

JASON CAI (HE/HIM)

MAX PERRY (HE/HIM)

STACK EFFECT

TEAM REPRESENTATIVE JASON CAI

UNIVERSITY OF WATERLOO

HERON FLIGHT CENTER

OR name to be decided in consultation with Indigenous population

Land Acknowledgment: The project site of the Waterloo Wellington Flight Centre are situated on the Haldimand Tract, land that was granted to the Haudenosaunee of the Six Nations of the Grand River, and is within the territory of the Neutral, Anishinaabe, and Haudenosaunee peoples.

The building responds to the difficult challenge of social, environmental and economic sustainability by achieving a high-performance thermal envelope while retaining the light, airy feeling that comes with large expanses of glazing. Careful material selection, curated fenestration and the layering of envelopes create a bright and comfortable interior that can be scaled and applied across the country.

In the Main Building, triple glazed, high-performance curtain wall clads the northern exposure, welcoming in diffused sunlight and providing an exciting view out to the runway. Views towards the apron and taxiway drive the plan layout; the student space and flight dispatch run along the glass while the classrooms, hoteling office space, and admin areas look onto these open spaces. R-44 walls use SIP panels and rigid mineral wool to wrap the East, South, and West walls with continuous insulation. Limited penetrations and enclosed structure eliminate thermal breaks and creates an effective R-value that approaches the theoretical one.

Moveable acoustic glass partitions encase the classrooms and hoteling office space to allow for light penetration while blocking out the noise of the rest of the building. Additionally, the moveable partitions support the ability to combine multiple classrooms for larger lessons or functions. These enclosures, along with other internal walls for the admin and lecture hall, further insulate the spaces that are occupied for longer periods of time.

Similarly, the Hangar uses the uninsulated bay as a buffer for the glazing on the conditioned portion. Translucent polycarbonate panels clad the service bay, filtering light and providing levity to the large spans. The insulated section of the Hangar optimizes the floor area to surface area ratio by creating a two-storey form that opens onto the uninsulated section on both levels.

The large, single slope roofs and cistern collect significant rainwater for greywater uses like flushing toilets, washing planes, and irrigation. The South (Main Building) and West (Hangar) facing roofs provide ample space for the grid-connected photovoltaic array, which exceeds the requirements to charge aircraft and power the two buildings.

An extensive geothermal system under the apron provides ground-source heating for both buildings and for a heat trace system for the apron and taxiway to reduce the need for harsh salts and ongoing labour. Heat recovery ventilators (HRVs) and water-to-air heat pumps ensure high efficiency heating and cooling. LEDs, occupancy sensors, light sensors, and strategically positioned windows limit lighting energy consumption while low-flow fixtures curb water use.

A mass timber structure makes use of a renewable resource, while the innovative hollow-core mass timber panels (CLT top and bottom panels with Glulam beam webs) meet the demands of long spans with significantly less material than a solid slab. The SIP walls lend themselves to efficient prefabrication, transferability, and scalability to meet the needs of the buildings. Mineral wool insulation avoids harmful carbon emissions associated with other insulations and resists moisture. The metal cladding sheds water effectively, is recyclable, low maintenance, and provides easy site installation.

