

## The language of space – a housing support strategy in Mamelodi

*When dwellers control the major decision and are free to make their own contribution to the design, construction or management of their housing, both the process and the environment produce and stimulate individual and social well-being. When people have neither control over, nor responsibility for key decisions in the housing process, on the other hand, dwelling environments may instead become a barrier to personal fulfilment and a burden on the community. (Hamdi 2004: 11)*



# **The Language of space – a housing support strategy in Mamelodi**

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## Introduction

Of those who need housing in South Africa, almost 69% earn less than R1 500 a month that make the housing process an extremely difficult and unaffordable task. These potential dwellers could be regarded as a vulnerable section of the dwelling community that need support, guidance and a unique understanding. Housing is much more than providing shelter, but rather a process that addresses man within his psychosocial context and needs.

The UP Mamelodi campus is situated in the middle of a fast growing housing node with low income dwellers on its edge, struggling with their housing needs. The University is currently isolated from this dwelling community by means of a concrete security barrier and poor urban qualities.

The University should be involved in this unique housing process by means of a Housing Support Centre and continuous housing research. The intention of this study is to emphasize the interrelationship between housing needs, human needs, housing support and dwelling issues. Housing could be seen as design instrument in the regeneration of urban environments and sustainable human settlement.

This dissertation attempts to propose a housing strategy on the given site, next to the UP campus, that would result in an optimum housing environment that addresses man in his totality.

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## 1. PROBLEMS AND GOAL STATEMENT

### 1.1 Problem Statement

In accordance with Government's policy regarding the restructuring of higher education in South Africa, the University of Pretoria (UP) incorporated the former Vista University into its structure since January 2004. The University of Pretoria Mamelodi campus is located in the south/eastern part of Mamelodi on the corner of Hans Strijdom Avenue and Hinterland Street.

Currently the UP Mamelodi campus offers selected academic tuition; student numbers are limited and several facilities are underutilized. The campus is isolated from the surrounding neighbourhood and fenced off with a concrete security barrier. Access to the campus can be obtained through one main entrance on Hinterland Street. The previous Vista campus, built during the apartheid political dispensation, served a specific purpose for that period. Currently, with declining student numbers and most students prefer studying at the main campus of the UP, facilities

are under utilized. Buildings and facilities are, however, in excellent condition and well maintained.

On an urban level, the campus functions as an isolated and disjointed entity, alienated from the surrounding urban community with social and virtual boundaries constraining both the university and urban environment growth.

The problem statement to be addressed in this study, therefore, consist of the following interrelated design issues:

- The urban qualities of the UP campus and its integration with the residential urban environment and;
- The residential environment surrounding the UP Mamelodi campus, which is a fast growing residential node with a growing informal dwelling population and;
- The university's role in the regeneration of the residential urban environment.





Figure 1.2 Image collage by author, 2008, Mamelodi campus and site



Figure 1.3 and 1.4 Aerial view of UP Mamelodi campus



Figure 1-3 illustrates the project location within the context of Mamelodi. The campus, indicated with blue, is located on the corner of Hans Strijdom and Hinterland Road. Residential growth and informal trading characterize the urban environment. From the aerial view, it is evident the campus is fenced off and alienated from the surrounding environment.

Figure 1-4 illustrates the specific site, highlighted in blue, allocated for this project. The site with its surrounding context can be seen on these images. Movement corridors on the western and southern edge with residential on the northern and south/western edge of the site.

## 1.2 Goal Statement

This thesis seeks to present the following:

- An Urban Design Framework for the urban regeneration of the UP Mamelodi campus into an university village by integrating human settlement and psychosocial qualities, public and private sector interfaces and social cohesion on the campus, and;
- A framework for the site provided that includes a mixed use development with housing options, a Housing Support Centre that connects the campus and residential environment and retail opportunities with formal and informal trading.

In addition to these, the argument examines appropriate design responses for redefining the campus into a housing research precinct and connecting the academic institution by means of a Housing Support Centre with housing projects. The proposed project acknowledges the need to see housing as:

- A design instrument to regenerate urban environments, and;
- An instrument of spatial restructuring by creating a sustainable human settlement.



Figure 1.5 Image by author, 2008, Mamelodi campus



Figure 1.6 Image by author, 2008, Illustrating open spaces on the Mamelodi campus interface with a concrete fence visible on the campus edge



### 1.3 Research Questions

The **first** question, that guides this research, is what the impact of urban regeneration would be on the integration of the UP Mamelodi campus within the urban context of surrounding residential areas. The unique character of the campus, diverse surrounding dwelling practices and cultural and social differences of the inhabitants of the area should be incorporated in any research.

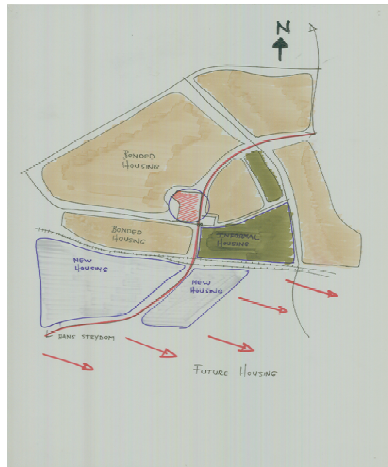
The **second** question deals with spatial qualities. What psycho spatial qualities need to be addressed in order to facilitate optimal human sustainable qualities and dwelling conditions for the thousands of potential dwellers on the campus interface?

The **third** question deals with housing support. Could a Housing Support Centre, jointly managed by the University and a Housing Institution, facilitate and support the dwelling process of potential dwellers. Could a Housing Support Centre contribute to the regeneration of the campus into a housing precinct with academic discourse and in the process contribute to joint University and

community involvement in the housing process of low to medium low- income dwellers?



Figure1.7 illustrating the residential environment surrounding the campus



**Figure 1.8** Image by author, illustrating the residential growth towards an eastern direction. More open spaces/land are available for development in this direction.

## 1.4 Hypothesis

The hypothesis that drives this thesis is the principle that housing be seen as a fundamental design tool in the regeneration of urban environments. A campus interface with mixed use, medium density housing, a Housing Support Centre with linkages between the university and the residential environment and pedestrian circulation routes connecting fundamental nodes, would result in a

regenerated urban environment. The Mamelodi campus could be part of a regenerated housing precinct, with qualities of an urban human settlement.

## 1.5 Importance of the Study

Of those in need of housing in South Africa, almost 69% earn less than R1500 a month. These potential dwellers could be regarded as a vulnerable section of the dwelling community. In the past, many of these dwellers had been exposed to bad policies, inferior building practices and financial exploitation. Not only do they need financial assistance, but also administrative, technical and logistical support, as well as legal, and moral support, financial support, technical support etc. The University of Pretoria Mamelodi campus, being situated in the middle of a housing node, should have a Housing department with academic housing discourse. Linking the Housing Department with a Housing Support Centre, would result in an academic housing discourse, continued housing research, policy making, implementation, community involvement, global housing design and overseeing housing projects of quality.

Housing for the urban poor should not be seen in isolation from the valuable public assets that constitute an urban public environment.

The intention of this study is to emphasize the interrelationship between housing needs, human needs, housing support, dwelling issues, housing research, policy making and particular housing responses to the latter. The concept of house as physical dwelling form, compared to home being an emotional experience based on a meaningful relationship between dwellers and their dwelling place, is discussed.

Housing for the poorest of the poor, should be properly administered. This housing process could be administered and facilitated by means of housing support in the form of information, assistance and skills transfer.

## **1.6 Delimitations**

The housing process proposed in this thesis, will exclude the following:

- Legislation, administration, funding, municipal approval and legal process regarding social housing and medium density housing projects.
- Testing of soil conditions. Soil conditions to be taken as optimal for the proposed structures.

## **1.7 Client Profile**

The proposed Housing Support Centre is to be a joint venture by the University of Pretoria and an accredited Social Housing Institution. Social rental housing units developed on the site would be the housing rental stock of a Social Housing Institution. Co-operative housing units to be developed on the site would be the collective property of a housing co-operative, with an association of people who collectively own and govern the housing units.

Social Housing Institutions (SHI) develops, own and manage its own rental stock without any intermediary associations.

According to the Government's draft policy on Social Housing (2003) Social Housing Institutions are expected to:

- Develop and/or manage housing stock for low to moderate-income residents
- Promote the creation of quality living environments for low and middle-income residents
- Reinvest any operational surpluses in further housing development
- Initiate accreditation application and comply with the accreditation requirements of the Social Housing Accreditation Board
- Consult with local governments with a view to developing social housing stock within the framework of the IDP of the areas within which they operate
- Consult with residents through meaningful participation
- Inform residents on issues relating to consumer protection
- Observe and operate within a best practice and value regime as supported by national policy

- Comply under all conditions with the Ministerial National Norms and Standards in respect of Permanent Residential Structures, the National building Regulations and the technical standards imposed by the National Home Builders Registration Council, where applicable.

Approved SHI's will thus be entitled to free in-kind Social Housing Foundation capacity-building support for the purpose of submitting its accreditation application and business plan. A pre-establishment grant will also be made available through Social Housing Foundation.

After provisional accreditation, an SHI will be entitled to a combination of establishment cost and capacity building grants (to be specified in the business plan to be approved and out of which it can pay for further Social Housing Foundation support, if so required) for a maximum period of five years to full accreditation. Capacity building cost items will be eligible for grant support as per Social Housing Foundation costing (on reimbursement or voucher basis).



## 1.8 Assumptions

The Housing Support Centre should be a joint venture between the University of Pretoria and an accredited Social Housing Institution. Funding for social rental residential development on Hans Strijdom Drive should come from combined investments by the Gauteng Housing Department, Gauteng Partnership Fund, the National Housing Finance Corporation and a Social Housing Institution. The local authority, City of Tswane, will provide the land.

A further assumption is that a Capital Restructuring Grant system for social housing be put in place. The innovation in this system is that it provides capital grants to support social housing projects of a particular description and delivery standards in selected restructuring zones.

The assumption to be made is that the site provided be located in a restructuring zone. If not, then exemption of this condition would be granted, as it was the case with some mega social housing

projects like the N2 Gateway project in Cape Town. The assumption is to be made that cost grants be provided to the SHI by the government through the MEC/provincial housing department/Capital Restructuring Grant of R125 615-00 per unit, upon provisional accreditation, at a normative level adequate to cover institutional overhead expenditure.

The residential units are expected to have a social impact on the area.



Figure 1.9 Image by author, 2008, the site seen from Hans Strijdom Road

## 1.9 Existing Urban Framework

Figure 1.10 illustrates the existing and potential housing increase in the urban environment. The campus is alienated from the urban environment with visual, political, and social barriers. No linkages exist between the campus and the environment. Fundamental nodes in the area are cut off from the campus by means of a concrete fence and result in poor pedestrian circulation, linkages, social spaces, corridors and retail opportunities.

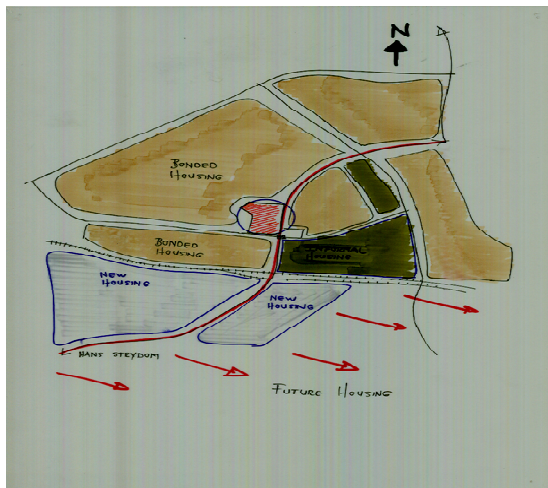


Figure 1.10 Image by author, 2008, Illustrating residential growth in an eastern direction

The campus has only one entrance on Hinterland Road with a ring road system running along the fence, serving neighbourhoods next to the campus. Hans Strijdom Road serves as main entrance to the eastern suburbs of Mamelodi, but also functions as the main activity and transportation corridor/spine running through the entire eastern Mamelodi. Figure 1.11 illustrates the secluded and constrained urban qualities of the area. The campus interface is secured with a concrete fence and inhibits social cohesion and the formation of a human orientated settlement.

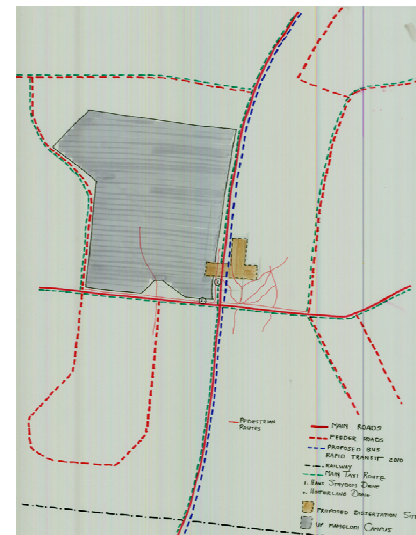


Figure 1.11 Image by author, 2008

## 1.10 Proposed Urban Framework for Mamelodi Campus

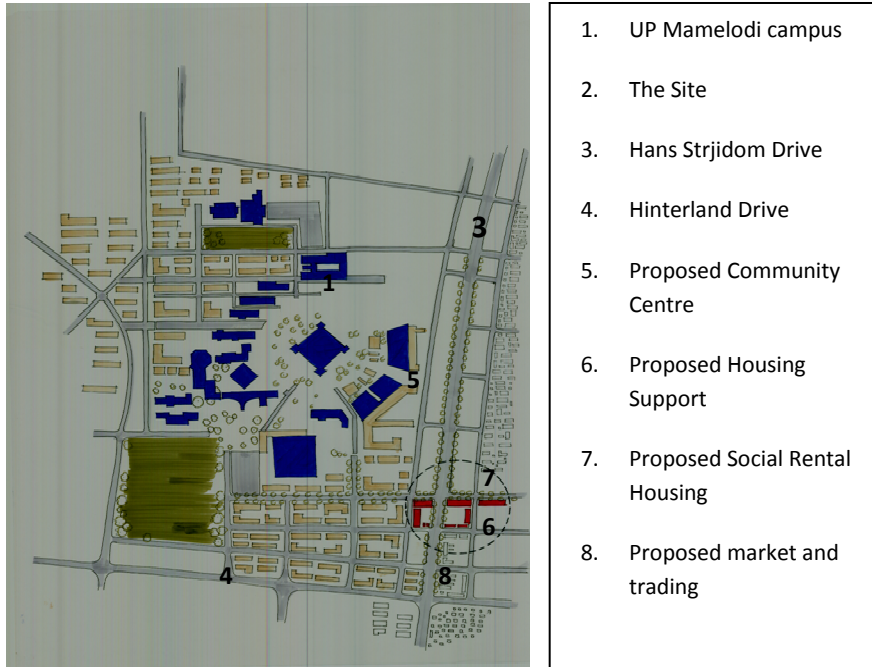


Figure 1.12 Group Urban Framework, 2008

For purposes of this thesis, the intension is to integrate the Mamelodi campus with the urban residential environment and to generate a positive urban environment with residential projects,

public institutions, public spaces, movement patterns and corridors.

The proposed urban framework (Fig 1.12) includes regeneration and restructuring strategies based on the principles of human settlements. Regeneration can be defined as the renewal of the existing environment with the purpose of improving their present condition and transforming it into a sustainable human settlement.

The Mamelodi campus should be part of an integrated sustainable human settlement with various housing, retail, recreation, education and community development opportunities. The campus must be part of a university village where the urban fabric is designed at a human scale and where buildings become nodes of social and academic interaction. Exterior spaces could become sociable spaces.

The Hans Strijdom Avenue interface serves as important node/catalyst and should be explored in terms of regenerating and integration proposals. Slowdown of traffic in favour of pedestrian

circulation and movement corridors could see the emergence of new public spaces. Currently, the area is underutilised and underdeveloped with isolated spaces. The area lacks spatial cohesion and is somewhat spatially disjointed. The latter is to contribute to the challenging socio-spatial qualities of this urban environment.

The campus and Hans Strijdom Avenue interface should be treated as a social space with urban design qualities.

### **1.11 Design Proposal for the Given Site**

On a design level, the following design interventions are proposed:

- A Housing Support Centre (HSC), a joint venture between the University of Pretoria and a Social Housing Institution. This HSC could function as link between the campus, surrounding urban residential developments and future social housing projects in Mamelodi.

- A Social Rental Housing development of medium density to include mixed-use rental accommodation (social rental housing).
- A market area linking the HSC and existing taxi-parking area on Hinterland Road.
- Proposals are made for further housing projects such as co-operative housing with co-operative ownership and incremental housing. Incremental housing to include informal settlement upgrading and self built housing projects.

A Housing Support Centre (HSC) can serve as catalyst in the regeneration and restructuring strategy of the environment, assist people with information, training, technical support, skills transfer on community level, and be a fundamental catalyst to achieve community development. On academic and research level, an HSC could be linked to the University by implementing a formal academic housing discourse and research. Keeping in mind the current academic discourse and development in the field of human settlements and sustainable housing, a tertiary institution such as the University of Pretoria, Mamelodi campus, could be in the forefront of housing research and education.

Social rental units should be developed in accordance to the Social Housing Policy Framework. Units can be leased on a rent to buy basis and could only be owned by the tenant after a period of 15 years. An ideal social housing development should consist of a mixture of units. The suggested framework, according to SHIFT framework, should consist of 10% one-roomed units of minimum 30m<sup>2</sup>; 35% one-bedroom units of 37m<sup>2</sup>; 45% two-bedroom units of 45m<sup>2</sup> and 10% three-bedroom units of 52m<sup>2</sup>.

## 2. Contextual Research

### 2.1 Macro Scale

Total population in Tshwane in 2003	2 100 000
Growth rate of total population as percentage	50 000 people 2,4%
Growth rate of urban population as percentage	50 000 people 2,65%
Density of overall population per hectare	9,5 people per hectare not available
Informal settlements within the boundaries of the CTMM	constitute 35% of all households.

**Table 2.1 City of Tshwane, Statistics, 2003, illustrating population and population growth statistics.**

Mamelodi is a historically black, densely populated township in Pretoria situated 30 km from the Pretoria CBD, planned by authorities on the periphery of Pretoria CBD. Mamelodi still has mono-functional residential areas isolated from the CBD with poor quality housing and a large component of informal housing settlements. The area is characterised by predominantly low-income formal to informal housing. The UP Mamelodi campus is situated on Hans Strijdom Avenue, in the eastern part of Mamelodi. The campus is surrounded by a range of housing environments ranging from better quality houses, houses bonded through bank loans, to typical RDP housing, RDP being the term given to give-away housing under the Housing Subsidy Scheme (HSS) and informal settlements to the east of the campus.

## 2.2 Micro Scale



Figure 2.1 Residential environment surrounding the campus



Figure 2.2 Image collage by author, 2008, Western view of site



The site of choice is located on Hans Strijdom Avenue, on the eastern side of the campus. The area is characterised by predominantly low-income informal and formal housing. Hans Strijdom Avenue offers informal trading opportunities. Several vendors and temporary built structures are on the site.

### 2.2.1 The Existing Site – Visual Urban Fabric



Figure 2.3 and 2.4 Image Collage by author 2008, – illustrating trading and built structures on the Mamelodi site. Most structures are built from corrugated roof sheeting and timber.



Figure 2.4 Image Collage by author 2008, – illustrating trading and built structures on the Mamelodi site. Most structures are built from corrugated roof sheeting and timber.



Figure 2.5 Trading structures on Hans Strijdom Road



Figure 2.6 Taxi holding area on Hinterland Road



Figure 2.7 Retail edge on Hinterland Road

## 2.2.2 Local Building Practices, Skills and Materials



Figure 2.8 Extended room with corrugated roof sheeting illustrating typical township extension principles.



Figure 2.9 Shack components being sold on Tsamaya Road, Mamelodi

Informal dwellings in Mamelodi are built from timber, corrugated metal sheets, fibre cement or a combination of the three.



Corrugated sheets seem to be popular due to its lightweight, durability and availability.

### 2.2.3 Prevailing Socio-Economic Systems



**Fig 2.10 and 2.11** Image collage by author, 2008. Commercial activities on the site. Building material sales and informal trading structures.



**Figure 2.12 and 2.13.** Image collage by author, 2008. Mamelodi illustrating formal and informal trading on Hans Strjidom and Hinterland Road

Unemployment in Mamelodi is almost 63.6%, (City of Tshwane, 2003). Most residents in the area are self-employed and have to rely on formal and informal trading. Informal trading is an existing activity on the proposed site and should be incorporated in design proposals for the site. The concentration of trading is very high in

the area close to the taxi ranking area on Hinterland. Commuters wait for transport. Informal trading on the edge of Hans Strijdom and Hinterland Road provides an income to numerous people and counter unemployment.

	ATTERIDGEVILLE	SOSHANGUVE	MAMELODI	CENTURION
<b>&lt;800</b>	48.0	72.2	74.5	75.4
<b>R801 to 1500</b>	39.2	22.1	20.3	16.8
<b>R1505 to 2500</b>	11.3	4.8	4.4	6.4

**Table 2.2 Employment statistics comparing Mamelodi with other areas, City of Tshwane, 2003.**

	ATTERIDGEVILLE	SOSHANGUVE	MAMELODI	CENTURION
<b>% EMPLOYED</b>	<b>39.2</b>	<b>48.4</b>	<b>36.4</b>	<b>52.5</b>
<b>%UNEMPLOYED</b>	<b>60.7</b>	<b>51.6</b>	<b>63.6</b>	<b>47.5</b>

**Table 2.3 Monthly income per household, comparing Mamelodi with other areas in City of Tshwane, 2003.**

## 2.2.4 Infrastructure Analysis



**Figure 2.14 Image by author, 2008, Mamelodi**

Hans Strijdom not only serves as a main entrance to the eastern suburbs of Mamelodi, but also functions as the main activity and transportation corridor/spine running through the entire eastern Mamelodi. The **Hans Strijdom Avenue** interface serves as important catalysts and could be explored in terms of regenerating the urban fabric. Pedestrian dominant circulation, with linkages between public spaces, the campus and residential urban environment, could contribute to the urban fabric of a university village. During peak hours, taxis park on the open site on Hinterland Road, creating an informal taxi-ranking and holding site.



## 2.3 Climatic Context

Climatic conditions in Mamelodi are characterized by a hot/dry climate. Humidity is low with higher temperatures during the summer afternoons. Summer rains can reach an average of 741mm per year with precipitation in the form of thunderstorm activity. Prevailing winds blow mainly from the northeast in the morning to northwest in the afternoon. During wintertime, cold winds could blow from the south. Thunderstorms are accompanied by turbulent wind patterns (Kunz, B. 2007)

	Jan	March	May	July	Sept	Nov	Average
<b>Maximum average monthly temperature</b>							
<b>Minimum average monthly temperature</b>	17.4	16	7.8	4.5	11.7	15.7	12.13
<b>Average monthly amplitude</b>	11.2	11	14.1	15.1	13.8	11.4	12.68
<b>Average monthly relative humidity (%)</b>	58.0	60.0	55	50.0	45.0	54	53.83
<b>Average monthly rainfall (mm)</b>	136	82	13	3	22	98	56.17

Table 2.4 Climatic studies, City of Tshwane Statistics, 2003

### 3. RESEARCH METHODOLOGY

Several sets of data were studied to conceptualise relevant principles and patterns. The information obtained, were used to determine a possible design intervention.

- Interviews with several members of the community/public on the given site
- Existing housing practices and development in the area
- Precedent studies, local and global
- Spatial standards

#### 3.1 Needs and perceptions of residents

Needs and perceptions of residents in the area were collected by means of unstructured and informal interviews on the site. Most of the people interviewed are self employed and could be categorised in the lower income group. Most strive towards their own home and would prefer a work/living environment.

From these interviews the following perceptions and needs regarding spatial standards and housing can be summarised:

1. There is a common perception under residents that new housing project appears to be very small and houses being overcrowded.
2. Residents still prefer mortar and brick houses, over more modern and lighter construction methods.
3. Many residents are self-employed and prefer a work, live and play housing environment. Units with retail/commercial opportunities seem to be very popular.
4. Internal kitchen, bathroom and WC's space seem to be very important.
5. The need to extend and add rooms to existing units, appear important, and generate rental income.
6. The need for security and safe environments are emphasized.
7. Services such as infrastructure, waste removal and public transport in the area should be upgraded.

8. Residents prefer living close to work opportunities and transport systems.
9. Units should have sufficient storage space.
10. The need for privacy is important. Residential units should be designed in such a way that the basic need for privacy is well planned.
11. Higher density developments appear to be acceptable. External communal spaces, courtyards and parks should be provided for.



Figure 3.1 Image collage by author, 2008. Existing housing neighbouring the site, bonded housing, RDP housing and informal settlements.

### Proposed baseline standards for SA Medium Density

SHIFT (South African Housing Forum Trust) suggests the following minimum internal dwelling area to be used as indicators for Social Rental Housing in South Africa:

Bachelor unit 30 m<sup>2</sup> (gross dwelling area)

1 Bedroom unit 37m<sup>2</sup>

2 Bedroom unit 45m<sup>2</sup>

3 Bedroom unit 52m<sup>2</sup>

Table 3.1 Compilation of needs and perceptions of residents

### Housing Typologies





**THE PROPOSED BASELINE STANDARDS ARE:**

**1) The minimum floor area for the aggregate of the cooking, eating and living areas (CEL areas) is to be:**

**CEL AREAS (m<sup>2</sup>)**

**1- person apartment 22(m<sup>2</sup>)**

**2- person apartment 22**

**3- person apartment 24**

**4- person apartment 27**

**5- person apartment 30**

**6- person apartment 33**

**7- person apartment 36**

***NB: Cooking, eating and living (Kitchen / Dining / Living) areas exclude any utility area or space taken up on plan by staircases or hallways/corridors connecting these areas***

**2) The minimum floor area for bedrooms to be based on:**

**a) Aggregate bedroom areas to be no less than 7m<sup>2</sup> per single bedroom and 12m<sup>2</sup> per double/twin bedroom provided AND**

**b) Each bedroom to have a minimum internal floor area of 6.5m<sup>2</sup> for a 1-person bedroom, and 10m<sup>2</sup> for a 2-person bedroom.**

***NB1: in larger dwellings each bedroom does not have to be at least 7m<sup>2</sup> or 12m<sup>2</sup> floor area; the designer is free to distribute the total amount of space among the bedrooms as they see fit so long as the aggregate space equates to the minimum requirements stated AND the individual rooms meet the minimum requirement of 6.5m<sup>2</sup> and 10m<sup>2</sup> noted above.***

***NB2: ensuite bathrooms or shower rooms do NOT count towards this minimum.***

***NB3: the floor space taken up by built in wardrobes in bedrooms counts towards the bedroom floor area***

- Units to have minimum floor areas of no less than 30m<sup>2</sup> for bachelor or 1-bedroom units.
- Minimum space standards apply – 18m<sup>2</sup> for Living, Eating and Cooking, 5m<sup>2</sup> for a one person bedroom and 9m<sup>2</sup> for a two person bedroom (cupboards included).
- Dwelling should be able to accommodate a mixed use of activities, e.g. work, live and play.
- The need for privacy with suitable separation of bathrooms and WC's and rooms for sleeping by adolescents and adult members of the opposite sex, except husband and wife.
- Suitable internal storage space.
- Private exterior spaces such as enclosed external balconies or gardens.
- Multifunctional internal spaces. Bedrooms should be designed as places for privacy, study and recreation, not only for sleeping and dressing.
- Internal spaces e.g. trading spaces should be convertible and multi- function.

**Table 3.2 The Greater London Authority proposes the following spatial standards for medium to high density housing projects in London: Greater London Authority (2006: 13)**

- Security. Residents should be able to leave their children in a secure environment. Access to the residential development should be controlled.
- Transition of public and private spaces should be well designed.
- Resident should be able to 'age' in their units.
- Wider span between structural walls enhance future expanding and remodelling of the building and extend the life of the building.
- Climate responsive design principles apply.

**Table 3.3 The Greater London Authority Spatial Standards for medium to high density housing projects in London: Greater London Authority (2006: 13), adapted to spatial standards for South African context**

## 4. THEORETICAL DISCOURSE

### 4.1 Housing in South African Context



**Fig 4.1 Image by author. One stand, one house, Nellmapius 2008, illustrating poor urban principles**

South Africa's National Housing Policy is being undertaken in terms of seven key strategies namely:

1. Stabilising the housing environment.
2. Mobilising housing credit.
3. Providing subsidy assistance.
4. Supporting the people's housing process.



5. Rationalising institutional capacity.
6. Facilitating speedy release and servicing of land.
7. Co-ordinating government investment in development.  
(South Africa's National Housing Policy, Part 1, 1997)

In terms of section 26 of the Constitution everyone has the right to have access to adequate housing (Section 26(1)). The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of this right (Section 26(2)).

Section 2 of the Housing Act, 1997 (Act No. 107 of 1997) compels all three spheres of Government to give priority to the needs of the poor in respect of housing development (Section 2(1)(a)). In addition all three spheres of government must ensure that a housing development:

- Provides a wide choice of housing and tenure options as is reasonably possible;
- Is economically, fiscally, socially and financially affordable and sustainable;

- Is based on integrated development planning; and
- Is administered in a transparent, accountable and equitable manner, and upholds the practice of good governance (Section 2(1)(c)).

In short, the housing process seeks to fulfil the vision of a nation housed in sustainable human settlements with access to socio-economic infrastructure ([www.housing.gov.za/content/legislation](http://www.housing.gov.za/content/legislation))

For quality to improve, housing policy needs to shift towards a demand driven mentality. The importance of such policy changes lies in the creation of sustainable environments, rather than a collection of houses in an instituted and prefabricated urban framework. Sustainable environments are those that serve the current social, economic and environmental requirements of its inhabitants as well as of future generations. (Macagnano, M: 2005)

In South African context, housing comprises designing with **cultural** and **social sensitivity** that exceeds the cause of provision of formal shelter, but instead serves to improve a current way of life. It

entails an environmental intervention that reflects a community, which adapts to its needs, instead of a community changing to fit into an environment. Therefore a home is created where interest is sustained and opportunity for future development is created – economic empowerment opportunity lives rife in a community where a sustained population is guaranteed (Macagnano, M: 2005).

Housing is not seen in isolation from the complex layers of urban society, but rather as an integral component to the totality of settlement. A key concern is that housing cannot be considered in isolation of other fundamental urban imperatives, including land, capital, financial resources, technology, transport, communication systems, people and energy (Mammon, N and Ewing K, 2005)

In low-income housing areas the primary spatial structure should consist of positive public spaces, green systems, transportation networks, community amenities, and human-scale local interventions for informal and formal economic and social activities, with potential for mixed-use opportunities. Core

gathering points and public spaces should form the social and economic heart of communities (Ewing, K: 2005)

The current backlog in terms of households without security of tenure is estimated at about 200 000, where the focus will be on upgrading informal settlements that have no formalised access to social and municipal services. The current backlog in terms of households without water and sanitation is estimated at about 300 000. Close to 50 000 new households are formed every year as a result of the combined effect of natural growth and urbanisation (Ewing, K: 2005)

## 4.2 Housing – Breaking New Ground (BNG)

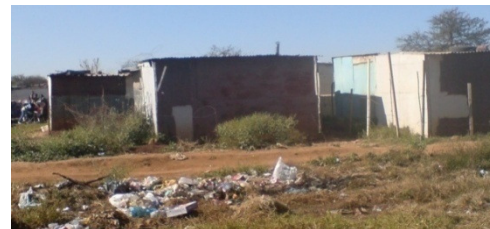


Figure 4.2 Residential Environment in SA context



#### Figure 4.3 Residential Environment SA contexts

Housing in South Africa, with reference to several current township developments, still bear the reminiscent legacy of a political ideology of apartheid where ‘matchbox’ type of houses were provided. The latter represents the policies of a historical, discriminating, political ideology of race separation and fragmentation in housing and urban spaces. This ideology led to mono-functional, uninspiring and bland living environments, inhibiting optimal human development and functioning.

According to Low (2005), till the mid-90’s, housing in South Africa has promoted a 1 house, 1 site approach. The result of such an approach is the fragmentation and compartmentalization of a reductive design and delivery process with the loss of community and social cohesion. The current objectives of the South African Housing Department’s policy document, *Breaking New Ground: a comprehensive plan for the development of sustainable human settlements*, are to facilitate a new approach to housing in South Africa. Housing should be based on creating human settlements

where psychosocial and socio-spatial qualities of settlements are seen as fundamental to optimal housing.

