

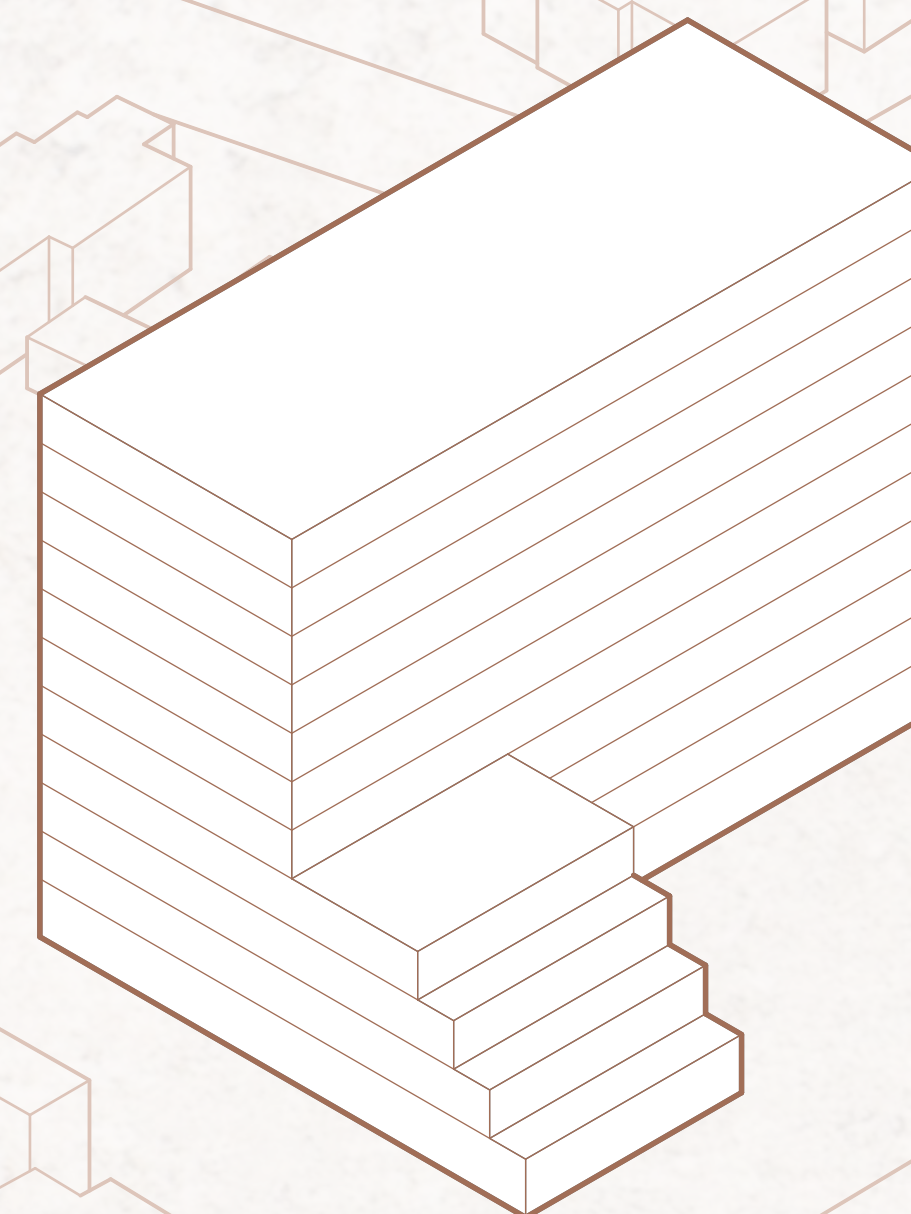
nulo

152
shanley
street

Shinyoung Samantha Seo
Vaishnavi Pasalkar
Nicholas Sterner
Brittney Cheng
Javier Fierro



01 site



01: site

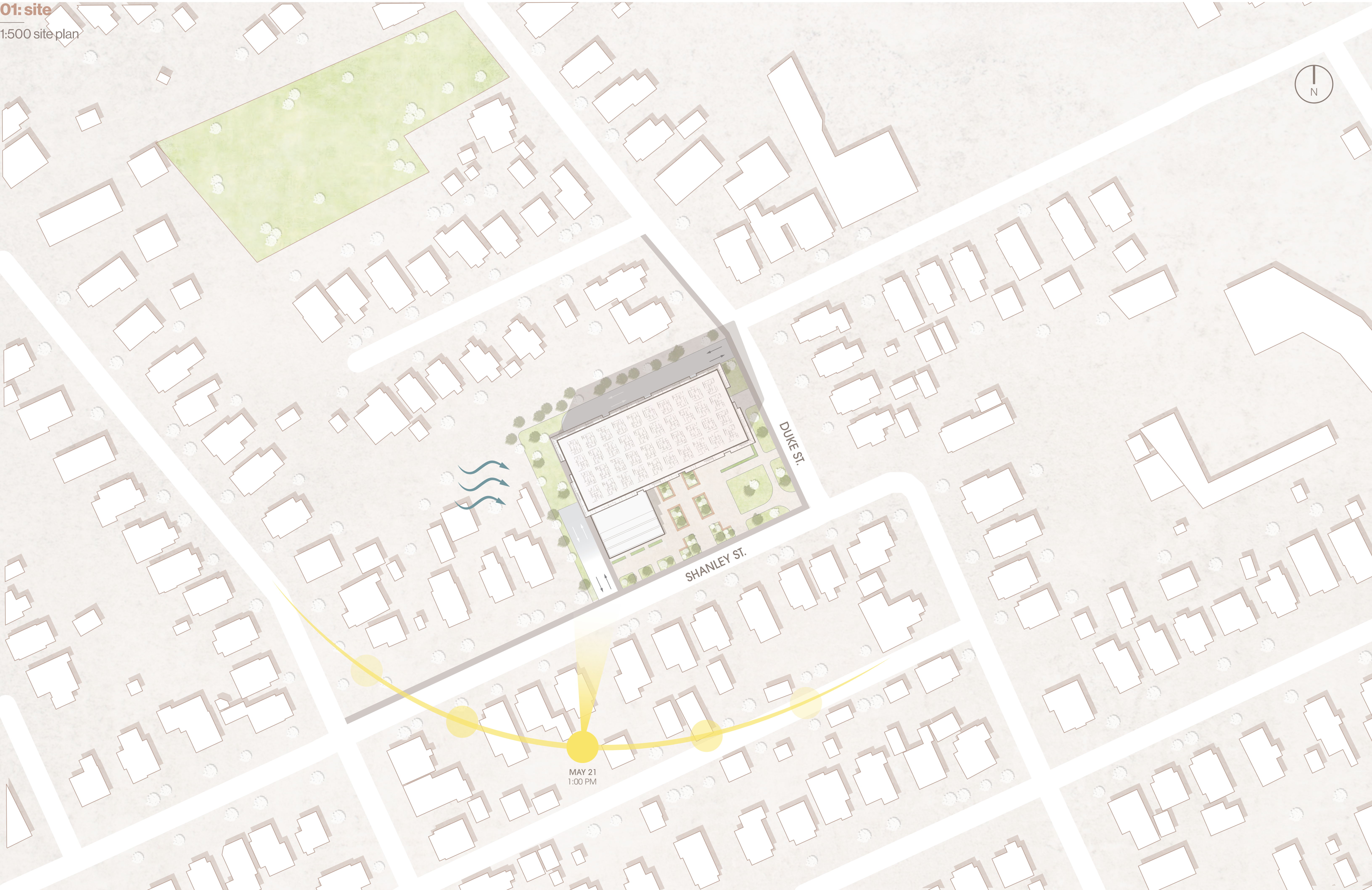
site context



LEGEND

- Green Space
- Downtown Core
- Site Location
- Google Office
- Town Hall
- Library
- School
- Church
- GRT Bus Stop
- ION Station
- GO Station
- 10 min Walking Radius
- ION Train
- GO Train
- Duke St.
- Shanley St.
- Main Road





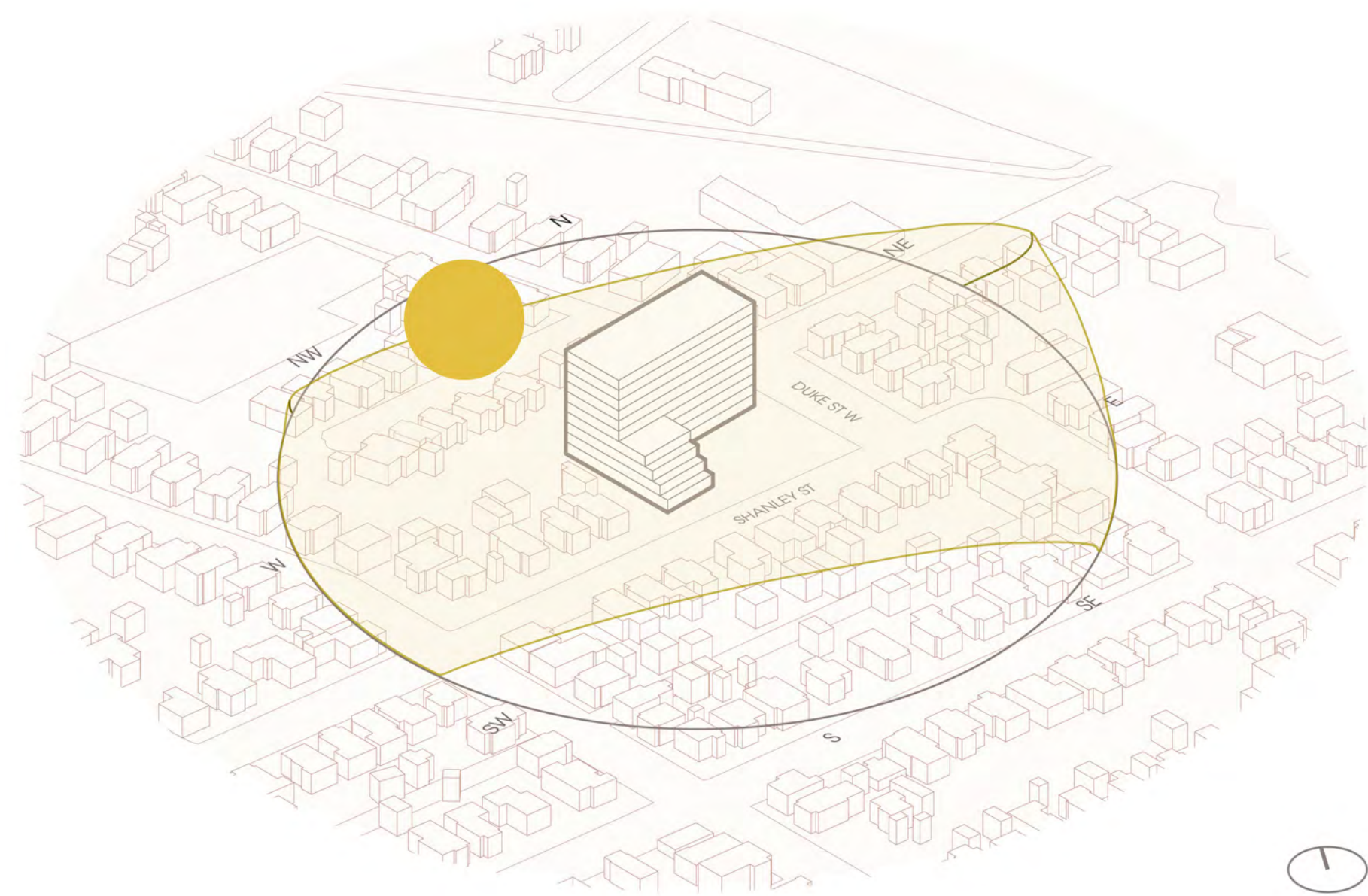
passive heating + cooling strategies

The building form and orientation is strategically considered to optimize uses of natural sunlight and ventilation. The shortened four-storey graded terrace on the West face allows for light penetration into the courtyard, whilst also providing sufficient shading throughout the day. Commercial units, the atrium and exterior terraces in the South benefit from the great sun exposure.

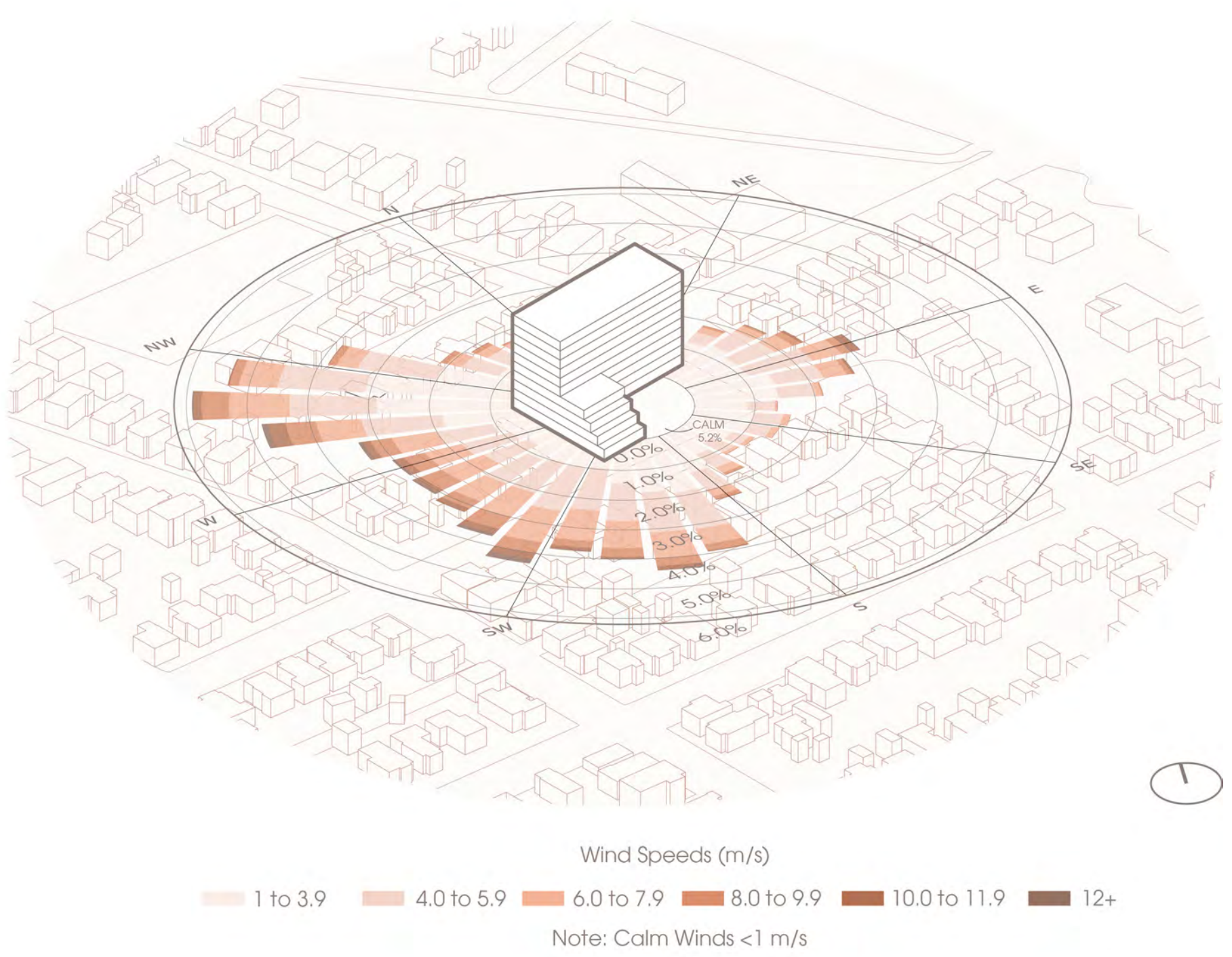
Passive heating is achieved in the atrium space of our building as the South-facing curtainwall acts as a solar collector. The glazing admits solar energy into the space when it strikes the concrete floors, which stores the heat and radiates it back out into the room at night.

Passive cooling is acheived in our building to reduce unwanted heat gain during the day. The void is nested 3.8 m into the building to create a natural overhang which shades the atrium from harsh sunlight. Trees in the courtyard also provide shading for the glazing in the South facade. Balconies are enclosed with overhangs to further reduce intense heat gain. Furthermore, the balcony geometry in general acts as sun shading devices across the West and South facades. Operable windows, specifically on the West side, allow for natural ventilation to cool the space during the day.

