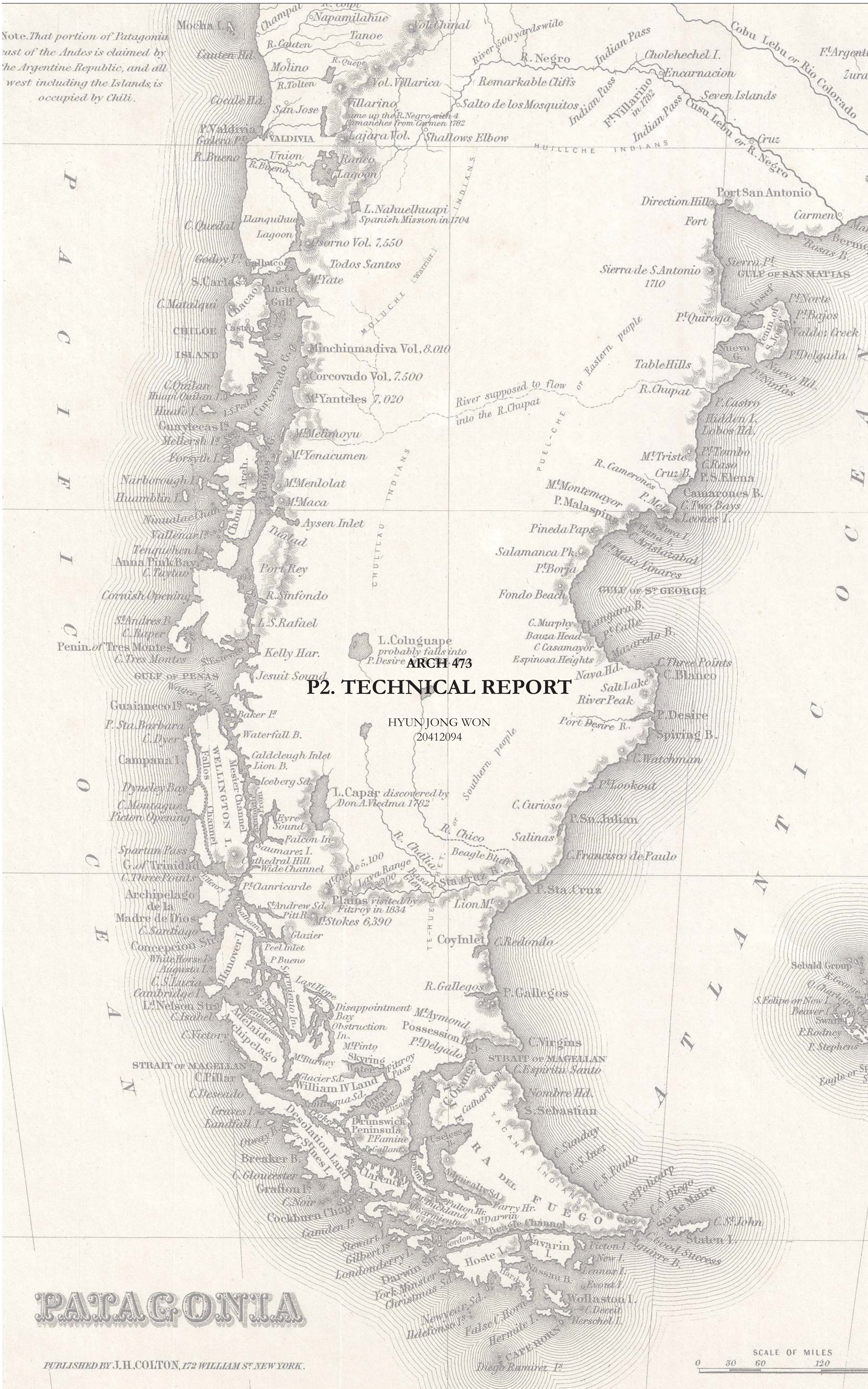


ARCH 473

P2. TECHNICAL REPORT

HYUN JONG WON
20412094

PATAGONIAN GIANTS

Ferdinand Magellan, the first European to reach Patagonia in 1520 during his journey around the world, recorded in his journal,

"the giant marveled greatly.. made signs with one finger raised upward, believing we had come from the sky…"

At a later time in 1850, a Welsh explorer recorded

"...we were amazed by the vast natural wealth of the scenery, incredibly beautiful sights and acres upon acres of virgin ground..."

Patagonian Giant

10 feet tall

TABLE OF CONTENTS

PART 1: ENERGY MANIFESTO

AEES SPREADSHEET
INTENTION

ENERGY MANIFESTO

The building consists of two volumes with distinct typologies: a shed and a tower.

The SHED is envisioned as a shelter nested in the forest from the prevailing western wind. It introduces linear progression of living, social, and service spaces that are universally accessed from a continous porch that provides an opportunity for the building to spill out onto the exterior. It minimizes window to wall ratio on the eastern and southern facade to minimize heat loss while maximizing on the northern and western facade towards the view of Fitz Roy. Given the shallow depth of the building, there is potential for passive daylighting and cross ventilation. Such passive strategies reduce the overall mechanical load of the building while on the other it provides a seamless transition between the building and the landscape.

The TOWER takes inspiration from medieval towers and the Russian chimney. It is envisioned as a fully-insulated mass that contains single continuous space connected by shifting floor plates and stairs, spiralling upwards around a structural core. Dubbed as the “vertical porch,” this staggering arrangement of floors aim to delay and take advantage of the spiralling air flow caused by stack effect. Hence the building have an air intake at its base and an outtake vent at its top. During the summer, the aperture of the entrance door and the operable window on the viewing deck promote passive ventilation, whereas during the winter, the run-around loop system facilitates a similar mechanism while recovering partial heat. The core, dubbed as the “stacked hearth,” acts as the thermal mass of the building, conducting and convecting heat from vertically-stacked wood furnaces that are distributed throughout the building. This works in conjuction with the in-floor hydronic heating system, which act as local sources of heat throughout the tower. However, the system of the building, for the most part, is envisioned to be partially functional and hence “dormant” when the spa program is not in use. The shallow depth of the tower require minimum penetrations to sufficiently evoke the dim interior.

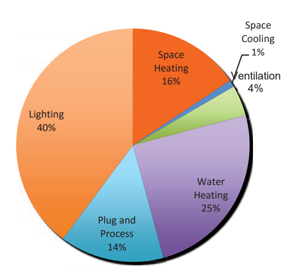
AEES SPREADSHEET ENERGY REPORT SUMMARY

SHED

Total Net Floor Area	423 m^2	Window-to-Wall Ratio	0.17
Total Gross Floor Area	423 m^2	Floor Area to Enclosure Ratio	0.43
Site Area	1330 m^2	Window Spec: U-value = 1.1 SHGC = 0.67	
		Daylight Fraction	0.10

Estimated Total Annual Energy Use	**42674 ekWh**
Energy Use by End-Use	
Space Heating	6678 kWh
Space Cooling	413 kWh
Ventilation	1814 kWh
Water Heating	10629 kWh
Plug and Process	6164 kWh
Lighting	16975 kWh
Renewable Energy Generation	0 kWh
Energy Use Intensity (EUI)	**101** ekWh/m²/year
EUI with Renewable Energy	101 ekWh/m²/year
Estimated Global Warming Potential	
Nitrogen oxides (NOx)	13 kg
Sulphur dioxide (SO_2)	29 kg
Carbon dioxide (CO_2)	6841 kg
Equivalent to CO_2 emissions from	13.5 cars

Energy Use by End-Use Table

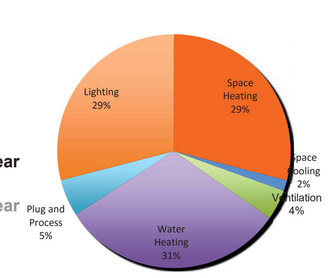


TOWER - TREATMENT + CHANGEROOMS

Total Net Floor Area	118 m^2	Window-to-Wall Ratio	0.15
Total Gross Floor Area	194 m^2	Floor Area to Enclosure Ratio	0.27
Site Area	0 m^2	Window Spec: U-value = 1.1 SHGC = 0.67	
		Daylight Fraction	0.00

Estimated Total Annual Energy Use	**33621 ekWh**
Energy Use by End-Use	
Space Heating	9761 kWh
Space Cooling	494 kWh
Ventilation	1403 kWh
Water Heating	10490 kWh
Plug and Process	1721 kWh
Lighting	9752 kWh
Renewable Energy Generation	0 kWh
Energy Use Intensity (EUI)	**173** ekWh/m²/year
EUI with Renewable Energy	173 ekWh/m²/year
Estimated Global Warming Potential	
Nitrogen oxides (NOx)	10 kg
Sulphur dioxide (SO_2)	23 kg
Carbon dioxide (CO_2)	5390 kg
Equivalent to CO_2 emissions from	10.6 cars

Energy Use by End-Use Table

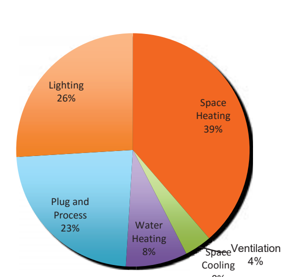


TOWER - WET + DRY SAUNA

Total Net Floor Area	24 m^2	Window-to-Wall Ratio	0.16
Total Gross Floor Area	94 m^2	Floor Area to Enclosure Ratio	0.14
Site Area	0 m^2	Window Spec: U-value = 0 SHGC = 0.67	
		Daylight Fraction	0.00

Estimated Total Annual Energy Use	**27366 ekWh**
Energy Use by End-Use	
Space Heating	10581 kWh
Space Cooling	0 kWh
Ventilation	1030 kWh
Water Heating	2337 kWh
Plug and Process	6311 kWh
Lighting	7107 kWh
Renewable Energy Generation	0 kWh
Energy Use Intensity (EUI)	**291** ekWh/m²/year
EUI with Renewable Energy	291 ekWh/m²/year
Estimated Global Warming Potential	
Nitrogen oxides (NOx)	8 kg
Sulphur dioxide (SO_2)	18 kg
Carbon dioxide (CO_2)	4387 kg
Equivalent to CO_2 emissions from	8.6 cars

Energy Use by End-Use Table



ENERGY STRATEGIES

SPACE HEATING
Highly insulated walls (R-39)
Well-insulated double glazed windows
Increased western and northern exposure
Heat recovery ventilation systems maintain 90% of heat generated by radiant floor heating
Run-around loop in the tower to recover heat from the exhaust and rising air from the atrium.
Use of high-efficiency boiler (90% efficient)

SPACE COOLING
Due to the local climate, the building does not require a cooling system.

VENTILATION:
Operable windows and passive ventilation strategies reduce need for mechanical systems during transition seasons, Fall and Spring.
Low velocity ventilation system using decentralized HRV units result in increased efficiency.

WATER HEATING:
Operable windows and passive ventilation strategies reduce need for mechanical systems during transition seasons, fall and spring
Low velocity ventilation system using decentralized HRV units result in increased efficiency.

PLUG AND PROCESS:

Incorporation of variable frequency drive for fans result in increased overall efficiency
Thermal isolation of sauna and use of radiant floor heating system reduce plug load

LIGHTING
Reduction of Site + Circulation Space lighting
Installation of efficient LED lighting system
Increased efficiency with the use of motion sensors

Zone	Area	AEES Score
Shed	423	101
Tower - Wet/Dry Saunas	94	313
Tower - Treatment/Changerooms	194	173
Total	711	

PART 2: ILLUSTRATED ENERGY MANIFESTO

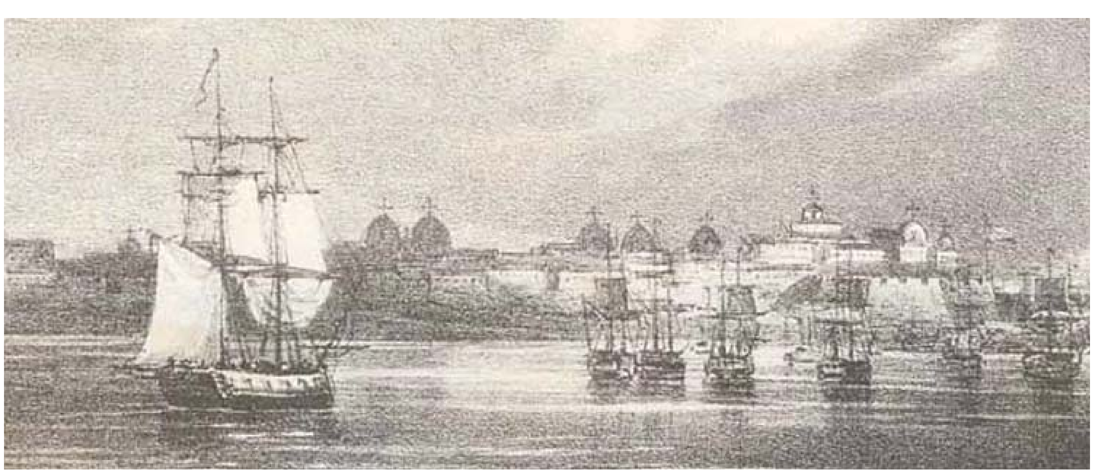
ARCHITECTURAL PARTI
SITE SCALE DIAGRAMS
BUILDING SCALE DIAGRAMS
ROOM SCALE DIAGRAMS

ARCHITECTURAL PARTI

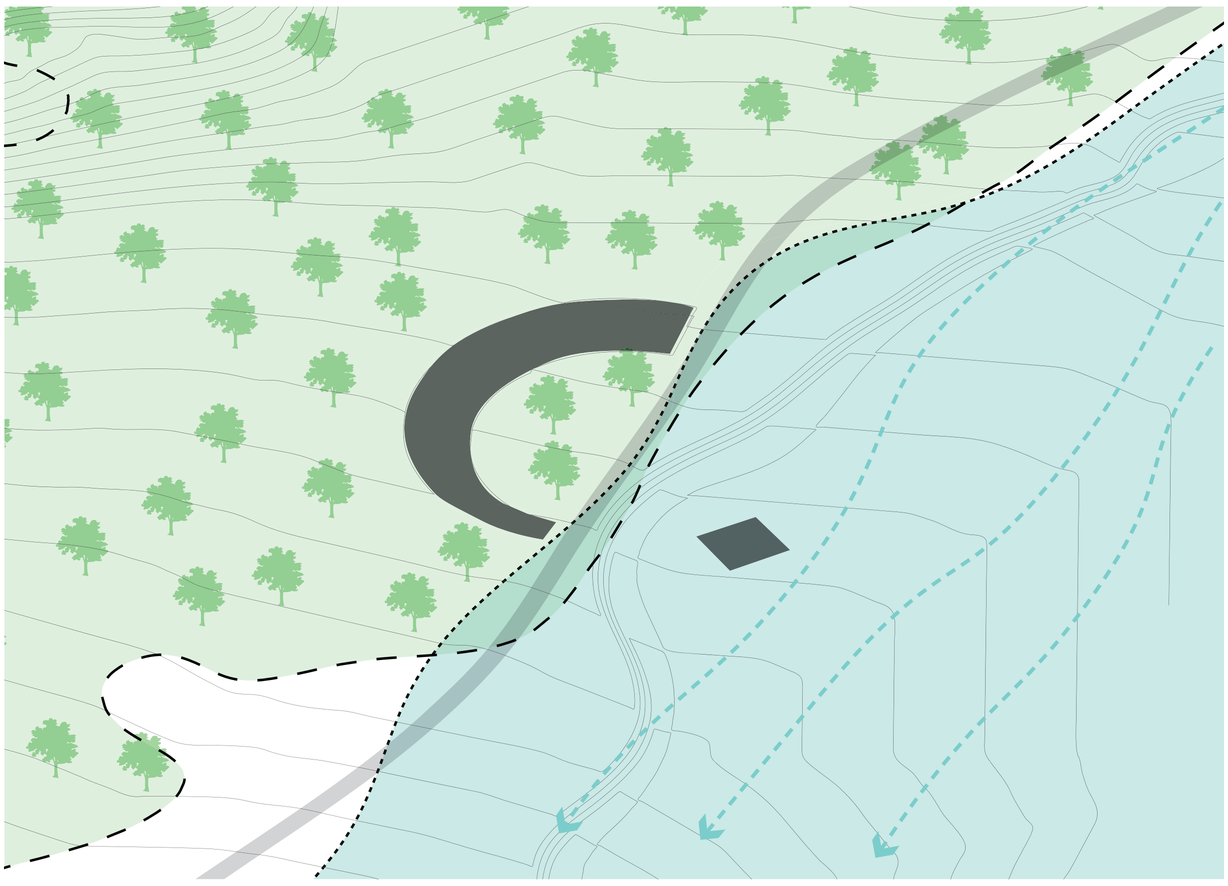
Inspired by the recorded encounters between the early European settlers and the Patagonian giants, the parti seeks to draw on the polarity of this encounter through architectural manifestation. It seeks to narrate an experience that plays off of two contrasting conditions, whether it be material, space, light, sound, or heat. Hence the building is comprised of two volumes, each with its own distinct character, sitting at the intersection where the flood plain meets the forest.

The shed, a low-lying vernacular typology, seeks to invoke a sense of the human scale and engage with the surrounding landscape. It is a place of living where daily rituals are performed and where one can engage in a social interaction with other travellers.

On the other hand, the soaring figure of the tower takes on a different tone. With its monolithic appearance, absence of tectonics, tall dimly-lit interior; it is immeasurable in scale. It is a place of meditation, where one experiences a mental or physical transformation. It is where one can feel the warmth of the hearth, where one can feel the movement of the rising wind, where one can peak into one of the apertures framing the enchanting landscape of Patagonia.

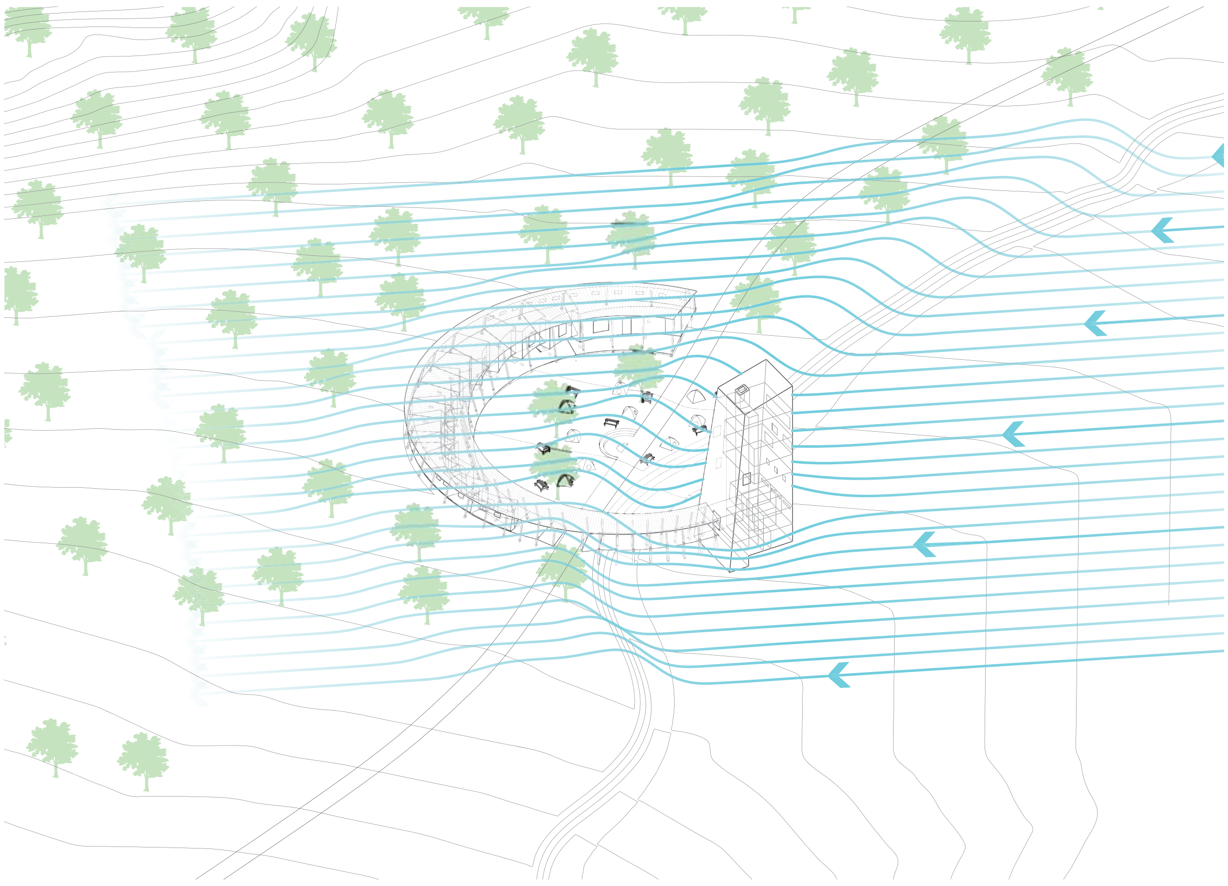


SITE SCALE STRATEGIES



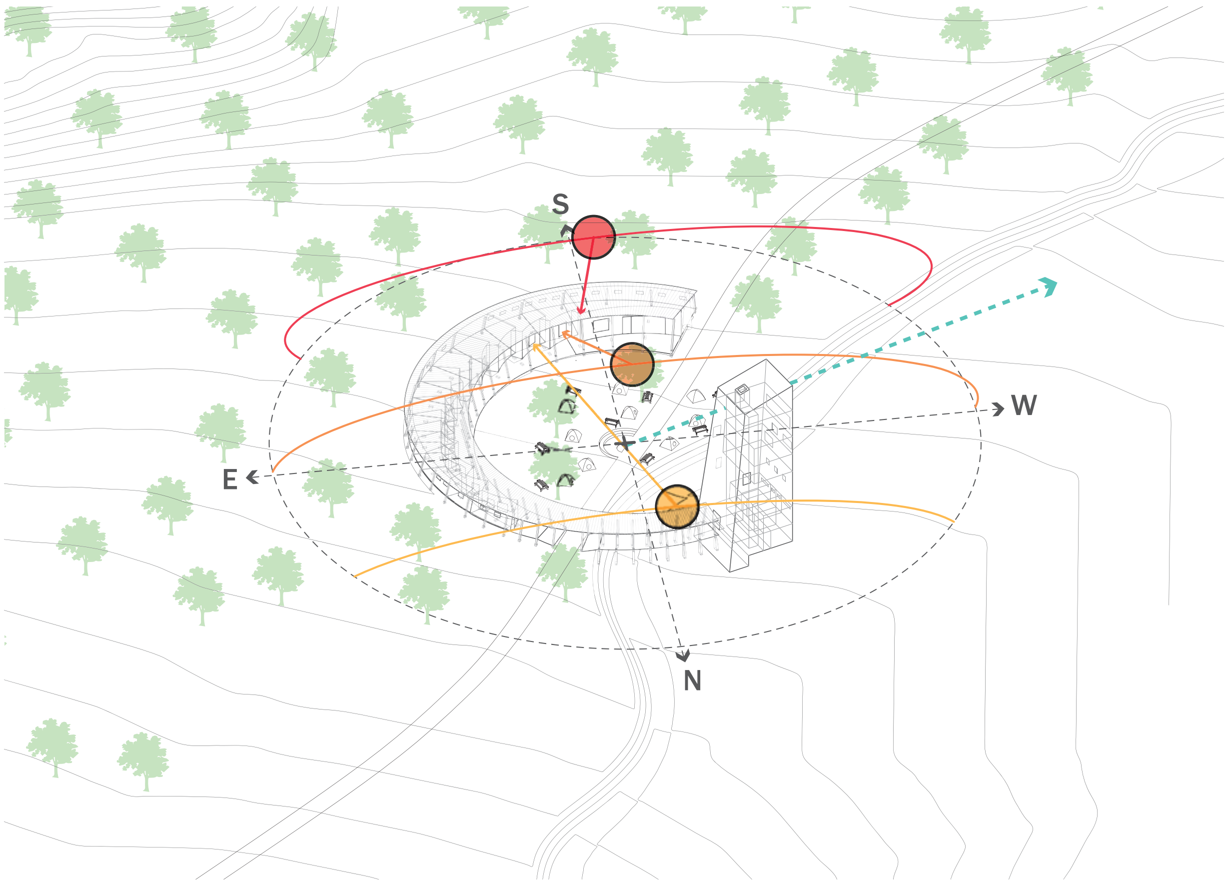
1. SITING

The original path is diverted towards a point in the landscape where the natural foliage area overlaps the flood-prone area. The living portion of the program is set back from the flood plain and takes on a form of a linear shed with an expansive footprint as compared to the tower with a minimal footprint that anchors into the flood plain. Together, they form a central space at the bank of the river, an enclosure of the landscape.



2. WINDBREAK

The shed shelters itself from the prevailing western wind by relying on strategic foliage in the central camping ground to deflect the wind upwards above the roof line of the building. The shed in turn creates microclimate within the camping ground through its enclosure.



3. VIEW + SOLAR ORIENTATION

The two volumes frame the camping ground that opens up towards the view of Fitz Roy.
The shallow interior depth of the shed and the compact form of the tower maximizes daylighting potential and natural heat gain during the winter.
The deciduous trees loses leaves during the winter that allows for deeper interior daylight penetration and extensive passive heat gain, whereas during the summer it provides shading for the camping ground.

