



7.1 TECHNICAL CONCEPT

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7.3 TECHNOLOGICAL INTENTION

7.4 MATERIAL CHOICES AND CHARACTERISTICS

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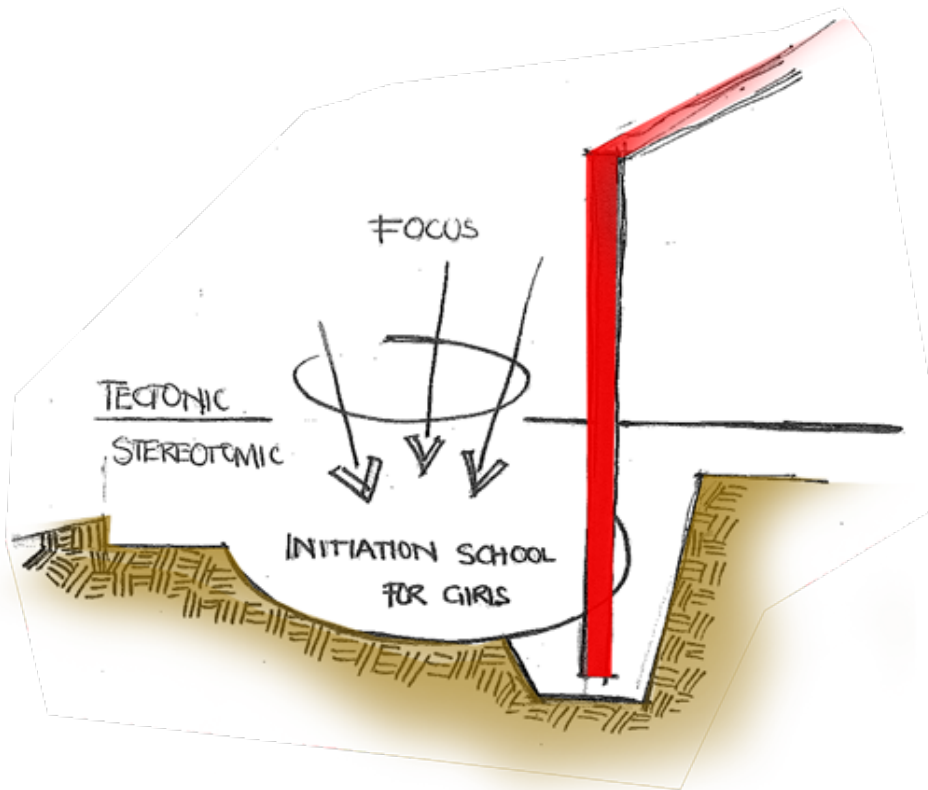


Figure 7.1 Technical concept diagram (Author, October 2016).

An Architecture of Inversion

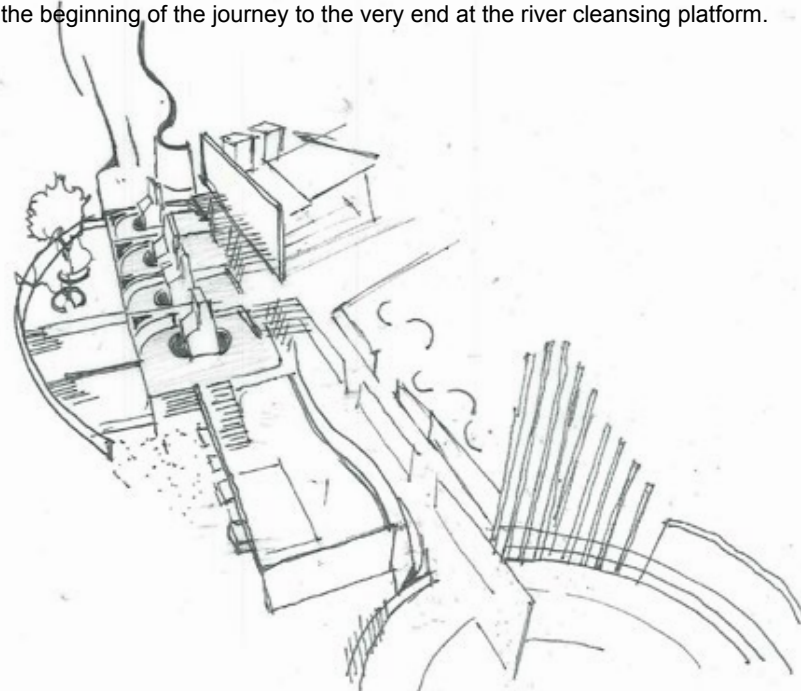
As design and the art of making this building remain inseparable the technical concept is carried through from the design into the technical. The technical concept addresses the quadrant with a very specific focus on the Traditional Ritual, investigating the way knowledge, wisdom and cultural identity has been preserved and passed down from generation to generation through the LEKHULENI Girls Initiation school. The tectonic concept is broken down into 3 approaches that build on from the concept of the design of an architecture that addresses social inversion.

7.1 Technical concept

The technical concept is one of Inversion. An inversion of Stereotomic and tectonic through the inverting of what is heavy and of the earth Being brought up to the foreground, through a lens that focuses on the Stereotomic. The project focuses on the Heavy underground space that is lit up and made an outdoor space through openings and stepping down the spaces to allow access to the outside. This is the Primary Structure of the building: the underground spaces that open up to the outside on the Northern façade onto a courtyard for making and being made.

The Tectonic structures sit on the Heavy semi basement spaces of the initiation school, these are the Traditional healers spaces that are perceived as dark spaces that need very little light. The spaces are the buildings secondary structures that are sculptural in their nature, these elements sit on top on the Initiation school and serve more than one function. They are the traditional healers spaces and also serve as light wells and ventilation for the spaces below.

The Tertiary structures are the pathway definers, which are lightweight tensile corten poles that work as path definers. They are found along the entire journey of the Initiation process. They are used as shading devices with clingers growing on them on the northern façade or as solar panel support structures on the main pathways. The tertiary Structures define the journey from the beginning of the journey to the very end at the river cleansing platform.



7.2 Structural Intention

The Structural intention is to create defensible space for these young girls going through the process of initiation along a highly public space for women and the greater public. The project is rooted in an understanding of the crucial elements of appropriate African urbanism. This is indispensable in the translation of the theory into spatial configurations that adapt and fit into the new context. Finding a balance between the past, present and the future of the space mediating through the lived experience of this young girl through the process of becoming a woman. This study hopes to contribute to that understanding of how these indigenous forms can be translated into modern a understanding of spatial configurations rooted in the essential elements of African urbanism and symbolism in creating a space where knowledge is passed down from generation to generation manifesting cultural identity and a strong socialization into a resilient network of women in Mamelodi. This space looks at meeting this woman at all stages of her journey from before she is born as an Ancestor to the entire journey as young girl who goes through the initiation process of making and being made into a woman and as an elder and back to being an ancestor who's presence is known and felt as all these women continue to go through their journey at different stages.

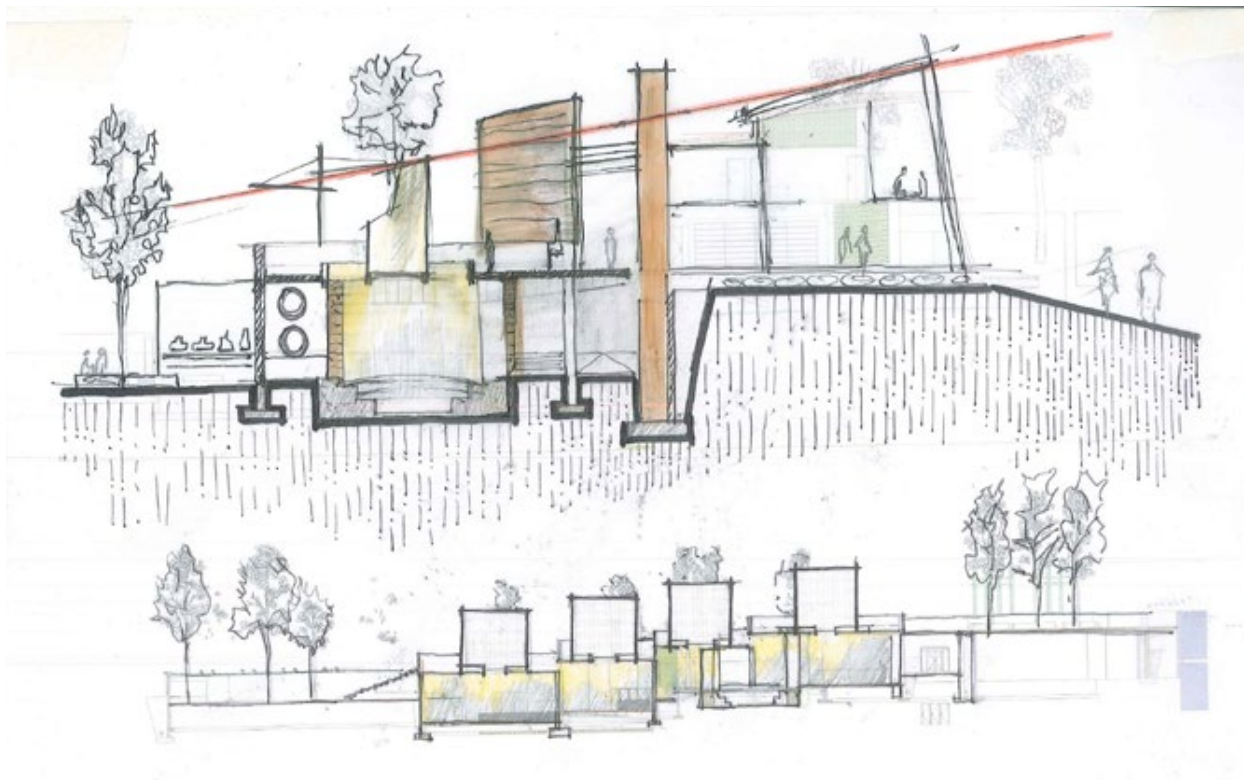


Figure 7.2 Structural intentions focusing on Light and Ventilation in the semi-basement space (Author, October 2016).