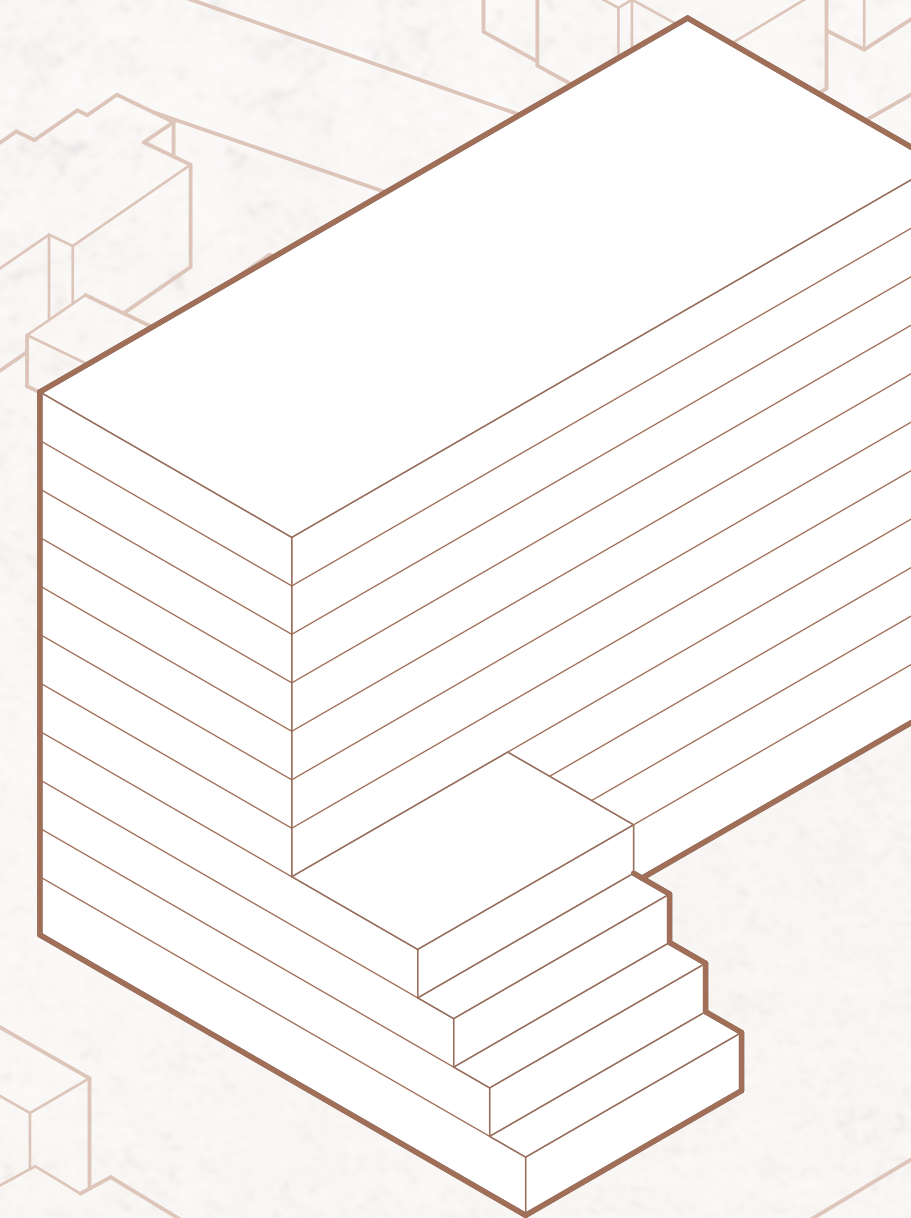
optimizing daylight



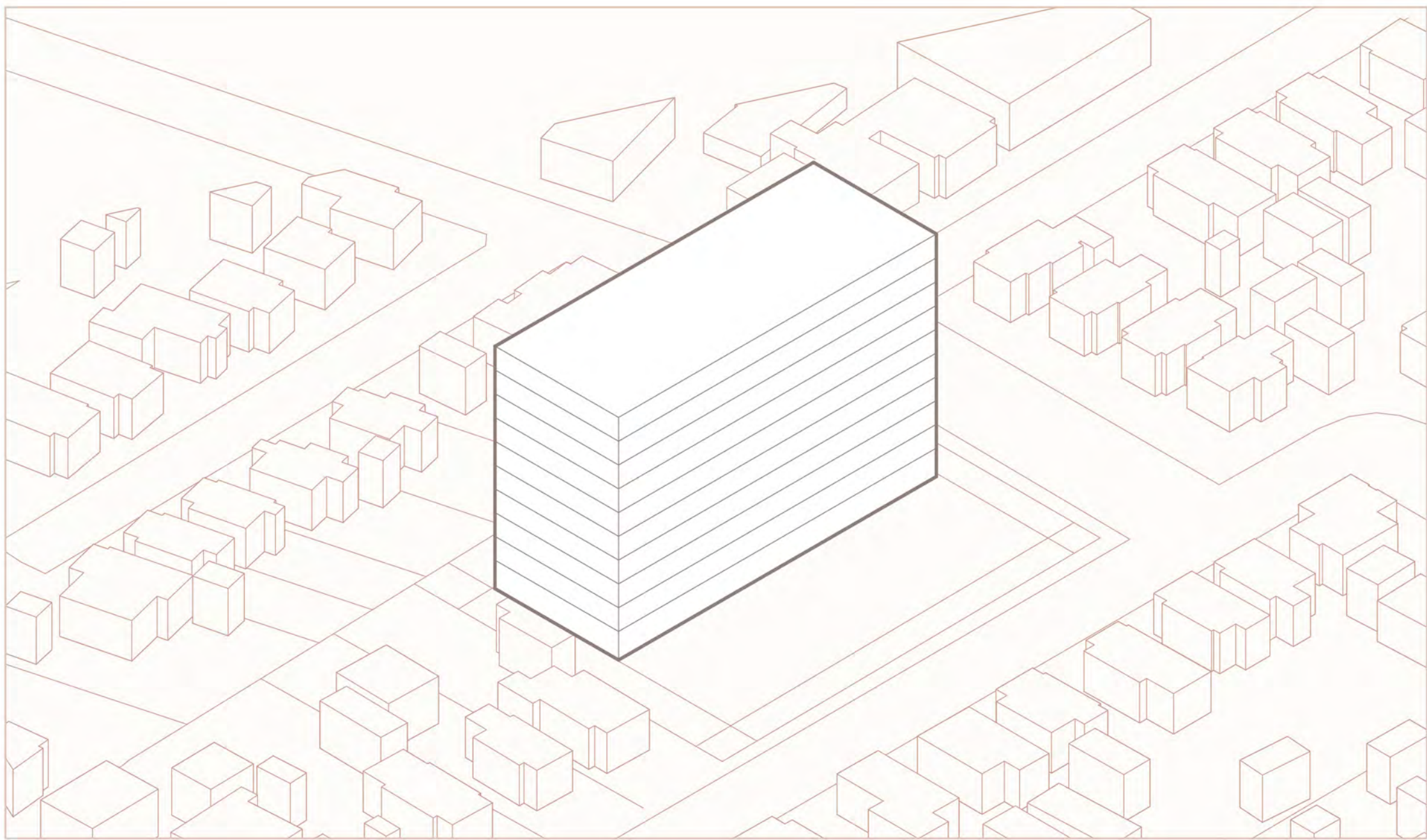
natural ventilation



02 massing

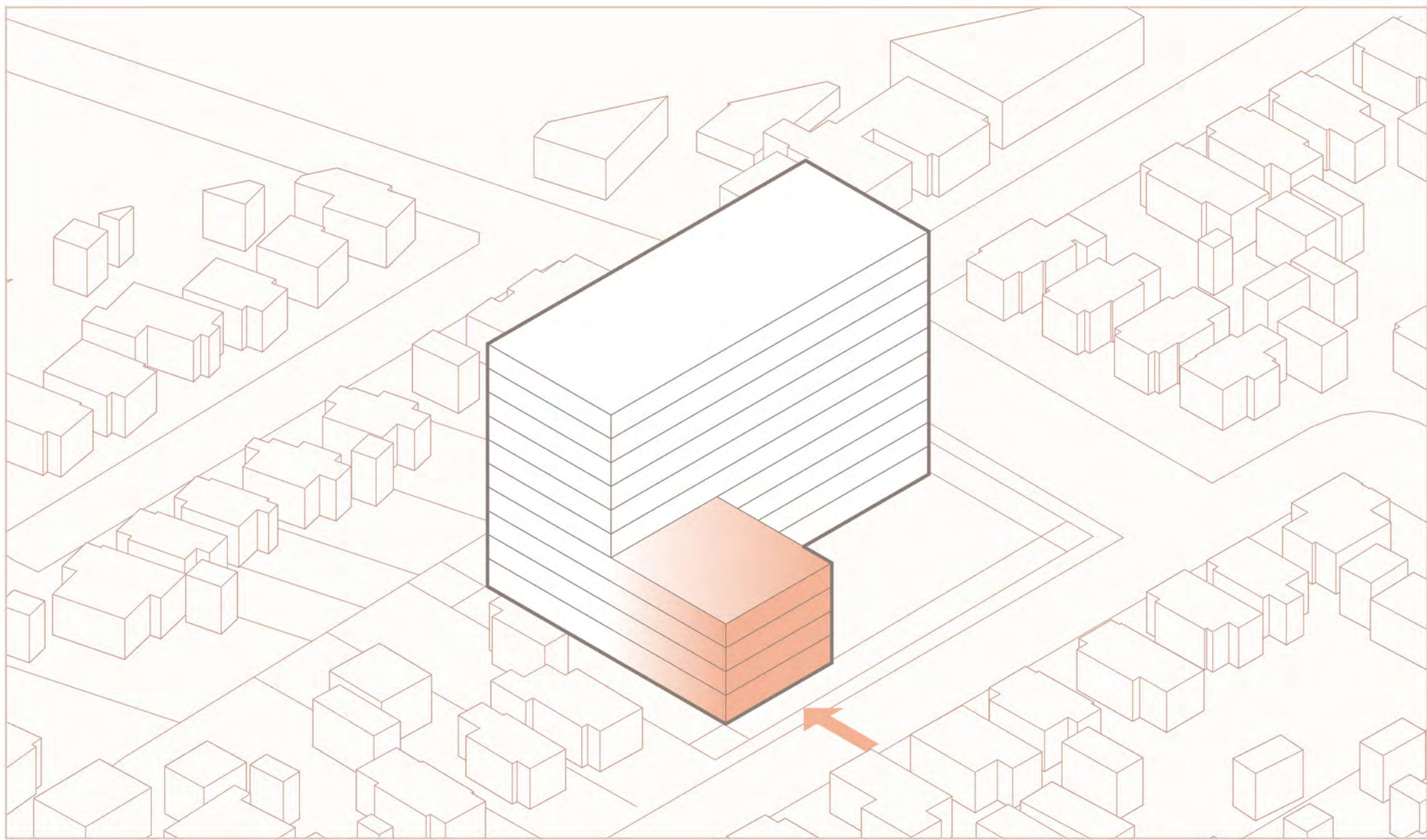


02: massing
massing steps



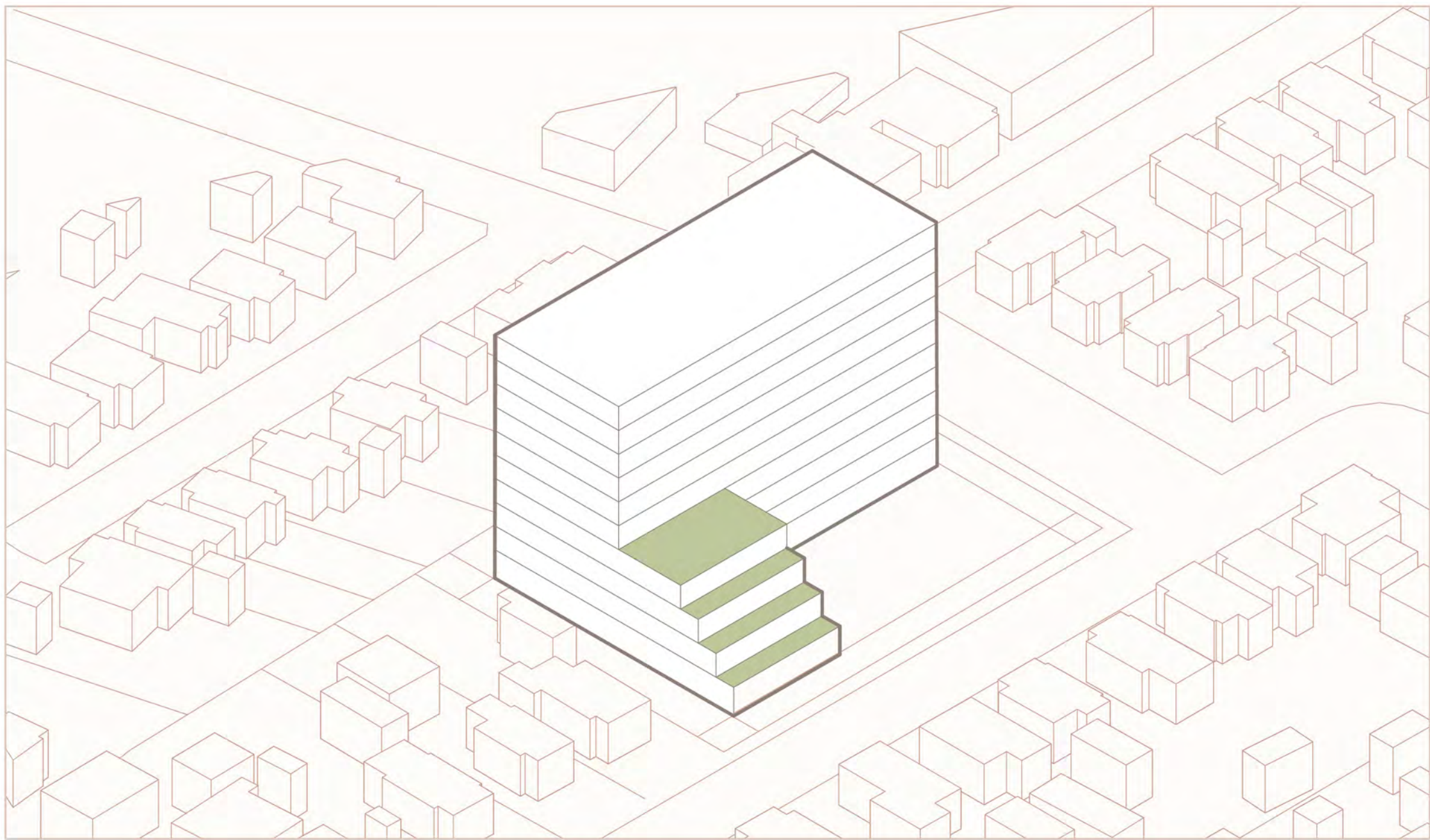
01 position

base volume of 40 m x 21 m x 36 m
onto the site



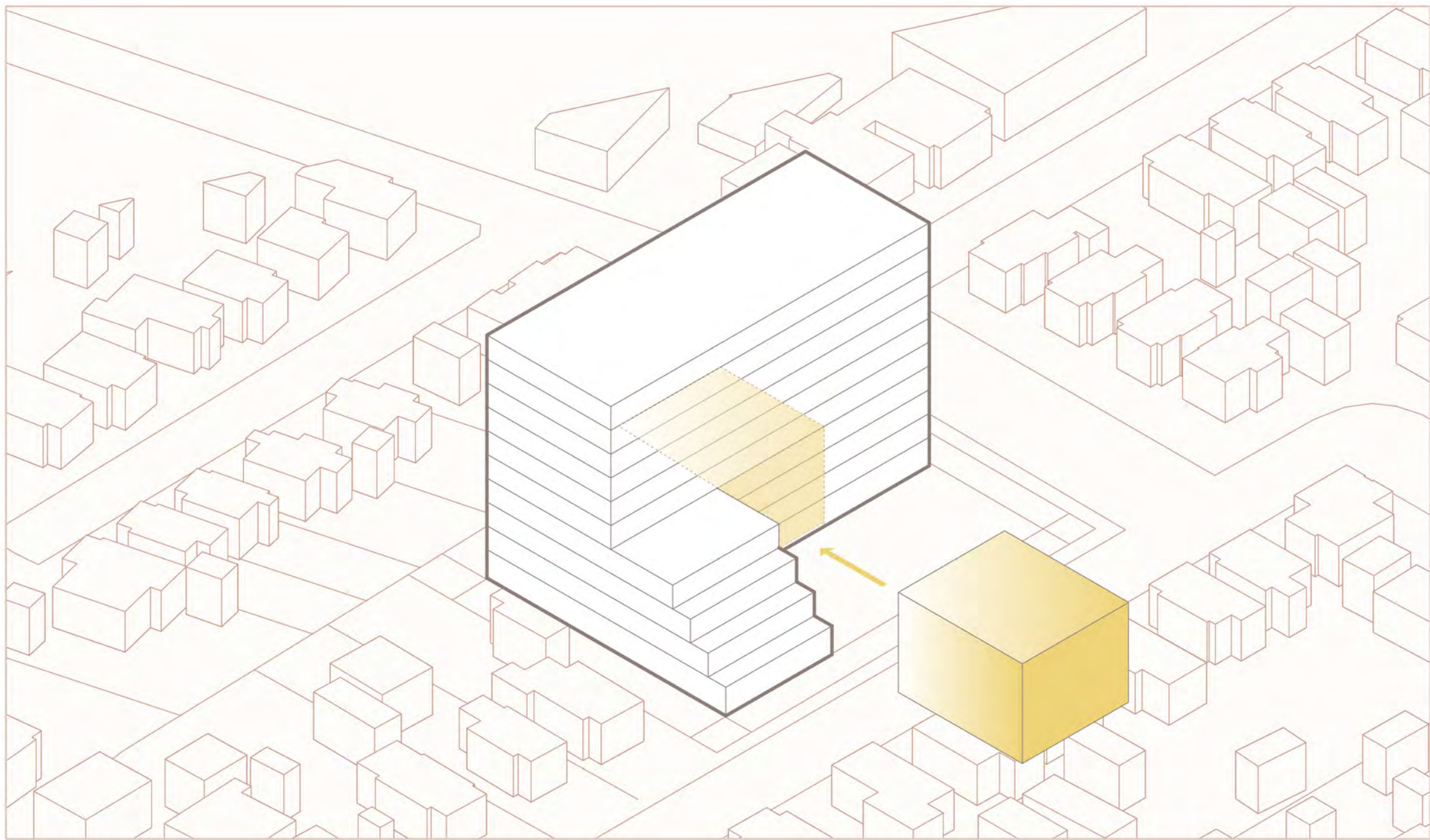
02 merge

to create an enclosed courtyard for building
residents and neighbourhood visitors



03 grade

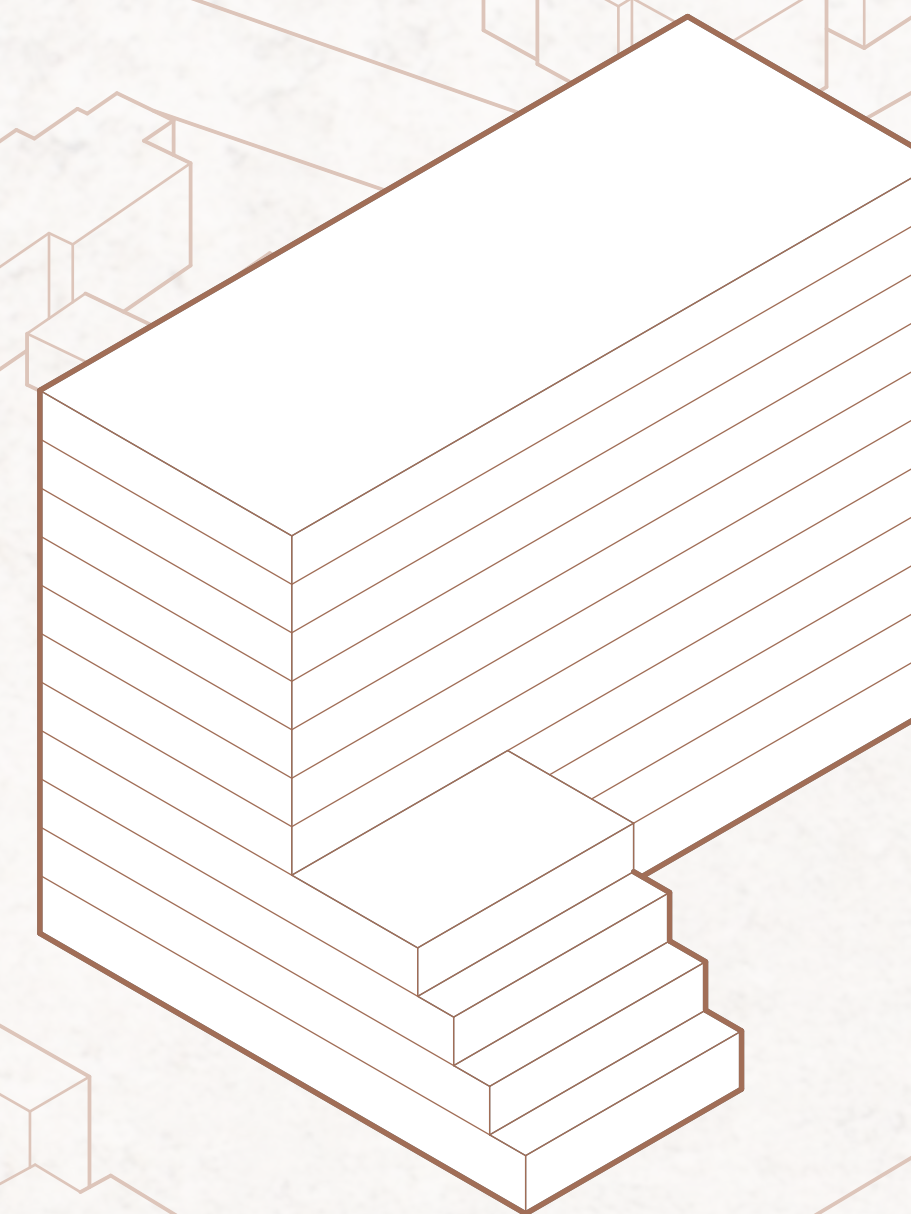
to create green spaces and welcome
sunlight and natural ventilation



04 nest

to create a multi-height atrium space
for a welcoming entrance

03 ideation



03: precedents + ideation

envisioning our building

mass



SAWA — Rotterdam, Netherlands
Mei Architects, 2022

The SAWA wooden residential building features a graded mass that creates communal terraces for users to enjoy. Creating outdoor community spaces was a priority for our design.



The Carve — Oslo, Norway
a-lab, 2014

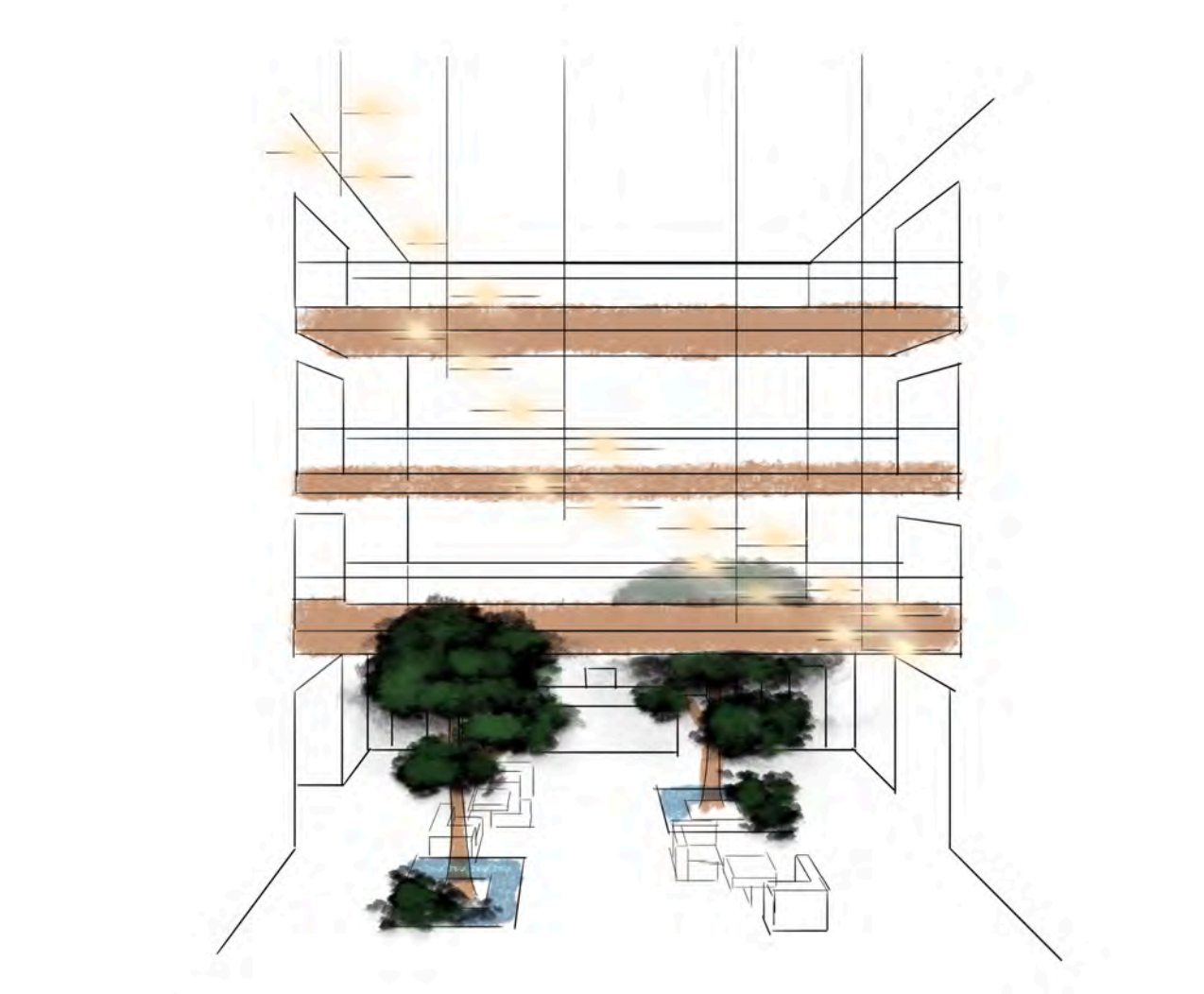
The Carve is a high-rise apartment with a unique void in the centre of the mass. The void creates a multi-height atrium space and the opportunity to include mezzanines for a more engaging entrance hall. It also helps break up the large mass.

atrium



Cedar ING Offices — Amsterdam, Netherlands
Bentham Crowel + HofmanDujardin, 2020

The atrium space in the Cedar ING Office building brings vibrancy to user relationships as its multiple platforms connect people across various storeys.



