

The Poplar Revolution

Exploring poplar in urban densification



A4 presentation

Architectural Wood - Timber for Urban Density
Approach: 25%

Housing shortage

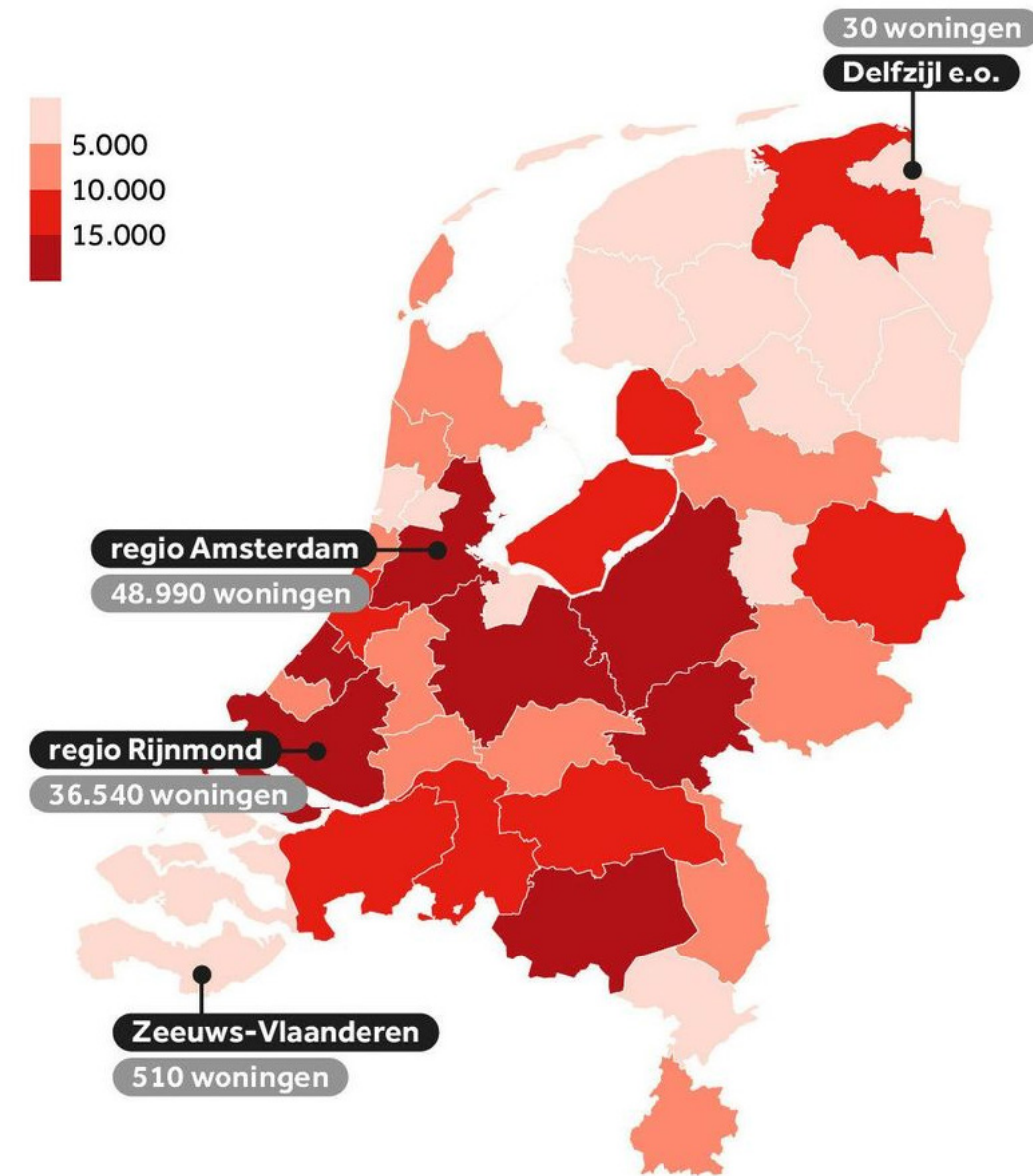


Figure 1: Housing shortage in the Netherlands

Figure 1: Mouissie, S., Kraniotis, (2023, November 11). Schreeuwend tekort aan woningen en hoge huizenprijzen: hoe is het zo gekomen? NOS. <https://nos.nl/collectie/13960/artikel/2497415-schreeuwend-tekort-aan-woningen-en-hoge-huizenprijzen-hoe-is-het-zo-gekomen>

Figure 2: ABF Research. (2022). Woningtekort in de Metropoolregio Amsterdam en Nederland. https://primos.abfresearch.nl/jive?presel_code=tekort

400.000
Netherlands

48.990
Metropolitan Region
Amsterdam

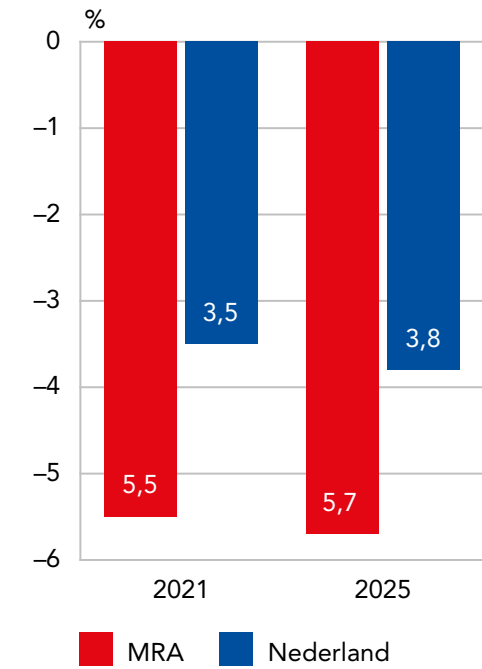


Figure 2: Percentage of housing shortage in MRA and the Netherlands

Starters

Slechts fractie van woningaanbod binnen bereik starters

Vereniging eigen huis (2025, June 5)

Starters komen moeilijk aan een woning

De Nederlandsche Bank (n.d.)

Startersbarometer: Starters hebben het moeilijk op de Nederlandse woningmarkt

Viisi Hypotheken (n.d.)

Jongvolwassenen meest eenzame groep in Nederland

Resto VanHarte (2025, September 25)

Eenzaamheid

27% van de jongvolwassenen voelt zich sterk eenzaam en 63% van de jongvolwassenen voelt zich enigszins tot sterk eenzaam.

Binnen eenzaamheid kan onderscheid gemaakt worden tussen emotionele en sociale eenzaamheid. Zowel emotionele eenzaamheid als sociale eenzaamheid komen veel voor onder jongvolwassenen, maar emotionele eenzaamheid het meest.

GGD GHOR Nederland (n.d.)

29% voelt zich sterk emotioneel eenzaam en 70% voelt zich enigszins tot sterk emotioneel eenzaam. Emotionele eenzaamheid uit zich in het gemis van relaties met een hechte of intieme band.

24% voelt zich sterk sociaal eenzaam en 60% voelt zich enigszins tot sterk sociaal eenzaam. Sociale eenzaamheid uit zich in het gemis van contact met vrienden, familie en kennissen.

Problems

Mismatch between demand and supply of timber

2X
Demand
By 2050

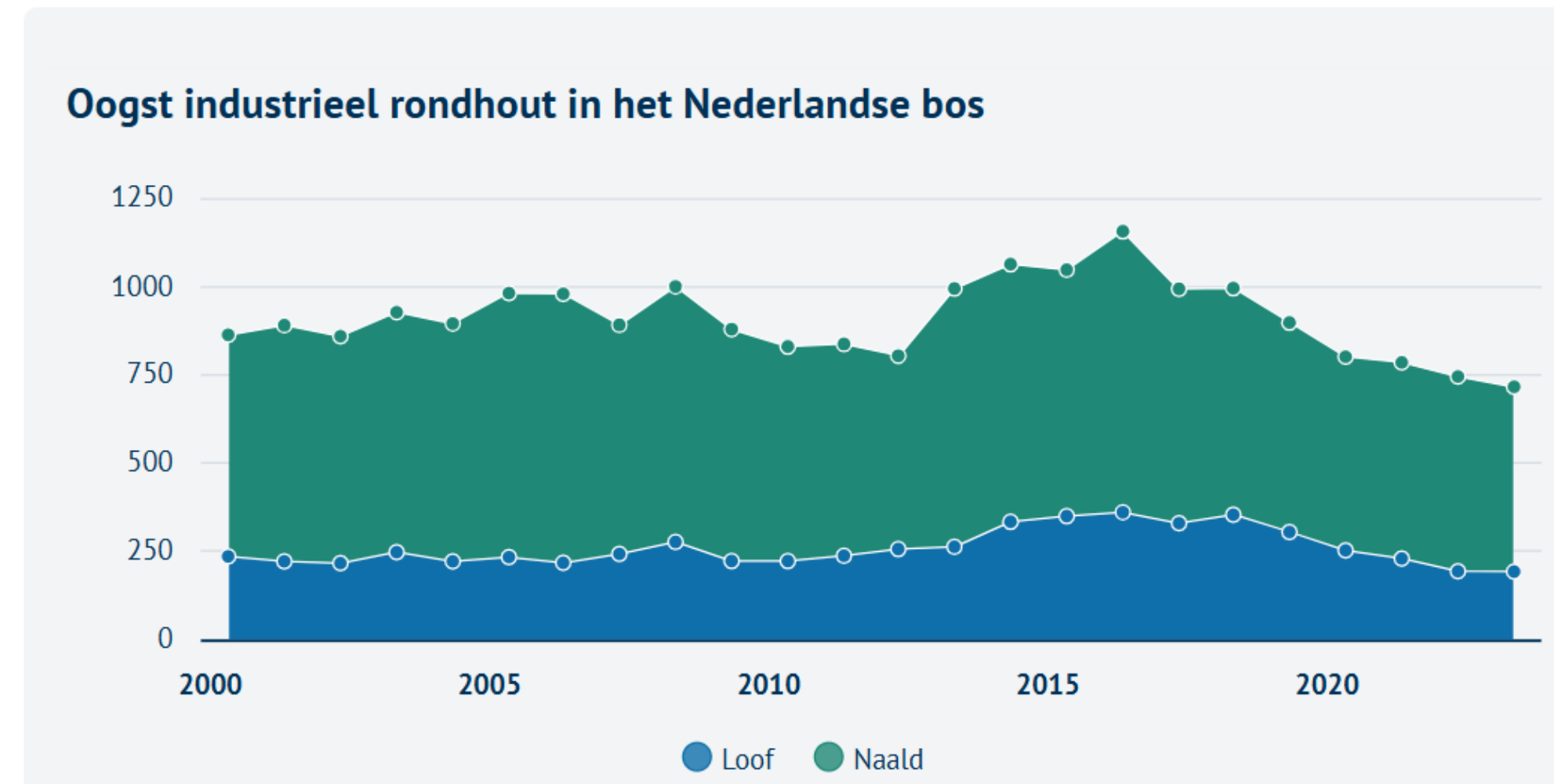
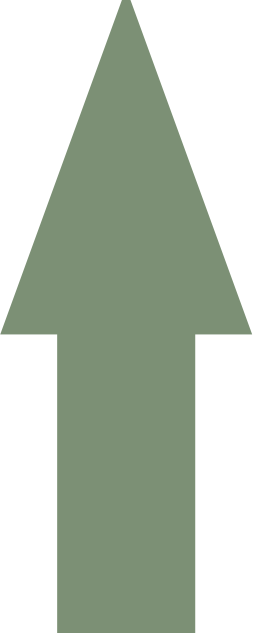


