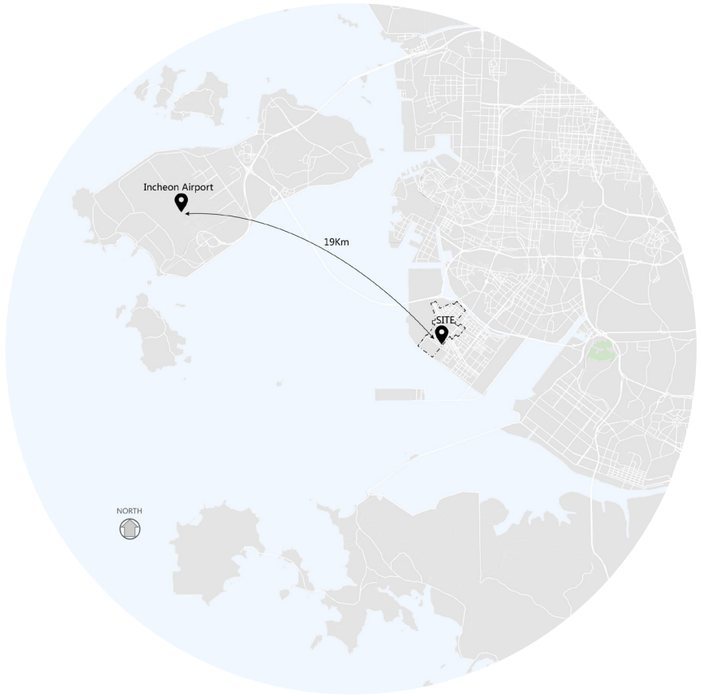
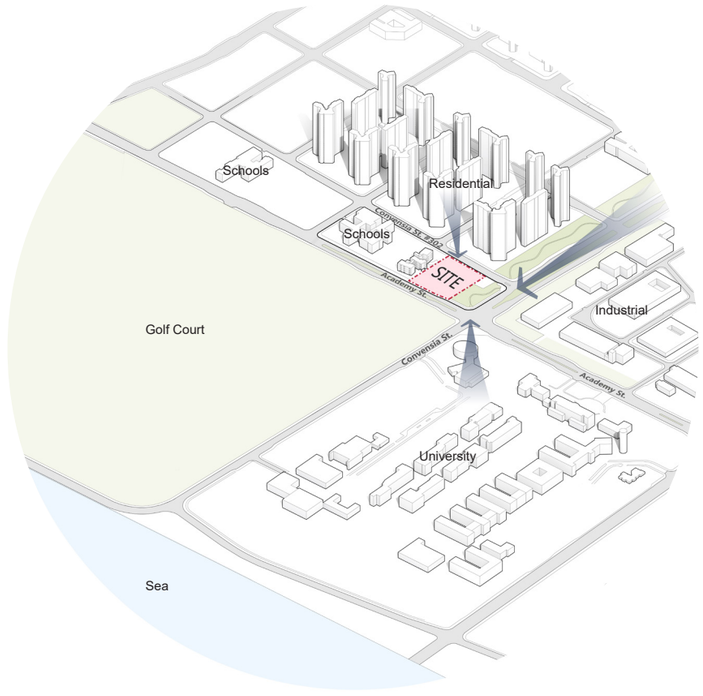
SONGDO INTERNATIONAL LIBRARY



Site Location

Songdo International City is known for its intellectual and sustainable city developments in recent years. With its ideal location, 15 minutes away from Incheon airport, this city is becoming one of the best venue for business, trades, and meetings to happen in Northeast Asia.

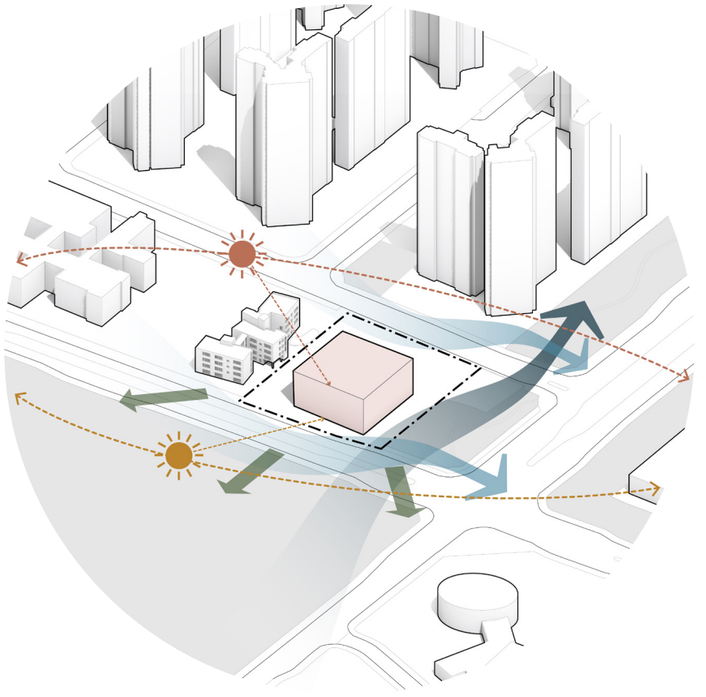
Now, with more cultural developments such as this public library, a key indicator to carry out a cultural purpose into the city and hoped to draw closer connection with their living citizens.



Surrounding Context

The site locates at 115-2, Songdo-dong, it is adjacent to the Convensia main St. to the north and Academy St. to the south. It is about 1 kilometre away from the city central, and, as shown above, the site is surrounded by Schools, Residential blocks, Industrial buildings and a Golf Court. Therefore, most of the visitors would be approaching to the site from Northeast side where the city central and most of the residentials are. Some would be coming from the schools on the west side, and the university on the east side across the street.

There is a potential scenary view looking out to the Golf Court on the south side and if on site elevation at 20 meters or above, it would be able to have a view to the sea beyond the Golf Court.

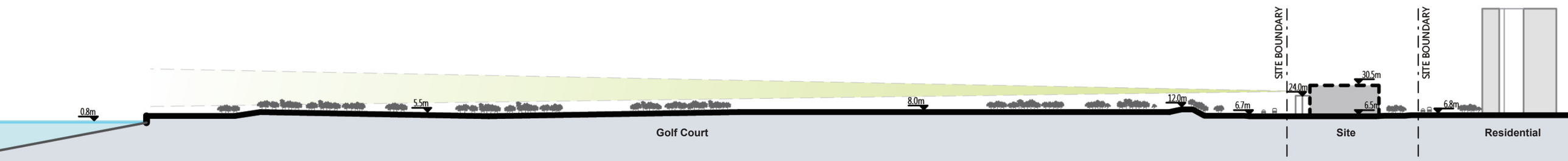


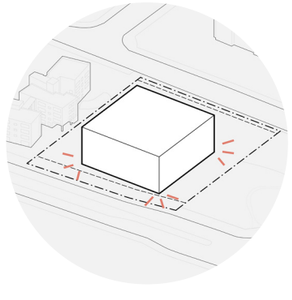
Environmental Influences

Songdo International City is located in the northwest of the country, on the coast of the Yellow Sea and a short distance from Seoul, the climate is continental: winters are cold but sunny, and summers are hot, sultry and rainy, though tempered by the breeze.

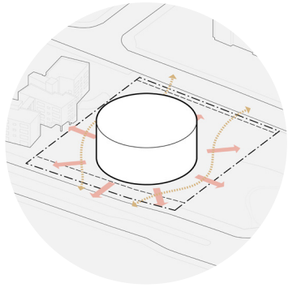
In winter, the average temperature is around freezing (0 °C or 32 °F) or a few degrees below; sunshine is quite common, and a cold wind often blows from the Asian continent. On colder periods, the temperature remains below freezing during the day; in the worst moments, it can drop to -15 °C (5 °F) or below.

The amount of sunshine in Incheon is decent in winter and also in spring and autumn, while it reaches its minimum in July, when cloudy skies prevail (and the amount of sunshine drops to 35%) because of the summer monsoon.

