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**UNIVERSITY OF PRETORIA**  
**DEPARTMENT OF ARCHITECTURE**

**LIVING CLOSE TO LIFE:**  
**SOCIAL HOUSING IN THE INNER CITY OF PRETORIA**

## **LIVING CLOSE TO LIFE:**

### **SOCIAL HOUSING IN THE INNER CITY OF PRETORIA**

Study of uplifting disadvantaged communities who live far from their daily base activities and development growth of the area

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(Professional)

MArch (prof)

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Information Technology

In memory of my eldest brother **Celso Jafete Timóteo Mavimbe**

29/11/66 - 24/08/07

May rest in peace

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## INTRODUCTION

Housing shortage in South Africa is a historic problem that has yet to be addressed. Pre-1994 in the apartheid era the separation both in terms of locale and economic opportunities with this basis based on race led to the construction of what we have now as townships.

These were poorly designed without focus on the economic socio-cultural viability of the peoples that populated these areas. The result; the creation of a built environment that became and still is a breeding ground to a lot of social economic and cultural ills. Out of this developed the base on which the “Struggle” led by the ANC that led to the liberation of the people that were marginalized in this system. This liberation came to pass in 1994 with the election of the ANC. With the election of an all encompassing government who have made the issue of housing a priority.

A priority that has to date failed to cover and balance out the issues that were brought about as a result of past planning practices.



Figure 1.0.1 Standards housing for disadvantaged communities designed by Apartheid regime.

(The Social Housing Foundation, 2000:4)

As a result of the delay in addressing these ills born from a troubled and unpleasant past the masses have resorted to strikes in an effort to force the government address their distress making housing and housing delivery a priority especially in the township areas.

The Apartheid system was designed in such a manner as to contain the “disadvantaged” people in areas that were far from their workplaces and the economic hubs within the cities towns and municipalities. This allowed that system to control and continue to implement the marginalisation of the “disadvantaged” peoples.

This implies that people have to travel long distances and spend a lot of the marginal income they earn on moving from one place to the other. This thesis will attempt to address some of these issues and allow for the integration of various incomes in the same built environment with access to the amenities within the city and its surrounds.



Figure 1.0.2  
(Sun, 2007:1)



With abolition of apartheid an exodus of peoples from the lower economic environments to the more formalised urban areas has meant that the lack of housing facilities in the cities has increased with even greater ferocity than before, a catalyst to the growth of informal settlements within the urban contexts. These settlements happen in unsafe abandoned high rise buildings, on open green spaces and even with areas designated for services such as dumping sewage and the like. Inevitable leading to a breakdown in the urban fabric not to mention the unbearable conditions people are being forced to live in as a result of inadequate affordable housing with the urban context.

Many of these buildings do not have running water and the sewerage system is not working. People have no access to waste management and dump waste everywhere in the buildings and even in the streets. They also steal power by connecting electrical cables from electrical facilities to the buildings. However, the buildings have also become overloaded, putting additional pressure on poorly maintained services. In addition crime has become rampant because of the poverty stricken residents.

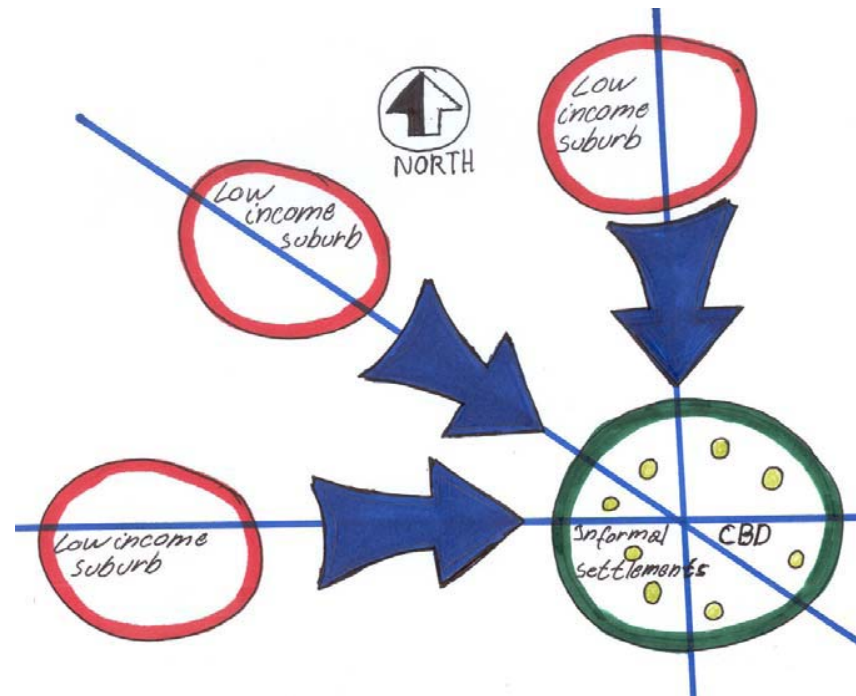


Figure 1.0.3 Diagram of people's moving from townships to CBD.

## PROPOSED PROJECT AIM

The proposed project aims to uplifting disadvantaged communities by providing appropriate affordable social housing in the Inner City of Pretoria and developing the growth thereof. The Inner City requires an innovation framework of new urban context demands. Throughout the investigation, the new concept design approaches architecture by thinking of people in relation to housing in an urban context.

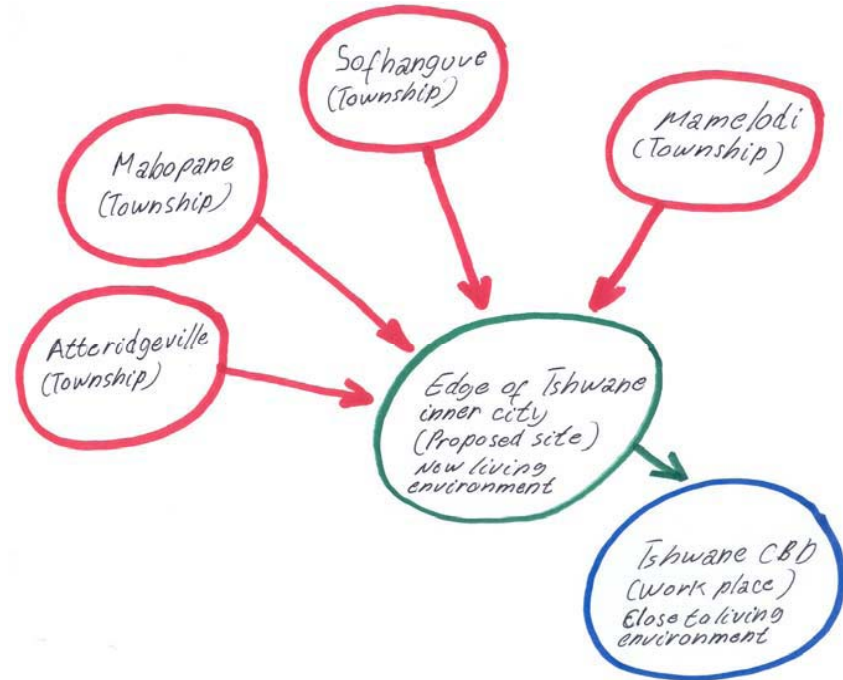


Figure 1.1.1 Project aim diagram.

## BACKGROUND

### THE FOCUS AREA

Over many years the North-west edge of Pretoria's Inner City has been forgotten by the development framework of Inner City integration. As a result the edge has a dead area with large open tracts of undeveloped land. The appearance of the area demonstrates a significant moment in the history of the city. To preserve the history and uplift social economic growth the site has been chosen as a pioneer project of the development process in the area.

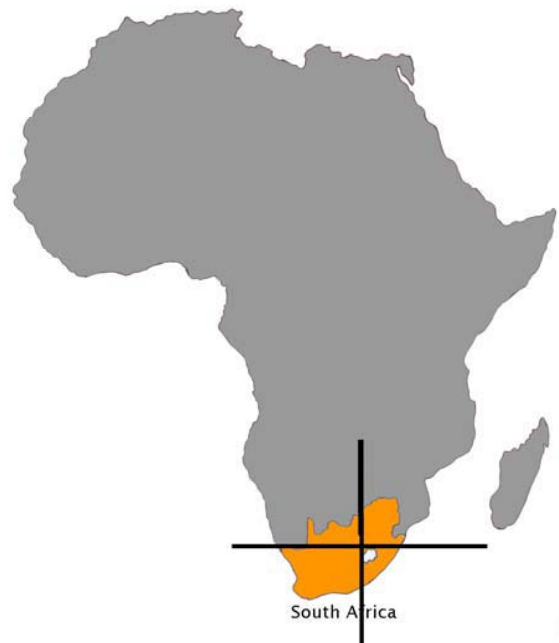


Figure 2.1.1 Location in Africa

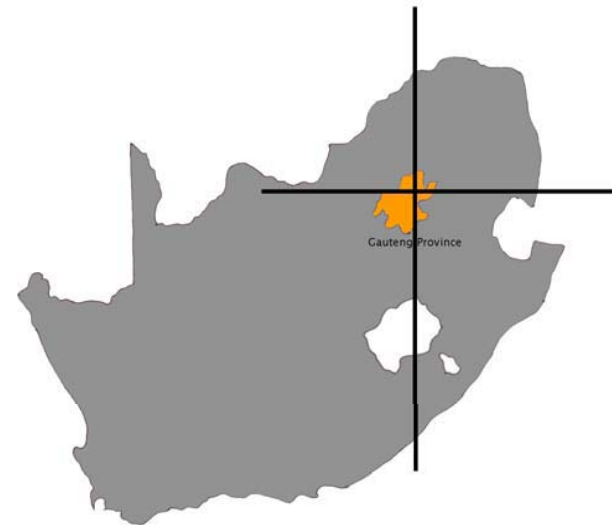


Figure 2.1.2 Location in South Africa

## SITE LOCATION

The proposed site meant to accommodate the social housing project is situated in the North-west of Pretoria Inner City, close to Marabastad. It is located on the corner of Schubart Street and Struben Street.

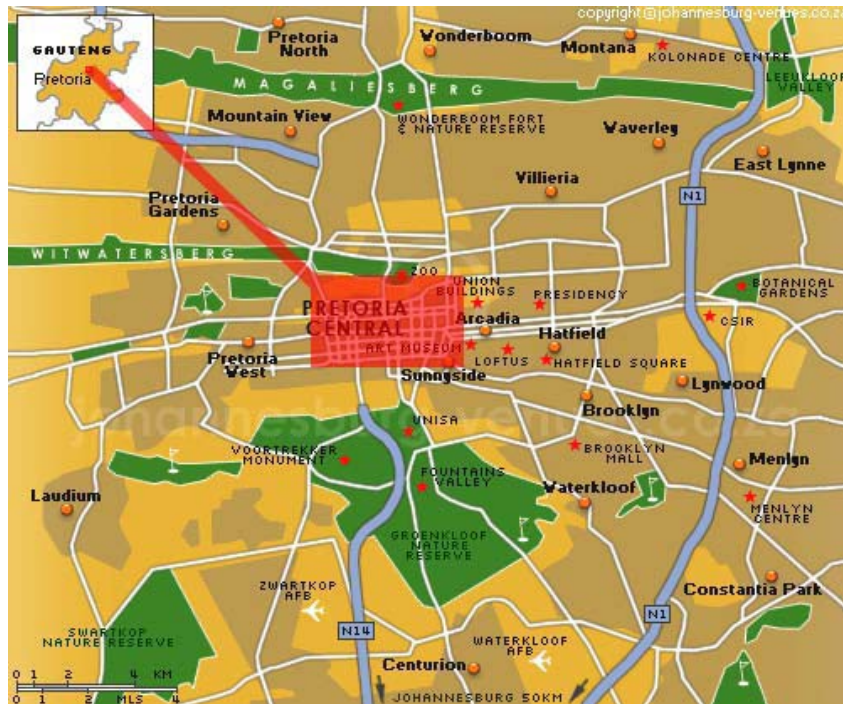


Figure 2.2.1 Location in Gauteng Province  
([www.johannesburg-venues.co.za/pretoria-map.htm](http://www.johannesburg-venues.co.za/pretoria-map.htm))



Figure 2.2.2 Location in Pretoria CBD  
(Department of Geography, University of Pretoria 2007)

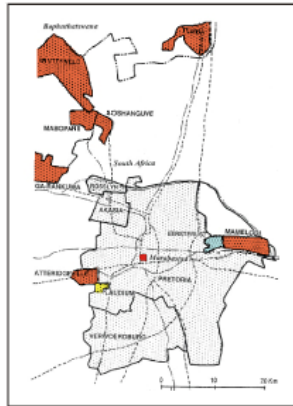


## HISTORICAL CONTEXT

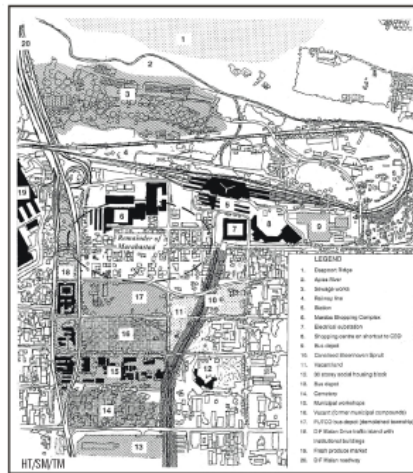
Marabastad plays an important role in the function of Pretoria. Over a hundred years ago Marabastad was not part of the Inner City of what was then Pretoria. It was planned by the Apartheid regime to accommodate mixed-use facilities for black, coloured and Asian communities. The growth of the black population, the Indian immigrants and the coloured community during the 20th century forced the Apartheid regime to pass new laws to stop the expansion of the communities towards the Inner City of Pretoria. The new relocation of the black community to the North of Pretoria drastically increased commuter traffic from the new townships to the city centre through Marabastad.



Figure 2.3.1 The transformation of Marabastad (Tayob, 2002: 42)



Divided Pretoria in 1990 (Source: Lemon)



Besieged Marabastad in 1990



Figure 2.3.2 Marabastad as a bridge from surrounding townships to the city.  
(Tayob, 2002: 60)

The new railway station, Belle Ombre, and associated bus and taxi ranks, was proposed by the regime in 1965 to deal with the increased traffic and was completed in 1981.

The development of the Belle Ombre Station established a node for trading and public transport. It acted as a bridge from the townships to the city centre and from Marabastad to other destinations around the country.

Marabastad was a vibrant mixed-used community environment. The end of this development process during the 1960's resulted in a downward spiral that made the area an inadequate place to live.

Crime, poverty, unemployment, homelessness, informal trading, inappropriate services delivered to squatters in open land and disintegrated community life emerged.

Post 1994 the South African Government on the basis of the new National Constitution appeared in 1996 to address the problems of the past, embarking on a new development programme for. An urban framework project to uplift Marabastad, and integrate it into Pretoria's Inner City

## URBAN CONTEXT

The area around the proposed site currently has a mixed-use function associated with it.

It consists of residential areas, commercial areas, open land and education and Government facilities. Most of the facilities are for the working class. The residential zone is situated to the South of the proposed site, along Proes Street. Considered as low cost housing it is accommodated within a complex of four high rise buildings, each more than 20 stories high. The complex has sport and recreation facilities. The existing recreation facilities are for children to use after school and are monitored by a supervisor.

The adjacent building, on the corner of Potgieter Street, is a 7 storey building housing flats, but is however not classified as inner city low cost housing.



Figure 2.4.1 The urban context around the site  
(Department of Geography, University of Pretoria 2007)





Figure 2.4.2 urban context



The East side of Proes Street comprises Government and education facilities. The education facility is a primary school for boys and girls from grade 1 to 7. Within a walking distance of 25 minutes from the proposed site there are existing recreation and historical facilities. The National Zoological Garden is situated in the North-east along Boom Street at the corner of Paul Kruger Street.

The Belle Ombre Train Station is located in the North-west along the extension of the Potgieter Street corner with Boom Street. Further, on the South-east, Church Square is situated in the centre of Pretorius, Vermeulen, Bosman and Andries Streets. The Paul Kruger House and a Church are situated to the South of the site, along Church Street

## **THE PROPOSED SITE CONTEXT**

The site is L shaped and falls in a smooth slope from the South-east of Proes Street to the North-west of Struben Street. It comprises 50% open land, with the rest covered by buildings. The existing built environment is made up of a car workshop and parking on Struben Street, at the corner with Schubart Street. Proes Street is occupied by a car workshop. A middle class school, with crèche and pre-primary levels from grade 1 to 5, is situated on Potgieter Street, at the corner with Struben Street.

The open land at the corner of Proes and Potgieter Street is used by the school as a sports facility. The other portion of open land on the corner of Schubart Street and Proes Street is an informal taxi rank.

The middle of the site is occupied by different informal and trading activities. Footpaths play an important role as a short cut between the streets.

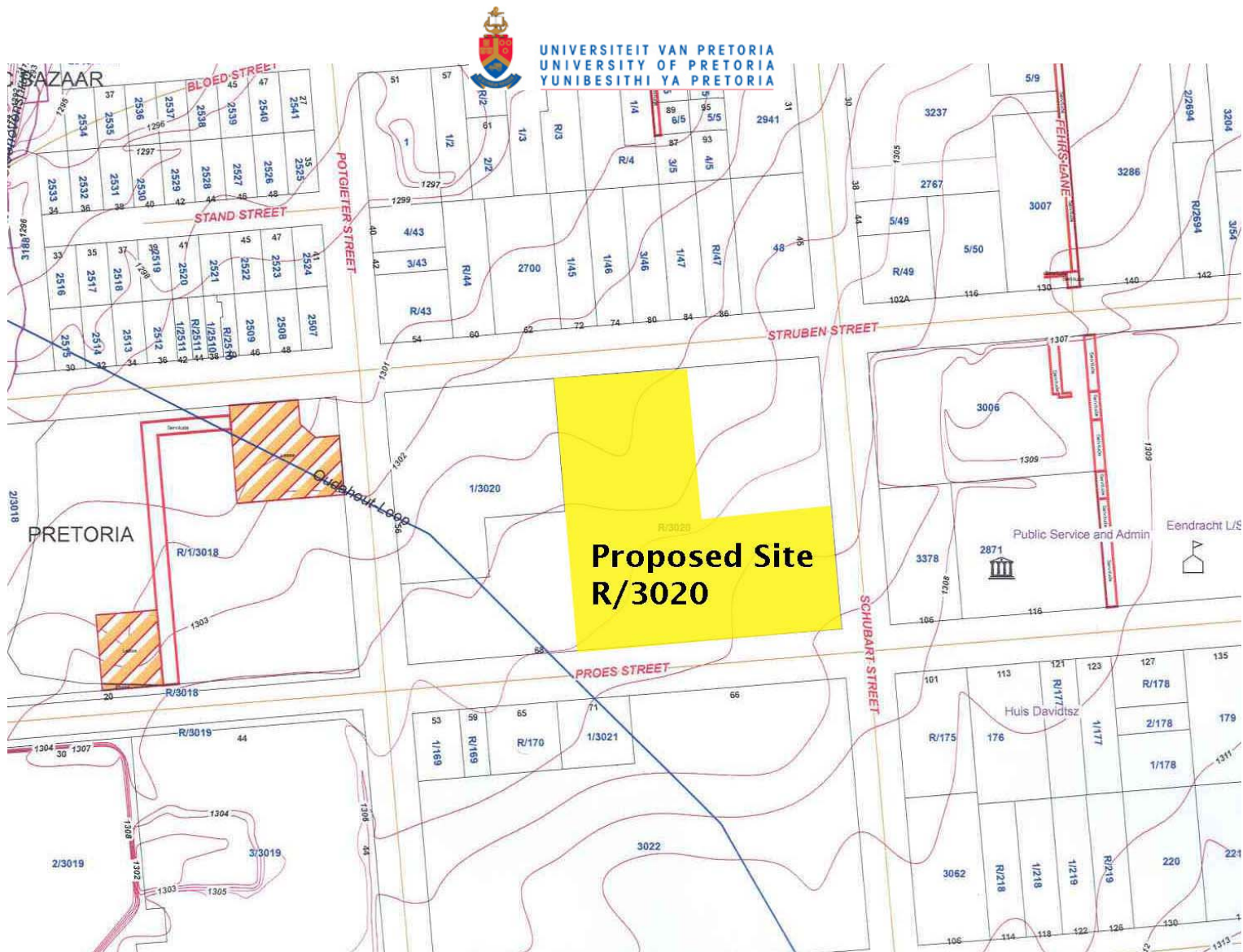


Figure 2.5.1 Site topography  
 (Municipality Council, Pretoria. 2007)

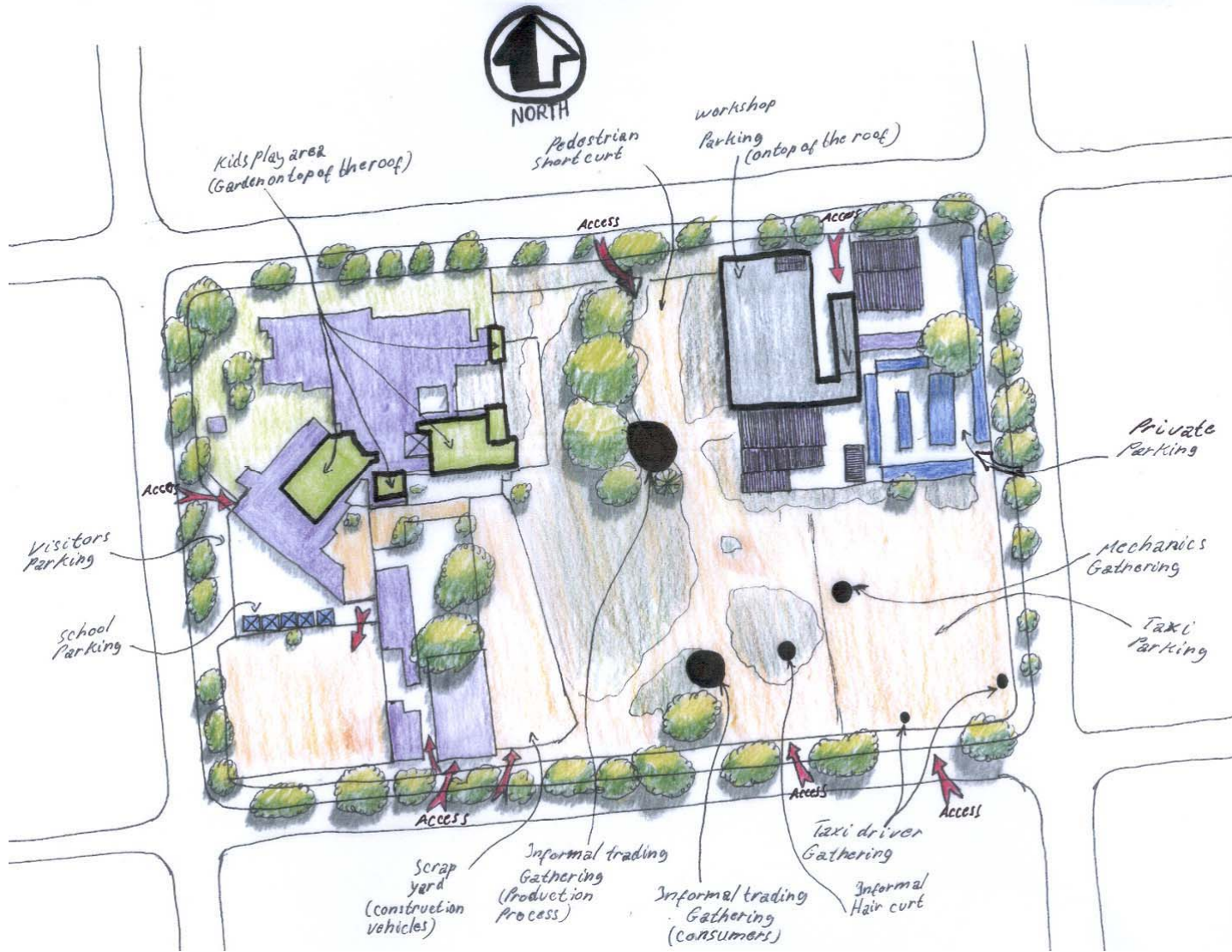


Figure 2.5.2 Existing activities on site





Figure 2.5.3 Car workshop on North-east of the side



Figure 2.5.4 Car workshop on South-west of the site



Figure 2.5.5 Rental parking



Figure 2.5.6 Education facility



Figure 2.5.7 Sport facility

## Transport and Routes

Public and private transport links the West of Pretoria and Pretoria Central Business District through Struben and Proes Street. Transport is frequent in this area. However, no bus stops exist on the site. The surrounding roads are not very busy. The distance from the site to Church Square is walkable. Pedestrian traffic is very low compared to bus and taxi traffic. Noise pollution is relatively low. The existing taxi rank on site is not a pickup point, it is only for parking services.

