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D U A L I S M S I N M O D E R N I T Y :

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A M A C H I N E F O R L E A R N I N G I N



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Submitted in partial fulfilment of the requirements for the degree of Magister of Architecture, MArch(Prof)

Faculty of Engineering, Built Environment and Information Technology.

University of Pretoria 2016

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### Declaration

In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and thesis, I declare that the thesis, which I hereby submit for the degree Master of Architecture (Professional) at the University of Pretoria, is my own work and has not been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of my thesis has already, or is currently being submitted for any such degree, diploma or other qualification.

I further declare that the thesis is substantially my own works. Where reference is made to the works of other, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

.....

Saskia Marti Harrison



A C K N O W L E D G E M E N T S

Thank you to our loving heavenly Father who continues to show me that through Him all things are possible - Matthew 19:26

Thank you to my mother for her endless patience, unconditional love, care and support.

Thank you to my father for his support and life as example of hard work and dedication.

Thank you to Johan Swart, for his time, his effort and all the guiding conversations which contributed immensely to this project.

Thank you to Doctor Arthur Barker for his guidance; and especially for his remarkable ability to distil any element to its absolute essence and thereby making it easier to comprehend.

Thank you to Marianne de Klerk for her free mind, for allowing students to speculate, to question the norm and for her broad frame of reference.



“Technology is rooted in the past. It dominates the present and tends into the future. It is a real historical movement— One of the great movements which shape and represent their epoch. It can be compared only with the Classic discovery of man as a person, the Roman will to power, and the religious movement of the Middle Ages.

Technology is far more than a method, it is a world in itself. As a method it is superior in almost every respect. But only where it is left to itself as in the construction of machinery, or as in the gigantic structures of engineering, there technology reveals its true nature. There it is evident that it is not only a useful means, that it is something, something in itself, something that has a meaning and a powerful form— so powerful in fact, that it is not easy to name it. Is that still technology or is it architecture? And that may be the reason why some people are convinced that architecture will be outmoded and replaced by technology. Such a conviction is not based on clear thinking. The opposite happens. Wherever technology reaches its real fulfillment, it transcends into architecture. It is true that architecture depends on facts, But its real field of activity is in the realm of the significance.

I hope you will understand that architecture has nothing to do with the inventions of forms. It is not a playground for children, young or old. Architecture is the real battleground of the spirit. Architecture wrote the history of the epochs and gave them their names. Architecture depends on its time. It is the crystallization of its inner structure, the slow unfolding of its form. That is the reason why technology and architecture are so closely related. Our real hope is that they grow together, that someday the one be the expression of the other. Only then will we have an architecture worthy of its name: Architecture as a true symbol of our time.”

- Ludwig Mies van der Rohe

April 17, 1950

ID Merger Speech at the Blackstone Hotel in celebration of the addition of the Institute of Design to Illinois Institute of Technology

## A B S T R A C T

This dissertation is rooted in the theory of time and place and it considers the built environment through the lens of past, present and projected future evolution. The project examines various themes of dualistic study within the broader subject of time and change. Pertinent to the 21st century, the interface between man, technology and architecture is investigated in an examination of how architecture can intervene in the process of perpetual modernisation and the benefits or compromising attributes it has on man. Additionally, the relationship between old and new built fabric in architectural heritage is studied and a mediative architectural approach is proposed. Also, the dual construct of permanence and change in architecture is investigated.

At the dawn of the fourth industrial revolution, where the physical- and the cyber worlds are continuously interwoven, a re-examination of learning models and the volatile situation of higher education in South Africa is conducted in anticipation of what technological advancement continuously presents and the impact this has on man and the built environment.

The site of the Government Printing Works embodies a comprehensive intersection between time, change and architecture with a rich development history spanning over 120 years. The block tells the story of function, production and dissemination of knowledge, and this intangible heritage is commemorated by the proposed programme of a T.E.L. (Technology-Enabled-Learning) Centre that blends physical and virtual learning environments and where knowledge is distributed in a ubiquitous manner.

## O P S O M M I N G

Hierdie studie is gegrond in die teorie oor tyd en plek en dit beskou die bou-omgewing deur die lens van verlede, hede en geprojekteerde toekomstige evolusie. In die wyer onderwerp van tyd en plek word verskeie temas van dualistiese studie ondersoek. Met toepassing op die 21ste eeu, word die koppelvlak tussen die mens, tegnologie en argitektuur ondersoek, deur 'n studie oor hoe argitektuur kan ingryp in the proses van onophoudelike modernisering en die voordele of nadele wat dit inhou vir die mens. Daarbenewens word die verhouding tussen ou en nuwe geboue bestudeer en 'n bemiddelende argitektoniese benadering word voorgestel. Verder word die dubbele benadring van vastheid en verandering in argitektoniese elemente ondersoek.

Aan die omvang van 'n vierde industriële revolusie, waar die fisiese en die kuber wêreld voortdurend verweef word, word 'n herondersoek van leermodelle en die huidige wisselvallige situasie van hoër onderwys in Suid-Afrika gedoen, in afwagting van wat tegnologiese vooruitgang voortdurend bied vir die mens en die beboude omgewing.

Die terrein van die Staatsdrukkery verpersoonlik 'n omvattende kruising tussen tyd, verandering en argitektuur met 'n ryk geskiedenis van ontwikkeling wat strek oor meer as 120 jaar. Die blok vertel die verhaal van funksie, produksie en die verspreiding van kennis, en hierdie nie-tasbare erfenis is herdenk deur die voorgestelde program van 'n T.A.L. (Tegnologie Aangedrewe-Leer) Sentrum wat fisiese en virtuele leeromgewings saamsmelt en waar kennis versprei word in 'n alomteenwoordige wyse.





P R O J E C T S U M M A R Y

TITLE: *Dualisms in Modernity: A Machine for Learning in*

PROGRAMME: T.E.L. [Technology-Enabled-Learning] Center

ADDRESS: Government Printing Works: 127 Johannes Ramokhoase Street, Pretoria CBD

RESEARCH FIELD: Heritage & Cultural Landscapes

THEORETICAL PREMISE: Time and Change: Man, Technology & Architecture

KEYWORDS: Technology, Architecture, Education, 21st Century, Digital, Virtual





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# Chapter 1

## I N T R O D U C T I O N



PROBLEM STATEMENT / IDENTIFICATION / DIAGNOSIS / LOADING

## 1.1 THEORETICAL BACKGROUND : TIME AND PLACE

This dissertation is broadly rooted in the dual subject matter of **time** and **place** and the inevitable (cultural, social, political, environmental and specifically technological) **changes** that accompany the passage of **time**; also, the effects of these **changes** on the built environment and resultantly, on everyday life. The problem statement for this study partly examines how architecture, as a permanent fixture in the landscape, is inconsistent with the **changes** that The Modern Project continuously presents.

The 21st century **paradigm** is thus far predominantly associated with designations of the *digital age* or the *information revolution*; and it is a relatively young development when viewed in relation to the average **life-span** of buildings. Technology has brought about such a radical shift in **contemporary** culture over the last two **decades**, especially in the realms of information and communication.

Frank Lloyd Wright (1953) stated that "Every great architect is - necessarily - a great poet. He must be a great original interpreter of his **time**, his **day**, his **age**". By 'interpreting' this **era**, the architect has to take cognisance of and engage with the things that characterise and dominate the culture of his **time**. The broad, underlying research questions that this dissertation therefore aims to investigate are as follows:

***How can architecture intervene in the process of perpetual modernisation and the inevitable benefits or side-effects that it presents?***

More specific to the contemporary age, the question is:

***How can architecture engage with the technological phenomena of the digital age, mass media and cyberculture?***

***How can architecture be 'a true symbol of our time' as professed by Mies van der Rohe (1950) (as cited on page iii) and in addition to this, how can architecture remain that symbol in perpetuity?***

## 1.2 TIME AND PLACE: HERITAGE vs PERPETUAL MODERNIZATION

The subject of **time** and **place** is also intrinsically connected to **heritage** in architecture; with every passing day another layer can be added to South Africa's architectural **heritage**. **Changes** over **time** (very often technological **advancement**) may render the functional value of a historical building obsolete. Especially during a period of radical **transformation** there is a general tendency towards nostalgia for the **past**: examples being the romantic period in reaction to the industrial revolution toward the end of the 18th century, or postmodernism in reaction to modernism in the 20th century. The term *conservation* can refer to a number of things, and it is exactly this nebulous area of definition that brings forth confusion as to *how to conserve*.

The same confusion exists when constructing a new neighbour next to (or in the immediate context of) the **historic** heritage building. Generally, we are either too afraid to touch something of the **past**, or, with legislature in place that forbids us to demolish it, in our ignorance we construct an a-contextual, **contemporary** structure beside it with an arbitrary, if any, relationship to the historic building. This being said, if we do not deal with the functional aspects of **heritage** we will just end up with scenographic 'cardboard cut-outs' of old buildings in the city (Barker, 2016). Dormant **heritage** buildings also have a stagnating effect on their surrounding environment, therefore they need to be **adapted** and integrated into **contemporary** life.

### 1.3 MODERNITY'S INHERENT DUALISMS

In light of these postulations the theoretical backdrop of this dissertation is concerned with three themes (related to the theory of **time and change**) of dualistic study (Fig 1.1):

- Firstly, the dichotomy of **old** and **new** in one symbiosis will be investigated in terms of both tangible and intangible relationships. This will be done by extensive analysis of the existing (separate components and as a whole ) in order to arrive at a synergic strategy of intervention.
- Secondly this project will examine the duality of the beneficial nature of technological **progression**, while also contemplating the resultant compromising conditions that accompany it. Various technological **advancements** related to spatial design will be considered and critiqued in order to generate strategies for the built environment that are relevant and necessary for the **21st century** (Fig 1.2).
- The third dualism that will arise in the dissertation is an approach that considers the built environment not only in terms of the **past** and **present** time-dimensions, but also in terms of the **future**; the same logic of *change through time* and *adapting the old* is applied to the new building, for **future** reference. This suggests a new conception with varying degrees of **alterability**, so the dualism of **permanence** and **change** within architectural design is another area of investigation in this dissertation.

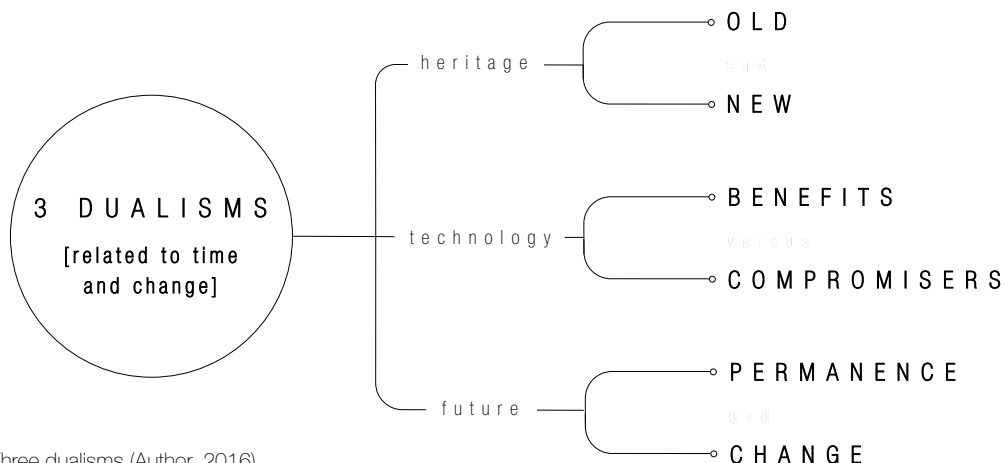
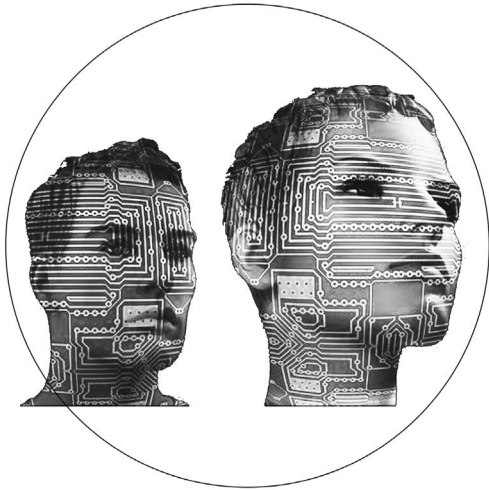
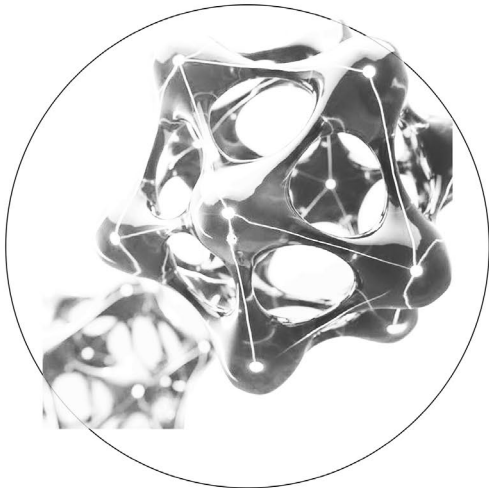


Figure 1.1: Three dualisms (Author, 2016)

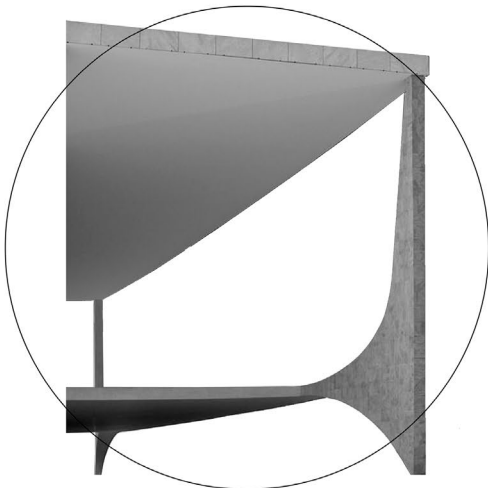




[man]



[technology]



[architecture]



[ designing the interface between man & technology ]

**Figure 1.2:** Theme of dissertation:  
Man, Technology and Architecture

#### 1 . 4 I D E N T I F I C A T I O N O F S I T E :

#### G O V E R N M E N T P R I N T I N G W O R K S

Bordering the periphery of the north-western quadrant in the Pretoria CBD is the site under investigation: the block of the old Government Printing Works (GPW) on the corner of Bosman and Madiba Streets (Fig 1.3), just one block north-west of Churh Square. This block has a rich **history** of development spanning over 120 years and includes an example of architectural **heritage** that has **become dormant over time**. The block is owned by the DPW (Department of Public Works) and the Government Printing Works rents it from them; however, they (GPW) are in the process of migrating to another location - which opens up opportunities for intervention on this site. This dissertation aims to interrogate the city block as a whole, in order to unlock inherent spatial potential for a broader context.

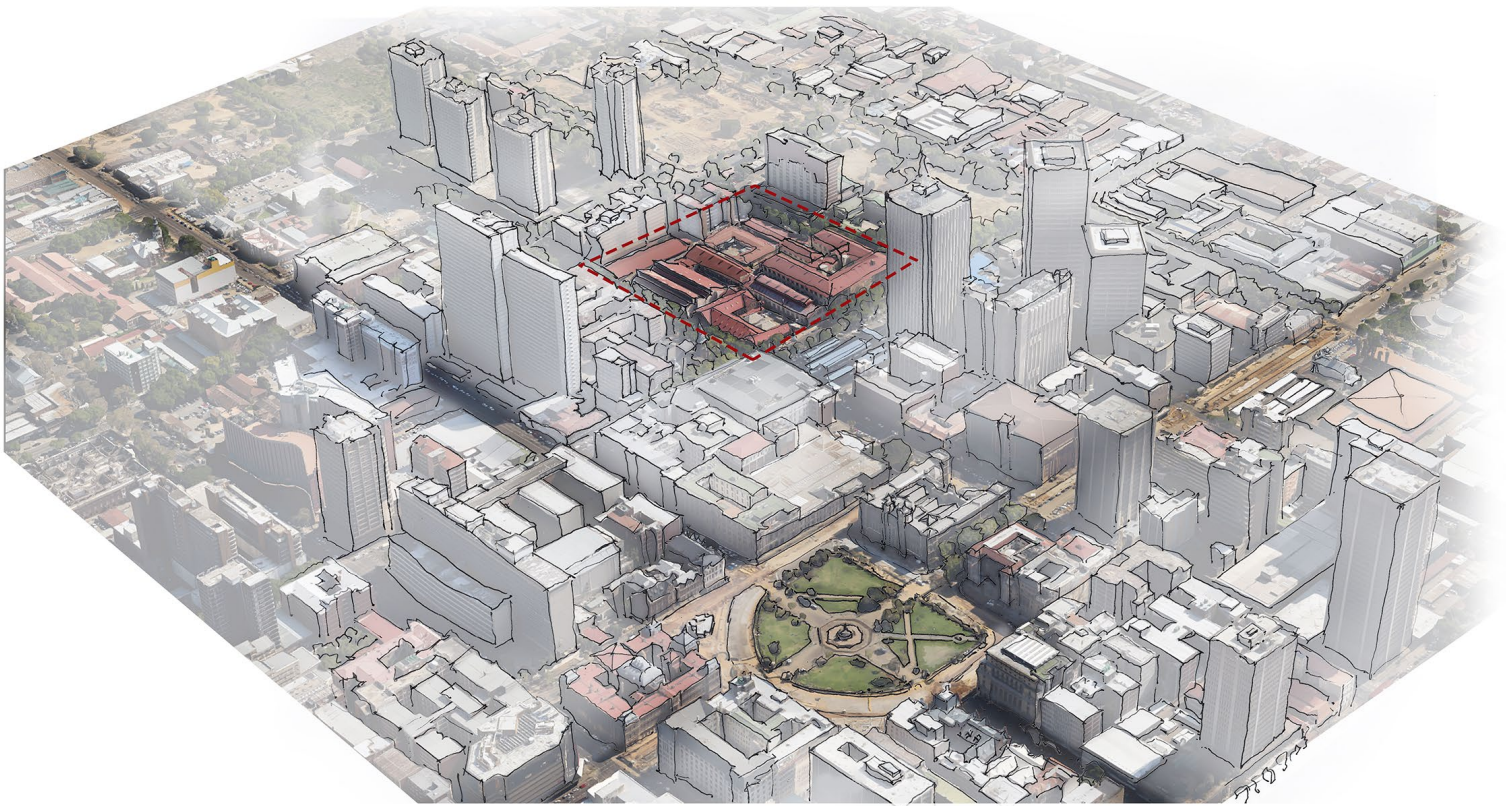


Figure 1.3: Locality map (Author, 2016)

## 1.5 DISCONNECTED NORTH - WESTERN QUADRANT

The most influential socio-political **change through time** that present-day architects and city-planners in South Africa are faced with is the **resultant conditions** of the previous political **paradigm**, in which cities are still marked by the scarring of segregation. The administrative capital of Pretoria is a prime example; Clarke and de Villiers (2015: 67) recognise that “due to the historic forced removals undertaken under Apartheid planning policies, the north-western quadrant of the city centre has become a place of desolation.” Church Square is arguably the most important civic space in Pretoria (if not the country) and its surrounding urban fabric should reinforce it as such. Currently the north-western quadrant is in dissonance with the rest of the CBD context. For this reason the government is implementing various visionary planning schemes to revitalise this stagnant stretch of land, which is already evolving towards a more community-oriented area. The urban intention of this dissertation is therefore to establish an open and engaging urban block precinct to give an invigorating energy to the surrounding environment.

## 1.6 INEQUALITY, EDUCATION & TECHNOLOGY

The current unemployment rate for South Africa is 25,2% (Statssa, 2016). This dire economic situation is directly linked to the overall educational structure in the country. Nelson Mandela (2003) stated that “Education is the most powerful weapon which you can use to **change** the world”. Twenty-two years into democracy, however, the educational infrastructure is still trying to eradicate the effects of the Bantu-education system and level the scales of equality.

In an interview conducted with Adam Habib (Poplak, 2016) he recognises the need for (and current lack of) alternative higher educational institutions in South Africa, beyond universities, such as **vocational schools and training facilities** “to sop up students destined to fall through the gaps”. While universities need to maintain high standards, according to Habib, intermediary institutions (beyond secondary schooling) that provide technical trade skills, are necessary for people at the lower end of the educational scale to move upwards from their existing skill-level.

In addition to the existing unemployment rate, Lodder (2016) states that we stand on the brink of the *fourth industrial revolution* (explained in Chapter 2) “that will fundamentally **alter** the way we live, work, and relate to one another”; it is estimated that 47% of existing jobs are at risk for replacement by digital and robotic technologies in the next twenty years (Lynch, 2015). In an article in *The Economist* (2014), it is also suggested that this new **era** will bring forth even greater **inequality**, as most of the jobs that will be automated are in the lower- and middle-class spectrum (positions in the manufacturing and services industries (Lynch, 2015)), while the higher end will prosper even more with regard to skills and wealth.



## 1.7 T.E.L. [TECHNOLOGY-ENABLED-LEARNING] CENTRE

South Africa cannot afford the gap of inequality to grow even larger, and therefore, in order to ensure job availability in **future**, educational content should additionally be focused those professions that will not be consumed by technology.

Associate Professor in machine learning at Oxford University, Michael Osborne (as cited by David, 2015) states that “Creativity is arguably the most difficult human faculty to automate: robots are unlikely to be fully creative any time soon”; in addition to this, writer Joel Lee (2014) explains that learning content should be focused on “jobs that require an element of human behaviour that computers cannot replicate: intuition, creativity, innovation, compassion, imagination, and so on”. The creative arts industry is therefore a more sustainable investment in terms of inevitable **future** technological **advancement** and, especially in South Africa, with the dire call for decolonised education, creative learning facilities present a fresh and continuously reshaped outcome.

Additionally it is estimated that by 2019 more than 50% of educational courses will be done through ‘e-learning’ (electronic learning) (Laskaris, 2015), in which educational institutions will present all the learning content (regardless of the subject matter) on a virtual basis to the student. This presents the advantage of non-place-based (distance) learning but also the disadvantage of a dependence on technological enablement to provide one with the content. However, as this document will argue, e-learning will prove to be a much more **personalised** and **effective** way of learning, and therefore it will be implemented.

Set within a community-oriented neighbourhood, a public educational facility will add value to the lives of the people in the immediate area. The intrinsic function of the Government Printing Works block is primarily about the ‘production and dissemination of information’ (Clarke, Kuipers and Swart, 2015: 115); and this intangible **heritage** is commemorated through a public T.E.L. (Technology-Enabled-Learning) Centre. This training centre is firstly focused on technical trade-skills in response to the current, broader economic, social and educational circumstances in South Africa, but also focussed on training for the creative arts, in preparation of the *fourth industrial revolution* (programme fully explained in Chapter 5). The programmatic intention is that the learning stretches beyond the physical ‘school’ boundaries into the urban realm and makes use of digital and virtual reality technologies to stimulate the learner. Furthermore the technology-enabled-programme blurs the boundary between education and recreation, and contributes to the neighbourhood as an exciting drawing point for people of all ages and backgrounds.

This document starts out with a theoretical background supposition to establish the basis of the underlying subject matter, thereafter it examines the project-specific informants.



# Chapter 2

## T H E O R Y



RESEARCH / CONJECTURE / SUPPOSITION / SPECULATION





“The First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.”

- Klaus Schwab, 2016



Figure 2.1: Four industrial revolutions (Schwab, 2016, edited by author)



## 2 . I N T R O D U C T I O N

Chapter 2 is an investigation of the theoretical basis that shapes the background subject matter of the dissertation project and informs the programme and the eventual architectural product. The theory is concerned with the inherent dualities (discussed in Chapter 1) related to respectively, the side-effects ('compromisers') of technology and conversely the benefits of technology and its role in the built environment. It is subdivided into two main sections:

### 2.1 Notes on the background of modernization:

'Compromising attributes of technological advancement'

#### 2.1.1 INTRODUCTION

#### 2.1.2 SIDE-EFFECTS OF TECHNOLOGY

#### 2.1.3 TECHNOLOGY AS COMPROMISER: HISTORICAL CASES

#### 2.1.4 TECHNOLOGY AS COMPROMISER: RECENT CASES

### 2.2 Interactive [digital] environments

#### 2.2.1 INTRODUCTION

#### 2.2.2 INTERACTIVE INSTALLATIONS AS A SPATIAL CONSTRUCT

#### 2.2.3 INTERACTIVE ENVIRONMENTS AS A COUNTER-STRATEGY TO COMPROMISERS

1, 4, 5 AND 6: 'Interactive architecture as a cultural negotiator'

### 2.3 CONCLUSION:

#### 2.3.1 DUALITY OF PERMANENCE AND CHANGE



2.1 NOTES ON THE BACKGROUND OF MODERNIZATION:  
'COMPROMISING ATTRIBUTES OF TECHNOLOGICAL ADVANCEMENT'

"It has become appallingly obvious that our technology has exceeded our humanity."

- Albert Einstein

2.1.1 INTRODUCTION

Section 2.1 is an outline of the underlying theories that inform the programme and resultant architecture, specifically focused on the **side-effects of technology**. The sources used in this section range from various architectural and urban theorists to other disciplines, such as the fields of social psychology and contemporary culture. Everything is considered through the lens of advancing technology and what effects it has on man and reciprocally the built environment.

## 2.1.2 SIDE-EFFECTS OF TECHNOLOGY

The intention of The Modern Project was and still is to emancipate humankind; instead, we are entering an age where modernity has, in some ways, shifted from emancipator to enslaver (van Rensburg, 2016). The following section elucidates various ways in which modernisation has, in its attempt to aid mankind's progression, impeded certain traits of basic human nature. It starts out with historical notes on the subject; thereafter, the specific ways in which technology has compromised human nature over the past two decades (with which this dissertation is concerned) are listed, with a discussion on various ways of overcoming these 'compromising side-effects'.

## 2.1.3 TECHNOLOGY AS COMPROMISER: HISTORICAL CASES

Throughout history, most technological advancements - whilst assisting growth - came with some form of compromise of mankind's own abilities. Examples include the following: the Gutenberg printing press was a great accomplishment during the fifteenth century and the first vehicle of spreading information throughout society, but it was the first of many 'crutches of cognitive memory' that would have 'nefarious effects on organic memory' of mankind (Choay, 2001: 9). The invention of the car is another example; it advanced our speed and transformed our perception of place, but simultaneously also impeded our own physical movement abilities.

The widespread proliferation of television in the mid-twentieth century provided extended entertainment within the confines of our homes, rendering the need for social interaction with outside people to a minimum; in essence, the television characters replaced our friends (more on the subject of *escapism* to follow later). In *The Work of Art in the Age of Mechanical Reproduction*, Walter Benjamin (1936: 5) gave a comprehensive account on the 'decay of the aura' of art and predicted the fall of art and architecture as a form of culture, because, he said, man would become obsessed with the two-dimensional image (van Rensburg, 2016).



Figure 2.2: Illustrations depicting historical cases of 'technology as compromiser'



#### 2.1.4 TECHNOLOGY AS COMPROMISER: RECENT CASES

"Before 1900, daily life for the majority of individuals was agrarian, static, local - in other words, not that different from what it had been for centuries. The twentieth century, however, altered the pace and pattern of daily life forever. Within two generations, the old world (for better and worse) was gone. Its loss meant the loss of two things that had always grounded us: our place within an actual community and our connection to a particular landscape.

What started us on the road to unreality? Though the catalogue reads like a shopping list of many of the century's most dramatic trends - urbanization, consumerism, increasing mobility, loss of regionality, growing alienation from the landscape, and so on - technology, their common denominator, was the real force behind our journey toward abstraction." (Slouka, 1995: 2)

Recent examples related to the compromising attributes of technological advancement (similar to those stated above) but which specifically transpired over more or less the last two decades are identified as follows:

1. Loss of slow pace of reality
2. Loss of work-life balance
3. Loss of relationship with nature
4. Loss of identity
  - Cultural identity
  - Architectural identity
5. Loss of the quality of intimate face-to-face communication
6. Mass allure of [negative] 'escapism'

Each compromising attribute will now be discussed with an investigation as to how these can be overcome. The first two, namely the *loss of the quality of intimate face-to-face communication* and the *mass allurement of [negative] escapism*, will be discussed in relation to one another as they are inter-related circumstances; thereafter each is discussed separately.

#### 2.1.4.1 COMPROMISER 1: Loss of slow pace of reality

In *War of the Worlds: Cyberspace and the high-tech assault on reality* (1995: 3) Slouka uses the example of **speed** to illustrate our affiliation with *unreality*, as a result of technology:

*"As everyone knows, unreality increases with speed. Walking across a landscape at six miles an hour, we experience the particular reality of place: its smells, sounds, colors, textures, and so on. Driving at seventy miles an hour, the experience is very different. The car isolates us, distances us; the world beyond the windshield...seems vaguely unreal. At supersonic speeds, the divorce is complete. A landscape at 30,000 feet is an abstraction, as unlike real life as a painting. It's an unreality we've grown used to. Habit has dulled the strangeness of it."*

The same is true of cities. Like most cities that developed during the nineteenth and twentieth century, overall, Pretoria honours the car far above the pedestrian. Danish architect, Jan Gehl (as cited by Betts, 2011) notes how modernisation plunges everything into an accelerating fast-forward plummet - everything except for the human being himself. Marshall Berman (1988: 165) states that "the distinctive sign of nineteenth-century urbanism was the boulevard, a medium for bringing explosive material and human forces together; the hallmark of twentieth-century urbanism has been the highway, a means for putting them asunder. We see a strange dialectic here, in which one mode of modernism both energizes and exhausts itself trying to annihilate another, all in modernism's name." Danish architect, Jan Gehl (2011, 72) professes that *life takes place on foot*, stating that 'only "on foot" does a situation function as a meaningful opportunity...in which the individual is at ease and able to take time to experience, pause, or become involved.'

Even on foot, the Modern Project has rendered the leisurely act of *flânerie* obsolete ("*flânerie*" defined as "*aimless idling; dawdling*"). Modern metropolises today are characterised by hustle, rush, hastened activity, everything happens quickly. Eric Jaffe (2012) reflects on the *urban metabolism* of cities and draws a direct parallel between the "fleetness of foot and the fatness of wallet". When one *strolls* today in a capitalist-driven society, it is thought to be strange. Still, Gehl (2011, 69) advocates sufficient slow speed for 'meaningful social information' to be discerned.

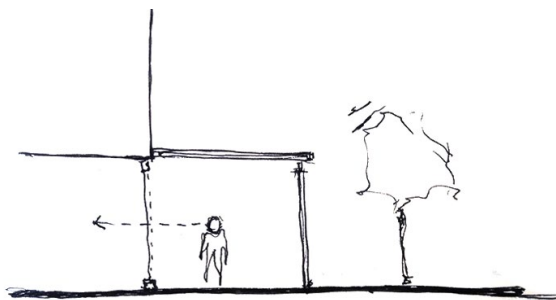
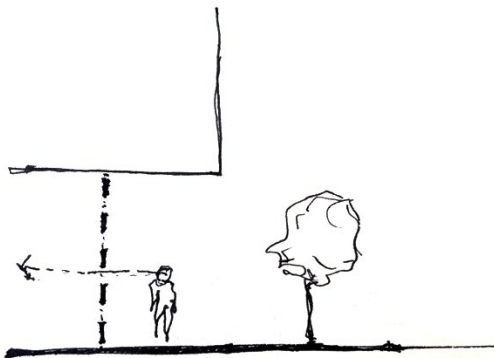
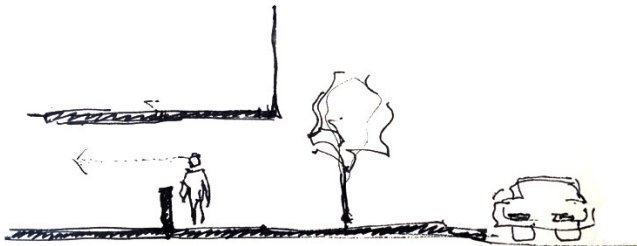
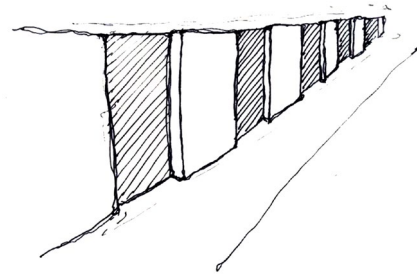
The question is therefore, how to slow down *urban time*; and once pedestrianisation is maximised, how to further slow down the speed of the walker?

A.) By the **thickening of the spatial experience**:

- **Providing enticing attractions** & as much diversity as possible along the meandering route.



- Soft ground floor edges (Open, active)



*"In front of the open and active facades there was a noticeable tendency for pedestrians to slow down and turn their heads towards the facade, and they stopped frequently. In front of the closed facade sections the walking tempo was markedly higher, and there were fewer turned heads and stops...the average number of people who walked by or stopped in front of the active facade sections was seven times greater than the activity level in front of the passive facades. This is because people walked more slowly, made more stops and walked more often to and from the the shops on the street with the soft edge." (Gehl, 2010: 79)*

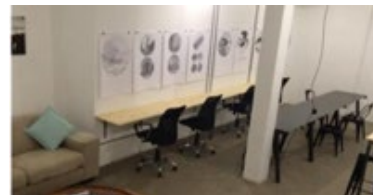
B.) By **crafting a relaxing environment** (When people are at ease they do not feel the need to pass by quickly, they will linger):

- **Human-centred and -scaled spaces**

- **Integrating nature** much more into urban life: in a study conducted on the *vitalising effects of being outdoors and in nature*, Bernstein et al. (2010: 159) states that "being outdoors was associated with greater vitality, a relation that was mediated by the presence of natural elements". (See section on the *Biophilia Hypothesis*)

## 2.1.4.2 COMPROMISER 2: Loss of Work-life balance

With the rise of communicative technologies the line between work and one's personal life is excessively blurred. In some professions, it is extremely beneficial, (journalism, news-reporting, stock markets etc) in most others it is very convenient and therefore utilised, resulting in all the more



non-place-based working-time as well as infringement between work-hours and personal hours. In a study conducted by E. J. Hill et al. in 2003, a comparison was drawn between the following three office types: a traditional office, a virtual office and a home office. The study found that although the virtual office proves more efficient than the traditional office in terms of work-performance, it 'is associated with lower work/life balance' and that 'less success in personal/family life is cause for personal and family concern' (Hill et al, 2003: 236).

### - Co-working offices :

The recent abundance of contemporary 'co-working office' typologies (or 'coffices' which can also relate to a coffeeshop + office combination) (Figure 2.3) provide workspace for the general public, but to which the worker is not constrained.



Figure 2.3: Local (Pretoria Station) and international examples of co-working offices

It provides the option of a workplace and the daily routine of 'going somewhere to work' and coming home for personal life, but does not keep you to the confines of the same office each day; it gives one more access and choice of surroundings so one can choose where to work each day. It is also especially targeted towards freelance professionals who typically work from home but still want a daily routine of going somewhere to work. The 'coffice'-owner wins because his tables are always full, and the professional 'wins' because he only has to rent a table and wifi-connection instead of the walls, floors and furniture of a traditional office - and his work-life-balance can be reclaimed.

### 2.1.4.3 COMPROMISER 3: Loss of relationship with nature

The *Biophilia Hypothesis* was introduced by Edward O. Wilson in 1984 and is a description of humankind's inborn need to connect with nature; he defines (1993, 31) it as "the innately emotional affiliation of human beings to other living organisms". The term *biophilia* was first used by German psychologist Erich Fromm (1964), to denote an inherent psychological orientation of man's attraction to everything that is alive and living. Stephen R. Kellert (1993, 21) states that "the biophilia hypothesis proclaims a human dependence on nature that extends far beyond the simple issues of material and physical sustenance as well the human craving for aesthetic, intellectual, cognitive, and even spiritual meaning and satisfaction." Wilson goes on to note that these biophilic rules remain a part of humans even when they remove themselves from the natural environment and that "they persist from generation to generation, atrophied and fitfully manifested in the artificial new environments into which technology has catapulted humanity" (1993, 31-32).



Figure 2.4: Nature versus Technology

#### [ MEDIATED NATURE ]

In a research study on The Human Relation With Nature and Technological Nature, Kahn et al. (2009, 37) investigates the effects of nature versus technological nature - "technologies that in various ways mediate, augment, or simulate the natural world". (Examples include video footage of nature, robot animals, plasma display 'window' simulating nature and immersive virtual environments etc.). Their findings concluded with the concern that as each generation's frame of reference (of nature) changes, due to the real natural environment being replaced by simulations of it, humanity will suffer what is called 'environmental generational amnesia' (Kahn et al, 2009: 41); but because of biophilia (which, as Wilson states, is a human condition that will persist whether we are in connection with nature or not) 'we will suffer physical and psychological costs' (Kahn et al, 2009: 41). Therefore the importance of **integrating (real) nature into the built environment** (Figure 2.5), especially in the case of a predominantly urban heat island where the GPW site is situated, for the benefit of mankind's physical and psychological health, is established.



A.) Integrating nature into built fabric:

- **Blurring the inside - outside** relationship

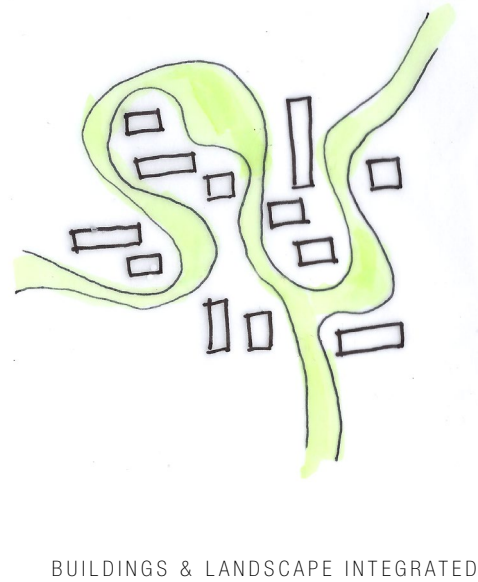
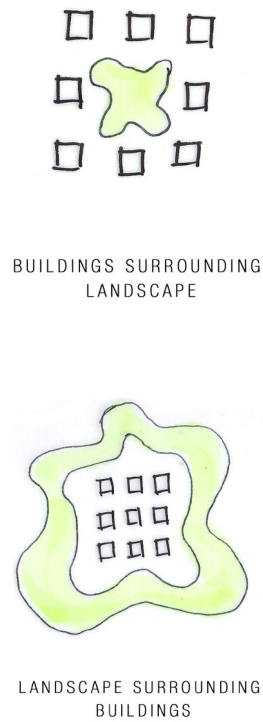
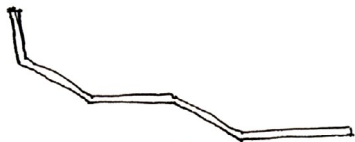
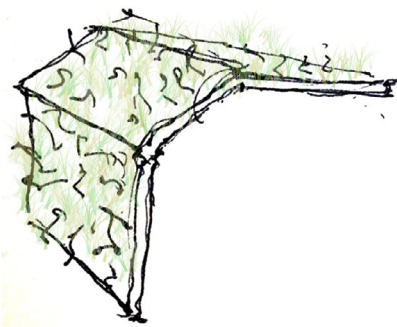


Figure 2.5 Integrating nature into the built environment



- **Continuous urban surface** - from walkway to wall to roof



- Bring user in contact with natural properties of water by **integrating water elements** in the design

- **Vegetation throughout building** - horizontal, vertical and slanted planes (inside and out)

#### 2.1.4.4 COMPROMISER 4: LOSS OF CULTURE & IDENTITY

##### A.) CULTURAL IDENTITY

“Are we not gradually becoming detached from our foothold in geographic and cultural soil and going to live in a fictitious and fabricated culture, the culture of simulacra that Umberto Eco has written about?” (Pallasmaa, 1988 as cited by Canizaro, 2007, 130)

Globalisation and information technology are eroding local place-based traditions and cultural identities. Johnston (2001: 38) writes that “modern technology has seriously contributed to the breakdown and loss of self. Human existence is commonly cloaked in technological language”. He cites postmodern writer Jean Baudrillard who calls the human mind “a pure screen, a switching centre for all the networks of influence.” As a result of one country predominantly controlling the media, all over the world, the americanisation of other cultures is taking place; individual identities are being dissolved and resultantly, collective identities along with them.

A heterogenous country like South Africa is already challenged with finding a collective national identity as it is and now technologies are transforming the rich and diverse South African culture into one global non-identity. Fred Kent, director of *Project for Public Spaces* (n.d.) states that “culture is born out of human interaction”. The question is then how spatial design can play a role in this; and the obvious suggestion is that maximized public space that encourages spontaneous social interaction between people is the answer, but according to author and architectural critic Aaron Betsky, the nebulous concept called “*public space*” is not enough, it no longer suffices “as an antidote to this loss of control and collective identity we have been using for at least the last century” (2015: a), he notes the thing that makes public space valuable as the essentially, “*other*” (2015: b). Jan Gehl (as cited by Betts, 2011) states that “there is nothing that is more interesting than other people”; echoing Jane Jacob’s “eyes on the street”, Gehl likened the city to movies, noting that watching other people is “our greatest joy.”

“The modern city can turn people outward, not inward; rather than wholeness, the city can give them experiences of otherness. The power of the city to reorient people in this way lies in its diversity; in the presence of difference people have at least the possibility to step outside themselves.” (Baudelaire, 1986 as cited by Sennett, 1990: 123)

“In a society becoming steadily more privatized with private homes, cars, computers, offices and shopping centers, the public component of our lives is disappearing. It is more and more important to make the cities inviting, so we can meet our fellow citizens face to face and experience directly through our senses. Public life in good quality public spaces is an important part of a democratic life and a full life.” - Jan Gehl, 2011

In light of these statements, if the thing which makes public space so attractive is *diversity* and 'encountering otherness', a multicultural society like South Africa has an advantage over other countries to craft rich and diversified public space. Furthermore, Betsky (2015: a) sees that an essential problem with the public urban realm is the fact that "any space that is not private is immediately appropriated by the state or by commercial interests, regulated, and thus not free."

Alternatively he explores the methods that architects can use to counter this and "wrest a space of common identity from the state and corporate control." He advocates **blurred, liminal or expanded border spaces** and warns against the creation of monumentality, saying that it might work spatially in some instances, but in terms of identity, it excludes through its semiotic messages ("Columns and pediments speak of centuries of control, while large spaces in which you do not do anything in particular also weigh on those of us who do not take or have the time to meditate on the freedoms they afford" (2015: a)).



Instead he prefers the "the messy vitality of spaces that send confused and contradictory messages" which is "more liberating than those that tell you what they are and where (or whether) you belong in their confines." Embracing this overall multiplicity is the key, according to Betsky, to place-making for rich and diversified culture.





## B.) ARCHITECTURAL IDENTITY

“The Modern Movement enthusiastically aspired to create a universal culture. The new “machines for living in” set in “space, light and greenery” were to emancipate their inhabitants from their bonds with the past, and to cultivate a New Universal Man.

Half a century later, however, the techno-rationally biased and economy-obsessed buildings that have become only too familiar everywhere impair our sense of locality and identity. The standard building of today accelerates estrangement and alienation instead of integrating our world-view and sense of self. Simply, we have lost our faith in utopia.” (Juhani Pallasmaa, 1988 as cited by Canizaro, 2007, 129)

The advent of widespread intercontinental air-travel during the 20th century (and before that, widespread commercial trans-oceanic travel by steam-vessels in the 19th century) exposed people on a large scale to other cultures and other architectural styles. It was a great step of enlightenment for architects to broaden their frame of reference and also played a role in the stimulation of the International Style (as first defined by Hitchcock and Johnson in 1932). It was, however, cause for the first of many great digs in the grave for the concept of placed-based locality in architecture. Juhani Pallasmaa (1988 as cited by

Canizaro, 2007, 129) states that “the sheer force of industrial technology, combined with mobility, mass-communication, and uniformity of life-style, is causing cultural entropy that minimalises diversity.”



Once exposed to another cultural influence, however enriched by it, we are also infiltrated by it and subconsciously, it erodes our regionalist *genius loci*. Especially as advancing travelling technology brings us to places completely contrary to where we are from, it seduces the mind with forms and styles not necessarily appropriate to our native context, resulting in confused, hybridised architectural product; (various post-modernist examples exemplify this cross-breeding) and in this sense, technology sabotages our intuitive sense of place-making.

Another detrimental attribute of technology on architecture is the tendency of (especially internationally renowned) architects to design buildings from the perspective of the 2D image. Knowing that the whole world will perceive their creations on the world wide web, they tend to design for that, rather than for the people who will use them. In an interview with Frank Gehry, (AspenInstitute, 2009) a parallel was drawn between his Guggenheim Museum in Bilbao as an “iconic object”, with the main function being mere observation, and Snøhetta’s opera house in Oslo,

as an “iconic place”, which the public can use and interact with. Gehry called the man who asked the question extremely pompous and ordered him to be escorted from the premises. Jan Gehl goes further to term Dubai’s buildings’ “birdshit architecture” as the “process of premium architects being flown in to drop their buildings onto a city with no regard for their impact on public life.” (Betts, 2011).

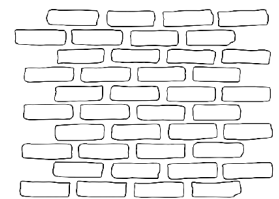
Alternatively, Pallasmaa (1988 as cited by Canizaro, 2007, 130) advocates the “constituents of locality” which are “reflections of natural, physical and social realities” as “expressions and experiences of **specific nature, geography, landscape, local materials, skills, and cultural patterns**”. Furthermore, Barker (2012: 118) describes a *mediative regionalist* approach that “straddles the boundaries of tradition and modernity in both imitative and inventive ways”:

*“Mediated regionalist responses straddle the line between the polarities of machine and nature. They accept and resist the extremes of local and global influences, preferring to synthesise the positive aspects of both with a view to allowing the inhabitant to progress technologically but still attain an experiential connection with their surroundings and a concrete association with tradition. Here a mutually beneficial relationship between tradition and modernity is achieved.” (Barker, 2012 : 115)*



In relating these theories to the context of Pretoria it is necessary to fleetingly highlight the distinctive characteristics of the regionalist style in Pretoria. As noted by Fisher, le Roux and Mare (1998), ‘*The Third Vernacular*’, regionalist architecture emerged in Pretoria in the 1940s and 1950s and is characterised by the following:

- Traditional plan-forms
- Rustic brick, either directly as clinker or as whitewashed stock
- Low-pitched iron roofs
- Deep shaded eaves and verandas
- Sun-shy windows
- Sensitivity to landscape and land features
- An architecture responsive to climatic constraints



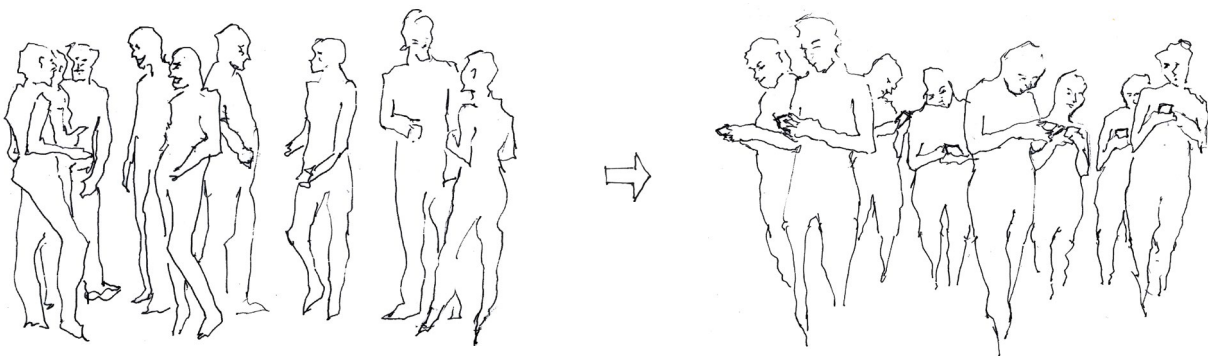
In light of the above-mentioned theory, the main architectural intention in relation to architectural identity is therefore to *mediate* the existing traditions that characterise Pretoria’s regionalist identity (as well as the existing site-specific architectural identities and tectonic coherency as discussed in Chapter 3) with the ensuing modernity and inevitable global evolution in architecture.

#### 2.1.4.5 COMPROMISER 5: Loss of the quality of intimate face-to-face communication

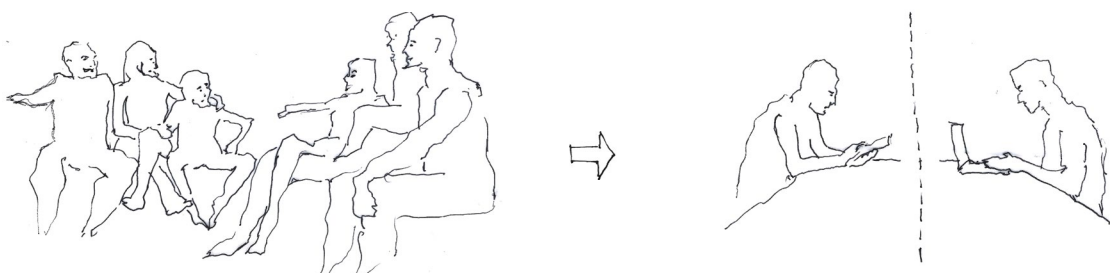
"I fear the day that technology will surpass our human interaction. The world will have a generation of idiots." - Albert Einstein

In an age where the availability of mass-information and communication has aided personalised learning and information-sharing, it has also isolated human beings from one another in a physical, social sense. In this section, the contemporary cult of cyber-culture that has brought about numerous shifts in social behaviour in society over the past two decades is examined. American author, Mark Slouka (as cited by Choay, 2001: 167), analyses "cyberspace's double denial of the corporeal dimension of the human condition and of the body's role in the constitution of the social link". The following statement is from his publication: *War of the Worlds: Cyberspace and the high-tech assault on reality* (1995: 4):

*"We've come a long way, very quickly. What surprises us now, increasingly, is the shock of the real: the nakedness of face-to-face communication, the rough force of the natural world. We can watch hours of nature programming, but place us in a forest or a meadow and we don't know quite what to do with ourselves. We look forward to hanging out at The Brick with Chris on Northern Exposure but dread running into our neighbour while putting out the trash. There has come to be something almost embarrassing about the unmediated event.... It's so naked, somehow."*



This statement carries even more weight two decades after its publication and is a critical prognosis for the future. In a sense, *information-technology* and the *digital age* (and currently entering the *virtual age*), have become *reverse prostheses*, aiding in communication but simultaneously restricting face-to-face, social interaction. A Stanford psychiatrist and author of *Virtually You, The Dangerous Powers of the E-Personality*, Dr. Elias Aboujaoude (2011 as cited by Kim, 2015) states that "we may stop 'needing' or craving real social interactions because they may become foreign to us".



#### 2.1.4.6 COMPROMISER 6: Mass allure of [negative] escapism

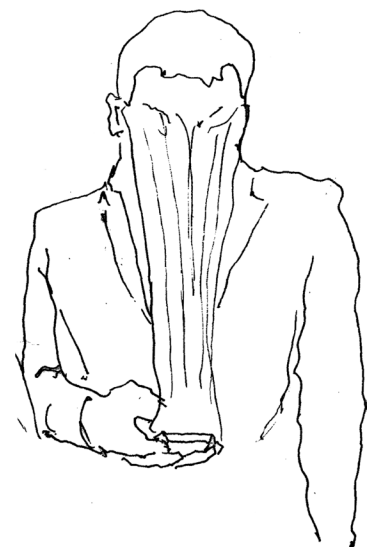
Beyond just the lack of face-to-face interaction is the phenomenon of *negative escapism*. Although it is not a new occurrence - human beings have *escaped* into written and staged narratives for centuries, the ancient greek theatre can be seen as an example - and although most people do it in some form or another, **it cannot be denied that recent (and continuing-) advancing technologies have made the act of escapism so much more ubiquitously available and so much more alluring**. A definition of escapism is as follows: 'a mental diversion by means of entertainment or recreation, as an "escape" or dissociation from the perceived unpleasant, boring, arduous, scary, or banal aspects of daily life' (Doveling et al, 2011: 174).



There are many opinions on the subject of escapism, some positive, other negative. A Norwegian psychologist, Frode Stenseng devised a dualistic model of escapism to denote various forms of engagement on a scale in relation to the resultant self-suppression or self-expansion it might have. 'Self-suppression escapism derives from motivation to avoid negative evaluation of self by getting focused on an activity, whereas self-expansion is motivated from facilitations of positive experiences by getting immersed in an activity' (Stenseng, 2009: 4). Examples of self-suppression escapism are clearly those which have self-detrimental effects such as drug and alcohol

abuse, most forms of addictions, masochism, eating disorders etc; examples of self-expansion escapism are things that promote creativity and growth such as a youth reading fantasy literature.

"The idea of a life lived online, or outside of regular society, is largely seen as dangerous and unhealthy. There have been some reports of self-imposed social isolation that illustrate the negative side of withdrawal. Since the 1990s, the term hikikomori has been used to describe the estimated 500,000 to one million Japanese citizens who refuse to leave their homes. According to Dr. Takahiro Kato, a psychiatrist working at a hikikomori support center in Fukuoka, Japan, many hikikomori display depressive and obsessive-compulsive tendencies, while a minority "appear addicted to the Internet." Then there are the infamous World of Warcraft players who lose themselves in their massive online universe. In 2004, Zhang Xiaoyi, a 13-year-old from China, reportedly committed suicide after playing WoW for 36 consecutive hours, in order to "join the heroes of the game he worshipped." In 2009, a three-year-old girl from New Mexico tragically passed away from malnutrition and dehydration; on the day of her death, her mother was said to have spent 15 hours playing the game. Former Warcraft player Ryan van Cleave explained to The Guardian in 2011 that "living inside World of Warcraft seemed preferable to the drudgery of everyday life" when he had played 60 hours a week. Groups like WOWaholics Anonymous have been created to help former players like van Cleave who became too invested in the game." (Kim, 2015)



Another psychologist and author of *This Virtual Life: Escapism and Simulation in Our Media World*, (2001) Andrew Evans, defines *negative escapism* in relation to Abraham Maslow's *hierarchy of human needs*; noting that it constrains the individual's sense of love and belonging in the context of family, friends and social commitments, which is ranked just after basic physiological and safety needs (Figure 2.6).

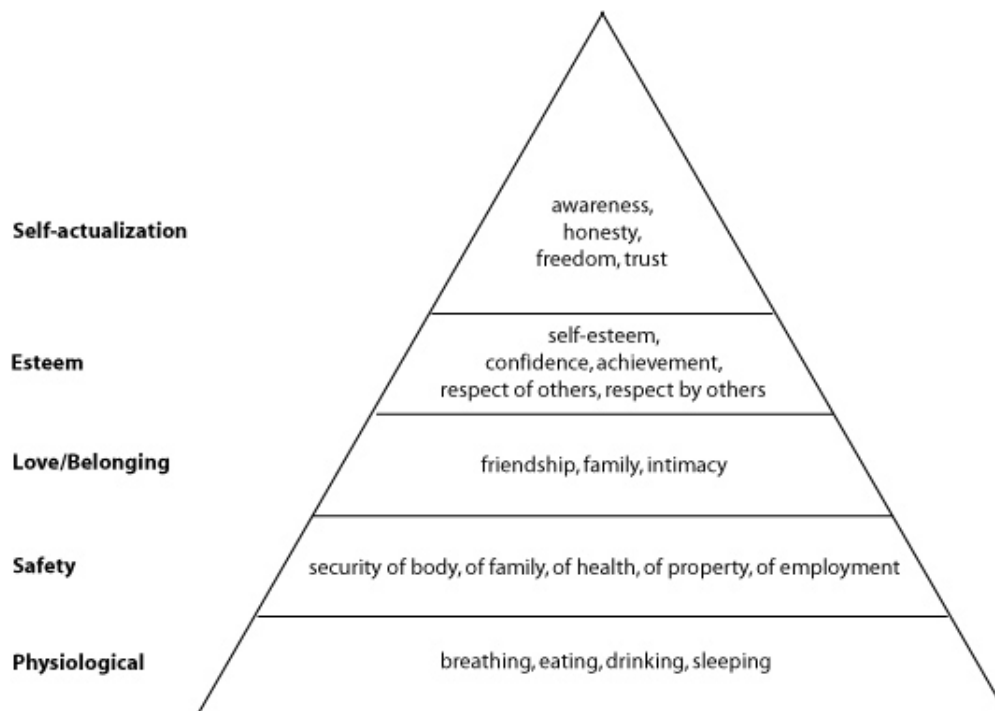


Figure 2.6: Maslow's Hierarchy of [Human] Needs

Johnston (2001: 38) states that "postmodernity compounded the already existing identity crisis brought on by modernity. By stressing the role of the individual freedom, modernity began to weaken one's sense of identity through the breakdown of the family and other bonds. ....The irony is that as individualism grows, it comes at the expense of the individual who fails to perceive his or her sense of connectedness in the world."

**The reason these psychological observations are important is that current technologies offer such an appealing and ever-improving immersive environment in which to get lost and escape.** Rem Koolhaas (2000, as cited in da Costa and van Rensburg, 2008: 47) stated that "architecture, as urban agent, can only intervene as a condition and a social negotiator once a full understanding of the human and social landscapes exists." The examples mentioned in Kim's article (2015) may sound extreme, but as technology advances, and virtual reality devices become much more accessible, the allure of immersing oneself in unreality will prove increasingly hard to resist and as a result of this, all indicators point to the fact that these unfortunate events (cited in Kim's article) will repeat themselves all the more often in future.

## 2.1.5 How to overcome these debilitating social phenomena?

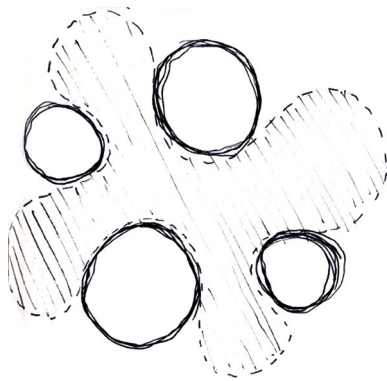
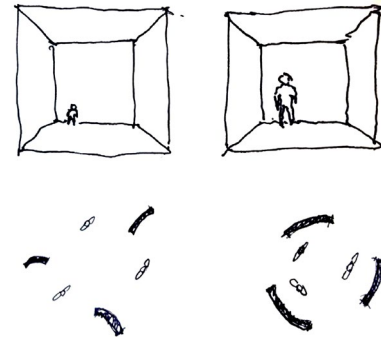
### HYPOTHESIS: ARCHITECTURE AS A 'HUMANIST NEGOTIATOR'

The fact of the matter is that modernisation is inevitable. Accelerated technological advancement is inevitable. All of these human-compromising circumstances are inevitable. That being said, as architects (and by extension, as shapers and builders of the space that contains human life) we have an opportunity to improve upon these conditions when designing for humanity and the following section is an investigation on how to overcome them.

Simply stated, (in light of the first two 'compromisers') the question is then:

1.) How do you make a building (or space) more **social**?

- Through **collective, social, humanist-scaled space-making** rather than universal, monumental, objective space-making

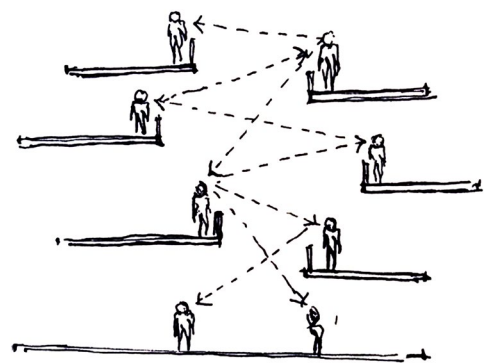


- By celebrating and enhancing (extending, thickening the experience of) the spaces in a building where social interaction would typically occur (i.e. circulation routes, foyers, landings, gathering spaces, all the 'grey' / un-programmed spaces)

- By **maximising informally programmed space**

- As much as possible **dialogue and connection** throughout all spaces and volumes.

- **Multi-functionality** - da Costa & van Rensburg states that "human behaviour and social practices are inherently spatial, and that the organisation of space is a social product." (2008:47) When a space is adaptable to a whole range of social functions, in-place social interaction is promoted and maximised.





## SECTION 2.2 : DIGITAL INTERACTIVE ENVIRONMENTS

### 2.2.1 INTRODUCTION

In response to technology-induced-compromisers 1, 4, 5 and 6, (as explained in Section 2.1) specifically, the 'loss of slow pace of reality', the 'loss of identity', the 'loss of the quality of intimate face-to-face communication and the 'mass allure of [negative] 'escapism'', the following section is an exploration of various ways in which digital technologies can 'thicken' the urban spatial experience. Firstly, the need for public urban space as a gathering platform for different cultures in a heterogenous society - and specifically, how digital interactive technology can enhance this process - is discussed; thereafter follows numerous case-studies of public interactive installations that aid in drawing people together.





“At their most supernatural, interactive design environments can have a transformative effect. They take the visitor to somewhere else. By actively involving the public they are both ‘porous’ and ‘responsive’, beckoning us like the rabbit in Alice in Wonderland to enter and participate in another world.” (Bullivant, 2007: 6)

## 2.2.2 INTERACTIVE INSTALLATIONS AS A SPATIAL CONSTRUCT:

In contemplation of whether or not these digital installations are considered to fall in the realm of spatial design, a precedent of ephemeral architecture is examined: the Blur building by Diller Scofidio & Benfro (Figure 2.7). According to the architects (2002), it is an “anti-spectacle” that highlights “our dependence on vision itself”. The Blur Building questions the fixed boundaries of space-making and illustrates how architecture can be a direct outflow of a transient event and nothing beyond that event. Interactive design environments have, albeit small-scale interventions, the “power to transform people’s experiences and perceptions...shift the way people interact both with those around them and also with the space around them” (Castle, 2007: 5). If architecture is about place-making and adding value to our environment, it can be said that in some instances these interactive installations have more potential to do that than bricks and mortar.



Figure 2.7: Blur building - Diller, Scofidio and Renfro

## 2.2.3 Interactive environments as a counter-strategy to compromisers 1,4, 5 and 6:

### INTERACTIVE ARCHITECTURE AS A CULTURAL NEGOTIATOR

Considering James Young's statement, from *Textures of Memory* (1994: 6), that “in the absence of shared beliefs or common interests, art in public spaces may form an otherwise fragmented populace to frame diverse values and ideals in common spaces” in order to “propagate the illusion of common memory.” In a very heterogenous cultural country like South Africa, the problem with reconciliation is not just a contested heritage, it is the mutual enlightenment and acceptance of current cultural differences.

Digital screening on buildings can aid the reconciliation process through selective educational information communicated to the general public, whereby these differences in cultures can be highlighted and common, ideal values can be celebrated just by walking down the street.

In support of this, Kirralie Houghton (2011: 4) discusses the potential of urban screening to generate a sense of fun and creativity that give a place vibrancy; she states that the “overlaying of digital narratives over physical place has the potential to enhance the meaning and understanding of heritage” and that “localised content can enhance a place’s unique identity and serve a civic function” - the recent example of the subversive political protest agenda (Figure 2.8) in 2015 is an example of this (however not digital). The possibilities with digital content are much more versatile.

Castle (2007: 5) goes on to say that it is “the encouragement of sociability where the interactive is at its most potent, where it has the ability to transcend the everyday – causing the individual to pause a minute in a street corner or a gallery foyer to have fun, be playful and have occasion to smile out of unassailable joy.” In light of these statements this report argues that digital screening has the potential to go beyond the one-sided spectatorship of mere marketing-objectives, to interactive, participatory public urban experiences that can be shared by the collective of city dwellers and encourage cultural interaction.



**Figure 2.8:** Utilising a building facade for subversive political strategy

The following section considers various case-studies of existing interactive installations that attempts to accomplish the social urban objectives as highlighted above, there-after follows a strategy of specific installations and their content to be employed in the design product.





Figure 2.9: Daan Roosegaarde's glowing Van Gogh cycle path in the Netherlands - 'where history meets the future'

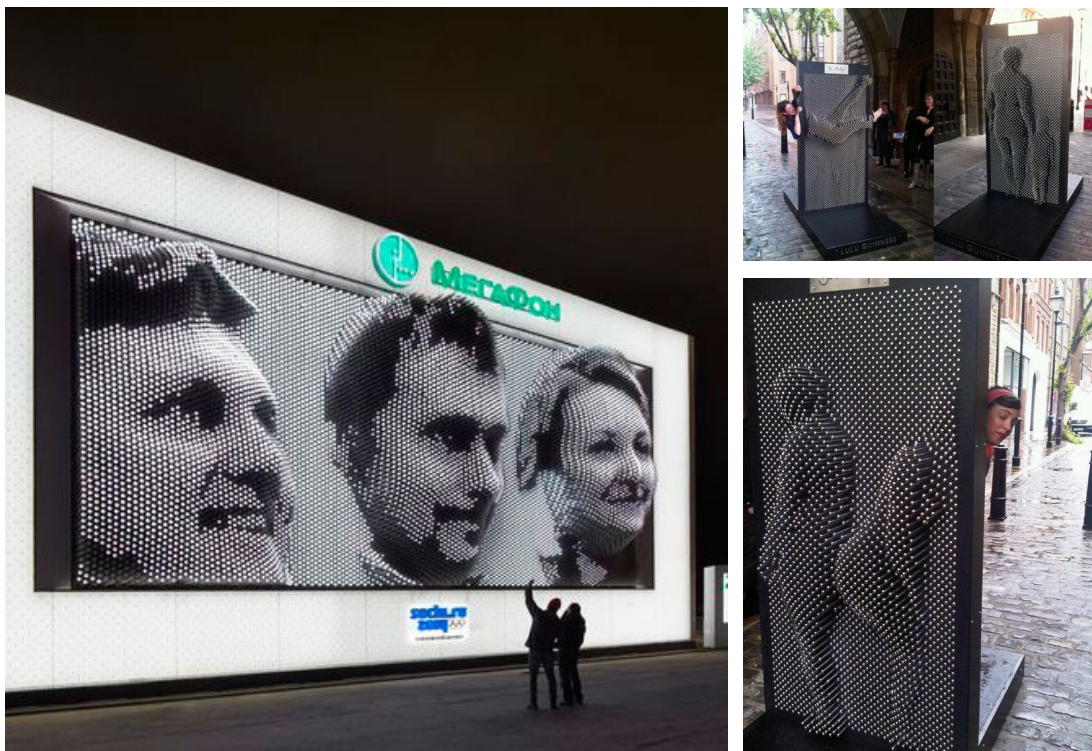


Figure 2.10: (Left) "Architectural Mount Rushmore" - Asif Khan Studio's *MegaFaces* (Right): Manual pin installation by Lulu

*MegaFaces* is a pavilion that "contorts itself to recreate 3D images of the faces of visitors relayed via digital face scans made in photo booths installed within the building". It comprises 11,000 actuators underneath the cube's stretchy fabric membrane, the installation allows for three, eight meter tall faces to emerge from the wall at a time (Taylor-Foster, 2014).





Figure 2.11: ICE - Interactive Communication Experience by Klein Dytham Architecture in Tokyo, Japan.

The ICE installation takes the form of a 5 x 3.5 metre curved glass wall suspended from the ceiling like an icicle, which responds to bodily movements in a small front lobby info-lounge space. Financial data streams in, visible as electronic ticker tape.

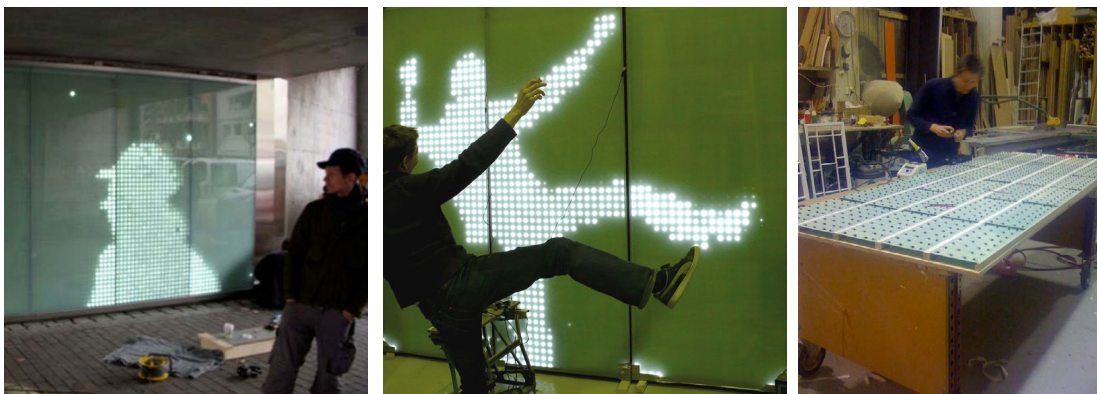
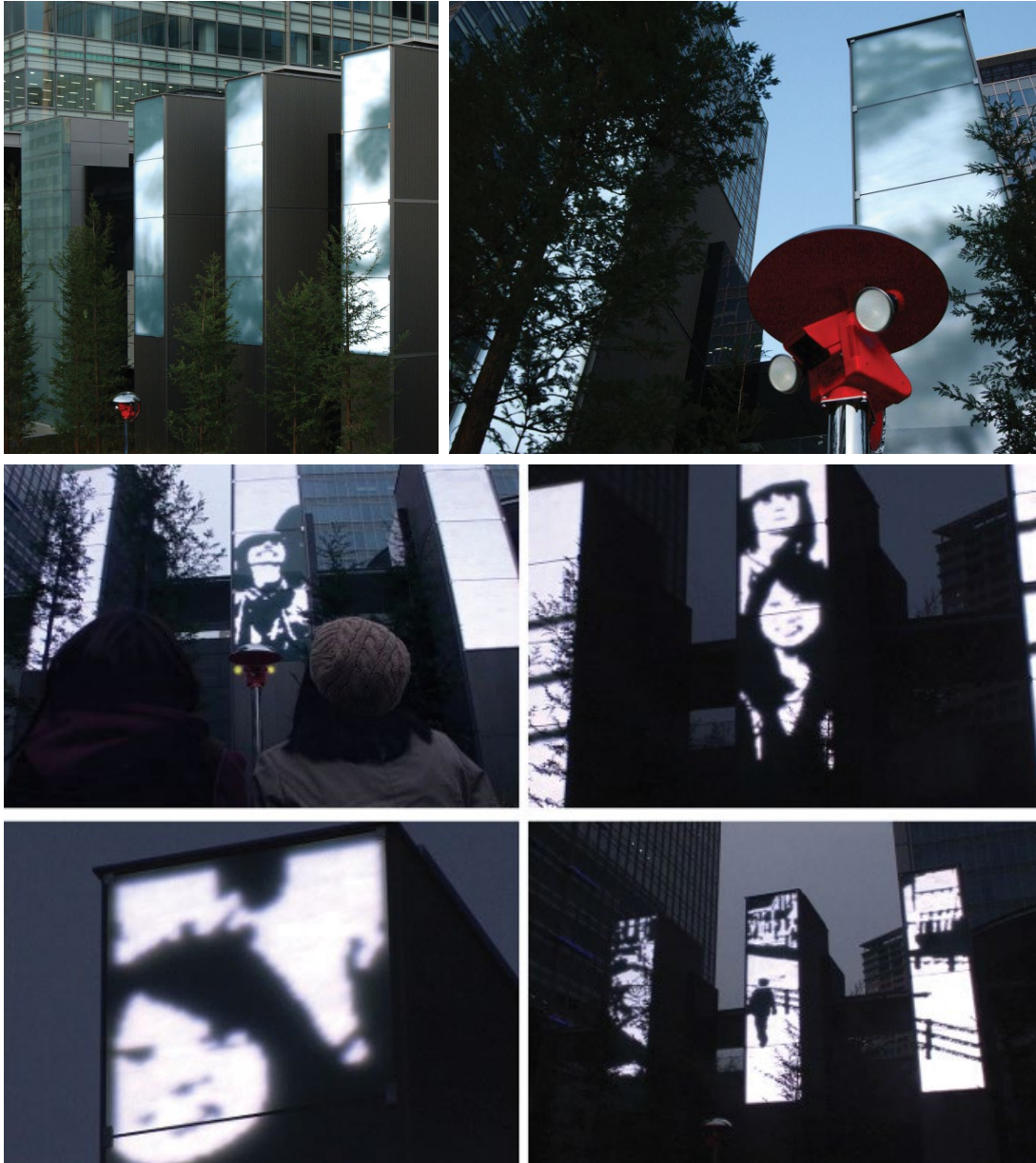


Figure 2.12: *Dobpler* Interactive LED system, *Streams and Flows* in Sandnes, Norway. Skjelvik Design, 2007.

*Dobpler* consists of an interactive LED installation in a pedestrian tunnel underneath a railway. It consists of 27m<sup>2</sup> *Dobpler* modules with motion sensors installed which tracks the movement of any passerby and lights up in the outline of their silhouette.

[\*Something which can aid in automatic surveillance of an area.]



**Figure 2.13:** *Nosy*, an interactive robotic camera and urban display in Tokyo, by Christian Moeller, 2006.

*Nosy* constitutes a robotic video camera randomly captures the surrounding landscape and people, which are then displayed in bitmap graphics onto three towers covered with white LED panels and laminated glass. Laminated glass, LEDs, robotic light and camera system. Dimensions: 43' x 43' x 15' (Moeller, 2006).





Figure 2.14: 'Civic Exchange' - A public information installation in New York City by Antenna Design, 2004.

*Civic Exchange* is based on a 'hub' and 'spokes' system that visually embodies the notion of a tree-like gathering place, the information system is an open platform with an interactive map allowing for community participation, with an LED column serving as a public announcement screen.





**Figure 2.15:** “Mojo” - Robotic light following passerby, by Christian Moeller, 2007, installed in San Pedro, California 2007

*Mojo* comprises a robotic arm holding a theater spotlight shines a perfect circle of light onto the sidewalk following the passers-by with its light beam. (Precedent for technological surveillance)



Better  
air quality



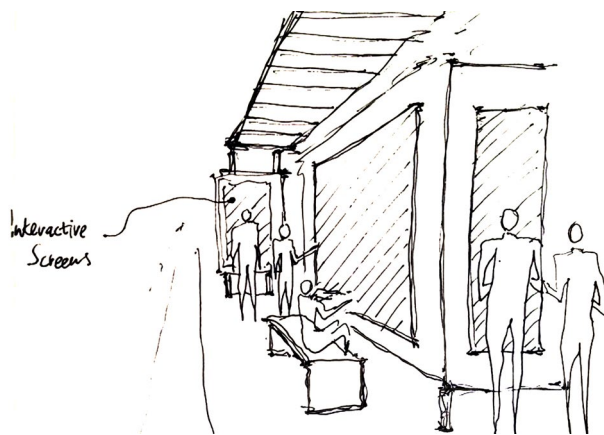
Figure 2.16: THINK Exhibit at the Lincoln Centre in New York, by IBM.

The *THINK* wall visualizes, in real time, the live data streaming from the systems surrounding the exhibit, from traffic on Broadway, to solar energy, to air quality. Visitors discovered how we can now see change, waste and opportunities in the world's systems.

In light of the case-studies discussed in section 2.2 and the potential of digitally interactive environments, the question (in response to Compromisers 5 and 6 discussed in section 2.1) is:

2.) How do you make a building (or space) **that would keep you from wanting to escape reality** (in a self-suppressing way)?

- By the thickening of the lived, real spatial experience:



- Use the technologies and create the inevitable immersive environment, **but do it in a public, urban way that can be experienced collectively**, by a multitude of people, not just one alone (which breeds social isolation)

- Digital urban screening



- Collective learning center programme
- **Combining recreation and education** - learning becomes fun - boundary between work and play is blurred (in a good way, when at work - different to compromiser of loss of work-life balance) therefore enhancing the real, lived experience.

### 7 . 3 . 1 D U A L I T Y O F P E R M A N E N C E A N D C H A N G E

Figure 2.17 illustrates the duality of “permanence and change” based on the theory discussed in this chapter. Firstly it depicts the inevitable concept of technological advancement that results in change; this modernization also presents us with the six identified ‘compromisers’ on human life.

This dissertation proposes the spatial and programmatic ‘counter-strategies’ to counter these compromisers, which should therefore be permanent elements that remain rooted, fixed constituents throughout future evolutions. On the other hand, the ‘benefits’ (or the ‘utilization of technology’) as well as the functional (and therewith structural- and spatial-) elements are open-ended to change to a degree, in order to accommodate the rapid obsolescence of emerging technologies or changes in future uses of the building.