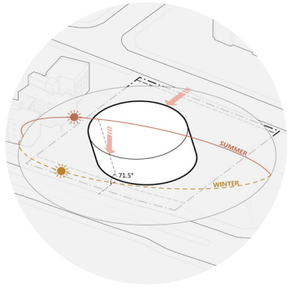




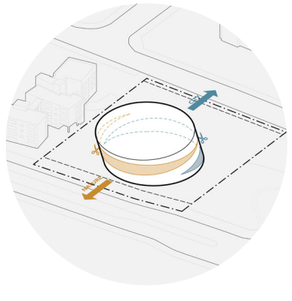
Massing Size of 6800m2 on site, with only 30% Site Coverage



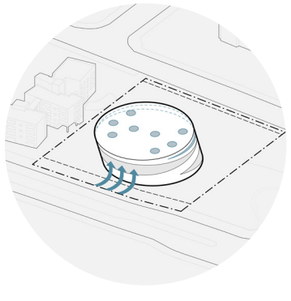
Rounded to allow maximum access from different directions and became the center of the place, minimized enviromental impact on the adjacent kindergarten.



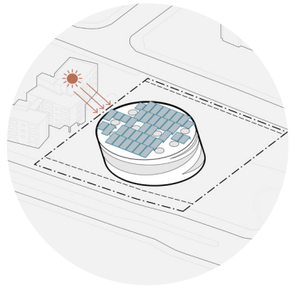
Building form Tilted towards south to minimize Direct Sunlight in Summer and Gain solar energy in Winter.



Two key spaces carved out to create Reading Hall (towards the south facing natural view) and Community Living Hall (towards north facing city/community)



Skylights and natural ventilation are designed to archieve thermal comfort for interior spaces and minimized energy consumption in the library



Solar Panels on rooftop are applied to generate cleaning energy to achieve Zero Carbon Building

Convensia St.#320

Academy St.

Convensia St.

Car Entry

Car Exit

Pedestrian Entry

Pedestrian Entry

Main Entry

To Undergound Carpark

Service Entry

Fire Exit

6.8

6.5

6.4

6.7

6.5

8.1

6.5

6.6

11.9

10.4

Site Plan

Site Area: 9427.4m2
Site Coverage: 28.2%
Landscaping Ratio: 30.5%
GFA: 8199.5m2
Underground: 1710.6m2
Above Ground: 6488.9m2
FAR: 0.87
Building Height: 26.0m
Number of Parking: 50 lots (17 on Grade)

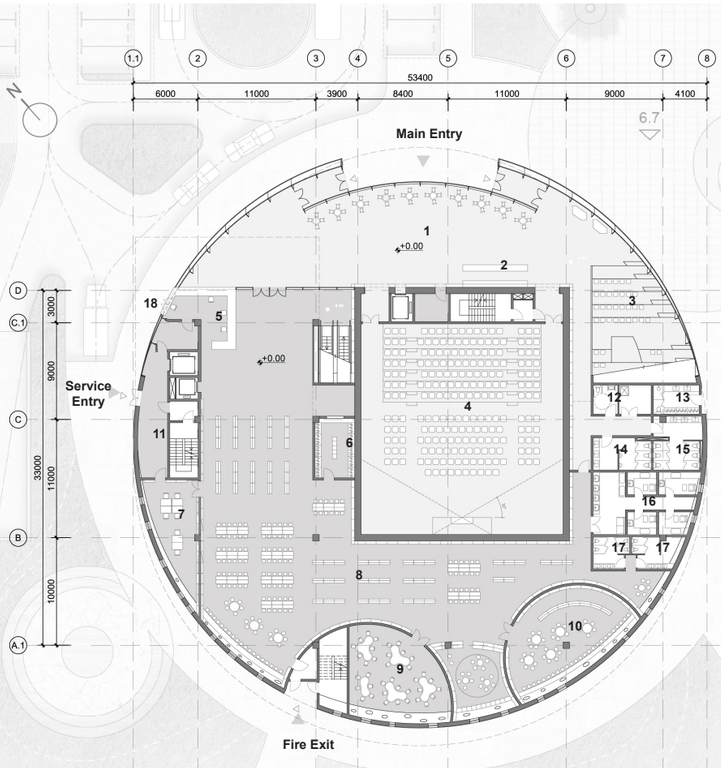
Legend:

1.Library
2.Pre-arranged Public Facility
3.Bike Parking
4.Book Drive Thru
5.On Grade Parking
6.Bus Drop Off
7.Drop Off
8.Loading Bay
9.Public Square
10.landscape
11.Park
12.Incheon Yesong Kindergarten

N

0 5 10 20

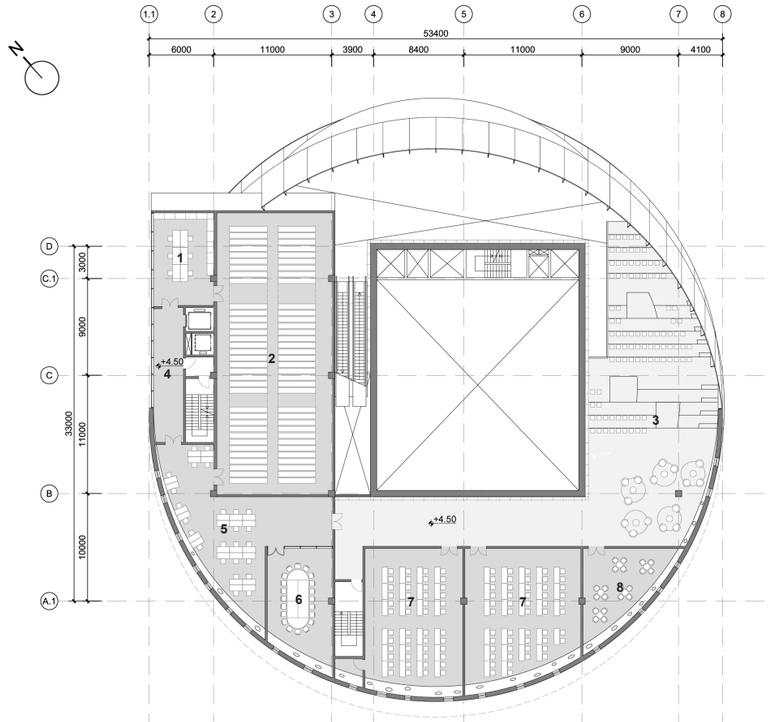
1st Floor Plan +0.00



1. Entrance Hall 188.3 m²
2. Main Cafe 150.3 m²
3. Learning Space & Exhibition 310.3 m²
4. Auditorium 394.0 m²
5. Main Information Desk 29.0 m²
6. Cloak Room 23.5 m²
7. Disabled Reading Room 48 m²
8. Children/Infant Materials 688 m²
9. Cultural Classroom 69.9 m²
10. Communication Room 84.3 m²
11. Lift Lobby 34.0 m²
12. Disabled Toilet 7.1 m²
13. Public Changeroom 13.0 m²
14. Male Toilet 17.9 m²
15. Female Toilet 25.3 m²
16. Feeding Room 64.8 m²
17. Children's Toilet 26.7 m²
18. Books Delivery Window

0 5 10 20

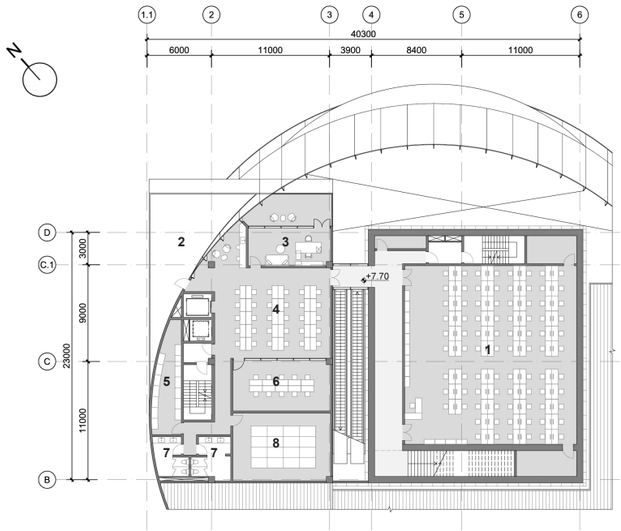
2nd Floor Plan +4.50



1. Incoming Materials Room 62.6 m²
2. Preservation Room(Stacks) 320 m²
3. Learning Space / Exhibition space 310.3 m²
4. Lift Lobby 39.2 m²
5. Staff Office 122.8 m²
6. Conference Room 53.3 m²
7. Cultural Classroom 258.9 m²
8. Club Room 64.6 m²