Figure 7.3 Sketches of defensible space (Author, October 2016).

7.3 Technological Intention

As an extension of the design concept of Inversion The projects intention is to investigate the Initiation School Spaces as the girls' weave in and out of the Semi basement spaces. Passive design systems investigated in depth are ventilation being the most important, daylight and natural and organic exploration of materials. The structure sits are this very strong defined axis in the landscape but should be experienced as an extension of the site and landscape.

A mediation between the Earth/ Ancestors, past/ present, interior/exterior and making and being made.



Figure 7.4 Model of space (Author, October 2016).

7.4 Material choices and characteristics

Primary Structure

The material palette of the building grew from the design concept. Architecture of inversion speaks of working with that which is found in the earth. The material palette explores the use of a primary structure that is derived from the soil. The use of rammed earth is explored firstly in the main spine of the building. The main element is the rammed earth wall that serves many functions on the site. The wall runs from the semi-basement up into the ground floor space. The wall is a binding element that serves a buffer separating the public functions of the site from the private spaces.

The wall is 1500mm in thickness to accommodate ducts at 600mm in width that run along the inside the wall at certain intervals. These ducts aid in the ventilation of the building creating buoyancy, causing stale air to be displaced. The rammed earth is also used in the traditional healer's hut in a modern way, reinterpreting the past uses of soil. The project takes soil as its primary material playing with the idea of how the use of soil is reinterpreted. The poetics of clay brick is the newer adaption of soil. A newer exploration of how clay bricks can be used is seen in the investigation of Brick Jali. Where the bricks are placed in a pattern to allow ventilation and light into spaces. The primary structure inverts that which is found in the earth, bringing it to the surface: through the concept of Inversion.

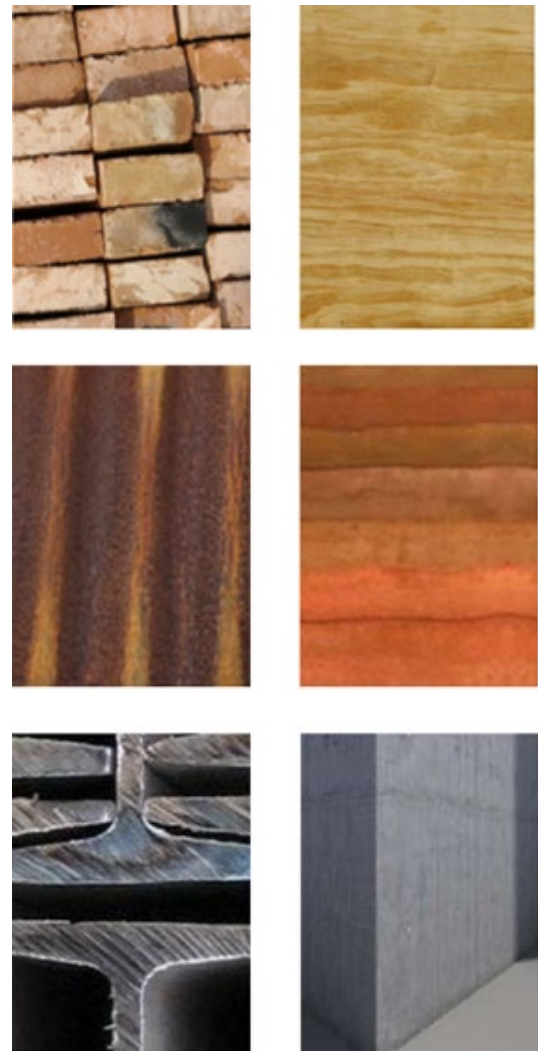
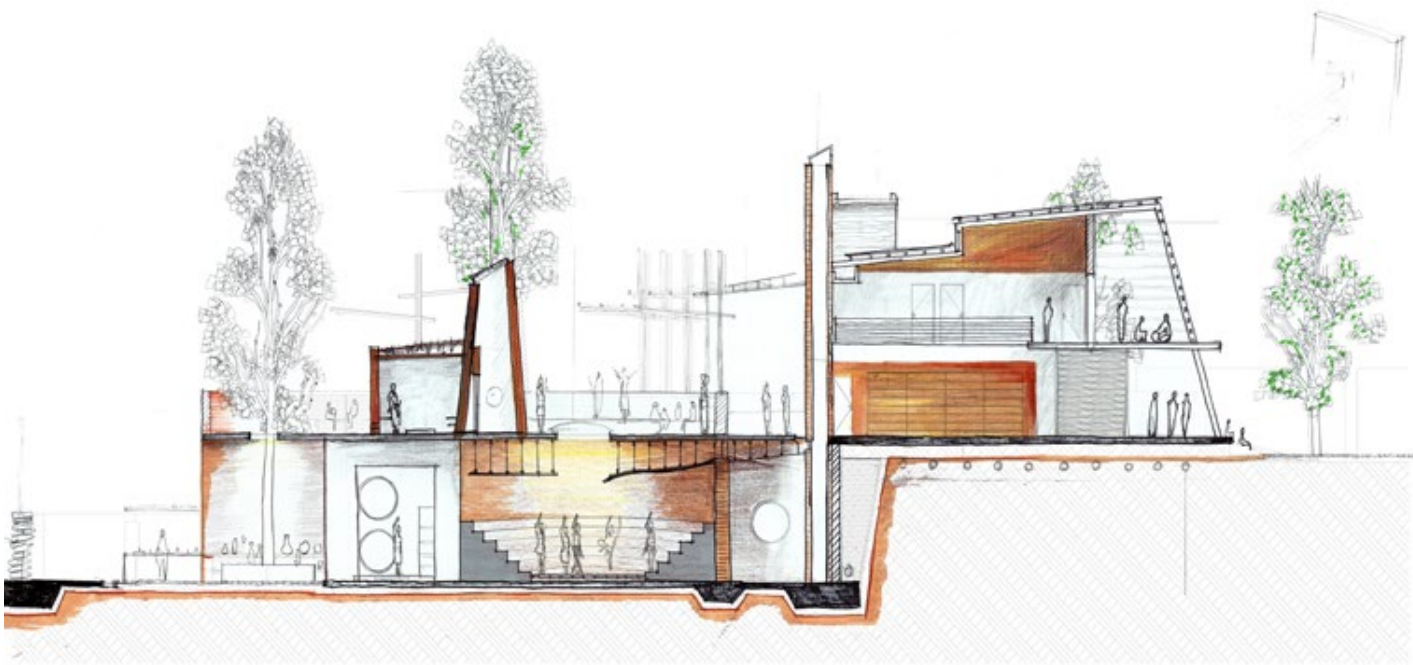


Figure 7.5 Material palette of construction (Author, October 2016).



SECTION B-B 1:50

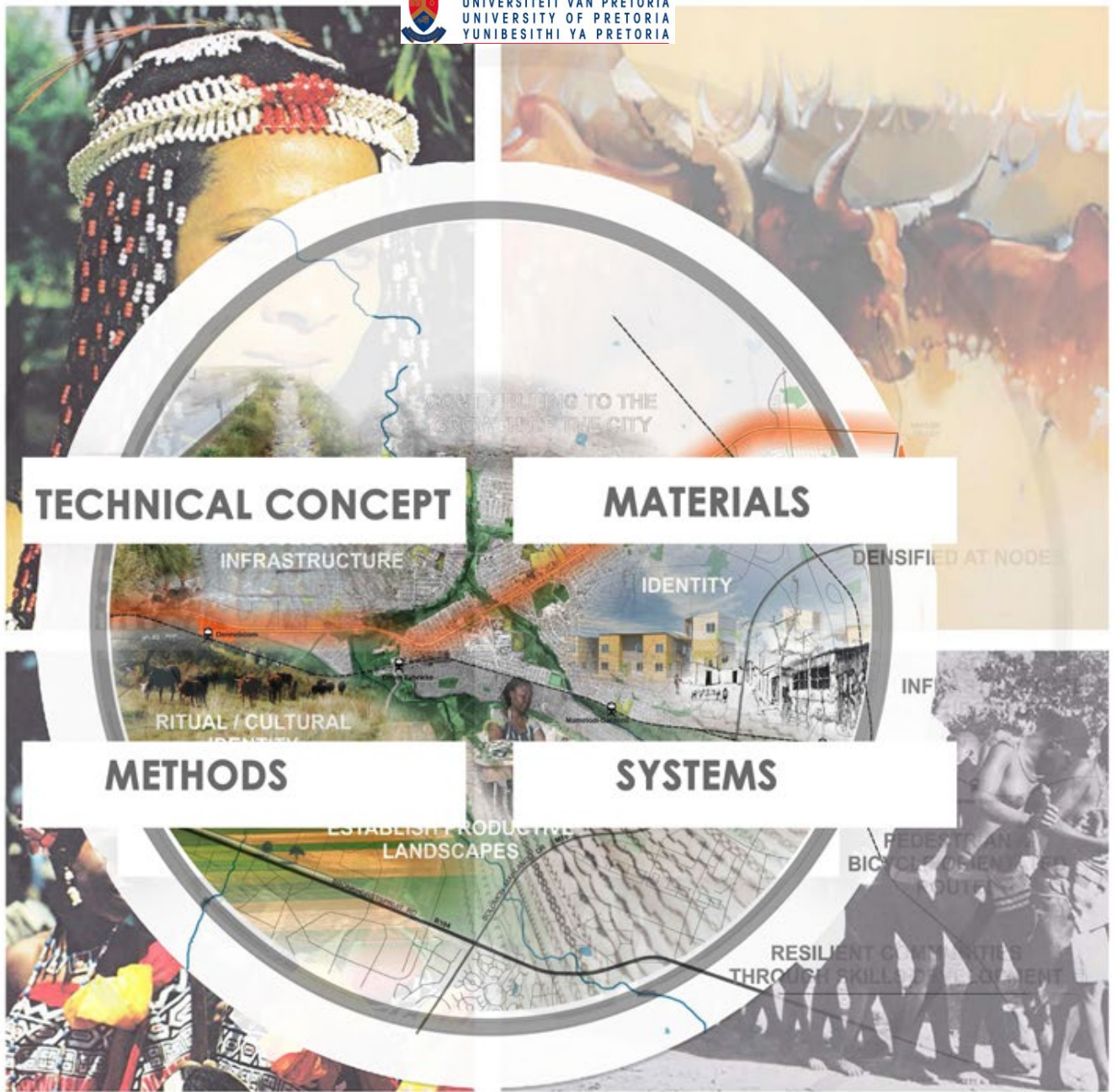
Figure 7.6 Cross -Section (Author, October 2016).

