

ENCLÖSE TÖ INCLUDE

Inspired by the organic flow of 'green fingers' that characterize Helsinki's urban development, our precinct in Viikki stands as a testament to sustainable progress. Embracing the ethos of renewal, one building has been meticulously renovated while another rises as a symbol of contemporary innovation. Adorned with verdant roofs and crafted from eco-conscious materials, the design intertwines with nature, blurring the boundaries between built and natural environments. With a focus on inclusivity, the precinct offers a harmonious blend of residences for both university students and families, fostering a vibrant community within its green embrace. Aspiring to be a beacon of sustainable living, the project embodies Helsinki's commitment to a greener, more equitable future.



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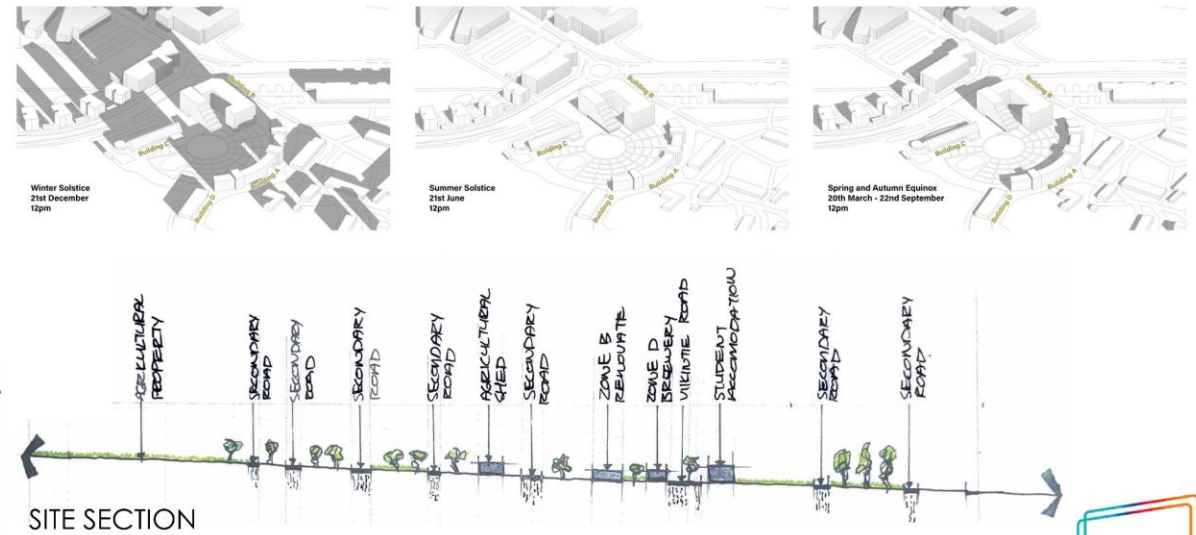
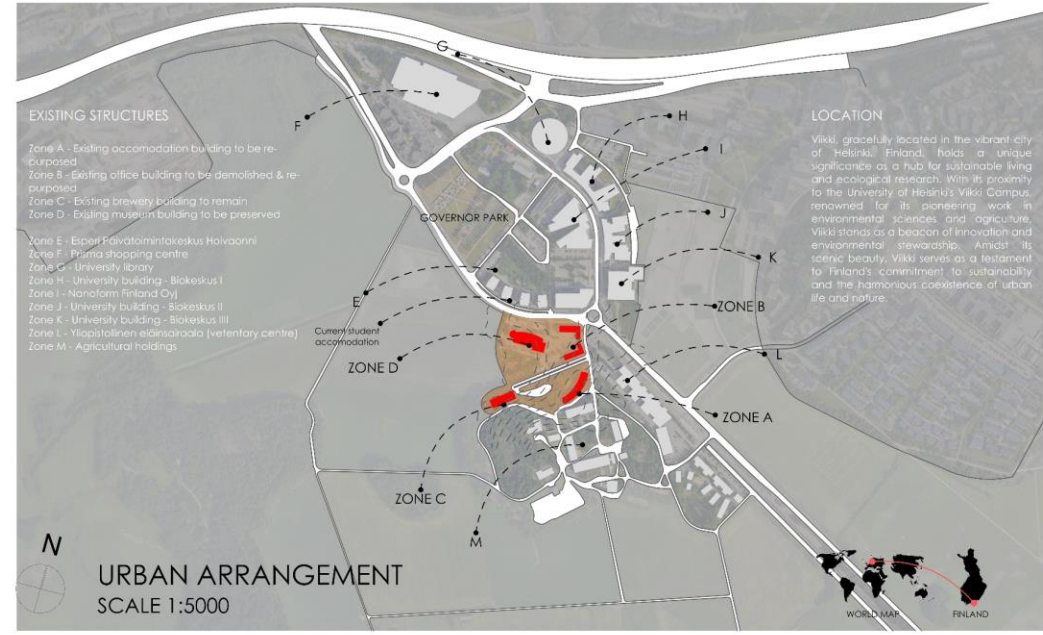
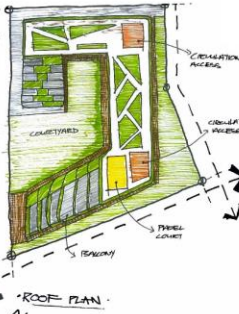
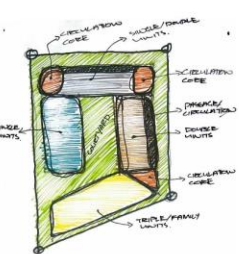
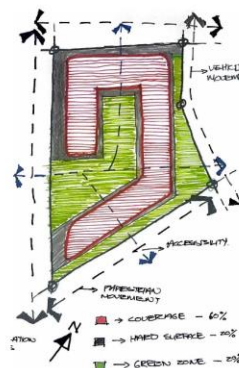
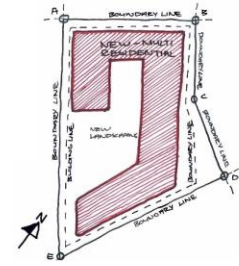
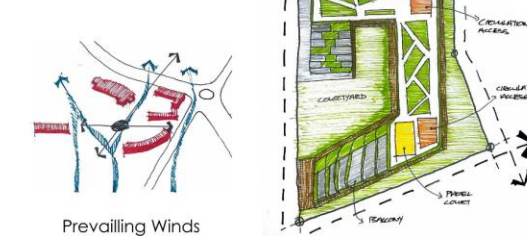
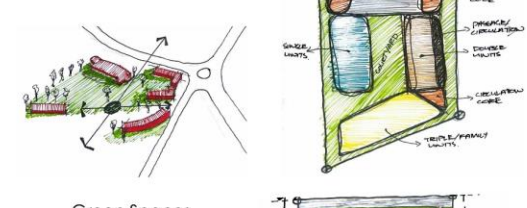
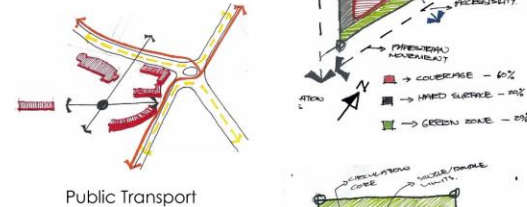
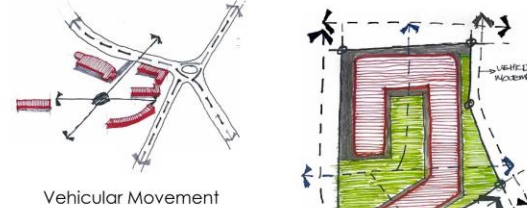
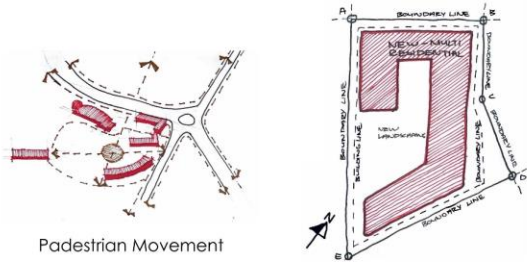
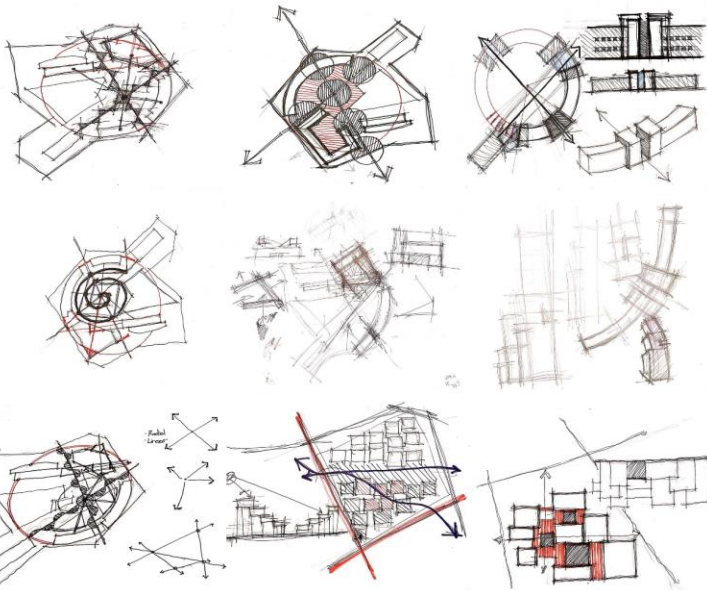
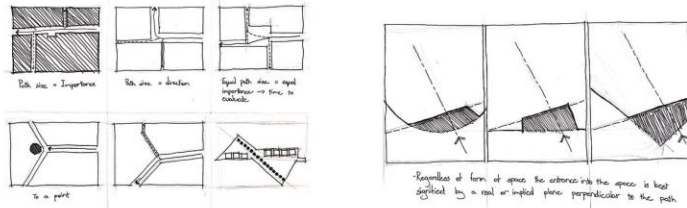
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SITE AND INTRODUCTION

URBAN ANALYSIS

Viikki's urban planning reflects a thoughtful integration of nature and modern living. With an emphasis on sustainability and environmental conservation, the design of Viikki prioritizes green spaces, pedestrian-friendly pathways, and efficient public transportation networks. This approach fosters a sense of community while minimizing the ecological footprint of the neighborhood. Additionally, Viikki's urban planning incorporates innovative solutions for waste management, energy efficiency, and water conservation, further solidifying its reputation as a model for sustainable development.