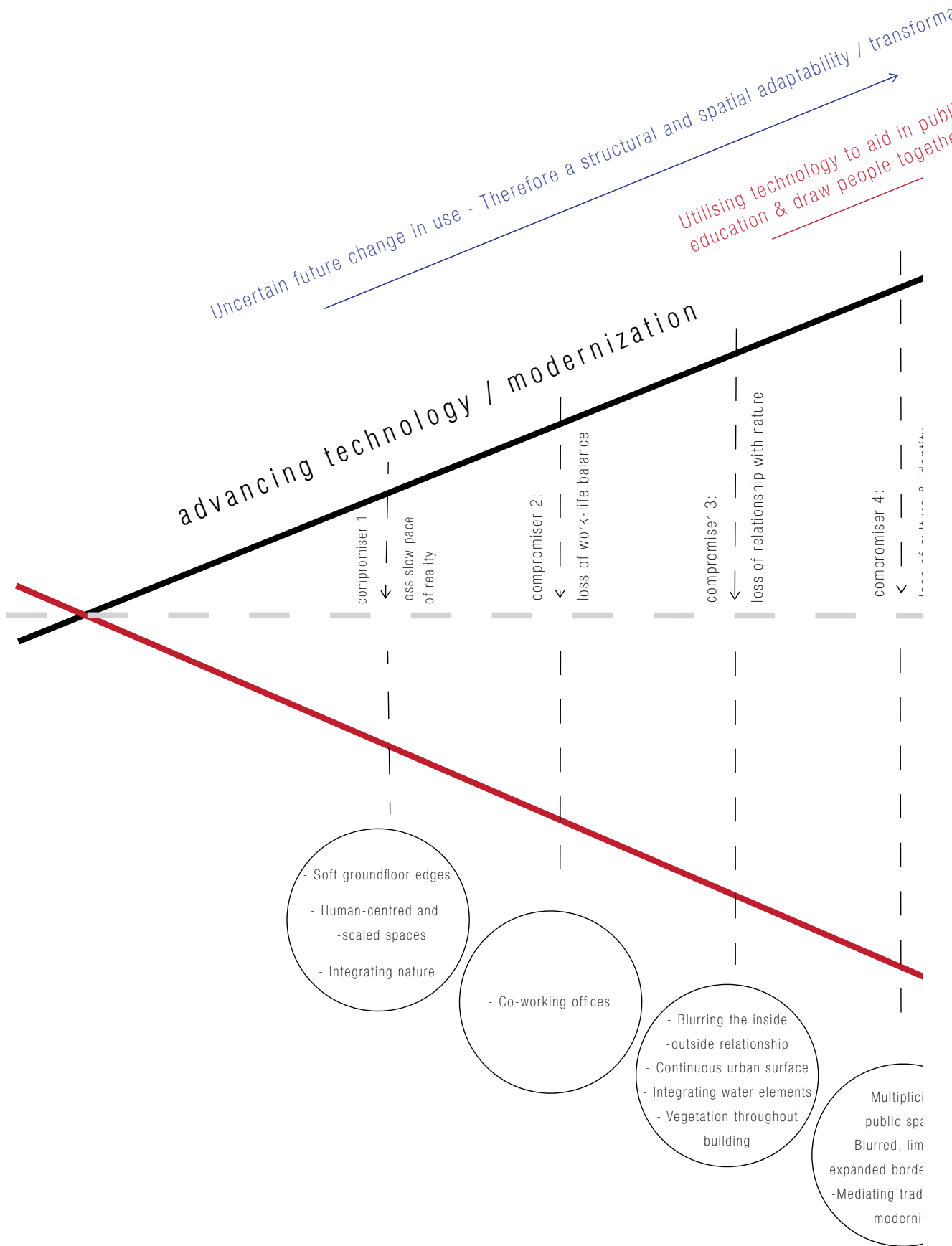


Figure 2.17: Diagram explaining the duality of permanence and change



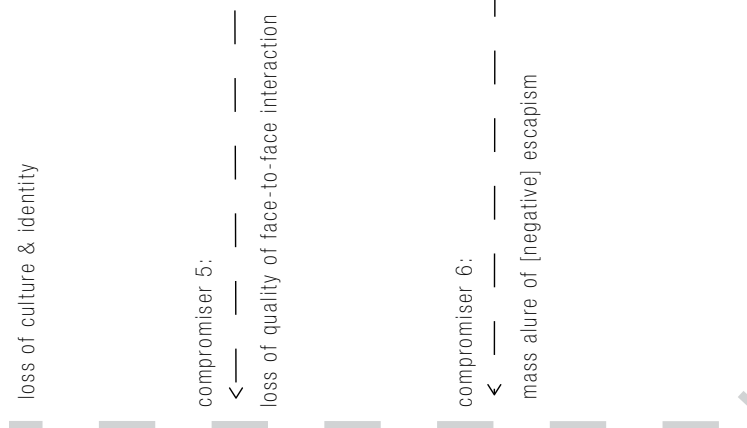
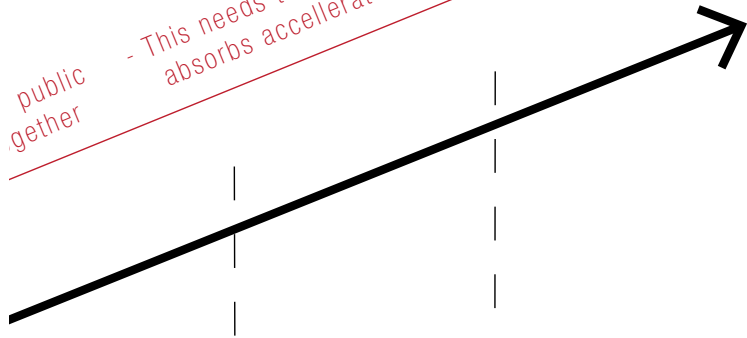


formability

public  
together

- This needs to be an **open infrastructure**  
absorbs accelerated changing technologies

c h a n g e



detrimental attributes of  
technology on human life

**Countering** the compromising  
attributes of technological  
advancements with spatial  
design strategies

- These counter-strategies need to  
stay on as **permanent** elements

city in  
pace  
minimal or  
order spaces  
definition and  
identity

- Collective, humanist-scaled space-making
- Maximising informally programmed space
- Dialogue and connection
- Multi-functionality

- Digital urban screening
- Use technologies in public to experience it collectively
- Collective TEL programme
- Combining recreation & education

p e r m a n e n t

### 2 . 3 . 2 C O N C L U S I O N

In conclusion of the the theory-chapter, this dissertation is rooted in the theory of time an change, which means that modernization and specifically technological adnacement is a inevitable outcome. However beneficial and inevitable modernization and technology advancement are, this document argues that spatial designers remain cognisant of the compromising attributes of this technological evolution. Secondly the intention of this project is to purposefully utilize technology and consolidate it within the spatial design process from the onset of the project; specifically with the main intention of engaging people and creating a collective, immersive and interactive environment which draws people together in the public realm.



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## Chapter 3

# U R B A N   C O N D I T I O N



INVESTIGATION / EXPLORATION / PROBING THE MALWARE



### 3.1 INTRODUCTION

Chapter 3 is an investigation of the urban condition of the north-western quadrant of Pretoria CBD, in order to establish the dissertation's broader urban-responsive intentions. It starts out with an overview of the site's history in relation to the rest of the city, thereafter follows the urban problem statement which is summed up in two general themes, and existing frameworks are considered and critiqued by an investigation of relevant theoretical research and case-studies. Finally the chapter concludes with the proposed urban framework in the north-western quadrant for this dissertation. The subject matter discussed in this chapter not only aims to inform the urban framework, but also the precinct plan and the eventual architectural product.

The outline of the chapter is as follows:

#### 3.2 HISTORY OF PRETORIA IN RELATION TO THE N-W-Q

#### 3.3 PROBLEM STATEMENT PART 1:

##### STAGNANT N-W-Q:

- PRESENT URBAN CONDITION
- EXISTING FRAMEWORKS
- LEARNING FROM THE PAST

#### 3.4 PROBLEM STATEMENT PART 2:

##### LIMITED SPACE FOR PUBLIC CITY LIFE

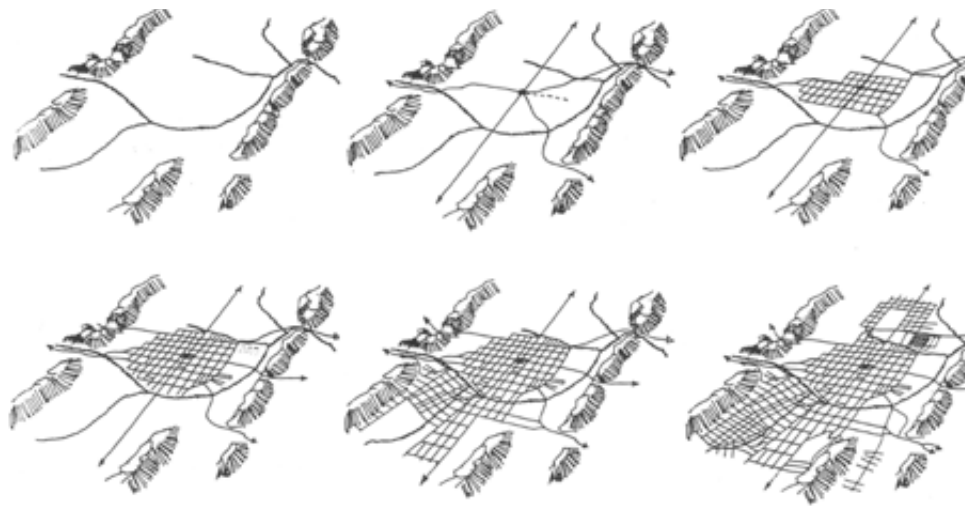
- BLOCK STUDIES

#### 3.5 PROPOSED URBAN FRAMEWORK:

##### 'AN ARTERY OF ACTIVITY'

### 3.2 HISTORY OF PRETORIA IN RELATION TO GPW

It was something about the defining setting inbetween two natural ridges and two waterbodies that attracted the early boer settlers. Around 1840 J. G. S. Bronkhorst settled down alongside a stream in an area known as Fountains Valley (Allen, 1971: 8). In 1854, one of the Voortrekker leaders, Marthinus Wessel Pretorius, bought the farm from Bronkhorst and within no time the growing community petitioned for a 'kerkplaats' (Allen, 1971: 8), where they could congregate for church services and other collective activities such as weddings and baptisms. In 1855 the town of Pretoria was established and named after Martinus Pretorius's father, Andries Pretorius (Allen, 1971: 8) and the establishment of the town can be viewed as that which signified the end of the boers' settlement movements of the 'Grote Trek'. Figure 3.1 illustrates the early development of Pretoria contained within these natural boundary conditions, with the two mountain ranges delineating the northern and southern edges, and the Steenhoven Spruit and Apies River the west and eastern edges.



**Figure 3.1:** Pretoria's development in between natural ridges and water-bodies (Jordaan, 1989:27)

In 1887 Dutch-born Sytze Wopkes Wierda (Fig 3.2) arrived in South Africa and was appointed to the two posts of Chief Engineer and Architect to the Zuid Afrikaansche Republiek; (Bakker, Clarke and Fisher, 2014: 42) thereafter, in 1895 he became Chief of the Department Publieke Werken (Bakker, Clarke and Fisher, 2014: 73). Some of his notable work includes the *Raadzaal* (1889-92) (Fig 3.3) and the Palace of Justice (1896-1900) (Fig 3.4) on Church Square, as well as the *Staatsartillerie* (late 1890s) (Fig 3.5) (Bakker, Clarke and Fisher, 2014: 43). Towards the end of the 19th century it became necessary for the government to have its own Printing Works, where, amongst others, confidential government documents and maps could be produced. In 1895 Wierda was commissioned with this project and work on the Government Printing Works (Fig 3.6) ensued in a variant of the Dutch Renaissance Revival style (Clarke and de Villiers, 2015: 79). The Printing Works gradually expanded into a whole complex over the block between 1927 and 1955.



Figure 3.2: Sytze Wopkes Wierda

other prominent  
buildings by  
Sytze Wierda



Figure 3.3: Raadzaal (1888 - 1892)



Figure 3.4: Palace of Justice (1896 - 1900)

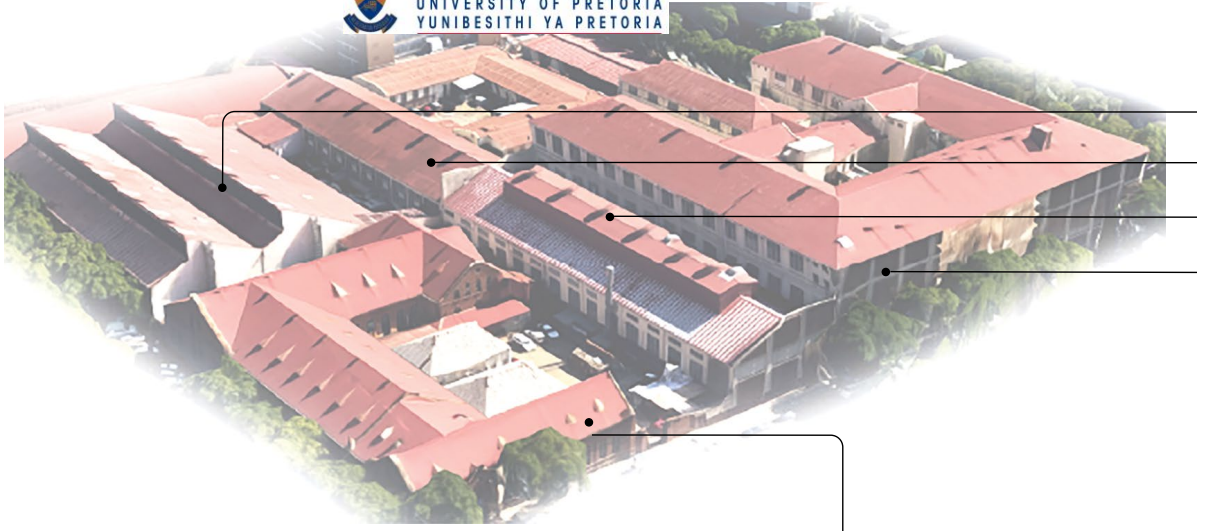


Figure 3.5: Staatsartillerie (1898)



Figure 3.6 Nieuwe Staatsdrukkerij (1896), (Swart, 2014)





s  
i  
t  
e

NIEUWE STAATSDRUKKERIJ  
BY SYTZE WIERDA

1896

c  
i  
t  
y

1855

Pretoria founded by  
Marthinus Pretorius



1883

Paul Kruger  
President of RSA



1887

Sytze Wopkes Wierda  
commissioned to  
South Africa



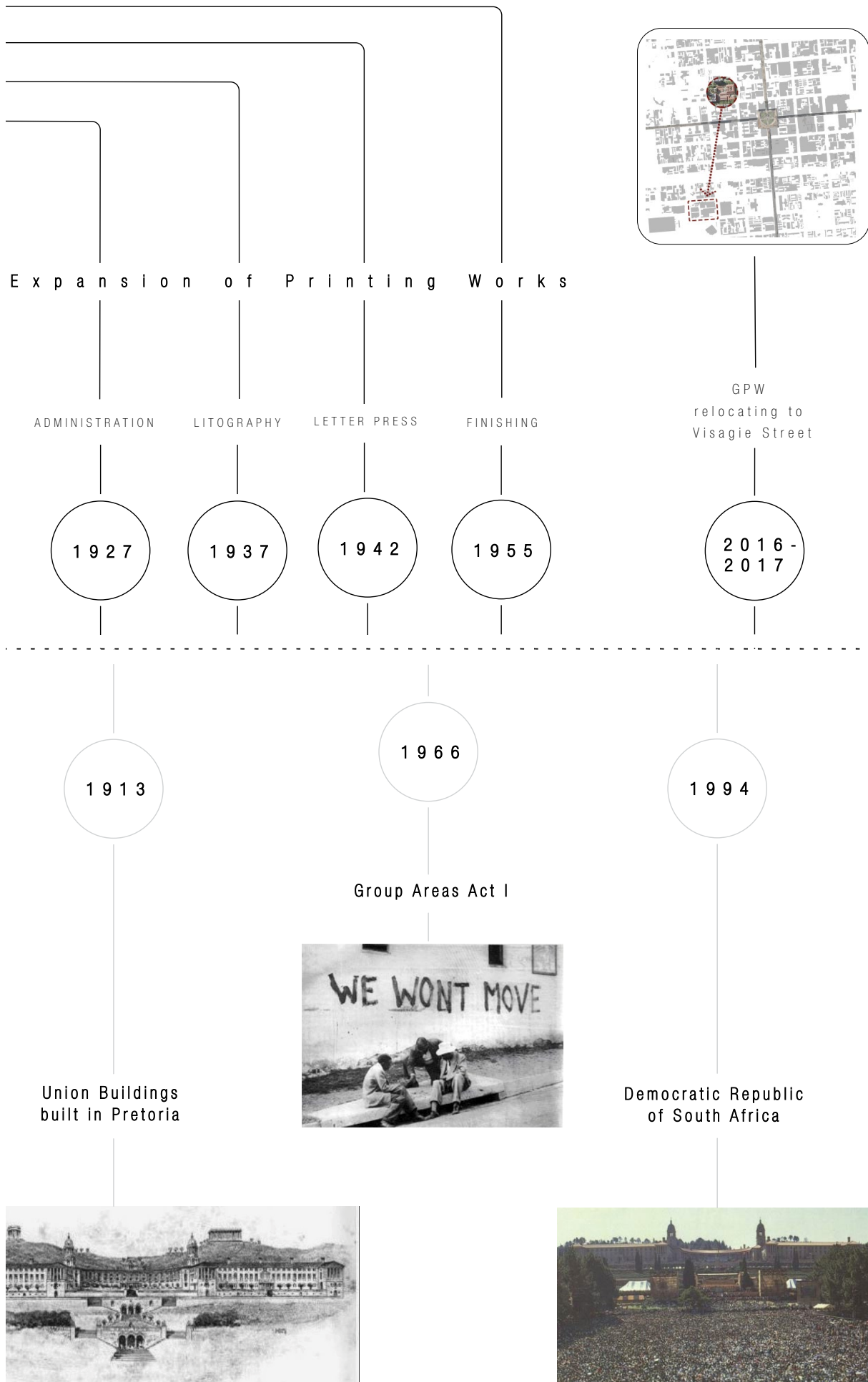
1897

Palace of Justice  
cornerstone laid





Figure 3.7: Historical timeline of site in relation to Pretoria (Author)





### 3.3 PROBLEM STATEMENT[S]:

The urban problem can be summarised in two general assertions and will be discussed alternately. Firstly it is the current stagnant condition of the north-western quadrant as a whole (discussed in 3.3.1), and secondly it is the current divorced condition of city blocks to its surroundings, which will be discussed later in the chapter (3.3.2).



Figure 3.8: North-western quadrant as "Pretoria se 'Brak'" - Naude (Author, 2016)



### 3.3.1 STAGNANT N - W - Q :

As evident in Figure 3.8, the north-western quadrant of Pretoria has clearly undergone stagnation, when it is related to the rest of the CBD. This is due to a number of socio-political planning policies that transpired during the second half of the twentieth century. Mauritz Naude (1991: 106) describes the area as “Pretoria se eie ‘braak’ of ‘brak’”, translated as something which is ‘fallow’ or ‘dormant’. He states (1991: 106) that the area is a peculiar stretch of undeveloped “no-man’s land” and his connotations to this area are activities of ‘unload, throw-away, store, bury, tailings of goods, vehicles and low-class people’ (1991: 107).

Van Biljon uses the term “smeltkroes” (1991: 109) (translated as ‘crucible’ or ‘melting pot’) to describe this area. He identifies three main incidents that further magnified the area’s “aspoestertjie”-image, firstly the Group Areas Act in 1966 (see timeline in Figure 3.7). Figure 3.9 is a 1902 map of the demarcated racially segregated areas in the historic area of Marabastad at the periphery of the north-western quadrant.

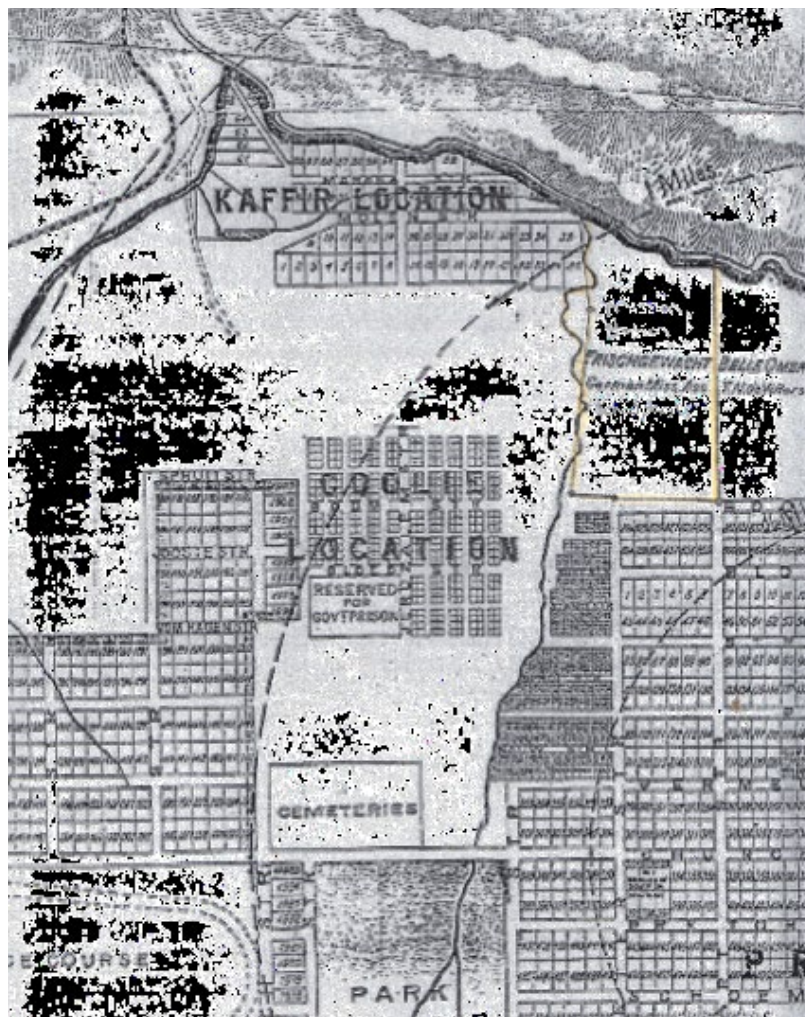


Figure 3.9: 1902 map of the demarcated racially segregated areas in the historic area of Marabastad

From as early as the 1940s the white government grew uneasy with the close proximity of 'non-whites' to the city-centre and the city council started enforcing actions to clean up the 'slums' (1991: 109). Clarke and de Villiers (2015: 67) also note that "due to the historic forced removals undertaken under Apartheid planning policies, the north-western quadrant of the city centre has become a place of desolation". Finally, in 1966 the government implemented the Group Areas Act which constituted the forced removal of non-white races to Eersterust, Atteridgeville and Laudium (Cronje, 2013).

The second incident Van Biljon mentions is the vast freeway development proposal in and around the Pretoria CBD (as illustrated in Figure 3.10). It is clear that this scheme (perhaps reminiscent of Robert Moses's urban planning interventions in New York City during the first half of the 20th century) intended to completely obliterate the fine-grained neighbourhood of Marabastad. Jordaan (1989: 28) describes this scheme as monofunctional roads that shred the existing street layout and city order.

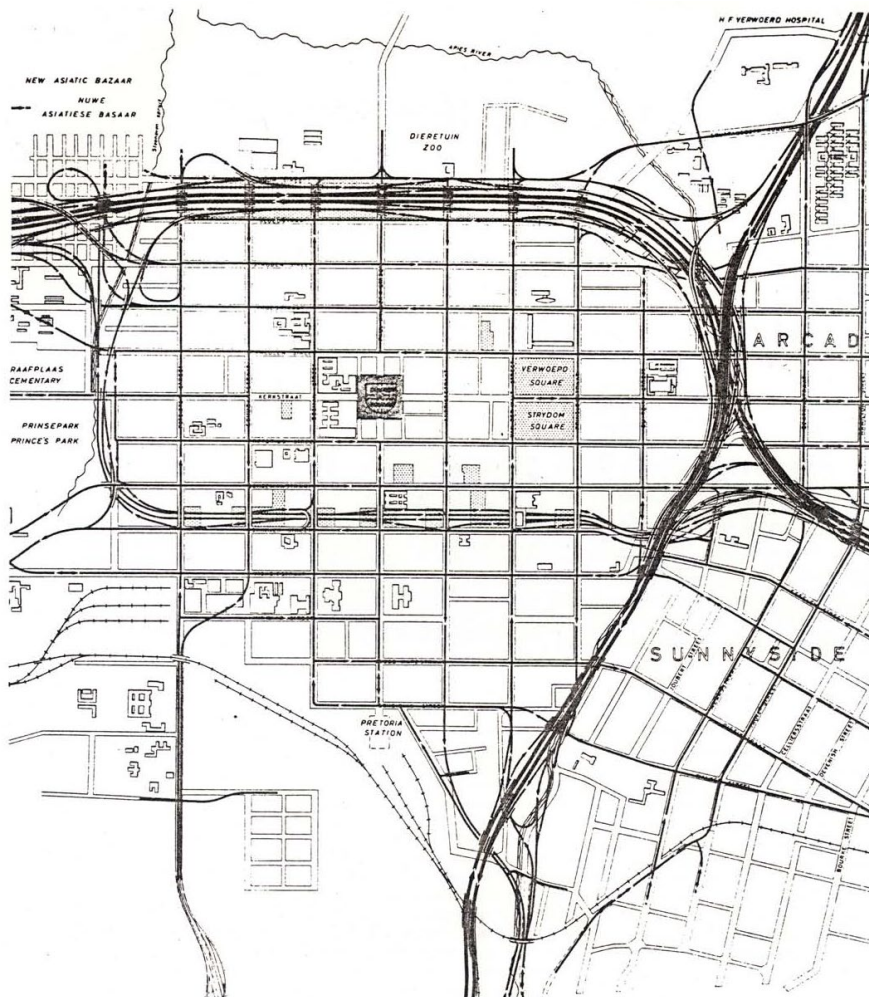
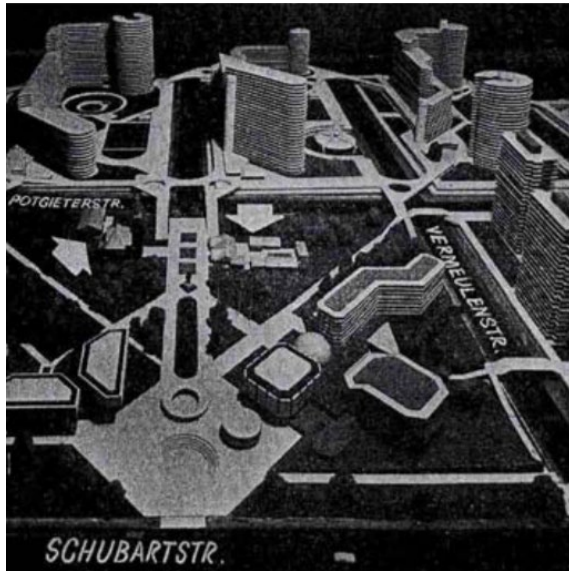


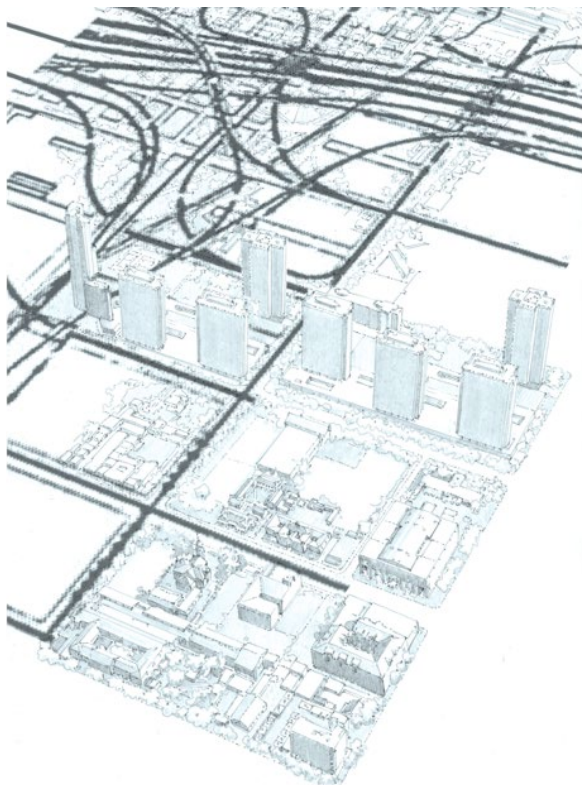
Figure 3.10: Freeway proposal for Pretoria (Jordaan, 1989)



The third incident that Van Biljon mentions is the 24-block development freeze (1991: 109) that occurred in the Goedehoop redevelopment scheme (Fig 3.11, also see Figure 3.12 - an impression of the freeway scheme and Goedehoop towers together, done by Jacques Mouton, 2014). With the intention of increased densities for the innercity, this scheme constituted the development of modernist-inspired residential towers for this area; only the four blocks at Schubart Park and the one at Kruger Park (Fig 3.8) were eventually realised and since 1969 no further development occurred in this regard (Van Biljon, 1991: 109).



**Figure 3.11:** Goedehoop redevelopment scheme, (Swart, 2010)



**Figure 3.12:** An impression of the 1967 urban scheme (freeways and Goedehoop residential blocks) for the north-west quadrant of Pretoria done by Mouton, (2014: 25) who notes that the scheme, "with its modernist inspired residential blocks dotting the urban grid, the spaghetti weave of thoroughfares obliterates Marabastad."

Since the nineties, according to du Toit, the housing complex at Schubart Park suffered degradation, and in 2011, over 3000 people were forcibly removed (Figure 3.13) from their homes due to the buildings being declared unfit for occupancy (Bilchitz, 2011). Since the evictions, the giant concrete structures have towered silently over the city with the occasional delinquent trespasser or photography student as visitors (Figures 3.14). These now dormant complexes have had a very stagnant effect on their environment since the evictions.

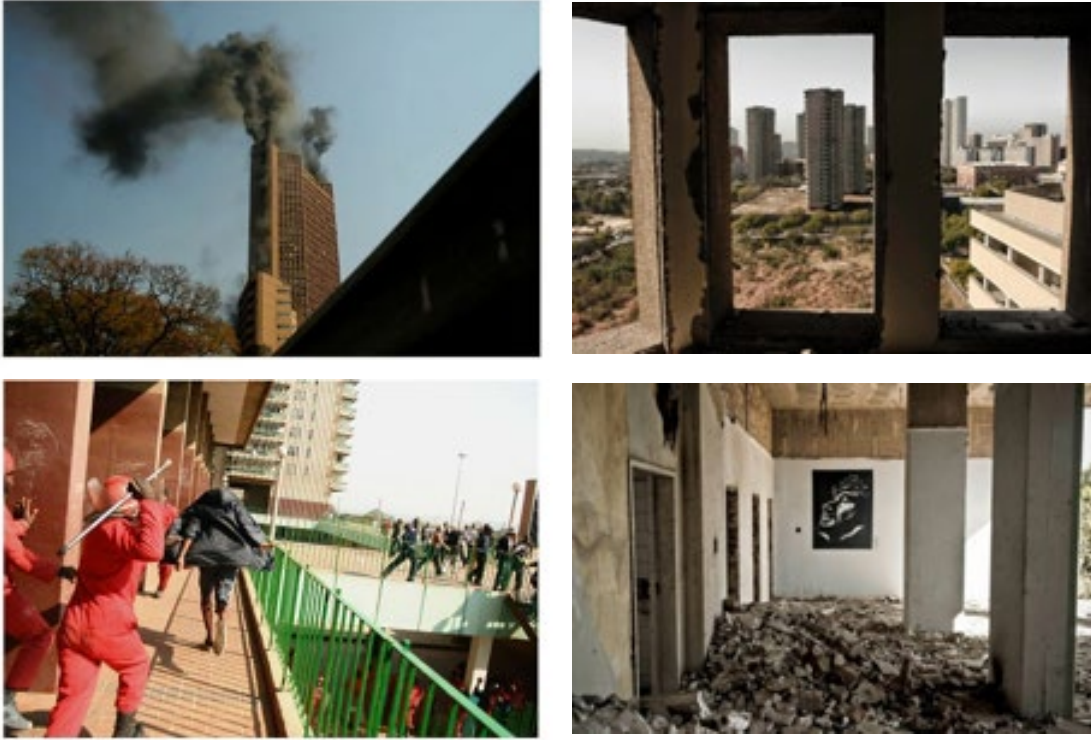


Figure 3.13 & 3.14: 2008 Kruger Park fire during attempted evictions & 2011 Schubart Park evictions

### 3.3.2 PRESENT URBAN CONDITION

In section 3.2 it is established what occurrences led to the general stagnant urban condition of the north-western quadrant. As a further result of this, Figure 3.15 illustrates the socio-economic growth and/or decline in the Pretoria CBD over the past two decades, which indicates that there has been no recent development to rectify this situation. When one considers the main movement patterns in the city (Figure 3.16), this mutated stretch of land is home to one of the strongest pedestrian movement lines, but presents nothing beyond car-dominated roads and fairly narrow sidewalks (which are also dominated by parked cars) to accommodate this.

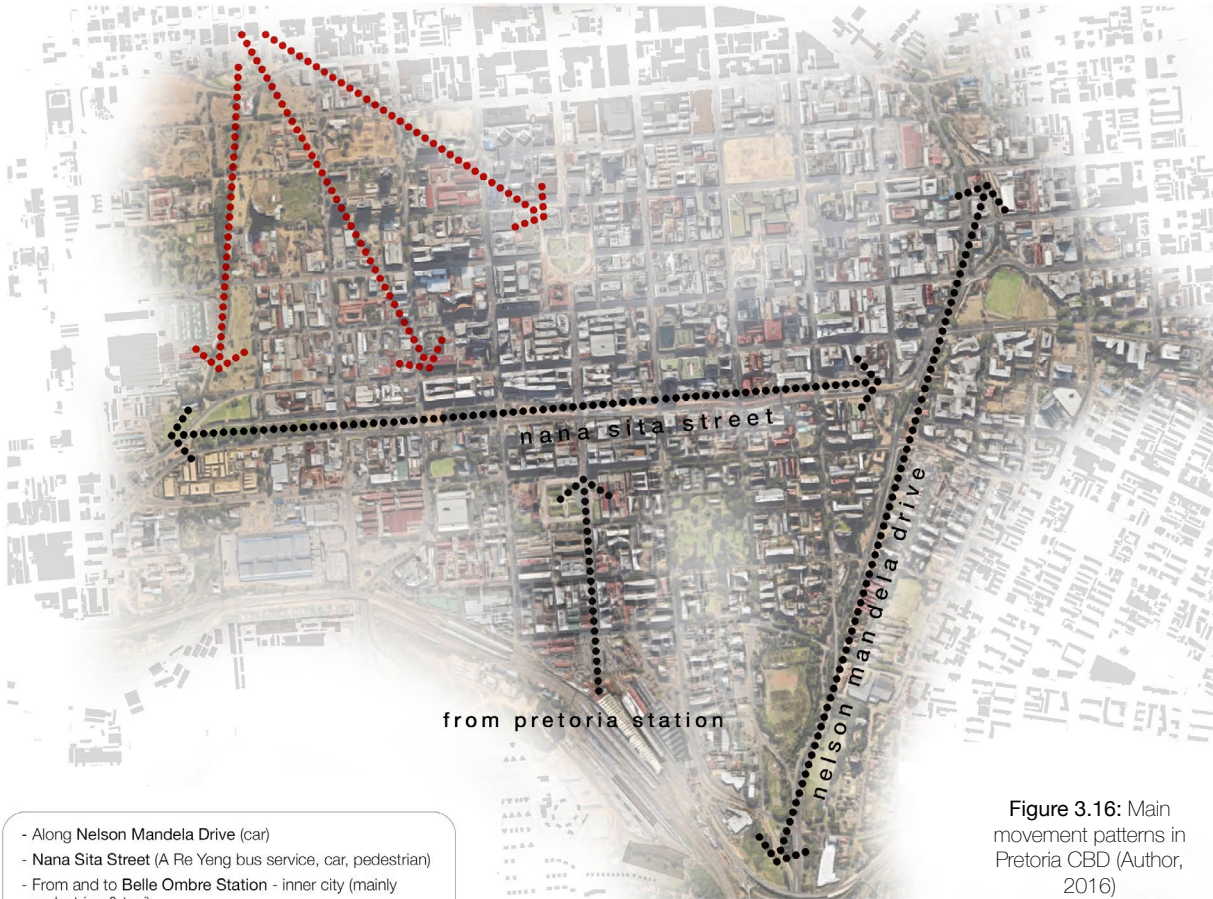


Figure 3.15: Socio-economic growth and/or decline in Pretoria CBD over the past two decades.

Furthermore, it can be said that Church Square is the heart of the Pretoria CBD: it is imbued with a lot of heritage value being the original center from which the city expanded. The built fabric surrounding such an important civic square should reinforce it as such and therefore add value to further centralize it. Currently the north-western quadrant does not fulfil this role and there have been numerous urban frameworks that attempt (amongst other things) to rectify this situation and create a stronger connection between this area and the rest of the CBD - a few of which will now be discussed. Afterwards, a critique (informed by relevant case studies and urban theorists) of them follows which will eventually inform the eventual urban framework.



from belle ombre station



from pretoria station

- Along Nelson Mandela Drive (car)
- Nana Sita Street (A Re Yeng bus service, car, pedestrian)
- From and to Belle Ombre Station - inner city (mainly pedestrian & taxi)
- From Pretoria Station

Figure 3.16: Main movement patterns in Pretoria CBD (Author, 2016)

The Department of Public Works has implemented an inner-city regeneration programme as of 2009, namely Re Kgabisa Tshwane, with a specific focus on the western area of the Pretoria CBD (Department of Public Works. 2009), to promote growth and development in this stagnant stretch of land (illustrated in Figures 3.17 - 3.18 A-C).

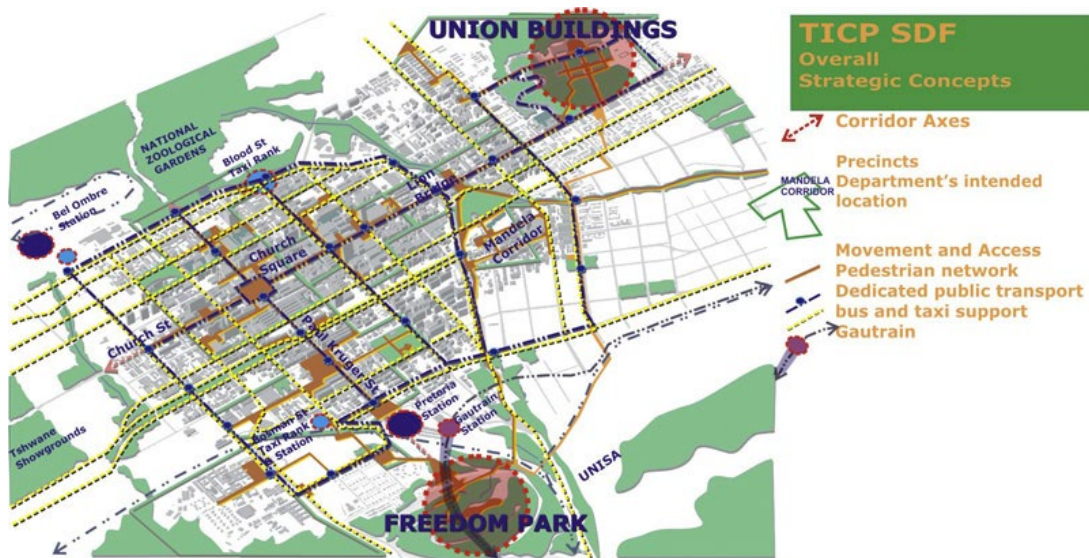
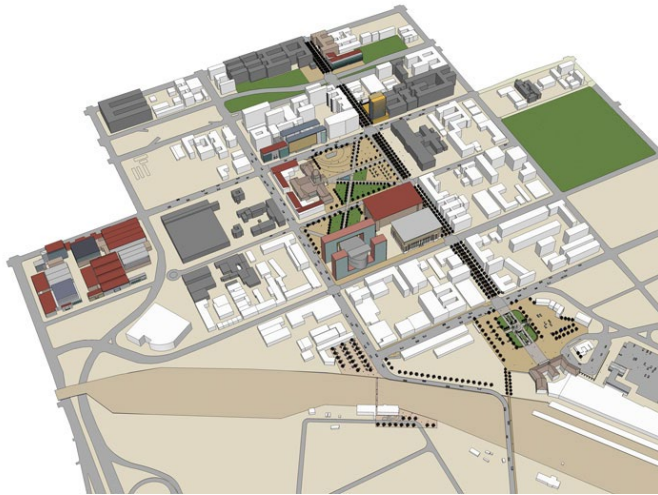


Figure 3.17: Re Kgabisa Tshwane inner-city regeneration programme: Public transportation network (DPW, 2009)



**Figure 3.18A:** Re Kgabisa Tshwane inner-city regeneration programme: Museum Precinct. (DPW, 2009)

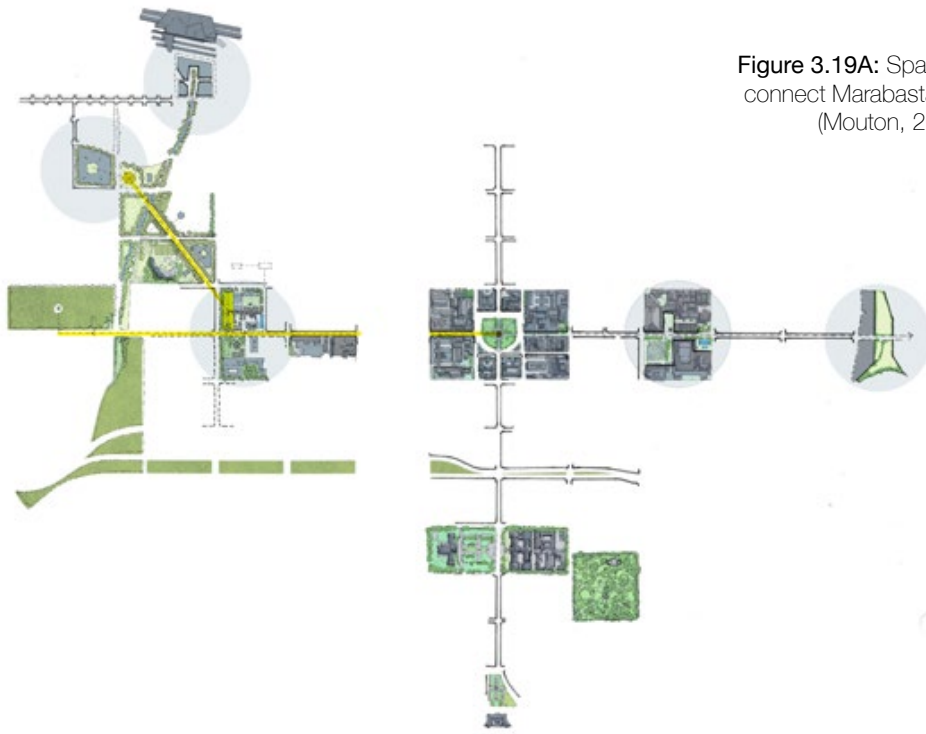


**Figure 3.18B:** Re Kgabisa Tshwane inner-city regeneration programme: Forecourt to the High Courts (DPW, 2009)



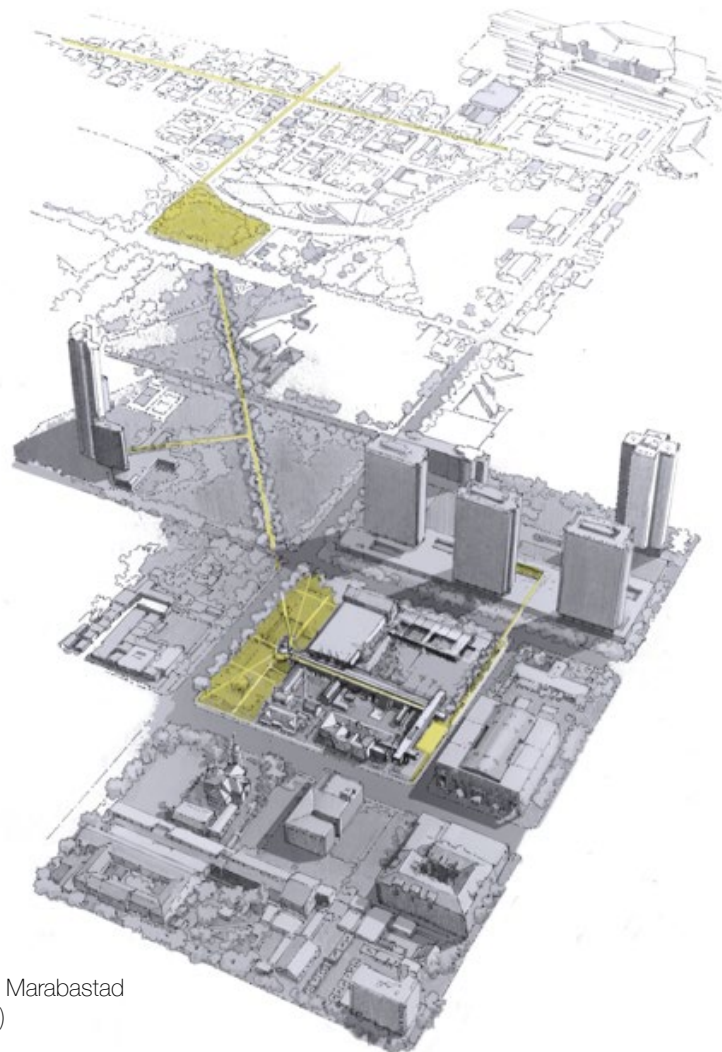
**Figure 3.18C:** Re Kgabisa Tshwane inner-city regeneration programme: Bosman Street Square (DPW, 2009)





**Figure 3.19A:** Spatial core frame to connect Marabastad to city centre (Mouton, 2014: 28)

Figures 3.19 (A and B) illustrate an urban framework done by Jacques Mouton in 2014 that attempts to create a spatial core between the cultural node of the Kruger Museum and Marabastad.



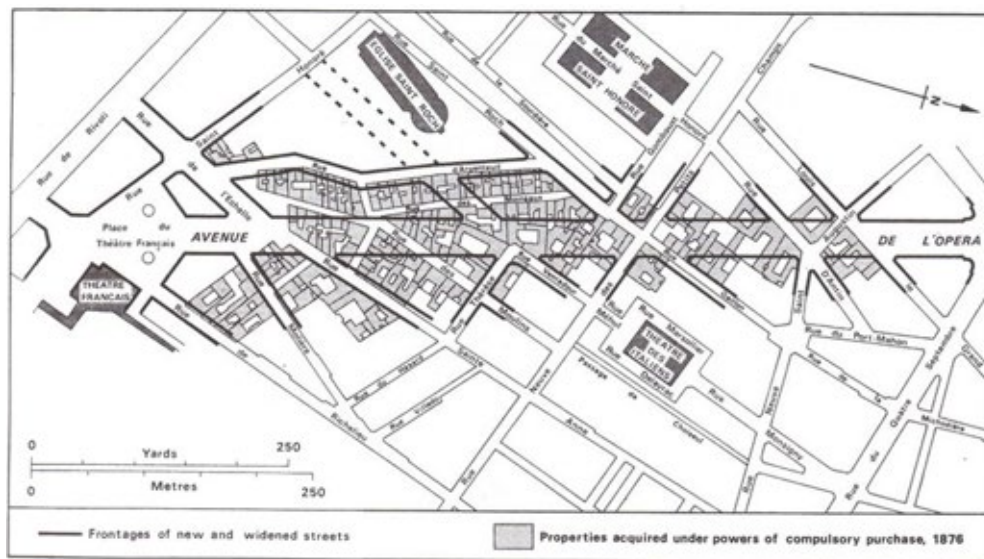
**Figure 2.19B:** Spatial core frame to connect Marabastad to city centre (Mouton, 2014: 31)

### 3.3.3 LEARNING FROM THE PAST:

#### 3.3.3.1 HAUSSMANN'S METAMORPHOSIS OF PARIS

Around the same time that Pretoria became a small town, the radical Haussmannian transformation of Paris occurred. It is a relevant case study as it comprised a complete city renovation in redeveloping the existing urban fabric, as in the case of the Pretoria CBD. Considering the general intention of cleaning up and modernisation, the changes (Figure 3.20) that Georges-Eugène Haussmann brought about on the French capital can be viewed as fairly successful; however, it was not without criticism. Philippe Panerai et al. (2004: 8) writes that his implementation of boulevards and avenues were 'devised from a culture that was anchored in the visual', that 'only certain agreed values were made readable', and that they 'functioned like masks, hiding differences in social status, in districts, in activities.'

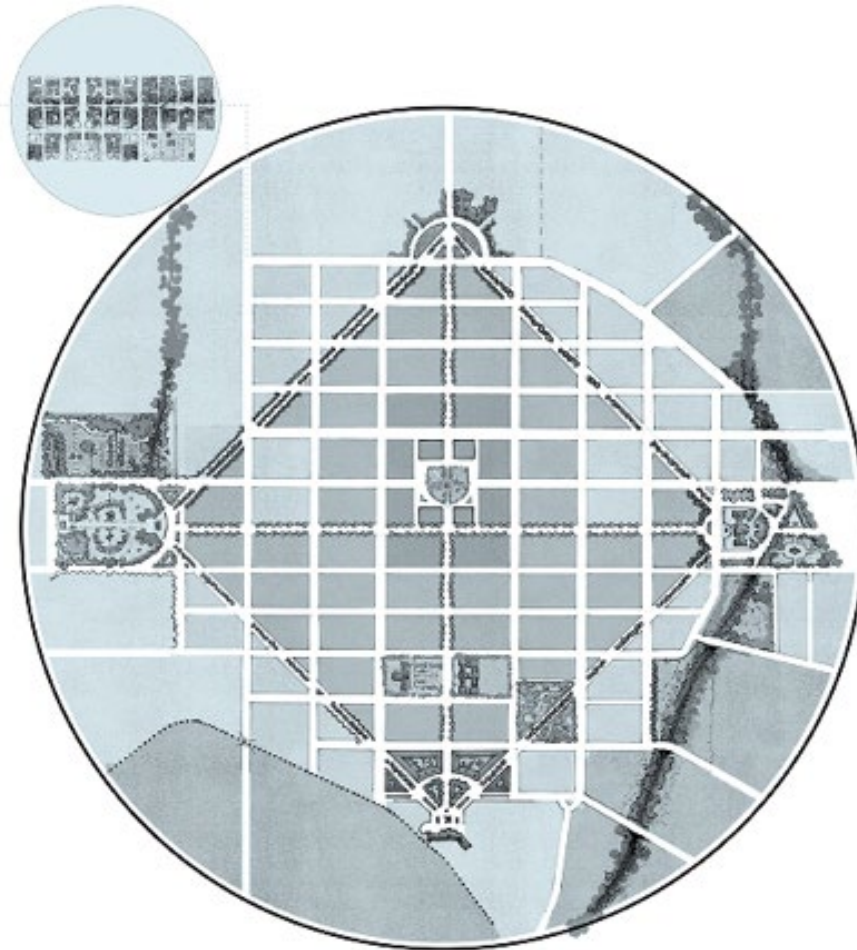
*"The haussmannien percées are of a rigorous, almost monotonous, formal conformity: they overshadow the identity of the districts (the centre, the working-class east, the residential west) to the benefit of the global signifier of Paris, the capital city."* (Panerai et al, 2004: 8)



**Figure 3.20:** Superimposition of the Avenue de l'Opéra before and after the Haussmannian transformations (Lambert, 2014)

In light of this statement, the renovation is an example of man's continuous attempts to instil a sense of formal rationality onto an informal, natural world, resulting in the complete negation of existing daily life in the city and basically masking reality.

In a post-apartheid era, Mouton's proposal of a diagonal thoroughfare makes sense to connect the previously racially-demarcated area (See Figure 3.19) of Marabastad to the rest of the city-core. However, it is still reminiscent of the rectilinear *Haussmanian* boulevard which, according to Panerai et al. (2004: 8) is of an "almost monotonous, formal conformity" that does not take into consideration the informal activity and natural, organic order of everyday life that Jacobs and Koolhaas speak about (see section 3.4.2).



**Figure 3.21:** Moerdijk's proposal for the *Beautification of Pretoria* proposal (cc 1930) attempts to preserve the inner core of the city. "The diagonal avenues impose a diamond grid over the rectilinear city and, as the case with Haussmann's urban upgrade for Paris, a so-called militarised strategy is induced in an attempt to fortify the core (note the enhanced exclusion of Marabstad with such a gesture)." (Mouton, 2014: 24)

### 3 . 3 . 3 . 2 J A N E J A C O B S C R I T I Q U E : ' S O R T I N G O U T '

In the course of her examination of all the chronicled city-planning movements (such as the Decentrists' Garden City ideas, Le Corbusier's Radiant City as well as the City Beautiful concepts towards the end of the 19th century), Jacobs (1992: 25) pinpoints the overall issues with inherited city-planning as being "the idea of sorting out certain cultural or public functions and decontaminating their relationship with the workaday city". In other words, all of our cities have been planned and developed with the distinct mutation that is the principle of "sorting out" - sorting out all that which is nice and pretty and ignoring that which is ugly but necessary. The City Beautiful concept was especially a predisposition with the sorting out of all the pretty, all of the ideal, planning the city according to how it looks, not how it works. Henceforth arises a certain degree of partitioned spatial arrangement - a divorce between the ideal and the common, or perhaps rather, the formal



and the informal. In relating these statements to Pretoria, especially in its current urban condition as a post-apartheid city, it is clear that the informal activity of everyday life has completely inundated the formal, idealistic intentions with which the city was built (Figure 3.22). Moerdyk's proposal for the Beautification of Pretoria (Fig 3.21) is typical of the previous political paradigm and a prime example of 'sorting out'.



**Figure 3.22:** Present day (informal) conditions overlaid onto formally planned city

### 3.3.3.3 "SORTING OUT" \_ COUNTER - STRATEGY

Alternatively, Jacobs (1992:14) advocates a "need of cities for a most intricate and close-grained diversity of uses that give each other constant and mutual support, both economically and socially". The architect Rem Koolhaas (as cited by Packer, 2006) has the same appreciation of this notion in his perspective of the city of Lagos as being "a protean organism that creatively defies constrictive Western ideas of urban order...that triggers off all sorts of unpredictable improvised conditions, so that there is a kind of mutual dependency...With its massive traffic jams creating instant markets on roads and highways, Lagos is not a kind of backward situation...but, rather, an announcement of the future". Albeit controversial, Koolhaas's commentary (Quirck, 2012) accepts exploding population growth, urbanisation and therewith poverty as being a reality, and the inevitable future outcome of all cities, and looks for opportunity within this chaos, stating that "modernity could actually be a state of spontaneous ingenuities within disorder, rather than a trajectory towards order".

#### 3.3.3.4 INTERROGATING SPATIAL STRUCTURE: THE GRID

It is generally accepted that Pretoria's grid-layout is based on the same planning principles of the town of Graaff-Reinet, which also comprises a rectangular grid set within the natural ridged landscape, with the church building as an important node in the city (Jordaan, 1989: 28).

Figure 3.23 illustrates different European urban design models presenting a much more organic composition such as Rome and Barcelona, in relation to the formal grid-layout of Manhattan and Pretoria.

In another instalment of opposition against strict formality in city planning, Koolhaas (1987:20) (specifically referring to Manhattan) renders the grid as the "subjugation, if not obliteration, of nature and its true ambition", stating that in its "indifference to topography, to what exists, it claims the superiority of mental construction over reality". The rationalisation behind the employment of the grid in New York City at the beginning of the 19th century is understood - to give a sense of legibility and comprehension to the city-dweller - but isn't this rigid definition of blocks within the grid-structure exactly what is constraining this fine-grained heterogeneity of spontaneous formal and informal functions?

#### 3.3.3.5 INTERROGATING SPATIAL FORM: SCALE

Apart from the two-dimensionality of the city block, when examining the issue of scale and imageability in urban environments, the difference between street-level and bird's-eye views should be considered; for example, when thinking of a city like London or New York, in addition to the busy streets, one also thinks of the iconic landmarks and built skyline (which appeals only to the ocular function); when imagining a city like Tokyo on the other hand, only the intimate streetscapes come to mind (Ikeda, 2008). Ian Borden (2001 cited in da Costa & van Rensburg, 2008: 45) writes that "the human body needs to be recovered in spatial production, to become both subject and object, where architecture and urban design is based on bodily experiences". This advocates the notion that city-planning should rather be focused on humanist-scaled 'iconic places' for people to dwell in and inhabit, than only 'iconic objects' for people to merely look at.



V E R S U S

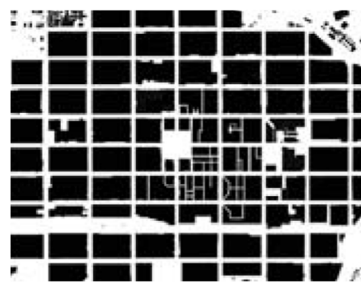


Figure 3.23: City-grain models - Rational grid of New York & Pretoria versus Organic composition of European cities

### 3.4 PROBLEM STATEMENT:

#### LIMITED SPACE FOR PUBLIC CITY LIFE

A comparative block study was done in which the sizes of typical city blocks in Pretoria are compared with those in other cities like Barcelona and New York. This indicates quite a difference in scale; as illustrated in Figure 3.24, Pretoria's city blocks are much bigger than the others. The spatial implications of this is that it limits the amount of space available for public city life. In the current model, the only space left for the pedestrian is that which is clearly defined as such, like Church Square, or the 5-meter side-walk around these completely secluded city-blocks, (Figure 3.25) which, in most cases, are dominated by parked cars.

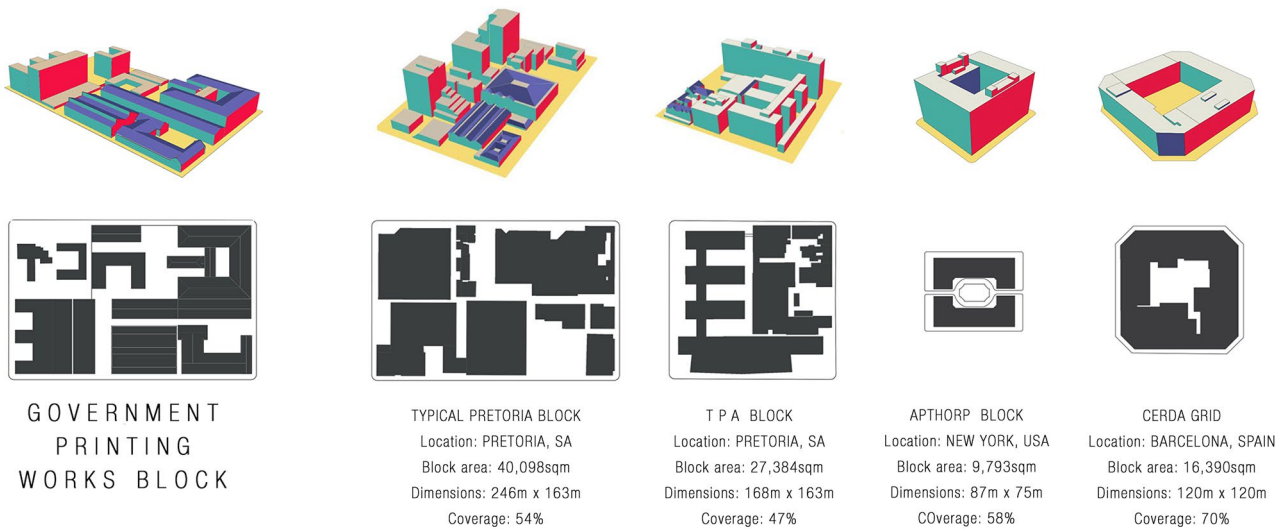


Figure 3.24: Comparative block study (Dodds, 2015, edited by author, 2016)

The alternative model is one that programmes public space into the centre of city blocks (Figure 3.25) and where the edges of those blocks are characterised by varying degrees of accessibility. This is to some extent in line with Haussmann's ideas about the 'strategic rupture' of city blocks, (except that his focus was on the boulevard, the rupture of city blocks was a by-product) where previously interiorised 'spaces become 'theatres of collective appropriation' into which individual modes of expression can be imprinted' (Wiggin, 2010: 42).



ISOLATED CITY BLOCKS

VS

RUPTURED CITY BLOCKS

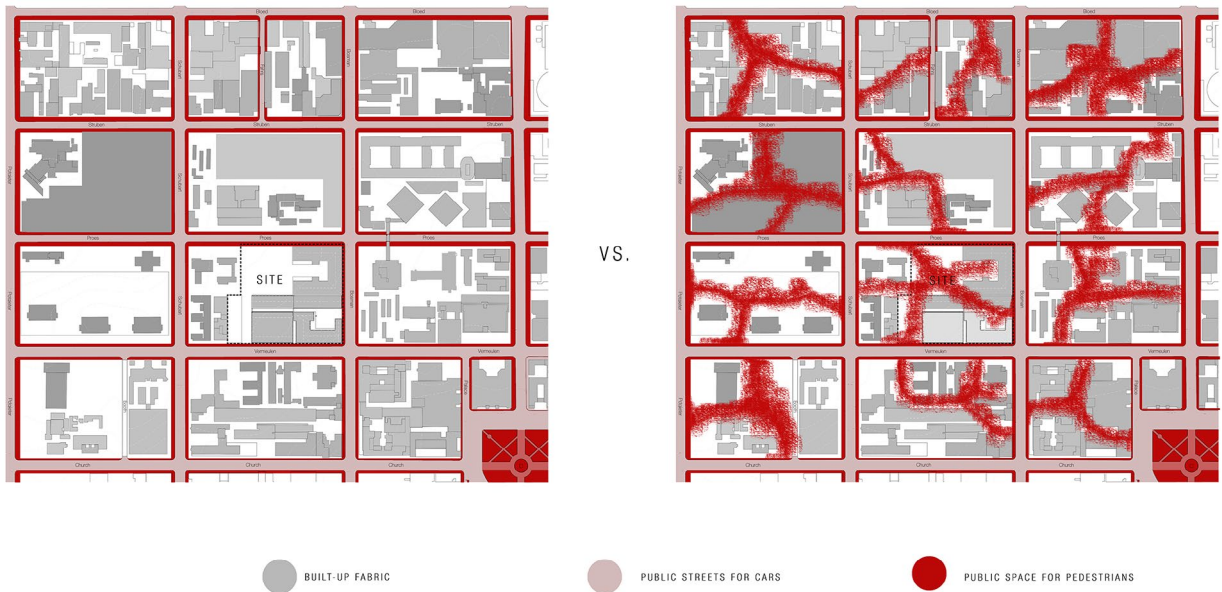


Figure 3.25: Juxtaposition of existing versus alternative city block models - (Only schematic diagram, not representational of realistic context) (Author, 2016)

Previous studies have been done whereby the city block typology has been ‘ruptured’ and opened up in various ways, as illustrated in Wiggin’s (2009) urban block investigation (Figure 3.26). In Figure 3.25 the current city block model is juxtaposed to one in which each block is ruptured, which differs from Wiggin’s approach in two distinct ways: firstly the idea is that each block is ruptured in a way that suits that block’s specific composition, (not a one-size-fits-all-rupture strategy) and secondly, in a more organic and informal way, more suited to the activity of aimless wandering and exploration by the urban flâneur.

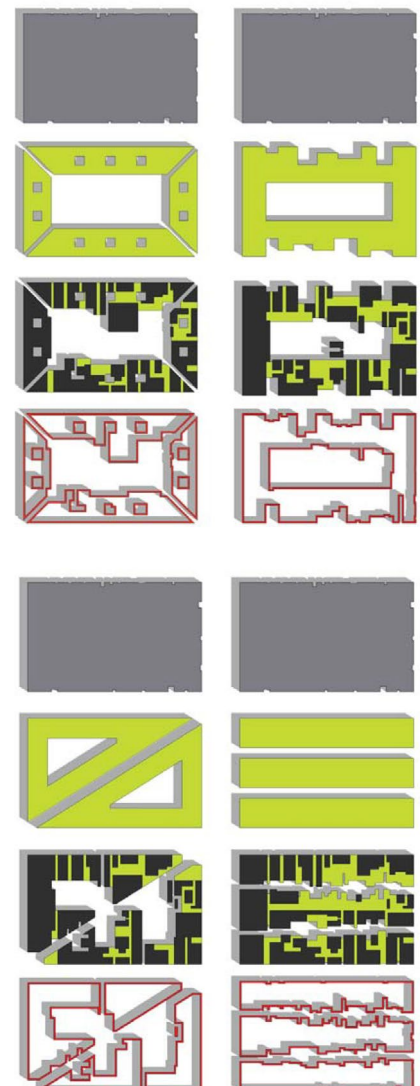
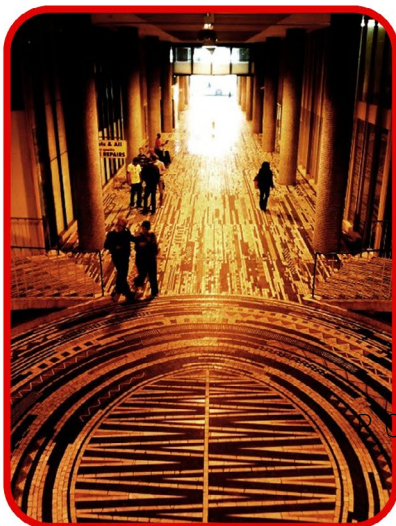


Figure 3.26: Urban block investigation (Wiggin, 2009)

Figure 3.27: Nolli map indicating the location of Koedoe Arkade and Polly's Arcade in Pretoria



KOEDOE ARCADE



POLLY'S ARCADE

A distinct feature that repeats itself in the Pretoria CBD fabric and which is a part of the city's urban heritage, is the public arcade route cutting through some of the blocks - examples include Koedoe Arcade and Norman Eaton's Polly's Arcade (see Figure 3.27). The idea of the covered walkway became popular in Paris during the 19th century, as it is an extension of public space for the act of aimlessly wandering about by the pedestrian, with the provision of protection from weather elements, especially in winter. Although Pretoria is not exposed to such a harsh climate, the arcade typology still managed to find its way through the urban fabric; which illustrates the importance of spatially celebrating the act of *flâneuring*. Being situated in a relatively comfortable and pleasant climate, the arcade route can perhaps be translated into an outdoor, open-air, meandering pedestrian route typology.

### 3.5 PROPOSED URBAN FRAMEWORK :

#### ‘ AN ARTERY OF ACTIVITY ’

In light of the theories and case studies discussed in this chapter, the urban framework proposed for this dissertation in the north-western quadrant of Pretoria CBD (Figure 3.29) is focused on four main considerations:

- 1.) To accommodate and provide for one of the existing main directions of movement in the city (as indicated in Figure 3.16) from the northern entryway to the city, down to the city-centre (and back).
- 2.) To activate the stagnant “brak” (Naude, 1991: 106) of Pretoria (as discussed in section 3.2) with a human-centric approach, in line with the main transportation mode in this direction of commuting on foot.
- 3.) Thirdly it aims to subjugate the rationality of the rectilinear grid layout for a more natural, organic composition more suitable to the act of *flânerie* (of aimlessly wandering about, discovery, observation and spontaneous social encounters) - with the scale of the route and spatial arrangement accommodating this.
- 4.) To serve the urban dwellers of Pretoria by expanding space for public city life at large, by rupturing the rationality of the urban grid, permeating the secluded boundaries of most city blocks, and giving them access to the inherent spatial potential on the inside of city blocks.

As illustrated in Figure 3.29, the ‘artery of activity’ constitutes a public route of pedestrian movement that starts from Belle Ombre Station, down to Jazz Square, cutting through the new Thembelihle Village, south-east through the Printing Works block and into Church Square. It is an open-air, urban arcade on a larger scale that defines a route, lined by various points of attraction that include tree-lined green spaces, permanent structures that accommodate informal trade activity and other public furniture and urban markers.



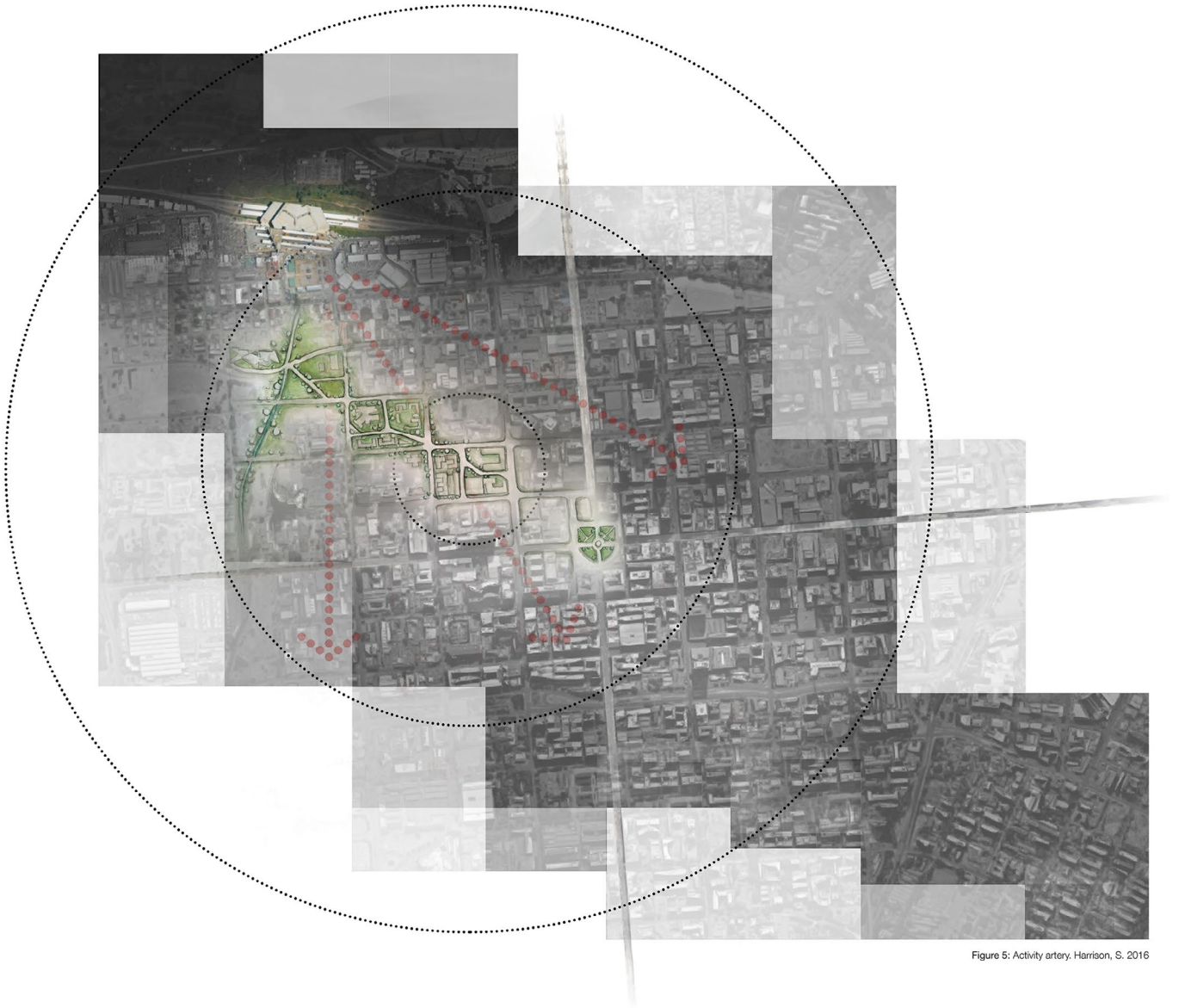


Figure 5: Activity artery. Harrison, S. 2016

North-western quadrant - Urban framework:  
Activity artery from Belle Ombre to city centre

GPW Block as GATEWAY

Figure 3.29: Urban framework proposal (Author, 2016)





# Chapter 4

## S I T E   A N A L Y S I S



DECODING / DECPHERING / DECRYPTING THE INHERENT SOFTWARE



## 4.1 INTRODUCTION

In Chapter 4 the urban investigation zooms in closer to the GPW city block. It starts off with a site analysis of the immediate surrounding context, then follows a description of the existing site in its current condition. Thereafter each building on the block is analysed individually which informs the statements of significance. Finally, the chapter concludes with an analysis of the GPW block as a whole, informed by the analysis of each building but also considering the spatial relationships between all the different components that make up the whole. The documentation referred to consists of the researcher's own analysis as well as the publication *Re-Centring Tswane: Urban heritage strategies for a resilient Capital (2015)*, in which the University of Pretoria's architecture department, specifically the honours studio, did a research lab in the north-western precinct in 2014, which included the site of the GPW building. Their investigation, however, only focused on the one historic (1896) building, in isolation to the rest of the block, limiting opportunity for a larger-scaled spatial impact. The structure of this chapter is as follows:

### 4.2 IMMEDIATE CONTEXT

### 4.3 OVERVIEW OF GPW BLOCK

### 4.4: ANALYSIS OF EACH BUILDING

#### 4.4.1 - DESCRIPTIVE ANALYSIS: 1896 WIERDA BUILDING

#### - STATEMENT OF SIGNIFICANCE: 1896 HISTORIC

#### 4.4.2 ADMINISTRATION BUILDING (NORTH-EAST CORNER)

#### 4.4.3 LETTER PRESS & LITOGRAPHY BUILDING

#### 4.4.4 'FINISHING' BUILDING (SAW-TOOTH)

#### 4.4.5 MAINTENANCE OFFICES

#### 4.4.6 COMPARATIVE ANALYSIS OF ARCHITECTURAL SIGNIFICANCE BETWEEN BUILDINGS

### 4.5: ANALYSIS OF BLOCK IN ITS ENTIRETY

#### 4.5.1 TECTONIC COHERENCY

#### 4.5.2 URBAN BLOCK ANALYSIS: PROBLEM AREAS

#### 4.5.3 URBAN BLOCK ANALYSIS: OPPORTUNITIES

#### 4.5.4 INTANGIBLE HERITAGE

#### 4.5.5 STATEMENT OF SIGNIFICANCE: BLOCK IN ITS ENTIRETY

## 4.2 IMMEDIATE CONTEXT

The programmatic functions surrounding the GPW block are generally drawn between two poles: community-oriented and more institutional; as illustrated in Figures 4.1 - 4.3, to the west there are many residential blocks of which the most prominent are the Schubart Park blocks (currently unoccupied and dilapidated) and the new Thembelihle Village which is a social housing and mixed-use development currently being constructed. Directly north of the GPW block is Laerskool Eendracht and to the south is the Bosman Street 'Grootekerk' and other religious and social institutions, as well as housing in its neighbouring buildings. The neighbouring block to the east constitutes the concrete Telkom Towers that dominate the city skyline.

On the same block as the GPW, west of the boundary wall, is an old-age home (Huis Davidtz) in Proes Street, Pennies Kindergarten in Struben Street as well as a block of flats to its south and the IPID (Independent Police Investigation Department) next to the boundary wall in Vermeulen Street. Overall the surroundings to the west are more community-oriented and to the east more institutionalised with, amongst others, the Department of Public Works across the street towards Church Square and the legislative institutions along Vermeulen Street.

