CHAPTER _9

Technical Concept
Technical Resolution
Material Pallet
Environmental Systems
SBAT Rating

Technical Concept

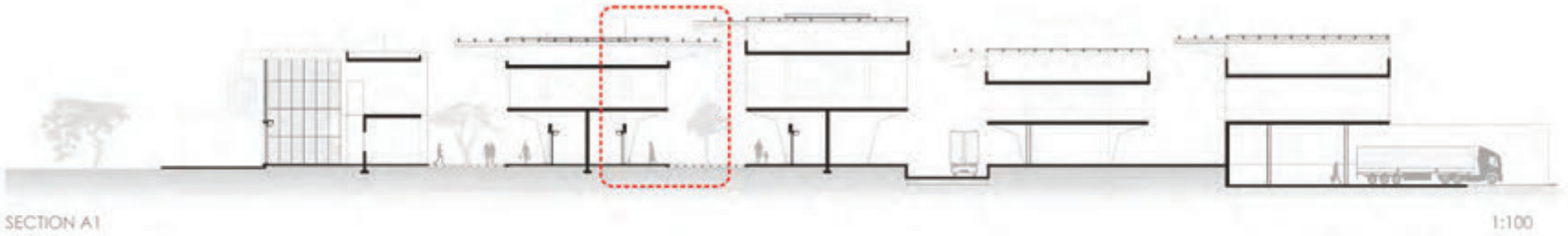


Figure 168: Section through greenhouse, laboratories, herbarium, administration, conference facilities and auditorium. By Author

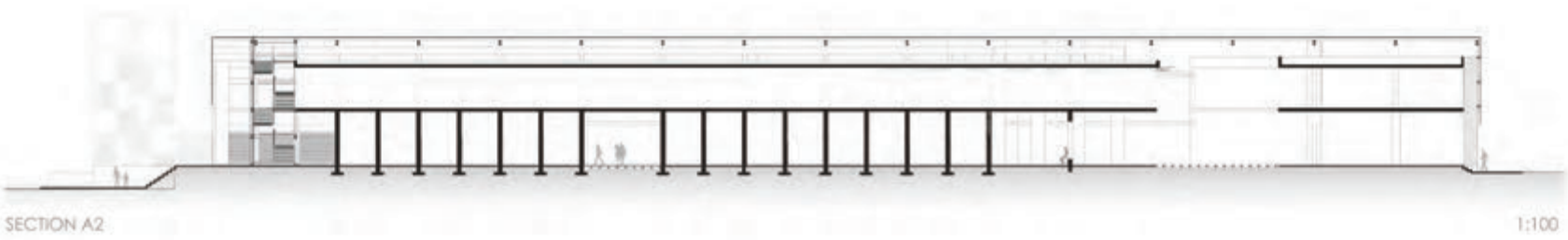


Figure169: Section through market stalls and laboratory By Author

Figure 170: Section through herbal healer quarters, laboratories, open green square and auditorium, By Author

Technical Concept of the Herbal Market

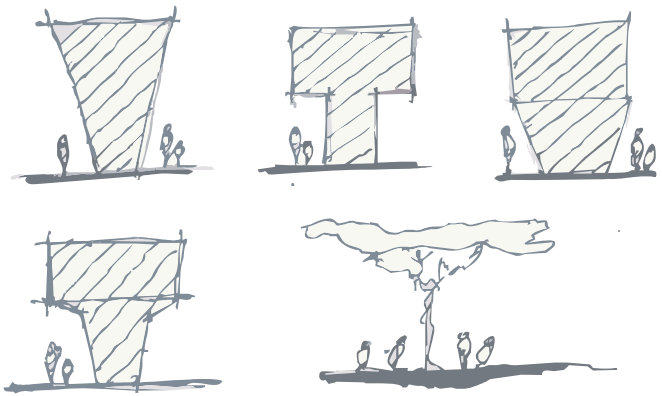


Figure 171: Technical design development of sectional form from tree. By Author

The herbal market and second floor laboratories also had to depict the dialectic relationship between the two. The shape of the section resembles that of a tree, a meeting place in African cultures where people came to converse, do business and socialize. The tree also has a structural system from the ground up. The structural member which is the main stem of the tree the branches which is a more light weight construction and the finer twigs which supports the leaves, the envelope.

The concept of the tree as structure also twins together the dialectics of the human connection (Herbal market), the structured organization and he curtain. Thus in section this layering is translated into structure, material and form. The public domain would be solid in nature mainly consisting of thick loadbearing concrete and face brick walls (the trunk). The second floor utilized by the organization consists of light weight walls and concrete columns and beams (the branches). Finally the envelope of the build consist of light weight steel

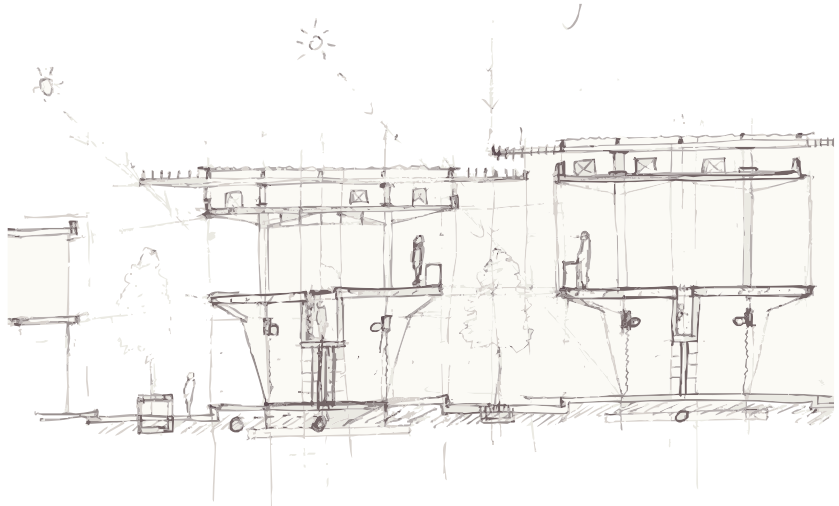


Figure 173: Technical design development of market corridors space in relation to greenhouse labs and herbarium. By Author

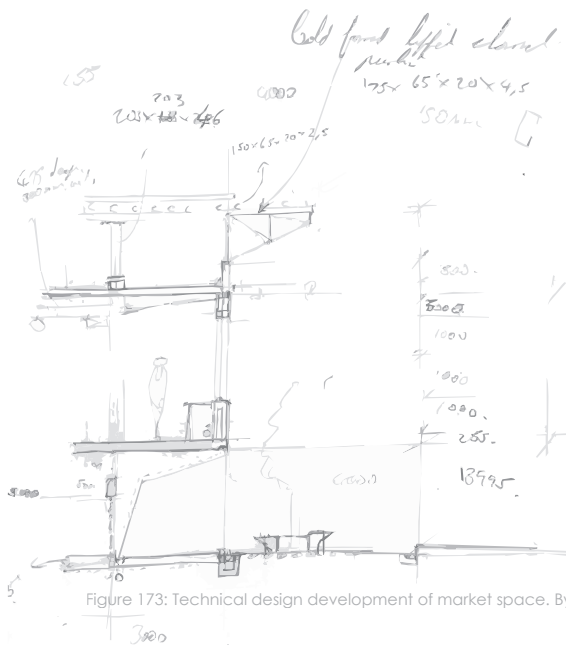


Figure 173: Technical design development of market space. By Author

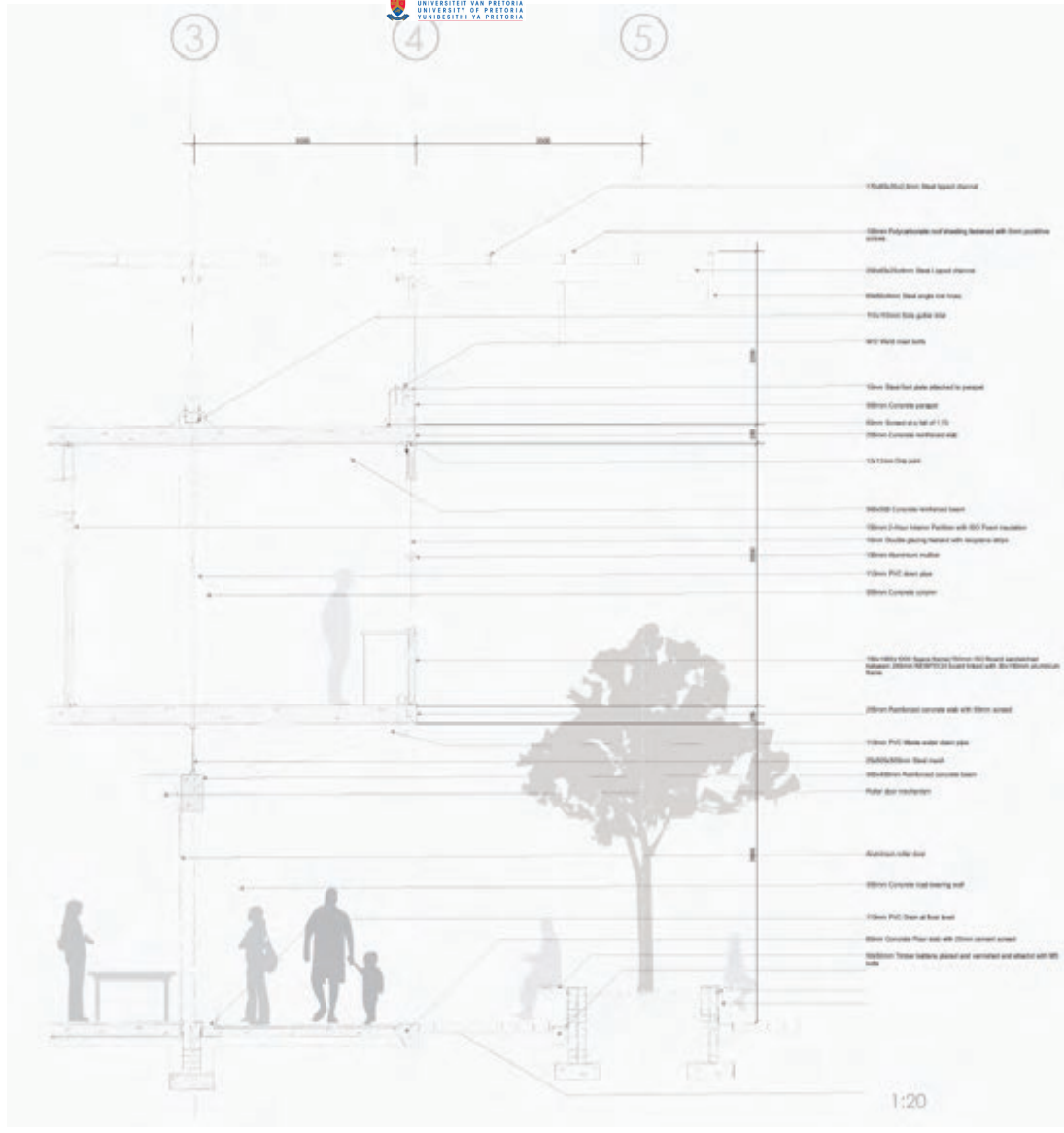


Figure 174: Technical development, sizing and materiality specification of market stalls, second level laboratories, roof structure and planters. By Author

The Trunk

Figure 175: Axonometric of market stalls and fire escapes. By Author

The Branches

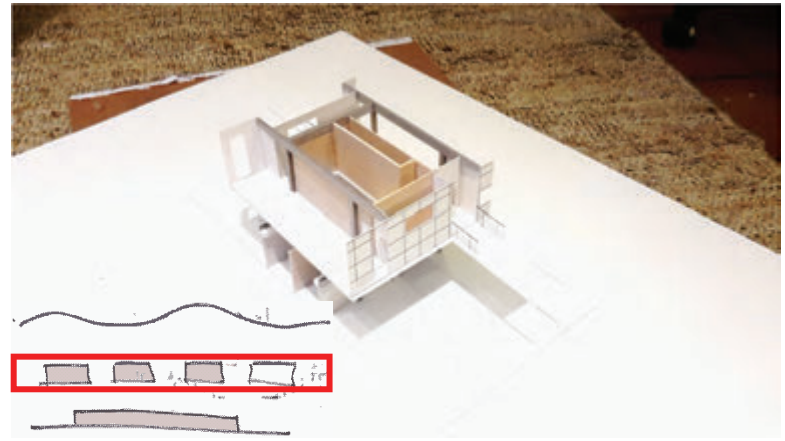
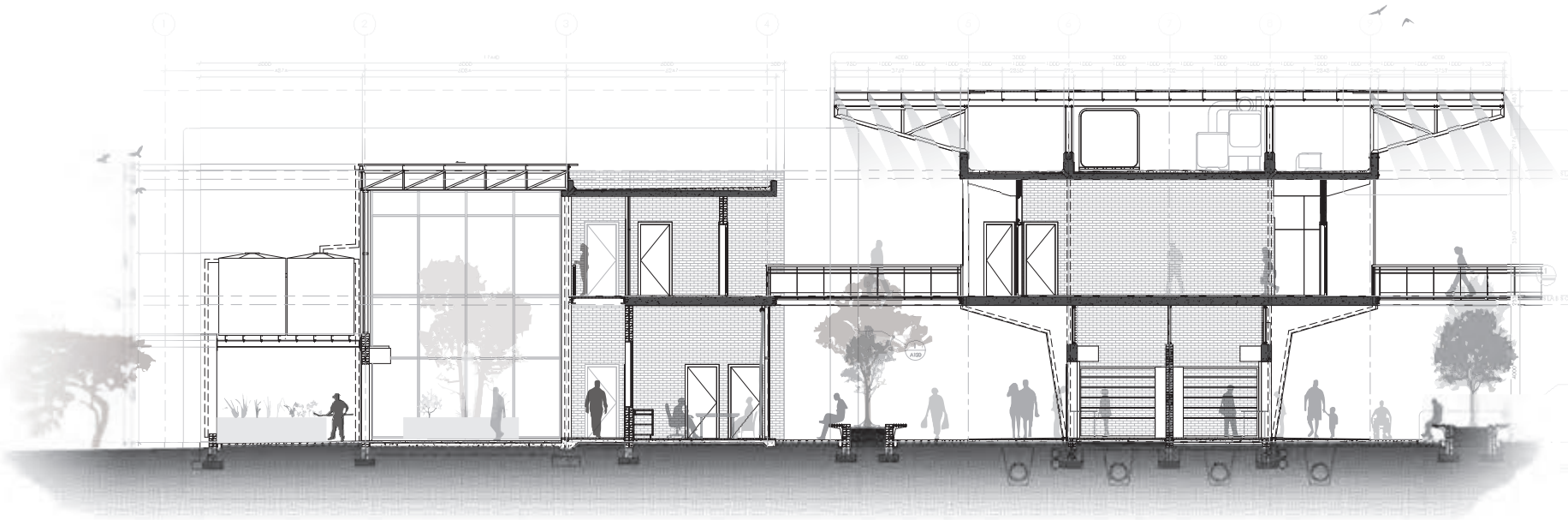


Figure 176: Axonometric of laboratory construction. By Author

The leaves

Figure 176: Axonometric of roof construction. By Author

Greenhouse, Market and Laboratories



Technical Concept of the Auditorium

The auditorium's technical design is simplistic and relates back to that of the market area with it cantilevering concrete elements creating covered walkways around the auditorium at public level. The auditorium with is curved walls in an almost spiral shape is constructed mainly of cast in situ concrete and face brick wall infill. The roof consists of lightweight steel girders that spans the full length of the auditorium. The steps forming the auditoriums seating are reinforced concrete slabs resting on stepped concrete ribs.

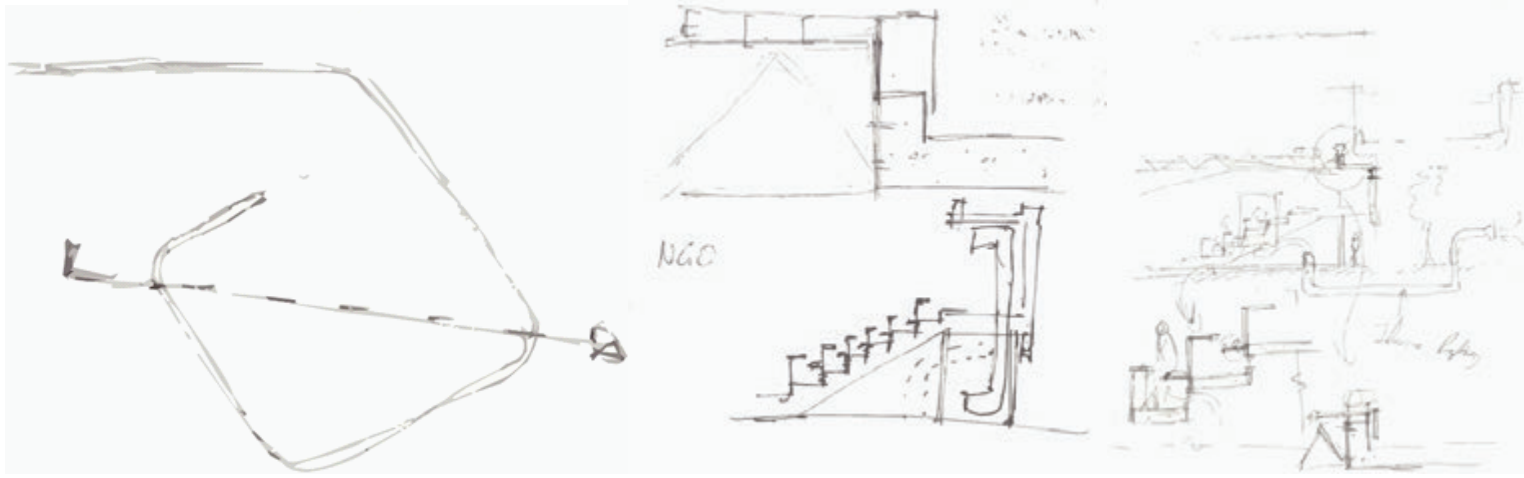


Figure 179: Sectional exploration of Auditorium's ventilation. By Author

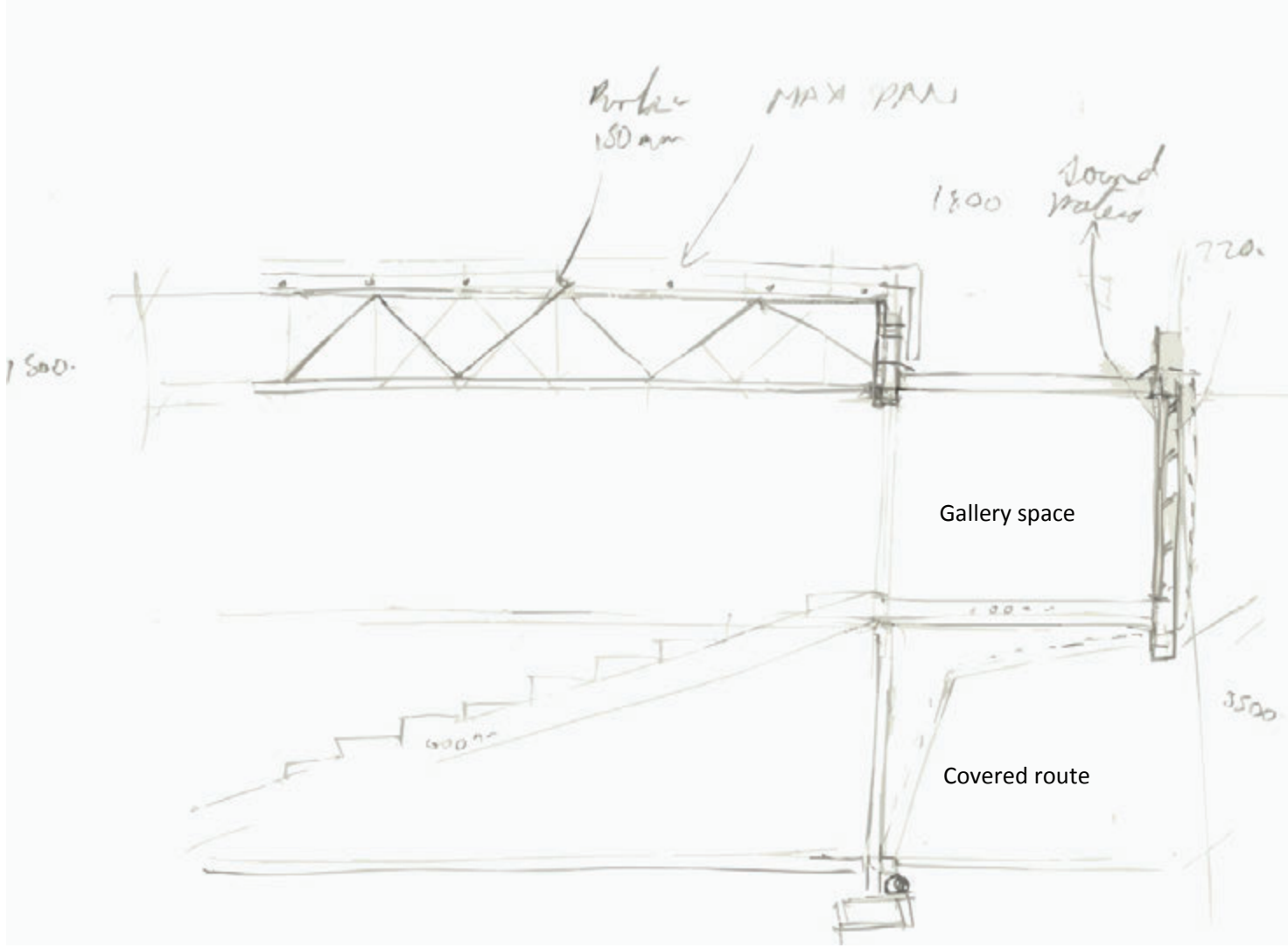


Figure 180: Sectional exploration steps, cantilevering slabs and materiality. By Author

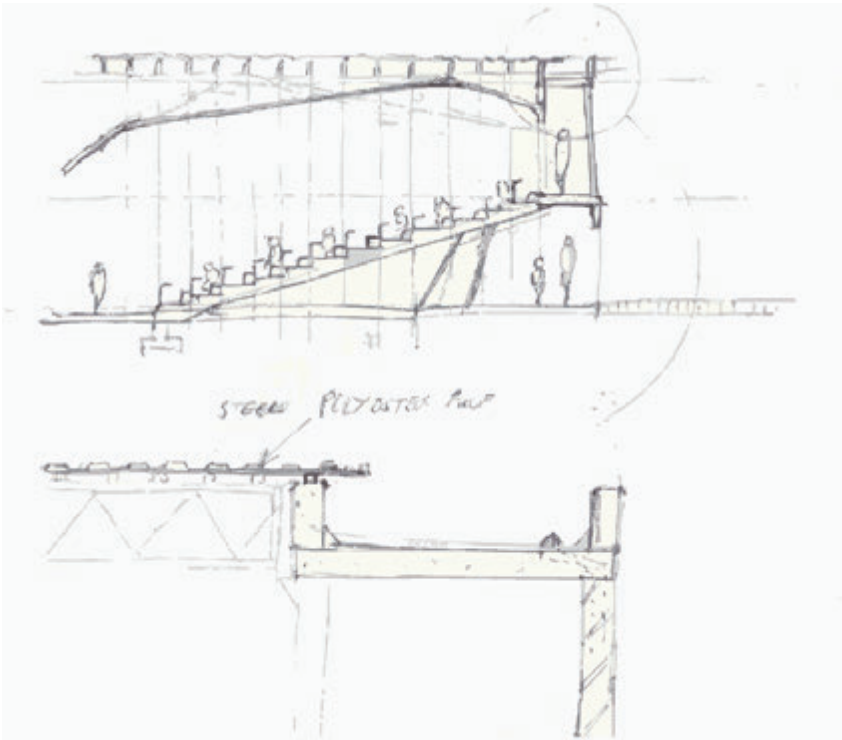


Figure 182: Auditorium section exploration

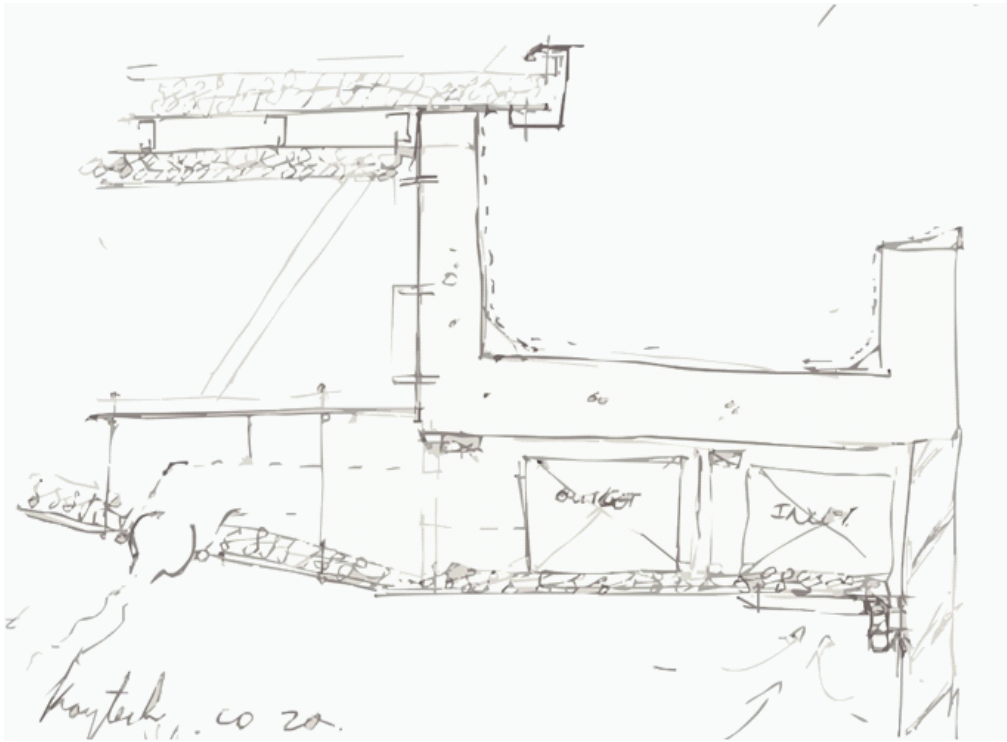


Figure 183: Auditorium detaill exploration

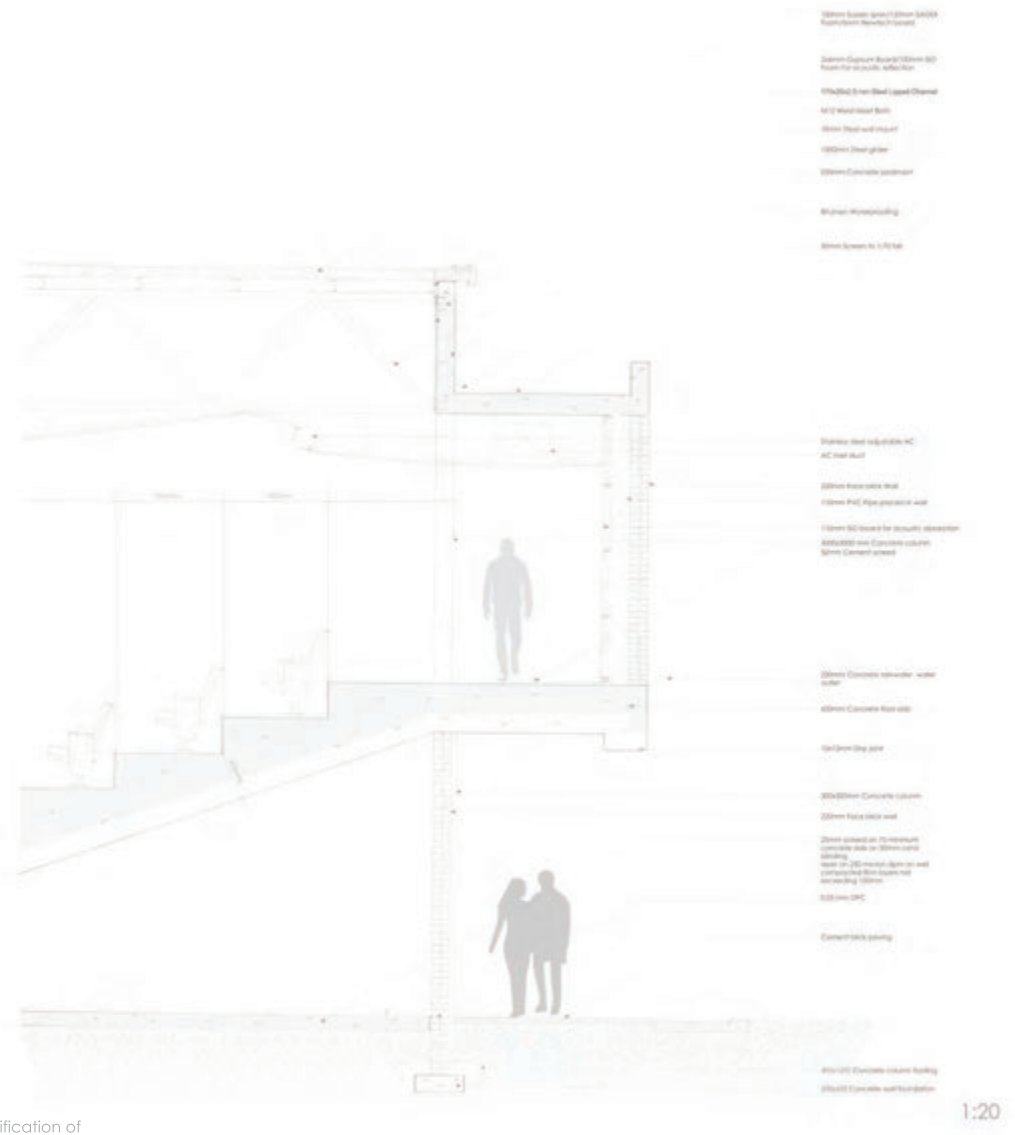
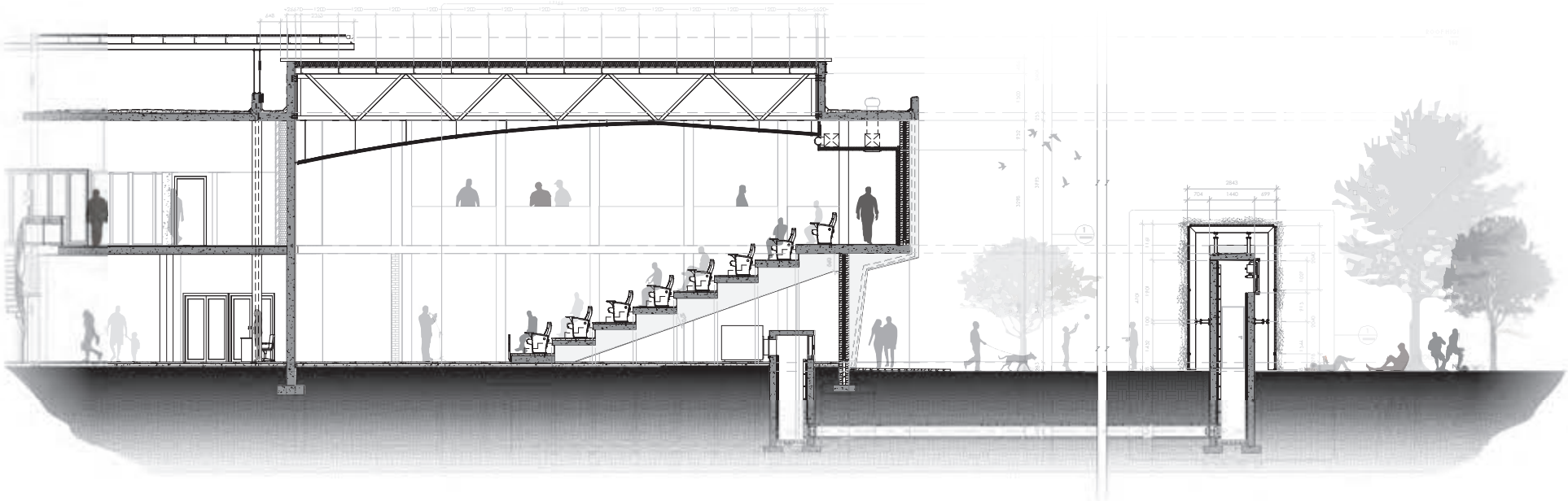
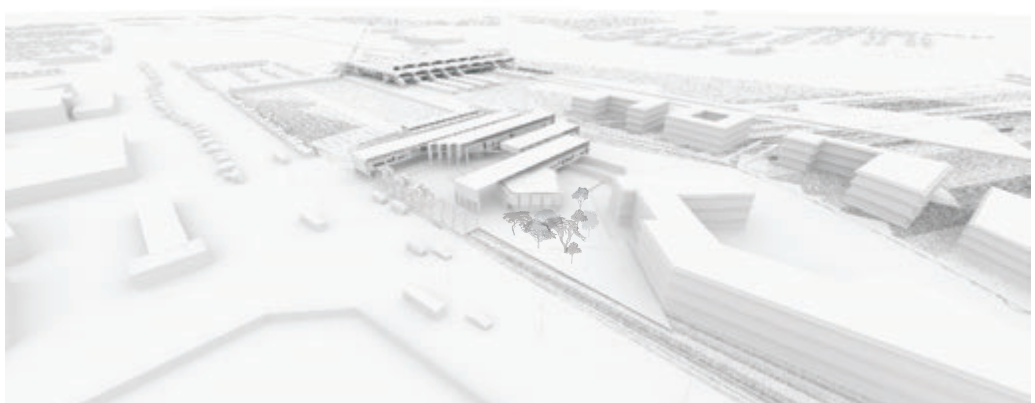
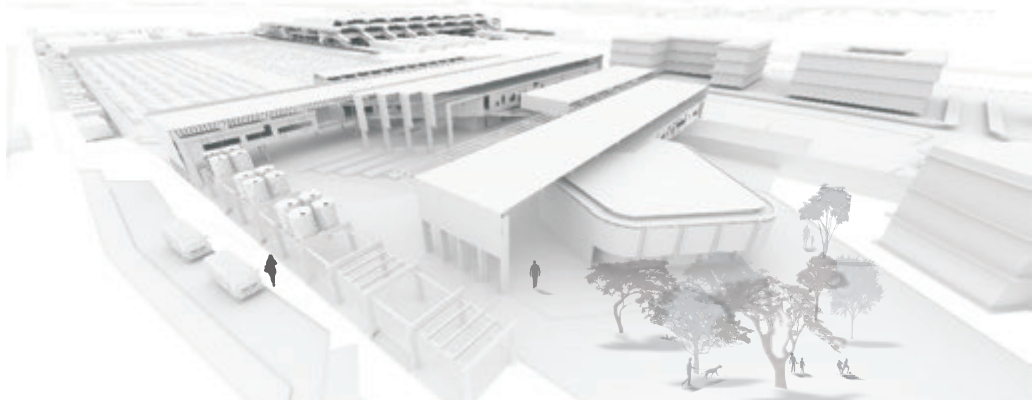


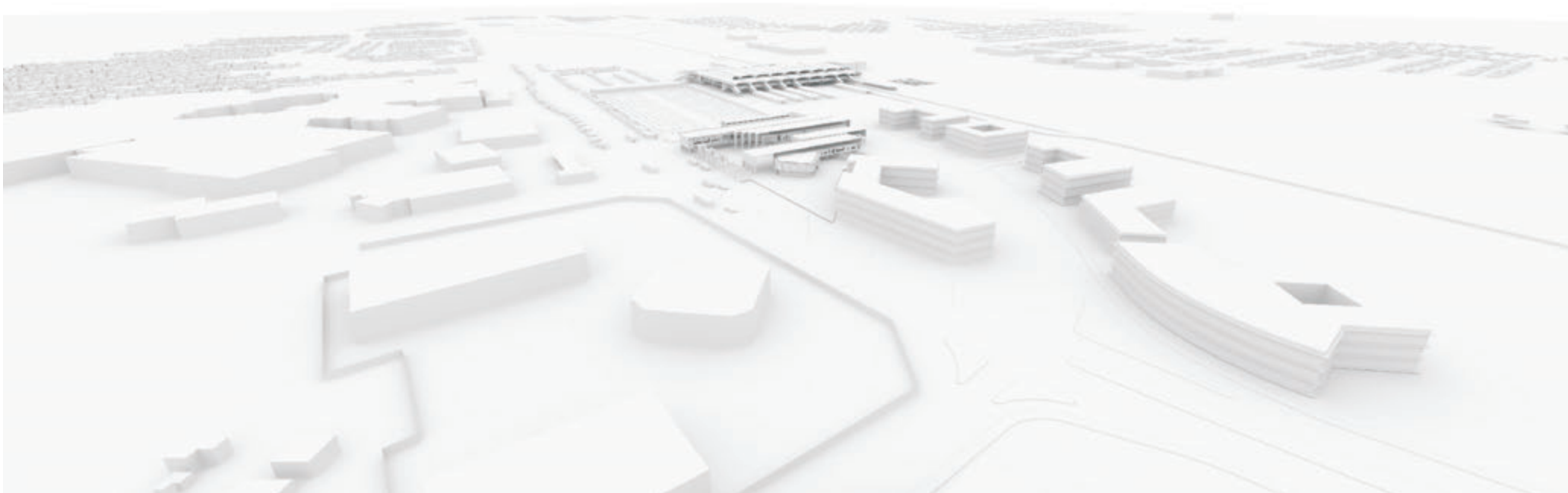
Figure 183: Technical development, sizing and materiality specification of market stalls, second level laboratories, roof structure and planters. By Author