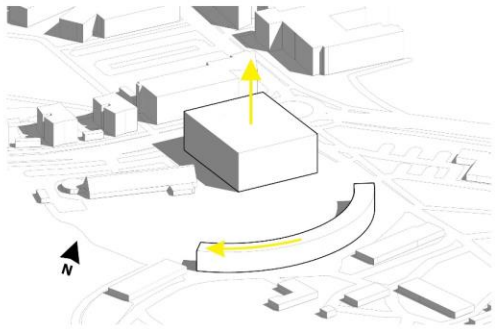
CONCEPT APPROACH



CÖNCEPT ÅND DEVELÖPMENT

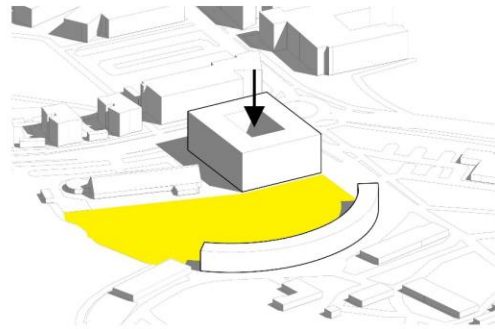
CÖNCEPT DIÅGRÅM DEVELÖPMENT

The architectural design for the site prioritizes efficient use of space while maximizing natural light and greenery integration. Building A and Building B are strategically positioned to accommodate a maximum number of apartments, with Building A extended to create a spacious courtyard spanning the site. This courtyard design not only floods Building B with natural light but also invites public access, fostering a sense of openness and community connection. To optimize solar exposure, the western wing of Building B is lowered, ensuring ample sunlight reaches the courtyard while minimizing shadows from neighbouring structures. Additionally, atriums within Building A enhance interior daylighting. Green roofs and garden spaces further enhance the site's sustainability, ensuring that no green space is lost but rather integrated into the urban fabric, creating a vibrant and environmentally conscious living environment.



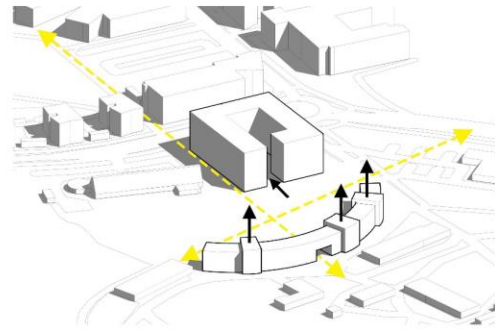
1. THE SITE

- Extending form of Building A
- Extruding form of Building B



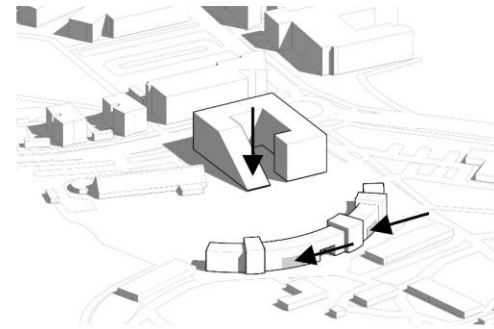
2. THE COURTYARD

- More natural lighting into courtyard
- Subtraction into Building B promotes daylight



3. OPENING TO THE PUBLIC

- Extrusion in Building A for variation on form
- Openings created on ground floor for public access



4. OPENING TO THE SUN

- Glass facades on Building A filter daylight
- Stepping of Building B filters light into its own courtyard



5. SITE VEGETATION

- Increasing vegetation within courtyard
- Increased vegetation on roofs for no loss of green space

MÅSTER PLÅNING

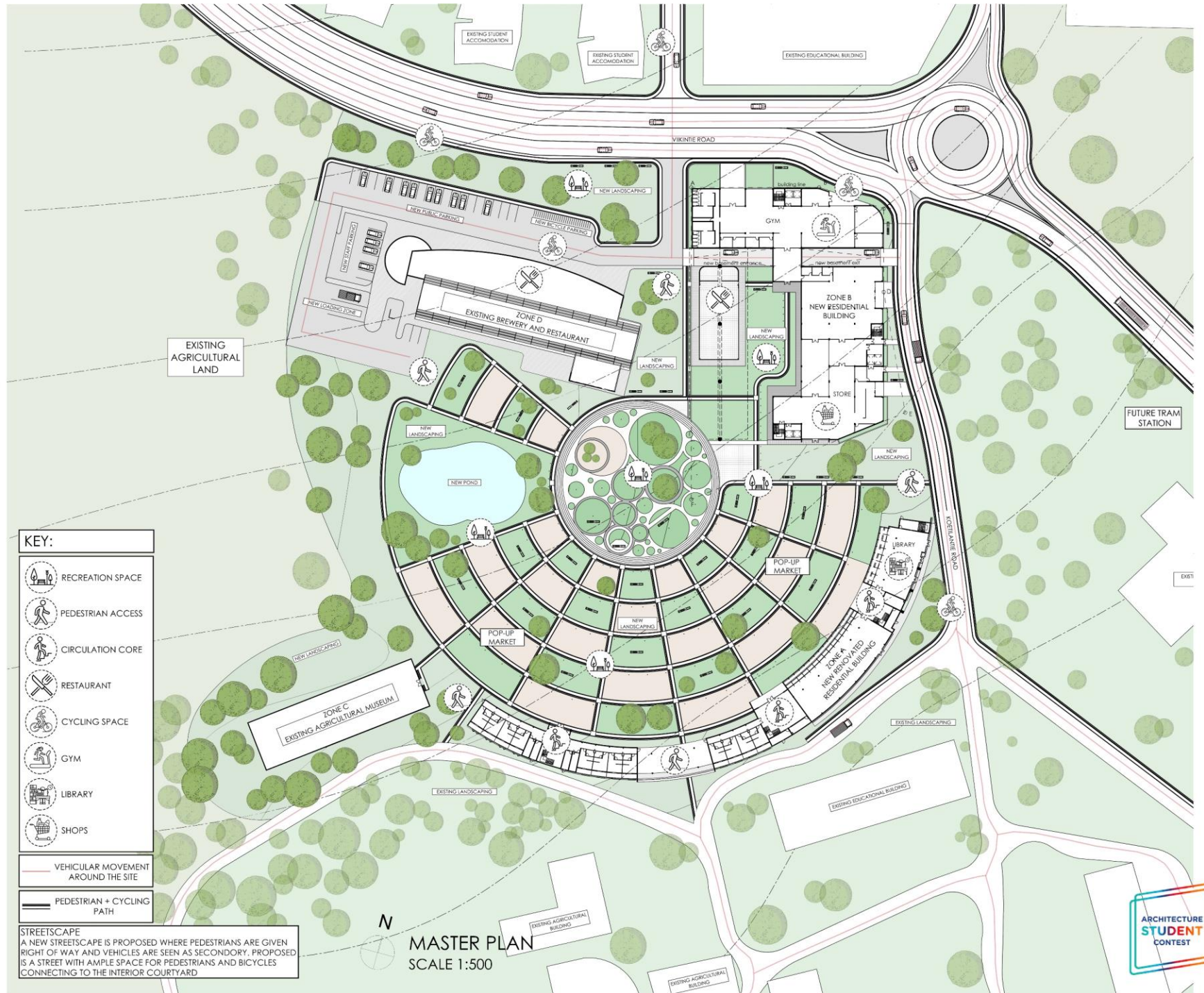
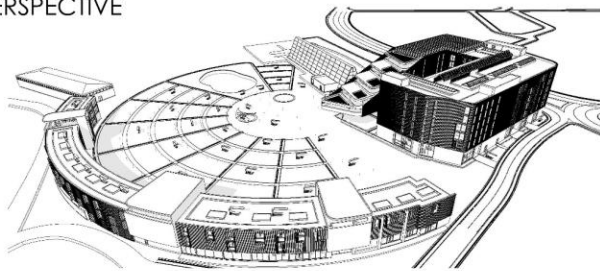
MÅSTER PLÅN DEVELÖPMENT

Imagine entering the precinct, greeted by the gentle embrace of radial patterns, reminiscent of a thriving farming community. The courtyard, with its organic layout, invites exploration and contemplation, each path leading to a discovery. As you traverse this green oasis, the towering presence of the new building commands attention, a symbol of modernity and progress, while the renovated structure stands proudly, its height carefully preserved to welcome streams of natural light into the heart of the site. Wandering further, you find yourself enveloped by the renovated building, its embrace serving not only as a testament to history but also as a protective barrier safeguarding the radial landscape gardens. Everywhere you turn, the buildings of the precinct open up onto these lush green spaces, blurring the lines between indoor and outdoor, urban and natural. The experience of this architectural marvel is one of harmony and connection, where the past and present converge, and the user is invited to engage with the landscape, fostering a sense of belonging and stewardship for the environment. In this vibrant community, every corner holds the promise of inspiration and renewal, creating a sanctuary where both body and soul can thrive.

SITE PERSPECTIVE



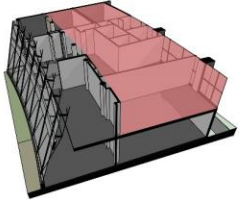
SITE PERSPECTIVE



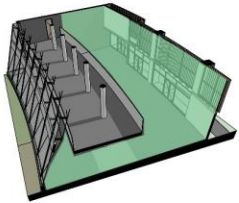
BUILDING Å - RENÖVATION

BUILDING Å - EXPLÖDAD ÅXONOMETRIC

Once an office building, now a residential gem, adorned with a captivating timber-clad facade. Inside, a clever removal of concrete floors creates a dynamic gallery space, flooding the interior with natural light. This transformation not only enhances aesthetics but also fosters a vibrant social atmosphere, blurring the lines between living space and cultural hub. A testament to innovation, it redefines urban living, breathing new life into its surroundings.