Atrium Space with Bridges
Parti Diagram

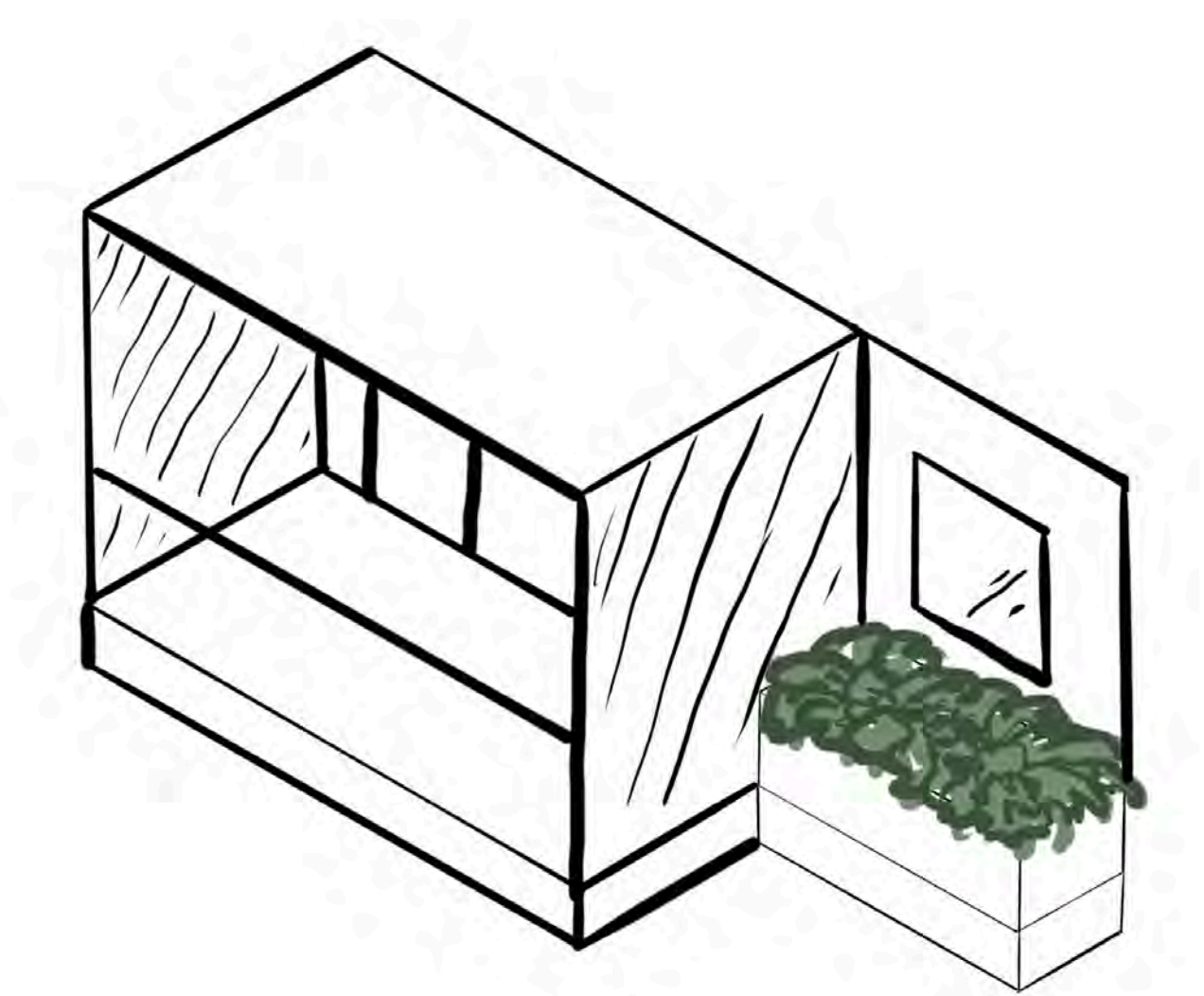
The vision of the atrium is to create a vibrant space that connects users passing through the sky bridges with the users on the ground floor. Cascading lights fill the large open space and frame the bridges nicely. Vegetation is added to enhance indoor-outdoor relationships.

balconies



70 Housing — Orleans, France
Dumont Legrand Architects, 2011

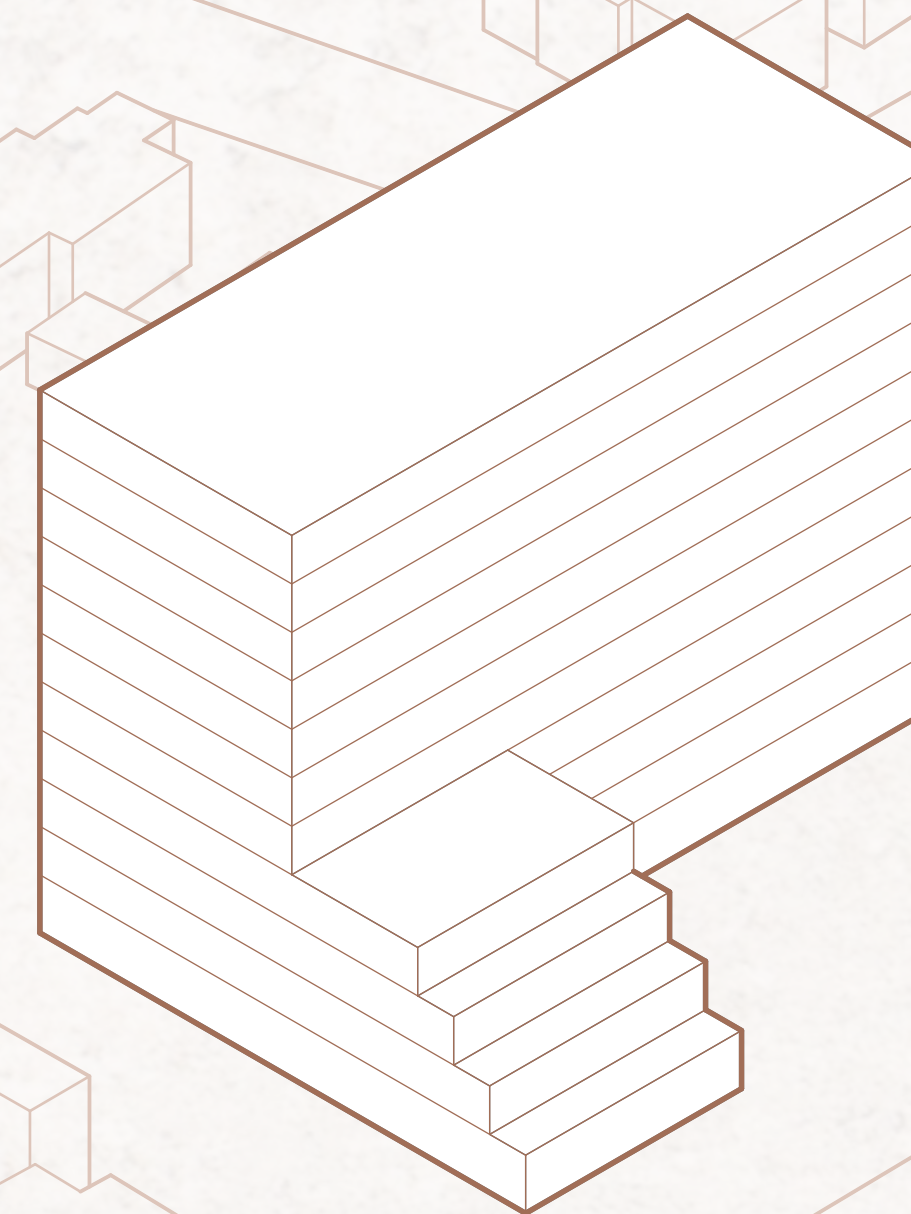
This social housing project proposal in France features extruded and enclosed balconies to add texture to the facade. Plants are also added to bring life to the building.



Balcony and Planter Module
Parti Diagram

The module consists of an extruded balcony and planter with varying depths for added dimension across the facade. The balcony area is enclosed to provide sun-shading and privacy from neighbours. The planter is filled with all season-friendly vegation.

04 plans



04: plans

unit specifications

The floor layout plays with the theme of transition and separation between the different programmatic spaces. The extensive front courtyard encourages patrons and residents to interact with the surrounding site while providing easy access to the ground floor commercial spaces and the recessed residential main entrance known as the “void”. Circulation is kept simple and consistent with wide corridors cutting through the space for accessibility and dual traffic needs. On Levels 2 to 5, exterior terraces provide connection to the unique programming of the front courtyard and other terraces below, while upper levels (5 to 10) have private balcony spaces coupled with planters to continue this connection with the environment and between levels.

residential unit count

Floor	1B	1B+DEN	2B	2B+DEN	3B	Total
1						
2	3	6	2	1	1	13
3	1	6	1	1	2	11
4	1	6	2	1	1	11
5	4	6	3	1	1	15
6	8	5	4	1	0	18
7	8	5	4	1	0	18
8	8	5	4	1	0	18
9	8	5	4	1	0	18
10	8	5	4	1	0	18
TOTAL	49	49	28	9	5	140

parking spaces

Parking	Proposed	Requirement	By-Law
Parking Spaces	178	126 (min)	0.9/Unit
		182 (max)	1.3/Unit
Bicycle Parking Stalls	69	0 (min)	0.5/Unit without private garage

unit area requirements

Type	Area (m²)	Min (m²)	Max (m²)
1B	48	43.2	52.8
1B+DEN	58	52.2	63.8
2B	70	63	77
2B+DEN	84	75.6	92.4
3B	94	84.6	103.4

basement unit areas

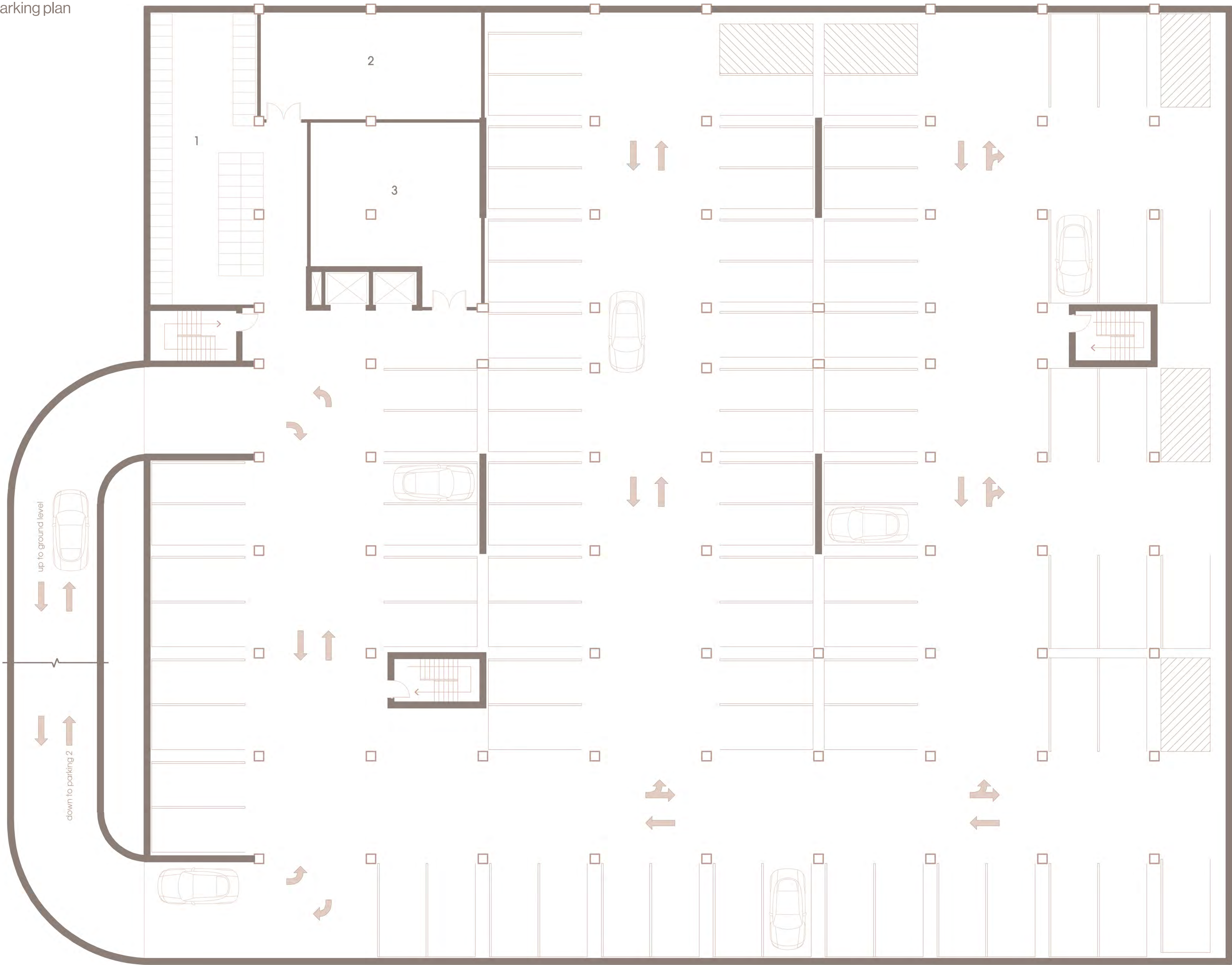
Room	Area (m²)
Basement 1	
Pump Room Fire Pump Room	68
Lockers	77
Basement 2	
Mechanical Room Electrical Room (including telecom)	266
Storm Water Tank	30

commercial unit areas

Commercial Space	Area (m²)
Restaurant	277
Thrift Store	67
Convenience store	67
Café 1	50
Café 2	59
Café 3	121
Bookstore	61
Total	702

