ROOM FOR NATURE

A VISITOR'S CENTRE FOR THE BOTANICAL GARDENS IN GOTHENBURG

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ABSTRACT

The fast pace of the city can often feel wearing and hectic. To find peace and quiet, nature can often offer an escape for many people and for some the tranquillity of nature can act as an almost religious or contemplative substitute. Regardless of how nature is perceived or experienced by various people, I doubt that there are few who would not feel relaxed when being present in a serene natural landscape, at least when it is not rainy or cold. In a slight contradiction, I can sometimes get the impression that there, at least in Sweden, is a sort of stress to go out in nature in order to grasp the fleeting, but very desirable tranquillity that nature has to offer during the part of the year that it is as most pleasurable.

In Gothenburg – this web or road, chaos and stress – there are fortunately a few green islands or serenity and peacefulness. During the Corona pandemic, the Botanical gardens and Änggårdsbergen acted as such a place for me.

In this project I will be designing a visitor's centre for the botanical gardens in Gothenburg. Such a visitor's centre is currently in development and a winning proposal has already been selected and planned for construction. In addition to a visitor's centre it will also include a large greenhouse complex. Since such a project is already underway, it indicates that there is a need for a building that can inform and inspire more visitors to learn about nature and botany. The visitor's centre and greenhouses will further strengthen the attractiveness of the botanical gardens in Gothenburg that already draws a large number of visitors of around 500 000 each year.

Furthermore, such a room dedicated to nature would be of great interest to school classes that wishes to embark on excursions over the day and for university students studying botany where they will be able to utilise this building as part of an enhancement of their education. In fact, the botanical gardens already has extensive collaboration with the university faculty.

The method for this project is to work contextually in such a way as to abstract forms that adhere to the context of the Botanical Gardens - in this case flowers. I will be using this as the driving generator for the design of the floor plan but also for various architectural elements.

ABOUT THE AUTHOR

GABRIEL DANIELSSON

I was born in Gothenburg in 1993 and has to this day lived my entire life here. Before I began my studies to become an architect, I studied musicology and latin and on the gymnasial level I studied social sciences with a focus on cultural history. In addition to that I also took a natural sciences base year.

Whenever I am not studying, I enjoy playing piano, doing various sorts of handicraft or taking relaxing walks in the Botanical gardens as a contrast to the hectic environment of the city of Gothenburg.

EDUCATIONAL BACKGROUND

Master's Programme in Architecture

2022 — Master Thesis
2021 — Matter Space Structure I
2020 — Housing Innovations
2019 — Residential Healthcare, Housing for Seniors

Bachelor's Programme in Architecture

2015 - 2019 — Bachelors Degree in Architecture at Chalmers

Higher Education

2013 - 2015 — Musicology at Gothenburg University
2013 - 2014 — Latin at Gothenburg University
2012 - 2013 — Natural Sciences Base Year at Chalmers

Gymnasium

2009 - 2012 — Social Sciences (Direction Cultural Studies) at Hvitfeldska Gymnasium

COMMISSIONS

2020 — Design proposal for a confessional
Calligraphic and Manuscript Illumination works
Small 3D-modelling commission for Anja Lund, researcher at Chalmers
2017 — Interior furnishing project for a vestry for Kristus Konungens Katolska Kyrka

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INTRODUCTION

AIM AND PURPOSE

The aim of this project is to make an architectural proposal of a building where city dwellers can have access to information of nature and get inspiration to venture into nature, in close proximity to the city. Thus, the architecture in itself should inspire to this by drawing inspiration for aesthetics from the building's natural context. This will be manifested in a proposal for a visitor's centre and greenhouse complex for the botanical gardens in Gothenburg as a counter proposal, or alternative proposal, for a structure of similar functions that are currently in development to be completed over the coming years.

THESIS QUESTIONS

How can a visitor's centre for nature be designed using geometrical abstraction of natural elements to harmonise with the surrounding context of the proposed building?

METHOD

Since the aim of the project is to present an architectural proposal of a building and not for example some general guidelines for design, this project can be classified as a research by design-project.

The method will be that of abstraction of or allusion to natural elements to generate form for either the large or the smaller scale of the building and thus adhere to the context of a visitor's centre in a botanical garden. Abstraction, is understood as a type of generalisation or destillation of a natural object, phenomena or function to retain its basic form, layout, function et cetera without being too literal of a representation.
Working methods include both digital and analogue modes of working with primarily sketching and drawing and digital modelling.

The focus lies on the drawn material but to give a background, some research and description of the historical and contemporary buildings and the garden in general is given.

Some reference architectural works are also looked into. For example some famous greenhouses and some structures where a similar artistic architectural method of working with nature have been employed.

DELIMITATIONS

Since this is classified as a research-by-design project and in the framework of the building tectonics direction, this thesis place emphasis on the architectural design of the proposed building rather than any theoretical exploration.

During the initial phase of this project, my goal was to keep contact with Västfastigheter that are currently constructing the planned visitor's centre on the same site. That way my thesis could be more anchored to the clients specific needs in terms of space program, area size, requirements for specific plants et cetera. Unfortunately, Västfastigheter were unable to partake in such an exchange of information due to legal restrictions. The nature of this thesis and design proposal is therefore of a more hypothetical or quite speculative approach. Furthermore I have chosen not to take into account any financial restrictions or site specific building regulations.

BACKGROUND

Roten

Restaurant/Café

Stora Änggården

Greenhouse complex
and staff building

Gate houses,
Administrative building and Shop

BACKGROUND

THE BOTANICAL GARDENS IN GOTHENBURG

The Botanical gardens in Gothenburg was inaugurated in 1923 on initiative of Swedish botanist and painter Carl Slottsberg and with great financial support from the Charles Felix Lindberg foundation. Today, the garden is among one of the largest botanical gardens in Europe. The garden itself is roughly 40 acres in size but has, over the decades, expanded and now also includes parts of the nature reserve Änggårdsbergen for a total of 175 acres. The garden houses over 16 000 different species of plants and is s also home to the largest collection of orchids in Sweden that resides in the greenhouses.

The current owner of the botanical garden is Västra Götalandsregionen who are currently planning for an expansion of the greenhouses and restructuring of the entry area with the addition of a new visitor's centre. This is expected to be in place around the time of the Botanical gardens 100-years jubilee in 2023-2026.

Located adjacent to the main entrance of the garden, there are facilities for the Gothenburg University, department of Marine Sciences and the Botanical Analysis Group. The Botanical gardens have had a close collaboration with Gothenburg University over the years, and functions as their garden for excursions. This is also the main difference between a regular garden and a botanical garden, where the purpose is to promote research, cultivation and protection and to collect plants to create a sort of living gene bank. (Västfastigheter, et al.)

CURRENTLY BUILT STRUCTURES

At the entrance to the garden, visitors are welcomed by two gate houses in red bricks that were designed by architect Axel Jonsson and completed in 1928. The administrative building, in close proximity, was finished two years earlier and was designed by Arvid Bjerke. This building encompasses roughly 400 m^2, divided on two storeys. Ten years after it's completion a herbarium – a collection of dried plants for botanical studies – was added to the administrative building. These buildings for the entrance area all harmonise very well in regard to the material and style.

In 1998 the architects Jan Räntfors and Stina Wallinder designed a small building that was added in direct connection to the herbarium. The building houses a small shop for visitors and parts of the herbarium is thus today used for storage for the shop while the upper level houses area for exhibitions of various purposes.

One of the two gate houses designed by Axel Jonsson
(author's own image)

The administrative building designed by Arvid Bjerke
(author's own image)

Shop designed by architects Jan Räntfors and Stina Wallinder
(author's own image)

Entrance to the greenhouse complex
(author's own image)

The old stable
(author's own image)

Stora Änggården
(author's own image)

The building for the staff designed by Su Andersson
(author's own image)

A bit further down the main road of the garden there is located a big greenhouse complex that was completed in 1981/1982. The current buildings replaced an earlier smaller version from the 1920s and today the current greenhouses are to be demolished and replaced with a new complex. The existing greenhouse complex encompasses an area of roughly 1900m² even though, in addition to that there are some areas for growing plants that are detached from the main structure; some enclosed and others semi-open-air. (Karlsson, 2010. et al.)