EXISTING OFFICE SPACE



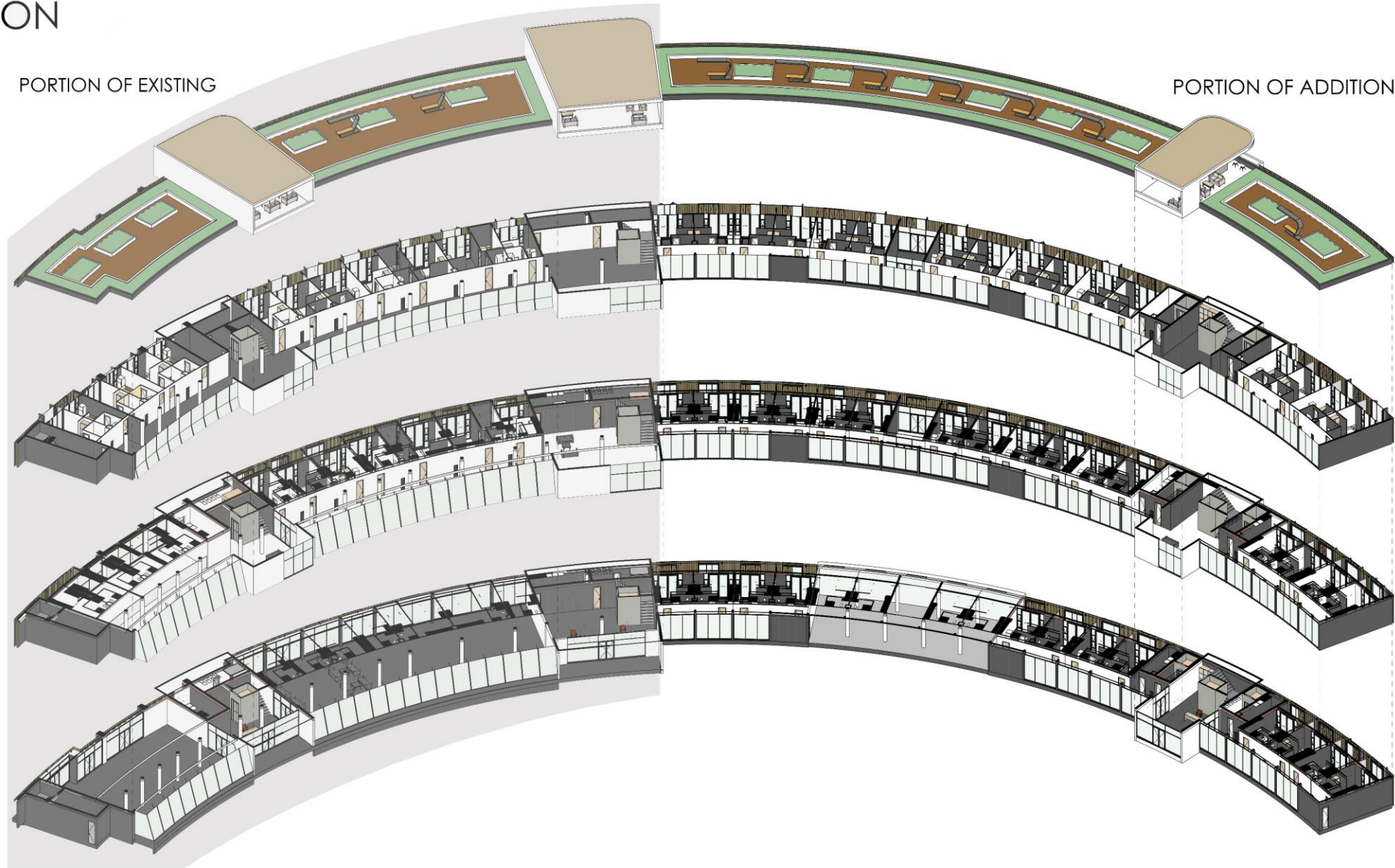
NEW EXHIBITION SPACE



TYPICAL ROOM LAYOUT

PORTION OF EXISTING

PORTION OF ADDITION



EXPLODED AXONOMETRIC

BUILDING Å - RENÖVATION

BUILDING Å - BUILDING PRÖGRÅM

The renovated building, extruded along its circular pattern, encapsulates a vibrant courtyard to the north. Designed to cater for university students and occasional lecturers, it offers a mix of student rooms and versatile educational spaces. With ample room for social events, this modern structure embodies contemporary living and learning, fostering a sense of community and collaboration within its sleek and efficient design.

BUILDING A SURFACES:

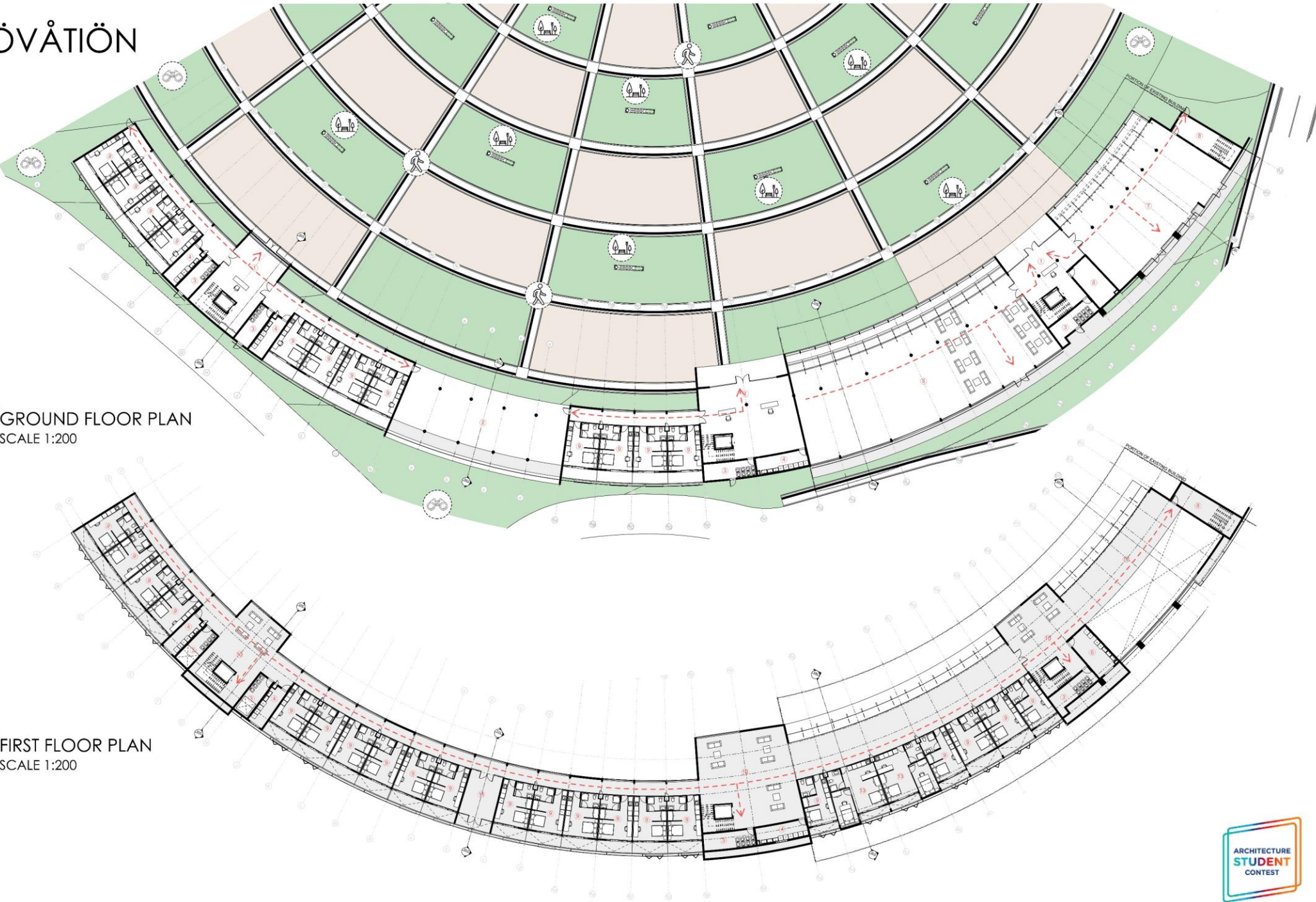
-  Plant/Flower Bedding
-  Landscape Grass Terraces
-  Existing Landscape
-  Covered Surfaces
-  Significant View Points
-  Landscape Pathways
-  Landscape Seating Features
-  Fire Escape Routes

 GROUND FLOOR PLAN
SCALE 1:200

ROOM ALLOCATIONS:

- 1 Access Controlled Reception
- 2 Covered Walkway
- 3 Waste Management
- 4 Laundry Room
- 5 Academic Lounge
- 6 Archive Room
- 7 Gallery/Exhibition Centre
- 8 Emergency Escape
- 9 Student Accomodation
- 10 Lobby
- 11 Smokers Room
- 12 Gallery Mezzanine Level
- 13 Co-living Unit

 FIRST FLOOR PLAN
SCALE 1:200











BUILDING Å - RENÖVATION

BUILDING Å - BUILDING PROGRAM

The renovated building now features voids in the slab, allowing for circulation and movement of air between the separate levels of the structure. The design of the roof now creates a space to escape. Although the extension of the building takes away from vegetation, new vegetation is brought up to the roof so the user of the space can enjoy the view of the sunrise and sunset. This design accommodates students and lecturers of the space by providing outdoor study spaces as one of the key features.

BUILDING A SURFACES:

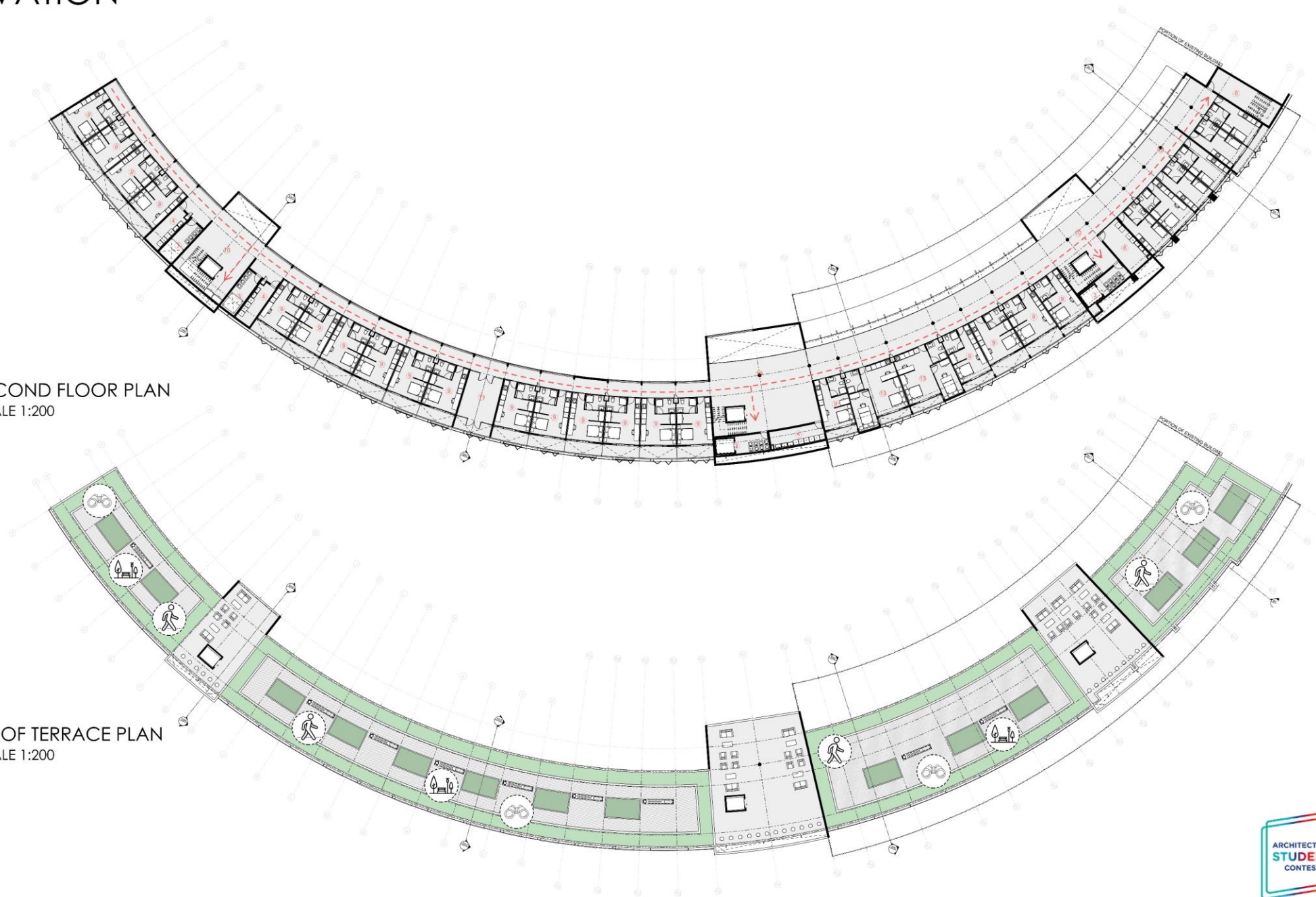
-  Voids
-  Roof Top Vegetation
-  Timber Decking
-  Covered Surfaces
-  Significant View Points
-  Pathways
-  Seating Features
-  Fire Escape Routes