04: plans

1:100 B2 underground parking plan



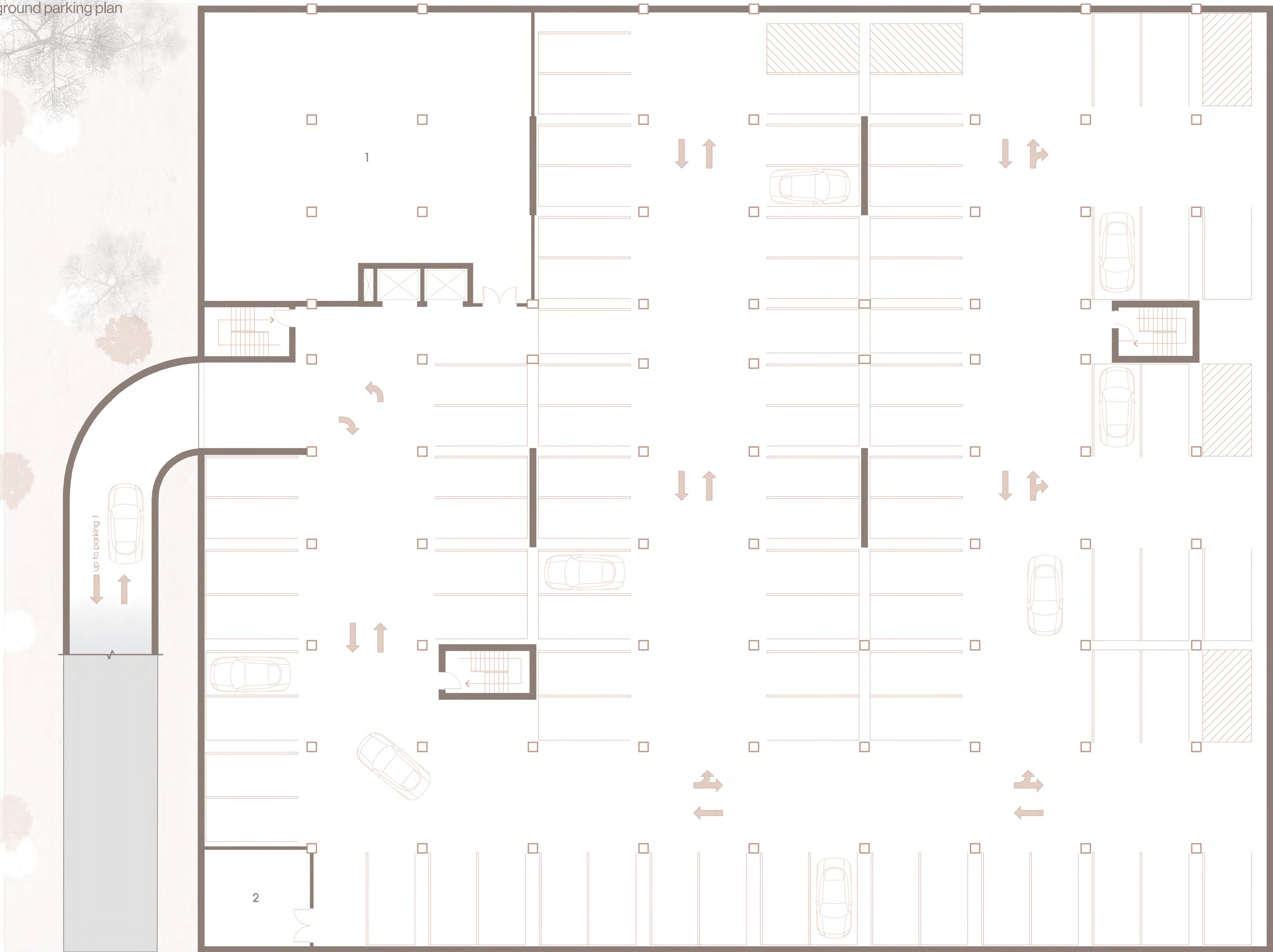
LEGEND

- 1 Bike Room
- 2 Pump + Fire Pump Storage
- 3 Lockers

0 2 5 10 m

04: plans

1:100 B1 underground parking plan



- LEGEND
- 1 Mechanical + Electrical Room
 - 2 Storage



04: plans

1:125 ground floor plan



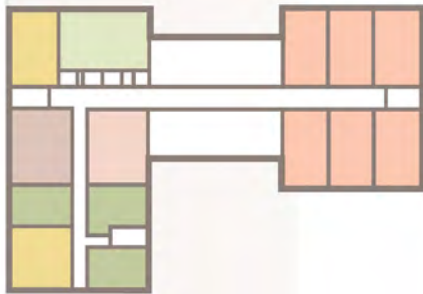
04: plans

1:100 second floor plan



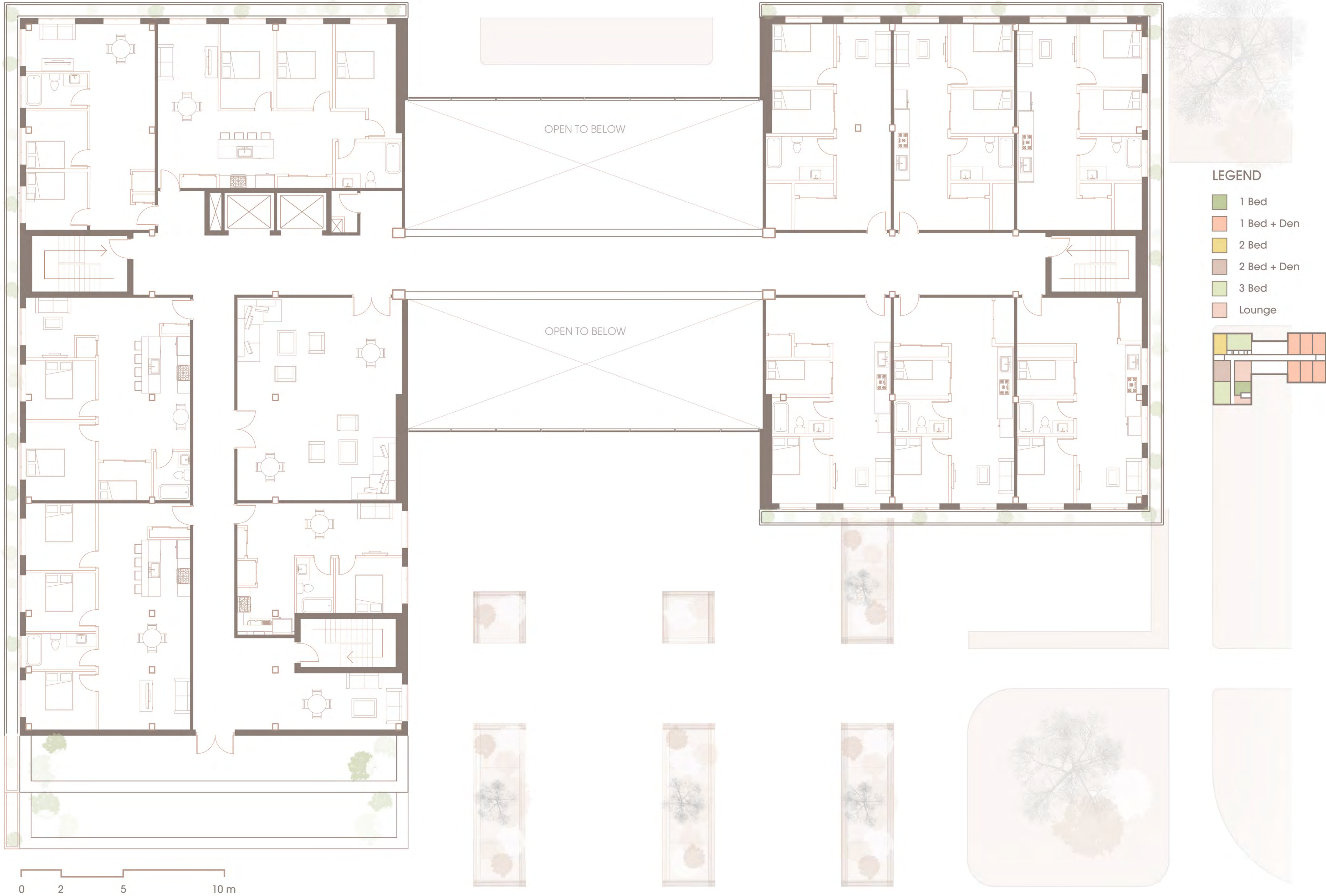
LEGEND

- 1 Bed
- 1 Bed + Den
- 2 Bed
- 2 Bed + Den
- 3 Bed
- Lounge



04: plans

1:100 third floor plan



04: plans

1:100 fourth floor plan



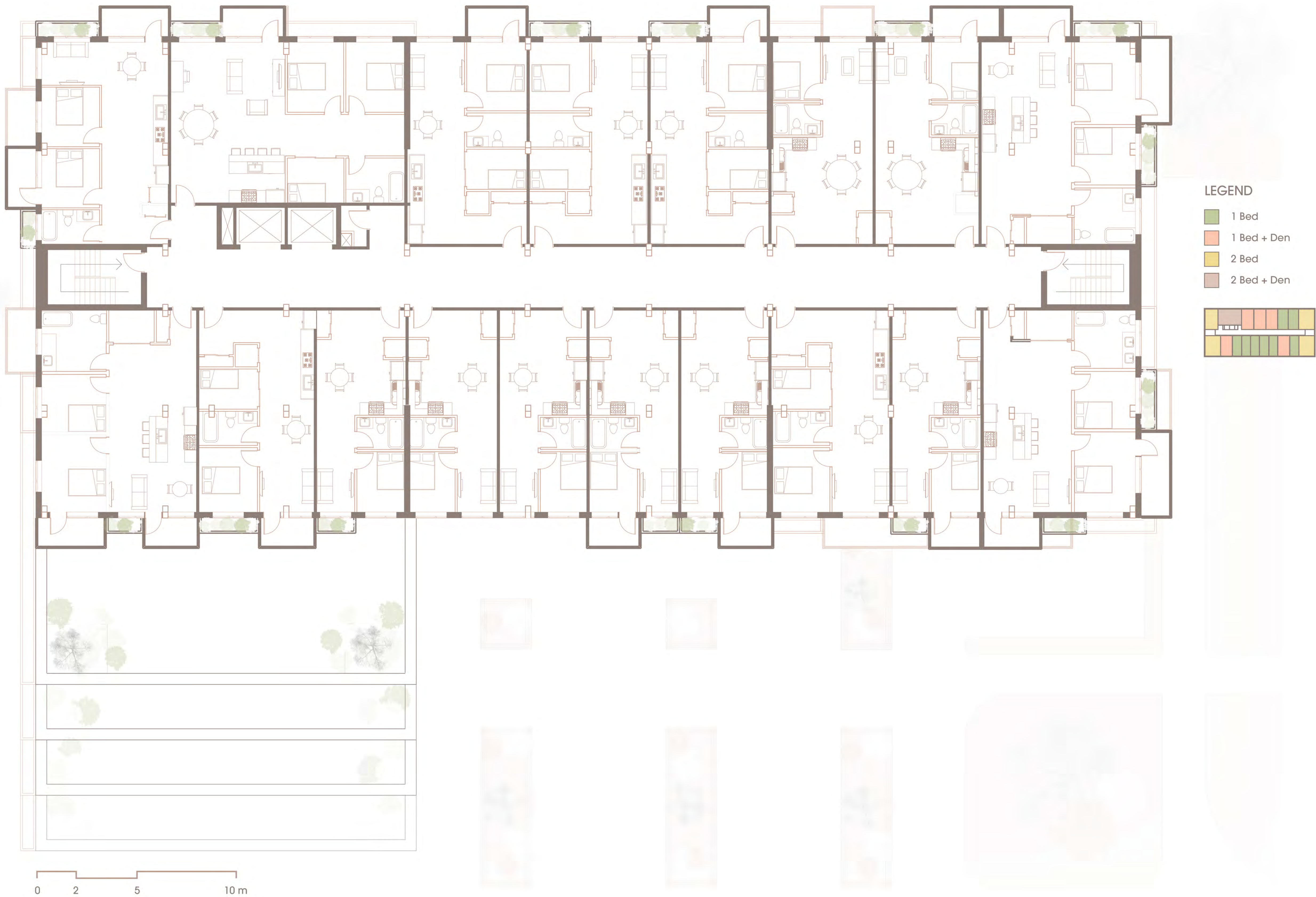
04: plans

1:100 fifth floor plan

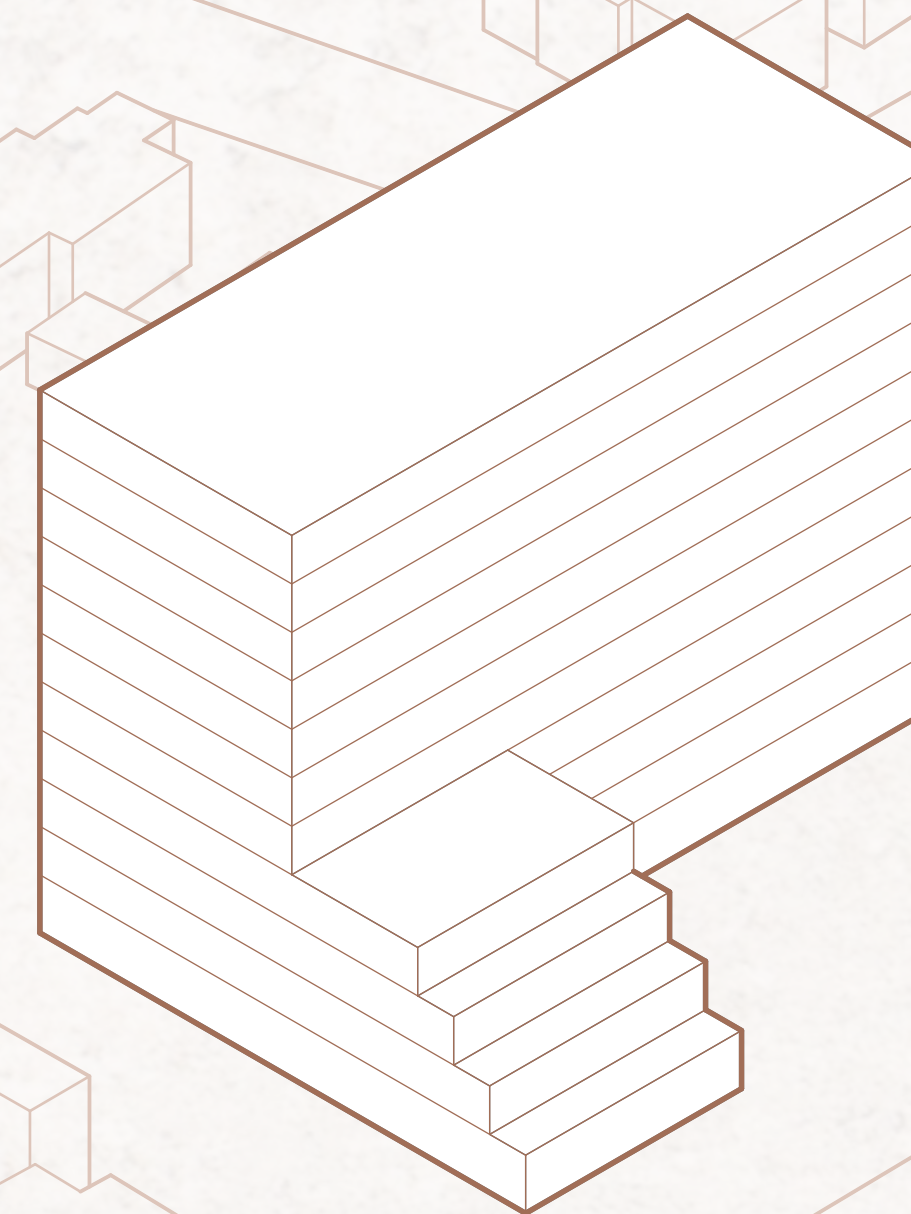


04: plans

1:100 sixth-eleventh floor plan



05 elevations



05: elevations

1:100 east elevation



05: elevations

1:100 south elevation



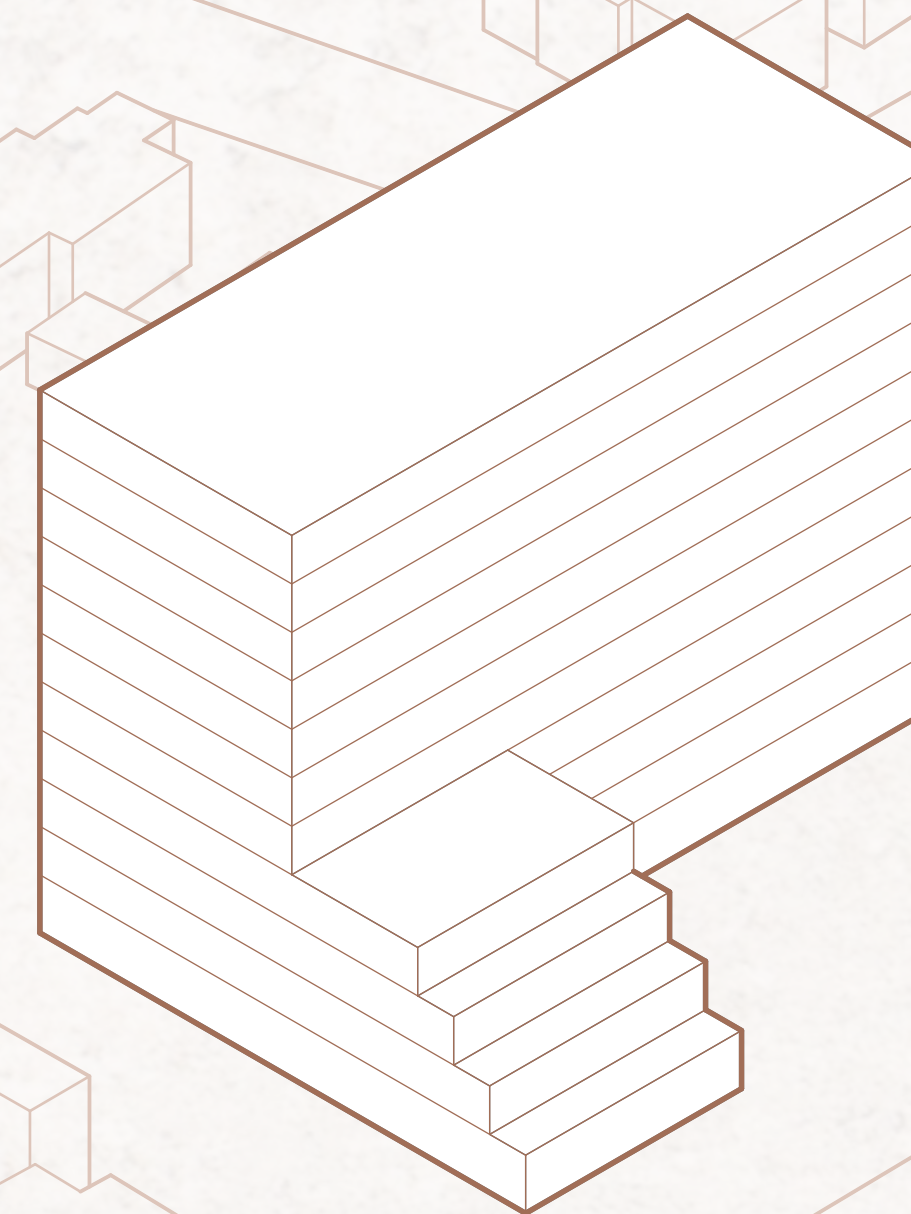
05: elevations

1:100 west elevation



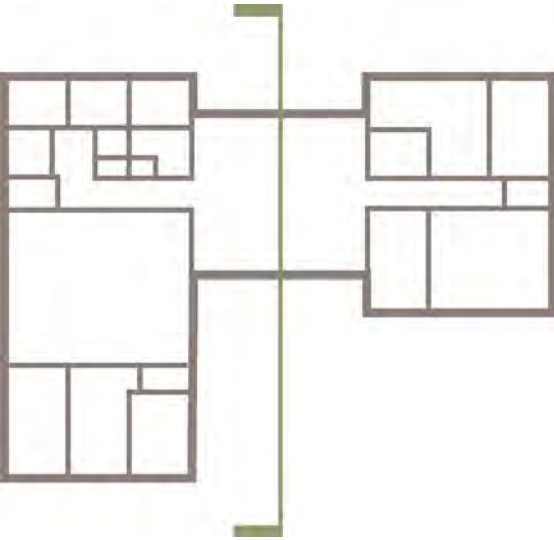


06 sections



06: sections

1:100 east-west section



The void serves as a transitional space between the exterior and interior programming, a separation between the commercial and residential programming, and as an architectural and experiential moment for residents.

The intrinsic connection between the building and landscape is reflected by the interior design of the void through the usage of green walls and raised planters.

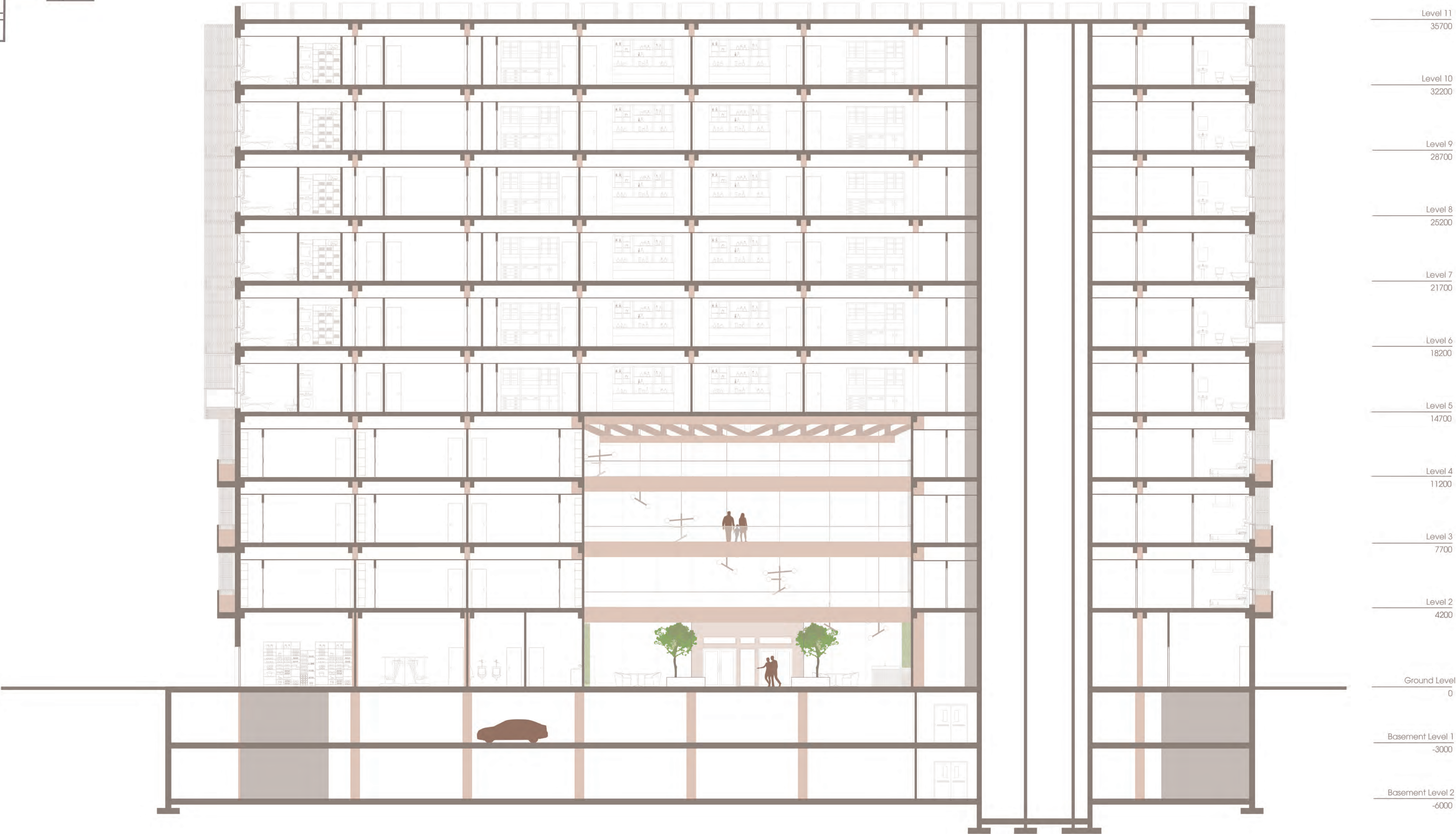
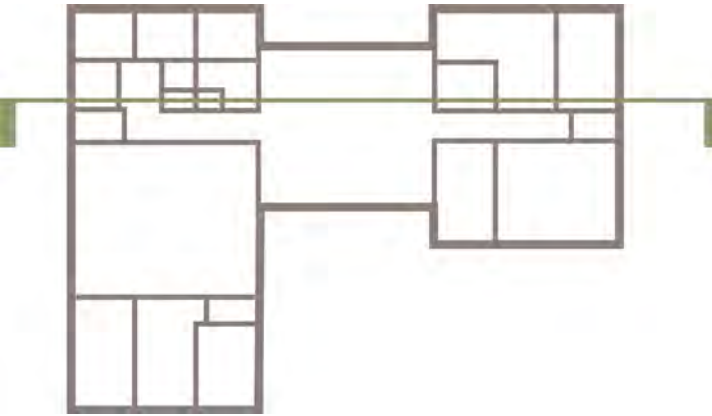
Cascading lights straddle bridges on the second through fourth floors that connect the residential spaces on either side of the void, providing a beautiful architectural feature that also creates unique lighting moments throughout each level and within the void.

The void features a multi-use platform placed against the north side aimed towards catering the community by providing a space to hold communal meetings and/or events, as residents watch from the bridges.