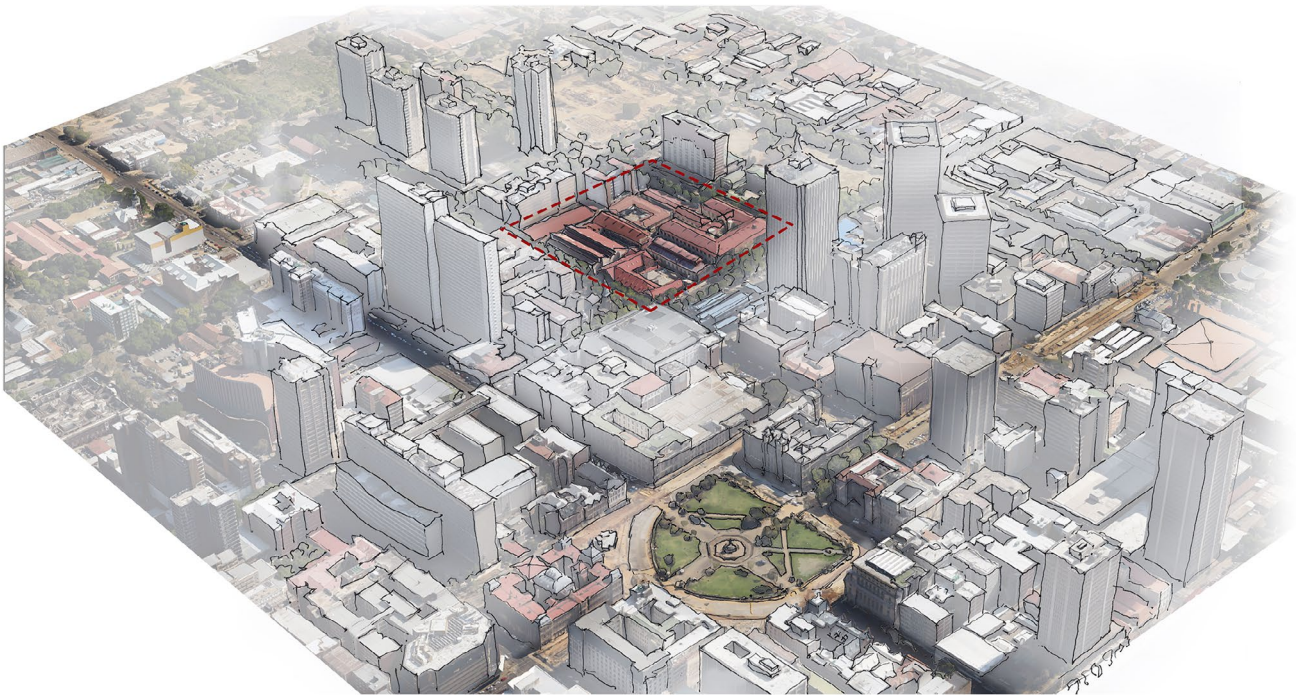


Figure 1.3: Locality map (Author, 2016)

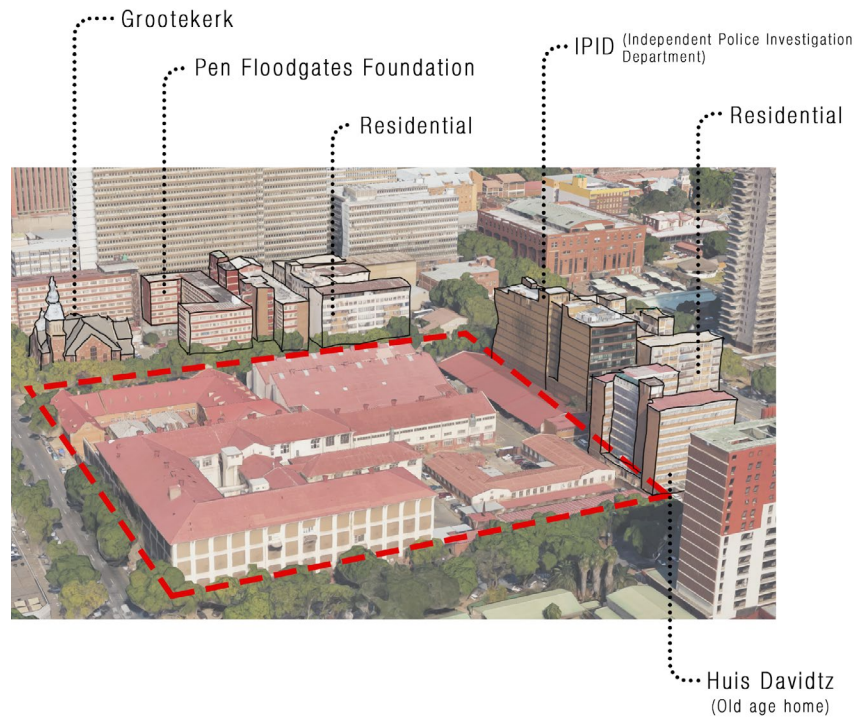


Figure 4.1: Programmatic context, looking south-west (Author)

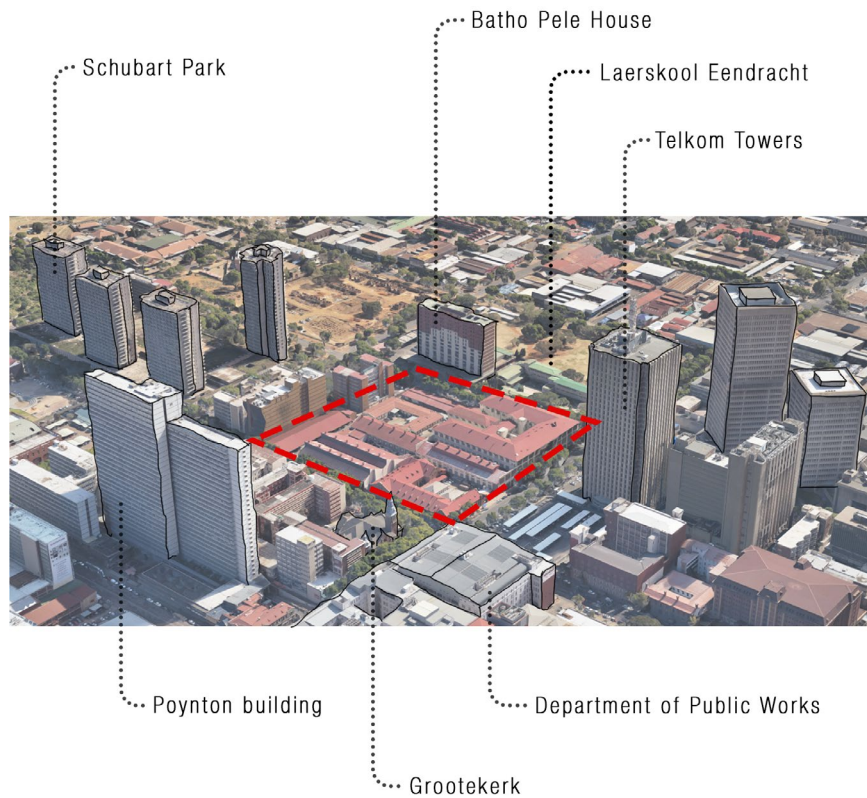


Figure 4.2: Programmatic context, looking north-west (Author)












Figure 4.3: Programmatic context (Author)



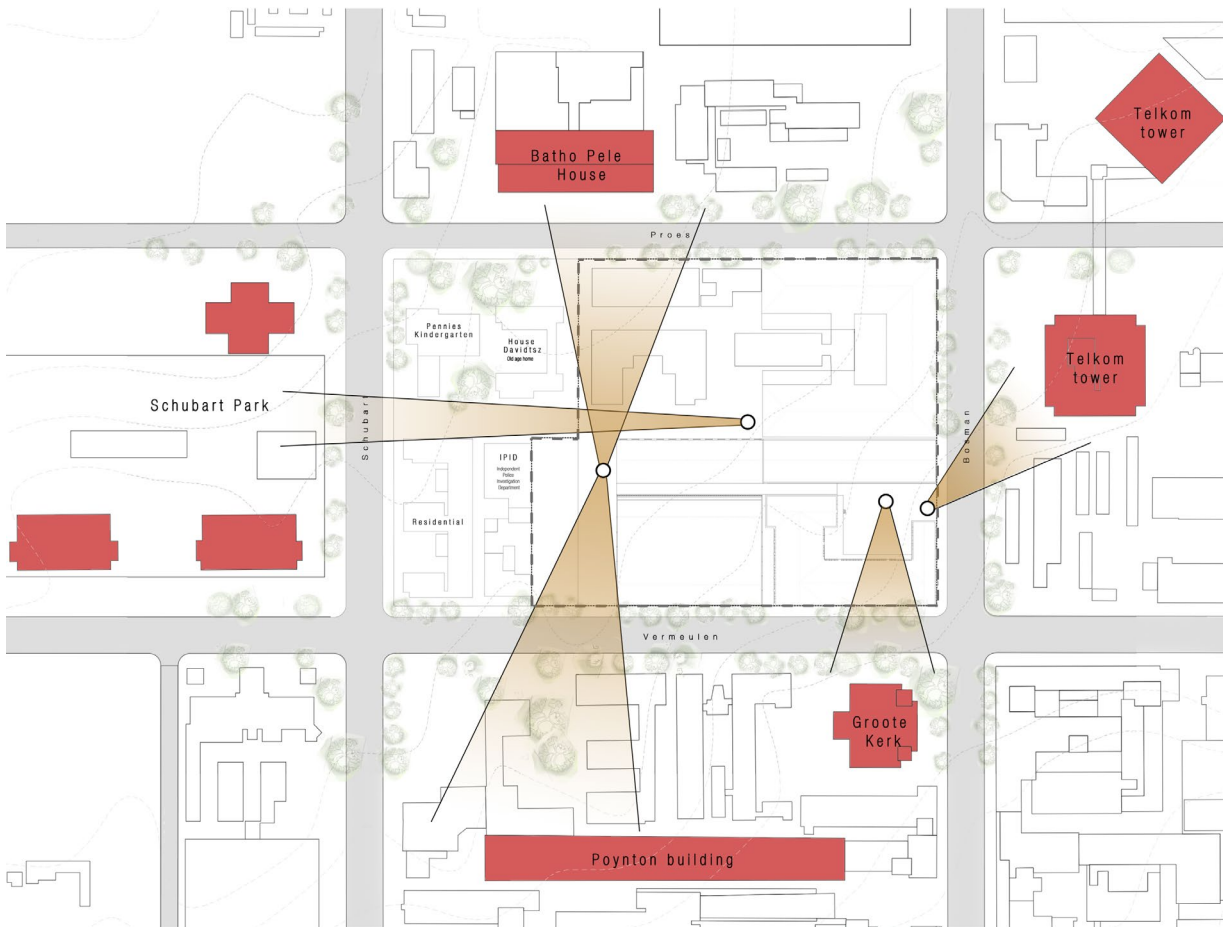


COMMUNITY-ORIENTED

-  housing & old age home
-  schools & creches
-  church & related social institutions
-  commercial
-  private bussiness institutions
-  legislative institutions
-  government institutions

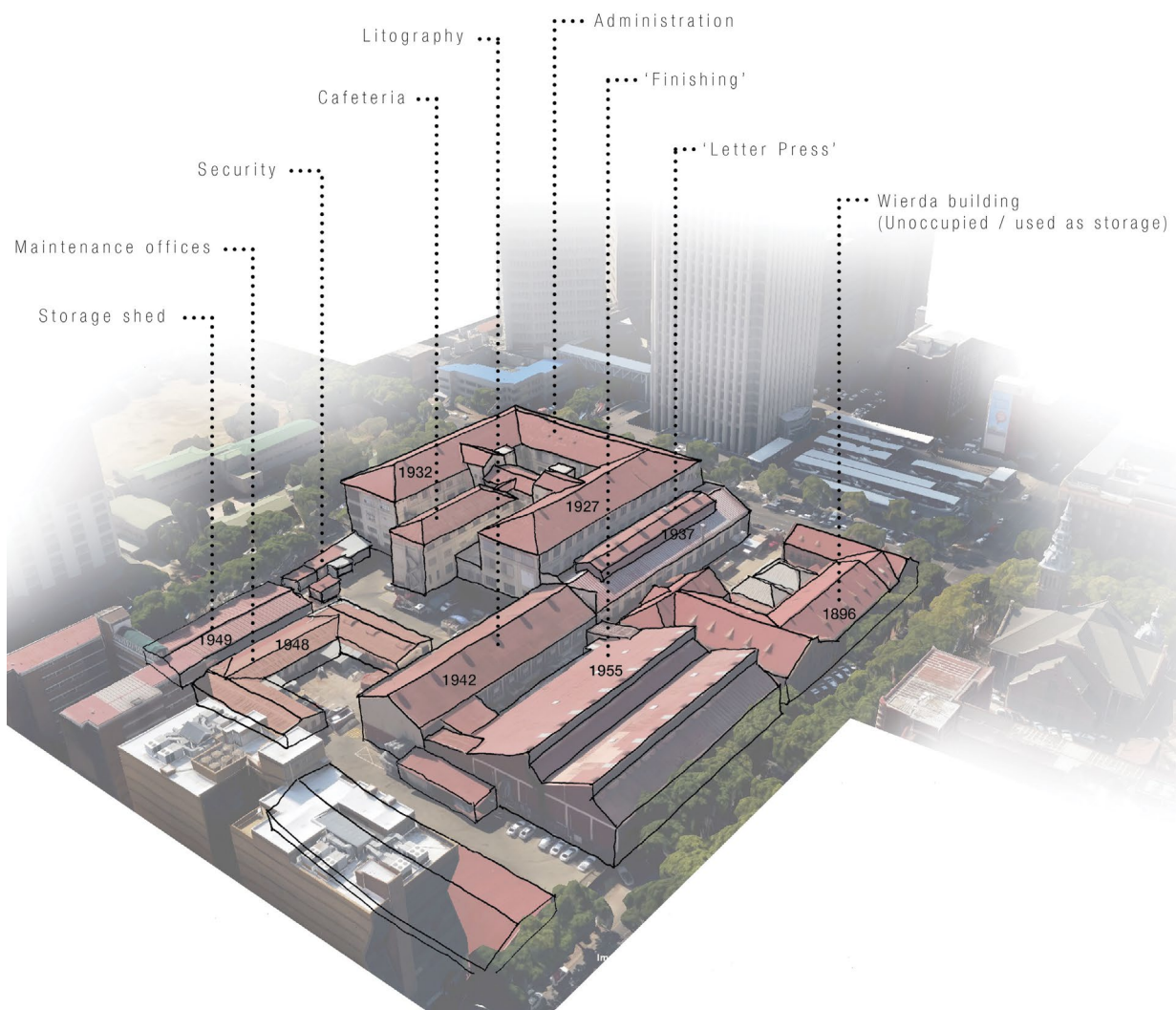
INSTITUTIONAL

Figure 4.4: Site lines and Views of surrounding buildings



### 4.3 OVERVIEW OF GPW BLOCK

The Department of Public Works (DPW) owns the property and the Government Printing Works institution rents the buildings from them. As previously mentioned, the GPW is relocating to another site in Visagie Street as the new location offers more space and is mostly on one level, therefore it will not present the challenge of moving heavy printing equipment between different levels as the current site does (Deppe, 2016). Figures 3.7 and 4.5 highlight the timeline with which the block developed over the period between 1896 and 1955. From what documentation suggests, there was no decent masterplan for this block; the DPW just expanded over time as the GPW was in need of more space. De Villiers and Clarke (2015:97) note that “the original program of the site has remained roughly the same for decades, but as new technologies evolved, it has become obsolete and will now enter a new era of use”. Figure 4.5 also indicates the different uses of each building as it is currently being operated.



**Figure 4.5:** Existing uses & timeline of buildings on block



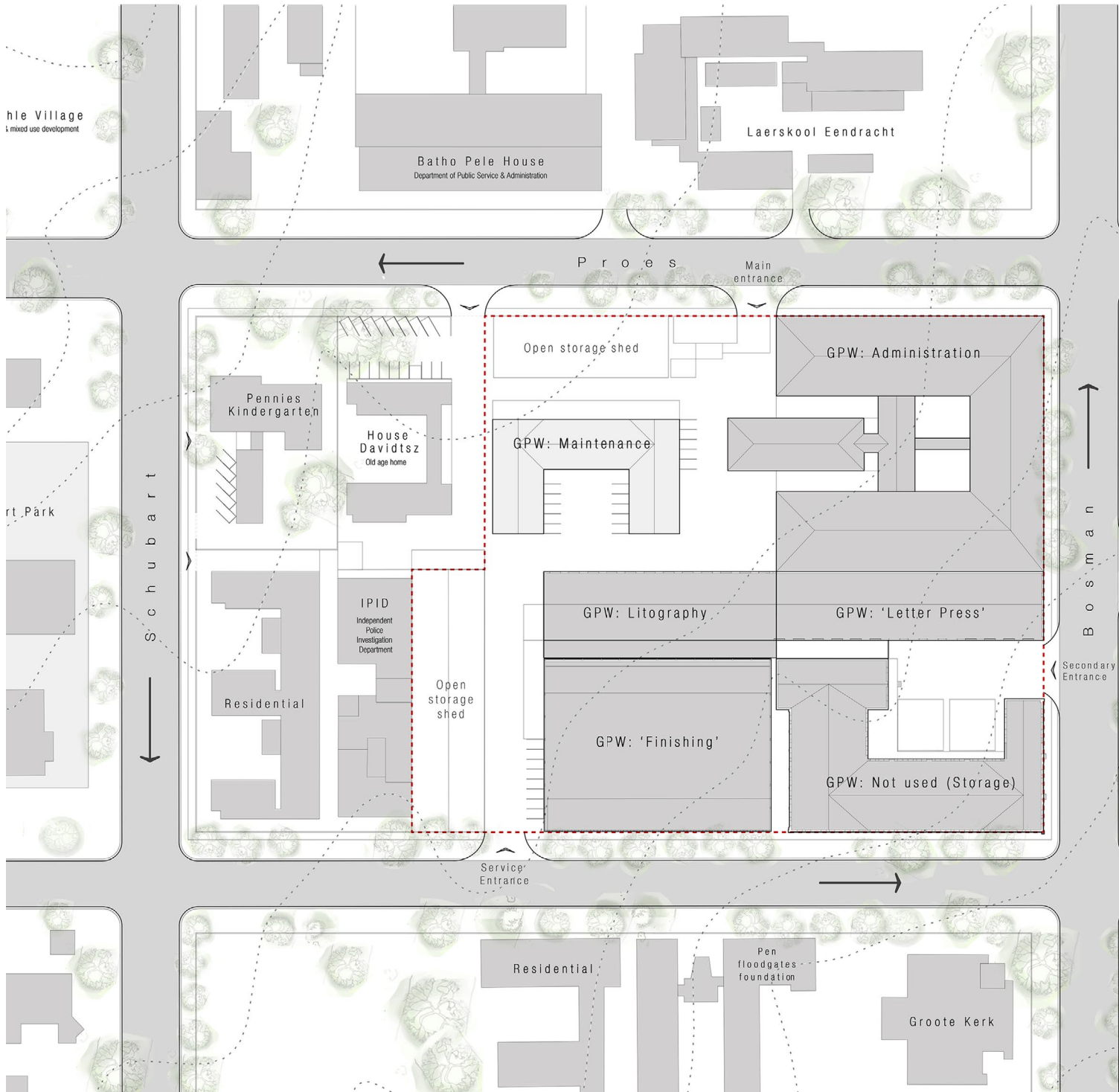


Figure 4.6: Site Plan, NTS (Author)

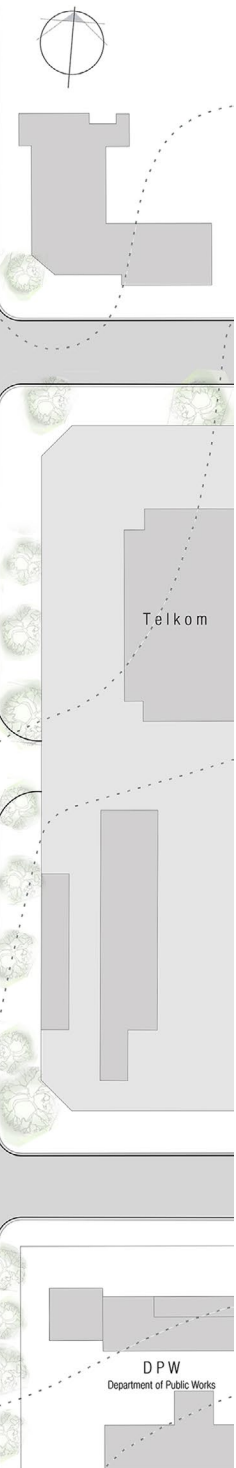


Figure 4.6 illustrates the site plan of the GPW block in its existing condition as well as the immediate surrounding context.





#### SECTION 4.4: 'SIGNIFICANCE PER BUILDING'

In the following section each building on the block is discussed separately in terms of its stylistic, formal, structural and spatial composition, as well as important historical background information. Thereafter a statement of significance is compiled based on the descriptions. Once each separate component has been analyzed, the block as a whole is discussed in section 4.5, to come to an understanding of all the spatial opportunities and problem areas that this block presents in its existing condition.



description  
of existing

4.4.1 ADMINISTRATION BUILDING (NORTH-EAST CORNER)

1927 - 1932

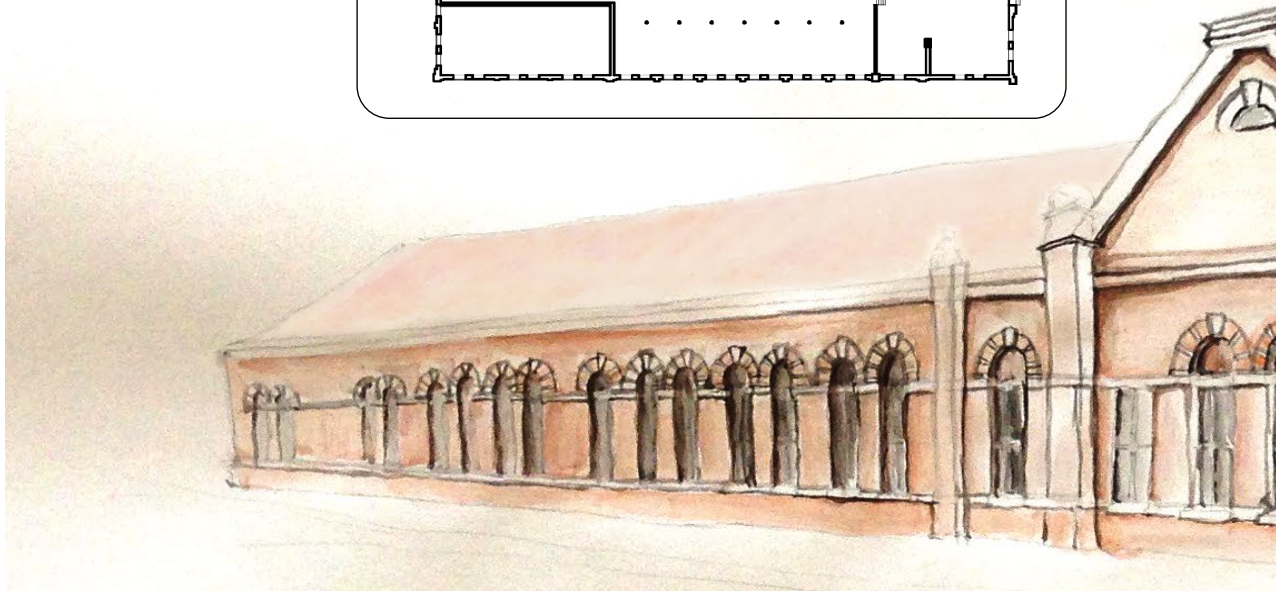
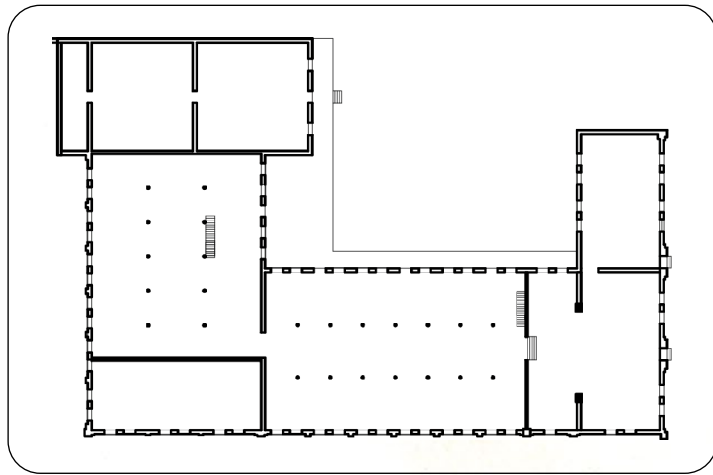
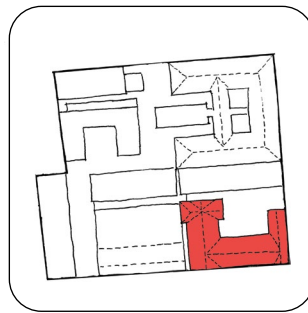
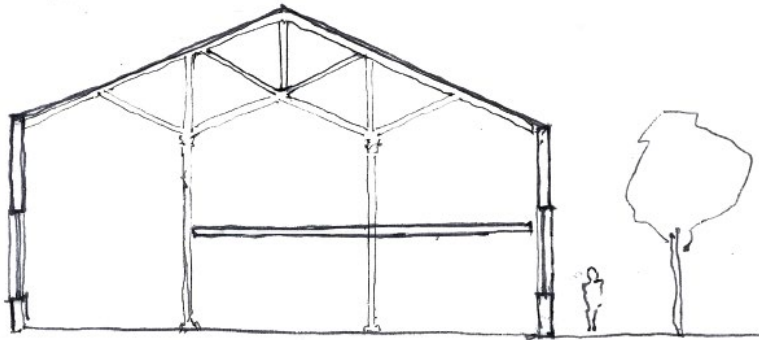




Figure 4.7: Description of Wierda building



**Year of completion:** 1895 -1896

**Architect:** Sytze Wopkes Wierda

**Commissioner:** Departement Publieke Werken, ZAR

**Architectural style:** 'Dutch Renaissance Revival'

**Uses:** Government printing works, now vacant (used as storage space)

**Current heritage status:** Article 34 of the National Heritage Resources Act (structures older than 60 years) is applicable. (Clarke and de Villiers, 2015: 79)



## A . ) D E S C R I P T I V E A N A L Y S I S : 1 8 9 6 W I E R D A B U I L D I N G

The following analysis of the 1896 Wierda building is a descriptive assessment of the originally intended design, the tangible and intangible values instilled within it, as well as its present condition.

As mentioned in Chapter 3, towards the end of the 19th century it became necessary for the government to have its own Printing Works, where, amongst others, confidential government documents and maps could be produced. In 1895 Sytze Wopkes Wierda was commissioned with this project and work on the Government Printing Works (Fig 4.7) ensued in a variant of the Dutch Renaissance Revival style (Clarke and de Villiers, 2015: 79). At the time of conception this building was thought to be of the highest quality for printing works buildings - even higher than many European standards (Rex, 1974: 416). During the Anglo Boer War the Printing Works was shut down and the printing service continued on a train on the Pretoria–Lourenço Marques (Maputo) line (Clarke and de Villiers, 2015: 79) until after the war. The building was also occupied by the South African Police Department at one point and besides this it also presented a publication service department to the general public (today it still serves this role in conjunction with printing).

The building's aesthetic value presents itself mostly on the red face-brick facade which is characterised by sandstone decorations in the form of streaky-bacon coursing, key-stones, quoining and bollards or pinnacles/obelisks as pediment finials (Clarke and de Villiers, 2015: 79). Furthermore the decorated arched window is a repetitive facade element as well as the stepped-gables with Neo-Classical styling; these were all architectural features used in many similar industrial buildings in the Netherlands at the time (Clarke and de Villiers, 2015: 79). Besides these, the red corrugated iron roof sheeting was chosen as a result of the local climatic conditions and the roof ventilators (discussed in relation to the scientific significance) became a characteristic element of the Pretoria regionalist building style (Clarke and de Villiers, 2015: 79). Furthermore the building has a U-shaped plan which frames a central courtyard.

The building has an exposed structural system that allows for large open-plan adaptable spaces that are not dependent on the perimeter walls for their structural integrity (Clarke and de Villiers, 2015: 79). According to Clarke and de Villiers (2015: 80), this structural system is an 'ingenious system' and a 'beautiful amalgam of cast-iron columns and brackets supporting a timber roof structure, all kept in equilibrium by steel tie-rods with adjustable tumbuckles'. Furthermore the roof-ventilators were included due to the need for buoyancy-driven natural ventilation in that time of earth-roads surrounding the building and the requirement to keep the interior printing equipment dust-free (Clarke and de Villiers, 2015: 79).

Later additions to the building include the mezzanine floor level in 1984, the fire escape stairs, the two square shape structures in the middle of the courtyard as well as the arched roof covering along the courtyard perimeter.

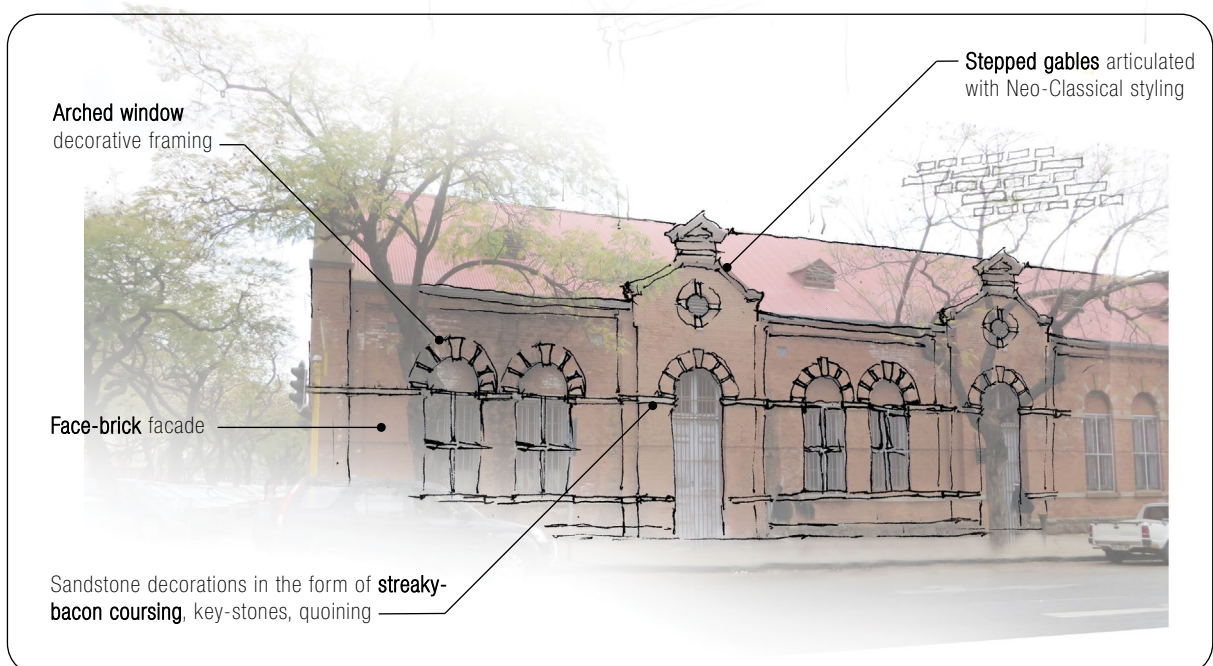


The building's intangible heritage and meaning are instilled in its function; according to Clarke, Kuipers and Swart (2015: 115) the GPW was "a place of production and dissemination of information". Although it was originally commissioned to print classified government information, there was also a public function to it. Deppe (2016) informs of the eastern entrance in Bosman Street where members of the public could come in and amongst others, buy newspapers.

Currently the building is unoccupied and serves as a (storage) dumping yard for anything that needs to be out of the way at the complex. There are also some maintenance issues such as paint peeling off walls, broken windows, moisture bulges in the plaster, sun damage to the timber window frames, etc.



**Figure 4.8:** Exposed structural system - Allows for large open-plan adaptable spaces that are not dependent on perimeter walls for structural integrity.

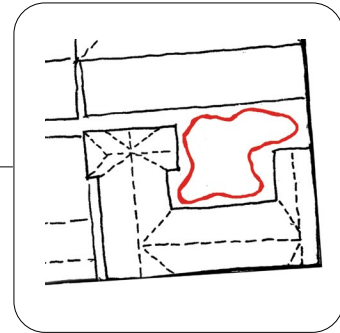


**Figure 4.9:** Stylistic characteristics

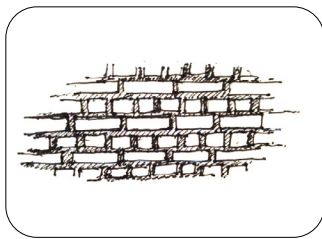
building strengths to be celebrated

### 1.) CENTRAL COURTYARD

- Building shape forms a a central **courtyard space**

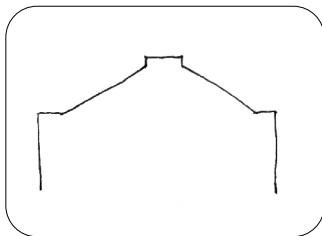


### 2.) STYLISTIC CHARACTERISTICS WHICH NEED TO BE PRESERVED:

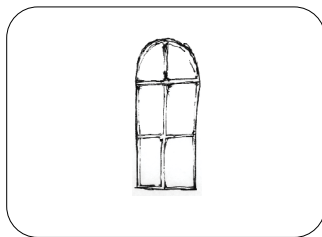


**Face-brick facade** [english bond]

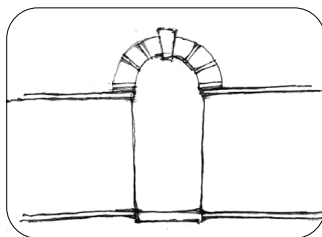
- Consists of alternating courses of headers and stretchers, with the alternative headers centred over and under the vertical joints of the stretchers.



- **Stepped gables** articulated with Neo-Classical styling



- **Arched window** & decorative framing



- **Sandstone decorations** in the form of streaky-bacon coursing, key-stones, quoining

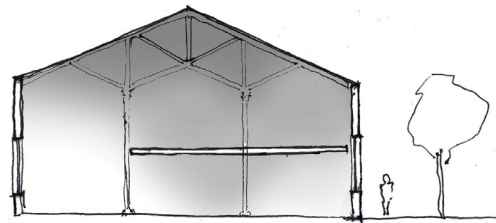
Figure 4.10: Wierda building - strengths



building  
weaknesses

1.) POOR INDOOR DAYLIGHTING QUALITY

Especially on mezzanine level (1984 addition) as arched windows' height were intended only for ground floor level



2.) BLUNT STREET EDGE

- No street interaction

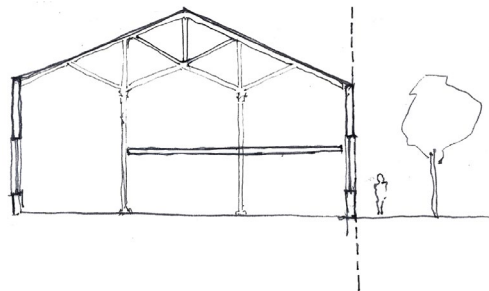


Figure 4.11: Wierda building - weaknesses



## B . ) STATEMENT OF SIGNIFICANCE : 1 8 9 6 W I E R D A B U I L D I N G

In conclusion, the statement of significance for the 1896 Wierda building is analysed according to the principles as set forth by the Burra Charter which states that “cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations” (1999: 2).

The building’s aesthetic value presents itself mostly on the exterior - the street facades in particular - and it is the aesthetic value that sets it apart at first glance as an important heritage asset to the city even to the layman. The exterior facade of the inside courtyard is unfortunately cluttered up with later additions at this point in time.

The scientific value is instilled in the building’s structural system which was ingenious at the time for a light-industry building to be able to present largely uncluttered open space; furthermore the roof ventilators were also a valuable technique used.

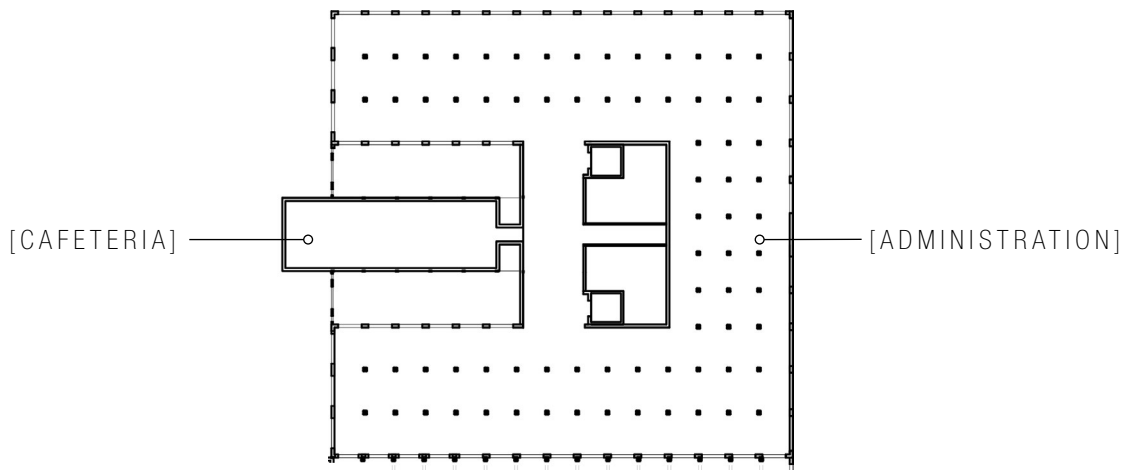
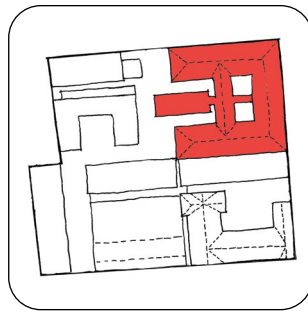
The social value of the building lies in its intangible heritage as a place for the “production and dissemination of information” and existing recommendations made for the building’s future use “mixed-use (semi-)public programming” (Clarke, Kuipers and Swart, 2015: 115).

The historic value encompasses all the value mentioned here and really specifically the fact that at the time of its conception this building was really a cut above the rest (above international standards) and a prime example for light-industrial buildings. Besides this, the building really speaks about a period in the history of Pretoria where Dutch influence wound its way into the South African context with the result being an amalgamation between 19th century Dutch style adapted to the regional climate in Pretoria.

description  
of existing

4.4.2 ADMINISTRATION BUILDING (NORTH-EAST CORNER)

1927 - 1932



PLAN SHOWING STRUCTURE OF BUILDING  
5-story building with a concrete column and beam infill structure



SECTION SHOWING STRUCTURE OF BUILDINGS



This is a four-storey concrete column and beam, with brick-infill, structure with the main building primarily u-shaped in plan. Besides this it has an extra protrusion, of the same construction, sticking out to the western side (in which the cafeteria is currently situated), connected to the main building by the central circulation and services core. The roof is constructed of timber trusses and red corrugated iron roof sheeting, to fit into the rest of the block's roof tradition (see 'tectonic coherency' at section 4.5.1). The floor to soffit heights of the four levels range between 4 and 6 meters - higher than normal to accommodate some of the printing equipment.



It has an all-round monotonous facade of relatively large square window openings; these windows (with the additional heat produced by the printing machinery inside) rendered the interior space too hot and during the 70s (when air-conditioning was not yet 'trusted' in buildings (Deppe, 2016)) all the window openings on the east, north and western sides were covered with horizontal steel louvred screens to keep the sun out.



The ground floor level functions as a storage garage where small carrier-trucks and vans can drive in and unload materials and supplies. The ground floor storage garage runs directly through to the longitudinal buildings south of it, and also through underneath the saw-tooth building. On the first floor, on the southern side, it is connected to the longitudinal building (from the outside and above it looks like two separate buildings but inside the space functions as one).

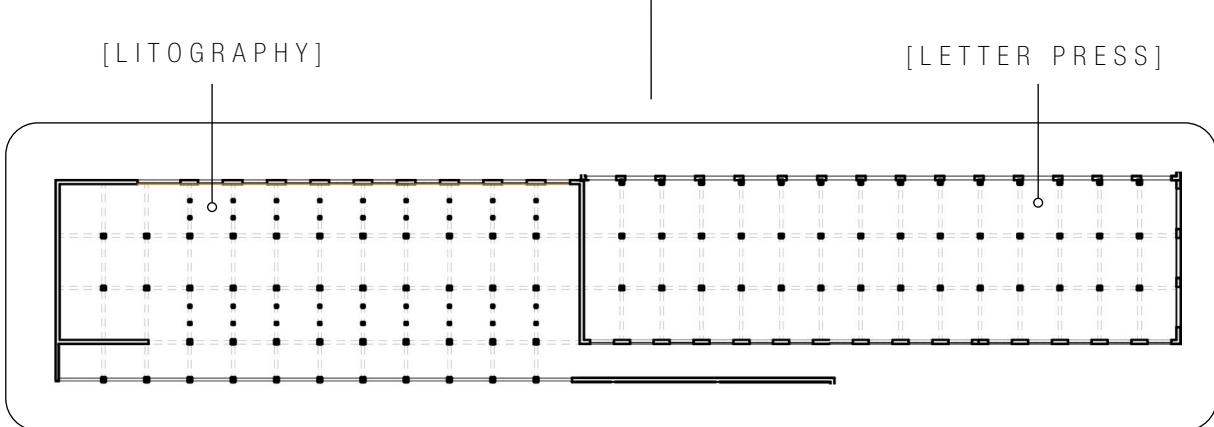
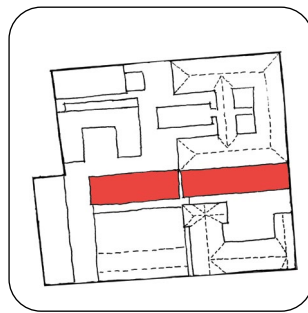
Figure 4.12: Description of Administration building



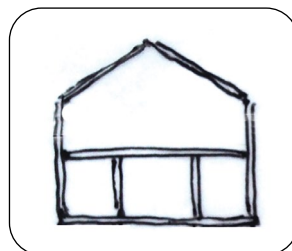
description  
of existing

4.4.3 LETTER-PRESS & LITOGRAPHY

1927 - 1932



PLAN SHOWING STRUCTURE OF BUILDINGS  
Concrete column and beam structure with beams spanning in both directions



SECTION SHOWING STRUCTURE OF BUILDINGS



These two buildings have exactly the same construction as the administration building, square concrete column and beam structure with the same monotonous window spacing.

The first floor slab is supported by two rows of columns spaced about 6m apart (the western building has extra, smaller columns in between). The slab consists of two-directional concrete beams (running in both directions). On first floor, the roof is supported entirely by the perimeter walls, therefore there are no columns on the first floor.



These buildings are also characterised by the red corrugated iron roof sheeting tradition, with distinctive circular shaped roof ventilators on top of them. As mentioned earlier, the southern building ('Letter Press') is an extension of the administration building, both on ground and first floor.



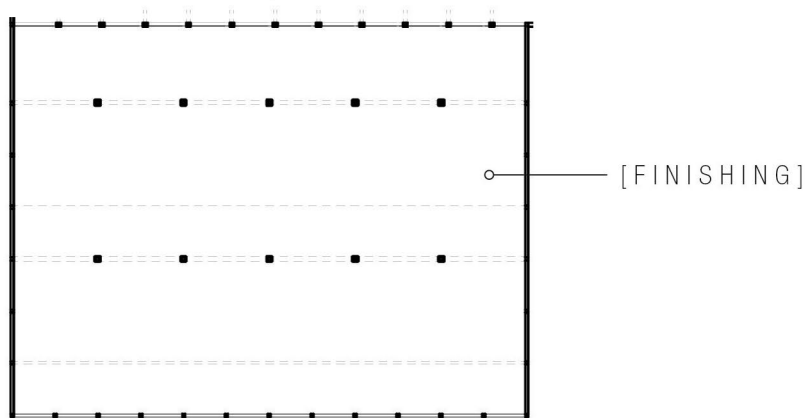
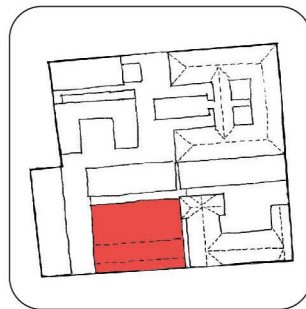
The western building ('Lithography') on the other hand, is an extension of the saw-tooth building ('Finishing') on ground floor level. On the first floor, the two are separated, as the saw-tooth was only built in 1955.

Figure 4.13: Description of Lithography & Letter Press buildings

description  
of existing

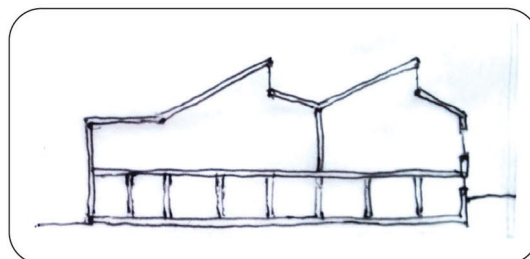
#### 4.4.4 FINISHING [SAW-TOOTH]

1927 - 1932



#### PLAN SHOWING STRUCTURE OF BUILDINGS

Concrete beam and column with brick infill structure with characteristic saw-tooth roof profile with exposed steel structure to let natural light in



#### SECTION SHOWING STRUCTURE OF BUILDINGS



This building constitutes a concrete beam and column structure with red face-brick walls (Figure 4.14). The ground floor level is sunken in to the ground with a semi-basement opening on the southern street side, then it extends into the ground floor underneath the 'Litography' level (see Figure 4.13).



The first floor slab is supported by the same column structure as the Litography building. The building features a characteristic saw-tooth roof profile with clerestory windows facing south to let natural daylight into the open volume space.



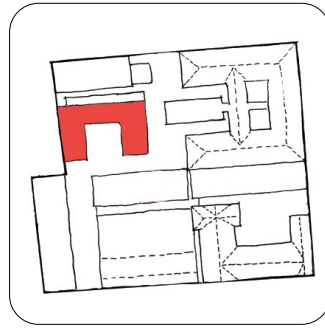
The roof also features the traditional red corrugated iron roof sheeting and is supported by steel trusses, which are carried by only one row of columns down the middle of the floor.

The saw-tooth profile-roof allows for a completely open plan and a well-lit, large volume that can accommodate many industrial production functions.

Figure 4.14: Description of Finishing (saw-tooth) building



#### 4.4.7 MAINTENANCE OFFICES :



The maintenance offices comprise a one-storey u-shaped building on ground floor level. On the site visit in February the building was very dilapidated (Figure 4.16) and some attempts at maintenance were in the process of being carried out - all the plaster was cracked and needed replastering, all the ceilings were rotted and services were hanging out over the offices. The operations director also complained that the building was extremely hot in summer and cold in winter (because of the lack of any insulation and low pitched roofs resulting in direct heat induction) and that the occupants inside this small building could not wait to relocate to their new premises (Deppe, 2016).

- Dilapidated structure
- Arbitrary (small) scale in relation to the rest of the block and for its central position in the city
- Random placement on the block - does not add any value to the rest of the block as a whole.

The 'storage shed' (which constituted an open steel structure and roof covering) just north of the maintenance offices was removed and people started using the space for parking (see Figures 4.17 and 4.18)



Figure 4.15: Maintenance offices building, Huis Davidtz in the background





**Figure 4.16:** Maintenance office building in relation to the Batho Pele House across Vermeulen Street



**Figure 4.17:** Empty space where storage shed structure once stood (recently removed)

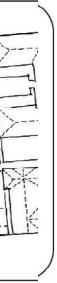


**Figure 4.18:** Open space where storage shed structure was, now used for parking, Huis Davidtz in the background

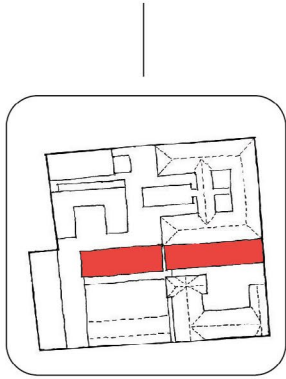
#### 4.4.6 COMPARATIVE ANALYSIS OF ARCHITECTURAL SIGNIFICANCE

	<p style="text-align: center;">N-E CORNER BUILDING 1927 - 1932</p> 	<p style="text-align: center;">STORAGE MAINTENAN</p> 
<p style="text-align: center;"><b>AESTHETIC VALUE</b></p> <p>(“consideration of the form, scale, colour, texture and material of the fabric” - Burra Charter, 1999: 12)</p>	<ul style="list-style-type: none"> <li>- Central courtyard potential if protruding mass is demolished</li> <li>- Facade manipulation potential if altered</li> <li>- Red corrugated iron roof sheeting (coherent tectonic roof identity)</li> </ul>	<p style="text-align: center;">None</p>
<p style="text-align: center;"><b>SCIENTIFIC VALUE</b></p> <p>(“importance of the data involved, on its rarity, quality or representativeness” - Burra Charter, 1999: 12)</p>	<ul style="list-style-type: none"> <li>- Large floor-to-soffit heights (4-6m)</li> </ul>	<p style="text-align: center;">None</p>
<p style="text-align: center;"><b>SOCIAL VALUE</b></p> <p>(“focus of spiritual, political, national or other cultural sentiment” - Burra Charter, 1999: 12)</p>	<p style="text-align: center;">None</p>	<p style="text-align: center;">None</p>
<p style="text-align: center;"><b>HISTORIC VALUE</b></p> <p>(“influenced, or has been influenced by, an historic figure, event, phase or activity” - Burra Charter, 1999: 12)</p>	<ul style="list-style-type: none"> <li>- Red corrugated iron roof tradition</li> </ul>	<p style="text-align: center;">None</p>

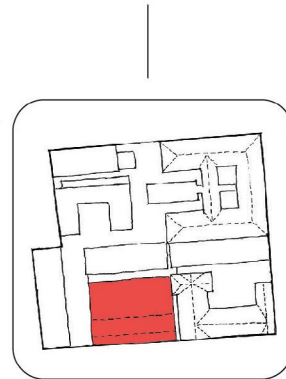
SH &  
CEICES



2 LONGITUDINAL BUILDINGS  
1937 - 1942



SAW-TOOTH BUILDING  
1955



- Red corrugated iron roof sheeting with ventilators (coherent tectonic roof identity tradition carried on from 1896 Wierda building)

- Distinctive saw-tooth roof-profile
- Red corrugated iron roof sheeting (coherent tectonic roof identity)
- Red face-brick facades (coherent materiality to 1896 building)

- Large floor-to-soffit heights
- Easily alterable because of cross-beam concrete structure
- Roof ventilators

- Distinctive saw-tooth roof-profile
- Red corrugated iron roof sheeting (coherent tectonic roof identity)
- Red face-brick facades (coherent materiality to 1896 building)

None

None

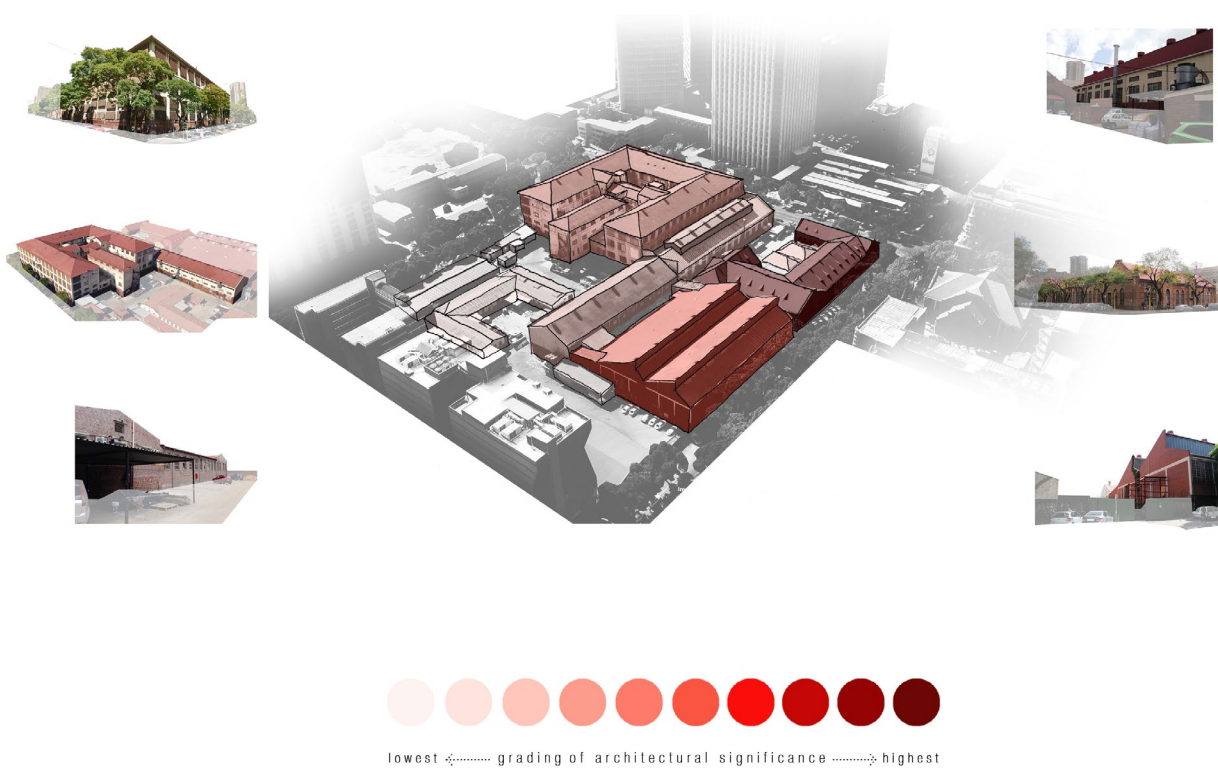
- Red corrugated iron roof with ventilators tradition

- Early example of free-plan & open volume & saw-tooth roof profile building

Figure 4.19: Comparative analysis of existing buildings

#### 4.4.10 GRADING OF ARCHITECTURAL SIGNIFICANCE

In light of the statements of cultural significance for both the block in its entirety as well as the 1896 Wierda building in particular, it is clear that the 1896 historic building has the most significance (Figure 4.20) as it carries the most value in terms of stylistic architectural heritage. Second is the 1955 saw-tooth building as the open plan, large volume and natural daylighting lends itself to be fairly adaptable to other uses as well as changing technologies in light-industry uses. After this comes the square building on the north-east corner with high floor to soffit heights, open plan and a shape that defines a central courtyard. Thereafter the two longitudinal buildings and then the rest of the existing storage sheds and smaller maintenance office buildings.



**Figure 4.20:** Grading of architectural significance of existing buildings on block (Author)

## SECTION 4.5: SIGNIFICANCE OF BLOCK IN ITS ENTIRETY

Now that each existing building has been discussed, the block as a whole can be analysed. Next the data presented in the previous section and also the inbetween, negative space in the block, the connections and contextual relationships between all the different parts will be investigated. Thereupon a statement of significance will be compiled whereby the spatial opportunities as well as problem areas are considered.



#### 4.5.1 TECTONIC COHERENCY IN GPW BLOCK

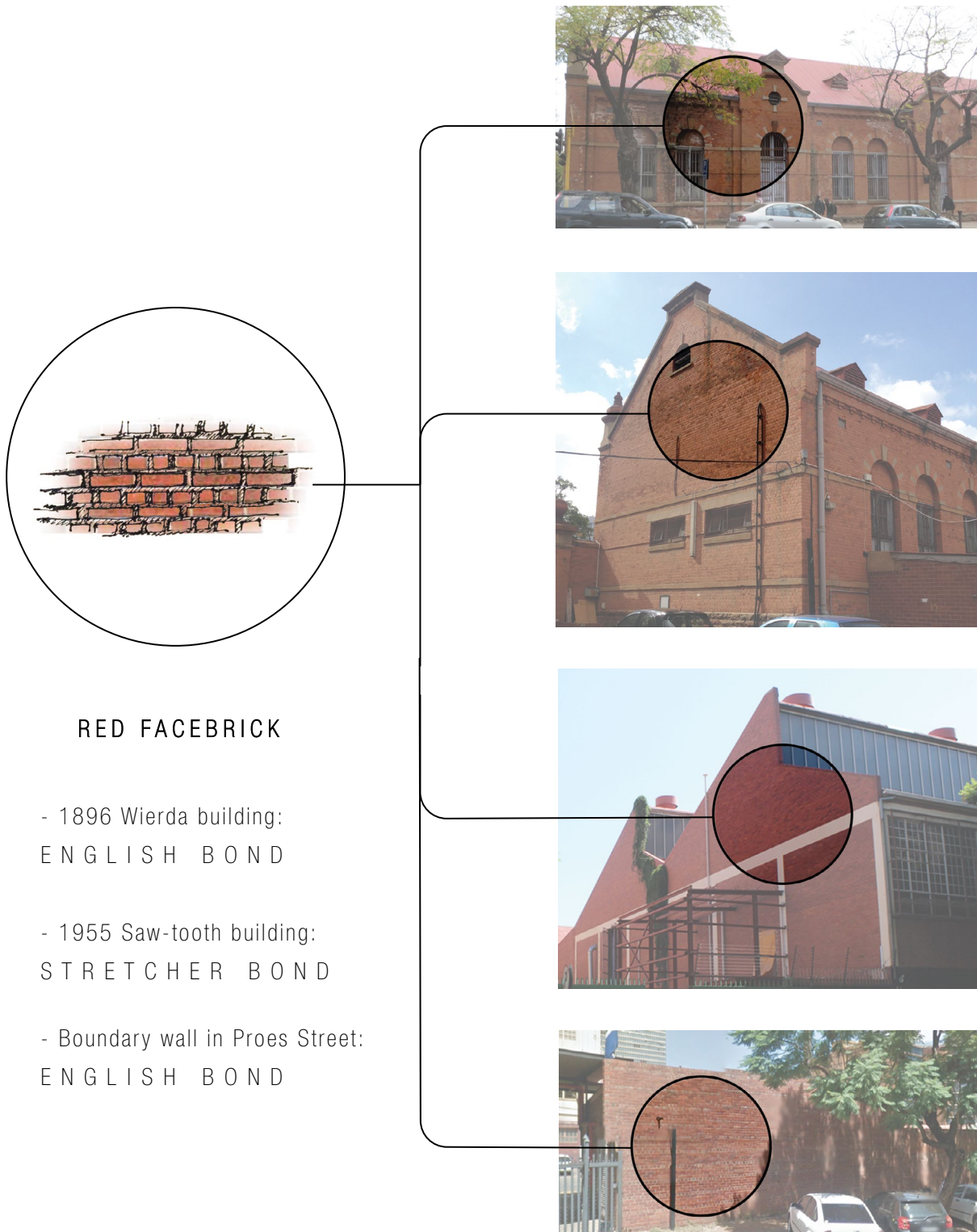
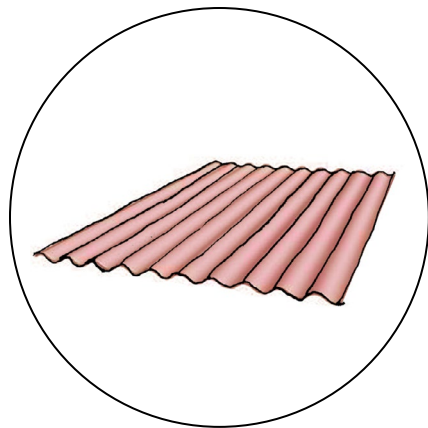


Figure 4.21: Tectonic coherency: Brickwork



### RED CORRUGATED IRON ROOF SHEETING

- All buildings on this block have the same red coloured corrugated iron roof sheeting with various shaped roof ventilators which becomes a part of the aesthetic.

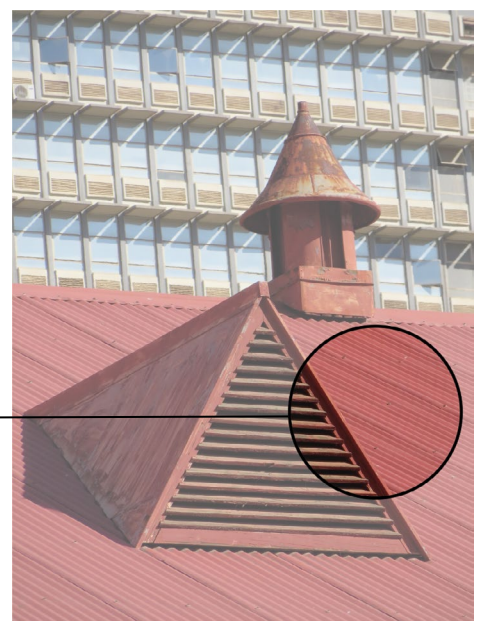
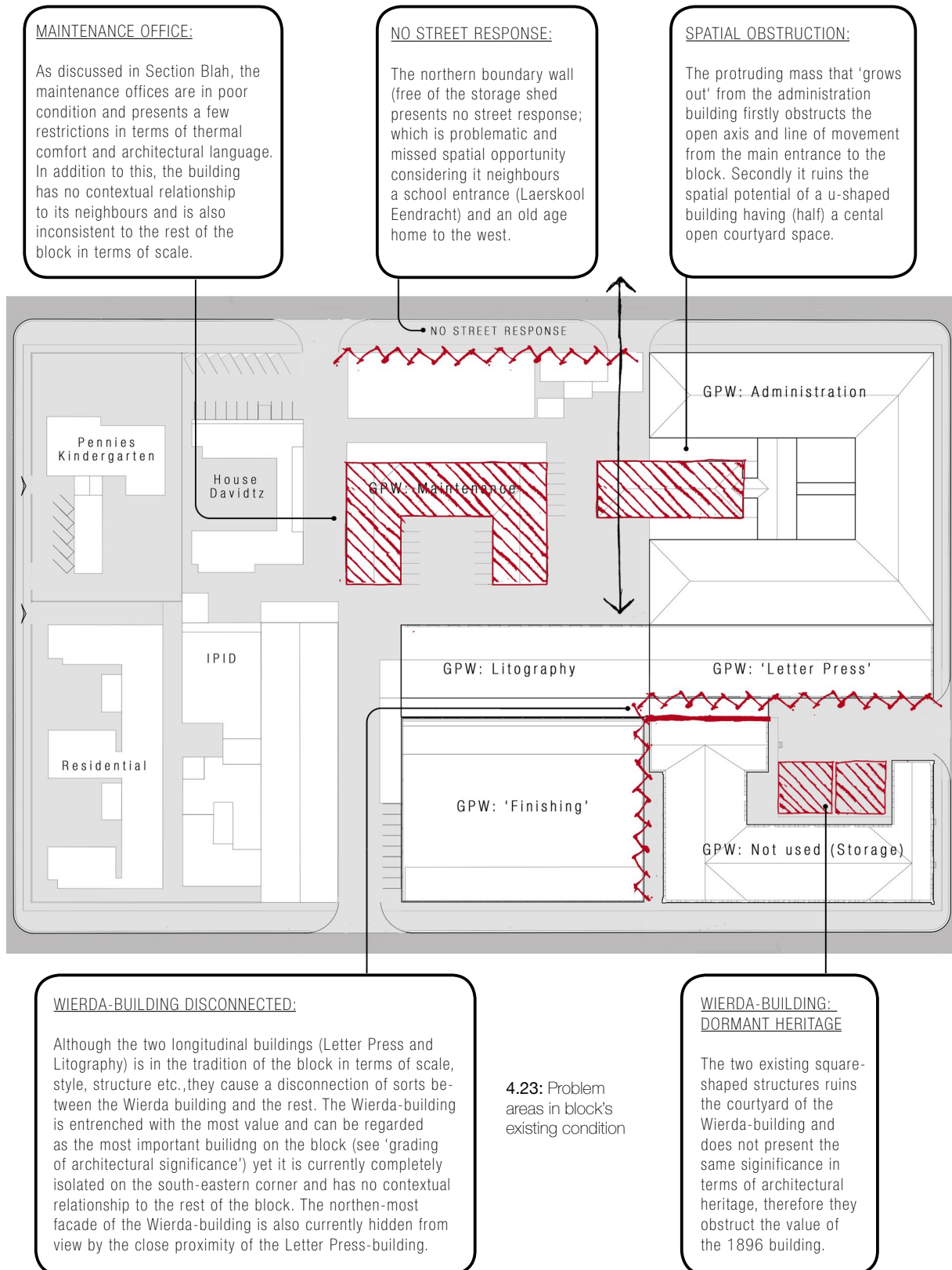
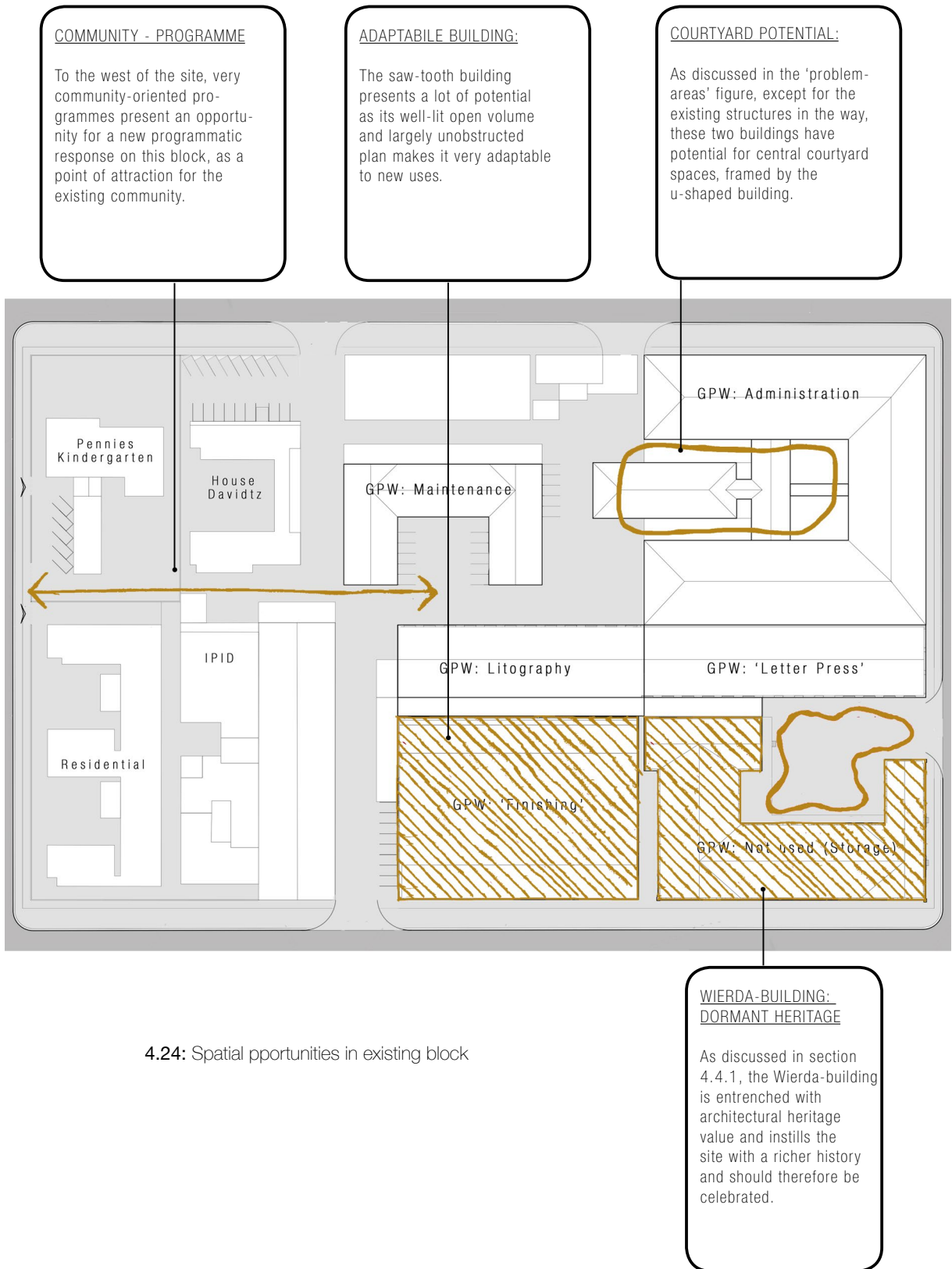


Figure 4.22: Tectonic coherency: Roof sheeting

#### 4.5.2 URBAN BLOCK ANALYSIS: PROBLEM AREAS



### 4.5.3 URBAN BLOCK ANALYSIS: OPPORTUNITIES



4.24: Spatial opportunities in existing block



#### 4.5.4 INTANGIBLE HERITAGE

The GPW block is a light-industrial complex built for the “production and dissemination of information” (Clarke, Kuipers and Swart, 2015: 115). This site is about the recording, printing and publishing of knowledge and the architecture tells this story. Figure 4.25 is a summarizing illustration of the intangible heritage that is captured by the physical and meta-physical qualities on this site.



4.25: Intangible heritage of GPW block (Author, 2016)



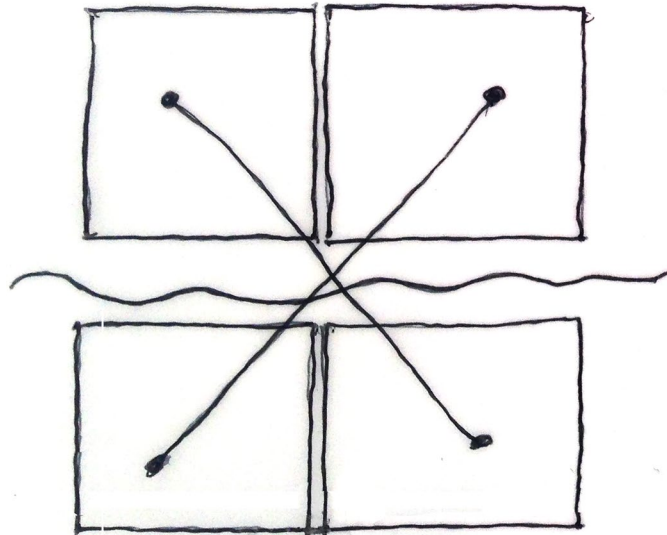
#### 4.5.5 STATEMENT OF SIGNIFICANCE:

##### BLOCK IN ITS ENTIRETY

In conclusion, the GPW block is a light-industrial complex with a rich (both tangible and intangible) heritage. The architecture embodies the essences of its intrinsic purpose: gathering, producing and distributing knowledge.

In light of all the information discussed in this chapter, the structures on this site present a history dating back more than a century. The architectural languages are characterised with traits of functionality, efficiency, industry and in some cases there is a layered effect of after-thoughts for unforeseen problematic elements (examples include the sun-screening add-on's and all the randomly-scattered open shed structures throughout the block).

The existing composition of the block as a whole suggests that there was no masterplan for this block; it just expanded over time and another building was built wherever seemed logical, as more space was needed. Therefore the resultant condition is one of overcrowding, buildings seem as though they are almost 'compressed' together (as if they do not have space to 'breathe'). This in turn caused disconnectedness between certain parts - specifically the part ranked highest on the grading of architectural significance - the 1896 Wierda building, which is cut off and isolated from the rest.





# Chapter 5

# P R O G R A M M E



SOFTWARE / OPERATING SYSTEM / ENGINE / PROGRAMMING



“Education is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that the son of a mineworker can become the head of the mine, that a child of farmworkers can become the president of a great nation. It is what we make out of what we have, not what we are given, that separates one person from another.”

- Nelson Mandela, 1995





## 5 . 1 I N T R O D U C T I O N

The following section is an explanation of the programme of a T.E.L. (Technology-Enabled-Learning) Centre for the Creative Arts. It starts off highlighting the need for educational centres in the country beyond just formal schooling; thereafter it zooms in to the context of the GPW site and investigates why such a programme is necessary in that area. Following is a discussion on the future of education and what impact technology will have on it, as well as an analysis on various methods of learning and the spatial arrangements to accommodate them. Finally this chapter concludes with an explanation of a typical development scenario for such a learning centre. Various sources were consulted for this chapter, including general statistics as well as academic research studies and their implications in the built environment.

## 5.2 NEED FOR EDUCATION IN SOUTH AFRICA

## 5.3 NEED FOR ALTERNATIVE HIGHER EDUCATIONAL FACILITIES

## 5.4 PROMOTING CREATIVE ARTS IN THE CYBER-AGE [ESPECIALLY IN THE N-W-Q]

## 5.5 FUTURE OF EDUCATION

## 5.6 TYPES OF LEARNING:

### 5.6.1.1 TOWARDS LEARNING AS A SOCIAL PRACTICE

### 5.6.1.2 COMBINING EDUCATION AND RECREATION

### 5.6.2 PERSONALISED LEARNING [ENVIRONMENTS]

### 5.6.3 CITY AS A SCHOOL

### 5.6.4 BLENDING PHYSICAL & VIRTUAL LEARNING SPACES

## 5.7 PROGRAMME: T.E.L. [TECHNOLOGY-ENABLED-LEARNING] CENTRE

## 5.8 DEVELOPMENT SCENARIO

## 5.2 NEED FOR EDUCATION IN SOUTH AFRICA

As mentioned in Chapter 1, the current unemployment rate for South Africa is 25,2% (Statssa, 2016), and that is only the recorded rate - one can speculate about the true figure being higher. This condition is a result of many underlying factors, one of them being the lack of good quality education for all spheres of society - and not only in the current era, but also in the past few generations. Economist Francis Wilson (as cited by Fiske and Ladd, 2004: 52) wrote in an essay on the legacy of apartheid:

*"The destructive impact of the "Bantu Education" system wrought damage that will take decades if not generations to repair. The old pre-apartheid education system, despite its many faults, had the potential for ensuring a decent education for all South Africans during the second half of the 20th century. But the mean-spiritedness which underlay the philosophy of "Bantu education"; the inadequacy of the funds made available throughout most of the apartheid years; and the crippling effect of job-reservation and the color-bar on the acquisition of skills and experience by the majority of workers could almost have been designed to prevent them from being adequately prepared for the challenges of globalisation in the 21st century."*

In light of this statement, the following generations will still be fixing the scarring of the previous political paradigm in terms of educational equality. During the last two decades, in the city of Pretoria there has been a great surge in the number of schools and various educational facilities, especially in the CBD area. The National Library of South Africa on the corner of Johannes Ramokhoase and Thabo Sehume Streets accommodates over 3000 people on a daily basis (Malan, 2016). Therefore, beyond just formal schooling, there is a greater need for public services that provide for the enrichment and further education of the people.

## 5.3 NEED FOR ALTERNATIVE HIGHER EDUCATIONAL FACILITIES

As noted in the introduction, universities alone are not sustainable if they are the only form of tertiary educational institutions: Poplak (2016) writes that "young South Africans desperately need higher education in order to close an inequality gap", but that they find difficulty in navigating the university system partly because "it costs so much in fees and related expenses" and also that "too many students are unprepared for university" because of inadequate primary and secondary education.

In an interview conducted with Adam Habib (Poplak, 2016) he recognises the need for (and current lack of) alternative higher educational institutions in South Africa, beyond universities, such as **vocational schools and training facilities** "to sop up students destined to fall through the gaps". While universities need to maintain high standards, according to Habib, intermediary institutions (beyond secondary schooling) are necessary for people at the lower end of the educational scale to move upwards from their existing skill-level. Therefore, in order to move towards closing the inequality gap in South Africa, alternative educational facilities, that provide learning courses beyond secondary schooling, are necessary. These alternative learning courses include vocational skills and technical training for practical trades such as carpentry, plumbing, electrician, automotive service technicians and mechanics, etc.

## 5.4 PROMOTING CREATIVE ARTS IN THE CYBER-AGE [ ESPECIALLY IN THE N - W - Q ]

This being said, (as briefly mentioned in Chapter 1), Lodder (2016) states that we stand on the brink of the *fourth industrial revolution* (see Figure 2.1) in which it is estimated that 47% of existing jobs are at risk for replacement by digital and robotic technologies in the next twenty years (Lynch, 2015). This 47% constitutes jobs that typically characterise positions in the manufacturing and services industries (Lynch, 2015). Therefore, the people who will suffer the most by *the fourth industrial revolution* are the middle- and lower-income spheres of society. The north-western quadrant is currently characterised by these spheres, especially with the new mixed-use and social housing complex (Thembelihle Village) being constructed across the road to the north-west. It is therefore of critical importance that the inhabitants of this neighbourhood be equipped with skills that will be of value not only now but also throughout future changes in the employment market.

In summary, although technical skills training is very necessary in the current condition of education and inequality in South Africa, one cannot ignore the fact that it will be largely consumed by technology in the near future, and then what occupations will these people be left with?

As pointed out in the introduction, one thing that technology will not replace (at least not for a while, according to author Ian Pearson, (2015 as cited by Muoio)) is humans' ability to think creatively, which, he says "will protect a certain subset of jobs". In a study conducted by Oxford associate professor, Michael Osborne (as cited by David, 2015), it was found "for both the UK and the US, that almost 90% of creative jobs are at low or no risk of automation". These 'creative jobs' constitute a variety of creative artisan skills, including visual art and sculpture, fashion and jewellery design, also musical training such as learning instruments and notes, etc.

