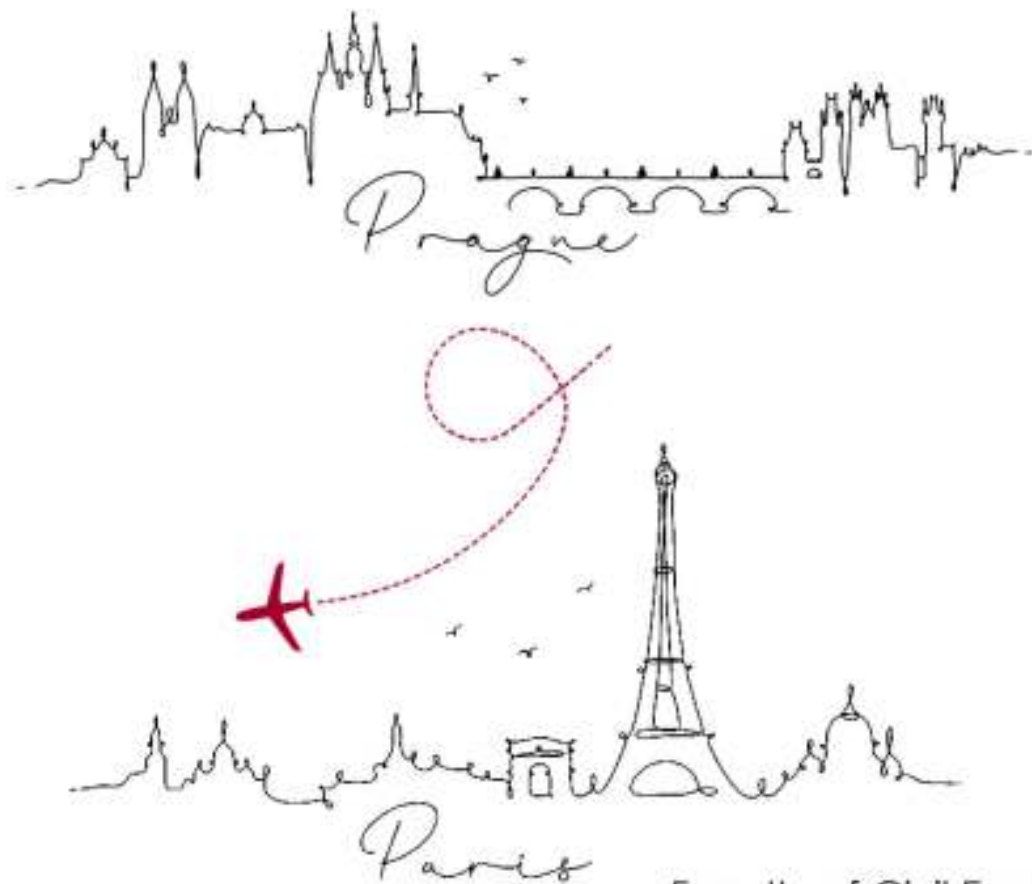


Jiří Petrželka, Kristýna Klůsová
Faculty of Civil Engineering
Czech Technical University in Prague
2020-2021





JIŘÍ PETRŽELKA



KRISTÝNA KLŮSOVÁ

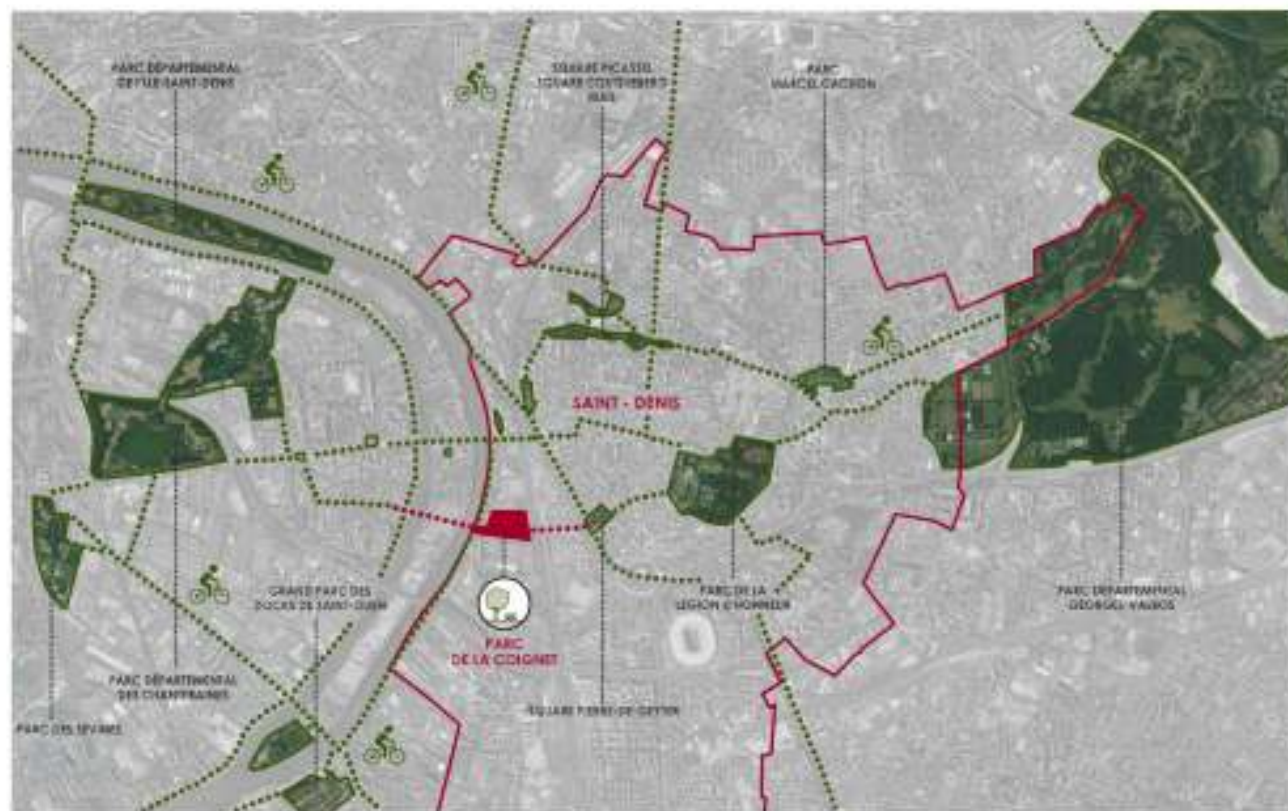


TEACHERS:

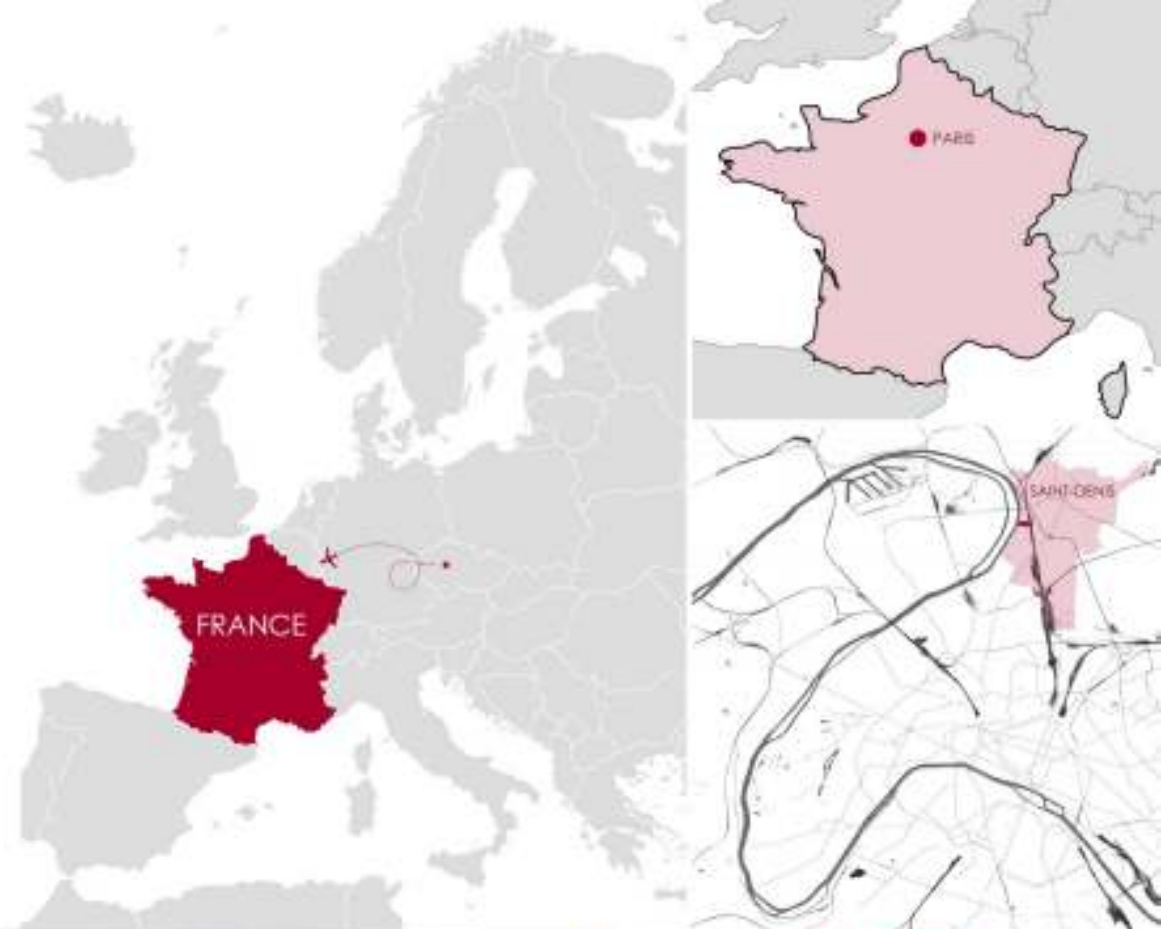
Ing. arch. Josef Smola
Ing. arch. Ladislav Kalivoda, CSc.
Ing. arch. Martin Stark
Akad. Arch. Aleš Brotánek
Ing. Jiří Tencar, Ph.D.
Ing. Jiří Novák, Ph.D.
Ing. Marek Pokorný, Ph.D