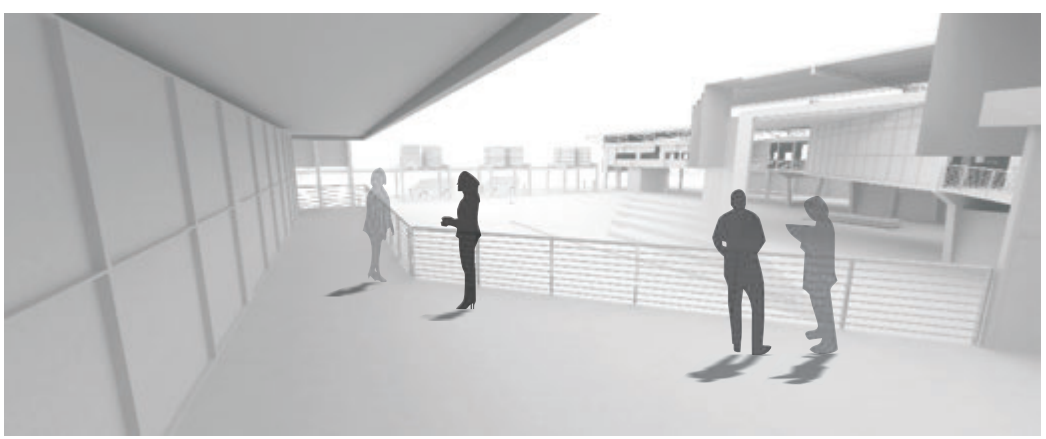
Auditorium

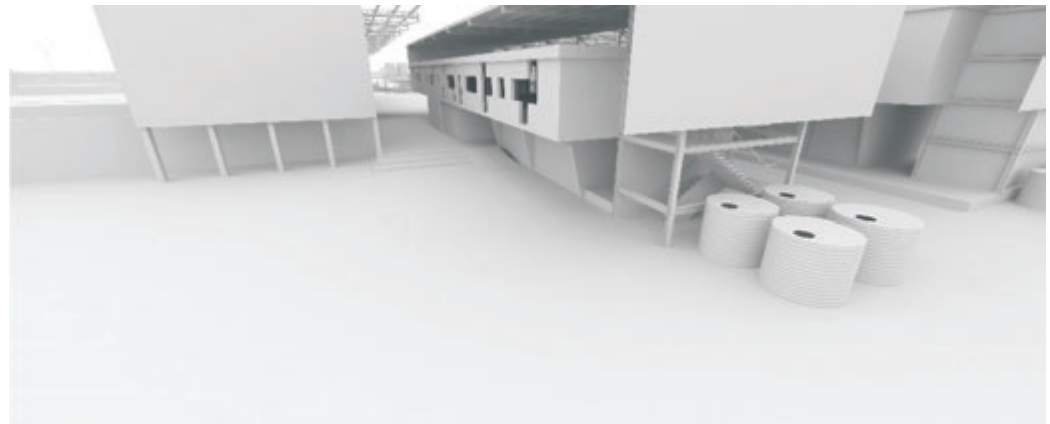


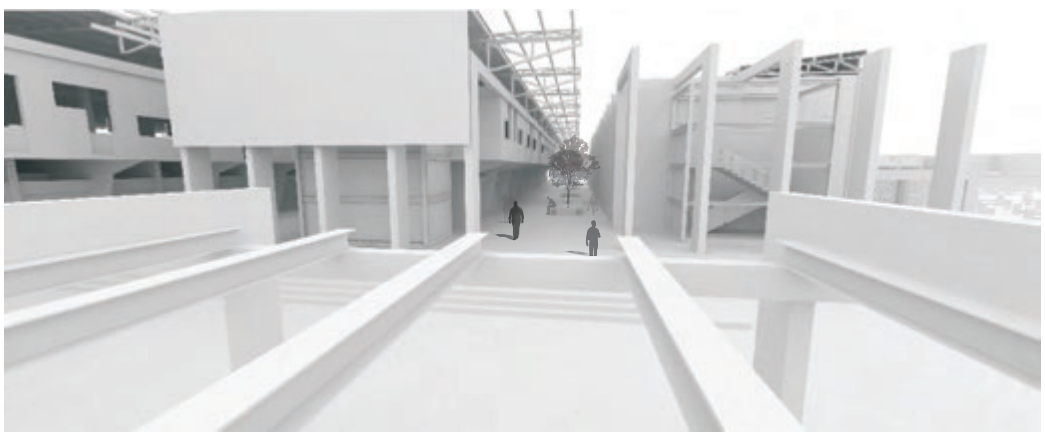


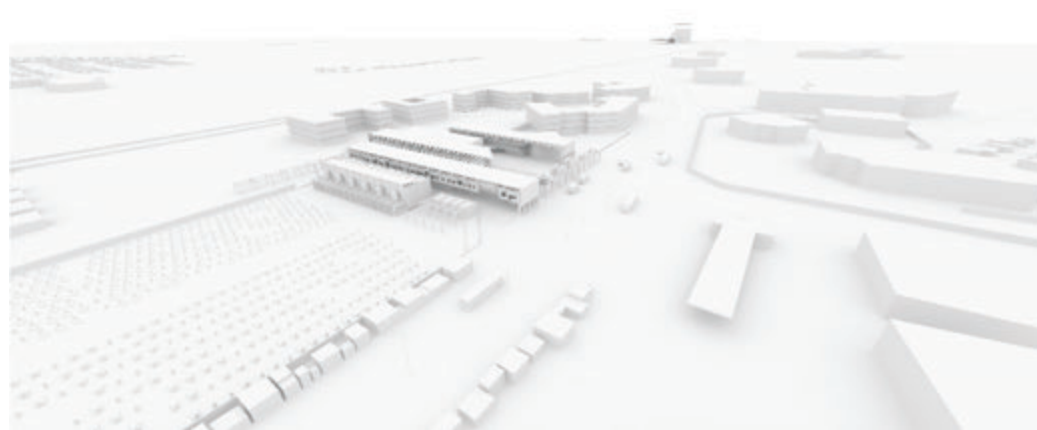




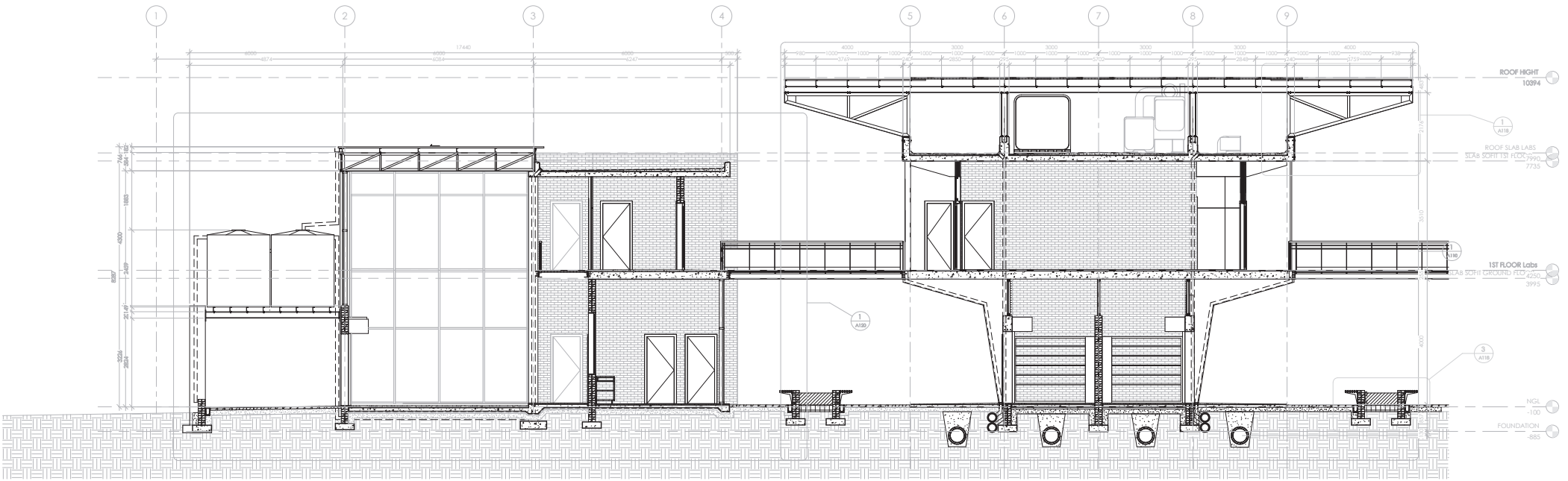






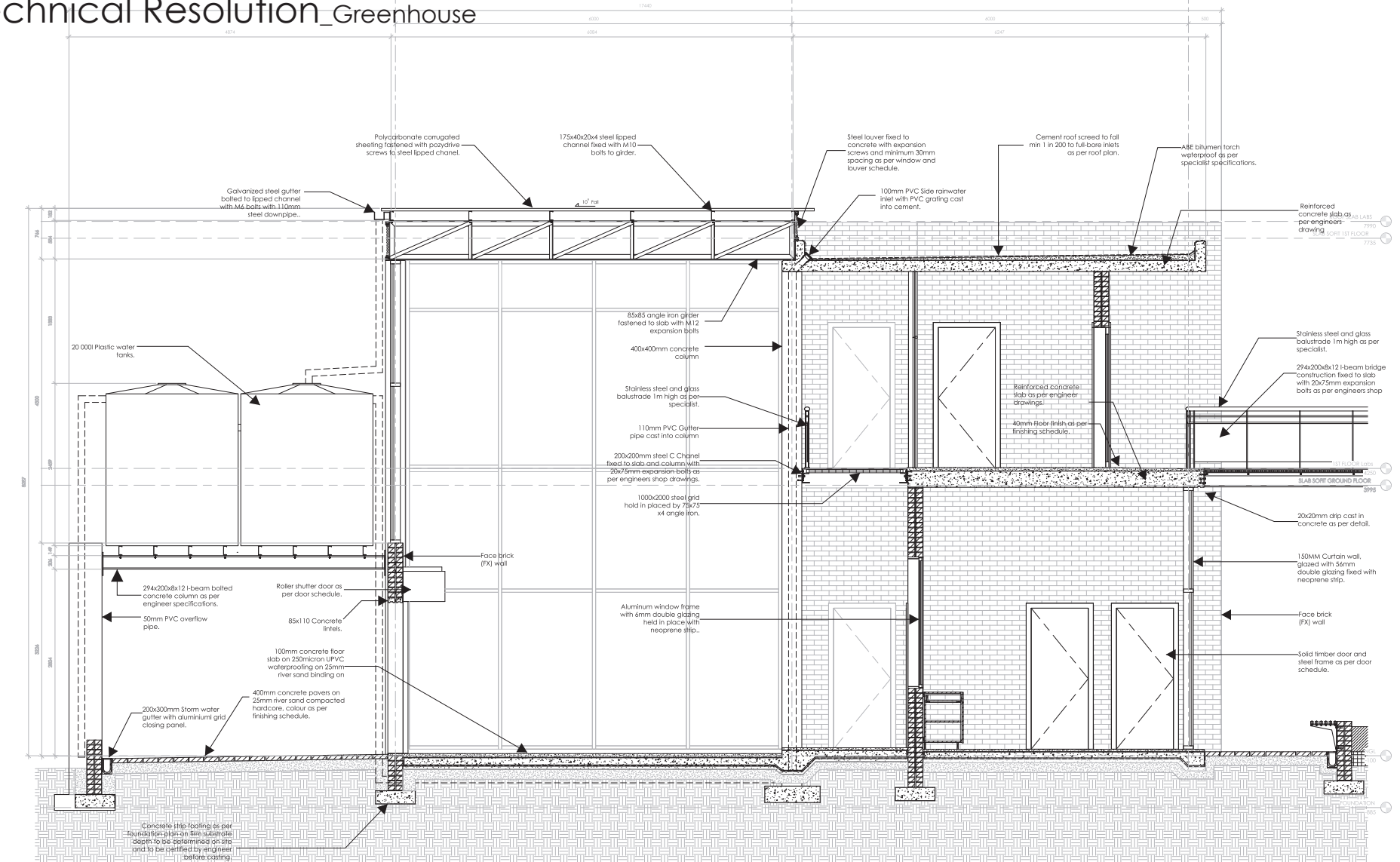


Technical Resolution_Greenhouse and Laboratory



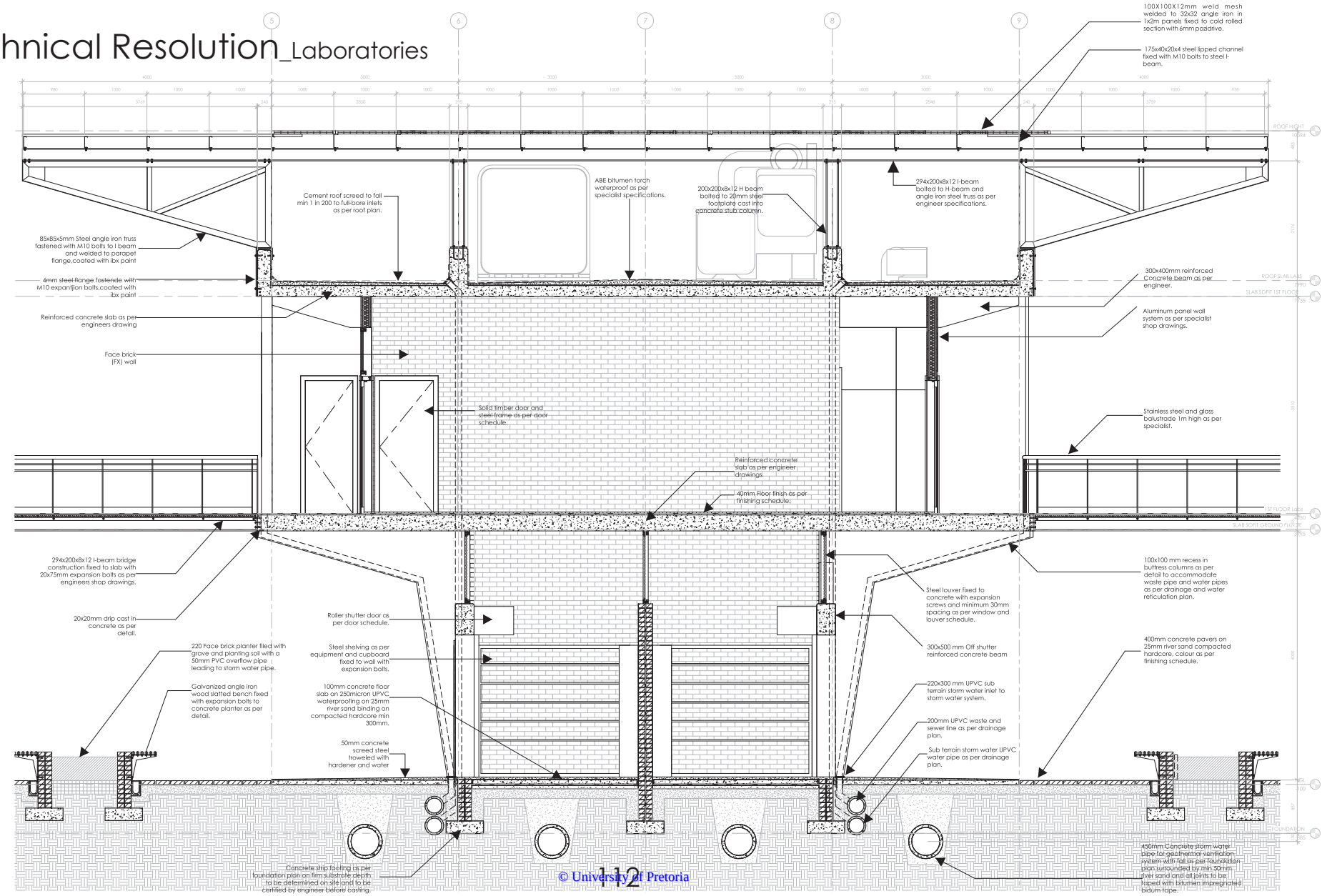
1 Greenhouse and Lab section

Technical Resolution_Greenhouse



1 Greenhouse section

Technical Resolution_Laboratories



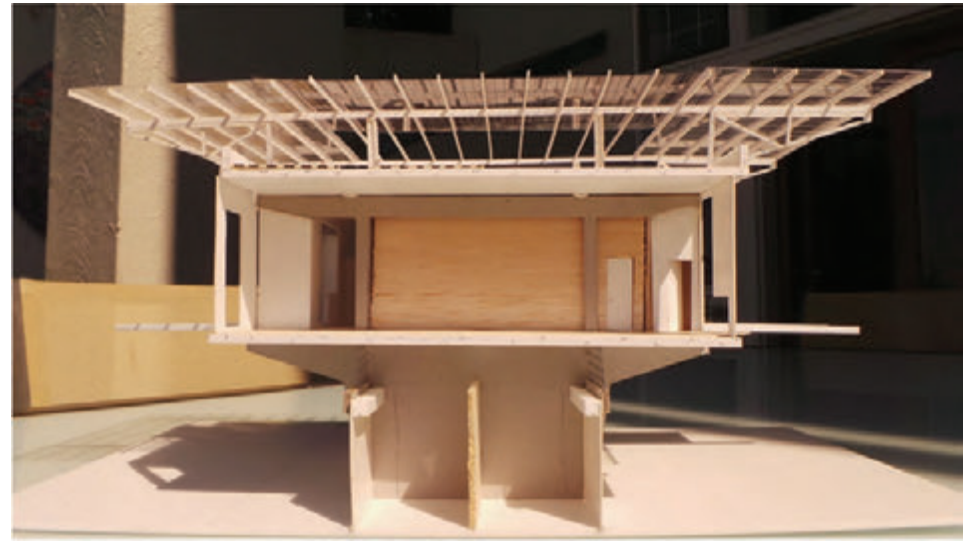


Figure 184: Section of market and laboratories, By Author

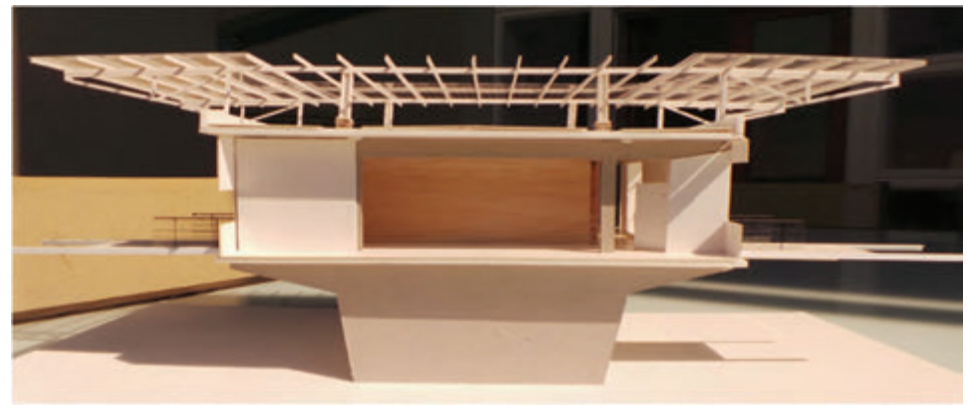
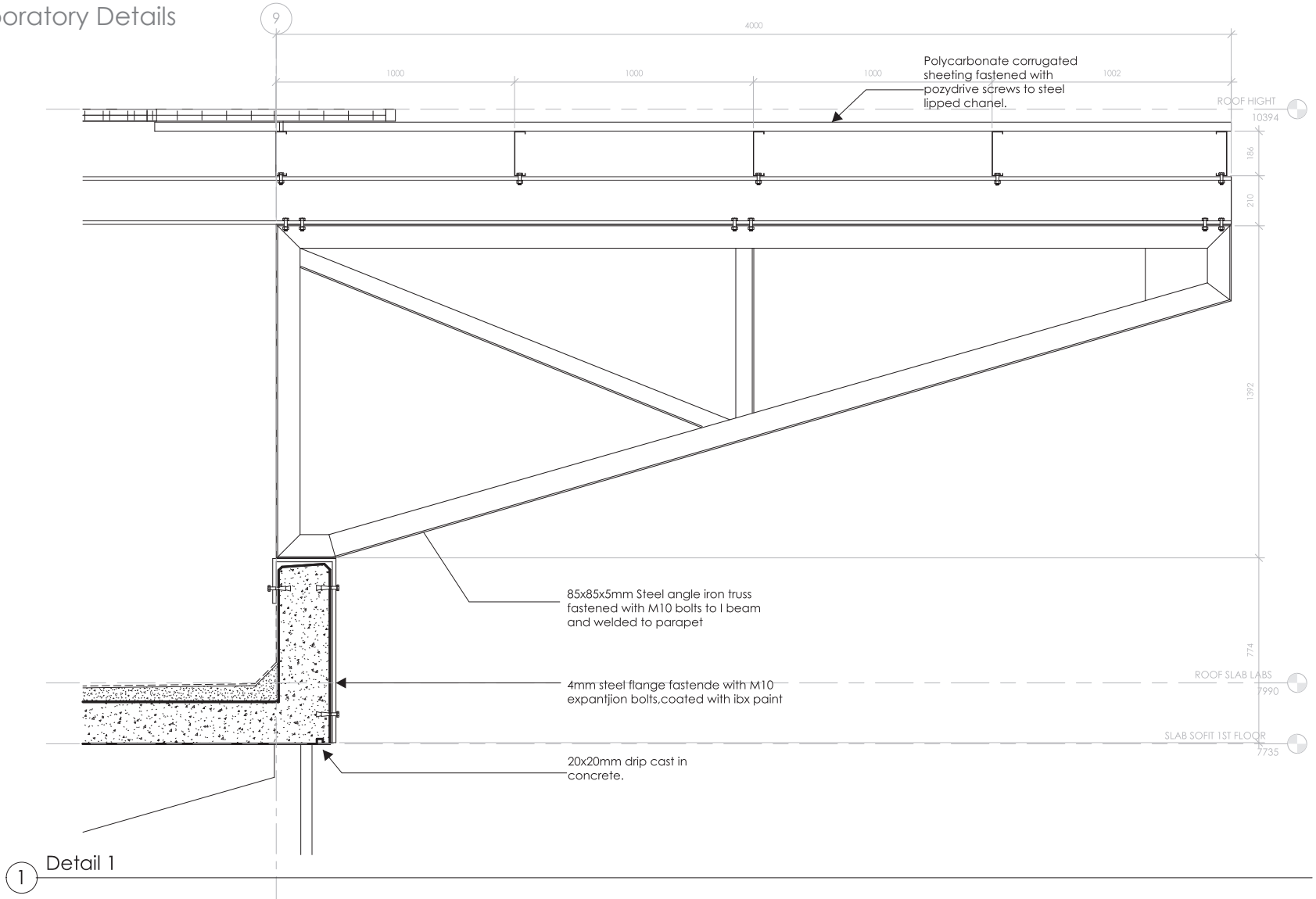


Figure 185: Section of market and laboratories, By Author



1 Detail 1

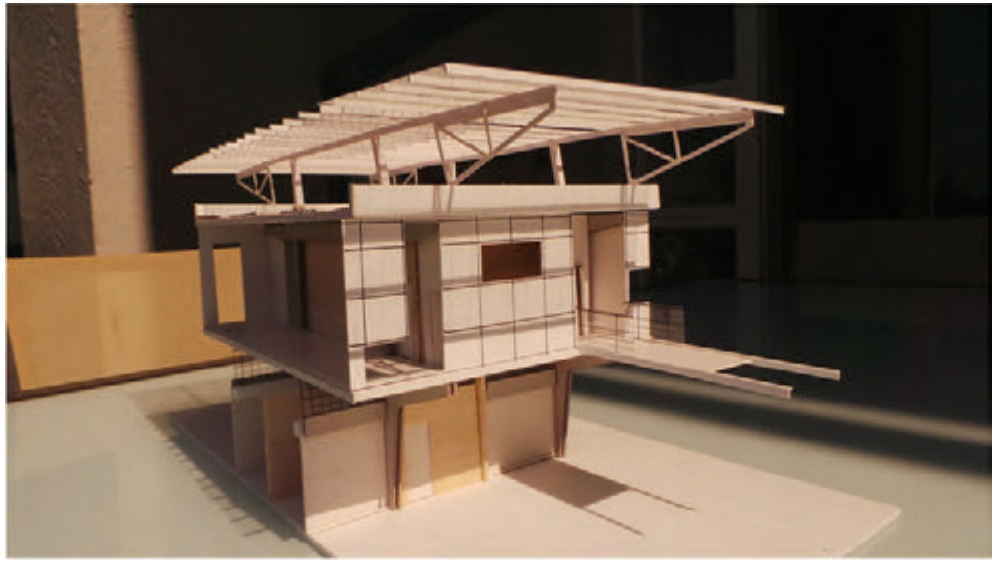
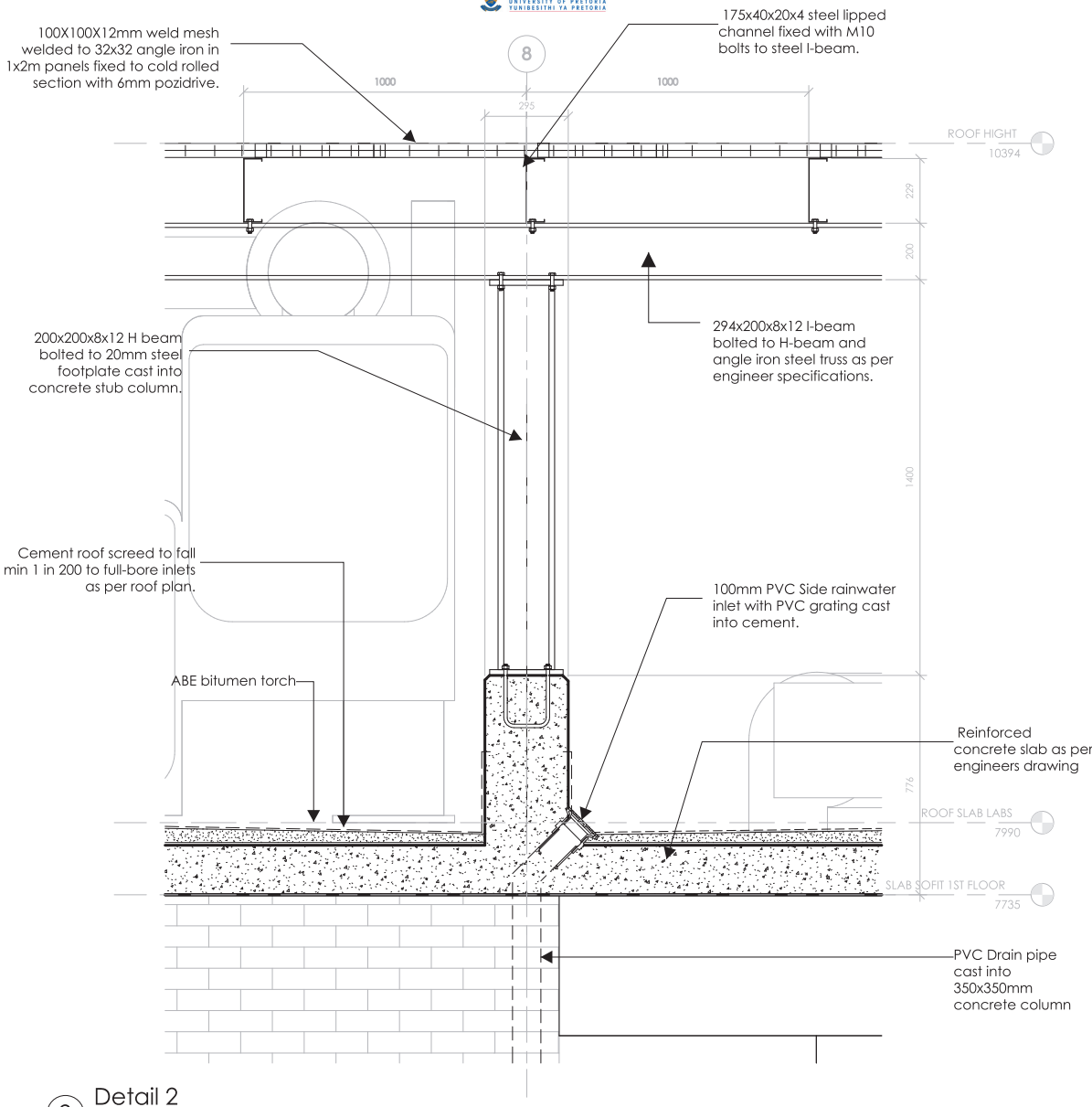


Figure 186: Section of market and laboratories, By Author

Figure 187: Covered walkway showing herbal stalls and fire escapes, By Author



2 Detail 2
1 : 10

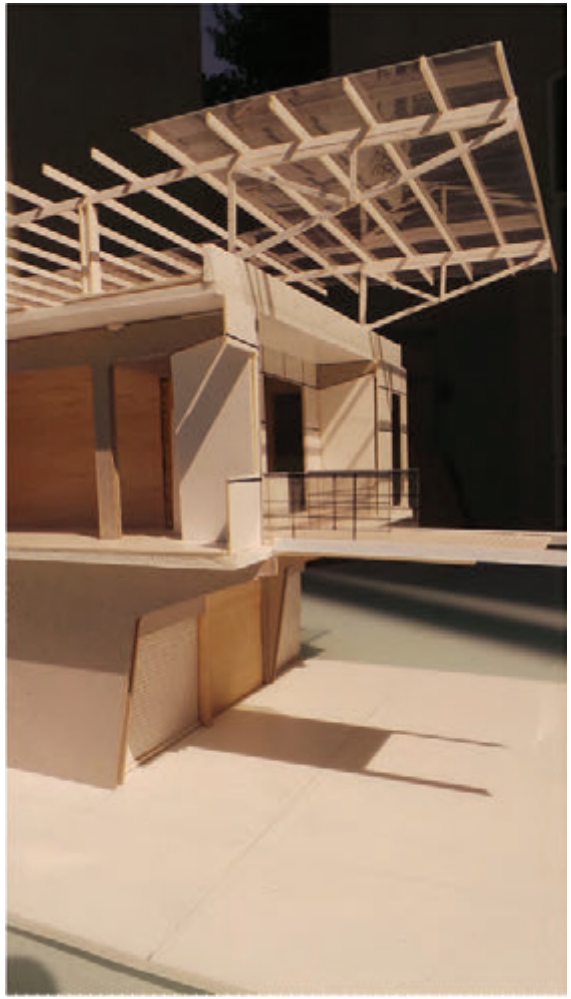


Figure 188: View of market and laboratories connected by bridge, By Author

Figure 189: View of market and laboratories connected by bridge, By Author

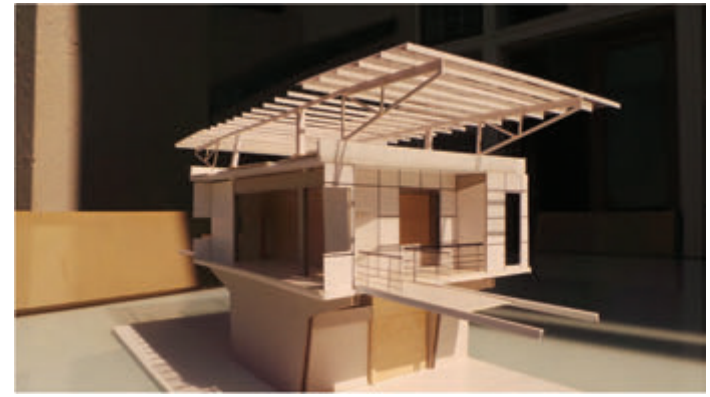
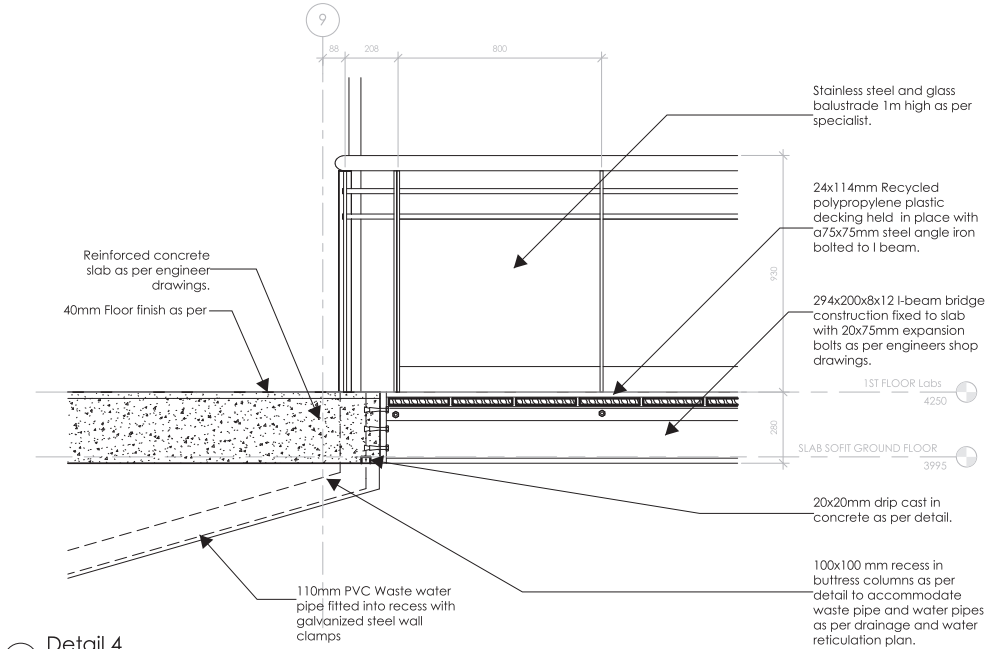
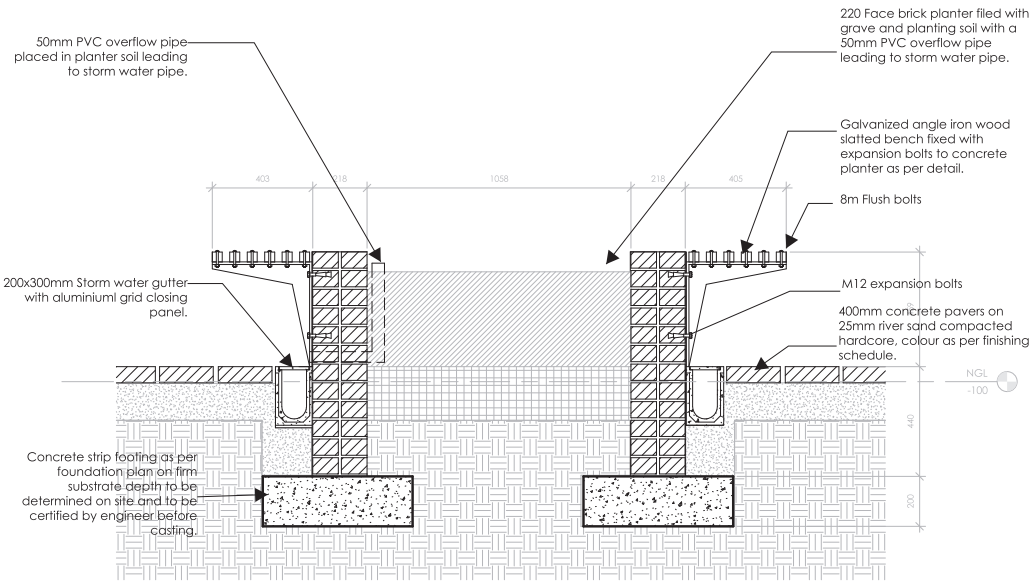


