07

DESIGN SOLUTION:

The Taxi transit Park located within the urban environment was envisioned as a sustainable multi-functional complex of buildings. Taxis are a transport system using carbon dioxide this requires a move towards sustainability resulting in a new typology. Using canopies for protection is not sufficient anymore. The taxi facilities should represent the symbiosis between the various role players. Taxi facilities should move away from extremes (see Mahube in Mamelodi) where an over designed urban field does not contribute to the city. From afore mentioned it was concluded that a taxi rank should be defined as a sustainable urban park.

Through planting trees and vegetation the carbon footprint of the taxis (and their users) can be reduced. In addition green spaces could re-establish a sense of place. The use of recycled material can further assist in reducing the carbon footprint. The harvesting of rainwater should be employed as part of the technical resolution of the design. Excess water is allowed filter into the landscape (hard and soft). Recreational sport facilities in the interest of the user should be provided. The result will be an increase in pedestrian attracting people during the day and night. By using this method to the communal aspect of the Taxi Transit Park is enriched.

Designated areas with proper facilities for the key users should be provided. Through proper allocation possible conflict between pedestrian and vehicle is minimised. Offices for taxi association and transport officials should be provided.

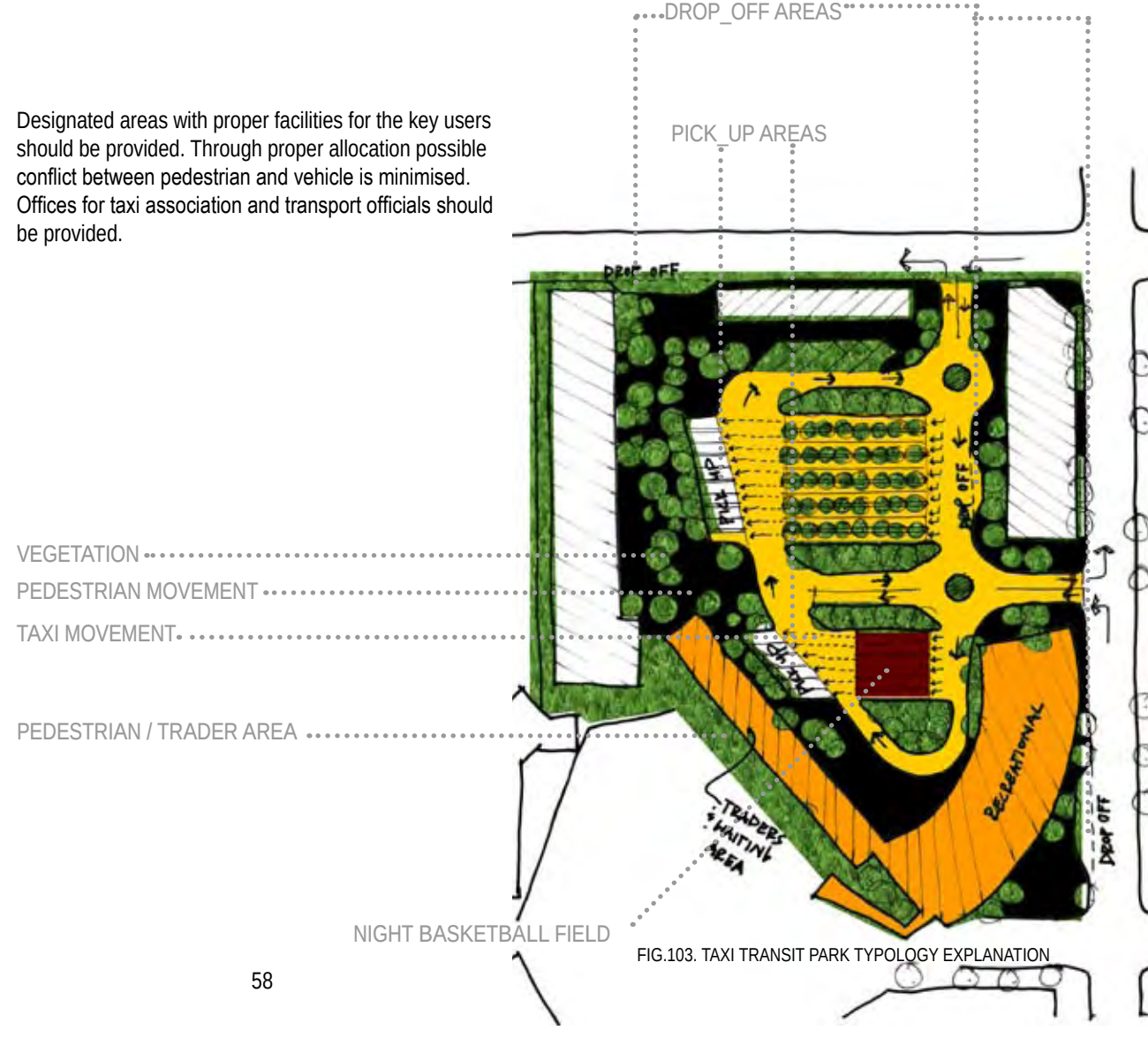

FIG.103. TAXI TRANSIT PARK TYPOLOGY EXPLANATION

SHARED FUNCTIONS

- The entrance (service foyer) and circulation area positioned around the main stairs. These stairs serve both main building and the offices.
- The services includes the following:
  - Refuse area
  - Recycle area
  - Plant Room
  - Store Room
- Restrooms: there are four ablutions facilities placed in the building.
  - The changing rooms for the boxing club.
  - The toilets for the taxi commuters.
  - The toilets for the retail area
  - The toilets for the office area.

PRIMARY FUNCTIONS

- Trader area with trading booths defining the waiting area for the commuters. This connects to the taxi pick-up area.
- Restaurants:
  - A traditional Pap & Vleis restaurant
  - A more conventional restaurant for instance (i.e. Wimpy).
- Retail:
  - Facilities
  - Post Office.
- South African National Council (SANTACO)
  - 10 Offices
  - 2 Boardrooms
  - 2 Offices for Secretary