BUILDING SCALE - PROGRAM DIAGRAMS

SHED

SOCIAL SPACES
Kitchen, Great Room

RECEPTION
Office, Reception, Waiting Vestibule

ACCOMODATION
Guest Rooms, Public Washrooms

SERVICES
Laundry + Dry Room, Guest Storage, Waste Management

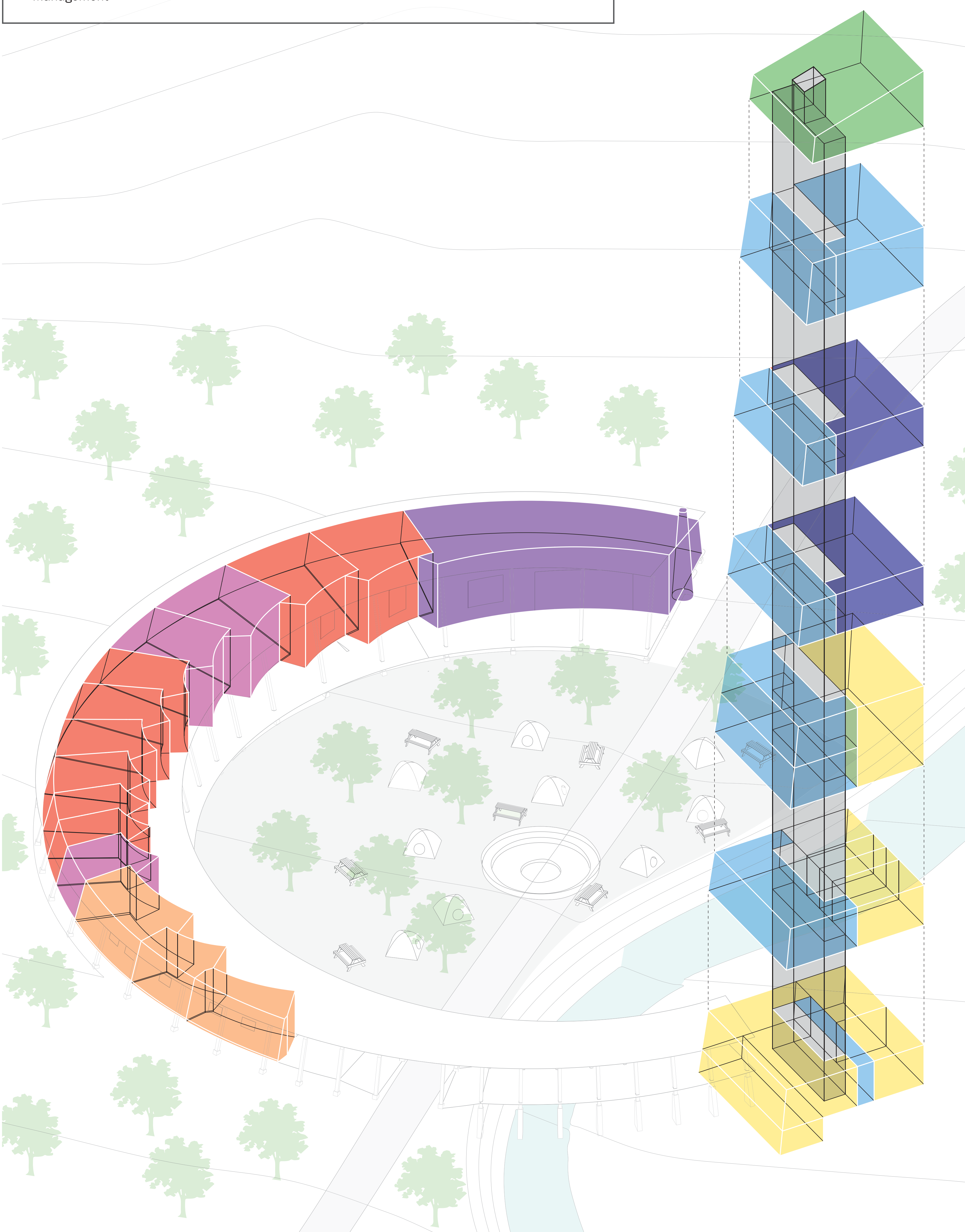
TOWER

SPA
Wet Sauna, Dry Sauna, Plunge Pool, Wash-rooms, Treatment Space

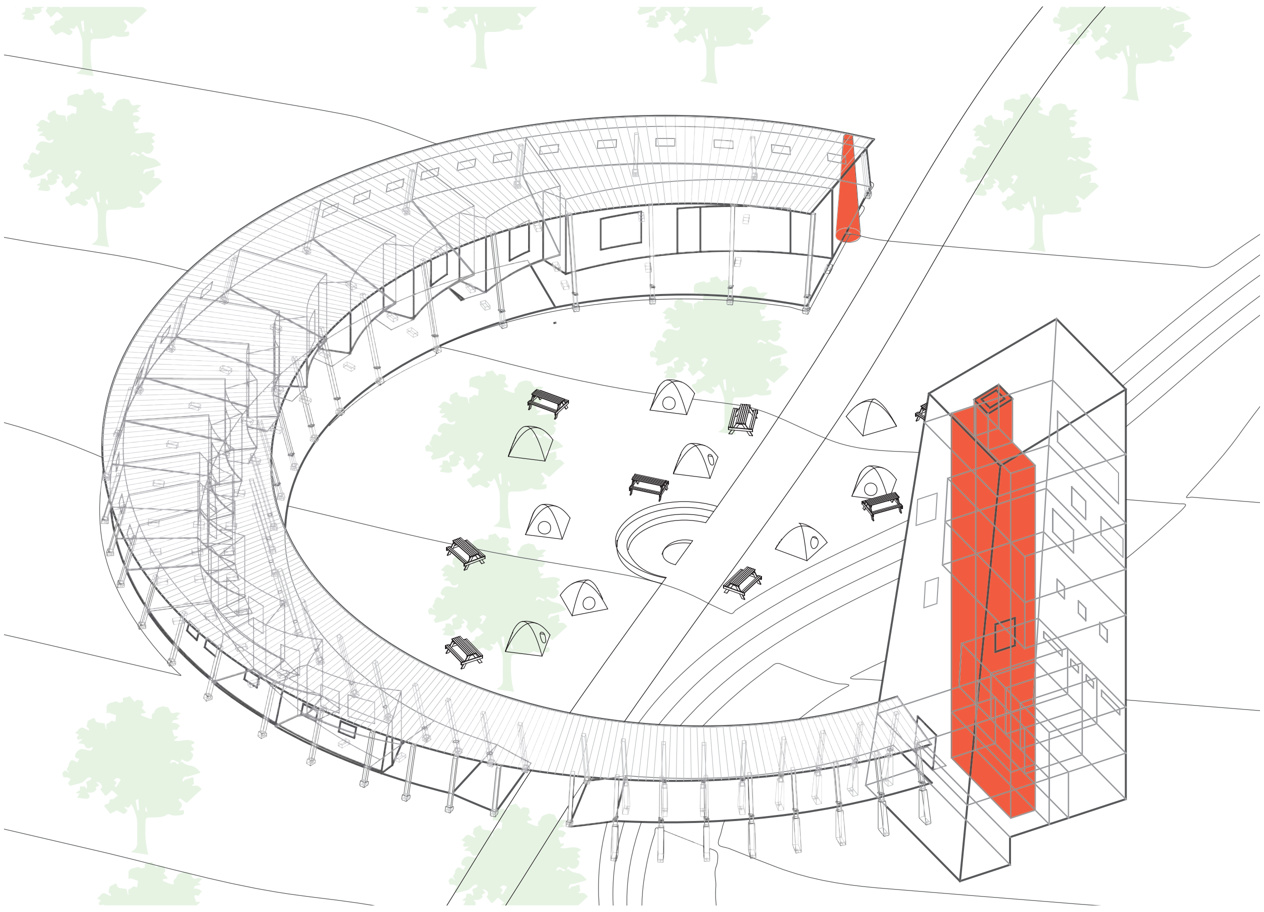
ACCOMODATION
Private Residences

TRANSITION
Circulation, Viewing Deck

GREENHOUSE



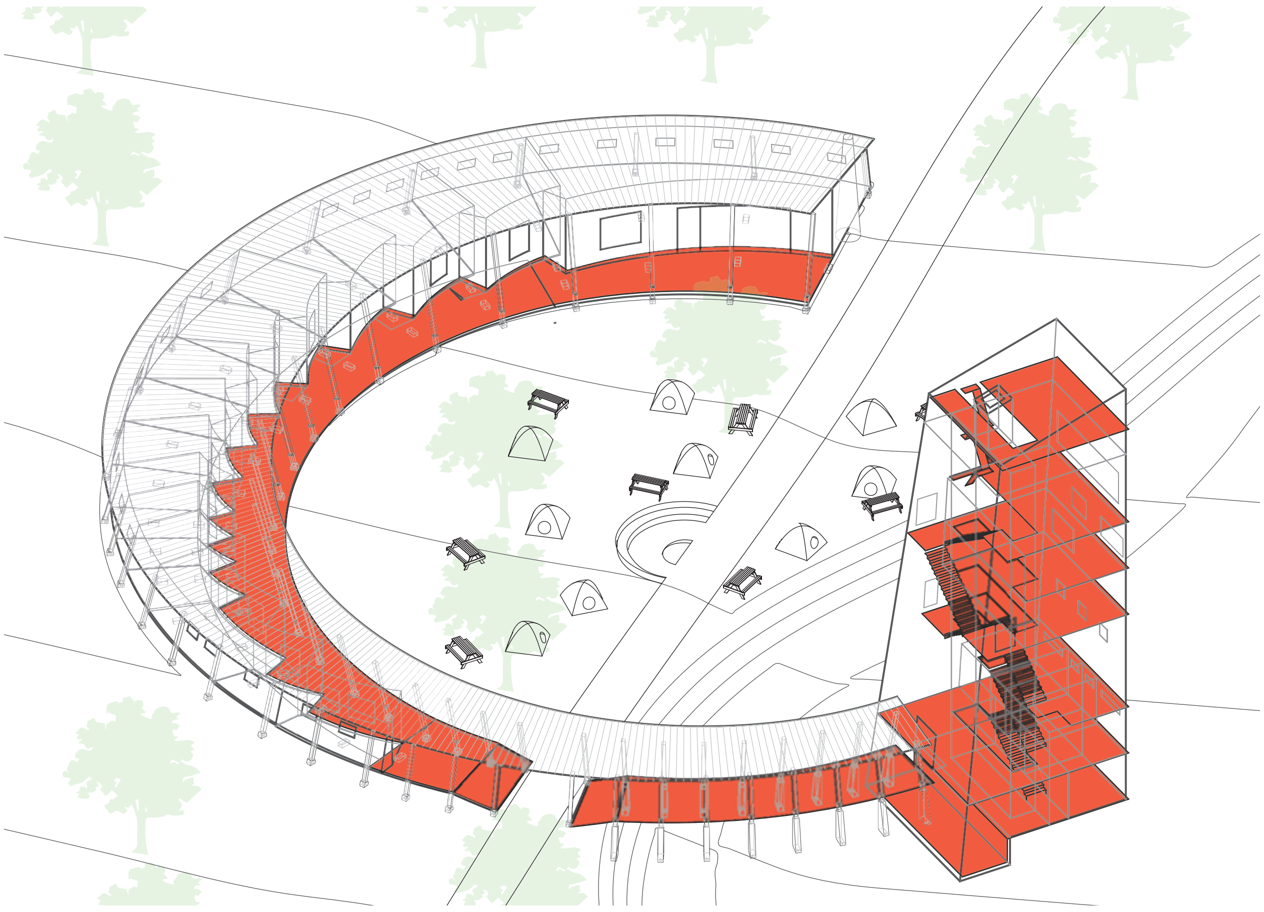
BUILDING SCALE STRATEGY - SHED + TOWER



THE HEARTH ANCHORS

SHED
The masonry chimney within the great room act as a supplementary sources of heat in addition to the radiant floor heating system. It also acts as an anchor point that visually connects between the tip of the shed and the tower.

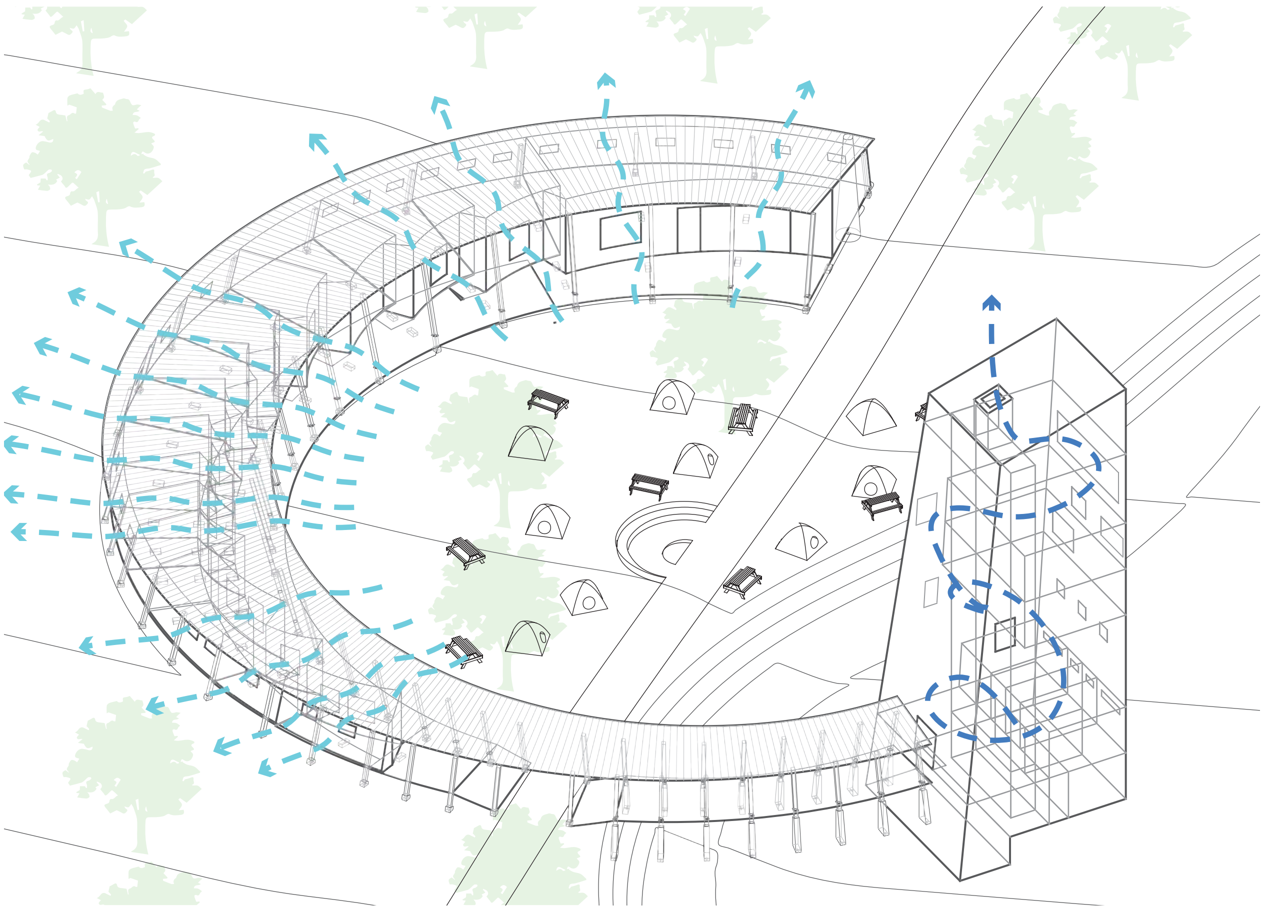
TOWER
The stacked hearth acts as the dominant thermal mass within the tower. The burning furnaces provide heat locally by conduction as well as distribute it vertically by convection through stack effect. Such process reduces the need for supplementary mechanical conditioning especially during the summer. Also, the hearth presents an opporunity for passive heat recovery at the tip of the chimney via run-around loop system.



THE PORCH

SHED
Utilizing the porch as a covered exterior corridor space reduces isolated circulation spaces between programs, hence reducing the overall mechanical load in conditioning the spaces. Such direct adjacency to the exterior also allows maximum daylight potential for the interior spaces.

TOWER
The spiraling nature of the atrium allows for a fluid flow of air vertically throughout the building. The shallow depth of the interior spaces also allow minimum and sparse openings to sufficiently light the interior. The terracing floors incorporate radiant heating system that provide heat locally throughout the building, allowing a continuous thermal experience.

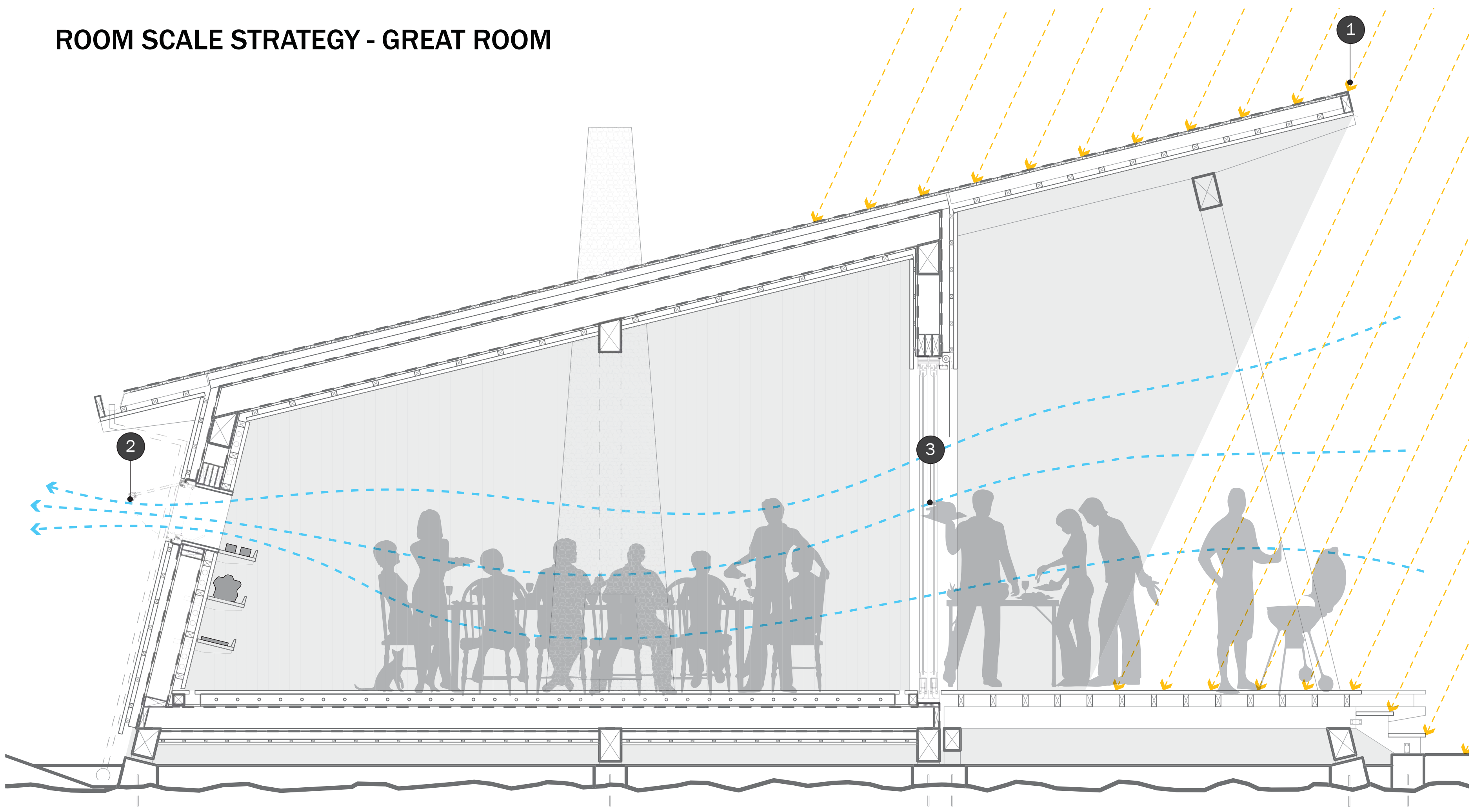


CROSS VENTILATION

SHED
Operable double-hung windows along the north + west facades and punched awning windows on the south + east facades of the volume allow cross ventilation, which eliminates the need for mechanical ventilation during the hotter summer months.

TOWER
A single vertical interior space allows potential for continuous air flow by stack effect. During the summer, the entrance door at the base and the observation window at the top are left open as the air rises and escapes at the top, collecting heat as it rises through the building.

ROOM SCALE STRATEGY - GREAT ROOM

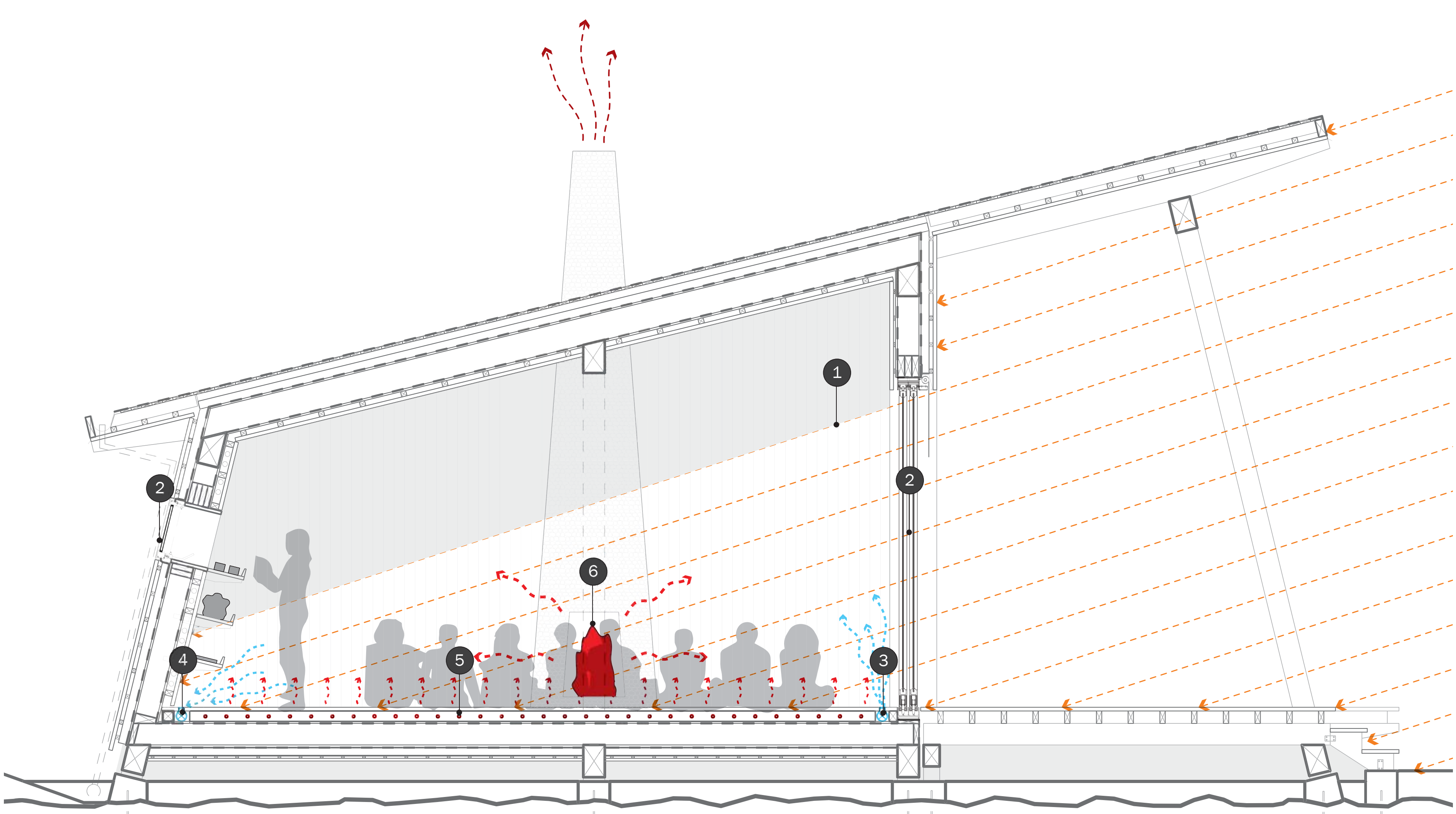


SUMMER:

1. The overhang over the porch provides shading to prevent undesirable solar gain from the high-angle summer sun.

2. Operable awning window allows potential for cross ventilation, eliminating the need for mechanical ventilation.

3. Operable sliding door allows potential for cross ventilation as well as providing the potential for the interior activity to spill out onto the porch.



WINTER:

1. The low-angle winter sun penetrates deep into the great room, providing passive solar heat gain as well as daylighting.