Figure 1: Harvest industrial roundwood from Dutch forests

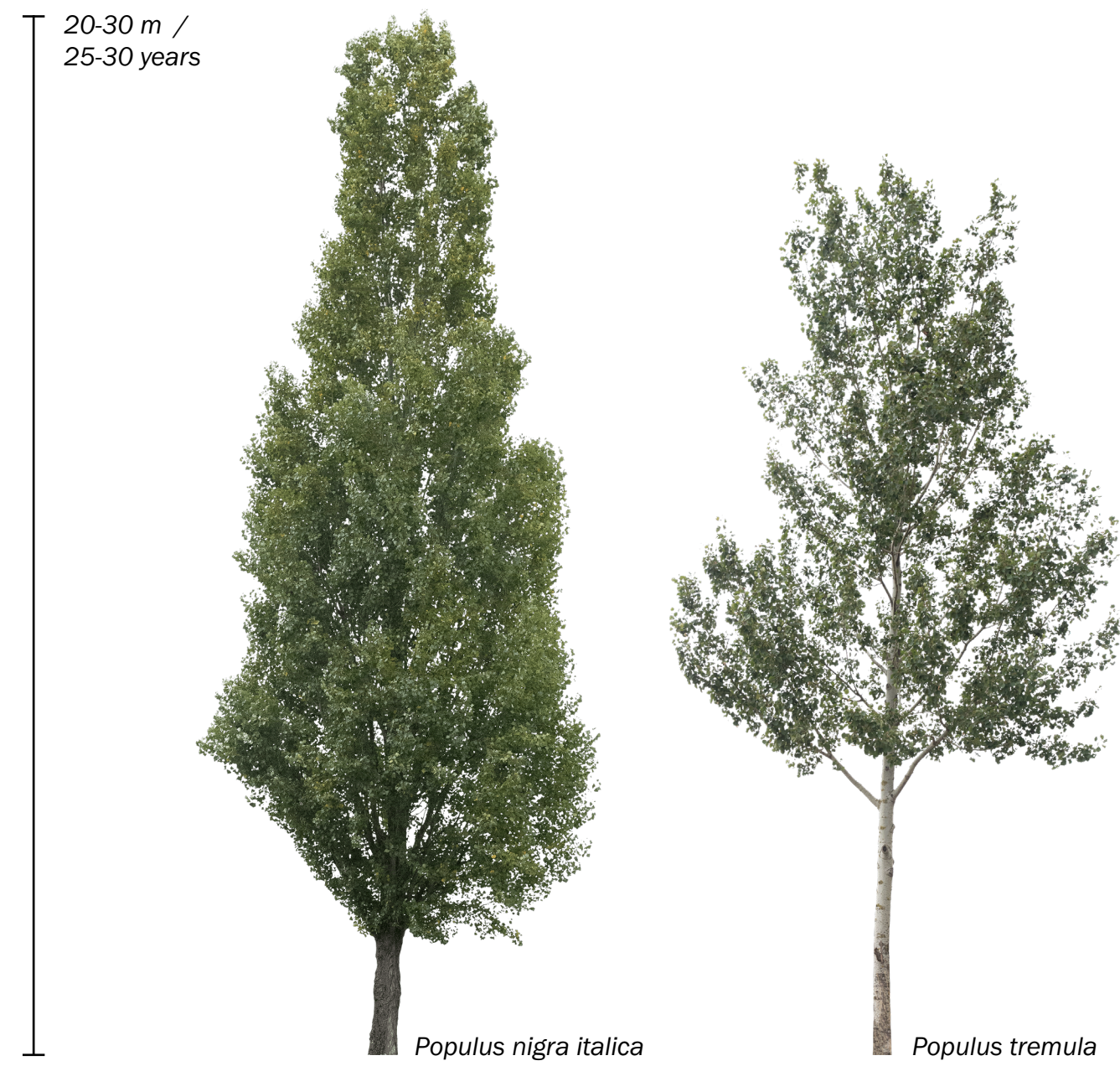
Poplar



Figure 1: Poplars in the Netherlands

Poplar

Potential of poplar



Fast growing
Native deciduous tree specie
Light weight timber

BUT

Lower strenght than spruce,
pine, fir,...



d'Peliekaans hat



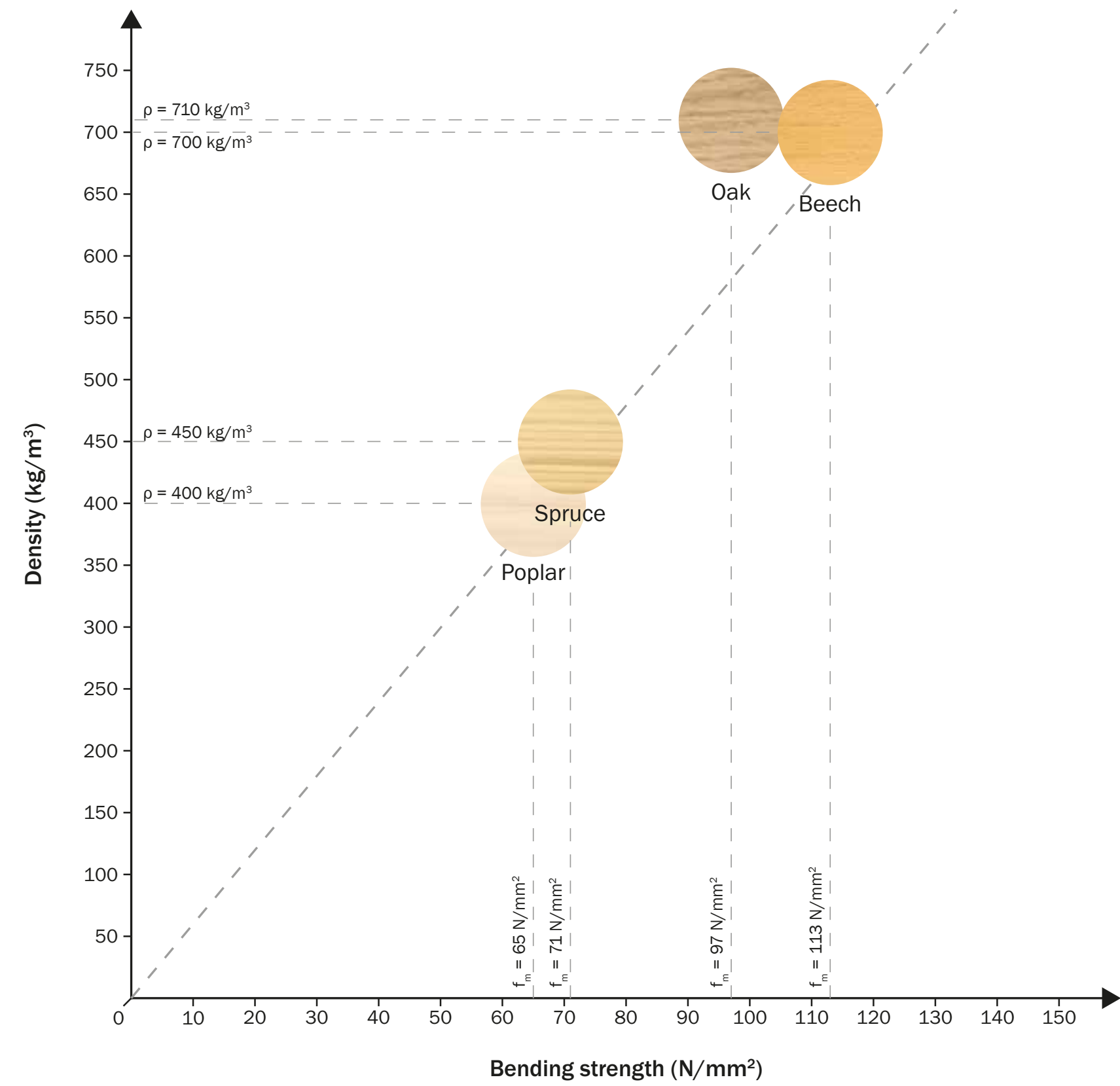
Research Question

"Does poplar timber have potential in the construction sector of the 21st century?"

Design

- Top-up in Amsterdam
- Starter dwellings
- Public/collective function
- Adaptability

Strength to density

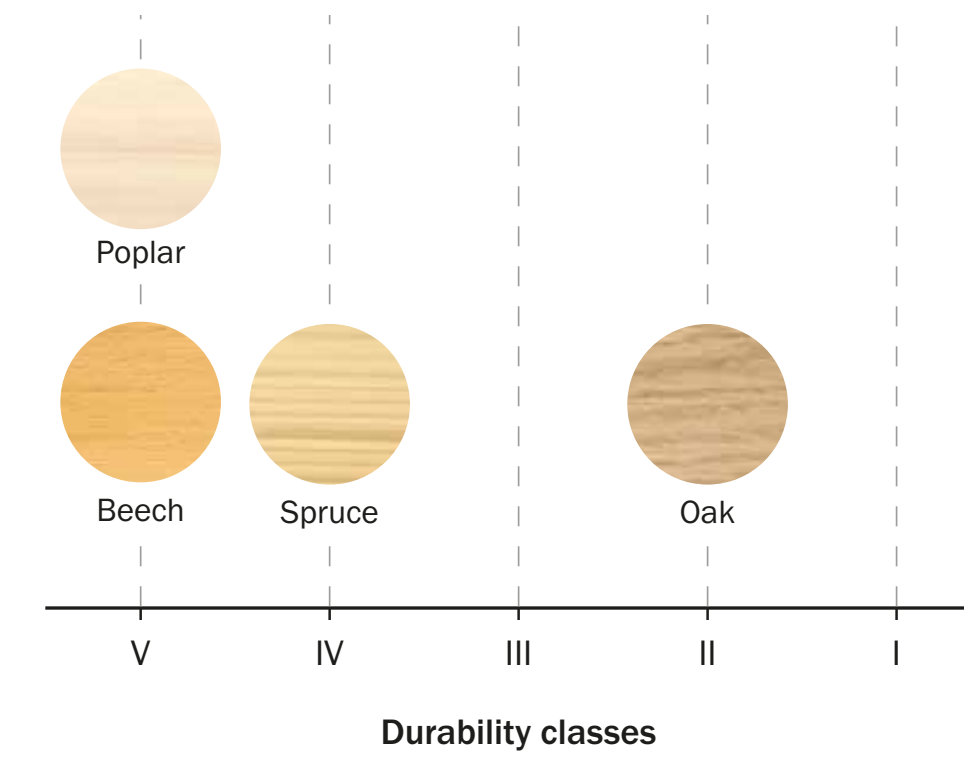


Strength to density ratio
Bending strength

$Strength\ to\ density = \frac{Bending\ strength}{Density}$

Poplar:	162 500 Nxm/kg
Spruce:	157 800 Nxm/kg
Oak:	136 600 Nxm/kg
Beech:	161 400 Nxm/kg

Durability



Sub-varieties

Populus canadensis Robusta



- Mulders (2008) *NL*
C20

- Obers (2019) *NL*
Acetic anhydride modified
C20
Unmodified
C18

- EN 1912 (+2024) *FR*
C18, C24

Populus canadensis Koster



- Mulders (2008) *NL*
Rejected

- Obers (2019) *NL*
Acetic anhydride modified
C16
Unmodified
C14

Populus canadensis Ellert



- Obers (2019) *NL*
Rejected

Populus tremula L.