Figure 7.7 Technical exploration of Main cross section(Author, October 2016).

7.4 Material choices and characteristics -Continued

The **SECONDARY STRUCTURE** is an investigation of Corten as a roofing material that displays another passage of time . As time passes it changes in shade and texture, The reference of using Corten as the secondary focus in the building is also a play on how initially the spaces used by the traditional healers was soil huts and now with the change in location and availability of materials the spaces have become corrugated steel sheeting used as a material in the huts where the traditional healers practice currently.

The **TERTIARY STRUCTURE** can be seen in the steel poles that serve as boundaries and space definers. The poles are there to define movement in the journey and are treated to weather over time. They are lightweight tensile steel poles with stainless steel cabling to support the structures. They also support the photo-voltaic panels



TECHNICAL CONCEPT

MATERIALS

METHODS

SYSTEMS

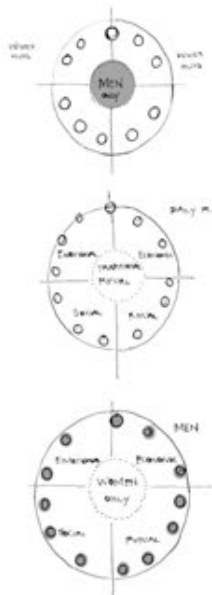
rites of passage

Technical concept

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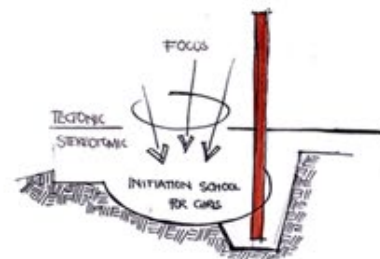
The Tectonic structures sit on the Heavy semi-assembly spaces of the initiation school, these are the Traditional healers spaces that are perceived as dark spaces that need very little light. The spaces are the buildings secondary structures that are a lightweight steel frame with a corten ladding that rusts and fades over time showing the passage of time.

The Tertiary structures are the pathway definers, which are lightweight tensile corten poles that work as path definers. They are found along the entire journey of the Initiation process. They are used as shading devices with clingers growing on them on the northern façade or as solar panel support structures on the main path. The tertiary structures define the journey from the beginning of the journey to the very end at the river cleansing platform.



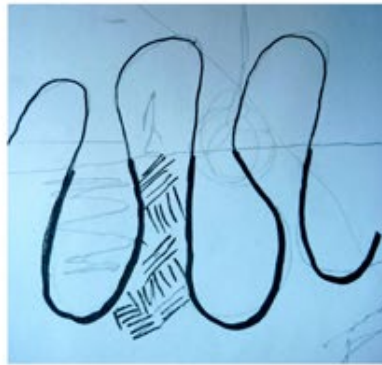
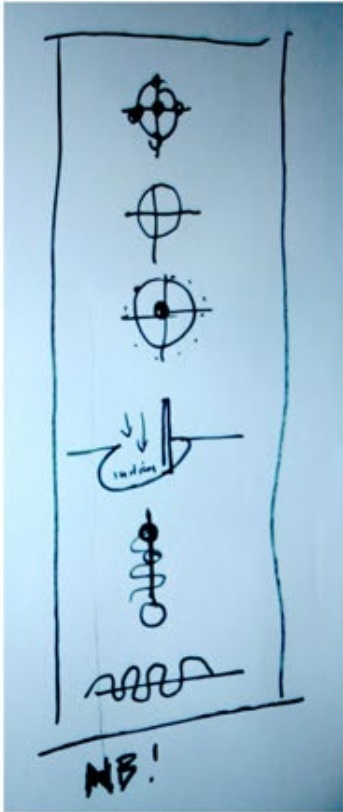
[An exploration of Cultural Catalytic spaces in the urban context]

An architectural investigation of a space that facilitates the carrying out of traditional rituals while enhancing the everyday rituals of the women of Mamelodi.

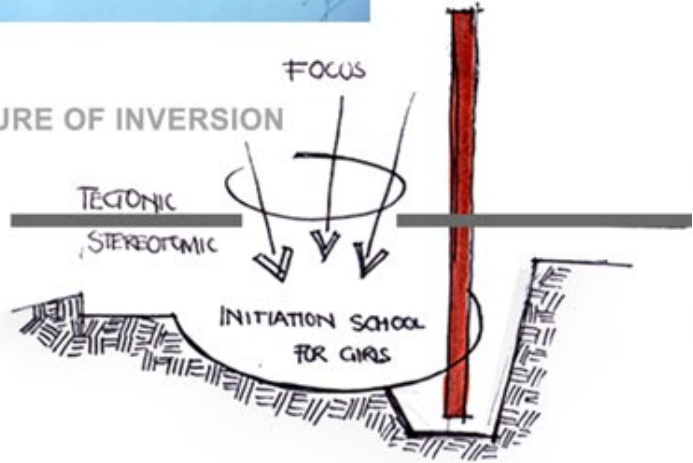


System and Service response to issues of Sustainability:

This Dissertation is an exploration of a cultural catalytic space in Mamelodi. The approach to services and systems looks at addressing the four Pillars of sustainability for the women of Mamelodi. This is achieved by a holistic approach that reduces dependency from the national grid while enhancing the livelihoods of the women. The approach looks at The social, cultural, economical and ecological means of creating a space that empowers the women through Job creation, reuse of material from the site (Timber and earth), anaerobic digester and the harvesting of water in a sustainable and resilient approach through passive systems.



AN ARCHITECTURE OF INVERSION



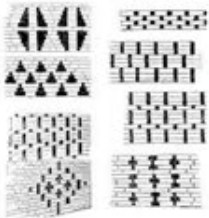
TECHNICAL CONCEPT

SOIL- OF THE EARTH: THE ANCESTORS

RAMMED EARTH CONSTRUCTION

BRICK
TIMBER
REEDS

STEEL
CONCRETE
GLASS



OLD AND NEW

MATERIALS

IKHAYA AND URBAN

MAKING AND BEING MADE





7.5 Ventilation

Is one of the main focuses in terms of systems in the building. Ventilation in this spaces is very important as the girls spend most of their time in here. Most of the dance rituals are taught here and this is the main learning space. The girls release a lot of heat through the dance rituals resulting in a need for this space to be thoroughly ventilated. The ritual does not involve bathing for a certain period of time during the time they are in this liminal space and it also requires the girls to do a lot of physical work. The spaces should be properly ventilated to avoid stale air building up. The building uses the rammed earth wall as it's main ventilation system to allow hot air to rise creating a constant flow of air in the building.

The northern trombé assisted solar chimneys will have glass panels facing the northern sun. This allows solar energy to accumulate in the chimney creating pressure and thus an upward movement in the stack.

The ventilation system works on the following principles:

- Air moves from an area of high air pressure in the dance room where the girls spend most of their time to an area of low pressure through ducts placed in the rammed earth wall.

The warm air is pushed to the duct through the use of slanted reeded panels that serve as acoustic panels and pushes the air towards the opening in the wall leading to the stack.

- The trombé assisted solar chimney heats up due to the accumulation of long-wave radiation from the solar exposure on to the glass panel.

This causes a negative pressure in the stack, the negative pressure encourages the air from the room up into the stack, towards the opening of the stack.

- Heated air moves upwards, which is sped up by the narrowing of the stack

- When the hot air is channeled into a constricted opening, it's speed increases due to the venturi effect.

- The air exists the chimney.

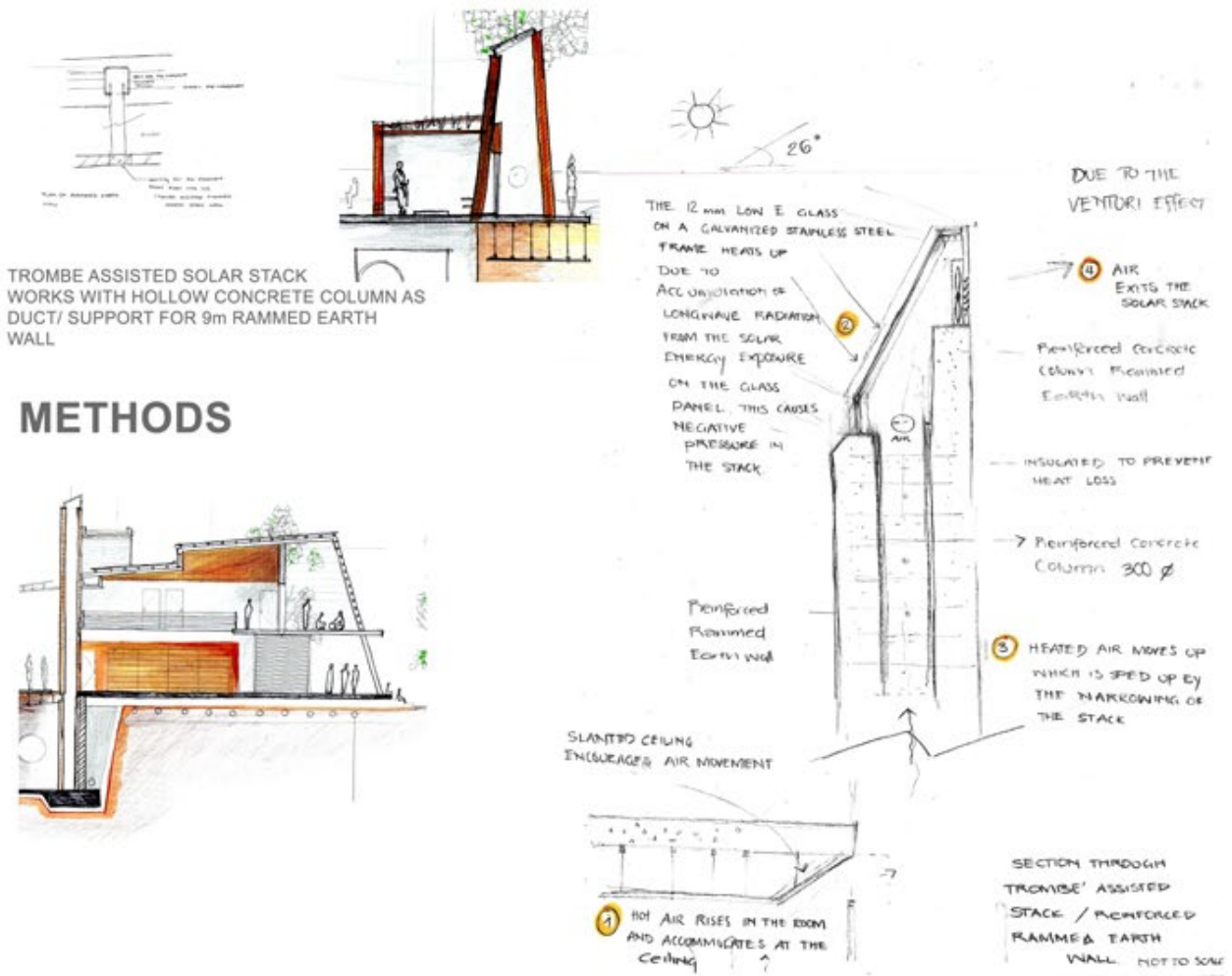
- The constant displacement of air in the main room causes a constant pulling up of air from the outside. Into the dance hall.



