GROUNDING DENSITY

Mobilising the economic and spatial potential of affordable housing along the Delft South Main Road

Kayla Brown 2016

Grounding Density: Mobilising the economic and spatial potential of low-income housing along the Delft South main road

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CONTENTS

Chapter 4: *Construction Opportunities*

Chapter 5: *Design Response*

INTRODUCTION

"Home as Economic Generator" is the theme of the research inquiry carried out by our Masters Research Studio, *Space of Good Hope*. The studio is grounded in the area of Delft South, which is a place affected by a history of violence and trauma, but is, at the same time, home to an active and vibrant community that has recognised the economic potential that the area offers. Thus, "Home as Economic Generator" does not only refer to the ability of the residential unit to generate income, but also, to Delft South as a community being able to take advantage of the area's opportunities.

Although Delft South functions as an enclave, far from the city centre or any areas of formal job opportunities, its planners provided it with one strong spatial element that would be able to generate economic opportunity over time: the main road. Houses along the main road are presented with great economic potential and almost every house along the main road is fronted by a business. Furthermore, Delft South has huge rental opportunity and the vast majority of homes have backyard structures that are rented out. The combination of very cheap property to buy with relatively high rent, makes it an ideal place for small local developers to invest in property in order to make an income from rental.

Figure 1: The main road functions as an active corridor with many micro-enterprises lining the edge, often operating out of the front yards of homes.

However, while the main road functions as the area's active retail corridor, it is still greatly underutilised as it has a very low-rise built form and weak, undefined edges. The low-rise sprawl of Delft South is a result of the single, freestanding RDP housing model that was used at the time of development. Because of the RDP unit's inability to support a second storey, the density of units reaches a ceiling when the open space on the ground floor is used up. Most plots in Delft South are currently at this ceiling, which coincides with overcrowded, cramped conditions and a lack of meaningful private open space.

Figure 2: The low-rise "ceiling" to Delft South's density

Thus, strategically densifying certain areas of economic opportunity through a variety of dense medium-rise infill housing developments seems to be a potential solution for Delft South to harness its spatial and economic potential. This dissertation maintains that there is not one single housing solution to any area, but rather that a solution can be found through a variety and diversity of housing typologies. This needs to be achieved in a way that capacitates individuals and communities on a spatial, social and economic level by giving people agency and choice in how they live. Therefore, in order to create housing that capacitates communities, we should pursue a variety of medium density housing types that allows inhabitants to have a strong connection to the ground plane where economic and civic activity can take place. Ultimately, housing must be *grounded* both socially, in the community, and physically, on the street.

This dissertation comprises five chapters. The first chapter explores issues of housing and density. Case studies are used to examine the relationship between agency and housing as well as the trade-offs of efficiency of circulation systems in dense housing. The second chapter locates the research within the context of Delft South and, more specifically, along the main road. The idea of 'Home as Economic Generator" is explored through studying housing and retail patterns. The third chapter moves towards a design outcome by choosing and analysing Sibanye Square as a site within Delft. Chapter four explores a variety of technical considerations that could develop into an architectural language by studying how people are currently building in Delft. Finally, chapter five proposes an architectural outcome that explores three typologically different housing developments located on and around Sibanye Square.

CHAPTER ONE | housing and density

1.1. Context

LSE's *The Endless City* (2007) was compiled in the context of the rapid urbanisation that has been taking place worldwide and specifically in the cities of the Global South. The fundamental statistic, that by 2050, 75% of the world's population will be living in cities, has changed the way we need to think about our urban areas.[1] Pietserse (2014) discusses this same issue within an African context in *Africa's Urban Revolution* and argues that with the number of African city-dwellers only second to Asia, Africa's urban revolution is already taking place and that the impact is severe for all areas of urban life; food, transport, energy, water and housing.[2] This has resulted in an urban crisis that manifests as the vast shanty towns that exist on the periphery of almost every African city.[3]

Since 1994, the South African government has been providing households earning under R3500 a month, a fully subsidised RDP house in order to deal with this rapid urbanisation and housing shortage. This low-rise, low-density model has often been compared to the apartheid NE51/9 housing

[1] Burdett and Sudjic, 2007:8
[2] Pieterse and Parnell, 2014:1
[3] Pieterse and Simone, 2013:20

and included a small house placed in the middle of the plot.[4] While people did manage to densify by building backyard shacks and business spaces around the house, the placement of the unit in the middle of the plot did not encourage this. Backyard informality was mostly viewed in a negative light by authorities because of the pressures placed on services and infrastructure.[5] However, this perception started to change around the time *Breaking New Ground* policy was released in 2004, as part of the government's integrated sustainable settlement plan, which acknowledges that backyard shacks could provide viable solutions to many urban problems.[6]

Figure 3: Low-rise informality of Delft, Cape Town

[4] Harber, 1998: 40
[5] Poulsen and Silverman, 2012
[6] DoH, 2004

Thus, the *Breaking New Ground* [BNG] policy tried to create housing that *allowed* for densification around the subsidised unit[7]. This was achieved in a variety of ways but mainly through the placement of the unit on the plot as well as decreasing the unit's footprint through the use of a second storey. While this shift in approach to informal densification is regarded as a step in the right direction, a *limit* to the degree of densification still exists, which will be explored in greater depth in Chapter Two.

Furthermore, most of the RDP and BNG developments are not as dense as the informal settlements that existed before them, resulting in the need to forcibly relocate people who do not qualify for subsidised houses. This creates resentment towards the developments, as non-qualifiers are forced to move "temporarily" to inhumane, tin shacks much further away from the city, such as "Blikkiesdorp" on the edge of Delft.[8]

Figure 4: Blikkiesdorp Temporary Relocation Area, Delft

[7] *ibid*
[8] Centre on Housing Rights and Evictions. 2009: 18

A consequence of the subsidisation of housing, is the occurrence of a housing "gap market".[9] This gap market is comprised of households who earn above the R3500 required for the subsidy, but not enough to enter the bonded market by securing a home loan from a bank.[10] Foreigners are also not able to qualify for a housing subsidy regardless of monthly income. McGaffin and Kirov (2016) emphasise that this gap market is by no means homogenous, and within the gap lies many different levels of purchasing power as well as a variety of household needs.[11] While there are some initiatives to address this gap, such as Social Housing and The Financed Linked Individual Subsidy Programme (FLISP), there is still a vast deficit of affordable housing for non-qualifiers of the subsidy scheme. Thus, the gap market has meant that poor households who do not qualify for the subsidy largely rely on informal housing systems, such as backyard dwelling.

Figure 5: A backyard shack is rented out to a foreign family who are unable to qualify for a subsidised house.

[9] McGaffin and Kirov, 2016: 2
[10] *Ibid*
[11] *Ibid*

1.2. Motivating Densification

South African Cities: A Manifesto for Change, by Dewar and Uytenbogaardt (1991) was written in the context of South Africa being on the brink of becoming classified as 'urbanised' with 50% of its population living in cities. Their concern with the rapid growth and urbanisation was rooted in their observation that the most change and growth was happening amongst South Africa's poorest people, resulting in extreme unemployment, poverty and inequality.[12] They argue that in order to create high performing cities, the form of the city must be compacted in order to allow development over time that works at the "scale of the pedestrian".[13]

One fundamental reason for compaction is to maximise the "generative capacity of urban systems".[14] In the case of small economic enterprises, a denser urban environment will result in more economic opportunity as well as reduced distribution costs.[15] Conversely, in sprawling cities, small businesses cannot survive due to the thinly spread potential market and are often dominated by big businesses who are able to "initiate, rather than react to, desire lines"[16] where they tend to monopolise opportunity rather than allow small businesses to benefit from the activity that they generate.

[12] Dewar and Uytenbogaardt, 1991:10
[13] *Ibid:* 43
[14] *Ibid*
[15] *Ibid*
[16] *Ibid*

A second reason for densification is that high levels of social and commercial services can be more efficiently, conveniently and equitably accessed when an urban area is more compact.[17] Furthermore, they can be accessed by pedestrians rather than cars. Similarly, viable public transport systems are much more likely to work when a city is dense rather than sprawling due to the necessary efficiency of the system.[18] In a diffused city, poor people struggle to access fixed lines of transport systems.

A fundamental aspect of Dewar and Uytenbogaardt's argument is that successful urban environments require *complexity* and a variety of different housing conditions.[19] Thus, they are not promoting uniform levels of intensity, but rather a variety of intensities and activities, as well as gradations and combinations of intensity and moderation which will give inhabitants a sense of *choice*.[20]

It is also important to note that Uytenbogaardt and Dewar are not suggesting that high-rise housing blocks are a solution, but rather "very urban, *ground-related* environments through encouraging greater use of attached housing and two, three, or four-storey walk-up housing forms".[21]

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[17] *Ibid:* 45
[18] *Ibid*
[19] *Ibid:* 20
[20] *Ibid*
[21] *Ibid:* 91

In *The New Landscape,* Correa (1988) argues for an alternative to the modernist high-rises apartment blocks, and suggests what he calls "low-rise" high density (but what South Africans would call "medium-rise") for a number of reasons.[22] Firstly, it is incremental and thus can grow with the owner's needs and earning capacity. It has great variety and heterogeneity because the owner can build according to his/her specific needs. It makes for much quicker provision of housing and has a much shorter construction period. He identifies seven fundamental principles that all housing projects must include: incrementality, pluralism, participation, income generation, equity, open-to-sky space and disaggregation[23].

Correa acknowledges the complexity of finding optimal densities. For Indian urban conditions, ground-floor housing can accommodate around 125 families per hectare, five-storey walk-ups double this figure to about 250 families per hectare and 20-storey apartment buildings double it again to around 500 families per hectare[24]. Thus, while the building height increases by twenty, the neighbourhood density only increases by four. At the same time, increasing the number of storeys increases the cost of construction.[25] Therefore, finding the desired density is a complex process involving trade-offs and compromises that must extend beyond only

[22] Correa, 1988:46
[23] *Ibid*: 53
[24] *Ibid*: 39
[25] *Ibid*

providing housing, to also include neighbourhood and community spaces to support these densities[26].

Ultimately, although Correa and Dewar *et al*'s perspectives reflect different housing contexts, they are both arguing for a model that promotes strategic, high-density, medium-rise housing that is close to areas of economic opportunity and transport, and that allows for the existence of autonomous micro-enterprises. Both Correa and Dewar *et al,* argue for a *variety* of different housing types and conditions that allows communities and inhabitants a sense of choice and that can suit each family's or individual's specific housing needs.

Figure 6: A collage showing variety and diversity of housing typologies

[26] *Ibid*: 40

1.3. Housing and Agency

In order to avoid having to deal with potentially oppressive structures, unaffordable rent and overcrowding, newcomers to the city informally and illegally build their own shelters on available sites.[27] Eventually, these newly urbanised groups manage to bring in public services and facilities and start to consolidate their settlement to eventually set up a functional community with civic structures and their own local economy.[28] Asef Bayat (1997) explains this as the "ordinary practices of everyday life" in *Un-Civil Society: The Politics of the 'Informal People'*.[29]

According to Bayat this "silent encroachment" reflects the actions of the disenfranchised and formally unemployed people to find a more autonomous way of living that enables them to have a sense of agency that they otherwise would not have.[30] This silent encroachment is similarly used in the domain of work where the unemployed resort to "autonomous, subsistence activities" that constitute the informal economy and allow people *agency* through their work.[31] Bayat emphasises that although these informal micro-enterprises may be born out of survivalist motives, they

[27] Bayat, 1997:53
[28] *Ibid*
[29] *Ibid*
[30] *Ibid*: 54
[31] *Ibid*

quickly become more than mere subsistence strategies and can grow into substantial businesses.

In the case of South Africa, there is process of providing previously disadvantaged people with a free house if they qualify as a beneficiary through various development programs. However, housing does not solve the problem of joblessness, and beneficiaries of houses still resort to methods of silent encroachment to generate an income, often using their house as an anchor to achieve this. Thus, it is fundamental that the low-income house allows for this kind of economic agency through participating in the informal economy.

In order to explore the ability of housing to accommodate agency, four housing projects in Cape Town are compared and analysed according to their densities as well as my criteria of agency. The criteria that I have identified as constituting agency in housing are: user participation; change potential; ability to generate revenue for inhabitants; ability to contribute to communal space and facilities; and tenure type. The projects have been identiefied to represent a variety of dense, low-income, ownership housing of both free-standing and walk-up models. All are located within Cape Town.

The four projects include: N2 Gateway Phase 3, Joe Slovo; the apartheid walk-up model, Hanover Park; Springfield Terrace, Woodstock; and the RDP model, Delft.

N2 GATEWAY, PHASE 3, JOE SLOVO
144 du/ha

WALK-UPS, HANOVER PARK
90 du/ha

SPRINGFIELD TERRACE, WOODSTOCK
165 du/ha

RDP HOUSING, DELFT SOUTH
40 du/ha, potential for 160 du/ha

Figure 7: Aerial images showing the density of the four case studies

N2 Gateway Phase 3, Joe Slovo

Phase 3 of the N2 Gateway project in Joe Slovo, Langa, is the last phase of the national pilot project launched in accordance with the government's sustainable human settlement plan, Breaking New Ground.[32] The project presents an alternative to the standard RDP solution with much higher built densities and a commitment to integration and sustainability.[33] This high level of density was required in order to accommodate all the people who were previously living in Joe Slovo in informal structures, so that no people would be relocated against their will.[34]

The advantages of the Joe Slovo Phase 3 model, are its high density (144 du/ha), well-designed communal courtyards and pedestrian-friendly streets, and simple tenure system of private ownership. However, the compromise of this is the incredibly tight unit size and outdoor space, making it very difficult for residents to alter their units or to have the space to trade from their units. In order to ensure equity between beneficiaries, all unit layouts are the same.

[32] DAG, 2008:356
[33] Cook, 2004:32
[34] *Ibid*

Figure 8: The very tight open space around the units means that mostly very small alterations can be achieved, such as the addition of secutrity fences

Figure 9: A spaza shop's altered window for a trading hatch

Figure 10: A dress-making business inside someone's unit

Figure 11: Vibrant and well-designed communal space

Apartheid Walk-ups, Hanover Park

The apartheid "walk-up model" that is typically found on the Cape Flats, remains the most common subsidised tenure model that exceeds two-storeys in height.[35] However, these housing blocks are seen as undesirable and unsafe spaces that do not offer inhabitants the same kind of opportunities as the single-unit freestanding alternative. The housing block itself is extremely dense with 30 tiny units fitting into three storeys on a 520m^2 footprint. However, the way in which the housing blocks are placed on the sites not only creates hostile, disconnected environments, but also does not achieve densities much higher than the freestanding RDP model.

Not only are densities relatively low, inhabitants are also not allowed to renovate their unit and units are not designed to effectively run a business from. Ground floor units however, take advantage of being able to be renovated and occupy communal space with their additions. There is no difference in unit layout and the design process did not include any user participation. Communal spaces are unhealthy, dead spaces and units are incredibly tight. This walk-up model typifies the kind of housing that *debilitates,* as opposed to capacitating its inhabitant.

[35] DAG, 2012: 98

Figure 12: Surrounding open spaces are vast and undefined

Figure 13: Six blocks of 30 units each over two hectares results in a relatively low density of 90 units/hectare

Figure 14: Communal courtyards are open, hostile and undefined spaces

Springfield Terrace, Woodstock

Springfield Terrace can be seen as a flagship project signifying an attempt to present a different model of urban housing. Designed by Roelof Uytenbogaardt in 1992, it was the first non-racial infill project in South Africa with the aim of providing high-density but well-located housing for a lower income market.[36] Springfield Terrace is made up of 133 sectional title units arranged in nine separate blocks. Gross residential density is at approximately 165 dwelling units per hectare, while net residential density is at approximately 257 dwelling units per hectare.[37]

Like Joe Slovo Phase 3, the trade-off of high density is the model's inability to allow residents to easily renovate their homes or to generate an income from them through business or rental. However, unlike Joe Slovo, the very close proximity to the city centre and to excellent services and facilities helps to mitigate this problem. Positive vibrant communal spaces contribute to creating a healthy environment; however, complicated tenure systems have created tensions and a lack of autonomy.

[36] DAG, 2008:192
[37] *ibid*

Figure 15: The combination of three and four storey walk-ups with external staircases creates a vibrant and integrated community

Figure 16: Although it is prohibited to run a business from the units, this family is running a leather workshop in a backyard structure of a unit

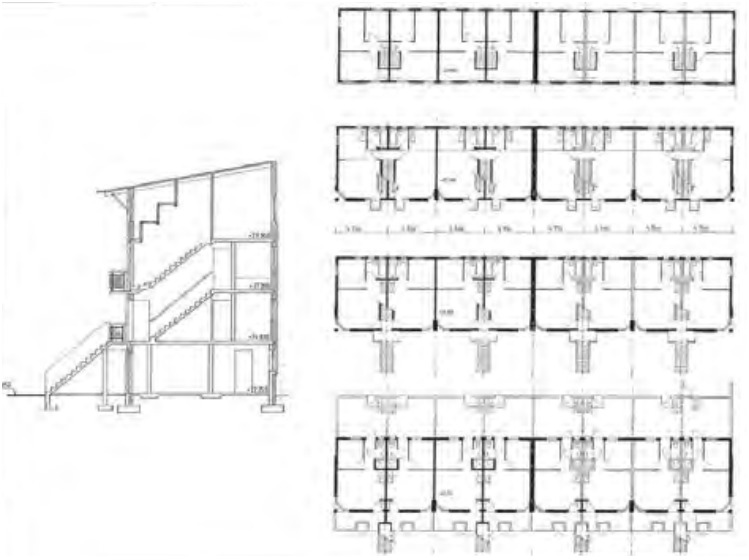


Figure 17: Section and plans showing the variety of unit types

Figure 18: Vibrant communal street space

RDP Model, Delft

The mass roll-out of RDP housing between 1995 and 2004 included a single free-standing two-bedroom house, placed on the middle of the site.[38] This low-rise, low-density model was seen as being very similar to the housing supplied under apartheid. However, the advantage of this model is its ability to be altered and to accommodate backyard rental.[39]

Although the initial densities of the RDP model is at a very low 40 to 50 units per hectare, through its ability to be renovated and to accommodate backyard structures, it can reach much higher densities of up to 160 units per hectare. This flexibility allows households to generate an income through their homes, either through rental or retail. The simple tenure system of private ownership enables this incredible flexibility. However, RDP developments are typically lacking in efficient community services and facilities and are generally located far away from economic opportunity and transport lines. Furthermore, this low-rise high-density model results in a homogenous mass of uniform density that is lacking in privacy and open space.