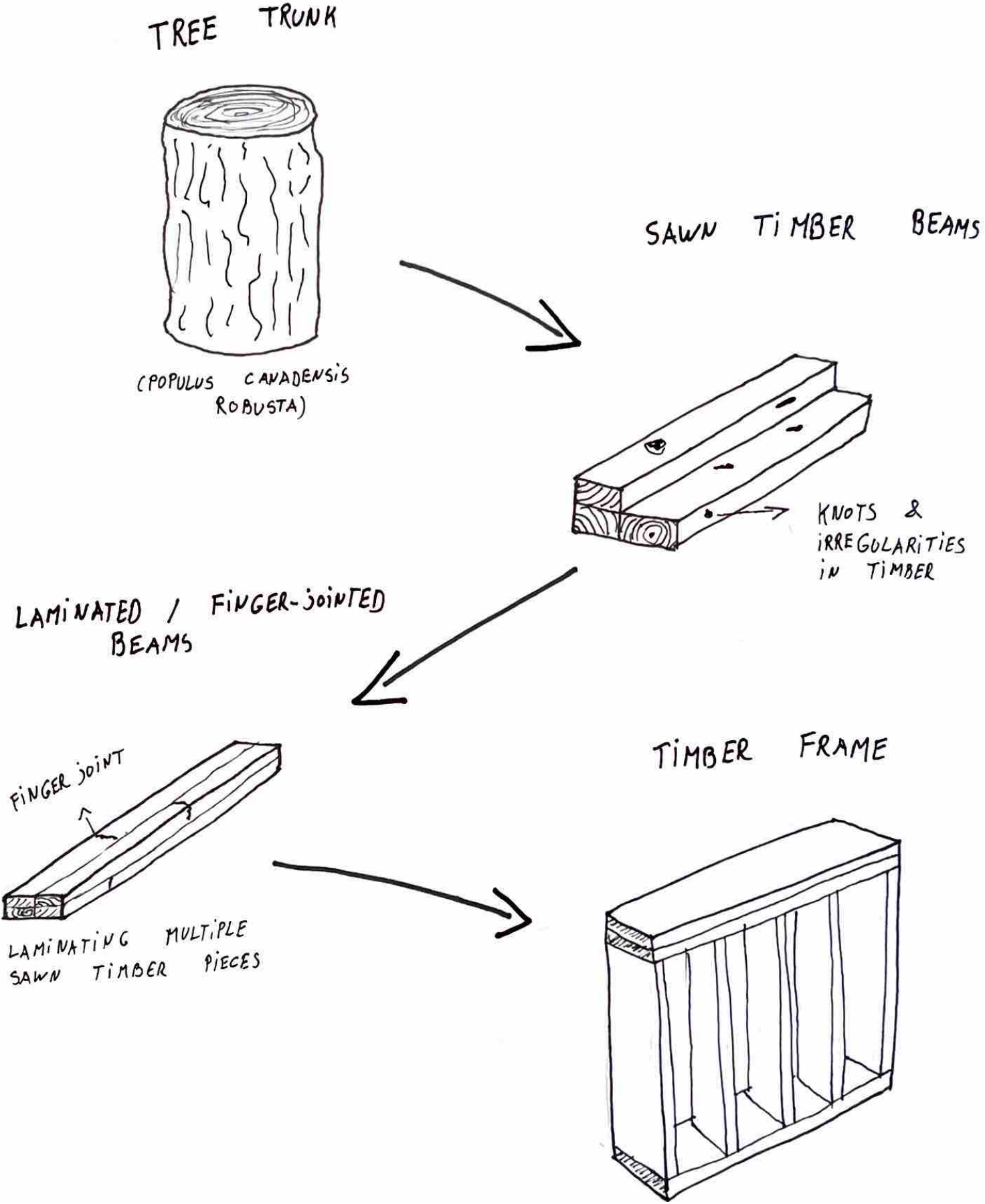
- Herdova et al. (2025) *SK*
C24

Populus nigra



- EN 1912 (+2024) *DE*
C22

Processing



Poplar timber frame construction



Figure 1: Poplar timber frame construction Peppelhout

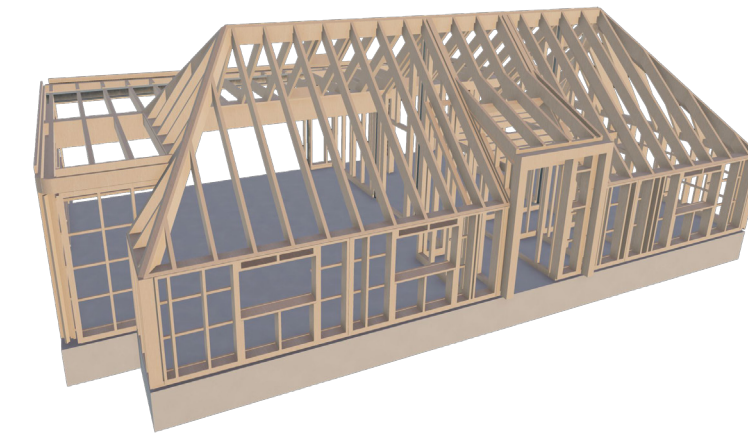


Figure 2: Poplar timber frame construction Peppelhout



Figure 3: Fingerjointed and laminated poplar beams



Figure 4: Planing fingerjointed and laminated poplar beams

Three-point bending tests

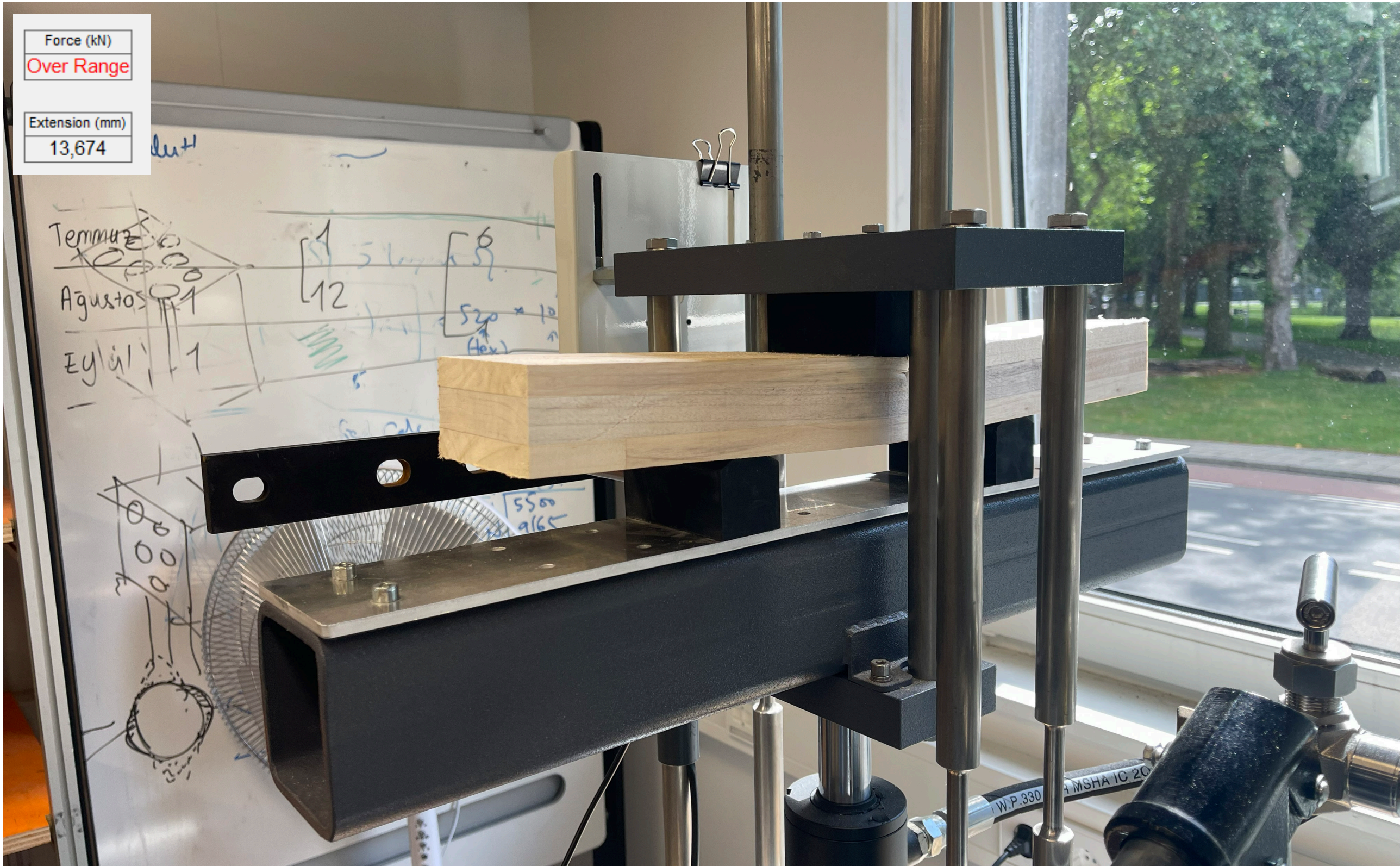


Figure 1: Three-point bending test test piece 1 (L=200mm)