2. The sliding door and the windows are closed shut to retain heat in the space.

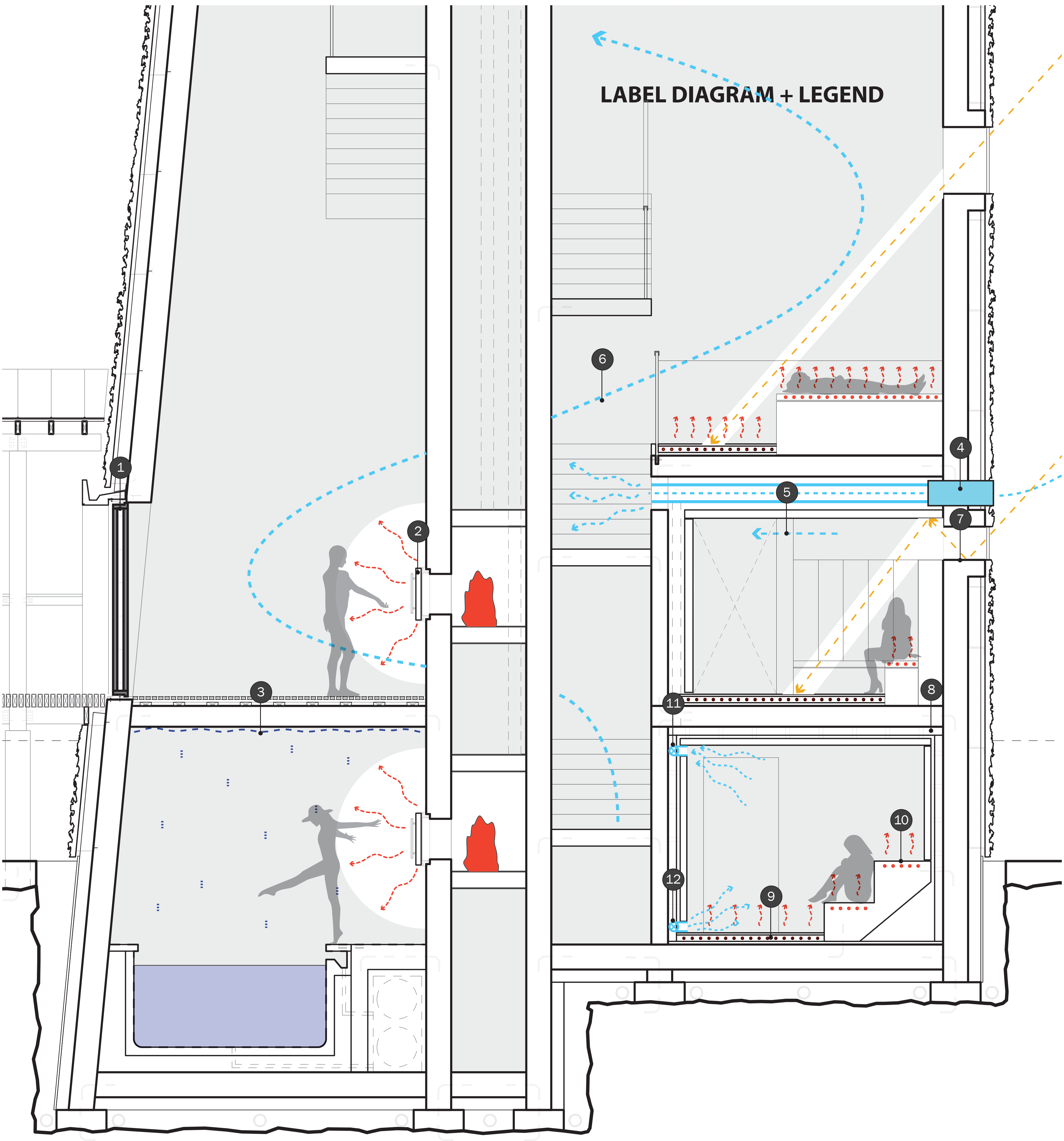
3. Supply Air Enters at the floor at a low velocity in a way that air change is unnoticeable by the occupant.

4. Exhaust air pulls air slowly across the room.

5. Radiant heating in floors provide optimized user comfort in the space.

6. The hearth act as additional source of heat as well as provide ambience for the great room.

ROOM SCALE - TOWER ATRIUM + SPA



1. Insulated weather door prevents any heat leakage and ensures an isolated environment for the atrium.

2. The stacked wood furnace act as local sources of heat as well as provide ambience for the interior space.

3. The hot air from the furnace condenses as it meets the cold surface of the concrete.

4. Run-around loop unit provides supply air for the atrium space.

5. Thresholds allow the air to diffuse into the atirum space.

6. The air spirals vertically as it moves upwards in the atrium.

7. The window sill acts as a light shelf to prevent direct penetration.

8. Interior concrete cladding panel with insulation behind for complete thermal isolation.

9. Radiant floor heating as the heat source for the sauna.

10. Precast concrete furnitures with radiant heating tubes.

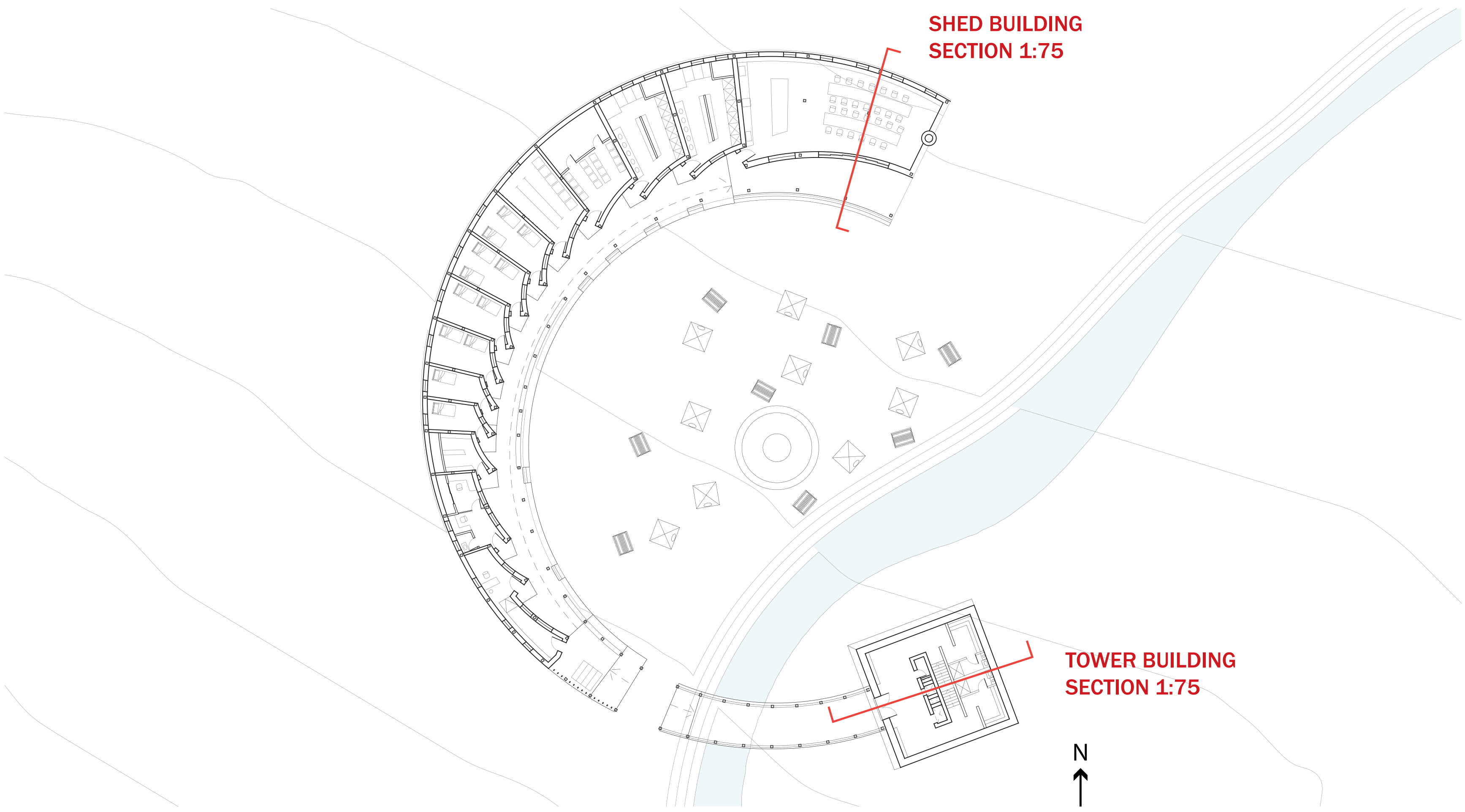
11. Low velocity ventilation supply at floor.

12. Return in ceiling to ERV unit to maintain heat and humidity.

PART3: BUILDING ENVELOPE

TYPICAL WALL ASSEMBLIES
SHED WALL ASSEMBLY SECTION
TOWER WALL ASSEMBLY SECTION
TOWER WINDOW SEAT DETAIL

REFERENCE SITE PLAN



STRATEGIES

SHED

- Stilt construction to minimize bedrock disturbances

- Woodframe construction with repetitive members to simplify assembly

- Maximum glazing along western and northern facade for passive solar gain and daylighting, whereas minimum penetrations on the southern and eastern facade reduce heat loss.

- Double-glazed operable awning and sliding doors to promote cross ventilation.

- Operable shading device to control glare and solar heat gain into the interior.

- Low U-Value assemblies to minimize heat loss through envelope

TOWER

- Durable concrete construction for building longevity against weathering

- Waterproofing the basement to prevent damages from possible flooding

- Insitu re-inforced concrete structure

- Low U-Value assemblies to minimize heat loss through envelope

- Minimum penetrations of windows to minimize heat loss.

- Airlock entrance door to minimize heat loss.

U-VALUE

SHED

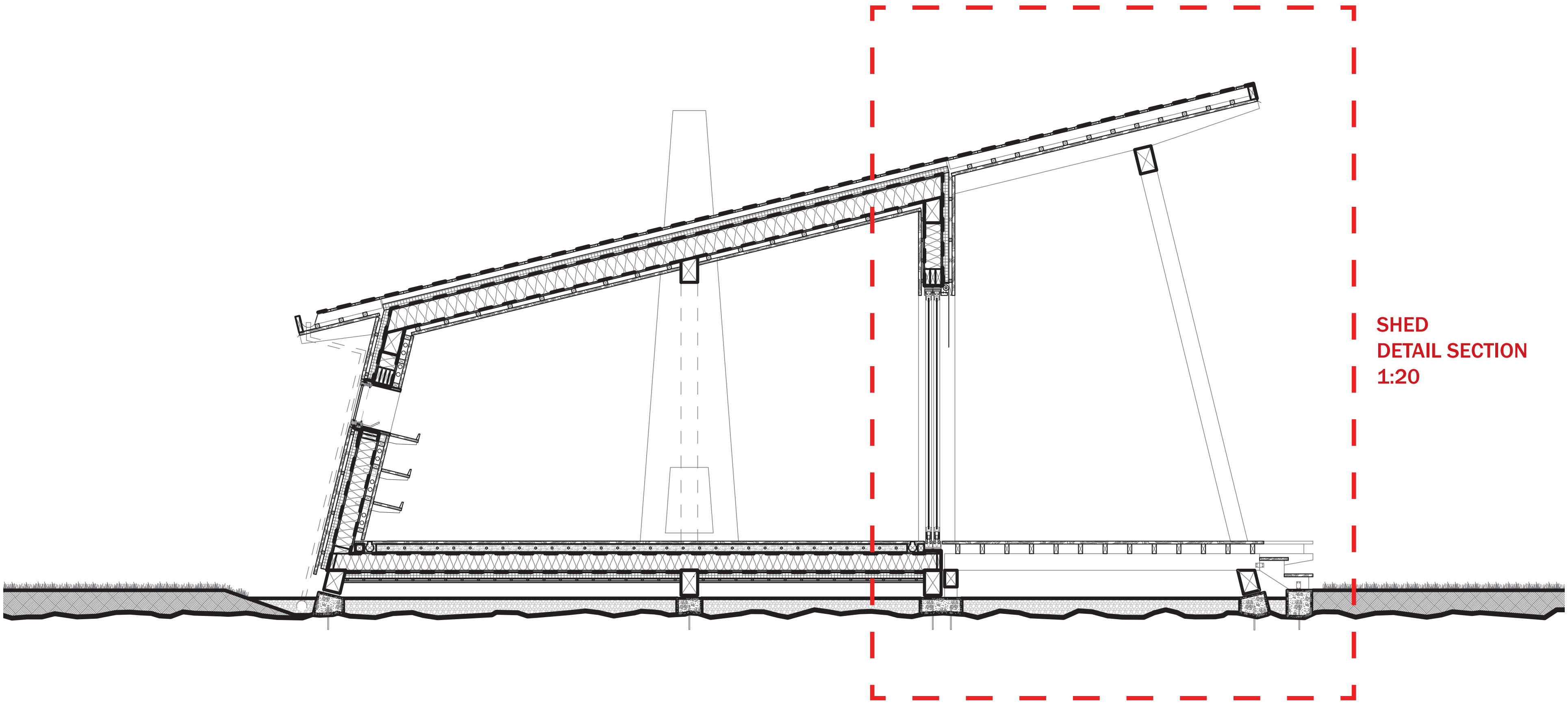
- Exposed Wall: U = 0.15 (200mm Roxul + 75mm XPS Rigid)
- Exposed Floor: U = 0.15 (200mm Roxul + 75mm XPS Rigid)
- Roof: U = 0.13 (250mm Roxul + 75mm XPS Rigid)
- Windows: U = 1.10 (Double-glazed)

TOWER

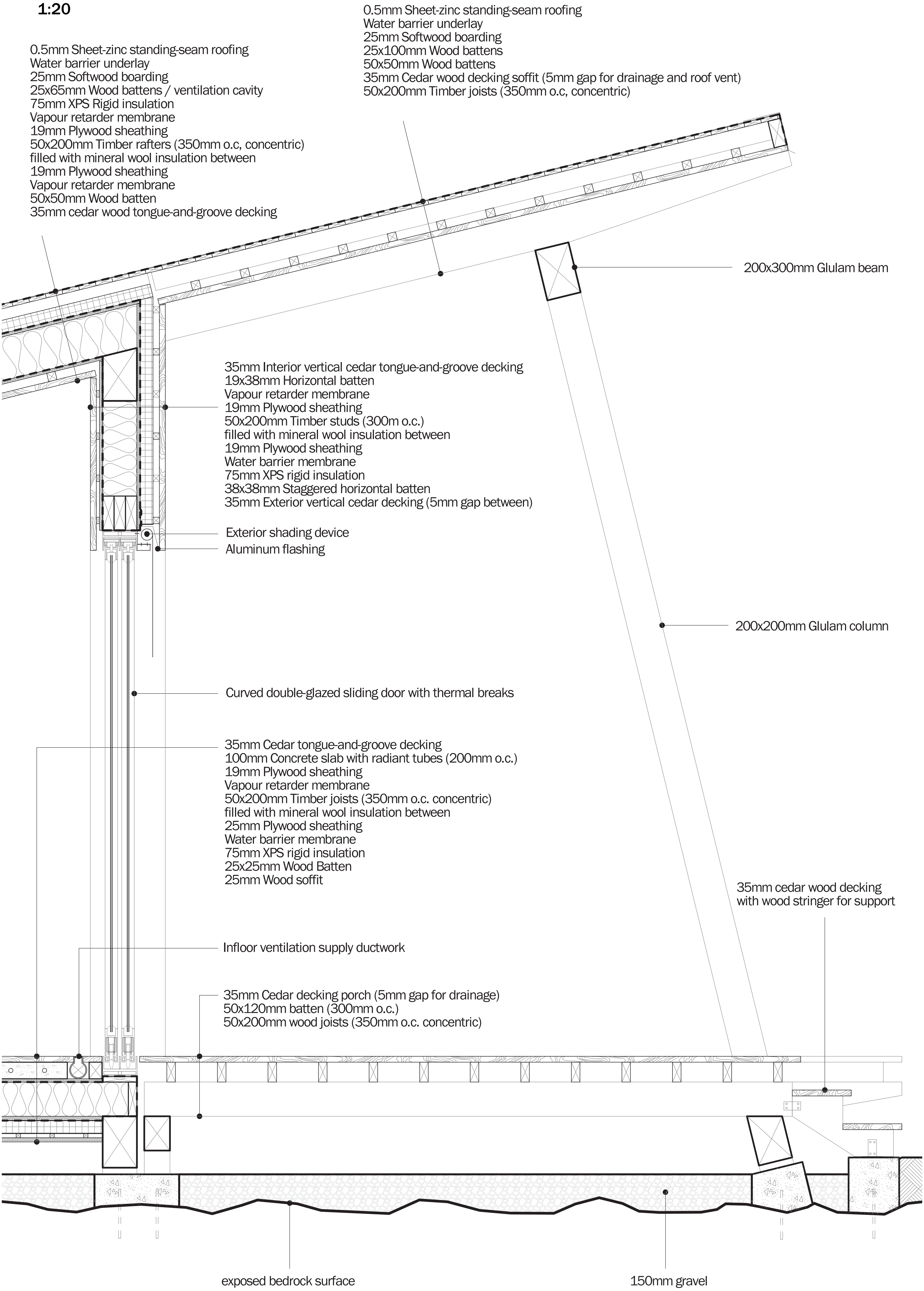
- Exposed Wall: U = 0.19 (150mm XPS Rigid)
- Below-Grade Wall: U = 0.19 (150mm XPS Rigid)
- Foundation Floor: U = 0.19 (150mm XPS Rigid)
- Roof: U = 0.19 (150mm XPS Rigid)
- Windows: U = 1.10 (Double-glazed)

SELECTED DETAILS:

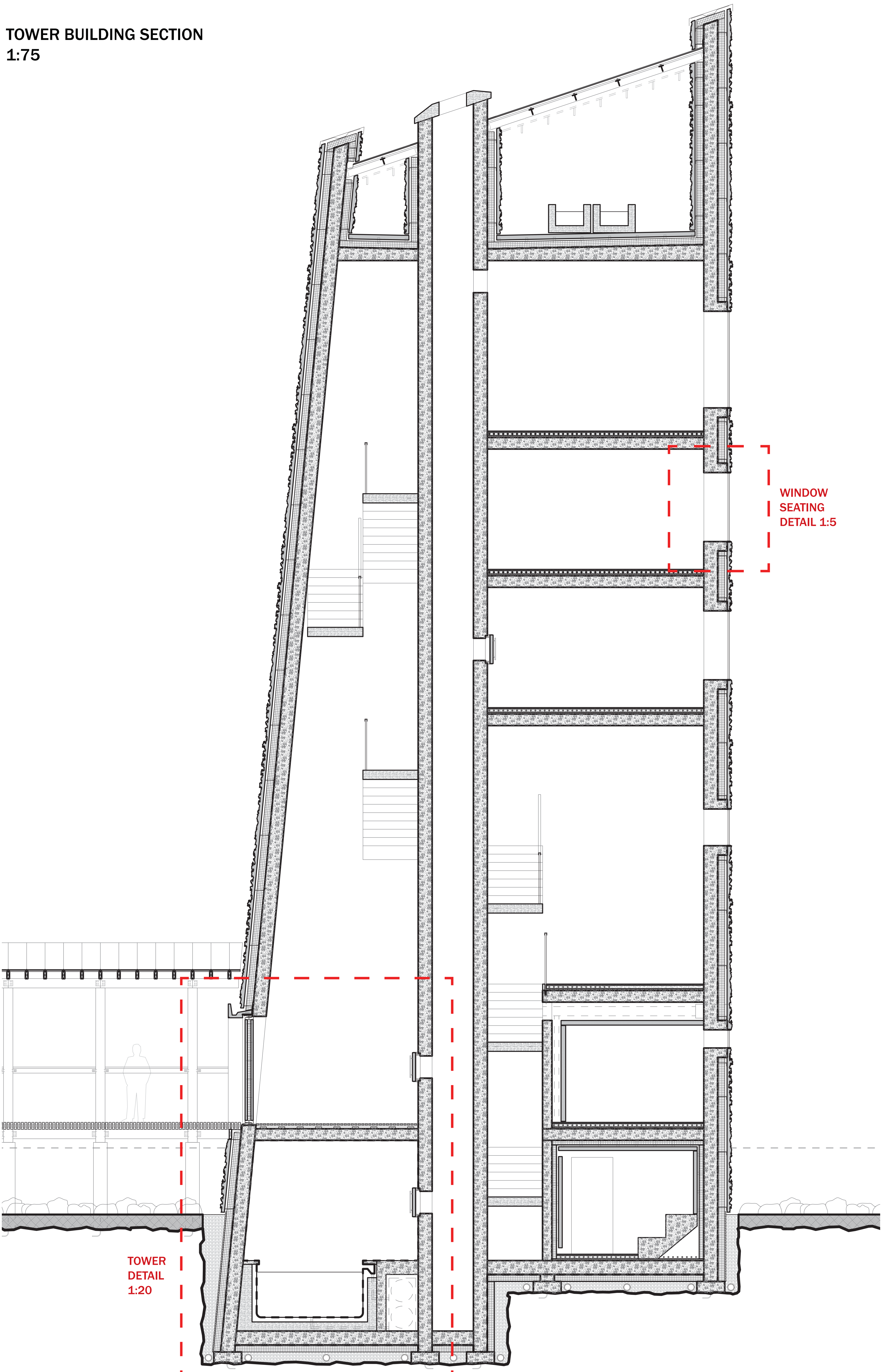
SHED. TYPICAL SECTION THROUGH GREAT ROOM
TOWER. TYPICAL WALL SECTION THROUGH ENTRANCE
TOWER. WINDOW SEATING DETAIL 1:5

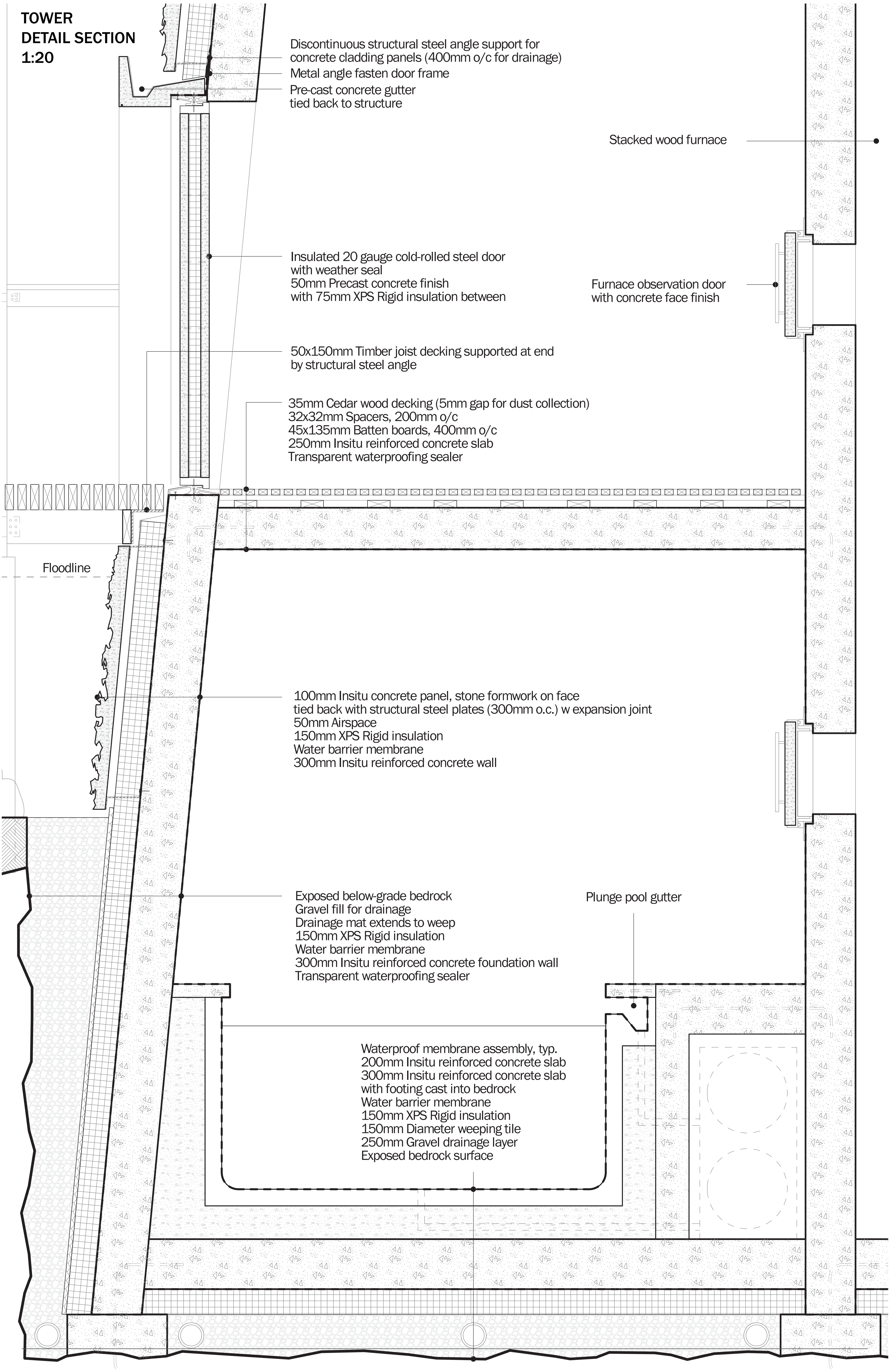


SHED DETAIL SECTION
1:20

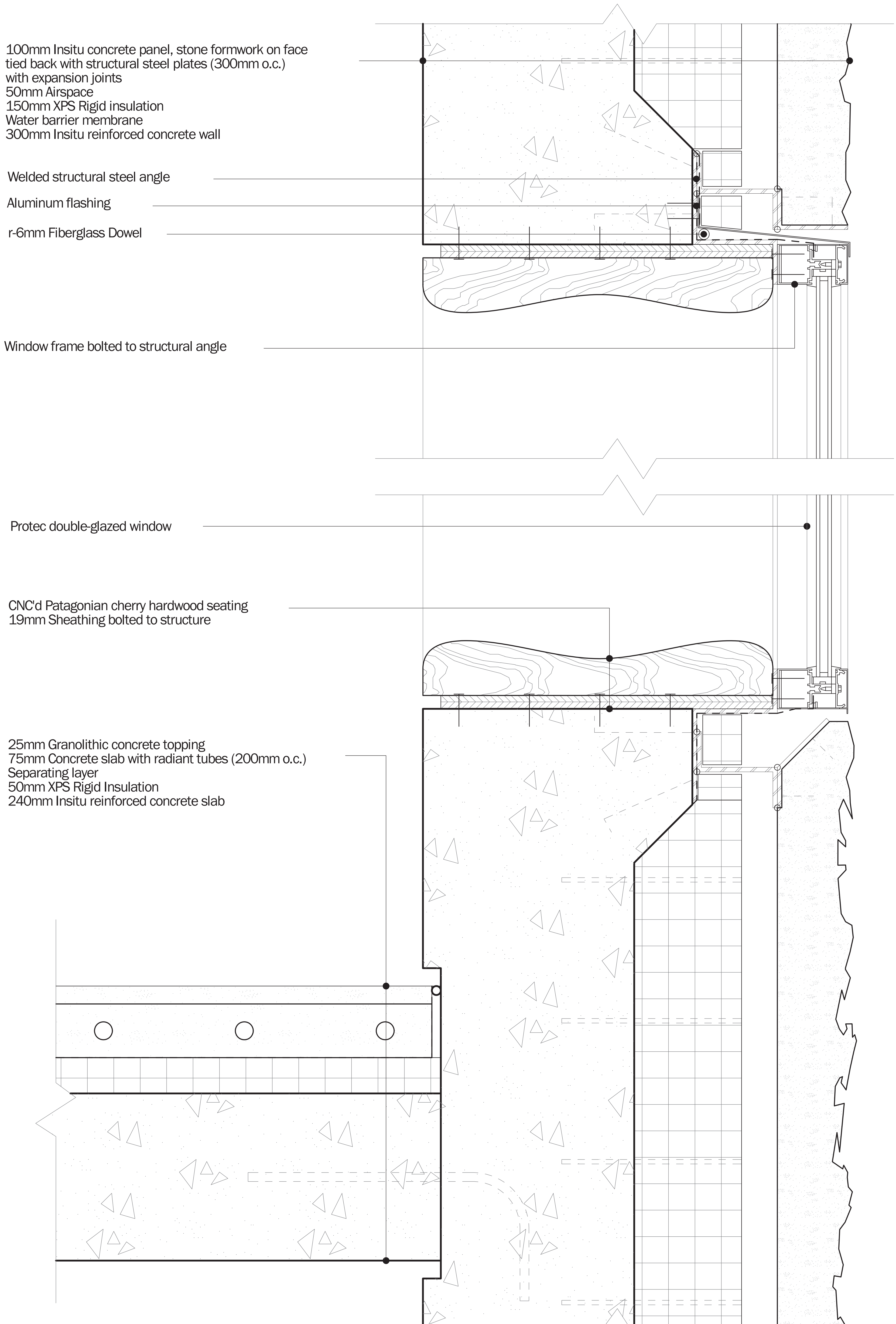


TOWER BUILDING SECTION
1:75




TOWER
DETAIL SECTION
1:20
Discontinuous structural steel angle support for
concrete cladding panels (400mm o/c for drainage)
Metal angle fasten door frame
Pre-cast concrete gutter
tied back to structure
Stacked wood furnace
Insulated 20 gauge cold-rolled steel door
with weather seal
50mm Precast concrete finish
with 75mm XPS Rigid insulation between
Furnace observation door
with concrete face finish
50x150mm Timber joist decking supported at end
by structural steel angle
35mm Cedar wood decking (5mm gap for dust collection)
32x32mm Spacers, 200mm o/c
45x135mm Batten boards, 400mm o/c
250mm Insitu reinforced concrete slab
Transparent waterproofing sealer
Floodline
100mm Insitu concrete panel, stone formwork on face
tied back with structural steel plates (300mm o.c.) w expansion joint
50mm Airspace
150mm XPS Rigid insulation
Water barrier membrane
300mm Insitu reinforced concrete wall
Exposed below-grade bedrock
Gravel fill for drainage
Drainage mat extends to weep
150mm XPS Rigid insulation
Water barrier membrane
300mm Insitu reinforced concrete foundation wall
Transparent waterproofing sealer
Plunge pool gutter
Waterproof membrane assembly, typ.
200mm Insitu reinforced concrete slab
300mm Insitu reinforced concrete slab
with footing cast into bedrock
Water barrier membrane
150mm XPS Rigid insulation
150mm Diameter weeping tile
250mm Gravel drainage layer
Exposed bedrock surface

WINDOW SEATING DETAIL 1:5



PART 4: SYSTEMS

RADIANT FLOOR HEATING
VENTILATION
WATER MANAGEMENT
WASTE MANAGEMENT

SHED

SOCIAL ZONES

KITCHEN AND THE GREAT ROOM
The hearth provides ambience to the space and complements the radiant floor heating system. The space is warm and bright, with tall double-glazed sliding doors to maximize passive daylighting and solar gain. The great room opens out onto the porch towards the landscape.