0 5 10 20

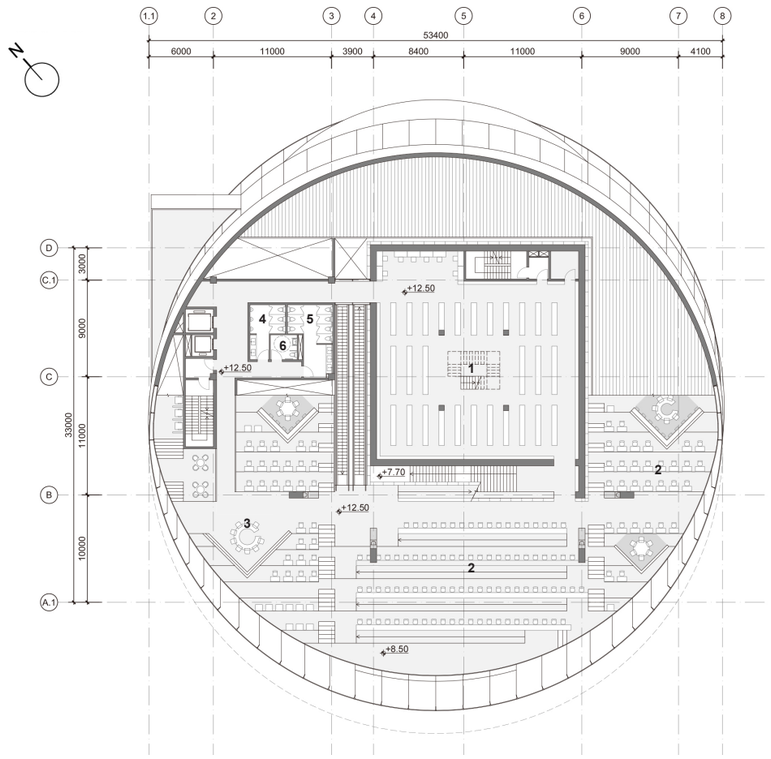
Mezzanine Plan +7.70



1. Multimedia Room 278.8 m²
2. Outdoor Deck
3. Chief Executive Office 31.8 m²
4. Staff Office 96.7 m²
5. Archives 31.3 m²
6. Volunteer Room 43.3 m²
7. Staff Toilet 26.2 m²
8. Server 65.4 m²

0 5 10 20

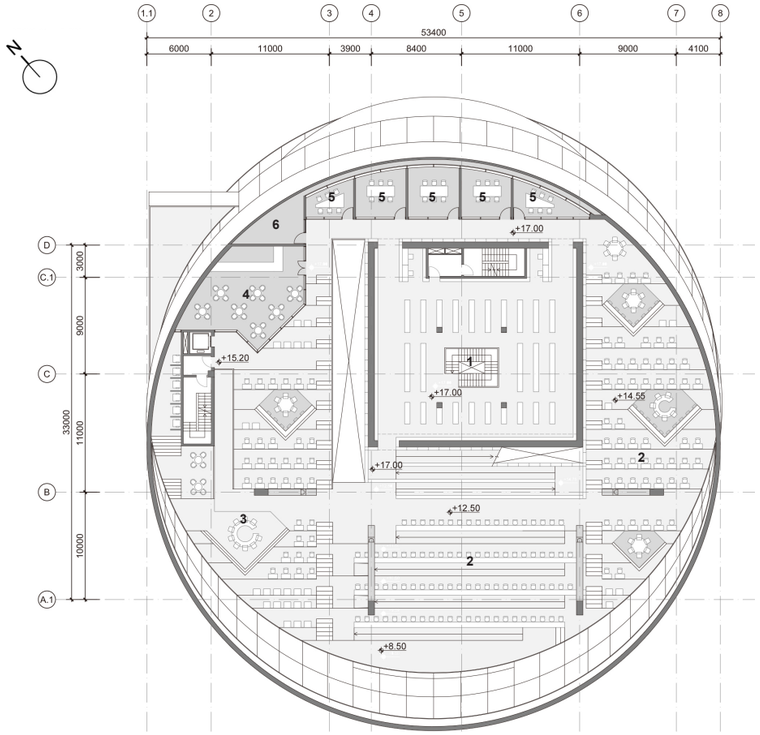
3rd Floor Plan +12.50



1. General Materials 321.8 m²
2. General Reading Space 1595.2 m²
3. Periodicals
4. Male Toilet 14.8 m²
5. Female Toilet 24.5 m²
6. Disabled Toilet 6.4 m²

0 5 10 20

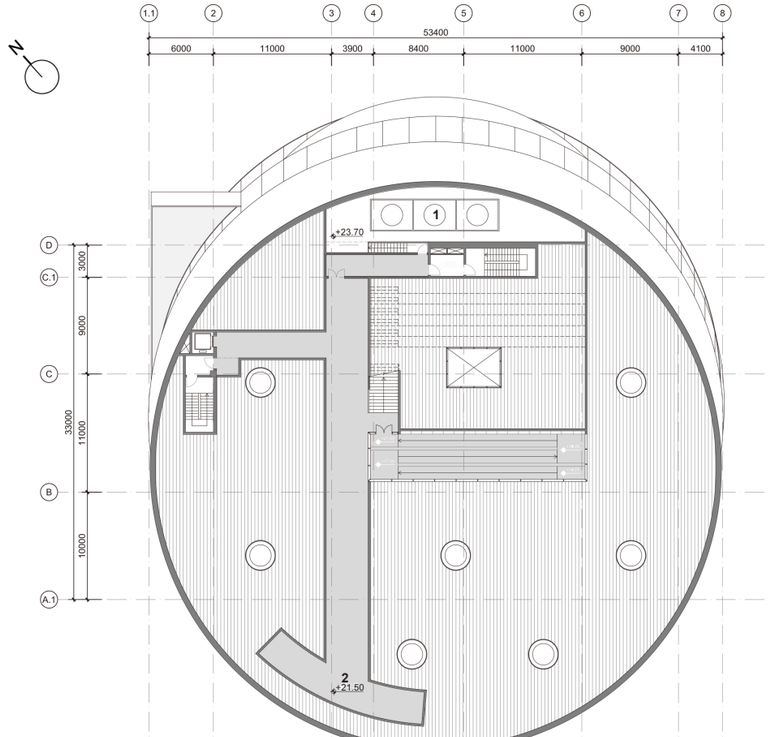
4th Floor Plan +17.00



1. General Materials 282.8 m²
2. General Reading Space 1595.2 m²
3. Periodicals
4. Book Cafe 82.7 m²
5. Study Room 78.0 m²
6. Outdoor Deck (Smoking)

