

The Architecture of the Street

Design Research Project APG5058S

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for the degree Master of Architecture (Professional)

by
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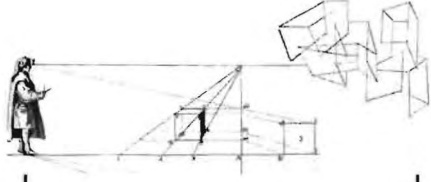
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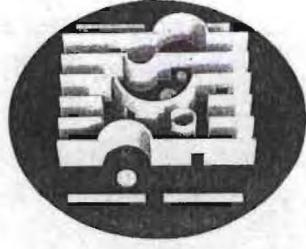
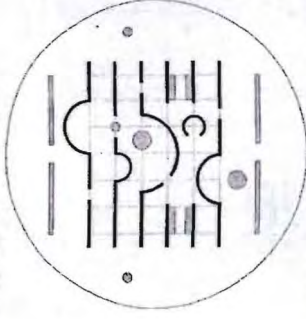
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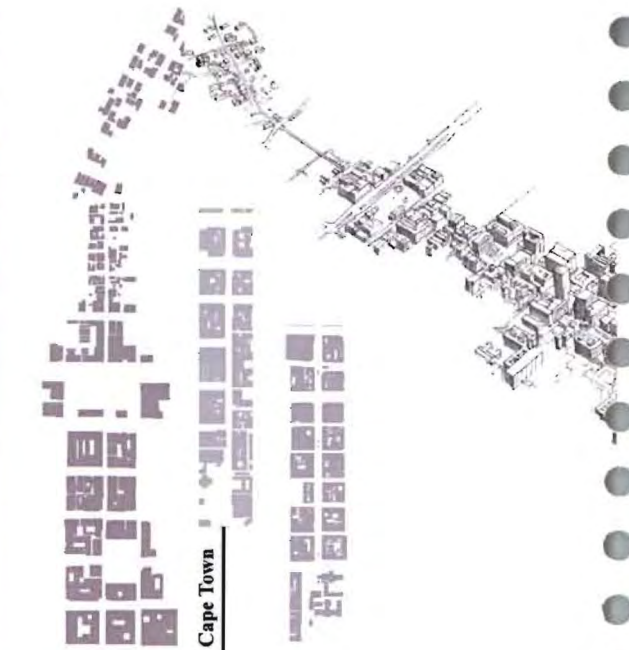
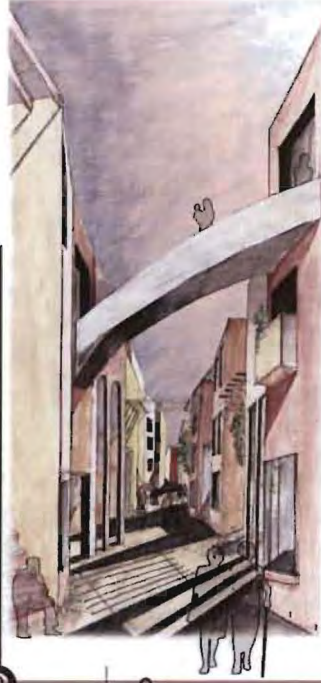
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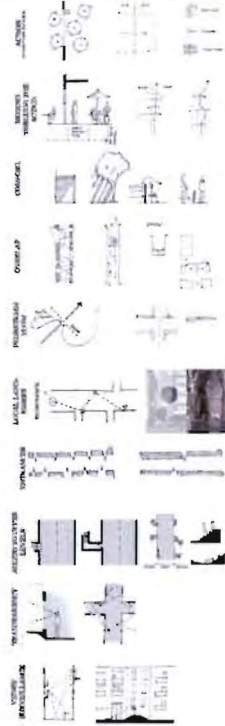
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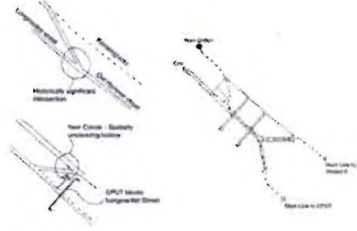
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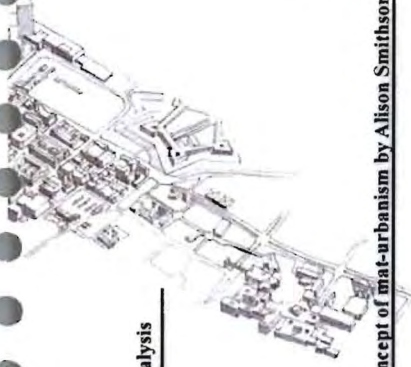
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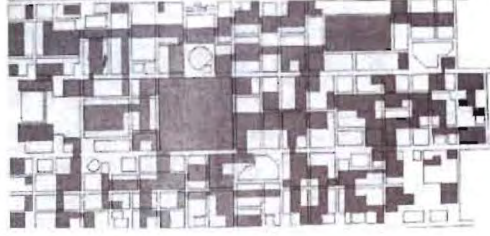
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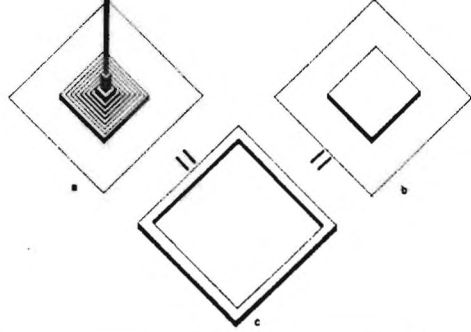
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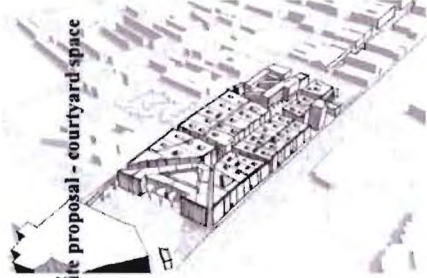
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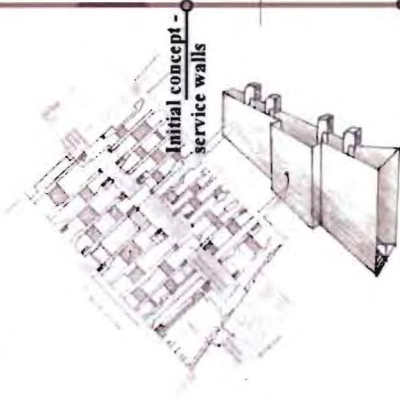
Density



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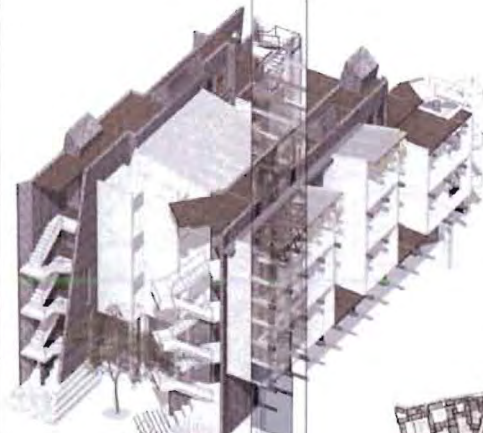


Initial concept - service walls



REV B -

Mixed use development - highly variegated



Hierarchy of streets



Development over time



Analysis of Arabic-Islamic Urban planning



Testing Urban Proposal



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Figure 1: A varied mixed use street in Aibar, Spain.



Figure 2: The street as an outdoor "living room"



Figure 3: Endless single storey sub-urban sprawl, Cape Town

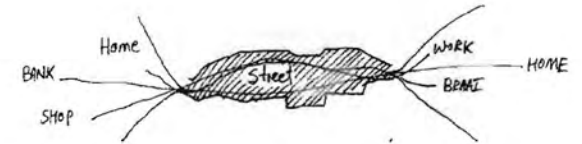


Figure 4. Streets as a part in our everyday existence

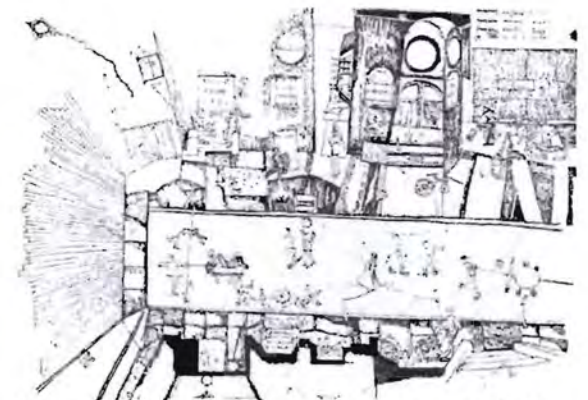


Figure 5. San Francisco cul-de-sac drawing by Charles Zerner - the life of the street

Introduction to the street

“Think of a city and what comes to mind? Its streets. If a city’s streets look interesting, the city looks interesting; if they look dull, the city looks dull” Jane Jacobs (1961: 37)

The majority of South African people live in a sub-urban environment that is characterised by urban sprawl, long travelling times, inaccessibility to economic and social opportunity, and environmental unsustainability. The average density of the City of Cape Town is 10 to 13 dwelling units per hectare, which is the lowest density in the world outside of America (Turok, 2011:) (figure 3). A compact urban environment has numerous benefits – it creates an environmentally and financially sustainable city for the future, promotes economic growth through the proximity of firms and provides social and economic inclusion (Turok, 2009:1). Therefore, density in the city should be a priority for architects and planners.

Currently there are two policies that deal with density in Cape Town; one is the draft *Cape Town Densification Strategy* (2009), which aims to double the average density of the City of Cape Town, and the other, the *Central City Development Strategy* (2008), aims to bring 100,000 more residents into the city centre over a 10 year period. As space decreases as a result of densification, more emphasis needs to be placed on public spaces.

The streets make up nearly 80% of the

public space in an average city (Jones, Boujenko and Marshall, 2007). The urban street is the soul of a city as it knits the social, cultural and economic fabric together. It has the potential to become incredible conduits of human life and create an urban environment that is conducive to social cohesion, economic upliftment and defined identity. Streets are comprised of numerous spatial and architectural characteristics, which have been unpacked into three categories; movement, place-making, and content. Movement relates to how the experience of the street is altered by the movement of our bodies through the space. Place-making looks at how the street can be used as a space of dwelling and content looks at how the street is made and the subsequent sensory effect it can have. This thesis aims to develop a highly dense, mixed-use urban settlement in Cape Town city centre, which will focus on making the streets into vibrant, safe, public “living rooms”.



Figure 6. A Greek pedestrian street with a small child playing safely

Densification of the urban centre

In 1900, one tenth of the world's population were city dwellers. In contrast, in 2007, more people were living in cities than not. The increase of the urban population has risen and continues to rise exponentially (O'Meara, 1999:5). With the dramatic increase of people living in cities, there has been an international drive to increase urban population densities. The main reason for this is that densely populated cities make more intensive use of urban infrastructure as well as reduce the carbon footprint of car travel (Turok, 2011:470). Densely populated cities also increase the proximity to social and economic opportunity, which is of real concern within the context of South Africa.

As mentioned earlier, Cape Town has a density of 10 to 13 dwelling units per hectare. (figure 7,8). Over the past 30 years, Cape Town's land area has grown by over 200%, yet the population has grown by 125% (CoCT, 2012) (figure 9). Therefore, the urban population density has significantly decreased. The *Cape Town Densification Strategy* (2009) aims to double the density of Cape Town to 25 du/ha in "the short to medium term" (5), as this is the internationally accepted minimum density required in order for public transport to be efficient and sustainable (CoCT, 2009:5). *Central City Development Strategy* (2008) by the Cape Town Partnership suggests that an increase of 100,000 residents should be brought into the city in the next 10 years, almost trebling the current population of 55,000. The increased interest in densification is

extremely positive.

In general, the concept of densification in South Africa is not accepted within the average population, which thinks only of low income, noisy, dirty, towering buildings with a low quality of life. But it is possible to have high densities of people in low to medium rise buildings with high levels of privacy and security – and an incredibly rich life.

Mathematical studies on urban density prove that the same densities that can be achieved in a tall tower block can be achieved in a perimeter block massing (Martin and March, 1972) (figure 10). The psychological, social and environmental benefits of having low-medium rise buildings as opposed to tall buildings (figure 11) has been discussed in detail in many scholarly articles and books (Fanning, 1967; Cappon, 1971; Newman, 1973). Christopher Alexander et al propose a four storey limit in order to still retain the connection between the inhabitants of the building the street and city below (Alexander et al, 1977:115).

The increased density of people living in the city centre means that the urban infrastructure, including the public space in the city, is more intensely utilised. The public space in the city is arguably the most important aspect of city living. It provides a platform that people can use to create interactions that can benefit their lives as well as to utilise as a place of relaxation and enjoyment.



Figure 7. Gross density of the City of Cape Town

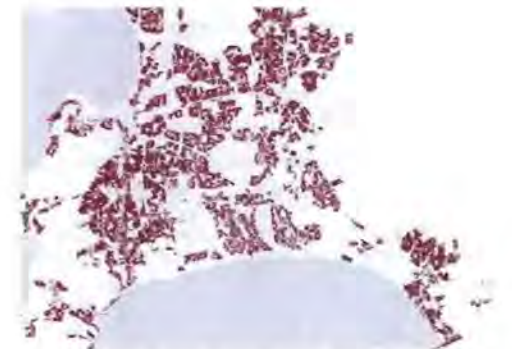


Figure 8. Nett density of the City of Cape Town

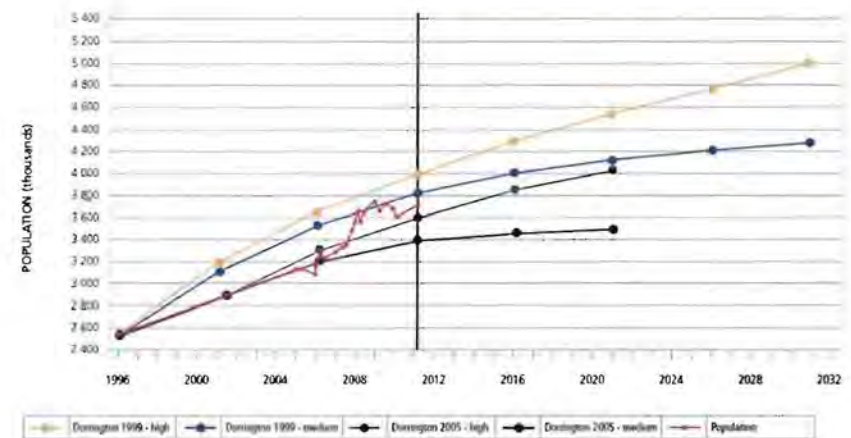


Figure 9. The population projection for Cape Town over the next 20 years

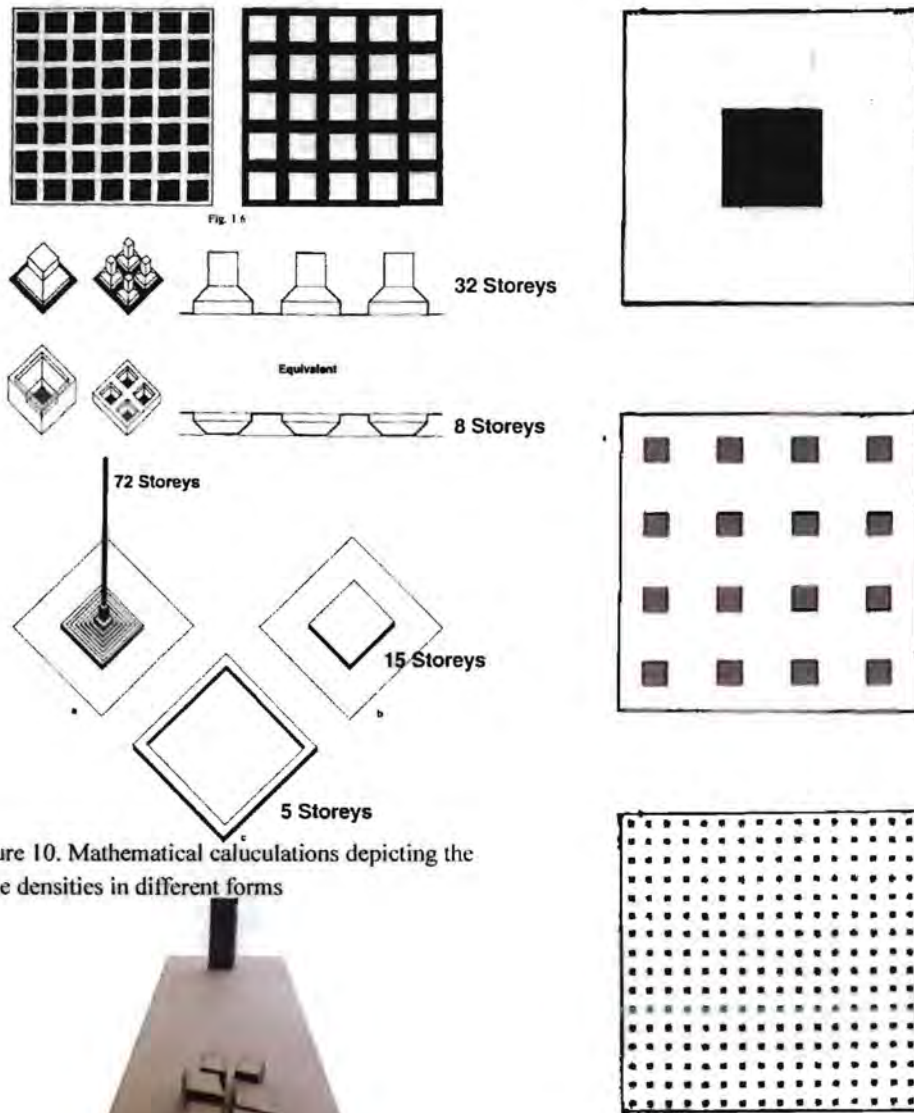


Figure 10. Mathematical calculations depicting the same densities in different forms



Figure 11. Physical model showing how urban forms can create the space around the buildings as opposed to singular buildings randomly located in the landscape

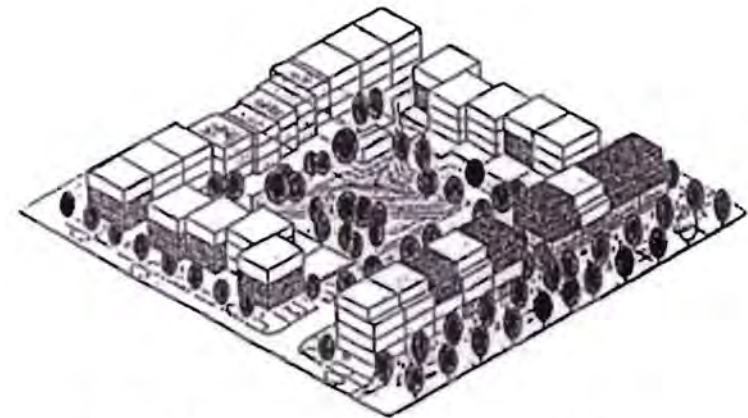
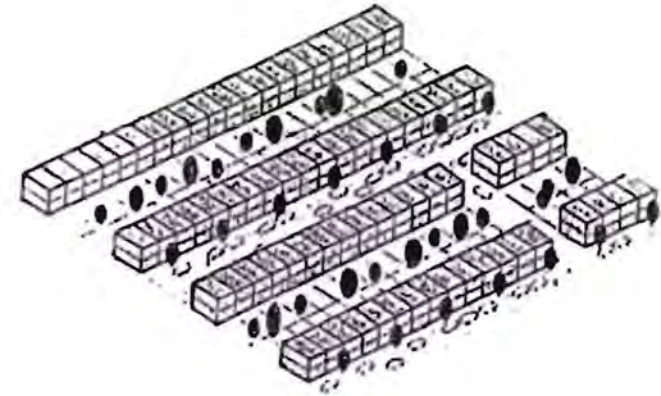
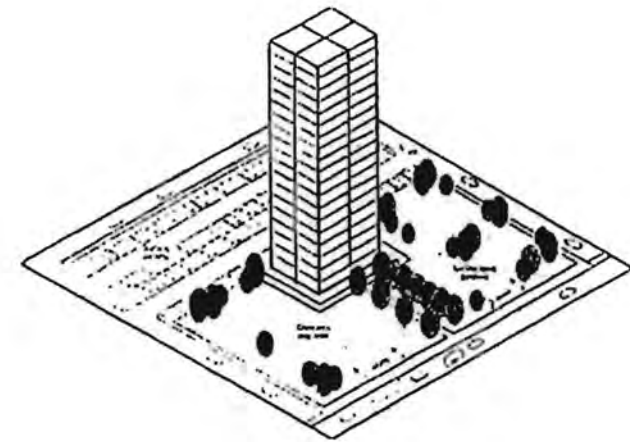


Figure 12. Urban forms of the same density in different layouts

Streets

Experiencing any city is felt through its streets. Everyone in the world lives on some sort of a street – as soon as you leave your property you are a part of a network of interconnected public realms. These public realms are comprised of movement and loitering, pleasure and pain, hope and dread. Streets offer a dual purpose: (a) Movement: they offer connection in the form of efficient passage of people and goods to a destination; and (b) Placemaking: public outdoor living rooms allow for people to linger for extended periods of time. I strongly believe that for a street to be alive there needs to be both of these components.

Experiencing the city through movement

The city is a very complex constituent of human evolution. Bringing people together to form communities and living spaces creates amenity and safety that would otherwise be impossible. It also creates immense dynamism of movement. Millions of people live in cities and all are in a constant state of movement and flux – hundreds of thousands of people in the streets, alleyways, parks and squares each with their own mission and path, each grappling with the abundance of activity and amenities, and each affecting everyone else. The movement of people, vehicles, wind, the experience of the sun, and innumerable other elements are influenced and affected by the city form.

“First, we shape our cities, then our cities shape us.” (Gehl, 2010: 9) The experience of this vibrating and eternally fluctuating conglomeration is vitally important for the happiness and fulfilment of urbanites.



Figure 13. A elevated pedestrian street in Matera, Italy



Figure 14. Moving along the steep streets of the old District Six

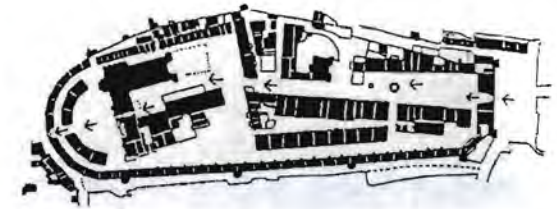


Figure 15. Gordon Cullens “jerk and revelations”. Each arrow on the plan represents a drawing below.

Constituents of movement

1. Perspective

Perspective impacts the experience of the streets of a city. A street could be a straight line visually extending endlessly into the city like the Portici via Saragozza in Bologna (figure 16), promoting a strong linear movement, drawing people further along its line. Or it could be curved and haphazard, like the streets of Munich, that promotes a sense of discovery – “what lies around the next corner?” (figure 17). One factor that affects the perspective on the street is its uniformity with regards to building heights and building setbacks – the streets that have the same heights of buildings and the same setbacks create a line at its top and base, promoting a sense of perspective (figure 18).



Figure 16. Seemingly never-ending straight line, Portici via Saragozza in Bologna



Figure 17 Curved haphazard streets of Munich



Figure 18 Perspective disappears around the curve, Munich



Figure 19. An example of a visual landmark on Longmarket street, Cape Town



Figure 20. Urban signage as path choice modifiers on Plein Street, Cape Town

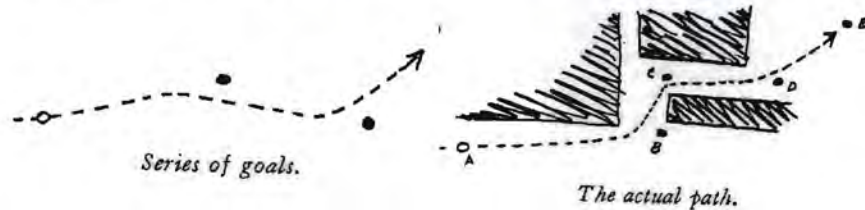


Figure 21. Alexander's view on path choice

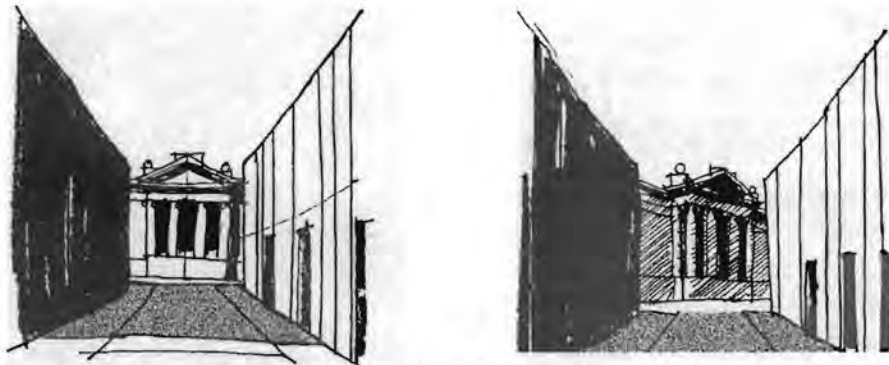


Figure 22. Which path is more appealing? The right image is more inviting and intriguing because the closed vista opens up, arousing the expectation that it is doing this for some reason, that it is a part of another urban realm that is yet unseen. (Cullen, 1971: 43)

2. Path choice

Moving through any environment means that one has to make intuitive direction-based decisions centred on a single, moving perspective. The path choice that you make defines a temporal line in the ground that is alive with point-by-point decisions. What are the reasons one might choose a specific path through the urban landscape over another?

It is through the clarity of the city form that we can, within our minds, build a cognitive understanding of the environment we are at a particular point in time, which then influences the path one might take. (Zacharias, 2001a; 2001b) Landmarks and other identifying architectural features help build up the cognitive picture and as such are good locators (figure 19). Christopher Alexander believes that people arrange their walking direction based on temporary goals that lie within their visual realm (Alexander et al, 1977:587).

Another vital factor to consider in path choice is land use. It is likely that you would choose the path with the most activity, or give directions based on land use. With the absence of memorable architectural features, land uses and their subsequent signage is often what most people remember and use to navigate while on a street (figure 20).

Each person perceives their environment and feels their effort subjectively and thus the path choice alters significantly from person to person. Furthermore, micro-climatic conditions, ambient sound, maintenance upkeep, detailing, the amount of crowding, lighting, as well as other psychological factors all affect the path one might take, and how one might utilise the space (Zacharias, 2001b: 12).

3. Vertical movement

Humans enjoy being at a height. This is because of the power we feel and the control we have over something when we are above it, as well as the view it provides (figure 24). Cullen states that every place has a datum line and that to be above it provides feelings of “exhilaration, command, authority and privilege” while below that datum produces “intimacy and protection” (1971: 38, 175) (figure 25-26). Therefore, exploitation of the slope of a site is a powerful spatial tool. This primarily concerns the very direct relationship between the observer’s perception and the environment.

Vertical movement is often relegated into the depths of buildings via enclosed staircases or dark elevators. This enclosure does not in any way add to the experience of moving upward, the incredible changing perceptual field, or the street and its vibrancy. The street needs to offer both the feeling of exhilaration when at a height and the intimacy of being below. These places of height in public spaces need to be directly connected to the lower level so that they have a relationship with what is happening below (Alexander et al., 1977: 604). This can be achieved by placing as many staircases and ramps on the street edge as possible, as well as exploiting the existing slope of the site. This provides not only activity on the street but also dynamic relationships between street users (figure 27).



Figure 23. Exhilaration of heights, Cape Town



Figure 24. Space redefined by height, Waterkant Str, Cape Town

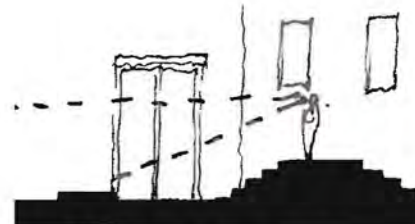


Figure 25. The view provided, and power created by being at a height



Figure 26. Below datum, stair seats ‘carved’ out of ground plain, Cape College, Longmarket



Figure 27. Stairs to upper levels as a continuation of the street, Longmarket Street, CT

4. Field of forces

Having discussed the perceptual changes that occur because of the movement of bodies through space, I will now discuss the perceptual changes that other forces – such as physical, socio-historical and socio-cultural forces – have on the urban environment because of their movement.

The environment is in a state of constant motion – from the fury of a storm, to the earth hurtling through space. We can seldom grasp these forces with our human senses; we can only infer the forces through their effects (figure 28). Thus, the revealed forces are subjective and implicit (Kerkidou, 2006: 15).

Physical forces are just one type of the many forces being played out on a particular site – socio-cultural and socio-historical forces are also acting in various forms – seen and unseen. Streets magnetise abundant fields of directional forces. The street's width, height, texture, history, social fabric and location impacts on all of the natural and man-made forces acting in and on it. Natural forces such as wind, water and sun are influenced by the physical properties of the street and play an important role in the comfort of the street. They also provide elements that allude to the greater context in which the street is located. Historical forces on the street can be seen in the weathering of the materials, but, more abstractly, history is felt through memory.

Socially, the street-scape is defined extensively by the field of forces being played out on a regular basis – for example,

the rolling trolleys of the Longmarket Street informal traders at 5 o'clock in Cape Town. Countless other forces emanate into the urban scene, projecting their directional energy, affecting people, the buildings, and the street-scape.



Figure 28. An implied directional force: a wind swept tree. Cape Town



Figure 29. Steven Holl's implicit fields of forces in the Helsinki Museum



Figure 30. The Voortrekker monument capturing sunlight at one specific time of year

5. Action on the street

Directional forces can be very temporary but often create events that define the character of a place. In *The Timeless way of Building*, Christopher Alexander suggests: "The life and soul of a place, all of our experiences there depend not simply on the physical environment, but on the patterns of events which we experience there." (1979: 62)

The action of the street is formed by the programmes and events that the street affords. The building fronts and edges that create the space of the street, as well as the ground surface need to have specific characteristics to support this varied action. Street fronts, especially street fronts that offer highly public activities such as restaurants, cafés, or stores need simultaneously to define a distinction between public and private and be an element that dissolves this distinction. Floor surfaces, street furniture and temporary shelters such as umbrellas help to define this binary condition. It is interesting to note that many spaces in the city that are highly vibrant are not specifically designed for vibrancy. A narrow street sidewalk that is just wide enough to squeeze by, for instance, should not rationally work as a centre of action; however, it often becomes an incredible lively city space (figure 31). This is because architects and urban planners design spaces of action and vibrancy that are too large, and thus lack the density that is required to create activity nodes.

Movement defining streets

The movement of people in the street and the perceptual changes that occur because of that movement has been discussed. This incorporates theories of space and time, as well as more practical examples of spatial properties affecting the movement of people. Perspective, path choice, vertical movement, field of forces and action on the street have been discussed as primary examples of spatial constituents that influence street spaces. However, there needs to be a feeling of place or dwelling within this realm of movement. Public place-making in the street will now be discussed and analysed, both in terms of its theoretical underpinnings and practical spatial properties.

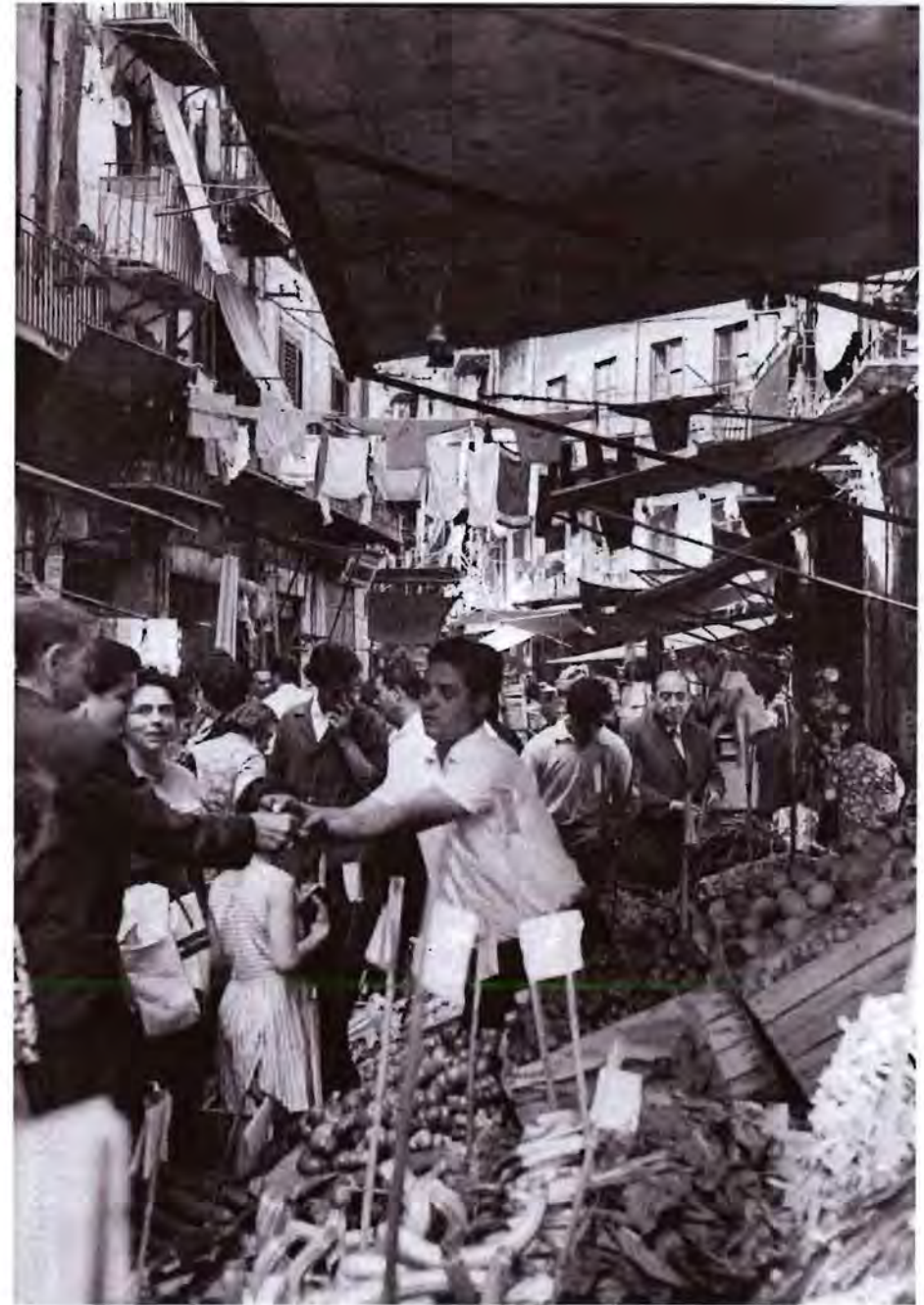


Figure 31. Immense action on the street: A street scene in Palermo, Italy.

Place-making on the street

Theory of place-making

“Whatever space and time mean, place and occasion mean more, for space in the image of man is place, and time in the image of man is occasion.” Aldo van Eyck (as cited in Straven, 1959:357)

Contrary to the notions of space, “place”, as defined by Norberg-Schulz, is not about the measurable elements of spatial relationships, but is a qualitative and atmospheric phenomenon that defines a location’s character (1980: 189). The fundamental spatial property of place is enclosure. Whether that enclosure is physical, or implied, its primary purpose is to provide humans with a sense of safety and, in so doing, provide places in which humans may dwell. In *The Concept of Dwelling*, Norberg-Schulz defines dwelling as the “establishment of a meaningful relationship between man and a given environment” (1985: 13). By establishing your place in the world and creating a sense of belonging to a specific place, your identity is confirmed (Norberg-Schulz, 1980: 180). In order for a city’s streets to live, there needs to be life on the street. This can only happen if the architecture of the street is conducive for people to dwell.

Place-making in the city

Lynch, in *The Image of the City* (1960), notes that for people to feel at home, the city needs to be legible, first and foremost.

The city needs to be read as distinctive forms such as “nodes”, “edges”, “paths”, “landmarks” and “districts” (46 - 48). If the city is easily read, it gives a sense of orientation and thus, people may feel at ease and form a harmonious relationship with their environment. However, it is not only through the clarity of defined city forms and spatial enclosure that provide people with the desire to be on street as opposed to in their homes.

The street, especially in South Africa, needs to have a high enough density of people for it to be safe. This is huge problem in South Africa, as a common issue against spending time and taking ownership of the streets is crime. What are the architectural elements that promote density and vibrancy, and in so doing, provide safety? Jane Jacobs, in *The Death and Life of Great American Cities* (1961), argues for certain architectural features to support a varied, highly dense and safe city street. Firstly, city blocks need to be small enough to accommodate maximum path choice. This allows people the option to utilise different streets, as opposed to only the one they live on. Secondly, to create activity on the street, there needs to be a high number of entrances directly onto the street, and thirdly, there needs to be opportunity for pedestrians to turn corners frequently (47 - 48). Coupled with these architectural features, land use that promotes density such as cafés, restaurants and bars considerably contribute to a dense, lively street. A great urban scene is one that has many people in it, experiencing and living in urbanity. Loitering has a negative association; however, it should be encouraged. The people who live or work in the area

should spend time on the street to create a sense of ownership. Our streets are dead and anonymous – only people can revive them!

Street place-making incorporates the physical aspects of comfort. It must provide benches and seating that is comfortable to the touch as well as shelter from adverse weather conditions. This simple act of providing sources of comfort drastically increases the possibility of people wanting to spend extended periods of time on the street. It changes the mindset from “move along” to “here, stay awhile”. Additionally, the street needs to provide entertainment to retain people’s attention, either through the simple act of people-watching or formalised activities on the street.

Architectural elements impact on the potential for public place-making. So, what are the architectural factors that can be built in support of public dwelling?



Figure 32. Sperlonga Staircase, Italy



Figure 33. Comfortable enough to sleep on a bench in the street

Constituents of place

1. Precincts/ identifiable districts

Place-making on the street happens most successfully when people feel that the street belongs to them in some way. Therefore, the architectural implications for creating identifiable neighbourhoods as distinctive from elsewhere in the city is an important place-making feature. But it is really important to strike a balance between distinctive parts of the city and restricted, inaccessible enclaves.

