Mike Newsway

Newid
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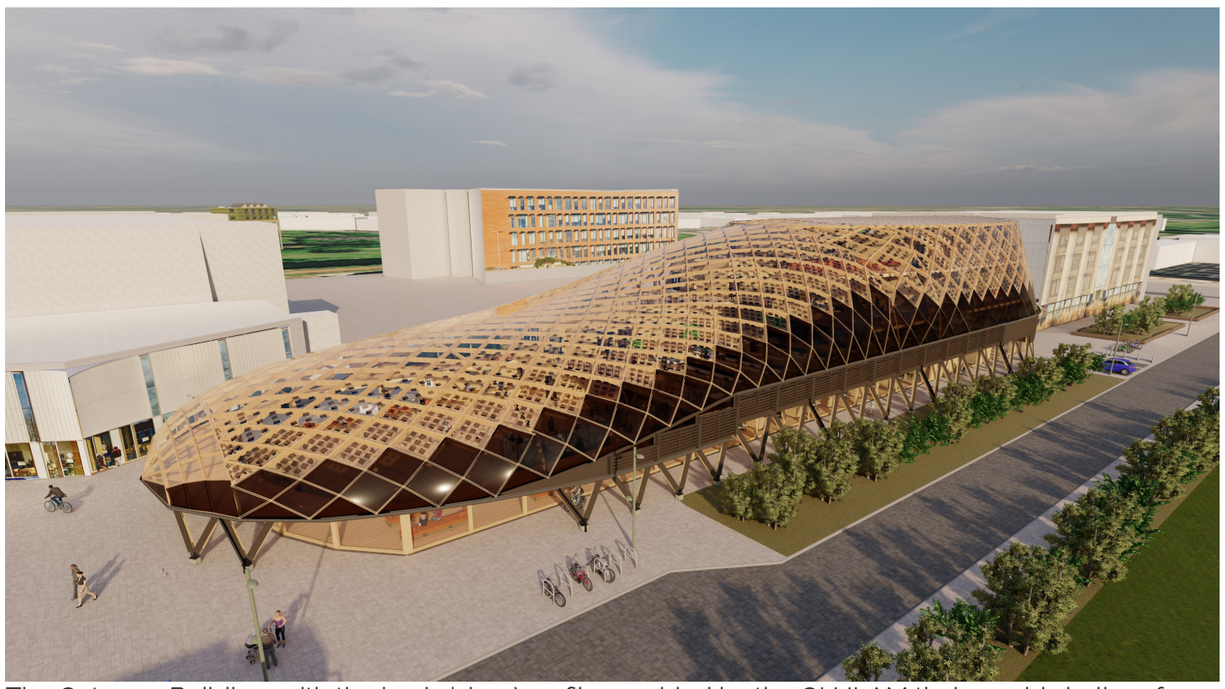
University Gateway



The Gateway Building; with the basic 'shoe' profile provided by the GLULAM timber grid shell roof provides a striking, sustainable building within the heart of the University Campus.

The main exhibition space provides a flexible open space under the double height grid frame roof.

The Gateway Building is to serve as the University's Reception, Art Gallery and Events centre. It is going to be the central hub of the University as well as the link between the institution and the people of Northampton.

Project Brief – Key Elements

- Must meet BREEAM's 'Excellent' or 'Outstanding' rating
- Sustainability in the design, build and future use
- The building is to serve as the University's Reception, Art Gallery and Events Centre and Theatre
- It must be a hallmark for near zero carbon building
- It should reflect the history of Northampton

Design strategies

Materials / Structure / Construction

Minimise the use of materials and where possible the aim is to either use renewable or reclaimed materials.

- Renewable timber for the superstructure
  - **Cross Laminated Timber** (CLT) panels for structural walls and floors
  - **Glulam** for columns and grid-shell roof structure
- In sub-structure use concrete with recycled cement alternatives
- 'Open' areas of building on south aspect
- 'Closed' areas grouped on north side

Use of off-site prefabrication and on-site assembly

Systems / Services

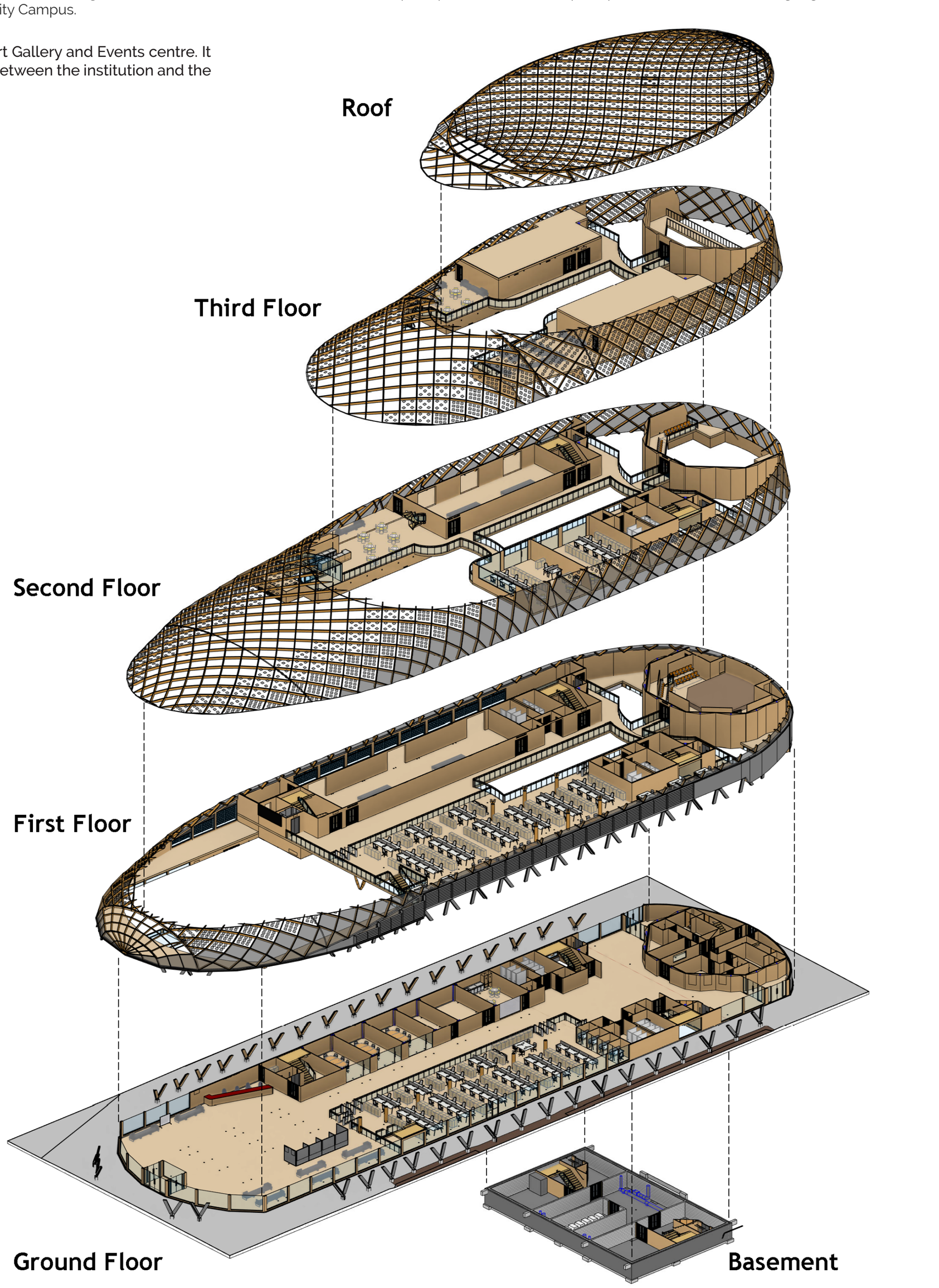
Reduce the resource / energy consumption of the building with