 SECOND FLOOR PLAN
SCALE 1:200

ROOM ALLOCATIONS:

- 1 Access Controlled Reception
- 2 Covered Walkway
- 3 Waste Management
- 4 Laundry Room
- 5 Academic Lounge
- 6 Archive Room
- 7 Gallery/Exhibition Centre
- 8 Emergency Escape
- 9 Student Accomodation
- 10 Lobby
- 11 Smokers Room
- 12 Gallery Mezzanine Level
- 13 Co-living Unit

 ROOF TERRACE PLAN
SCALE 1:200



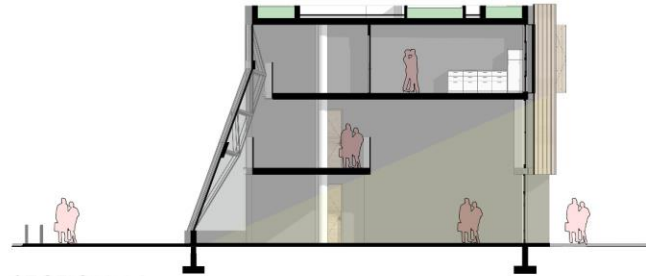
BUILDING Å - RENÖVATION

BUILDING Å - SECTIONS AND DETAILS

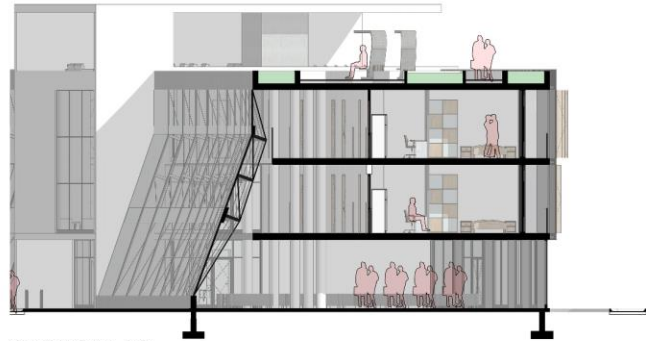
In the recent renovation of an office building into a residential space, a strategic intervention was made to enhance the interior environment and engage with the surrounding context. A portion of the concrete slab was meticulously removed, creating an inviting space for exhibitions and facilitating the ingress of natural light into both the interior and the courtyard. This alteration not only enriches the visual experience within the building but also fosters a dynamic connection between the indoor and outdoor realms. Meanwhile, the architectural support structure of the northern glazing facade has been retained, serving as a distinctive feature that adds character and identity to the building expressing adaptive reuse. Building A (renovation) and building B (new construction) share the same details and material use.



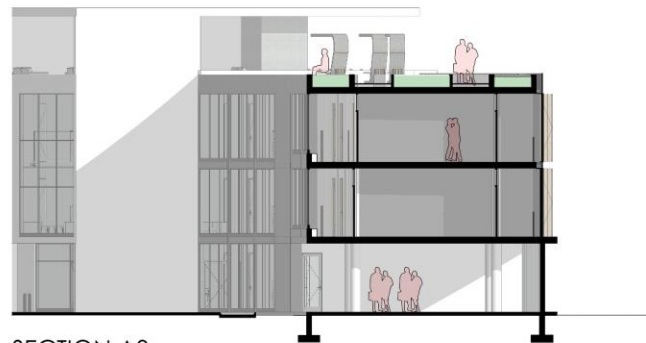
FACADE AXONOMETRIC



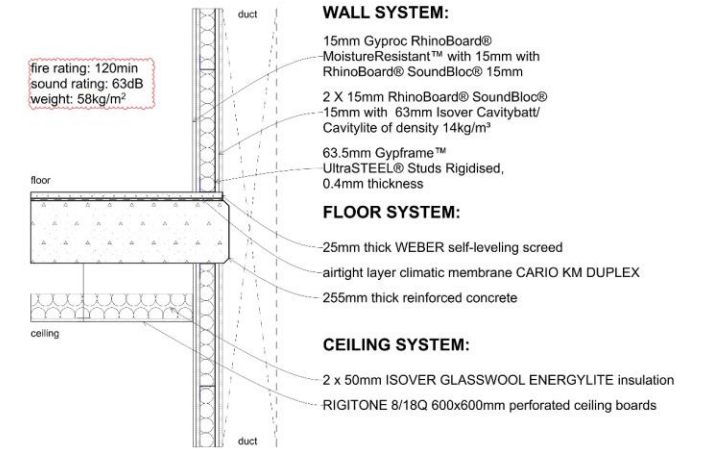
SECTION A1
SCALE 1:100



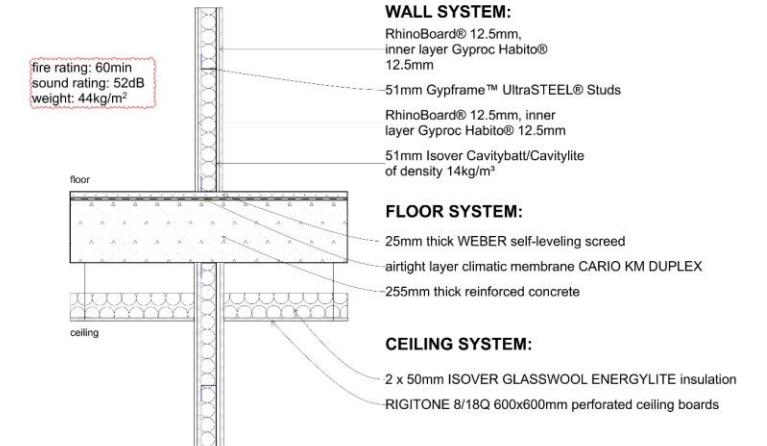
SECTION A2
SCALE 1:100



SECTION A3
SCALE 1:100



DETAIL 1: BATHROOM WALL
SCALE 1:10



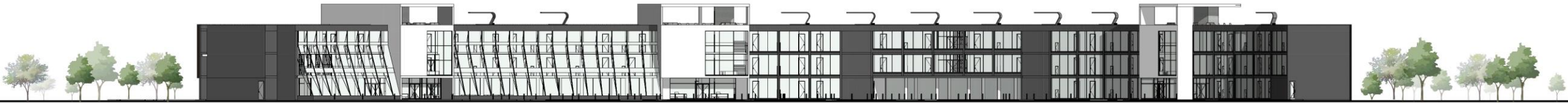
DETAIL 2: INTERNAL ROOM WALL
SCALE 1:10



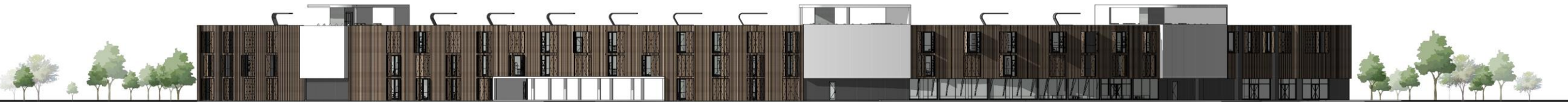
BUILDING Å - RENÖVATION

BUILDING Å - ELEVATION

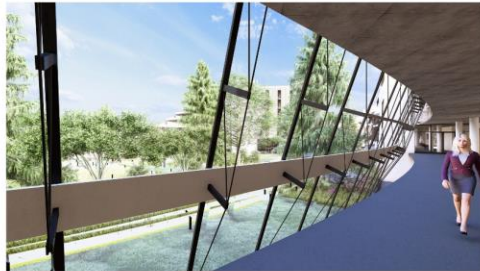
The transformation of the office block into an educational accommodation building stands as a testament to adaptive design meeting community needs. With its innovative timber dynamic facade, the structure seamlessly merges functionality and aesthetics, offering inhabitants control over their environment while embracing sustainability. The manual operation of the facade openings fosters a sense of connection and ownership, promoting a symbiotic relationship between occupants and architecture. The expansion along the radial axis not only amplifies spatial capacity but also symbolizes growth and evolution within the Viikki agricultural community. This design ethos not only revitalizes the building but also reflects a commitment to fostering a dynamic, inclusive, and sustainable environment that resonates deeply with the ethos of Viikki's agricultural heritage.



NORTH ELEVATION
SCALE 1:200



SOUTH ELEVATION
SCALE 1:200



BUILDING B - NEW CÖNSTRUCTION

BUILDING B - EXPLÖDED ÅXÖNÖMETRIC

Building B provides accommodation for studio units, double units and 3-bedroom family units. All three variations are designed across all levels of the building. Each unit has its own enclosed aluminium ramed balcony. The balcony has been designed to protrude the timber skin to create a double-layered facade. operable timber shutter screens are fixed to the aluminium form and controlled by the occupant of the unit. This design element allows the building's facade to constantly adapt and with this brings character to the building skin.