[38] Morange, 2006:58
[39] Poulsen and Silverman, 2005: 3

Figure 19: Low-rise, dense sprawl of Delft South

Figure 20: An area in Delft after 20 years of additions to houses, which are shown in black

Figure 21: The RDP house has the ability to be transformed creating a heterogeneous streetscape

Figures 22 & 23: Photographs of "home as economic generator" on Delft South Main Road

Conclusion of case studies

Through studying the four projects, it appears that the private ownership, free-standing model typically allows inhabitants a great deal more agency at the scale of the unit. Inhabitants are able to freely renovate their homes, build additional backyard rooms for family or rental and use their front yards to run a business from or rent out to other business owners. While the choice of variety of units is generally very limited, the change potential of these units is vast and inhabitants are capitated by their ability to mould their unit to their specific needs. Furthermore, the tenure system is simple and requires little management. The drawback of this model however, is its inability to capacitate inhabitants at an urban scale. The low densities results in less efficient and equitable services and facilities, and these developments are generally located far from economic opportunity and efficient transport.

Conversely, the walk-up models do not provide inhabitants agency over the way they live, at the scale of the unit. Inhabitants are not allowed to renovate their units or to run small businesses from their homes. When they are allowed to run a business from their unit, it is often spatially challenging especially if the unit is not on ground level. However, walk-ups can offer potential inhabitants a larger degree of choice of unit type. The tenure system is very complicated and often presents problems for the community and management. However, the benefit of this model, is its ability to capacitate inhabitants at an urban scale, with increased economic

opportunity due to higher densities, decreased reliance on the need for relocation areas and much more equitable access to services and transport.

While this research has shown that strategically densifying certain areas of economic opportunity through dense infill housing developments *can* be a potential solution to creating integrated and sustainable human settlements, there are also drawbacks to this model. It is very complex to achieve higher densities in a way that capacitates individuals and communities on a social and economic level. If this medium-density strategy is to be pursued for low-income housing, it should be done in a way that allows inhabitants to still have a strong connection to the ground plane and a degree of flexibility in order to allow the generation of an income from the unit. In addition, it should create positive communal spaces of social cohesion and have access to efficient and functional services and facilities.

1.4. The Economy of Circulation Space

Circulation spaces in dense housing projects are fundamental spaces of social contact and can help to create vibrant, healthy community spaces. Especially in the case of walk-ups, the staircase is a critical moment of spatial contact with the activity on the ground plane. However, often housing projects compromise on the social implications of these spaces in order to increase spatial and economic efficiency. In the case of low-income housing, in particular, the reliance of dense housing on the activity of the ground plane is essential, and ways to achieve this connection need to be explored further.

Perez de Arce's (2006) article, *Urban Domicile: The Apartment Block*, is useful in exploring the significance of circulation space in connecting the apartment block to the city.[40] He describes the ambiguity of the idea of the front door in an apartment block and the degrees of public and private access to the unit. A "sequence of corridors, stairs, lift lobbies, parking spaces and entry halls"[41] form the journey from the street to the private unit, often resulting in disconnected and insulated environments.

[40] Perez de Arce, 2006: 142
[41] *Ibid*

Because of the importance of circulation space in apartment housing, finding the line of trade-off between the efficiencies of circulation spaces and the spatial and social implications, is fundamental in creating sustainable and well-designed, dense housing projects. A compendium of projects will explore to what extent trade-offs must be made between the efficiency and the social or place-making implications of circulation spaces in dense low-cost housing models. A variety of dense housing types will be analysed including examples from high rise flats, walk-ups and hybrid systems.

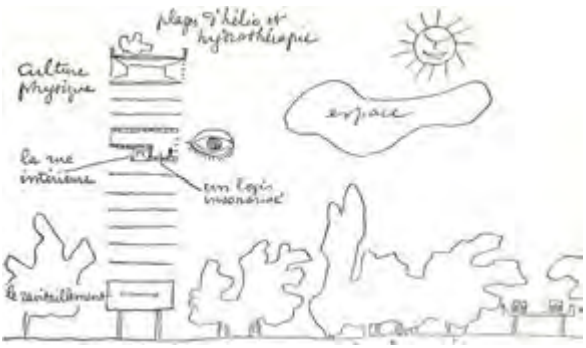
Thus, Unite d'Habitation (Le Corbusier, France), Narkomfin (Ginzburg, Russia), Byker Housing (Erskine, England), Springfield Terrace (Uytenbogaardt, South Africa), Cape Flats walk-ups (South Africa), Hostels to Homes upgrade (South Africa), and the Du Noon Flats (South Africa) will all be analysed according to:

- Efficiency of system: The number of units per corridor or staircase, and the amount of square meterage dedicated to circulation versus the square meterage of habitable space.
- Place-making: The ability of the circulation space to create positive place-making as well as the environmental implications.
- SANS requirements: The safety parameters of circulation spaces
- Social and economic implications: The social dimension of the circulation space and how the circulation system contributes to economic generation.

Le Corbusier drastically compromised on the safety as well as spatial and social quality of the Unite d'Habitation's circulation space in order to maximise the efficiency of the system.[42] This ultimately contributed to the inhumane and hostile quality of the housing as well as its detachment from the rest of the city. Ginzburg, on the other hand, tried to compromise on the efficiency in order to create a more pleasant circulation space in Narkomfin by making very wide, single-loaded corridors. Regardless of his intentions however, the building is still poorly integrated with the street and does not contribute to a cohesive community space, due to the system of internal core and corridor circulation.

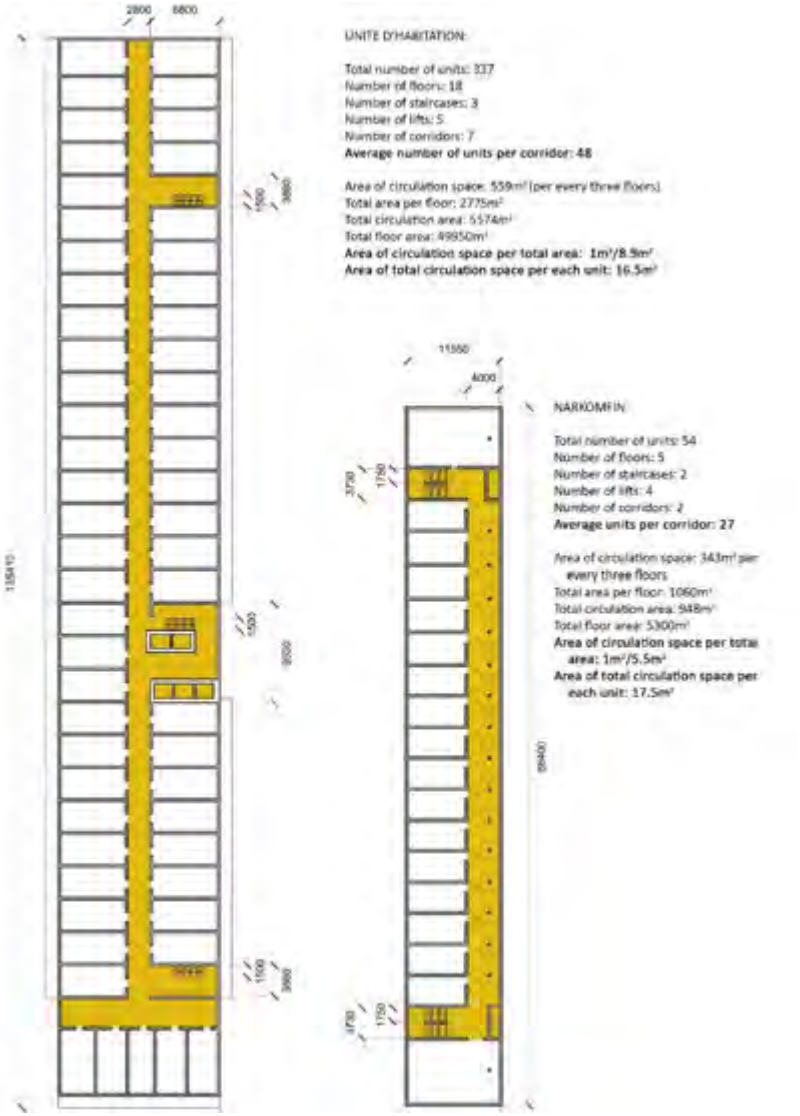
Figures 24&25: The comparison between Narkomfin's (left) and Unite's (right) sections shows how efficient Unite's circulation is, with very long thin double-loaded corridors. Both buildings make use of staggered access to units in order to decrease the number of corridors needed.

[42] Sbriglio, 2004:69

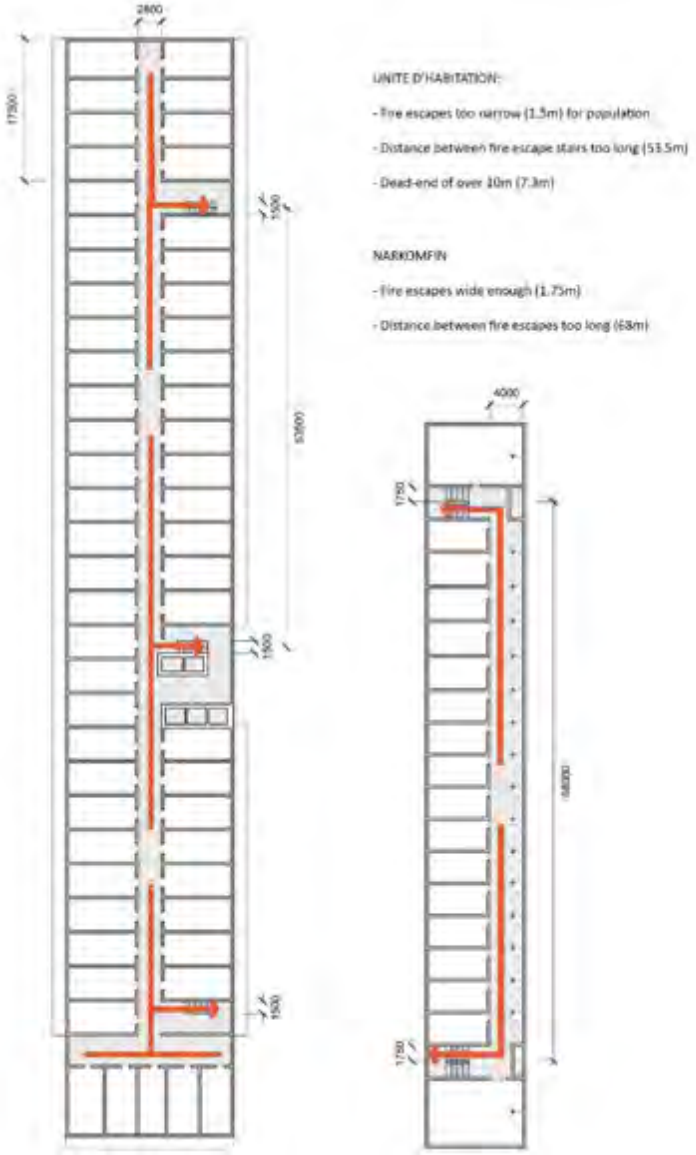


Figures 26 & 27: The comparison between Narkofim's (left) and Unite's (right) corridor space show that, while both corridors are inhumane and relentless, Unite's lack of natural light and ventilation is even more unpleasant.

Figures 28 & 29: Le Corbusier's sketch of Unite's elevation demonstrates the building's clear separation from the ground plane which is further emphasised by the internal core and corridor circulation system.



Figures 30: Efficiency of circulation for Unite d'Habitation and Narkomfin



Figures 31: Saftey compliance of circulation for Unite d'Habitation and Narkomfin

Byker Housing, on the other hand, is an example of a very dense housing project with a circulation system that manages to achieve very high efficiencies as well as contributing positively to a vibrant and integrated community space with interesting spatial qualities. While Springfield Terrace's staircases also contribute to creating healthy, safe and lively public space, their trade-off is a very economically inefficient system.


Figures 32 & 33: The exterior walk-ways visually connect residents to the rest of the city and contribute to a sense of vibrancy and social integration.

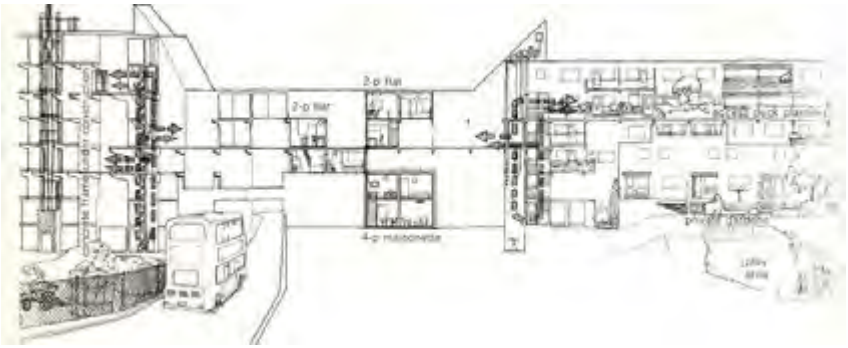


Figure 34: Erskine's diagram explaining Byker's complex circulation system comprised of internal cores, external corridors, and ground-floor-accessed units.

Figures 35 & 36: The photograph of Springfield Terrace shows the vibrant community spaces created by the external staircases that overlook the street. The section explains the circulation system of external and internal staircases.

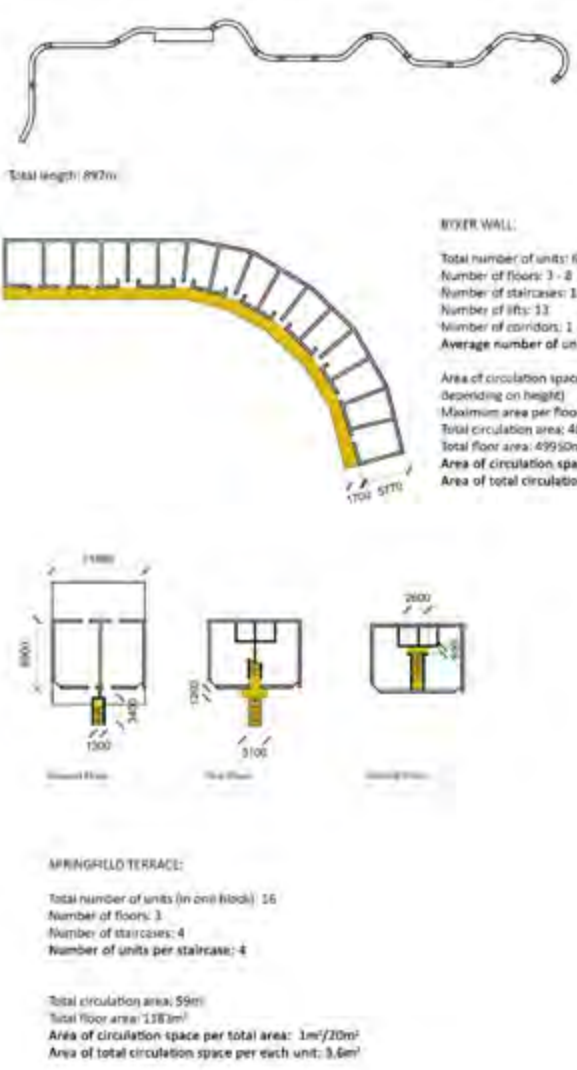


Figure 37: Efficiency of circulation for Byker and Springfield Terrace

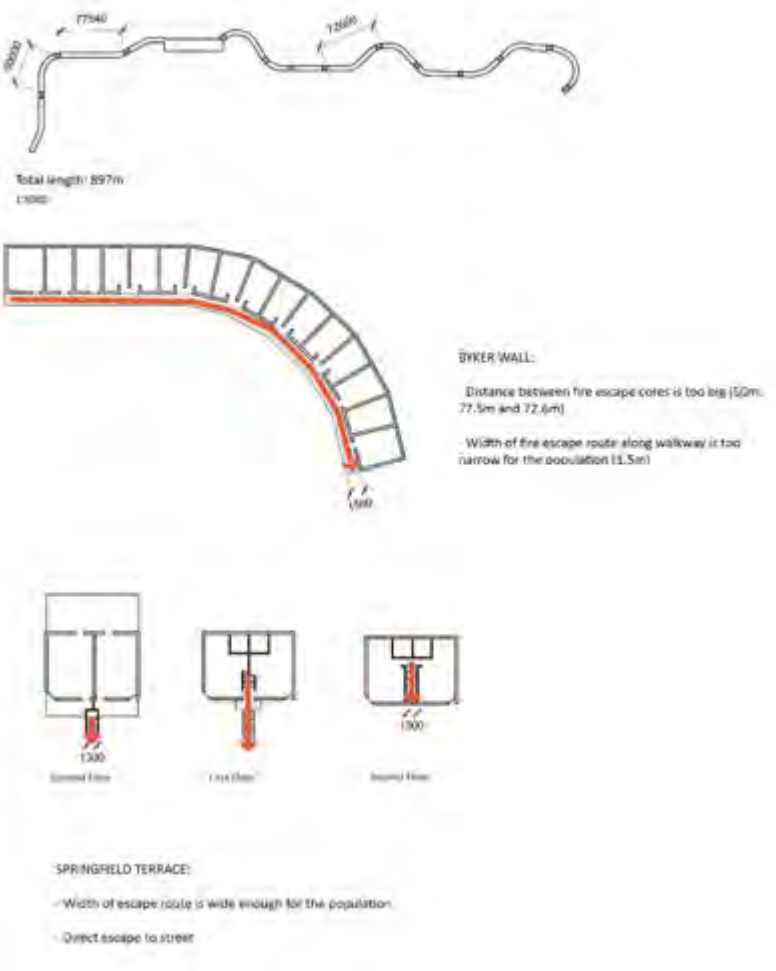
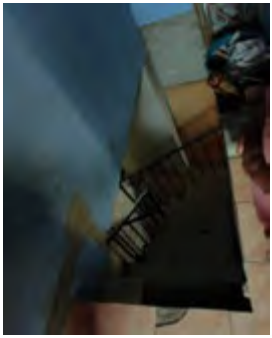


Figure 38: Saftey compliance of circulation for Byker and Springfield Terrace

The Hostels to Homes upgrade sits somewhere in between Byker and Springfield Terrace, with a relatively efficient circulation system that still allows for visual and social connections. The Cape Flats walk-up, on the other hand, demonstrates a bleaker situation where the trade-off of the efficiency has not actually contributed in any positive way to the spatial and social quality of the housing. While the Du Noon flat also does not have a circulation system that creates a positive spatial quality, the place-making has been compromised in order to create highly efficient and tight circulation as a result of very rigid economic and spatial constraints.

Figures 39 & 40: The photograph and section of the Langa Hostel Upgrade shows the exterior staircase and walkway system which creates vibrant and positive street conditions, while at the same time is an efficient circulation system.

Figure 41: In the Cape Flats Walk-ups, the many unprotected exterior staircases overlook the back courtyard, instead of overlooking the street side to create surveillance. Thus the circulation system is both inefficient and does not create positive community environments.