The “Breaking New Ground” document highlights a number of ways to support this drive towards spatial restructuring, including the following:

- Progressive informal settlement eradication.
- Promoting densification and integration.
- Enhancing spatial planning.
- Enhancing the location of new housing projects.
- Supporting urban renewal and inner city regeneration.
- Developing social and economic infrastructure.
- Enhancing the housing product.
- Choice ([www.housing.gov.za](http://www.housing.gov.za)).

Low (2005) indicates that housing design should be a qualitative process, resulting in socio-economic transformation of urban environments. Housing design must provide an interface between economic utilitarianism and social expression. In contemporary urbanisation, the primary priorities of housing must be the consideration of the home as an economic entity, the mixed use of

tenure and function, urban infill and medium rise building projects with diversity and densification. When the home becomes an extension of the work place, economic and social advantages are leveraged for the poor communities.

According to Dewar and Uytendogaardt (1991: 10), some 26 million people will live in South African cities by the turn of the century - an urban explosion to demand housing for millions migrating to cities.

### **4.3. Incremental Housing**

The Incremental housing market is targeted at households earning less than R1 500 per month. The most important element of this programme is the harnessing of community based equity and energy. The People's Housing Process has been initiated to assist people who are poor and homeless or inadequately housed ([www.housing.gov.za](http://www.housing.gov.za))

The output will be the building of capacity of communities and local authorities to engage with People's Housing Processes. The

emphasis is on the mobilisation of "sweat equity" in support of housing projects by ensuring that even the very poor and the unemployed also have an opportunity to be provided with adequate housing.

The idea behind this programme is to assist people living on serviced sites to build their own homes. This programme will be supported through public-private-community partnerships with building material suppliers and communities building themselves.

All programmes aimed at developing adequate housing over a period of time, at the rate and pace shaped largely by the affordability levels of the beneficiaries, have been clustered into one Incremental Housing Programme. This will focus on upgrading and servicing sites in informal settlements, whilst ensuring the provision of tenure security to thousands of people living in such settlements. This will be undertaken in collaboration with local government and will upgrade existing settlements and eradicate any new ones ([www.housing.gov.za](http://www.housing.gov.za)).

People-centred housing development has been widely acknowledged as a positive move in the creation of suitable environments for living, whereby communities actively participate in the provision of their own housing (Poulsen. L and Silverman, M : 2005).

#### 4.4 Social Housing

Social housing is defined as being higher density subsidised housing which is managed by independent social housing institutions.

Social housing could be defined as a housing option for low-to-medium income persons housing institutions provides that, and that excludes immediate individual ownership (Social Housing Foundation).

The Social Housing Foundation, SHF, was established by the NHFC in November 1997 as a Section 21 Company to promote, support and assist in the development of social housing in South Africa. The SHF provides training, advice, and technical support to established

and emerging social housing institutions, advises on policy and raises funds for social housing developments.

The Government has acknowledged that the development of acceptable and sustainable medium density rental housing can only be realised through sustainable social housing institutions and adequate private sector involvement. Social housing has shown to be able to significantly address concerns around urban regeneration and improve housing densities. It clearly contributes to sustainable development, especially when location, integration, viability and sustainability are carefully considered.

In the context of this policy, a housing institution is defined as a legal entity established with the primary objective of developing and/or managing housing stock that has been funded through the grant programmes specified in this policy. The housing institution can own the housing stock, or it can be owned collectively by a grouping of residents.

The Social Housing Programme is primarily aimed at beneficiaries earning between R1500 to R3500 per month.

Social housing is not an option for the very poor. By its very nature, persons accessing accommodation from housing institutions will have to earn a secure income, formally or informally, to be able to afford the rental or other periodic payment for accommodation. Furthermore, social housing cannot be limited to specific income groups if the broader integration, regeneration and market demand objectives are to be realised. The housing option therefore should promote a mix of income groupings covering both low income and medium income persons, as prescribed in the regulations for social housing from time to time (Social Housing Foundation)

Social housing primarily covers the rental tenure option and excludes immediate individual ownership by the residents. The social housing option is not intended to be used by beneficiaries seeking immediate individual ownership, as other options have been created within the Housing Subsidy Scheme to accommodate such needs. The social housing option, however, does allow for

collective forms of ownership, on condition that the persons involved and being housed through collective ownership are fully aware, understand and subscribe to these forms of collective ownership options. The conversion of these rental schemes into ownership options is not excluded. Such conversions, however, will only become viable options in the long term, and will be based on feasibility studies confirming the sustainability of such a conversion scheme and that of the SHI concerned. Under normal circumstances the conversion of rental schemes to sale options should not be considered within the first 10 to 15 years (Social Housing Policy for South Africa, Draft document, July, 2003).

[www.housing.gov.za/content/legislation\\_policies](http://www.housing.gov.za/content/legislation_policies)

#### **4.5 Co-Operative Housing**

A housing co-operative is an association of people who collectively own and govern their housing on a not-for-profit basis. Co-operative principles accord closely with the idea of 'UBUNTU', well established in South Africa.

By working together, members of a co-operative can provide themselves with better and more affordable housing than they could as individuals. Within the housing sector, co-operative housing meets the particular need of people wishing to build a community, have a say over how their housing is managed and promote a culture of democracy. A housing co-operative differs from other forms of tenure in that residents share responsibility, ownership and governance of their homes ([www.housing.gov.za](http://www.housing.gov.za)).

#### **4.6 Housing Support Centre (HSC)**

Of those who need housing, 68.7% earn less than R1500 per month and would rely on support in the form of subsidies and financial assistance, technical advice, technical support, and general housing support.

According to Pecar, M (2005), housing or the dwelling experience is a complicated process and comprises more than providing shelter. The housing process should address the potential dweller in its totality and should be an interactive process with choices, options

and participation. Pecar further indicated several behavioural elements that could influence the housing process and should be addressed by housing research:

- How do people go about finding and making their home?
- What do people look for in order to commit to a particular place and what help do they need from society?
- Can the design profession (HSC) offer support and solutions to the dwelling needs of the contemporary individual homeowner?
- What can one individual (HSC) offer to improve the housing condition of individuals and communities?

Since 1994, approximately 1.5mil-subsidized houses have been built in South Africa at a cost of about R24 billion. Most of these houses were delivered by the South African Government through project-linked subsidies and became known as RDP houses. This mode of delivery was shifted towards the People's Housing Process (PHP) with its launch in 1998. Beneficiaries were encouraged to participate in this delivery process and have been obliged to

contribute a sum of R2479. Houses have become known as ‘2479s’ (Poulson L. and Silverman M: 2005)

The PHP comprises of community participation and initiative in the housing process, beneficiary involvement with households receiving subsidies, local job creation and skill development. The PHP ensures access to housing subsidies for those earning below R1 500 p.m. with the option to enhance their subsidy by building their homes themselves.

Taking in consideration the current urban environment of Mamelodi East, being an area with a fast growing residential population, the potential of a Housing Support Centre (HSC), could be substantial in the process of transforming the urban fabric of this node. The latter concept to enhance resident participation and involvement in decision making on certain housing processes, providing assistance, training and education

A Housing Support Centre, a joint venture between the University of Pretoria, Housing Department and a Social Housing Institution,

could facilitate and support the entire housing process on several levels:

1. Facilitate the Formal Housing, Social Rental Housing, Co-operative Housing and Peoples Housing Process by means of access to information and financial, institutional, technical and logistical support.
2. Training in the form of hard and soft skill training programmes with housing workshops and skills transfer.
3. Technical support in the form of hard skill training, building material advice and equipment and material display for the PHP.
4. Housing support on outreach and community level.
5. Building material provision.
6. Academic housing research (sustainability, urban planning, environmental studies etc).

Ongoing research should be a fundamental component of the housing process. The HSC, linked to the UP Mamelodi as academic institution, should address these housing topics in order to ensure human sustainable housing environments in South Africa.



#### **4.7 Housing – An Urban Regeneration Strategy for the Mamelodi Campus**

Housing could be seen as the driving force behind a regeneration strategy on the campus. Many authors argue that housing be a generating factor in the process of transforming urban environments.

According to Mammon (2005), housing is not seen in isolation from the complex layers of urban society, but as integral component of urban society. In the context of the Mamelodi campus, housing plays a fundamental role in regenerating the urban potential of the urban environment.

Housing could be seen as a design instrument in transformation and regeneration of urban environments and has become the leading form-determining element in twentieth century urban development. According to Dewar and Uytendogaardt (1991: 56), currently community institutions are embedded in housing areas, as opposed to housing infilling between.

Housing delivery needs to be combined with mechanisms for community upliftment, job creation, capacity building, empowerment and public utilities. Housing delivery mechanisms will ultimately influence the spatial and physical characteristics of the resultant environment. Housing has the potential to glue and bind an urban environment together. In the context of the Mamelodi campus, housing could be the binding force between the campus and the urban residential environment. (Osman and Lemmer, 2005).

Keeping in mind the research by Boyden (1971) a comprehensive housing strategy should address all psychosocial and wellbeing needs in order to create a healthy and sensual rich urban environment. Housing should be seen in the context of a human settlement, addressing the needs of residents in all spheres of life.

Several international housing researches agree that housing, as the central locus of everyday life patterns, is likely to be a crucial component in the way in which socio-economic factors shape mental health of a population. According to Dunn (2002: 2) a

definite correlation exists between housing as a socio-economic determinant of population health. Lynch and Kaplan (1997) also suggest the importance of housing and urban environments as a nexus or medium through which a wide range of health determinants may operate.

According to Osman and Hinds (1998: 22), one should move away from the sterile, regimented and inefficient settlement patterns that dominated housing delivery in the past.

Dewar and Uytendogaardt (1991: 15-16) argue that human settlements should meet certain *performance criteria*, in order to accommodate the activities of urban life. The **Need, Programme** and **Idea** of any urban environment, should be explored in order to develop a cohesive approach to urban design.

**Need:**

- To turn South African cities into efficient economic machines.
- All urban inhabitants should enjoy easy and equitable access to urban opportunities and movement on foot should define the primary scale of urban development.

- Promotion of social contact and interaction
- Individual needs, which includes physical needs, psychological needs and sensory needs (Inclusive design/environment).

**Programme:** (Qualities which contribute to the satisfaction of the need):

- Balance between society and cosmos
- Balance between society and nature
- Balance between people
- Promote the maximum positive freedom.
- Urban environments, which are equitable.
- Intensity, diversity and complexity
- Integration
- Creating a sense of belonging and identity

**Idea:** (This is concerned with the nature of plan and the structural relationship which should be pursued):

- Positive environments should release individual creativity, ingenuity and resources as well as the freedom to find expression.

- Freedom only exists when there is choice and choice is only available when there is constraint. The residential open building principle where occupants are allowed a level of participation and choice in the layout and finish of their units, might contribute to individual creativity and pride.
- Plans should create opportunities to which people can respond and it needs to widely accept “corporate urban culture”
- Plans should provide for small scale building processes so that the urban poor can participate in the system.
- Plans should contain three generic types of actions, which is holding actions, structural actions and controlling actions. Holding actions are decisions, which are made to reserve options for future generations. Structural actions create opportunities for people and controlling actions reduce freedom of decision-making. (Support and infill)
- Access to opportunity
- Liveability
- Identity
- Community and public life
- Authentic and meaning
- Social justice
- Self-reliance
- To create an environment conducive to the continuous flow of harmonious flow experience. (Dewar and Uytenbogaardt, 1991: 15-16).

Lewis (2005: 38) indicates that fundamental to housing design, is the physical form of the urban environment as central aspect of the social world itself. Spatial solutions affect social action by setting constraints, providing opportunities and fostering activities. Social values and processes, as well as the physical form of housing projects are mutually inclusive dimensions of housing provision. Social values such as sustainability (an overriding social value influenced by the provision of choice, safety and sense of neighbourliness) community and safety indicate the relationships between buildings and spaces. The social issue of safety is one that predominates over others in many social contexts.

Successful urban regeneration, in South African (developing countries) context, pivots on the need to generate opportunities for small-scale, self-generated economic activity. Part of regenerating neighbourhoods, is allowing people sufficient freedom to find opportunities to express their own ingenuity and creativity and turning cities into economic machines (Dewar and Uytendogaardt 1991: 16)

In the context of housing and regeneration of cities, all the above-mentioned authors agree that housing be a design tool in urban transformation and social change. Besides providing shelter, housing could be used to give scale, definition, create socio-spatial change and be a catalyst of empowering people (Hamdi, 2008). Housing could be the core of upgrading and regenerating of the urban environment; making the environment safer and more pleasant.

#### 4.8 Campuses and Street Interface



**Figure 4-4 and 4-5 Image collage author, 2008. Mamelodi campus**

Nicks (2003: 179-205) argues that urban design, and specific designing the interface, could be a valid tool in reconstructing apartheid villages, towns and cities. He highlights the opinion the urban qualities could play a mediating role in regenerating cities. Urban design is not confined to the physical and spatial, but embraces the social, economic, symbolic and spiritual as well. The single-minded implementation of nearly 40 years of apartheid, exaggerated the physical separation of urban activities. Social and economic activities are segregated on the basis of race and class. The latter to result in fragmented and disjointed urban environments.

An important urban consideration when designing within settlements is the design of edges between different urban activities and the integration of functions and spaces that can accommodate mixed uses, with multi-functional spaces and gradual selective infill. The interface being that area in which buildings relate to other buildings and where they relate to the street. (Righini, 2000: 285) The relation of the building to the street

frontage should be seen as the key to the success of the proposed design. The mixed-use strips are buildings, which create a habitable wall with different functions accommodated on the different levels, each interacting differently with the street (Osman and Hinderes, 2005: 59)

Hans Strijdom Avenue, being the street on the eastern edge of the campus, should be treated as a social space with rich qualities and be incorporated within the urban regeneration strategy for the campus. The Hans Strijdom and Hinterland intersection should be recognised for its social qualities as venue for human contact and events, a central place of identity and a change of direction for streets. Architectural and urban spaces surrounding the campus could be treated as containers to accommodate, separate, structure and organize, facilitate and celebrate human spatial behaviour. Louis Kahn indicated in 1960 that it's time for the street to be a subject of conscious design, or to treat the street as if a building. A more positive function of capital design is to make the streets into channels of symbolic intelligence. (Crane 1960: 288)

According to Appleyard (1983: 116-117) streets are guidebooks to the city; they tell visitors and commuters where things are and what the city is about. They are the most visible places in town. Streets could serve as places of sanctuary, places where communal life is possible, territory that residents feel belong to them, places for play and learning, a green and pleasant land and a liveable environment to which traffic should conform. Characteristics of positive environments are intensity and diversity of activity.

The Hans Strijdom corridor should be seen as a life-sustaining system and not a movement route. Movement along this corridor will be slower, reducing the amount of aggregate movement. Accessibility should be maximized and mobility reduced.

#### **4.9 Housing without Houses – Architecture and Design Psychology**

Design psychology is the use of psychological principles as the fundamental principle for design decisions in architecture.

Architecture is inseparable from its social purpose and from its environmental setting.

Dunn (2002: 4) indicates that housing serves an important role as place of refuge in society. Home is one of the few places in everyday life where a person is socially and legally sanctioned to exercise complete control. A home is also an important source of prestige, status, pride and identity and is a crucial setting for social interaction and the centre of individuals' social networks. A home should be a place of continuity, stability and permanence in everyday life

Propow (2000) indicates that the human body is biologically predisposed to recognizing design and structure either consciously or unconsciously and that a variety of criteria may be at work influencing us when we find ourselves living, working or playing within the urban environment.

According to Propow (2000), Gestalt psychology seems to be central to how we experience architecture. Our brains are wired to

infer the rhythm and patterns of architecture that in turn yield a behavioural effect. Architecture a symbolic and intentional endeavour seems to reflect the psychology of its designers regardless of time, culture and perhaps even spaces.

Poor human settlement qualities with lack of proper urban design initiatives, result in poor spatial qualities and could be seen as a case study of housing policies based on the provision of houses only with no respect to human qualities and psychosocial values. The latter will result in a characterless neighbourhood with poor socio spatial qualities. Alexander (1977: 393) indicates that the latter would work against the natural processes, which allow people to form stable, self-healing communities.

Marcus (2007: 10) is of opinion that the houses people live in; say much about their lifestyle, development and dreams. How people built their houses indicate much about their needs and desires. According to him design cannot cause behaviour, but it can offer the possibility of certain behaviour-taking place. The physical environment of the housing developments, can encourage,



discourage or be neutral to its resident's behaviour. The environment can thus facilitate certain behaviour simultaneously via certain modes of physical, social and symbolic communication. We avoid settings that have no meaning for us or where we feel confused, fearful or under stress. In a housing context, people would use spaces and settings that have a functional use or aesthetic attraction and avoid those that do not. Environments with high psychosocial value are designed around basic human needs, ancient preferences, and connections to the patterns of nature and the mind.

The South African housing environment requires a new approach in housing and spatial planning. Housing should address man within the context of his psychosocial needs. As Marcus (2007 : 10) stated, built structures affect our psyche as well as our bodies. They can be inspiring and supportive of daily activities, or they can deplete the spirits and undermine the best intentions of the designer. Positively experienced, psychologically healthy buildings and environments have a host of features that distinguish them from less enjoyable buildings. Environments with high psychosocial value are designed

around basic human needs, ancient preferences, and connections to the patterns of nature and the mind.

According to Macagnano (2005), the provision of housing is more than just the provision of shelter but also that of a lifestyle. These homes represent a stable future for a family or individual around which a new life may evolve and thus need to be able to cater for every occurring opportunity for improvement. In doing so a world of possibility is opened to those concerned rather than one of complacency and limitations. The forging of personalised and well structured homes and environments result not only in a lifestyle based on freedom of choice, but also the establishment of a personal economic investment in one's home, granting certain economic empowerment in the long term.

According to Fisher et al. (1984: 67), if the environment offers little or no stimulation, environmental-behaviour problems are called into existence. We usually prefer an optimum level of stimulation, which is a combination of sensory stimulation, social stimulation and movement. The experience of under stimulation of the

resident of this area could lead to social deprivation, behavioural decompensation and environmental degradation. Social constraints could be related to behavioural disorders, social deterioration and poor mental health of communities.

Lewis (2005: 42) and Dewar (1991) are of opinion that social values can be realised through a series of socio-spatial qualities. Socio-spatial qualities of permeability, legibility, adaptability, energy efficiency, variety, activity and privacy; all contributing to a optimum healthy environment. Positive environments can be achieved regardless of the quality of the individual building and emphasises the environmental, social and economic benefits of high densities.

#### **4.10 Towards a Healthy Environment**

Environmental psychology studies the interrelationship between the built environment and the human psyche. According to environmentalists, the environment people move around in, influence their behaviour and feelings. A definite interrelationship exists between the built environment and human behaviour.

Environment could influence and constrain behaviour, but can also provide optimal conditions for personal growth and actualizing (Marcus 2007 : 10).

The Psychology of Architecture studies how architectural styles reflect the needs and preferences of people and how different designs mould and shape behaviour. A proper investigation of cultural, social and personal needs of potential urban dwellers should be considered before an acceptable urban planning and spatial design can be made.

Norberg-Schulz (1980: 85) mentions that, when man dwells, he is simultaneously located in space and exposed to a certain environmental character. The two psychological functions involved may be called **orientation and identification**. These two functions relate to man's safety, welfare, and friendly man-place relationship. It is at the presence of these aspects that man can function to the optimum level in the urban environment. The structure of a building has a direct impact on the social consciousness of the viewer, where the appearance and the function of a specific

building create a sense of purpose within those who live and work within and around it. The correlation between people and place means that architecture is thus inseparable from the social purpose of the building, not its environmental setting.

Biologist Stephen Boyden (1971) defines the optimum healthy environment as "the conditions, which tend to promote or permit optimal physiological, mental, and social performance in a natural environment." Boyden argues that environments need to fully satisfy both "survival needs" and "well-being needs." Survival needs deal with aspects of the environment that directly affect human health, such as clean air and water, lack of pathogens or toxins, and opportunity for rest and sleep. Well-being needs, on the other hand, are associated with fulfilment, quality of life, and psychological health. Failure to satisfy survival needs may lead to serious illness or death and failure to meet the well being needs that can lead to psychosocial maladjustment and stress-related illnesses. Environmental psychologists have also considered other needs such as comfort maintenance and sense of equity, which are important in today's building environments.

Boyden (1971) identifies well being needs that should be addressed in spatial and urban design:

- Opportunity for relaxation and psychological restoration.
- Opportunity for privacy and for movement between interaction and solitude, as desired.
- Opportunity for learning and information sharing.
- Opportunity for connection to the natural environment.
- Opportunity for regular exercise.
- Sound levels not much above or below that of nature.
- Meaningful change and sensory variability.
- An interesting visual environment with aesthetic integrity.
- Ability to maintain and control personal comfort.
- Making sense of the environment.

According to Kendall (2003: 8), participation and adaptation could be an asset of new urbanism and contribute to residents' *sense of place* experience. The residential community; they express stronger attachment to their community and sense of identity with open building principle allows for participation, shared responsibility and distributed control. Kendall shares the opinion that giving residents participation and option for personal input in their homes, lead to

greater responsibility and ownership of their units. The latter will, therefore, contribute to better social interaction and socio spatial qualities. Within a residential open building project, residents perceive substantially greater sense of adaptability and expansion. Change and growth over time requires flexibility in design to provide for a number of accommodation alternatives. Balance and equity refer to finding the mean between excess and insufficiency and ensuring equitable access to resources and opportunities out at the occupants' discretion.

Housing today should be a merger between the peoples' needs, desires, design and the delivery process. The overarching principle in low-income housing today should be the creation of the compact city and the need to see housing as an instrument to spatial restructuring by creating sustainable human settlements. Housing should help to form a positive spatial structure in relation to the public spaces and internal residential courts that it creates. The diversity of form and density of the housing units could be expanding around internal courts and activity nodes.

The idea of the Compact City is fundamental to mitigate the problems of inefficiency and fragmentation. A Compact City includes a socially just city where justice, food, shelter, education and health are distributed fairly. Integrated compact cities, where access and proximity to essentials are at reach on foot, and a diverse democratic city where diverse interests, culture and activities come together. (Mammon, N and Ewing K, 2005)

Change and growth over time requires flexibility in design to provide for a number of accommodation alternatives. Balance and equity refer to finding the mean between excess and insufficiency and ensuring equitable access to resources and opportunities.

In low-income housing areas the primary spatial structure should consist of positive public spaces, green systems, transportation networks, community amenities, and human-scale local interventions for informal and formal economic and social activities, with potential for mixed-use opportunities. Core gathering points and public spaces should form the social and economic heart of communities (Ewing, K: 2005)

## 4.11 Courtyard Housing

The design possibilities of courtyard housing will result in various socio spatial qualities. Courtyards provide sociable spaces with a spatial system and inherent social logic to it. The latter must be seen as a generator of contact between people. Rapoport (2007: 57-65) argues that the nature of courtyard housing, contributes to sustainable design principles and urban qualities. Climatic control, socio-spatial qualities, vernacular and cultural tradition led to maintain the courtyard design for centuries.

Limited urban space and quests for higher urban density, led to recent attempts to re-introduce courtyard houses in areas where the tradition of freestanding houses has prevailed. The ability of courtyard housing to create a higher density fabric is often seen as one of the major advantages of courtyard design. Courtyard design could be defined as *the inside out city*, replacing outward facing individual house on a stand. Houses relate to a courtyard or semi-private space and not to the street. With courtyard design, the private domain of the individual unit can be linked to the public

domain of the courtyard space. The building being part of a permeable boundary will serve as barrier in the hierarchy of spaces.

The use of the courtyard form in residential design, should mediate between public and private spaces. This gives residents the opportunity to choose between activity and privacy. The extent to which buildings make the distinction between public and private space, will depend on required levels of security and penetration into the blocks and buildings. The boundaries between public and private spaces are easy to manage with perimeter blocks, which can have varying levels of enclosure. Some housing units only require the suggestion of enclosure, with gaps between the buildings where access is managed by natural surveillance. In other blocks that require more security or privacy, the building form can be a solid and continuous barrier between inside and outside or public and private space (Lewis, 2005: 57)

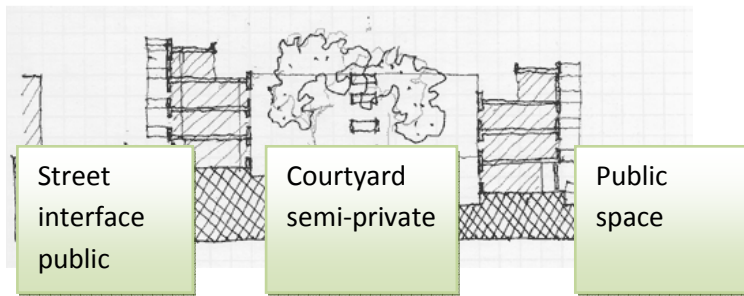


Fig 4.6 Illustrating Courtyard Housing with hierarchy of spaces

## 5. PRECEDENT STUDIES

### 5.1 South African – Precedent Studies

Several new urban housing projects in various areas of urban South African cities appear at first review to be relatively unsustainable. The latter is inter alia due to poor performance of the building fabric; a lack of responsiveness in the design to the harshness and forces of the climate; and an absence of a significant deficiency in a more comprehensive environmental strategy.



Figure 5.1 Image by author. Nellmapius, 2008, illustrating new residential projects with poor urban principles.

Some new projects seem to apply urban and spatial qualities, integrating sustainable settlement principles with housing. According to Cooke (2005: 5), in context of housing in South Africa, new cities and neighbourhoods should be densely built and offer everyone similar access to pleasant places and necessary facilities, and ample choice in shops, markets, schools and recreational places. Erskine (1998: 22) indicates that housing is more than only building units, but more the design of a whole environment that provides accommodation, jobs, education, health services etc.



### 5.1.1 Graca Machel Residence, University of Cape Town

<b>Project</b>	Graca Machel Residence, University of Cape Town
<b>Architect</b>	Kruger Roos Urban Architecture Design
<b>City</b>	Cape Town
<b>Country</b>	South Africa
<b>Address</b>	Lower Campus, Rondebosch
<b>Building Type</b>	Perimeter block Slab, point-access
<b>Number of Dwellings</b>	384
<b>Date Built</b>	2007
<b>Dwelling Types</b>	studio, one and two bedroom units
<b>No. Floors</b>	3
<b>Section Type</b>	Flats
<b>Exterior Finish Materials</b>	plaster, concrete, glass, steel,

**Construction Type** RC frame



**Figure 5.2 Graca Machel Residence, Cape Town**

The University of Cape Town commissioned Kruger Roos Architects for a new 384-bedroom women's residence on the lower campus of the university. The framework called for the making of a *Great Street* to the west of the site, linking the lower campus to the middle campus. The architects perceived the building as a city, with a public arcade and shops on the street and public functions at the crossroads of Show Road and the Great Street, treating the street as social space with multi function.

A large roof supported by concrete columns, covering a public balcony, marks the entrance. Three internal courtyards are linked with an internal arcade, which lies parallel to the external arcade. The 11 500m<sup>2</sup> three-storey building steps down the slope terraces. The slope is further utilised to create a number of neighbourhood clusters, each accessible through the courtyards with circulation stairs doubling up as fire escapes.

The three courtyards have diverse characters that are reflected in the use of different trees, shrubs and groundcover. The legibility of the residence was supported by a system of colour coding and coloured glass in the cores. The upper courtyard adjacent to the dining hall serves as the more public space that can be used for special events. The other two are more intimate and private.

Solar panels and ventilation chimneys from the ablutions, express the energy harvesting and passive cooling system (Digest of South African Architecture, 2007/8 : 174)

### 5.1.2 N2 Gateway – Joe Slovo



Figures 5.3 - 5.7, N2 Gateway Joe Slovo Social Housing

<b>Project</b>	N2 Gateway Joe Slovo
<b>Architect</b>	JSA Architects and Urban Designers
<b>City</b>	Cape Town
<b>Country</b>	South Africa
<b>Address</b>	Langa Cape Town
<b>Building Type</b>	Perimeter block Walk up residential
<b>Number of Dwellings</b>	705
<b>Date Built</b>	2005
<b>Dwelling Types</b>	Bachelor, 1-2 Bedroom units
<b>No. Floors</b>	3
<b>Section Type</b>	Flats
<b>Exterior Finish</b>	plaster, concrete, glass, steel,
<b>Construction Type</b>	Pre cast floor slabs with load bearing masonry walls

(SHIFT, Project Review Series, 2006)



Figure 5.8 N2 Gateway Joe Slovo

### 5.1.3 International House Students Residence at Wits

<b>Project</b>	International House, Students Residence Wits
<b>Architect</b>	Kate Otten Architects
<b>City</b>	Johannesburg
<b>Country</b>	South Africa
<b>Address</b>	Old Campus, Johannesburg
<b>Building Type</b>	Perimeter block Slab, point-access
<b>Number of Dwellings</b>	89
<b>Date Built</b>	2003
<b>Dwelling Types</b>	one bedroom units

<b>No. Floors</b>	3
<b>Section Type</b>	Flats
<b>Exterior Finish</b>	plaster, concrete, glass, steel,
<b>Materials</b>	
<b>Construction Type</b>	RC frame

The building is sited within the old campus on a north-facing, well-wooded area. The building is on three levels, lower ground, upper ground and first floor. Entry is on the upper ground level and accessed from a public pedestrian way through the campus. The entrance canopy invitingly covers this path creating a meeting space at the front door and integrating internal with external, public with private.

The building comprises 89 bedsit units with associated communal facilities. Each unit self-contained and consists of a kitchenette, shower room, single common rooms encourages interaction en route to and from private accommodation.

Common rooms open onto balconies to the north, overlooking the courtyard spaces between apartment blocks and the extensive garden to the south. Six or seven unit are grouped together and accessed via covered walkways. Small groups are connected to other groups via balconies and covered patios – promoting interaction between units. Indoor and outdoor spaces merge freely, with trees invading bedrooms, giving shade and character to courtyards

The building is designed with the specific aim of engendering a sense of community among those living there. It creates a feeling of inclusion and strives to promote ongoing and positive interaction between residents. bed and workspace. Access between the common rooms connects the blocks at all levels.

## 5.2 Global Housing Precedent Studies

Several international housing projects, facilitating the integration of mixed tenure and residential open building oversee the regeneration and reconstruction of urban wasteland.

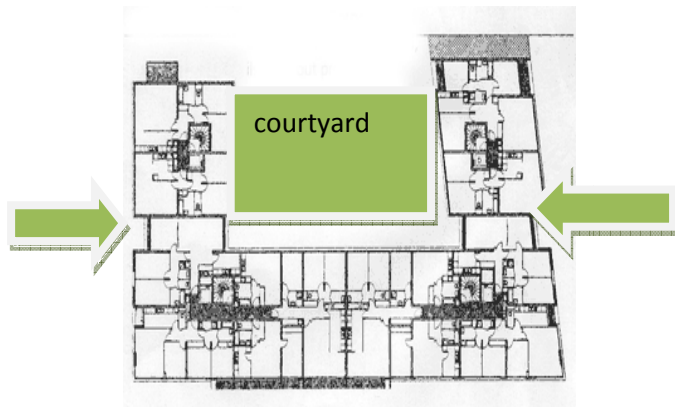
### 5.2.1 Housing at Parc de Bercy, Paris, France

<b>Project</b>	Bercy-Gabriel Apartments
<b>Architect</b>	LLTR Architects (O. Le Boursicot, P. Loth, G. Testas, Y. Robert)
<b>City</b>	Paris
<b>Country</b>	France
<b>Address</b>	14-16 Rue l'Aubrac/51 rue Francois Truffanu2th)
<b>Building Type</b>	Perimeter block Slab, point-access
<b>Number of Dwellings</b>	187
<b>Date Built</b>	1997
<b>Dwelling Types</b>	studio, 2,2, & 3 BR flats, some penthouse maisonettes
<b>No. Floors</b>	7-9

<b>Section Type</b>	Flats
<b>Exterior Finish Materials</b>	plaster, stone, concrete, glass, steel,
<b>Construction Type</b>	RC frame
<b>Ancillary Services</b>	below grade parking, shops at grade

#### Project description:

Housing comprise of apartment buildings, 514 units, and some apartment buildings eight/nine storeys high. Blocks facilitate the integration of mix tenure such as private housing, social housing and rentable units. Mixed use comprise of residential, shops, schools, nursery school and offices. Some units are duplexes and grouped around circulation cores. All buildings have access to courtyards within the blocks for communal use. All units overlook the park and have balconies. The park as the primary green element is visually and spatially linked to the housing courtyards and transverse streets.



**Figure 5.9** Parc de Bercy , Paris



**Figure 5.10** Parc de Bercy, Paris

Apartment buildings (Fig 5-10) are grouped around courtyards. Openings/entrance spaces filter the link between the courtyard and the park. The latter allows visual permeability in the courtyard and park.



