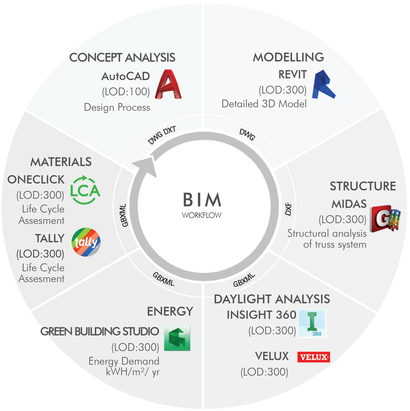
LEED v4 for BD+C: New Construction and Major Renovation

PROJECT NAME: BASEL LIFE SCIENCES CAMPUS

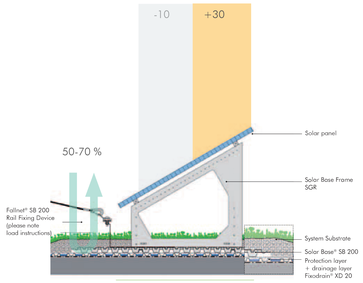
70 points



ENERGY AND ATMOSPHERE

RENEWABLE ENERGY PRODUCTION

33 points



Enhanced performance of photovoltaic modules of ZinCo Solar Base, combined with the green roof and significant synergy effects are achieved with combination of two system: Solar Green Roof.

SolarVert® System Build-up

Solar Green Roof

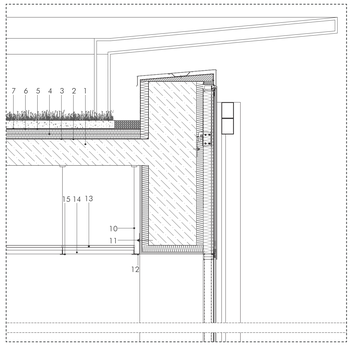
1. Higher water retention
2. Higher evaporation and cooling
3. Minimum surface discharge

The mounting system "Saddle" combines two solar frames onto a dolar base. The inclination of panels directs the rainwater toward the aisle between the panels rows so that increased growth of the vegetation can be expected.

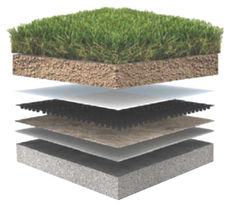
SUSTAINABLE SITES

HEAT ISLAND REDUCTION

10 points



The roof of the development hosts an extensive green roof, which forms a microclimate that reduces the local heat island effect, provides habitats, insulates the building, and minimizes the roof's water run-off.



Green Roof Envelope

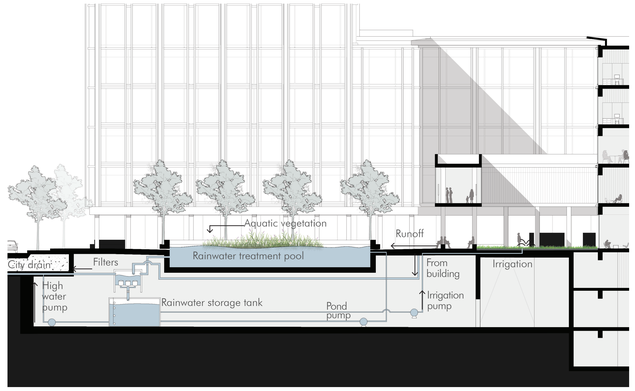
1. RC slab 330 mm
2. Splast primer 1 mm
3. Preflex - Elastomer bitumen-membrane 4 mm
4. Rock mineral wool insulation 120 mm
5. Water proofing membrane 4 mm
6. Root barrier 1 mm
7. Drainage Layer 7 mm
8. Filter Layer 1.1 mm
9. Growing substrate 100 mm
10. Vernier suspension
11. Drilling screw
12. L angle
13. Post cap profile
14. Ceiling panel 600*600 mm
15. Partition connection profile

WATER EFFICIENCY

RAINWATER MANAGEMENT TECHNIQUES

11 points

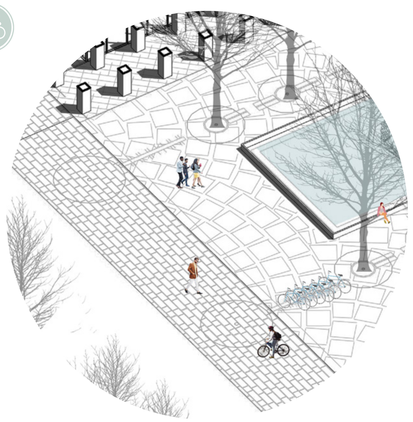
This water feature functions as part of the larger stormwater management system that collects all rainwater that falls within the property. The water then drains through a stormwater filter to a cistern located below the courtyard. This water is continuously recirculated. The stored water can also be used to provide irrigation for the courtyard plantings throughout the growing seasons.