  - 2 Offices for the Transport Officials.
- Boxing Club
  - Admin Office
  - Management Office
  - Open Plan Office
  - Biokenetic Office
  - 2 Studios
  - Warm up and training area.
- Kitchen for both restaurants and SANTACO office.

FIG.104. TRANSIT TAXI PARK ACCOMMODATION SIGNAGE DIAGRAM

FINAL DESIGN

The Taxi Transit Park is designed as a possible prototype for future taxi facilities. The building complex acts as a gateway between the Public Square, as required by the Urban Framework, and taxi area. Trader booths depicting jewellery boxes are scattered on the ground floor. The trader booths are a steel frame with polycarbonate infill panels. Their placement regulates the movement towards the water points further emphasising the path to the pick-up area. These areas are accentuated with solid vertical red face brick elements that originate from the concrete box gutters.

The structure and envelope for the offices consist of a concrete frame with glazing and red face brick infill. Steel mesh screens are employed as sun screening devices. A public gathering space in the form of a Restaurant connects the bridge with the service building, overlooking the taxi rank by day, and basketball court by night. The main focus on ground floor is the boxing club.

The upper level is accessed via a ramp on the public square side, and stairs on the side of the taxis. Various retail activities are hosted on the first floor together with a post office and an information sector. The transport officials' offices take on an identity of a commentator's box. The site is landscaped with trees and a roof garden over the building. When the need arises the building can be changed into a high rise building. The structure is also a concrete frame with glazing and off shutter concrete infill panels. Steel mesh acts as sunscreen devices on the western façade. Recycled rubber pavers are used around the building for pedestrian traffic.

The design remains unpretentious and it is linked to the landscape. The fixed structure and varied infills assists in this aim. The openness and potential flexibility allow for future change rather than only adhering to current requirements. The building contributes towards public space in an existing urban area where it is desperately needed. The spaces related to the traditional restaurant, traders and taxis respond toward the landscape. It offers shelter, it is open to sky space at times and covered elsewhere. Within this context the building forms on human scale an extension of the podium of Kruger Park and Schubart Park.