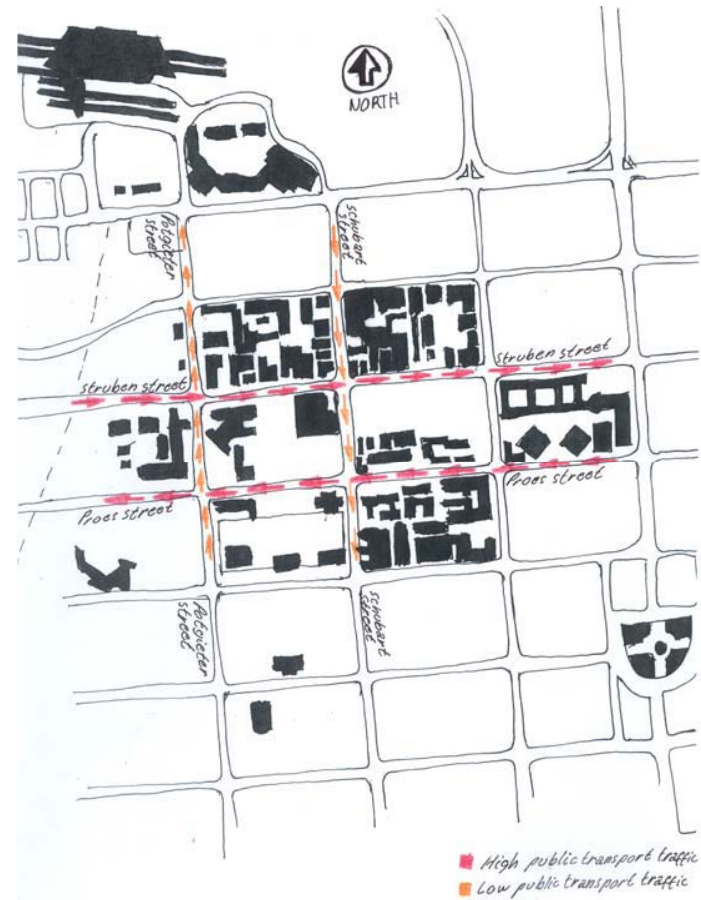


Figure 2.5.1.1 Public transport route

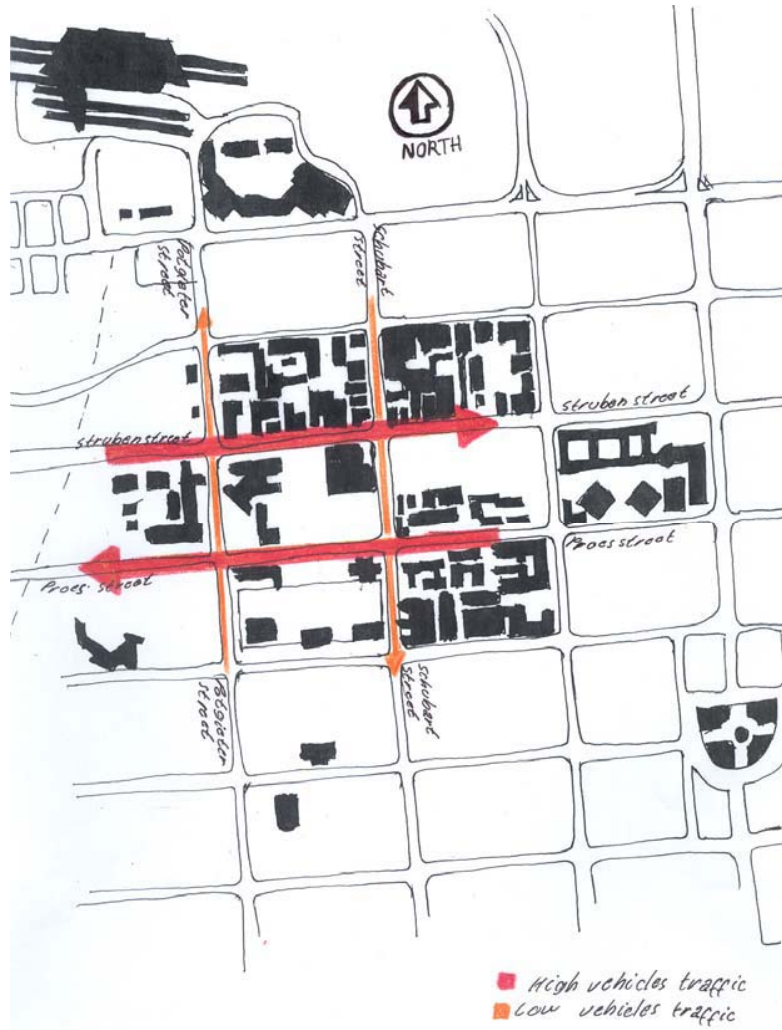


Figure 2.5.1.2 Vehicles traffic

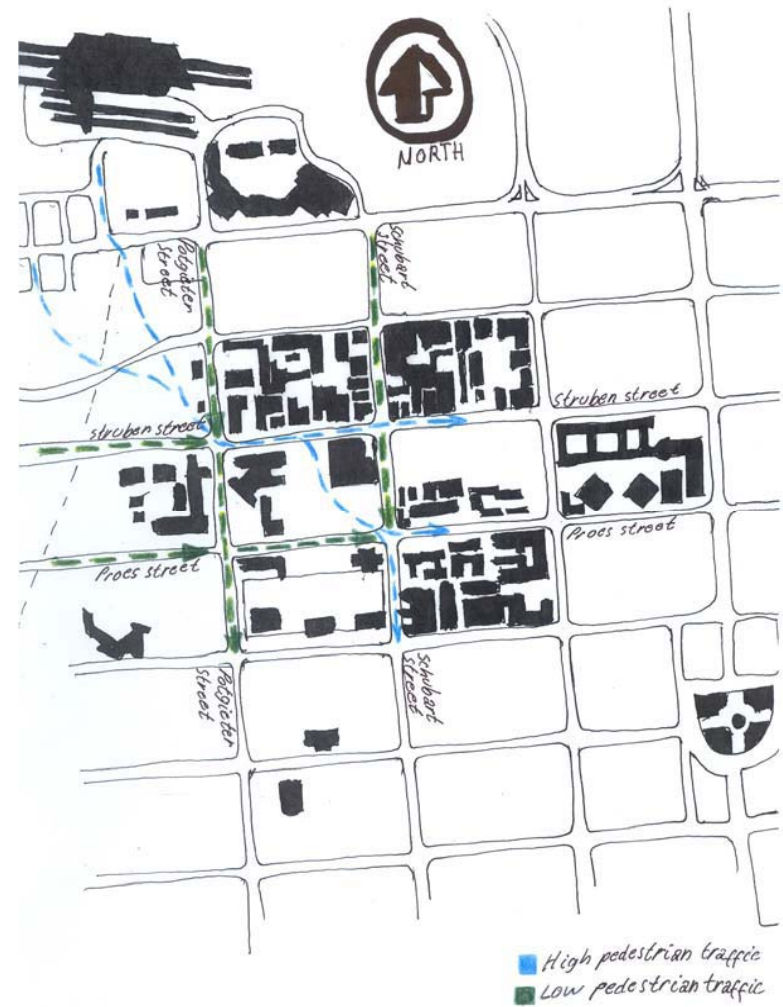


Figure 2.5.1.3 Pedestrian traffic



## Trading and Safety

Due to the open nature of the site, as well as the pedestrian traffic and the existing taxi rank, informal trading has emerged.

The businesses are run by homeless people who produce and sell their own goods and by hawkers who supply meals to taxi drivers.

The site is inappropriate to sustain these types of businesses. It does not have running water, sanitary or disposal facilities. Therefore, the informal trading has destroyed the environment through overcrowding. The site has also become unsafe and vulnerable for crime activities



Figure 2.5.2.1 Existing informal trading



Figure 2.5.2.2 Existing taxi parking



Figure 2.5.2.3 Foot paths layout  
(Department of Geography,  
University of Pretoria. 2007)

## Servitudes

The site's sewer connection runs along Proes and Schubart Street. No water connection runs on the proposed site. It runs on adjacent sites along Struben, Potgieter and Proes Streets.

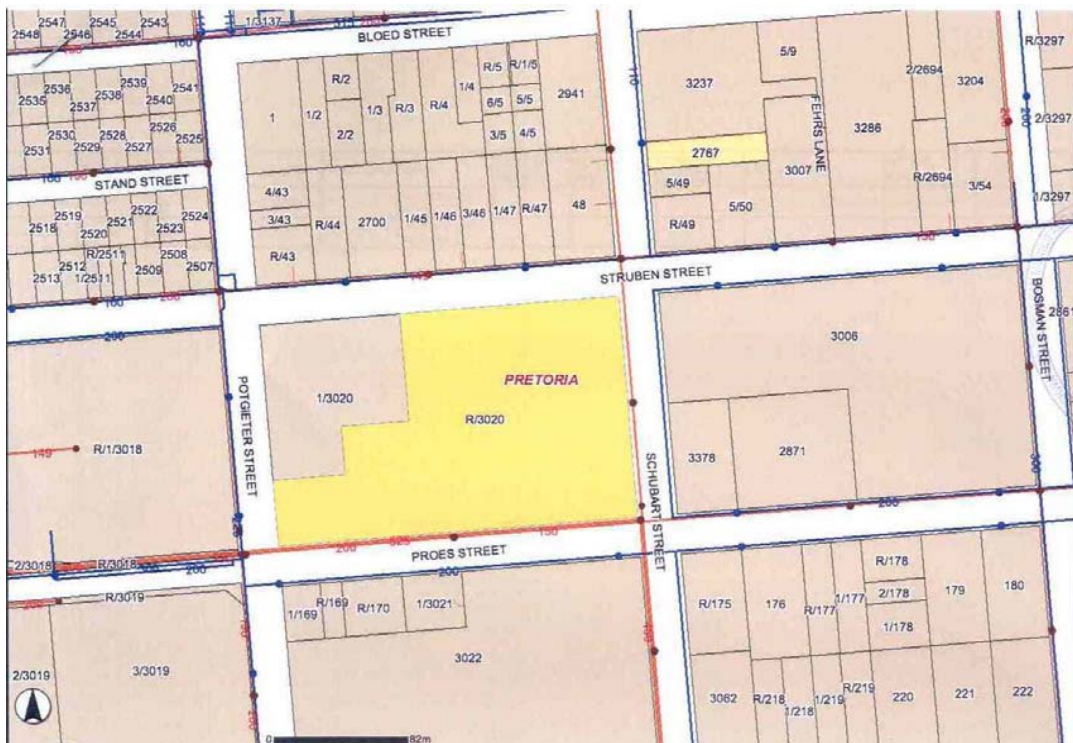


Figure 2.5.3.1 Servitude layout around the site  
(Municipality Council, Pretoria. 2007)



## Climate

The area is characterised by high temperatures during the summer season and low temperatures in winter. The rainy season is in summer, with an average rainfall of 741mm per year. “Mostly precipitation occurs in thunderstorms with rates of around 901 to 100mm per hour”. (A. Tayob, 2002:14)

The wind is not strong during either of the seasons. It blows mostly from the North-east in the morning and the North-west in the afternoon.

## SWOT ANALYSIS OF THE SITE

### **S** = Strengths

- Excellent site for a residential zone: calm, low noise pollution, easy access from Pretoria CBD along Proes Street and Pretoria West through Struben Street. Regular public transports and taxis along Strube and Proes streets.
- Close to education, recreation, historical facilities and the Pretoria CBD, which is within a 25 minute walking distance.
- Predominance of light industrial activities along Struben Street.
- High pedestrian movement during rush hour.

**W** = Weakness

- Open land, pedestrians use the site as a short cut.
- High level of homelessness.
- Predominantly unemployed people and hawkers use the land.
- Little pedestrian traffic after rush hour.
- Lack of market, shops, food outlets, parking bays, safety, public spaces and public toilets.
- Few bus stops along the streets around the site.

**O** = Opportunity

- Reinforce commercial facilities along the streets creating infrastructure for both formal and informal business activities.

**T** = Threats

- Crime activities.
- Slow development process.
- Lack of safety and job opportunities.
- Existing taxi rank parking.
- Alcohol abuse amongst the homeless.

## SITE ZONING

The proposed site is under the zoning certificate: Remainder of ERF 3020 Pretoria, Pretoria Town-Planning Scheme, 1974. This indicates that the site shall be used only for general business and residential areas.

## Site Coverage

The total coverage of the buildings shall not exceed 50% of the site.

## Site Height Restrictions

The maximum height of the buildings shall not exceed 16 metres

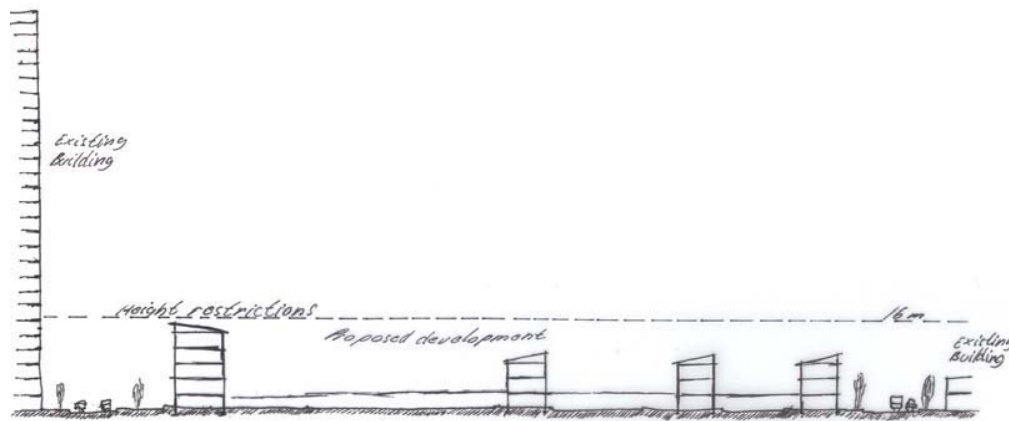


Figure 2.7.2.1 Height restriction

## Site Parking Requirements

The buildings shall provide demarcated parking spaces with manoeuvring space and 4 parking bays per 100m<sup>2</sup> gross floor areas.

## Site Floor Space Ratio (FSR)

The maximum floor space ratio (FSR) of the buildings shall not exceed 0.7

## Building Lines

The building lines are 3.5 metres from the boundary line of Struben and Potgieter Street. The site has an excellent context for a Social Housing Building. It is close to the centre of the Pretoria Central Business District. Transport routers, education, historical and recreation facilities are within walking distance. Walking distances will reduce the time and cost of transport along the routes, from home to work and school and vice versa.

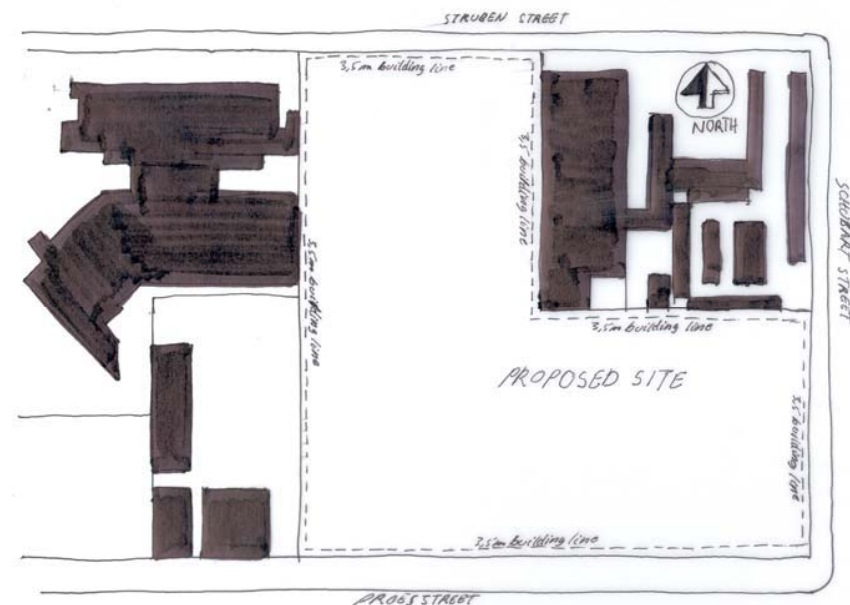


Figure 2.7.5.1 Site building lines

## PROPOSED DEVELOPMENT FRAME WORK

Aziz Tayob Partnership Architects Inc was appointed by the City Planning and Development Department of the City Council of Pretoria in 1997 to propose the integration of the urban design framework for Marabastad into the grid of the Inner City.

The proposal was based on physical and social economic issues related to urban design and environmental reintegration. The urban framework is aimed to develop guidelines for a roads network, site layout, informal trade, public transport and public spaces in order to engage the socio-economic context of the Inner City. According to this proposal the chosen site was designed as a high-density residential and commercial zone.

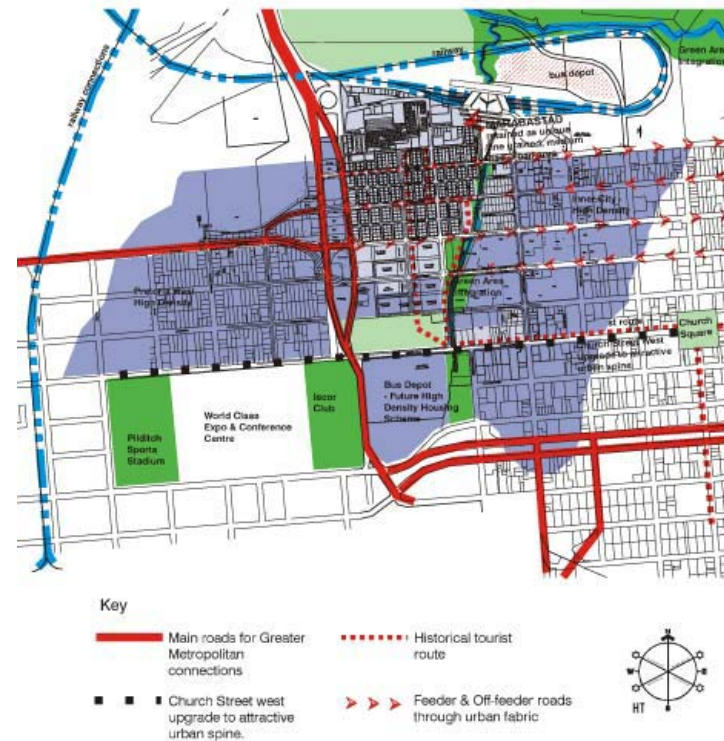


Figure 2.8.1 Proposed integration to the Inner City (Tayob, 2002:5)

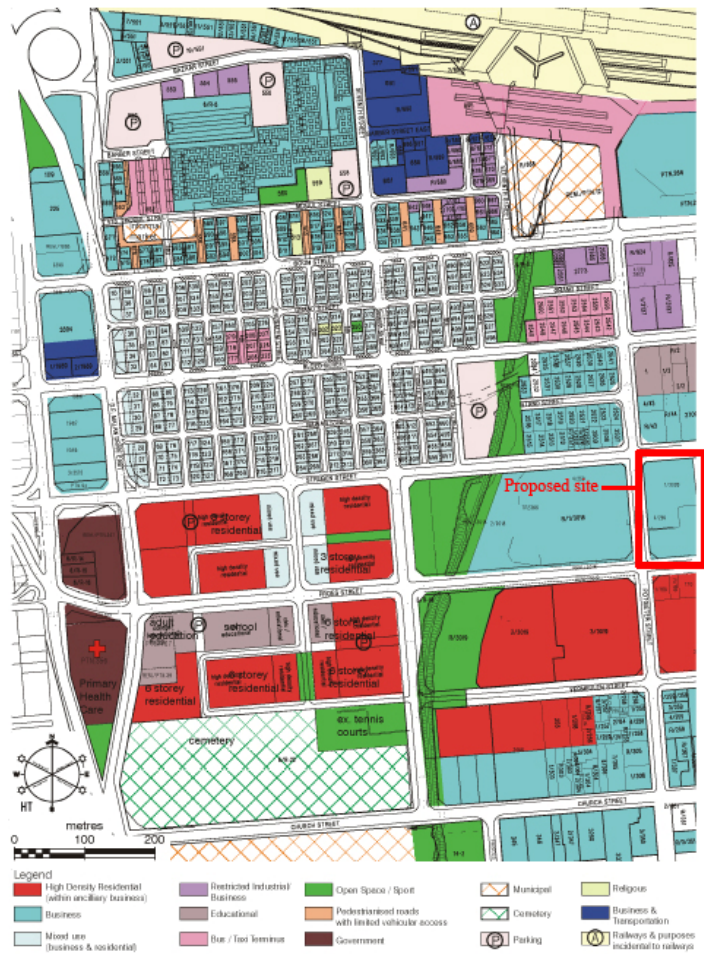


Figure 2.8.2 Proposed zoning  
(Tayob, 2002:22)

The physical aspect was to be integrated by defining the areas between Marabastad and the edge of the city through a transition in scale and density, where urban context (transport infrastructure and green spaces) and building context (heights and building function) filter into the city. On the other hand the socio-economic proposal integrates the community in uplifting programmes with regard to finance in housing, marketing and other diverse potential investments that re-establish the area as a tourist destination, and as a better place to live in Pretoria city. According with the framework, the proposed site was zoning for business.

## BASELINE DOCUMENTATION

The proposed project is committed to create sustainability, by making it both affordable and durable. It will provide suitable quality accommodation, services and facilities through design concept and sustainability methods.

In the architecture concept, sustainability is used as a tool of building design which applies the most appropriate material choices. The dominant natural resources are natural climate, vegetation and mechanical (solar panels, green house effect and water harvesting). These have been used in the building design to reduce consumption of energy and water.

Design, social, economic and environment issues are the aspects that need to be analysed and applied to provide sustainable development.

To make the project sustainable social issues will be analysed in terms of flexibility, accessibility and the necessary facilities to satisfy the needs of the users.

Economic issues will focus on local contractors, materials, labourers, existing facilities, site orientation and building construction regulation regarding the specific site.

The aim of the economic study is to reduce the project and maintenance costs.

Environmental issues will deal with natural energy and pollution to create an appropriate place to live.



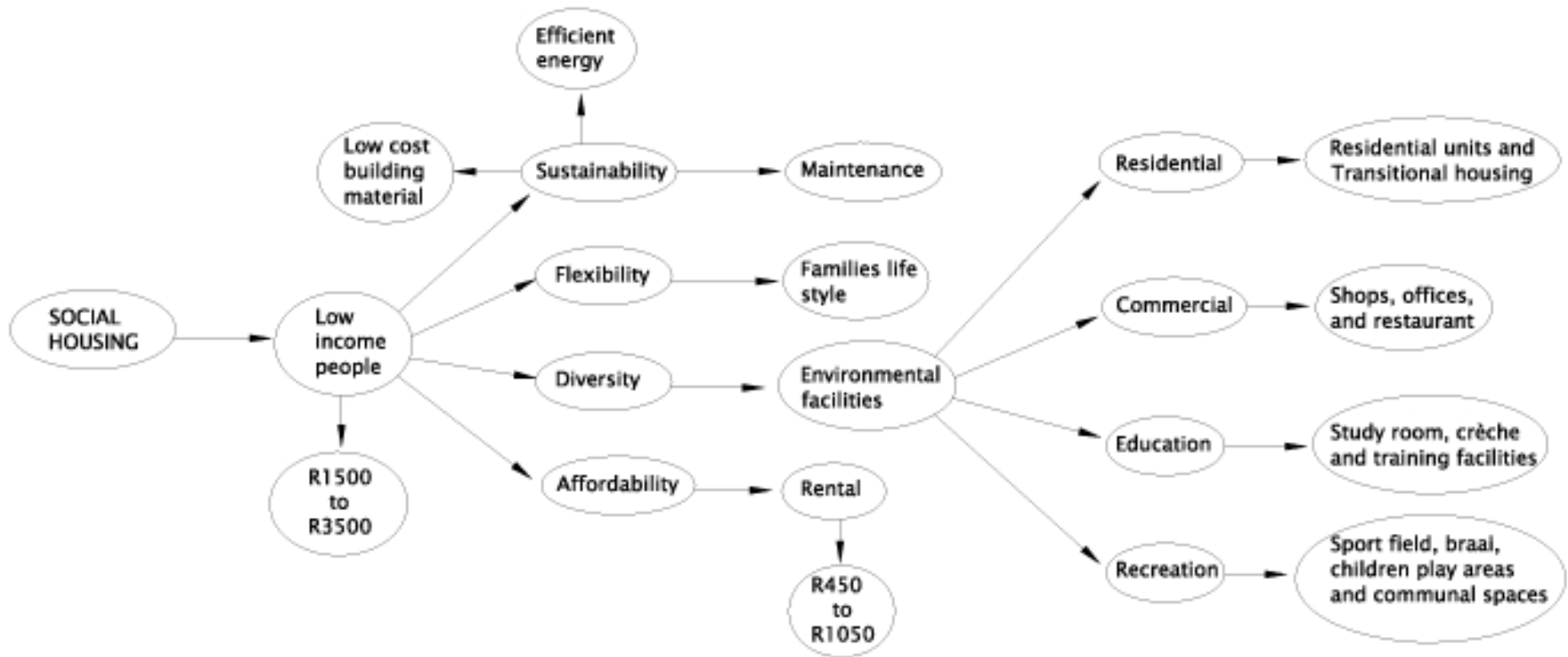


Figure 3.0.1 Concept diagram



## BRIEF

The project aims to propose better quality housing for low-income people. It provides sustainability, flexibility, diversity, and affordability, where people can live close to their work and school, etc. The project also aims to propose a social housing principle as a guideline for social and economical programmes that will uplift the disadvantaged communities by improving their income and lifestyle. The proposed programmes will be divided into two periods: the first into 8 months and the second into 5 years.

The programmes established by the proposed project aim to train people to reduce lifestyle costs and increase financial growth. The training programme of 8 months will allow people to gain knowledge that will improve their business skills and the necessary skills for living in a community. After financial growth and skills training in the proposed period they will move out and live on their own.

The programme will be monitored at the Social Housing Institute in such a way that in 8 months and 5 years time the residents will be able to leave the project, and find alternative housing. They will be better able to sustain themselves and the project will then recruit other families. The programme is for people who live far from their work in the Pretoria Central Business District and are earning between R1500 and R3500a month. They will be living within rental criteria of between R450 to R1050 a month in a period of 8 months to 5 years. It is a non-profit service. The building facilities will not be sold to any private companies or individuals. The rental charge from residential units and commercial facilities will be used to maintain the project.

## The client

The Matabane family is one example of disadvantaged people who live in a difficult home scenario. They live in a Reconstruction and Development Programme House (RDP) in Mamelodi Township, North-east of Pretoria. The family is made up of five members: parents and three children (a girl and two young boys). The father is the only member that has a permanent job in the Pretoria CBD. His monthly income is between R 2000 and R 3500. The mother is a homemaker and sells fruits and vegetables in the front yard of their house. The boys are still in primary school. The oldest girl has finished matric and could not continue her education towards University due to financial restrictions.



Figure 3.1.1.1 RDP housing with commercial facility (Hair Salon)

Figure 3.1.1.2 Example of a family selling good in the front yard



She runs a small plaiting business, also in the yard of the house.

Transport is available in various ways. Train, busses and taxies are the commonly available public transport, which have a different price from Mamelodi to town and vice versa. The route by train costs R13 and it is R18 for the taxi on a daily basis.

Mr Matabane travels to work by train every day. He spends R4.50 in the morning and R8.50 in the afternoon. Mr Matabane spends R286 on transport monthly. If he earns up to R3500 this means that he spends more or less 8% of his income on transport monthly.

## Financing

Funding will be granted by the Government through the low cost housing programme and managed by the Social Housing Institute.

## Management

The project will be managed by the South African Social Housing Institute. The premises will be supervised by some of the residents, who will be chosen by a body comprising all the residents, to deal with issues on a daily basis. To make the project run smoothly, the Social Housing Institute, resident community and other parties involved in it must be committed to the project.

The residential community representatives are responsible for the decisions made on behalf of the Social Housing Institute. They must act transparently between the parties in all matters in order to keep good relationships. The Institute will assist the community development projects, such as skills management training.



Figure 3.1.3.1



Figure 3.1.3.2

## PROJECT DEVELOPMENT

The project is conceptualised as a complex of social and transitional housing. It is made up of mixed-use high density residential and commercial housing as well as hostels. The complex is composed of building blocks of two to four storeys. Recreation facilities are located around the buildings. Shops and other commercial facilities are located on the ground floor along the street façade, and flat units vary in size from the first to fourth floor. The residential buildings mixed with commercial buildings, have two separate vertical and horizontal circulations, which are not disturbed by one another. The vertical and horizontal circulation will be provided on both areas. An open plan design will be integrated to accommodate the required space for different tenants.

The main entrance will face the Northern side of the site. Play areas for children will be surrounded by the buildings in such a way that parents can monitor them from the flats through the windows and balconies. Shops and other commercial facilities will face North, South and East due to existing traffic and pedestrian movement. Public phones and toilets will be integrated in the building design to satisfy the needs of the users.