Figure190: Section of market and laboratories, By Author

Laboratory Details

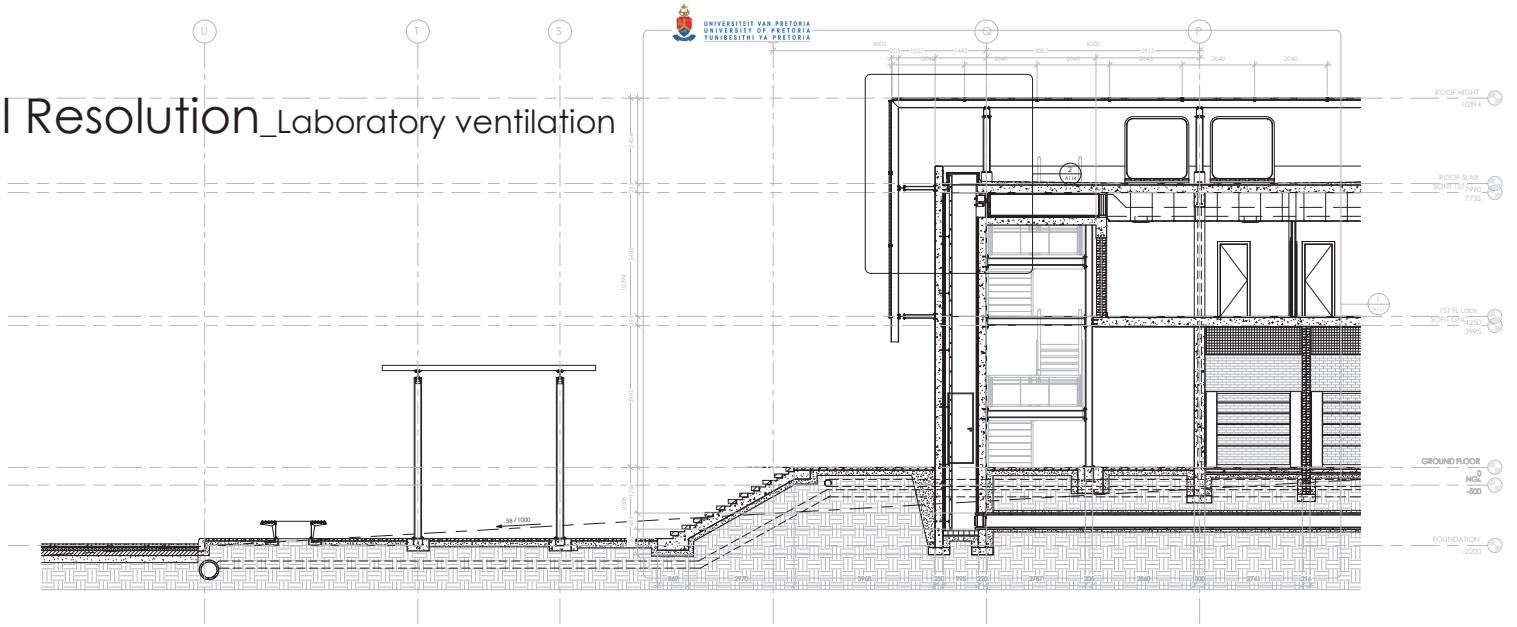


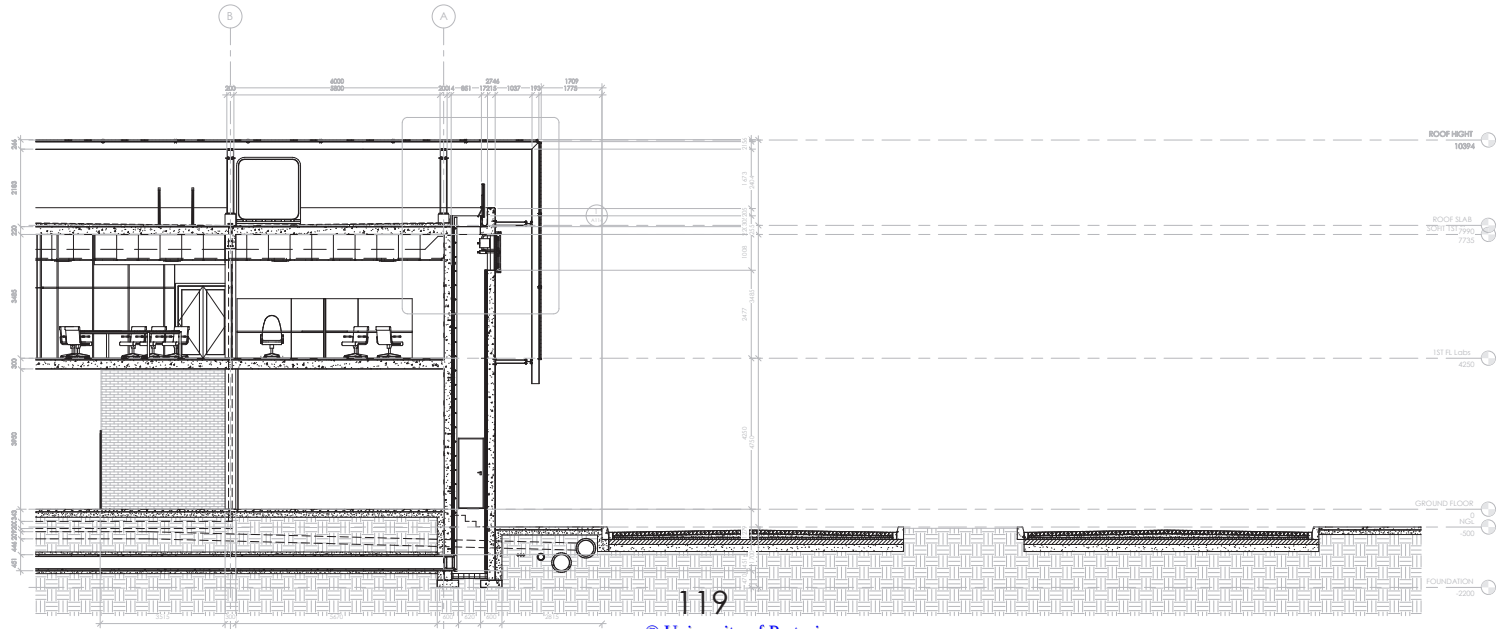
4 Detail 4
1 : 10



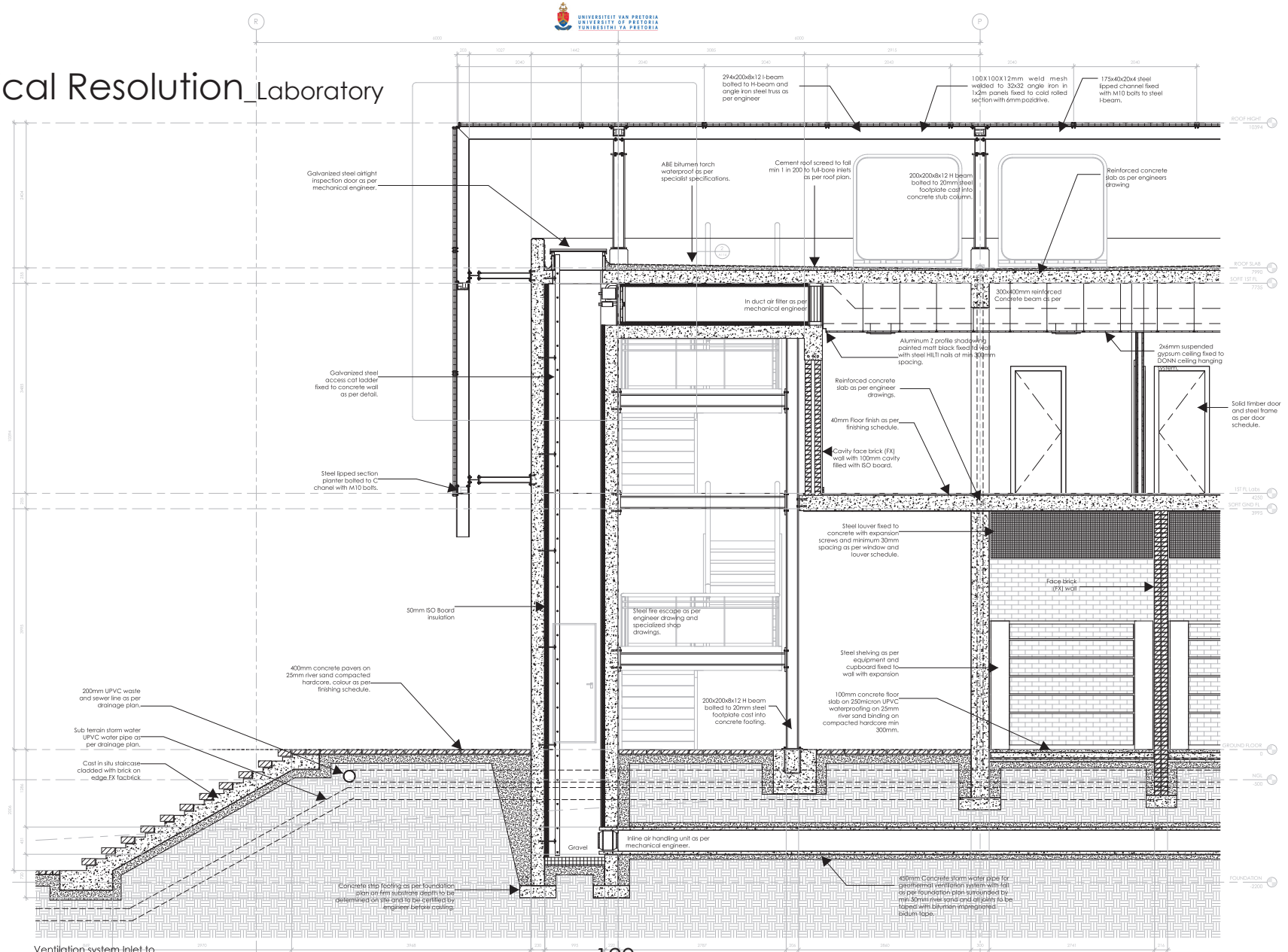
3 Detail 3
1 : 10

Technical Resolution_Laboratory ventilation

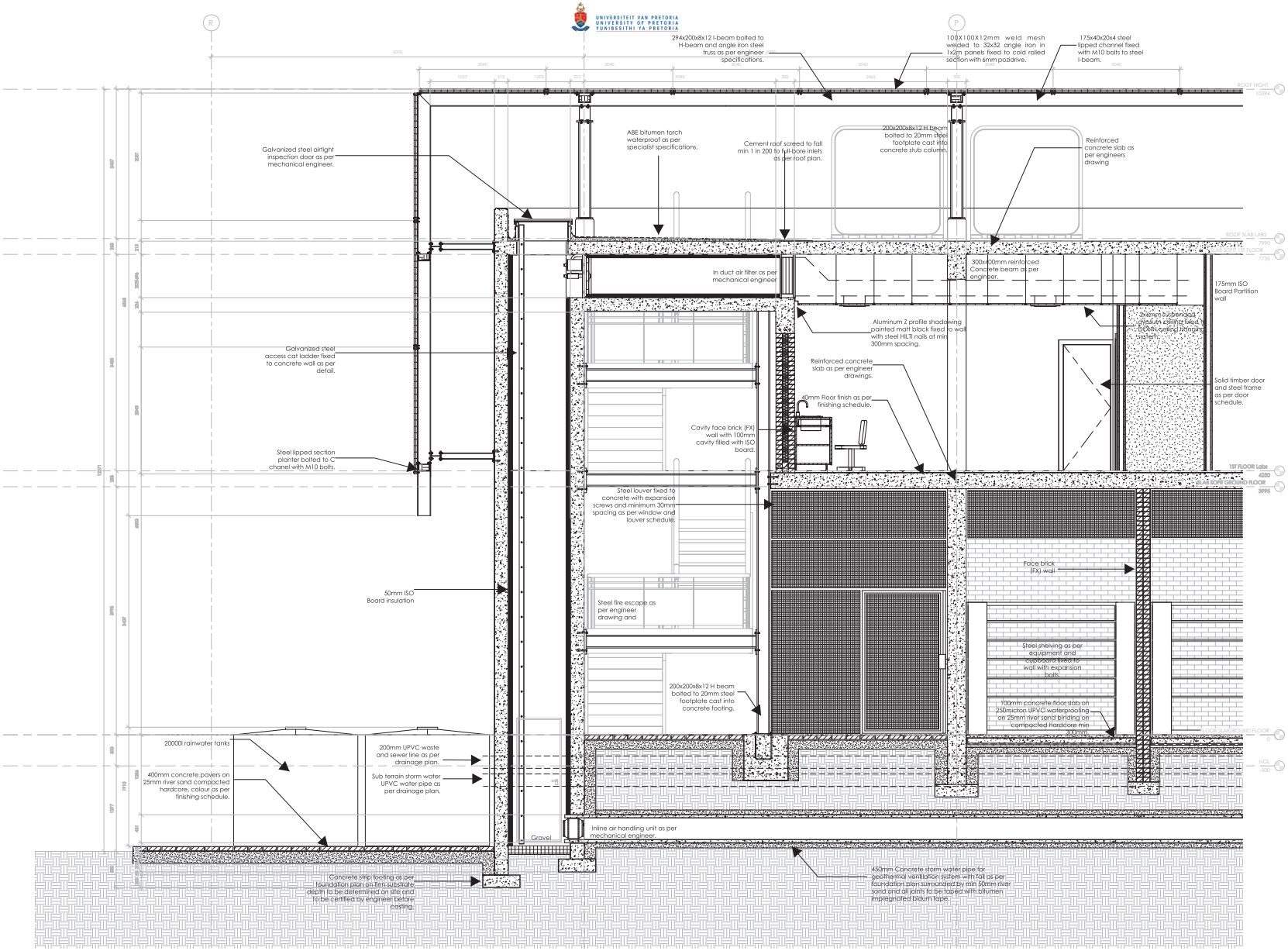




Technical Resolution_Laboratory

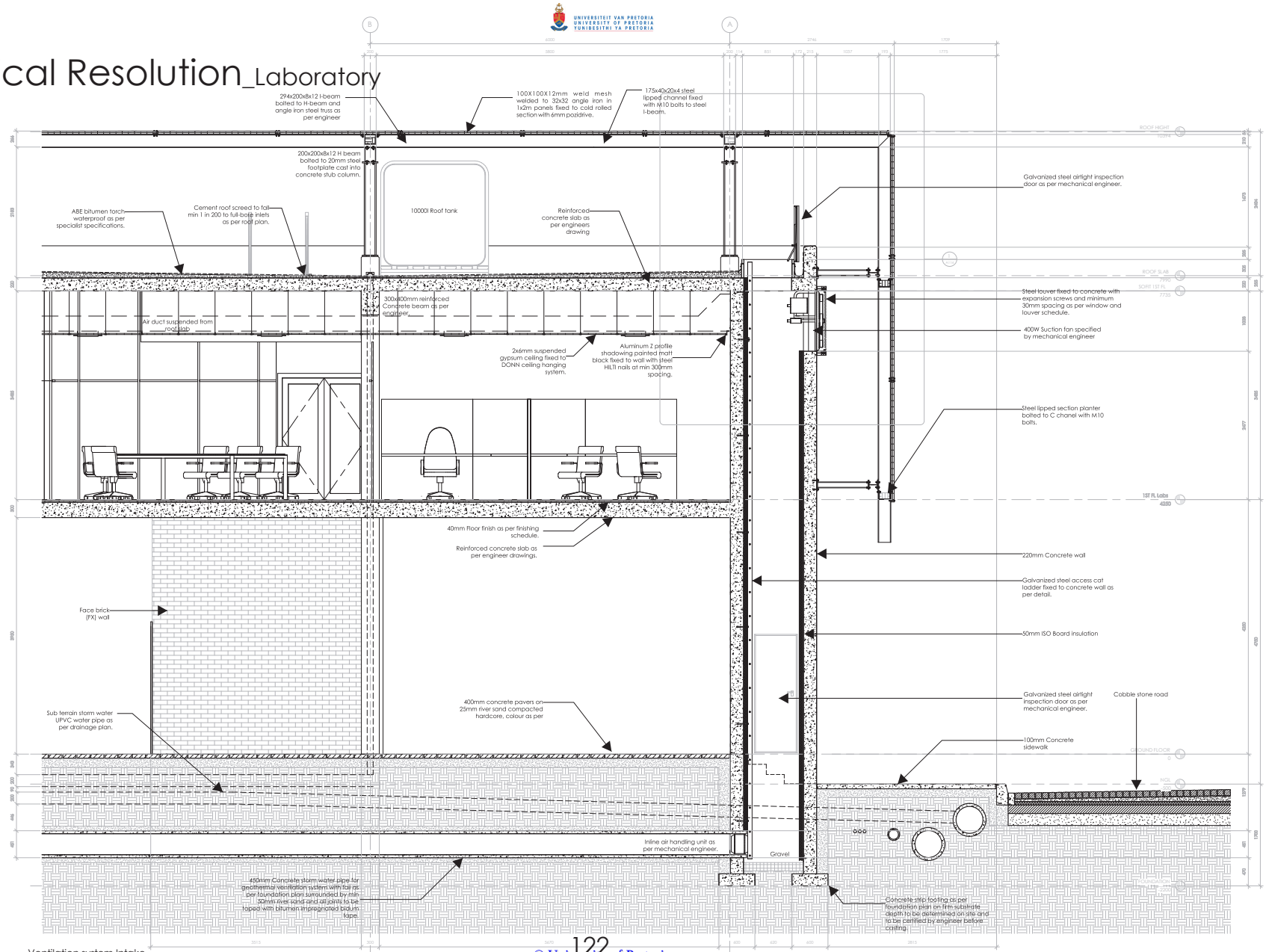


1 Ventilation system Inlet to interior

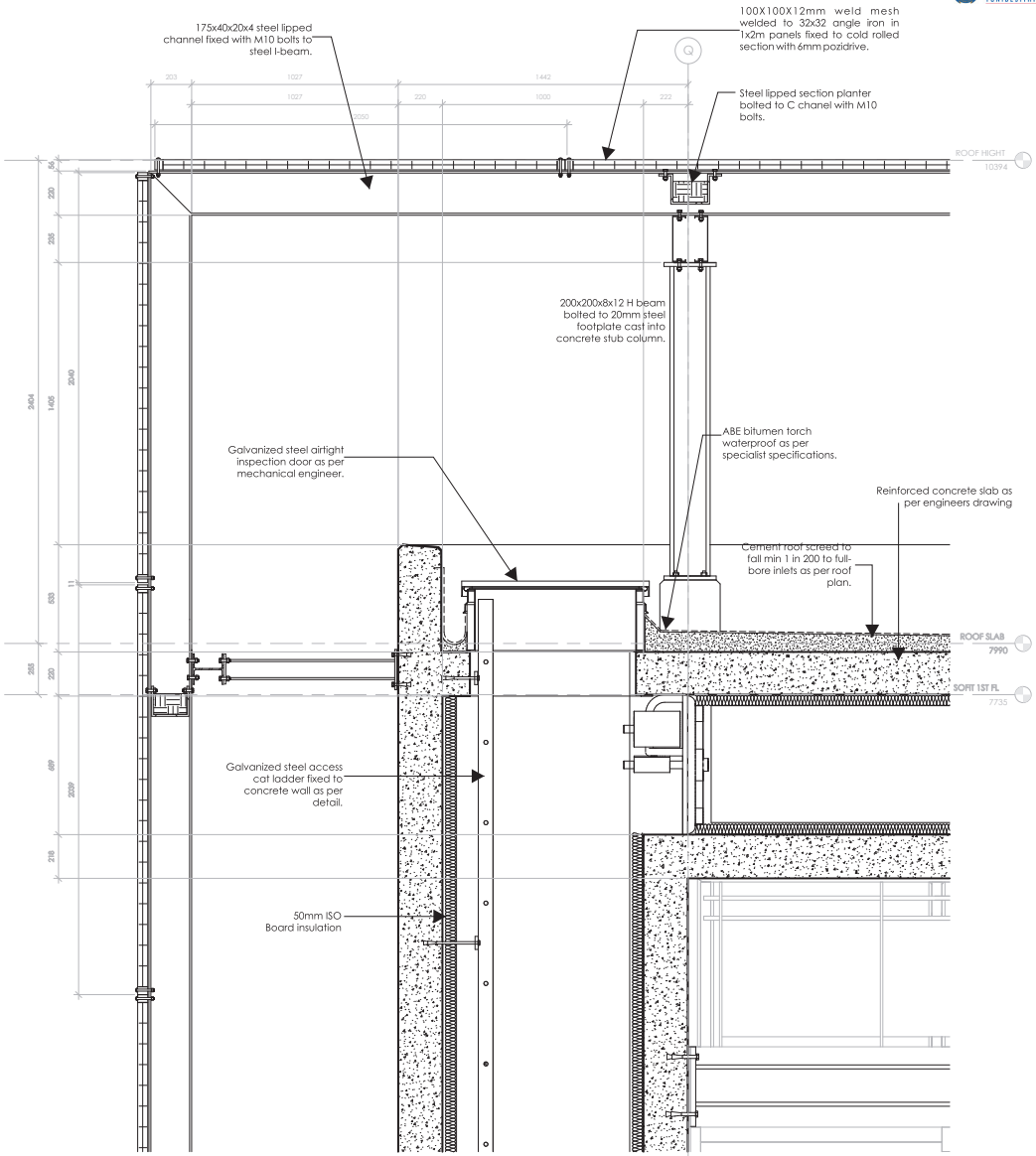


1 Ventilation system Input
1 : 20

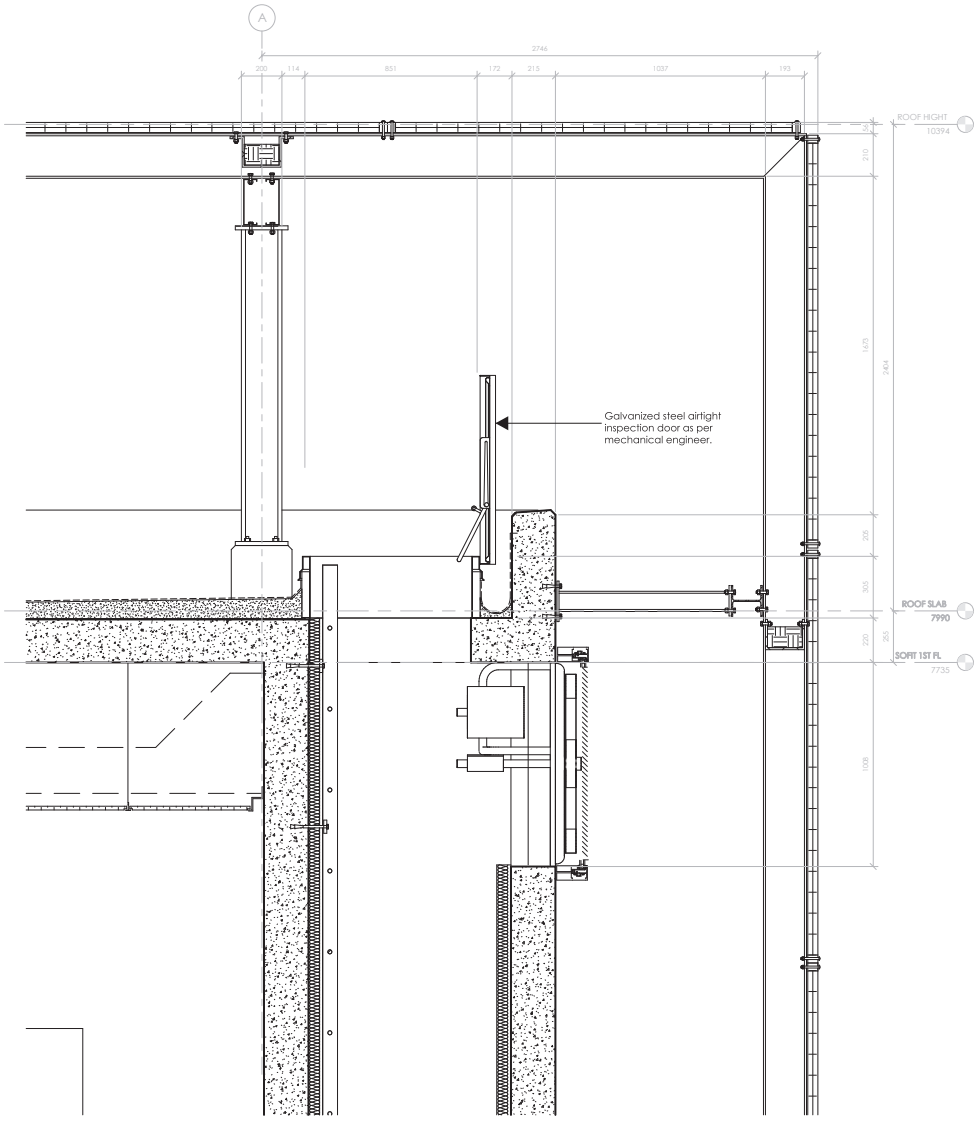
Technical Resolution_Laboratory



1 Ventilation system Intake

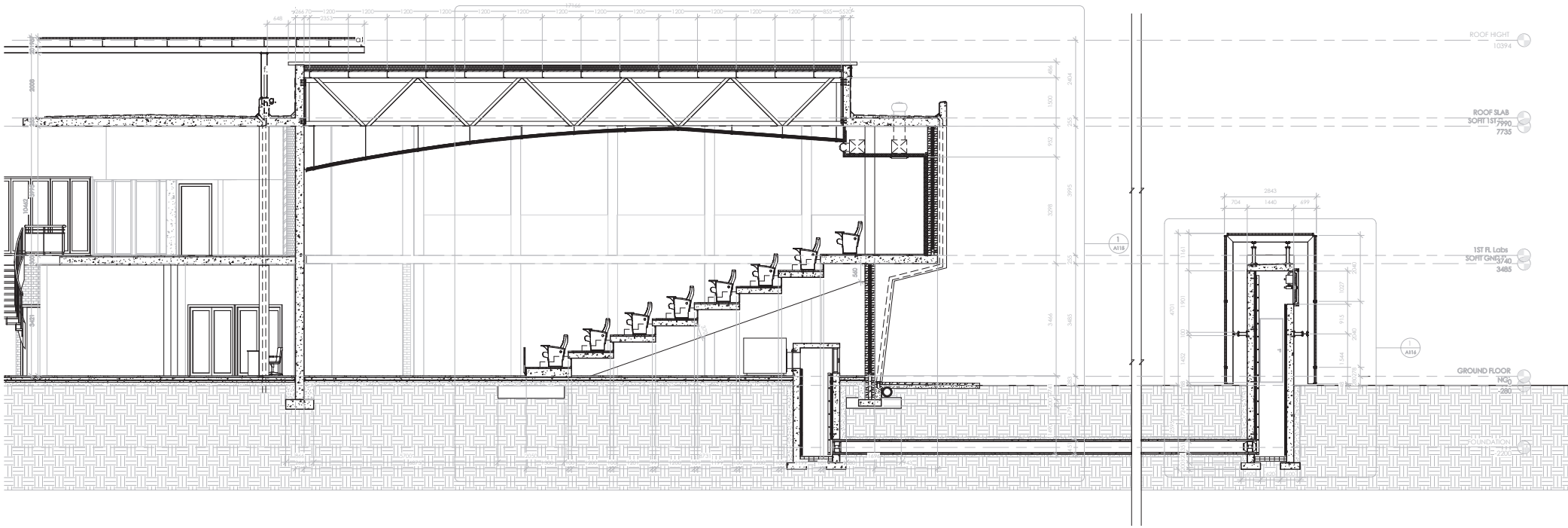


2 Detail 2



1 Detail 1

Technical Resolution_Auditorium



1 Auditorium

Figure 191: Section model of auditorium and conference facility. By Author

Figure 192" Section model of auditorium roof structure. By Author

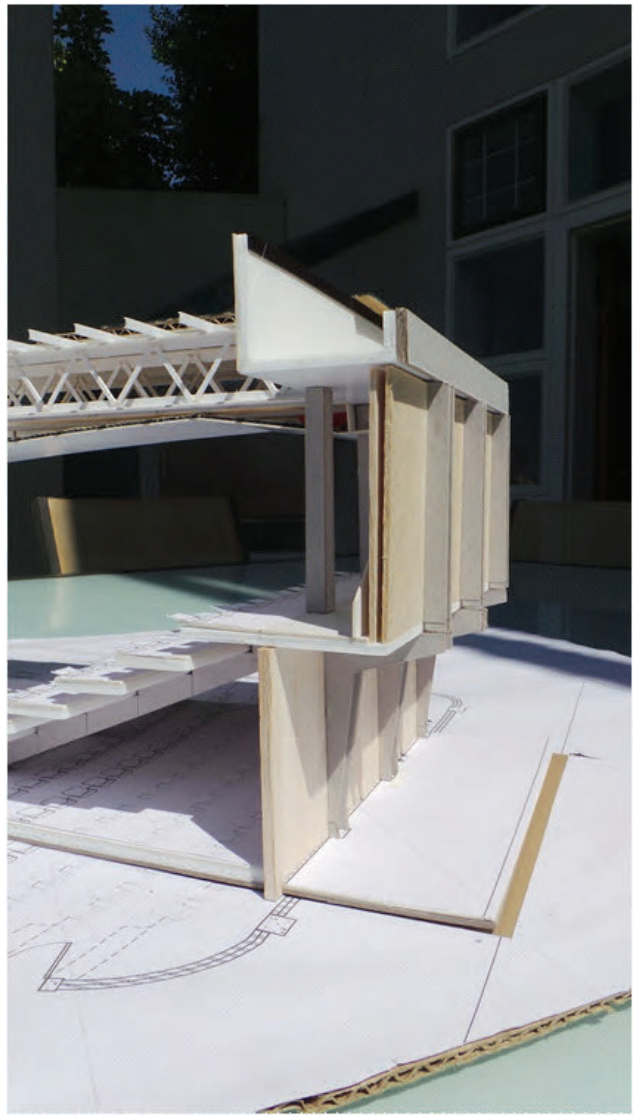


Figure 193: Section showing concrete columns and beams. By Author

Figure 194: Section showing acoustic panelling on cavity wall, By Author

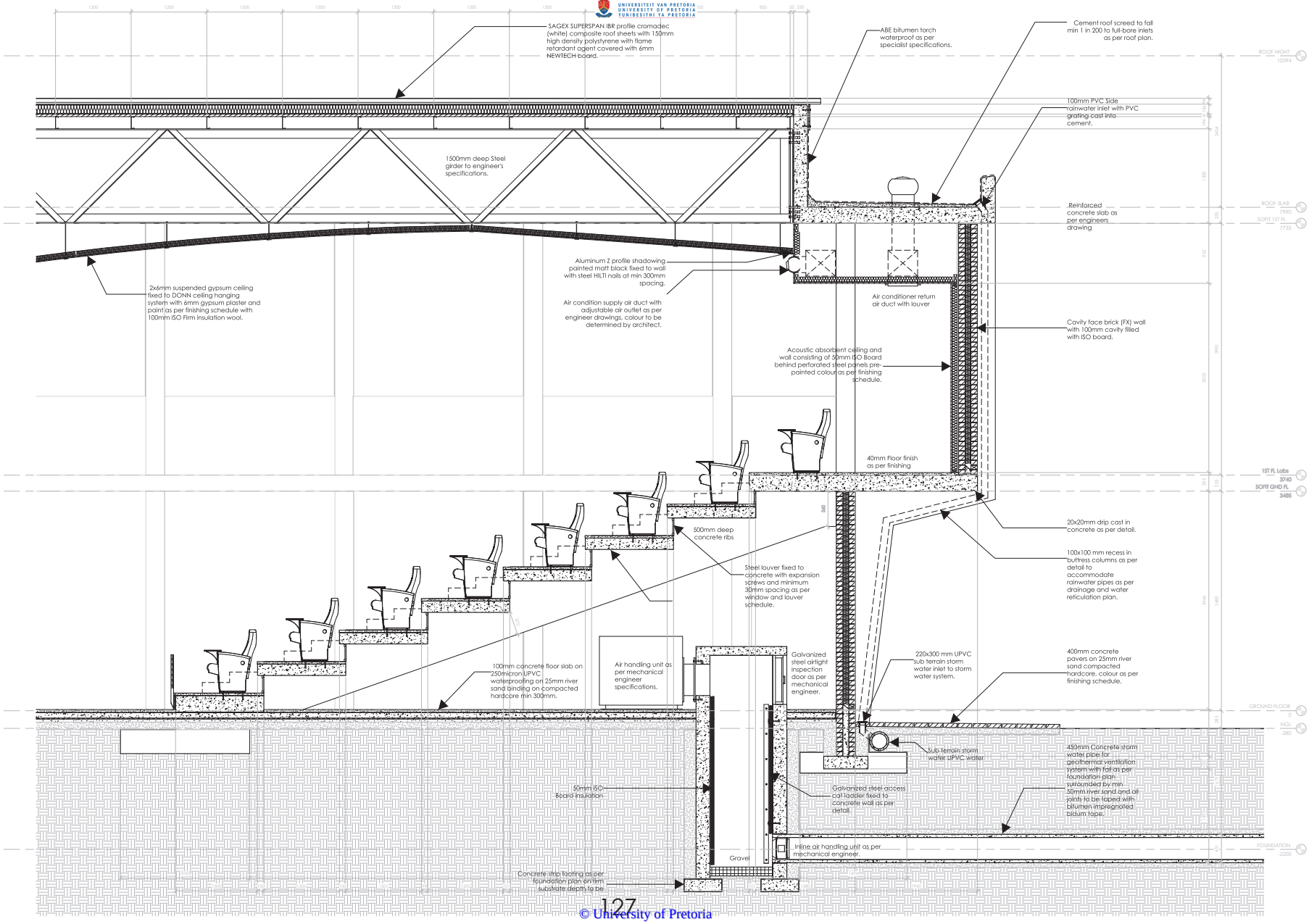


Figure 195: View from passage to auditorium stage. By Author

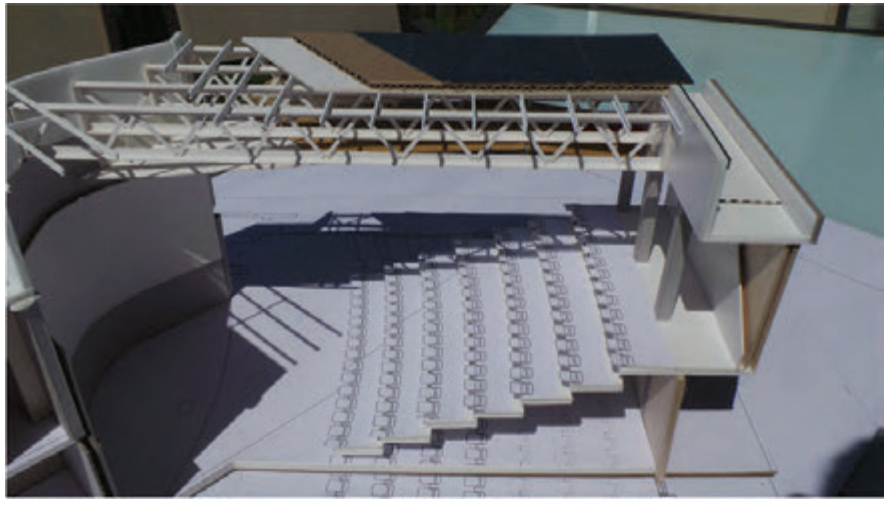


Figure 196: Section showing roof details of girders and sheeting, By Author

Figure 197: Section indicating concrete ribs, ceiling construction and steps, By Author

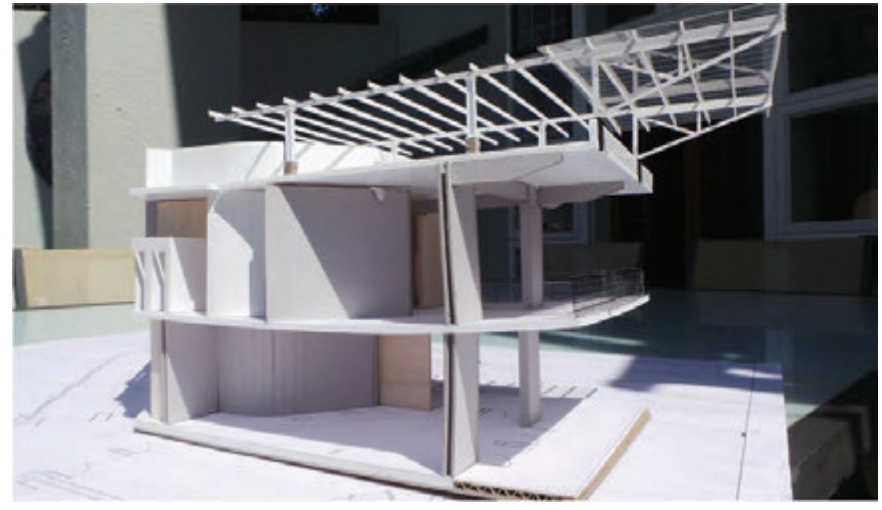
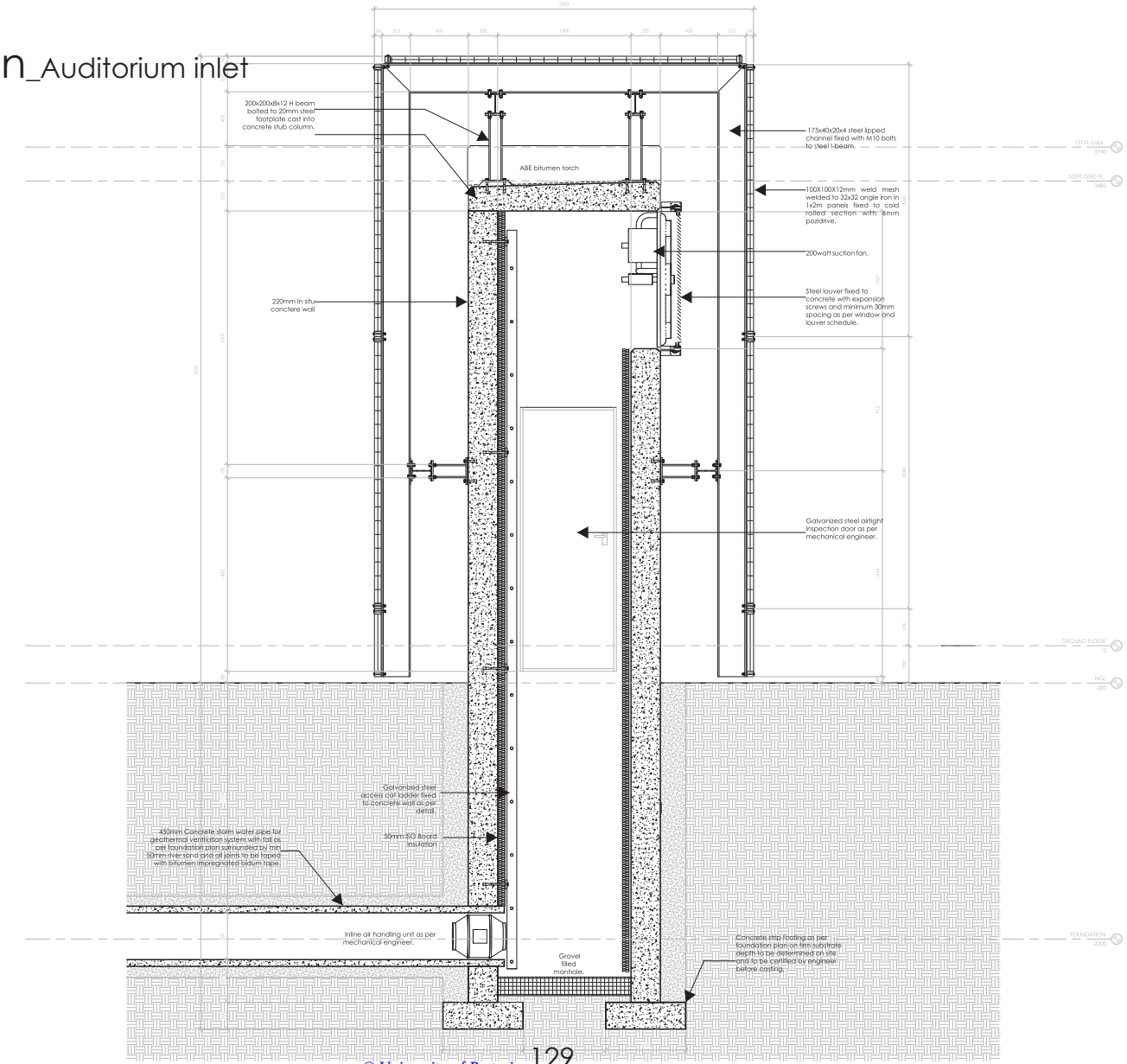


Figure 198: Section showing roof details through conference facility, By Author

Technical Resolution_Auditorium inlet



1 Auditorium Callout 2

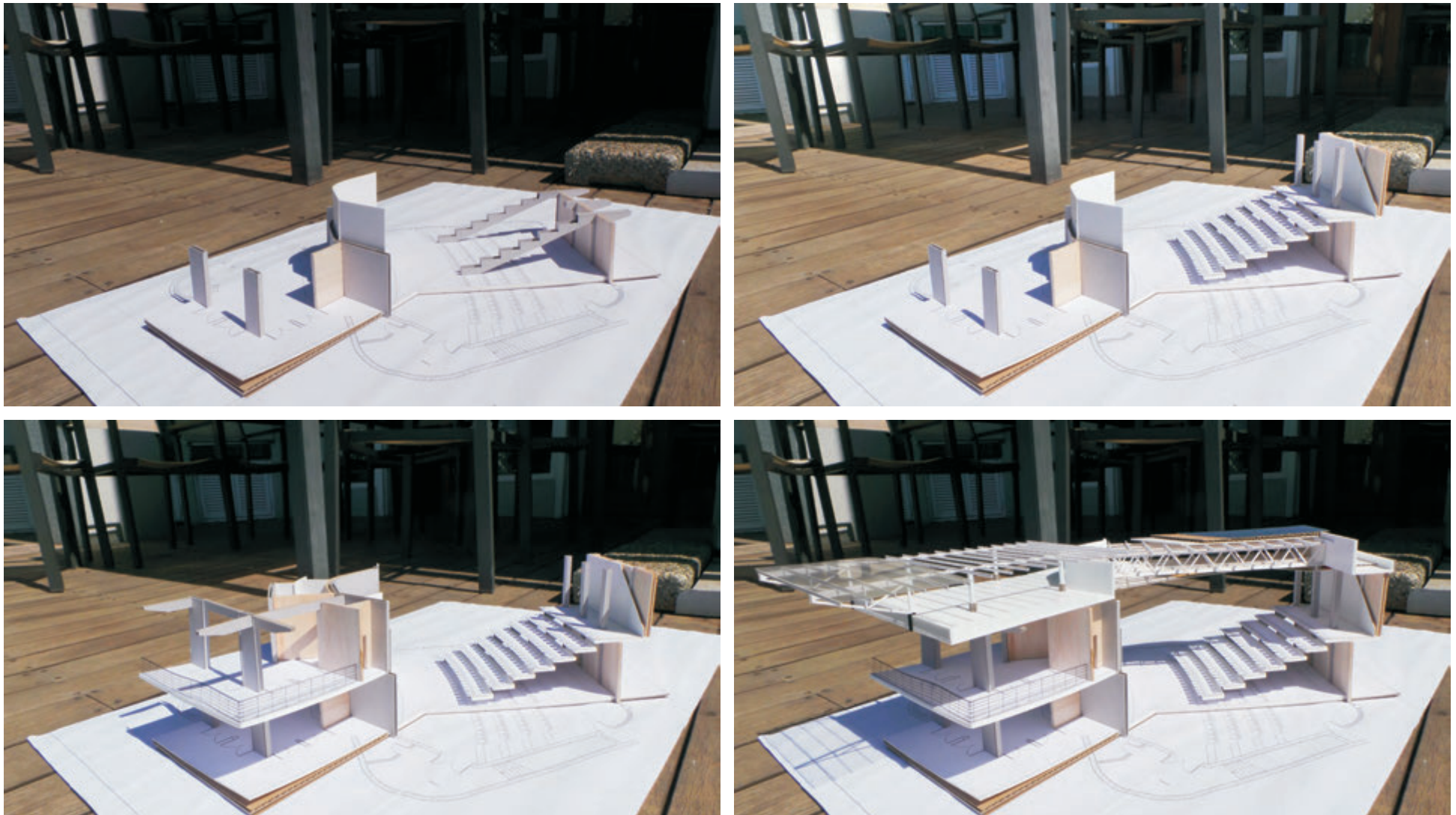


Figure 200: Deconstructing section showing construction elements, By Author

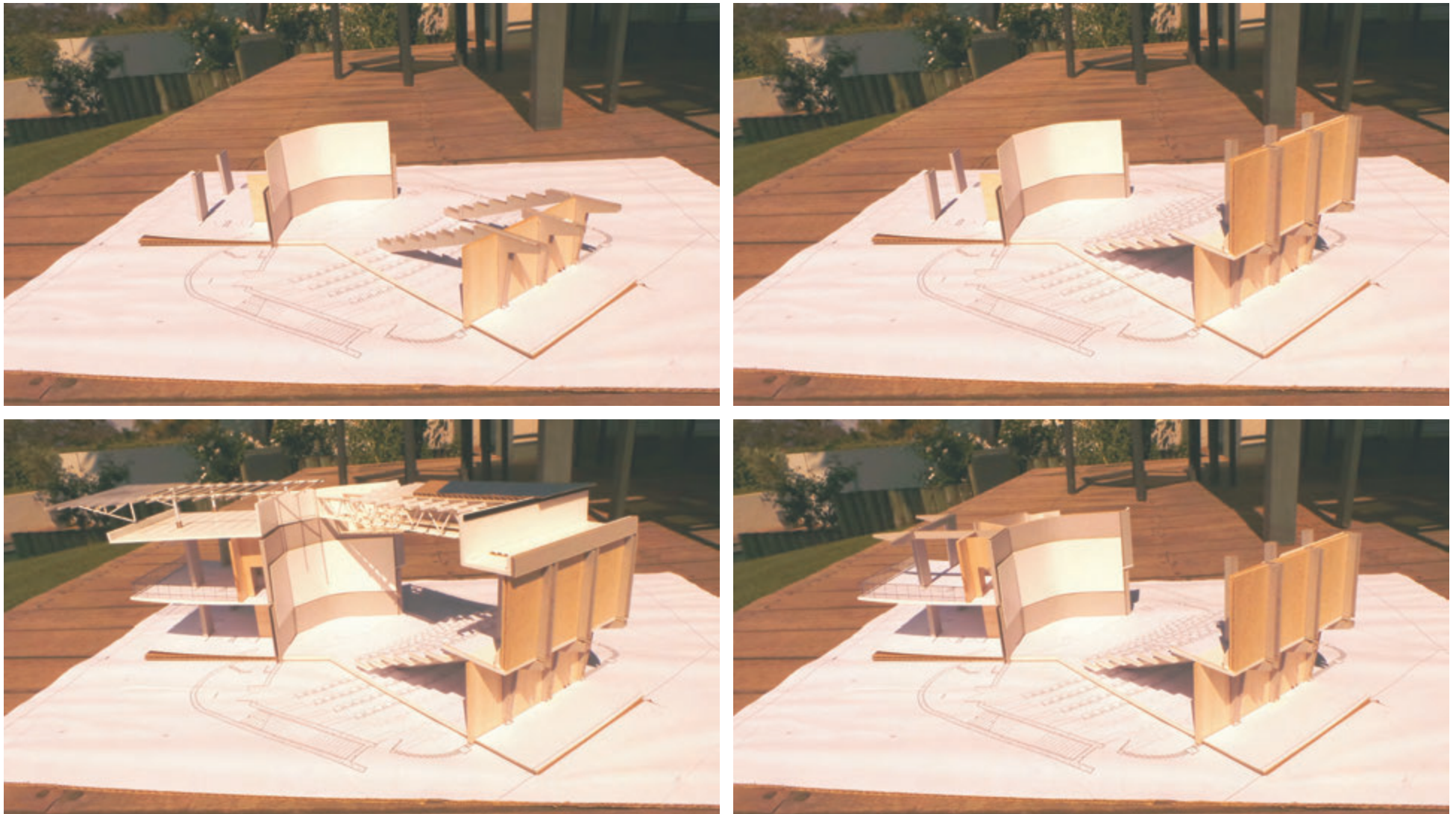


Figure 201: Deconstructing section showing construction elements, By Author

Environmental Systems_Water harvesting

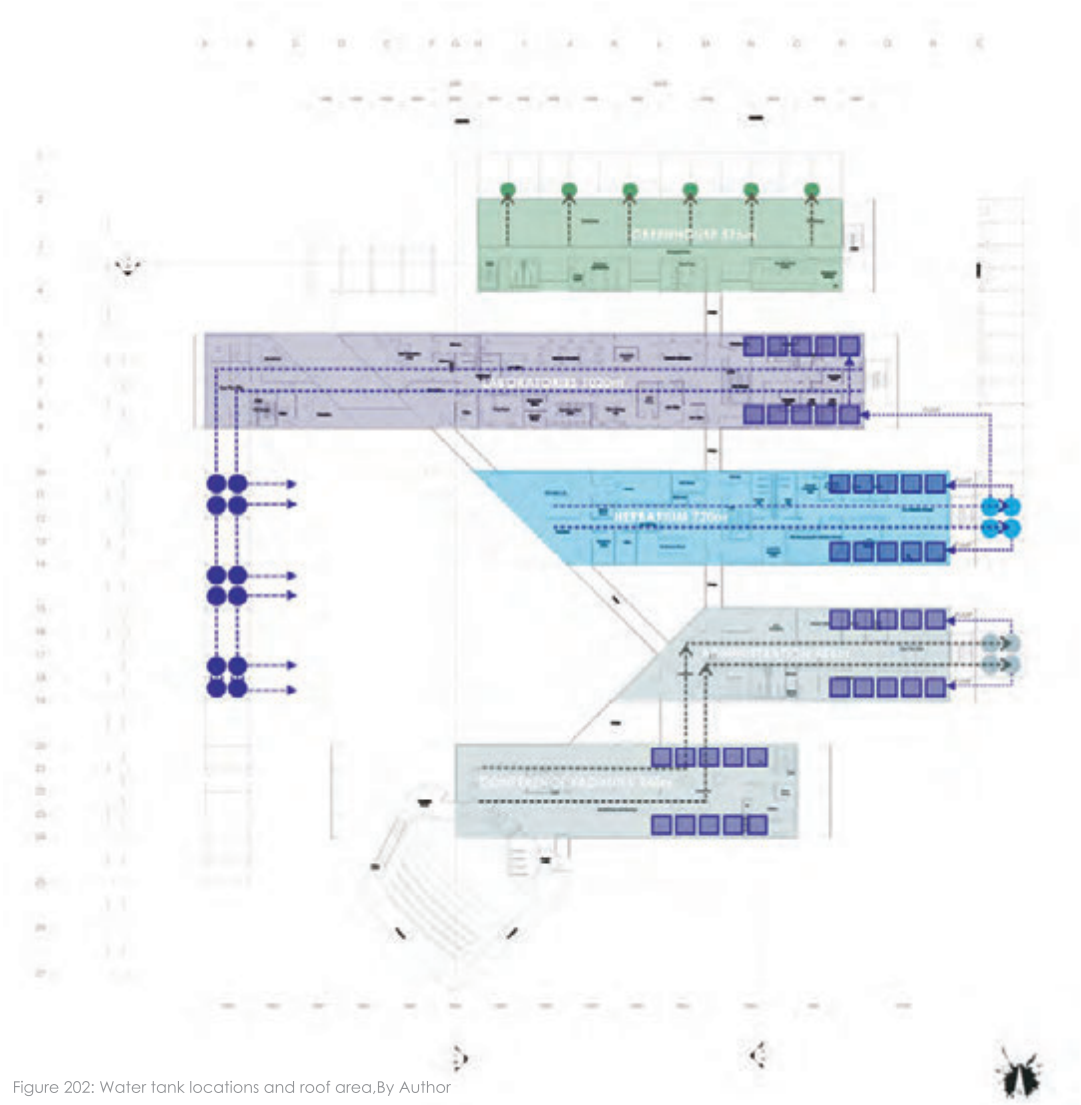


Figure 202: Water tank locations and roof area,By Author

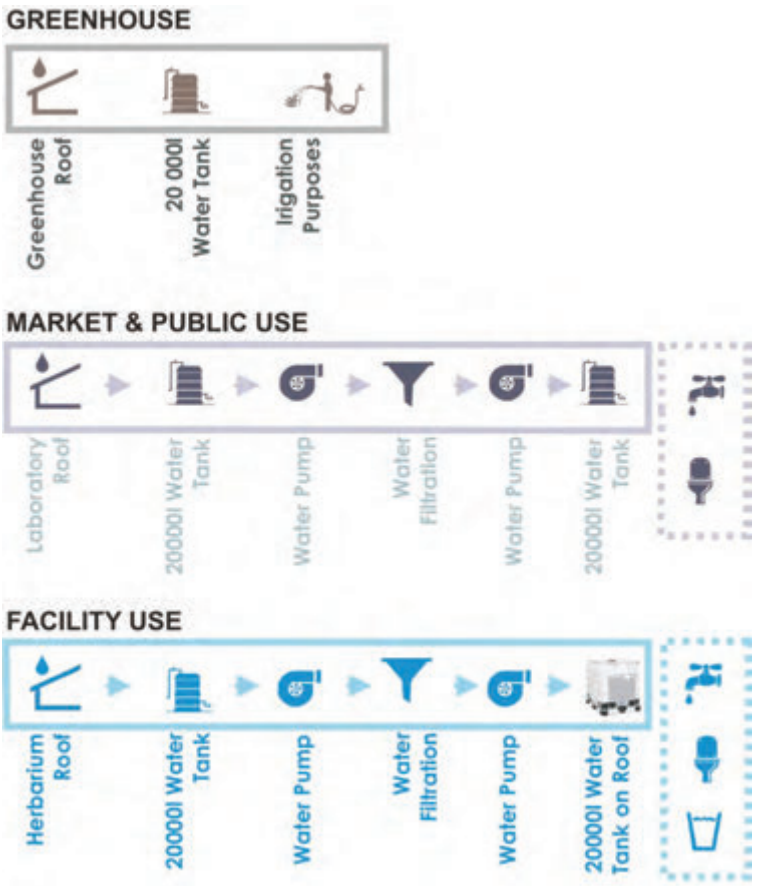


Figure 203: Diagram of water processes,By Author

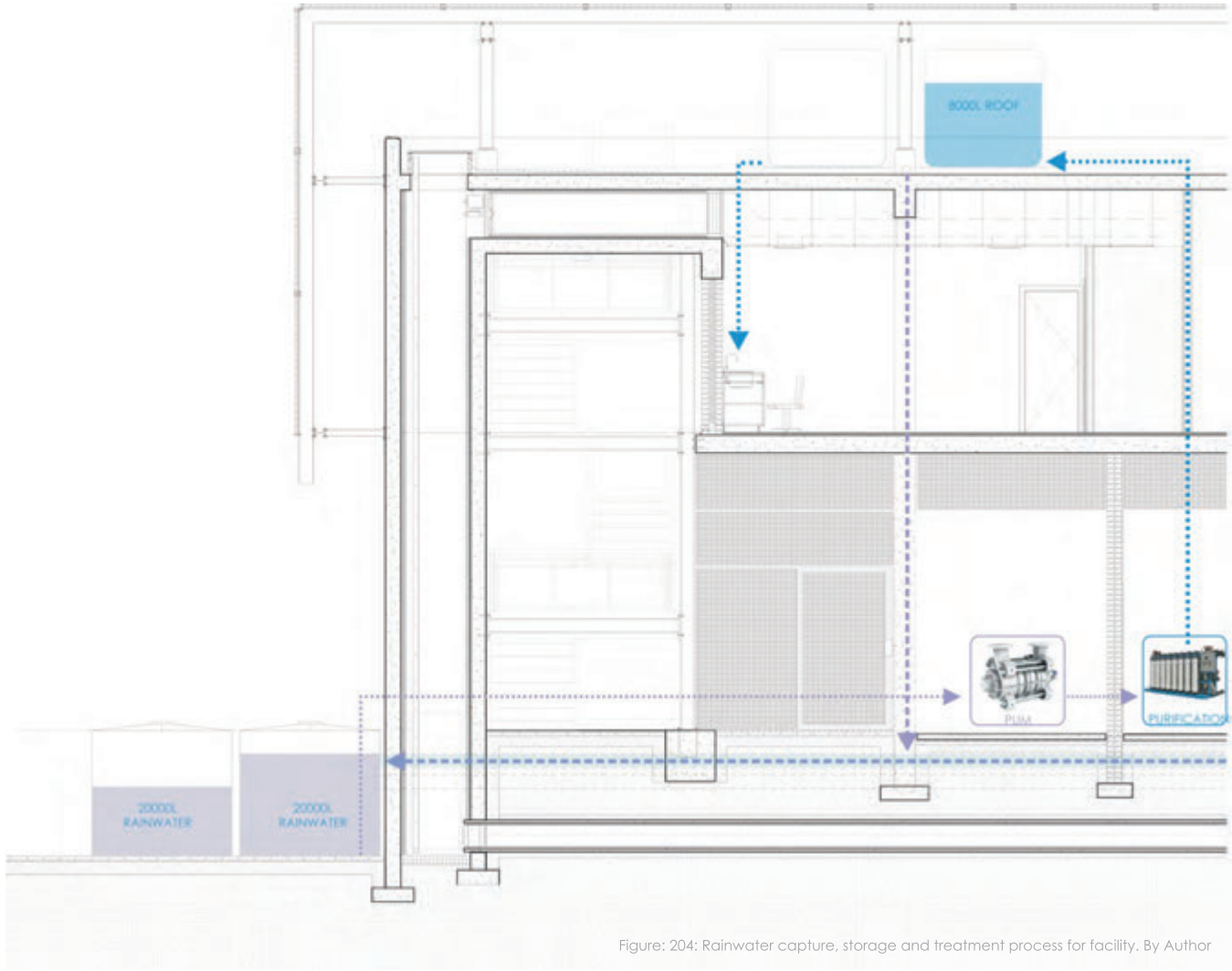


Figure: 204: Rainwater capture, storage and treatment process for facility. By Author