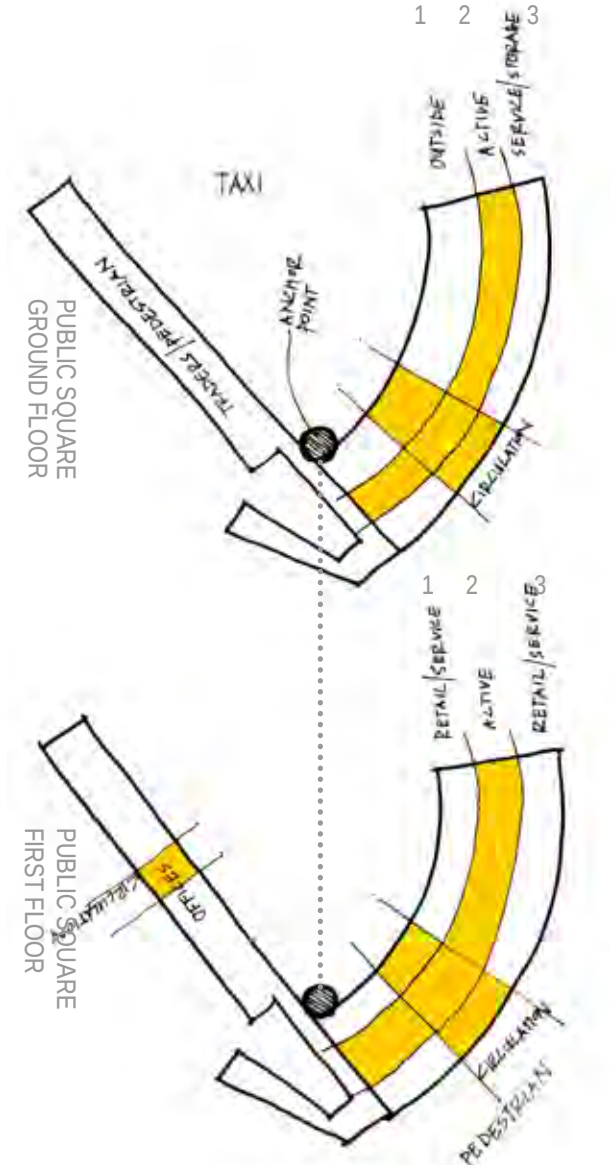

FIG.105. TAXI TRANSIT PARK DIAGRAM PLAN

CARBON FOOTPRINT TRADE-OFF

FIG.106. VEGETATION PULLED OVER THROUGH TRANSIT PARK

HUMAN SCALE PLINTH

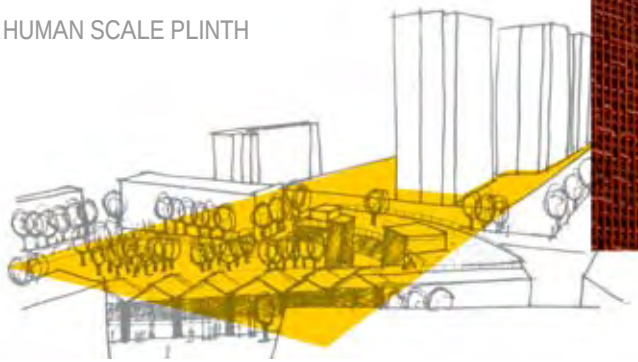

FIG.107. BUILDING AS EXTENSION OF KRUGER & SCHUBART PARK PODIUM

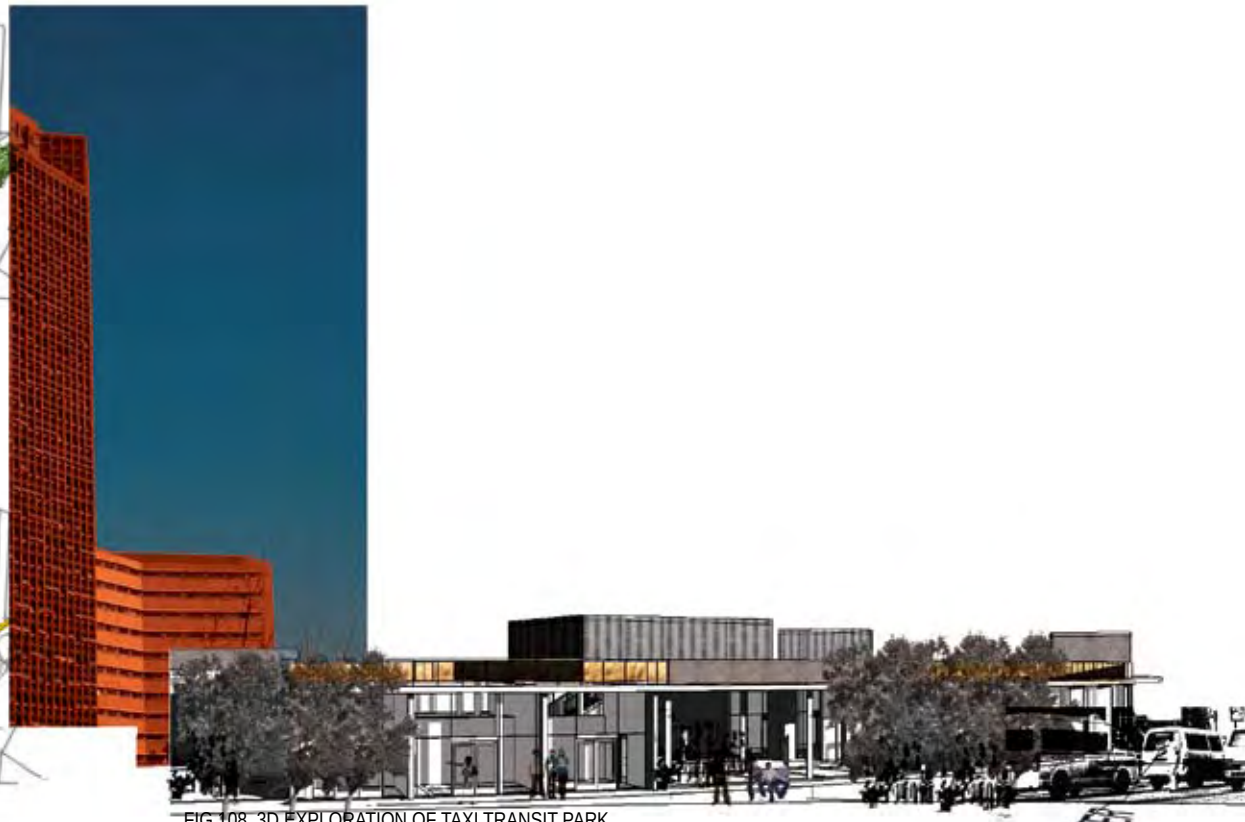

FIG.108. 3D EXPLORATION OF TAXI TRANSIT PARK STREET FACADE

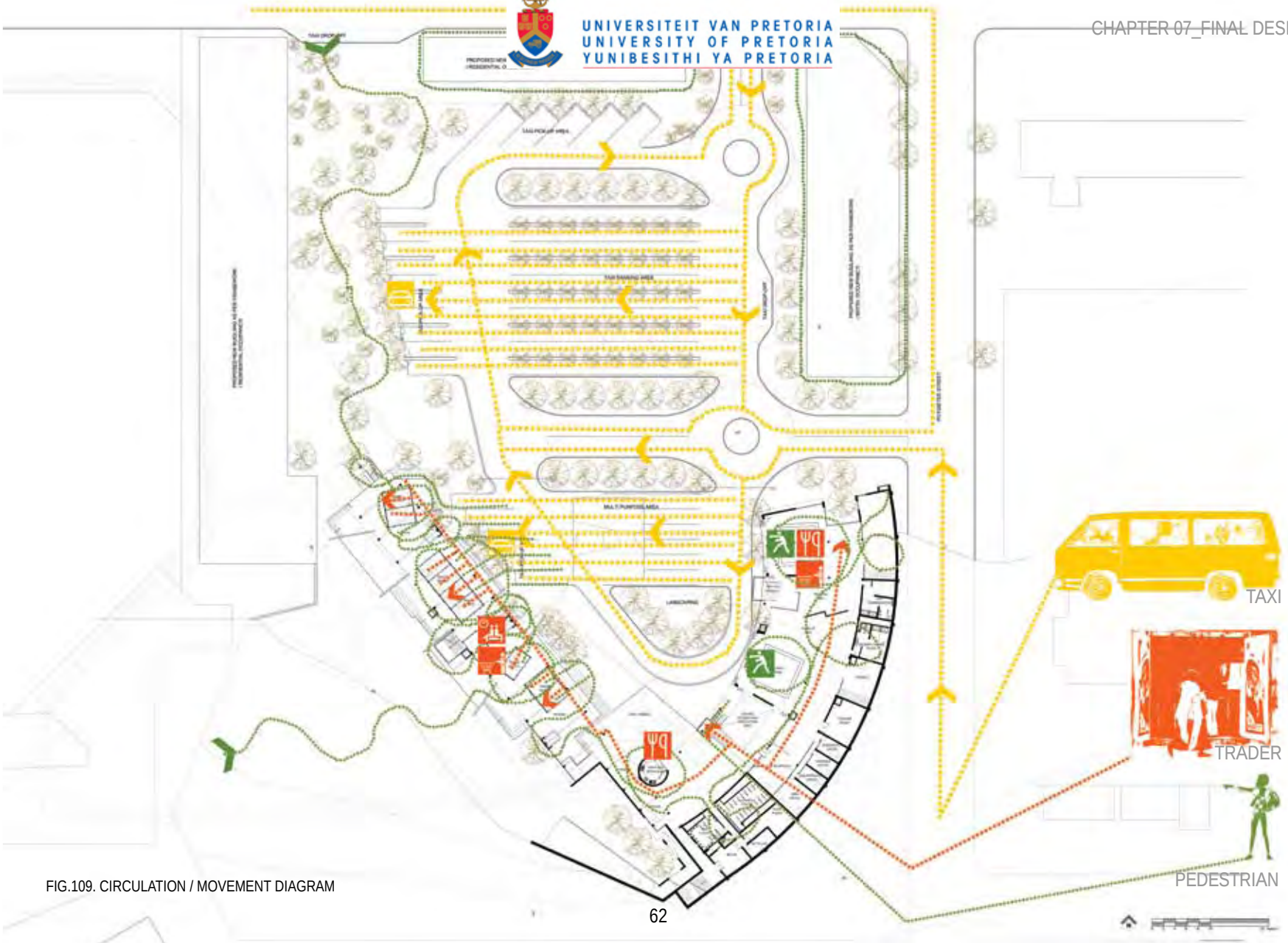

FIG.109. CIRCULATION / MOVEMENT DIAGRAM

FIG.110. 3D EXPLORATION OF TAXI TRANSIT PARK WAITING AREA

FIG.111. INSIDE 3D EXPLORATION OF TAXI TRANSIT PARK

FIG.112. 3D EXPLORATION OF WATER POINT

FIG.113. TRADER BOOTH JEWELLERY BOX IN WAITING AREA

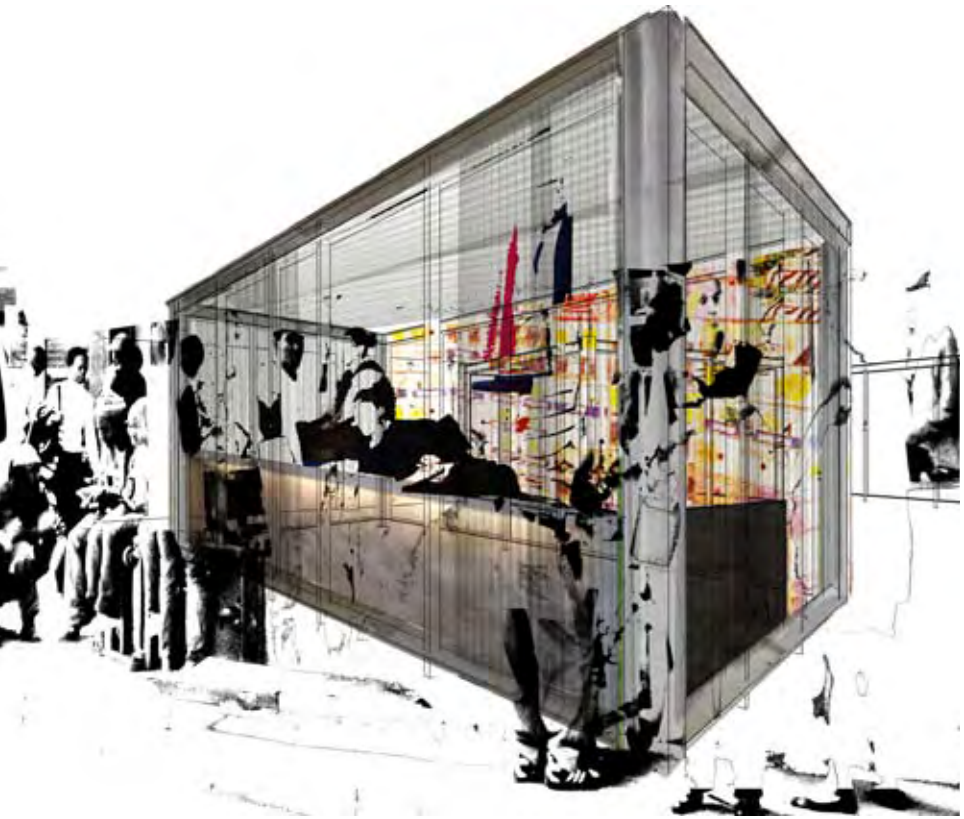

FIG.114. TRADER BOOTH JEWELLERY BOX IN WAITING AREA