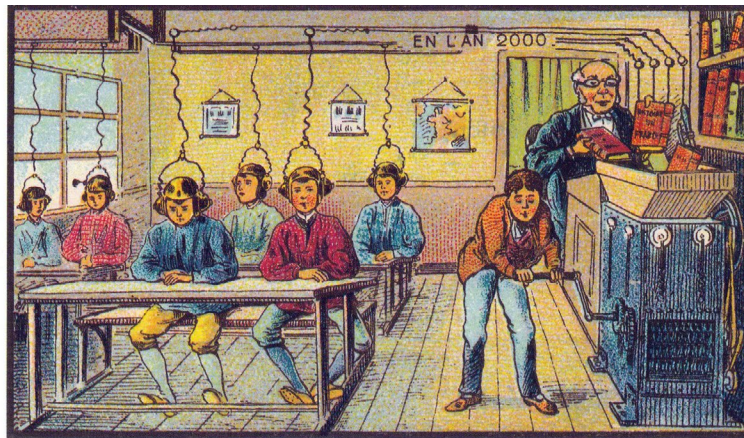
The learning programme content presented at this facility will therefore be focussed on a variety of craft skills; including vocational trade skills in response to current conditions, and also creative arts training in preparation of future conditions. It forms part of the EPWP (Expanded Public Works Programme) which will be discussed further in section 5.11. This will also have an uplifting effect on the stagnant condition of the area, which is in dire need of urban regeneration, and, as Jane Jacobs points out (1992:14), the success lies in the "most intricate and close-grained diversity of uses that give each other constant and mutual support, both economically and socially". A public learning centre will work well as a core attraction in the area to further stimulate a healthy urban neighbourhood.



v o c a t i o n a l t o c r e a t i v e s k i l l s t r a i n i n g

## 5.5 FUTURE OF EDUCATION

With regards to the underlying theme in this dissertation of *time and change*, it is necessary to investigate current modes of learning as well as how these will change throughout the life-span of a building.



At School

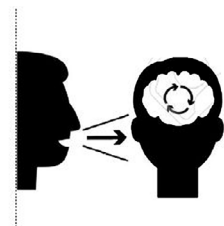
**Figure 5.1:** Representation of a future school by either Jean Marc Cote (in 1901) or Villemard (in 1910)

An interview was carried out with Bill Gates (Newton, 2016) and he speculated on the future of education and specifically, *personalised learning*. His own foundation has invested more than \$240 million in this field and he is confident about how technology will transform the educational system from a one-size-fits-all (thirty kids - one teacher) scenario to much more personalised learning for each student. He stated the following:

*"In general, the idea is that people progress at a different rate. If you're ahead of what's being taught in the class, that's not good, you get bored. If you're behind, then they're using terms and concepts that create a general impression of "Hey, I'm not good at this." And science and math in particular — if they're talking about something you haven't had the explanation on, you just really give up in that area. And there is no way that you are brought back into it."*

It is estimated that by 2019 more than 50% of educational courses will be done through 'e-learning' (electronic learning) (Laskaris, 2015). Most educational institutions are already providing electronic courses that can be completed from home without ever attending a physical class; live video streaming of lectures and the development of automatic grading software also provide online learning platforms. Beyond this, with the rise of virtual reality technology, in the coming decade (according to Gates) education will see a much greater level of interactivity between learner and (virtual) teacher. He states (Newton, 2016) that one will be able to engage in a dialogue with an AI (artificial intelligence) tutor, asking questions and advice. The beauty of this virtual teacher is that the learner will be able to go through the same lesson as many times as he wants - the virtual tutor won't get tired of repeating himself. Furthermore, the virtual learning software will be able to track a learner's progress and record information and data to come to a better understanding of where and how learners struggle (Koller, 2012).

virtual tutor





## 5.6 TYPES OF LEARNING:

### 5.6.1.1 TOWARDS LEARNING AS A SOCIAL PRACTICE

*"Our institutions...are largely based on the assumption that learning is an individual process... and that it is the result of teaching...Hence we arrange classrooms where students - free from the distractions of their participation in the outside world - can pay attention to a teacher or focus on exercises...To assess learning we use tests with which students struggle in one-on-one combat... and where collaborating is considered cheating. As a result, much of our institutionalised teaching and training is perceived by would-be learners as irrelevant, and most of us come out of this treatment feeling that learning is boring and arduous, and that we are not really cut out for it.*

*So, what if we adopted a different perspective, one that placed learning in the context of our lived experience of participation in the world? What if we assumed that learning is as much a part of our human nature as eating or sleeping, that it is both life-sustaining and inevitable, and that - given a chance - we are quite good at it? And what if, in addition we assumed that learning is, in its essence, a fundamentally social phenomenon, reflecting our own deeply social nature as human beings capable of knowing?"*

*- Wenger, 1998: 3*

The proliferation of personalised learning brings forth the individualised learning experience in which the learner has full control. It also conveys learning on one's own, which breeds social isolation (see Chapter 4). In opposition to this, is the social constructivism theory which maintains that learning is intrinsically a social phenomenon; and, as demonstrated by Swiss educational theorist, Étienne Wenger (1998: 5), all humans are social beings of nature, and they belong and learn in communities; he dismisses the distinctions between learning, socialising and living - saying that they are intrinsically one and the same. Wenger devised a learning model (Figure 5.2) that interconnects the concepts of community, identity, practice and meaning with the act of learning as being one inseparable process. Furthermore, Chatti et al. (2010) explains that T.E.L. (technology-enabled learning) "models thus need to recognise the social aspect of learning and put a strong emphasis on knowledge harnessing within a social context". In light of this inherent social nature of humans, the T.E.L. Centre is focused on collective, social space-making.

This is especially commendable in a heterogenous South African context to promote social interaction and cultural blending. A spatial configuration in a public learning centre can spark a spontaneous conversation between individuals from different cultures, and thereby breaching previous cultural boundaries. Learning is intrinsically a social phenomenon; and, as demonstrated by Swiss educational theorist, Étienne Wenger (1998: 5), all humans are social beings of nature, and they belong and learn in communities; he dismisses the distinctions between learning, socialising and living - saying that they are intrinsically one in the same. Wenger devised a learning model (Figure 5.2) that interconnects the concepts of community, identity, practice and meaning with the

act of learning as being one inseparable process. Furthermore, Chatti et al. (2010) explains that TEL (technology-enabled learning) “models thus need to recognise the social aspect of learning and put a strong emphasis on knowledge harnessing within a social context”. In light of this inherent social nature of humans, the digital and virtual [reality] learning arcade is focussed on collective, social space-making.



Figure 5.2: Wenger's learning model that integrates learning with community, identity, practice and meaning

#### 5 . 6 . 1 . 2 C O M B I N I N G E D U C A T I O N A N D R E C R E A T I O N :



Malone and Lepper (1987: 223) states that “it seems a frequent assumption about schools that learning is boring and unpleasant drudgery - something one endures only to avoid punishment or to achieve some external goal” and advocates the design of ‘intrinsically motivating learning environments’. In light of this statement, this negative perception that people - not only school children, but adults as well - have of learning is impeding a lot of human potential. If one can alter the general impression of learning, the motivational issues that inhibit learning will be lessened. Therefore the purpose of the programme of the learning centre is to combine the educational function with an underlying atmosphere of recreation. Besides the blurring of physical and virtual learning spaces, the programme should therefore also include ‘pockets of play’ throughout the learning complex, for example a games arcade, social canteen space and green relaxation cavities. This provides relief from the concentration of learning and it will also alter the general perception and view from the outside of the place of ‘boring and unpleasant drudgery’ to an attraction point for fun and enjoyment.

## 5.6.2 PERSONALISED LEARNING [ENVIRONMENTS]

### - TOWARDS SPATIAL ADJUSTABILITY -

In a study conducted by Cameron and Harrison on the *interrelatedness of formal, non-formal and informal learning, and also semi-formal learning* (see definition of terms), it was found that 84% of the respondents reported to drawing on a combined approach in terms of learning modes for learning new skills; only 16% of the self-reported skills were learnt using a single learning mode. Their report argues for a **holistic approach in terms of all the different learning modes** and its dynamic interrelatedness rather than constraining learners by a 'deterministic dichotomy between formality and informality' (Cameron & Harrison, 2012: 278). Further in support of this, Walton (2016: 145) states that 'formal' and 'informal' learning must be seen as a continuum of 'learning' rather than as contrasting modes".

Wenger asks the question of how we can "minimise teaching so as to maximise learning?" (1998: 267). This query puts the focus on the **learner to have full control over his own learning**, stimulating his own personal will for voluntary and autonomous learning. Therefore, apart from just the fixed physical spatial arrangements of learning environments that are provided to the learner, an emphasis is put on how the learner should have control over his own spatial learning arrangement.

Keppel (2014: 6) emphasises that learning spaces should "provide sufficient flexibility so that learners can re-configure the informal space to suit their own learning needs". Furthermore, Chatti et al. (2010 as cited by Fraser, 2014: 7) states that "personalised learning strategies are based on personal learning environments that 'support self-organised, informal, lifelong learning and network learning and translates the principles of constructivism and connectives into actual practice'" where 'learners are responsible for creating and maintaining their very own learning environments, self-adapted to their individual needs'.

DEFINITION OF TERMS FOR MODES OF LEARNING: (Cameron & Harrison, 2012: 280)

**Formal learning:** Learning through a programme of instruction in an educational institution, adult training centre or in the workplace, which is generally recognised in a qualification or a certificate.

**Informal learning:** Learning resulting from daily work related, family or leisure activities.

**Non-formal learning:** Learning through a programme but it is not usually evaluated and does not lead to certification.

**Semi-formal learning:** Learning in which individuals, 'may learn during activities with learning objectives but they learn beyond the learning objectives; this is semi-formal learning...Individuals have the intention of learning about something and, without knowing it, learn also about something else' (Verquin 2007 as cited by Cameron & Harrison, 2012: 284).

### 5 . 6 . 3 C I T Y A S A S C H O O L

Chatti et al. (2010: 75) notes that “knowledge is distributed and ubiquitous in nature and learning is now happening in a world without boundaries...and that T.E.L. (Technology-Enabled Learning) models need therefore to operate in a decentralized, loosely coupled, and open context.” In relation to this, an architect known for his humanist-centred educational design philosophies, Herman Hertzberger, (2008: 9) states the following:

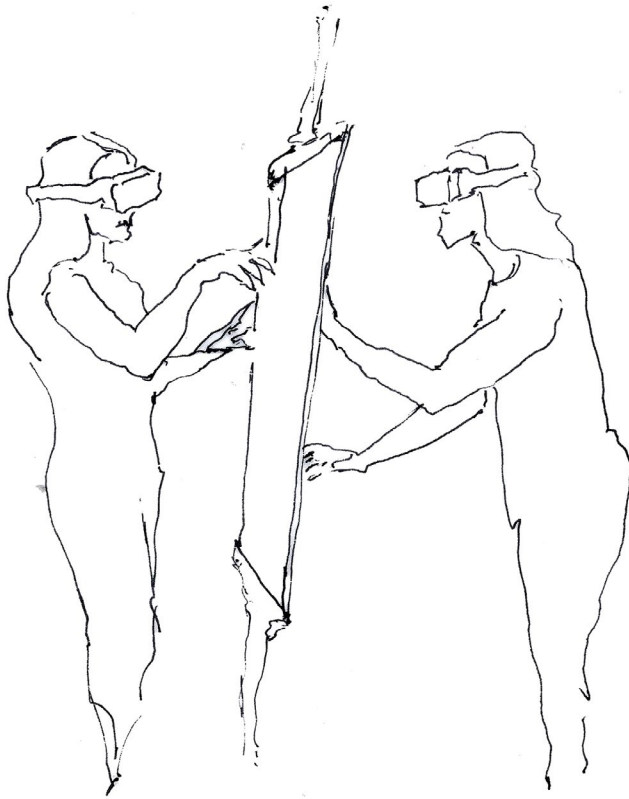
“Not only does the school become like a city; with learning expanding beyond the school curriculum it is important that our entire environment is educational. Just as continuing education is no longer confined to school hours, so with learning leaving the school territory and embracing the surroundings as a whole we can speak of ‘boundless education’. Then not only does the school become a small city but the city becomes an exceedingly large school. This is a call to make the city instructive, a ‘Learning City’, in other words a stimulating, meaningful environment that points people, especially young people, in the right direction and leaves them wiser.”

### 5 . 6 . 4 B L E N D I N G P H Y S I C A L & V I R T U A L L E A R N I N G S P A C E S

In the spirit of how digital technologies are taking over the educational realm, it is important for architects to take this into consideration when designing - otherwise the digital screen will just pop up wherever an economically-driven opportunity presents itself, with *Times Square* being the prime public example. Keppel (2014: 5) advocates ‘physical, blended or virtual learning environments’ or ‘areas’ that enhance learning and motivate a learner to learn, which constitutes a design approach “whereby both face-to-face and online learning are made better in the presence of each other”. In support of this van Schaik (2014: 244) notes that “briefing and procuring real and virtual environments in tandem will enliven future space use in universities”; in taking his statement further, to the city (as a school) at large (as Hertzberger pointed out), the design focus is a hybrid space that blends virtual and physical spatial arrangements that are all focused on the act of learning.

## 5.7 PROGRAMME:

### T.E.L. [TECHNOLOGY-ENABLED-LEARNING] CENTRE



In conclusion, the programme for the new building therefore constitutes a T.E.L. [Technology-Enabled-Learning] Centre that is focused on absolute adaptability in terms of spatial arrangement, which puts the learner in full control of his learning environment; that seeks to blend the real and virtual learning spaces in a stimulating way for the learner, as well as blur the programmes of education and recreation; and which also needs to be able to absorb and adapt to changing technologies in future.

Figure 5.3 (programmatic masterplan) indicates a schedule of accommodation and proposed spaces for the T.E.L. Centre; it is indicated if the underlying programmatic intention of the function is educational (blue) or recreational (green) or a blurred combination of the two.



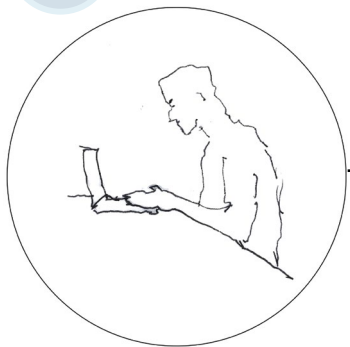
Additionally illustrated in this figure is the proposed typical characters that would form a part of the public clientele. Following the masterplan is an elaboration of each programmatic component with relevant case studies.





# programmatic masterplan

education



**E - STUDENT**

DOING ONLINE  
COURSE



**SCHOOL  
CHILDREN**

DOING HOMEWORK  
/ PROJECTS



**FREELANCE  
PROFESSIONAL**

CO-WORKING WITH  
OTHER FREELANCERS

**T.E.L.  
stations**

individual

**MODULAR  
BUILT-IN  
T.E.L. PODS**

collaborative

**T.E.L.  
group  
stations**

**group  
meeting  
rooms**

**HOUSE  
KEEPING**

server  
rooms

locker  
rooms

V.R.  
programmer's  
offices

reception

service &  
kitchen

**cafe /  
canteen**

restroom

restroom

**interactive  
[open] T.E.L.  
commons**

learning spaces

restroom

**SO  
PL**

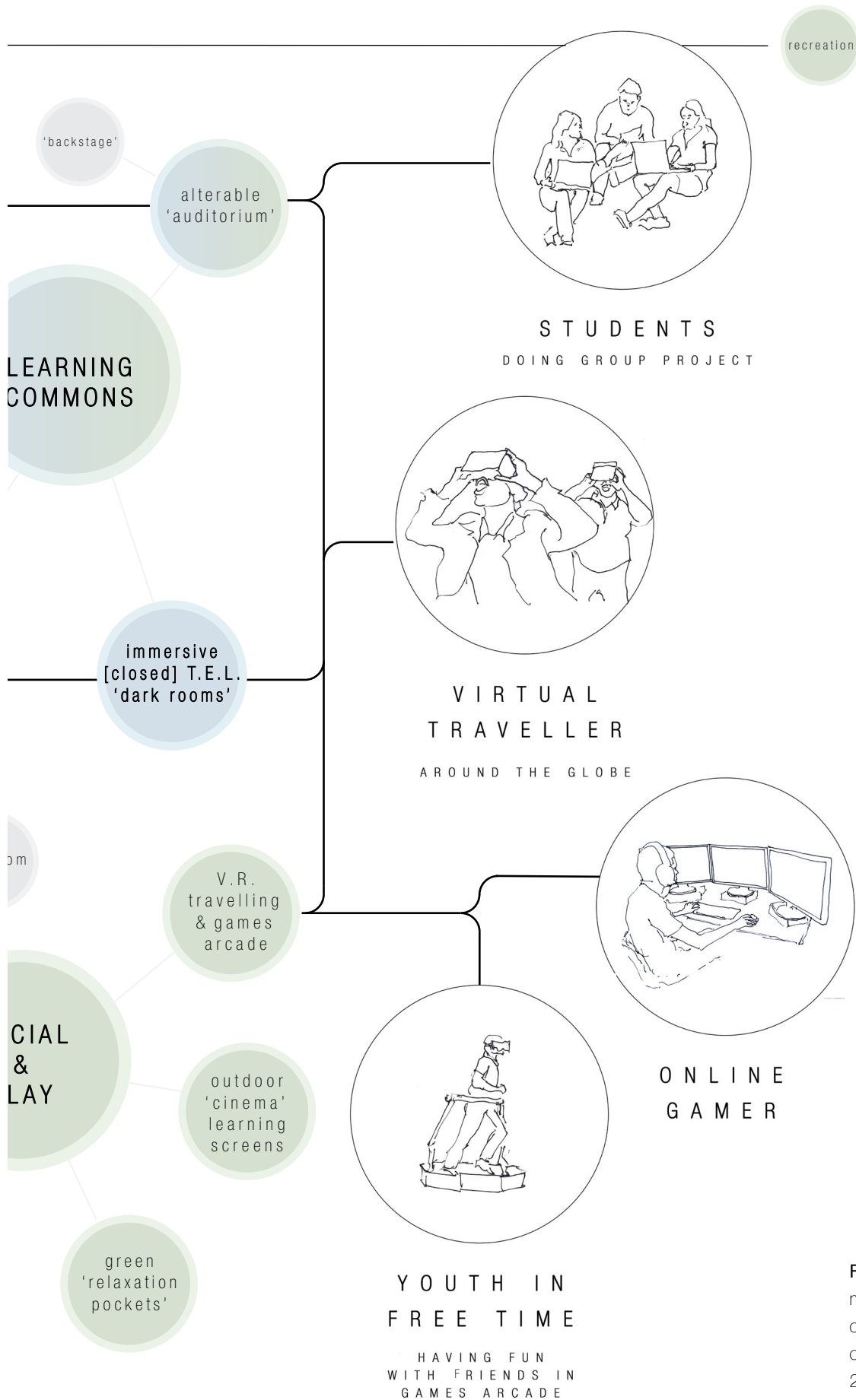


Figure 5.3: Programmatic masterplan indicating different characters and schedule of accommodation (Author, 2016)

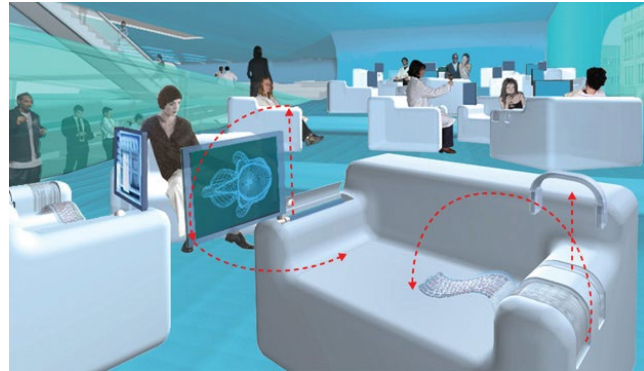
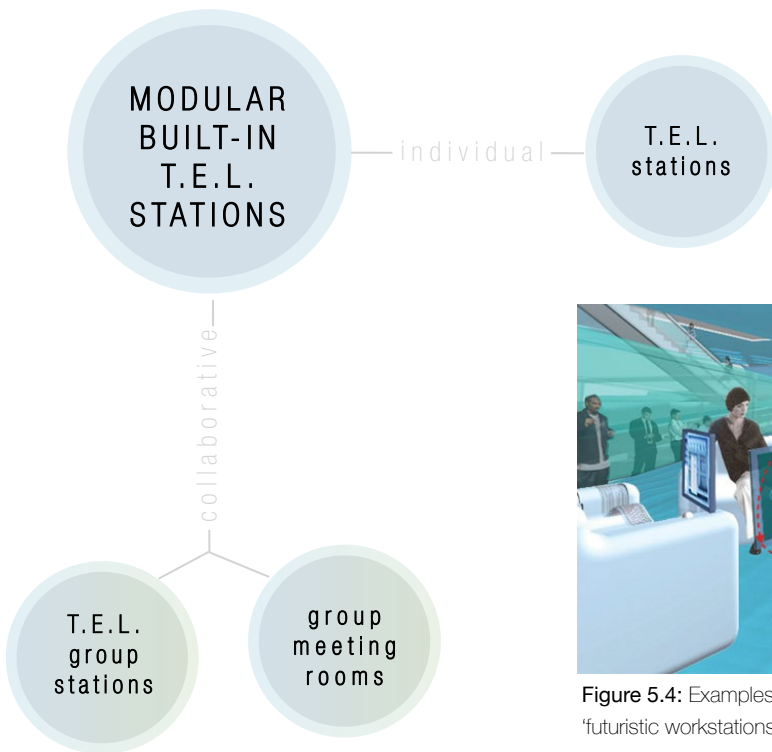


Figure 5.4: Examples of 'futuristic workstations'

### 5.7.1 MODULAR T.E.L. PODS

Figure 5.4 indicates examples of visionary futuristic 'workstations' in which the boundary between technology and physical ergonomic dimensions is blurred; the technology-enablement is integrated with the physical elements.

It also focusses on accommodating physical human needs that are compromised by the static computer screen sitting position - for example integrating walking and / or running tracks to the station (where a hamster-wheel meets an office desk).

Another focus point is the adjustability of the seating, screen heights, and operability to accommodate different and personalised user-requirements.

Figure 5.5 also shows adjustable group-working stations that are integrated with technology to ease the workflow and promote a communal, social interactive working environment.



Figure 5.5: Adjustable group working stations





Figure 5.6 illustrates newly emerging (currently existing prototypes) technologies that visualises the way forward with regards to the digital display screen and which will have an impact on the spatial requirements.



A.) FLEXIBLE DISPLAY:

Thin and bendable LED screen which allows for a wider (panoramic) view span.



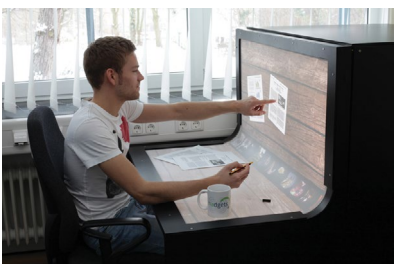
B.) HOLOGRAPHIC PROJECTION:

- Concentrated light projection
- Visible in mid air but display is better when projected in front of a blank backdrop



C.) AUGMENTED REALITY:

- Mixed reality whereby virtual elements are seen through A.R. headset in the context of the real physical surroundings. Depending on the content, a blank backdrop may be necessary



D.) BENDABLE SCREEN-DESK

- Desk and display screen in one whereby physical user-input can happen directly into the screen interface

Figure 5.6: Newly emerging technologies

In light of these examples, the spatial requirement for the T.E.L. pod (whether individual or group configuration) is summed up in the following:

- Connection points to whatever electrical and data services necessary for the specific technology
- Adjustable ergonomic constituents
- In most cases a blank backdrop plane (onto which light projections can be shown, against which augmented projections can be viewed or into which digital display screens (whether bendable or not) can be mounted).



## LEARNING COMMONS

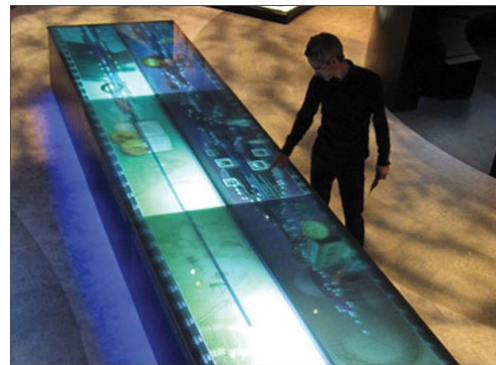
“interactive learning”

interactive [open] T.E.L. commons

### 5.7.2 LEARNING COMMONS

The term ‘learning commons’ typically refers to ‘learning spaces, similar to libraries and classrooms that share space for information technology, remote or online education, tutoring, collaboration, content creation, meetings and reading or study’ (Educause, 2011). It is frequently noted as a model for the “library of the future” (Attis, 2013).

#### DIGITAL LEARNING SCREENS:

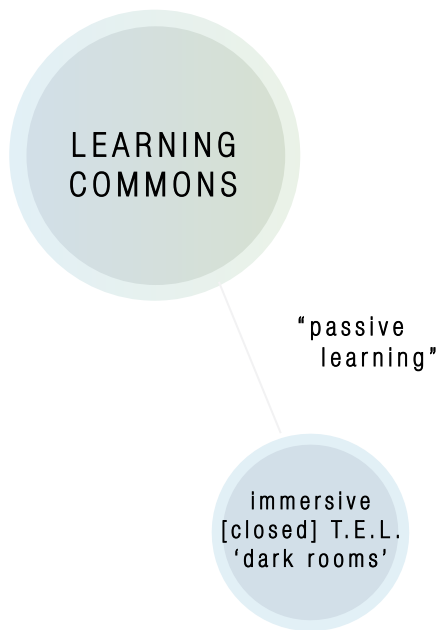


Open-ended spaces where learning material is exhibited and learners can immerse themselves as a collective and ‘experience’ the process together with other people; content can be discussed and analyzed together in an informal manner. In this way learning becomes a social experience when topics are visibly selected and learners are aware of similar interests between themselves and others around them.

#### INTERACTIVE LEARNING EXHIBITIONS:



The learner becomes engaged with the content when the technology-enabled-learning medium is made interactive and ‘fun’.



#### IMMERSIVE LEARNING EXHIBITION (DARK) ROOMS:



Separated exhibition rooms in which learning content, informative documentaries and so forth can be exhibited and the learner can immerse himself in these. The learner himself can become a participant in determining what gets displayed by means of accessible 'control stations' (Unlike a museum in which the content displayed is pre-arranged).

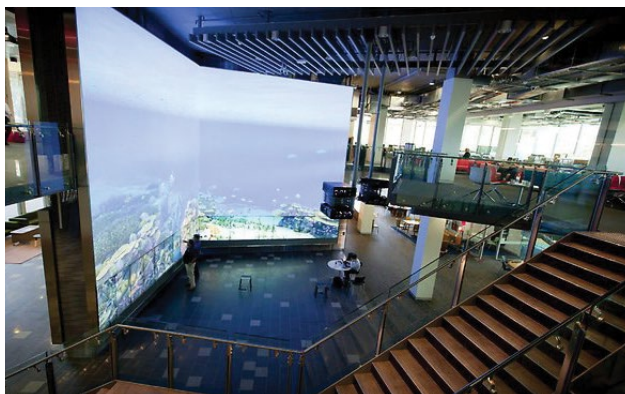


Figure 5.7: Interactive digital screens

Learning screen can double up as a display medium for film screenings





SOCIAL  
&  
PLAY

T.E.  
travelling  
and games  
arcade



YOUTH IN  
FREE TIME

HAVING FUN  
WITH FRIENDS IN  
GAMES ARCADE



ONLINE  
GAMER

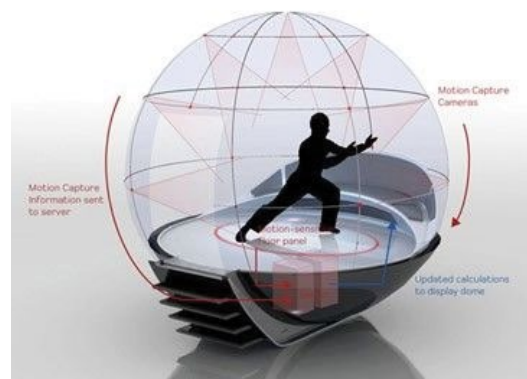


VIRTUAL  
TRAVELLER

AROUND THE GLOBE

### 5.7.3 T.E.L. TRAVELLING AND GAMES ARCADE

The technology-enabled-gaming and -travelling arcade provides recreational activities when learners seek to take a break from their studying. This arcade constitutes various digital as well as virtual and augmented reality gaming activities. It includes both group and individual gaming pods, which are comprised of an omni-directional treadmill (see Figure 5.8) and in some cases a 360 degree projection and motion-tracking dome (see Igloo Vision example in Figure 5.9). Inside these pods the gamer or traveller can virtually experience his surroundings, walk and look around and interact with other characters.



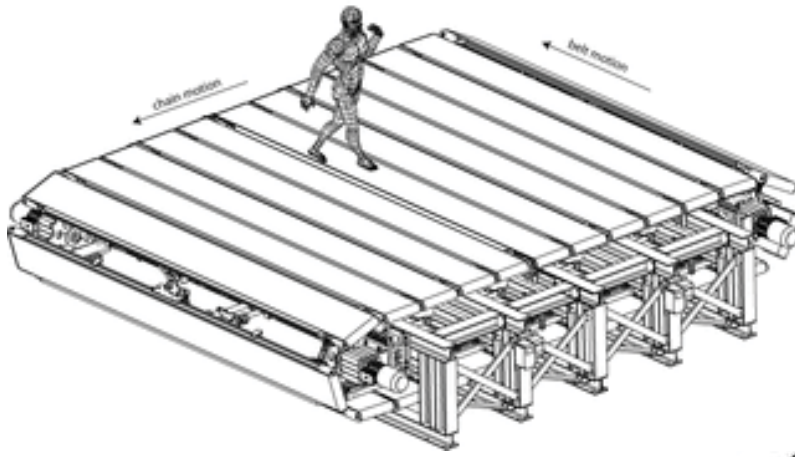


Figure 5.8: Omni-directional treadmill

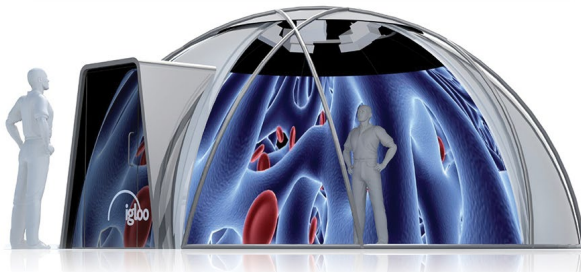
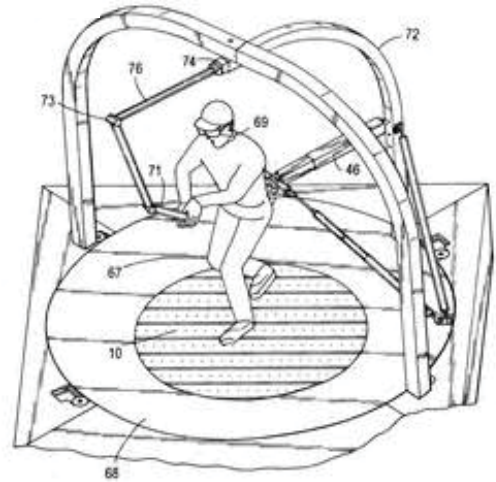
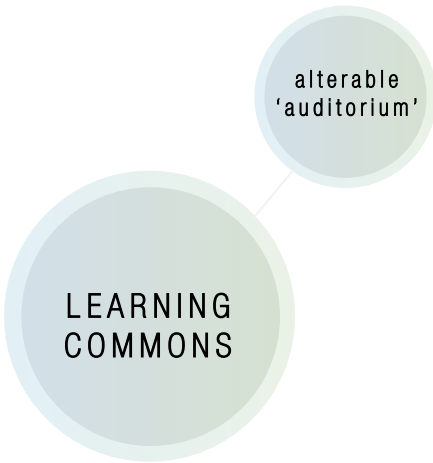


Figure 5.9: 360 degree projection and motion tracking





#### 5.7.4 ALTERABLE 'AUDITORIUM'

In light of the underlying theory of time and change and the alterability of architecture, the conventional *auditorium* typology is viewed rather as a collective assembly of gathered people in a number of situations. These include the accommodation of collective educational functions, such as a public lecture venue, holographic-projected lectures or even educational film-screenings. On the recreational side, the 'gathering space' accommodates events such as film screenings, live or virtually-projected music shows, light-projection concerts etc.

In addition to this the venue can be rented out as a completely open, large volume hall for exhibitions. These different scenarios therefore suggests a modular, dismantable seating arrangement which can be altered and reconfigured for different situations, or completely disassembled. *Theatre on the Fly* (Figure 5.10) is a travelling modular structure with seating levels that can be constructed or dismantled wherever need be.

Figure 5.11 illustrates the holographic projection technology method for virtual characters. With this technology one is able to conduct a lecture or a live interview with a correspondent or advisor on the subject which is on the other side of the planet, but is holographically projected onto the stage. This technology comes in handy when, during the lecture, something arises that is best explained when physically demonstrated in real time by the guest speaker.

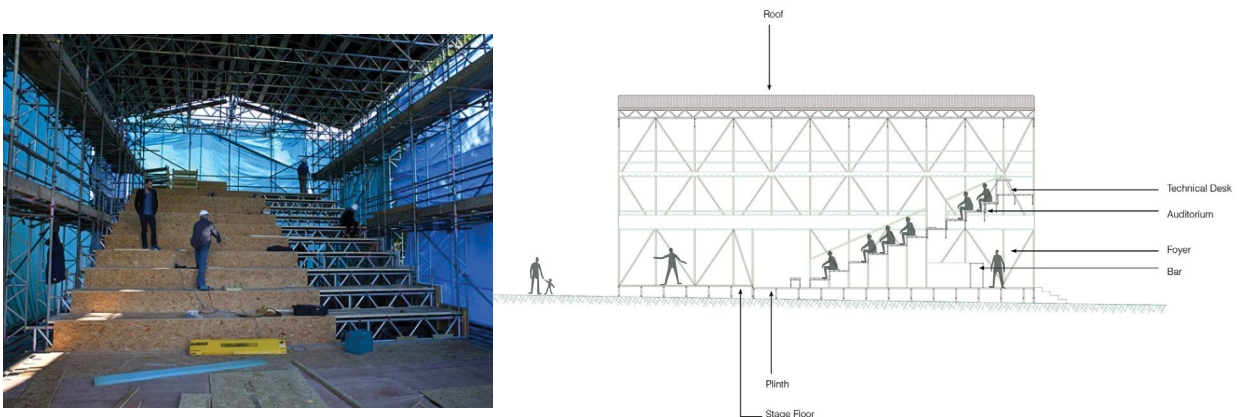


Figure 5.10: Theatre on the Fly



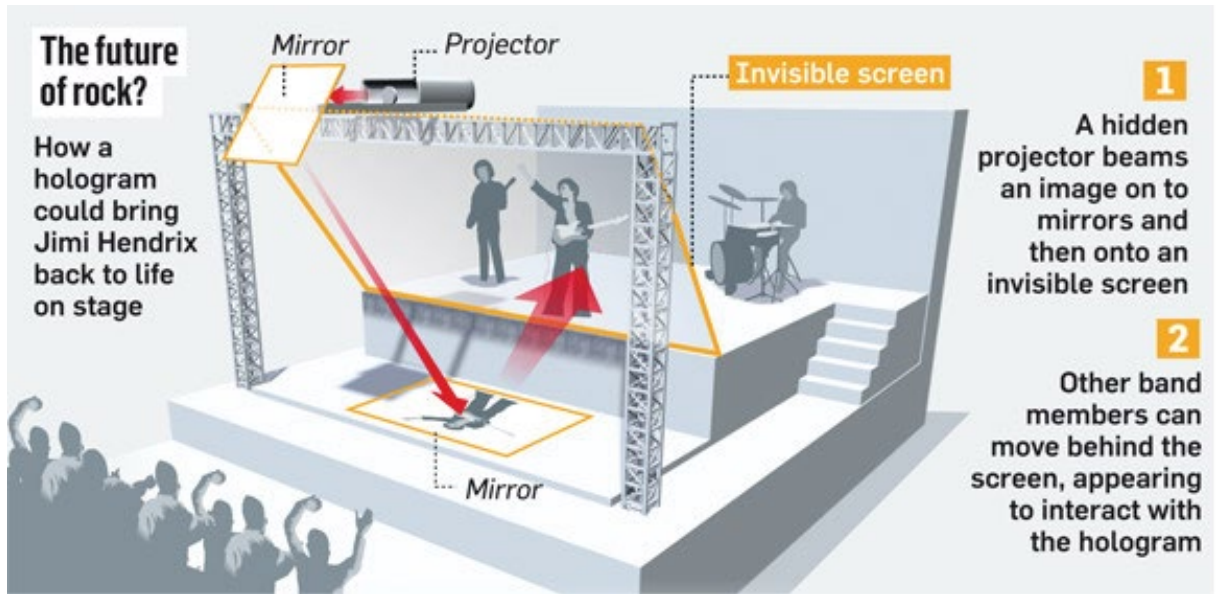
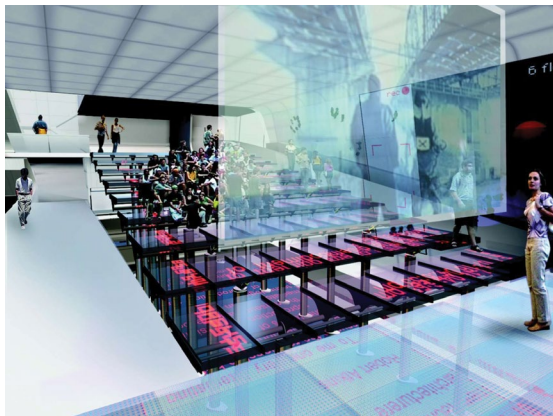


Figure 5.11: Holographic projection for stage backdrop



Figure 5.12: Eyebeam museum proposal by Diller, Scofidio and Renfro



## 5.8 DEVELOPMENT SCENARIO

As previously mentioned, the GPW block is owned by the Department of Public Works. As illustrated in Figure 5.13 the T.E.L. Centre will be a government-funded and developed project by the DPW in relation with the Department of Education. This will occur as a platform to accommodate existing state-provided educational programmes beyond formal schooling, such as the EPWP (Expanded Public Works Programme) which has a sub-programme of a skills-training and business enterprise development.

The EPWP is sub-divided into four categories namely Infrastructure, Non-state, Environment and Culture and Social. (EPWP, 2013). The skills training and development (Vuk'uphile) (EPWP, 2013) fall largely under the infrastructure division, which constitutes the development of labour intensive projects to provide work for unemployed people. When enrolled in this programme, the worker is provided with the necessary technical training for the specific construction methods that will be used in the respective infrastructure project, (whether they are building roads, houses, landscaping, other infrastructural elements etc.).

In addition to this, the Social subdivision presents the 'Kha Ri Gude (Tshivenda for 'let us learn'), which is a mass literacy campaign specifically aimed at adults who missed out on their schooling (EPWP, 2013).

As explained in sections 5.3 and 5.4, this project proposes an expansion within the EPWP of vocational trades skills- and creative-arts-training conducted with digital e-learning and virtual reality. The training constitutes instructive learning from a virtual tutor and with regards to practical training, the virtual system tracks physical demonstrations by means of motion-tracking gloves and 3D-printed (at the Production House (saw-tooth building)) plastic simulations of the actual operating tools necessary; furthermore the practical light-industrial craft techniques can additionally be exercised at the Production House.

The T.E.L. Centre is, however, not limited to state-driven training programmes; the development scenario envisions the project taking the shape of a private-public-partnership (P.P.P.) service in the way of the government to give (tax -) incentives to private-sector companies to provide skills-training courses and professional discipline-specific learning material for any interested party. This government-provided incentive can also form part of the BBBEE skills-development framework for the private sector to score accreditation points for providing a skills-development training service for the public. The following scenarios illustrate this idea:

- A practising architecture firm puts together a virtual presentation (with the help of the T.E.L. Centre's virtual programmers) that truly portrays what the profession is about to a prospective student; a virtual tour can be 'experienced' from the architect's point of view, by the user to effectively understand the process of creation from briefing point up to completion of the building.



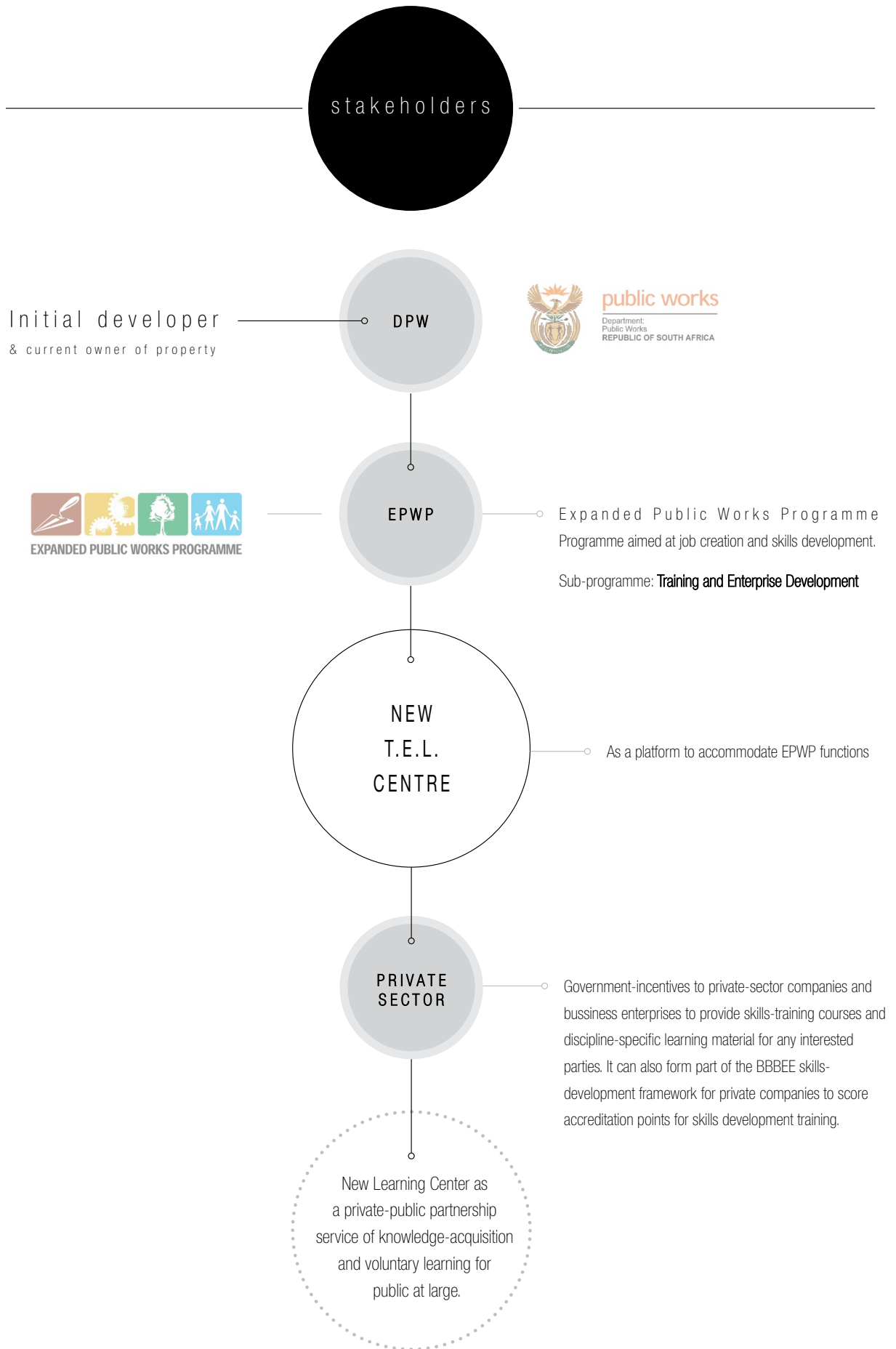


Figure 5.13: Development scenario (Author, 2016)

- A law firm can give a true representation of what the experience of a cross-examination in court is like
- A surgeon can give the learner a true experience of what it feels like with someone's life in their hands; the list can go on.
- Beyond just an introductory virtual tour of the occupation, the professional can effectively provide training courses on their specialised field of study. It can replace the 'book' that many experienced professionals want to write at the end of their careers.

In conclusion, Figure 5.14 sums up the existing and proposed learning programmes hosted by the EPWP and accommodated at the T.E.L. Centre; but the learning centre is, however, also not limited to people who form part of a training programme; it is open to the general public for whoever is in need of a public learning facility. As already mentioned, Figure 5.3 highlights some of the typical users to form part of the clientele.

- Students that are enrolled in an e-learning course can sit and study in the T.E.L. pods
- Students or school children with group projects can use the group T.E.L. pods
- Freelance professionals can use the technology-enabled facility as an office space
- Youths (or anyone else) can use the technology-enabled gaming arcade for recreational purposes
- Any interested party (for example archeology students) can virtually travel the world
- Campus-less students (in light of protests and campus-seizure scenarios) can utilize the T.E.L. pods as well as the 'alterable auditorium'
- This collective gathering space can also be rented out as a conference facility to outside parties for public lectures etc., or for entertainment purposes (- blending education and recreation).

The intention is that the facility will be hosted and managed by the EPWP itself, and that it will function on a membership arrangement - with those who qualify for subsidiary membership grants to be funded by the state.

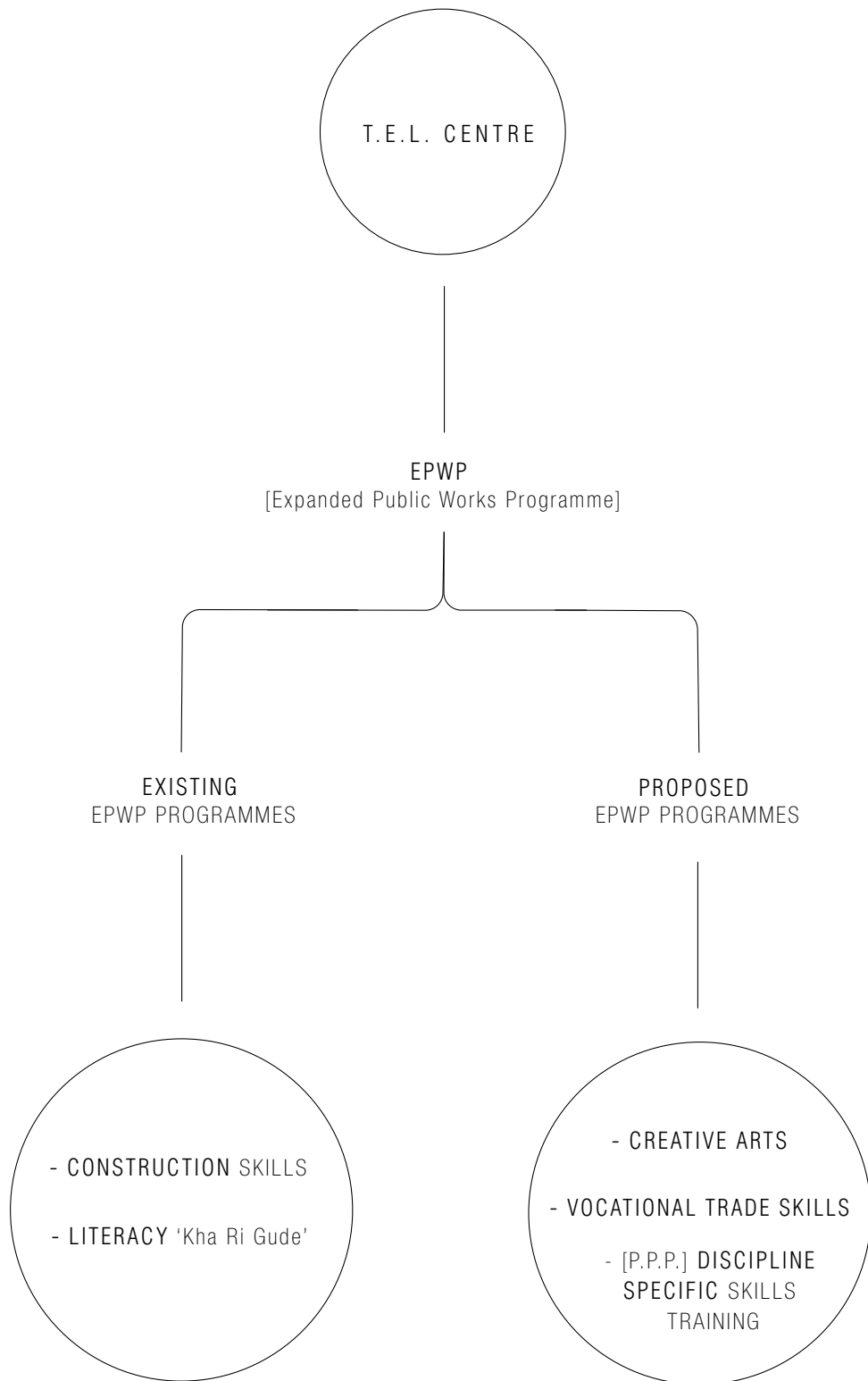


Figure 5.14: Learning programmes in T.E.L Centre



# Chapter 6

## T H E O R Y



RESEARCH / CONJECTURE / SUPPOSITION / SPECULATION





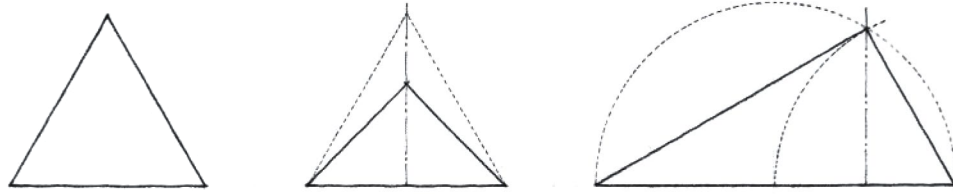


"Life has always seemed to me like a plant that lives on its rhizome. Its true life is invisible, hidden in the rhizome. The part that appears above ground lasts only a single summer. Then it withers away—an ephemeral apparition. When we think of the unending growth and decay of life and civilizations, we cannot escape the impression of absolute nullity. Yet I have never lost a sense of something that lives and endures underneath the eternal flux. What we see is the blossom, which passes. The rhizome remains."

- C.G. Jung



## 6.1 INTRODUCTION



The necessity of an investigation into the adaptability of architecture for this research document is two-fold. Firstly, its basis lies in the overall theoretical premise of time and change as a constant condition of life and how architecture, as a fixed element in the landscape, is inconsistent with this condition. Secondly, this concept of absolute adaptability is particularly emphasised (rendered important) by the programme of a T.E.L. (Technology-Enabled-Learning) centre, which is once more two-fold in its basis for adaptability: firstly as educational theorists point out that the learner needs to be in full spatial control of his personalised T.E.L. environment (as explained in Chapter 4), but also, that the T.E.L. technologies themselves change at an accelerating rate and the architecture needs to be able to accommodate this change.

This section is therefore an investigation into the adaptability of architecture. It starts out with notes on some architectural theorists who have researched this subject, and after each theory follows a discussion on how these theories are applied to the T.E.L. Centre. Then the different elements of the design product are investigated with regard to permanence and change - indicating varying degrees of adaptability for each element. The theorists referred to in this section include Dutch architect Herman Hertzberger, American writer Stewart Brand and Joshua Prince-Ramus of OMA New York.

6.2 Herman Hertzberger: 'POLYVALENCE'

6.3 Stewart brand's 'SHEARING LAYERS'

6.4 Joshua Prince-Ramus: 'COMPARTMENTALISED FLEXIBILITY'

6.5 PERSONALIZED LEARNING ENVIRONMENTS: TOWARDS SPATIAL TRANSFORMABILITY

6.6 CONCLUSION

## 6 . 2 H E R M A N H E R T Z B E R G E R : ‘ P O L Y V A L E N C E ’

In a discussion on the topic of adaptable spatial strategies in an increasingly changing environment, Herman Hertzberger (2014: 108) states the following:

*“That need to have everything under control fosters the compulsion to find lasting solutions for each component, which in turn leads to a fully crystallised outcome appropriate to some fictional static final state where everything is arranged for eternity; that is, where everything is hermetically defined, provided with a fixed meaning, an enclosed world devoid of freedom and change. As long as this illusion persists, more buildings will soon prove to be unusable and past their prime, condemned to an increasingly short useful life.”*

Instead of providing a user with completely open-ended, generic space, which, Hertzberger (2014:109) explains is devoid of all meaning and identity, he introduces the concept of *polyvalence*, or *polyvalent space*, defined by him as a **spatial competence** that can “generate specific responses to each new situation”, that is “able to handle unexpected applications” and “take up ever-new content and still remain itself: inclusiveness as a structure open to interpretation” (2014: 112). He (2014: 113) contrasts the freedom and reduction (“leaving out as much as possible”) of generic space to the concentration and addition of as many place-making potentials as possible to increase the spatial quality of polyvalence. Additionally (2014: 113) he states that “architects must provide, independently of changing designations, not neutral buildings, but buildings with character, explicit, recognisable, authentic, original yet without imposing a particular taste and without deriving their characteristics from the function or designation.”

In order to arrive at this idea of what polyvalent space is (or should be), Hertzberger (2014: 112) advises that architects need to look back in history and see what spatial qualities keep recurring, “albeit in ever new forms from which we can assume that they have played a key role for people everywhere and of all times and therefore possess a greater significance”; he includes a few of these ‘recurring themes’ as the “spatial means of apportioning enclosure and views, light and dark” and of “emphasising ‘linger power’”. Similar to Brand (1995: 59) (6.3), Hertzberger (2014: 113) advises against over-specific and over-expressive forms and fabrications and states that we should rather seek to “distil the essence without lapsing into too explicit a response”.



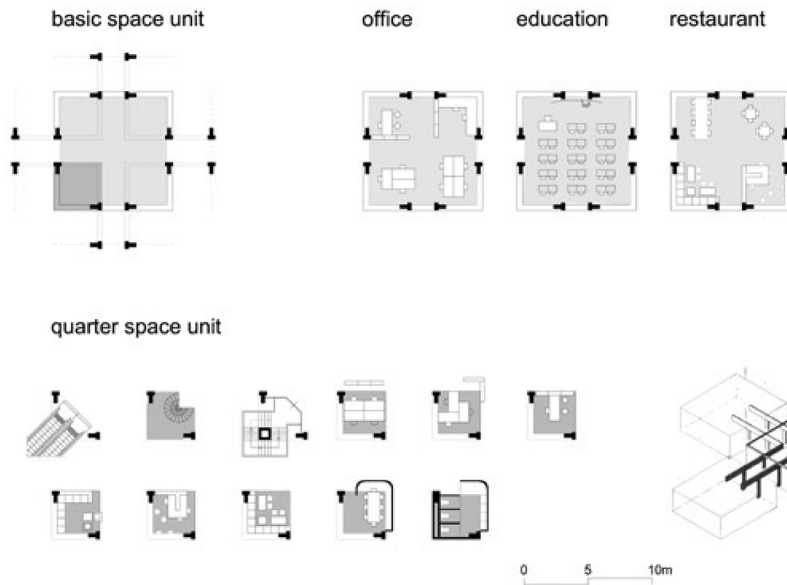
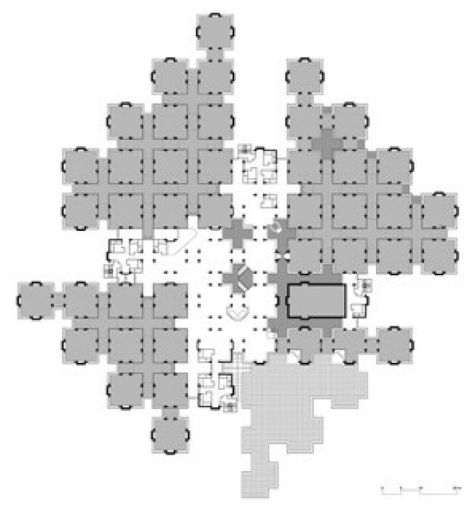
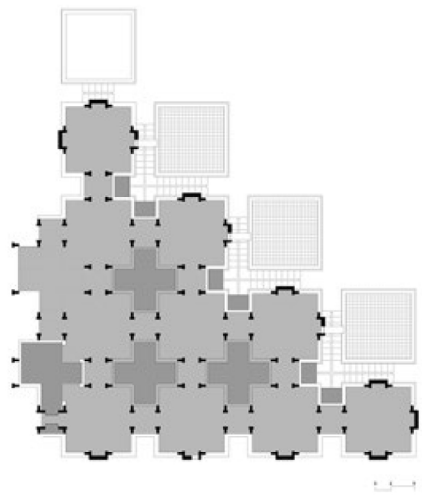


Figure 6.1: Case study on adaptability of space - Centraal Beheer Apeldoorn, The Netherlands, Architectuurstudio HH, 1972: maximised dialogue & connection throughout building on plan and section + modular design of plan layout is adaptable to many functions. (Derix and Izaki, 2014: 110)





**Figure 6.2:** Centraal Beheer Apeldoorn (1968-72) by Herman Hertzberger (Aviodrome Luchtfotografie)

The design-principles of flexibility and maximised human-interaction and dialogue throughout the building are successfully prevalent in the modular design of Centraal Beheer Apeldoorn (Fig 6.2); it also provides flexibility in terms of furniture layout for different usage-scenarios. However, in terms of the overall design, the structure is fairly rigid and the maximum module to house a large group of people is still only a 9m x 9m square shape. The building accommodates its educational facility fairly well but any other programme (or any other educational programme) would still have to conform to that square size space. Perhaps a degree of variability in the layout structure would allow for a wider range of uses and render the building more resilient throughout changes in its future use. This document therefore argues for a building with various degrees of spatial adaptability beyond just furniture layout.

### 6.3 Stewart brand's 'SHEARING LAYERS'

In *How Buildings Learn: What happens after they're built*, Stewart Brand (2012) states that all buildings "keep on growing" and that the thing which makes the difference in whether they grow in a better direction or a worse one, is their *ability to adapt*. Brand (2012) emphasises that city buildings especially, "are constantly forced to regenerate themselves to suit new uses"; he states (2012) that a *learning building* is one that is "constantly improved and refined" and that even the best buildings have to be "refreshed and challenged from time to time" to keep them from becoming a 'beautiful corpse'.

In order to achieve this, Brand (1995: 178) introduces the concept of *scenario planning*; which is a foresight methodology (not future predictions) in order to arrive at an idea about what plausible futures might look like for the building. Through this process, basic plot lines are established on a scale of more realistic to more shocking (1995: 181); thereafter common threads are sought

through these scenarios. He advises not to be too specific about user's needs, or to think short term. Furthermore he states (1995: 186) that one should "favour moves that increase options" and to "shy from moves that end well but require cutting off choices". More specifically Brand recommends having **excessive structural and service capacity** and using **shapes and materials that can grow or be altered easily** (Fig 6.3). This suggests a modular, organic approach to massing and form-making; an architecture to which one could add or subtract later on without destroying the entire architectural intent - additions should not look like add-ons for instance.

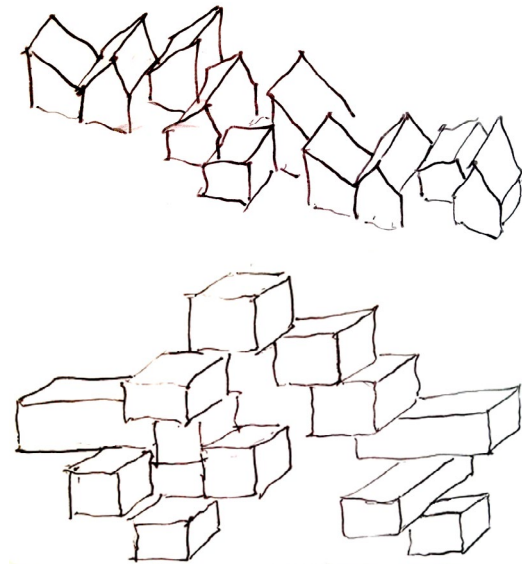


Figure 6.3: Organic composition of building-massing

Figure 6.4 illustrates the 'scenario-buffered-planning' approach applied to the T.E.L. Centre. The typologies chosen are based on existing conversion models that are currently taking place in the CBD context (existing buildings being converted to housing, retail or offices etc.); besides this, the scenarios are informed by what other programmes would work or are necessary in that context. On the more 'plausible' side of the scale, a common thread that can be identified is a modular spatial

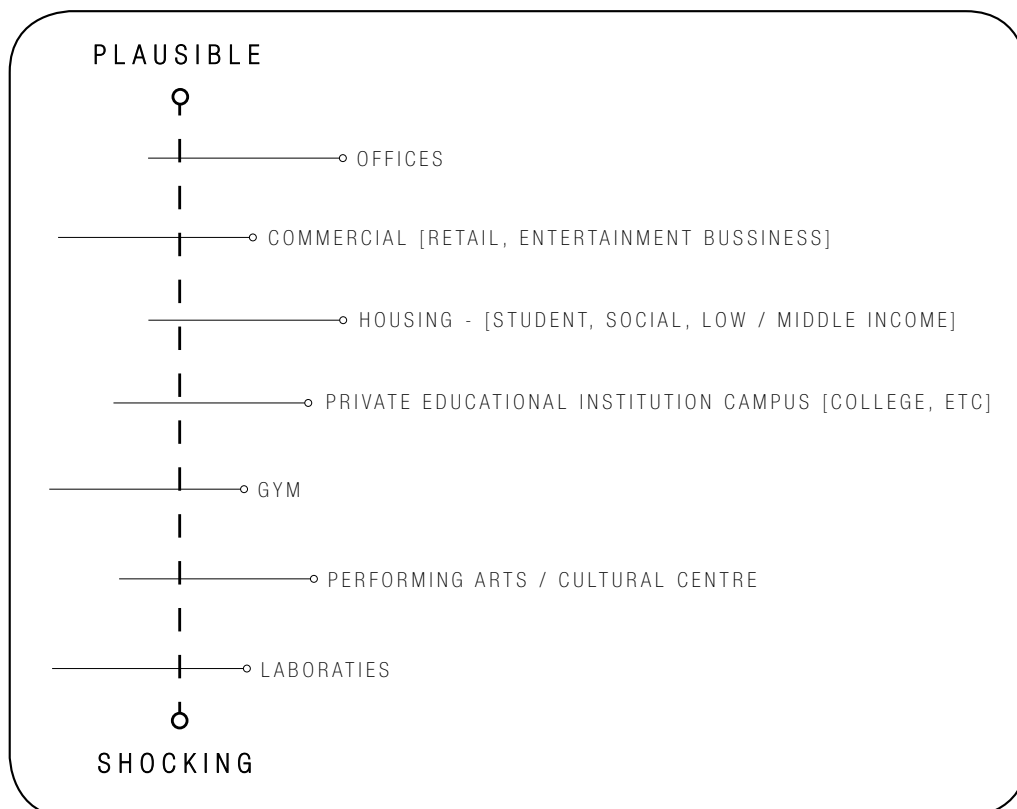
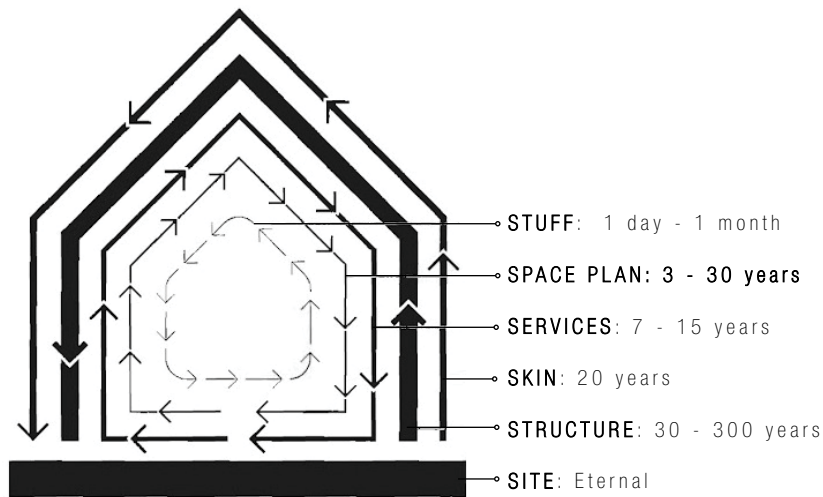


Figure 6.4: 'Scenario-buffered-planning' approach for T.E.L. Centre



**Figure 6.5:** Stewart Brand's 'Shearing layers' that make up a building (Brand, 1995: 13)

approach in terms of scale; whereas to the more 'shocking' side, larger open spaces may rather be required. Besides this, other identified 'threads' include good ventilation and good public access, as well as general good building strategies namely dialogue and interaction throughout the building as well as being in close contact with natural elements. Another important design consideration to take into account in the spirit of future change is sub-division of the building (especially for housing, offices and for retail) - in which case numerous service cores will be necessary; even if the initial design does not supply these extra services, it should not restrict the strategic additions of them later on in the building.

In section 2.1 the various "human compromisers of technological advancement" are highlighted as negative by-products of perpetual modernity, thereafter the various ways in which architecture can counter them were discussed. As illustrated in Figure 2.17, these 'counter-strategies' should be permanent 'fixtures' in the building, as they constitute things that need to persist throughout time and change for optimal human health and behaviour.

Conversely, the technological attributes that aid the programmatic and public, or urban intentions (school as city and city as school - specifically referring to the interactive, digital environments) should be open-ended, 'alterable' elements, as they are rapidly-advancing elements and their application should be easily alterable through time. Brand's diagram indicates the life-span for overall services to be 7 - 15 years; in this case, however, where the building's programme is a T.E.L. Centre, the digital, virtual and electronic technologies might change even faster than that, whereas the other services in the building can be expected to fall into his description.

The background theory discussed in Chapter 2 as well as Brand's theory of a building's *shearing layers* (1995: 13) - which indicates a life-span for each of the main components that make up a building (Figure 6.5) - are used as a guiding tool to investigate the following building and design elements of the T.E.L. Centre in relation to their respective life-span and replaceability:

- 1.) SITE (Eternal)
- 2.) STRUCTURE (30 - 300 years)
- 3.) 'SOCIABILITY' OF BUILDING (Permanent)
- 4.) CLOSE CONNECTION TO NATURE (Permanent)
- 5.) SLOWNESS OF CITY PACE (manipulating city pace with soft ground floor edges- Permanent)
- 6.) IDENTITY & ARCHITECTURAL LANGUAGE (Mediative through time)
- 7.) SKIN (20 years - Brand, 2012)
- 8.) SERVICES (7-15 years - Brand, 2012) (In this case perhaps faster, as will be explained)
- 9.) USE (Programmatic function)
  - Space layout plan (3- 30 years - Brand, 2012)
  - Size & shape of interior spaces
  - Privacy control
  - Daylighting control (in terms of digital programmes)



#### 6.4 Joshua Prince-Ramus: “COMPARTMENTALISED FLEXIBILITY”

In line with Hertzberger’s favouring polyvalent space to generic space, OMA New York architect, Joshua Prince-Ramus (2006) challenges the ideals of high-modernist flexibility which sought to produce completely open-ended spaces in which absolutely anything could happen, but which subsequently resulted in very generic buildings that all looked the same and in which every interior space functioned in the same way, thereby subverting their original intention. He also states

that these generic spaces get completely dominated by the most immediate need and “imposes itself on all the other functions”. Instead, Prince-Ramus (2006) advocates what he calls ‘*compartmentalised flexibility*’, in which a building houses certain fixed programmes which are intertwined with other open-ended areas. An example to illustrate this principle is their Seattle Public Library (Figure 6.8), in which the necessary library programmes are stacked in five primary platforms (hq, book-spiral, meeting, staff and parking), but on top of each of these is an open-ended, un-programmed ‘grey’ social area (reading room, mixing chamber, living room and kids) of which the use or spatial arrangement may change over time.

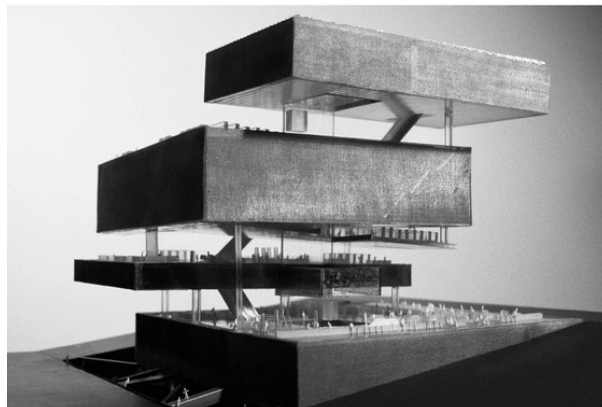
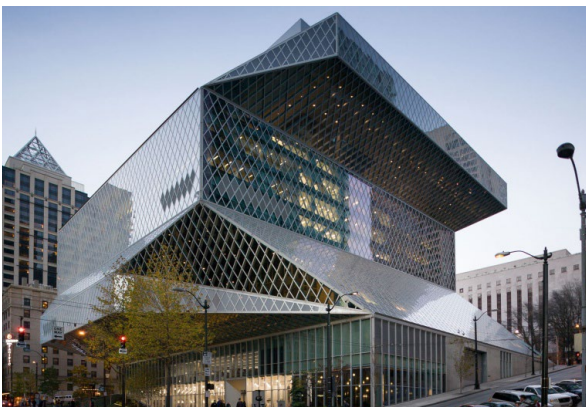
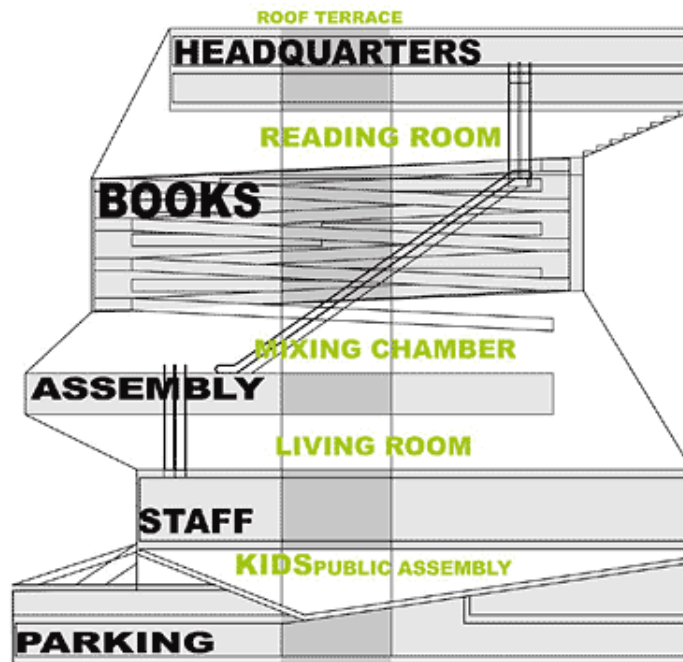


Figure 6.6: Seattle Library by REX (then OMA New York) (Rex, 2015)





In addition to this, Joshua Prince-Ramus (2009) advocates what he calls 'architectural agency', in which architecture does things instead of just representing things; he calls it "the lost art of productively losing control" (2009) in which one does not know what the end result will be. An example that he uses to illustrate this concept is the Wily Theatre in Dallas which they designed as a "theatrical machine" that reconfigures itself in order to accommodate a number of activities or performance types (as illustrated in Figure 6.7). Specifically, they altered the conventional 'back of house' and 'front of house' to above and below house, which opened up the entire ground floor perimeter. Prince-Ramus states that the project intentions were that this type of reconfiguring should be able to occur "at the touch of a button" (2009); but, whether due to budget-constraints or a lack of technology, the end product requires manual labour to transform. Still, the intentions of architecture as agency, are there.

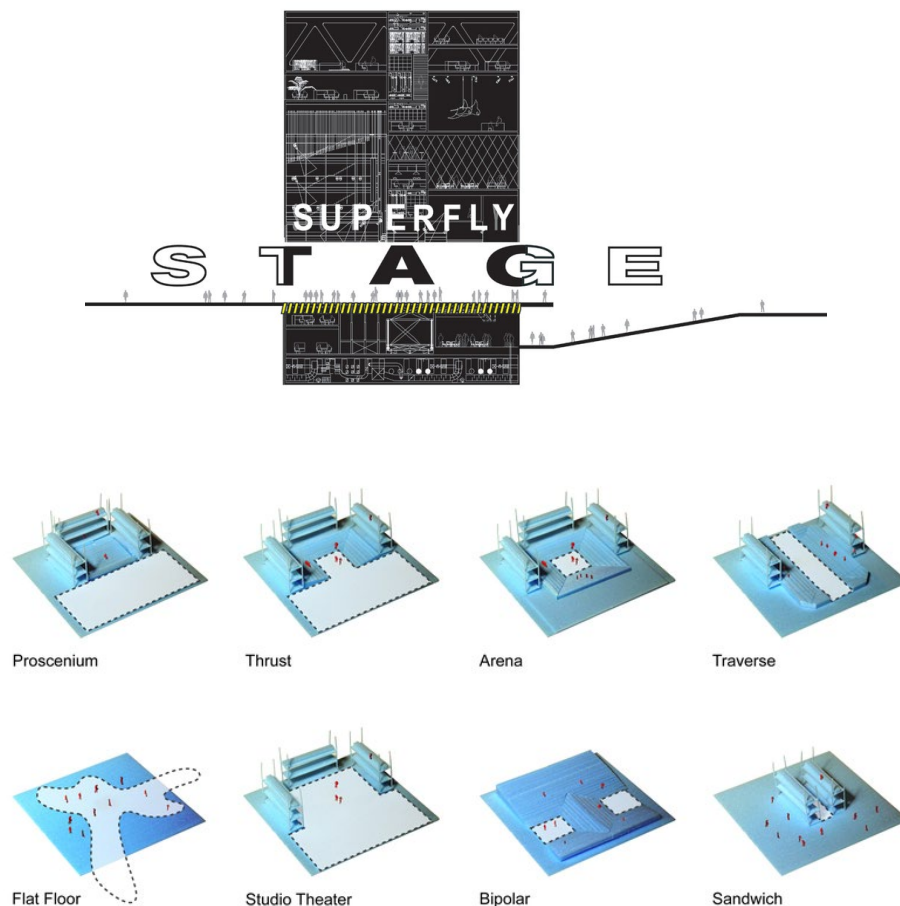
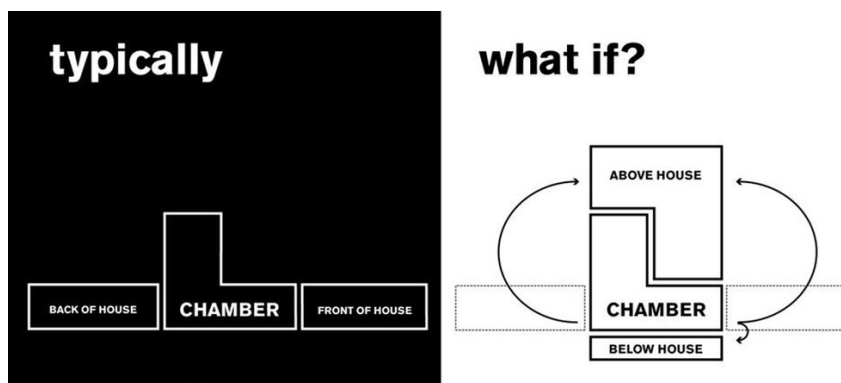


Figure 6.7: Wily theatre concepts in Dallas, designed by Rex in 2009

## 6.5 PERSONALIZED LEARNING ENVIRONMENTS:

### - TOWARDS SPATIAL TRANSFORMABILITY -

In light of the theory discussed in Chapter 5, section 5.6.2, on the importance of spatial adjustability for personalized learning environments, this section is an exploration of certain spatial strategies that encompass this theory.

The spatial adaptability design considerations will range from the following aspects:

- Scale (rooms should be able to open up and grow to accommodate bigger groups/functions)
- Adaptable spatial arrangements in terms of furniture and room layout
- Control over daylighting quality



Figure 6.8: Adjustable exterior screening

- Control over visibility from and to other learners
- Digital display screening in which learning content changes - can also change by input from the learner himself

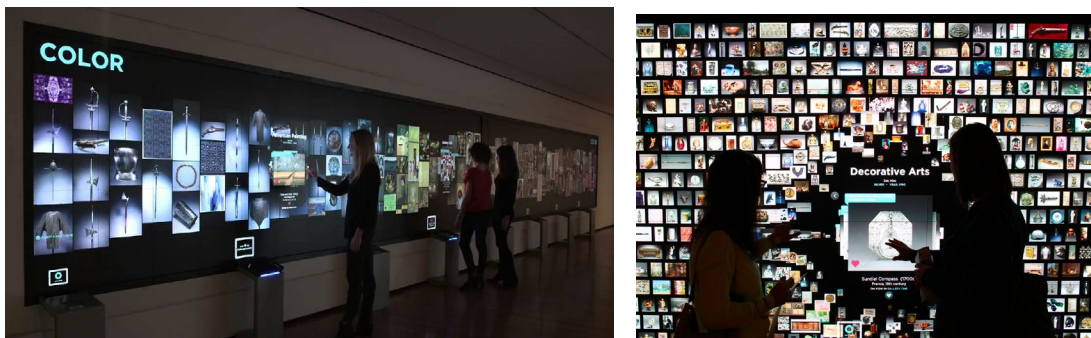


Figure 6.9: Interactive digital learning displays

## 6 . 6 C O N C L U S I O N

In conclusion of the theory-chapter on *alterability*, this chapter was an investigation on the varying degrees of adjustability for buildings in general, and more specifically it highlighted the spatial strategies on alterability for personalized learning environments. This project aims to achieve a more durable architecture - not by merely relying on robust materials but by its ability to absorb change and accommodate numerous spatial applications.