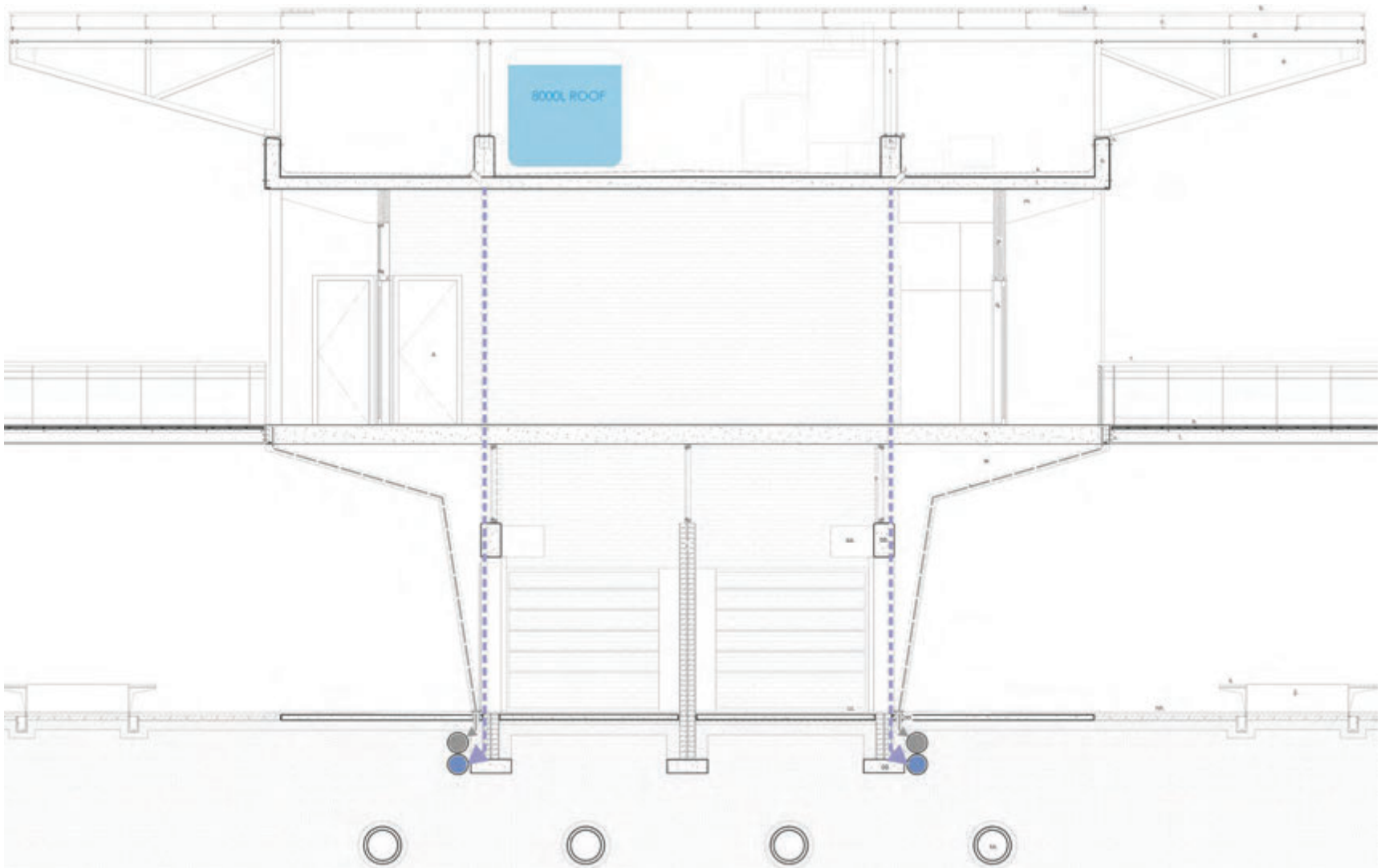


Figure 205: Rainwater capture, storage and treatment process for market and laboratories. By Author

Water Calculations

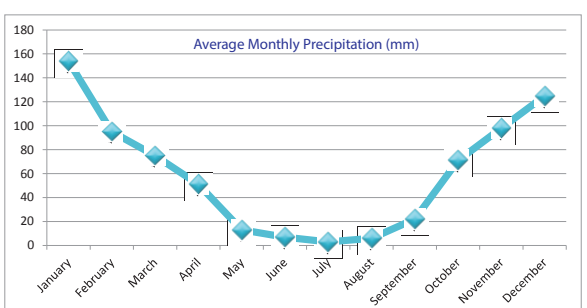
1. Climate Data

Place: Mabopane

Position:
Height: 1330m
Period: 1961-1990

Climate data

	MONTH	Temperatur: Highest Recorded	Average Daily maximum	Average Daily Minimum	Lowest Recorded	Precipitation: Average Monthly (mm)	Average number of Days >== 1mm	Highest 24hr rainfall (mm)
1.	January	36	29	18	8	154	14	160
2.	February	36	28	17	11	95	11	95
3.	March	35	27	16	6	75	10	84
4.	April	33	24	12	3	51	7	72
5.	May	29	22	8	-1	13	3	40
6.	June	25	19	5	-6	7	1	32
7.	July	26	20	5	-4	3	1	18
8.	August	31	22	8	-1	6	2	15
9.	September	34	26	12	2	22	3	43
10.	October	36	27	14	4	71	9	108
11.	November	36	27	16	7	98	12	67
12.	December	35	28	17	7	125	15	50
	YEAR	36	25	12	-6	720	87	160

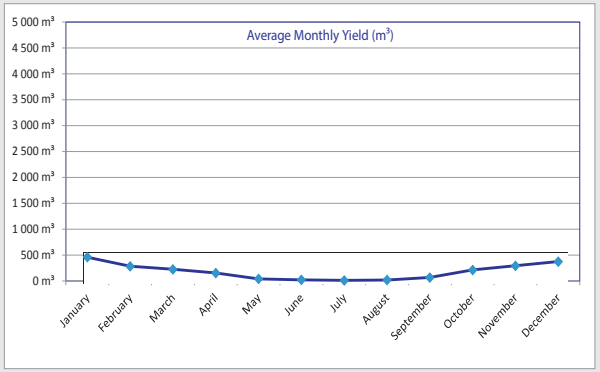


2. Yield

Yield (m^3) = P x A x C (Where P=precipitation (m), A=area (m^2), and C=run-off coefficient)

Area of Catchment: (Per surface)	Area (m^2)	Run-off Coefficient
Roofing	3 312.00 m^2	0.9
Paving	0.00 m^2	0.8
Lawn	0.00 m^2	0.4
Playground	0.00 m^2	0.2
Park	0.00 m^2	0.2
TOTAL:	3 312.00 m^2	0.90

	MONTH	Precipitation: Average Monthly (mm)	Area	Run-off Coefficient	Yield P(m) x A(m^2) x C
1.	January	154 mm	3 312 m^2	0.90	459 m^3
2.	February	95 mm	3 312 m^2	0.90	283 m^3
3.	March	75 mm	3 312 m^2	0.90	224 m^3
4.	April	51 mm	3 312 m^2	0.90	152 m^3
5.	May	13 mm	3 312 m^2	0.90	39 m^3
6.	June	7 mm	3 312 m^2	0.90	21 m^3
7.	July	3 mm	3 312 m^2	0.90	9 m^3
8.	August	6 mm	3 312 m^2	0.90	18 m^3
9.	September	22 mm	3 312 m^2	0.90	66 m^3
10.	October	71 mm	3 312 m^2	0.90	212 m^3
11.	November	98 mm	3 312 m^2	0.90	292 m^3
12.	December	125 mm	3 312 m^2	0.90	373 m^3
	YEAR	720 mm	3 312 m^2	0.90	2 146 m^3



3. Demand (Irrigation and Domestic)

IRRIGATION DEMAND

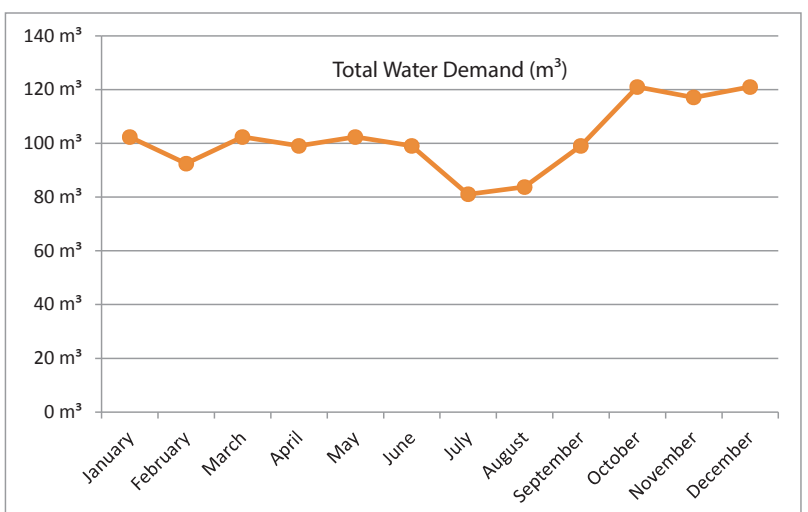
	Planting Area (m^2)	Irrigation Depth per week (m)	Irrigation Depth per month (m)	IRRIGATION DEMAND (m^3)
January	420 m^2	0.030 m	0.133 m	56 m^3
February	420 m^2	0.030 m	0.120 m	50 m^3
March	420 m^2	0.030 m	0.133 m	56 m^3
April	420 m^2	0.030 m	0.129 m	54 m^3
May	420 m^2	0.030 m	0.133 m	56 m^3
June	420 m^2	0.030 m	0.129 m	54 m^3
July	420 m^2	0.020 m	0.086 m	36 m^3
August	420 m^2	0.020 m	0.089 m	37 m^3
September	420 m^2	0.030 m	0.129 m	54 m^3
October	420 m^2	0.040 m	0.177 m	74 m^3
November	420 m^2	0.040 m	0.171 m	72 m^3
December	420 m^2	0.040 m	0.177 m	74 m^3
YEAR	420 m^2 (Average)	0.031 m (Average)	1.604 m (Total)	674 m^3 (Total)

DOMESTIC DEMAND

	Number of Individuals	Water / capita / day (Litres)	Total Water / month (Liters)	DOMESTIC DEMAND (m^3)
January	60	25 l	46 500 l	47 m^3
February	60	25 l	42 000 l	42 m^3
March	60	25 l	46 500 l	47 m^3
April	60	25 l	45 000 l	45 m^3
May	60	25 l	46 500 l	47 m^3
June	60	25 l	45 000 l	45 m^3
July	60	25 l	45 000 l	45 m^3
August	60	25 l	46 500 l	47 m^3
September	60	25 l	45 000 l	45 m^3
October	60	25 l	46 500 l	47 m^3
November	60	25 l	45 000 l	45 m^3
December	60	25 l	46 500 l	47 m^3
YEAR	60 (Average)	25 l (Average)	45 500 l (Total)	546 m^3 (Total)

3. Total Demand

	IRRIGATION DEMAND (m^3)	DOMESTIC DEMAND (m^3)	TOTAL WATER DEMAND
January	56 m^3	47 m^3	102 m^3
February	50 m^3	42 m^3	92 m^3
March	56 m^3	47 m^3	102 m^3
April	54 m^3	45 m^3	99 m^3
May	56 m^3	47 m^3	102 m^3
June	54 m^3	45 m^3	99 m^3
July	36 m^3	45 m^3	81 m^3
August	37 m^3	47 m^3	84 m^3
September	54 m^3	45 m^3	99 m^3
October	74 m^3	47 m^3	121 m^3
November	72 m^3	45 m^3	117 m^3
December	74 m^3	47 m^3	121 m^3
YEAR	674 m^3 (Total)	546 m^3 (Total)	1 220 m^3 (TOTAL)

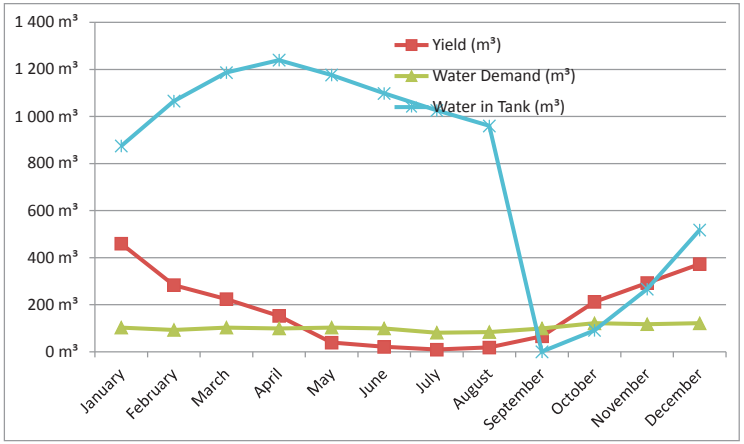


4. Water Budget Exercise + Safety Factor + Number of Tanks needed

	YIELD from onsite runoff (m^3)	DEMAND total onsite water demand (m^3)	Monthly Balance	Water in Tank/Reservoir (m^3)
January	459 m^3	102 m^3	357 m^3	874 m^3
February	283 m^3	92 m^3	191 m^3	1 065 m^3
March	224 m^3	102 m^3	121 m^3	1 186 m^3
April	152 m^3	99 m^3	53 m^3	1 239 m^3
May	39 m^3	102 m^3	- 64 m^3	1 176 m^3
June	21 m^3	99 m^3	- 78 m^3	1 098 m^3
July	9 m^3	81 m^3	- 72 m^3	1 026 m^3
August	18 m^3	84 m^3	- 66 m^3	960 m^3
September	66 m^3	99 m^3	- 33 m^3	0 m^3
October	212 m^3	121 m^3	91 m^3	91 m^3
November	292 m^3	117 m^3	175 m^3	266 m^3
December	373 m^3	121 m^3	252 m^3	518 m^3
YEAR	3 366 m^3 (Total)	1 220 m^3 (TOTAL)		

Greatest volume of water in tank/reservoir at any time is the minimum capacity of the tank	1 239 m^3

Safety Factor:	2.5	Final Tank/Reservoir Size:	3 098 m^3
Proprietory Tank Volume: (e.g. Jojo Tanks)	20 000 l 20 m^3	Number of Tanks needed	155



Passive Ventilation

Geo-Thermal Ventilation
The building makes use of geo-thermal ventilation to cool the internal spaces. The concrete geo-piping stretches from one side of the building to the other utilizing the length to achieve maximum air cooling during summer and air heating during winter.

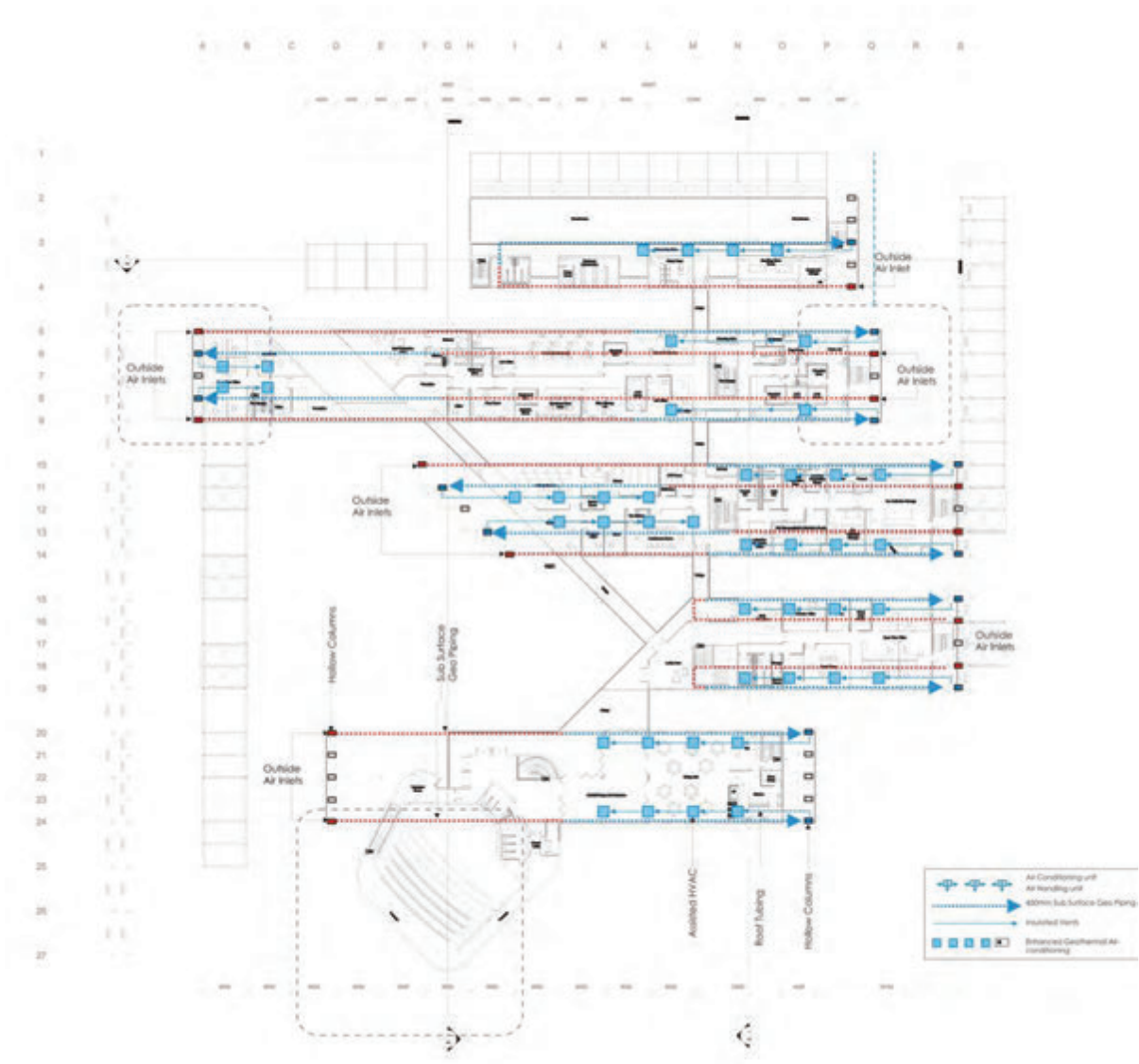


Figure 206 Ventilation diagram of ge-thermal piping

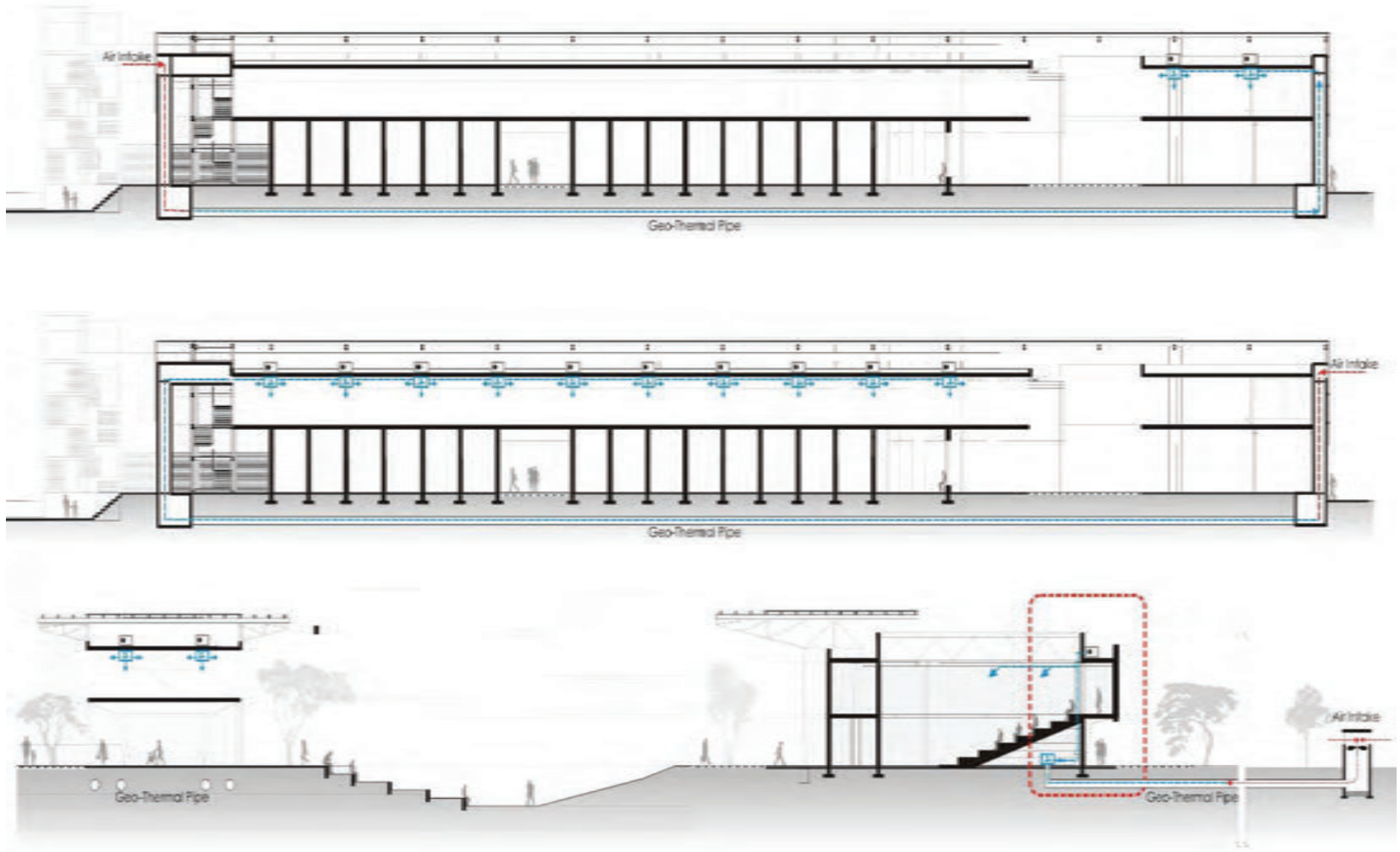


Figure 207: Geo-thermal ventilation system in section

Ventilation System_ Laboratory, Herbarium, Admin, Conference facility

The laboratories, herbarium, admin and conference facilities make use of concrete shafts on either side of the building as inlet and outlets of fresh air to the building's interior. The system is mechanically assisted by inlet fans situated at certain points to achieve regulated airflow. In the case where the geo-thermal ventilation is not sufficient the cooling can be assisted by small HVAC systems.

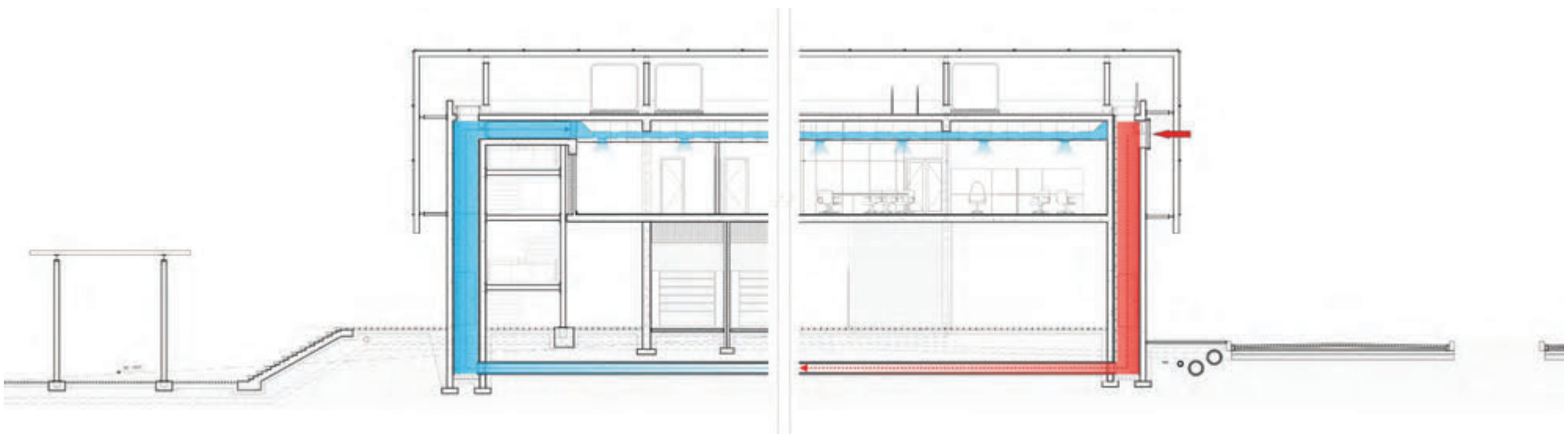


Figure 208: Geo-thermal ventilation system on section indicating inlet and outlet vents connected to geo piping of market and laboratories. By Author

Ventilation System_ Auditorium

The auditorium makes use of the same geo-thermal ventilation to regulate the air temperature inside the building. The inlet vent however is situated at a distance in the landscape to achieve optimal cooling and heating of the air. The ingoing air is distributed through the auditorium venting through the steps. The system is mechanically assisted by inlet fans. In the case where the geo-thermal ventilation is not sufficient the cooling can be assisted by
:

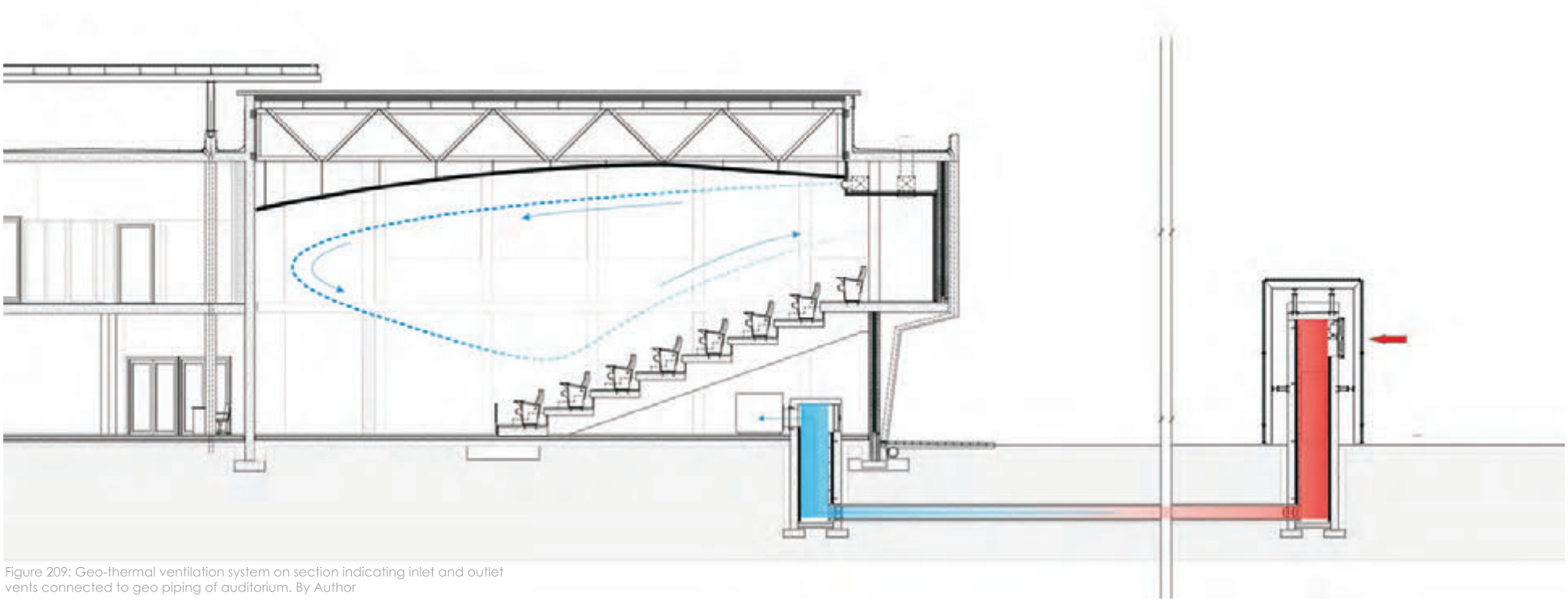
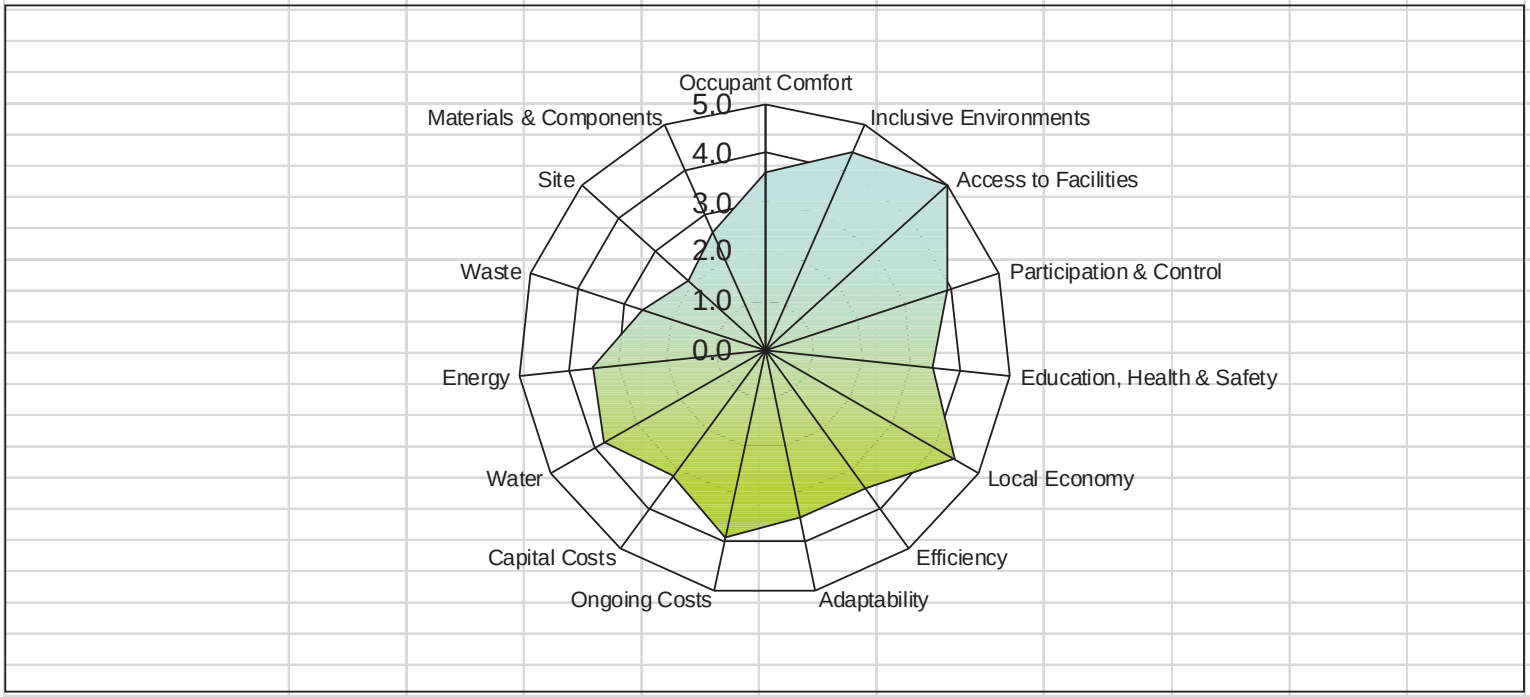


Figure 209: Geo-thermal ventilation system on section indicating inlet and outlet vents connected to geo piping of auditorium. By Author

SBAT Sating

Project title:	Herbalist Centre	Date:	7-Oct-14
Location:	Mabopane	Undertaken by:	Jacques Jordaan
Building type (specify):	Research Facility	Company / organisation:	Traditional Healers Organization of Africa
Internal area (m2): 3750		Telephone:	733052535 Fax:
Number of users: 45		Email:	jjordaan1@gmail.com
Building life cycle stage (specify):	Design/Construction/Operation		



Social	4.1	Economic	3.7	Environmental	2.9
		Overall	3.6		

SO 1	Occupant Comfort		Explanatory notes		3.6
SO 1.1	Daylighting	% of occupied spaces that are within distance 2H from window, where H is the height of the window or where there is good daylight from skylights	60	0.8
SO 1.2	Ventilation	% of occupied spaces have equivalent of opening window area equivalent to 10% of floor area or adequate mechanical system, with upolluted air source	70	0.7
SO 1.3	Noise	% of occupied spaces where external/internal/reverberation noise does not impinge on normal conversation (50dbA)	60	0.6
SO 1.5	Thermal comfort	Tempreture of occupied space does not exceed 28 or go below 19oC for less than 5 days per year (100%)	70	0.7
SO 1.5	Views	% of occupied space that is 6m from an external window (not a skylight) with a view	80	0.8
SO 2	Inclusive Environments		Explanatory notes		4.4
SO 2.1	Public Transport	% of building (s) within 400m of disabled accessible (20%) and affordable (80%) public transport	90	0.9
SO 2.2	Information	Comprehensive signage provided (50%), Signage high contrast, clear print signage in appropriate locations and language(s) / use of understandable symbols / manned reception at all entrances (50%)	100	1.0
SO 2.3	Space	% of occupied spaces that are accessible to ambulant disabled / wheelchair users	100	1.0
SO 2.4	Toilets	% of occupied space with fully accessible toilets within 50m along easily accessible route	70	0.7
SO 2.5	Fittings & Furniture	% of commonly used furniture and fittings (reception desk, kitchenette, auditorium) fully accessible	80	0.8
SO 3	Access to Facilities		Explanatory notes		5.0
SO 3.1	Children	All users can walk (100%) / use public transport (50%) to get to their childrens' schools and creches	100	1.0
SO 3.2	Banking	All users can walk (100%) / use public transport (50%) to get to banking facilities	100	1.0
SO 3.3	Retail	All users can walk (100%) / use public transport (50%) to get to food retail	100	1.0
SO 3.4	Communication	All users can walk (100%) / use public transport (50%) to get to communication facilities (post/telephone/internet)	100	1.0
SO 3.5	Exercise	All users can walk (100%) / use public transport (50%) to get to recreation/excercise facilities	100	1.0
SO 4	Participation & Control		Explanatory notes		3.9
SO 4.1	Environmental control	% of occupied space able to control their thermal environment (adjacent to openable windows/thermal controls)	80	0.8
SO 4.2	Lighting control	% of occupied space able to control their light (adjacent to controllable blinds etc/local lighting control)	70	0.7
SO 4.3	Social spaces	Social informal meeting spaces (parks / staff canteens / cafes) provided locally (within 400m) (100%)	80	0.8
SO 4.4	Sharing facilties	5% or more of facilities shared with other users / organisations on a weekly basis (100%)	90	0.9
SO 4.5	User group	Users actively involved in the design process (50%) / Active and representative management user group (50%)	70	0.7
SO 5	Education, Health & Safety		Explanatory notes		3.5
SO 5.1	Education	Two percent or more space/facilities available for education (seminar rooms / reading / libraries) per occupied space (75%). Construction training provided on site (25%)	70	0.7
SO 5.2	Safety	All well used routes in and around building well lit (25%), all routes in and around buildings visually supervised (25%), secure perimeter and access control (50%), No crime (100%)	70	0.7
SO 5.3	Awareness	% of users who can access information on health & safety issues (ie HIV/AIDS), training and employment opportunities easily (posters/personnel/intranet site)	60	0.6
SO 5.4	Materials	All materials/components used have no negative effects on indoor air quality (100%)	70	0.7
SO 5.5	Accidents	Process in place for recording all occupational accidents and diseases and addressing these	75	0.8

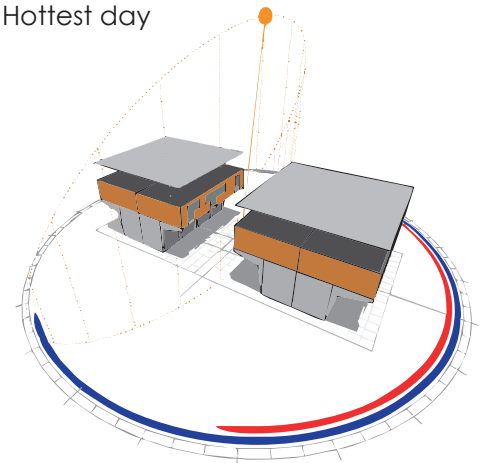
EN 2	Energy		Explanatory notes		3.5
EN 2.1	Location	% of users who walk / cycle / use public transport to commute to the building	80	0.8
EN 2.2	Ventilation	% of building ventilation requirements met through natural / passive ventilation	95	1.0
EN 2.3	Heating & Cooling	% of occupied space which relies solely on passive environmental control (no or minimal energy consumption)	80	0.8
EN 2.4	Appliances & fittings	% of appliances / lighting fixtures that are classed as highly energy efficient (ie energy star rating)	95	1.0
EN 2.5	Renewable energy	% of building energy requirements met from renewable sources	0	0.0
EN 3	Waste		Explanatory notes		2.6
EN 3.1	Toxic waste	% of toxic waste (batteries, ink cartridges, flourescent lamps) recycled	85	0.9
EN 3.2	Organic waste	% of organic waste recycled	100	1.0
EN 3.3	Inorganic waste	% of inorganic waste recycled.	75	0.8
EN 3.4	Sewerage	% of sewerage recycled on site	0	0.0
EN 3.5	Construction waste	% of damaged building materials / waste developed in construction recycled on site	0	0.0
EN 4	Site		Explanatory notes		2.1
EN 4.1	Brownfield site	% of proposed site already disturbed / brownfield (previously developed)	0	0.0
EN 4.2	Neighbouring buildings	No neighbouring buildings negatively affected (access to sunlight, daylight, ventilation) (100%)	100	1.0
EN 4.3	Vegetation	% of area of area covered in vegetation (include green roofs, internal planting) relative to whole site	65	0.7
EN 4.4	Food gardens	Food gardens on site (100%)	0	0.0
EN 4.5	Landscape inputs	% of landscape that does not require mechanical equipment (ie lawn cutting) and or artificial inputs such as weed killers and pesticides	45	0.5
EN 5	Materials & Components		Explanatory notes		2.6
EN 5.1	Embodied energy	Materials with high embodied energy (aluminium,plastics) make up less than 1% of weight of building (100%)	35	0.4
EN 5.2	Material sources	% of materials and components by volume from grown sources (animal/plant)	75	0.8
EN 5.3	Ozone depletion	No materials and components used requiring ozone depleting processes (100%)	100	1.0
EN 5.4	Recyled / reuse	% of materials and components (by weight) reused / from recycled sources	30	0.3
EN 5.5	Construction process	Volume / area of site disturbed during construction less than 2X volume/area of new building (100%)	20	0.2

Building Performance - Economic				
	Criteria	Indicative performance measure	Measured	Points
EC 1	Local economy	Explanatory notes		4.5
EC 1.1	Local contractors	% value of the building constructed by local (within 50km) small (employees<20) contractors	100	1.0
EC 1.2	Local materials	% of materials (sand, bricks, blocks, roofing material) sourced from within 50km	100	1.0
EC 1.3	Local components	% of components (windows, doors etc) made locally (in the country)	75	0.8
EC 1.4	Local furniture/fittings	% of furniture and fittings made locally (in the country)	70	0.7
EC 1.5	Maintenance	% of maintenance and repairs by value that can, and are undertaken, by local contractors (within 50km)	100	1.0
EC 2	Efficiency	Explanatory notes		3.5
EC 2.1	Capacity	% capacity of building used on a daily basis (actual number of users / number of users at full capacity*100)	70	0.7
EC 2.2	Occupancy	% of time building is occupied and used (actual average number of hours used / all potential hours building could be used (24) *100)	60	0.6
EC 2.3	Space per occupant	Space provision per user not more than 10% above national average for building type (100%)	70	0.7
EC 2.4	Communication	Site/building has access to internet and telephone (100%), telephone only (50%)	80	0.8
EC 2.5	Material & Components	Building design coordinated with material / component sizes in order to minimise wastage. Walls (50%), Roof and floors (50%)	70	0.7
EC 3	Adaptability	Explanatory notes		4.1
EC 3.1	Vertical heights	% of spaces that have a floor to ceiling height of 3000mm or more	100	1.0
EC 3.2	External space	Design facilitates flexible external space use (100%)	83	0.8
EC 3.3	Internal partition	Non loadbearing internal partitions that can be easily adapted (loose partioning (100%), studwall (50%), masonary (25%)	85	0.9
EC 3.4	Modular planning	Building with modular stucture, envelope (fenestration) & services allowing easly internal adaptaptation (100%)	60	0.6
EC 3.5	Furniture	Modular, limited variety furniture - can be easily configured for different uses (100%)	78	0.8
EC 4	Ongoing costs	Explanatory notes		3.9
EC 4.1	Induction	All new users receive induction training on building systems (50%), Detailed building user manual (50%)	93	0.9
EC4.2	Consumption & waste	% of users exposed on a monthly basis to building performance figures (water (25%), electricity (25%), waste (25%), accidents (25%)	84	0.8
EC 4.2	Metering	Easily monitored localised metering system for water (50%) and energy (50%)	100	1.0
EC4.3	Maintenance & Cleaning	% of building that can be cleaned and maintained easily and safely using simple equipment and local non-hazardous materials	45	0.5
SO 4.5	Procurement	% of value of all materials/equipment used in the building on a daily basis supplied by local (within the country) manufacturers	70	0.7
EC 5	Capital Costs	Explanatory notes		3.2
EC 5.1	Local need	Five percent capital cost allocated to address urgent local issues (employment, training etc) during construction process (100%)	87	0.9
EC5.2	Procurement	Tender / construction packaged to ensure involvement of small local contractors/manufacturers (100%)	80	0.8
EC 5.3	Building costs	Capital cost not more than fifteen % above national average building costs for the building type (100%)	75	0.8
EC5.4	Technology	3% or more of capital costs allocated to new sustainable/indigenous technology (100%)	76	0.8
EC 5.5	Existing Buildings	Existing buildings reused (100%)	0	0.0

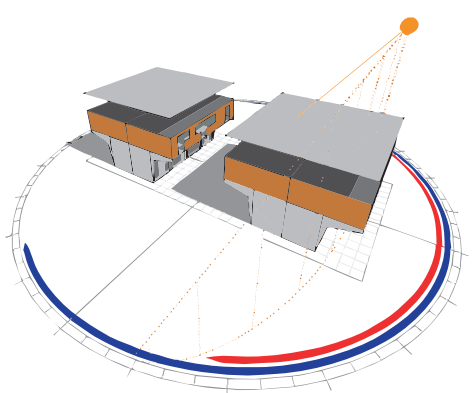
Climate Analysis of building

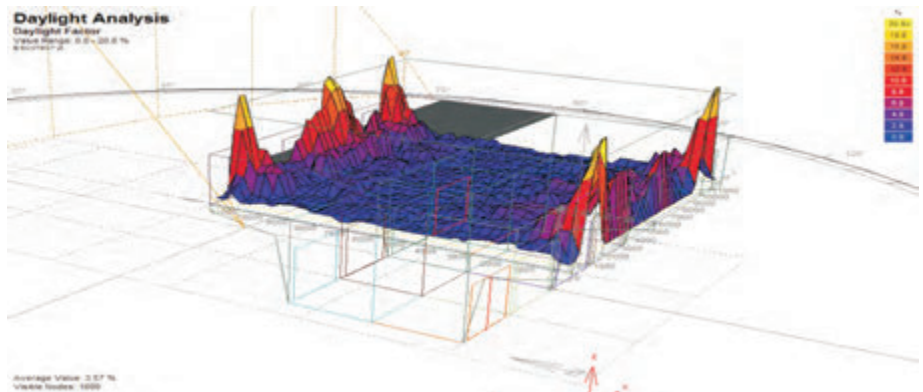
SOLAR ANALYSIS

Hottest day



Coldest day



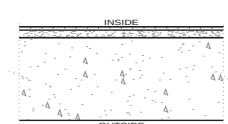


MATERIAL PROPERTIES

Material	Width	Density	Sp. Heat	Conduct
Concrete Slab	150	2000	656.9	0.753
Concrete Screed	6	900	1966	0.088

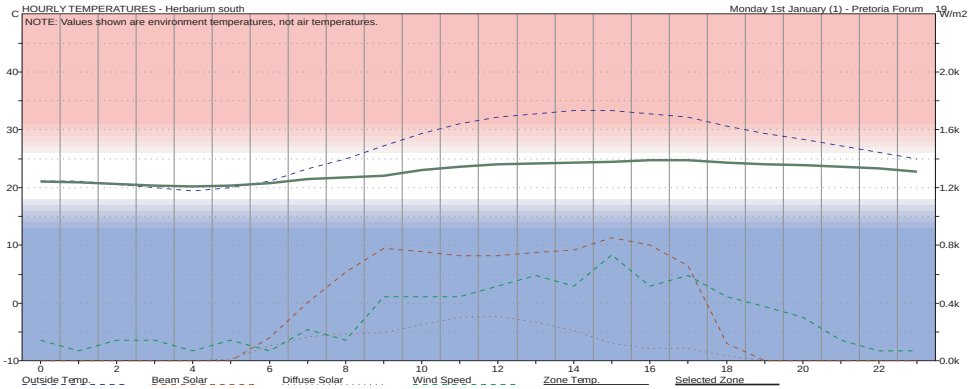
Material	Width	Density	Sp. Heat	Conduct
Aluminium Clading	0.5	7680.2	420	45
Polyurethane Foamed-In-Place Rig-	200	40	1674	0.32
Chipboard, Bonded With UF	20	630	5020	0.25

Material	Width	Density	Sp. Heat	Conduct
Ceramic Tiles	220	2500	656.9	0.753
Concrete Screed	20	2000	621	0.753
Concrete Slab	10	1900	566.9	0.309

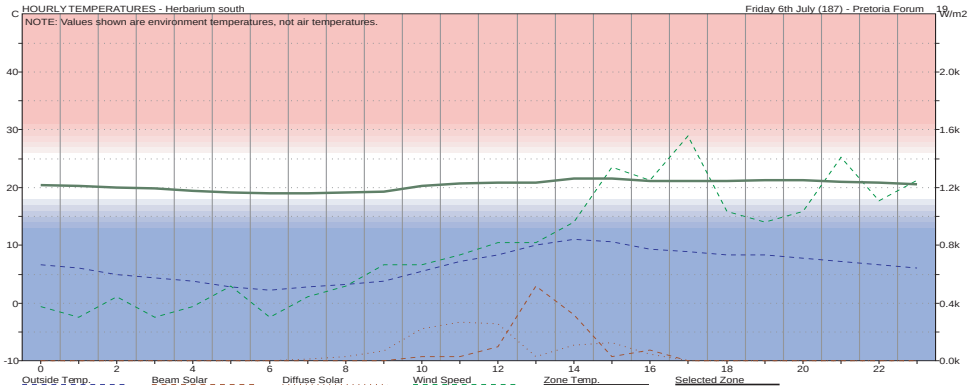


TEMPERATURE ANALYSIS

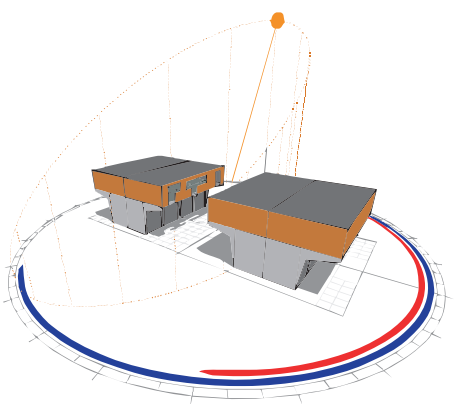
Hottest day



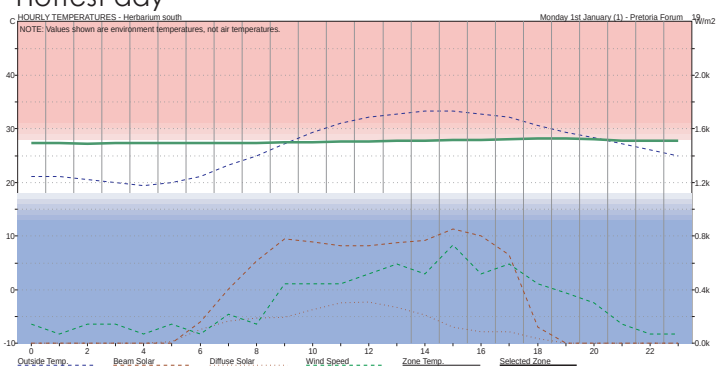
Coldest day



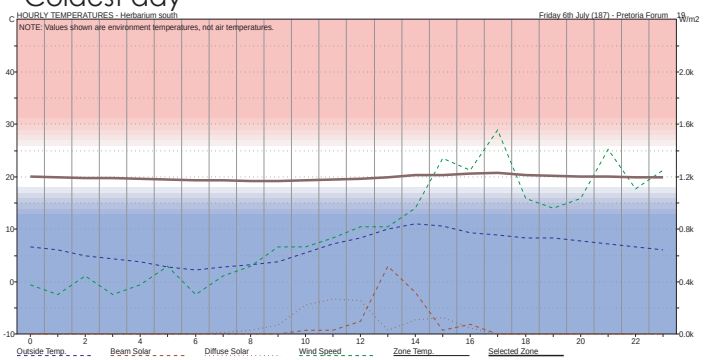
TEMPERATURE ANALYSIS **WITHOUT** ENVIRONMENTAL BLANKET



Hottest day



Coldest day



Conclusion

This dissertation has allowed the author the opportunity to study and become familiar with the implementation and execution of a highly specialized structure in an informal African context.