0 5 10 20

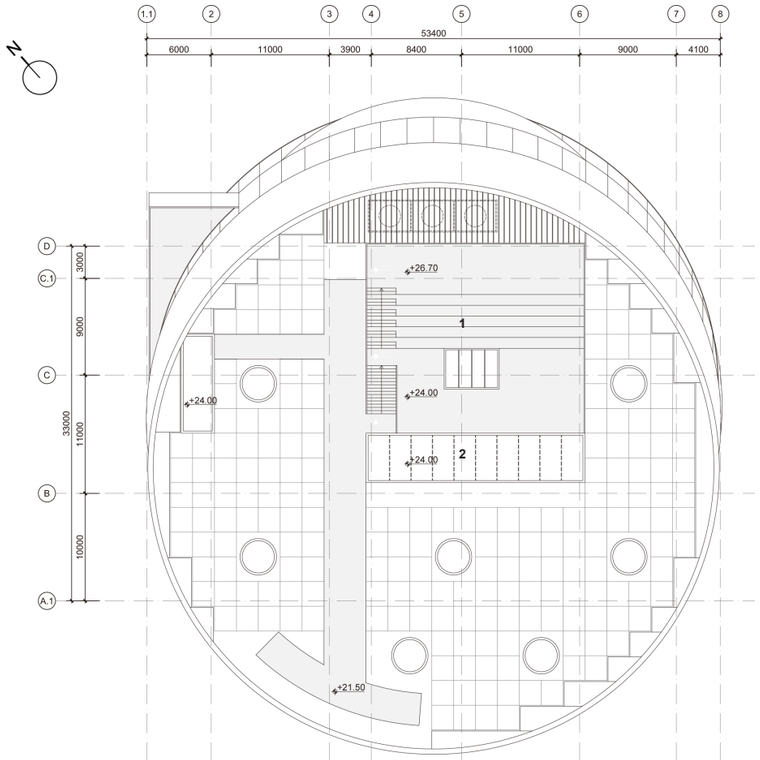
Roof Terrace +21.50



1. Machine & Electricity
2. OutdoorObservation Deck

0 5 10 20

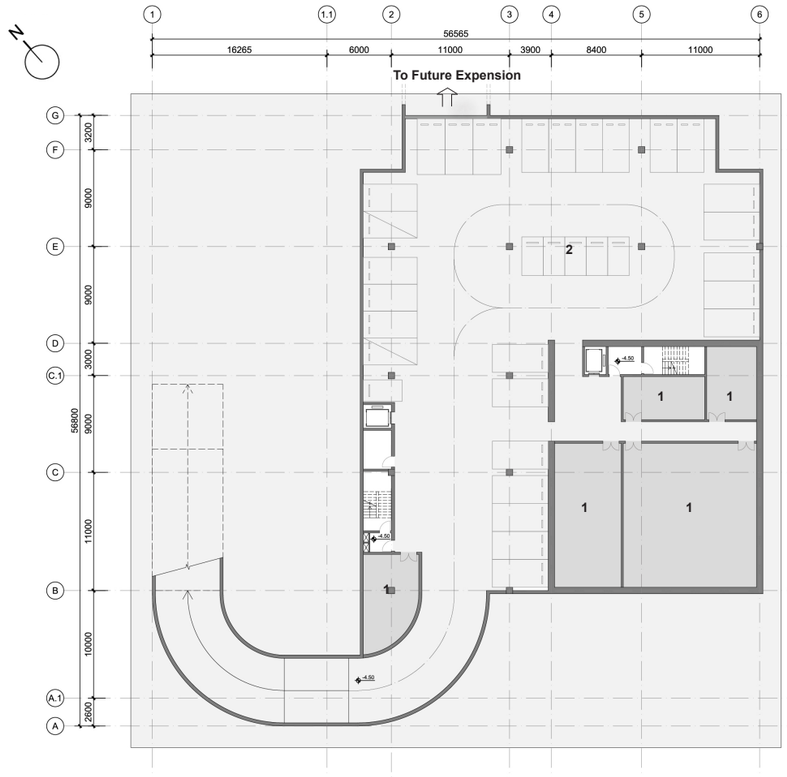
Roof Plan +26.00



1. Outdoor Amphitheatre
2. Outdoor Water Feature

0 5 10 20

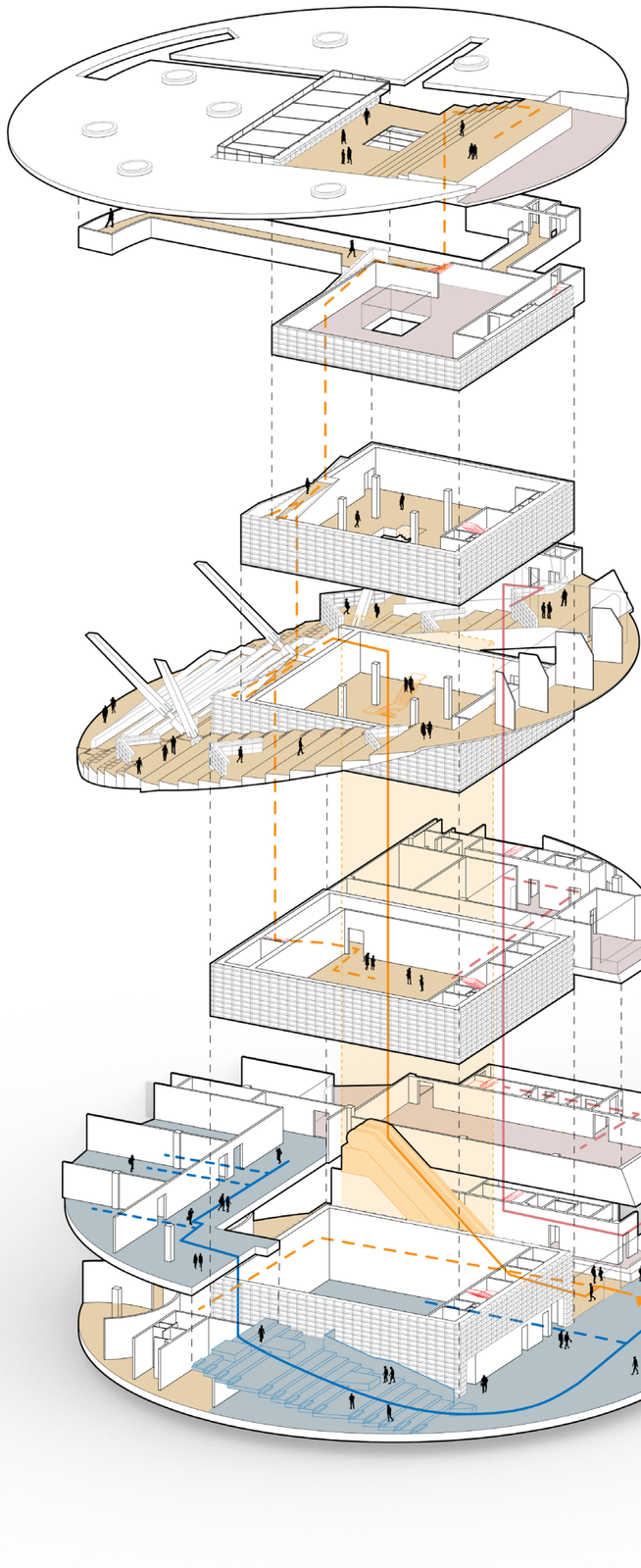
Basement -4.50



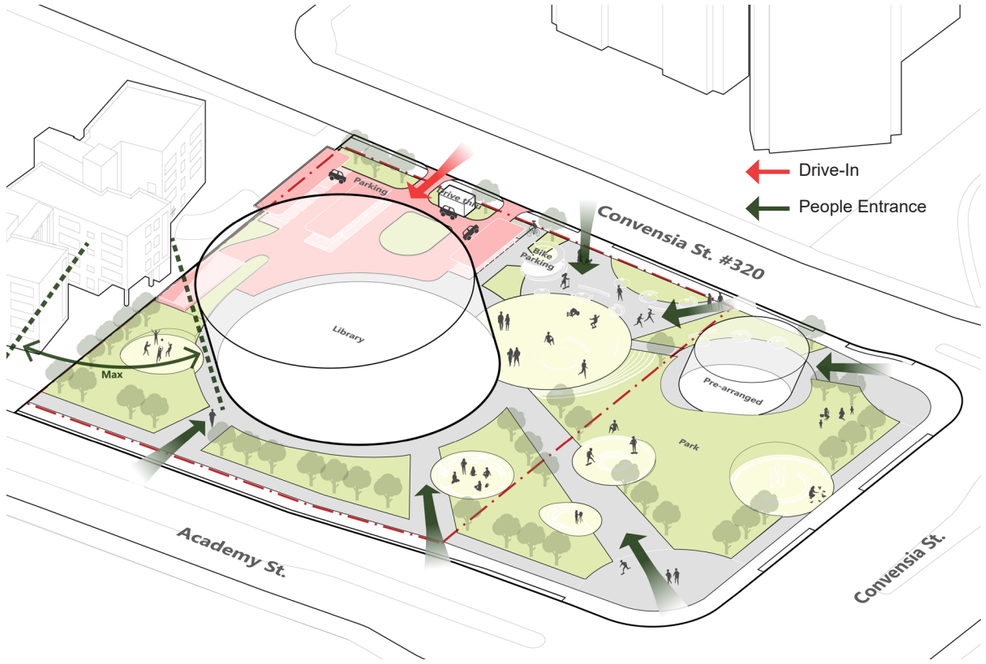
1. Machine & Electricity, Storage 457.1 m²
2. Underground Parking 1179.0 m²