LIVING ZONES

GUEST ROOMS
All guest rooms share one HRV system for ventilation. The spaces are heated by infloor heating with separate thermostats for maximum user comfort.

SERVICE ZONES

WASHROOMS AND SHOWERS
Negatively pressured space with dedicated exhausts to prevent humidity and undesirable odor from contaminating adjacent spaces.

WASTE MANAGEMENT
Negatively pressured space with dedicated exhausts to prevent humidity and undesirable odor from contaminating adjacent spaces.

LAUNDRY
Negatively pressured space with dedicated exhausts to prevent humidity and pollutants from contaminating adjacent spaces.

STORAGE
Reduced system requirements controlled by occupancy sensors due to infrequent use.

RECEPTION + ENTRY VESTIBULE + OFFICE
The offices share same ventilation system with the reception as the hour of operation overlaps. Independent thermal and ventilation controls ensure a comfortable working environment. Heated with radiant floor system.

TOWER

ATRIUM ZONES

CIRCULATION AND VIEWING DECK
As the atrium is a continuous vertical environmental zone, a single input at the base and output at the top is provided through a run-around loop ventilation system that recovers heat. The air flows vertically upwards by stack effect, accumulating heat as it ascends.

TREATMENT ROOMS
Locally heated with radiant floor and furniture heating system, with the environment sharing with the atrium.

CHANGEROOMS
For maximum user comfort, the rooms and the bench are heated with radiant tubes and its washrooms have individual exhaust.

ISOLATED ZONES

FULL-TIME RESIDENCE
Environmentally isolated from the atrium with glass partitions. It is heated with radiant floor heating, with access to the wood furnace. It is ventilated with an independent HRV.

PLUNGE POOL
Environmetally isolated from the stair leading up to atrium with glass partitions due to its high moisture content. It shares same ERV unit with the wet sauna for ventilation.

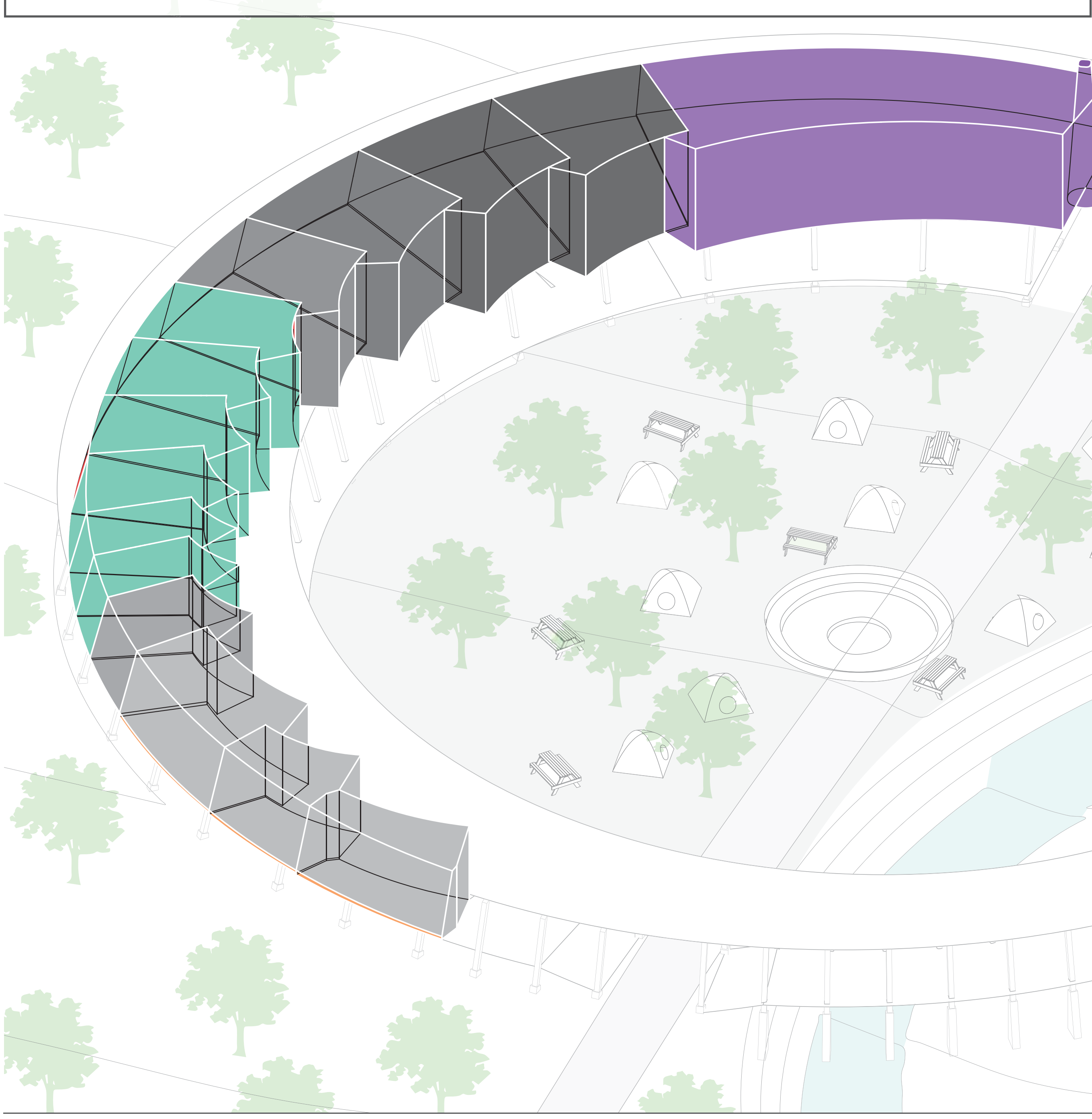
INSULATED ZONES

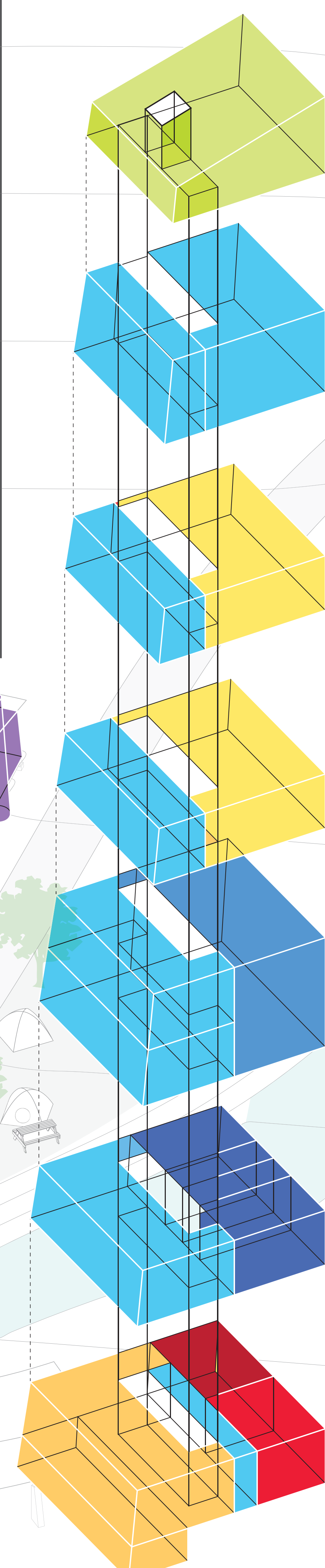
DRY SAUNA
Thermally insulated from the plunge pool due to extreme temperatures and humidity. It relies on radiant floor heating as the major source of heat. HRV used to efficiently maintain heat. It utilizes the wet sauna as its vestibule.

WET SAUNA
Thermally insulated from the spa due to extreme temperatures and humidity. Shares same ERV unit with the plunge pool to efficiently maintain heat and humidity.

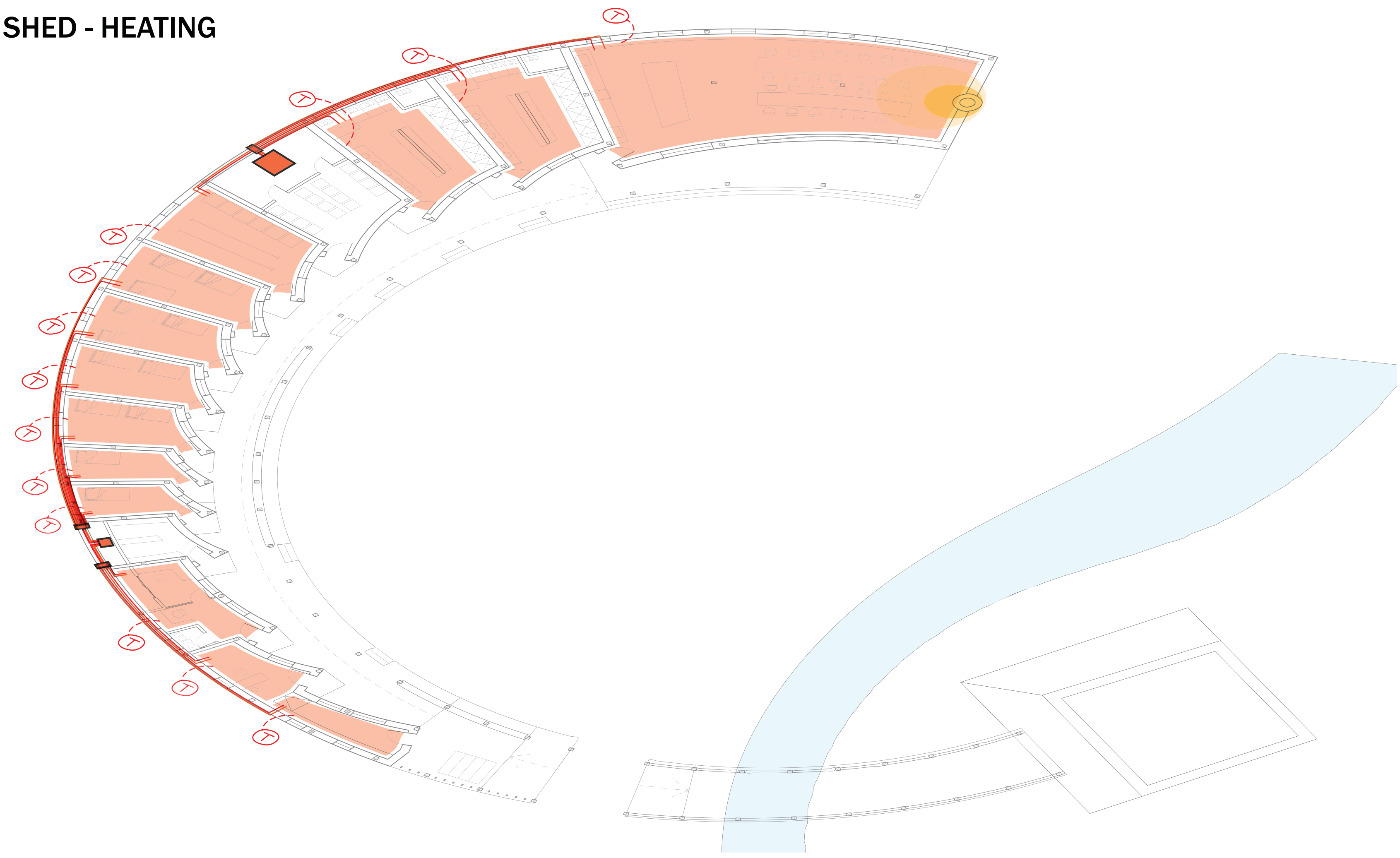
EXPOSED ZONES

GREENHOUSE
Environmetally and thermally isolated from the tower as the skylight is prone to significant heat loss. Due to its high moisture content, the space is ventilated with an independent ERV unit.





SHED - HEATING



RADIANT HEATING

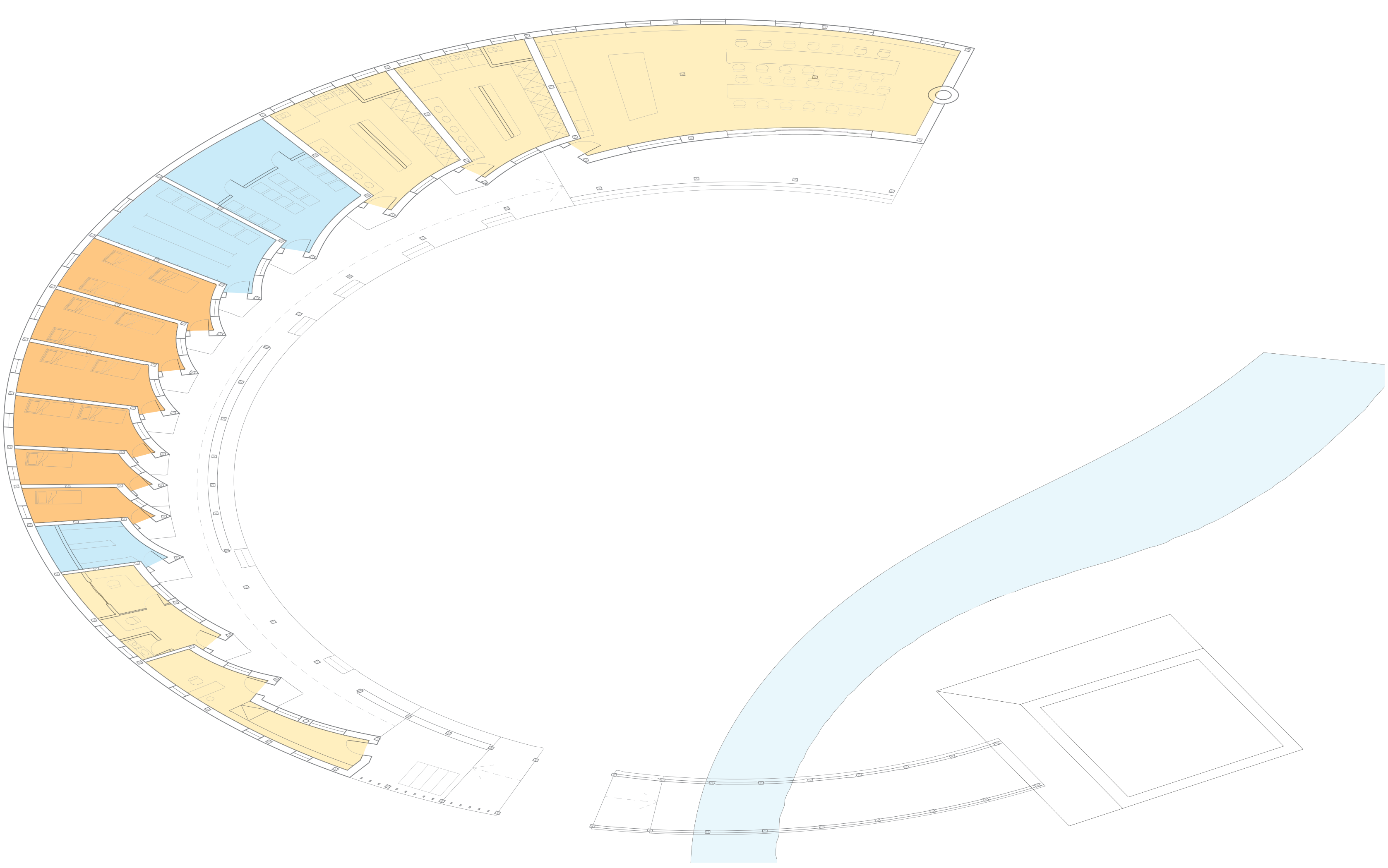
The heating of the shed building relies primarily on radiant floor heating system for maximum user comfort. This system operates in closed loops that maximizes retention of heat energy by a heat exhanger when it runs through the boiler. It allows heat to penetrate into both the small and large scale spaces of the building, catering to various indoor temperature of the zones.

The hearth anchor located at the end of the Great Room provides ambience to the space as well as serve as a supplementary heat source in the case of large fluctuation of user occupancy.

RADIANT FLOOR

- RADIANT FLOOR
- MANIFOLD
- BOILER
- THERMOSTAT
- HEARTH

- SUPPLY PIPE
- RETURN PIPE



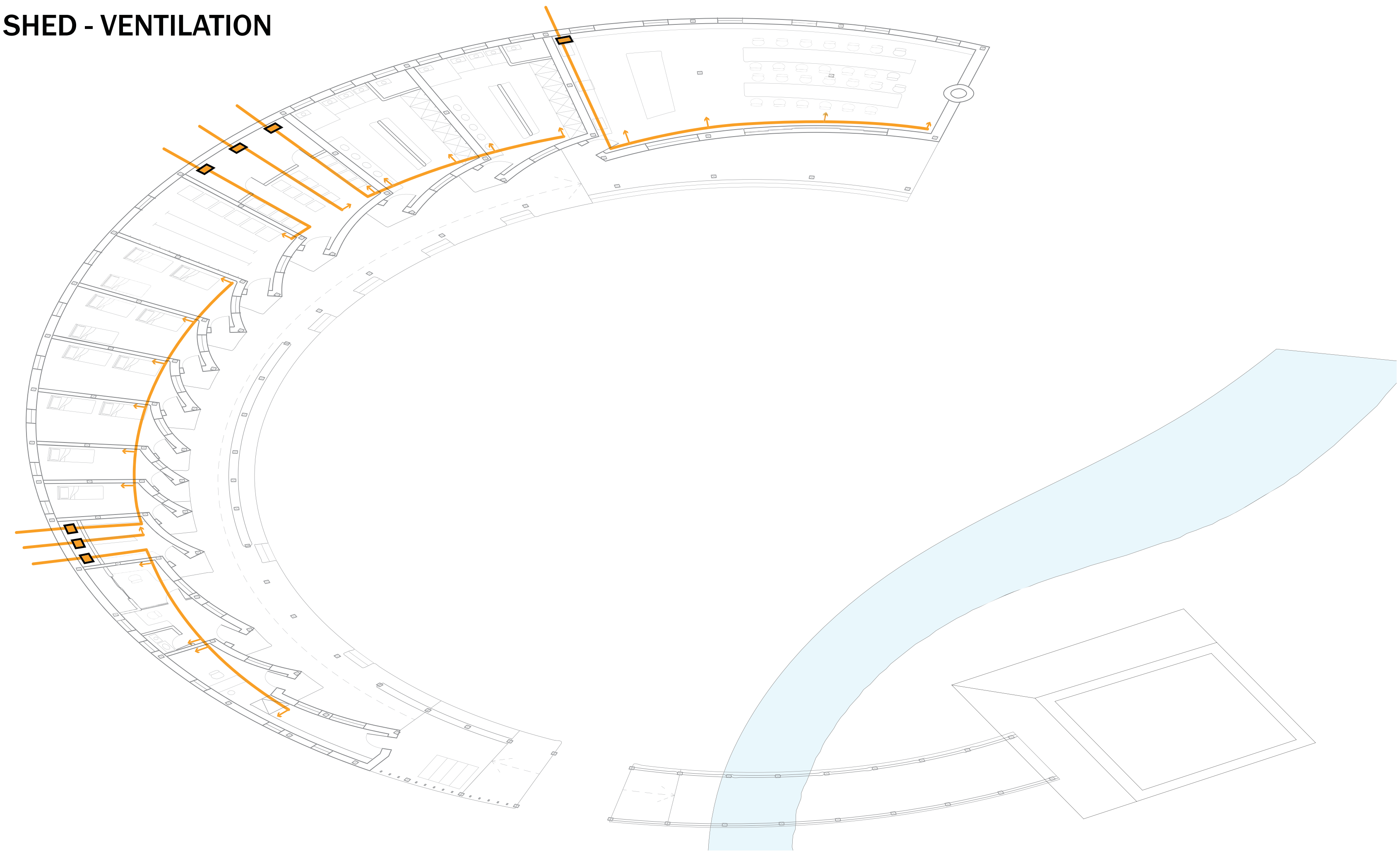
TEMPERATURE

Due to the duration of occupancy and the nature of the bodily exposure, the guest rooms are provided with the warmest indoor temperature. As opposed to the storage, laundry, and waste management rooms which have occasional occupation, the more frequently utilized service spaces such as the public washrooms are provided with an ambient degree of heat for comfort.

TEMPERATURE

- HOT
- WARM
- AMBIENT
- COOL

SHED - VENTILATION



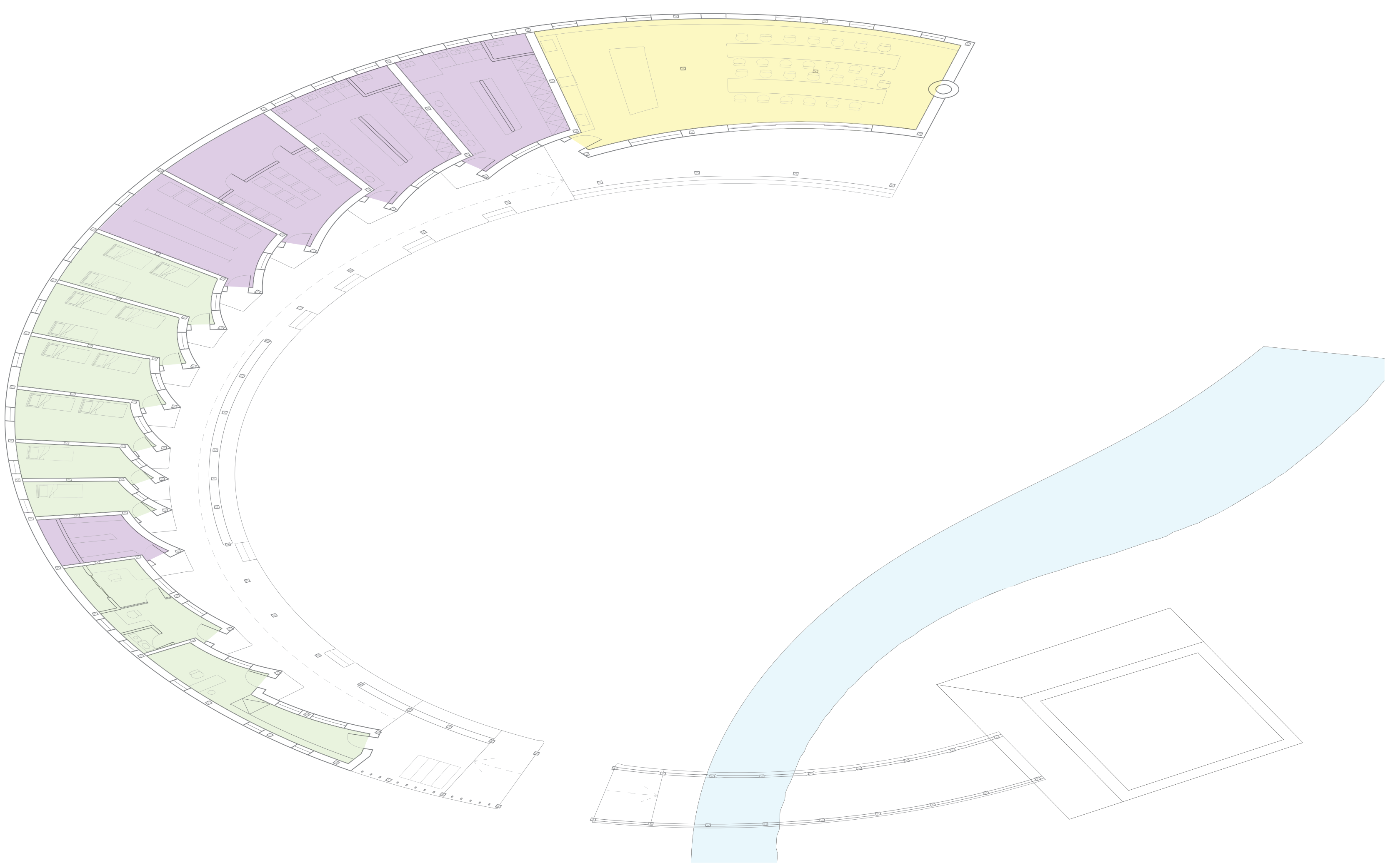
SUPPLY AIR

Decentralized supply air system is deployed to cater to different interior thermal conditions of the zones. This allows smaller duct sizes to be incorporated into the floor hence optimizing the building assembly. Furthermore, air intake fans are hidden on the outer perimeter wall.
HRV units are universally used to maximize the retention of heat energy within the building.