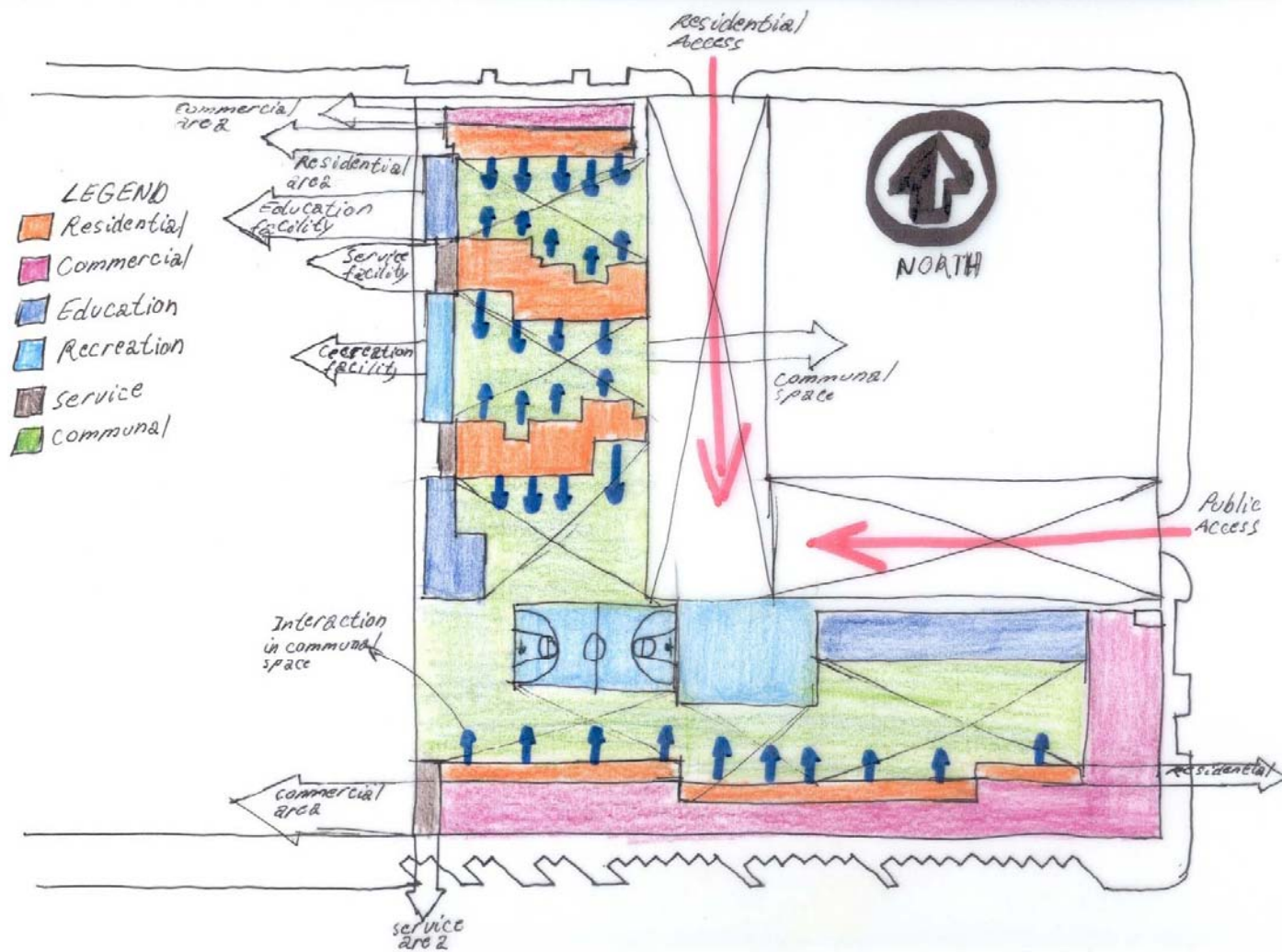


Figure 3.2.1 Plan layout

## Project composition

1. **Residential:** Social and Transitional Housing.
2. **Educational:** Crèche, Library, Study room, Training facilities.
3. **Recreation:** Sport field, gymnasium, Braai area and communal spaces.
4. **Commercial:** Shops, Offices and Restaurant.

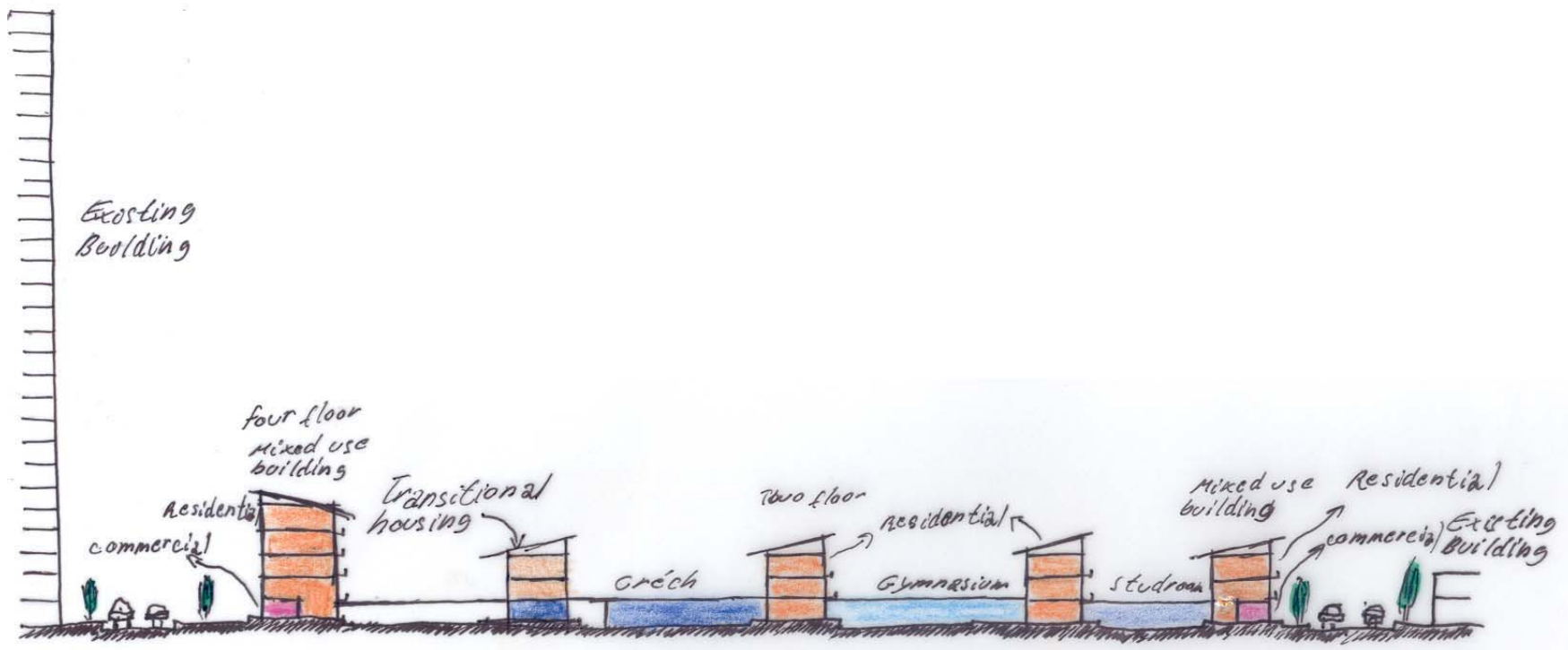


Figure 3.2.1.1 Section illustrating function in the building

## Residential

1. **Ground floor:** 1 to 2 bedrooms (Block B), 3 bedrooms (Block C).  
**Double volume:** 1 to 3 bedrooms (Block A), 1 to 2 bedrooms (Block D).
2. **First and second floor:** 1 to 2 bedrooms (Block B), 3 bedrooms (Block C).  
Hostel 4 to 6 bedrooms (Block F). (Ed: check formatting)

## Education

1. **Ground floor:** Training facilities (Block F) with 2 classrooms, library, computer room, kitchen, filing room, reception, office and meeting room.  
Study room (Between block A and B).  
Crèche (Between block C and D).

## Recreation

1. **Ground floor:** Sport facilities (soccer field and basketball court).  
Gymnasium (Between block B and C).  
Braai, green spaces and fire place.
2. **First to fourth floor:** Communal areas (Block D).



## Commercial

1. **Ground floor:** Shops (Block A, D & E).
2. **First floor:** Restaurant and offices (Block E).
3. **Second to fourth floor:** Offices (Block E).

## Chosen Site

The site context plays a very important role in sustaining this type of building.

This particular area of the city contains a School, Government services, Commercial activities, Museums and Offices. Also, the proposed site is far from the noise pollution and activities of the Central Business District.

The existing potential on site will be integrated in the design concept in order to improve upon the existing activities on the site.

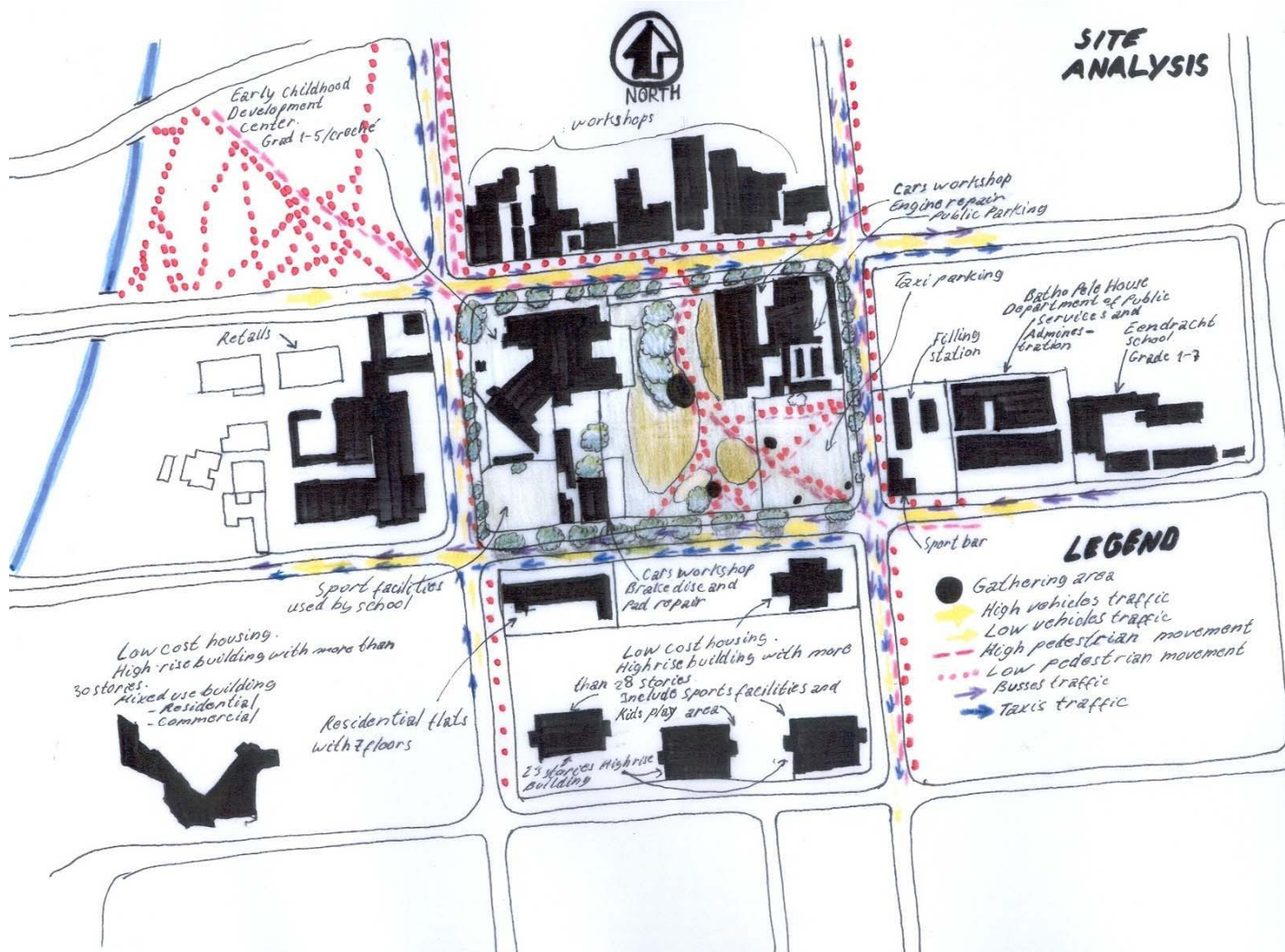


Figure 3.2.2.1 The existing facilities around the site



Figure 3.2.2.2 Car workshop and retail facilities on North side of the site



Figure 3.2.2.3 Felling station, Sport bar and Government building on East side of the site



Figure 3.2.2.4 Residential buildings on South side of the site



Figure 3.2.2.5 Residential building on South-west of the site



Figure 3.2.2.6 Retail facilities on West side of the site

## Vision of the project

The proposed project is a channel to uplift the economic growth of disadvantaged communities in the area. By living close to work and close to other facilities such as education, health and recreation, the costs of transport and energy consumption will be reduced. The programme will cut down the cost of living and promote financial growth. To make sure that the project will work, the South Africa Social Housing Institute must train and monitor tenants in such a way that after they finish the programme they will be able to leave the project and live on their own so that other families can be recruited.

The project will also regenerate the North-west edge of the city, as facilities provided by the development will bring life to the area and encourage investors to develop the area, due to history facilities and business opportunities. Therefore, tender will be open only for small local contractors.



Figure 3.2.3.1  
(The Social Housing Foundation, 2005:13)





## ACCOMMODATION SCHEDULE

Function	Unit Type	No	Size
Residential	1 Bedroom	31	39m <sup>2</sup>
	1 Bedroom Double volume	10	55m <sup>2</sup>
	2 Bedrooms	19	53m <sup>2</sup>
	2 Bedrooms Double volume	6	73m <sup>2</sup>
	3 Bedrooms	9	66m <sup>2</sup>
	3 Bedrooms Double volume	1	83m <sup>2</sup>
	4 Bedroom	2	54m <sup>2</sup>
	6 Bedroom	6	81m <sup>2</sup>

Function	Unit Type	No	Total
Commercial	Shop Struben Street	5	127m <sup>2</sup>
	Shop Proes Street	14	447m <sup>2</sup>
	Shop (1st Floor) Proes Street	2	78m <sup>2</sup>
	Shop Schubart Street	4	284m <sup>2</sup>
	Office (1st Floor) Schubart Street	2	117m <sup>2</sup>
	Office (2nd Floor) Schubart Street	6	301m <sup>2</sup>
	Office (3rd Floor) Schubart Street	6	301m <sup>2</sup>
	Office (4th Floor) Schubart Street	5	340m <sup>2</sup>
	Restaurant	1	398m <sup>2</sup>

Function	Unit Type	No	Size
Education	Training Facility	1	301m <sup>2</sup>
	Crèche	1	164m <sup>2</sup>
	Study room	1	71m <sup>2</sup>

Function	Unit Type	No	Size
Recreation	Gymnasium	1	113m <sup>2</sup>
	Sports Field	1	420m <sup>2</sup>
	Braai	1	30m <sup>2</sup>
	Communal space A to F	6	23m <sup>2</sup>
	Meeting Room	1	10m <sup>2</sup>

Function	Unit Type	No	Size
Service	residential Parking	1	1381m <sup>2</sup>
	Rental Parking	1	1110m <sup>2</sup>
	Washing line Area	2	184m <sup>2</sup>
	Washing Tank Area	2	52m <sup>2</sup>
	Public Toilets Struben Street	1	4m <sup>2</sup>
	Public Toilets Proes Street	2	18m <sup>2</sup>
	Public Toilets Schubart Street	5	32m <sup>2</sup>
	Guard House Struben Street	1	10m <sup>2</sup>
	Guard House Schubart Street	1	8m <sup>2</sup>

## SOCIAL PERFORMANCE

### Occupant Comfort

The building design must provide a positive environment, in regards to the user's comfort and health, especially in the areas of the building where people spend more time during the day and night.

Natural daylight must be maximised in order to illuminate and regulate climate inside the building as well as reduce artificial energy consumption. Direct solar radiation will be avoided by the use of louvres or balconies that will serve as recesses during the winter season



Figure 3.4.1.1  
(The Social Housing Foundation)

## **Ventilation**

The building will provide natural ventilation through mechanic systems and the building itself will control airflow during the day and night in different seasons. Mechanical systems will be allocated in the roof and a wall of each room of the building. Windows, doors, and balconies on the North side and circulation areas on the South side of the building will allow for a system that generates cross ventilation and controls air flow.

## **Noise**

The site is very quiet. Any noise pollution comes from passing vehicles along the streets. Noise pollution will not affect the external or internal comfort zone of the building.

## **Thermal Comfort**

The building foot will be oriented in such way as to monitor suitable indoor temperatures, creating appropriate comfort zones for tenants and their visitors.

## **Views**

The site mostly allows views to the North. Views will be seen through windows and from balconies. Due to a high-rise building on the Southern side and double stories on the Northern side of the site, the proposed building will be located on the Southern side of the site to provide a better view to the North.

## **Inclusive Environment**

According to the South African National Building Regulations, the proposed building does not require any accessible facilities for disabled people. Commercial areas on the ground floor are accessible to disabled people, with a threshold between pedestrian paving and shops of 170mm. The restaurant and offices on the upper floor are accessible by lifts and by stairs.

## **Access to Facilities**

All access to facilities will comply with the South African National Building Regulations. Services, paths, roads, circulation and recreation areas will be designed in such a way as to not compromise access to privacy in those areas. The proposed design will create suitable space to prevent accidents in the children's play areas. Access views from the flats to the children's play areas will be through windows and from balconies where parents can monitor their children. Mail-boxes, public phones and Internet facilities will be provided in the building. Noise pollution as well as bad smells emitted from waste areas will be considered in the design.

## **Participation and Control**

The temperature and natural light inside of the building will be monitored by the tenants through mechanical system, adjustable louvres, open windows and doors, creating appropriate environmental spaces to live and work. Public spaces such as parking bays, recreation and circulation areas will be controlled by tenants in order to satisfy and respect their privacy. The spaces are designed to allow furniture to be movable at the wish of the tenants. Communal spaces are large enough to allow for comfortable social interaction. Therefore a braai space, a fire-place, sport facilities, a children's play area, a study room, a crèche, a laundry, and benches under the trees are all provided.



## **Education**

The building will incorporate a crèche, study rooms, a library, a computer room, a children's play area and classrooms as training facilities.

## **Health**

Rules will be drafted by the tenants' committee to provide a healthy living environment. The building will provide space to accommodate waste.

## **Safety**

The building will be provided a secure entrance, routes, and a secure perimeter and access control to prevent crime activities. Safety of the building will be monitored by a security guard. The building will allow for viewing of routes

## ECONOMIC PERFORMANCE

### Local Economy

Construction will be executed by a local small contracting company using local labour and material. The building materials will be supplied by the nearest suppliers.

### Efficiency

The building will be designed to be used on a daily basis. Various activities will be performed during the day and night. Recreation facilities will function during the day and after work hours to give the tenants a place to socialise and provide a comfortable and safe environment to live in. The flats' unit types will be designed to accommodate a specific number of occupants. Communication and entertainment services such as Internet access and telephone and television connections will be provided. The use of all spaces will be regulated and supervised by the management of the project.



Figure 3.5.1.1  
(The Social Housing Foundation, Issue 1, 2006:6)

## **Adaptability**

Through the implementation of an open plan, the building will be flexible and will be able to be temporarily or permanently extended without compromising the structure of the building. Spaces can be adapted for different purposes. Internal spaces and front façades along the streets can be reconfigured according to the needs of the tenants.

## **Ongoing Costs**

For building maintenance, all tenants must comply with the rules of the building, which will be decided by the tenants' committee. Income generated by the rentable shops and other commercial activities will be used to maintain the building in the long term.

For instance, photovoltaic panels, fluorescent light fittings and water harvesting will be installed to reduce water and energy consumption. The participation of the residents in supervising the premises will reduce the costs of security.

## **Capital Costs**

To reduce building construction costs, local contractors and other local companies in the construction industry will be employed. The building design will maximise on simplicity of the effectively scheme.

Capital costs will be allocated for accidents or problems occurring during construction and the implementation of sustainable design methods.

## ENVIRONMENTAL PERFORMANCE

### Water

Water is required for many functions in large buildings. Water supplied by the municipality becomes expensive due to the large number of users. To reduce water consumption, water harvesting will be used in the building. Rainwater will be collected from the roof, roads, paths, parking, and subsequently stored in a tank. Water will be treated so it can be used in toilets and garden taps.



Figure 3.6.1.1  
(The Social Housing Foundation)

## Energy

Due to insufficient delivery capacity from the electricity supplier, photovoltaic panels as well as natural lighting and ventilation will be availed of to provide efficient energy. The panels are part of the building design, allocated on places with maximum daylight absorption potential. This will be used for heating water. Balconies, windows, doors and mechanical systems will provide air-flow in the building to control temperature during the summer season. Direct sunlight and the mechanical system will provide heating during the winter season. Fluorescent light fittings are an efficient source of artificial light for this project due to their low energy consumption. Renewable energy methods are used in many buildings today. Sun, wind and waste material are harnessed, as they are renewable resources. But to integrate them in the building design, the resources must be analysed in relation to viability on site in order to perform effectively.

## Waste

To create a comfortable environment, waste must be separated into bins, one for recyclable materials and the other for waste that has to be dumped. Waste-paper, metal and glass can be sold. Leaves can be composted on site and reused as a fertilizer. Management of organic waste, brown and grey water will remain the responsibility of the city council of Pretoria.

## Site

The proposed site is a Brownfields site. It is not disturbed. Nothing has been built previously. Neighbouring buildings do not negatively affect the proposed building orientation, building access or sunlight capture. The site is flexible enough to share and relate with the surrounding buildings. The site is covered with a few trees. These trees can be removed from their original location and integrated into the landscaping design. The Pretoria Council has handed over the site temporarily to the Taxi Association due to a lack of parking in the CBD. The use of parking by taxis on the site has encouraged informal trading.

## Materials

All materials used in the construction process must be sustainable, flexible (in order that they can be recycled) and available in the local market with low embodied energy. It must also be based on materials used in the neighbouring buildings to maintain the neighbouring feeling. The materials are standard and produced by manufacturers to avoid damage to the environment.



## DESIGN GUIDELINES

### DEFINITION

#### Social housing

Social housing is the integration of disadvantaged communities by providing an affordable quality of life in adequate standard accommodation to satisfy the needs of that specific community in the urban area where the housing is located. It is a subsidised housing programme and managed by a viable and sustainable institution which engages the participation of the residents in the management of their own communities. The programme is designed under principles to accommodate low-income families by providing opportunities to integrate a variety of lifestyles from families with different backgrounds, but does not include individual ownership.



Figure 4.1.1.1  
(The Social Housing Foundation)

## **Integration of disadvantaged communities**

Social housing is a type of built environment that aims to engage families from different backgrounds, so that they can share, socialise and work in the same environment.

## **Affordable quality**

The housing is affordable and offers financial flexibility for low-income families, in terms of low building costs and rentals.

## **Adequate standard accommodation**

Social housing is low cost, but that does not mean low quality. The principle means that the housing is low cost, but of an appropriate standard to accommodate human beings with dignity.



Figure 4.1.1.2  
(The Social Housing Foundation, Issue 2, 2005)

## **Subsidised**

The project is subsidised by the Government through the Social Housing Institute. The Institute charges monthly rent for the housing units. The rental fees cover the capital invested in the long term and the maintenance costs of the project. To be affordable, the rental fees should not be more than one quarter of the families' gross income.

## **Area location of the project**

The site of the project must have facilities to accommodate the needs of the future residents. These facilities include public transport routes and commercial, health and education facilities, which will encourage people to live in that particular area, as well as stimulating local economic growth and other developments.

## **Viable and sustainable institution**

Development, management and maintenance of the project has to be conducted by a non-profit institution. The institution does not have to be part of any Government or political organisation. It must operate as a business company in order to be sustainable in the long term.

## **Participation of residents**

The residents have to be involved in the process of development and management of the project. This includes participating in the skill training sessions, as well as applying these skills to their new environment.

## **Way of living**

Families with different backgrounds should have the opportunity to define their needs by being integrated into the design process and sharing with other families in order to build a community environment.

## PRECEDENT STUDY

Precedent studies for the project were made in conjunction with analysis of the proposed site and the local social housing project. The study aims to understand and elaborate on the concept of what is an adequate design for a specific community. The use of local precedents helps to effectively analyse the unique socio-economic issues of the communities, which need to be addressed to satisfy the needs of these communities. Through the precedent study, it will be decided how the waste management, communal spaces, security and children's play area safety needs will be integrated into the design.

### Royal Maitland

Jac Snyman and JS Associates architects designed one of the phases of such a project. The project was developed by the Cape Town Community Housing Company. The concept was based on affordable housing and developed by the Social Housing Institute. The project is located in the CBD of Cape Town, on the edge of a Spoornet container complex and close to the harbour.

(The Social Housing Foundation, Issue 2, 2005:2)



Figure 4.2.1.1 Access to housing units

(The Social Housing Foundation, Issue 2, 2005:4)

The area is characterised by single storey units which fit into the neighbouring context. This development creates a desirable living area in the Inner City with medium density that encourages further development of the area. The target market is families with an income of between R5000 and R9000 who cannot afford to buy a house and do not qualify for subsidies.

The topography of the site is flat land that allows for appropriate open spaces around the buildings. The project was designed in such a way that units have views to the streets and public spaces. The semi-public spaces were designed by defining the ownership of that particular space.

The units were designed to be flexible enough to accommodate various needs. 1 bedroom units of 45m<sup>2</sup> and 2 bedroom units of 54 m<sup>2</sup> make up the 168 units of phase1. The materials used were inexpensive in order to minimise the building and maintenance costs. The site layout was initially designed to be open and have free access. The residents felt that the complex was too exposed for their safety. Therefore, a security gate and a guard-house were introduced at the main access area of the complex.

Pre-cast concrete walls and palisade fences were installed around the complex boundaries. Parking was conceptualised as one bay per unit and placed close to each unit for security purposes. Washing lines were provided in separate areas next to the management office. The spaces under the staircases provide storage for refuse bins in order to maximise the use of space. Landscaping has been designed around the buildings to increase interaction between residents.



Figure 4.2.1.2 Units overlooking the public spaces  
(The Social Housing Foundation, Issue 2, 2005:5)



## Troyeville

The Troyeville project was designed by Chris Shabangu Architects cc and developed by the Cope Housing Association. The complex is located on the edge of the Johannesburg CBD on the corner of Cornelia Avenue and Beelaerts Street.