In close proximity to the greenhouse complex, there is a building for the staff which houses offices, changing rooms and dining room. This building was created in 2009 and was designed by architect Su Andersson. This building, along with the greenhouse complex are all located adjacent to the loading/delivery area. Other buildings that are in the same vicinity is the wooden facade building that worked as a stable. It was constructed in 1921 and the current plan is that the building will be relocated to another part of the garden in order to give more space for the planned greenhouses and visitor's centre.

Even further down the main road one can find the oldest building in the botanical gardens. It is a yellow painted house with wooden facade that was built in 1807 and it bears the same name as the area: Stora Änggården. The building has a tradition to be the residence of the prefect of the botanical

The grain deposit building (author's own image)

The Restaurant/Café designed by Liljewall Architects (author's own image)

gardens and the house lies in immediate relation to what is called a kitchen garden and an area that is sometimes used by school classes for plantation and in collaboration with the Swedish University for Agriculture (Sveriges Lantbruksunivesitet). Close to his area there is an old grain deposit building that sometimes houses various exhibitions. It is close to this area that the stable will be moved and where there will be created a so called cultural garden.

Two other larger buildings in the garden is the café/restaurant that was built in 1993 by Liljewall Architects and the other is Roten that replaced an earlier construction. The building was designed by Ulla Rundstedt and Kenneth Eriksson in 2016 and acts as a locale for educational purposes. (Botaniska, et al.)

SECTIONS OF THE GARDEN

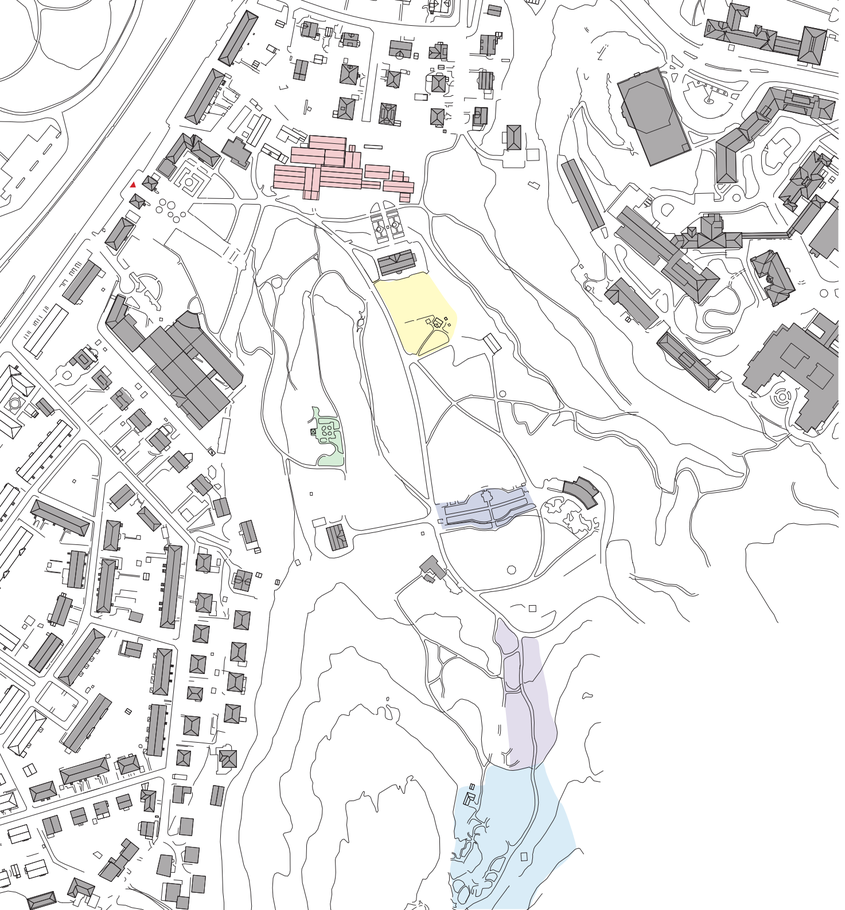
The garden is divided in different sections showcasing various types of plants. At the entrance near the pond there are the annuals, with varying flowers each year. In close proximity to the greenhouses there are the bulb garden and along the main road towards the kitchen garden there are collection of dahlias. At the hill side of the main road one can find alpine plants and a greenhouse for this specific purpose is currently being built at the top of the hill. In close proximity to the planned alpine green house, there is the herb garden with a small building pavilion from the 18th century. This building was relocated to the gardens from the Röhsska Museum's gardens.

At the end of the garden there is the Asian section with the Japanese dell and the Korea valley. This section is preceded by the Rock garden that houses plants from the continents of both Europe and North America. To get to this part one can take the road through the Rhododendron valley or the Bamboo thickets.

At the end of the Japanese dell the enclosed garden ends and one can venture out into the more wild parts of nature; up in the area called Änggårdsbergen, a popular place for hikers, cyclists, joggers and nature lovers. (Karlsson, 2010. et al.)

ÄNGGÅRDSBERGEN

Änggårdsbergen is since 1975 designated as a nature reserve and covers an area of roughly 353 acres that is divided between Gothenburg and Mölndal municipality. At the start of the 20th century a much larger part of Änggårdsbergen was a more open landscape without a lot of trees. The area was used for grazing by the livestock of the local herders. As the city expanded and during the 20th century, the grazing ended and a many parts of Änggårdsbergen was taken over by forest,



Kitchen Garden
Greenhouses
Herb Garden
Perennial Garden
Rhododendron Valley
Rock Garden

some wild and others planted (the arboretum). Some parts of the old vegetation is still remaining on a plateau called the Heather heath and here there are still a few sheep that graze the land.

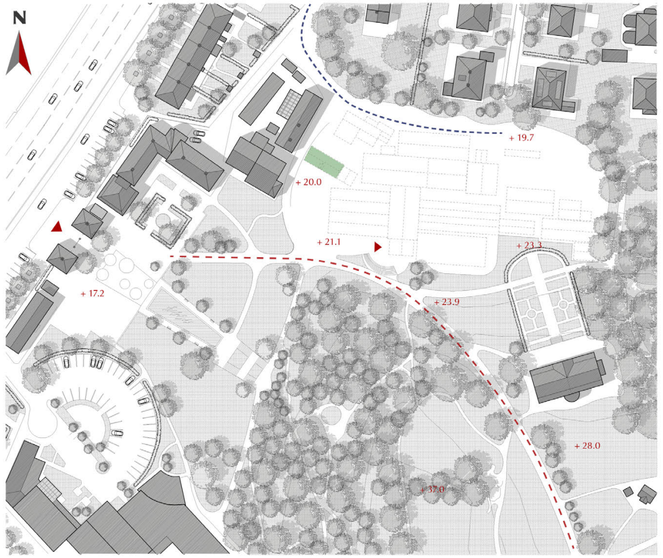
In direct connection to the Botanical Garden is Vitsippsdalen that is a protected nature reserve. This part of Änggårdsbergen is still located within the enclosed parts of the Botanical garden. Outside the enclosure is the Arboretum, which covers 15 acres where trees from various parts of the world is planted. These trees are divided in the sections for Europe, North America and Asia, that is connected to the Japanese dell (inside the enclosed garden). the arboretum consists of roughly 6 000 trees and 300 species from all around the world.

In Änggårdsbergen there are also a number of lakes and wet habitats, bogs. Some of these are Axlemossen, Finnsmossen, Trindemossen and the upper and lower Torbjörnsmossen. (C. Danielsson, 2020. et al.)