LOCATION & TRANSPORTATION

ACCESS TO QUALITY TRANSIT

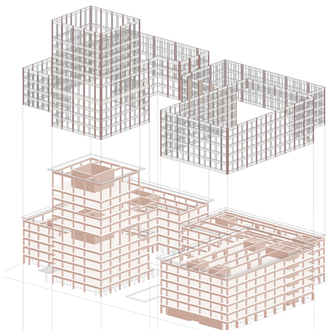
16 points

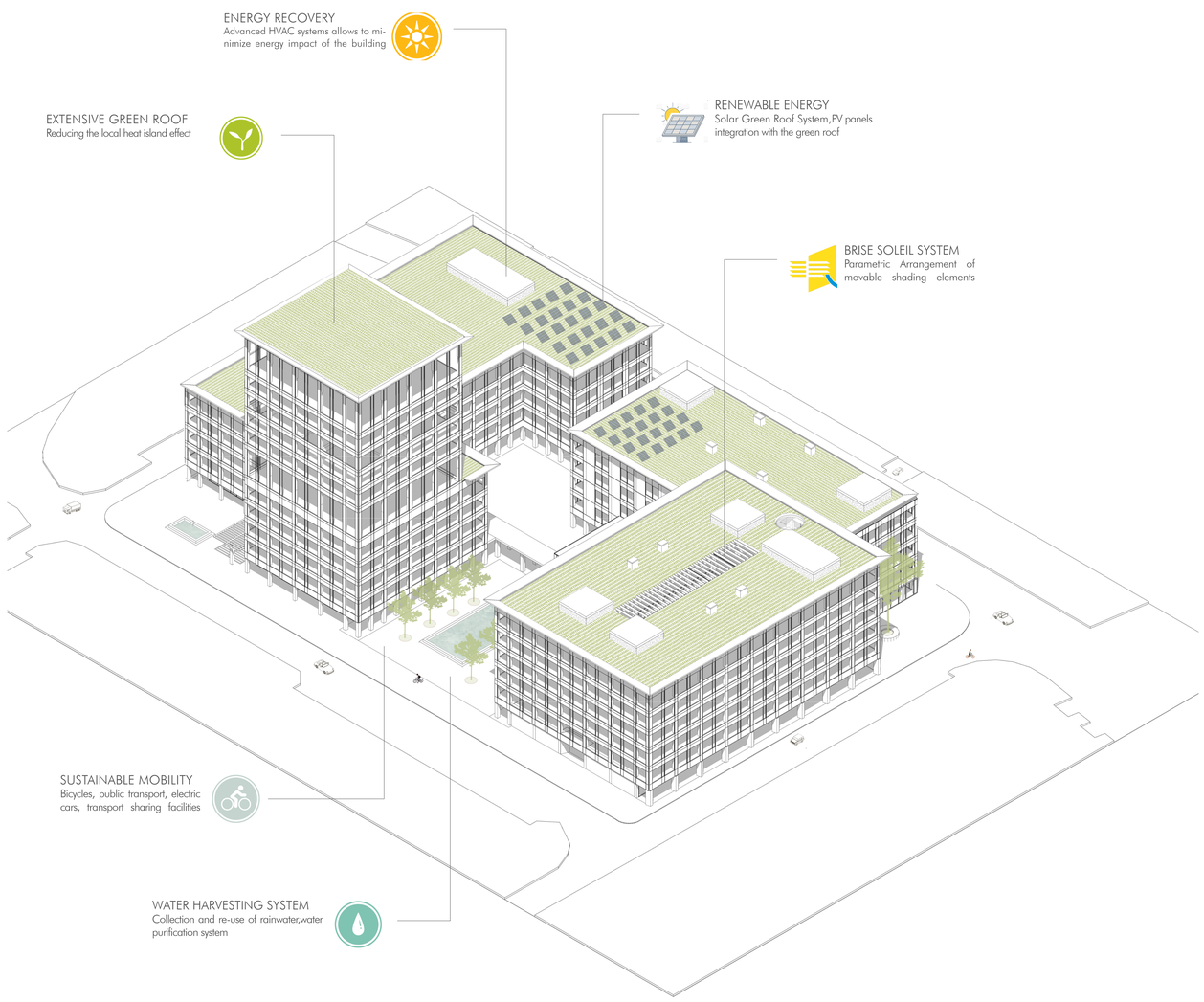


MATERIALS AND RESOURCES

BUILDING LIFE CYCLE IMPACT REDUCTION

16 points

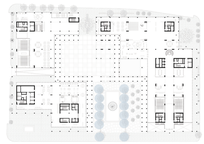


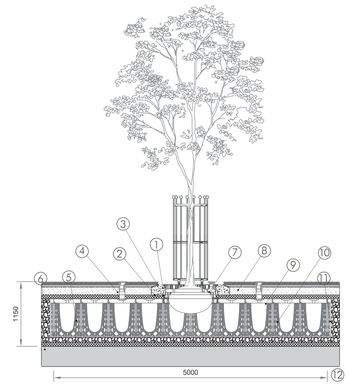


TREE PITS - LID-SUDS SOLUTIONS

RAINWATER MANAGEMENT TECHNIQUES

Stormwater tree pits improve water quality of local waterways, reduce peak runoff flows, increase groundwater infiltration (if site appropriate), and improve the health of urban trees.



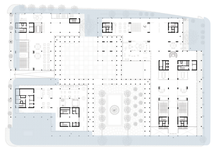


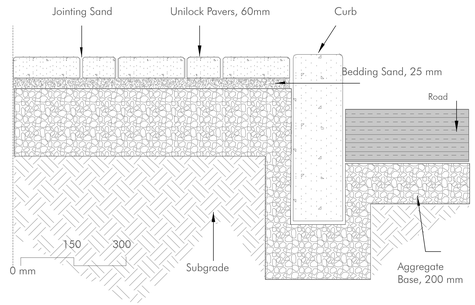
1. 1200mm x 1200mm tree tree grille c/w Root Rain Hydrogrille irrigation inlet
2. Galvanised tree grille support frame set on concrete haunch
3. RD1000-RS RootSpace
4. Arborvent 150 double inlet aeration /irrigation system
5. Strapped anchor system c/w ground anchors
6. Drainage layer - 150mm
7. Root Rain Hydrogrille single inlet aeration/irrigation system with cast inlet
8. Pavement construction
9. Twin wall geonet laid over RootSpace structure
10. RootSpace structure - 1 module deep x 10 modules across x 6 modules wide
11. GRN20 plastic open reinforcing mesh, 20mm aperture laid below and around
12. Sub-base and drainage installed below RootSpace

ECO -PROMENADE

PERMEABLE PAVINGS

Through this movement, pervious concrete mimics the natural process that occurs on the ground's surface, consequently reducing runoff and returning water to underground aquifers. It also traps suspended solids and pollutants, keeping them from polluting the water stream.





ECO-PROMONADE*B

ECO-PROMONADE*A

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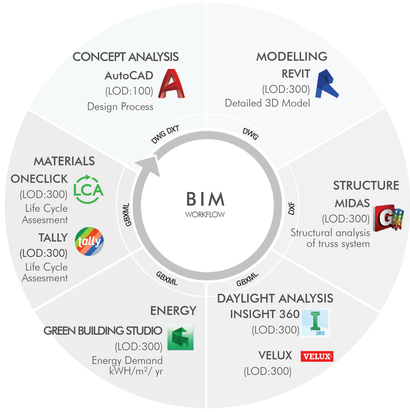
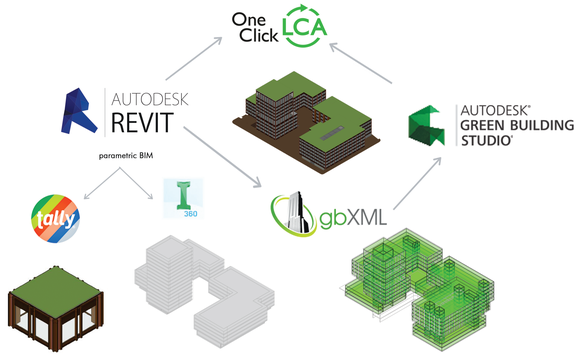
PROJECT NAME: BASEL LIFE SCIENCES CAMPUS

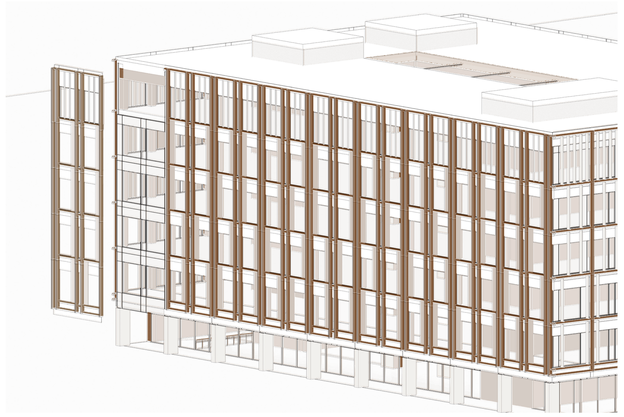
70 points

BUILDING INFORMATION MODELLING
WORK FLOW STRUCTURE

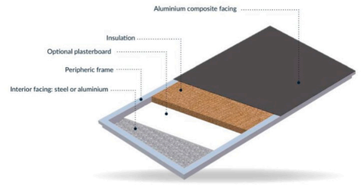




LIFE CYCLE ASSESMENT
ENVIRONMENTAL IMPACT



MATERIALS AND RESOURCES
BUILDING LIFE CYCLE IMPACT REDUCTION

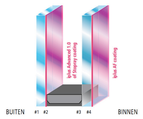


ECOSTA ALU COMPOSITE

TECHNICAL INFORMATION

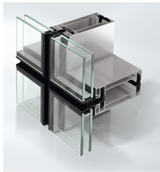
Thermal insulation, compliance with IT249 rules

MATERIAL
Aluminium composite facing
XPS Insulation
Optional Plasterboard
Aluminum frame
Steel or aluminum facing



ACG GLASS THERMOBEL ADVANCED 0.8

TECHNICAL INFORMATION
Ug value of glass : 0.8 W/m²K
Free Solar Heat : 50%
Light Transmission: 72%
Global warming potential
Total A1-A3 Production:
3.92E+01 kg CO2 eq/FU
Total life cycle
4.37E+01 kg CO2 eq/FU

