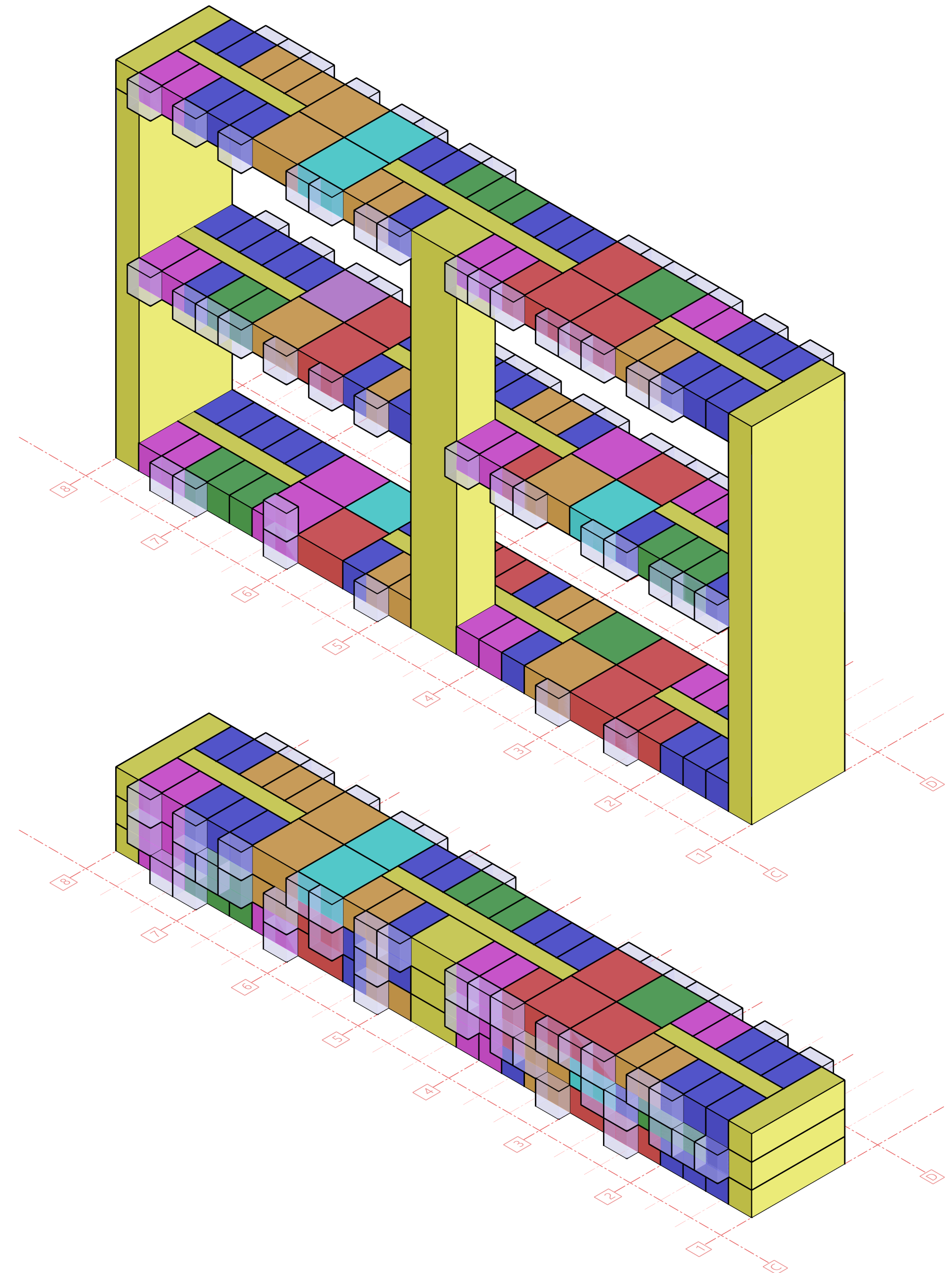
Variant 13

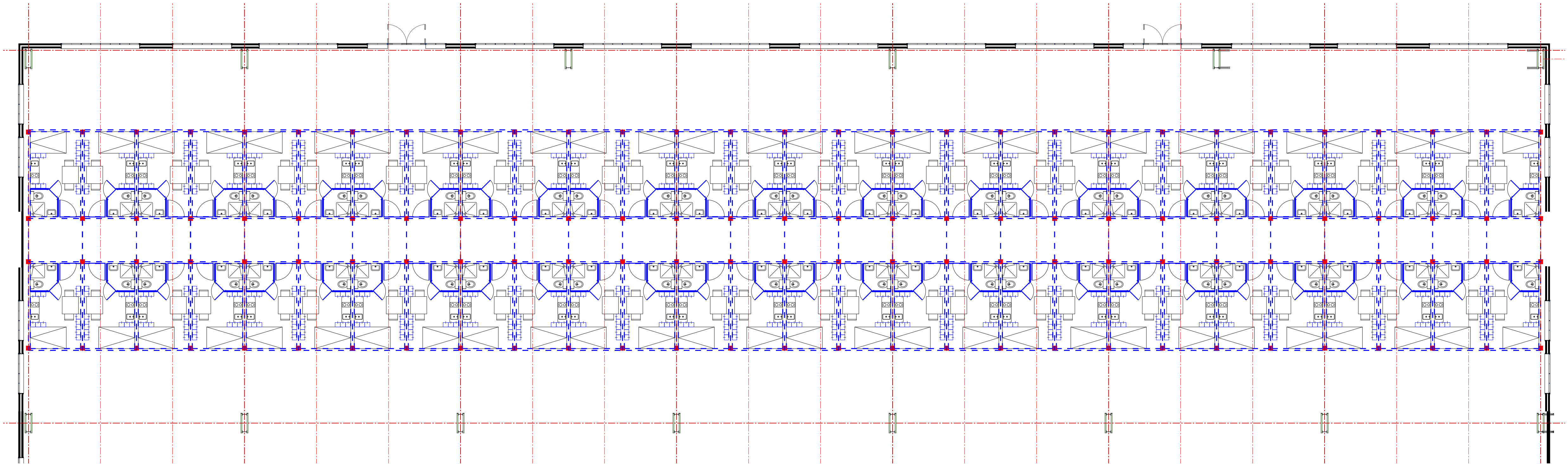


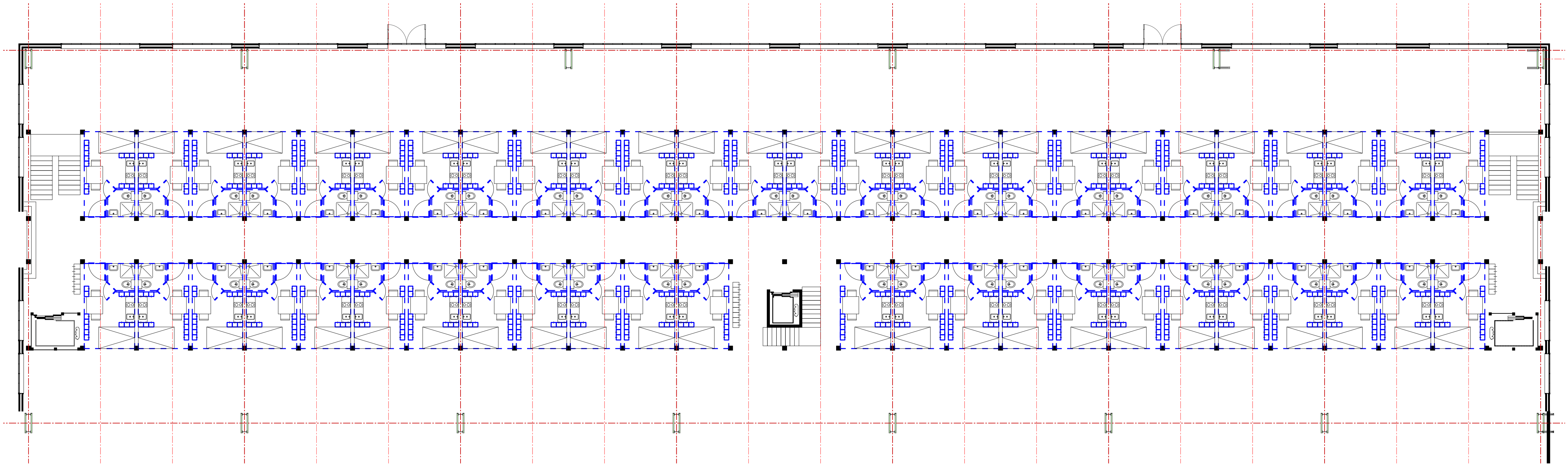
1. Open structural framework
2. Maximum possibilities for future adaptability
3. Coherent within existing structure

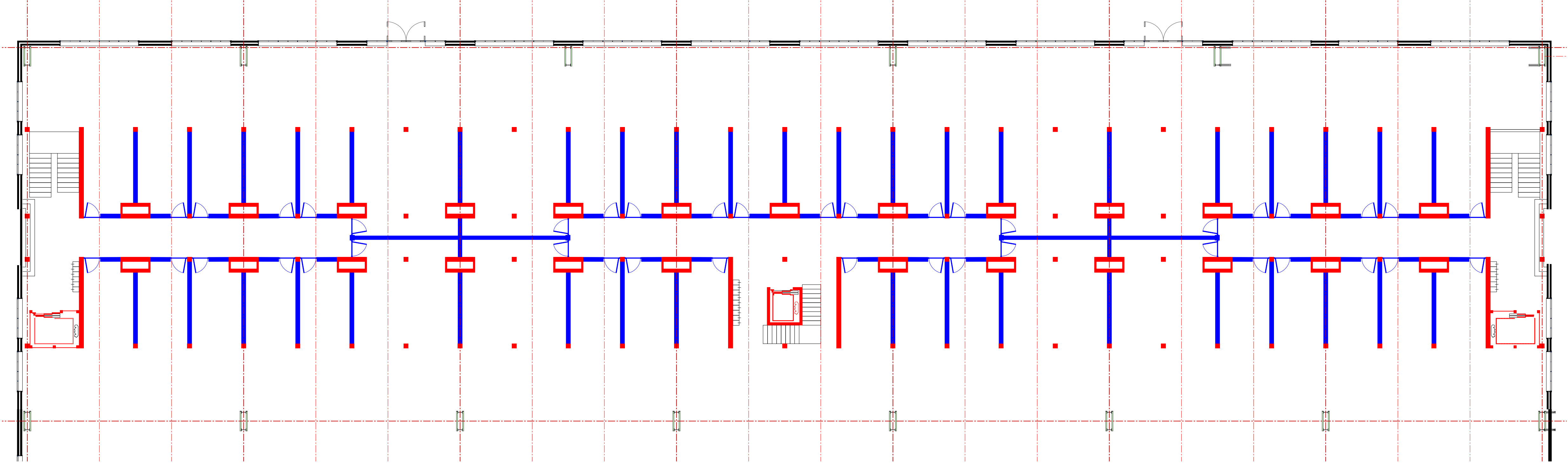


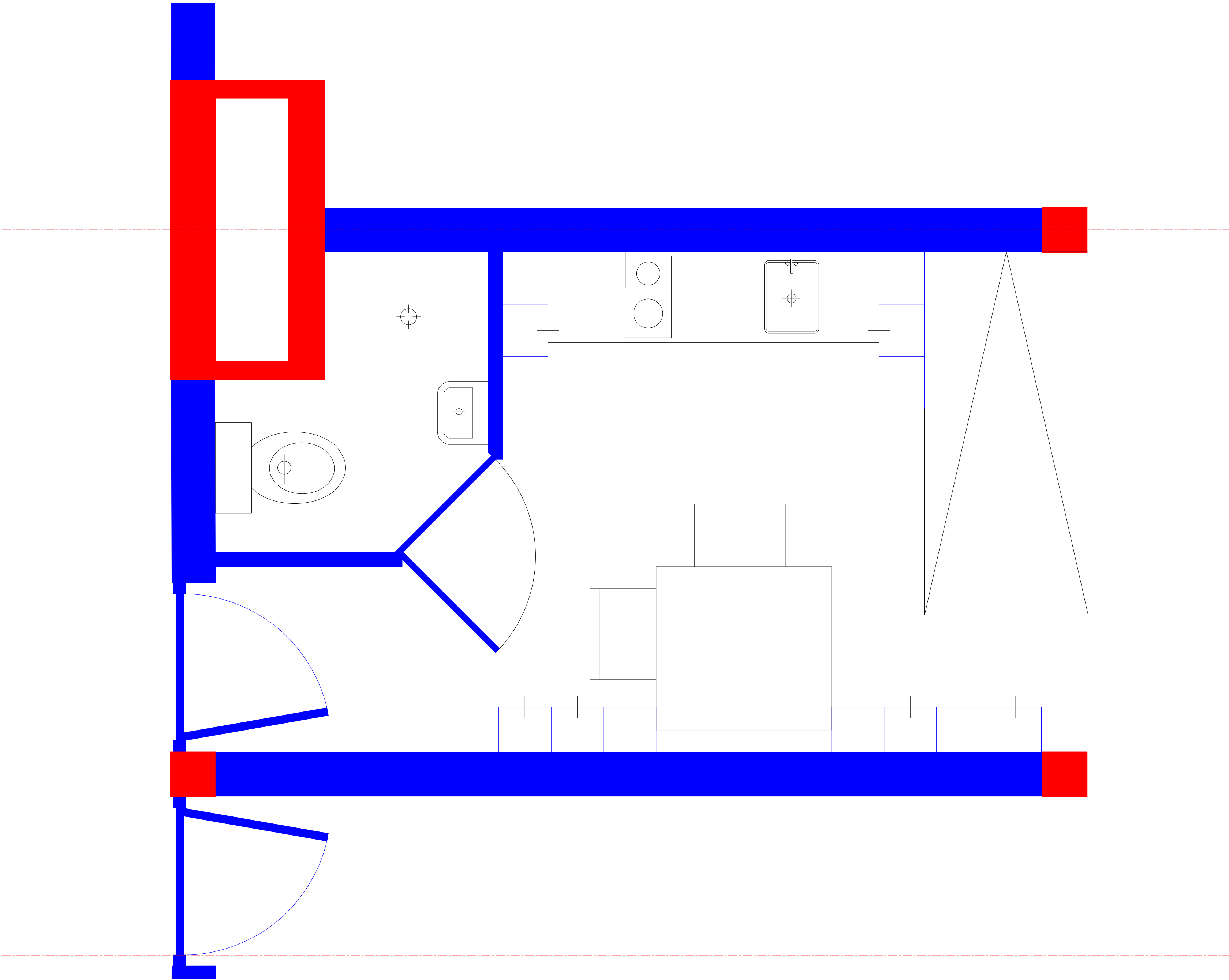
1. Open structural framework
2. Maximum possibilities for future adaptability
3. Coherent within existing structure









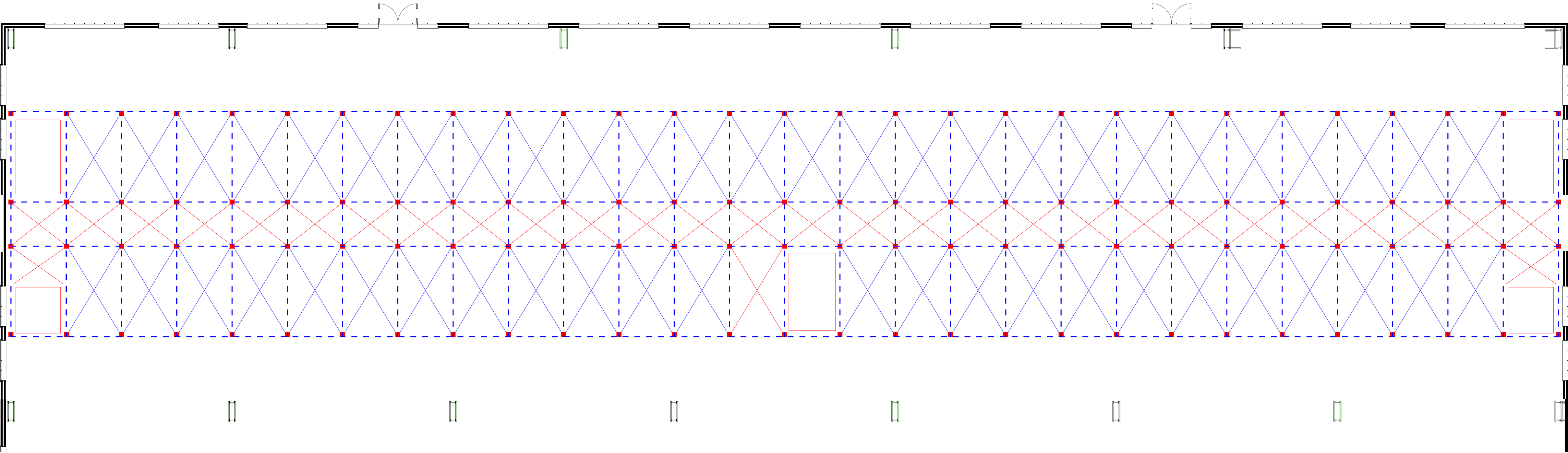


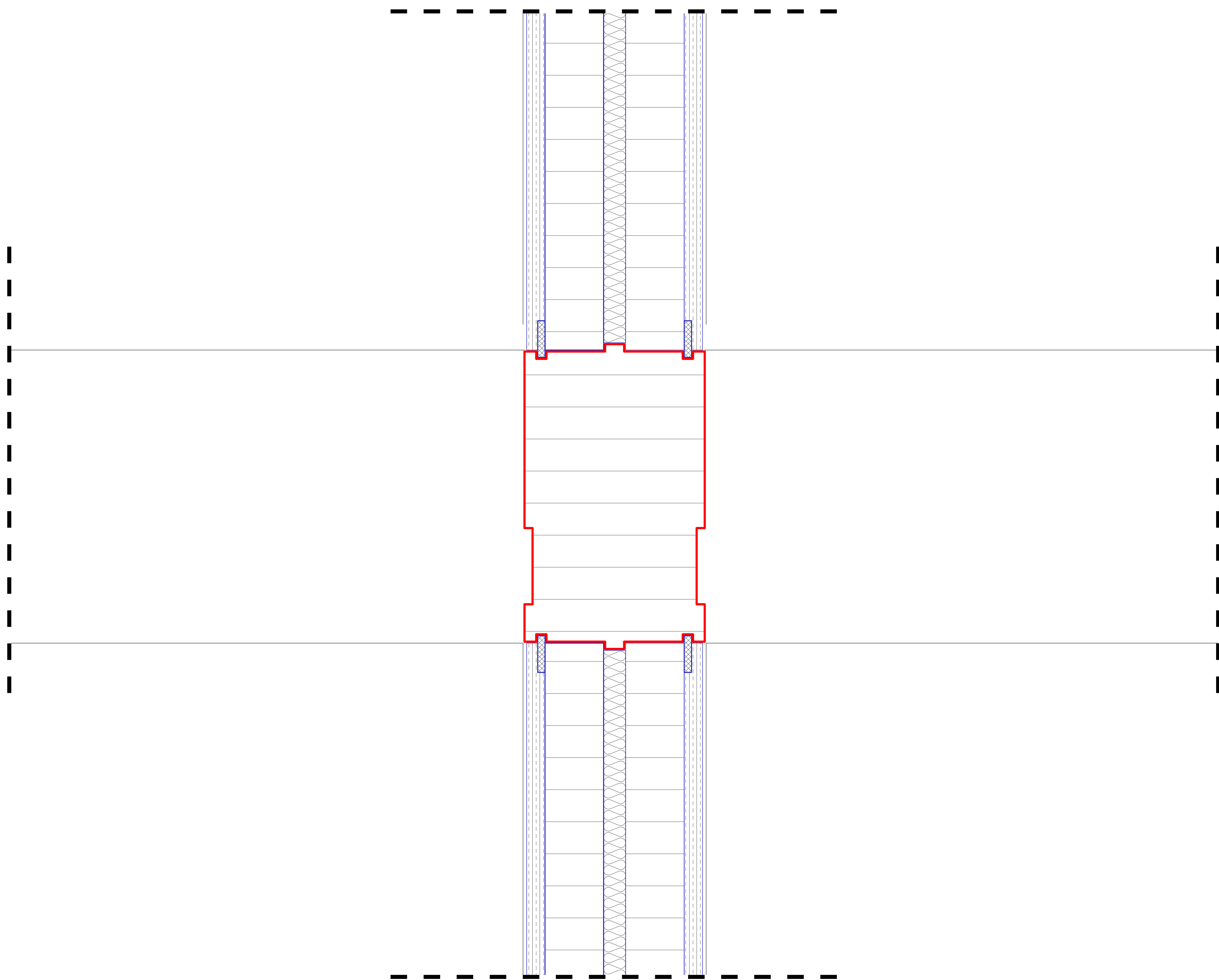
Adaptable partition elements (Floor and wall system)

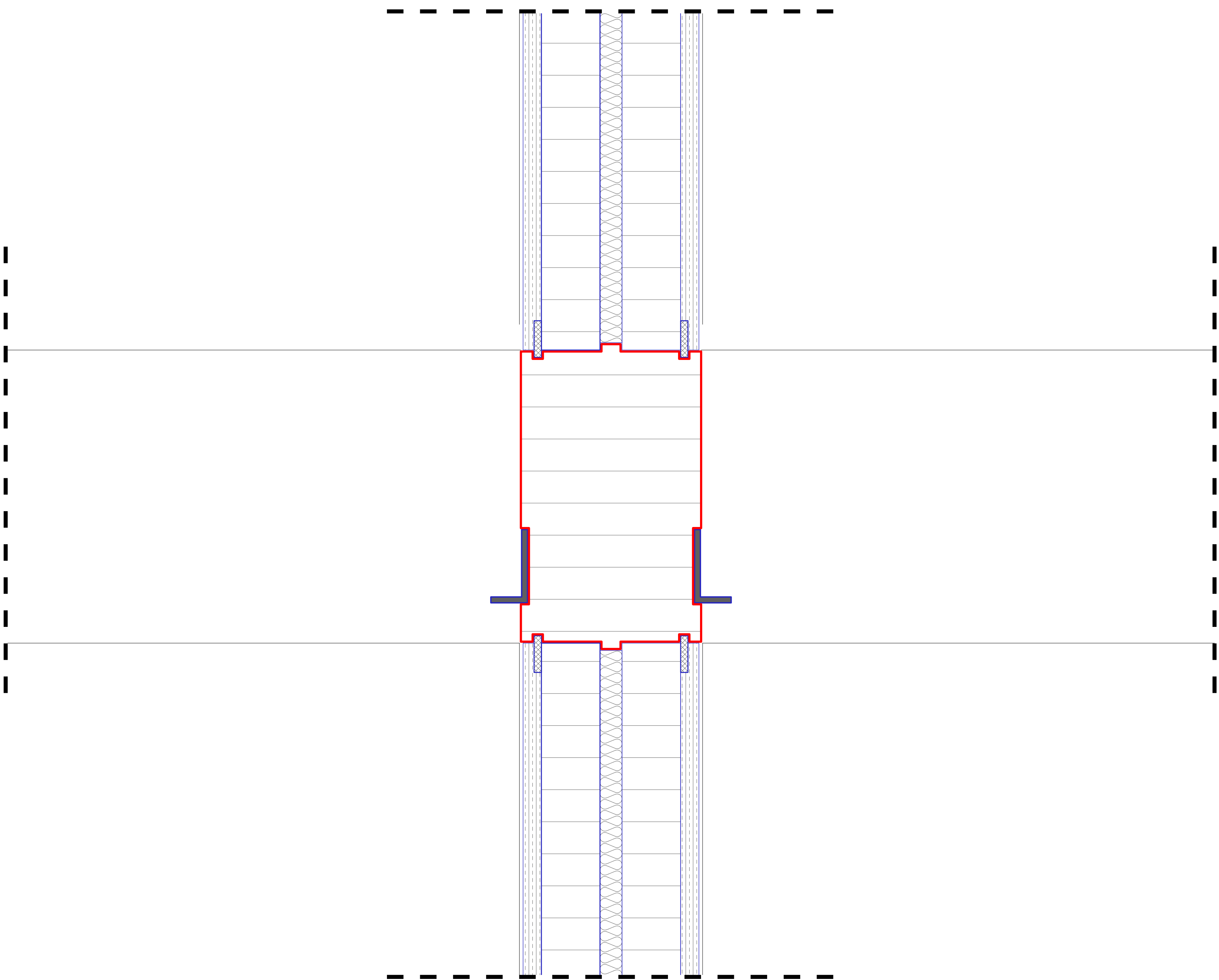
Design principles

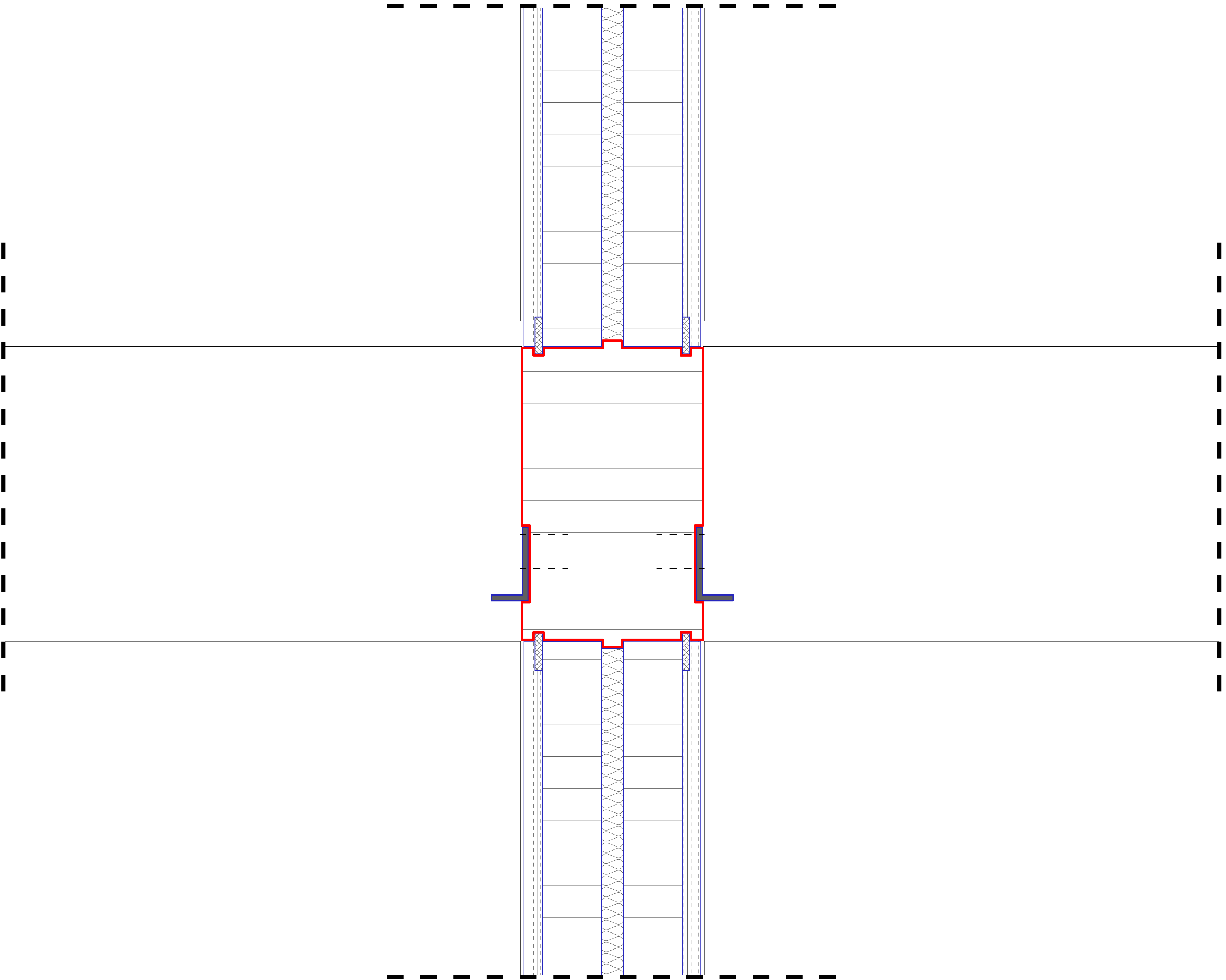
1. Dry, reversible assembly
2. User friendly assembly with hand liftable components (max. 50kg)
3. Reusable
4. Independent from each other (floor and wall)
5. Acoustic and fire separation compliant
6. Integrated service infrastructure