7.5.1 Heating and Cooling

The heating and cooling of the building is highly dependent on the principles of the ventilation system. The ventilation system removes the heated air from the intended space, and Geo-pipes are used on the southern side of the building to bring in cool air into the space. This system was designed after consultation with Vosloo (2016).





PASSIVE SYSTEMS USED:

- TROMBE ASSISTED SOLAR STACK
- GEOTHERMAL EARTH TUBING
- EVAPORATIVE COOLING TOWER
- TREES AS SHADING DEVICES
- PHOTOVOLTAIC PANELS



EVAPORATIVE COOLING TOWER

ROOF CATCHES ROOF WATER THATS STORED IN A WATER TANK. HOT AIR IS PULLED IN FROM THE NORTHERN SIDE IS COOLED BY EVAPORATIVE COOLING PADS CAUSING THE AIR TO COOL DOWN AND DROP INTO THE REQUIRED SPACES.

SYSTEMS

Figure 7.8 Model of space (Author, October 2016).

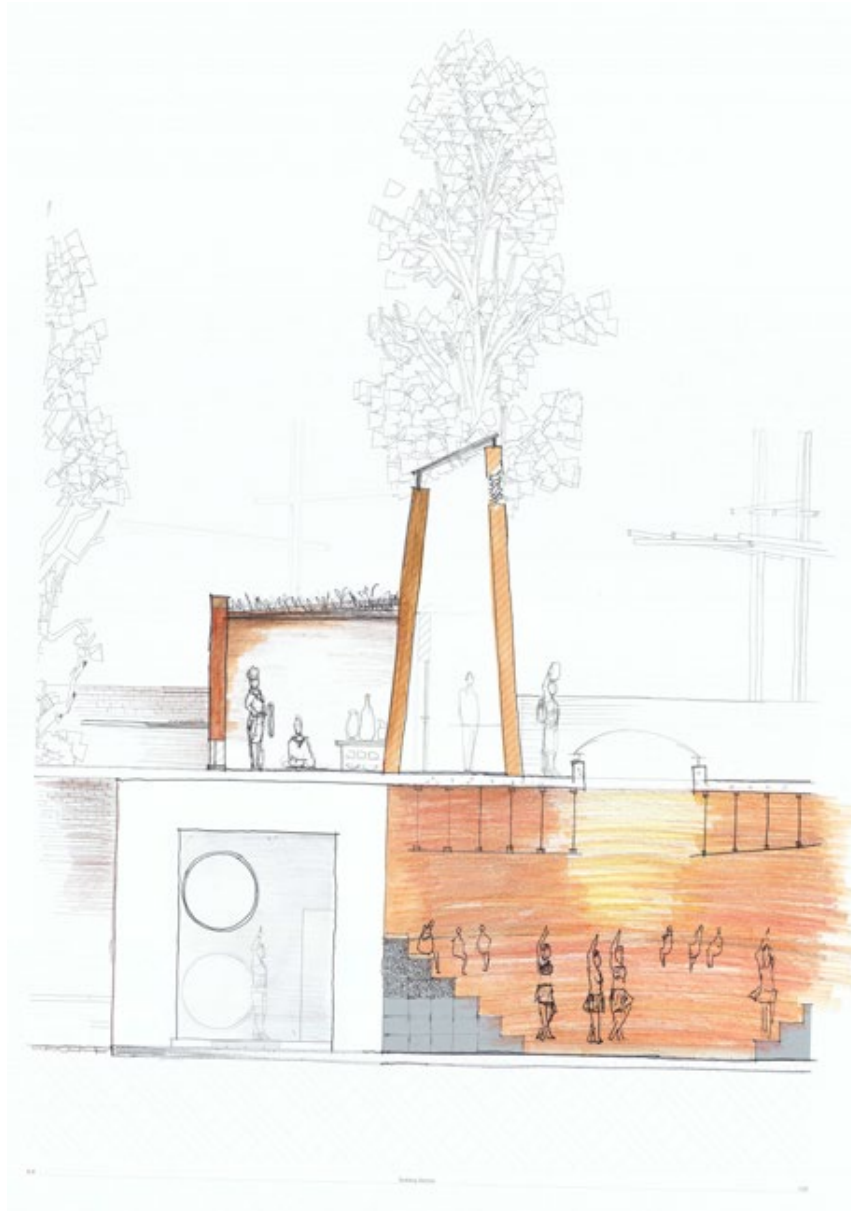
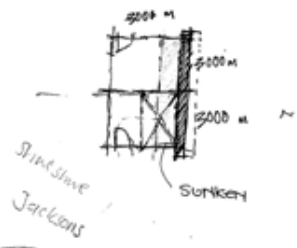


Figure 7.9 Sketch of the Semi-basement space with traditional healers hut above (Author, October 2016).

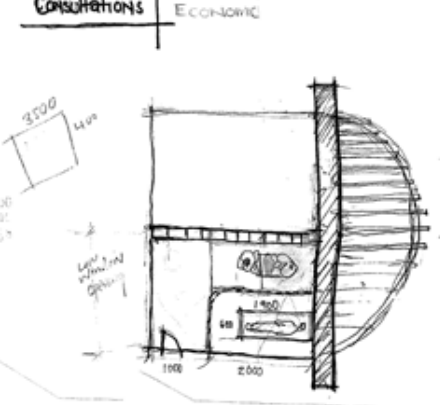
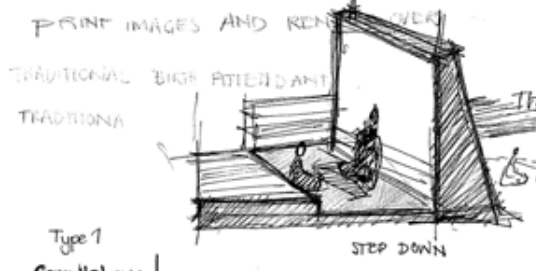
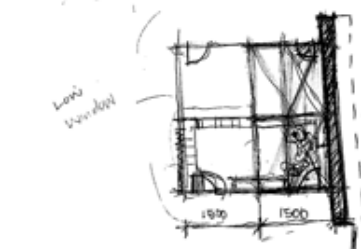
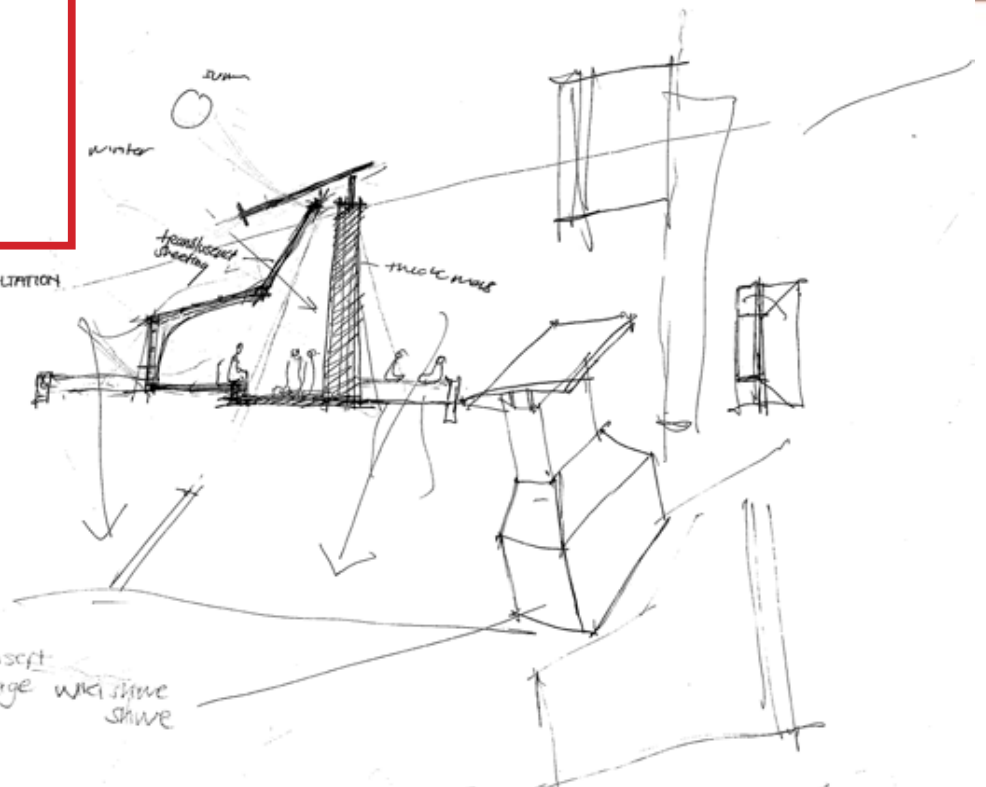
Consultation huts