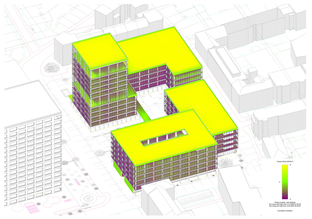


SCHÜCO FACADE UCC 65 SG

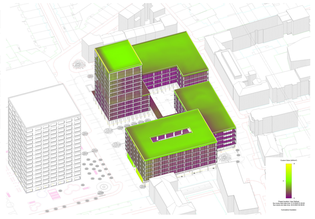
TECHNICAL INFORMATION
U value of frame : 2,2 W/(m²K)
Material : ALuminium
Max height: 3600 mm
Max. width 2700 mm
Max weight: 250 kg
Max. glass thickness : 36 mm
EPD Recycable

SOLAR RADIATION ANALYSIS
REVIT-INSIGHT

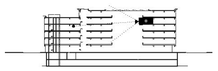
DECEMBER 21st



JUNE 21st



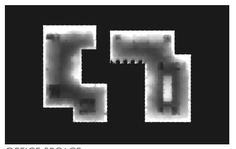
DAYLIGHT COMFORT ANALYSIS
VELUX DAYLIGHT VISUALIZER



KEY PLAN-CENTRAL ATRIUM

KEY PLAN-OFFICE SPACES

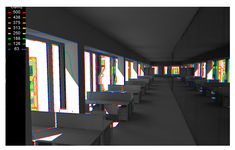
LUMINANCE ANALYSIS

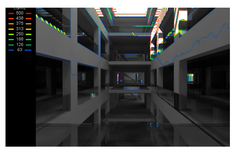


OFFICE SPCACE

CENTRAL ATRIUM

DAYLIGHT FACTOR - 21st MARCH





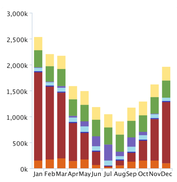
ENERGY OPTIMIZATION
GREEN BUILDING STUDIO

Energy, Carbon and Cost Summary	
Annual Energy Cost	CHF1,440,027
Lifecycle Cost	CHF19,613,165
Annual CO_2 Emissions	
Electric	0.0 Mg
Onsite Fuel	1,750.3 Mg
Large SUV Equivalent	175.4 SUVs / Year
Annual Energy	
Energy Use Intensity (EUI)	994 MJ / m² / year
Electric	9,456,727 kWh
Fuel	35,097,460 MJ
Annual Peak Demand	3,592.8 kW

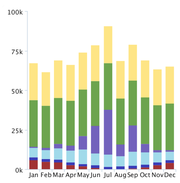
LEED Water Efficiency (more details)	L / yr	CHF / yr
Indoor:	54,478,360	CHF87,710
Outdoor:	696,701	CHF481
Total	55,175,061	CHF88,191

Photovoltaic Potential (more details)	
Annual Energy Savings:	830,868 kWh
Total Installed Panel Cost:	CHF6,124,420
Nominal Rated Power:	766 kW
Total Panel Area:	5,544 m²
Maximum Payback Period:	49 years @ CHF0.09 / kWh

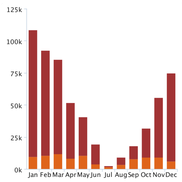
TOTAL ENERGY, COST



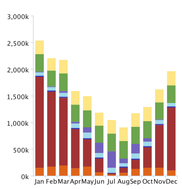
ELECTRICITY, COST



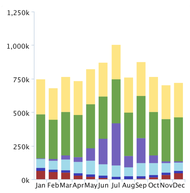
NATURAL GAS, COST



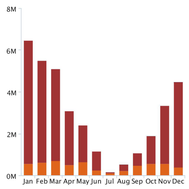
TOTAL ENERGY, kWh



ELECTRICITY, kWh



NATURAL GAS, MJ

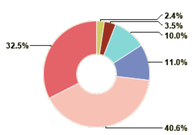


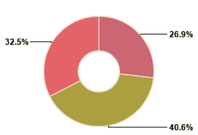
Area lights
Misc Equipment

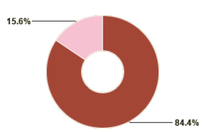
Space cooling
Vent fans
Pump aux

Space heat
Hot water

ANNUAL ELECTRIC END USE





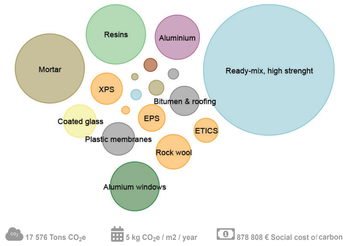


Pumps & Aux 2.4%
Space heating3.5%
Fans 10.0%
Space cooling 11.0%
Misc equip 40.6%
Lights 32.5%

HVAC 26.9%
Other 40.6%
Lights 32.5%

Space heating 84.4%
Hot water 15.6%

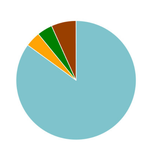
LIFE CYCLE ASSESMENT
ONE CLICK LCA



Cradle to grave (A1-A4, B4-B5, C1-C4)	kg CO_2e/m^2
(< 350) A	258
(350-500) B	
(500-650) C	
(650-800) D	
(800-950) E	
(950-1100) F	
(> 1100) G	

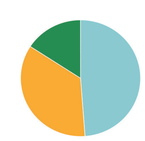
An in-depth form of analysis performed on whole buildings, manufactured building products and materials, and material assemblies to obtain a complete picture of the environmental impacts associated with a building.

GLOBAL WARMING, kg CO2e
LIFE CYCLE STAGES



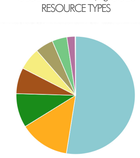
A1-A3 Materials - 85.1%
A4 Transportation - 4.1%
B1-B5 Maintenance and replacemen...
C1-C4 End of life - 6.7%

GLOBAL WARMING, kg CO2e
CLASSIFICATIONS



External walls and facade - 48.8%
Floor slabs, ceilings, roofing decks,
Columns and load-bearing vertical st...

GLOBAL WARMING, kg CO2e
RESOURCE TYPES

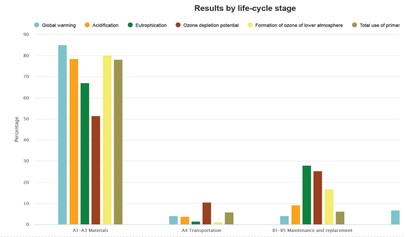


Concrete - 52.5%
Coatings & pastes - 9.3%
Doors & windows - 6.1%
Plastics, membranes & roofing - 4.0%
Masses - 0.1%
Gypsum, plaster & cement - 13.6%
Insulation - 7.1%
Metals - 4.9%
Glass - 2.2%

MASS kg - CLASSIFICATIONS

External walls and facade - 50.0%
Floor slabs, ceilings, roofing decks,
Columns and load-bearing vertical st...