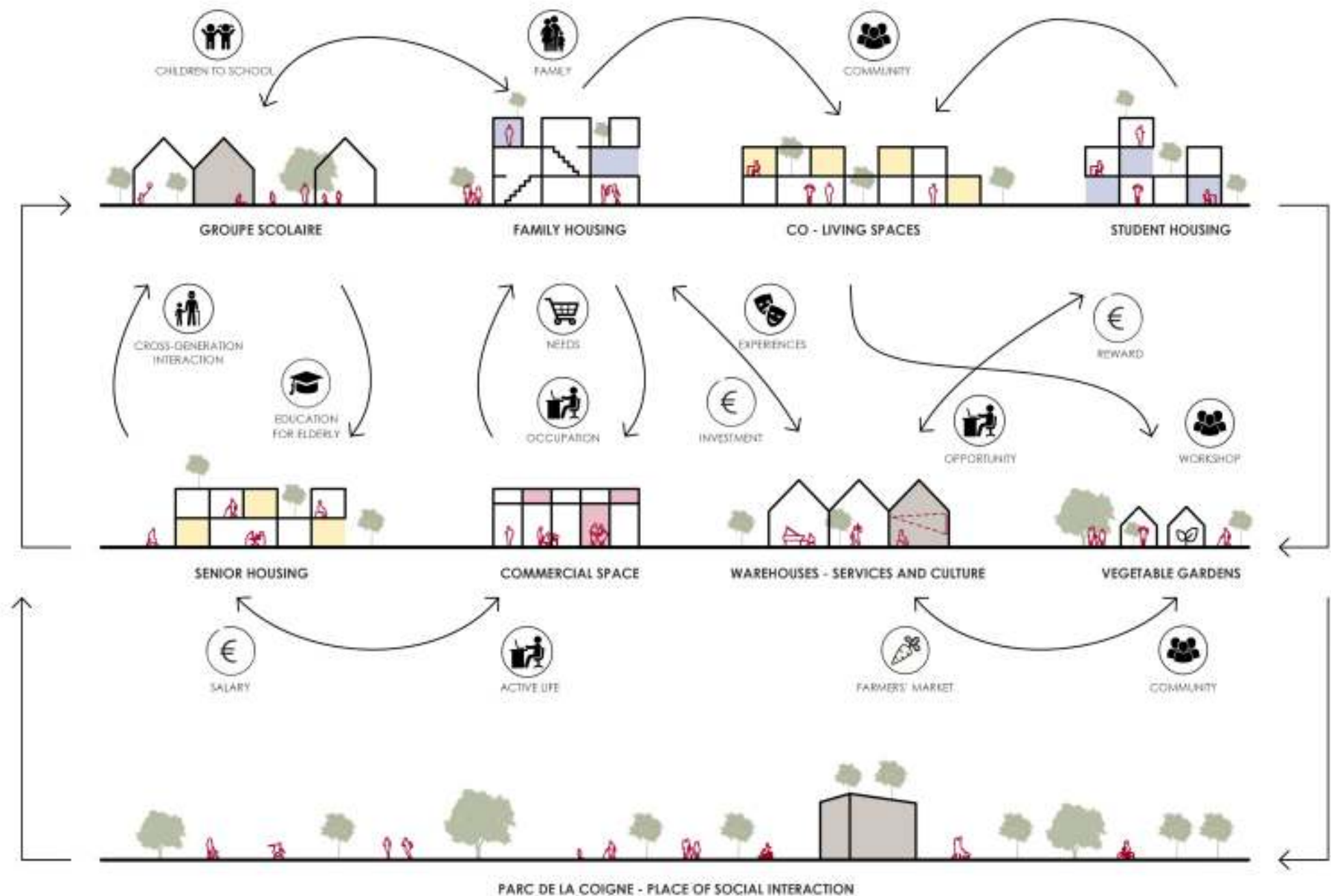
Faculty of Civil Engineering, Czech Technical University in Prague

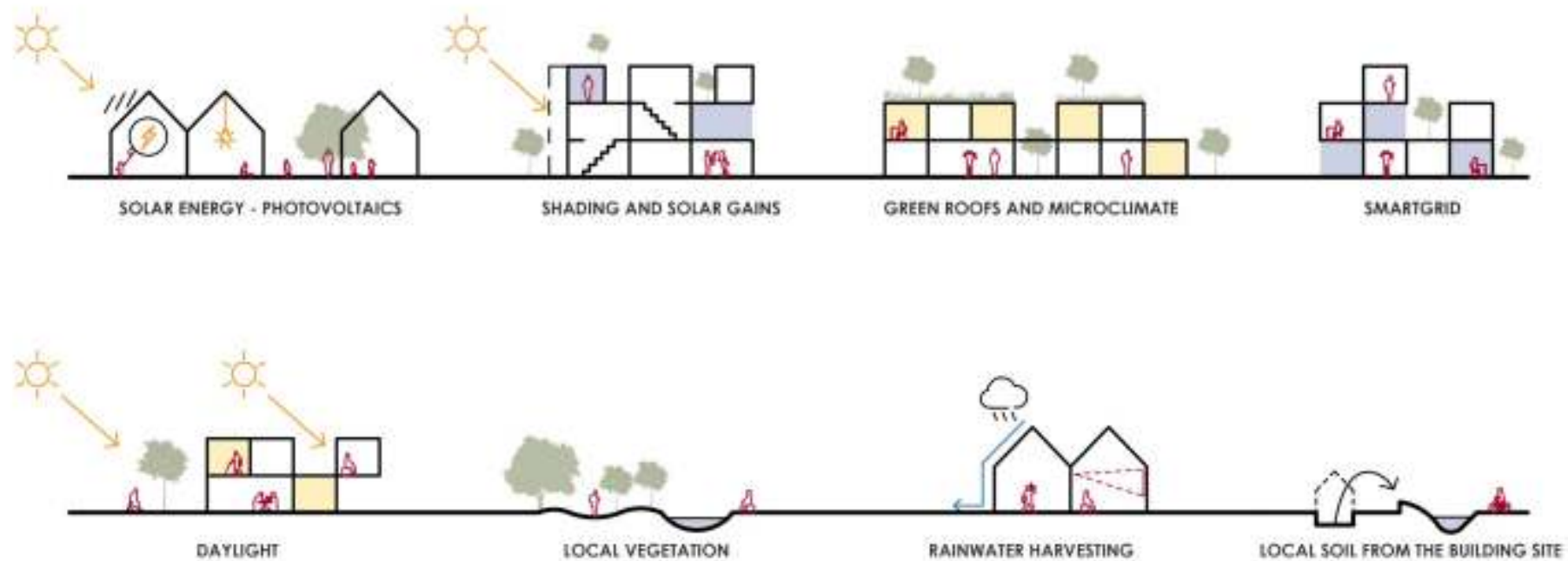


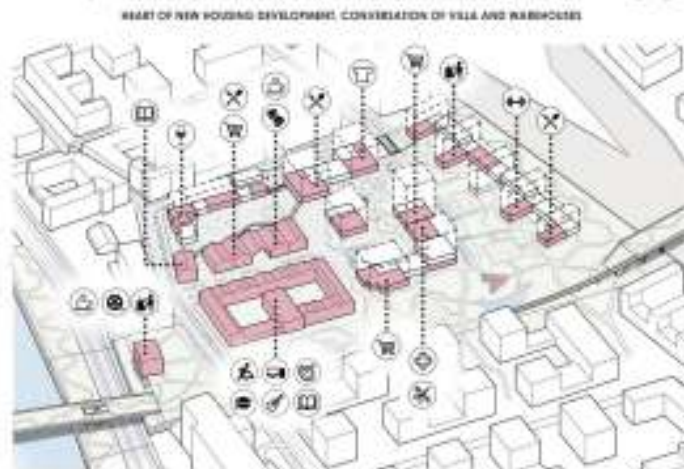


CONNECTION OF THE AREA INTO THE CITY PARK NETWORK VIA CYCLING ROUTES









261

1044

249

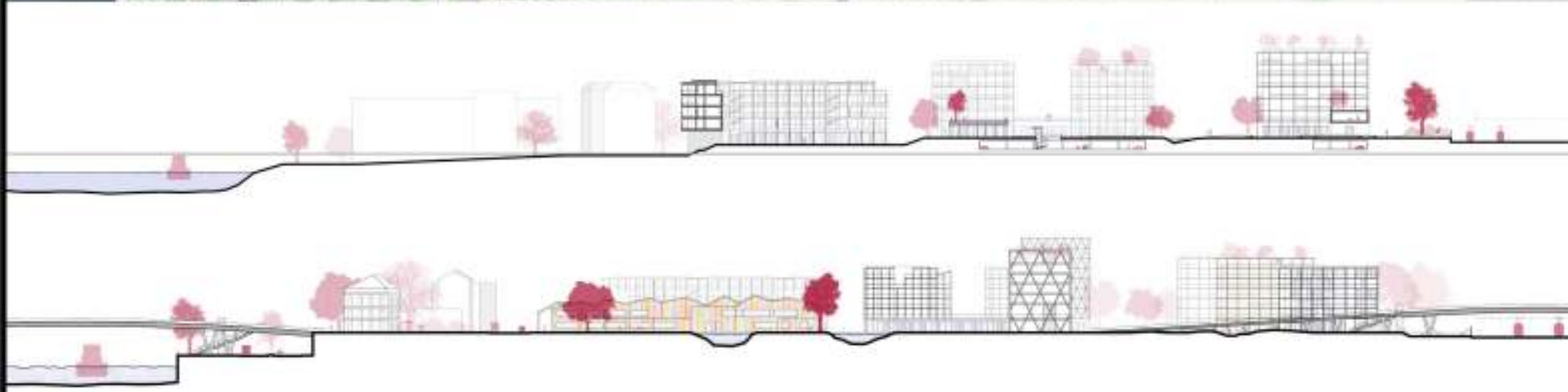
17

40

STORAGE UNIT



PARKING SPOT





ARCHITECTURE



261



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17



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LES ENTREPOTS COIGNET - WAREHOUSES