# Chapter 7

## DESIGN

## DEVELOPMENT



APPLICATION / VIRTUALIZATION / PROCESSING / HACKING





## 7.1 INTRODUCTION

Chapter 7 is an account of the design development process throughout the duration of the dissertation project. It starts off with a summary of all the main design informants; following this is an investigation of the augmentation of the existing built fabric on the GPW block, which is based on the site analysis in Chapter 4. Thereafter is an explanatory programmatic masterplan for the block to explain how the different programmes function together. In the next section the various theoretical premises (as discussed in Chapter 2) are translated to spatial design strategies by means of supporting case-studies and then follows the design development process work as well as the main design iterations throughout the year. The chapter concludes with the final design drawings and documentation.

- SUMMARY OF DESIGN INFORMANTS
- SITE INVESTIGATION (IN ITS EXISTING CONDITION)
- STRIPPING BACK PROCESS
- SITE INVESTIGATION (AFTER STRIPPING BACK PROCESS)
- PROGRAMMATIC MASTERPLAN
- PROCESS-WORK
- ITERATIONS
- FINAL DESIGN



## 7.2 SUMMARY OF MAIN DESIGN INFORMANTS :

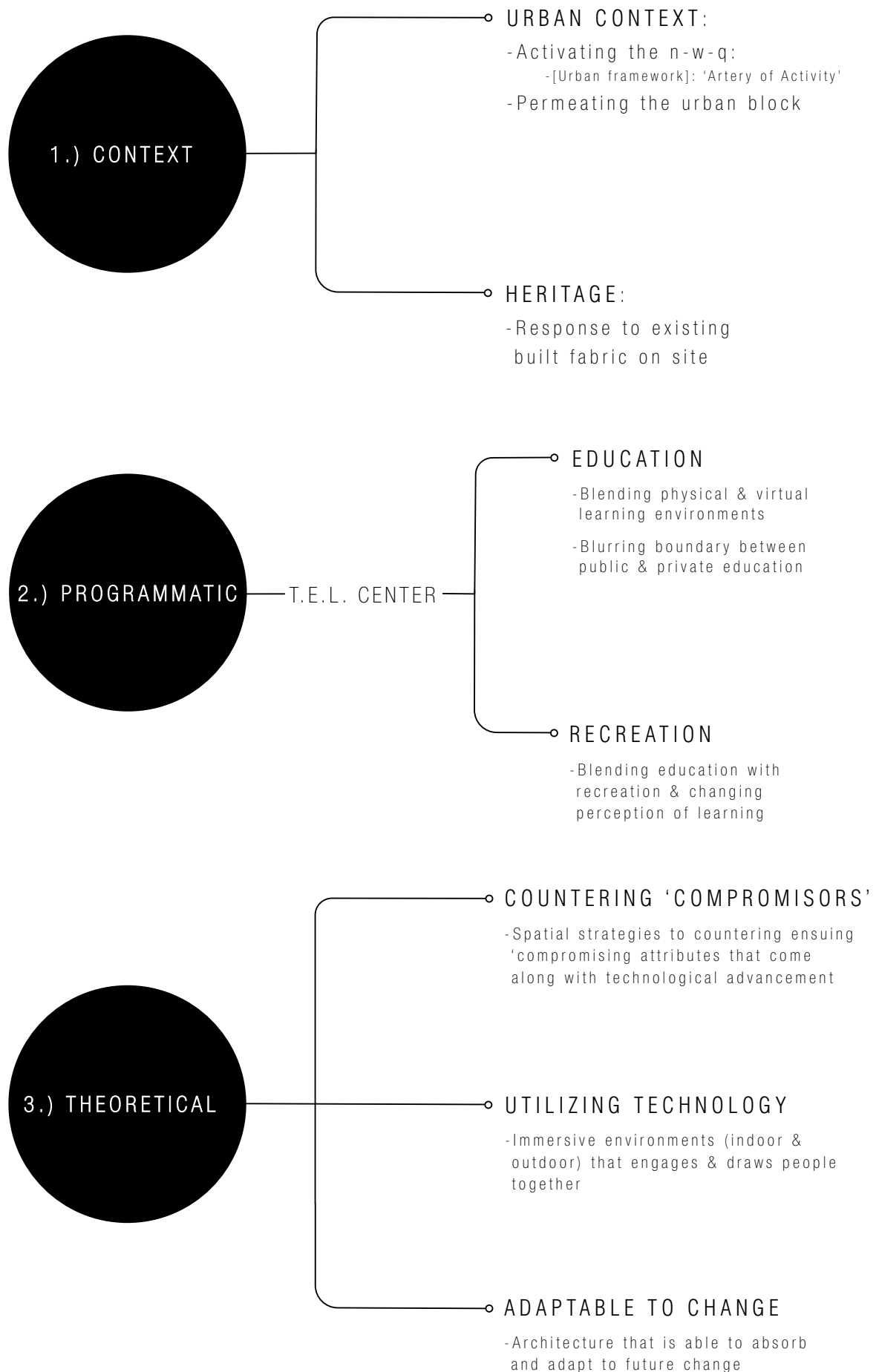
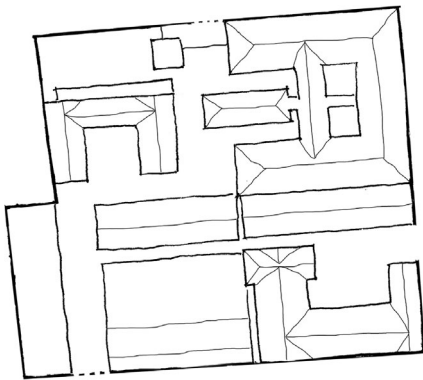


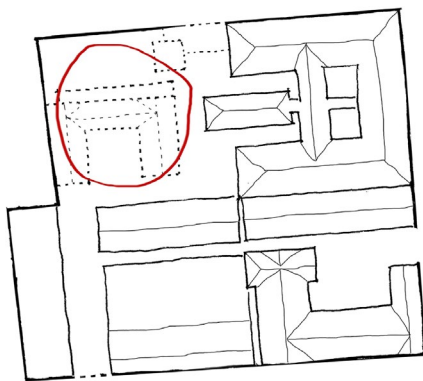
Figure 7.1: Summary of design informants  
 (Author, 2016)

### 7.3 SITE INVESTIGATION (IN ITS EXISTING CONDITION)

As recounted in the statement of significance for the block as a whole (see section 3.5.3), the existing condition is one of overcrowding, and buildings seem as though they are almost 'compressed' together (as if they do not have space to 'breathe'). This in turn causes disconnectedness between certain parts; in particular, the most important part (or the part with the most architectural and cultural value, see 'grading of architectural significance', section 3.4.10) which is the 1896 Wierda-building on the south-eastern corner. De Villiers and Clarke (2015: 97) note that "the relatively small building on the corner of the urban block is overshadowed by recent and senseless development of the urban tissue". The following is an investigation of various strategies of how this 'compression' and 'disconnectedness' can be solved:

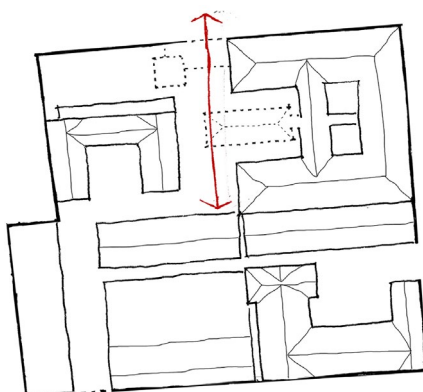


GPW block in its existing condition



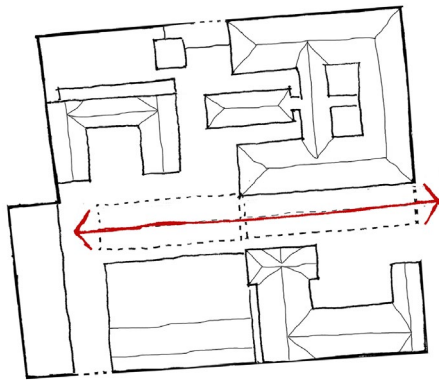
Maintenance offices and security office (at main entrance) omitted:

- Results in new open quadrant with the possibility of new, densified development appropriate to the context



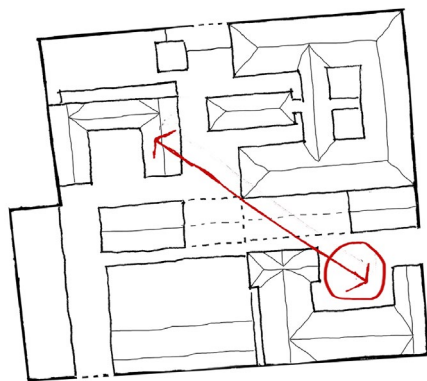
Protruding segment of administration building and security office (at main entrance) omitted

- Unobstructed movement line, semi-courtyard for administration building



Two longitudinal buildings (Litography and Letter Press) omitted

- Open movement line (east-west but results in ill-defined entrance at Wierda-building and movement on western side hits dead end

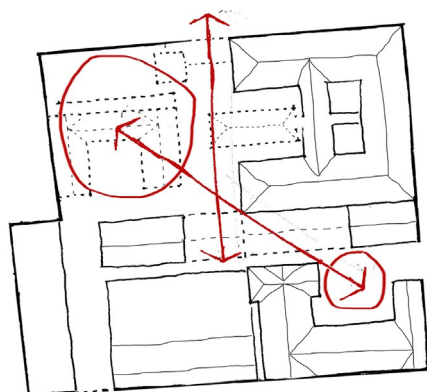


Two longitudinal buildings (Litography and Letter Press) partially omitted (Possible due to cross-beam and column structure)

- Connecting Wierda-building courtyard to centre of site

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#### CONCLUSION OF INVESTIGATIVE ANALYSIS:



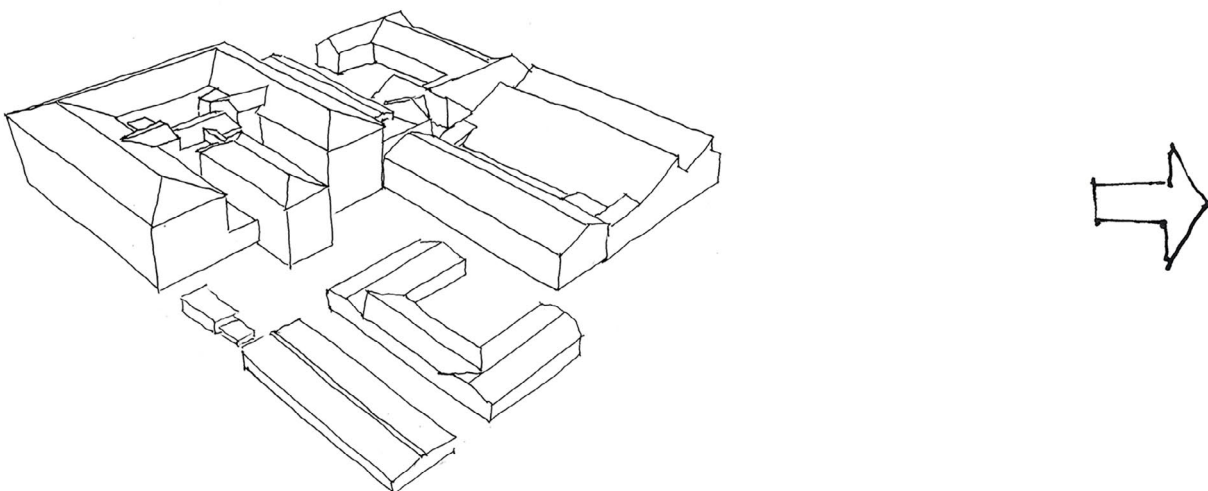
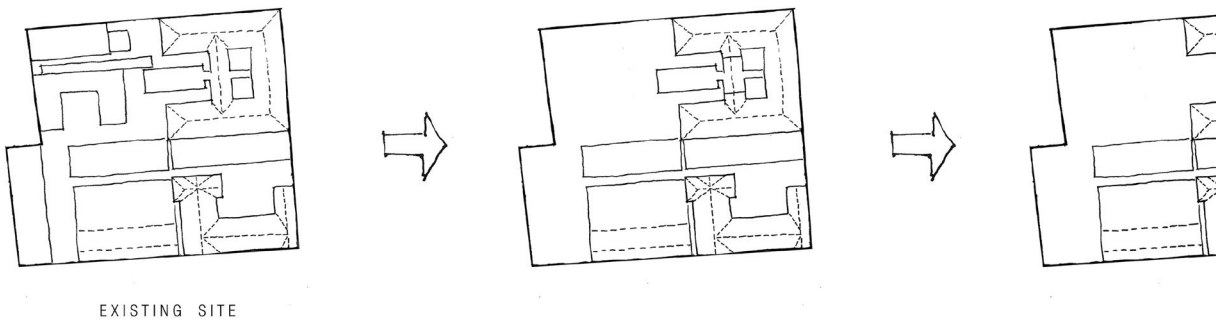
Protruding segment of administration building, maintenance, security offices omitted. Letter-Press and Litography partially omitted

- New open quadrant, existing Wierda-building courtyard connected to site, administration building - new semi-courtyard, two movement axes across block

## 7.4 'STRIPPING BACK'

In light of this site investigation in 7.3 as well as the 'grading of architectural significance' of the existing buildings on the GPW block (section 4.4.10), a stripping back process was conducted on the block whereby certain buildings (or segments of buildings) were fully or partially omitted. Only the buildings on the lower grading of significance were edited; those on the higher end (Wierda and saw-tooth) remained in their existing state. The end result ('new building ground') is one in which the most valuable (Wierda) building's previously obstructed facade is opened up and the building as a whole is connected to the rest of the block.

Stripping back: '*Selective, strategic subtraction*'





In addition, the buildings can 'breathe' and have a better urban and contextual relationship (with regard to the strategies discussed in Chapter 3, section 3.5, about the 'strategic rupture' and organic composition of a city-block). Furthermore the administration (north-west corner) building has gained a central courtyard, and there is an open quadrant on the north-western side in which an appropriate, urban and contextually-responsive intervention can occur which will further enhance the spatial potential of the city-block as a whole.

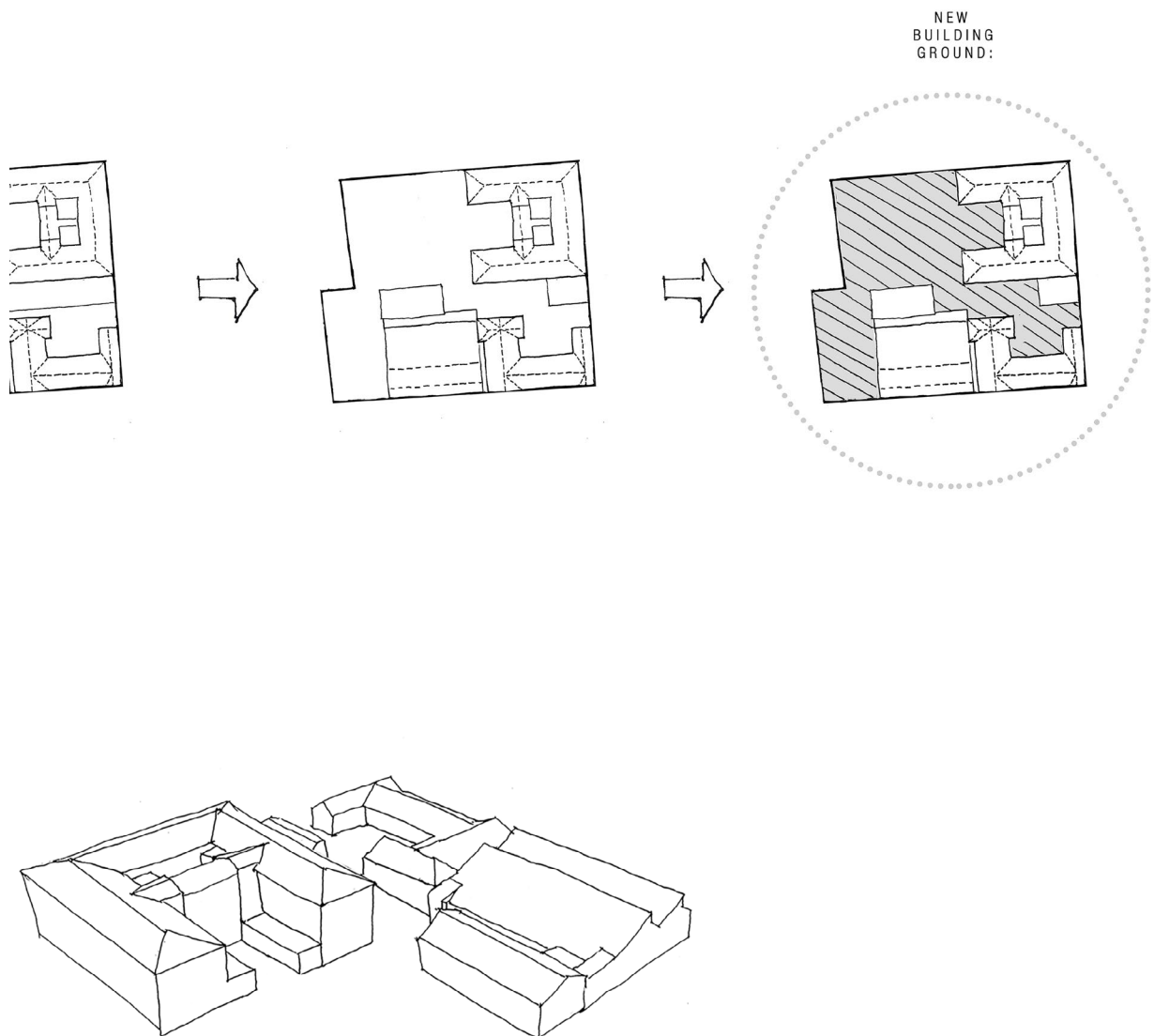


Figure 7.2: 'Stripping back'

## 7.5 SITE INVESTIGATION (AFTER STRIPPING BACK PROCESS)

After the stripping back process it is clear that two of the remaining U-shaped building's (Administration - and Wierda-buildings) urban role is one of 'framing public space'. This suggests a similar spatial strategy for a new built mass in the north-western quadrant of this block. Another U-shaped or perhaps L-shaped building in this area (Fig 7.3) will fill in the 'toothless gap' and complete the intrinsic DNA (of 'framing space') of this block.

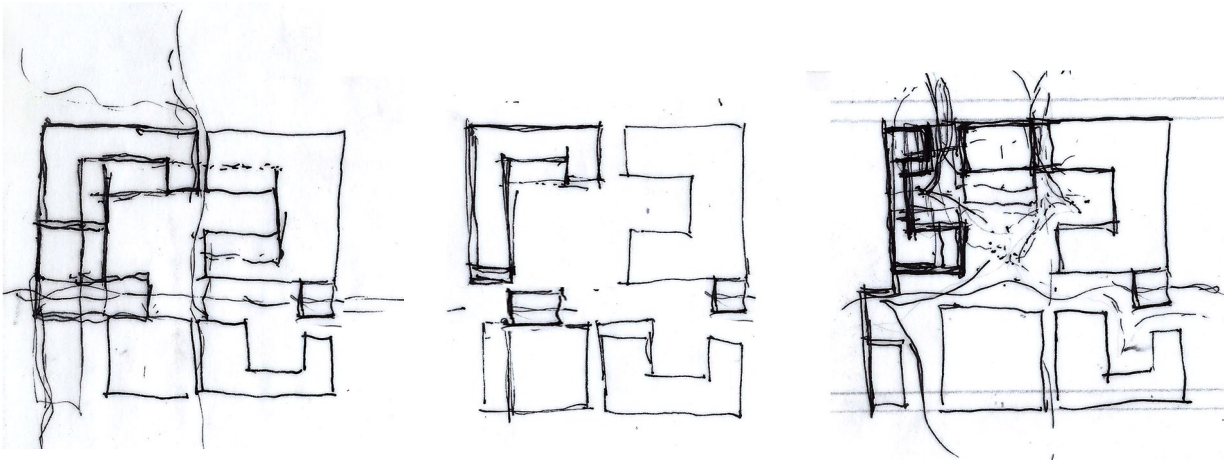


Figure 7.3: 'Completing the whole' (Author, 2016)

In line with the idea of 'strategic rupture' and 'expanding space for public city life' (see section 3.5) to the centre of the block, the movement patterns are an essential design consideration. As illustrated in the urban framework proposal (Fig 3.29), the main pedestrian movement in this area is in a diagonal north-west - south-east direction (between Belle Ombre station and city-centre); the main route of movement through this block should therefore accommodate this broader urban consideration.

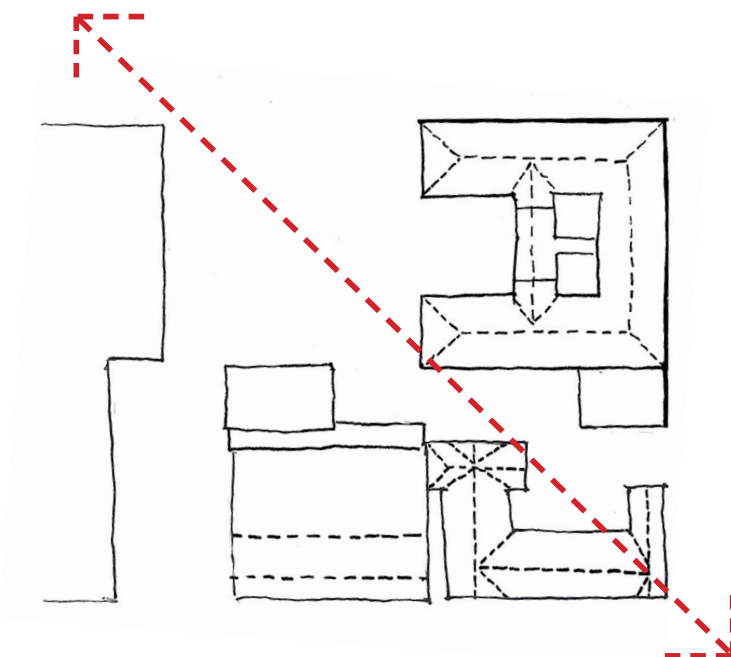
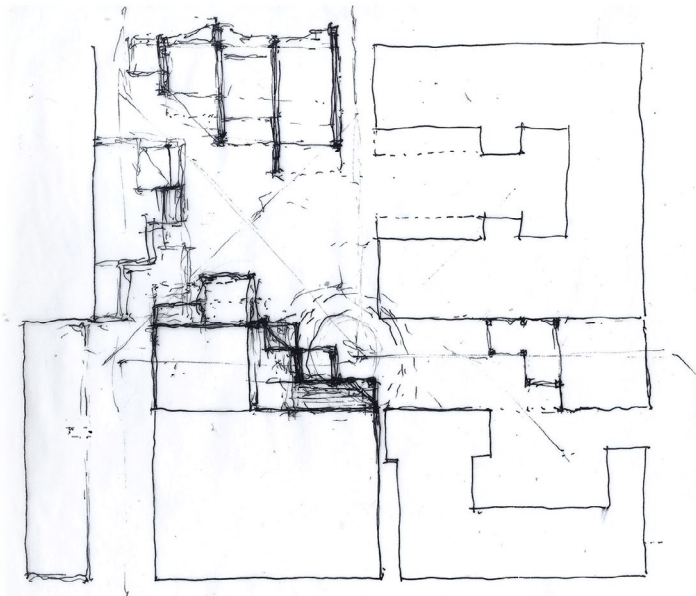
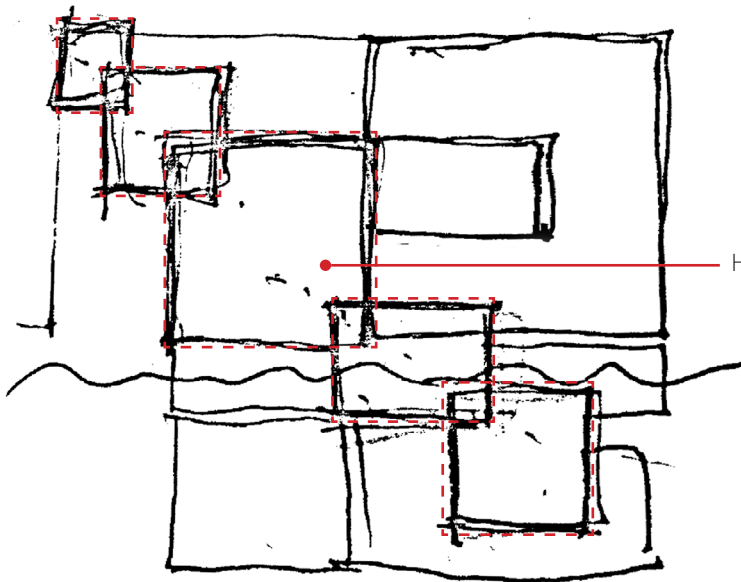


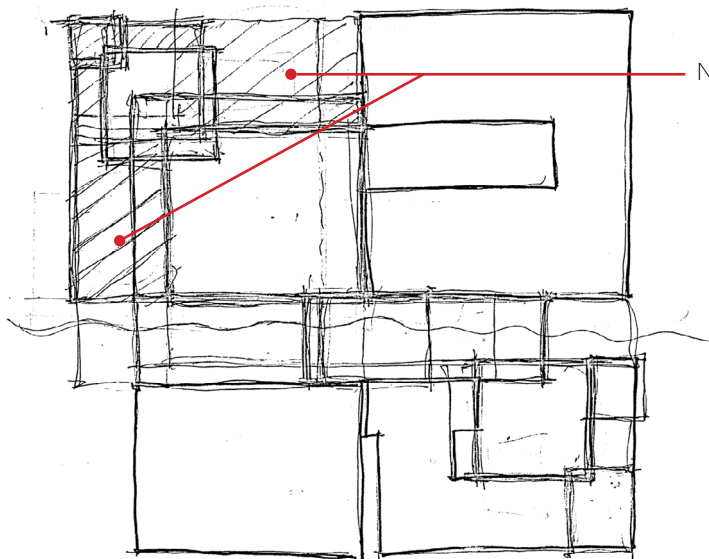
Figure 7.4: Main pedestrian movement direction diagonally across block (Author, 2016)



The new open 'building ground' presents a range of urban spatial opportunities in line with the 'strategic rupture' of a city block (as discussed in Chapter 3, Section 3.5). Figure 7.5 illustrates some of the spatial exploration in which a network of linked negative spaces in the block emerges. This network also constitutes a spatial hierarchy in the resultant open negative spaces.



Hierarchy of negative spaces



New building masses to 'frame central public space'

Figure 7.5: Spatial exploration for block as a whole (Author, 2016)

Figure 7.6: Spatial structure for block as a whole (Author, 2016)

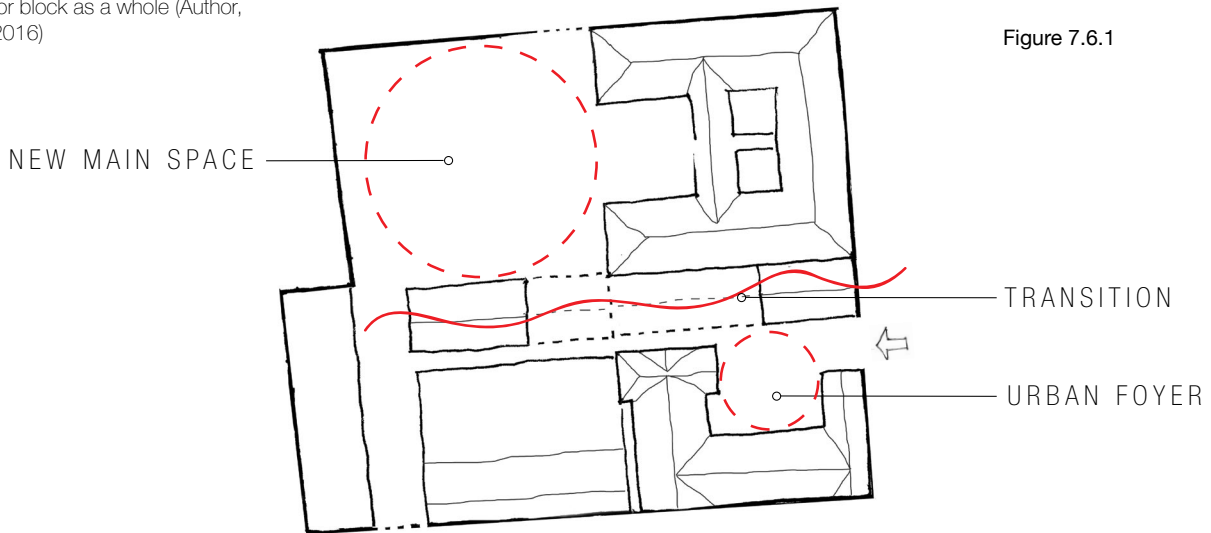


Figure 7.6.1

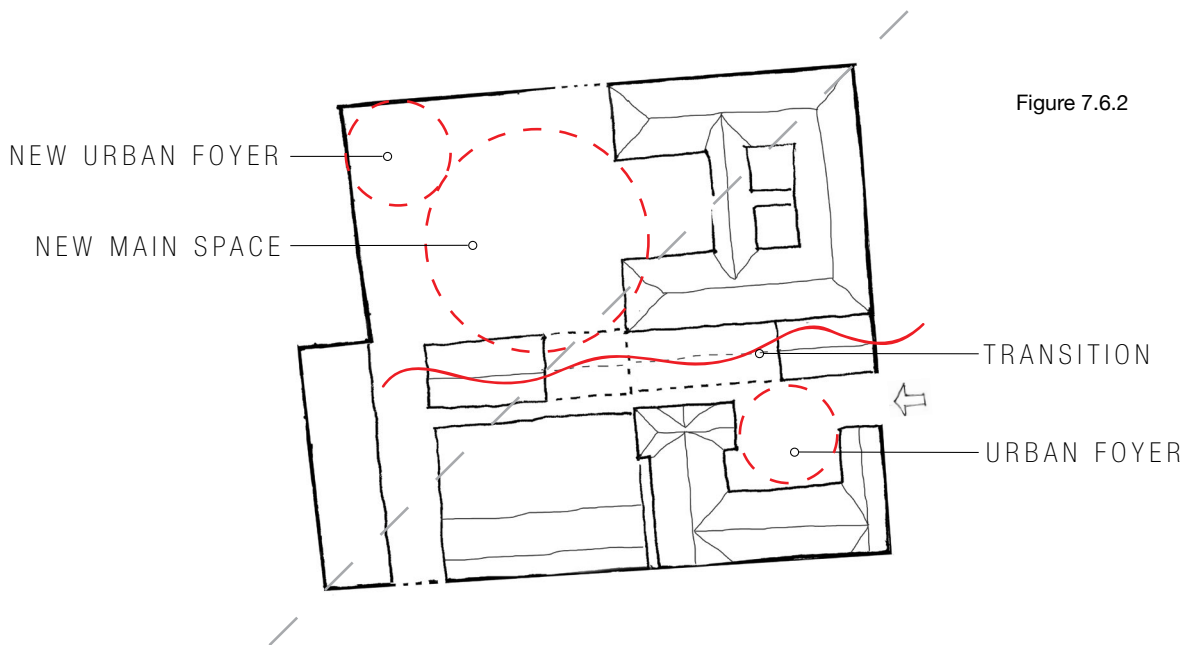


Figure 7.6.2

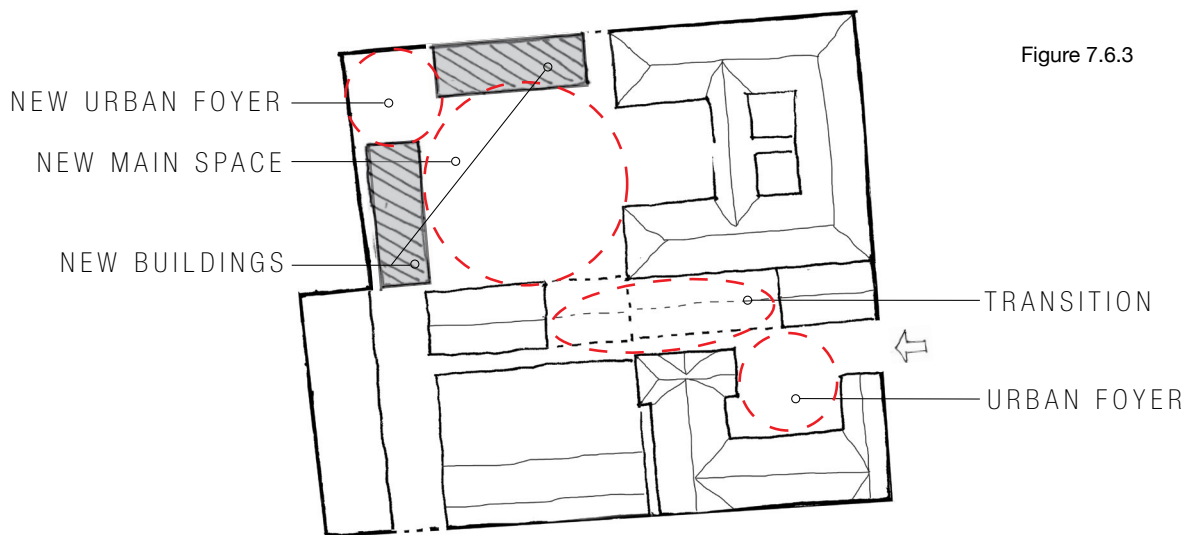


Figure 7.6.3

If one considers the overall nature of the open, negative spaces in the block, the particular space framed by the Wierda building can be regarded as an 'urban foyer' to the rest of the block (see Fig 7.6.1). The newly-opened main space is the central core negative space to which all the other parts connect. The longitudinal open space between the two acts as a transitional corridor that interconnects these two.

In response to this existing nature of negative spaces in the block, the 'urban foyer' is diagonally mirrored to the north-western quadrant (Fig 7.6.2), as a new point of arrival from the north-western direction. This extends and 'completes' the series of interconnected negative spaces in the diagonal line of movement.

In order to achieve this 'mirrored urban foyer', the new building's role also becomes one of 'framing public space', framing the foyer, and also framing, or more accurately, defining the main central square (Fig 7.6.3).

## 7.6 PROGRAMMATIC RELATIONSHIPS IN CONTEXT

Figures 7.7 and 7.8 illustrate the programmatic relationships of the new proposed uses for the existing as well as the new buildings on the GPW site. The contextual relationships are analysed according to the context analysis in Figure 4.3, which is on a scale from *community-oriented* to the west and more to *institutional* towards the east. The proposed programmatic usage for each building is a response to the surrounding context; the administration building (on the north-eastern corner) is a neighbouring extension of the DPW (across the street to the south-east) office space. Furthermore this building can also be utilised by them for archive space, as their archive is an ever-growing accumulation of data, documentation and goods.

The intention for the saw-tooth-building is still one of light-industry production as this building is highly suited to such a function (see section 4.4.6 in Chapter 4). In the spirit of technological advancement this building will house a production facility that includes 3D printers, lasercutters, holographic projectors and so forth; these methods of production will change over time as technology advances. The intention is that it will be a service run and used by the DPW but will also be extended to public use as a production service.

With regard to an adaptive reuse strategy for the 1896 Wierda building, notes are taken from the heritage research lab done by the University of Pretoria's architecture department (specifically the 2014 honours programme) and captured in the publication *RE-CENTRING TSHWANE Urban heritage strategies for a resilient Capital (2015)*. The following are suggestions from this publication:

- Clarke and de Villiers (2015: 97) suggest that the “physical structure is easily adaptable and its position in the city lends itself to a more public function that subverts the ‘private’ governmental control that this site has embodied for decades”.
- Clarke, Kuipers and Swart (2015: 115) advocate a mixed-use (semi-)public programming to “generate a new urban energy, which would spill out beyond the complex”, saying that the GPW has a “relatively great tolerance for change (particularly inside), and holds the most potential for a mix of cultural, civic and commercial activities” (2015:115).
- Clarke and de Villiers (2016: 97) suggest “sensitively repurposing the interior spaces of the GPW and its outdoor courtyard, while drawing pedestrian energy in from the street”.
- They also suggest a programme that is related to the “daily or mundane rituals of life” and that “the GPW can become a place to go and meet, a place with great a



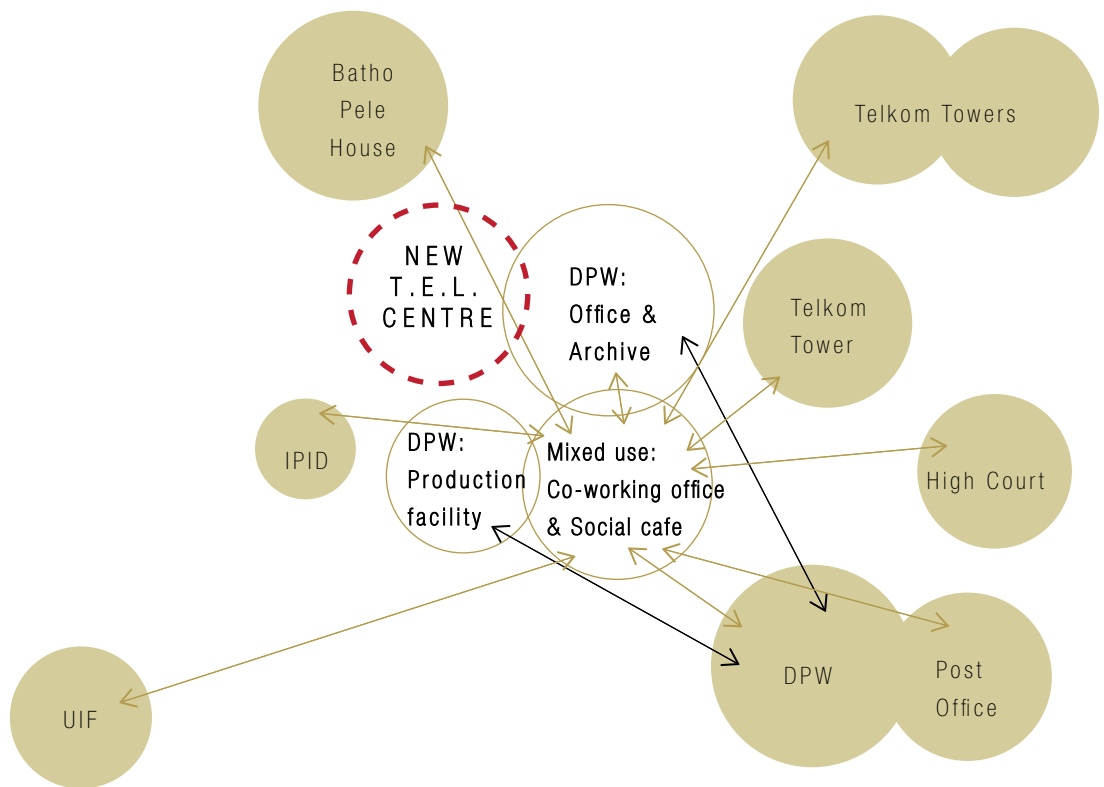
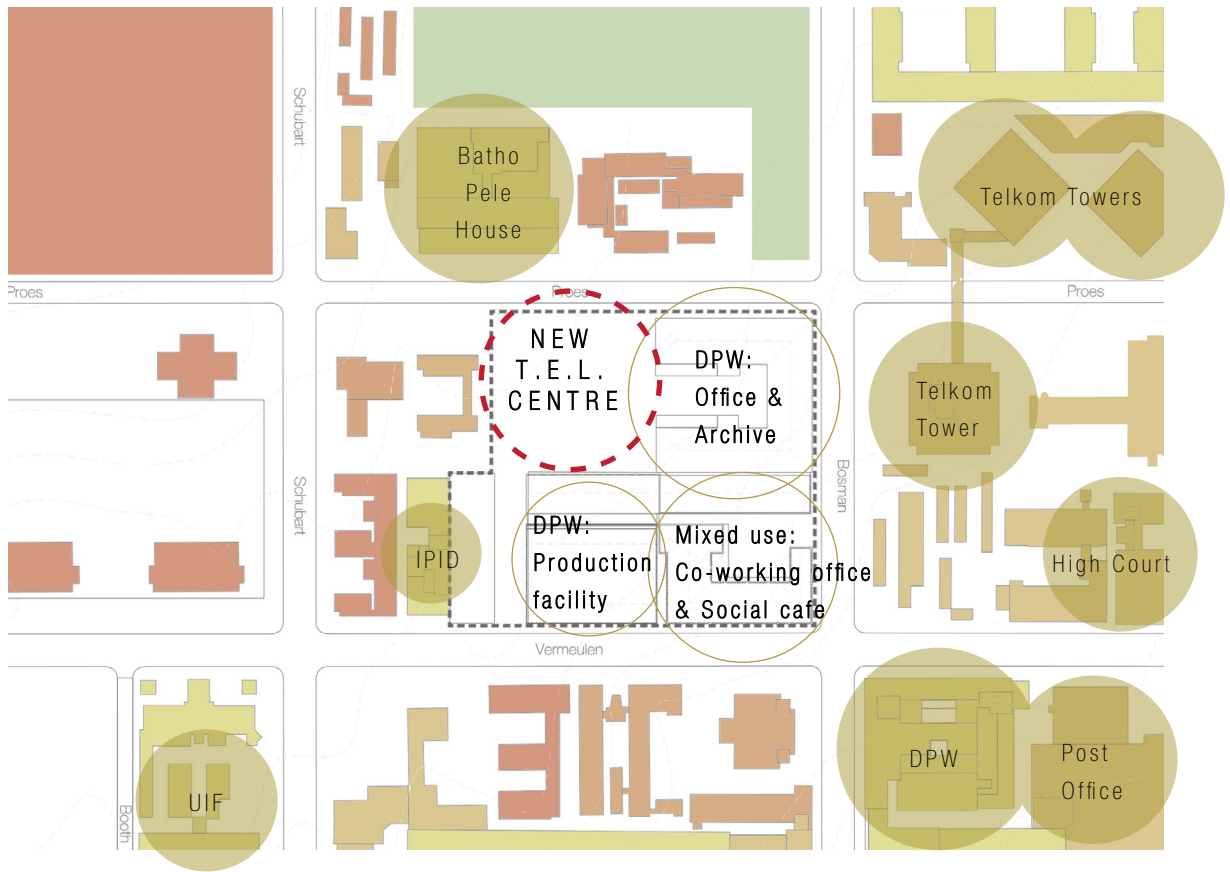


Figure 7.7: Programmatic context - Institutional

intangible value” (2015:97) saying that “by enhancing ‘ordinary’ city life, the vulnerable heritage (under pressure by recent inner city development) is taken seriously, but giving it new life and new purpose for a new generation and society will allow the site to evolve in future” (2015: 97).

In light of these suggestions and also in response to the technology-induced compromisor number 2 (loss of work-life balance - how technology brings an inroad of work-life into one’s personal ‘home-life’ (as discussed in Chapter 2), the currently unoccupied Wierda building is converted to a co-working office space. As recalled in section 2.1.4.2, this programme provides the option of a workplace and the daily routine of ‘going somewhere to work’ and coming home for personal life, but does not keep one to the confines of the same office each day. It is especially targeted at all the institutional and corporate office buildings in the surrounding context (mainly to the east) for office workers to have an alternative place to work when they want to take a break from their conventional office, a place to have their bussiness meetings, eat lunch or socialize after work. It is also targeted towards freelance-professionals who typically work from home but still want a daily routine of going somewhere to work.

The ‘coffice’-owner ‘wins’ because his tables are always full, and the professional wins because he only has to rent a table and wifi-connection instead of the walls, floors and furniture of a traditional office - and his work-life-balance can be reclaimed. The intention of such a programme is also to blur the boundaries of social and work (making the idea of ‘working’ fun) - if one desires it - by working alongside new people each day and offering collaborative interaction between people from different backgrounds, cultures and professions.

As discussed in Chapter 5, the new building in the north-western quadrant of the site constitutes a T.E.L. (Technology-Enabled-Learning) Center which is a public service equipped with various newly emerging technologies that enable the user to gain knowledge in a much more efficient and personalized manner. This programme is in response to a contextural understanding that is very community-oriented mainly to the west of the site. This programme also evolved from a distillation of the intangible heritage intrinsic to the GPW block, which is about the *gathering, producing and distribution of knowledge* (as illustrated in Figure 4.25).

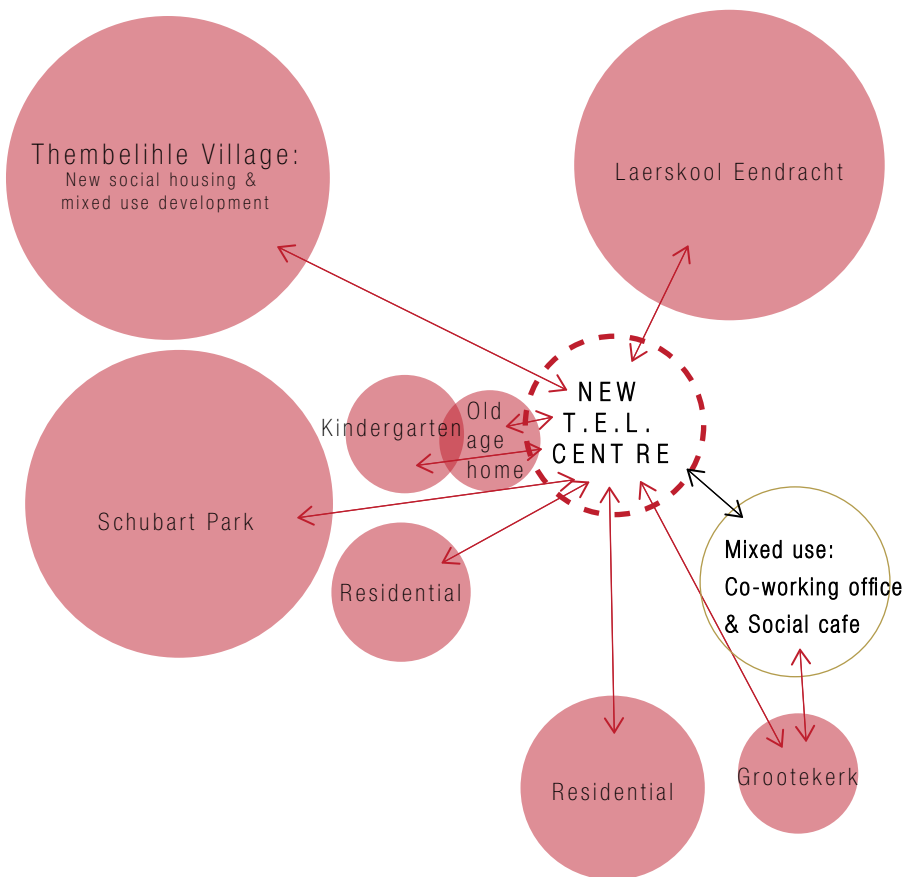
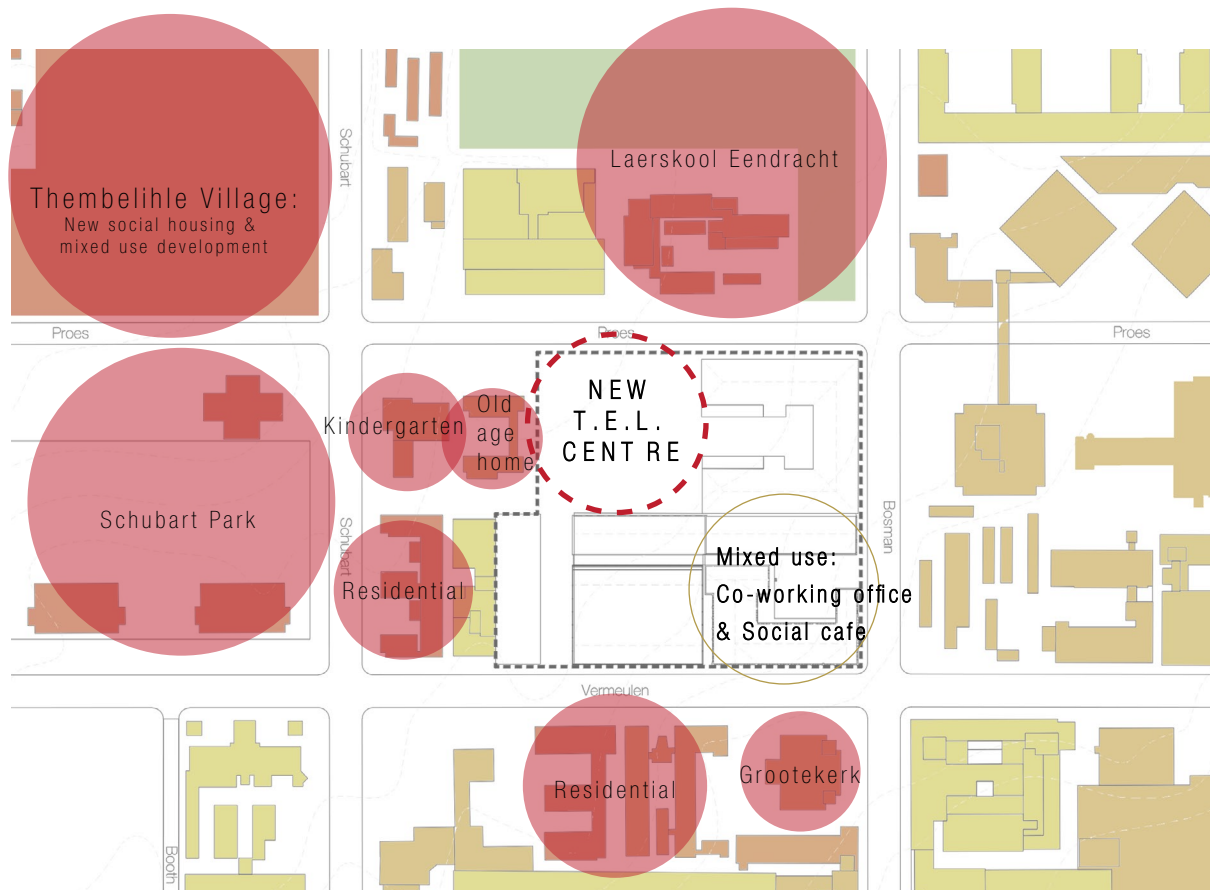


Figure 7.8: Programmatic context - Community-oriented

# ‘ Translation ’ of intangible heritage

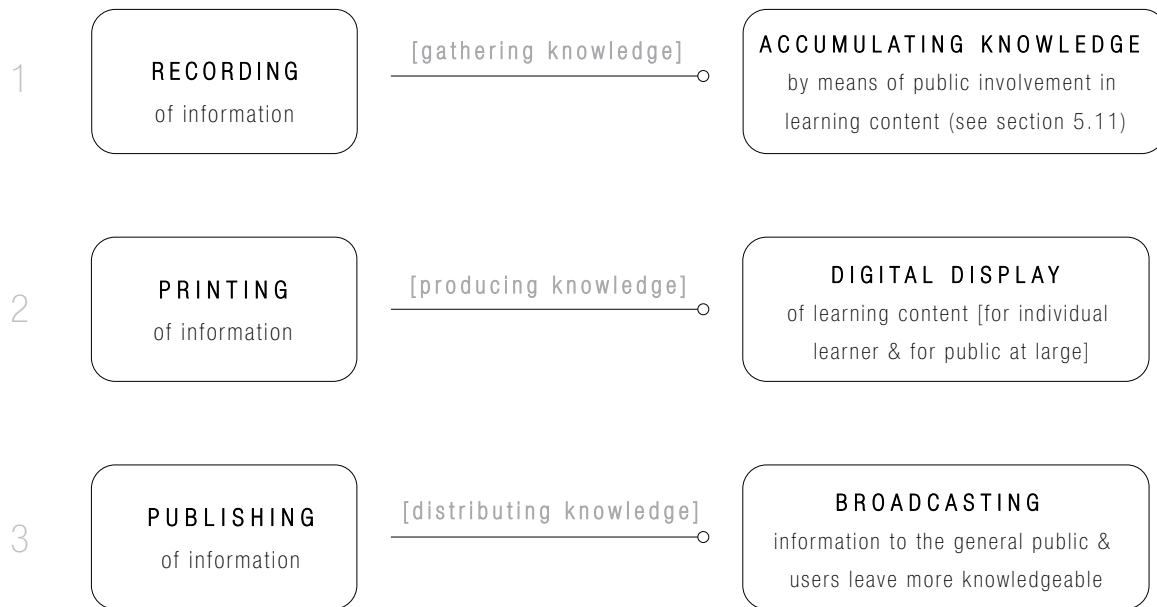


Figure 7.9: Translation of intangible heritage (Author, 2016)

## 7.7 PROGRAMMATIC MASTERPLAN

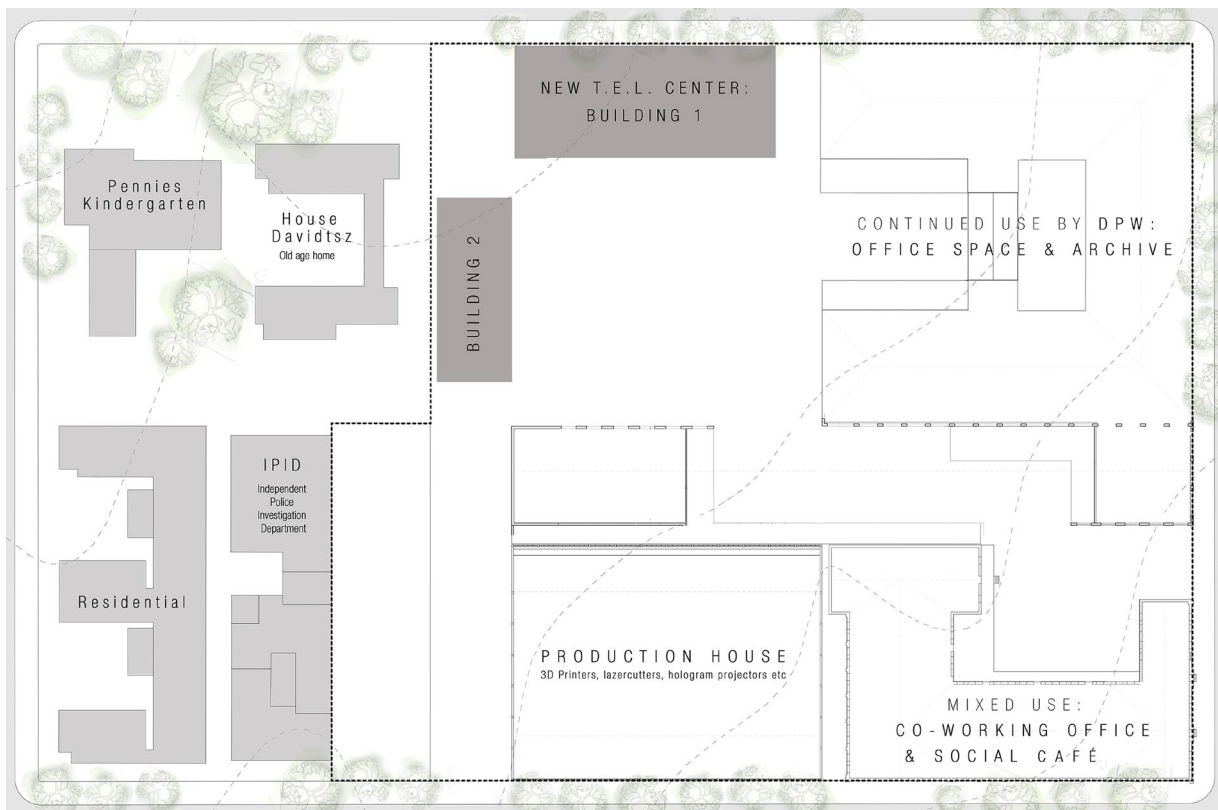


Figure 7.10: Programmatic masterplan (Author, 2016)

Figure 7.10 illustrates the programmatic masterplan for the block in its entirety as informed by the contextual and theoretical analysis. Figures 7.11 - 7.13 indicates the spatial relationships and scale of the new proposed T.E.L. Centre in relation to the existing buildings on the block. Figure 7.11 indicates the northern elevation which shows the relationship of the administration building and Huis Davidtz (the old age home) to the new T.E.L. Centre. Figure 7.13 is a north-south section through the saw-tooth building and new T.E.L. Centre, and Figure 7.12 shows a west-east section through Huis Davidtz, the western footprint of the T.E.L. Centre and the administration building.

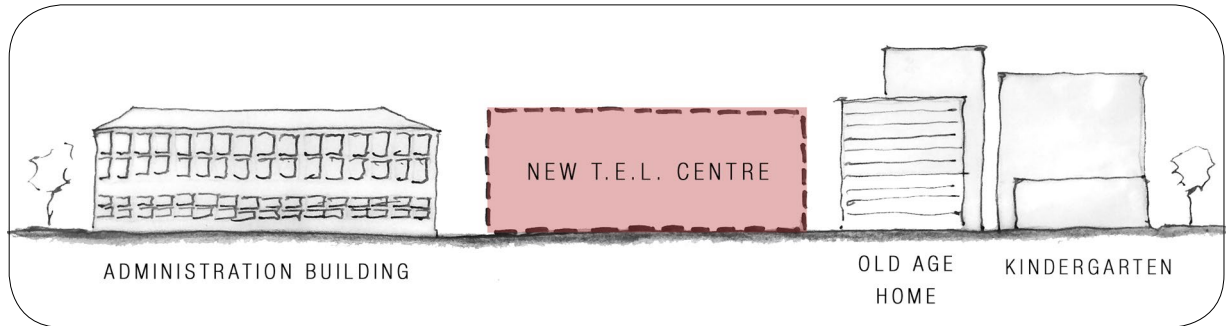


Figure 7.11: Northern elevation - contextual relationships

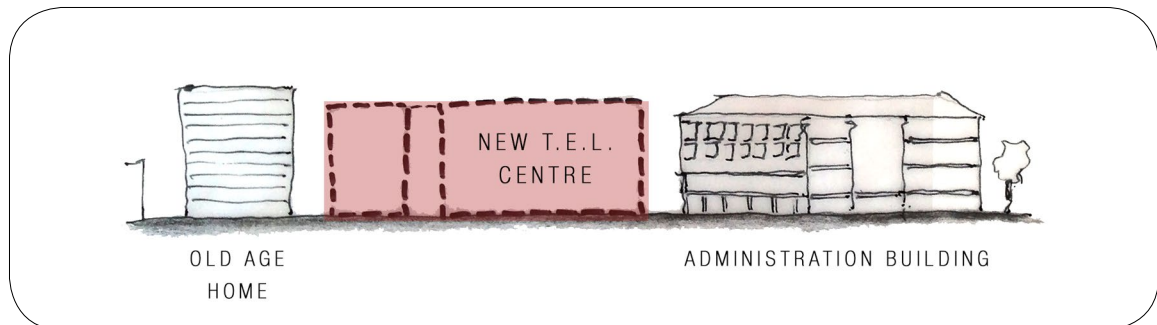


Figure 7.12: West - east section - contextual relationships

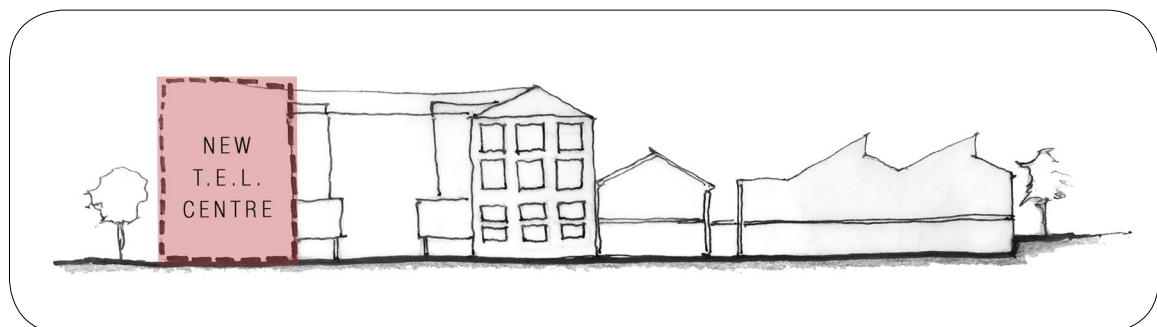


Figure 7.13: North - south section - contextual relationships

Figure 7.14 illustrates the proposed spatial relationships for the new building footprints; the main building has the north-south orientation and street front and the secondary building the east-western orientation. Both buildings 'open up' to the main square which also links with the surrounding open spaces in the block to form a negative spatial network. The main entrance is in the 'urban foyer' on the north-western corner in relation to the main movement pattern from that direction.



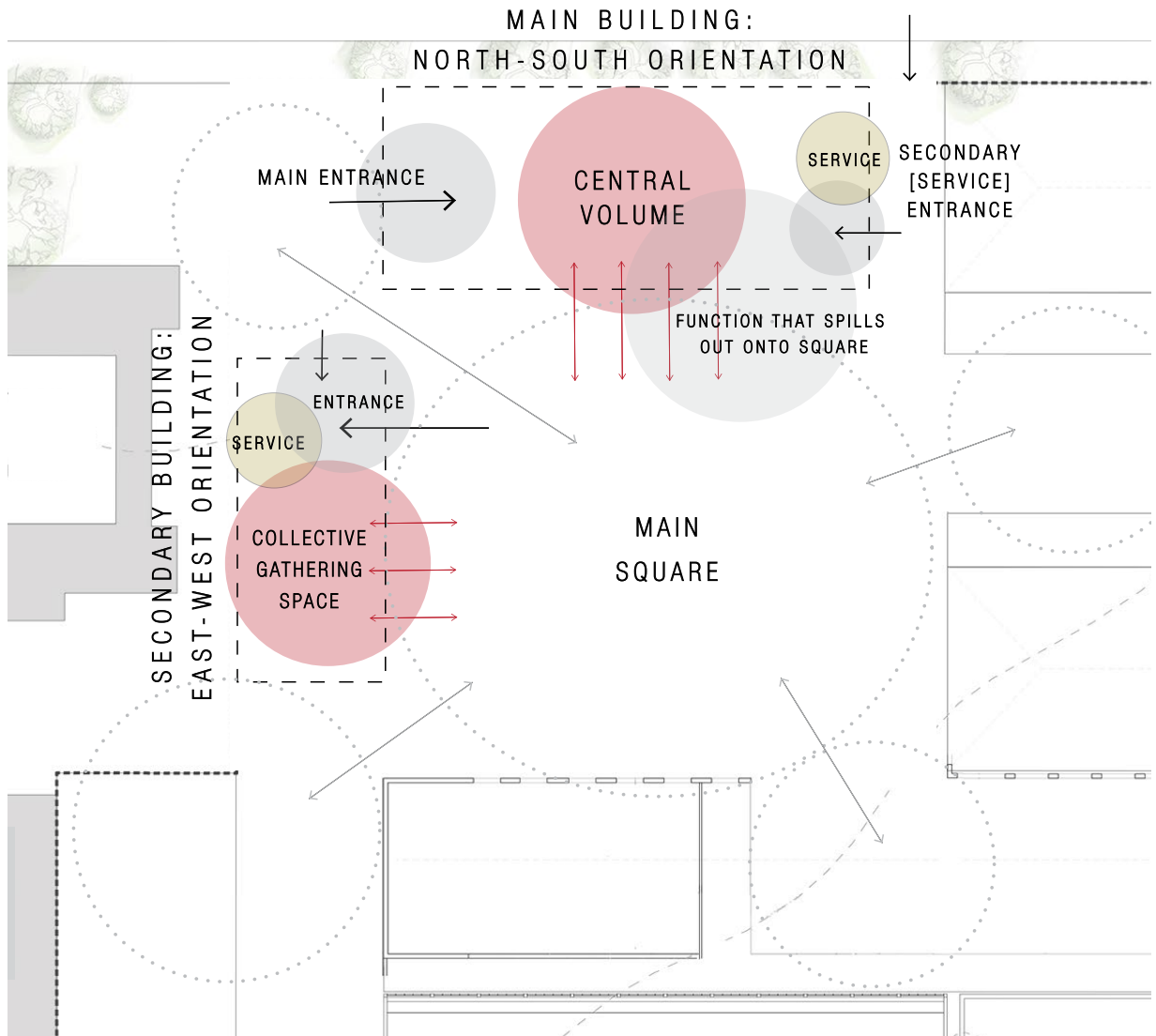


Figure 7.14: Site plan - contextual relationships



## 7 . 8 T R A N S L A T I N G T H E O R Y T O D E S I G N

In light of the discussion on the various ‘technology-induced compromisers’ and their respective ‘counter-strategies’, the following is a section which will translate these counter-strategies (to compromisers 1, 3, 4, 5 and 6, (2 is a programmatic response in the Wierda building, as explained in section 7.6)) into spatial design scenarios and consider relevant precedent studies related to each. The sequence of dealing with each ‘compromiser-translation’ does not follow that of the theory chapter, but rather the approach taken to the design process as a whole; still, each ‘compromiser’ is numbered correspondingly to the theory chapter for clear reference between the two.

SEQUENCE OF COMPROMISER-TRANSLATIONS:

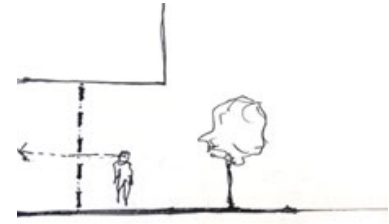
- COUNTER-STRATEGY to Compromiser 1 [Loss of slow pace of reality]
- COUNTER-STRATEGY to Compromiser 5 [Loss of quality of intimate face-to-face communication]
- COUNTER-STRATEGY to Compromiser 3: Loss of relationship with nature
- COUNTER-STRATEGY to Compromiser 4: Loss of culture & Identity
- COUNTER-STRATEGY to compromiser 6: Mass allure of [negative] escapism

COUNTER-STRATEGY to Compromiser 1 [Loss of slow pace of reality]

A.) Thickening of the spatial experience:

- Providing enticing attractions & as much diversity as possible along the meandering route.

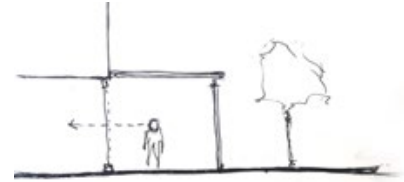
- Soft ground floor edges  
(Open, active edges with varying degrees of permeability)



B.) Crafting a relaxed environment

(When people are at ease they would not feel the need to pass by quickly, they will linger):

- Human-centred and -scaled spaces
- Integrating nature much more into urban life (see 'compromiser 3')



EXISTING :

————— EXISTING HARD EDGE  
Existing building



PROPOSED :

————— HARD EDGE  
New building wall

----- SOFT EDGE  
Semi-permeable, openings, layering, thresholds, unveiling

||||| INTERACTIVE EDGE  
Dialogue between inside and outside

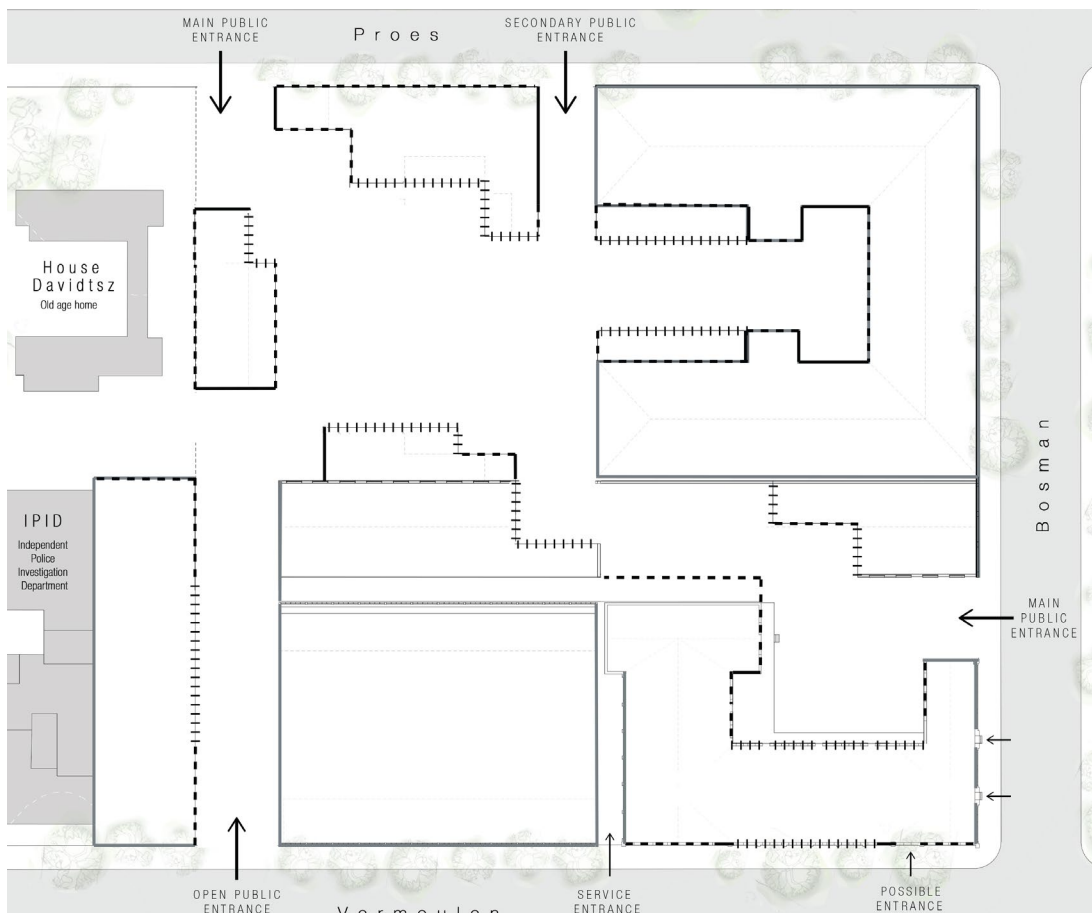
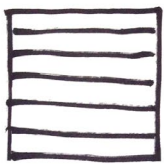
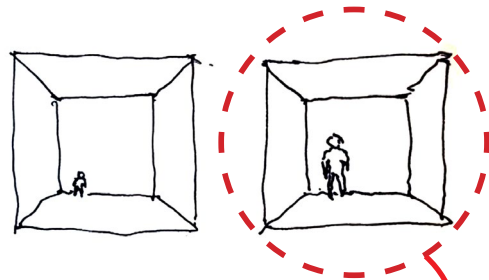


Figure 7.15: Existing & proposed edge conditions

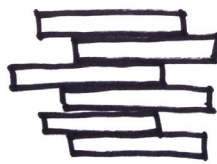
COUNTER-STRATEGY to Compromiser 5 [Loss of quality of intimate face-to-face communication]

HYPOTHESIS: ARCHITECTURE AS A 'HUMANIST NEGOTIATOR'

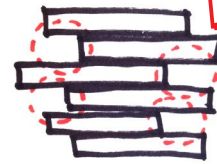
- Through **collective, social, humanist-scaled space-making** rather than universal, monumental, objective space-making



Standard building



Levels shifted



Small pockets of indoor-outdoor spaces

- By celebrating and enhancing (extending, thickening the experience of) the spaces in a building where social interaction would typically occur (i.e. circulation routes, foyers, landings, gathering spaces, all the 'grey' / un-programmed spaces)

- By **maximising informally programmed space**

- As much as possible **dialogue and connection** throughout all spaces and volumes.

- **Multi-functionality** - da Costa & van Rensburg states that "human behaviour and social practices are inherently spatial, and that the organisation of space is a social product." (2008:47) When a space is adaptable to a whole range of social functions, in-place social interaction is promoted and maximised.

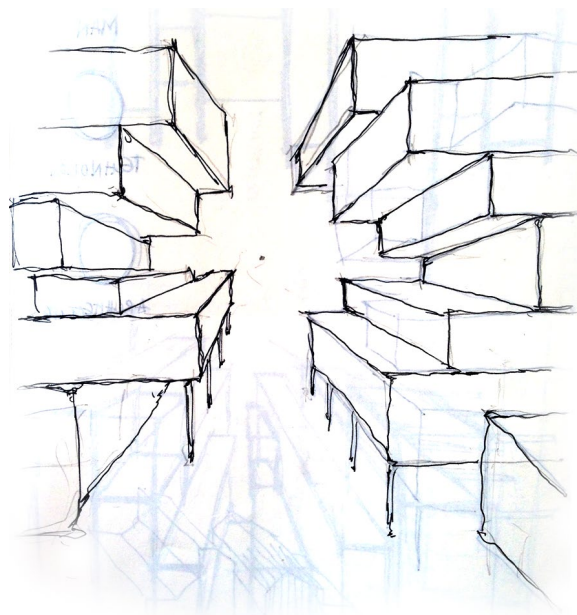
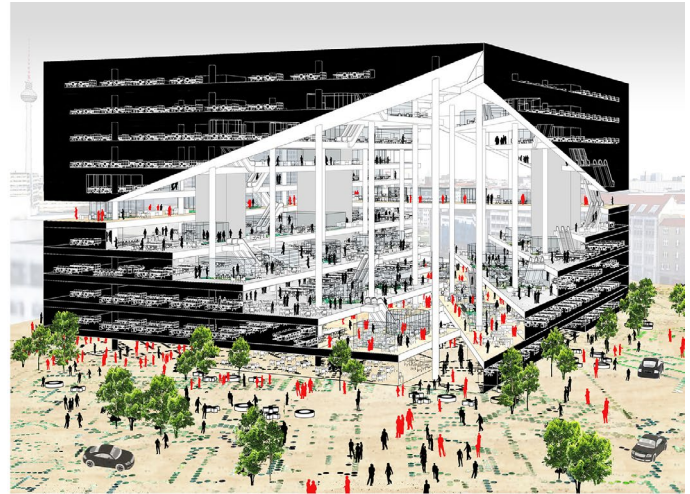




Figure 7.16 illustrates a proposal by OMA for 'Digital Valley' - a media campus in Berlin. The architects derived the design in response to the crucial consequence of technological advancement: "the relationship between the worker and his computer, which isolates him in a bubble of introverted performance, inaccessible to collective overview" (Quirck, 2013).



According to the architects, "In the digital office, staring intently at a screen dampens all other forms of attention and therefore undermines the collective intelligence necessary for true innovation" (Quirck, 2013).



The concept for their building constitutes a terraced structure that opens up to a central open volume, and is mirrored to the top to form a three-dimensional canopy.



Figure 7.16: Proposal for 'Digital Valley' by OMA

Figure 7.17 is another proposal for the same project: Ole Scheeren's Creative Cloud, which presents the same type of interactive spaces around a central open volume.



Figure 7.17: Proposal for 'Digital Valley' by Ole Shereen

From these case studies it is clear that this is an important design generator in order to maximise interactivity, dialogue and collective space-making.