A0.0



A0.1

1:1500 0m 25m 50m 75m 125m

SITE PLAN



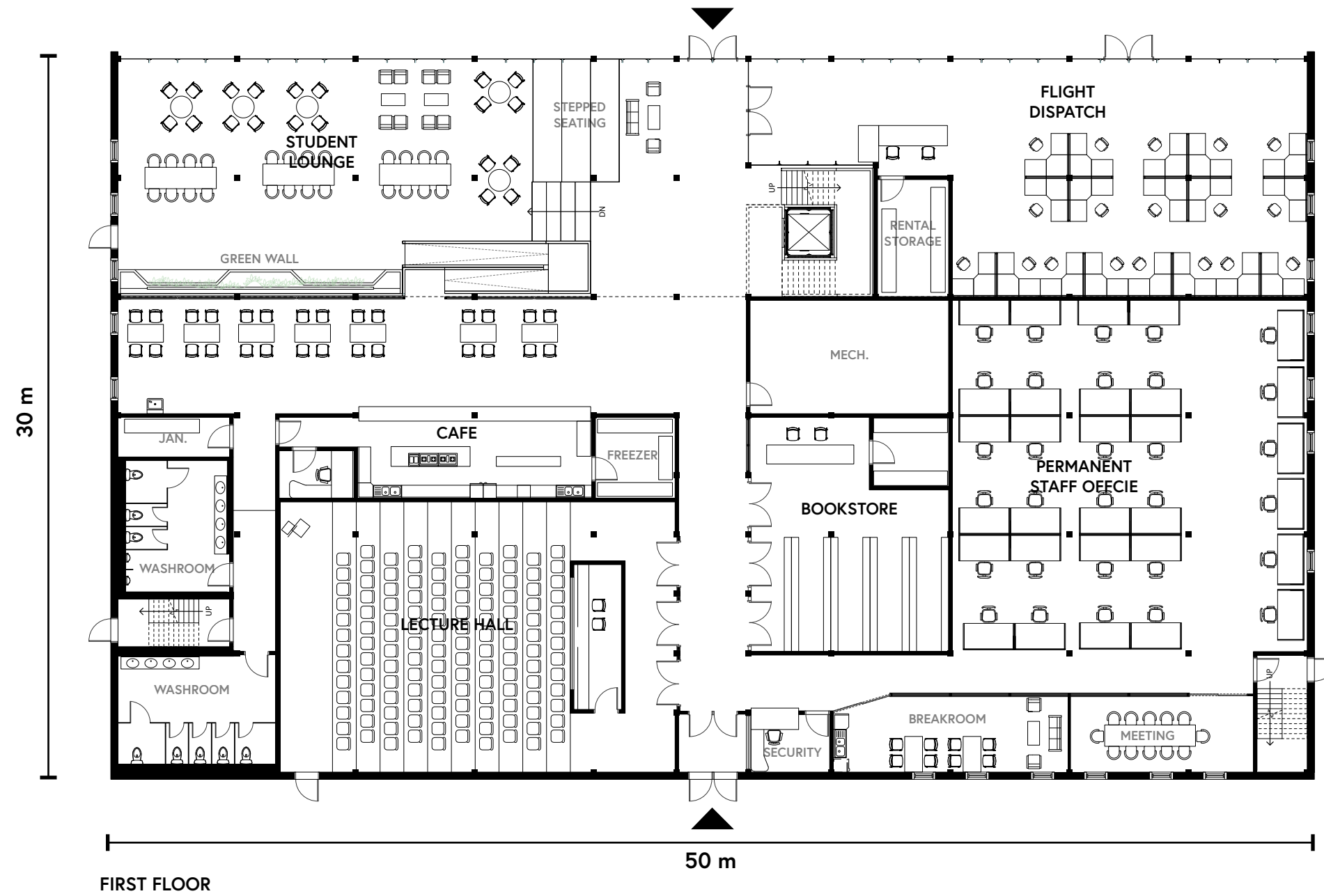
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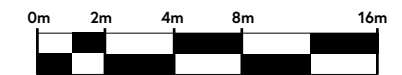
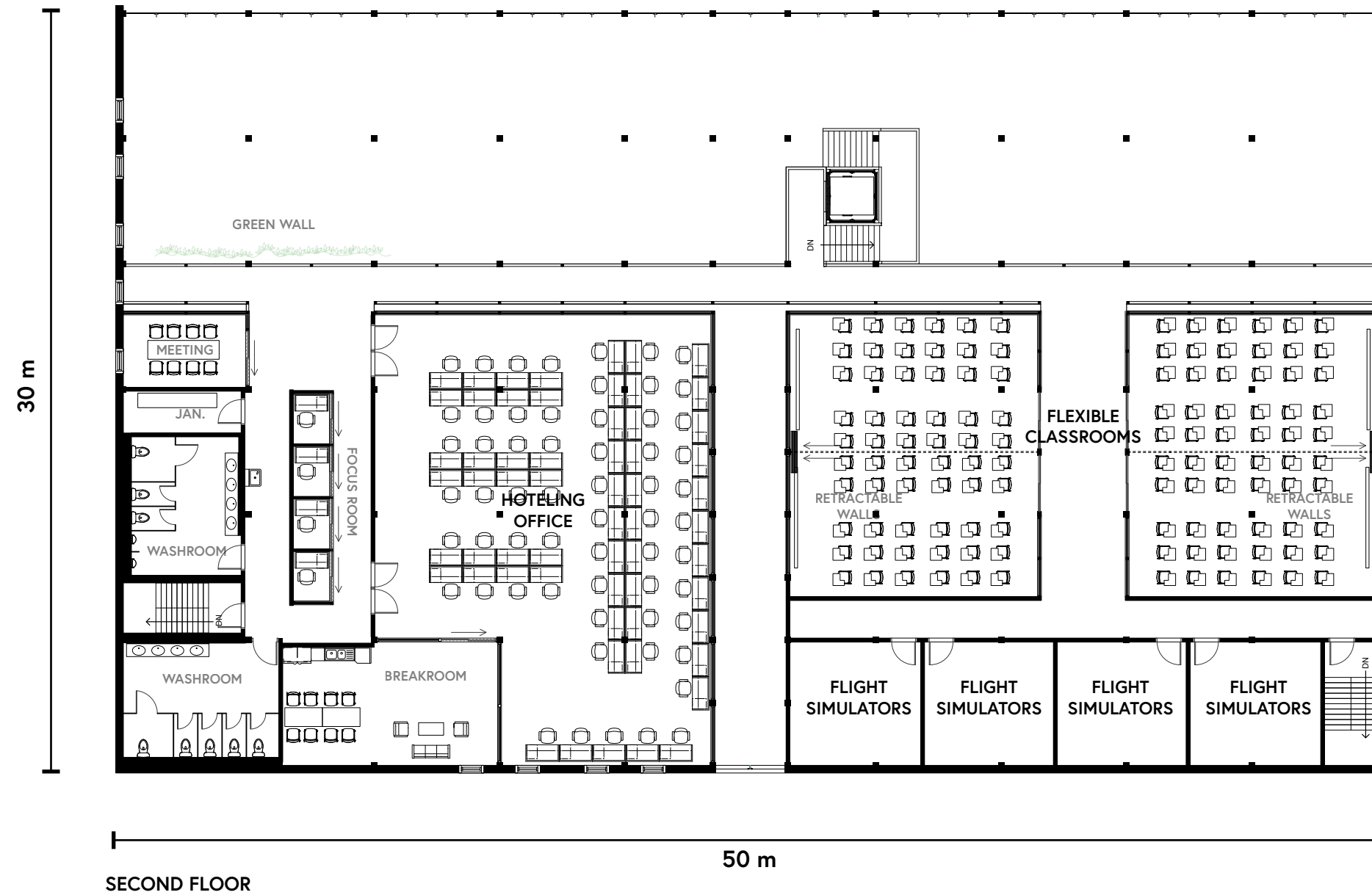
PROPOSED VIEW - MAIN BUILDING

