

# 07 TECHNÈ

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## *Refining the intention*

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The technical chapter aims to present the honing process of the development of the Thebe Medupe Planetarium. Focusing on the three aspects of the project, this chapter presents the Dome, Water and Light as the three technical topics for the scheme.

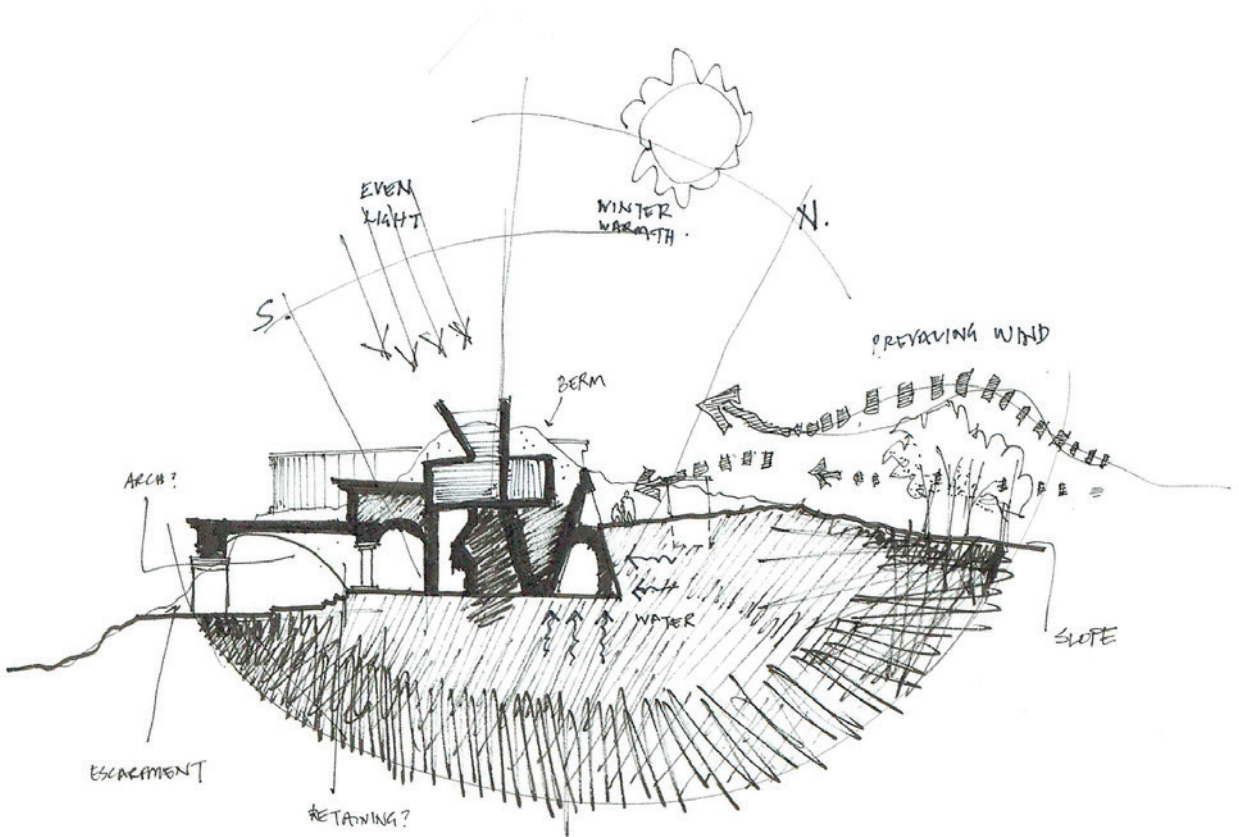
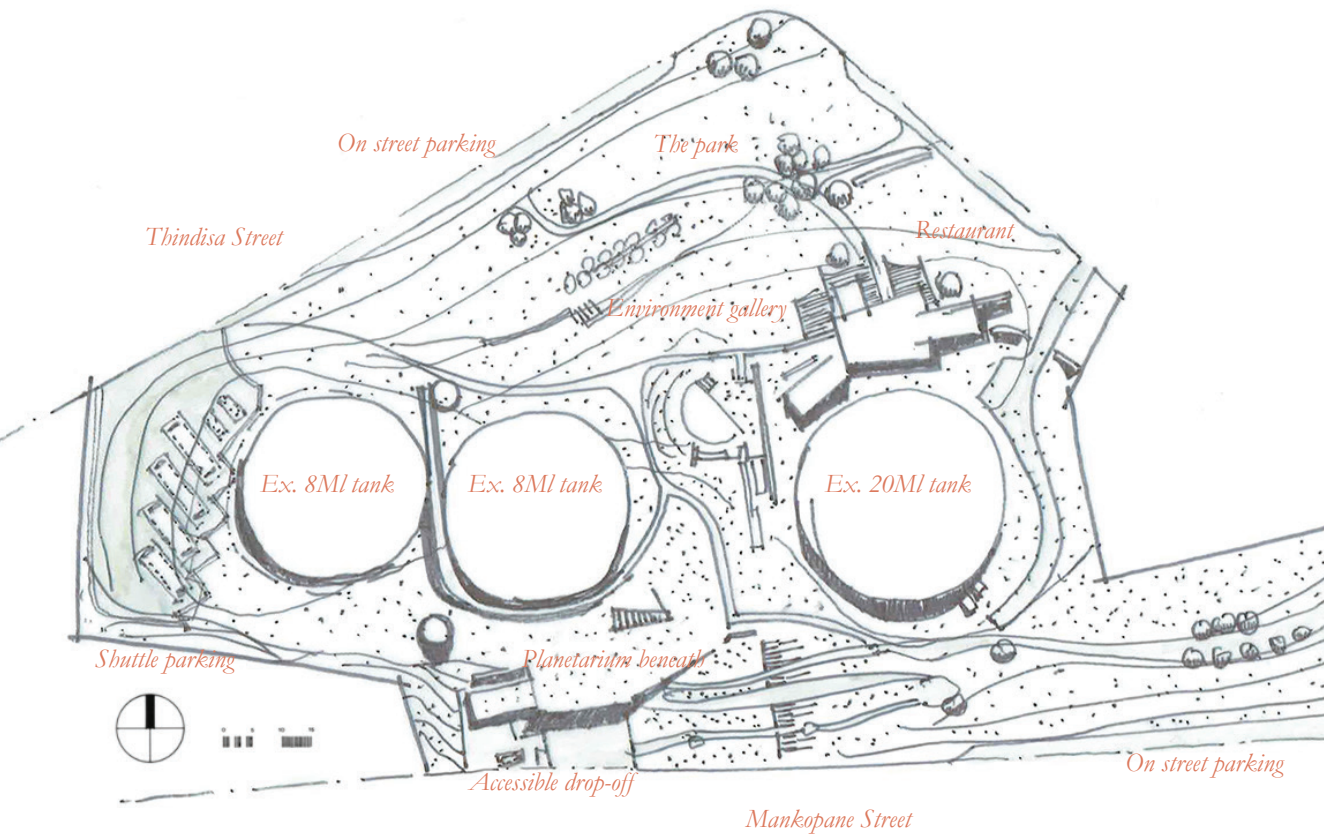
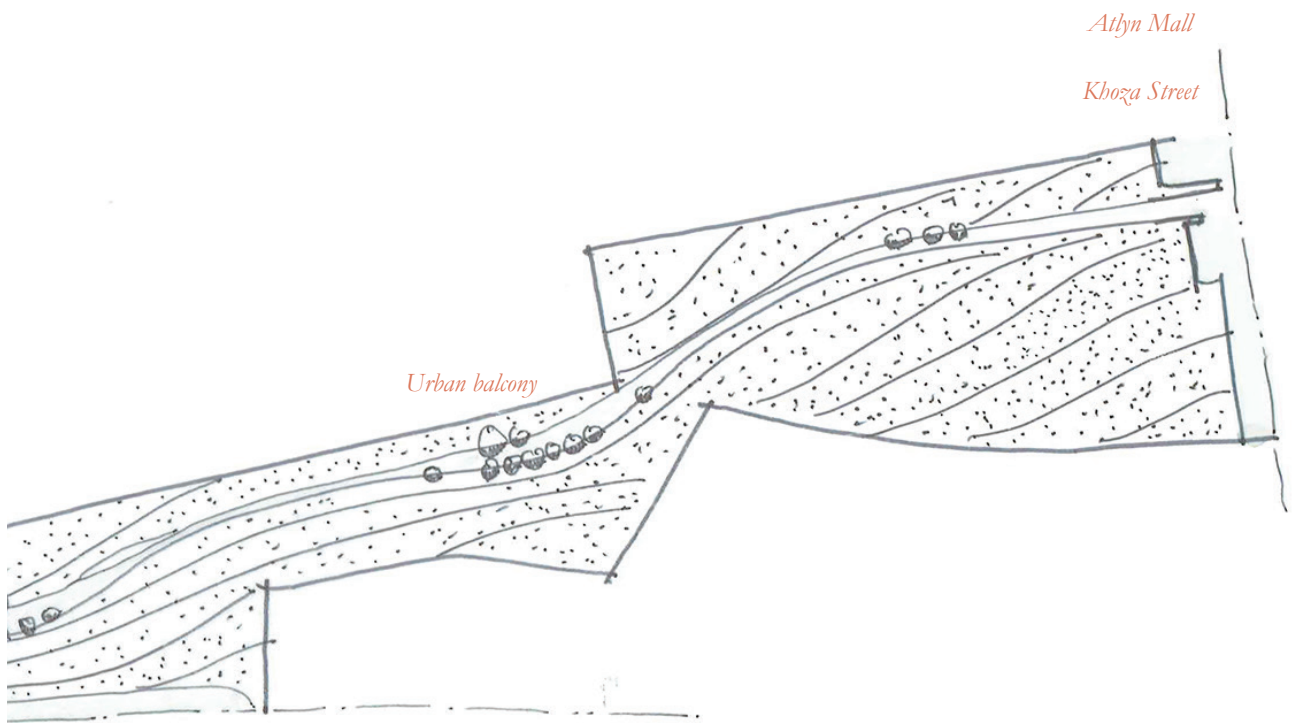


Fig.126. Knowing what to look for. This conceptual diagram considered the external and internal forces affecting the scheme. Attempting to exaggerate the architectural concept as in response to the climatic conditions. May, 2016.

# 7.1 THE THEBE MEDUPE PLANETARIUM

*Technical development*



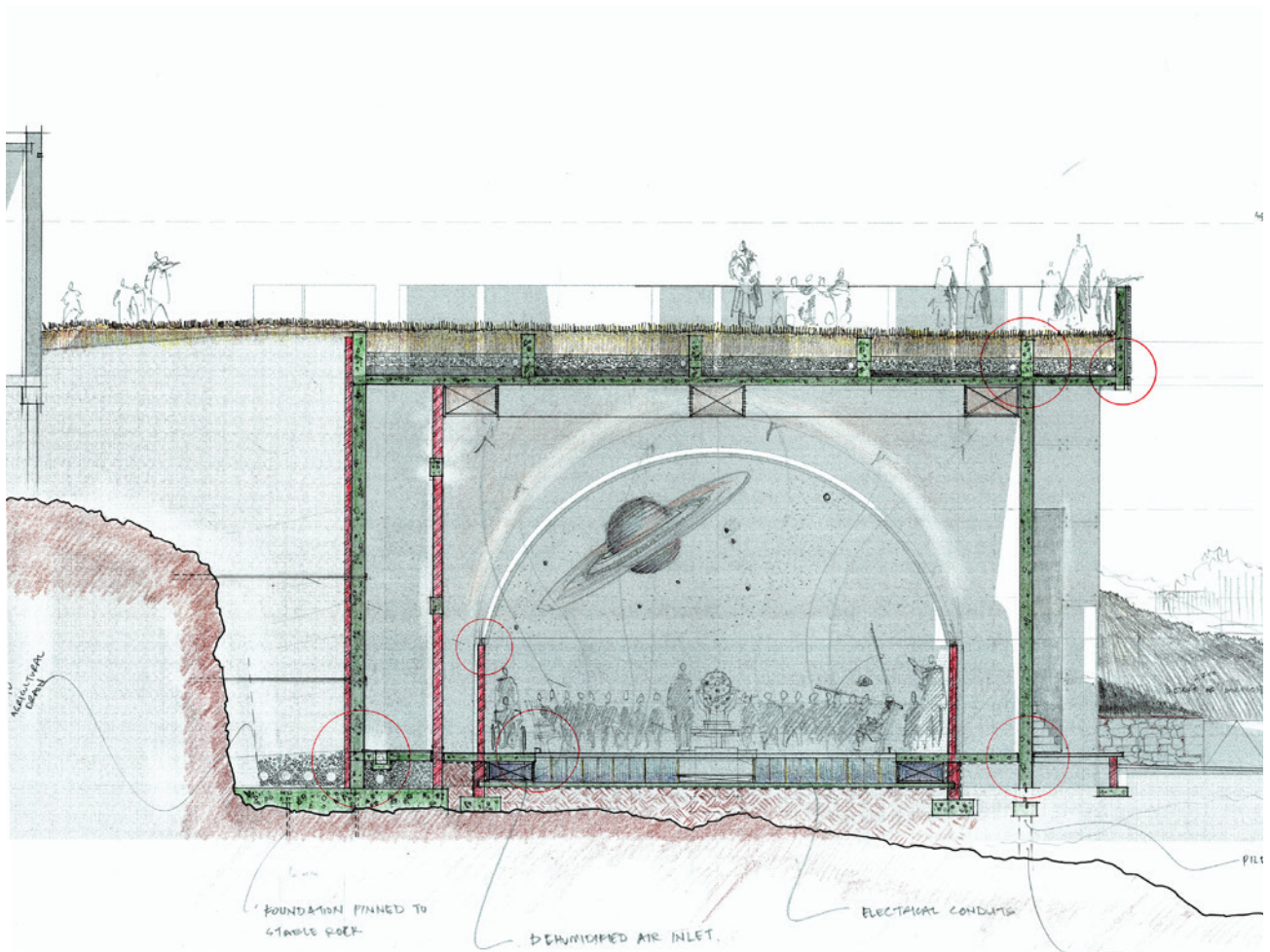


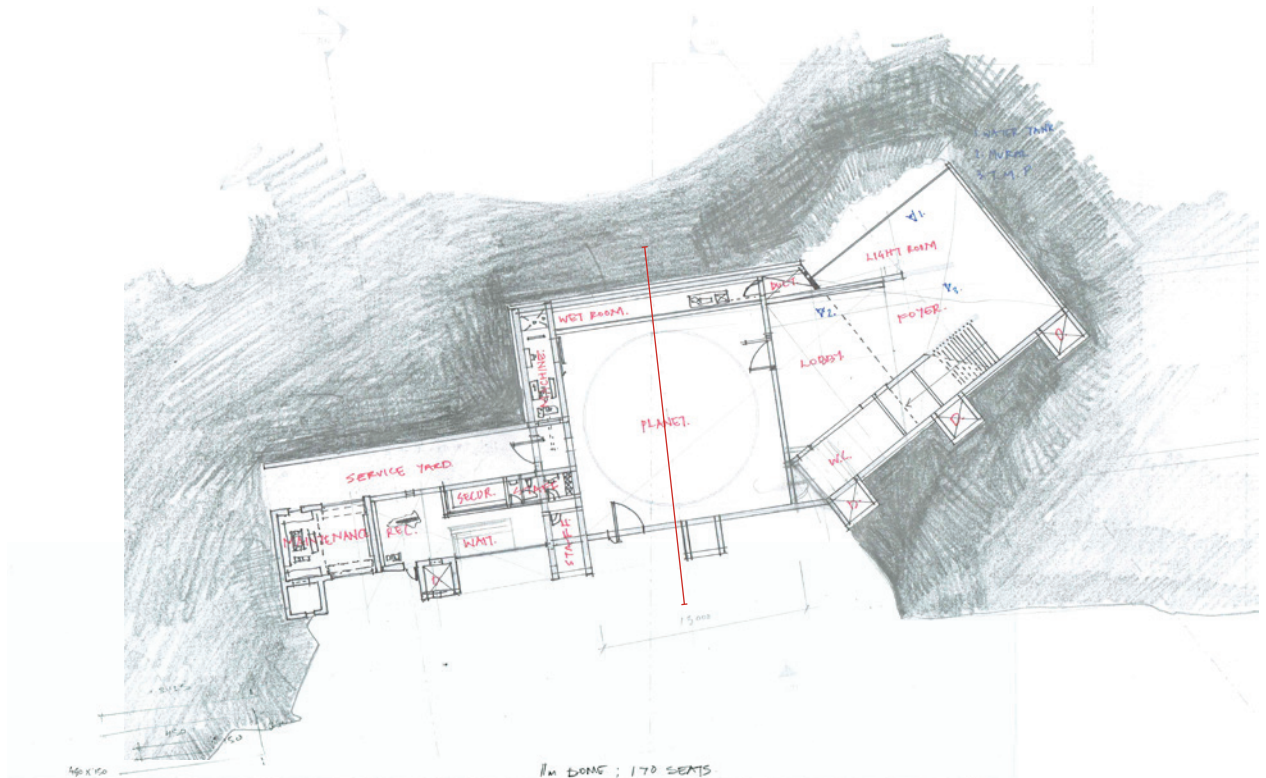
**Fig.127.** Reorientating. The master plan shows the park in its final iteration stage. From the north the park stretches the width of the site, flanking the park on the north east portion is the restaurant, which acts as the new datum on site. For the visitor, the route enters the landscape where the environment gallery provides a large sheltered and supervised play area for the children. Towards the south, a public staircase descends to meet Mankopane street. This is the visual route. The Planetarium is located on the south west beneath the new terrace. A series of meandering ramps, guided by rainwater filtration channels trace the contours to bridge the 10 meter drop. On the west, the shuttle service and maintenance parking grounds are located behind the last tank. To the east the urban balcony stretches to meet Atlyn Mall on Khoza Street.



## 7.1.1 THE DOME

*The projection room*





1m DOME ; 170 SEATS  
OPERATED: YES  
TILT: NO

FROM UPSTAND  
RETAINING

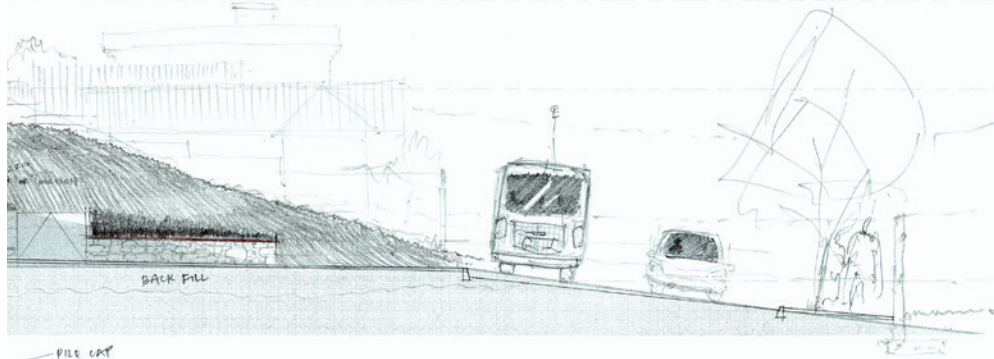
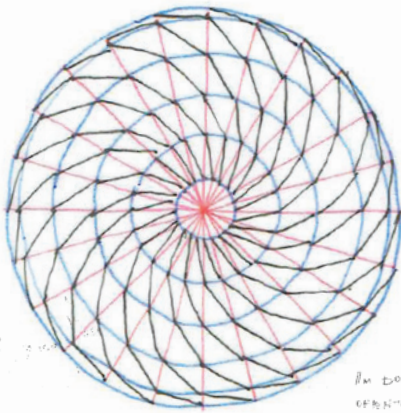
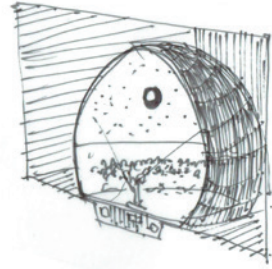
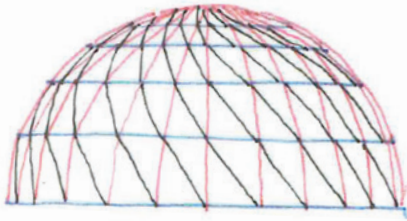


Fig.128. The auditorium. The first iteration of the auditorium focused on the interior space. Responding to the technical requirements of the Carl Zeiss Starmaster projector, the line of horizon was determined and the dome dimensions calculated. This section also considered the retaining wall necessary to withstand the force of the earth and ground water. In this iteration, a series of up-stand beams were utilised to stabilise the earth above. This was inverted to minimise the loading capacity necessary to retain 1m of replaced earth. Instead a well-draining growth medium will be considered in order to rehabilitate the roof.