BUILDING B OCCUPANCY

FLOOR LEVEL	UNIT TYPE	TOTAL UNITS PER FLOOR	PERCENTAGE OF FLOOR AREA	OCCUPANTS
FIRST FLOOR OCCUPANCY	STUDIO UNITS	11	440m ² = 24%	11
	DOUBLE UNITS	8	640m ² = 35%	16
	FAMILY UNITS	7	770m ² = 41%	28
	TOTAL UNITS	26	1 850m ²	55
SECOND FLOOR OCCUPANCY	STUDIO UNITS	14	560m ² = 29%	14
	DOUBLE UNITS	9	720m ² = 37%	18
	FAMILY UNITS	6	660m ² = 34%	24
	TOTAL UNITS	29	1 940m ²	56
THIRD FLOOR OCCUPANCY	STUDIO UNITS	14	560m ² = 27.5%	14
	DOUBLE UNITS	13	1 040m ² = 51%	26
	FAMILY UNITS	4	440m ² = 21.5%	16
	TOTAL UNITS	31	2 040m ²	56
FOURTH FLOOR OCCUPANCY	STUDIO UNITS	14	560m ² = 30%	14
	DOUBLE UNITS	11	880m ² = 47%	22
	FAMILY UNITS	4	440m ² = 23%	16
	TOTAL UNITS	29	1 880m ²	52
FIFTH FLOOR OCCUPANCY	STUDIO UNITS	11	440m ² = 27.5%	11
	DOUBLE UNITS	9	720m ² = 45%	18
	FAMILY UNITS	4	440m ² = 27.5%	16
	TOTAL UNITS	24	1 600m ²	45
TOTAL		139	9 310m ² of living space	264
		28% floor area = studio apartments	43% floor area = double unit apartments	29% floor area = family unit apartments



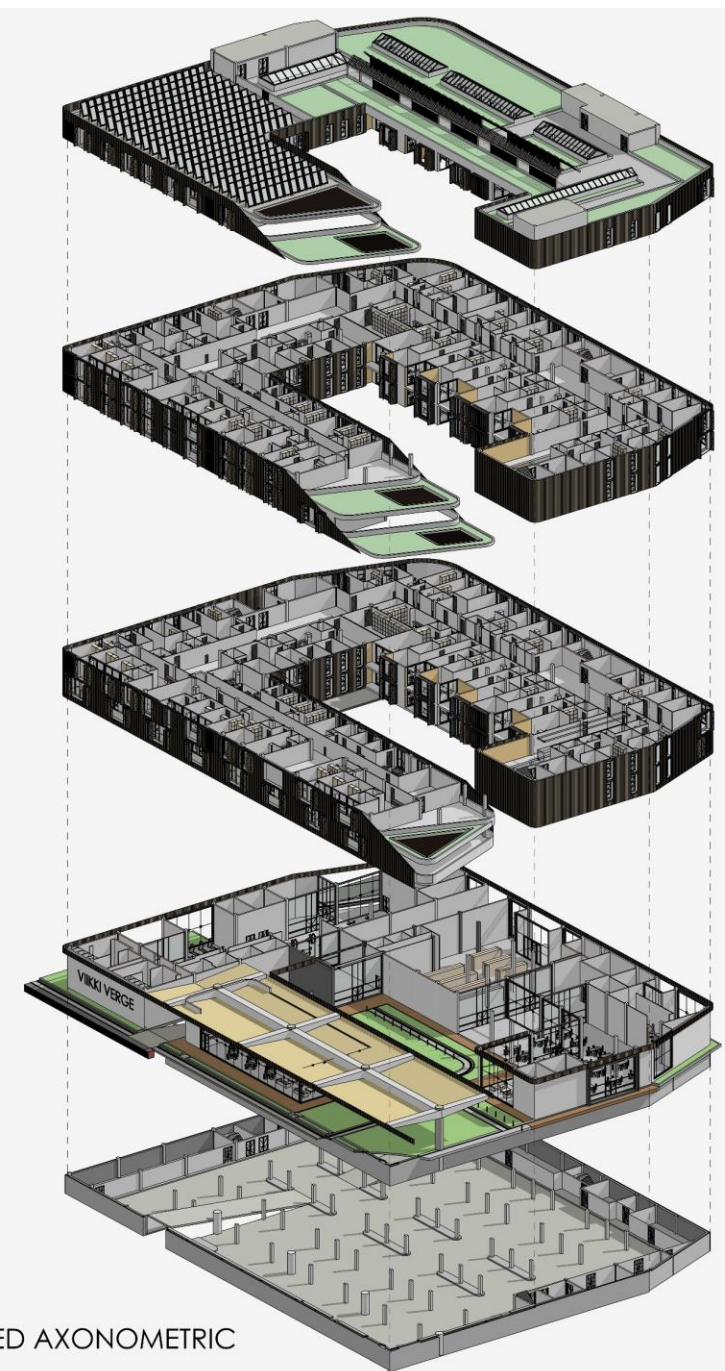
TYPICAL STUDIO UNIT



TYPICAL DOUBLE UNIT



TYPICAL FAMILY UNIT



EXPLODED AXONOMETRIC

BUILDING B - NEW CÖNSTRUCTION



















BUILDING B - BUILDING PRÖGRÅM

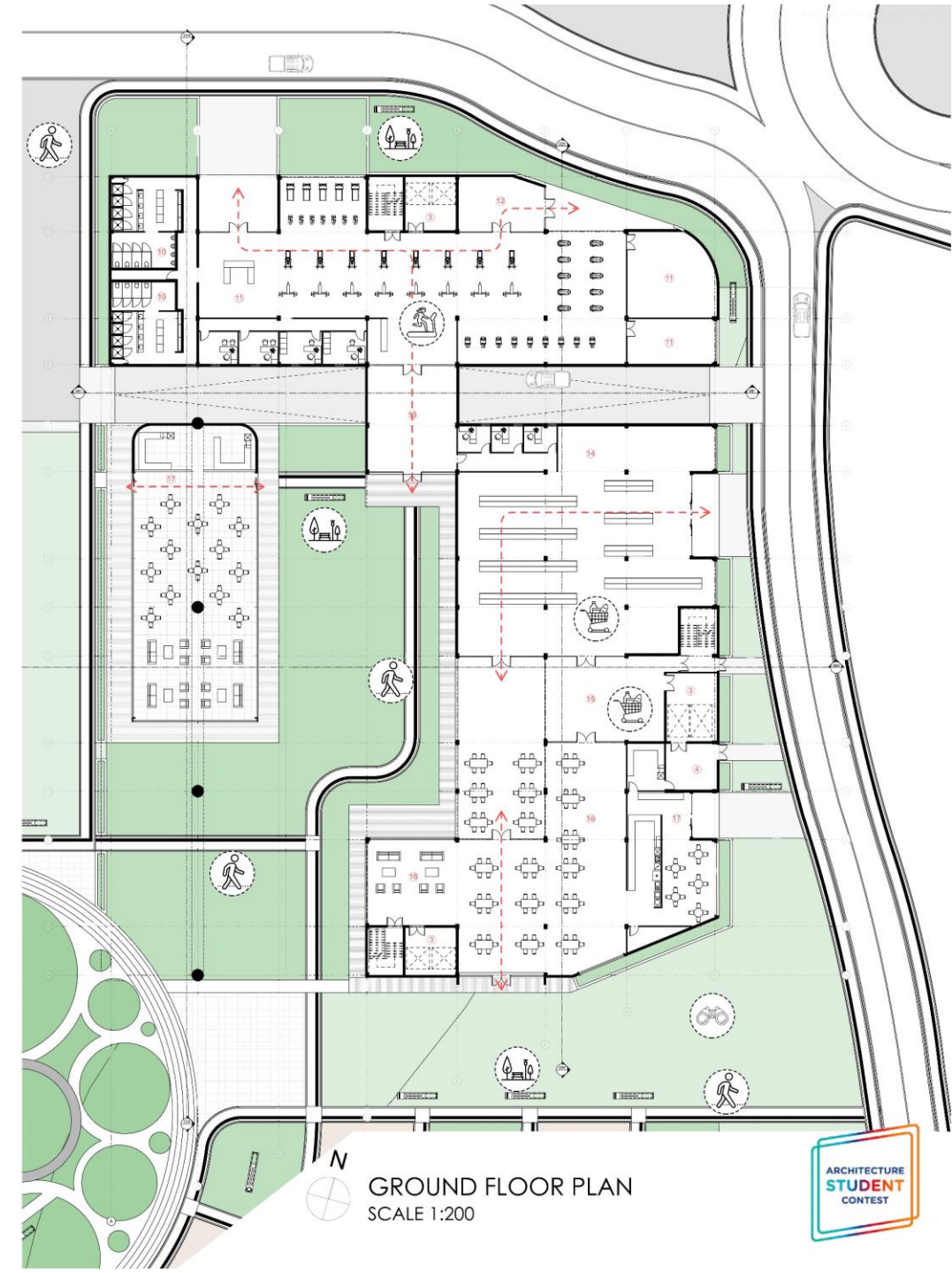
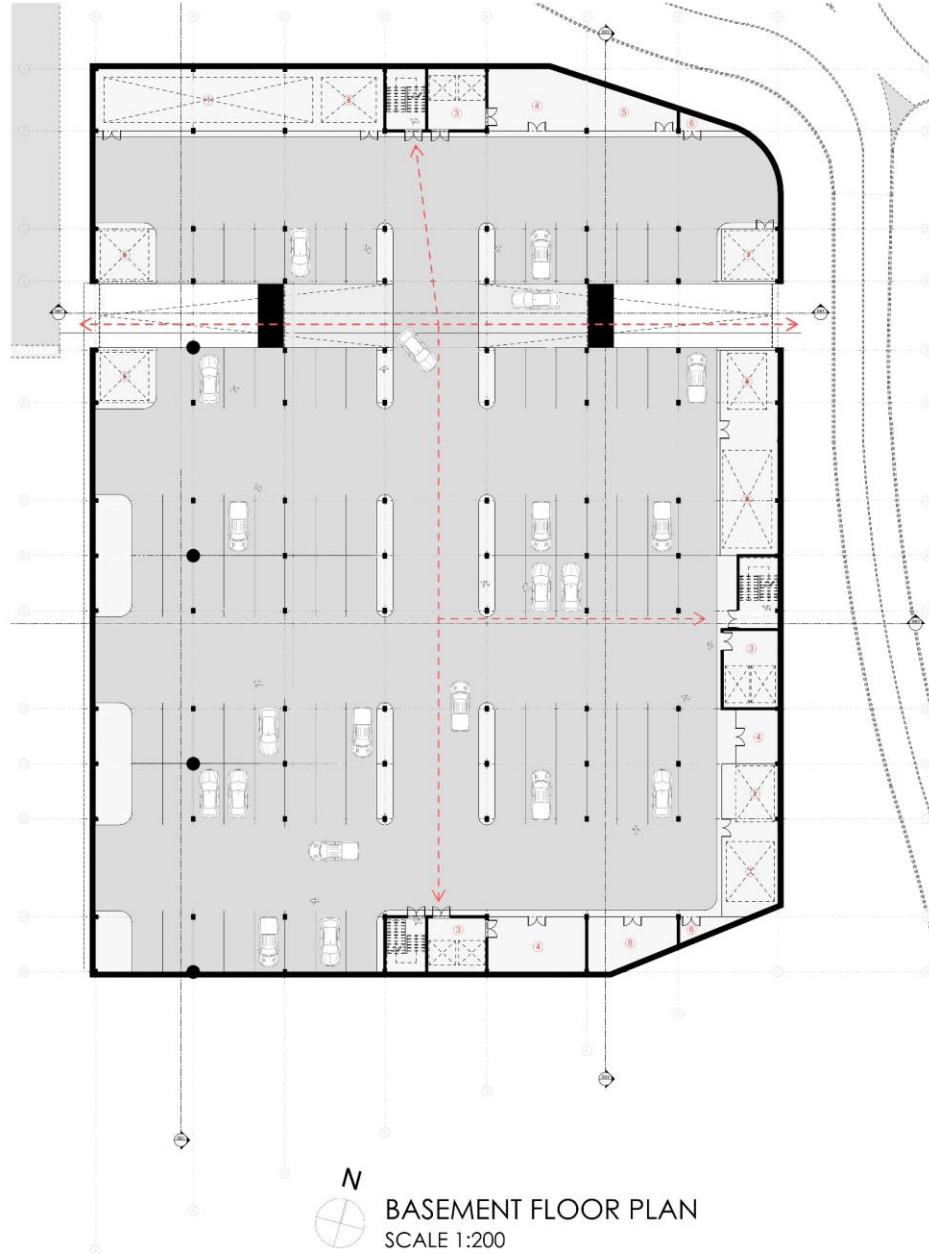
Building B basement accounts for 96 parkings dedicated to residents of the building. The parking can only be accessed from the western facade and depart from the eastern facade to avoid congestion. All service delivery systems can be reached from the eastern facade in a less busier street to avoid congestion. The ground floor comprises of commercial activity related to fitness, retail, health and various eating destinations. The building can be entered by foot from all adjacent streets as well as the new courtyard.

