9. Conclusion

Given that we can barely begin to understand the present urban realities in the African context, it would be even more problematical to begin to comprehend how the city would operate in the future, therefore we can only begin to predict or begin to affect the way the future African city might be; and such a process would begin with redefining and re-conceptualising the urban condition, that encompasses democracy and sociability. Perhaps an African City, in accordance with (Koolhaas, et al. 2000:653) is one where public space is continuously been occupied in different ways, and interior spaces are dynamic and flexible constantly regenerating themselves; where boundaries are flexible and elastic, allowing for variable and impermanent patterns to occur.

The dissertation is an investigation of the role of architecture and open space in the African urban condition. The author is of the opinion that architecture cannot be the sole contributor to urban reform and that architects should begin to implement a multi-disciplinary approach that begins to understand and work within the context that is unique to South African cities. It is important that the city should rather be understood as a social structure in which the temporal condition supersedes the physical condition, in order for the public to actively engage with each other and the urban condition. This is to be achieved by implementing multi-disciplinary strategies, which go beyond mere architectural solutions, but rather strategies that have the ability to strengthen the social tissue. It is in this social condition that urban processes begin to emerge.

10. Technical Investigation

10.1. Ventilation

10.1.1. Mechanical Ventilation of the Underground Parking Garage.

In any underground parking garage, ventilation is an important issue to consider due to the carbon monoxide build up as a result of the combustion of fuels. The design of the basement parking, which has been proposed for Pretorius Square, is not a completely enclosed structure, as it has openings on the south side where it meets the proposed building and on the north side where the vehicular entrance is situated. As a result of this the most efficient method of ventilation would be to mechanically extract the contaminated air and not use a mechanical method to introduce clean air, but rather use the openings that are part of the structure and the openings as a result of the ramp that connects all three levels of the basement, as inlets points for the introduction of fresh air (Mahmood, 2007). This method of ventilation that involves the creation of pressure differentials by exhaust fans and air return inlets is known as *space air distribution* (McQuiston & Parker, 1994:107).

This method of ventilation will be achieved by having an exhaust fan on each basement level, each one of them to be in a plant room and connected to a shaft that has an outlet on the roof, in this case the ground floor, that will allow for the extracted air to escape. It is important that openings in the basement structure are sufficient enough to ensure that there is always a balance between the amount of air mass entering and the amount leaving the space (McQuiston & Parker, 1994:107).

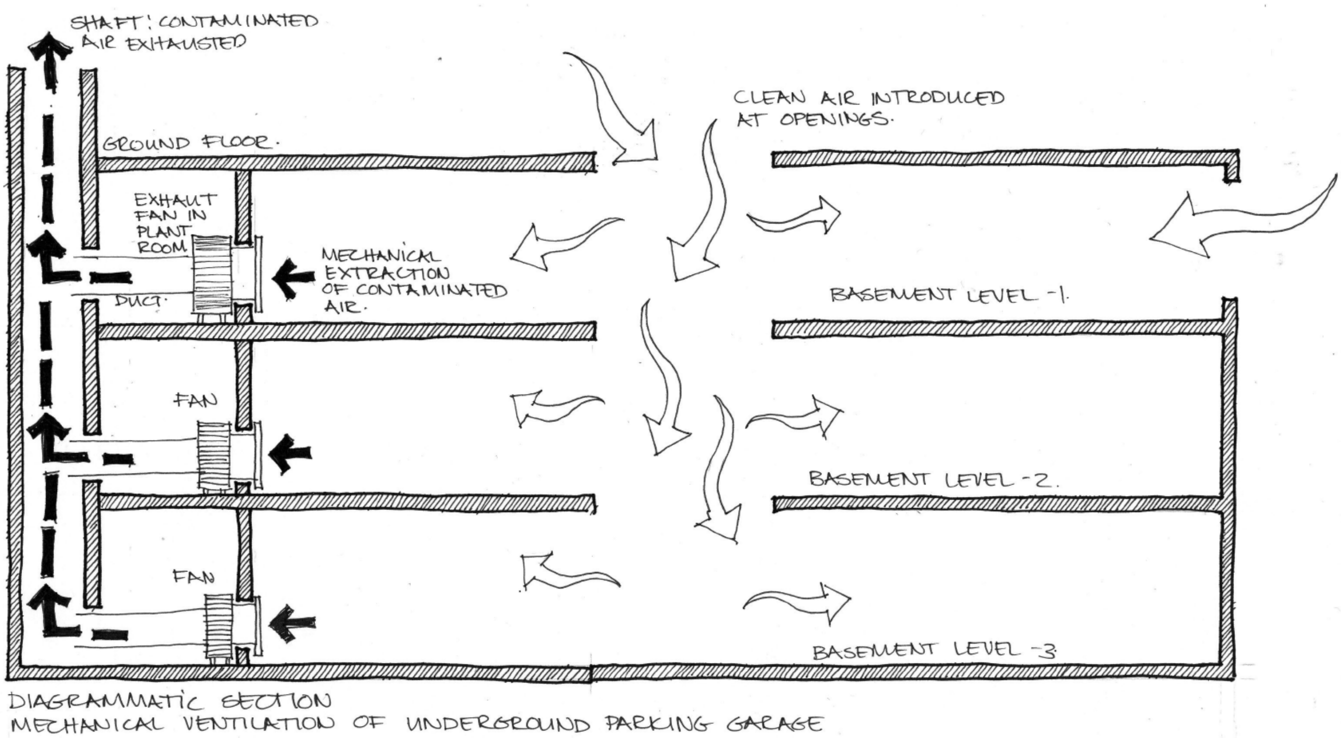

Fig. 138 Space air distribution, the mechanical extraction of contaminated air (Author, 2007).

A centrifugal fan will be used as the exhaust fan, as it not only makes the least amount of noise, but it can efficiently move large volumes of air over a wide range of pressures therefore creating a high flow rate which is essential in this type of ventilation (Mahmood, 2007). The factors that influence the type, size and power of the fan is determined by the noise level and the required flow rate. The following calculation was used to determine the size and power of the centrifugal fan, and hence the space required for the plant room to house the fan. The following factors were worked into the calculation, as they contributed to the overall loss of pressure which has a direct influence on the flow rate:

- The maximum number of cars the parking garage can accommodate
- Size and length of the duct
- Number and size of columns
- Filters in ducts to prevent the entry of dust

An underground parking garage will not always require the same level of ventilation as the amount of cars within it will always differ; therefore it will be uneconomical to have the fans requiring the same amount of energy whether or not the garage is completely occupied or empty. Therefore the installation of carbon monoxide sensors will be able to determine the level of mechanical extraction that is necessary, therefore ventilation is activated only when needed. As a result the energy requirement, maintenance needed and noise levels are reduced. A carbon monoxide sensor is a small device that is box shaped and is fitted to top of a column. A sensor is only able to detect the amount of carbon monoxide within a 15,2m radius (Mahmood, 2007).

10. Technical Investigation

10.1. Ventilation

10.1.2. Calculations to Determine the Horsepower and Dimensions of the Exhaust Fan

$A_{flow} = (2,8m \times 135m) - 28$
$= 350m^2$.

* 2,8 is BASED ON FLOOR TO CEILING HEIGHT = 2,720 m.
135 m = LENGTH OF BASEMENT

N° OF CARS = 1215

A = AREA OF DUCT. (A_{duct})
= $1m^2$

A_{beam} = 28m

A_{duct} = ~~0,8~~ HYDROLIC DIAMETER $\left(\frac{\pi}{4}\right) \times$ AREA OF DUCT (1)
= 0,8

ΔP = CHANGE IN PRESSURE
= 87000 kPa (PRESSURE OUTSIDE) − 84000 kPa (PRESSURE IN BASEMENT).
= 3000 kPa.

ρ_{air} = DENSITY OF AIR
= 1,2

ρ_{water} = DENSITY OF WATER
= 999.

g = GRAVITATIONAL CONSTANT
= 9,81.

H_{losses} = LOSS IN PRESSURE BASED ON SIZE OF DUCT, N° OF BENDS IN DUCT, LENGTH OF DUCT, N° OF CARS IN PARKING + COLUMNS. + SCREENS IN DUCT TO PREV. THE ENTRY OF DUST
= 5m.

Q = AIRFLOW FLAT (m^3/SECOND)
= $V \times A_{flow}$
= (0,1) 350
= $35m^3/s$ (second)

* V = VELOCITY OF AIRFLOW
= 0,1 m/s

$$\frac{\Delta W}{g} = \frac{\Delta P}{\rho_{water} g} + H_{losses} + \left(\frac{Q^2}{A_{duct}^2}\right)\left(\frac{1}{2g}\right)$$

$$\frac{\Delta W}{g} = \frac{3000}{(999)(9,81)} + \frac{5}{1} + \left(\frac{35^2}{0,8^2}\right)\left[\frac{1}{2(9,81)}\right]$$

$$= \frac{3000}{9800,19} + \frac{5}{1} + \left(\frac{1225}{0,64}\right)\left(\frac{1}{19,62}\right)$$

$$= 0,306 + 5 + (1914,06)(0,051)$$

$$= 5,306 + 97,62$$

$$= 102,92 \approx 103.3$$

$$103,3 = \frac{\Delta W}{9,81}$$

$\therefore \Delta W = 1013$

ΔW = 43 kW. (POWER OF FAN)
≈ 58 HORSE POWER

m = mass flow.
= $\rho_{air} \times Q$
= $1,2 \times 35$
= 42.