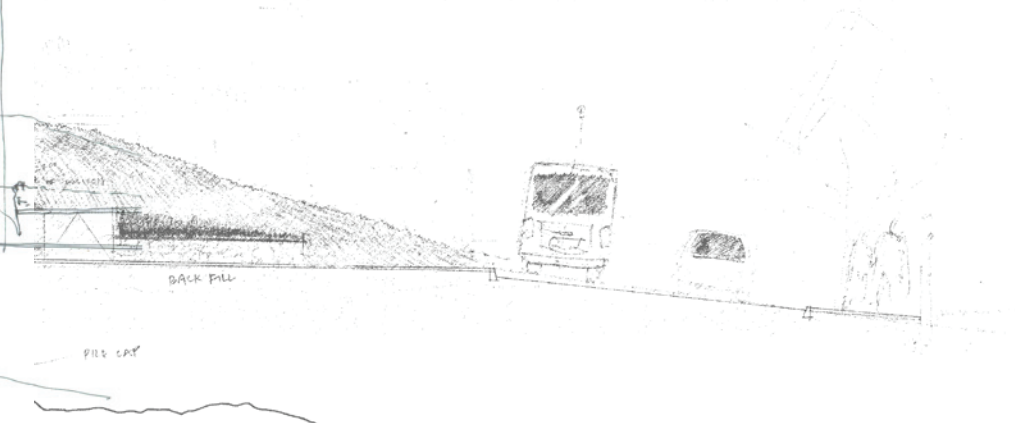


IN DOME : 170 SEATS  
VENTILATED : 700  
7000



Perhaps increase

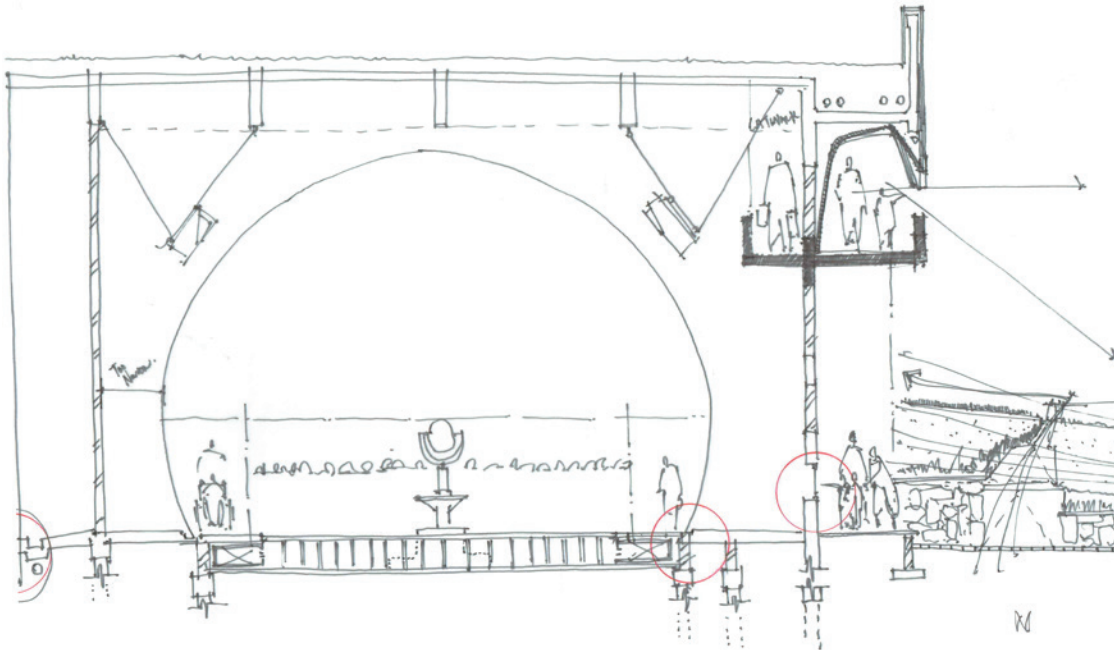
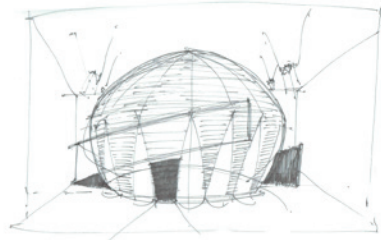
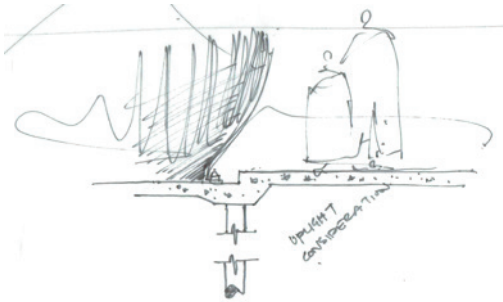
100mm UPSTANDING  
100mm

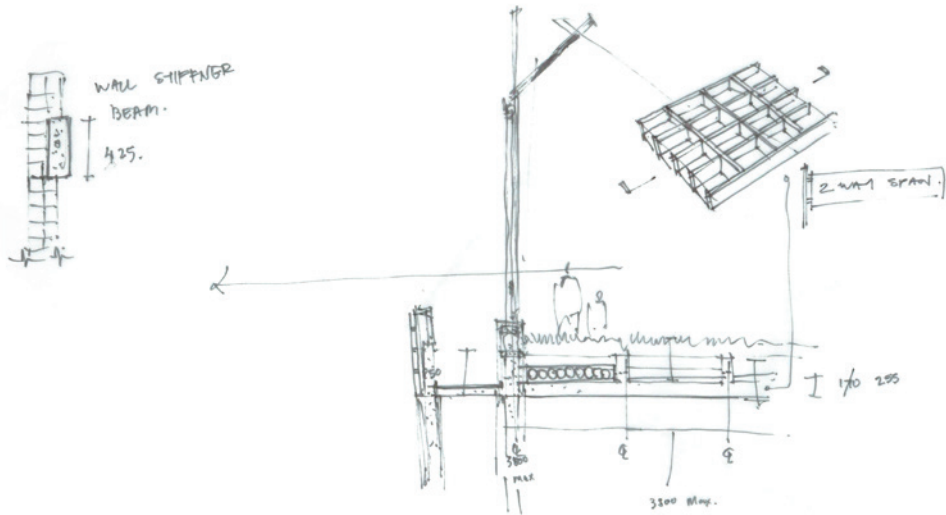


**Fig.129.** The Schwedler dome. Illustrated above, the Schwedler dome makes use of 3 members: the red compression members are laid out longitudinally; and the blue members tie the compression members together by providing tensional support in the latitudes whilst the black diagonal lines provide the necessary triangulation to stiffen the structure. In order to ensure thermal comfort for the 170 visitors, low-lying inlets provide fresh cool air whilst the perforation in the aluminium skin allows the dome to ventilate towards the extraction points provided in the ceiling void. The dome sits within the larger void of the cube, and must be erected within the enclosure. Detail to follow.

### 7.1.3 MAINTENANCE

#### *Services*

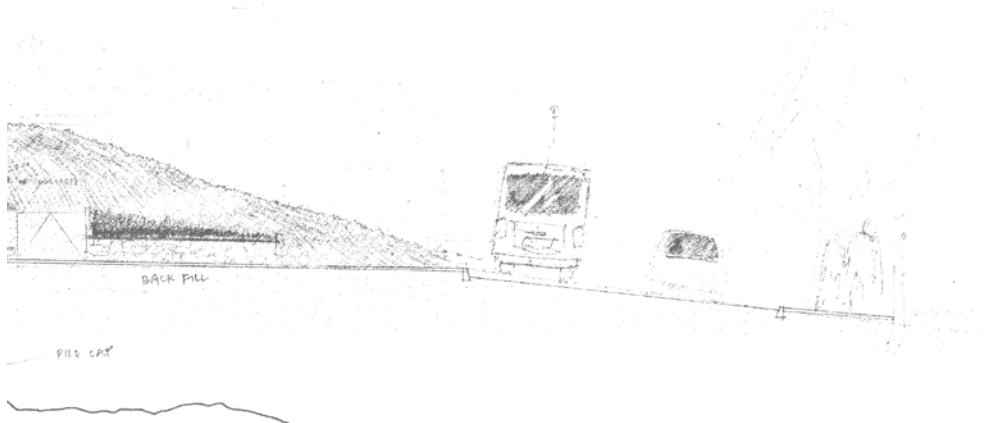




IN DOME : 170 SEATS  
OFF DOME : 700  
TOTAL : 870

**Fig.130.** The catwalk. In addition to creating an experience for the user, planetariums boast longevity; hence, ease of maintenance and provision for services needs to be considered. The speaker units are mounted externally to avoid obstruction within the dome. A series of down-lighters and up-lighters are used to accentuate the shape of the spherical room such that it provides an opportunity for passers-by to engage with the interior space.

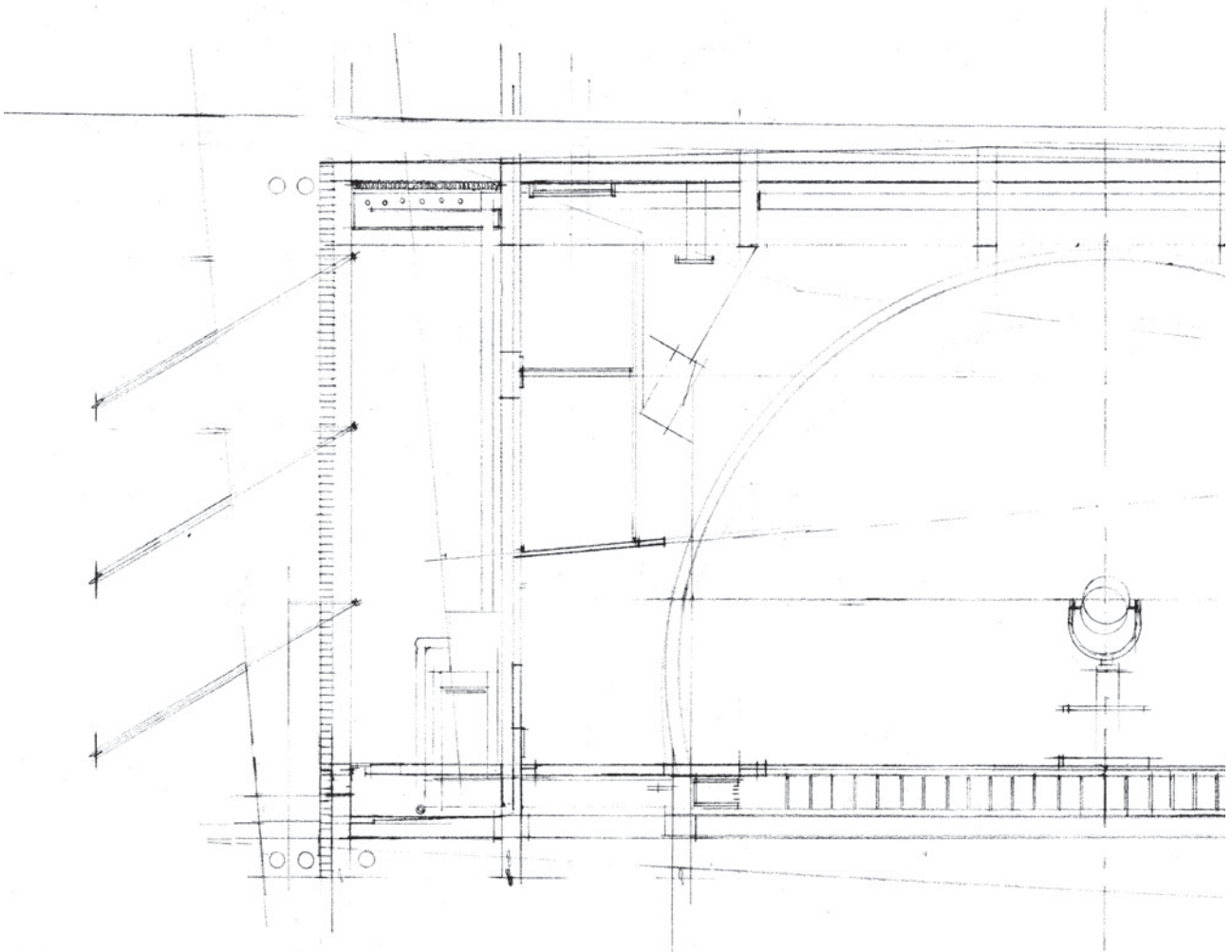
Ventilation is provided through a dehumidifier placed in the service room behind the north wall. This system imports air from the ground via earth tubes to ensure that the necessity for cooling is kept to a minimum. The extracted air is introduced into an insulated air-water heat exchange, before it is recirculated into the system. The service room is highlighted in the section on the following page.



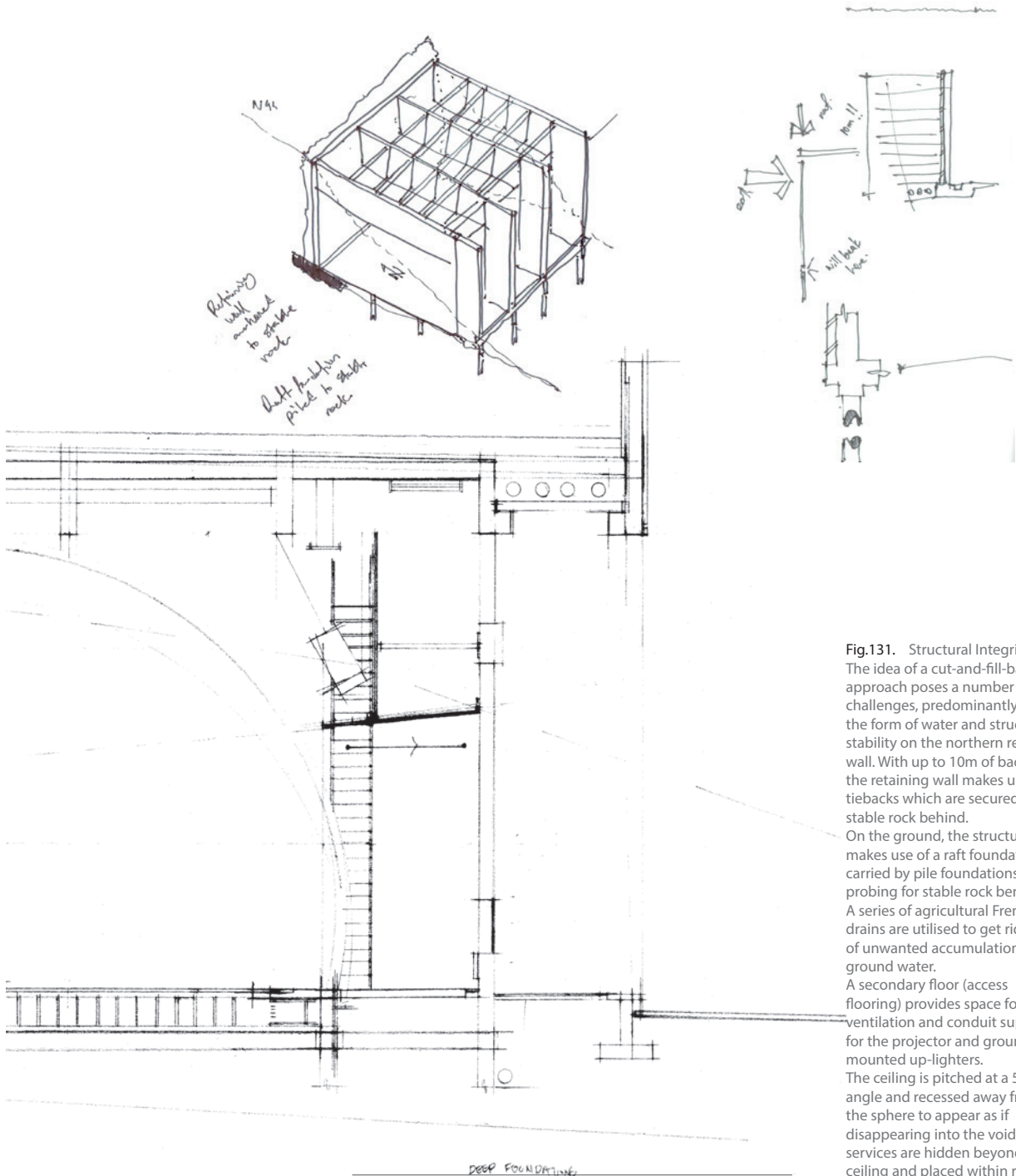


## 7.1.4 THE PLANETARIUM

*October reflection*



CRAWL SPACE



**Fig.131. Structural Integrity.** The idea of a cut-and-fill-back approach poses a number of challenges, predominantly in the form of water and structural stability on the northern retaining wall. With up to 10m of backfill, the retaining wall makes use of tiebacks which are secured to stable rock behind. On the ground, the structure makes use of a raft foundation, carried by pile foundations probing for stable rock beneath. A series of agricultural French drains are utilised to get rid of unwanted accumulation of ground water. A secondary floor (access flooring) provides space for ventilation and conduit support for the projector and ground mounted up-lighters. The ceiling is pitched at a 5° angle and recessed away from the sphere to appear as if disappearing into the void. The services are hidden beyond the ceiling and placed within reach of the catwalk.

## 7.1.5 THE PLANETARIUM

### Cladding note:

Custom 0.58mm thick 'white' powder coated perforated aluminium flat sheet cladding panels fixed with Stainless steel self tapping screws to 12mm MDF board bent to shape on site fixed to steel structure with s/s self tapping screws.

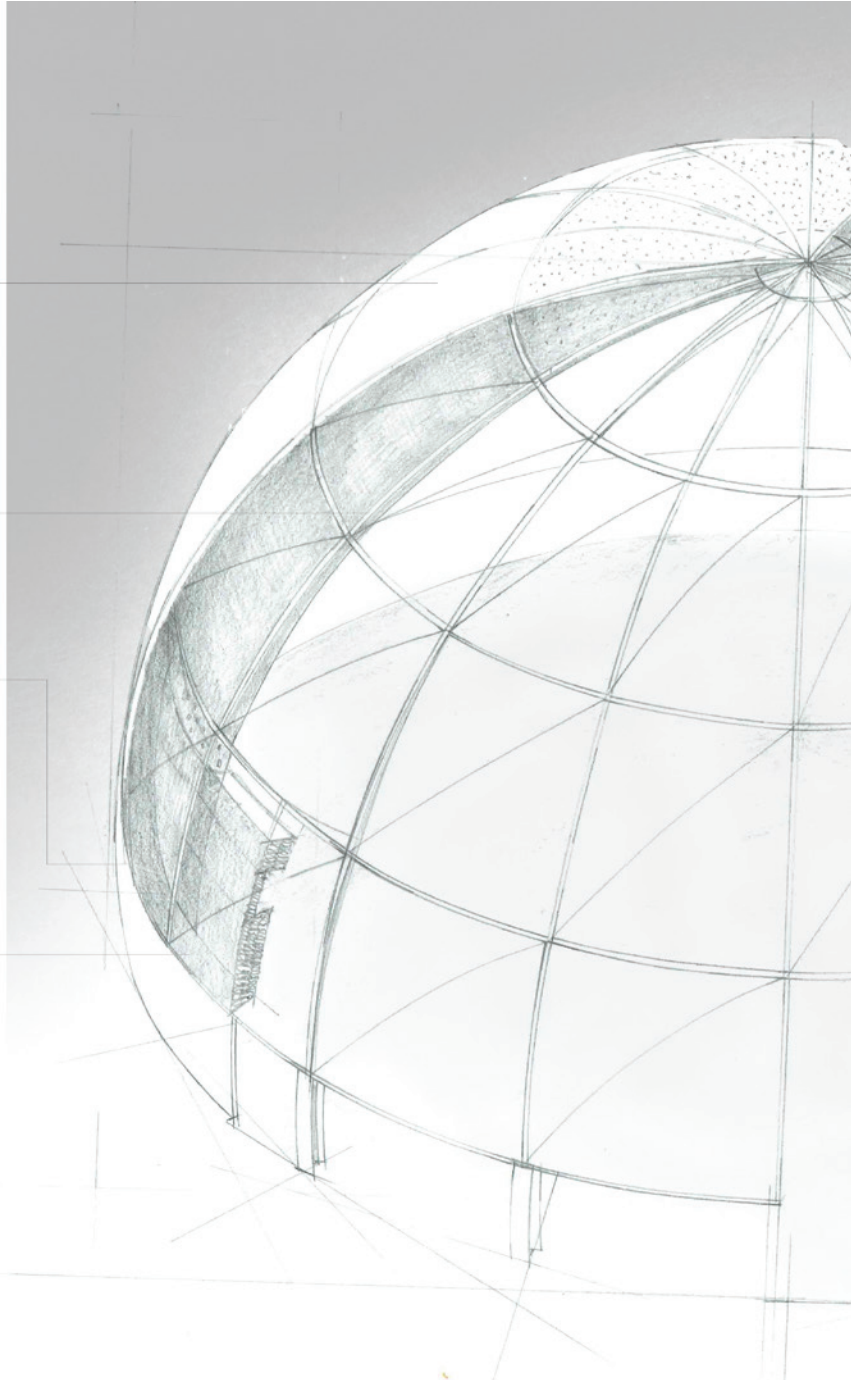
### Structure Note:

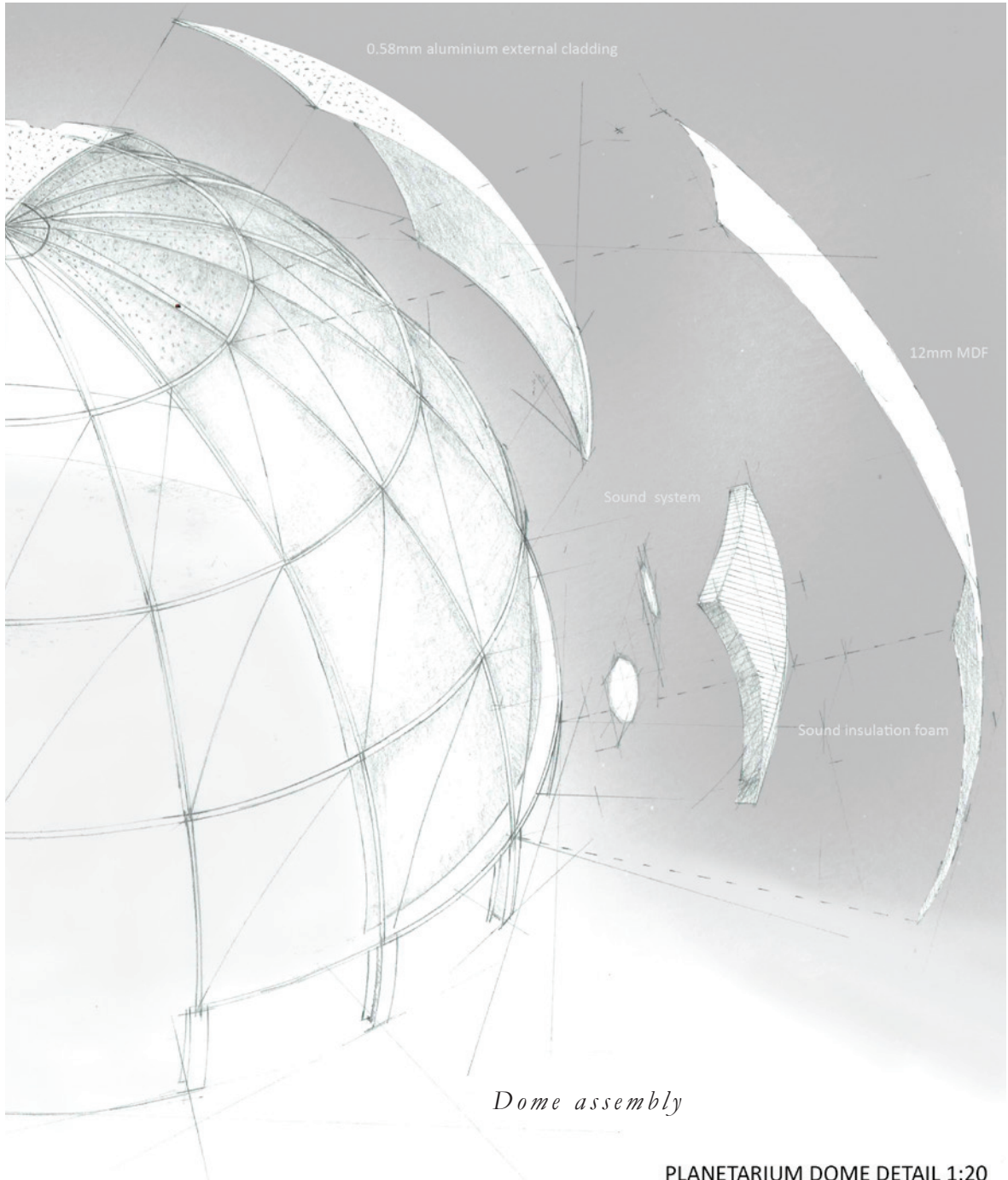
Compression Members: 40x40x3mm Galvanised Mild steel tubular sections with custom fixing plates fixed to 40x40x3mm Galvanised Mild Steel Tension ring beam with 6mm  $\emptyset$  s/s hexagon bolts.

Bottom Tension member: 40x40x3mm Galvanised Mild steel tubular sections fixed to custom bent 230x230x6mm H-columns with Galvanised mild steel end base plates chemically fixed with 6mm  $\emptyset$  stainless steel hexagon bolts to 300mm thick Reinforced concrete ground ring beam as per Engineers detail and specifications.

### Acoustic Note:

Noise dampening foam to be propped in place with straining wire. Positioned between the MDF board and cut out where speakers are located. Conduits for sound system to be designed by engineer to fit within the provided cavity between the MDF layers.