0 5 10 20

Space Organization



Main Library Area
Public Accessible Area
Office Area
Reading Circulation
Public Circulation
Office Circulation



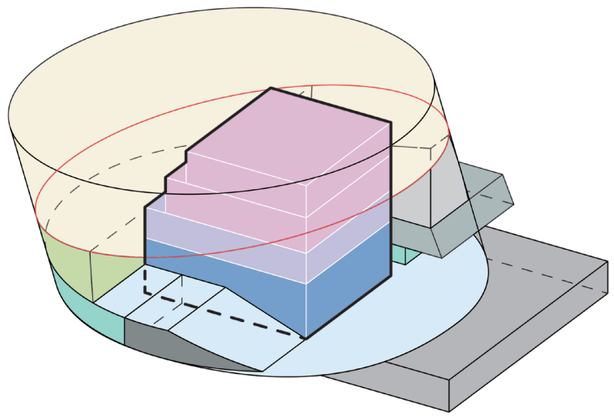
Master Plan

The overall planning of the Songdo Library took place in considering the best response to surrounding context and possible future adjacent developments.

Firstly we put the library at the centre south in the site to create a public square at the north east corner for the local citizens, and it allows the adjacent park to be directly connected into our site. The service zone is arranged in the North West corner to be coherence as the adjacent kindergarten's and it also allows the maximum place for the public square and the library itself.

The footpaths in the park are considered, based on our pedestrian circulation analysis, with the possible amount of incoming visitors from the city centre, adjacent schools, residential areas etc. A possible future government building is considered in coherence with the scheme.

Functions



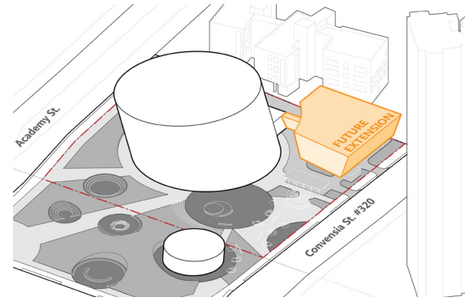
Community Living Hall
General Reading Space
Auditorium
Multi-Media
Book collections
Kid's Library
Community Classrooms
Staff Office
Book Stacks
Carpark & Mechanicals
Services & Others

The arrangement of the functions are mainly considered its publicity and library's security.

The Entrance Hall, Exhibition Space, Community Classrooms and the Auditorium are arranged open to the public, possible events can be hosted in such spaces. The Main Library is located in the Third floor onwards with Multi-Media, Books Collections and General Reading zones. However Kid's Library, Information Desk and Disable Material Room (Blind) is arrange on the Ground Floor due to security, noise level and the ease of access.

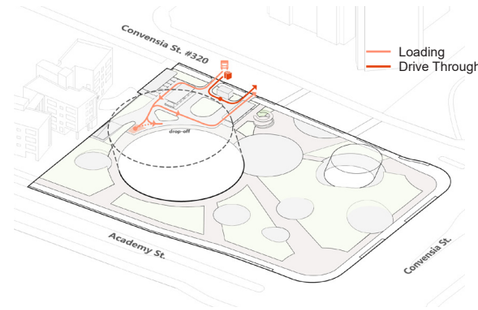
Staff's office, Incoming Books and Book Stacks are arrange on the same side as service circulations. For the ease of the management of the library.

Future Expension Plan

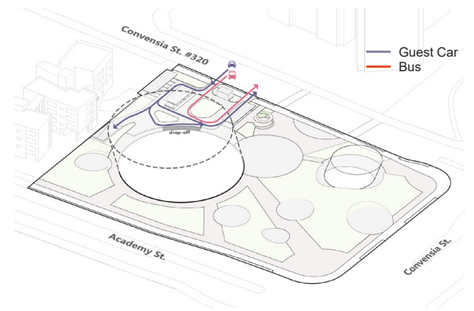


Future expension plan considered a volumn of 2000m2 above the on ground parking area, possibly to become a Art gallery place to embrace the cultural charactor of this site. It is linked on the second floor from the main library.

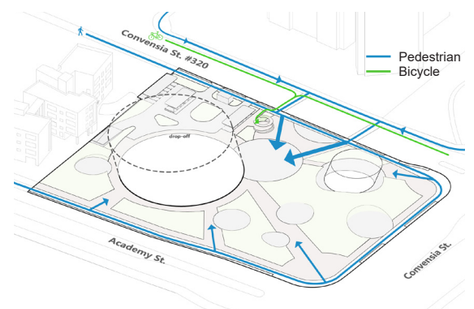
Key Circulation Diagrams



Loading Circulation & Book Drive Through Circulation



Private Car Arrival and Parking Circulation & Bus Arrical Circualtion



Pedestrian Circulations & Bicycle Circulation

A

A

Legend:

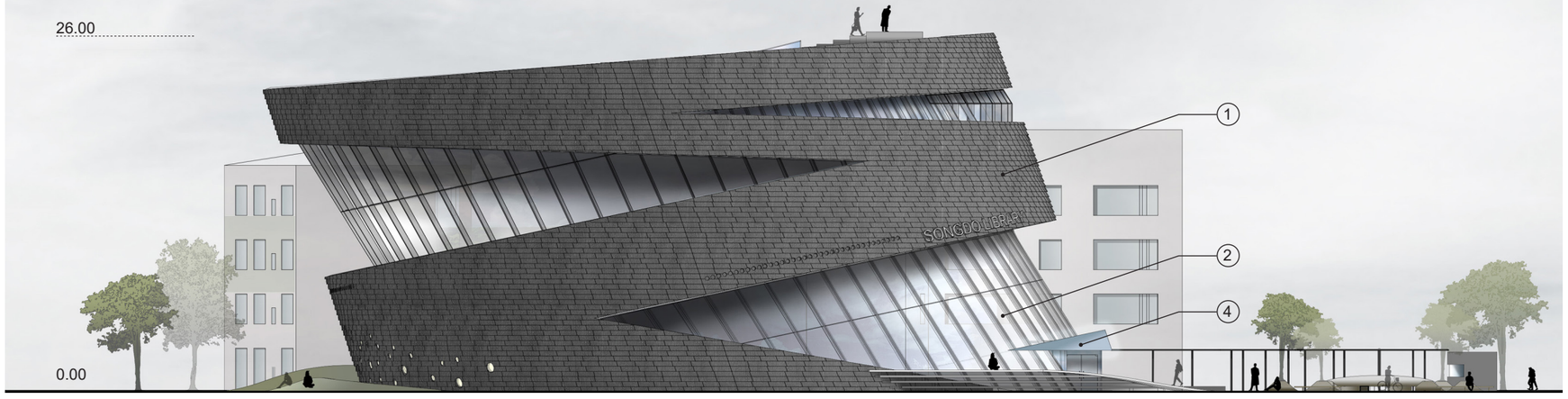
1.Community Living Hall
A key space that people gathers, and events, exhibitions can take place.
2.Study Room
3.Outdoor Mechanical Space
4.OutDoor Amphitheatre
5.Roof Terrace
6.Roof Water Pool
7.General Reading Hall
The main reading space which designed to suit both individual and group users, they would have a view towards golf court on the south side.
8.Outdoor Deck
9.Community Classroom
10. Kid's Library
11.Book Collections
12.Multimedia Room
13. Auditorium
14. Mechanicals & Storage (Basement)
15. Underground Carpark
16. Public Square