EXPOSED MASONRY



WOODEN CEILING



STEEL STRUCTURE



PHOTOVOLTAICS



GLASS



EPOXY FLOOR





REFLECTIVE GLASS
SHADOWING LAMELLA



STUDY ROOM
90 m²



COMMERCIAL
225 m²



LIBRARY
200 m²



PHOTOVOLTAIC PANELS
INTEGRATED ROOF



CAFE AND BAR
140 m²



MULTIFUNCTIONAL HALL
POYER 270 + 120 m²



COMMERCIAL
113 m²



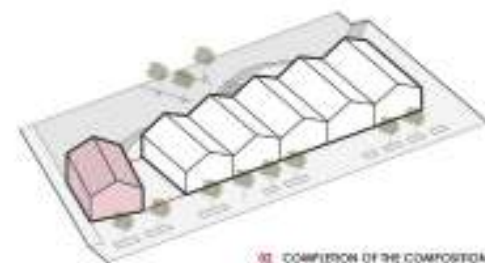
COMMERCIAL
113 m²



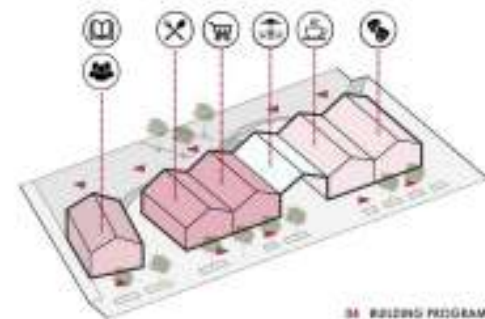
01 STREET LINE BUILDING CONVERSION



02 SPACE COMBUSTION



03 COMPARISON OF THE COMPOSITION



04 BUILDING PROGRAM





LA MAISON COIGNET - VILLA

EXPOSED CONCRETE



PARQUETTE FLOOR



STEEL ELEMENTS



OLD PLASTERWORK



GLASS ELEMENTS

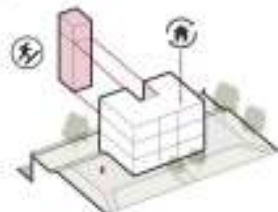


GREEN ROOF





01 SPACE VIEW



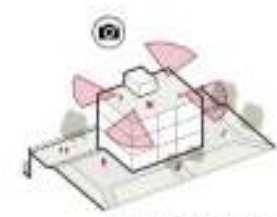
02 IMPERMEABLE AND RAINWATER



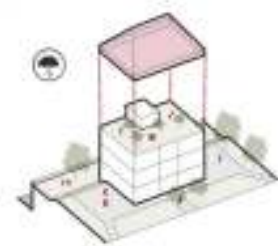
03 OPEN LAYOUT



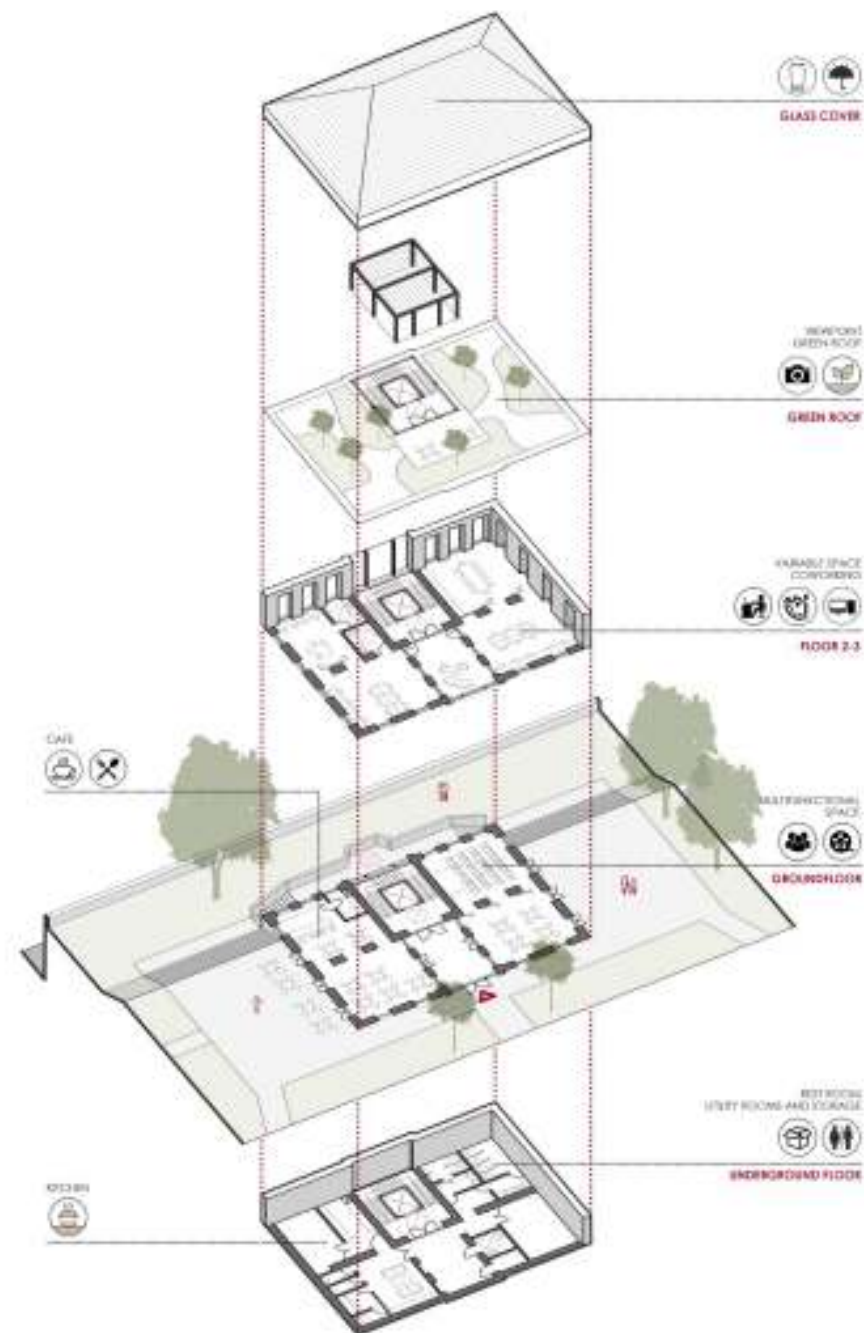
04 KINABLE AND FLEXIBLE SPACE



05 GREEN ROOF AND VIEWPORT



06 PROTECTION - GLASS COVER





EXPOSED CONCRETE



GLASS



STEEL ELEMENTS



GREEN ROOF



WHITE PLASTER



RUBBER FLOORING



POLYCARBONATE



TIMBER CLADDING



METAL COVERING



PHOTOVOLTAICS



GLULAM + CLT



ECOPHON



01 SCHOOL LOOKIE



02 CONNECTION



03 CLIMBING WALL



04 VARIABLE SEATING