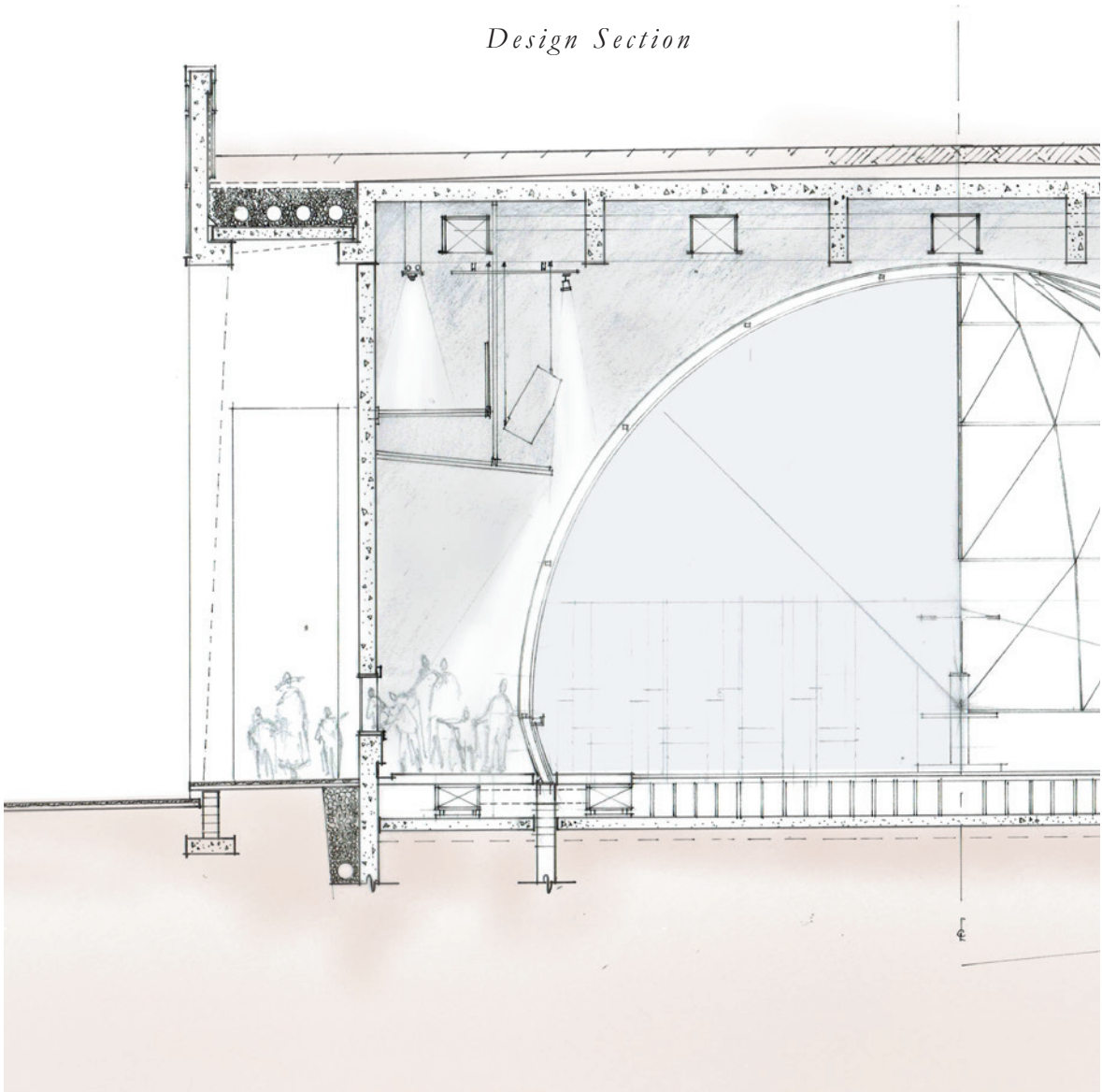


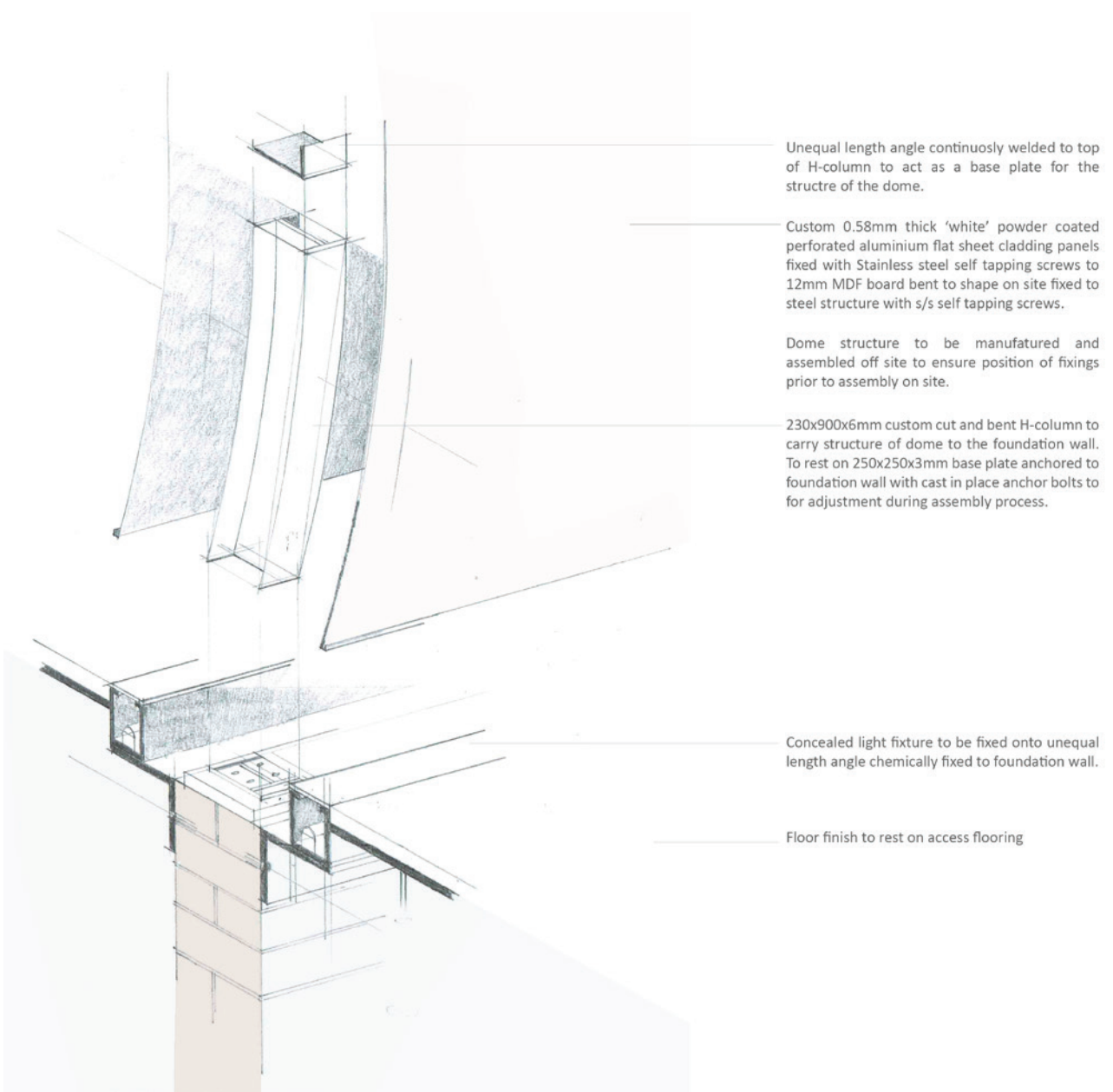




## 7.1.6 THE PLANETARIUM

*Design Section*





*Footing detail 1:20*



## 7.2 WATER

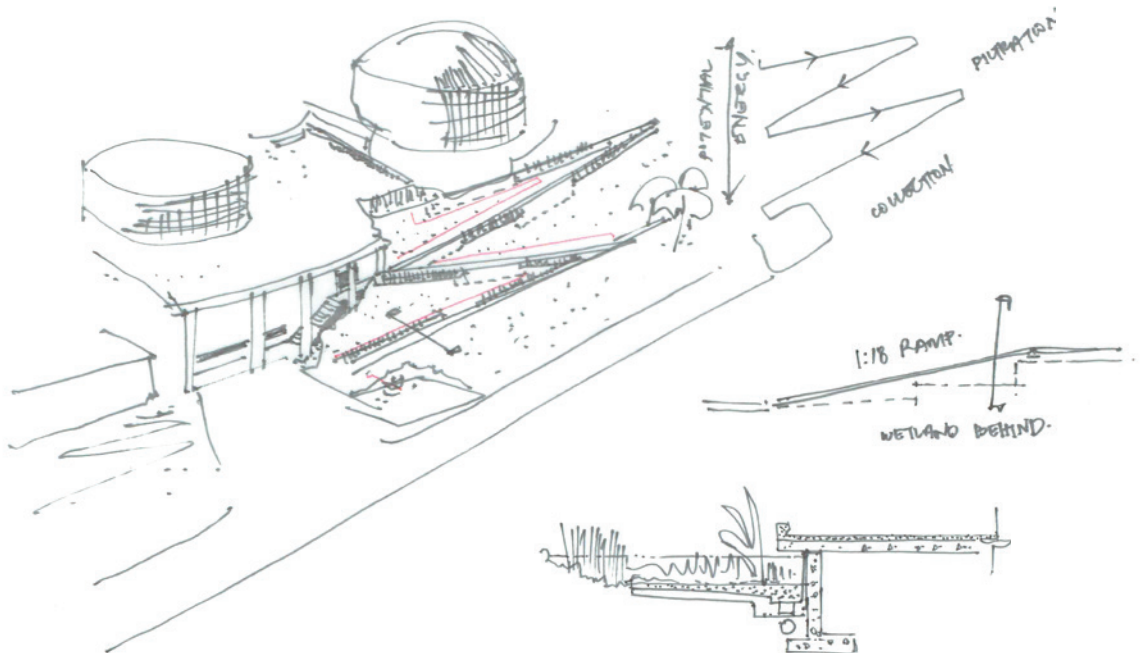
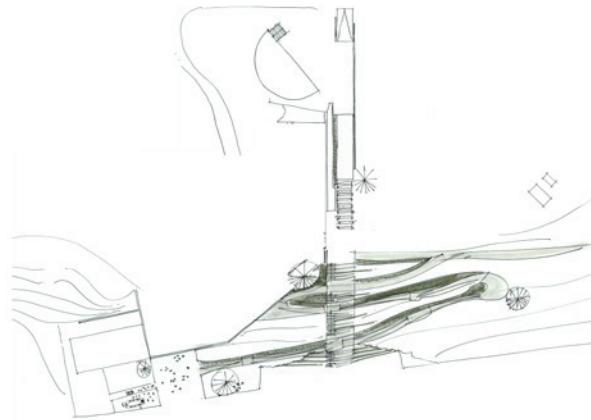
### *Rain water drainage and filtration*

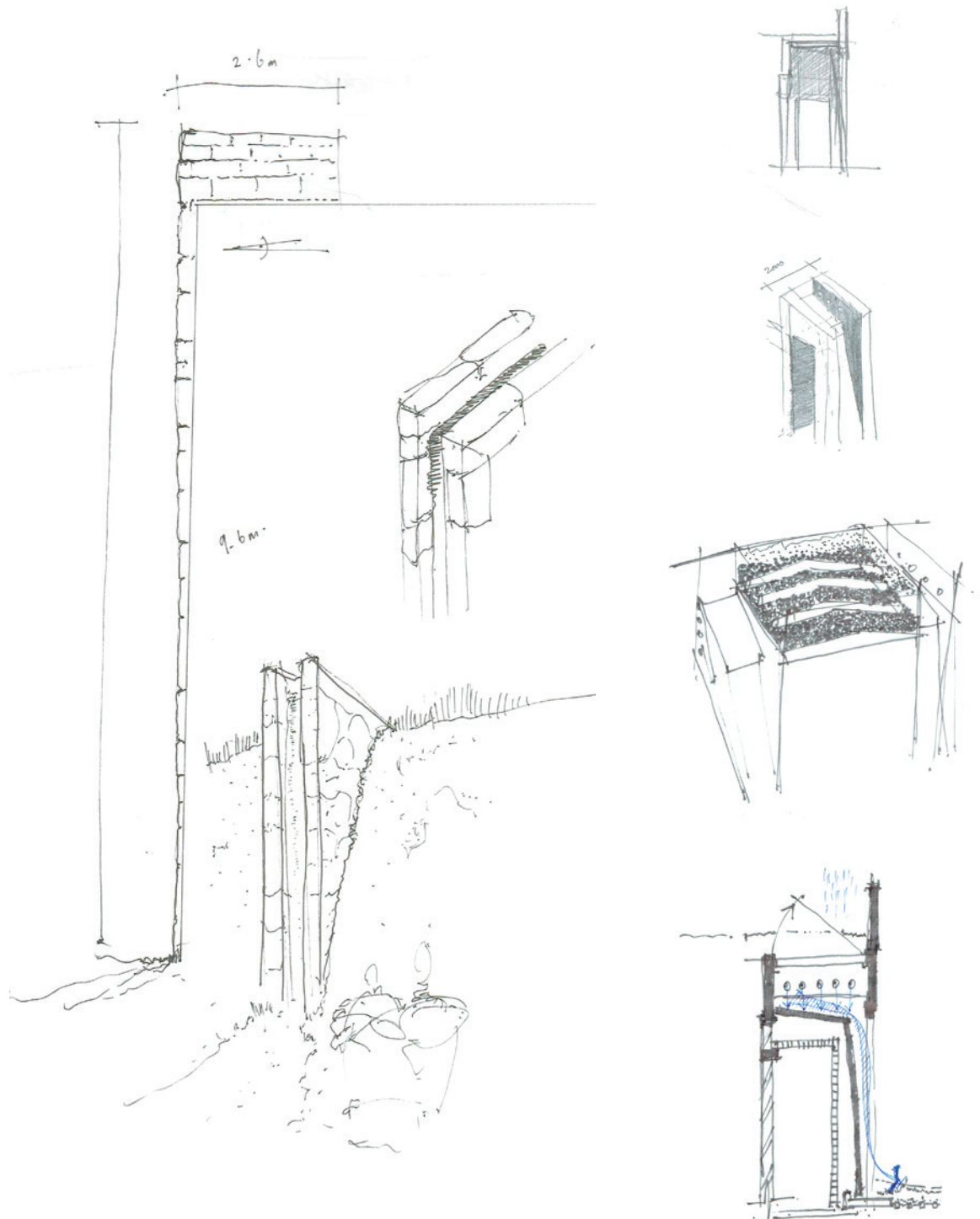
Fig.132. Approach to water.

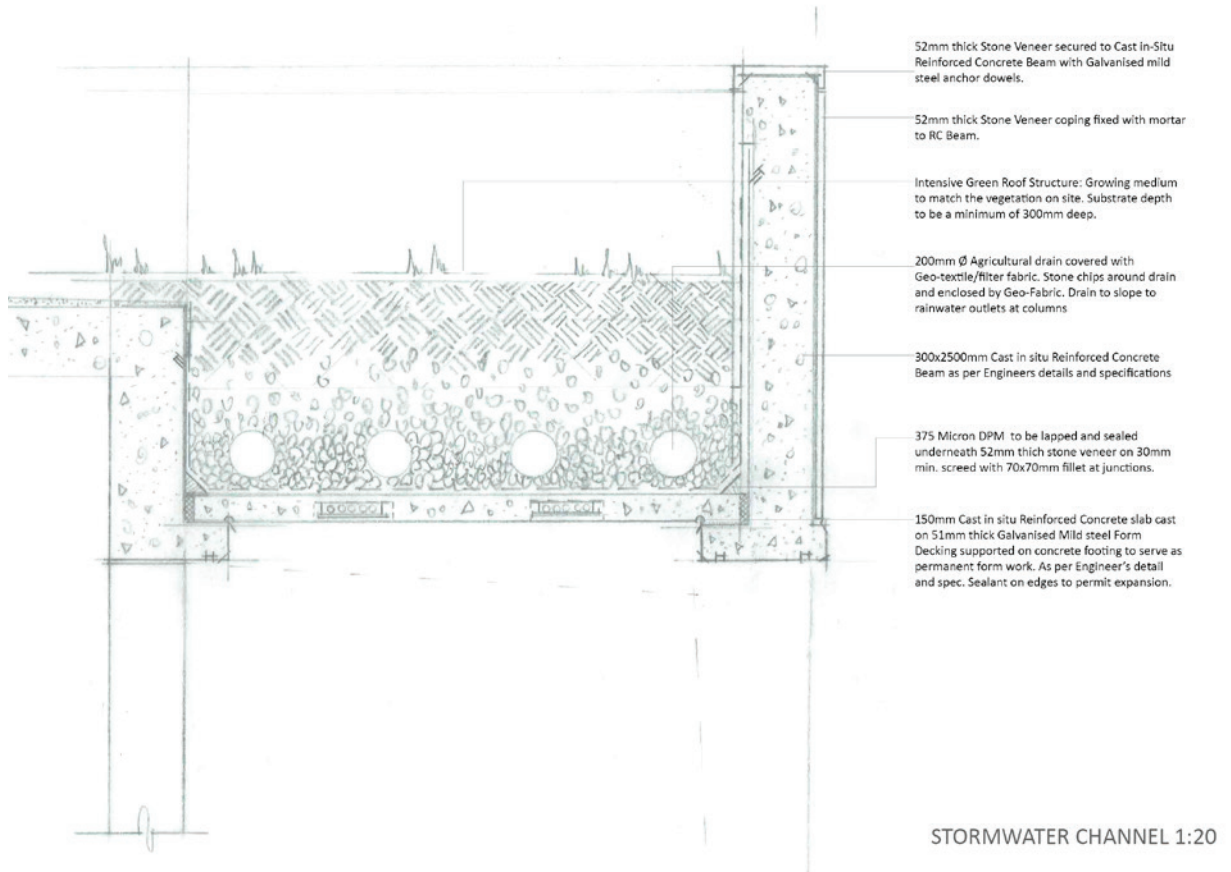
At the summit of the hill, there is no opportunity to capture run-off water from adjacent sites.

Thus, the design aims to slow down storm water and filter it, before tapping off portions of it for the use within the building.

The filtration process occurs within the terraces such that the water is cleared from any debris or dirt before slowly being released back into the water table. This is done through a series of connected sub-surface flow wetlands that align themselves with the ramps. This breaks the rigidity of the ramps and provides an opportunity to highlight the scarcity of water. At a higher level, the columns of the main structure act to transport water down and are detailed across. This is done to disperse water effectively from the green roof above. Maintenance and accessibility are also considered.





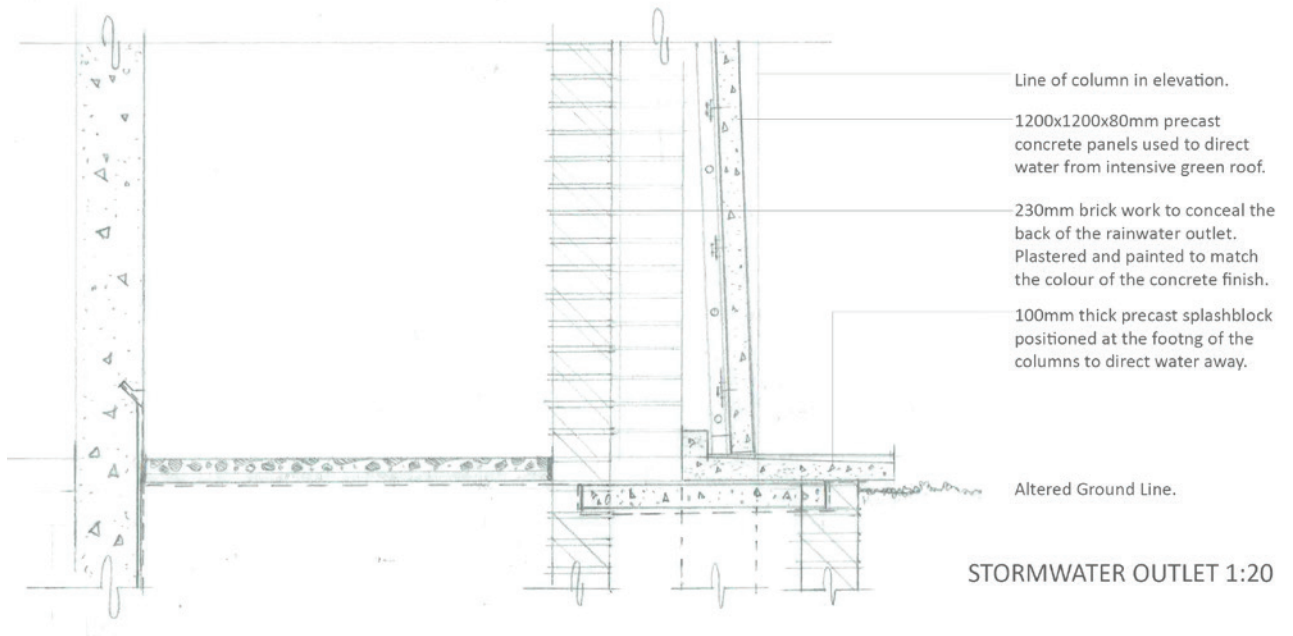
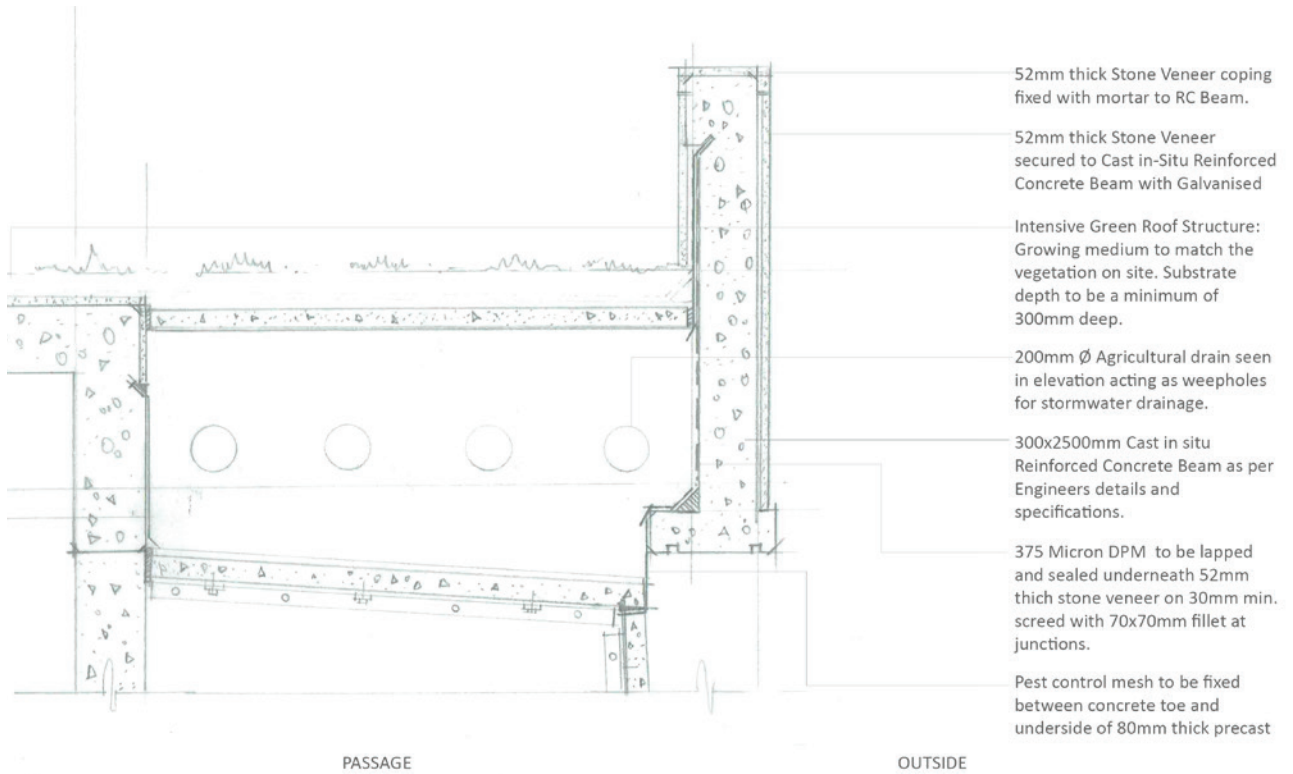


## 7.2.1 WATER TREATMENT

### *Highlighting the collection of water*

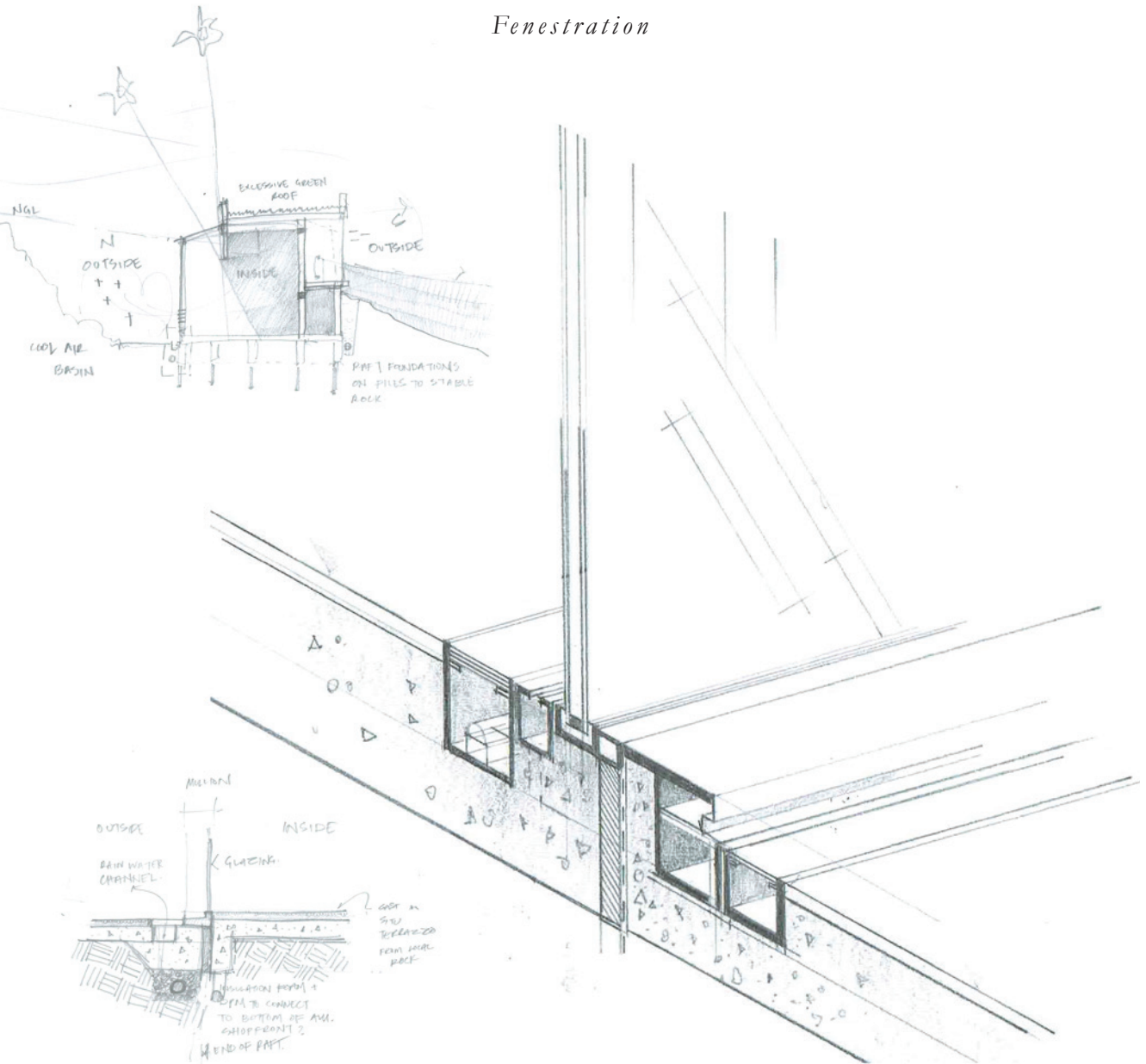
**Fig.133.** Filtration and discharge. Filtration occurs on this level, providing a sediment-free discharge through the use of a French drain system. Positioned at a central incline, water flows towards two opposite discharge points (as detailed on the previous page). Four drains are provided to provide a fail-safe discharge of water accumulating on the roof.