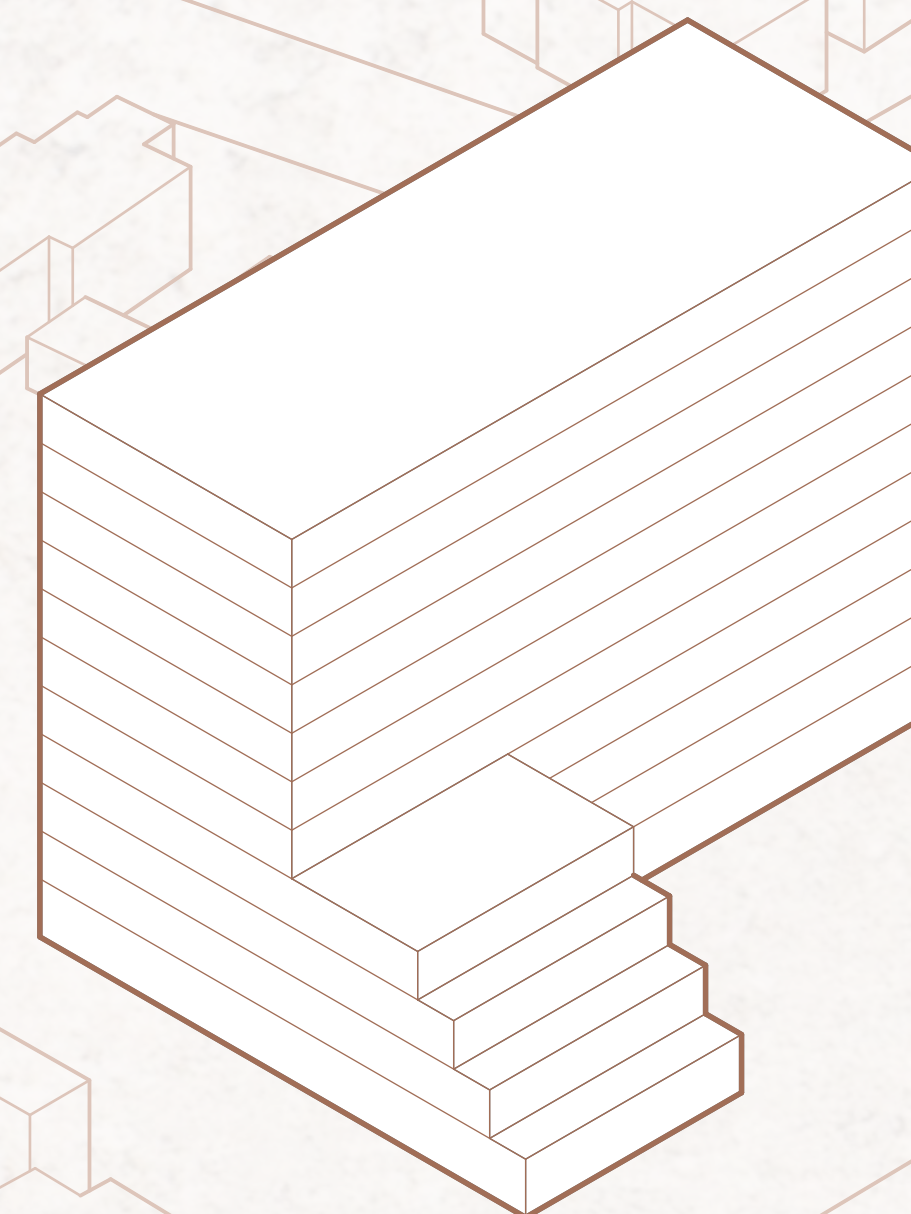
06: sections

1:100 north-south section



Level 11	35700
Level 10	32200
Level 9	28700
Level 8	25200
Level 7	21700
Level 6	18200
Level 5	14700
Level 4	11200
Level 3	7700
Level 2	4200
Ground Level	0
Basement Level 1	-3000
Basement Level 2	-6000

07 renders



07: renders

south-east exterior from shanley street



07: renders

building entrance from exterior courtyard



07: renders

lobby interior





07: renders

living room interior

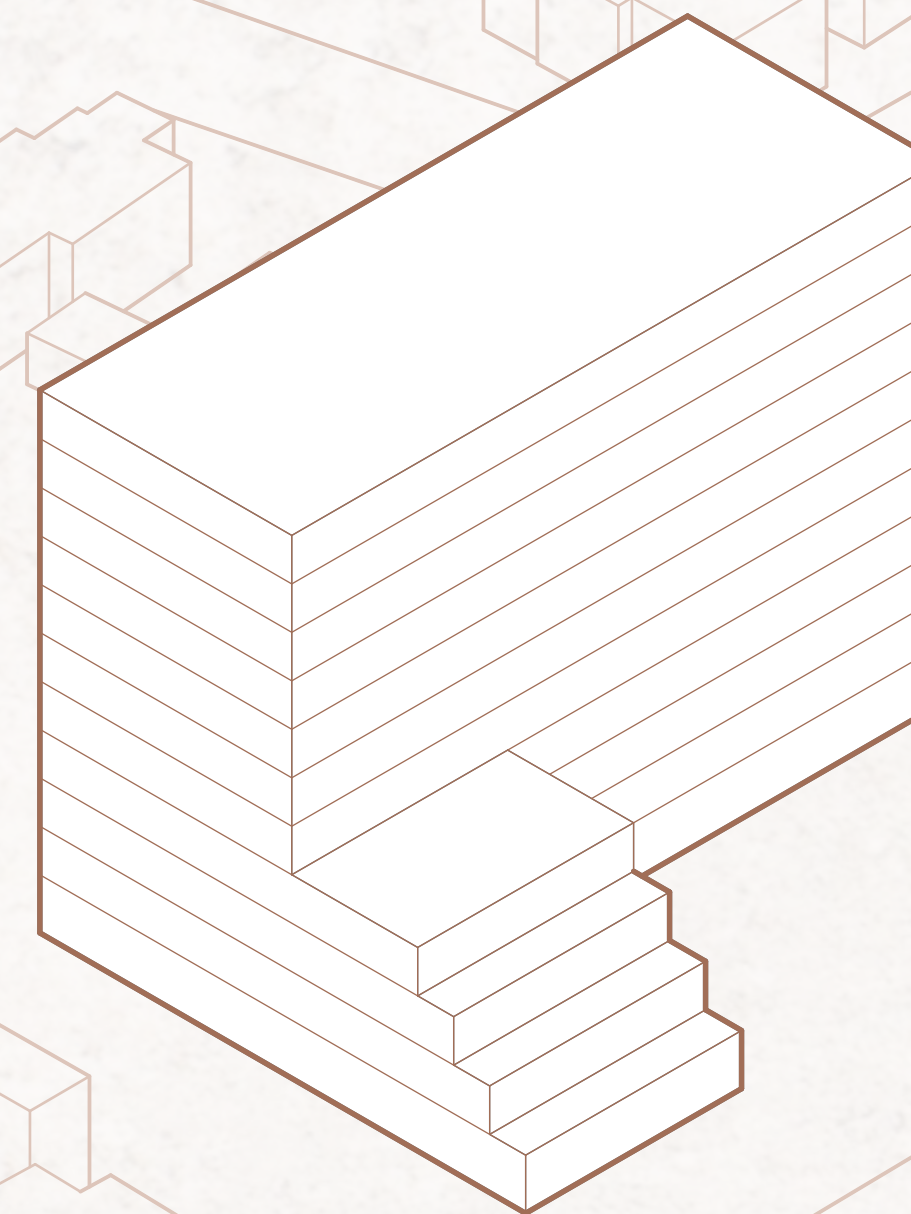


07: renders

rooftop terrace exterior



08 structure



08: structure

structural isometric

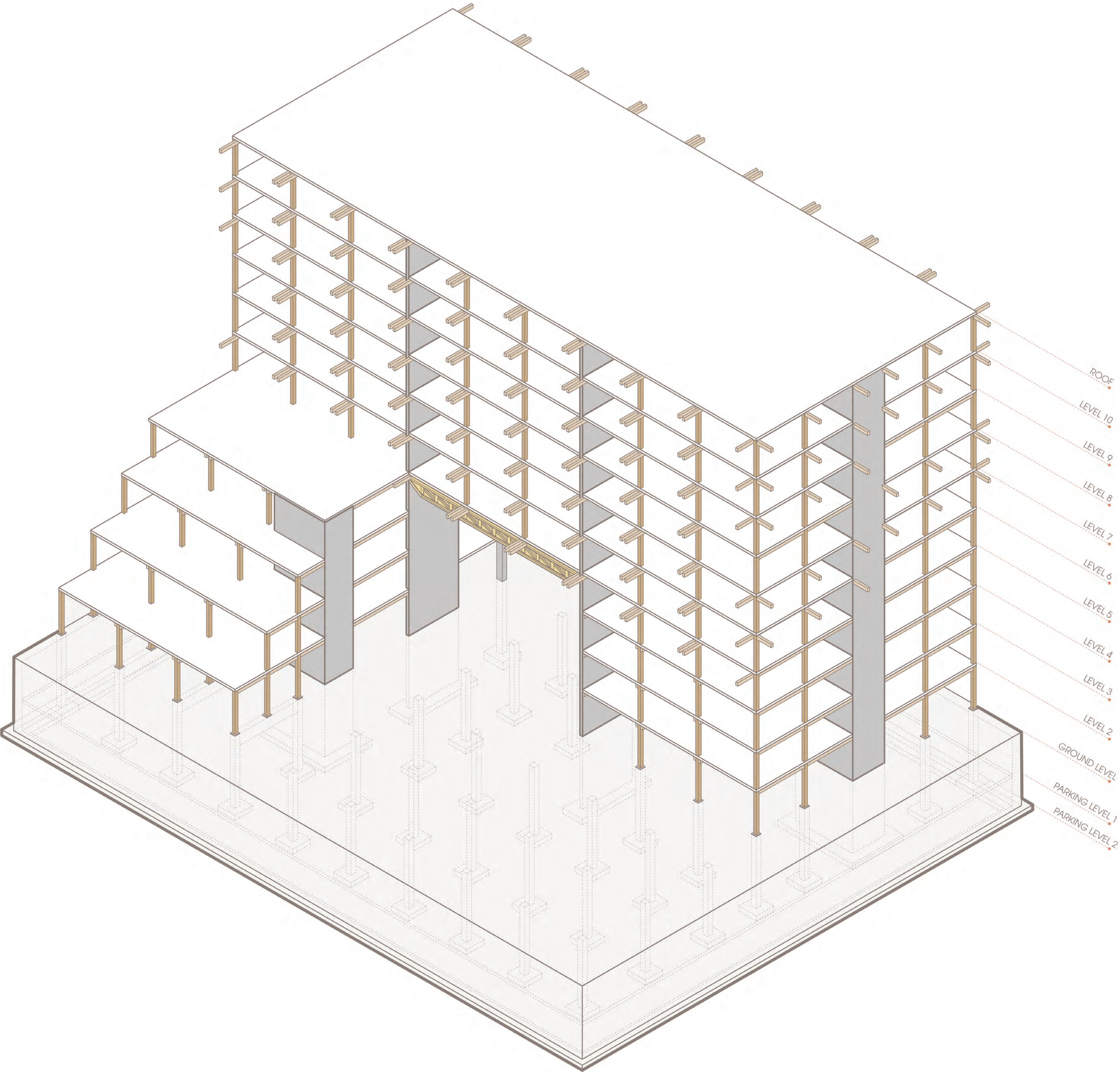
structural system

The building structural design aims to maximize the use of mass timber and take advantage of its sustainability, aesthetics, and speed of construction capabilities. The superstructure consists of a CLT slab supported on a post-and-beam glulam system and the substructure is comprised of a flat slab reinforced concrete structure.

The structural grid maximized the available size and efficiency of CLT by using 18-meter panels that span 6-meters. The post-and-beam mass timber system consist of 265x342 mm double beams connected at each side of the glulam column in order to cantilever the beams to frame the balconies. To diminish the cross-grain shrinkage, a custom plate connector transfer the loads from the column above to the column below and provide bearing plates at each side of the column to transfer the loads from the beams. The deck at the corridor area is supported with a single 130x175 mm glulam beam that allow the building services to run through the corridor and distribute to each unit without interfering with the structure because of the lack of members between the corridor and the units.

The column loads from the levels above the atrium are transferred through steel trusses that spans 18 meters and are supported by reinforced concrete walls at each side of the atrium. From level 2 to level 4, the corridor on each side of the atrium are connected through CLT deck supported on one-meter depth glulam beams that are also integrated as part of the railing system to diminish the depth of the structure and maximize height clearance.

The lateral system is comprised of reinforced concrete shear walls as well as elevator and stair cores, that are strategically placed to accommodate the architectural program at the above grade levels while allowing an efficient circulation at the underground parking levels.



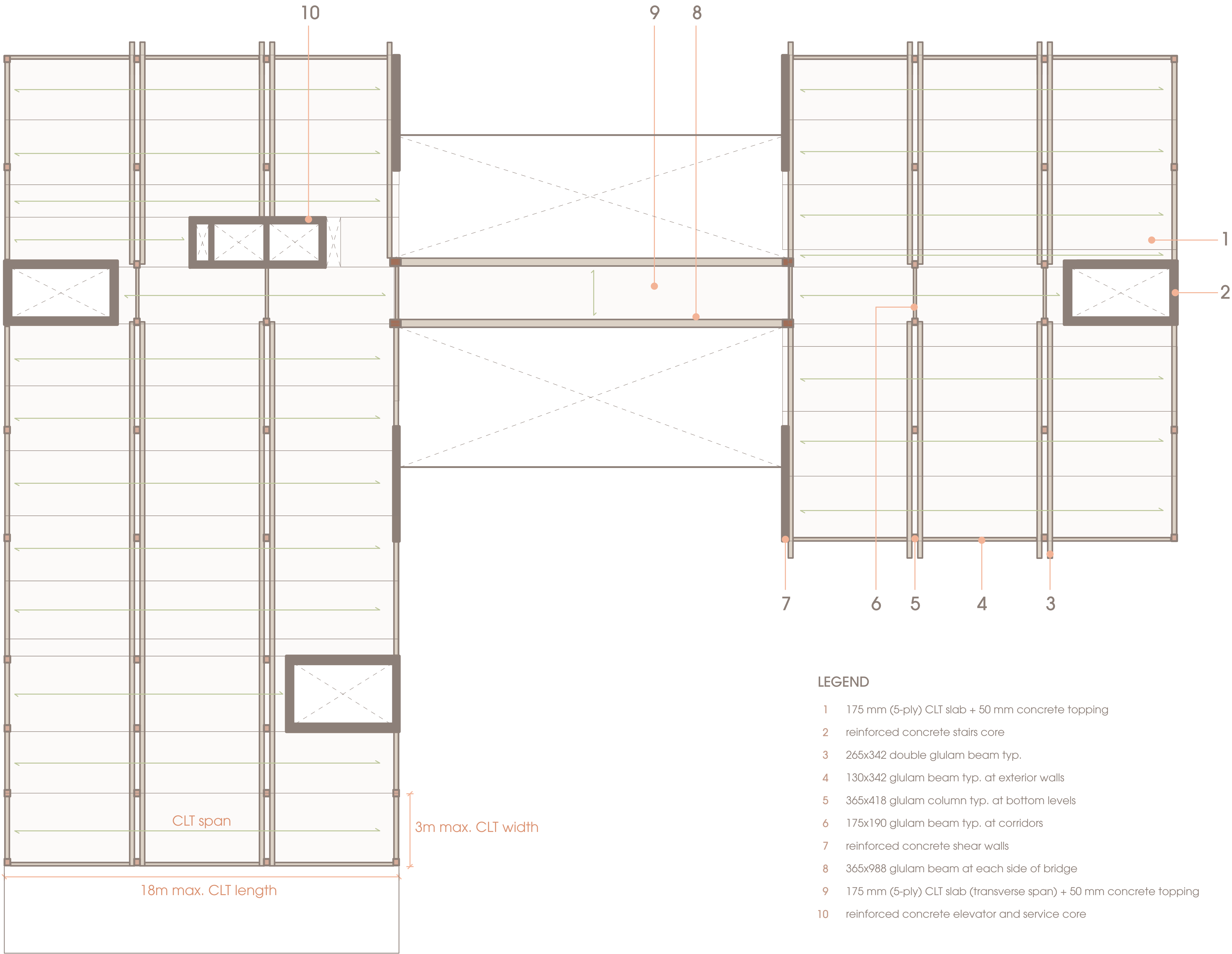
LEGEND

Lateral System - Shear Wall System

- reinforced concrete shear walls
- SPF E1 175 mm (5-ply) CLT diaphragm w/ 50 mm concrete topping

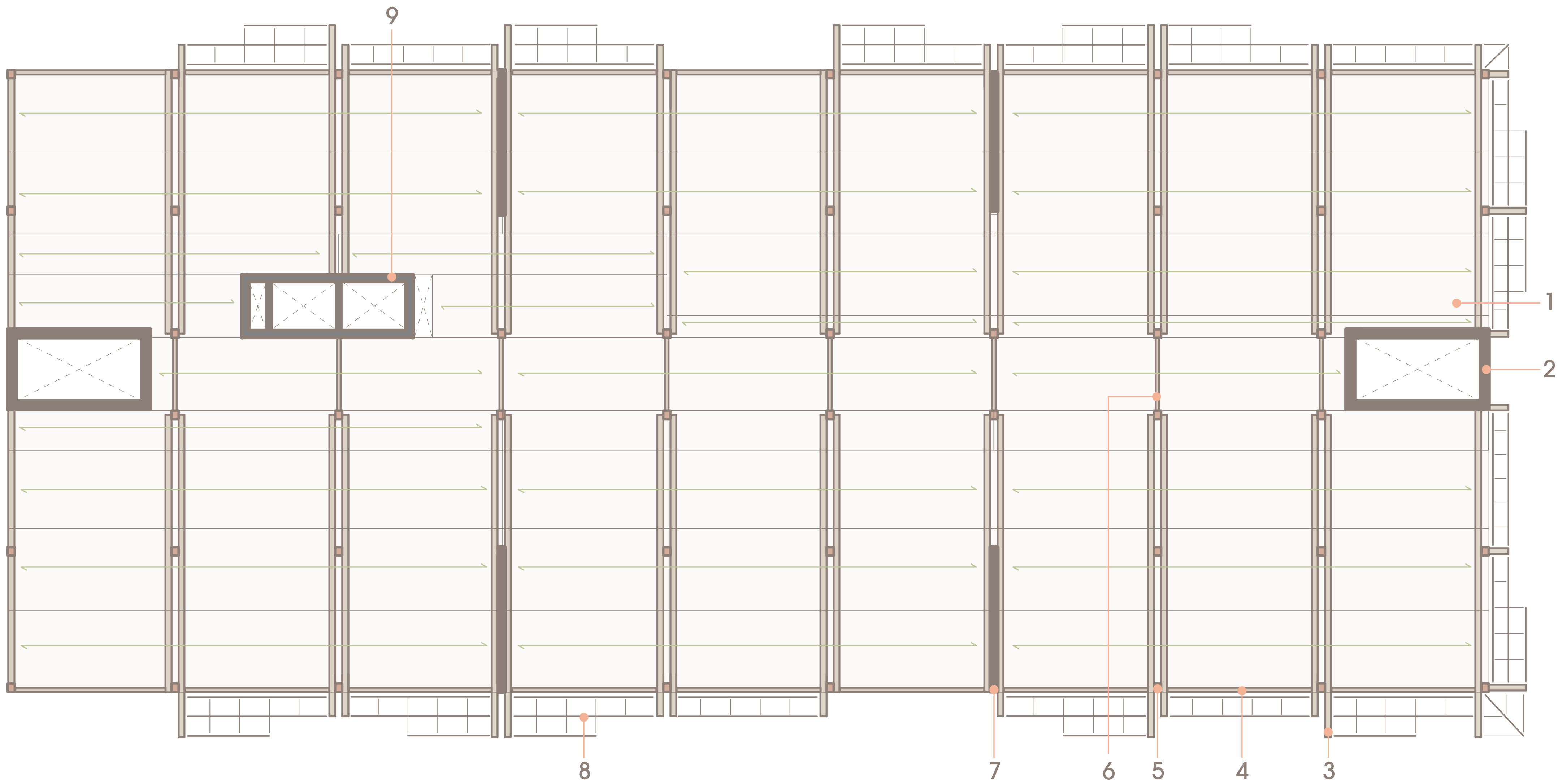
Gravity System - Post + Beam Mass Timber System

- SPF 20f-E glulam columns
- SPF 20f-E glulam beams
- SPF E1 175 mm (5-ply) CLT slab w/ 50 mm concrete topping
- 350W steel truss (w-sections)
- reinforced concrete basement structure + foundation