- Mixed-Mode ventilation & ground source temperature regulation for mixed-mode heating / cooling
- Sun shading to control overheating
- Building-integrated photovoltaics (BIPV) for power & shading
- LED Lighting
- Rainwater capture for use in toilets
- Building Management system to control and monitor systems.

BREEAM ratings are gained across a range of categories from the BREEAM UK New Construction Scheme to measure the sustainable impact of the Gateway Buildings' design and construction.

BREEAM Scorecard - UNIVERSITY GATEWAY

BREEAM section	Credits targeted	Credits achieved	Credits available	% of credits achieved	Category weighting (fully-fitted)	Section score (%)
Management	14	14	21	66.67%	0.11	7.33%
Health and Wellbeing	16	17	20	85.00%	0.14	11.90%
Energy	19	19	24	79.17%	0.16	12.67%
Transport	12	12	12	100.00%	0.1	10.00%
Water	8	8	9	88.89%	0.07	6.22%
Materials	12	12	14	85.71%	0.15	12.86%
Waste	9	9	10	90.00%	0.06	5.40%
Land Use and Ecology	4	4	13	30.77%	0.13	4.00%
Pollution	8	8	9	88.89%	0.08	7.11%
Innovation	2	2	2	100.00%	0.1	10.00%
Final BREEAM score / rating		**OUTSTANDING**			**87.49%**	



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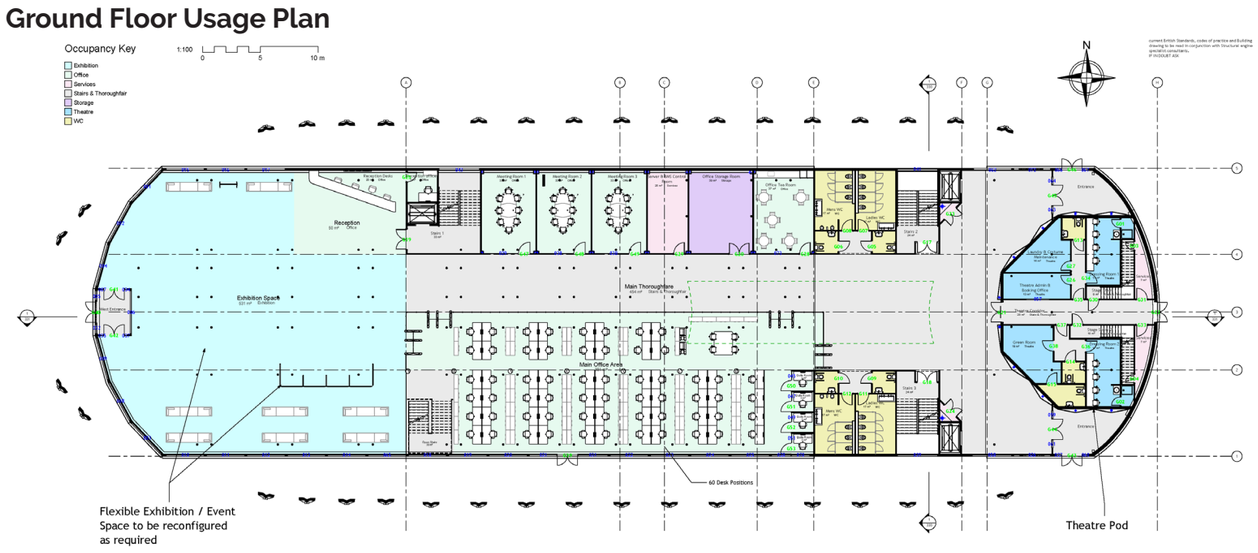
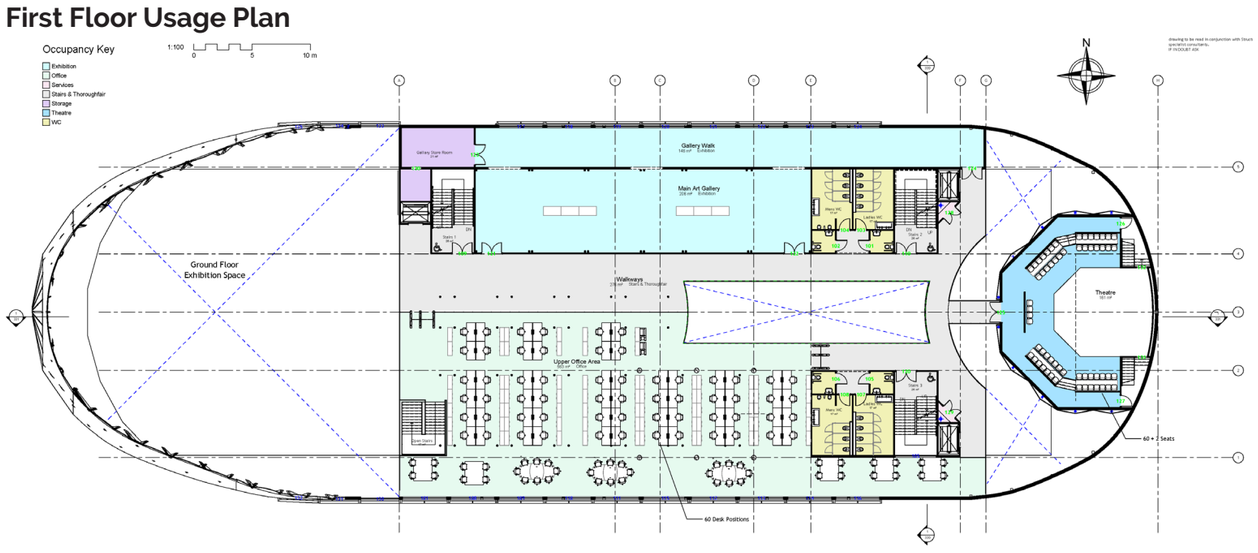
The main thorough-fair at ground floor approaching the Theatre with open view up to the top roof level.