Results by life-cycle stage



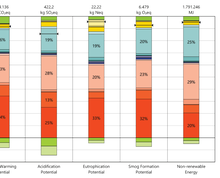
ENVIRONMENTAL IMPACT
REVIT - TALLY

Environmental Impact Totals	Product Stage [A1-A3]	Construction Stage [A4]	Use Stage [B2-B5]	End of Life Stage [C2-C4]	Module D [D]
Global Warming (kg CO2eq)	79.027	1.156	22.828	4.322	-2.612
Acidification (kg SO2eq)	288.3	5.356	91.44	21.36	-47.2
Eutrophication (kg Neq)	13.55	0.4361	5.462	2.198	-0.4081
Smog Formation (kg O3eq)	4.187	177.0	1.513	377.2	-248
Ozone Depletion (kg CFC-11eq)	5.952E-005	3.959E-011	8.168E-005	8.921E-009	-4.588E-005
Primary Energy (MJ)	1.230.127	16.808	573.497	68.305	-85.935
Non-renewable Energy (MJ)	1.103.659	16.406	545.304	63.865	-26.035
Renewable Energy (MJ)	126.990	406.4	28.398	4.511	-59.839
Environmental Impacts / Area					
Global Warming (kg CO2eq/m²)	1.162	0.017	0.3357	0.06356	-0.03841
Acidification (kg SO2eq/m²)	0.00424	7.876E-005	0.001374	3.142E-004	-6.937E-004
Eutrophication (kg Neq/m²)	1.993E-004	6.413E-006	8.032E-005	3.233E-005	-6.001E-006
Smog Formation (kg O3eq/m²)	0.06158	0.002603	0.02225	0.005546	-0.00364
Ozone Depletion (kg CFC-11eq/m²)	8.752E-010	5.821E-016	1.201E-009	1.312E-013	-6.747E-010
Primary Energy (MJ/m²)	18.09	0.2472	8.434	1.004	-1.26

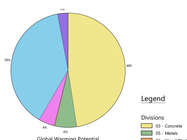
EPD VERIFIED

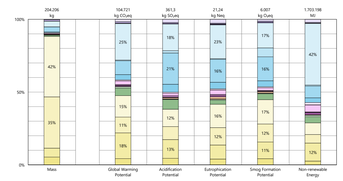
The building materials and quantities are assigned in Tally for a part of the building (a portion of facade) to guide the material choices according to analysis that show their impact on the overall sustainability.

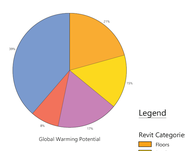
LIFE CYCLE STAGES

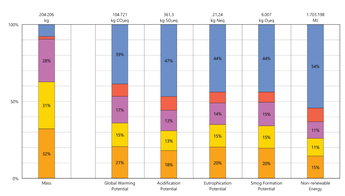


ENVIRONMENTAL IMPACT CATEGORIES









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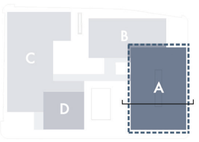
BEATRICE TOSINI - 918341



PHYSICS BUILDING HVAC SYSTEM PLAN

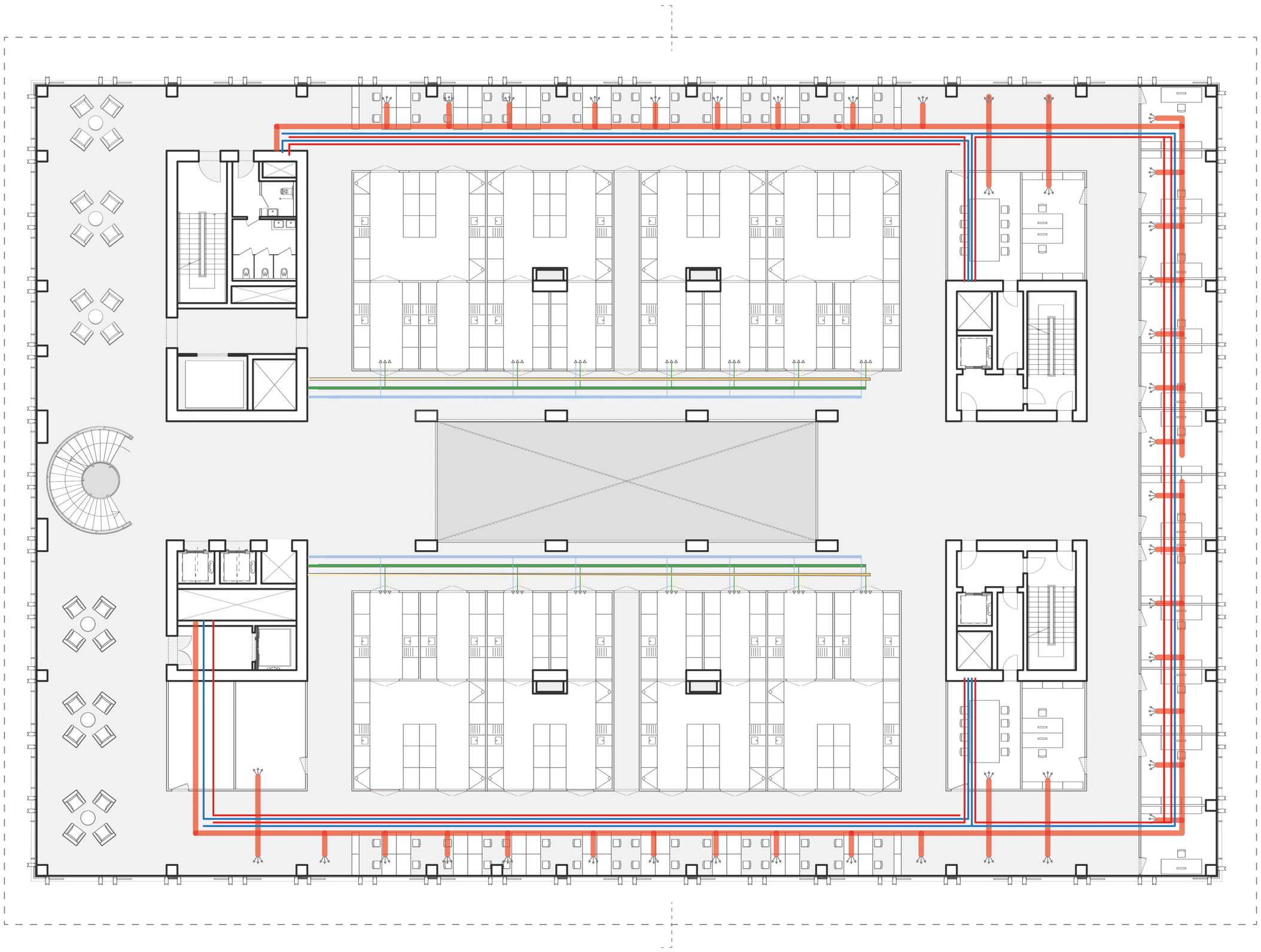
ANIMAL STATION - ALL AIR SYSTEM
LABORATORY - ALL AIR SYSTEM
OFFICES - COMMON AREA - MIXED USE SYSTEM