4 types

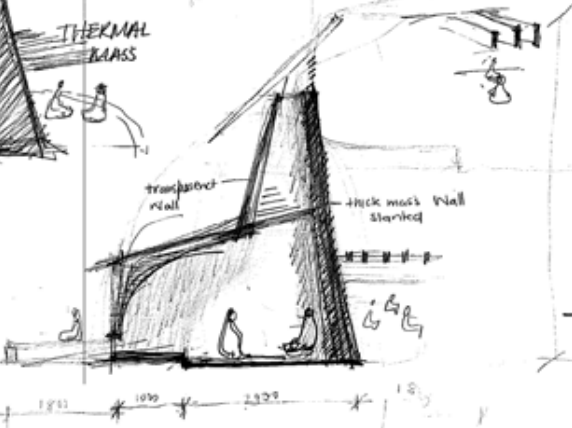
① ECONOMIC : OVER CONSULTATION



Scan fabric
show show definition insert on last page with show show



- INYANGA → TRADITIONAL Doctor
- SANGOMA → SPIRITUAL DIVINER
- Umprofen → Faith Healer
- Herbalist



- Veci
- Model platform
 - pergola structure
 - Huts structure
 - LINE weights

- Vipua
- Fix toilets outside
 - Refuse yard
 - Fix internet

Figure 7.10 Technical exploration of The Traditional Healers hut (Author, October 2016).T



7.5.2 Investigation of the Traditional healers hut.

The Traditional healers huts have evolved over time from the original context. The space in its original context is a round space that was made of mud and grass. The space has changed over time as the traditional healers had to adapt in the urban context. Availability of materials has changed the way the space functions in Mamelodi. The huts found in the context are made of corrugated steel sheets. The project investigates how the spaces can be improved and how lessons can be derived from the original hut (Von Geysso, 2016).

The design and construction is an investigation of how the ritual takes place and what the space needs to become. The form of the space is defined by the fact that it needs light to flood the space and at the same time it needs to allow stale air out. The stack effect is investigated in the form. Allowing fresh air to enter the space and escape at a higher point in the form, through the stack effect. The Hut is a rectangular form responding to the current spaces and the light-well surrounding the structure is reference to the round hut of the past.

The light-wells illuminate the initiates in the semi-basement.

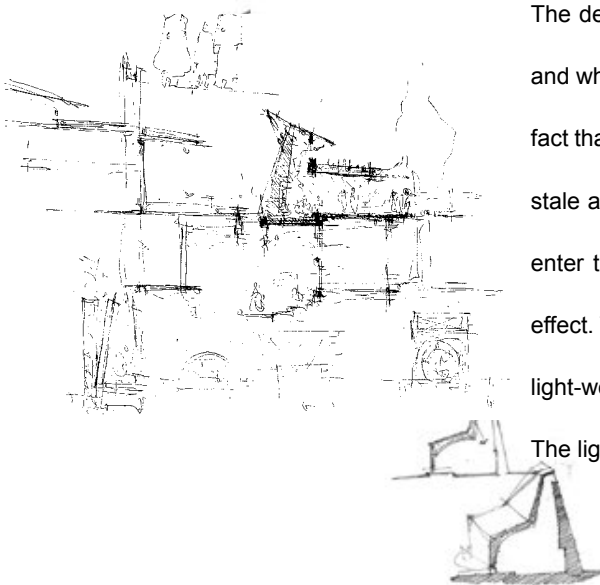


Figure 7.11 Technical exploration of The Traditional Healers hut (Author 2016).



Figure 7.11.1 Technical exploration of The Traditional Healers hut spatial requirements (Metric Handbook 2016).

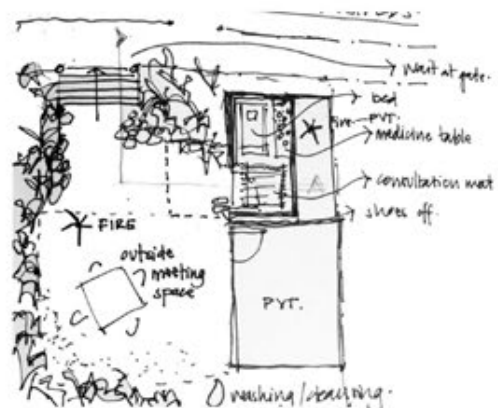


Figure 7.11.2 Technical exploration of The Traditional Healers hut Spatial requirements adapted from (du Trevou 2016:69).

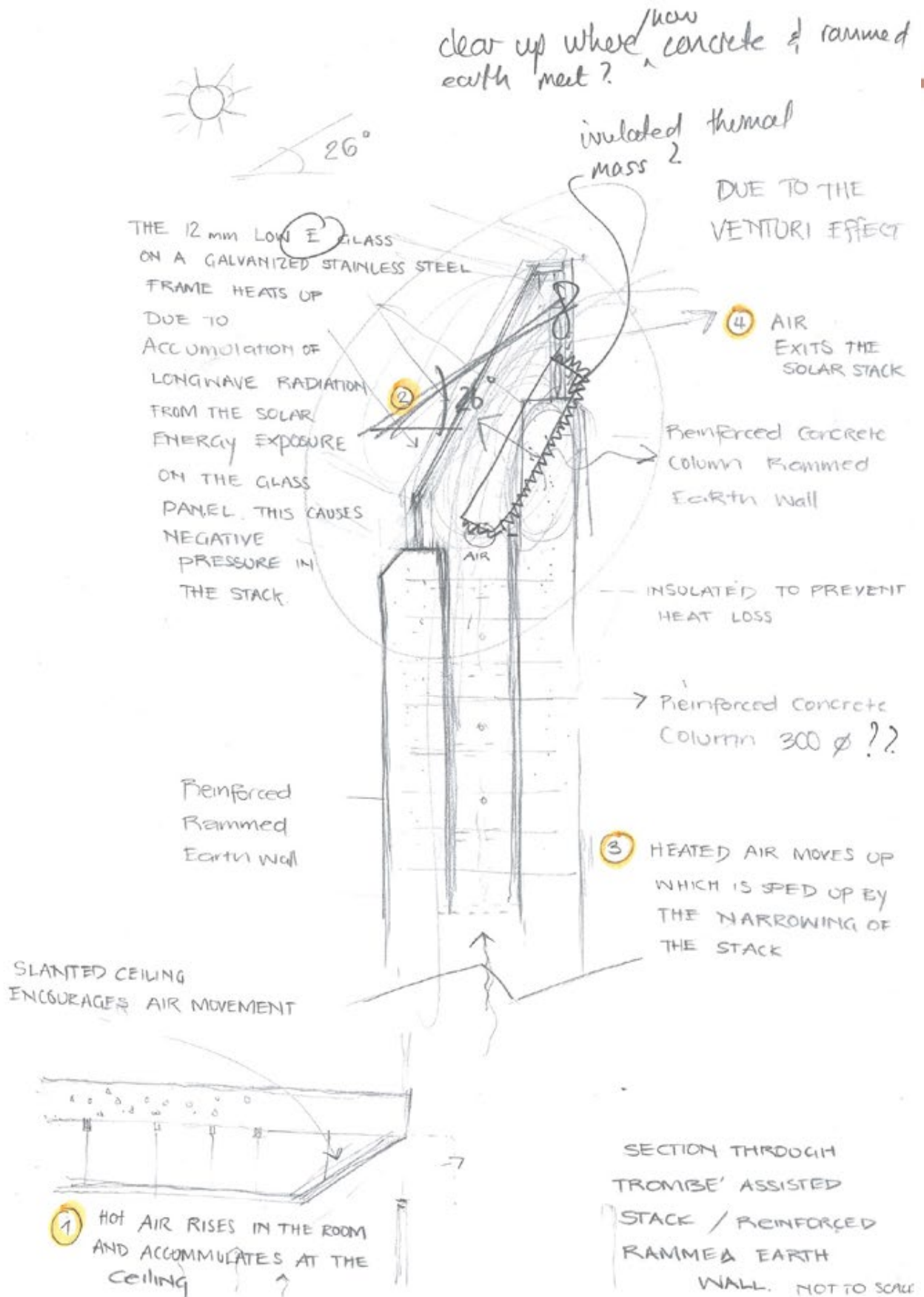


Figure 7.12 Technical exploration of The Rammed earth Spine of the building (Author, October 2016).

7.6 Systems and Service response

WHAT is the 'trombé assisted solar chimney' ?

A trombé assisted solar chimney is a rammed earth air shaft duct wall with openings at every floor level allowing air to exit the space, into the shaft and into the atmosphere. The north facing façade has double glazing , which traps long wave radiation.

WHERE is it located In the Lekhuleni

Initiation school for girls?

It is found on the northern façade of the building embedded in the thick rammed earth wall that ventilates the buildings on different levels. Ground floor for the initiates and the Muti Studio on Ground floor and the Offices on the Southern side of the wall.

WHY is it used in the design?