05 STORAGE + SEATING



06 CREATIVE WALL + SEATING



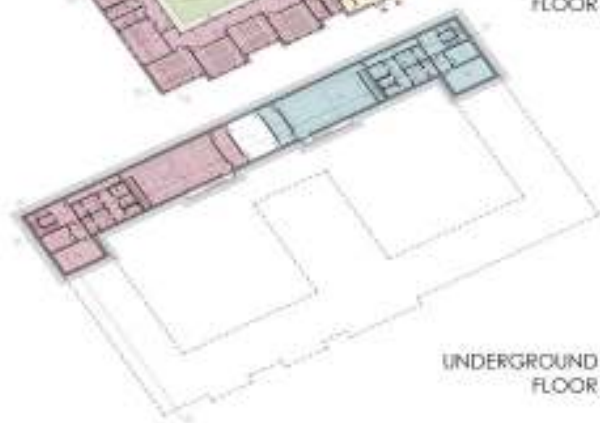
ROOF



FLOOR 2

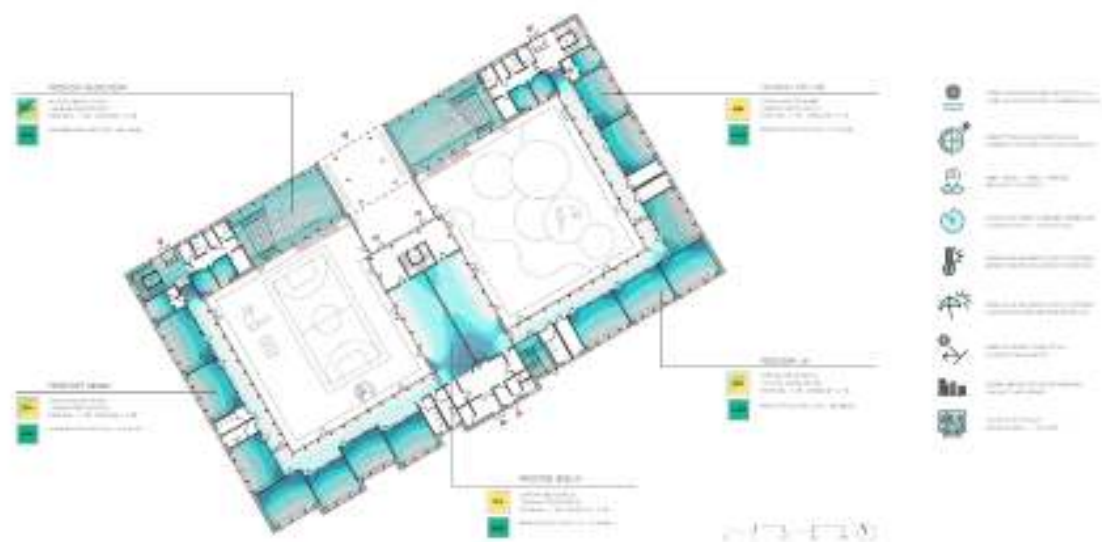


GROUND FLOOR



UNDERGROUND FLOOR





RESIDENTIAL BUILDINGS



261



1044



249



17



40







ONE BEDROOM APT

requirement	18 m ²	22 pcs
design	21 m ²	8,43 %



ONE BEDROOM APT

requirement	30 m ²	21 pcs
design	35 m ²	8,05 %



TWO BEDROOM APT

requirement	46 m ²	52 pcs
design	51 m ²	19,92 %



THREE BEDROOM APT

requirement	60 m ²	56 pcs
design	63 m ²	21,46 %



FOUR BEDROOM APT

requirement	73 m ²	41 pcs
design	75 m ²	15,71 %



FIVE BEDROOM APT

requirement	88 m ²	32 pcs
design	92 m ²	12,26 %



SIX BEDROOM APT

requirement	99 m ²	22 pcs
design	104 m ²	8,43 %



SEVEN BEDROOM APT

requirement	114 m ²	15 pcs
design	117 m ²	5,75 %

261

Housing units

TOTAL

166

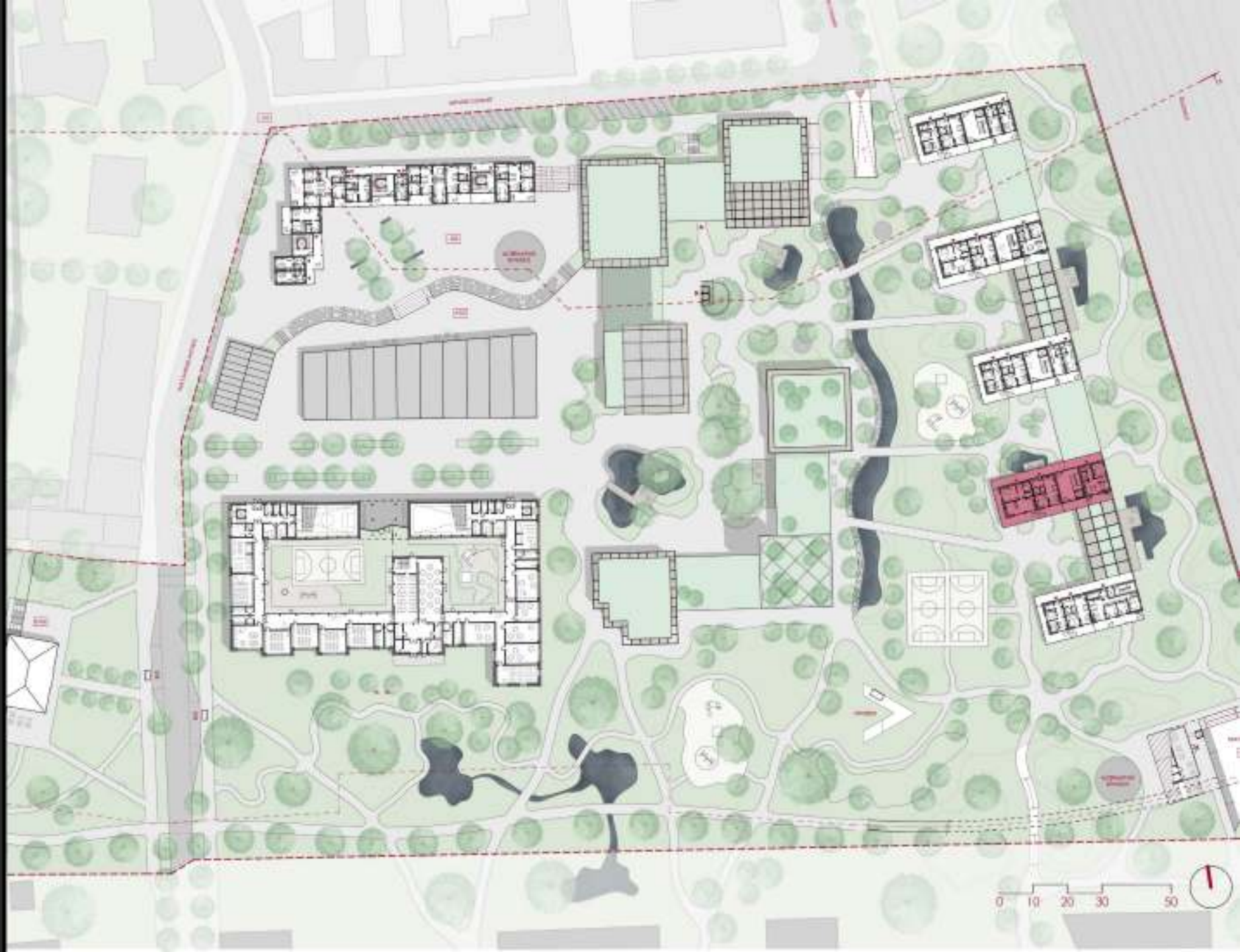
Housing units

> 60 m²

63,6 %

Housing units

> 60 %





ONE BEDROOM APT

requirement	18 m2	22 pcs
design	21 m2	8,43 %

ONE BEDROOM APT

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Housing units

TOTAL

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Housing units

> 60 m2

63,6 %

Housing units

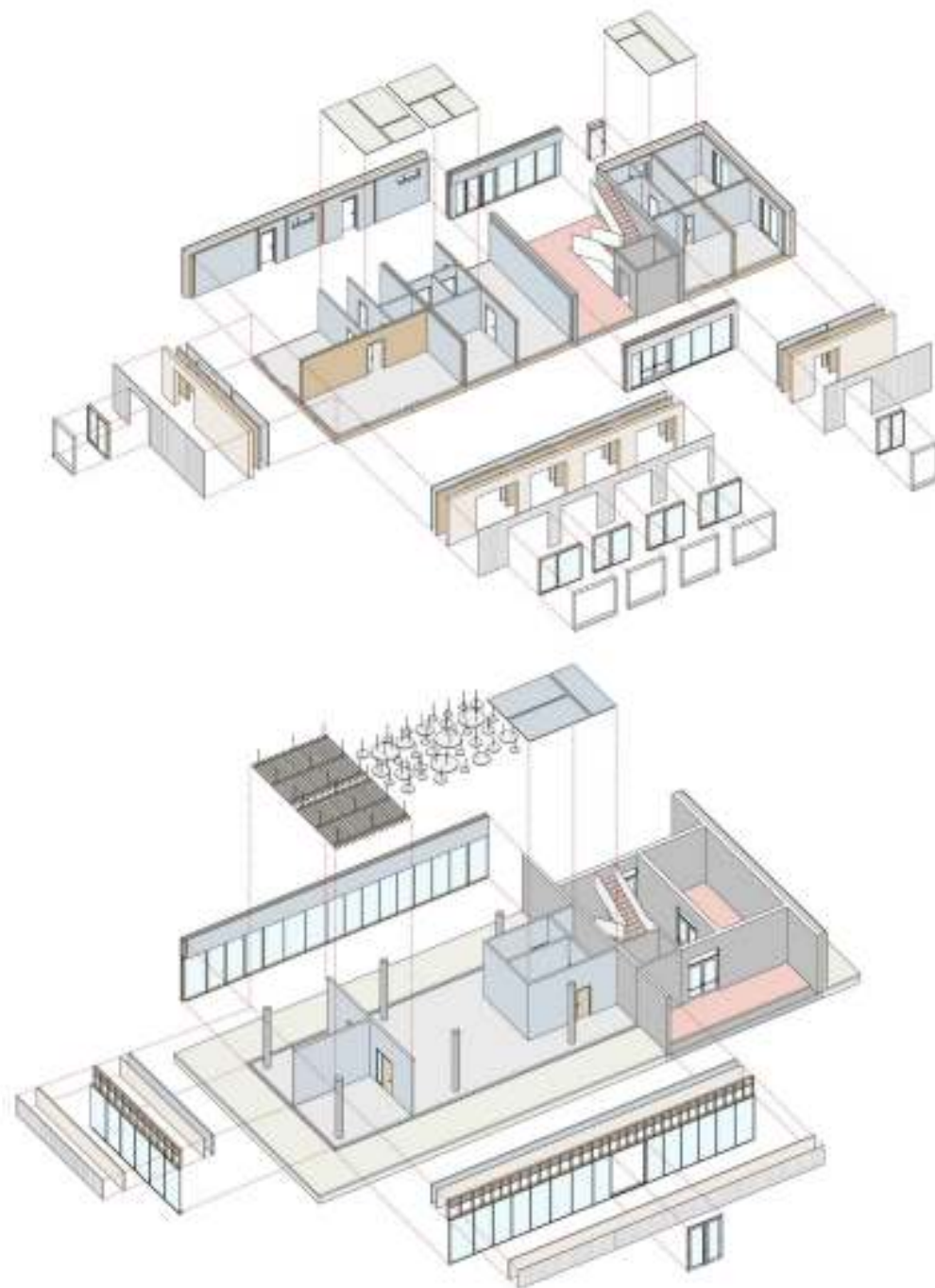
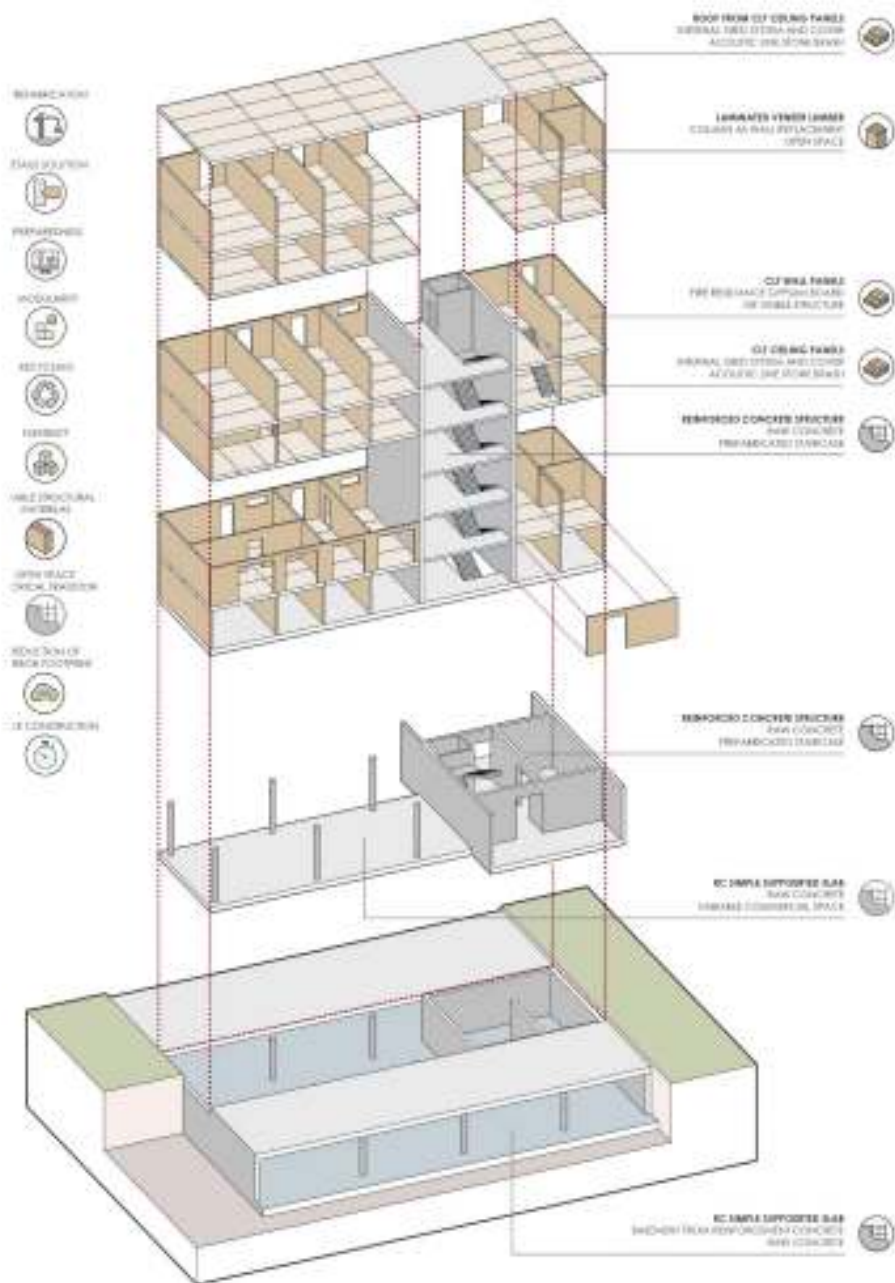
> 60 %