PLANNED VISITOR'S CENTRE AND GREENHOUSES

For the upcoming 100-years jubilee of the garden, there are plans on demolishing the existing greenhouses and build a new larger complex on the same site close to the main entrance of the garden. This project is still in planning stage but will, apart form greenhouses, contain a new visitor's centre and café. The target group will, apart from visitor's to the garden, be school classes and the complex is therefore planned to house educational facilities for school groups. (Västfastigheter)

The planned complex was designed by the Danish architectural firm Cobe and will have a planned exploitation area of roughly 6 000 m^2. In addition to the large greenhouse complex with visitor's centre, there will also be a smaller greenhouse showcasing alpine plants at the hilltop near the entrance to the garden. (Pressmachine)



Main public road through the garden

Road used as service/ transport entrance

Entry points to the garden and the current greenhouse

The old Stables building. Will be moved to another location

+ 0.0 Terrain height as meters above sea level

SITE

The site of the current greenhouse complex, and the place for the new one, is located along the main public road that goes through the garden. The entrance of the old greenhouse is however not facing the main road but is rather placed in parallel to the walkway and might be one of the cases that the greenhouse is perhaps not as attractive to visitors as it could be. Placing the entrance more visible from the entrance point of the gardens or having one or multiple entrances in a tangential extension of the main road might be a more attractive solution

On the north side of the site there is a service entrance used for transport, this is an area where vehicles and heavier types of machinery (tractors) are parked. To the north of the site there is also a residential area characterised by villas and row houses from the early half of the 20th century.

To the east of the site the section of Vitsippsdalen (the *Woodlands* or the *"Valley of the Wood Anemone"*) marks its beginning.

The site of the greenhouse is located at a slope where there is roughly 3 meters height difference between the point of the stables (marked in green) and entrance to the greenhouse complex and the point where the road is levelling out/the more formal geometrical garden. Placing a building at a slope might not be the ideal conditions in terms of possible heavy rainfall and subsequent potential flooding. Things to keep in mind might be to maintain a buffer zone of vegetation to the south of the site, a ditch and some water management functions.

If the building site is to be levelled completely flat this will give extra soil that may be used to build up certain areas of the site.

A sun study of the site would serve little purpose since the main point of this complex is to maximise the area for the use of plants and with a facade and roof that would be mostly made out of glass.

REFERENCE PROJECTS

REFERENCE PROJECTS

LOTUS TEMPLE IN DEHLI

This structure was designed by architect Fariborz Sahba in collaboration with the engineering firm Flint & Neill. The building was completed in 1986 and is a place for worship for the adherents of the Baha'i faith. Similar structures have been erected as temples for that religion which all features a solitude dome with nine entrances composed in a radial symmetrical fashion as is specified in the religion. For this particular temple, the main source of inspiration was the lotus flower. The structure is made of a armoured concrete frame and concrete ribs (precast) that then have been cladded with white marble. The form language is somewhat reminiscent of the Sydney Opera House by Jørn Utzon.

The dome itself is almost 40 meters in height and would appear to be open at the top. This is however not the case as there is a steel construction with glazing. This allows for intake of light in the fashion of an oculus. The building is also raised on a plinth and is surrounded by water pools that both humidifies and cools the surrounding air and acts to strengthen the allusion to a lotus flower. (Britannica, Lotus temple, n.d.)

As a worthy mention in regard to the Baha'i faith on can mention that the adherents of the faith have erected several structures of similar character around the world, for example in Santiago, Chile designed by architect Siamak Hariri that was completed in 2016. The design has been can be described to resemble sails or a garlic even though the architect main idea was "embodied light" due to the fact that the facade is a cladding with translucent stone that covers a triangulated steel structure.

What is of interest in this reference of the Lotus temple in Dehli is the artistic mode of working where an architectural structure and element is clearly referencing forms from nature, in this instance a lotus flower; perfected in an, to some degree, abstracted geometrical composition. The way that the ribbed dome is constructed has also been of great influence in my proposal for the visitor's centre in the Botanical Gardens in Gothenburg.

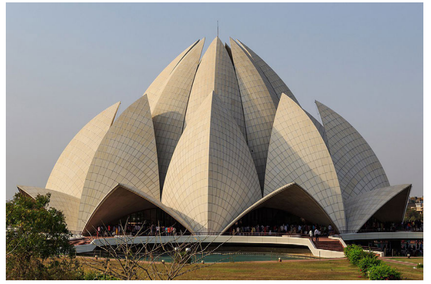


Figure 1 (top) 2 (bottom): The Baha'i Lotus Temple in Dehli (Wikimedia)

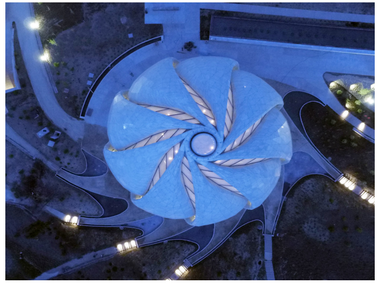


Figure 3 (top and bottom): The Baha'i Temple in Santiago (Wikimedia)

ROYAL BOTANIC GARDENS IN KEW

The Royal Botanic Gardens in Kew, outside of London, is the world's largest botanical garden and features a number of various greenhouses for different types of plants.

The Davis Alpine House was completed in 2006 and is a greenhouse structure that has it's shape optimised for creating a climate that is suitable for alpine plants. The temperature should not exceed 20 ºC and thus the proportions of the building is very tall and designed to create a stack, or chimney, effect. The greenhouse also has a foldable fan shaped sun protection to prevent the greenhouse from overheating. This, along with good ventilation is very important for greenhouses for certain types of plants. Another feature of the building is the material of the glass that is of a low iron grade and allows a large portion (90%) of light to be transferred into the inner climate of the building. (Kew Gardens, n.d.)

Another greenhouse that is located in the Kew Gardens is The Princess of Wales Conservatory that houses the similar type of plant collection as in the greenhouse of the Botanic Garden in Gothenburg. The Conservatory's collection includes orchids, carnivorous plants and cacti. It also includes waterlilies which require a large amount of warm and humid climate. The building is composed in such a way that the plants requiring most energy/heat has its section in the centre of the structure and the plants that are thrives in a bit cooler climate is located in the sections at the exterior walls. Thus heating costs are saved for those plants that need a hotter climate. Furthermore the climate is computer controlled for optimal performance. (Kew Gardens, n.d.)

Another interesting structure in the Kew gardens is The Hive. Although this is not a greenhouse, but an art installation, it is an inspirational design language. The aesthetic is derived by abstraction from nature, by recreating the perception of bees multi faceted vision. The installation was designed by artist Wolfgang Buttress in 2015.

What has been of interest in these references are the various technical solutions that have been employed: the shading system, glass type, importance of ventilation and the arrangement of space to minimise loss of heat.

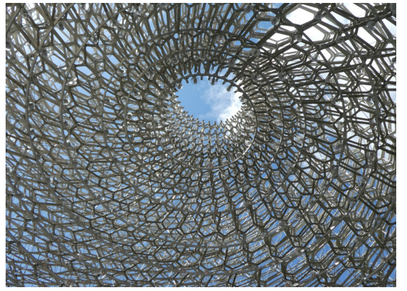


Figure 4 (top) 5 (bottom): The Davies Alpine House (left: Wikimedia, right Wikipedia)

Figure 6 (top) 7 (bottom): The Hive (left: Photo by Mark Hadden. Wikipedia, right: Photo by DS Pugh. Geograph)

Figure 8: The Princess of Wales Conservatory (Photo by David Iliff. Wikipedia)

ROYAL GREENHOUSES OF LAEKEN

The Royal Greenhouses of Laeken was constructed between 1874 and 1905 in direct connection to the Royal Palace of Laeken in Brussels which is a private domain of the royal family of Belgium. The structure was designed by architect Alphonse Balat and after his death the project was inherited by architects Henri Maquet and Charles Girault. The complex features various sections that houses flora from various parts of the world such as the Congo House, the Winter Garden (the large dome), Palm pavilion and more. The complex was designed so that some parts of the structure could be combined with both featuring plants but also as to hold banquets, theatre, chapel and a bathing house. The entire complex encompasses an area of 6,2 acres (roughly 25 000 m^2) and the largest dome has a diameter of 57m. The main structural construction is made up of cast iron trusses. (The Belgian Monarchy, n.d.)