It is used in the ventilation of the building. The trombé assisted solar chimney is heated due to the accumulation of long-wave radiation from solar energy exposure on to the glass panel (Vosloo 2016). This causes negative pressure in the stack, thus the warm air rises, encouraging the movement of air from the

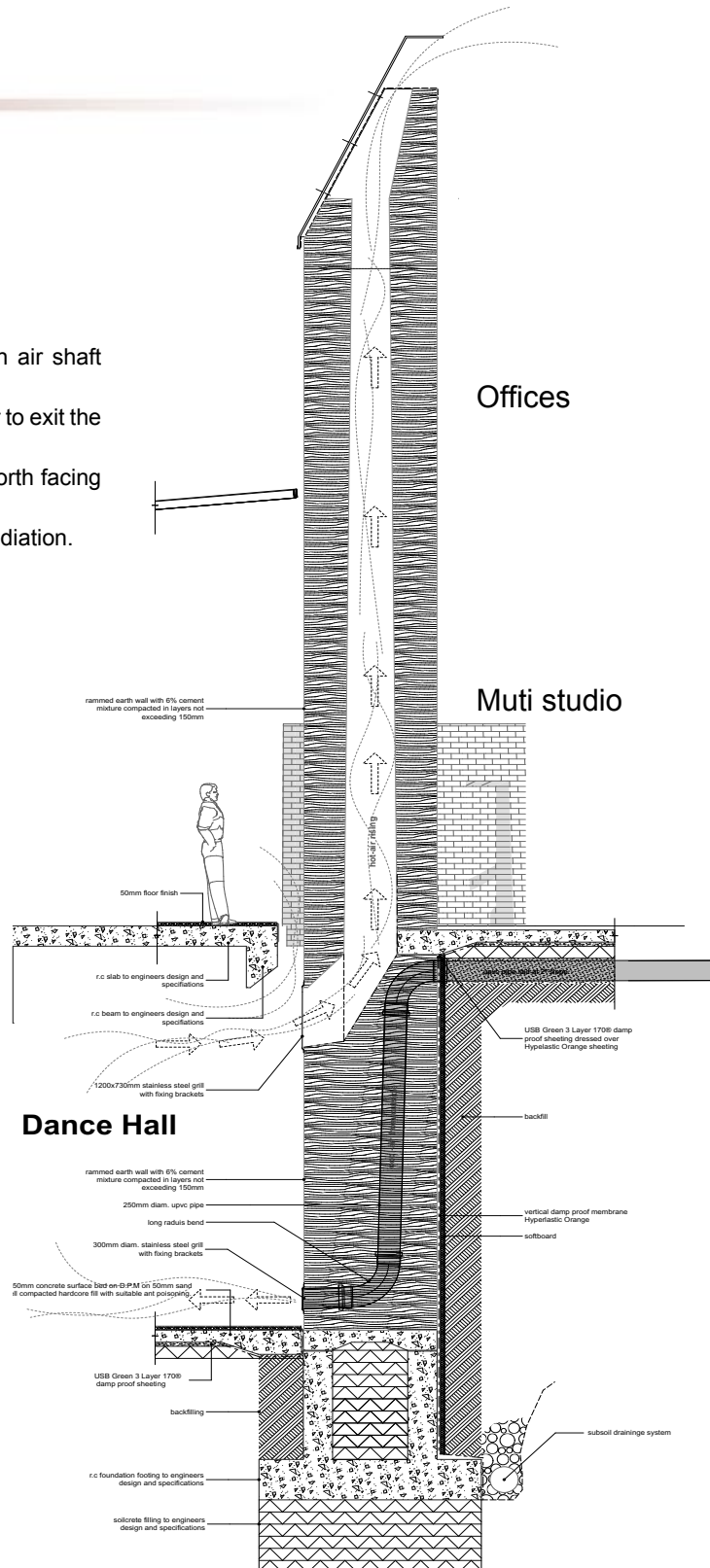


Figure 7.13 Technical exploration of The Rammed earth ventilation duct (Author, October 2016).

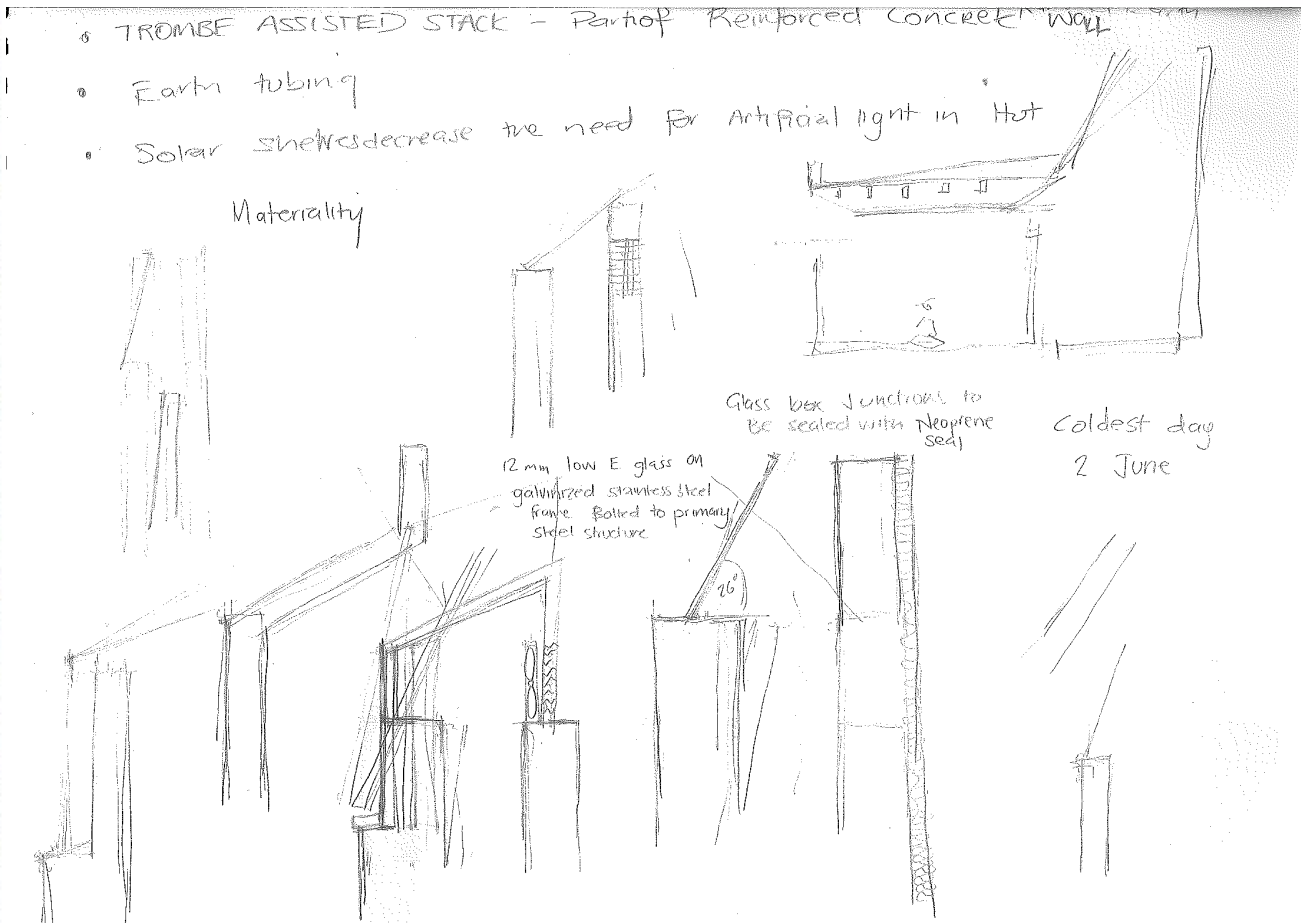


Figure 7.14 Technical exploration sketches of The Rammed earth ventilation duct (Author, October 2016)..

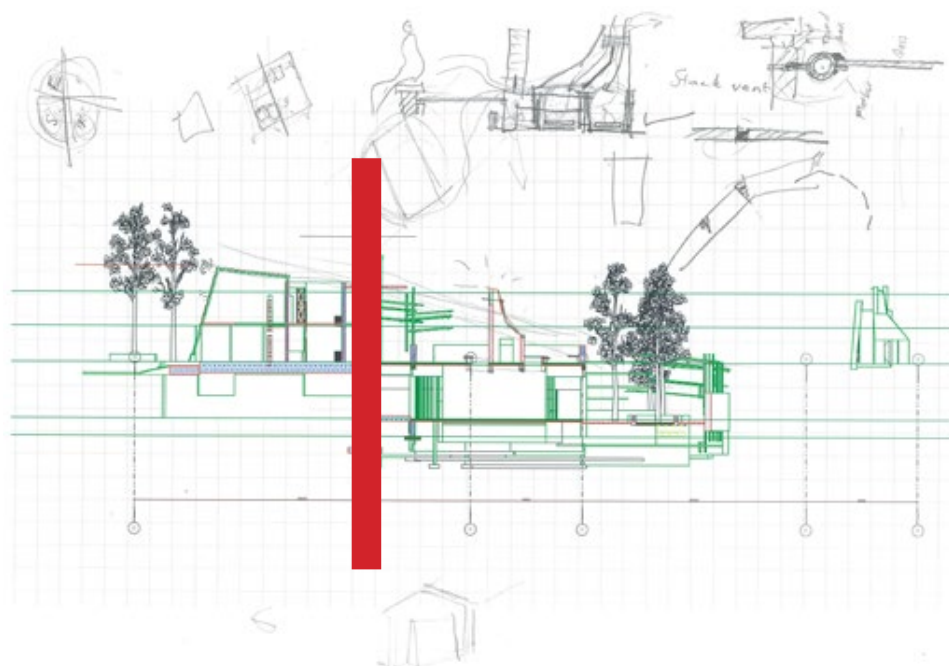


Figure 7.15 Technical exploration of The stack ventilation for the traditional healers Stacks (Author, October 2016)..



7.6 Systems and Service response -Ventilation

Heating and cooling

The building steps down 3 meters ensuring the space used by the initiates has stable temperatures compared to the ground level spaces. The spaces for the initiates does not require excessive heating and cooling as the girls use the space on a daily basis. As the occupancy rate is increased, this causes the space to heat up. The rammed earth pulls out the hot air causing a venturi effect whereby cool air is displaced into the space.

The glass roof panels above the specifically allocated spaces serve as a light source around the traditional healers hut from above lighting up the main spaces used by the girls.

The rammed earths heats up during the day and releases heat slowly at night, warming up the underground spaces.

The glass panel at the top of the rammed earth wall heats up creating a heat build-up at the top, this causes the air at the bottom space to rise up along the wall in a duct inserted in the wall. This results in buoyancy.

Stack ventilation is also applied in the traditional healers huts. The huts have opening on the northern side at the bottom allowing air to enter at a low point the air is heated up from incense used as part of the rituals. The huts need a higher point to allow this air out which resulted in the various iterations of the hut to allow the air out through a stack.