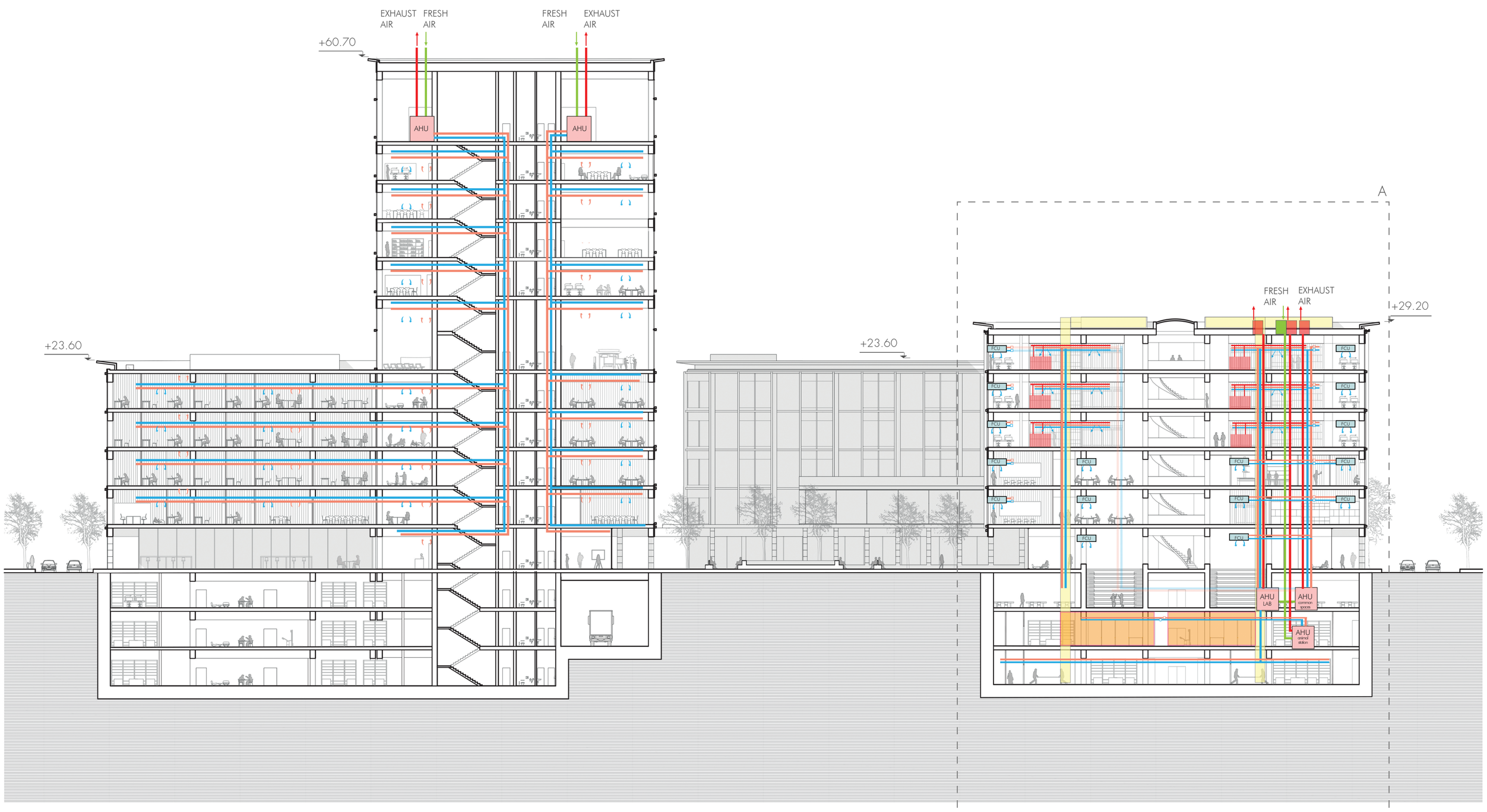
AIR SUPPLY & RETURN DUCTS
2*2 WATER PIPES
HEATING & COOLING
LABORATORY
COOLING
EQUIPMENT

FACILITY TOWER & CHEMISTRY HVAC SYSTEM SECTION

FACILITY TOWER - ALL AIR SYSTEM
CHEMISTRY LABORATORY - ALL AIR SYSTEM

SUPPLIED AIR
RETURN AIR
FRESH AIR
EXHAUST AIR





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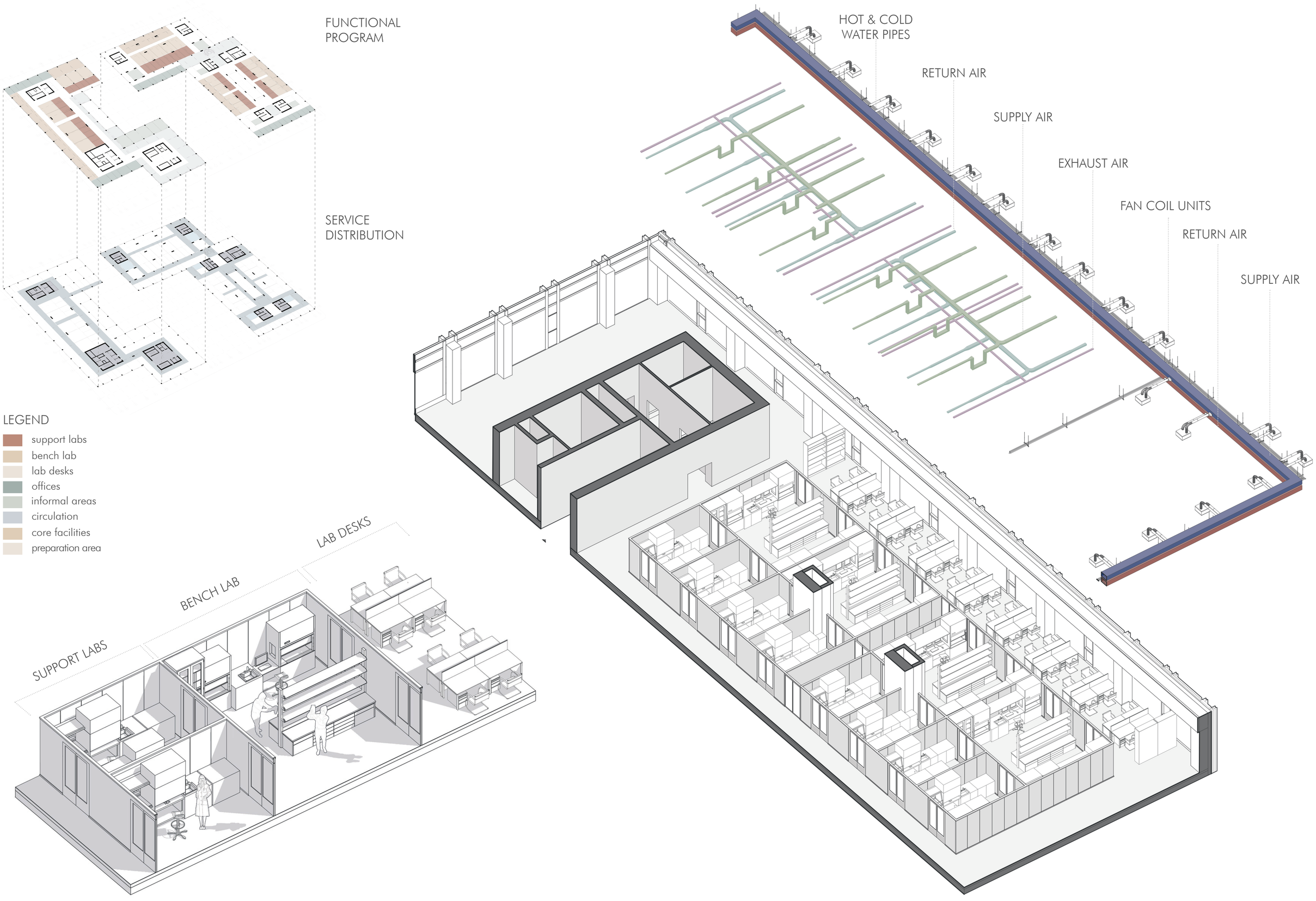
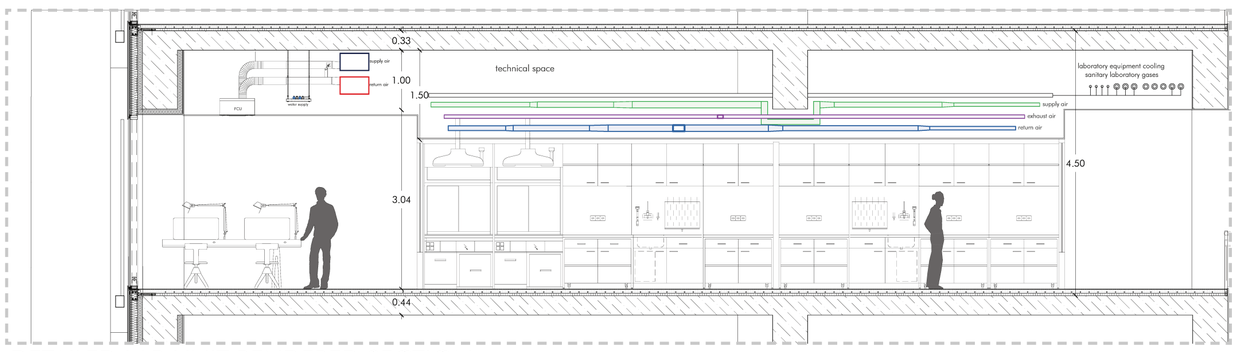
LEGEND