**Fig.134.** Highlighting water. On the opposite page the discharge points can be seen in elevation as weep holes, topped with a precast concrete lid above the column. The lid retains a portion of the growing medium whilst remaining accessible for service. The weep holes discharge onto an angled concrete panel that allows the water to drain until it meets the splash block, where it is then collected via underground pipes.



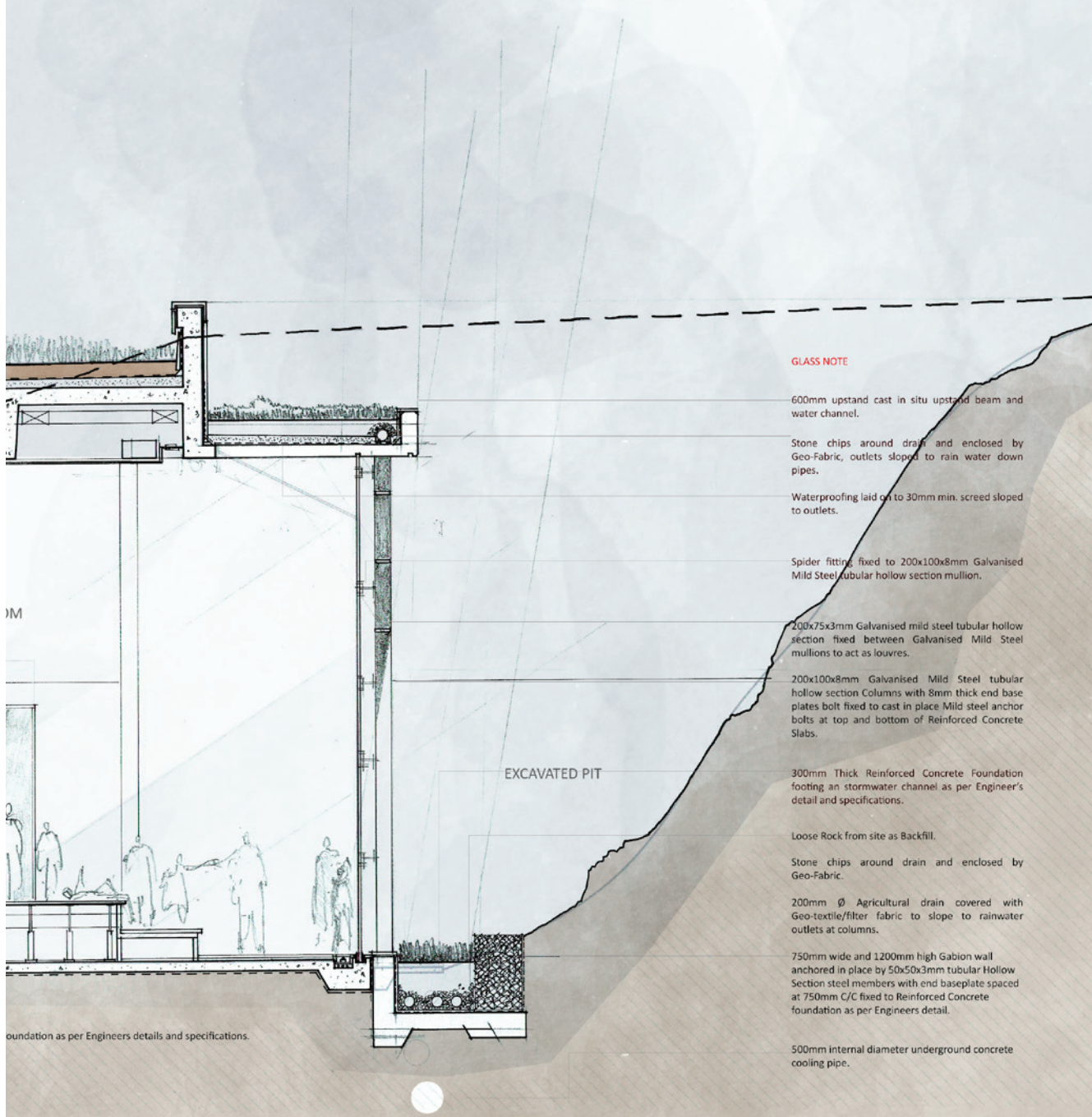
## 7.3 LIGHT

### *Fenestration*



FLUSH GLAZING DETAIL 1:10





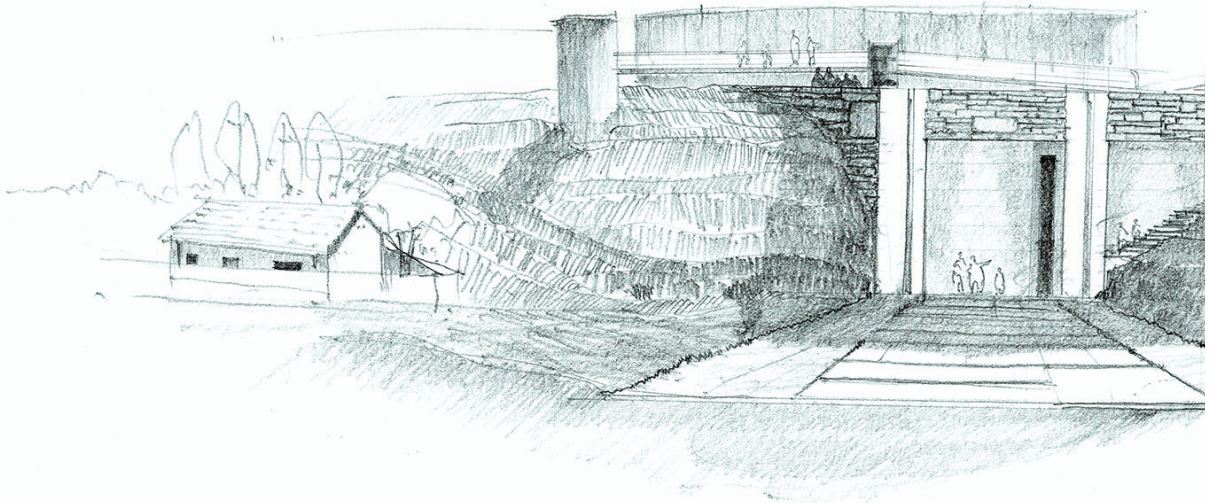


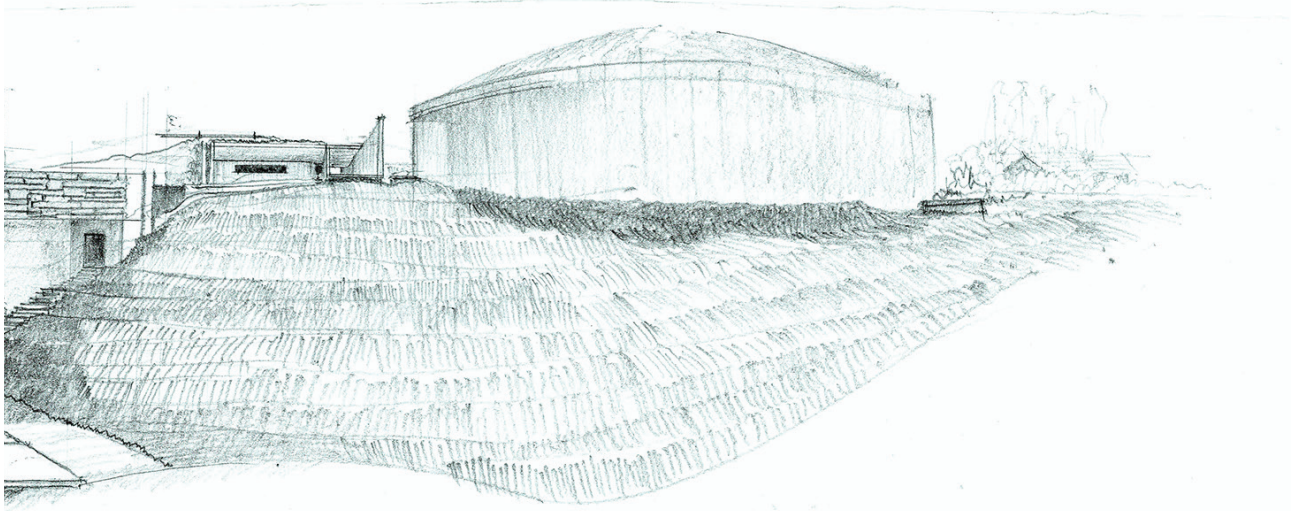
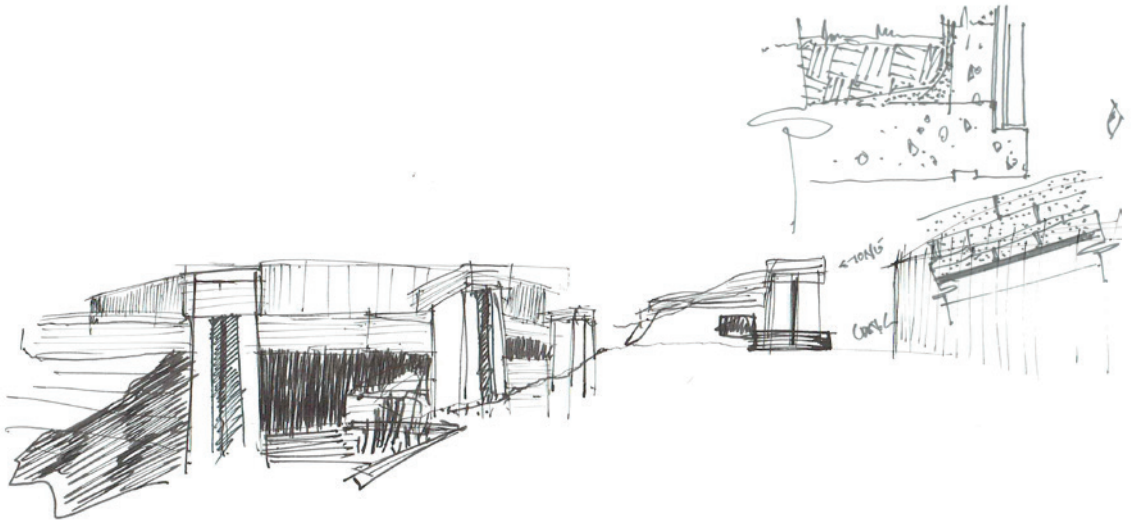
## 7.4 THE ELEVATION

### *Articulating the facade*

**Fig.135.** The elevation.

The technical development of the elevation focuses on the cladding system used to achieve the required aesthetic. Initially envisioned as a horizontal band of stone masonry, the southern elevation suspends the rock to appear as if the building was carved out of the landscape. The elevation below illustrates how stone recycled from the earth works could be used. To achieve this, the stone would be cut to shape from larger pieces of rock. This process would require the stone to be bonded to the upstand beam due to the lack of uniformity in the size of stone. Elevation: August, 2016. Sketches: August, 2016.



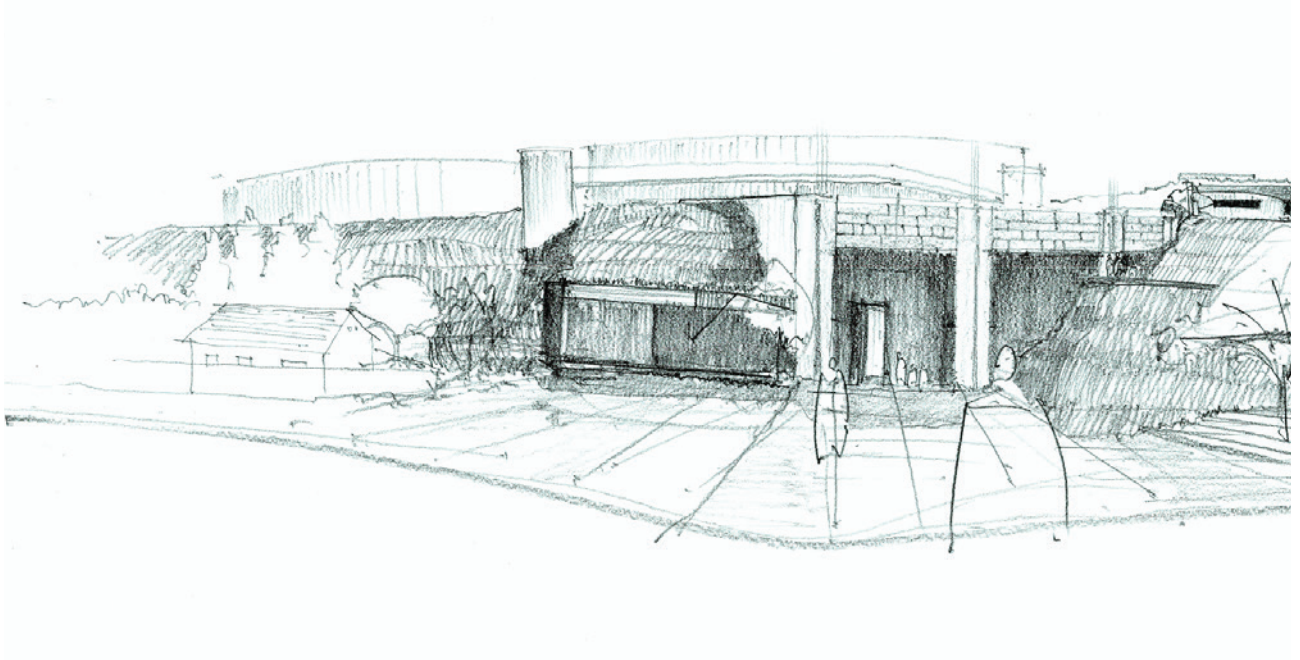


## 7.4.1 THE ELEVATION

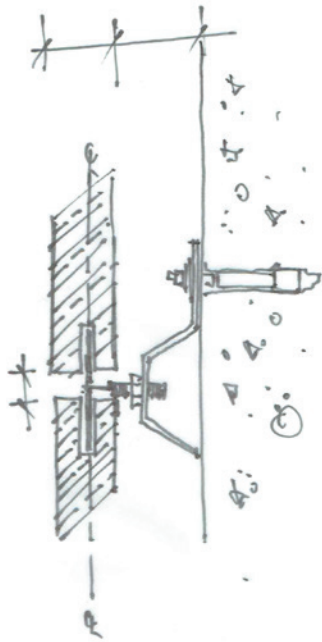
### *Articulating the facade*

**Fig.136.** The elevation.

This iteration considers a uniform pattern which allows for the introduction of an anchor, allowing the stone to attach in an orderly fashion to the concrete upstand beam. Although this system would provide for ease of assembly, the process of preparing the rock might require more skilled labour and could be time consuming. Elevation: August, 2016. Details: September, 2016.

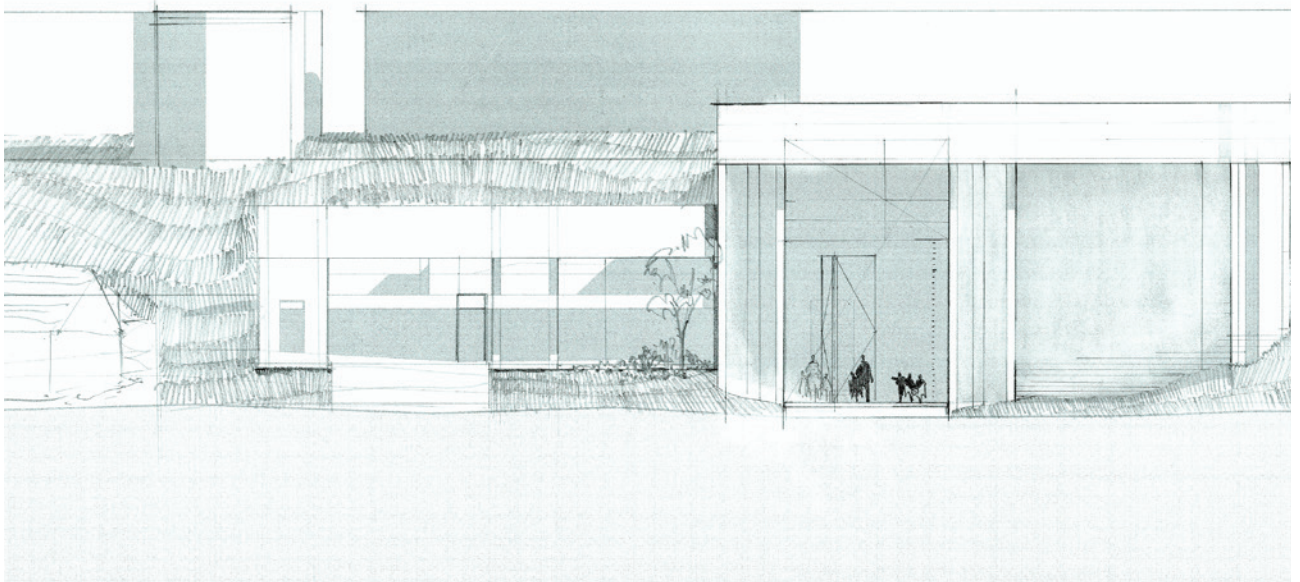
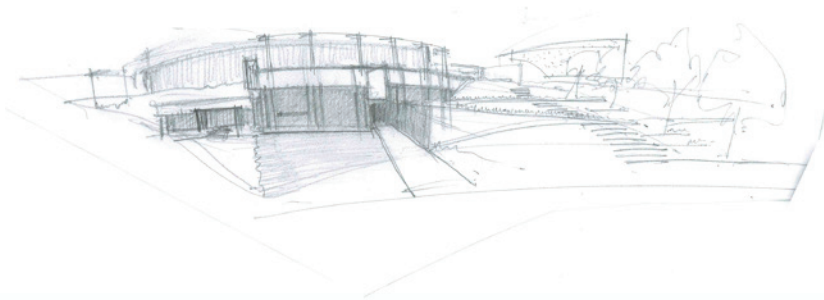


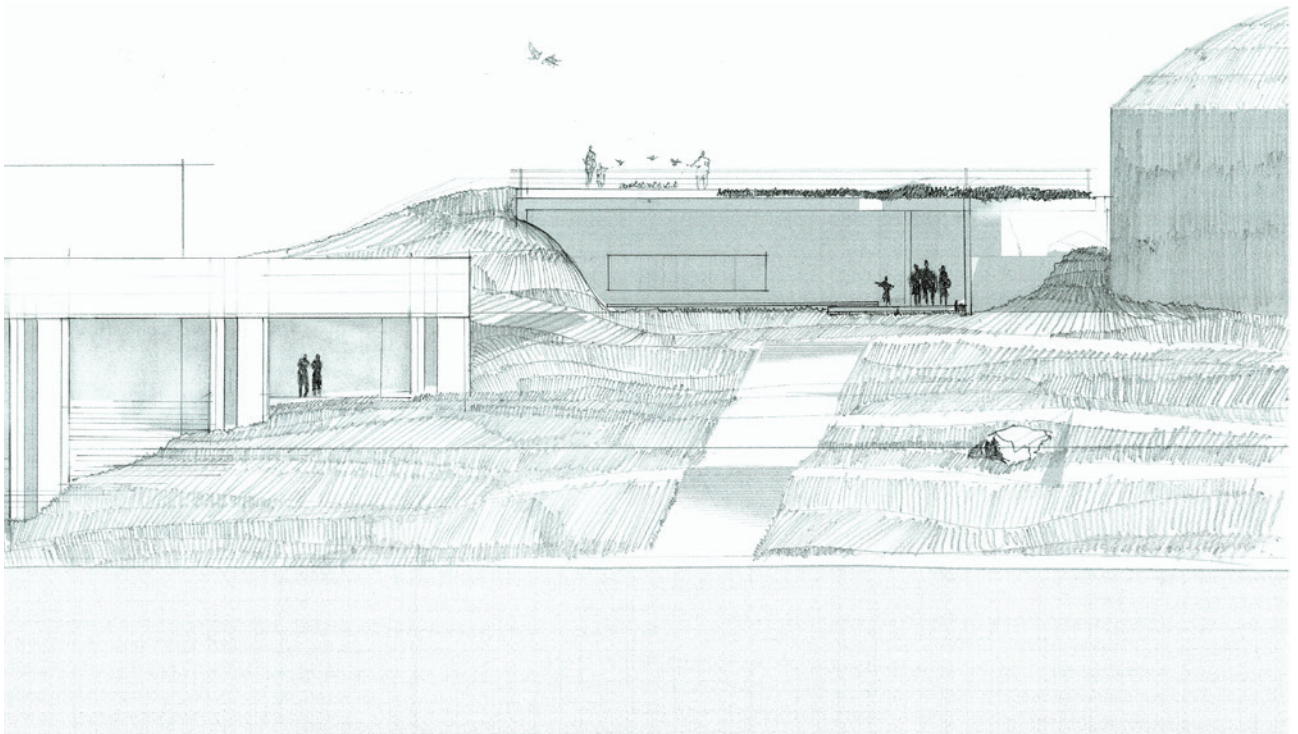
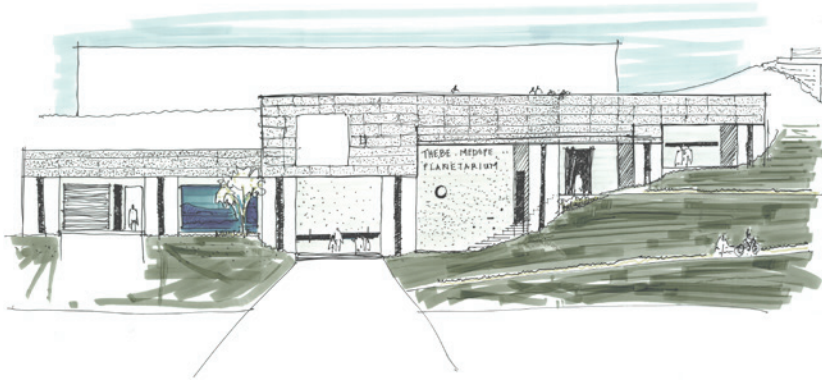