(The Social Housing Foundation, Issue 3, 2005:8)

The site was chosen in order to benefit from existing facilities, such as schools, shops, recreation areas, public transport and clinics. The project was conceptualised as affordable housing units with low longterm maintenance, where residents could have the feeling of ownership, but could also feel involvement in community life by sharing some spaces. The development targets families that qualify for subsidy and have an income of between R2800 and R3500. The topography of the site has appropriate conditions to accommodate this type of building.



Figure 4.2.2.1 The blocks overlooking the courtyard  
(The Social Housing Foundation, Issue 3, 2005:4)

The site is situated on land which is relatively high in relation to the surroundings, giving views over Johannesburg city. The building layout was designed to look out over a large open space. The layout orientation allows residents to supervise children in the play area, as well as to monitor other types of movement around the open space and access to the complex.





Figure 4.2.2.2 Recreation space  
(The Social Housing Foundation, Issue 3, 2005:4)

The units were designed in order to accommodate the needs of different families. The project accommodates 120 housing units in which 14 are 1 bedroom units and 106 are 2 bedroom units. The security of the complex was achieved through the design of the building. The main access can be viewed from each unit. It is controlled for 24 hours a day by security guards.

Lighting of the street in the open spaces provides security during the night. Openings, such as windows and balconies, allow surveillance by the residents around the building boundaries, the streets and the building itself. The parking bays initially were provided around the communal space. The increase in the number of cars in the complex meant that parking bays were extended along the street. The outside parking facilities have had a negative impact on residents due to a lack of safety. Washing lines are located in the communal spaces. Each building has an area for refuse bins. Waste from these refuse bins is disposed of in the municipality bin. Landscaping has been introduced for communal spaces for the purpose of children's play areas. The layout of the project responds positively to the site context. The communal spaces serve as areas for interaction, where the residents can engage in gatherings.

## Brickfields

Brickfields was one of the projects developed by the Johannesburg Housing Company and was designed by Savage and Dodd Architects cc, Fee and Chalis Architecture and Makhene and Associates. The building is situated in the Johannesburg CBD, on the edge of Newtown along Ntemi Piliso Street and Gwigwi Mrwebi.

(Project Review Series, Issue 6, 2005. pg 11)

The site is close to facilities such as a taxi rank, shops and recreation facilities. The aim of the design was to renovate the Inner City of Johannesburg, providing affordable housing and services, which in turn promotes sustainability and good quality of life. The project targets families with a monthly income of between R3500 and R10000. The site is clay soil and falls from South-west to North-east.



Figure 4.2.3.1 Commercial units overlooking the street

The design layout was based on an urban design framework that creates a unique concept by fusing high density for commercial and residential areas with recreation facilities. The complex is composed of buildings with different heights. The higher buildings have lifts and an emergency staircase. Design guidelines were based on the goal of providing an adequate living environment.



Figure 4.2.3.2 Access control of the complex  
(The Social Housing Foundation, Issue 6, 2005:6)

Technology was one of tools used in the design concept. The buildings were designed to have views over the communal spaces and the streets, with interaction through balconies and windows. Materials used were based on long-term durability with low cost maintenance and aesthetic diversity.

Safety of the environment has been reached by the building orientation in which access to the units is from communal spaces. Technology was also implemented in the security system due to the development's location within the city. The complex has only one access point for vehicles and pedestrians. It is controlled by security guards and security cameras. Lifts have a malfunction system control by the guard-house that has direct access to the lift company in case of emergencies. All residents have an electronic gate card. The visitor access to the premises is by a temporary card collected from the security guard house. The units have been designed in order to be the same size, all facing communal space and the streets so as not to compromise safety. Washing lines are located on each floor and serve that particular floor. They are secured by facing gate and controlled by unit members of that specific floor. The washing line areas aim to avoid forcing residents to walk long distances with a washing load. Each unit has refuse bins which are stored under the staircase. Landscaping was developed to create many small green areas so as avoid large paving areas. Areas were also specifically designed as play areas for children.

## PRECEDENT STUDIES RESPONSE TO THE PROJECT

- Royal Maitland has a good orientation plan. The proposed complex should have easy access to the destination. The private and semi-private spaces give the feeling of ownership. People like to have outdoor spaces to entertain themselves

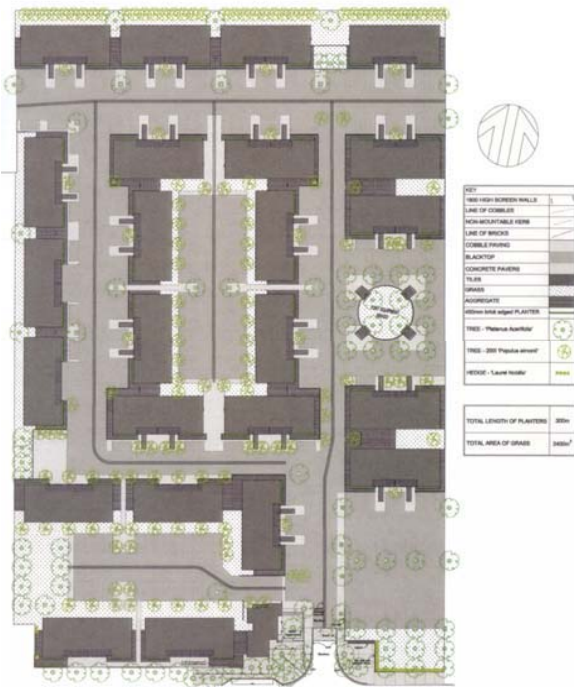


Figure 4.3.1 Royal Maitland site plan  
(The Social Housing Foundation, Issue 2, 2005:3)

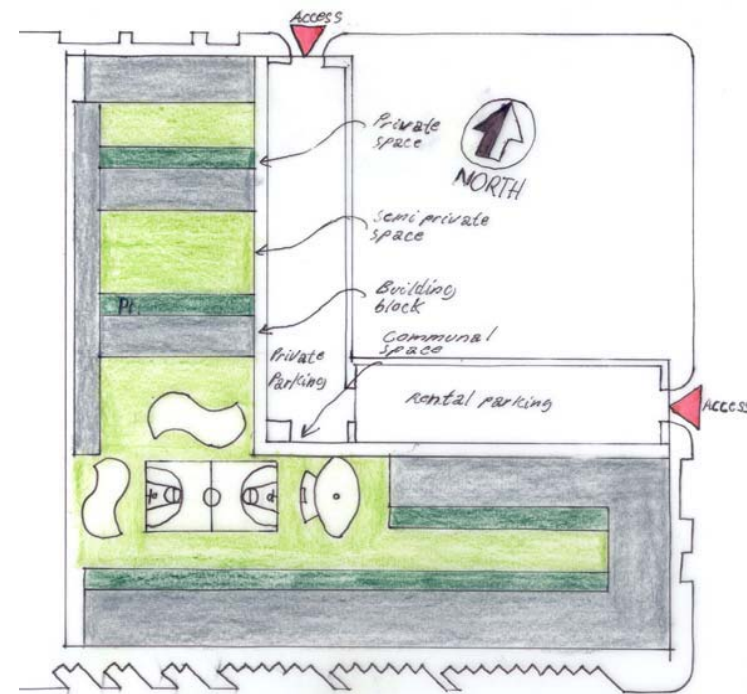


Figure 4.3.2 Layout of the proposed project



- The Troyeville scheme allows residents interaction between the buildings and views over the central communal space in order to supervise their cars, the main entrance and their children.

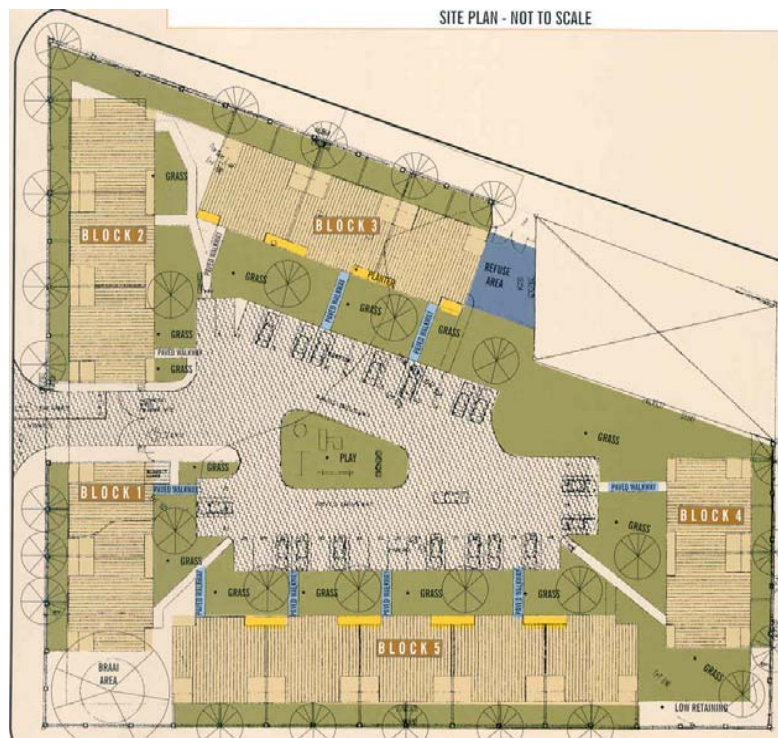


Figure 4.3.3 Troyeville site plan  
(The Social Housing Foundation, Issue 3, 2005:3)

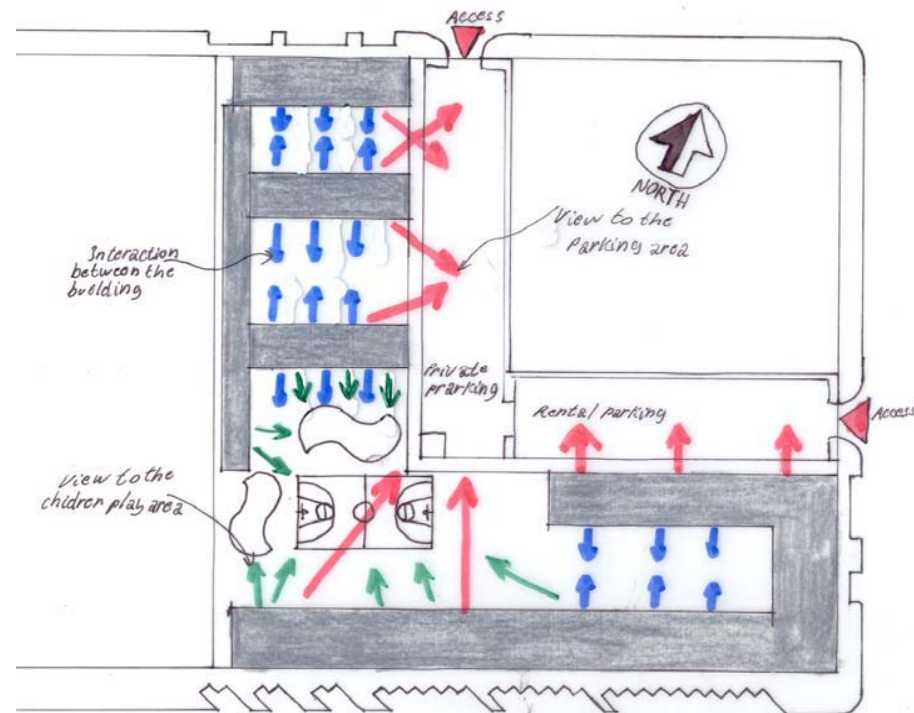


Figure 4.3.4 Interaction between the buildings

- Brickfields is a good example for a high density mixed-use programme. It provides diverse facilities to accommodate the needs of the residents without compromising affordability.



Figure 4.3.5 Brickfields 9 storey building

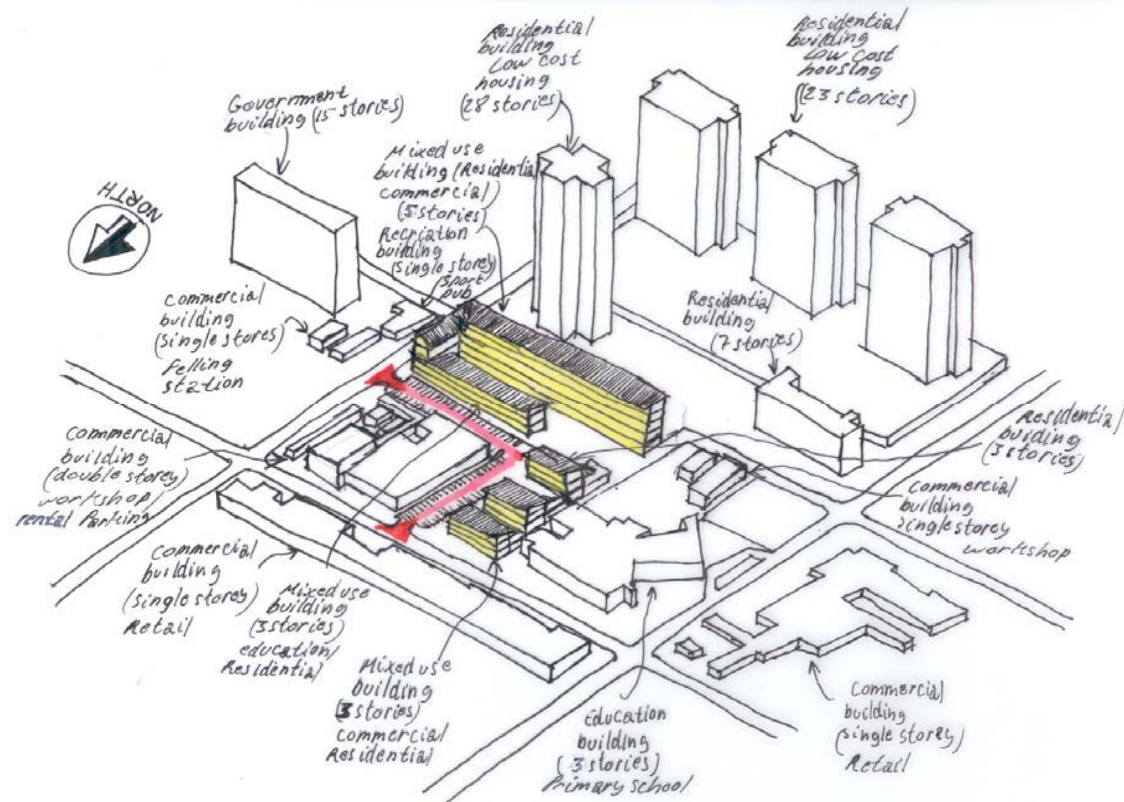


Figure 4.3.6 Proposed project high density



## DESIGN PROCESS

The design process demonstrates the most effective approach to reaching a final product through exploration of the design principles, context studies, precedent studies and, finally, building design. The process aims to articulate methods to be integrated in the building design in order to respond to the requirements of the clients, site context and National Building Regulations. Design process will be followed by design principles, design concept, design development and design response.

### DESIGN PRINCIPLES

Good quality social housing projects are based on certain design principles, in relation to the socio-economic issues existing in the specific targeted community. To achieve a good quality project, the social housing programme must draw on principles that accommodate the requirements mentioned above. The principles are focused on affordability, sustainability, security, safety and the needs of the specific target market. On the other hand, it also focuses on the integration of building orientation as well as urban and site context. The building deals with appropriate density for certain types of future users, function, aesthetics, material choice, mechanical systems, natural energy resources and unit size.

## Affordability

This project is for people who earn between R 1500 to R 3500 monthly. Therefore, families will spend between 25% and 30% of their income on rental from R450 to R875 per month. The funding is subsidised by Government through the housing programme and managed by the Social Housing Institute. Affordability relates to the target market for the quality of the project. Affordability must balance with design in such a way that users should be able to afford rental fee and the Institute should be able to produce, manage and maintain the environment in an appropriate condition.

## Sustainability

Sustainability is the key to maintaining the project in the long run. The Social Housing Institute acts as management for the project.

Residents, as users, have a commitment to maintain the safety and security of the environment, the quality of the building as well as a good relationship between both parties involved and between the users.



Figure 5.1.2.1  
(The Social Housing Foundation, Issue 4, 2005:1)

## Target Market

To satisfy the needs of a specific community, design integrates all of their unique needs. The management of the project must be in touch with future users so as to best assist the residents.

## Safety and Security

Safety and security is one of the main challenges in social housing projects. Fences, security cameras, alarms, building orientation and resident's participation are methods to be used to combat this problem. All these methods have an impact on the design concept. In addition, the residents have an obligation to supervise the children and share community infrastructure.



Figure 5.1.3.1  
(The Social Housing Foundation)



Figure 5.1.4.1

## Urban Context

The environmental design integrates the particular building design within its urban context, creating better spaces for living. Each area has its own environmental context that expresses culture, history and people's customs. People develop ways of living that correspond with their income and needs. The proposed new development has to integrate the characteristics of the existing environmental context and lifestyle habits of the future residents. The living environment has to provide for the community's needs and facilitate their activities on a daily basis. Public transport, education, commercial activities, communal spaces and interaction facilities for children and adults all need to be integrated into the design. The proposed building also has to relate to the existing urban context to complement and improve the quality of the area. This means that the building must be designed in accordance with street access, existing buildings as well as existing activities and facilities in the area.

Implementing these criteria means that the building will fit on site, and respond to the needs of the area, making it a unique environment for good living.

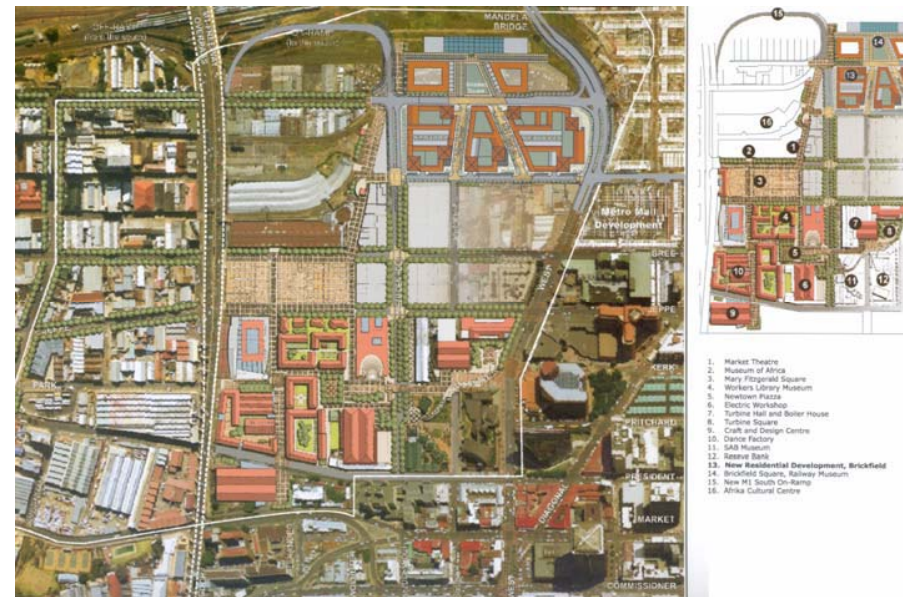


Figure 5.1.5.1

(The Social Housing Foundation, Issue 6, 2005:4)



## Site Context

The site helps decide the building foot print and design context in relation to its surroundings. It defines the building orientation and the user activities. The relation between the site and the city plays an important role in deciding on the design concept. The proposed site has to be allocated in an area where facilities for this type of project are provided. The site has impact on the building costs. However, the topography has to provide appropriate soil, with service connection facilities. The building design must be oriented according to:

- Street activities
- Building function
- Density
- Site access
- Public transport routes as well as pick up and drop off points
- Public facilities, such as toilets and phones
- Shops, clinics and recreation facilities
- Safety

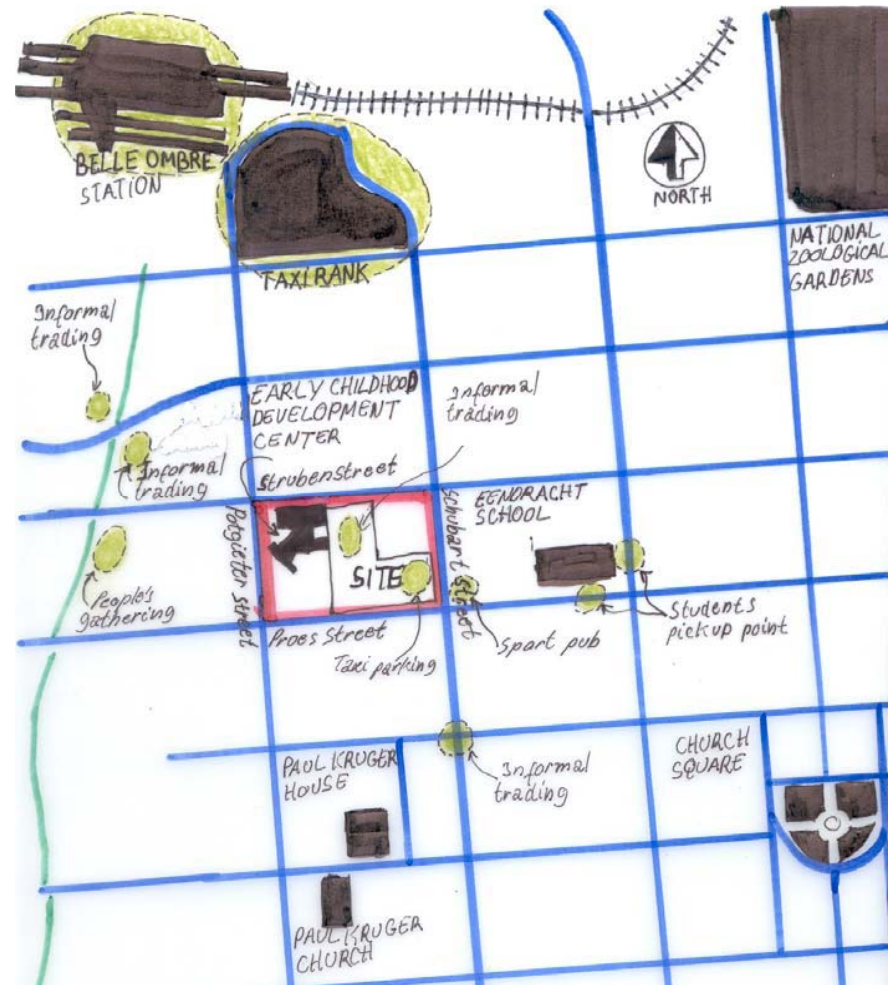


Figure 5.1.6.1 Social network

## Design Context

The design of the building must respond positively to the demands of the residents in relation to its urban context. Communal spaces and green areas are the focal point of community interaction. The spaces have different sizes for different purposes. The spaces are designed to reflect the lifestyle of the residents, thus providing a feeling of ownership.



Figure 5.1.7.1

## The Building

The building has to relate to the density requirements of the site context. The design integrates small unit sizes. Height is directly linked to density. In urban areas the building height should relate to the height of the surrounding buildings. The children's play areas are placed in a safe area so that adults can supervise easily. Parking bays are provided per certain square meterage, but not for all units. The chosen materials must be affordable and easy to maintain in the long term. Services are shared between units, with bathrooms and a kitchen next to each other. Natural environment plays an important role for the use of passive energy and water collection. The buildings are designed taking into account the North orientation to capture and control the sun's heat and light.



## The Unit

To make the unit affordable its size has to be small. However, this does not mean that the housing unit cannot be well designed and function well. Design of the units allocates rooms with enough space to accommodate appropriate circulation and functions. The kitchen, living and dining rooms are the spaces where people circulate the most. Therefore, these rooms are linked without any wall division, increasing space. The unit has to be flexible so that circulation can be effective for easy access without compromising furniture orientation or the circulation of people. The living and dining room can also function as a study or an extra sleeping area for visitors. The washing lines are allocated to specific areas. This area can be supervised by both security guards and the residents. The finishing is low cost and has a long life. The floors are tiled, which allows for easy cleaning.

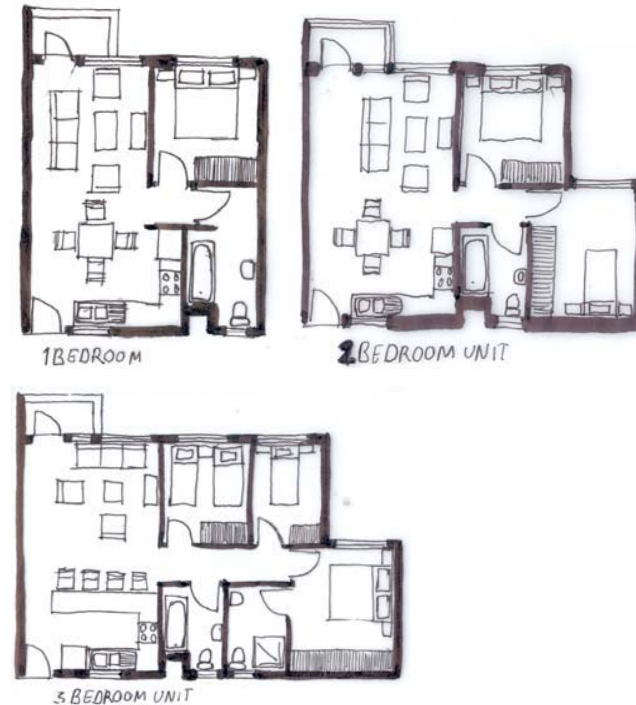


Figure 5.1.9.1 The proposed unit types

## DESIGN CONCEPT

The design concept is a key so that the building realises the design principles that have been conceptualised. The building design is derived from the positive elements of informal dwellings in townships.

“Shacks are the beginning of unique cities.”

(South Africa Institute of Architecture, 2007: 55)

In informal settlements the construction of the dwellings is based on needs income and materiality availability. This typology doesn't take into consideration the urban context rather grows organic within its locale following the needs demands and requirements of the users. Completely disregarding the human comfort into consideration, with the spaces thus created forming from an “organic” random pattern. Resulting in an amalgamation of materials structures spaces to put together to what we refer to as informal settlements and or townships that are usually overpopulated with the sanitary and hygiene levels at a terrifyingly low standard.

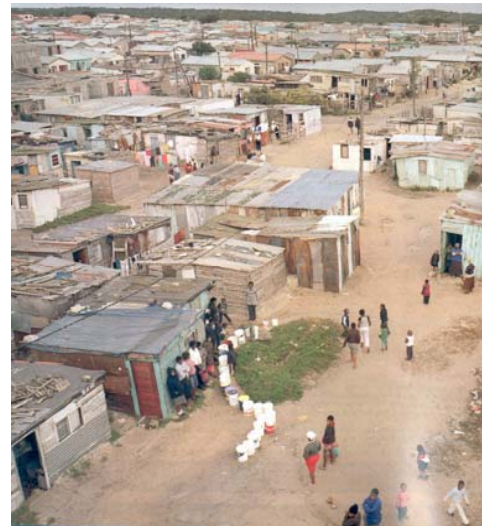


Figure 5.2.1

(South Africa Institute of Architecture, 2007: 54)

However, the high density, multiple access routes and gathering areas create and recreate a unique identity, a sense of community and peculiarity that contributes to some of the few positive aspects of space making within these settlements and or townships.