The lower West Entrance matches the height / scale of the adjacent Market Hall, leading into the open Exhibition Hall and the main reception desk..

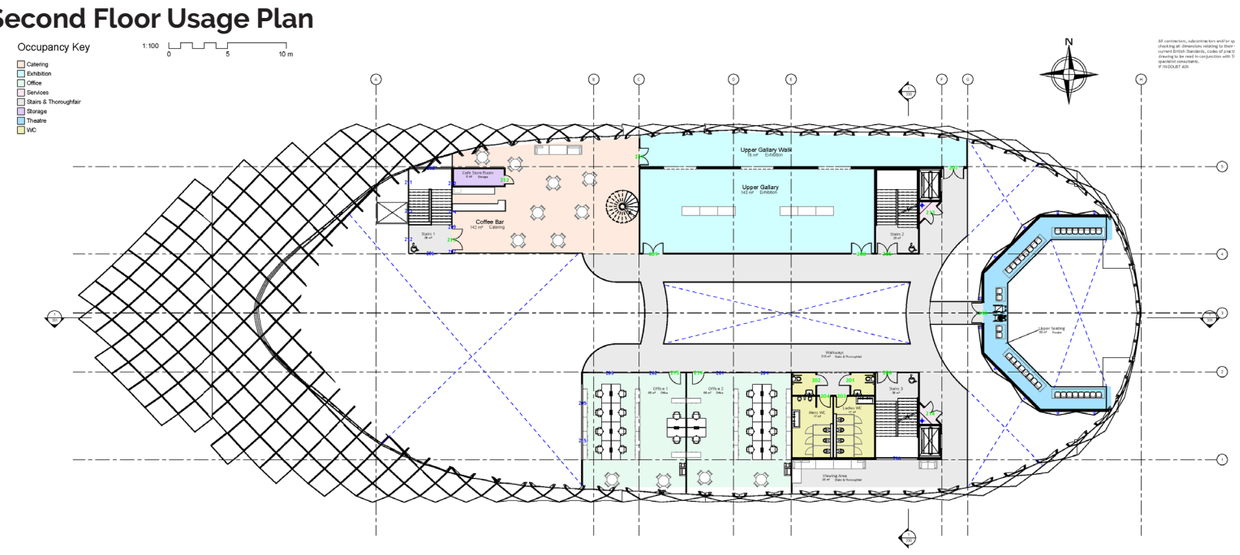
Ground Floor Usage Plan



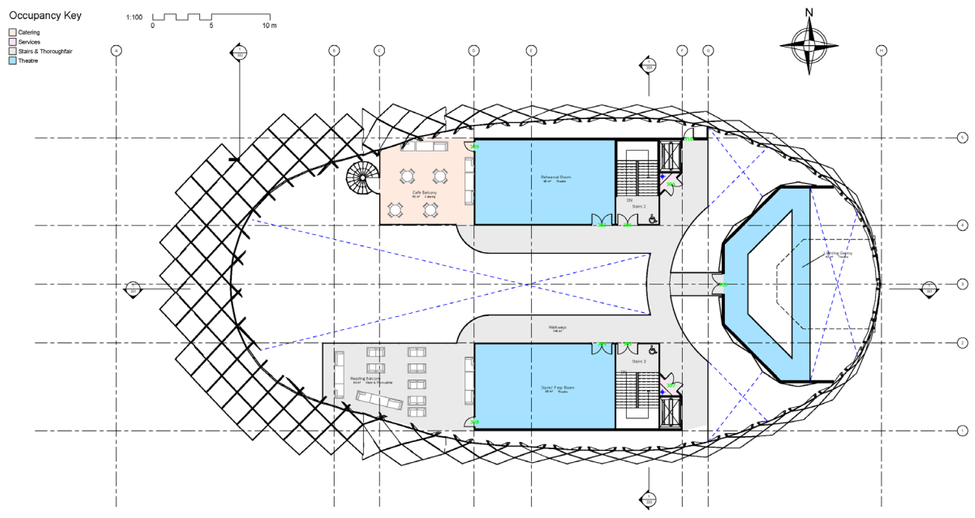
First Floor Usage Plan



Second Floor Usage Plan



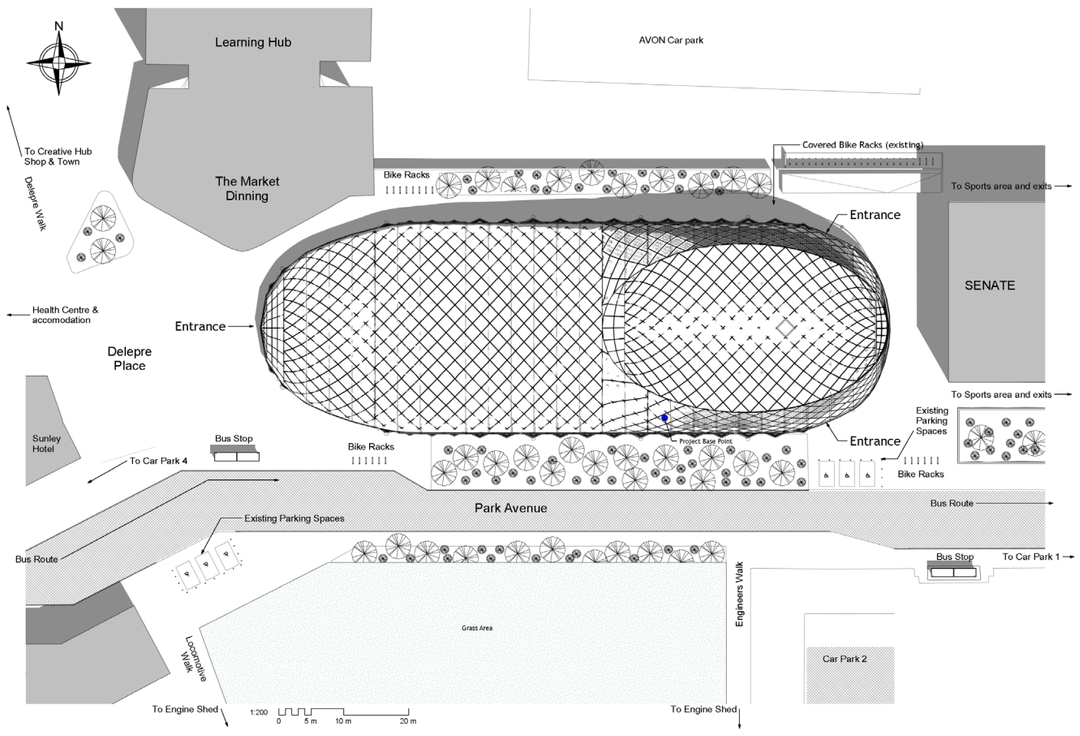
Third Floor Usage Plan



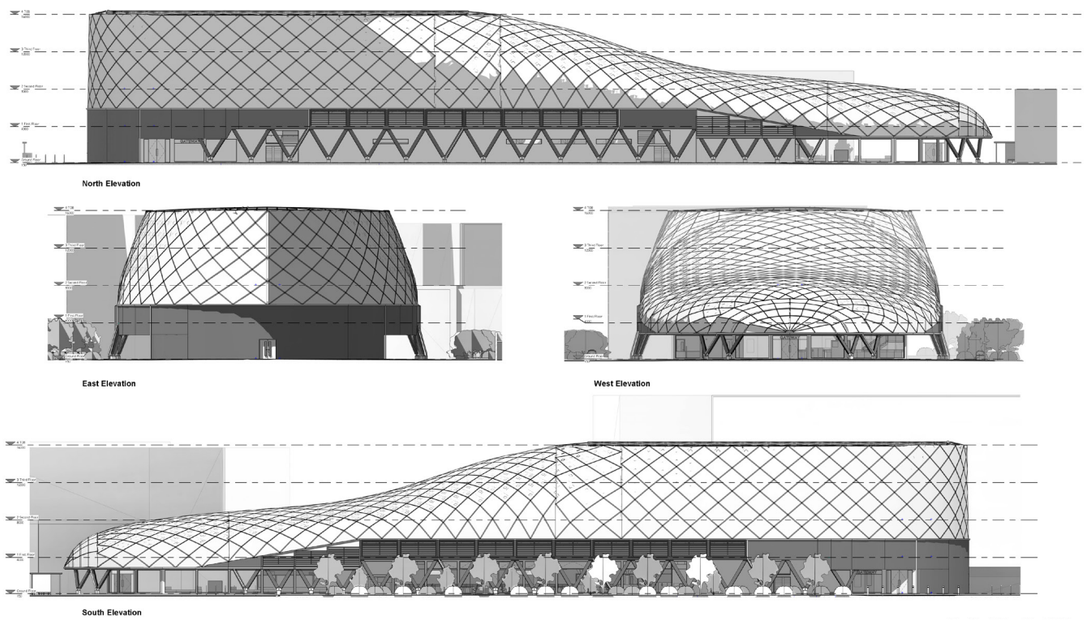
Occupancy Key
- all floors

- Catering
- Exhibition
- Office
- Services
- Stairs & Thoroughfair