## 7.4.2 APPROACH

*Designing the elevation*

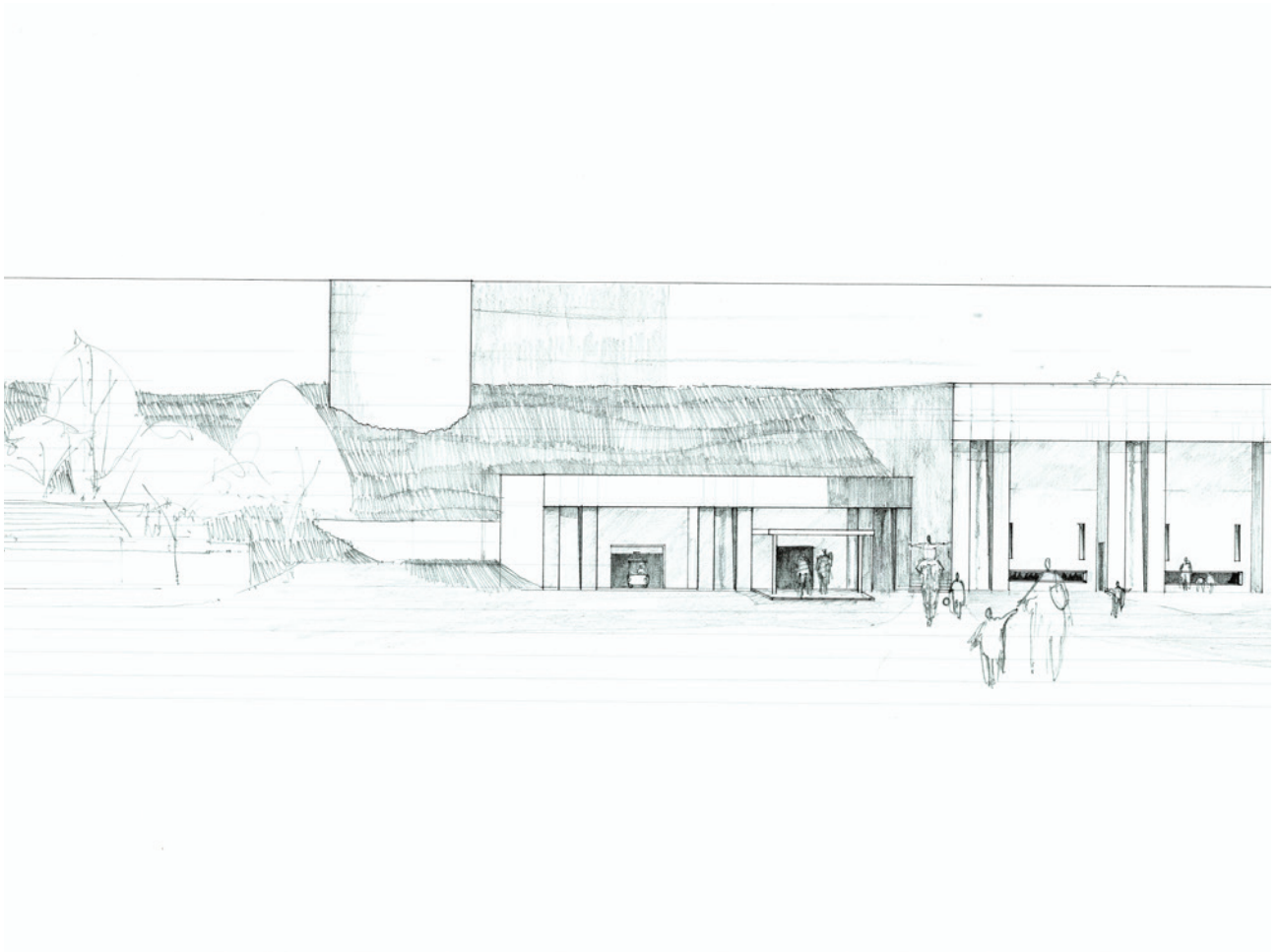




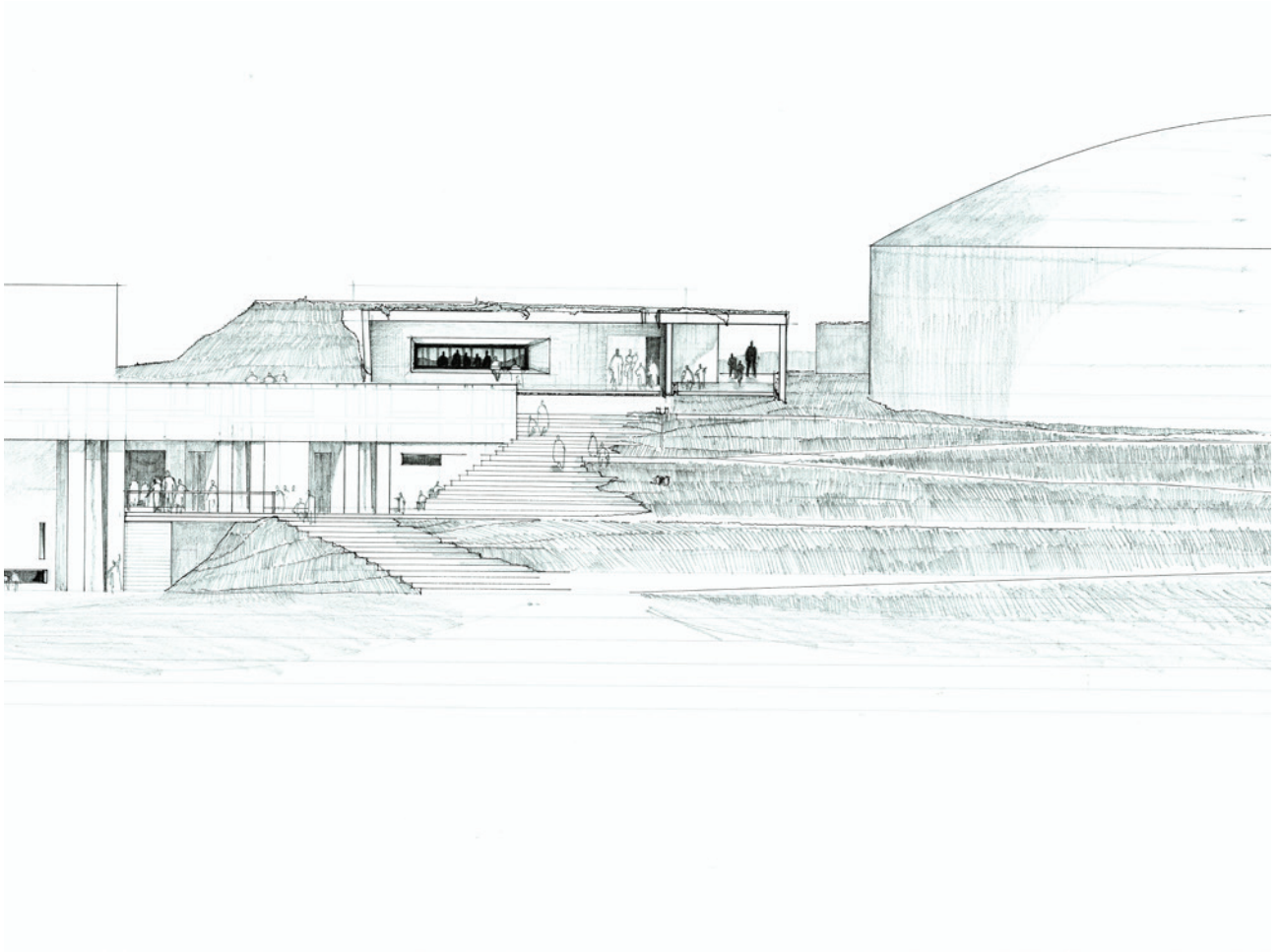


## 7.4.3 THE PLINTH

*Designing the Southern entrance*

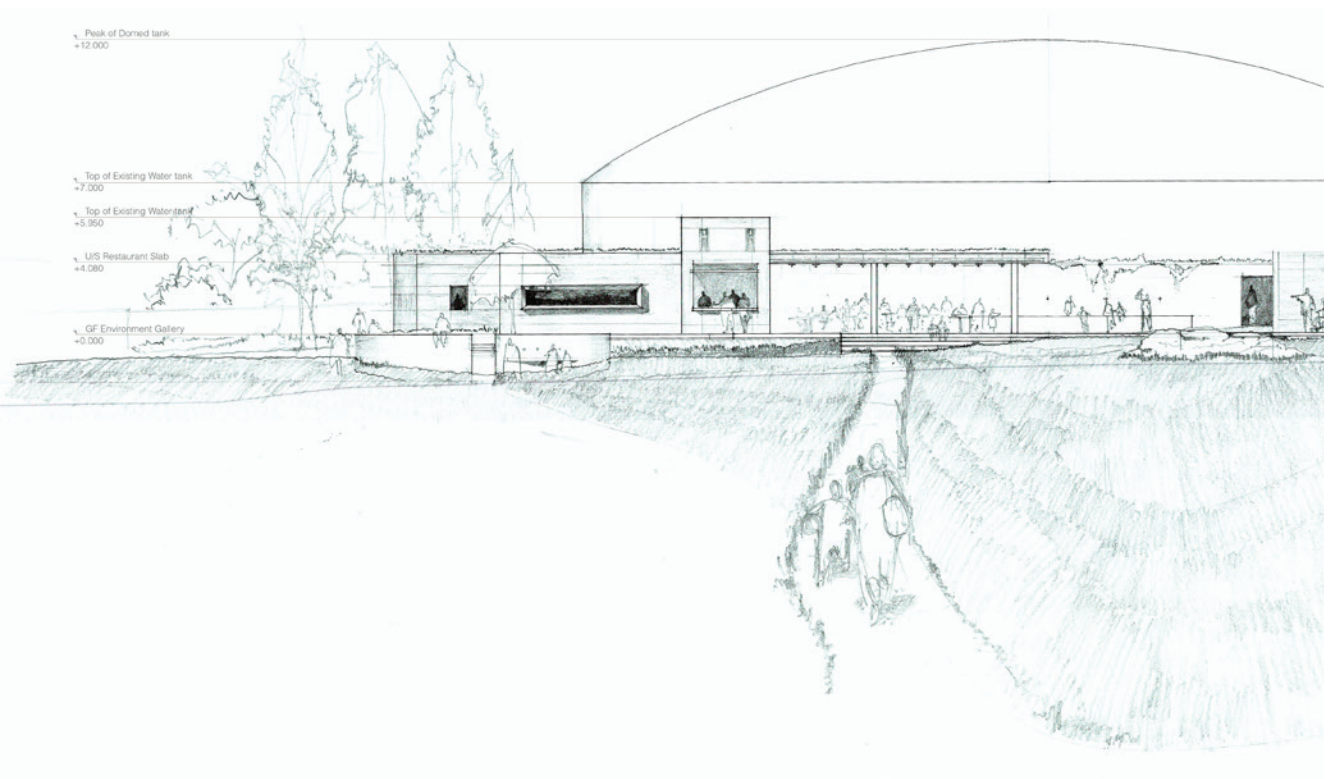


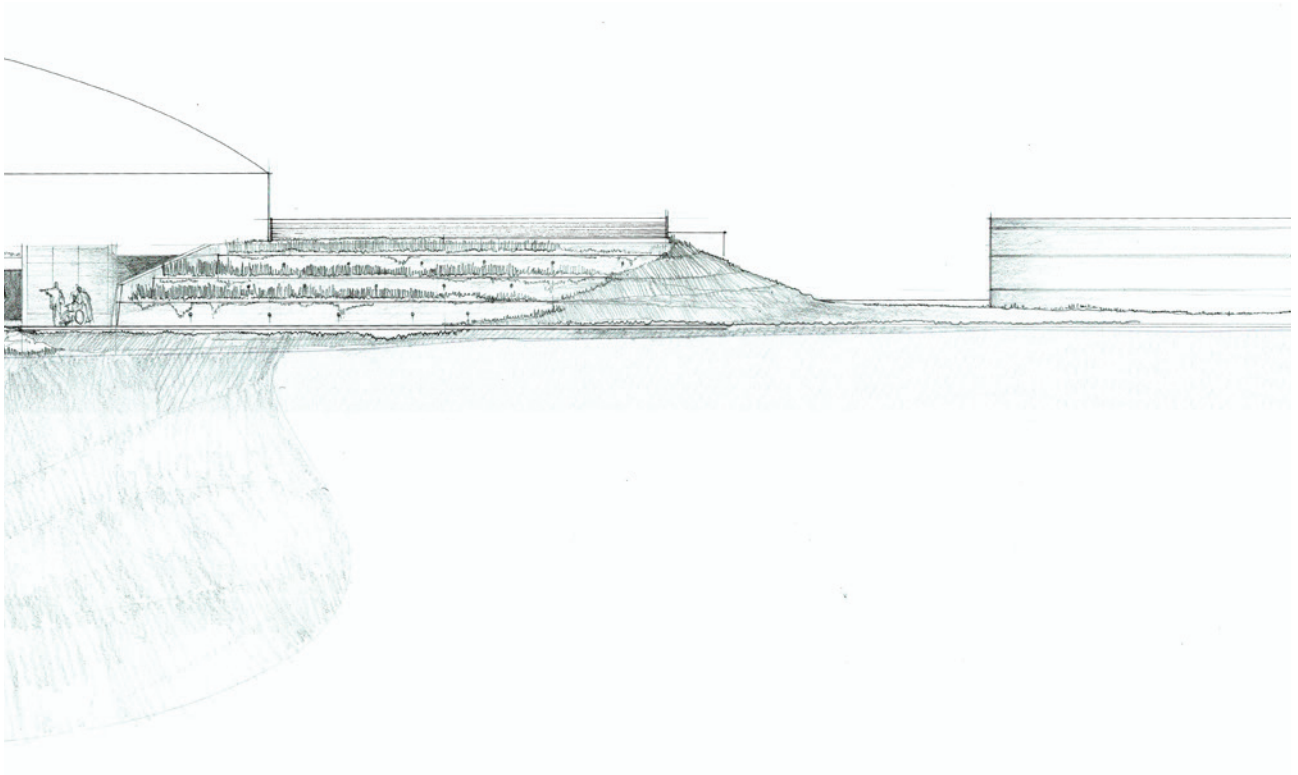
Southern Elevation NTS drawn at 1:100



## 7.4.4 THE PARK

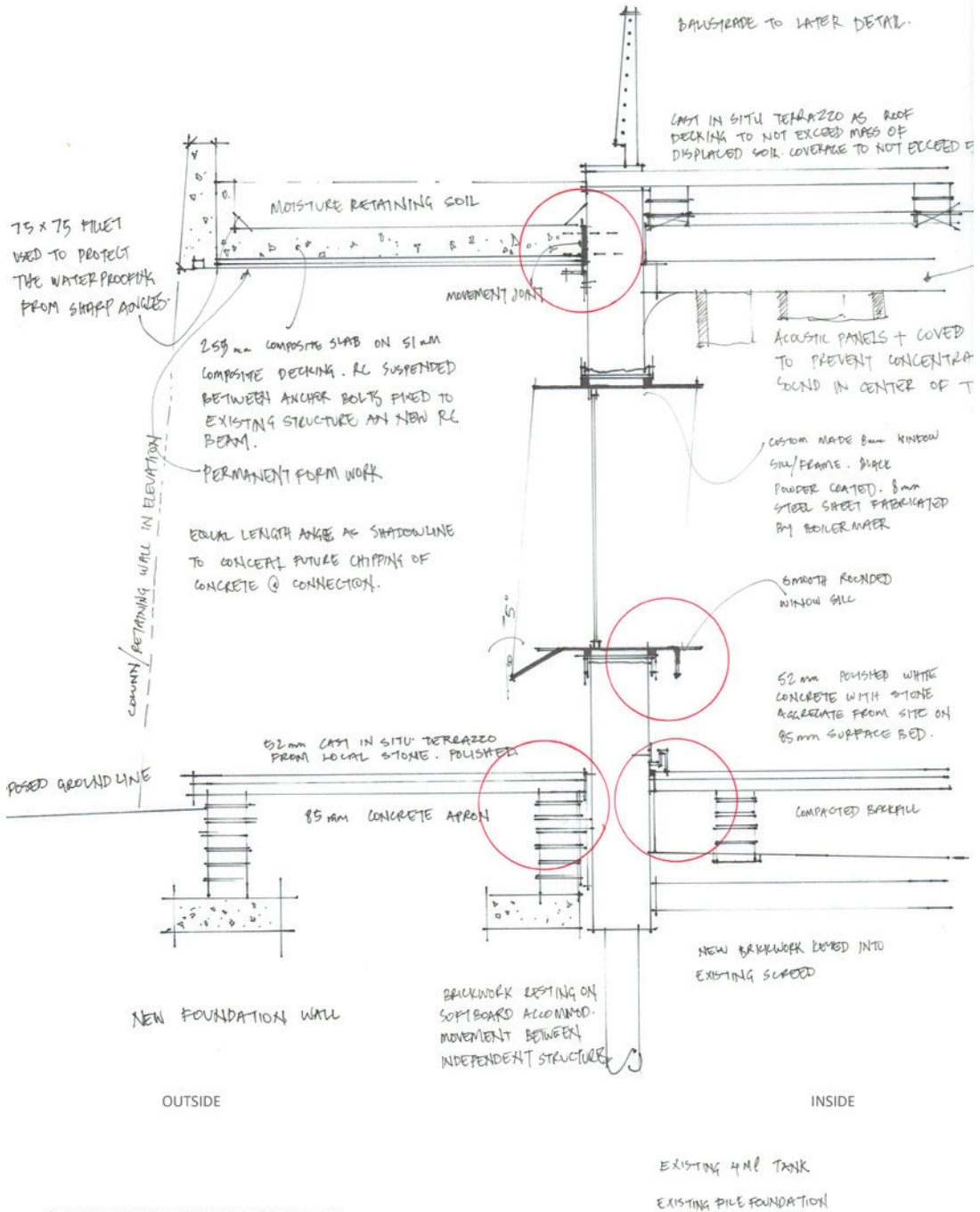
*Designing the Northern entrance*



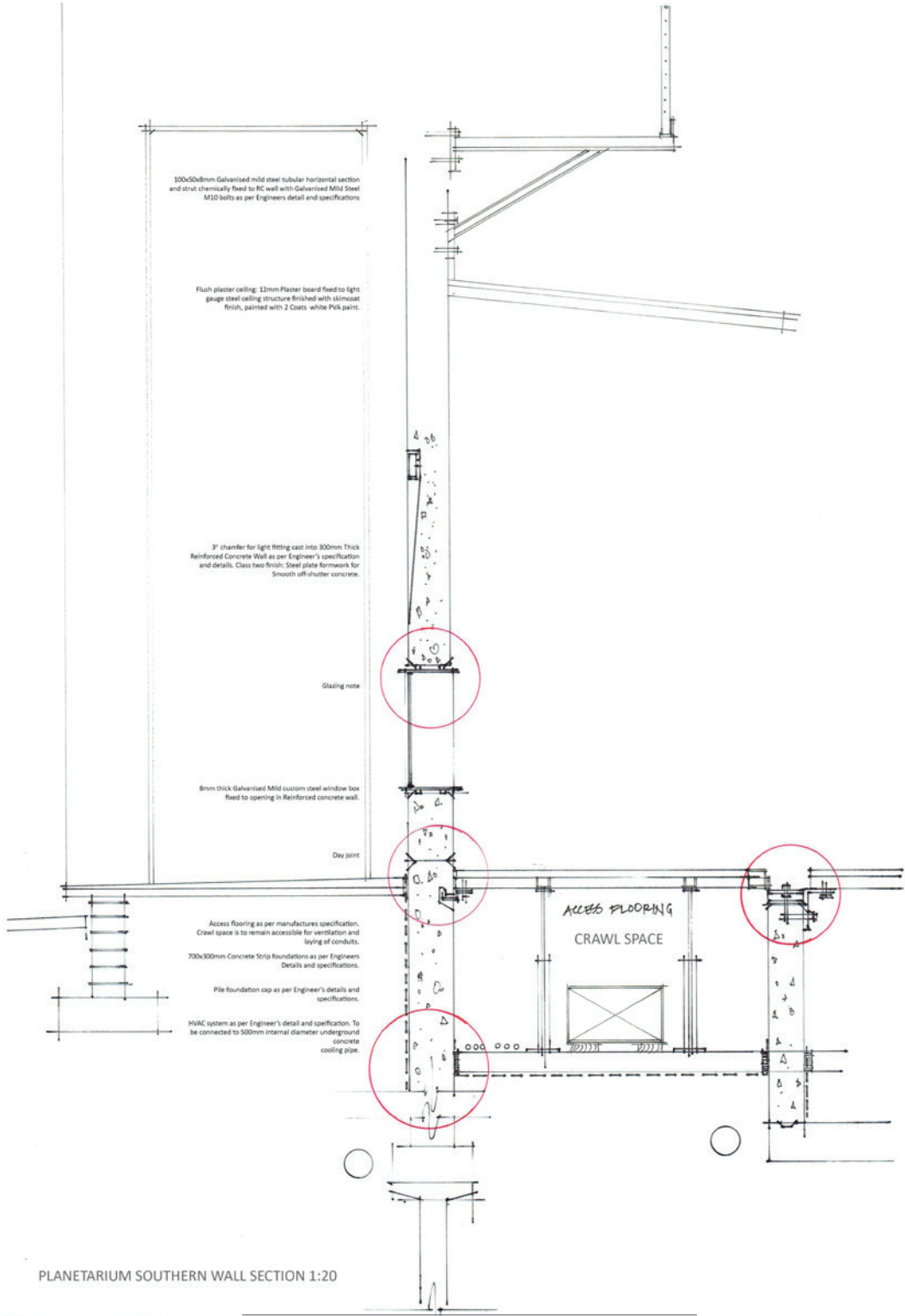




## 7.5 1:20 EXPLORATION



ENVIRONMENT GALLERY WALL SECTION 1:20