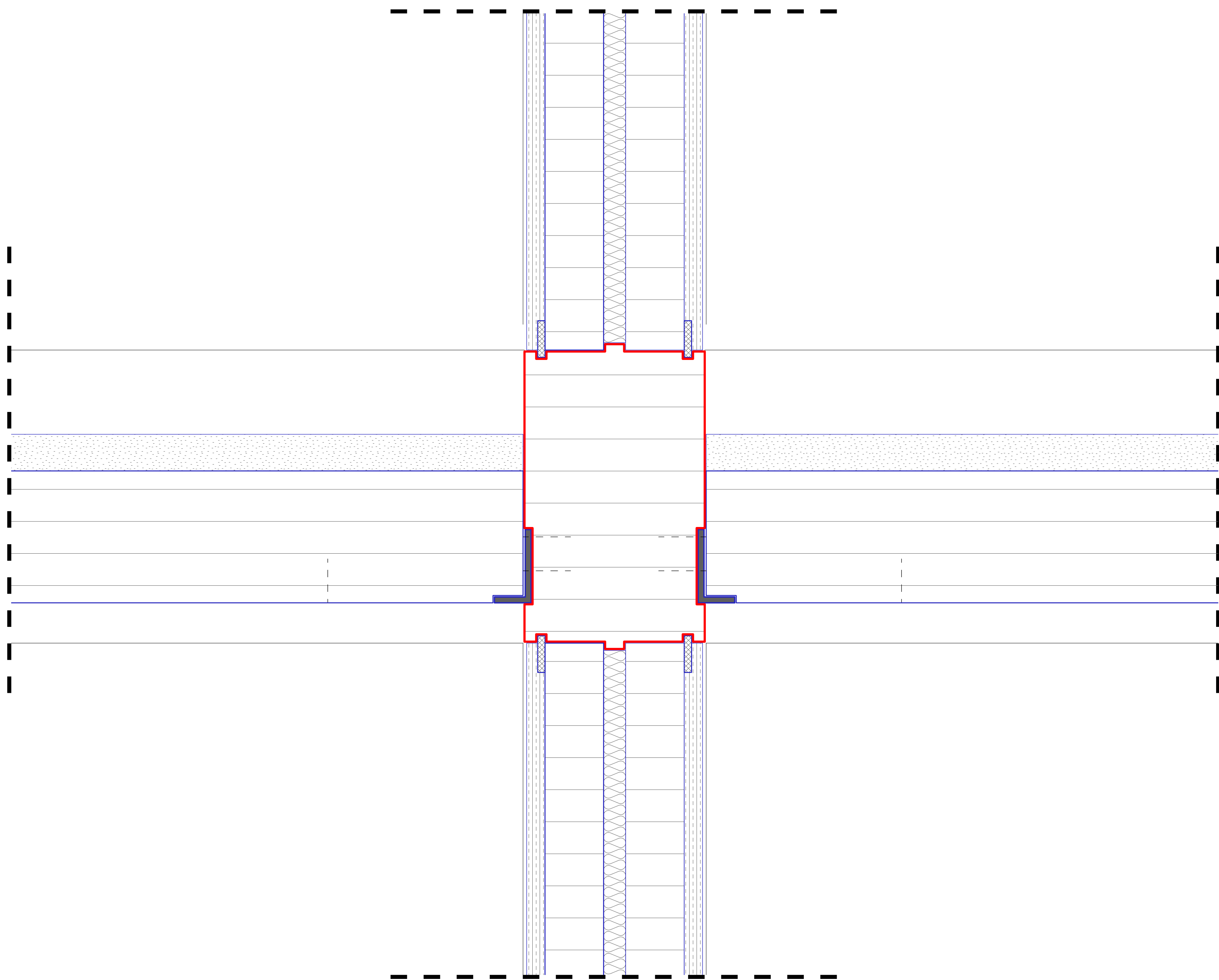
Floor system

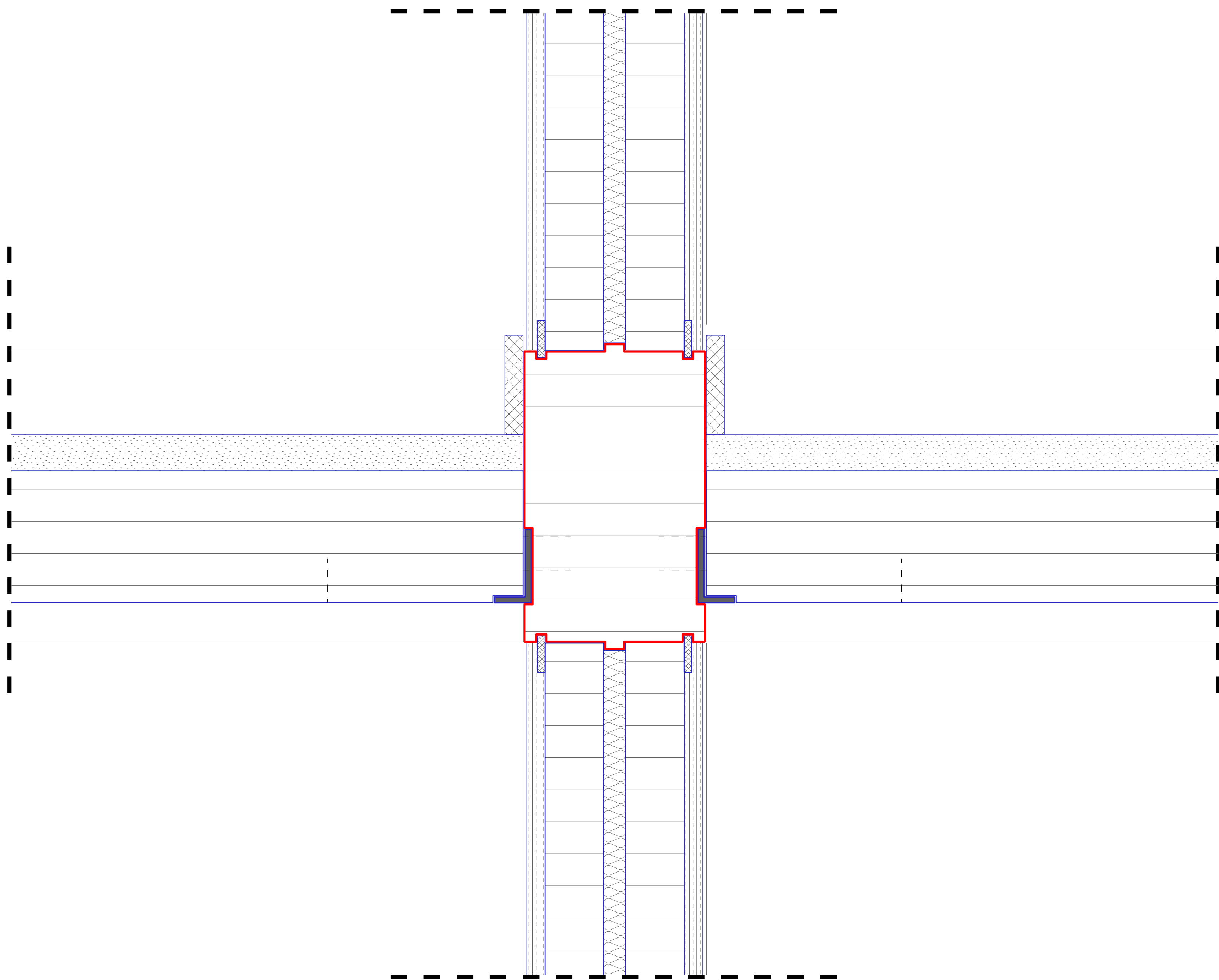


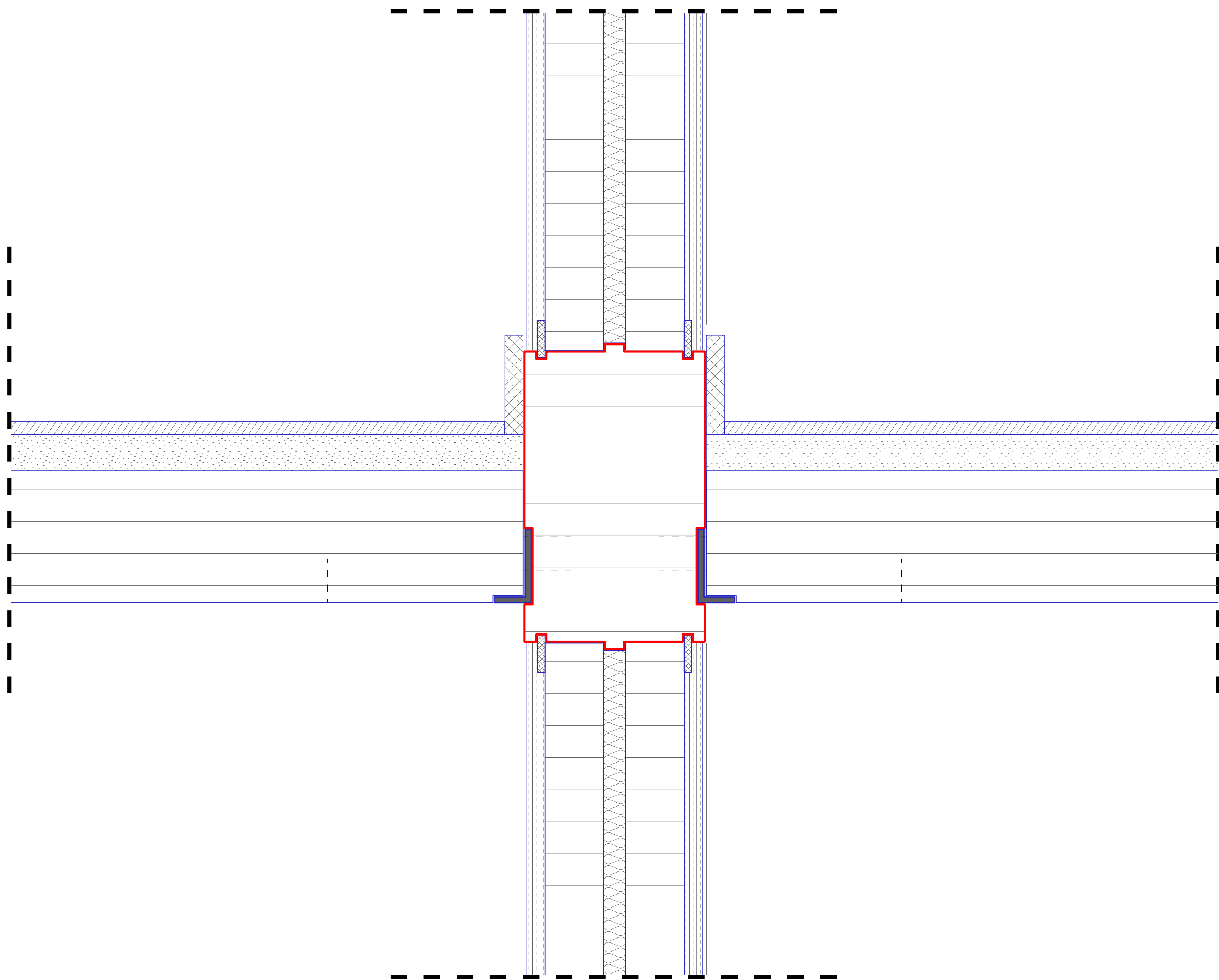


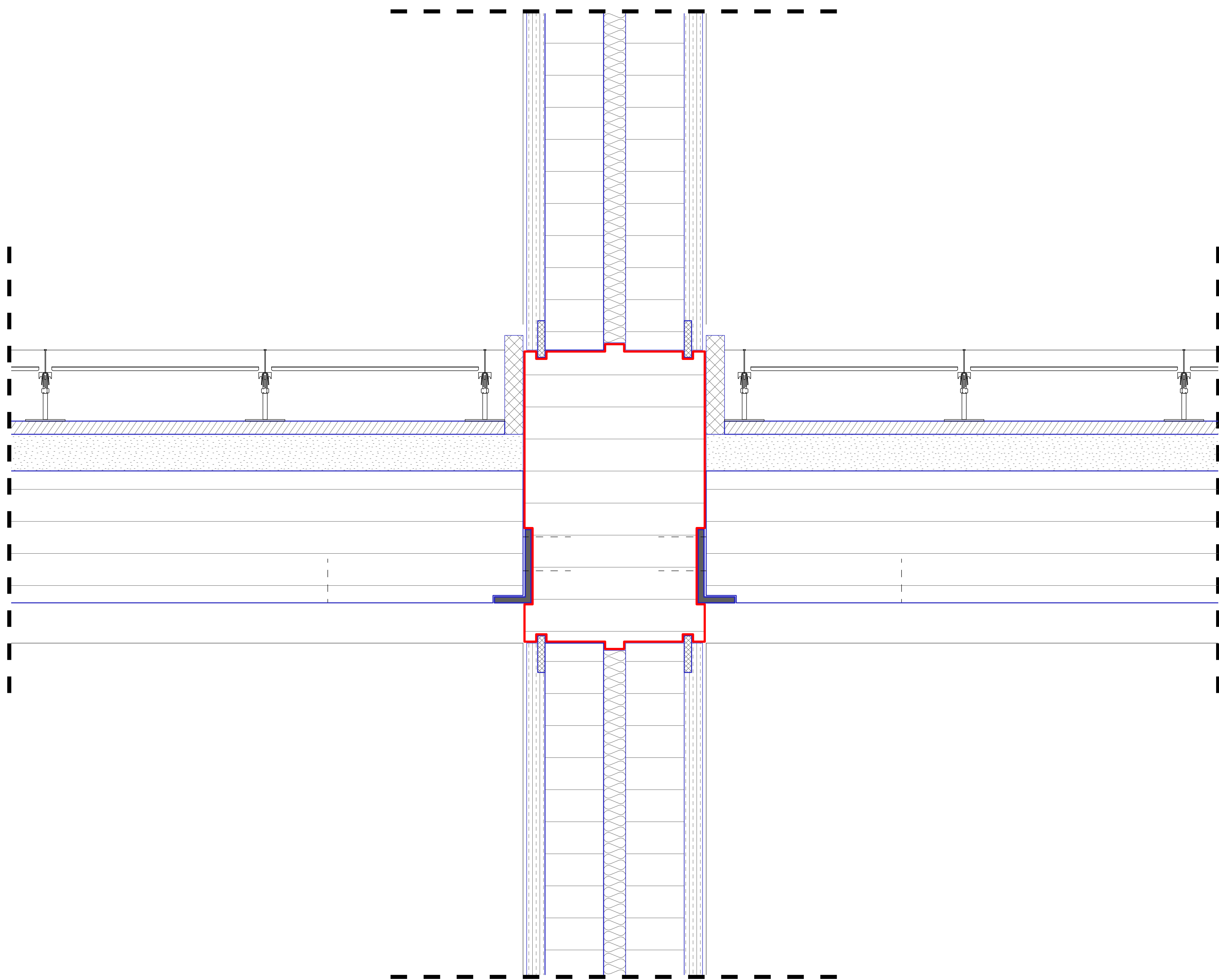


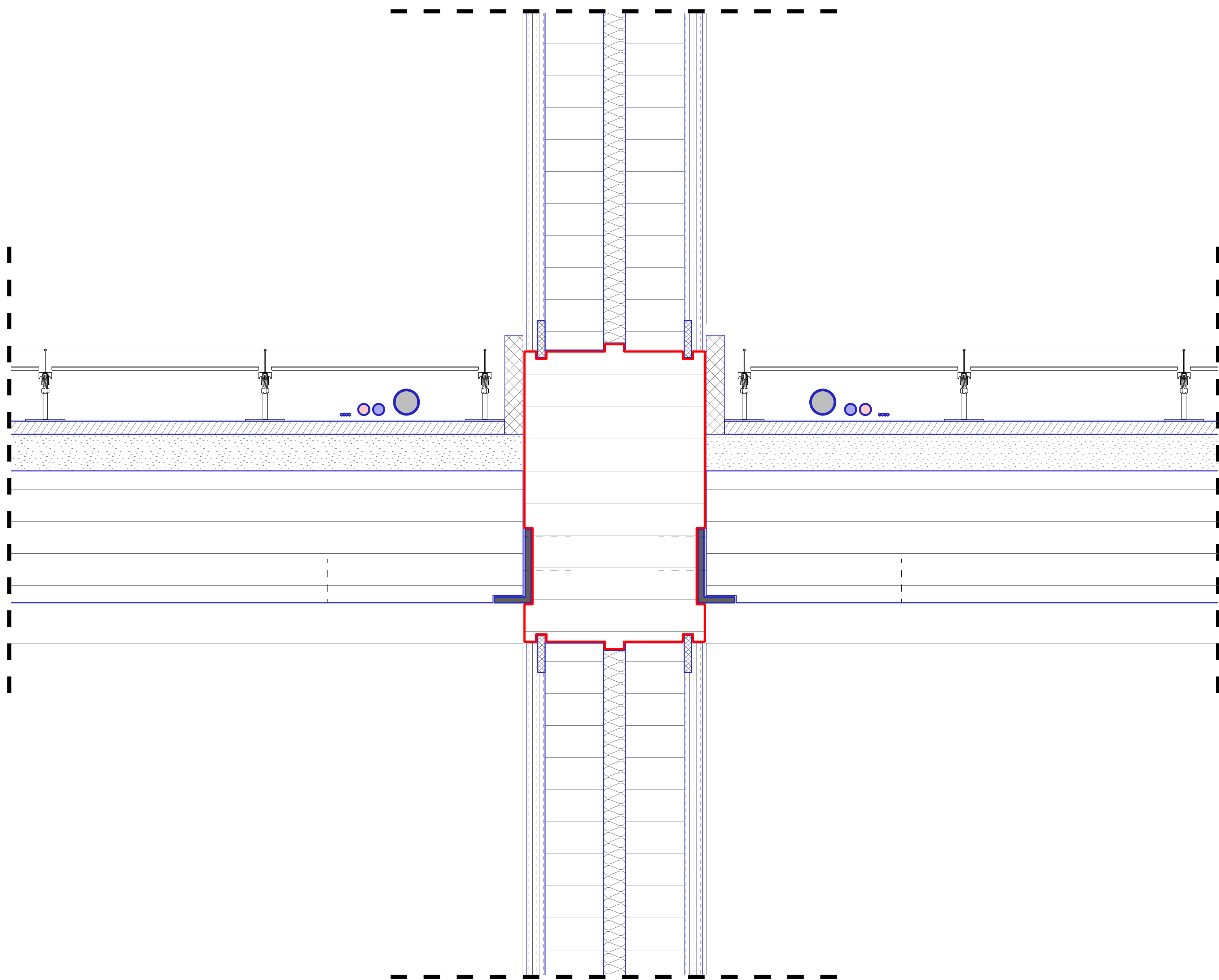


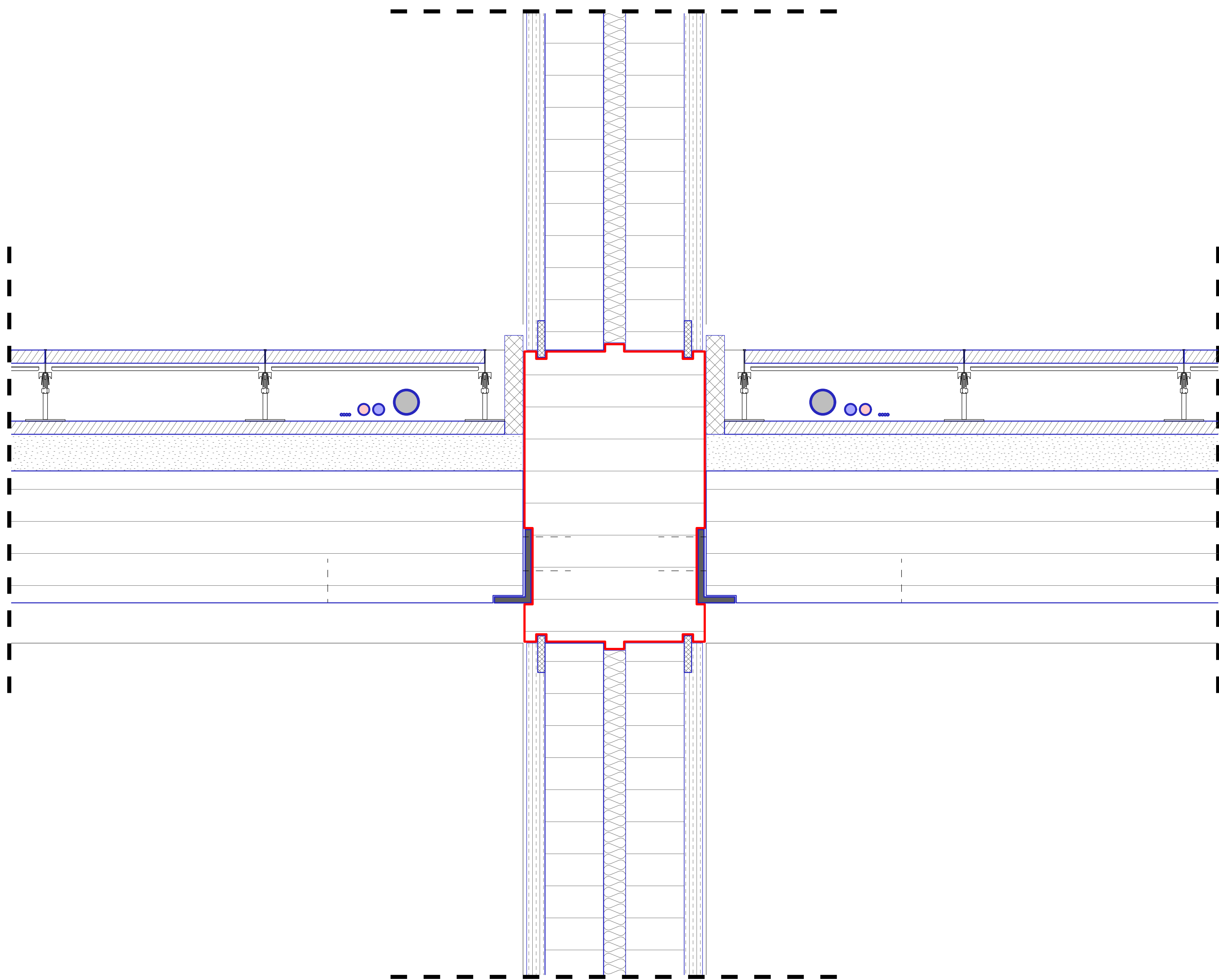


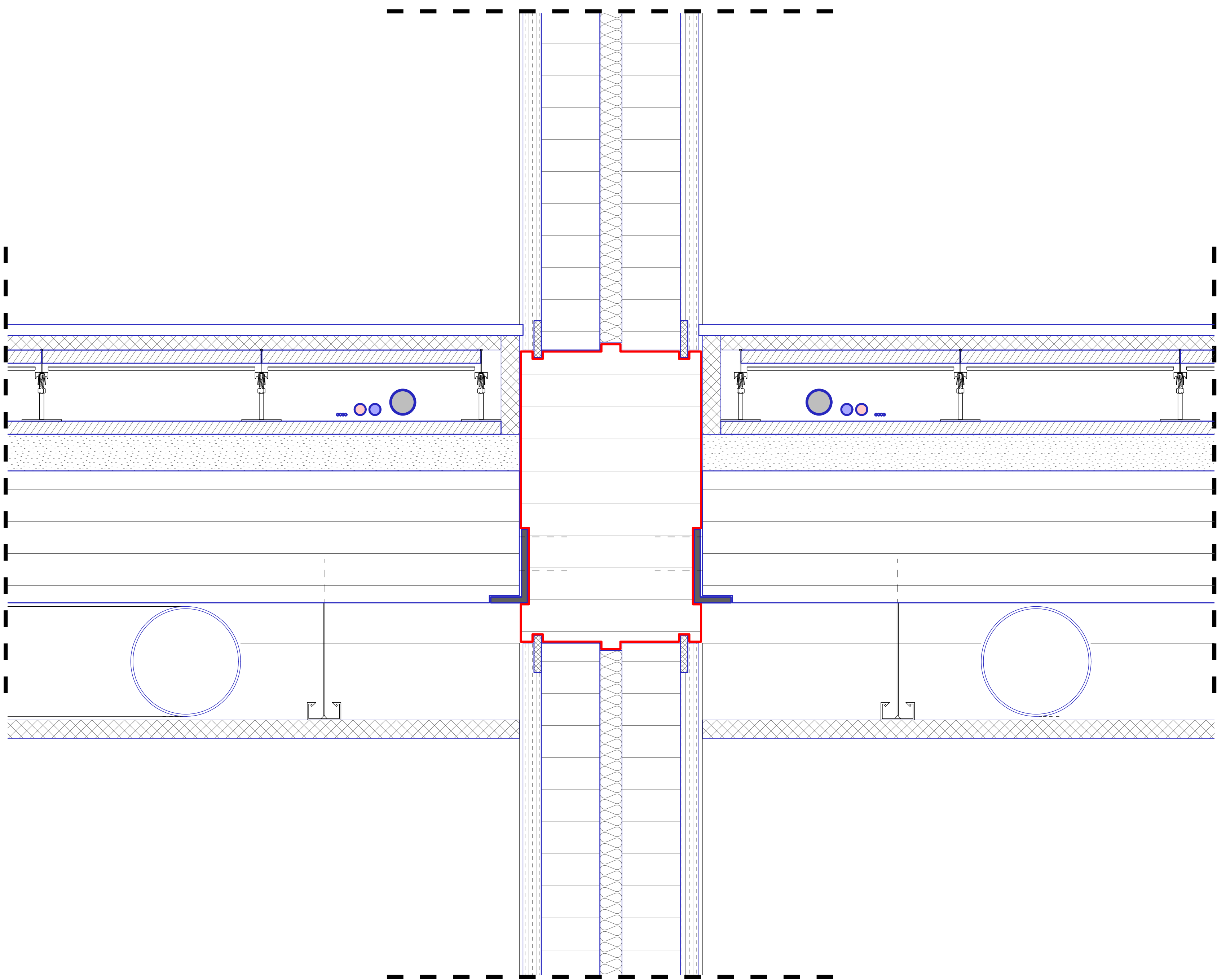




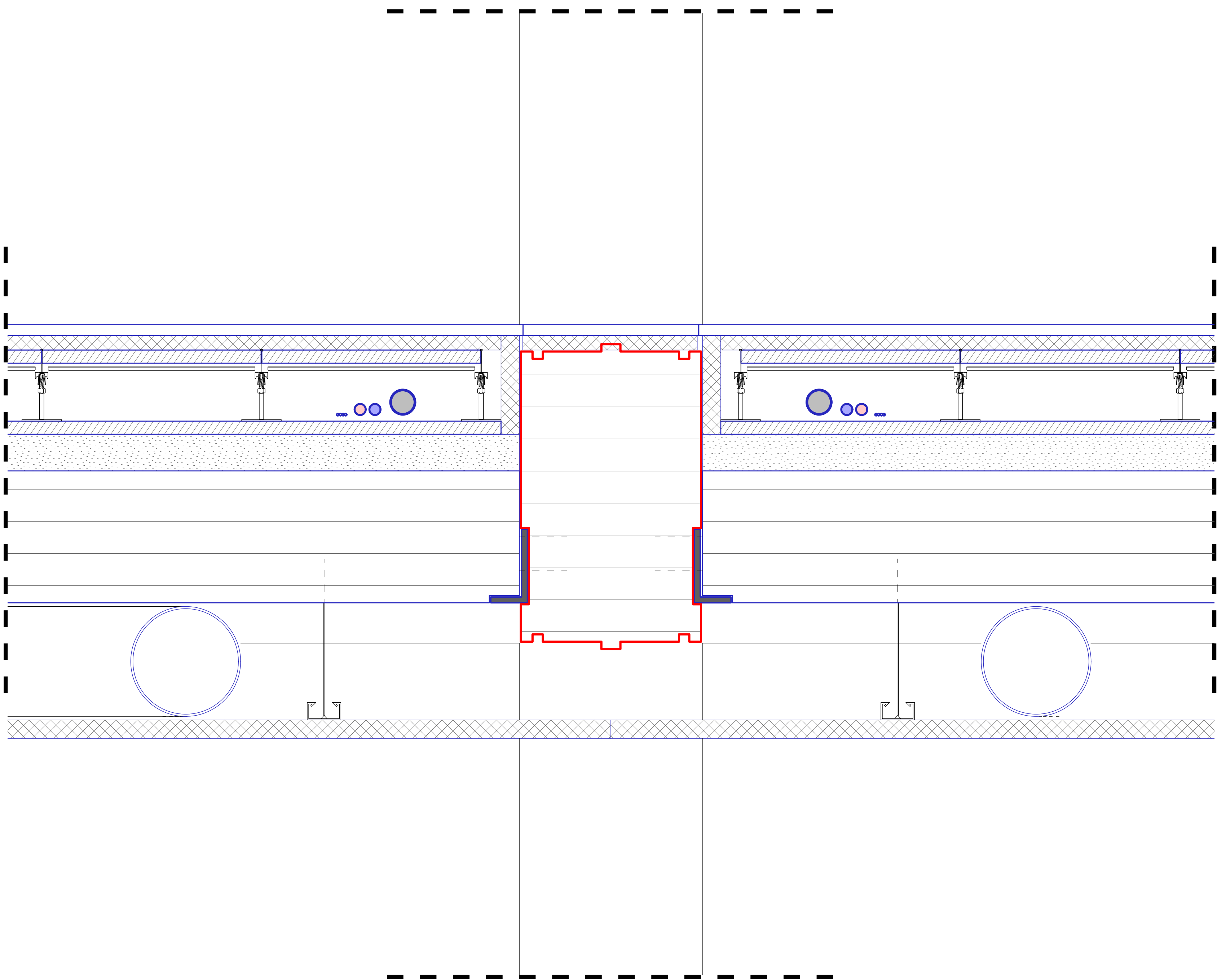


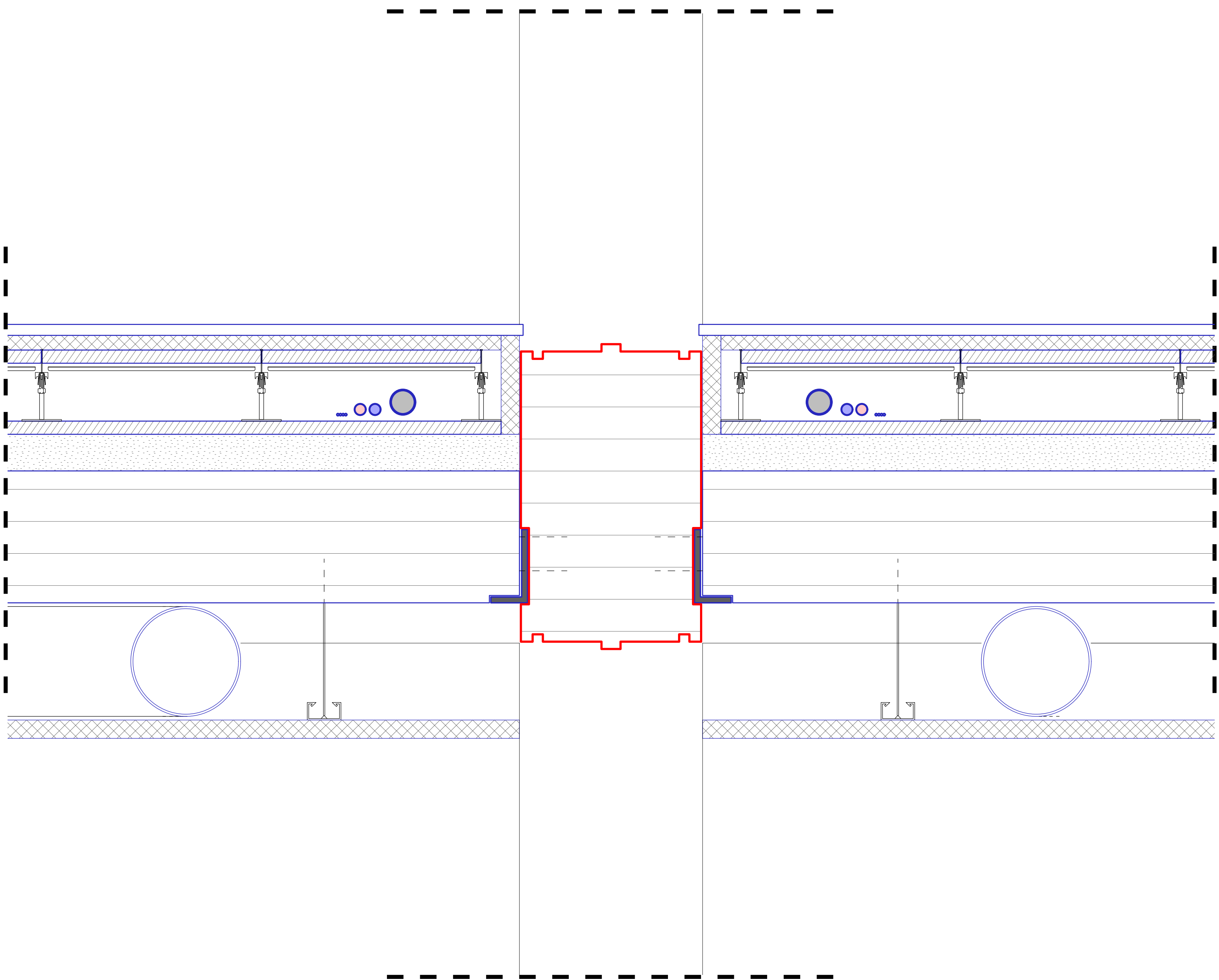


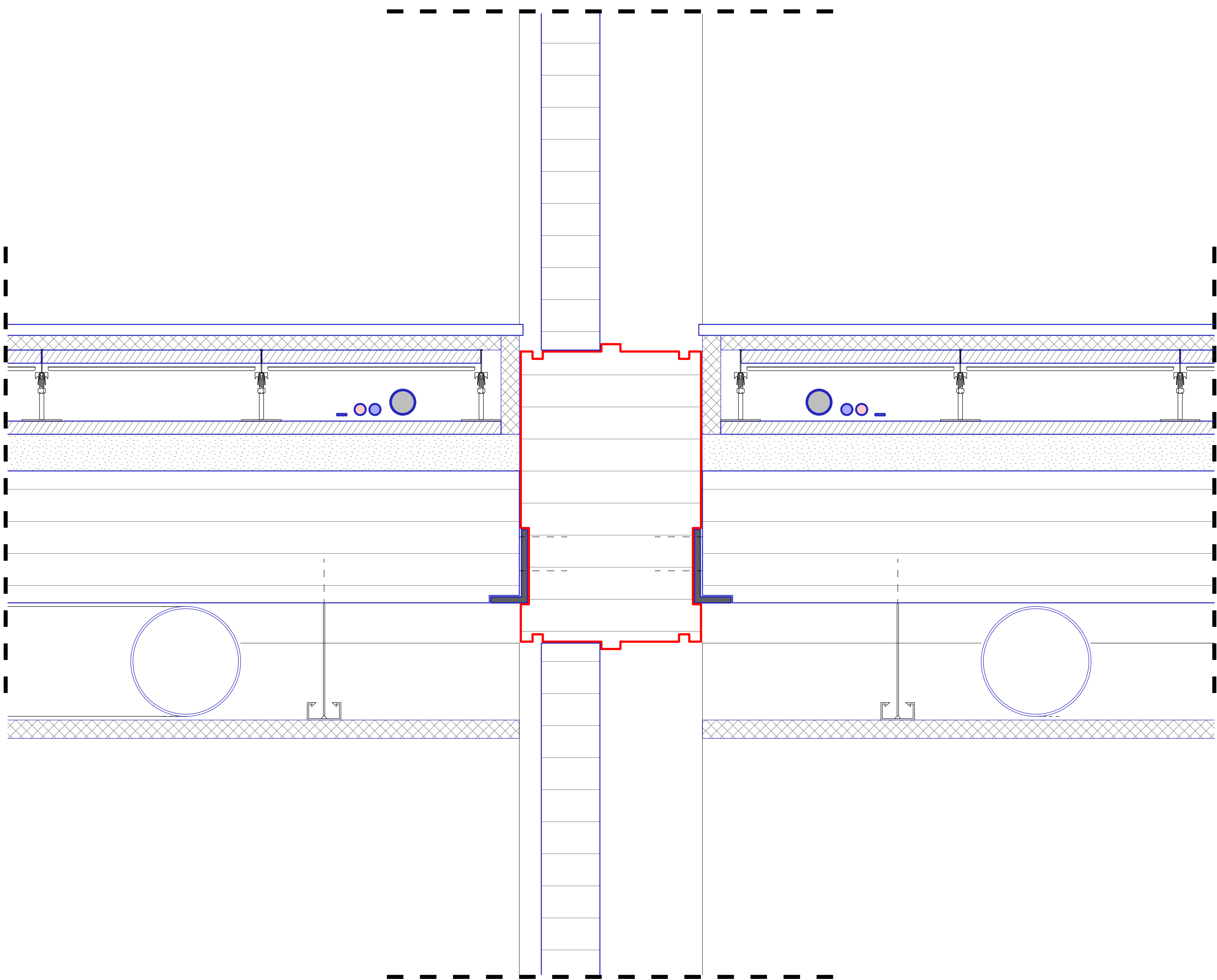


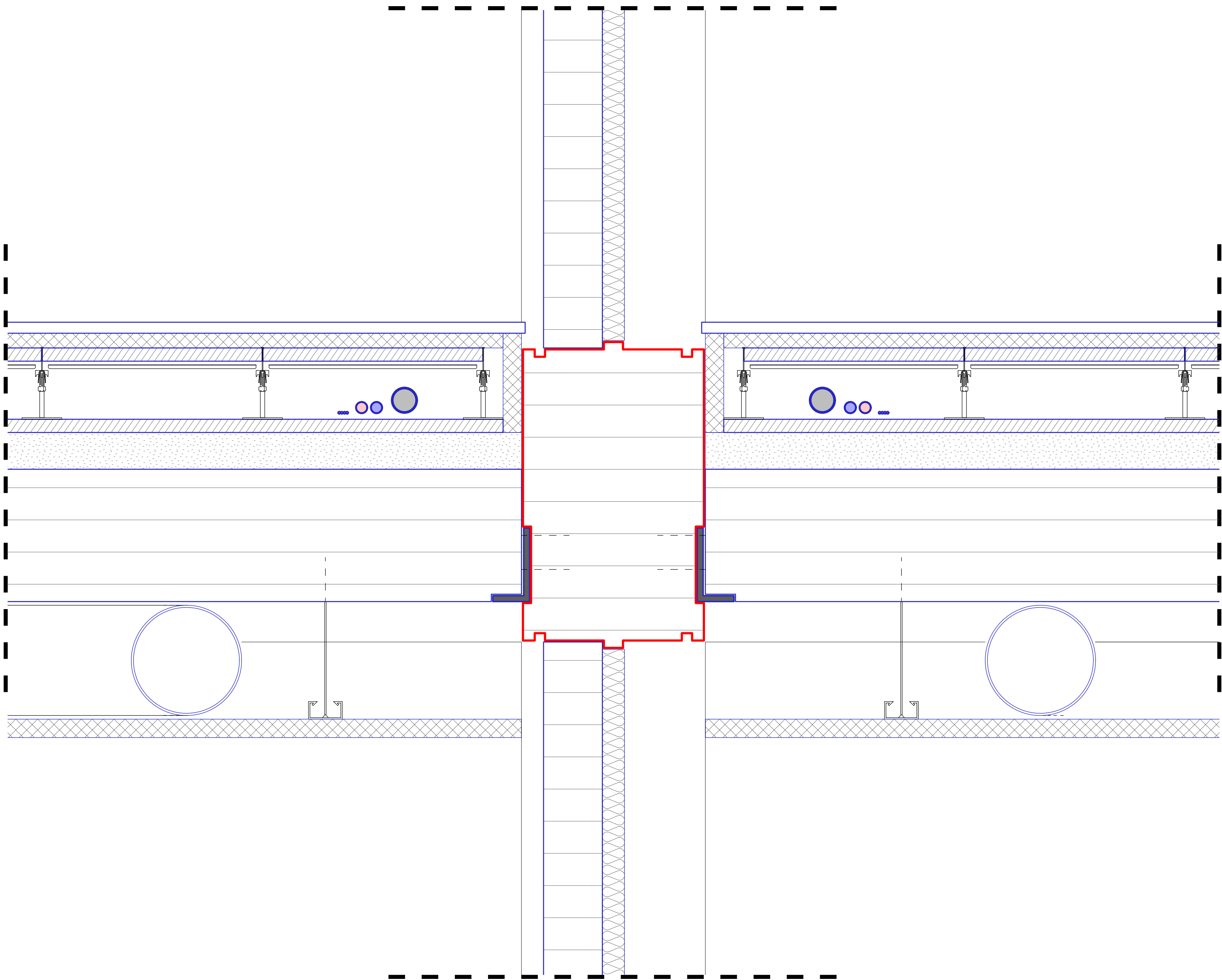


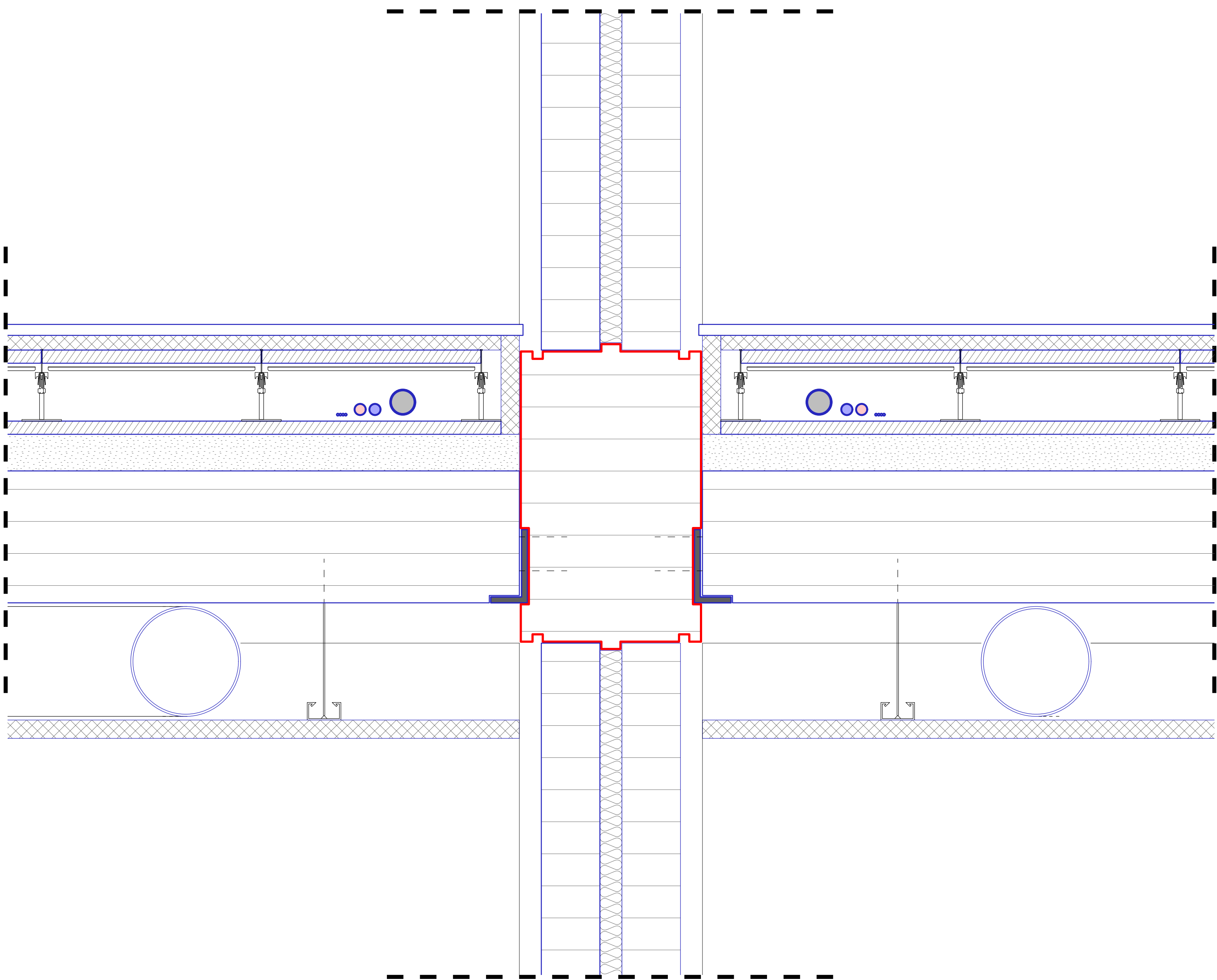
Wall system