- Storage
- Theatre
- WC

Site Plan

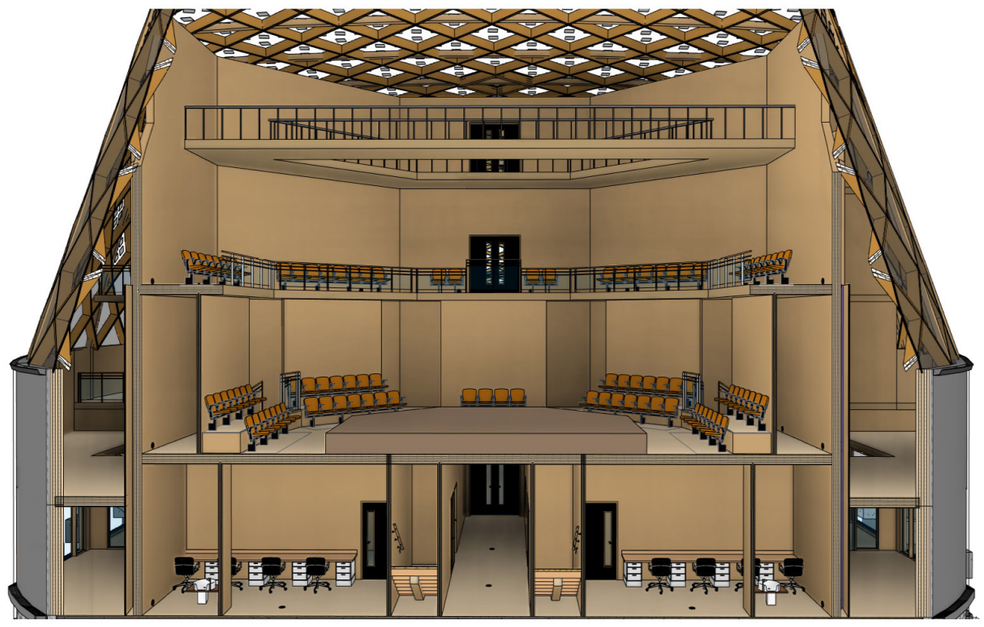


Elevations



The Gateway Theatre

The Theatre seats 100, wrapped around a 'thrust' stage which provides an intimate performing space that reduces the 'footprint' of the theatre within the building. Wheelchair spaces are provided on both seating levels



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CLT & GLULAM Structure

View from the cafe Bar of the first floor open office area and the second floor closed offices.