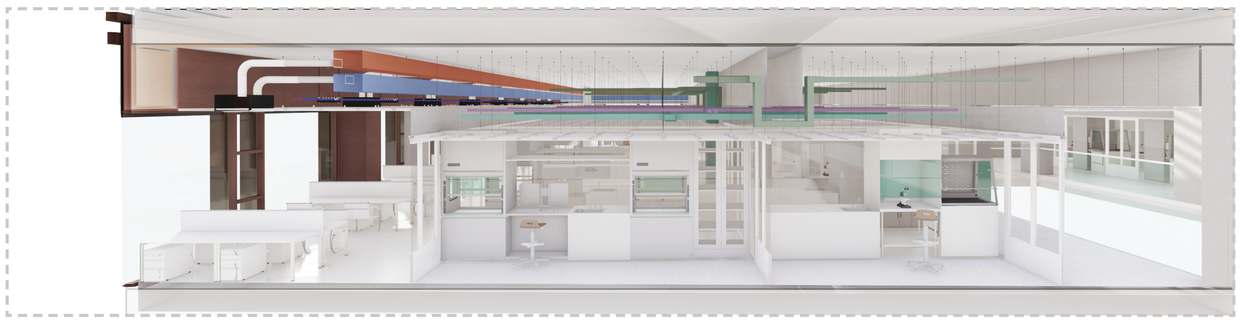
- support labs
- bench lab
- lab desks
- offices
- informal areas
- circulation
- core facilities
- preparation area