Fig. 139 A calculation to determine the horsepower of the fan required to mechanically extract contaminated air from the underground parking garage. (Author & Mahmood, 2007)

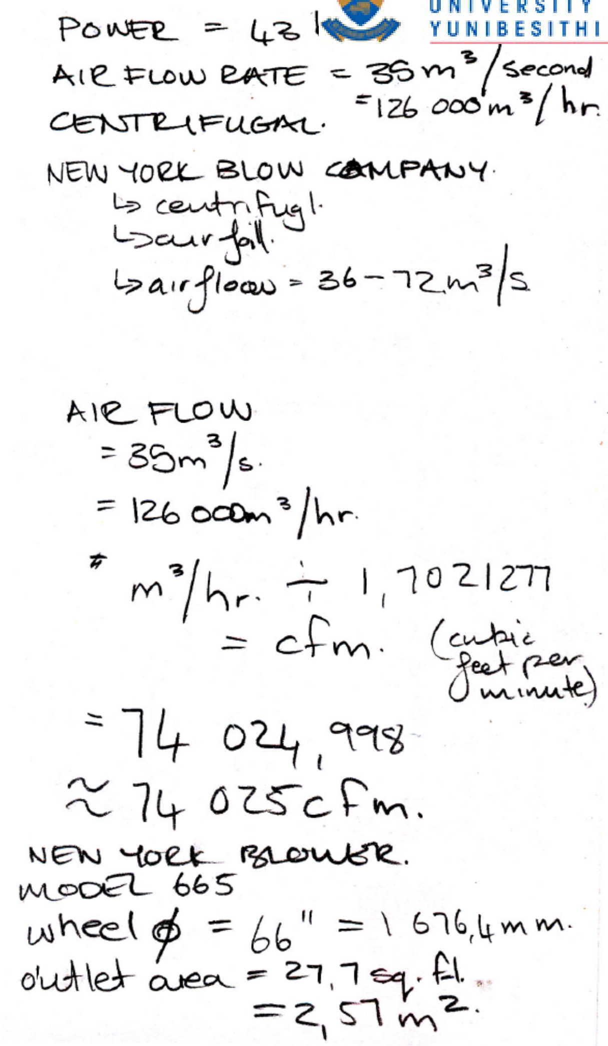

Fig. 140 The size and type of centrifugal fan required based on the horsepower that is needed for sufficient mechanical extraction. (Author & Mahmood, 2007)

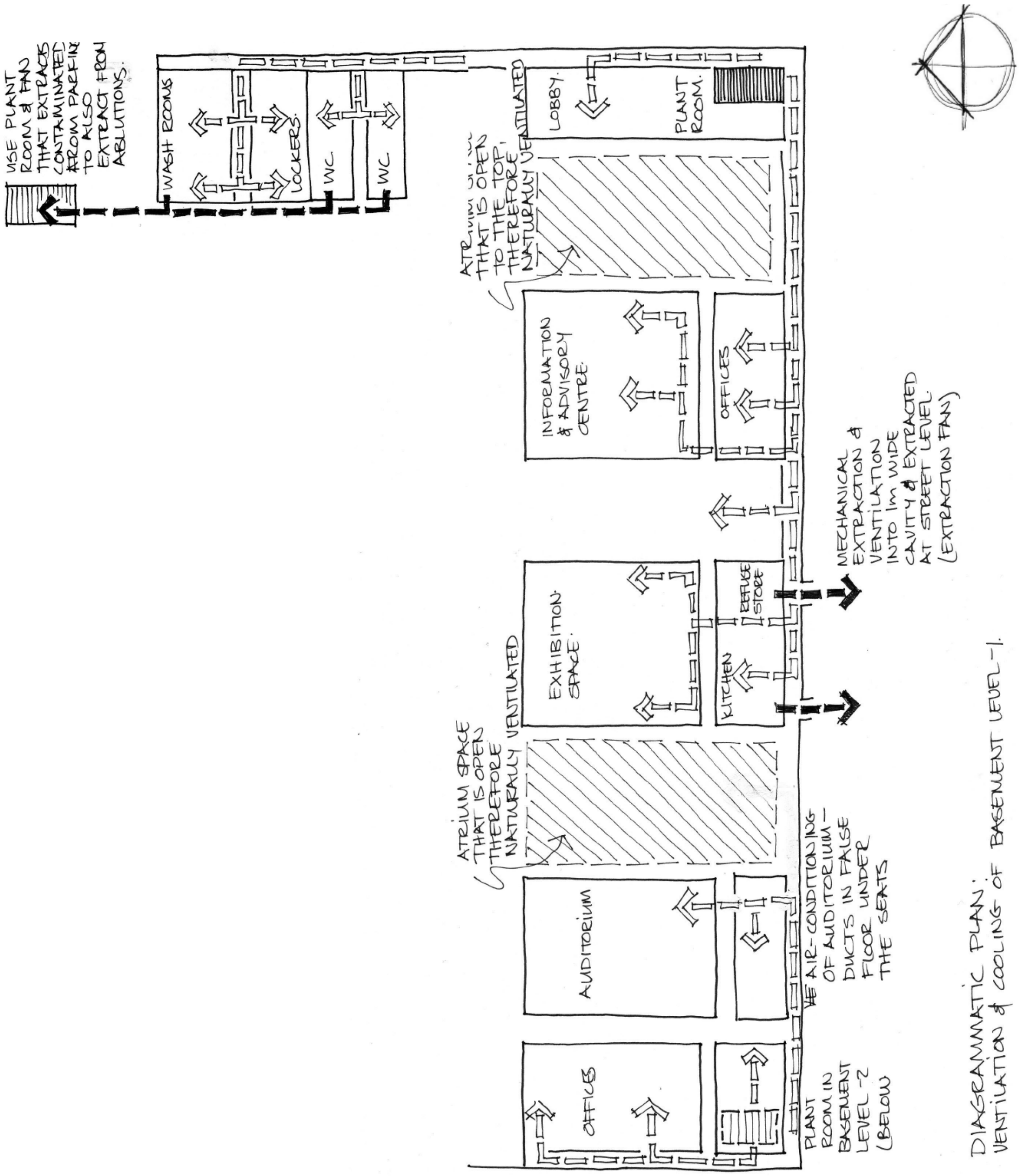

Fig. 141 Investigation of the the ventilation and cooling of basement level -1 (Author, 2007)

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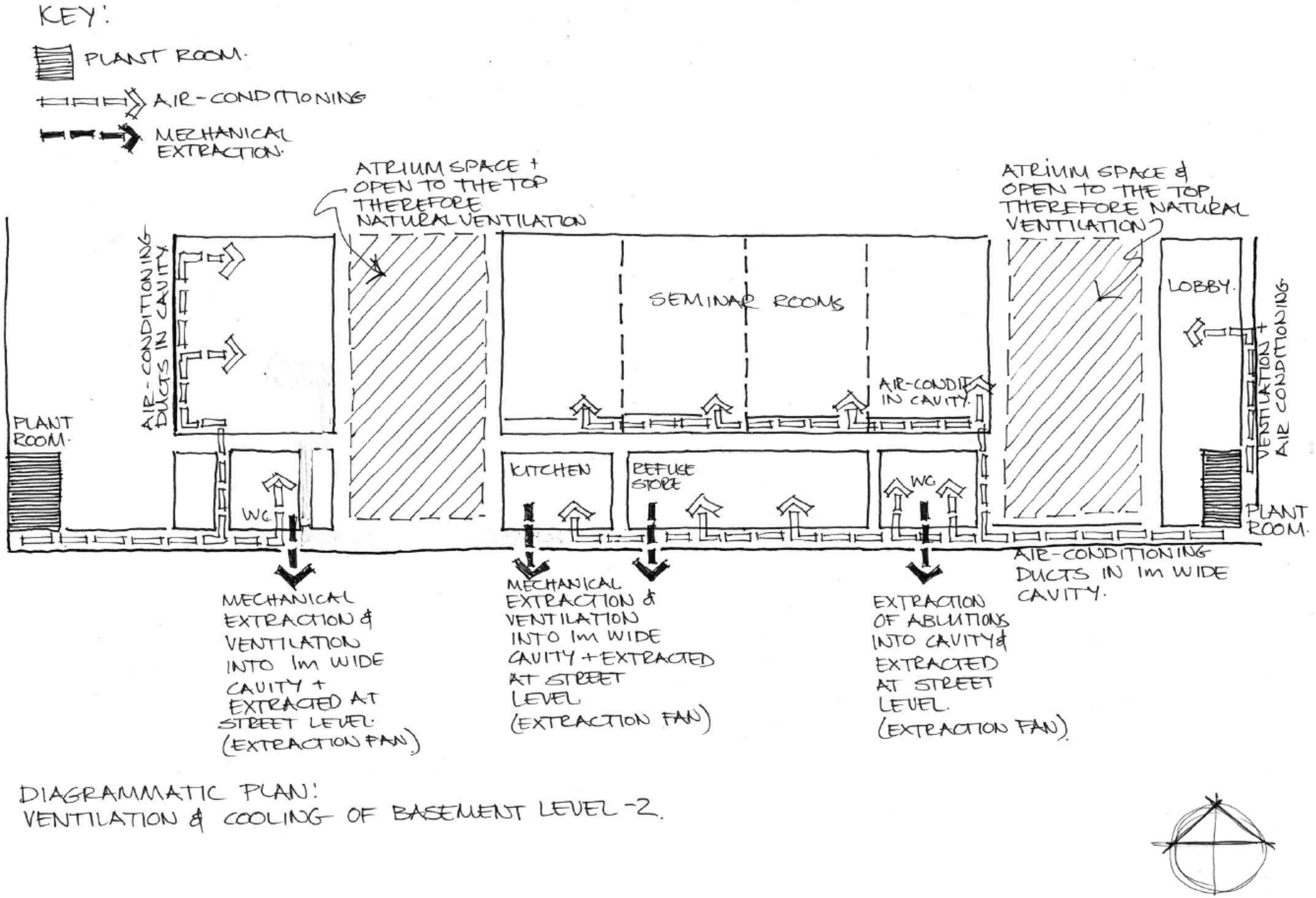

Fig. 142 Investigation of the the ventilation and cooling of basement level -2 (Author, 2007)