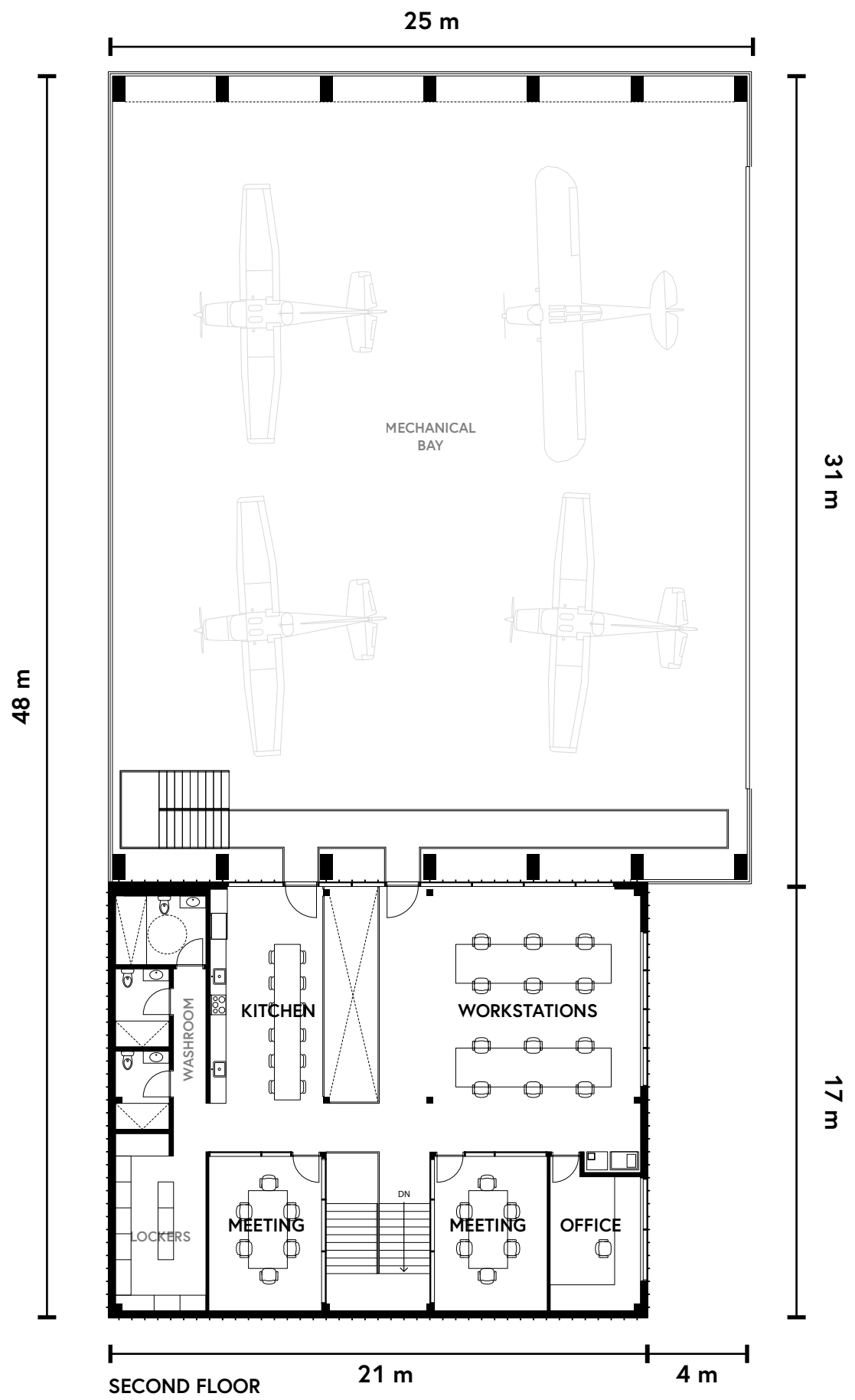
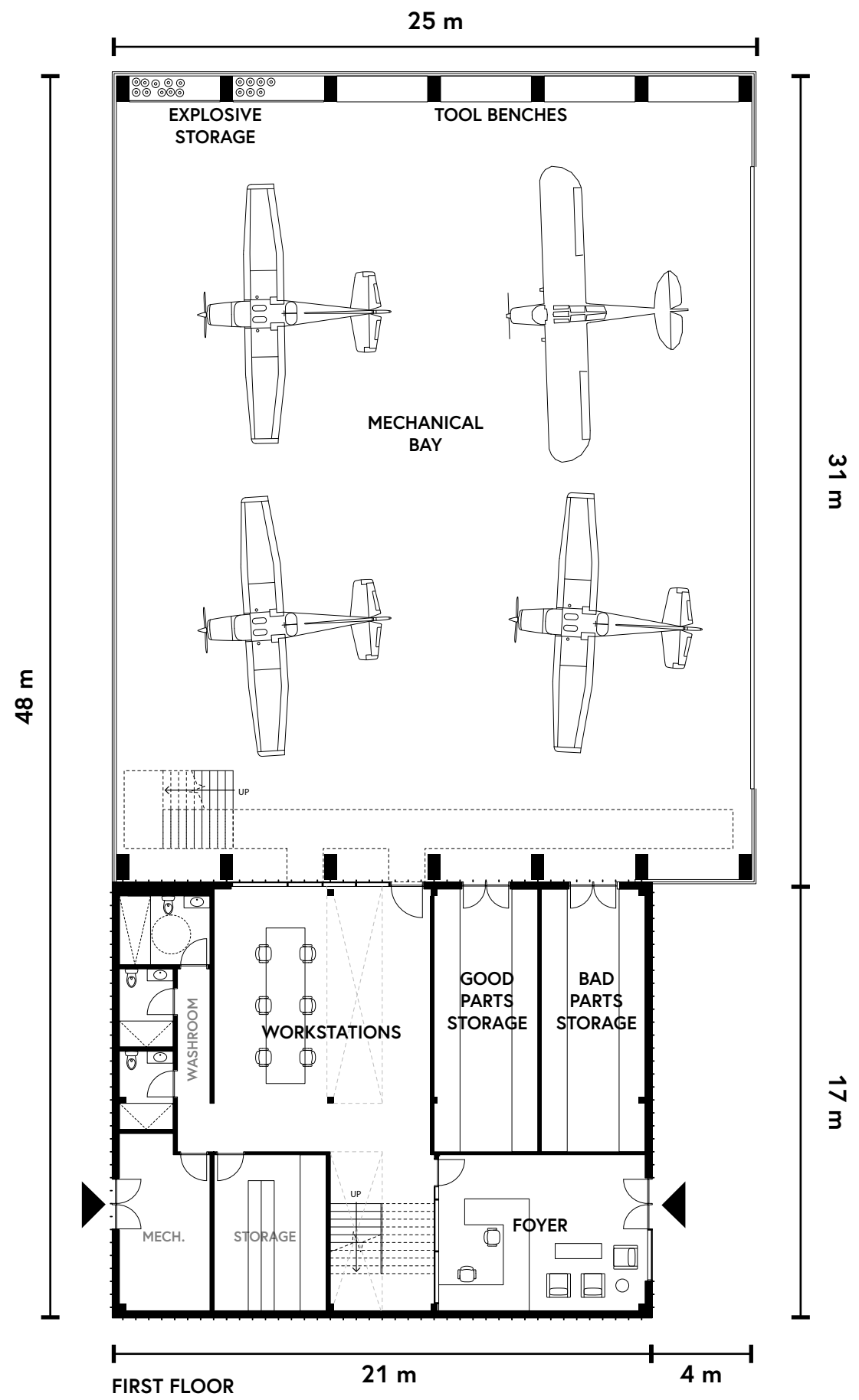