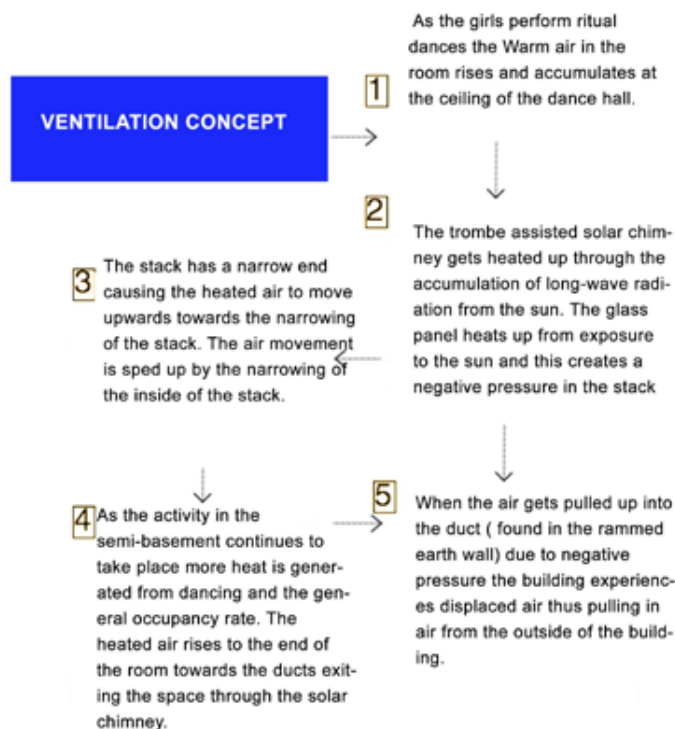
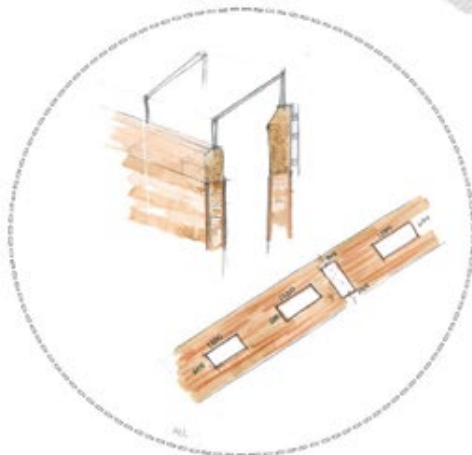
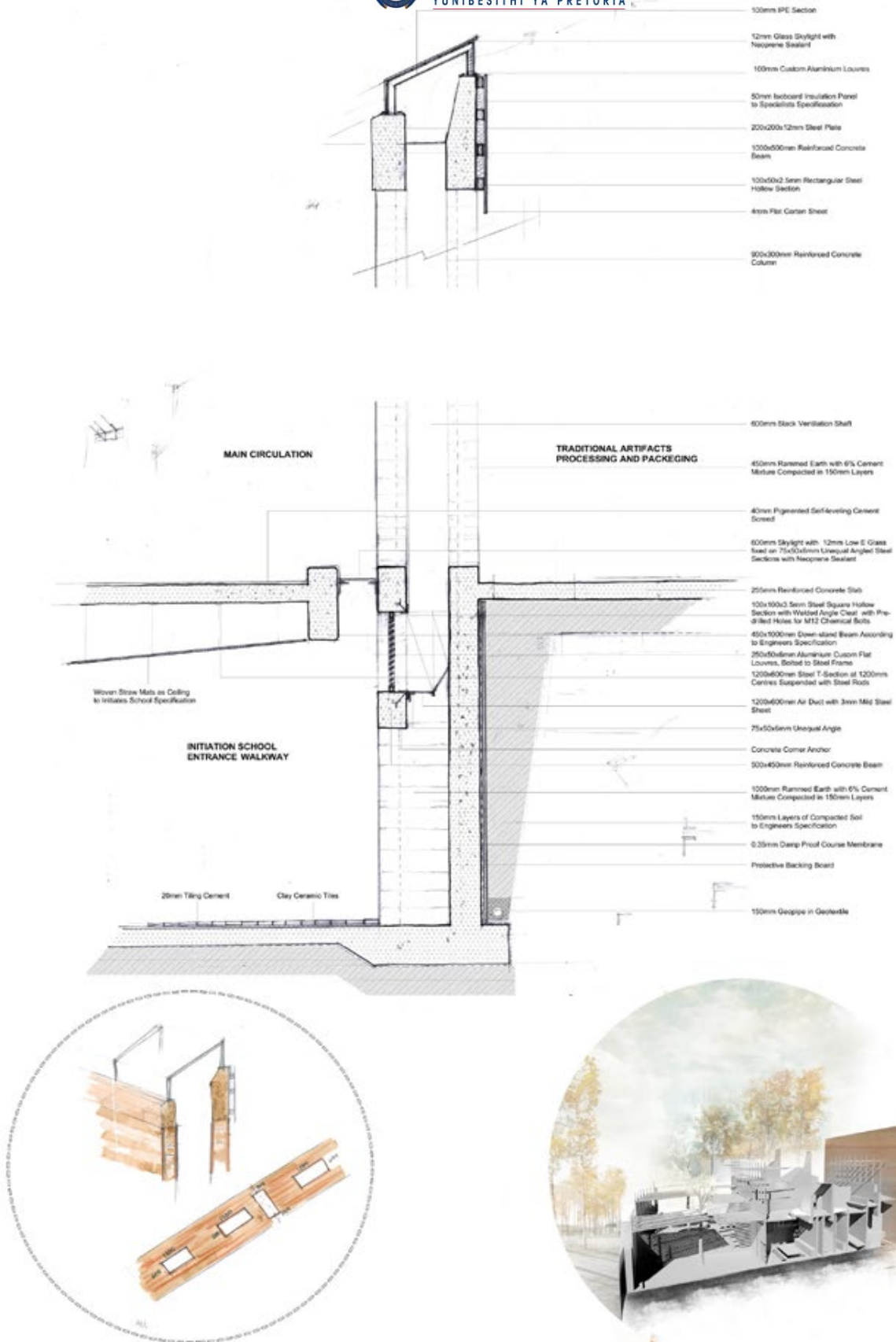


Figure 7.16 Technical exploration of The ventilation in the building (Author, October 2016)..



TROMBE ASSISTED SOLAR CHIMNEY THROUGH RAMMED EARTH WALL 1:20

AXONOMETRIC EXPLORATION

Figure 7.18 Technical exploration of The ventilation in the rammed earth wall at intervals(Author, October 2016)..



Figure 7.18 Technical exploration of The ventilation in the rammed earth wall at intervals(Author, October 2016)..

7.6 Systems and Service response -Ventilation

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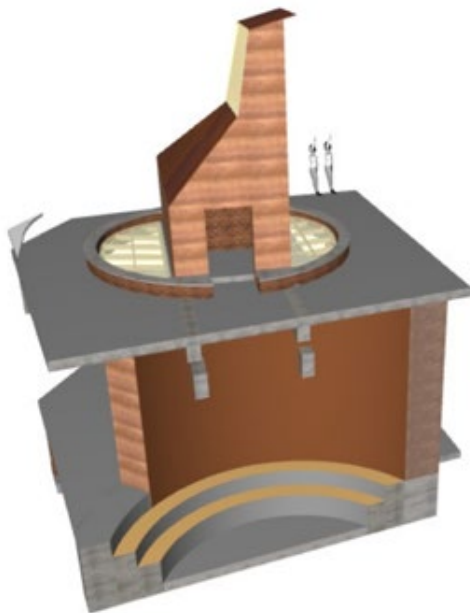


Figure 7.20 Technical exploration of The ventilation in the building (Author, October 2016)..

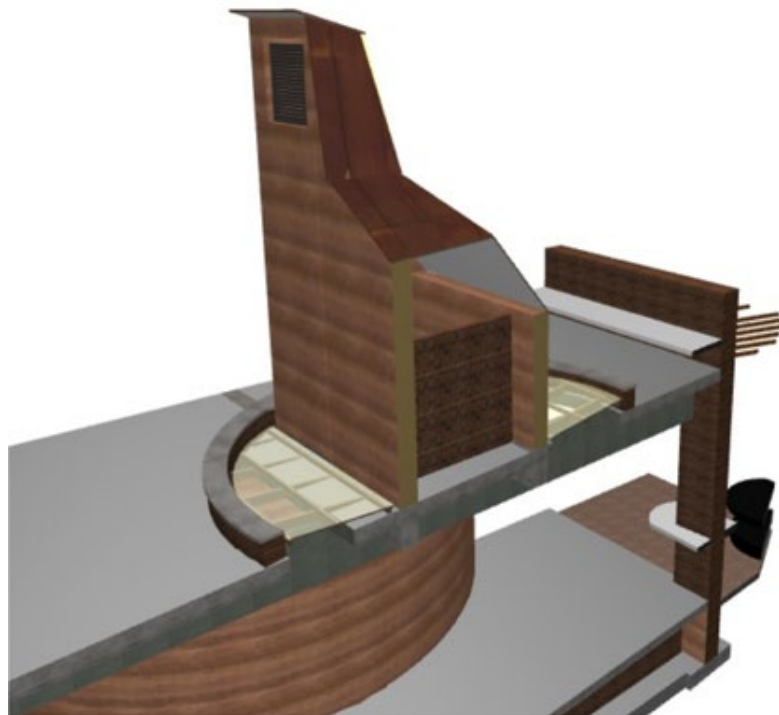


Figure 7.21 Technical exploration of The ventilation in the building (Author, October 2016)..