Section A-A

1m 5m 10m 20m

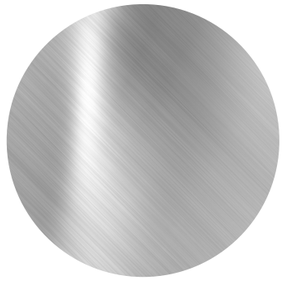
North Elevation 1:400

East Elevation 1:400



1. Charred Wood

2. Laminated Hollow Low-E Glass

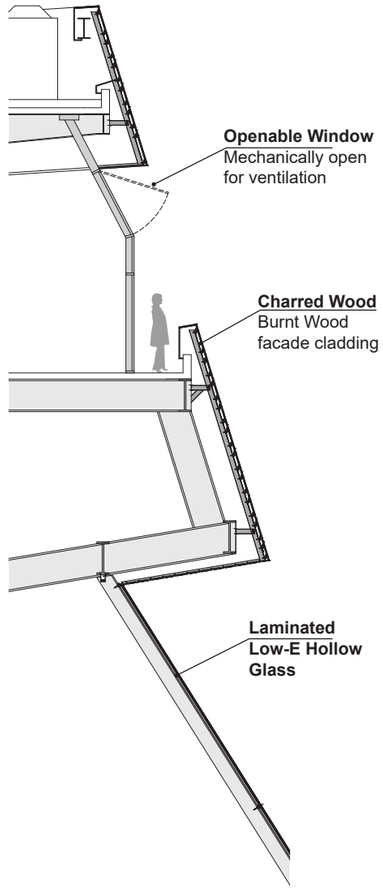


3. Brushed Stainless Steel

4. LED Screen

Pine Wood (Interior)

Facade Details



Elevations & Materiality

The Songdo Library has a highest point of 26.0 meter, where the top of the Outdoor Amphitheatre is, and the Outdoor Observation is at 21.5 meter in elevation.

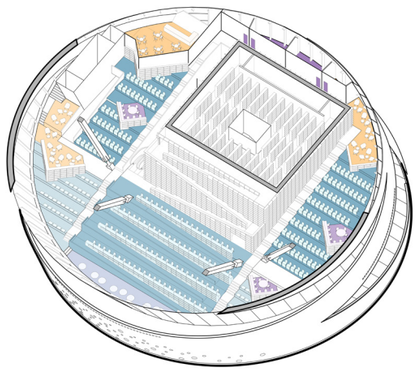
The General Reading Area starts from 8.5 meter to 17.0 meter in elevation, it allows the visitors to be separated from the traffic below and be able to enjoy the beautiful scenery of the golf court across the street and even see beyond it.

The key material considered for exterior façade is Charred Wood, a burnt wood which could last for 80-100 years. A local, sustainable material with minimum carbon footprint caused and minimum maintenance needed. It also brings a huge contrast with the warm timber material inside the library.

The glass curtain wall adopts vertical and horizontal concealed glass curtain wall;
The supporting keel of the curtain wall adopts T-shaped steel cross-section, which can ensure the transparency of the curtain wall to the greatest extent under the premise of ensuring sufficient strength;

The glass curtain panels are divided into not more than 6 meter by 2.4 meter, and the size of the keel is calculated based on local wind speed and pressure. It comes to the sectional T-shape size of 100mm by 360mm based on façade engineer's calculation.

The glass is made of hollow laminated glass, which not only takes into account the winter heat preservation and summer sun protection, but also ensures the safety of the structure and avoids the damage of the glass caused by the broken and falling glass.

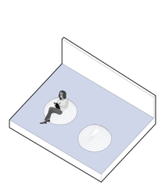


Interior Organization

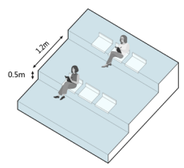
- Casual Zone
- Single Study Zone
- Study Rooms
- Periodicals
- Leisure Reading Zone
- Single Reading Zone
- Group Reading / Study islands
- Cafe & Leisure

Multiple reading experiences including individual and group users are designed to encourage different learning activities and the best use of spaces.

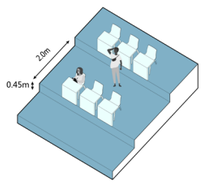
A small in house coffee shop is designed to serve the users in house.

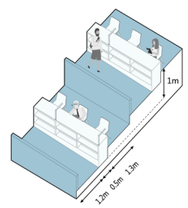


Casual Zone

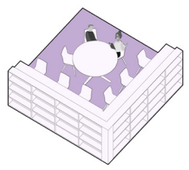


Single Leisure Reading



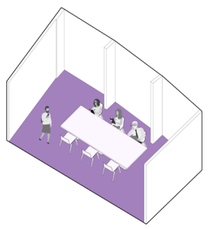


Single Study



Group Reading

Leisure Seating



Group Study Room

Area Table

Classification		Area(㎡)
Ground	1st Floor Level	2041.6
	2nd Floor Level	1441.5
	Mezzanine	754.7
	3rd Floor Level	483.9
	4th Floor Level	1701.2
	Roof Terrace	66
	Total	6488.9
Underground		1710.6
Grand total		8199.5

Classification	Space		Area(㎡)	Seats	Materials (number of volumes)	
Material	General Materials	General Materials	1865.5	347	Books in Collection	105400
		Periodicals				
		Valuable/Local Materials			Books at Reading Area	15000
		Elder/Disabled Materials				
		Multimedia	278.8	85		
		Sub-total	2144.3	432		120400
	Children Materials	Children Materials	688	195		30200
		Infant Material	84.3	55		5600
		Communication Room				
		Cultural Class	69.9	38		
		Feeding Room	64.8			
		Sub-total	907	288		35800
	Sum 1		3051.3	720		156200
Culture & Education	Cultural Classroom		258.9	110		
	Club Room		64.6	20		
	Auditorium		394	230		
	Exhibition Space		100			
	Learning Space		210.3	113		
	sum 2		1027.8	473		
Work & Management	Main information desk		29	4		
	office	Chief executive office	31.8	1		
		Office/Lounge	219.5	30		
		Archive	31.3			
	Conference room		53.3	20		
	Volunteer room		43.3	10		
	Server/Communications		65.4			
	Incoming materials & arrangement		62.6			6800
	Preservation Room(Stacks)		320			98000
	Sum 3		856.2	65		104800
Total 1			4935.3	1258		261000
Common	Hall,Book Café,Cloakroom,Lounge,ect		412.9			
	ELVE,Stairs		391.3			
	Toilet	Hall Toilet	63.3			
		General Materials Toilet	46.8			
		Children Materials Toilet	26.7			
		Office Toilet	26.2			
	Corridor,ect		586.4			
Total 2			1553.6			
Ground Total			6488.9	1260		261000
Others	Machine		457.1			
	Stairs		74.5			
	Underground Parking Lot		1179			
Total 3			1710.6			
Grand Total			8199.5	1260		261000

Structural System

Overview

The structural system for this building is concrete core with local steel frames at bottom floors. The vertical gravity load transfer and lateral stability of the building will be provided by the steel beam-column frame structure + core wall structure system, and most of the column spacing is 11.0m×11.0m. The concrete slab on steel decking system supported mainly by steel beams constitute the composite floor system to reduce the self weight of the large span floors. For the cantilevered floor and roof, steel trusses are extended from the core walls which have economic depth to achieve a minimum steel tonnage. The overall layout of the structure is shown in the figure below:

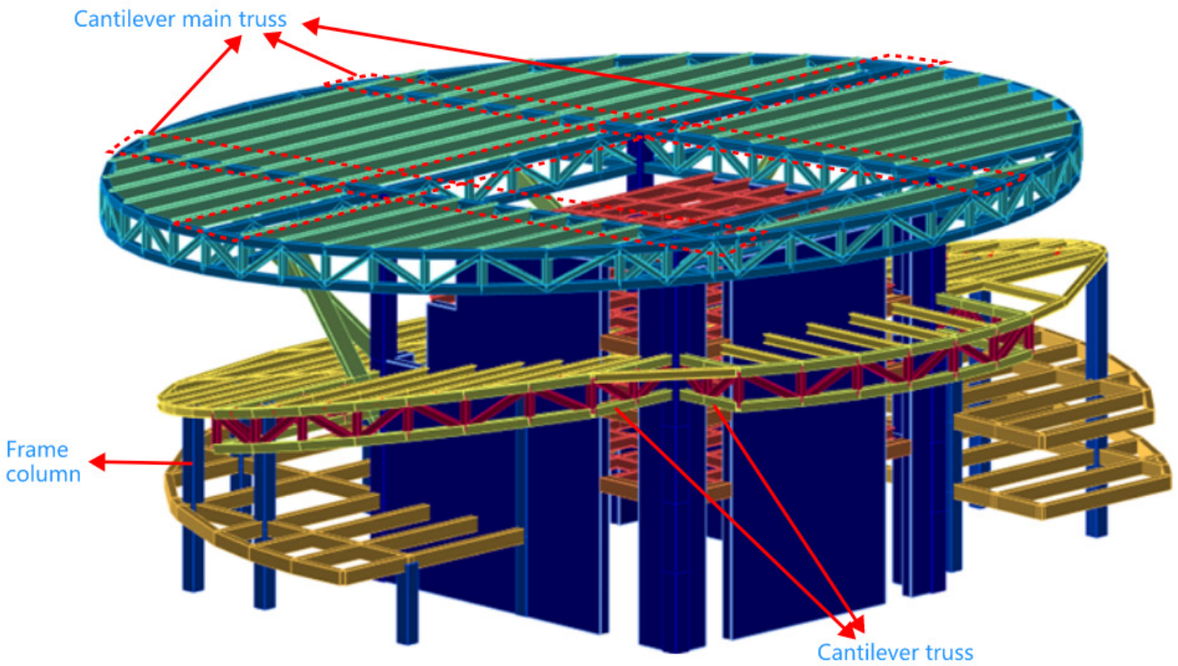


Figure 1.1 Frame + core wall + cantilever truss structure

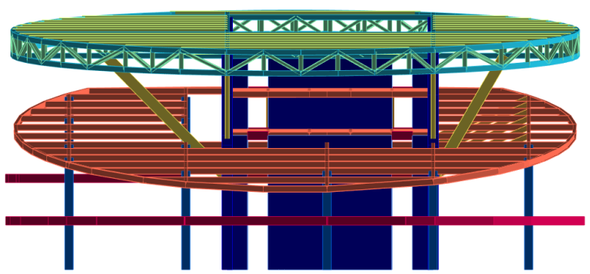


Figure 1.2 The front elevation of overall structure

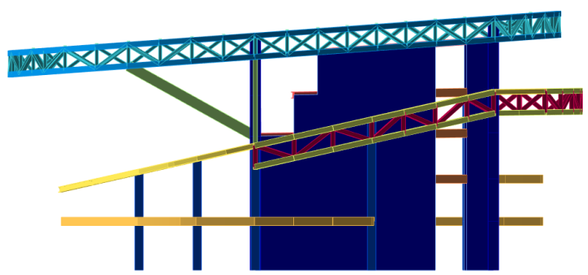


Figure 1.2 The front elevation of overall structure

Concrete Core Wall

The concrete core wall is the primary gravity load and lateral force carrying system. The core wall is a square shape, that is continuous throughout the tower, with some setbacks at the collar levels. The eccentricity of the tower and cantilever truss causes an uneven distribution at the base of the core, which is however deemed manageable. The large-span inside the core shall be catered by steel floor beam/trusses.

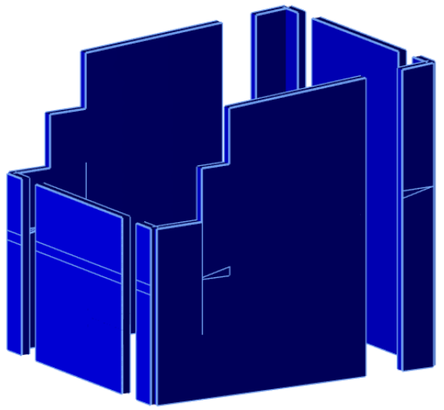


Figure 1.4 Concrete core wall

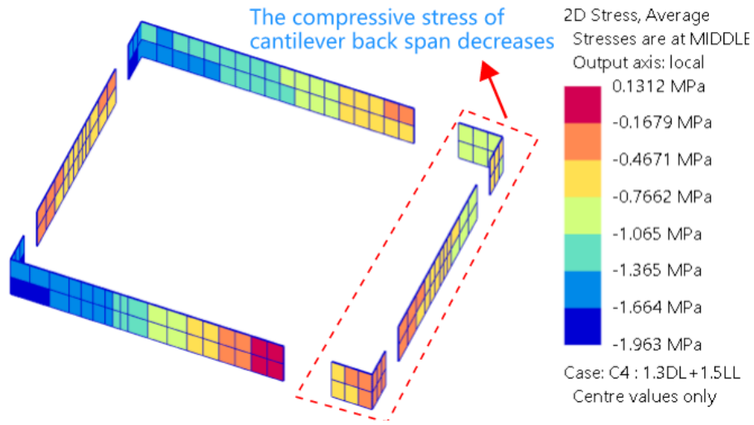


Figure 1.5 Stress of the bottom core wall

Cantilever Truss

As the maximum cantilever span is approximately 23m, therefore the vertical deflection at the cantilever is very critical. The roof cantilever trusses are arranged to align the core walls, and the main cantilever trusses will support the edge trusses. To minimise the deflection of the main cantilever truss, timber braces are added to support in the middle of the main cantilever truss. As only limited area of the roof is people accessible, the deflection at the tip of the cantilever is within the limit. Timber structure may also be explored in the design stage to further increase sustainability performance of this project.

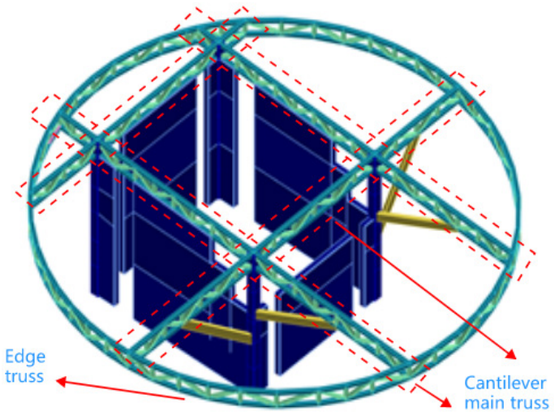


Figure 1.6 Cantilever truss of roof

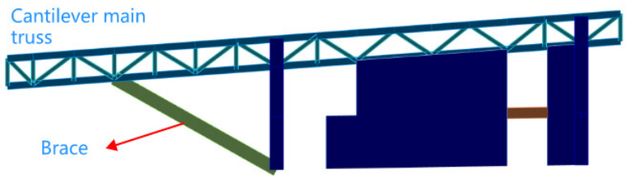


Figure 1.7 The side elevation of cantilever truss

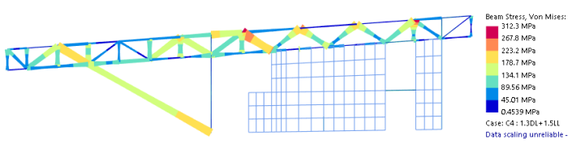


Figure 1.8 Truss member stress under gravity load

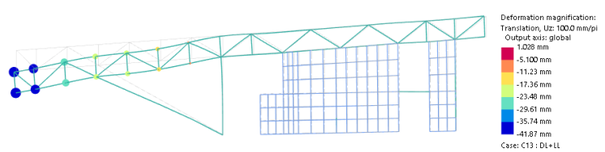


Figure 1.9 Truss deflection under gravity load

Sustainability

Sustainable Strategy Target: Zero Carbon

Energy: Solar Panel
Install solar panels on the roof top to generate electricity, which can offset the day-time energy consumption. Extra electricity can be fed to the grid to compensate the surrounding neighborhoods requirements.