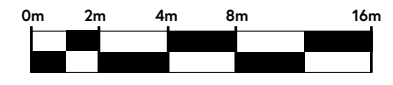
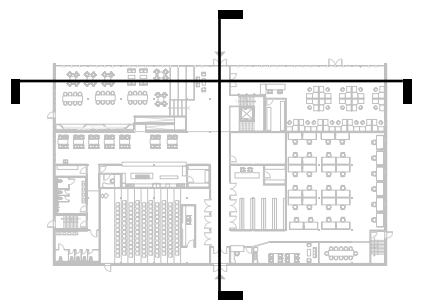
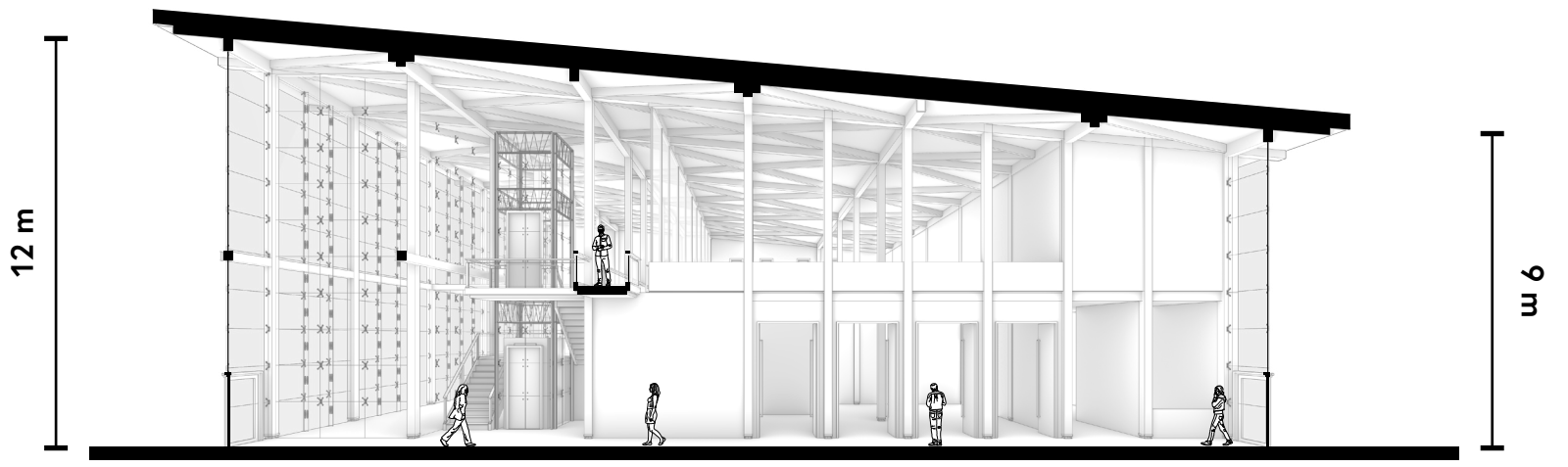
A1.1