Three-point bending tests

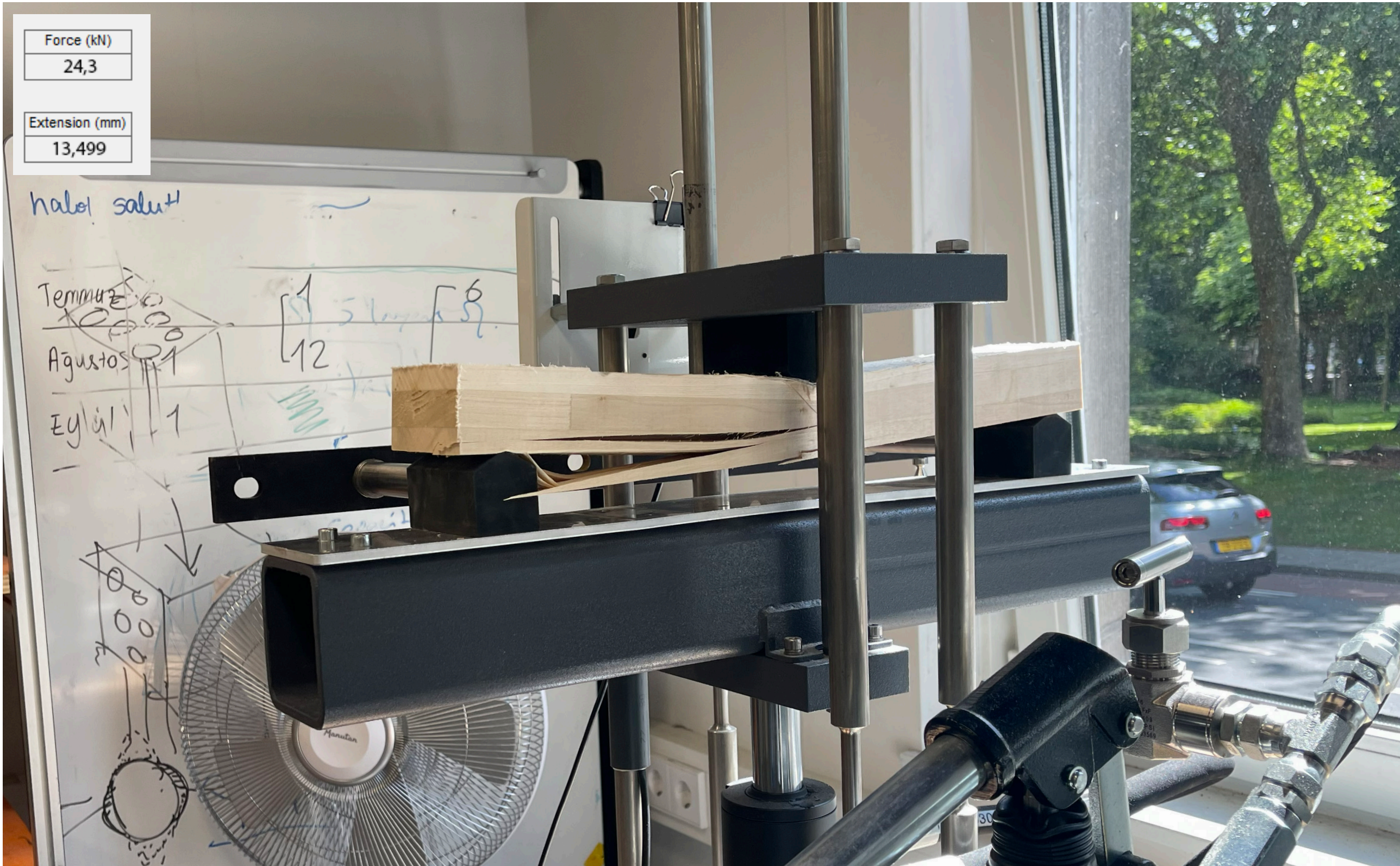
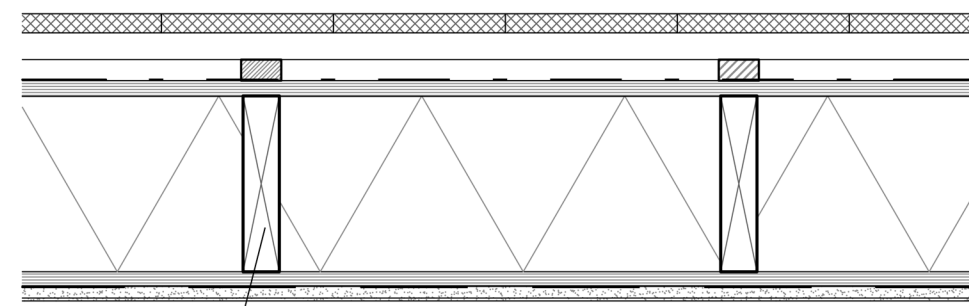


Figure 1: Three-point bending test test piece 1 (L=398mm)

Packages

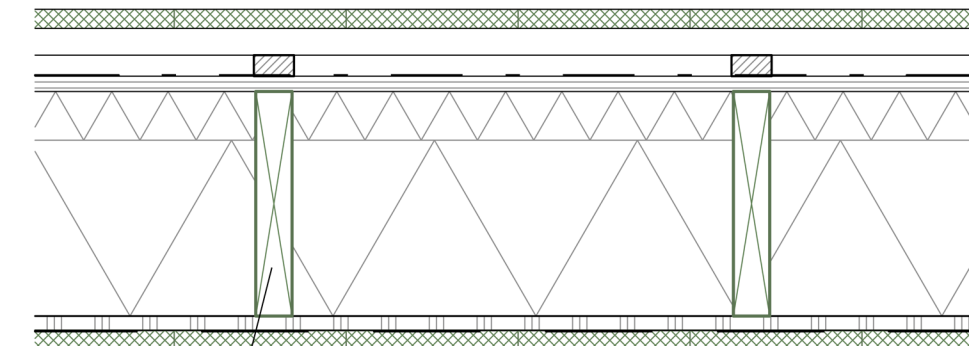
Spruce



Spruce beams C24 (38x184mm)

Total thickness package = 300mm

Poplar in standard sizes



Laminated poplar beams C22 (38x235mm)
→ increased thickness package of 51mm compared to spruce
→ Rc value + 1,42 W/m²K

Total thickness package = 356mm

Thermal modification - façade cladding

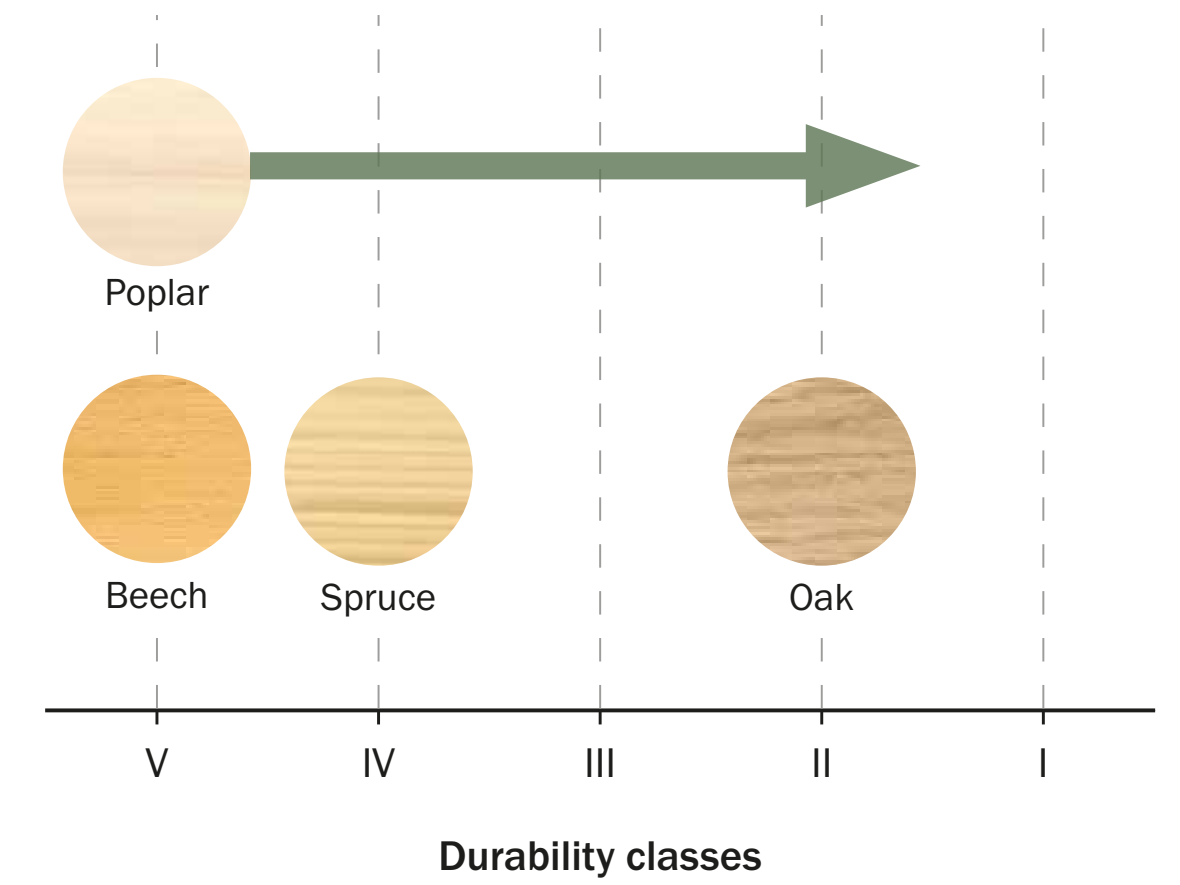


Figure 1: Thermal modification - PLATO

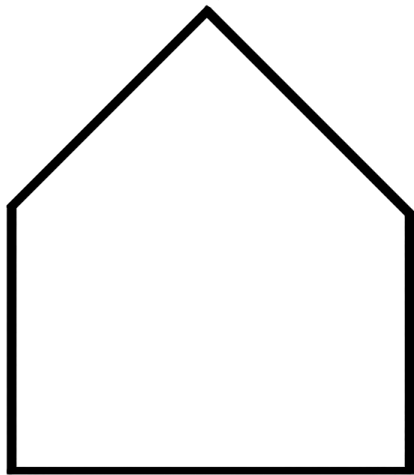
Acetylation - structural outdoor application



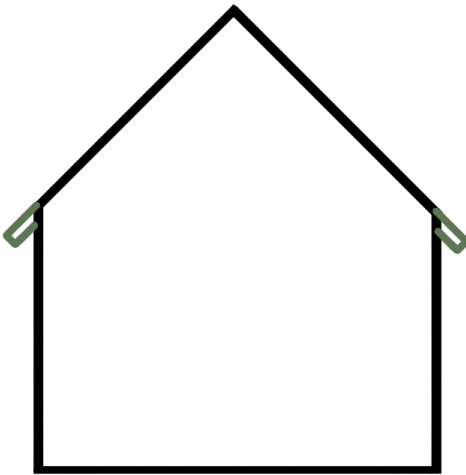
Figure 2: Chemical modification - Acetylation