## 7.6 SITE PLAN

*Drawn 1:500 illustration NTS*



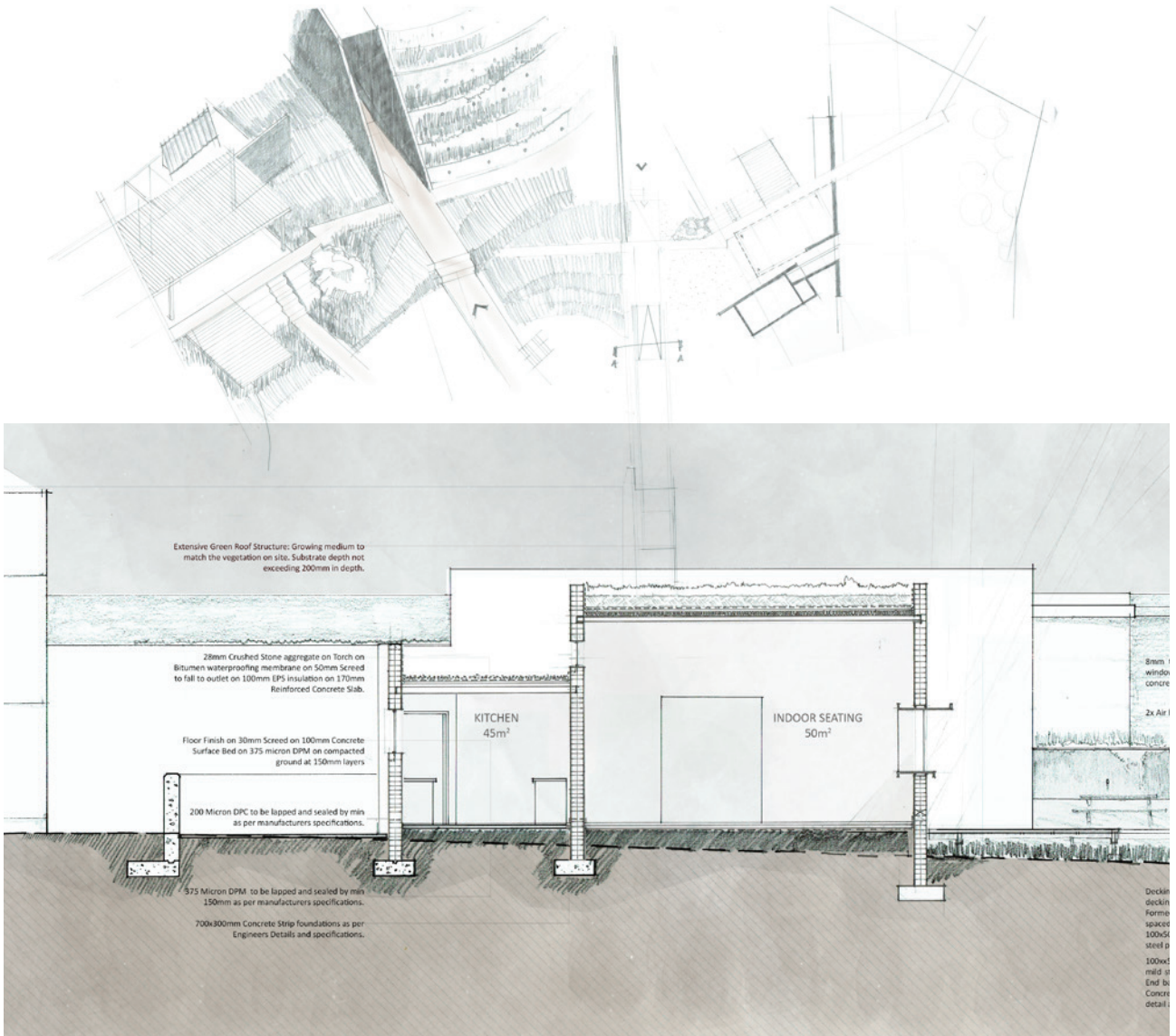


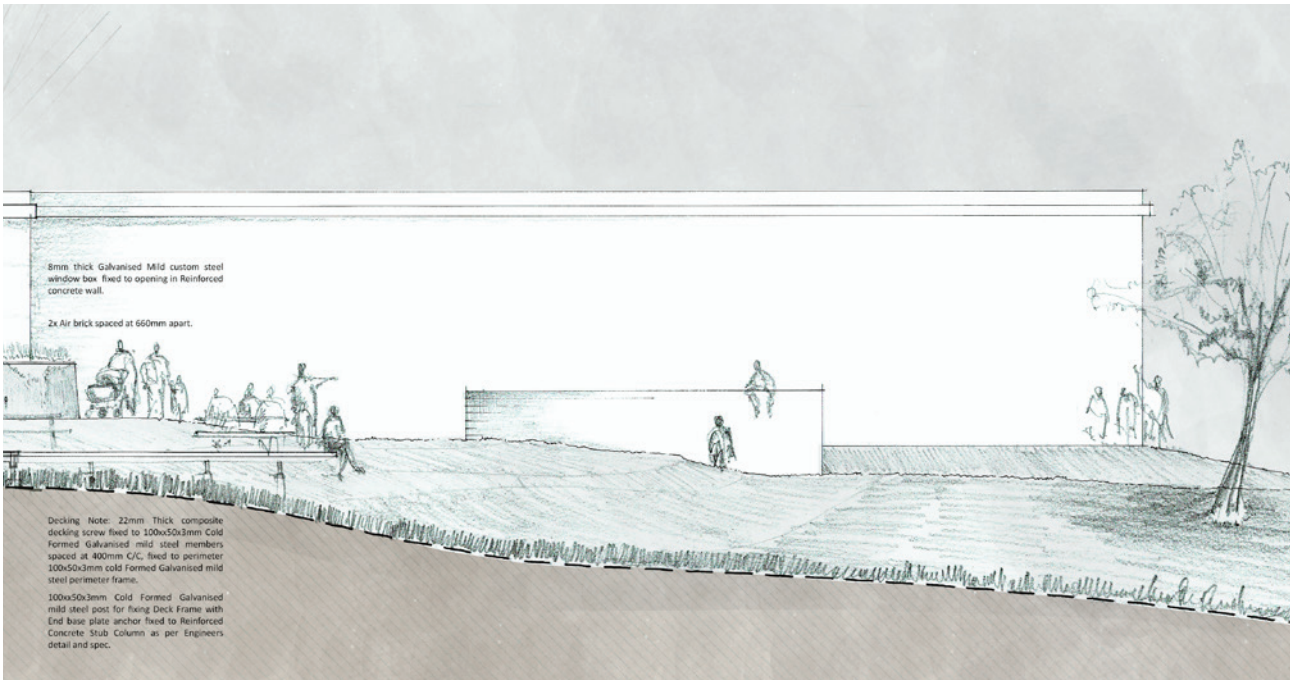
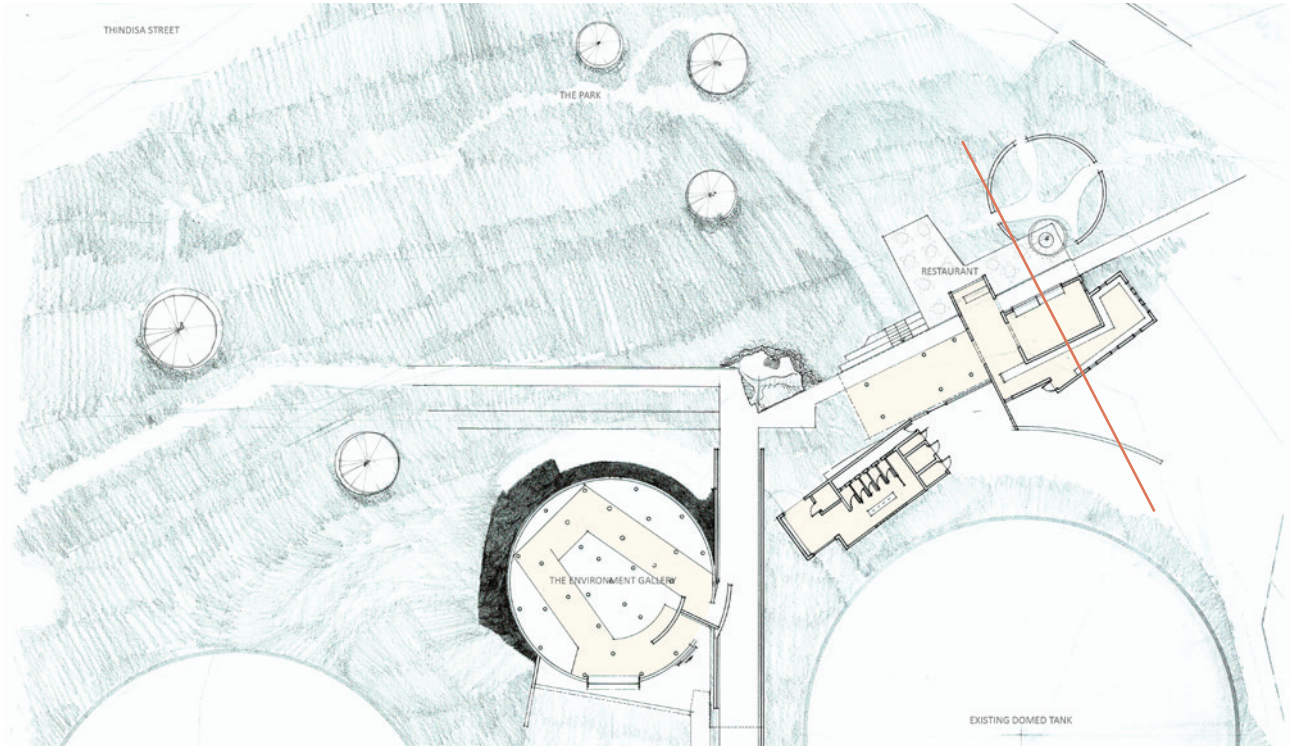




## 7.6.1 THE RESTAURANT

*1:50 Section illustration NTS*

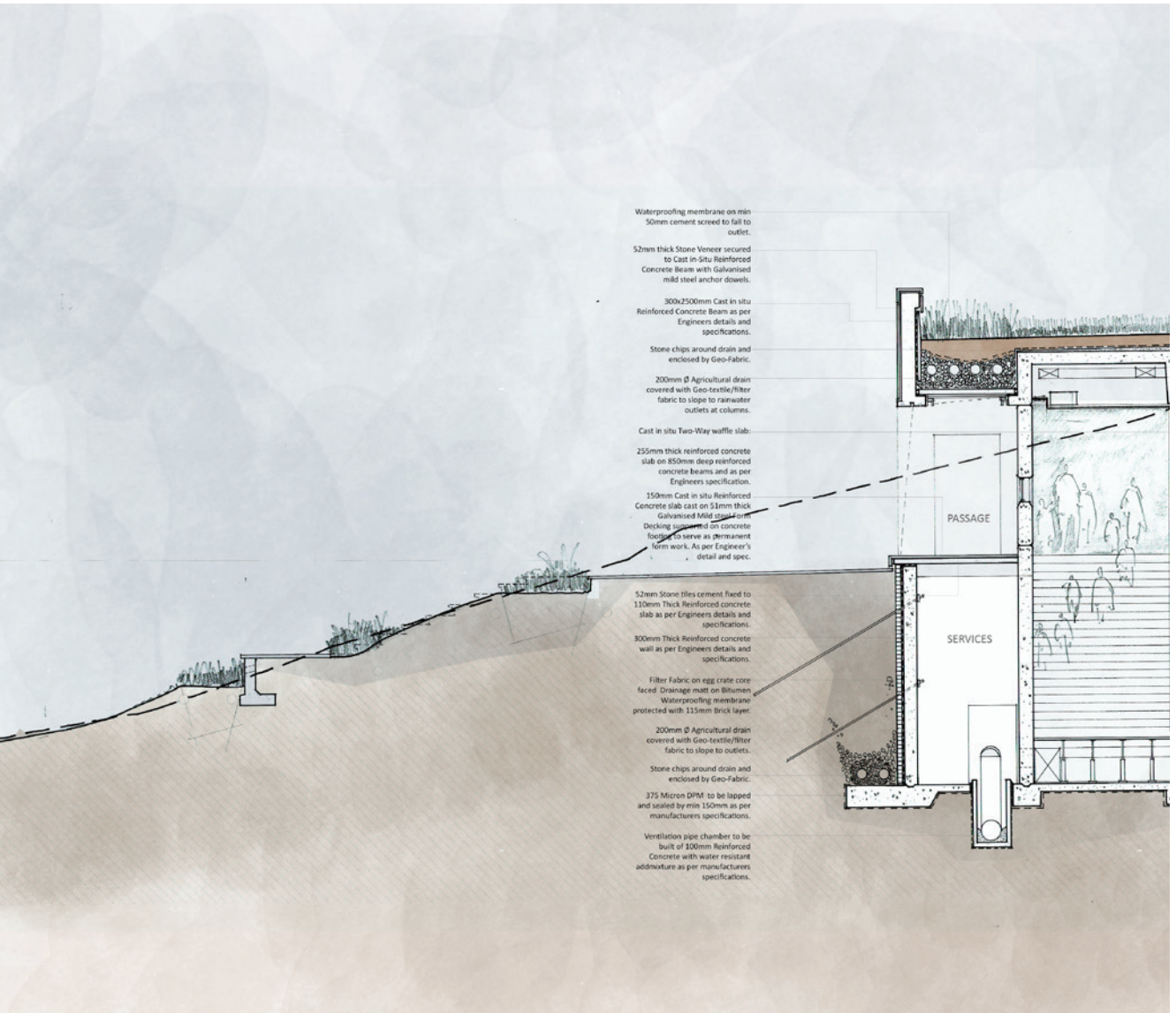


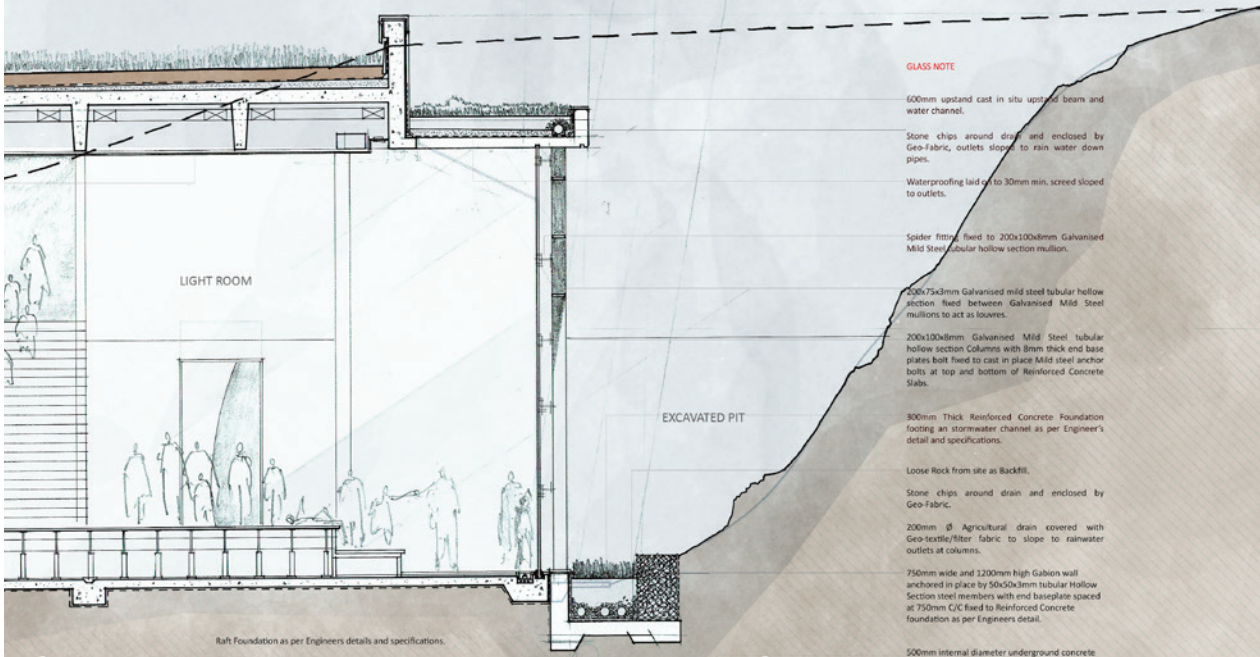
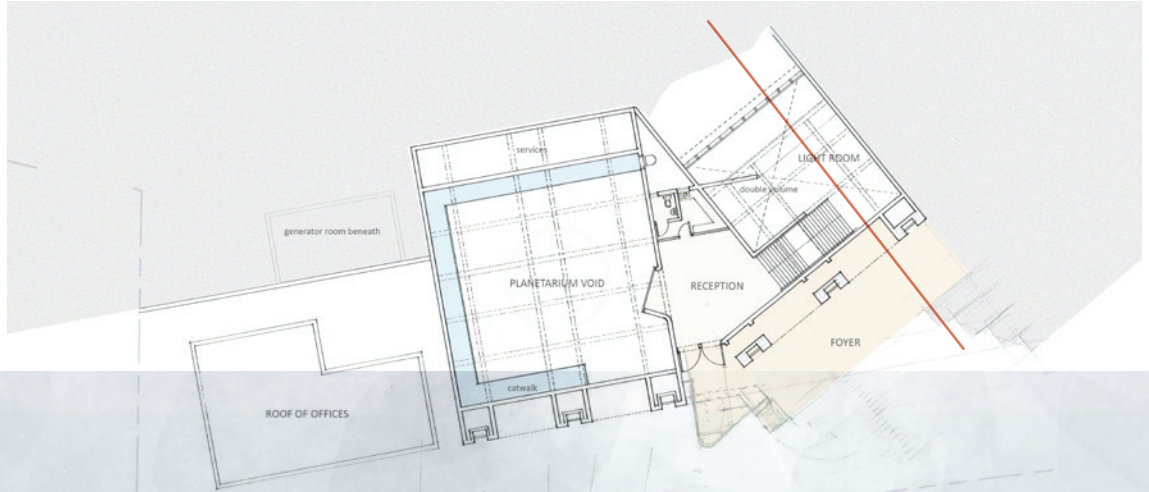




## 7.6.2 THE LIGHT ROOM

*1:50 Section illustration NTS*

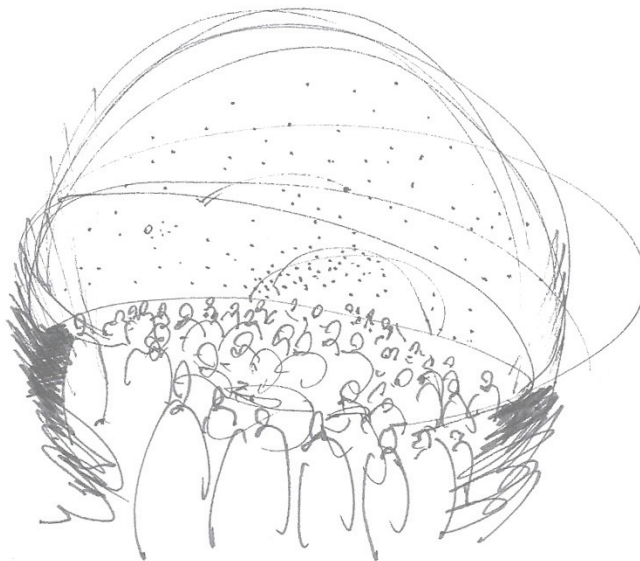
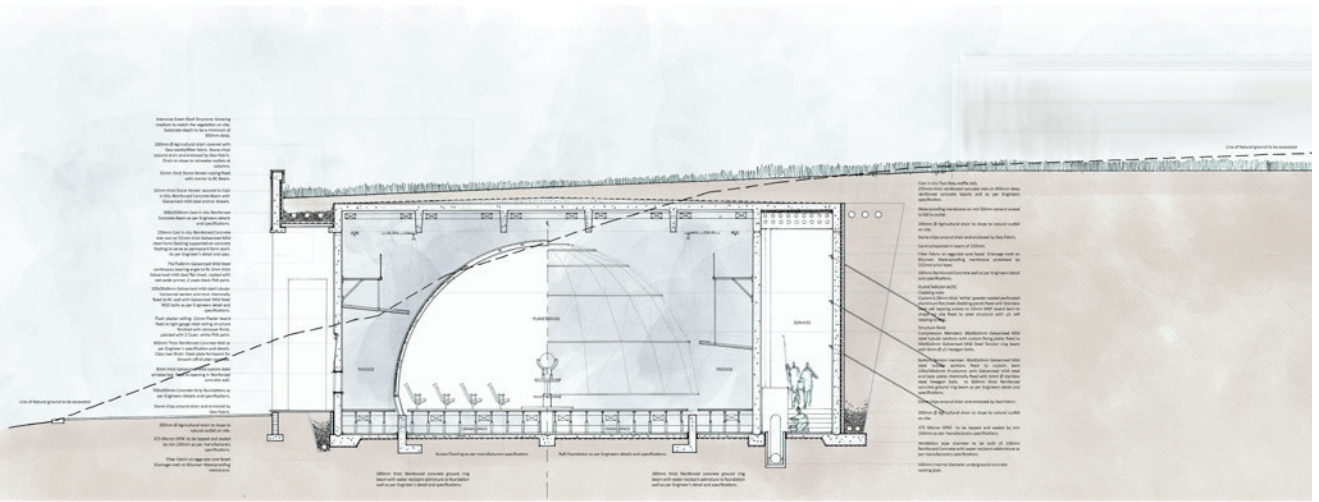