PROPOSED VIEW - HANGAR



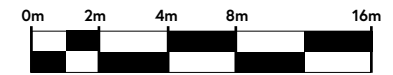
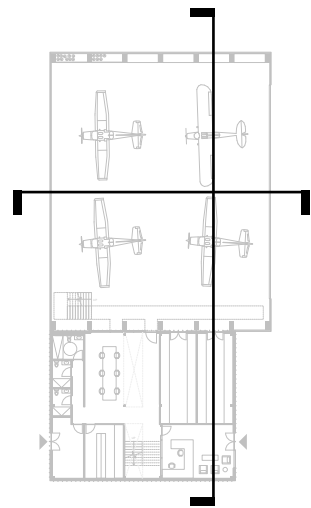
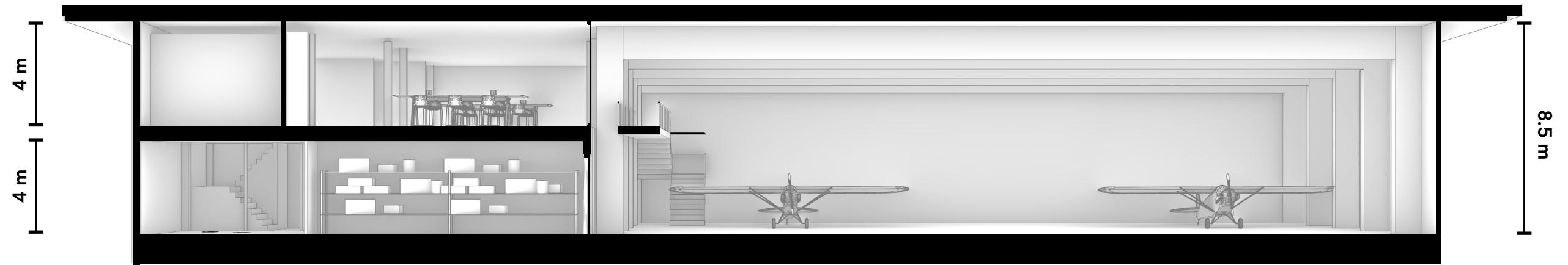