**Figure 5.11** Parc de Bercy , Paris

The central concepts and key success of the Bercy Housing is that of the highly positive relationship between the housing and the park. Without being dominating, the housing units frame the park and make it feel safe and well overlooked. Housing units gave the park a necessary strong and defining edge. Surveillance is maximised with balconies running along and projecting from the park façades. Units are designed in such a manner as to maximise lateral views towards the park, courtyards and street.



No visual distinction between social, rent and market housing are made. Different tenure units are well integrated and provided for. A key success to Bercy Housing is the fine balance that was struck between transparency and definition of the housing blocks. Housing blocks function well as perimeter blocks, making clear distinctions between public and private space, remaining visually permeable with links to the park.

Courtyard gardens (Fig 5.11) form a tranquil inner realm removed from the public and transport activity on the street façade. 120-birch tree form a canopy of foliage above a grass and narrow paved walkways. The seven story walls at the sides and rear of the (Housing at Parc de Bercy, www, 2008)



**Figure 5.12 Growth Homes**

## 5.2.2 Growth Homes, Almere, The Netherlands

**Project** Growth Homes, Almere, The Netherlands

**Architect** Herman Hertzberger

**City** Almere

**Country** The Netherlands

**Address**

**Building Type** Residential Open Building

**Date Built** 2002

Units can be extended without difficulty. All units have the same basic unit plan plus a variable zone that can be fitted with discretion of the occupant. Occupants can modify these zones over time and add extra rooms to their houses (fig 5.12). Modifying is about excluding and as well as including (Growth Homes, www, 2008)

## 5.3 Housing Support Centre

### 5.3.1 Galeshewe Housing Support Centre (HSC)



**Figure 5.13 Housing Support Centre Galeshewe**

The Housing Support Centre in Galeshewe, a township in Sol Plaatje, was established in 1996 to facilitate access to subsidies and speed up housing delivery to the poor.

The support centre was initiated by Sol Plaatje Municipality and the community, and was supported by the provincial Department of

Housing and Local Government and Sida, which financed the operating costs during the first three years.

The Housing Support Centre (HSC) is a municipal structure that manages low-cost housing projects to increase housing delivery to families eligible for the housing subsidy.

The centre provides information on subsidies, facilitates community participation in housing programmes and assists poor people to build and improve their houses, e.g. by introducing the self help concept.

The HSC target group is poor people entitled to a housing subsidy, and who were in need of assistance with housing, services, urban environment and household economy issues.

The HSC facilitated the planning of a project that included the construction of 5000 houses. The community was heavily involved, alongside other stakeholders from the municipality, the Province, and private business. The construction required compliance with

the IDP, standard planning regulations and the municipal housing plans and budgets. The proposal was approved; the municipality allocated land and the provincial Department of Housing and Local Government provided subsidies.

The HSC has been the main channel for user involvement in housing processes and related services. Numerous meetings have been held at the centre, which manages information on the recipients of housing subsidies and is responsible for the housing waiting lists that ensure fair and transparent allocation.

Women were motivated to participate on an equal basis in information and decision making processes related to housing delivery. Single female-headed households were encouraged to apply for housing subsidies and female contractors were provided with special technical and administrative support.

Not only the recipients of housing subsidies but also the wider community have through the project gained new insights into different housing solutions, alternative building materials and

ecological solutions. People have also learned more about their rights and obligations as citizens. This has made them more confident to require service delivery from the municipality and to engage with the municipality and other stakeholders regarding services ([www.citiesofopportunity.com/booklets/housing](http://www.citiesofopportunity.com/booklets/housing))

### **5.3.2 Waterloo Housing Support Centre (HSC)**

The provision of a housing support centre at Waterloo was seen by the Local Authority as an opportunity to establish a regional facility in the Northern Sub-Structure. It was proposed that the CSC/HSC provided would cover issues relevant to the project of the housing process. The intention was to provide a “one-stop” centre where people could obtain information, advice and assistance, which would enable them to take control of their own housing needs.

Support would be given on the following aspects of housing:

- ***Technical Support***

This would entail the provision of advice and assistance with the selection of a housing option, construction method and materials, the preparation, submission and approval of building plans and preparation of cost estimates. It was envisaged that this function would dovetail with that of the residual administrator, who would be responsible for the release of the subsidy residuals for payment for building materials. It was at this stage that the beneficiary would be given sufficient information and advice to make an informed decision on the size, type and cost of house they required as well as the delivery method. The options available were:

- Contractor Built – where a beneficiary enters into a building contract with a contractor to deliver a house.
- Self-Help – where the beneficiary undertakes the construction using the self-help process via the approved self-help provider.
- Self-Build – where the beneficiary uses whatever means at his or her disposal to construct the house.

The CSC/HSC would provide opportunity for the people engaging in the self-help and self-build process to manufacture materials and receive training and support within the centre.

- ***Legal Advice***

The centre would provide people with basic legal assistance with contractual matters relating to housing. This would be more specifically aimed at individuals who elected to make use of contractors/builders to construct their houses. Advice on the National Home Builders Registration Council (NHBRC) its functions and role in housing would also be made available.

- ***Finance***

The provision of end-user finance and access to finance are often problems encountered by beneficiaries who make use of the Provincial Housing Board (PHB) subsidy scheme. The centre would facilitate the participation of lending institutions in the project and provide advice and assistance to beneficiaries on sources and procedures to access finance. The centre was built at Waterloo where a site on which the building erected had been identified. The North Local Council, the Local Authority for the area, had agreed to make the land available at no cost.

([www.dab.uts.edu.au/ebf/conferences/earthbuild.2005](http://www.dab.uts.edu.au/ebf/conferences/earthbuild.2005))

## 6. CONCEPTUAL EXPLORATION

### 6.1 Site specific Exploration



Fig 6.1 Image collage author - Indicating existing activities on the site

Activities on the site include mainly informal retail and trading, brick and building material sales and informal taxi ranking on the

corner of Hans Strijdom and Hinterland roads. Several informal structures were erected to facilitate trading.

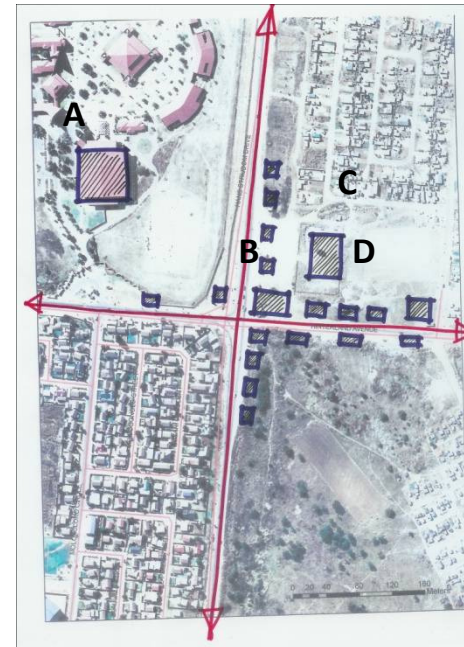


Fig 6.2 Indicating the existing retail edge on Hans Strijdom Road and Hinterland Road

A – The Mamelodi campus

B – Retail activities on the corner of the Hinterland intersection and Hans Strijdom edge

C – Brick and building material sales

D – Informal taxi ranking and taxi holding area

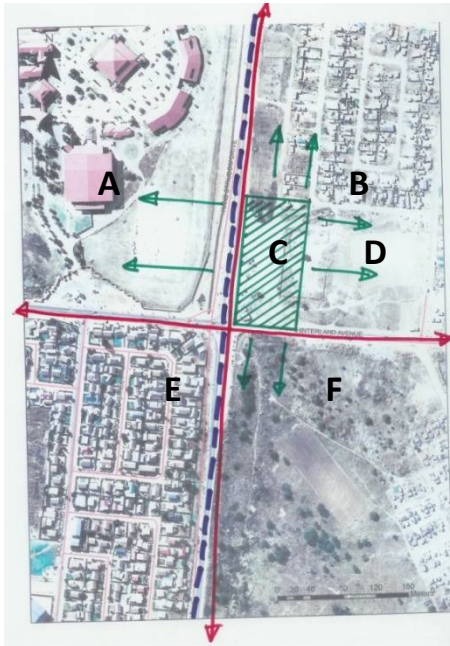


Figure 6.3 Indicating the relation of site to existing features and built environment

A – The Mamelodi UP campus

B – Residential/ Bonded housing with informal infill

C – Informal retail activities

D – Brick and building material sales

E – Residential / Bonded housing

F – Informal housing

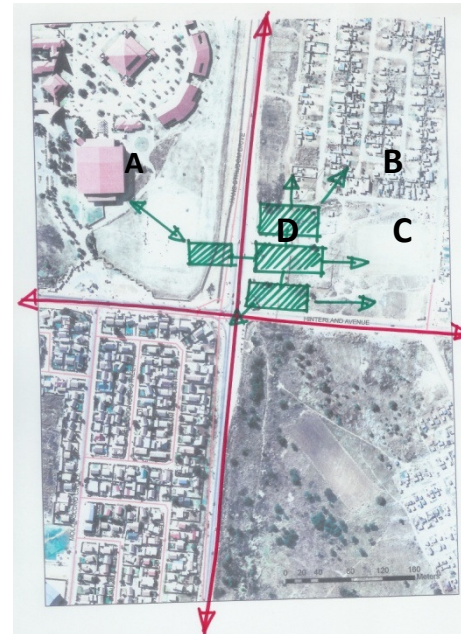


Figure 6.4 Illustrating the proposed zoning areas of the site to determine design intervention



- A - Academic institution. Design intervention to relate to the campus . Any intervention should be in response to the campus and its activities.
- B – Residential zone to respond to residential /urban environment to the eastern side of the site
- C – Building and retail zone as response to the existing retail activities on the site. Existing brick and building material retail activities operating in this zone.
- D – Retail, trading and transport zone. This zone is characterized by informal street corner trading activities, taxi and pedestrian movement and informal taxi holding and washing.



**Figure 6.5** Illustrating existing and proposed circulation on the site with roads and pedestrian routes connecting the site and UP campus.

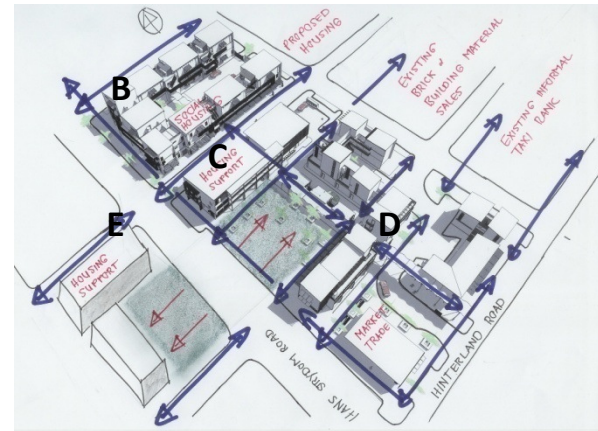
**Existing main roads**

**Existing secondary roads**

**Proposed secondary roads**

**Proposed pedestrian routes circulating the site**

There is significant pedestrian movement on the site. People move past the site along Hans Strijdom in a north/south direction and east/west along Hinterland Road.



**Figure 6.6** Illustrating proposed site layout as response to the site



B – Social Rental Housing developed by a Housing Institution with visual and physical connection with residential environment and proposed Housing Support Centre at C.

C – Housing Support Centre as combined project by a Housing Institution and the University of Pretoria(Mamelodi campus). The Housing Support Centre as response to the housing character of the site, fast growing formal and informal residential character of the urban environment, housing need and housing research environment of the university.

E – Proposed Housing Support Centre with housing research facilities, connecting the university with the residential urban environment, acting as bridge between the university and urban society. C and E are visually connected by means of an open space/courtyard/social gathering place.

D – Market and trading facilities with link to taxi ranking site. Proposed market and trader structures as response to the existing informal trading character of the site.

B, C and D to be connected with pedestrian circulation routes to promote pedestrian movement and permeability on the site. B,C and D to emphasize and strengthen the existing retail edge in Hans Strijdom and Hinterland Road.



Figure 6.7 and 6.8 Building material and brick sales on eastern part of site

### 6.1.1 Zoning and Site Layout

Built structures comprise of:

1. Residential (private spaces); and
2. Public/commercial zones.



Figure 6.9 Zoning and Site layout

### 6.1.2 Internal Courtyard and Public Courts

The design possibilities of courtyard housing result in various socio spatial qualities. Courtyards provide sociable spaces with a spatial system and inherent social logic to it and could be seen as a generator of contact between people.

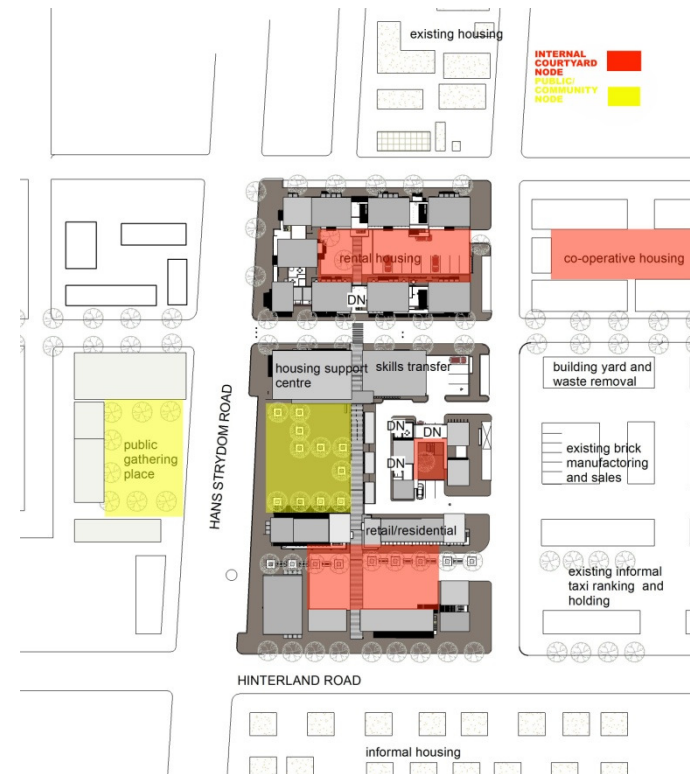


Figure 6.10 Internal and Public Courts

### 6.1.3 Pedestrian Circulation

- Formalisation of street trading and the provision of more permanent home for large number of public transport lead to increased pedestrian traffic on Hans Strjidom and Hinterland Road. Large number of pedestrian traffic enter the site on route from the taxi ranking site on Hinterland Road.
- Trading edge encourage pedestrian traffic through site.
- Trading facilities on the public square/gathering place, encourage pedestrian traffic on the site.



Figure 6.11 Pedestrian circulation

### 6.1.4 Vehicle Circulation

Hans Strjdom serves as main transport corridor connecting Mamelodi and the Eastern suburbs of Pretoria. Existing taxi ranking and holding on Hinterland Road lead to increased traffic on Hans Strjdom. Most Mamelodi commuters are dependent on minibus taxi transport. New infrastructure is needed for taxi industry, housing support visitors and trading informal street traders.

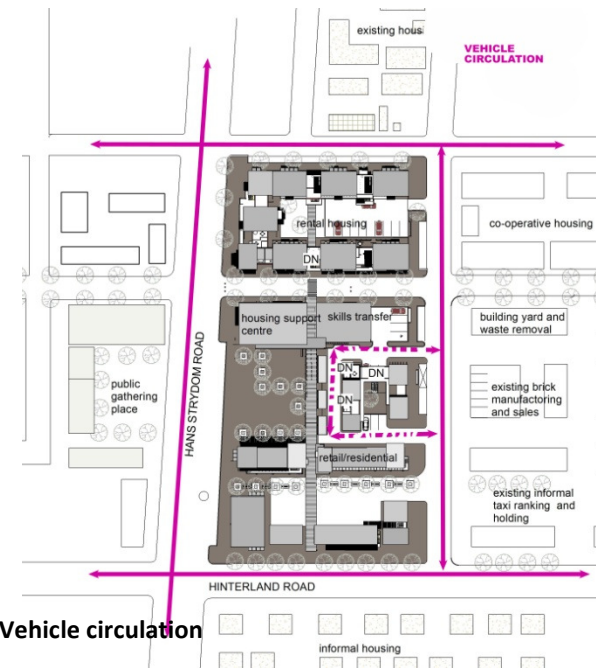


Fig 6.12 Vehicle circulation

### 6.1.5 Waste Removal

The following figure illustrates the circulation of waste services and refuses collection points in the site. Refuse collection points are well provided for at the housing node, housing support centre and market and trading area.

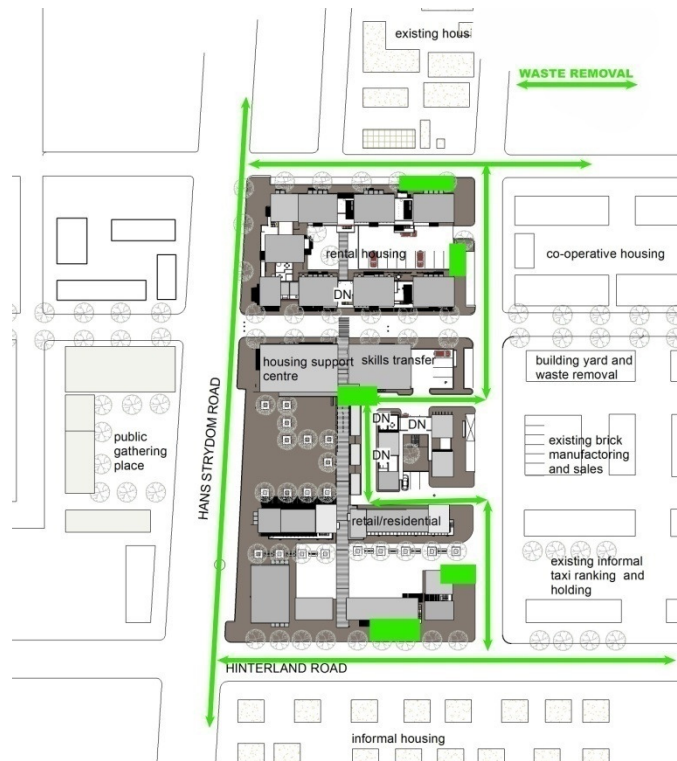


Figure 6.13 Waste removal

### 6.1.6 Storm Water

On site storm water to be directed towards an existing storm water/ street drainage channel on the western side of Hans Strijdom Road.

Concrete storm water pipes to be unreinforced concrete non-pressure pipes to comply with SABS 677.

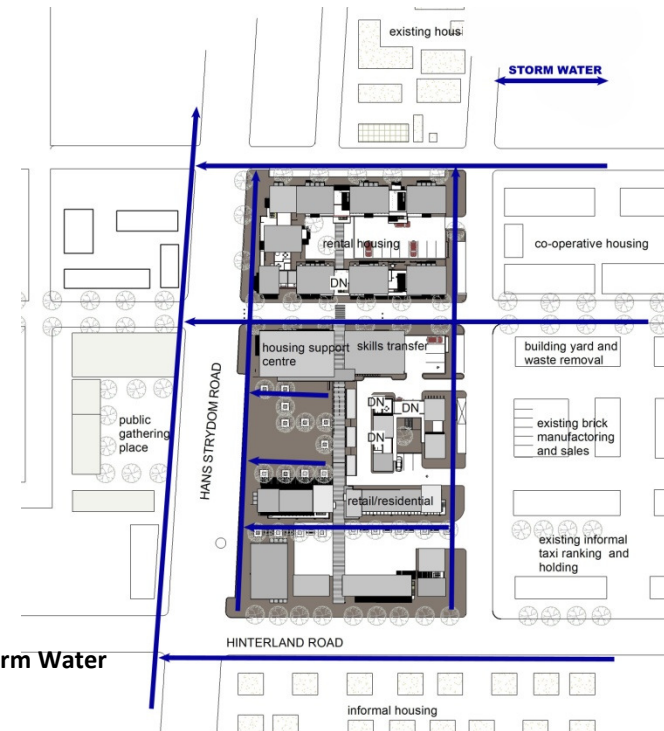


Figure 6.14 Storm Water

### 6.1.7 Parking

The following figure to illustrate parking provided for each precinct on the site.



Figure 6.15 Parking

### 6.2 Design Exploration

**Design and conceptual considerations to be explored during the conceptual phase:**

- Site-specific analysis indicate a mixed-use development with residential, commercial, trade, public and social amenities.
- The project to be connected to the UP campus by means of a Housing Support centre and social gathering place/open space on both sides of Hans Strijdom.
- Any project should strengthen the trading and social character of the site.
- Residential units to be mixed use and allow work, live and recreation.
- Exterior circulation walkway's to allow visual connection with Hans Strijdom Road, with secure, courtyard spaces and semi-private spaces from within.
- Residential units should target the low-income group. Social Rental Housing being an option for low income dwellers.



- Streets, circulation routes and walkways should be treated as social spaces and enhance socializing.
- Design of residential units should comply with very high human sustainable factor.

From literature studies, Greater London Authority (2006) and SHIFT spatial recommendations, the following spatial qualities should be kept in mind:

- Units to have minimum floor areas of no less than 30m<sup>2</sup> for bachelor or 1-bedroom units.
- Dwelling should be able to accommodate a mixed use of activities, e.g. work, live and play.
- The need for privacy with suitable separation of bathrooms and WC's and rooms for sleeping by adolescents and adult members of the opposite sex, except husband and wife.
- Suitable internal storage space.
- Private exterior spaces such as enclosed external balconies or gardens.
- Multifunctional internal spaces. Bedrooms should be designed as places for privacy, study and recreation, not only for sleeping and dressing.

- Internal spaces e.g. trading spaces should be convertible and multi- function.
- Security. Residents should be able to leave their children in a secure environment. Access to the residential development should be controlled.
- Transition of public and private spaces should be well designed.
- Resident should be able to 'age' in their units.
- Wider span between structural walls enhance future expanding and remodelling of the building and extend the life of the building.
- Climate responsive design principles apply.

**Table 6-1 summarises proposed housing standards and spatial design for medium density housing.**



**Fig 6.16 Image collage by author 2008, illustrating the retail edge and possible design of retail edge living units. The concept of live work, mixed use units to be explored.**

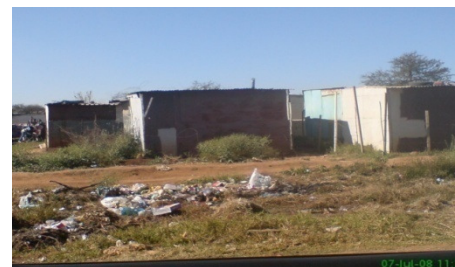




Fig 6.17 and 6.18 Image by author, 2008. The language of mono-pitched roof and corrugated sheeting structures are dominating in the area.

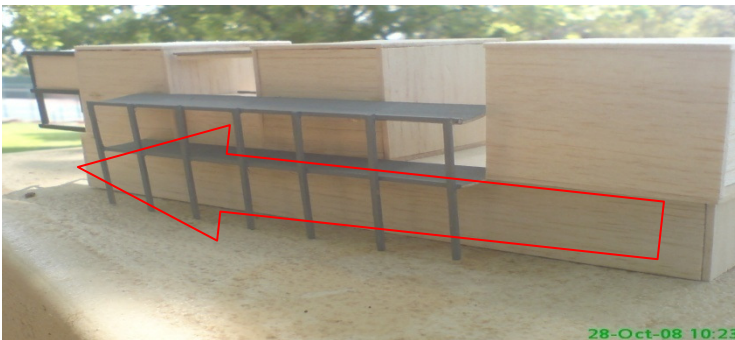


Fig 6.19 exploring the concept of circulation on first floor street level with surveillance of street and public space. Living units to be arranged around courtyards with retail on ground level.

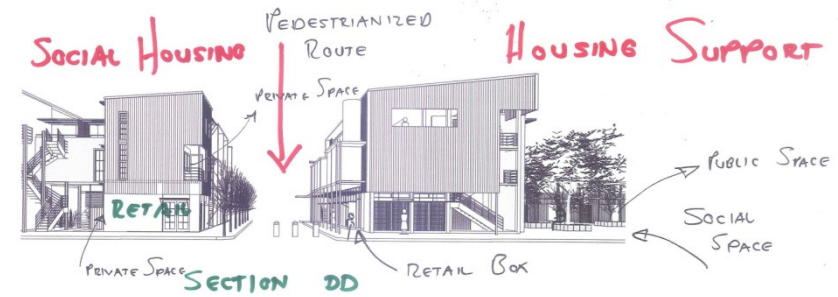


Fig 6.20 Exploring with mass and building height. Pedestrian routes should be a design priority and respond to the social character of the site.

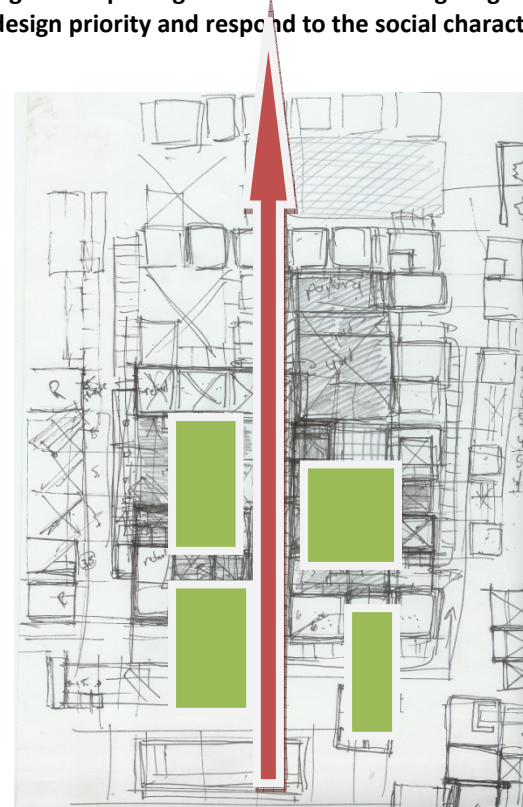




Fig 6.21 Exploring the concept of pedestrian routes along an axis, flanked by courtyards and public spaces.

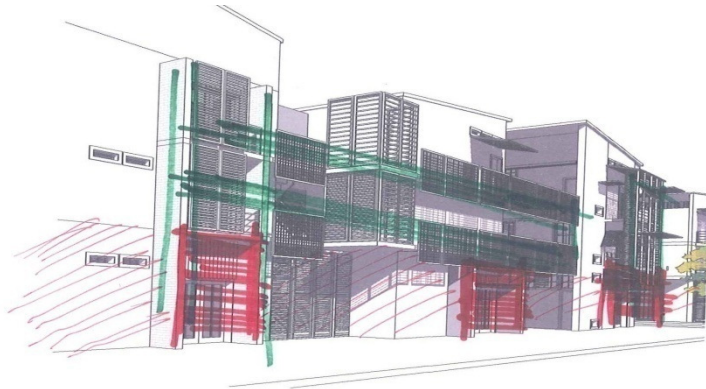


Fig 6.22 Circulation as sociable spaces on street interface

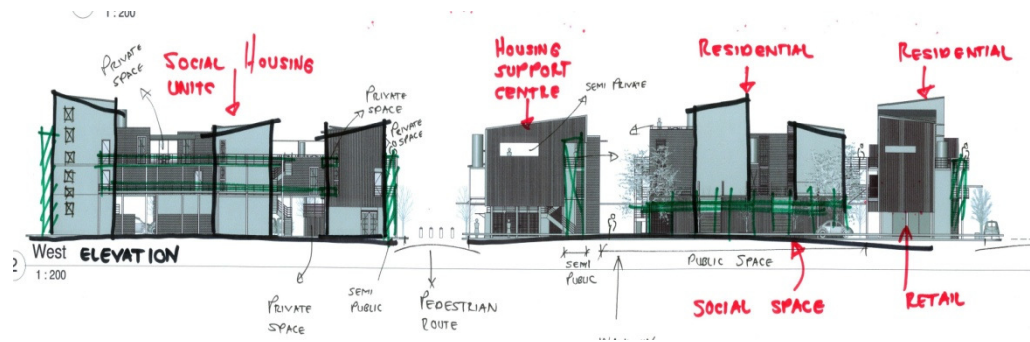


Fig 6.23 Exploring with mixed use buildings, trading zone and pedestrian circulation through the site. Interfaces and hierarchy of spaces should be dealt with.

Fig 6.25 Exploring live/work units on trading edge



**Fig 6.26 Trading structures designed on a pedestrian route. Pedestrian routes should penetrate buildings and function as important feature of the project Trading area with pedestrian routes emphasize the social character of the site.**

### 6.3 Climate Responsive Design Principles

All built structures to be seen as climate filters where the filtering mechanism is related to:

- Micro and microclimate.
- Building form and fabric.
- Plant and equipment.

For purposes of this design, the PASSIVE MODEL OF CLIMATE MODIFICATION should be considered. To minimize energy consumption, passive energy saving systems such as optimized cross ventilation, solar control and thermal loading are implemented. (Hyde, R. 2000 : 56)

#### Passive building model:

- Uses no plant or equipment to modify climate;
- Internal temperature follows that of nature;
- Thermal performance be kept at external shade temperature; and
- Building should be narrow, with cross ventilation and stack effect from low-to-high openings.(Hyde, R. 2000 : 56).

**Climatic**

<b>Roof:</b>	Light coloured to reflect solar radiation. Insulation to ceiling for improved thermal performance. Reflecting foil under roof to reflect radiation.
<b>Walls:</b>	Medium to heavy mass with shaded windows in summer. Windows to admit night ventilation. Avoid windows to the west.
<b>Floor:</b>	Light coloured to reflect solar radiation. Solid massive and ground connection.
<b>Plan:</b>	Orientation long axis east-west. Smallest building aspect to east/west to reduce solar gain.
<b>Courtyards:</b>	Light and ventilation/cool air from evaporative cooling

The following table indicates design considerations for hot/dry-moderate climate (Mamelodi):

**Table 6.2,3 Design considerations for sustainable housing, (Hyde, R 2000 : 57)**

**Climatic elements****Climate method****Response**

Insulation	Minimize heat loss in winter and heat gain in summer	Large overhangs for excluding summer sun
		Large windows facing winter sun
Large diurnal temperature variation	Utilize diurnal temperature variation For summer cooling and winter heating	Higher mass walls with large time lag
Summer heat	Minimize insulation in summer	Roof insulation or ventilated roof
	Utilize ventilation in summer	Large openings with cross ventilation

## 7. MATERIALS AND TECHNICAL INVESTIGATION

Materials were chosen to provide minimal long-term maintenance. Hardwearing materials on ground floor levels were chosen to withstand the wear and tear of children playing and increased foot plaster, more durable than paint.

Pre-cast elements were designed to speed up construction and to eliminate on-site shutter work. Pre-cast hollow-core Echo floor slabs are proposed. Pre-cast hollow core slabs 7200x899x150, to be laid onto load bearing brickwork. Echo floors are a simply supported, one directional, and structural slab panels with dimensions of 7200x899x150. Slab panels, with 50MPa concrete strength and a structural topping of 80mm, have Live Load capacity of 1.50Kn/m<sup>2</sup>.

Standard small pane steel window frames must be used. Steel windows to respond to architectural language of the residential environment. Mono pitched roofs to be covered with 0.6 IBR profile metal sheeting.

Bubble foil or factory lite, 50mm, to be used in roofs to ensure interior climate control with white polyethylene side facing downwards and the foil facing upwards. Bubble foil with thermal resistance of 0.91m<sup>2</sup>.K/W.

Bubble foil reduces heat radiation by 95%, is tear resistant and flexible, waterproof and non-toxic and effective at temperatures ranging from -20 to 80 degrees Celsius. The white polyethylene side could be used as ceiling as well.

Rainwater to be collected by means of standard reinforced fibreglass water tanks, placed on typical stand tank stands.

Standard 330 and 220 load bearing brick walls are proposed.

## Thermal properties of plastered brick wall:

R-value indicates the resistance to heat transmittance. Total resistance of external wall can be determined by calculating/adding the R-values of layers of the envelope elements.

Total air-to-air resistance of envelope is expressed as overall thermal transmittance or U-value.

(Grobbelaar, A 2006 : 210)

220mm brick wall, conductivity 0,84 W/m.K

15mm plaster, conductivity 0.6 W/m.K

Surface resistance  $R_{si} = 0.14$   $R_{so} = 0.06 \text{ m}^2\text{K/W}$

$R_{a-a} = R_{si} + R_{body} + R_{so}$

$R_{body} = 0.220/0.84 + 0.015/0.6 = 0.287$

$R_{a-a} = 0.14 + 0.287 + 0.06 = 0.487$

$U = 1/R_{a-a} = 1/0.487 = 2.054 \text{ W/m}^2\text{K}$

## Heat storage capacity of 220 brick wall

The amount of heat stored in a element is given by  $Q = m * c * DT$

$m$  = mass of material

$c$  = specific heat of material (J/kgK)

$DT$  = change in temperature due to addition of heat energy

For a 220 brick wall and rise of 1 degree Celsius, the amount of energy stored:

$$440 * 850 * 1 = 374 \text{ kJ/m}^2$$

For a composite light weight steel panel, the amount of energy stored under the same circumstances, would be:

$$25 * 1000 * 1 = 25 \text{ kJ/m}^2$$

High mass walls can absorb several times more energy compared to a lightweight steel structure. In direct sunlight, the light structure will heat up quickly and transmit the heat inside surface within half an hour. The high mass structure will need more time to heat. Time

needed to transmit heat from one surface to another, is known as lag time.