Within this context focal points are created and become centres for socio-cultural expression and growth. These areas tend to be and or are located at water collection points, spaza shops and the local shebens. These areas subsequently become points of communal gathering identity and interaction, allowing for a cultural and social dynamic to generate a sense of community integration and interaction, something that is lacking within the more formalised suburbs. Taking these aspects into consideration the design attempts to suggest a spatial framework within the urban context that exhibits these qualities while allowing for the formalisation of these living hubs and providing within them the essentials for human comfort and living.

A part of the design proposal is to take into consideration the existing activities in and around the site that will allow for a mixed-use context that would then aid in the design, planning and laying out of the various proposed focal points within the design in and along the identified site.

The proposed building is oriented along the north-south axis with proposed commercial facilities creating the interface with the street. This orientation allows for solar gains, where the bedrooms and living rooms are located. These are the spaces where people spend most of their time when indoors. Services such as ducts, fire protection and horizontal and vertical circulation are placed on the South side of the buildings. The complex is designed in order to allow for interaction between units by providing communal spaces. The units are designed to be similar, in order to have a consistent aesthetic feeling. Corridors and staircases become social spaces. To avoid overcrowding along the vertical and horizontal circulation routes, communal spaces are provided next to the staircases in the building that has the most housing units. The routes are open to increase natural light and cross ventilation.

The landscaping of the communal space was designed to create varying degrees of private, semi-private and public space. The spaces are defined by the use of plants for each unit and the use of different materials and floor surface changes from paving to grass. The site is also surrounded by one-way roads which provide access to the site from the CBD facing south. The existing office buildings and private parking are situated on the East side. Access for the residents is allocated on the North side and on the East of the complex access is meant for people who want use parking facilities.

## DESIGN DEVELOPMENT

Design development plays with articulation of the building orientation, spaces and functions in different development stages to accommodate appropriate layout.

### Ground floor

Public movement occurs frequently along the streets. Retail services and public services such as public phones and toilets are located on this level. This level promotes diversity of commercial activities throughout the building, which encourages the public to engage with it. Inside the complex, the ground floor level is dominated by flat units together with education, recreation and washing facilities. On the North-east side, the education facilities are separated from the community area by a security gate and fence. The area accommodates facilities for members of the public that want to take advantage of it.



Figure 5.3.1.1 Proposed ground floor layout

## First floor

The building along East Street is dominated by a restaurant and office facilities. The rest of the buildings are made up of flat units and washing lines.

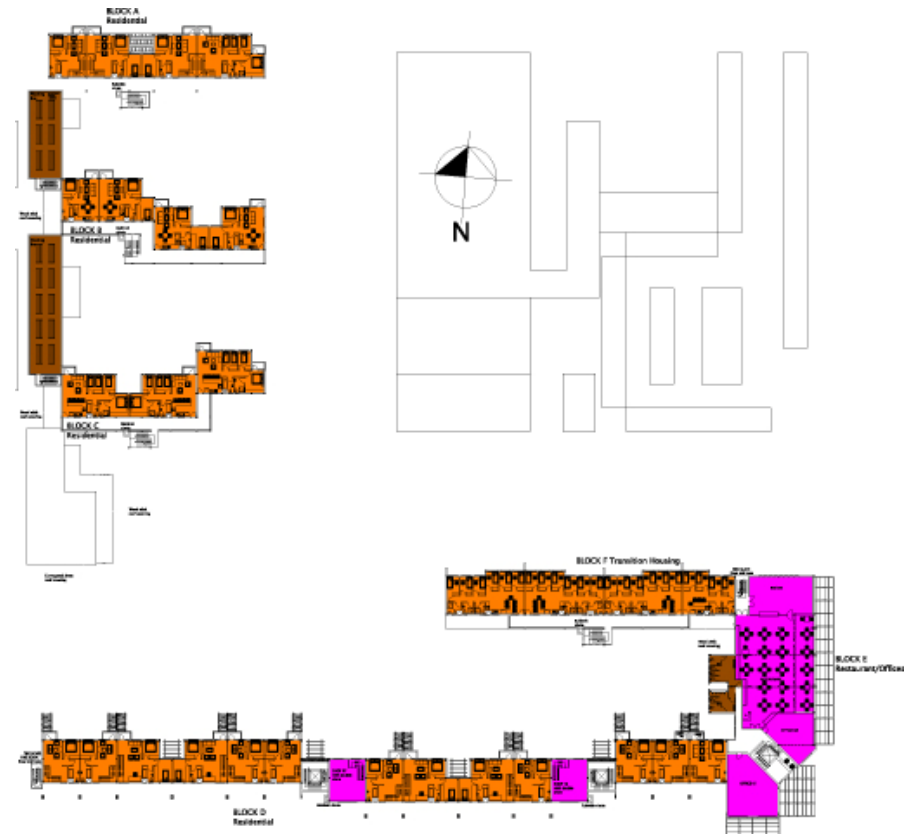


Figure 5.3.2.1 Proposed first floor layout



## Second floor and above

The level is composed of flat units which continue through to the upper floor. The East building is the only one that has office facilities right up to the upper level.



Figure 5.3.3.1 Proposed second floor layout

## Model 1

The first concept was to accommodate the existing activities on site. After finding that a portion of the site has been given temporarily to the Taxi Association by Pretoria Municipality due to a lack of taxi parking facilities in town, the layout had been changed.



Figure 5.3.4.1

## Model 2

The building layout concept was to create a large communal space and block the North-east building due to its degraded state, which attracts unsavoury activities. However, the orientation did not work as the space created between the buildings was not enough to maximise North and East sunlight.



Figure 5.3.5.1

### Model 3

The aim of the layout was to maximise North and East sun radiation. The buildings allocated on the East side were moved to the West side of the site. The proposed North-east building was moved back. Therefore, the new layout created efficient spaces, increasing light penetration and communal spaces. The horizontal circulation on ground floor was not well designed. The main communal space could not link to diverse activities.



Figure 5.3.6.1

## DESIGN RESPONSE

Currently the area of the chosen site does not have enough commercial activities and facilities to satisfy the needs of the residents. However, the proposed development will respond to the needs of the users through implementation of the appropriate facilities.

The traffic movement and communal interaction on the proposed site are reflected in the building design. The shops, restaurant, offices, public toilets and phones facing the streets create the facilities that the proposed building offers to users. The façades communicate the building function and category of the users. The function of each level is defined by the design and material used on the façades. Services are provided in proximity to living spaces in order to accommodate affordability



Figure 5.4.1 South elevation of the proposed building

## Social Amenities

Communal space is one of the tools used in designing the social housing concept. It promotes social gatherings between families with different backgrounds. This tool will encourage families to become a community, and to work together for a better living environment where spaces are defined as private, semi private and public. Therefore, the spaces have different communal functions. Due to the small size of the units, the communal spaces provide outdoor rooms as an extension of the units for moments when families receive visitors. Meanwhile, outdoor rooms contribute to security, as it encourages outdoor activities. On the commercial façade the building provides space for billboards and diverse commercial activities such as restaurants, shops and pubs along the streets.

Benches under the trees are provided in communal spaces around the children's play areas, sport facilities and the communal meeting area. A braai area, green spaces, a gymnasium, a crèche, a study room and Internet facilities provide for communal interaction. The crèche is only for residents. It will be supervised by adults. The services will be paid for by the parents to the service provider.



Figure 5.4.1.1 Section illustrating communal spaces between the buildings

## Landscaping

Landscaping has been designed with different materials to define different spaces. Paving bricks are used to define pedestrian circulation and also leads the residents to their destinations. Grass defines open space between walkways and private spaces. Plants are used to demarcate private spaces between flats and open spaces.

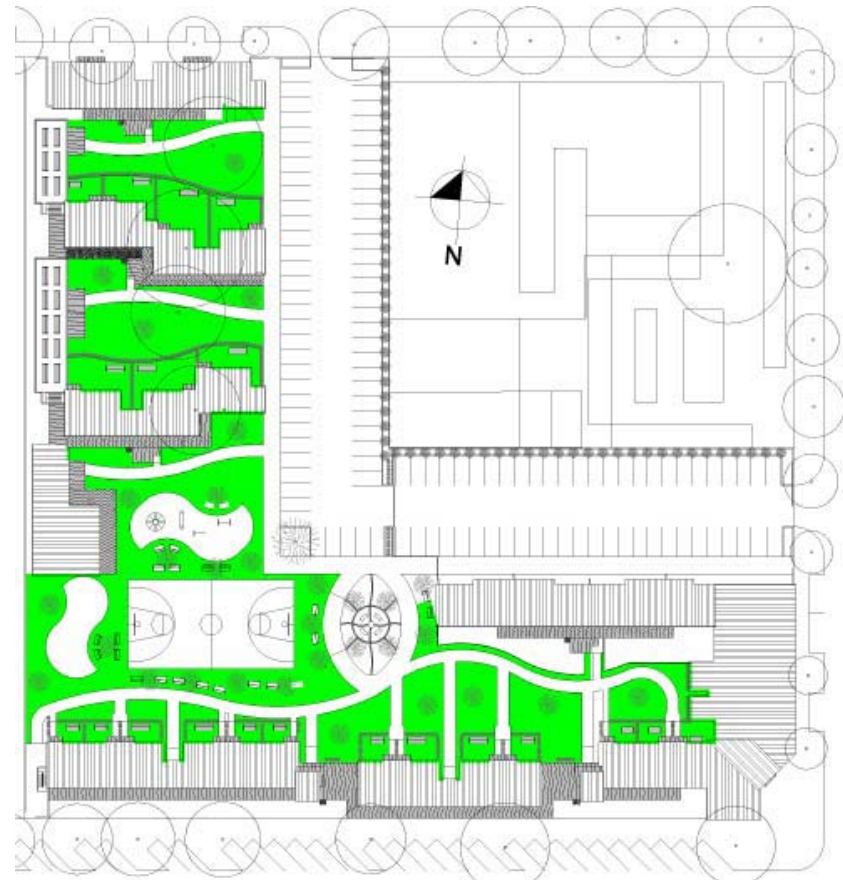


Figure 5.4.2.1 Landscaping layout



## **Washing Lines**

The units do not provide laundry areas. Instead laundry areas are located between the buildings on the West side of the site. Wash trough areas are situated between the study, gymnasium, and crèche. Washing lines are placed on top of the gymnasium and study room due to the height of the building, which maximises sun heat gain. It is also for security purposes and avoids long walking distances with loads of washing. People can supervise their washing from the floors above through the openings and horizontal circulation.

## **Parking**

The parking area is divided in two parts, with one for residents and the other for rental to the public during work hours. The rental and residential areas are divided by a security gate to which only the residents have access. Most of the parking bays are designed to be as close to the flats as possible for security and distance purposes.

## **Security**

The building is separated into residential and commercial areas. The flat units access through the communal area, while residents have access through the communal area to some of the commercial facilities. The boundary along the West side of the site is secured by a 2.5m high boundary wall with 0.5m electrical wires on top of it. There are two access points to the premises. Both of them have a gate for pedestrian and vehicular traffic. These access points are monitored by both security cameras and an intercom. All residents have access to these electronic communication devices. Visitors can access the premises by permission of the residents through the security guard. The study and gymnasium facilities are also monitored by security guards. The rooms are supplied with security cameras. Those who want to use the facilities have to request an access key from the security guard. The complex complies with fire regulations. Signage will be used for easy orientation.

## Refuse

The spaces under the staircases are used for the storage of refuse bins on the ground floor in order to avoid wasting space. Each floor has access to refuse bins through a rubbish chute. The system aims to reduce travelling long distances to dispose of waste, and avoid the unpleasant smells of waste placed next to unit doors. The refuse bins will be removed by people who are responsible for the cleaning of the complex and moved to the refuse yard. Afterwards, refuse will be collected by the Council.

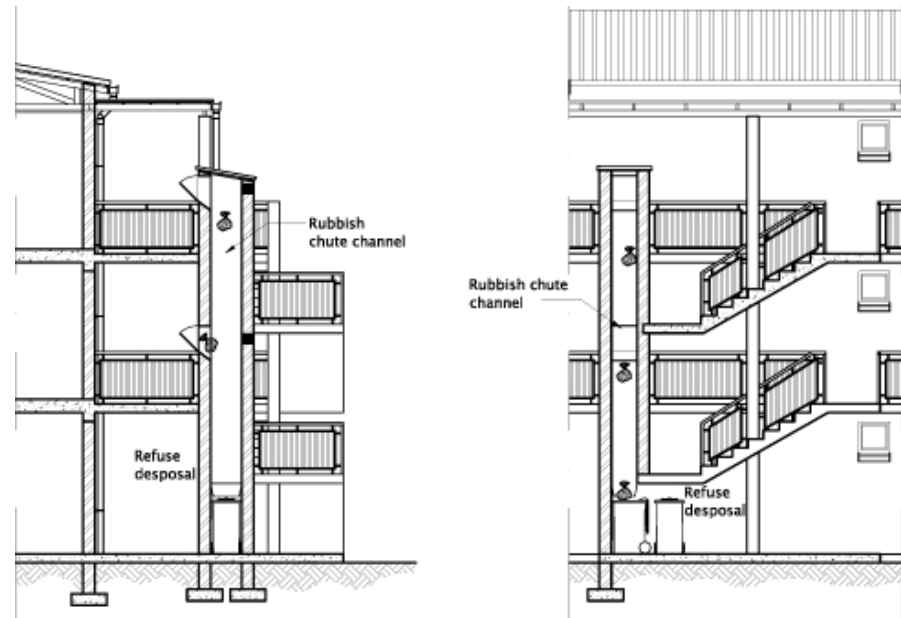


Figure 5.4.6.1 Section of rubbish chute

## TECHNICAL INVESTIGATION

The technical investigation towards the building aims to analyse efficient methods of minimising the use of material with high-embodied energy. The use of these materials reduces consumption of non-renewable energy and reduces the building construction costs by applying low cost material with long life durability. This is combined with the use of climatic elements such as sun and wind. Solar panels, roof insulation, bio fuel and wind turbines are the systems used for energy production and climate control. To achieve sustainable results the investigation will be based on an analysis of the climate of the proposed site in order to apply adequate design methods and materials.

### CLIMATE

The climate of Pretoria is generally warm in summer with a maximum average temperature of 27C° and a 15C° minimum. The weather in winter is more or less warm during the day due to solar radiation that equalises the cold temperature, and is very cold over night. The maximum average temperature is 21C° and 7C° minimum. The average rainfall over the year is 56mm where January and December has the highest rainfall, with 136mm and 110mm respectively. Wind blows predominately from North-east in summer and South-west in winter. Humidity levels are not considered problematic in the region, with the average in summer at 55% and 50% in winter.

(D, Holm, 1996:69)

## EXPLORATION OF DESIGN METHODS

Water harvesting and passive use of solar energy are the technical methods chosen to explore and evaluate whether they are sustainable for the design concept. These methods aim to create a comfortable living space while increasing energy efficiency and reducing consumption costs.

### Water Harvesting

Water harvesting is a process of collecting and storing rainwater that has run off from the roof, roads and other surfaces, and storing it in tanks for future use. Water harvested from the abovementioned surfaces is not suitable for human consumption without treatment. In urban areas rainwater is used for flushing toilets and watering the garden. Due to insufficient rainfall in the region and the high density of the project, this method was omitted.

### Passive Solar Energy

Passive solar energy is the use of natural environmental resources such as sun and wind temperature to generate energy. The design of passive solar energy in the building aims to achieve a comfort zone indoors by using the resources mentioned above together with building materials.

A comfort zone is a space in which a human body can easily adjust to the environment with the available energy.

## EXAMPLES OF THE METHODS USED IN THE BUILDING

### Bedzed

Bedzed is one of the largest housing associations in London. It was designed by Arup and architect Bill Dunster and built in 2002. The buildings are key to generating social advancement and prosperity in the area, and are also a great example of the use of passive energy.

The buildings were designed to use low-cost renewable energy. Therefore, the design was generated to control the indoor climate during different seasons, so that mechanical systems could be omitted.

The creation of a greenhouse was one of the methods used to control solar heat indoors.

It extends from the ground to the second floor. Thick walls were provided to control heat escaping if the external conditions changed.

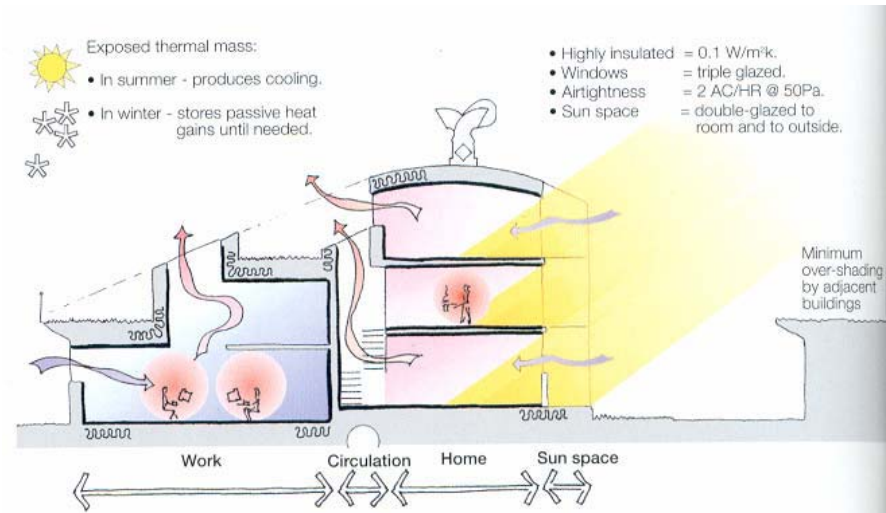


Figure 6.3.1.1 Building physics

(Brown, 1/2003, 12)

The building has both homes and workspaces. They have different orientations according to use. The office machine room in the workspaces building is oriented North to avoid solar heat gain during the summer, while maximising natural daylight and reducing the need for daytime artificial lighting.

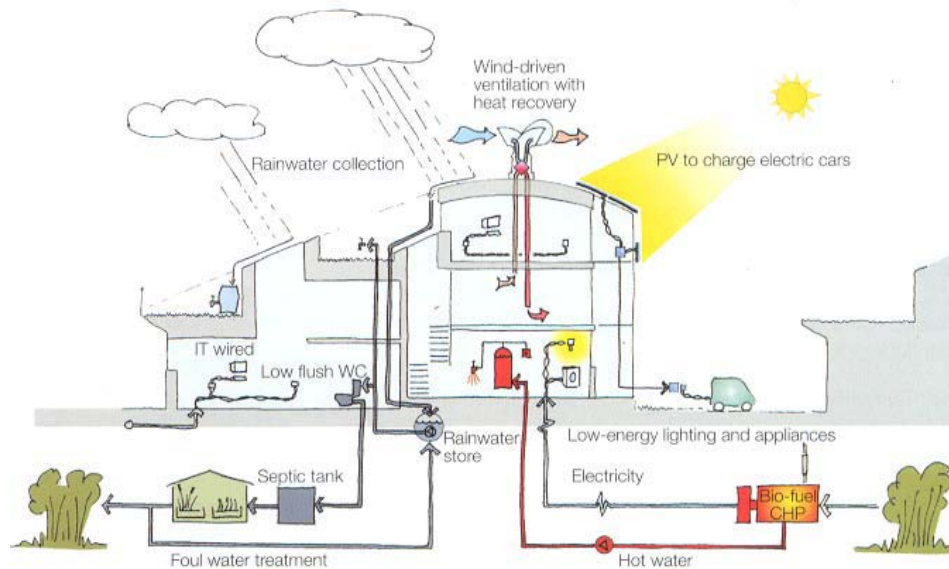


Figure 6.3.1.2 Mechanical and electrical system  
(Brown, 1/2003, 12)

Homes, on the other hand, have less occupancy density and less internal heat gain, so by facing South, they gain supplementary solar heat.

The wind cowl ventilation system pumps fresh air to remove condensation moisture from the kitchens and bathrooms as well as toilet smells and kitchen fumes.

Conventionally, much high-grade fan and pump electricity is consumed to deliver low-grade energy to achieve a comfortable room temperature control and ventilation. This tends to be significant because these systems run for extended operating periods. As building envelopes become more airtight to reduce uncontrolled heat-loss, provision of controlled minimum ventilation becomes particularly important.

The photovoltaic panels were provided on the Southern façades of the building, to supply power to electrical vehicles. Rainwater is collected to reduce the cost of treated potable water. It is collected from roof surfaces and stored in underground tanks for irrigation and toilet flushing.



## Photovoltaic system

The use of solar energy through a photovoltaic system is a real alternative to the conventional electricity production in low-cost housing. The highly developed artificial climatizing technology of the '50s allowed architects to design building envelopes without particular concern for their orientation. In the '80s, building regulations were imposed to save energy, which has resulted in new buildings with two and three-layer outer skin constructions, which were expensive and more characteristic than stylistic features.

Today photovoltaic panels not only function to collect and store solar energy, but are also integrated into building design elements.

Façade and roof areas are integrated actively into energy and thermal systems with the idea of making self-sufficient buildings.



Figure 6.3.2.1 Photovoltaic panels on to of the roof tiles  
(Toggweiler, 1993, 51)



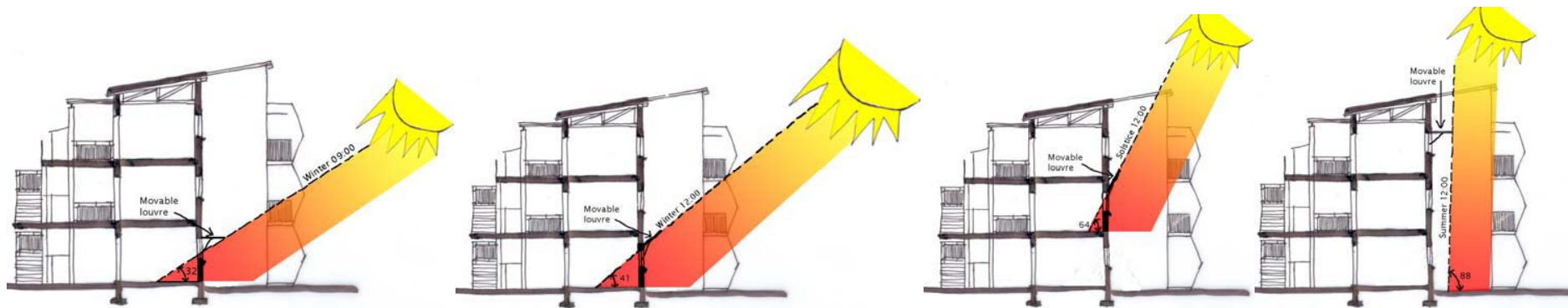
Figure 6.3.2.2 Photovoltaic panels as a building element  
(Toggweiler, 1993, 65-60)

## BUILDING RESPONSE

The building was designed to respond to local climate factors using passive solar energy methods and materials with low energy consumption. The proposed site has major impact on climate. The low density of trees, open land and sun heat are generators of uncomfortable temperatures. The highest point sun angle in summer, solstice, and winter are 88C°, 64C° and 41C° respectively.

(Holm, 1996:72)

Therefore, the buildings were placed at a minimum distance of 12,5m in relation to building height and roof orientation, to control sun penetration into the building from 9 o'clock. The building controls indoors temperature by radiation, conduction and convection.



Winter at 09:00h

32 C°

Winter at 12:00h

41C°

Solstice at 12:00h

64C°

Summer at 12:00

88C°

Figure 6.4.1 Sun angle

## **MATERIAL APPLIED IN THE DESIGN PROPOSED**

The skin of the building separates the indoor and outdoor environment by using materials with different physical properties and layout orientation to achieve sustainability.

### **Mass**

Thermal mass is a property of building material that provides storage heat. Masonry wall is one of the elements that used in the design concept to reduce temperature swing by controlling heat flow from outside to inside and vice versa, keeping indoor temperatures adequate for humankind.

### **Conduction**

Glazing in doors and windows is the conduction element that allows heat transmission. The use of glazing reduces solar radiation through reflection in summer and absorbs solar radiation in winter for effective performance of the comfort zone.

Areas of the building facing North where windows are placed, act as a greenhouse effect which collects and traps solar radiation to heat the building during the winter season.

The greenhouse effect consists of a passive solar heating system.

A passive solar heating system is a method that collects, stores, and redistributes solar energy without the use of fans, pumps or complex controllers.

Windows facing north capture heat from the sun more than any other orientation during the winter season.

During the day, radiation from the sun transmits short wave solar energy and passes easily right through the glazing. Furniture, floors, walls and other objects absorb it. Indoor elements warm up, increasing their emission of radiation in the long wave and store it for nighttime use. To prevent overheating in the summer, the indoor space must be vented through the openings.