With sustainably sourced timber used for :-

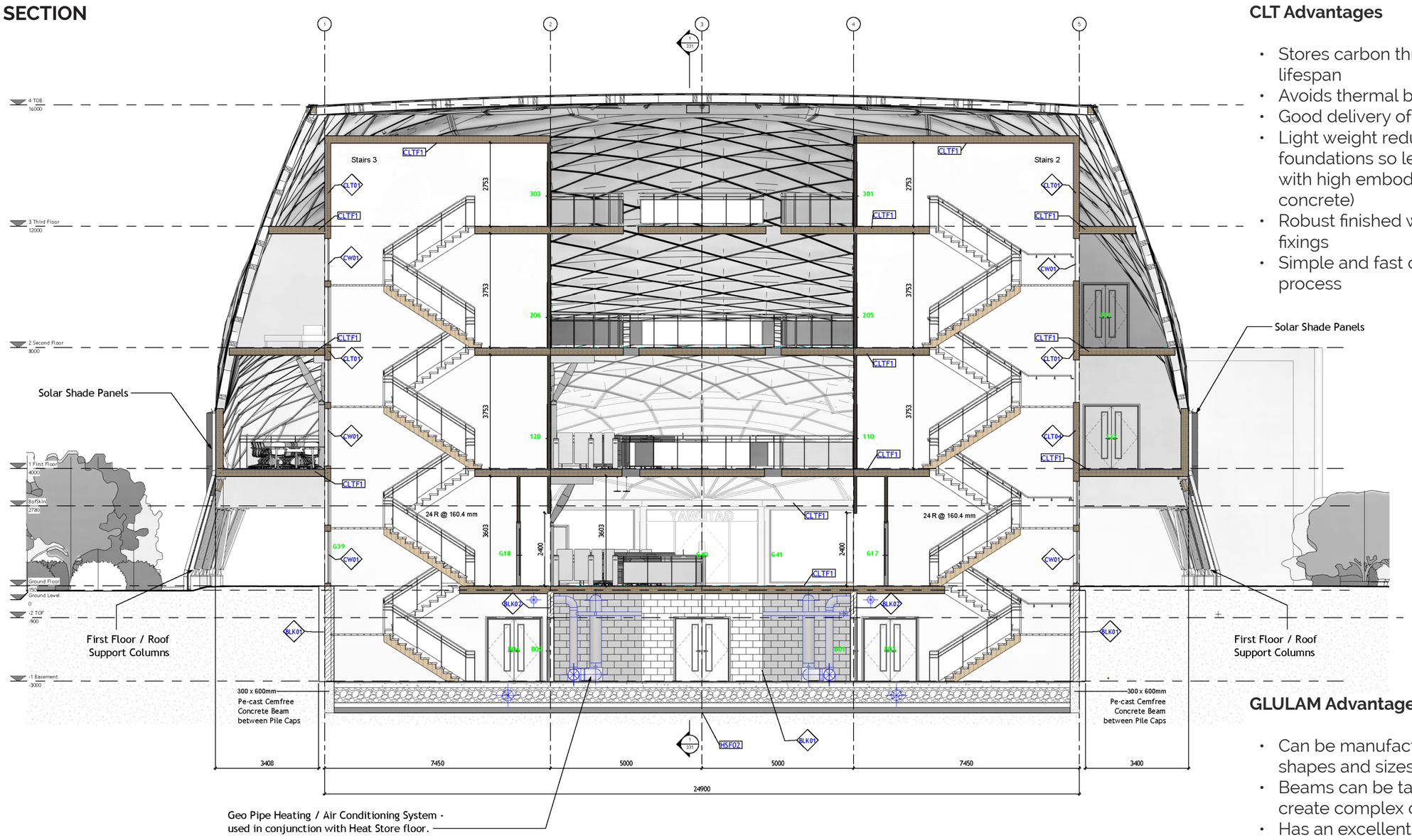
- CLT Floors and Walls
- GLULAM external and internal columns
- GLULAM grid shell roof

A range of panels have been modelled in the Gateway design, for use in different wall and floor types.

With different widths / thickness's and finishes as required by their use.

For the purpose of the design the wall width and floor thickness of the CLT panels in the design model was based on case study examples; however these sizes would be subject to analysis and confirmation by structural engineers

SECTION



CLT Advantages

- Stores carbon throughout its usable lifespan
- Avoids thermal bridging
- Good delivery of airtight envelope
- Light weight reduces load on foundations so less need for materials with high embodied energy (e.g. concrete)
- Robust finished wall will take sundry fixings
- Simple and fast on-site construction process

GLULAM Advantages

- Can be manufactured in wide variety of shapes and sizes
- Beams can be tapered, bevelled to create complex configurations
- Has an excellent strength to weight and stiffness to weight ratio
- Can be used internally and externally depending on the grade / timber species / treatment
- Excellent fire safety; slow to char, the uncharred section retains its strength.

A Life Cycle Analysis (LCA) calculation was created for the CLT elements of the building which illustrates the level of Carbon captured.

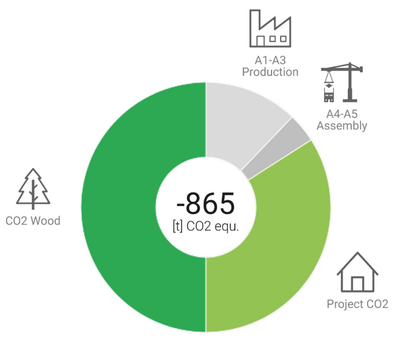
CLT Wall Schedule						
Type	Description	Width (mm)	Count	Finish	Volume (m3)	Heat Transfer Coefficient (U)
CLT01	CLT01_CLT wall 5x20mm	100	127	CLT Timber	265.34 m³	1.0588 W/(m²·K)
CLT02	CLT02_CLT wall 5x40mm_Ext	200	23	CLT Timber	59.78 m³	0.5531 W/(m²·K)
CLT03	CLT03_CLT wall 5x40mm_Ext_clad	250	33	Timber Cladding	90.81 m³	0.3333 W/(m²·K)
CLT04	CLT04_CLT wall 5x40mm_Int	200	17	CLT Timber	175.87 m³	0.5294 W/(m²·K)
					591.80 m³	