- Lag time for a concrete roof slab or 220 brick wall = 6 hours.
- Lag time for a 330 brick wall = 11 hours.

(Grobbelaar, A 2006 : 210)

Higher thermal mass, promotes better thermal comfort for dryer regions such as Pretoria, Mamelodi.

Higher mass would be material of choice for better thermal inertia.

## 7.1 Structural Calculation

If considered the Floor Nominal Dead Load of  $4.8\text{kN/m}^2$  and Floor Nominal Imposed Load (Live Load) of  $5\text{kN/m}^2$  and  $180\text{kN/m}$  factored load from upper storeys, the following formula could be used to determine suitable bricks and mortar for a 220 load bearing ground floor wall:

- Consider a 1m length of a 5m 220 wall with self weight of  $22\text{kN/m}^2$

Dead loads: Floor =  $4.8 \times 5$  (floor span) =  $24\text{kN}$

Self Weight of walls =  $0.220 \times 3.5$  (wall height)  $\times 22 = 16.94\text{kN}$

Total =  $40.94$

Imposed load =  $5 \times 5 = 25\text{kN}$

Factored/m run =  $1.2\text{DL} + 1.6\text{LL}$

$1.2 \times 40.94 + 1.6 \times 25 = 89.13\text{kN}$

**Total load:**  $180 + 89.13 = 269.13\text{ kN/m}$

Effective height =  $2625\text{mm}$

Slenderness ratio =  $11.9$

Plan area of wall =  $5 \times 0.220 = 1.1\text{m}^2$

Material safety factor =  $2.9$

$$f_k = \frac{2.9 \times 269.13 \times 1000}{0.93 \times 1.0 \times 1000.220} = 3.81 \text{MPa}$$

Class I mortar with 14MPa bricks, or Class II mortar with 17MPa bricks would be suitable.

### Pre-cast hollow core slab – Echo floor

- Pre-cast hollow core slabs are self-supporting up to 7.2-meter span.
- Hollow core slabs are placed on load bearing walls on top of damp proof as a slip layer.
- Slabs over 5.0m require a structural topping.
- Props are placed 1 meter apart.
- Steel is required in a structural topping on all cantilever panels.
- Twice the length of the cantilever must sit on the building.
- Slabs can be used as roof slabs, balconies, and external walkways of flat roofs with a reference 100 mesh in the screed/topping over the slab - Textured paint or tyroleen finish is used on the soffit of the slabs.

- Use 25MPa premix concrete for structural screed/topping.
- Props to be in place for 14 days after casting of concrete (Echo Floors : 1991).

## 7.2 Housing Support Centre

For purposes of the Housing Support Centre, a reinforced concrete frame structure with masonry brick infill is proposed. Cast-in-situ slabs 255m, one way, with reinforced concrete columns, 440x220 to be suitable for this building. Columns carry all vertical loads to foundations in compression with column layout on a 5m grid.

Slab thickness determined by L/20 for one-way slab.

Column alignment and spacing on a 5m grid would be structurally ideal for gathering of loads and descending vertically in compression.

For cantilever slabs a 500mm R8 stirrup with steel Y16-20 is recommended (Echo Floors: 1991)



Pedestrian walkways on first and second floor should be constructed of composite slabs. BMT profiled steel decking with a 110 r/c slab to be used.

0.6 IBR profile sheet metal is used to continue the architectural language of the environment. White polyethylene with thermal resistance of 0.91 M<sup>2</sup>K/W should be used.

Steel mesh/ expanded metal fixed to a mild steel frame is used for balustrades and security gates.

For the workshop section of the support centre, a steel construction frame with lightweight steel panel and masonry infill is used. A steel construction is used for this section of the building, due to its open and adaptable character and the recyclability properties of steel.

### 7.3 Market Area

A steel construction with lightweight steel panel, IBR profiled roof sheeting and masonry infill is used. The market area comprises of

trading units, secured with a mild steel frame and expanded metal security gates.

A covered walkway gives access to the Housing Support node. IBR profiled sheeting supported by a mild steel frame, are used.

### 7.4 Ventilations Options

**Natural ventilation** is generated by pressure differences in and around the building. Pressure differences from air movement are generated by air temperature and wind.

**Temperature driven ventilation** - stack effect - uses natural buoyancy of the hotter air to rise and displace cooler air. Stratification occur - hotter air rise, cooler air at bottom move in.

#### **Design factors affecting ventilation:**

1. Reduction of plan depth and increase openness of section to facilitate cross-flow and vertical flow.

2. Optimum orientation of rooms to prevailing breeze and linkage between leeward and windward side.
3. Maximise skin opacity through number and size openings, horizontal versus vertical stacking of openings.
4. Reduction of internal obstructions.
5. Increase exposure to airflow effects.
6. Open able bottom and top louvers/windows to allow cooler air to flow in at bottom, while hot air to rise with stack effect and escape through top windows (Hyde, R. 2000 : 75)

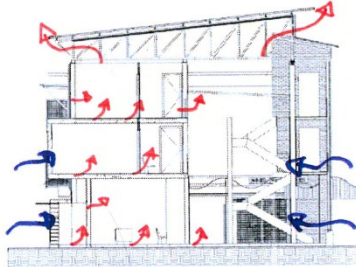
## 7.5 Passive Building Model

The building aspects of climate modification in terms of the Housing Support Centre can be classified as a passive model. The passive model makes use of natural energy in the environment, building form and fabric to modify climate. No plant or equipment is used to modify the climate.

Figure 7.1 Housing Support Centre with Ventilation Strategies

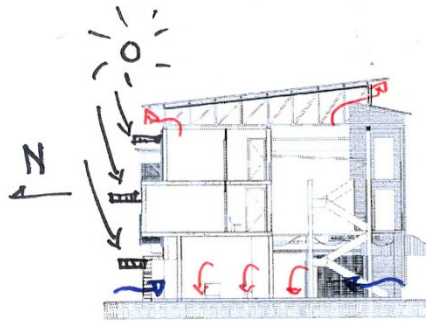


**SUMMER THERMAL STRATEGY**



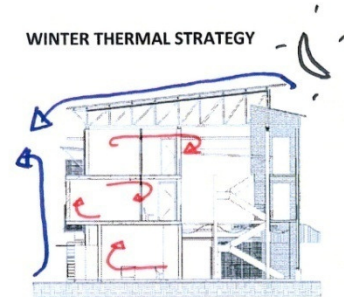
Night ventilation – removes heat

Stored in thermal mass



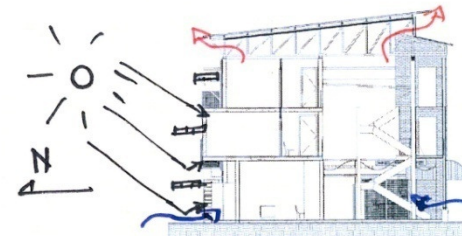
Internal heat gain absorbed by thermal mass

**WINTER THERMAL STRATEGY**



Insulation and wind barrier retains heat

at night, no night ventilation



Internal heat gains and sun energy stored in thermal mass and released

Figure 7.2 Summer and Winter Ventilation Strategies (ARG Design, 2008:79)

## 7.6 Solar Water Heating

All residential units and Housing support Centre to be provided with a 150l Solar Heating System. Insulated storage tanks to be mounted to outside wall above balcony and Solar Heat Collector Panels mounted over the top of a mild steel frame structure of the balcony, facing the equator. Solar panels to be connected on a mild steel roof rail and clamp, bolted to steel frame above balcony with stainless steel bolts, washers and nylock nuts. The collector panels fulfil the dual function of providing shade and weather protection for the balconies in top floor.

### Insulated storage tank with solar heating panels

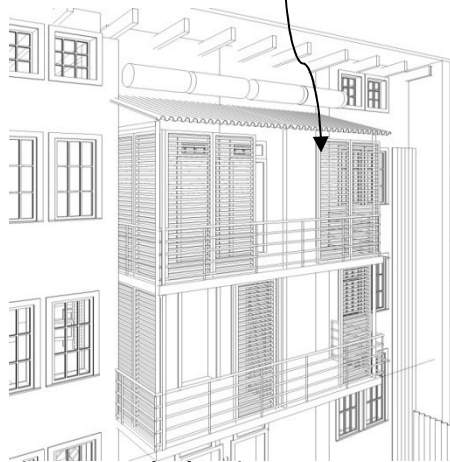


Figure 7.3 Solar heating strategy

## 7.7 Rain Water Harvesting

Each top storey unit to be fitted with a standard 2000l reinforced fibreglass water reservoir for harvesting rainwater. Rainwater should be used for WC, gardening and exterior use.

## 7.8 Energy Efficiency

The thermal qualities of a typical 30m<sup>2</sup> second floor rental unit with western exposure are determined for a typical summers afternoon at 15h00. Three different material options with different thermal qualities are taken in consideration:

### *Option 1: (32m<sup>2</sup> unit)*

- 0.6 IBR profile sheet metal roof, painted in dark colour, or unpainted
- dark, unplastered exposed 200 brick wall,
- think pink/mineral wool roof insulation,
- standard ceiling board,
- 800-roof overhang.

Maximum internal day temperature: 30.5

Minimum internal day temperature: 12.7

**Option 2: (30 m2 unit)**

- 0.6 IBR profile sheet metal roof, painted white,
- 15m plastered wall finish,
- 220 plastered cement brick wall,
- light coloured painted exterior walls,
- 50mm metalized factory lite roof insulation,
- 800-roof overhang.

Maximum internal day temperature: 27

Minimum internal day temperature: 10.5

**Option 3: (30m2 unit)**

- Same as option 2'

- Western facade with sun shading panels that block out 50% of western sun

Maximum internal day temperature: 26.8

Minimum internal day temperature: 10.5

Option 3 provides the best option for residential design in Mamelodi. Option 2 provides better winter thermal qualities, although option 3 offers the best option, taking in consideration the longer summer than winter climate in Gauteng.

**(Energy Analyses Programming, IMECH Consulting, October 2008)**

## 8. DESIGN IMPLEMENTATION

### 8.1 Markets and Trading Area

#### 8.1.1 Objectives

The approach to the project involved addressing the fundamental concept of establishing a dynamic public realm that could support:

- an informal and formal trading zone for commuters
- provide a pedestrian link between taxi rank and Housing Support Centre
- provide rentable lockable trading units for retail purposes with storage facilities
- different levels of informal trade, namely small, medium and larger scale
- encourage formal and informal economic and social activities
- a positive public space/public realm
- encourage pedestrian movement
- sufficient public ablution and washing facilities

A large part of Mamelodi's commuter population is dependent on minibus taxis for daily transport. With an existing taxi ranking site in Hinterland Road, pedestrian traffic and informal trading dominate the site.

The market and trading zone were identified as important catalytic projects to link the existing informal taxi-ranking site with the Housing Support Centre and future urban renewal projects along Hans Strijdom and Hinterland Road. The market and trading zone form part of the urban renewal programme for the site allocated for this project.

The formalisation of the street trading community and the provision of more permanent trading structures, were the main drivers of the project. Formal retail stores are located along Hans Strijdom and Hinterland Road, while smaller and more informal trading structures are located along pedestrian routes and edges.

### 8.1.2 Programme

Trading opportunities include a mixture of enclosed and open trading shelters, a market trading canopy, storage facilities, ablutions, and water points and landscaping.

Pedestrians arriving on foot will enter the market on a covered pedestrian walkway or movement route, moving in the direction of the Housing Support Centre. The walkway is flanked with retail units to the right.

The market and trading zone serve as a trading forecourt to the Housing Support node and taxi ranking facilities on Hinterland Road. The Hans Strjdom and Hinterland Road intersection is perceived as a hub of informal activities and pedestrian movement. The proposed market area would serve as trading area, capitalizing on the energy created by pedestrian and vehicular movement (Ewing, K. 2005). The development focuses on the need to direct and allow pedestrian flow from the taxi rank on Hinterland Road, commuters from future public Bus Rapid Transport system and

pedestrian movement along Hans Strjdom, in a south-north and east-west direction to residential areas, Housing Support Centre, UP and other amenities.

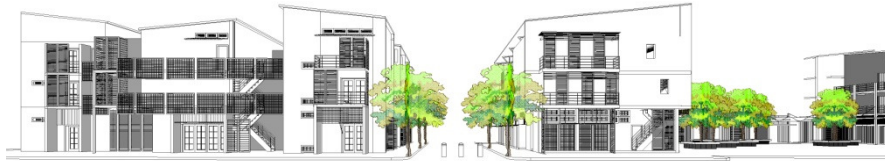
The market takes the form of steel/framed structures with rentable spaces intended for market activities. Material used would be basic steel frames, masonry infill and metal roof sheeting. The market is designed to allow for flexibility and maximum pedestrian movement. Walkways allow for possible trading, pedestrian movement, waiting and socializing (Ewing, K. 2005).



Fig 8.1 Image of proposed market



## 8.2 Housing Support Centre



**Figure 8.2 Western elevations HSC and Rental Housing (left) with pedestrian route**

### 8.2.1 Objectives

The conceptual basis for a Housing Support Centre, is the vision of achieving a community that is self sufficient and informed in house building practices, equipped with construction skills and having access to spatially well designed and well built dwellings.

The Housing Support Centre enables disenfranchised communities to access and take ownership of their dwelling resources and needs. Targeting the lower income group, skill and knowledge transfer, could stimulate the local housing sector, improve the quality of housing and generate independence. An attitude of

responsible stewardship of common housing resources is fostered to encourage the conversion of degraded, dilapidated and unsustainable housing practises into more sustainable, lasting and comfortable housing options.

These are achieved by housing support in the form of soft and hard skills transfer, training, information, technical advice, legal and social support.

### 8.2.2 Programme

The HSC comprises of:

1. Two rectangular shape buildings/sections arranged on both sides of a pedestrian circulation axis;
2. A covered pedestrian walkway;
3. Trading/commercial units; and
4. A courtyard space.

The first building to be the proposed soft skill transfer and administration section and would be home to a Social Housing Institution. Housing Departments, providing information and

housing support could be tenants in this building. The building is designed as a three-storey reinforced concrete frame office building on Hans Strijdom Road.

The second of the two proposed buildings to be a steel/portal frame workshop area for skills transfer, workshop training and more hard skills orientated training. The Peoples Housing Process or any organization actively involved in hard skill training could be a tenant using the workshop facilities. The workshop facility is visually connected with more workshop facilities, trading and material manufacturing activities across the street (to the eastern side of the HSC). An existing cement brick manufacturer operates from this site.

The covered pedestrian walkway must be a linear axis, connecting the housing support centre with the taxi drop-off and market area.

The walkway penetrates the HSC and visually connects the Social Rental Housing project with the HSC and trading area.

Trading/commercial units, rental and lockable spaces of 2.5x3m in size must form a linear edge along the courtyard space.

The courtyard space must provide an area for social gathering and trading.

The office block on Hans Strijdom, a joint venture between a social housing institution and the University of Pretoria, is arranged around a triple volume entrance foyer/reception area. The programme of the office building, allows for soft skill training, information, support, advice, social rental administration and most housing related advice.

The office building comprises of a triple volume reception area, information helpdesks, waiting areas, office space, boardrooms, tearoom/lounge, staff room, kitchen area, vendor/trading stores and storerooms. The triple volume foyer is a major source of natural light, penetrating the building from the south.

Pedestrian circulation is perceived as an exterior space and located on the southern façade of the building. Exterior circulation contributes to a visual and social connection with the social activities in the courtyard/social gathering space. Circulation routes are extended social spaces and exterior circulation connects the office building with the workshop section across the pedestrian axis.

Access to the building is via a covered pedestrian walkway, crossing the social/public node and passing the retail edge. Retail opportunities are created along the pedestrian circulation axis and maximise trading, formal and informal on the site. The covered pedestrian walkway offers retail and socializing opportunities.

### 8.2.3 Design Parameters

- Use of natural light, passive ventilation and visual contact with the outdoors were taken as design parameters.
- The building should fit into its direct residential context in terms of scale and urban fabric.

- The building should have a visual and social connection with Hans Strijdom Road and with the proposed courtyard and social gathering space.
- Individual offices are placed with visual connection to the courtyard, and triple volume space.
- Design to optimise natural climatic conditions with offices to have direct north orientation and screen walls to block out the western sun.
- A social and visual connection with Hans Strijdom Road is achieved by projecting the facade forward from the row of supporting columns and adding balconies with movable, mild steel frame, sun panels with timber slats to protect balconies from the western sun (Digest of South African Architecture, 2007/8 : 126).

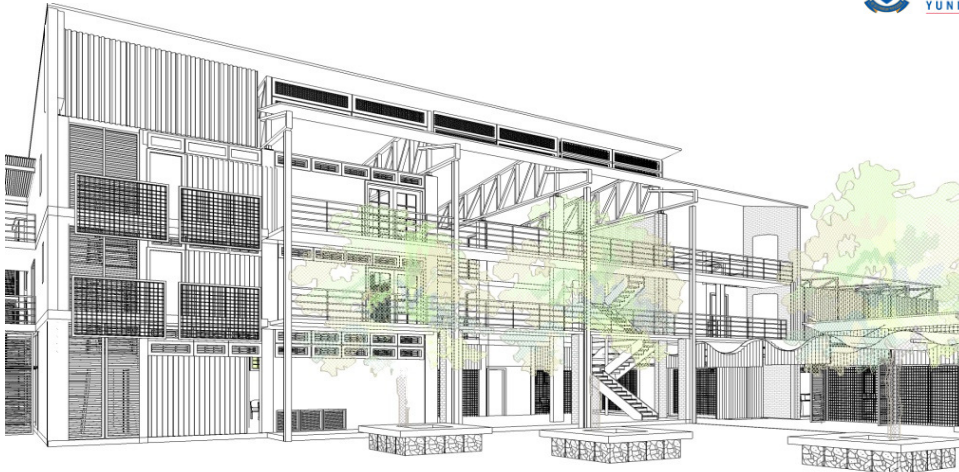


Figure 8.3 Circulation walkways connecting with exterior space with modular steel balustrades

Figure 8.4 Pedestrian circulation axis, functioning as vertically articulated spine, set between two flanking wings

### 8.2.4 Plan and Layout



Figure 8.5 Floor Plan Housing Support Centre



Figure 8.6 Floor Plan – Level 1 Housing Support Centre

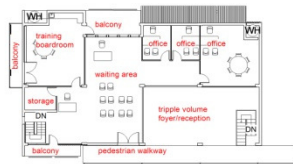


Figure 8.7 Floor Plan – Level 2 Housing Support Centre



Figure 8.8 Public gathering space with retail edge



Figure 8.9 Trading opportunities are created along the pedestrian axis and edge of open/social gathering space

The opportunity to interact is a palpable quality of the place.

The Housing Support Centre is proposed as part of a social and public precinct. Opportunity for social gathering, waiting, informal and formal trading is created with a public open place.





Figure 8.10 Housing Support Centre seen from Hans Strijdom Road



Figure 8.11 Housing Support Centre – Hard Skills transfer. Steel/portal frame workshop area for training and hard skills orientated training

## 8.3 Social Rental Housing Units

### 8.3.1 Objectives

**Table 8.1** Indicating the objectives of this housing project:

- an alternative for, overcrowded tiny houses with no design flexibility, consideration for cultural diversity, privacy or personal space.
- encourage a medium density rental development, which is innovative, responsive to the site's visual, environmental and cultural characteristics and in accordance with the desired future characteristics of the area,
- provide a range and style of housing which is appropriate to the diversity of the people of Mamelodi,
- provide a mixed use project with synergy of living, working and recreation
- provide flexible and adaptable interior options to ensure spatial usage which could adapt to changing personal needs and lifecycles over a period of time; and
- provide climate responsive design qualities.

### 8.3.2 Site Analysis and Layout

The site is located on the corner of Hans Strjidom and Hinterland Road, next to the UP Mamelodi campus. The Housing development was designed around a courtyard with integrated community living in mind. The site is ideally located in terms of served by road and rail based public transport, with ample taxi transport and the City of Tshwane's proposed Bus Rapid Transport running along the western border on Hans Strjidom Road.



**Figure 8.12** Northern elevation: Social Housing Rental Units



### 8.3.3 Design Response

From interviews conducted with residents of Mamelodi, literature studies, Greater London Authority Spatial Standards and local precedents studies, the following spatial guidelines to be implemented in the design of the social rental units:

- Units to have minimum floor areas of no less than 30m<sup>2</sup> for bachelor or 1-bedroom units.
- Minimum space standards apply – 18m<sup>2</sup> for Living, Eating and Cooking, 5m<sup>2</sup> for a one person bedroom and 9m<sup>2</sup> for a two person bedroom (cupboards included).
- Dwelling should be able to accommodate a mixed use of activities, e.g. work, live and play.
- The need for privacy with suitable separation of bathrooms and WC's and rooms for sleeping by adolescents and adult members of the opposite sex, except husband and wife.
- Suitable internal storage space.
- Private exterior spaces such as enclosed external balconies or gardens.
- Multifunctional internal spaces. Bedrooms should be designed as places for privacy, study and recreation, not only for sleeping and dressing.
- Internal spaces e.g. trading spaces should be convertible and multi- function.

- Security. Residents should be able to leave their children in a secure environment. Access to the residential development should be controlled.
- Transition of public and private spaces should be well designed.
- Resident should be able to 'age' in their units.
- Wider span between structural walls enhance future expanding and remodelling of the building and extend the life of the building.
- Climate responsive design principles apply.

**Table 8.2 Design response**

### 8.3.4 Security

Security seems to be a determining in most residential developments. Access control and protection of private spaces contribute to a safe environment. The development has only two access points, which allow entrance for residents only. Staircases are secured with steel framed mesh panels and gates. The development is designed around a courtyard space with residential

units on the edge. Units must provide security in the form of passive surveillance. The eastern border could be a fenced steel palisade with a vehicular access gate to the onsite parking provided in the courtyard space.

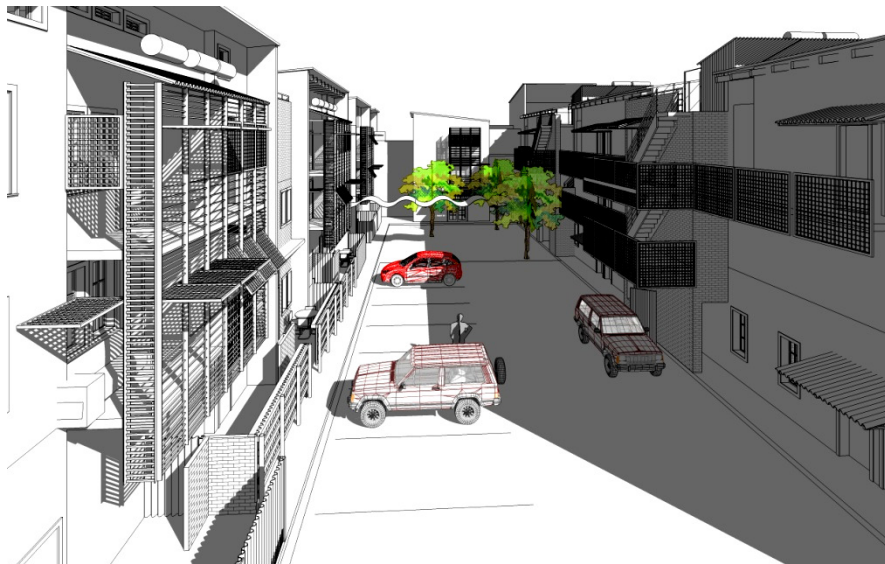


Figure 8.14 Courtyard with secured access control

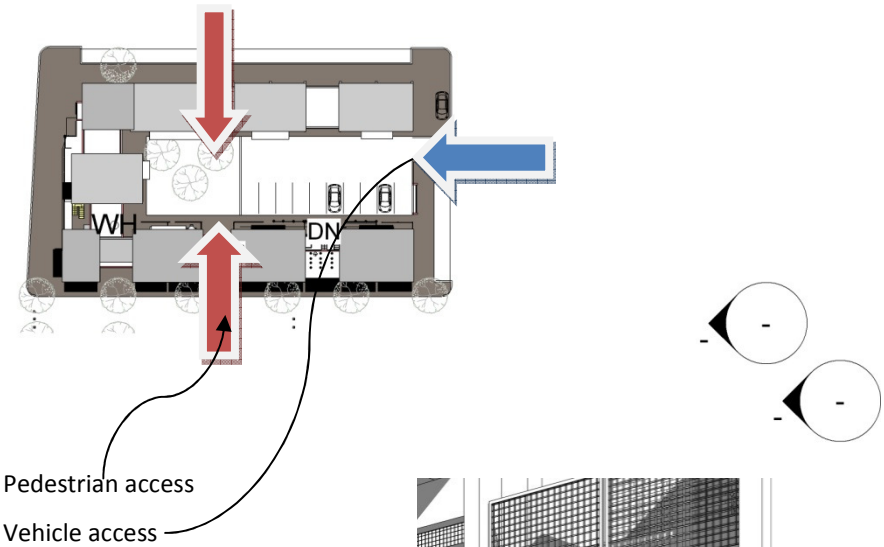


Figure 8.15 Access points indicated

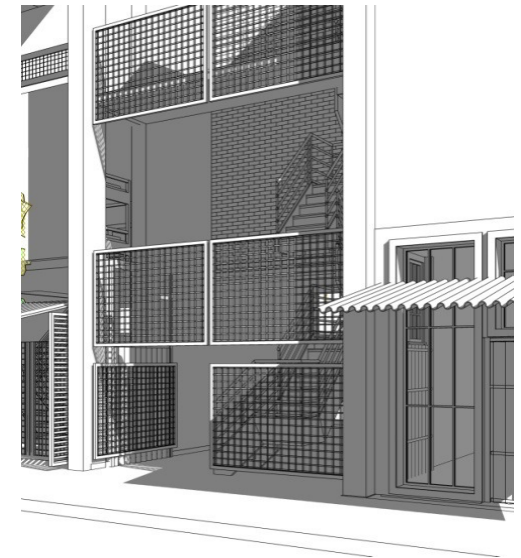


Figure 8.16 40x40x3 mild steel angle frame with mesh welded to frame to form security gates and balustrades.

### 8.3.5 Unit design

There are 34 units in total. Bachelor units are 32m<sup>2</sup> in size with one and two bedroom units varying from between 47 and 61m<sup>2</sup>.

Orientation and building height were considered according to the urban framework of the regenerating framework for Mamelodi campus and urban environment, as well as to maximise the living conditions within individual units. Height and distance between blocks ensure adequate sunlight during the day.

Three storey buildings:

1. Provide protection for internal courtyards against prevailing wind.
2. Offer visual and sound barrier to protect development from noise and visual pollution from Hans Strijdom Road.
3. Provide elevated views surrounding Mamelodi and campus.

Ground floor units with floor to ceiling height of 3500 to ensure storage space and flexible use space. Units have been staggered to

get north light into all the lounges. Bathrooms on first floor lead off the living and sleeping section. The kitchen on ground floor is open plan in the ground floor living area. Loft units have been designed with a mezzanine level over the kitchen/bathroom area, creating an extra bedroom or storage area.

The units are built around a central courtyard. Some units have both front and back entrances and others (first- and second-floor units) have access from the walkways only. Upper-floor units are accessed through an external staircase along the southern and northern façade of the block. Low-level walls define small front gardens and entrances to the ground-floor units on the southern block. Small front verandas allow for social interaction with other residents.

A bath is installed (instead of a shower) as it is easier to wash the children and/or clothes in a bath. It makes it possible to provide a shower facility within the bath at a later stage.

TV points, sufficient electrical points, washing machine plumbing and a stove plug should be provided. All units to be provided with

tiled floor finishes within the kitchen and bathroom areas and carpets in the lounge and bedrooms. A kitchen sink, double door standing cupboard and a worktop should be provided. A shelf and a rail in the bedroom provide space for both hanging and stacking of items. Cupboard doors not to be provided in order to save costs (Social Housing Foundation : Project Review Series, 2006).

The top floor units were designed to take advantage of the roof space and have a mezzanine level, which accommodates an extra bedroom. These loft units have a steel staircase with concrete infill treads in order to reduce the footfall noise within and between the units.

The commercial units include live-work units and a few straight commercial units. A roller shutter and grid gate is provided. The live-work unit comprises of a 20m<sup>2</sup> shop area with a two-bedroom living unit above, suitable for occupation by a small family.

Hard wearing, wood trowelled and brushed concrete walkways were constructed without any other floor finishes applied. The first

flight of stairs to be enclosed as to give a storeroom and bin area but the rest of them are open to bring “lightness” and openness to the scheme.

The development caters for elderly and disabled people in the community. A percentage of ground-floor units closest to public amenities and transport routes were designed for wheelchair access (Social Housing Foundation : Project Review Series, 2006)

### **8.3.6 Adaptable Housing Typology**

Units are designed with adaptable and flexible floor plan options. Interior walls are either timber cupboards or adjustable panels that provide flexible interior spaces and allow residents to ‘age’ in their units. Consideration is given to a design that allows residents to ‘age-in-place’. Housing units will adapt to and support residents’ changing needs as they proceed through different life cycles. Further consideration is given to design certain units that allow several floor plan options without any structural intervention or change.

Units to be designed with fixed structural support/load bearing exterior walls and fixed wet/plumbing core (bathroom and kitchen). Living spaces and bedrooms should have adaptable interior walls. Interior walls must either be sliding panels, mobile wall partitions or timber cupboards that could be removed or adapted to changing needs. Ground floor units with retail opportunities should be designed with sliding panels, enabling a floor layout to maximise space usage. The plan consists of a versatile retail space, separated by mobile wall partitions. During the day the ground floor living space can be made smaller by pushing the partitions back, creating a secluded retail space. At night, the partitions could be sliding open to enlarge the kitchen/living space. Movable dividing walls are mounted on wheels, and ceiling rails that lock into place. Some units must be fitted with mobile cupboards and fold-up beds. Expansion and retraction of bedroom space is made possible by fold-up beds that fit into a boxed wall unit. (Digest of South African Architecture, 2007/8 : 60-61). Certain units to be designed with removable infill panels in the support structure between two units. These panels could be removed at a later stage to incorporate two adjoining

units into a bigger unit or for other purposes. Several floor plan options are designed for the same unit without any structural intervention or change (Social Housing Foundation : Project Review Series, 2006).

Certain units to be designed with removable infill panels (dry walling) in the support structure between two units. These panels could be removed at a later stage to incorporate two adjoining units into a bigger unit or for other purposes.