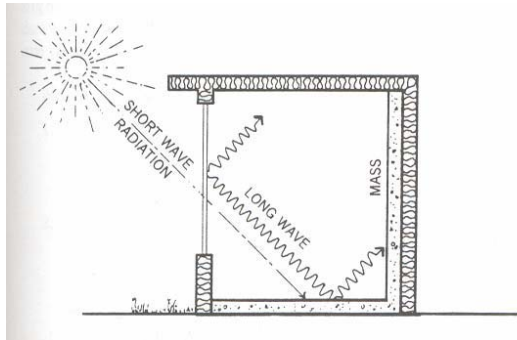


Figure 6.5.2.1

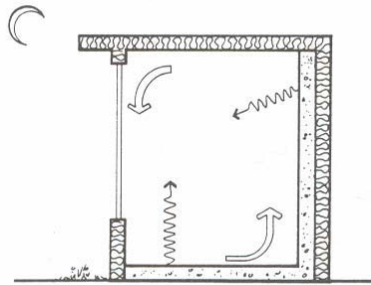


Figure 6.5.2.2

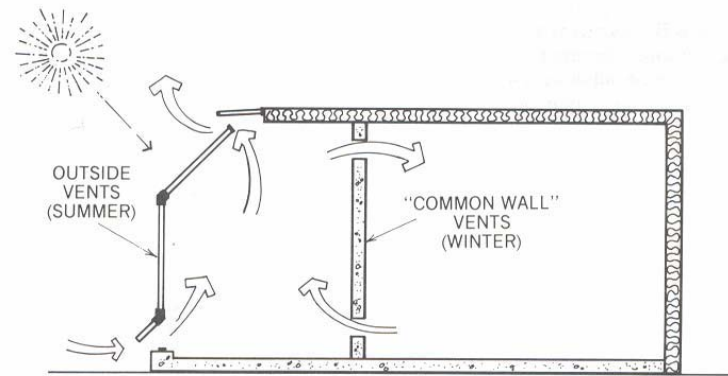


Figure 6.5.2.3

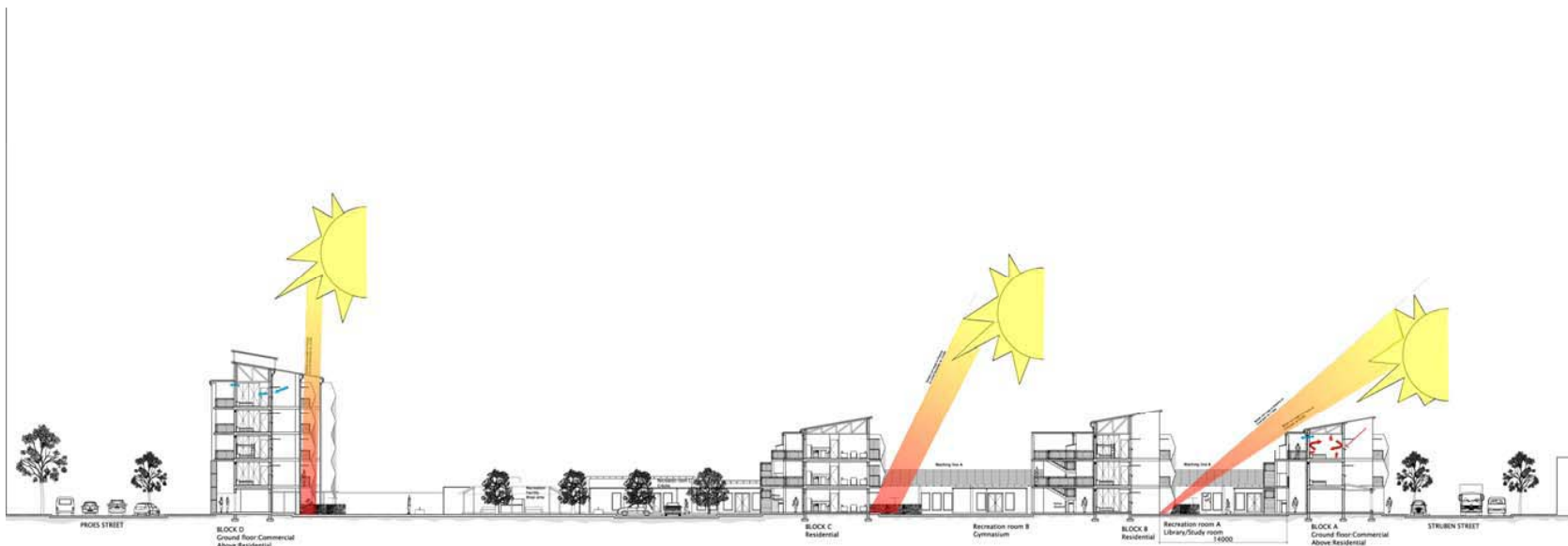


Figure 6.5.2.4 Building responding to climate factors

## Radiation

The building gains solar heat through openings, windows and doors.

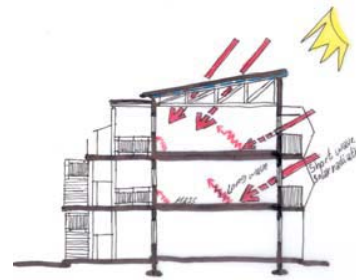


Figure 6.5.3.1

## Conduction

The internal spaces absorb heat through openings and store heat in furniture, walls and floors for later use.



Figure 6.5.4.1

## Convection

The use of openings allows air-flow to moderate temperature indoors. Windows, doors and airbricks are placed on opposite sides, orientated North-south for effective cross ventilation.



Figure 6.5.5.1

## Solar Control Device

External movable wood louvers are control devices designed for sun angle orientation specifically in rooms where people spend most of their time. Louvers are made out of wood with steel arms as a control device. The steel arm regulates the louver to control sun angle radiation. Balconies oriented North-west have vertical cladding made out of wood with gaps of 50mm between them. The shade creates comfort zones for people standing in it by reducing Western sun radiation.

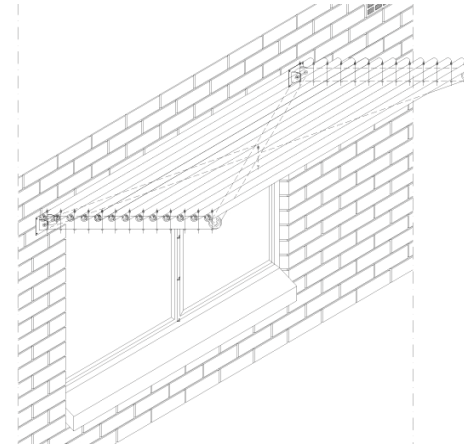


Figure 6.5.6.1 Movable louver

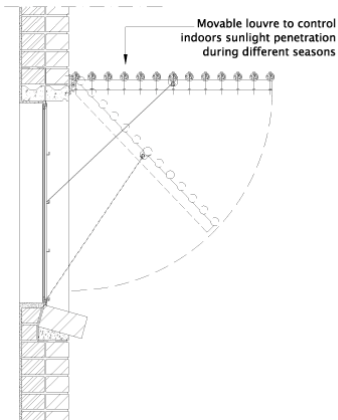


Figure 6.5.6.2 Section illustrating louvre controlling sun angle radiation





## SUBSTRUCTURE

### Foundation

The foundation has the function to sustain and transmit to the ground on which the combination dead loads imposed rest, in order to avoid any movement that can affect the stability of the building.

(Chudley, Greeno, 1998:163)

According to engineers, 700x230mm double wall strip foundations and 850x230mm movement joint foundations are the suitable substructures for the proposed project. Double wall strip foundation is ideal particularly for this type of building where 255mm and 170mm reinforced concrete slabs with 460x230mm and 2300x230mm reinforced concrete columns are applied. The buildings are split into blocks which means it does not line up in the same grid for the design purpose. Therefore, movement joint foundation was introduced

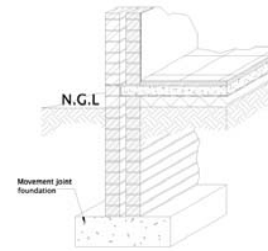


Figure 6.6.1.1 Movement joint foundation

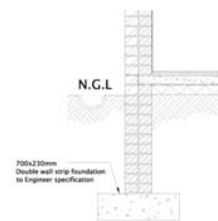


Figure 6.6.1.2 Double wall strip foundation

## **SUPERSTRUCTURE**

### **Slab**

Ground floor slabs aim to provide a level surface with sufficient capacity to sustain imposed loads from building elements. For climate purposes it traps penetration of water and water vapour into the building and reduces heat loss

(Chudley,Greeno 1998:475)

The slab used in the building is composed of fill compact in maximum 150 layers to 90% mod, plastic membrane, 85mm concrete surface bed, 25mm screed and 300x300mm ceramic tiles. Reinforced concrete slabs used on floors above are not economically sustainable for spans over 5m. To reduce the cost of construction 230x170mm reinforced concrete beams were incorporated into the structure design to span in two directions between the columns. The use of beams could compromise the height of the floors. However the beams were placed underneath walls and columns so as to not disturb the height of floors.

### **Columns**

460x230mm and 230x230mm reinforced concrete columns are the vertical load-bearing members of the structure that transmits the slab's and beam's load to the foundation. The rectangular 460x230mm columns are used in the building of 5 storey due to the load quantity that the foundation carries. Square 230x230mm columns used in the building of 3 storey and some parts of 5 storey building where the foundation carries a low load.

## Walls

230mm external walls and 115mm internal walls are used in the building. Stock bricks are used in plastered sections while face bricks are used on external walls for aesthetic and maintenance purposes. Nahoon Travertine face bricks are used for external walls.

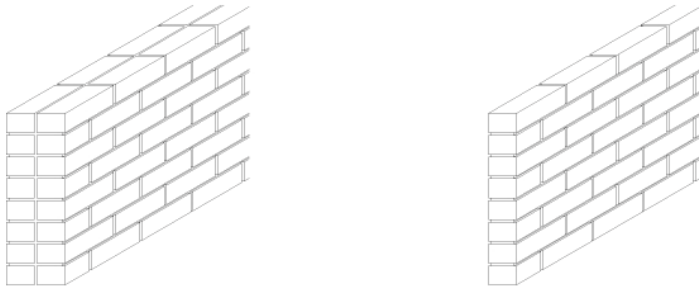


Figure 6.7.3.1 230mm external and 115mm internal walls



*Nahoon Travertine – FBA*

Figure 6.7.3.2 Nahoon Travertine FBA  
(Grobbelaar, 1992:13)

## Curtain walls

Steel windows are cheaper in initial cost and have long life durability with low cost maintenance. 4mm clear float glass and 4mm obscured glass are used on domestic levels. 6mm safety glass with aluminum frames are placed on commercial levels due to large areas used.

## Doors

All doors are also steel frame on residential levels and aluminum frame on commercial levels. The flat units are compiled with external 2 paneled timber doors and internal flush doors. On the commercial level, the external doors are 6mm safety glass. The internal doors are also flush doors.

## Air-brick

Most of the houses in South Africa do not have air-bricks or other systems that allow cross ventilation in the building. Small-scale houses without cross ventilation systems, especially in winter, with doors and windows closed become critical for air flow and an uncomfortable space to live in. Air-brick is one of the methods that can be used in this season to reduce this effect. The building provides air-brick in each compartment of the flat units due to the size of the units and high-density occupancy that absorbs heat.

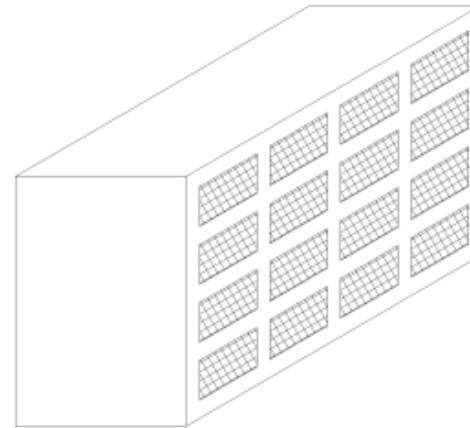


Figure 6.7.6.1 .Air brick

## Roof

Materials of roof trusses and sheeting also have impact on heat gain. Wood is used for roof trusses due to low heat absorption. RCP 10½ roof sheeting is the most available, durable and affordable on the local market. It is lighter to carry and easy to assemble. The higher heat conduction is the negative point of the product, but with use of an insulation device in the roof it will perform well. As discussed in the chapter above, the size of the units in relation to air-flow indoors, the introduction of an insulation device in the roof will control heat flow. 54mm bubble fibre insulation is placed between trusses and roof sheeting. Bubble fibre traps heat indoors reducing heat loss from the roof. In the summer it will offer resistance against heat gain.

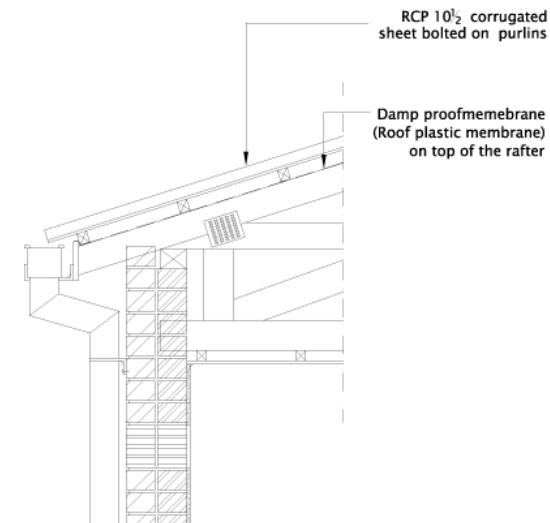


Figure 6.7.7.1 Roof section

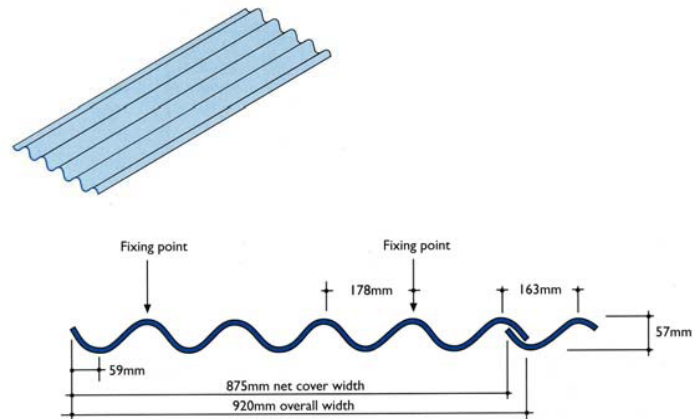


Figure 6.7.7.2 RCP 10½ roof sheeting  
([www.everite.co.za](http://www.everite.co.za))



## Storm water

Metal gutters and 110mm diameter steel down pipes are the storm water channels that will collect rainwater from the roof and direct it to storm water drains through runoffs. Stormwater drains compiled within National Building Regulations (SABS 0400) where drain points do not exceed 40m.



Figure 6.7.8.1 Stormwater drain



Figure 6.7.8.2 Stormwater layout

## **FIRE STABILITY OF STRUCTURAL ELEMENTS**

All the columns comply with fire stability regulations of structural elements for multi-storey buildings.

The class of occupancy of the building is E3 and G1 where the stability rating is 120 and 60 minutes.

### **Provision of Escape Routes**

The escape routes of the building comply with the SABS. Corridors are provided on each floor on the South side with travel distance less than 45m, 2m in width, to the nearest 1.1m wide stairways. The steel stairways covered with chain link fencing is provided on the Western side of the South building. The 230mm and 115mm brick walls comply with fire rating resistance of 120 minutes.

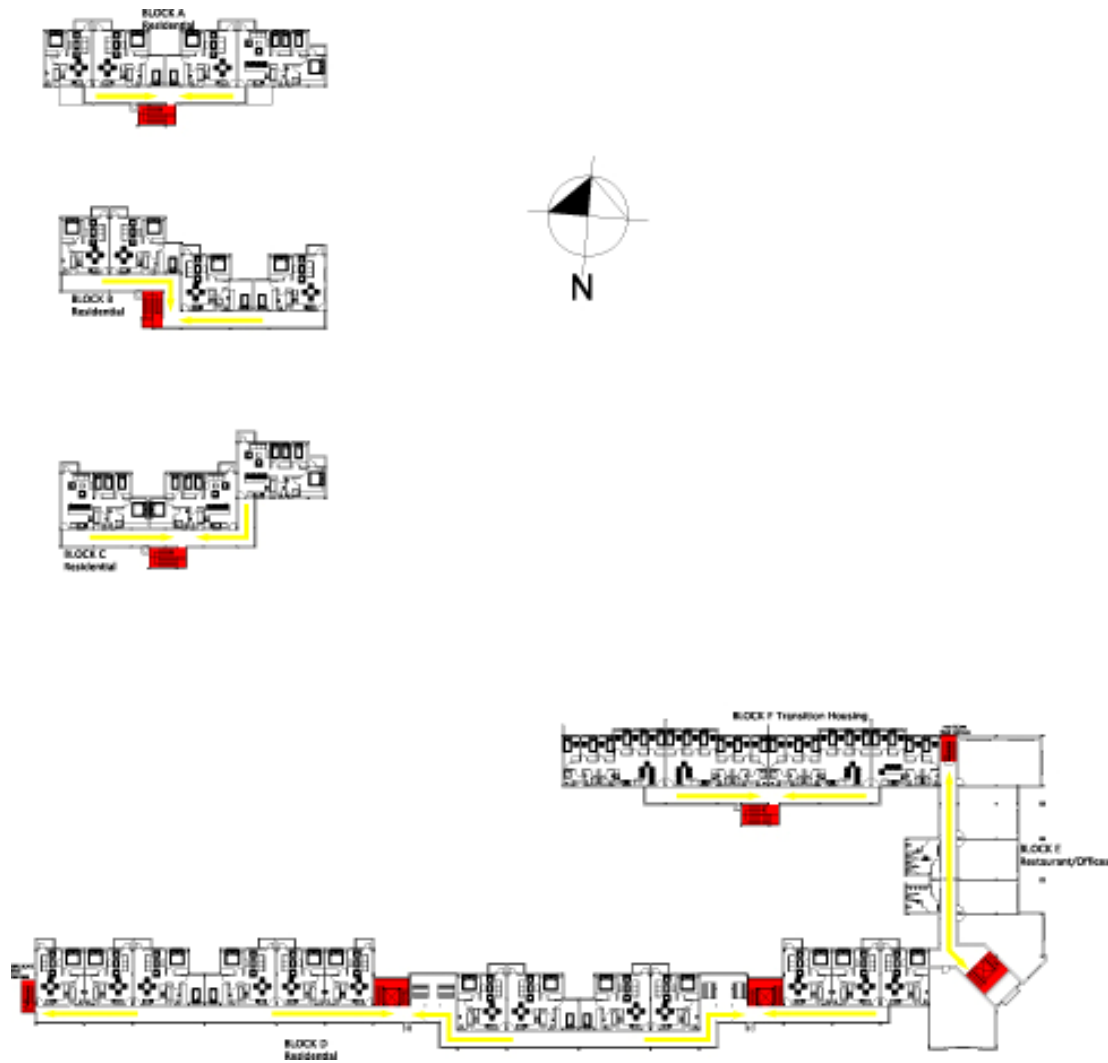


Figure 6.8.1.1 Fire escape route layout

## Markings and Signposting

The building is clearly marked and signposted indicating the direction of exits and fire fighting equipment in case of any emergency. Signs used comply with the standard symbolic system, which is coloured. Sign symbols are provided adjacent to the exit, fixed the on wall just above door height.

The fire hose reel sign symbol is provided on the wall adjacent to the fire hose reel.

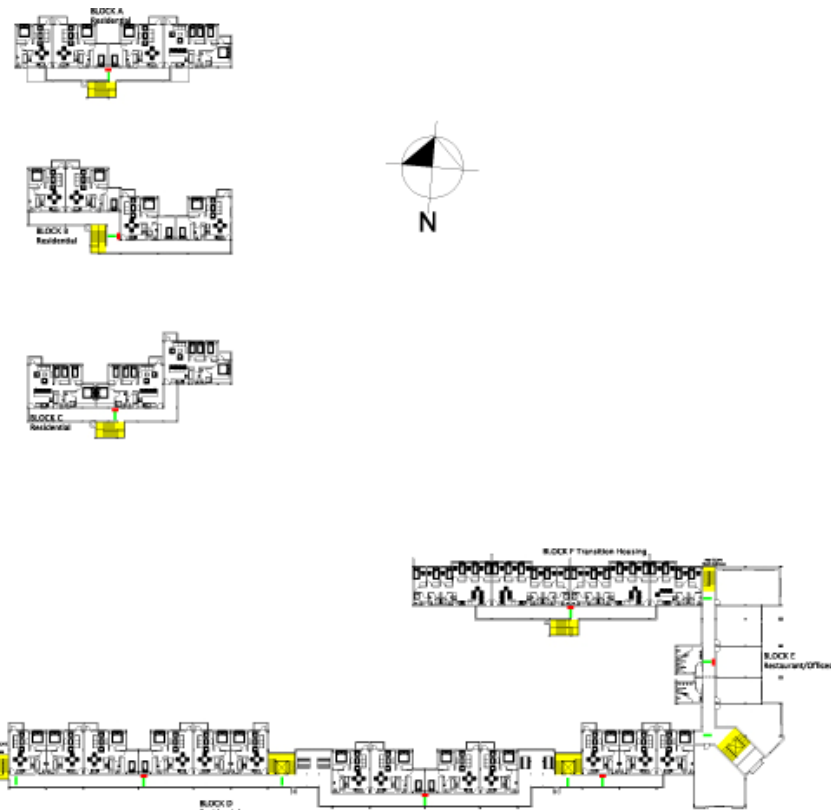


Figure 6.8.2.1 Signposting

Figure 6.8.2.2 Location of signposting

## Provision of Fire Fighting Equipment

The fire fighting equipment in the building is installed so as to be ready at all times for their purpose. The position of the equipment is clearly visible and indicated by symbolic signs which comply with the requirements contained in SABS 1186. Each floor is provided with fire hose reels and fire extinguishers placed next to each stairway.



Figure 6.8.3.1 Fire fighting equipment

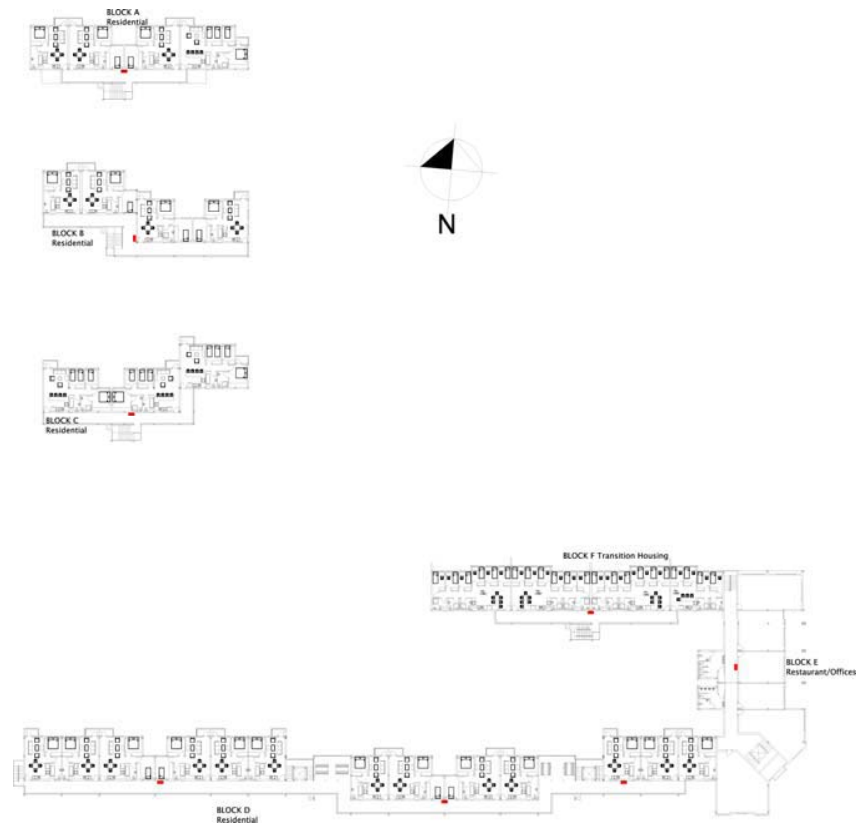
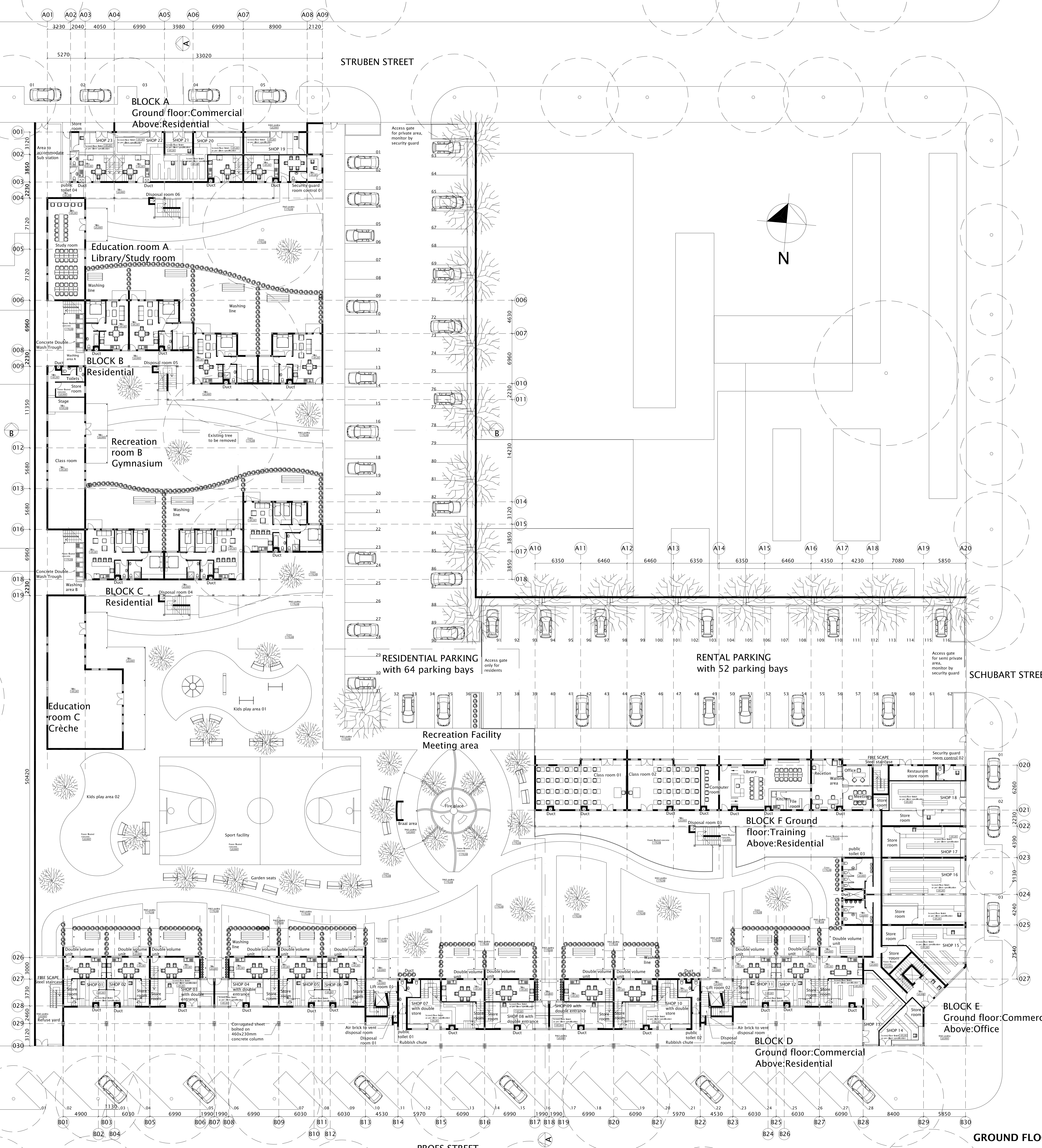
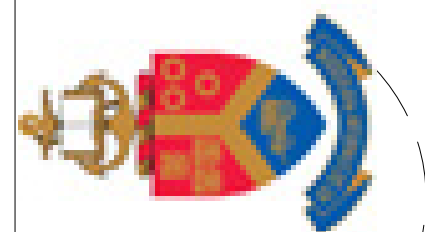
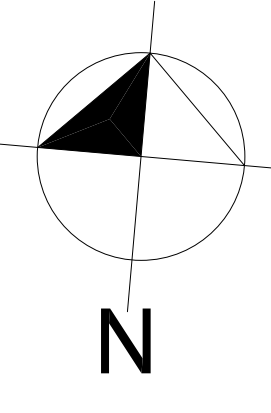