08

VEGETATION

Motor vehicles are weighty contributors to global warming their Carbon footprint should be considered in any design. As previously discussed the new typology for taxi ranks require a green trade off to reduce the taxis Carbon footprint. However all the trees should not necessary be accommodated on the premises it could also be positioned along the route (productive landscape). This consideration renders taxi rank a multi functional space that allows for activities.

CALCULATION FOR CARBON DIOXIDE TRADE

According to the Carbon free PATT foundation a large tree will absorb approximately 20.3kgs of carbon dioxide / annum during its 40 year life span.
Emissions factors are required to estimate the CO2 impact per km (or passenger-km, tonne-km) from passenger and freight transport. An assumption is made from the Department for Environment Food and Rural Affairs Table 15 p20 that the emission factor of taxis is 224.4gCO^2 per km. 73 Taxis on site. An assumption is made of a third of the taxis for each destination.

DISTANCES
• Atteridgeville single trip is average 15km: Double is 30km
• Mabopane single trip is average 35km: Double is 70km
• City CBD single trip is average 1.2km: Double is 2.4km: Average 4 trips a day is 4.8km from proposed site.

ATTERIDGEVILLE

30km x 224.4gCO^2	= 6 732gCO^2 per day
6 732 gCO^2 x 365days	= 2457 180 gCO^2 per year
	=2457.2 kgCO^2
2 457.2 / 20.3 year	=121 trees per taxi for a
121 trees x 24 taxis Atteridgeville destination	=2 904 trees for