The investigation and knowledge gained regarding the programme of traditional herbal healers and the approach to defining civic space in an African urban context has rendered the author more open minded to the possibilities and necessity of mixed use building typologies.

With the increasing expansion of the informal sector it has become ever more important to implement similar facilities that would benefit not only the client but also the socio-economic growth of the local community.
It has also come to light that architects can also learn from the informal sector and the humanistic space making qualities thereof to better the approach to designing future urban developments.

As a result of this dissertation the author has come to the realization that it is possible to introduce a high-tech, program specific, first world implementation into an informal South African context, without disrupting the delicate urban network whilst igniting further growth and development.

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List of Figures

Exam Presentation

UNIVERSITEIT VAN PRETORIA
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CENTRE FOR INDIGENOUS HERBAL MEDICINE IN

MABOPANE

HEALING THE MISCONCEPTION

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
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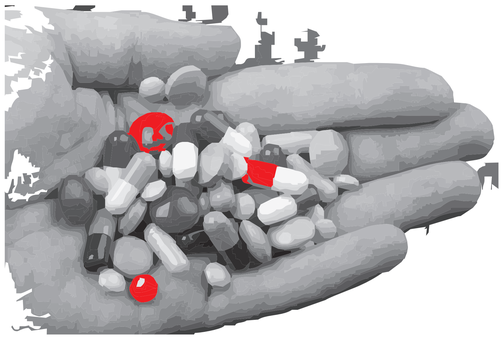
WHAT IS MEDICINE?

MEDICINE
[med-uh-sin]
the science or practice of the diagnosis, treatment, and prevention of disease (in technical use often taken to exclude surgery).

- **Improves quality of life**
- **Increases productivity**
- **Longevity**
- **Improves well-being**

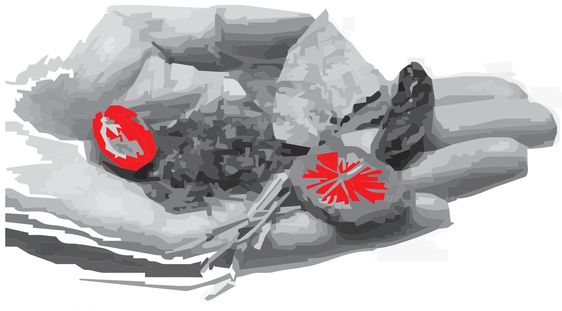
PHARMACEUTICAL MEDICINE



- Effective
- Revolutionary
- Scientifically driven
- Part of a system

- **BUT**
- Profit driven
- Narrow minded
- Institutionalized
- A business concept
- Mainstream
- Expensive
- Not accessible

INDIGENOUS MEDICINE



- Natural
- Traditional
- Culturally based
- People driven
- Affordable
- Accessible
- Sometimes ritually based
- Based on verbal knowledge

But
- Misunderstood
- Shone in many cases
- Fringed upon
- Rejected
- Dangerous
- Unstructured

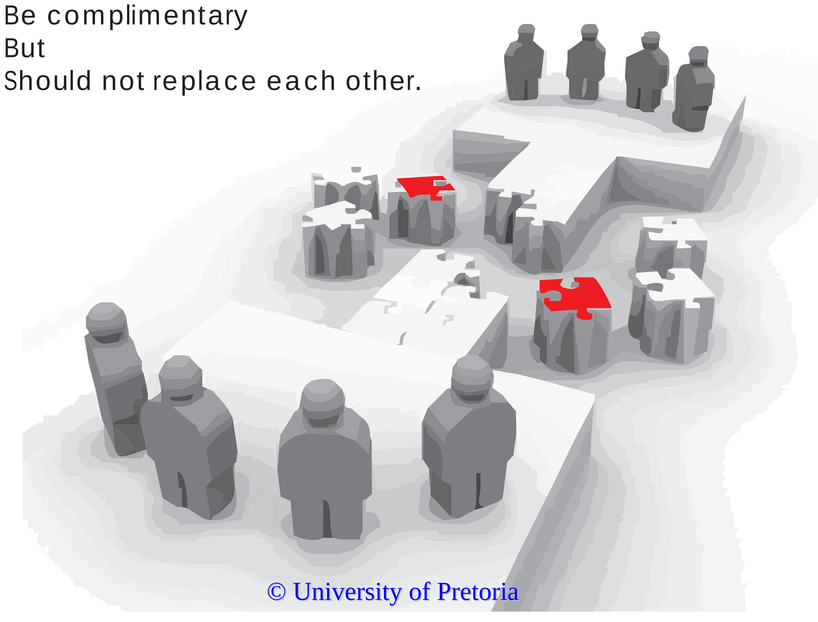
WHAT IS THE PROBLEM?

- Unintegrated
- Dialectically misrepresented
- Schizophrenic
- “Either or instead” of “both and”
- Lack of support
- No identity
- Not catering for the masses

75%

WHAT IS THE NEED?

- Mutual respect
- Integration
- Learn for each other
- Creating space for each other
- Enhance each other
- Be complimentary
- But
- Should not replace each other.



W.H.O IS MY CLIENT?

World Health Organization

WORLD HEALTH ORGANISATION, 345 Round the Corner Ave ,GENEVA SWITZERLAND, 234-645-98

Our ref: 4657-865-2014
2014-01-12

The Director
JACQUES JORDAAN ARCHITECTS
P O Box 27026
Sunnyside
0132
PRETORIA
SOUTH AFRICA

e-mail:jjordaan1@gmail.com
Fax. (012) 473-5987

Attention: Mr Jacques Jordaan

CENTRE FOR HERBAL MEDICINE, MABOPANE

Further to our recent discussions and your proposal dated 2013-03-13, we hereby confirm your appointment as Architects for the project above.

As the project is of global significance, the WORLD HEALTH ORGANISATION (WHO) has obtained funding from the WORLD BANK with a budget limit of $24 million (excl. VAT). Please ensure that the procedures and cost control mechanism of the World Bank is closely followed as per the attached documentation.

The architectural fees will be based on the standard world bank consultant remuneration fee structure for international specialist consultants (attached). Your appointment will be based on the Standard Appointment Agreement as provided by the WHO. The documents will be furthered to you in due course for signing.

The site as identified before, will be leased from the City of Tshwane as per the Heads of Agreement.

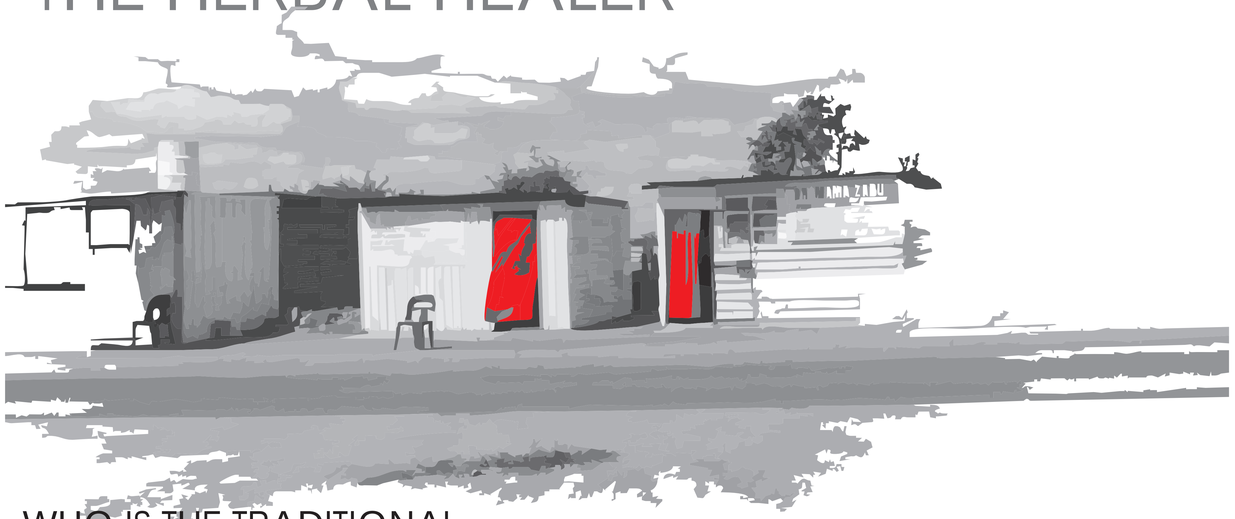
As discussed, we understand the brief and approach to include the following:

- Laboratories to do primary research and documentation, as well as storage of herbal medicine specimens.
- Multifunctional greenhouse to grow new types of herbal specimens.
- Offices for administration of herbal community and boardrooms as required based on your research.
- Lecture rooms with a capacity as per schedule dated May 2007.
- Ensure interface with the urban environment and local community.
- Stalls for herbal medicine practitioners are to be included.
- Provide enough parking for future phases as per the Municipal requirements
- Conference and auditorium facility of 140 capacity that should be able to operate as a stand-alone unit.

Please provide us with an Acceptance Letter, Program and deadline for the Research Report as soon as possible.
Yours faithfully

Dr. I A M Verygood
Projects Director Africa
WORLD HEALTH ORGANISATION

THE HERBAL HEALER



WHO IS THE TRADITIONAL HEALER?

- Mentor
- Healer
- Respected community member
- Revered
- Culturally managed

BUT

- Sometimes feared
- Can be manipulative
- Uncontrolled
- Un-institutionalised
- Doubted

Indigenous African Medicine

Indigenous African medicine is a **holistic discipline** involving indigenous herbalism and African spirituality, typically involving diviners, midwives, and herbalists. Practitioners of traditional African medicine claim to be able to cure various and diverse conditions

African/Western Medicine

Although Western medicine is successful in developed countries, **it doesn't have the same positive impact** in many of the underdeveloped African countries. Though Western practices can make an impact in health care practices, in certain areas such as in the spread of various diseases, it cannot integrate wholly into the culture and society. This makes the traditional **African practitioners a vital part of their health care system.**

In recent years, the treatments and remedies used in traditional African medicine have **gained more appreciation from researchers in Western science.** Developing countries have begun to realize the high costs of modern health care systems and the technologies that are required, thus proving Africa's dependence to it. Due to this, interest has recently been expressed in **integrating traditional African medicine** into the continent's national health care systems.

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THE HERBS

The five most common herbs in South Africa are The Buchu herb, Devil's claw, African potato, South African Geranium or Umckaloabo and the African ginger only to name a few.

AFRICAN POTATO

The African potato (Hypoxis) is mainly found in Gauteng, Limpopo, Mpumalanga, KwaZulu-Natal and Eastern Cape. This herb is commonly known to boost ones immune system and is alleged to reduce and battle cancer cells, HIV, asthma, TB and other chronic illnesses. The buld of the African potato is dried and crushed into powders which can be mixed with water and consumed or mixed with cream for creating ointments.

- Reduce cancer cells
- HIV
- Asthma
- TB
- Other chronic illnesses

BUCHU

The buchu (Agathosma Betulina) herb is already commercially grown in the Weatern Cape region for its essential oils which is known worldwide for its anti-inflammatory and antiseptic properties to treat high blood pressure, UTI infections, arthritis, gout and countless other ailments.

- high blood pressure
- UTI infections
- arthritis
- gout

GERANIUM

The South African Geranium or Umckaloabo (Pelargonium sidoides) is alike to a common geranium and is filled with natural healing capabilities that is found in its fleshy blood red stem. The stems are dried and also made into infustion,tinctures and powders. It has a potent antibacterial and antiviral property that is ideal in the treatment of chronic respiratory tract infections such as bronchitis,sore throat, sinusitis,colds and flu.

- Bronchitis
- Sore throat
- Sinusitis
- Colds
- Flu

DEVILS CLAW

Devils claw is common to the arid areas of Southern Africa, Namibia and Botswana. The healing properties of the Devils claw is found in the roots that are then dried to the extent where it is then turned into a powder, extracts and solutions. It used to treat pain, increase mobility and provide relief from a wide range of musculoskeletal conditions, diabetes, neuralgia, headaches and menstrual problems.

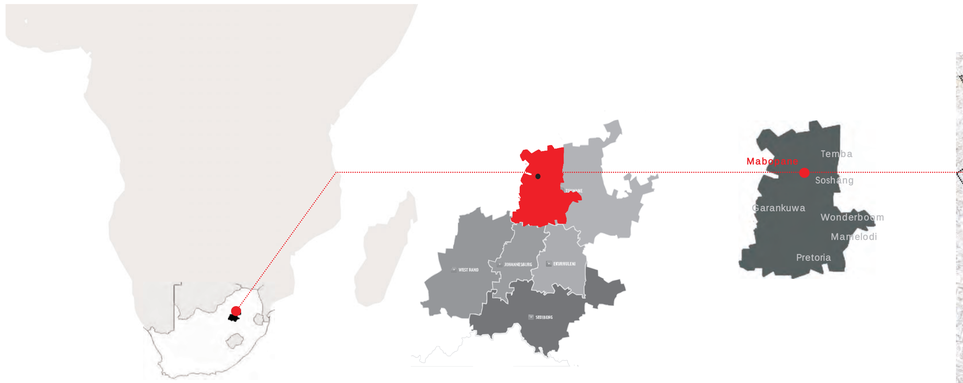
- musculoskeletal conditions
- diabetes
- neuralgia
- headaches
- menstrual problems

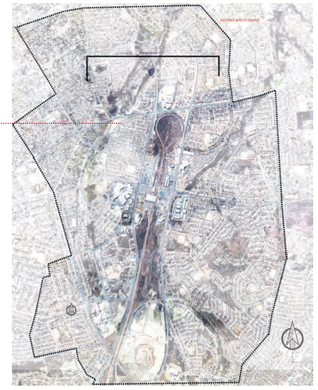
AFRICAN GINGER

African ginger (Siphonochilus aethiopicus) which can be found at almost every fresh food store or market is mainly found in the Northern Province and Mpumalanga. It is the most commonly used medicinal herb in South Africa's informal sector and is so popular that it has become almost endangered due it's over harvesting. The roots of the ginger plant are dried and crumpled to a powder or formed into tablets and is used to treat countless health problems, from coughs,colds,asthma and flu to menstrual cramps.

- Coughs
- Colds
- Asthma and
- Flu
- Menstrual cramps
- Migraines.

WHAT IS THE CONTEXT?





URBAN LEGACY

Mabopane was proclaimed in 1963 as a black-only residential settlement by the then Transvaal administration. The settlement is situated **NW of Pretoria** and fall within the Tshwane municipal boundary. This town is a perfect example of the way in which **Apartheid** functioned, moving the majority of black South Africans to the peripheries of the city.

Mabopane use to be situated in Bophuthatswane a neighbouring state before it was included in the then Transvaal province in 1962. It used to be the border which crosses over to the town of Soshanguve which consists of **So**tho, **Shan**gaan, N**gu**ni and **Ve**nda people, hence the name.






SWOT ANALYSIS

Initial Issues:

Strengths:

1. **High energy** in and around station precinct.
2. The ability of the inhabitants to **adapt to their surroundings.**
3. Makes us of the available infrastructure and **uses it to fullest** even if it has a negative effect on the environment.
4. The community's **ability to survive** by utilizing all resources to their disposals.
5. **Self regulating** system.
6. Social network extremely strong.
7. Finds **order in chaos**.
8. Welcoming towards development
9. Entrepreneurial spirit,(**Adapt or die**)
10. Strong community network (Possible safety factor)
11. Ability of optimizing **economic potential** by indentifying and focusing on an area with high energy. (Seeing potential.)
12. **Sense of community**.(In some sense more than middle class suburbs, Know your neighbour)
13. Organic growth pattern.(**Ecological**)
14. **High growth** pattern of urban fabric.(Even if unstructured)

Weaknesses:

1. Community is in **survival mode** which leads to criminal networks forming.
2. **Unsafe** environment in and around the station.
3. There is a **lack of connectivity** in and around the station precinct.(Separation)
4. Linkages are minimal.
5. Mabopane appears strong but **fragile in nature.**
6. Social and economical elements are **not resilient to change**.
7. Incomplete and **insufficient infrastructure**.
8. Not catering for the pedestrian (The majority of the population).
9. **Movement of vehicles** and taxis are obscured and **not effective** (dangerous).
10. Informal trading is susceptible to external forces. (Suppliers)
11. Proposed infrastructure **developments are sensitive to politics** and thus never implemented nor completed.
12. **Not analyzed contextually** by council before planning future infrastructure thus nothing happens.
13. Living from the bare necessities (**on the edge**)
14. Waste disposal is informal and a health hazard.

One can get a better description of Mabopane through use of **S.W.O."C"** indentifiying **strengths, weakness, opportunities and constraints.**

Implied Issues:

Opportunities:

1. **Enabling** the **public** domain.
2. **Creating linkages** in existing and to proposed urban fabric.
3. Upward mobility of the community to **become resilient**.
4. Expanding and **reinforcing existing socio-economic elements.**
5. **Formalizing existing** infrastructure without affecting already existing functional elements in a negative manner.
6. **Identifying** and then building on **hidden structures**.
7. Creating **tectonic logic**.
8. Researching a contextual approach to space making in an African city.

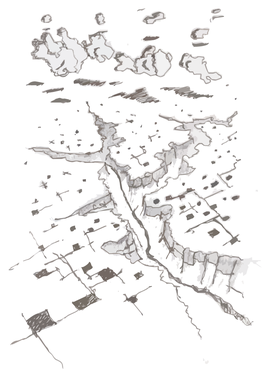
Constraints:

1. **Lack of knowledge** about the people operating in these settlements.
2. **Cultural indifference** weaken community participation.
3. **Ownership boundaries** are dealt with in an informal manner which makes them **obscured.**
4. Inhabitants of settlement have an **unpredictable approach** to dealing with issues.
5. **Community mind set** about the external.
6. The physical site conditions and **lack of infrastructure**.
7. **Dominated by Western/modern ideologies** of how to approach space. Koolhaas's "the generic city"

ARCHITECTURAL ISSUES

The station and the intermodal facilities are treated as a **"human conveyor belt"** instead of infrastructure that fosters viable urban spaces. It is "infiltrated" by the community in order to **"survive"**. The linkages of the urban fabric depend strongly on the station operating as a movement connector between Mabopane and Soshanguve. This connection requires further framework to become operational.

The nearby surrounding area consists of mixed typologies namely informal housing, RDP developments, suburban layouts and retail. This emphasizes **Mabopane's complexity in its diversity**. The overall sense of the architectural issue is the fact that **everyone is involved but no one is committed or in control** of a certain approach, an approach suited for Mabopane and its development.

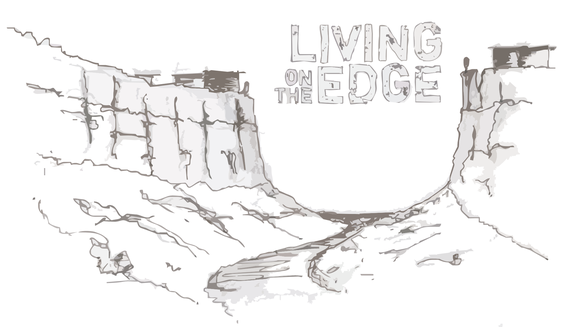


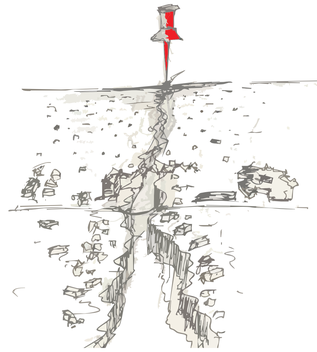
URBAN FORM

URBAN ISSUES

Mabopane's **under-developed urban condition** is mainly a result of poor past and future planning and management by the post Apartheid City Council the City of Tshwane Metropolitan Municipality and has stifled development possibilities. The lack of management in and around the transport node has resulted in a **fragmented urban condition** which the locals have moulded and adapted to suit their needs.
The area surrounding the station has undergone multiple urban design proposals where only a few has been implemented and to only a certain extent.

Mabopane consists of a mix of first and second economy **individuals separated and dispersed** across the landscape by insufficient infrastructure. In order to stitch the broken fabric of social and economic separation **enablement is necessary** as Thomas mentions. The urban condition needs to be a catalyst to develop the potential of the **upward mobility of the individual** (user) and to engage in the urban environment as part of the community.





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URBAN ELEMENTS

THE MARKET

The informal market outside the station can almost be described as an **organism in itself**, growing and breathing a multitude of different functions and activities throughout the day. The market which is **situated on the previous taxi rank** assigned for the station has completely taken over and thrives on the thousands of commuters that moves through it each day. The market has grown to such proportions that it has **infiltrated the surrounding area and even the station** itself.

THE TRAIN STATION

All of the transportation to and from Mabopane is concentrated in and around the train station which has grown into an **inter model hub** which is transit orientated and also houses an informal market. **Almost 200 000 people move through this node each day**.

Although the station is an essential part of Mabopane and can even be seen as its **beating heart** it does cause its own problems. The railway line not only servers the community but also divides it simultaneously creating a **divider and an enabler**.

THE SHOPPING CENTRES

As a result of Mabopane being separated from Soshanguve by the railroad **two detached energies** started to form, this was quickly identified by retail developers as a lucrative opportunity to capitalize on both sides. The result is **two gigantic shopping centers** not even 200m from one another, Central city mall and Soshanguve Plaza. The shopping centres cater mainly for franchised shops and fast food outlets and because they are the only ones in the area the centers are extremely popular.

THE TRADITIONAL HEALERS

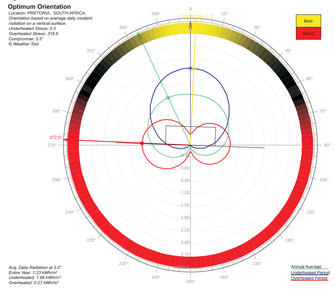
The large amount Traditional herbalists in Mabopane is quickly noticed as they define and envelop the street leading to the market and train station. The herbalist's consultation rooms are located on the street edge and thus almost creating a boulevard of sort living off the existing energy of the station, market and pedestrians that passes it every day.

THE CEMETERY

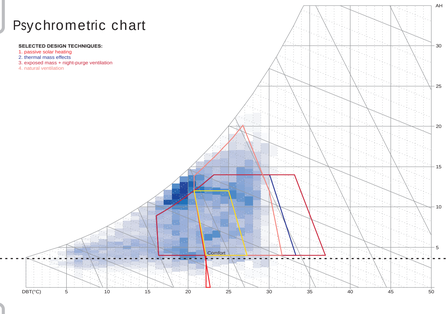
The cemetery is located between the traditional herbalists and the Mabopane train station comprising of **±1300 graves**. The cemetery is **cordoned off from the public** by means of a concrete panel wall with one entrance to the south. Unauthorized movement through the cemetery is non-existent due to cultural and religious beliefs of the majority of Mabopane's inhabitants.

CLIMATE CONDITIONS

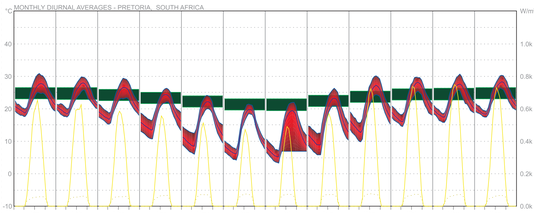
Optimum Orientation

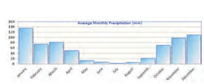


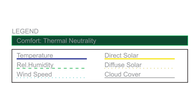
Psychrometric chart

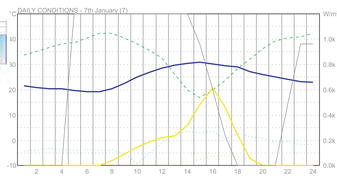


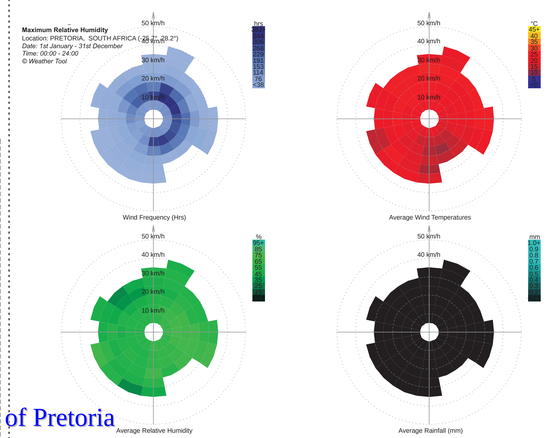
Monthly temperature averages



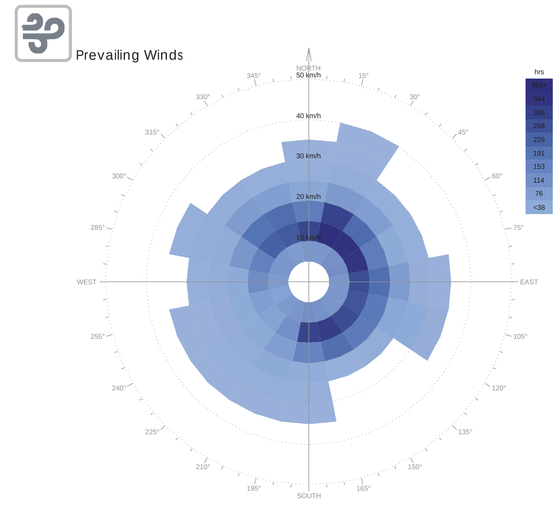


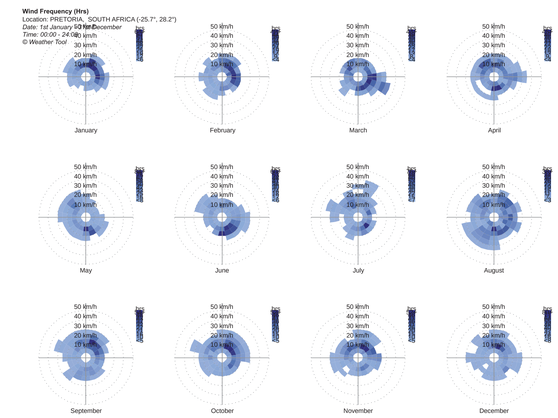




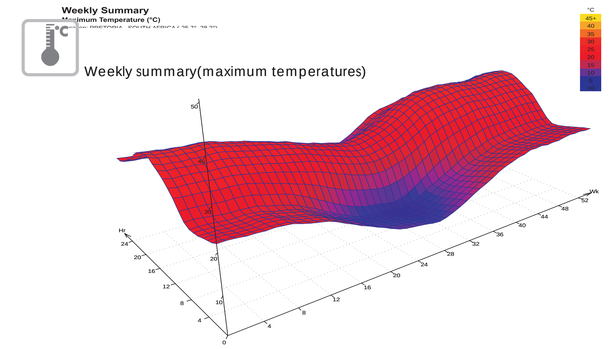


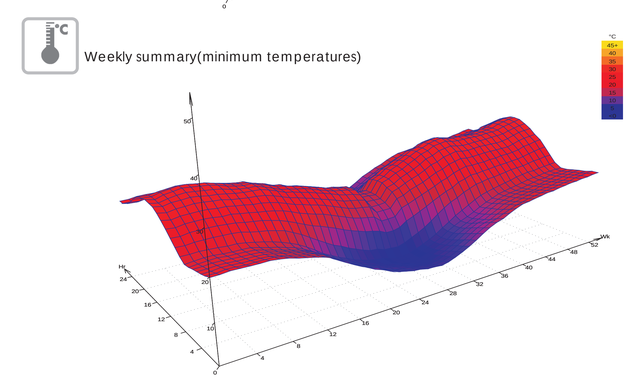
Prevailing Winds



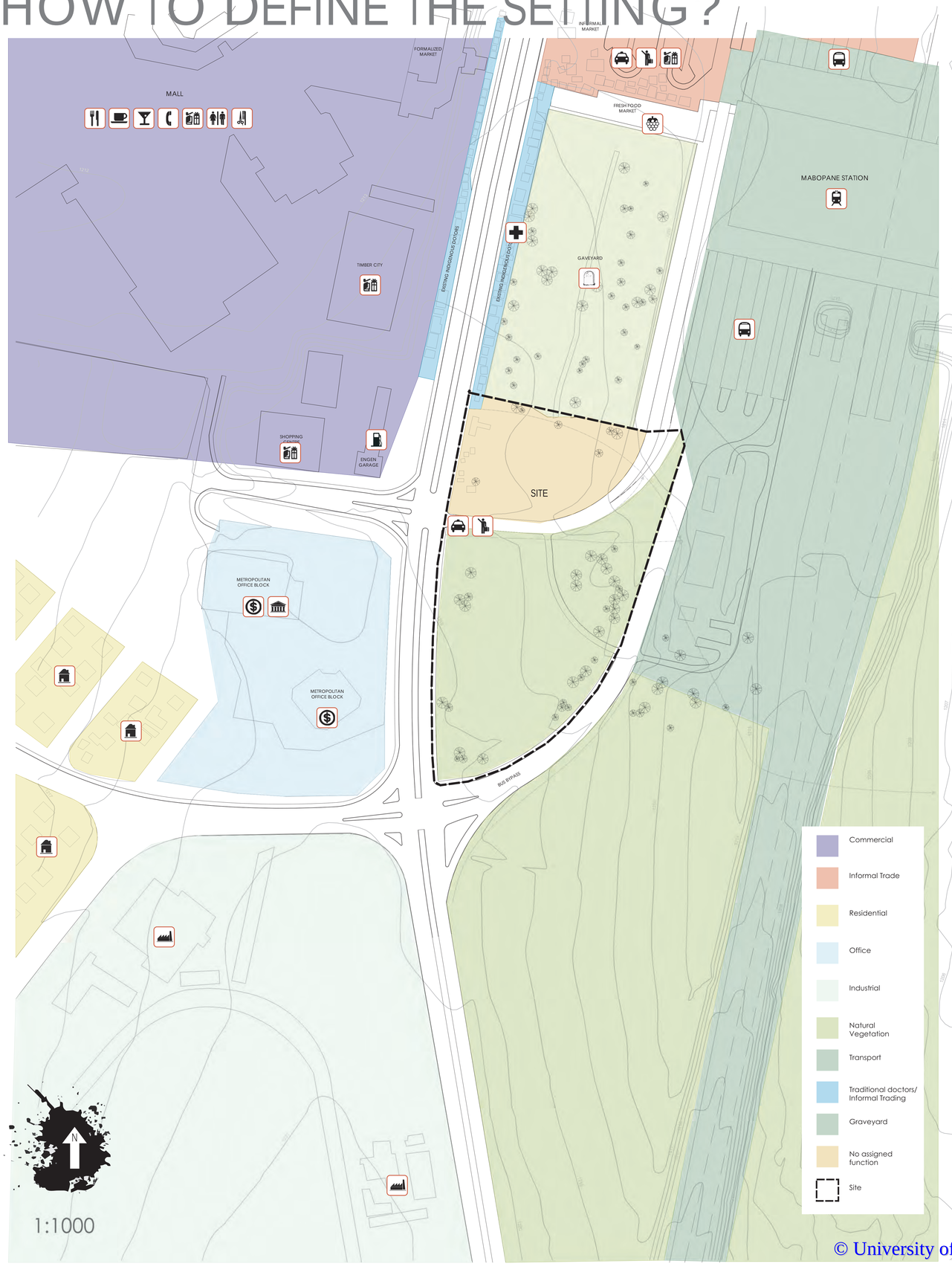


Weekly Summary

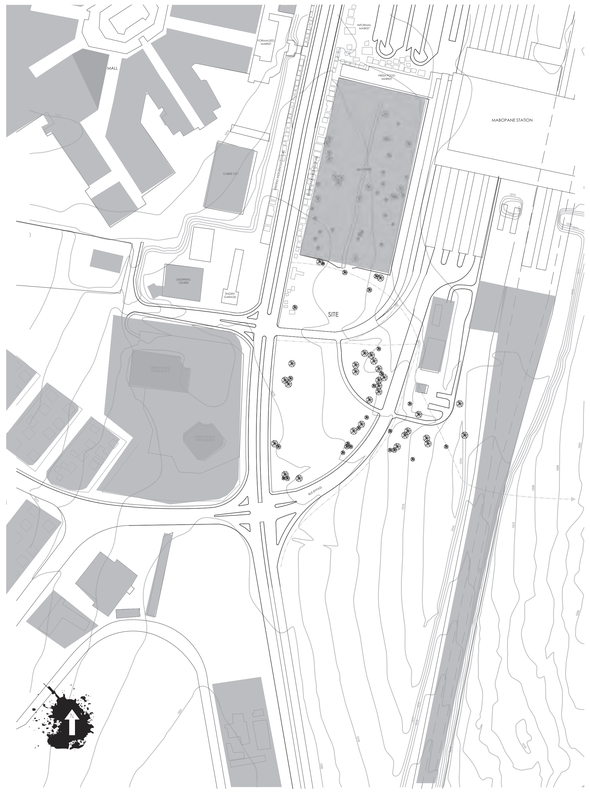




HOW TO DEFINE THE SETTING?



URBAN FORM



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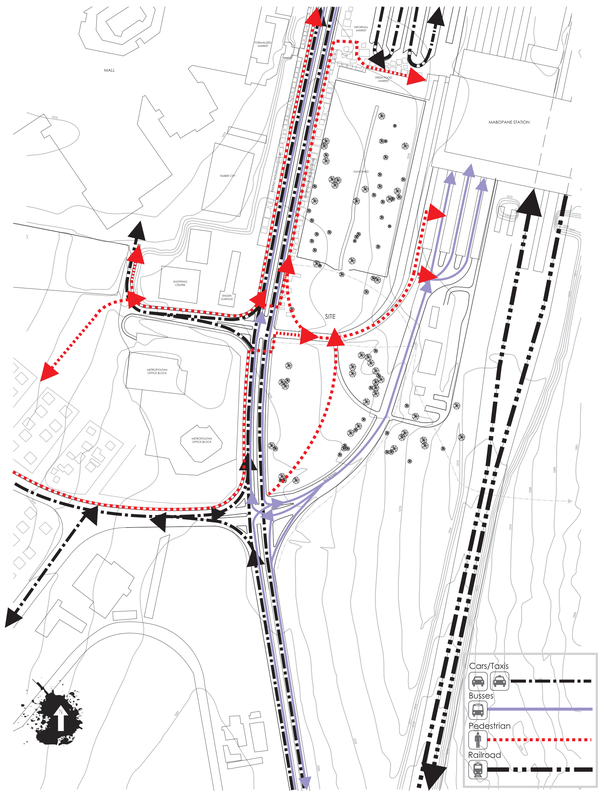
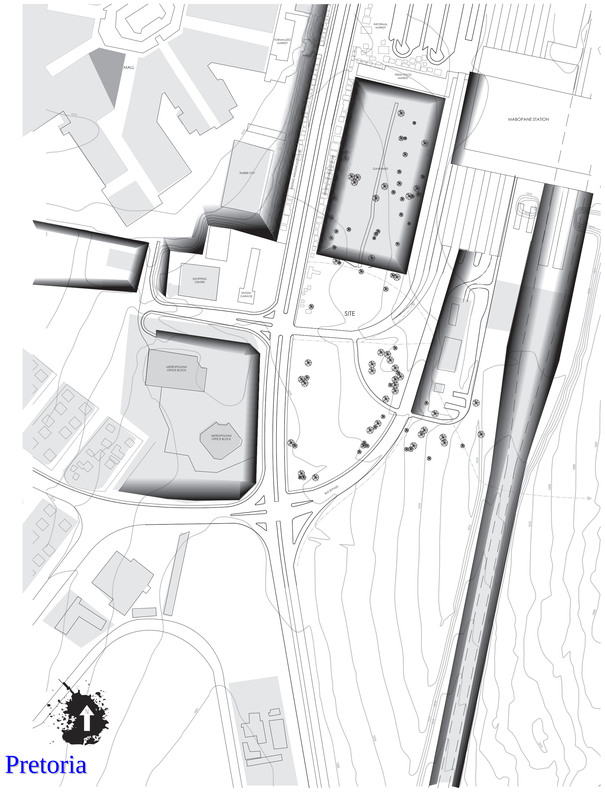
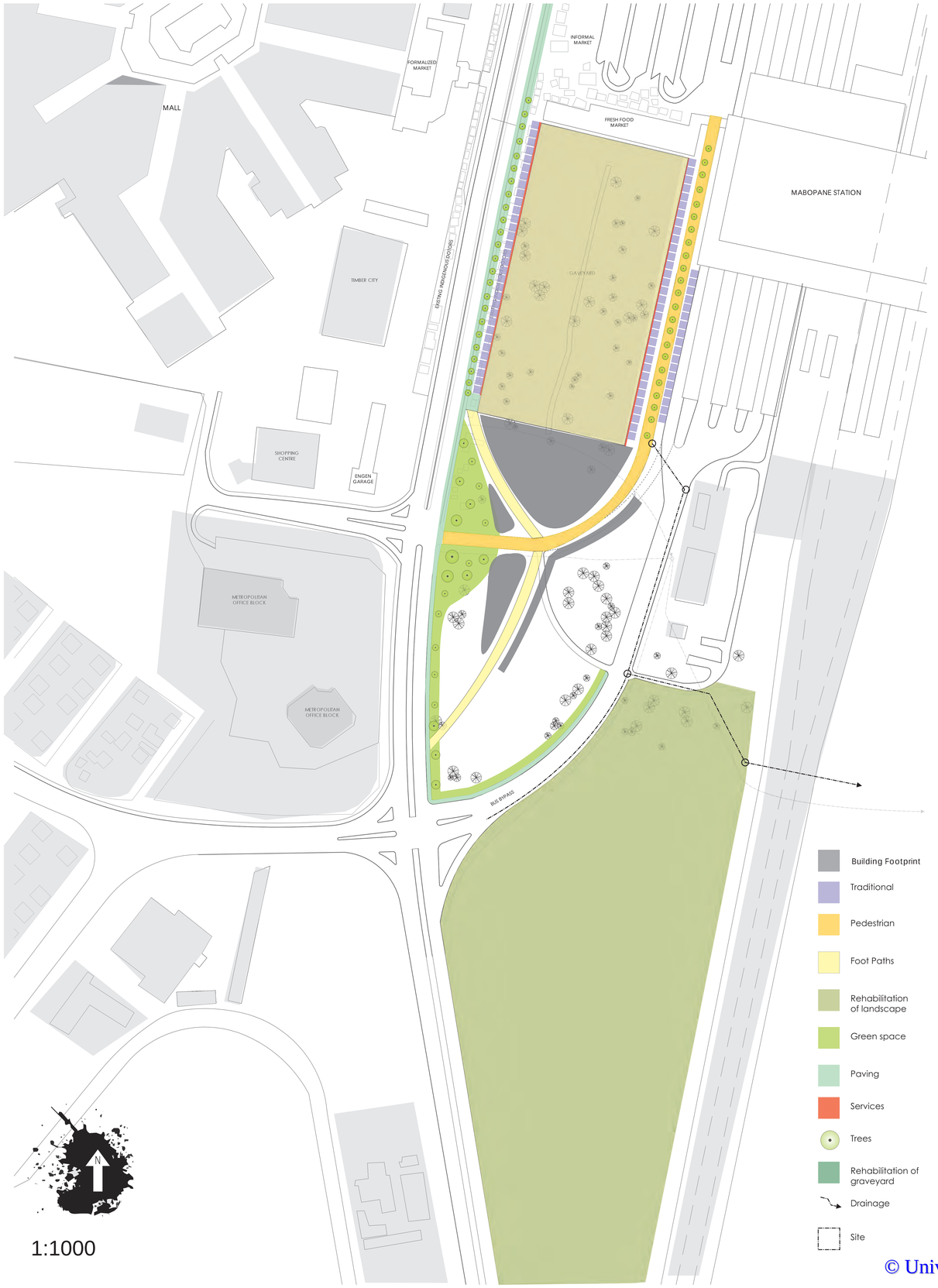


EDGES



WHAT IS THE SETTING ?