Figures 42 & 43: The dark windy corridors and precarious staircase of a Du Noon flat demonstrates the safety issues that arise when circulation systems are contrained by such tight economic factors.

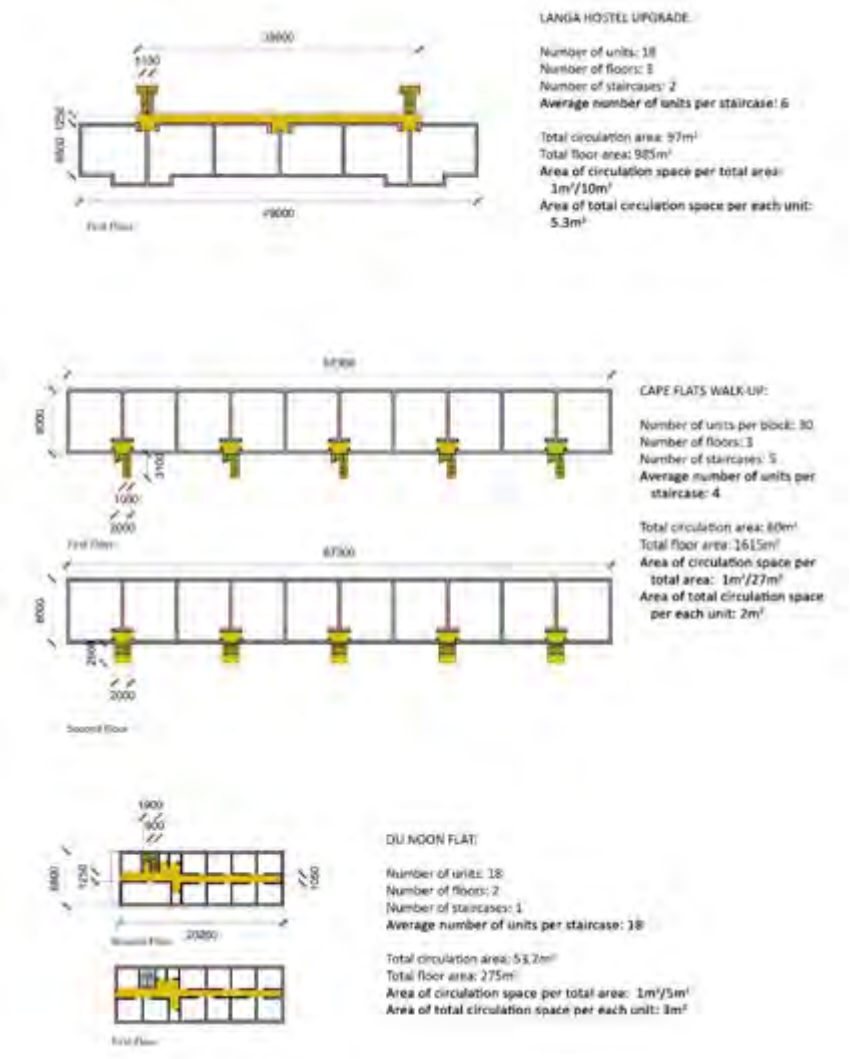
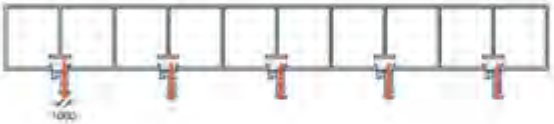


Figure 44: Efficiency of circulation for Langa Hostel Upgrade, the Cape Flats Walk-up, and the Du Noon Flat

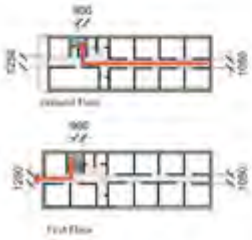
LANGA HOSTEL UPGRADE:

- Width of escape route is wide enough for the population (1.1m)
- Two escape routes are provided
- Distance between escape stairs is within 45m (32.5m)



CAPE FLATS WALK-UP:

- Width of escape route is wide enough for the population (1m)
- Direct escape to street



DU NOON FLAT:

- Only one escape stair is provided
- Only one escape exit is provided
- Escape route is not wide enough for population (1.05m)
- Escape stair is not wide enough for population (0.9m)
- Gradient of stairs is too steep
- Adequate handrail is not provided

Figure 45 : Saftey compliance of circulation for Langa Hostel Upgrade, the Cape Flats Walk-up, and the Du Noon Flat

Each of the above projects has had to make compromises to varying degrees in order to be economically and spatially viable, as well as integrated and vibrant. Each housing project has very different spatial and economic implications that has resulted in certain trade-offs having to be made. Housing projects are more likely to be successful when they manage to create vibrant, integrated and sustainable communal circulation spaces, while simultaneously working as functional, safe and efficient systems. In some cases housing projects have managed to achieve this under very constrained economic or spatial situations. Ultimately, in order to create a successful housing project, the architect must be able to mitigate and manage the trade-offs between the circulation system being economically and spatially viable, being safe in terms of fire and access, contributing to positive place-making and creating socially integrated environments.

Table of summarised findings:

	EFFICIENCY	SAFETY REGULATIONS
UNITE D'HABTATION 	Area of circulation space per total area: **1/8.9m²** Average number of units per corridor: **48** - Highly efficient circulation system both spatially and economically - Reduced number of corridors due to split levels - Many people sharing circulation elements	**Does not comply** - Fire escapes are too narrow - Distance between escapes is too big
NARKOMFIN 	Area of circulation space per total area: **1/5.5m²** Average number of units per corridor: **27** -Less spatially efficient circulation system but economically efficient due to few stairs - Reduced number of corridors due to split levels	**Does not comply** - Fire escapes are wide enough - Distance between escapes is too big
BYKER 	Area of circulation space per total area: **1/11m²** Average number of units per corridor: **110** - Highly efficient circulation system both spatially and economically - Reduced number of corridors due to split levels - Many people sharing circulation elements	**Does not comply** - Walkways are not wide enough for occupancy - Distance between escapes is too big
SPRINGFIELD TERRACE 	Area of circulation space per total area: **1/20m²** Average number of units per staircase: **4** - Efficient circulation system spatially, but highly inefficient economically - Many staircases shared between few units - No corridors or circulation cores	**Does comply** - Very few units sharing escape stairs
HOSTELS TO HOMES 	Area of circulation space per total area: **1/10m²** Average number of units per staircase: **6** -Efficient system both spatially and economically Corridors allow fewer stairs per unit	**Does comply** - Multiple means of escape - Corridors and stairs are wide enough - Distances between escapes are small enough
CAPE FLATS WALK-UP 	Area of circulation space per total area: **1/27m²** Average number of units per staircase: **4** - Efficient circulation system spatially, but highly inefficient economically - Many staircases shared between few units - No corridors or circulation cores	**Does comply** - Very few units sharing escape stairs
DUN NOON FLAT 	Area of circulation space per total area: **1/5m²** Average number of units per staircase: **18** - Very economically efficient circulation system spatially, but inefficient spatially - Only one staircase shared between few units	**Does not comply** - Very hazardous system - Only one means of escape - Escape stair is too narrow and steep and does not have appropriate railing

PLACE-MAKING	SOCIAL/ECONOMIC IMPLICATIONS	TRADE-OFFS
- Extremely long dark corridors with no natural light or ventilation - Connected to the ground through lift shafts and lobby - Generous, naturally lit lift lobbies - No ground floor units	- Building is socially disconnected from the public street - Socially disconnected community due to hostile communal space - "Shopping floor" intended for economic generation and social integration but did not work	**Compromise:** **Place-making, safety and social implications** **Gain:** **High efficiency**
- Long corridors with ample natural light - Connected to the ground through lifts and lobby - No ground floor units	- Building is socially disconnected from the public street - Socially alienated community due to hostile communal space	**Compromise:** **Place-making, safety and social implications** **Gain:** **Relative efficiency**
- Long exterior covered walkways instead of internal corridors - Interior stairs and lifts for protection from weather - Ground floor access to some units	- Strong and vibrant community due to positive place-making of communal space - Ground floor access creates vibrancy - Strong visual connections through exterior walkways creates sense of community and increases safety	**Compromise:** **Safety** **Gain:** **High efficiency, place-making and social implications**
- Many staircases contain public space - Protrusion of stairs demarcates a more private threshold - Underside of stairs used for storage - Solid balustrade increases privacy of stairs - Top stairs move inside	- Strong and vibrant community due to positive place-making of communal space - Ground floor access creates vibrancy - Strong visual connections through exterior walkways creates sense of community and increases safety	**Compromise:** **Efficiency** **Gain:** **Safety, place-making and social implications**
- Many staircases increase integration - External, covered walk-ways - Protrusion of stairs demarcates a more private threshold - Underside of stairs used for storage - Solid balustrade increases privacy of circulation	- Strong and vibrant community due to positive place-making of communal space - Ground floor access creates vibrancy - Strong visual connections through exterior walkways creates sense of community and increases safety - Economic activity creates vibrancy	**Compromise:** **Efficiency (to a small extent)** **Gain:** **Safety, place-making and social implications**
- Many stairs increase surveillance - Circulation open to rain and wind - Stairs placed behind the blocks instead of on the street - Thin balustrades provide little privacy - Stairs are open underneath creating awkward spaces	- Poor place-making strategies create a hostile and dangerous environment - Socially disconnected from the street - Ground floor access creates some social and economic activity	**Compromise:** **Efficiency, place-making and social implications** **Gain:** **Safety**
- Corridors have no natural light or ventilation - Stairs are narrow and awkward - No integration with the street	- Due to shared bathrooms and a kitchen, the corridor space becomes very public and busy - Owners of property able to generate an income through the rent	**Compromise:** **Safety, place-making and social implications** **Gain:** **Efficiency**

CHAPTER TWO | delft south

2.1. Introduction to Delft South

Situated approximately 34 km east of Cape Town next to the Cape Town International Airport, Delft was established in 1989 as Cape Town's first "mixed-race" township. Delft *South* was then later developed in order to accommodate the rapidly growing population of Cape Town. Delft South is notorious for its gangsterism, poverty, unemployment, high crime rate, inadequate schools, lack of jobs, and many government built housing projects such as the RDP housing and the N2 Gateway housing.

Delft is also notorious for its much criticised Temporary Relocation Areas (TRAs) such as Tsunami and "Blikkiesdorp". The TRAs are inhumane relocation camps made of small corrugated iron shacks. Blikkiesdorp, which is Afrikaans for "Tin Can Town", was given its name by the residents because of the uniform mass of one room tin structures throughout the settlement.

Despite the violence and poverty that characterises Delft South, it still manages to be a vibrant and bustling community with many informal shops and traders lining the busy Main Road and Sandelhout Road. It has a strong sense of community with an active Community Policing Forum as well as respected community leaders.

Figure 46: Residents from the Tsunami TRA protest about the lack of services and "no voice"

Figure 47: The vibrant retail node around the Spar

Figure 48: Delft located within the Cape Peninsula. The main road of Cape Town and main road of Delft are shown in yellow.

2.2. The main road

When Delft South was originally designed in the early 1990s, the planners deliberately created a high street running through the middle of Delft and connecting to Belhar to the north. This was achieved by creating one long continuous street with asymmetrical ring roads coming off it on either side. The idea was that pedestrians and cars could not move around Delft without needing to, at some point, move along the main road. The plan was highly successful in creating a hierarchy of streets with the main road clearly being the most active street.

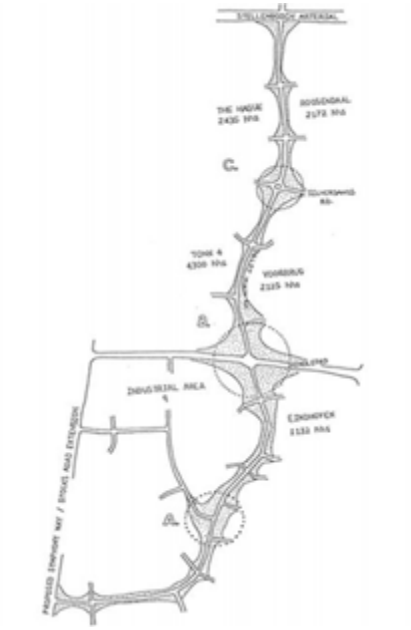


Figure 49: Delft's planner's diagram of the main road

The two taxi ranks are situated along the main road emphasising the importance of the main route as a route that functions at a both local and metropolitan scale. The few civic institutions in Delft are also mainly found along the main road, such as the police station, library, community hall and clinics. Because of the large amount of both pedestrian and vehicle movement along the main road, the vast majority of informal retail activity takes place here. The only formal commercial shop in Delft South is the Spar, which is situated at the important intersection between Main Road and Sandelhout Road, and has generated a busy retail node around it.

Thus, by designing Delft South along a high street, the planners were able to provide an important asset for the community that would be able to generate an income for many people and there are very few homes along the main road that have not made use of this retail opportunity. Even if the home owners themselves do not run a business from their house, in many cases they will rent out their front yard to other businesses. However, despite the vast opportunity that the main road offers, it is still underutilised. There are many plots along the main road that are largely empty, with only a few small retail structures lining the street edge. Furthermore, along the entire main road in Delft South there is only a very small handful of buildings that are more than one storey high. This incredibly low-rise street edge is hindering the full potential of what the main road could offer, not only for increasing retail and residential opportunity, but also for creating a defined, civic street condition with urban importance and spatial distinction.

Figure 50: This drawing of a busy portion of the main road shows the leakage of the main road activity and the often undefined and leaky street edges which create an uncontained streetscape.

2.3. Housing patterns

When Delft South was built in 1996, there was neither formal nor informal retail. The only infrastructure that was provided were the roads, services, a clinic and a sea of monotonous low-rise, low-density, subsidised houses. The houses were all single-storey, free-standing units of a very small footprint and were placed in the centre of their much bigger plots, creating a very low density of around 40 units per hectare.

Figure 51: Delft South as originally built in 1996 with original houses shown in orange.

Inevitably, over the last 20 years, Delft South has changed dramatically due to the additions and renovations that people have made to their homes over time. Rather than settle with the tiny two bedroom house that the state provided, people have expanded their homes in every direction with both formal renovations as well as backyard shacks in order to accommodate bigger families, tenants and/or businesses. This has resulted in Delft South becoming extremely dense with entire plots being built on, and a general lack of meaningful private open space. The density has increased from around 40 units per hectare in 1996, to around 160 units per hectare in 2016.

Figure 52: Delft after 20 years of additions and renovations (shown in black)

The inability to add additional storeys coupled with the utilisation of the entire plot has meant that the density of housing in Delft South has reached a ceiling, as has already been discussed. This ceiling is synonymous with overcrowding and a lack of private open space and also with an incredibly low-rise built form. Furthermore, it appears that this limit in density is able to exist when the population pressures are high enough to create drastic overcrowding but too low to warrant building multiple storeys. However, with the dramatically increasing population of South African cities, this could start to change, especially if housing units are designed to accommodate additional storeys.

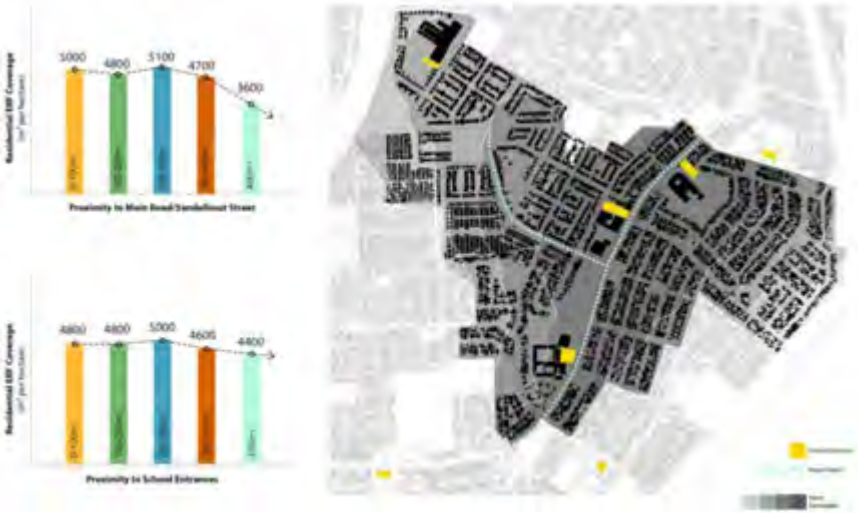


Figure 53: The map depicts the 'desirability' of certain areas due to the proximity to schools and the main road. The two graphs show that density does not dramatically increase in more desirable spaces, possibly due to the fact that a limit in density has already been reached.

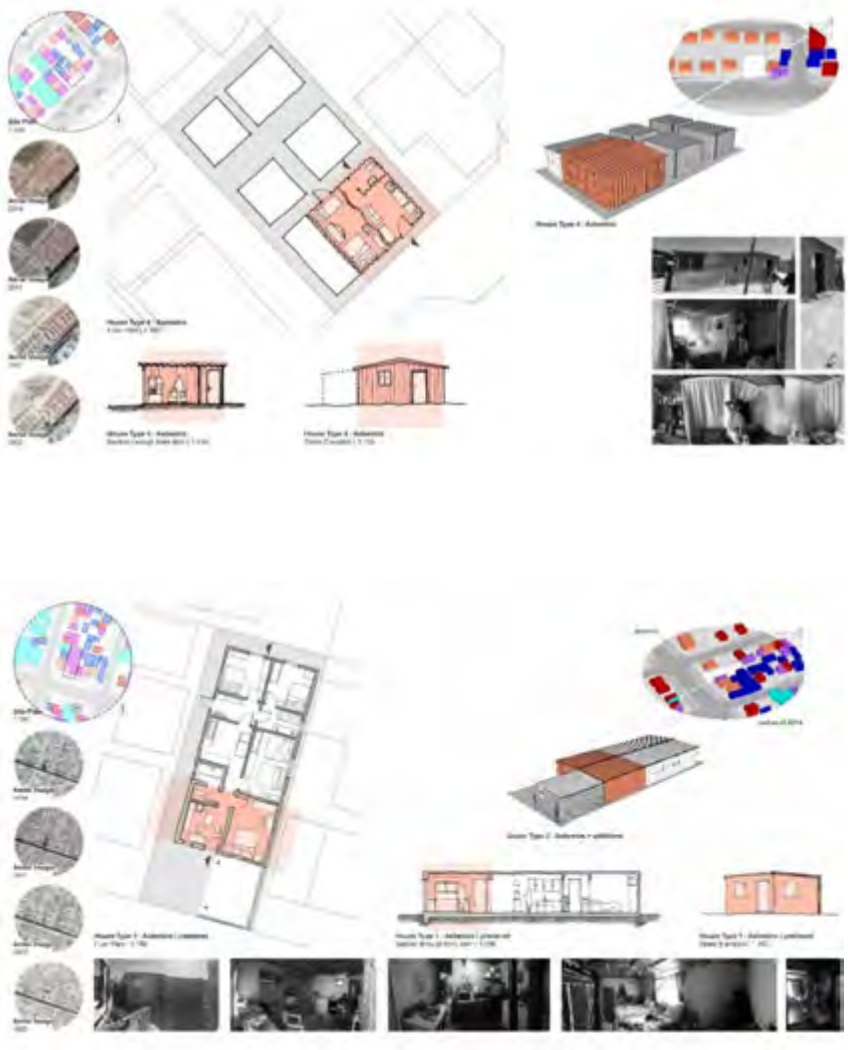


Figure 54: Mapping of two case studies showing the ability of the RDP unit to accommodate backyard shacks and extensions

2.4. The power of the plot

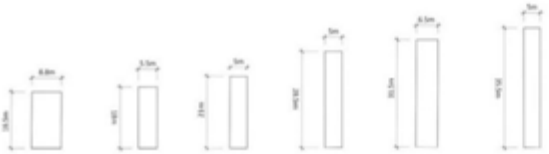
Because Delft South was conceptualised as an area comprised entirely of state subsidised homes, it was important that a sense of equality was maintained. This resulted in all residential plots being an identical size of 10m wide by 16m deep. It is not clear why this relatively wide but shallow geometry was chosen, but it has resulted in a particular street edge condition that is often uncontained and undefined.