### 1. Site layout and ground floor units.



Figure 8.17 Site layout ground floor units

### 2. Typical unit layout

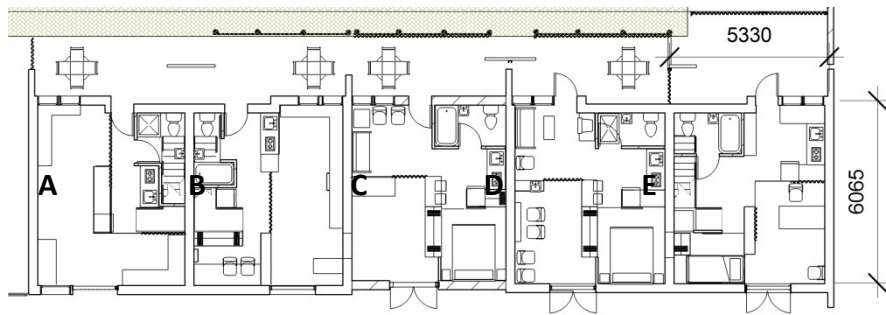


Figure 8.18 Typical ground floor unit

**Unit A:** 3 Bedroom unit / 71m<sup>2</sup>

**Unit B:** 2 Bedroom unit / 64m<sup>2</sup>

**Unit C:** Bachelor/1 Bedroom / 32m<sup>2</sup>

**Unit D:** Bachelor / 1 Bedroom / 32m<sup>2</sup>

**Unit E:** 2 Bedroom unit / 64m<sup>2</sup>

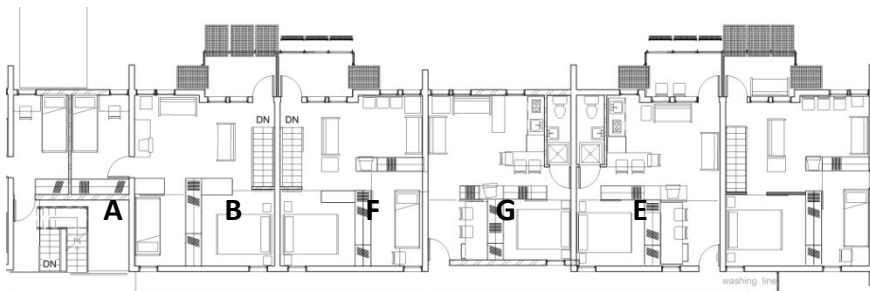


Figure 8.19 Typical first floor unit

**Unit F:** Bachelor / 1 Bedroom / 32m<sup>2</sup>

**Unit G:** Bachelor / 1 Bedroom / 32m<sup>2</sup>

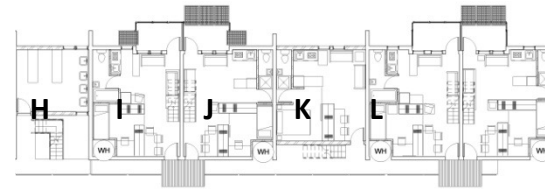


Figure 8.20 Typical second floor unit

**Unit H-I:** 1 Bedroom with mezzanine / 47m<sup>2</sup>

**Unit J:** Bachelor / 1 Bedroom / 32m<sup>2</sup>

**Unit K-L:** 1 Bedroom with mezzanine / 47m<sup>2</sup>

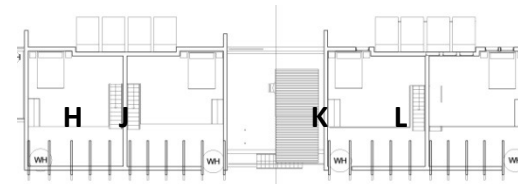
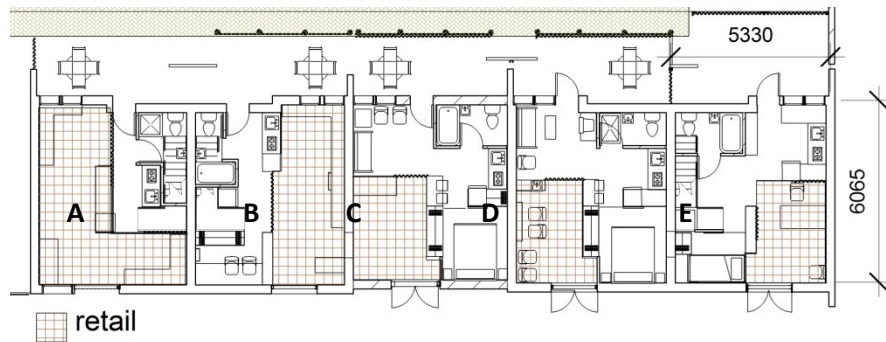


Figure 8.21 Typical mezzanine layout

### 3. Typical ground floor unit with retail options





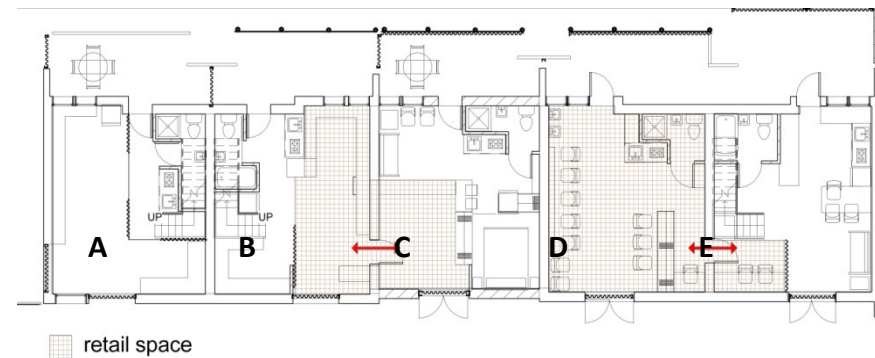
**Figure 8.22 Retail spaces**

Ground floor units to form live and work spaces on retail edge with street interfaces. Small/limited retail opportunities are viable in these live/work units. Retail/commercial options/suggestions for units A-E include the following:

- Unit A: Bookshop
- Unit B: General dealer
- Unit C: Take a ways/eatery
- Unit D: Hairdresser
- Unit E: Small office space

Retail spaces in ground floor units are separated from living spaces/kitchen with sliding panels. These panels could be closed during office hours to create a semi-private retail/commercial zone. Panels could be sliding open at night to incorporate the retail space into living/kitchen area.

#### 4. Ground floor units incorporating adjacent apartments



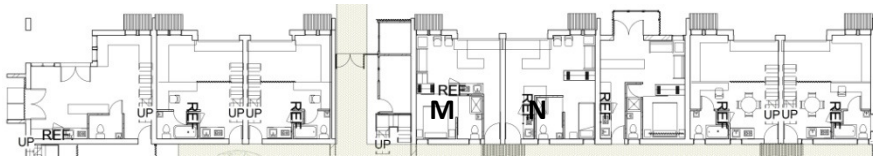
**Figure 8-23 Flexible floor plans**

Units are resigned with flexible floor plan options. Tenants in unit E, could rent unit D with the option of incorporating the two units. Structural walls between unit D and E, and B and C, are designed with removable infill drywall panels. Drywall panels could be



removed to combine D and E into a bigger unit with floor space of 93m<sup>2</sup>. Timber built in cupboards and room dividers are removed from unit E, to create a new floor plan with bigger kitchen, living area and extended retail space in D.

### 5. Ground floor unit with disabled facilities



**Fig 8-24 Unit M-N: Typical layout of ground floor unit adapted for disabled person.**

According to Macagnano (2005), flexibility of design ensures a sustainable livelihood in housing. A flexible home offers the user opportunity to apply hands-on modifications to the physical layout without disruption to the essential layout. Such modifications take shape in the modification of internal partitions, additions for an extending family (birth of children or refuge for relatives) and

possibility for internal subdivision and reduction of space for easier management in the case of a contracting family.

### 8.3.7 Setback and Building Height

Street widths vary from 6m, to 8m, 10m and 20m with residential units providing active frontages to these streets, the edges of which are animated by the provision of regular entrances, openings, narrow frontages, balconies, stairs and the articulation of facades. This allows for clearly defined transitory zones between public, semi-public and private domains (Mammon, N and Ewing K. 2005)

Building is to be setback a minimum of 9m along the Hans Strijdom frontage to allow a functional retail edge with pedestrian activity. A minimum front boundary setback of 3m applies for buildings adjoining the pedestrianized route on the southern boundary of the development. Minimum front setbacks of 4m apply for the buildings adjoining the northern and eastern boundary.

Cantilevered unroofed balconies, sunscreens and sun blinds may encroach into the setback area.

Building heights vary from 3-4 storeys, according to urban framework for the area.



Figure 8-24 Illustrating spatial relationship between building height and roads

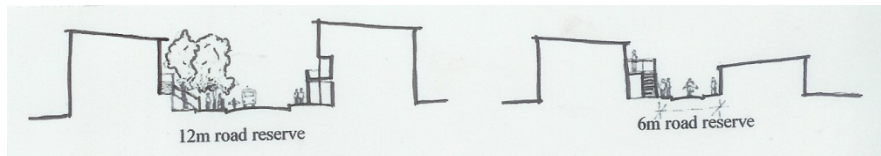


Figure 8-25 Illustrating building setbacks and building height (Mammon, N and Ewing K, 2005)

### 8 3.8 Mixed Use and Retail Edge

Edges of residential units on ground floor are spaces with rich qualities. Pedestrian circulation through the Housing Support Centre and along Hans Strijdom, create ample retail opportunity for ground floor units on the edges of the housing project. Since many residents are self-employed, live and work units would be an attractive option. Ground floor units are designated to become living and working spaces.

Ground floor units should be converted into trading/retail space. Sliding panels to separate retail/office space from living area, adapting to individual needs of tenant.

Centre-to-centre distance of 6400 and flexibility of floor plan on ground floor, allows for various floor plan variations. From conventional living to small retailer, hairdresser, take a ways, office and spaza shop. Tenants are free to divide the spaces between load bearing cross walls with purpose made sliding panels.

Opening or closing of sliding of panels offer a number of combination options and sizes for retail/living.

Ground floor, with a room height of 3500, is designated as a working and storing zone



Figure 8-26 Ground floor units on pedestrian route with retail edge

### 8.3.9 Hierarchy of Spaces

Differentiation and transition between private and communal spaces are clearly defined so that people may socialize or withdraw when needed.

The success of this residential developments, hinge on the interface between street and building. Retail edges as part of the street/building interface communicate a sense of interaction. Roads serve as circulation corridors and public space.

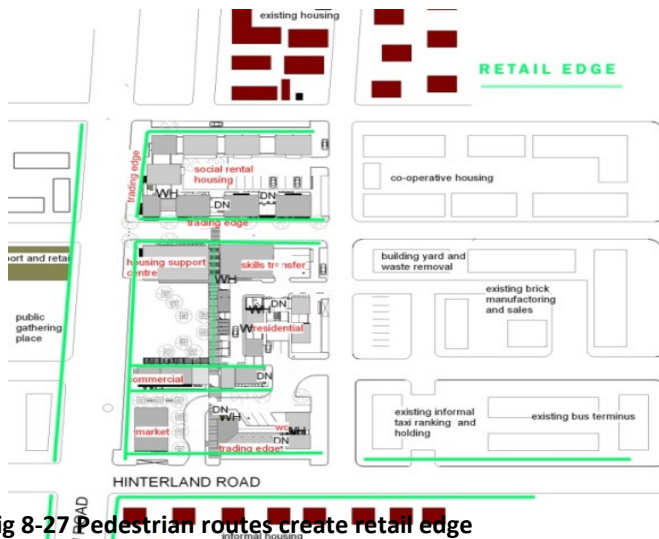


Fig 8-27 Pedestrian routes create retail edge



Public space Private space Private space Semi-private Private space Public space

Figure 8.28 Illustrating differentiation of spaces

### 8.3.10 Private Exterior Space

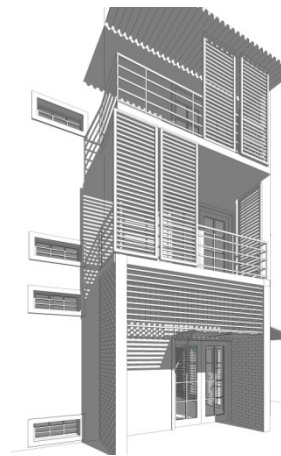
The home and the private exterior space is one area where the influences of the outside world can still be measured out at one's own discretion. In this social housing project, the private exterior spaces (balconies) are placed at the transition from private to public space and are particularly exposed (Schittich, C 2004 : 36).

Exterior spaces can make a greater contribution to the private sphere when the boundaries are more enclosed. These should not have an adverse effect on the lighting of the interior living spaces.

In this rental housing project, a cantilevered balcony zone on the northern façade of each unit complements the spatial programme. The latter to create a spatially differentiated exterior space. Balconies are provided with translucent timber slat balustrades with mild steel frame panels. Shading panels act as balcony shutters and when closed, creating a sense of privacy. This space acts as a shady retreat when closed. The external aspect of the units provide in the need for socialising and privacy.

Shutter panels to be fitted with bullet hinges and fixed to a mild steel frame to the one end.

Balconies serve as additional private spaces and can be used as extension of the interior private space. Balconies also relieve the monotony of the façade.



**Figure 8.29 Balconies to become exterior private spaces with moveable sun panels; balconies provide an extension of living space.**



walkways with a structural topping of 50mm, can be used as pedestrian circulation routes for first and second floor units. Walkways are secured with mild steel framed and mesh balustrade.

Walkways on street interface, allow for passive surveillance of street become an extended social space for visual social interaction. Open/visible walkways provide a more secure and visible route than enclosed, dark corridors.

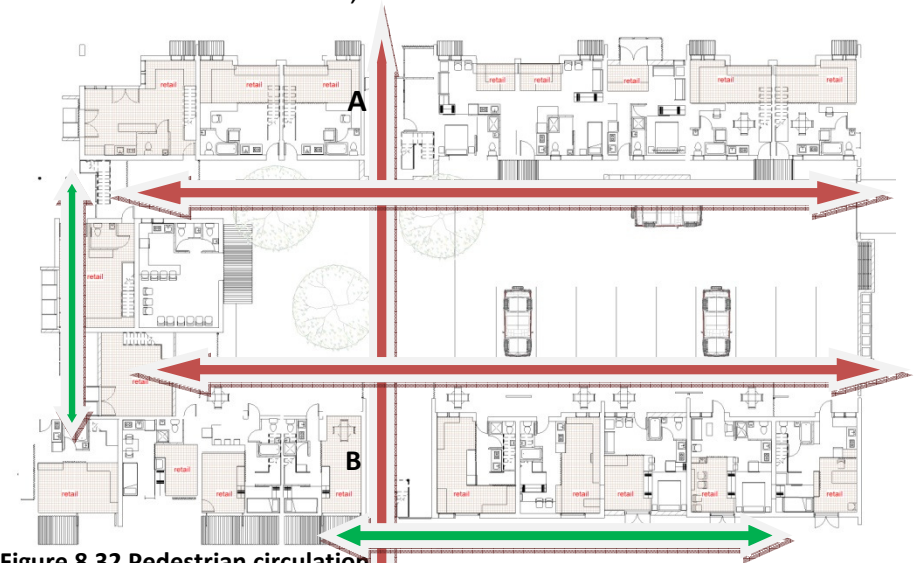
**Figure 8.30** Sun panels to be adjustable to allow balconies to be extension of interior private spaces when closed



**Figure 8.31** Sun panels open to allow visual and social interaction with courtyard and street

### 8.3.11 Pedestrian Circulation

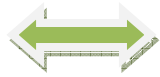
Echo precast hollow core floor slabs allow for an unsupported cantilevered balcony or walkway of 1.2 m. These cantilevered



**Figure 8.32** Pedestrian circulation

Interior circulation within courtyard space and interior walkways.





Exterior circulation on first and second floor levels with street interaction. Circulation from inside courtyard. No circulation access points from street, besides A and B.

**A and B:** Secured/gated pedestrian access.



Figure 8.33 Circulation on outside with street interaction

### 8.3.12 Green space and Landscaping

The provision of grassed areas between the blocks not only contributed to landscape, it has also created soft play areas for the children. Trees in the heavy-duty areas, such as the parking areas, are protected with metal rails. (Social Housing Foundation, Project Review Series : 2006)

Soft landscaping (fruit trees, shrub beds and lawn) is to be provided in the courtyard area. Hard landscaping to be provided in front of setbacks and retail edge.

Street trees are to be provided in accordance with City of Tshwane's street tree planting requirements.

### 8.3.13 Parking

Parking is kept to a minimum with less than one parking bay per unit. Limiting road markings and kerbs have reduced the visual impact of parking spaces. Parking is allocated to residents willing to pay for the parking bay, which is a fair method of allocation.

Hollow blocks are laid to encourage grass to grow through and this introduces additional greens to the project. (Social Housing Foundation, Project Review Series : 2006)

### 8.3.14 Garbage Services

Residents must take their household garbage to the collection points on the ground level storage spaces under the staircases. Appointed staff take garbage bins from storage place to garbage stand area from where appointed contractors then ensure that the bins are ready for municipal collection once a week (Social Housing Foundation, Project Review Series : 2006)

The garbage stand area is to be located in a position next to the vehicle access point in a position behind the boundary wall. The stand area is to be constructed of materials, which are in keeping with the character of the development. Garbage areas to be screened from public and semi-private courtyard spaces.

### 8.3.15 Laundry

Several drying areas are provided for. Certain units have access to drying areas on walkway level. These areas are secluded with timber slat panels to provide a visual sheltered area. Some units have access to communal rooftop drying areas. A flight of stairs leads up to a communal laundry area. Some apartments have access to a washing area and wash lines inside the courtyard.



Figure 8.34 Rooftop communal drying area

### 8.3.16 Social Amenities



The proposed facilities available to the residents include a children's play area, open public spaces and a resident's multi-functional room with kitchen facilities. The multi-functional room could be used for children day care, after school club for older children or multi social use.



**Figure 8.35** Illustrating pedestrian route between HSC and Social Housing towards Hans Strijdom Road

## 9. TECHNICAL DOCUMENTATION

As attached.



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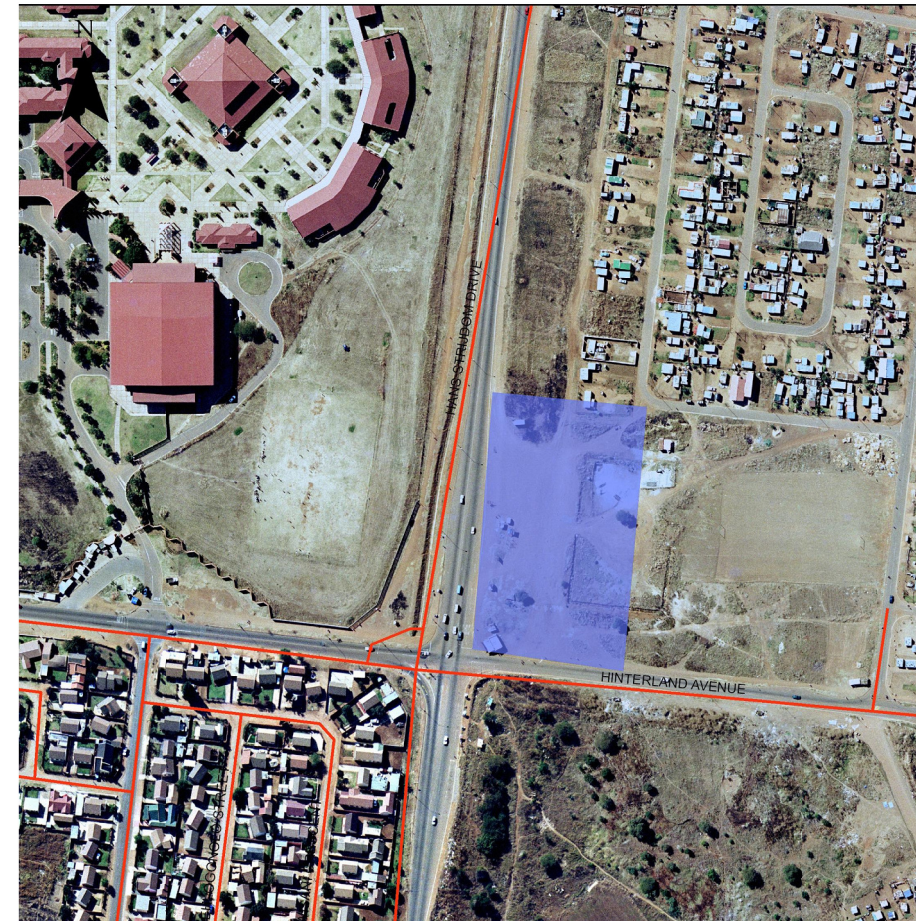
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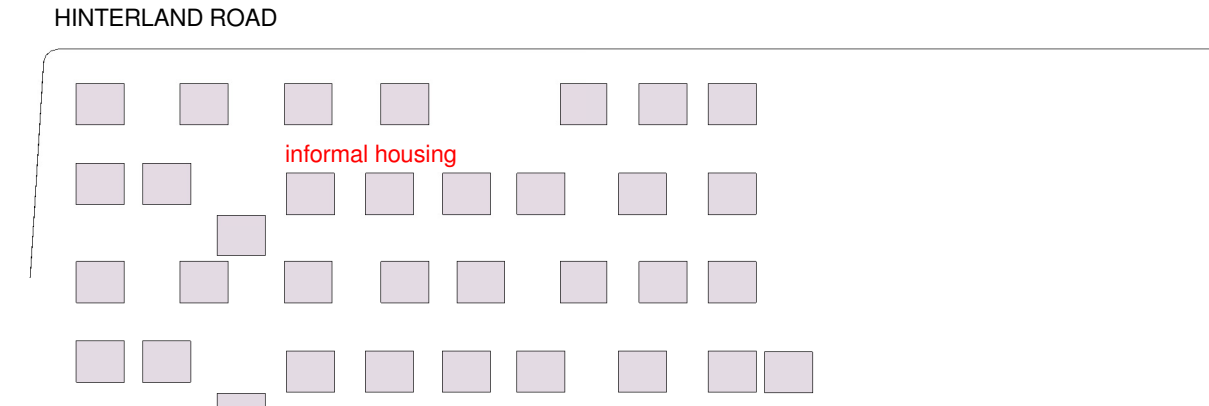
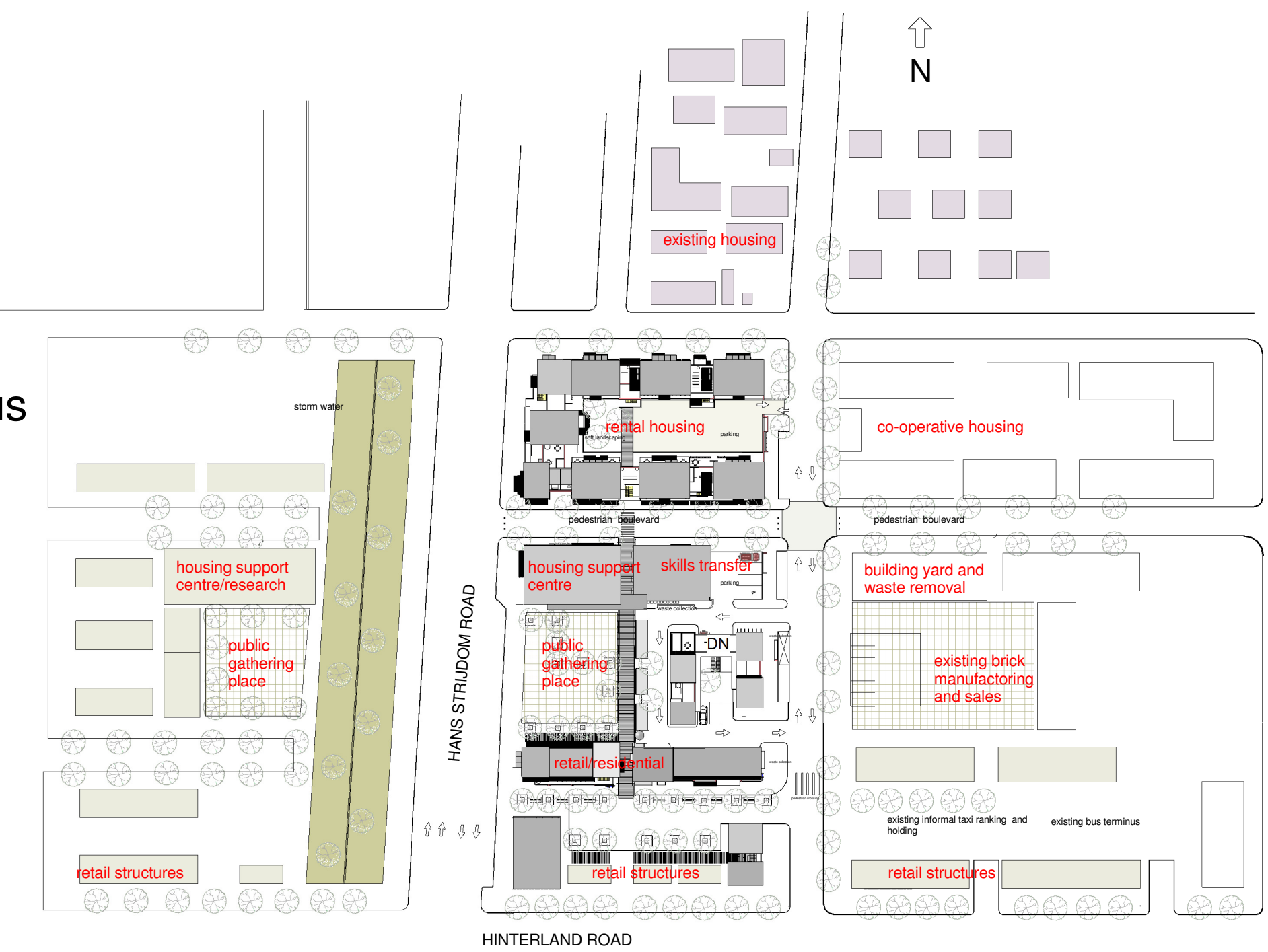