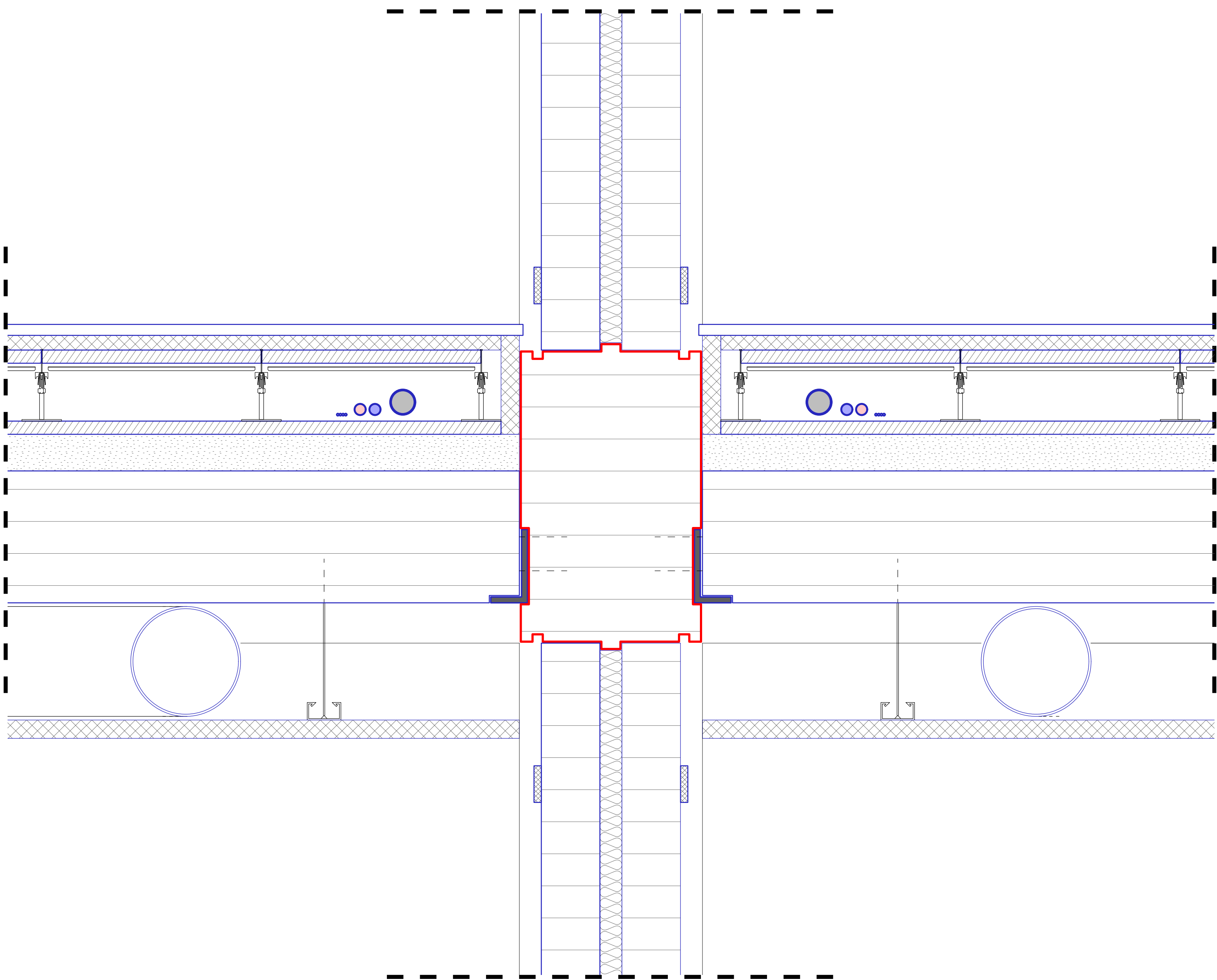


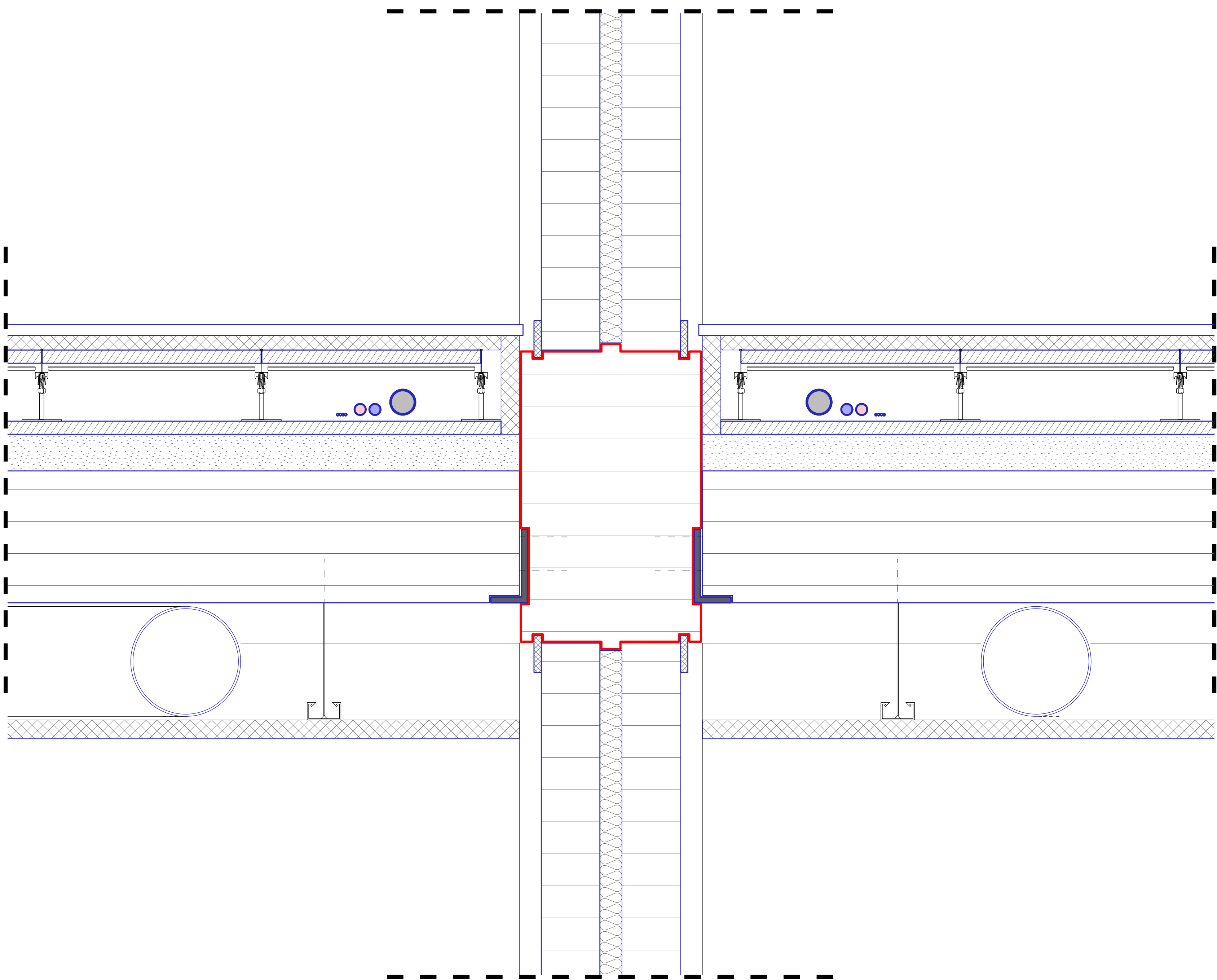


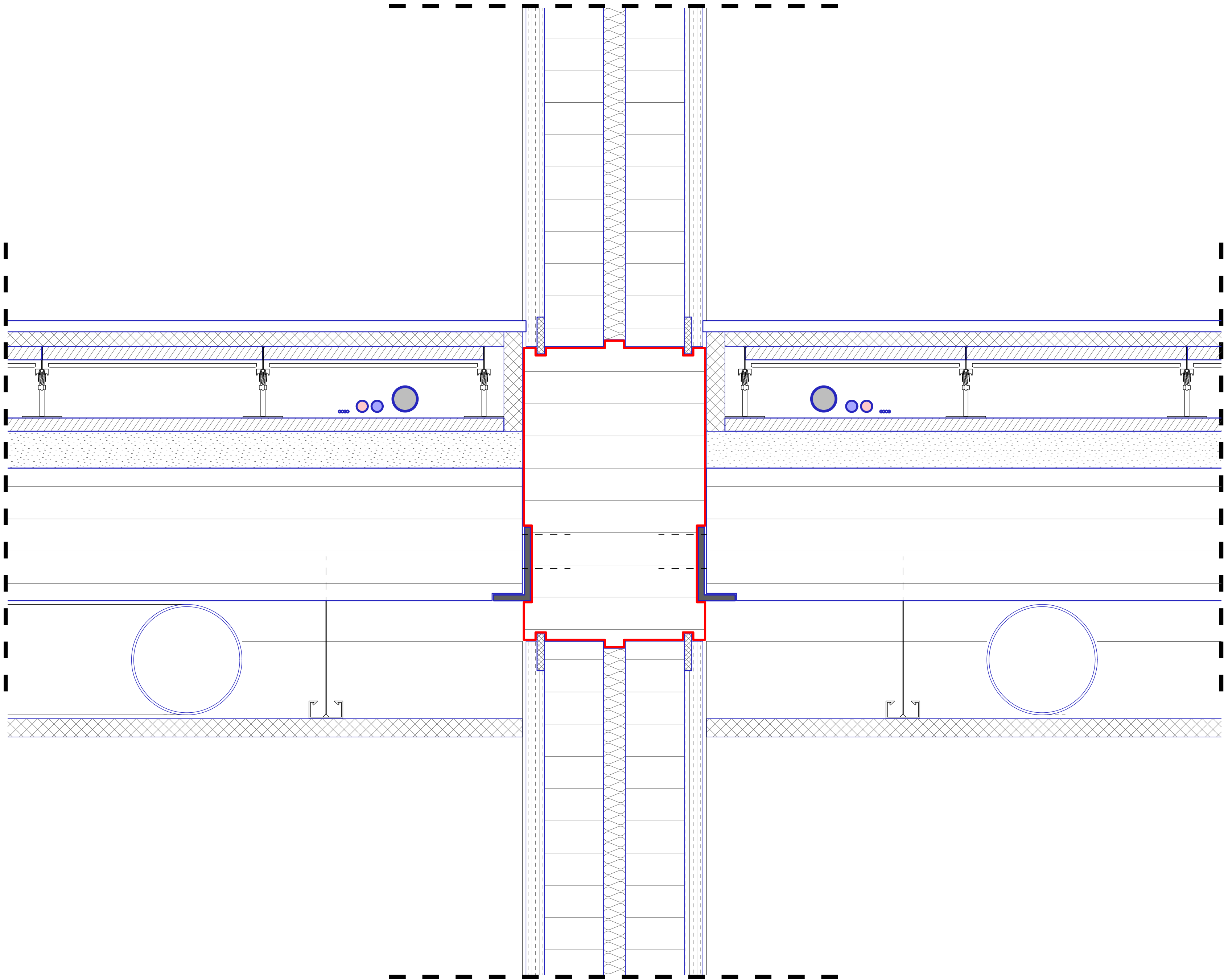




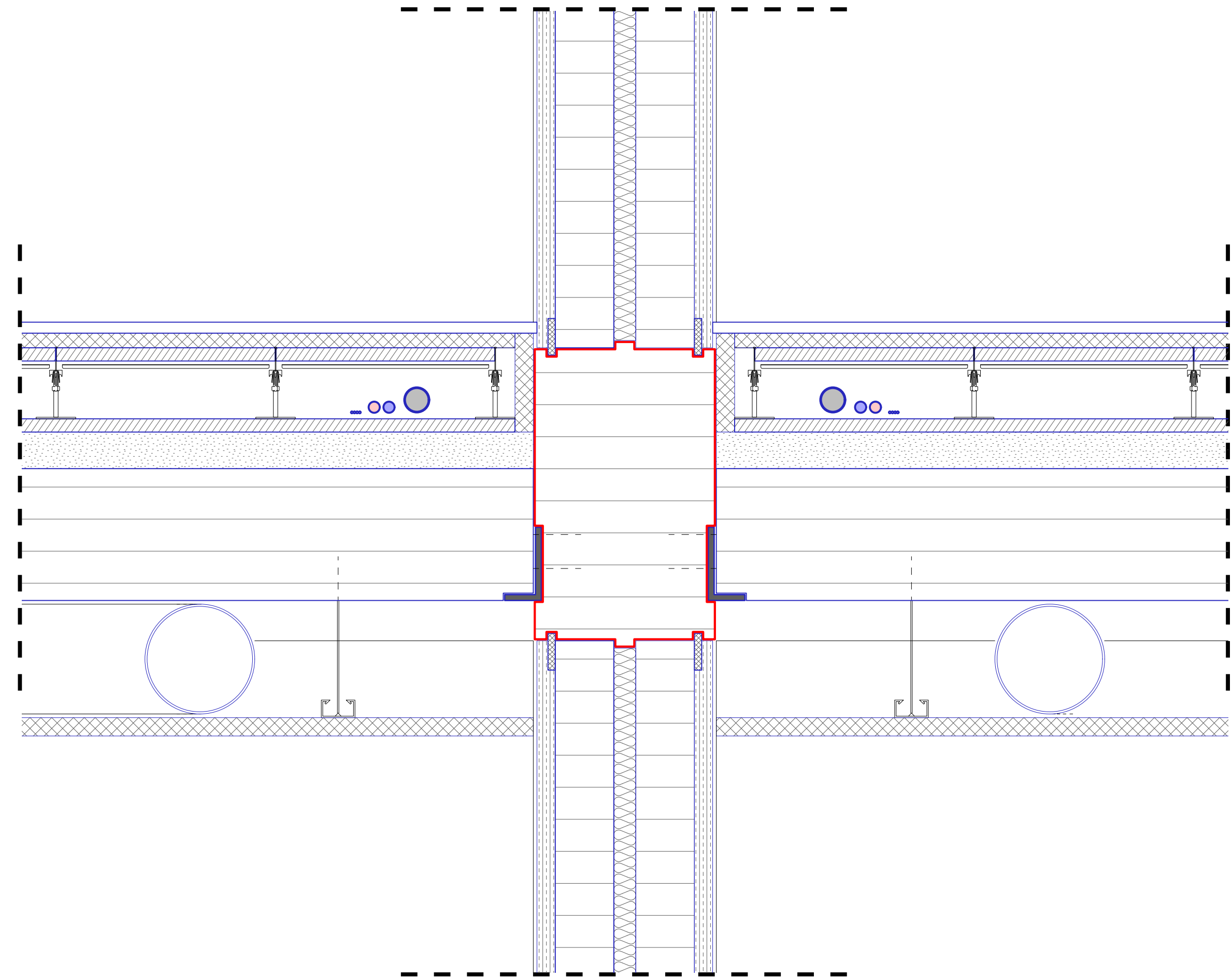








1. Dry, reversible assembly
2. User friendly assembly with hand liftable components (max. 50kg)
3. Reusable
4. Independent from each other (floor and wall)
5. Acoustic and fire separation compliant
6. Integrated service infrastructure

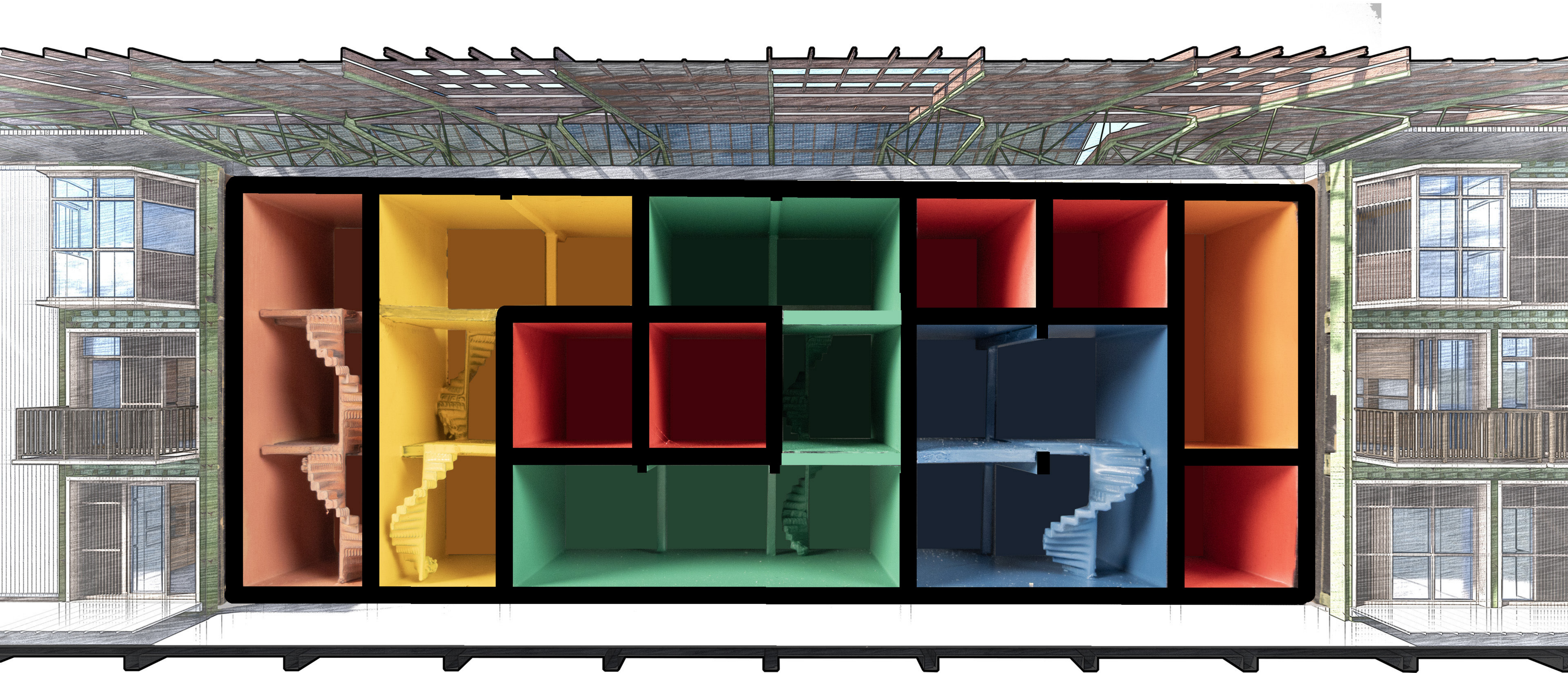


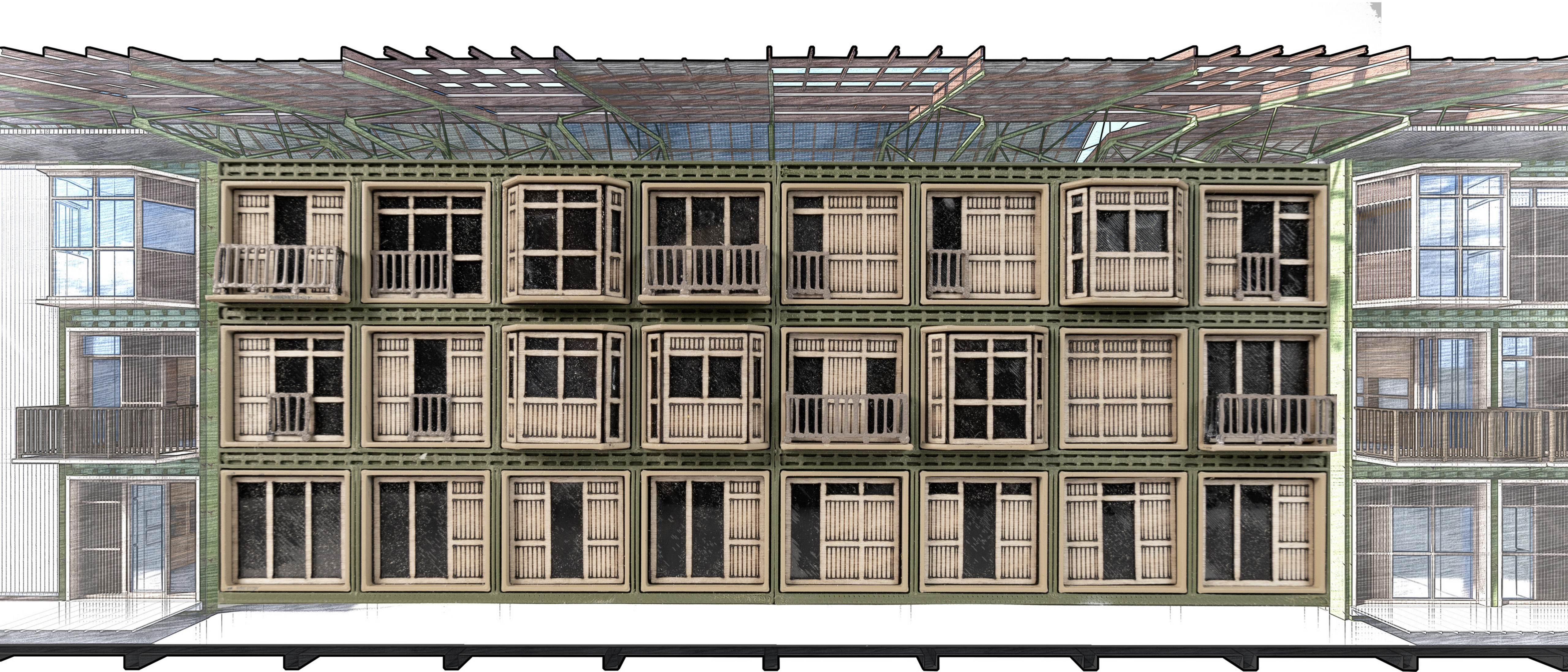
**People change,
Society changes,
Cities change,**