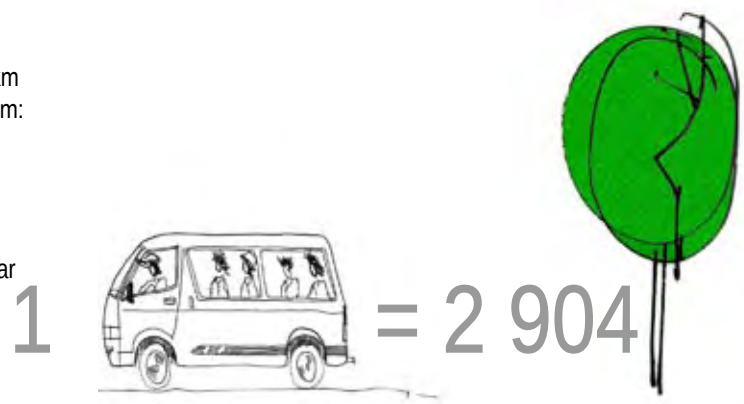

FIG.115. ATTERIDGEVILLE TAXIS CARBON TRADE

MABOPANE

70km x 224.4gCO^2	= 15 708gCO^2 per day
15 708 gCO^2 x 365days	= 5733 420 gCO^2 per year
	=5 733.4 kgCO^2
5 733.4 / 20.3 year	=283 trees per taxi for a
283 trees x 24 taxis destination	=6 792 trees for Mabopane

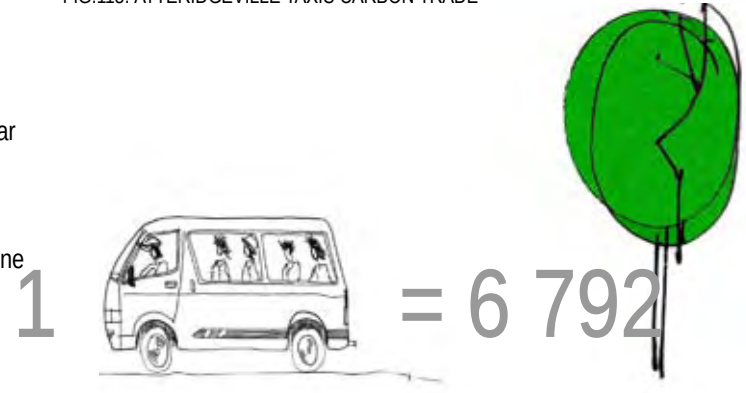

FIG.116. MABOPANE TAXIS CARBON TRADE

CITY

2.4km x 224.4gCO^2	= 538gCO^2 per day
15 708 gCO^2 x 365days	= 196 574 gCO^2 per year
	=196.6 kgCO^2
196.6 / 20.3	=10 trees per taxi for a year
10 trees x 24 taxis	=240 trees for City CBD destination

TOTAL

2 904 + 6 792 + 240 = 9 936 trees ≈ 10 000 trees
200 trees on site
Estimate of 1000 trees in Productive Landscape

PROPOSED TREES:

Fruit bearing trees for Productive Landscape.
Combretaceae (River Bushwillow) for Taxi Rank Facility
Olea europaea Africana (Wild Olive) outlining edge of facility. Both trees are indigenous evergreen trees with dense foliage.

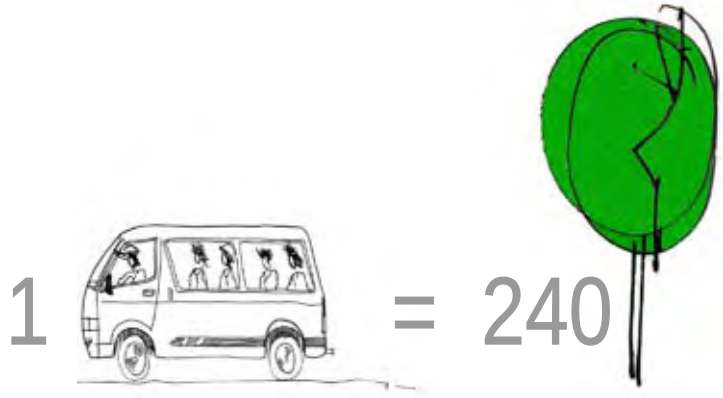

FIG.117. CITY CBD TAXIS CARBON TRADE

FIG.118. RIVER BUSHWILLOW AND WILD OLIVE TREES

PAVING

RUBBER PAVEMENTS

South Africa faces a major environmental problem with the volume of waste tyres generated. As many landfill sites do not accept waste tyres for disposal, large quantities are dumped in the veldt. These are then either burnt, to recover the steel content, contributing significantly to air pollution. Of the tyres are recovered and sold as second-hand tyres leading to excessive road accident statistics (Department of Environmental Affairs, 2009). The other option is to recycle the tyres at one of the two 'tyre recycler' companies in South Africa. The two companies are Vredestein SA Recycling & Alrode and SA Tyre Recyclers in Atlantis. These companies process the old tyres into "rubber crumbs" that are being sold at R2 per KG to companies like master Rubber which in turn manufacture products for instance rubber sheets for playgrounds and parks from the rubber crumbs. At present no company manufactures rubber pavers as it is too expensive to manufacture, but Rubber pavement Blocks are being imported by a company called Spectrum. Master Rubber manufactures rubber blocks 300x300x12mm and claims that they can manufacture rubber pavers. The upcoming law about recycling tyres will be implicated in 2010 (Department of Environmental Affairs, 2009), stipulates that all tyres must be recycled and a green fee added to each new tyre sold in South Africa. Through this an established network will form of registered companies, waste tyre agents and a waste tyre industry. With this law it is an ideal opportunity to implement the use of rubber pavers for all new taxi transit facilities, as the technology exists and there is a movement to a greener South Africa. Rubber sidewalks are a modular sidewalk system made from recycled tyres with a polyurethane binder and colorant, and is particularly intended for use near trees (Rubbersidewalks, Inc, 2009). Just to give an example of a whole tyres' equivalent: 2 500 tyres are needed for 1km road porous bitumen additive, and 1400 tyres for a 25mm playground surface of about 500m². Reason for Rubber sidewalks being green:

- Post-consumer recycled material
- Reduces renovation impacts
- Reduces pollution or waste from operations

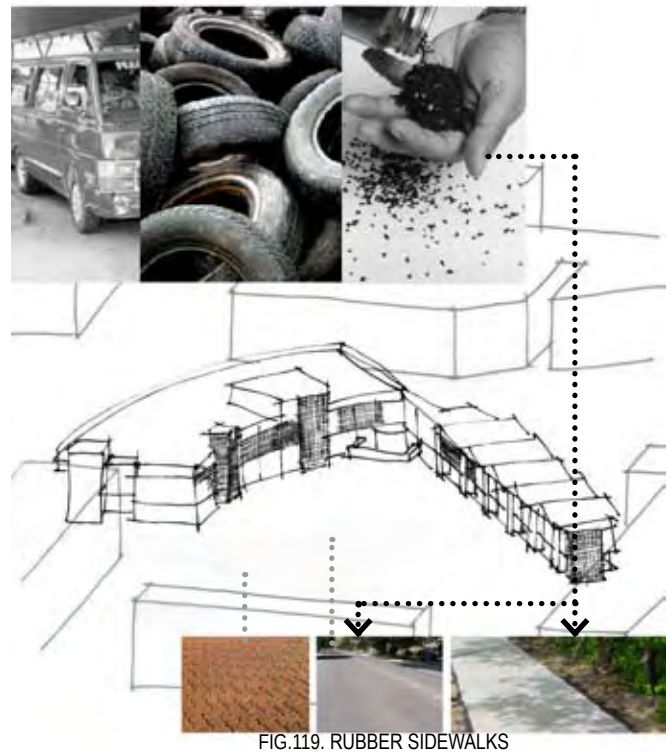

FIG.119. RUBBER SIDEWALKS
FIG.120. G BLOCKS PAVING
FIG.121. SITE MATERIALS DIAGRAM

G BLOCKS PAVING manufactured by INFRASET for taxi ranking area.

Reason for using G Blocks:
- Ideal for heavy parking areas.
- Little maintenance required
- G Block can be 80% recovered and reused
- Contribute to site drainage (www.infraset.co.za)

CRUMBED RUBBER ASPHALT for the road and night basketball play court:

Reason for using Asphalt:
-produced from recycled tyre rubber crumbs
- change of colour and texture appropriate for basketball court.

MATERIAL CHOICE

There are two main driving factors in material choice. The first concern is practicality and the second concern that the building has to be a robust building because of its public programme with the focus on materials to be sustainable.

EXTERIOR

PG BISON SURINNO SOLID SURFACING
Used as infill panels underneath various office windows on building facade.

SURINNO Solid Surfacing is a homogenous, innovative, composite acrylic modified polyester resin system with pure inert fillers and proprietary colorants. The solid composition creates colour and pattern throughout the material that are being used alongside building facade (www.surinno.co.za).

RED FACEBRICK
Used at gateway wing to emphasise the catchment's area of the rainwater.

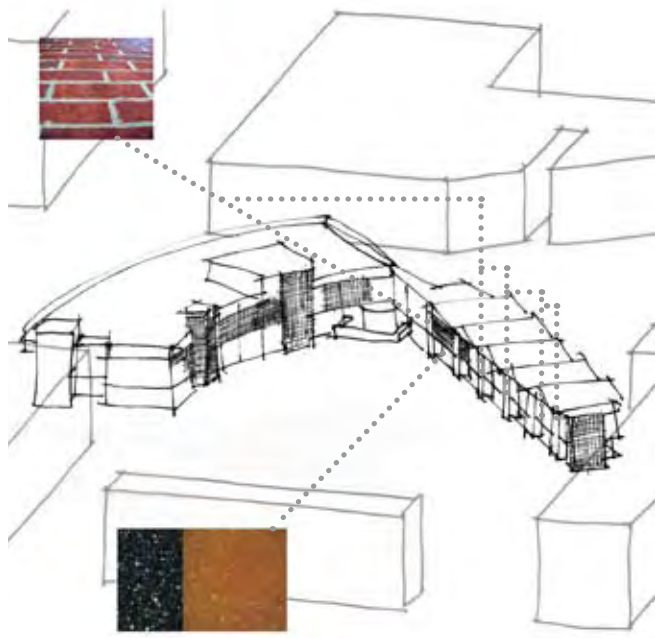

FIG.122. BUILDING MATERIALS DIAGRAM

CORRUGATED POLYCARBONATE SHEETING:
Used as infill panels for trader booth and lighting wall detail in First Floor Restaurant manufactured by Safintra (www.safintra.co.za).