Figure 9: Royal Greenhouses of Laeken (Wikimedia)

Figure 10: Brookfield Place by Santiago Calatrava (Wikimedia)

Figure 11: Milwaukee Art Museum by Santiago Calatrava (Wikimedia)

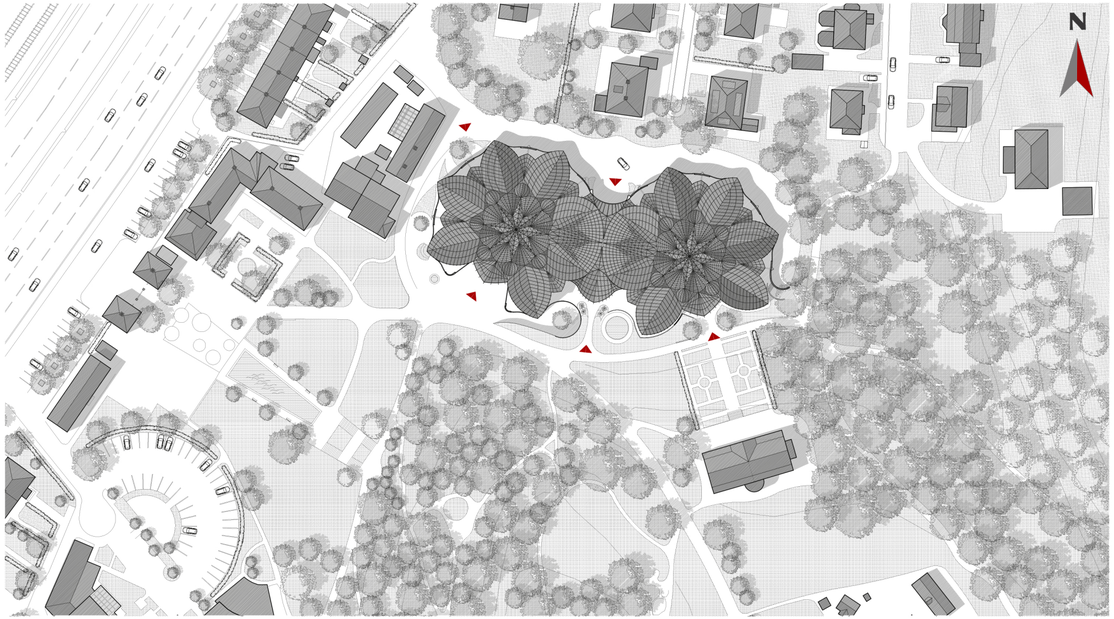
DESIGN PROPOSAL

DESIGN PROPOSAL

VIEW FROM THE MAIN ENTRANCE

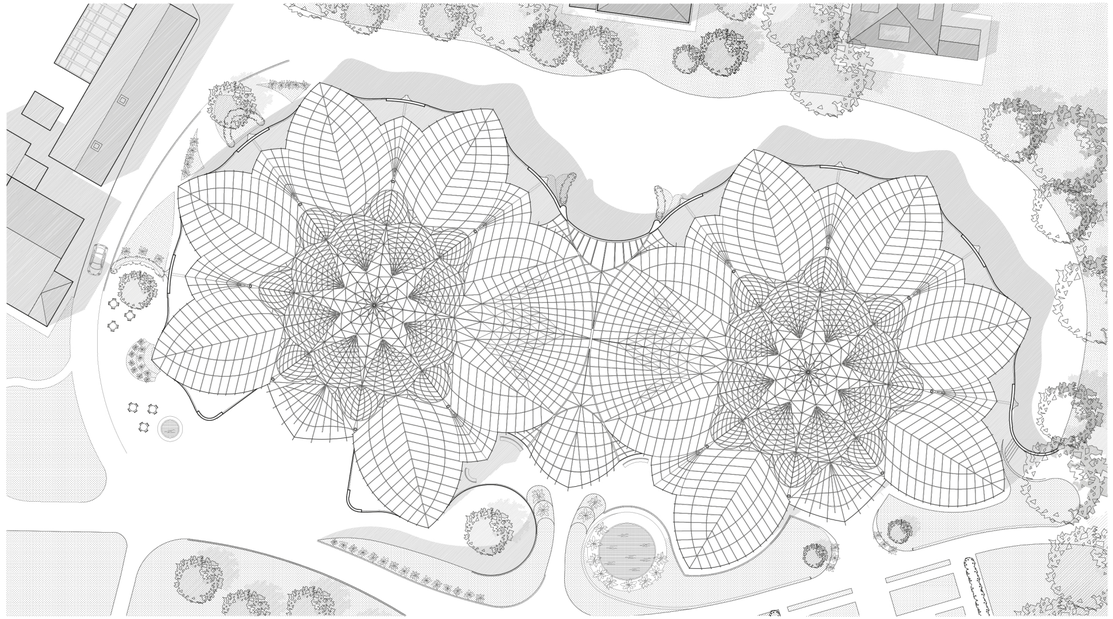
When one first enters the Botanical Gardens, the visitor is greeted by the sight of a structure that depicts itself as two domes in the distance. The composition is made so as to strengthen the sense of depth along the main road and the round domes picks up the similar forms of the rounded shapes of the tree canopies. This is to create a compositional balance to the tree covered hill at the opposite side of the visitor's centre. The building has a heavier base in red brick as a nod to the buildings from the 1920s. The first floor is also partially docked in the ground and the facade have rounded corners and a rounded base to give the building a somewhat more smooth appearance as is sprung from the ground. For the second floor, the building has a lighter expression with a structure in glass, steel and aluminium.

SITE PLAN



SCALE 1 : 1000 (A3)

ROOF VIEW



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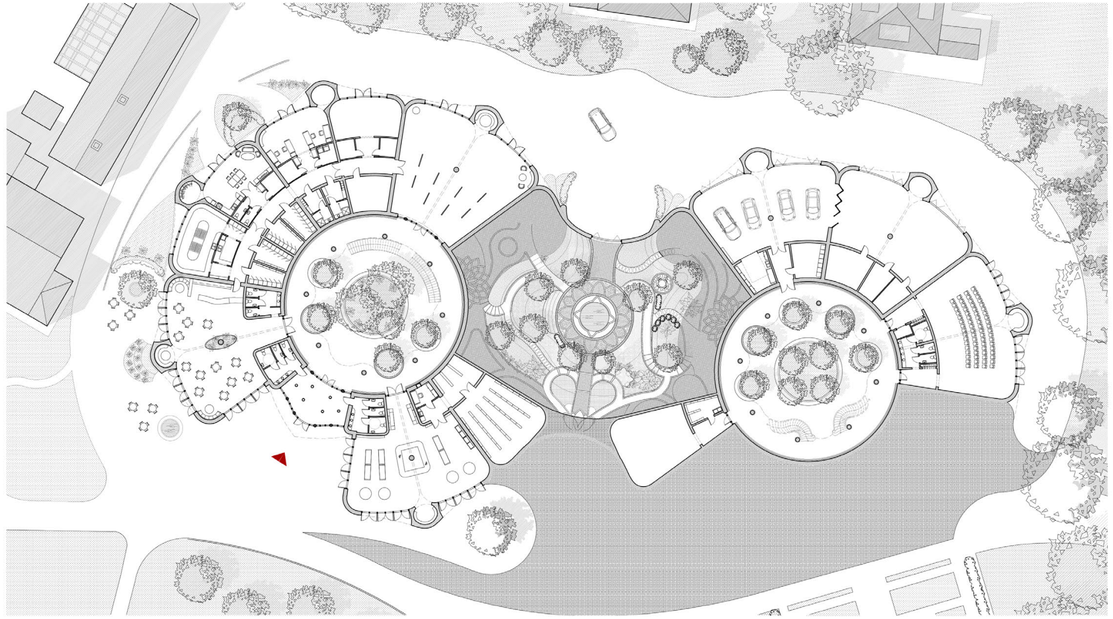
FLOOR PLAN I



SCALE 1 : 400 (A3)