BUILDING A SURFACES:

-  Landscape Grass Terraces
-  Existing Landscape
-  Covered Surfaces
-  Significant View Points
-  Landscape Pathways
-  Landscape Seating Features
-  Fire Escape Routes

ROOM ALLOCATIONS:

- | | |
|---|--|
|  1 Water Storage Tank |  15 Circulation Lobby |
|  2 Water Heating Systems |  16 Restaurant |
|  3 Circulation Services |  17 Coffee Shop |
|  4 Waste Management |  18 Coffee Lounge |
|  5 Storage | |
|  6 Sump Room | |
|  7 Electrical Service Room | |
|  8 Back-up Power Unit | |
|  9 Heating/Cooling System | |
|  10 Restrooms | |
|  11 Gymnasium | |
|  12 Sports Nutrition Store | |
|  13 Fitness Retail Store | |
|  14 Retail Super Store | |



BUILDING B - NEW CÖNSTRUCTION




BUILDING B - FIRST FLOÖR

Building B first floor provides living unit for 11 studio apartments (35-46m²), 8 double unit apartments (70-90m²) and 7 family units (100-120m²). This level also provides residents with personal storage facilities, laundry spaces, waste management facilities and each unit with its own private balcony. Wide corridors provide a better feel and proportion to the user of the space allowing them to feel free. Voids in the slabs have been incorporated into the design to filter air and light throughout the building fostering a more comfortable internal environmental quality.












BUILDING B - SECÖND FLOÖR

Building B second floor provides living unit for 14 studio apartments (35-46m²), 9 double unit apartments (70-90m²) and 6 family units (100-120m²). This level also provides residents with personal storage facilities, laundry spaces, waste management facilities and each unit with its own private balcony. Wide corridors provide a better feel and proportion to the user of the space allowing them to feel free. Voids in the slabs have been incorporated into the design to filter air and light throughout the building fostering a more comfortable internal environmental quality.

BUILDING A SURFACES:

-  Landscape Grass Terraces
-  Covered Surfaces
-  Fire Escape Routes

ROOM ALLOCATIONS:

-  1 Family Unit
-  2 Double Unit
-  3 Circulation Services
-  4 Waste Management
-  5 Studio Unit
-  6 Storage Facility
-  7 Electrical Service Room
-  8 Laundry Facility
-  9 Coffee Lounge
-  10 Lobby Lounge
-  11 Viewing Patio



BUILDING B - NEW CÖNSTRUCTION




BUILDING B - THIRD FLOÖR

Building B third floor provides living unit for 14 studio apartments (35-46m²), 13 double unit apartments (70-90m²) and 4 family units (100-120m²). This level also provides residents with personal storage facilities, laundry spaces, waste management facilities and each unit with its own private balcony. Wide corridors provide a better feel and proportion to the user of the space allowing them to feel free. Voids in the slabs have been incorporated into the design to filter air and light throughout the building fostering a more comfortable internal environmental quality.












BUILDING B - FÖURTH FLOÖR

Building B fourth floor provides living unit for 14 studio apartments (35-46m²), 11 double unit apartments (70-90m²) and 4 family units (100-120m²). This level also provides residents with personal storage facilities, laundry spaces, waste management facilities and each unit with its own private balcony. Wide corridors provide a better feel and proportion to the user of the space allowing them to feel free. Voids in the slabs have been incorporated into the design to filter air and light throughout the building fostering a more comfortable internal environmental quality.

BUILDING A SURFACES:

-  Landscape Grass Terraces
-  Covered Surfaces
-  Fire Escape Routes

ROOM ALLOCATIONS:

-  1 Family Unit
-  2 Double Unit
-  3 Circulation Services
-  4 Waste Management
-  5 Studio Unit
-  6 Storage Facility
-  7 Electrical Service Room
-  8 Laundry Facility
-  9 Coffee Lounge
-  10 Lobby Lounge
-  11 Viewing Patio



BUILDING B - NEW CÖNSTRUCTION

BUILDING B - FIFTH FLOÖR

Building B fifth floor provides living unit for 11 studio apartments (35-46m²), 9 double unit apartments (70-90m²) and 4 family units (100-120m²). This level also provides residents with personal storage facilities, laundry spaces, waste management facilities and each unit with its own private balcony. Wide corridors provide a better feel and proportion to the user of the space allowing them to feel free. Voids in the slabs have been incorporated into the design to filter air and light throughout the building fostering a more comfortable internal environmental quality.

BUILDING B - RÖÖF TERRÅCE

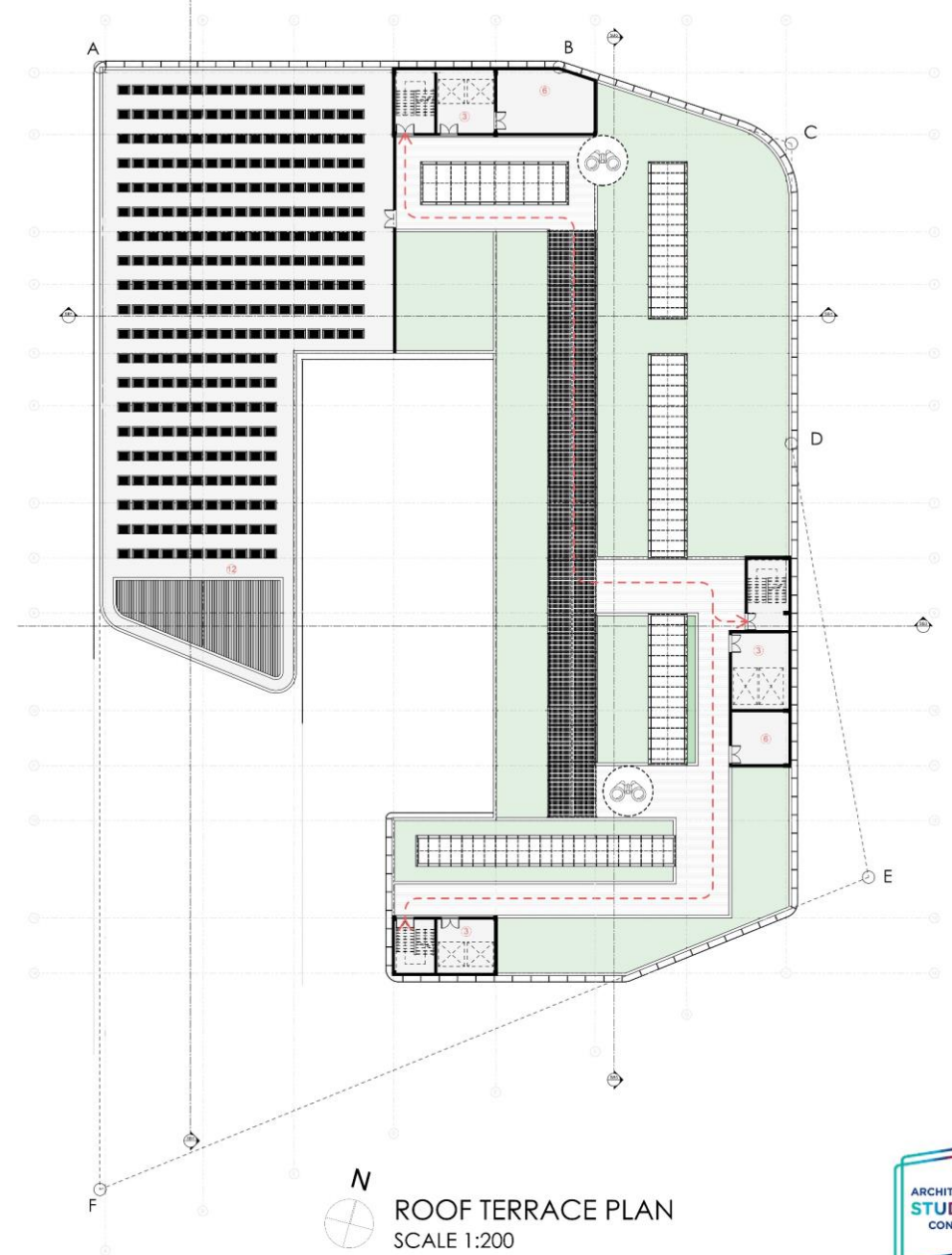
Building B roof terrace is designed to accommodate horticultural activity (1 150m²), featuring an array of solar panels (286 solar panels across 800m²) to provide passive energy usage to the building. Storage space is also provided for agricultural activity. This space has provides expansive views across the immediate farming community and provides the user of the space with a break away into a simple natural environment. Large aluminium framed glass composite skylights are brought in to promote the amount of natural light entering into the building.