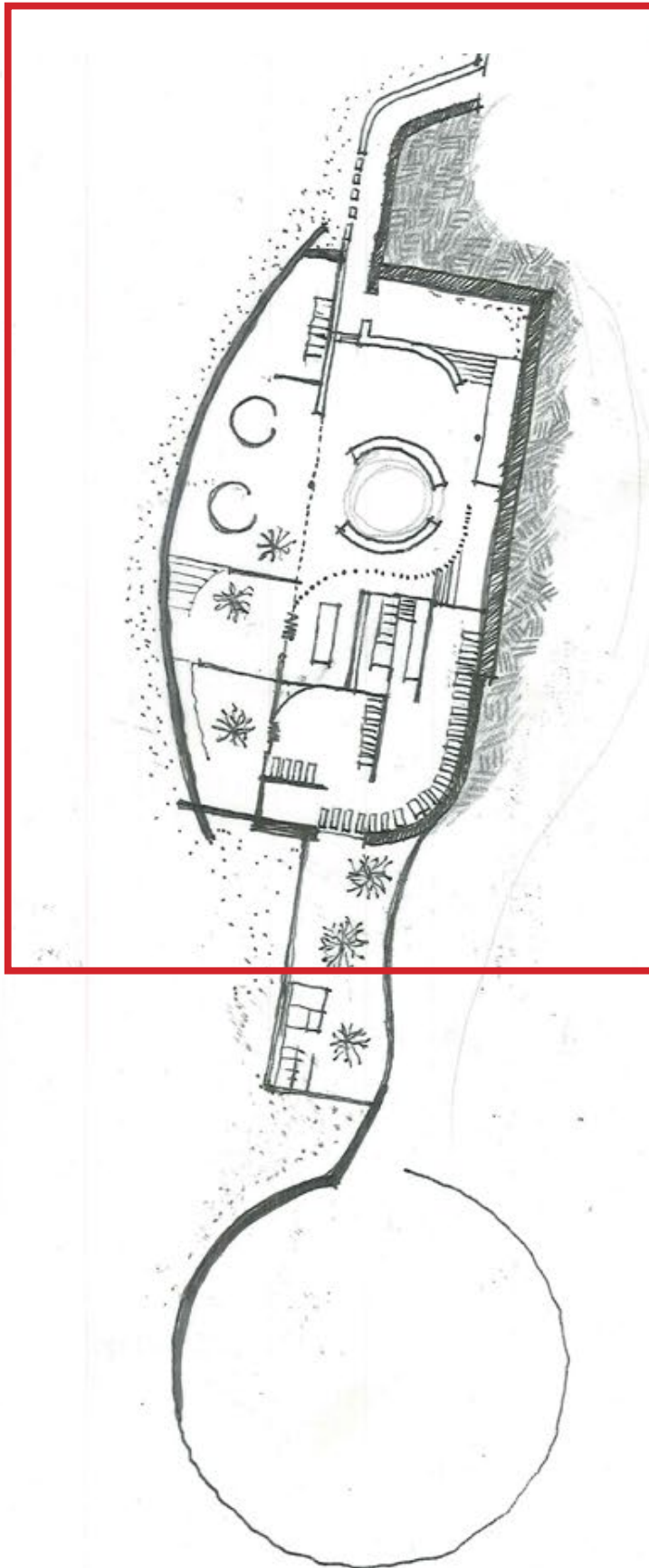


Figure 7.22 Technical exploration of The ventilation in the semi-basement (Author, October 2016)..

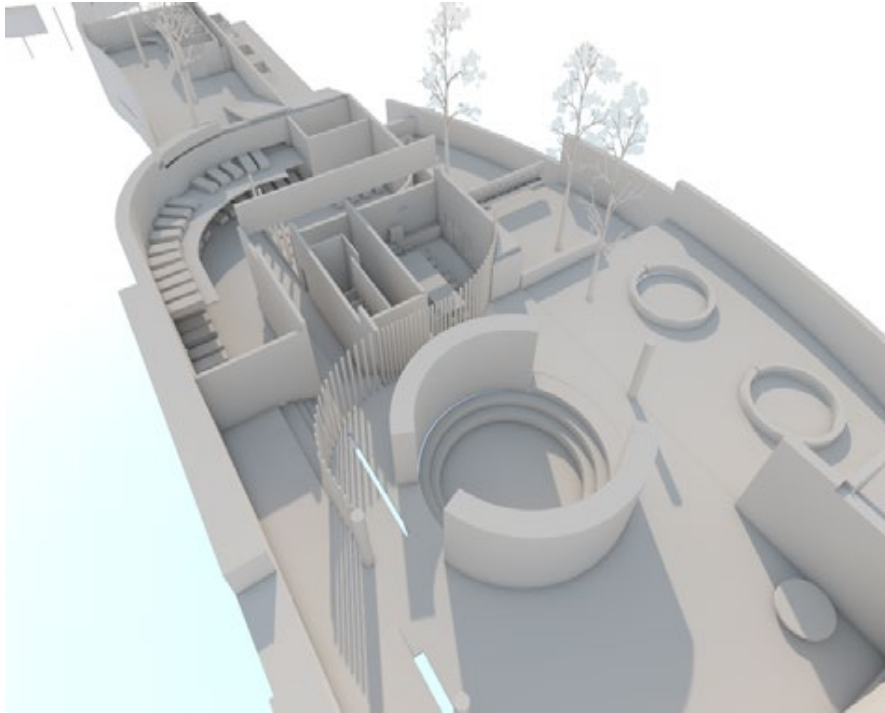
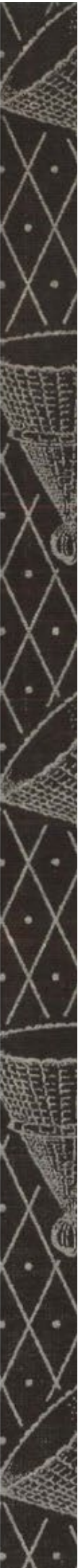


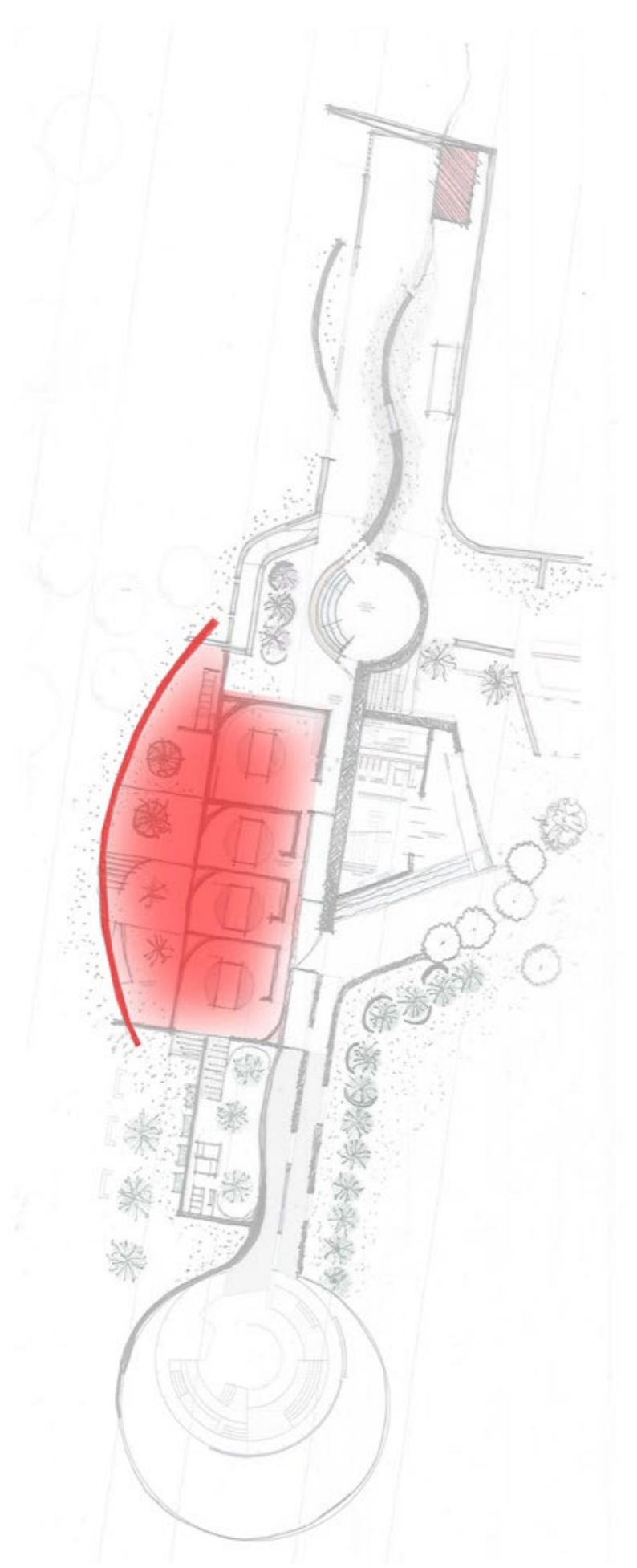
Figure 7.23 Technical exploration of The stack ventilation for the traditional healers Stacks (Author, October 7.7 Passive climate control

The Semi-Basement opens up to the northern side, most rooms are located on this side to allow for passive heating in winter. The Semi-basement has a fully glazed façade to optimize the space the girls have and to blur the transition between the interior and exterior. The summer solar gain is mitigated by a 1-meter pergola canopy that sets the façade back enough to keep the interior spaces shaded. The boundary walls with creepers running along it also helps to cool off the air as it moves into the space. However, in the winter the sun is allowed into the space (as the plants die during the cold winter months) where the concrete flooring absorbs the heat and releases it into the interior keeping the girls warm during the winter months.

The buildings for the traditional healers are long and thin making it optimal for passive ventilation. The spaces allow air in from a small opening from the northern side to an opening on the southern side through a stack vent positioned at a higher point. The entire little building serves as a light-well and a stack ventilation system: lighting up the space below it and the space where the traditional healer sits.

The skylight shafts allow light into the lower spaces only. As the spaces step down there are vents in the wall at the sides of the courtyards where the slab steps down allowing air to move into in to the spaces below.







7.10 Chapter 7 Synopsis

Chapter 7 is the merging of the design and the technical chapters, it is the process of making and being made. Addressing the process of an Architecture of Inversion through the process of a building that is made and makes the users. The chapter investigates the merging of the systems to create spaces rich in the human experience. Chapter 7 addresses the architecture of this space as a space focused on the human experience rather than an aesthetic approach. The architecture is pushed through a series of lessons adapted from the past such as the Bilobial spaces of the Tswana women and the original spaces dedicated to the process of initiation. Chapter seven investigates how architecture can be more than aesthetics. How architecture can serve the ritual, enhancing and enriching it without compromising the original nature of the ritual.