The air is supplied on the side of the room with predominant glazing as a way to prevent condensation on the building assembly during extreme exterior conditions.
The amount of supply air is determined by the air pressure required by each ventilation zone.

SUPPLY AIR

- ERV UNIT
- HRV UNIT
- RUNAROUND LOOP UNIT
- BOILER
- ERV DUCT
- HRV DUCT
- RUNAROUND LOOP DUCT

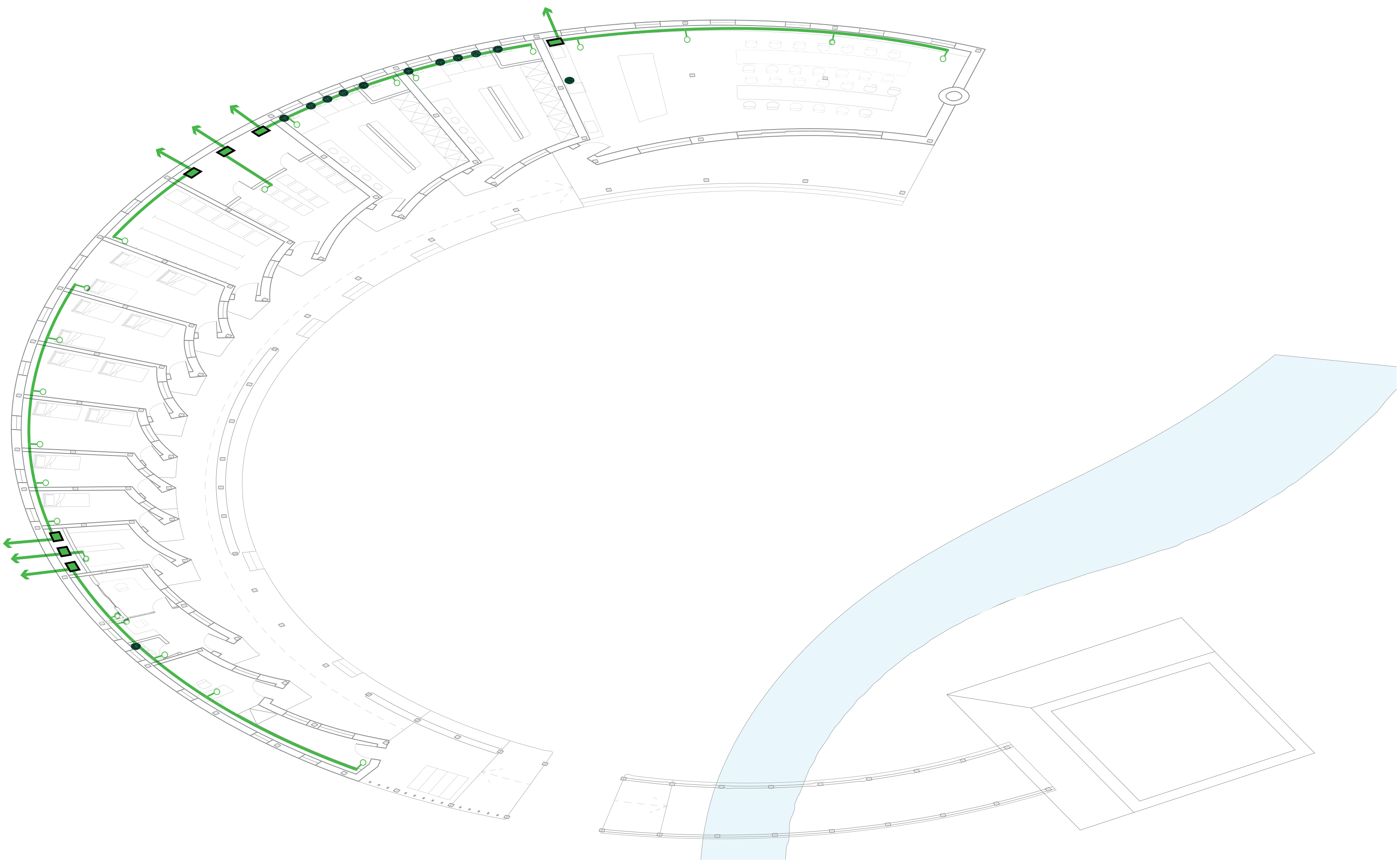


AIR PRESSURE

The service spaces of the building require negative pressure as a way to prevent any undesirable odor or pollutant to escape the space and contaminate the adjacent spaces. Vice versa, the living spaces such as the accommodation rooms and the reception area have positive pressure to block such air from entering the space.

AIR PRESSURE

- POSITIVE
- AMBIENT
- NEGATIVE



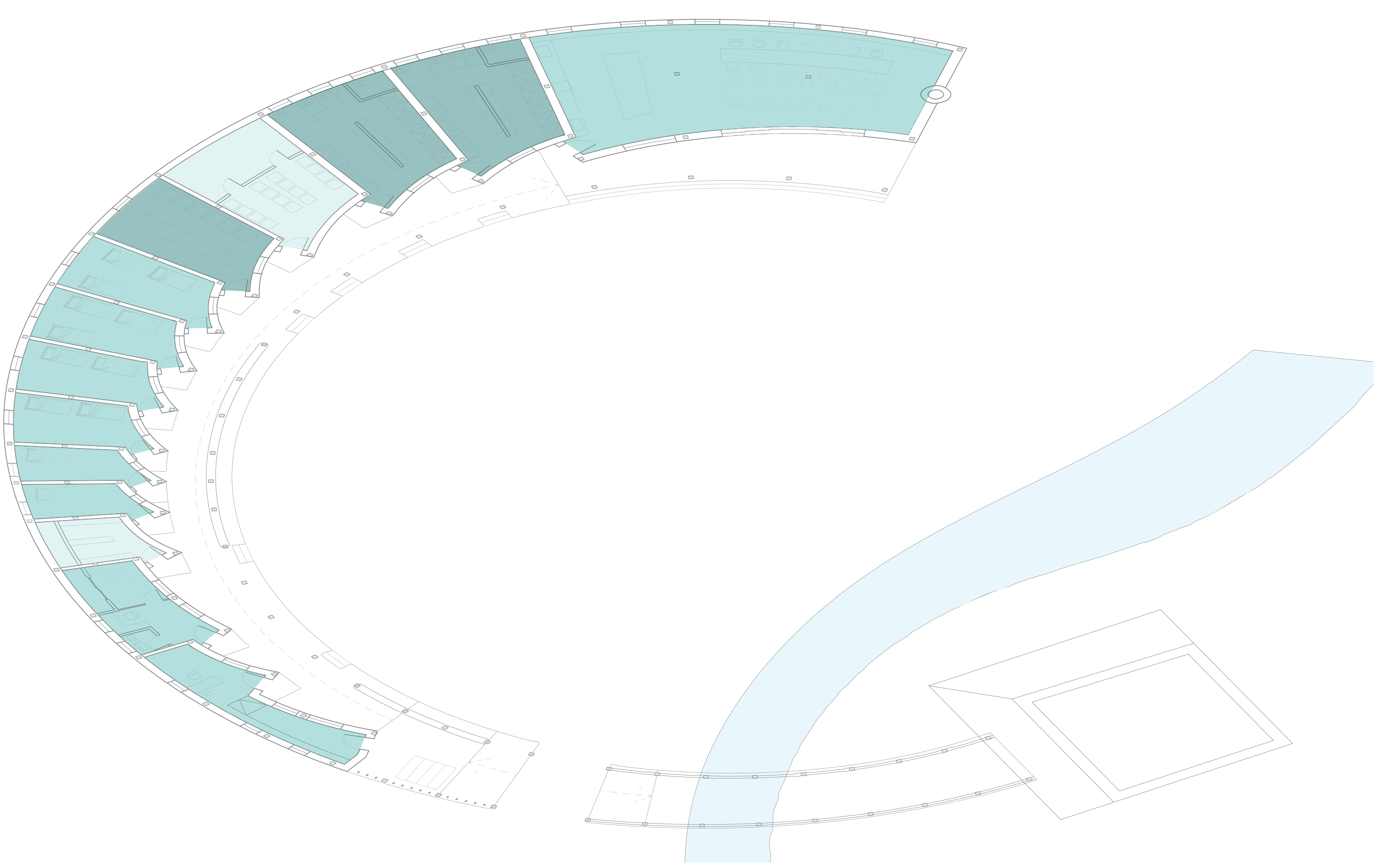
RETURN AIR

The return ductwork is also decentralized for greater efficiency and user comfort. It runs in the depth of the floor along the outer perimeter wall where it is often concealed beneath millwork. The public washrooms and the kitchen in the great room are provided with a separate exhaust fans to quickly remove pollutants from the air. Each compost toilet tank in the washrooms are provided with its own designated exhaust to facilitate the composting process of the waste and remove undesirable build-up of pollutants.

RETURN AIR

- ERV UNIT
- HRV UNIT
- RUNAROUND LOOP UNIT
- BOILER
- EXHAUST FAN

- ERV DUCT
- HRV DUCT
- RUNAROUND LOOP DUCT



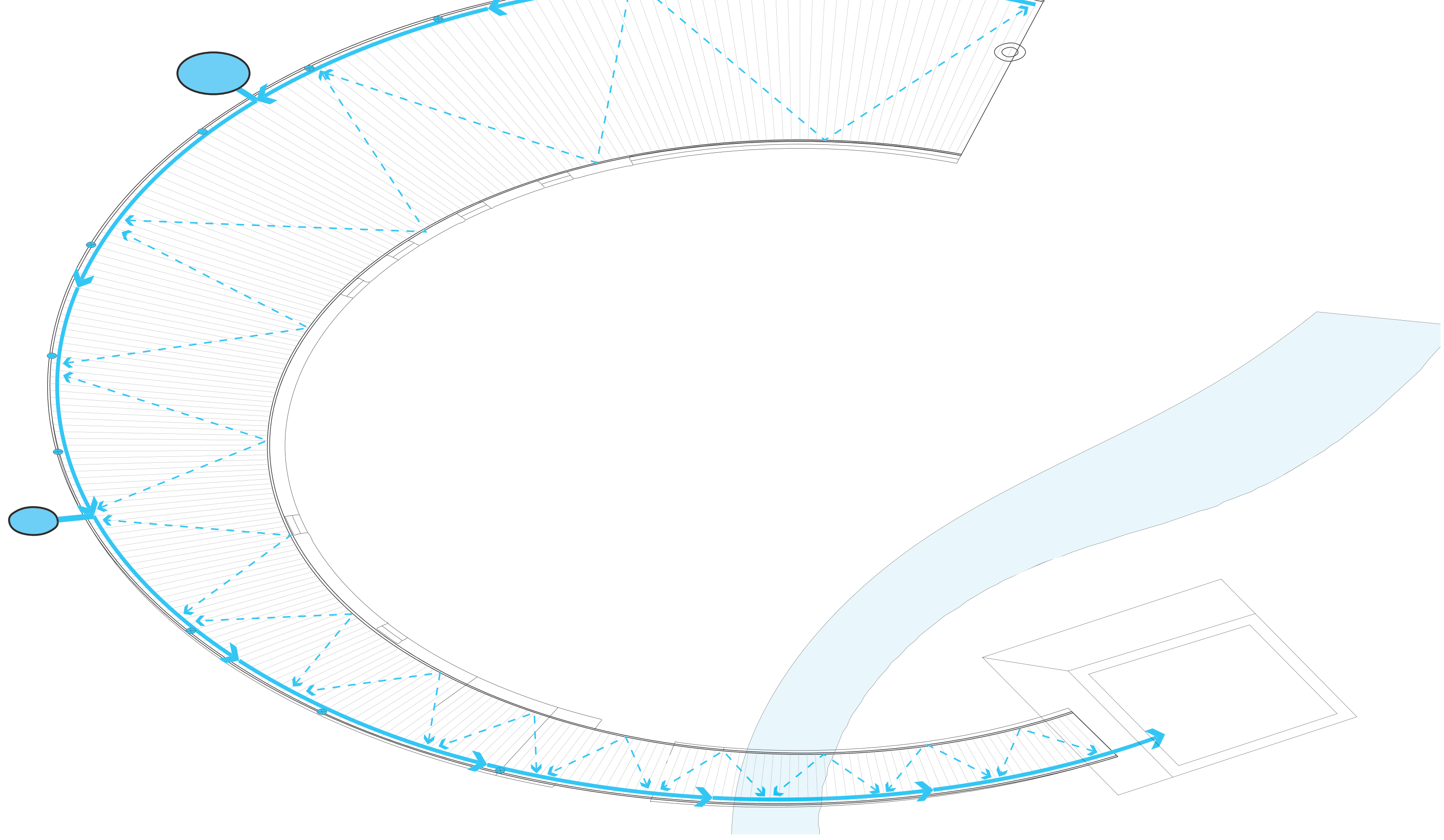
HUMIDITY

Frequently occupied spaces such as the accommodation rooms and the great room are provided with ambient humidity for maximum comfort. The waste management room and the storage rooms are prescribed with low humidity level to prevent any bacteria or mold growth in the interior.

HUMIDITY

- HIGH
- AMBIENT
- LOW

SHED - WATER MANAGEMENT



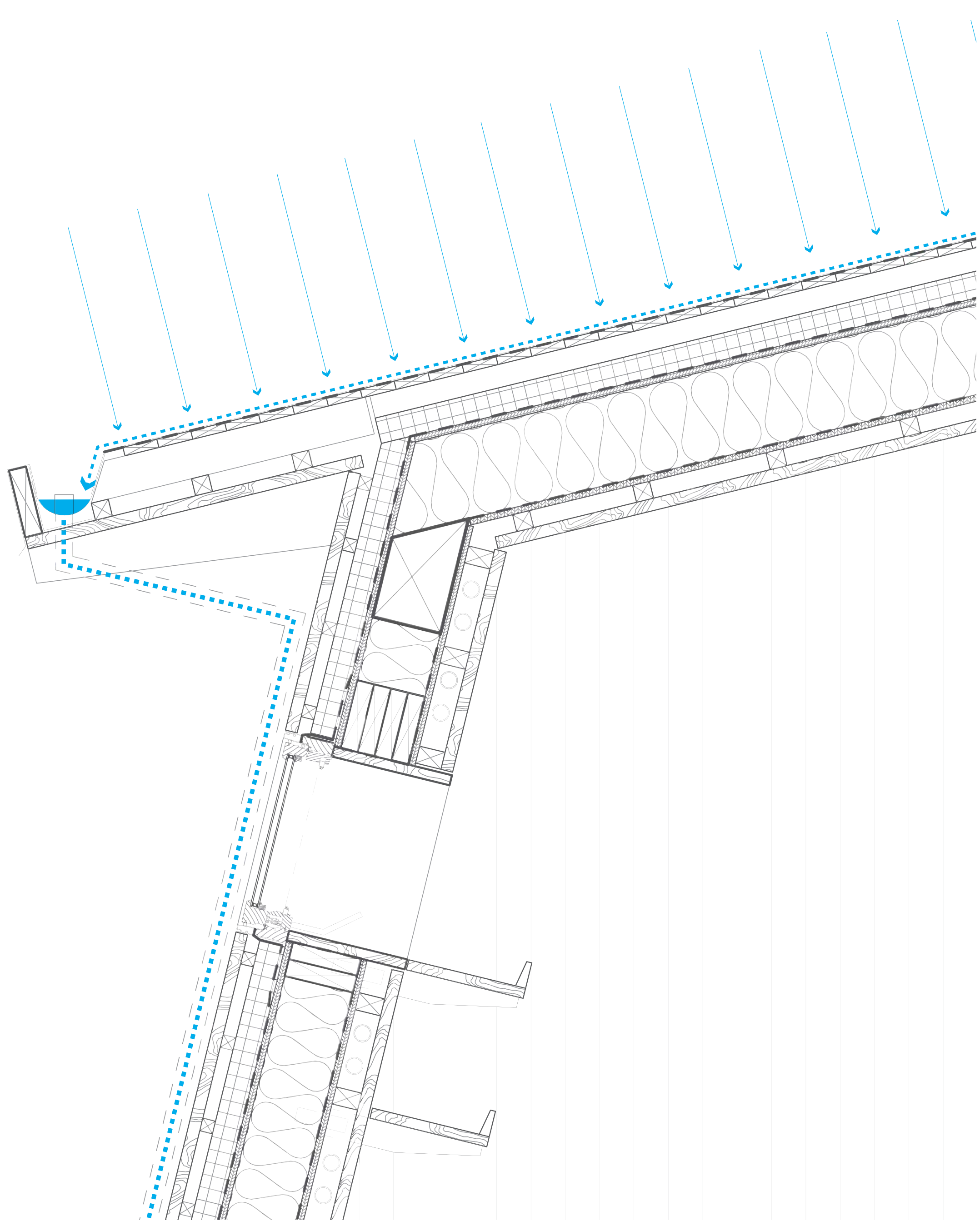
RAINWATER COLLECTION

The extensive roof of the shed provides an opportunity to harvest grey water. The concealed gutter located at the edge of the rear overhang collects the water and channels it down by gravity along the length of the roof. The water is incrementally drained along the path into the cistern to prevent any overflow and therefore waste of such valuable resource. The main cistern serves the spaces that require extensive consumption of water, such as the washrooms and the laundry. The secondary cistern primarily acts as a storage tank that supplements such spaces or the tower. The water collected from the remainder of the roof flows over the bridge and is drained into the cistern within the tower.

WATER COLLECT

- CISTERN TANK
- DRAINAGE POINTS
- RAINWATER FLOW
- GUTTER DRAINAGE

ROOF RAINWATER COLLECTION DETAIL



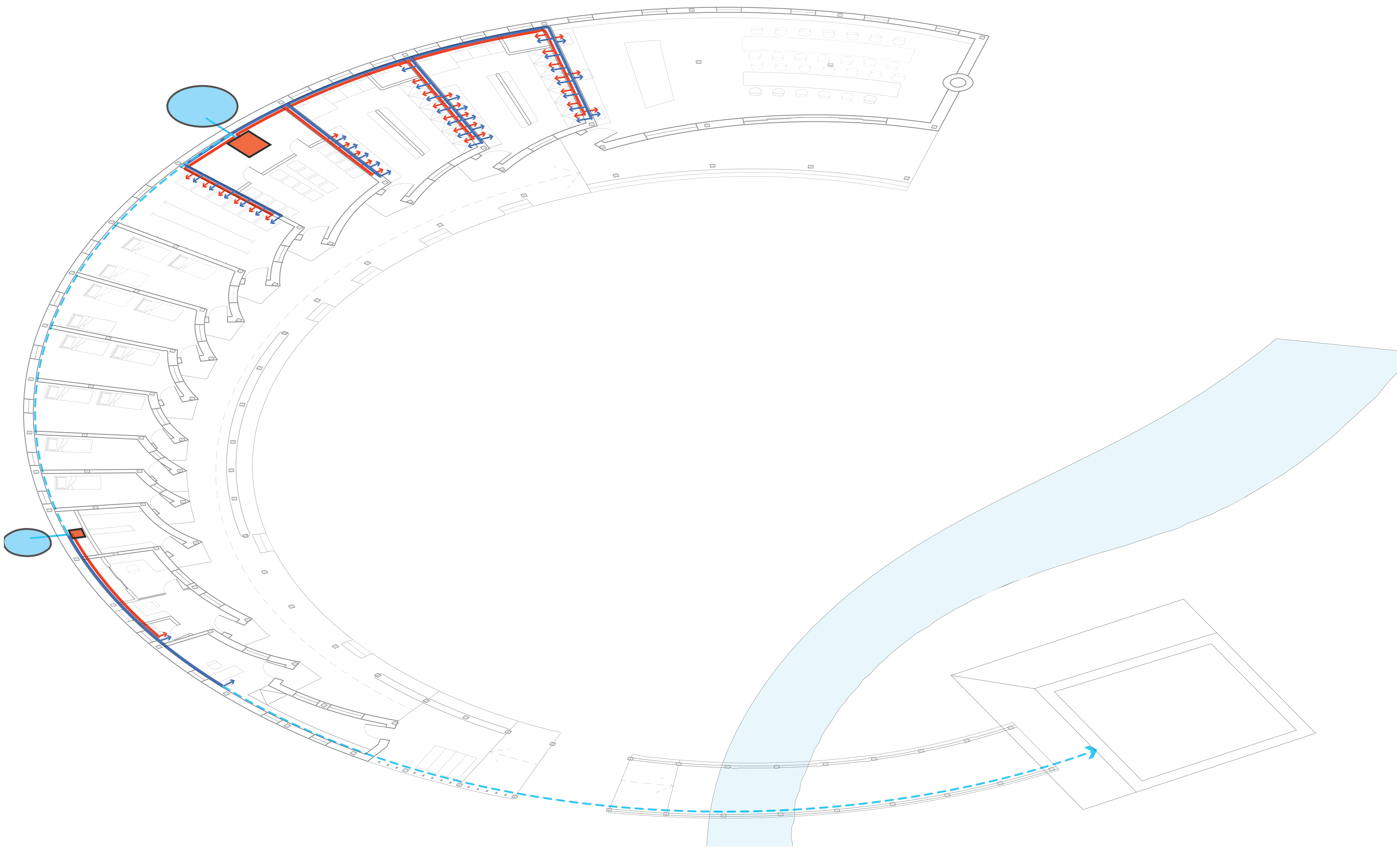
CALCULATIONS

1 Person = 200 L / Day
20 People * 200 L / Day = 4000 L
4000L / Day * 7 = 28000 L / Week

Precipitation: 800mm / year = 15.4 mm / week
Roof surface area for collection = 860 M2

860 M2 * 15.4mm * 0.9 = **12000 L -> 12 M3**
(Approx. Cistern Volume Capacity)

28000 L / Week – 12000 L / Week = **16000 L / Week** (for River Collection)



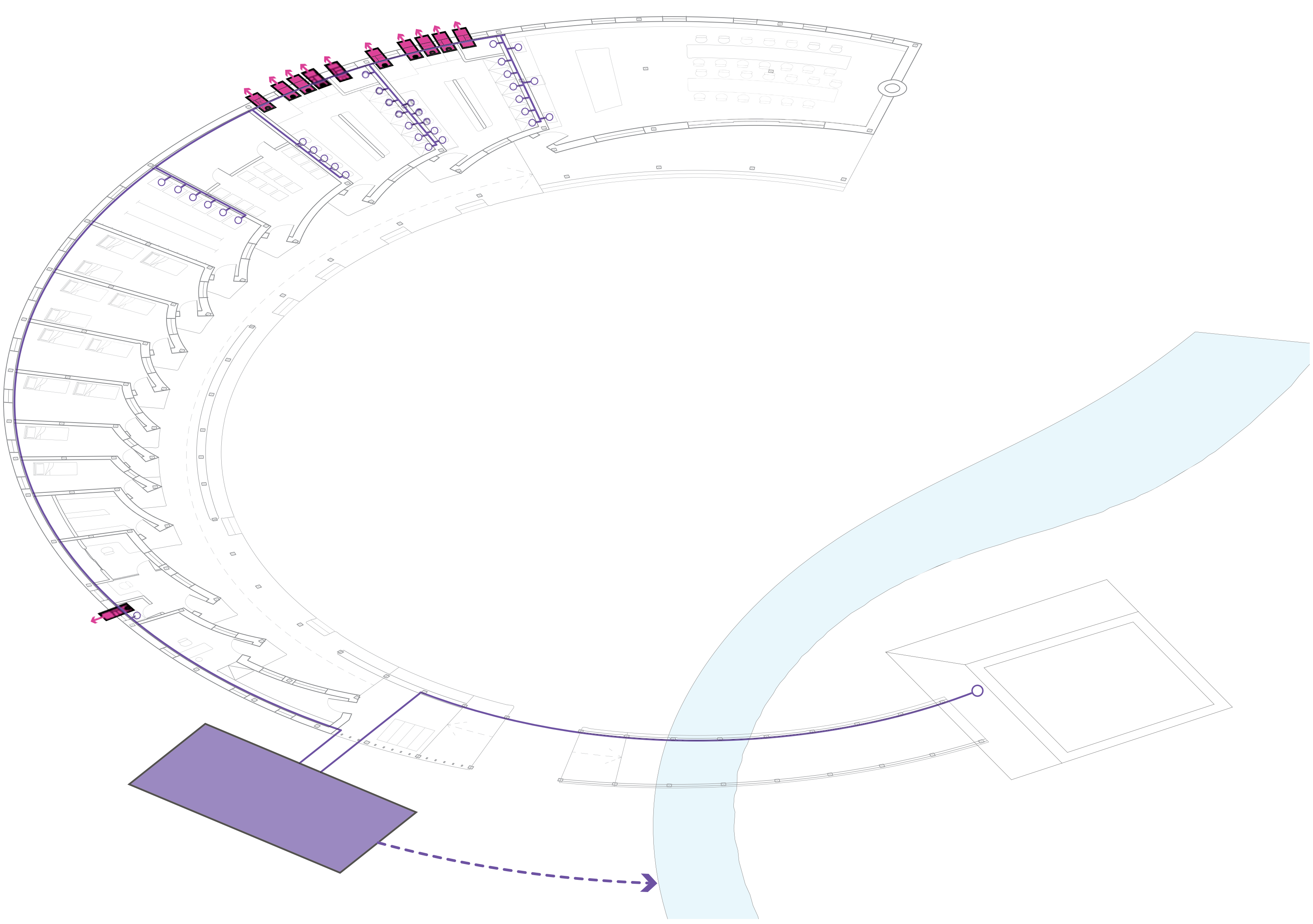
WATER DISTRIBUTION

The freshwater pipes are concealed within the cavity space in the outer perimeter wall. The main boiler located within the mech room serves the spaces with high usage of freshwater.
Half of the required freshwater will be supplied by the greywater cisterns, while the remainder will be complemented by the water from the river.