10. Technical Investigation

10.3. Services

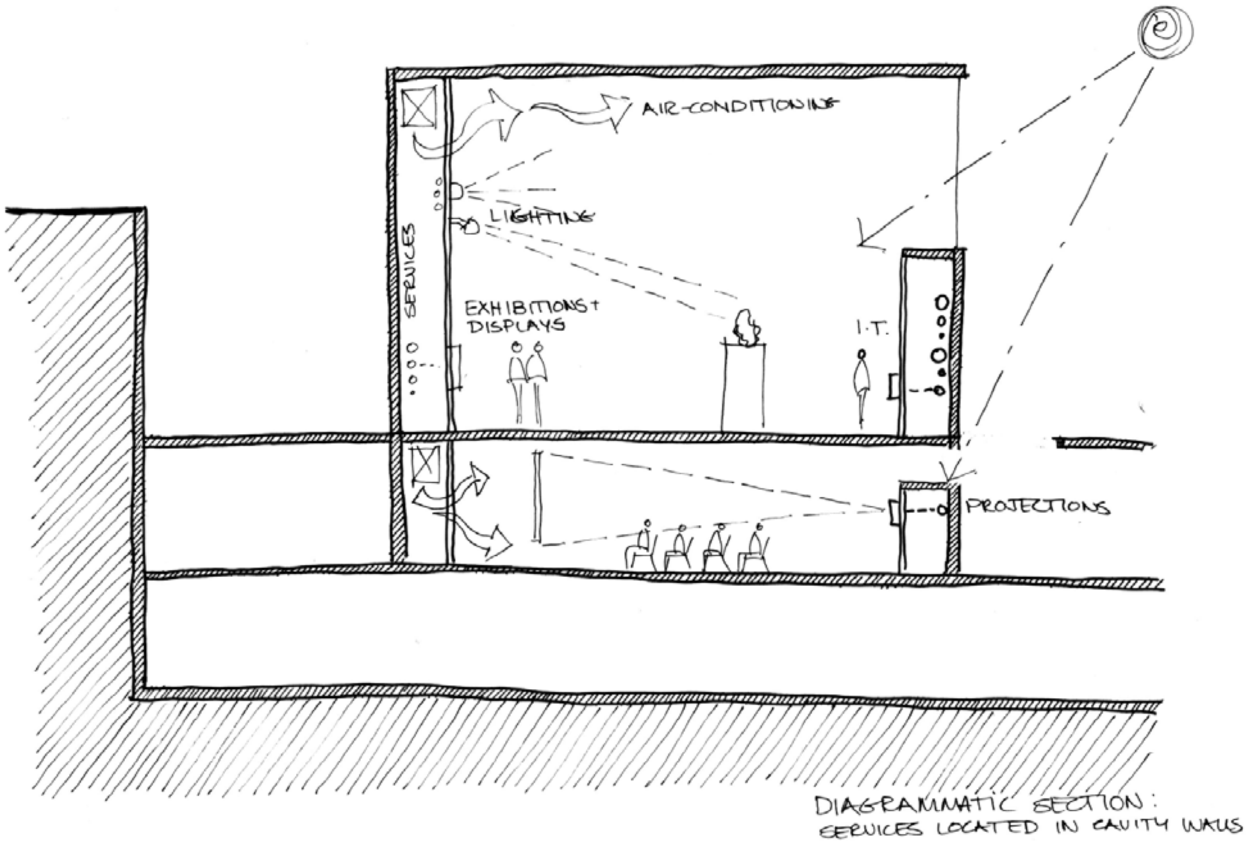

Fig. 143 Investigation of the incorporation of services into cavity walls. These services are aimed at providing digital information and to facilitate exhibitions (Author, 2007).

10. Technical Investigation

10.4. Stormwater Managemetn

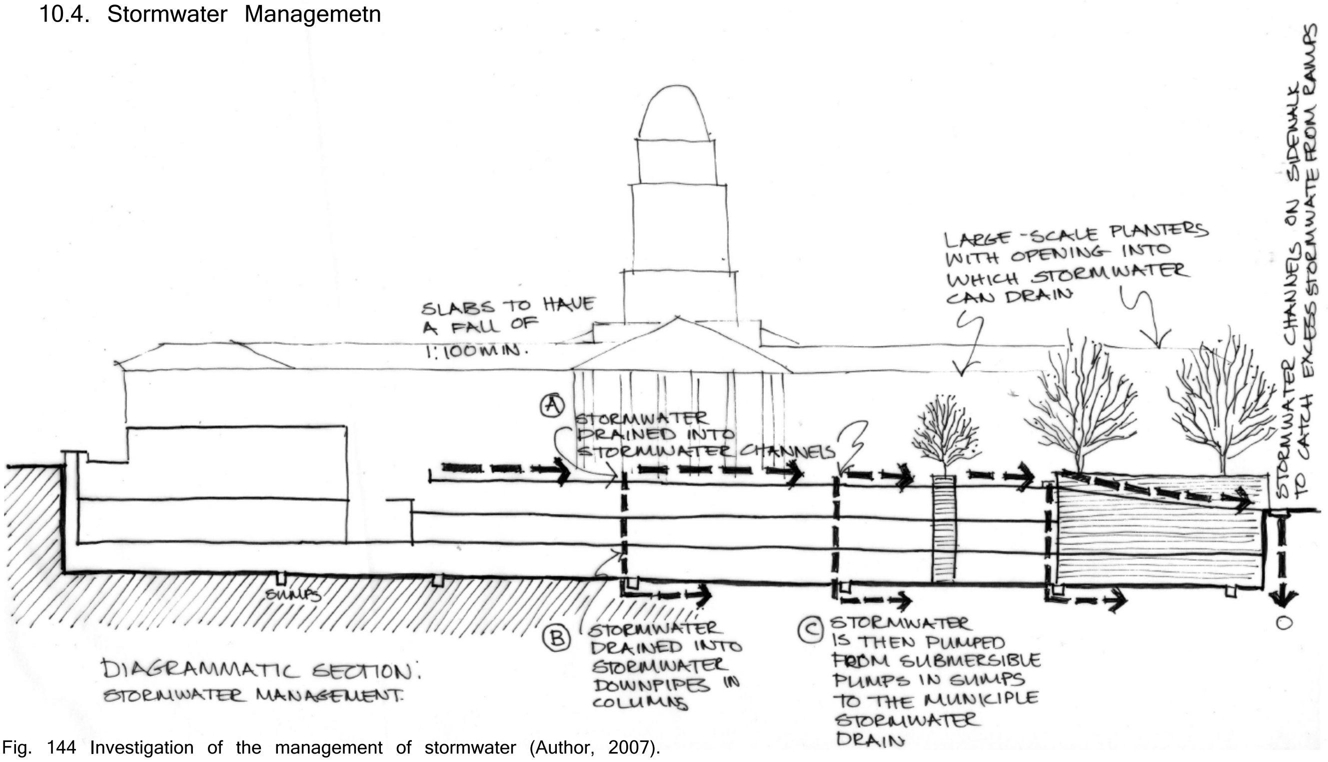

Fig. 144 Investigation of the management of stormwater (Author, 2007).

11. Design

11.1. Photo Montage

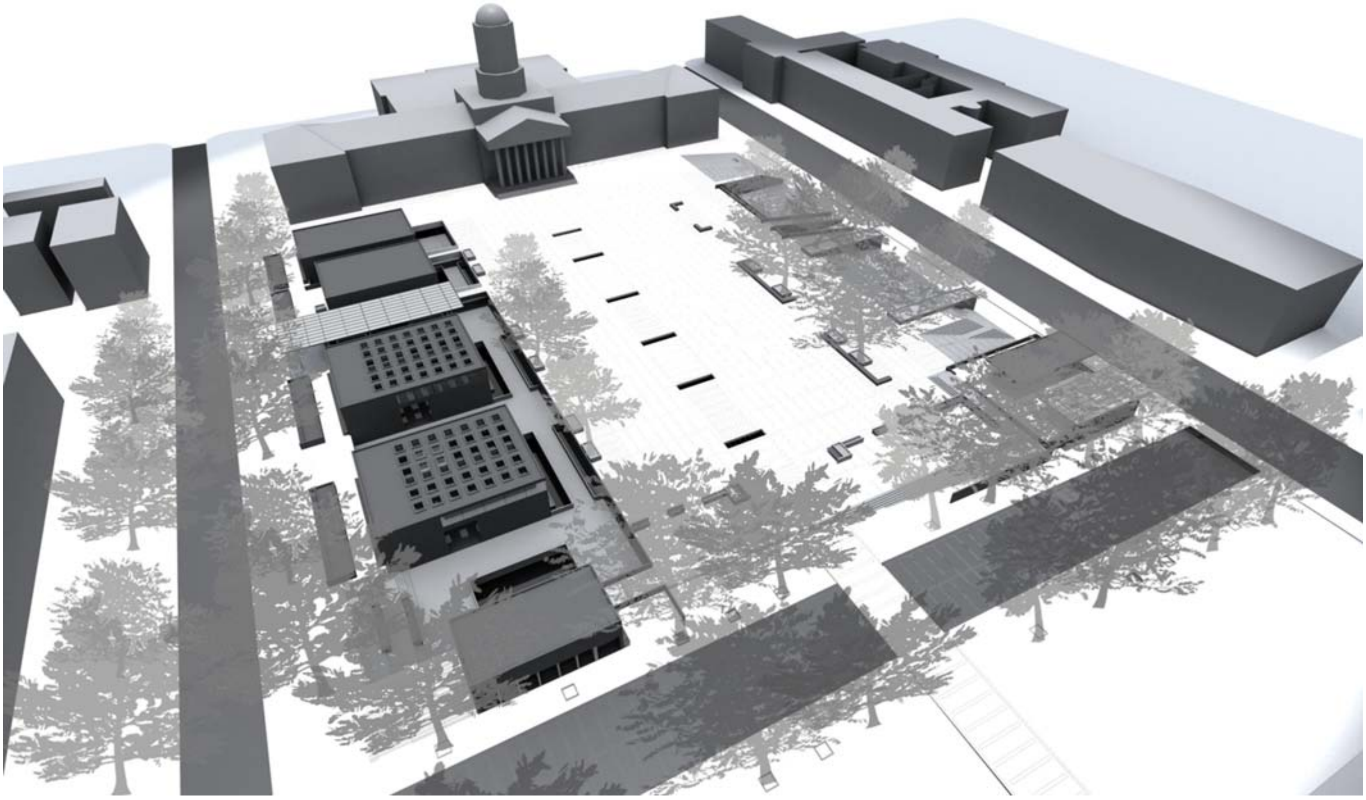

Fig. 145 An aerial view of the square (Author & Sackett, 2007).