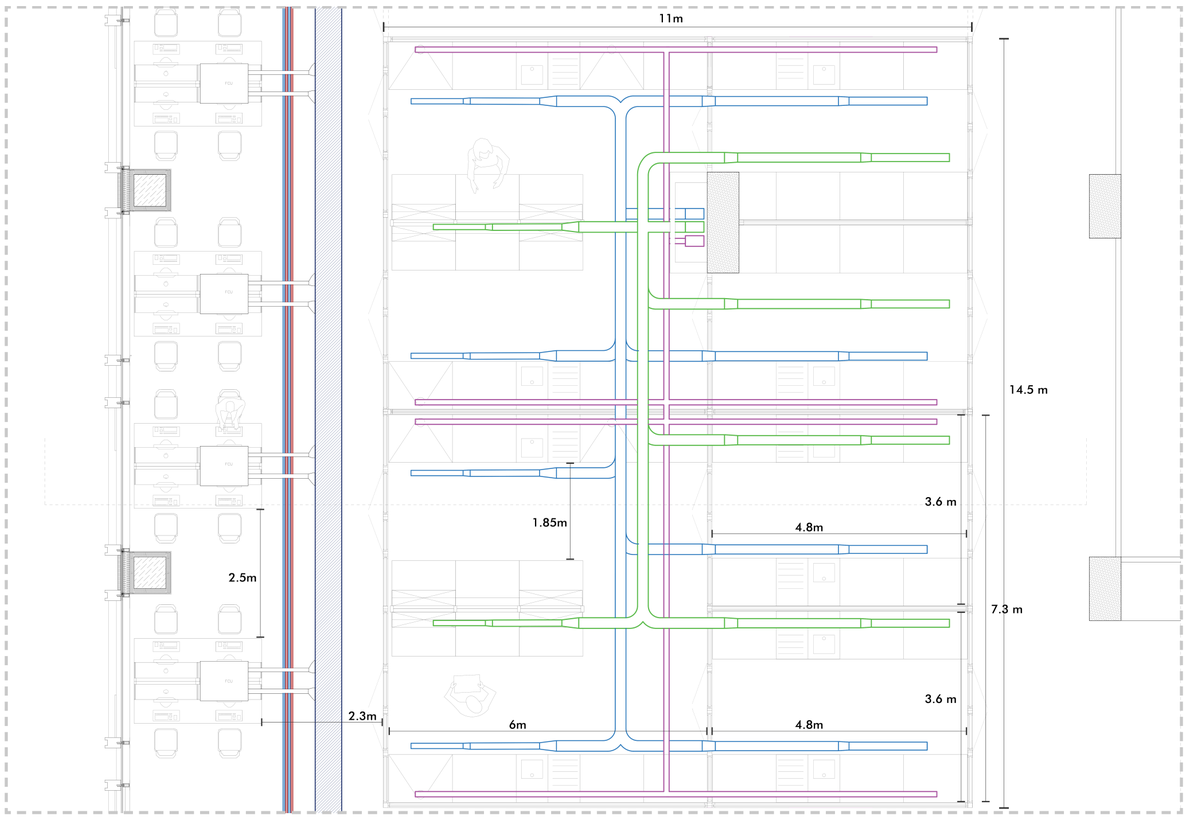
DETAILED LAB UNIT SECTION WITH SYSTEMS



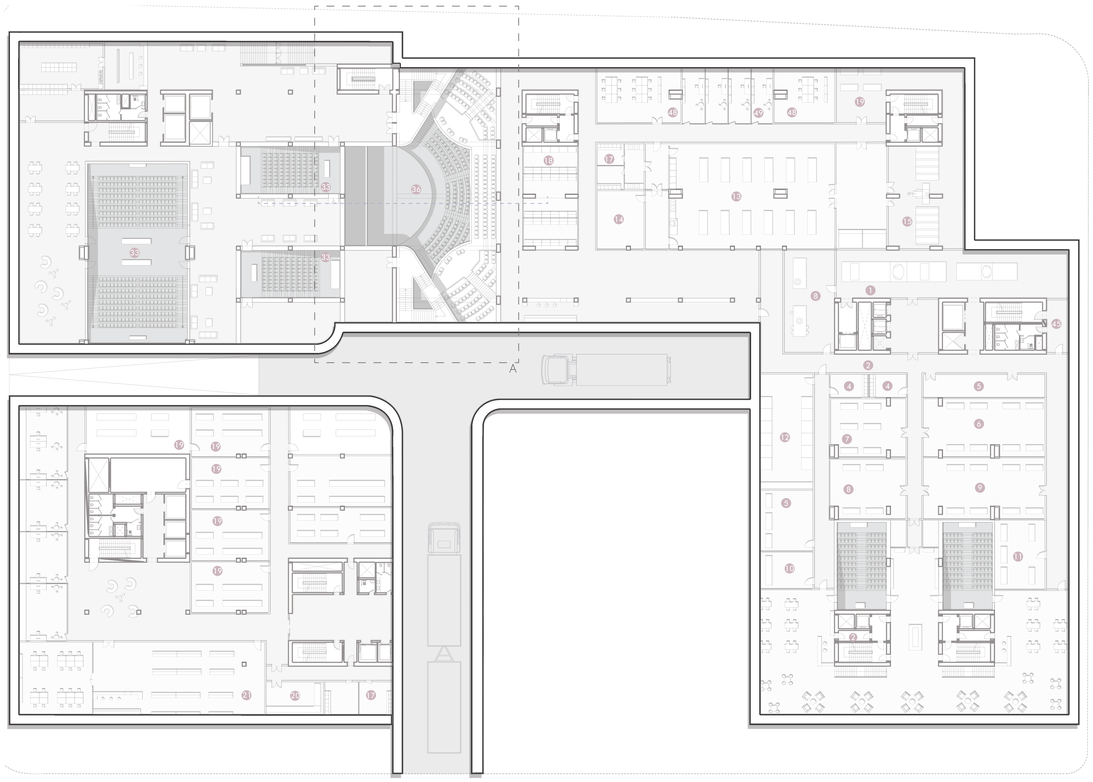
DETAILED LAB UNIT RENDERED SECTION



SUPPLY AIR RETURN AIR EXHAUST LABS RETURN AIR SUPPLY AIR FAN COIL UNIT

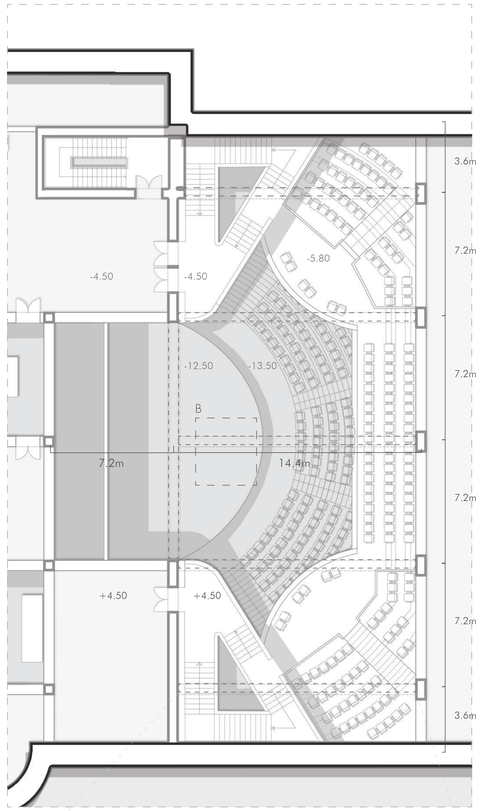


DETAILED LAB UNIT PLAN WITH SYSTEMS

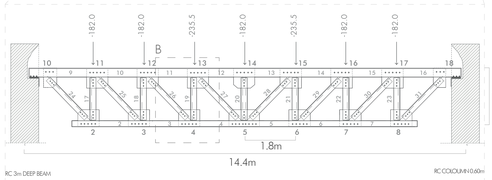


BASEMENT FLOOR PLAN
1. Technical Center Ventilation/ Laboratories
2. Outside air intake -ventilation animal rooms (4,5 sqm)
3. Shaft (rising) RDA, HK, exhaust air animal rooms (4.5 sqm)
4. Personal Wardrobe
5. Central disposal room
6. Technical center-refrigeration
7. Technical center-sanitary
8. Technical centerheating/steam
9. Disposal room solvent
10. Disposal for animal rooms
11. Warehouse workshops
12. Washing machines
13. Dissection room
14. Embedding Lab
15. Cadaver storage cooler
16. Freezer- Storage
17. Lockers room
18. Special labs
19. Facility- Storage
20. Cleaning Room
21. Archieve Professorship
22. Bathroom
23. Autoclave
24. Animal rooms area
25. Security locker room with shower
26. Personal locker room without shower
27. Experiments incl. Irradiation (34 sqm)
28. Unclean Corridor
29. Clean Corridor
30. Room for ultra-freezer
31. Warehouse goods incl. Distribution counter
32. SNI-Physics internship laboratory
33. Lecture Area (stepped)
Smal Auditorium 100 seat
Medium Auditorim 200 seat
34. Isotope depot bearing
35. Gas bottle space
36. Auditorium
37. Chemistry lab area
38. Laser Laboratory
39. Clean Laboratory
40. Quiet laboratory
41. Scanning Tunneling Microscopy (STM) laboratory
42. X-Ray laboratory
43. CCLS Laboratory
44. NMR Laboratory
45. Power Station
46. Shaft 4 sqm plumbing, exhaust air office

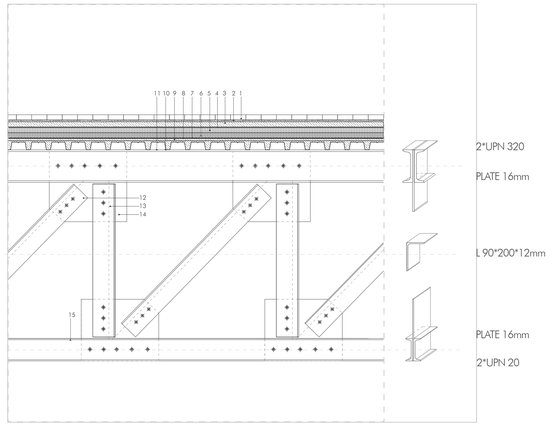
PARTIAL PLAN LEVEL -1.00
SCALE 1/100



PARTIAL PLAN A - LEVEL -1.00
SCALE 1/100



PARTIAL TRUSS ELEVATION

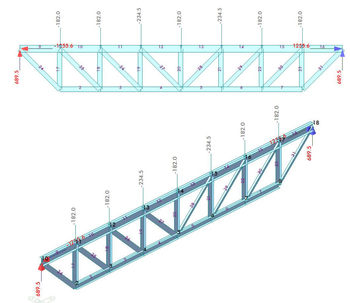


DETAIL B
SCALE 1/20

Auditorium Roof Envelope
1 Pavement Stone (50 mm)
2 Mortar (20 mm)
3 Screed (50mm)
4 Moisture Layer (4 mm)
5 XPS thermal insulation layer (50 mm)
6 Impact-sound insulation (EPS) (50mm)
7 Protection mat (4mm)
8 Waterproofing membrane (2mm)
9 Cast concrete (55 mm)
10 Galvanized iron corrugated sheet (3mm)
11 Top chord UPN 320
12 Diagonal bracing L 90*200*12 mm
13 Vertical chord L 90*200*12 mm
14 Gusset Plate 16 mm
15 Bottom chord UPN 220

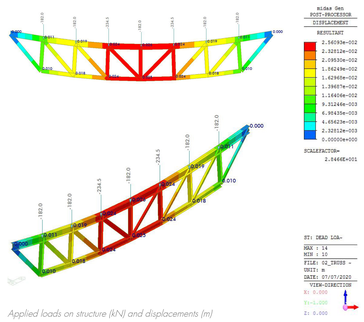
STRUCTRAL ANALYSIS / MIDAS
AUDITORIUM - TRUSS SYSTEM

Finite Element Method (numerical method) is used by using the Midas software to satisfy the boundary conditions with the performance of the structure. The aspects that is specified with the program are;
Geometry, Materials, Boundary conditions, Loads(forces)



Applied loads on structure and reaction forces (kN)

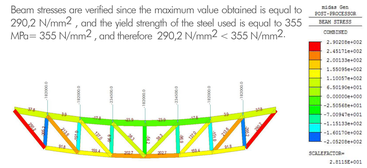
DISPLACEMENT RESULTS

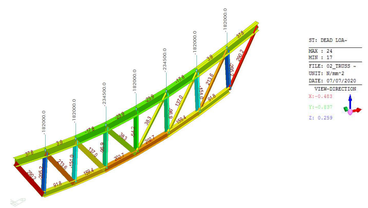


Applied loads on structure (kN) and displacements (m)

BEAM STRESS ANALYSIS

Beam stresses are verified since the maximum value obtained is equal to 290,2 N/mm^2 , and the yield strength of the steel used is equal to 355 MPa= 355 N/mm^2 , and therefore 290,2 N/mm^2 < 355 N/mm^2.