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

PRECEDENTS

Farraday Muti Market

Location: South of Johannesburg CBD
Architect: Albonico and Sack Architects and urban designers
Date:2002

The Muti Market in Johannesburg's Faraday Street is active throughout the day with people **buying and selling herbs and animal skins**. The Market is situated in city centre and has become an **energetic hub of healing and socializing**. (Southafrica.net, 2014)

There are many **consulting rooms**, each with a doorway that is only 1.6m high. They are built like this to force clients to stoop as they enter. This is an attempt to recreate the **traditional way of entering a healer's hut**. It gives the space a sense of ceremony, and by stooping you are also showing reverence for the healer and indicating that you are ready to submit to his or her wisdom.

The elements:
- Housing traditional healers
- Traditional requirements
- Healer requirements
- Open air market
- Roofed market
- Ease of public movement

Tectonic elements:
- Robustness
- Roofed public areas
- Market/stalls
- Locable stalls



Warwick Junction

Architect: MA Gafoor, Kooblal and Steyn
Location: Berea,Durban 2001
Date: 2001

The Warwick Junction is part of an even greater project, including the Durban Point Waterfront Development reaching Bridge City and the Moses Mabhida Stadium. Theses project's main goal is to **kick-start an urban renewal** strategy focused on the upliftment of the cities **socio-economic elements**.

The junction is **one of South Africa's busiest transport and commercial nodes**. Despite that it is situated in a rundown area of town it is still the most energetic and vibrant part of Durban perfect for a renewal initiative. Close to **60% of the cities informal traders** gather at Warwick junction to cater and thrive off the **450 000 people that pass** through it each day whether by foot ,bus, train or taxi. The market also includes an herbal market consisting of 500 stall keepers and a broader network of almost **14000 herbalists outside the market area.** (Veldsman, 2006)

The elements:
- Urban renewal
- Upliftment
- Respectfully formalizing trade
- Transport, socio-economic node

Tectonic elements:
- Robustness
- Roofed public areas
- Market/stalls



Gugulehtu Central Meat Market

Architects: CS Studios
Location: Gugulehtu, Weastern Cape
Date: 1994

The building is in an L shape which was requested by the traders to screen off the prevailing winds. This L shape also houses the public toilets,spaza shops,offices etc.

At night when the roof is lit up, it creates the impression that it floats, allowing all the 'informal' market and "African restaurant" activity to take place beneath it. This adds to a **positive and vibrant urban space**.

This is an influential precedent because of its **approach to informal situations**, its robustness and the way in which it accentuates the surrounding architectural expression whilst introducing an iconic and recognisable form. The site chosen in Mabopane to implement the intended project share a lot of the

The elements:
- Lockable units (Security)
- Communal ownership
- Creates Arcade

Tectonic elements:
- Robustness
- Thick concrete columns
- Light Steel roof.
- Natural ventilation
- Umbrella roof


BUILDING REQUIREMENTS

1 Herbal market

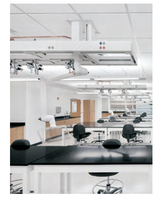
1.	Open market space.	
2.	linking surrounding urban elements.	
3.	25 Lock up storage units	(9m² each)
4.	14 Consultation rooms	(14m² each)
5.	8 Private greenhouses	(9m² each)
6.	Ablutions for public use	(45m²)
7.	Open green space	(225m²)


2 Greenhouse

1.	1 Greenhouse office	(16m²)
2.	1 Workshop	(16m²)
3.	1 Fertilizer store	(32m²)
4.	1 Irrigation control room	(32m²)
5.	1 Seedling grow room	(32m²)
6.	1 Hydroponics room	(36m²)
7.	1 Worm farm room	(36m²)
8.	1 Large indoor greenhouse	(360m²)
9.	Ablutions	(16m²)


3 Laboratories

	1) Laboratories		**2) Laboratory admin**	
a)	Reception		Reception	
b)	2 General Labs	(72m² each)	1 Head office	(16m²)
c)	1 Microbiology Lab	(24m²)	Open plan office	(42m²)
d)	2 Clean Labs	(30m² each)	3 Offices	(9m² each)
e)	4 Chemical stores	(16m² each)	1Boardroom	(30m²)
f)	4 Cold rooms and freezer	(16m² each)	Staff relaxation area	(30m²)
g)	2 Prep rooms	(20m² each)	Kitchen	(9m²)
h)	Specimen room	(20m²)	Ablutions	(16m²)
i)	Ablutions	(16m²)	Stationary store	(8m²)
j)	2 Lab offices	(9m² each)	Server room	(8m²)
k)	Equipment store	(9m²)	Cleaning room	(4m²)

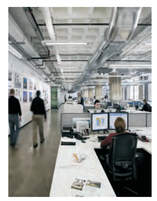
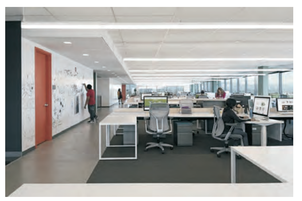



4 Herbarium

1)	Herbarium archives		2) Herbarium administration	
a)	Collection managers office	(16m²)	a) Reception	
b)	General specimen preparation area	(18m²)	b) Manager office	(16m²)
c)	Botanical preparation area	(9m²)	c) 1 Office	(9m²)
d)	Cold room and freezer	(18m²)	d) Library	(30m²)
e)	Wet storage (spirit collectors room)	(36m²)	e) Information Lab	(30m²)
f)	Dry collectors room	(36m²)	f) UPS room	(14m²)
g)	Main dry collectors archive	(96m²)	g) Server room	(4m²)
			h) Tea kitchen	(6m²)
			i) Cleaning room	(3m²)


5 Administration

1)	Main Entrance to facility		9) Server room	(4m²)
2)	Security		10) Board room	(36m²)
3)	Lobby	(48m²)	11) 2 Offices	(9m²)
4)	Reception		12) Photo copy room	(9m²)
5)	Directors office	(20m²)	13) Clean room	(4m²)
6)	WC's		14) Kitchen	(18m²)
7)	Store room	(9m²)	15)Open plan office	(96m²)
8)	Stationary store	(6m²)		

6 Conference Facilities

1)	Dining hall/exhibition space	(144m²)
2)	Dining hall extension/exhibition space	(96m²)
3)	Bar facilities	(12m²)
4)	Kitchen	(36m²)
5)	Storage room	(18m²)
6)	Cold room	(12m²)
7)	Service Yard	


7 Auditorium

1)	Entrance and lobby	
2)	Security	
3)	2 Sound lobbies	(9m² each)
4)	WC's	
5)	Auditorium	(324m²)
6)	Translators room	(12m²)
7)	Storage room	(48m²)

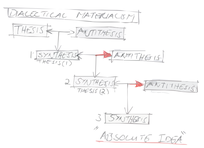

WHAT IS THE CONCEPT?

DIALECTISM

BETWEEN NATURE AND SCIENCE

Dialectical materialism is a **philosophy of science and nature**, based on the writings of Karl Marx and Friedrich Engels, and developed largely in Russia and the Soviet Union. The **main idea of dialectical materialism lies in the concept of the evolution of the natural world** and the emergence of new qualities of being at new stages of evolution.(Jordaan,1967)

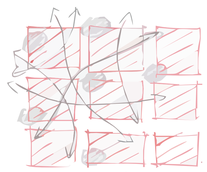
SCIENCE = RATIONAL

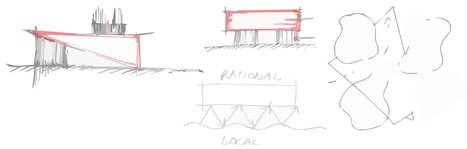


NATURE = ECOLOGICAL

Integral relationship between apparent opposites that have been kept apart and regarded as distinct.(Jordaan,1967)

SYNTHESIS





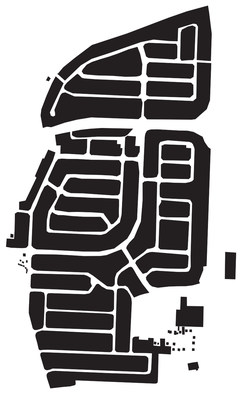
BETWEEN STRUCTURE AND ORGANIC

I AM BECAUSE YOU ARE

The **"I am"** in African sense is that of being in a relationship, how does the one make the other feel. The African mindset of "You are" means to relate or have a relationship with someone towards a problem and solution which is a **communal** mindset

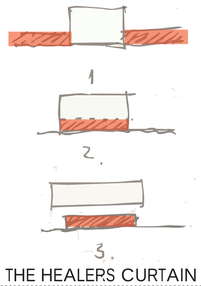
VS.

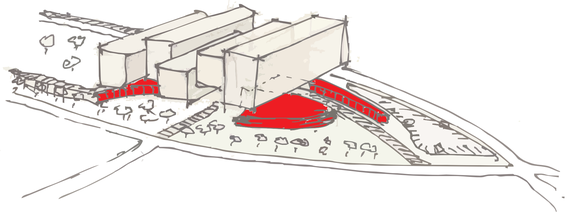
" I THINK THEREFOR I AM "
-DECAR



The **" I think"** in western terms is a **rational approach**, out of rational comes science, out of science comes chemistry and out of chemistry comes medicine.

BETWEEN PUBLIC AND PRIVATE



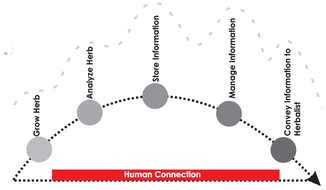


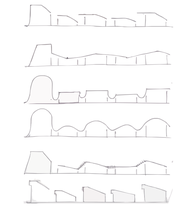
THE HEALERS CURTAIN

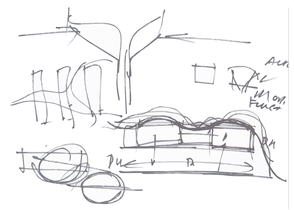
THRESHOLD
PRIVATE BUT NOT BEHIND CLOSED DOORS

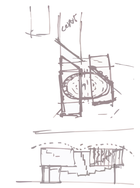
VENTILATION
ALLOWS FOR NATURAL VENTILATION WHILST STILL BEING PRIVATE.

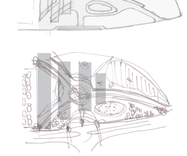
BELIEF
SOAKS THE CURTAIN IN HERBS TO KEEP SANITARY AND TO WARD OFF EVIL SPIRITS.

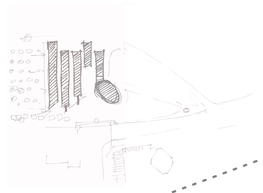






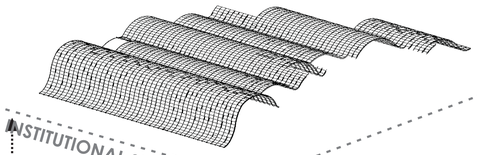






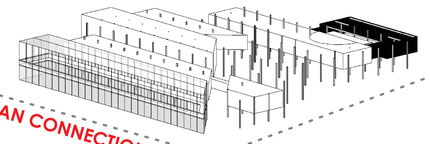
ENVIRONMENTAL CURTAIN

- Reveals
- Conceals
- Ventilates



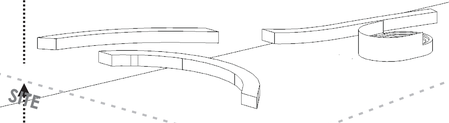
INSTITUTIONAL SUPPORT

- Green House
- Laboratories
- Herbarium
- Administration
- Conference Facilities

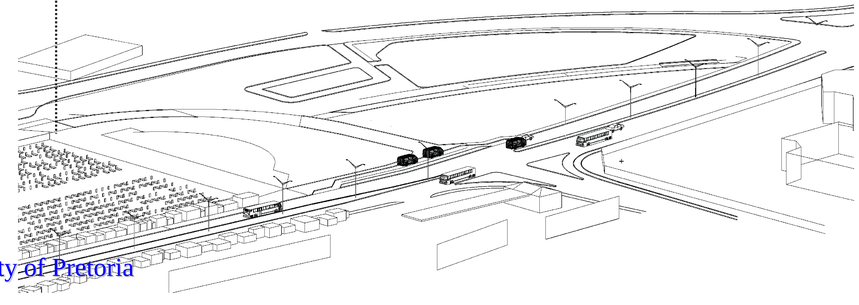


HUMAN CONNECTION

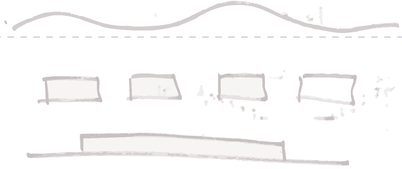
- Public Domain
- Herbalist Practices
- Herbal Market
- Auditorium



SITE



DISTILLING THE CONSEPT



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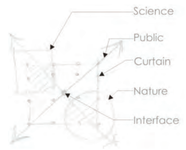

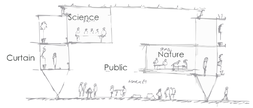

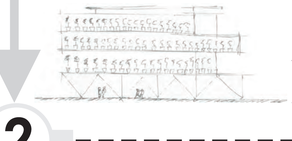

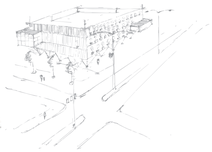

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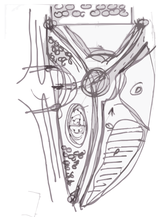

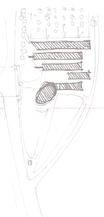

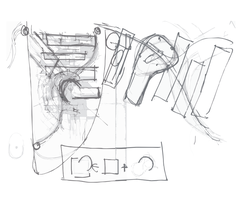

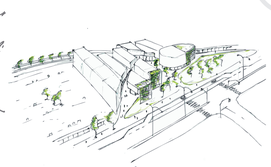

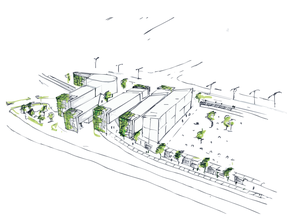

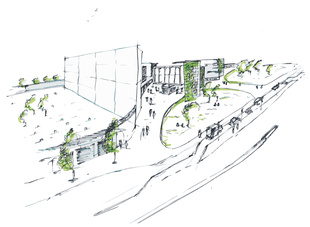

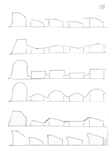

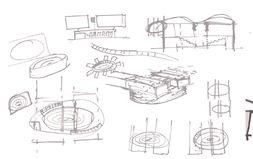

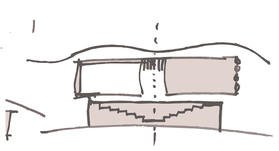

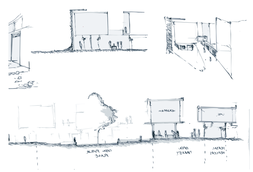

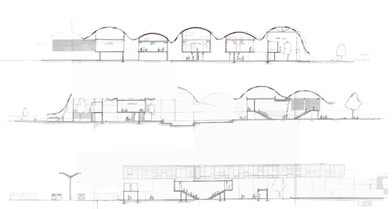

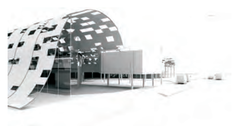

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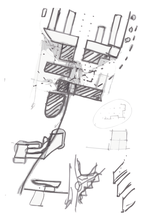
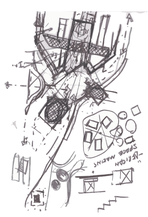
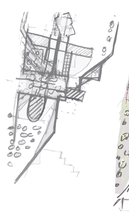
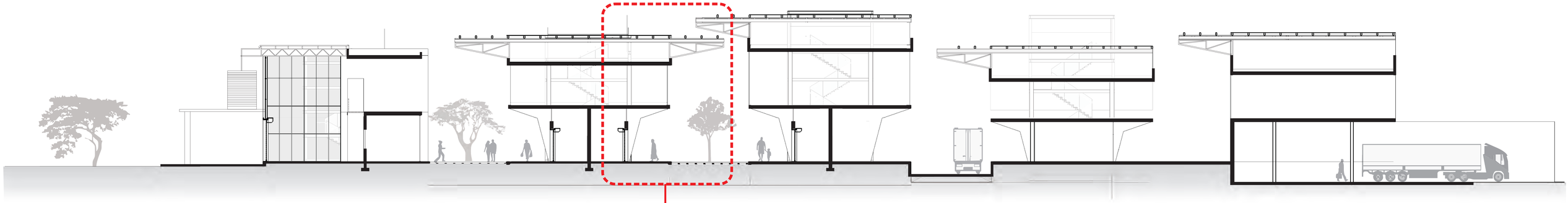






SPATIAL RESOLUTION



SECTION A1

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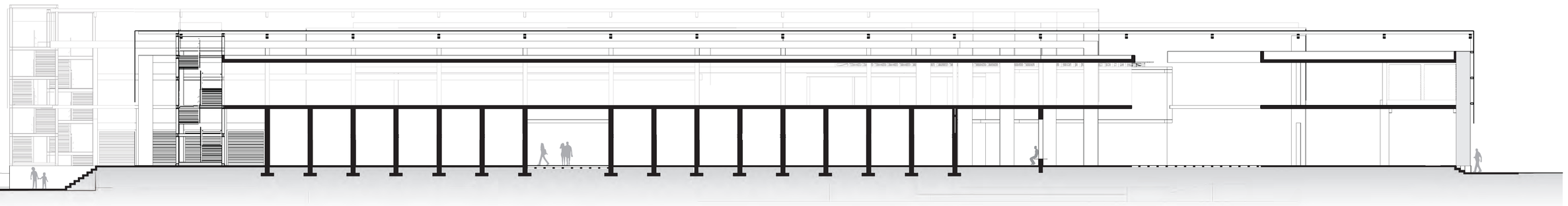

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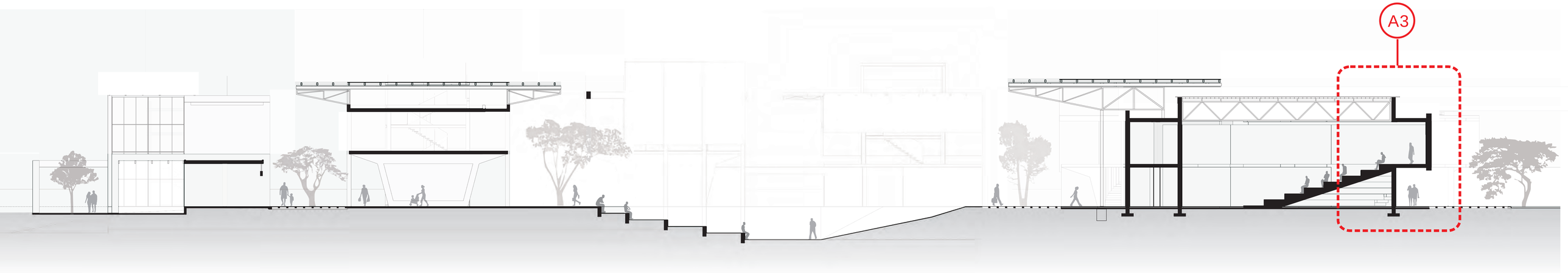

SECTION A3

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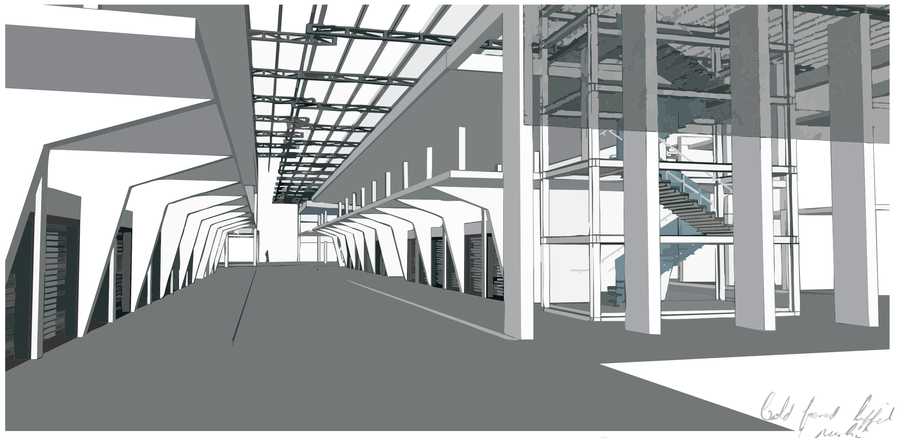
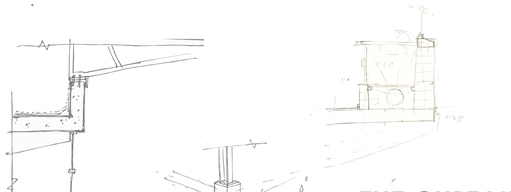
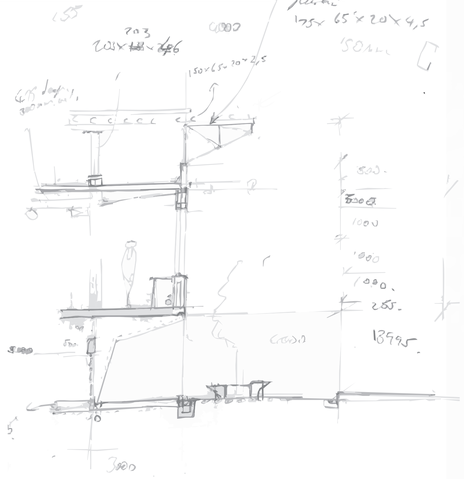
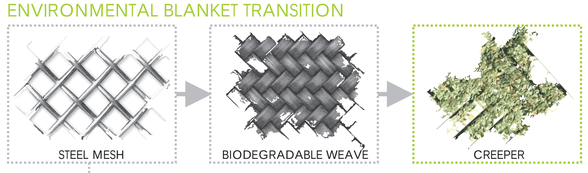


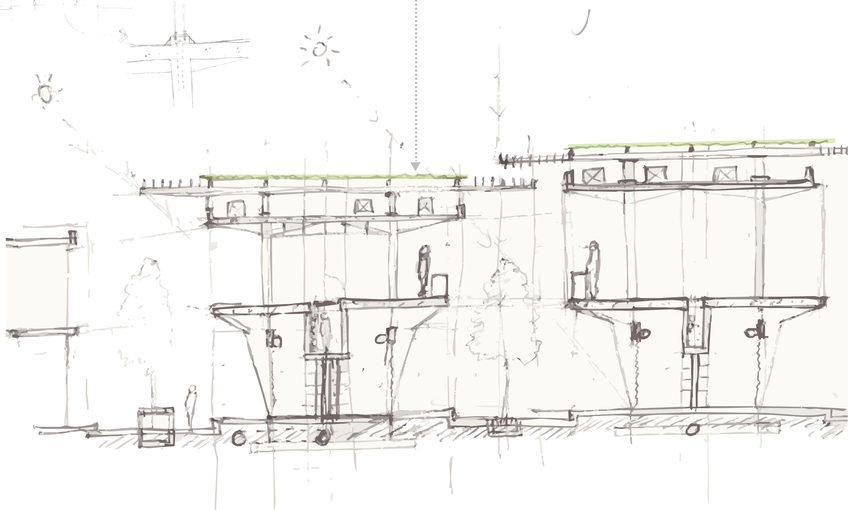




THE CURTAIN

ENVIRONMENTAL BLANKET TRANSITION





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GREENHOUSE & HERBAL MARKET

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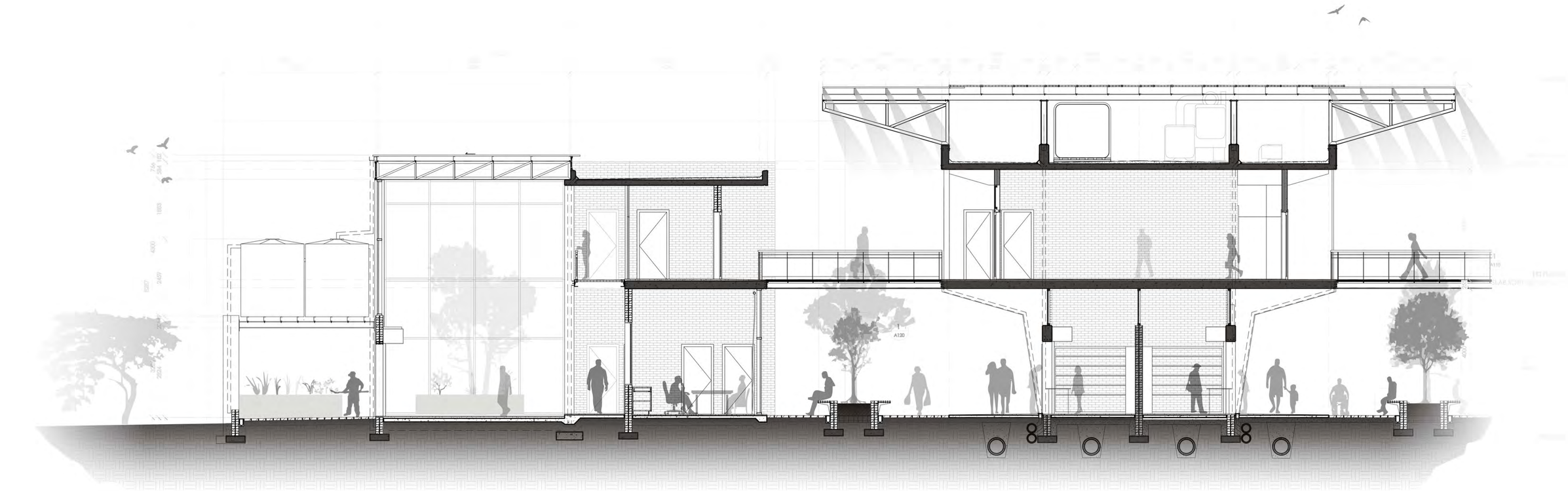
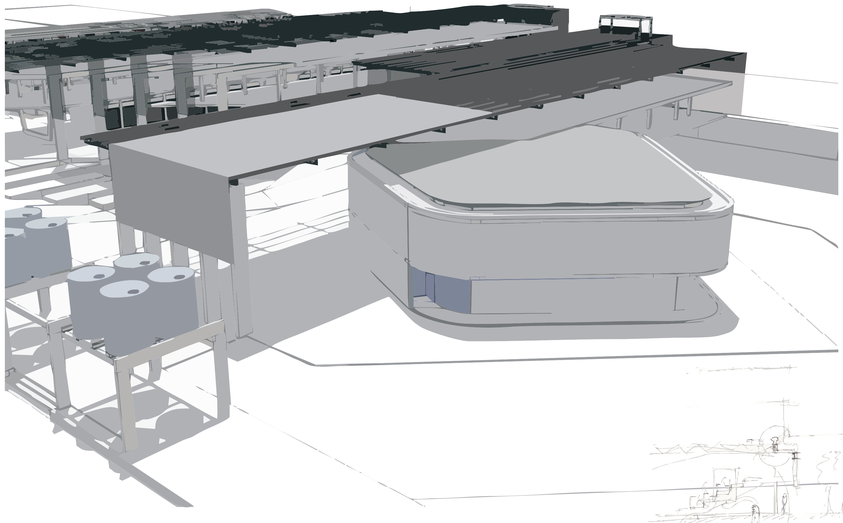
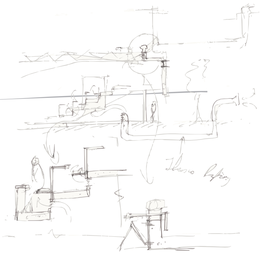
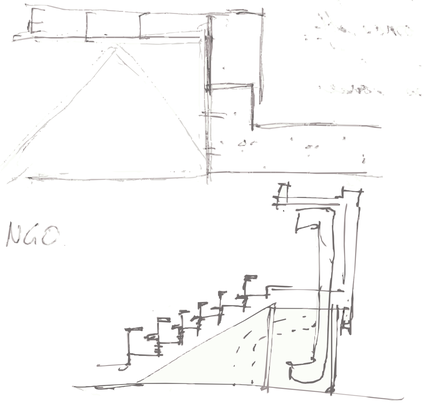
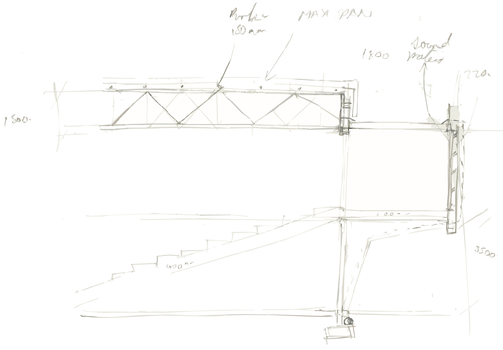


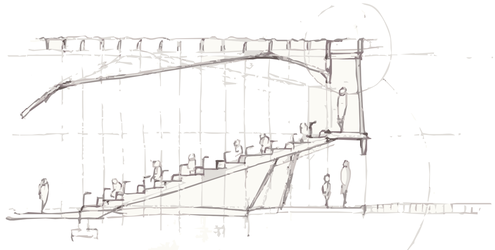
TECTONIC RESOLUTION OF AUDITORIUM

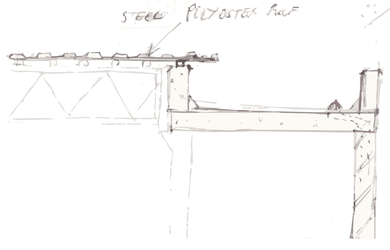


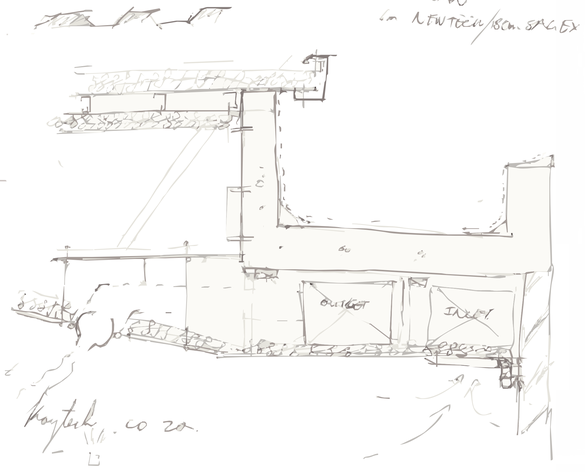


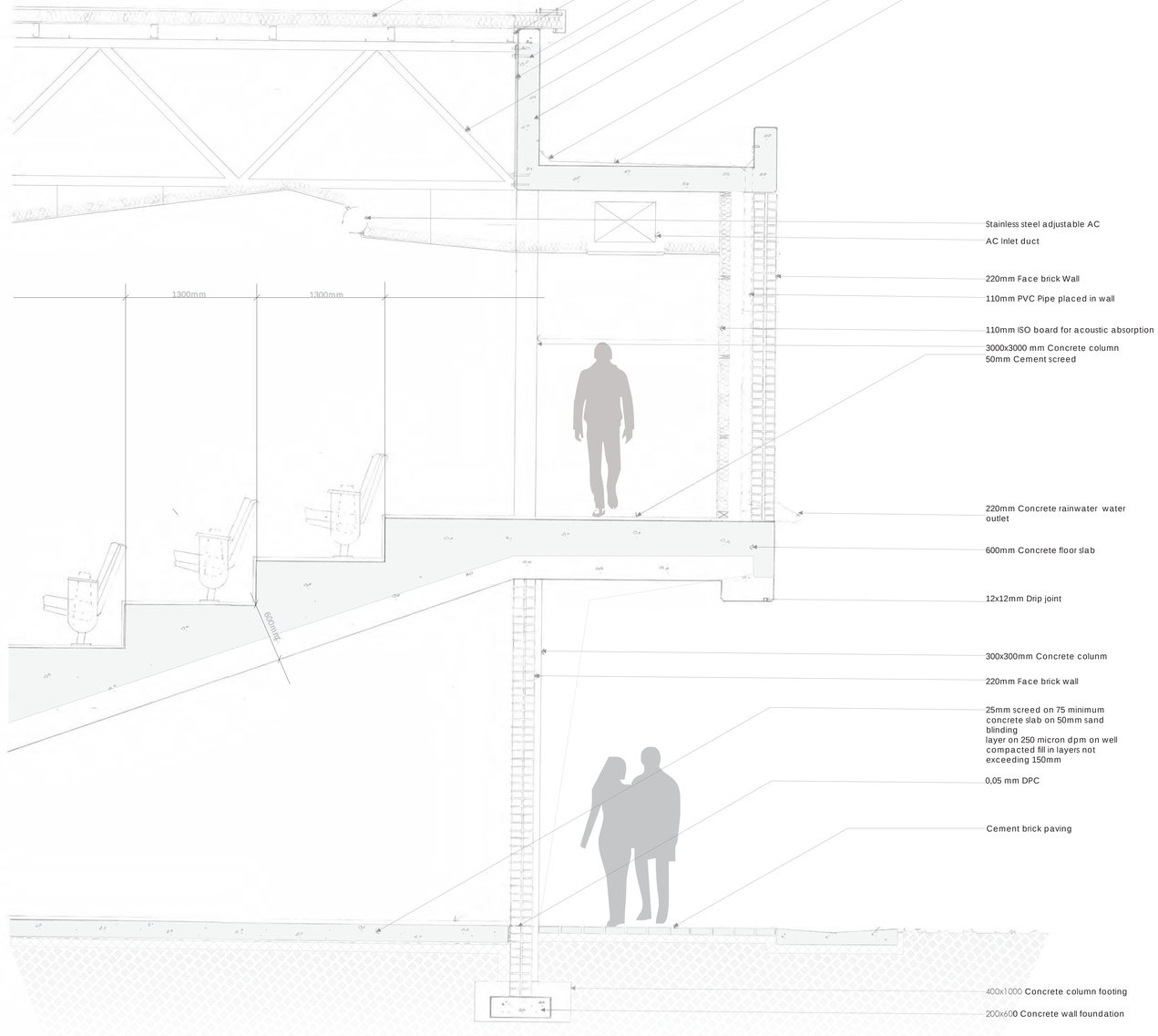












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AUDITORIUM

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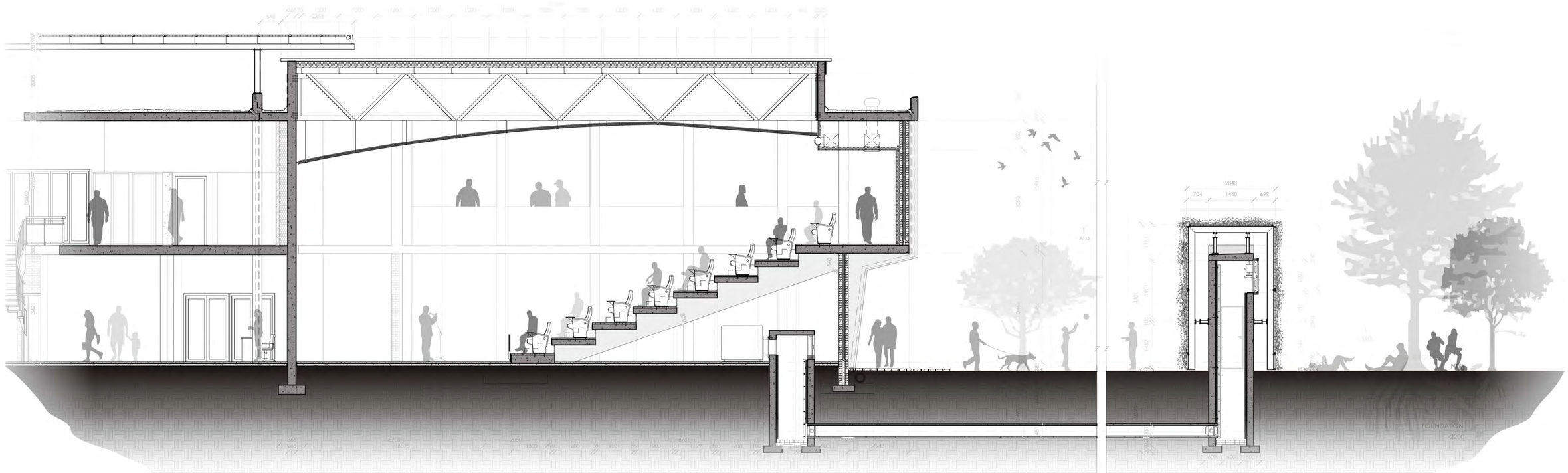

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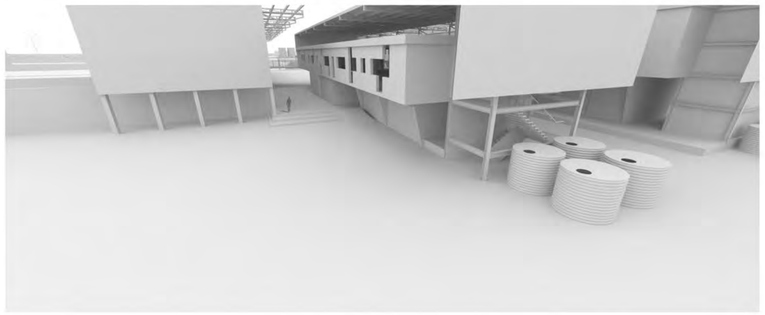
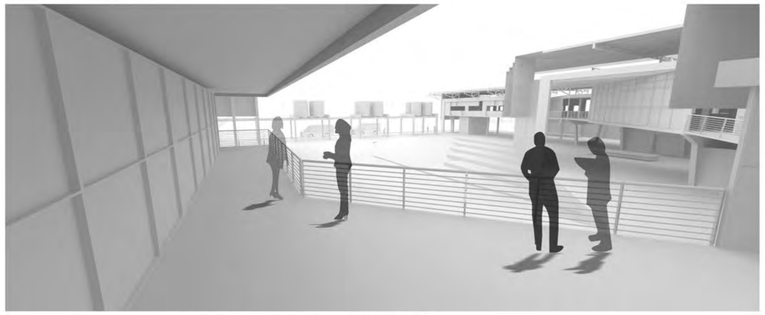
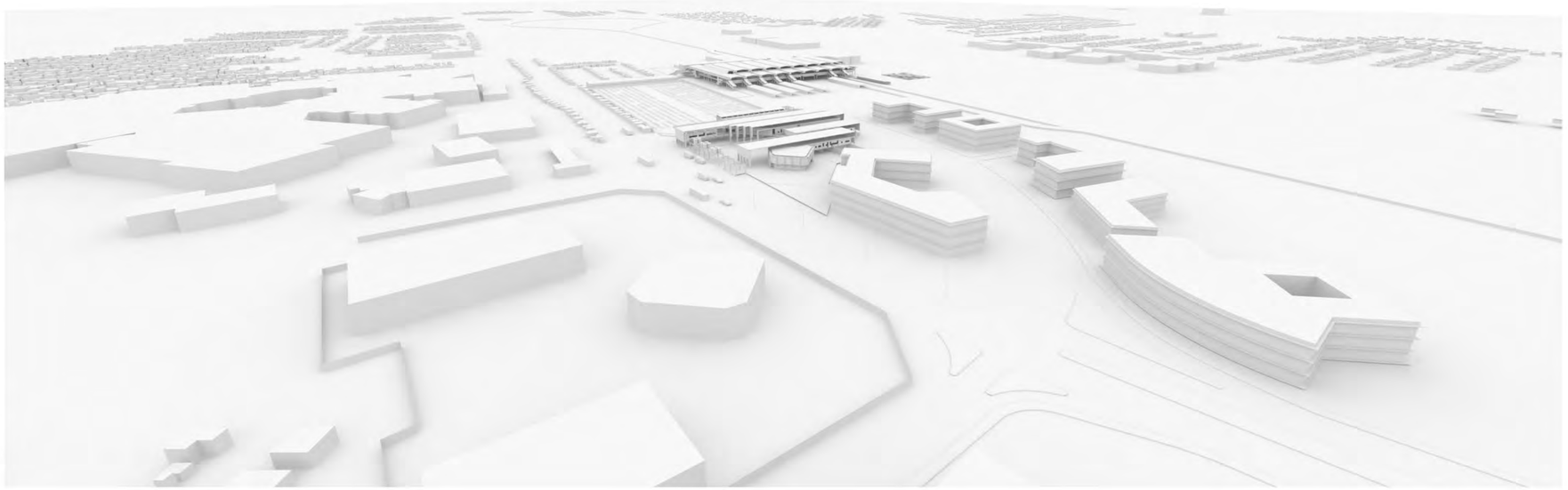
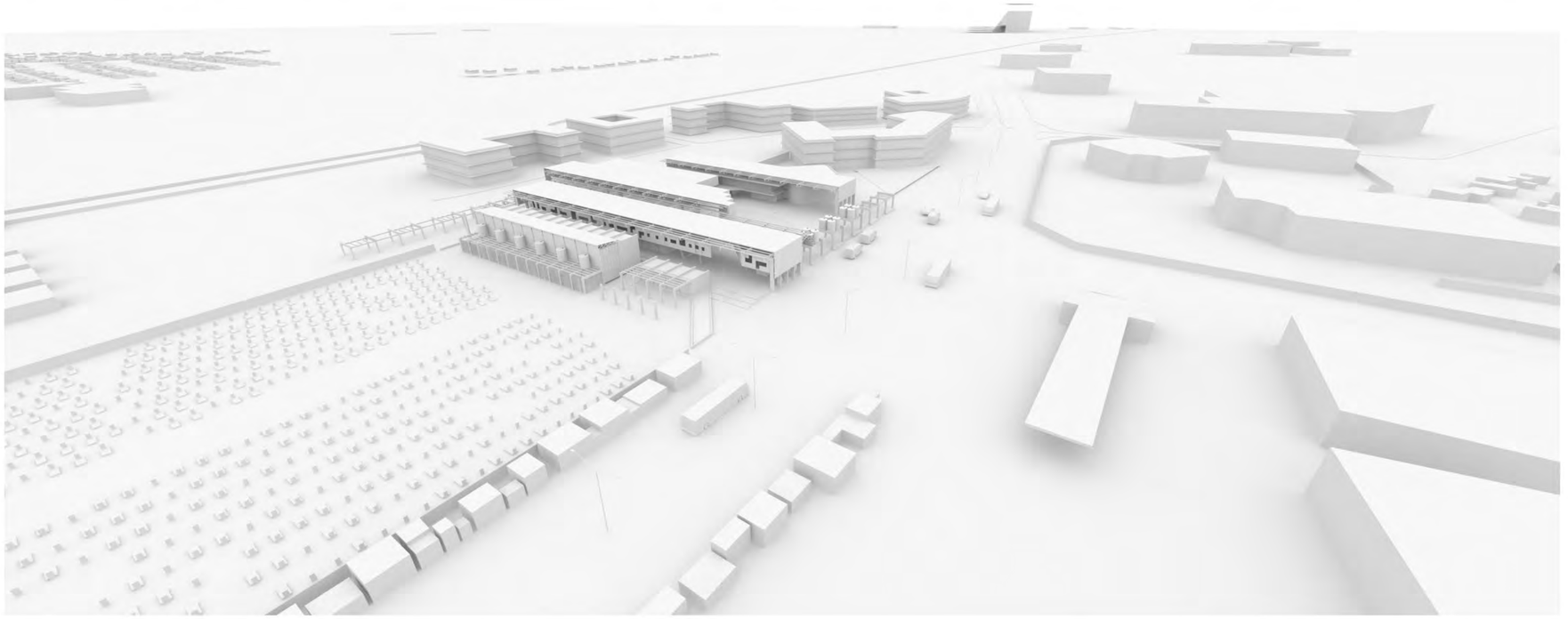
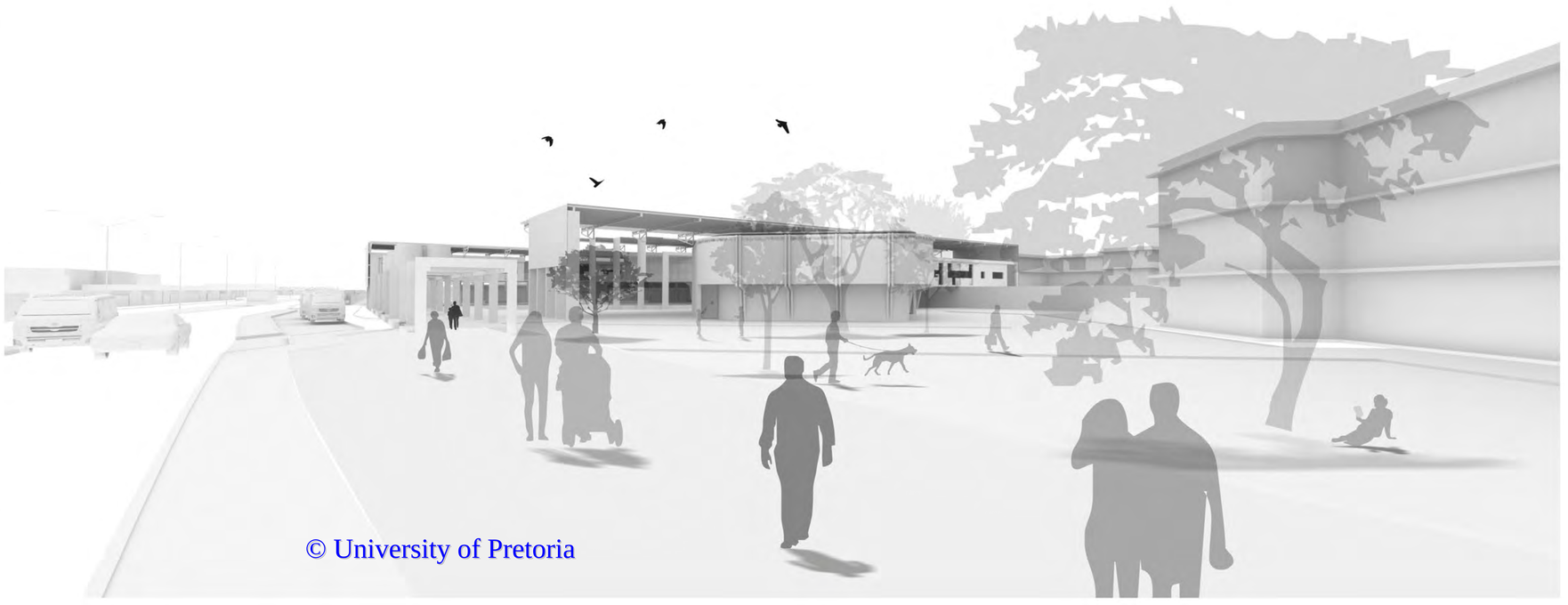