FLOOR I DESCRIPTION

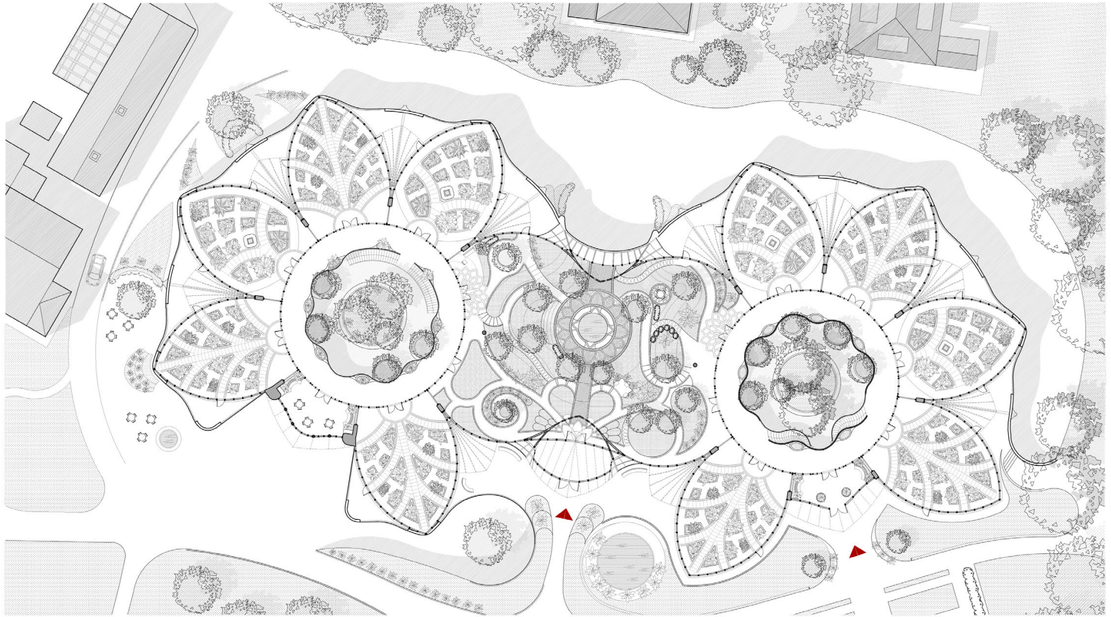
The building is composed so as to have the functions for the visitor's centre on the first floor and the functions for the greenhouse on the second floor.

The main entrance to the visitor's centre is located along the main road and is slightly angled to face an axis, and so as to be visible, from the entrance point of the garden. Flanking the sides of the main entrance one can find a smaller shop and a café/restaurant to the right and the left respectively. These functions are stated to be part of the upcoming built structure even though there already is a shop (at roughly 100m^2) and a restaurant in the garden.

The entrance foyer is designed to be a space with excessive amounts of columns so as to illustrate a tree grove that you pass through before entering into the large atrium. The two circular atriums in the building complex is thought to be more warmer spaces for plants that require at a minimum 20°C. If one passes straight through the central room the visitor comes to a space that could be used as an exhibition space for example botanical art.

On the other side of the structure, in the other dome there are rooms dedicated to plant and seed storage, soil deposits and vehicles and equipment storages. There is also a room that could be used as a multi-purpose hall or an auditorium for lectures when the students of botany would be visiting the greenhouse complex.

FLOOR PLAN II



SCALE 1 : 400 (A3)

FLOOR II DESCRIPTION

On the second floor, all the functions are reserved for the plants with separate rooms of varying temperature. The main arrangement is that the warmest rooms are located in the two central domes with cooler rooms located around each centre in a radial fashion and in the shape of leaves. Thus when superimposing the main structure of the first floor and the second, there is a reminiscence of a flower with both sepals and petals. The atrium space is arranged with a large central bed of soil for plants and trees and around it there are smaller beds of soil. All in the arrangement like a pistil and stamens.

In the surrounding petal rooms there are flower beds that are arranged so as to allude to natural elements with main walkways to be like the primary and secondary veins of a leaf.

Between the two architectural flowers there is a larger space that connects the two parts of the building. This area is arranged more in a free flowing and terrained landscape fashion.

SPACE PROGRAMME

FLOOR I

Foyer	35 m²
Lavatory, Public (×2)	10 m²
Toilets, Public (×4)	2 m²
Accessible Toilets/Nursing Room, Public (×2)	5 m²
Shop	200 m²
Office Space	7 m²
Storage, Warehouse	81 m²
Exhibition Space/Gallery	232 m²
Café/Bistro/Restaurant	200 m²
Lavatory, Public	9 m²
Toilets, Public (×3)	2 m²
Kitchen	48 m²
Dishwasher/Cleaning	9 m²
Preparation area	5 m²
Storage for Tableware and Cutlery	5 m²
Storage, Dry	12 m²
Storage, Fridge	12 m²
Storage, Freezer	11 m²
Storage	11 m²
Multi Purpose Hall	183 m²
Entrance Space with Wardrobe (×2)	13m²
Lavatory, Public	9m²
Toilets, Public (×2)	3 m²
Accessible Toilet, Public	5 m²
Storage	3 m²
Staff Room	48 m²
Wardrobe	7 m²
Toilets, Staff (×2)	3 m²
Storage, Cleaning	5 m²
Storage, Equipment	5 m²
Changing Room, Men	7 m²
Changing Room, Women	7 m²
Shower (×2)	4 m²
Laundry	6 m²
Staff Office	48 m²
Staff Office, Equipment Space	7 m²
Garage	183 m²
Storage, Vehicle Equipment	18 m²
Storage, Garden Equipment	18 m²
Ventilation Control Room (×2)	24 m²
Electrical Control Central	12 m²
Water and Heat Regulation Control Central	12 m²
Growing Room	81 m²
Storage, Seeds	12 m²
Storage, Soil (alternatively additional Garage)	183 m²
Flexible Area/Unprogrammed	48 m²
Flexible Area/Drawn as Storage Space (×2)	6 m²
Flexible Area/Drawn as Communication Space	7 m²
Total Communication Area	107 m²
Greenhouse Atrium 20 °C	436 m²
Greenhouse Atrium 20 °C	436 m²
Total Area for Floor I	**2913 m²**

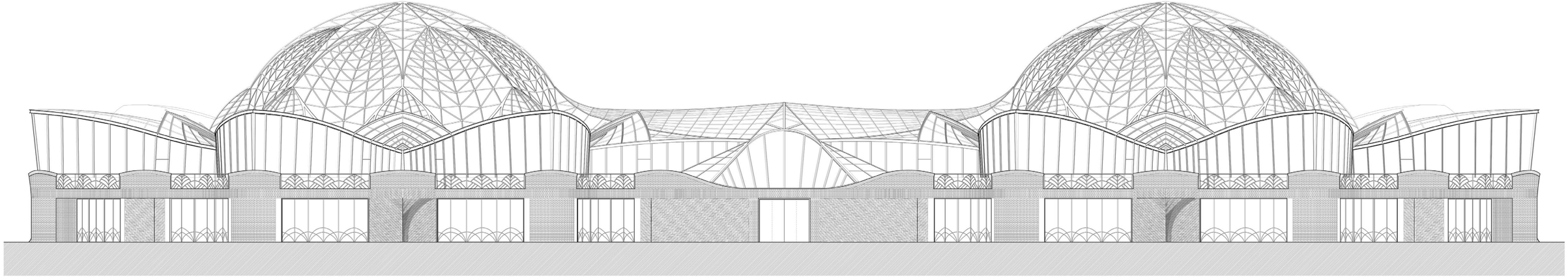
FLOOR II

Foyer	40 m²
Small Petal Room	40 m²
Foyer	45 m²
Greenhouse Room 15 °C (×2)	179 m²
Greenhouse Room 12 °C (×2)	179 m²
Greenhouse Room 10 °C (×2)	179 m²
Greenhouse Room (×4)	179 m²
Greenhouse Terrained Landscape	910 m²
Total Area of Terrace and Balconies	850 m²
Total Area for Floor II (Excluding Terraces and Balconies)	**2825 m²**
Total Area (Excluding Terraces and Balconies)	**5738 m²**

ENTRANCE VIEW OF TROPICAL ATRIUM

VIEW OF TROPICAL ATRIUM UNDER THE STAIRS

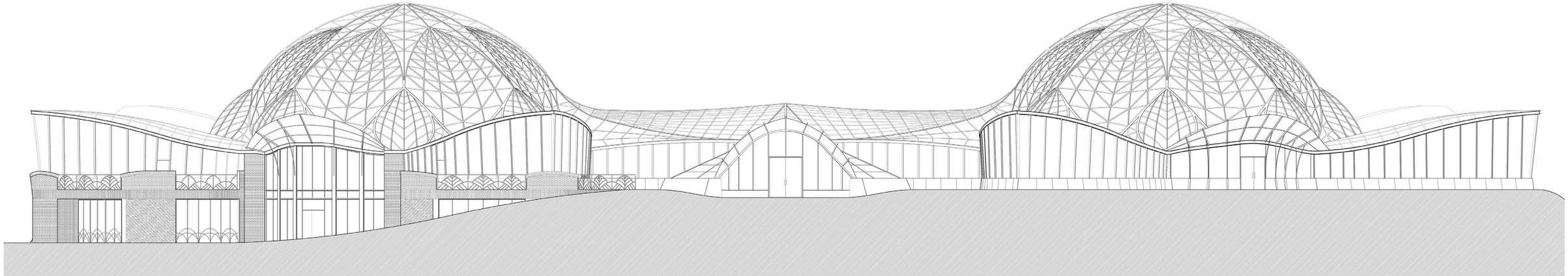
FACADE NORTH



SCALE 1 : 150 (A3)