When compared to other housing types in Cape Town, the Delft South plot size seems relatively wide. The residential plots in Woodstock, for example, are typically half the width of the Delft South plots, at 5m wide, and are designed to accommodate a row-house typology. The relative width of the Delft South plot coupled with the placement of the unit in the middle of the plot, has contributed to the expanding outward in each direction of the unit, resulting in an absence of meaningful open space.

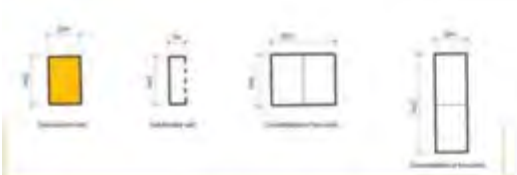
Despite the awkward size of the 10mx16m Delft South plots, there is interesting opportunity for the subdivision or consolidation of plots. Because 5m is a viable width of a plot for a row-house typology, owners of a 10m wide plot have the opportunity to subdivide and sell or rent half of their plot. On the other hand, small local developers have the opportunity to buy up a combination of plots and create a consolidated housing development. Once four plots are consolidated, a new courtyard walk-up typology is possible, as will be explored as one of the architectural outputs.

Typical block on Main Road, Delft South

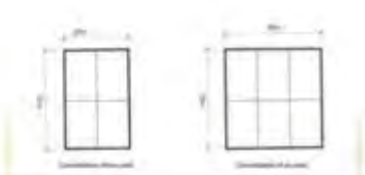
1:500 Block Plan



Typical erf unit sizes in Woodstock, Cape Town



Row-House typology



Courtyard and Walk-up Typology

Figure 55: A typical block in Delft South comprising many identical 10mx15m plots, with two large plots on either end of the block, each the size of four plots combined. The two end plots are typically zoned for business.

Figure 56: The variation of typical plot sizes in Woodstock, Cape Town. These plots are typically much thinner and longer than the Delft plots.

Figure 57: The potential for subdivision and consolidation of plots in Delft South

In some cases, small developers have started to consolidate two plots next to each other in order to build flats with rooms to rent. One woman from Delft, Mrs Nakho*, was able to buy her neighbour's plot and demolish both her and her neighbour's houses in order to build a double storey flat with 14 rooms to rent. She charges R2500 per month for a 4mx4m bedroom and a private toilet. She is thus able to make R35 000 per month from rent. While the consolidation of plots in Delft South is not yet a very regular occurrence, there is evidently a large amount of money to be made. Furthermore, different sizes of plots which can be created through the consolidation or subdivision of standard plot sizes, allow for different housing typologies to exist.

Figure 58: Aerial images of different housing typologies in Cape Town are overlaid by plans of possible plot configurations in Delft.

* Names have been changed to protect the identity of interviewees

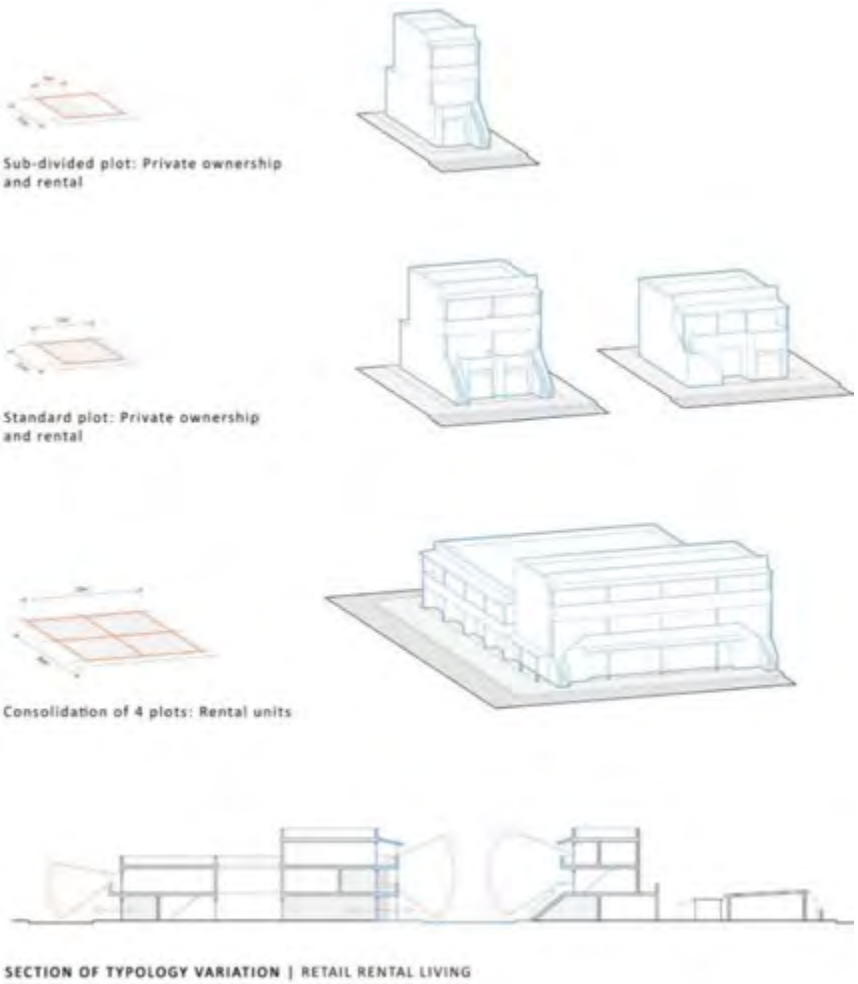


Figure 59: Conceptual diagrams showing the possibility of variation of typology through the consolidation or subdivision of plots

2.5. Home as economic generator

Before conducting a mapping study of the way in which people are able to generate an income from their home in Delft South, it was assumed that using one's home to run a business from was the most effective way to generate revenue. However, it was soon discovered that most people with businesses in front of their homes do not actually own those businesses but are renting out that space to separate retailers. Furthermore, it was revealed that while there is money to be made from renting out one's front yard as retail space, the real potential for making a substantial income comes from the rental of residential space.

Delft South, like many other low-income areas in South African cities, is in a position where the price of buying property is very low, while the price of renting a room or house is on average very high for what you get. This combination of cheap property with high rent means that there is the potential for small, local developers to make a relatively large income by buying property and developing rental housing. It is this relationship between rental price and property price that allowed Mrs Nakho to consolidate her plot with her neighbours, and to now generate R35 000 a month from rent.

The extent of both renting and selling of property in Delft indicates the vast "gap market" that exists. People who earn more than R3500 a month or are not South African citizens, are unable to qualify for a subsidised house and

therefore rely on the informal housing economy, such as backyard shacks and flats.

In Delft, people often use online platforms, such as Gumtree.com, to advertise their properties. By studying the advertisements on Gumtree, it is possible to understand property selling and rental prices in Delft South and certain factors that influence these prices.

The first table below, shows a list of advertisements for properties that are being *sold*, either by the current owners or through property agents. The property prices range from R120 000 for a one bedroom house to R575 000 for a well-designed and relatively sophisticated three bedroom house. Some prices are surprisingly cheap, such as R170 000 for a three bedroom house, and some prices seem remarkably expensive, such as a two bedroom house being sold for R485 000.

By studying the adverts' descriptions of the houses being sold, it is evident that there are a variety of factors that affect the cost of the property. An important factor that influences the cost dramatically is whether there is space for parking or whether there is an enclosed garage space. Another important factor is the location which is expressed through the property's proximity to the main road, the taxi-rank, the Spar or schools. Other factors that can increase the price include: a tiled floor finish, burglar bars and a security gate, an enclosed yard, a bath or shower, built-in furniture and the general aesthetics of the house which is expressed by words such as "beautiful", "chic" or "neat".

The most interesting factor advertised is the ability for the property to generate money for the owner. Often the description will include the fact that the property has a "big yard" that has the potential for accommodating additional rental units or that the property has "business opportunity" in the front yard. One advert explicitly describes how the property can generate more income from rent than the cost of the monthly bond instalments, thus creating the "ideal investment opportunity":

> *"Delft South / Suburban: Situated close to 2nd Mango from Spar side. Large neat, chic house offered. Ideal investment opportunity. Consists of main house: 2 large bed rooms; lounge; study; kitchen with built-in cupboards; bath with shower; lock up garage. In addition, there are 2 double storey flat-lets at back of yard, for 4 tenants, who currently each pay R1500pm rental, thus yielding an income of R6000p/m. So if a 100% bond of R485000 @ Prime (10,5%) is taken out over 20 years, instalment shall be approximately R4842pm. Thus the tenants' rental is more than enough and literally pays for the bond instalments.*
> *SELLING PRICE = R485000.*

TYPE	PRICE	LOCATION	FEATURES	PHOTO
1 bedroom	R120 000	Leiden	-	-
3 bedroom	R480 000	Symphony Way	Close to transport, 'beautiful', parking	
3 bedroom	R575 000	Close to Spar	'beautiful house', parking, location	
2 bedroom	R420 000		Parking, tiles, built in furniture	
3 bedroom	R220 000	Rosendal	Big yard, close to transport	
3 bedroom	R170 000	Eindhoven	Free-standing, parking	
2 bedroom	R250 000	Leiden	Beautiful, double storey, balcony	
1 bedroom	R140 000	Eindhoven	Close to transport, spacious yard	
2 bedroom	R485 000	Delft South	Garage, 4 rental units	

The second table below shows rooms or houses advertised on Gumtree that are available for *rent*. The vast majority of advertisements are for single rooms either in 'flats' or in the backyards of houses. These single rooms may either be more expensive, formally built structures, or much cheaper backyard shacks. In both cases there does not seem to be a limit to how many people are allowed to occupy a single room. The price for a backyard single shack starts at around R800 per month, which would include the use of an outdoor shared toilet but would not include access to a bath or shower. The price for a single room in a formal structure starts at around R1200 but is typically in the region of R1500.

Similar to the houses for sale, the price of rooms for rent are also dependent on a variety of factors. The most important factor for rental units is whether there is a separate entrance which allows tenants to access their room without going through the main house. The ablutions are another important factor and having access to a private toilet as well as a shower or bath will increase the price dramatically. In many cases however, the toilet will be shared between many tenants and there may not be access to a shower or bath at all. Burglar bars and a security gate also increases the rent, as well as built-in furniture and the inclusion of a kitchenette in the room. Proximity to the main road and transport links are also important, however; parking is less important, perhaps indicating that often tenants do not own cars.

TYPE	RENT	LOCATION	FEATURES	PHOTO
Flat, single bedroom, own bathroom	R1500	Above main road, Delft South	Parking	
Backyard, single room 4mx4m, no bath/shower	R1800	Close to Spar	Separate entrance, burglar bars	
Flats, single bedroom,	R1400	Delft South	Shower and toilet,	
Flats, single bedroom	R2300	Delft South	Self-contained, burglar bars	
Backyard shack, single room, shared toilet	R800	Delft South	Separate entrance	
Two bedrooms, backyard, outside toilet	R2600	Delft South, close to Spar	Separate entrance, burglar bars	
Flat, single room with private bathroom	R1300	Symphony Way	Private bathroom	
2 bedroom house	R3500	Delft South	Close to transport	
Single room, backyard, shared bathroom	R1450	The Hague		
Single room, backyard, shared bathroom	R1200		Separate entrance,	
2 bedroom house	R3600	Rosendal	Free-standing	

Undoubtedly, the most effective way to generate revenue from a residential property in Delft South is to use the front yard for retail or to rent to a business, *and* to use the backyard to rent single units to tenants. In some cases in Delft South, where people have been able to add another storey, the front yard can be used for a business and the entire first level can be used as rental units. This allows the owners of the property to have a much bigger house in addition to enjoying privacy from the tenants.

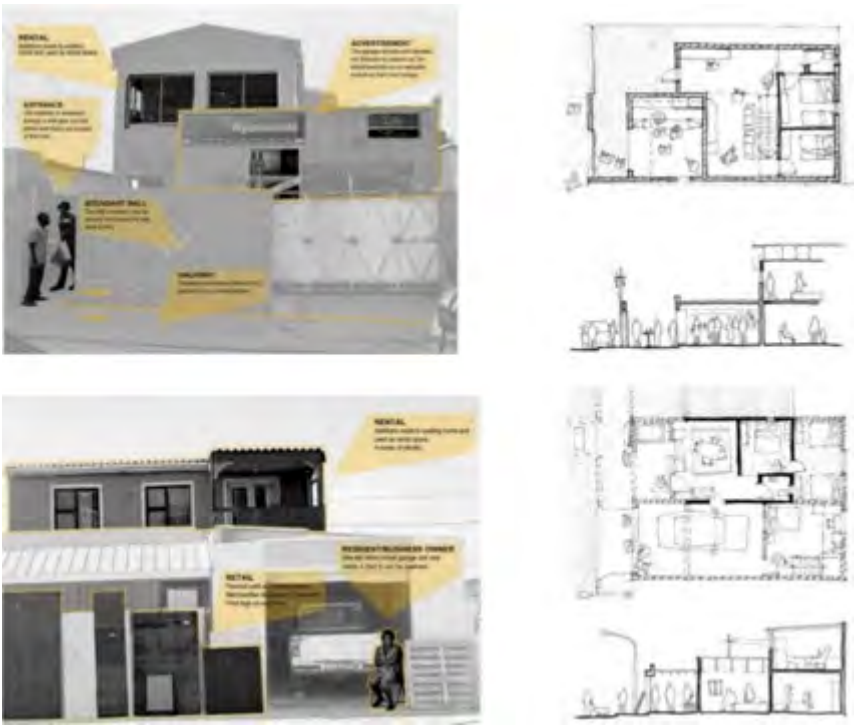


Figure 60: Two case studies each showing a double storey house accommodating both retail in the front and rental on the first floor.

CHAPTER THREE | siting sibanye square

3.1. Main Road as a Site

While the main road functions as an important asset for the Delft South community, it is evident that this street is still underutilised and is not reaching its full housing and retail potential. The existence of empty plots coupled with the very low-rise form demonstrates that there is still much opportunity for the main road to develop and for people to benefit from the potential that it offers. Increasing the built densities strategically along the main road could not only allow the main road to reach its full housing and retail potential, but also could help create a more defined and civic street condition.

Figure 61: Two well-located main road sites show how the bulk of the site remains vacant.

The reason that there are still empty plots along Main Road relates to the zoning of these plots. The vast majority of Delft South plots are zoned as "Incremental Housing" which allows residential units as well as small businesses to develop on these plots. However, in strategically located places or at the ends of the residential blocks, there are plots zoned specifically for "General Business 1" or for "Community Space". In some areas, such as around the taxi rank, plots are zoned as "Transport: Parking". It is these non-residential zoned plots that are underutilised due to the size of the plots being undesirable for small informal business and bigger formal businesses not wanting to invest in Delft. What inevitably occurs is that small retail structures line the main road border of the plots, while the bulk of the plots remain vacant.

The map of Delft South below depicts all the vacant or underutilised non-residential sites along the Southern part of the main road. While there are many vacant plots over the whole of Delft South, the vacant plots along main road have much greater economic potential for local developers. Some of the plots are very large and some are much smaller, but together they cover a surface area of 40 838m^2. The 4.1 hectares of underutilised space just along the main road has the potential to contribute both economically and spatially to the Delft South community.

Figure 62: Underutilised non-residential sites along the Southern part of the main road. Sibanye Square shown in the red circle.

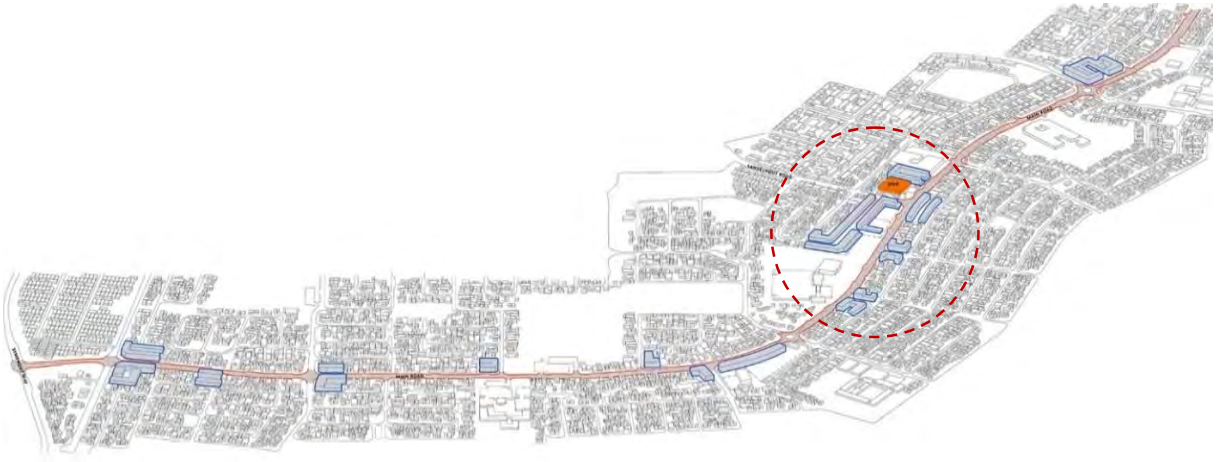


Figure 63: Massing diagram showing the potential of underutilised sites along main road. Sibanye Square shown in the red circle.