TECHNICAL PART





ISOVER

weber

Rigips

Beeptron

GLASSOLUTIONS

ROFORS

CLT FRANCE

POINT.P

sinbpla

EQUIOM

bimify

SIMONIN

total-fenêtres

CSTB

GRUPE ATLANTIC

STABALUX

GSE integration

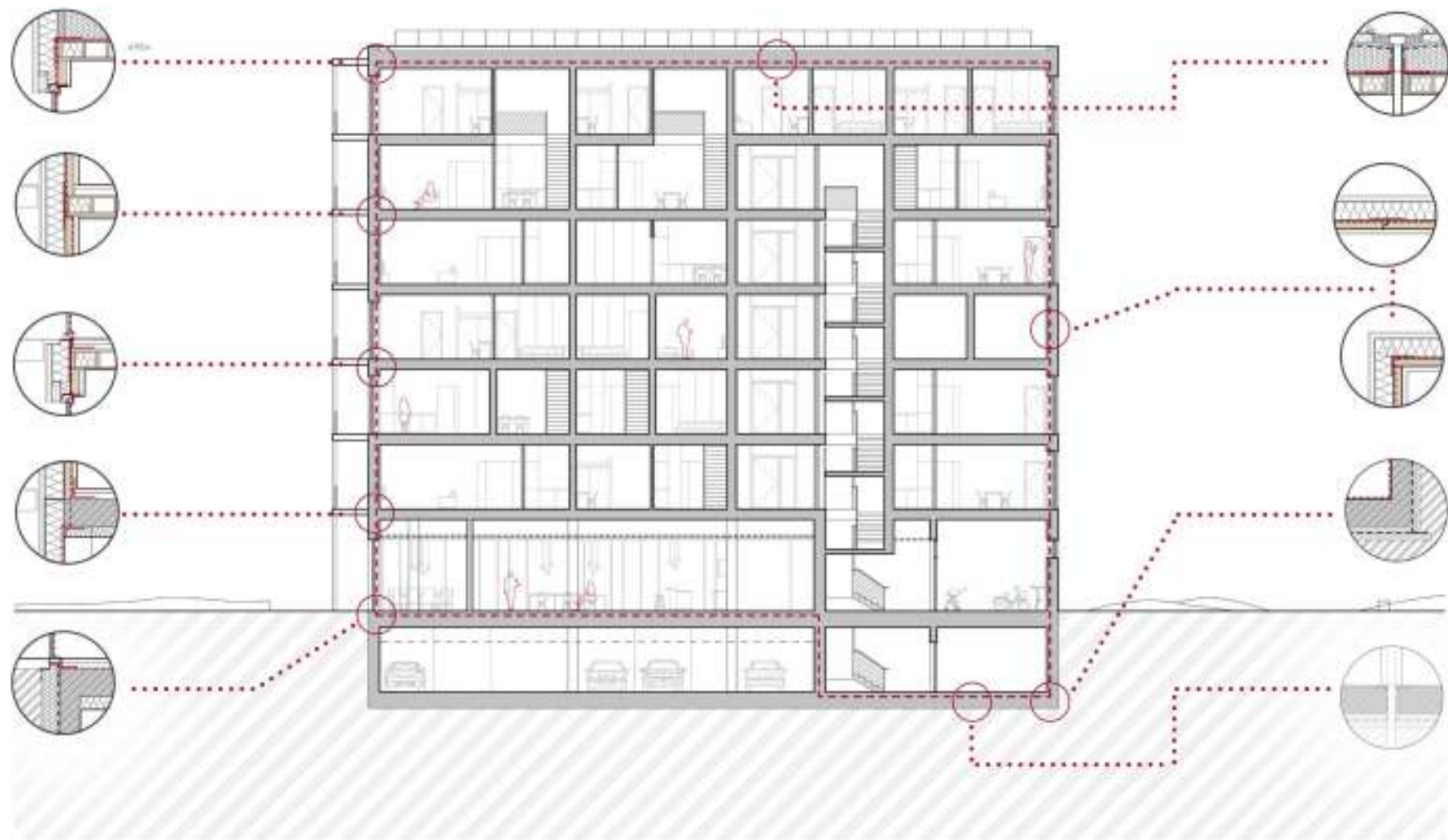
SMA

PARQUETS DE FRANCE

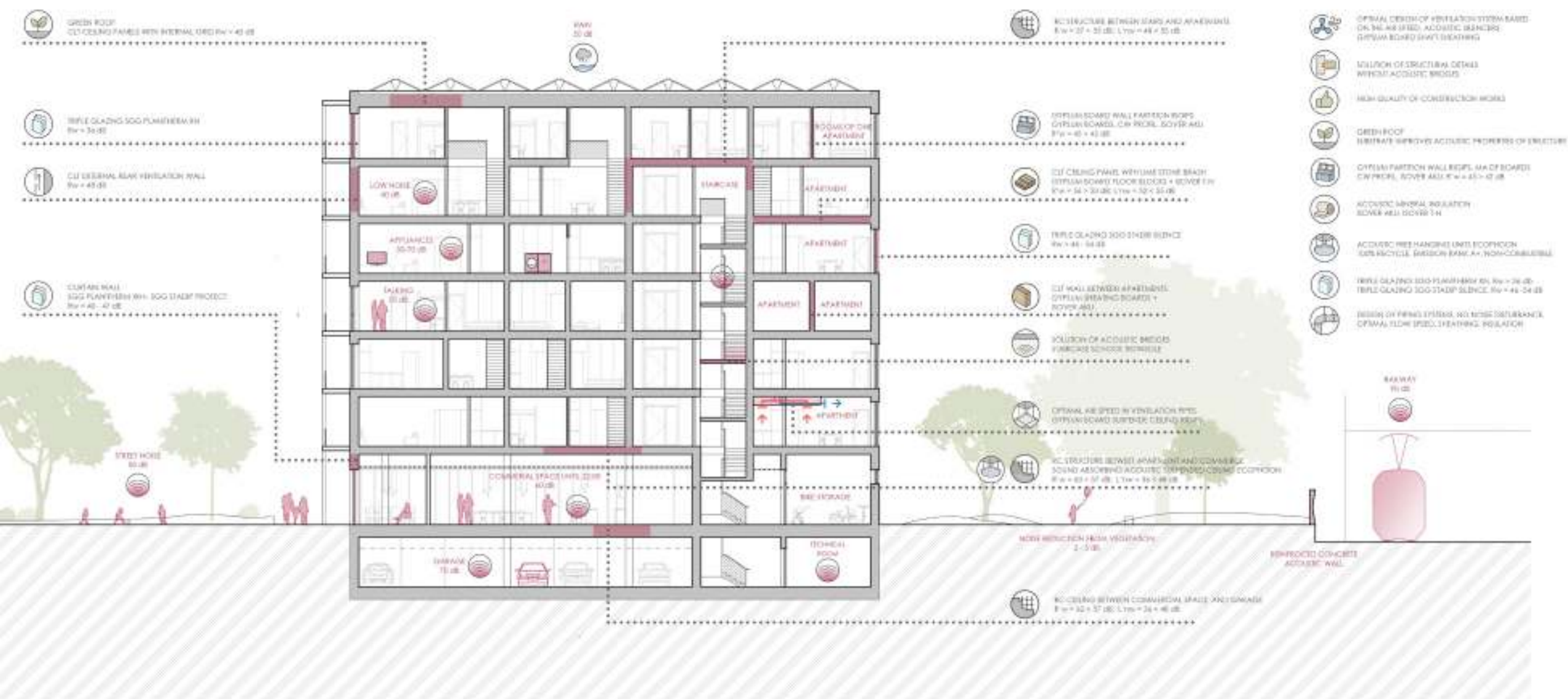
DESIGN PARQUET

DESIGN PARQUET

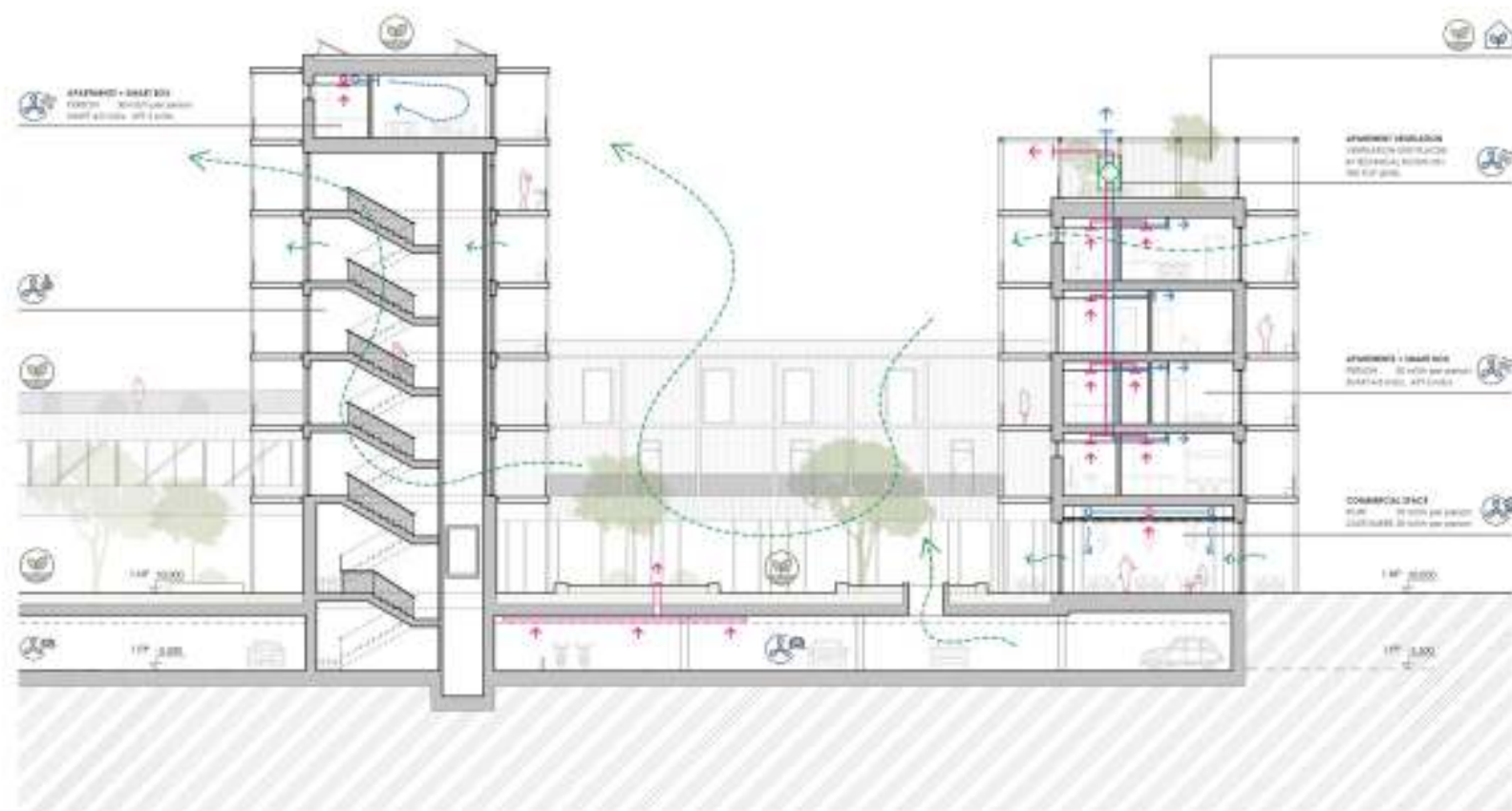
Fabrique en France



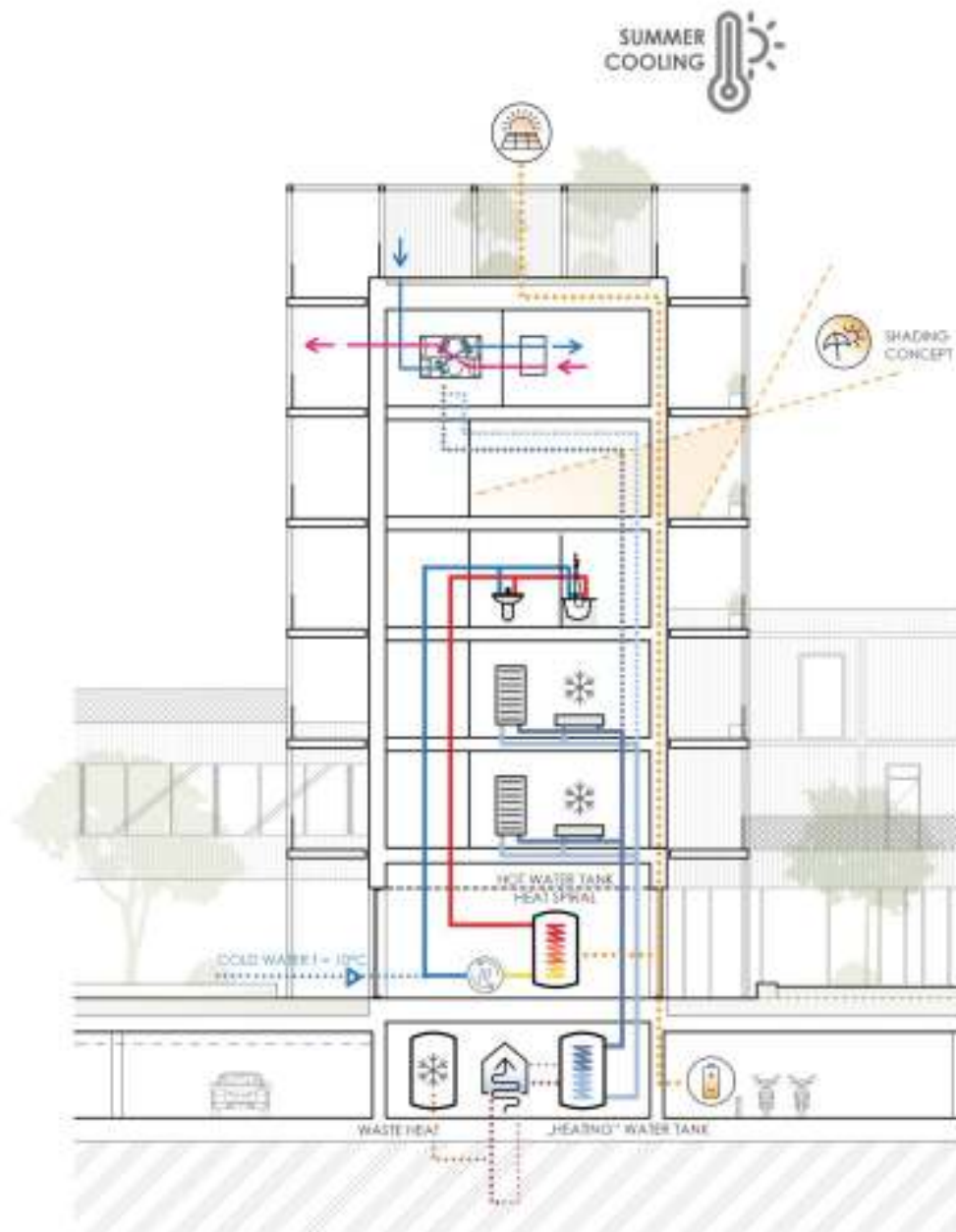
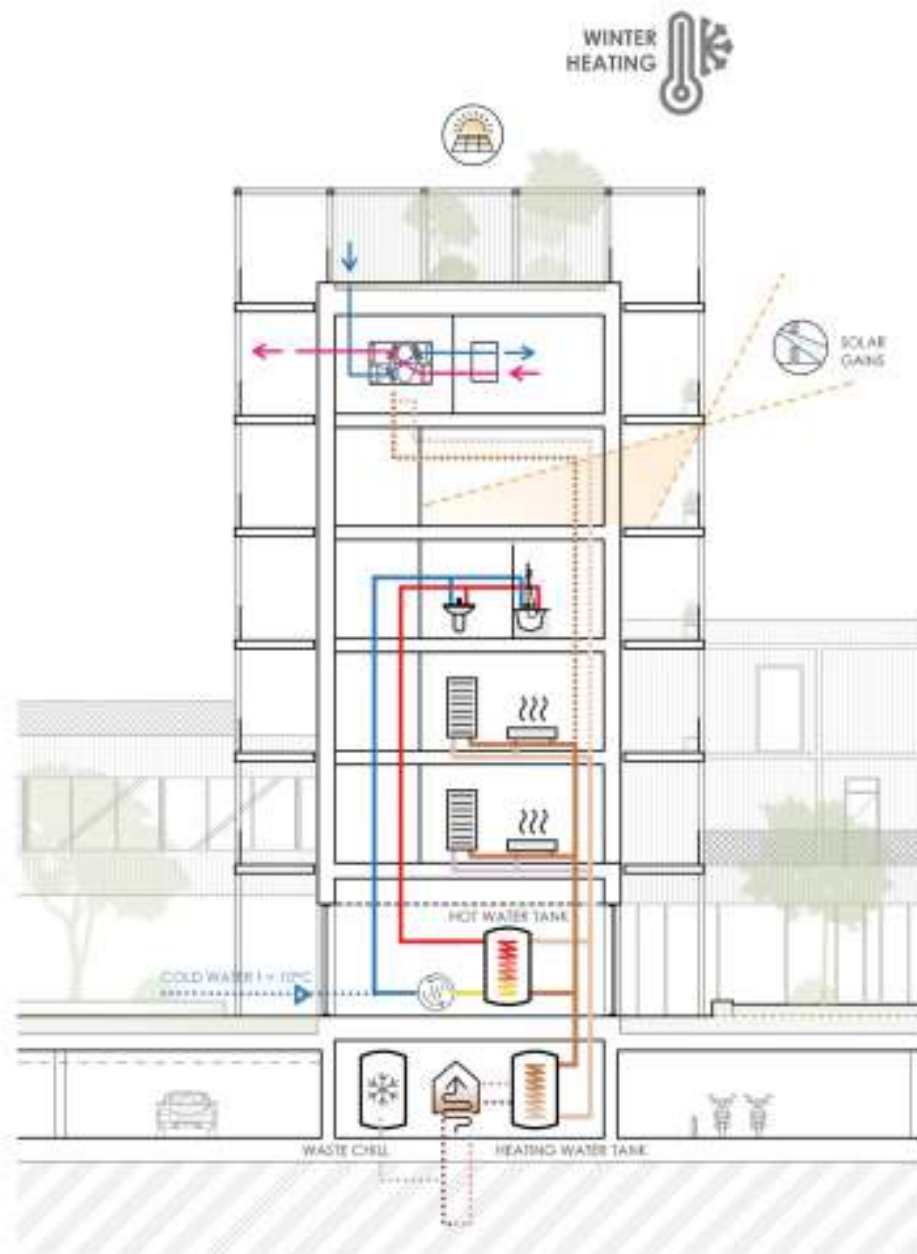
-  HIGH AIRTIGHTNESS OF THE BUILDING ENVELOPE
n50 < 0.5 h/m³
-  MECHANICAL BALANCED VENTILATION
HEAT RECOVERY - max. EFFICIENCY 90%
-  CORRECT STRUCTURAL DETAILS AND PRECISELY
MOORED STRUCTURAL CONNECTIONS
-  BLOW-TOUR TEST FOR VERIFICATION OF
THE BUILDING AIRTIGHTNESS
-  VERY FINE BUILDING CONSTRUCTION WORK
-  HIGH THERMAL INSULATION PROPERTIES
THERMAL RESISTANCE R-VALUE
-  CLT FRAME STRUCTURE
CONNECTIONS GLUED BY ADHESIVE FILLS
CONNECTIONS SEALED UP BY VAPOUR BARRIER
-  REINFORCED CONCRETE STRUCTURE
ARTICULATED SEALING BY COMPRESSIVE
CONCRETE LAYER
-  THERMAL INSULATING TRIPLE GLAZING
THREE FRAME STRUCTURE
MULTIPLE WINDOW FRAME SPACERS
-  OSB 4 BOARD TONGUE AND GROOVE JOINT
BOARD CONNECTIONS SEALED UP BY VAPOUR
BARRIER LAYER
-  ARTICULATED SEALING OF SEALING OF STRUCTURAL
CONNECTIONS BY VAPOUR BARRIER LAYER
BARRIER
-  MINERALS WOOL THROUGH THE BUILDING ENVELOPE