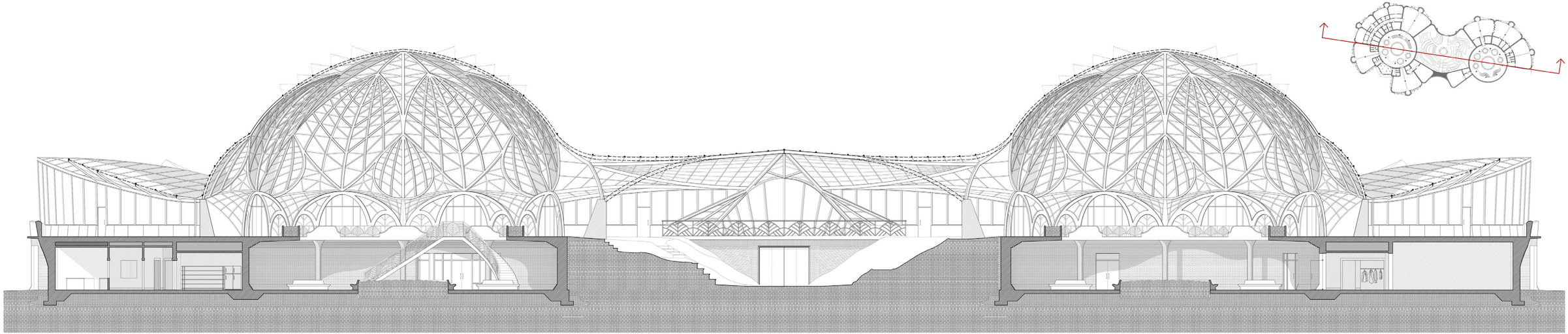
The facade is composed so as to give a gradually lighter appearance with a heavy red brick first floor and a lighter glass structure on top. The choice of red brick is acts as a small reference to the brick buildings from the 1920s. To lighten the base and to allow light to enter the rather deep first floor, large sections of fully glazed parts are inserted into the facade to break up the heavy appearance. There are almost no straight walls but the facade rather undulates to give a more soft natural appearance. In this elevation projection, the arrangement of radially oriented leaves is more visible in the structural construction of the domes.

FACADE SOUTH



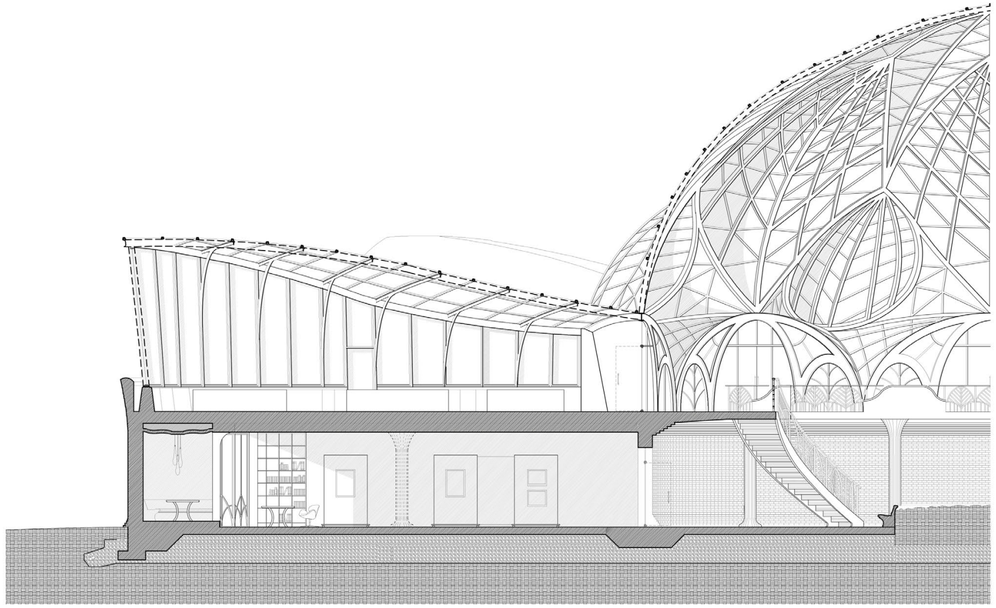
SCALE 1 : 150 (A3)

SECTION I

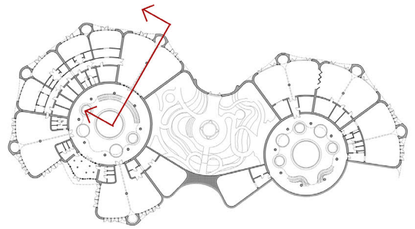


SCALE 1 : 150 (A3)

SECTION II



SCALE 1 : 150 (A4)



SECTION DESCRIPTION

The building offers rooms of variable height to allow for trees of diversified character. The main dome measures 18 meters from its lowest to its highest point.
Each surrounding greenhouse room has a varying ceiling height from 3,4 meters at its lower end, to 5,7 meters at its highest point. The mid section of the greenhouse complex also has differing heights due to the terrained character of the room, but at its highest point measures 10 meters. The lower level has a height of 3,3 meters measured to the inner ceiling.

The design of the dome has gone through several iterations and has throughout the process retained some characteristics of leaves stacked together in a radial fashion. Somewhat reminiscent of an artichoke.

RENDER OF GREENHOUSE SUCCULENTS ROOM

RENDER OF GREENHOUSE TROPICAL ROOM

DETAIL SECTION I

WALL COMPOSITION

260 MM BRICK AND MORTAR
120 MM INORGANIC INSULATION, PERLITE
120 MM ARMOURED CONCRETE
10 MM PLASTER

FOUNDATION AND FLOOR

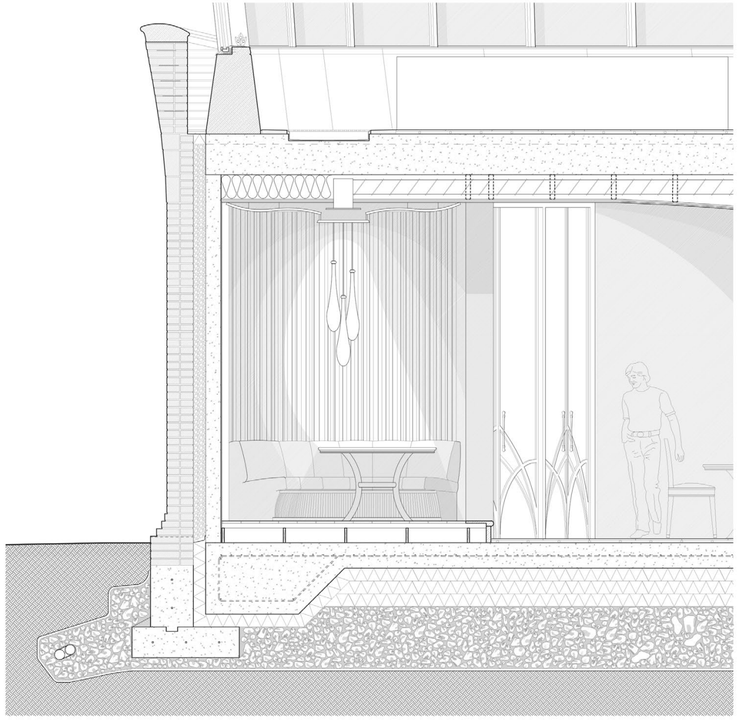
(SURFACE MATERIAL VARYING ON CERTAIN SECTIONS OF THE FLOOR)
22 MM WOODEN PARQUET
LIMESTONE TILE
BRICK FLOOR TILE
22 MM FLOOR HEATING IN FIBRE BOARD
250 MM ARMOURED CONCRETE
3×125 MM INSULATION
MACADAM
GEOTEXTILE
10 MM PLASTER

FLOOR TO GREENHOUSE

22 MM LIMESTONE TILE
BRICK FLOOR TILE
22 MM FLOOR HEATING IN FIBRE BOARD
400 MM ARMOURED CONCRETE
VARYING HEIGHT, INSULATION AND STEEL RIDGE BEAMS WITH PERPENDICULAR WOOD PURLINS
12 MM FIBRE BOARD, CURVED SHEATHING
10 MM GYPSUM BOARD
10 MM PLASTER

102 MM RECESS IN THE FLOOR FOR GRATE AND DRAINWATERDISPOSAL

THE GLAZED WINDOWS OF THE GREENHOUSE ARE FASTENED IN A PLINTH OF OPTIONALLY SANDSTONE BLOCKS, OR CUSTOM MADE INSULATED CONCRETE BLOCKS WITH MEASUREMENTS: HEIGHT 850 MM AND WIDTH 530 MM.