Aerial view - Mamelodi campus with Hans Strijdom Drive

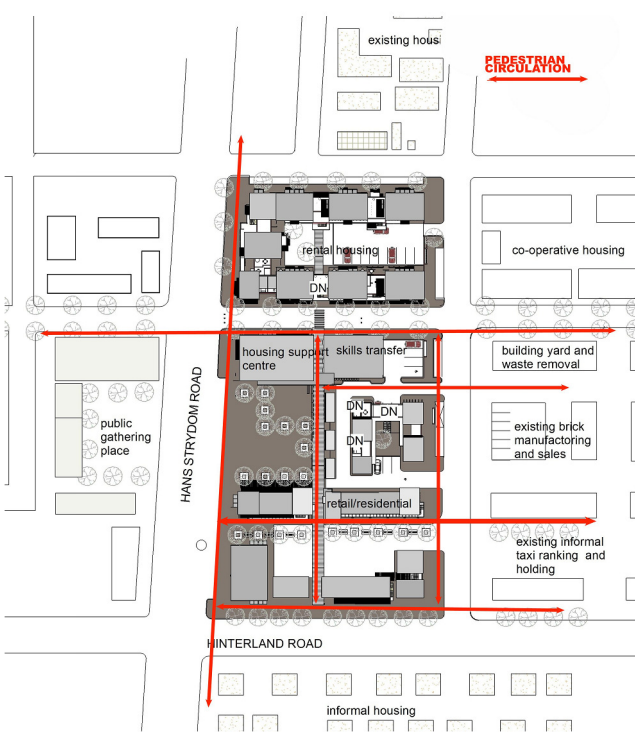


Proposed Site - Indicated with blue

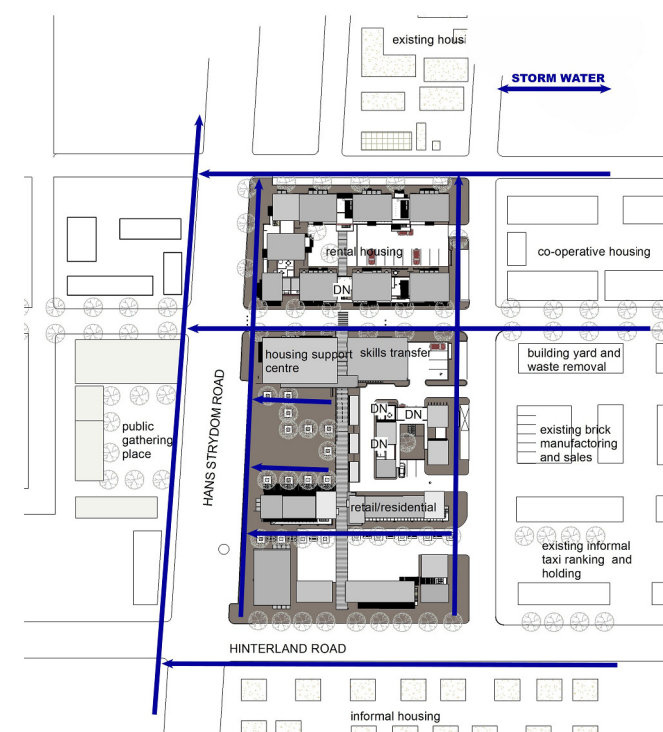
Mamelodi campus



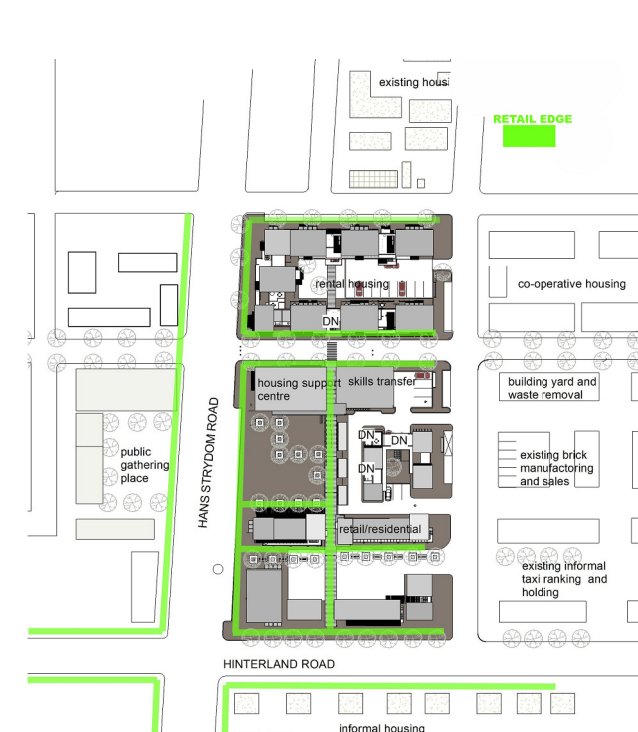
Site Plan 1:1000



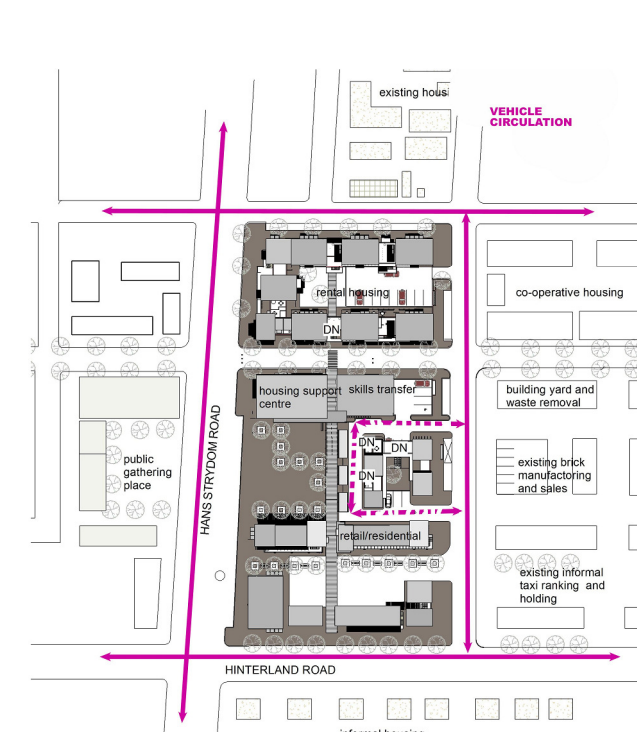
pedestrian circulation



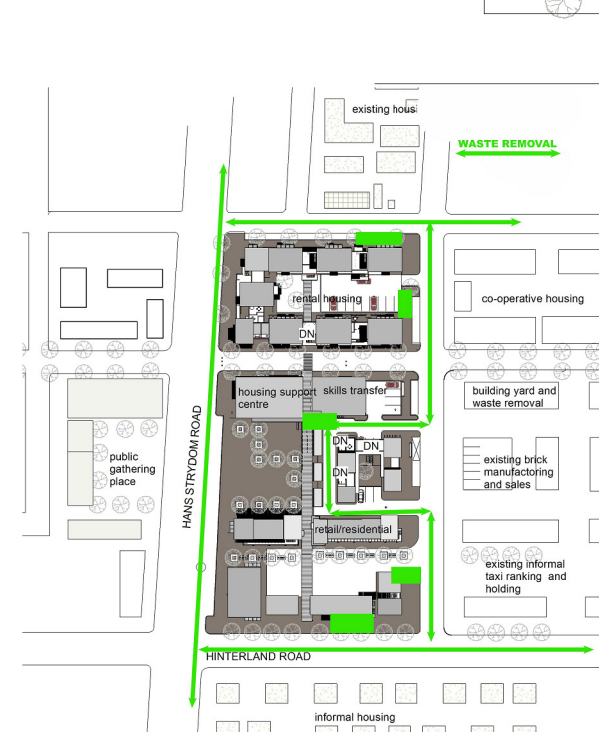
storm water drainage



retail edge



vehicle circulation

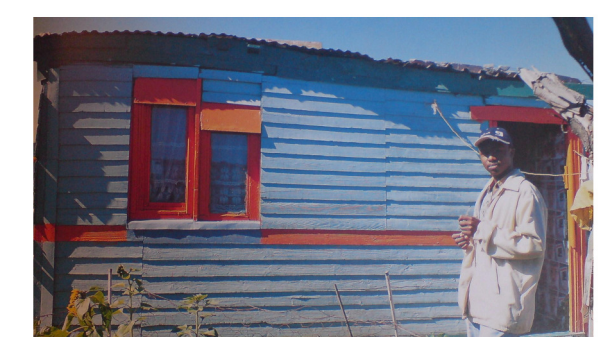


waste collection

UP Mamelod campus



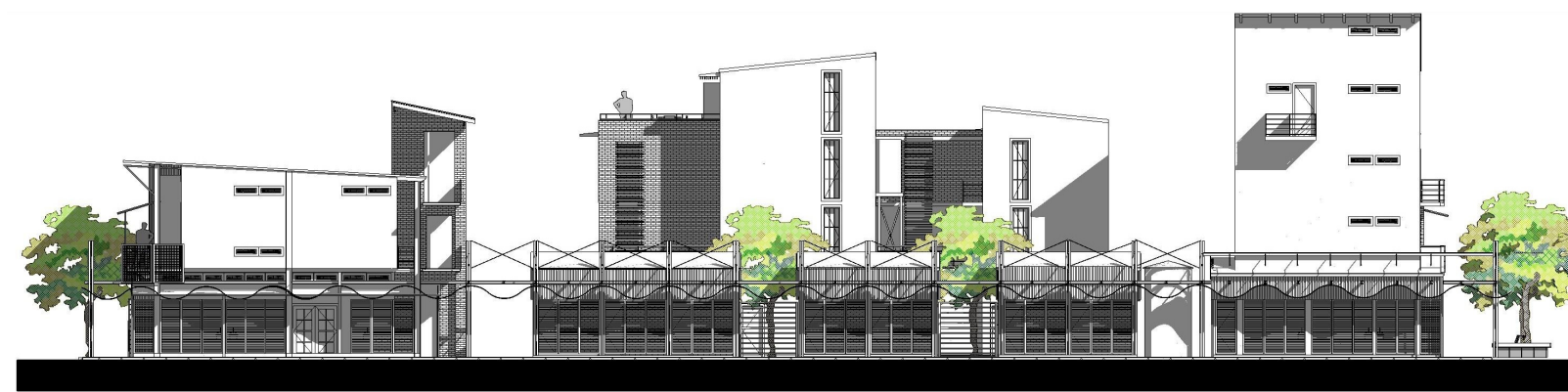
Site context



The Language of Space

HJ Moller 2008-11-27





## UP Mamelodi

Connecting UP with residential community

## Social gathering

Celebrating the social context of the site

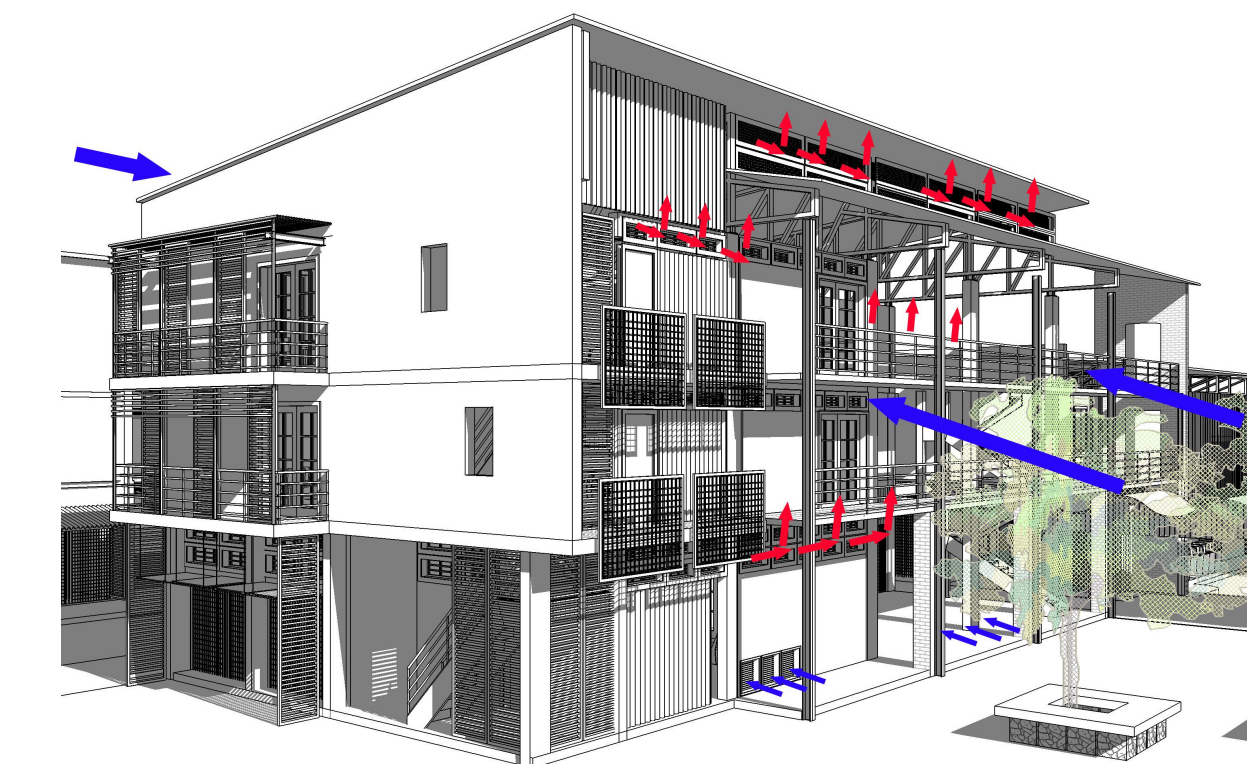
## Trading

Creating retail opportunities along pedestrian route

## Skills transfer

Empowering dwelling community

# HOUSING SUPPORT CENTRE



## Sustainability

Passive and sustainable building principles

## Housing

Facilitate the housing process



## Pedestrian friendly environment

## Retail edge

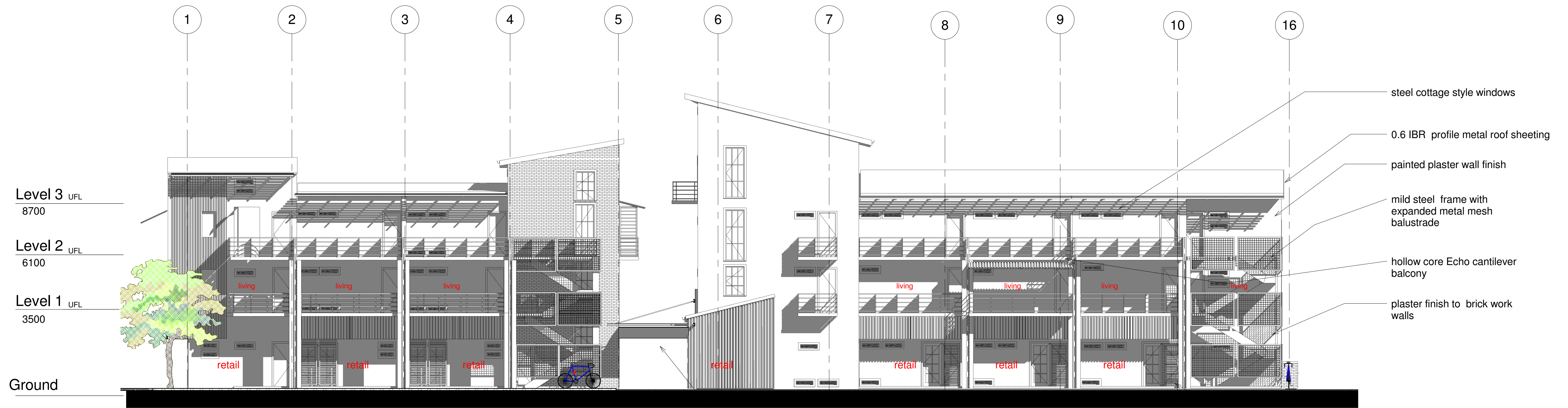
Emphasize self employment

*The Language of Space*

Walkable city

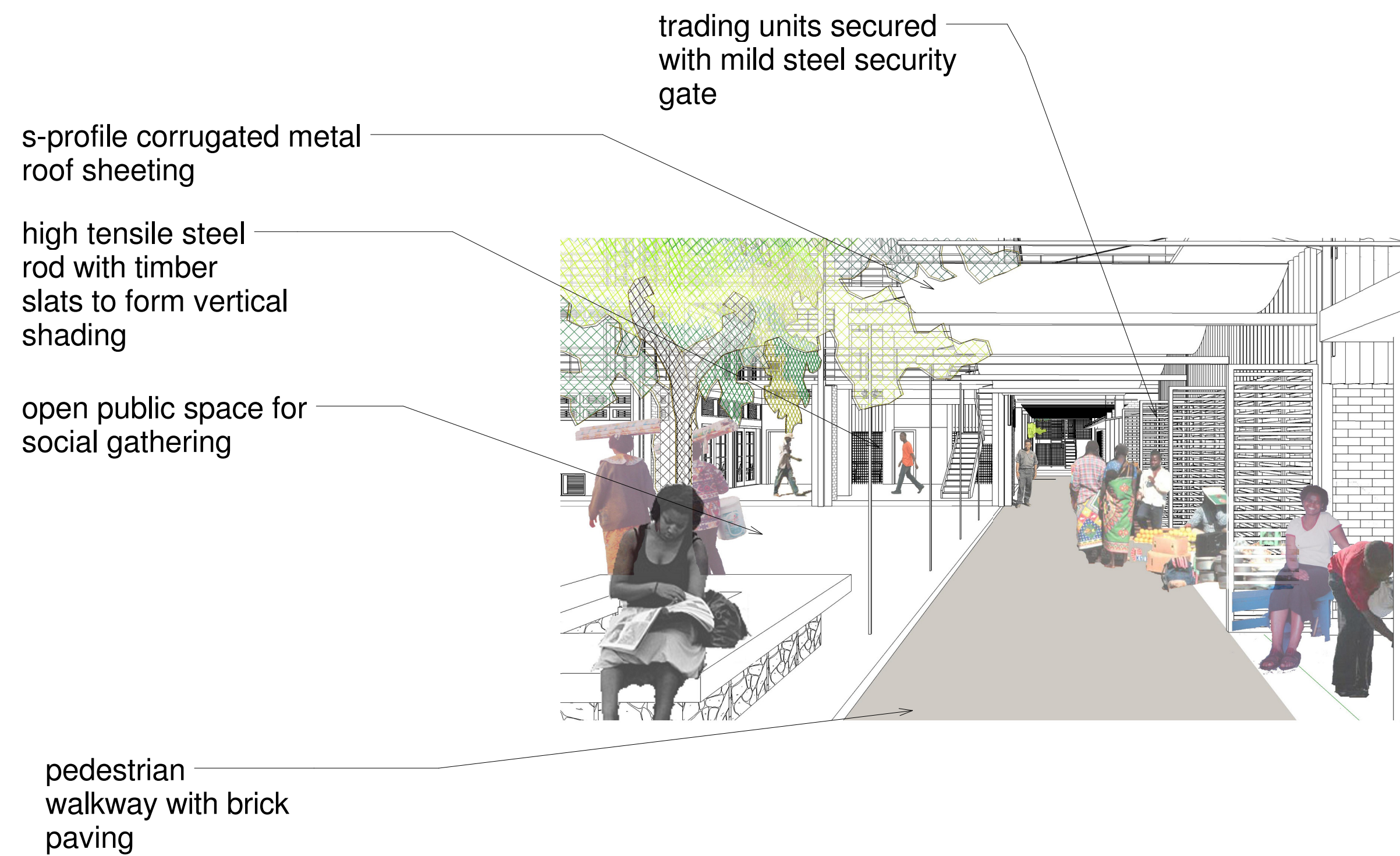
*HJ Moller 2008-11-27*





South Elevation - Commercial and Living Units, 1:100

Covered pedestrian walkway indicating entrance to Housing Support area

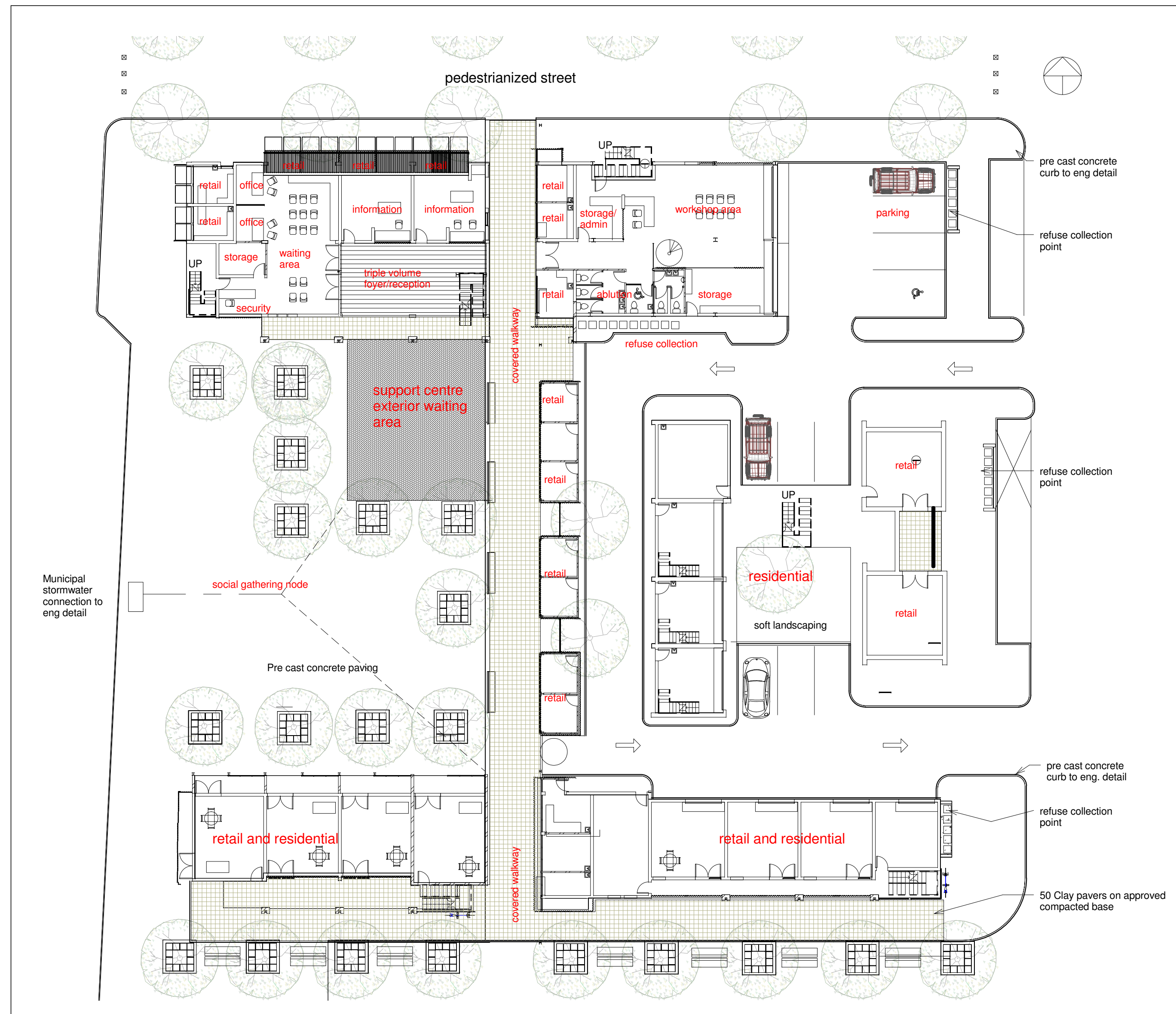


s profile corrugated metal roof sheeting

pedestrian walkway canopy indicating entrance to housing support site and retail units





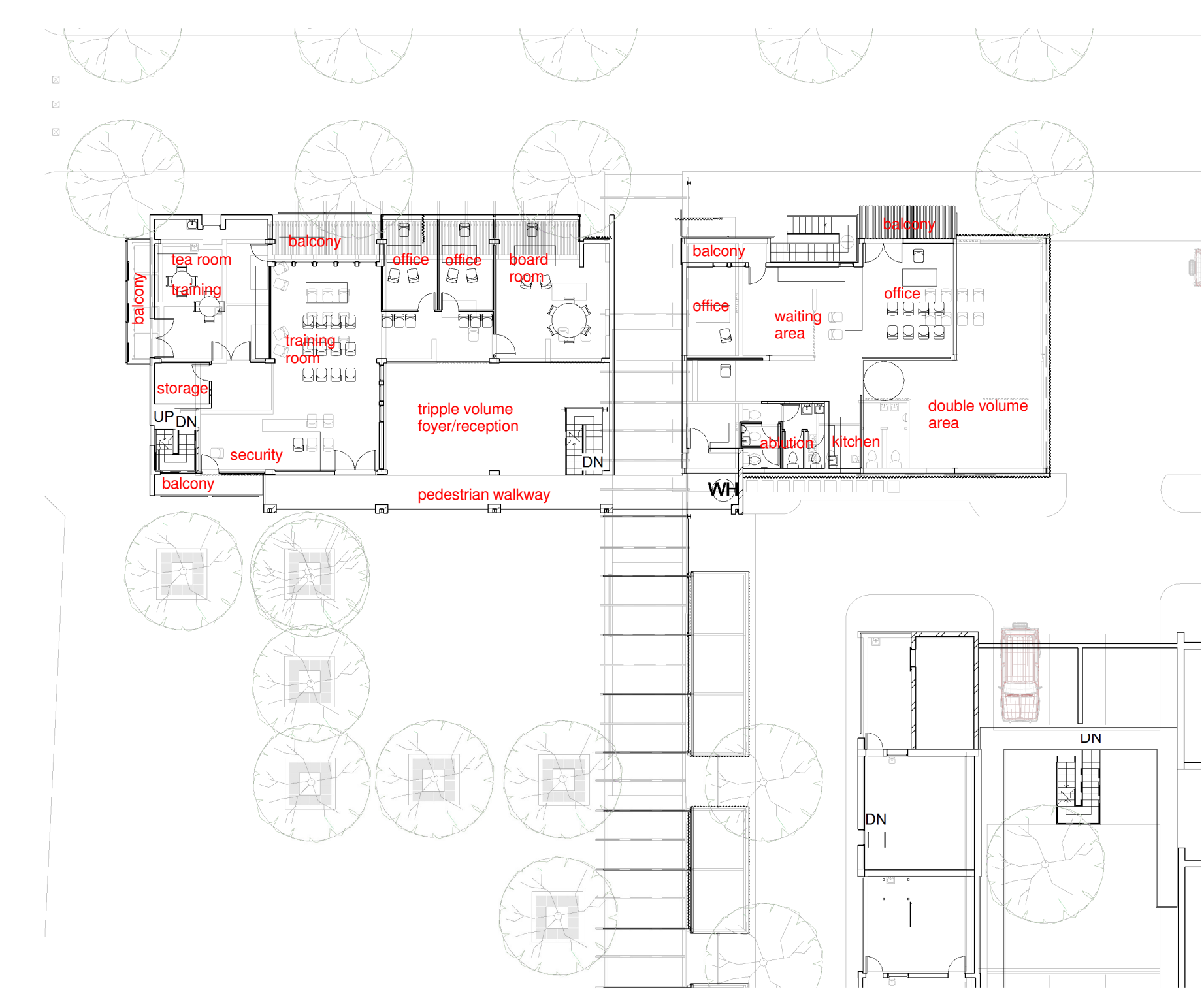


Ground Floor Plan 1:100  
Housing Support Centre

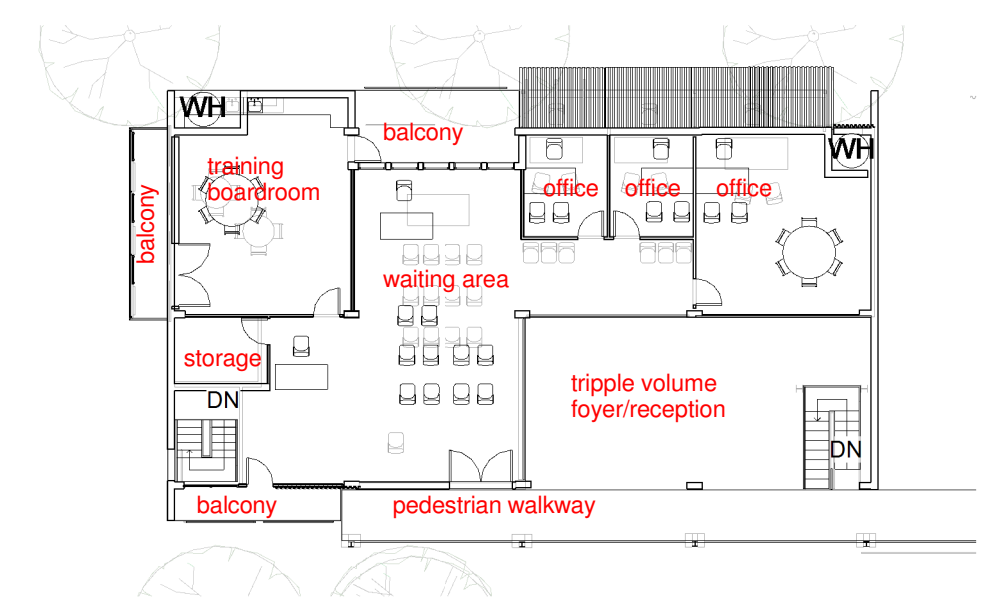


Western Elevation Housing Support Centre

*The Language of Space*



First Floor Plan 1:100  
Housing Support Centre



Second Floor Plan 1:100  
Housing Support

*HJ Moller 2008-11-27*



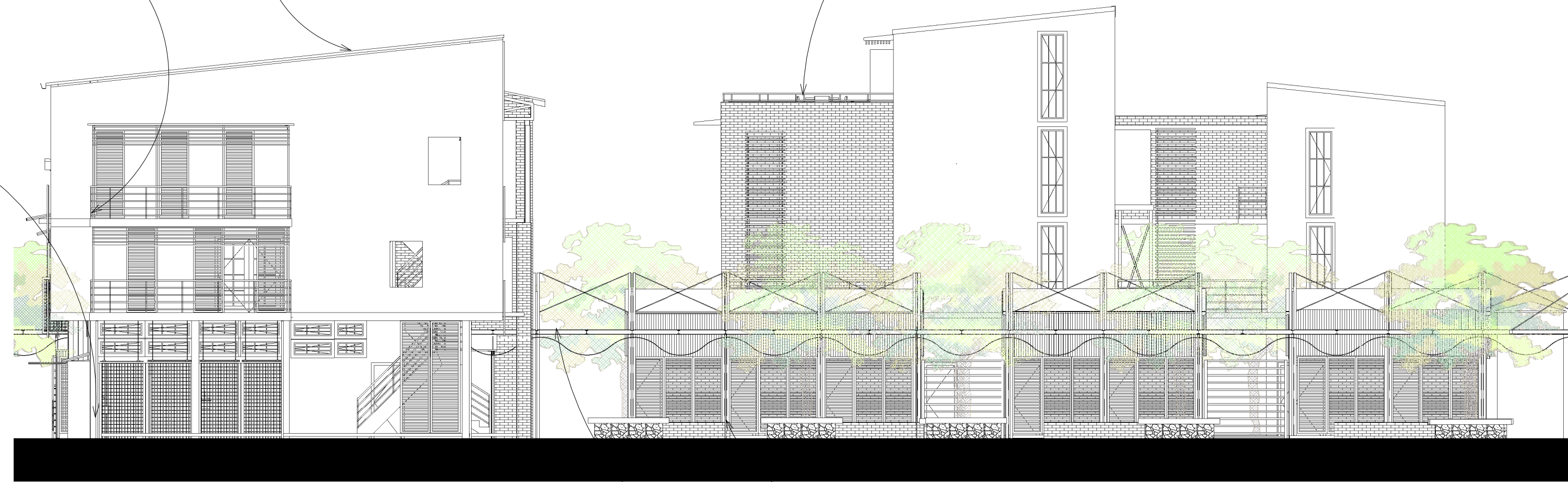
HOUSING SUPPORT CENTRE

street interface/balcony  
with mild steel frame and timber  
slat sun shading

trading edge

housing support  
centre

rental housing



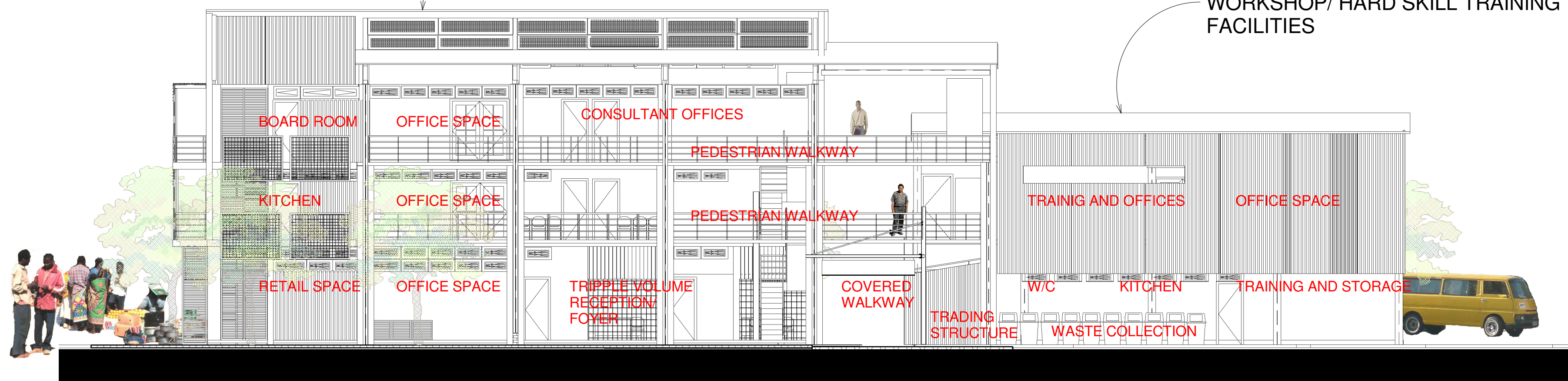
West Elevation Housing Support Centre  
1:100

trading structures

s-profile sheet metal  
covered walkway

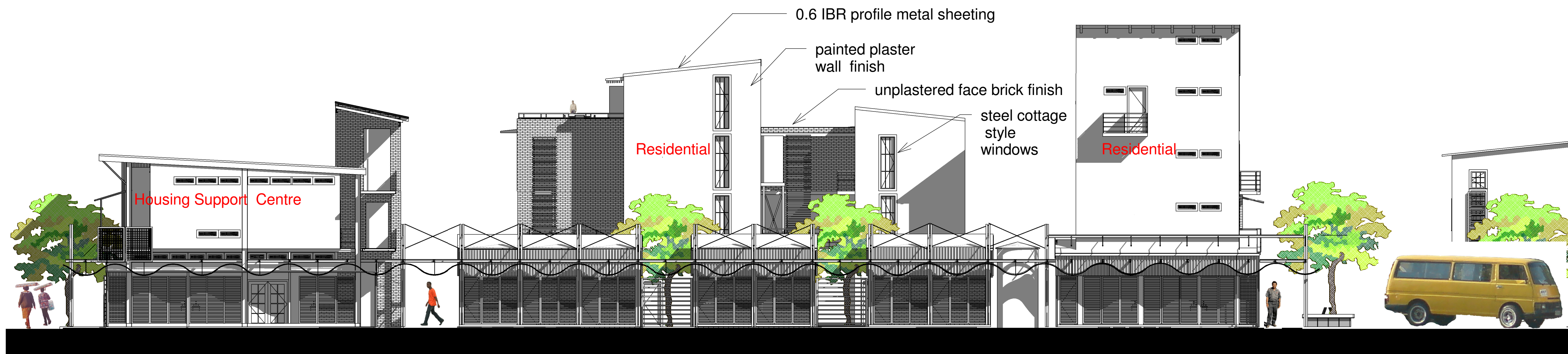
OFFICE AND SOFT SKILL  
TRAINING

WORKSHOP/ HARD SKILL TRAINING  
FACILITIES



South Elevation Housing Support Centre  
1:100

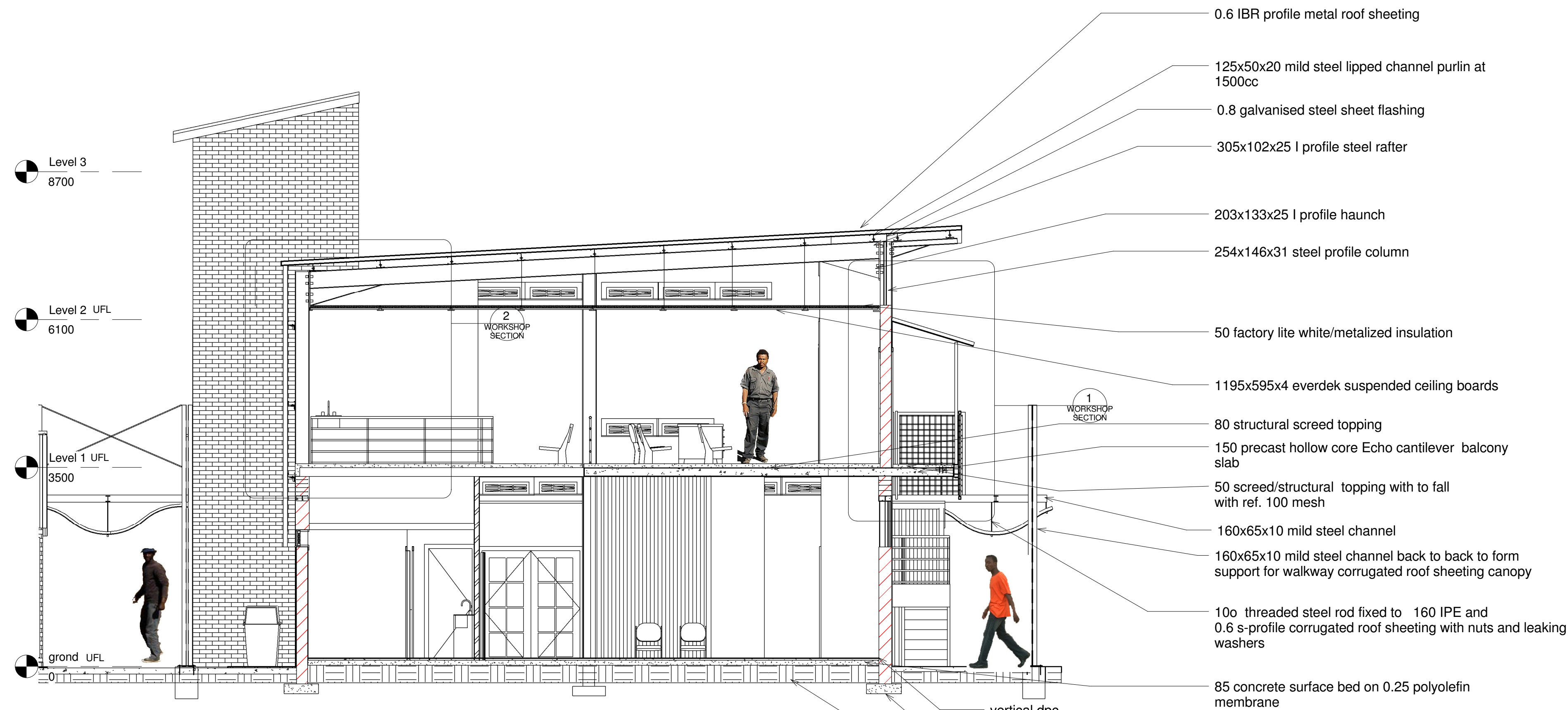




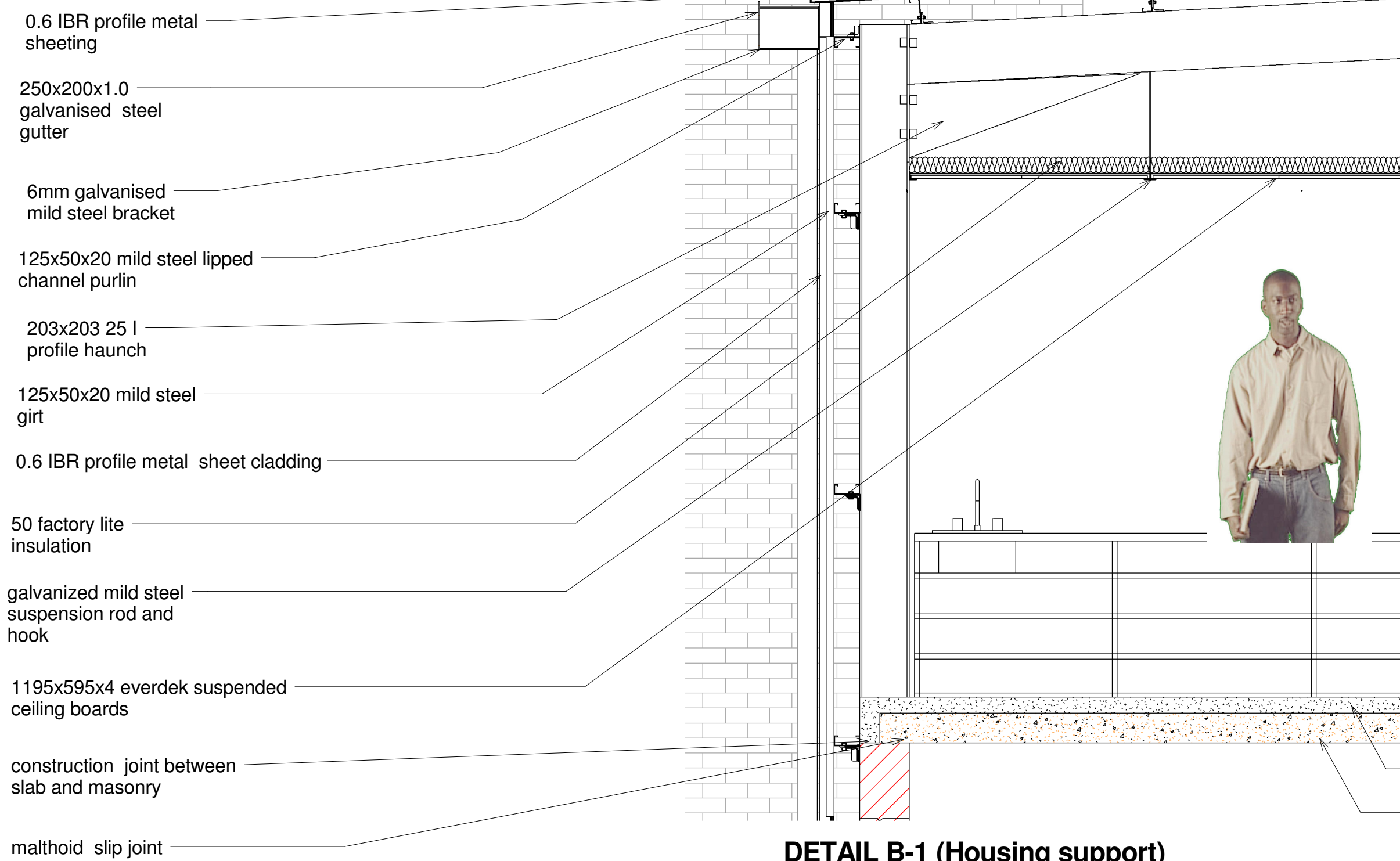
Western elevation (pedestrian walkway)  
1:200