3.2. Sibanye Square

Perhaps the most interesting and complex of these underutilised plots along Main Road is Sibanye Square. This important square is situated halfway along the length of Delft South's Main Road, between the Spar and the taxi rank. It occupies the corner of the two busiest commercial streets in Delft South: Main Road to the east of the site and Sandelhout Road to the north. It is lined with houses on the western side and borders the taxi rank and Sunray Primary School on the southern side. To the north of the Spar are the important civic institutions of the library and the community hall.

The most active part of the square is the north-eastern side that is bordered by the two busy streets and is adjacent to the Spar. The Spar acts as an important retail anchor for the area and many small businesses cluster around the Spar to take advantage of the activity that it generates. This informal and temporary retail activity spills across the road onto the Square, creating an active corner and northern edge of the square. The eastern edge of the square is also lined with temporary traders taking advantage of the activity from the main road. On a typical Saturday morning the entire north-eastern portion of the square becomes a busy outdoor market, mostly comprised of women selling second-hand clothes laid out on the paving.

Figure 64: Plan of Sibanye Square showing available sites in yellow

While the square plays an important role in the Delft South community, it is not fully utilised. On the square adjacent to the taxi rank, there is a dilapidated skating park that was undoubtedly the city's attempt to improve the square but, in reality, is unused. Furthermore, halfway across the width of the square, a row of traders' shipping containers line the length of the square, thus dividing the square in half. This intuitive, organically formed border shows that the scale of the square is too big for the interest of the traders. While the eastern half of the square is active, the western half, which makes up the bulk of the square, is completely dead. The western half is bordered by the backs of the houses, the wall of the school, as well as the backs of the shipping containers, creating a large inactive dead zone.

Figure 65: Perspective site diagram of Sibanye Square facing north

3.3. Retail ynamics around Sibanye Square

One of the components of the architectural outcome of this dissertation is a housing development that surrounds the Sibanye Market. In order to design an appropriate market space it is fundamental to understand the complex retail dynamics that occur around the site. While retail occurs mostly along the main road, there are many other nuanced retail patterns that are taking place in Delft South, often pertaining to the location of retail activity. It was discovered through a series of urban mappings that different types of retail occur in very different ways.

Some types of retail prefer to cluster close to other similar types, and will often cluster along the main road or around Sibanye Square. Businesses such as meat and braai shops, clothing shops, hardware shops, cell phone shops and take-aways thrive off the commercial activity of being around other businesses and appear to not be compromised by being next to an identical business. These types of business also thrive off using *formal* retail as an anchor, such as the Spar. Conversely, businesses such as shebeens and spaza shops prefer to scatter away from the main road and away from other similar types of retail. Both spaza shops and shebeens benefit instead from isolation and an absence of competition as well as being located closer to residential areas rather than the commercial main road or Sibanye Square.

Figure 66: The clustering of informal traders around the Spar, opposite Sibanye Square

Figure 67: Plan of the busy retail node around Sibanye Square and the Spar

Through the mapping exercise, three typologies of retail in Delft South were identified: mobile, temporary and static. Mobile traders are able to move around and sell goods wherever the activity may be at a particular time, such as the women selling juice and snacks out of wheelie bins at the taxi rank in the morning after which they move to the school fence during break time. Temporary traders are defined by being able to pack up their stalls at the end of the day and leave nothing behind, such as the traders who sell building hardware on tables along the main road. Static businesses are the more permanent shops that have a designated building or structure from where they can operate. In places of high commercial activity, such as Sibanye Square and the Spar, all three typologies operate next to each other.

Figure 68: An example of a "mobile trader" selling fruit out of her bakkie outside the Spar

However, regardless of retail type or typology, there are certain patterns that are evident in all businesses. Through mapping a variety of retail case-studies, it was found that the way that a business displays its service or product was of the utmost importance. Advertising is achieved through signs, images, paintings and often the visual connection of seeing the product or service. The traders who sell chickens and eggs place the stacks of eggs and cages of chickens on the pavement in front of their stalls in order to display the product that is for sale. Similarly, the tailor sets up his sewing machine outside his stall on the pavement to advertise his service. Location and display are intrinsically linked in their ability to increase the visibility and success of a business and are probably the two most important aspects of retail in Delft South, and particularly around Sibanye Square.

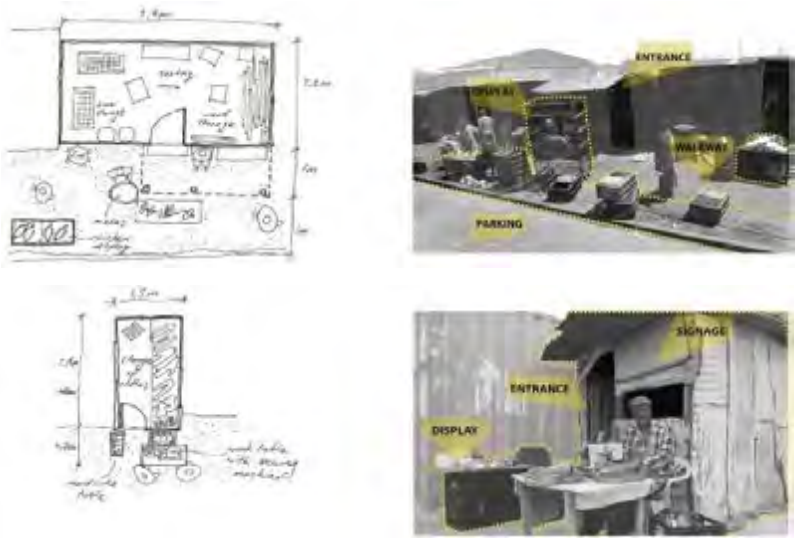


Figure 69: Two case-studies of traders demonstrating the display of products

In order to understand the very complex and nuanced networks and urban patterns around Sibanye Square, the studio undertook a variety of interviews with traders. Through these interviews it is possible to determine what the greatest needs are for traders and to extract clues as to how to design retail space around Sibanye Square. Some of these requirements are: secure storage, shelter, a place to display the product, flexible selling space, and a good location. It is clear that different traders have very specific needs; consequently, retail space needs to be flexible enough to accommodate many different types of retail.

Figure 70: One of the bigger shops around the Square, the Chinese container shop is made of four shipping containers joined together to create one big shop. This seems to be one of the more affluent shops, selling a variety of items from imported clothes, to televisions, sound systems and other electronics. The owner's main concern is getting robbed, and one of his four employees' job is as a security guard for the shop. He has been robbed many times and would like to move his shop from a container to a formal structure. He is one of the few shop owners who pays rent to the City of Cape Town.

Figure 71: The "chairman" of Sibanye Square seems to be the self-appointed manager of the square's retail operations. He operates from a container on the northern edge of the square from where he also runs a braai shop.

Figure 72: Pamela sells second-hand clothes on Sibanye Square at the Saturday market. The only items she needs to run her stall is a piece of cloth laid out on the ground to keep the clothes clean and 10 small rocks to weigh down the cloth. She is a temporary trader and takes the clothes with her when she leaves Sibanye Square by carrying them in a bundle in the big cloth. At the time of the interview it started raining and she was forced to bundle up the clothes and wait under a tree for the rain to stop before she could lay out her stall again. She would like to be able to sell her clothes under a shelter so that she does not have to spend the day standing in the sun or rain. She would also like to have somewhere safe, close to the square, to store her clothes so that she does not have to transport them home and back.*

Figure 73: Lindi is a temporary trader selling household equipment, such as buckets and brooms, outside the Spar. She lives in Khayelitsha and buys her goods in Athlone. Since she is a temporary trader and has nowhere to store her goods, she has to transport all of her buckets and brooms on a taxi every day. She would like to trade from a container so that she can safely keep her goods in Delft.*

Figure 74: John is a business man who owns a shipping container on Sibanye Square that he rents out to a tailor. The tailor operates his service from the container and pays R800 a month in rent to John. R800 is considered a relatively high price for renting a container, due to the good location on Sibanye Square.*

*Names have been changed to protect the privacy of interviewees

CHAPTER FOUR | construction opportunities

4.1. Delft's self-build industry

One of the most prominent types of micro-enterprises found in Delft South is the hardware store, which caters to Delft's flourishing self-build culture. Everything from tools, electric fittings, cement mix, concrete blocks, sanitary ware, timber boards, gates, burglar bars to entire shacks (or "Wendy houses") are sold to people who are renovating or building their homes. Many building services are also offered, such as the installation of gates and burglar bars, plumbers, painters, and general builders.

Figure 75: A truck delivers building sand to a main road hardware store.

Figure 76: This hardware store owner sells cement mix and concrete blocks.

Figure 77: This shop specialises in plywood, chipboard and timber sheets.

Figure 78: A welder constructs burglar bars on the main road.

Figure 79: Recycled metal tools on the main road.

Figure 80: Metal gates made in Delft are sold on the pavement along main road.

Figure 81: One of the bigger hardware shops selling concrete and timber products.

Because there is an existing method of building in Delft South, it is important to design and construct in a way that accommodates these techniques and technologies and that takes advantage of what is already being sold in Delft. Methods that are most often used to construct or renovate homes are concrete block construction or timber frame construction that is clad with corrugated metal. These construction methods are both very cost effective as well as easy to carry out by people who are not necessarily trained builders and can be executed in an ad-hoc way.

Figure 82: Concrete block double storey renovation.

Figure 83: Lightweight frame construction is used for a first floor renovation.

4.2. Potentials of the concrete block

While the dominating material and method of construction in Delft is clearly the concrete block due to its accessibility and affordability, there is still opportunity for a wider group of people to benefit from this material, in terms of income and skills development.

Concrete blocks are very easy to make as they set on their own and do not need to be fired. All that is needed to manufacture concrete blocks are the ingredients (sand, cement and water), a flat surface and a mould or press. While the mould or press can be a relatively costly investment, the running costs are very low. All of these factors coupled with the incredibly high demand of blocks in Delft, makes the manufacturing of concrete blocks a potentially lucrative business.

By speaking to a hardware store owner who also makes his own concrete blocks, it seems that the biggest challenge for the business is storage of the blocks, as many of his blocks get stolen when they are laid out to dry. If it were not for the compromised security of the blocks, he would have a thriving business. He is able to make 1000 blocks in two days and estimated that if he had a bigger space he would be able to make 1500 blocks in one day. He only makes a 140mm deep block and therefore needs only one type of press. He sells a block for R6 which is cheaper than the price from a certified factory due to their poorer quality.

Figure 84: A local hardware shop owner makes his own concrete blocks using a press.

Figure 85: He sells his concrete blocks on an empty plot on the main road.

This three-part housing project therefore has the potential to create business opportunities for people making blocks in Delft. In order for this to happen in a more worthwhile way, concrete block manufactures should be assisted with secure land to operate from and should comply with a certain quality of product. In order to carry this out in a sustainable way, a partnership between the developers, the City and the Cement and Concrete Institute would be required. The Cement and Concrete Institute already has a skills development department and encourage small businesses to make their own concrete blocks through their step-by-step guide to starting a block manufacturing business.

Table 3: Information on a small selection of available blockmaking machines

Equipment	Operation H = hand P = power	Brick or block		** Approx. maximum daily production
		Size, mm	Type	
6-brick hand mould	H	222 x 106 x 73 or 220 x 105 x 75	Brick	1 200
10-brick egg-layer	H		Brick	4 000
15-brick egg-layer	H		Brick	8 000
Vibrating egg-layer*	P		Brick	10 000
Vibrating 8-drop with pallets	P		Brick	10 000
1-block mould	H	390 x 190 x 190	Hollow block	500
1-block mould	H	390 x 190 x 140	Hollow block	500
4-block egg-layer	H	390 x 190 x 190	Hollow block	1 200
5-block egg-layer	H	390 x 190 x 140	Hollow block	2 000
Vibrating egg-layer*	P	390 x 190 x 190	Hollow block	1 600
Vibrating egg-layer*	P	390 x 190 x 140	Hollow block	2 400
Vibrating egg-layer***	P	190 x 90 x 90	Brick	1 000
Vibrating egg-layer***	P	290 x 140 x 90	Solid block	5 000

Figure 86: The Cement and Concrete Institute's estimate of the daily production of concrete blocks.

Aside from the income generating potential of manufacturing concrete blocks, there is also the opportunity for skills development in building with concrete blocks. Currently, people build with concrete blocks in a very straightforward way without always using the blocks to their full potential. There is opportunity, again through a partnership with Cement and Concrete Institute, to develop better masonry skills so that people can also build better houses for themselves.

Furthermore, using the principles of casting small but robust concrete elements, there is potential to take it further than concrete masonry units only. By manufacturers buying or making new moulds, they open up the opportunity to create new elements that can become part of Delft's construction culture. These elements can include decorative breezeblocks, used for screens and non-load bearing walls, or even rib and block elements for floor slabs.

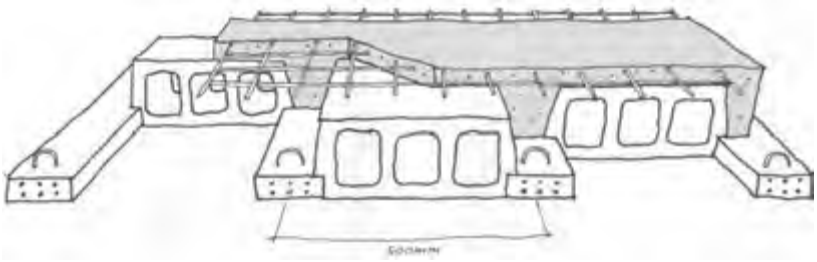


Figure 87: Rib and Block floor slab
The blocks are supported by reinforced concrete lintels (ribs). 50mm of reinforced concrete is cast over the ribs and blocks. The block elements are cast in the same way as concrete masonry units.

4.3. Lightweight frame structures

While concrete blocks are preferred for their robustness and durability, lightweight timber frame structures are also very popular for their lightness, ease of construction and affordability. The limitations of the ways that lightweight structures are used in Delft result in very poor thermal and acoustic insulation and seriously compromised security and safety of the structure. Timber frame construction is used both informally and formally.

Currently, the way that people self-build informally with timber frame structures is very basic and does not fulfil the potential of the construction method. In most cases, a basic recycled timber frame is clad with corrugated metal or plywood sheeting with no insulation and limited structural integrity. Similarly to the concrete block construction, there is the potential for skills development in building with timber frames.

Figure 88: Homes made of recycled metal and timber.

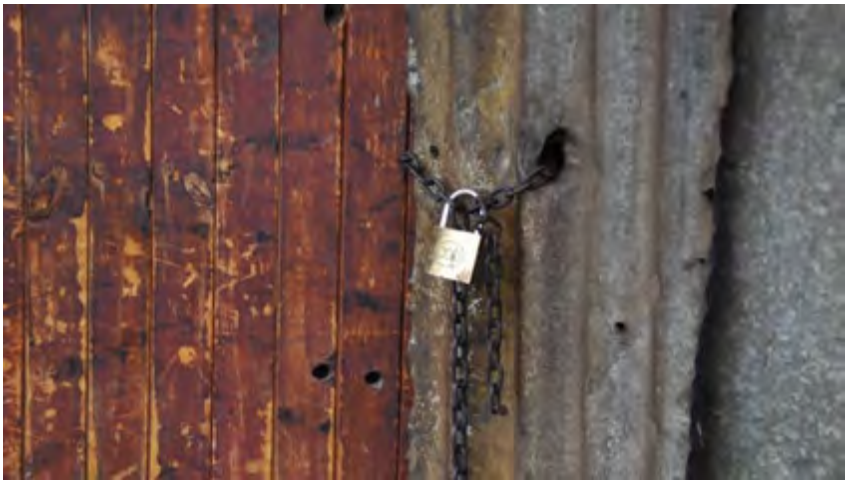


Figure 89: The "foundation" of a timber frame shop.

Figure 90: A small padlock is used to lock a shop made of a lightweight structure.

Figure 91: This tailor has endured many break-ins into his shop and is now unable to store anything in his shop due to the inadequate security of his structure.

While timber frames form a significant part of the informal building culture in Delft, many *formal* subsidised houses were also built using lightweight timber frames and clad with corrugated asbestos, corrugated metal, or more recently in the case of the N2 Gateway development, Nu-tec. Although the move from asbestos to Nu-tec is certainly an improvement, there is still a sense of dissatisfaction with the Nu-tec houses because of issues relating to thermal insulation and safety, and it is clear that people's first choice for the materiality of their homes is always concrete blocks or bricks.

Some of the more interesting subsidised houses built in the 1990s used a combination of blocks *and* lightweight asbestos panels. The asbestos panels were used to clad the sides of the houses in order to allow people to easily renovate and add to their houses along the sides. In this way, the lightweight panels were used to give clues as to how people should add to their homes.

Figure 92 & 93: These two homes have been renovated using corrugated metal along the sides of the houses that are made out of asbestos. The front facades were built out of blockwork.

Because building with lightweight materials is cheap and easy but concrete blocks are more desirable, often a combination of masonry and lightweight construction is used. In some cases people live in or run a shop from a lightweight structure but are in the process of building an entirely separate blockwork structure around the lightweight structure. This allows people to slowly save money over time and build the blockwork bit by bit while still living or working from the site.

Figure 94 & 95: Two lightweight structures are occupied while a new concrete block building is slowly constructed around the original structure.

4.4. Construction precedent

Elemental - Quinta Monroy Housing

While this precedent has been used prolifically over the last few years, it is included in this study by virtue of its capacity as inspiration for technical consideration. The combination of blockwork and lightweight materials, develops a language of incrementality and gives clues as to how to renovate.

As shown in the section below, the use of heavy- and lightweight material for certain walls, demonstrates to owners where they should extend. This creates a clear set of rules that can ensure the avoidance of conflict and tension between neighbours. It also means that while the overall house is robust and sturdy, there are elements that can be changed.

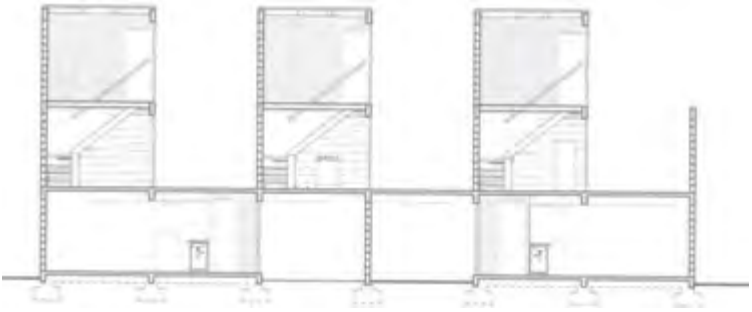


Figure 96: Section through Elemental's Quinta Monroy housing showing the solid concrete masonry wall on the left of the unit and the lightweight flexible wall on the right.

Figure 97: The lightweight board wall allows for easy extensions to the side of the unit.