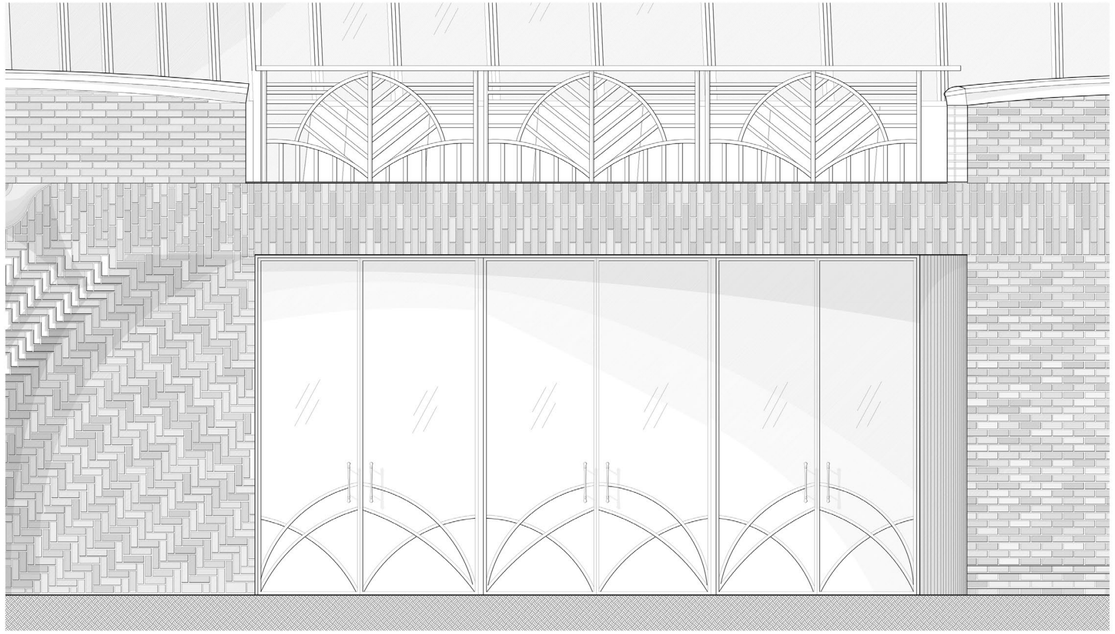


SCALE 1:30 (A3)

FACADE ELEVATION

FACADE DESCRIPTION

The facade curves along its extension but it also curves smoothly from the ground and gradually bends at the parapet on the terrace. The brick is laid in different fashion to create a textural variation both horizontally, vertically and in a herringbone pattern with gradual transitions in some parts. Large portions of the facade is made up of glass doors that extends from floor to ceiling so as to allow for sunlight to shine in despite the rather deep distance from the facade to the core of the building.

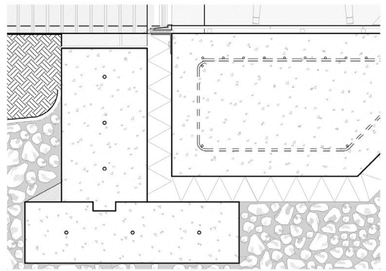


SCALE 1 : 30 (A3)

DETAIL SECTION II

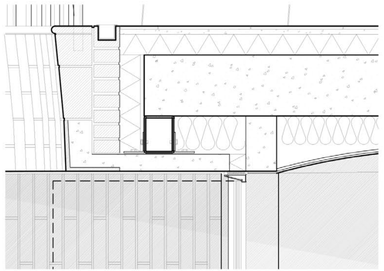
FOUNDATION AND FLOOR

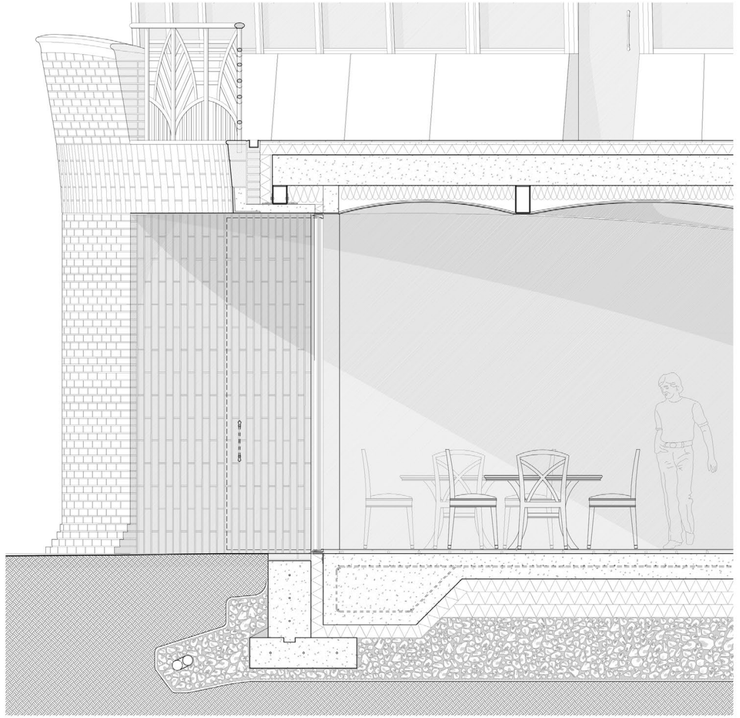
(SURFACE MATERIAL VARYING ON CERTAIN SECTIONS OF THE FLOOR)
22 MM WOODEN PARQUET
LIMESTONE TILE
BRICK FLOOR TILE
22 MM FLOOR HEATING IN FIBRE BOARD
250 MM ARMOURED CONCRETE
3×125 MM INSULATION
MACADAM
GEOTEXTILE



TERRACE ROOF

22 MM LIMESTONE TILE
BRICK FLOOR TILE
26 MM CONCRETE
100 MM INSULATION
300 MM ARMOURED CONCRETE
VARYING HEIGHT, INSULATION AND STEEL RIDGE BEAMS WITH
PERPENDICULAR WOOD PURLINS
12 MM FIBRE BOARD, CURVED SHEATHING
10 MM GYPSUM BOARD
10 MM PLASTER





SCALE 1:30 (A3)