Reason for use:
- Flexibility: virtually unbreakable, offer great design flexibility curving along and across corrugations.
- Longevity: guaranteed not to lose more than 8 % of the sheets light transmission in first 10 years and not more than 1% for every year thereafter.
- Versatility: Light weight with best combination of light and heat transmission.
- Maximum protection against harmful UV rays, allows 90% light through sheet and resistance to weathering makes it ideal for South Africa.

FIG.123. 3D BUILDING MATERIALS DIAGRAM

CONCRETE
Structure frame.
Off shutter concrete is used to emphasise box gutter details, and facade textures.
Cast in Situ concrete for roof.

GLASS
Infill glazing and window panels for shops, offices and the restaurant.
GKD MESH,
LAMELLA Mesh used for stair balustrade, and
KIWI Mesh used for exterior sun screens (www.gkdmetalfabricks.com).

CORRUGATED METAL SHEETING
Roof cladding for gateway wing.

COR-TEN SHINGLES
Ramp walls are clad with Cor-Ten to underline the theory of time and movement in building by means of colour change.

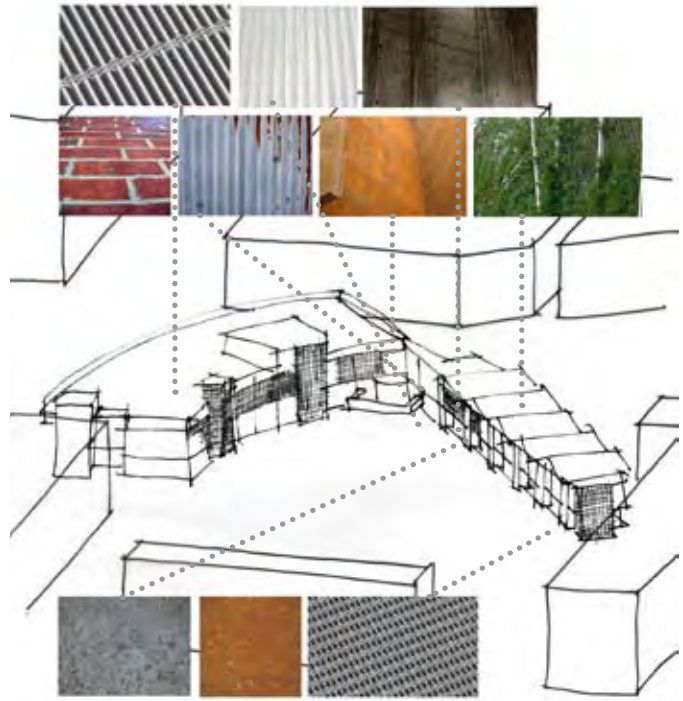

FIG.124. BUILDING MATLS DIAGRAM

VENTILATION

The design opted for natural cross ventilation throughout the building, except in the exercise studios and offices areas where mechanical cooling was required due to heat build up. HVAC units on 85mm concrete pediment are placed on roof for this reason. Vertical Stacks are placed over staircases to assist in natural ventilation. Floor to ceiling heights are increased with a roof garden that contributes to passive cooling, by means of plants and mass.

FIRE PLAN

According to SANS 10400

Three steel staircases are strategically placed that also functions as fire escapes. The travel distance from any point in the building to the nearest escape is less than 45m. An automatic fire sprinkler system is installed and receives its water from the wet core on the Eastern building edge (ASIB Automatic Sprinkler Inspection Bureau.) All steel members are painted with a thin-film mastic coating and all internal walls are fire proofed with a coat B-seal.

STORMWATER

Emphasising the sustainable design, retaining water is important. The roof garden reduce excessive overflow to a minimum. The excess stormwater drains by means of a screed that falls towards inlet gutters. On gateway wing water harvesting are directed from box gutters to Polyethylene Aqua Slim Wall tank used for water points. Within the taxi rank area G-block pavers are used to reduce stormwater run off through drainage. Stormwater catch pits are provided for excess stormwater connected to municipality stromwater sewer.

SERVICES

Vertical shafts are placed strategically in building to host various services from where horizontal ceiling ducts are used to feed selected areas.

CLIMATE

Permeable sun screens are carefully placed on Western façade protecting it against excessive heat gain and glare by preventing direct sunlight on floor surfaces. A planter screen is used for sun protection on the South Western Façade of the gateway.

FIG.125. FIRE STAIRCASES

FIG.126. VERTICAL SERVICE SHAFTS

FIG.127. MODEL PRESENTATION