Figure 6.8.3.2 Position of fire fighting equipment





STRUBEN STREET

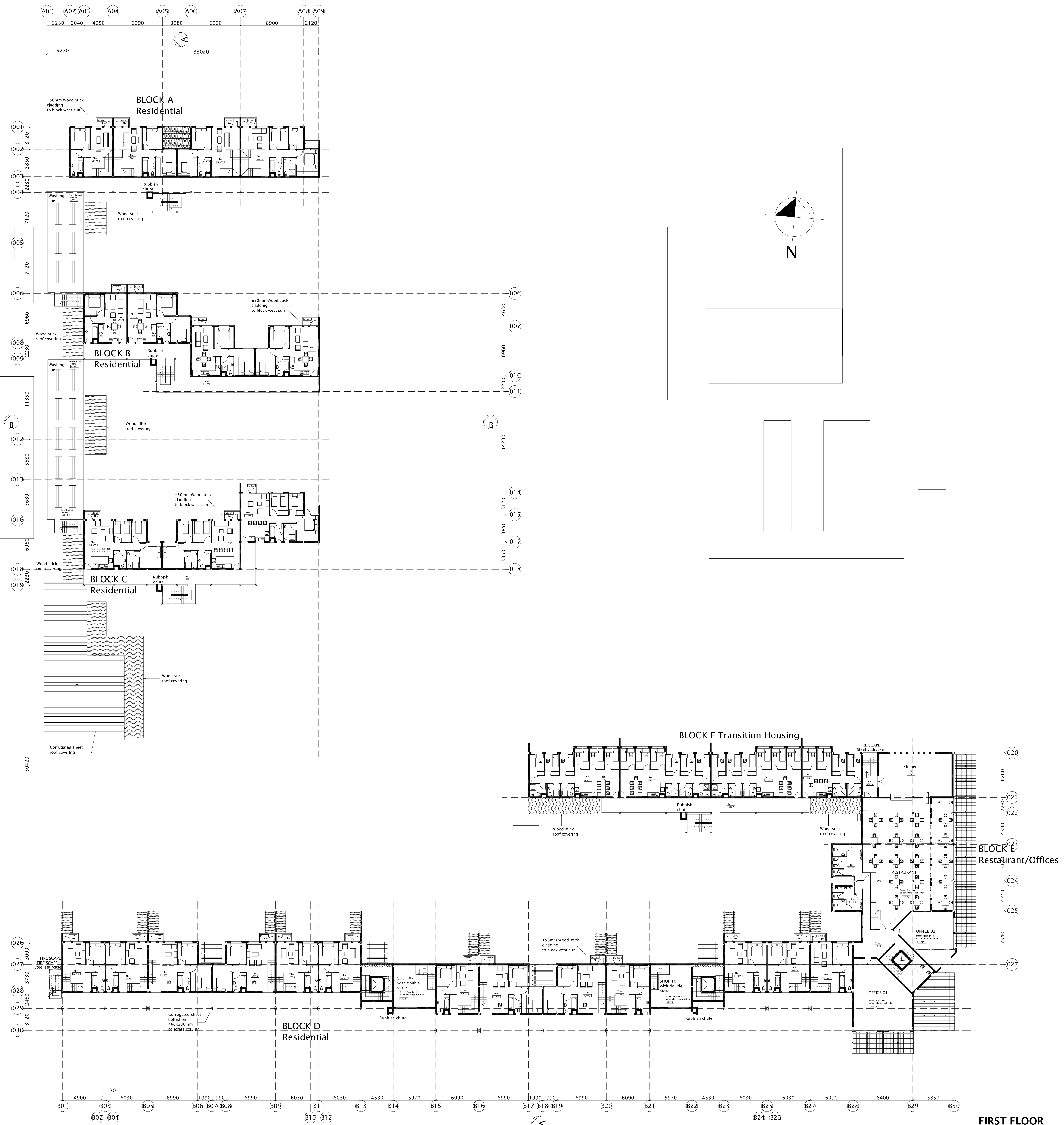


SCHUBART STREET

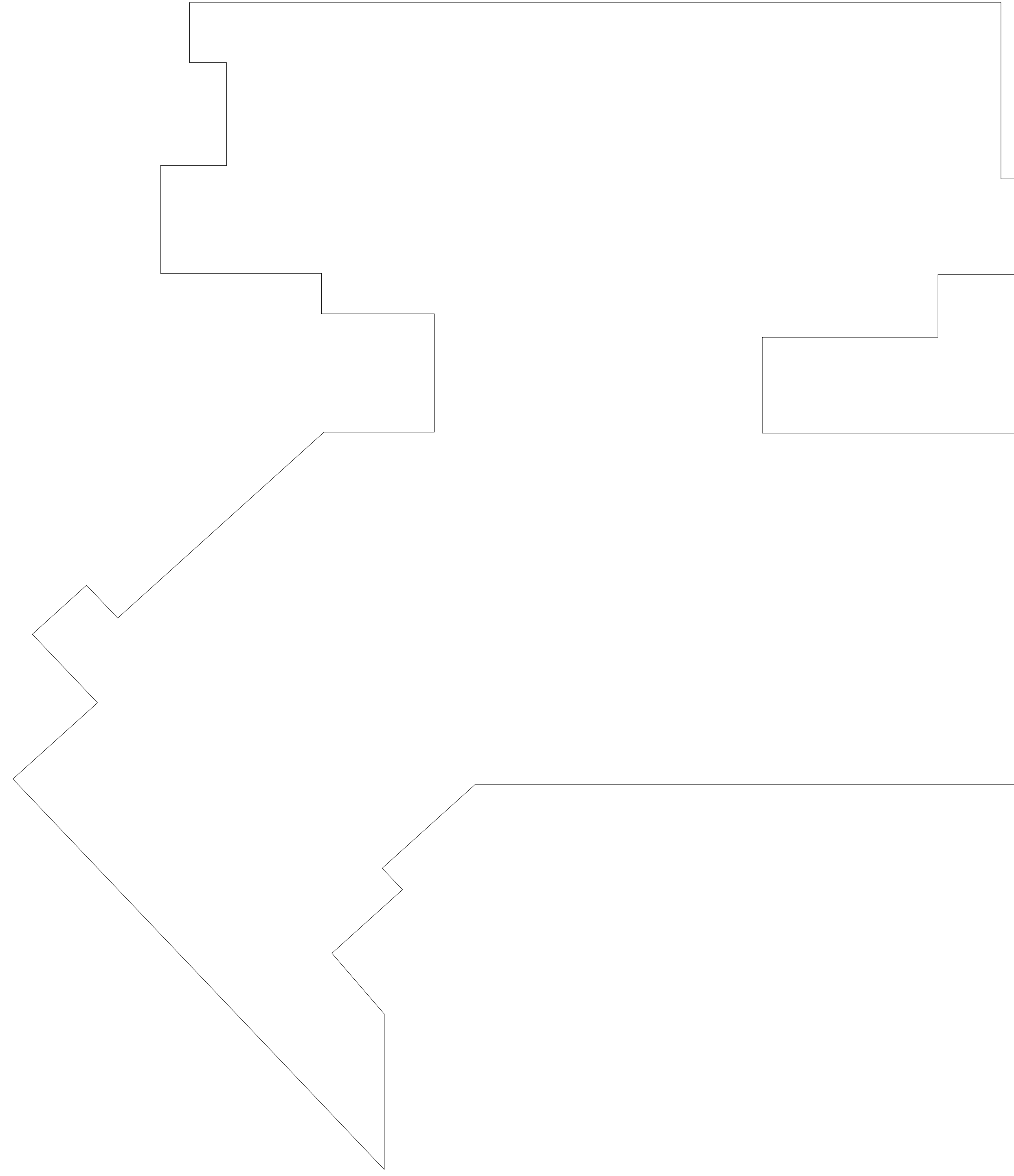
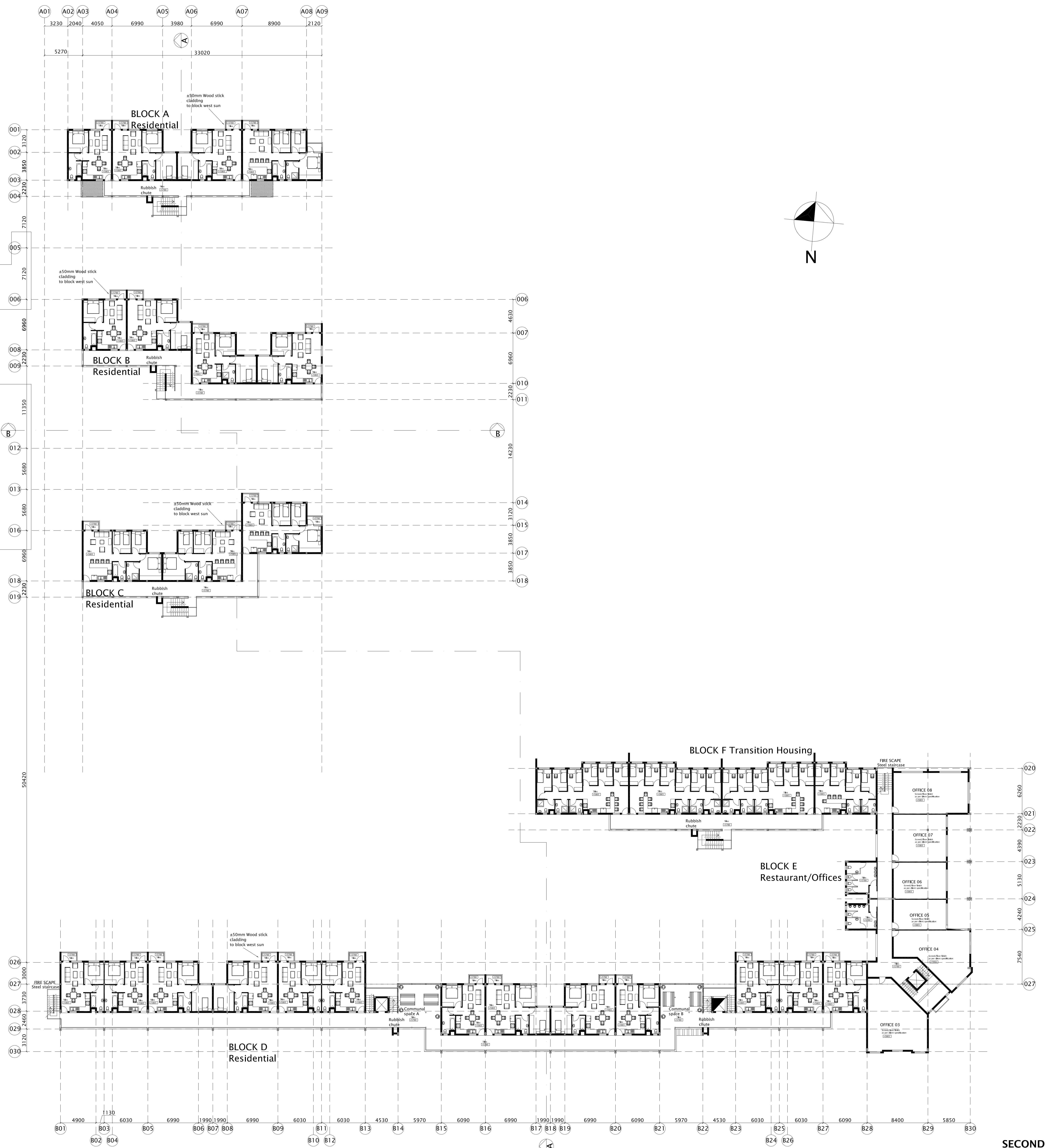
PROES STREET

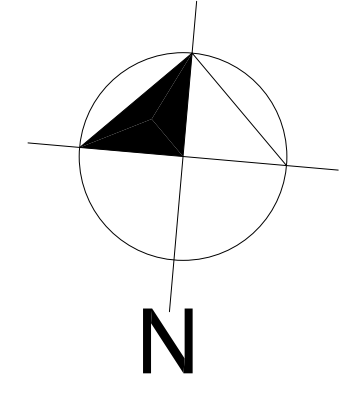
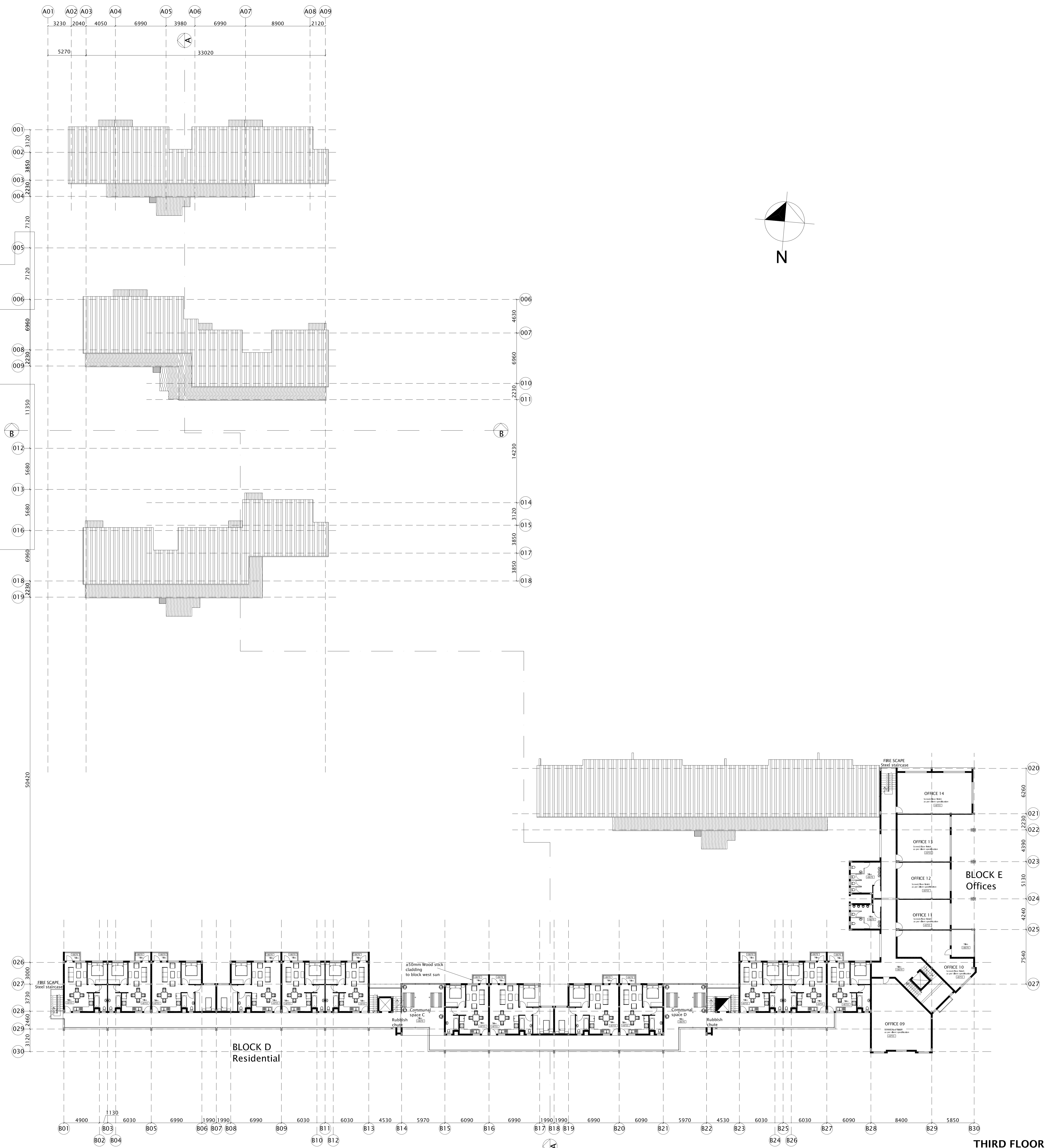
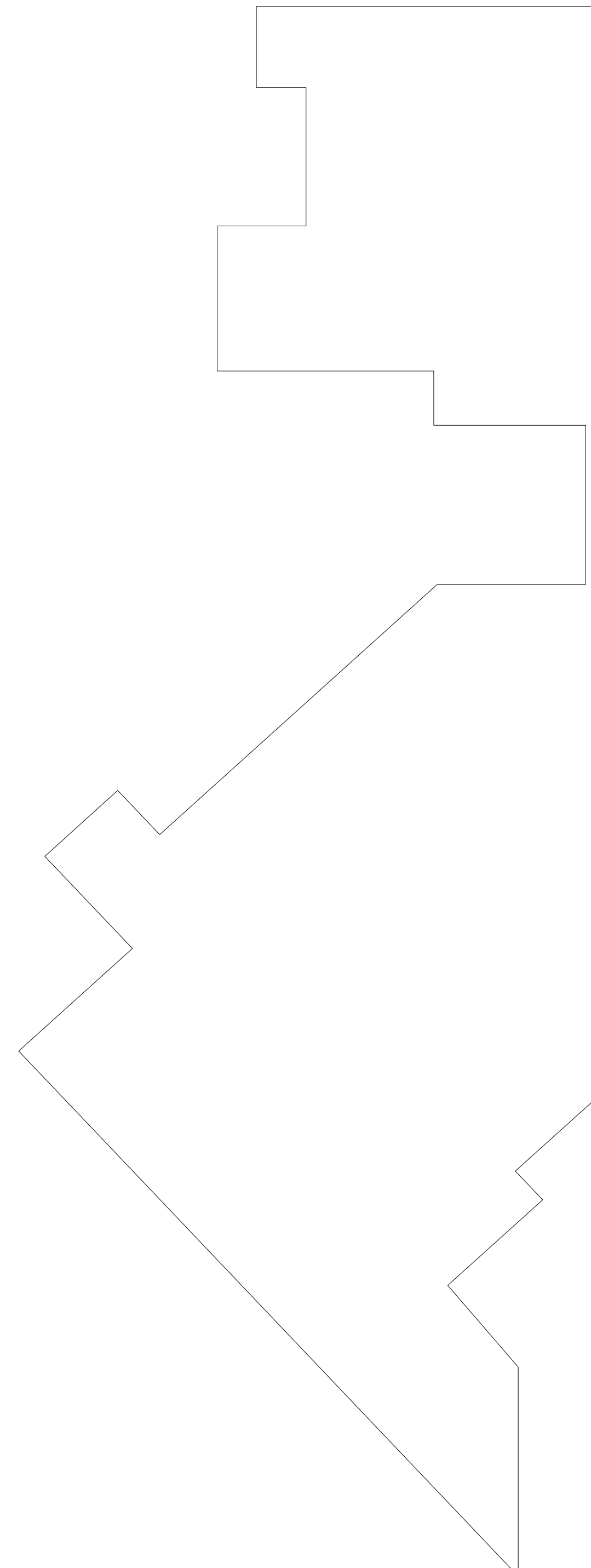
GROUND FLOOR  
Not scale