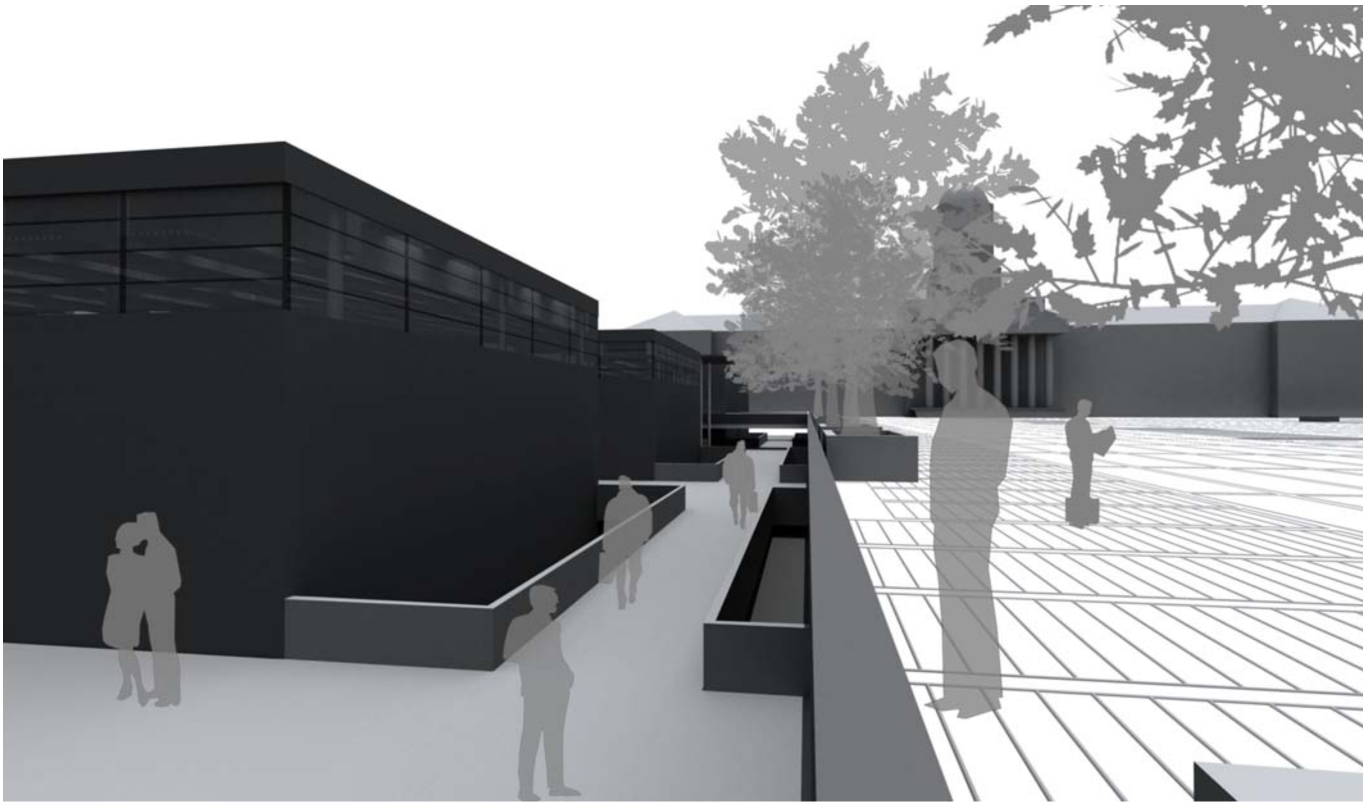

Fig. 146 A view from the Orientation Box (Author & Sackett, 2007).

Fig. 147 A view of the orientation and Information Boxes from the corner of Paul Kruger Street and Minnaar Street (Author & Sackett, 2007).

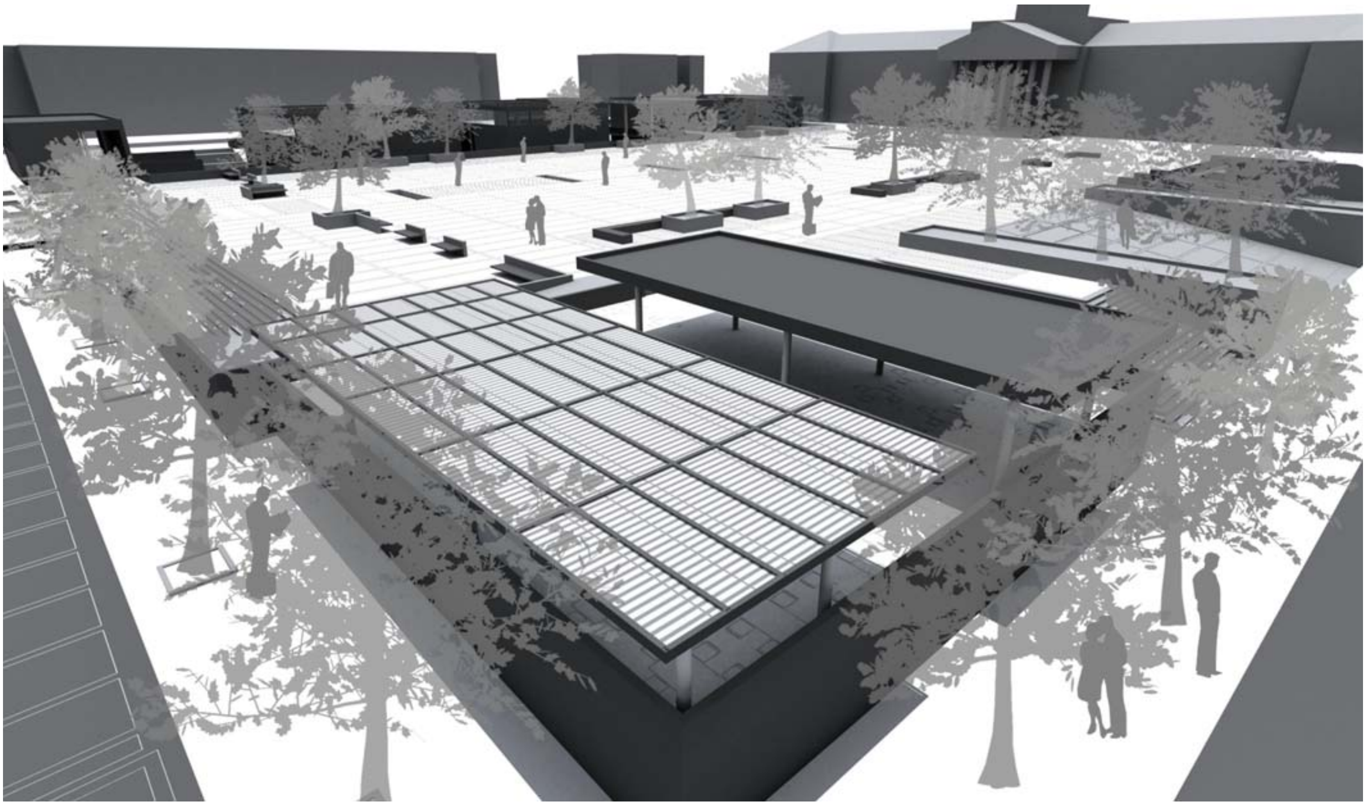

Fig. 148 A view of the Mixing Box (restaurant) from the corner of Paul Kruger Street and Visagie Street (Author & Sackett, 2007).

Fig. 149 A view of the entrance to the underground parking garage on Visagie Street (Author & Sackett, 2007).

Fig. 150 A view of the stramp and the square from Paul kruger Street (Author & Sackett, 2007).