Figure 98: The housing after extensions of units.

CHAPTER FIVE | design response

5.1. Narrative, brief and programme

The design outcome of the research for this dissertation constitutes a three-part housing development located around Sibanye Square in Delft South. Each of the three components of the housing project respond to different social and spatial conditions that emerged from the research, but at the same time work together to create one cohesive urban intervention. The three housing types include the "Bonded Row-Housing", the "4-Plot Apartment Housing" and the "Sibanye Market Housing".

A variety of housing types has been included in the project in order to demonstrate that there is not one single housing solution, but rather that there is value in a variety and diversity of housing types. While there is currently a degree of housing diversity within Delft South, there is also a gap housing market that has not yet been capitalised on.

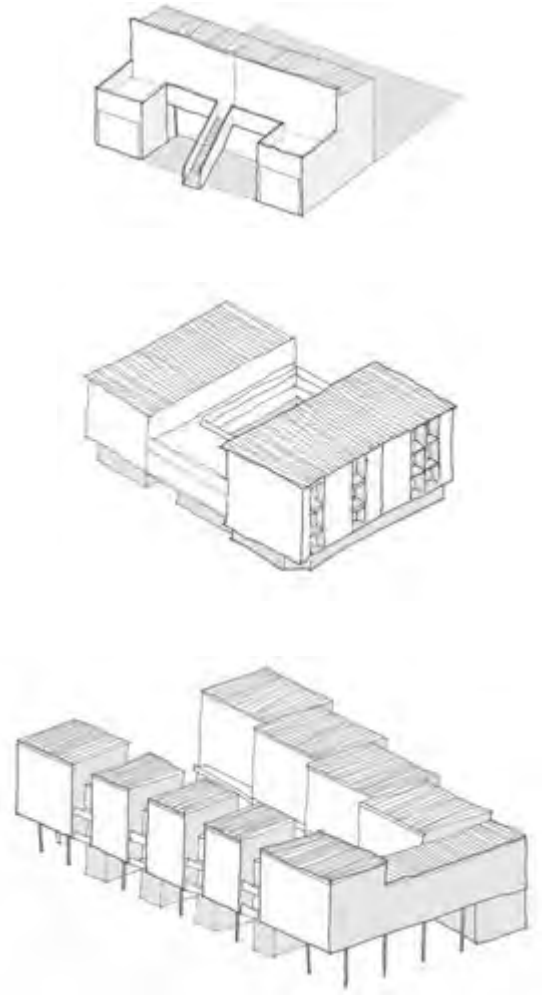


Figure 99: Massing diagrams of the Bonded Row-House, the 4-Plot Apartments, and the Sibanye Market Housing, respectively.

The Bonded Row-Housing development works as a private ownership model and is based on a public-private partnership with a bank that assists people in obtaining a loan to purchase a unit. This housing relies on the city's donation of the land but does not include an official state subsidy. A major consideration of this housing unit is to accommodate retail activity along the street edge as well as rental units, in order for households to generate income to pay off the bond. The model is generic in that it could be replicated on different sites in Delft as well as in similar areas outside of Delft.

The 4-Plot Apartment Housing is a mixed-use model that relies on a relatively small private local developer consolidating four Delft plots to build a single apartment block. This housing type works as a typical property development economic model with no government subsidy or assistance. The tenure type is rental and can accommodate a variety of units for singles, couples or families. The ground floor of the block would be reserved for retail activity. The developer would manage the rent collection and maintenance of the housing and shops. While rent would have to be very low, tenants would typically have to be earning some sort of income, either formally or informally, in order to pay rent, rates and services. This model is replicable but only to specific sites along the main road in Delft South.

The Sibanye Market Housing is a very specific non-replicable model that relies on a partnership between the City of Cape Town and a private developer. It occupies the main part of Sibanye Square where the Saturday market takes place. Like the 4-Plot Apartment Housing, it is a mixed-use model with rental units for couples or families. The ground floor can accommodate the market and retail activity in a very loose and flexible way, with both designated retail spaces for rent as well as free open retail space. The ground floor structure would be paid for by a grant from the city as it would act as a central civic and retail space in Delft. The upper levels accommodate rental apartment units and are provided by a housing developer, who would manage the rent collection and maintenance. Like the 4-Plot Apartment Housing, tenants would have to be earning some sort of income to pay for rent and rates. Because this is a relatively big housing development, a crèche, meeting room, homework room and caretaker's flat all have to be included.

While the three housing developments make up the most important part of the project, there are other programmes that form part of the urban design. These include public toilets for the taxi rank; shops; a taxi association building; a 5-a-side soccer pitch over the taxi rank; a small concrete block manufacturing factory; and other proposed housing developments.

5.2. Urban Considerations

Figure 100: A perspective diagram showing the various new urban developments.

Reinforcing the main road

The three housing developments are located halfway along the Delft South main road and are inextricably linked to the activity that takes place specifically on the main road. The main road provides huge potential for retail as well as proximity to civic amenities, and is seen as a desirable place to live in Delft. The three housing developments provide an opportunity to accommodate much higher living and retail densities that are currently not being achieved.

Dividing Sibanye Square

Currently the Sibanye Square block is double the depth of a normal Delft Block. The scale of this block is clearly too big, as people have intuitively divided the block into two, by placing a line of retail containers along the length of the block. Part of the urban plan is to divide the current Sibanye Square block into two parts by running an extra road down the middle of it, dividing the square into two more manageable pieces. This new road at the back of the market will have a much more residential feeling but will still accommodate retail activity.

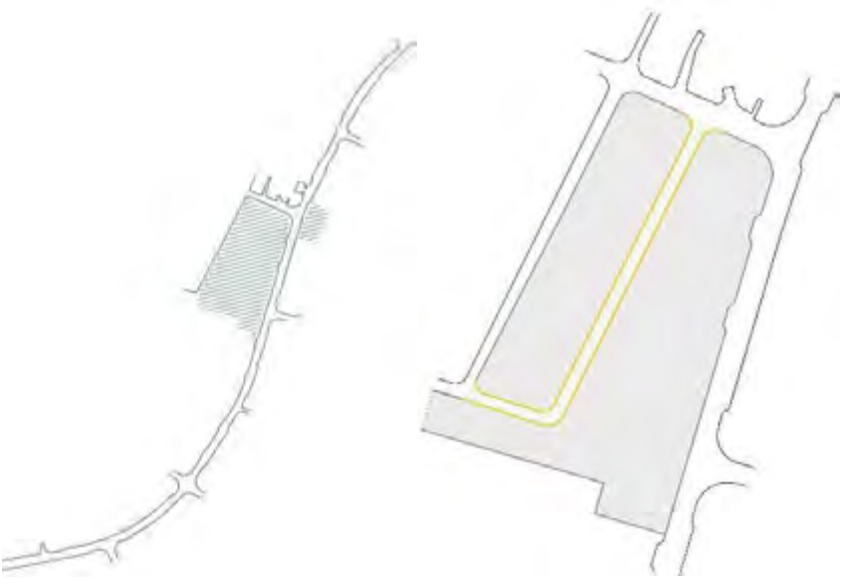


Figure 101: Reinforcing the main road

Figure 102: Dividing Sibanye Square, the new road shown in yellow

Creating civic anchors and landmarks

Anchors and landmark buildings are fundamental in creating a complex and interesting city and improving the legibility of the city. Currently there are very few anchors in Delft South, apart from the Spar and the taxi rank. The Sibanye Market Housing has the ability to become a very important civic anchor and landmark building in the area through its scale and use as a community market and retail node. It is also situated between the Spar and the taxi rank, thus creating an important civic precinct.

Defining street edge

Improving the Delft street edge has both social and spatial implications. On the one hand, it entails accommodating retail and social activity to ensure a vibrant urban environment. This can be done by accommodating informal shops and trading along the street edge and by providing external circulation for the housing developments on the street edge. On the other hand, improving the Delft street edge requires the creation of a spatially defined, clear and contained edge with an increase in scale in certain places of civic importance, such as Sibanye Square. Part of creating a legible and complex urban environment is allowing for spatial hierarchies of civic importance. The Sibanye Housing Developments will create both an active retail and social edge as well as a clearly defined and civically important edge.

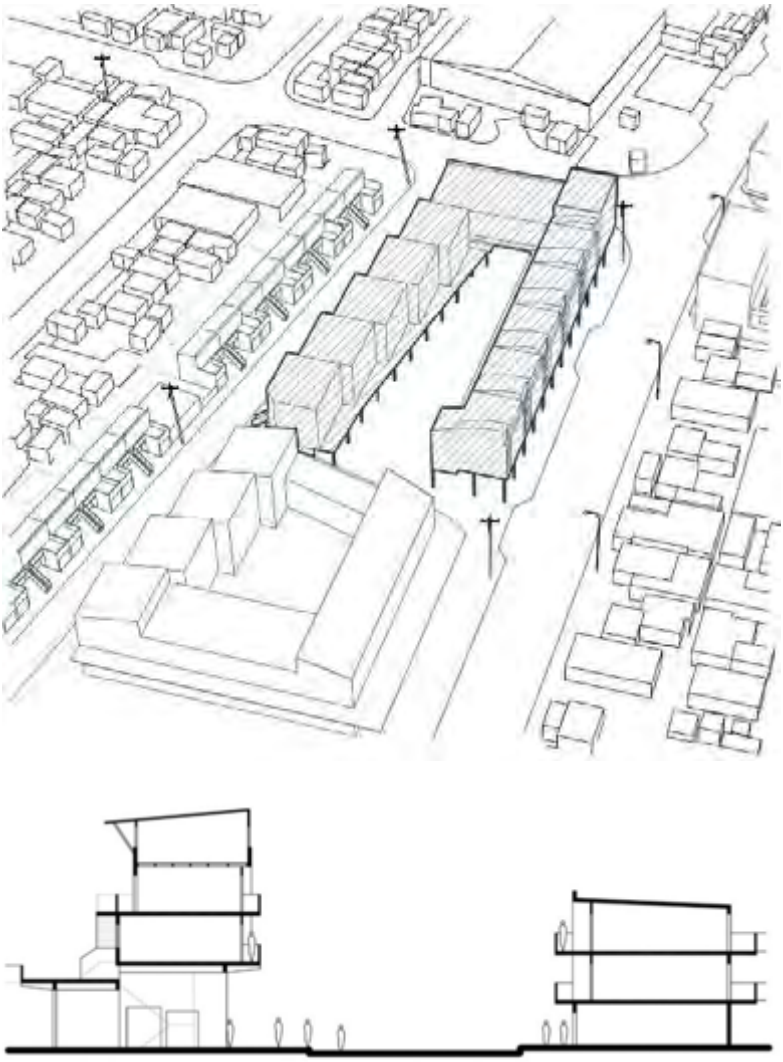


Figure 103: Creating civic anchors and landmarks

Figure 104: Defining street edge

Increasing scale

In order to accommodate the increased living densities an increase in scale from what is the current condition is necessary. The height of the housing however, is limited to the number of storeys that someone can comfortably walk up without a lift, which, in South Africa, is four. Four storeys is also an appropriate scale to use for an important landmark building but one that doesn't completely dominate the urban landscape.

Accommodating pedestrian movement and connections

Because the Sibanye Housing Developments are situated around an important civic, retail and transport node, movement routes are important considerations. Along main road is the busiest route, especially between the Spar and the taxi rank; however, there are also important movement routes perpendicular to main road that lead from the residential areas. Pedestrian movement happens in conjunction with crowded retail activity that spills onto the pavement and street, and walking along main road is a continuous negotiation. For this reason, pavements and strong movement routes are made much wider to accommodate the strip of chaotic retail activity.

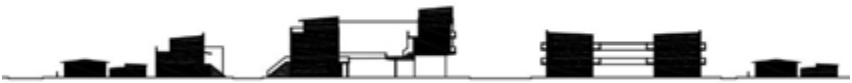


Figure 105: Increasing scale

Figure 106: Accommodating pedestrian movement and connections

Increasing density

To give an indication of the current density figures in Delft, the original government RDP houses were built at a density of 40 to 60 units per hectare. The current density of Delft South is around 150 units per hectare, which has created a very overcrowded urban condition because of the vast majority of dwellings being single storey.

Creating public space and amenities

Because of the high densities and increase in population due to the new housing around Sibanye Square, it is important for a variety of public and civic amenities and open space to be able to support the increased community size. For this reason, it was very important to keep the ground plane of Sibanye Market open with housing above. The taxi rank is another big open space that is only used for taxis in the morning and is unused in the afternoon, creating the opportunity for the dual use of 5-a-side hard surfaced soccer pitch. Other important public amenities are public toilets for the taxi rank and for traders, as well as crèches, homework rooms and meeting spaces.

	Row-House	Sibanye	4-plot (x2)
No. of Units	20	60	26
Footprint	2016m^2	2252m^2	602m^2
Original density	90 u/ha	266 u/ha	431 u/ha
Possible density	360 u/ha		
Population (estimate)	160	240	65

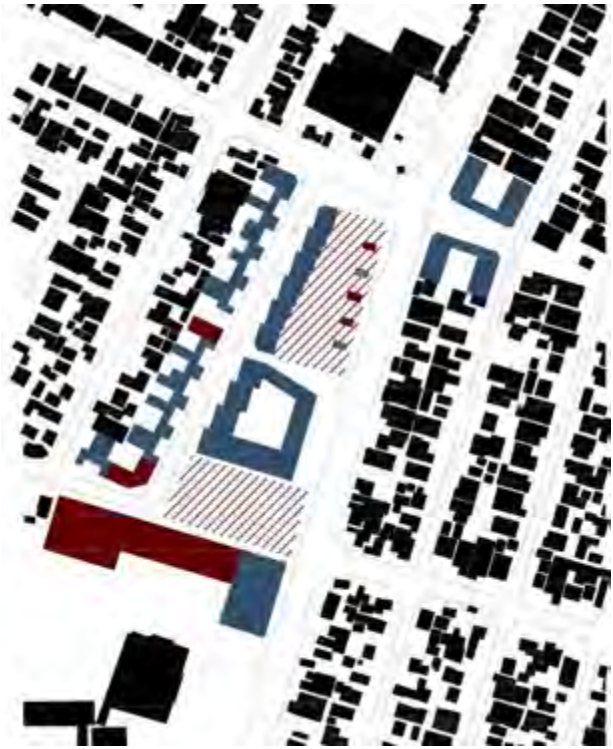


Figure 107: Creating public space and amenities: the new public amenities shown in red

5.3. Architectural Considerations

Although the Sibanye Housing development is comprised of three parts that each respond to different social and spatial conditions, there are many spatial considerations that are common across the three developments.

Accommodating agency

Accommodating agency in housing manifests very differently in rental units as opposed to owned units. In both types of tenure systems, this project seeks to maximise inhabitants' sense of autonomy and agency.

In the two rental models this manifests as giving inhabitants a sense of choice in unit types as well as freedom in the unit plan to arrange the space as required without needing to renovate the unit. The variety of unit types ranges from small bachelor rooms, simplex studio apartments, two bedroom simplex apartments and bigger two and three bedroom duplex apartments. This allows people to have freedom in choosing a unit type that financially works for them and that accommodates their family configuration. The freedom of unit plan is created by lining up service spaces (bathrooms, kitchens and staircases) in order to free up the rest of the unit that can be arranged with living or sleeping space, as the inhabitants require. This means that there is flexibility in the number of people a single unit can house in order to accommodate different financial needs. For

example, a family of four with a limited budget is able to occupy a single studio apartment by forfeiting a generous living space.

Figure 108: Two identical units are arranged in different ways to suit different households' needs.

Agency in the owned bonded row-housing, on the other hand, manifests as infinite change potential and the ability to build incrementally as required. It also allows the owners to generate a generous income from business and rental in order to supplement the payment of the bond. While the original units are very small and affordable core structures, they all have the potential to become multi-storied generous homes accommodating extended family, rental and business. The different way in which people renovate and extend their homes due to their specific needs, will also create an interesting and varied built fabric.

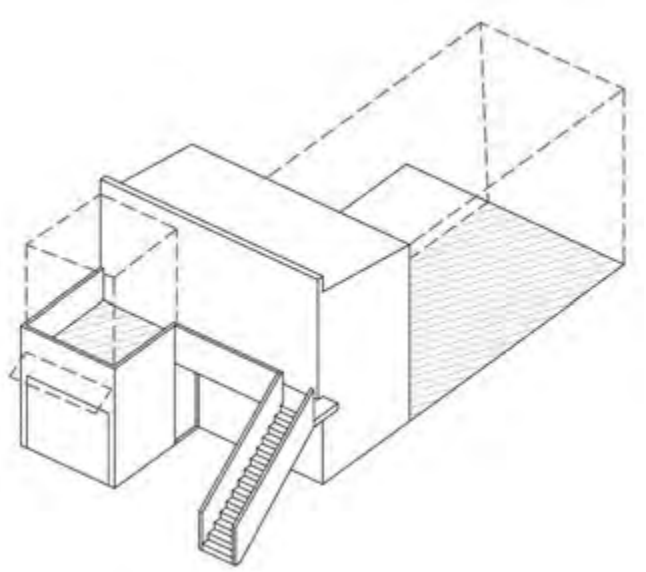


Figure 109: For the row-house typology, the original unit can be easily renovated incrementally over time to suit the household's requirement. Space for extended family, rental units and/or retail space can be accommodated once the unit is renovated.

By providing housing that offers a sense of autonomy and agency in these ways, density can be grounded in the financial and social realities of different families and individuals that each have very specific needs and desires.

Grounding circulation

A large part of this dissertation is acknowledging that circulation is a fundamental component of dense living conditions that have important social and spatial implications in its ability to connect people to each other and to the ground plane. In order to break from the modernist mass housing models, the Sibanye housing avoids long internal corridors and follows a walk-up typology with no lifts.

The three different housing developments' circulation all function in very different ways that are relevant to each project. Some have more important place-making functions, while others value high efficiency. However, they all have to follow strict fire regulations and all contribute to a sense of community and social cohesion within the housing projects. While the more efficient circulation happens internally, the circulation along the residential back street takes place directly off the street in the form of many staircases in order to create a vibrant and busy environment.

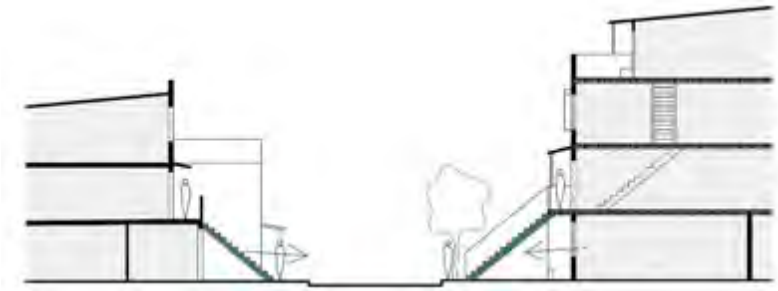


Figure 110: A section through the Row-Housing and Sibanye Market Housing showing how the staircases create a vibrant and defined streetscape.