I strongly believe that identifiable precincts need to be established through subtle architectural features such as landmarks or gateways at main entrances (figure 34). This creates a change in urban texture (Norberg-Schulz, 1980: 33) or distinctive street edges of some sort that promotes a level of homogeneity. These features must not reduce the levels of accessibility to the area, but rather subtly to signify that “this is ours, but, welcome!” Lynch (1960: 103) describes this homogeneity as either spatial, like the sloping, curved streets of Vredehoek in Cape Town, or as a building type, such as the colourful row houses of the Bo-Kaap (figure 35).



Figure 34. Physical Gateway defining a district



Figure 35. Distinctive street edges, Bo-Kaap, Cape Town

2. Public outdoor arenas/ activity pockets

“A boundary is not that at which something stops but, as the Greeks recognized, the boundary is that from which something begins its presencing” (Norberg-Schulz, 1980: 13).

The most basic features of public space in a city is the street and the square (Lynch, 1960), which Norberg-Schulz describes as the “path and the center” (1980: 24). Traditionally, the path lies more in the realm of movement whereas the centre, or square, acts as a “psychological parking place within the civic landscape and makes a community a community and not just an aggregate of individuals” (Zucker, 1970: 1) (figure 36-37). Thus, the public square is more a destination than an element of movement. However, it is important to note that often streets are not goal orientated, but the street itself is the destination. For a street to be vibrant in its entirety there needs to be numerous smaller centres – activity enclosures – strewn along the street, leading (not necessarily always) to a larger, more formalised centre. These nodes of activity happening at regular intervals on the street create smaller pockets of entertainment and commotion – and potential economic trading.

Public squares are important public outdoor rooms found along commonly used streets. Alexander notes that for public activity nodes to really thrive, four things need to be taken into account: firstly, to place the activity node where predominant paths converge, which

increases the density of people and ease of access. Secondly, to make the nodes small enough so that public life is concentrated. Thirdly, to group facilities that have a symbiotic relationship for more people to use the node at once. This means, for example, that it is better to group many nightclubs in one area than to group a nightclub, a police station, a cinema and a church. Although these examples are of a public nature there is no connection between them, which creates unevenly distributed activity times. And lastly, public outdoor rooms need to be in close proximity to each other along busy streets (1977: 164). A public square is merely a formalised version of a spatially enclosed area that accommodates human dwelling. This, in its most simplified form, is a cluster of benches that are out of the weather, are comfortable and promote staying.



Figure 36. Public Arena - Greenmarket Square, Cape Town - It provides strict visual boundary, has a floor texture that signifies pedestrian dominance, and has activity to keep people entertained



Figure 37. Public Arena at night - Harrington Square Market, Cape Town, Sufficient lighting, places to sit and activity creating vibrant city spaces.

3. Shelter

Shelter by definition is the most prominent function of architecture. The comfort of utilising the street, specifically place-making, is dependent on architectural features that include colonnades, street-edge canopies and covered arcades. These sheltering devices can provide a continuous sheltered environment or can be located at specific locations where they are required (figure 38-40). It is unnecessary and disadvantageous, in my opinion, to create streets that have a continuous sheltered environment. Shelter, whether from the rain, sun or wind, brings people together. This concept should be unpacked and shelters should be designed at specific locations where people might meet, creating a hierarchal urban street-scape. A doorway, for instance, that has a shelter that is big enough for people to meet for a chat in the rain, is better than having a continuous shelter that does not at any one point promote social interaction.

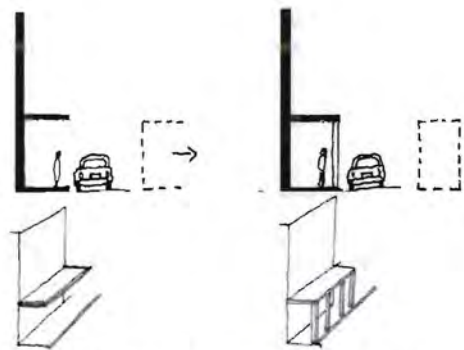


Figure 38. Spatial properties altered by the type of shelter. The left drawing is more open, while the right enclosed

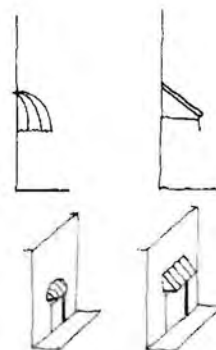


Figure 39. Shelter located at entrances magnetises people towards it promoting lingering and social interaction



Figure 40. Cape Town examples of shelter in the city. (a) Temporary shelter, (b) Linear open shelter, (c) Spatially enclosed colonnaded shelter, (d) Umbrella's only to define spatial enclosure, (e) Shelter located at entrance, (f) Long spatially open shelter

4. Planting

In an urban setting, trees provide the inhabitants with numerous social, economic and environmental benefits. A study done in Chicago in the mid-90s is revealing: trees reduce domestic violence (Sullivan and Kuo, 1996). This, quite obviously, is a sensational misrepresentation of the true association, which is more likely that trees create preferable outdoor environments that promote outdoor activity, which in turn strengthens community ties. Aesthetically, and psychologically, trees produce environments that are soothing and pleasing because of their link to the natural landscape. The changing texture of leaves and the sensory diversity it adds to the urban environment is highly pleasurable to the human psyche (Gold, 2008).



Figure 41. Trees have an association with place, Greenmarket Square, Cape Town



Figure 42. Benches with trees to facilitate place making, Long Street, Cape Town



Figure 43. Most people will find a place with a tree to relax under, Cape Town, St. Georges Mall

The spatial properties that define the street are important features that create the atmosphere of the streetscape. However, the physical aspects of the street – how it works visually, sonically and tacitly – impact the users' comfort. The next part of this paper will unpack the making of the street and the effect it has on its users.



Figure 44. Planting growing out of a textured stone wall



Figure 45. The effect weathering has on the ground surface



Figure 46. Weathered brickwork creating patterns of time

Constituents of content

How the making of the street affects experience

1. Surfaces of sound

The way sound echoes and vibrates off surrounding surfaces contributes significantly to spatial awareness. In *Spaces Speak: Are you Listening?* Barry Blesser and Linda-Ruth Salter (2007) argue that human beings have neglected hearing as a sense, which they believe uncovers the true character of a space. Humans can enter a room and immediately know if a window or door is open, if the floor is tiled or carpeted or how high the ceiling is. Outdoor public space is equally aurally decoded. Through sound you can tell the size of a public space, the height of the surrounding buildings, how many people are in it, if there are sound buffers such as trees or plants in the area and what type of events are likely to happen there. Sound reflections and the echoes off surfaces around you are important architectural features that few architects consider.

The space of sound is not limited by the same physical constraints as visual space. Sound travels through walls and over obstructions linking and associating disparate spaces (figure 47). “Open a window to enjoy a summer afternoon and all events on the street have the right to enter.” (Blesser and Salter, 2007: 15)

Before delving into how materials affect sound, the physical attributes of sound need to be clarified. The aural environment,

with regards to the surrounding surfaces, concern four sonic factors: transmission, absorption, reflection, and diffusion. This is related to the physical density, thickness, tension, and permeability of the material (Seep et al., 2000:5) (figure 48).

Different materials react differently to sound according to how the material is tectonically put together – its permeability or porosity, and its hardness. Intuitively, hard, smooth materials such as polished granite (figure 52) reflect sound and create echoes, whereas softer more permeable materials, such as fabric or timber absorb the majority of the sound, dissolve echoes and reduce sonic feedback. It is also important to note that certain materials absorb and reflect sound differently according to pitch (figure 49).

A major concern for city street surfaces is maintenance. This means that the street surfaces need to be made out of something that is hardwearing and solid, thus, sound reflecting and aurally difficult to control. The materials of the street therefore need to be put together in such a way as to mitigate sonic reflections, and increase aural absorption and diffusion through its geometric form (figure 50- 51). The street edge, for instance, could be built out of a material that is hard, such as brickwork, stone or concrete but with sufficient forms that promote sound diffusion (figure 53). The material surface is just one aspect to take into account in auditory street design. One needs to consider the geometric form of the street, natural sound buffers such as trees or plants, and, as vehicles produce the most unwanted noise on any street, where fast-moving vehicles are in relation to the street edge.

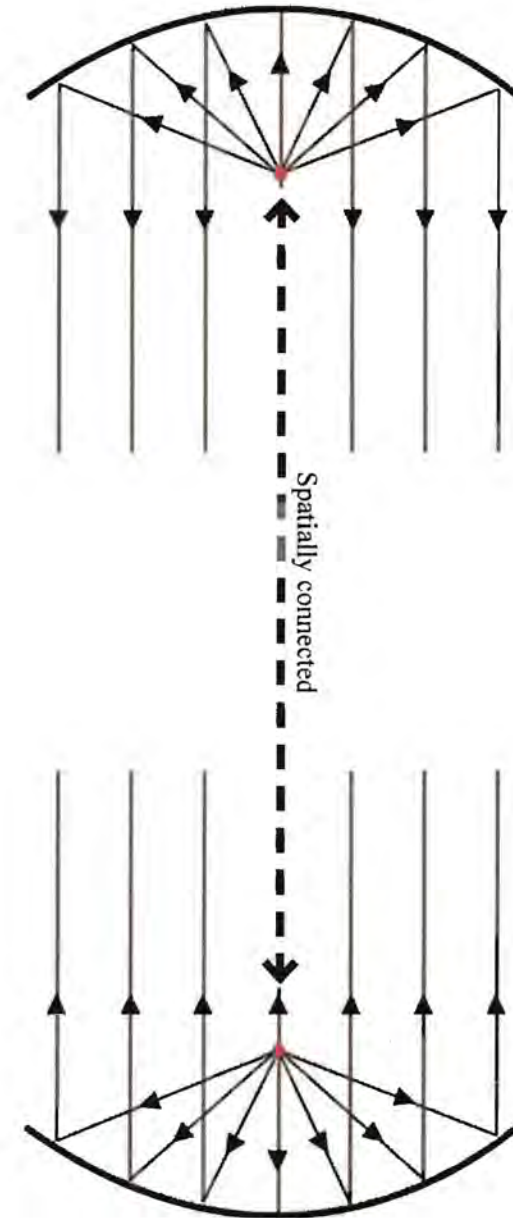


Figure 47 Visual representation of sound linking space

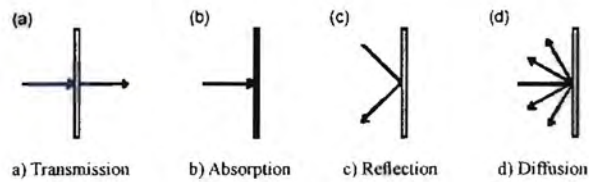


Figure 48. Four sonic factors to consider in designing for sound

Material	Frequency in Hertz		
	250	1000	4000
Marble	0.01	0.01	0.02
Acoustical Plaster	0.45	0.92	0.87
Concrete	0.01	0.02	0.03
Audience Member	4.3	7.0	6.0
Cloth Seats	2.8	5.0	4.4

Figure 49. Absorption coefficients for various materials according to pitch: larger coefficients indicates a more absorbent material; lower frequencies indicate lower pitch

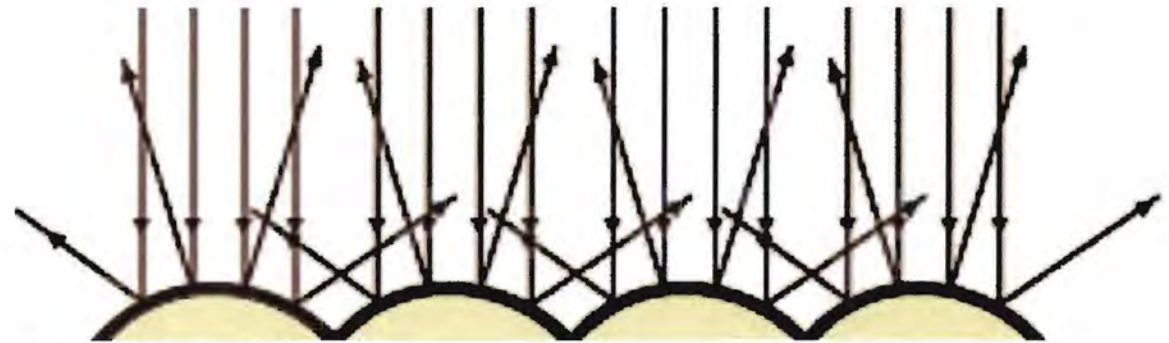


Figure 51. Diagram of diffusion

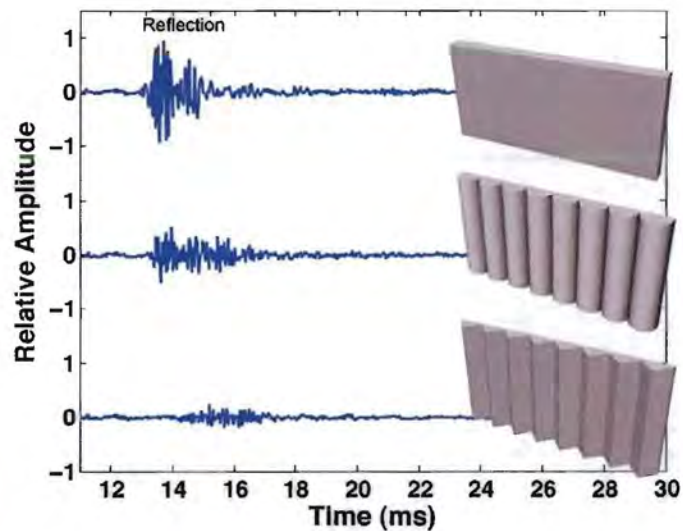


Figure 50. How form effects sound



Figure 52. Smooth granite wall, Darling Street, Cape Town, reflects sound and light



Figure 53. Textured with deep reliefs means that it will diffuse sound, and cast shadows



Figure 54. Shear glass wall, highly sound reflectant at high frequencies, Caledon Street



2. Surfaces of vision

The information field of an urban environment is generated out of everything that can be sensed in a built space and therefore concerns the material surfaces that human beings come into contact with (Salingaros, 1999a: 29). Contemporary architecture favours high-tech materials, which unfortunately have one common feature: they minimise surface information. The flat sheet-metal and sheer glass walls of modern day buildings consciously try to reduce materiality down to its most minimal texture. "The machine-made materials of today ... tend to present their unyielding surfaces to the eye without conveying their material essence or age." (Pallasmaa, 1996: 21) The absence of physical information creates environments that are alienating because we cannot connect to or enjoy immateriality.

Traditional building materials maximise optical and acoustical information at all angles. Texture, articulated relief and colour contribute to this phenomenon. The visual field needs to be highly articulated, replacing abstract minimalism with the fullness of a materials essence. For public outdoor spaces to be alive there should be dark and light, shadow and sunlight, texture and reflectivity, and hard and soft textures, all assaulting the senses in a harmonious and highly sensory manner. "How much more mysterious and inviting is the street of an old town with its alternating realms of darkness and light than the brightly and evenly lit streets of today?!" (Pallasmaa, 1996: 32) (figure 55)

Urban surfaces portray a number of representations about their proposed use. Walking on the street, you may notice subtle surface texture, surface orientation or surface level changes that influence your movement or use of the street. Certain textures signify certain functions. Tarmac, for example, is universally known as a surface for fast-moving vehicles, marble tiles that make a big fuss when high heels tap its surface signify a grand entrance, cobblestone pebbles signify a slowing of movement. Texture orientation or patterning such as an elongated tile or paver laid in a particular direction could either draw your eye to a focal point or attract you subconsciously into a shop. (figure 56, 59, 60) Level changes are more consciously understood — a few steps up a staircase in front of an entrance make privacy of the establishment crystal clear. Many such examples of texture changes and their effects can be seen in figures 56-58.



Figure 55. A street in Italy that is a tapestry of dark and light, rough and smooth, allowing maximum sensory phenomena

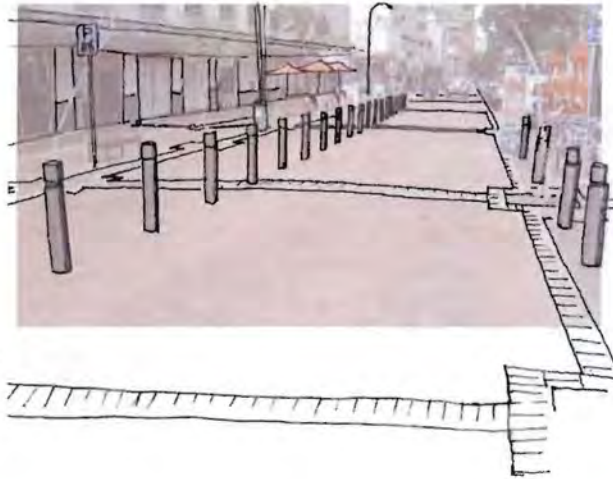


Figure 56. The lines of paving link the buildings on opposite sides of the street



Figure 57. The urban surface alluding to use. The slight ramp, texture change, and paving colours tell you how to use this intersection

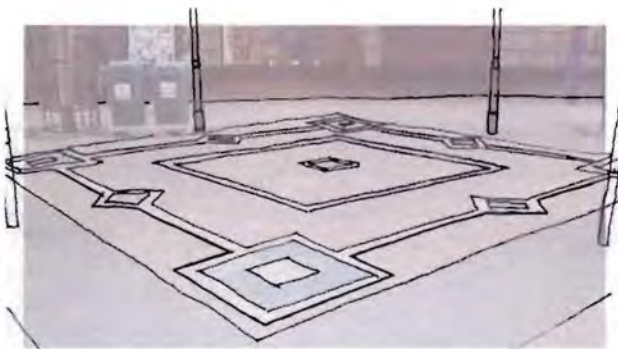


Figure 58. The role of ornament - The patterns of paving divide the space into movement space and staying space, as well as visually differentiating the open space



Figure 59. An interesting paving pattern drawing people in at the Port of Tel Aviv



Figure 60. This ornamental triangular paving pattern visually subdivides the large open space.

3. Surfaces of tactility

Tactility plays an important role in surface articulation firstly, it is inevitable because of gravity, and secondly, to complete the visual picture one needs to touch the texture of the surface (Mathews, 2003: 5). Juhani Pallasmaa in *The Eyes of the Skin* (1996) discusses how the eyes and skin work together to wholly interpret, understand and enjoy the experience of built materiality in architecture. The famous quote regarding the importance of material choice, “the door handle is the handshake of the building” (Pallasmaa, 1996: 40), extends into everything that comes into contact with our skin and our bodies. The surfaces that surround us create the atmosphere, and thus the character of a space, which in turn impacts on how we utilise the space. (figure 61) Norberg-Schulz rightly notes that “a shabby and broken floor surface is usually more disturbing to the cityscape than derelict buildings” (1985: 59). This is because it directly affects our bodies. (figure 62)

Although we measure the comfort of the urban environment by visual and acoustic clarity, when it comes down to spending extended time on the street, physical comfort is of critical consequence. (figure 63) The skin decodes texture, temperature, weight, and the density of matter (Pallasmaa, 1996: 40). The material mostly associated with the streets and with the public spaces of South Africa is the bitumen-based black tarmac surface that, if one were to compare it to other materials of the 20th and 21st century, would very likely be one of the most widely used – and most unpleasant – materials on the

planet. The surface becomes extremely hot, is a limiting texture in terms of its ability to differentiate and define space, and feels horrible to the touch. This is where the differentiation of roads and streets is pertinent. A road is a transport artery and requires tarmac because of fast-moving motorised transport, whereas a street is an urban armature, a place where people can experience the multiplicity and magnificence of public life, and needs surfaces that can accommodate this.

We define the space we are in by its solid boundaries; the physical surfaces that we touch with our skin (Salingaros, 1999a: 29). In an urban environment, those surfaces need to magnetise people towards them, and in so doing create highly active and well-populated urban scenes. The surface temperature of different materials alters drastically according to texture and colour (Doulos et al, 2004: 248).

A material’s temperature is influenced by its “reflectivity to solar radiation” and their “emissivity to long wave radiation” during the day (Doulos et al, 2004: 248). Black asphalt was proven to have the highest temperatures with an average of 46.7°C. The lowest temperatures were achieved with white marble tiles (29.7°C average) (Doulos et al, 2004: 250). In the study, all the materials mean surface temperatures over the study period were consistently hotter than the mean ambient air temperature except for the white marble tiles, which were a few degrees cooler (figure 65). This demonstrates the importance of selecting the right exterior surface for public outdoor use.

As stated previously, the visual information

provided by the urban environment needs to be highly articulated in order to maximise visual and acoustic stimulation (Salingaros, 1999a). But increasing the textural qualities of surfaces increases their heat conductivity, which in turn creates urban environments that are climatically unpleasant (Doulos et al, 2004: 248). Surfaces thus need to be carefully chosen, taking all factors into account, including their greater impact on the climate. The surface of the street is neither limited by the separation of horizontal and vertical surfaces nor is made up of one material. It includes everything, from the paving and curb-stones, to the fabric of awnings and all the possible combinations of different materials. Therefore, choosing one material for its aesthetic appeal, for instance, might be uncomfortably hot but must be supplemented by a surface that mitigates that heat.



Figure 61. The soft textures draw people to utilise the urban furniture, The High Line, New York



Figure 62. The Port of Tel Aviv, Mayslits Kassif Architects. The tactile timber deck allows people the option of utilising the ground plain as an enjoyable surface



Figure 63. The Port of Tel Aviv, Mayslits Kassif Architects. The smooth rocks magnetise people to touch and sit on them

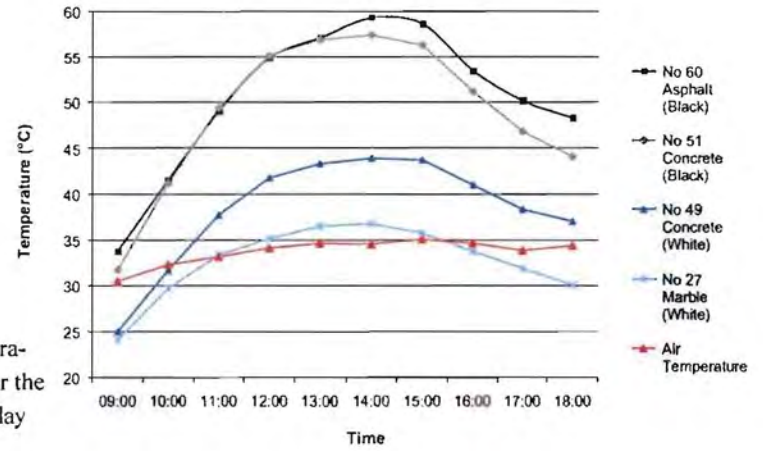
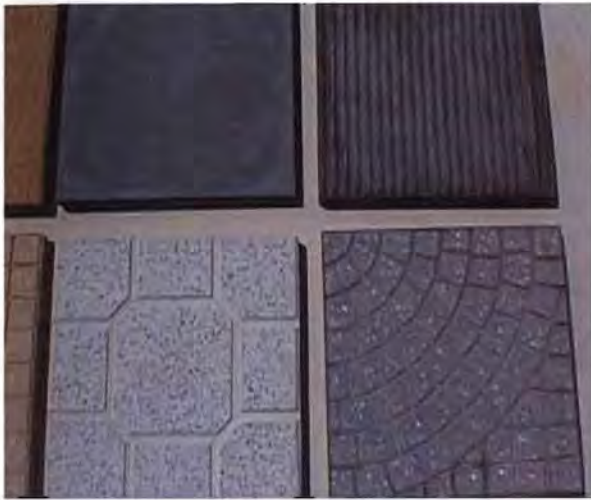


Figure 65. The temperatures of materials over the hottest period of the day

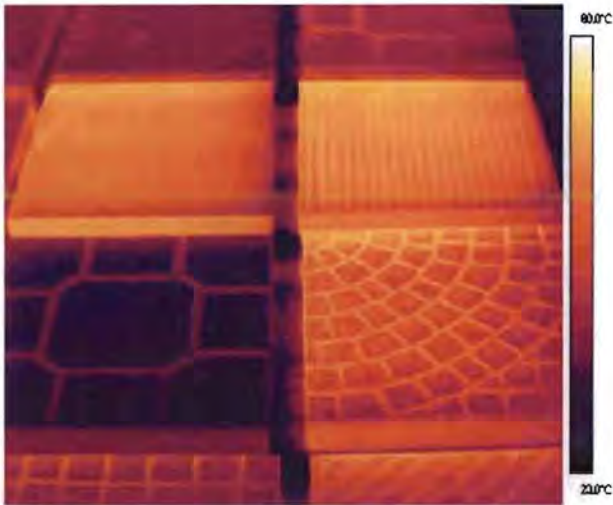


Figure 64. Infrared showing the heat differences between different materials.

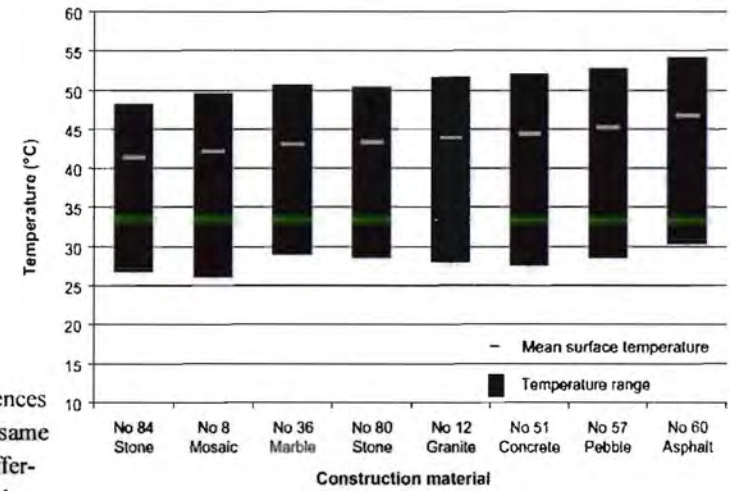


Figure 66. The differences in temperature of the same colour (black), yet differently textured materials



Analysis of three streets in Cape Town

St. Georges Mall

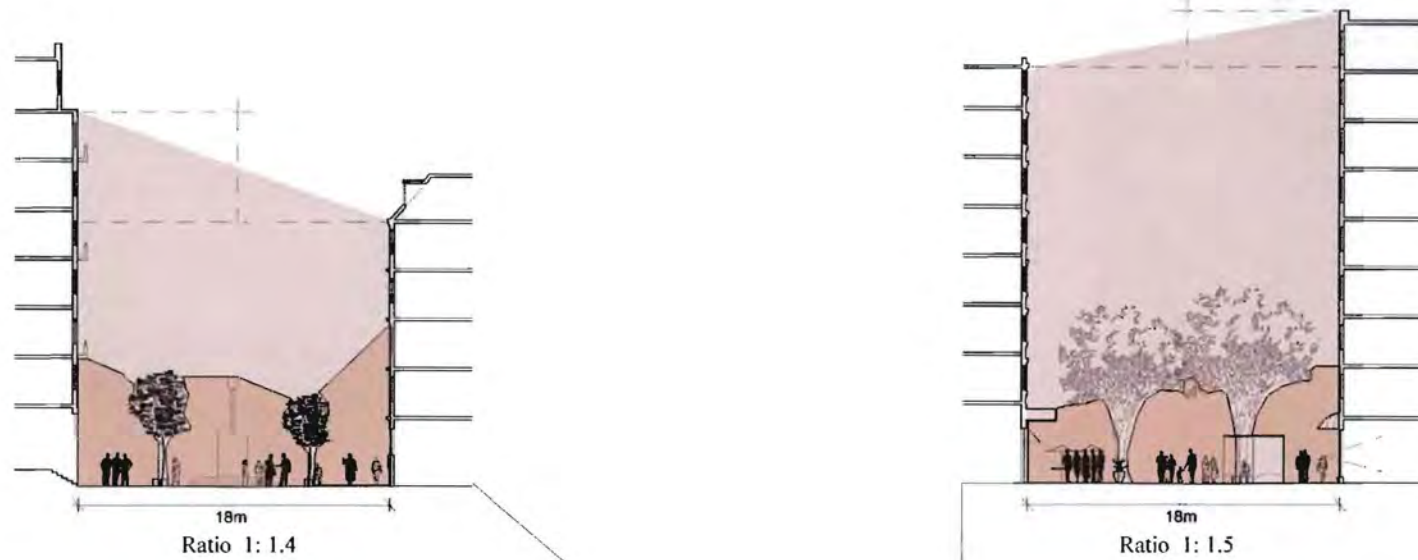
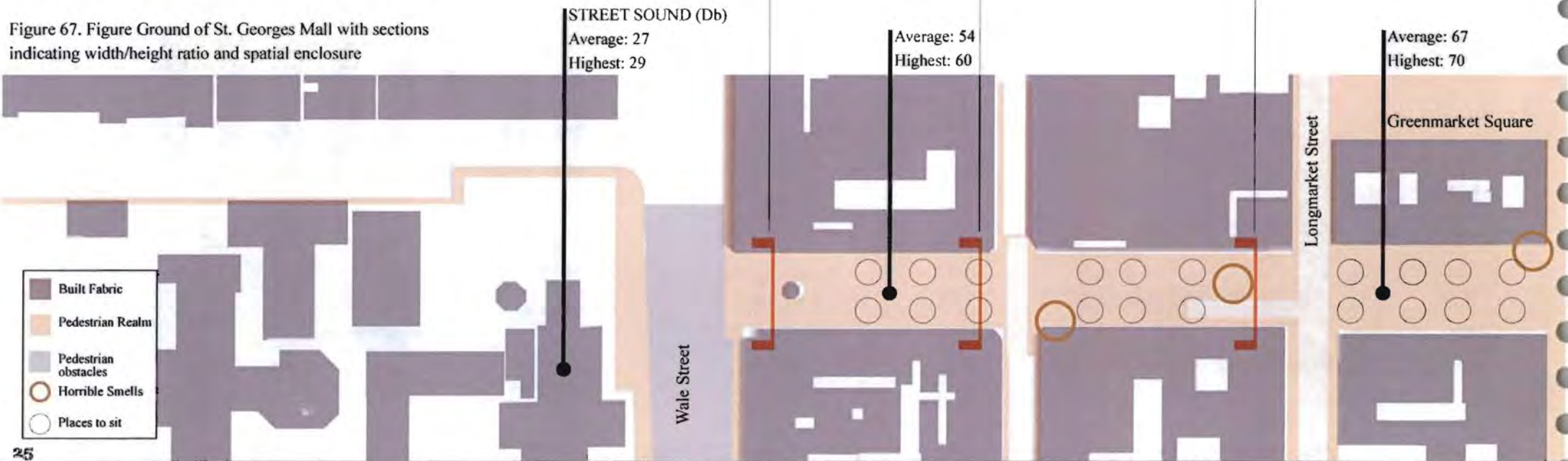
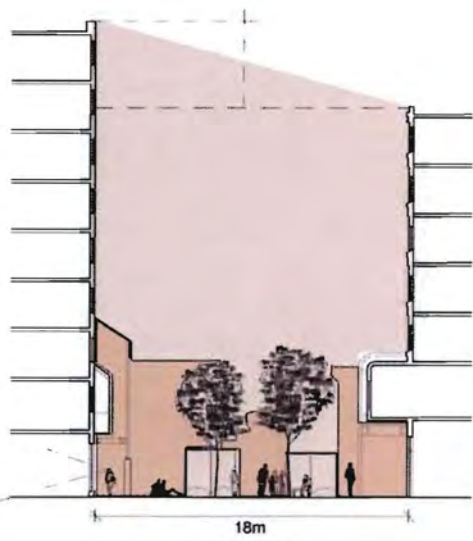
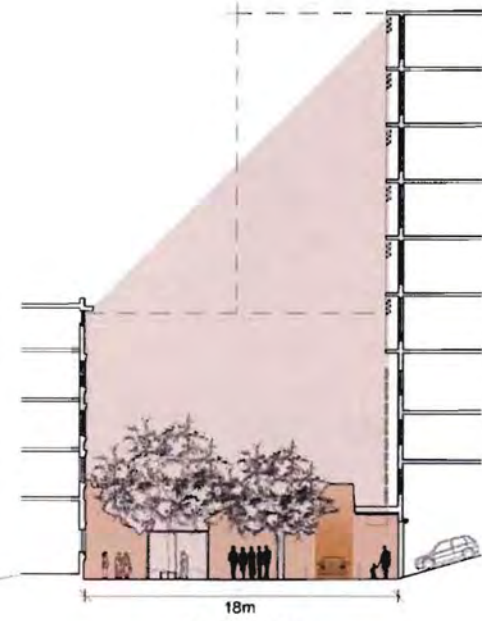


Figure 67. Figure Ground of St. Georges Mall with sections indicating width/height ratio and spatial enclosure





Ratio 1: 1.2



Ratio 1: 1.5

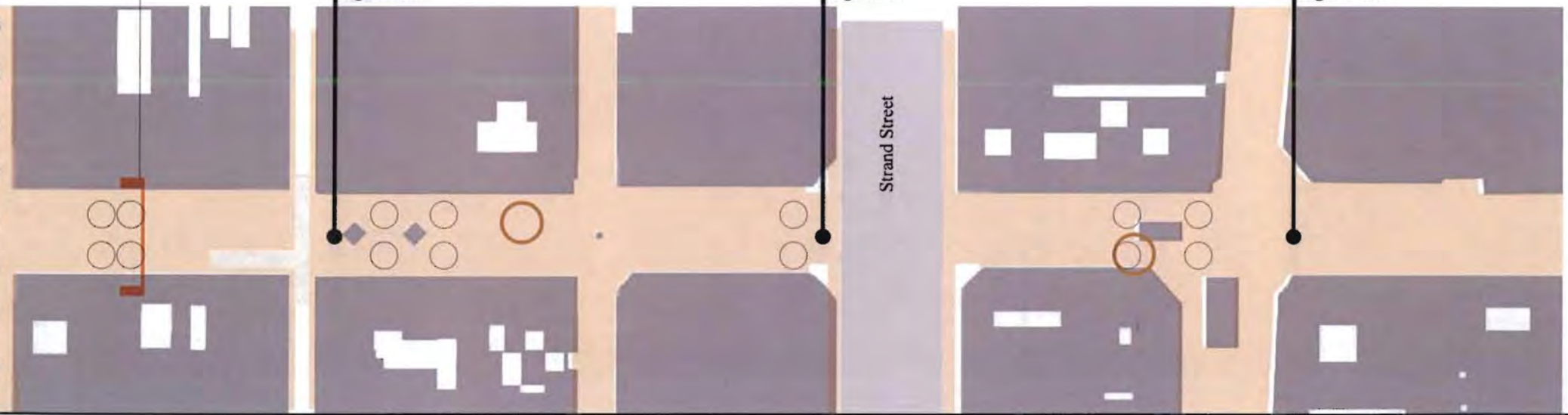
- Overall Spatial Ratio
- Experienced Spatial ratio
- Moving Vehicular Lane
- Parked Vehicular Lane