SEALED UP BY THERMAL INSULATING LAYER

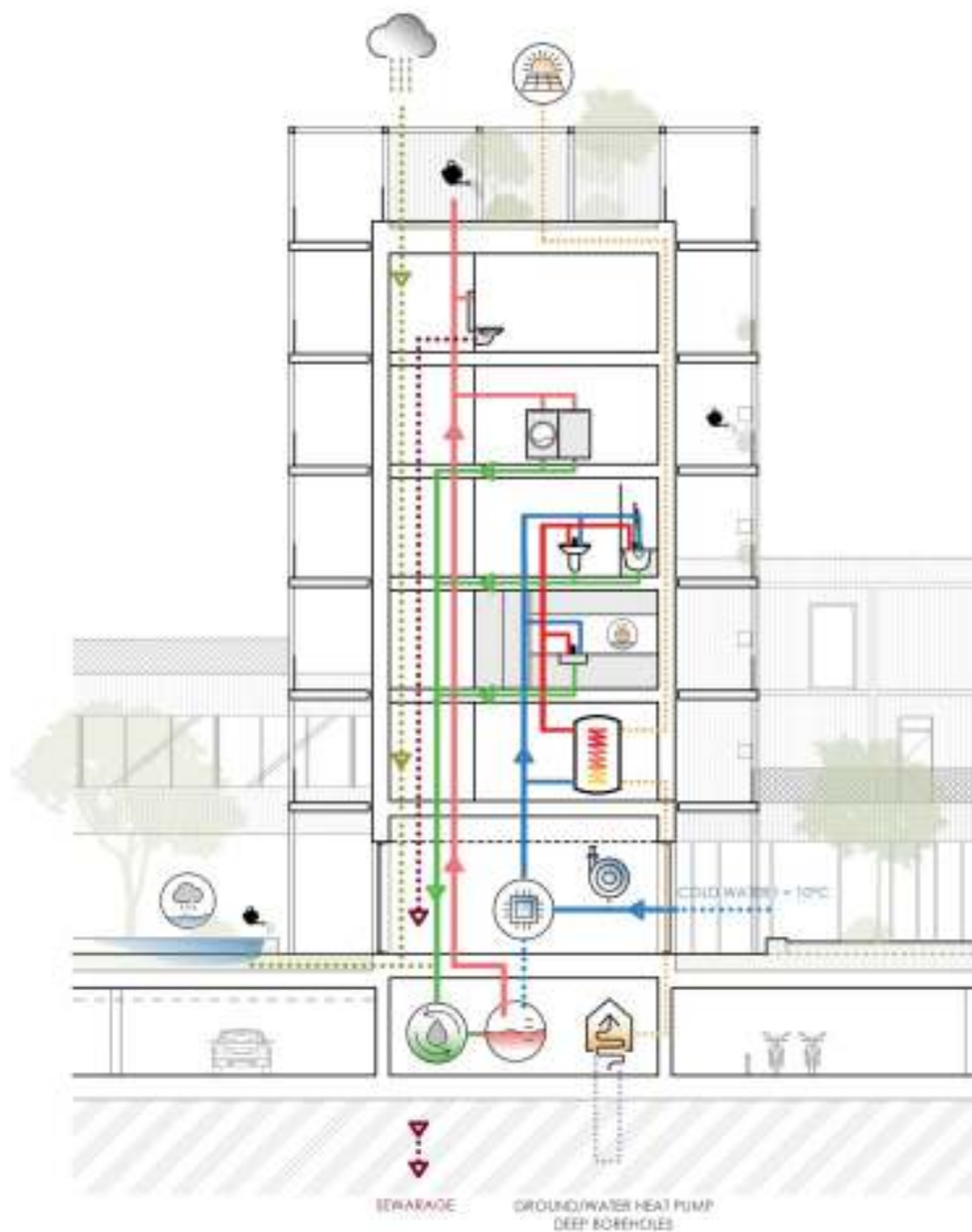






-  MECHANICAL BALANCED FRESH AIR SYSTEM WITH HEAT RECOVERY
-  SYSTEM 3 ZONES AND ROOMS WITH ZONE VENTILATION
-  NATURAL VENTILATION EACH ENTRY ROOM IS DESIGNED WITH AN OPENABLE WINDOW
-  NATURAL VENTILATION WITH FRESH COOLING MODE
-  INDOOR MICROCLIMATE QUALITY AIR QUALITY OF BUILDING ENVELOPE
-  GROWING GARDEN - GROWING GREENHOUSE (INDOOR CLIMATE) AND NATURAL VENTILATION
-  SUMMER - HOT AIR IS COOLED DOWN FOR COMFORTABLE VALUES FOR BREWING
-  WINTER - COOL AIR IS HEATED UP FOR COMFORTABLE VALUES FOR BREWING
-  OPTIMAL AIR QUALITY
-  AIR AND COOLING SPACES ARE COOLED WITH COOL ENERGY FROM THE TALL OF THE BUILDING
-  FIRE AND SMOKE VENTILATION (IF OCCURS) NATURAL VENTS AND MECHANICAL VENTILATION
-  VENTILATION OF OVERHEATED GARAGE NATURAL VENTS AND MECHANICAL VENTILATION
-  VENTILATION SYSTEM FOR COMMERCIAL SPACE BALANCED MECHANICAL VENTILATION
-  HEAT RECOVERY SYSTEM MEDIUM EFFICIENCY B&B
-  DESIGN OF FRESH AIR SYSTEM: NO NOISE DISTURBANCE, OPTIMAL FLOW SPEED, MAXIMUM INSULATION
-  FIRE RESISTANCE OF VENTILATION SYSTEM WITH DAMPERS FOR FIRE SECTIONS
-  COMFORT - IMPROVED COOL AIR SPEED FRESH COMFORT - BETTER VENTILATION FRESH AIR FRESH - FRESH VENTILATION FRESH
-  SYSTEM MONITORING EFFECTIVELY REGULATES SYSTEM COMFORT