08: structure

1:100 typical structural sixth to tenth floor plan

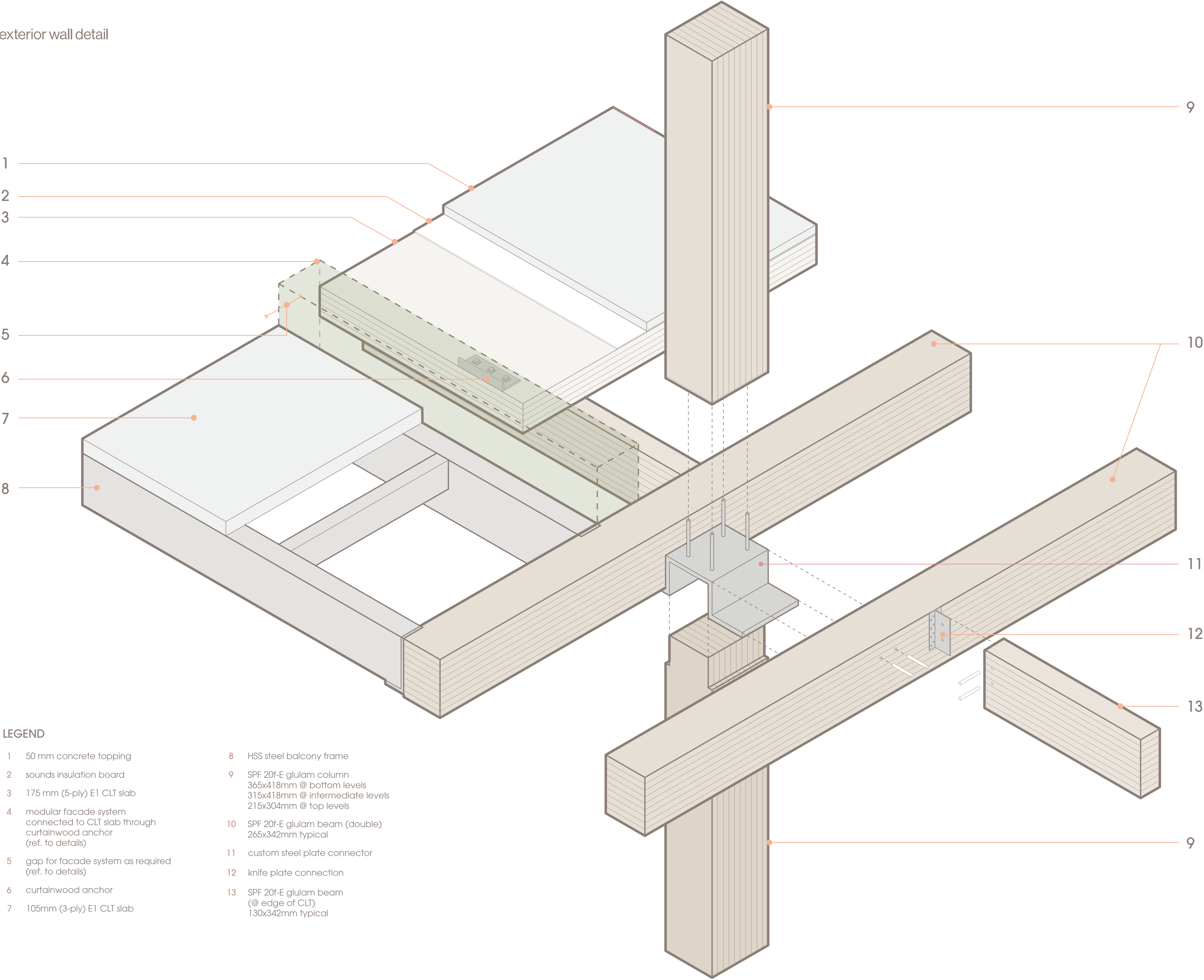


LEGEND

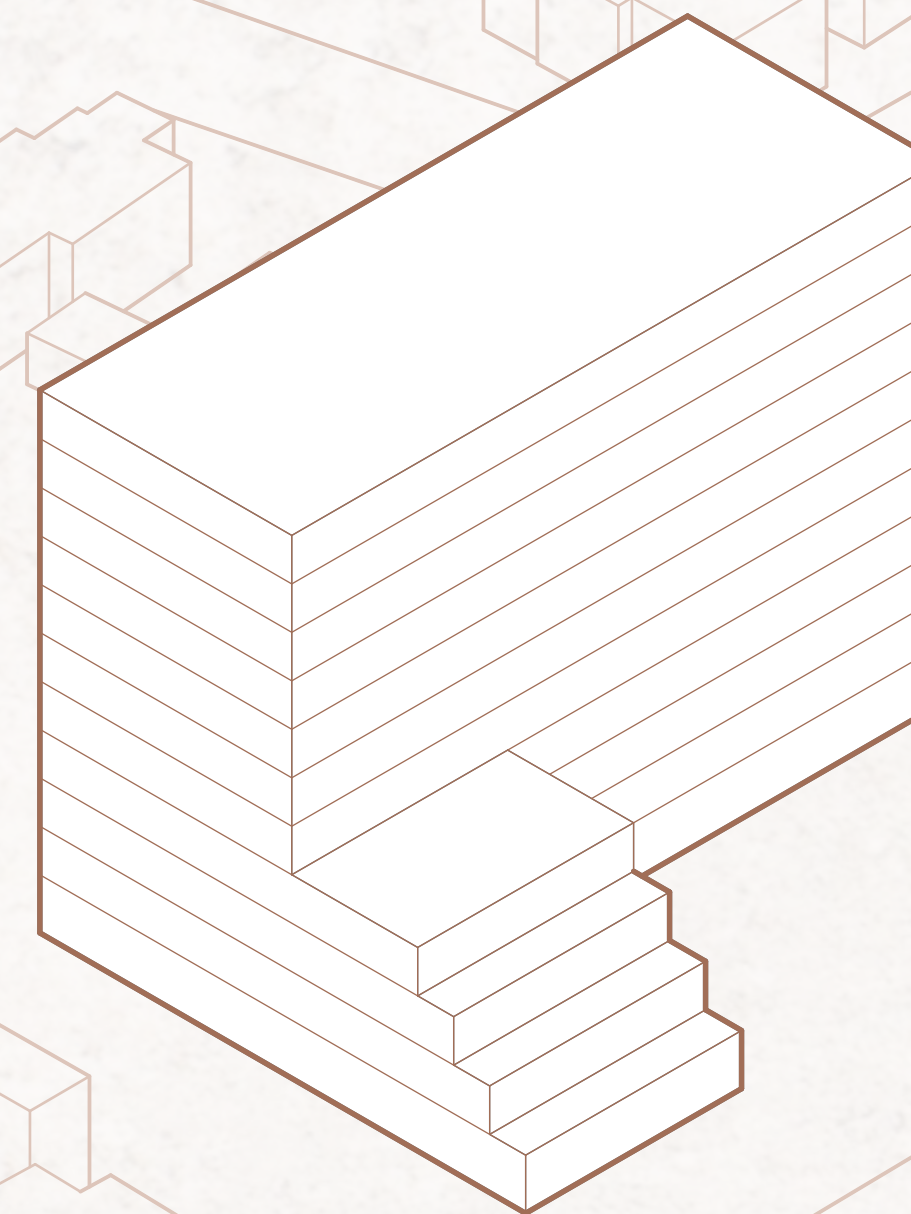
- 1 175 mm (5-ply) CLT slab + 50 mm concrete topping
- 2 reinforced concrete stairs core
- 3 265x342 double glulam beam typ.
- 4 130x342 glulam beam typ. at exterior walls
- 5 315x304 and 215x304 glulam column at bottom levels
- 6 175x190 glulam beam typ. at corridors
- 7 reinforced concrete shear walls
- 8 prefabricated HSS balcony frame
- 9 reinforced concrete elevator and service core

08: structure

structural assembly at exterior wall detail

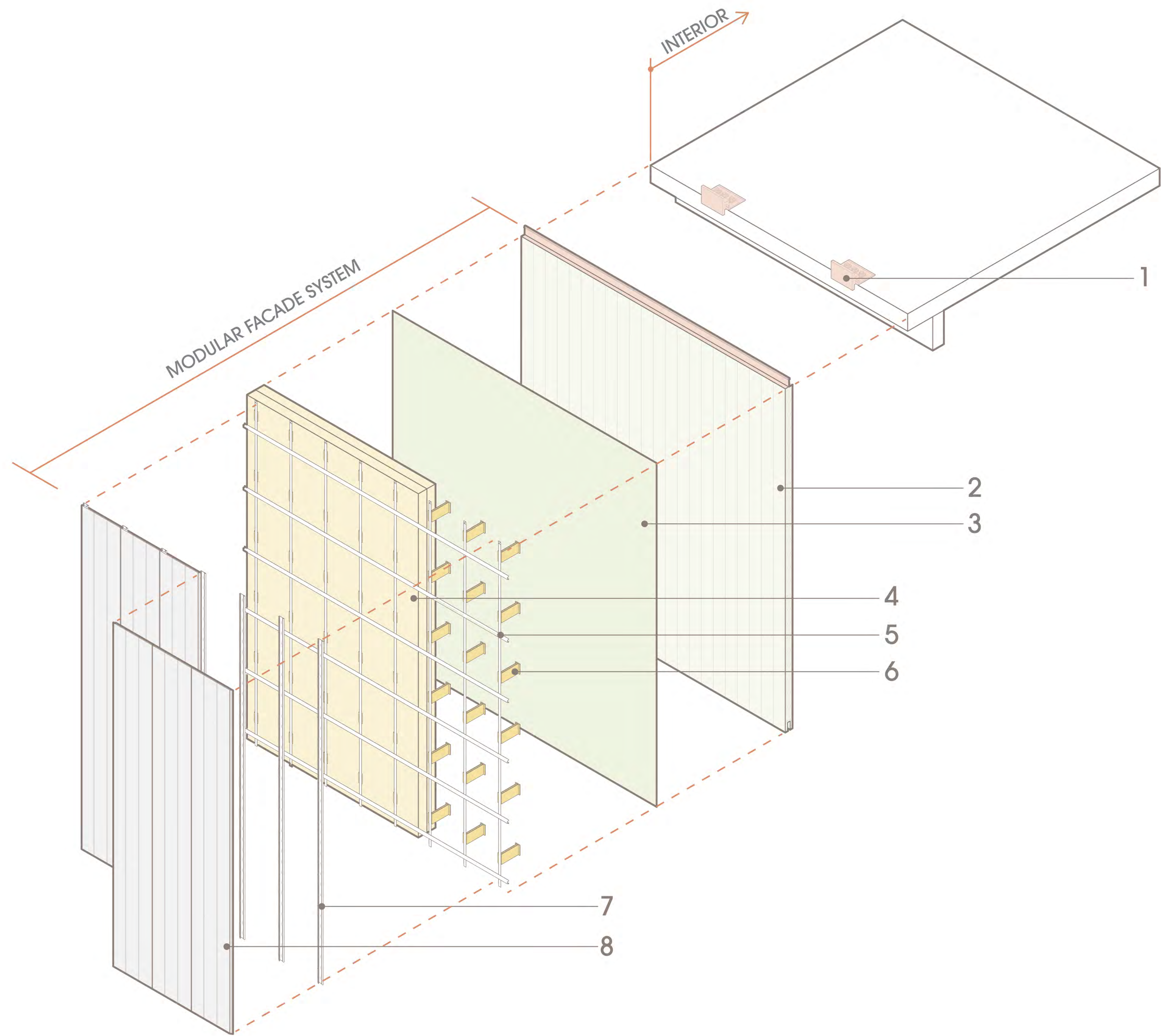


09 enclosure



09: enclosure

1:10 isometric peel back diagram



enclosure

Nulo primarily employs prefabricated mass timber panels that have been designed to be installed as a super-insulated curtain wall (Curtain Wood) for cladding the building from the second floor upwards. The Curtain Wood panels utilize a 5-ply (17mm per ply) CLT substrate with aluminum air seal extrusions fastened to the top and bottom. The panels are hung on modified steel curtain wall anchors that are top mounted at the edge of the structural CLT floor panels. Control layers and cladding would be pre-installed in a factory setting, allowing for fast and efficient attachment of the panels on-site. The use of 200mm of stone wool semi-rigid insulation allows for the panel assembly to achieve an effective R-value of approximately R-37 when accounting for the minimal thermal bridging through the fibreglass Cascadia clips.

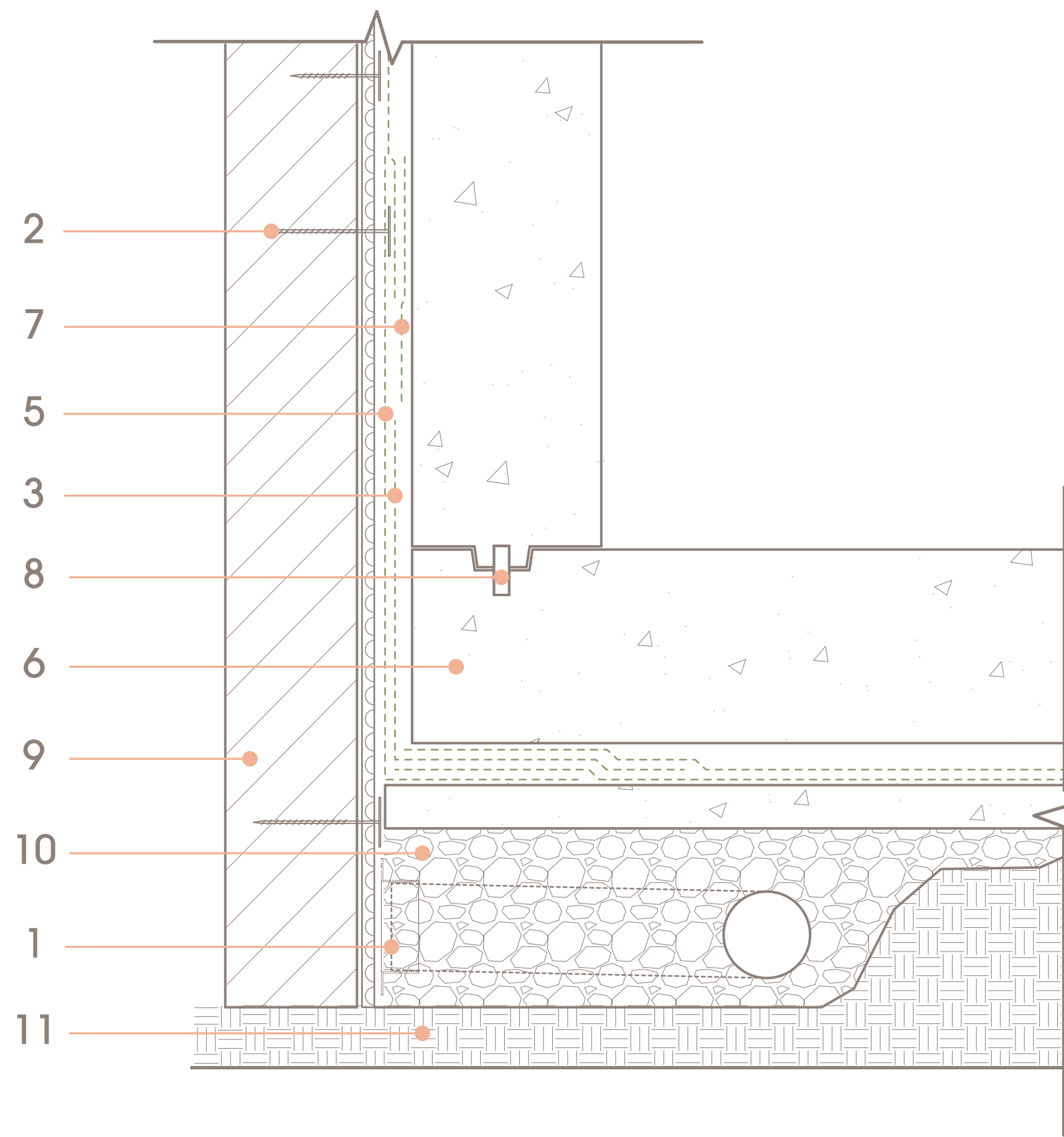
Prefabricated balcony and planter modules are secured to the cantilevered glulam beams that penetrate the building enclosure at various points throughout the building. At these beam penetrations, panel cut-outs permit a 100mm gap around the glulam beams to aid with installation and for tolerating differential movement of the Curtain Wood panels. The air and water resistive barrier membrane around the beam and would be installed on-site and tied into the surrounding membrane. Infill pieces of stone wool semi-rigid insulation would be stuffed around the beam prior to the installation of the fibre cement cladding around the beam.

LEGEND

- 1 custom "curtainwood" anchor
- 2 E1 85mm (5-ply) CLT panel
- 3 air and water-resistive barrier
- 4 2 x 100mm stonewool semi-rigid insulation
- 5 vertical z-girts and horizontal hat channels
- 6 cascadia clips
- 7 fibre cement cladding securing rails
- 8 vertical (or horizontal) wood grain fibre cement boards

09: enclosure

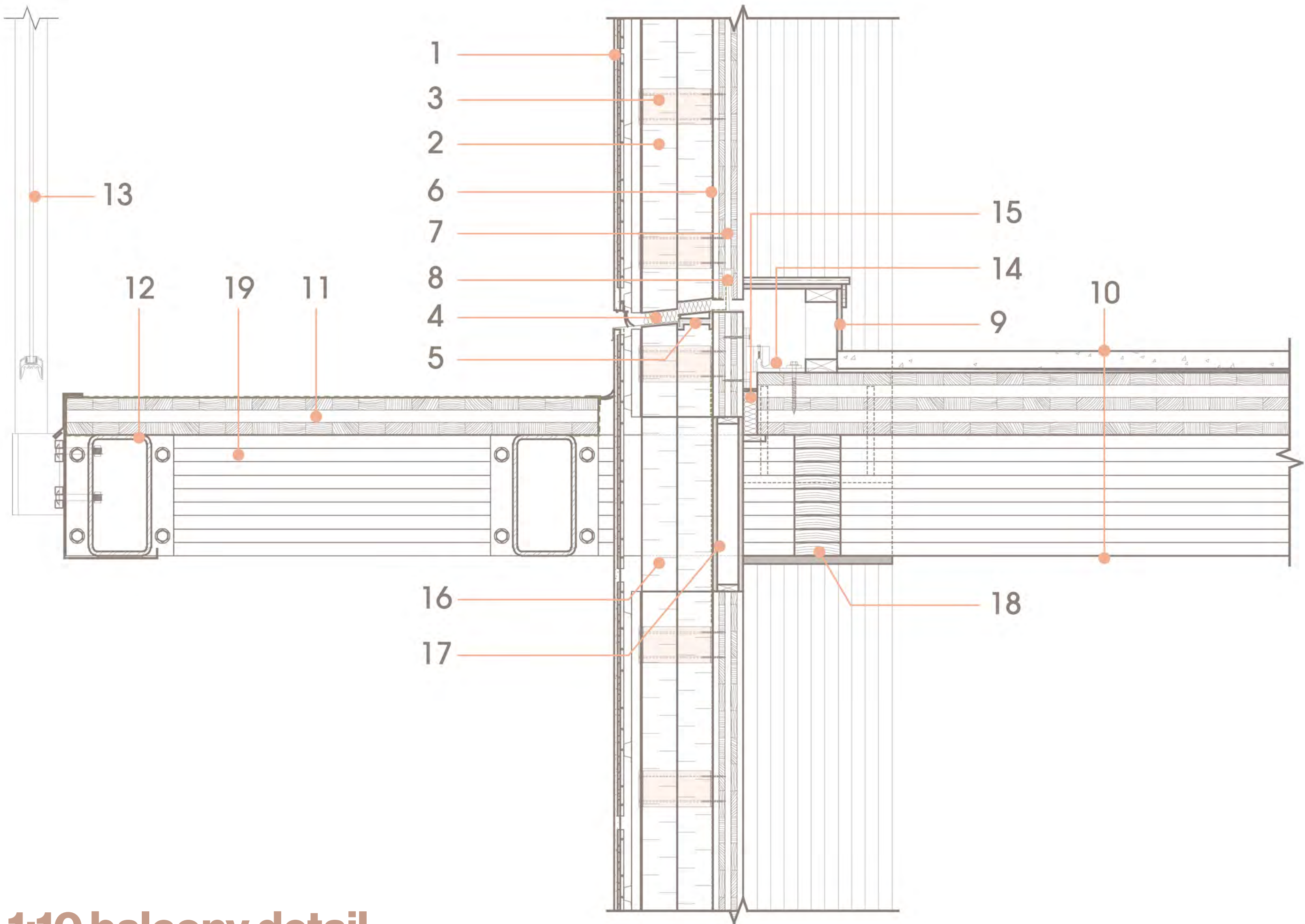
1:10 footing + window sill detail



1:10 footing detail

LEGEND

- 1 drain
- 2 fasteners
- 3 self-adhesive SBS modified bitumen waterproofing membrane with composite reinforcement
- 4 self-adhesive SBS modified bitumen protective waterproofing membrane with composite reinforcement.
- 5 dimple drainage board with factory-laminated geotextile
- 6 reinforced concrete
- 7 heat-welded SBS modified bitumen waterproofing membrane with non-woven polyester reinforcement.
- 8 waterstop
- 9 soil retention system