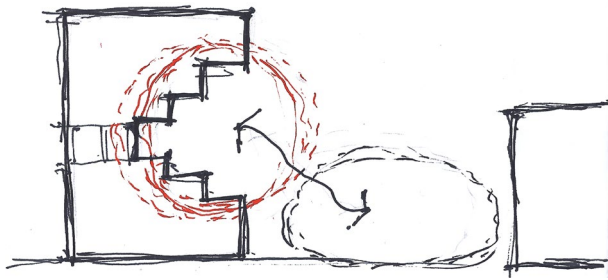
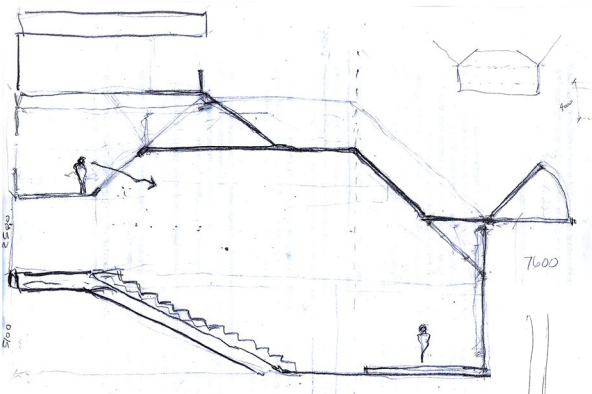
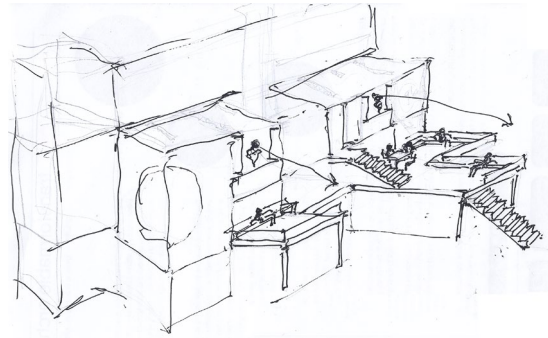


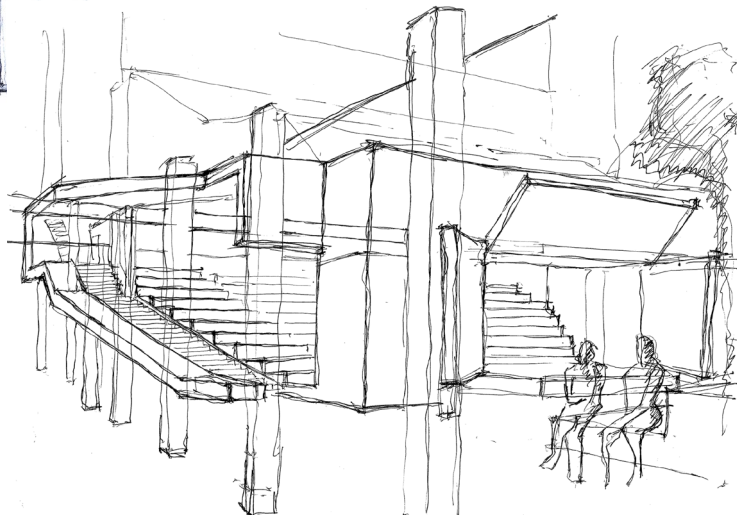
Figure 7.18: Sectional diagram: Interaction between void formed by building and main open square (Author, 2016)

Figure 7.18 illustrates a sectional diagram, related to the idea of spatial interactivity, but which also liaises directly with the central open square in the north-western quadrant of the block. One of the advantages inherent in a CBD context is the density and possibility of vertical development, with which comes the potential for views.



Visual interaction between auditorium and levels above

Visual interaction between auditorium and outside



Evolution of northern facade:

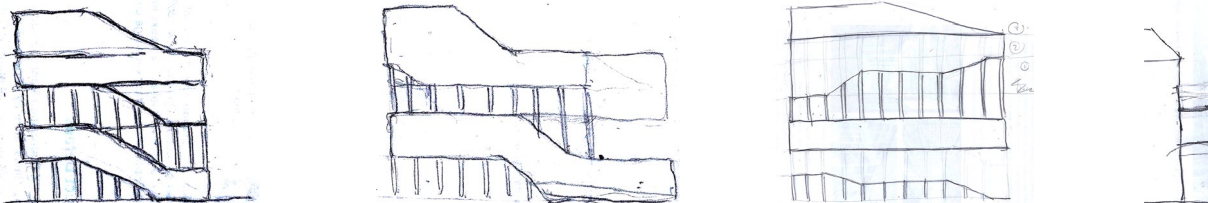






Figure 7.19: Museum of Image and Sound by Diller Scofidio + Renfro

As previously mentioned, the movement and circulation routes through a building are where spontaneous social interaction typically occur and this should therefore be enhanced.

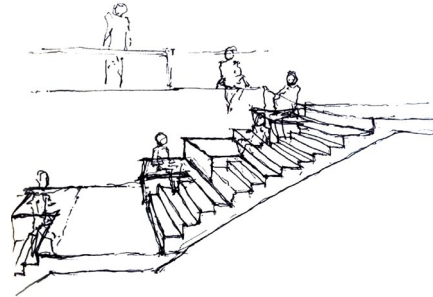


Figure 7.20: Columbia medical center by Diller Scofidio + Renfro

Figure 7.19 - 7.21 illustrates a few projects by Diller, Scofidio and Renfro in which the vertical movement is celebrated and expressed in the facade. The conventional method for vertical movement is typically a central staircase which repeats itself around an open volume; while this functions well, it causes a divide between the actual 'working spaces' from this open-ended interactive volume.

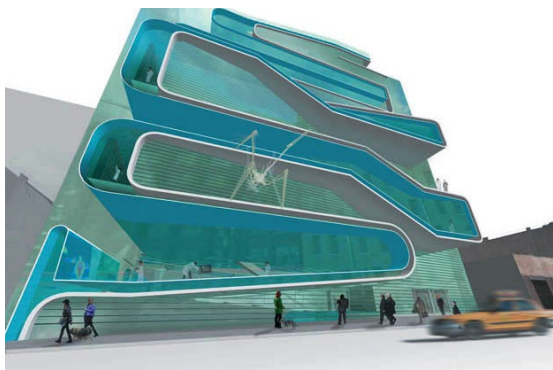
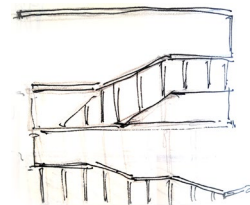
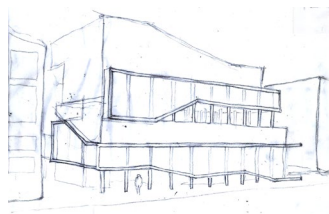
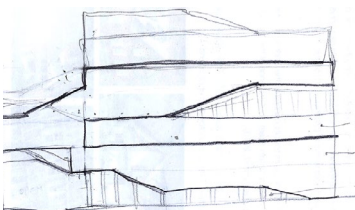


Figure 7.21: Eyebeam Museum by Diller Scofidio + Renfro

This paper therefore argues for various interpretations of the vertical movement, spread out in different ways (swept up from street level, rising up around open volume, interchanging from interior to exterior to encourage connection with the outside and blurring the boundaries between indoors and outdoors) but to still form a continuous route through the building (and not disjointed, separated stairs).



COUNTER-STRATEGY to Compromiser 3: Loss of relationship with nature

A.) Integrating nature into built fabric:

- Blurring the inside - outside relationship
- **Continuous urban surface** - from walkway to wall to roof
- **Vegetation throughout building** - horizontal, vertical and slanted planes (inside and out)

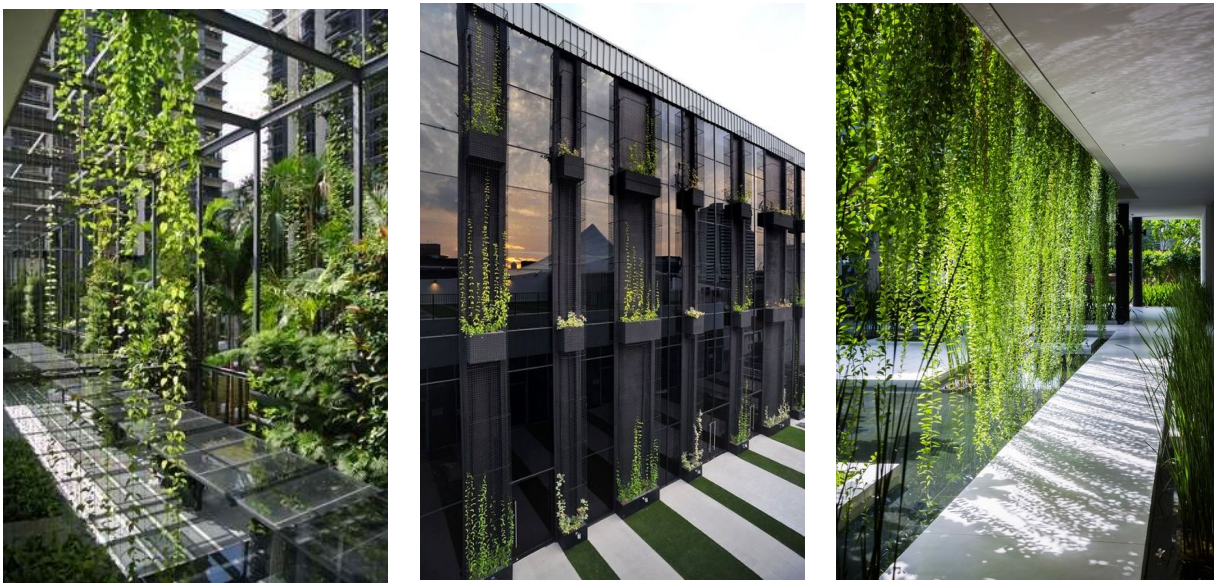
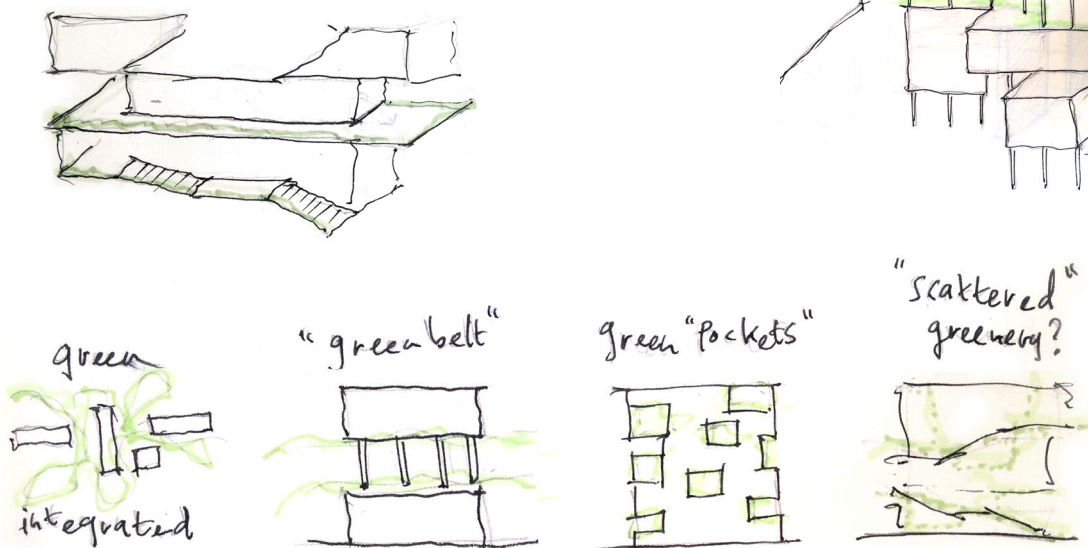
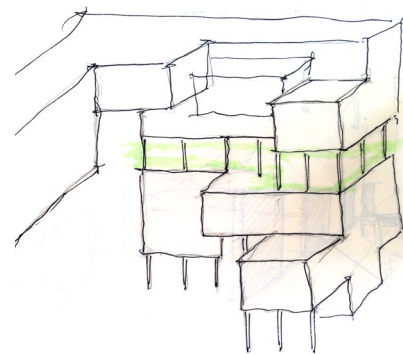
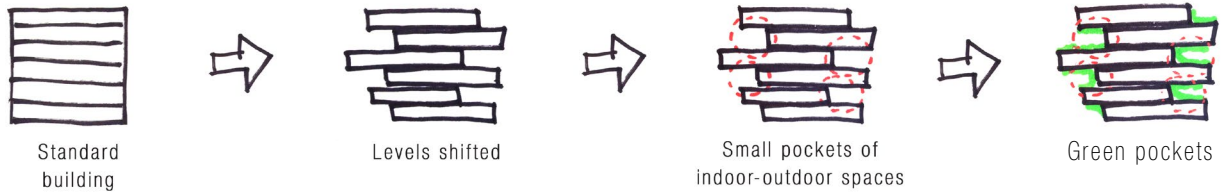


Figure 7.22: Examples of integrating nature into buildings

In response to compromiser 3, the incorporation of natural vegetation and exposed water elements (with which the user can come into close contact) is another main design generator.





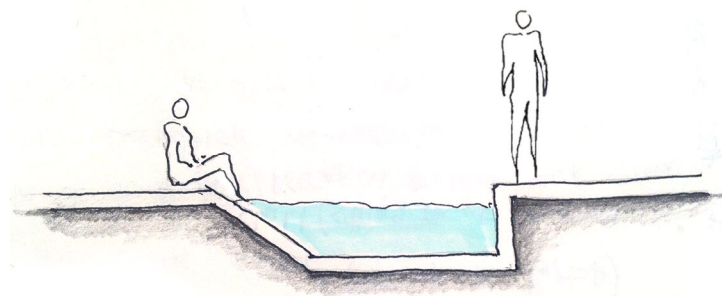


- Bring user in contact with natural properties of water by **integrating water elements** in the design



Figure 7.23: Examples of integrating water elements into public urban environments

Situated in an urban heat island, the water element can form part of an exposed water-harvesting system by means of an open water channel that makes use of the natural slope across the site to flow into the storage tank. Such a system presents the simultaneous benefits of public education about environmental issues as well as recreational intentions for the city-dweller.



Open water channel running down site's natural slope

## COUNTER-STRATEGY to Compromiser 4: Loss of culture & Identity

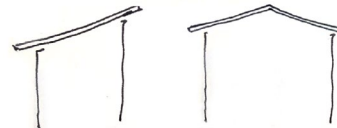
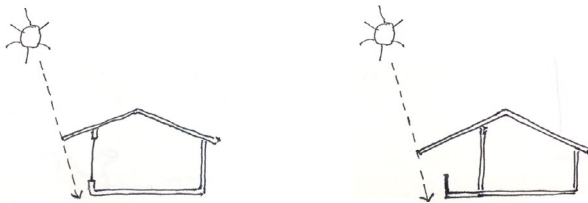
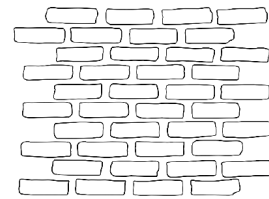
- MEDIATIVE APPROACH BETWEEN TRADITION AND MODERNITY (Barker, 2012 : 115):



In order to achieve this mediation, it is necessary to highlight the existing elements that characterise both the broader context of the city of Pretoria's architectural identity, as well as the GPW block's architectural identity.

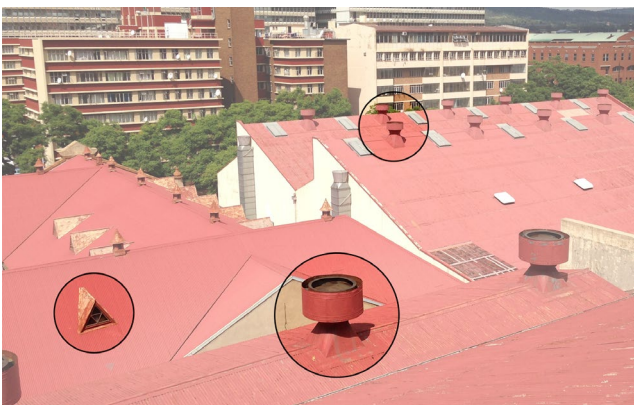
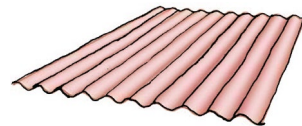
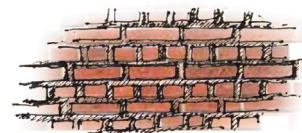
TRADITIONS IN CONTEXT OF PRETORIA (Fisher, le Roux and Mare, 1998):

- Traditional plan-forms
- Rustic brick, either directly as clinker or as whitewashed stock
- Low-pitched iron roofs
- Deep shaded eaves and verandas
- Sun-shy windows
- Sensitivity to landscape and land features
- An architecture responsive to climatic constraints



TRADITIONS IN CONTEXT OF GPW BLOCK:

- English bond-brickwork (see section 3.4.8)
- Red corrugated iron-roofing
- Variants of characteristic roof-ventilator



*"In South Africa, local conditions mandated the use of corrugated iron for roofing, allowing for the use of roof ventilators, which became part of a regionalist aesthetic."*

*(Carke and de Villiers, 1025: 79)*

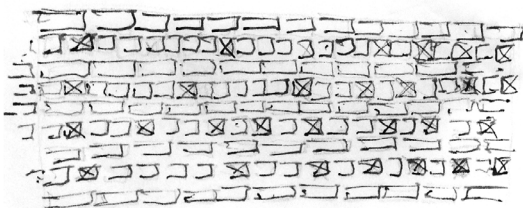
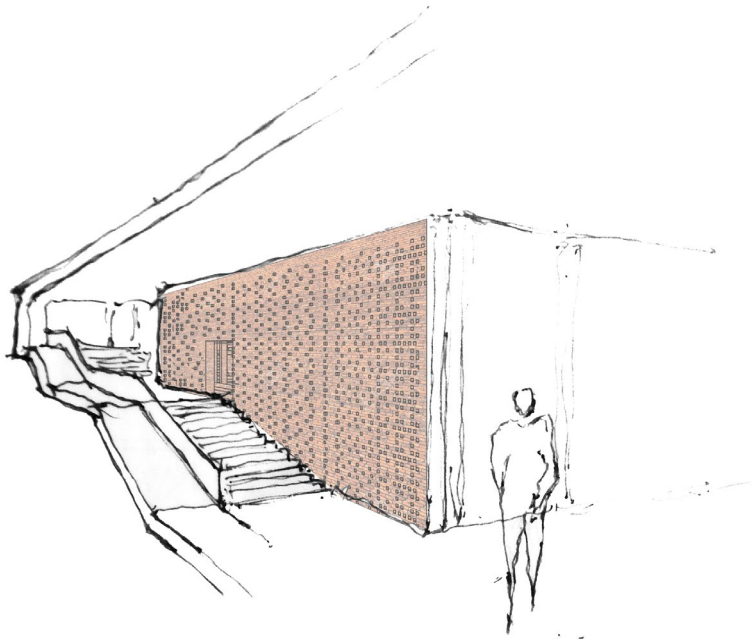
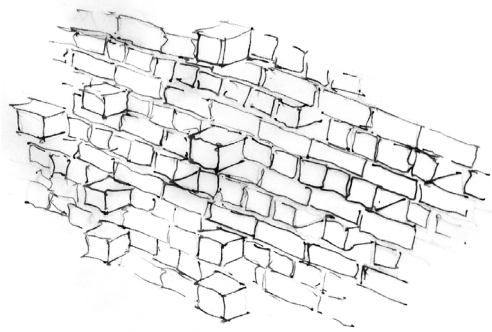
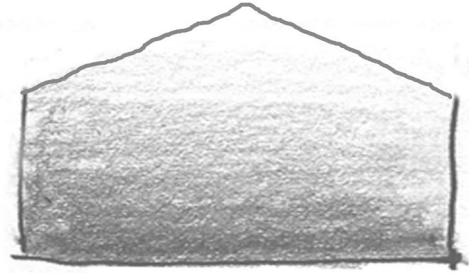
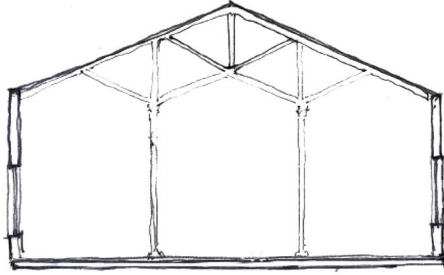
*"The historical rooflines and ventilators contribute to the heritage value of the cityscape. The GPW's hybrid structure demonstrates the transition from traditional to modern construction methods."*

*(Clarke, Kuipers and Swart, 2015: 115)*

Figure 7.24: Roof ventilators on existing GPW buildings



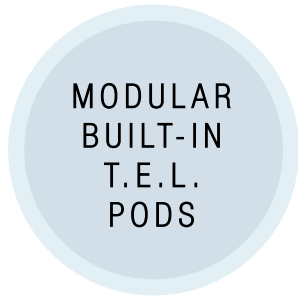
- Mediating structure between stereotomic (solid, heavy, earth, brickwalls, concrete ) at the bottom and tectonic (light, air, steel, metal sheeting) at the top



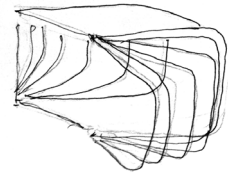
sparse headers to abundant openings (in line with tectonic concept)



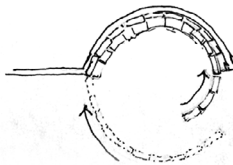
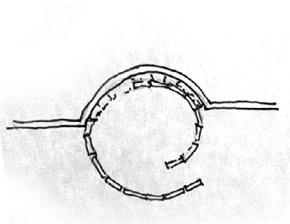
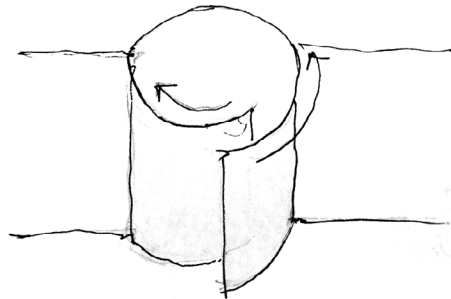
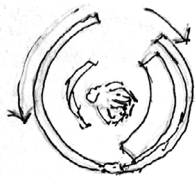
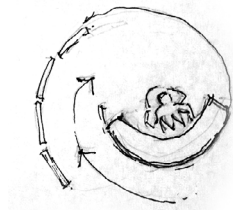
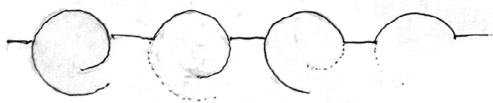
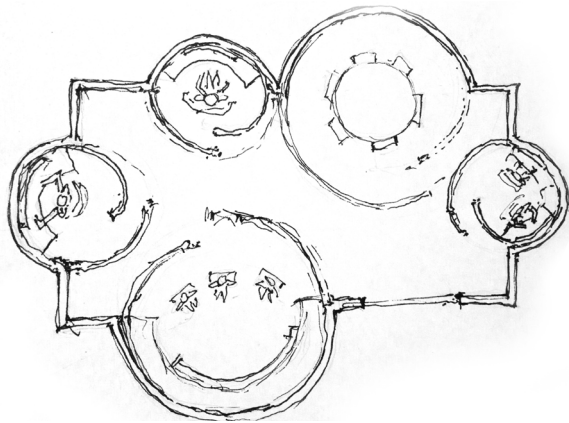
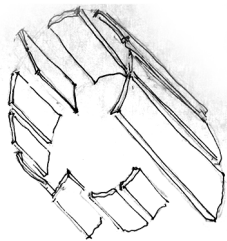
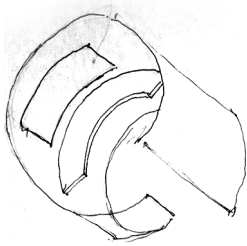
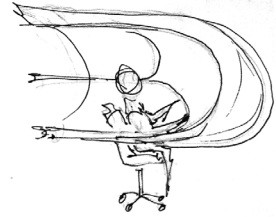
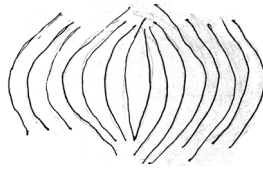
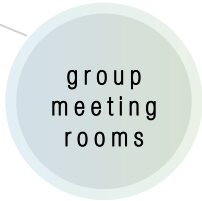
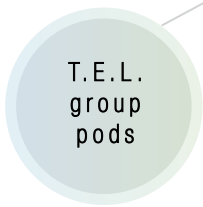
### 7.9 TRANSLATING PROGRAMME TO DESIGN [COUNTER-STRATEGY TO COMPROMISER 6]



individual

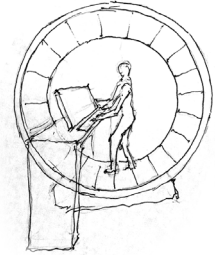
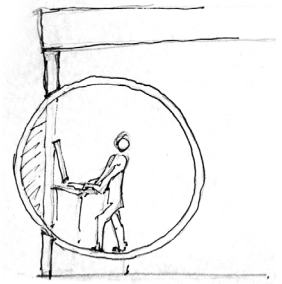
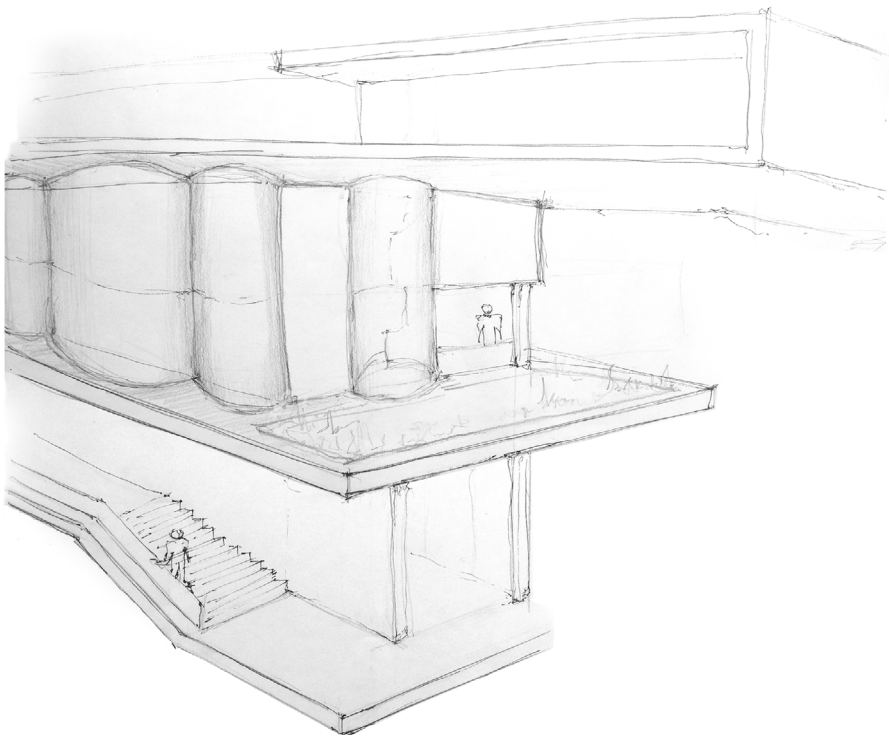


collaborative

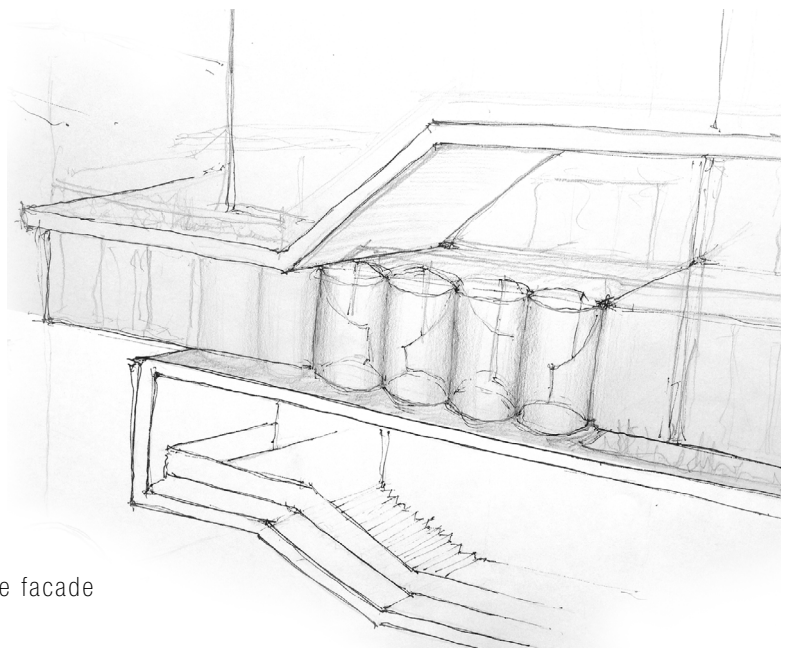
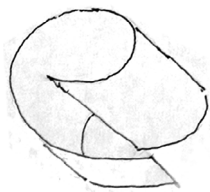
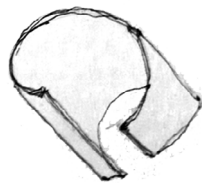
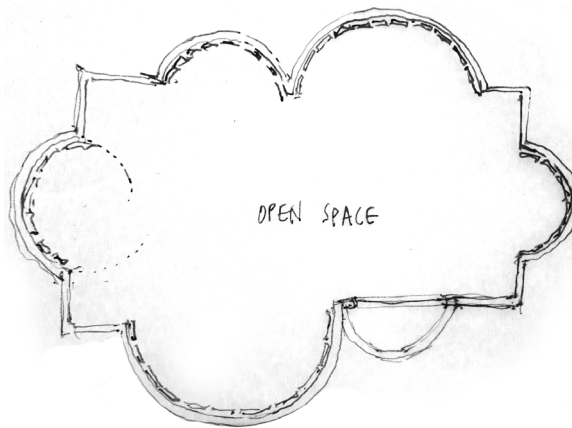


Alkibiade  
Cylindrical  
Square  
A.H.





Adjustable pods to  
open up space



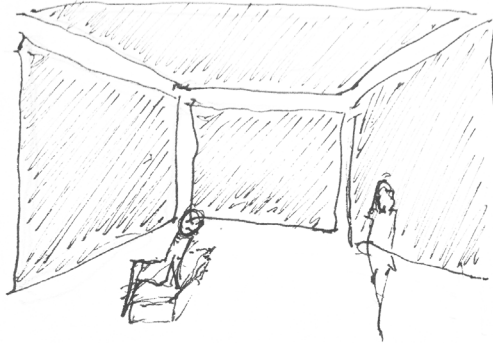
Expressing pods on the facade



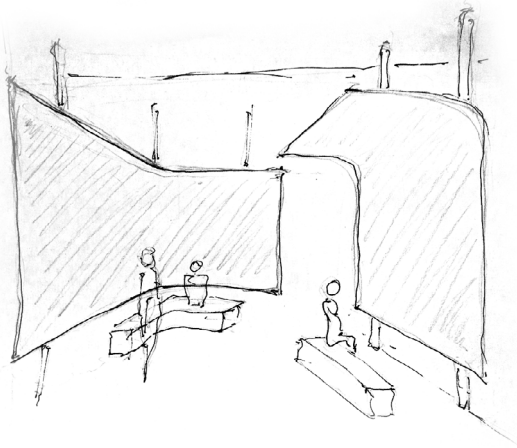


LEARNING  
COMMONS

"passive  
learning"



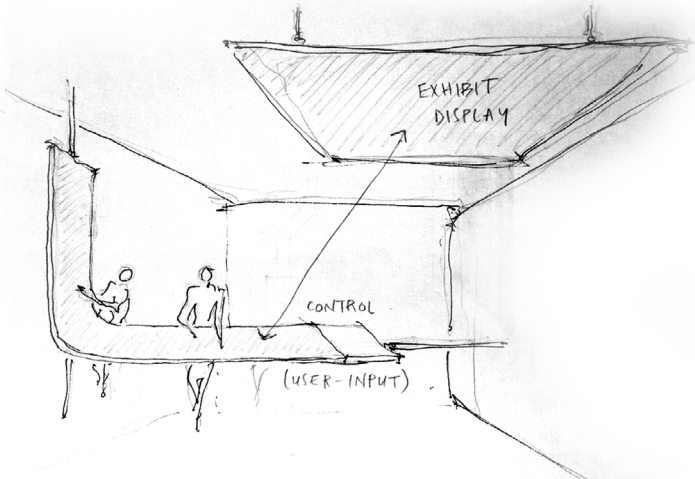
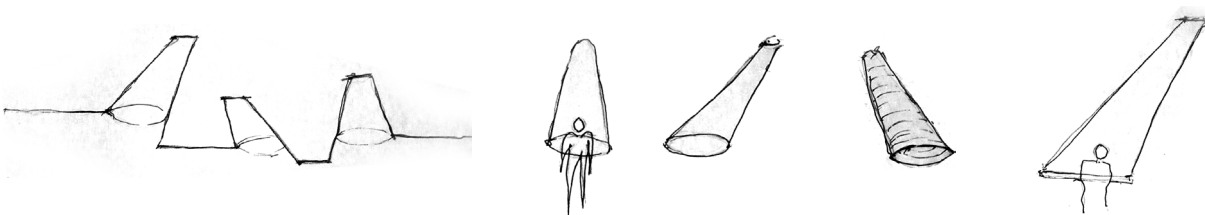
immersive  
[closed] T.E.L.  
'dark rooms'



LEARNING  
COMMONS

"interactive  
learning"

interactive  
[open] T.E.L.  
commons

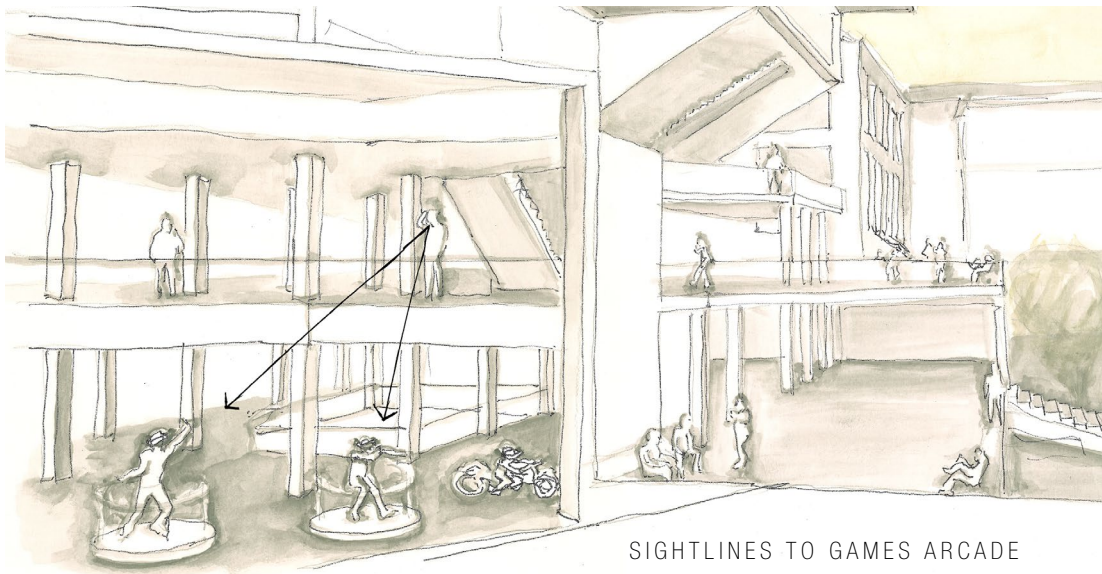
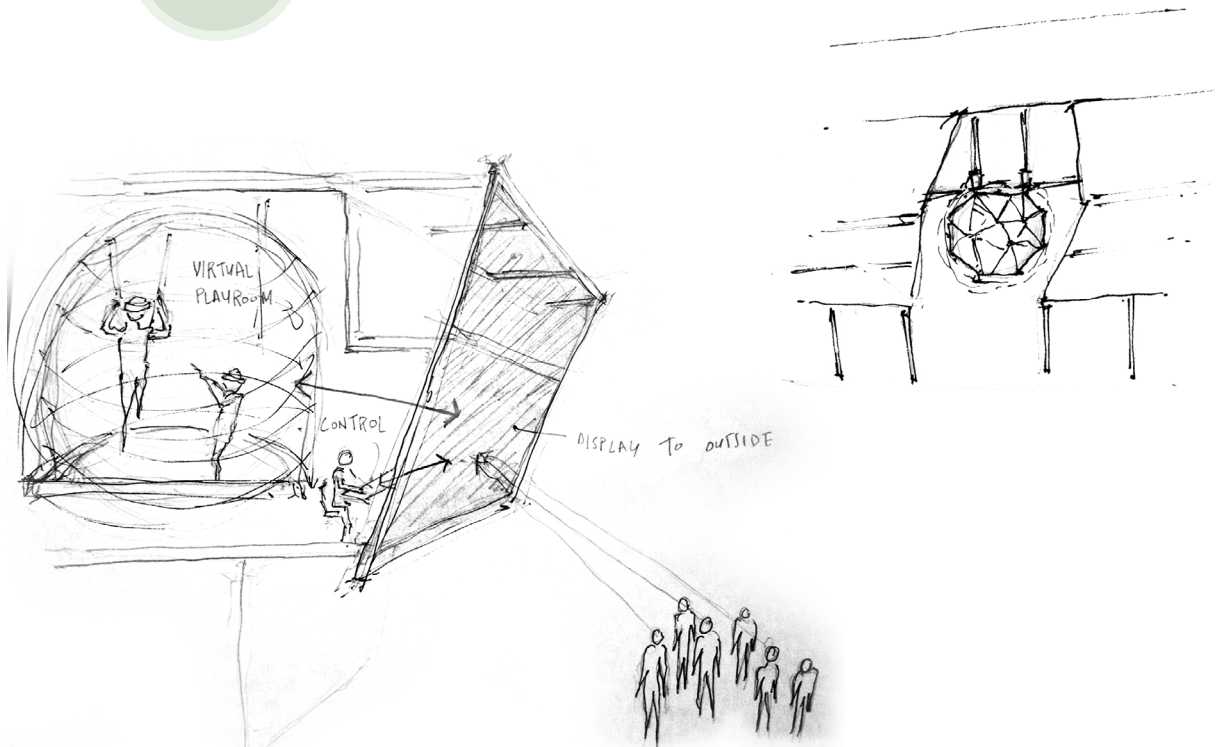
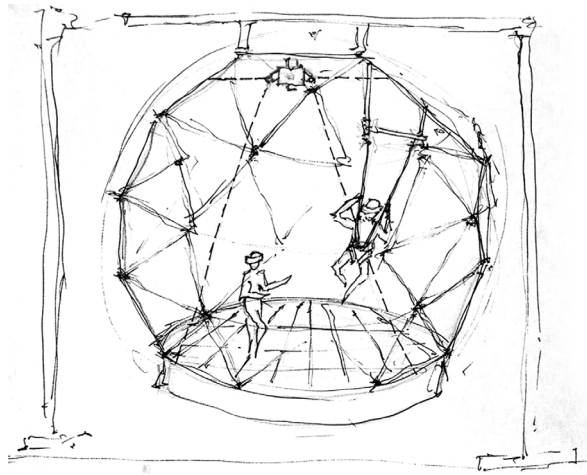


DIGITAL LEARNING SCREENS:



SOCIAL  
&  
PLAY

T.E.  
travelling  
and games  
arcade

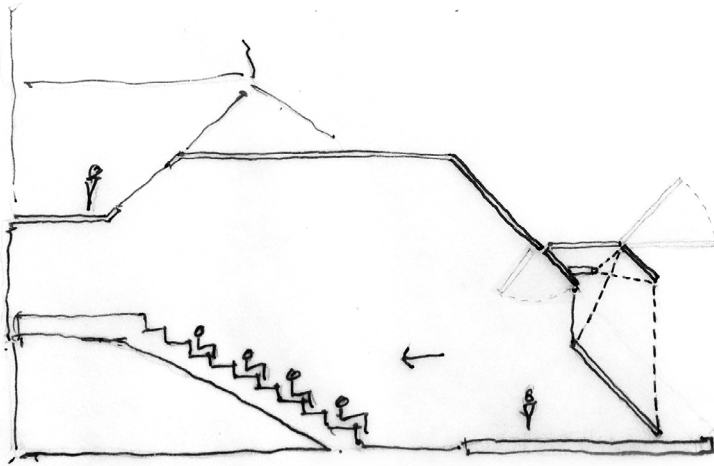
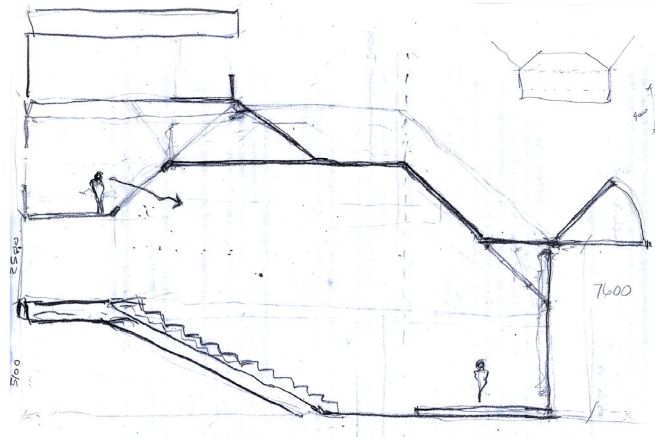


SIGHTLINES TO GAMES ARCADE

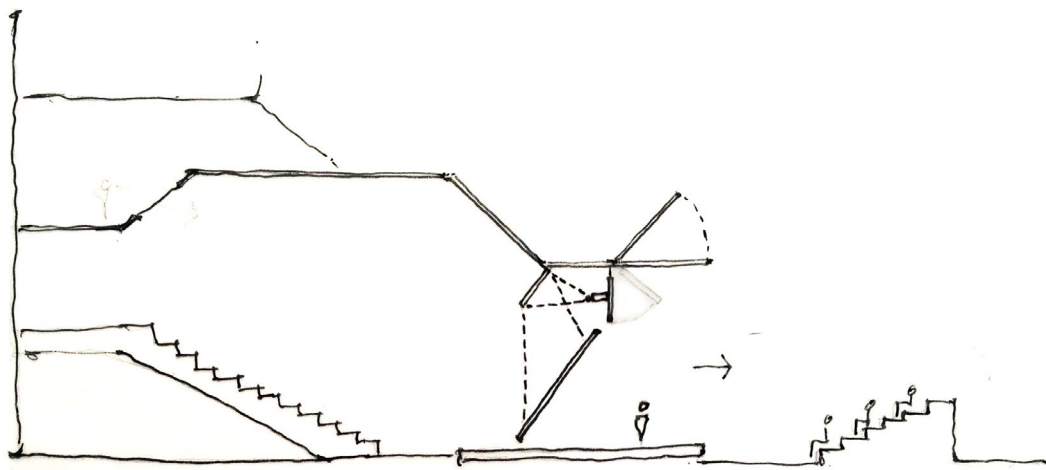


alterable  
'auditorium'

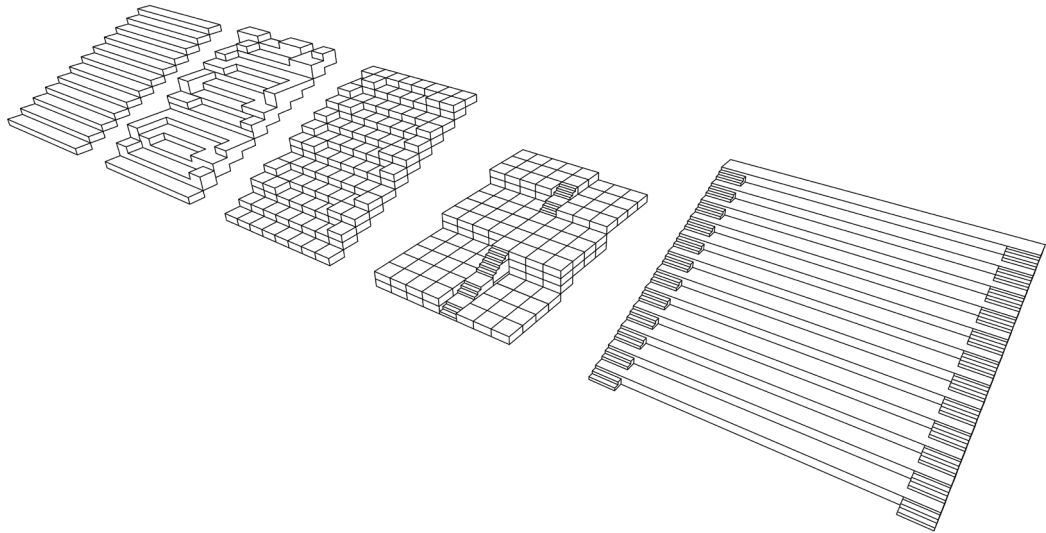
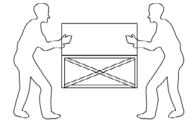
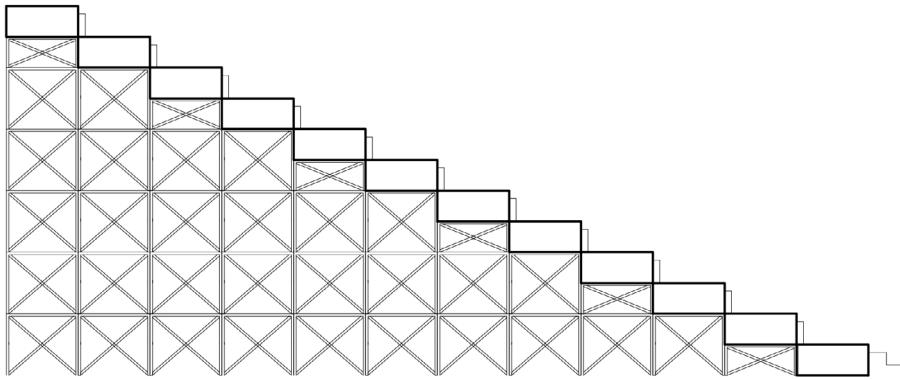
LEARNING  
COMMONS



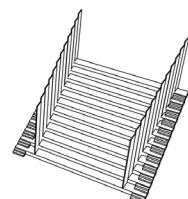
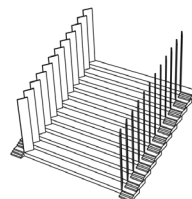
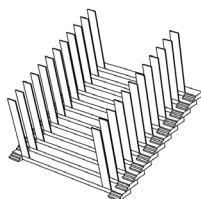
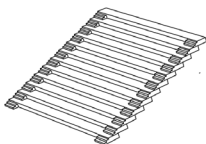
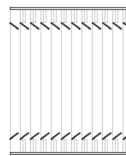
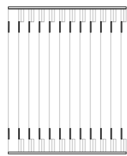
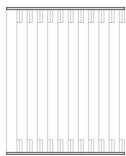
MULTI-DIRECTIONAL HOLOGRAM PROJECTION BACKSCREEN

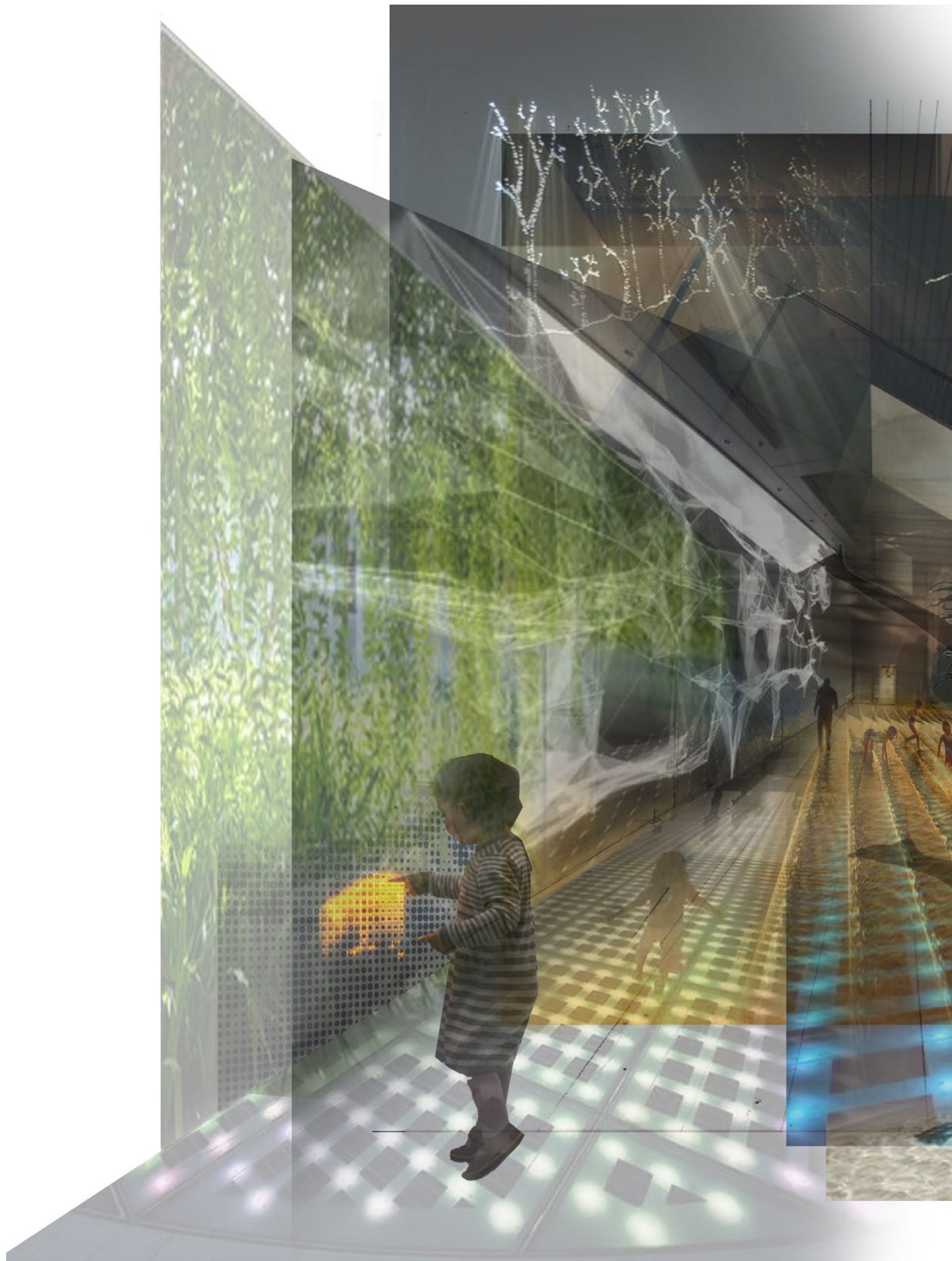






Modular structure for different seating configurations  
in adaptable 'auditorium'







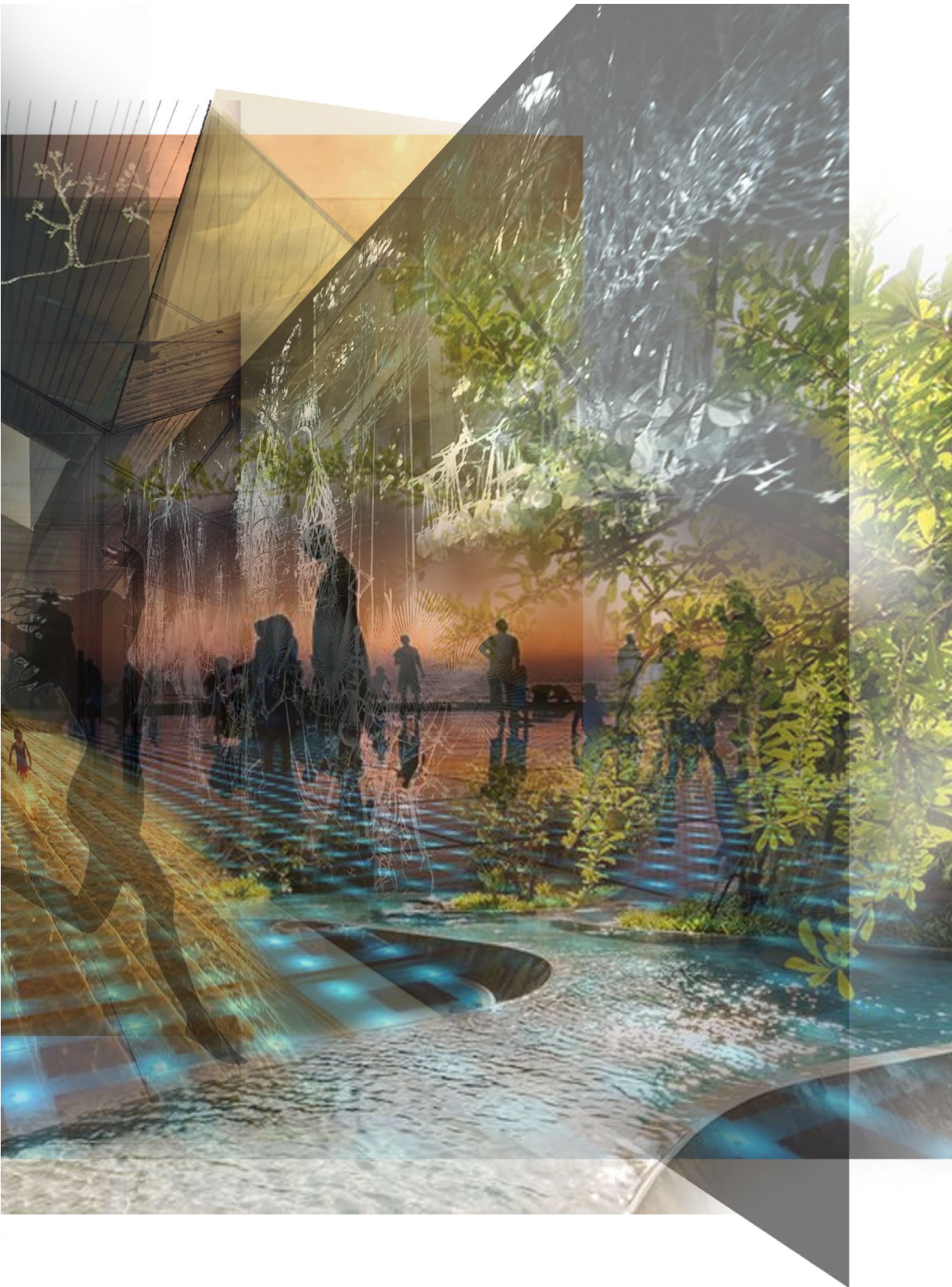
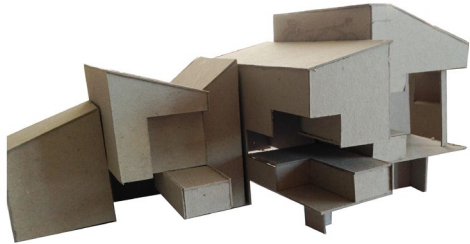


Figure 7.25: Conceptual vision (Author, 2016)

7 . 1 0   D E S I G N   D E V E L O P M E N T :  
7 . 1 0 . 1   E A R L Y   P R O C E S S   W O R K



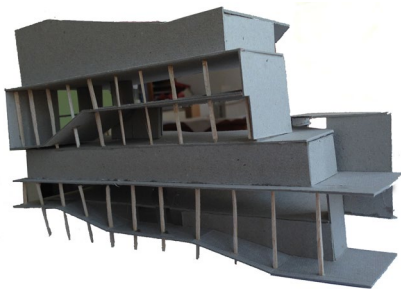
CONCEPT MODEL 1:  
Carving out 'interactive' void



CONCEPT MODEL 2:  
'Interactive' southern facade

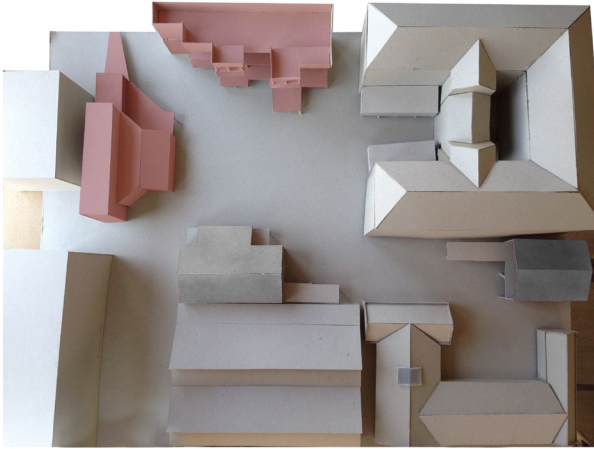


CONCEPT MODEL 2:  
Break through building -  
'Green belt'

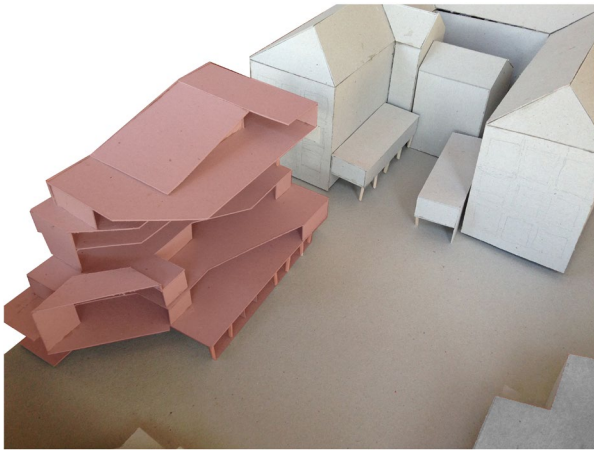


CONCEPT MODEL 3:  
Expressing movement on  
northern facade

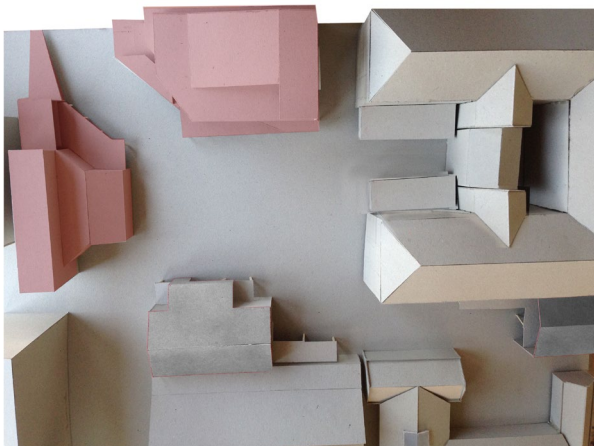




CONCEPT MODEL 2 in context:  
'Interactive' southern facade



CONCEPT MODEL 3 in context:  
North building in relation to  
neighbouring administration building

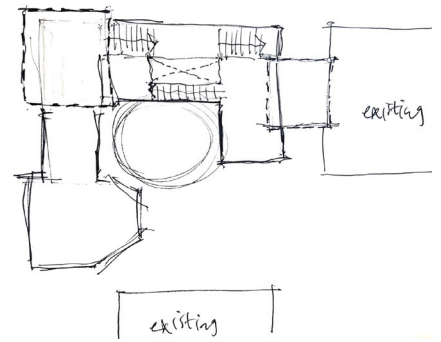
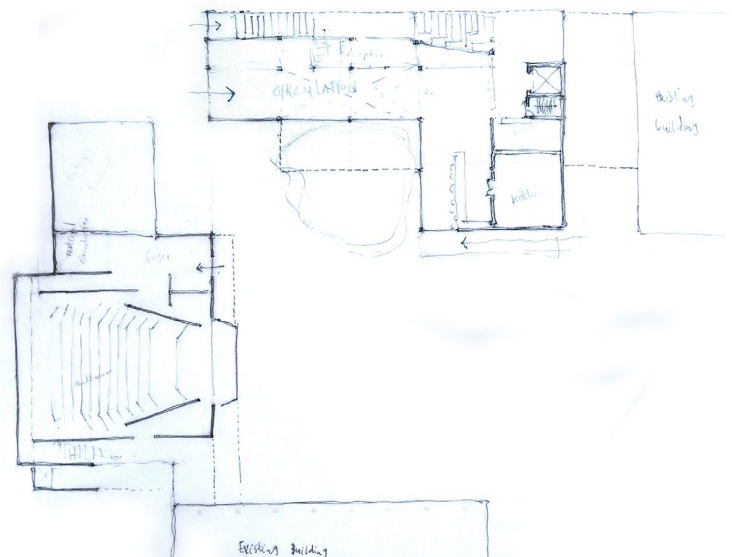
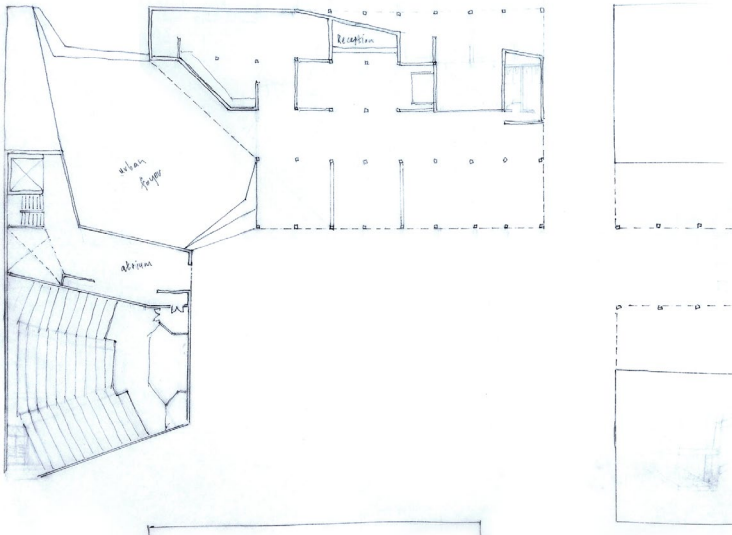
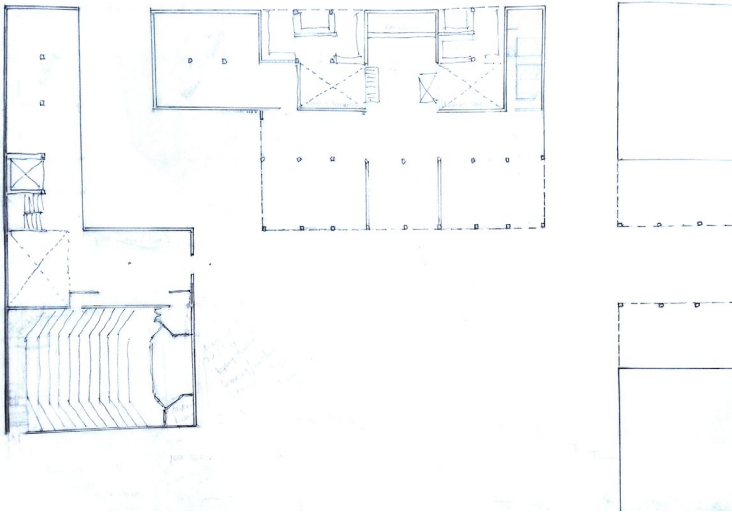


CONCEPT MODEL 3 in context:  
North & west building



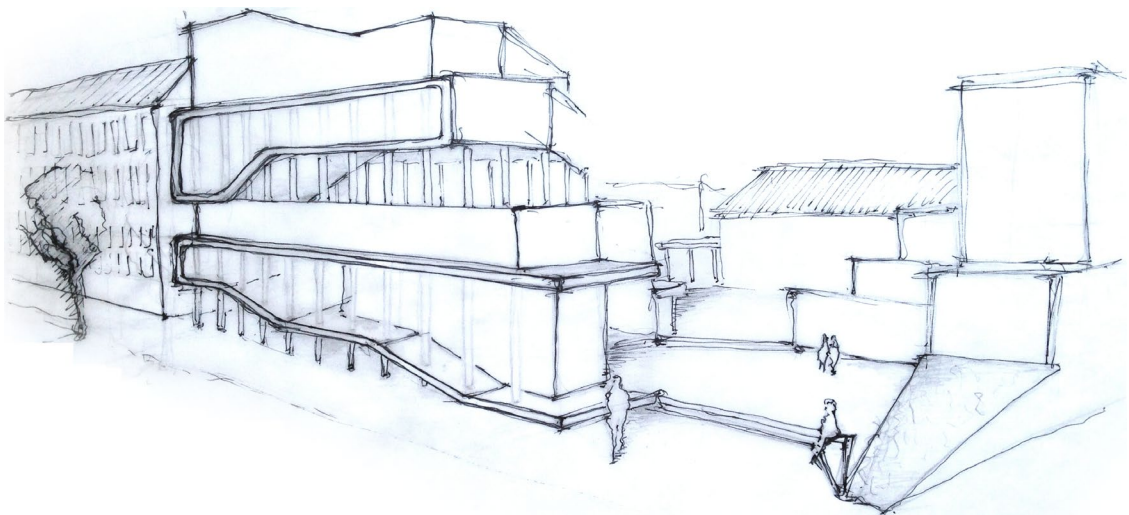
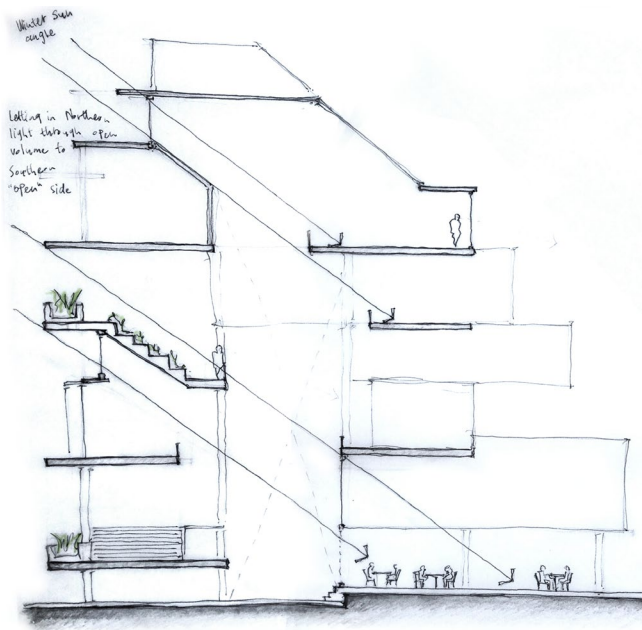
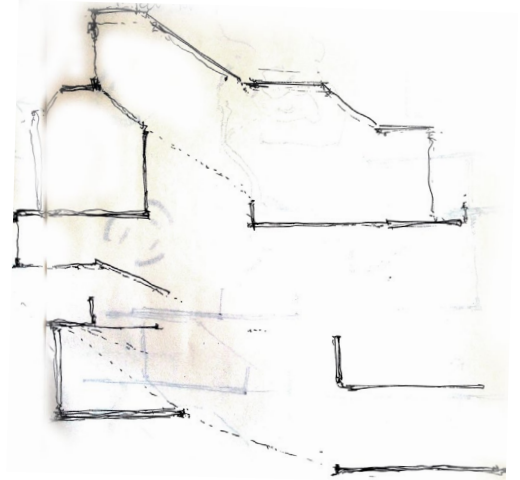
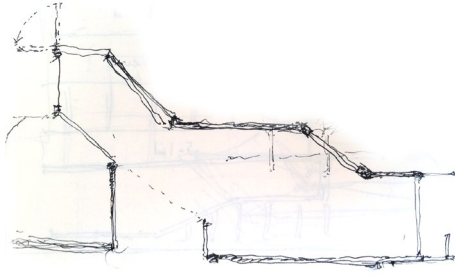


Evolution of plan:



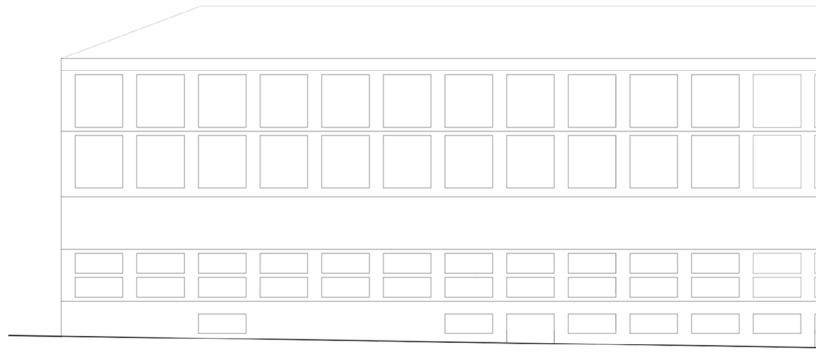


Sectional exploration:

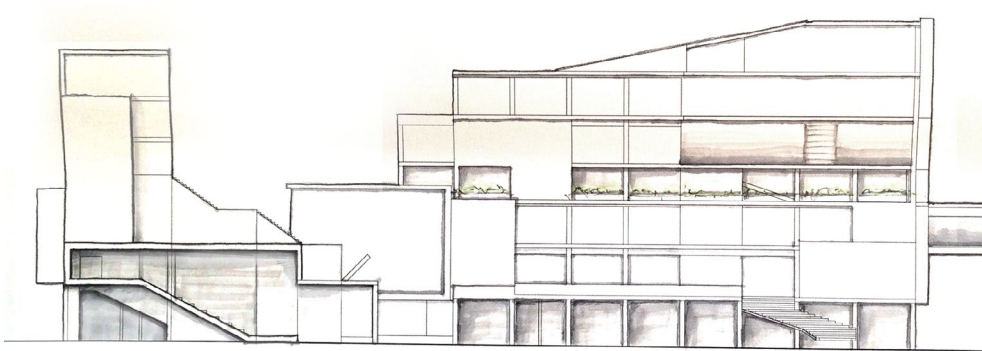




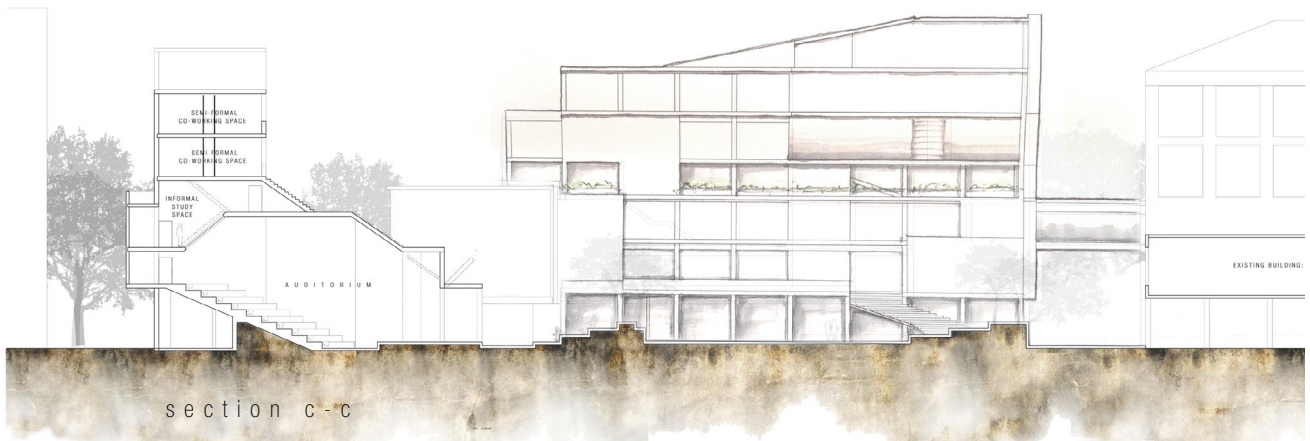
7.10.2 JUNE DESIGN  
CRIT DRAWINGS:



section a-a

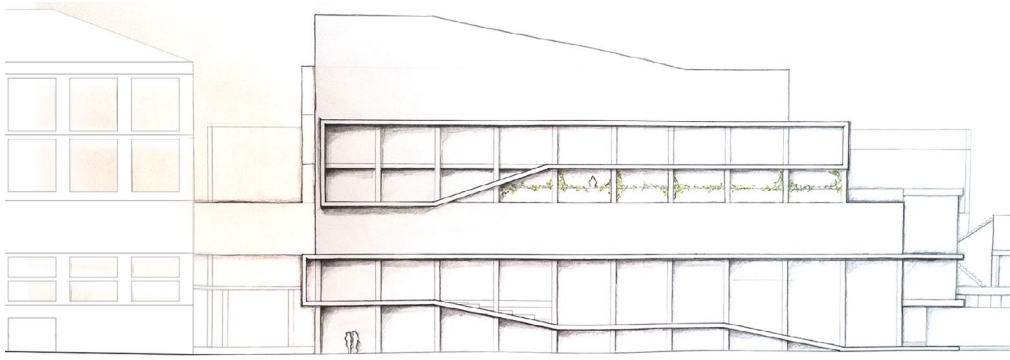


south elevation

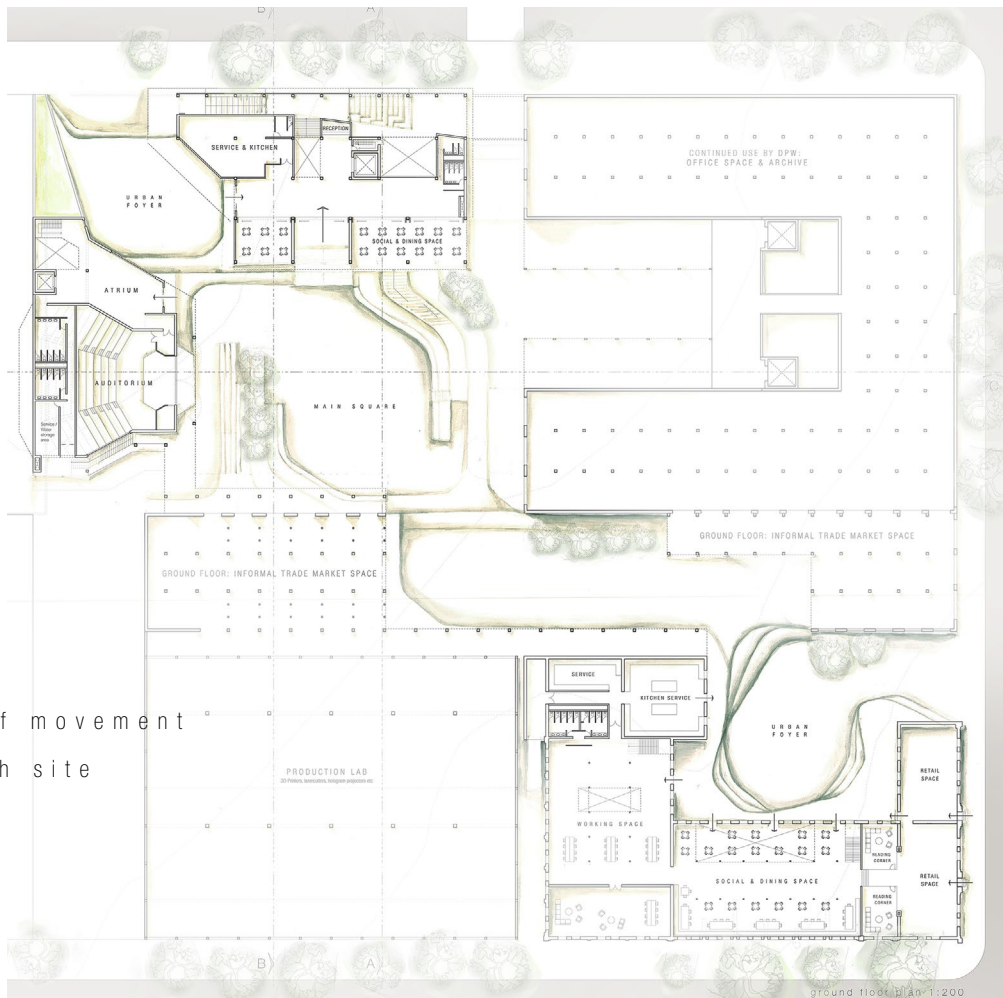
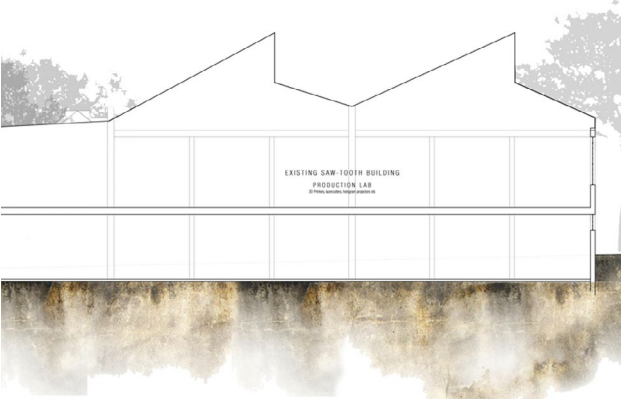


section c-c





north elevation

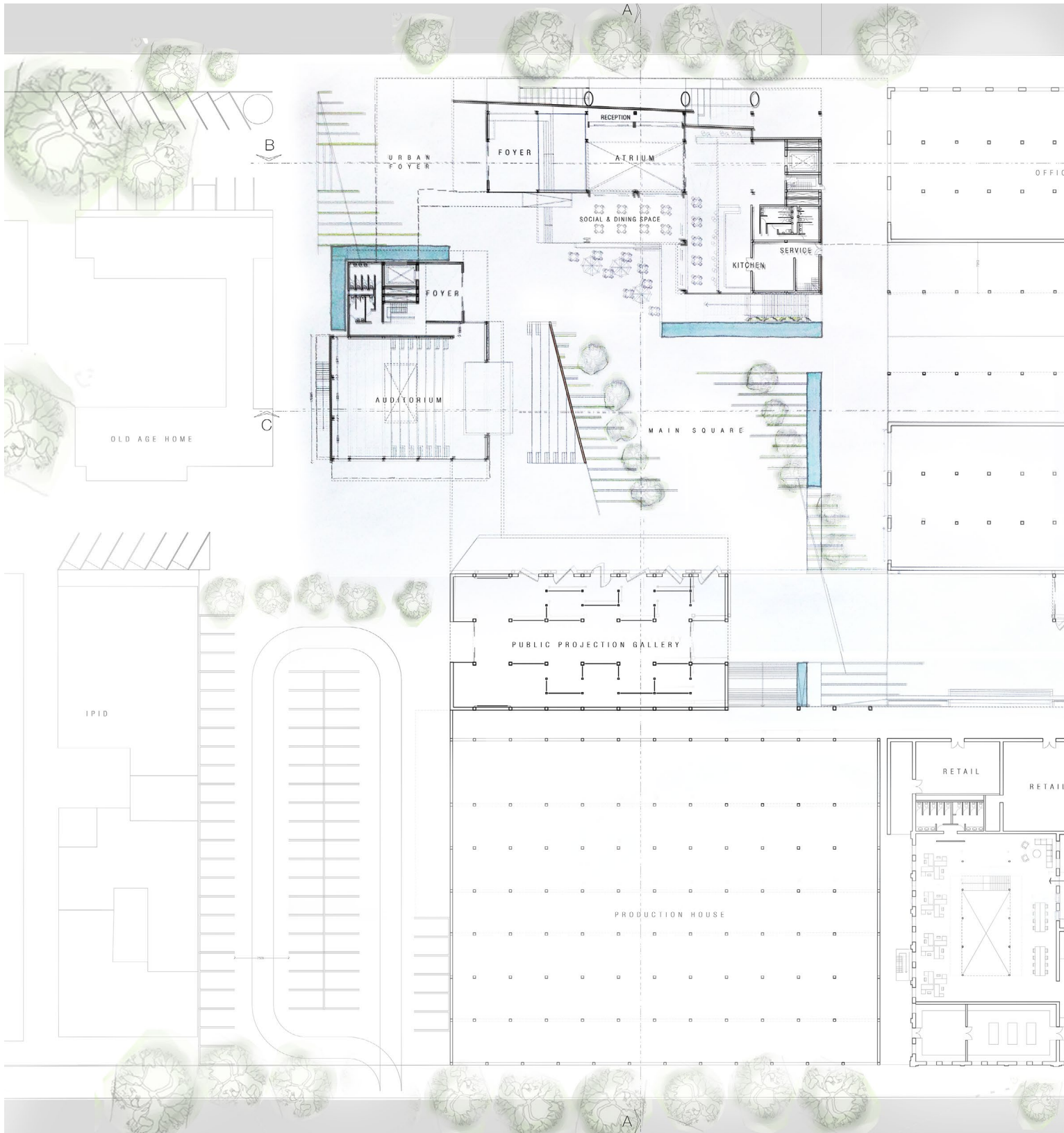


Flow of movement  
 through site

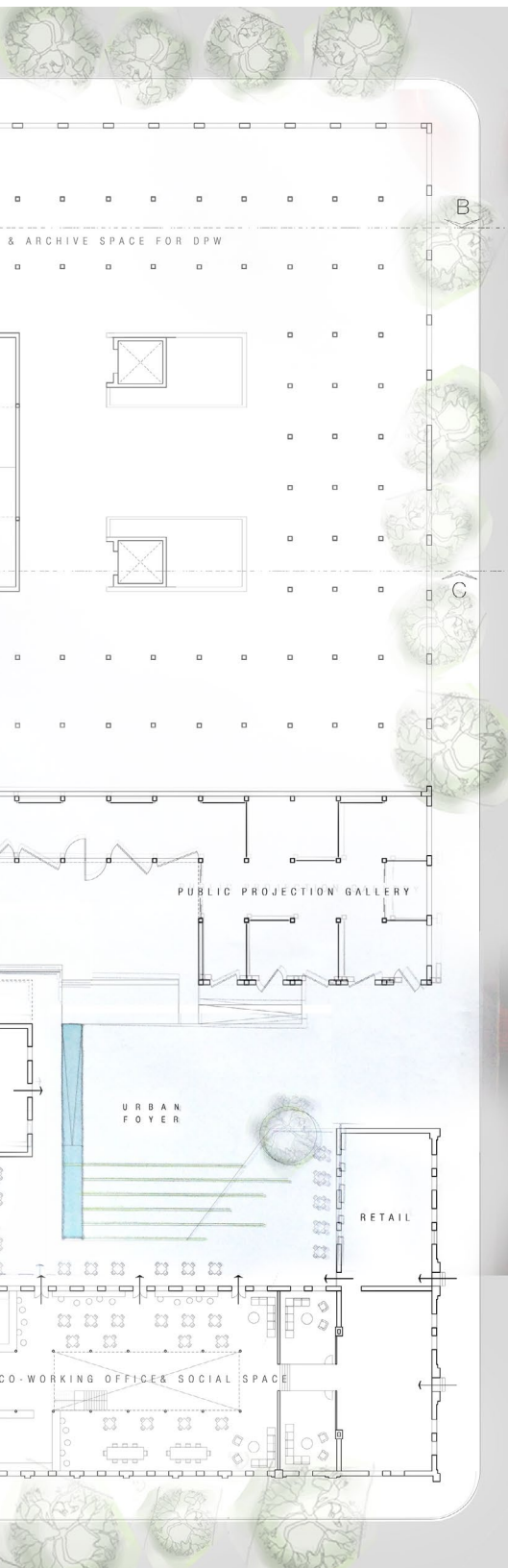
ground floor plan 1:200

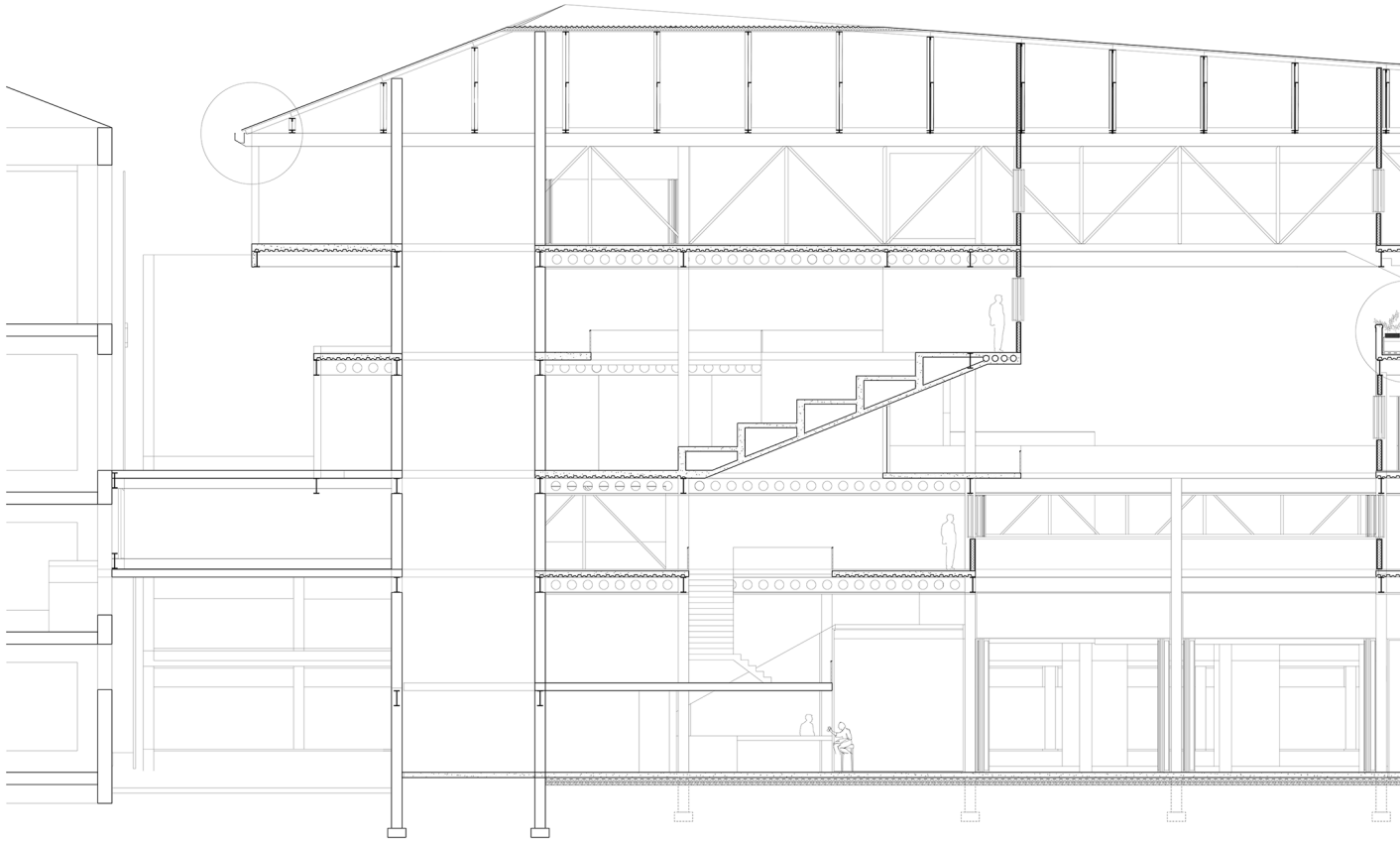


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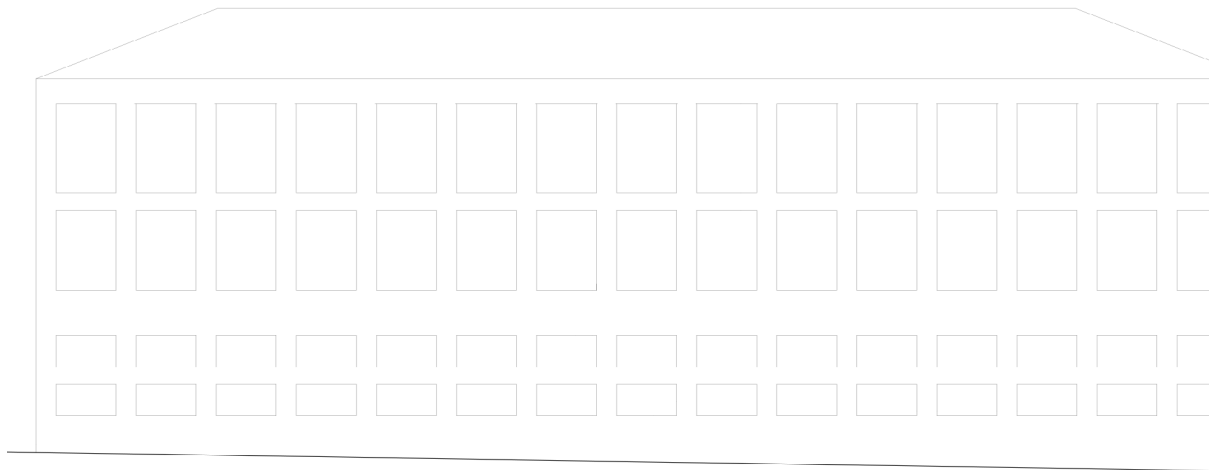


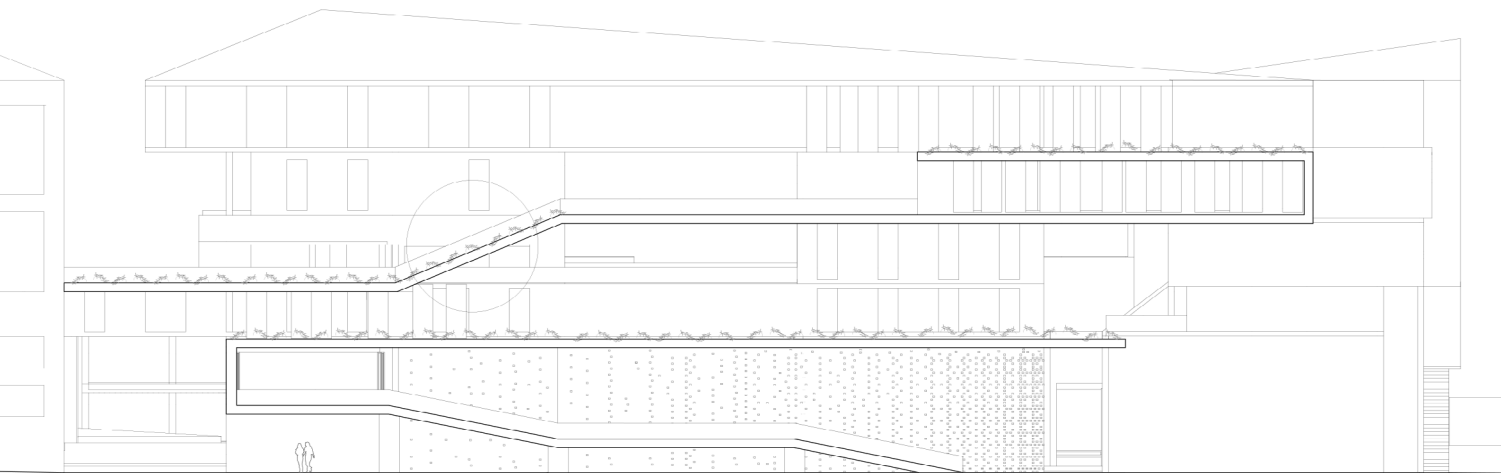
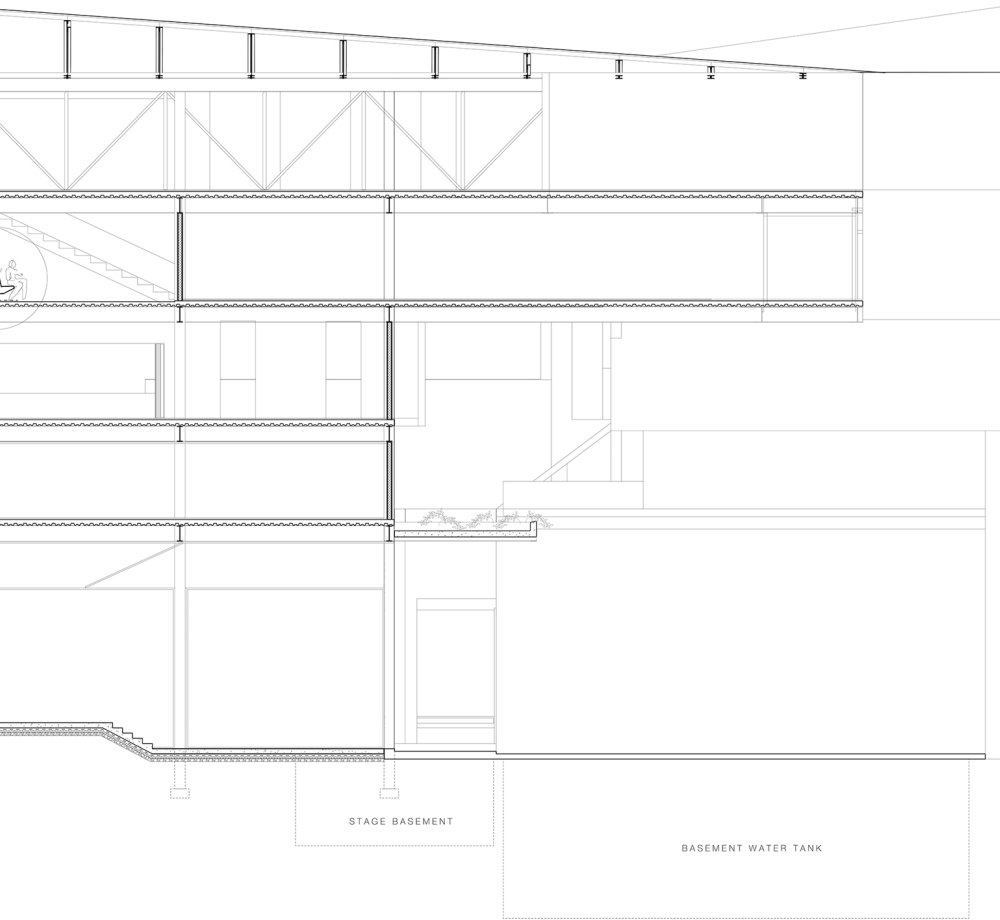






S e c t i o n   B - B



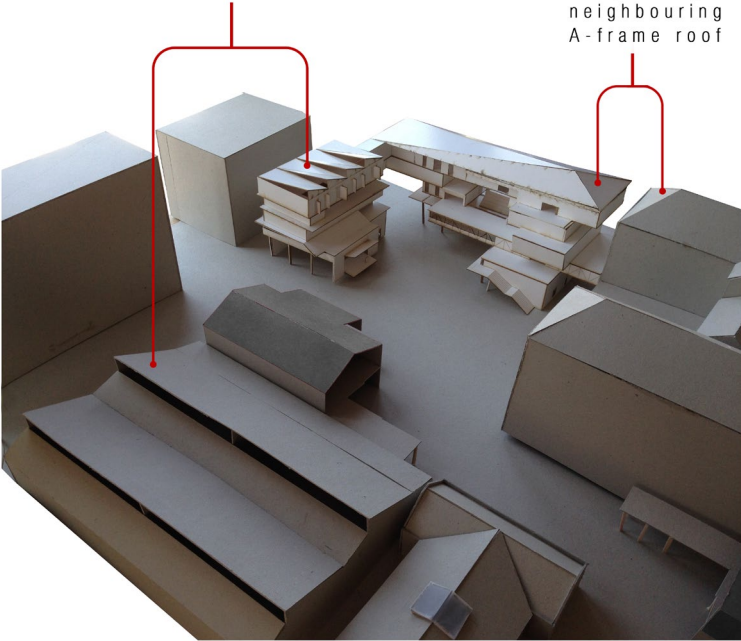


N o r t h e l e v a t i o n

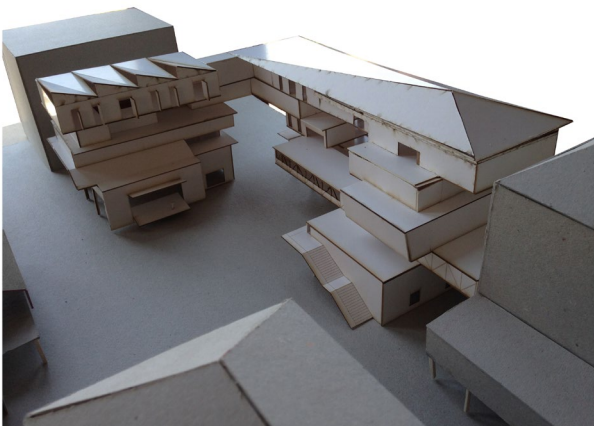
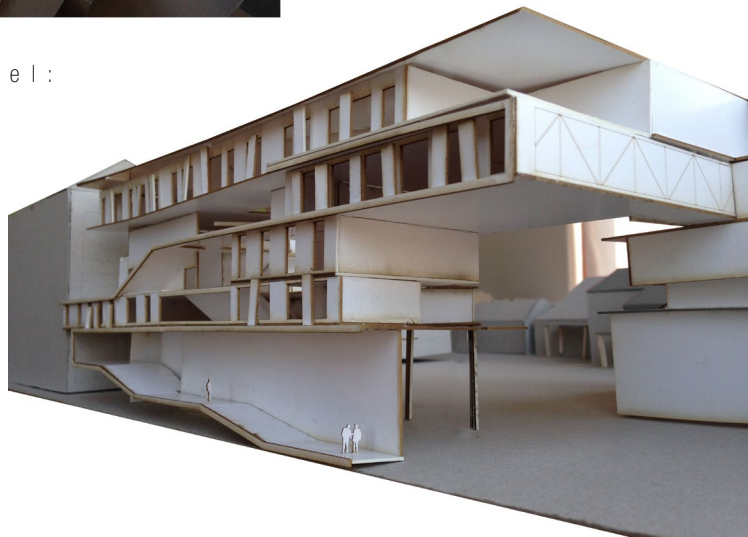


Responding to  
neighbouring  
saw-tooth roof

Responding to  
neighbouring  
A-frame roof



September tech crit model:



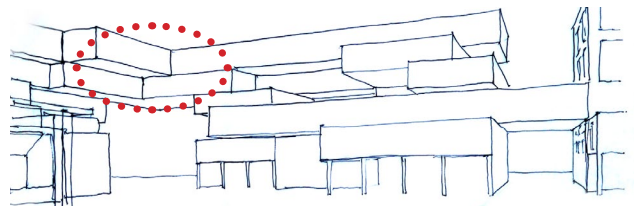


S e c t i o n   A - A

[ MAJOR DESIGN ITERATIONS : ]

1.) Connecting buildings with overhead corner cantilever

- Binds new elements in block together as one
- Defines entrance better



2.) One central open atrium that cuts through building (vertically and horizontally)

3.) Northern facade freed of exterior columns

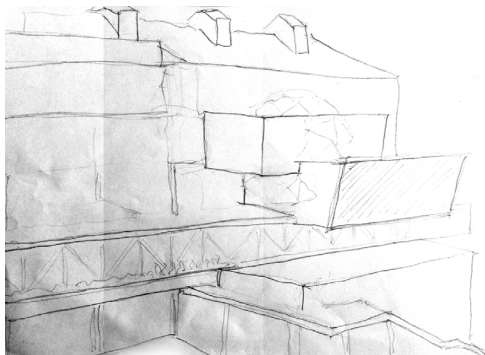
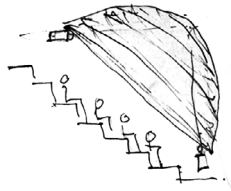
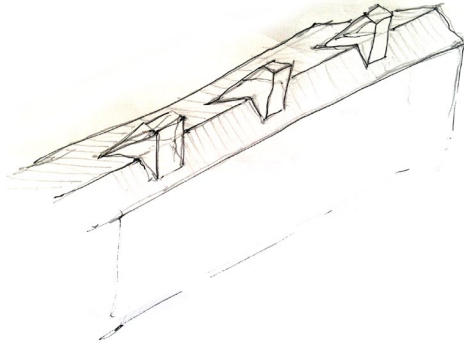
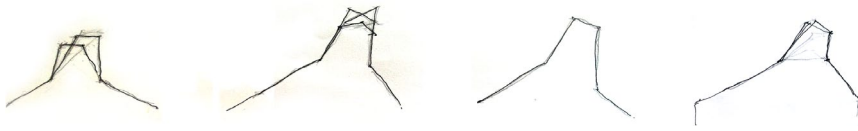
- Eliminates vertical line (cage-like) appearance (vertical elements from neighbouring building are rather picked up by proportions of window openings and sliding screens)

4.) Auditorium structure changed to modular elements that can change to different configurations instead of one static concrete element

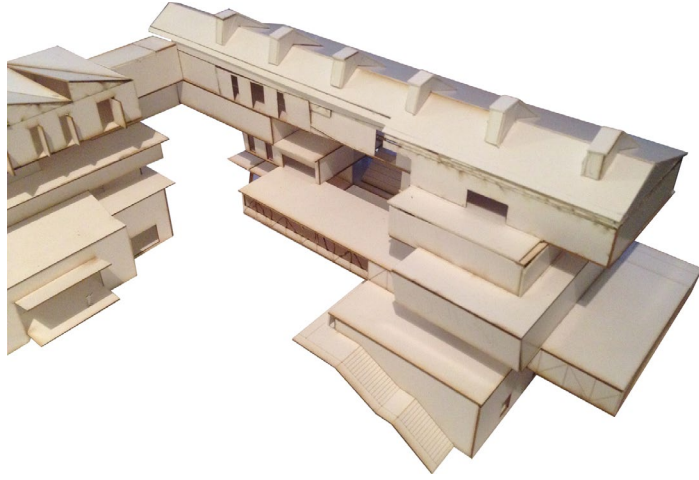
- Accommodates many more functions and change in uses

5.) Roof iterations

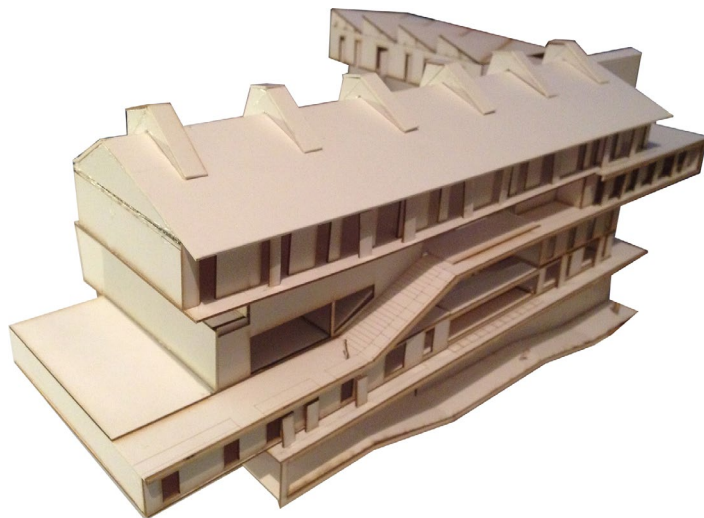


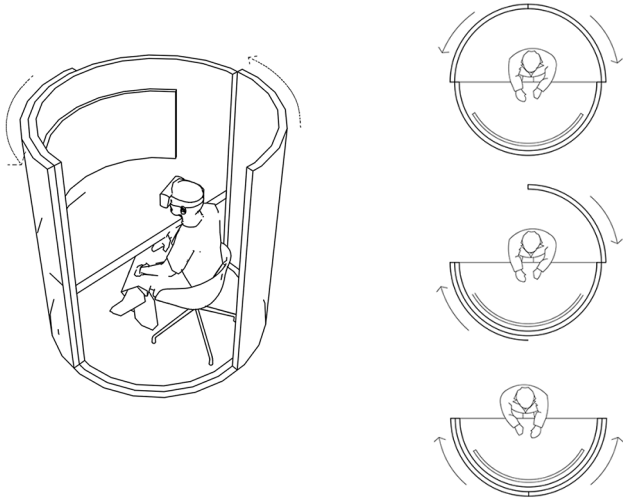


7.11 FINAL DESIGN DEVELOPMENT - END OF OCTOBER



R O O F   W I T H   S T A C K   V E N T I L A T O R S

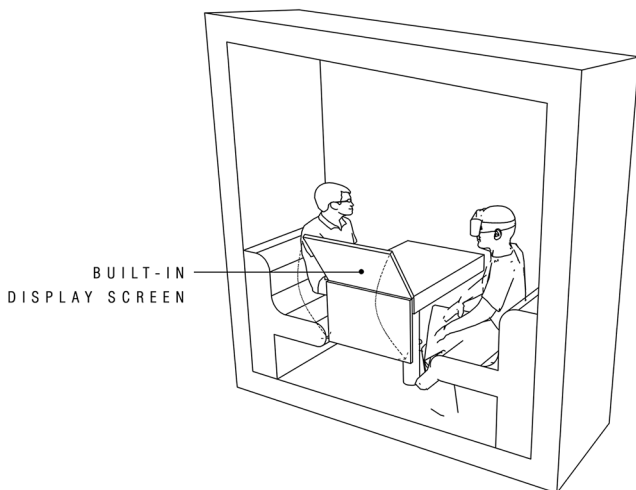




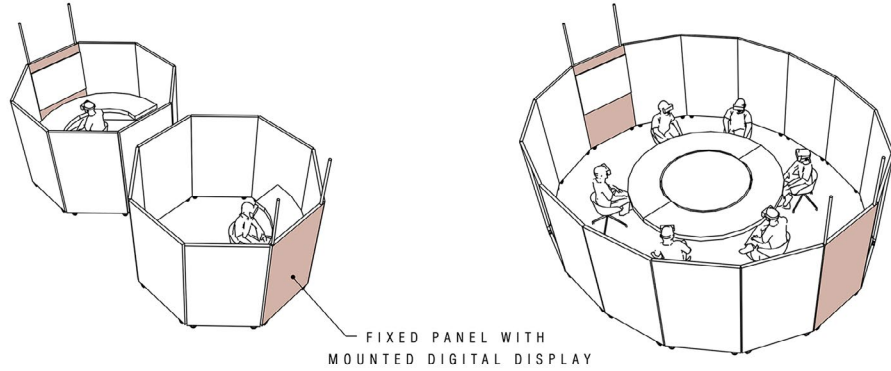
T.E.L. [TECHNOLOGY-  
ENABLED-LEARNING]  
PODS



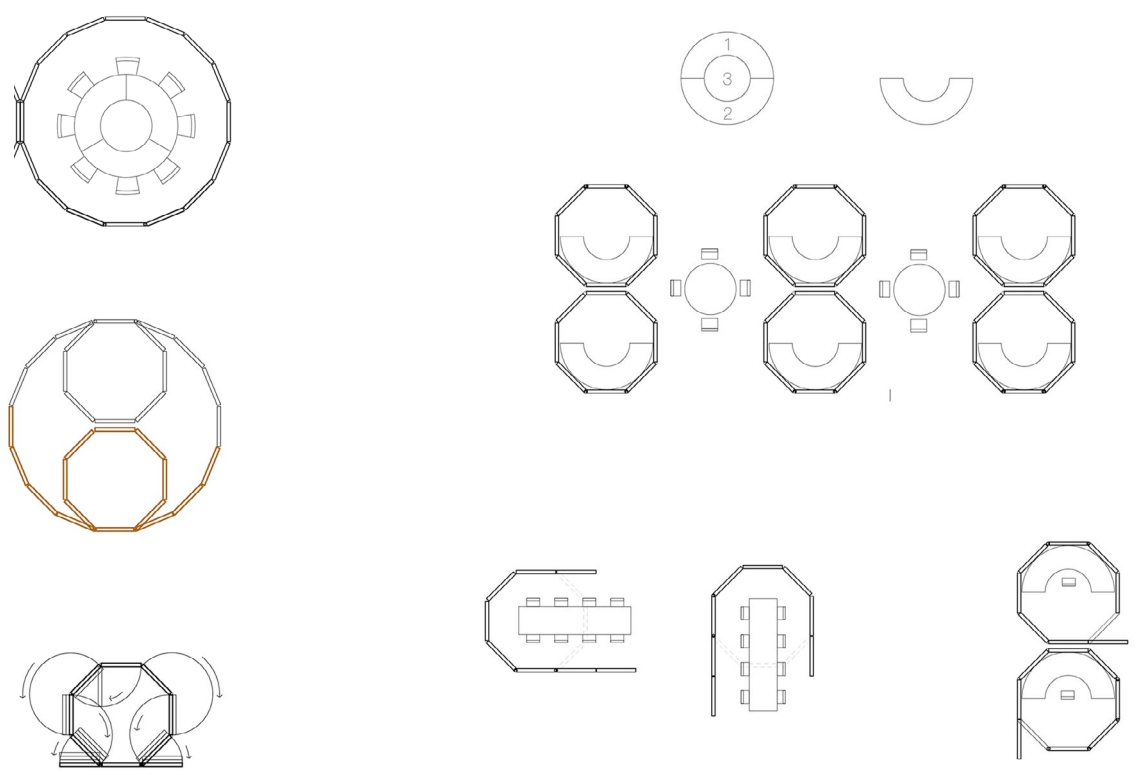
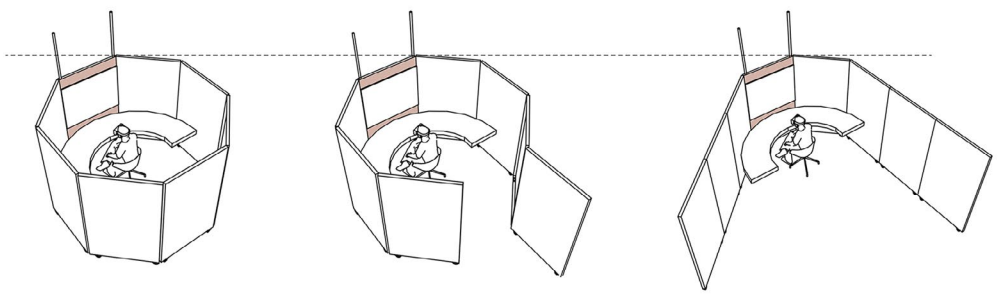
HAMSTER-WHEEL  
WALKING WORKSTATION



T.E.L. MEETING PODS

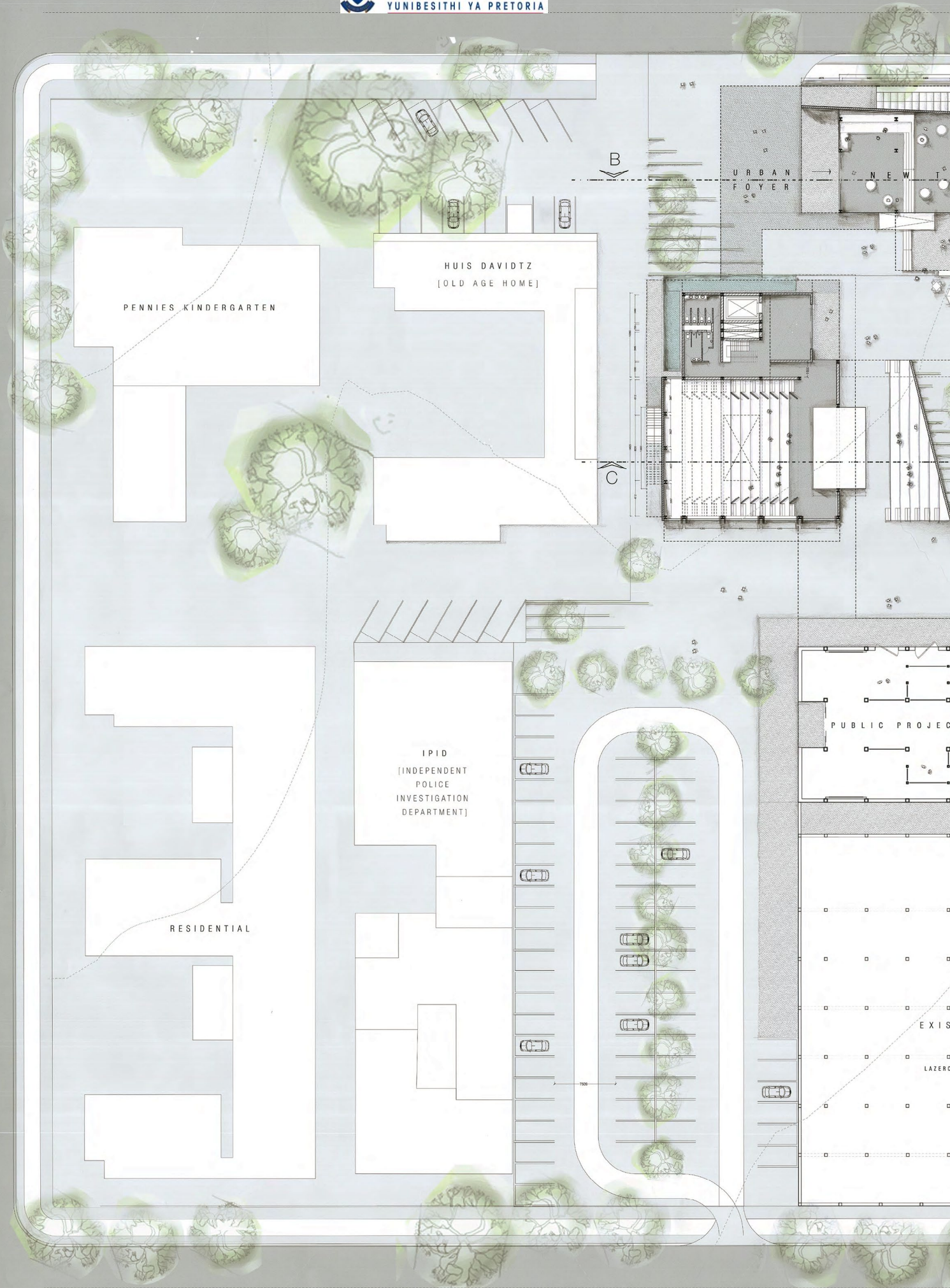


ADJUSTABLE GROUP PODS

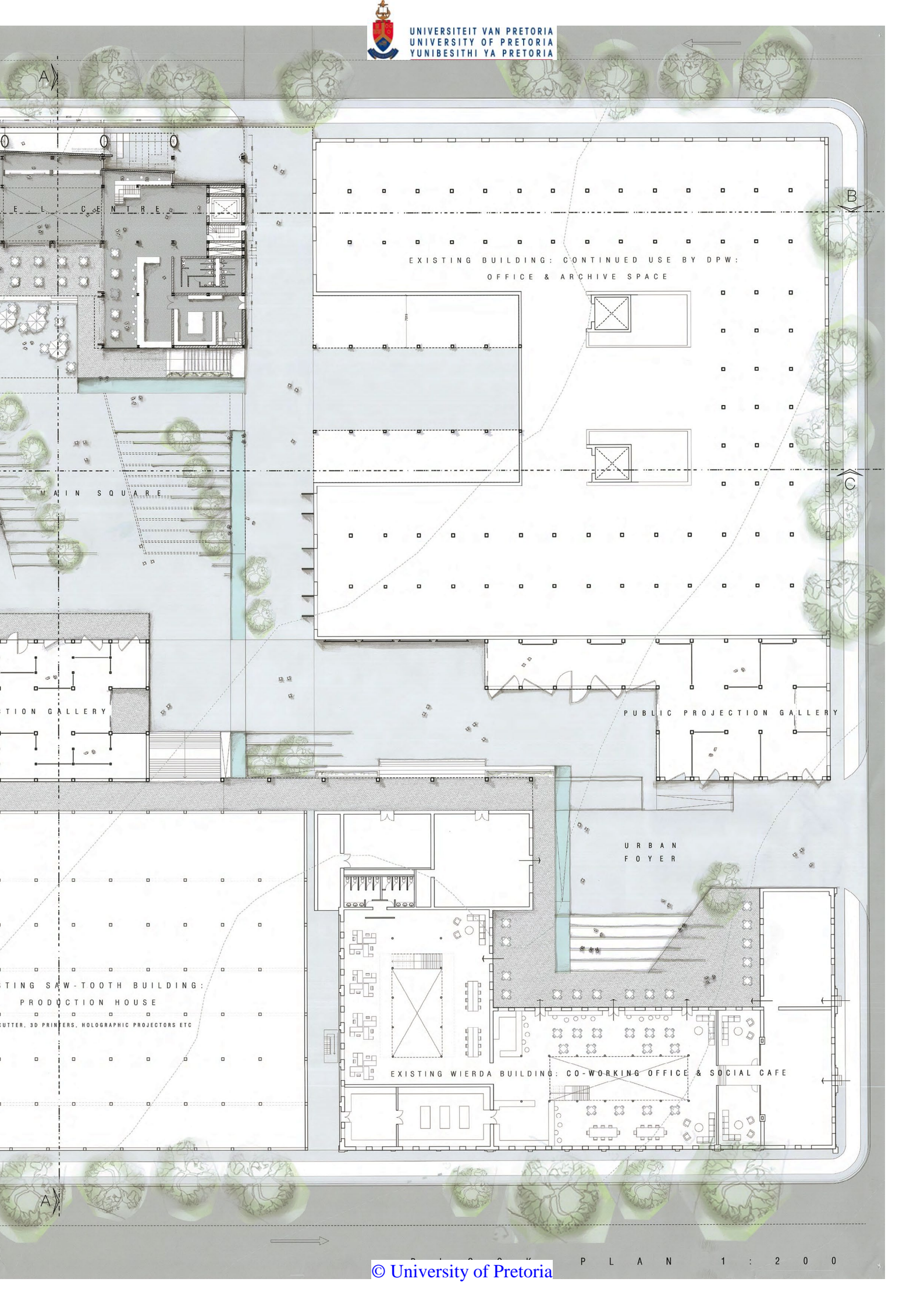


ADJUSTABLE GROUP POD - PARTITION CONFIGURATIONS









EXISTING BUILDING: CONTINUED USE BY DPW:  
OFFICE & ARCHIVE SPACE

MAIN SQUARE

EXHIBITION GALLERY

PUBLIC PROJECTION GALLERY

URBAN  
FOYER

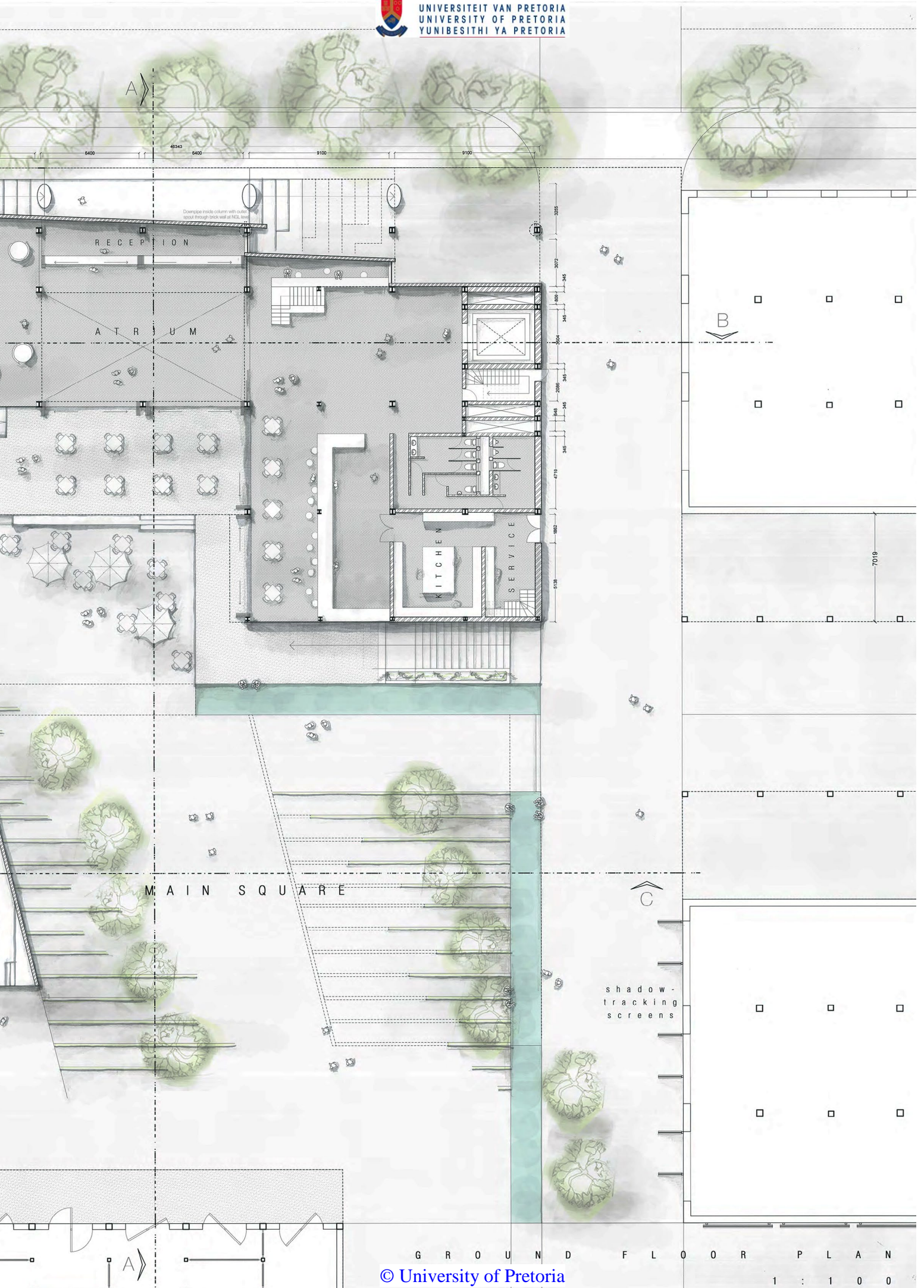
EXISTING SAW-TOOTH BUILDING:  
PRODUCTION HOUSE  
CUTTER, 3D PRINTERS, HOLOGRAPHIC PROJECTORS ETC

EXISTING WIERDA BUILDING: CO-WORKING OFFICE & SOCIAL CAFE

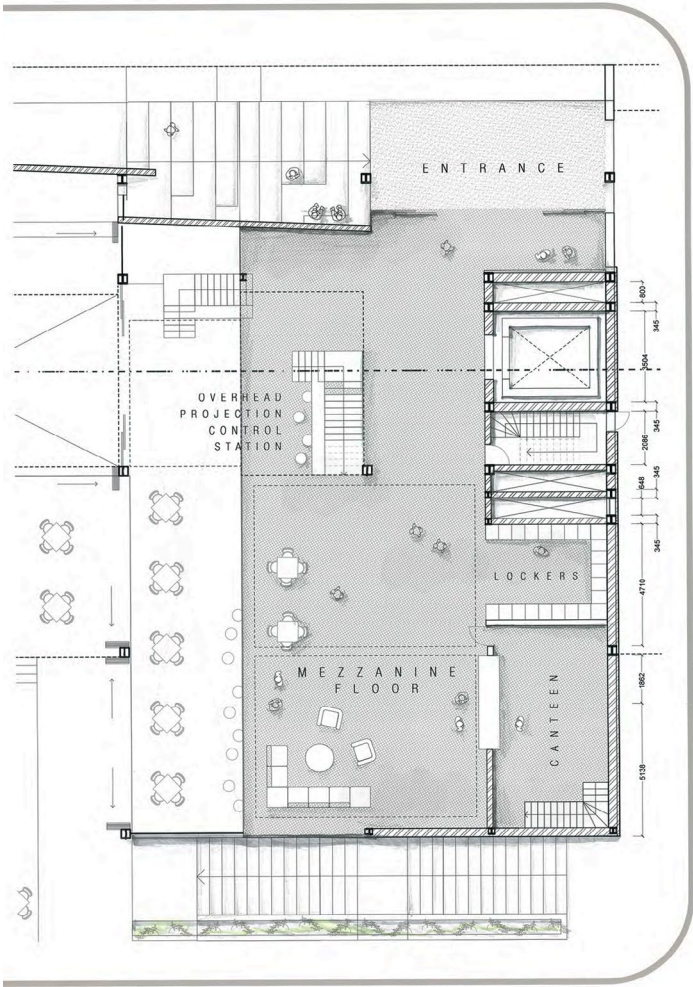




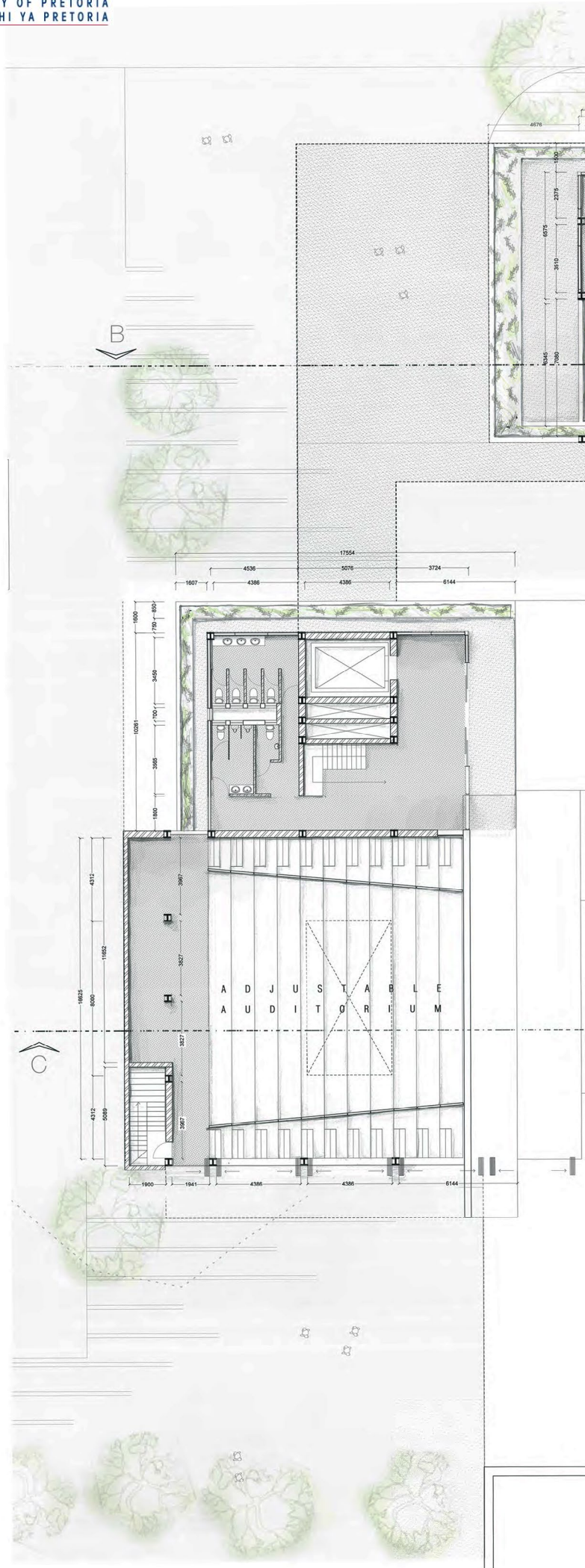




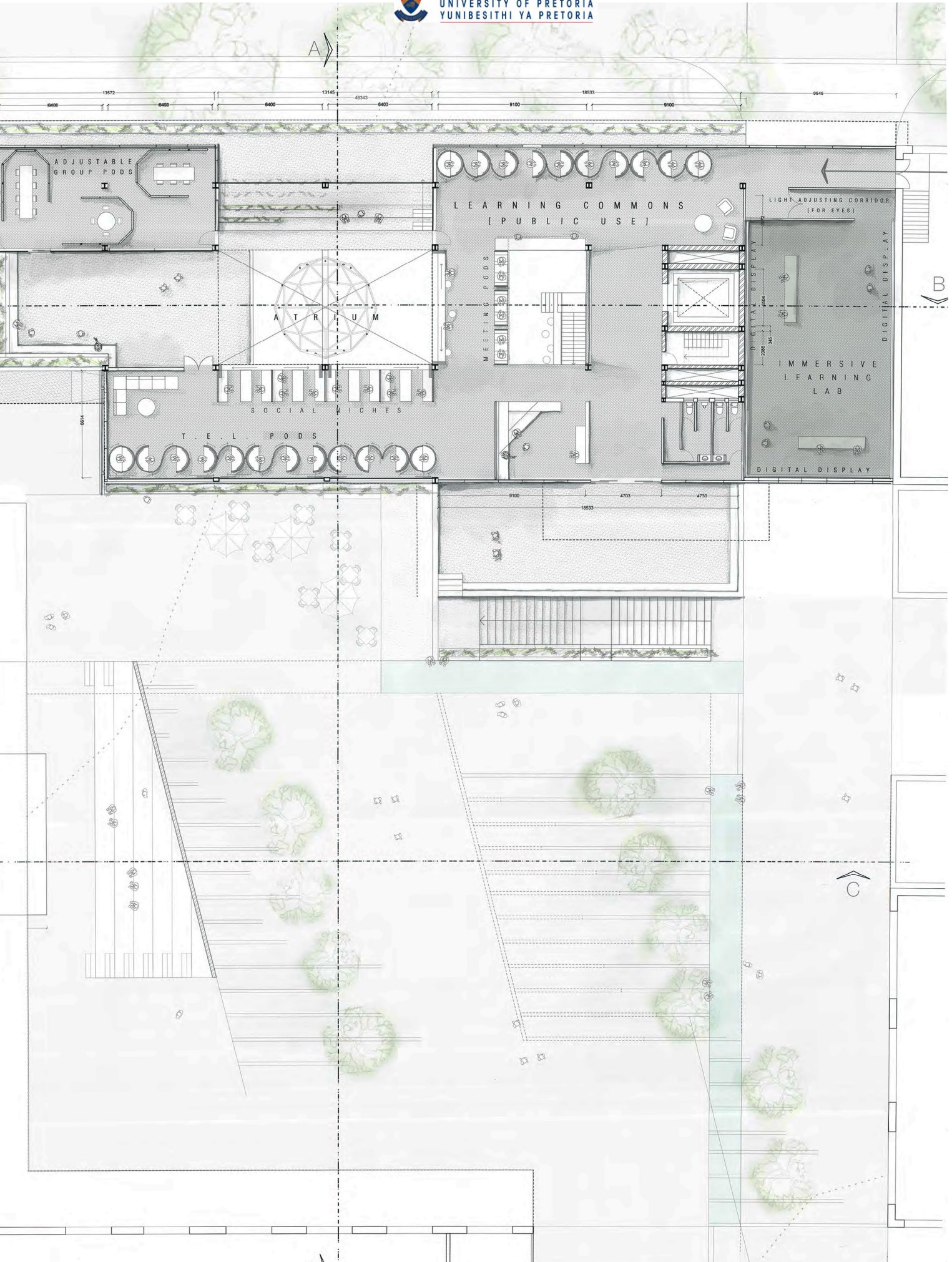




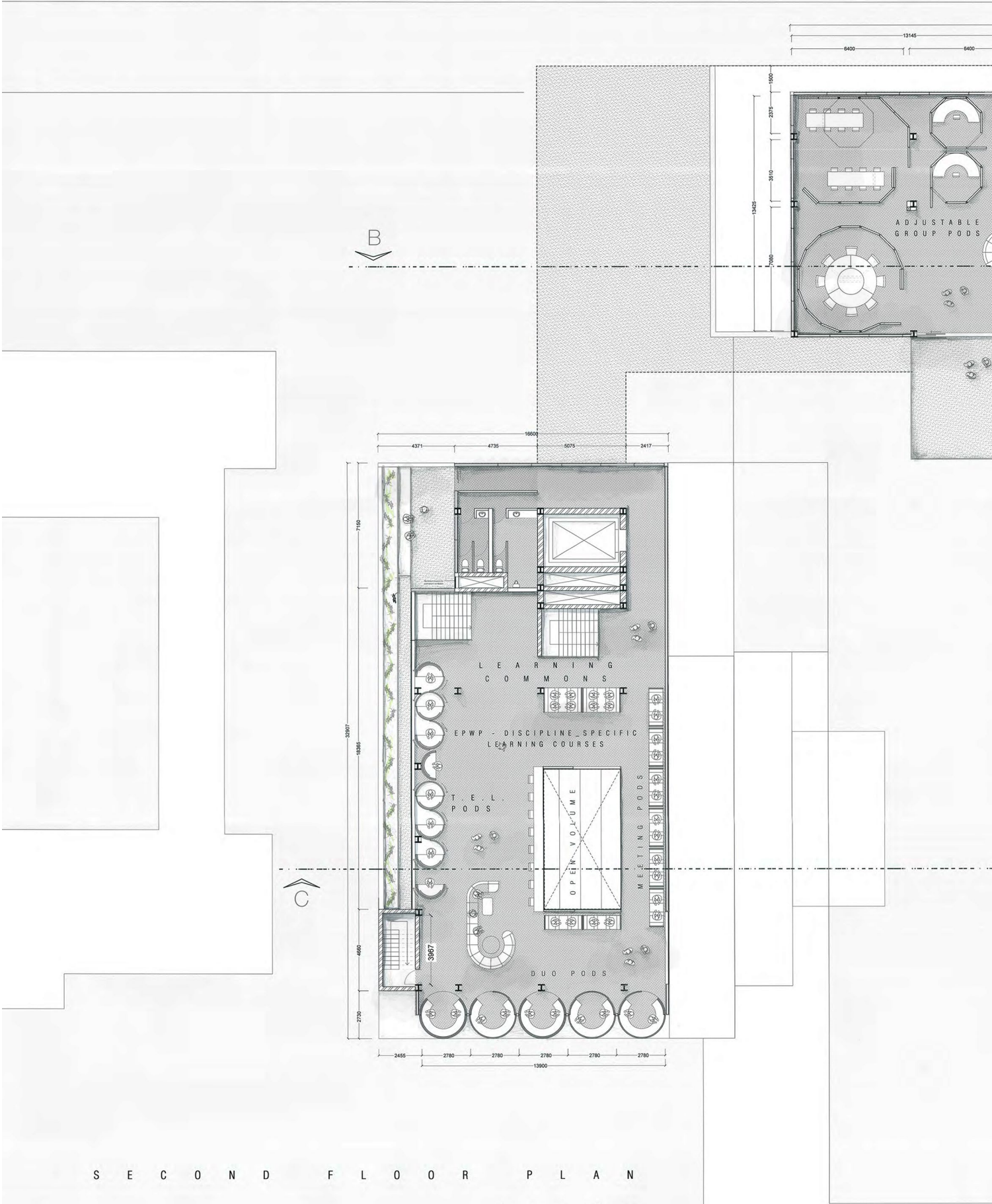
M E Z Z A N I N E  
F L O O R P L A N  
1 : 1 0 0



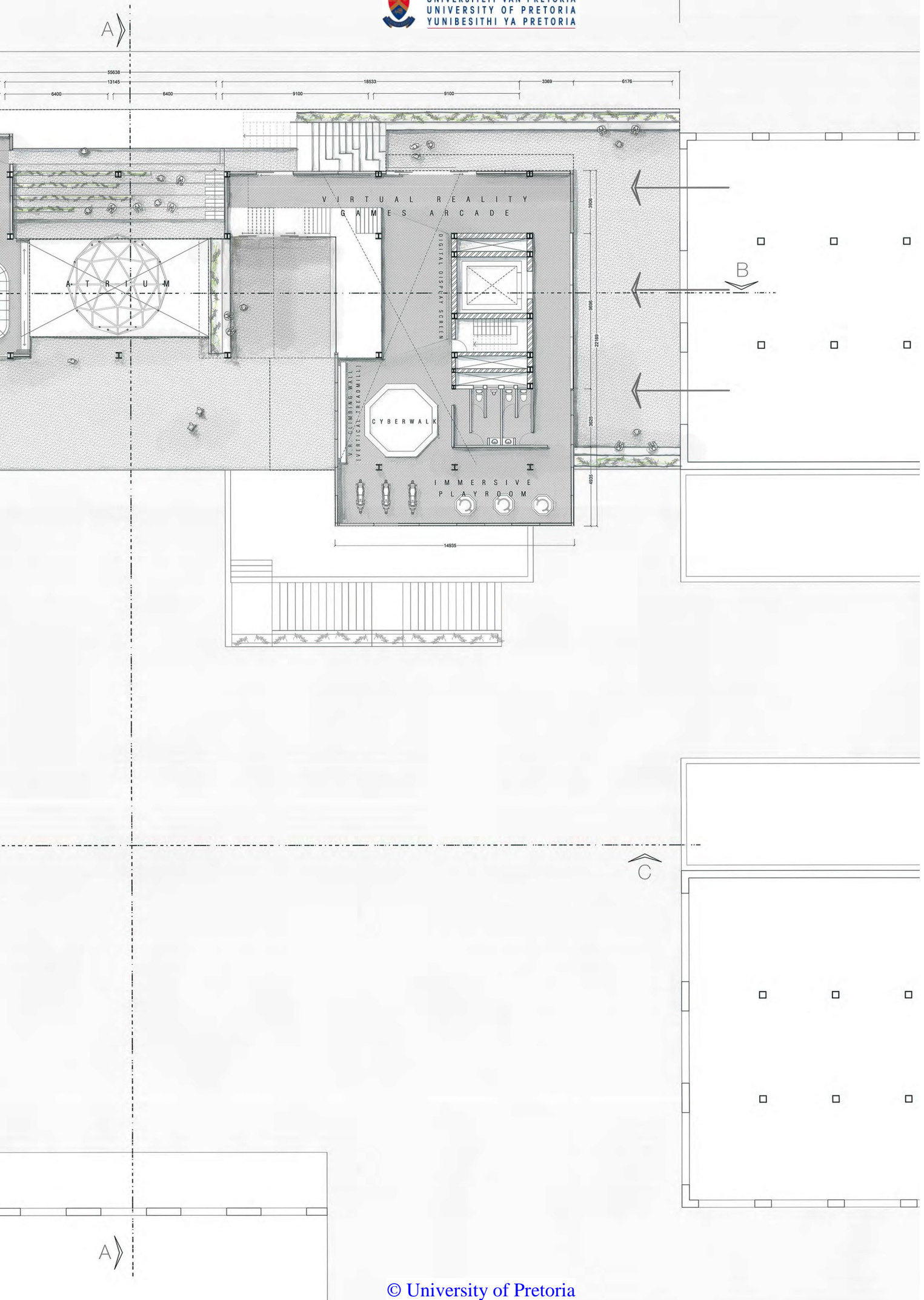




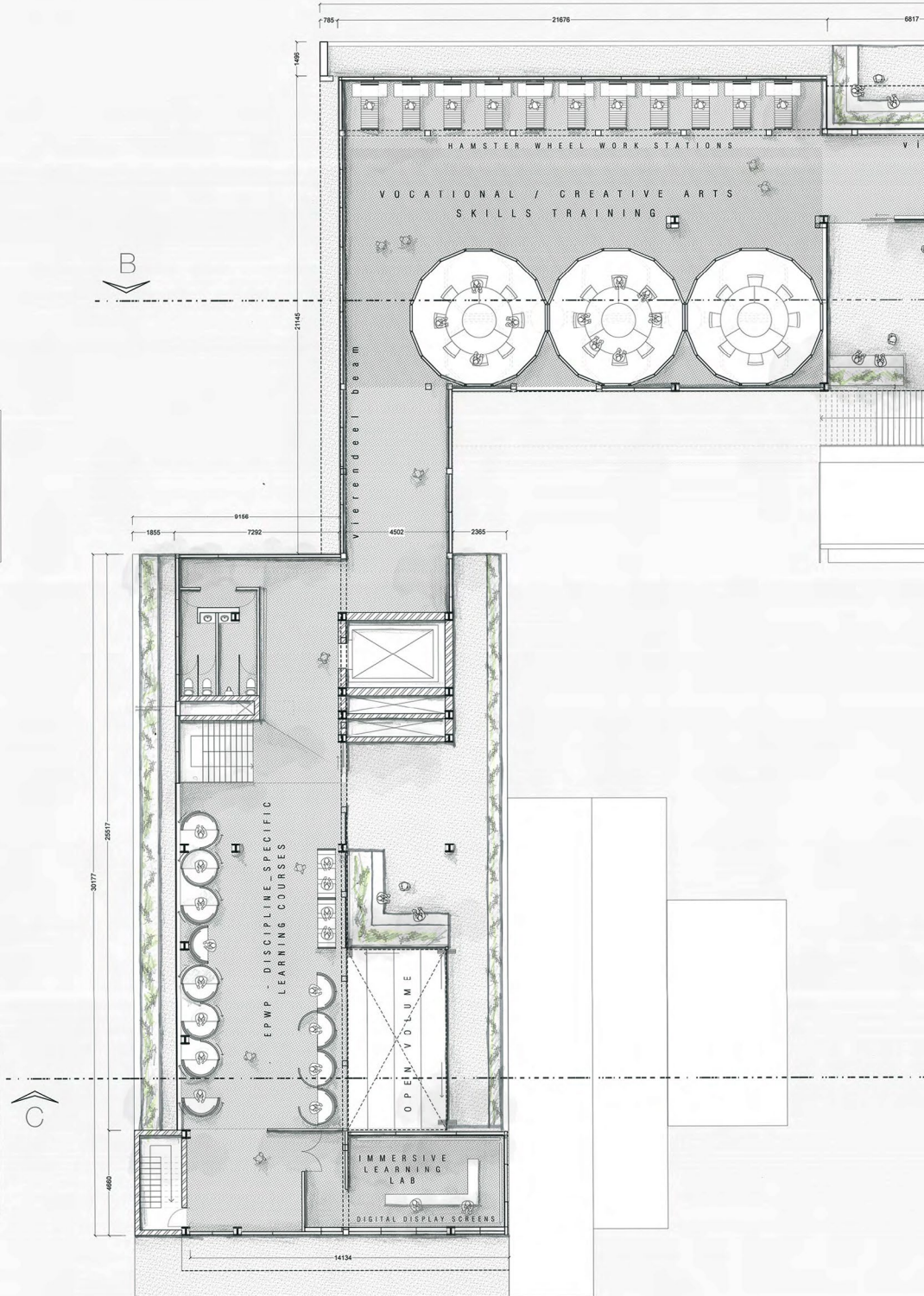




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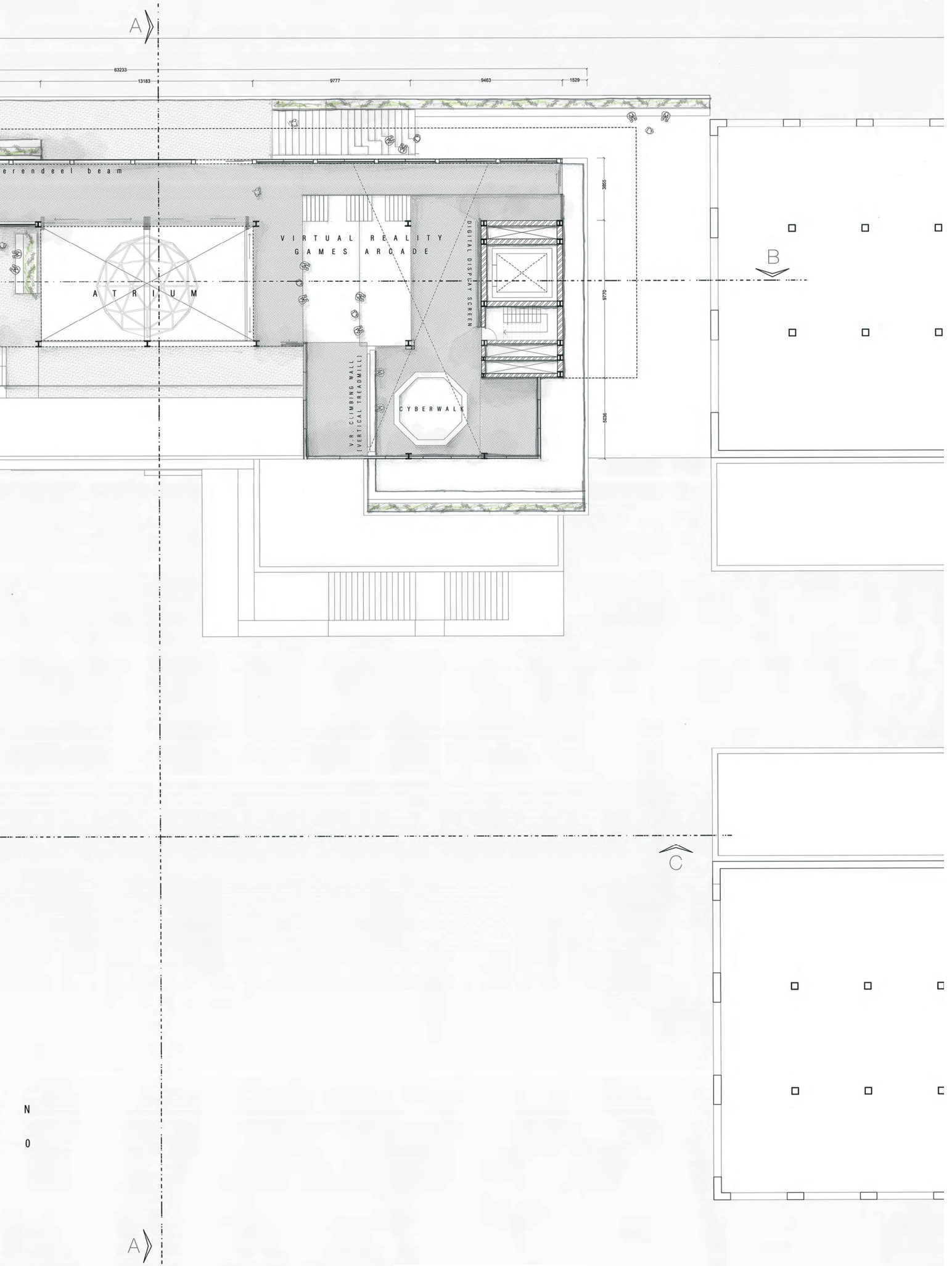




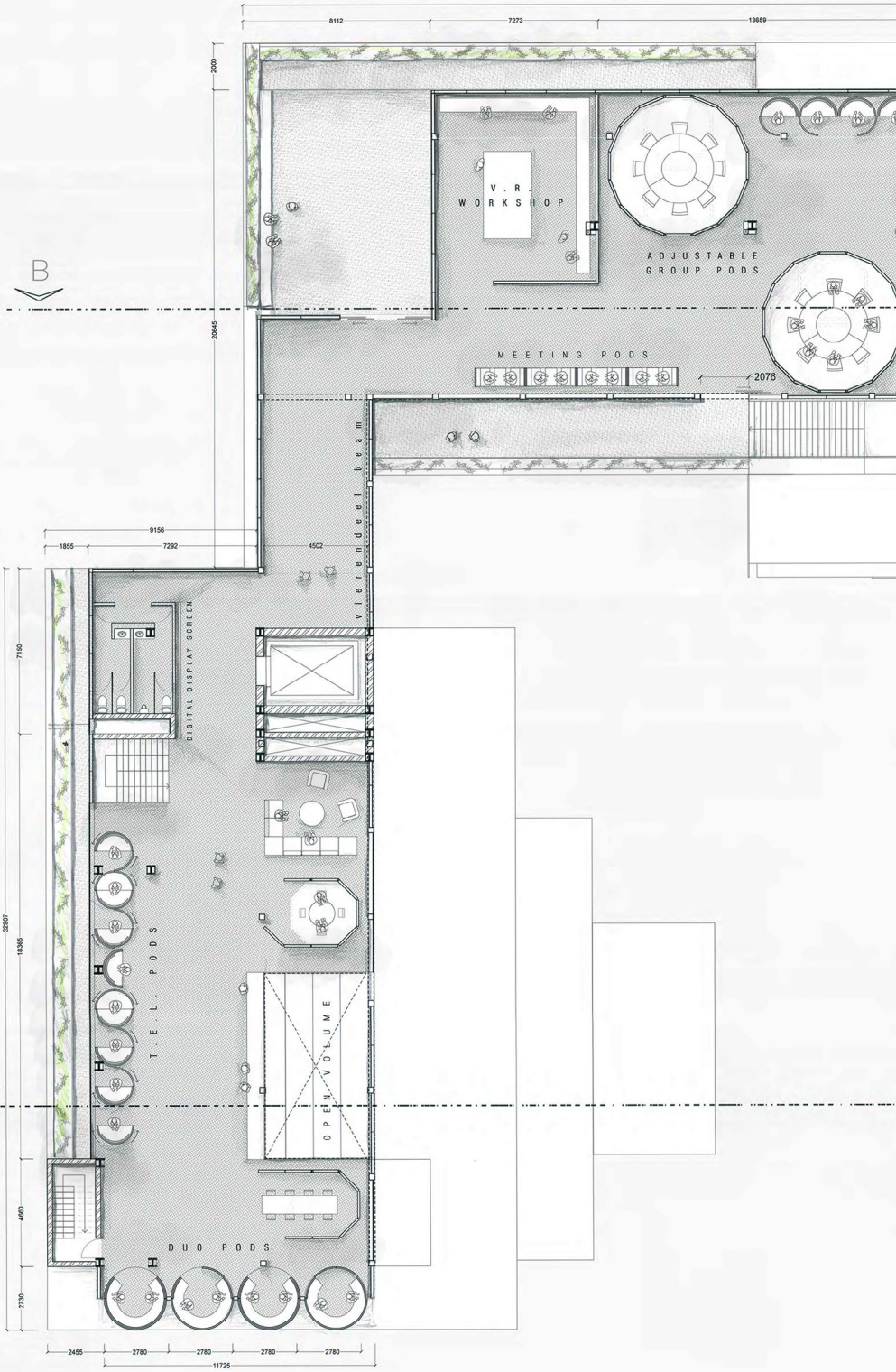


T H I R D F L O O R P L A

1 : 1 0



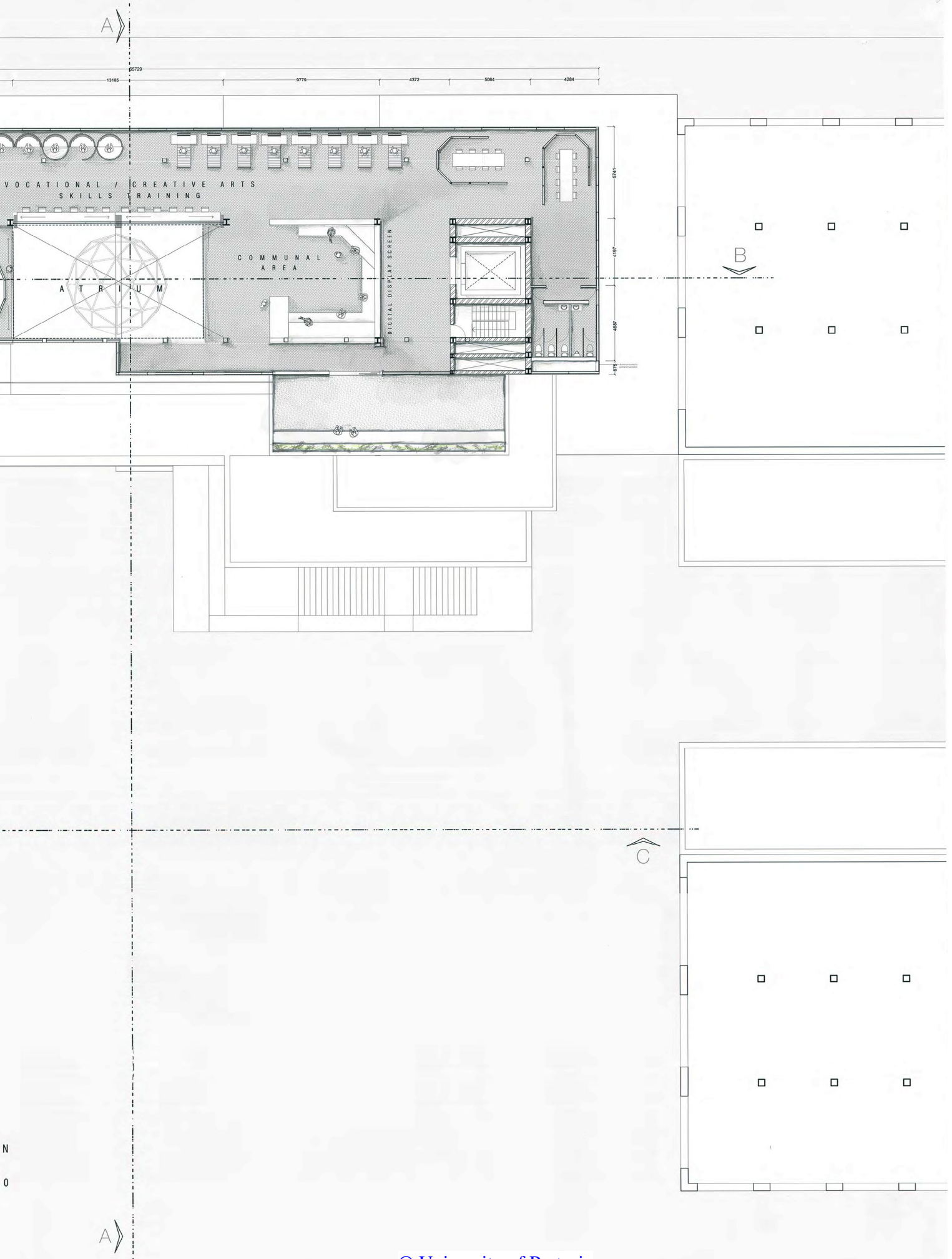




F O U R T H F L O O R P L A

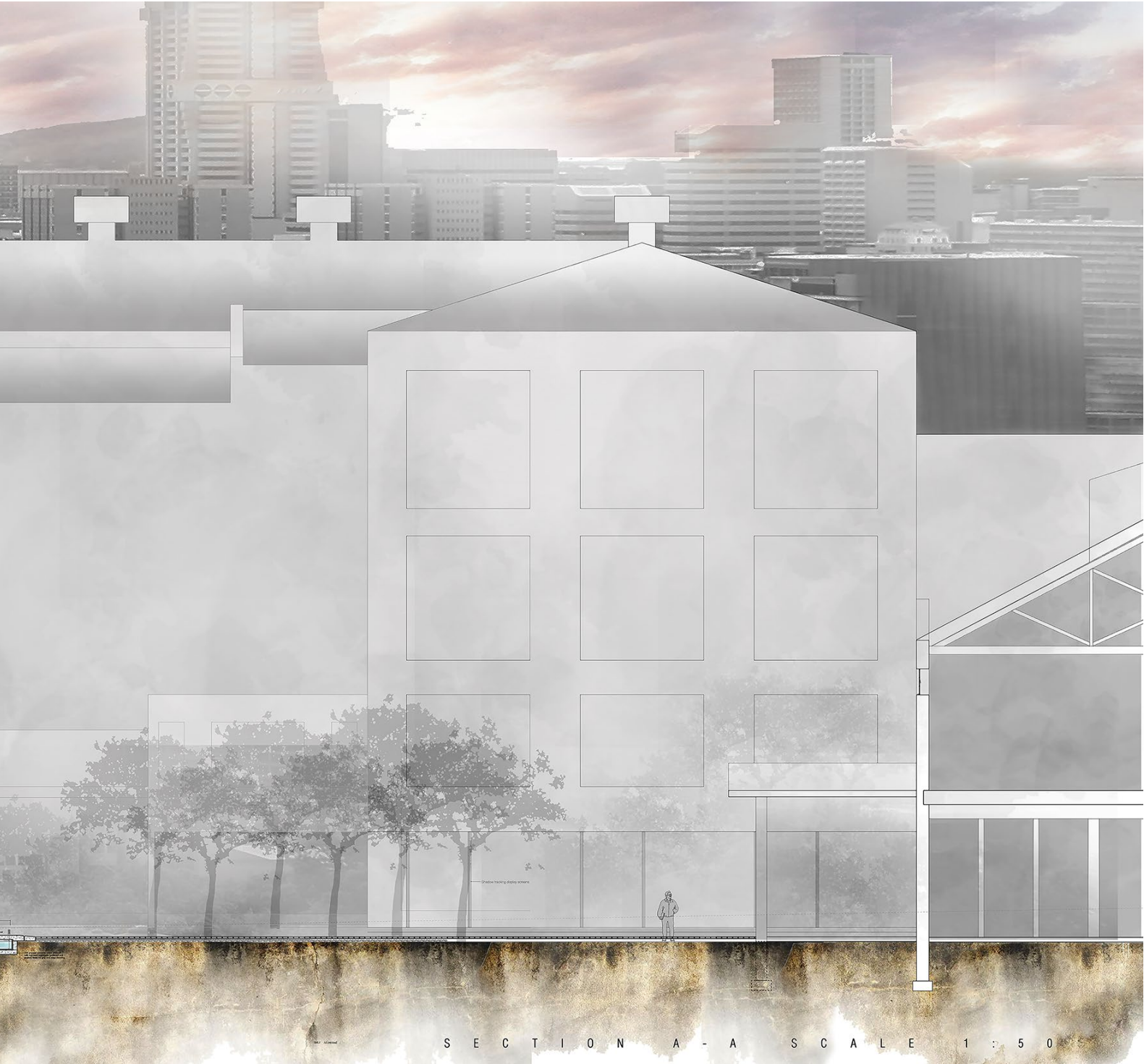
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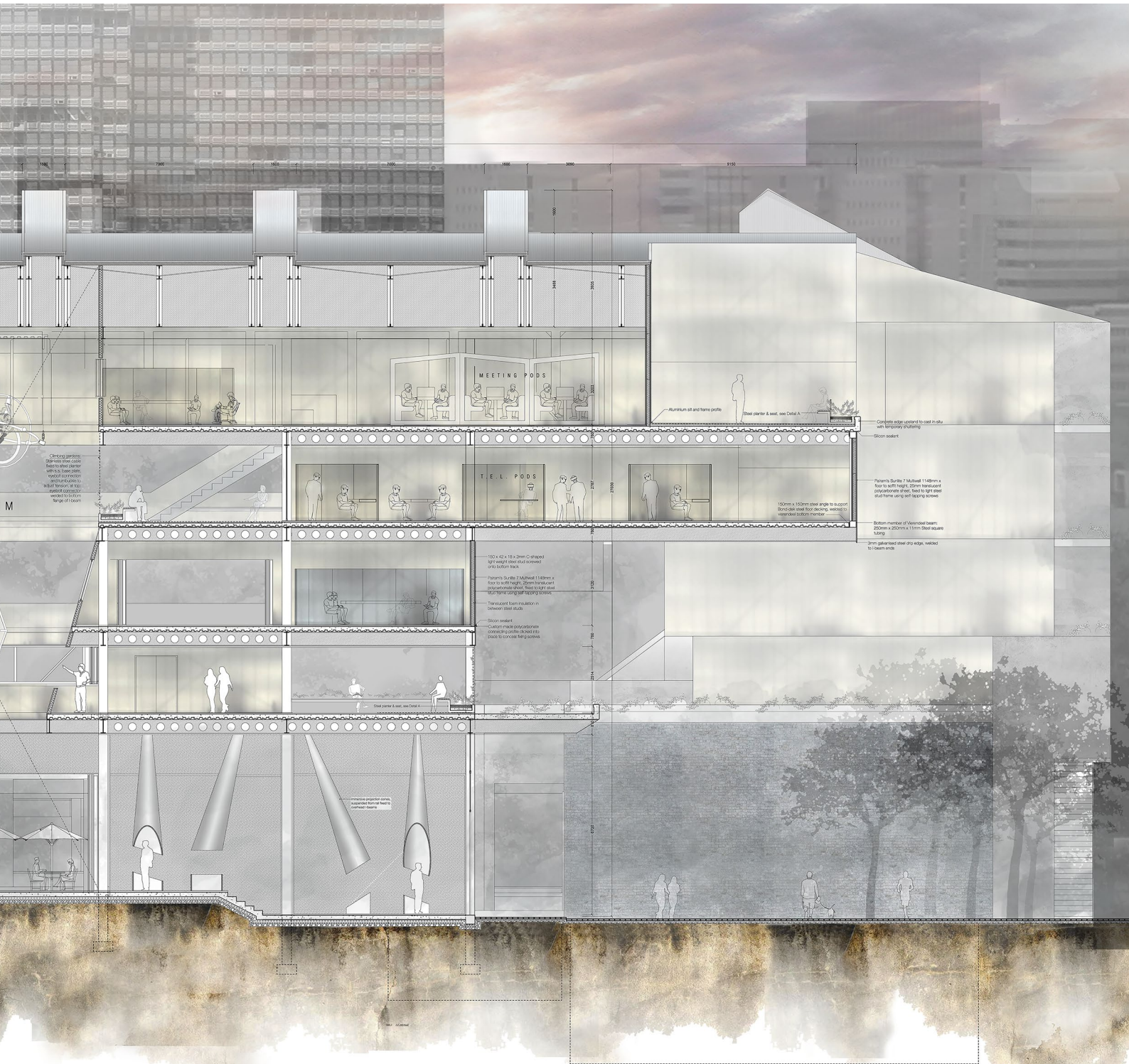