WATER DIST.

PLUNGE POOL TANK
STORAGE CISTERN
BOILER

WATER SUPPLY
COLD WATER
HOT / WARM WATER



WASTE MANAGEMENT

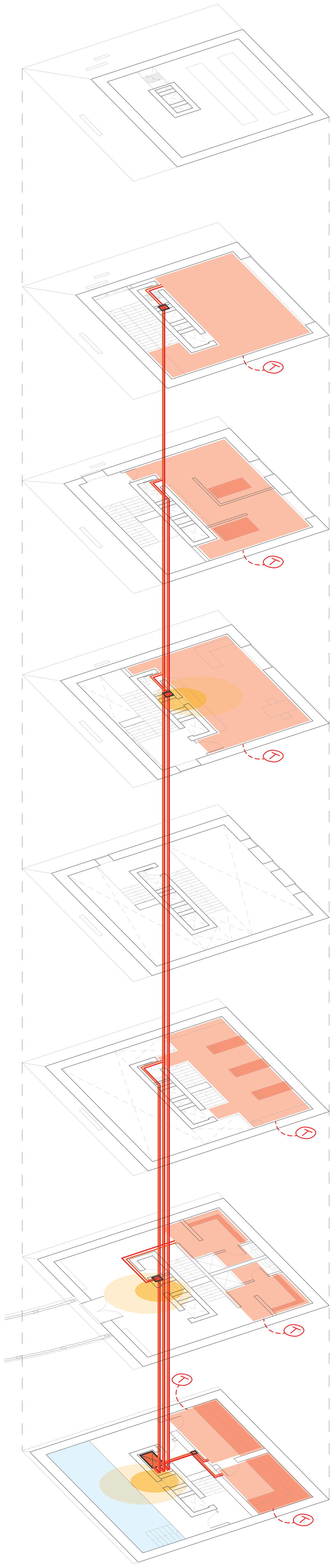
The waste water collected from the building are fed into a septic tank field that sits adjacent to the building. It is then filtered and the treated water is released back into the river.
The use of compost toilets eliminates any output of black water, hence reducing the load on the filteration system. The compost from the tank will be routinely emptied and recycled as nutrition for the greenhouse in the tower.

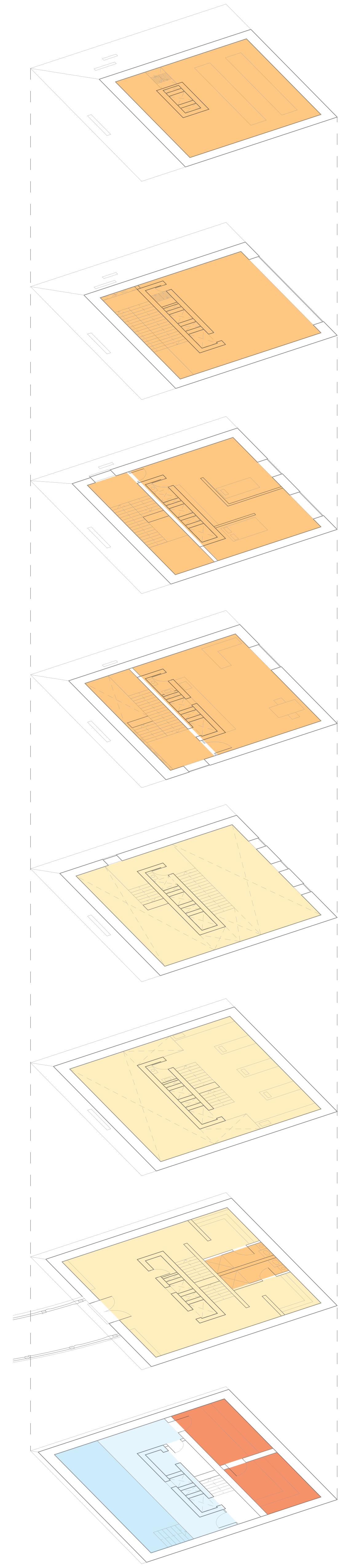
WASTE

COMPOST TOILET TANK
SEPTIC FIELD

COMPOST TANK ACCESS
WASTEWATER PIPE

TOWER - HEATING





INFLOOR HEATING

The heating of the tower relies primarily on radiant floor heating system for maximum user comfort. Using the core to transport the pipework vertically, the system acts in conjunction with the hearth to provide a continuous thermal experience upwards.

RADIANT FLOOR

- RADIANT FLOOR
- MANIFOLD
- BOILER
- THERMOSTAT
- HEARTH
- SUPPLY PIPE
- RETURN PIPE

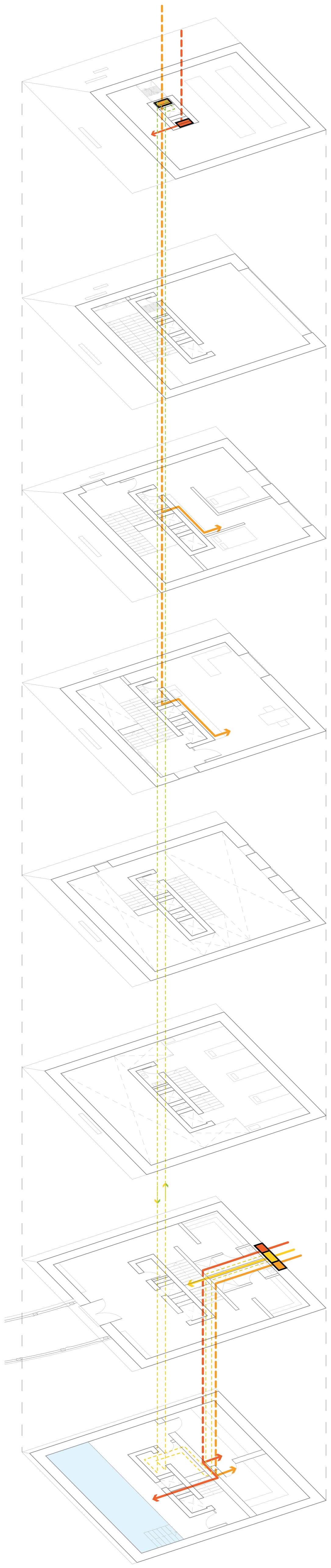
TEMPERATURE

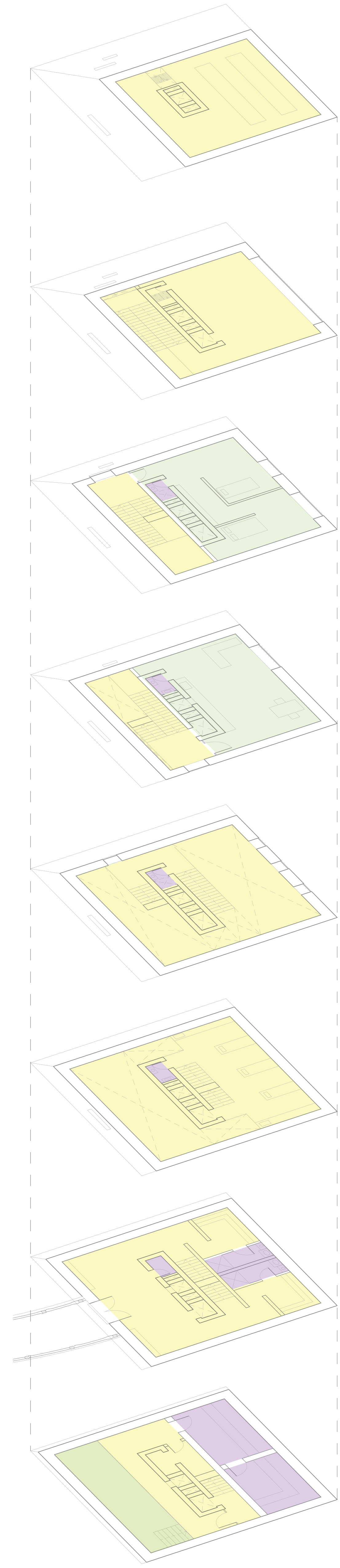
Due to stack effect, the temperature difference in the atrium space will be of a gradient of greater warmth towards the top. Environmentally isolated from the atrium, programs such as the sauna, plunge pool, and private residence have the capacity to cater the interior temperature to their respective comfort level.

TEMPERATURE

- HOT
- WARM
- AMBIENT
- COOL

TOWER - VENTILATION





SUPPLY AIR

Treating the atrium as a single continuous space, run-around loop system is devised to minimize the mechanical load and retain heat. The ductwork are concealed within the core, hence allowing the interior space to achieve a desirable monolithic aesthetic. HRV and ERV units are incorporated to cater to spaces that require distinguished conditioning such as the sauna and greenhouse.

SUPPLY AIR

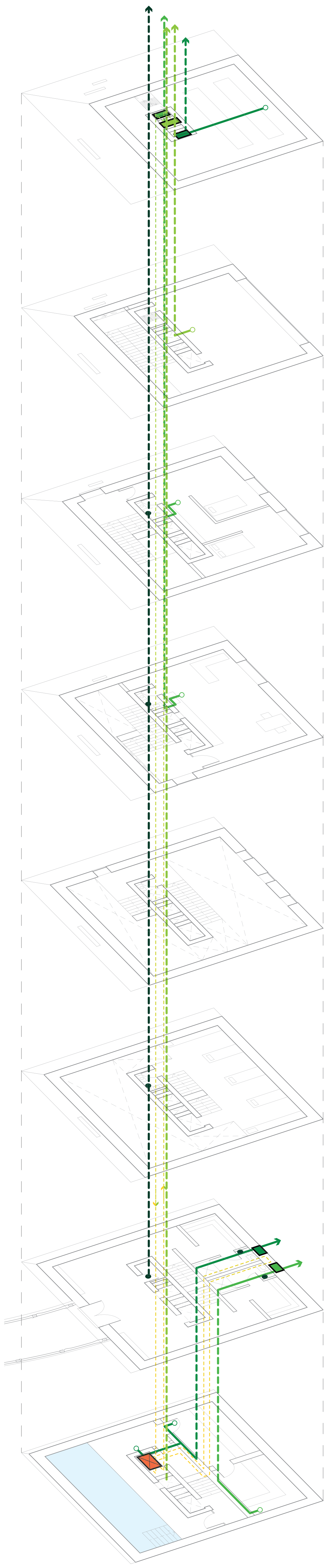
- ERV UNIT
- HRV UNIT
- RUNAROUND LOOP UNIT
- BOILER
- ERV DUCT
- HRV DUCT
- RUNAROUND LOOP DUCT

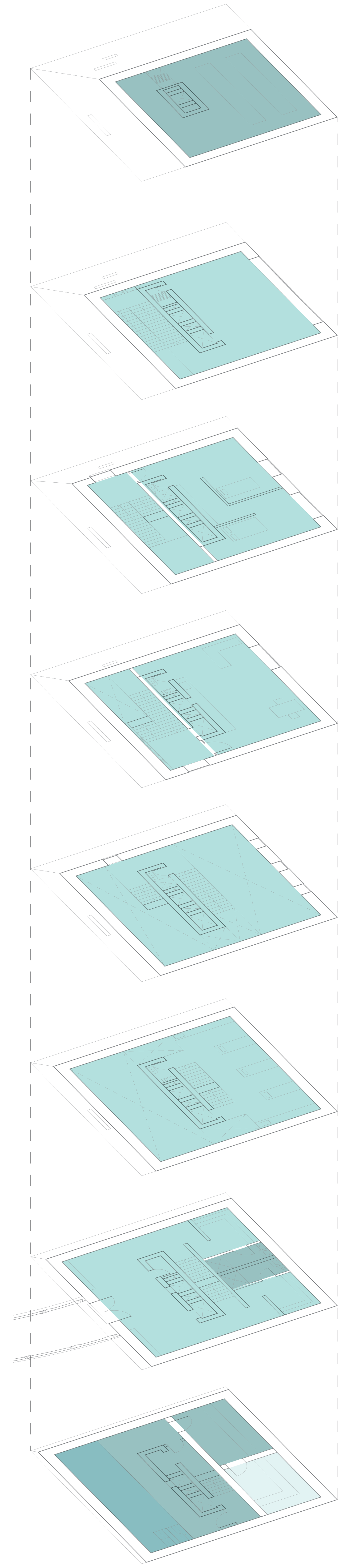
AIR PRESSURE

The service spaces of the building require negative pressure as a way to prevent any undesirable odor or pollutant to escape into the atrium space. The sauna is also of negative pressure to prevent any heat to escape whenever a user enters the space.

AIR PRESSURE

- POSITIVE
- AMBIENT
- NEGATIVE





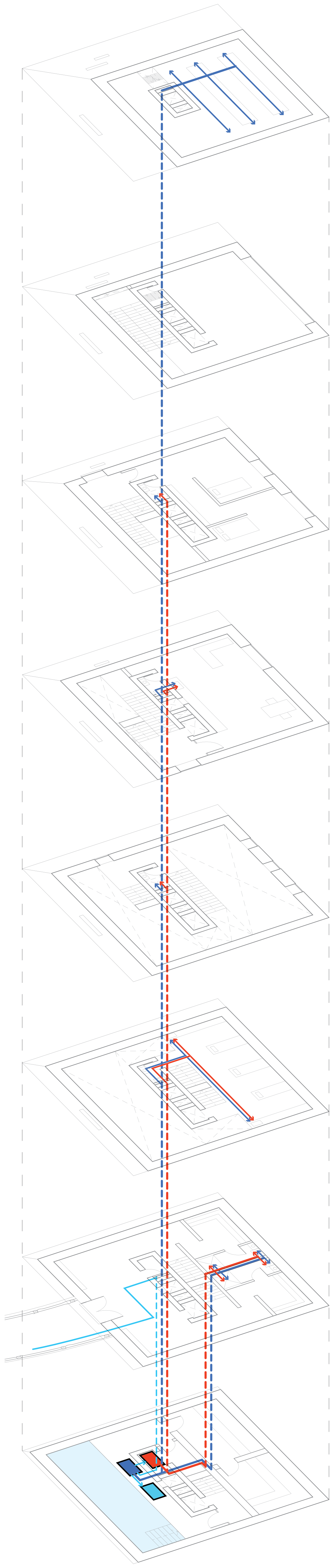
RETURN AIR

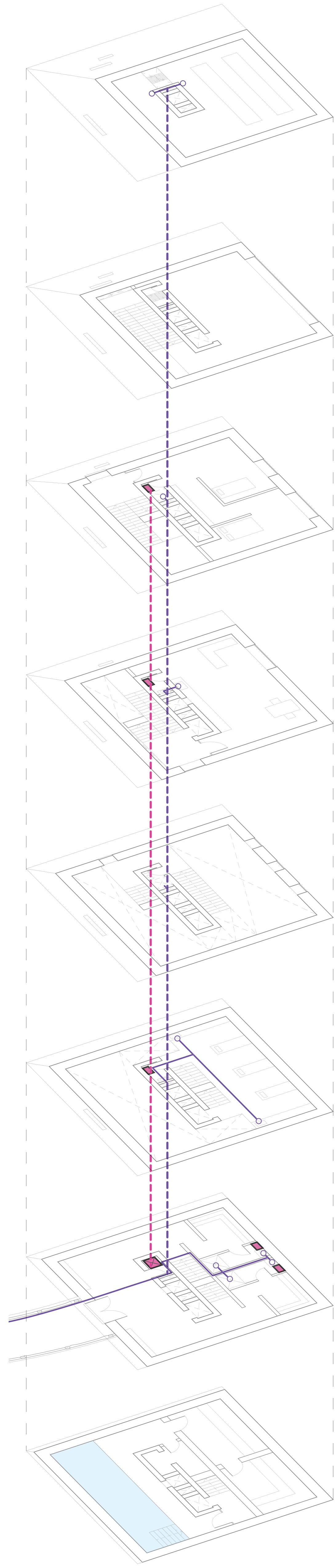
As the stack effect does the ventilation work for the atrium, return ductwork is only installed at the top of the tower before it is exhausted out through a chimney.
The washrooms in the core and the change-room are provided with a separate exhaust fans to quickly dispose pollutants.

HUMIDITY

The atrium space is of ambient humidity to promote maximum comfort, whereas the plunge pool and the wet sauna share a similar high moisture content. The wet sauna is seen as a vestibule into the dry sauna with a low humidity level.

TOWER - WATER MANAGEMENT





WATER DISTRIBUTION

The freshwater is supplied via the roof of the shed and is stored in the basement cistern. The freshwater pipes are concealed within the core where it vertically serves the plunge pool, the washrooms, and the greenhouse. The high-efficiency boiler in the basement is the only source of hot water for the tower.

WATER DIST.

PLUNGE POOL TANK
STORAGE CISTERN
BOILER

WATER SUPPLY
COLD WATER
HOT / WARM WATER

WASTE MANAGEMENT

The waste water are channelled down the core and disposed into the exterior septic field across the bridge. The use of compost toilets eliminates any output of black water, reducing the load on the filteration system. The compost will be collected into a tank inside the core, where it will occasionally be emptied.