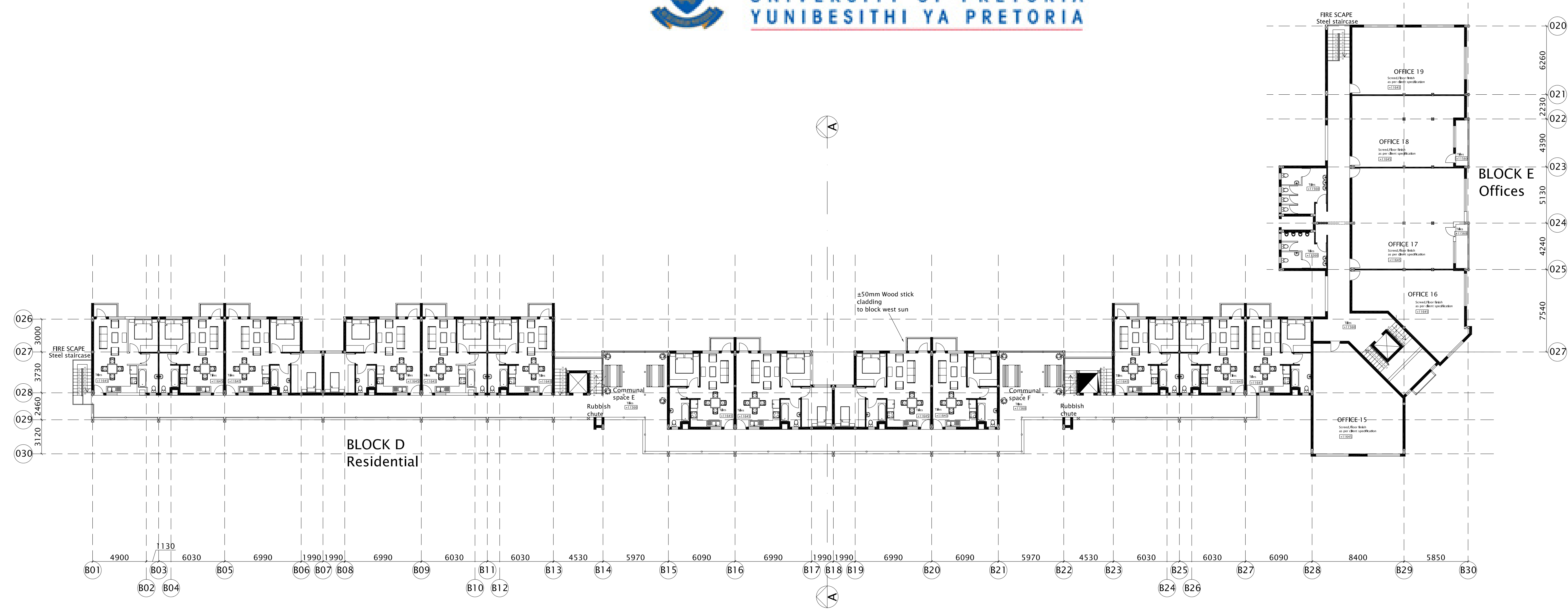






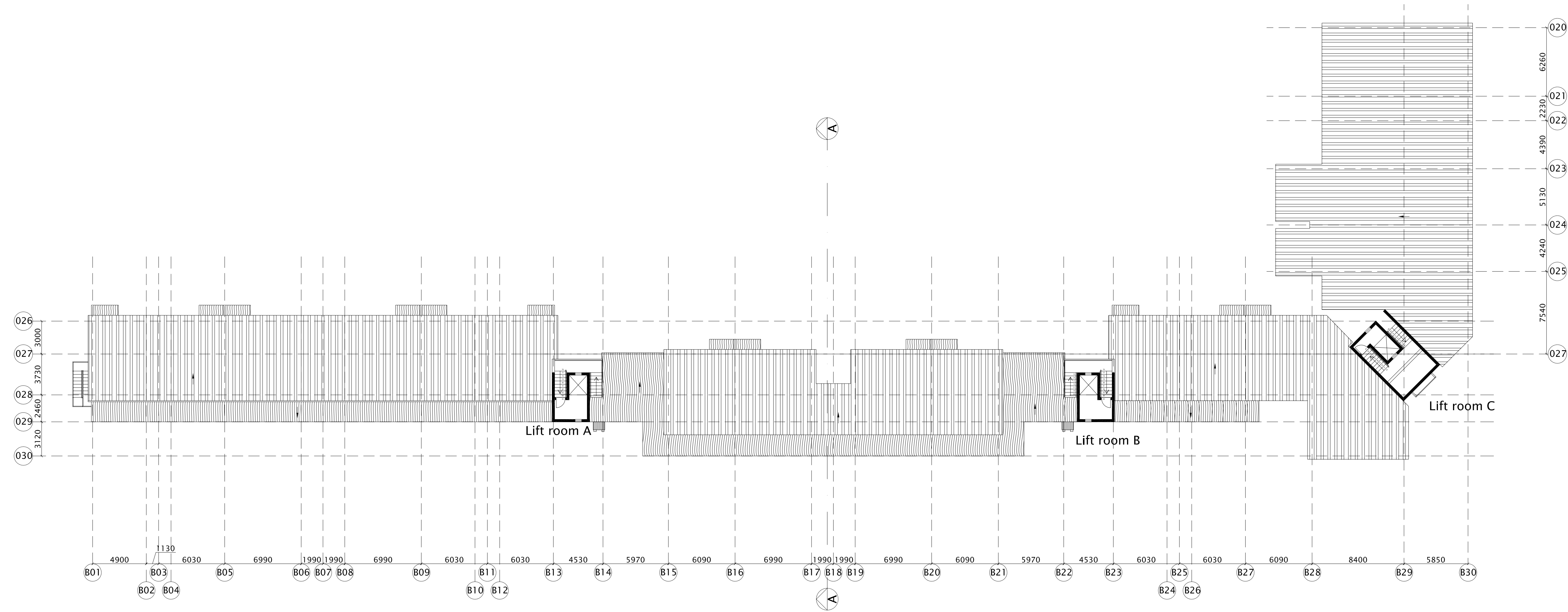






**FOURTH FLOOR**

Not scale



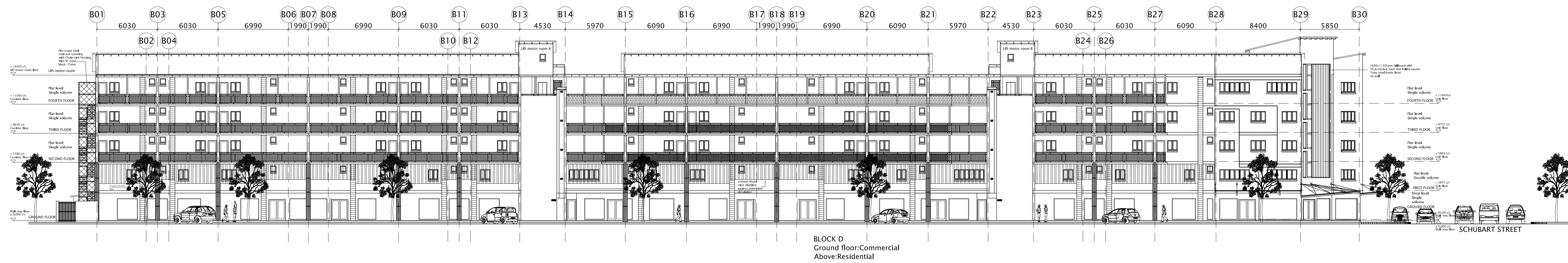
**LIFT MOTOR ROOM FLOOR**

Not scale

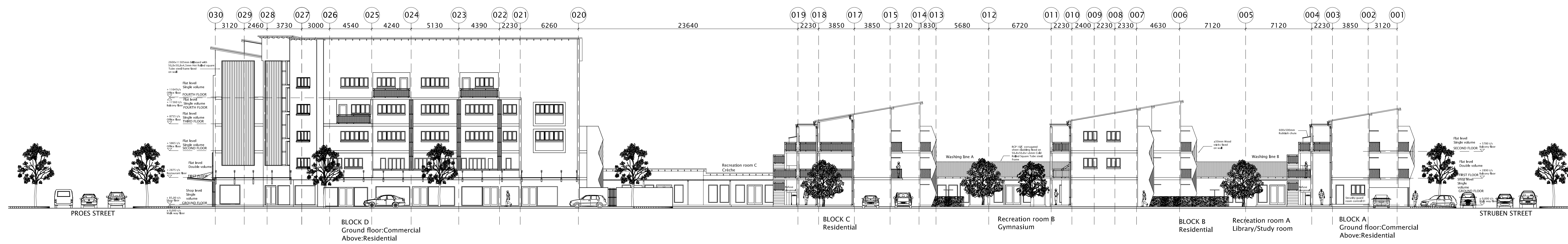




**NORTH ELEVATION**  
Not to scale

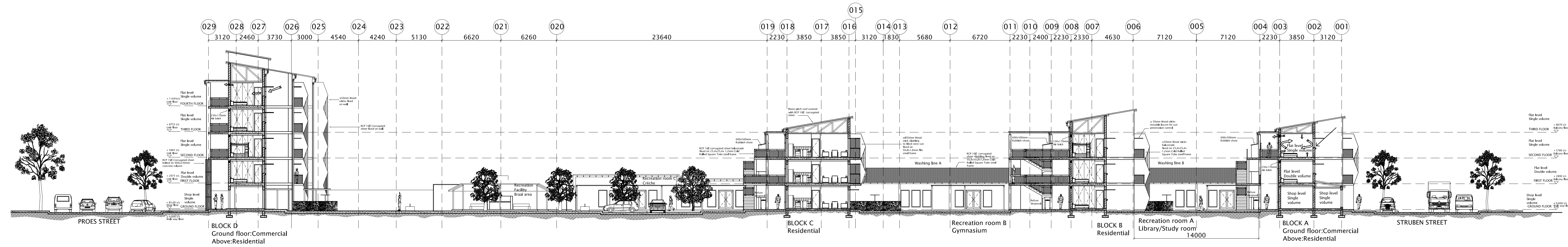


**SOUTH ELEVATION**  
Not to scale

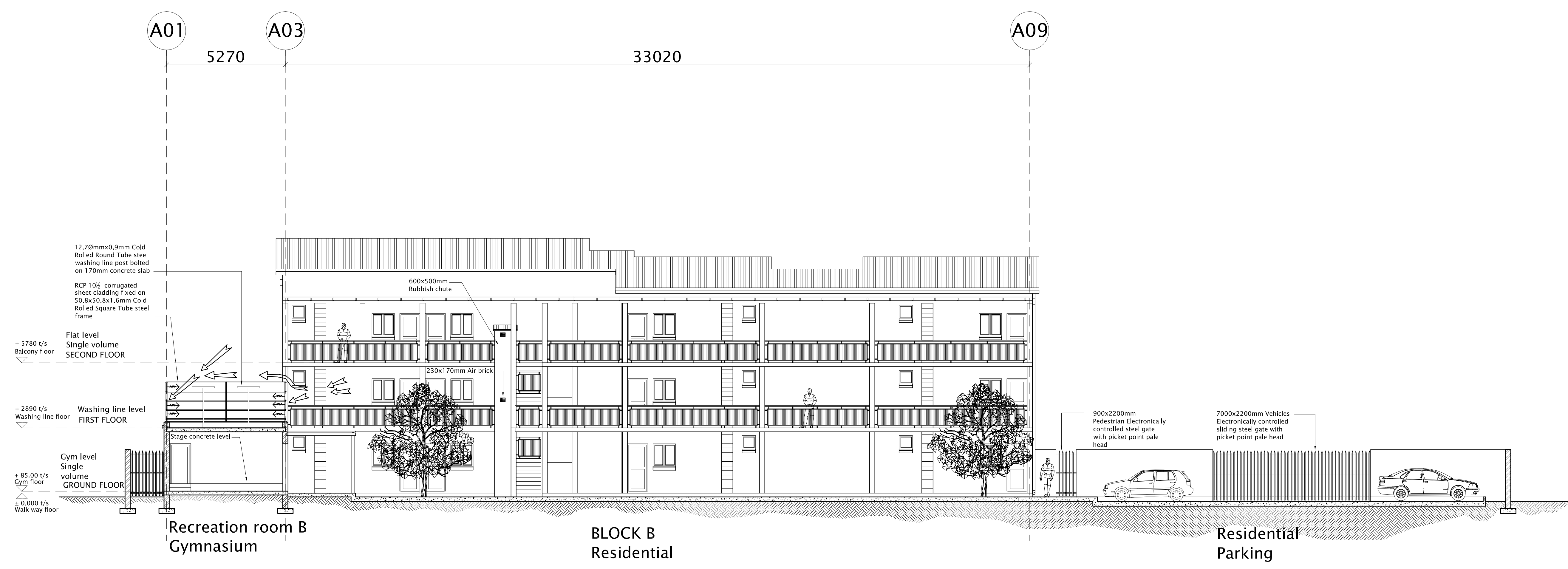


**EAST ELEVATION**  
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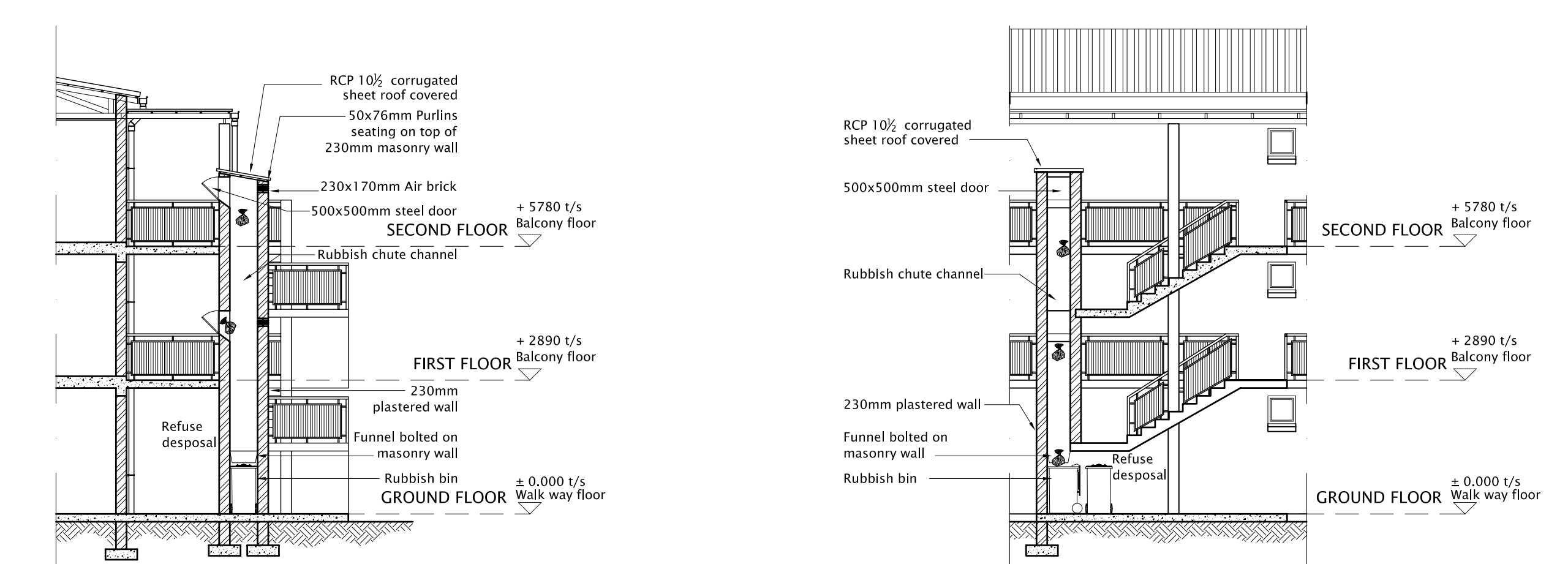




SECTION A-A  
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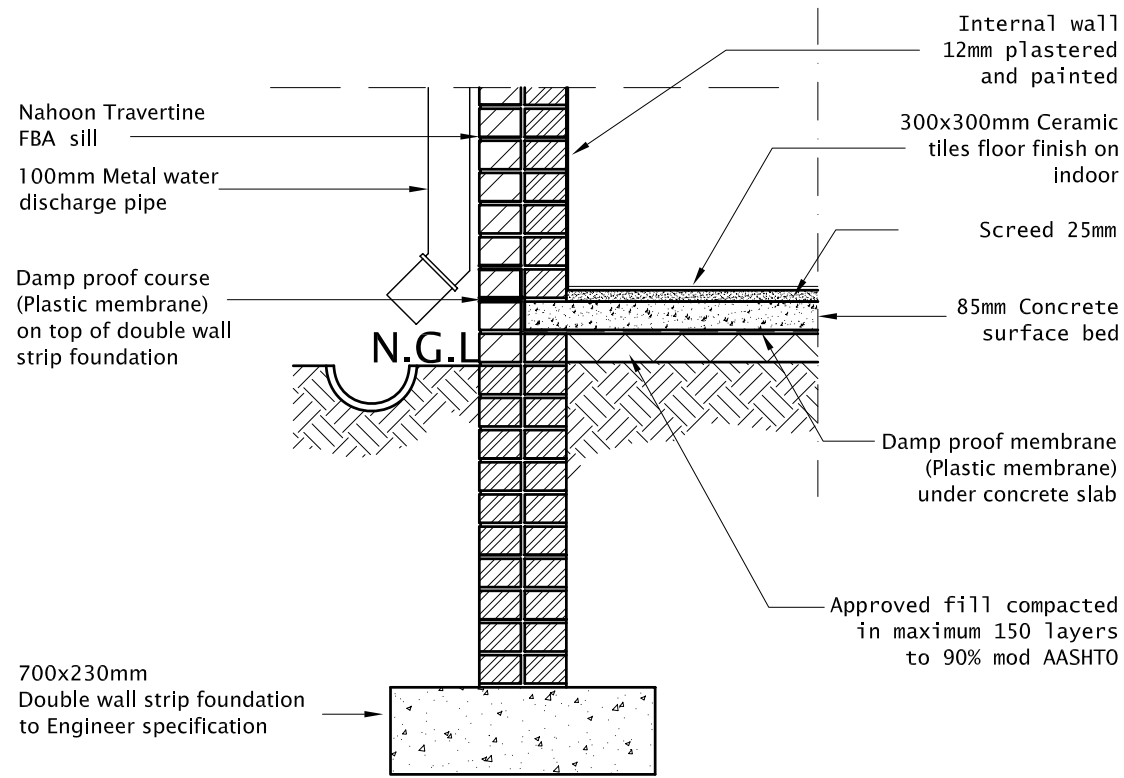


DETAIL 1  
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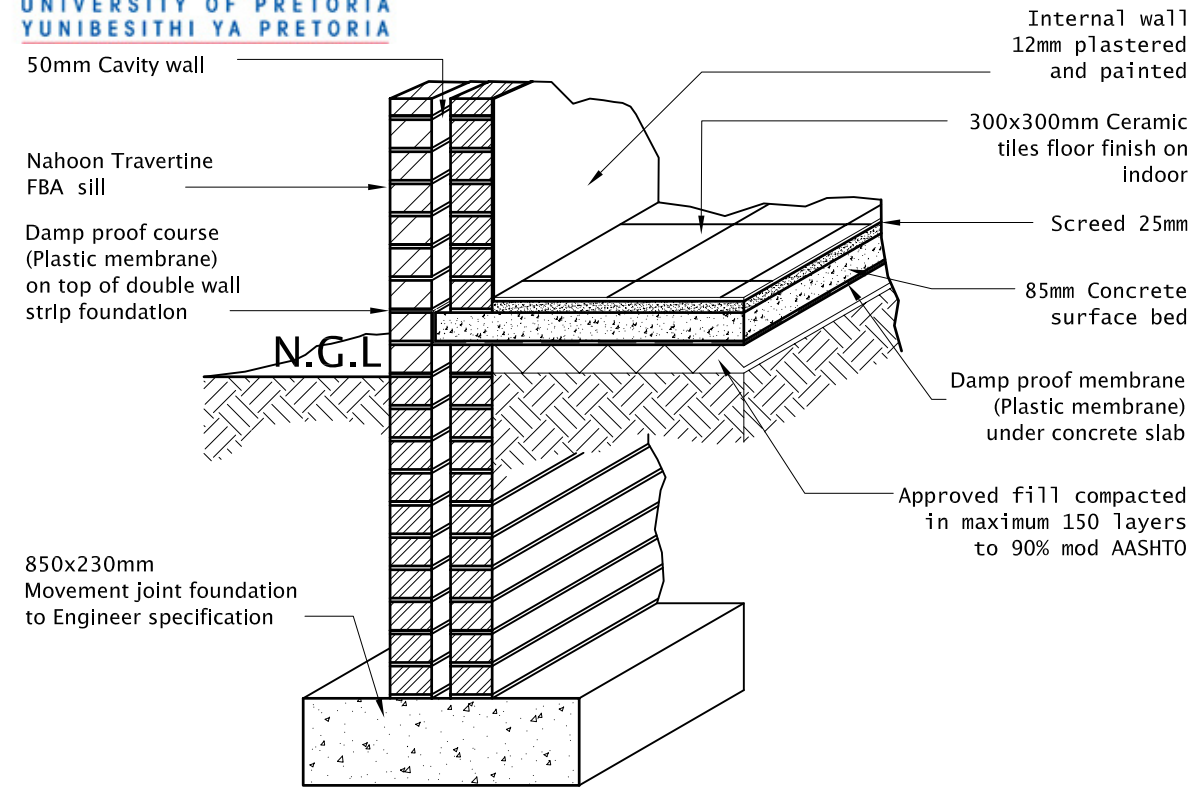


DETAIL 2  
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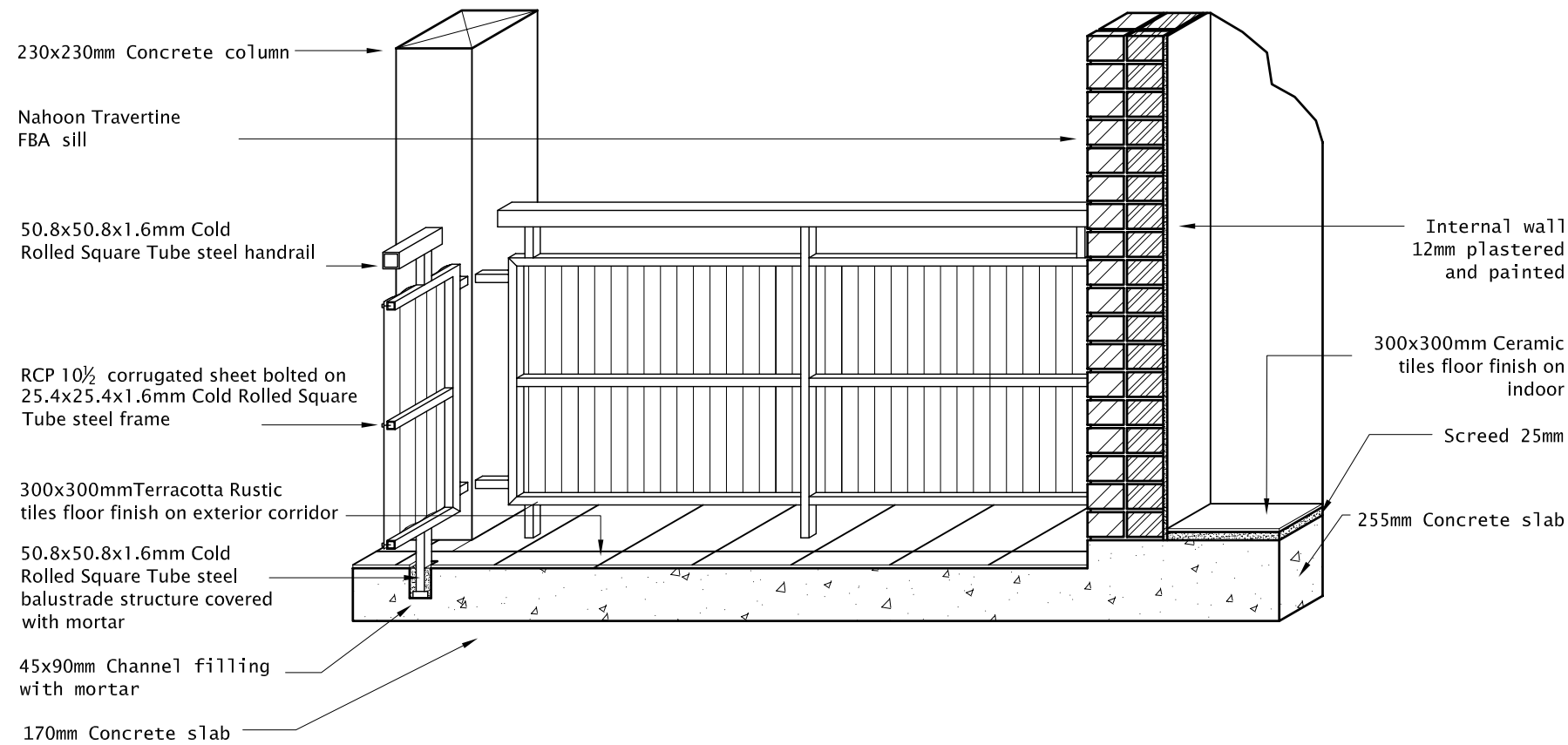




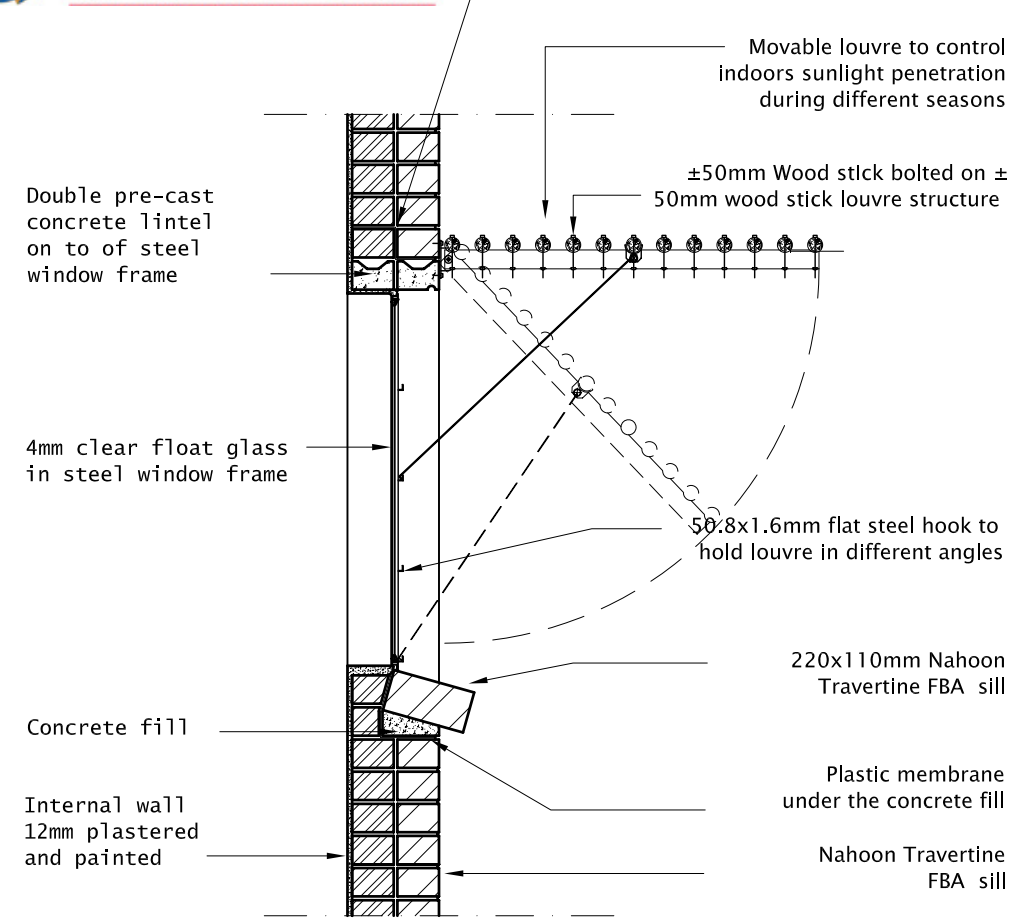
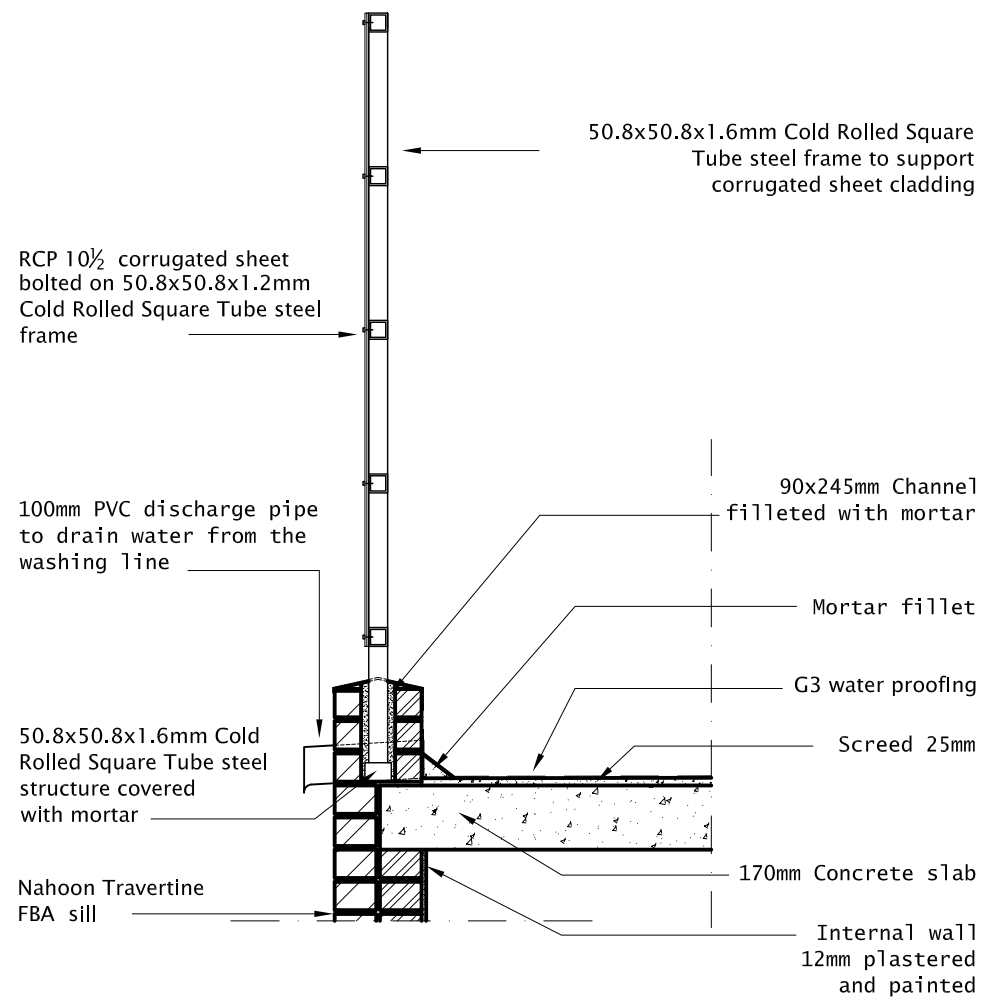
DETAIL 1  
scale to fit



DETAIL 2  
scale to fit

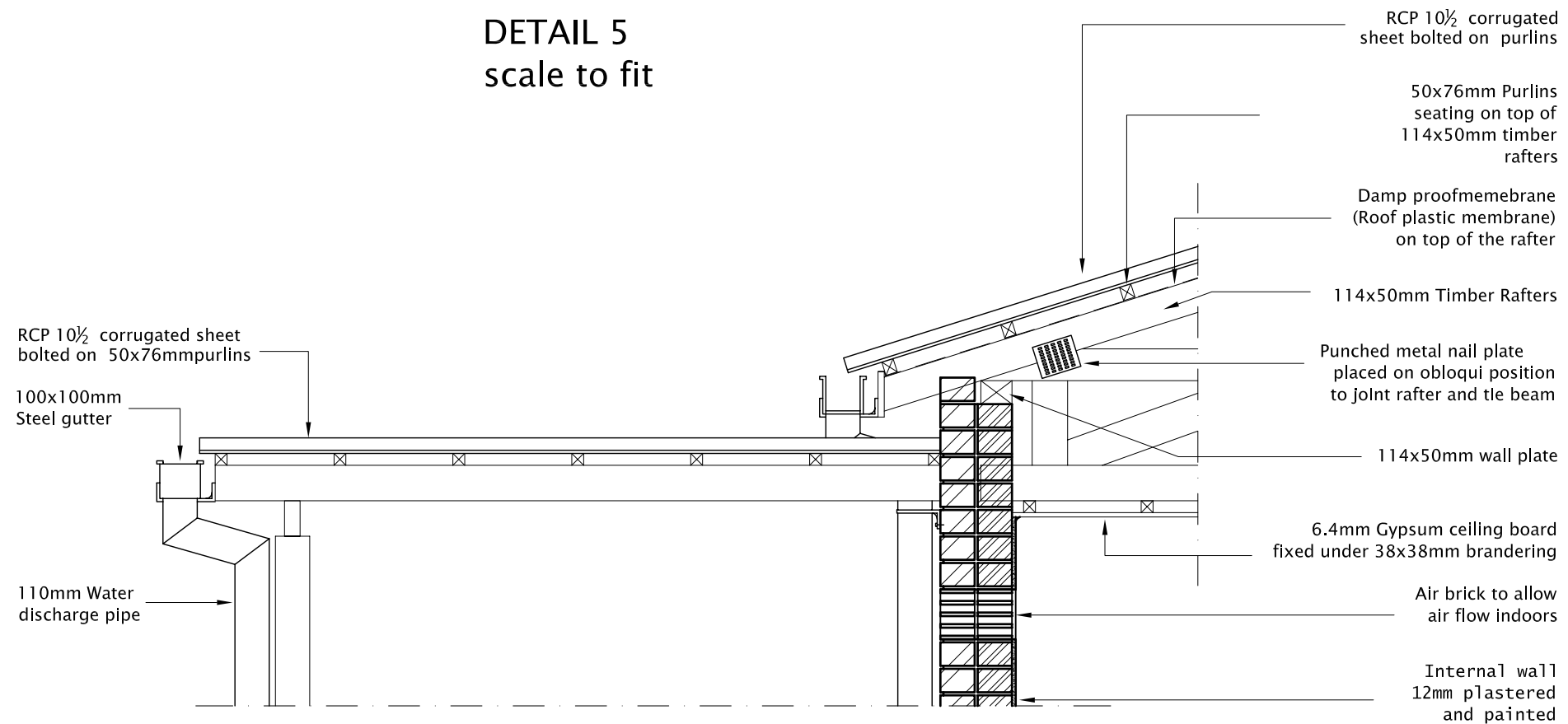


DETAIL 3  
scale to fit



DETAIL 4  
scale to fit

DETAIL 5  
scale to fit



DETAIL 6  
scale to fit

## CONCLUSION

The proposed project suggest an alternative form that allows for development within previously disadvantaged communities situated at the periphery of the Inner City, based on the specific needs of the communities and on existing facilities within the urban context.

The proposed forms are integrated into the architectural context as an attempt to achieve a positive solution in order to recreate and create an all encompassing integrated urban environment, thereby encouraging the use and contextualisation of Marabastad as a node for socio-cultural and economic development with the greater context of Pretoria City.

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