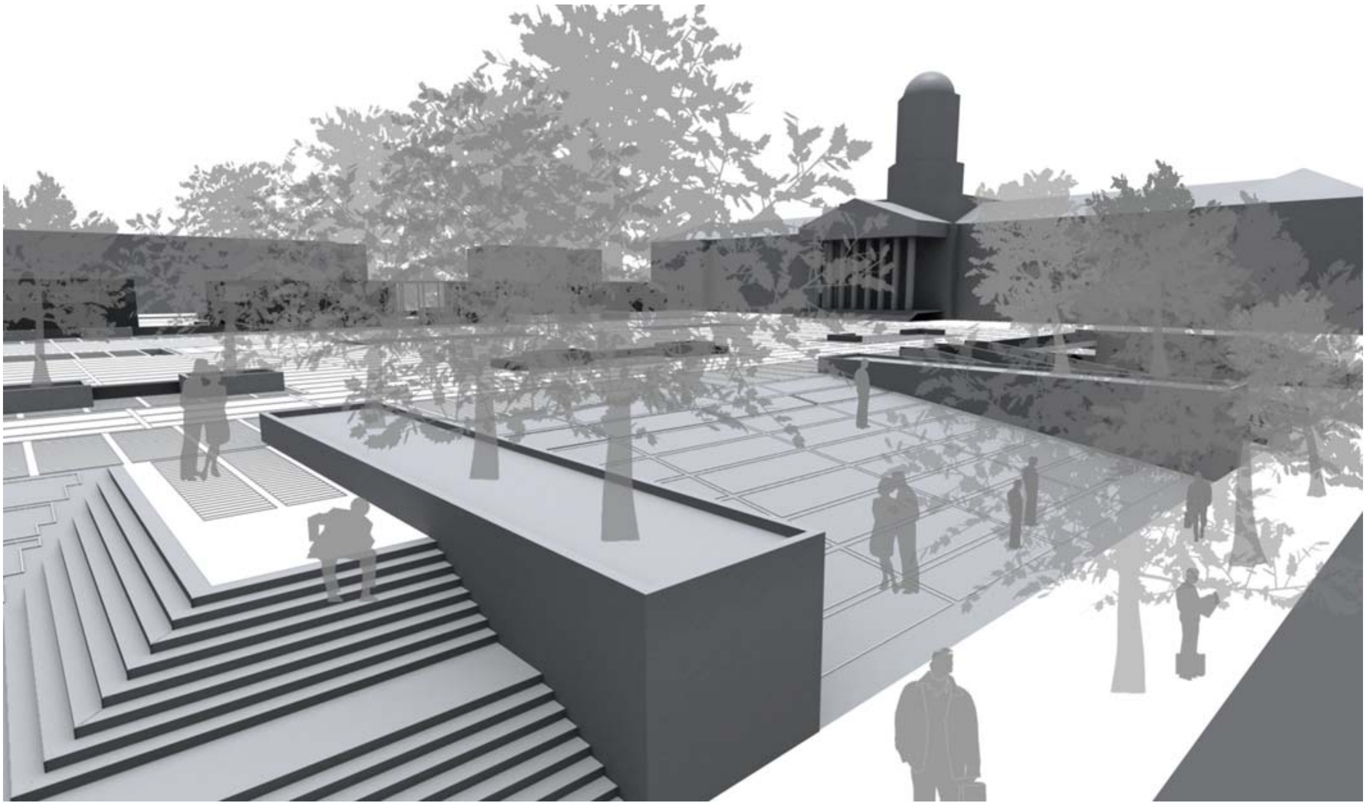

Fig. 151 A view of the square along Visagie Street (Author & Sackett, 2007).

Fig. 152 An interior view of the skylights and timber screens in the Information and Exhibition Boxes (Author & Sackett, 2007).

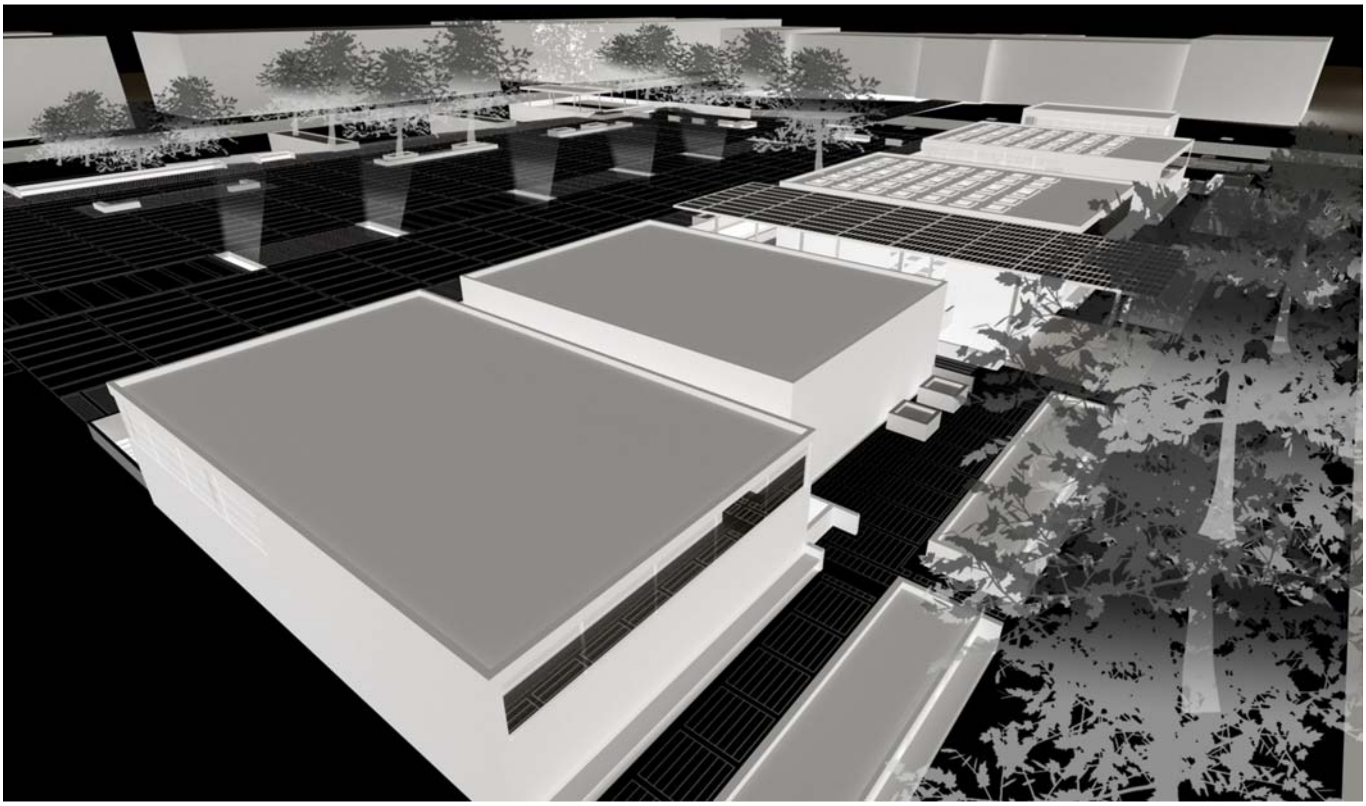

Fig. 153 A view of the skylights on the square (Author & Sackett, 2007).

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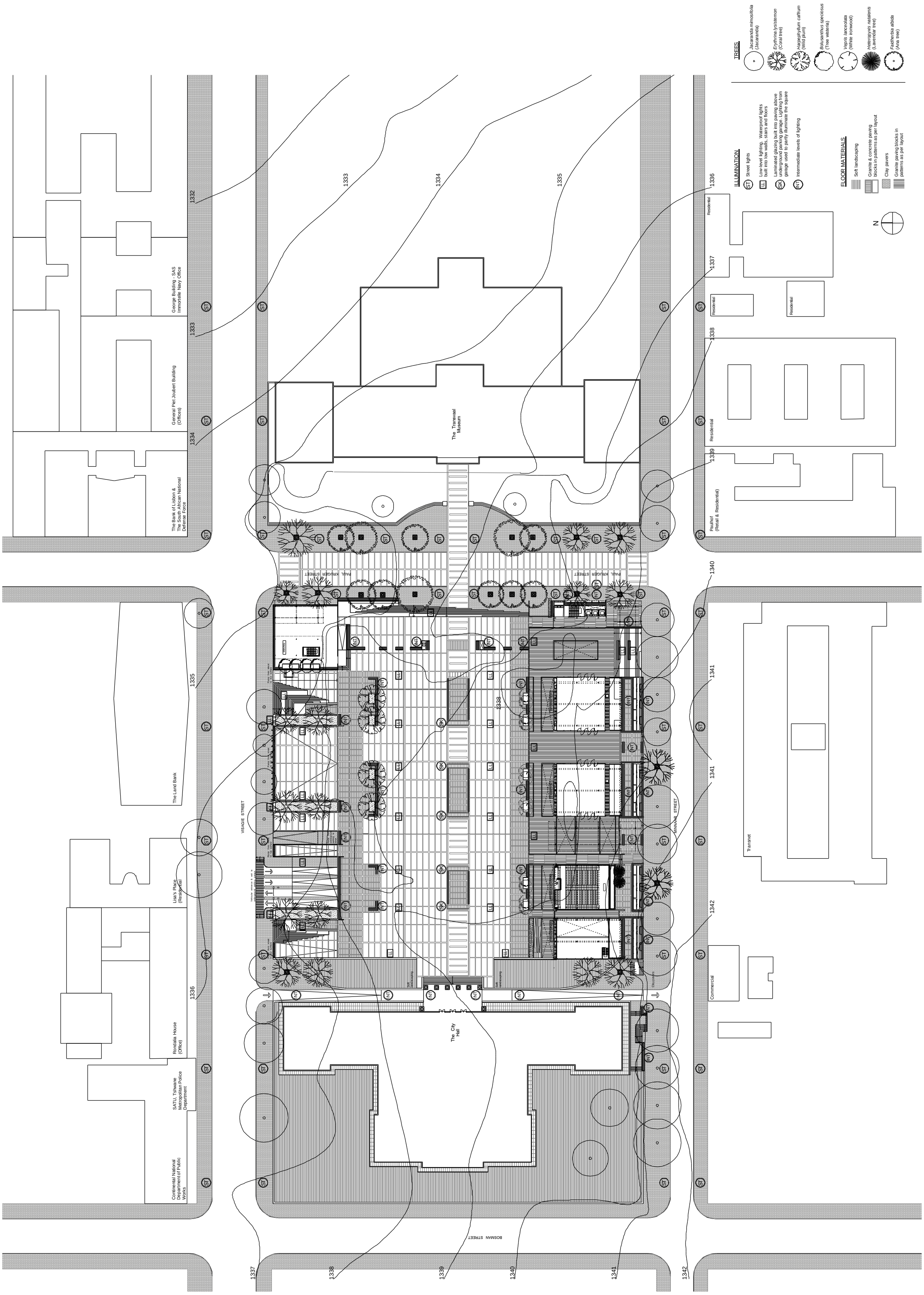