BUILDING A SURFACES:

- Horticultural Space
- Covered Surfaces
- Fire Escape Routes

ROOM ALLOCATIONS:

- 1 Family Unit
- 2 Double Unit
- 3 Circulation Services
- 4 Waste Management
- 5 Studio Unit
- 6 Storage Facility
- 7 Electrical Service Room
- 8 Laundry Facility
- 9 Coffee Lounge
- 10 Lobby Lounge
- 11 Viewing Patio
- 12 Solar Energy System



BUILDING B - NEW CÖNSTRUCTION

BUILDING B - ELEVÄTIONS ÄND SECTIÖNS

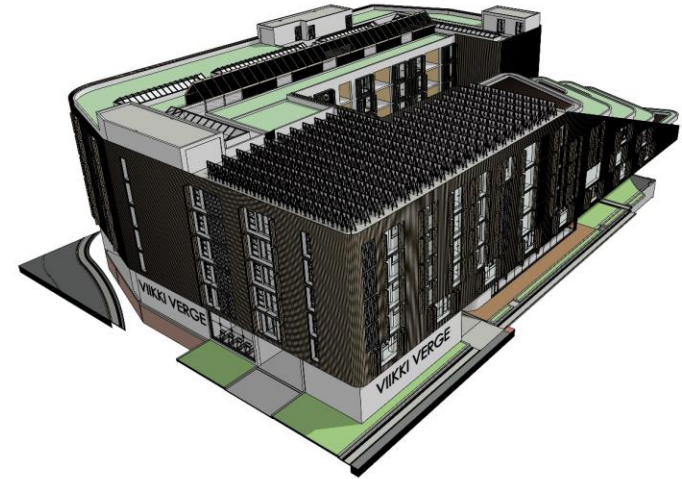
Manufactured in Finland using natural processes and free from chemicals, Lunawood ThermoWood® cladding presents an enduring and eco-friendly option for exterior construction. Combining visual charm, resilience, and ecological mindfulness, this thermally modified cladding withstands harsh weather, promising extended longevity with minimal upkeep requirements. It serves as a fitting choice for building exteriors with appealing wood cladding that prioritizes environmental considerations.



WEST ELEVATION
SCALE 1:200



SECTION B4
SCALE 1:200



ISOMETRIC - WITH OUTER SKIN

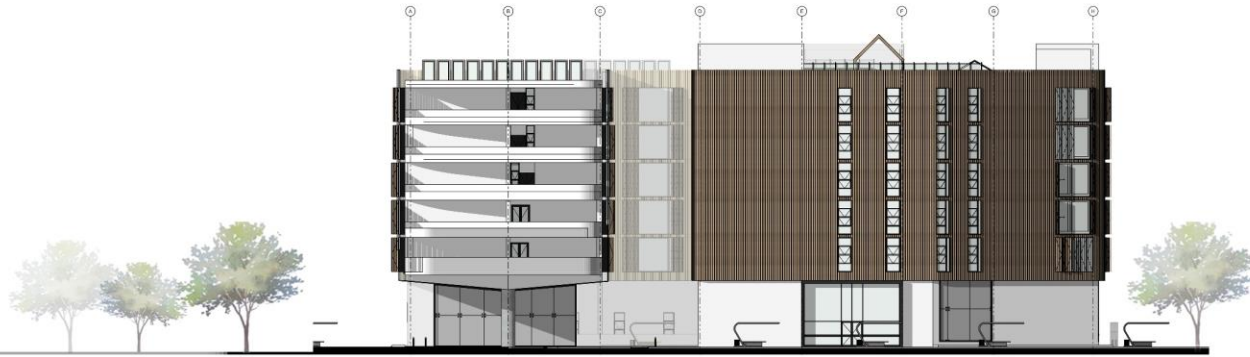


ISOMETRIC - REMOVED SKIN

BUILDING B - NEW CÖNSTRUCTION

BUILDING B - ELEVATIONS AND SECTIONS

This seven-level building features a ground-floor commercial space with a soaring roof for a grand experience. Two wings, contrasting in form, define the space. The western wing houses family-oriented units and is supported by four large concrete columns spanning a glass facade. The eastern wing accommodates double and single units. Together, they create a courtyard, fostering social opportunities. This design seamlessly blends functionality with social interaction, offering a unique architectural experience.



SOUTH ELEVATION
SCALE 1:200



SECTION B3
SCALE 1:200



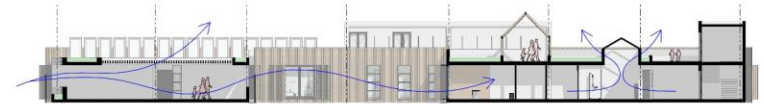
MORNING SUN

- skylights and openings in slabs allow the daylight to filter through, heating up internal spaces.



AFTERNOON SUN

- filters through into the courtyard of building B, heating up the facade to a more comfortable temperature.



AIR CIRCULATION

- skylights with louvre vents allow for movement of air through the corridors of the building and adequately ventilating spaces.



PRIVACY

- timber shutters, operated manually are controlled by the occupant of the unit where they can also control the air movement and shading of their unit.



HORTICULTURE

- green roofs with the intention of agricultural activity, can also contribute to the heat gain and heat loss of the building.



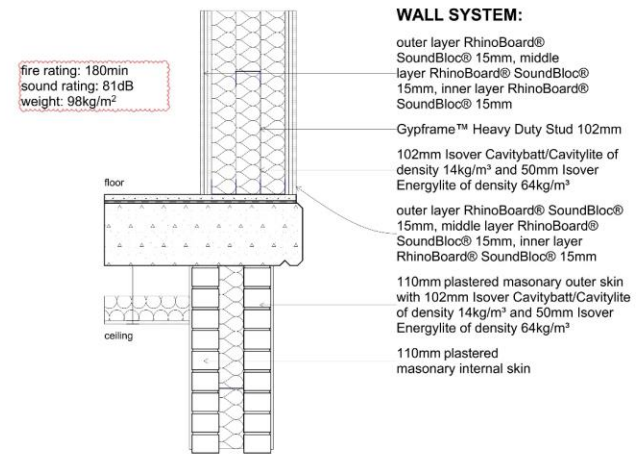
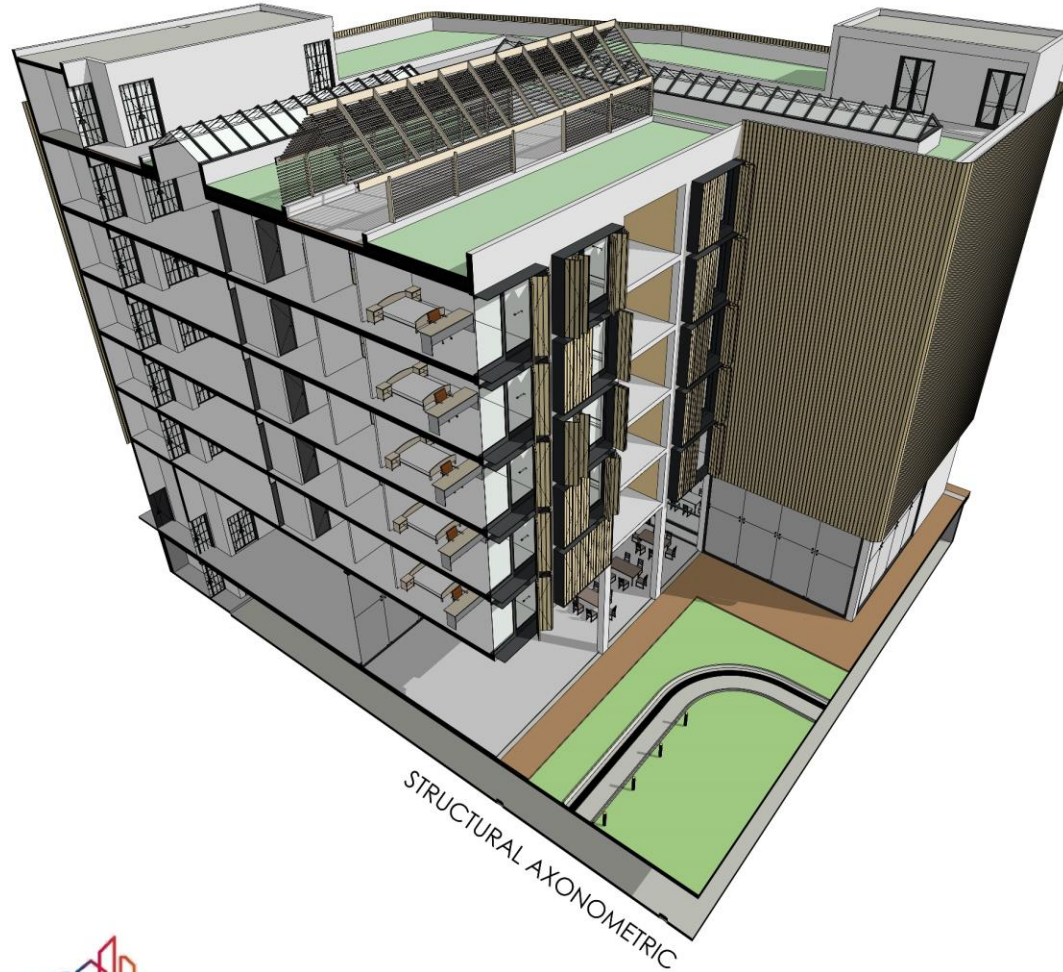
ACOUSTIC ABSORPTION

- the thermowood facade will better the acoustic performance through the building while also retaining heat as it serves as a double layer building skin.

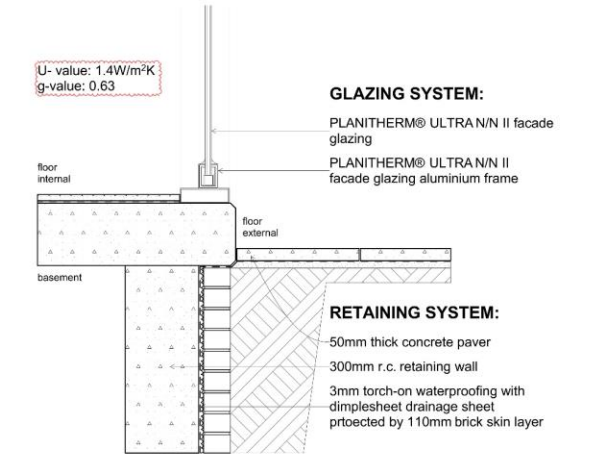
BUILDING B - NEW CÖNSTRUCTION

BUILDING B - PRÖDUCTS ÅND DETÅILS

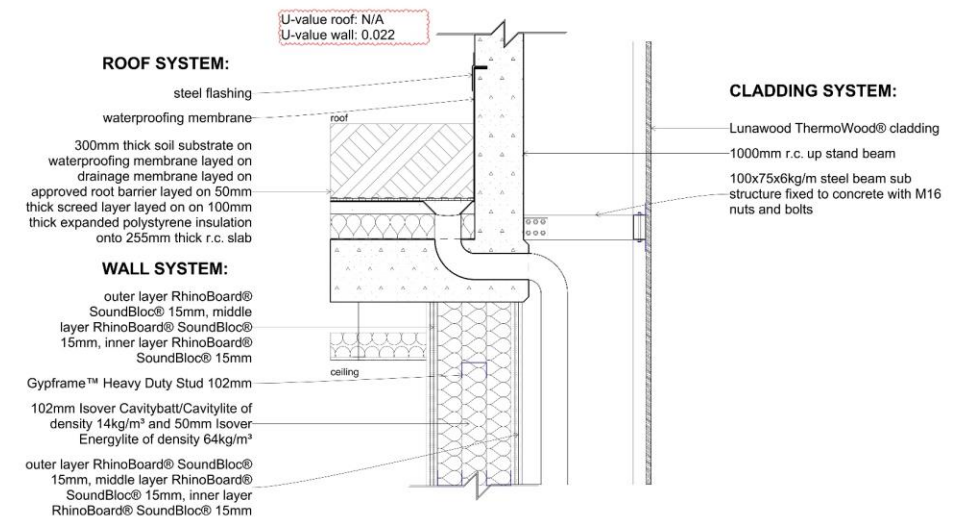
This meticulously designed structure in Viikki, Helsinki, incorporates world-class materials from Saint-Gobain, setting a new standard in comfortable and sustainable living. Dense insulation creates tranquility, shielding inhabitants from city noise. The facade, adorned with Lunawood ThermoWood® timber cladding, serves as a secondary skin, deflecting sounds from nearby roads and tram lines. This innovative approach ensures a serene living environment, enhancing residents' quality of life. Through meticulous attention to detail, this building stands as a beacon of modern living, blending comfort, sustainability, and functionality in Viikki's vibrant landscape. Building A and building B share the same details and values.