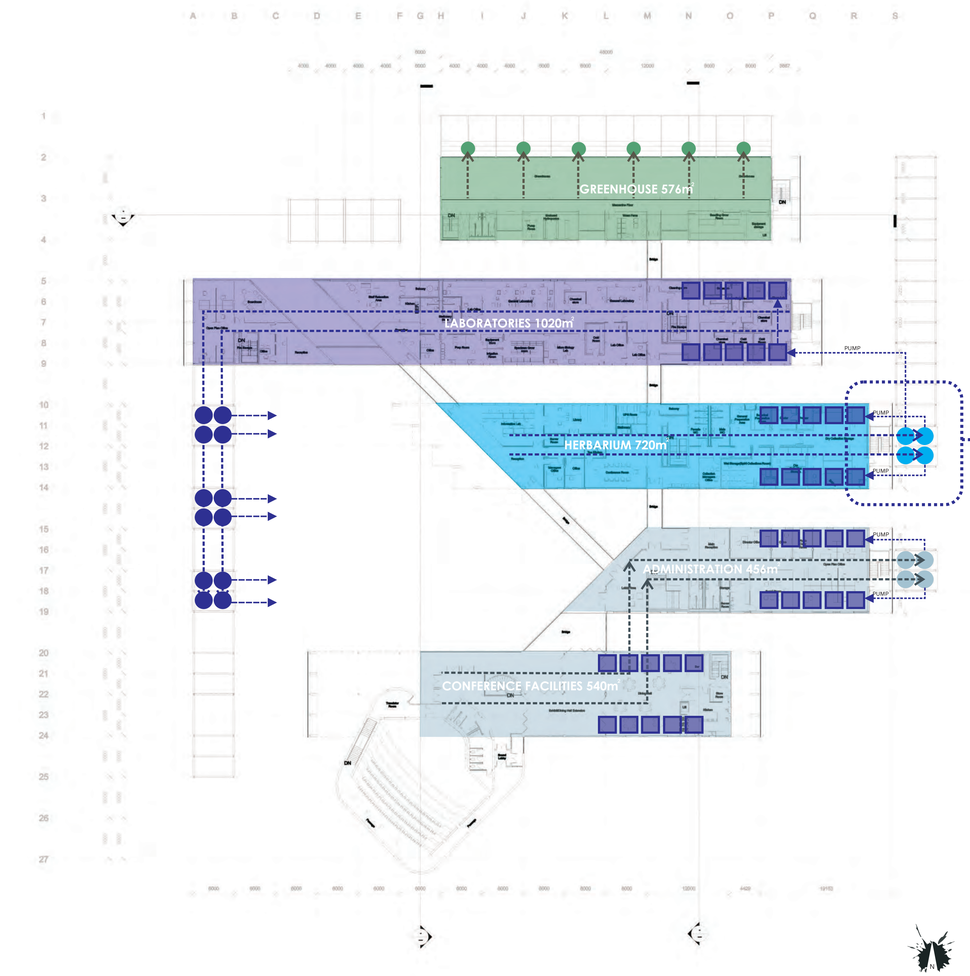


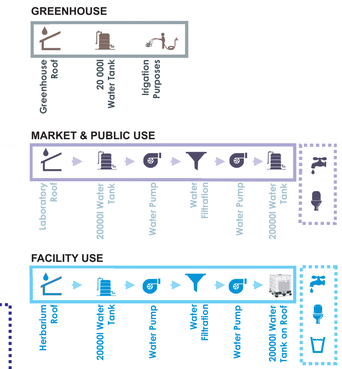


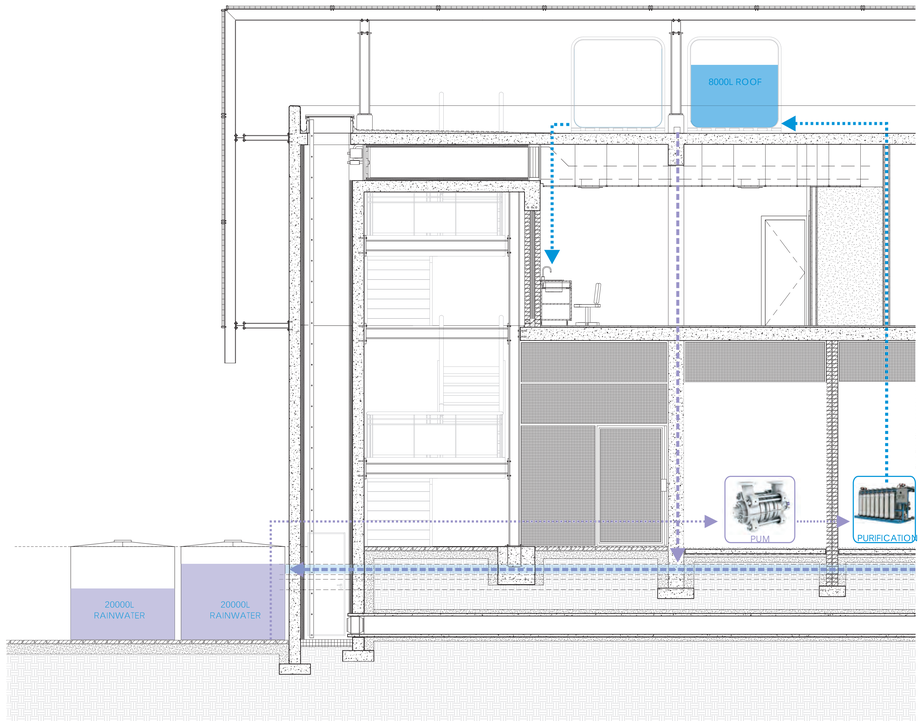


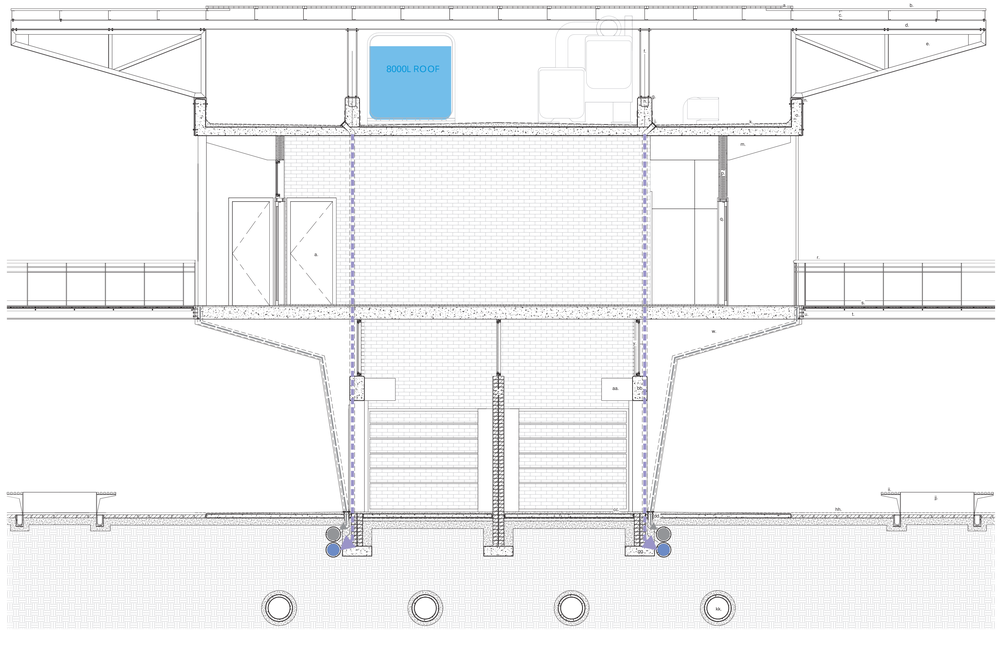
SYSTEMS

RAINWATER HARVESTING & MANAGEMENT









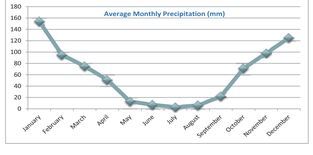
1. Climate Data

Place: Mabopane

Position:
Height: 1330m
Period: 1961-1990

Climate data

	MONTH	Temperatur: Highest Recorded	Average Daily maximum	Average Daily Minimum	Lowest Recorded	Precipitation: Average Monthly (mm)	Average number of Days >= 1mm	Highest 24hr rainfall (mm)
1.	January	36	29	18	8	154	14	160
2.	February	36	28	17	11	95	11	95
3.	March	35	27	16	6	75	10	84
4.	April	33	24	12	3	51	7	72
5.	May	29	22	8	-1	13	3	40
6.	June	25	19	5	-6	7	1	32
7.	July	26	20	5	-4	3	1	18
8.	August	31	22	8	-1	6	2	15
9.	September	34	26	12	2	22	3	43
10.	October	36	27	14	4	71	9	108
11.	November	36	27	16	7	98	12	67
12.	December	35	28	17	7	125	15	50
	YEAR	36	25	12	-6	720	87	160

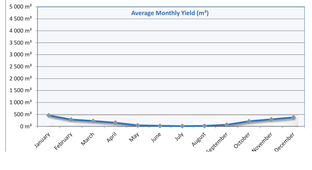


2. Yield

Yield (m³) = P x A x C (Where P=precipitation (m), A=area (m²), and C=run-off coefficient)

Area of Catchment (Per surface)	Area (m²)	Run-off Coefficient
Roofing	3 312.00 m²	0.9
Paving	0.00 m²	0.8
Lawn	0.00 m²	0.4
Playground	0.00 m²	0.2
Park	0.00 m²	0.2
TOTAL:	3 312.00 m²	0.90

	MONTH	Precipitation: Average Monthly (mm)	Area	Run-off Coefficient	Yield P(m) x A(m²) x C
1.	January	154 mm	3 312 m²	0.90	459 m³
2.	February	95 mm	3 312 m²	0.90	283 m³
3.	March	75 mm	3 312 m²	0.90	224 m³
4.	April	51 mm	3 312 m²	0.90	152 m³
5.	May	13 mm	3 312 m²	0.90	39 m³
6.	June	7 mm	3 312 m²	0.90	21 m³
7.	July	3 mm	3 312 m²	0.90	9 m³
8.	August	6 mm	3 312 m²	0.90	18 m³
9.	September	22 mm	3 312 m²	0.90	66 m³
10.	October	71 mm	3 312 m²	0.90	212 m³
11.	November	98 mm	3 312 m²	0.90	292 m³
12.	December	125 mm	3 312 m²	0.90	373 m³
	YEAR	720 mm	3 312 m²	0.90	2 166 m³



3. Demand (Irrigation and Domestic)

IRRIGATION DEMAND

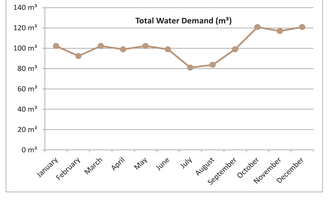
	Planting Area (m²)	Irrigation Depth per week (m)	Irrigation Depth per month (m)	IRRIGATION DEMAND (m³)
January	420 m²	0.030 m	0.133 m	56 m³
February	420 m²	0.030 m	0.120 m	50 m³
March	420 m²	0.030 m	0.133 m	56 m³
April	420 m²	0.030 m	0.129 m	54 m³
May	420 m²	0.030 m	0.133 m	56 m³
June	420 m²	0.030 m	0.129 m	54 m³
July	420 m²	0.020 m	0.086 m	36 m³
August	420 m²	0.020 m	0.089 m	37 m³
September	420 m²	0.030 m	0.129 m	54 m³
October	420 m²	0.040 m	0.177 m	74 m³
November	420 m²	0.040 m	0.171 m	72 m³
December	420 m²	0.040 m	0.177 m	74 m³
YEAR	420 m² (Average)	0.031 m (Average)	1.604 m (Total)	674 m³ (Total)

DOMESTIC DEMAND

	Number of Individuals	Water / capita / day (Litres)	Total Water / month (Liters)	DOMESTIC DEMAND (m³)
January	60	25 l	46 500 l	47 m³
February	60	25 l	42 000 l	42 m³
March	60	25 l	46 500 l	47 m³
April	60	25 l	45 000 l	45 m³
May	60	25 l	46 500 l	47 m³
June	60	25 l	45 000 l	45 m³
July	60	25 l	45 000 l	45 m³
August	60	25 l	46 500 l	47 m³
September	60	25 l	45 000 l	45 m³
October	60	25 l	46 500 l	47 m³
November	60	25 l	45 000 l	45 m³
December	60	25 l	46 500 l	47 m³
YEAR	60 (Average)	25 l (Average)	45 500 l (Total)	546 m³ (Total)

3. Total Demand

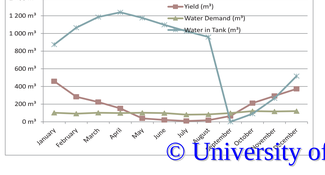
	IRRIGATION DEMAND (m³)	DOMESTIC DEMAND (m³)	TOTAL WATER DEMAND
January	56 m³	47 m³	102 m³
February	50 m³	42 m³	92 m³
March	56 m³	47 m³	102 m³
April	54 m³	45 m³	99 m³
May	56 m³	47 m³	102 m³
June	54 m³	45 m³	99 m³
July	36 m³	45 m³	81 m³
August	37 m³	47 m³	84 m³
September	54 m³	45 m³	99 m³
October	74 m³	47 m³	121 m³
November	72 m³	45 m³	117 m³
December	74 m³	47 m³	121 m³
YEAR	674 m³ (Total)	546 m³ (Total)	1 220 m³ (TOTAL)



4. Water Budget Exercise + Safety Factor + Number of Tanks needed

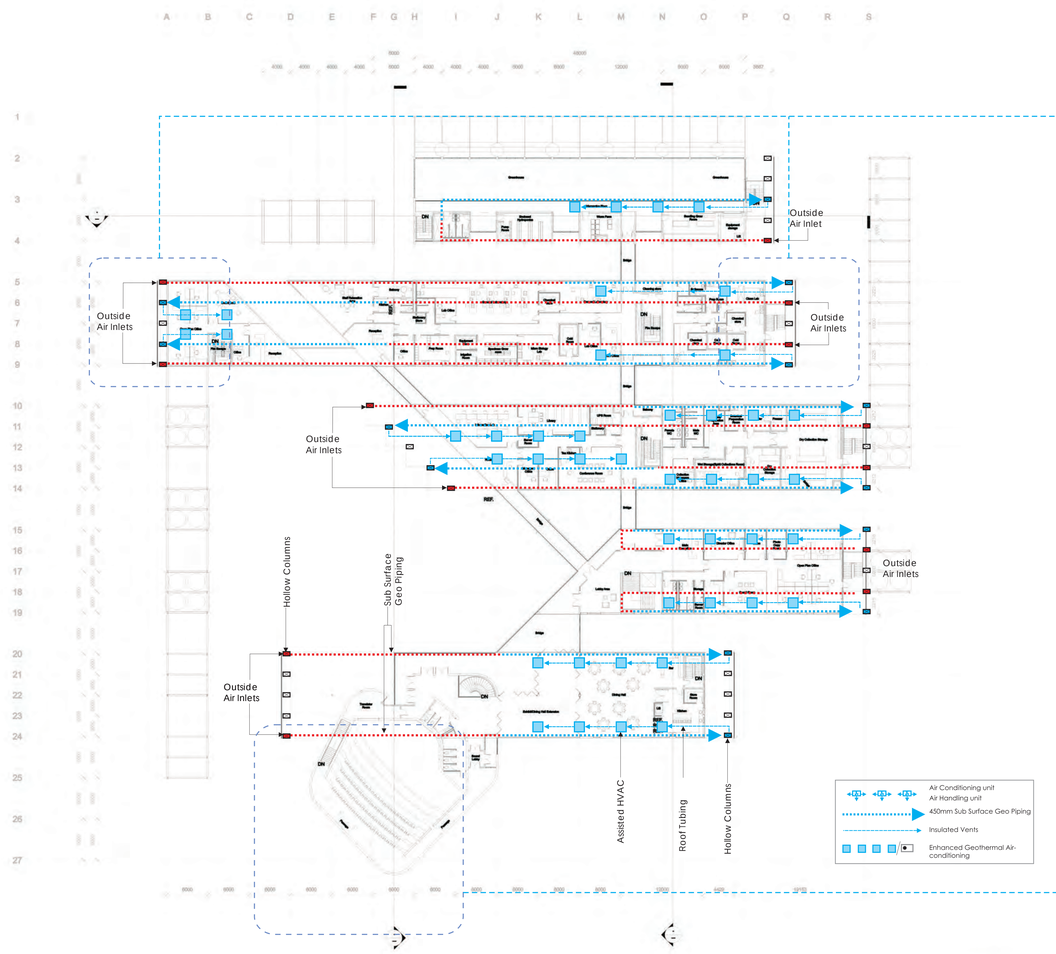
	YIELD from onsite runoff (m³)	DEMAND total onsite water demand (m³)	Monthly Balance	Water in Tank/Reservoir (m³)
January	459 m³	102 m³	357 m³	874 m³
February	283 m³	92 m³	191 m³	1 065 m³
March	224 m³	102 m³	121 m³	1 186 m³
April	152 m³	99 m³	53 m³	1 239 m³
May	39 m³	102 m³	- 64 m³	1 176 m³
June	21 m³	99 m³	- 78 m³	1 098 m³
July	9 m³	81 m³	- 72 m³	1 026 m³
August	18 m³	84 m³	- 66 m³	960 m³
September	66 m³	99 m³	- 33 m³	0 m³
October	212 m³	121 m³	91 m³	91 m³
November	292 m³	117 m³	175 m³	266 m³
December	373 m³	121 m³	252 m³	518 m³
YEAR	3 366 m³ (Total)	1 220 m³ (TOTAL)		

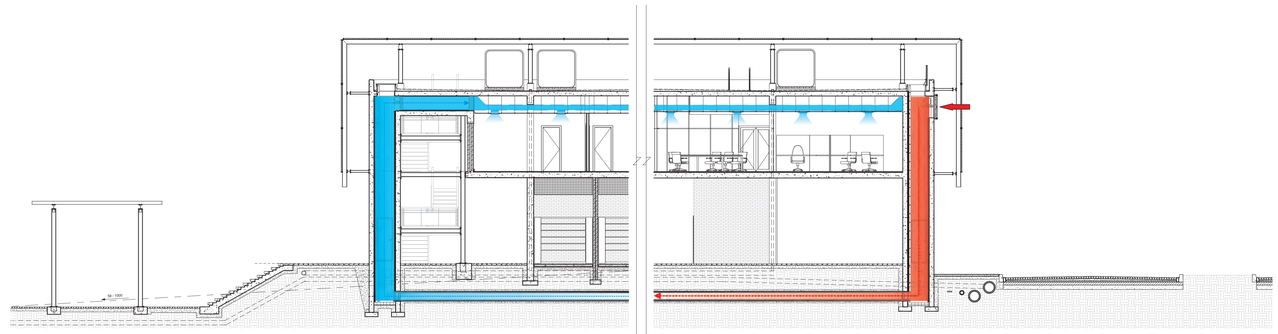
Greatest volume of water in tank/reservoir at any time is the minimum capacity of the tank	1 239 m³
Safety Factor: 2,5	Final Tank/Reservoir Size: 3 098 m³
Proprietory Tank Volume: 20 000 l (e.g. Jojo Tanks) 20 m³	Number of Tanks needed: 155



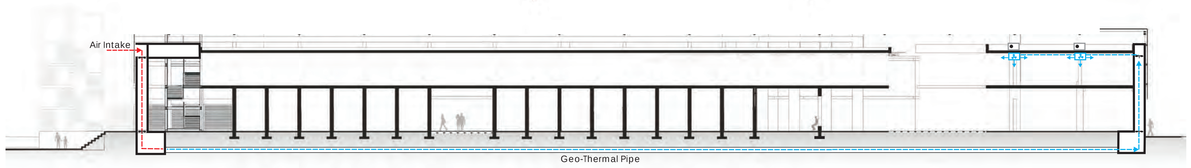
SYSTEMS

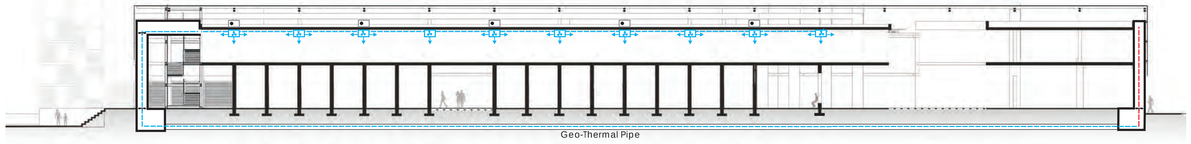
PASSIVE VENTILATION
GEO-THERMAL VENTILATION

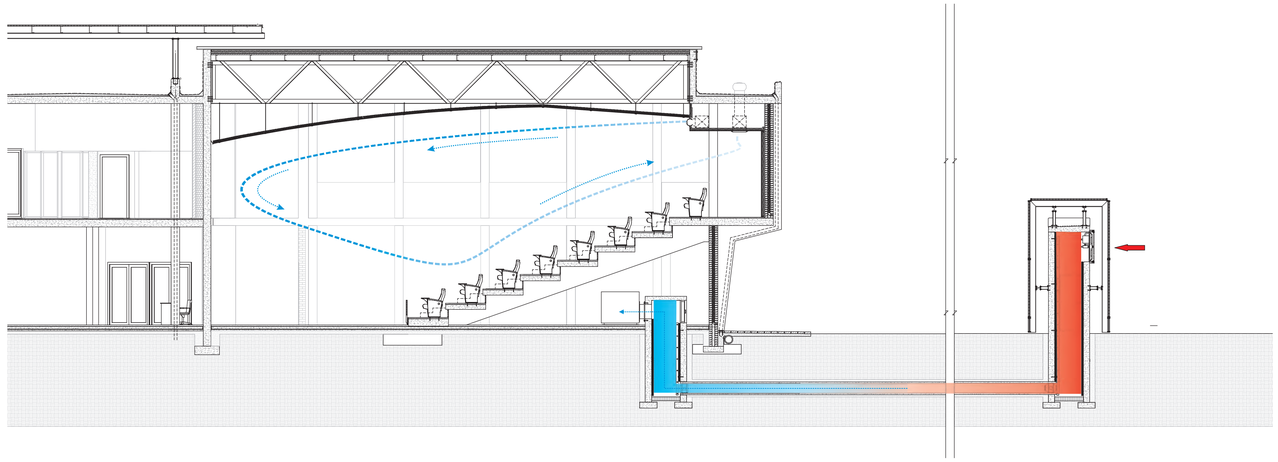




Laboratory Section







Laboratory Section

BUILDING CLIMATE ANALYSIS

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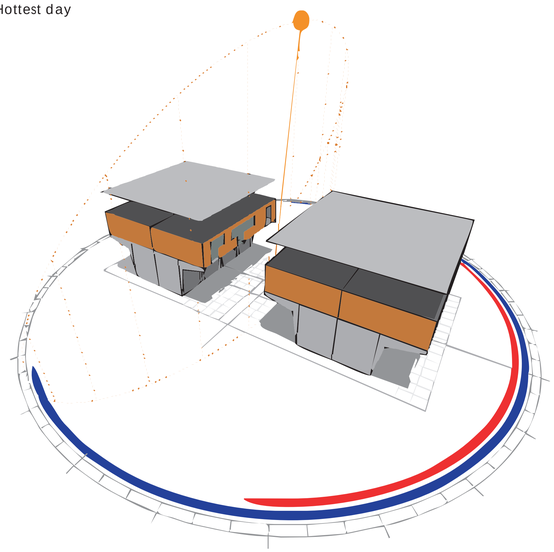
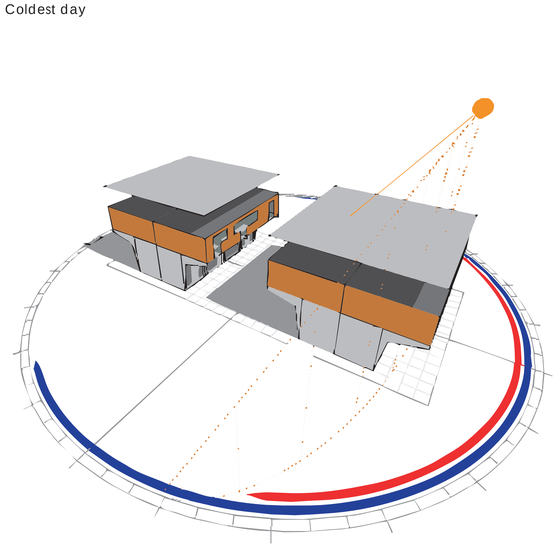
SOLAR ANALYSIS

Hottest day

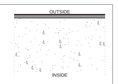


Coldest day

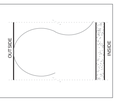


MATERIAL PROPERTIES

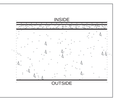
Material	Width	Density	Sp. Heat	Conduct
Concrete Slab	150	2000	656.9	0.753
Concrete Screed	6	900	1966	0.088

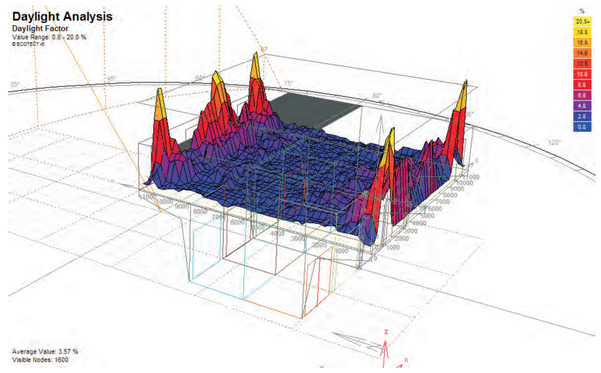


Material	Width	Density	Sp. Heat	Conduct
Aluminium Cladding	0.5	7680.2	420	45
Polyurethane Foamed-In-Place Rig-	200	40	1674	0.32
Chipboard, Bonded With UF	20	630	5020	0.25



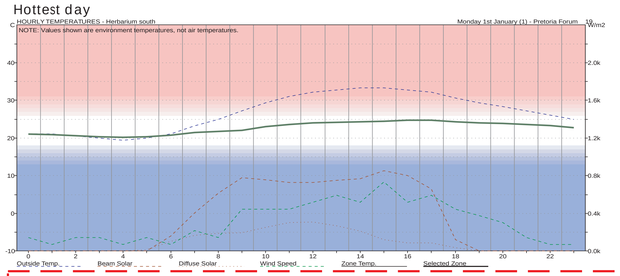
Material	Width	Density	Sp. Heat	Conduct
Ceramic Tiles	220	2500	656.9	0.753
Concrete Screed	20	2000	621	0.753
Concrete Slab	10	1900	566.9	0.309



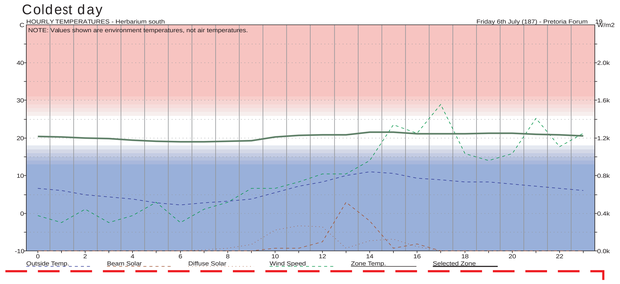


TEMPERATURE ANALYSIS

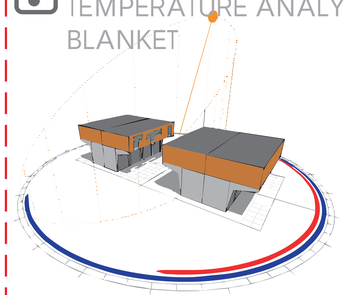
Hottest day



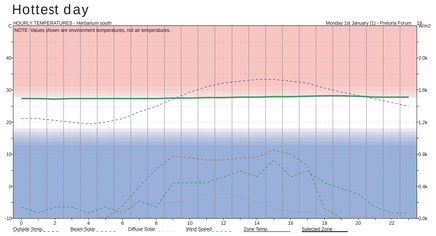
Coldest day



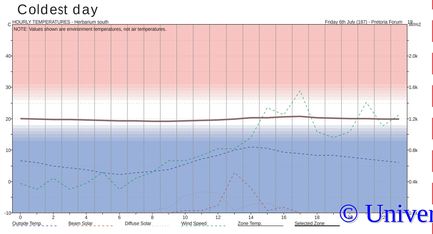
TEMPERATURE ANALYSIS **WITHOUT** ENVIRONMENTAL BLANKET



Hottest day



Coldest day



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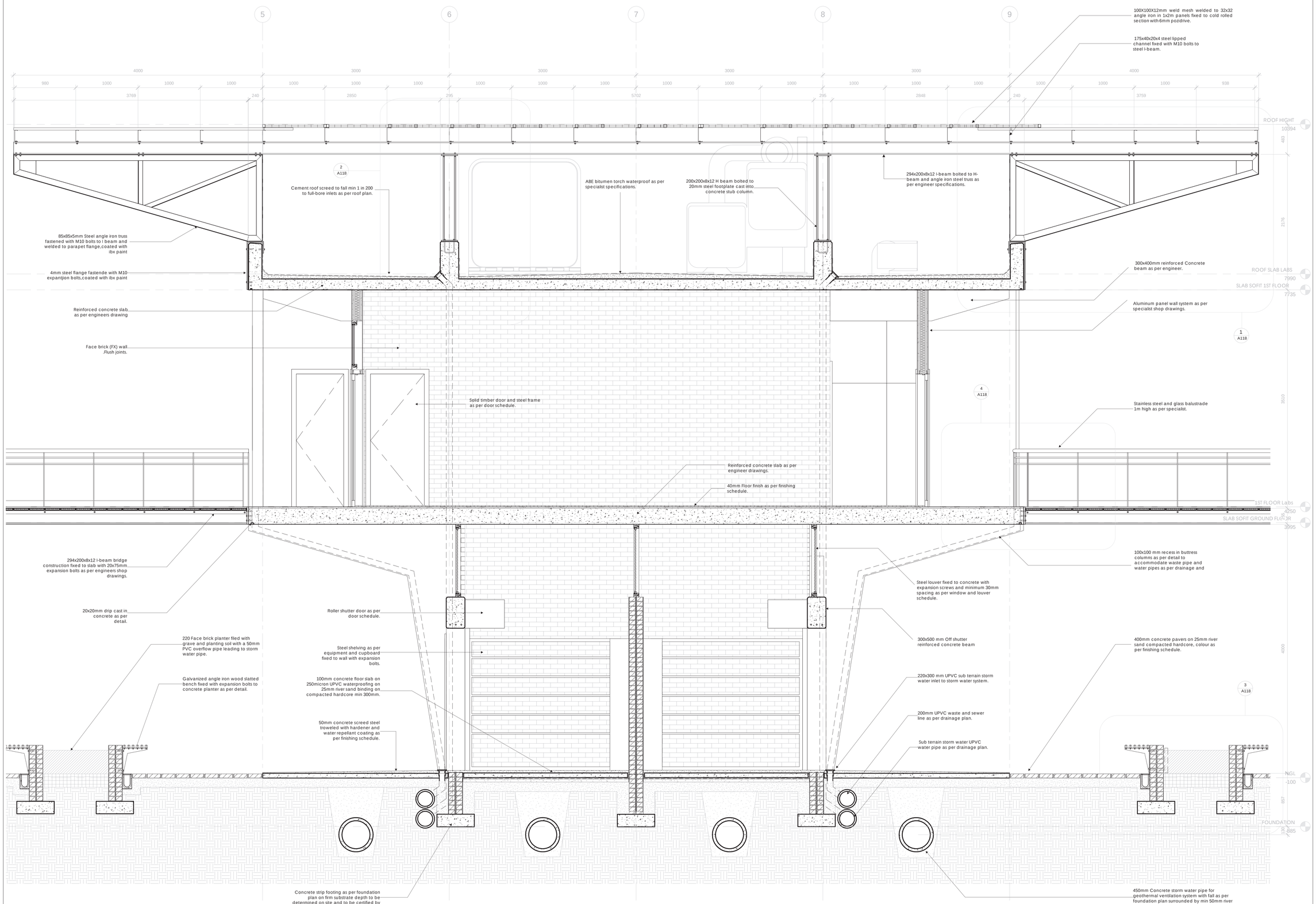


1 Market/Lab section
1 : 20

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jjordaan1@gmail.com

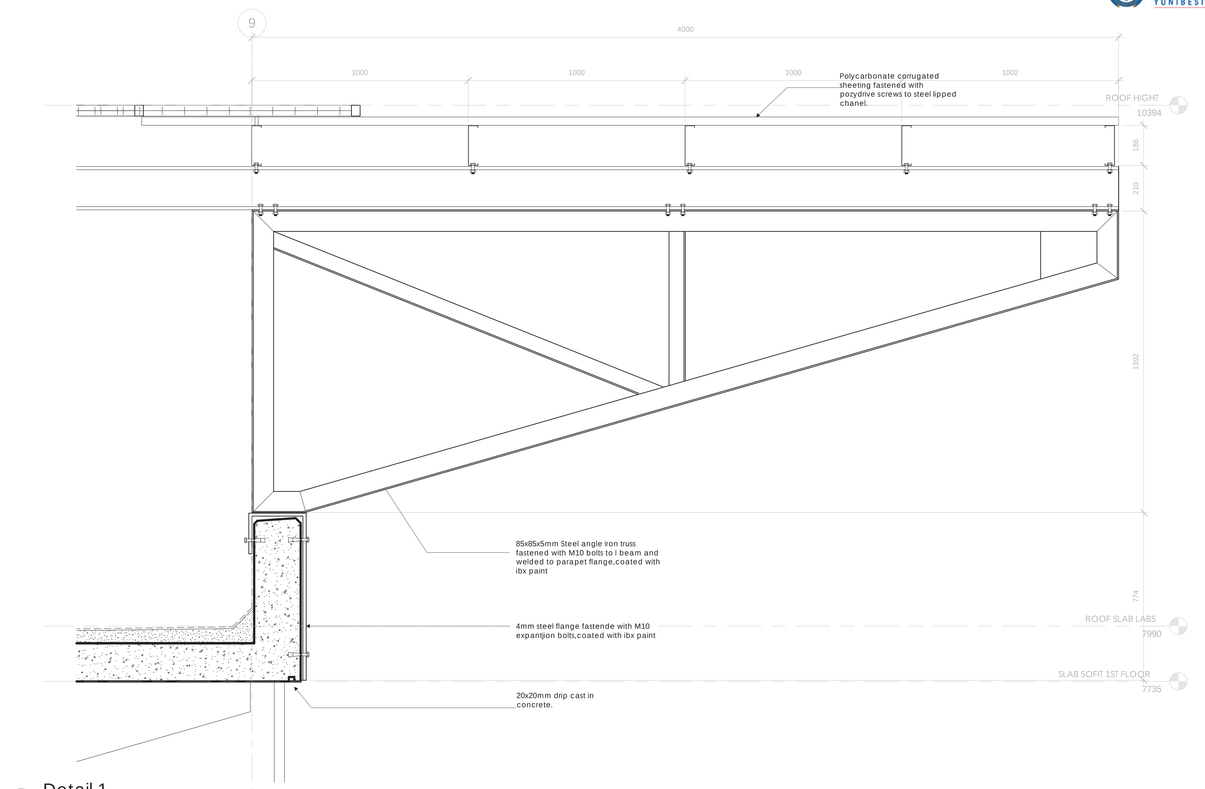
No.	Description	Date

World Health Organization

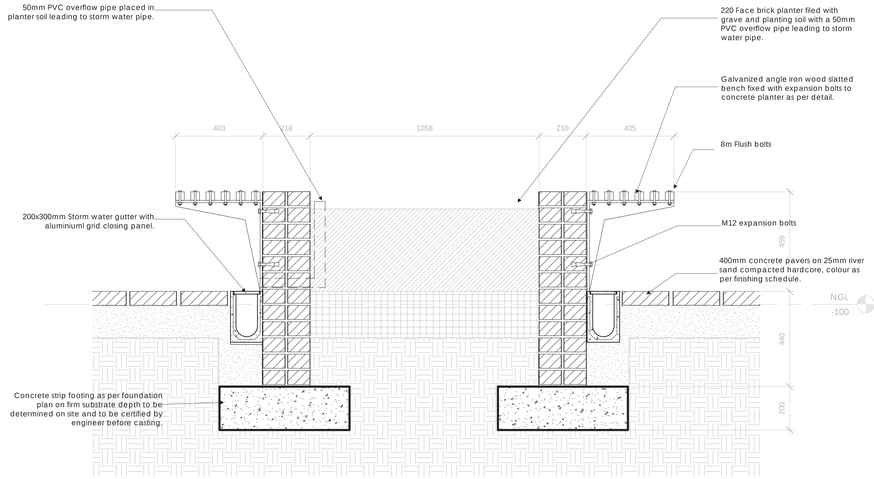
Centre for Traditional Herbal Medicine

Market/ lab Section

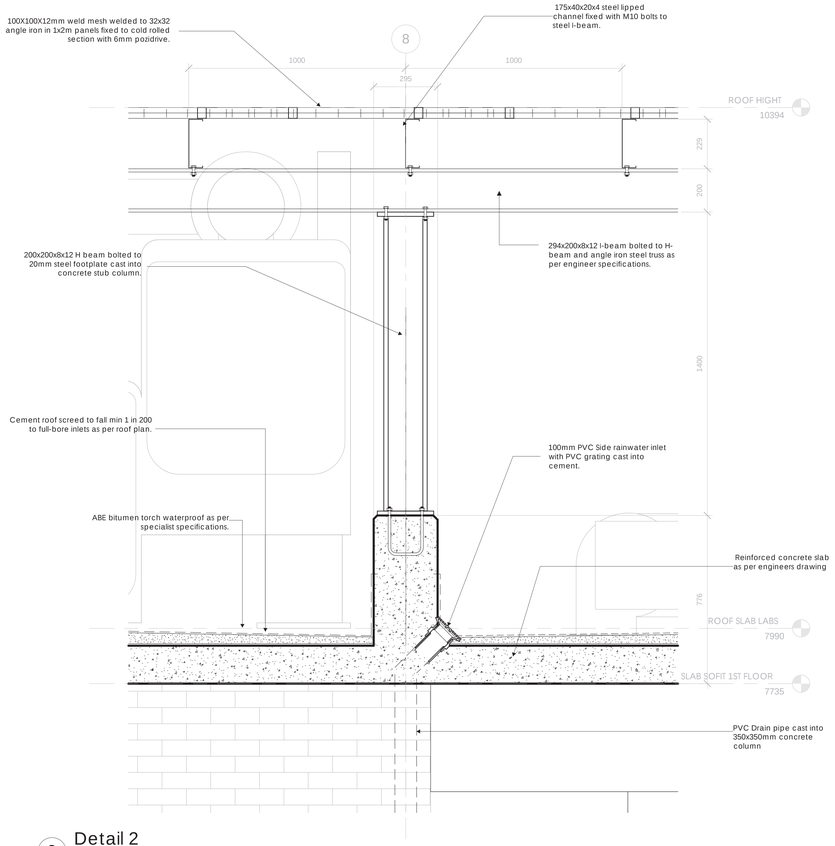
Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A110
Scale	1 : 20