Average: 50
Highest: 56

Average: 60
Highest: 66

Average: 52
Highest: 54

Strand Street



Longmarket Street

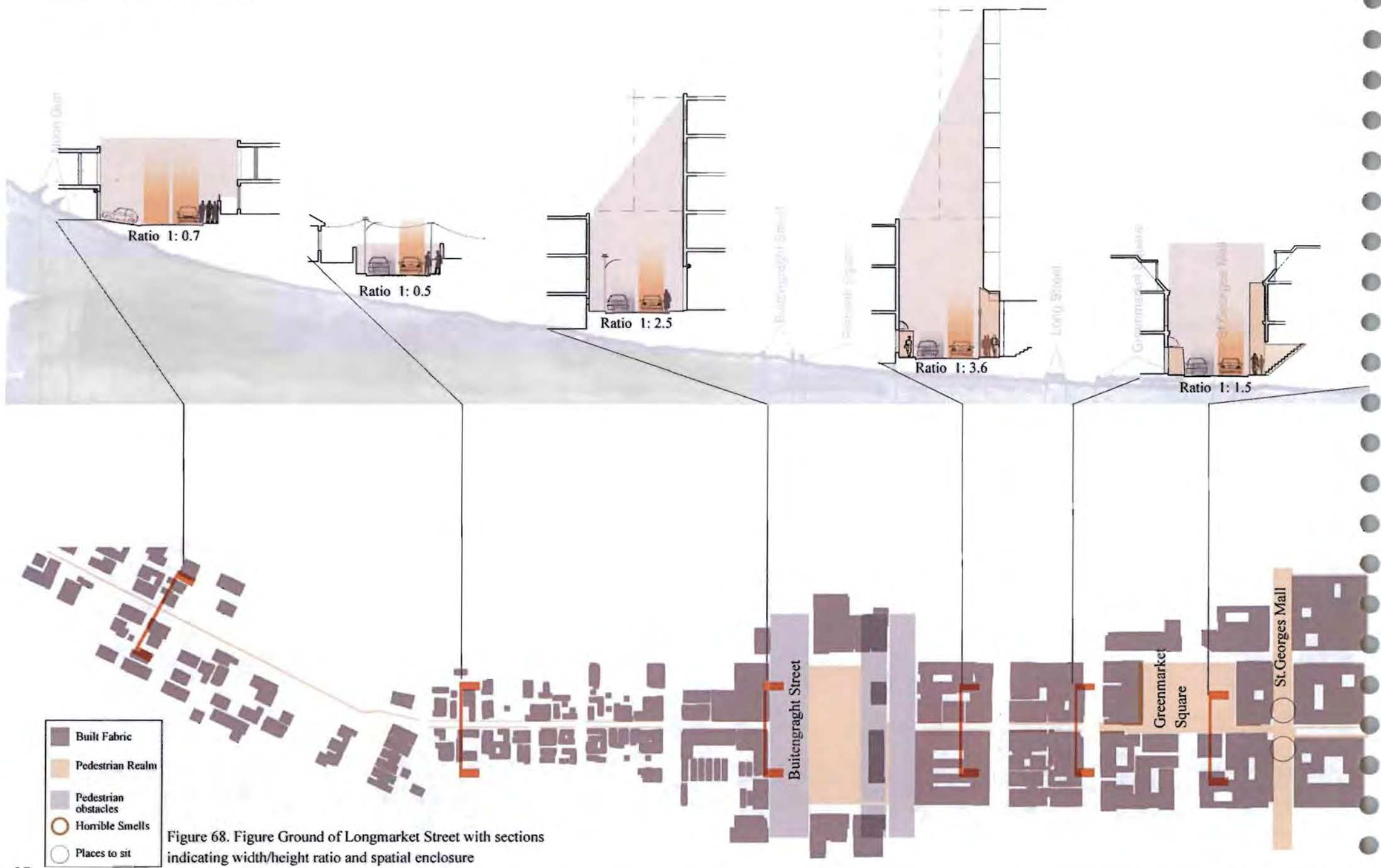
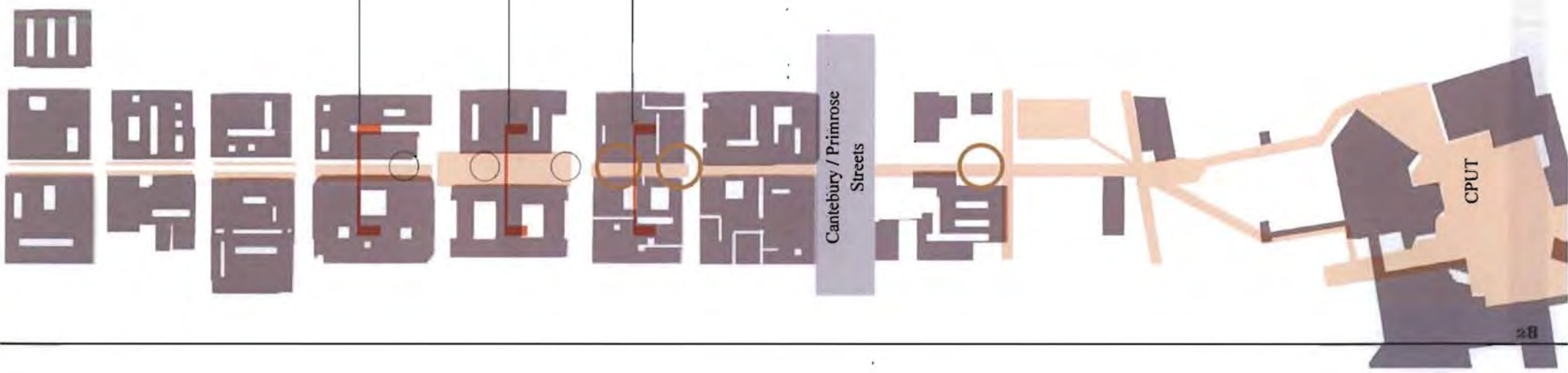
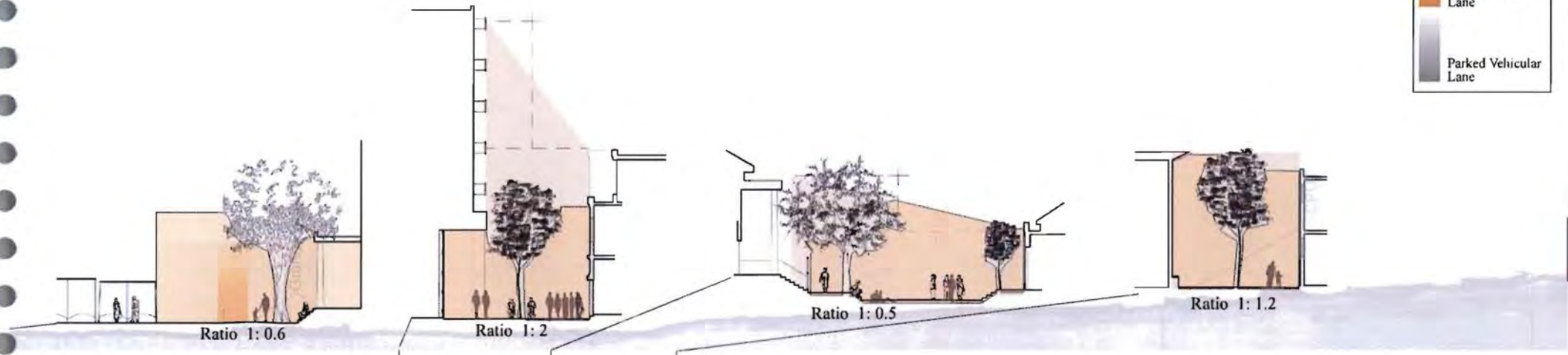
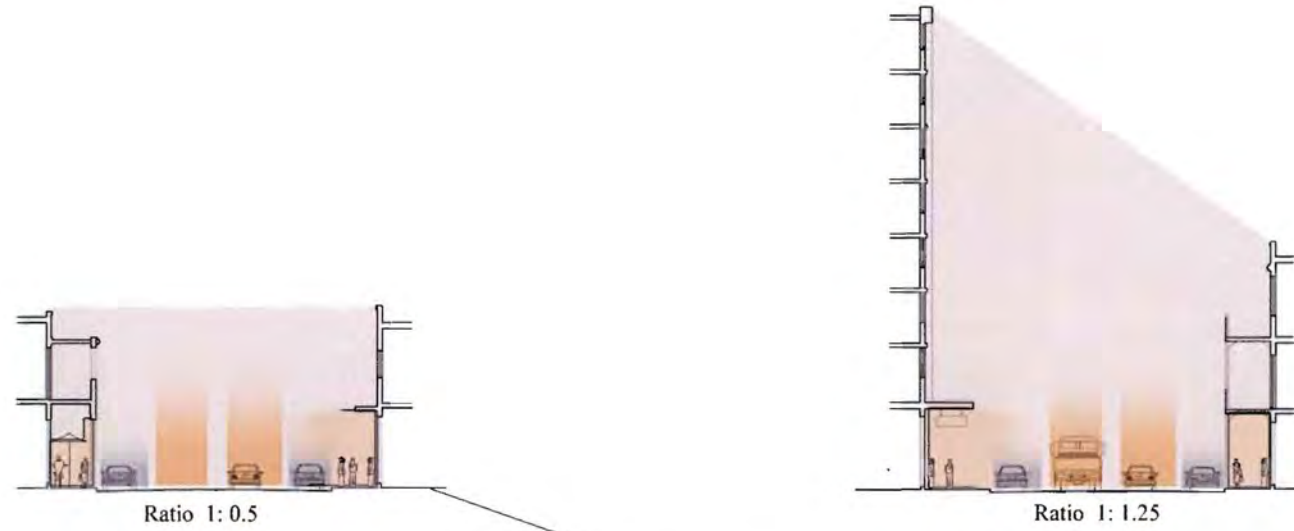


Figure 68. Figure Ground of Longmarket Street with sections indicating width/height ratio and spatial enclosure

- Overall Spatial Ratio
- Experienced Spatial ratio
- Moving Vehicular Lane
- Parked Vehicular Lane



Long Street



STREET SOUND (Db)

Average: 45
Highest: 49

- Built Fabric
- Pedestrian Realm
- Pedestrian obstacles
- Horrible Smells
- Places to sit

Average: 61
Highest: 65

Average: 59
Highest: 61

Average: 51
Highest: 54

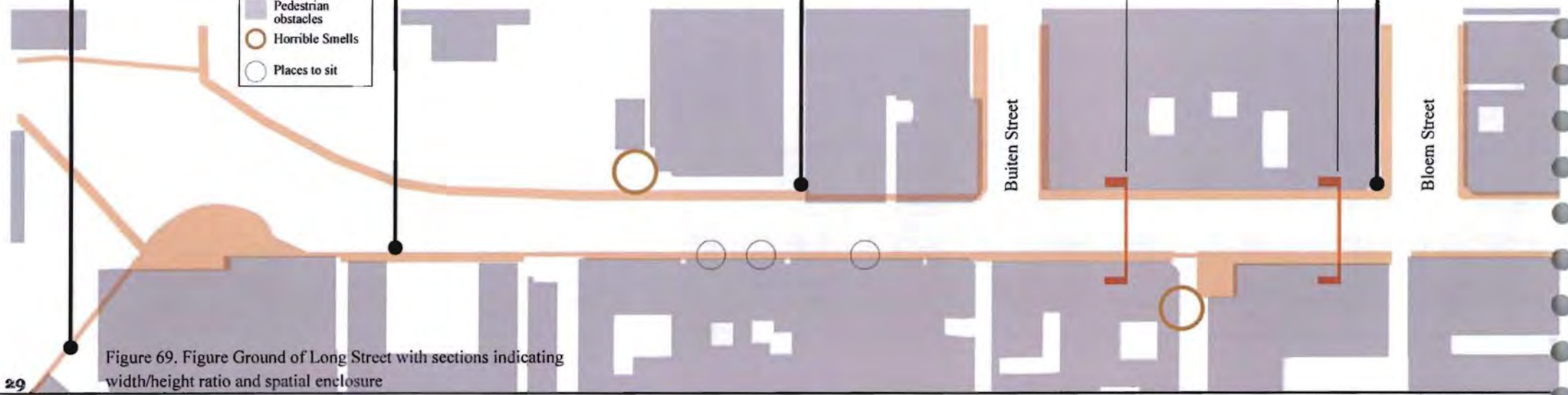
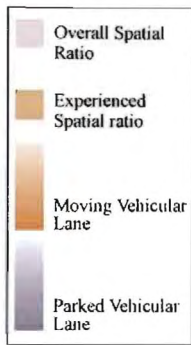
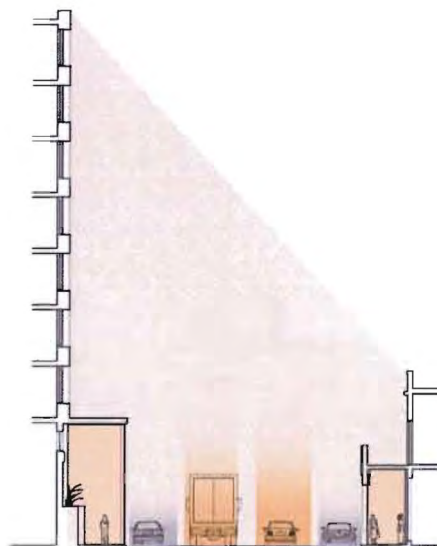


Figure 69. Figure Ground of Long Street with sections indicating width/height ratio and spatial enclosure



Ratio 1:0.6



Ratio 1:1.7

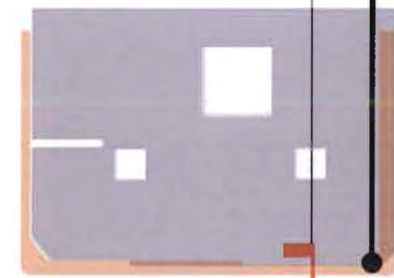


Pepper Street



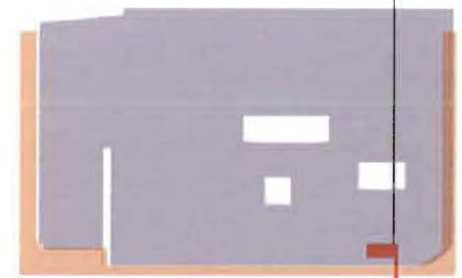
Leeuwen Street

Average: 61
Highest: 65

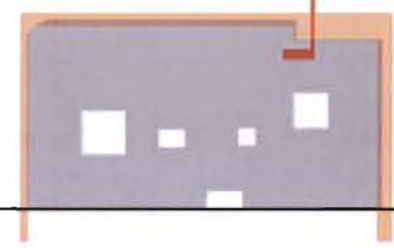
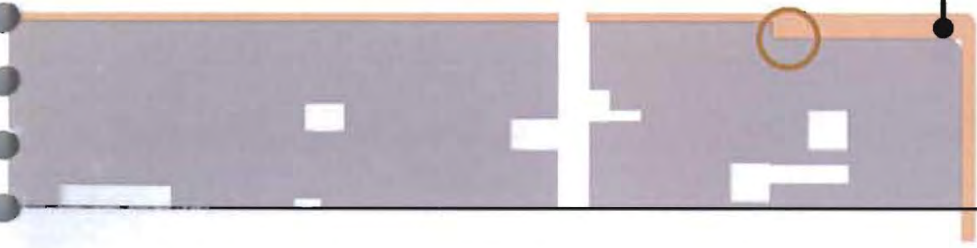


Dorp Street

Average: 54
Highest: 57



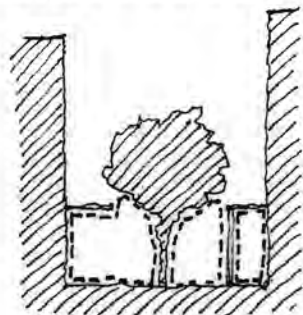
Wale Street



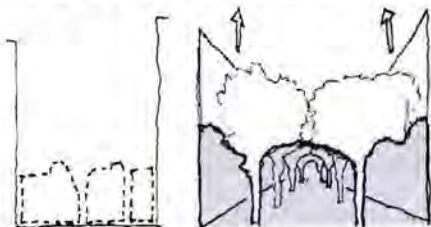
Synthesis - LEARNING FROM THE STREETS

This is a summary of the key aspects that was learnt during the analysis of the three streets in Cape Town.

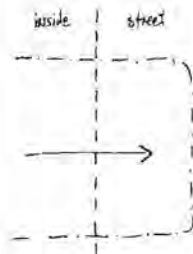
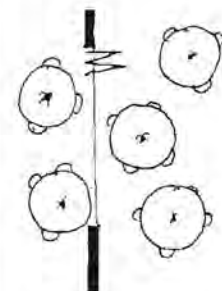
SPATIAL EXPERIENCE



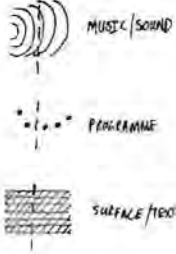
The width/height ratio of the street has little effect on the spatial experience as smaller streets are defined within the larger street through various spatial devices



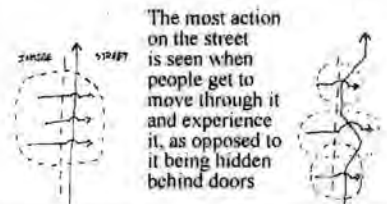
ACTION LEAKING ONTO THE STREET



The street is defined by the actions and functions that frame it. Where that action leaks out onto the street, public vibrancy and public place making is achieved

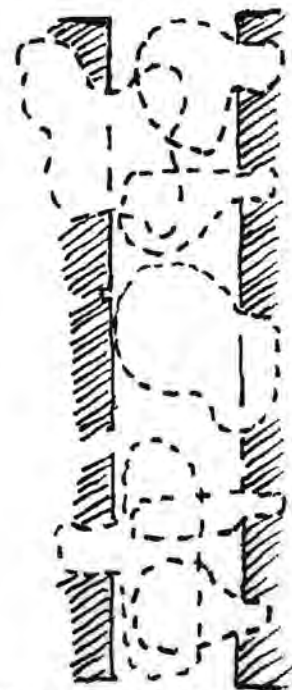


MOVING THROUGH THE ACTION

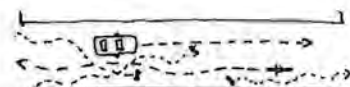


The most action on the street is seen when people get to move through it and experience it, as opposed to it being hidden behind doors

OVERLAP

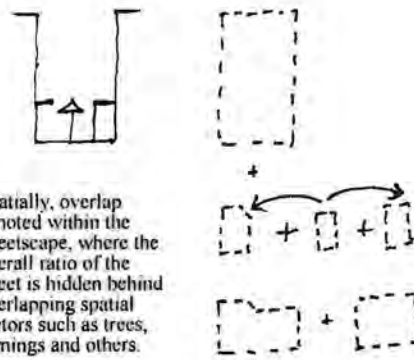


Overlapping programmes where one function spills out over the next creates pockets of diverse activity



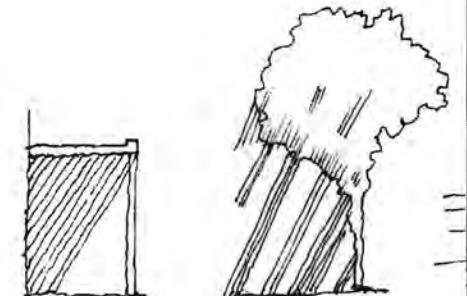
It is best when there are numerous options of movement on the street - walking, cycling, riding, or in a car

SPATIALLY...

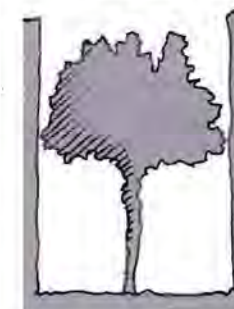


Spatially, overlap is noted within the streetscape, where the overall ratio of the street is hidden behind overlapping spatial factors such as trees, awnings and others.

COMFORT

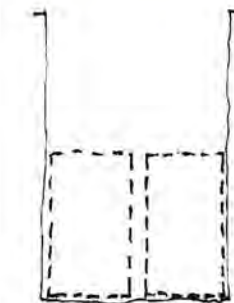


TREES/ GREENERY

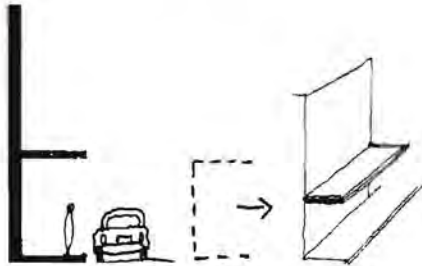


Most people gravitate towards trees in an urban setting. Trees provide shade as well as protection from the wind. Psychologically, trees provide visual relief in a city that is mostly concrete.

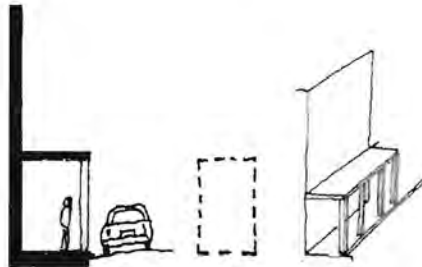
Planting in the urban landscape spatially defines the street. As seen to the left, a tree planted in a street defines two smaller streets within the larger.



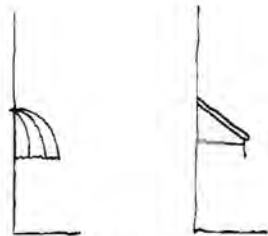
STREET EDGE



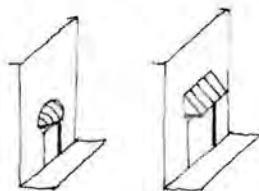
Spatially open street edge



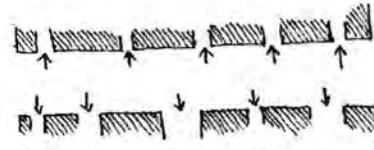
Spatially enclosed street edge



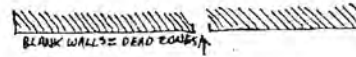
Small awnings and overhangs provide shelter in the rain and create places in the street that people gravitate towards



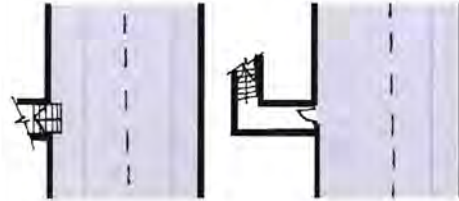
ACCESS



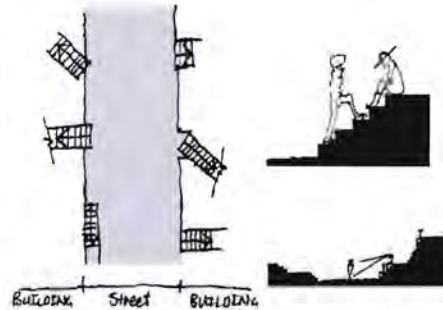
Many entrances located on the street creates vibrancy



Few entrances create dead street edges that inevitably become crime ridden.

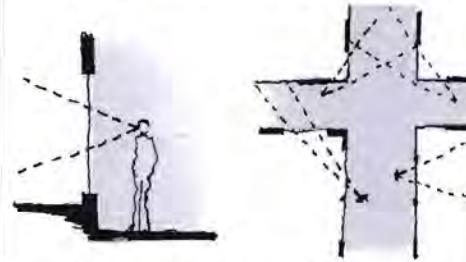


Staircases located immediately on the street edge create vibrancy and activity. The staircases act as a continuation of the street

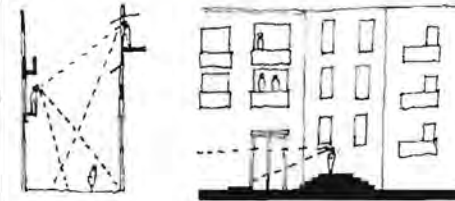


Staircases located immediately on the street also create places for people to hang out on promoting public place making

TRANSPARENCY/ Privacy

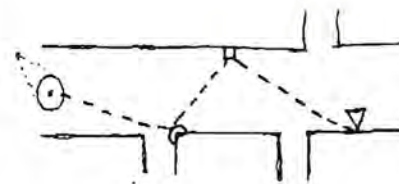


Visual transparency on ground floor promotes the level of publicness.

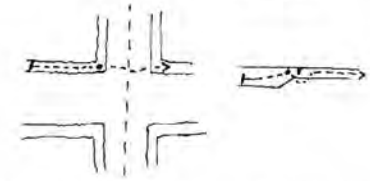
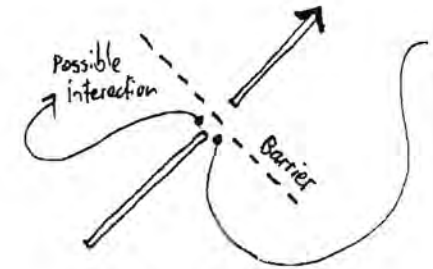


LOCAL LANDMARKS

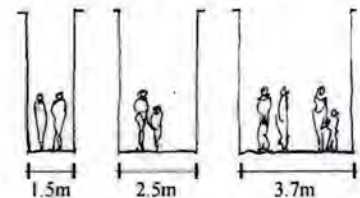
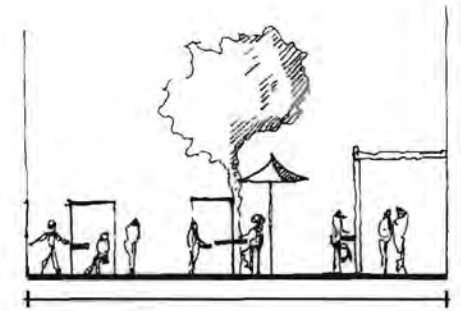
PATH CHOICE



PEDESTRIAN FLOW



Place of stopping is not necessarily a bad thing - as long as it is not dangerous to cross the barrier, you can pause and experience.



Site

Site rationale

The chosen site is located in the east city of Cape Town on Longmarket Street. The site is an underutilised piece of land on what used to be a very vibrant suburb of District 6.

The reason why I choose this site is due to its disconnected state – where Longmarket street, a strong NW-SE pedestrian connection in the city bowl fades away into a desolate empty place. The site is an extremely exciting piece of land in the city because of its potential. It is located as the strongest connection to the city from the future district 6.

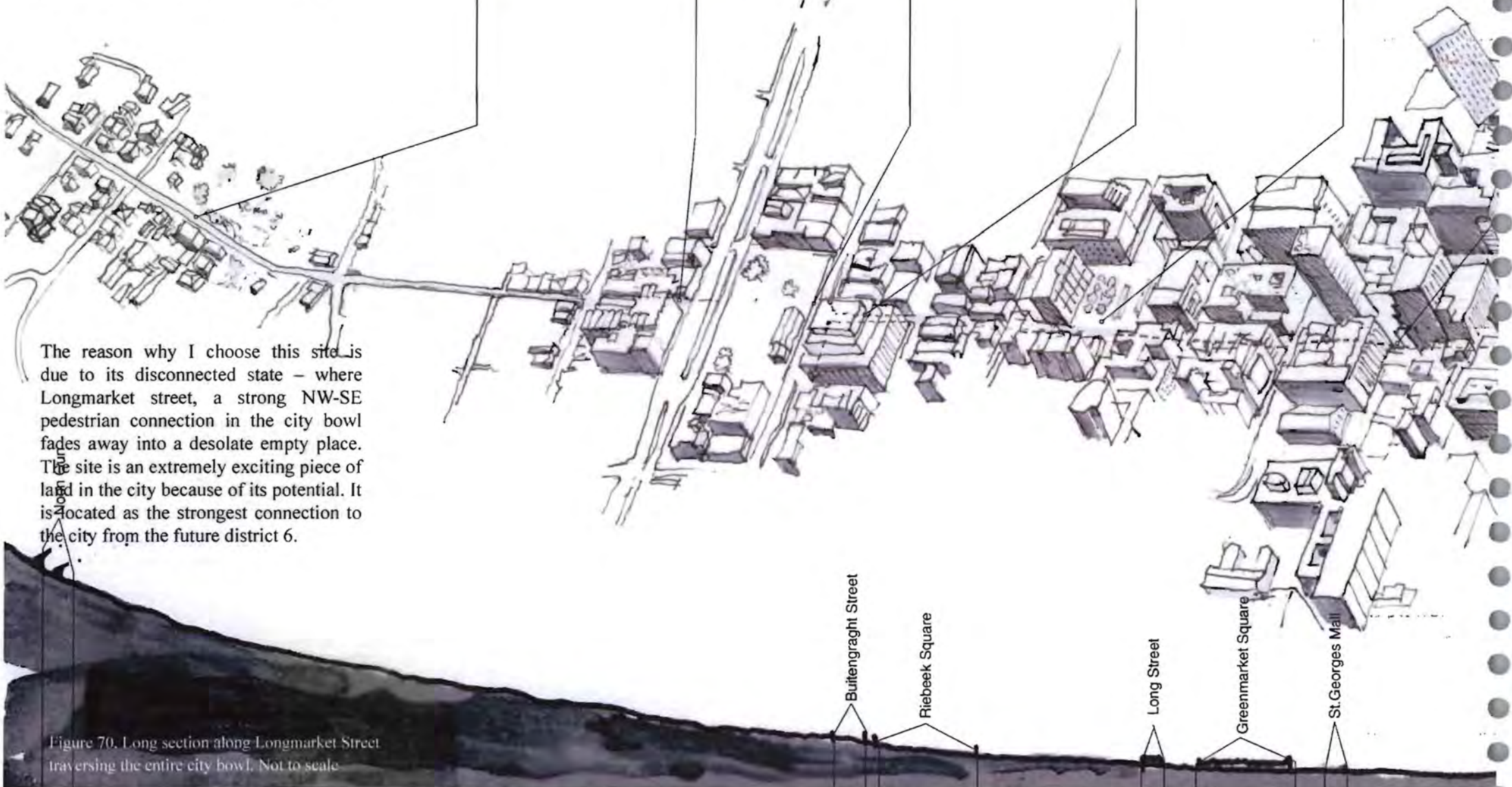
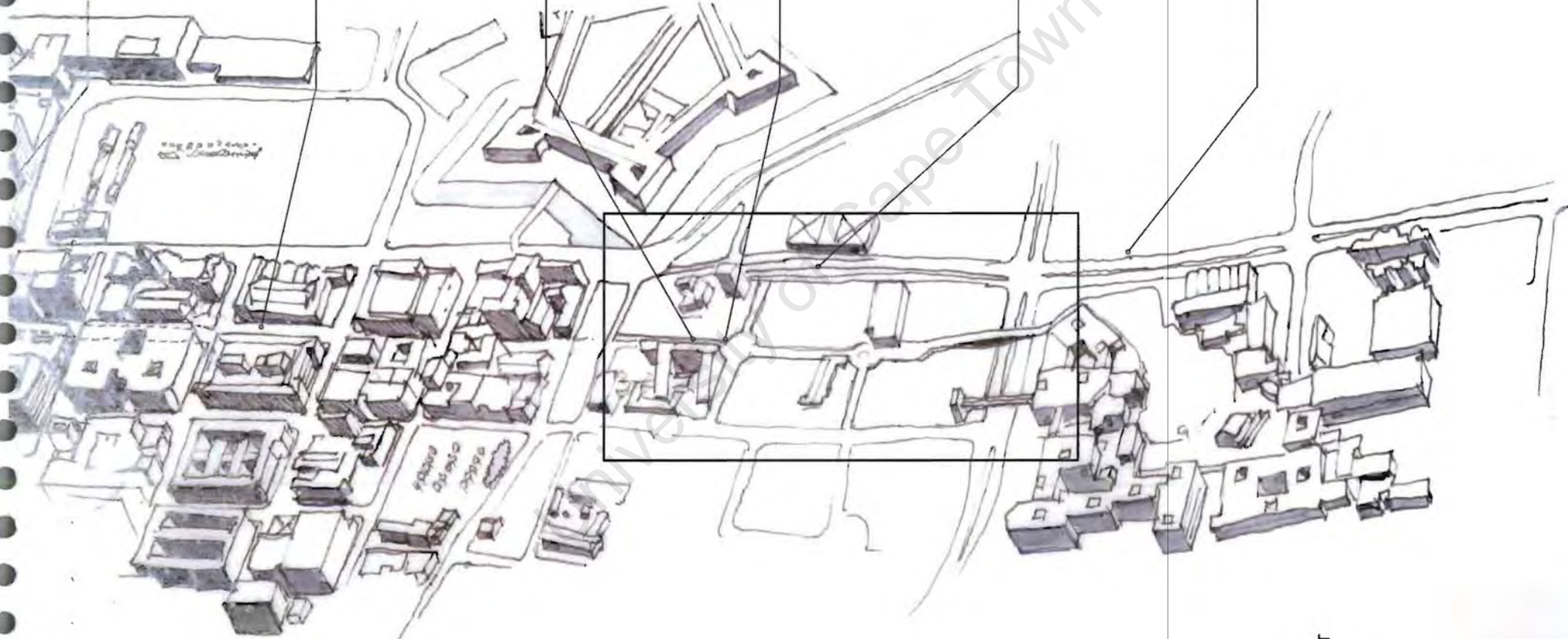


Figure 70. Long section along Longmarket Street traversing the entire city bowl. Not to scale



Figure 71. Photos of the journey along Longmarket Street



Grand Parade

SITE

CPUT

Site

Current condition

The site is characterised by parking lots, open underutilised land and the smell of urine. The main pedestrian traffic is to and from CPU and the station. The pedestrian bridge near CPU is very seldom used (see movement analysis, p41).



Figure 72. Google Maps image indicating site and surrounds



Site history

Longmarket Street is one of the oldest streets in Cape Town, originally set up to link Greenmarket Square to the Grand Parade. It was the primary pedestrian link between District 6 and the city and was a highly utilised, social and economic activity route. Unfortunately, the route has lost its significance because of the demolition of District 6. Furthermore, Cape Peninsula University of Technology, then known as Cape Technikon was built blocking its thoroughfare. However, I believe that the route can be reinstated as a major pedestrian link that traverses the entire city bowl.



Figure 73. Muddy Longmarket Street in the 1870's



Figure 74. Looking down Longmarket Street from Lion's Rump, 1890



Figure 75. The split between Longmarket Street and Hanover Street, 1969

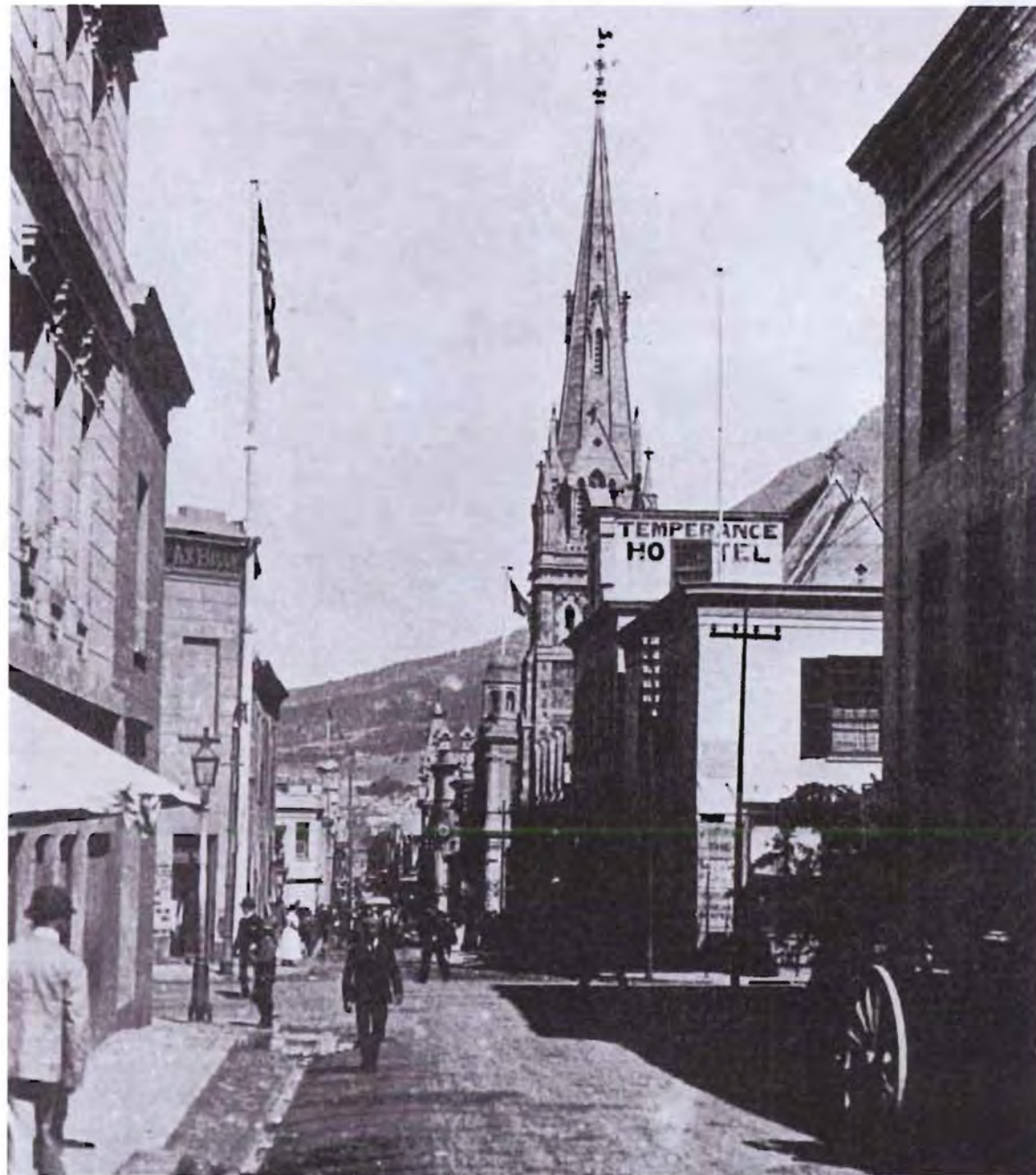
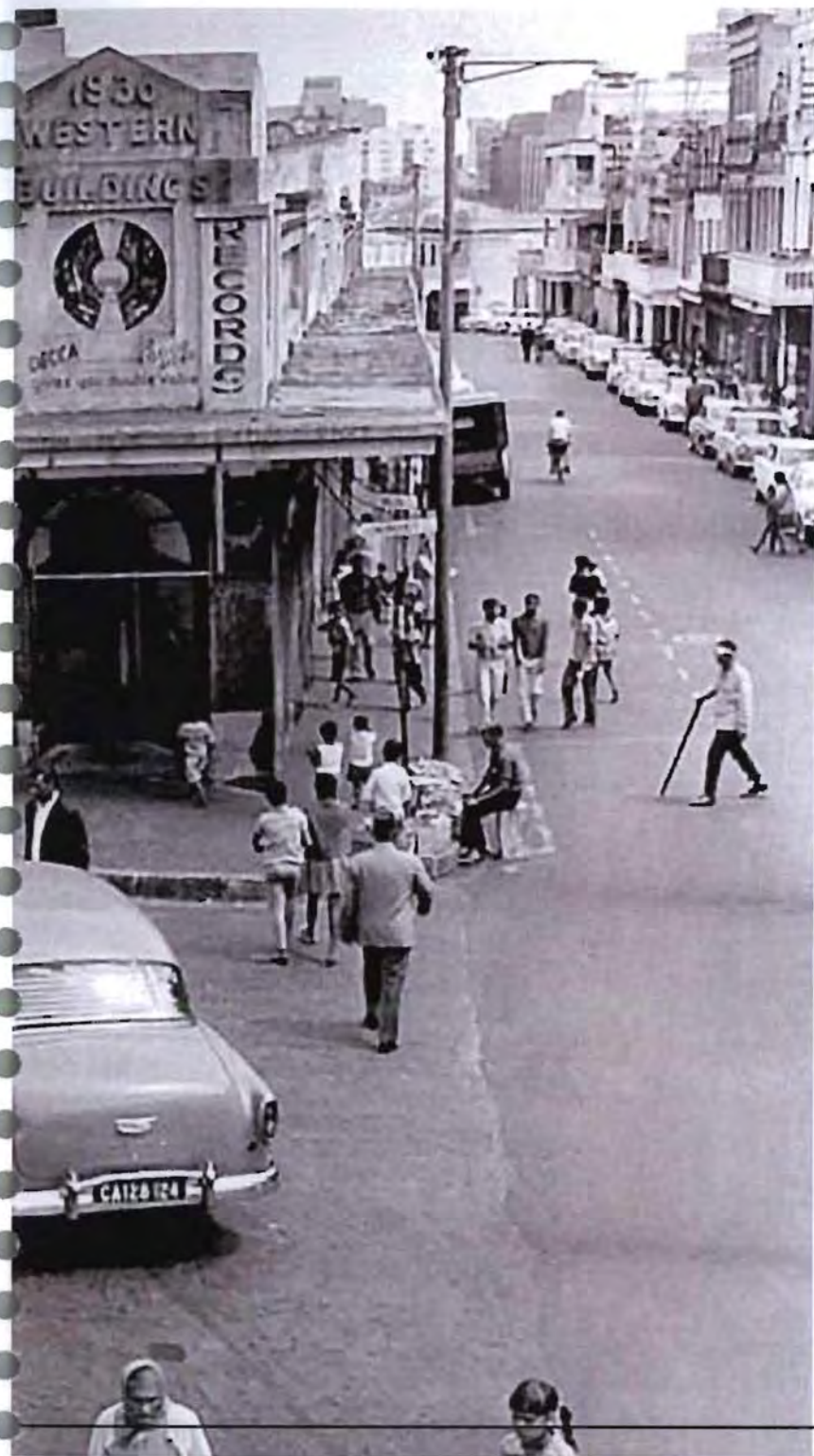