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SECTIONS - MAIN BUILDING



A3.2

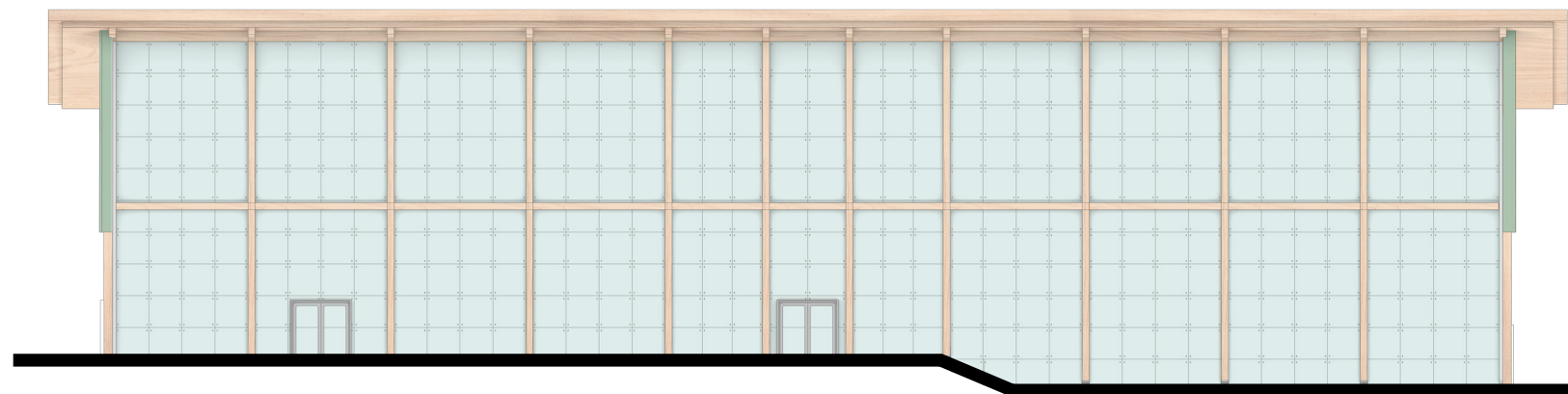
SECTIONS - HANGAR



SOUTH ELEVATION



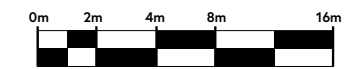
EAST ELEVATION

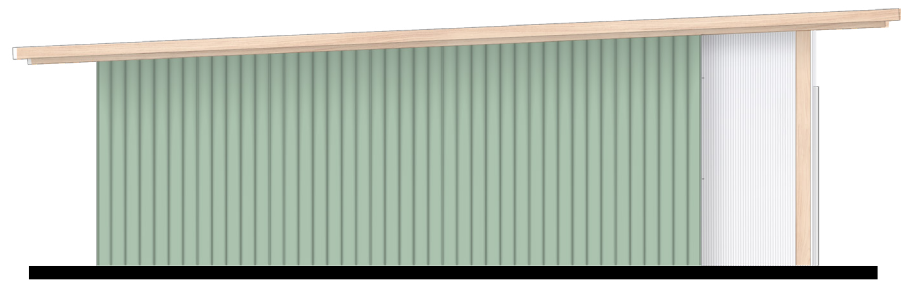


NORTH ELEVATION