Air: Cross ventilation
Fresh outdoor air flows through the operatable window on the enclosure, after the indoor circulation, the mixing air flows out through the ceiling and bring the excess heat out.

Light: Sunpipe
To maximum the use of sunlight, sunpipe is a great solution that provides the occupants with brighter and sustainable indoor environments. Apart from its no-maintenance feature, sunpipe has significant reduction in lighting costs thereby also reducing carbon footprint compared to traditional artificial lights.

Water: Sponge City
Both rainwater and grey water can be collected through swale, rain garden, water tank on site and used for irrigation, washing and flushing after treatment.

Comfort: Underfloor air supply
Conditioned air from the air handling units is supplied into the underfloor plenum and then flows freely to floor diffusers. It allows for a more efficient floor-to-ceiling airflow as indoor air quality is improved by delivering new fresh air into the space at floor level which is closer to building occupants.

Comfort: Low-energy Glazing
High performance glazing with the combination of glass and air can reduce energy usage both in winter and in summer. The glazing could significantly reduce outdoor noise pollution.

Performance: Indoor Air Quality
Adopt high efficiency air filter such as HEPA to remove most airborne particles that might make allergies or asthma worse. Carbon filter section could further reduce the organic pollutant like TVOCs and Formaldehyde.

Shading Design
A sun screen is designed on the inner south west glass facade, to reduce the direct sunlight of westen sun. It further optimized indoor environment & reduce heat gain.

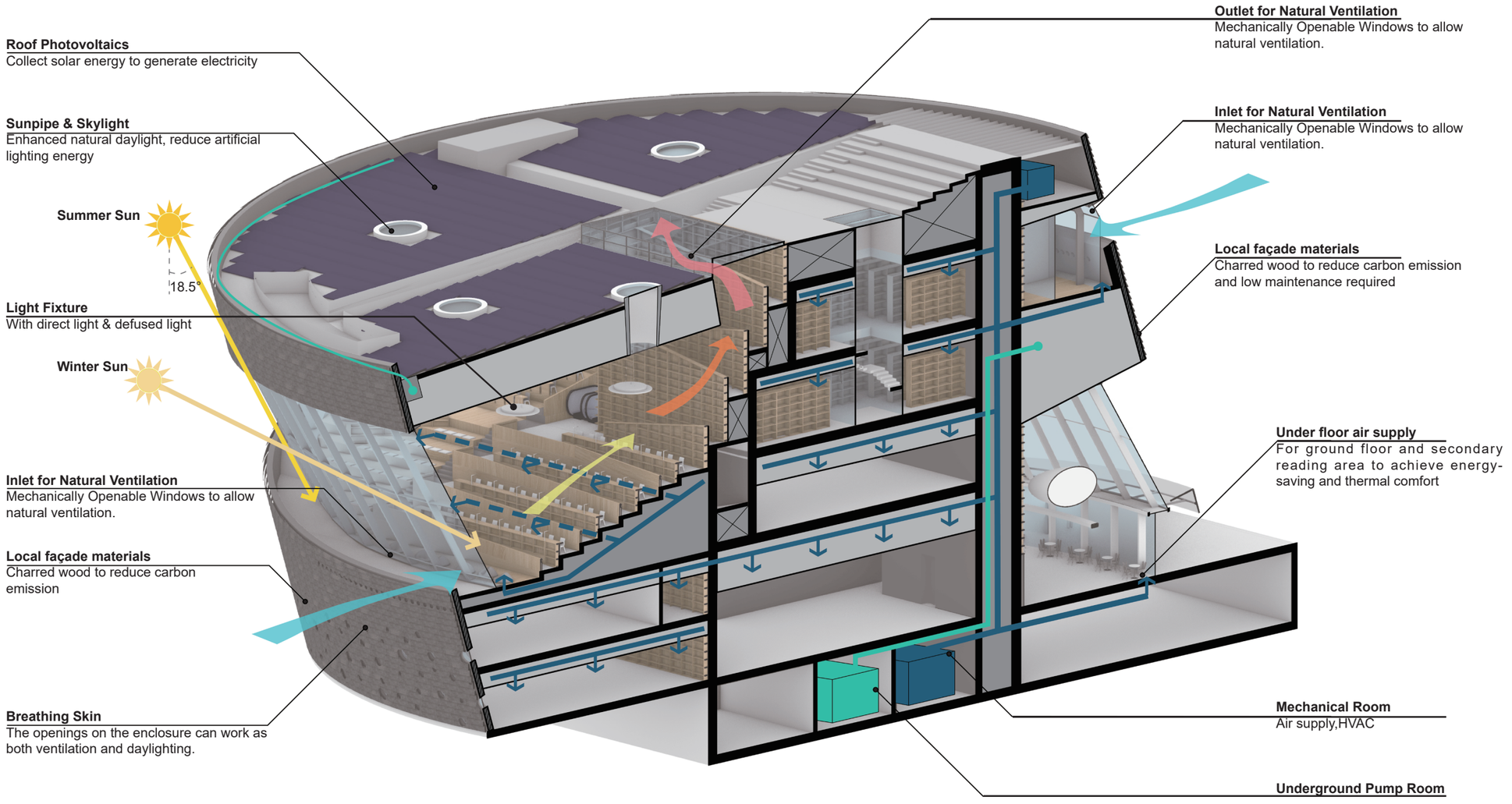
Natural ventilation / Cross Ventilation
Multiple openings are carefully designed to allow natural and cross ventilation in the library space. Inlets are mainly placed on the facade surface which also inline with the wind directions. And outlet is mainly place in the central skylight area.

Fresh air therefore can be circulated for the interior spaces and it optimized indoor air quality & save energy.

Greywater & Wastewater design
Reuse of rainwater and greywater for irrigation and toilet flushing through reclaimed water pump room which locates in the basement.

Solid waste management
Compostable foodservice & clear labeled bin locates in the basement near loading zone, which can be access by service vehicles.

Wellbeing: Post COVID-19 focus
Adopt healthy design strategy to fight with the virus and protect the occupant's health.
- Increased fresh air rate to dilute indoor pollutant
- Operable windows to bring more fresh air
- Ultraviolet air treatment using UV lamps
- Building material selection for better endurance and easy-cleaning
- Hand washing promotion by design the sink size properly



Global Sustainability Standard, LEED

Site:
Construct a building on a site that has easily accessed public transport. Provide secure bicycle storage with shower and changing facilities in the building. Provide preferred parking1 for low-emitting and fuel-efficient vehicles.

Energy:
Commissioning process activities must be completed for the energy-related systems. Use on-site renewable energy systems to offset building energy costs.
Provide internal and external fitness space, equipment or outdoor walking track. Prohibit smoking in the building.Offer mental health education, screening and services. Support Healthy Working Hours.

Thermal comfort:
At least additional 36% fresh air rate compared with ASHRAE standard in regular occupied place. Monitoring device for Temperature, Humidity, PM2.5, Carbon dioxide and TVOC. Provide comfort system controls for all shared multi-occupant spaces to enable adjustments that meet group needs and preferences.

Material:
Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site.
Try to use rapidly renewable building materials and products.

Nutrient:
Nutrition information is clearly displayed at point-of-decision on packaging or adjacent signage. limiting sugar and refined grains in all foods and beverages.

Health:
Provide internal and external fitness space, equipment or outdoor walking track. Prohibit smoking in the building.Offer mental health education, screening and services. Support Healthy Working Hours.

Nature:
Restore or protect 24% of the total site area with native or adapted vegetation. Implement a stormwater management plan that results in a 30% decrease in the volume of stormwater runoff, also promotes infiltration and captures and treats the stormwater runoff from 90% of the average annual rainfall.

Light:
Achieve daylighting in 78% of all other regularly occupied spaces.Achieve a direct line of sight to the outdoor environment via vision glazing.

Acoustic:
Reduce background noise level to 40 dBA or less in reading room, classrooms and other core learning spaces.

Water:
Employ strategies that in aggregate use 55% less water than baseline. Use only captured rainwater, recycled wastewater, recycled graywater or water treated for irrigation.

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