Figure 76. Longmarket street near Greenmarket Square, 1890's

Mappings – Past



Figure 77. The Old and the New

Source: Le Grange, 2003, Heritage Impact Assessment of District Six

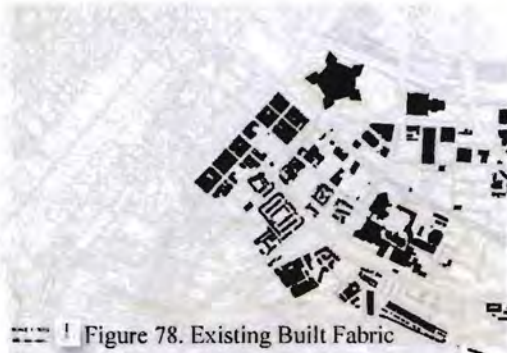


Figure 78. Existing Built Fabric

Source: Le Grange, 2003, Heritage Impact Assessment of District Six



The split between Longmarket and Hanover Streets

Figure 79. Important Buildings of District 6

Source: Le Grange, 2003, Heritage Impact Assessment of District Six



Figure 80. Land Programme, 1964
Source: Le Grange, 2003, Heritage Impact Assessment of District Six

Mappings - Future

District 6 Development Framework proposed by Nm Associates and Lucien Le Grange



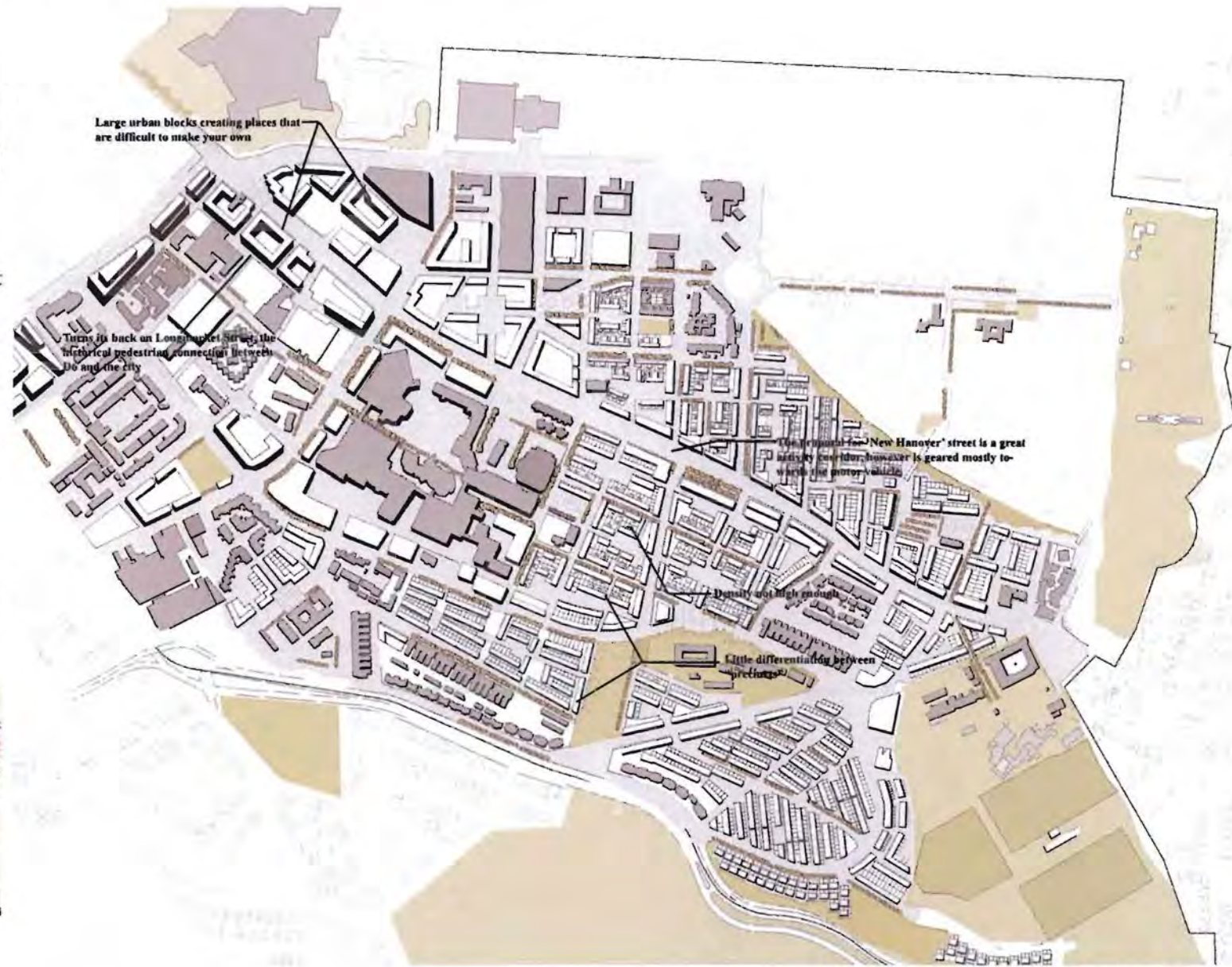
Figure 81. Proposed densities of D6
Source: NM Associates and Le Grange, 2010, District 6 Development Framework



Figure 82. Proposed activity Nodes
Source: NM Associates and Le Grange, 2010, District 6 Development Framework



Figure 83. Proposed Storey Densities
Source: NM Associates and Le Grange, 2010, District 6 Development Framework



↑ ... Figure 84. Urban Proposal - D6 Development Framework
Source: NM Associates and Le Grange, 2010, District 6 Development Framework

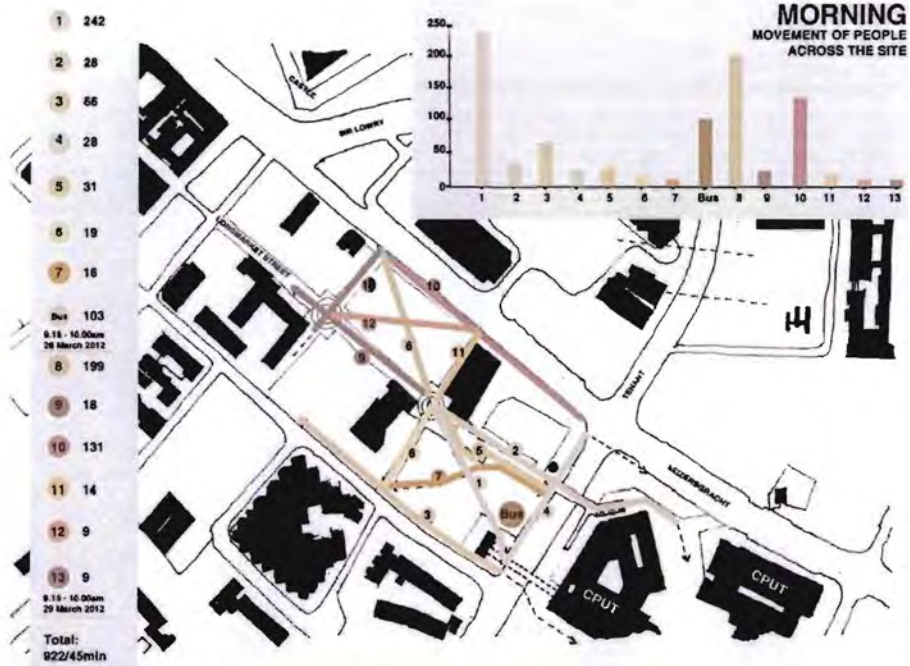


Figure 85. Movement of people across the site in the morning



Figure 87. Photo of Longmarket Street, looking towards CPUT

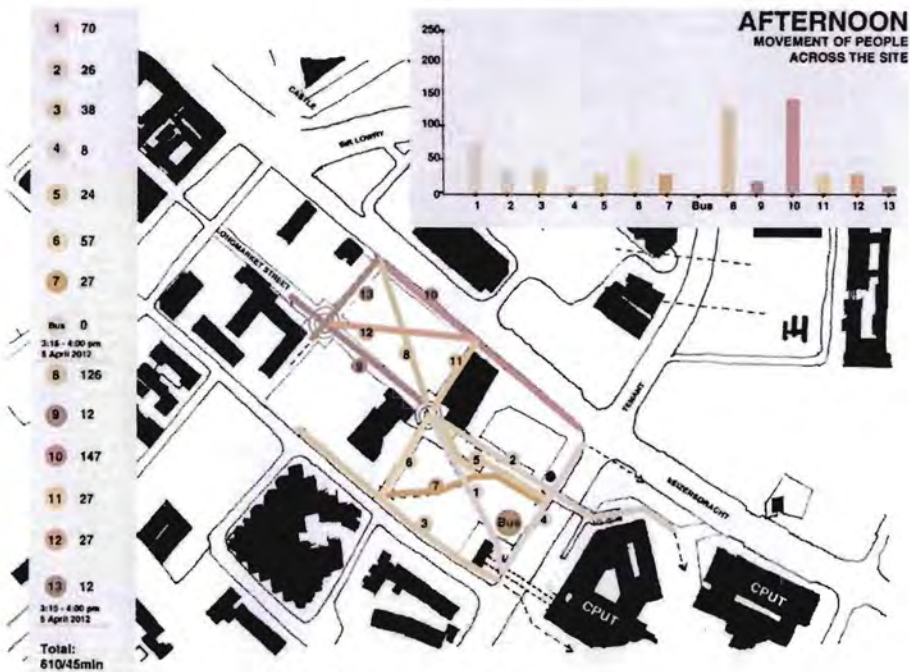
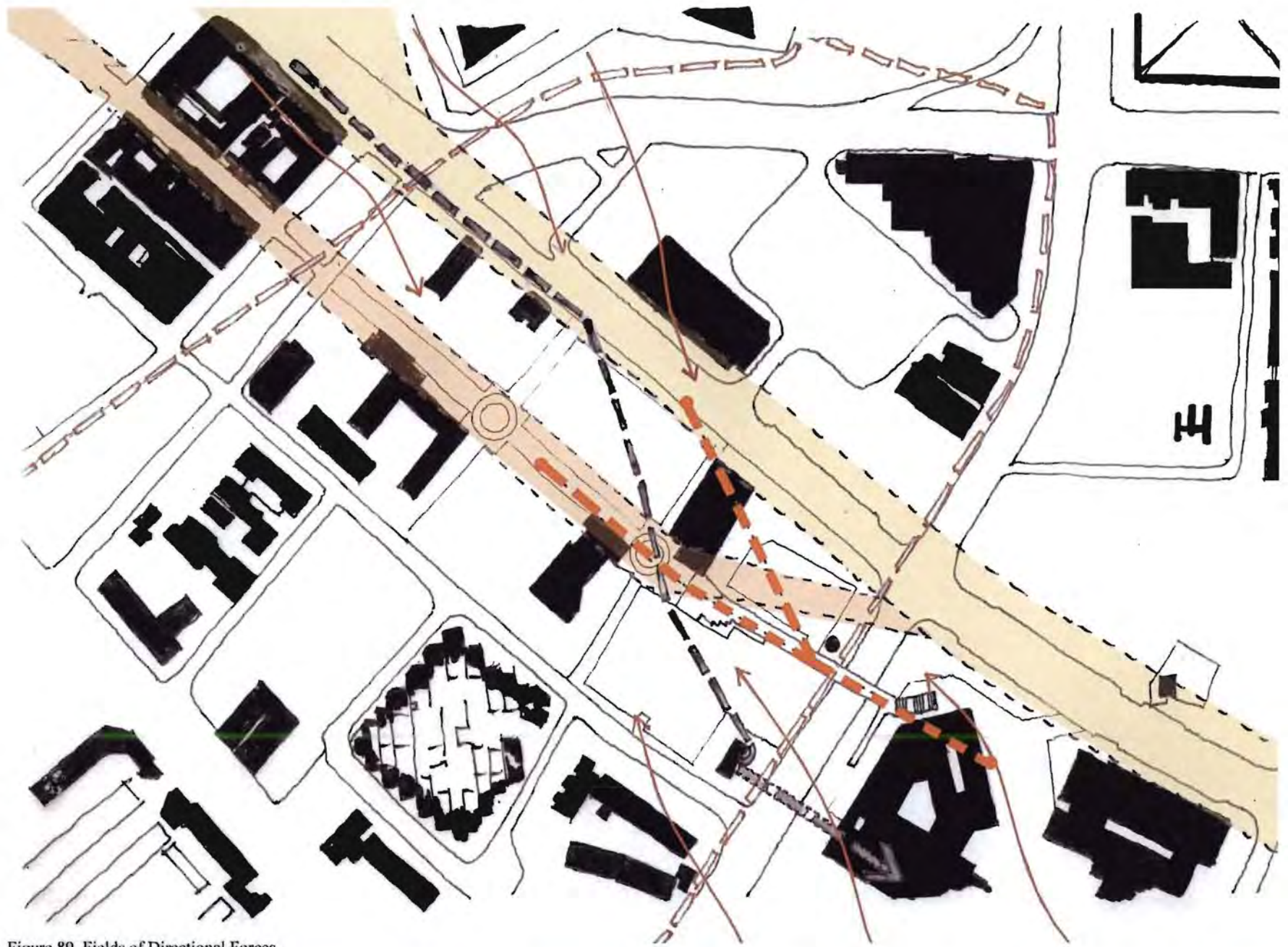


Figure 86. Movement of people across the site in the afternoon



Figure 88. Parking Lots



↑ Figure 89. Fields of Directional Forces
NTS

Proposed future main pedestrian route

Proposed Activity Corridor

Historical Force - the old Hanover/
Longmarket intersection

The most used existing
pedestrian route

Camissa Force - below ground
water

The Force of Winds

URBAN DESIGN PROPOSAL

1 Maximising Ex. Site Zoning Regulations

Existing Site:

LOT SIZE: Varies (average 825m²)

NUMBER OF LOTS: 16

TOTAL BUILT FORM: 4922m²

PERCENTAGE OF SITE BUILT: 13%

DENSITY: 282 du/ha (average of 80m² per unit)

(various m² x various levels = 15316m² / 80m² = 1508m² / 3.5 hectares (total site size) = 54 du/ha

TENURE OPTIONS: Traditional, Each erf owned individually

NOTES: The existing site is highly underutilised. Being so close to the city, there needs to be high density.

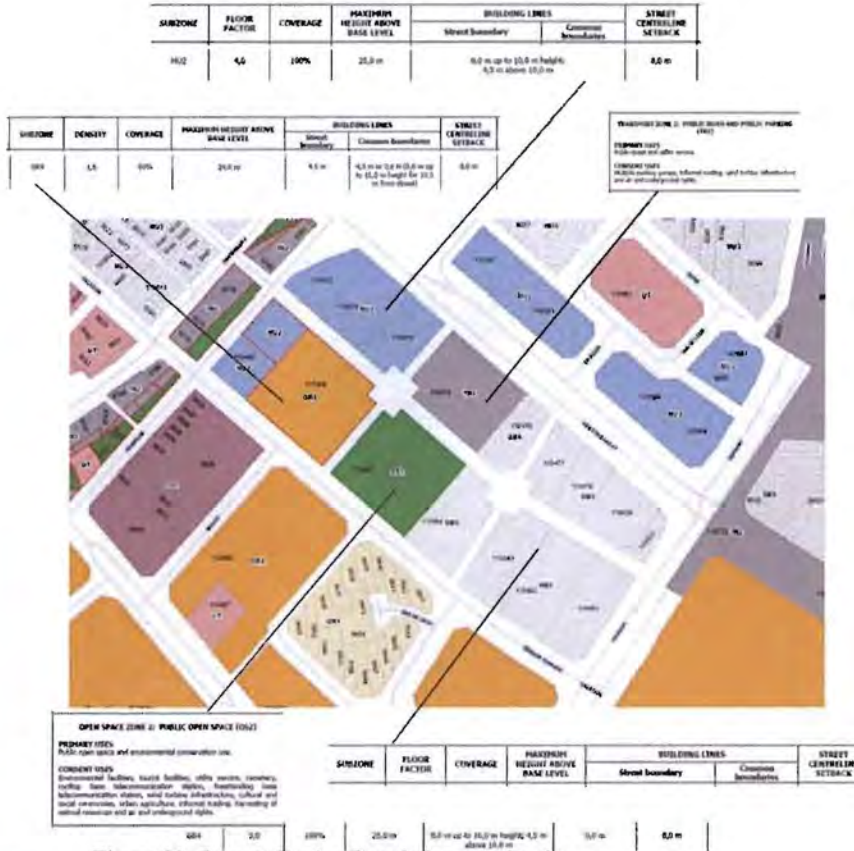


Figure 90. Current Zoning Restrictions on the site

Maximised Zoning Regulations:

LOT SIZE: Varies (average 48m x 31m)

NUMBER OF LOTS: 16

TOTAL BUILT FORM: 23 160m²

PERCENTAGE OF SITE BUILT: 43%

TOTAL AVAILABLE PROPERTY: 115 800m²

DENSITY: 413 du/ha (average of 80m² per unit)

(23 160m² x 4 levels = 115800m² / 80m² = 1447m² / 3.5 hectares (total site size) = 413 du/ha

TENURE OPTIONS:

NOTES: Setbacks do not help create a diverse and vibrant street space



The Reason for the proposed split in Longmarket Street

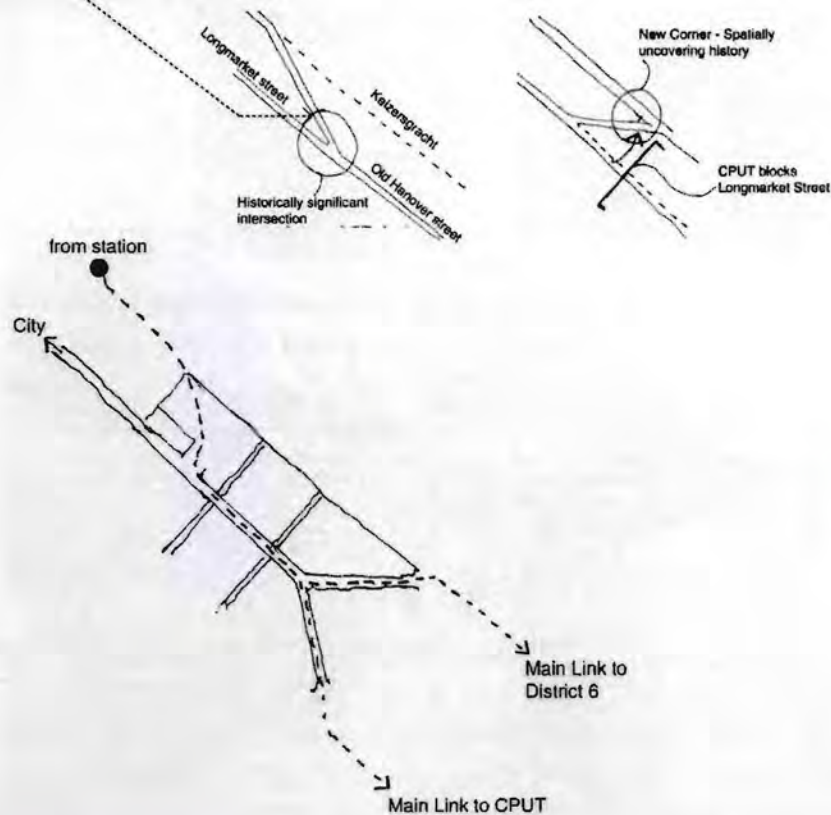


Figure 91. The split between Hanover and Longmarket

1. To bypass the solid block of CPUT

2. Gordon Cullen talks about the unfolding of space, where spaces are revealed as you move through them, and this split allows that to happen,

3. To spatially uncover the past in the form of the spatial split between Hanover and Longmarket, which is now happening on Keizersgracht



2 Layout A - Maximising Erven

LOT SIZE: 30m x 10m (average 270m²)

NUMBER OF LOTS: 110

TOTAL BUILT FORM: 30 160m²

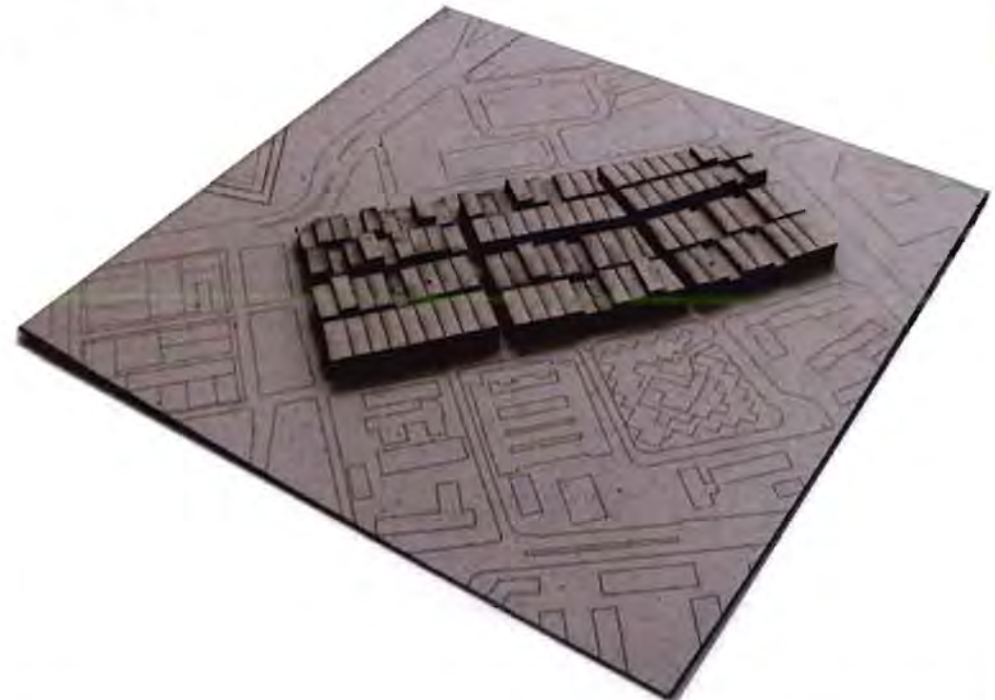
PERCENTAGE OF SITE BUILT: 85%

DENSITY: 282 du/ha (average of 80m² per unit)

(30160m² x 4 levels = 120640m² / 80m² = 1508m² / 3.5 hectares (total site size) = 430 du/ha

TENURE OPTIONS: Each erf owned or leased individually

NOTES: The slender erven require small internal courtyards, which I am after, however, they do not give much variety to the street front and is quite inaccessible. Also, the layout requires there to be a service lane in the centre of the block which will inevitably become dirty, dank and dark.



3 Layout B- Long Slender Erven

LOT SIZE: 60m x 15m or 50m x 15m
(average 825m²)

NUMBER OF LOTS: 36

TOTAL BUILT FORM: 30 160m²

PERCENTAGE OF SITE BUILT: 85%

DENSITY: 430du/ha (average of 80m²
per unit)

$(30160\text{m}^2 \times 4 \text{ levels} = 120640\text{m}^2 / 80\text{m}^2$
 $= 1508\text{m}^2 / 3.5 \text{ hectares (total site size)} =$
 430 du/ha

TENURE OPTIONS: Each erf owned in
sectional title. Due to the large length, the
erven would have to be subdivided in a
sectional manner

NOTES: Although the slightly wider
breadth creates opportunities to easily
place courtyards within them, the
internalized structure is difficult to deal
with in terms of fire regulations and
service delivery.



4 Perimeter Block

LOT SIZE: Varies (average 4950m²)

NUMBER OF LOTS: 6

TOTAL BUILT FORM: 19 760m²

PERCENTAGE OF SITE BUILT: 55%

DENSITY: 282 du/ha (average of 80m² per
unit)

$(19760\text{m}^2 \times 4 \text{ levels} = 79040\text{m}^2 / 80\text{m}^2$
 $= 988\text{m}^2 / 3.5 \text{ hectares (total site size)} = 282$
 du/ha

TENURE OPTIONS: Large housing
developments either owned and leased out,
or with a sectional title

NOTES: The large courtyard spaces are
often vast parking lots and are also often too
large for people to take ownership of.



5 Mat-Urbanism

LOT SIZE: highly variegated

NUMBER OF LOTS:-

TOTAL BUILT FORM: 28 350m²

PERCENTAGE OF SITE BUILT: 80%

DENSITY: 405 du/ha (average of 80m² per unit)

(28350m² x 4 levels = 113400m² / 80m² = 1417m²/3.5 hectares (total site size) = 405 du/ha

TENURE OPTIONS: Sectional title, ownership, lease, lease with option to buy

NOTES: The urban environment as conceived as a mat building where the entire site is covered in a horizontal "groundscraper" and is eroded away where light and ventilation as well as movement is required. It creates an environment that is highly adaptive, and highly interconnected, as well as highly variegated.



A brief synopsis of mat-urbanism

"Mat-building can be said to epitomize the anonymous collective; where the functions come to enrich the fabric, and the individual gains new freedoms of action through a new shuffled order, based on interconnection, close knit patterns of association and possibilities for growth, diminution and change." (Smithson, 1974)

The concept of mat-urbanism was started in the 1950's by Team 10 as a more individualistic and complex alternative to the universalising approach of Le Corbusier's Functional City. Le Corbusier's model segregated urban living into four simplistic parts – living, working, circulation and recreation, and suggested a small overlap between each segment of life. Mat-urbanism suggested a model of urban form that was easily adapted and concerned the notion of place, environmental sensitivity, and human association (Forés, 2011:74).

The basic principle was to fill the site with building mass – place, circulation and voids were then eroded from the mass, creating a complex environment filled with discovery, variety and individual expression. It is quite clear that Team 10 were highly influenced by the study of the *madina* or Islamic city's urban design principles. The similarities are evident in the network of paths and routes, the overall aesthetic, and the growth of the urban footprint over time. A concise summary of the concepts associated with Arabic-Islamic urban planning follows.

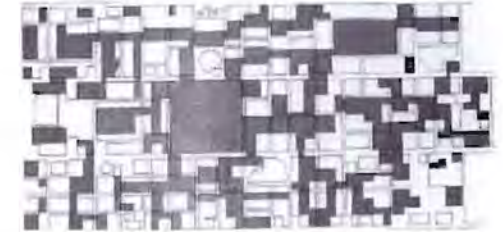


Figure 92. Diagrammatic plan of the Berlin Free University



Figure 93. Competition model for the Berlin Free University

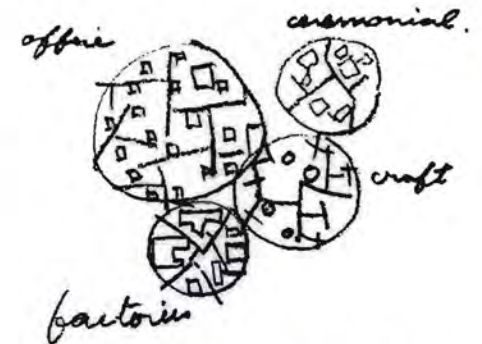


Figure 94. Cluster of overlapping functions. Source : Smithson and Smithson, 2005.



Figure 95. Diagrammatic plan of a small city

The planning of the madina

The urban form of the *madina*, or “Islamic city”, looks as if it is an unplanned, unintentional accumulation of buildings. Its rich urban nature, variety, high-density, mixed-use, complex layout sparks an interest in how this urban form was achieved. Innumerable studies have claimed that the planning of the *madina* is fully unintentional, implying urban randomness and chaos. However, these multifaceted human environments were organised around a complex system of social, religious, economic and political parameters (Radione, 2011:528) and most interestingly for this thesis, around a system of streets.

The guidelines concerning the overall urban “rules” were developed in the Sunna, the second source of law after the Qur’an, written from the 7th to 9th centuries CE (Hakim, 1986:16). These laws spanned from principles related to harming neighbours, privacy and ownership rights, to the widths and heights of streets. There is a stringent hierarchy of public space within the *madina*, defined and understood by the width of the street (figure 88). The most public or primary streets are 60 cubits wide (24m), the secondary streets are 20 cubits (8m), the intermediary streets are 7 cubits (2.8m) and the private cul-de-sac streets are 4 cubits (1.6m) wide. The public/private threshold continues within the layout of the house itself. As one exits the relative publicity of the cul-de-sac street, one enters into a small entrance room called a *Driba* (figure 89 ii), one level more private than the cul-de-sac. From there, in order

to hinder views into the extremely private courtyard space, a second level of privacy is achieved in the *Skifa* (figure 99), which is another small room that follows the *Driba*. This shows how defined thresholds between public and private are achieved within a very tight, densely populated urban centre. (figure 90).

The haphazard layout of the street system of the *madina* was an intentional strategy for defence against an enemy attack. This, coupled with the fact that the cities were created organically over many years, made the *madina* the place of discovery and mystery it is today. (figure 96, 100) Furthermore, the streets are, in fact, highly efficient in terms of infrastructure. In the *Tunis Madina*, streets only make up 12.5 % of the total built area. Of that, private cul-de-sacs make up 13% but serve more than 30% of the houses (Hakim, 1986:168). (figure 95)

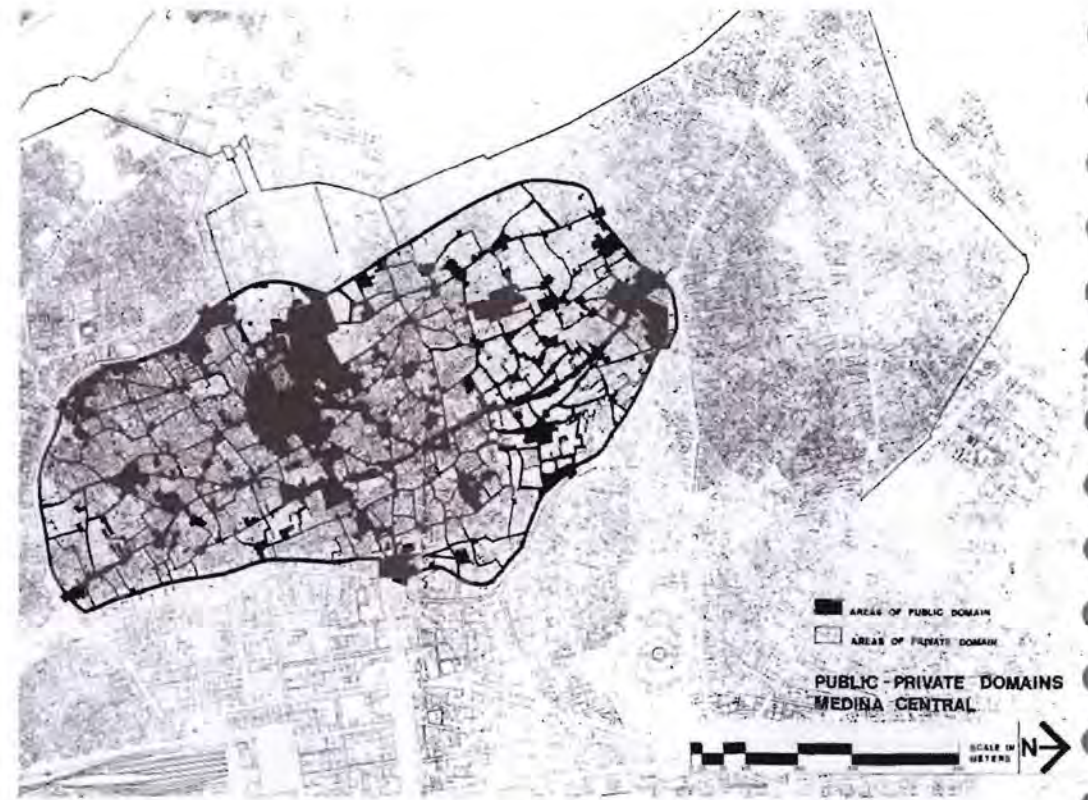


Figure 96. Public and private domains - Tunis Madina

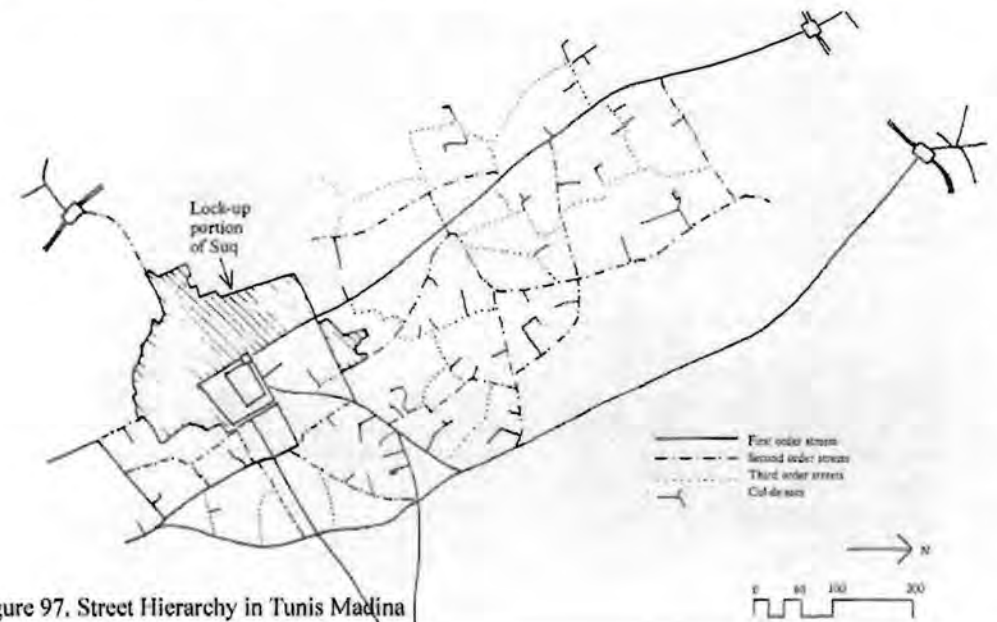


Figure 97. Street Hierarchy in Tunis Madina

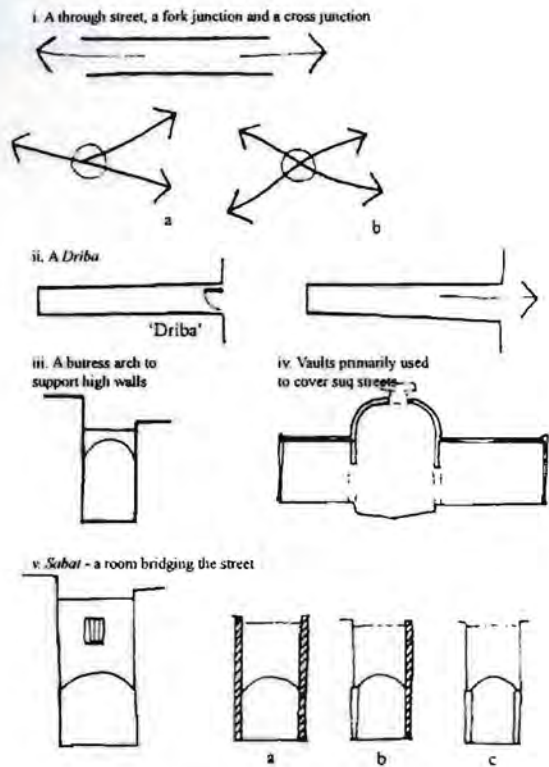


Figure 98. Constituents of a Madina street



Figure 100. Diagrammatic plan of the Skifa

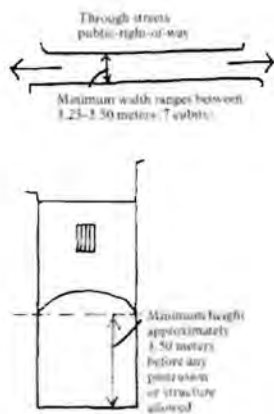


Figure 101. Height and width restrictions in a semi-private street

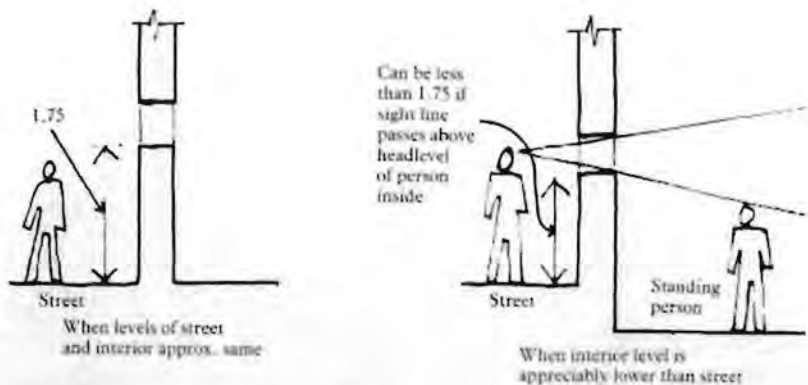
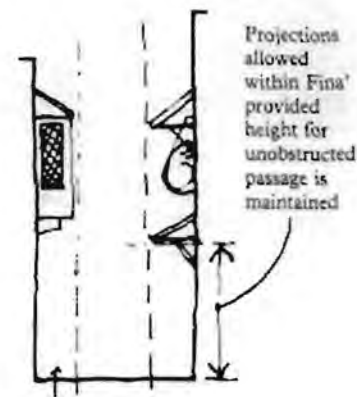
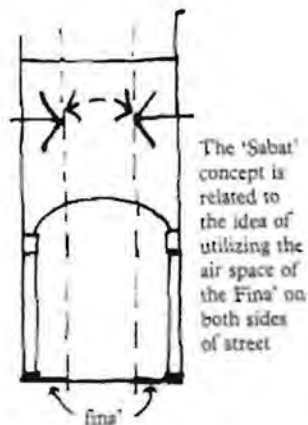
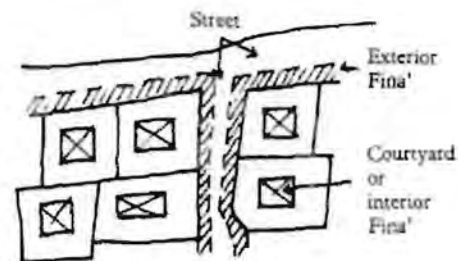


Figure 99. How privacy is achieved on the street in a dense environment

Related street elements



Concept of Fina' extends vertically

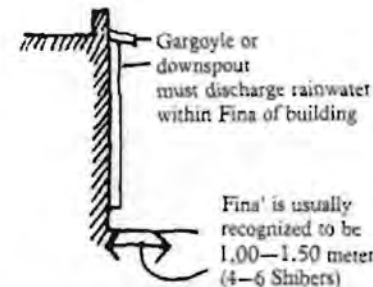


Figure 102. The concept of a "fina" - the exterior space just outside the walls of a house that belongs to the owner of the house but is located in the public realm

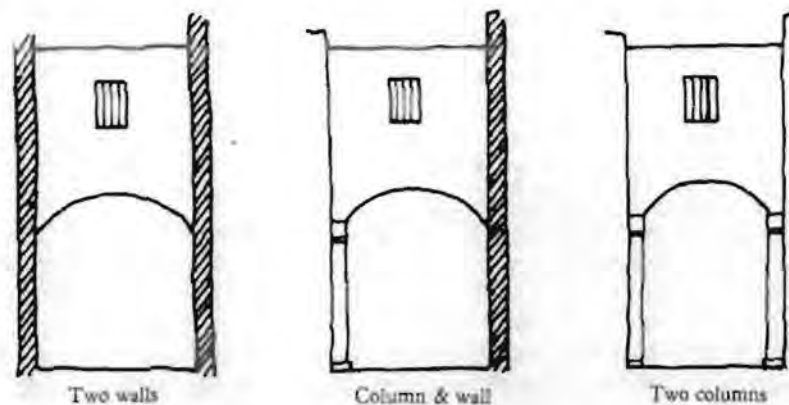


Figure 103. Diagrammatic of the structure of a sabat



Figure 104. Diagrams showing various urban factors contributing to the overall urban form

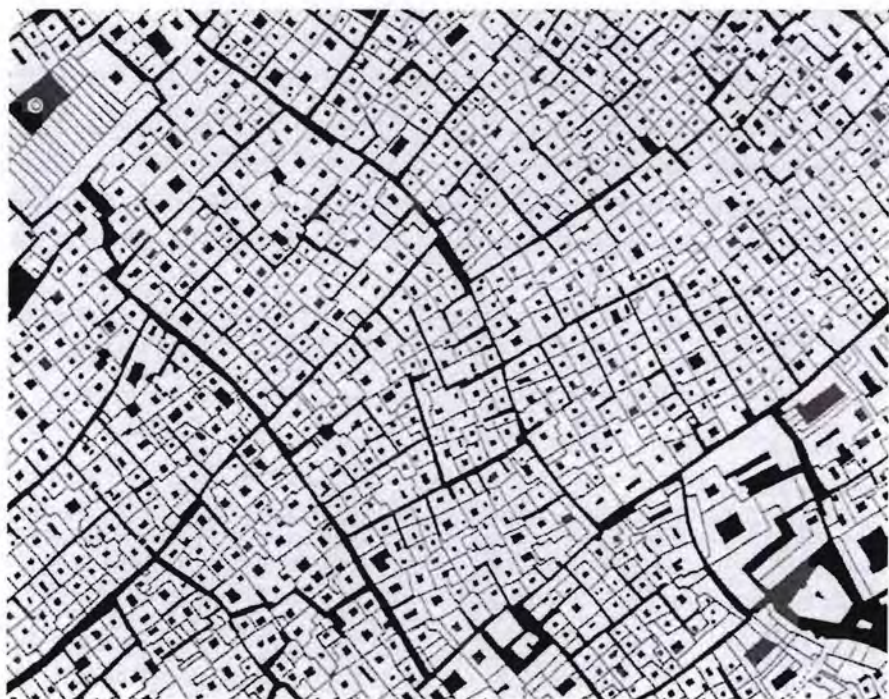


Figure 105. A highly dense, complex urban form. Courtyards and winding streets.