WEST ELEVATION





SOUTH ELEVATION



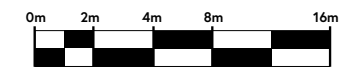
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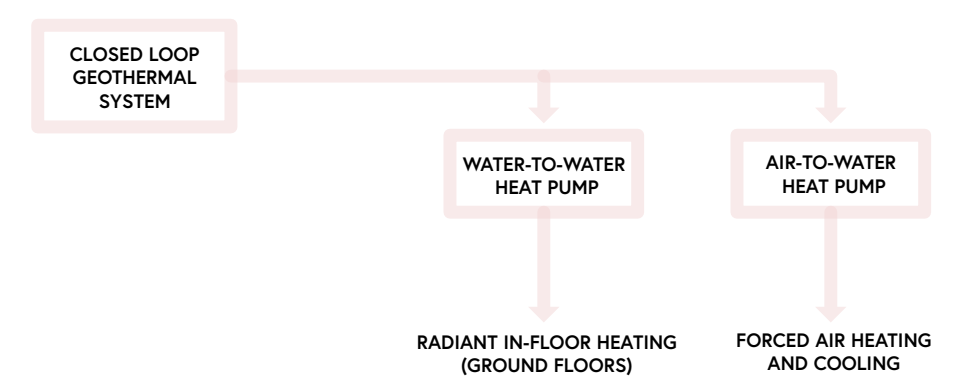
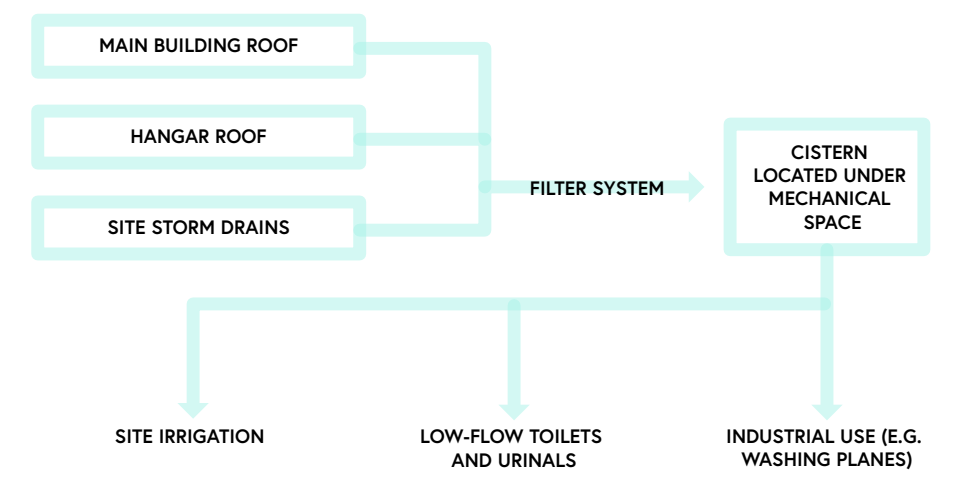
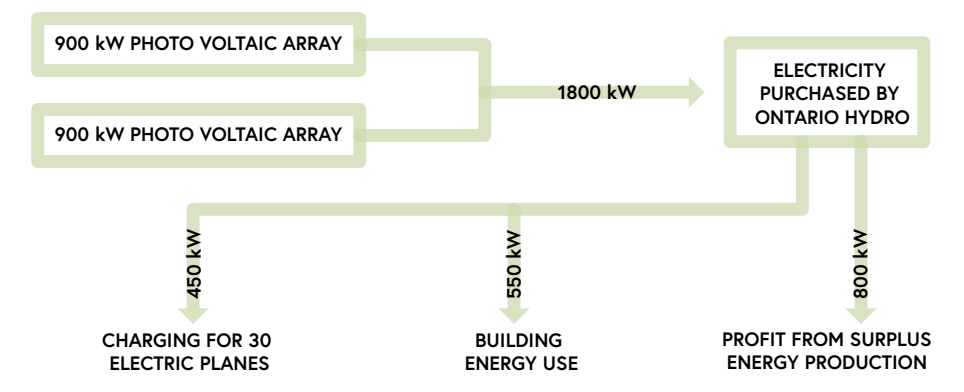
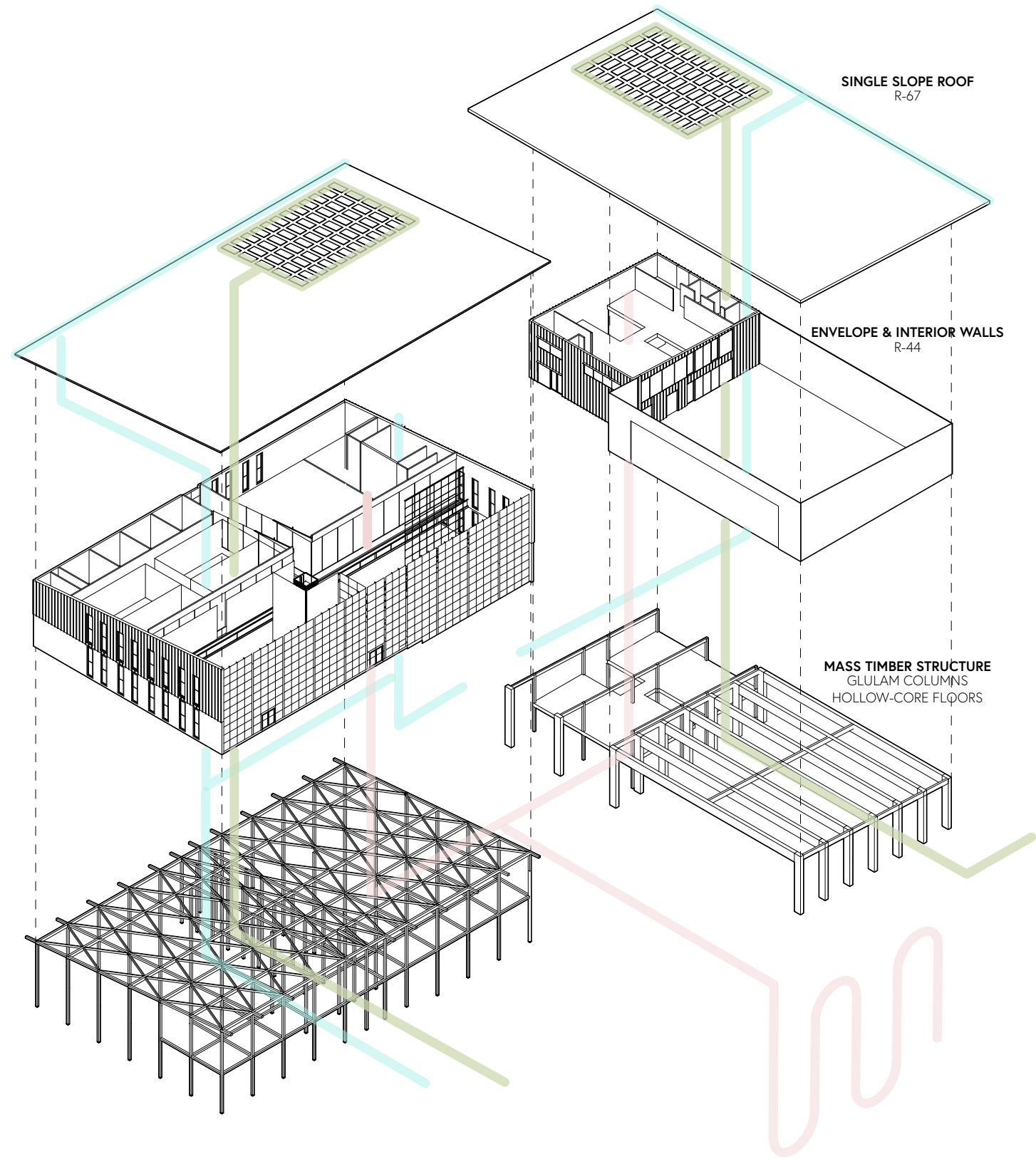