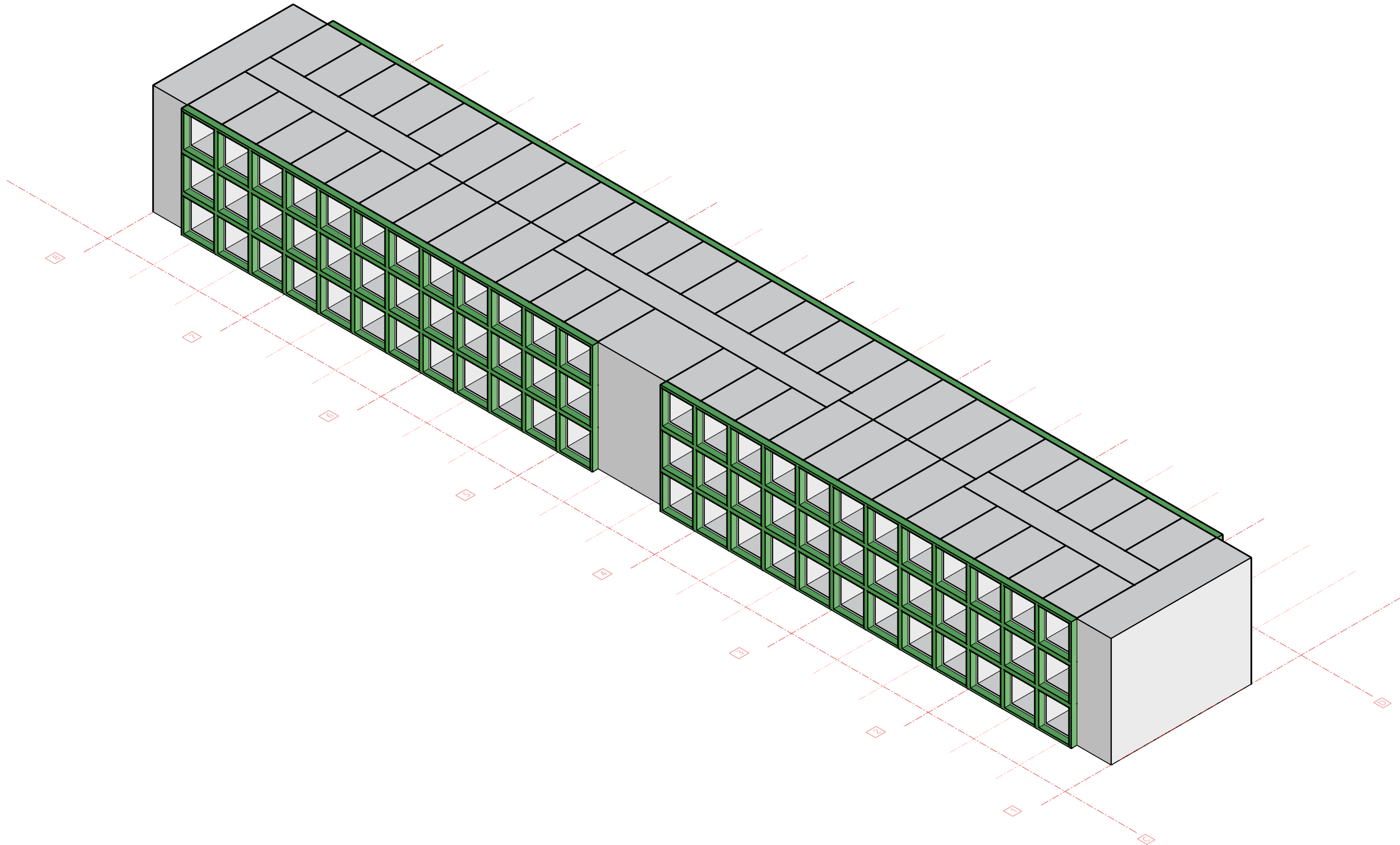


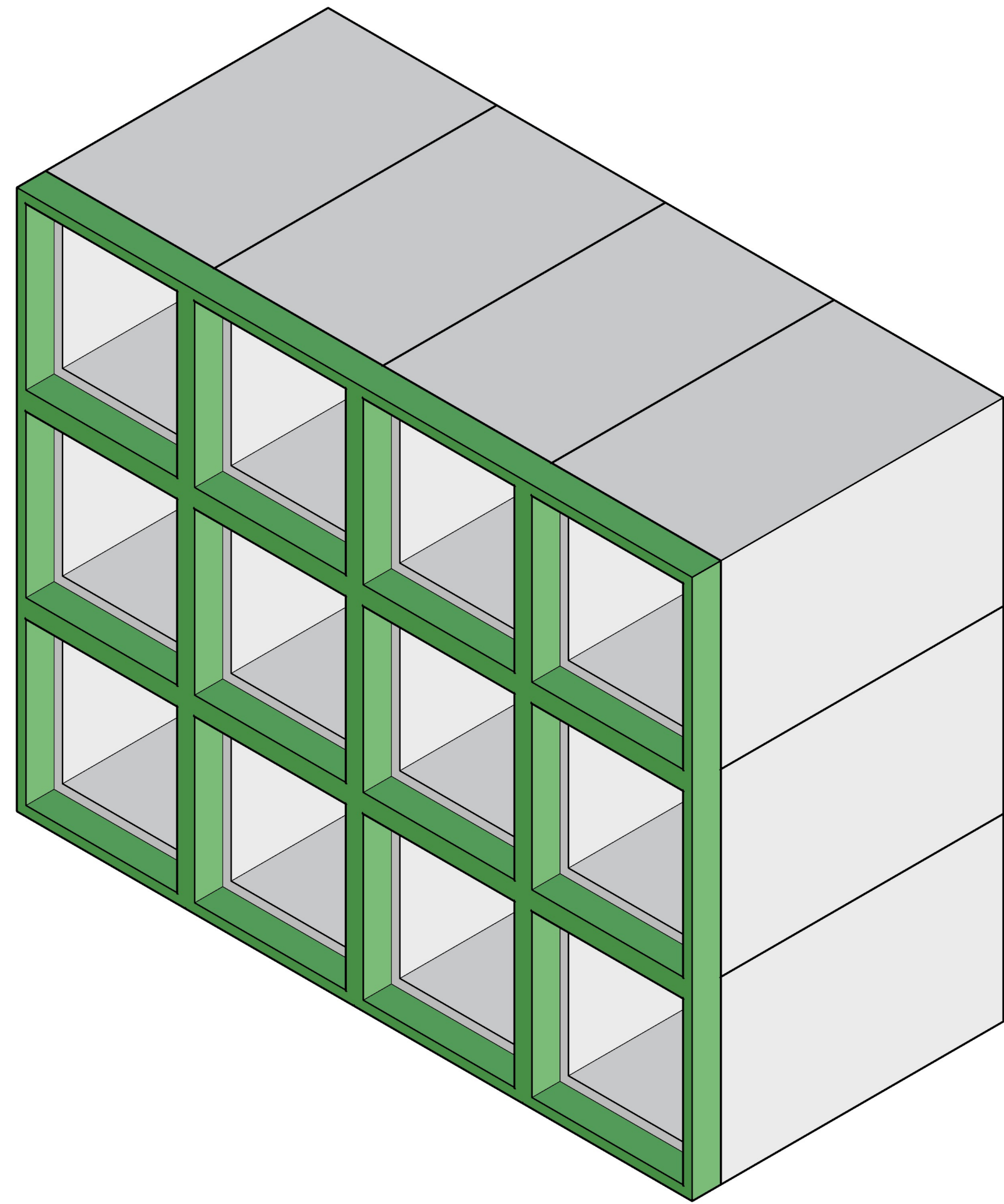


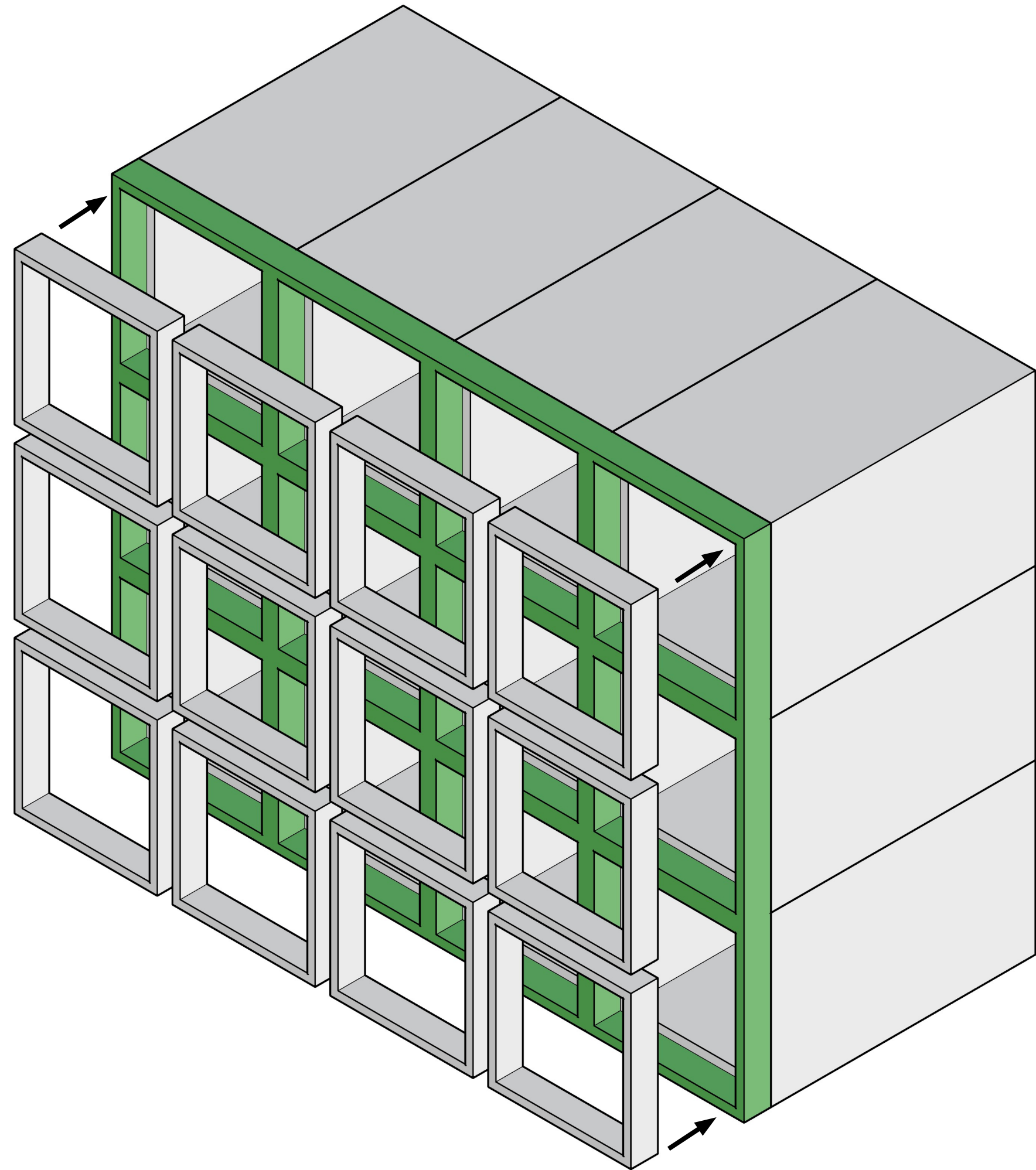


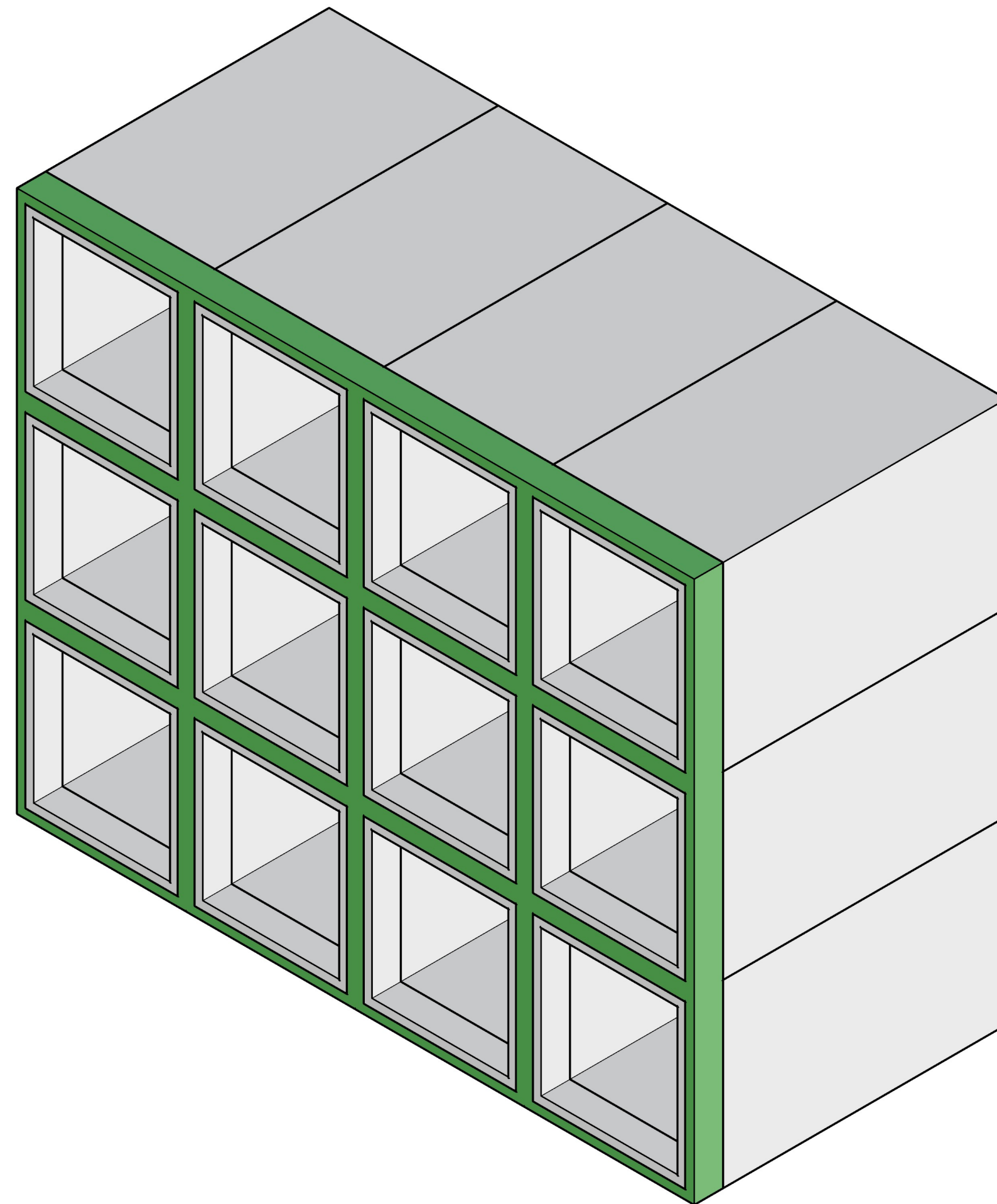
Design principles

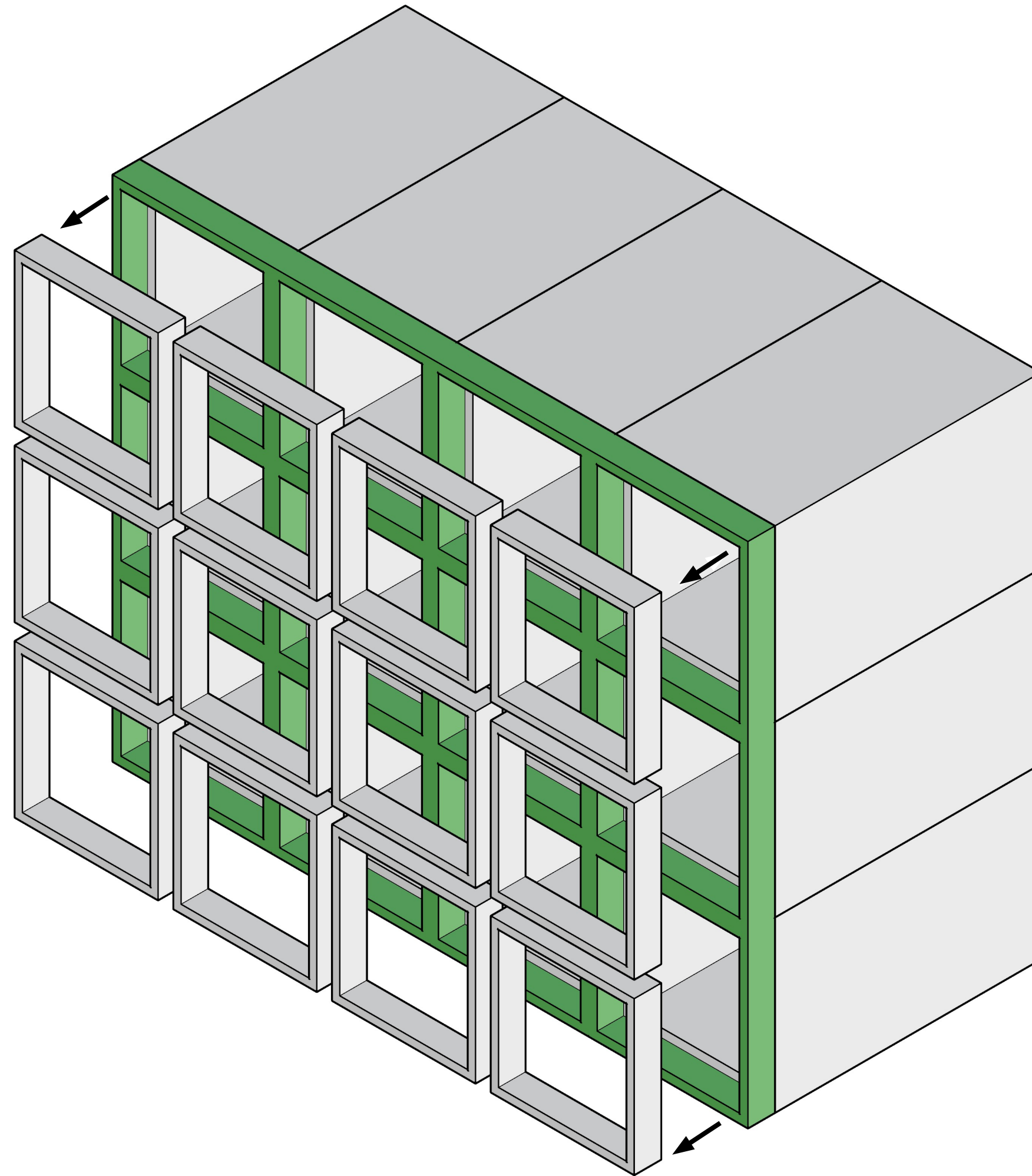
1. Unit-scale spatial adaptability
2. Dry, reversible assembly
3. User-driven customisation

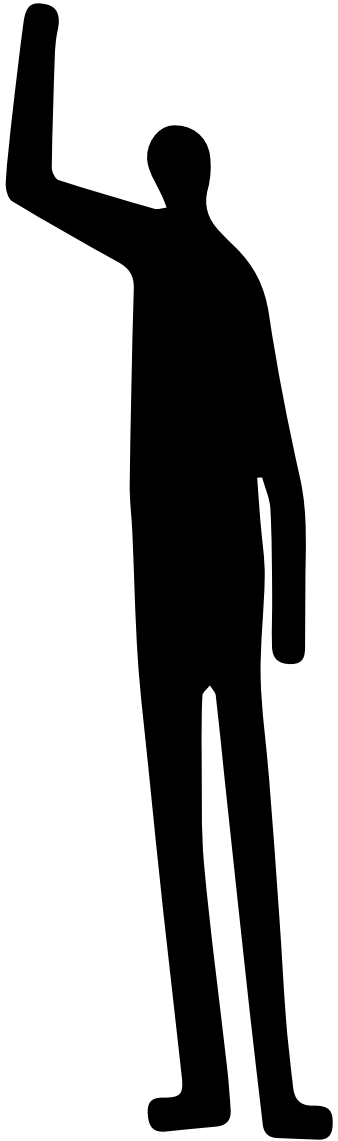
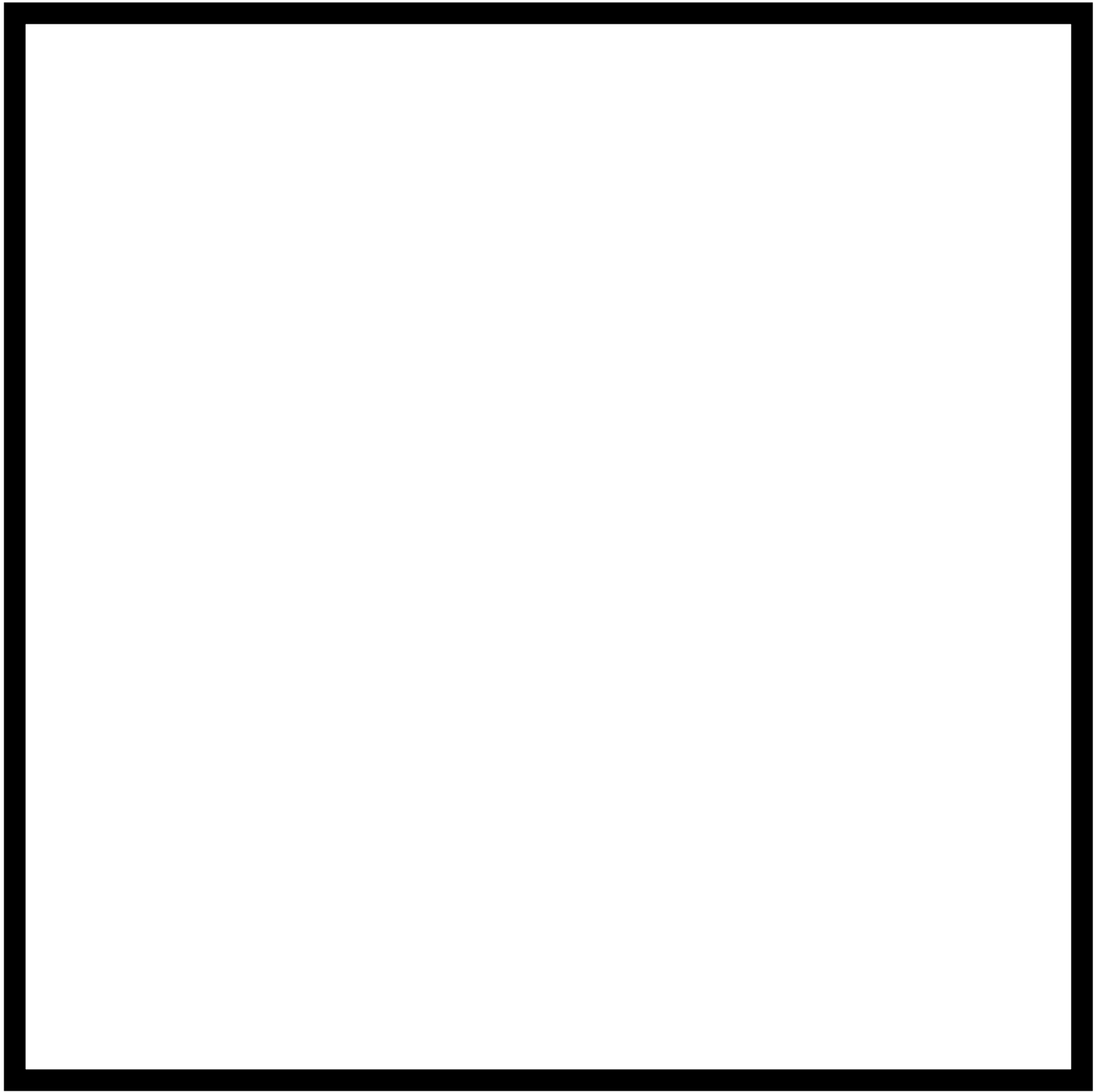


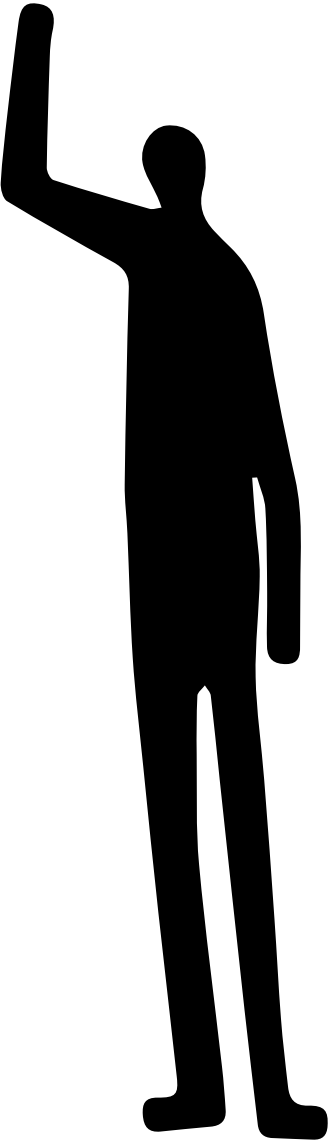
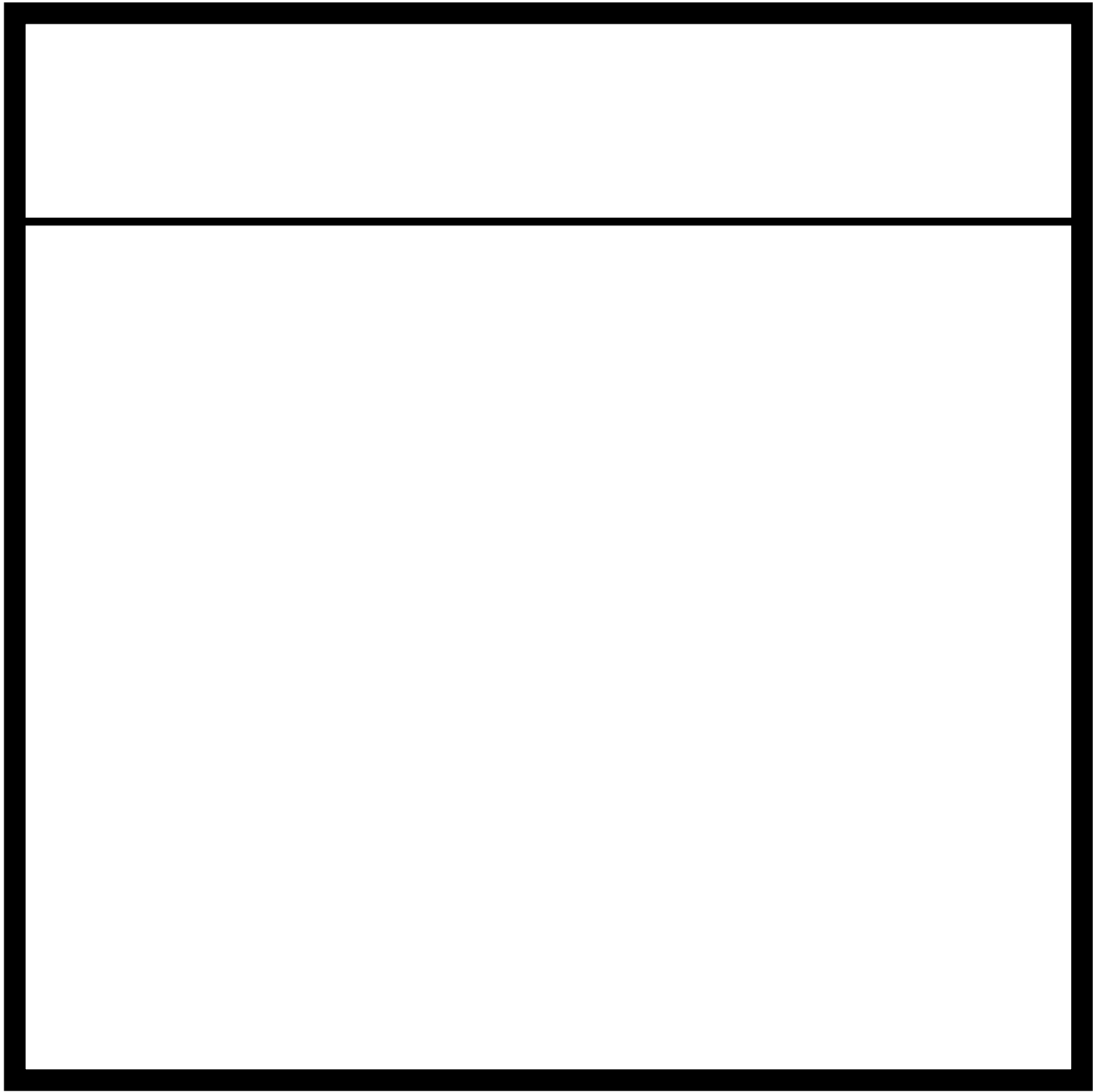