Figure 106. A cul-de-sac street showing a *sabat*, or a room bridging the street



Figure 107. The vaulted ceilings of a suq street

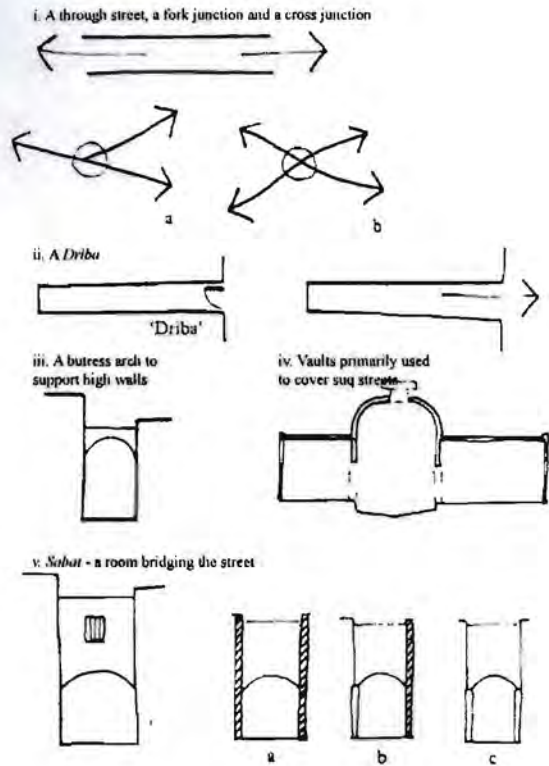


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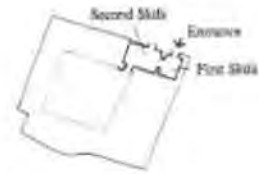


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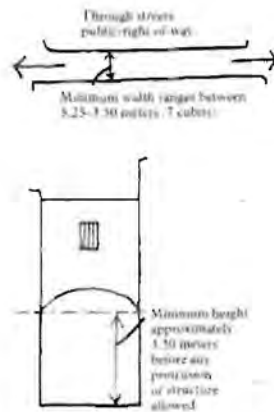


Figure 101. Height and width restrictions in a semi-private street

Related street elements

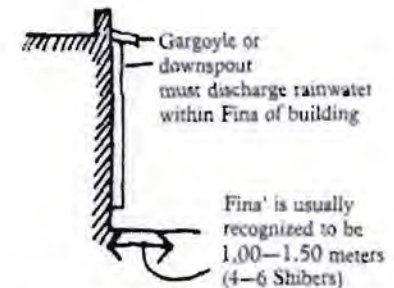
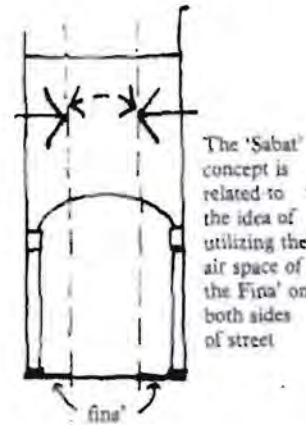
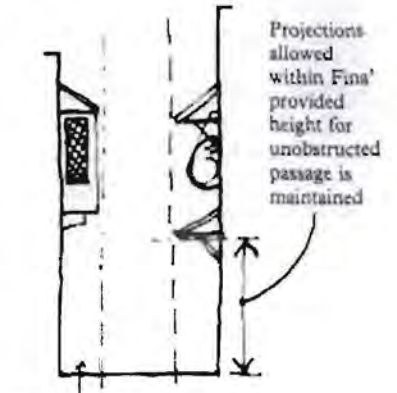
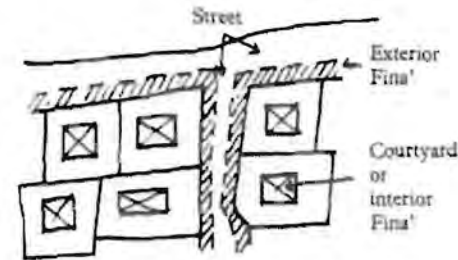


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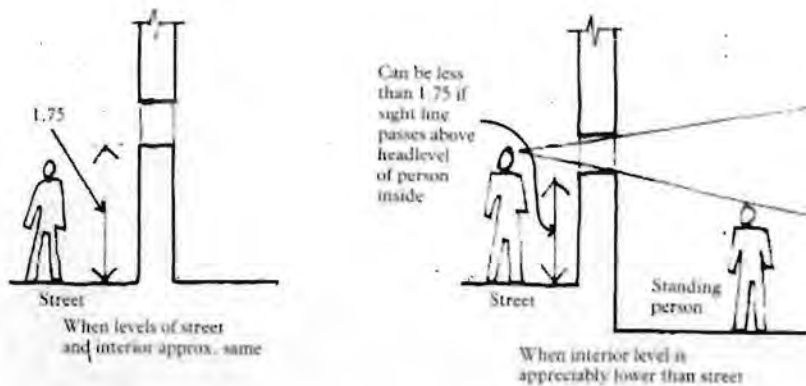


Figure 99. How privacy is achieved on the street in a dense environment

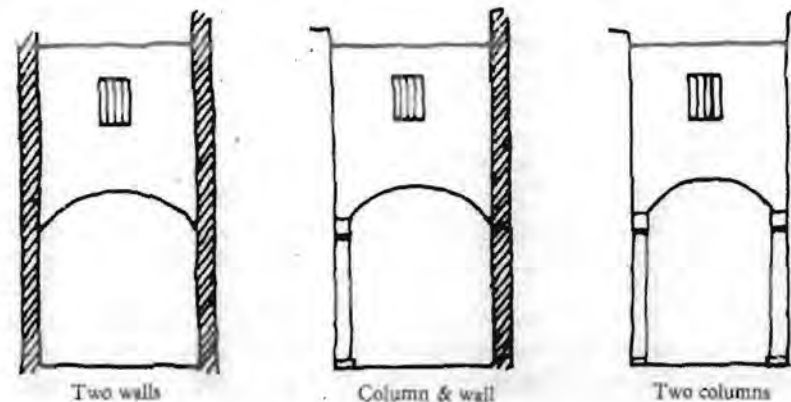


Figure 103. Diagrammatic of the structure of a sabat

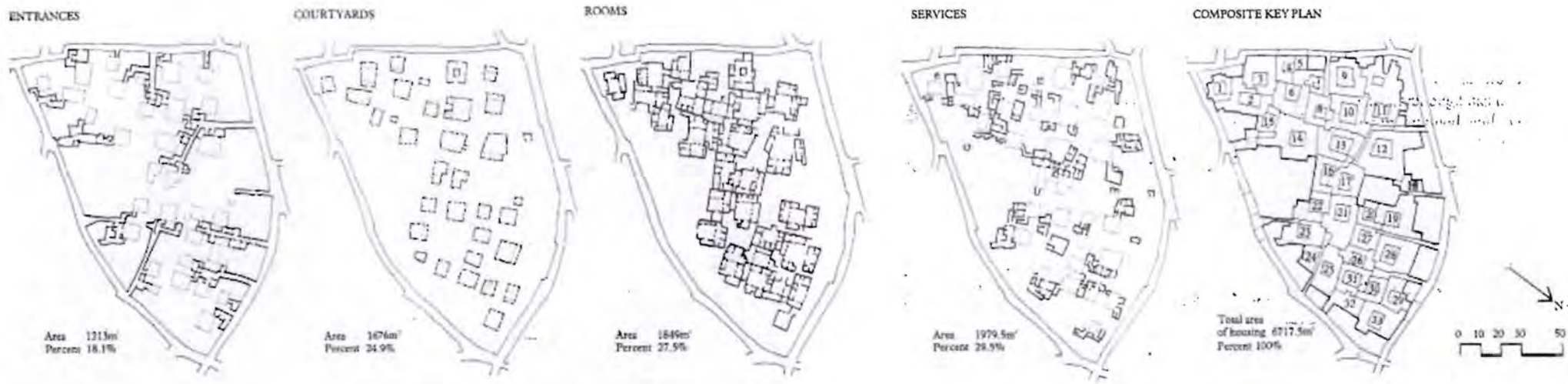


Figure 104. Diagrams showing various urban factors contributing to the overall urban form

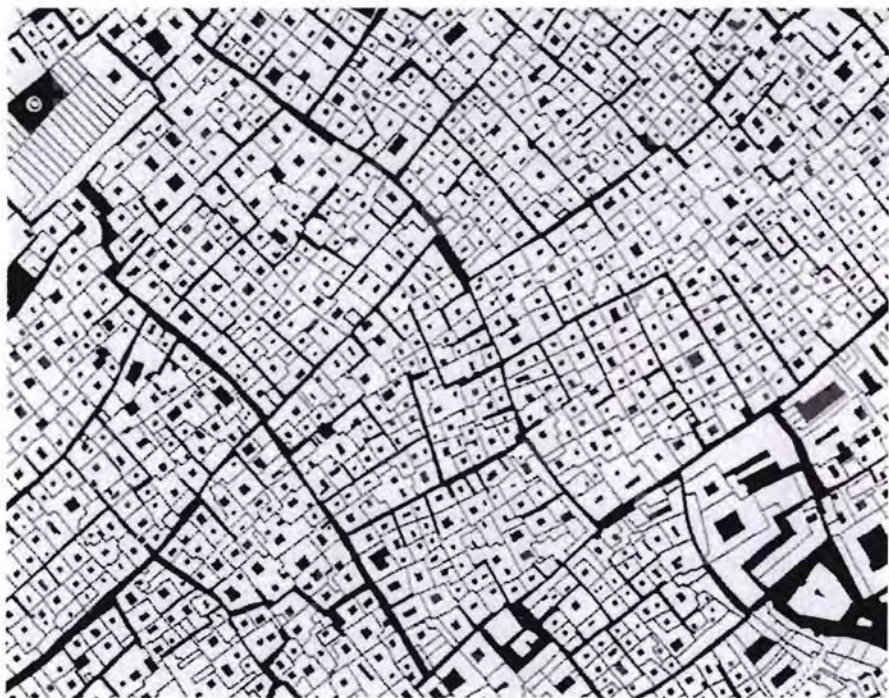


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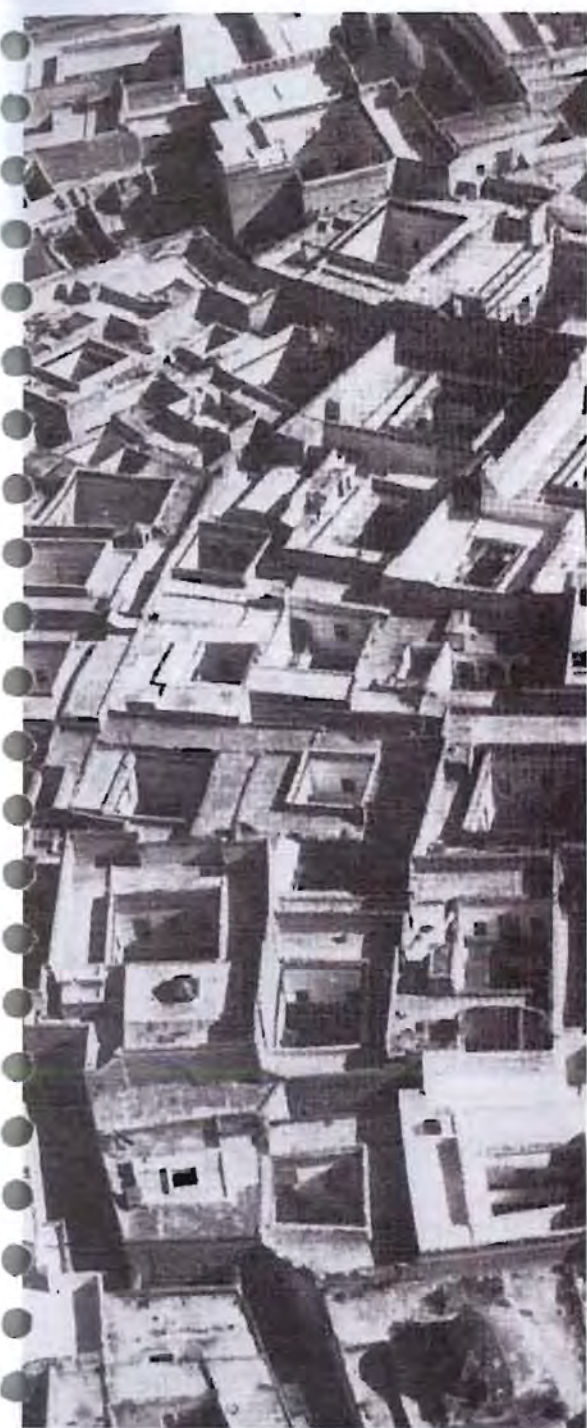


Figure 108. A city formed by a series of courtyards

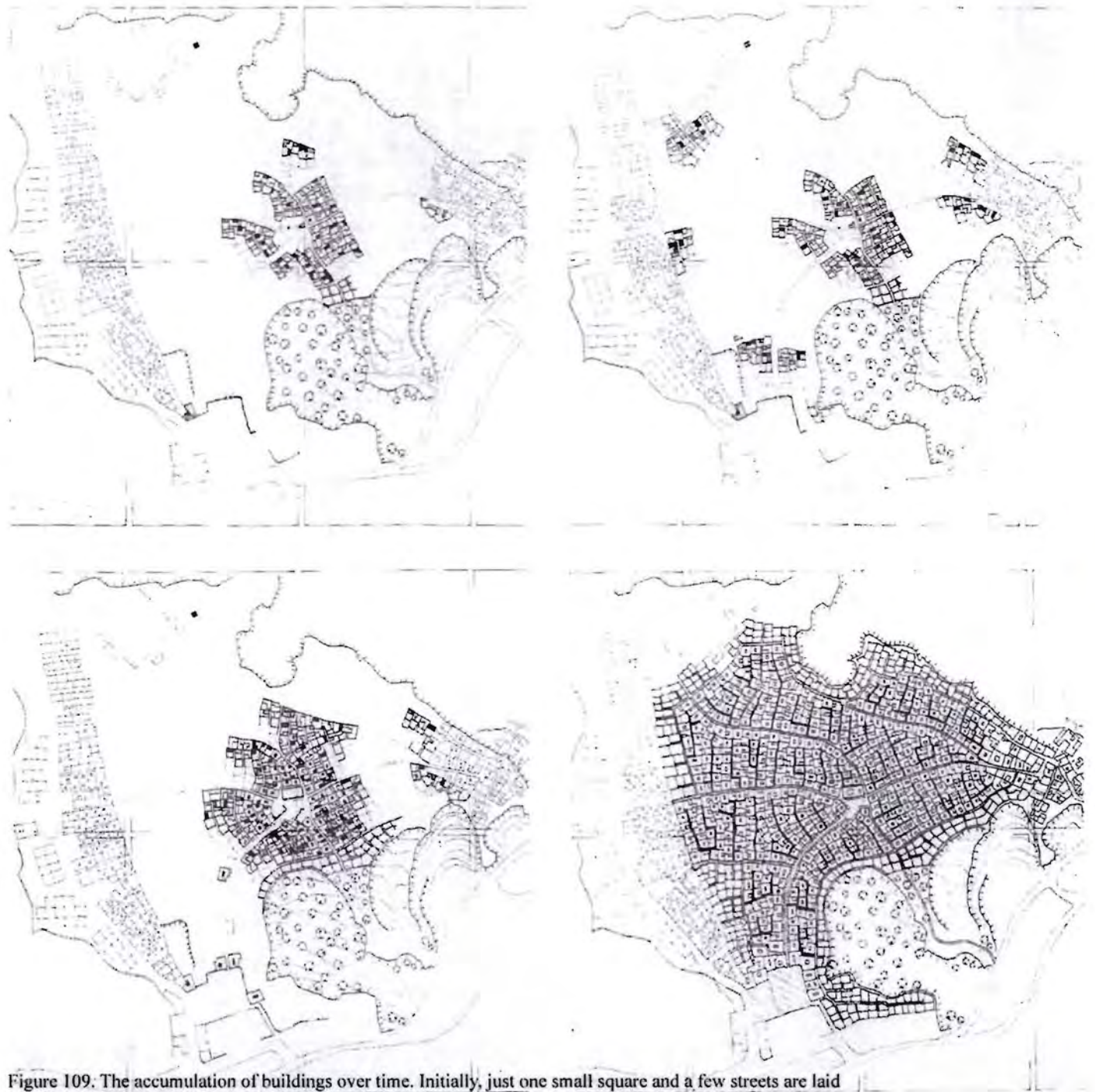


Figure 109. The accumulation of buildings over time. Initially, just one small square and a few streets are laid out and then over time a city is grown. A proposal for Fez by Werner Rey and Martin Steinmann

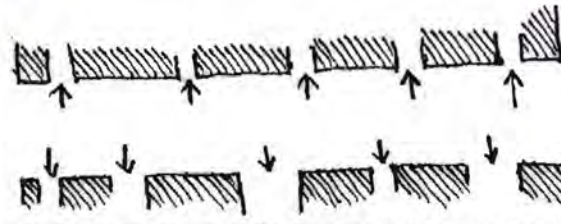
Guidelines

The city needs to be organically grown over time. A city that is developed with a masterplan – one solution that tries to solve all of its problems – inevitably results in a city that is severely lacking in social and economic variety. The most fitting way to design a city is to set up a framework of guidelines that architects, planners and the everyday man can act upon over a large span of time, and in doing so allow for a variety of interpretations. Therefore, these 12 guidelines precede and create the “imaginings of the urban future” that follow.

Framework

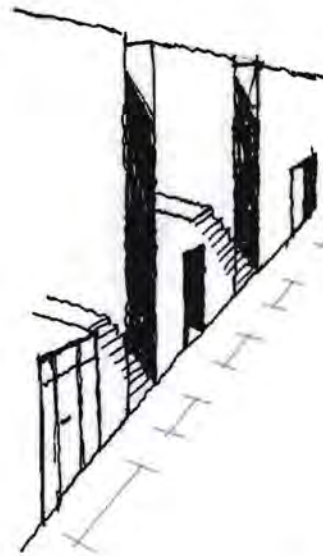
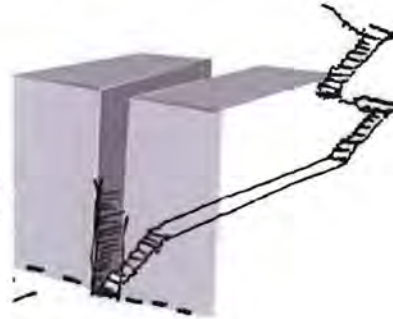
The following guidelines have been put together utilising the theory, urban design principles and street analysis in this document thus far. These guidelines are a concise summary of some of the architectural elements that need to be utilised to create streets that are safe, vibrant and accessible to a wide variety of inhabitants. It does not stray into policy or economics, but rather focuses on the architecture of the street.

1 Maximise entrances and exits onto the street

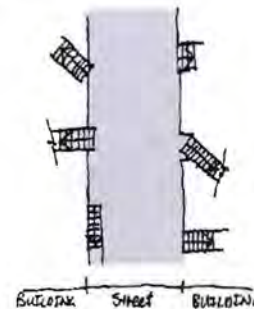


As many entrances onto the street as possible creating street edges that are highly utilised.

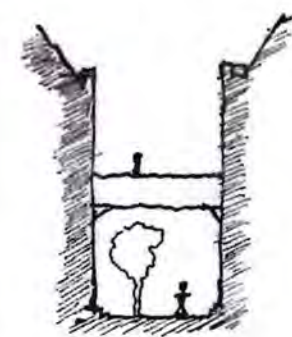
Access to upper levels must happen on the street edge. If not possible, then the stairs must begin/end on the street front



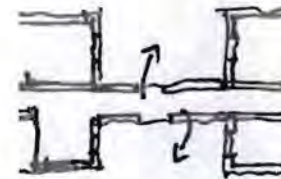
A mix of ground floor entrances, and access to the upper floors. All entrances, even for delivery vans, must gain access on the street front.



2 Buildings may bridge the street at the upper levels



By bridging across the street, a building's day to day functionality requires crossing the street.



Dynamic relationships are formed between the people on the upper levels and the people on the street.

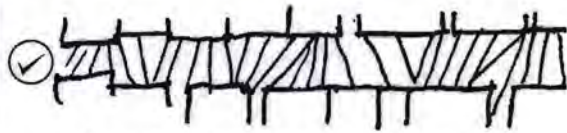


Spatially, the bridge creates divisions along the street, differentiating districts or precincts that promote place making.

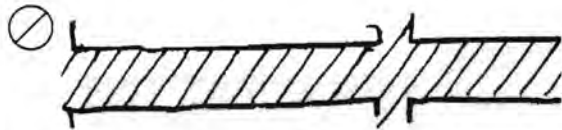


Where a property is located over the street, the street edge has to be maintained, and the bridge that crosses the street must be 4.5m above street level on public streets, and 3m above on semi-private streets.

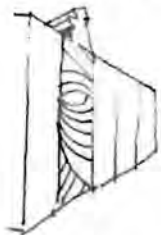
3 Maximise variety by minimising the width of building fronts and increasing vertical articulation



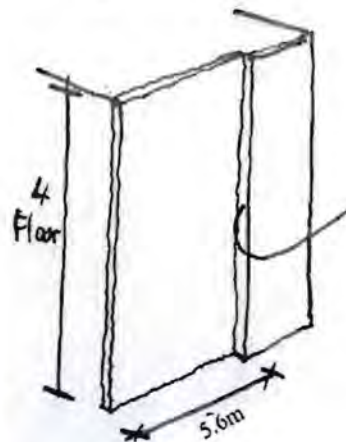
By maximising the amount of buildings on the street, the variety increases which promotes environments that are visually, acoustically and socially dynamic.



Large buildings in the urban environment create streets that suffer from "dead" zones, where little action can take place.

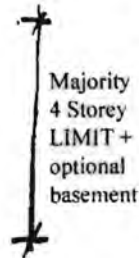
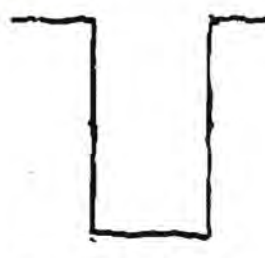


The urban environment needs to have visual interest. This can be achieved by the differentiation between different building facades.



There must be vertical articulation at a maximum of 5.6m running metres. This must occur by separating the two faces by a minimum of 0.35m

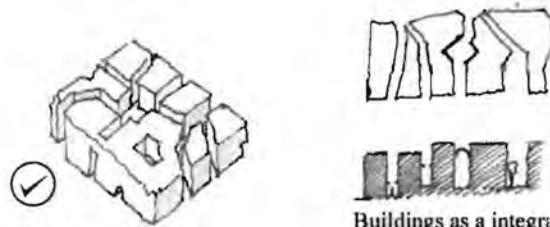
4 Height restrictions / Setbacks



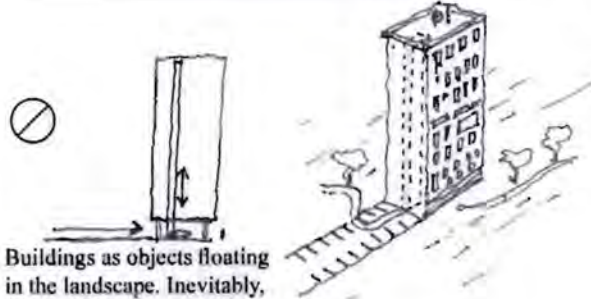
By limiting the floors to 4, elevators are not required. This is also a height at which high densities can be achieved

Majority 4 Storey LIMIT + optional basement

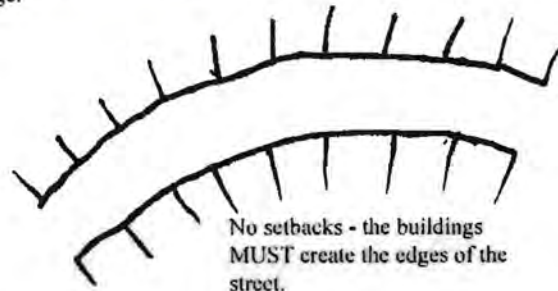
Ratio roughly 1.5: 1



Buildings as an integral part of the city fabric



Buildings as objects floating in the landscape. Inevitably, a fence becomes the street edge.

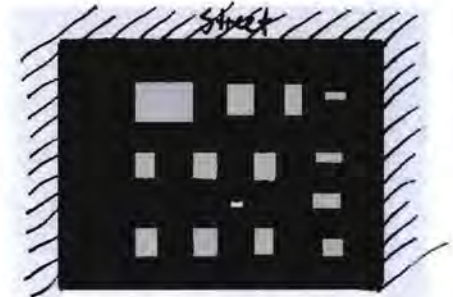


5 Internal light and ventilation

220 du/ hectare

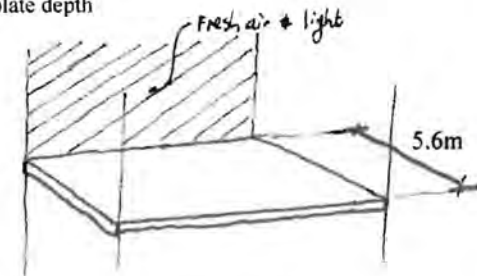


Plan



To increase the density of city blocks, light and ventilation must come from small shared internal courtyards.

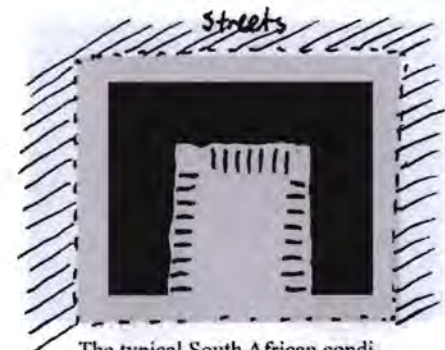
Floor plate depth



75 du/ hectare

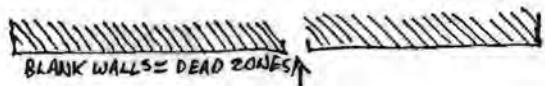


Plan

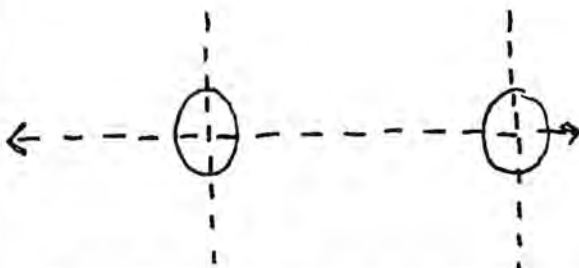


The typical South African condition for residential units. The large courtyard inevitably becomes a vast parking lot. The density is too low, the environment only caters for internal living, and the city block is often fenced in.

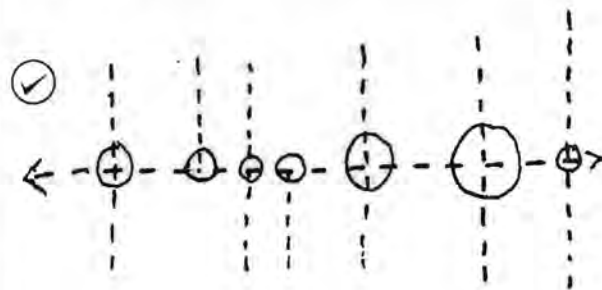
6 Maximise intersections/ Make short blocks



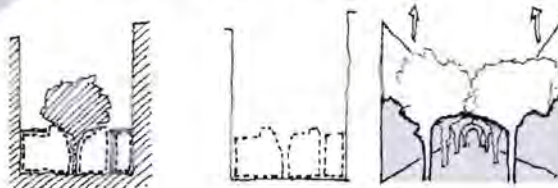
Intersections create conducive environments for interaction, and have since early times been places of meeting and socializing. The shorter the city blocks are, the more intersections there can be.



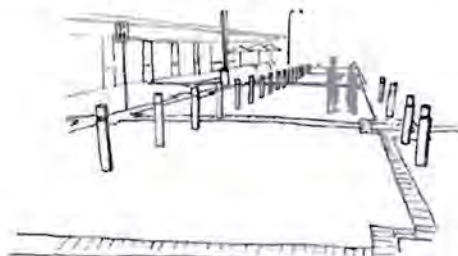
Because the intersections are too far apart, they are too large, creating places that are taken over by the car. Intersections must be kept small and frequent. An intersection can be designed for a commonly used building for instance where the amount of people going in and coming out of the building is significant.



7 Surfaces and ground articulation

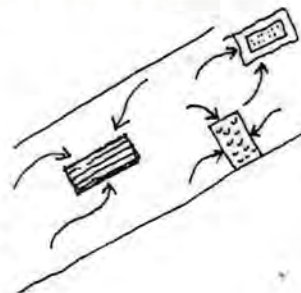


The urban surface must signify to the inhabitants how to use the street. This occurs by utilising differing materials, and textures to symbolise different usage patterns.



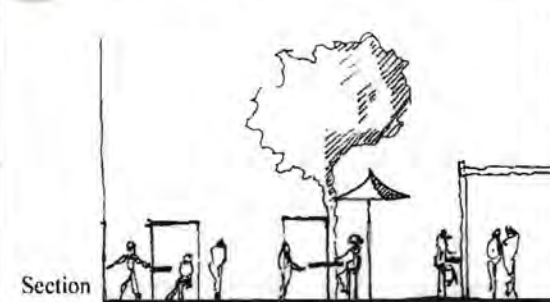
The surface must differentiate space. As such, poured surfaces like concrete or tarmac must be avoided. Pavers, or repetitive elements should link buildings, and functions, and create an element that is geared towards the pedestrian.

Surfaces that are warm or soft to the touch, such as timber decking, grass or a vast array of rubber surfaces could be laid on the ground and used as an element that attracts people thus creating zones of interaction, and place.



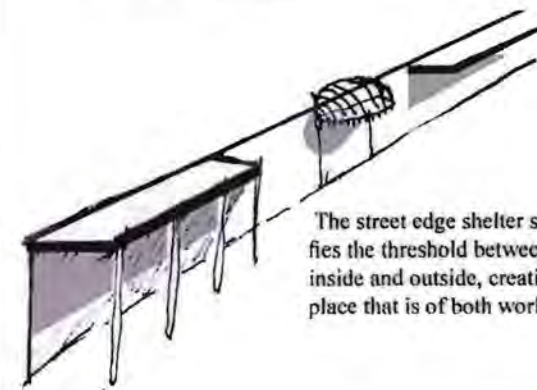
Surfaces should be articulated vertically and horizontally

8 Where there's shelter there's people

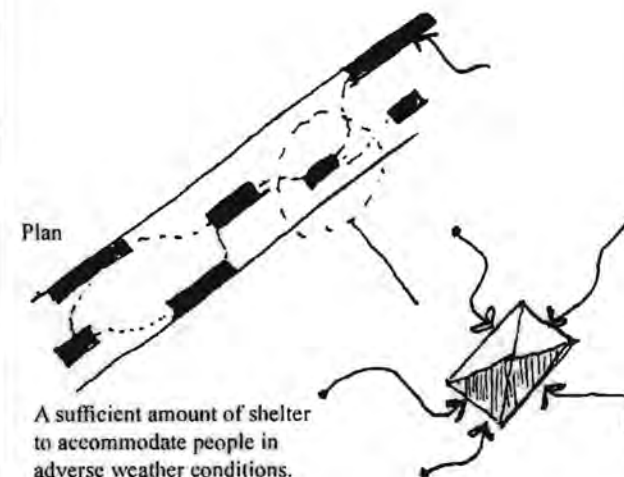


Section

Shelter attracts activity. It is one of the most powerful tools in any street.



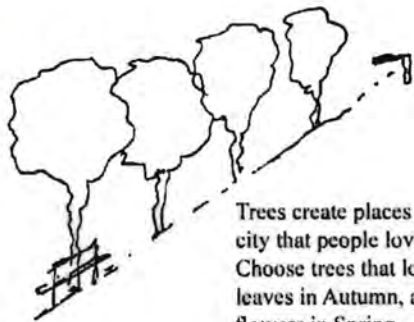
The street edge shelter signifies the threshold between inside and outside, creating a place that is of both worlds.



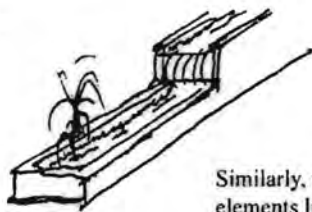
Plan

A sufficient amount of shelter to accommodate people in adverse weather conditions.

9 Natural elements draw people in



Trees create places in the city that people love to be in. Choose trees that lose their leaves in Autumn, and have flowers in Spring.

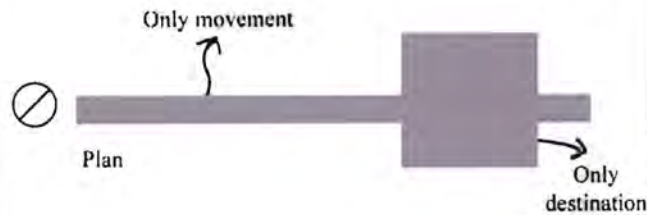


Similarly, water features and natural elements like rock boulders greatly attract people.

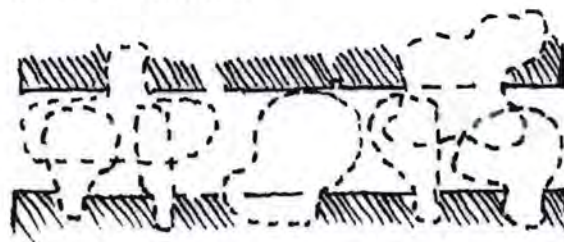


10 Many SMALL centres

Small centres or pockets of activity create both a movement corridor and destination



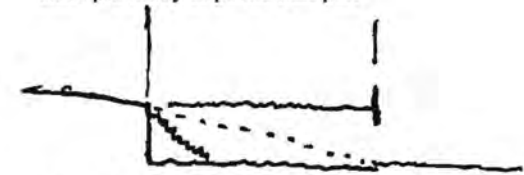
Land use / Activities



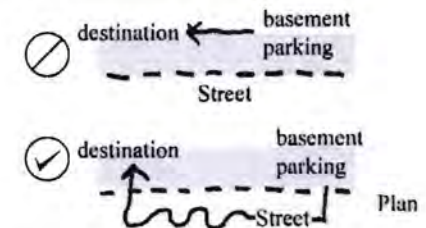
Street use, and vibrancy is affected significantly by the programmes that the street has to offer. Similar activities should be placed near each and a level of overlap between activities should be encouraged on the street. The land use should create vibrancy at all times, especially at night. As such, restaurants, bars, as well as residential units should be placed on the street.