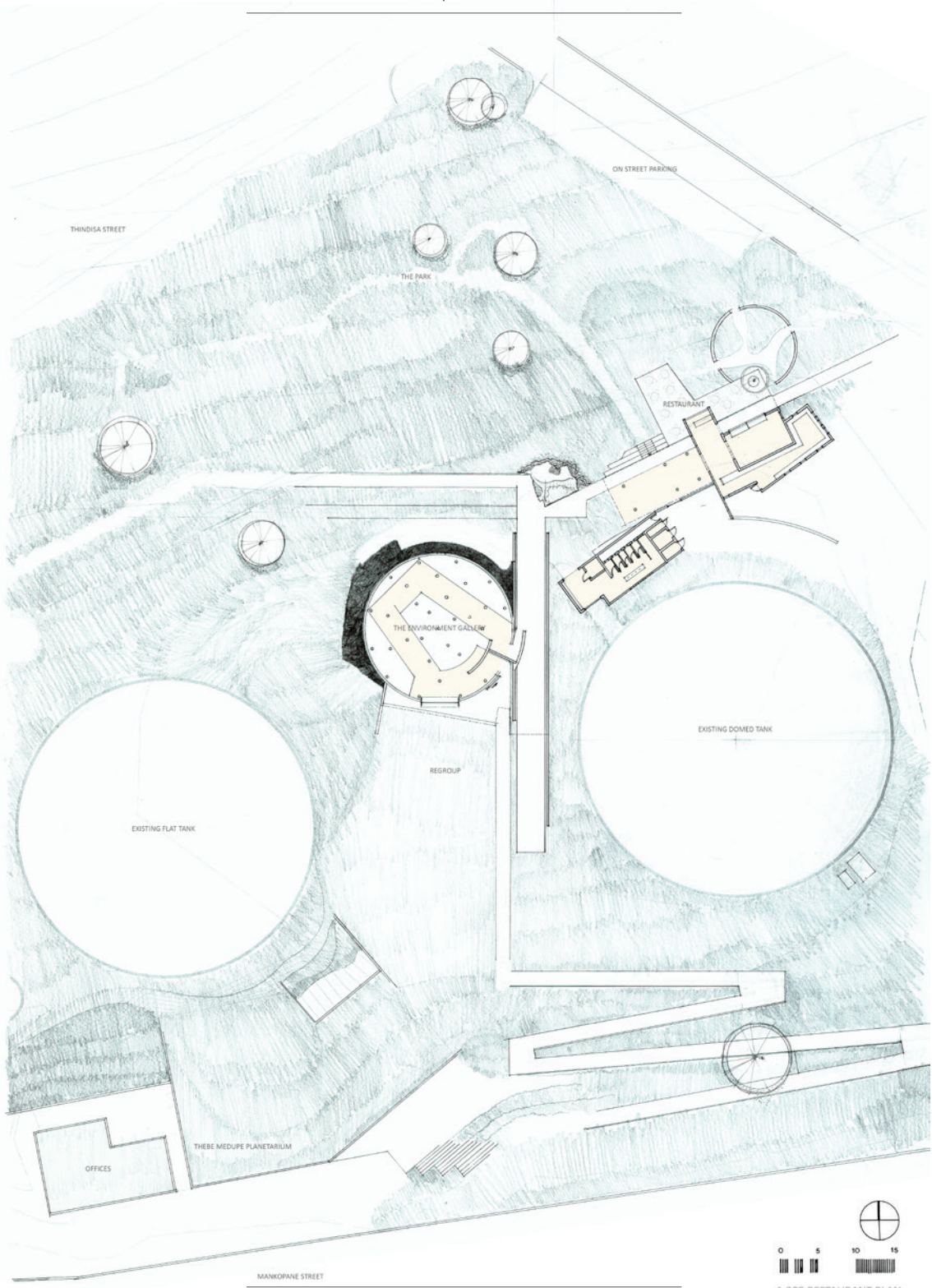


# 7.6.3 PLANETARIUM

*1:50 Section illustration NTS*





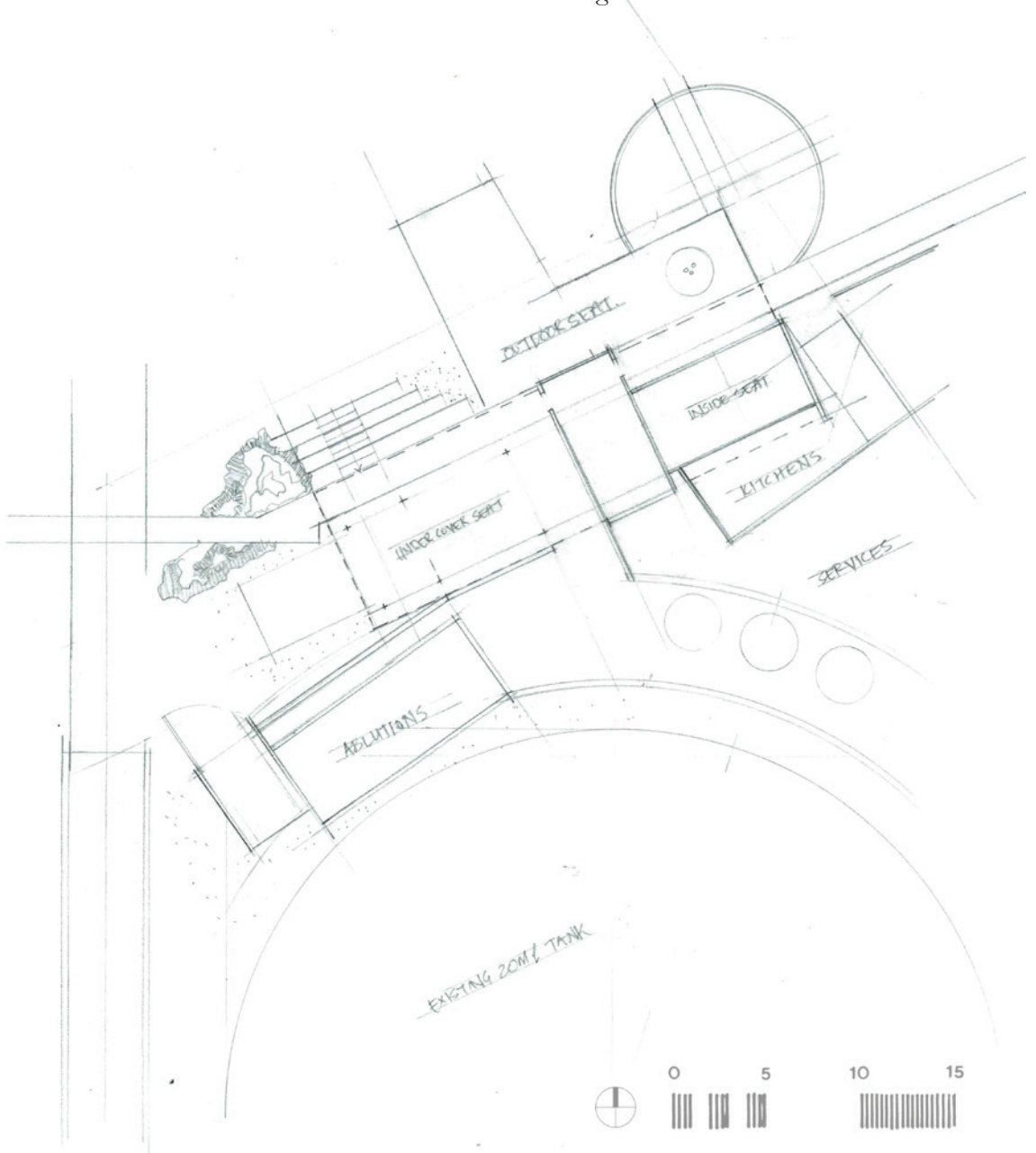


1:200 RESTAURANT PLAN



## 7.6.5 PLANS

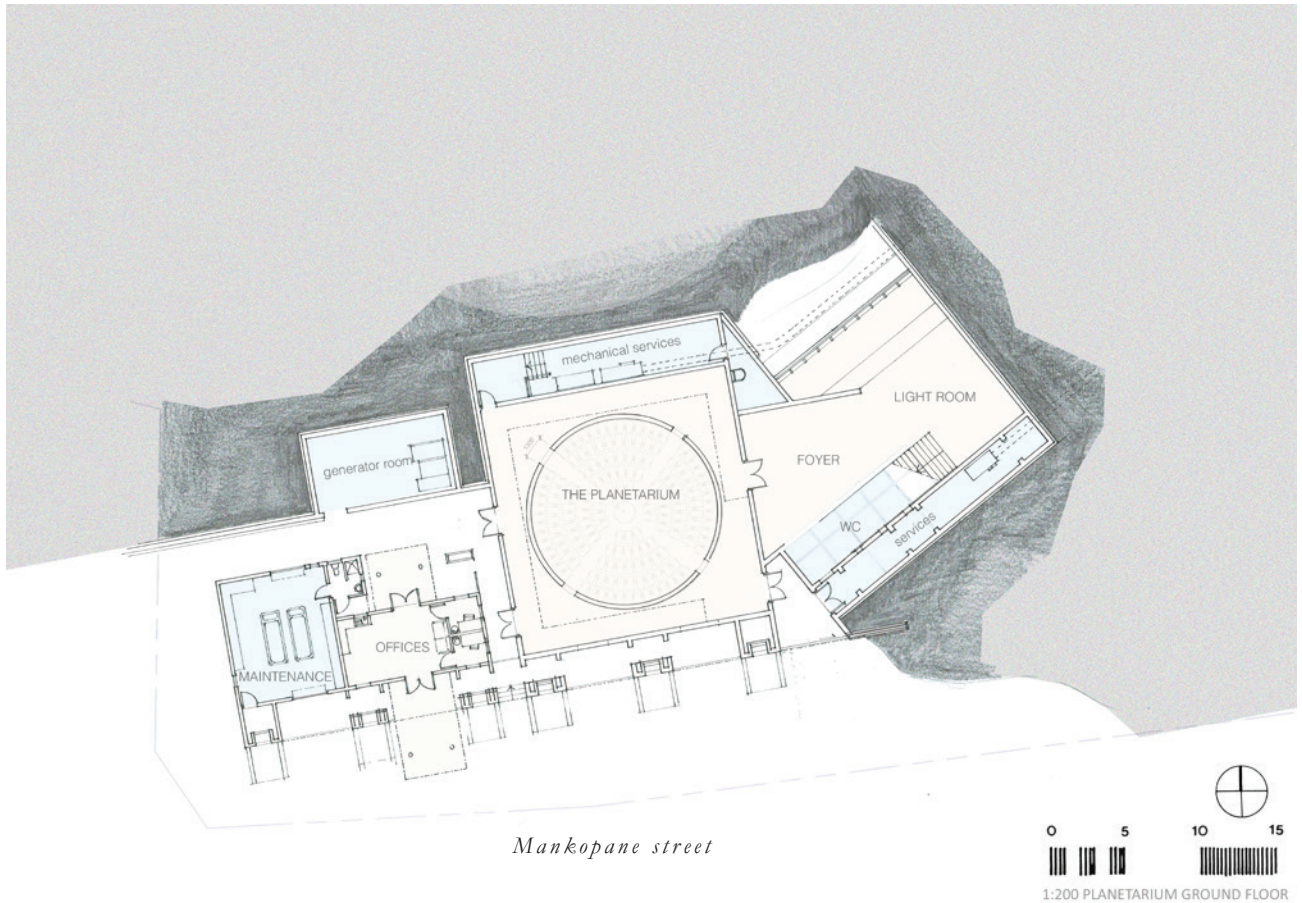
*The room and the garden*

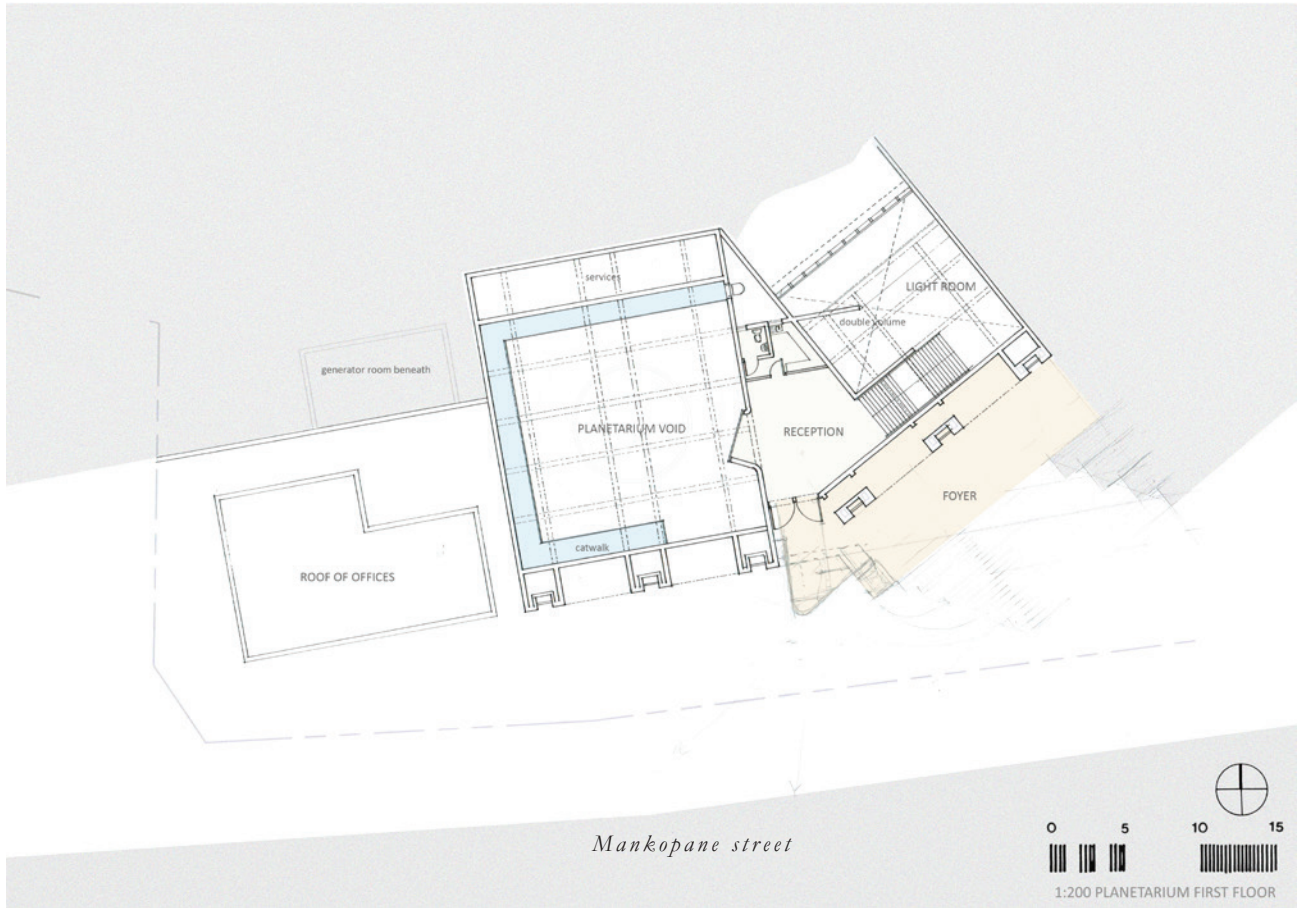




## 7.6.6 LOWER LEVELS

*Planetarium and lobby plans*

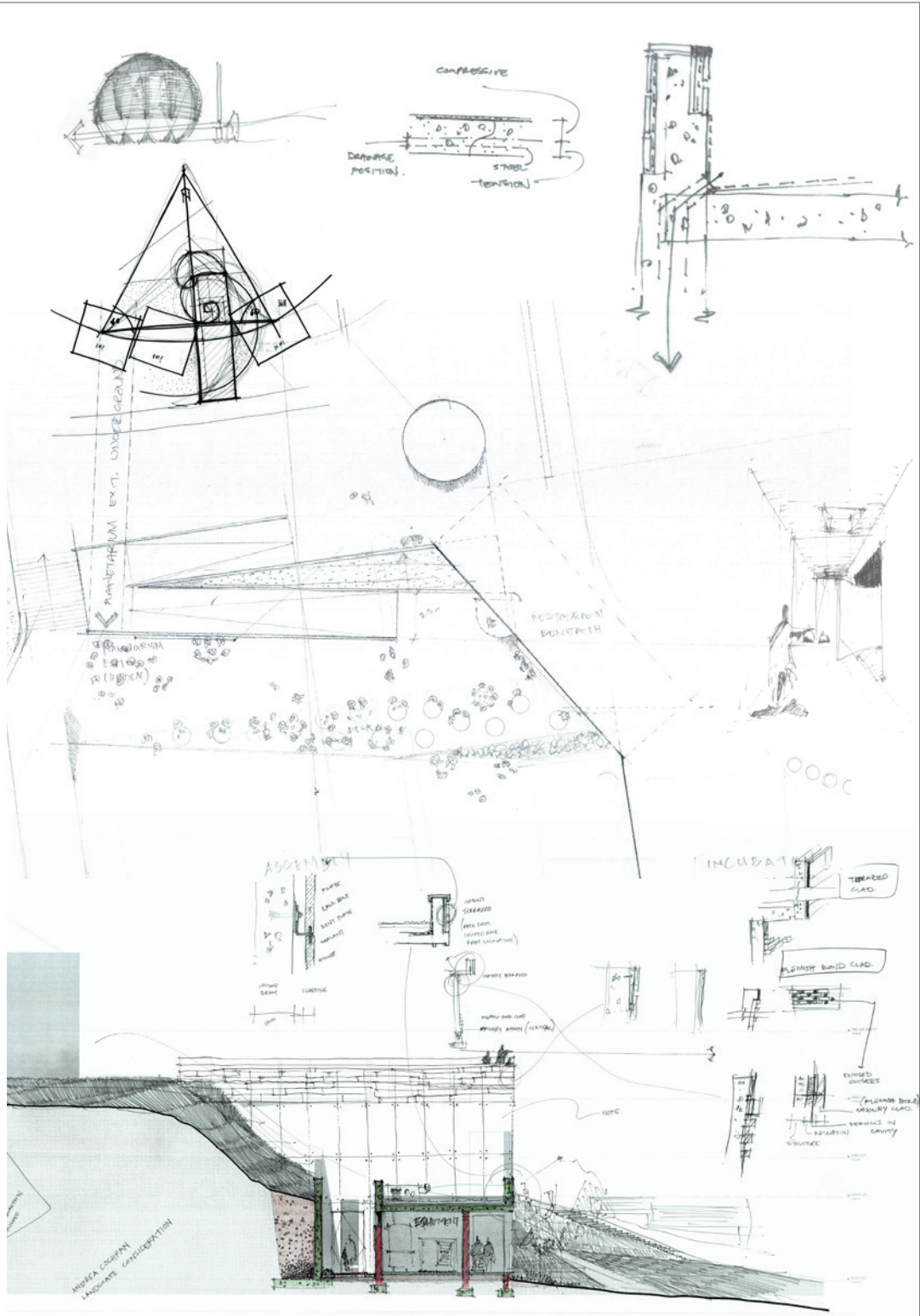








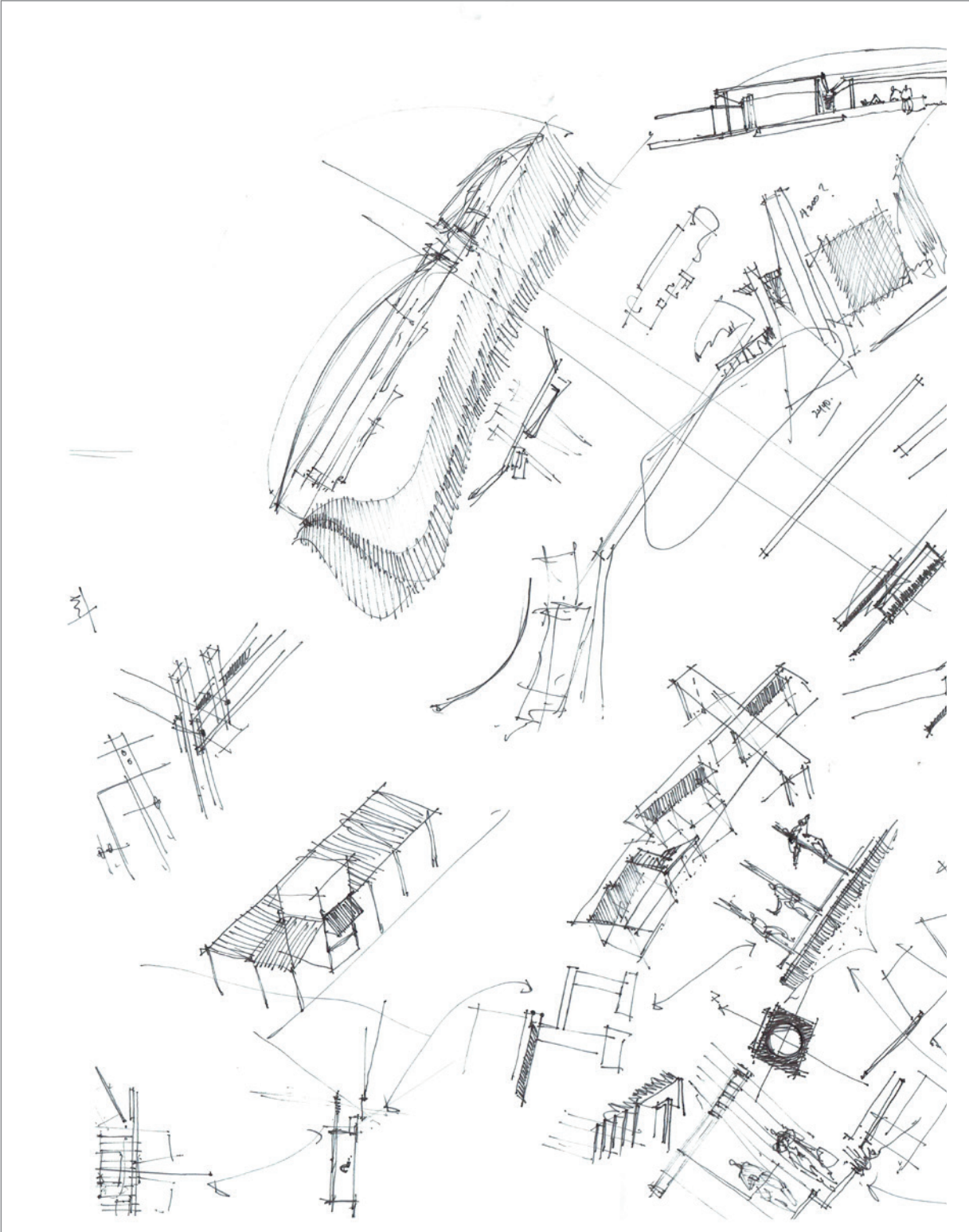
OUTRO





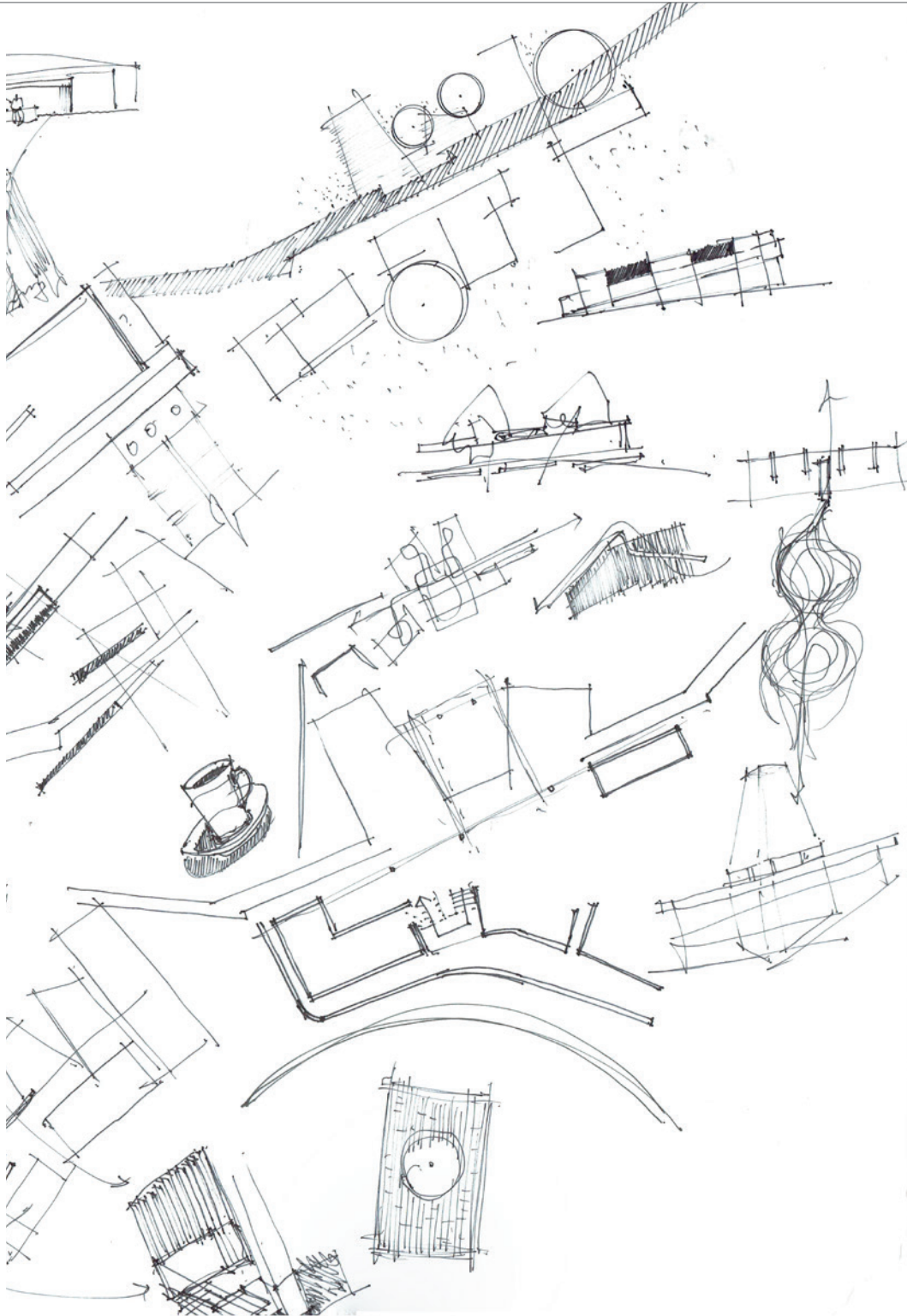


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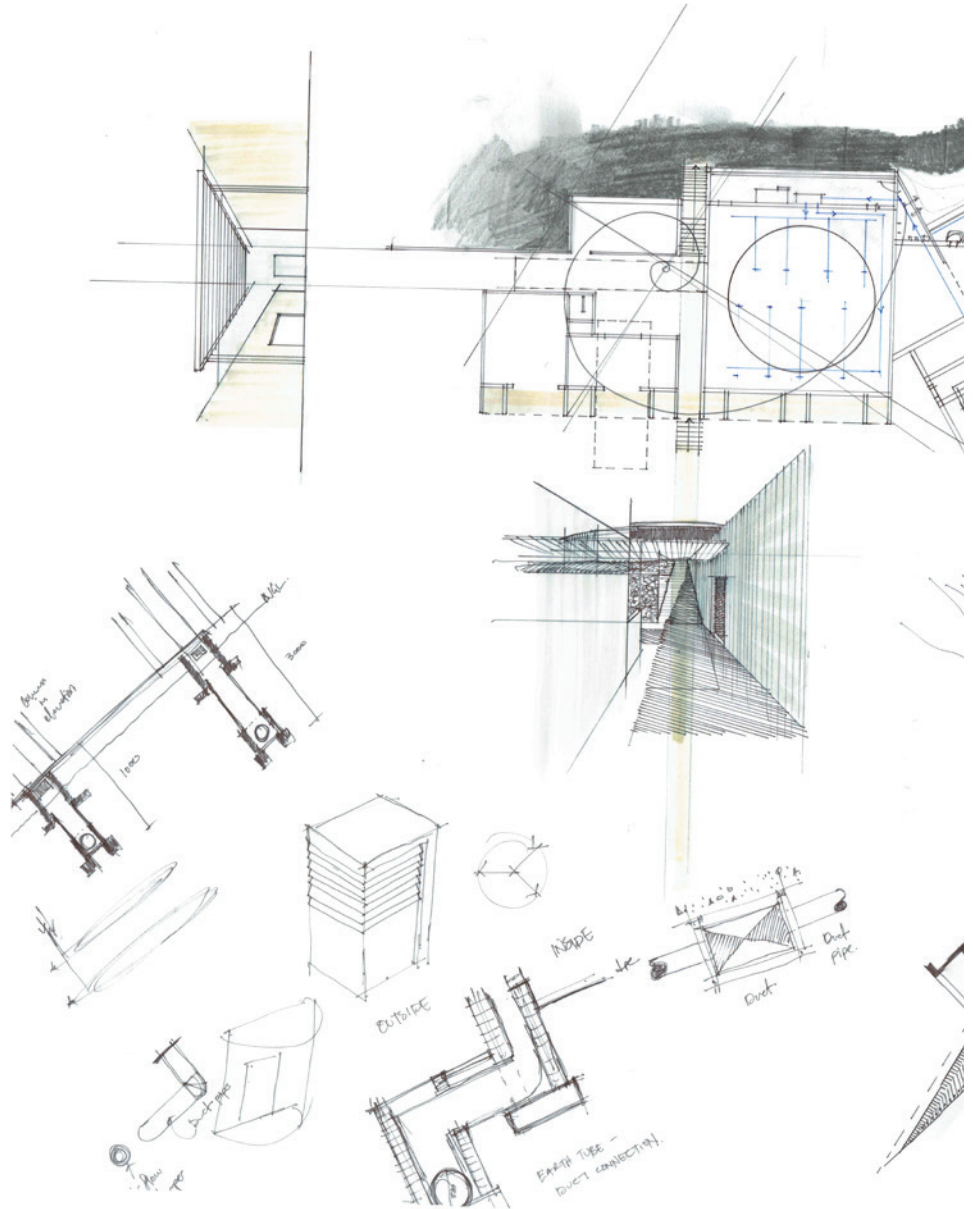