Creating meaningful open private space

High density living can often result in a lack of privacy. This is certainly true about the current low-rise, highly dense and overcrowded conditions of Delft South where there is very little private open space.

The Sibanye housing developments therefore, all strive to ensure a large degree of meaningful private outdoor space. In the rental units this is achieved by private balconies which are, in some cases, very generous. In the owned units, it is difficult to control the amount of open private space as people will extend their units as they please; however, open space can be encouraged by giving design clues on how to extend within a "zone of expansion". Furthermore, the addition of a second storey takes the pressure off the ground floor, and rental units can take place upstairs, freeing up the backyard to be used as private open space.

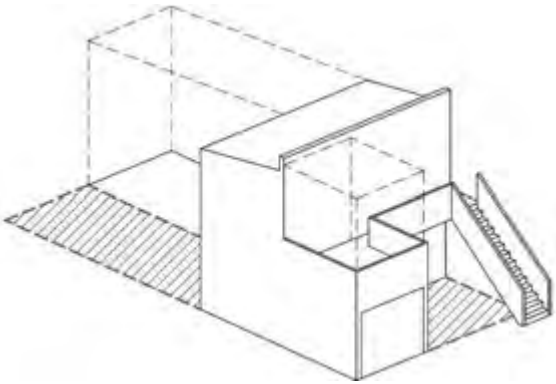
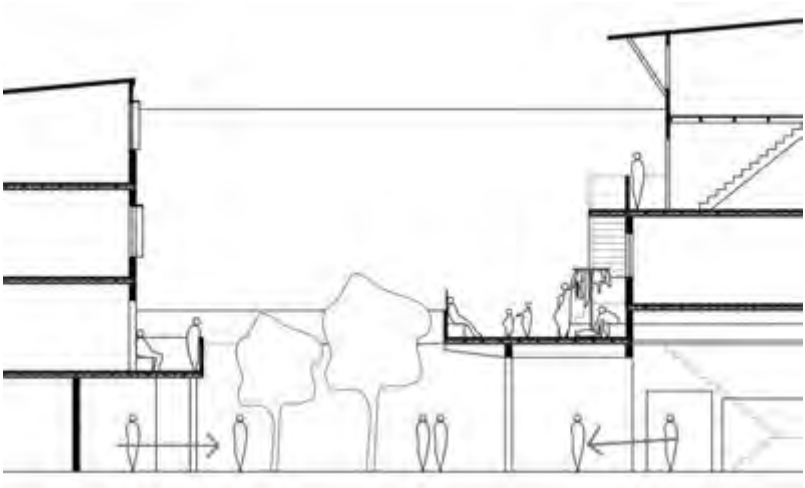


Figure 111: The "zone of expansion" encourages a generous amount of outdoor space to stay open.

Creating semi-private recreational space for the everyday

Such dense living also requires semi-private recreational space for the housing projects. Communal open recreational space are important facilities for dense living, especially in the apartment blocks where units do not have direct access to the ground floor. In the 4-plot Apartment block, this is achieved by a communal semi-private courtyard as well as an open deck on the top floor. These spaces can be used for hanging laundry and for children to play. The Sibanye Market Housing does not have a private ground floor, so this space has to be provided on the first floor with a large raised platform that gives access to the units. The combination of private balconies and semi-private communal outdoor space, can alleviate the feeling of overcrowding in such dense housing.

Simple domestic "ordinary" activity such as washing and hanging clothes, taking out rubbish, cooking, doing homework or talking to neighbours, all have the potential to be accommodated and celebrated in a way that contributes to a vibrant community. Thus the details of every day domesticity is acknowledge and designed for. Washing is big part of everyday domestic life and in each housing development it is thought through in terms of shading, sitting space, drainage and hanging. Storage of communal rubbish is important as well as storage of individual household "clutter".



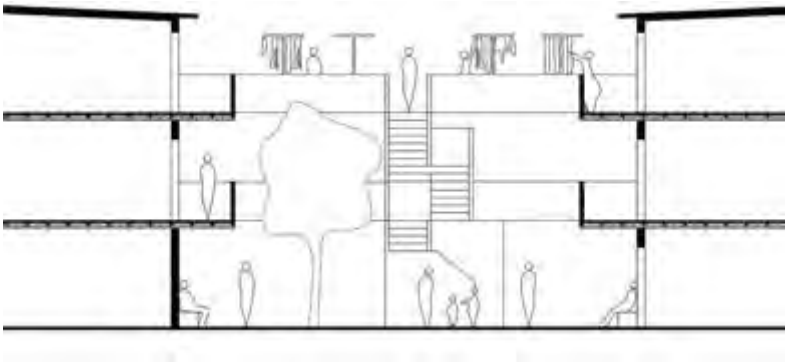


Figure 112: A section through the Sibanye Market Housing showing the communal elevated platform for hanging washing and children to play.

Figure 113: A section through the 4-plot Apartments showing the communal courtyard and washing deck.

Rationalising services

The placement of service spaces such as bathrooms and kitchens, as well as service ducts was an important part of designing the housing units. As mentioned before, services are lined up in order to free up the rest of the plan for flexibility of living and sleeping arrangements. It is also important to line up services in the apartment blocks for efficiency of plumbing systems and to minimise the number of ducts needed. Ducts are also made more efficient by being shared between two units. Mirroring units, rather than copying units, allows the services of two units to line up against each other and can then share one duct.

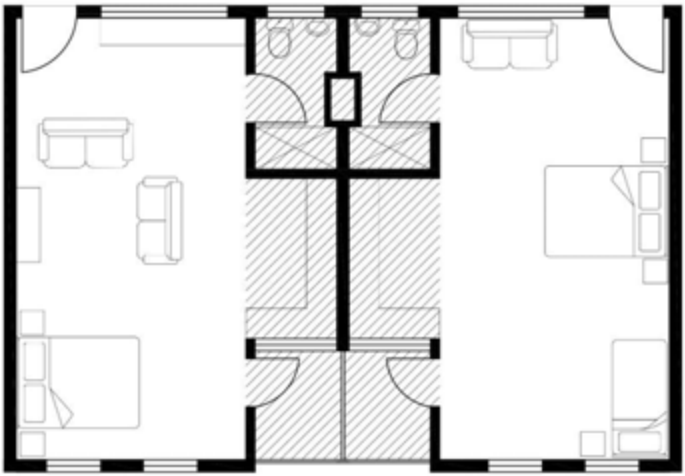


Figure 114: The plan of two rental units sharing the same service core, each made up of a bathroom, kitchen and balcony.

Responding to climate

Because the main road runs in a north-south direction, the Sibanye Housing developments, which face onto the main road, have their longest facades facing east and west, and very few units facing south. The lack of old big trees and other tall buildings means that there is little protection from the sun. Shading devices over openings are important to regulate the direct sunlight, as well as generous overhangs for protecting pedestrians. Deep fin walls enclosing the balconies on the north and west facades will ensure that the units get a lot of light but controlled direct sun.

Fortunately the prevailing winds, which are extremely strong in this part of the Cape Flats, run perpendicular to the main road. This means that the chance of the relatively tall housing blocks on either side of main road creating an unpleasant wind tunnel is very low.

Plenty of trees have been planted in the last few years on Sibanye Square. While they do not provide any shelter yet, it is important to preserve them as much as possible in the building of the new developments. As much as possible, the buildings surround the trees without having to remove many of them.

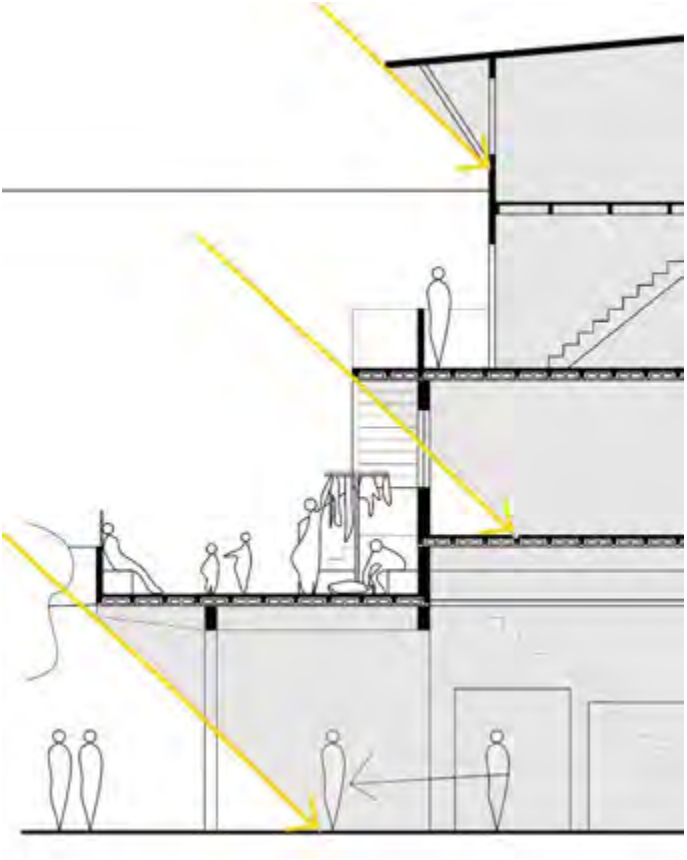


Figure 115: A section through the north-west façade of the Sibanye Market Housing shows the importance of shading devices and overhangs to create climatically comfortable conditions in both the units as well as on the public street below.

5.4. The three housing components

Bonded Row-Housing

Because the row-houses are an affordable bonded model, they would have to be as cheap as possible to ensure that people do not take out massive loans from the bank that they are unable to pay back. Such a limited budget can only produce a very small and basic "starter home"; therefore, it is fundamental to design units that can be incrementally extended and renovated over time and that can generate an income to pay off the bond. The general rule for designing incremental housing is to provide what the inhabitant may not be able to provide for themselves, such as service spaces, the main structure and staircases.

The Sibanye Bonded Row-Housing therefore, provides owners with a very basic double storey unit of around 80m^2 and a footprint of 40m^2. Each house sits on a 112m^2 plots size of 7m wide by 16m deep. The depth is determined by the current size of Delft plots, but the width is narrower than current plots sizes. The 7m width was determined by its ability to accommodate half a staircase (0.5m), a yard that can fit a car and access to the front door (3.5m), and a front room that can be used for a shop, bedroom or rental flat (3m).

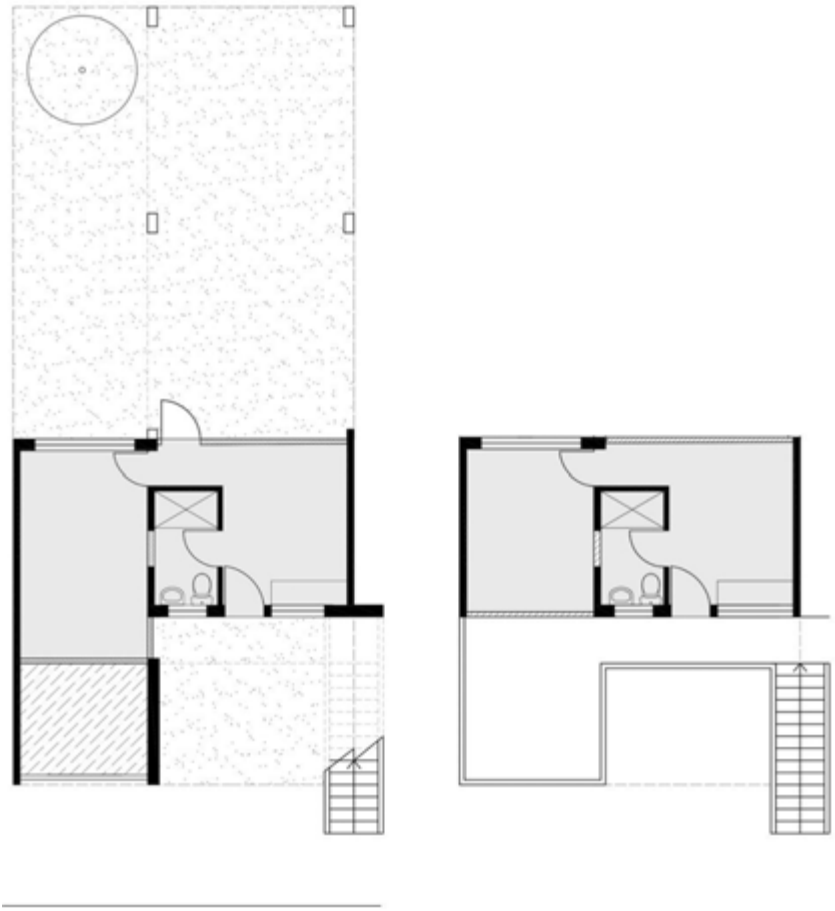


Figure 116: The ground and first floor plans of a row-house before any extensions or alterations are made to the unit.

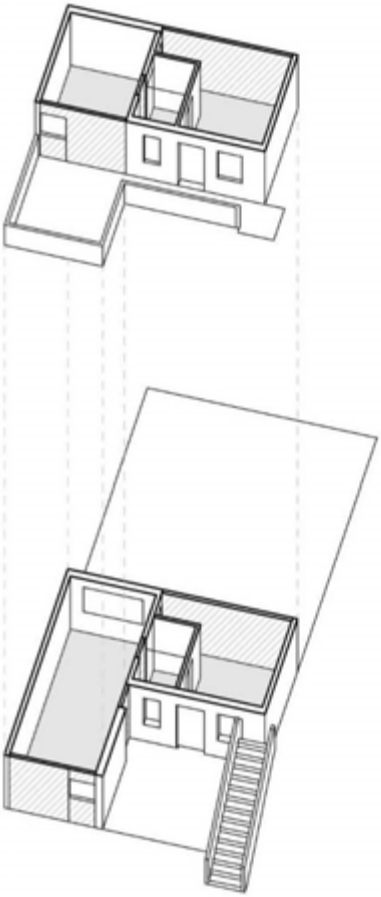
On each storey a small kitchen, a small bathroom, a single room and a staircase (shared between every two houses) is provided. On the first floor the room is the size of a single bedroom but on the ground floor the room is large enough to be two bedrooms, a bedroom and a shop, a large shop or a large rental unit. This room juts out from the rest of the house onto the edge of the boundary in order to function as a potential shop. The staircase also protrudes out onto the boundary on the other side of the house, creating a more private front yard with a deep threshold space that can accommodate a car or a small front garden.

The bulk of the site at the back is left open for people to extend in a way that suits them. There is an intended "zone of extension" along the side of the plot in order to keep a courtyard space open between the units. While this cannot be enforced, it can be encouraged by providing a simple timber structure in the zone of expansion only.

While a fundamental design principle for the row-houses is flexibility, there is an "optimal" way of using the unit in a way that generates income if the inhabitants require it to. This is especially relevant if households need a supplemented income to pay off the bond. This is achieved by the owners of the house occupying the ground floor and renting out the top floor. It is for this reason that the staircase is placed on the outside in order to give tenants private access to their rental units. Once extended, the top floor has the potential to act as one big three-bedroom rental unit, or two smaller units. The top floor can alternatively accommodate extended family. The

bottom floor, occupied by the owner's household, is able to function as a big three bedroom house once renovated, with a shop in the front, and/or another rental unit in the front.

Figure 117: The ground floor of a renovated unit showing an optimal situation, with living space for a family (light grey), a small rental unit (dark grey) and a small shop in the front (hatched).



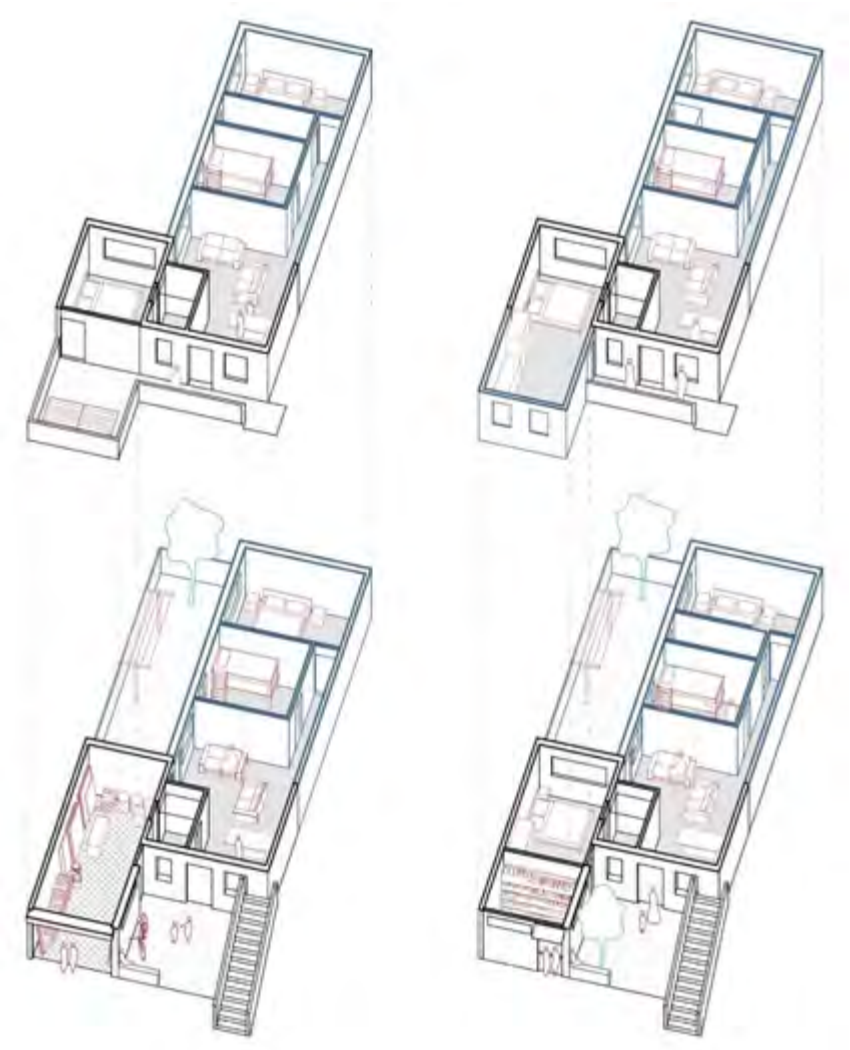


Figure 118: Exploded axos showing the potential for the unit to be incrementally renovated, with additions shown in blue and the original structure shown in black.

The strength of the model is that the household is able to choose what kind of configuration best suits their needs. A bigger family may forfeit the shop and rental units in favour of more bedrooms. An unemployed household may prefer as many income generating units as possible with fewer bedrooms. A successful shop owner may want to forfeit sleeping space to have a bigger shop. A wealthier family may choose to use the front room neither for business nor rental, but for a car garage.