11 Parking

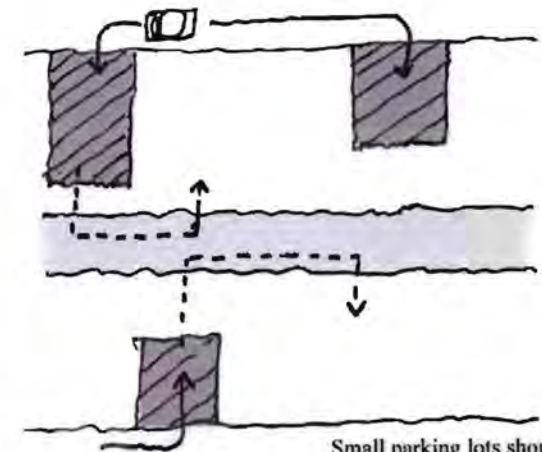
Parking should not be a priority. Urban living and working should be located in close proximity to public transport



Where appropriate parking should be located in the basement.



There should be no access from the parking basement into a building destination. Drivers should park their cars, enter the street, and then enter their building destination



Small parking lots should be distributed in the area

Urban Design INITIAL PROPOSAL

The initial urban framework was developed in terms of the 12th guideline. This guideline provides a framework to create variation within the urban environment. The principle is a simple one -- pockets of semi-public space must be given back to the public realm in the form of forecourts. A certain percentage of the property, depending on the size must be given back to the street in pockets no larger than 5 x 5m.

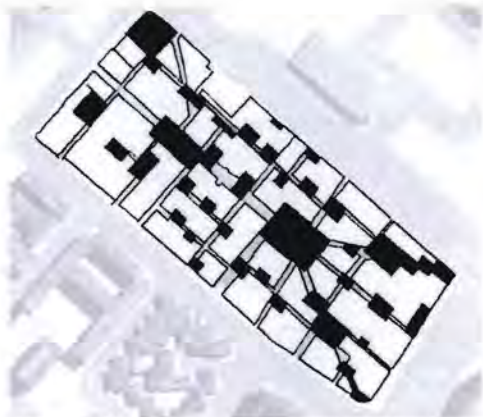
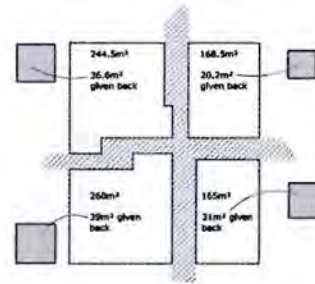
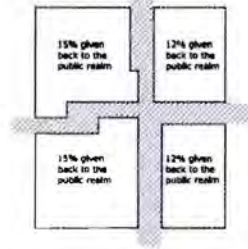


Figure 110. Conceptual Diagram of urban proposal

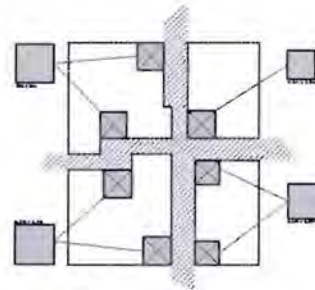


Figure 111. Part of 1:200 plan

12 Urban form through forecourts



Diagrams showing how the street will be highly vanegated with many small pockets of activity



The land given back:

- a) must be in the form of small semi-public/public pockets - no larger than 5m x 5m. The pockets can be no closer than 5m apart.
- b) must abut a public movement access
- c) can be raised but no higher than 750mm above street level



Figure 112. Plan of "eroded" urban form



Figure 113. Plan showing properties and courtyards

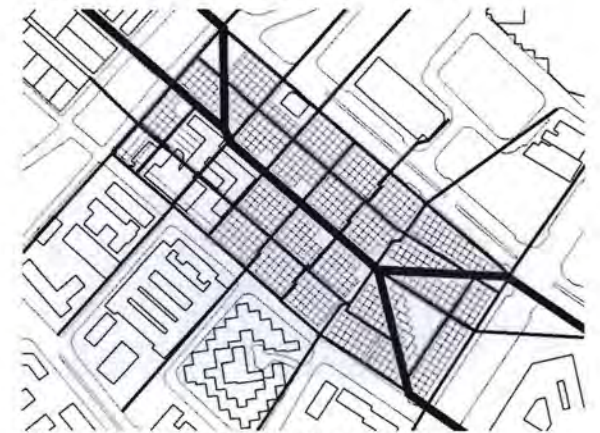


Figure 114. Proposed pedestrian connections

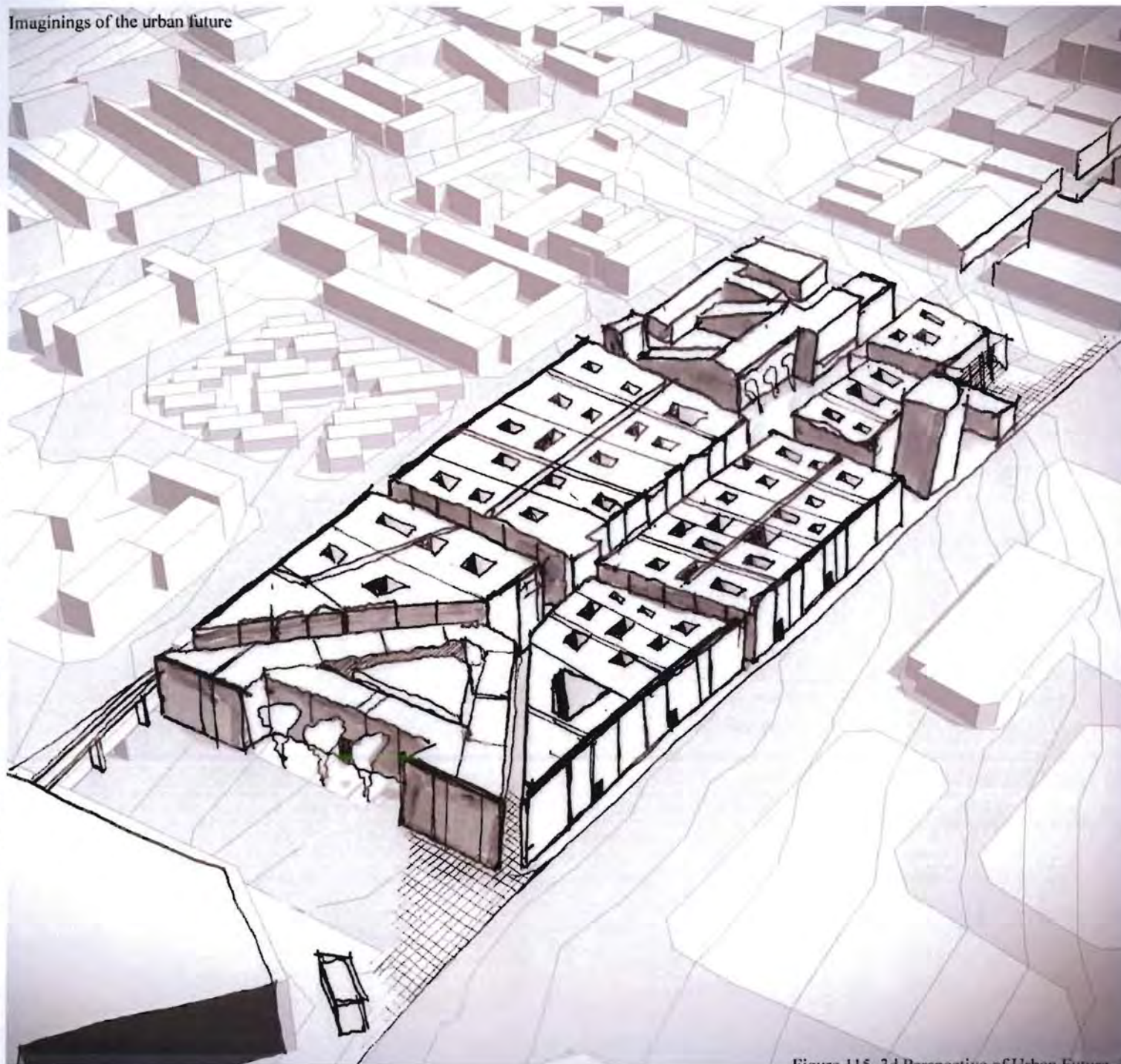
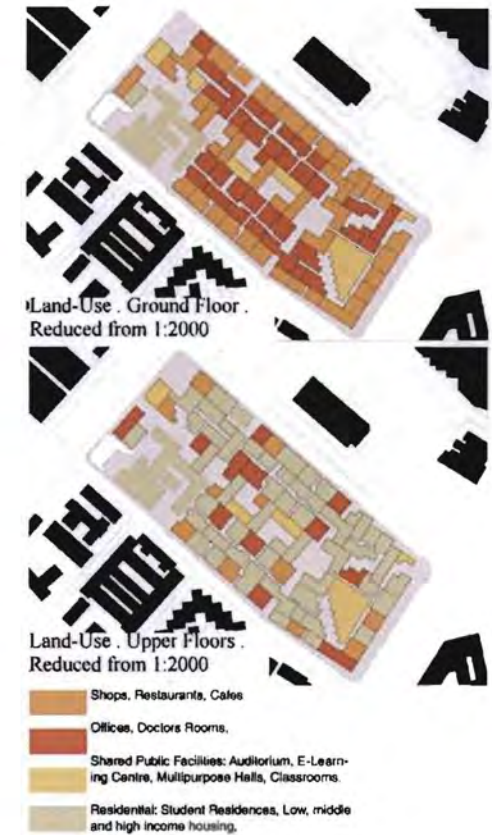


Figure 115. 3d Perspective of Urban Future



The urban form that was imagined is highly variegated. Framing the street with semi-public stoeps creates an urban environment that promotes interaction but with a threshold of privacy. However, there were inherent drawbacks to this proposal:

- a) no hierarchy
- b) the urban form is randomly limited to the existing city block.
- c) there is very little variation in height which gives no hierarchy
- d) the size of courtyards need to be large enough to allow sufficient light and ventilation to the depths of the block

Courtyard light

The light and thermal performance in courtyards depend on three elements:

a) Width/height ratio

A study by Muhaisen (2005) looks in depth at the proportions of courtyards and its affect on thermal comfort. As the courtyard becomes larger and shallower the light and temperature increases. The study found that in hot-dry and temperate climates the height of the courtyards should be between 2-3 storeys.

b) Orientation

The orientation of the courtyard has a slight affect on the overall light. In a climate such as Cape Town, the optimal orientation is NW -SE (Muhaisen, 2005:1740), which is great because the city is laid out a grid that is already in that orientation.

c) Wall surface treatment

As mentioned earlier in the surfaces of tactility section, the treatment of surfaces affects temperature gain, and light reflectivity. The walls of courtyards receive relatively low levels of direct sunlight - between 10-50% depending on the location (Muhaisen, 2005:1734). Thus, it is critical to optimise the light reflectivity on those surfaces.



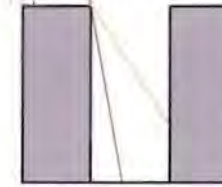
Figure 116. Small Courtyard Example at UCT Medical School Building; 3.5m x 3.5m x 12m

This is a small study that I did looking at the LUX in different sized courtyards. LUX was calculated using an SLR camera. The shutter speed, F-stop value and ISO are converted to a LUX value at a website called First-rays. [<http://www.firstrays.com/measurelight.htm> accessed 1 June 2012]. I found that even with relatively slender courtyards, the levels of LUX were still high.

100 000 Lux: Sunny day
 10000-100000 Lux: Sunny day with clouds
 100-10000 Lux: Overcast sky
 100-1000 Lux: Home/Office lighting
 1-10 Lux: Street lighting
 0.1 Lux: Full moon
 0.01 Lux: Young moon
 0.001 Lux: Clear night without moon
 0.0001 Lux: Dark cloudy night

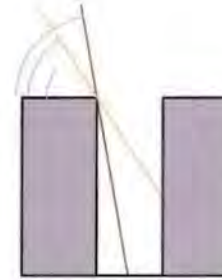
Sunlight recorded midday, 1 June 2012, Full Sun

6m x 6m courtyard



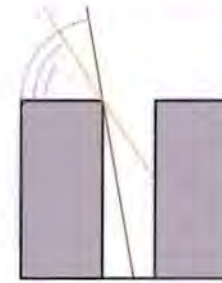
RATIO 1: 2.5
 Sunny day LUX: 13315
 6 x 6m
 Shutter: 1/1250
 F-Stop: F4
 ISO: 80

5m x 5m courtyard



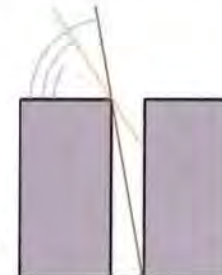
RATIO 1: 3
 LUX: 11858
 5 x 5m
 Shutter: 1/1000
 F-Stop: F4
 ISO: 80

4m x 4m courtyard



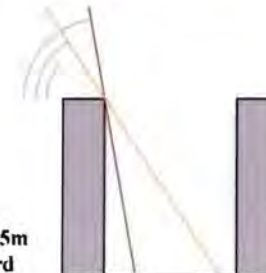
RATIO 1: 3.75
 LUX: 8307
 4 x 4m
 Shutter: 1/800
 F-Stop: F4
 ISO: 80

2.5m x 2.5m courtyard



RATIO 1: 6
 LUX: 3804
 2.5 x 2.5m
 Shutter: 1/320
 F-Stop: F4
 ISO: 80

10m x 2.5m courtyard



RATIO 1: 1.5
 LUX (N/S): 8307
 LUX (W/E): 7608
 10m x 2.5m
 Shutter: 1/800
 F-Stop: F4
 ISO: 80
 2.5m x 10m
 Shutter: 1/640
 F-Stop: F4
 ISO: 80

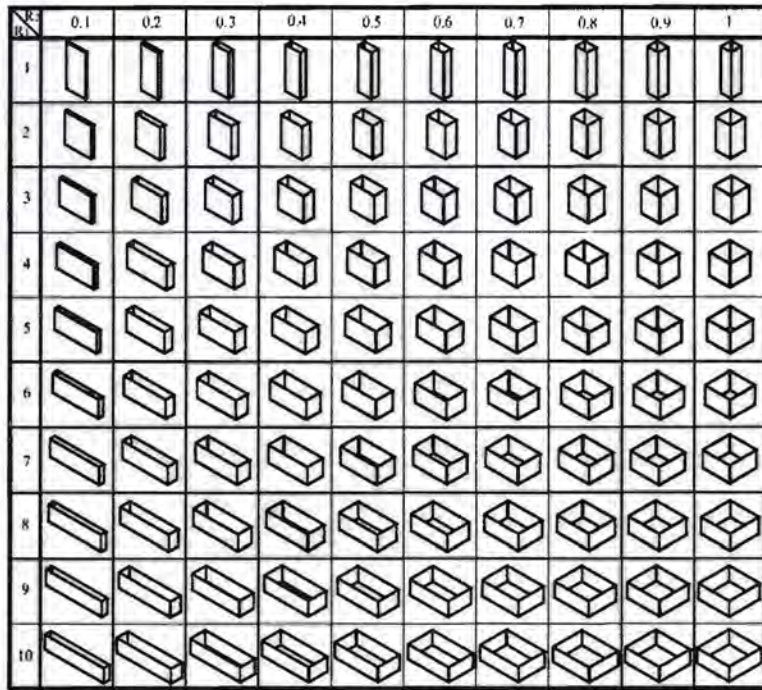


Figure 117. Courtyard proportional study

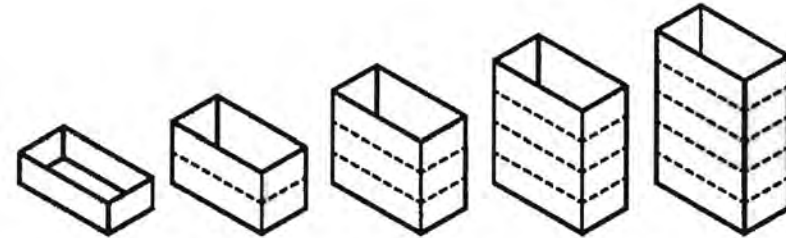


Figure 119. The effect of adding height to the courtyard without changing width or length

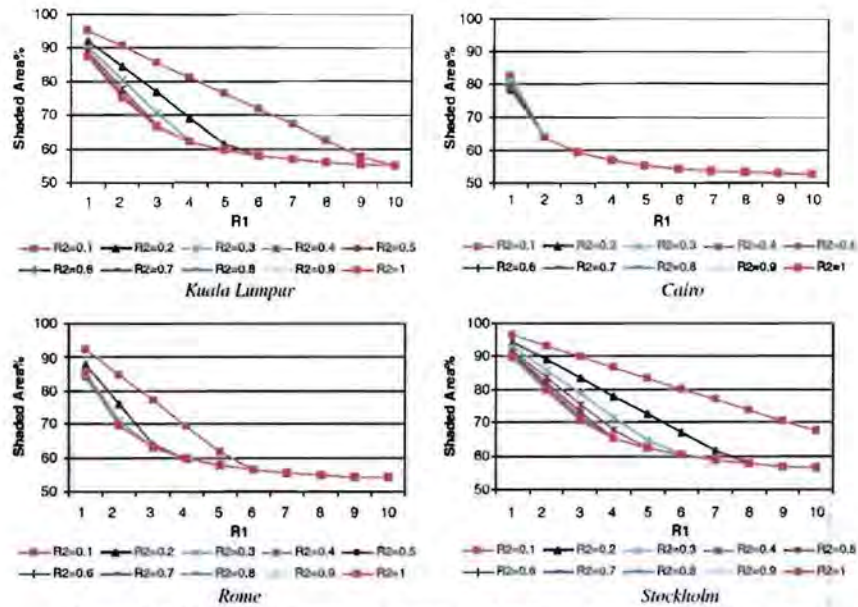


Figure 118. Effect of changing the courtyard proportions on the wall shaded area in summer

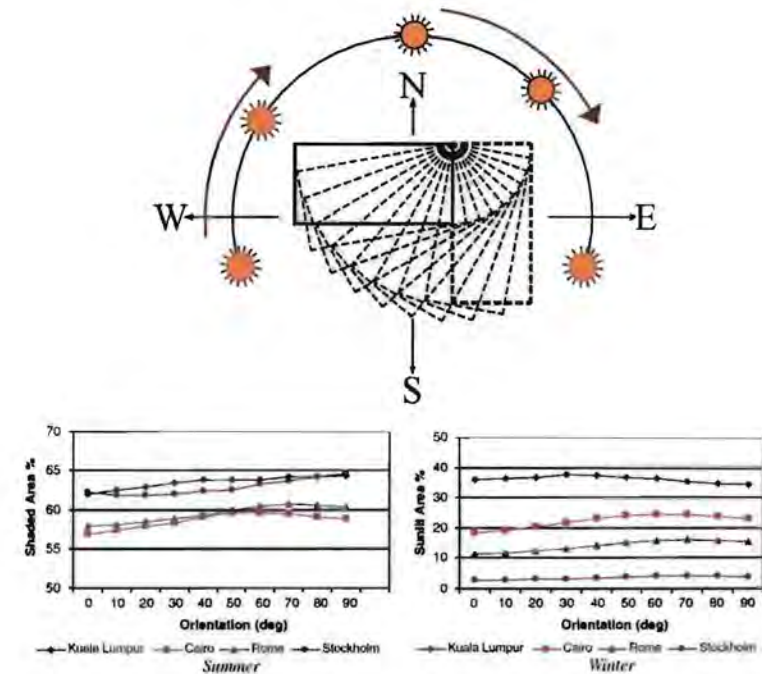


Figure 120. Effect of changing the courtyard's orientation in summer and winter

Urban design revision B

Revised Urban Proposal:

a) Looking at hierarchy:

- Increase in the size of the square on Longmarket Street
- Pinch points, or traffic slowing on the main roads surrounding the site
- size difference between subsidiary streets and Longmarket Street

b) The proposal now extends north-east creating a main vehicular street, Keizersgracht Street. Connections are made perpendicular to Longmarket Street, creating pedestrian links with the concept of going from street, to square, to street.

c) Height variation is achieved by locating taller buildings on the more public streets and smaller buildings on the subsidiary streets

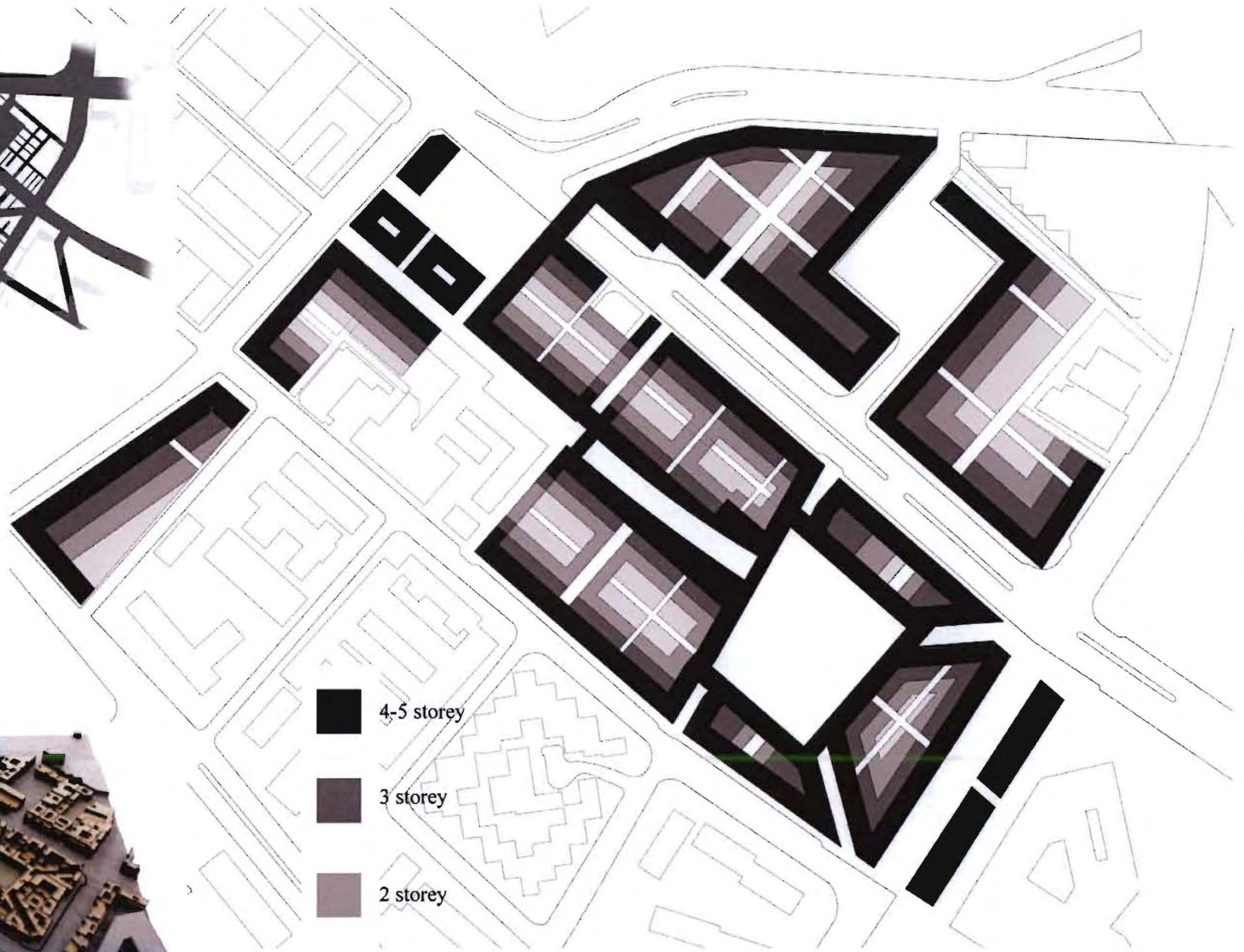
d) The size of courtyards are increased.



Figure 121. Revised urban proposal showing new green breathing space. This is an imagining of the far off future, where the entire site is filled with life and activity.



Figure 122. Diagram of connections



- 4-5 storey
- 3 storey
- 2 storey
- 1 storey

↑ Figure 124. Height Restrictions Reduced from 1:1000



Figure 123. Future Urban Imaginings Model

12 Urban form through the hierarchy of streets

Creating a system of hierarchal streets sets up a varying degree of privacy in the urban context. Each level of privacy has certain rules about setbacks, transparency, land-use and height limits (p62).

Moving from one level to the next requires moving through a series of security 'locks' or gateways. Each gateway will enable people to understand the privacy level they are entering, ranging from a wide and tall gateway in the public realm to a physical door that needs to be opened in the private realm.

A similar concept to the *fina* (figure 102, p48) is used in this guideline but on a much larger scale. Each street hierarchy level has a suggested minimum and maximum width. If the building is set back to maximise the street width, then the building can add another storey onto the height restriction limit. However, if the building is built minimising the street width, the building must obey the height restriction diagram.

Hierarchy of Streets



Figure 125 Proposed hierarchy of streets
Reduced from 1:1000

1 PUBLIC

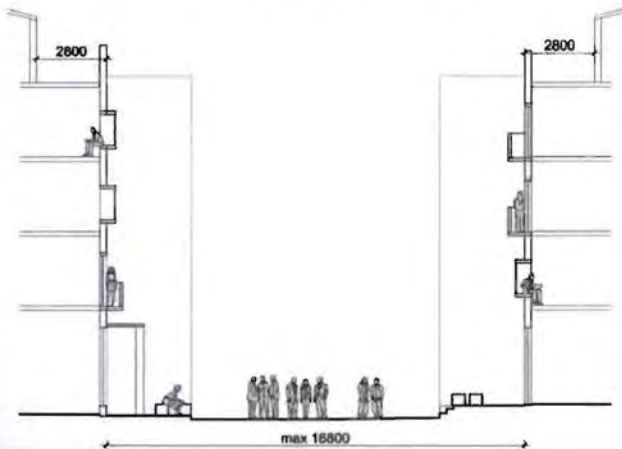
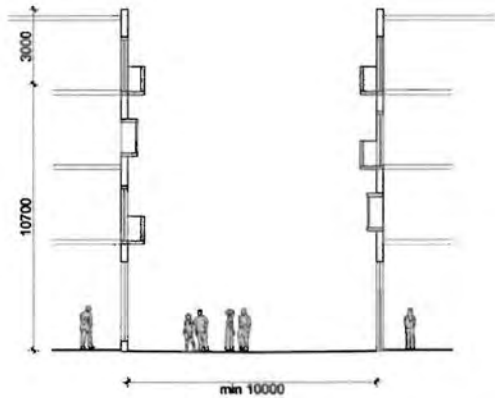
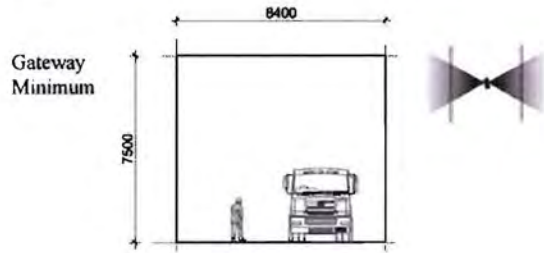
FOCUS: Pedestrians although there can be vehicular through traffic at certain times, deliveries, garage collection, emergencies

HEIGHT LIMIT: 4-6 Storey

SUGGESTED PROGRAMMES: Public facilities/ Shops/Service oriented offices/ Classrooms/ CPWT teaching facilities

VISUAL PENETRATION: High visual transparency

WIDTH: 10 - 16.8m



2 SEMI-PUBLIC

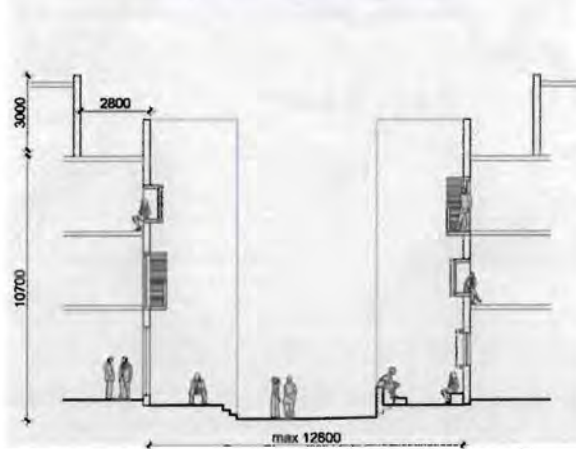
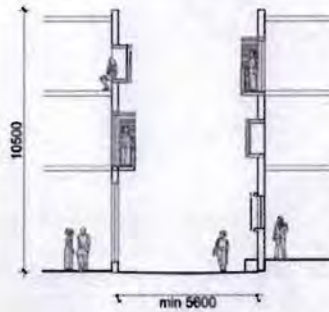
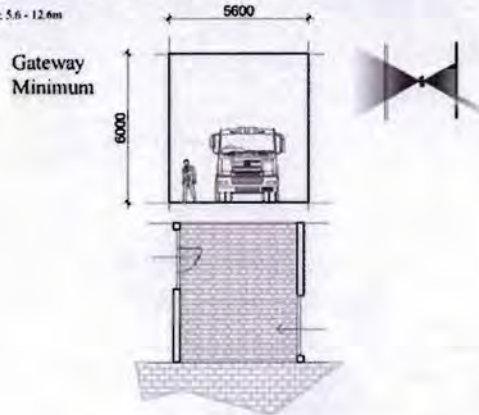
FOCUS: Pedestrians (vehicular route only for garbage collection, and emergencies)

HEIGHT: 2-4 Storey

SUGGESTED PROGRAMMES: Shops/ Communal rooms/ offices

VISUAL PENETRATION: Some visual transparency

WIDTH: 5.6 - 12.6m



3 SEMI-PRIVATE

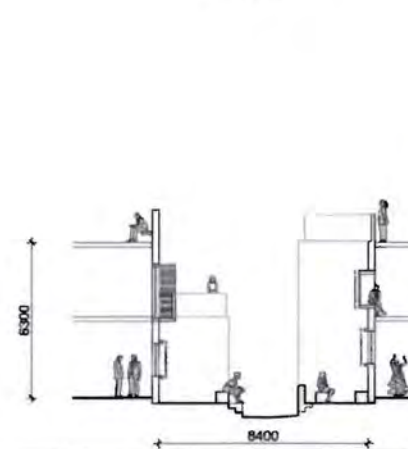
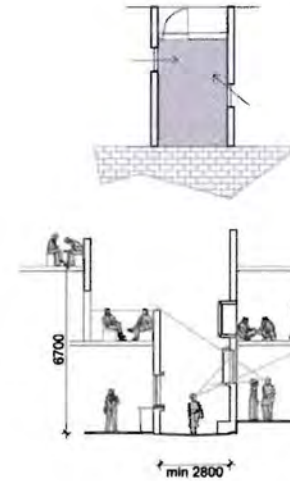
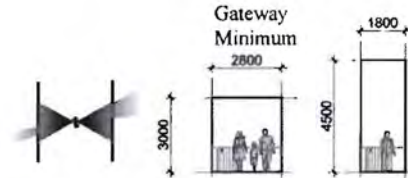
FOCUS: Pedestrians only

HEIGHT LIMIT: 1-2 Storey

SUGGESTED PROGRAMMES: Residential/ Offices

VISUAL PENETRATION: Little visual transparency - a private world

WIDTH: 2.8 - 8.4m



4 PRIVATE

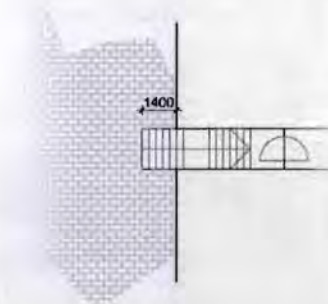
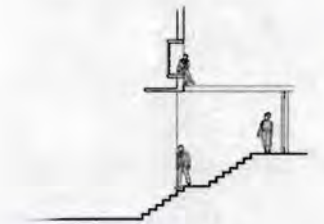
FOCUS: Internal circulation of the buildings that frame the streets

HEIGHT LIMIT: -

SUGGESTED PROGRAMMES: All

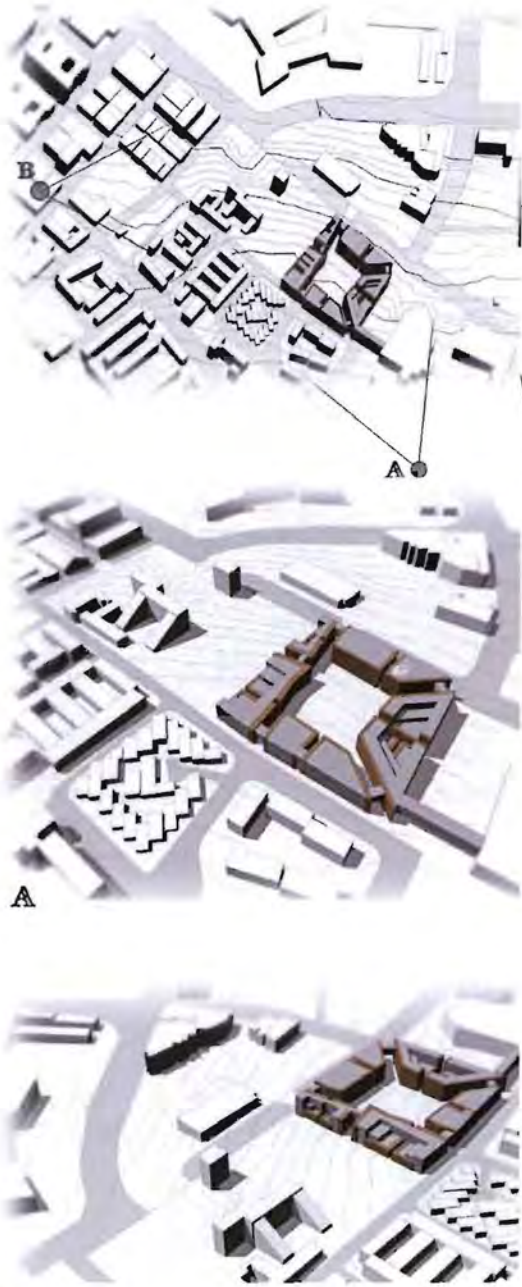
VISUAL PENETRATION: No visual transparency except into courtyard spaces

WIDTH: 1.1 - 2.8

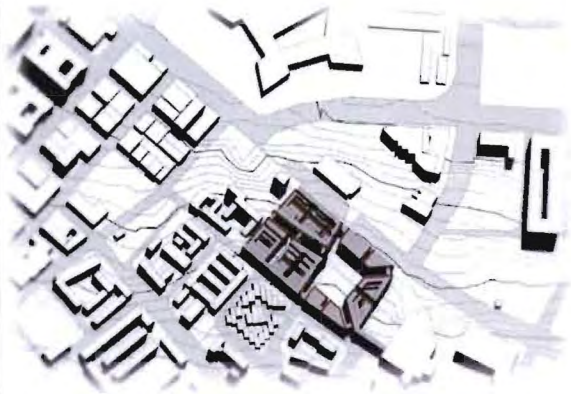


Urban future over time

5 Years →



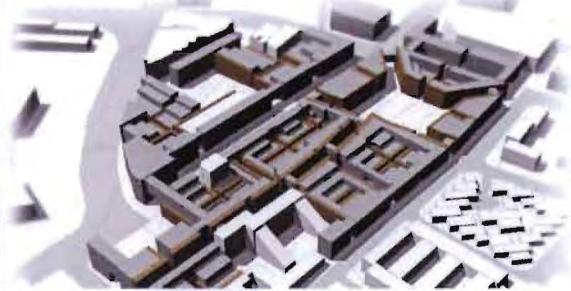
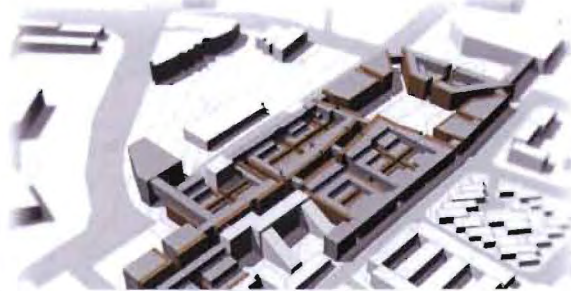
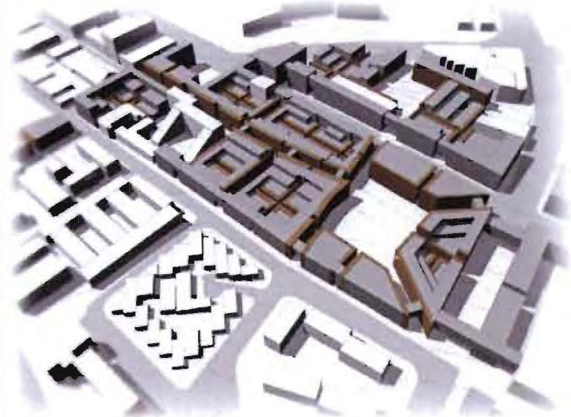
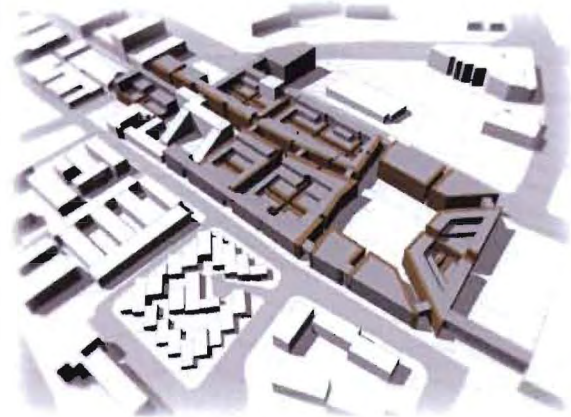
10 Years →



25 Years →



50 Years →



Proposed land-use

CPUT facilities

Commercial

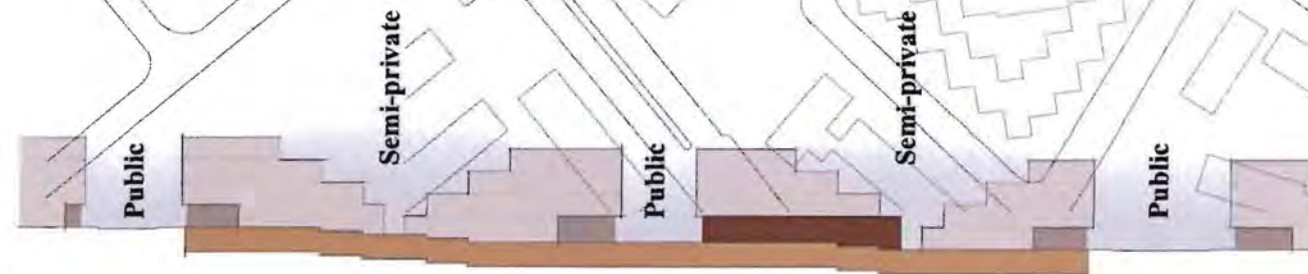
Offices*

Residential

Basement Parking

*Approximate location. This is due to unforeseen economic circumstances whereby these functions could be better located elsewhere

Offices, CPUT facilities and other functions of a more public nature may span from the public street to the semi-private street. The semi-private street is not necessarily only a residential zone but has unspoken rules about noise and security that need to be abided by.