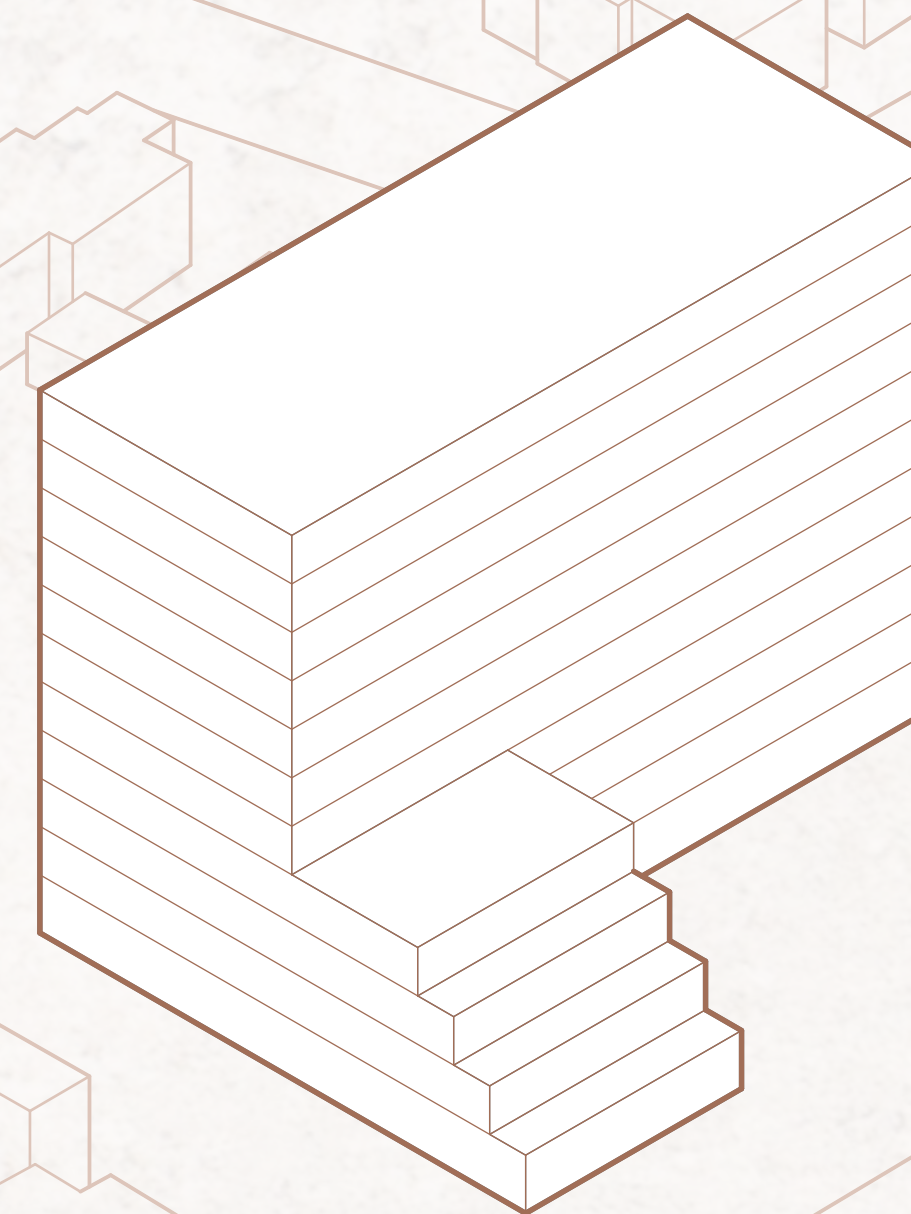


1:10 balcony detail

LEGEND

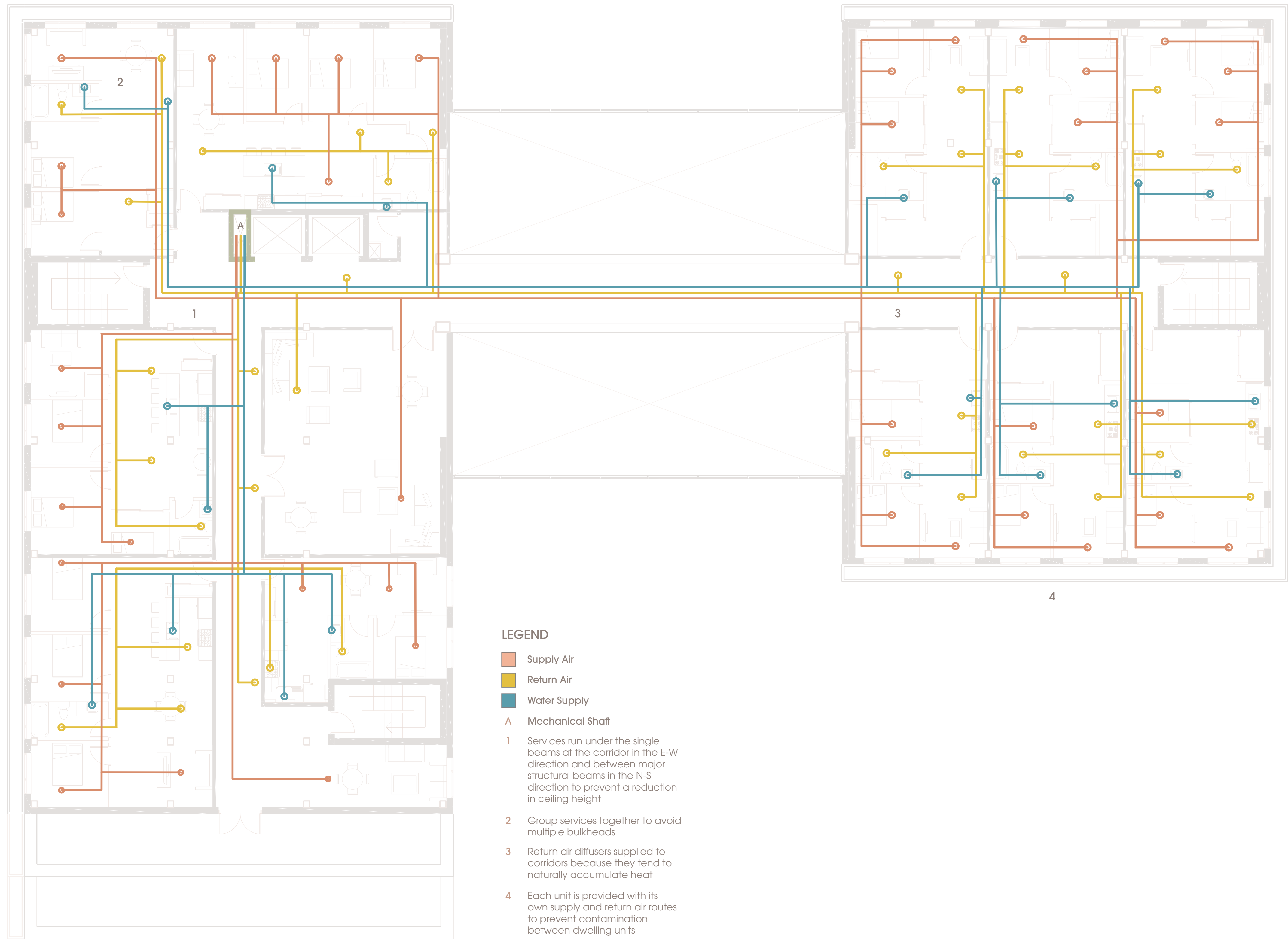
- 1 vertical fibre cement cladding w/sub-framing assembly in air gap
- 2 2x100mm stonewool semi-rigid insulation
- 3 200mm cascadia clips
- 4 stonewool batt insulation installed in gap between panels
- 5 aluminum flashing installed into 100mm cascadia clip
- 6 air and water resistive barrier membrane
- 7 85mm (5-ply) e1 clt curtainwood panel
- 8 aluminum air seal extrusions w/rubber gaskets at curtainwood panel edges
- 9 built-up interior curb
- 10 floor assembly
- 11 105mm (3-ply) e1 clt with balcony waterproofing membrane
- 12 hss balcony module frame
- 13 aluminum-framed glass balcony guardrail
- 14 curtainwood anchor
- 15 stonewool firestopping w/smoke-seal facing and caulking
- 16 site-installed infill stonewool insulation around glulam beam penetrations
- 17 site-installed transition membrane across cut-out for glulam beam penetration
- 18 130x342mm spf 20f-e glulam beam @ edge of clt
- 19 265x342mm spf 20f-e double glulam beam to cantilever

10 systems



10: systems

building systems distribution 1:100 third level plan



systems

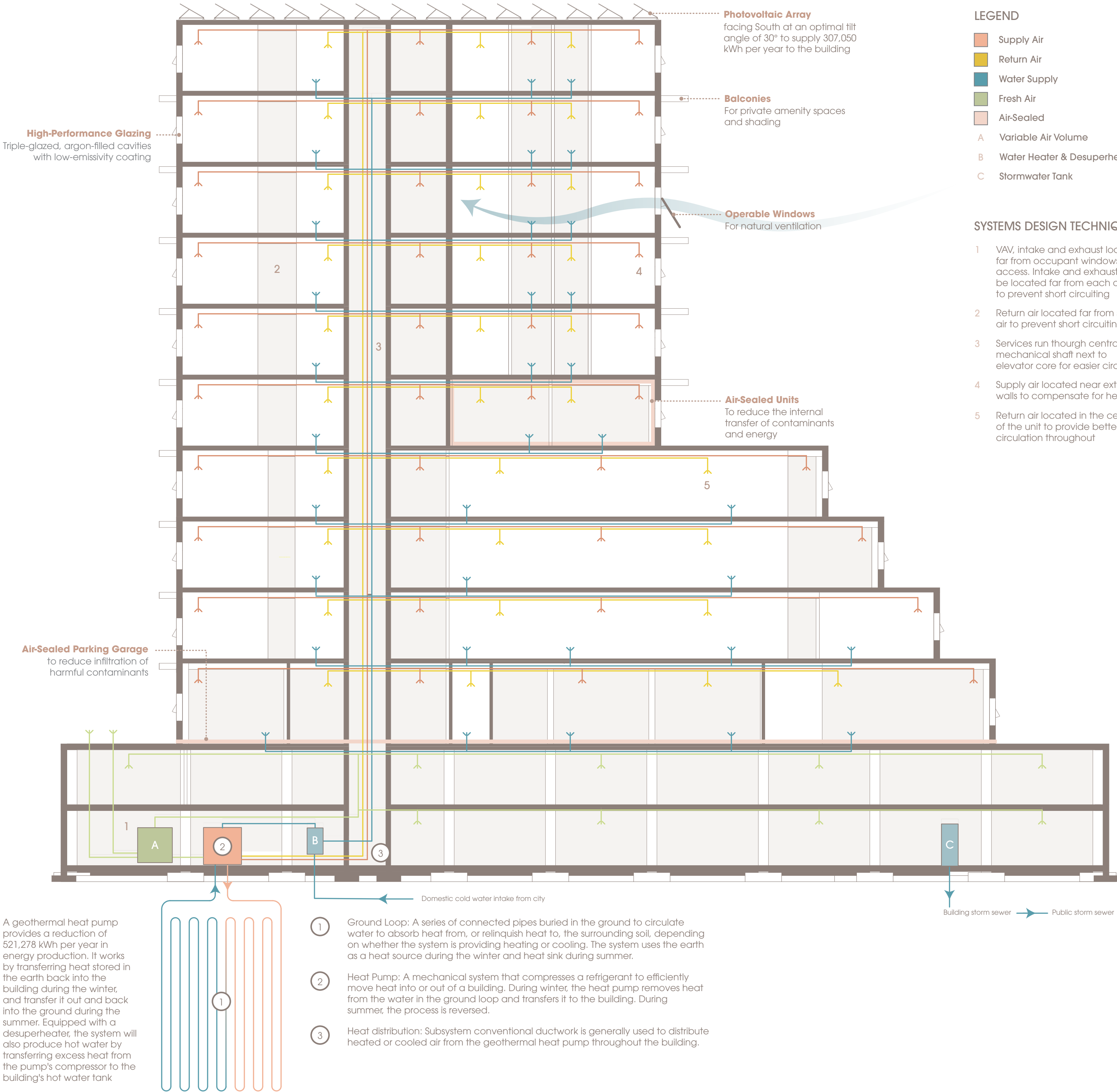
Nulo’s air and water heating and cooling is provided by a closed loop geothermal heat pump. Geothermal systems eliminate the combustion of fossil fuels and significantly lower the generation power, thus also reducing greenhouse gas emissions and environmental damage. Successes of geothermal systems can be found in local buildings, such as evolV1. While geothermal heat pumps can be a large upfront payment, they provide dramatic reductions in costs in the long term. The Earth’s thermal properties provide incomparable efficiency and operate significantly more efficiently compared to conventional heating and air conditioning systems.

The air will be circulated around the building using a variable air volume (VAV). VAV systems supply air at a variable temperature and airflow rate from an air handling unit, thus meeting the changing heating and cooling needs of different zones in the building. It allows an energy-efficient HVAC system distribution by optimizing the amount and temperature of distributed air. The VAV will provide a mix of outdoor ventilation air and recirculated space air to the inside. Dehumidification is also accomplished, thus providing comfortable indoor space for occupants. The VAV is located in the basement mechanical room to allow for direct access to the geothermal system, and its intake and exhaust is located to the outdoors, far from occupant windows and access to prevent uncomfortable pedestrian experiences.

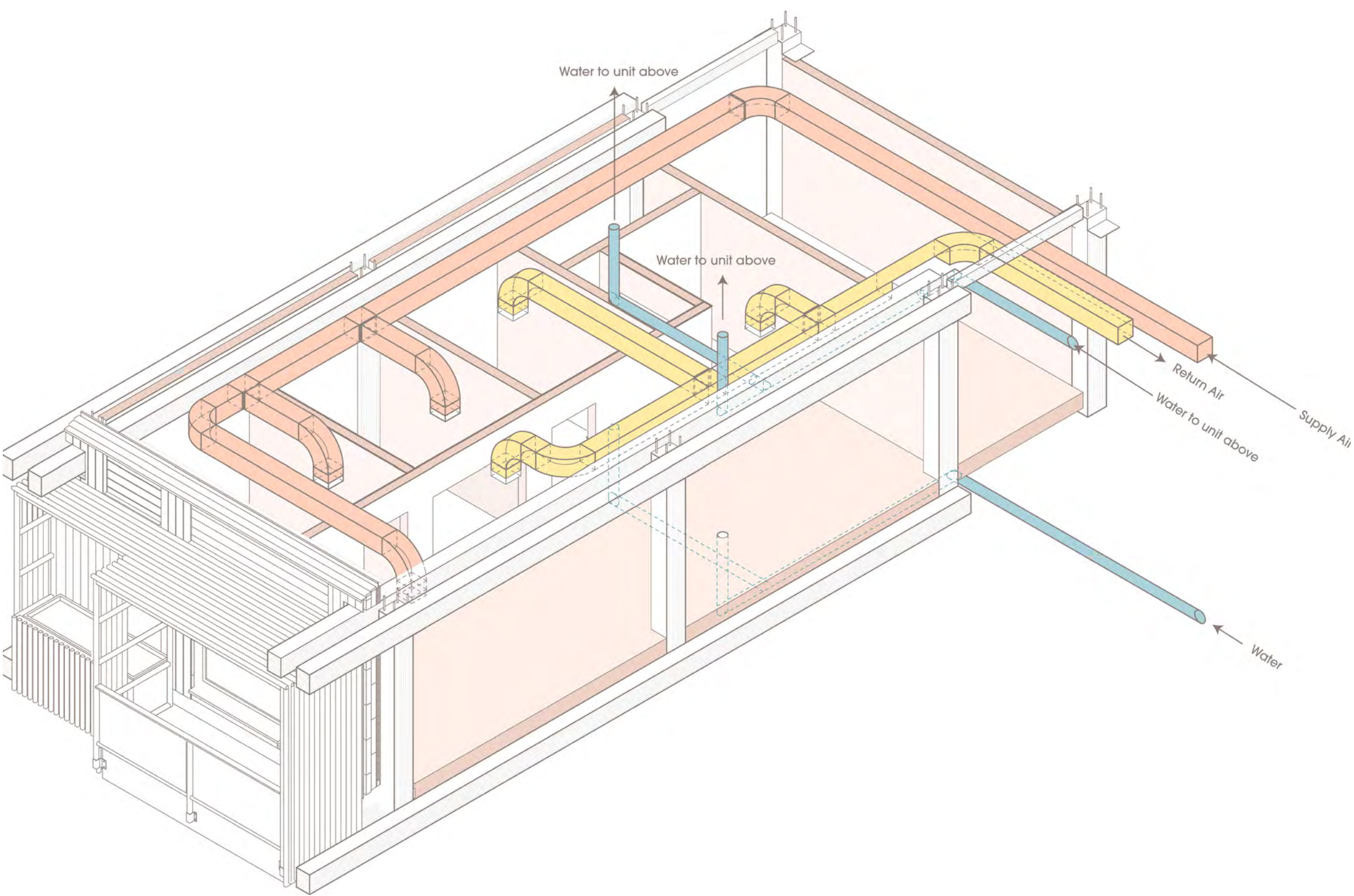
The services run through the central mechanical shaft next to the elevator shaft, which is also located directly in the basement mechanical room. For the distribution to units, the systems were strategically coordinated with the structure to allow for shallower beams the corridors to prevent a reduction in ceiling height. To prevent contamination between units, each system is provided with its own supply and return air routes.