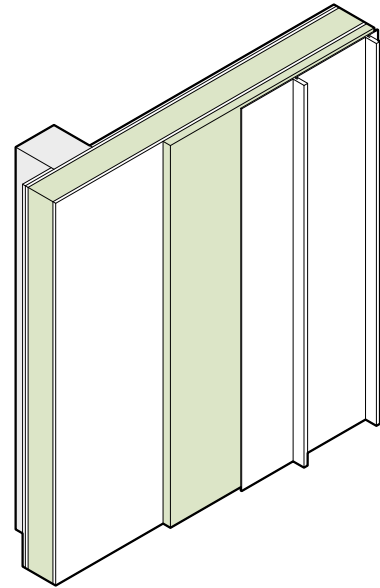
NORTH ELEVATION



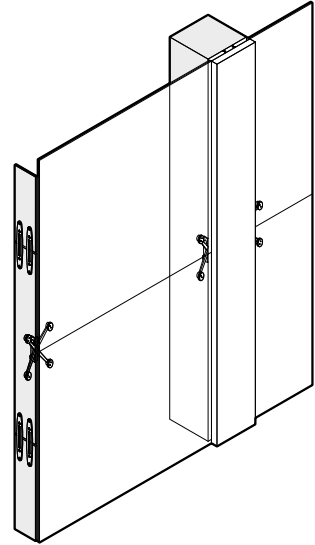
WEST ELEVATION



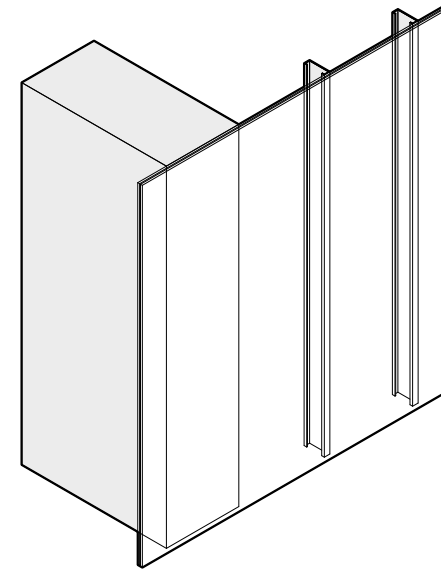




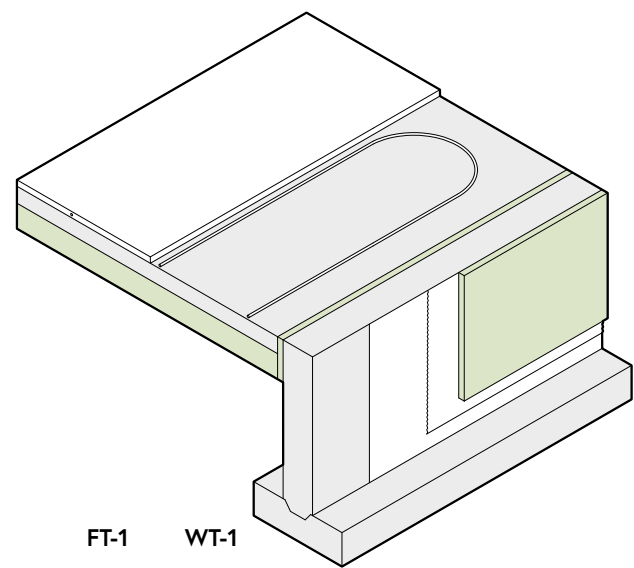
WT-2



WT-3

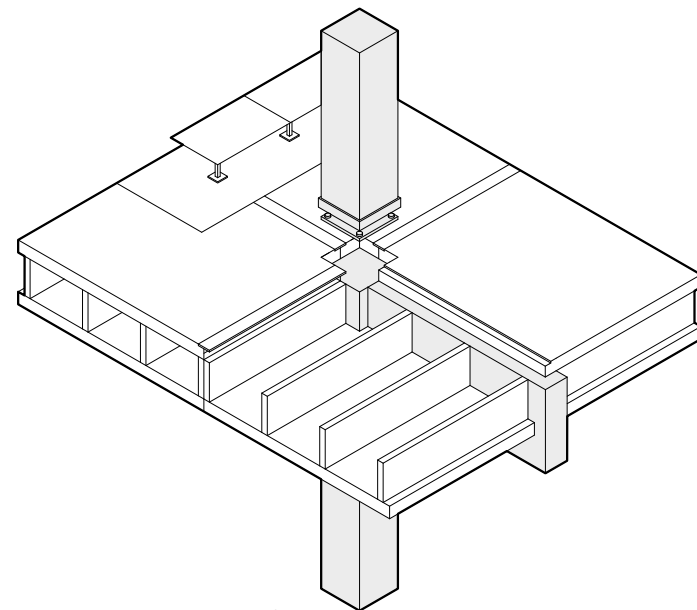


WT-4

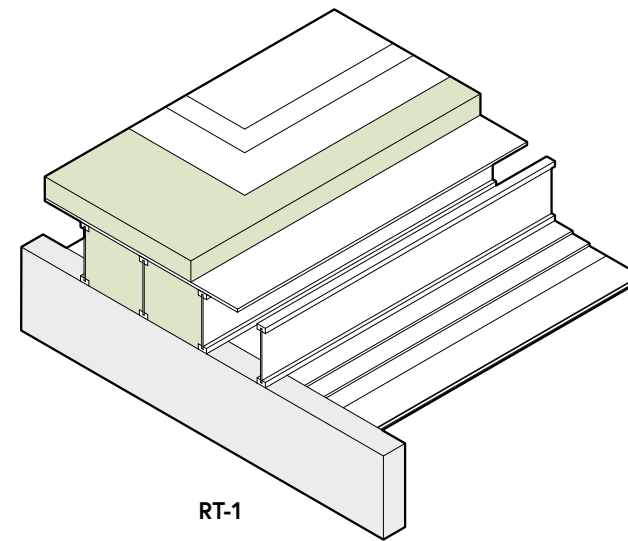


FT-1

WT-1



FT-2



RT-1

WT-1 EXTERIOR CONCRETE WALL - BELOW GRADE:

- 1.5" XPS RIGID INSULATION (R-7.5)
- COMPOSITE DRAINAGE BOARD
- LIQUID APPLIED WATERPROOFING MEMBRANE
- 8" CONCRETE FOUNDATION WALL PER STRUCTURAL
- 1.5" XPS RIGID INSULATION (R-7.5)
- 10 MIL POLY VAPOUR BARRIER (TAPE ALL SEAMS)

WT-2 EXTERIOR SIP WALL:

- METAL CLADDING, 2" STANDING SEAM @ 500MM O.C.
- 3/4" RAIN SCREEN CAVITY
- 2" RIGID MINERAL WOOL INSULATION (R-8)
- VAPOUR PERMEABLE SELF-ADHERED MEMBRANE
- 8.25" T&G NEOPOR EPS SIP PANEL PER STRUCTURAL (R-36)
- 6 MIL POLY VAPOUR BARRIER (TAPE ALL SEAMS)
- 5/8" GWB, PAINTED

WT-3 EXTERIOR CURTAIN WALL:

- TRIPLE-GLAZED, LOW-E, KRYPTON FILLED FRAMELESS CURTAIN WALL (R-8)

WT-4 EXTERIOR POLYCARBONATE WALL:

- 6MM TWIN-WALL POLYCARBONATE PANEL
- 3/4" RAIN SCREEN CAVITY
- 6MM TWIN-WALL POLYCARBONATE PANEL
- 2X6 METAL STUD @ 24" O.C. PER STRUCTURAL

FT-1 CONCRETE SLAB:

- 1.5" CONCRETE TOPPING WITH RADIANT TUBES USING RECYCLED AGGREGATE
- REINFORCED CONCRETE SLAB PER STRUCTURAL
- 10 MIL POLY VAPOUR BARRIER (TAPE ALL SEAMS)
- 6" XPS RIGID INSULATION (R-30)
- 6" MIN. FREE DRAINING COMPACTED GRAVEL

FT-2 INTERIOR FLOOR:

- RAISED FLOOR WITH INTEGRATED MEP SERVICES
- 3/4" CEMENT BOARD FIREPROOFING AND ACOUSTIC SHEET
- HOLLOW CORE MASS TIMBER PANEL (CLT PANEL, GLULAM WEBBING, CLT PANEL) PER STRUCTURAL
- 2 LAYERS 5/8" GWB, PAINTED

RT-1 SLOPED ROOF (UNVENTILATED):

- 2 PLY TORCH-ON MEMBRANE
- 3 MM PROTECTION BOARD
- 5" XPS RIGID INSULATION (R-25)
- 3/4" MIN. T&G PLYWOOD SHEATHING
- 14" TJI @ TYP. 16" O.C. PER STRUCTURAL
- 14" MINERAL WOOL CAVITY INSULATION (R-42)
- 2 LAYERS 5/8" GWB
- 1X10 T&G WOOD PANELING, STAIN TBD



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INTERIOR RENDER