DETAIL SECTION III

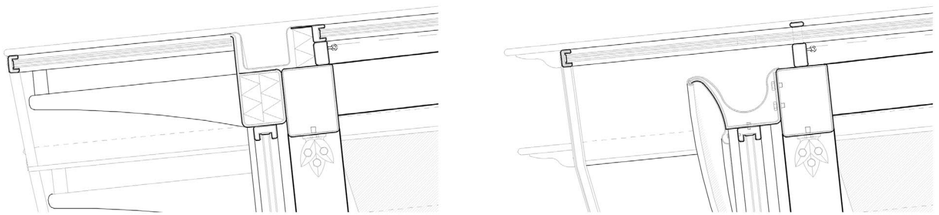
GLASS ROOF TO GREENHOUSE

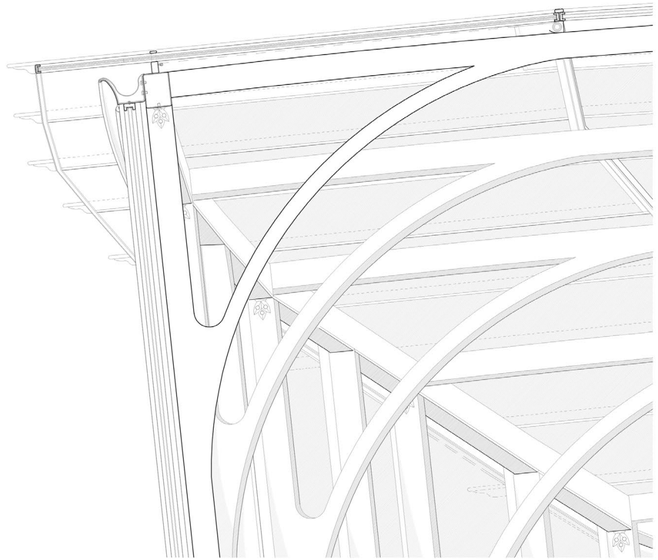
22 MM ALUMINIUM LID

DOUBLE GLAZED WINDOW IN ALUMINIUM FRAME 55×35 MM
/
TRIPPLE GLAZED STRUCTURAL GLASS WITH PRE-DRILLED WEEP-HOLES IN ALUMINIUM FRAME 55×35 MM AT ENDS OF ROOF.

75×45 MM ALUMINIUM RAFTER WITH CONCEALED SPACE FOR BLINDS
170×100 MM GALVANISED STEEL FRAMES

ALTERNATIVE SOLUTIONS REGARDING GUTTER SCALE 1:10 (A3)





SCALE 1 : 20 (A3)

RENDER OF CAFE

RENDER OF TERRAINED LANDSCAPE ROOM

PHYSICAL MODELS

PHYSICAL MODELS

SECTION DETAIL

The model illustrates a section of the “sepals and petals” of the building and this motif is mirrored and repeated in a radial symmetrical fashion around almost the entire building. The detail section cut-out shows the many curved brick walls and also the waterspout that expels water that travels along a central gutter on each terrace that in turn takes care of the water that flows through a downpipe (not modelled) attached to the vertical supports for the dome.

The detail section model was made using a plastic 3D printer, which in itself was something new to me at this scale of approximately 1 : 50.

LANDSCAPE AND BUILDING MODEL

The model illustrates the building placed in the landscape and gives a good bird's eye view of the volume of the building. The terrain model was made of linden tree and the building was made using a gypsum printer which also presented a new experience to me. Unfortunately the 3D printer has limitations in regard to printable area and for this model an exact scale relation was disregarded in favour of maximising the size of the model. The building model measures roughly 35 cm along it longest distance. This gives a scale relation in an approximate region of 1 : 320.

REFLECTIONS

REFLECTIONS

The process of this master's thesis has been an interesting one where I have widened my modes of working. Rather than drawing upon culture as a reference on generating form I have relied on a generalisation of nature's forms to create architecture. The proposal aligns clearly with the stated research question or point of departure:

How can a visitor's centre for nature be designed using geometrical abstraction of natural elements to harmonise with the surrounding context of the proposed building?

The somewhat indistinct wording *harmonise*, gives space for discussion. The building proposal references nature, but not in an overly explicit way. The floral shape and arrangement of space/architecture is only clearly visible in a more bird's eye perspective or when one is standing on top of the adjacent hill. Thus this piece of architecture could be described as to be less explicit in it's abstraction of nature than for example the lotus temple in Delhi. Such a building might be harmonious with the natural environment in the Botanical Gardens, but would it also be harmonious with the built environment (the cultural aspect)? In that regard it would be difficult as to ascertain what part of the cultural aspects of architecture one might allude to; is it the brick architecture from the 1920s, the traditional wooden architecture buildings that are scattered in the garden, or the contemporary architectural additions? Maybe the reference should be the cultural tradition of greenhouses/growing plants and trees in glass houses in general that is ascribed to have started of with the Victorians (in relation to colonial ambitions) and proponents such as Joseph Paxton's Crystal Palace, Decimus Burton's and Richard Turner's Palm House in Kew Gardens among others.

Another type of approach in regard to referencing in relation to theory would be that my design expresses somewhat similar theoretical ideas to architecture parlante; in short the idea that a building should speak clearly its purpose. Such a statement could also give a rather ambiguous outcome with architecture, proposed by Claude Nicholas Ledoux (1736-1806), in the shape of celestial spheres or floor plans in the shape of genitalia. Still those buildings could have the architectural *arrangement* as an allusion to their purpose but still have a classical architectural *expression*, or the opposite. Using that conceptual idea and applying it to the point of departure for this thesis could just as well have generated a proposal in an art nouveau fashion where the building would harmonise with nature through its nature inspired expression. An additional take could be that of a more biomimetic design where the architecture would emulate the engineering of nature. For example leaves collect sunlight and energy, and thus the implementation of solar cells for the ceiling in the petal rooms could be an evolvement of the design. As far as I know, fully transparent solar cells are still experimental but in the future they could be implemented used in the design.

My point is that there are many possible outcomes of the initial stated research question (or preferably "point of departure") and since the word *harmonise* is rather subjective and pragmatic, the degree of harmonisation will be dependent on what is chosen as a reference.

In earlier works I have usually referenced cultural historical references and had that as an approach. But I have chosen to treat this project on a more speculative and, for me, more experimental/a different approach.

Regardless of the degree of harmonisation that this proposal entail, it is my hope that such a design would strengthen the urge of visitors to enter into the public greenhouse complex to learn more about the diversity of nature.

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IMAGES

Figure 1: The Baha'i Lotus Temple in Dehli. *https://upload.wikimedia.org/wikipedia/commons/thumb/d/dc/Lotus_Temple_in_New_Delhi_03-2016.jpg/1280px-Lotus_Temple_in_New_Delhi_03-2016.jpg* (retrieved: march 2022)

Figure 2: The Baha'i Lotus Temple in Dehli. *https://upload.wikimedia.org/wikipedia/commons/5/50/104-Lotus-Temple-Information-Centre.JPG* (retrieved: march 2022)

Figure 3: The Baha'i Temple in Santiago. *https://commons.wikimedia.org/wiki/Category:Bah%C3%A1%27%C3%AD_Temple_of_South_America,_Santiago_de_Chile* (retrieved: may 2022)

Figure 4: The Davies Alpine House. *https://upload.wikimedia.org/wikipedia/commons/9/9e/Davies_Alpine_House_at_Kew_Gardens_18.jpg* (retrieved: may 2022)

Figure 5: The Davies Alpine House. *https://upload.wikimedia.org/wikipedia/commons/3/34/Alpine_House%2C_Kew_Gardens%2C_2018_edit.jpg* (retrieved: january 2022)

Figure 6: The Hive. *https://upload.wikimedia.org/wikipedia/commons/3/36/Wolfgang_Buttress_The_Hive_at_Ke_Gardens._Credit_Mark_Hadden.jpg* (retrieved: january 2022) Copyright/Credit: Mark Hadden

Figure 7: The Hive. *https://www.geograph.org.uk/photo/6146991* (retrieved: january 2022) Creative Commons license CC BY-SA 2.0) Copyright/Credit: DS Pugh

Figure 8: The Princess of Wales Conservatory. *https://en.wikipedia.org/wiki/Kew_Gardens#/media/File:Princess_of_Wales_Conservatory,_Kew_Gardens_-_July_2009.jpg* (retrieved: january 2022)

Figure 9: Royal Greenhouses of Laeken. *https://upload.wikimedia.org/wikipedia/commons/e/e4/Laeken_Greenhouses.jpg* (retrieved: march 2022)

Figure 10: Brookfield Place by Santiago Calatrava. *https://upload.wikimedia.org/wikipedia/commons/1/1e/Flickr_-_paul_bica_-_arches.jpg* (retrieved: march 2022)

Figure 11: Milwaukee Art Museum by Santiago Calatrava. *https://upload.wikimedia.org/wikipedia/commons/d/df/Milwaukee_Art_Museum_exterior.jpg* (retrieved: march 2022)