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


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

![Image of calculations]

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)
10. Technical Investigation

10.2. Ventilation & Cooling of the Building

Fig. 11: Investigation of the ventilation and cooling of basement level -1 (Author, 2007)
Fig. 142: Investigation of the ventilation and cooling of basement level -2 (Author, 2007)

KEY:
- PLANT ROOM
- AIR-CONDITIONING
- MECHANICAL EXTRACTION

DIAGRAMMATIC PLAN:
VENTILATION & COOLING OF BASEMENT LEVEL -2.
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).

10.4. Stormwater Management

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 ramp 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).
ROOF PLAN 1:500

CALCULATIONS TO DETERMINE DIMENSIONS OF COMPONENTS OF STEEL ROOF STRUCTURE:

1. COLUMN: ROLLED STEEL OF OPEN SECTIONS (Height = 7450mm)
   a) h/d = 20/1
      7450/d = 20/1
      d = 372.5mm
   b) h/d = 27/1
      7450/d = 27/1
      d = 276mm

2. PRIMARY BEAM (Span = 7800mm)
   a) Deep Rolled Steel Section
      • Typical depths: 200-500mm
      • Typical spans: 6-30m
      • Typical L/d: 15-20
      • Option 1 (largest):
         L/d = 15/1
         15d = 7800
         d = 520mm
      • Option 2 (smallest):
         L/d = 20/1
         7800/d = 20/1
         d = 390mm

ROOF TYPE D:
FLAT CONCRETE SLAB OVER SKYLIGHTS AND SERVICE CAVITY:
15mm dia. light coloured gravel on a double layer polymer modified bitumen waterproofing membrane and 40mm min.thick insulating screed to fall 1:70 on a 340mm prestressed concrete slab.

ROOF TYPE A:
FLAT CONCRETE ROOF:
15mm dia. light coloured gravel on a double layer polymer modified bitumen waterproofing membrane and 40mm min.thick insulating screed to fall 1:70 on a 340mm prestressed concrete slab. Parapet to be finished with an aluminium T-edge strip fixed to concrete upstand and waterproofing membrane with a 2.2mm dia. countersunk screw.

ROOF TYPE B:
PERMEABLE STEEL ROOF STRUCTURE:
COLUMNS: Four 150x150x18 painted steel angles welded to each other. Column is fixed to floor slab by welding it to a steel plate which is bolted down with holding downbolts set in resin anchor grout in holes in slab. Base plate to be covered with screed and final floor finish.
B1 - PRIMARY BEAMS: 406x140x54 painted steel I-section welded to base plates on top of columns
B2 - SECONDARY BEAM: 254x146x31 painted steel I-section fixed to primary beams with steel cleats
B3 - 20dia. steel cables suspended between secondary beams

ROOF TYPE C:
FLAT CONCRETE ROOF WITH SKYLIGHTS:
15mm dia. light coloured gravel on a double layer polymer modified bitumen waterproofing membrane and 40mm min.thick insulating screed to fall 1:70 on a 340mm prestressed concrete slab. Parapet to be finished with an aluminium T-edge strip fixed to concrete upstand and waterproofing membrane with a 2.2mm dia. countersunk screw.
Skylights to be 8.5 laminated glass fixed to 100x50x3 rectangular aluminium frame and sealed with a structural silicon weather seal.

ROOF TYPE D:
FLAT CONCRETE ROOF OVER SKYLIGHTS AND SERVICE CAVITY:
15mm dia. light coloured gravel on a double layer polymer modified bitumen waterproofing membrane and 40mm min.thick insulating screed to fall 1:70 on a 170mm prestressed concrete slab.
Drainage of planters into in-situ stormwater drain. Run-off to sumps.

200mm dia. downpipe into sump with submersible pump and pipe to municipal drain.

1m high concrete barrier.

Air-conditioning duct.

38x38 Iroko horizontal slats nailed at 45 centres to 20 thick painted gypsum panels which are fixed to wall above bench.

In-situ stormwater drain with cast-iron grating.

PLANTER

G

BASEMENT PARKING LEVEL -3

BASEMENT FLOOR: 150mm reinforced concrete slab with power trowled surface on a 200mm no-fines concrete base with geopipes laid in a herringbone pattern. Slab to fall 1:100min to sumps with cast iron grating and submersible pumps. One sump per 400m² of floor area.

CONCRETE SLABS:
340mm thick prestressed concrete slabs with power trowled surface. To fall 1:100min.

COLUMNS:
400mm dia. reinforced concrete columns.

Vibration damping: mechanical equipment to be mounted on steel springs.

85 dia. downpipe fixed to column, water to bed drained into sump.

Parking paypoints.

Bench.

H

D

LIFTS

STORE ROOM

STAIRS

STOREY 1

BASEMENT WALL:
Cavity basement construction with 350mm reinforced concrete retaining wall and 115mm internal masonry skin with openings for ventilation. Masonry wall to be supported with 230 wide masonry piers at 3900 centres, with a 0.45 poliolefin damp proof membrane between pier and concrete retaining wall. Finished with plaster and paint.

Centrifugal fan.

Motor.

PLANT ROOM

Mechanical ventilation (extraction only) of basement parking.

Service shaft.

Shear wall.

Aluminium louvre panel.

Granite paving.

Granite paving.

Power trowled concrete.

Granite paving.

Granite paving.
The Transvaal Museum

- The City Hall

- Existing Jacaranda trees

- Paving layout on sidewalks as per plan

- Existing Jacaranda trees

- Cavity basement construction as per detail 01

- Heteropyxis natalenis (lavendar tree)

- See detail 01 for bench construction

- 200 no-fines concrete base, with geopipes laid in herringbone pattern.

- 340 prestressed concrete slab

- See details for floor finishes

- INFORMAL TRADE

- 115 masonry interior skin

- Erythrinalysistemon (Coral tree) in planter

- See detail 01 for detailed information

- Ventilation

- 1000mm wide cavity for services and ventilation

- MALE WC

- ORIENTATION

- STAIRS

- STAIRS

- Stormwater drain with perforated granite cover to match

- 38x38 Iroko slats nailed to 75x150 Iroko posts @ 1100 centres and fixed to slabs

- Glazing as per detail 02

- All glazing to be 10 thick laminated glazing fixed to steel sections with structural silicon.

- See detail 02 for construction method of flat concrete roof

- Bench: Pre-cast concrete wall and frame with timber

- Stormwater from ground floor to bedrained into planter and into downpipe that is connected to a pipe that is fixed to side of planter. Drained into municipal stormwater pipe.

- SRK GALLERY & EXHIBITION

- MULTI-PURPOSE & SEMINAR ROOM 1

- MEZZANINE

- Louvred aluminium panel for air-conditioning plant room

- Acoustics: 25x25, 25x38 & 25x50 Iroko timber slats are alternately nailed to approved gypsum acoustic panels

- Stormwater drain, into downpipe which is to drain into sump

- Excess stormwater into boomgate

- Ticket machine

- Ramp to have a gradient of 1:8 min. As

- Audiorium

- Prestressed concrete beam

- Stormwater drain with cast iron grating

- Louvred aluminium ventilation panel

- Air-conditioning duct in suspended ceiling

- Air-conditioning vents in ceiling

- Air-conditioning duct

- Louvred panel

- Stormwater drain with cast iron grating

- Acoustics: 25x25, 25x38 & 25x50 Iroko timber slats are alternately nailed to approved gypsum acoustic panels

- Air-conditioning duct in suspended ceiling

- Air-conditioning vents in ceiling

- Air-conditioning duct
12. References