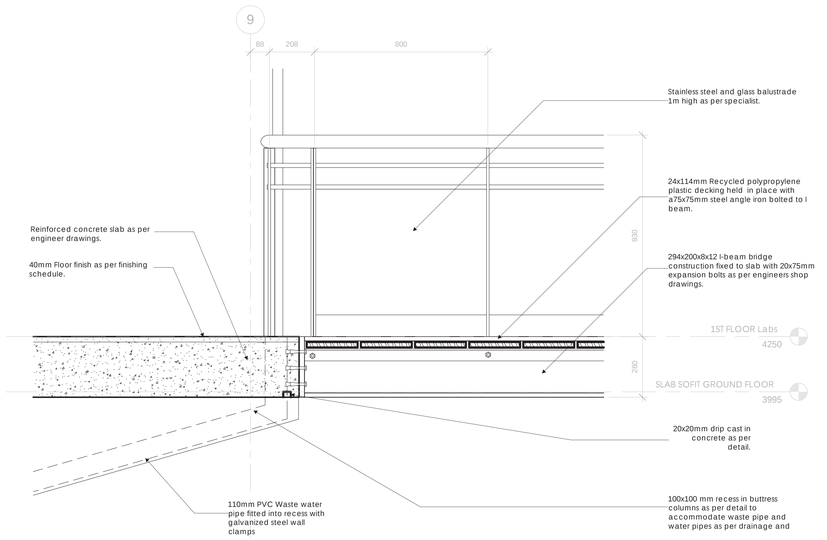
1 Detail 1
1 : 10



3 Detail 3
1 : 10



2 Detail 2
1 : 10



4 Detail 4
1 : 10

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

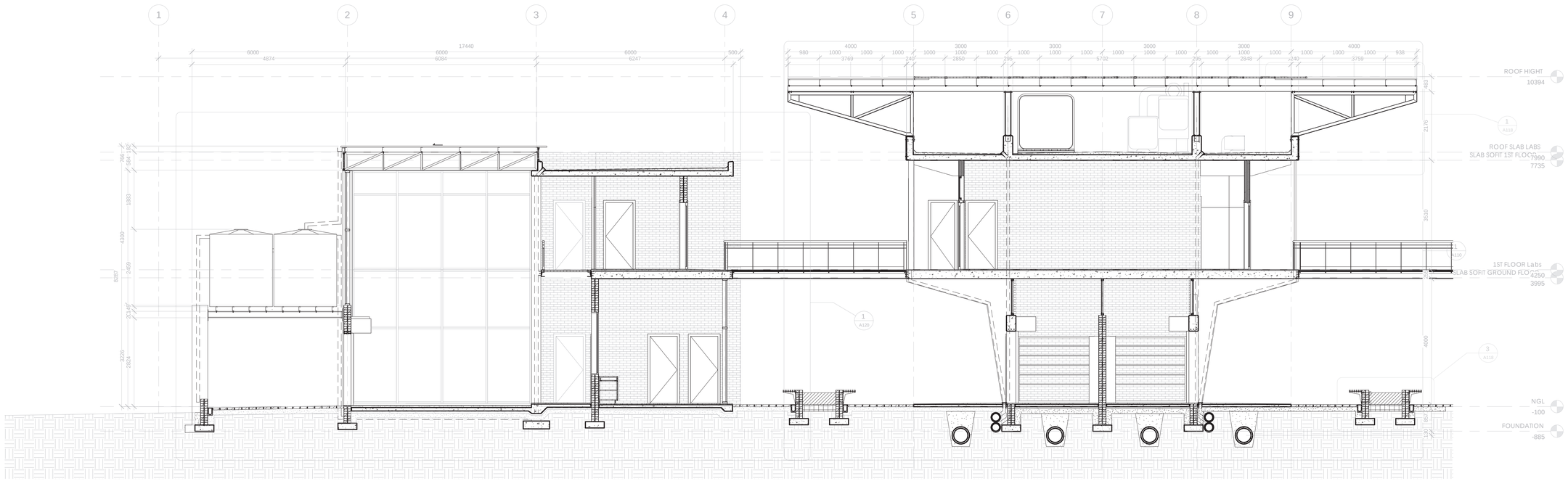
Centre for Traditional Herbal Medicine

Details

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan

A118

Scale 1 : 10



1 Greenhouse and Lab section
1 : 50

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jjordaan1@gmail.com

No.	Description	Date

World Health Organization

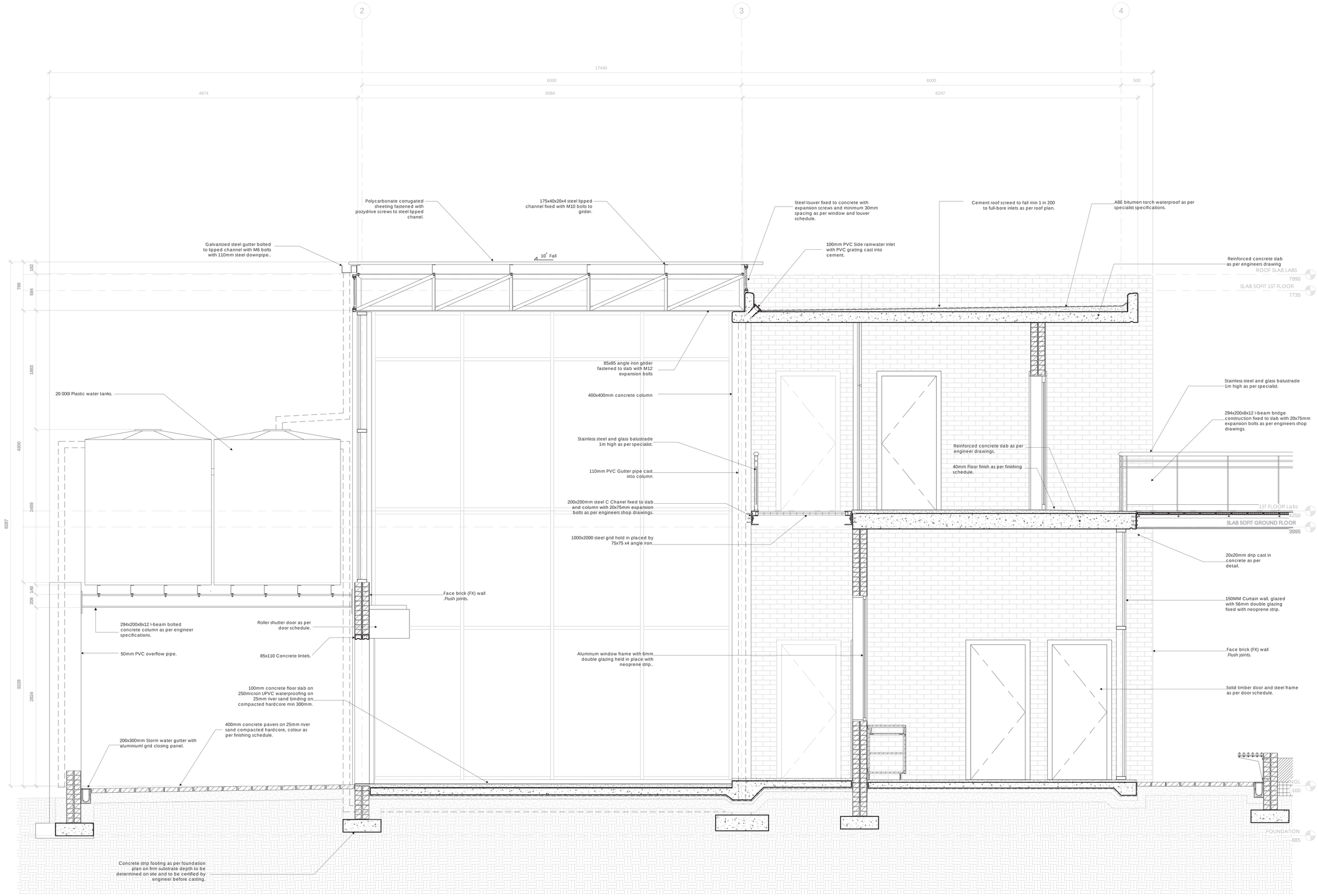
Centre for Traditional Herbal Medicine

Greenhouse and Lab section

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan

A119

Scale 1 : 50



1 Greenhouse section
1 : 20

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jordaan1@gmail.com

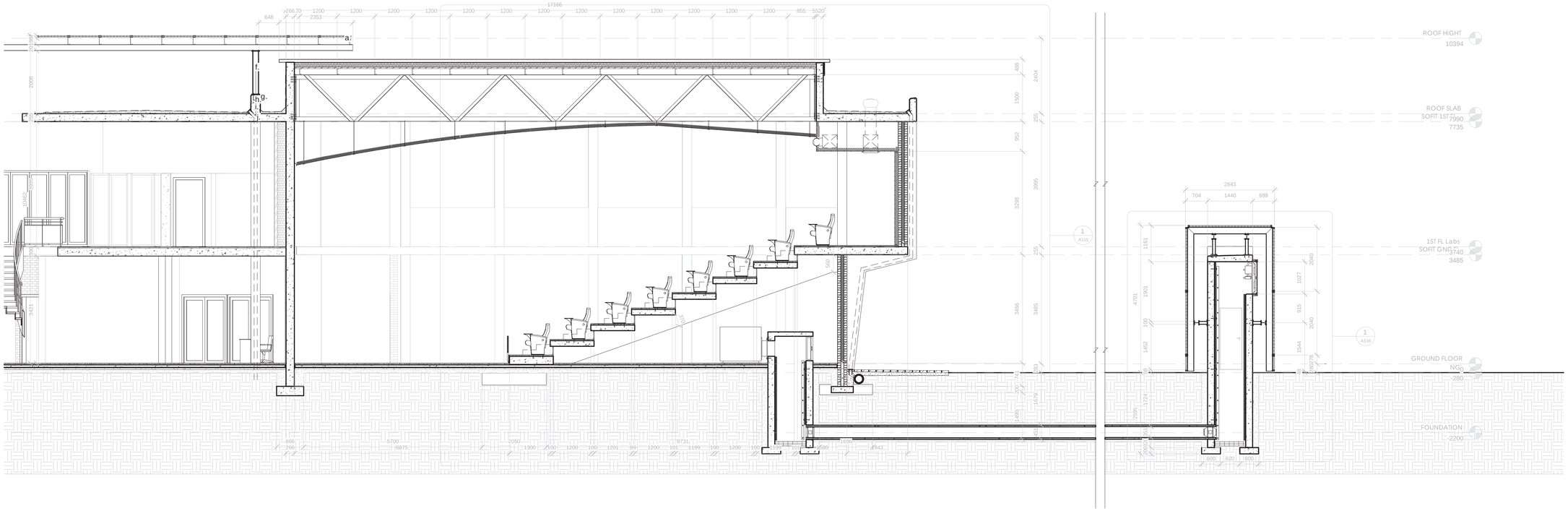
No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Greenhouse section

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A120
Scale	1 : 20



1 Auditorium
1 : 50

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Auditorium

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan

A114

Scale 1 : 50

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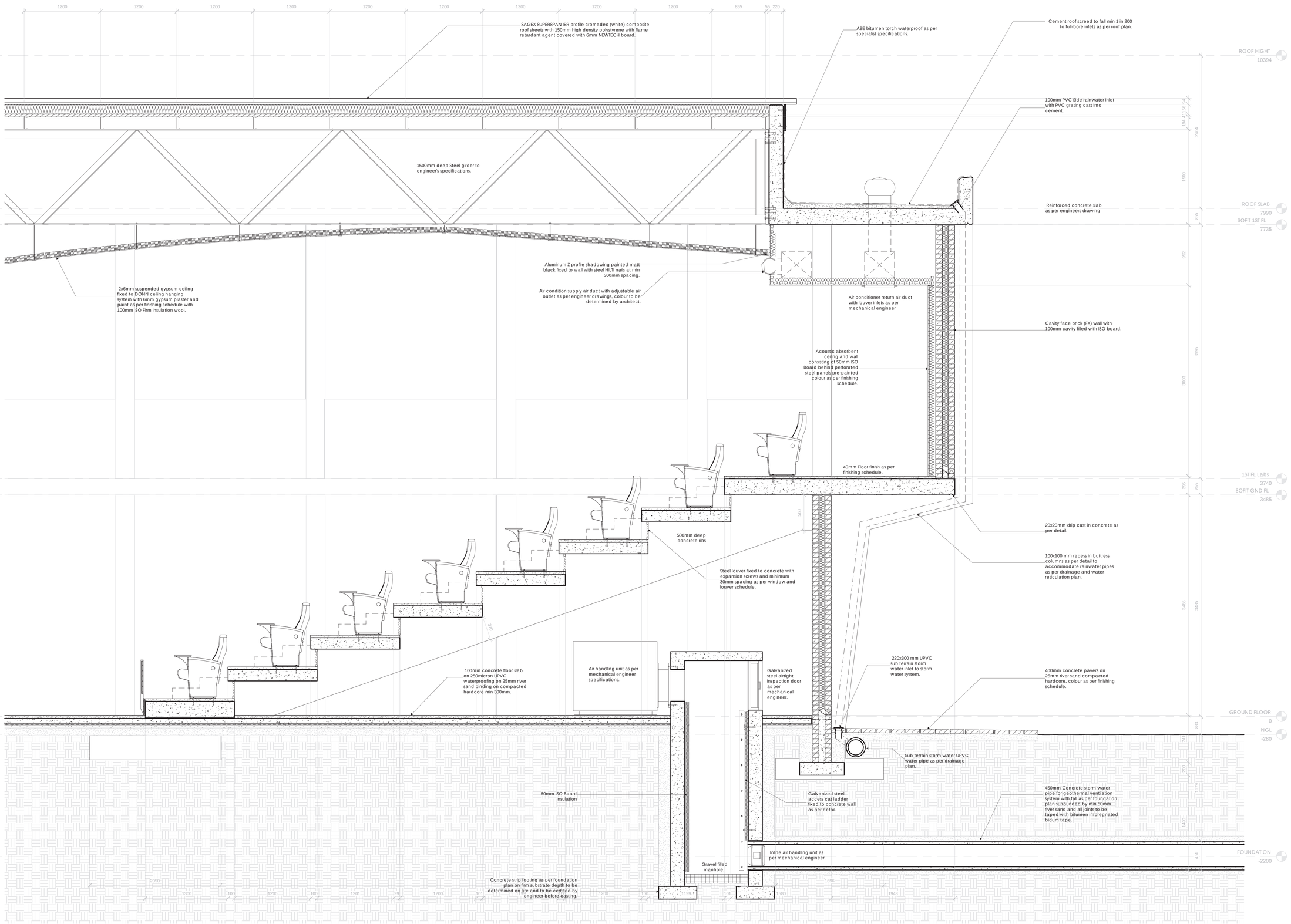

Consultant:
Address: 614 Berea Street
Phone:073052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Auditorium-Callout 1

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan

A115

Scale 1 : 20

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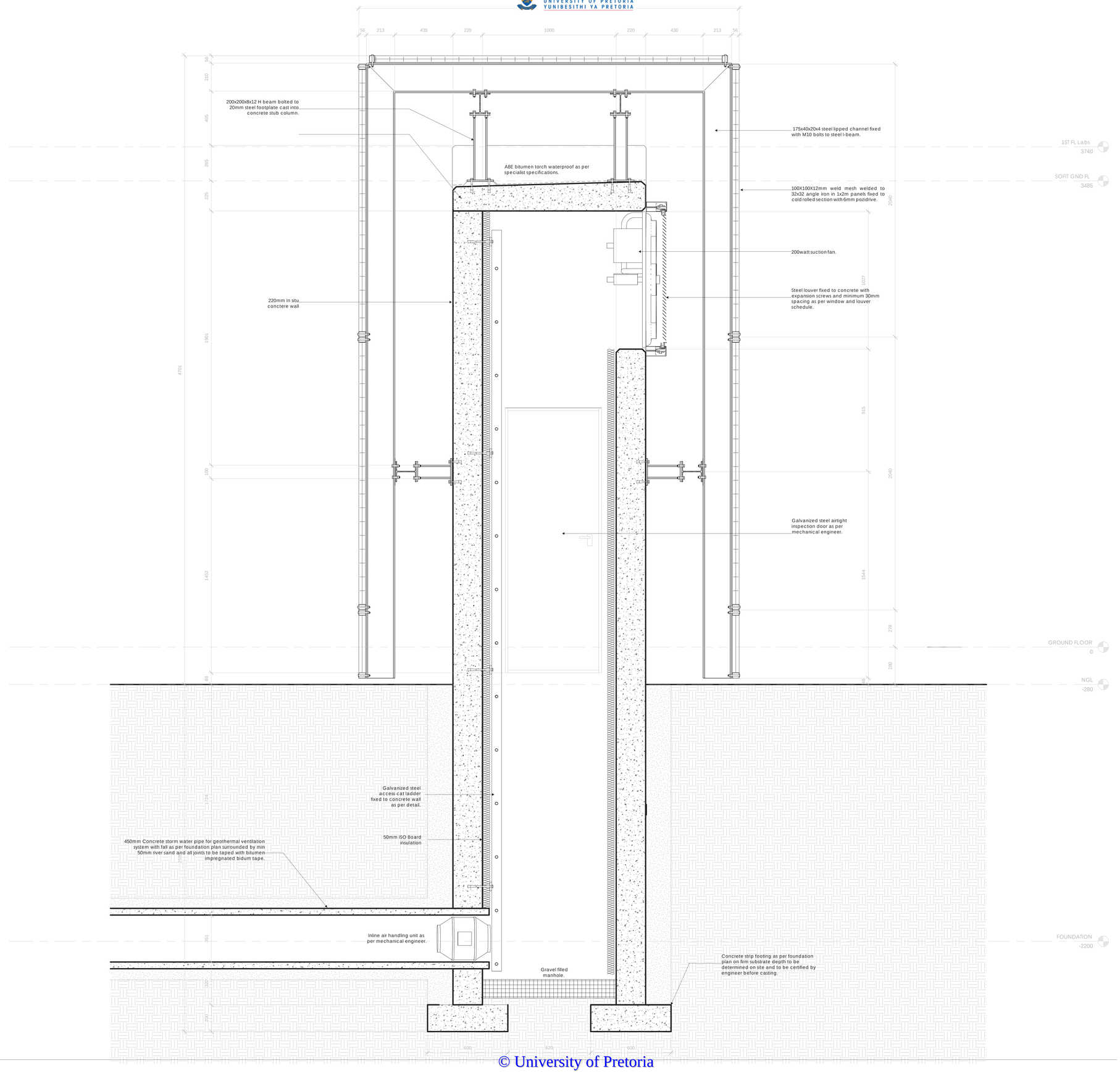
YUNIBESITHI YA PRETORIA



1 Auditorium Callout 2
1 : 10

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Auditorium-Callout 2

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A116
Scale	1 : 10

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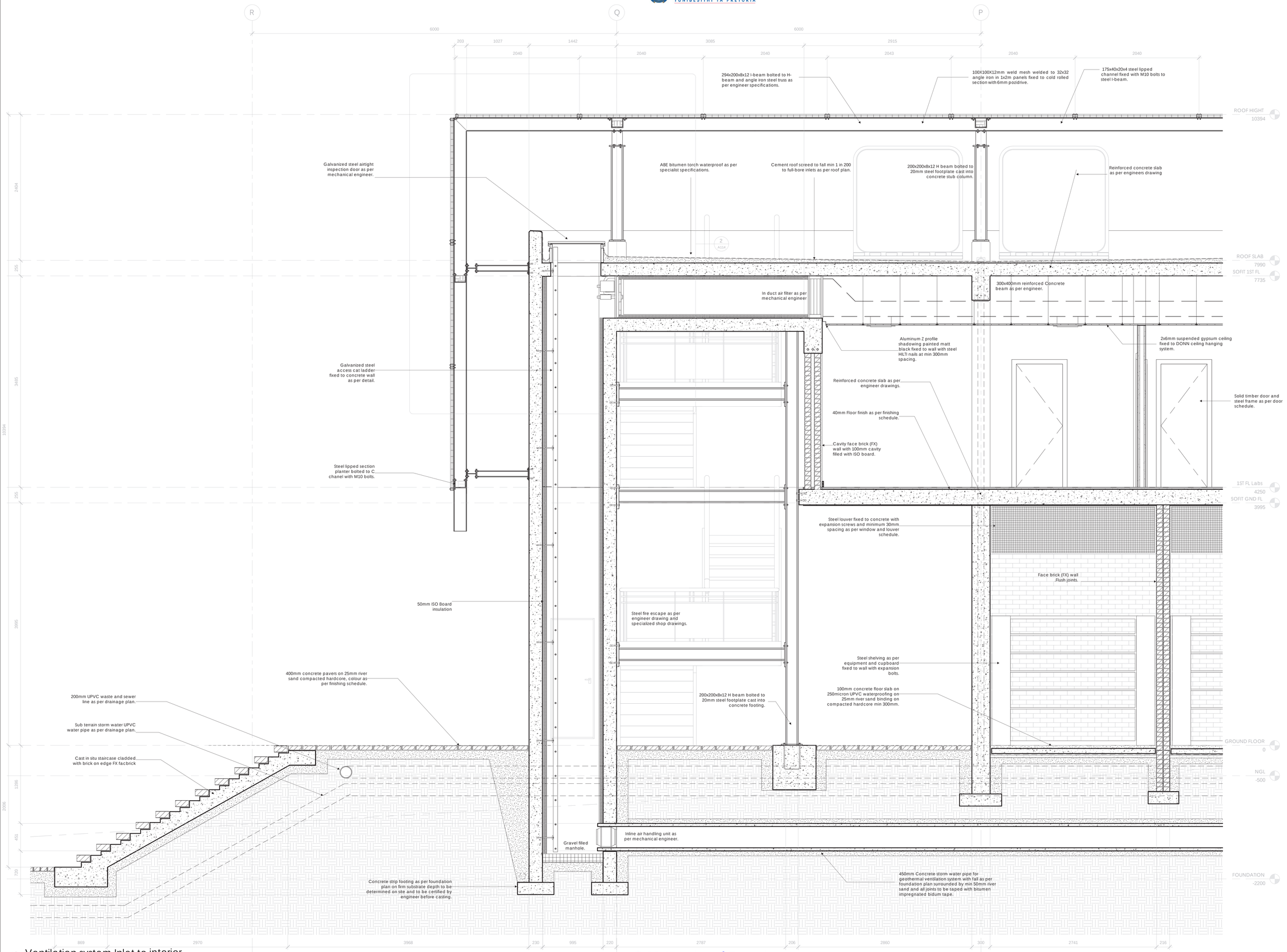

1 Ventilation system Inlet to interior
1 : 20

Consultant:
Address: 614 Berea Street
Phone:073052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Section A2 Inlet to Interior

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A111
Scale	1 : 20

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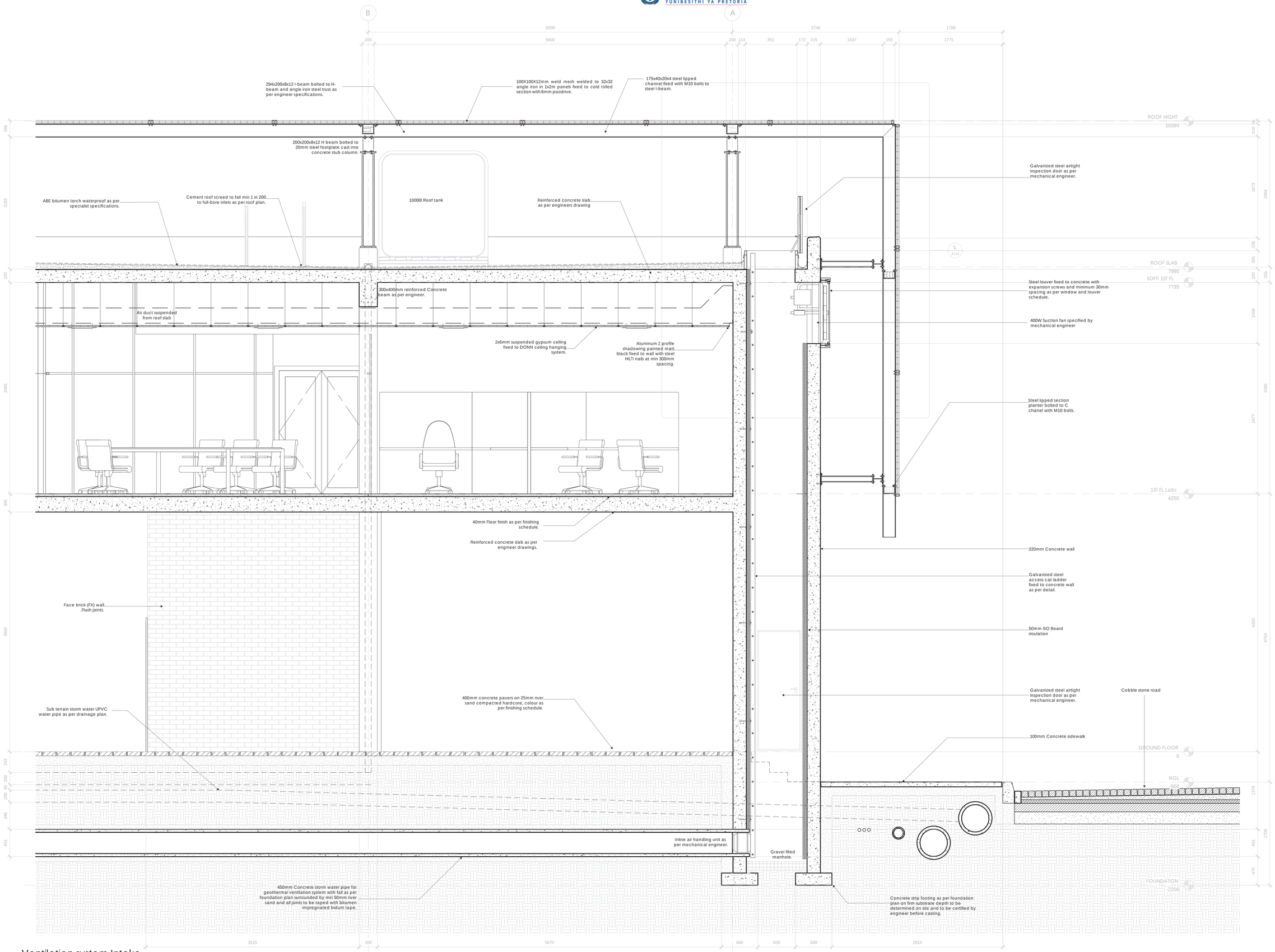


1 Ventilation system Intake
1 : 20

Consultant:
Address: 614 Berea Street
Phone:073305253 5
e-mail:jjordaan1@gmail.com

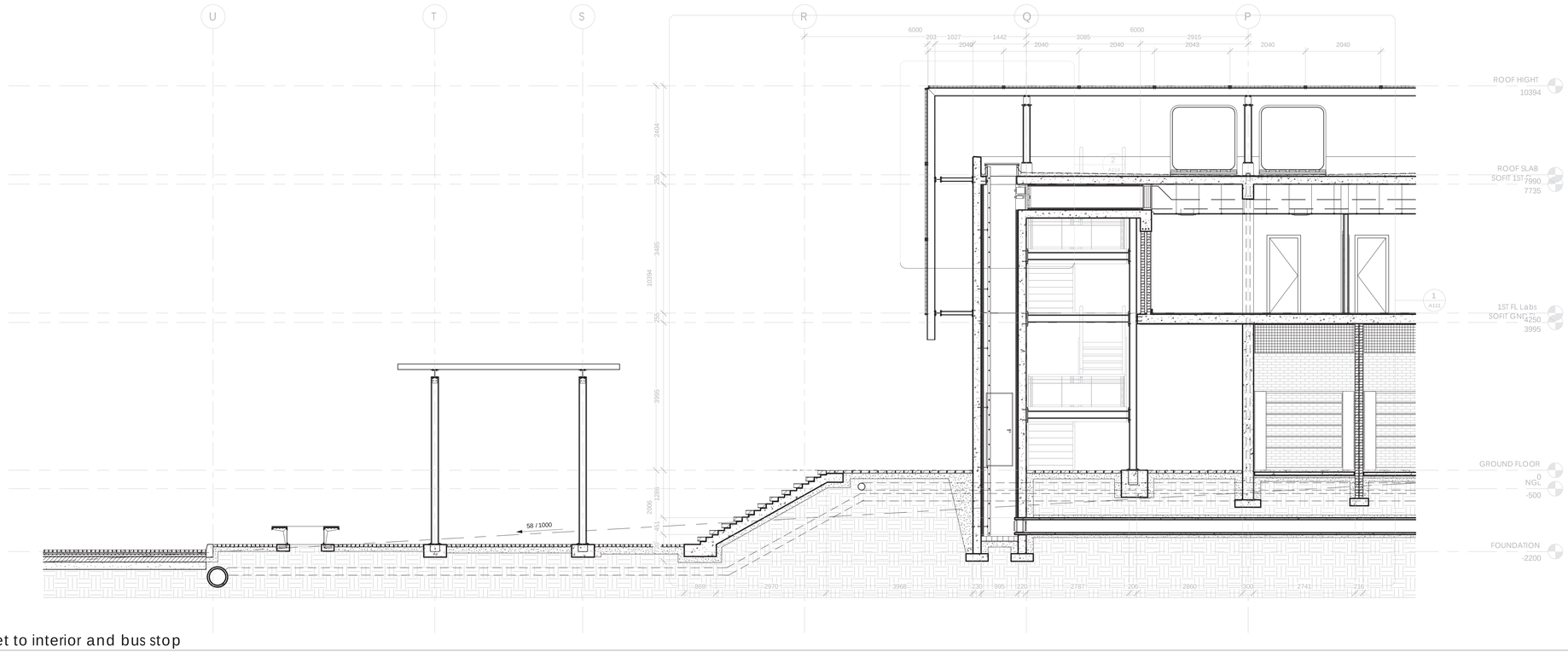
No.	Description	Date

World Health Organization

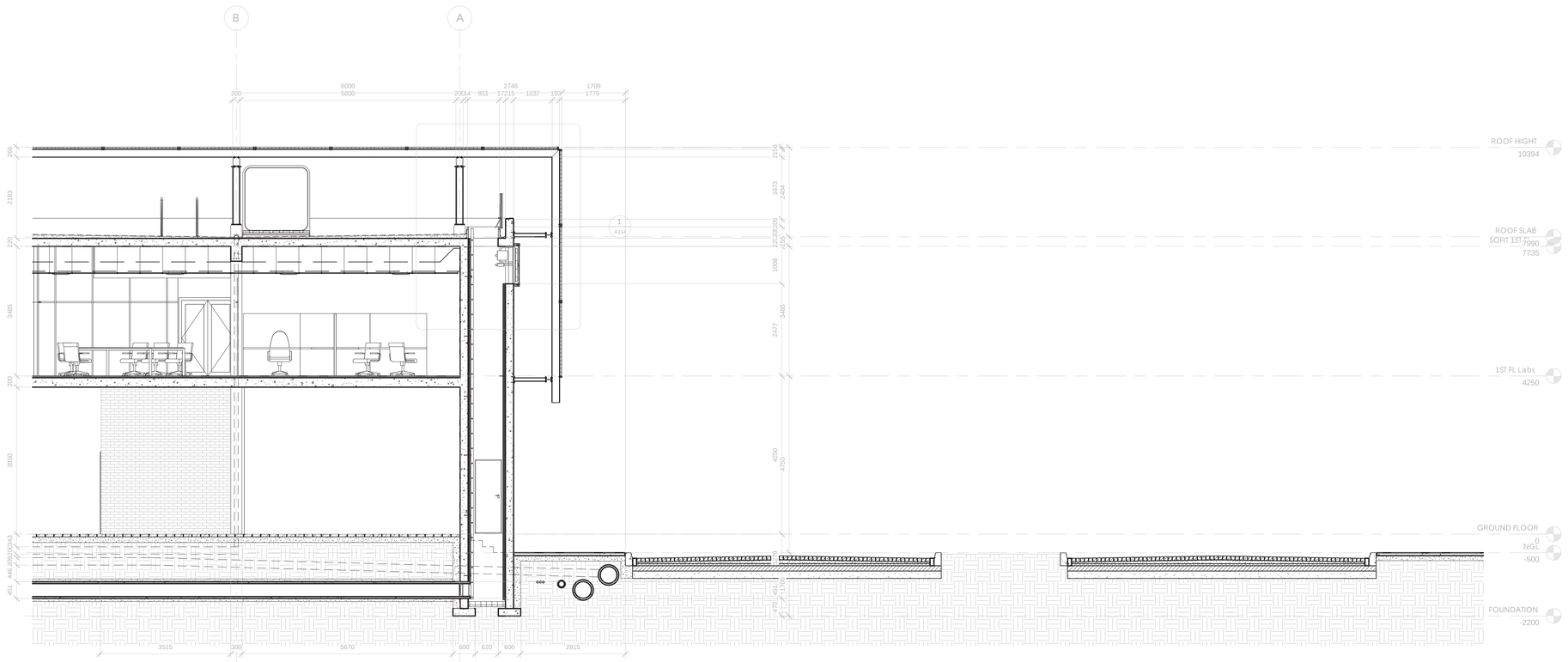
Centre for Traditional Herbal Medicine

Section A2 Intake

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A112
Scale	1 : 20



1 Ventilation system Inlet to interior and bus stop
1 : 50



2 Ventilation system Intake and street edge
1 : 50

Consultant:
Address: 614 Berea Street
Phone:073305253S
e-mail:jordaan1@gmail.com

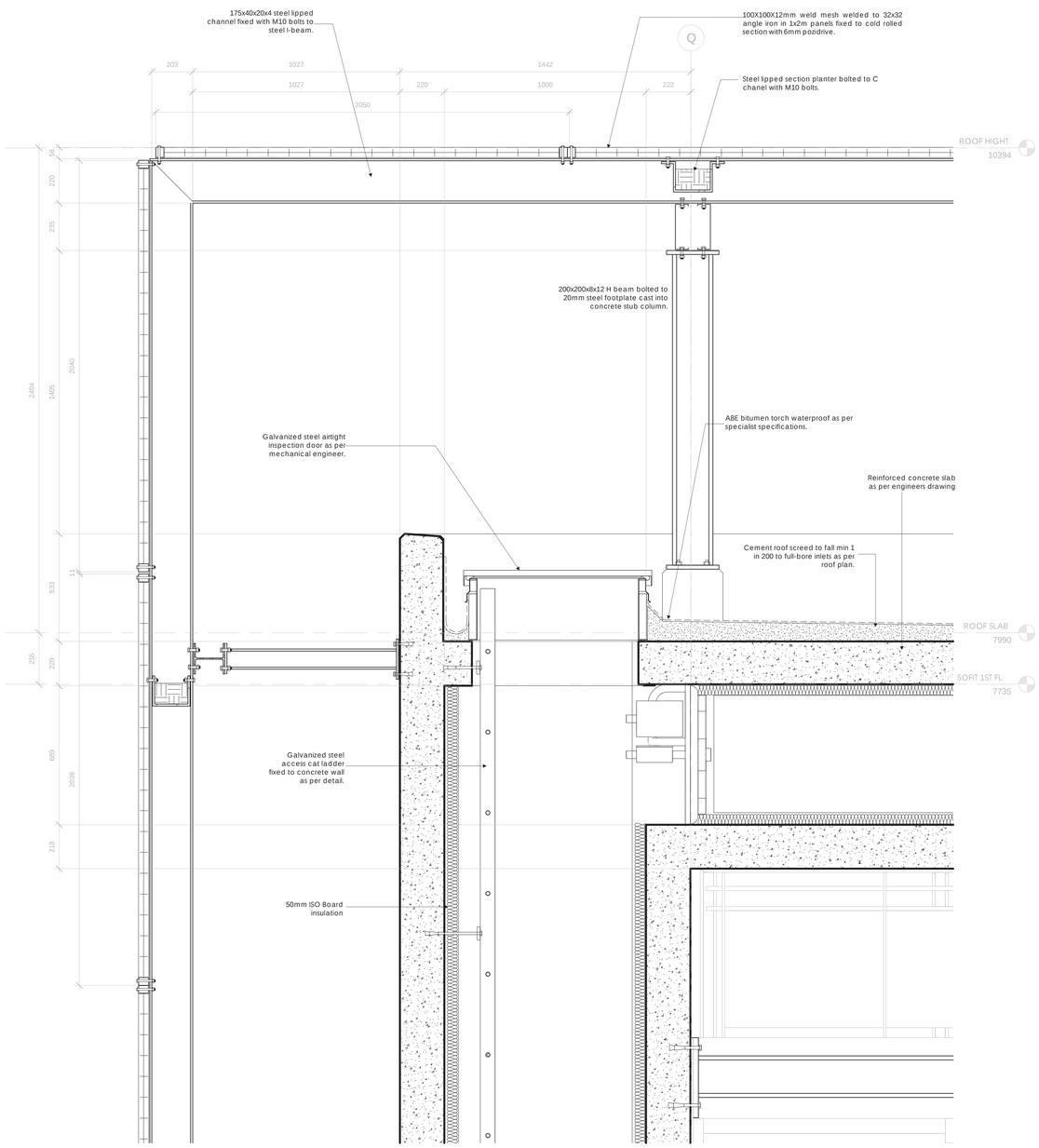
No.	Description	Date

World Health Organization

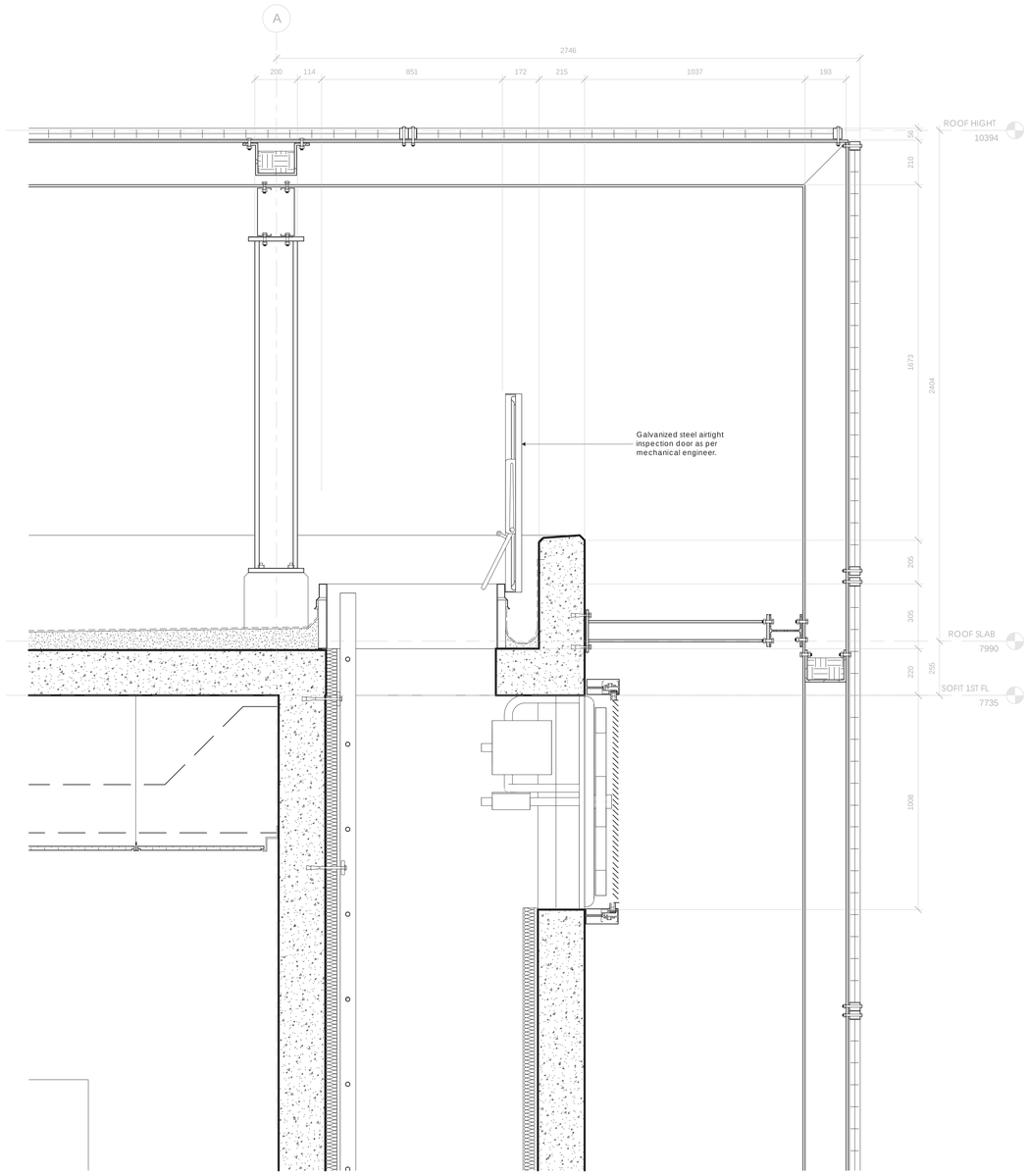
Centre for Traditional Herbal Medicine

Extended Sections 1_50

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A113
Scale	1 : 50



2 Detail 2
1 : 10



1 Detail 1
1 : 10

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Details

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A114
Scale	1 : 10

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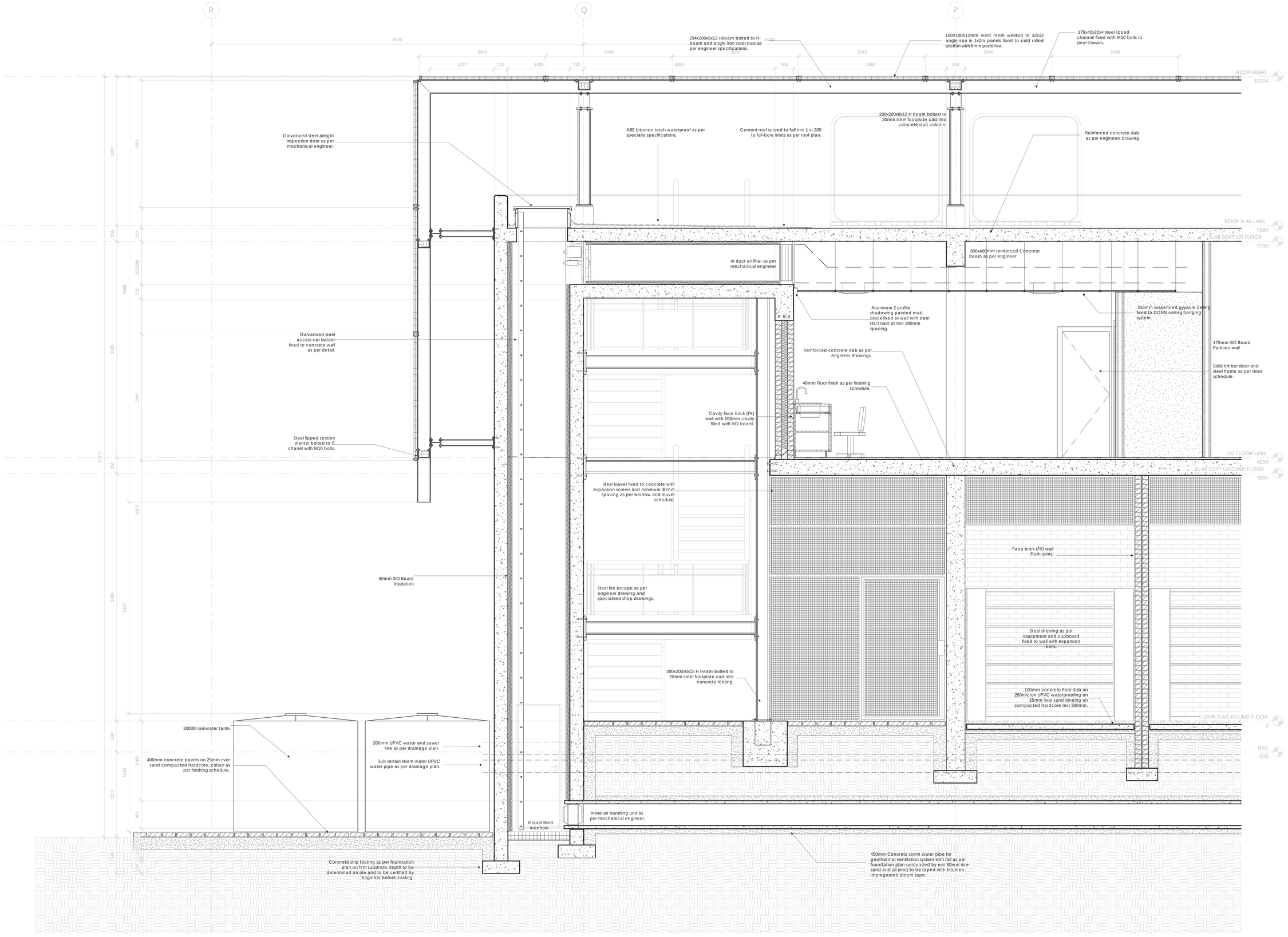

1 Ventilation system Input
1 : 20

Consultant:
Address: 614 Berea Street
Phone:0733052535
e-mail:jordaan1@gmail.com

No.	Description	Date

World Health Organization

Centre for Traditional Herbal Medicine

Section 3-Rainwater Collection

Project number	0001
Date	26/11/2014
Drawn by	Jacques Jordaan
	A109
Scale	1 : 20