It is useful to give inhabitants design clues on how to renovate in order to encourage a healthier living arrangement with meaningful private outdoor space and to offer flexibility. Design clues can be offered through the materiality of the house. As was used by Elemental in the Quinta Monroy housing, as well as the previous RDP houses in Delft, the combination of concrete blocks and lightweight construction can suggest which walls can be extended, such as to the back of the site.

Lightweight construction can also be used to suggest the addition of new doors and access points. For example on the walls of the bathrooms, a future door is suggested to make the bathrooms function as part of the separate rental unit. In this case another bathroom would have to be built for the other unit or alternatively two units could share the one bathroom, each with their own access.

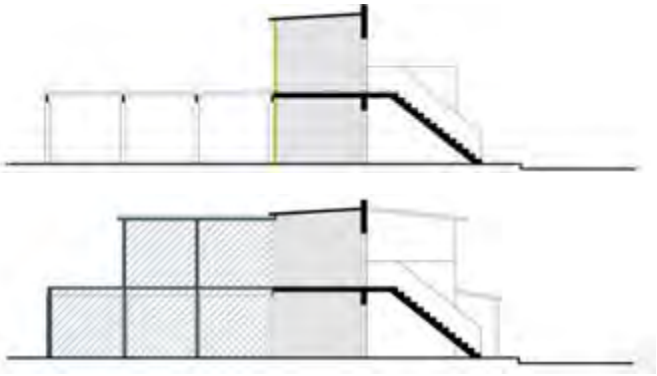


Figure 119: Diagrammatic sections show before and after renovations are made. Lightweight temporary walls are shown in yellow and the new additions are shown in blue.

Apart from the social implications of the space, there are also important aesthetic considerations, especially for the impact of the housing on the street. A strongly defined edge condition is created by placing the house close to the street edge and by the front room and staircase popping out to meet the pavement. The continuous row of houses creates a contained and defined street condition, and the pop-outs and recesses creates a complex façade. The exterior circulation, front balcony and potential shop creates an active street edge.

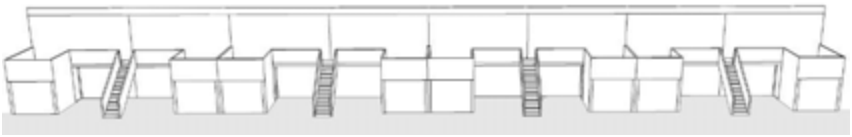


Figure 120: A diagrammatic elevation of a row of units

4-Plot Apartment Housing

The reality of private housing development is the desire to maximise efficiency and therefore, profit. As a result, the 4-Plot Apartment Housing is based on a highly efficient and dense model that has the capacity to generate large profits. The footprint is made up for four Delft plots of 10m by 16m each, creating a compact overall footprint of 20m by 32m.

While the purpose of this development is profit, it still has very important urban and spatial implications. The two blocks emphasise and create a clear movement route from the residential 'back-quarters' to the main road. Currently, this pedestrian route is undefined and unsafe. However, it is still an important retail node that the studio group came to call "the mall". Its prime location opposite the Spar and continuation from the bustling Sandelhout Road, means that it is constantly busy and dense with shops and traders. The entire ground floor facades facing Main road and the pedestrian route, are therefore rented out exclusively as shops. While these shops are more formal in the sense that they are rented, the route between the two buildings is still wide enough to accommodate free trading.

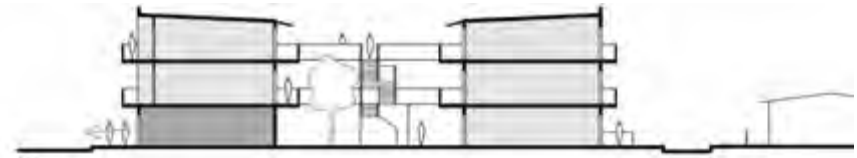
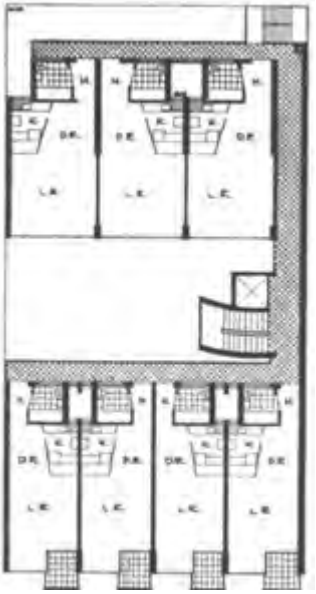


Figure 121: A section through the 4-plot Apartment, the retail space in shown in dark grey

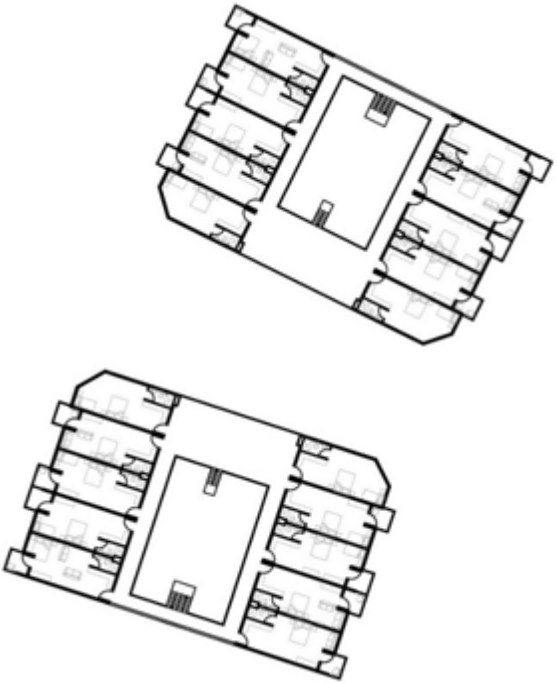
Figure 122: The ground floor plan of the 4-plot Apartment, showing rentable retail space in dark grey and the movement route in red

Instead of staircases being shared by only a few units, this model uses a much more efficient model of the whole block sharing two staircases and accessing their units via external corridors. Because these housing developments are relatively small, the efficient internal circulation does not have as negative an effect on the street as is the case with other big modernist mass housing developments. In order to still create an active and interesting façade large balconies face onto the main road and pedestrian route. This model is loosely based on Aiton Court in Johannesburg.



Figures 123 & 124: A photo and typical plan of Aiton Court, Johannesburg.

Access to the units is achieved via a communal courtyard with two staircases leading to the external corridors above. The four ground floor units have access from both the communal courtyard and the street behind main road. The first floor contains two smaller room units and ten bigger studio apartments for a couple or a small family. The second floor has an open deck area for hanging washing, and a further ten studio apartments. All units have their own private balconies. Shading on the north and west facades is achieved by deep balconies sheltered by the slab above and protected by deep structural fin walls.



Figures 125: The second floor plan of the 4-plot Apartment.

Sibanye Market Housing

Developed as a partnership between a private developer and the City of Cape Town, a primary function of the Sibanye Market Housing is its ability to act as a civic anchor, both spatially and socially.

This is achieved by maintaining a large portion of the ground plane free to continue acting as an important retail node and to accommodate the Saturday market. The housing above is supported by a large colonnade structure that surrounds and contains the market space and provides shelter for traders. The centre of the market is left open for light and ventilation. Small traders' stalls are available for rent and line the west end of the market. The rest of the market is open for free trading. Electricity and water points are provided in certain places.

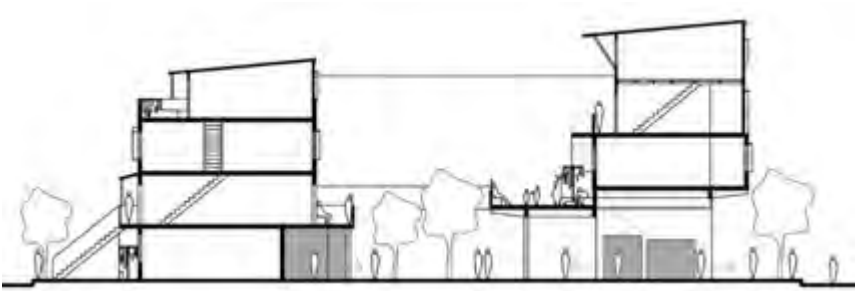


Figure 126: Section through the Sibanye Market Housing, showing the open ground floor and rentable retail space in dark grey.

The west housing strip faces the residential street behind the market and functions as a row-house walk-up typology similar to Uytenbogaardt's Springfield Terrace, in Woodstock. Shared staircases connect the units to the street and create a more private threshold for ground floor apartments. Ground floor apartments are single room units backed by the retail stalls facing onto the square. First floor apartments are two-bedrooms with generous balconies overlooking the market below. Second floor apartments are accessed via an internal staircase and are bigger three-bedroom duplex apartments with balconies on the top floor overlooking the market.

The east and north facing blocks are accessed via two staircases on the edge of the market. The staircases lead to a raised platform that acts as a wide elevated street with views to the market below that can accommodate washing and playing children. This platform leads to the apartments via small staircases, but also to the caretaker's flat and office, a meeting room, crèche and homework room.

The first floor of units are single studio apartments that can accommodate couples or small families. They each have their own private balcony overlooking the main road below and direct access to the elevated recreational space overlooking the market. Upper apartments are two-bedroom duplexes also with their own private balconies. Access to the duplexes is via another two staircases and an external corridor.

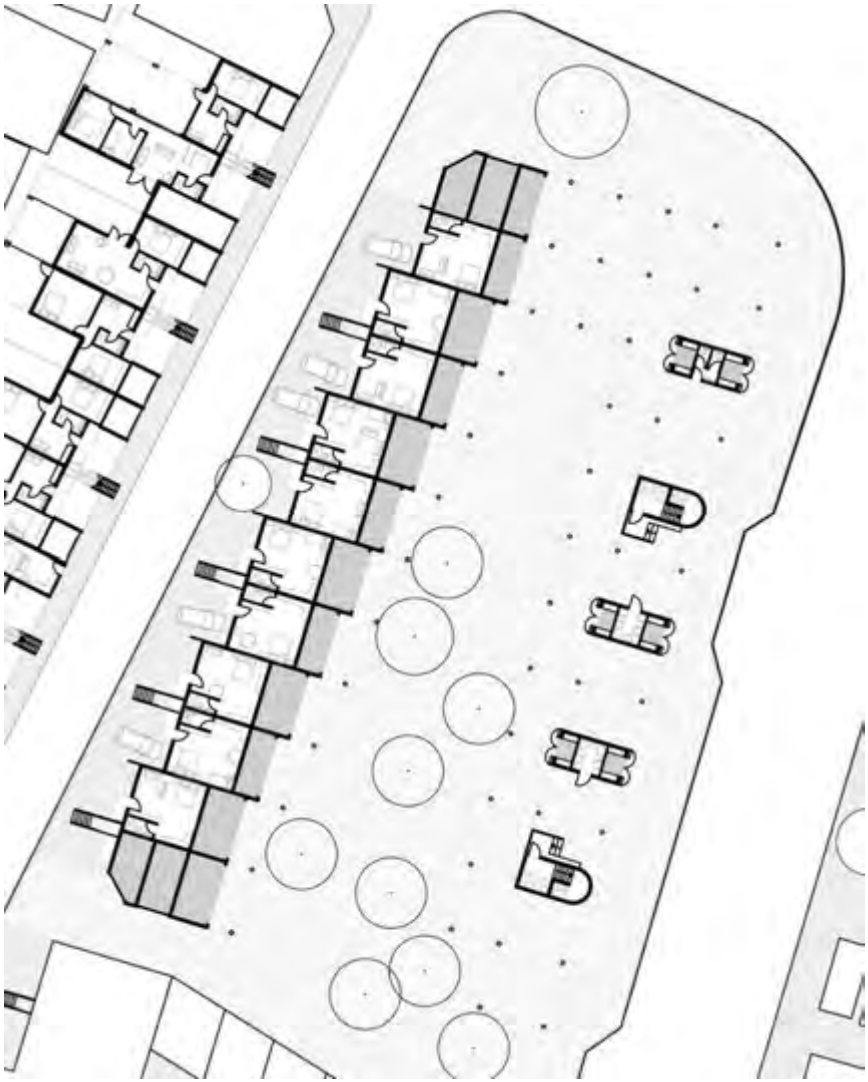


Figure 127: Ground plan of Sibanye Market Housing, with rentable retail space in dark grey.

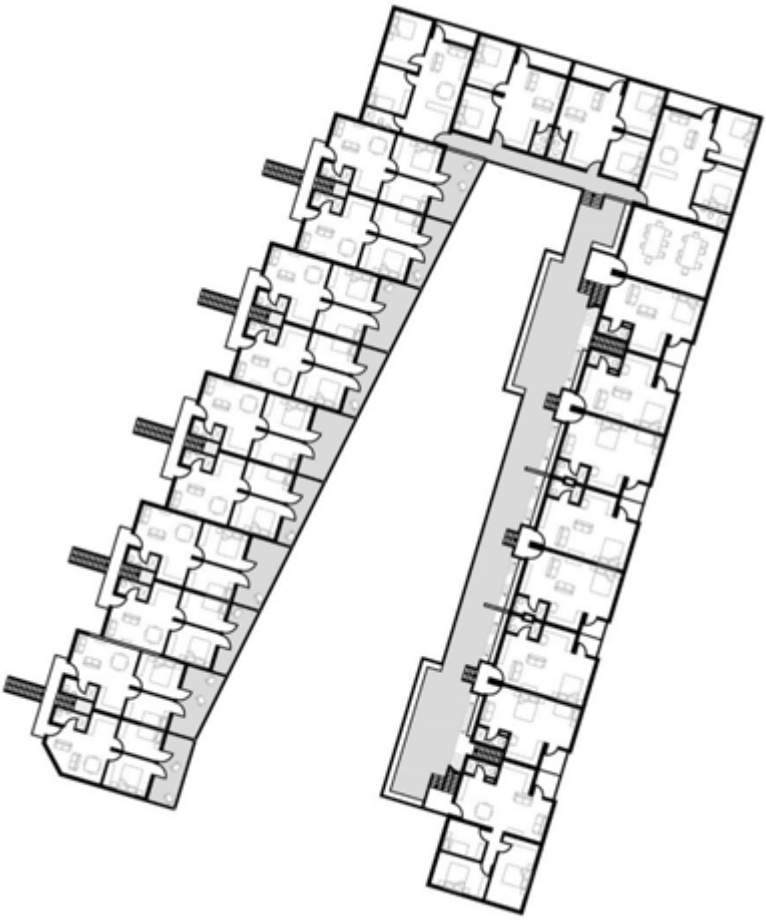


Figure 128: First floor plan of Sibanye Market Housing.

Figures 129, 130 & 131: Sketches of the Bonded Row-Housing, the 4-plot Apartments and the Sibanye Market Housing show the inhabitation of these spaces.

CONCLUDING THOUGHTS

"Home as Economic Generator" is a generic concept that could be applied to many informal or formal settlements, but one which will manifest in different ways depending on the area. For Delft South, strategically densifying certain areas of economic opportunity through a variety of dense medium-rise infill housing developments proved to be a potential solution for Delft South to harness its spatial and economic potential.

The three housing developments that were the architectural outcome for this research, all have different degrees of replicability that could allow them to be copied on different sites in different areas. The most specific to its site is the Sibanye Market Housing, while the 4-plot Apartment is a concept that could be replicated on other plots in Delft. The Bonded Row-Housing is the most generic model that could easily be replicated in many different low-income areas where there is a culture of using one's home to generate an income and a nascent housing market. The Bonded Row-House can thus be seen as a bonded housing prototype for similar areas.

Regardless of the particular solution however, housing should always be achieved in a way that capacitates individuals and communities on a spatial, social and economic level by giving people agency and choice in how they live. Furthermore, there is not one solution that will solve South Africa's housing problems. Rather, complex and vibrant settlements can only be achieved through a diversity and variation of housing typologies.

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Wolff, H. 2012. Du Noon Flats in The South African Informal City Exhibition

TABLE OF FIGURES

Figure 26: Fernández Per, A. 2013. *10 stories of collective housing.* Spain: A+T Architecture Publishers

Figure 27: Sbriglio, J. 2004. Le Corbusier: L'Unite d'Habitation. Le Corbusier Foundation: Paris

Figure 28: Sbriglio, J. 2004. Le Corbusier: L'Unite d'Habitation. Le Corbusier Foundation: Paris

Figure 29: Sbriglio, J. 2004. Le Corbusier: L'Unite d'Habitation. Le Corbusier Foundation: Paris

Figures 30 -31: Property of the author, 2016

Figures 32 - 34: Prince of Wales prize. 1988. Prince of Wales prize in urban design. Harvard University Graduate School of Design

Figures 35 & 36: Development Action Group. 2008. *Sustainable Medium Density Housing.* Development Action Group: Cape Town, pp. 202

Figures 37 -38: Property of the author, 2016

Figure 39 - 40: Property of Fadly Isaacs, University of Cape Town

Figure 41: VOC, by Newsroom on January 20, 2016

Figures 42 - 43: Wolff, H. Du Noon Flats in The South African Informal City Exhibition

Figures 44 -45: Property of the author, 2016

Figures 46 - 47: Property of Space of Good Hope Masters Studio, University of Cape Town, 2016

Figure 48: Property of the author, 2016

Figures 49 - 53: Property of Space of Good Hope Masters Studio, University of Cape Town, 2016

Figures 54: Property of Fadly Isaacs' Honours Studio, University of Cape Town, 2015

Figures 55 - 59: Property of the author, 2016

Figure 60: Property of Space of Good Hope Masters Studio, University of Cape Town, 2016

Figures 61 - 65: Property of the author, 2016

Figure 66 - 83: Property of Space of Good Hope Masters Studio, University of Cape Town, 2016

Figures 84 - 85: Property of the author, 2016

Figure 86: The Cement and Concrete Institute, *How to Make Bricks and Blocks,* Table 3

Figure 87: Property of the author, 2016

Figure 88 - 95: Property of Space of Good Hope Masters Studio, University of Cape Town, 2016

Figure 96: Aravena, A. 2012. Elemental: Incremental Housing and Participatory Design Manual. Hatje Cantz: Ostfildern pp. 114

Figures 97 & 98: Aravena, A. 2011. *The Forces in Architecture*. TOTO Publishing: Tokyo. Pp 127

Figures 99 - 122: Property of the author, 2016

Figures 123 - 124: Le Roux, H., Hart, B. and Mayat, Y. 2013. "Aiton Court: Relocating Conservation between Poverty and Modern Idealism" in *Docomomo International*. Issue 48. Pp 58

Figures 125 - 131: Property of the author, 2016