CLT Floor Schedule						
Type	Description	Thickness (mm) - incuding finishes	Count	Volume (m3)	Area (M2)	Heat Transfer Coefficient (U)
CLTF1	CLTF1_CLT Floor_5x40mm	247	11	1012.84 m³	4101 m²	0.5187 W/(m²·K)

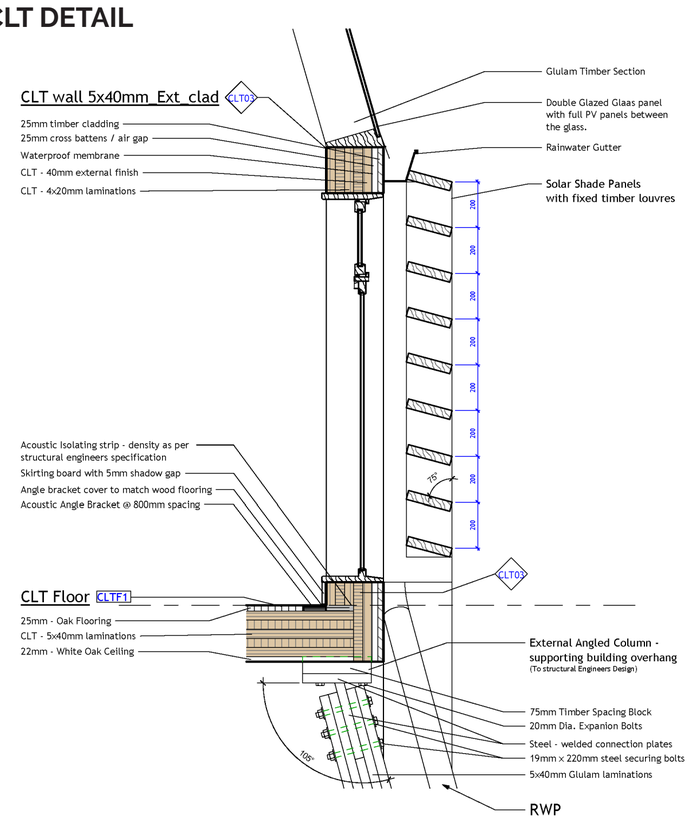
LCA (Life Cycle Assessment A1-A5)

Project Data	
Country	United Kingdom
Date	08/05/2022
Created by	MN
Project	Gateway

Volume of KLH® - CLT elements [m³]	1600.0
Transport distance truck (32 t) [km]	500.0
Transport distance ship [NM]	30.0



CLT DETAIL



CLT & GLULAM Construction Benefits

The pre-fabrication of CLT panels to tight factory tolerances and quality standards provides many benefits during construction.

- Scheduling benefits from defined assembly sequences
- Precision openings allow pre-order and rapid installation of windows,doors etc.
- Use of light weight tools means safer and quieter sites.
- Reduced material deliveries result in less disruption to neighbours
- Solid substrate for easy installation of 1st and 2nd fix items

The Gateway Building would be quicker to construct in CLT over traditional methods with some estimates claiming CLT construction is six times faster than a standard build with virtually no lost waiting times.

Furthermore, it would be clean with no secondary finishes, limited wet trades and no brick/block work creating dust, and with vastly reduced material handling, making it much better in terms of health and safety.

Presently the cost of CLT materials per square meter is higher when compared to steel and concrete. However, when reduced construction times and the reduction of on-site waste are taken into account, the cost of building with CLT is similar to traditional construction.

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Solar Shading

The Southern walkway and the equivalent Northern walkway provide covered routes between the Senate building and Delepre Place and its adjacent buildings without needing to pass through the Gateway Building.

With open aspects to the south without the shading strategies excess solar gain in the summer would result in higher than comfortable temperatures within the building;

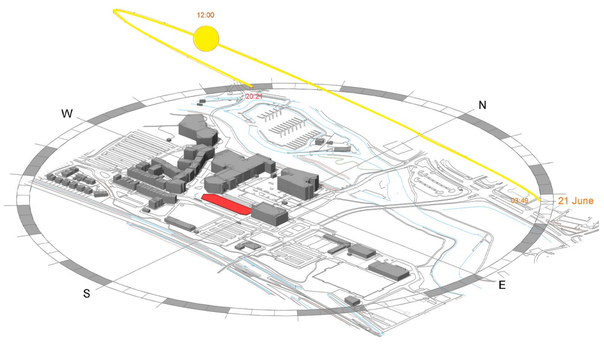
While in winter sun entering south-facing windows can positively contribute to passive solar heating.

Shading is provided:-

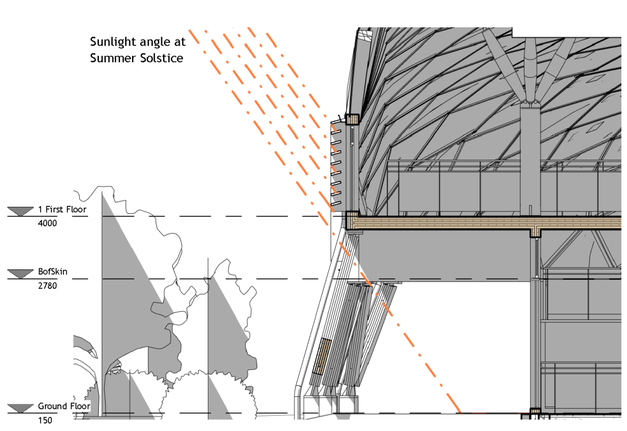
at ground floor level
- overhangs,
- natural landscaping

at first floor level
- louvred timber screens

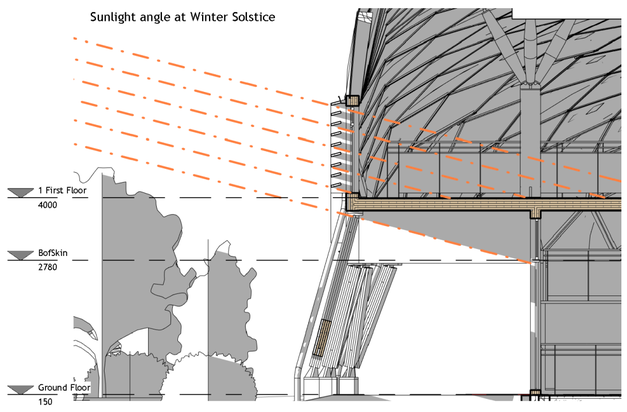
above first floor level
- photo-voltaic cells within grid shell window elements.