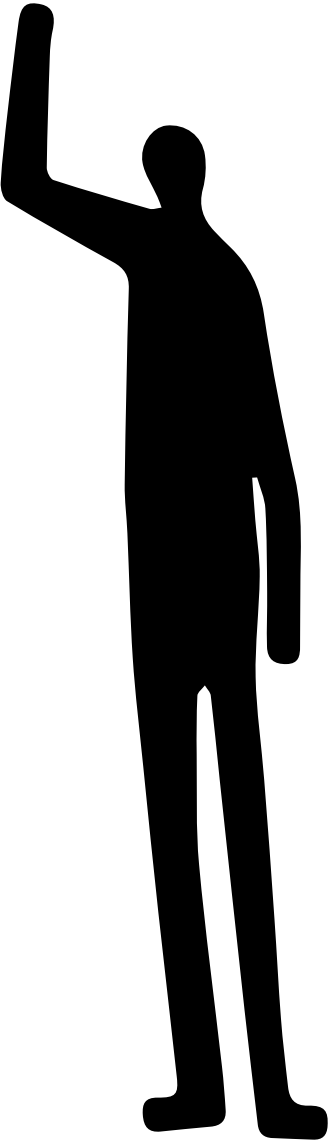
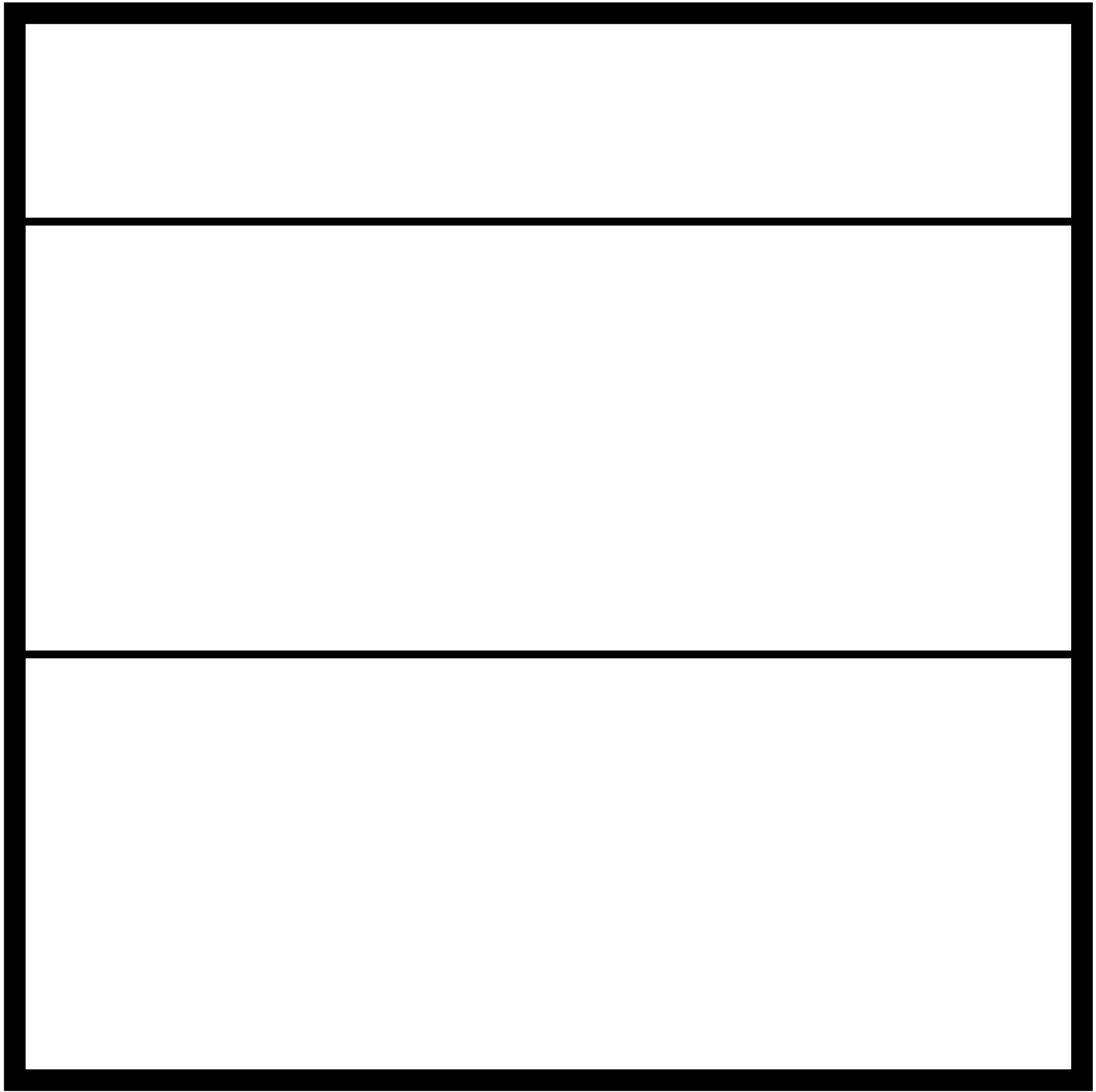


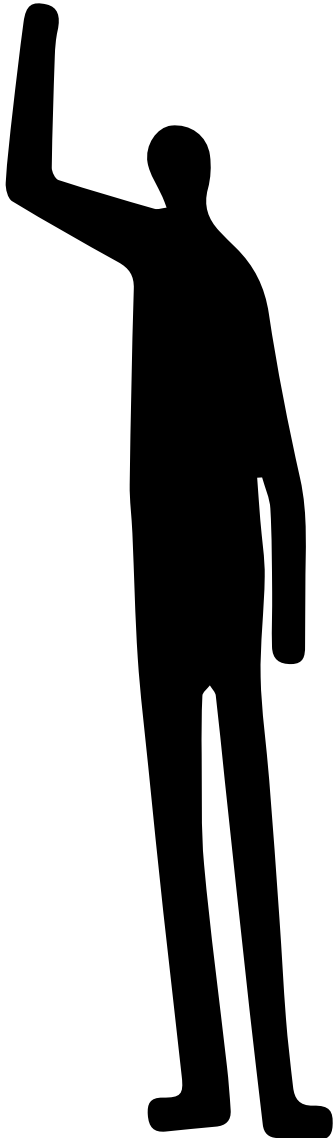
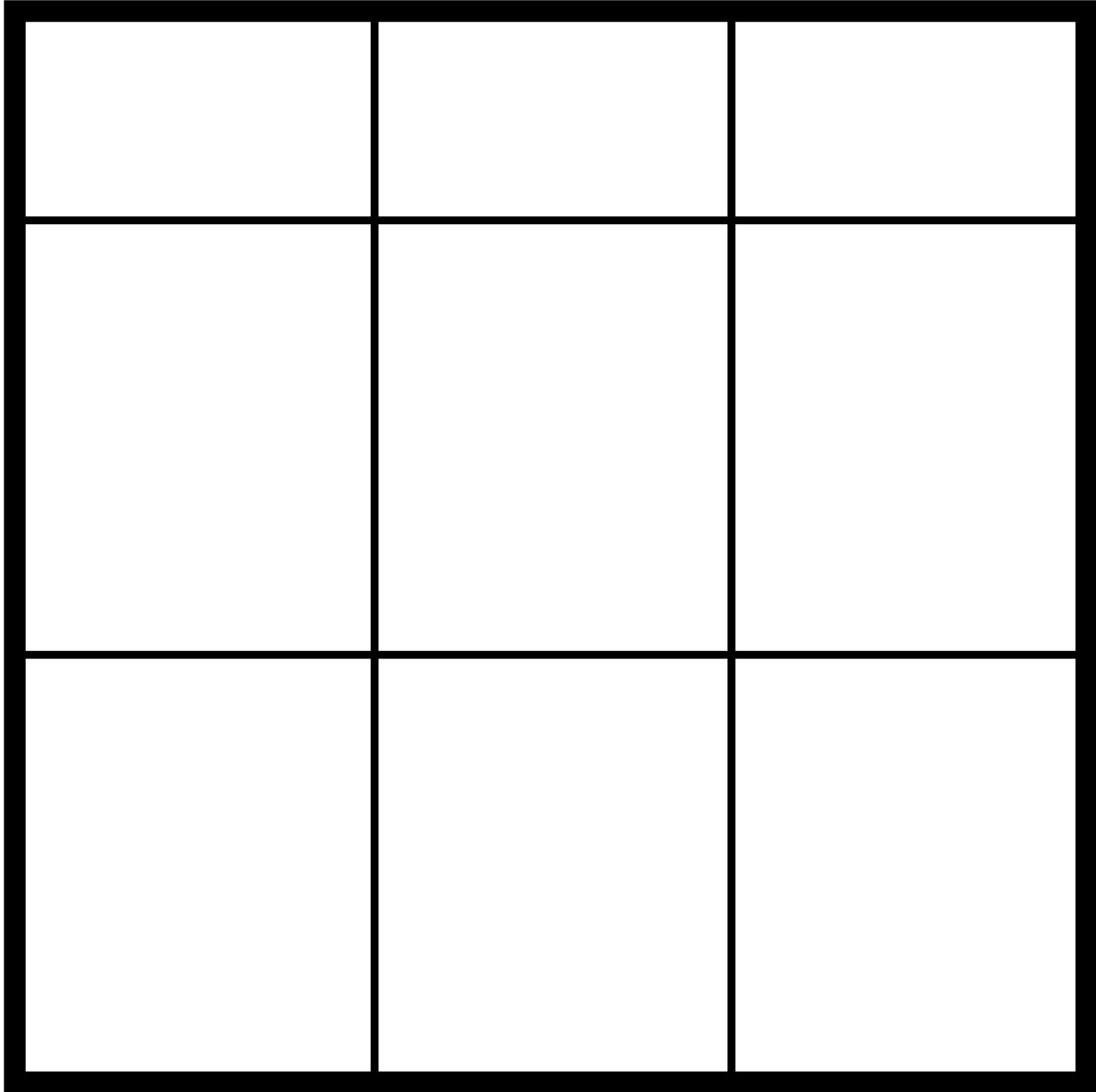


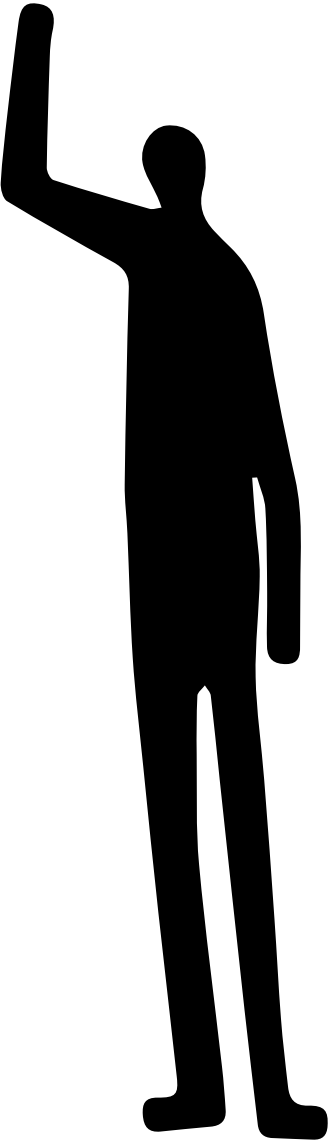
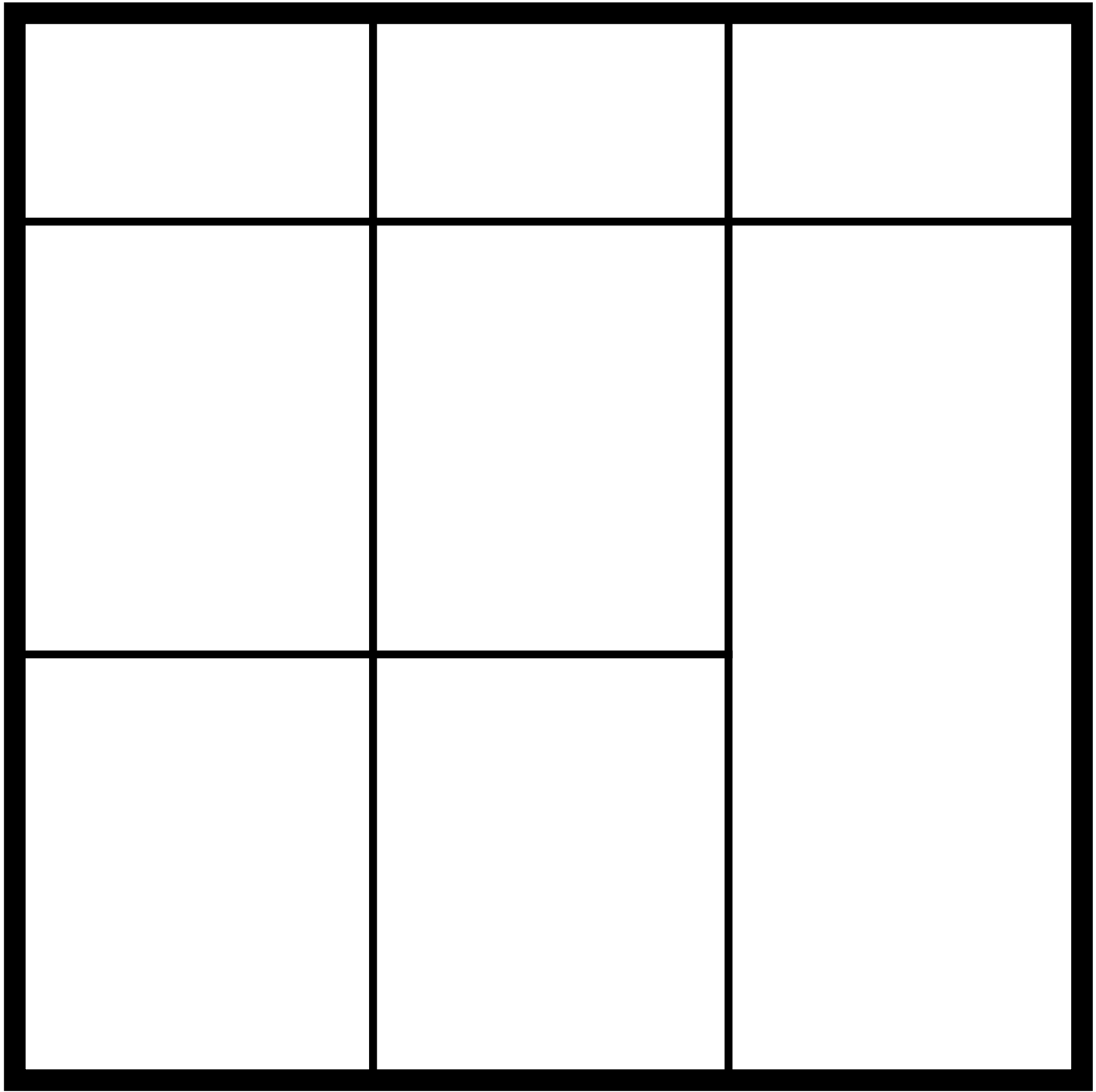


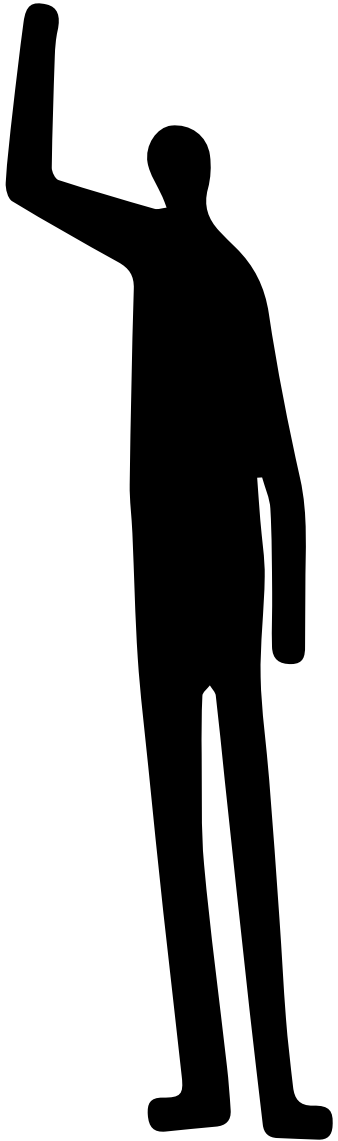
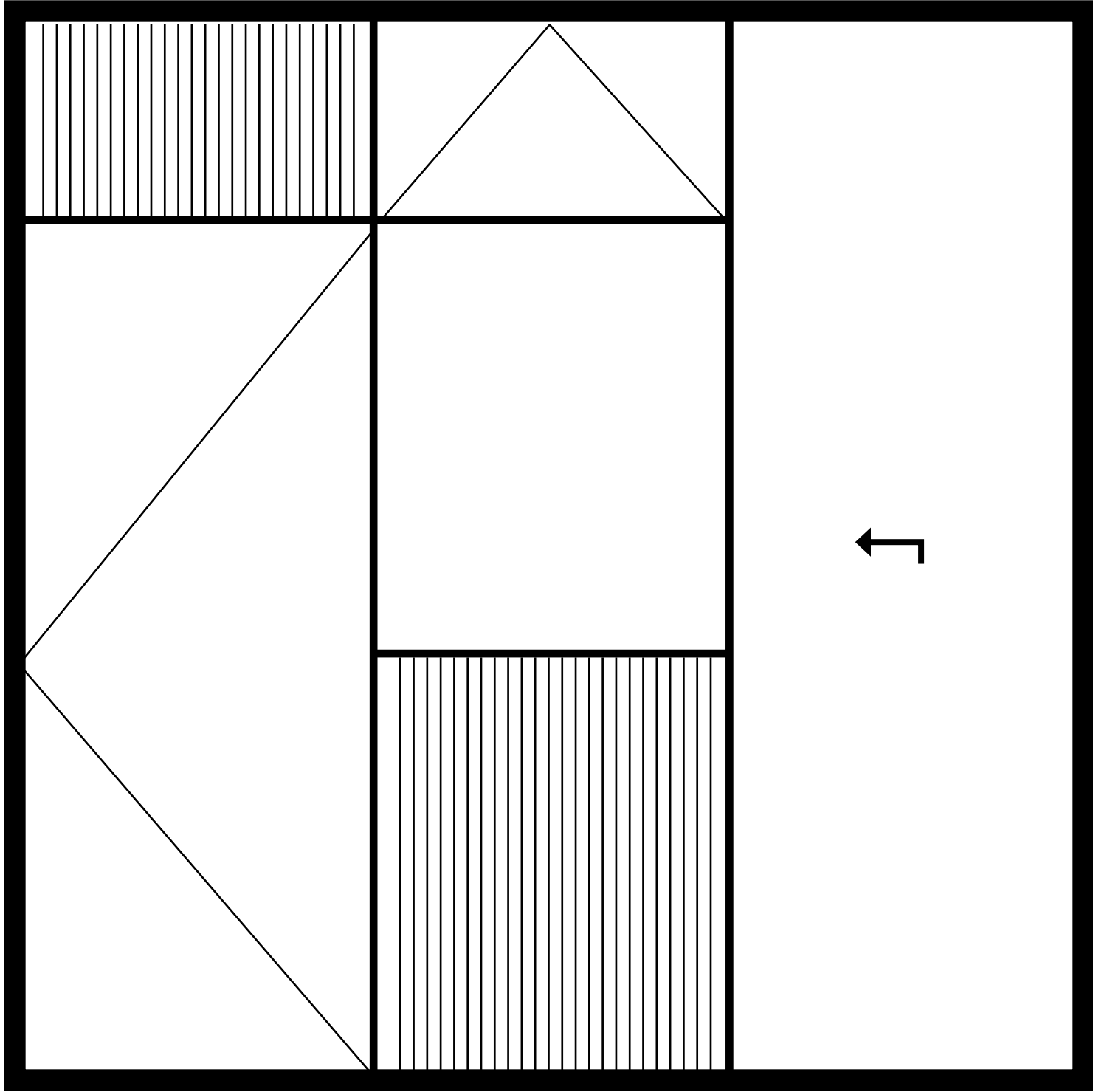


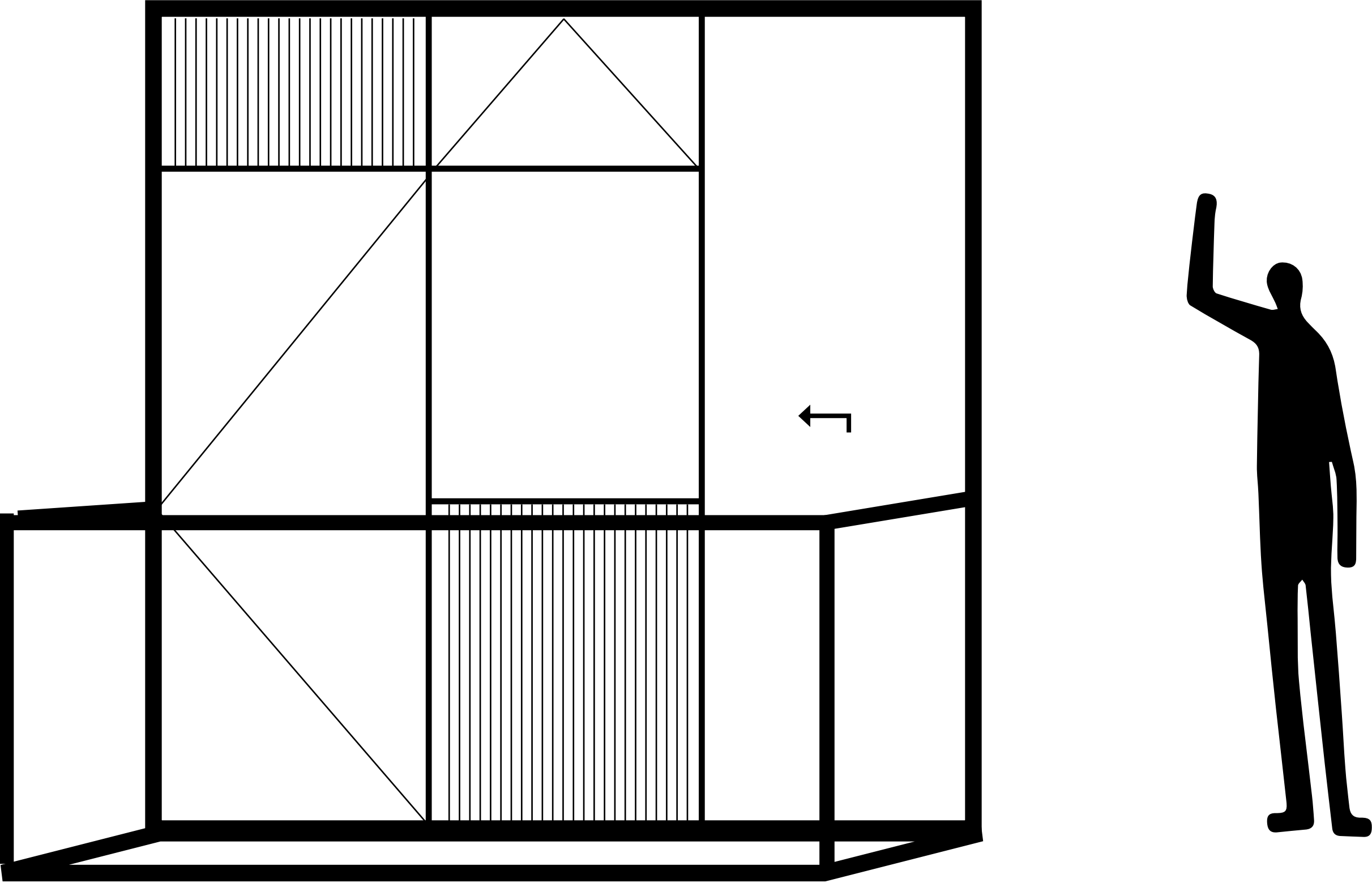


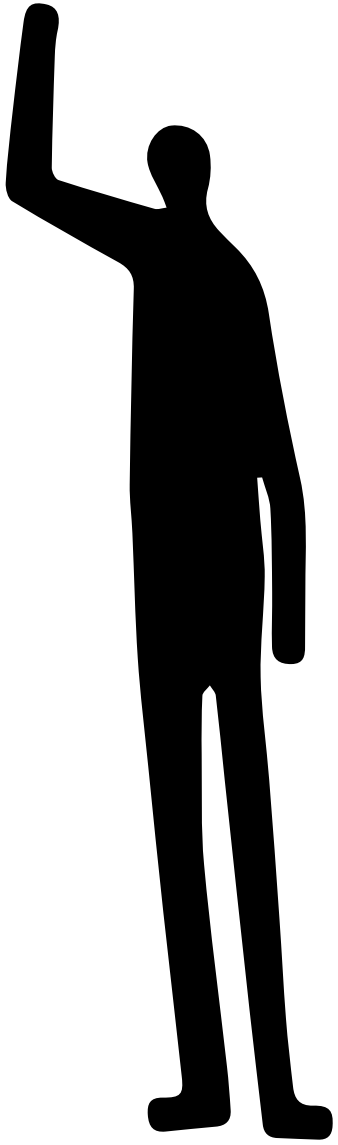
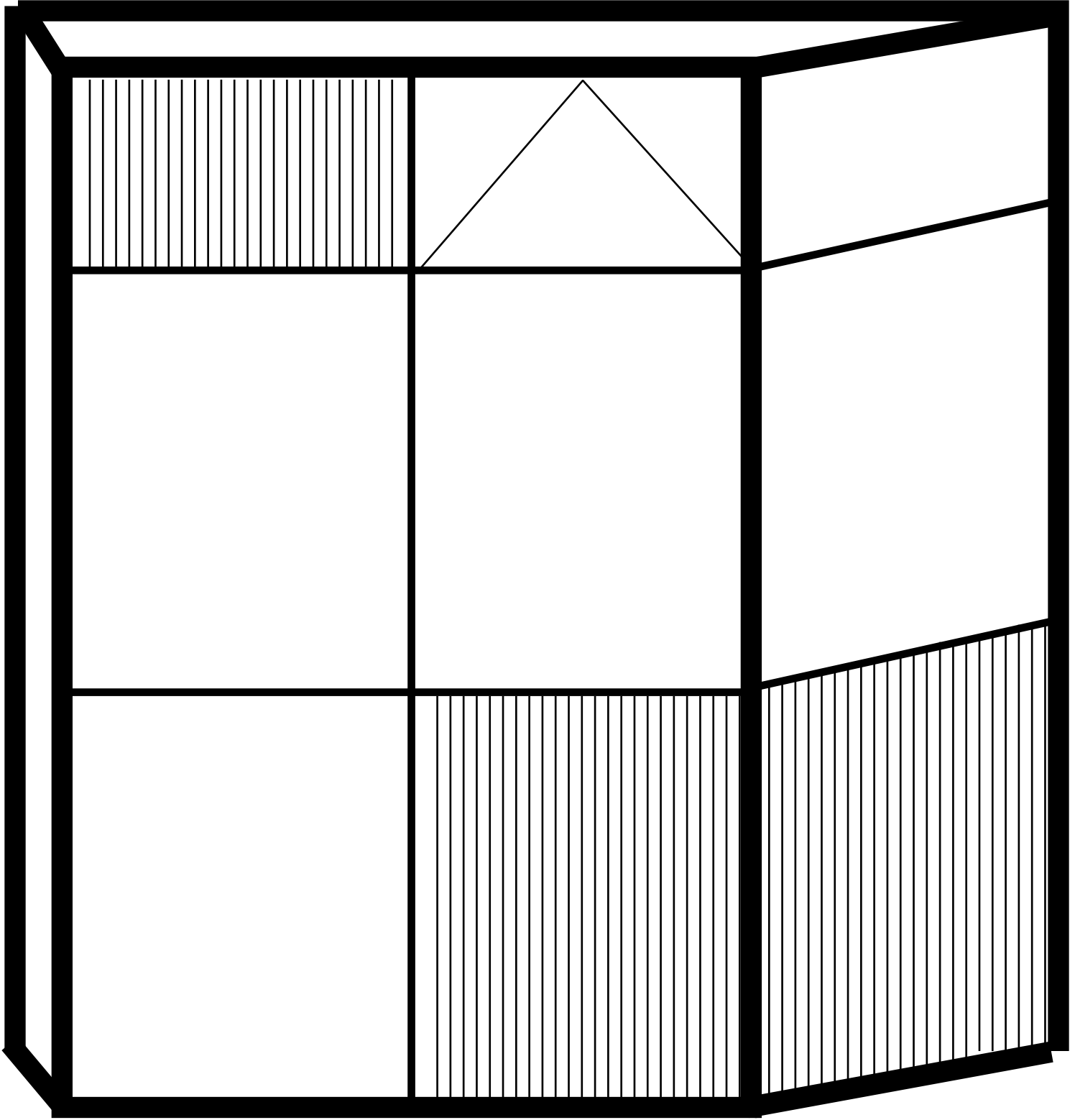