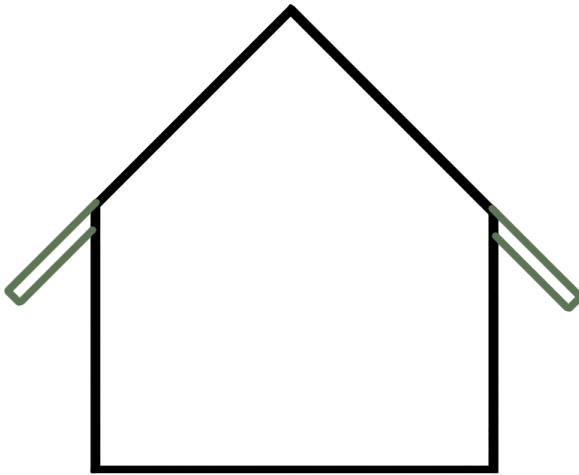
Building envelope



Standard typology roof brick façade



Standard typology roof timber façade

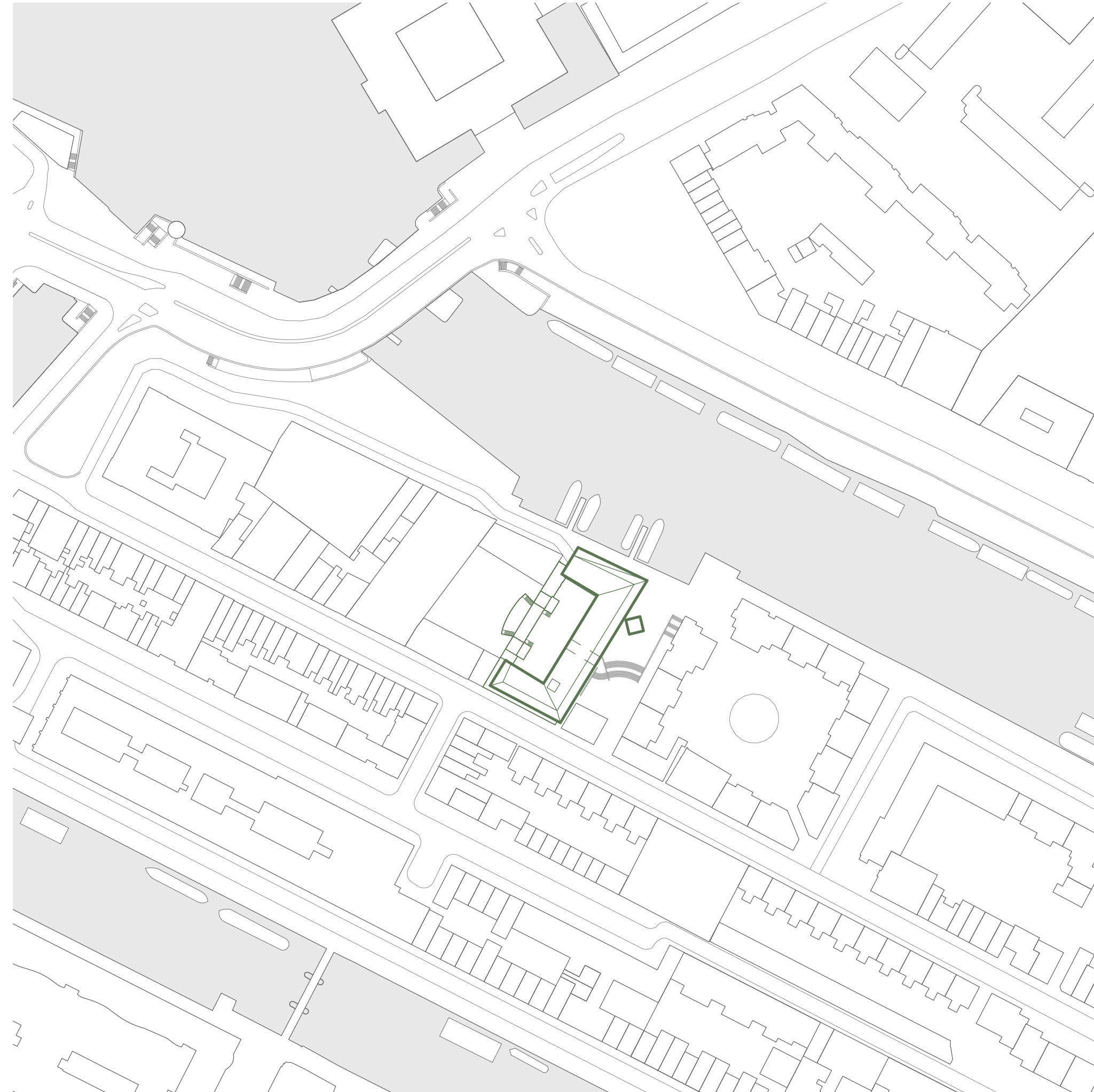


Standard typology roof poplar façade

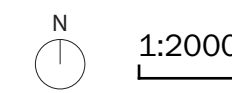
d'Peliekaan



Figure 1:d'Peliekaan



Site plan d'Peliekaan

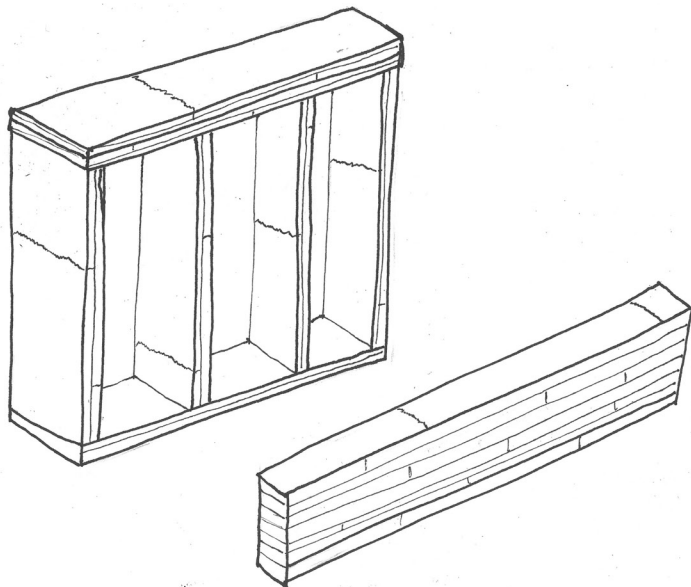


Transformation in 1987

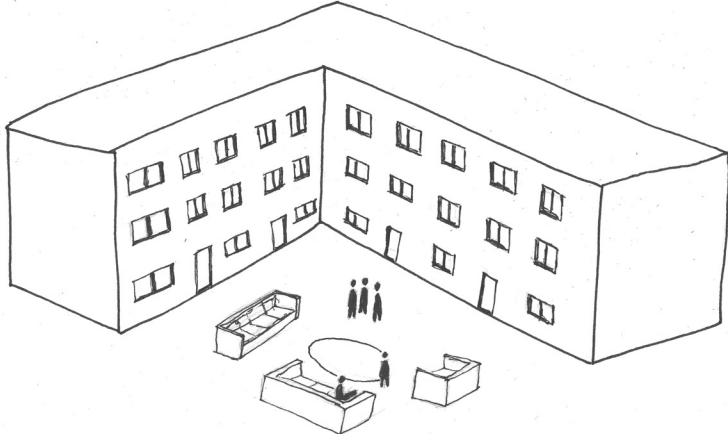


Figure 1: d'Peliekaan along the Nieuwe Vaart

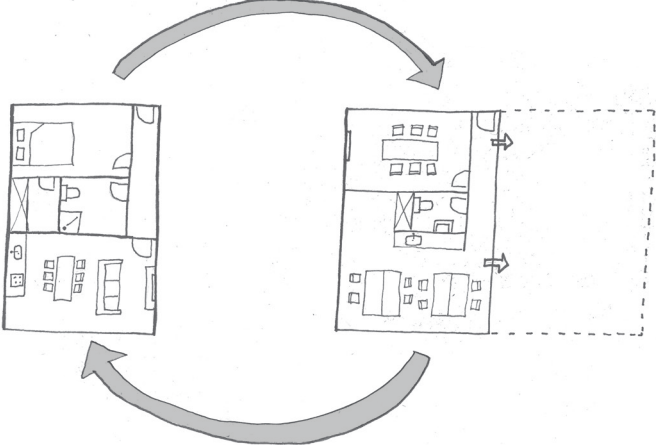
Design principles



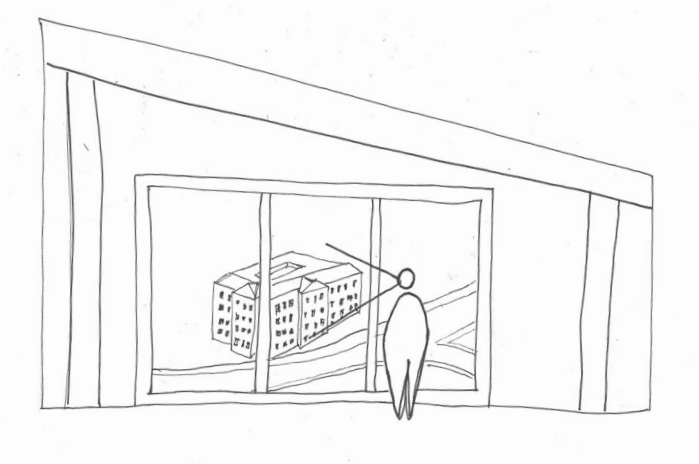
Poplar as a building material



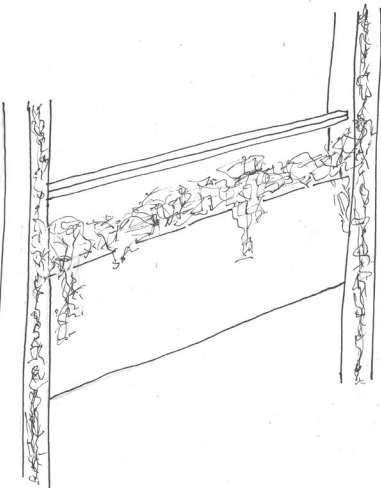
Community based design



Adaptability

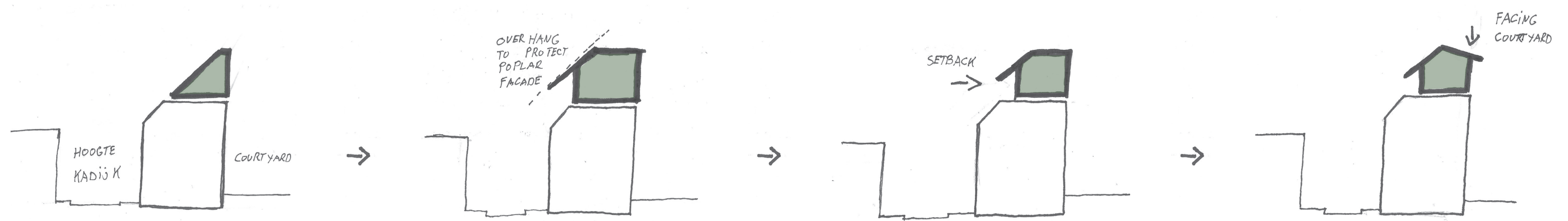


Sightlines



Green architecture

Protective roof



Façade



Elevation Matrozenhof (E)

1:200



Elevation Nieuwe Vaart (N)

1:500



Elevation Hoogte Kadijk (S)