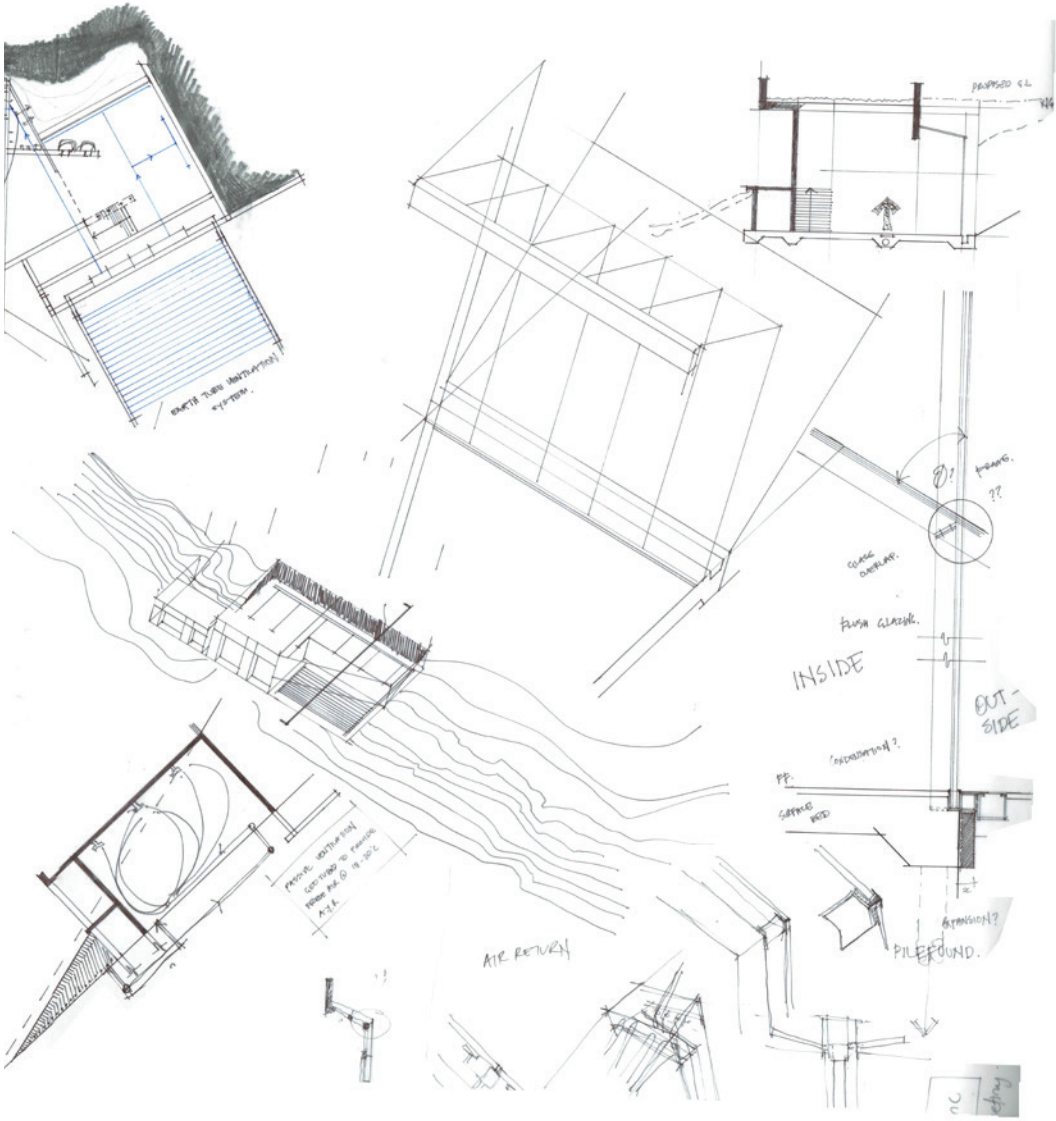
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OUTRO

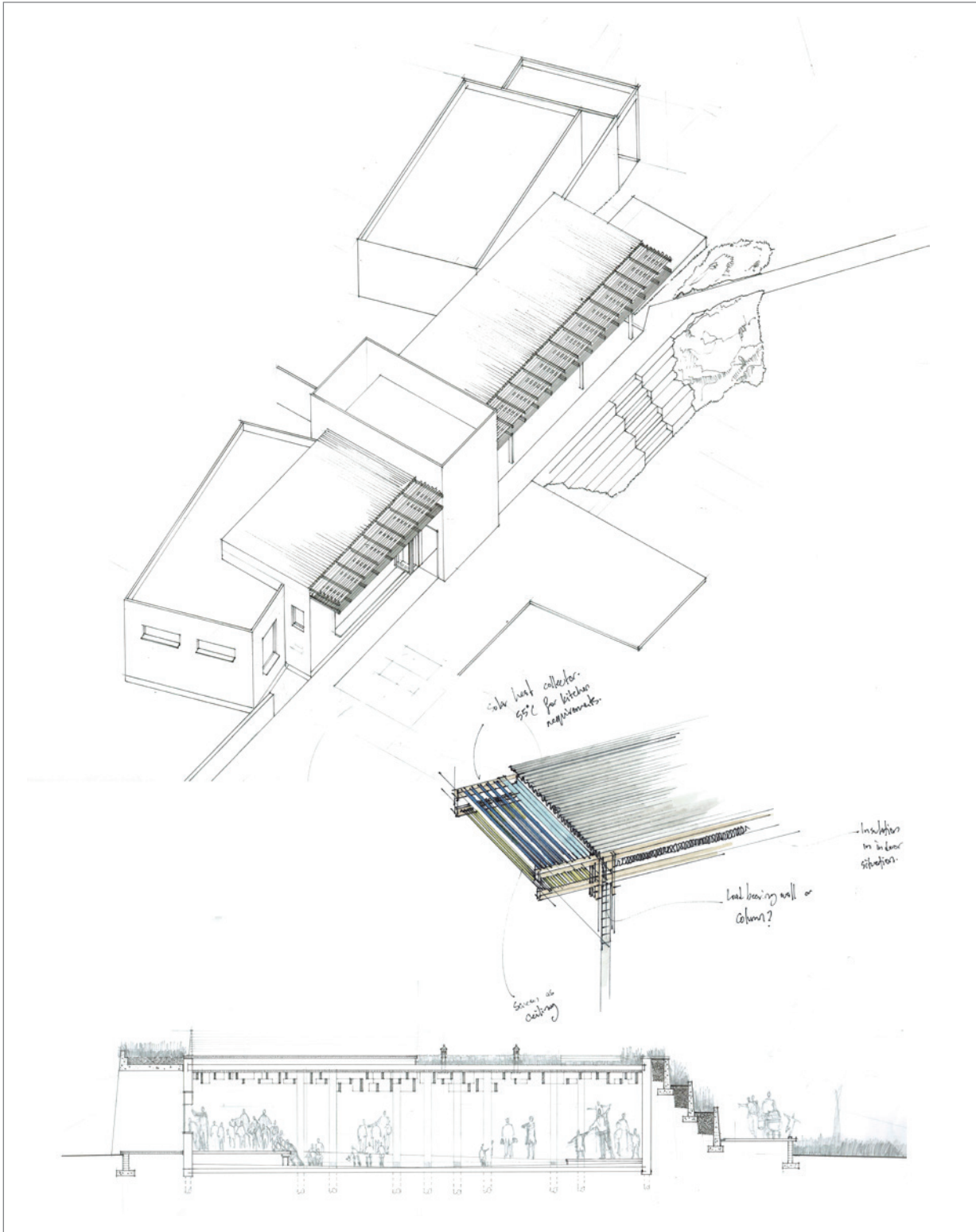


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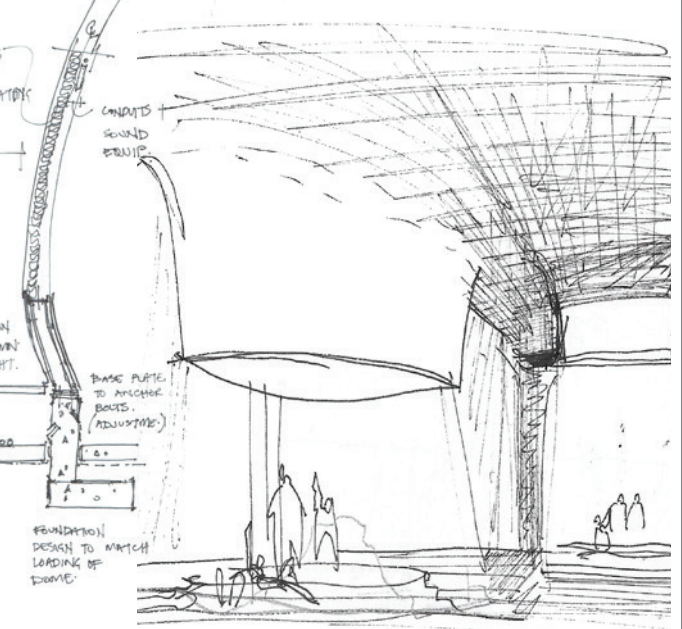
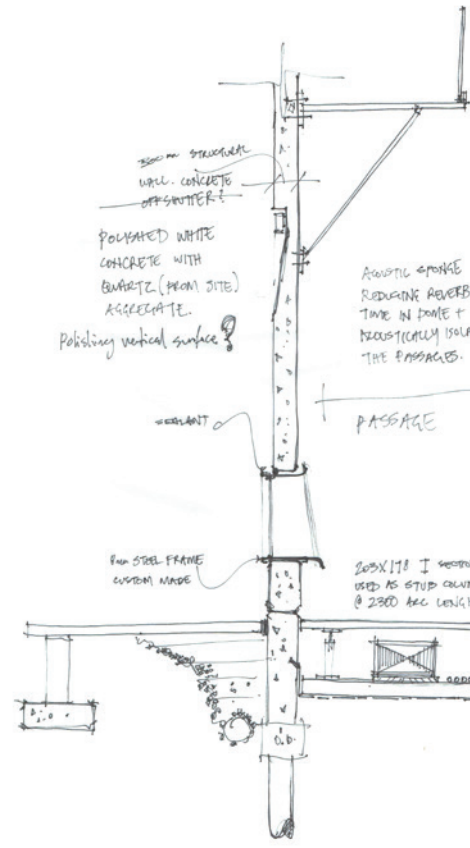
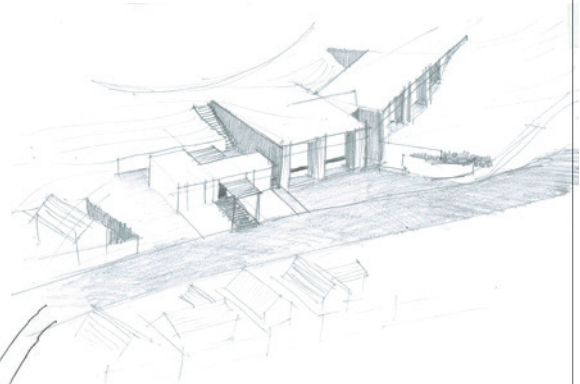
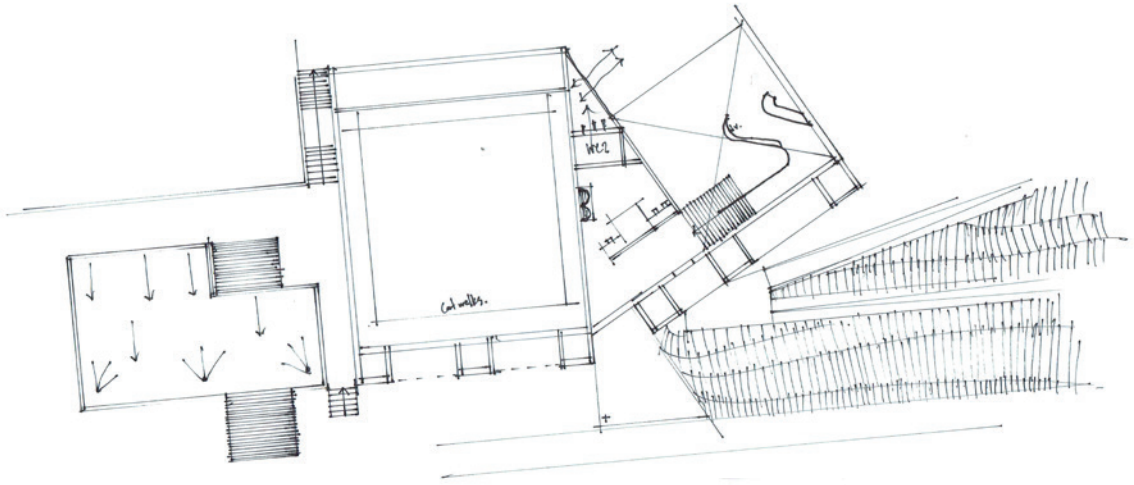




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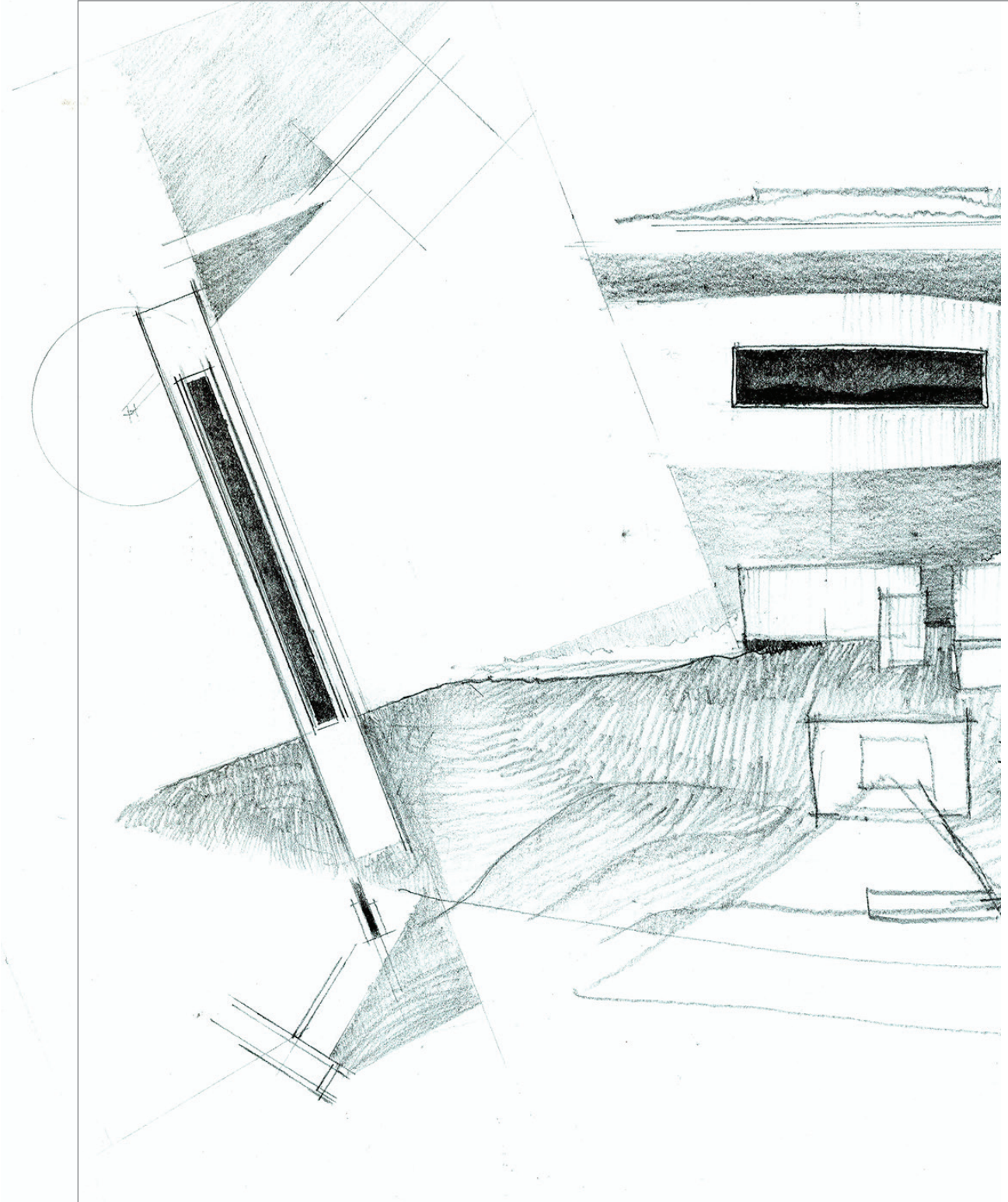
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OUTSIDE

INSIDE

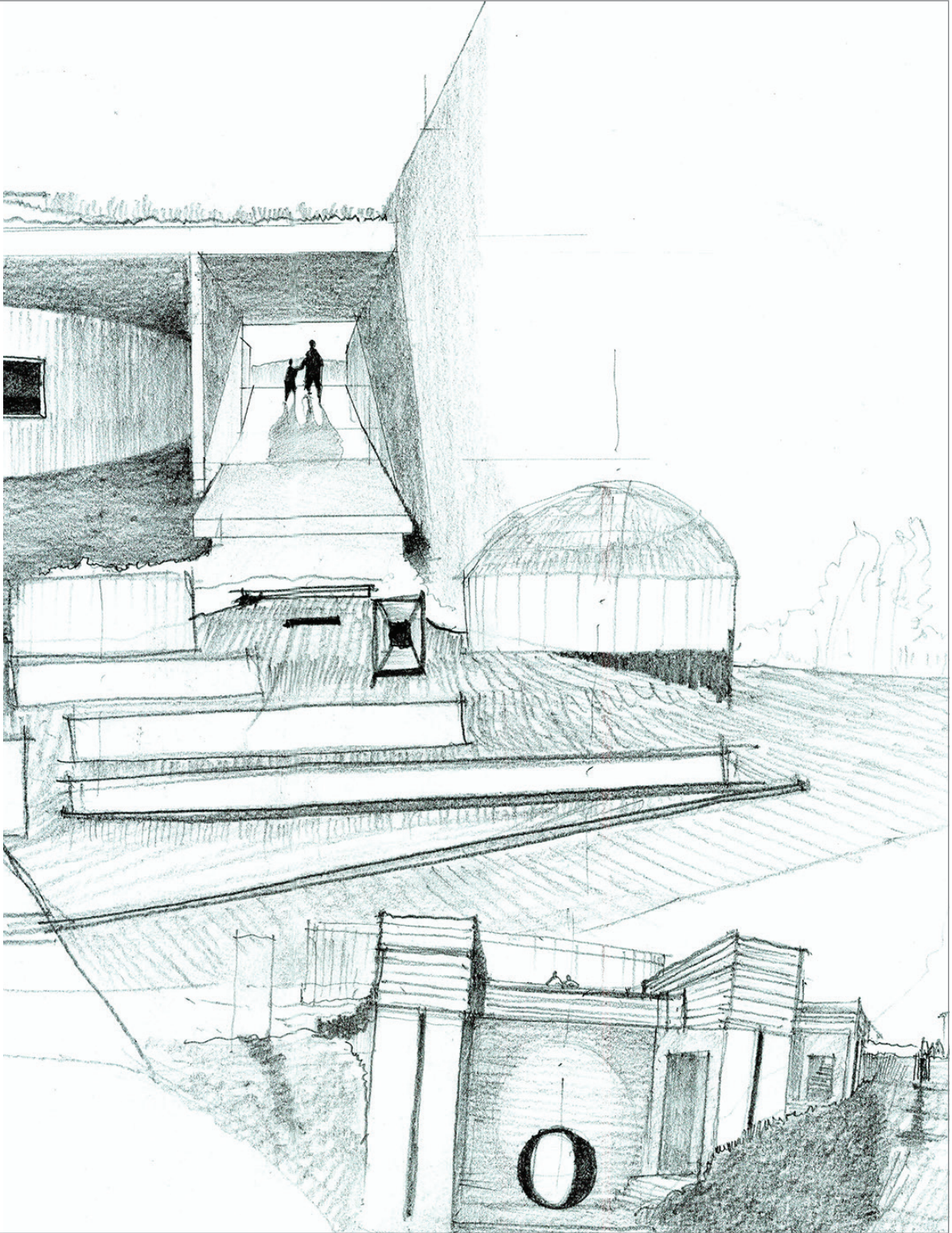
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OUTRO





# LIST OF FIGURES

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