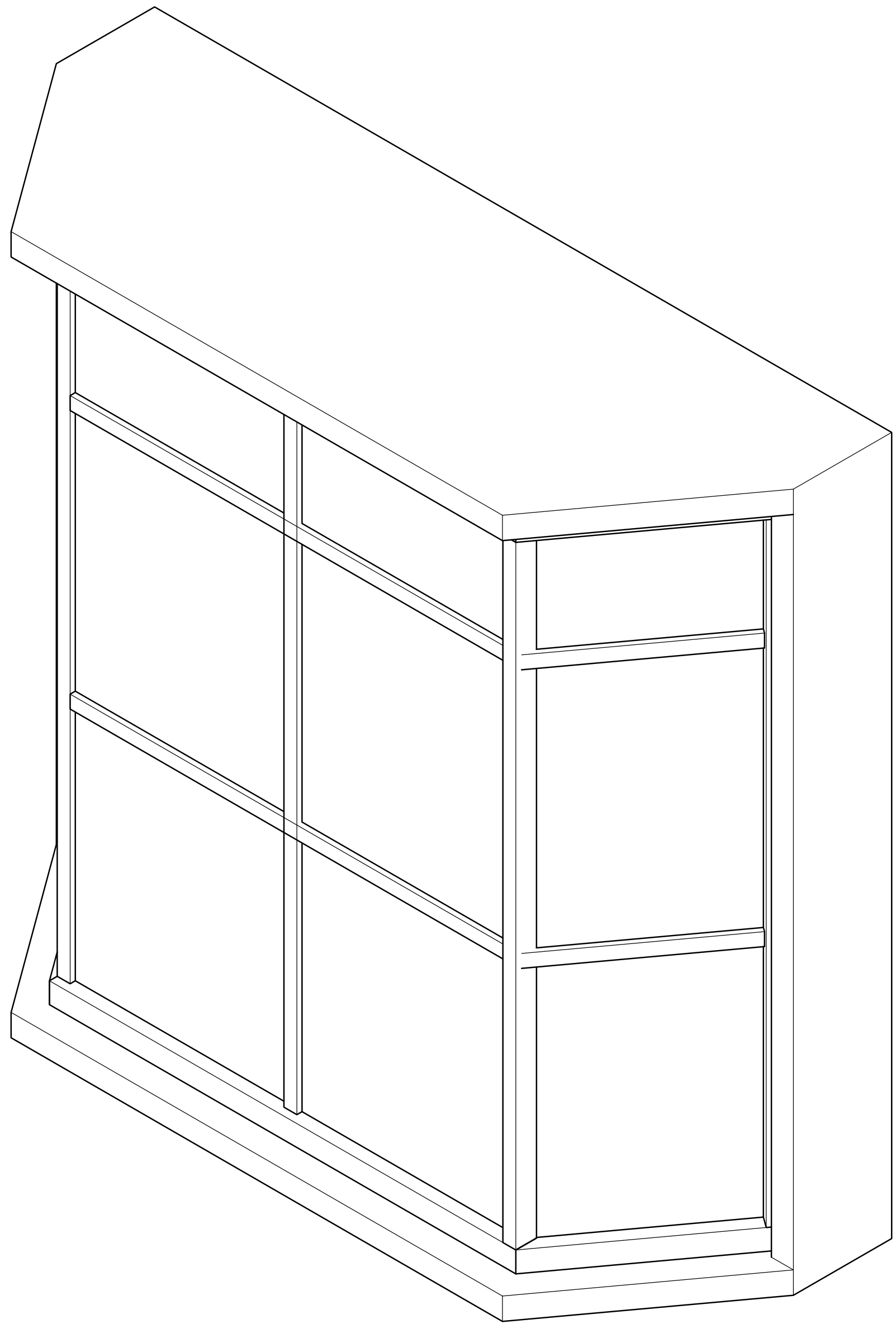


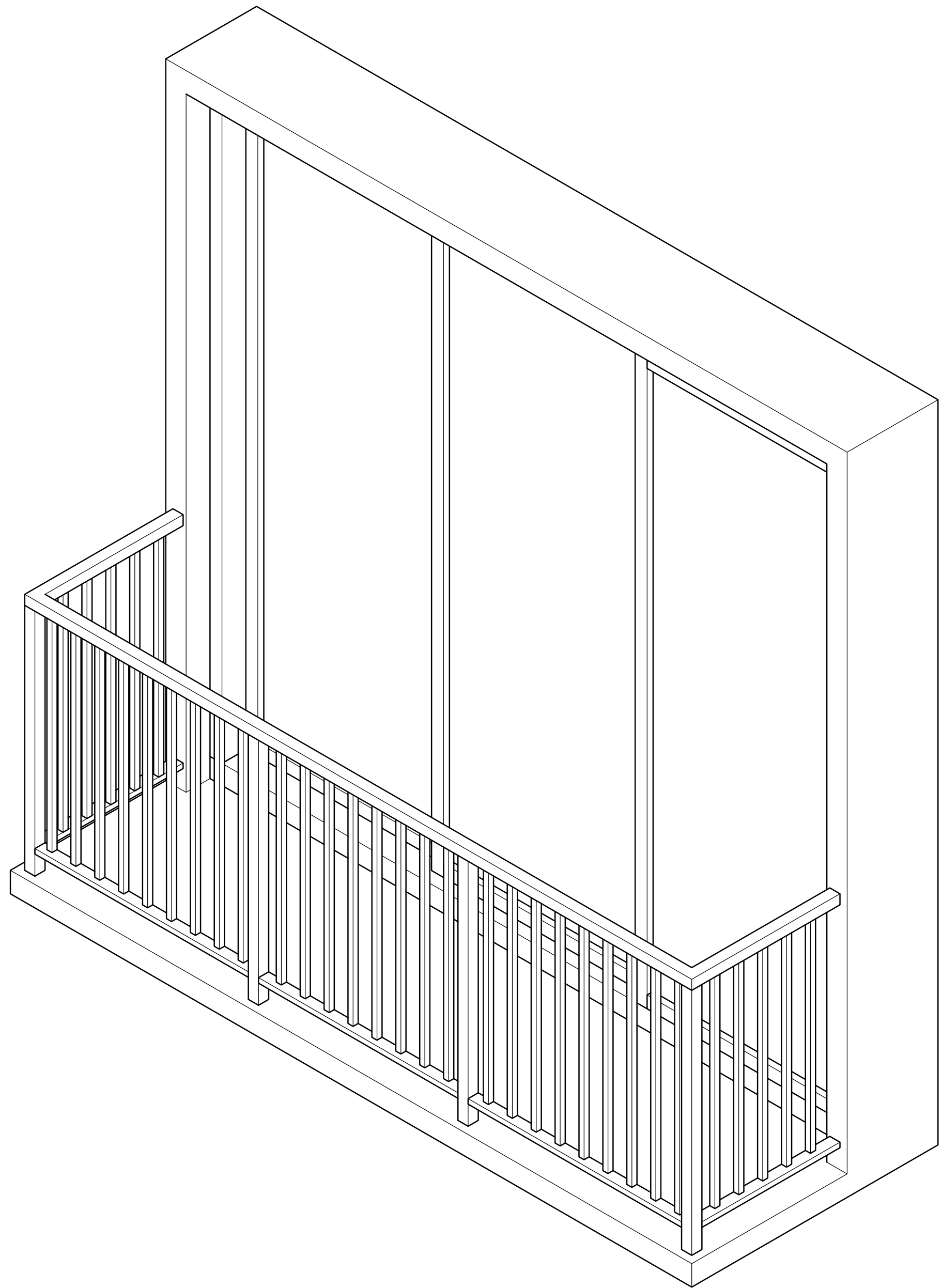


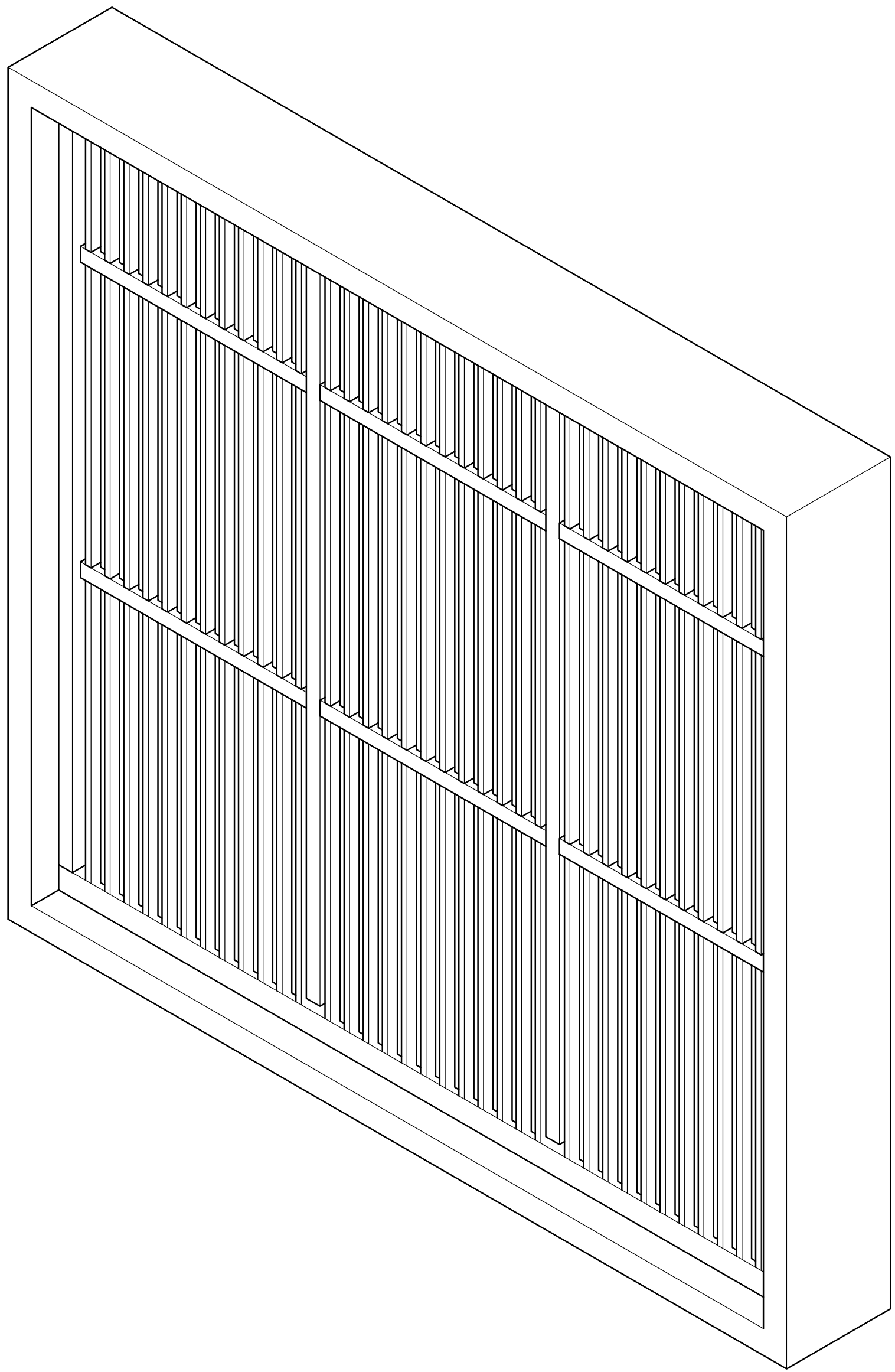


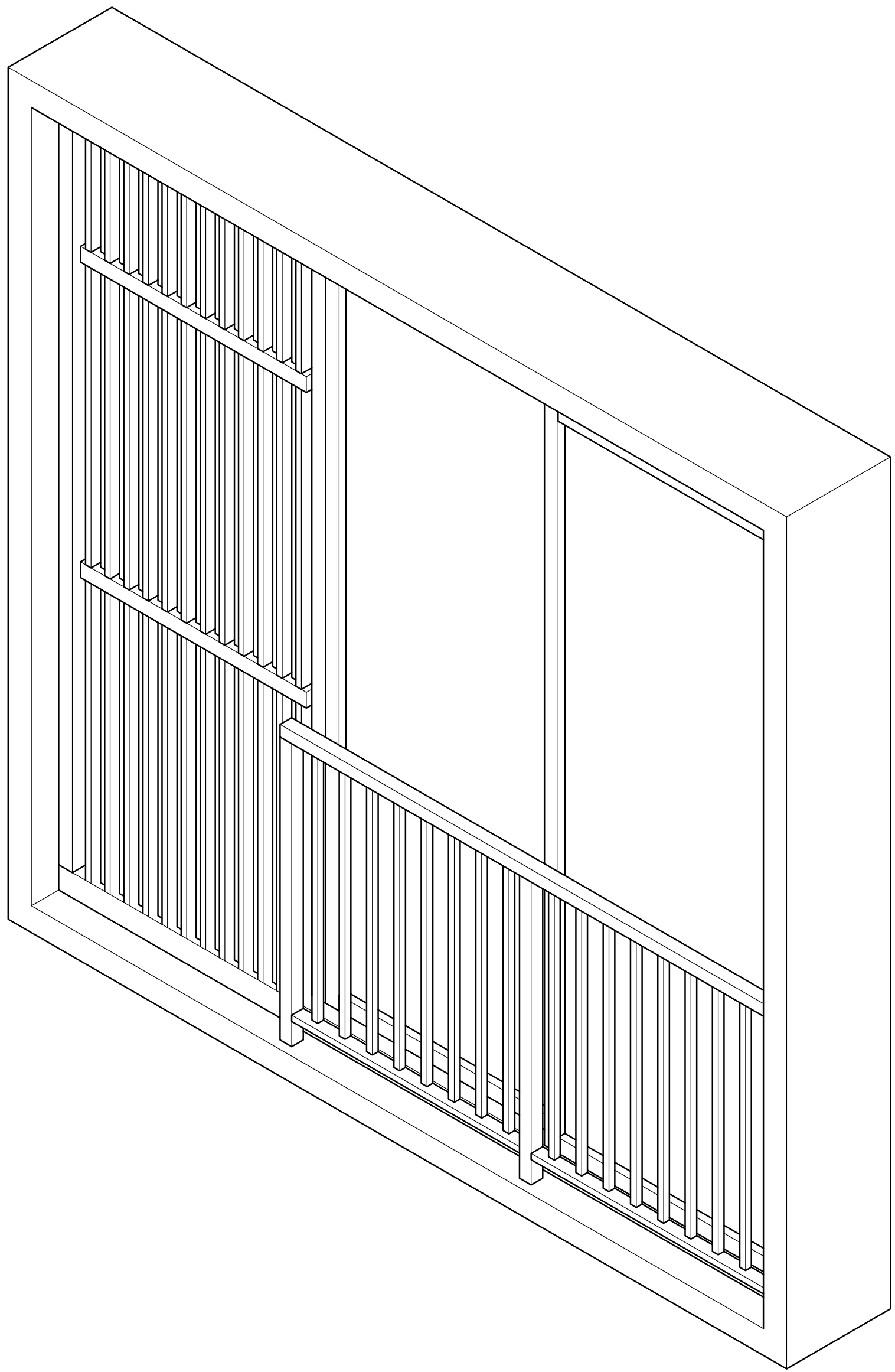


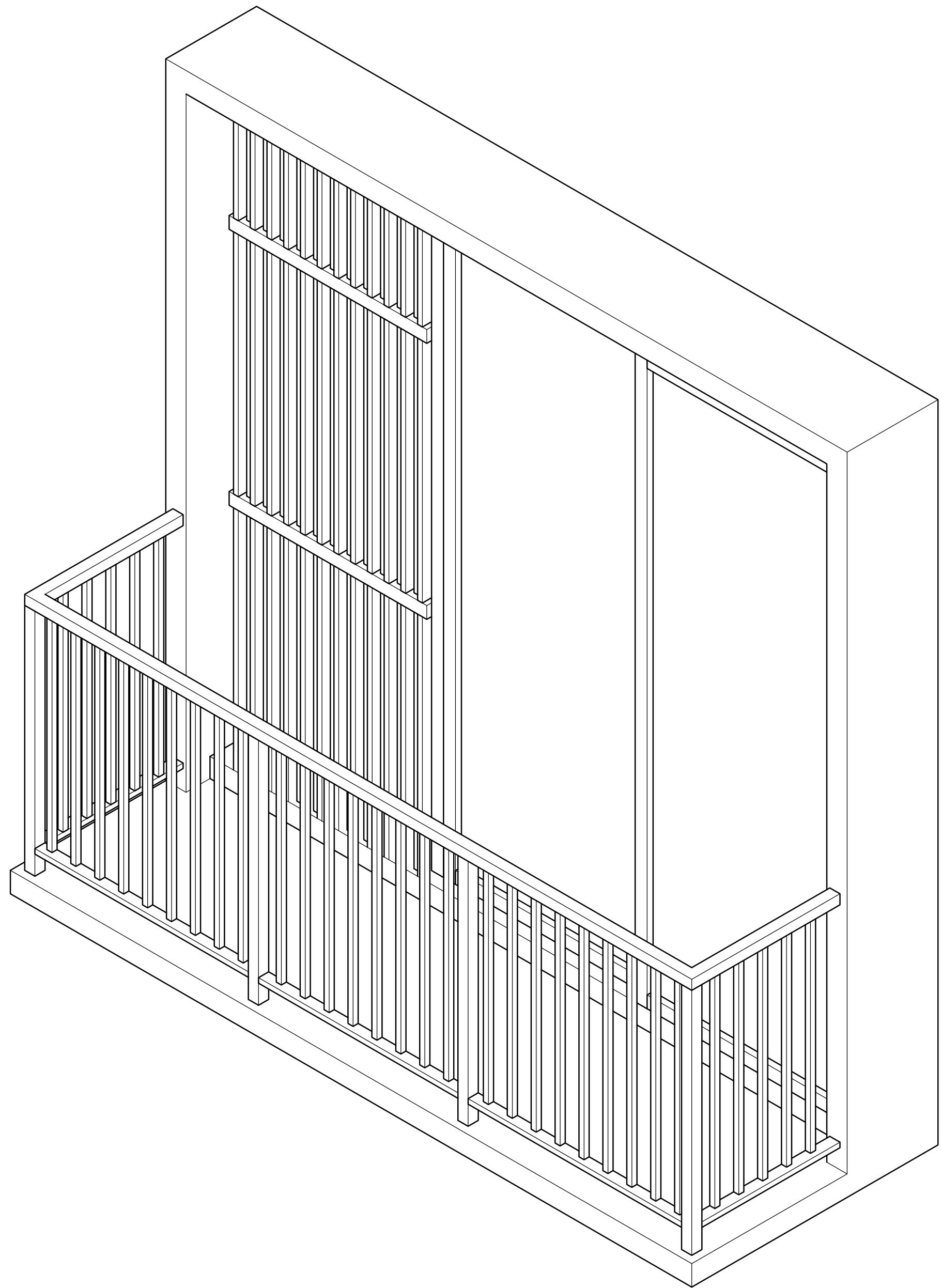


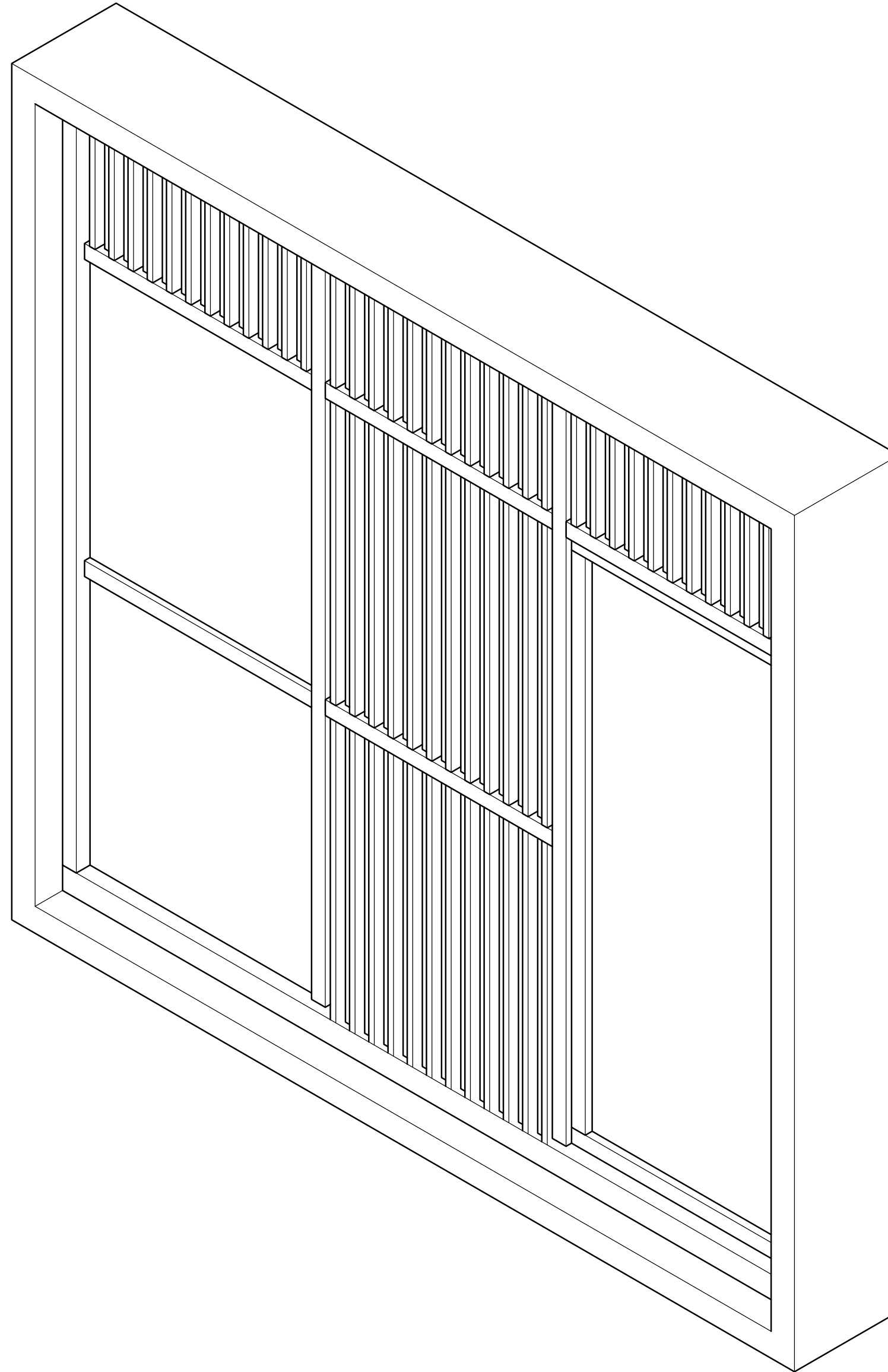


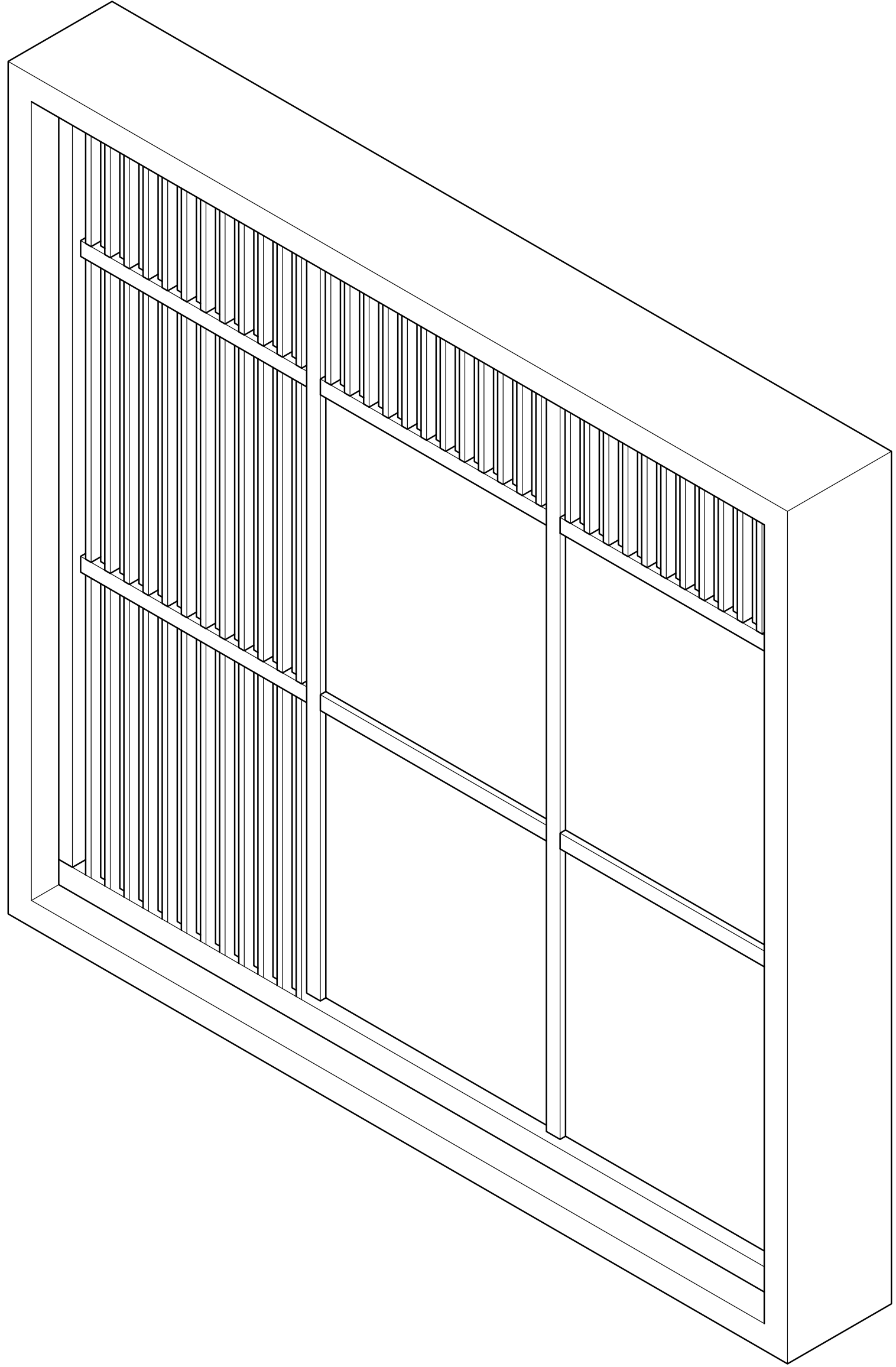


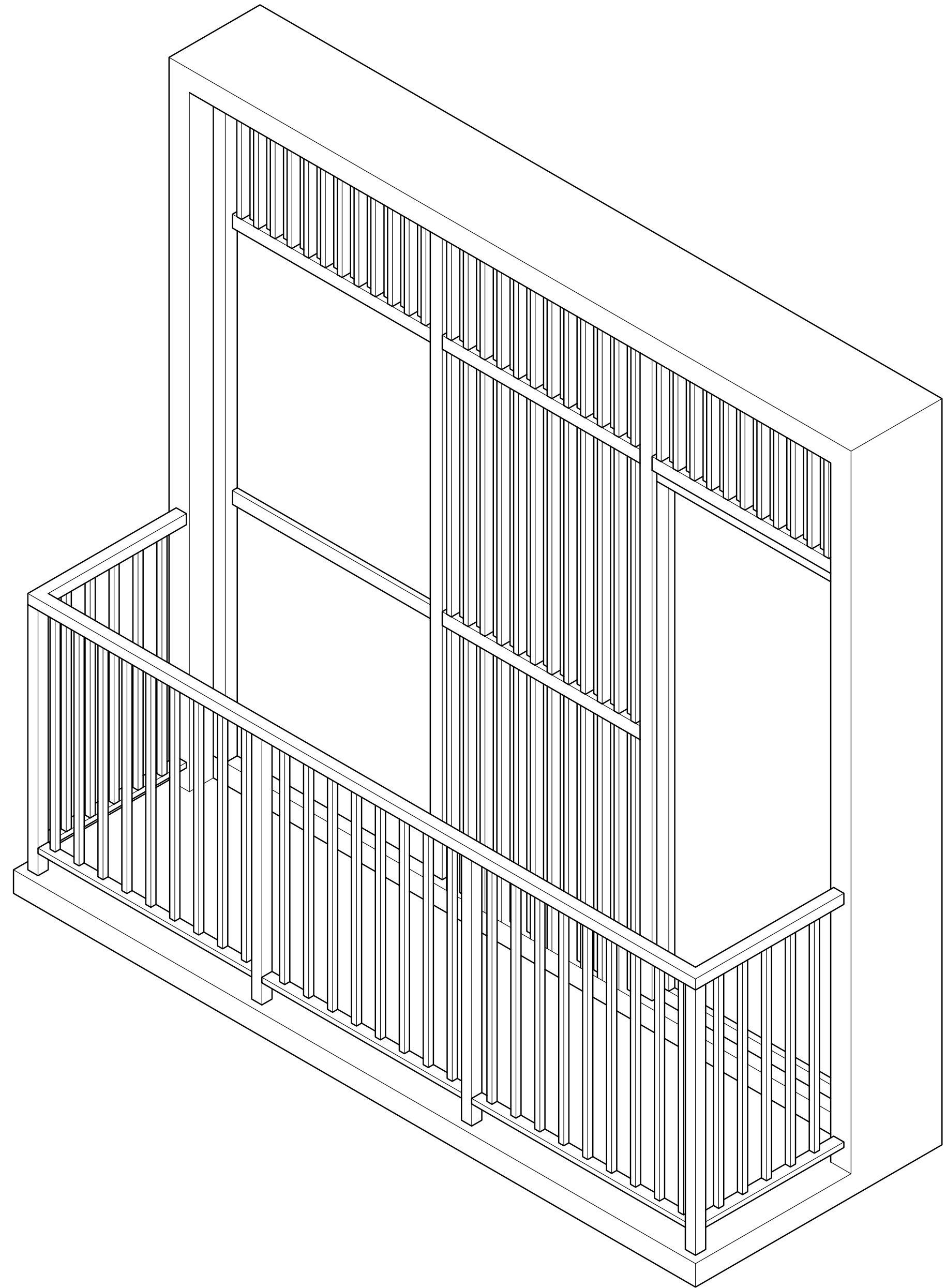


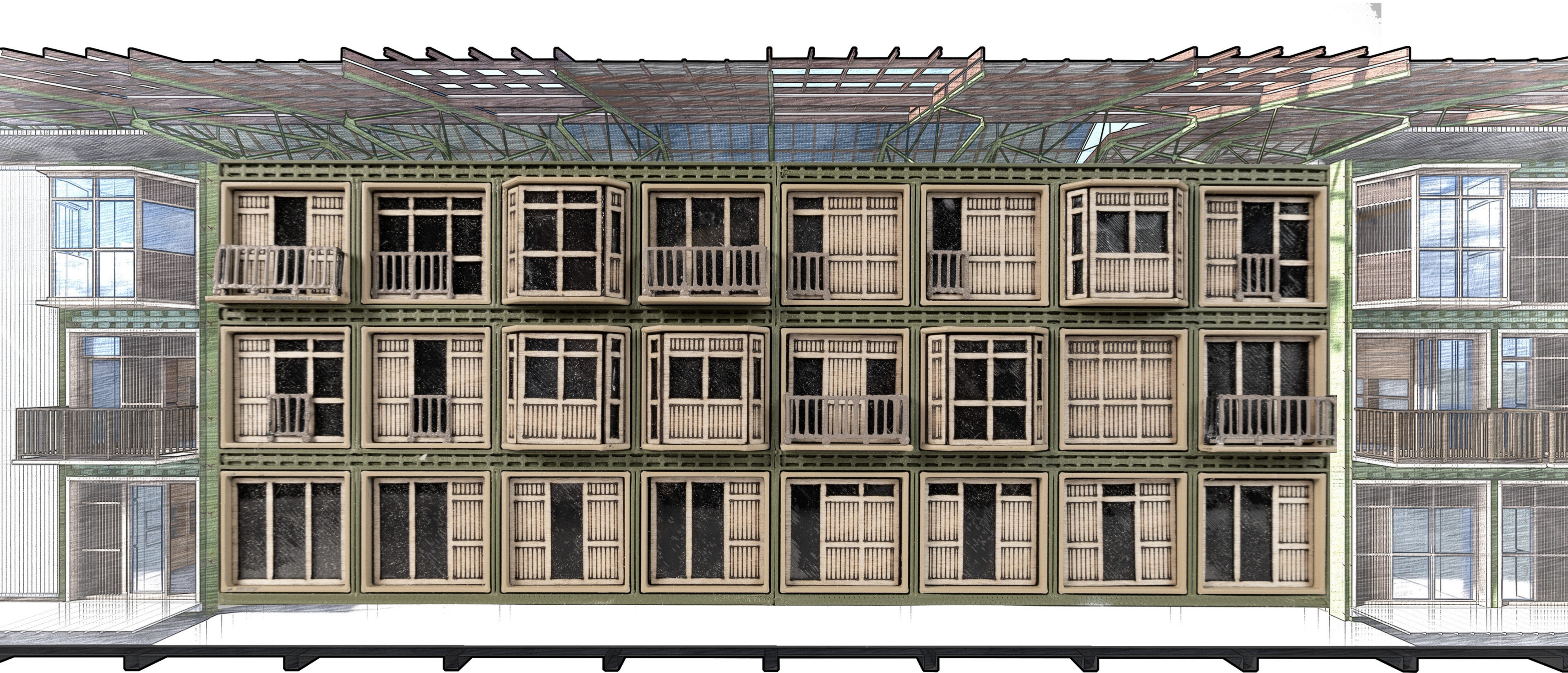


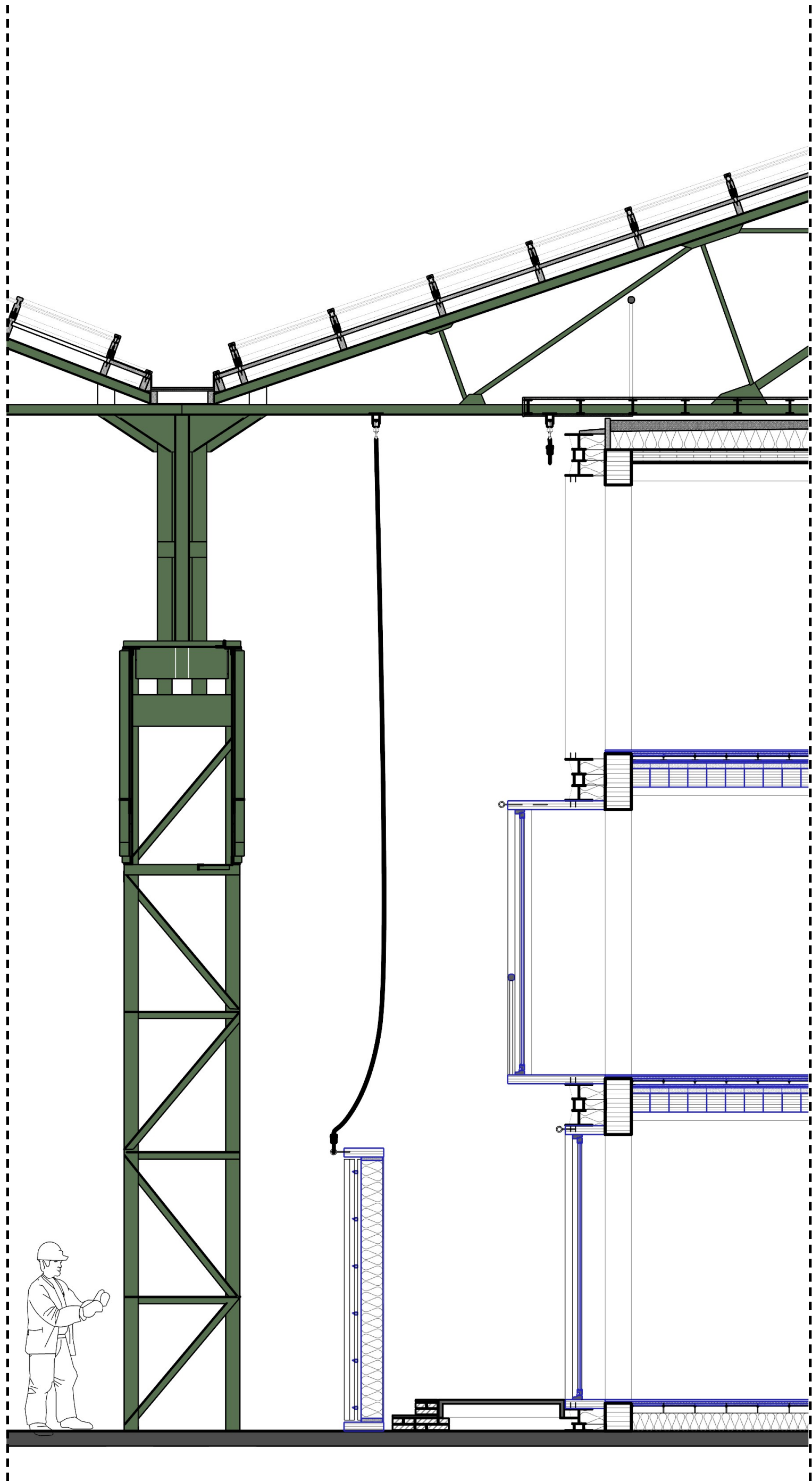


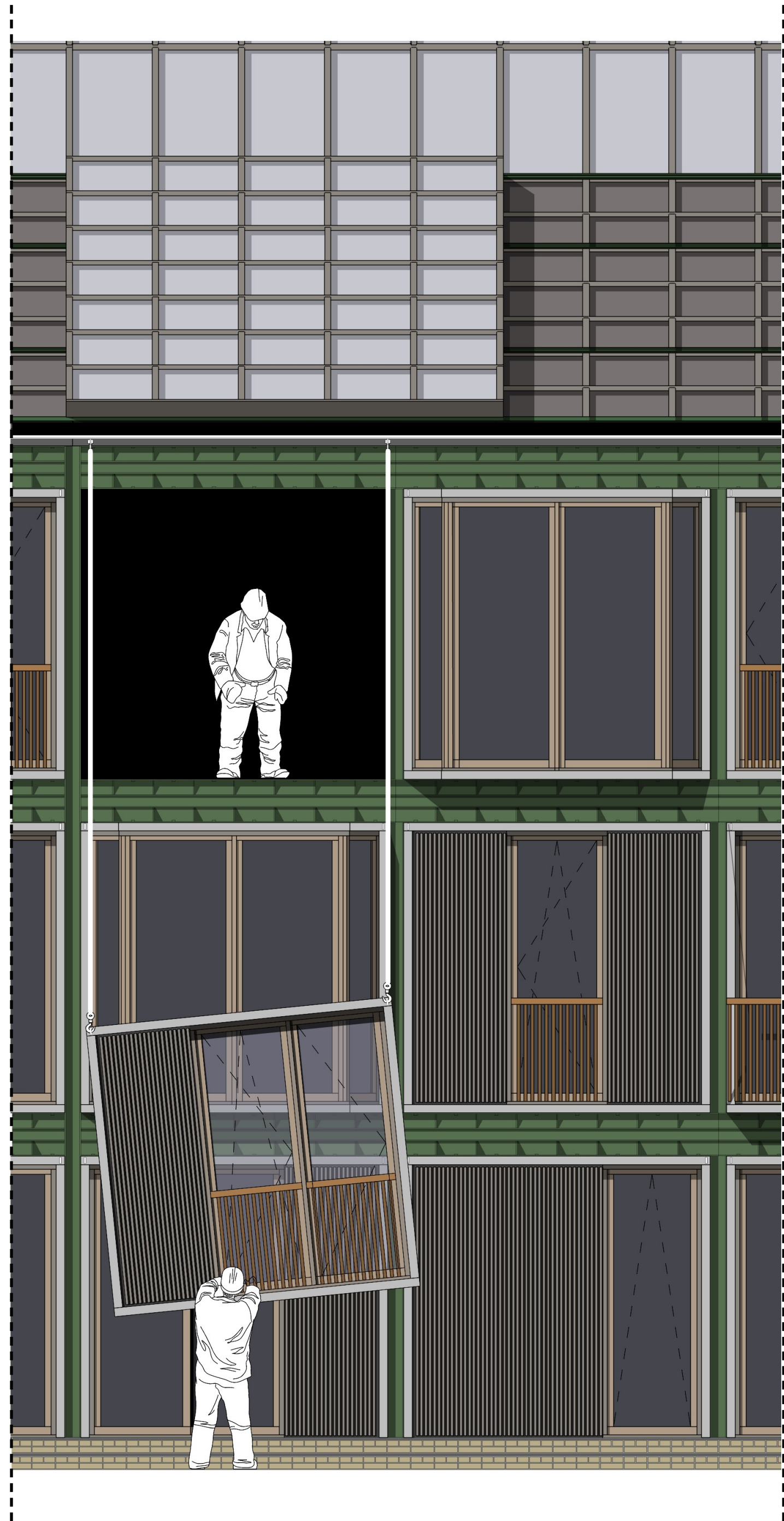
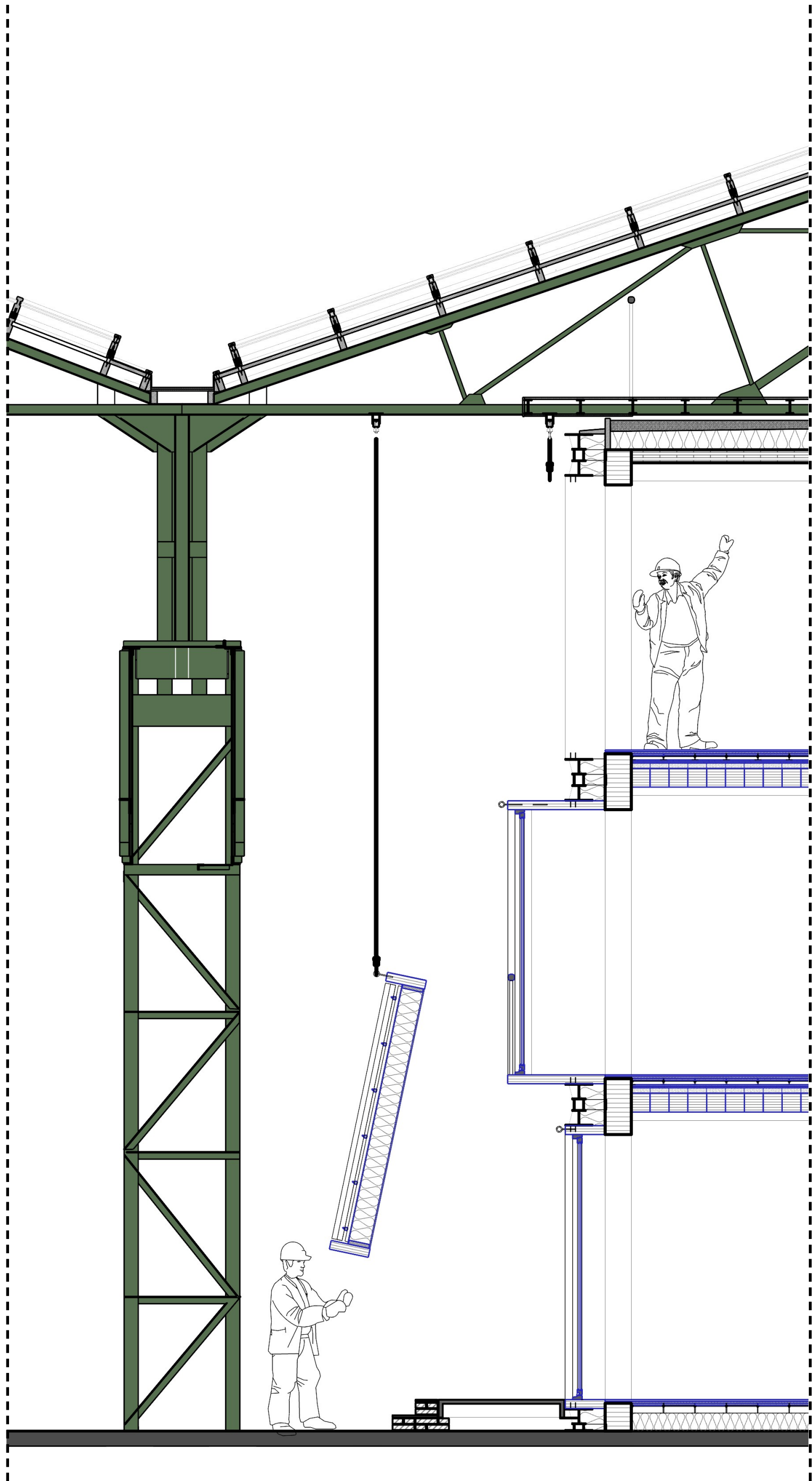