1:500

Green web

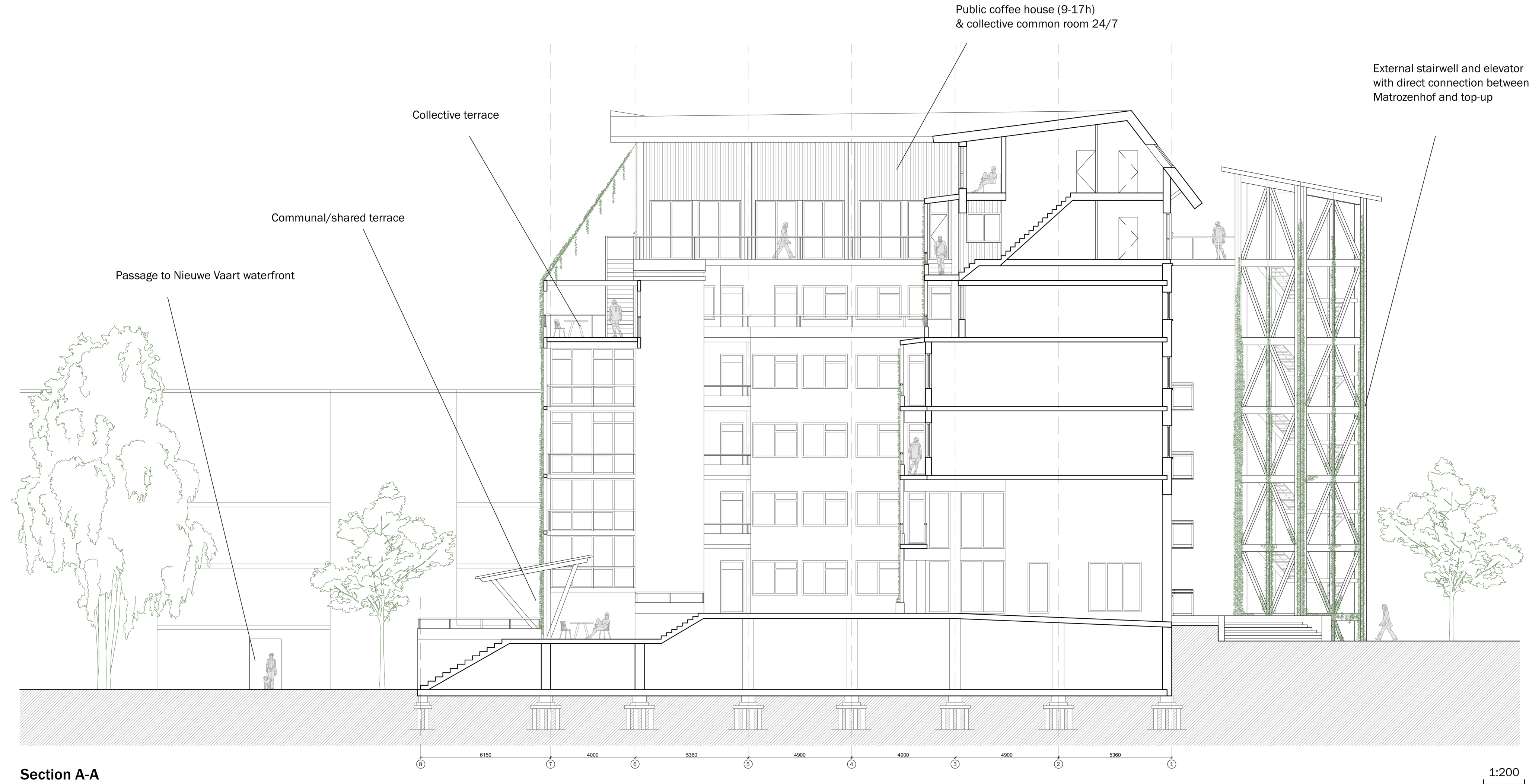


Green web at the level of the courtyard



Green web at the level of the top-up

Green connection

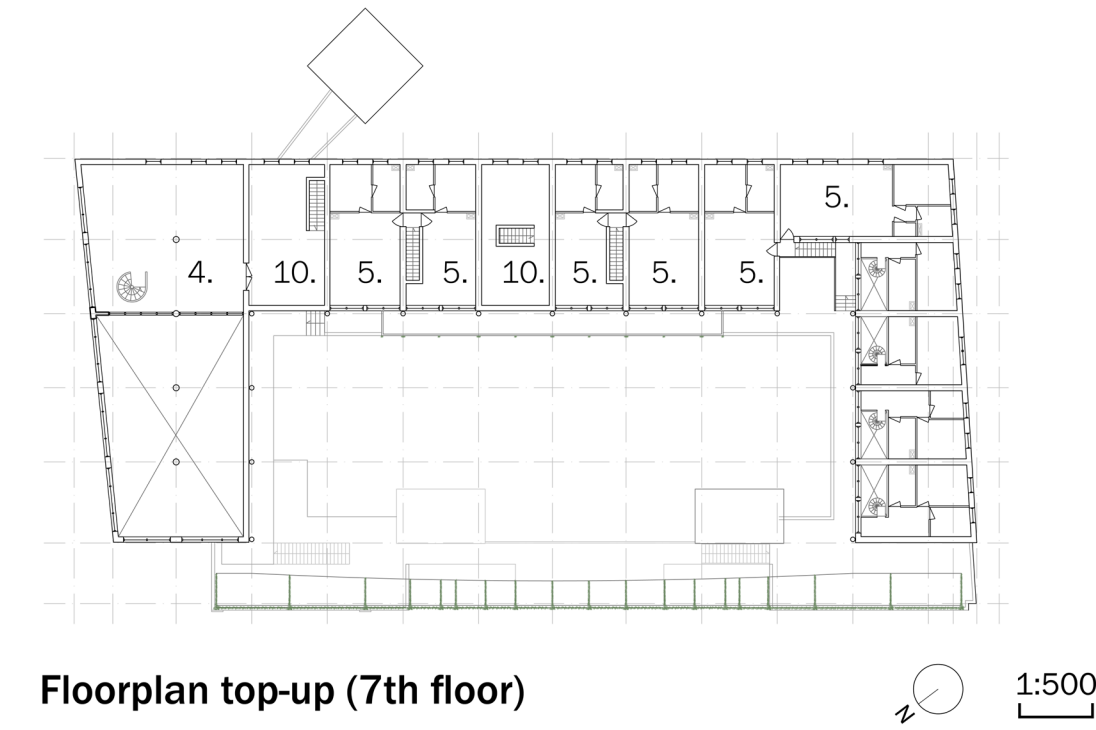
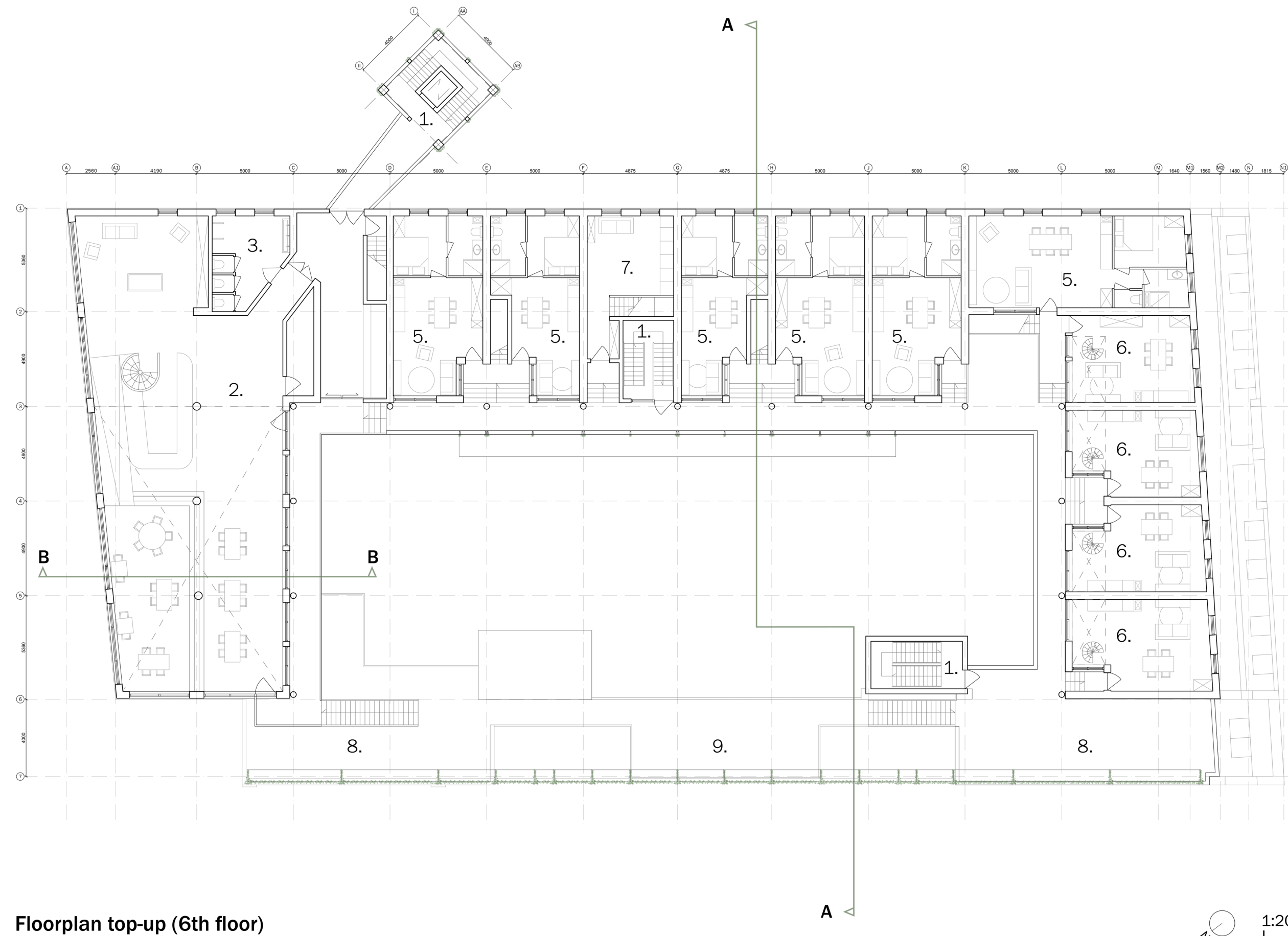


Gallery and 'second skin'