Summer solstice sun path



Shading - Summer



Shading - Winter

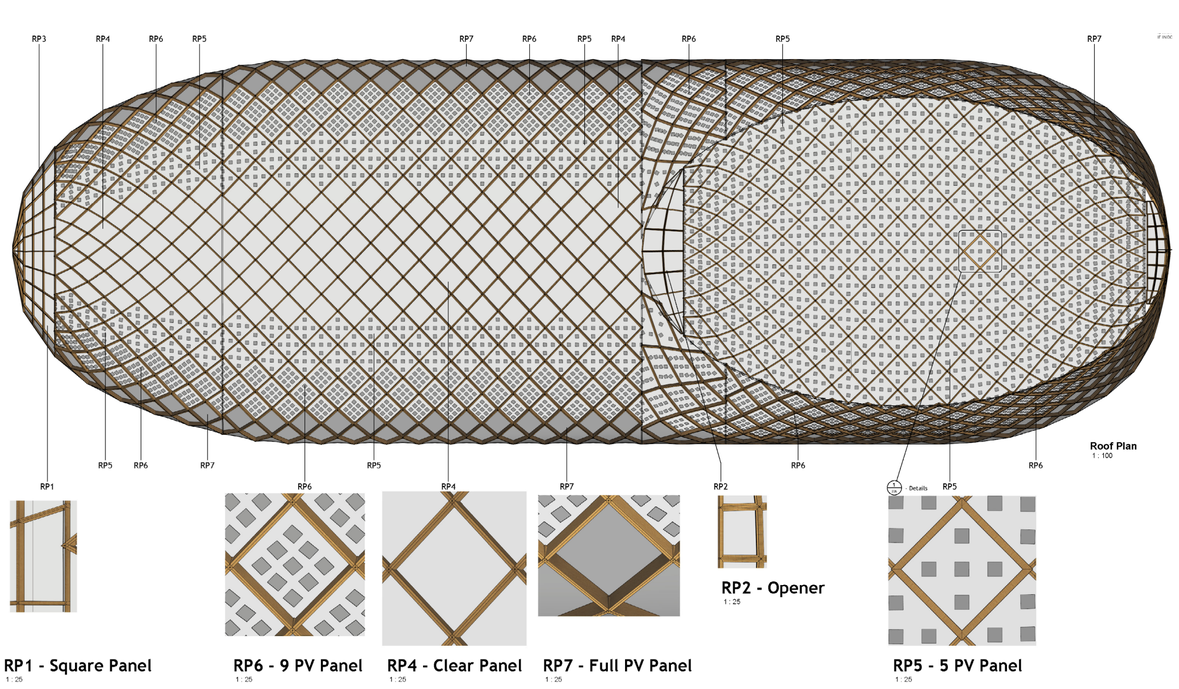
Building-integrated photovoltaics (BIPV)

Semitransparent modules integrated in the glazed roof panels. In addition to producing electric energy, these provide a level of shading, depending on the layout and density of the cells.

RP5 - Low shading - 5 BIPV cells

RP6 - Medium shading - 9 BIPV cells

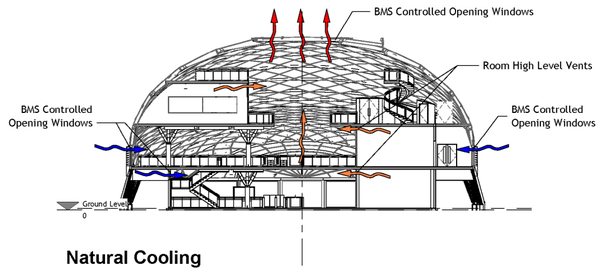
RP7 - High shading - full BIPV cells



South elevation showing roof grid structure and aspects of shading

Heating & Ventilation

Mixed mode ventilation is used, depending on the weather and controlled by a Building management System (BMS) – with different strategies in different parts of the building.

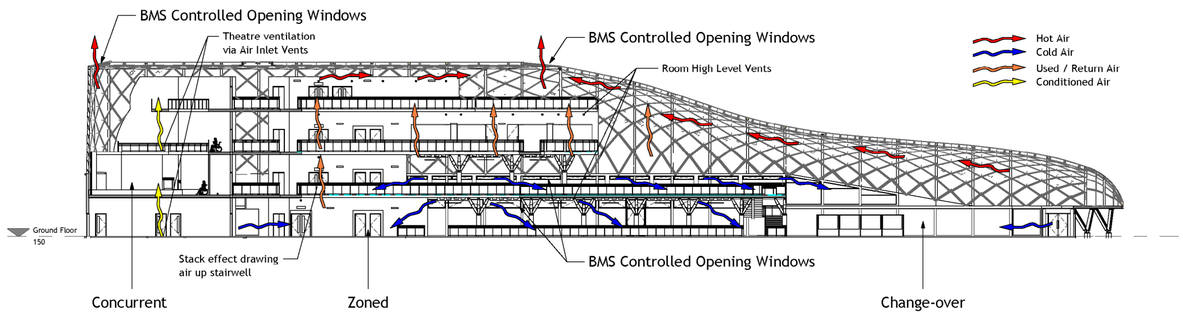


Natural Cooling

Theatre - "concurrent"
- both mechanical and natural ventilation at the same time

Exhibition space - "change-over"
- switches between mechanical and natural ventilation