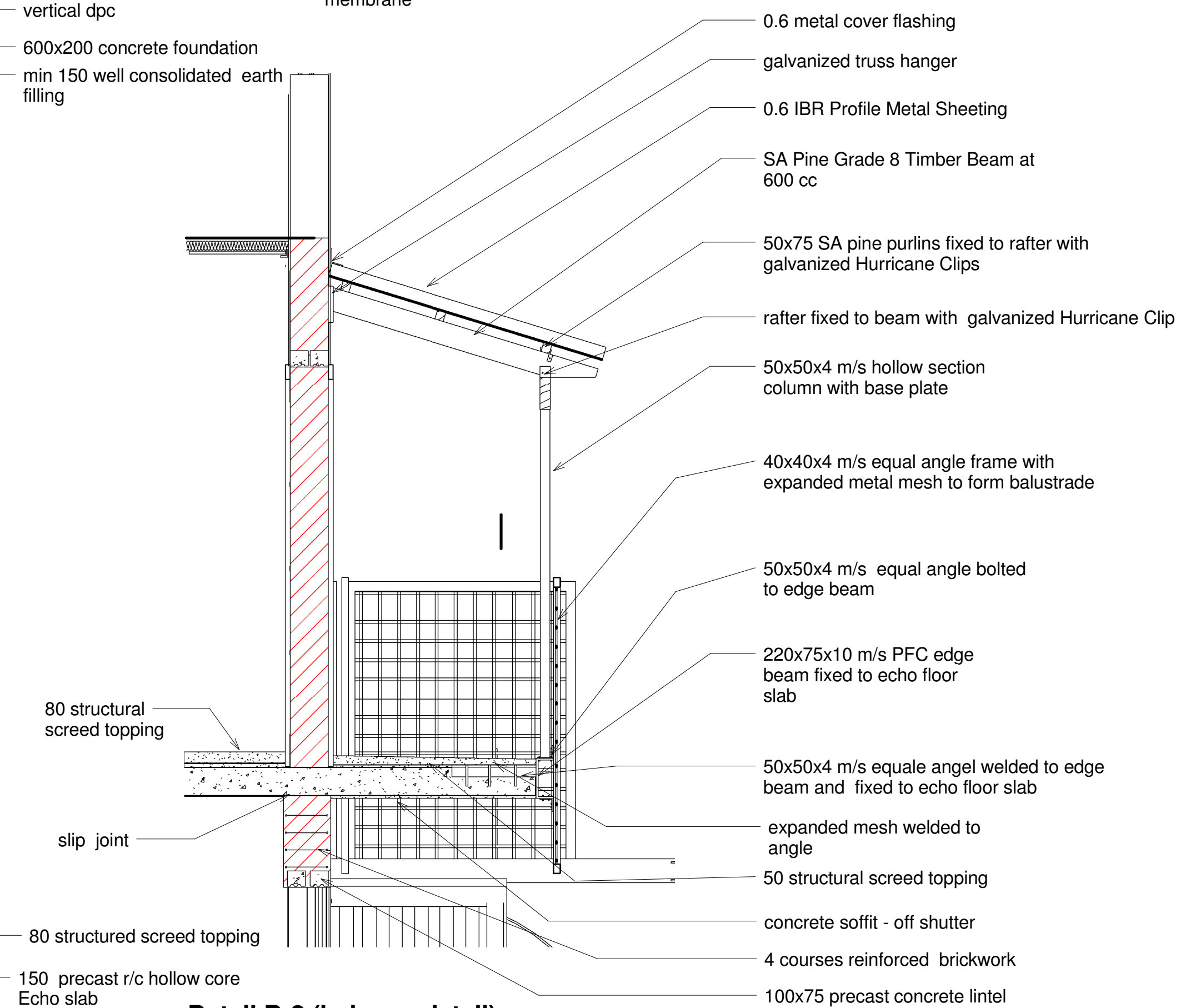




**SECTION B-B (Housing support centre)**  
**1:50**



**DETAIL B-1 (Housing support)**  
**1:20**

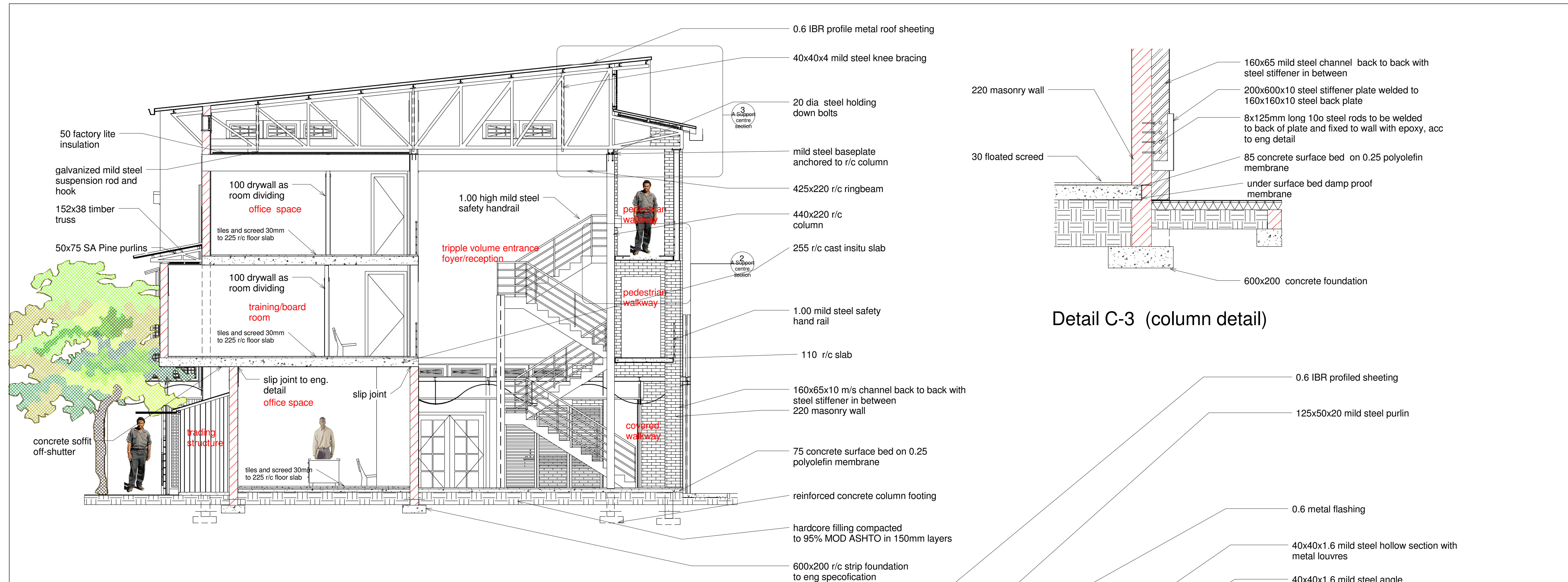


**Detail B-2 (balcony detail)**  
**1:20**

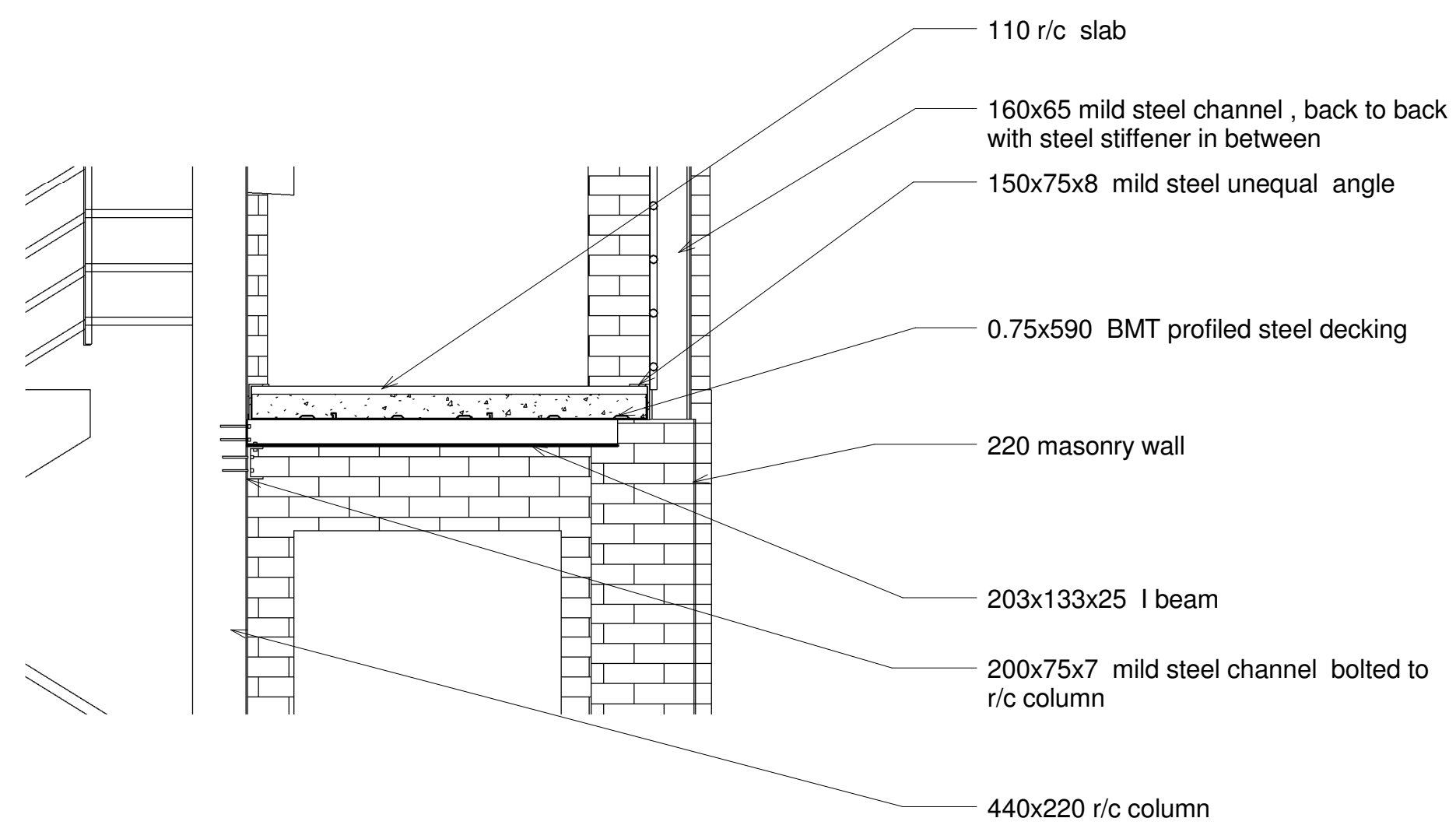
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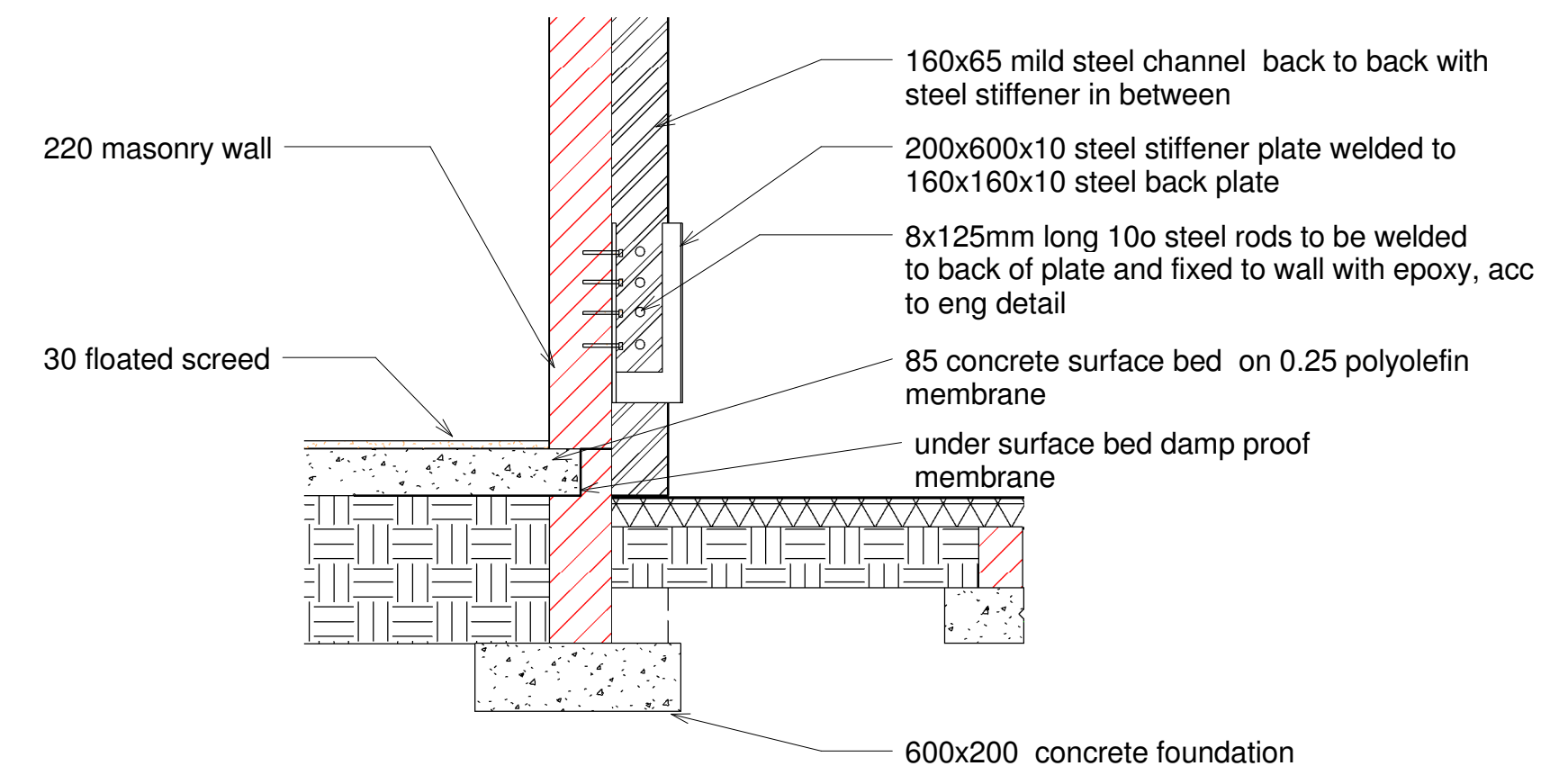




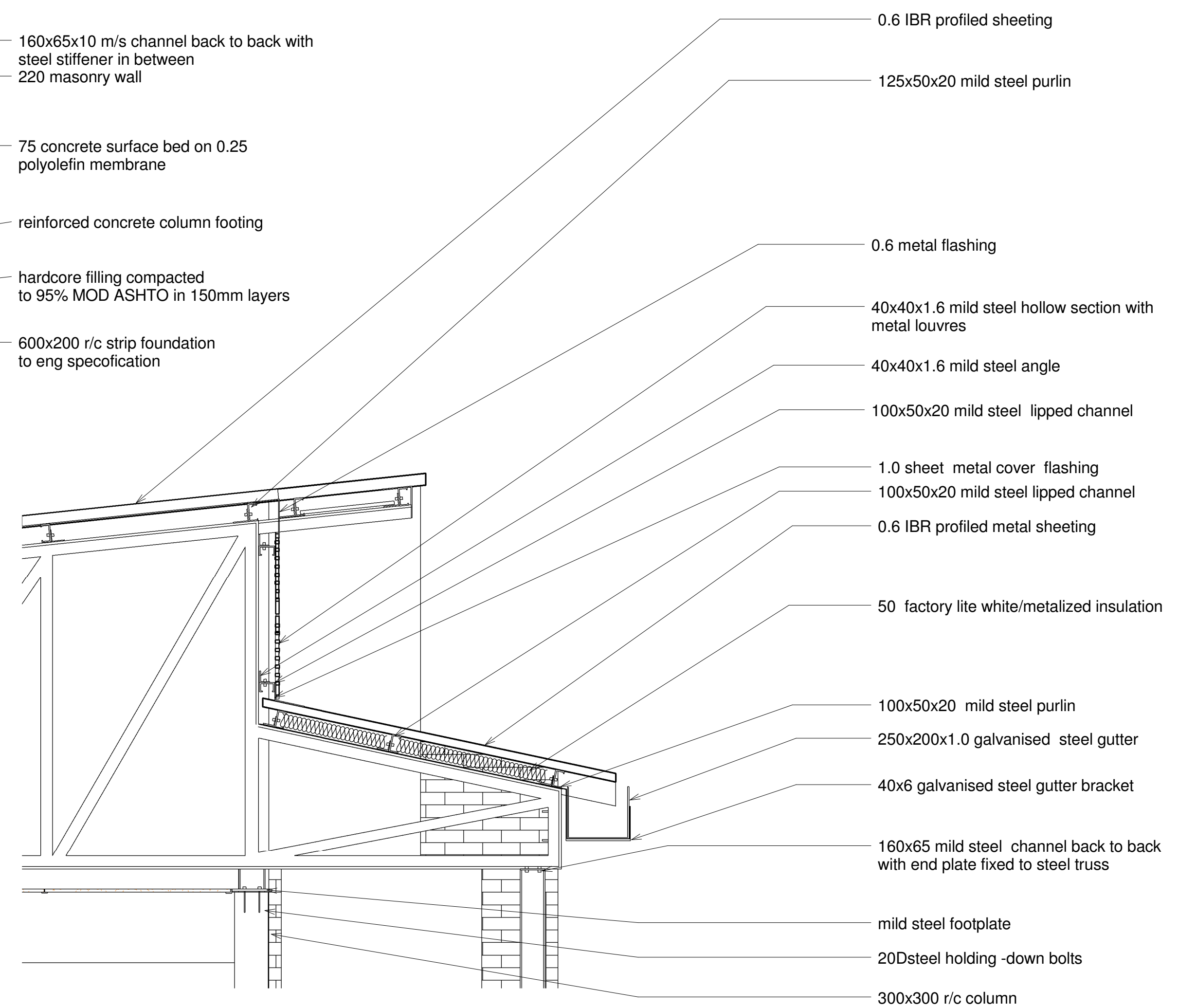
SECTION C-C (Housing support centre)



Detail C-1 (composite deck - walkway)



Detail C-3 (column detail)



Detail C-2 (roof detail)





## Medium Density

SHIFT - suggested density of 129 dwelling units per hectare (du's/ha)