- COLD WATER FROM WATER SUPPLY SYSTEM
T = 10 °C
- HOT WATER: T = 30 °C - HYGIENE, COOKING
- WHITE WATER - FLUSHING, WASHING, DISHWASHER, WATERING
- GREY WATER: T max = 35 °C
SHOWER, SINK, WASHING MACHINE, DISHWASHER
- BLACK WATER - TOILET
- RAINWATER

CONTROL UNIT SWITCHES SOURCE OF WATER, GREYWATER/ BACKUP RAINWATER AND WATER FROM THE WATER SUPPLY SYSTEM

HYDRANT WATER SUPPLY

GREYWATER TANK
FILTERING MEMBRANE BIOLOGICAL REACTOR (MBR) WITH UV DISINFECTION

PRODUCED WHITE WATER TANK

HEAT RECOVERY FROM WASTEWATER
EFFICIENCY UP TO 40%

RAINWATER TANK
WATER HARVESTING POND

GROUND/WATER HEAT PUMP WITH
DEEP BOREHOLES

ACCUMULATION HOT WATER TANK WITH INTEGRATED
HEAT SPIRAL CONNECTED TO ENERGY FROM
PHOTOVOLTAICS, THEREFORE LESS ENERGY USED FOR
PREPARING HOT WATER

FIXTURES WITH MAX. WATER SAVINGS
(FAUCET AERATOR)

SYSTEM MONITORING

ANALYSIS OF DAILY WATER CONSUMPTION PER PERSON (C/L / FR)

1 PERSON / DAY	C/L	FR	PRICE €/l
TOILET	23 l	38 l	0.15 €/l
HYGIENE	31 l	51 l	0.20 €/l
LAUNDRY	13 l	22 l	0.08 €/l
DISHWASHING	9 l	13 l	0.06 €/l
COOKING	4 l	7 l	0.03 €/l
HAND WASHING	3 l	8 l	0.04 €/l
OTHERS	5 l	8 l	0.04 €/l
	90 l	149 l	0.58 €/l PER. * DAY

CONSUMPTION PER PERSON PER YEAR IN FRANCE = 149 l = 0.58 € / 1 PER. * DAY

PRICE OF 1 m3 OF WATER FROM WATER SUPPLY SYSTEM IN FRANCE
= 3.92 €/m3 = 0.00392 €/l (2019)



OPERATIONAL WATER (GREY → WHITE)
approx. 83 l / 1 PER. * DAY = -0.32 € / 1 PER. * DAY

CLEAN WATER FROM THE WATER SUPPLY SYSTEM
approx. 83 l / 1 PER. * DAY = +0.25 € / 1 PER. * DAY

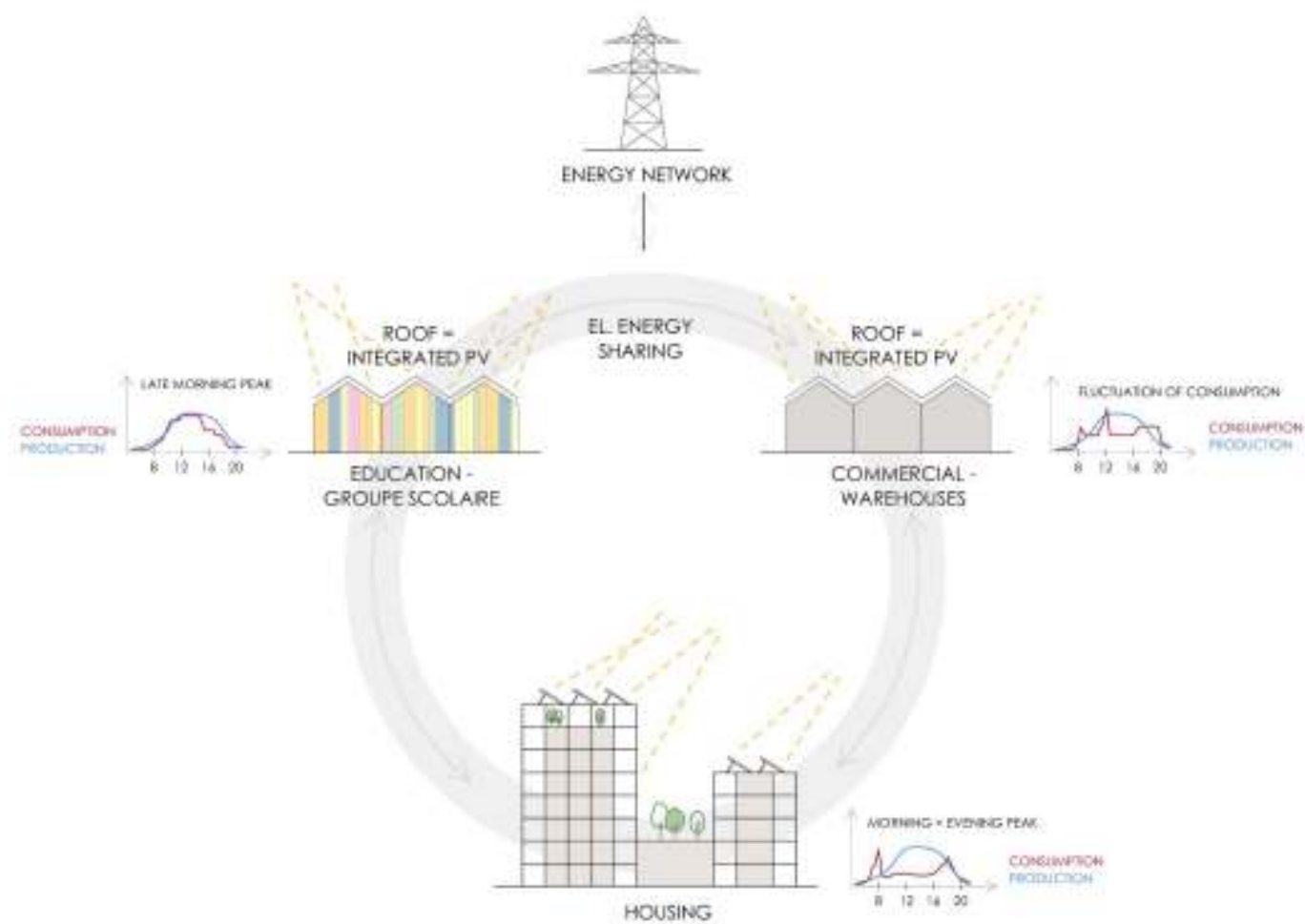
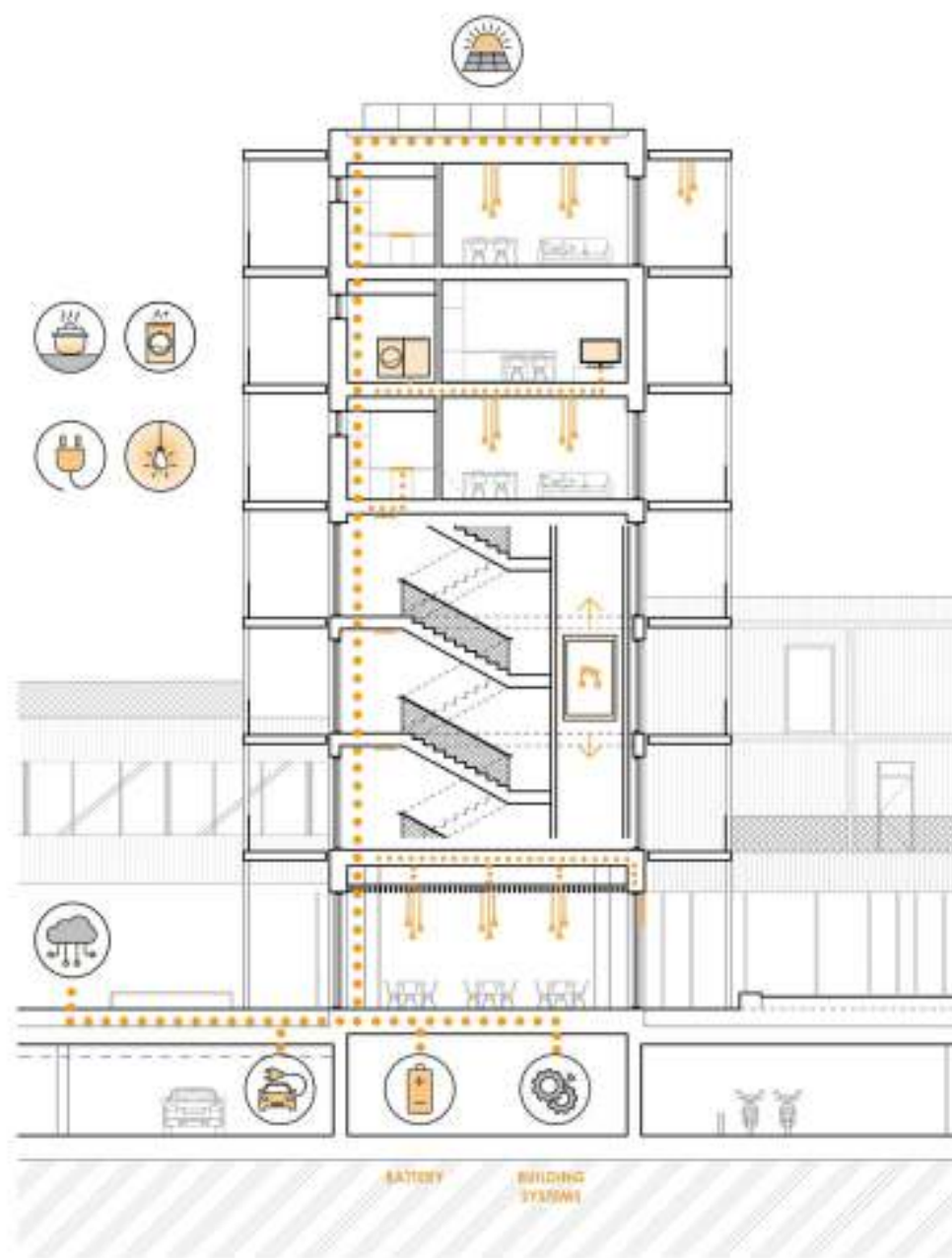
CLEAN WATER IS USED MULTIPLE TIMES AS A WHITE WATER
ACHIEVING 40% SAVINGS OF WATER AND PURCHASE PRICE.