Toilets - "zoned"
- mechanical ventilation

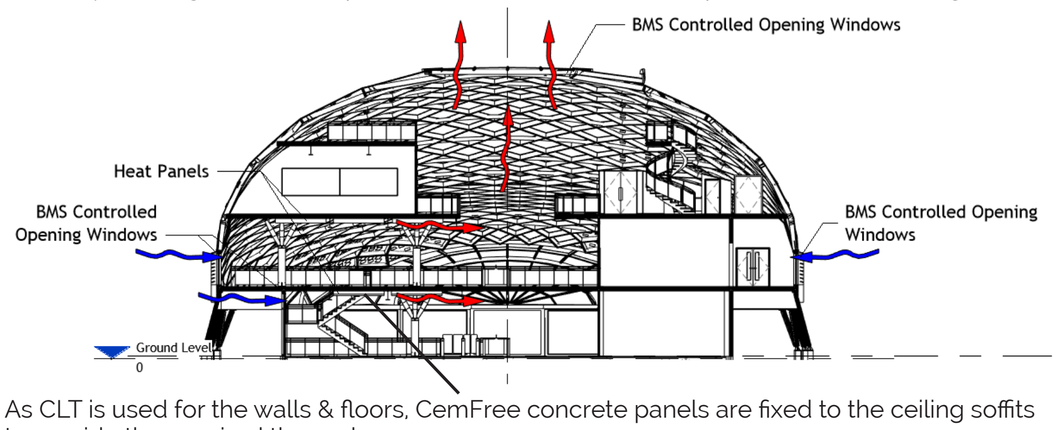


Natural Cooling

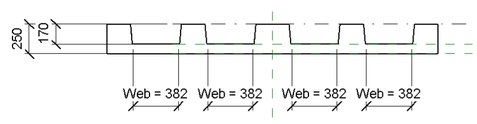
Night Time Cooling

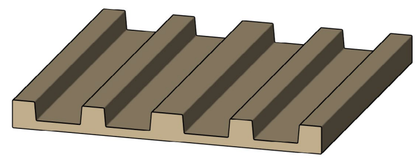
The building takes advantage of the lower running costs and environmental impact of natural ventilation coupled with night-time cooling.

However this requires large areas of exposed thermal mass, such as exposed concrete ceiling soffits.

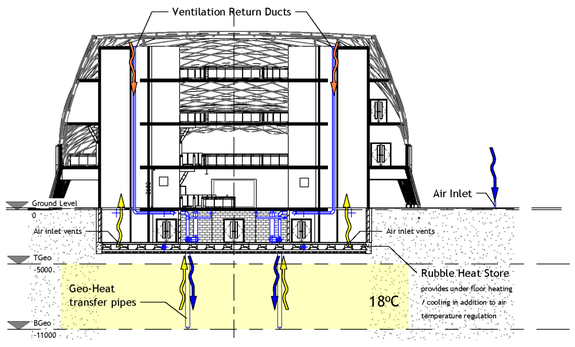


As CLT is used for the walls & floors, CemFree concrete panels are fixed to the ceiling soffits to provide the required thermal mass.

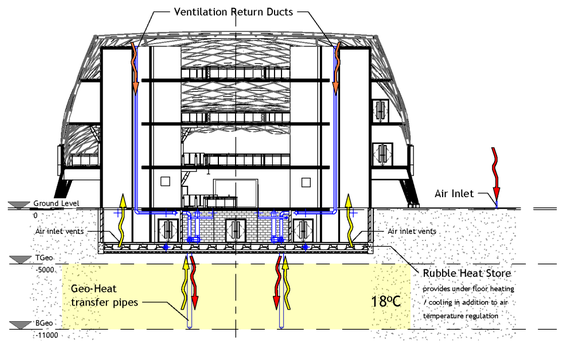




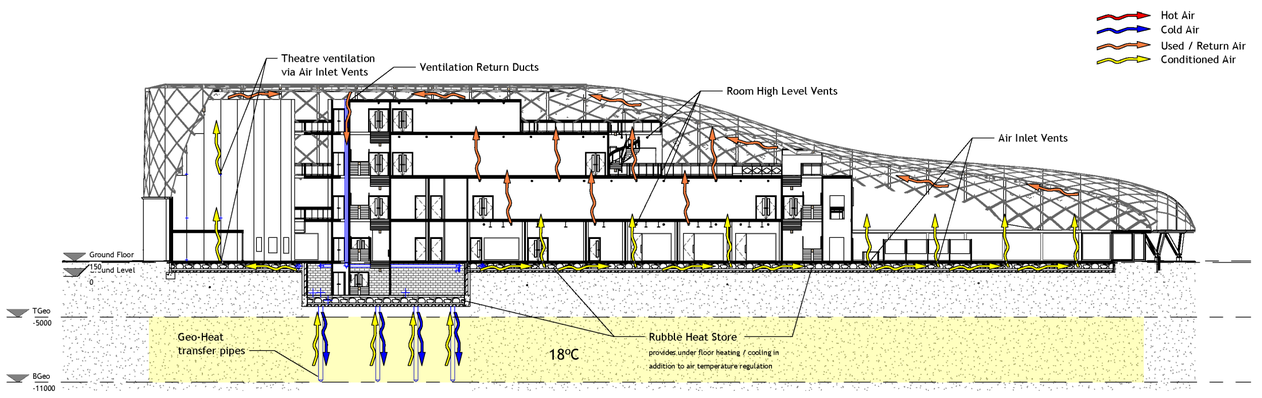
An air ventilation, preconditioning / filtration system using shallow underground renewable energy - with an integrated rubble stone heat store.

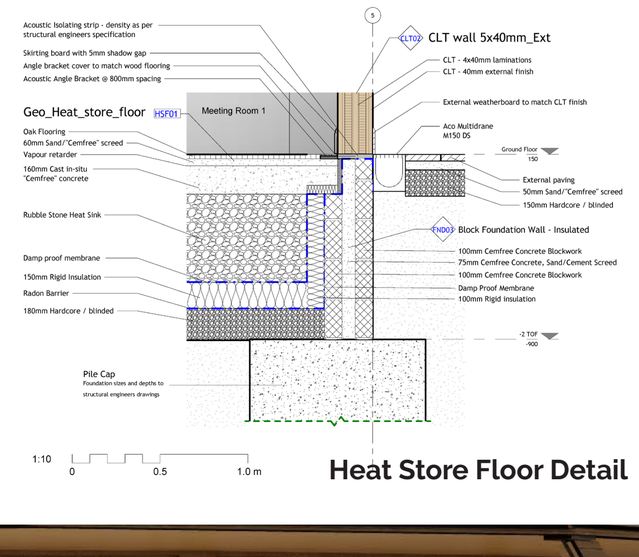


Geo System - Heating



Geo System - Cooling





Heat Store Floor Detail

GEO Power Heat exchange system

System Benefits

Effective use of energy.
- Condition outside air to moderate temperature More than 50% of HVAC energy saving
- Store "off-peak" lower cost energy and use it when the demand is high

High indoor air quality
- Fresh air supply without opening windows
- Built-in filtration system removes dust and pollen