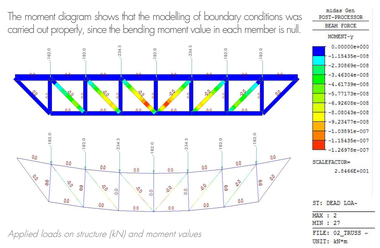




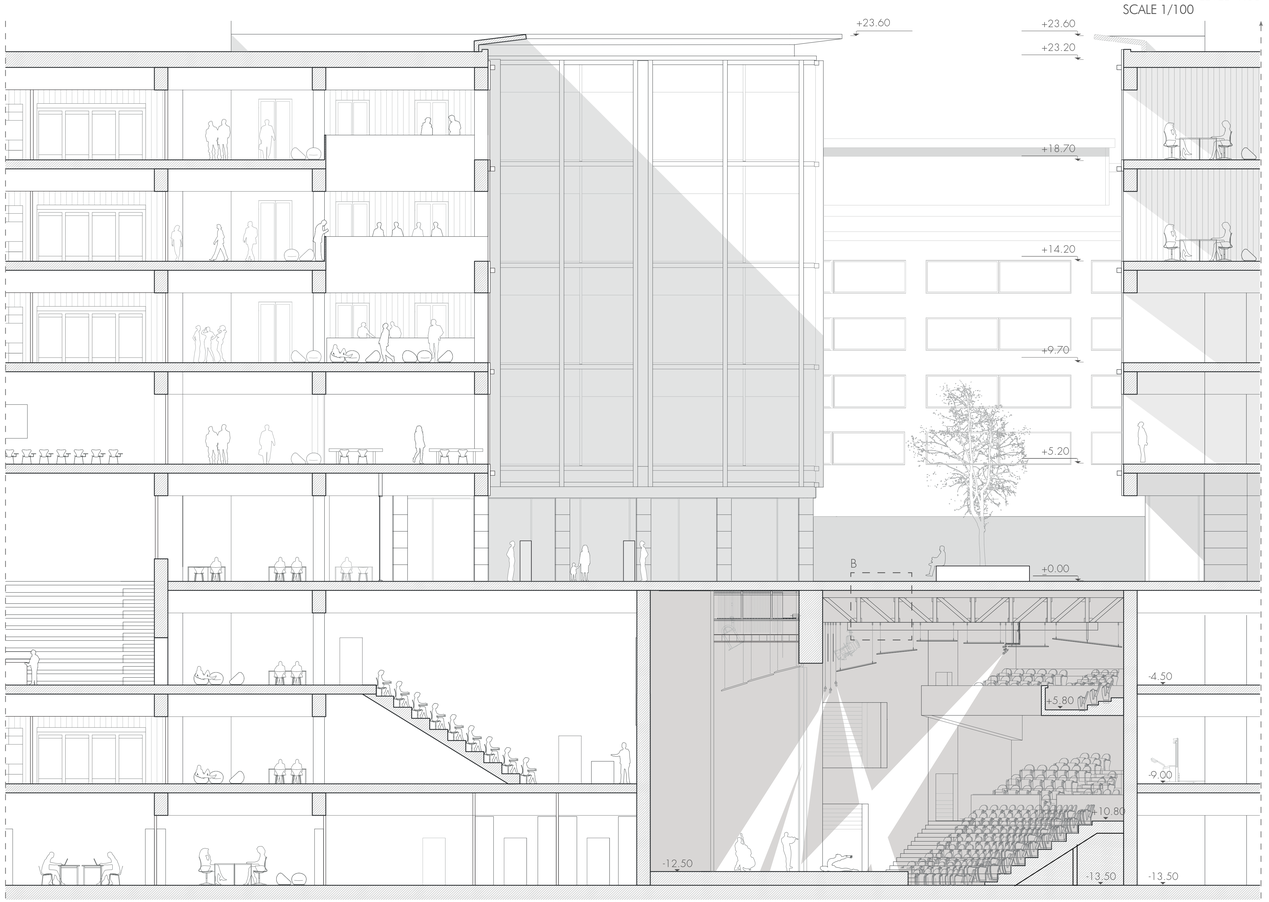
Applied loads on structure (N) and beam stresses (N/mm^2)

BEAM FORCE ANALYSIS: MOMENT

The moment diagram shows that the modelling of boundary conditions was carried out properly, since the bending moment value in each member is null.



Applied loads on structure (kN) and moment values



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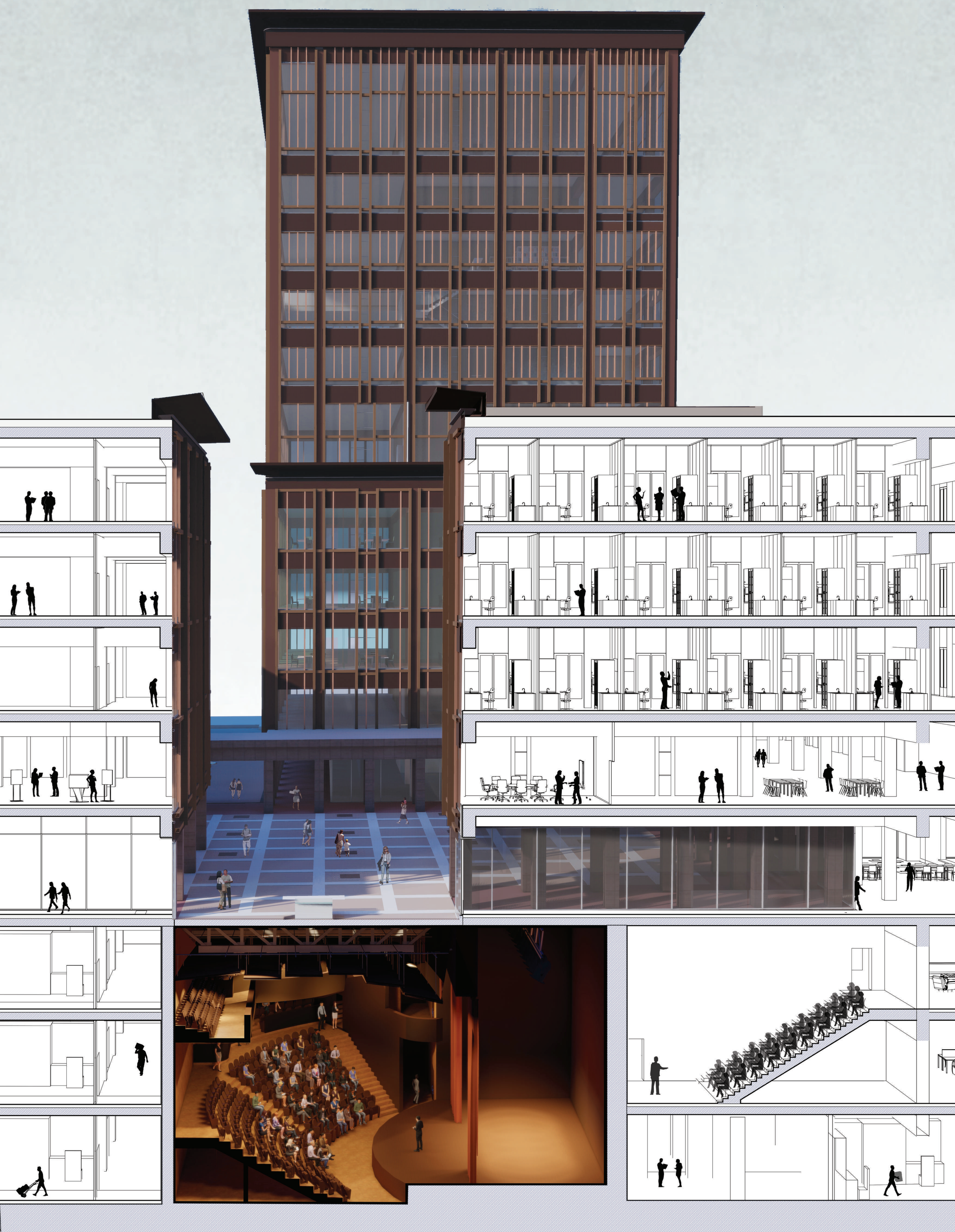
AUDITORIUM: SPACE IN-BETWEEN

AUDITORIUM: STRUCTURAL DESIGN