10: systems

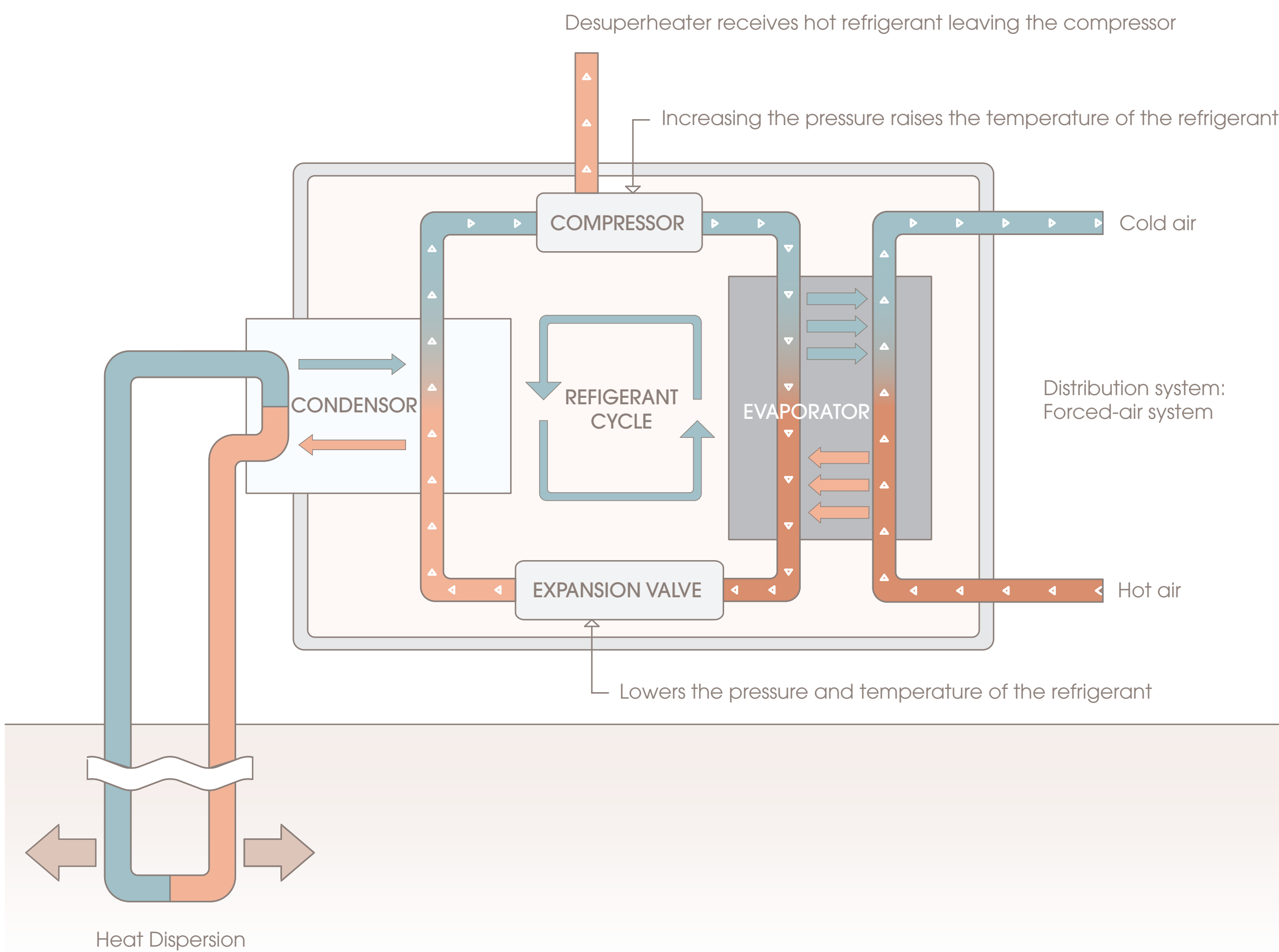
building systems integration



integrated systems: vertical distribution | north-south section

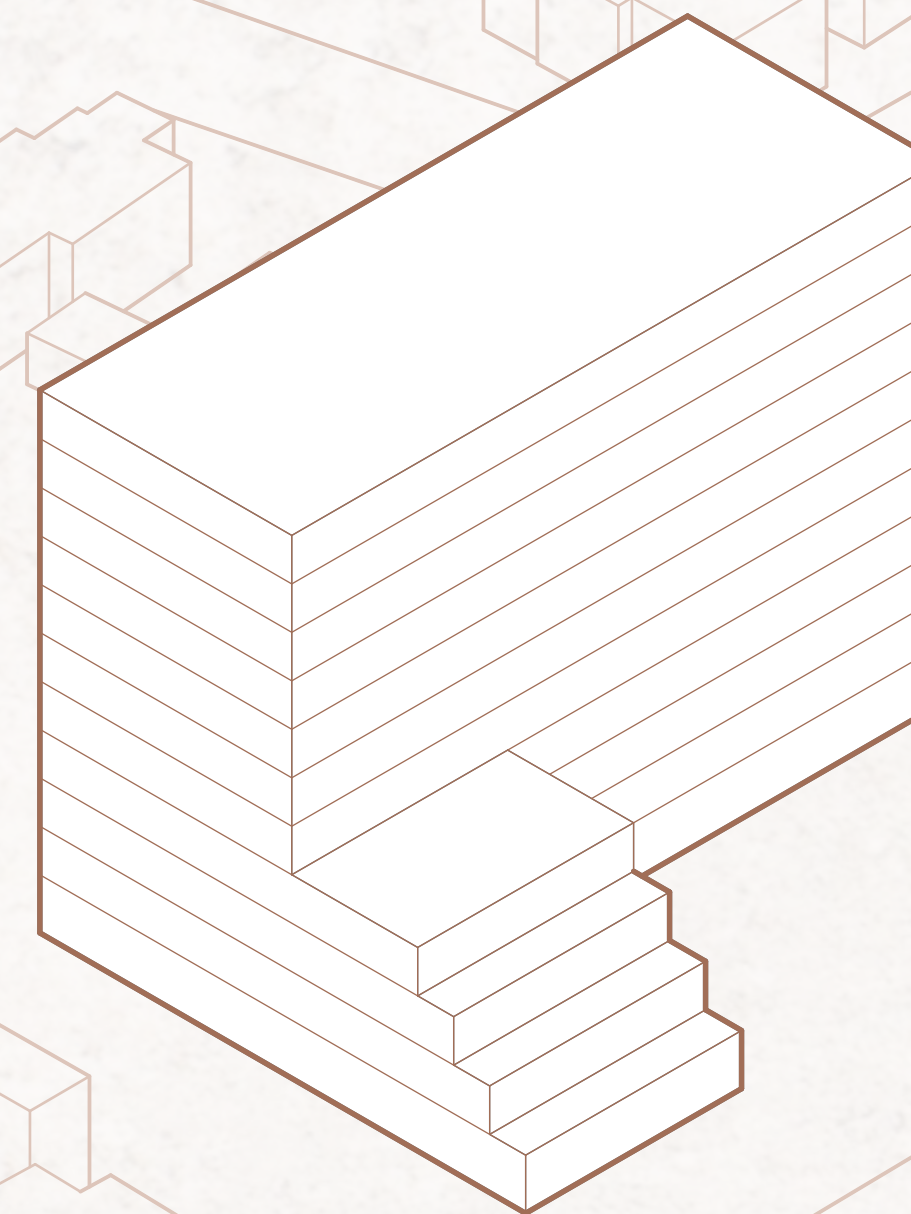


systems to unit integration isometric



geothermal cooling cycle in summer months

11 sustainability



strategies to develop building performance + overall sustainability

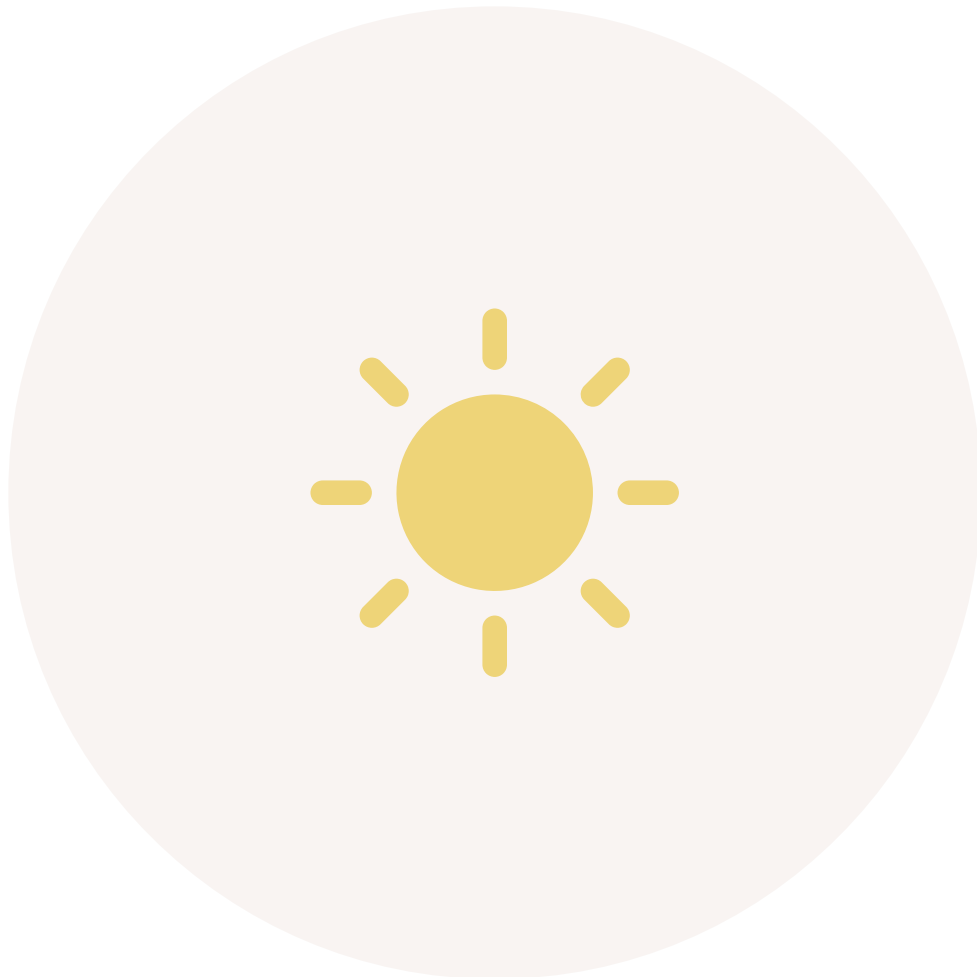
Our building’s heating and cooling system is a geothermal heat pump. Geothermal heat pumps use 25 to 50 percent less electricity than conventional heating or cooling systems, reducing energy consumption by 44 percent compared to air-source heat pumps. In Nulo, our operational carbon is reduced by 17% due to the geothermal system. A fraction of the building’s electricity will be powered using solar panels, reducing the amount of reliance on unrenewable forms of electricity by 54%. The building plans on using LED powered lighting systems which can reduce energy use by 75% when compared to incandescent lighting, coupled with the use of sensors in amenity spaces to mitigate wasted energy when spaces are no longer in use. The overall shape of the building allows for light penetration across all units throughout the day—maximizing daylighting opportunities. The construction of the building is mainly mass timber, which avoids CO2 emissions through its production rather than it’s concrete and steel counterparts.



geothermal heating



LED lighting



photovoltaic arrays



mass timber

11: sustainability

carbon accounting

building info

Total Floor Area	14253 m²
Lifespan	100 years
Energy Use Intensity	156 kWh/m²
Carbon Footprint	3047 kgCO ₂ e/m²

energy performance

Cooling	119732 kWh
Heating	401546 kWh
Mechanical Ventilation	820433 kWh
Lighting	270173 kWh
Plug Load	174982 kWh
Water Heating	744135 kWh
Solar	307050 kWh
Wind	0 kWh
Geothermal Reduction	521278 kWh

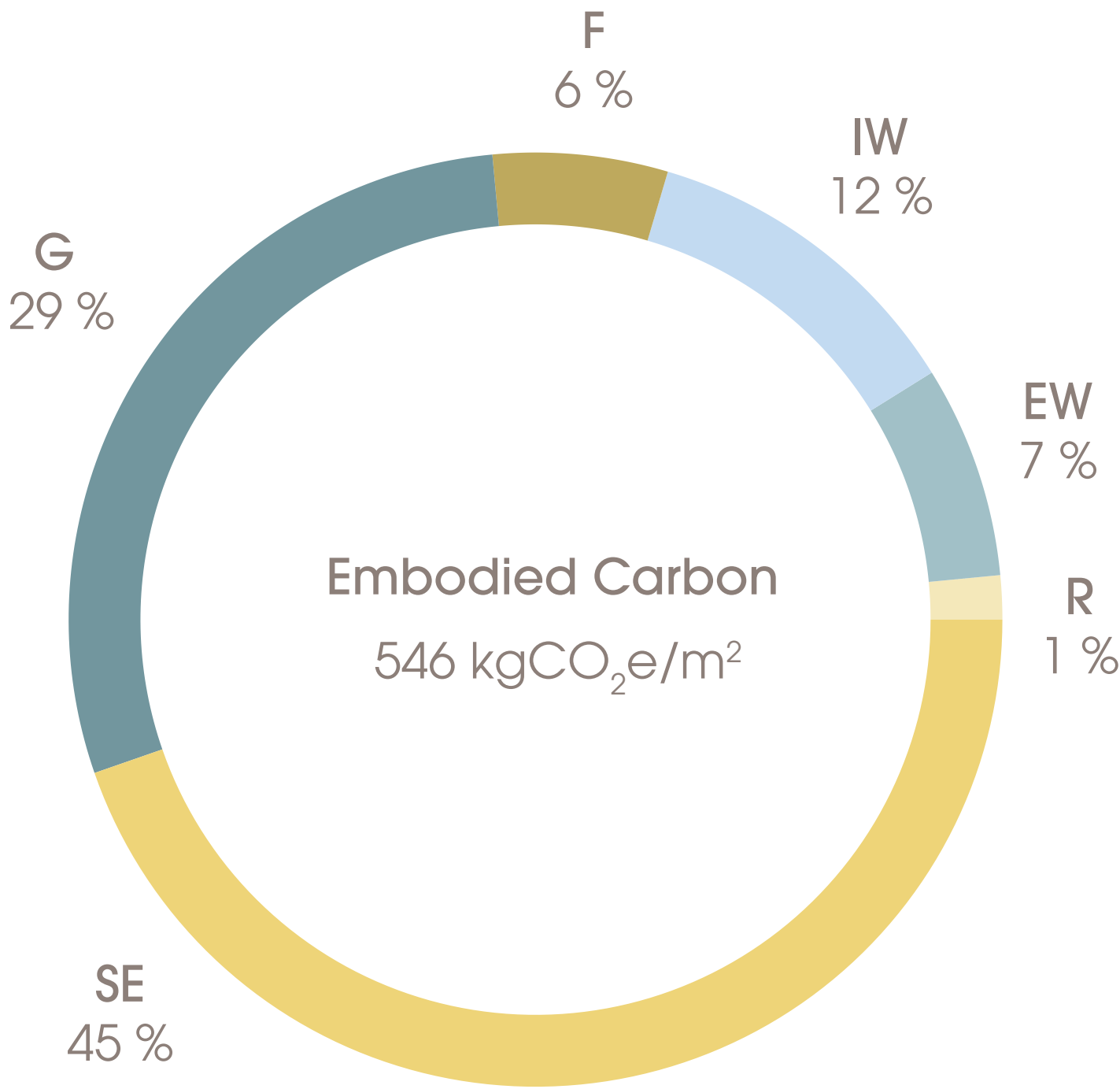
global warming potential

Nitric Oxide - NO	744 kg
Sulfur Dioxide - SO ₂	1704 kg
Carbon Dioxide - CO ₂	42427714 kg

carbon accounting

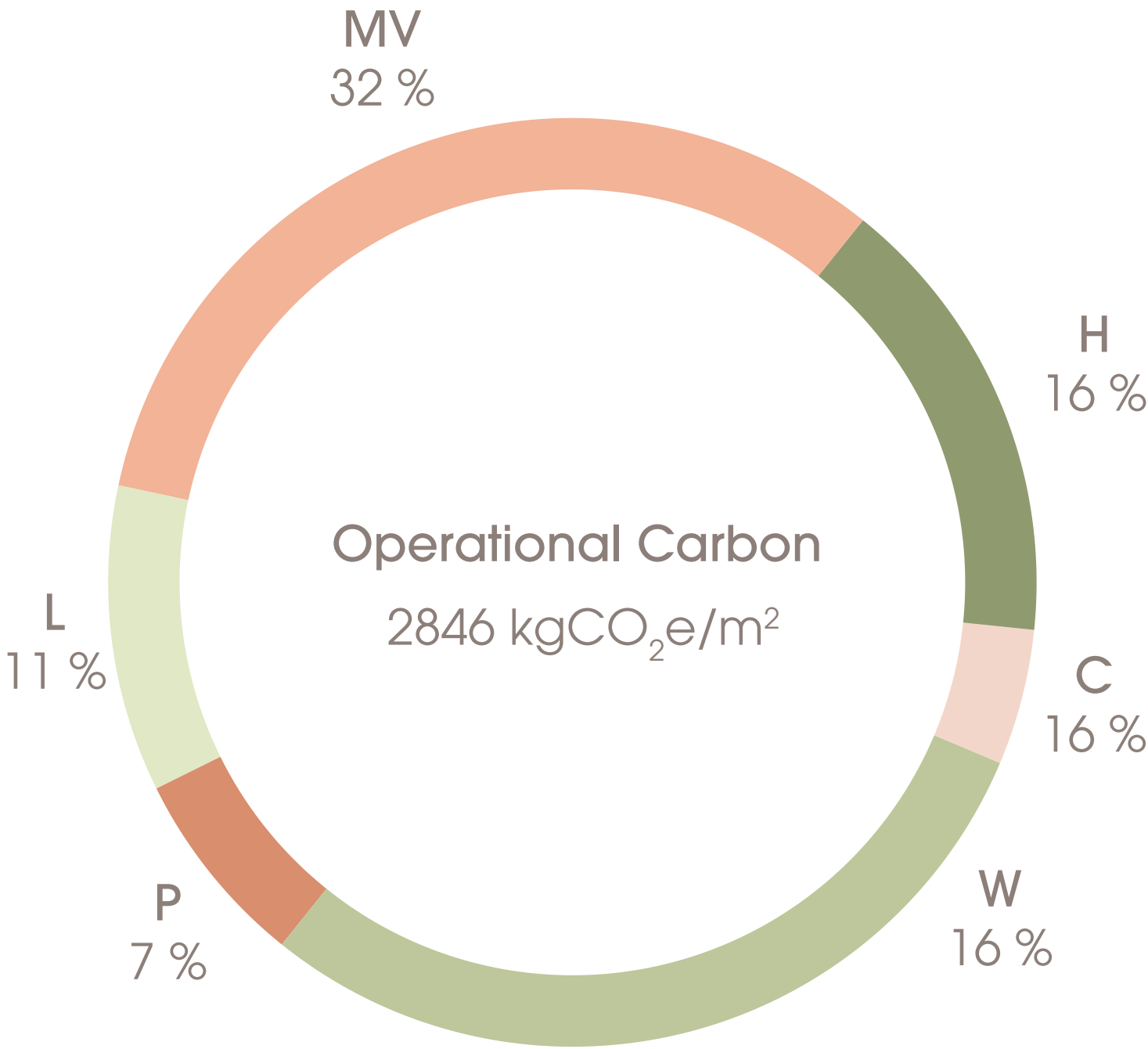
Regarding energy usage, our building lies between good and best practice in Ontario. It performs 185% higher than average buildings, 60% higher than good practice design and just 36% lower than best practice designs.

A 1136.8 m² monocrystalline silicon photovoltaic array system on our roof deck provides 10% of solar energy generation. With the use of a closed loop geothermal heat pump, our operational carbon is reduced by 17%. Solar energy (45%) is the primary factor contributing to embodied carbon reductions. Furthermore, the manufacturing and transport of mass timber emits approximately 40% and 75% less carbon than steel and concrete, respectively.



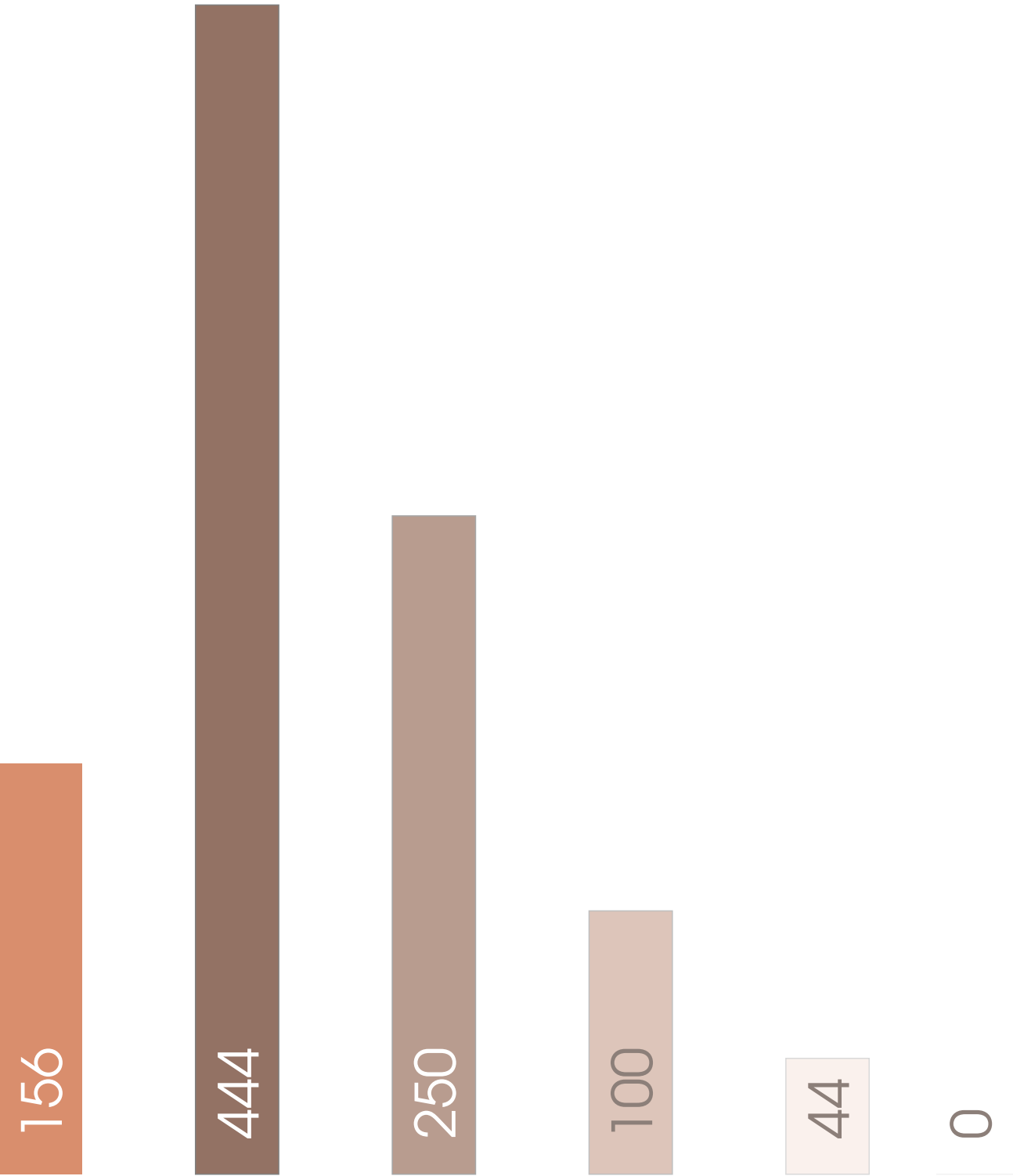
embodied carbon

R - Roof	F - Floors
EW - External Walls	G - Ground
IW - Internal Walls	SE - Solar Energy



operational carbon

C - Cooling	L - Lighting
H - Heating	P - Plug Load
MV - Mechanical Ventilation	W - Water Heating



energy use intensity

PD - Proposed Design	BP - Best Practice
AO - Average Ontario	A25 - Architecture 2030 T 2025
GP - Good Practice	A30 - Architecture 2030 T 2030