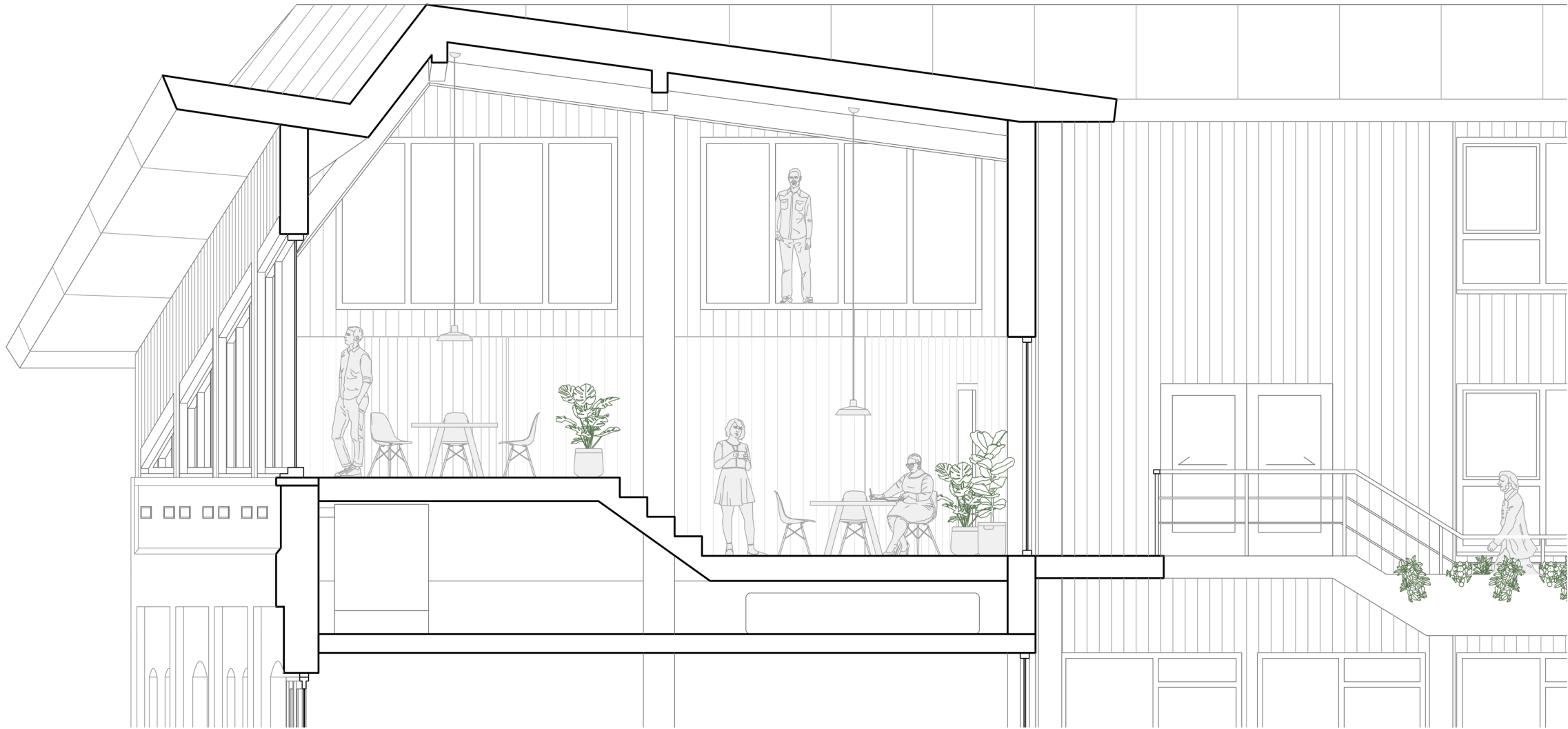
Impression gallery and 'second skin' structure

Floorplans



- 1. Elevator and staircase
- 2. Coffee house (9-17h)/common room
- 3. Toilets
- 4. Multifunctional co-working space
- 5. Single storey starter dwellings ($\pm 45m^2$)
- 6. Duplex starter dwellings ($\pm 60m^2$)
- 7. Communal laundry room
- 8. Roof terraces
- 9. Bridge
- 10. Technical space/storage

Coffee house/common room



Section fragment coffee house/common room B-B

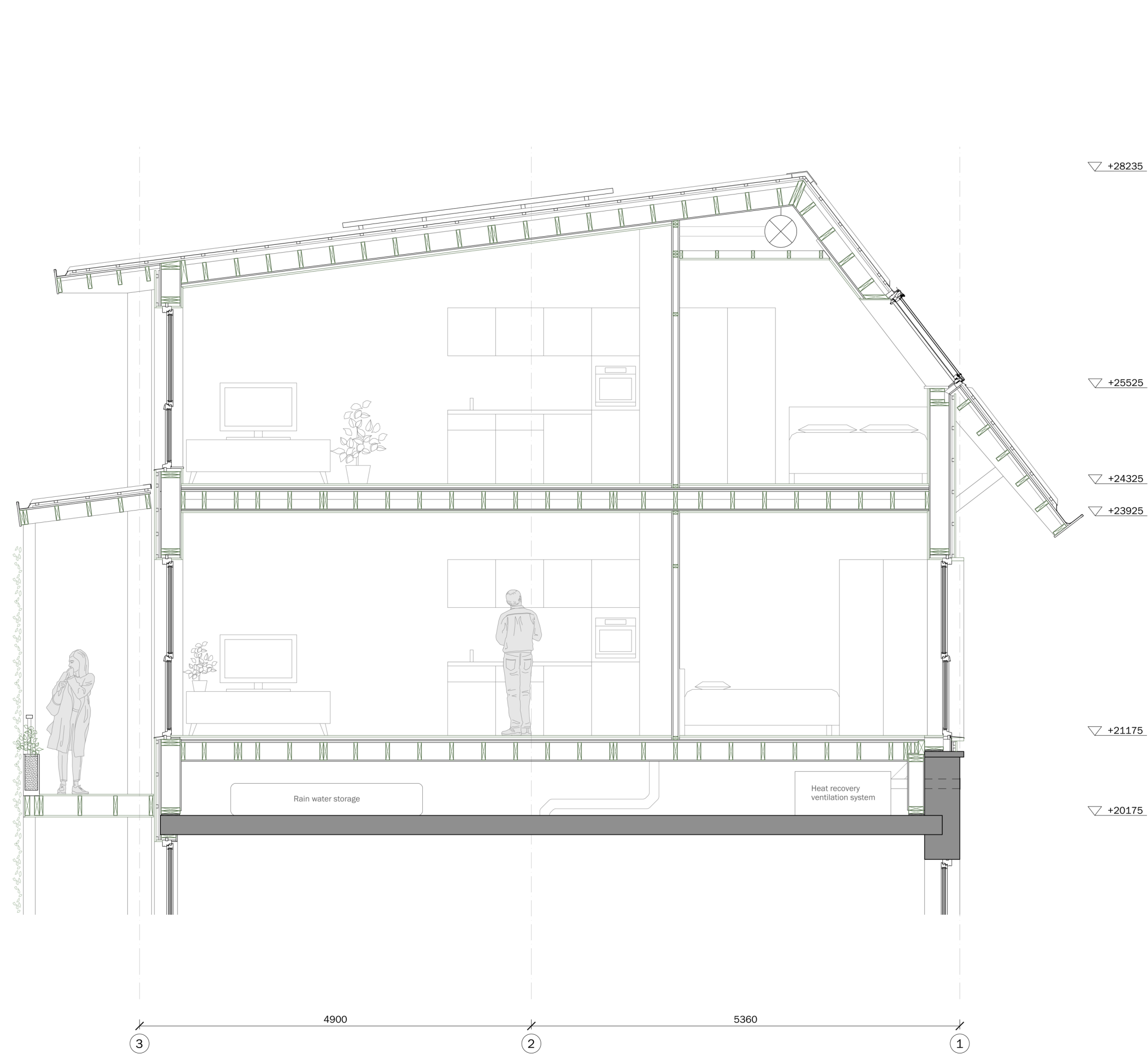
1:100

Sightlines



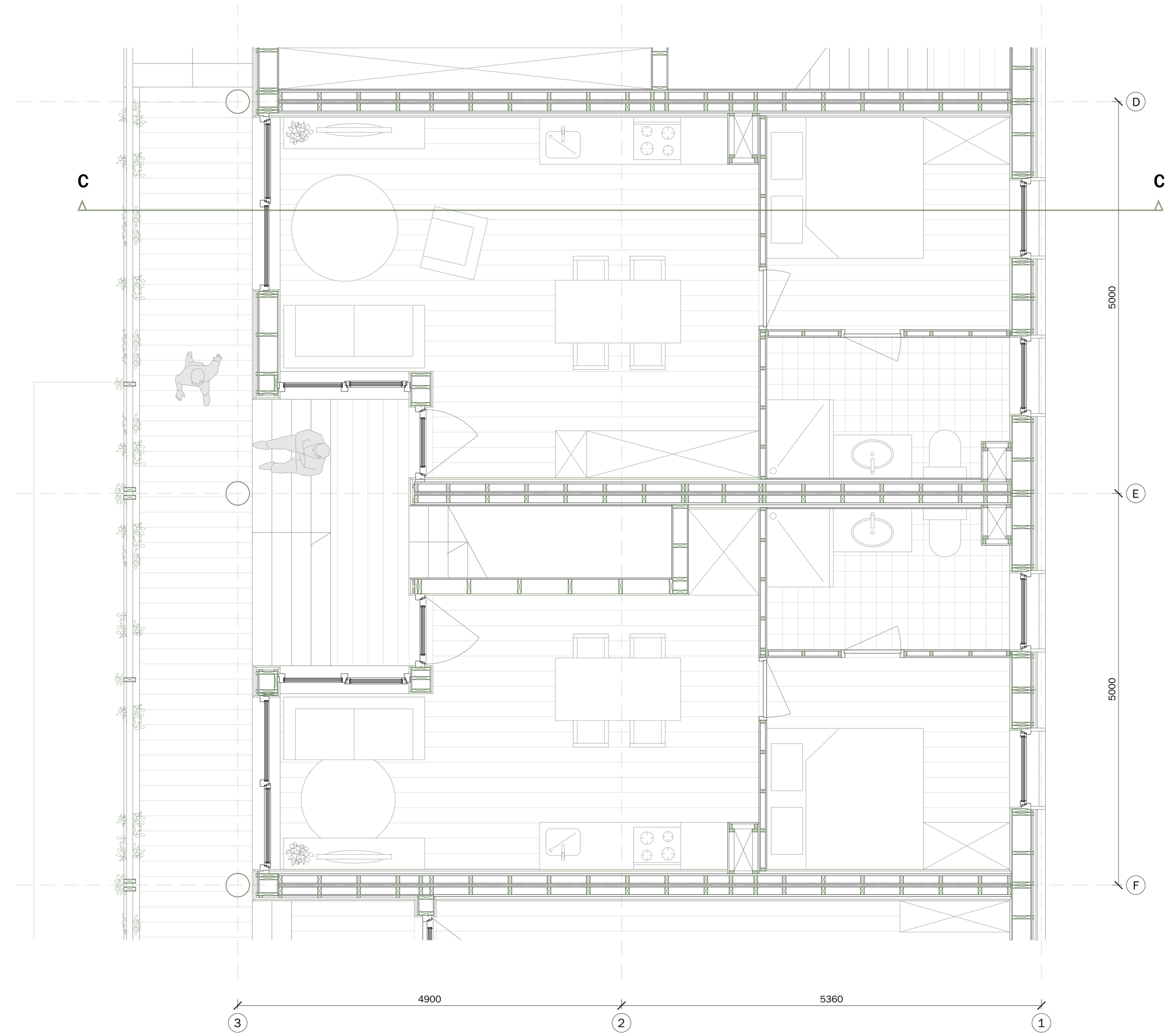
Sightlines from coffee house/common room