WASTE

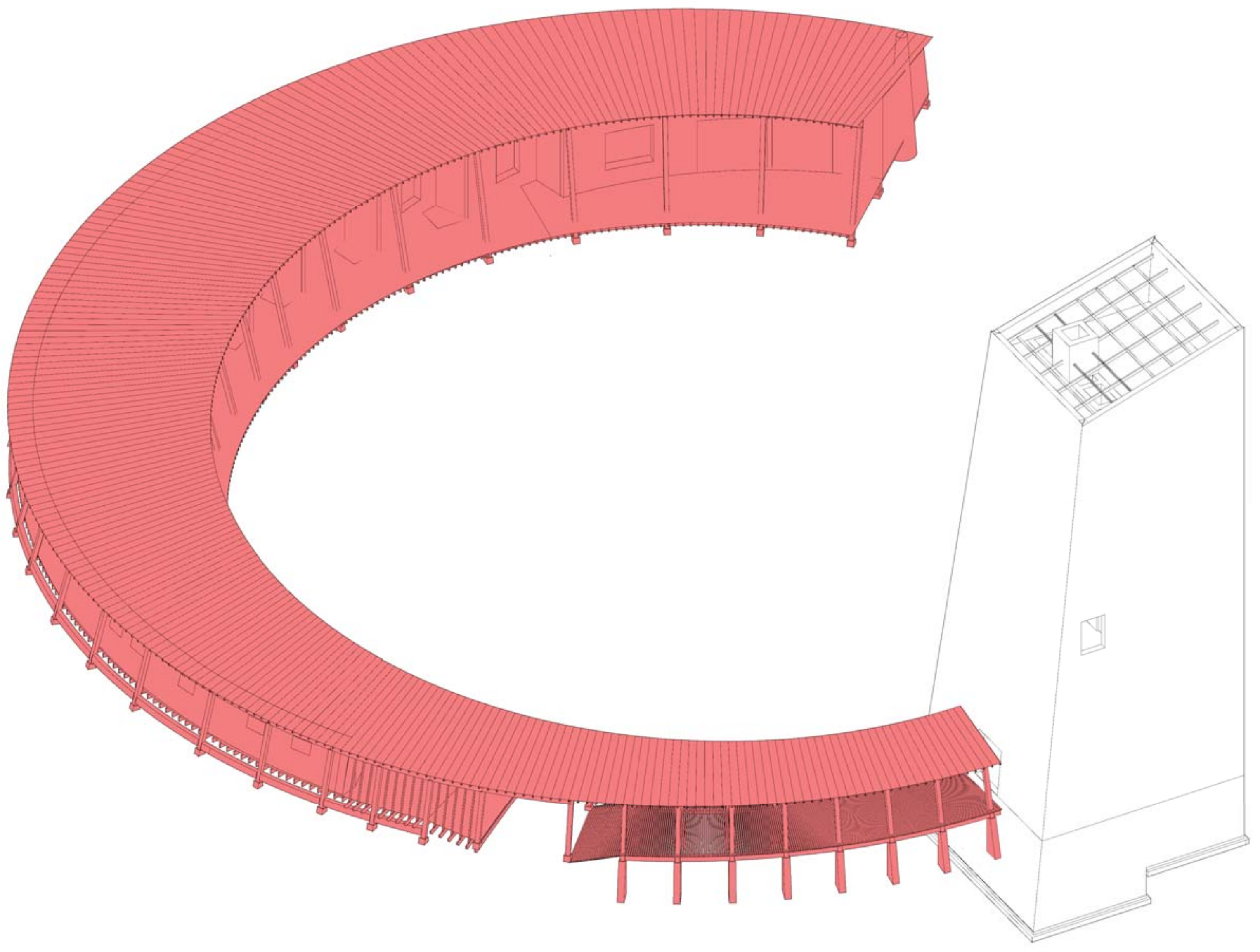
COMPOST TOILETS
COMPOST TANK

COMPOST PIPE
WASTEWATER PIPE

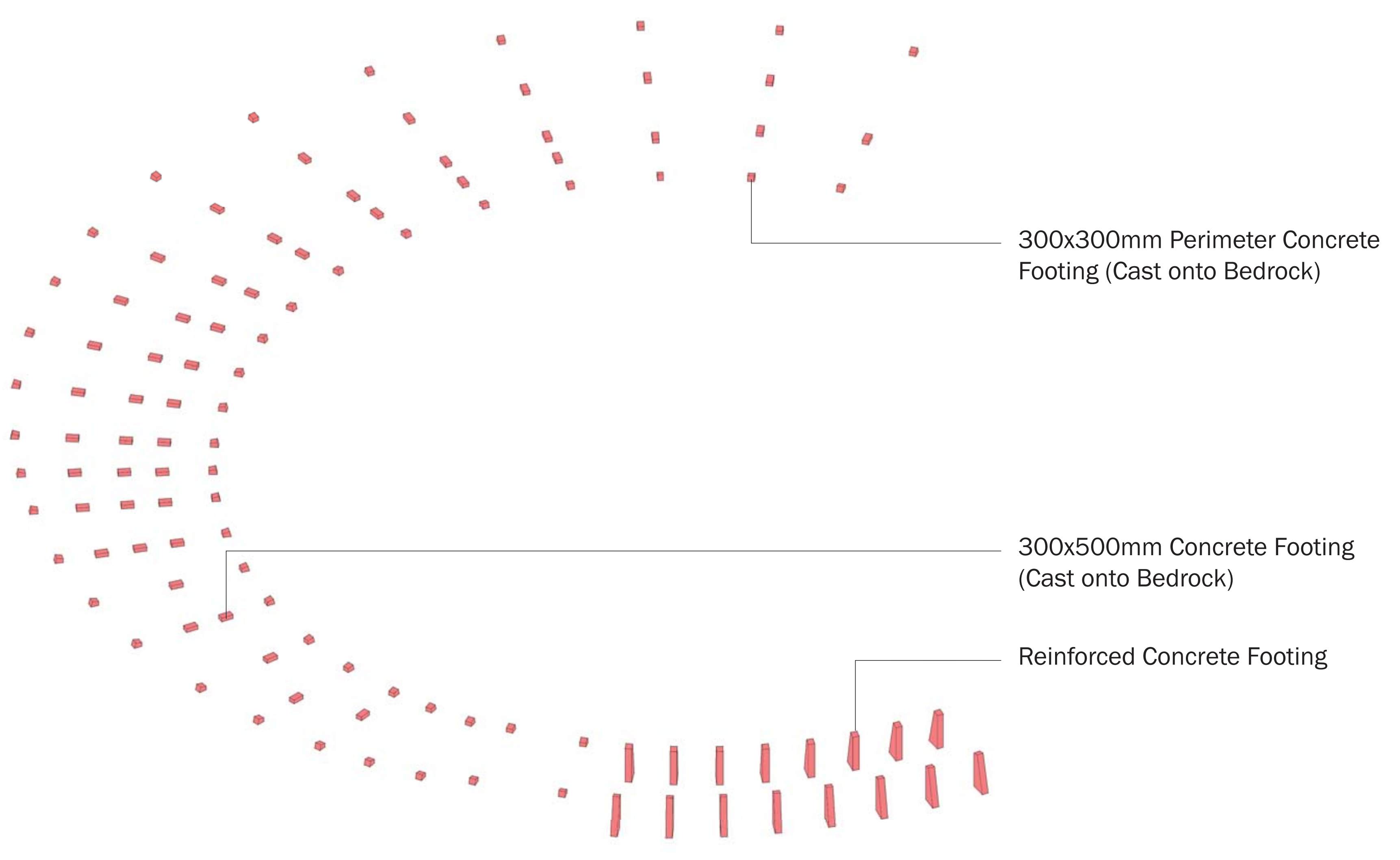
PART 5: STRUCTURE

SHED STRUCTURAL AXO
TOWER STRUCTURAL AXO

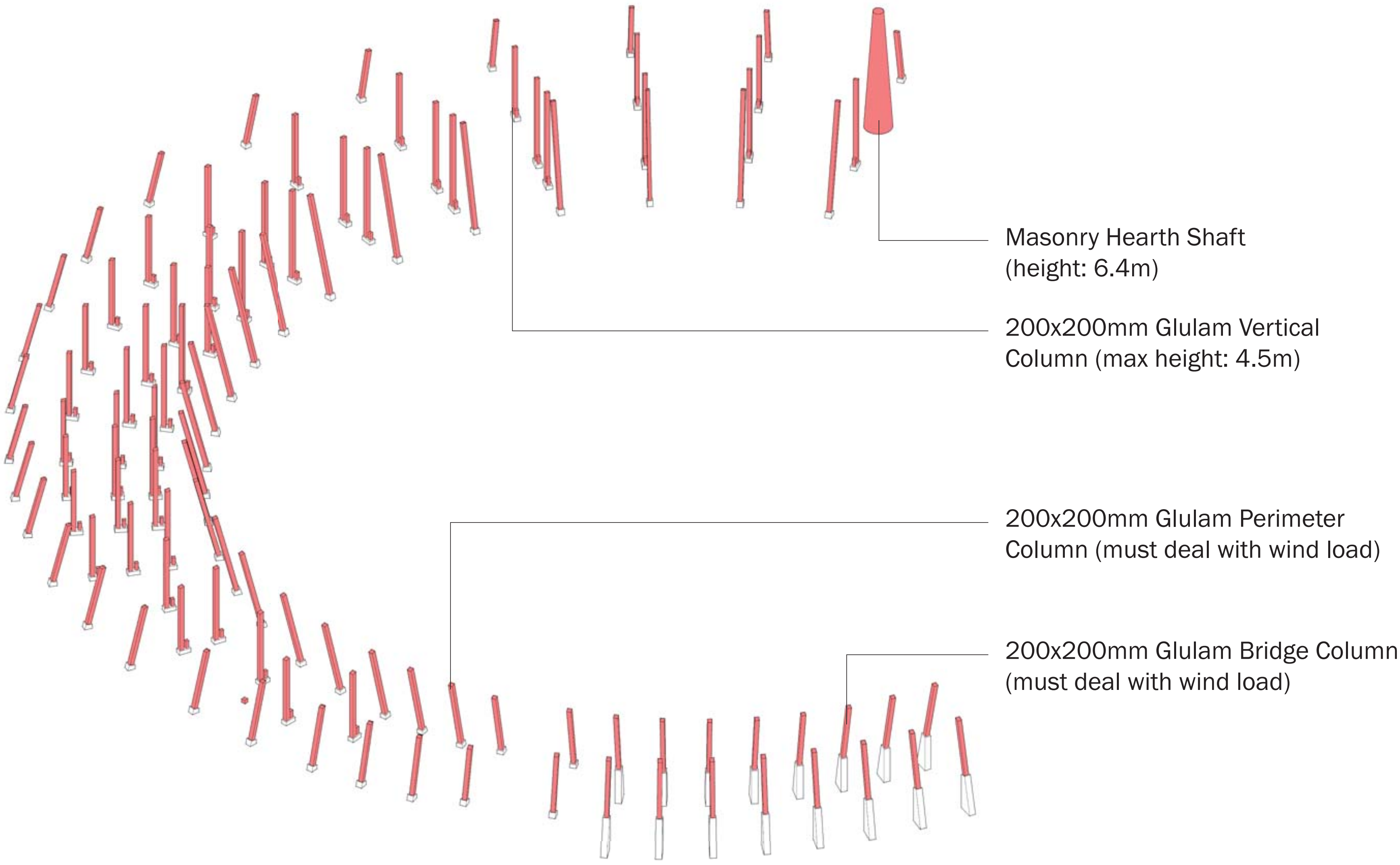
STRUCTURAL SYSTEMS - SHED



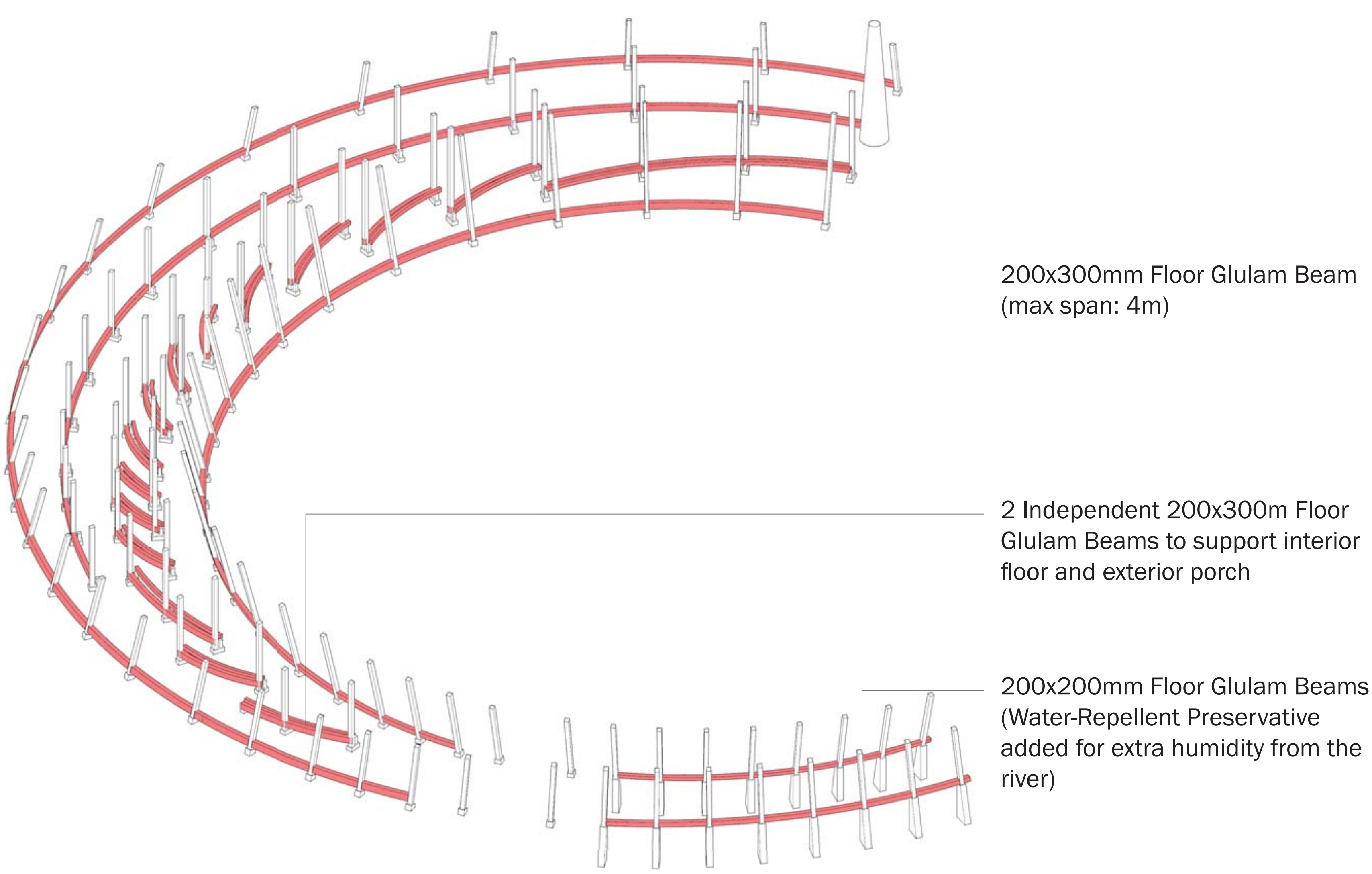
FOUNDATION FOOTINGS



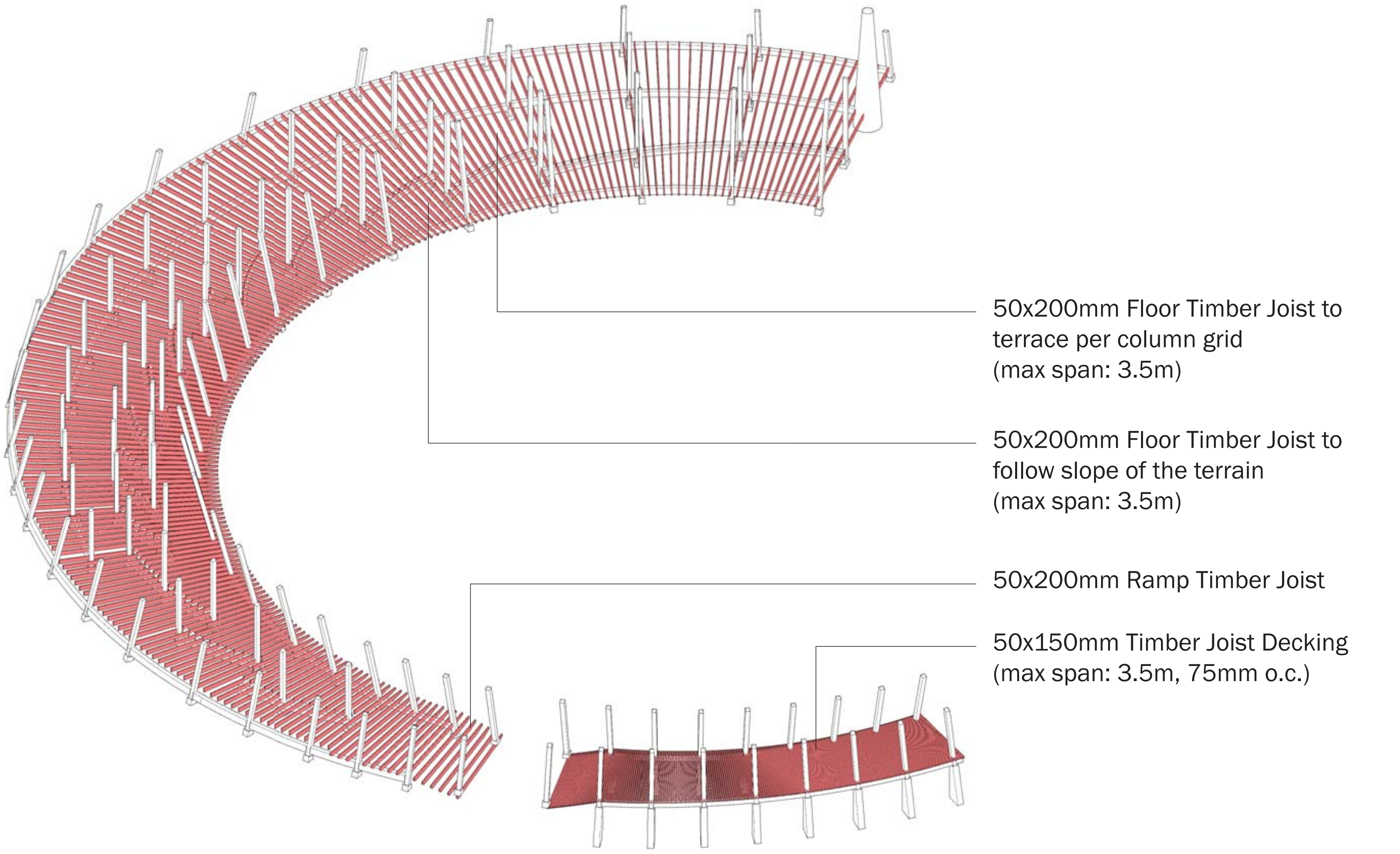
INTERIOR + EXTERIOR COLUMNS



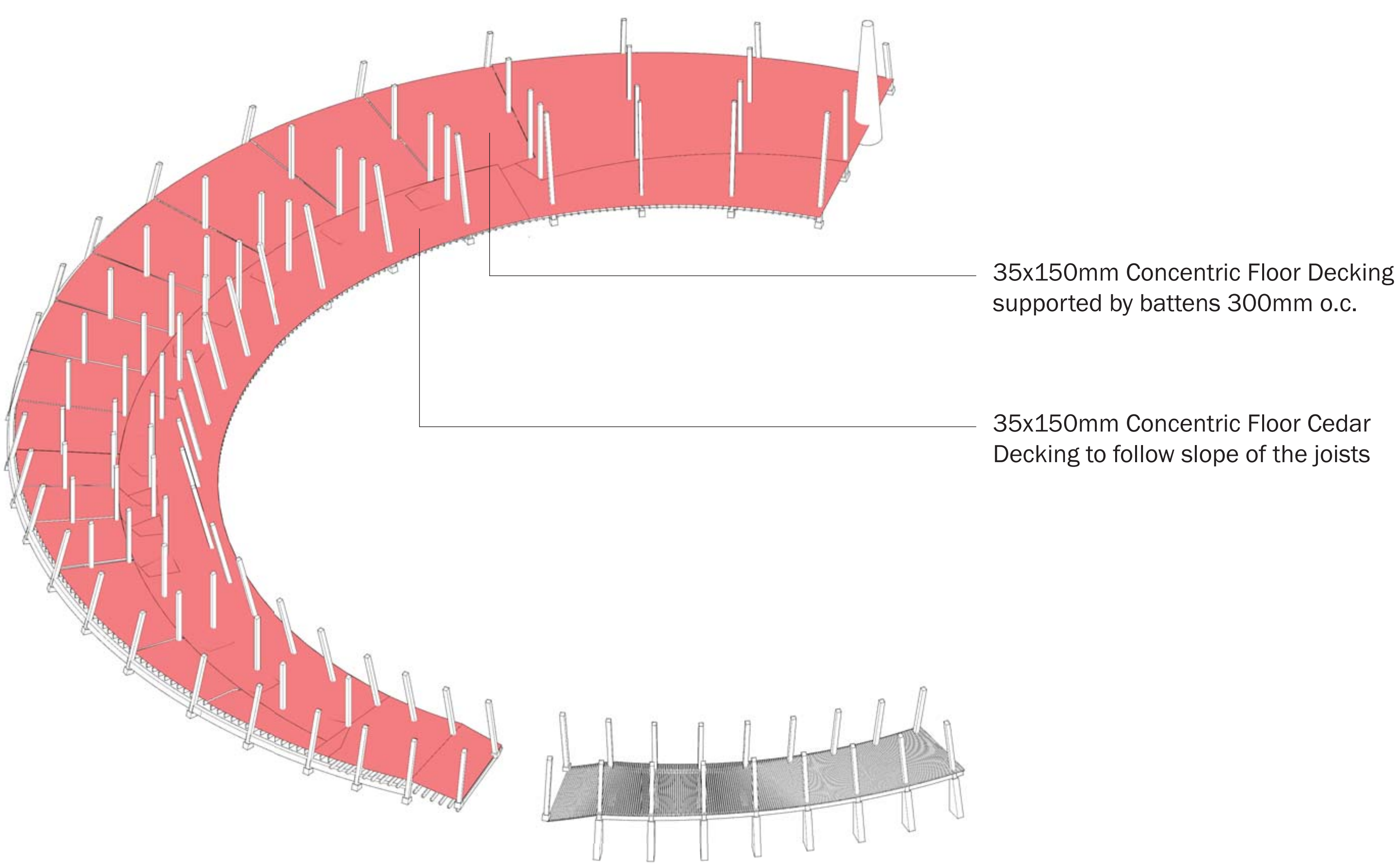
GLULAM FLOOR BEAMS



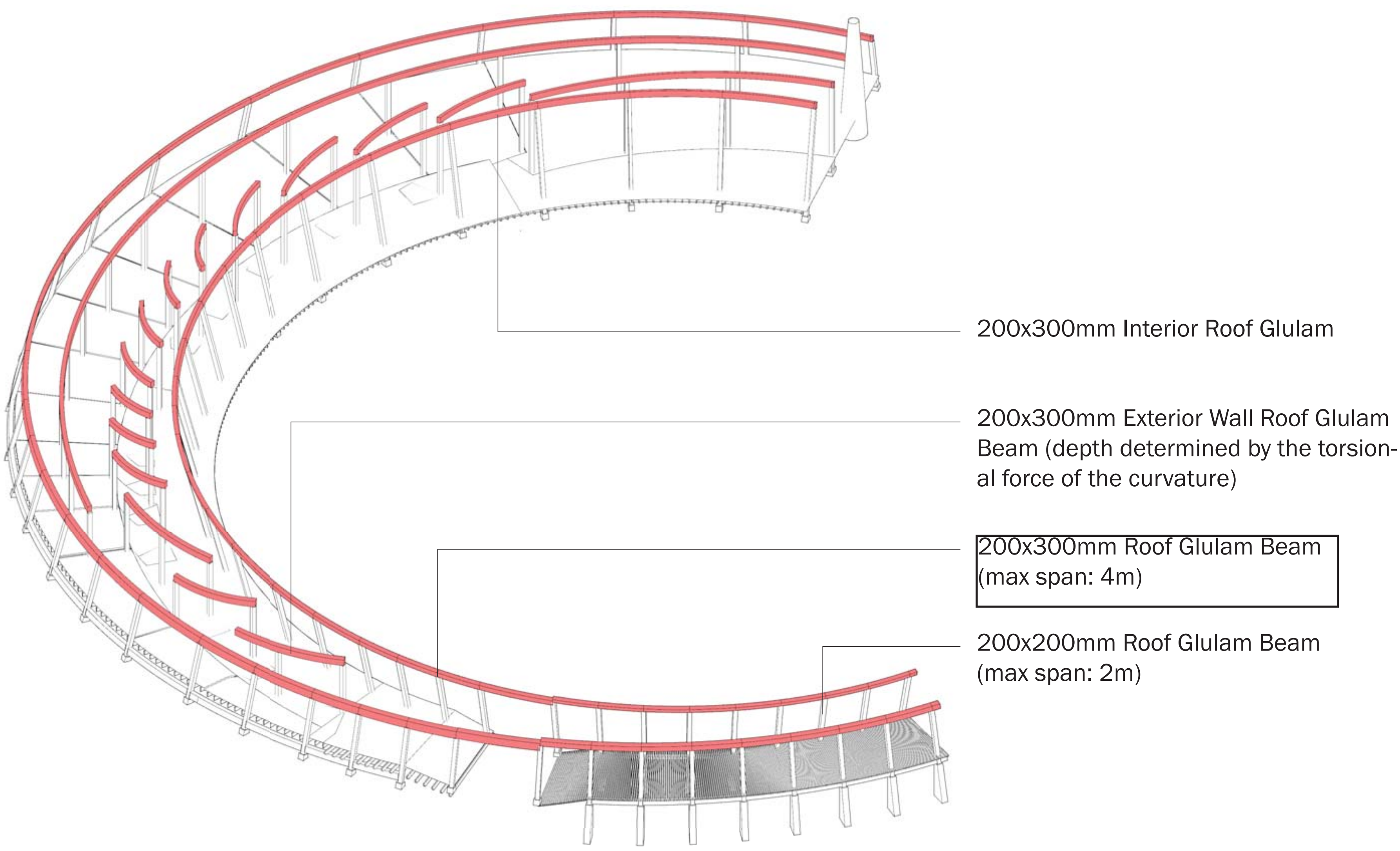
FLOOR TIMBER JOISTS



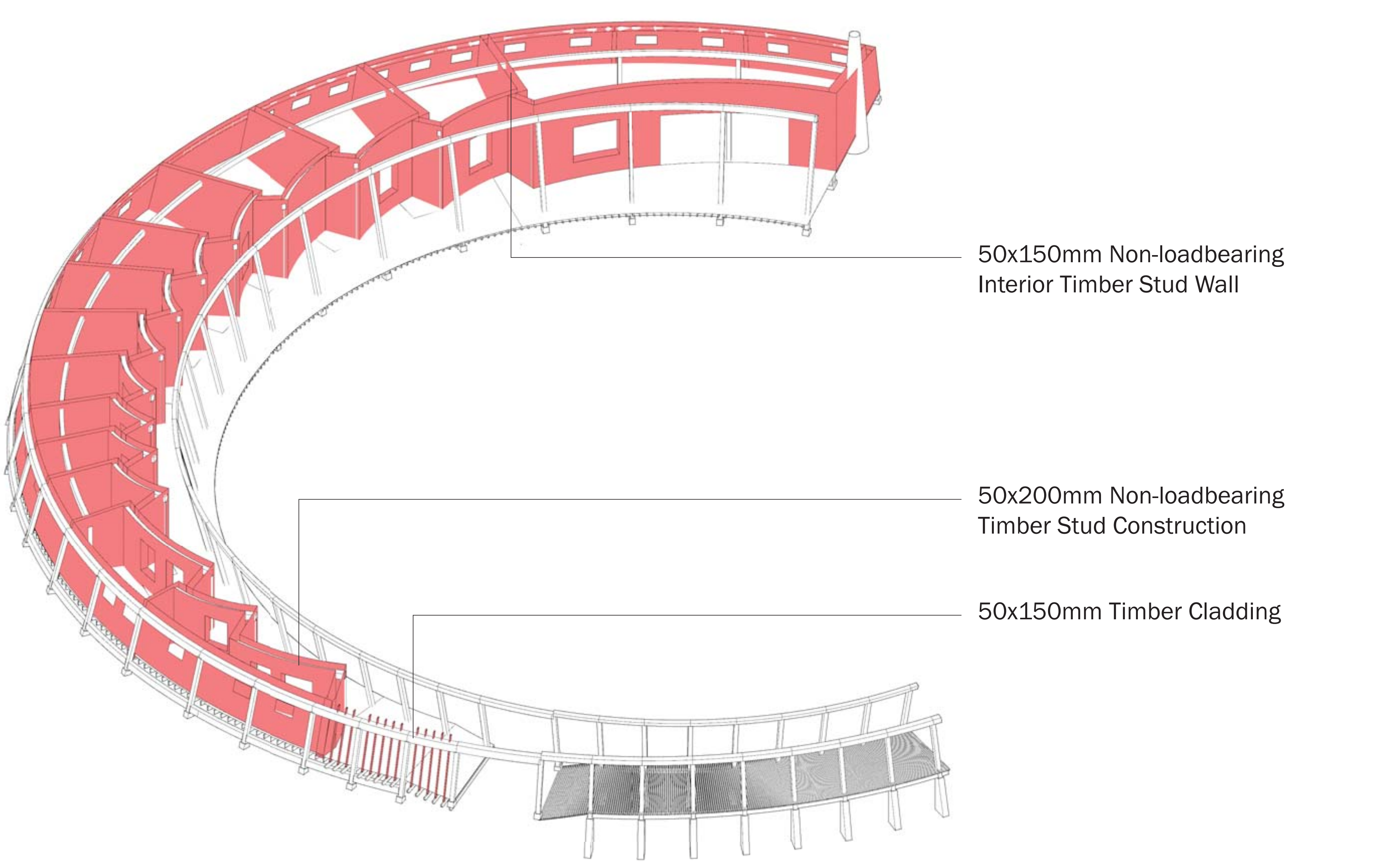
CEDAR DECKING FLOOR



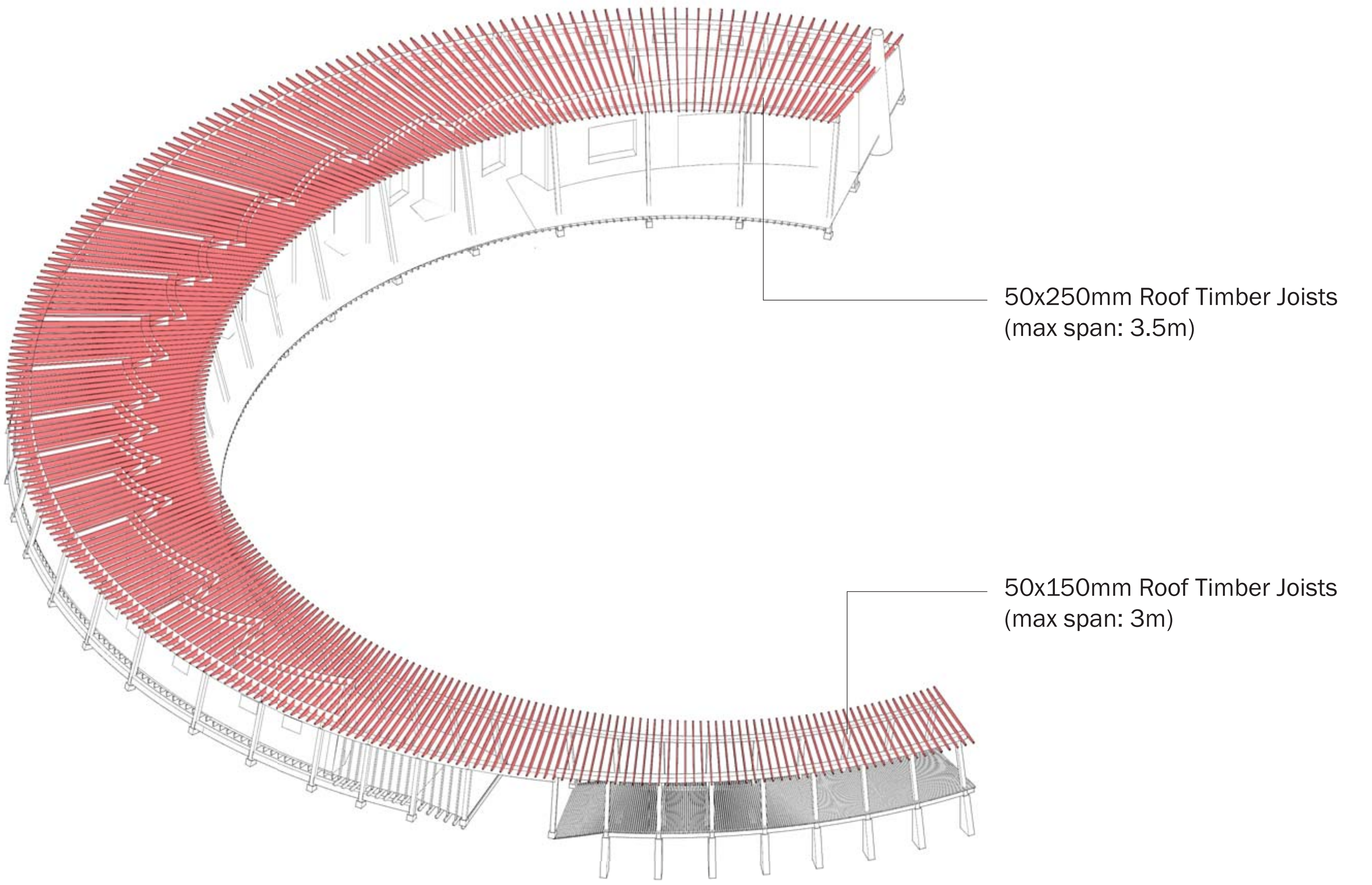
ROOF GLULAM BEAMS



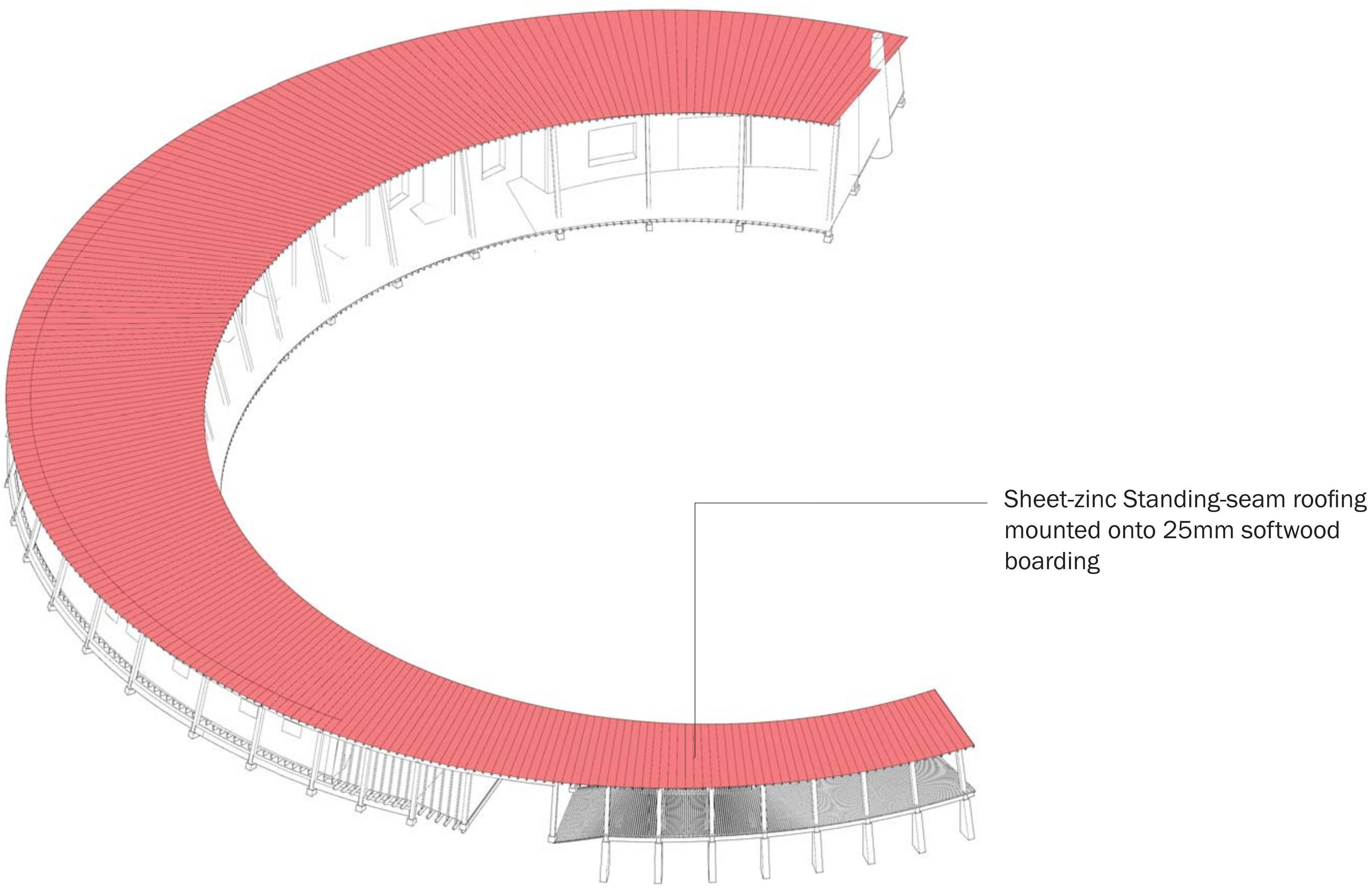