SURFACES + SERVICES

PRETORIUS SQUARE

SITE PLAN 1:500

Mary-Anne da Costa 21010456

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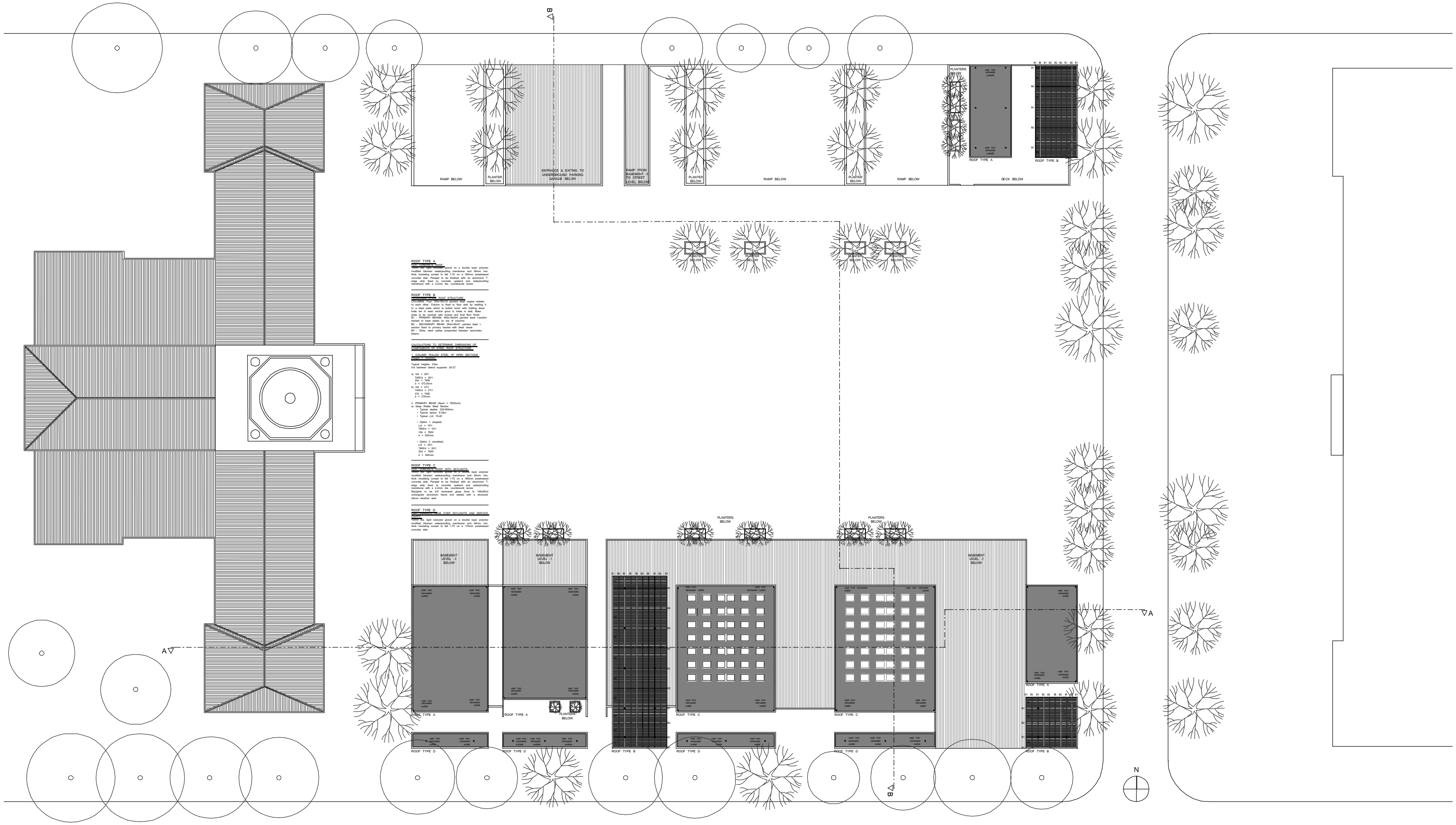

ROOF PLAN 1:500

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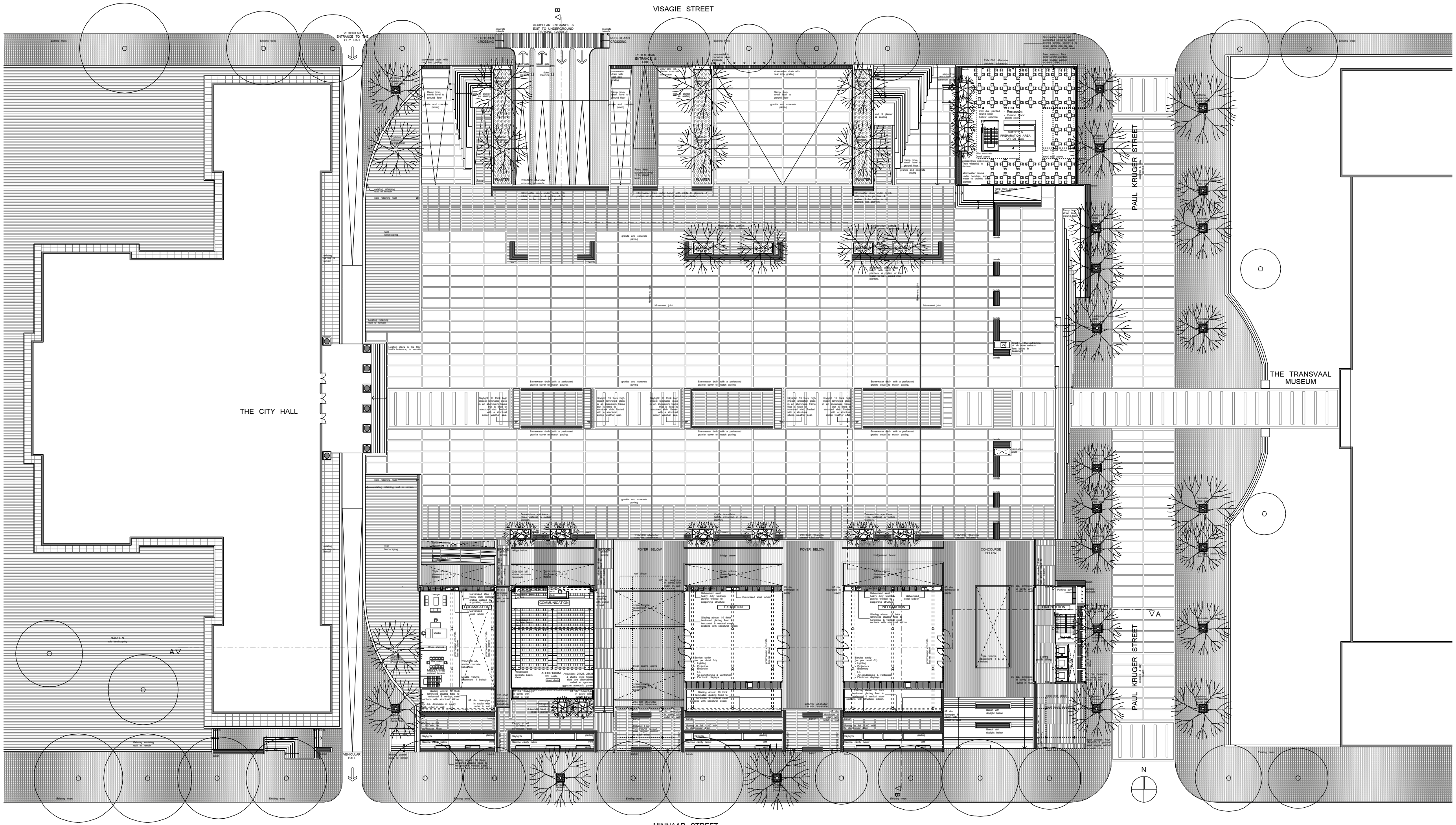

GROUND FLOOR PLAN 1:500

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BASEMENT -1 FLOOR PLAN 1:500

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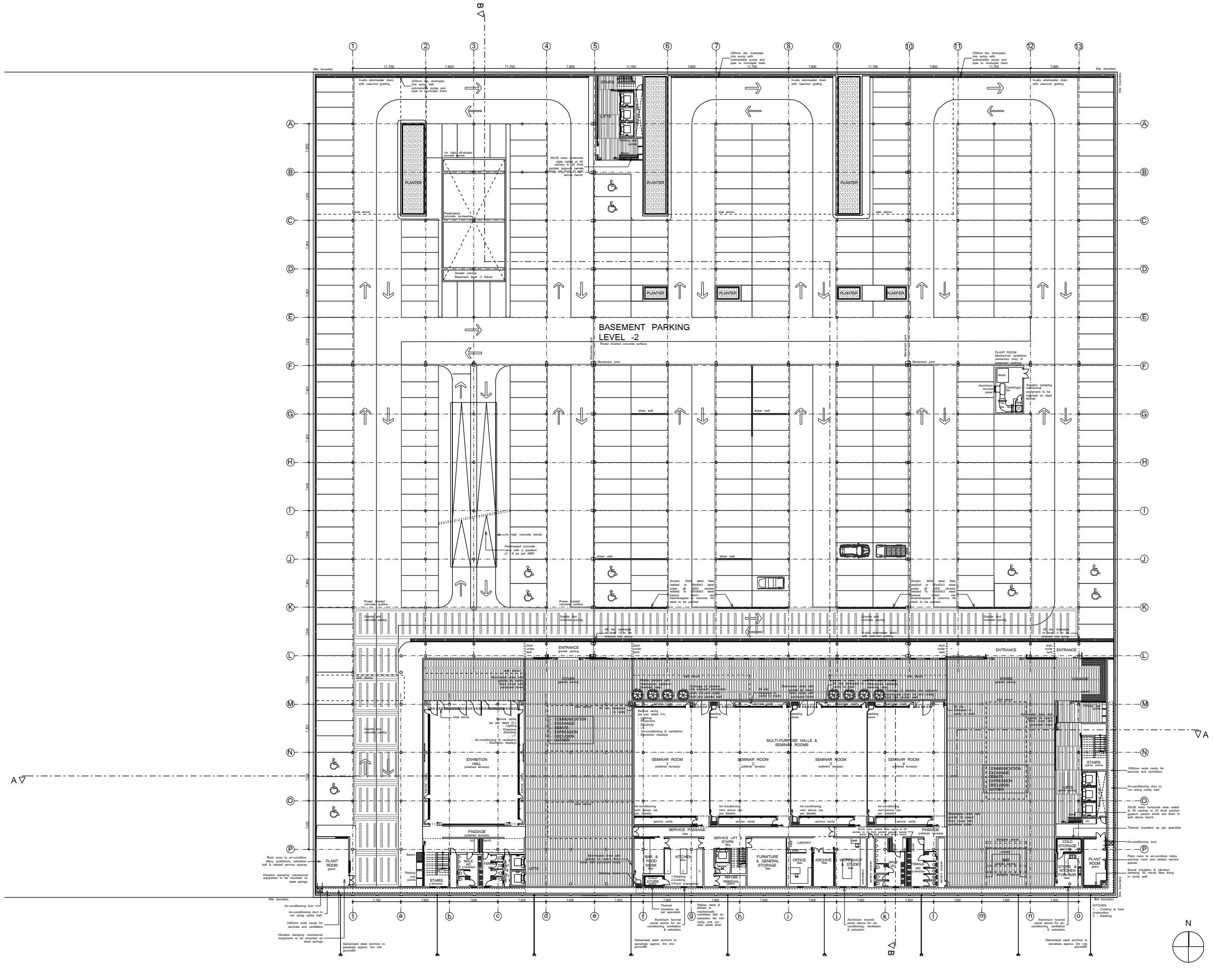