Starter dwellings



Section dwelling C-C

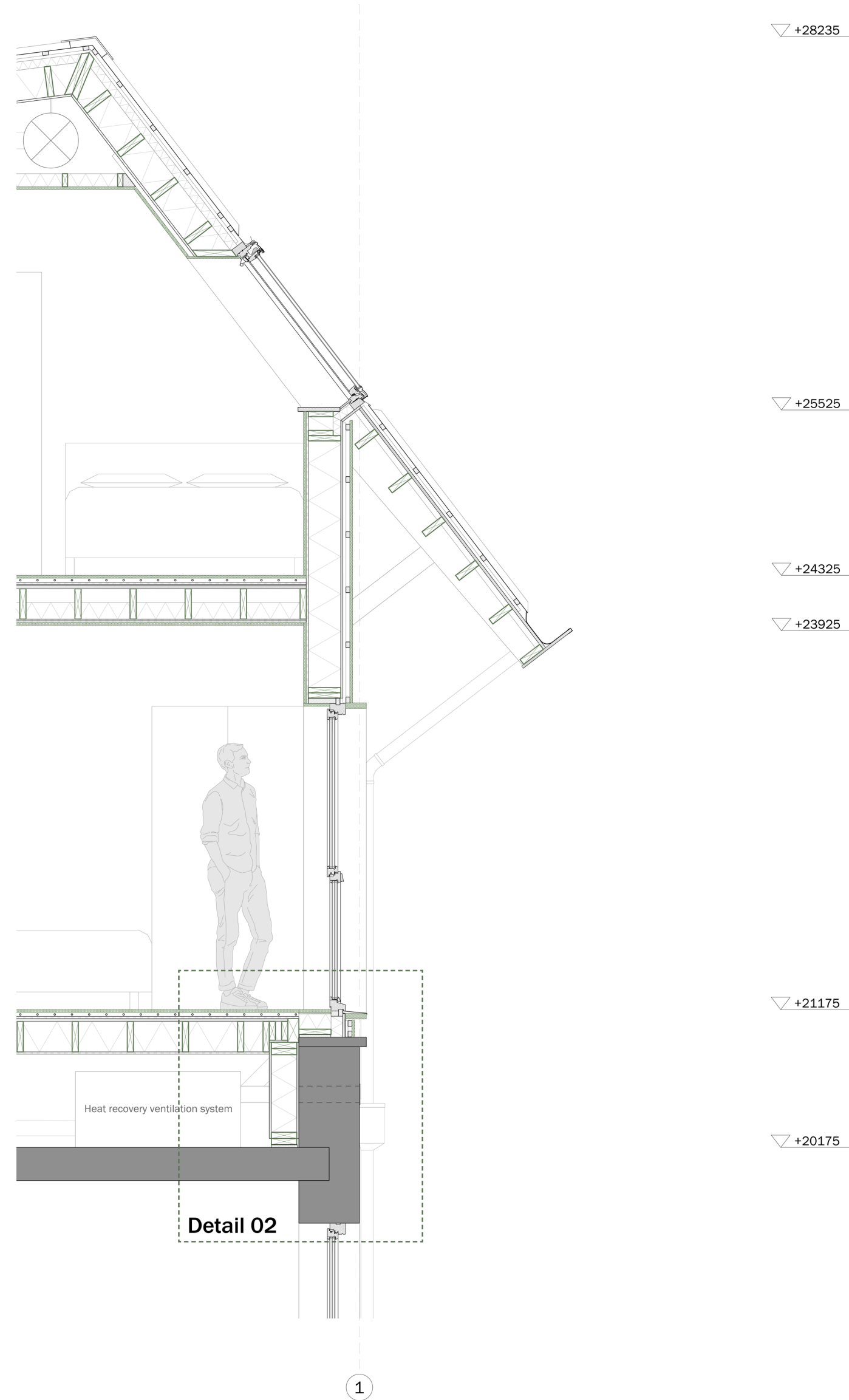
1:50



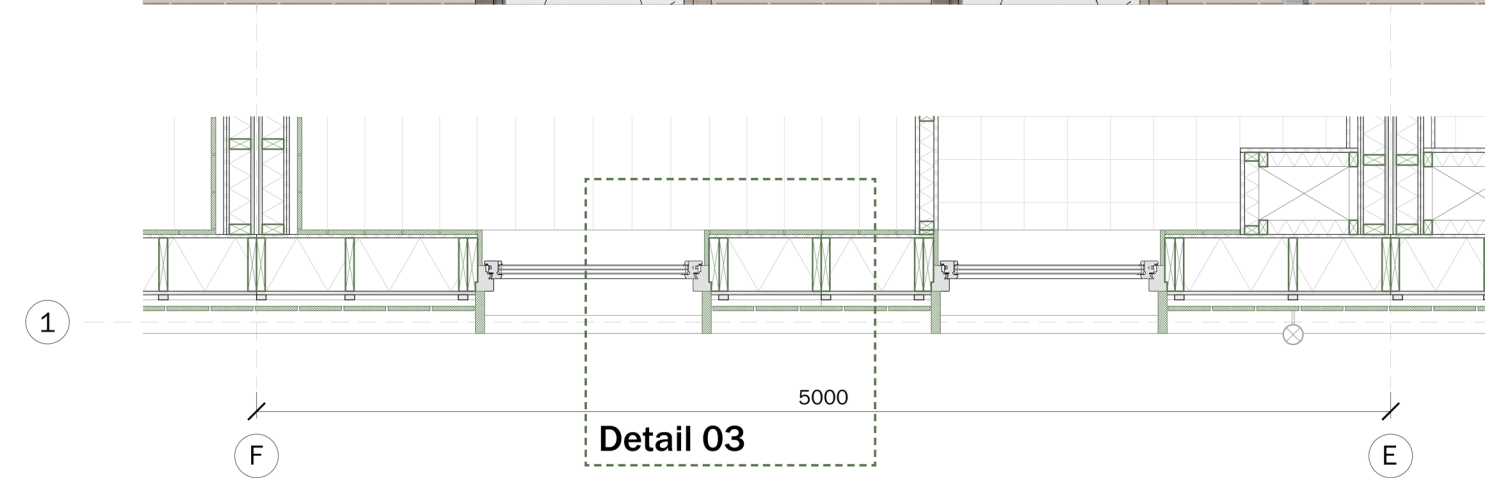
Floorplan dwellings

1:50

Poplar in the façade

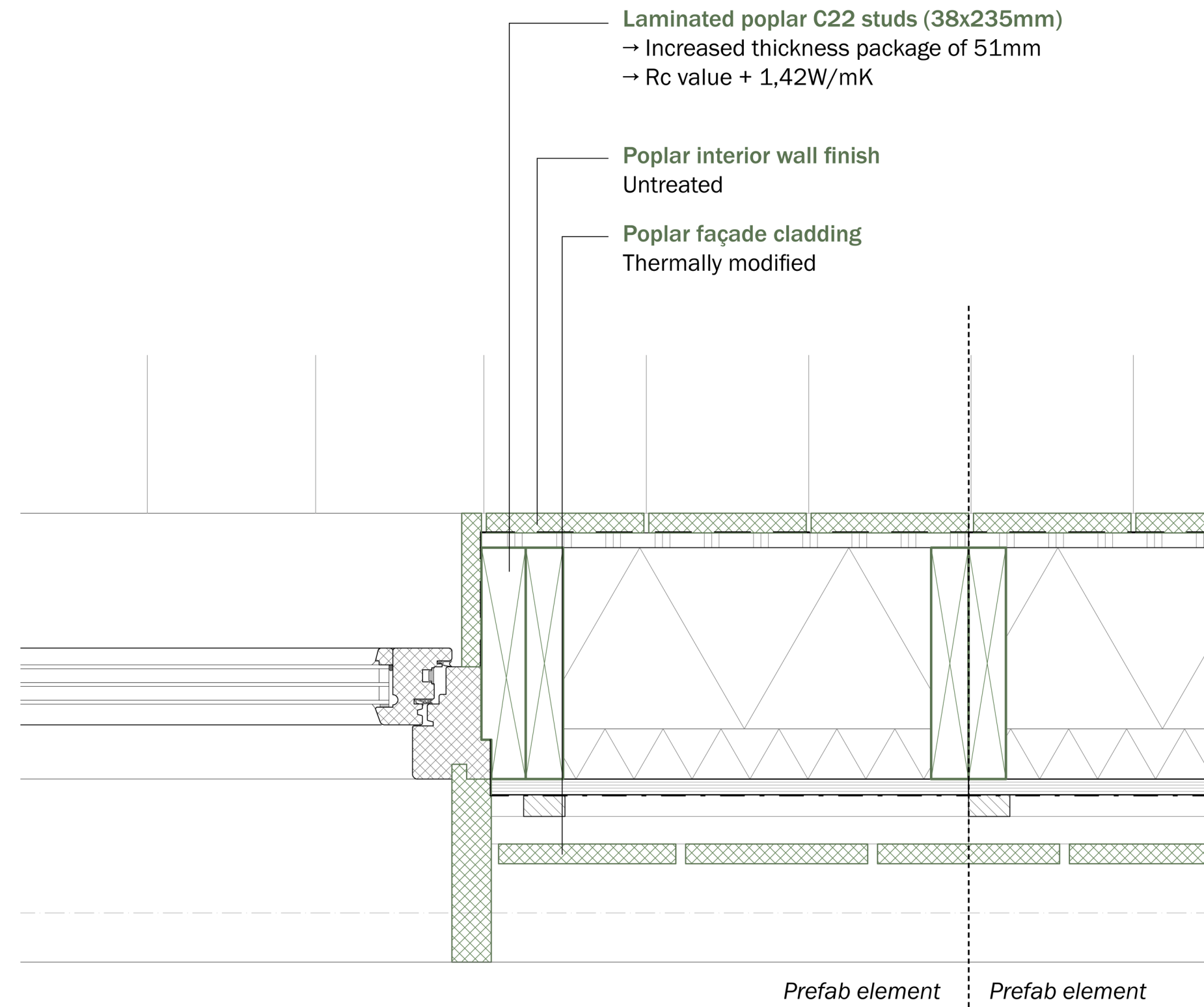


Detail 02



Detail 03

Detail horizontal connection window frame



Façade package (from outside to inside):

- 20mm - Poplar facade cladding (thermally modified)
- 28mm - Hor. framework (28x42mm), modified spruce
- 22mm - Vert. framework (22x42mm), modified spruce
- 16mm - Agepan board (stability)
- Waterproof, vapour-permeable membrane
- 235mm - Poplar timber frame (38x235mm, h.t.h. 500mm) + wood fibre insulation (thermal insulation)
- 15mm - Gypsum fibreboard (fire safety)
- Vapour-permeable membrane
- 20mm - Poplar interior wall finish

Total thickness package = 362mm

Detail 03: horizontal connection windowframe

1:5



Topping-up in Amsterdam



A future of poplar in construction