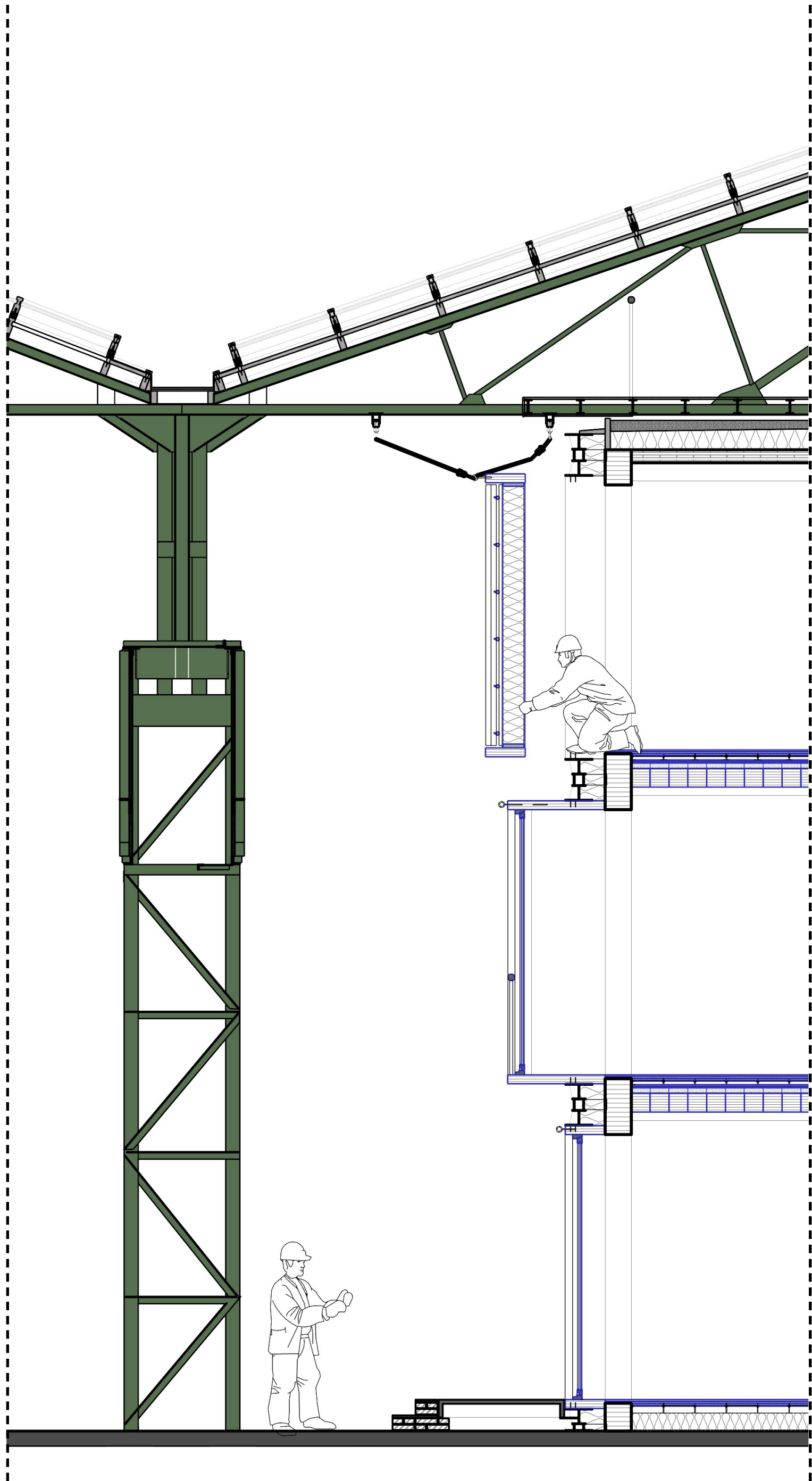


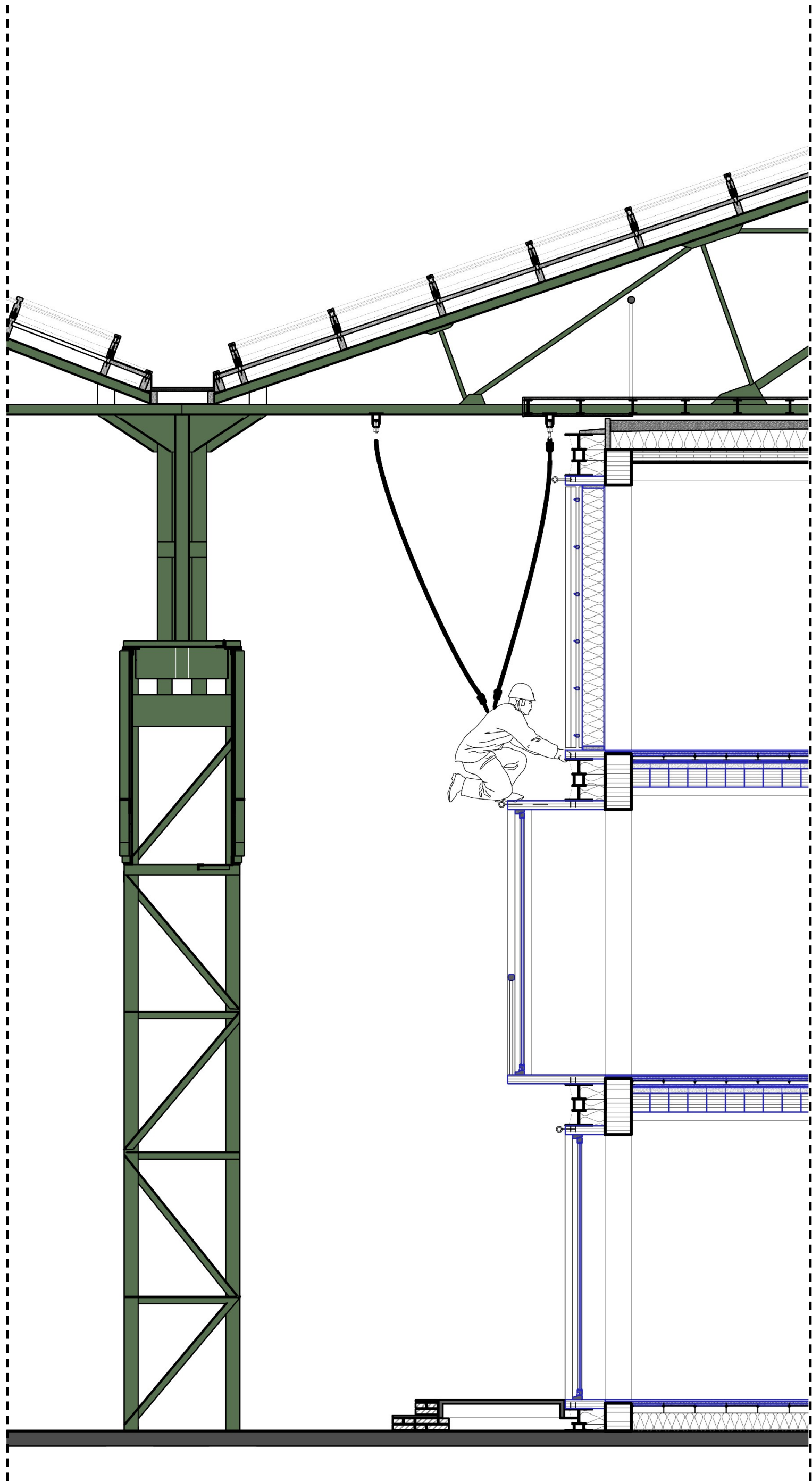






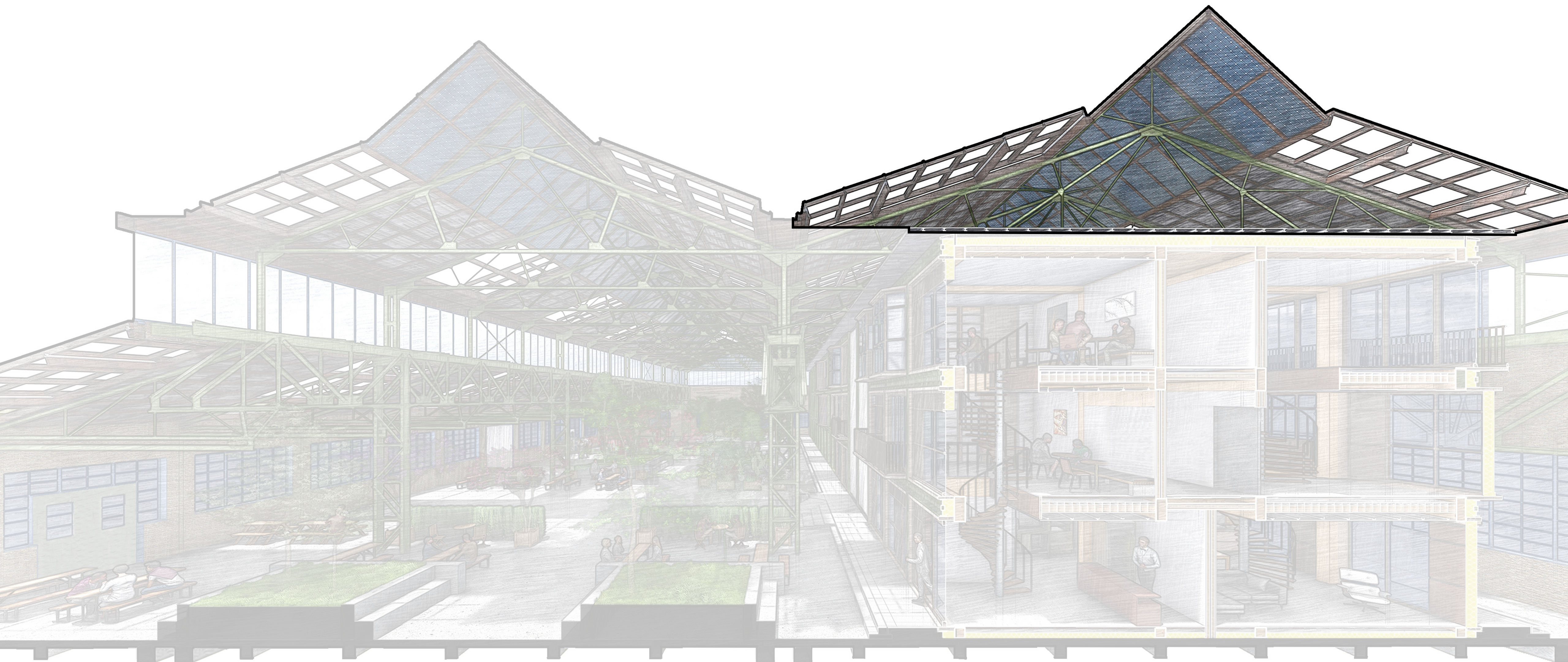








2. Collective rooftop







3. Geschutsplein

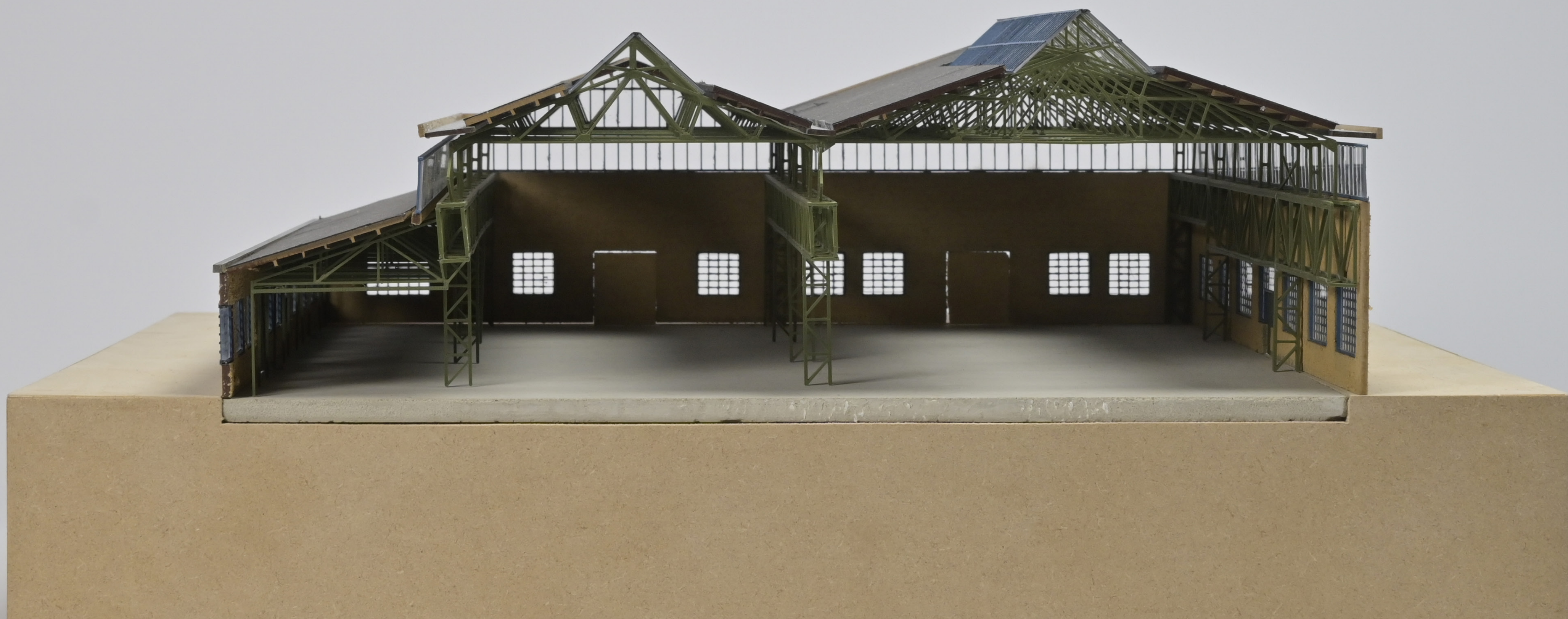


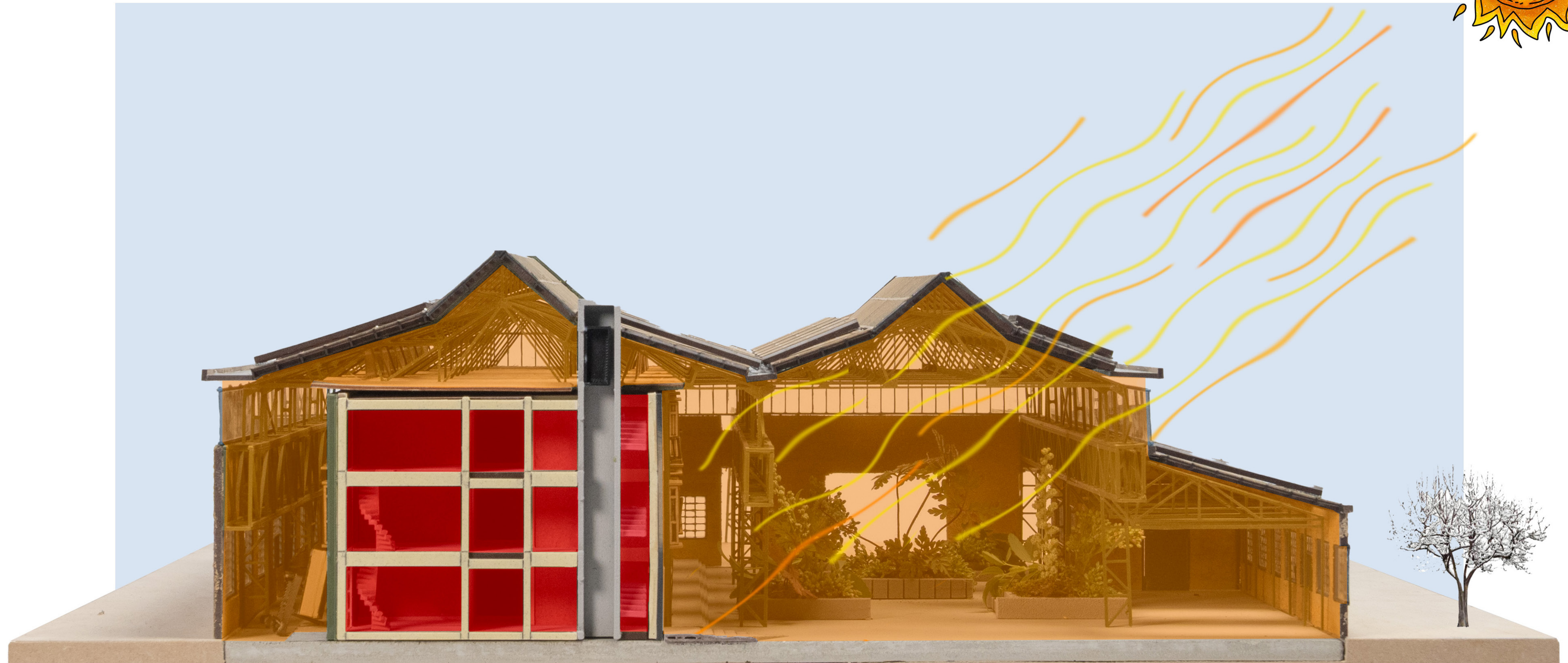
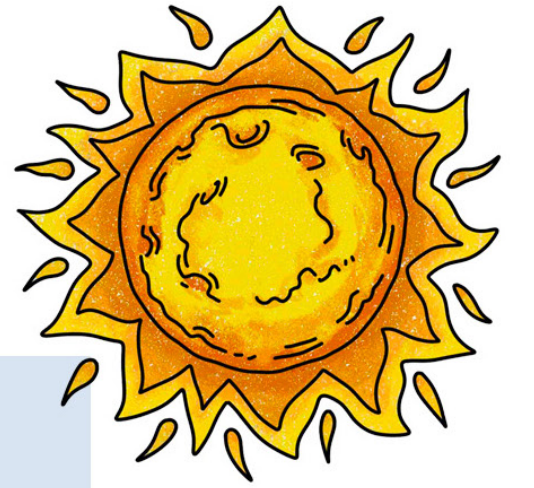




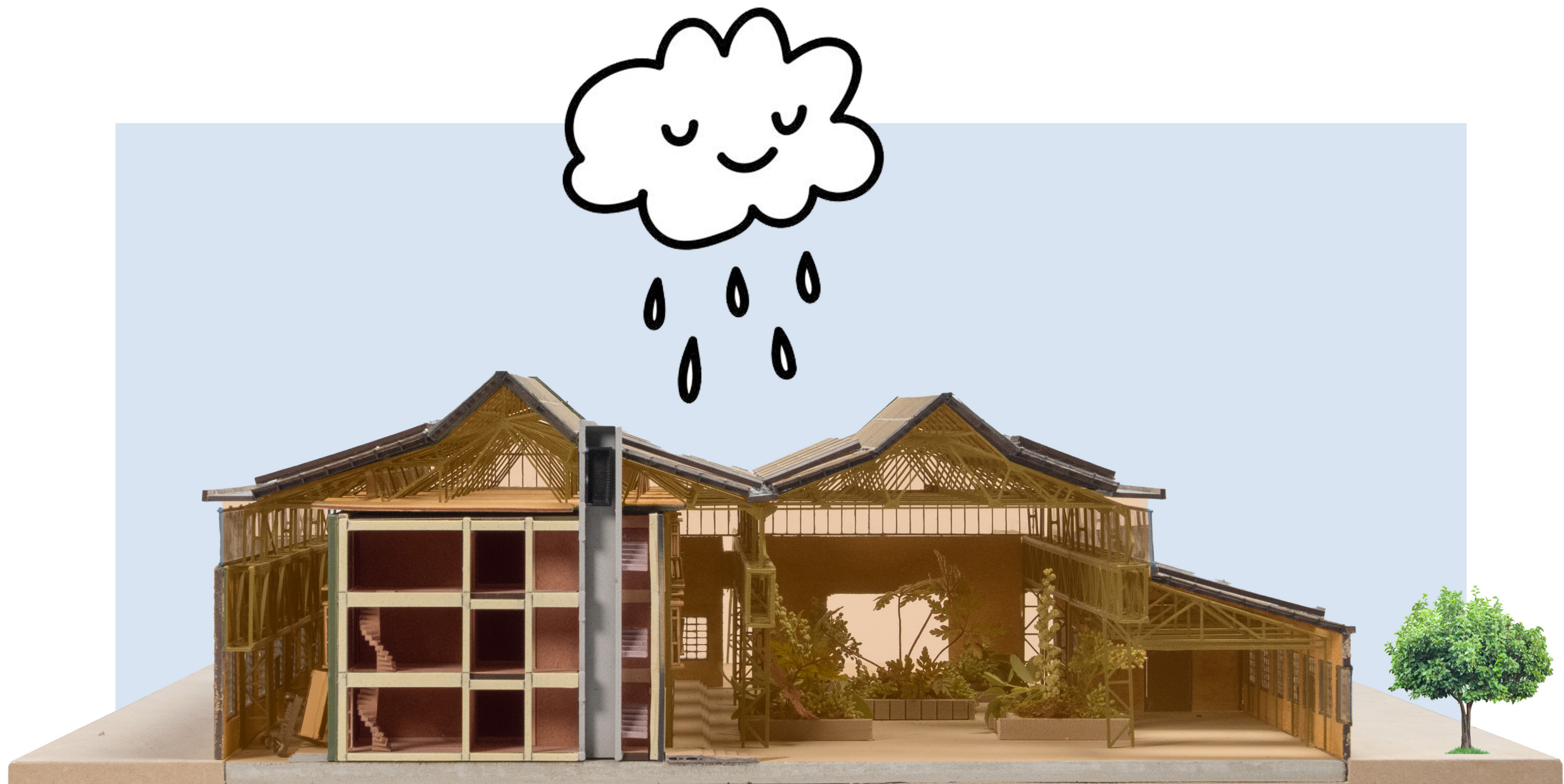
**People change,
Society changes,
Cities change,**

People change,
Society changes,
Cities change,
Climate changes...