BASEMENT -2 FLOOR PLAN 1:500

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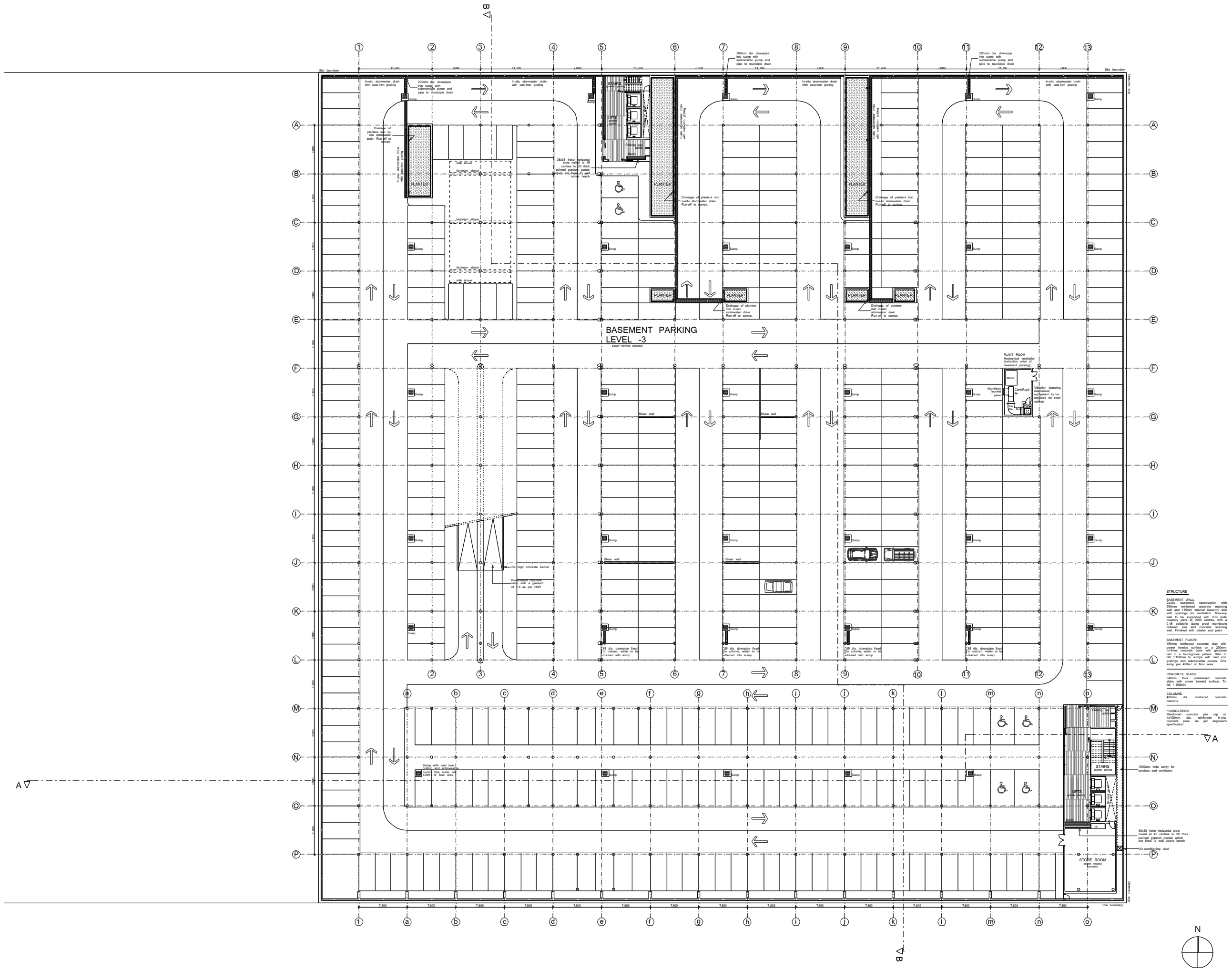
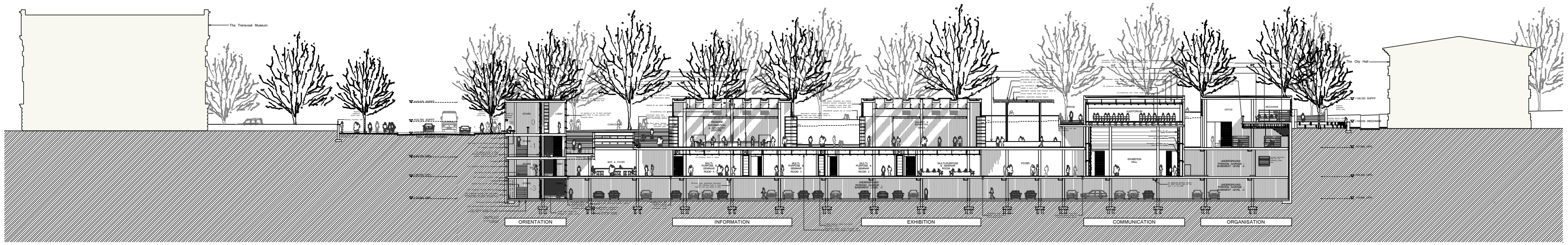
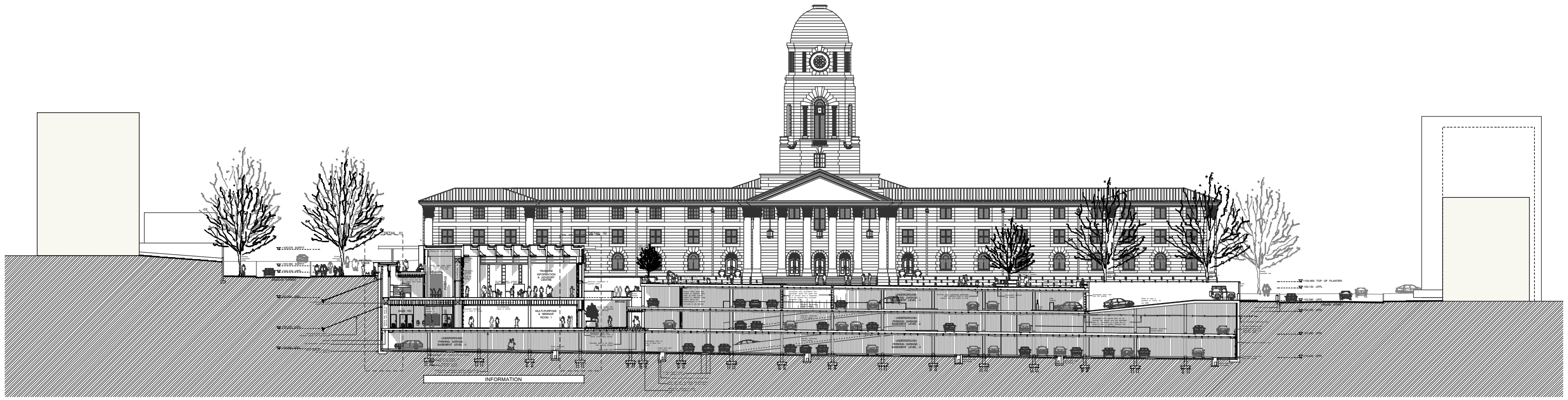