## Flexible Design Options

Floor plan options allow residents to age in their units

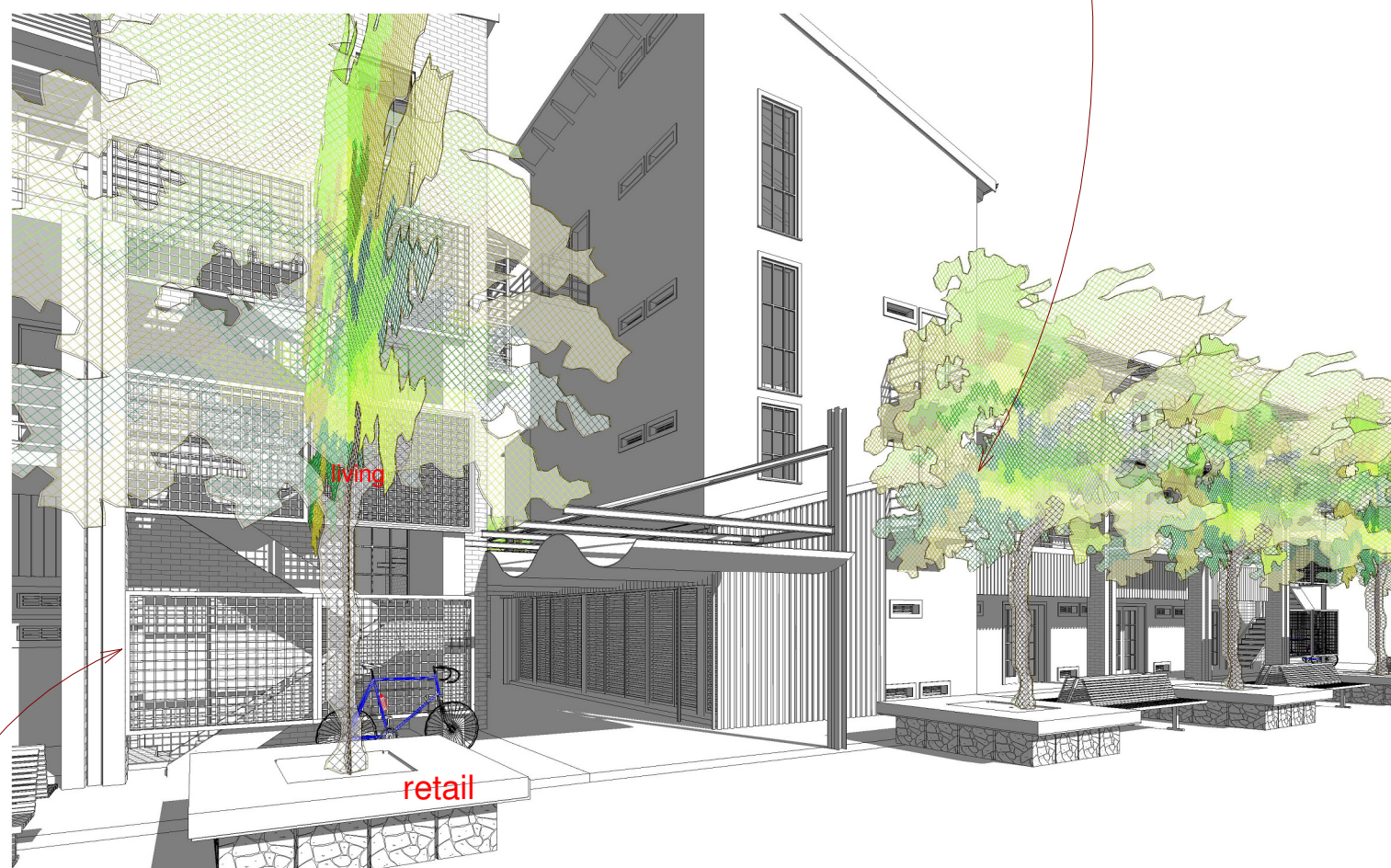


## Energy Sufficient

Design to optimise natural climatic conditions

## Mixed Use

Residential units allow for mix of living and working



# RESIDENTIAL DESIGN PRINCIPLES



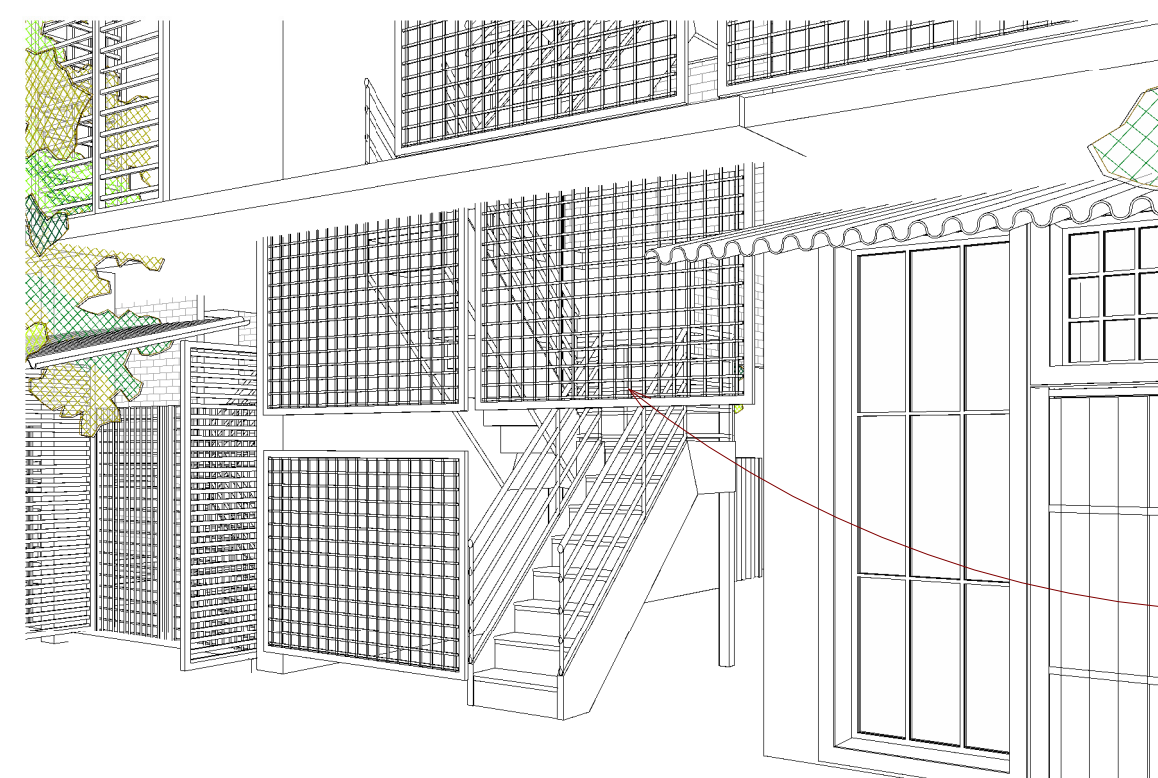
## Private Exterior Spaces

Cantilevered balconies create a spatially differentiated exterior space

## Pedestrian Friendly Environment with Exterior Circulation

## Retail Edge

Most residents are self employed and rely in trading



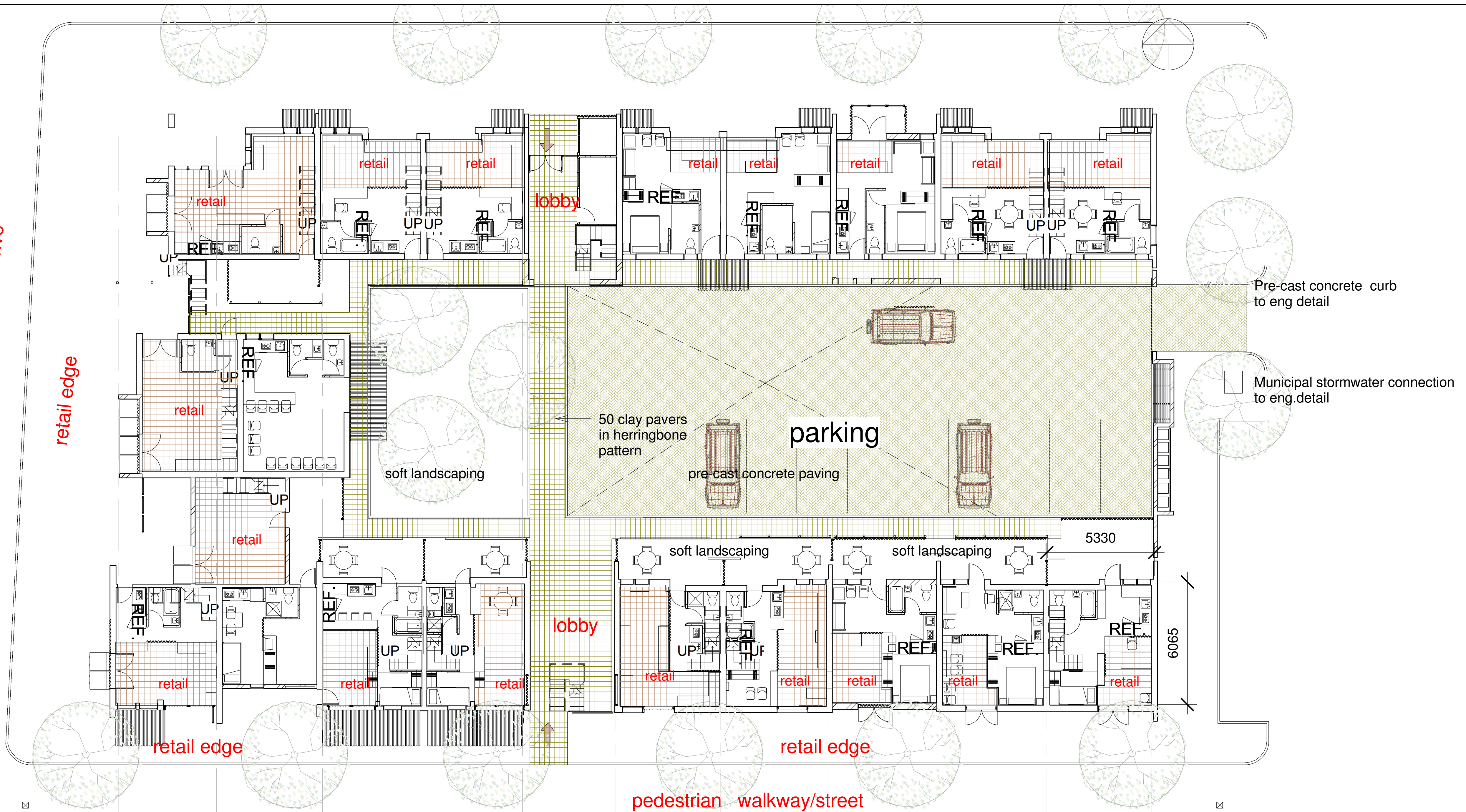
## Security

Access control allow secured courtyard semi private spaces





Hans Strijdom Drive



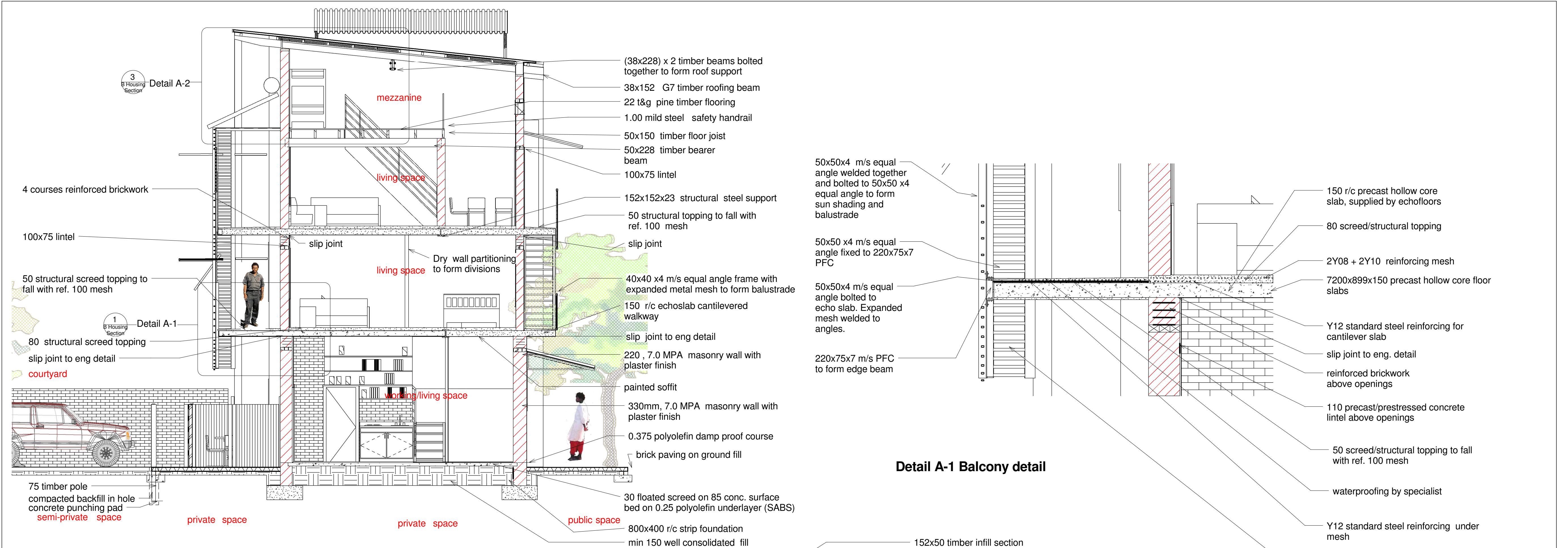
## Ground Floor Plan 1:200

Social rental apartments

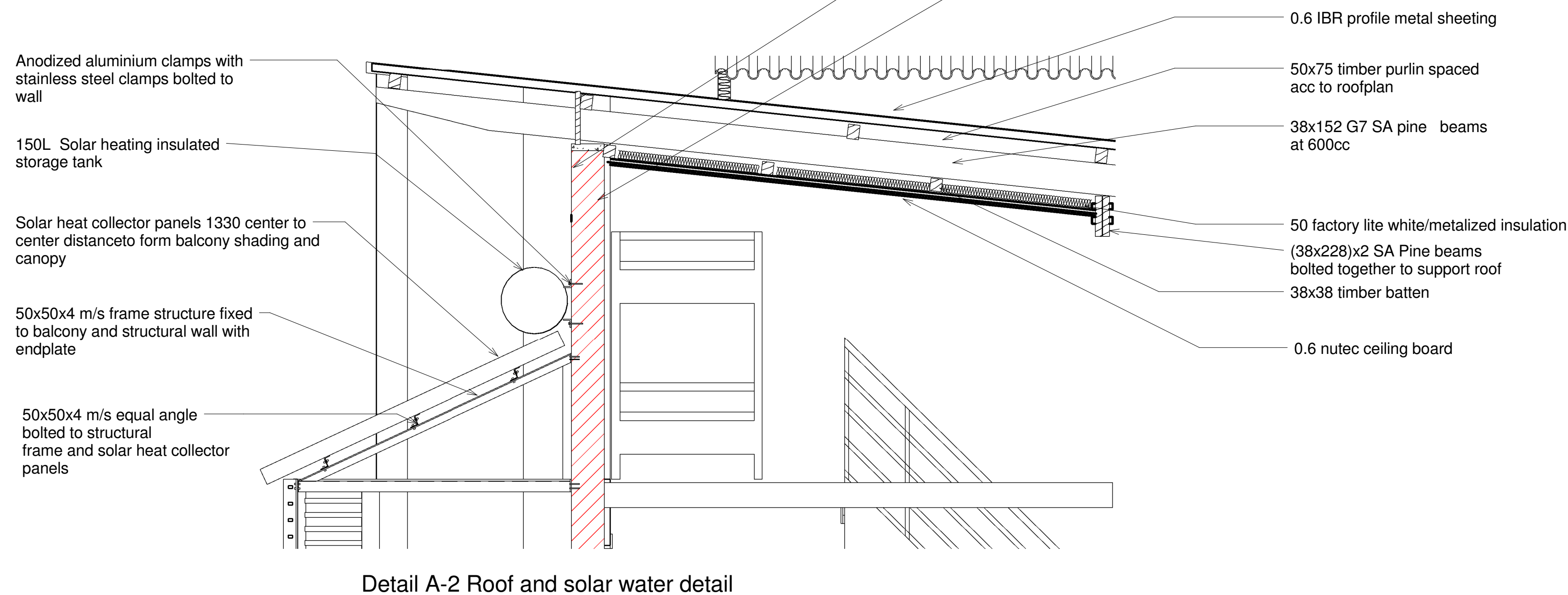
Floor plan variations with retail space







**SECTION A-A (Social Rental Housing)**  
**1:50**

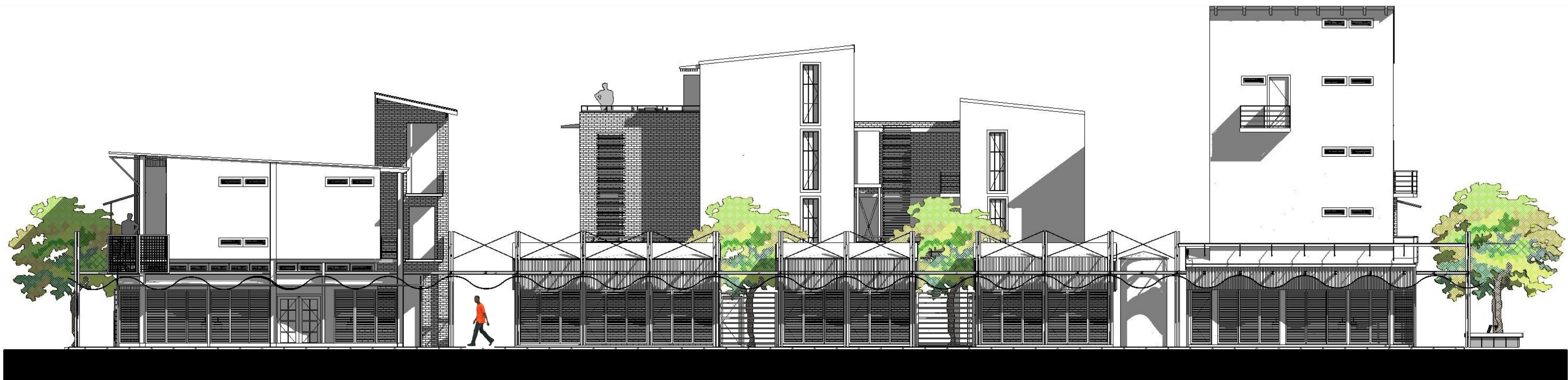


Detail A-2 Roof and solar water detail

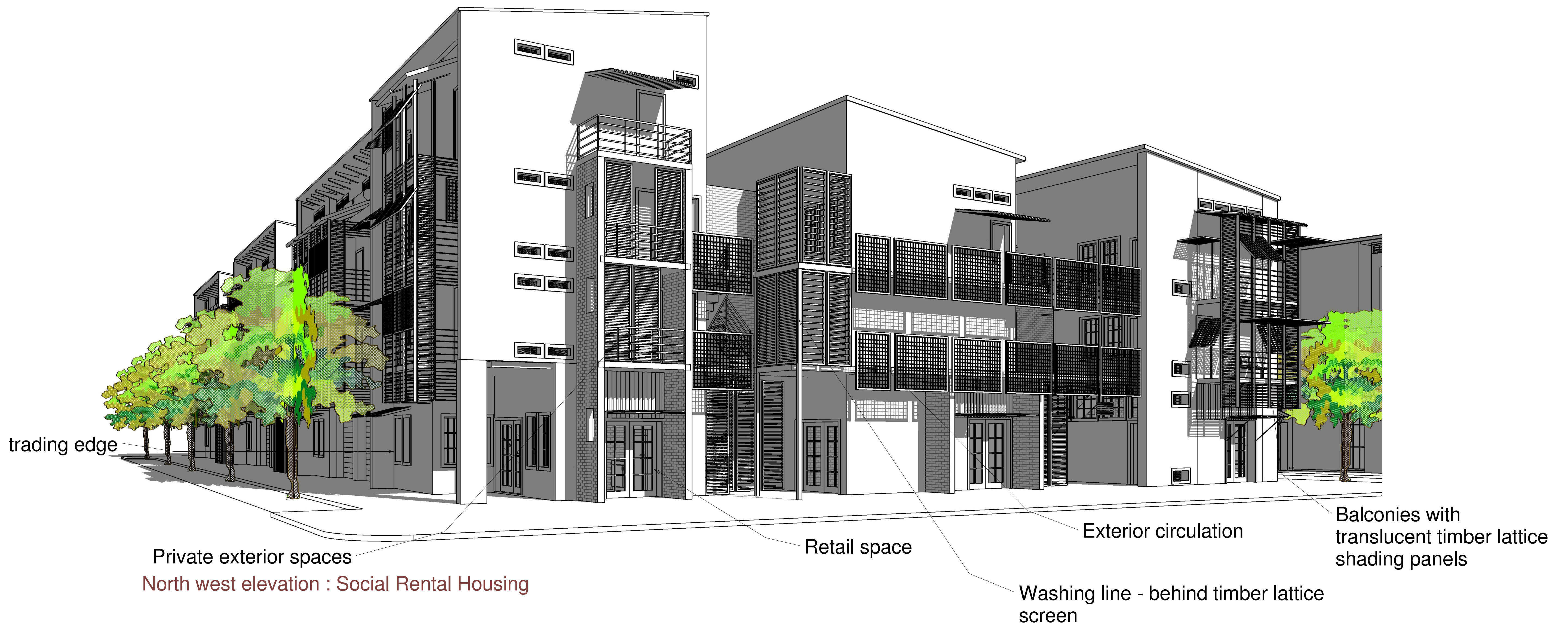
**ECHOSLAB**

- Precast hollow core slabs are self supporting up to 7.2 meter span.
- Hollow core slabs are placed on load bearing walls on top of dampcourse.
- Slabs over 5.0m require a structural topping
- Props are placed 1 meter apart.
- Steel is required in a structural topping on all cantilever panels.
- Twice the length of the cantilever must sit on the building.
- Slabs can be used as roof slabs, balconies, external walkways of flat roofs with a reference 100 mesh in the screed/topping over the slab slab.
- Textured paint or tyoleen finish is used on the soffit of the slabs.
- Use 25MPA premix concrete for structural screed/topping.
- Props to be in placed for 14 days after casting of concrete.



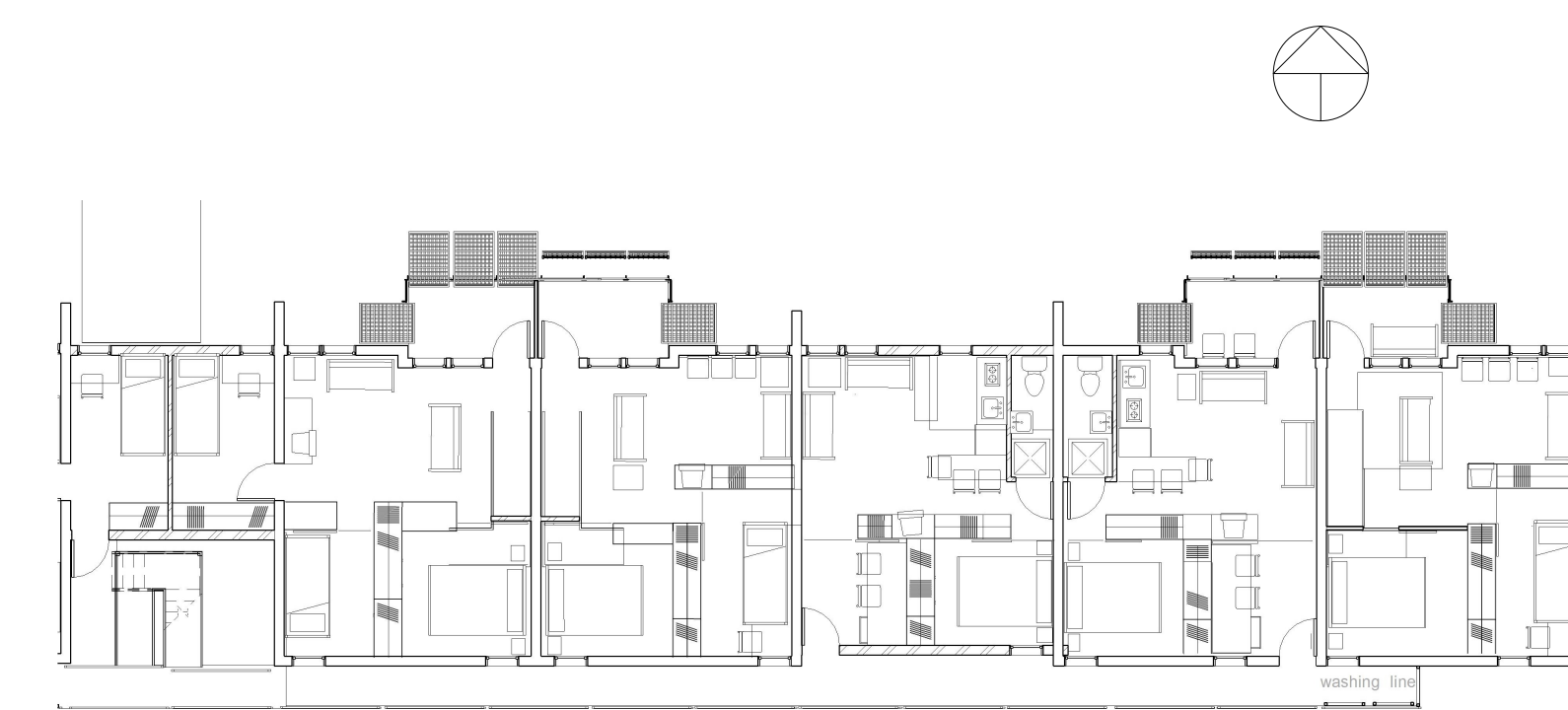
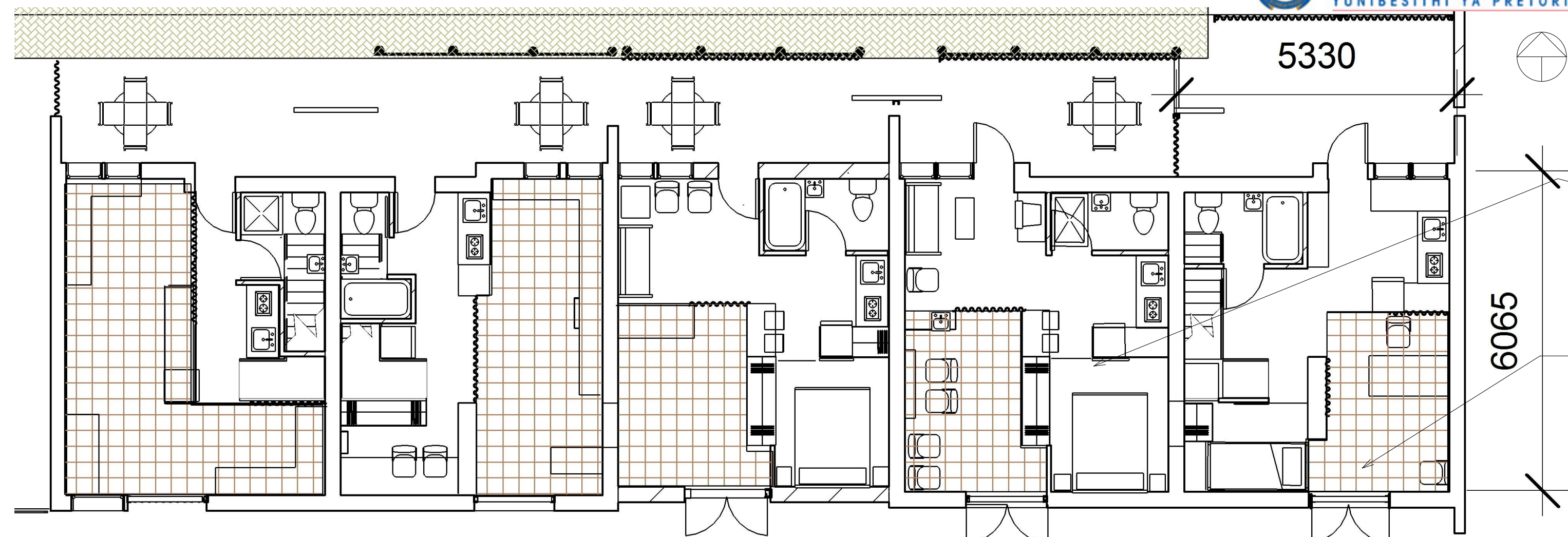


West elevation : Housing Support Centre - trading units and covered walkway



North west elevation : Social Rental Housing





Typical Bachelor unit - 32m<sup>2</sup>

Typical 2 bedroom unit - 64m<sup>2</sup>

Typical first floor unit layout

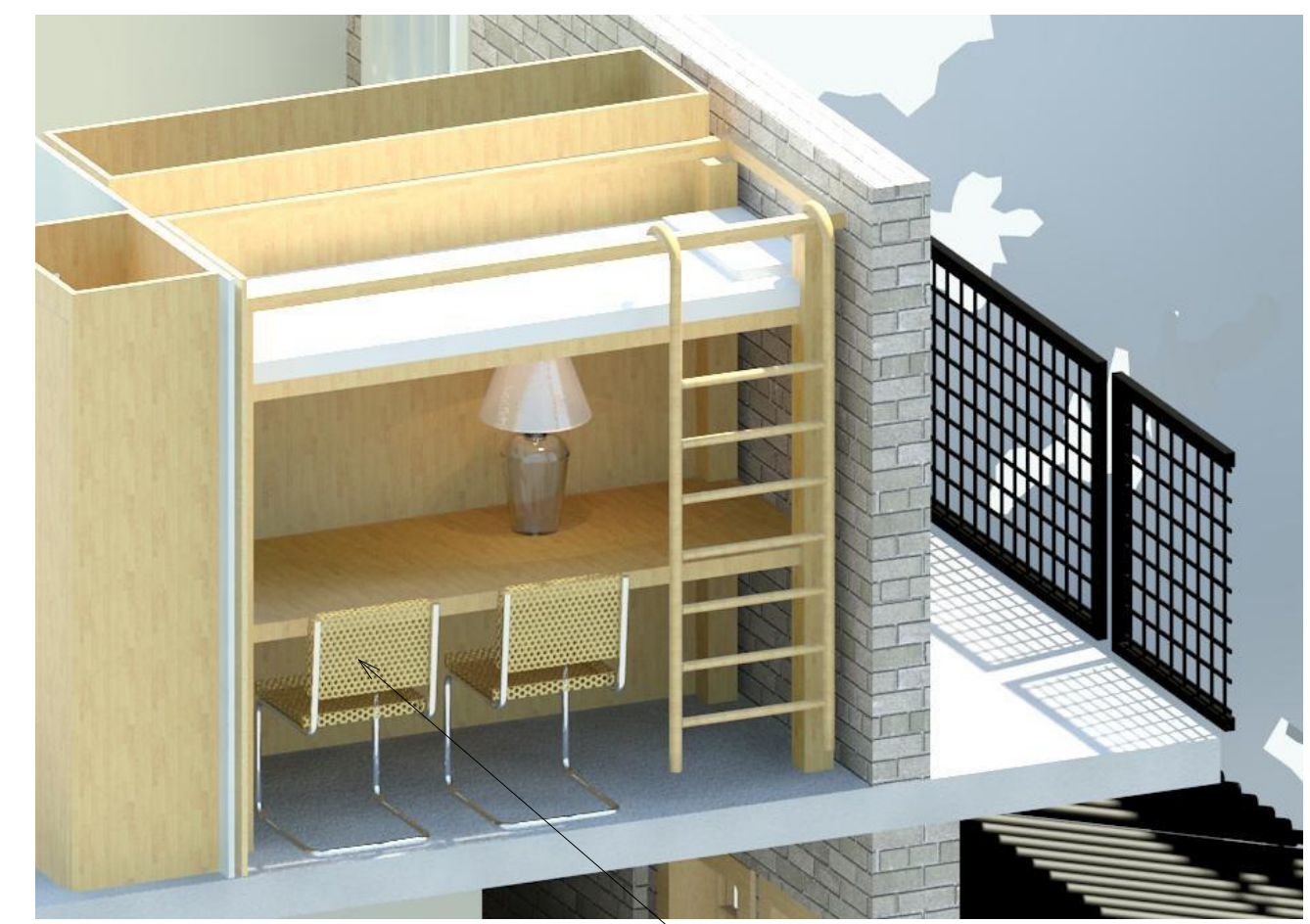
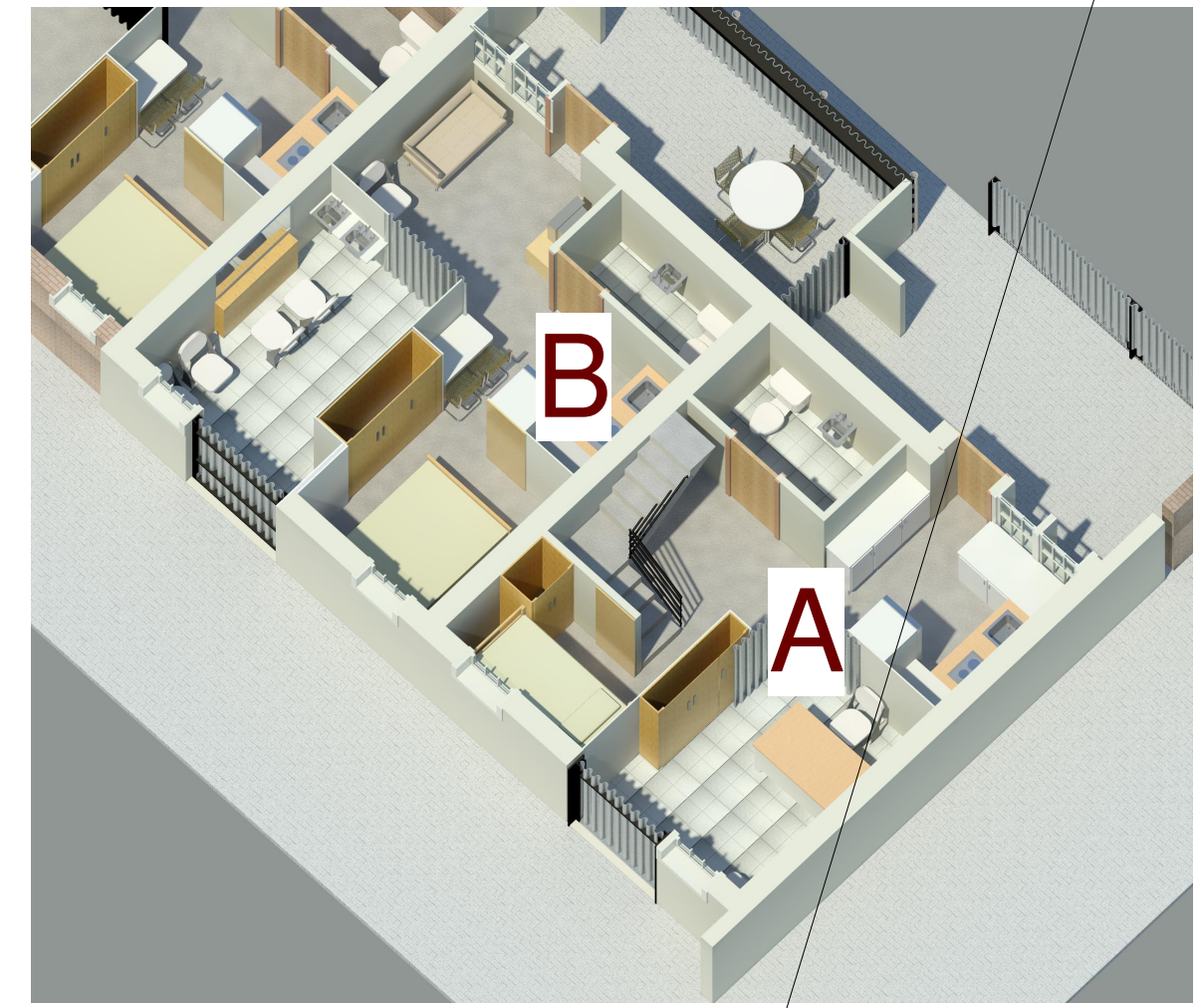
Incorporation of two adjoining units - A and B.  
B incorporated into A by removing dry wall panel between the two units. Dry wall designed as infill in support structure.

retail

Typical ground floor unit layout



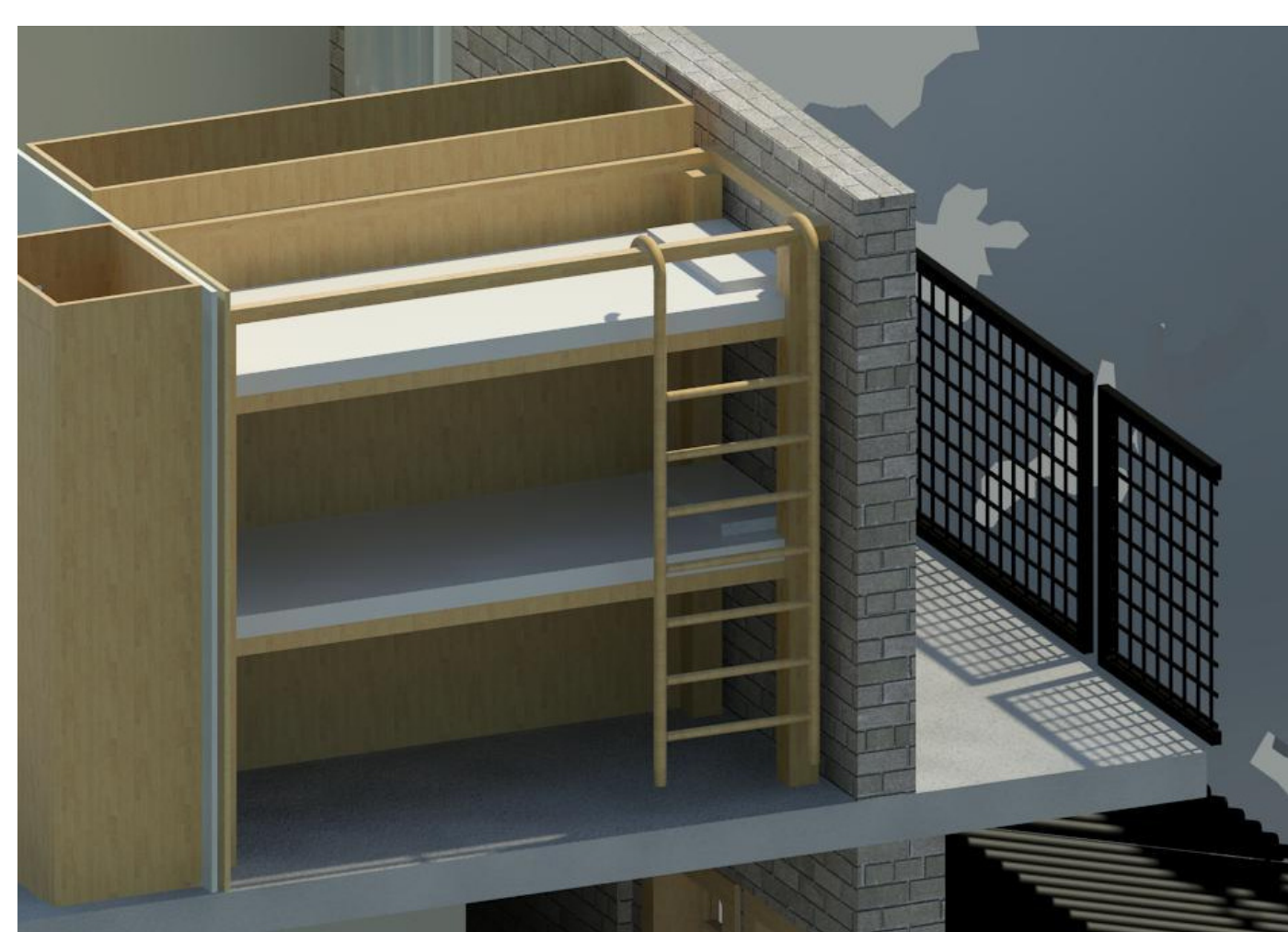
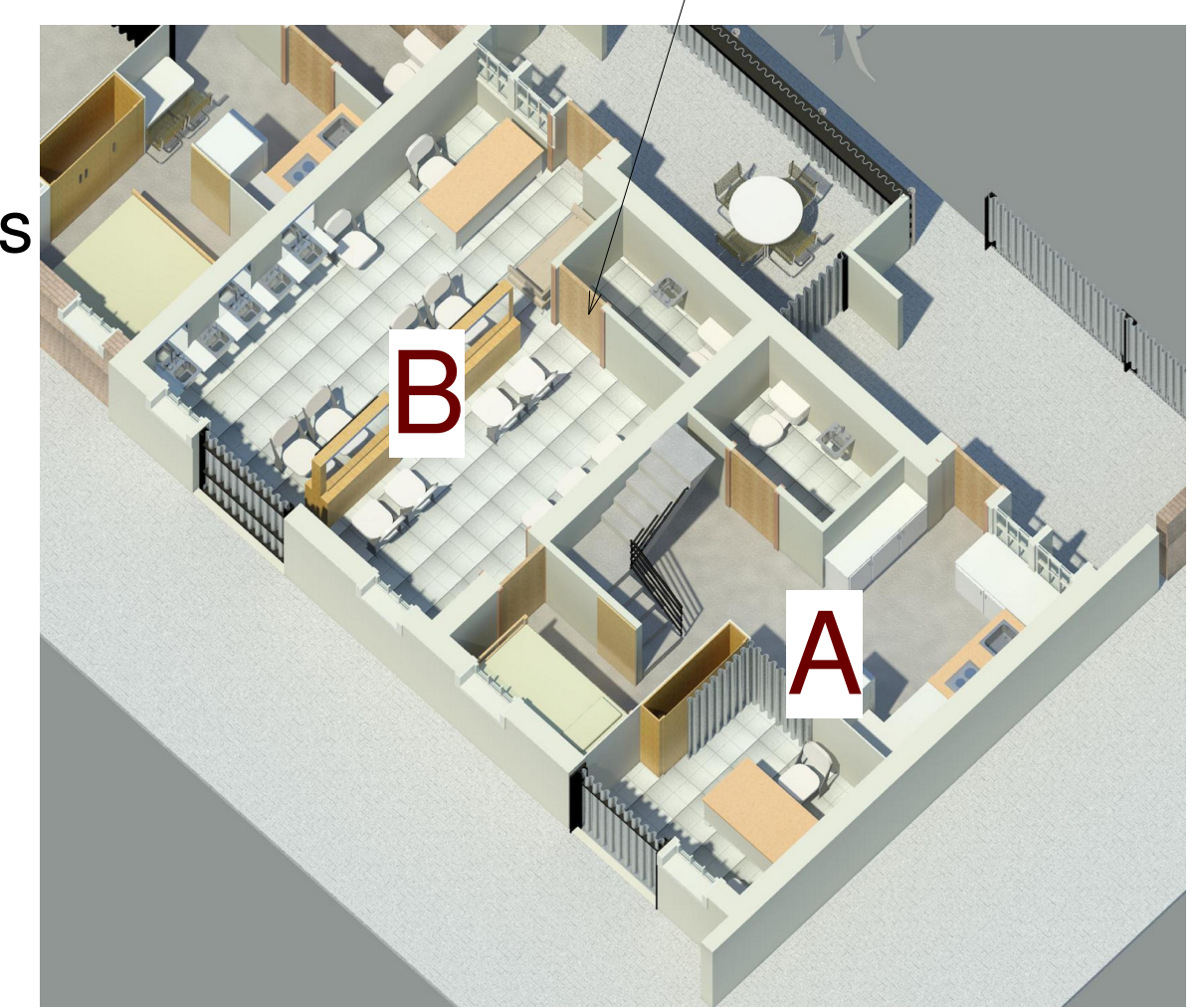
Night option with sliding panels enabling versatile spaces



study corner with bunk bed option



Day option with closed sliding panels to create private retail space



Adaptable Housing  
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WESTERN ELEVATION Social Rental Housing  
1:100



North western elevation  
Social Rental Units with street  
interface on retail edge