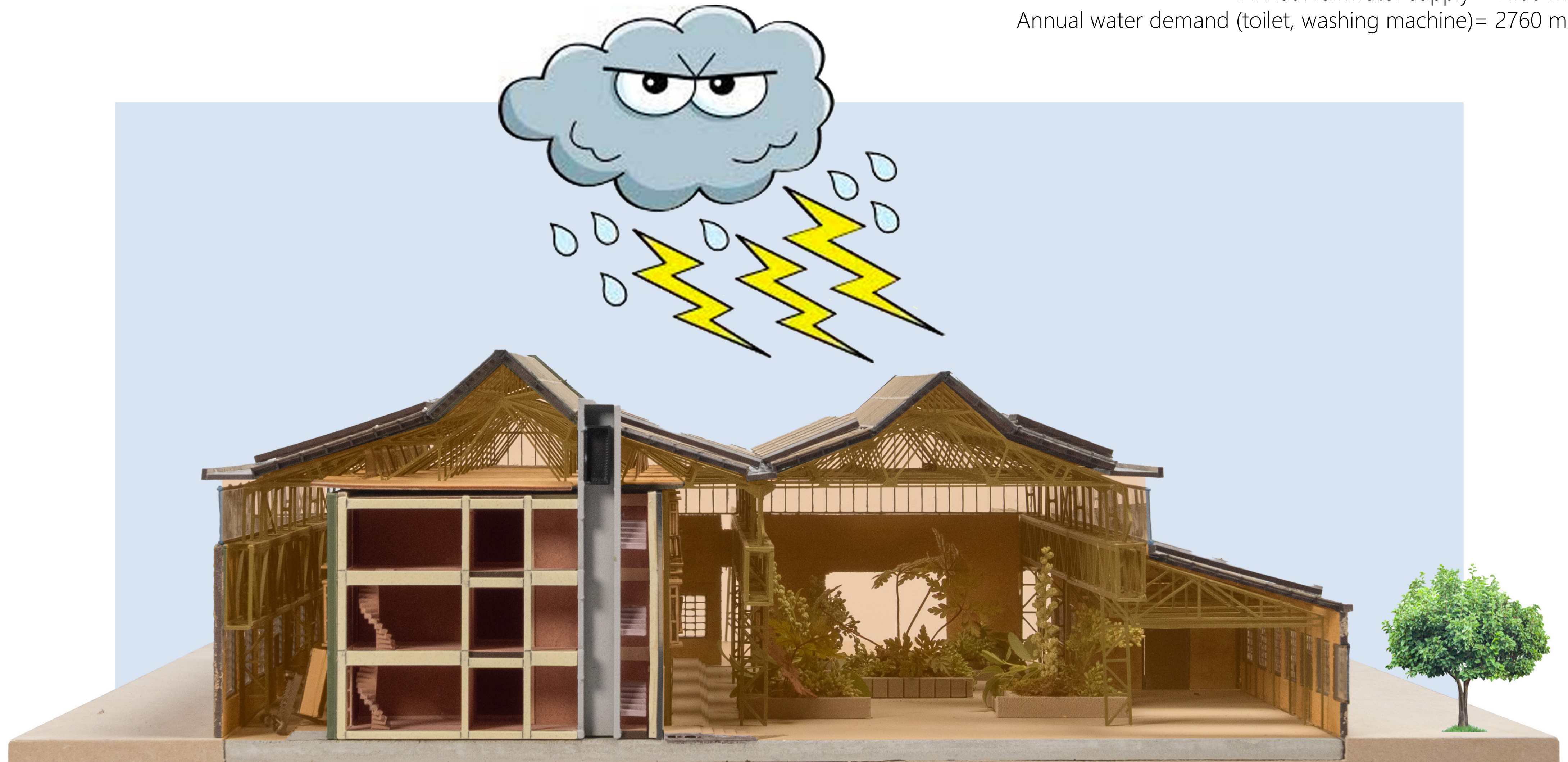


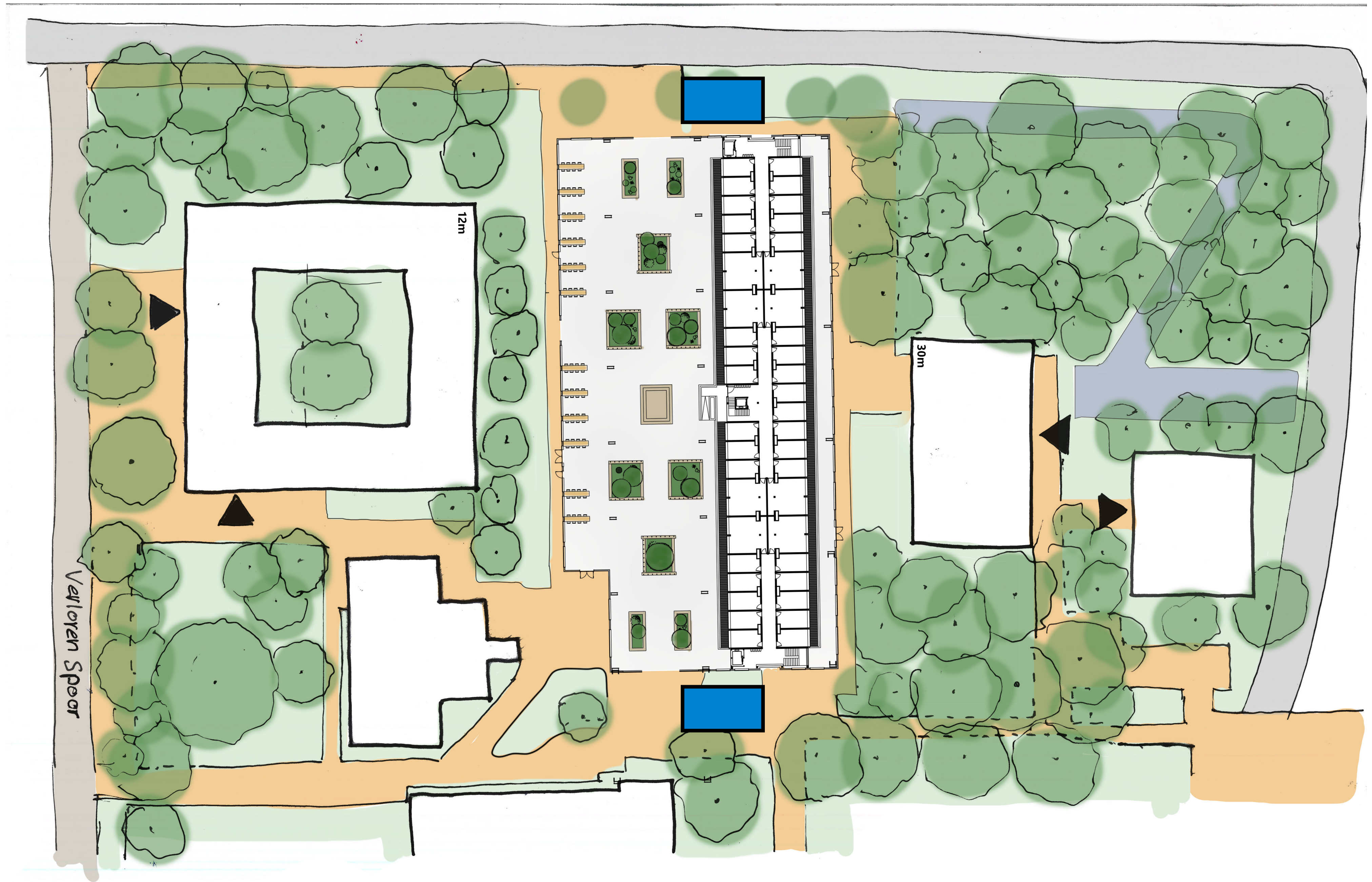






Annual rainwater supply = 2100 m³
Annual water demand (toilet, washing machine) = 2760 m³





Reflection on design criteria for Open Building

Support

1. The Support provides sufficient capacity. Which means it allows for a variety of layouts, flexible reconfiguration of unit boundaries and accommodating varying functions.
2. The support contains all shared building services (water, gas, electricity, drainage) which is constructed in a way where it is separated from the load-bearing structure and it offers maximized adaptable freedom
3. The support allows for independent assembly, alterations and removal of the infill.

Infill

4. The infill is compatible with the Support
5. The infill can independently be assembled, adjusted or disassembled
6. The façade is part of the adaptable infill

**People change,
Society changes,
Cities change,**

Performance Enabling Change

Thank you!

special thanks to: Mom, Dad, Tycho, Hugo, Floris,
Alex, Gijs, Pablo, Romio, Mirte, Jelmer, Niels, Silas

Types of change

1. Social
2. Economical
3. Ecological

Social change

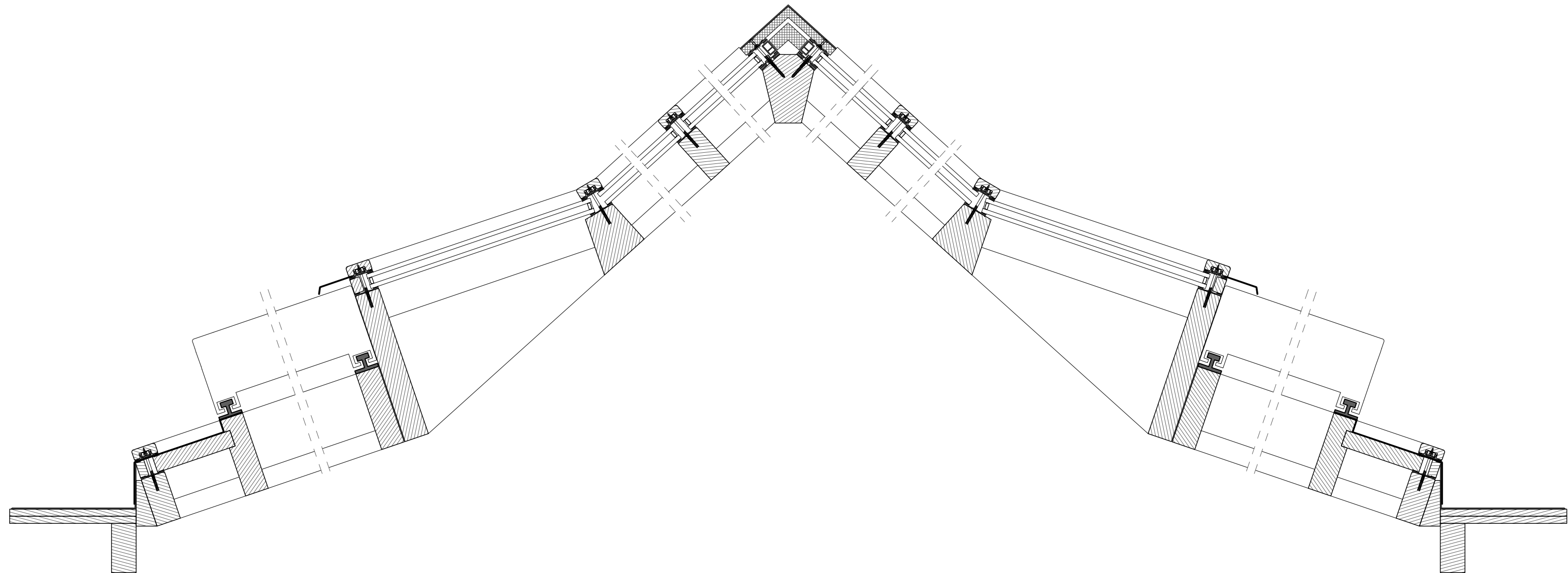
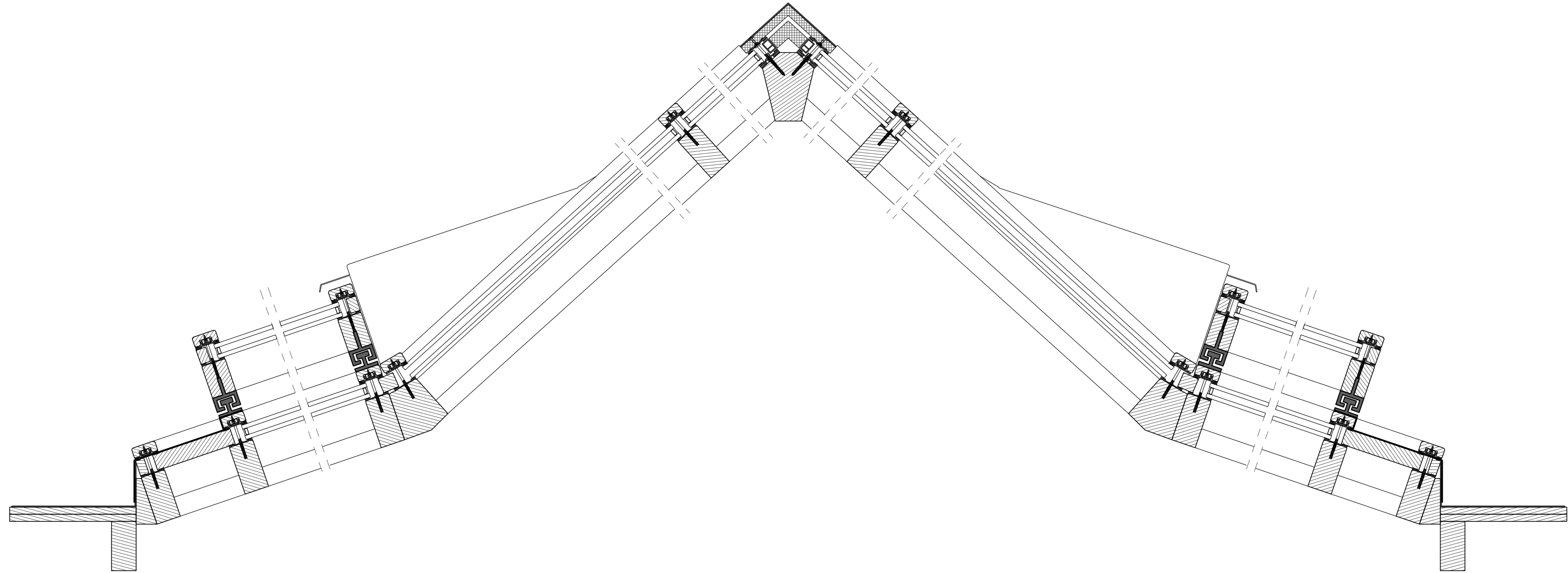
1. Demographic shifts
2. Migration and urbanisation
3. Shifts in cultural values or attitudes
4. Rise of digital social networks and new communication habits

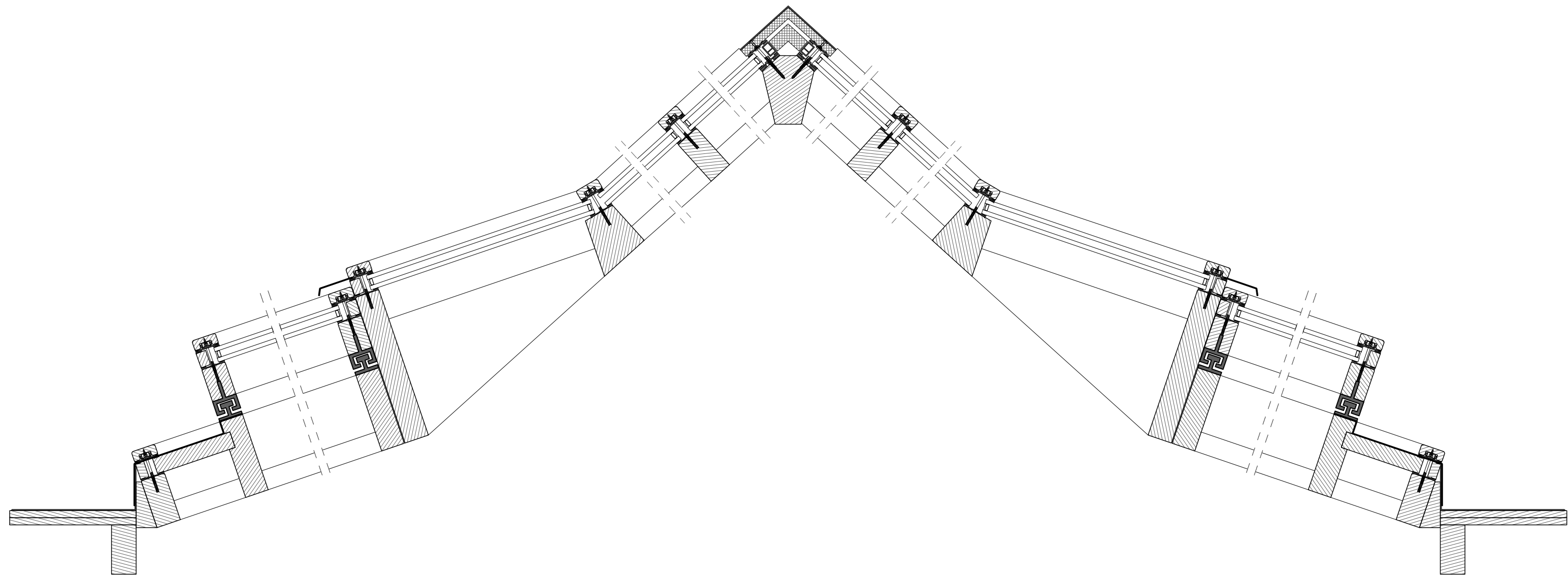
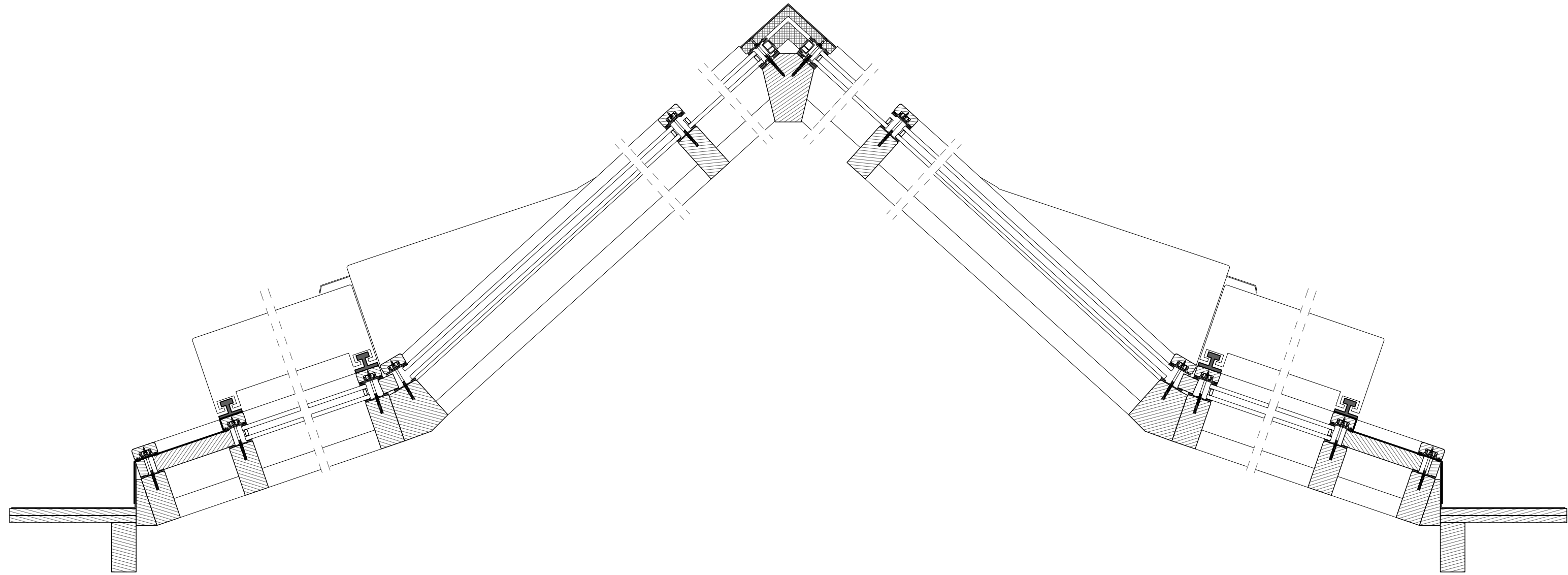
Economical change

1. Changes in employment structures
2. Inflation or deflation cycles
3. Technological automation impacting labour markets

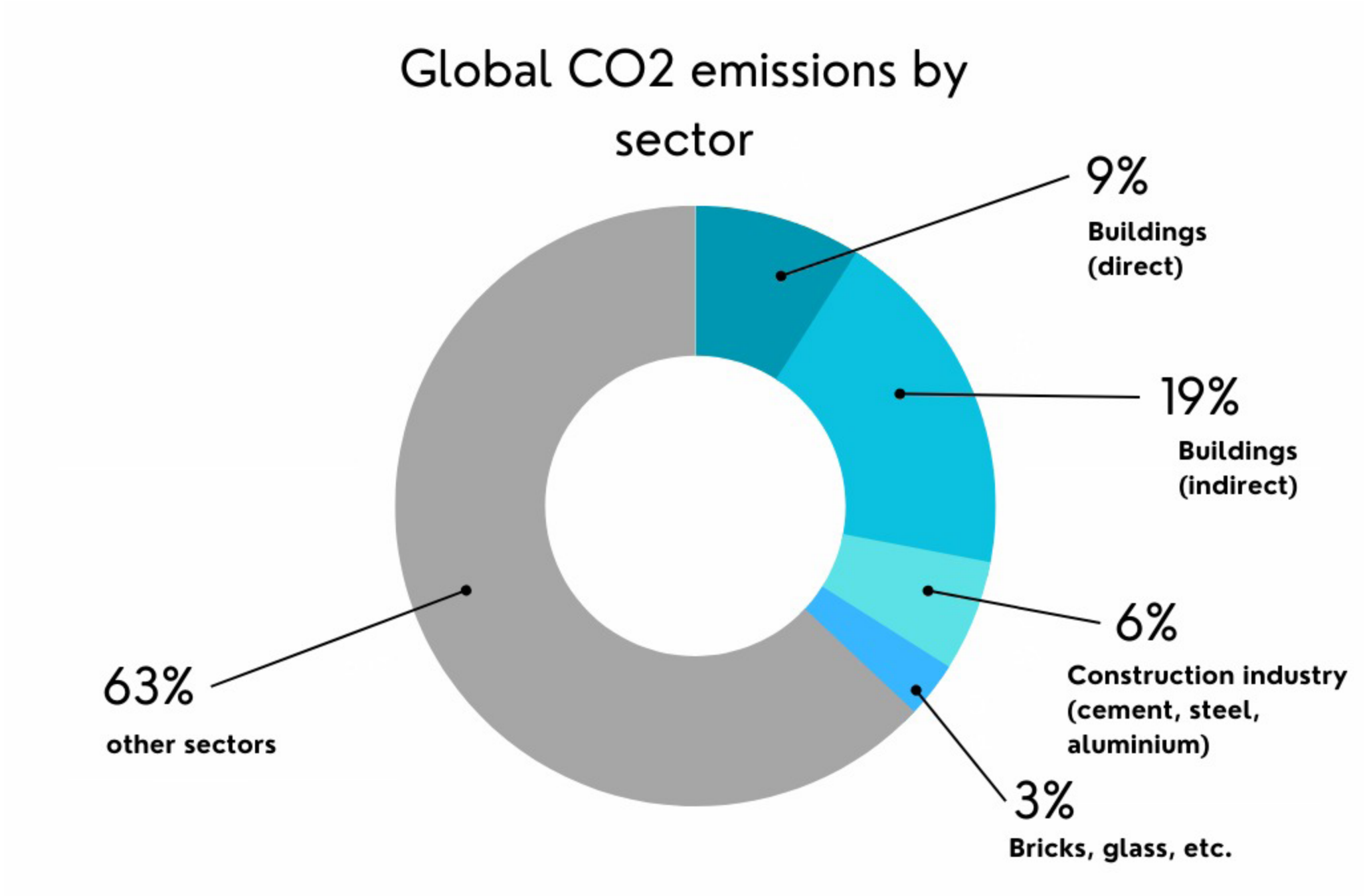
Ecological change

1. Climate change
2. Resource depletion (fresh drinkwater for example)









Rainwater infrastructure collection study

https://www.mijnwaterfabriek.nl/kennisbank/hoe-groot-moet-mijn-regenwatertank-zijn

- Total roof area: 3000 m²
- Rainwater yield (rule of thumb): 700 litres per m² per year
- Total annual rainwater yield: 3000 × 700 = 2,100,000 litres/year = 2100 m³/year
- Maximum number of residents: 126 (1-person studios)
- Average eligible water use: 60 litres per person per day (toilet, washing machine)

Total annual demand: 126 × 60 × 365 = 2,760,000 litres/year = 2760 m³/year

Balance:

- Annual rainwater supply = 2100 m³
- Annual demand for reuse = 2760 m³
- Rainwater can cover approximately 76% of the required volume

Tank sizing (following MijnWaterfabriek guidelines):
Minimum recommended buffer = 8% of annual yield
0.08 × 2100 = 168 m³

Regenwatertank (m³)	0	3	6	10
Watergebruik (m³/jaar)	100,1	100,1	100,1	100,1
Potentiële waterbesparing (m³/jaar)	0	46,0	46,0	46,0
Gem. neerslag 2012-2022 (m³/jaar)	54,4	54,4	54,4	54,4
Gem. benutting regenwater 2012-2022 (m³/jaar)	0	37,8	40,9	42,9
Gem. suppletie drinkwater 2012-2022 (m³/jaar)	0	8,2	5,1	3,1
Gem. overstort/infiltratie regenwater (m³/jaar)	48,6	6,2	3,1	1,1
Max. overstort/infiltratie regenwater2012-2022 (m³/dag)	3,0	1,8	1,4	0,9

In simulations using 60 m² roofs, a 10 m³ tank performs well under climate variability.
Scaling this to 3000 m² (which is 50 times larger):
10 × 50 = 500 m³

Conclusion:
A minimum tank size of 168 m³ is needed to cover at least one month of use.
To be climate-resilient and maximise water reuse, a tank of approximately 500 m³ is recommended.
This setup would prevent overflow during heavy rainfall and maintain supply during long dry periods.

This can also be split up into smaller tanks. 2x250m³ for example. These could perfectly be place in the ground on both ends (North and south) of the building.