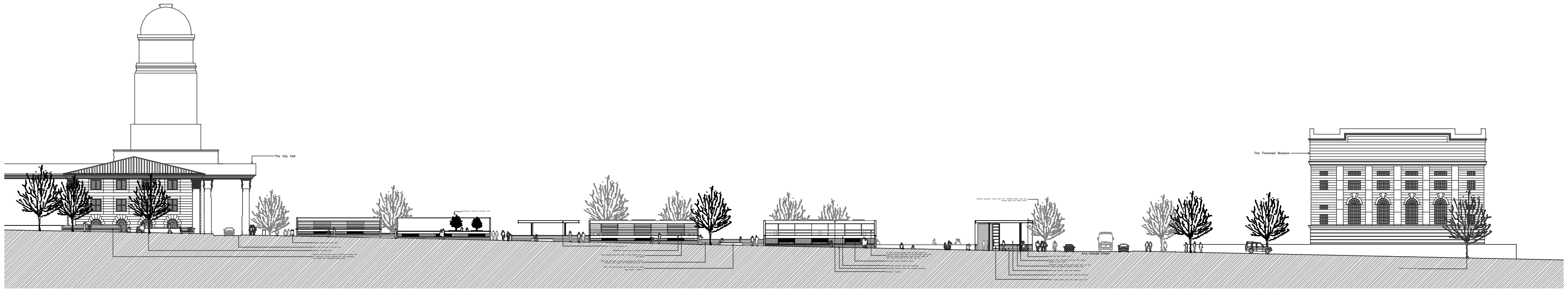
BASEMENT -3 FLOOR PLAN 1:500



SECTION A-A 1:500



SECTION B-B 1:500



SOUTH ELEVATION 1:500

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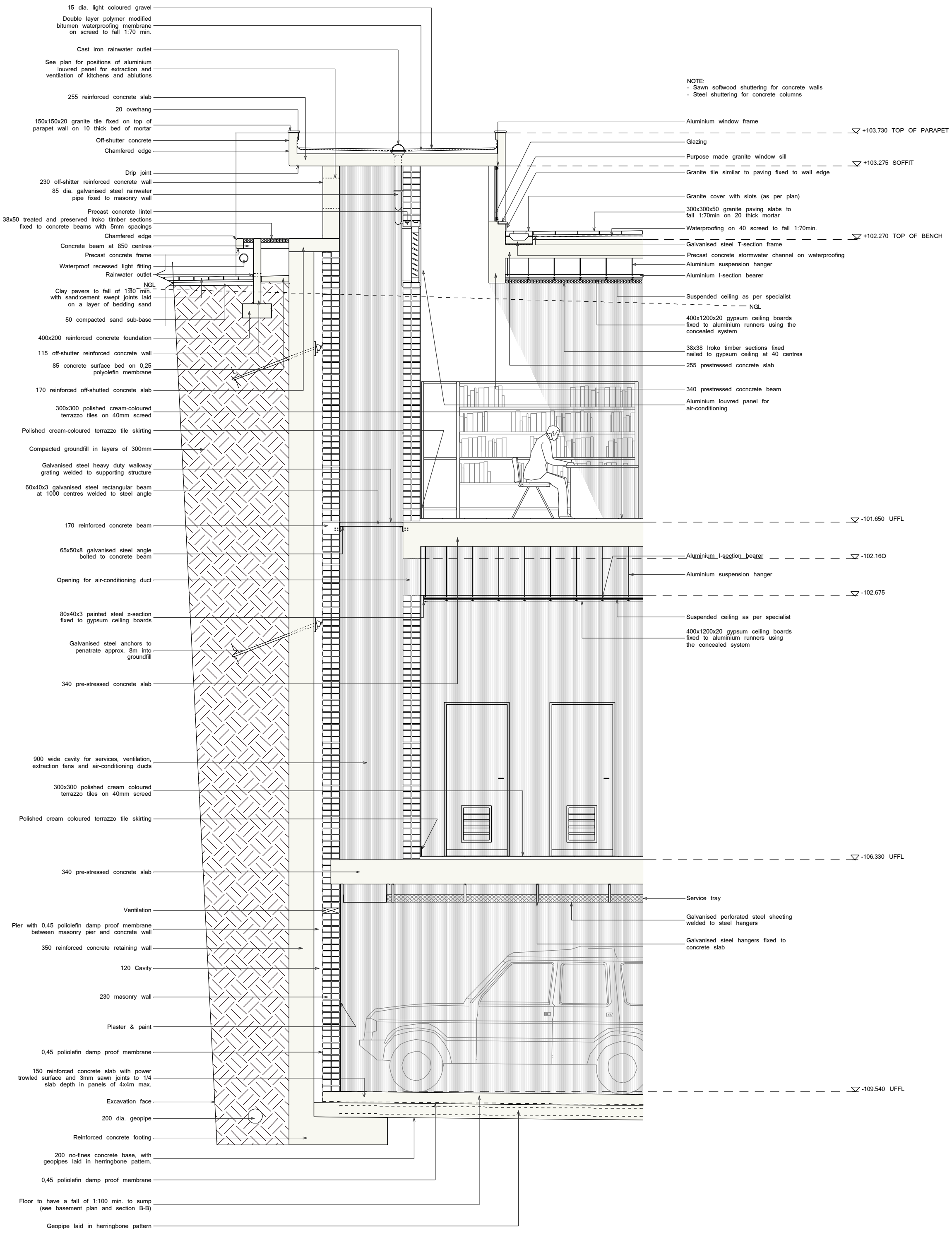

DETAIL 01 (N.T.S)

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BEAM TO SUPPORT TIMBER CEILING (Span = 7400mm)

OPTION 1: STEEL - Wide Flange Rolled Steel Section

Typical depths: 100-500mm
Typical spans: 6-14m
Typical L/d: 20-30

a) L/d = 20/1
7400/d = 20/1
20d = 7400
d = 370mm
b) L/d = 30/1
7400/d = 30/1
30d = 7400
d = 247mm

STEEL COLUMN IN CAVITY (Height = 5100mm)

OPTION 1: Rolled Steel Hollow Section

Typical heights: 2-8m
h/d between lateral supports: 20-35

a) h/d = 20/1
5100/d = 20/1
20d = 5100
d = 255mm
b) h/d = 35/1
5100/d = 35/1
35d = 5100
d = 146mm

REINFORCED CONCRETE COLUMN (Height = 6340mm)

Typical heights: 2-8m
h/d between lateral supports: 6-16

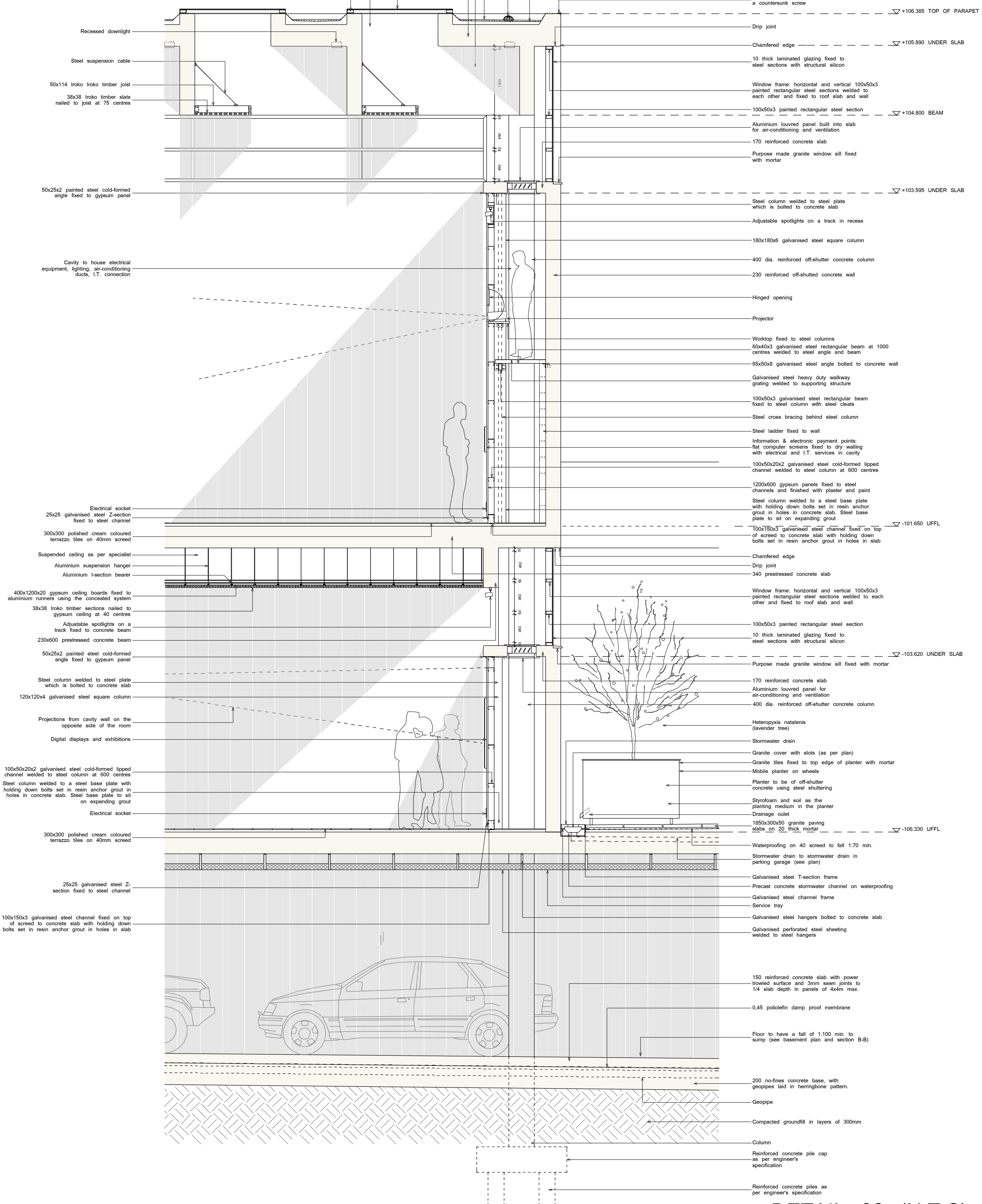
a) h/d = 6/1
6340/d = 6/1
6d = 6340
d = 1055mm
b) h/d = 16/1
6340/d = 16/1
16d = 6340
d = 396mm

PRESTRESSED FLAT CONCRETE SLAB (Span = 7800mm)

Typical depths: 100-350mm
Typical spans: 2-7m
Typical L/d: 22-32

a) L/d = 22/1
7800/d = 22/1
22d = 7800
d = 355mm
b) L/d = 32/1
7800/d = 32/1
32d = 7800
d = 243mm

NOTE:
- Sawn softwood shuttering for concrete walls
- Steel shuttering for concrete columns



DETAIL 02 (N.T.S)

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