TIMBER FRAME PARTITION WALLS



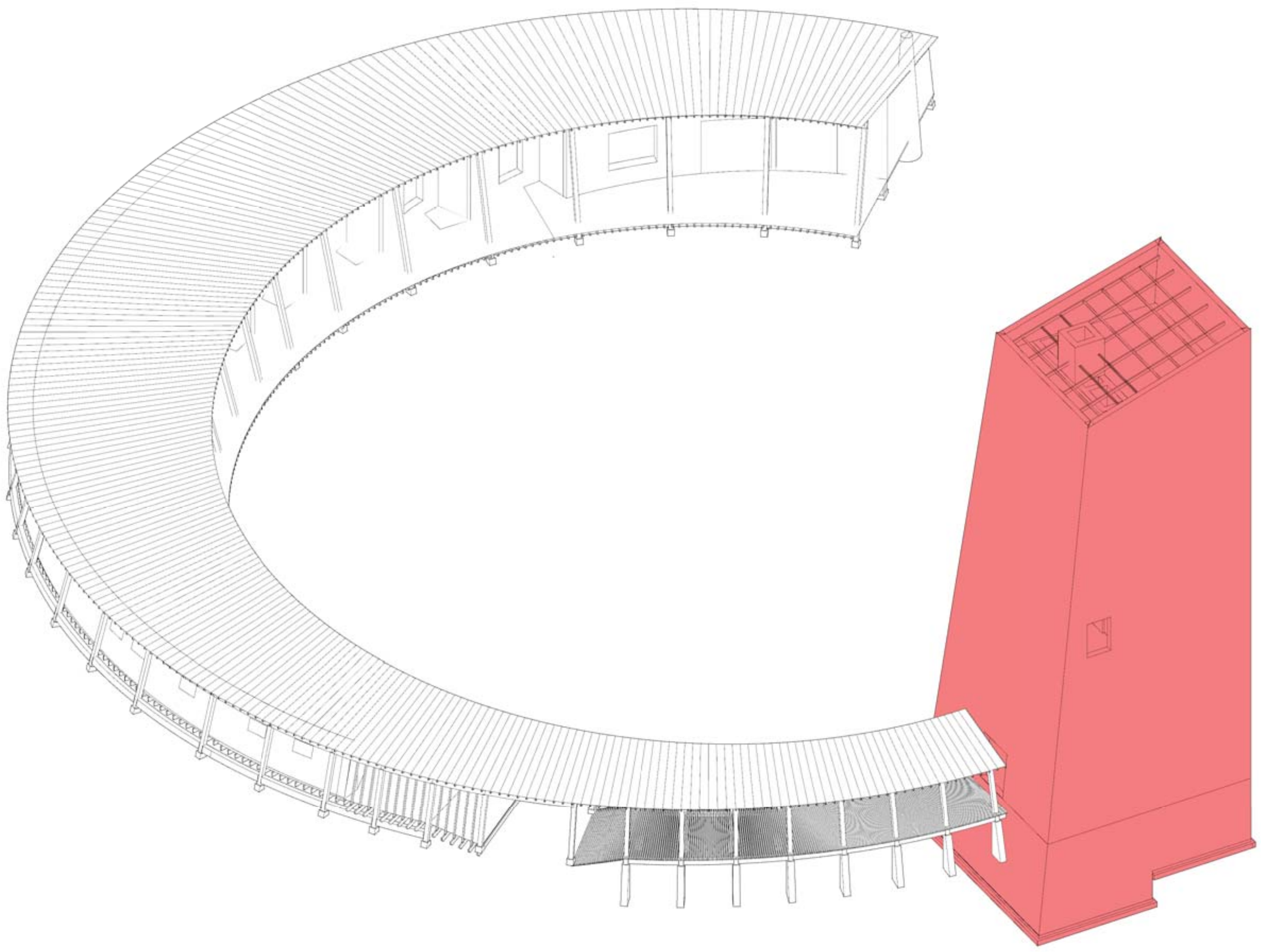
ROOF TIMBER JOISTS



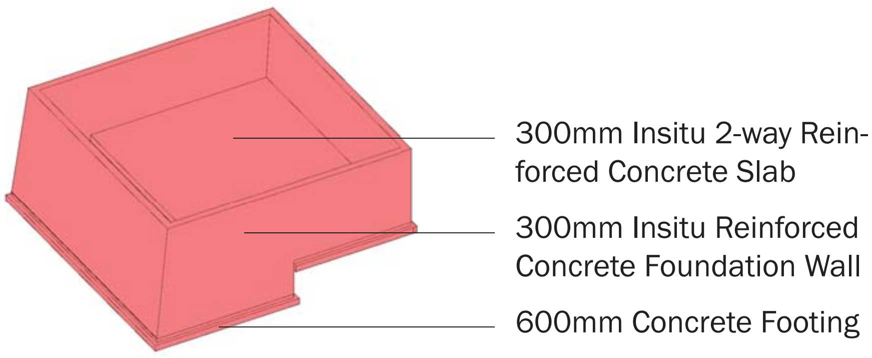
ZINC STANDING-SEAM ROOF



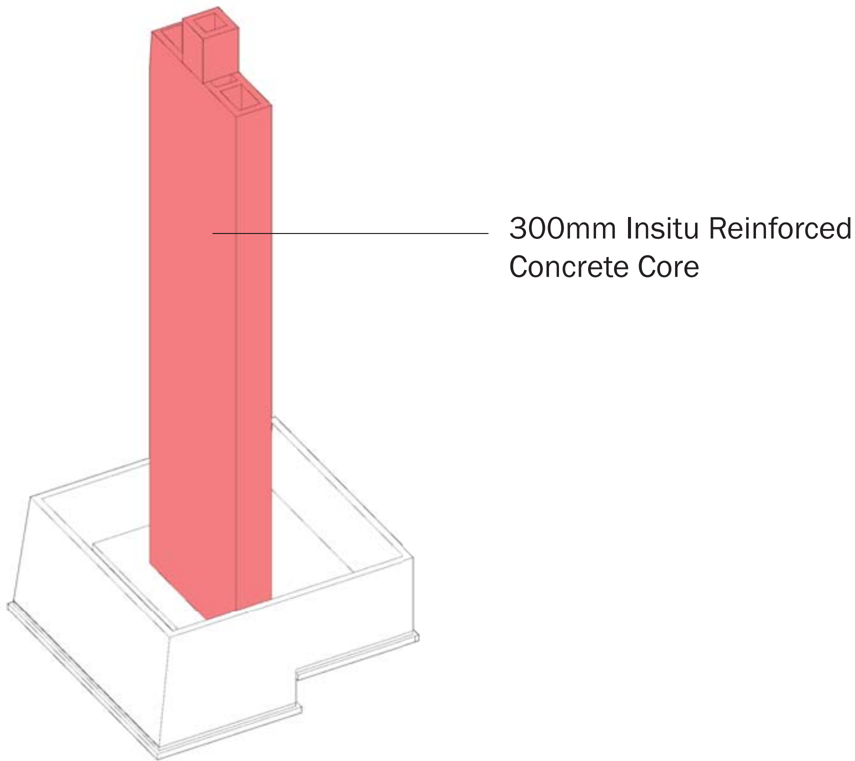
STRUCTURAL SYSTEMS - TOWER



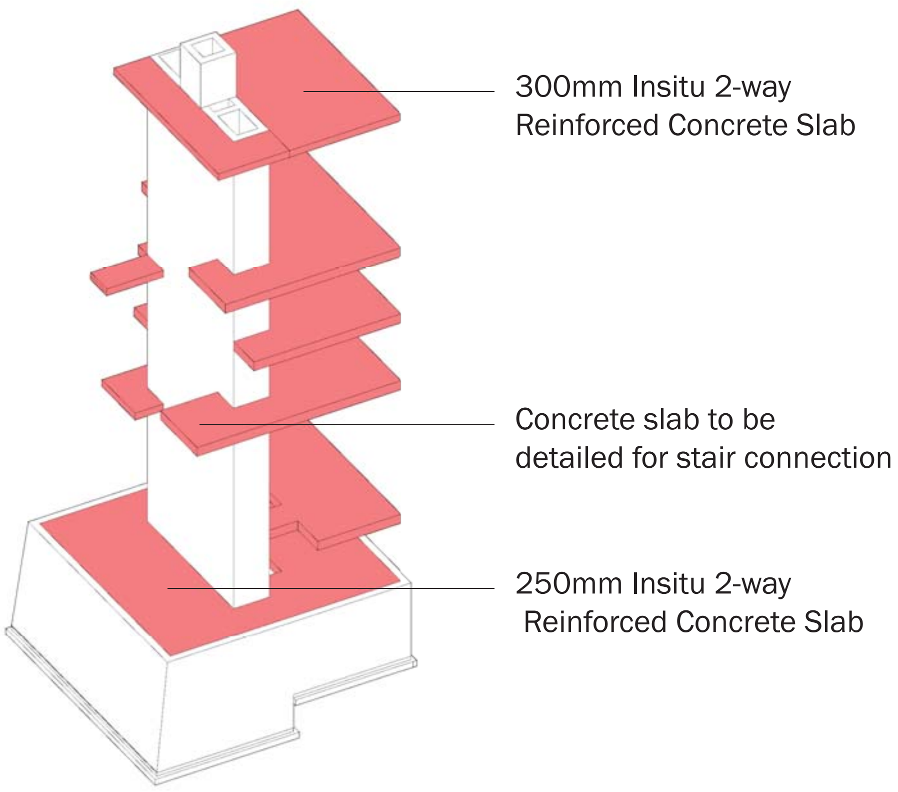
FOUNDATION



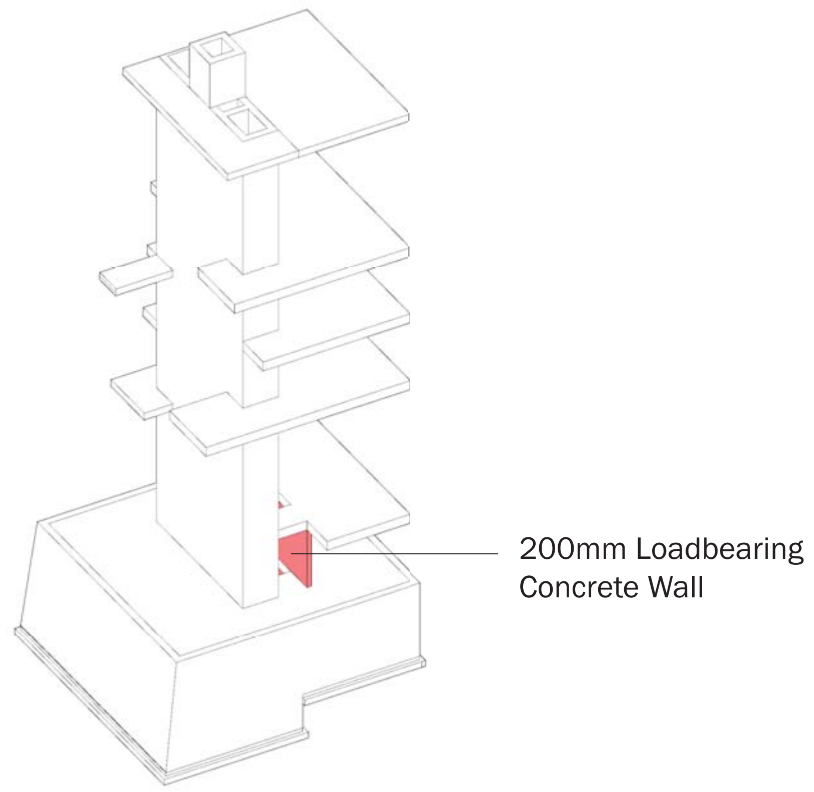
STRUCTURAL CORE



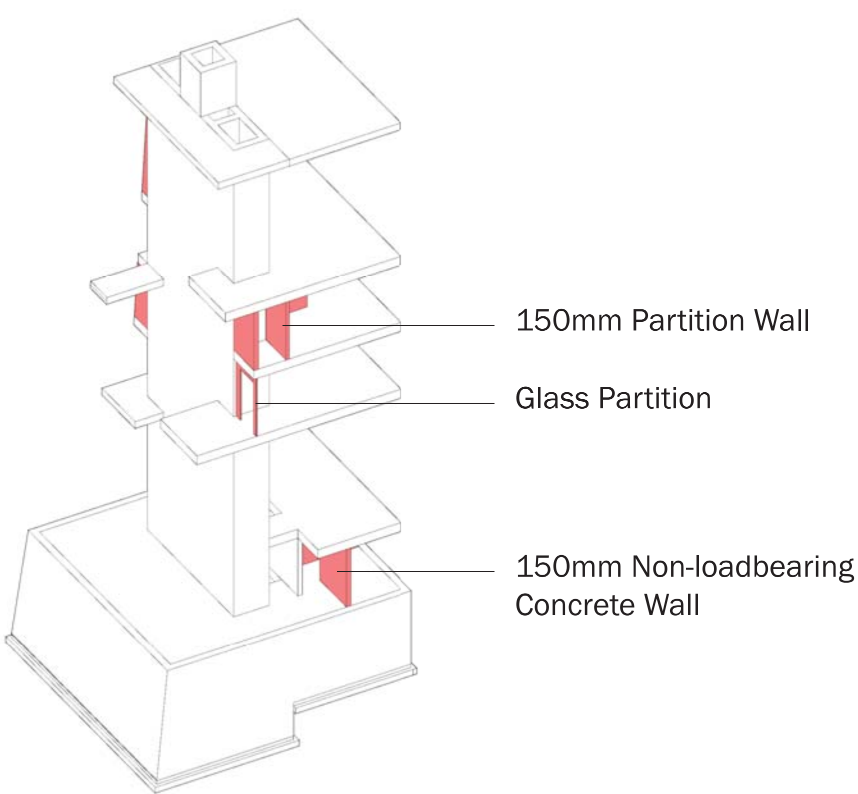
CONCRETE FLOOR SLABS



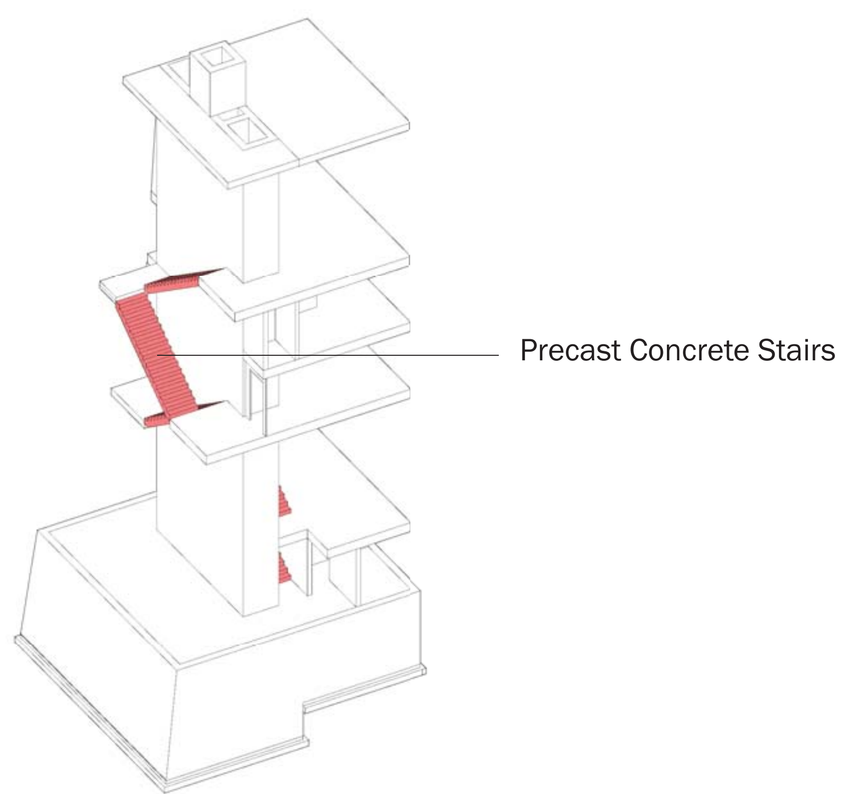
LOADBEARING WALLS



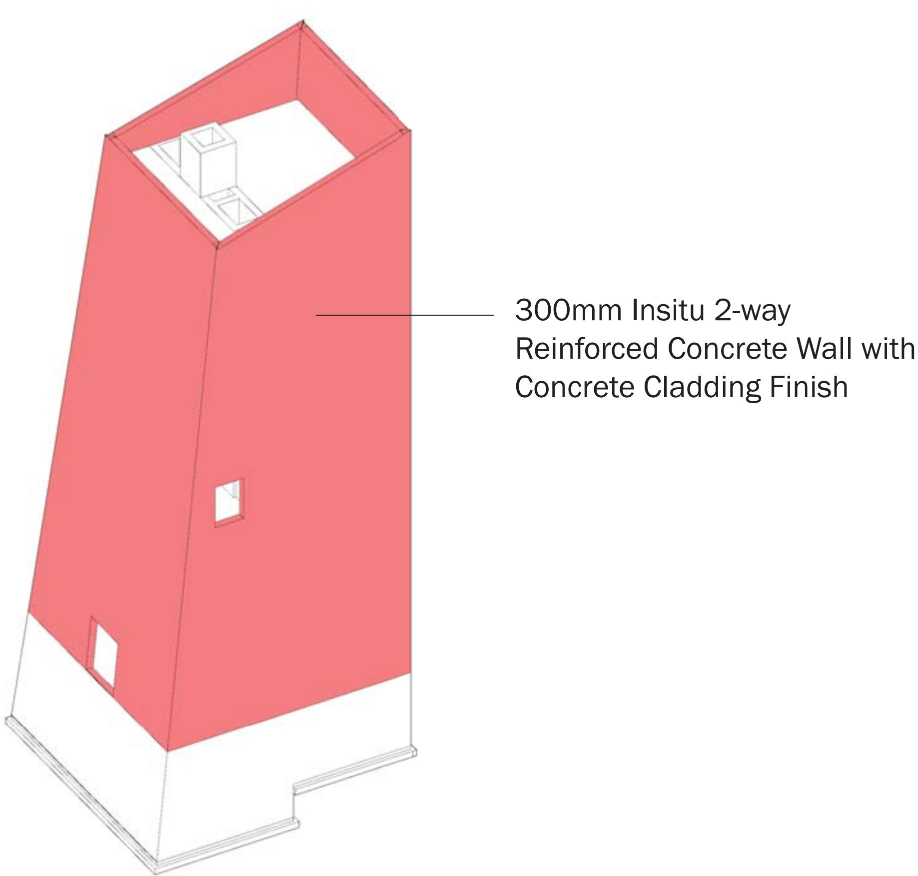
NON-LOADBEARING PARTITION WALLS



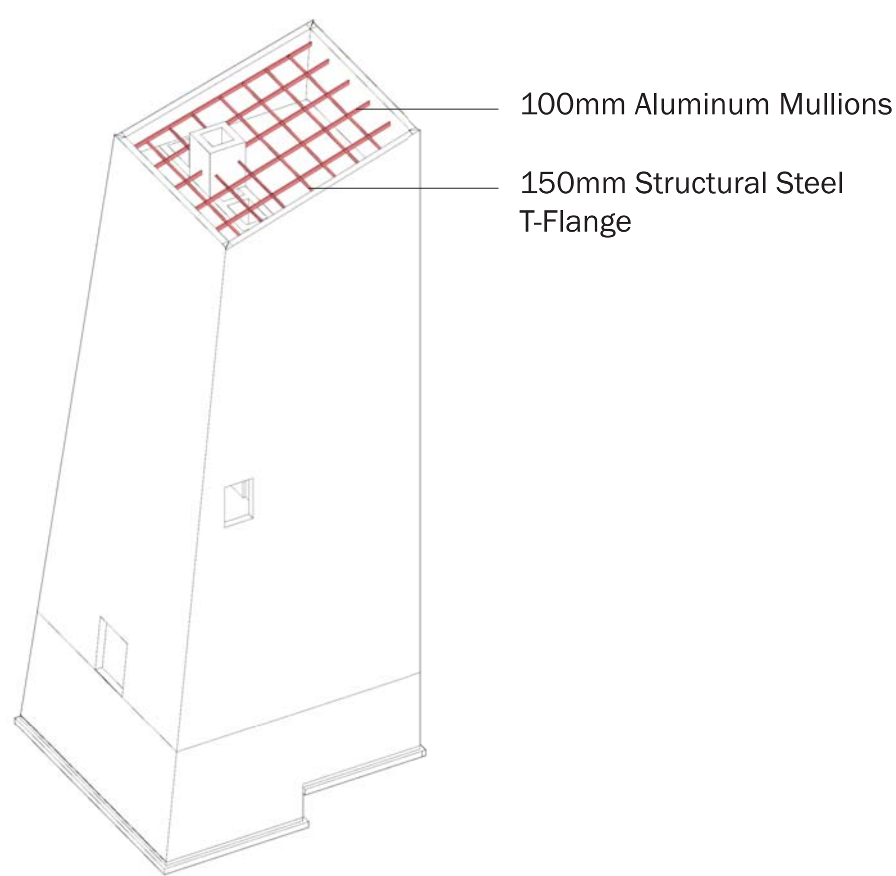
PRECAST CONCRETE STAIRS



EXTERIOR STRUCTURAL WALL



ROOF STEEL STRUCTURE



APPENDIX
FLOOR PLAN
SECTIONS
ELEVATIONS
PERSPECTIVES