DETAIL 1: BUILDING EXTERNAL WALL
SCALE 1:10



DETAIL 2: GLAZING FACADE
SCALE 1:10

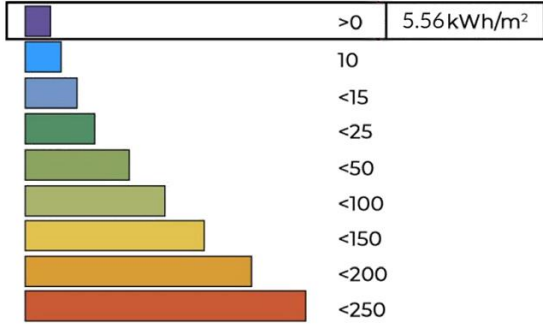


DETAIL 3: ROOF EDGE
SCALE 1:10

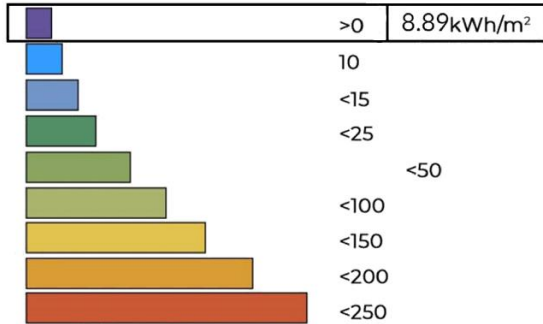
BUILDING B - NEW CÖNSTRUCTION

BUILDING B - ENERGY CÄLCULÄTÖNS

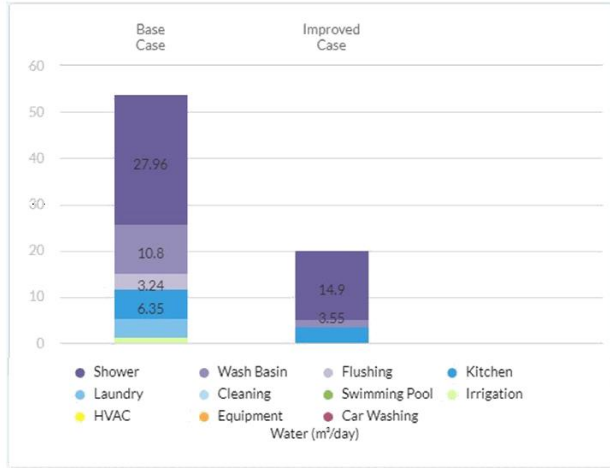
Calculated on eastern section of the building



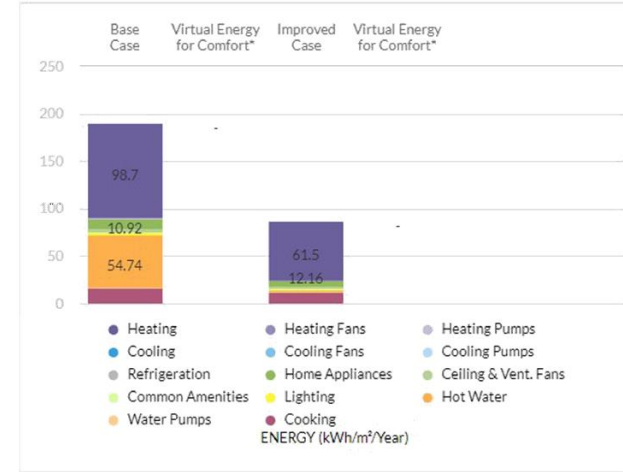
HEATING DEMAND



COOLING DEMAND



WATER SAVINGS 62.49%



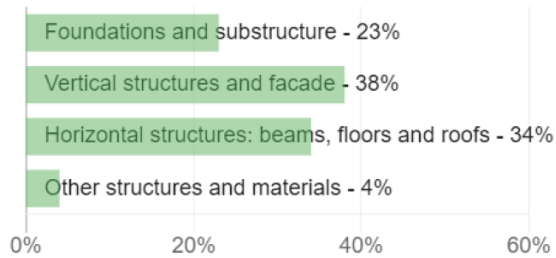
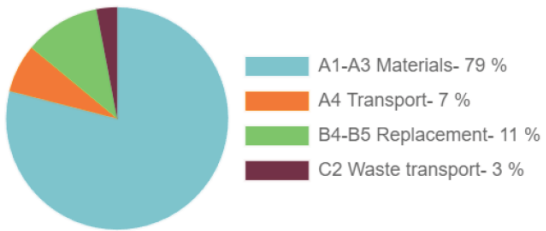
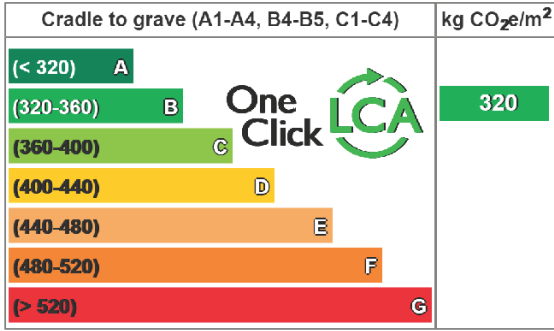
ENERGY SAVINGS 54.10%

Results	Improved Case EPI (kWh/m²/year)
Final Energy Use (kWh/Month)	88.0
48.453	
Final Water Use (m³/Month/Apartment)	13.5
614	
Final Operational CO ₂ Emissions (tCO ₂ /Month)	75.14
5.56	
Final Embodied Carbon (kg CO ₂ e/m²)	% Increase in cost
575	555.89%
Final Utility Cost (EUR/Month)	Payback in Years (Yrs.)
7.315	More than 50 years
Subproject Floor Area (m²)	Number of People Impacted (No./Year)
6,645	225
Energy Savings (MWh/Year)	Base Case - Refrigerant Global Warming Potential (tCO ₂ e/Year/Apartment)
684.44	5.6
Water Savings (m³/Year)	Improved Case - Refrigerant Global Warming Potential (tCO ₂ e/Year/Apartment)
12,278.50	5.6
Operational CO ₂ Savings (tCO ₂ /Year)	District Heating Demand (kWh/Month)
74.28	150.41
Embodied Carbon Savings (tCO ₂ e)	
-48.89	
Utility Cost Savings in USD (USD/Year)	Thermal Energy Saving for District Heating (kWh/Year)
178,081.89	-66.55
Utility Cost Savings in Local Currency (Million EUR/Year)	
0.164	
Base Case EPI (kWh/m²/year)	
191.0	

Energy Efficiency Measures 54.10%	
✓ EEM01* Window-to-Wall Ratio: 24%	✓ EEM09* Efficiency of Glass: U-Value 0.98 W/m²-K, SHGC 0.6 and VT 0.45
Base Case Value: 30%	Base Case Value: 1.4 W/m²-K & SHGC 0.8 & VT 0.7
✓ EEM02 Reflective Roof: Solar Reflectance Index 70	✓ EEM10 Air Infiltration of Envelope: 50% Reduction
Base Case Value: 45	Base Case Value: 0.3 L/s-m²
SRI: 70	EEM11 Natural Ventilation
✓ EEM03 Reflective Exterior Walls: Solar Reflectance Index 85	EEM12 Ceiling Fans
Base Case Value: 45	
✓ EEM04 External Shading Devices: Annual Average Shading Factor (AASF): 0.8	✓ EEM14 Variable Speed Drives
Base Case Value: No Shading	Base Case VFD for AHU: No
AASF: 0.8	Base Case VSD for Chilled Water Pumps: No
✓ EEM05* Insulation of Roof: U-value 0.12 W/m²-K	Base Case VSD for HW Pumps for Space Heating: Yes
Base Case Value: 0.15 W/m²-K	
✓ EEM06* Insulation of Ground/Raised Floor Slab: U-Value 0.43 W/m²-K	
Base Case Value: 0.35 W/m²-K	
U-Value (W/m²-K): 0.43	
Edge Insulation Type:None	
✓ EEM07 Green Roof	
Default	User Entry
Growing Media Depth (mm)	300.00
Leaf Area Index	5.00
Green Roof Area (%)	100%
	60
✓ EEM08* Insulation of Exterior Walls: U-Value 0.34 W/m²-K	
Base Case Value: 0.24 W/m²-K	
U-Value (W/m²-K): 0.34	

BUILDING B - NEW CÖNSTRUCTION

BUILDING B - LIFE CYCLE ANÁLISIS



CALCULATIONS FOR SOLAR ENERGY OUTPUT

BUILDING ROOF TOP:
 = 286 x 550W
 = 157 300/1000
 = 157.3 KWH

ANNUAL OUTPUT:
 SUN HOURS A YEAR = 5 HOURS x 365 DAYS
 = 1 802 HOURS/YEAR

DAILY SOLAR OUTPUT:
 KWH/DAY = KWH x DAYLIGHT IN HOURS
 = 157.3 x 5 HOURS
 = 786.5 KWH/DAY

ANNUAL OUTPUT = DAILY SOLAR OUTPUT x HOURS PER YEAR
 = 786.5 KWH x 1 802 HOURS PER YEAR
 = $\frac{1\,417\,273\text{ KWH/YEAR}}{100\,000}$
 = 14.17 MWH PER YEAR