↑ Figure 126. Proposed Land-use on Ground Floor
Reduced from 1:1000

Proposed parking layout

Provision of parking at a density 220 du/ha

Residential @ 0.7 bays/unit : 347

Commercial @ 1 bay/ 100m²: 139

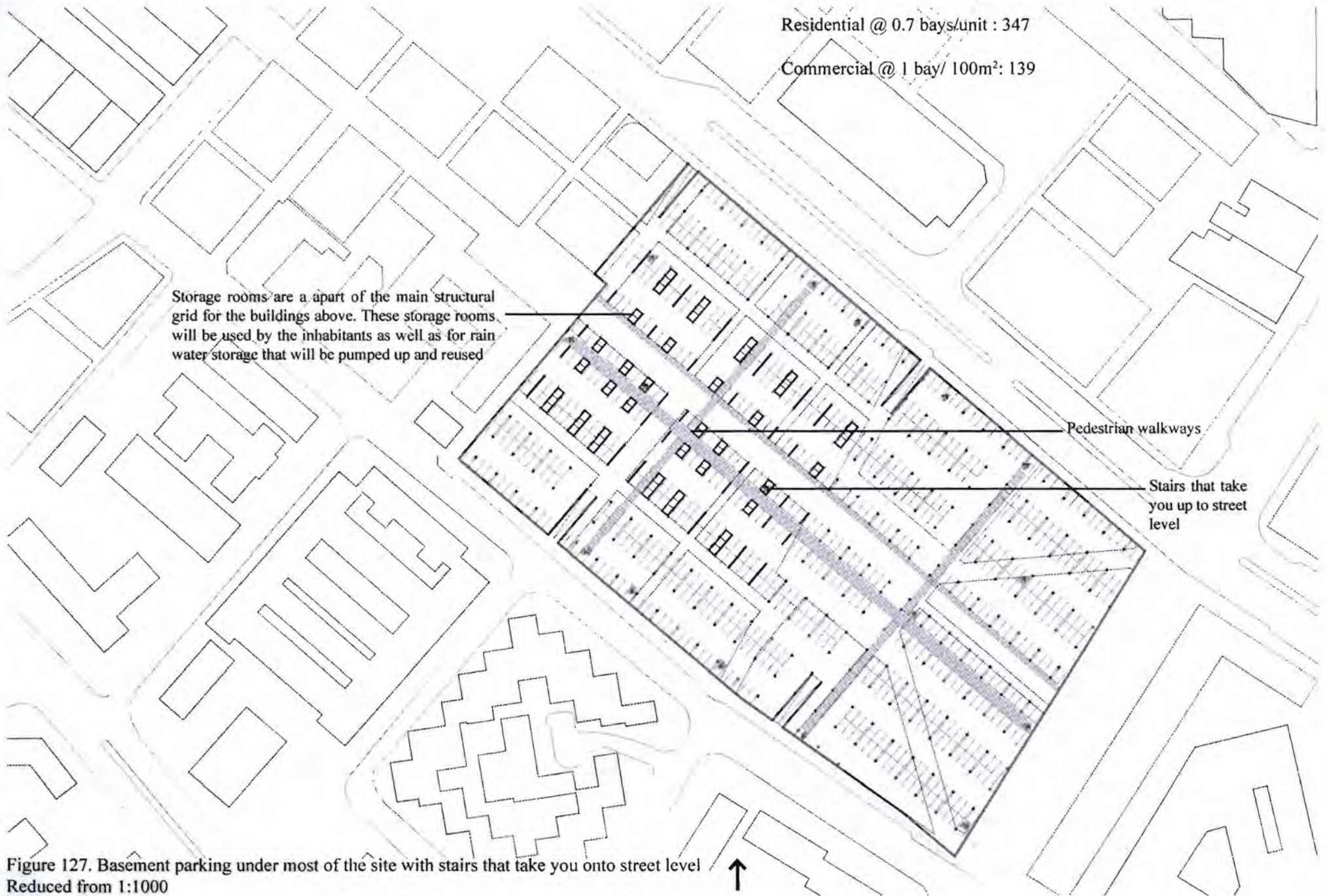


Figure 127. Basement parking under most of the site with stairs that take you onto street level
Reduced from 1:1000

Conceptual development

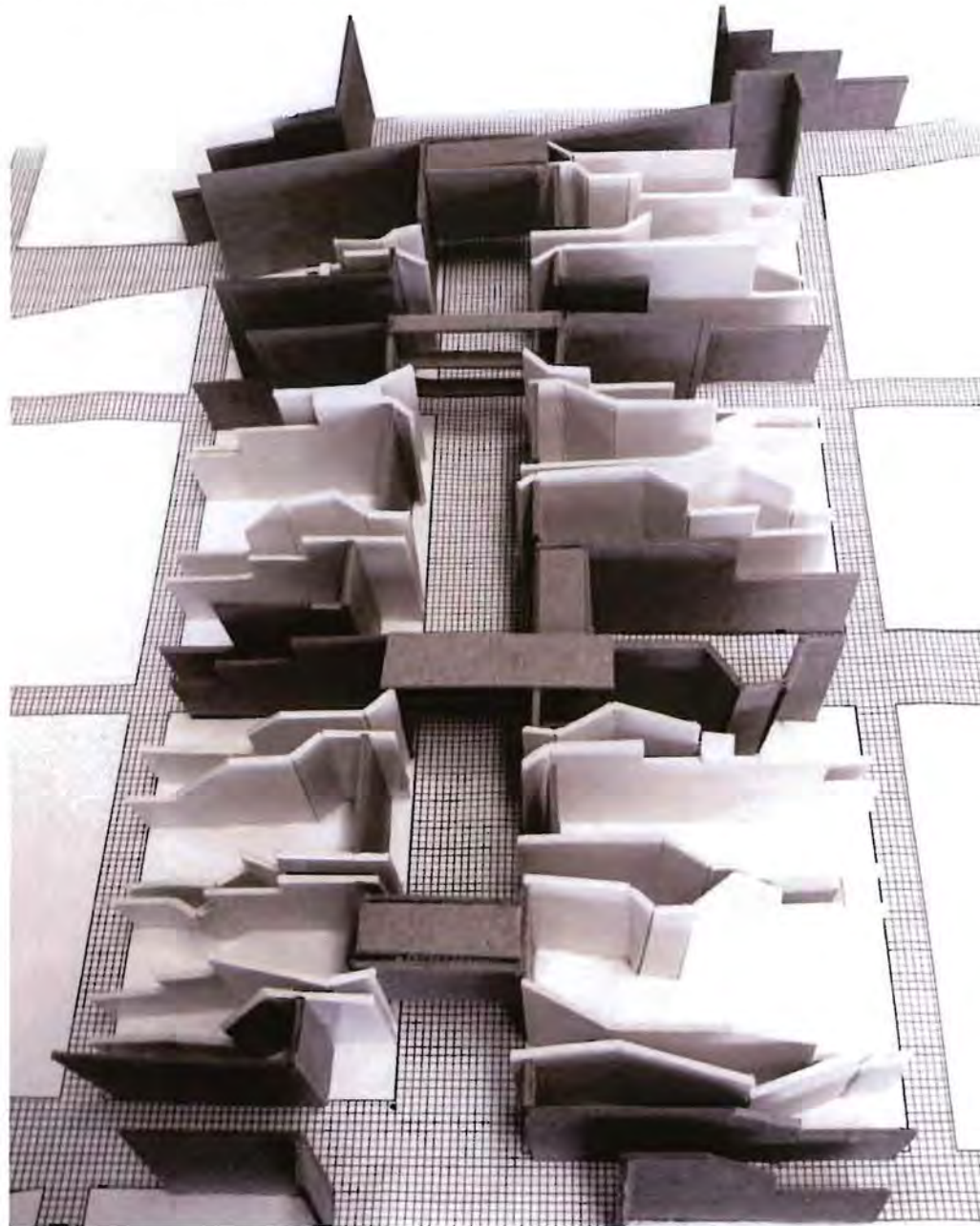
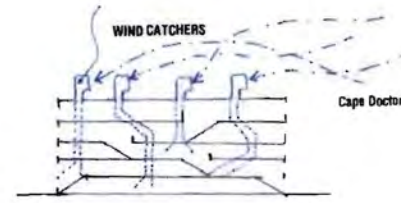


Figure 128. Conceptual Model - a series of service walls creating vertical articulation on the street front.

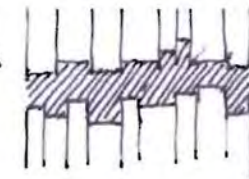


Only certain parts of the street are active at certain times, leaving parts to be quiet and dangerous



Mixing programme allows for vibrancy along the street at all hours. A relationship between the different functions must exist.

Increased diversity
variegated order



vs.

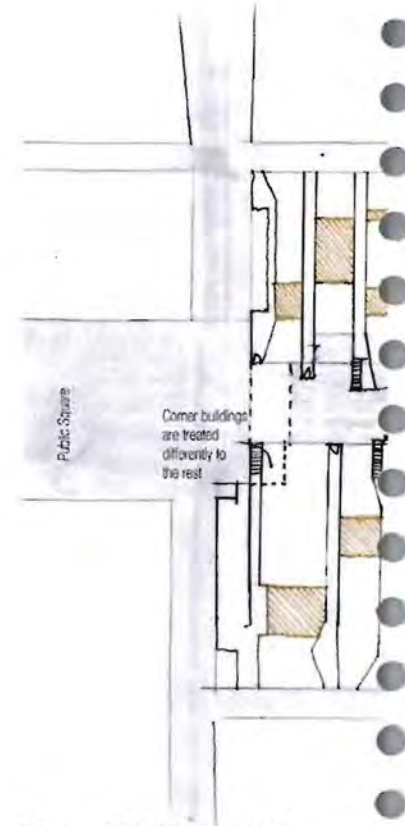
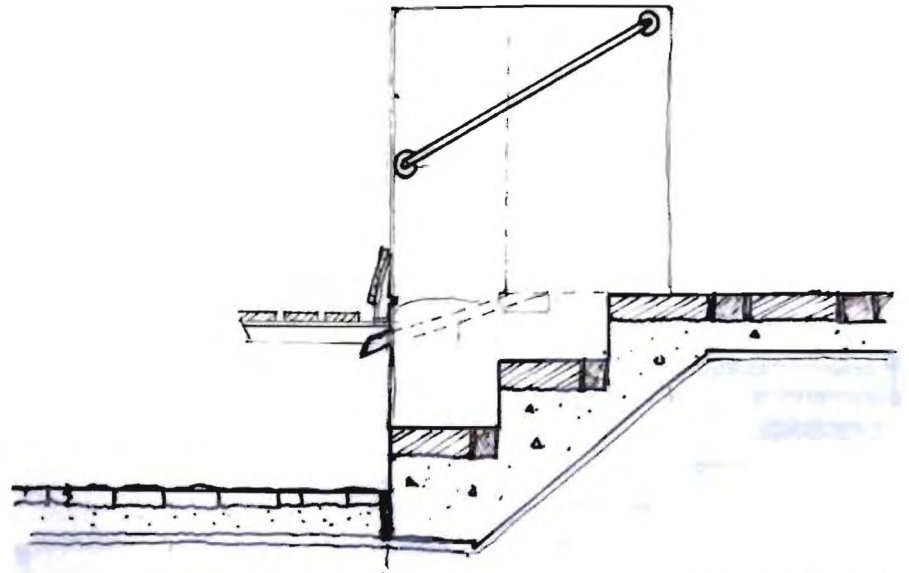
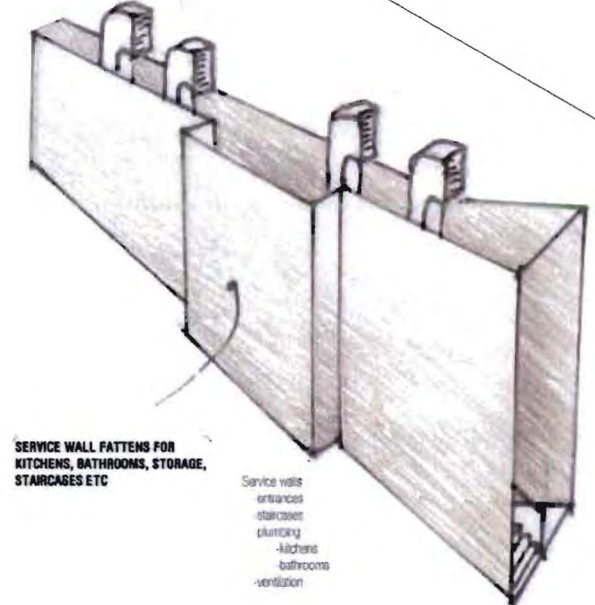
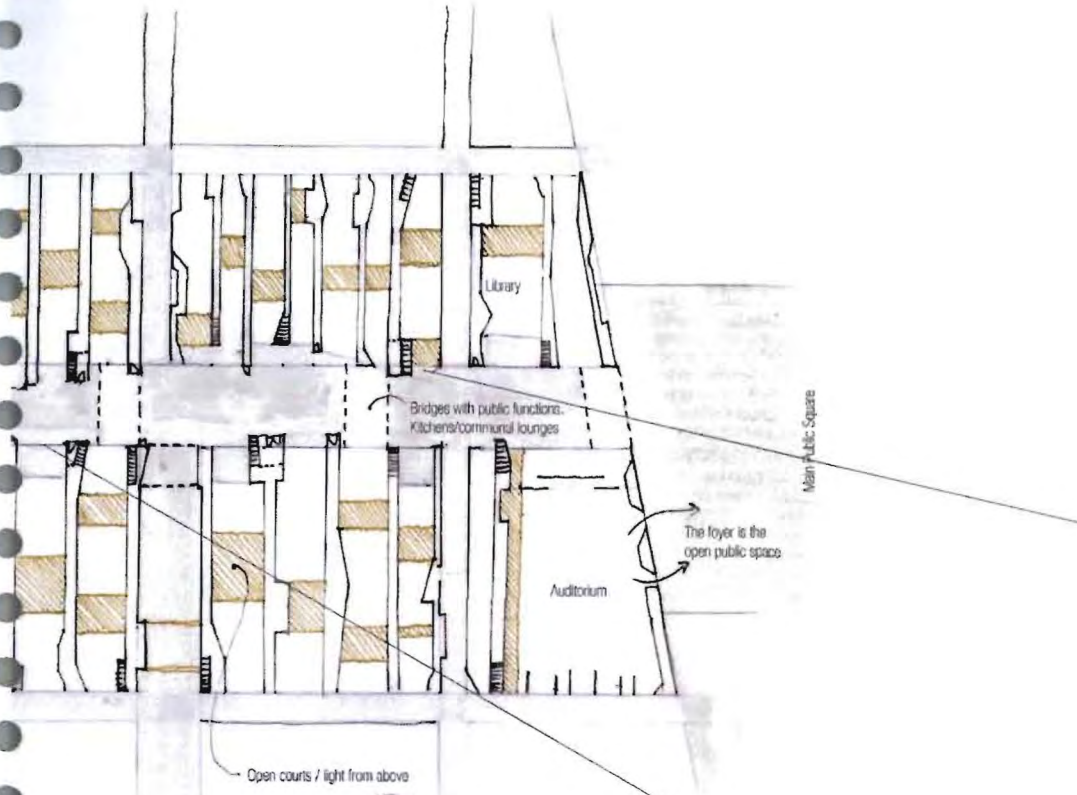
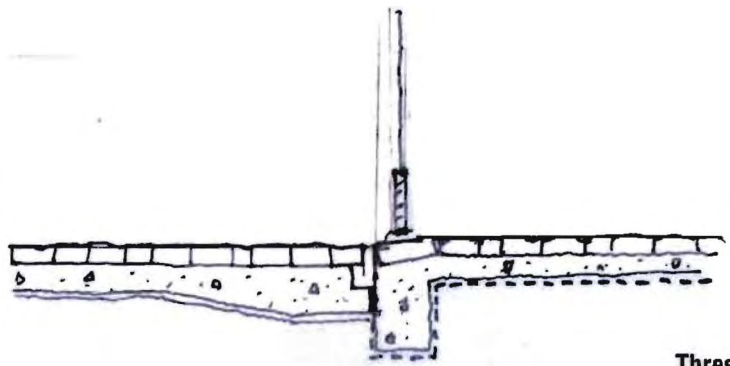


Figure 129. Conceptual diagram



Semi-public threshold
Scale 1:50



Threshold of shopfronts
Scale 1:50

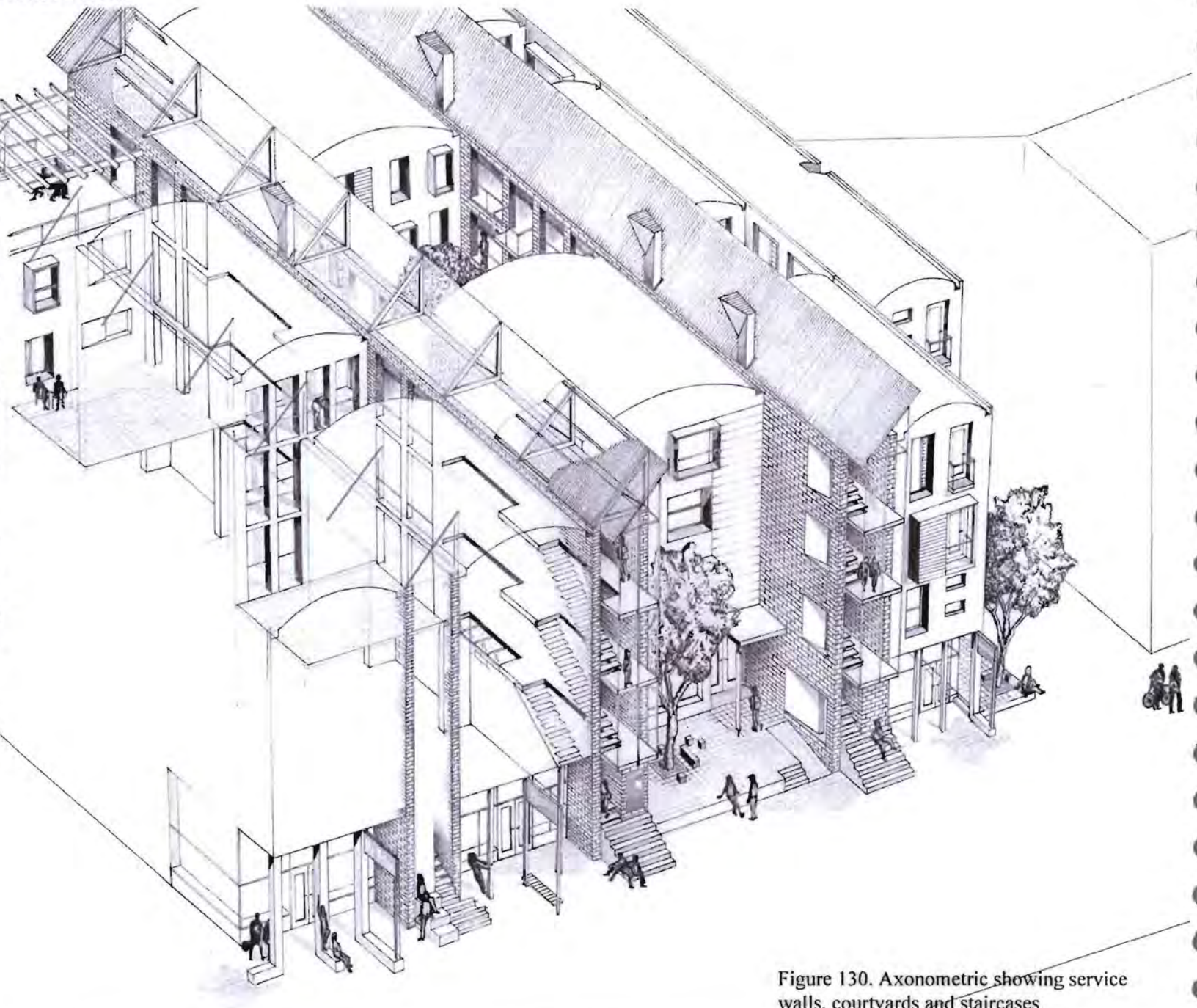
Testing the urban guidelines and frameworks

First Iteration

Defining the line between designing everything and letting the future play itself out over time through the urban guidelines was a huge challenge for me.

The initial building proposal tested the guidelines and created a building characterised by courtyards, lightweight roofs and stairs on the street edge. It is important to note that this proposal was developed before the hierarchy of the streets guideline.

The drawback of this proposal is that the lightweight roofs of the service walls became too repetitive and dominated the street front. Other issues included noise transmission in the service walls and too little sunlight in the courtyards.



Area of focus

Figure 130. Axonometric showing service walls, courtyards and staircases

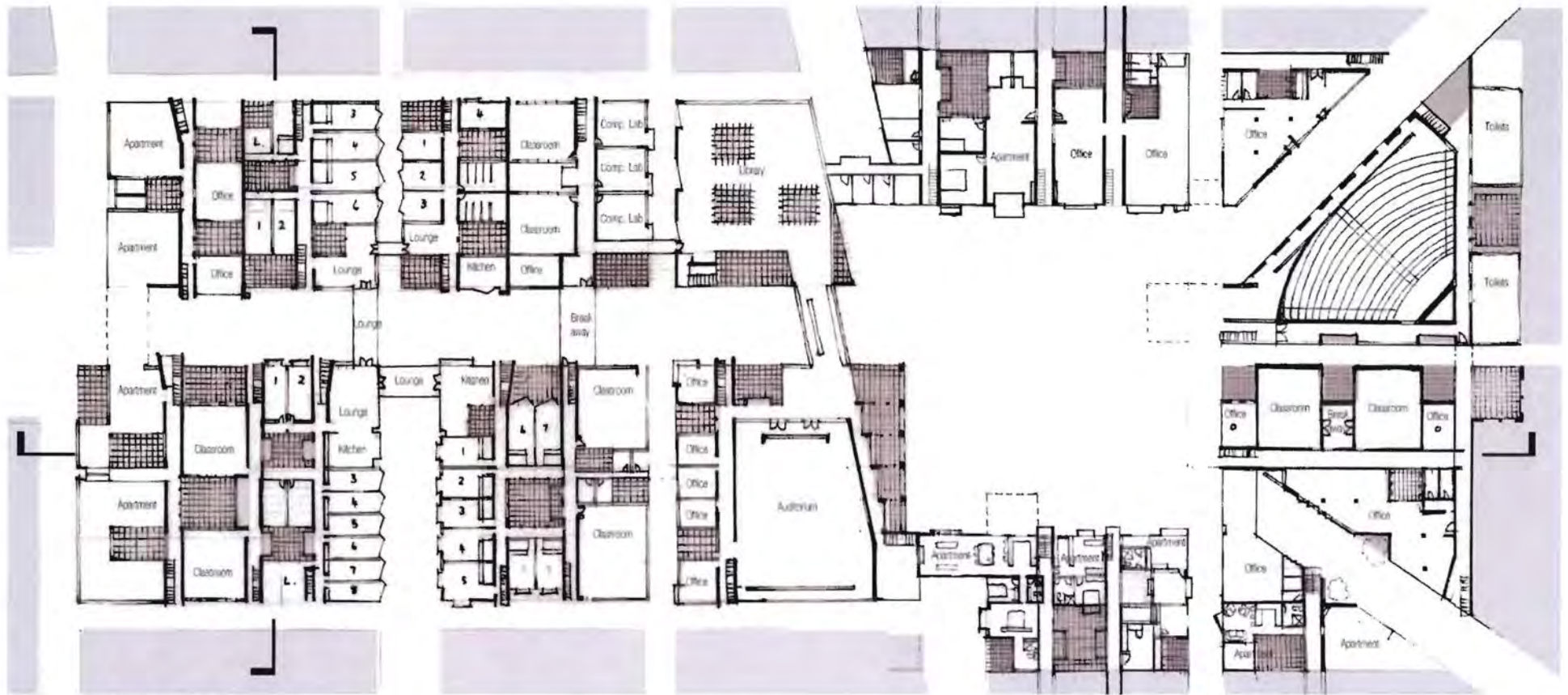


Figure 131. Typical Floor Plan
Reduced from 1:500

Density: 133 du/ha
Retail/offices: 9000m² within 1hectare

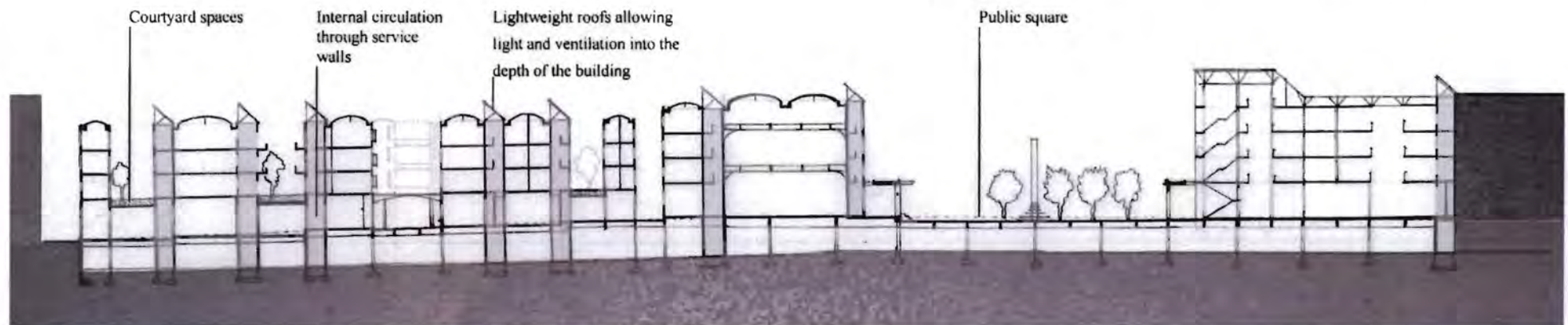
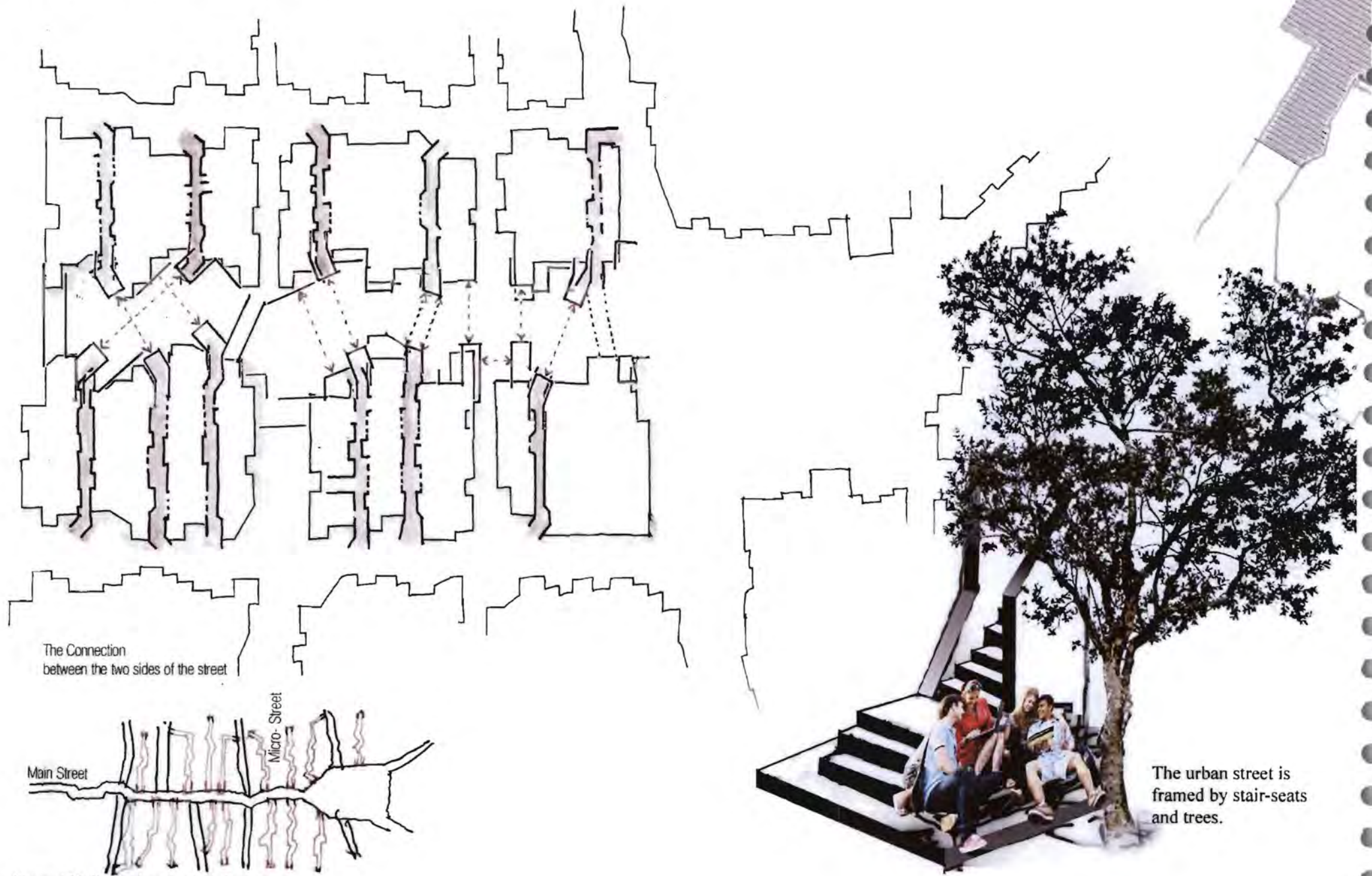
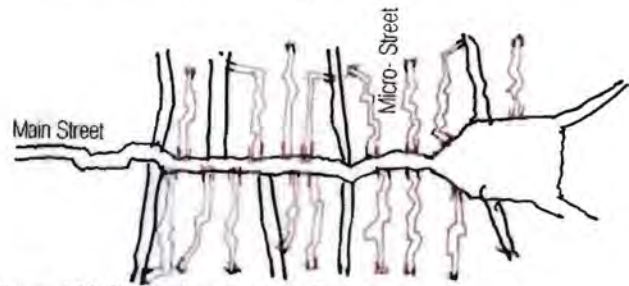


Figure 132. Long Section
Reduced from 1:500

Conceptual re-development

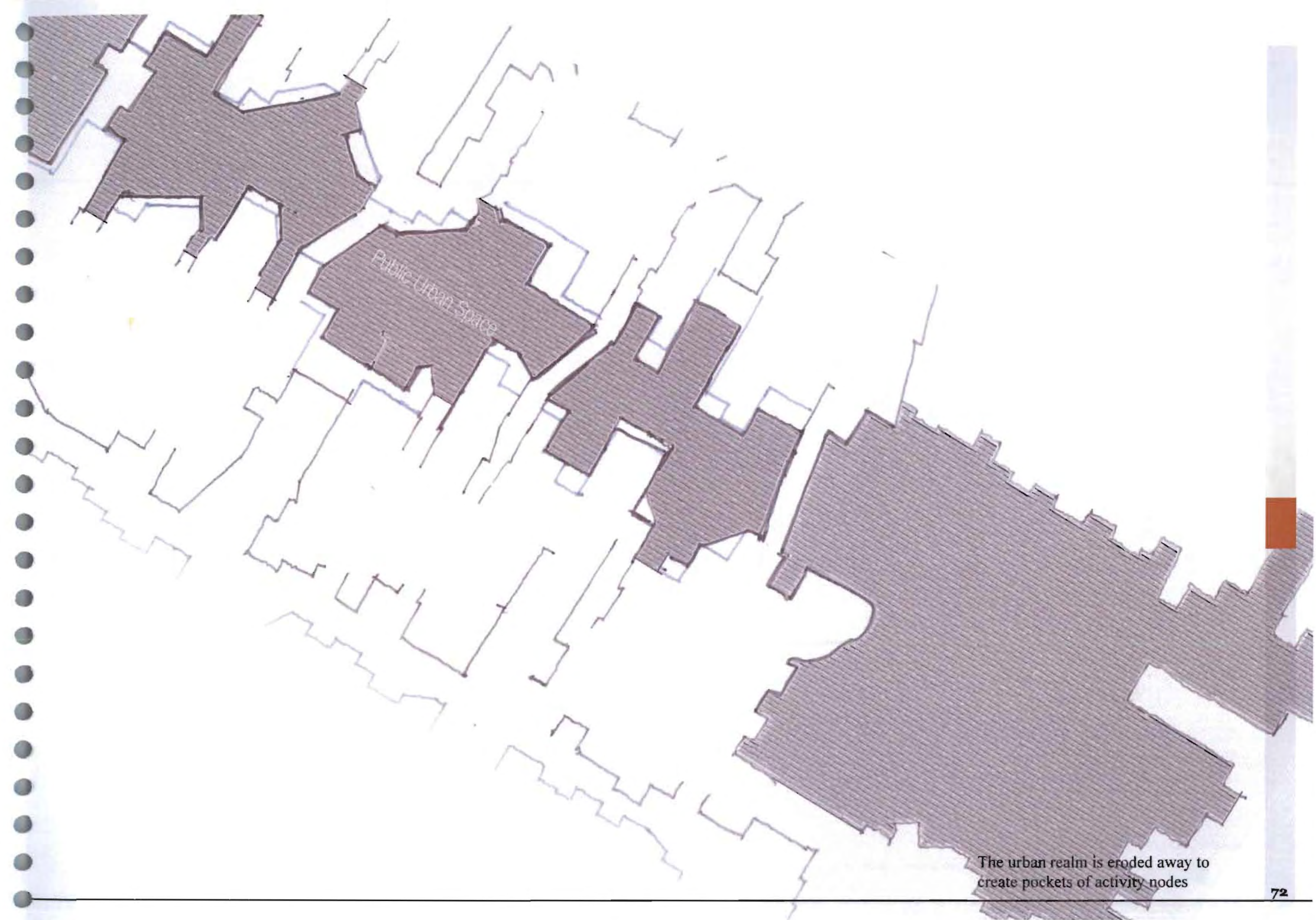


The Connection
between the two sides of the street



The urban street is framed by stair-seats and trees.

Figure 133. Revised conceptual diagram



The urban realm is eroded away to create pockets of activity nodes

Second Iteration

This proposal focused on the articulation of the private corridors or internal circulation. The corridors expand and contract as one moves through them. Light and ventilation is achieved through light scoops. The density that is achieved is 220 du/ha with a provision of roughly 8000 m² of retail and office space per hectare.