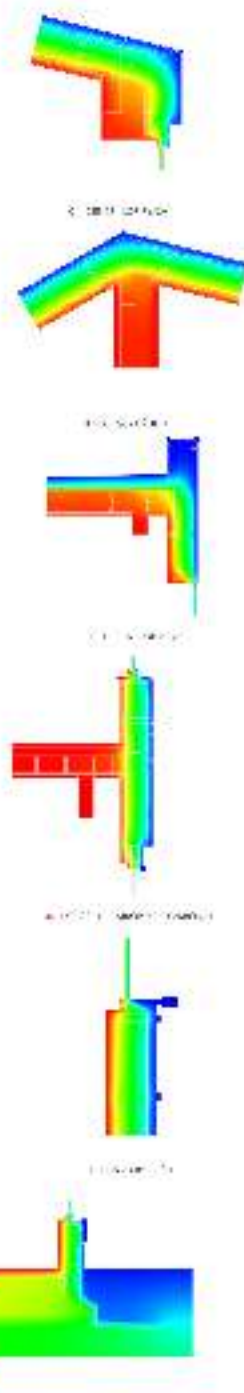
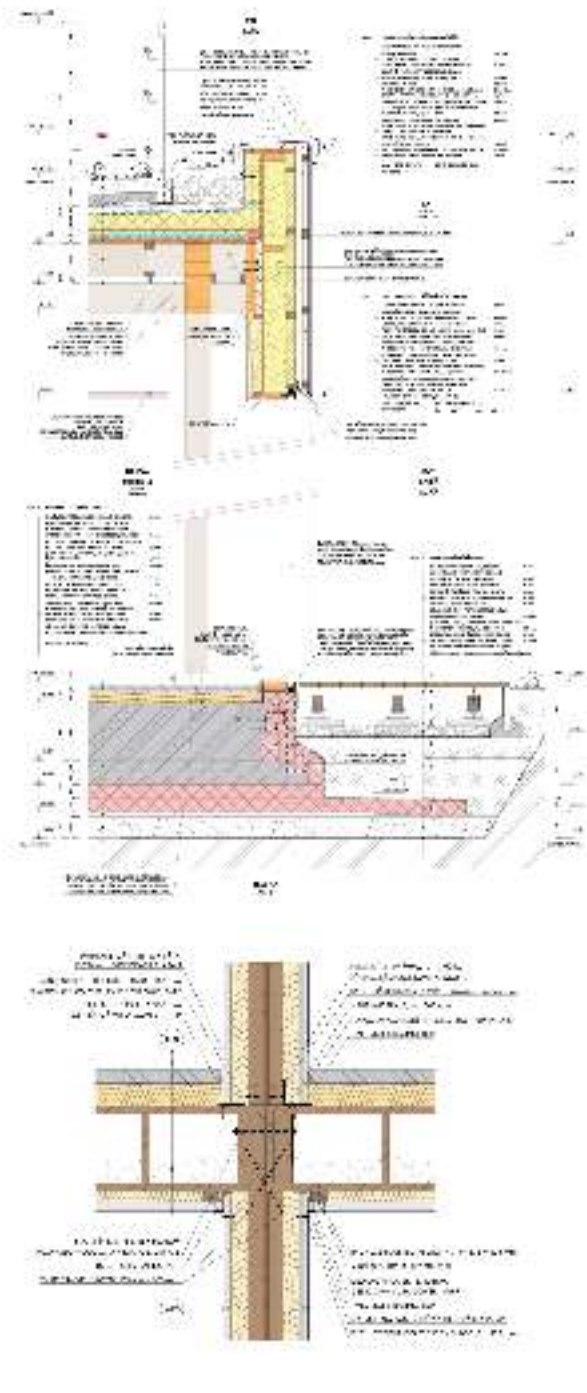
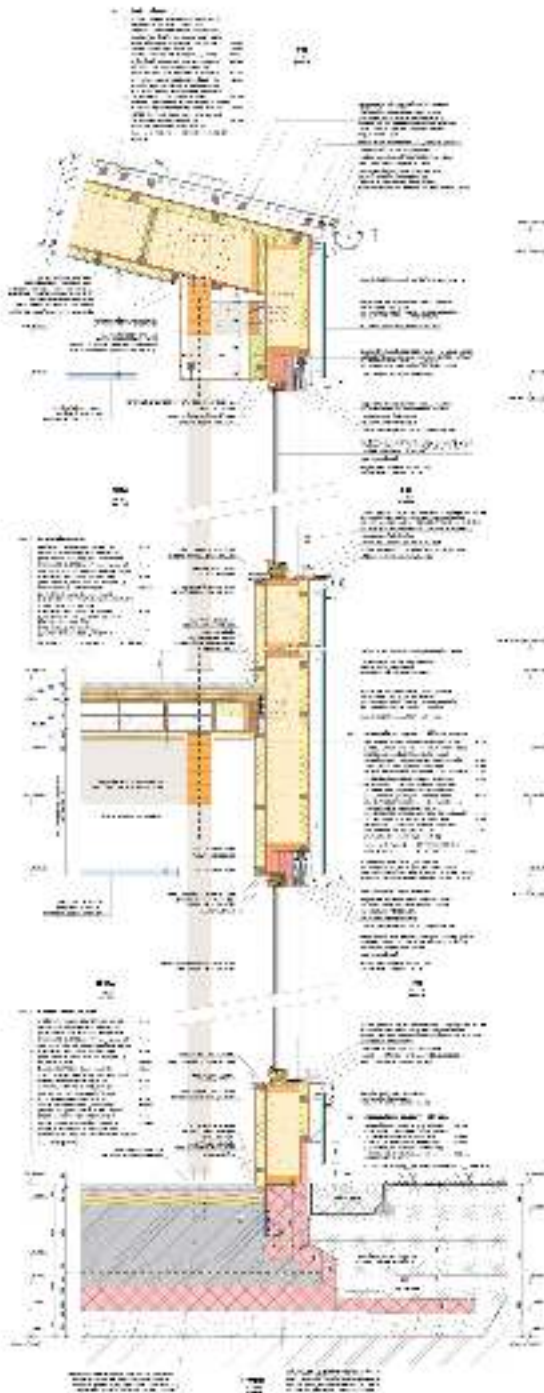
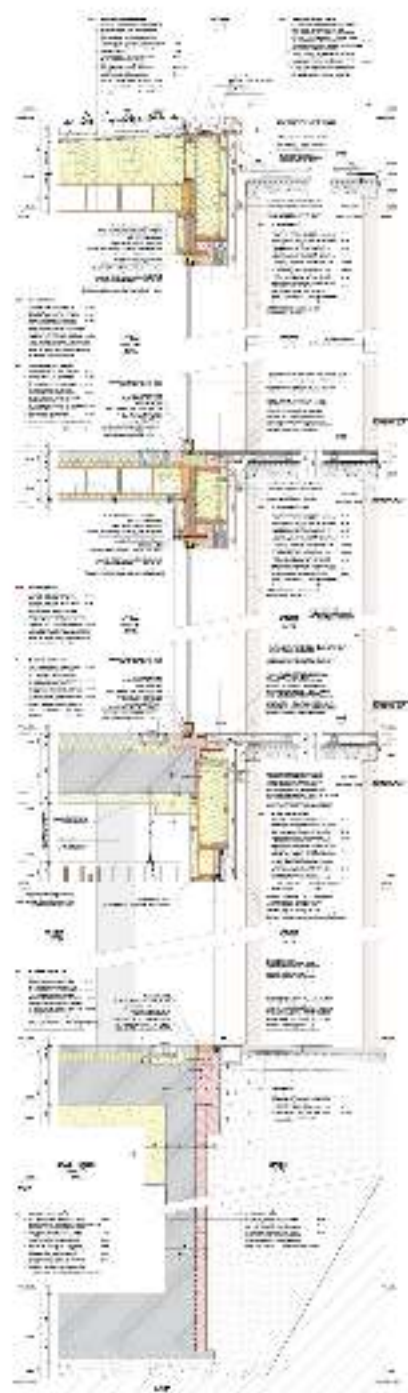
ANALYSIS OF ANNUAL DRINKING WATER AND PURCHASE PRICE SAVINGS

	WHITE / GREY	30 295 l	(117 €)	55.6 %
	SUPPLY WATER	24 090 l	(93 €)	44.4 %
1 PER.	SAVINGS approx.	21 900 l	(80 €)	40.0 %

	WHITE / GREY	121 180 l	(468 €)	55.6 %
	SUPPLY WATER	96 360 l	(360 €)	44.4 %
4 PER.	SAVINGS approx.	21 900 l	(80 €)	40.0 %

	WHITE / GREY	30 295 m3	(117 000 €)	55.6 %
	SUPPLY WATER	24 090 m3	(95 000 €)	44.4 %
1000 PER.	SAVINGS approx.	21 900 m3	(80 000 €)	40.0 %







ENERGY EFFICIENCY CALCULATION SVVOZDA SOFTWARE ENERGY 2019

VOLUME OF BUILDING V
BUILDING DEVELOPER AREA A
VOLUME FACTOR A/V
FLOOR AREA A_f

5.402.418
2.755.542
0.51 m³/m²
1.400.042

PVS - INTERNAL DESIGN TEMPERATURE
EXT - EXTERNAL DESIGN TEMPERATURE

35.0 °C
15.0 °C



GROUND / WATER HEAT PUMP
ENERGY NETWORK - SMART GRID SOLUTION



PHOTOVOLTAIC ROOF ORIENTATION KVAH/COEF
16kW - 35kW - EFFICIENCY 20%



CONSIDERING ALL ASPECTS ACTING ON THE BUILDING
OVERHEATING AND DAY LIGHT ANALYSIS



BALANCED MECHANICAL VENTILATION
HEAT RECOVERY EFFICIENCY 90%



TOTAL ENERGY CONSUMPTION PER YEAR
ENERGY CONSUMPTION PER YEAR PER M²
PRIMARY ENERGY CONSUMPTION
PRIMARY NON-RENEWABLE ENERGY CONSUMPTION



0 THERMAL TRANSMITTANCE U_{sum}
ENERGY NEED FOR HEATING

46.44% kWh
45 kWh/m² a
31 kWh/m² a
19 kWh/m² a

0.22 kWh/m²
8 kWh/m² a



ENERGY EFFICIENCY CALCULATION SVVOZDA SOFTWARE ENERGY 2019

VOLUME OF BUILDING V
BUILDING DEVELOPER AREA A
VOLUME FACTOR A/V
FLOOR AREA A_f

39.602.418
2.755.542
0.51 m³/m²
1.400.042

PVS - INTERNAL DESIGN TEMPERATURE
EXT - EXTERNAL DESIGN TEMPERATURE

35.0 °C
15.0 °C



GROUND / WATER HEAT PUMP
ENERGY NETWORK - SMART GRID SOLUTION



PHOTOVOLTAIC INSOLATED ROOFING
16kW - 35kW - EFFICIENCY 20%



CONSIDERING ALL ASPECTS ACTING ON THE BUILDING
OVERHEATING AND DAY LIGHT ANALYSIS



BALANCED MECHANICAL VENTILATION
HEAT RECOVERY EFFICIENCY 90%



TOTAL ENERGY CONSUMPTION PER YEAR
ENERGY CONSUMPTION PER YEAR PER M²
PRIMARY ENERGY CONSUMPTION
PRIMARY NON-RENEWABLE ENERGY CONSUMPTION



0 THERMAL TRANSMITTANCE U_{sum}
ENERGY NEED FOR HEATING

27.830 kWh
45 kWh/m² a
42 kWh/m² a
8 kWh/m² a

0.22 kWh/m²
14 kWh/m² a