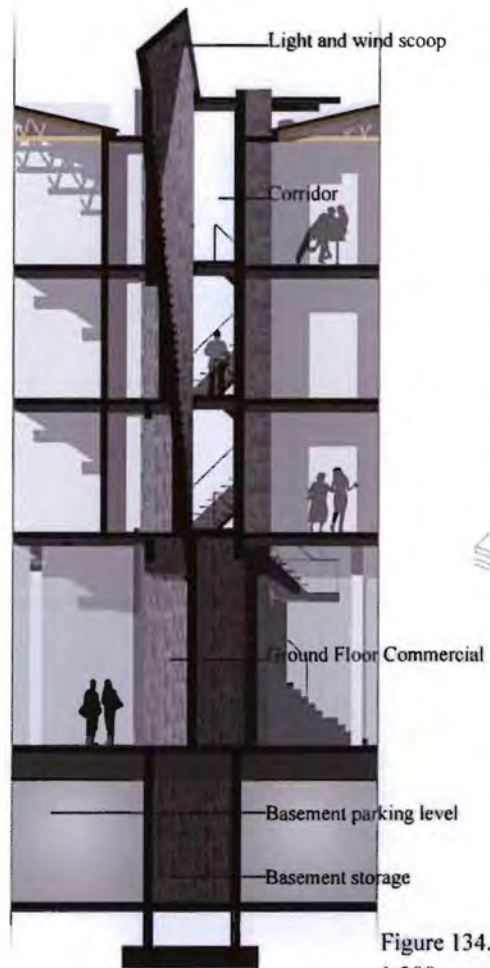


Figure 134. Section through corridor
1:200

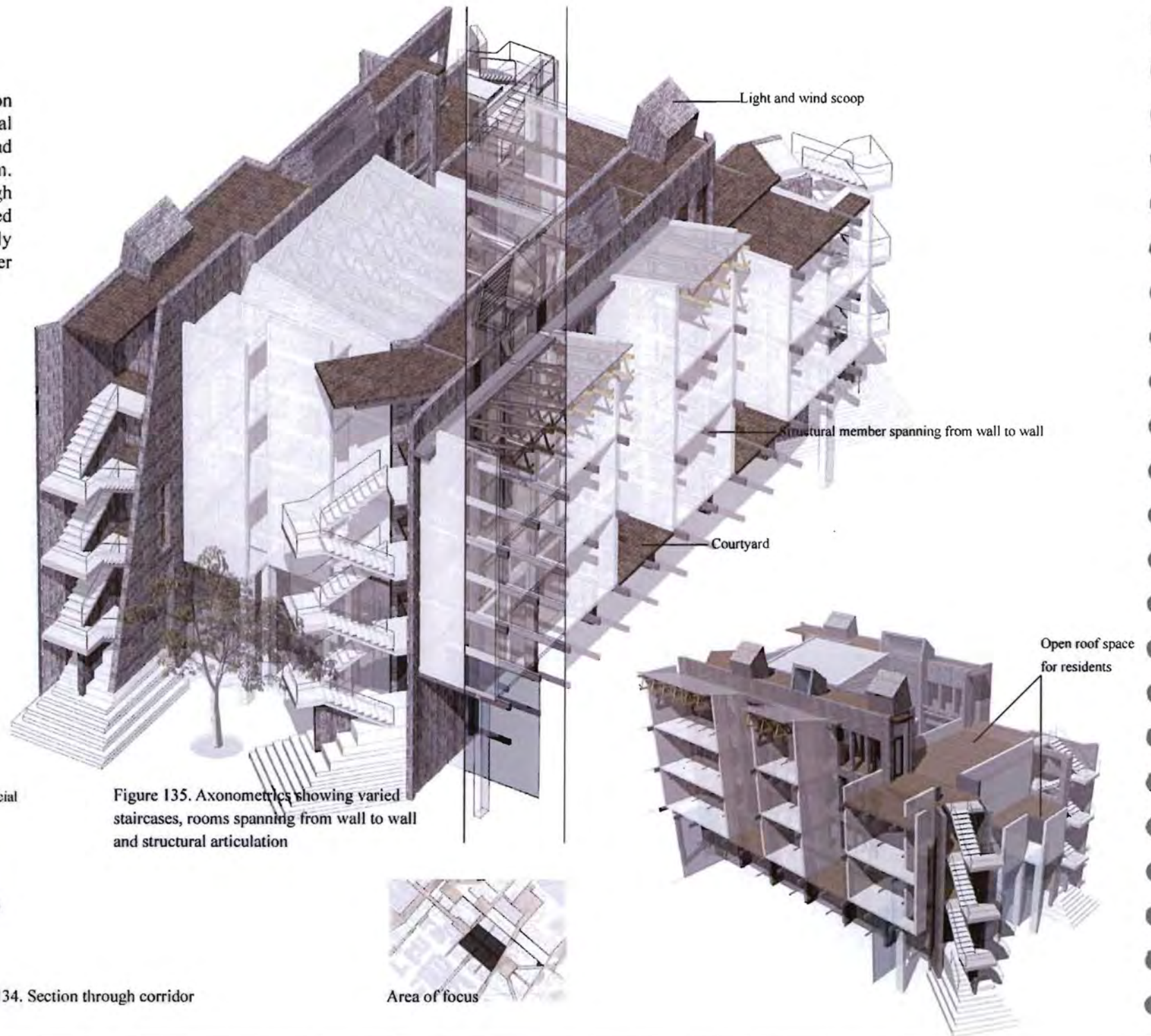


Figure 135. Axonometrics showing varied staircases, rooms spanning from wall to wall and structural articulation

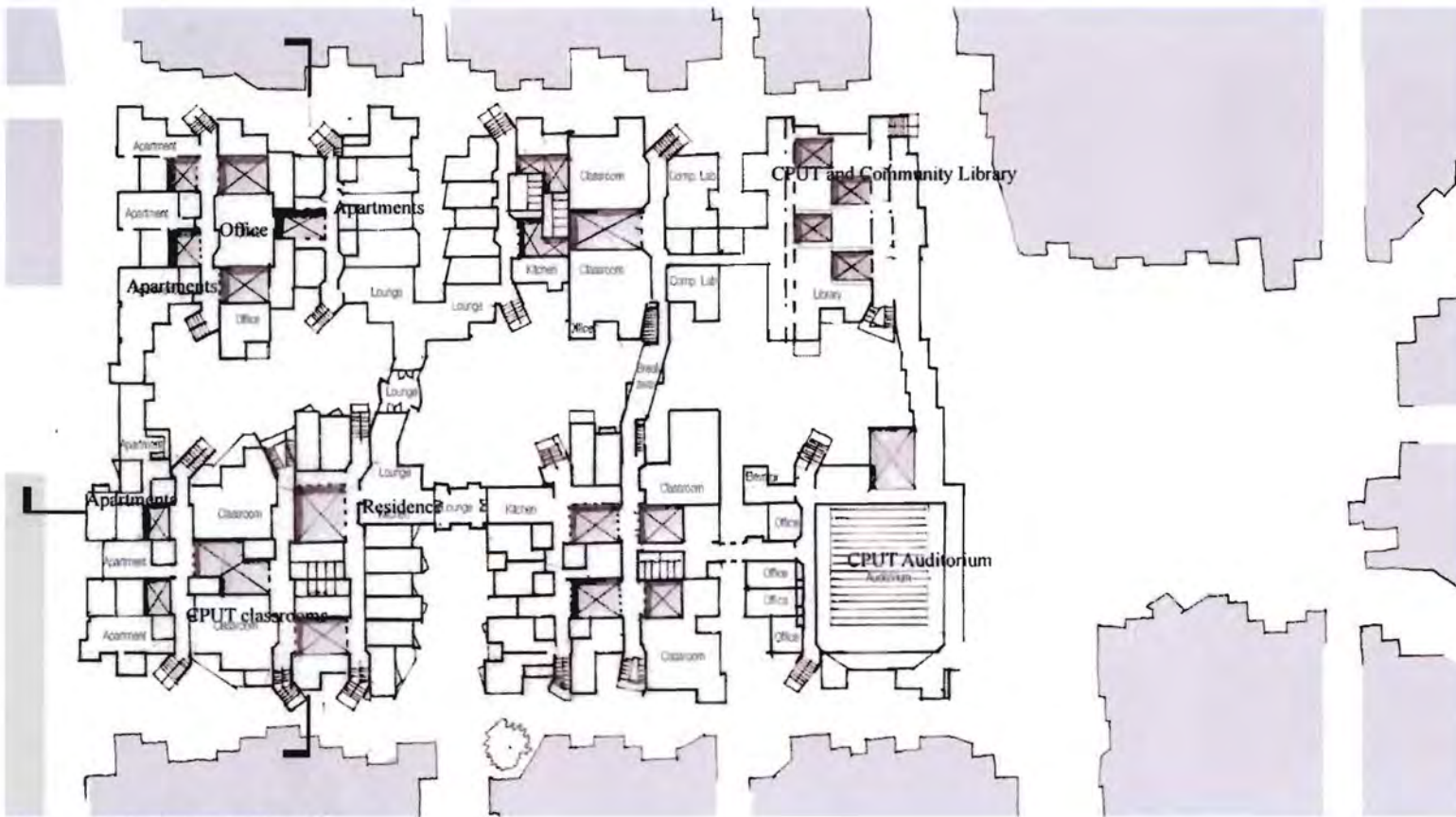


Figure 136. Typical Floor Plan
Reduced from 1:500



Light from above in deep retail spaces



Light into the depths of the block

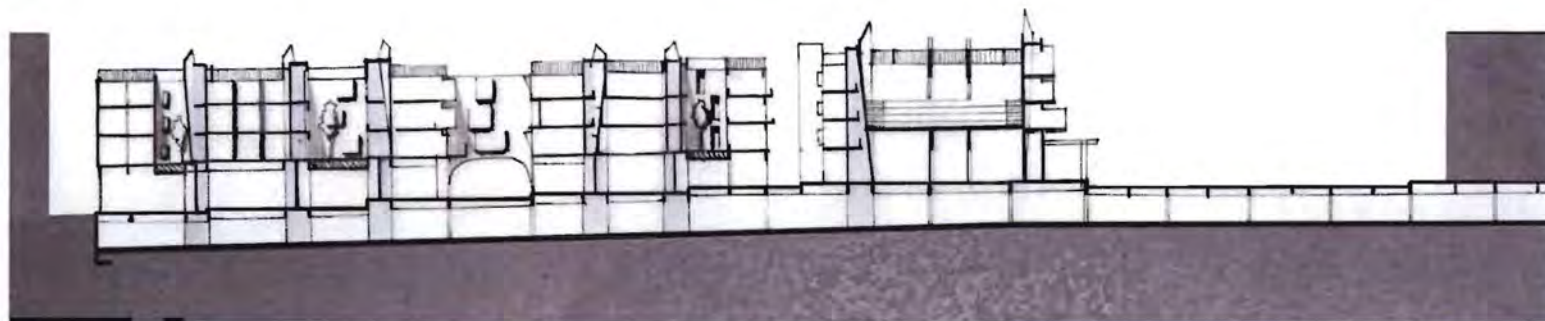


Figure 137. Long Section
Reduced from 1:500



Service wall lighting

Physical Model



Figure 138. 3d View of Longmarket Street



Figure 140. 3d View of Longmarket Street



Figure 139. 3d View of internal "streets"

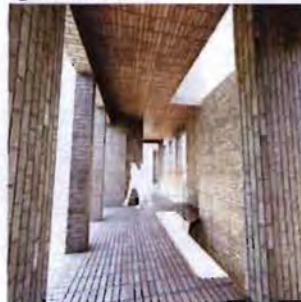


Figure 141. 3d View of internal "streets"

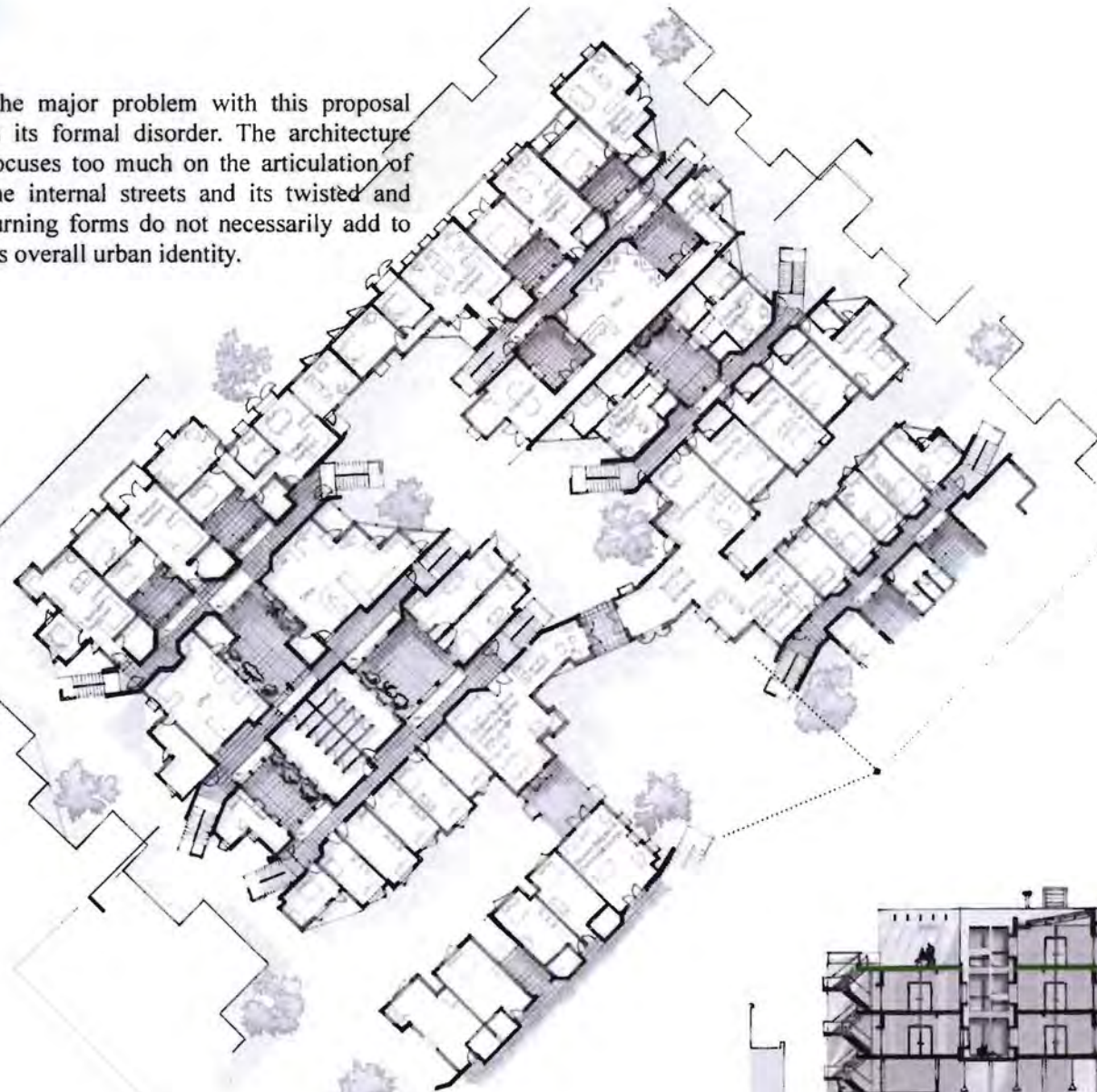


Figure 142. Light in internal corridors

The major problem with this proposal is its formal disorder. The architecture focuses too much on the articulation of the internal streets and its twisted and turning forms do not necessarily add to its overall urban identity.



Figure 145. 3d view - bridging the street



↑ Figure 143. Typical Floor Plan
Reduced from 1:200



Area of focus

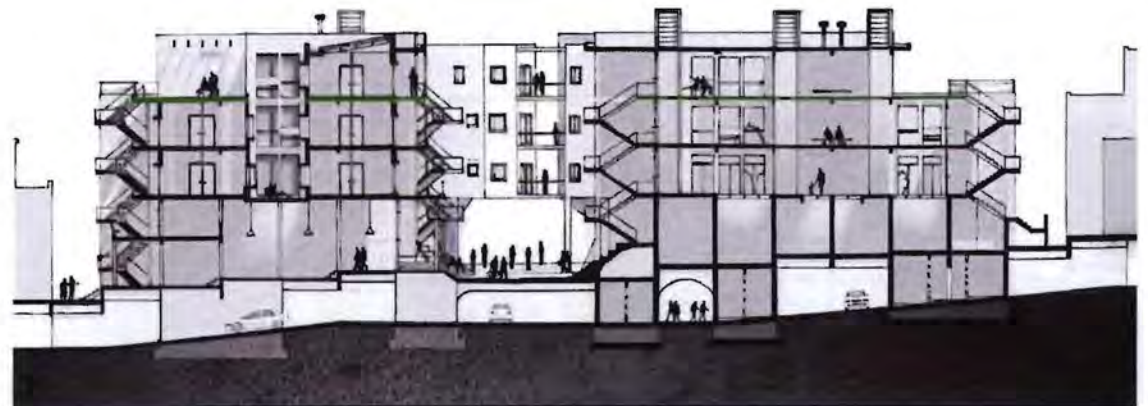


Figure 144. Section A-A
Reduced from 1:200

Third Iteration

With this proposal an order was achieved through standardising the courtyard size and creating a checker-board style form. The density is 267.5 du/ha, 2.6 times the proposed density of the District 6 Development Framework (NM Associates et al, 2010:48). It also provides 6000m² of retail and office space per hectare.

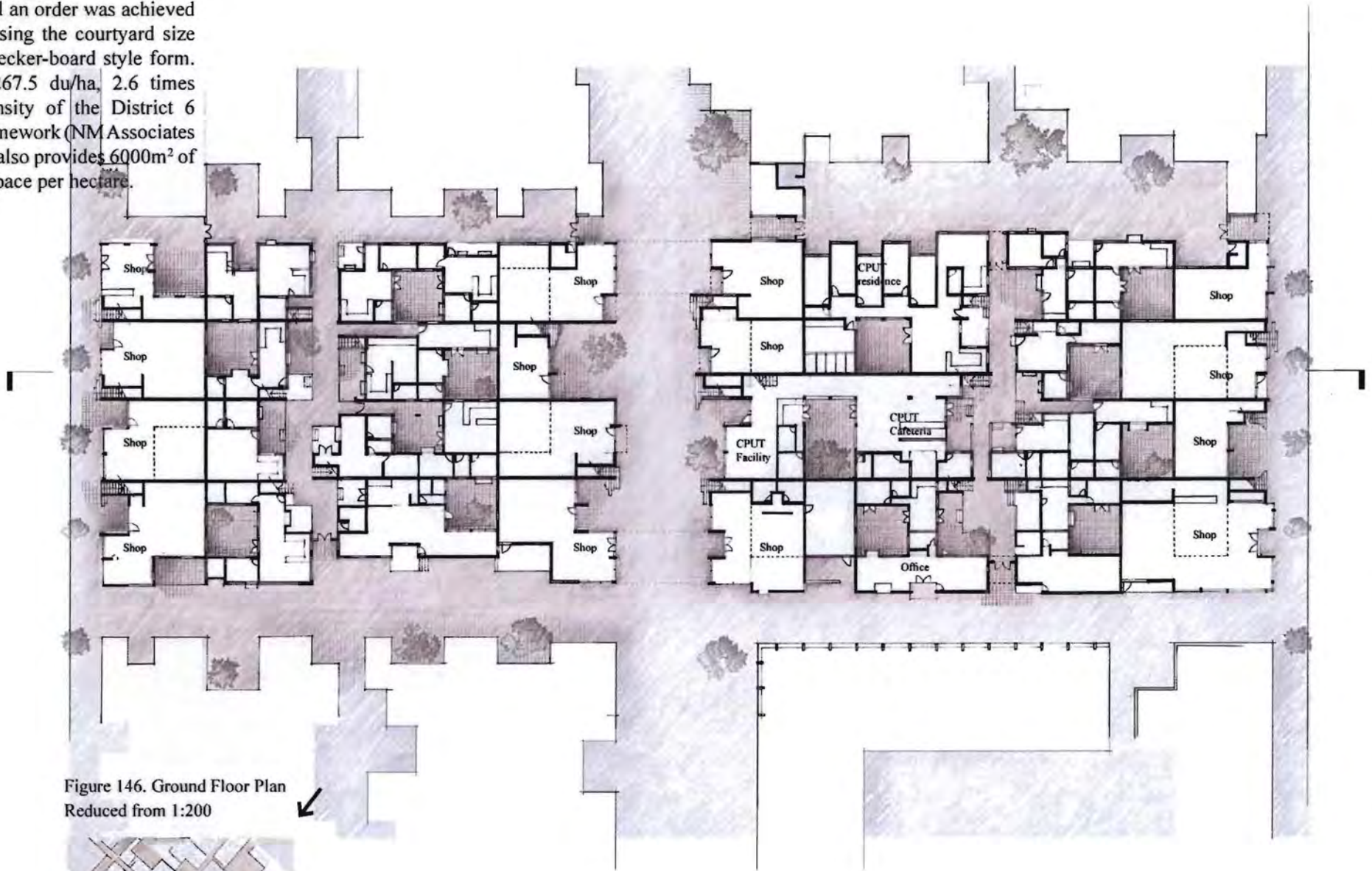


Figure 146. Ground Floor Plan
Reduced from 1:200



Area of focus

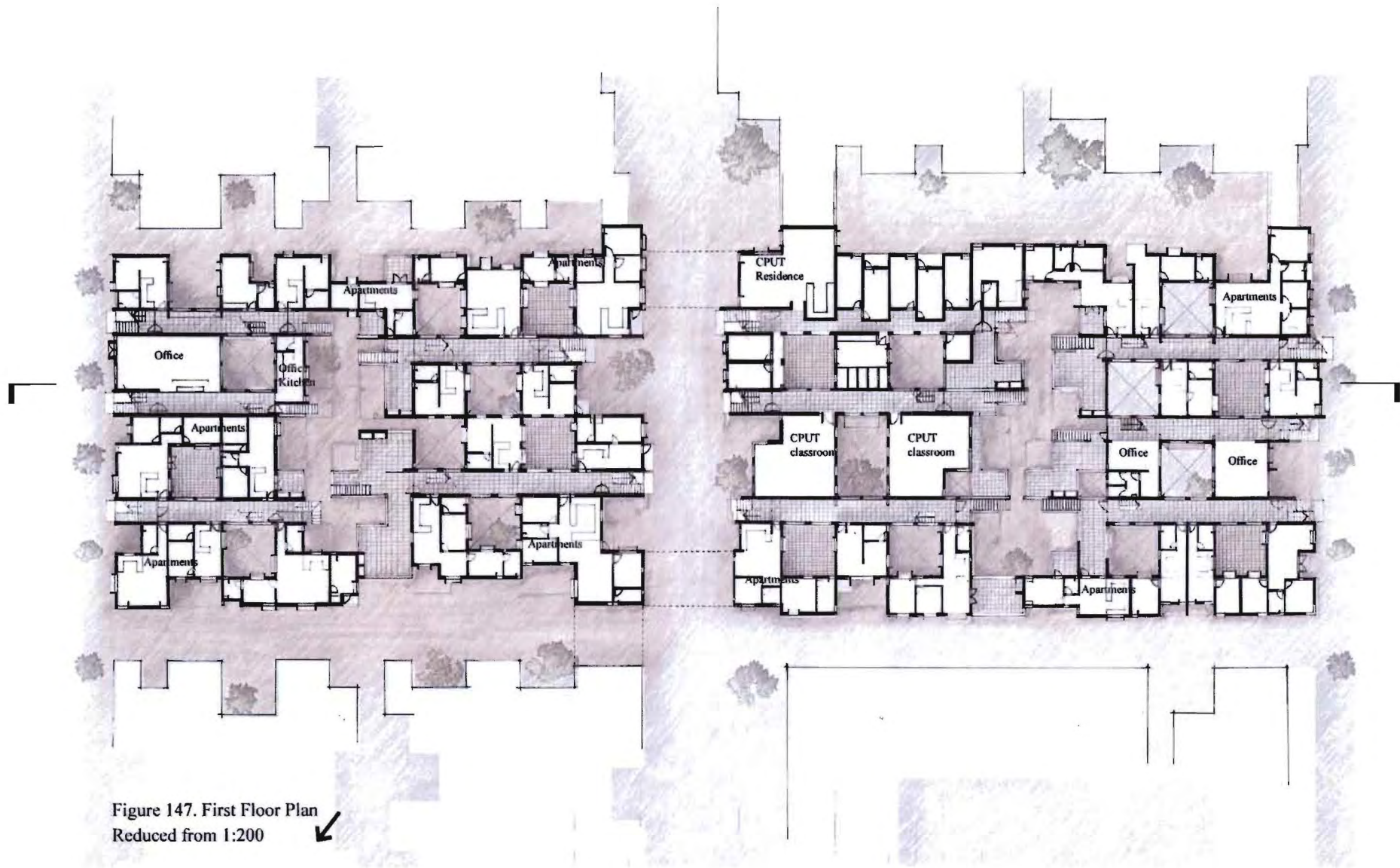


Figure 147. First Floor Plan
Reduced from 1:200



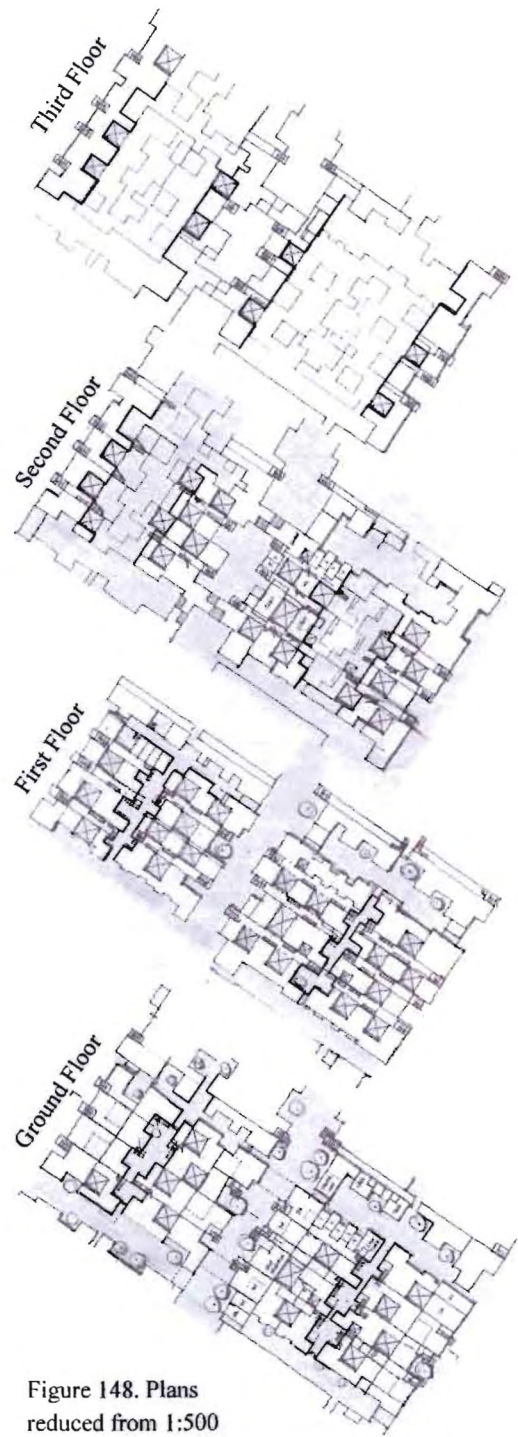


Figure 148. Plans
reduced from 1:500

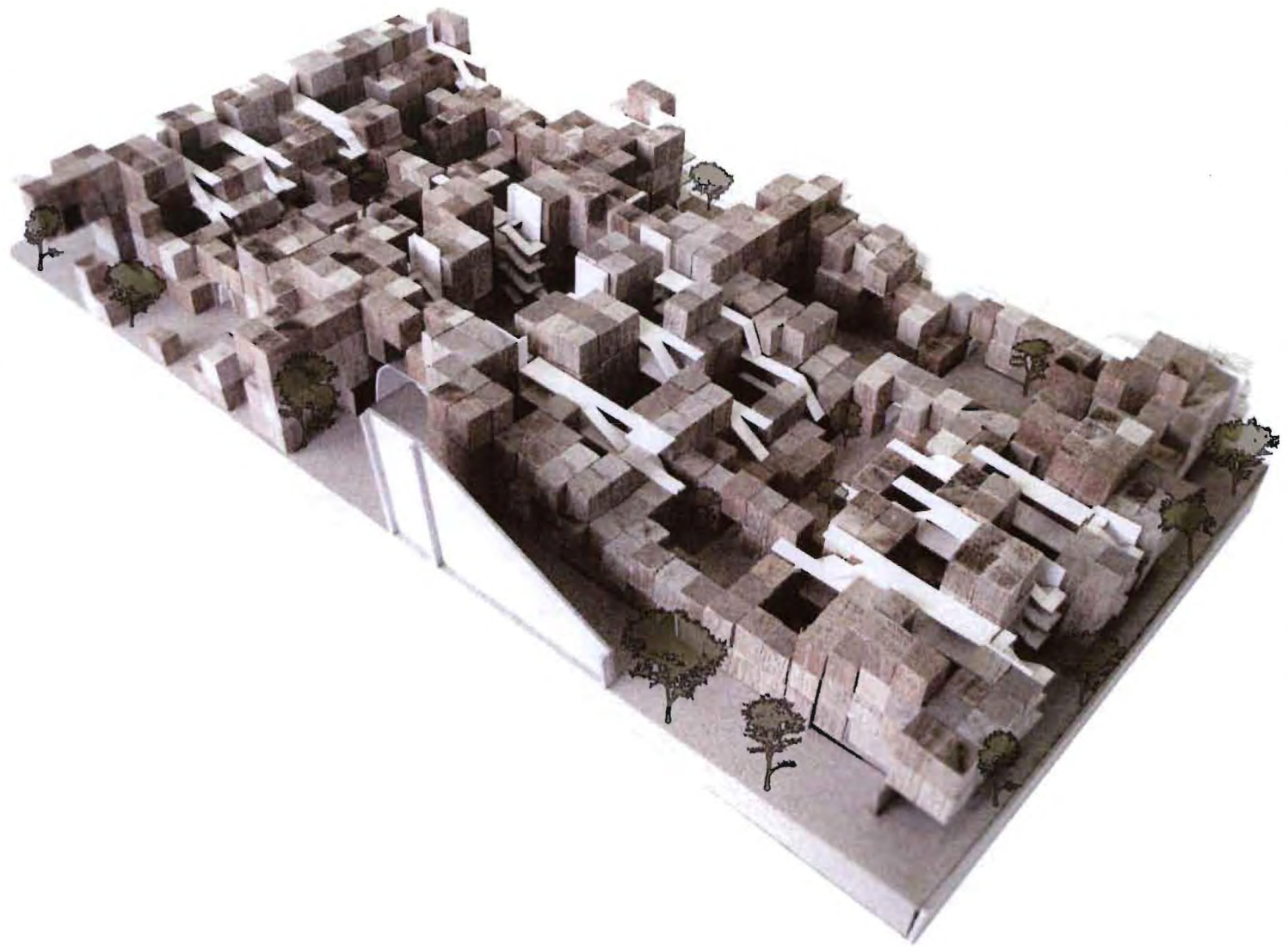


Figure 149. 1:200 model of focus
area showing overall massing



Figure 150. Photo of model showing Longmarket Street and staircases located on the street



Figure 151. Photo of model showing occupied accommodation bridged over Longmarket Street



Figure 152. The relationship between private streets, courtyards, and public streets.

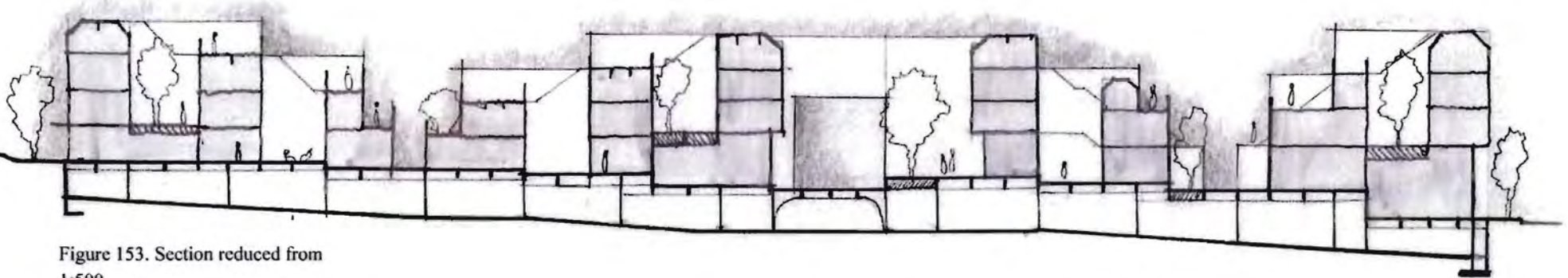


Figure 153. Section reduced from 1:500

Conclusion

The overarching aim of this thesis is to develop a framework that defines and creates quality high density, mixed-use living environments in the city. It is a topic filled with enormous challenges. These challenges, however, are the single most important architectural and urban design undertakings that face this generation – and in all likelihood, the next. In South Africa, there is a great need for densely populated urban centres because of the historical and continued social and cultural fragmentation in all our cities caused by dispersed peripheral development. People live in sprawling suburbs, increasingly isolated from one another; they lack a sense of community or social cohesion and are far from places of employment. Streets are dead places, used only for transport, without character or a sense of place. Comfortable and lively urban living environments, with streets that are dynamic and buzzing with people, will create a space to redress the negative impact of the heritage of apartheid. It will bring people together and open up a place for the hodgepodge, multicultural, diverse South African people to live in community. The benefits of high density cities span environmental, social, and economic realms. It is fast becoming a necessity.

A focus of this thesis is on providing quality public space in a high-density environment. I achieved this by using streets as public outdoor “living rooms”. Research spanning from the 1960s on the architecture of the street emphasises the

importance of movement on the street, place-making, and street materiality or content. Additionally, an architectural analysis of three streets in the local context gave me a clear understanding of what makes a street truly live.

Streets are made up of singular architectural elements that come together in complex spatial forms to create a larger element – one that is a sum of all its parts. Each singular element needs to be articulated and defined, and in some ways act autonomously, yet simultaneously needs to define the larger element. This is indicative of the complexity of streets; it functions on duality. It must be a movement corridor as well as a destination. It needs to create landmarks to help with navigation, yet not define a path. It must be covered for weather protection, but must also be open. It must be narrow, but wide enough to allow sunlight to penetrate its depths. It must be homogeneous, yet variegated; suppress noise, yet amplify song. The in-between is where the street lies; not just a part of two worlds, but rather multifarious systems, ranging from the texture of street surfaces to the larger urban consequence. The complexity of a great street is very difficult to design by one designer, and thus, utilising the literary research, as well as my own street analyses, I created a set of guidelines for future development for the complex and exciting site on Longmarket Street in Cape Town city centre.

The urban form of a city is always socially, spatially and economically richer if it is organically grown over many years – a single designer cannot predict the endless intricacies of the future of a

site. Urban form that is vibrant and alive is the cumulative efforts of hundreds of architects over hundreds of months and years. This variation is vital to its visual, acoustical, and programmatic vibrancy. However, it needs to be simultaneously uniform to acquire a level of imaginability, as well as spatial clarity. Therefore, general and relatively loose, as well as creatively inspiring spatial guidelines were designed to achieve both consistency and difference. The urban forms play itself out over time, forming coherent “chords” with different rhythms and configurations, as opposed to “a series of unrelated notes played with one finger on a piano” (Cullen, 1971: 53).

Architecturally, the two most important aims that are addressed in this thesis in terms of providing densification is to a) provide living environments that are safe and healthy for the inhabitants, and b) to set up a framework whereby each household does not harm their neighbours through noise or air pollution, or by blocking their sunlight or ventilation. With these two overarching objectives in mind, the urban guidelines were tested through various proposed iterations of buildings. Of course, the proposed guidelines will have to be tested and tweaked in the long term in order to fully understand the benefits and shortcomings of this urban framework.

I chose my urban form based on a number of studies investigating the pro's and con's of different types of urban forms. The mat-building urban concept and the planning principles of the madina sparked my interest because of the density that it accomplishes, its intrinsic growth-over-

time element, the physical and social variation it achieves, as well as the thresholds between public and private space.

The distinction between public and private in the urban realm is vital in order to achieve a level of ownership of the street space as well as to promote safe, secure living spaces. The hierarchy of the streets framework was developed to define distinct districts that create privacy levels within the public zone. In South Africa, crime is a major factor that deters people from using the street as an extension of their homes. Moving through a gateway from one privacy level to the next provides a physical structure that both defines an identifiable district and provides a level of security.

Though this is an ambitious, challenging urban framework, I believe that place-making in the street with high-density urban living environments is incredibly beneficial. It not only redresses the historical, social and cultural fragmentation that characterises South Africa, but also creates lively, safe, economically viable environments in our cities.



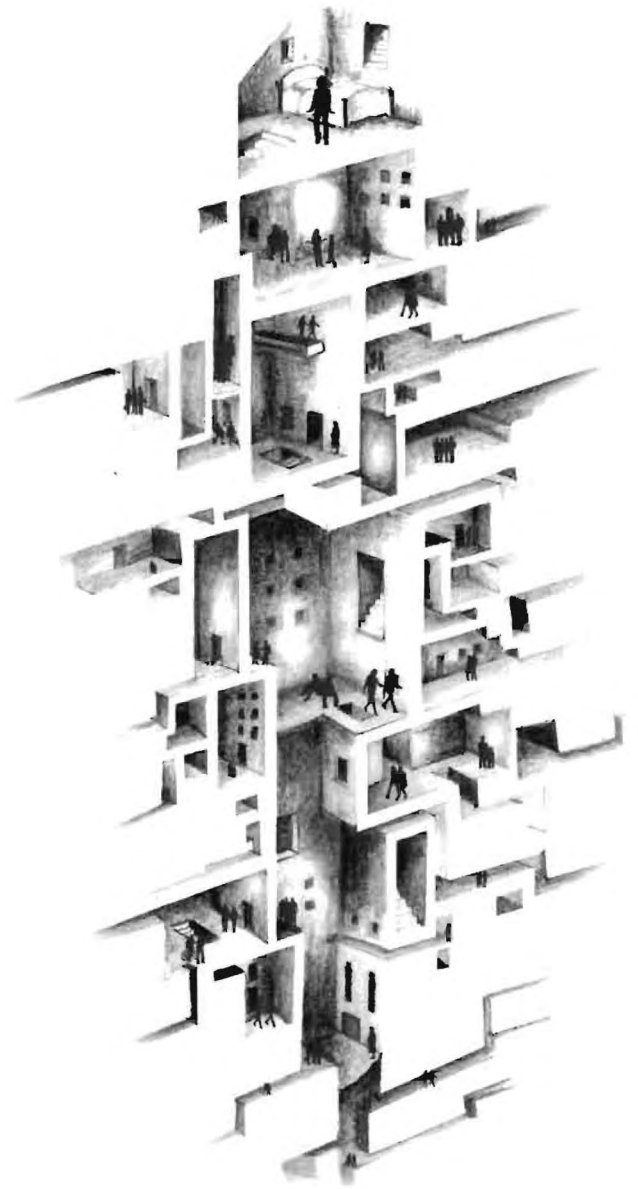
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Table of Images

FIGURE	REFERENCE
Front Cover	Author's sketch - based on Matthew Borret's drawing, 2005 - http://www.flickr.com/photos/yonderbean/4897116043/sizes/o/in/photostream/ [accessed 28 April 2012]
1, 2, 6, 13, 31, 32, 55	Rudofsky (1964) <i>Streets for People</i> , Doubleday and Company Inc. Publishers
3	http://www.skyscrapercity.com/showthread.php?t=346743&page=6 [accessed 15 June 2012]
4, 25, 38, 39, 67-70, 85, 86, 88, 89, 110-115, 121-148, 153	Author's drawing
5	Donald Appleyard (1981) <i>Livable Streets</i> , University of California Press, Berkeley
7,8,12	City of Cape Town, (2009) <i>Cape Town densification strategy</i> , Technical report, Cape Town: City of Cape Town
9	City of Cape Town, (2012) <i>Spatial Development Framework</i> , Statutory Report, CitySpace- Planning Cape Town
10	Martin, L., March, L., (1972) <i>Urban Space and Structures</i> , Cambridge University Press, London
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14	http://cainsa.files.wordpress.com/2010/12/district-six-before.jpg [accessed 12 May 2012]
15,22	Cullen, G., (1971) <i>The Concise Townscape</i> , William Clowes and Sons Limited, Great Britain
16	http://www.flickr.com/photos/manic-depression/4540149311/sizes/z/in/photostream/ [accessed 9 March 2012]
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Process timeline

Introduction

Density

Experiencing the city through movement

Place-making on the street

The making of the street

Analysis of three streets in Cape Town

Site

Urban design proposal

Conceptual development

First iteration

Second iteration

Third iteration

Conclusion

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