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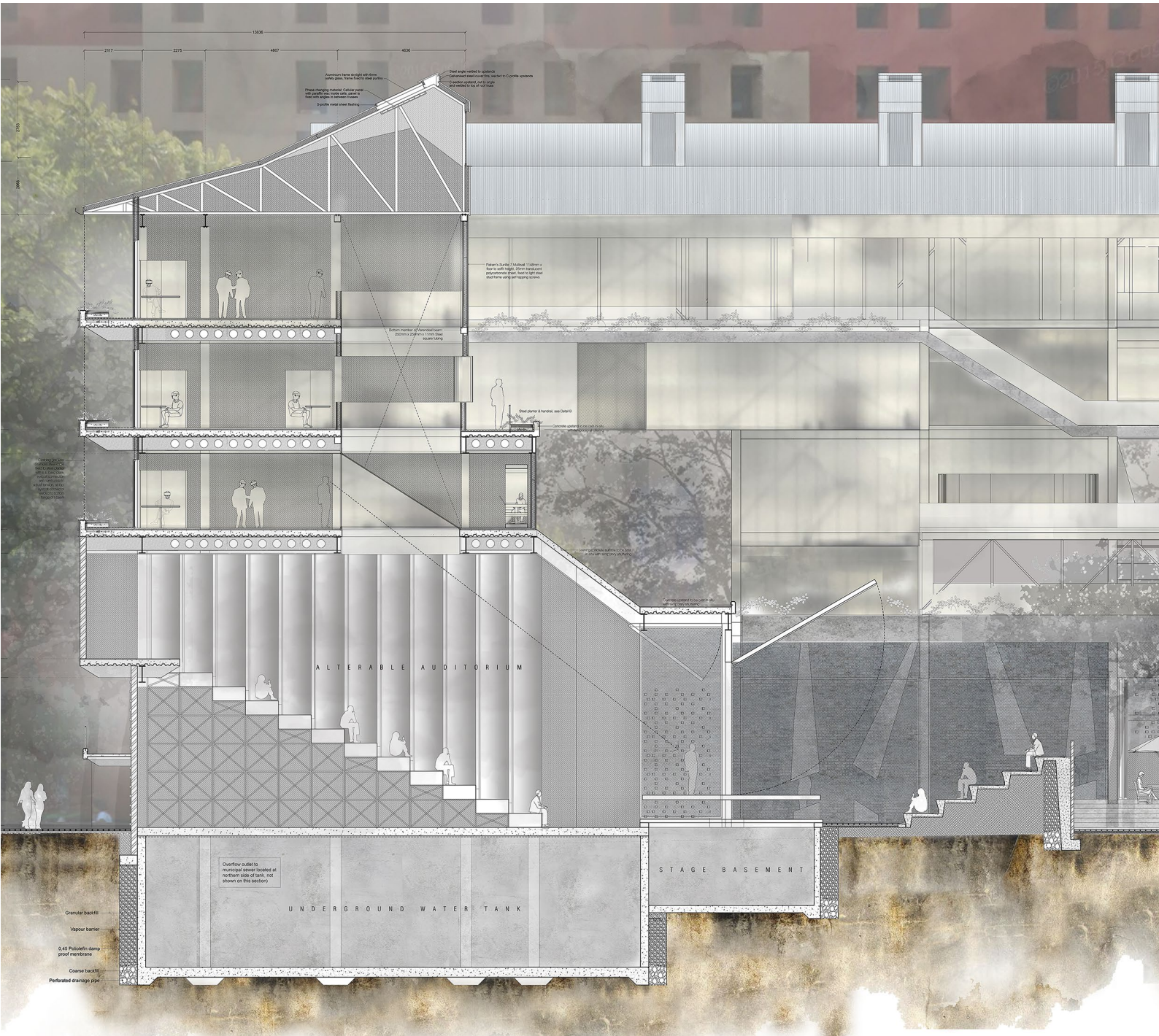




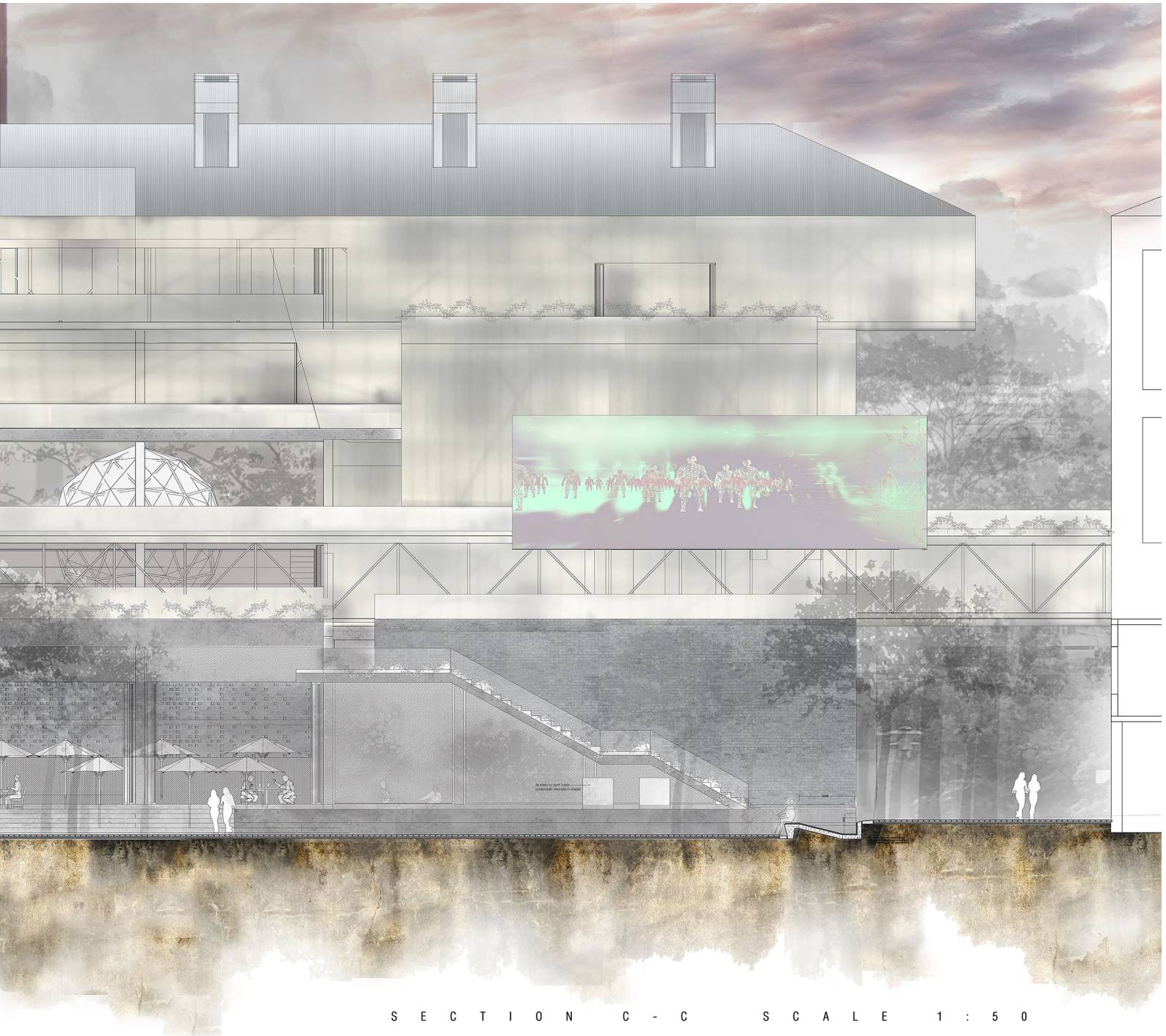




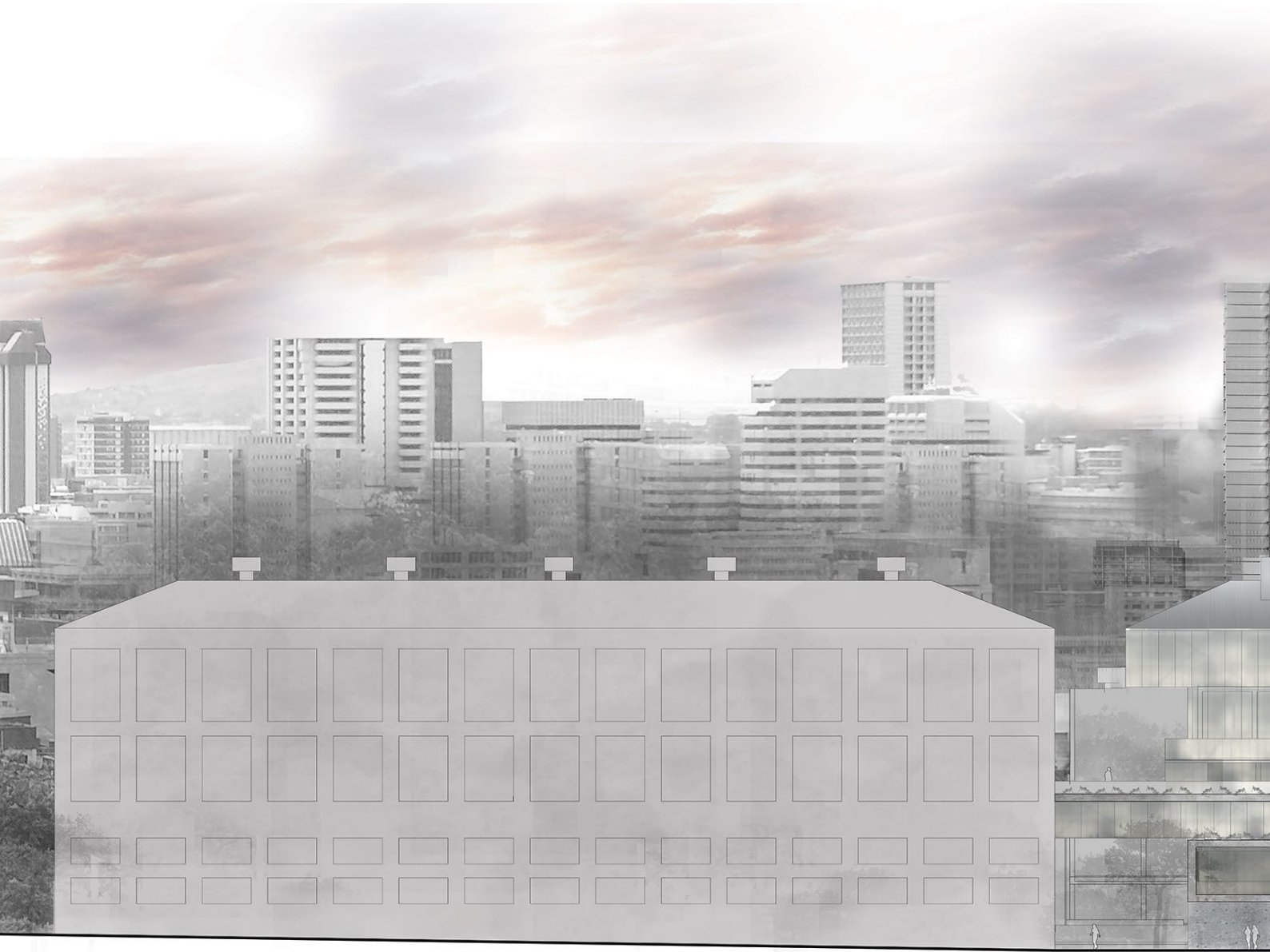




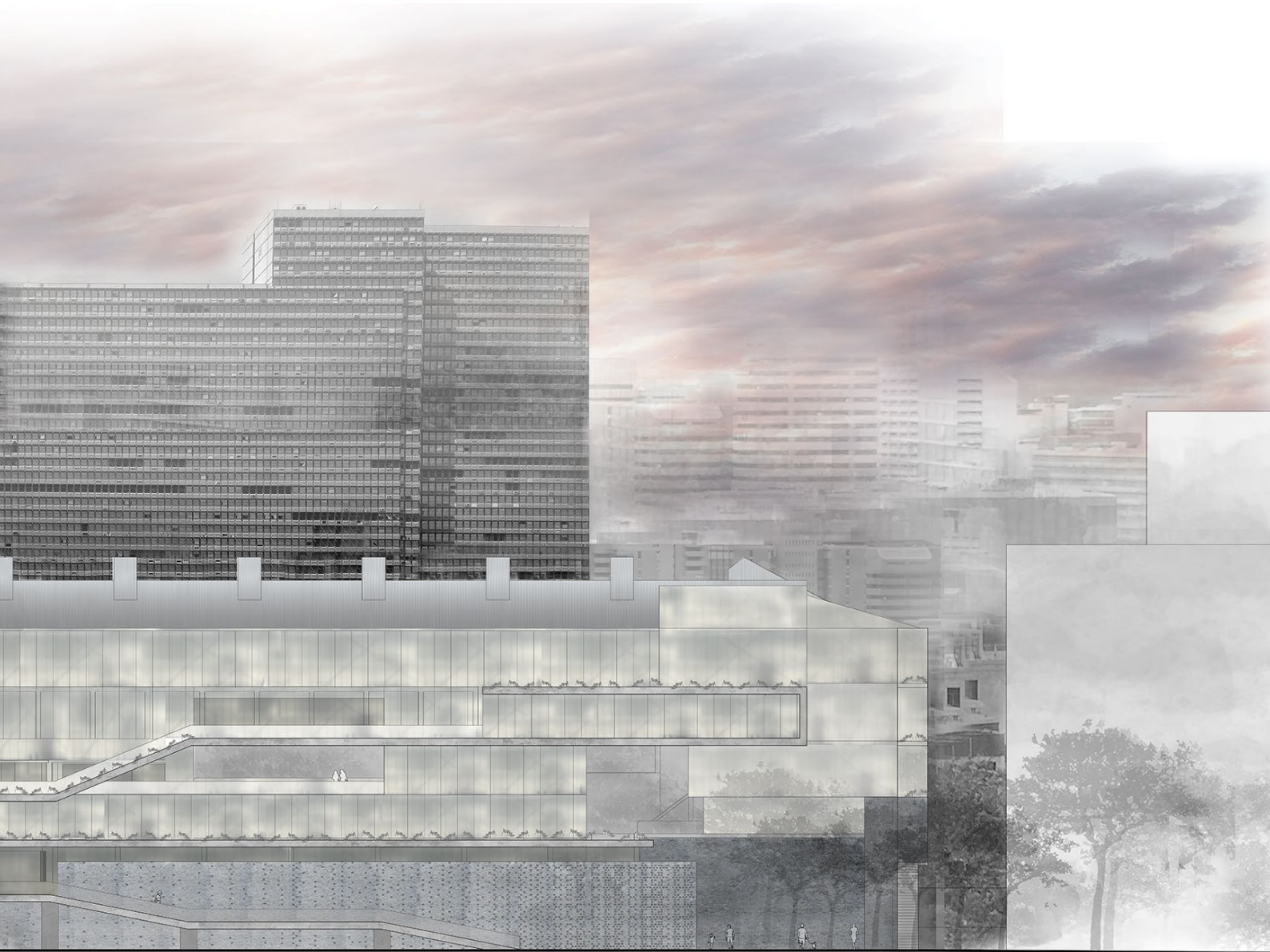




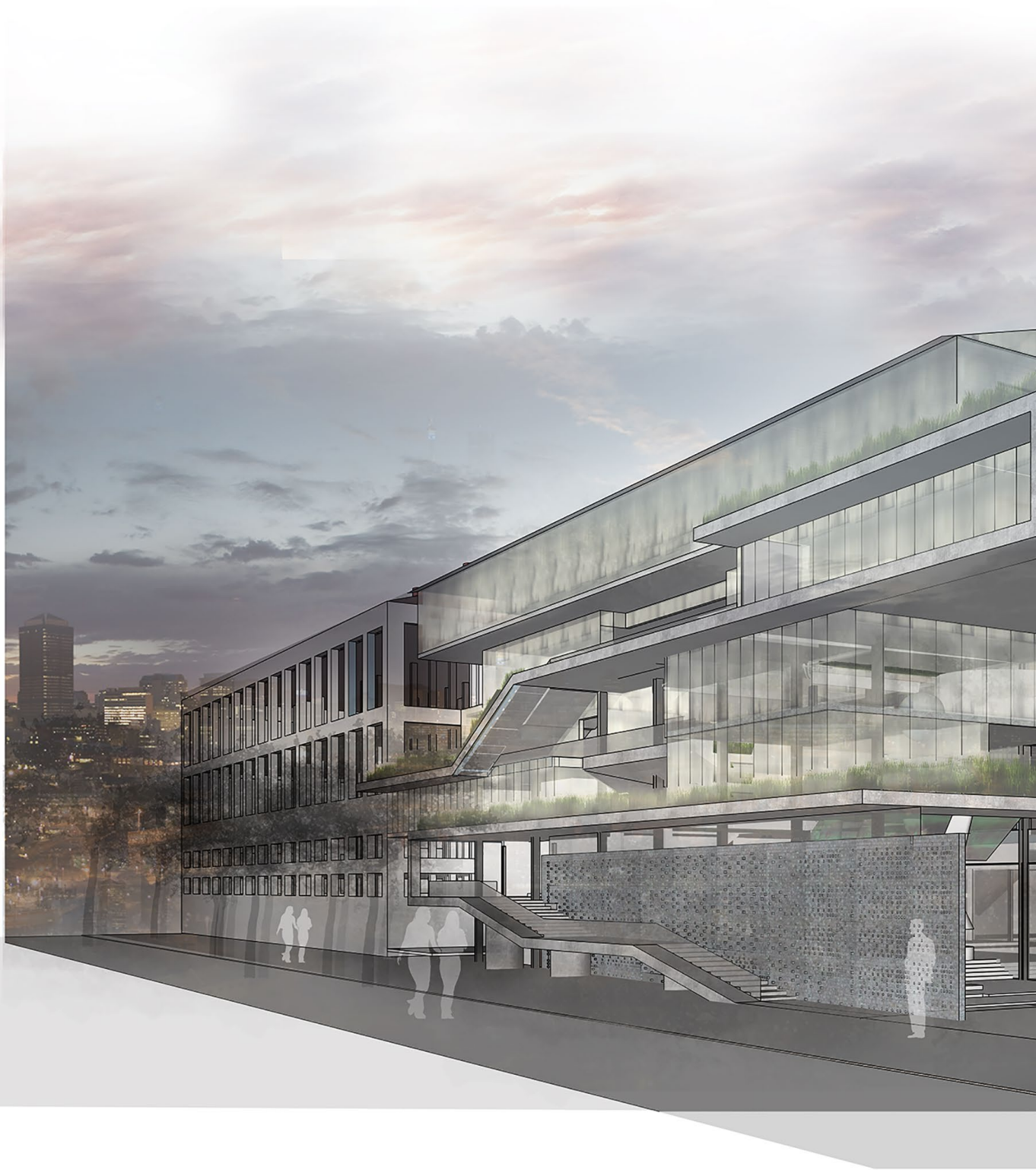
S E C T I O N C - C S C A L E 1 : 5 0







N O R T H E L E V A T I O N







N O R T H - W E S T E R N E N T R A N C E









# Chapter 8

## T E C H N É



HARDWARE / MOTHERBOARD / CPU / RAM



## 8 . 1 I N T R O D U C T I O N

Chapter 8 is a two-part investigation of firstly the technical resolution of the dissertation project, and secondly its environmental considerations. It starts out with a summary regarding different levels of alterability and permanence of different elements in the design. Then follows the tectonic concept as a starting point for technical decision-making; this is based on a mediative approach to the surrounding context as well as the consideration of alterability. Following this is an overall descriptive analysis of the technical approach to making the building. Subsequent to this is a structural analysis to clarify certain progressive structural elements. Then follows a description of the decision-making regarding the materiality and thereafter the roof form and structure.

In the second section the environmental considerations are investigated; this is in response to compromiser 3 (as discussed in Chapters 5 and 6 - loss of relationship to nature, and its respective counter-strategies). Therefore the main considerations in this section deal with hydroponic planting, as well as a rain-water harvesting system. Lastly section 2 concludes with a passive geothermal heating and cooling system to enhance the thermal comfort of the users inside the building.

### Section 1: TECHNICAL INVESTIGATION:

- TECTONIC CONCEPT
- DESCRIPTIVE TECHNICAL INVESTIGATION
  - PRIMARY STRUCTURE
  - STRUCTURAL ANALYSIS
  - SECONDARY STRUCTURE
  - TERTIARY STRUCTURE
- MATERIALITY

### Section 2: ENVIRONMENTAL CONSIDERATIONS:

- HYDROPONIC PLANTING
- EXPOSED RAIN WATER-HARVESTING SYSTEM
- PASSIVE GEOTHERMAL HEATING AND COOLING SYSTEM
- SOLAR-ASSISTED STACK VENTILATION





## S E C T I O N 1 : T E C H N I C A L I N V E S T I G A T I O N

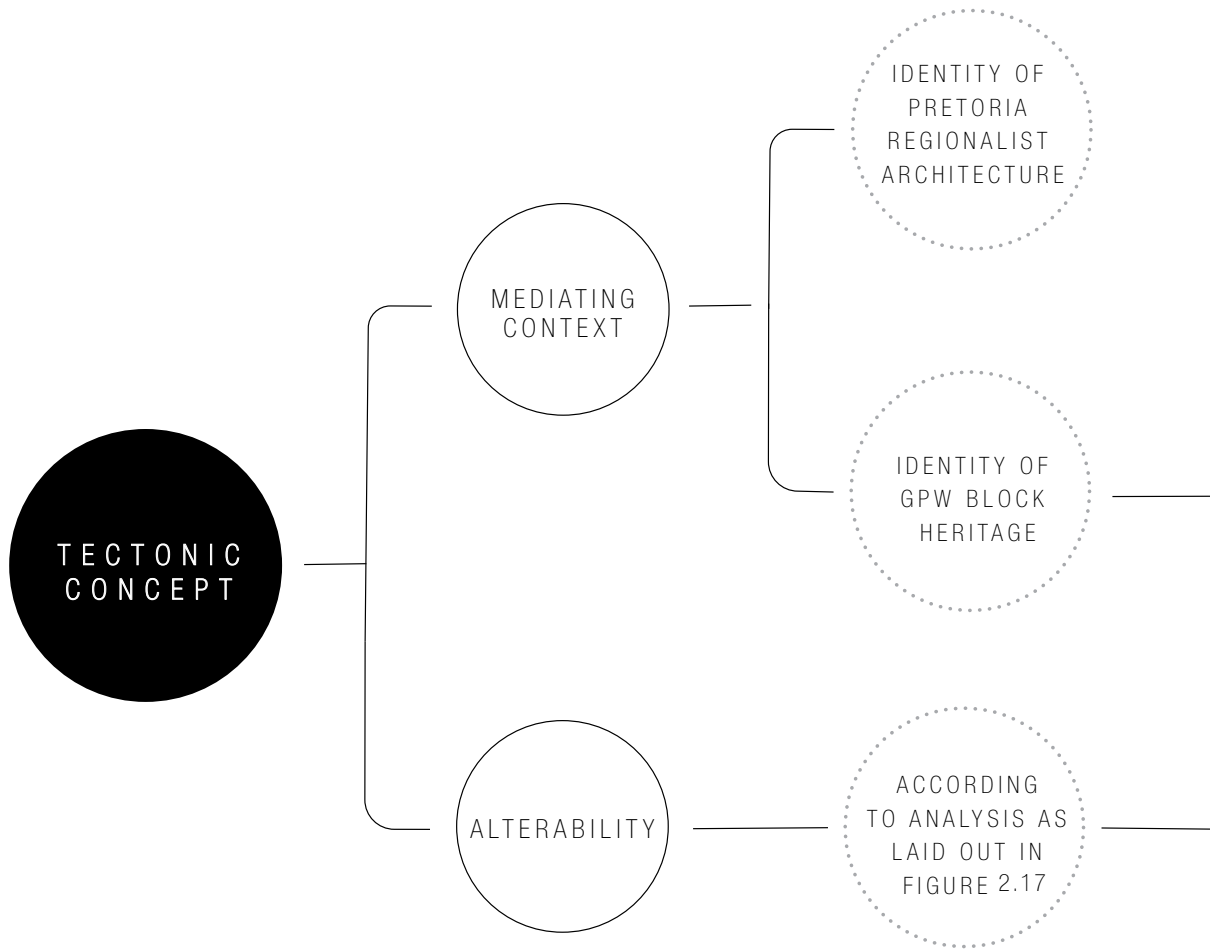
### 8 . 1 . 1 T E C T O N I C C O N C E P T

Figure 8.1 illustrates the various generating influences for the overall tectonic concept. The first one is a mediative approach to the existing context (as discussed in both Chapters 5 and 6). This *context* is divided into two sections, firstly (and more broadly) the regionalist architectural identity of Pretoria - of which the characteristics have been examined both in theoretical and design development (Chapters 2 and 7). As these local regionalist constituents include things like materiality (exposed craftsmanship of facebrick, for example) and environmental design considerations, they are also directly generative in the tectonic concept - but will be discussed in depth later.

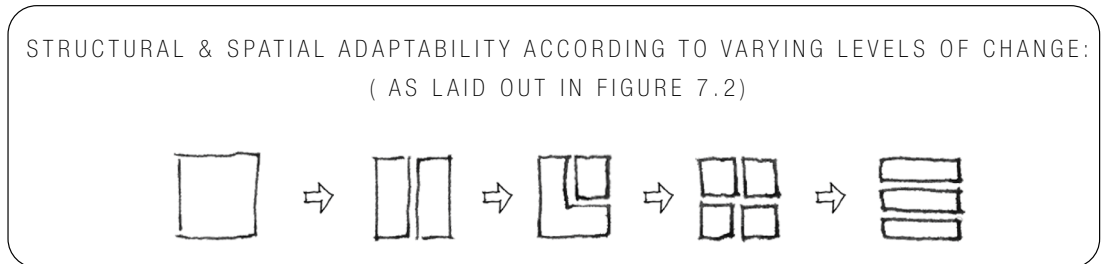
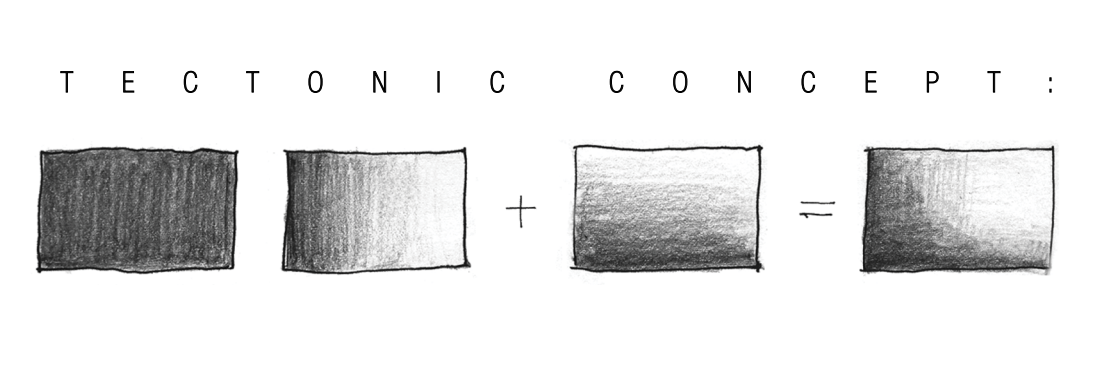
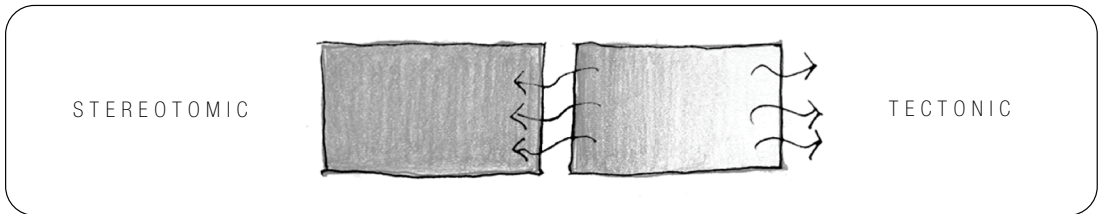
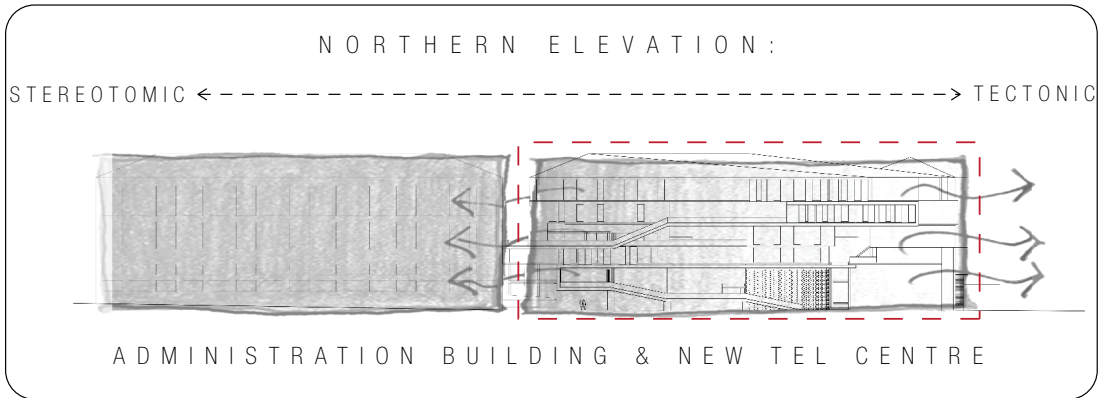
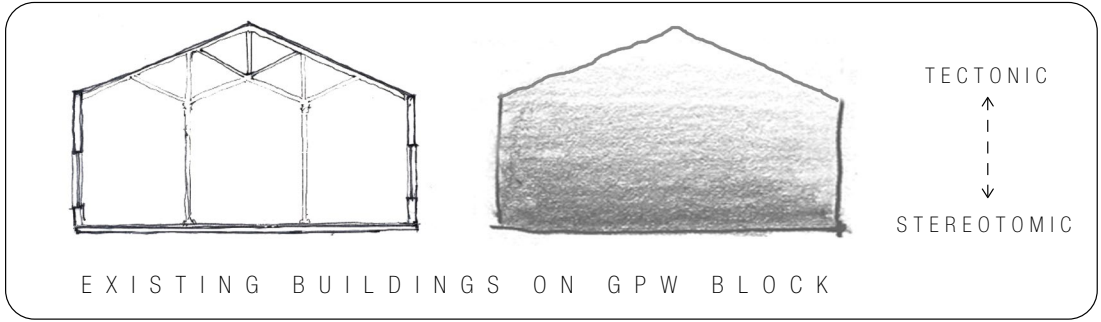
The second segment of the 'context' is the existing built fabric in the direct vicinity: the GPW block is populated with numerous existing buildings - the oldest dating back to 1896. These all have more or less the same technical composition that alternates between a more solid, heavy, stereotomic base (brickwork and concrete) and a lighter, tectonic steel roof structure with metal sheeting. As already discussed in Chapters 2 and 7, the heritage approach is one of mediation - whereby some elements of the existing context are continued in the new, and others are contrasted with.

Therefore, the tectonic concept of the new building firstly mediates between stereotomic (bottom) and tectonic (top) on a vertical scale - similar to its context. In addition to this, in a horizontal dimension (on elevation), the building responds with a similar, stereotomic nature (in terms of language and form) on the eastern side; then enlightens to the western entrance - opening up to a much more tectonic structure.

Furthermore, the structural concept is an execution of one of the main design intentions of adaptability / transformability to accommodate future change. This intention will be executed in varying degrees of adaptability as laid out in Figure 2.17 and discussed in Chapter 6.



**Figure 8.1:** Diagram explaining all the informants to the tectonic concept



## 8.1.2 DESCRIPTIVE TECHNICAL INVESTIGATION

### 8.1.2.1 PRIMARY STRUCTURE :

As discussed in Chapter 7, the overall building-mass concept is illustrated in Figure 8.2, where the levels are shifted to create humanist-scaled 'green pockets' throughout the structure where the boundary between inside and outside is blurred. This implies numerous cantilevers throughout the structure in both directions. In addition to this, the structure needs to be able to accommodate future changes in use, which can present the need for certain spatial or structural changes. For both long-spanning cantilevers as well as structural 'alterability', steel construction will work better than concrete for the primary structure. In addition to these considerations, steel construction presents numerous other advantages such as time and (therewith) cost savings on construction, easy and fast assembly with the ability to premanufacture many steel components, as well as the recyclability of steel as a material.

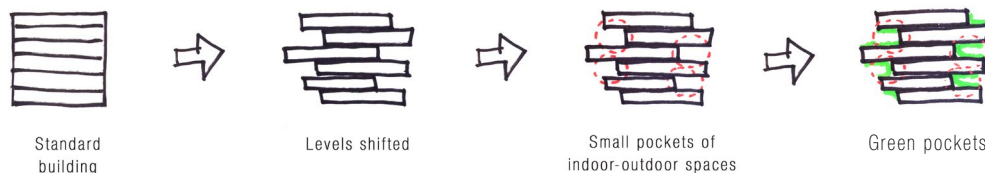


Figure 8.2: Building-mass concept

Figure 8.6 illustrates a structural diagram showing the positioning of the three primary support lines, and Figure 8.4 indicates a longitudinal section-diagram to indicate the segment of the top two floors which is cantilevered. These are constructed by means of two diagonally-braced steel members (Vierendeel-truss beams, Figure 8.3) on each side. The structure adheres to the general rule of thumb for cantilevers which stipulates that the segment which is cantilevered needs a supported 'backspan' of three times the length of the cantilever.

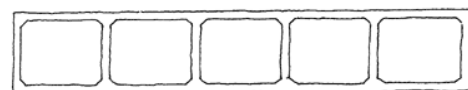


Figure 8.3: Vierendeel truss

As illustrated in Figure 8.5, one Warren-truss beam acts as an 'upstand' and one as a 'downstand', in which the diagonal bracing is on one side on the fourth level and the other on the fifth, with vertical steel members either suspended from or supported on the Warren-truss beam (only in the cantilevered part). The reason for this is two-fold: the overall building-mass-concept (Figure 8.2) indicates shifted levels; on the northern facade (left on the diagram in Figure 8.6) the topmost level is shifted outwards to provide horizontal sun-shading to the floor beneath it, which means that the Warren-truss beam needs to be on level four (otherwise the diagonal bracing will cut through the middle of the floorplan). On the southern side (right-hand side) the Warren-truss beam is on level 5, because level four stops short of the central atrium. This achieves a 3/4 backspan as necessary for the truss beam (see Figure 8.10) with the truss beams positioned in the outer envelope on both sides.

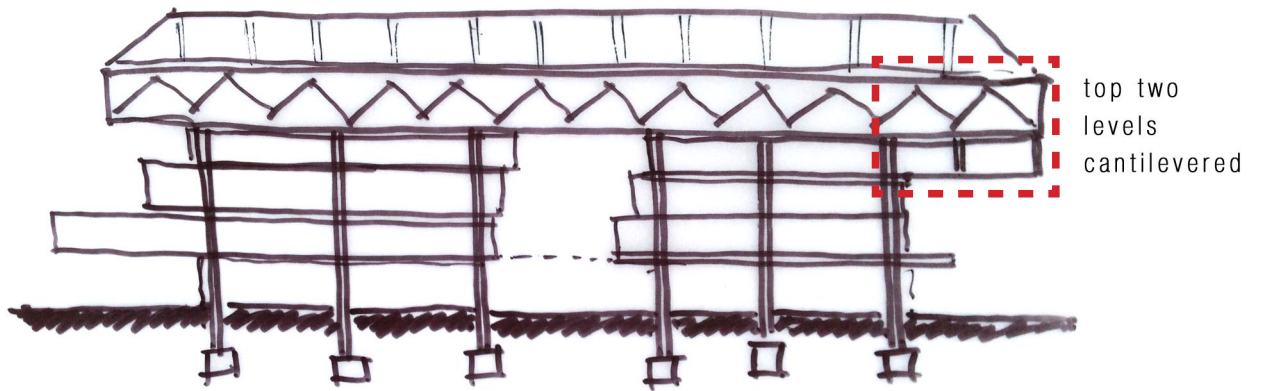


Figure 8.4: Longitudinal section-diagram indicating cantilevered



Figure 8.5: Diagonally-braced girders: 'upstand' and 'downstand'

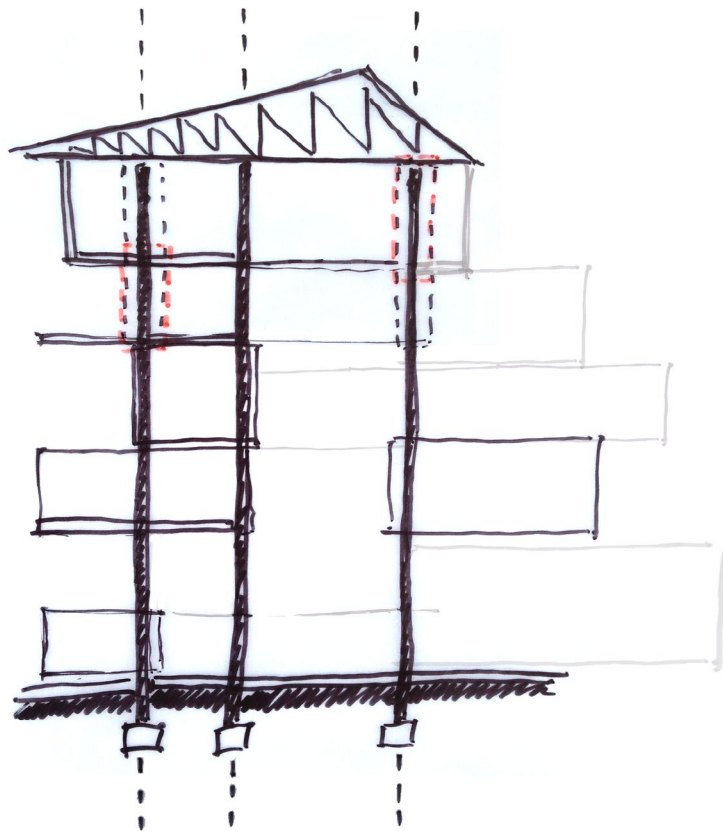


Figure 8.6: Cross section-diagram indicating cantilevered section



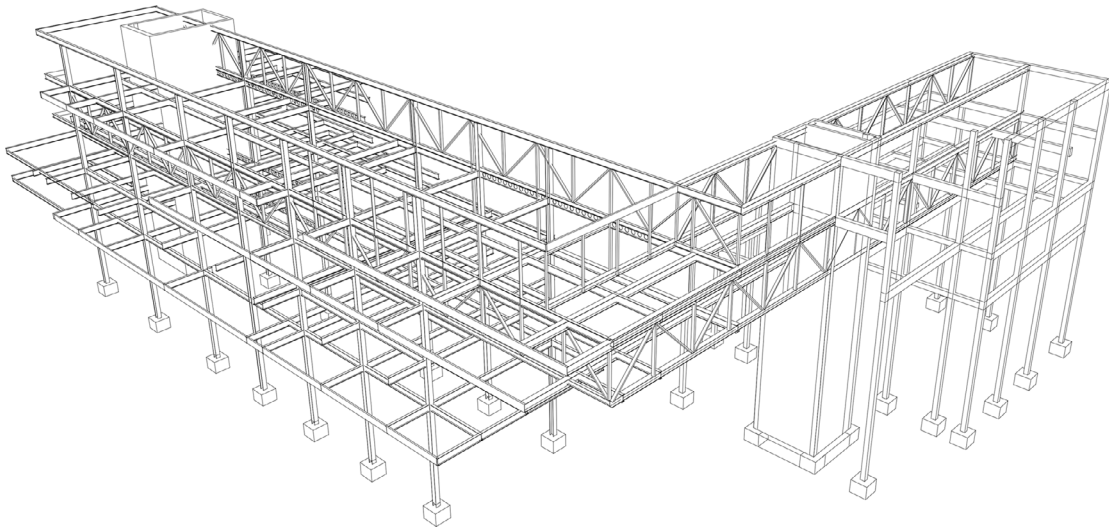


Figure 8.7: Primary structural members for entire building

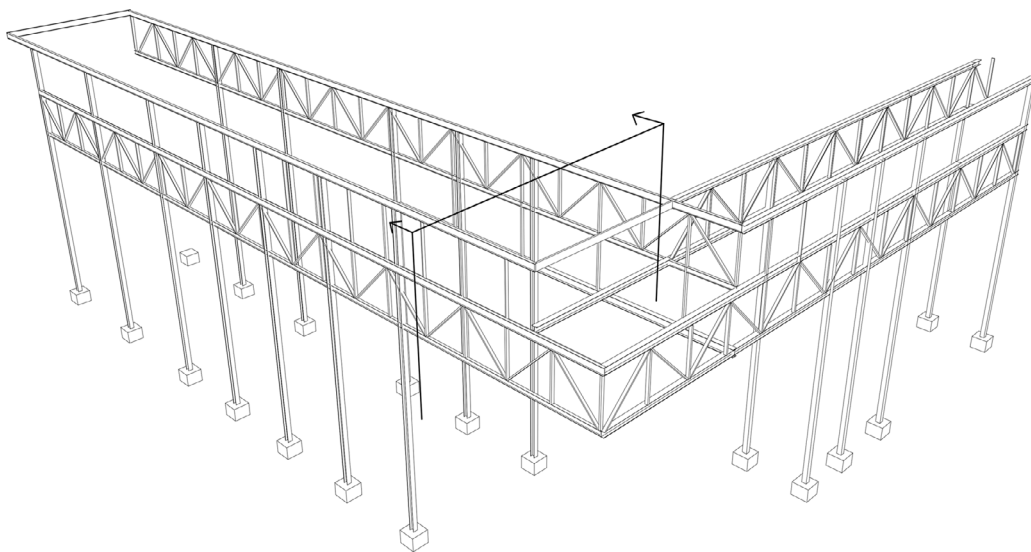


Figure 8.8: 3D showing structural members for corner-cantilever and columns

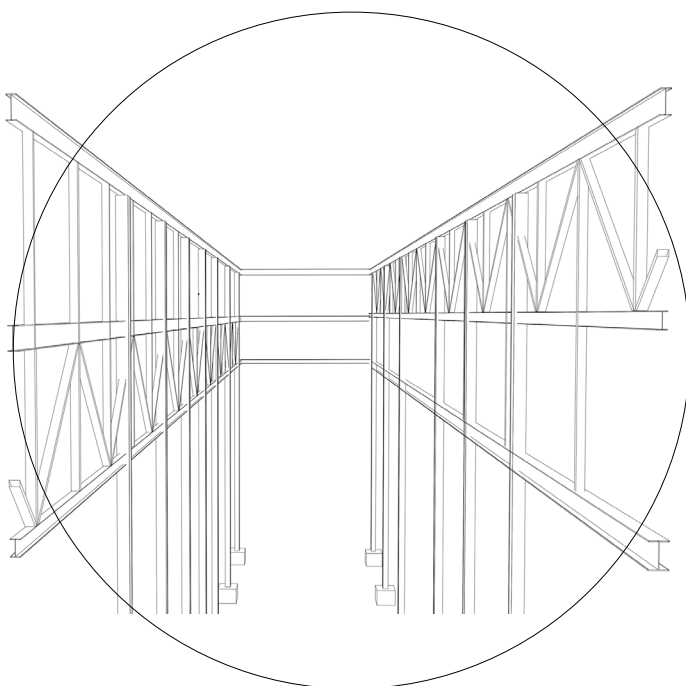


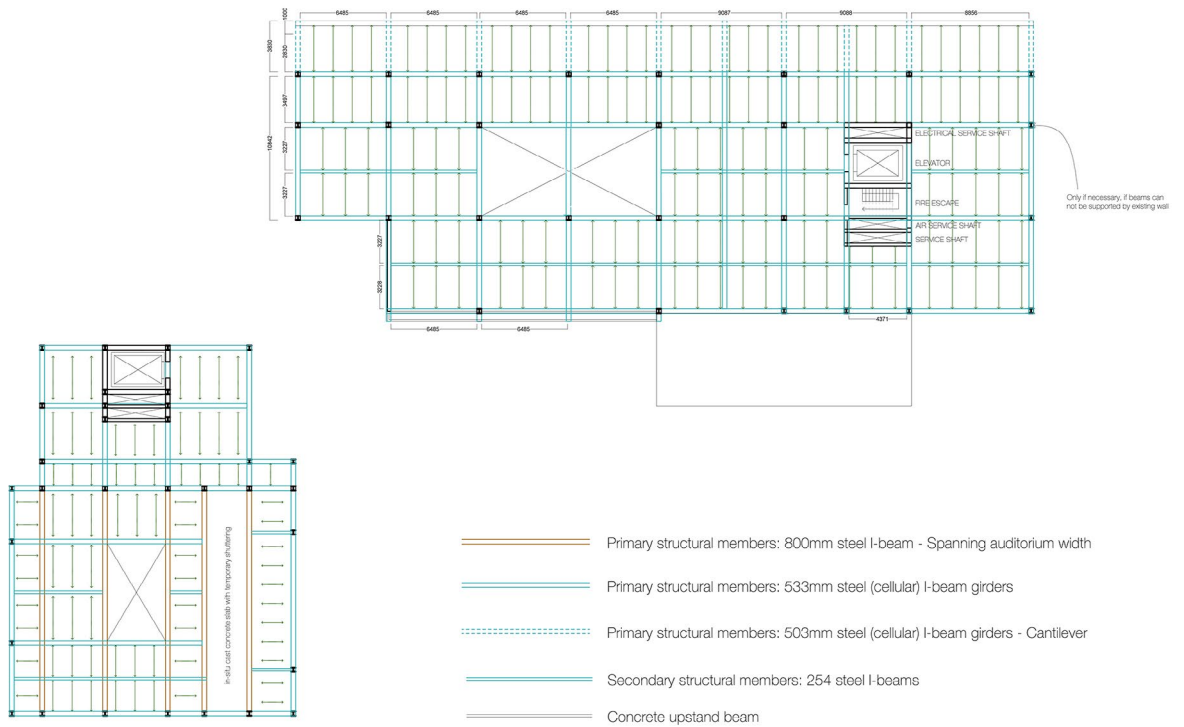
Figure 8.9: 'Upstand' and 'Downstand'

#### 8.1.2.2 STRUCTURAL INVESTIGATION :

Figures 7.7 - 7.10 illustrate the structural analysis of primary and secondary steel beams and H-profile columns of the first floor and the top floor layouts. They also indicate what parts are cantilevered as well as the diagonally-braced (Warren-truss beam) that are used for the top two levels corner-connecting-bridge structure.

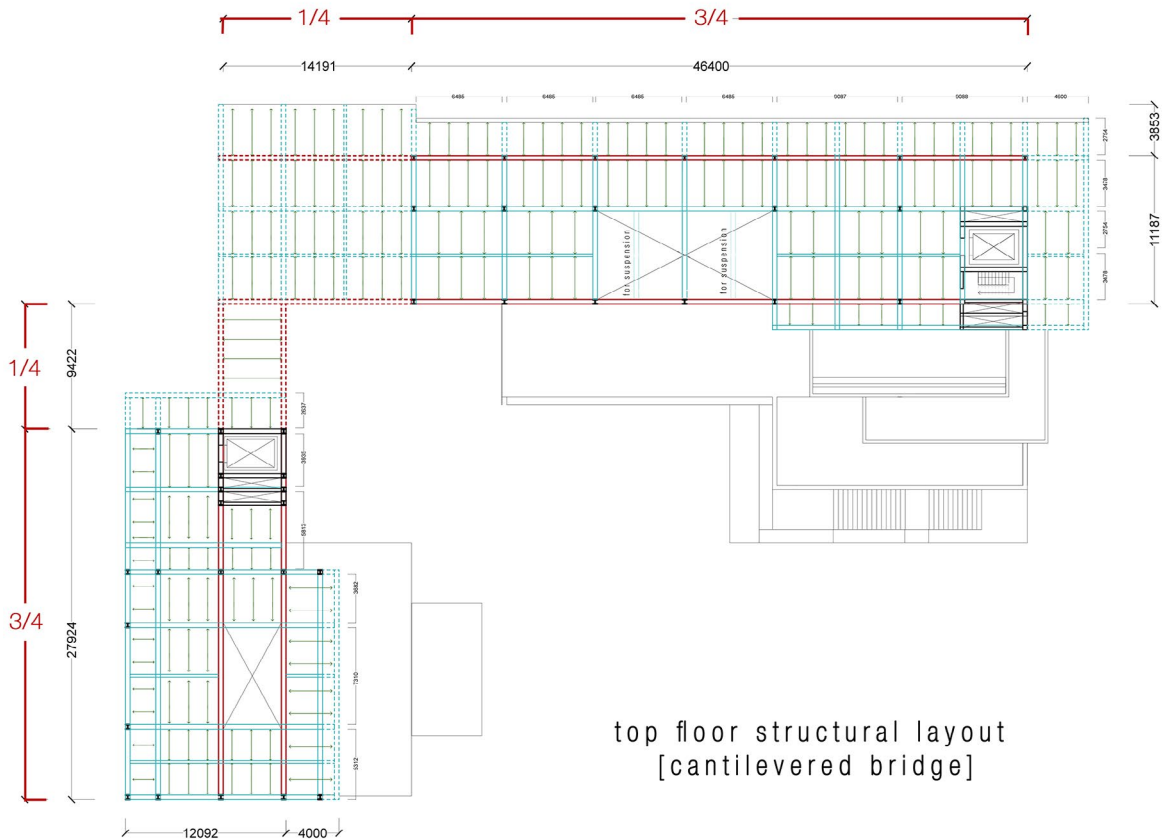
Figure 8.10: Structural layout

first floor structural layout



span direction of trapezoidal steel decking [permanent shuttering]

----- Vierendeel beam - cantilever  
===== Vierendeel beam - backspan

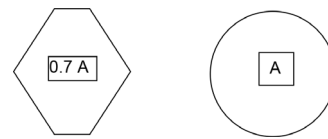


top floor structural layout  
[cantilevered bridge]

Furthermore, for the reason that the programme of a T.E.L. Centre constitutes a fairly intensive service structure with regards to electronic and electric service distribution, and more importantly, changing electric and electronic services to accommodate changing technologies, a cellular steel beam structure allows for an open infrastructure that can absorb these fast-changing services (more on the service to follow later in the chapter).



In comparison with using castellated beams versus cellular beams, the cellular beam presented a higher degree of flexibility with regards to its opening-dimensions. The castellated beam's hexagonal-dimensions are fixed and are also only 70% of the overall maximum circular opening of the cellular beam (Fig 8.11), which is important for accommodating services. This also means that the cellular beam has an overall lighter weight and flexible strength to weight ratio (Macsteel, n.d.). Furthermore, the infill plates are also something to consider; the cut-outs for the cellular beam can be planned ahead and solid web segments can be left where an end beam connection is to occur. The castellated beams need to have infill-plates reinserted wherever necessary (Fig 8.12), and this can add up to 40% of the initial cost (Macsteel, n.d.). Although the castellated beam uses less steel in its original manufacture, the circular void cut-outs of the cellular beam can be recycled.

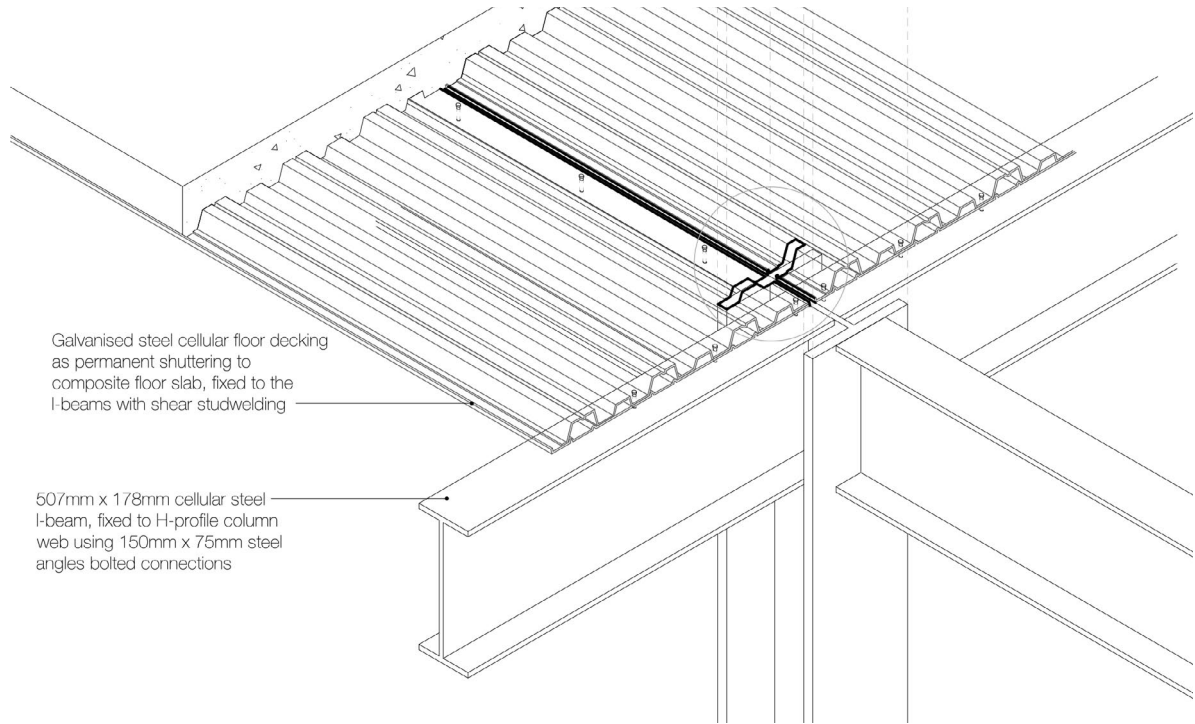


**Figure 8.11:** Openings of castellated and cellular steel beams (Macsteel, n.d.)

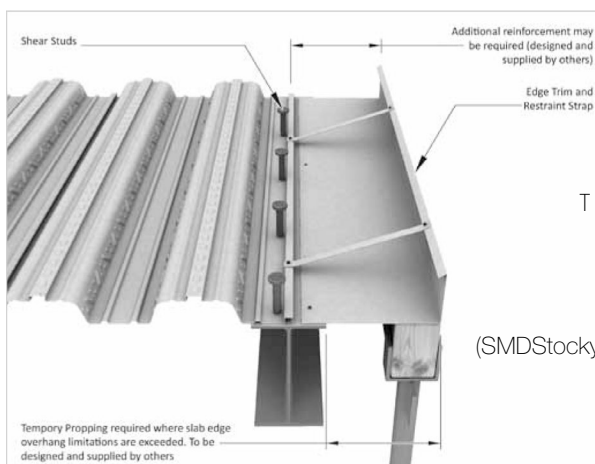
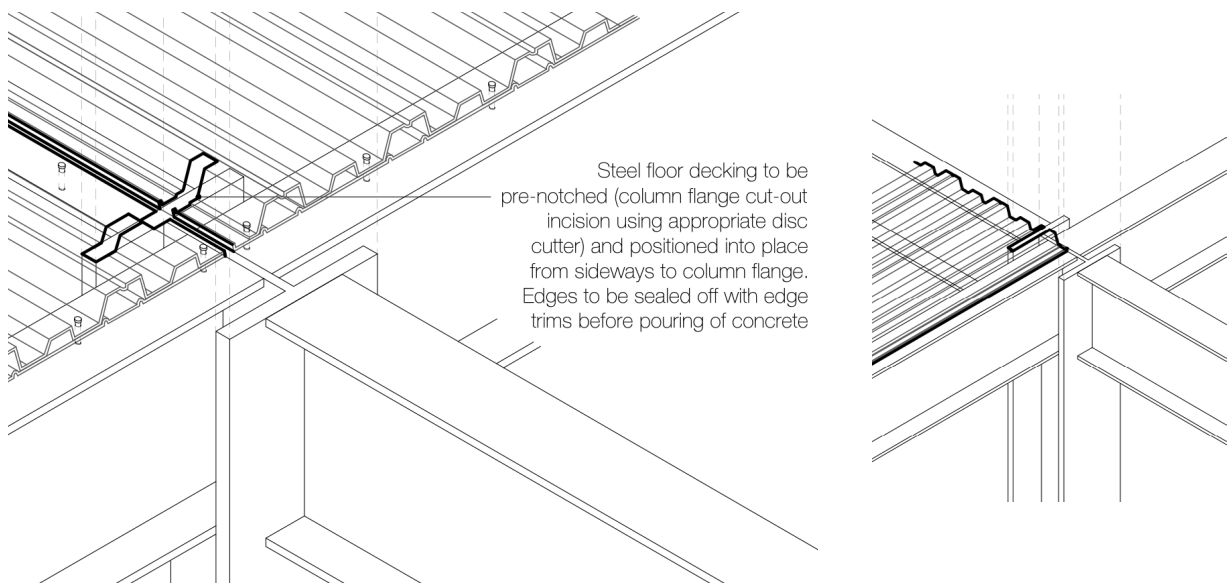


**Figure 8.12:** Infill plates in castellated beams vs pre-planned cells in cellular beams (Macsteel, n.d)

The floors are constructed of composite steel decking (permanent shuttering) and a concrete topping. Figure 8.12 illustrates some of the typical floor (cut-outs around columns) details as well a temporary structural propping detail for cantilevered edges (when concrete has cured it has attained its structural integrity and prop can be removed (SMD, n.d.)).



STEEL DECKING 'NOTCHING' DETAILS



TEMPORARY PROPPED EDGE DETAIL  
[FOR CANTILEVERS]

(SMDStockyards, n.d.)

Figure 8.13: Composite floor details



### 8.1.2.3 SECONDARY STRUCTURE :

From the first floor upwards, the secondary structure needs to be as lightweight as possible, considering the numerous multi-directional cantilevered levels. Therefore, the exterior infill walling comprises light steel stud wall framing (Fig 8.14) for its very lightweight 60kg/m<sup>3</sup> (Weber, 2013) compared with conventional brick infill which is 2100kg/m<sup>3</sup>, and also for its relatively easy adaptability with regard to future change.



Figure 8.14: Light steel framing

### 8.1.2.4 TERTIARY STRUCTURE :

These stud walls are clad with two materials that range from stereotomic to tectonic (in light of the technical concept, section 8.2). The solid, denser parts are clad with panels of expanded polystyrene composite material, of which the patent industry term is ETICS (Exterior Thermal Insulation Composite System) - see wall detail in Figure 8.34. This expanded polystyrene cladding panel presents the simultaneous benefits of being extremely lightweight compared with other cladding panels such as fibre cement or single-leaf brick walls; also, this panel presents very good thermal insulation for the exterior walls on the outermost side of the wall, which can be doubled up with insulation material in between the stud-framing as well. The R-value for the ETICS system is 3.67 (Weber, 2013) in relation to 0.88 for a double brick wall, which means that it insulates the building almost four times more than a double-leaf brick wall would.

The lighter cladding system consists of translucent polycarbonate wall sheeting. The patent term is *Palram's Sunlite 7 Multiwall* polycarbonate sheet, which is a 25mm thick panel with a seven-walled polycarbonate structure inside. This system has a U-value of 1.39 W/m<sup>2</sup>K, which is less than a cavity brick-wall of 1.5 W/m<sup>2</sup>K and it is very lightweight with a density of 3.4kg/m<sup>3</sup>.

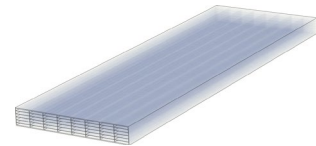
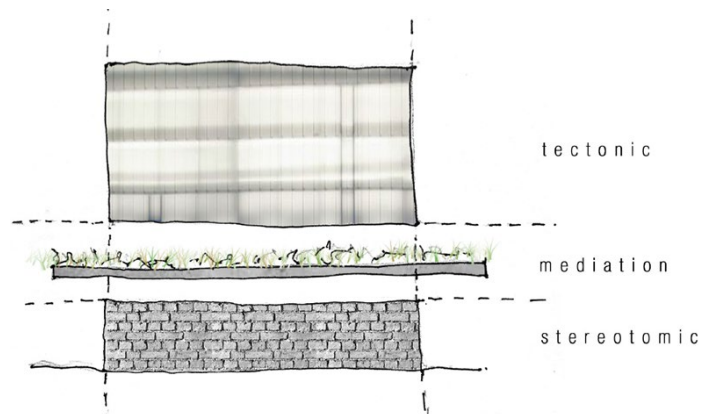


Figure 8.15: Precedents for translucent cladding

### MATERIALITY CONCEPT :





As illustrated in the tectonic concept, the secondary structure mimicks that of the existing built context on the GPW block, with a heavy bottom and a light top. The ground floor level has another design-role to fulfill with regards to the counter-strategy to compromiser 1 (loss of slow pace of reality) which is blurred boundaries, soft street edges and a layering of thresholds between street condition, building interior (and exterior) condition as well as the main central square condition in the block. Therefore, the groundfloor boundary walls constitute facebrick infill with variants of the english bond (to tie in with the existing materiality of the GPW buildings) that will mediate between solid wall, protruding header patterns and openings for brise-soleil (for soft, layered street edges), to expose the craftsmanship of brick and tie in with Pretoria regionalist elements.

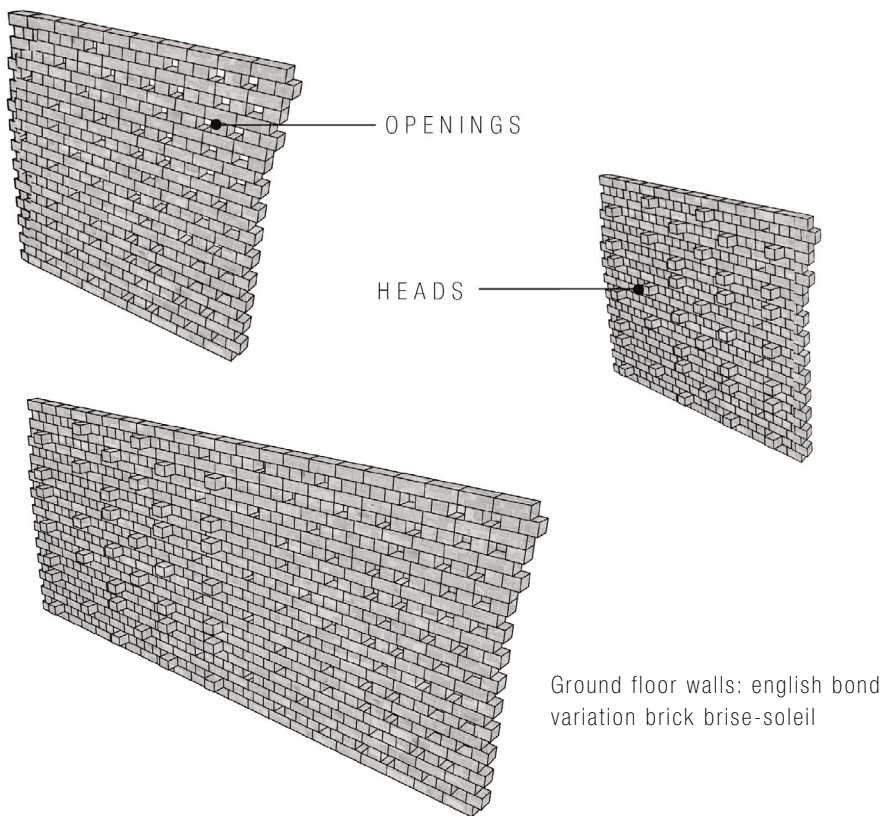
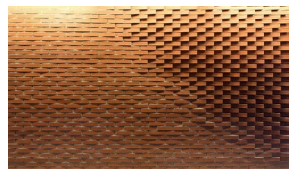
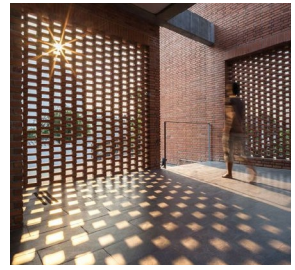


Figure 8.16: Brickwork precedents

NORTHERN FACADE GROUND FLOOR STREET 'BOUNDARY':  
 GREY BRICK BRISE SOLEIL IN A GRADIENT OF SOLID [HEADS] TO OPEN [OPENINGS]

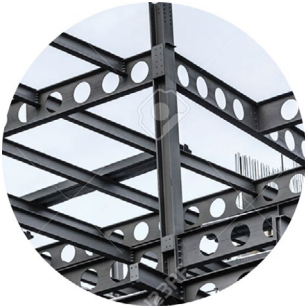




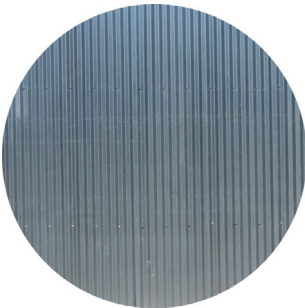
CHANGE

BENEFITS

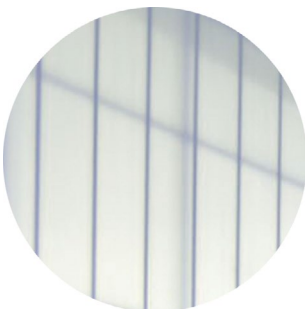
TECHNOLOGY



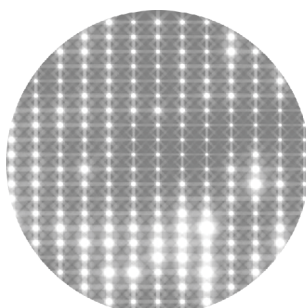
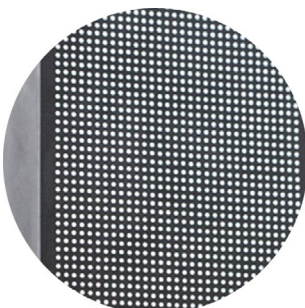
- STEEL STRUCTURE
- LIGHT GAUGE STEEL



- CORRUGATED IRON
- 'ETICS' CLADDING



- TRANSLUCENT  
POLYCARBONATE



- LED IN CONCRETE
- LED SCREEN (GLASS)



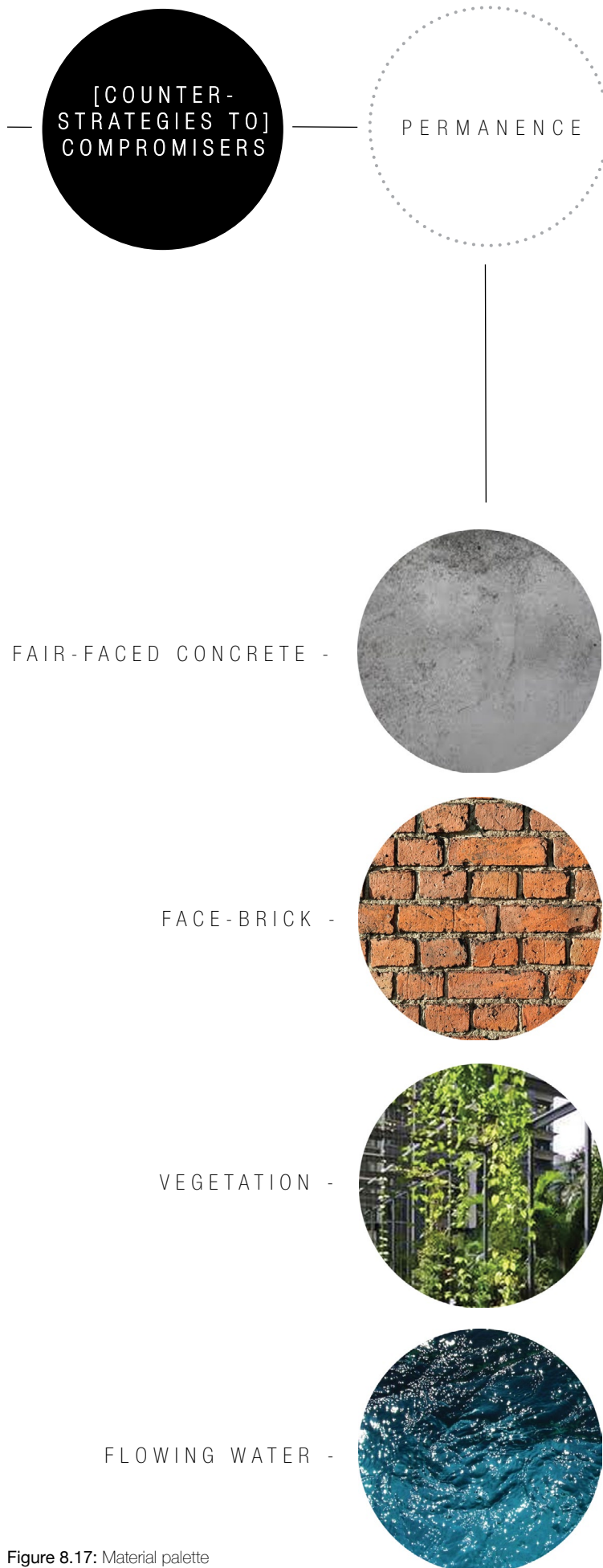


Figure 8.17: Material palette

### 8.1.3 MATERIALITY

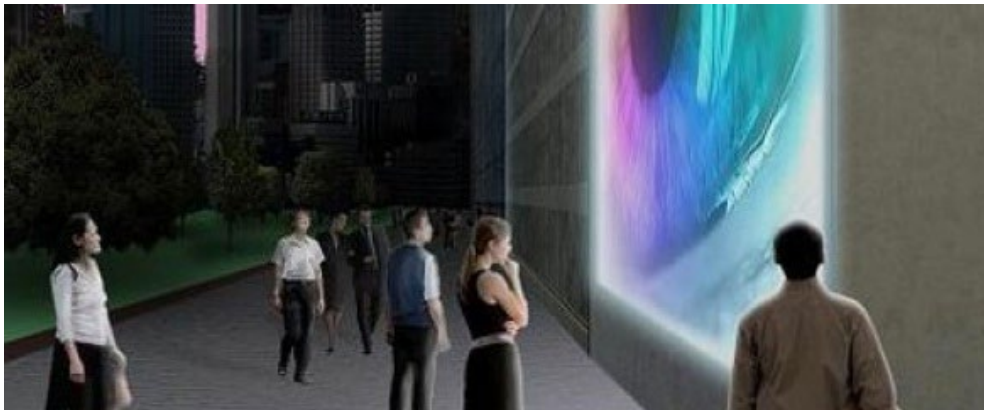
The material palette expresses the inherent duality of the benefits of technology and the counter-strategies to the compromisers of technology (as explained in section 7.3). These dual constituents are also directly linked to the degrees of permanence and change in the structure.

Therefore, the permanent elements (that manifest the counter-strategies) are the solid brickwork and brise-soleil walls on the groundfloor (counter-strategies to compromiser 1 and 4), natural elements such as water and vegetation (compromiser 3), and concrete 'framing of movement' (compromiser 5).

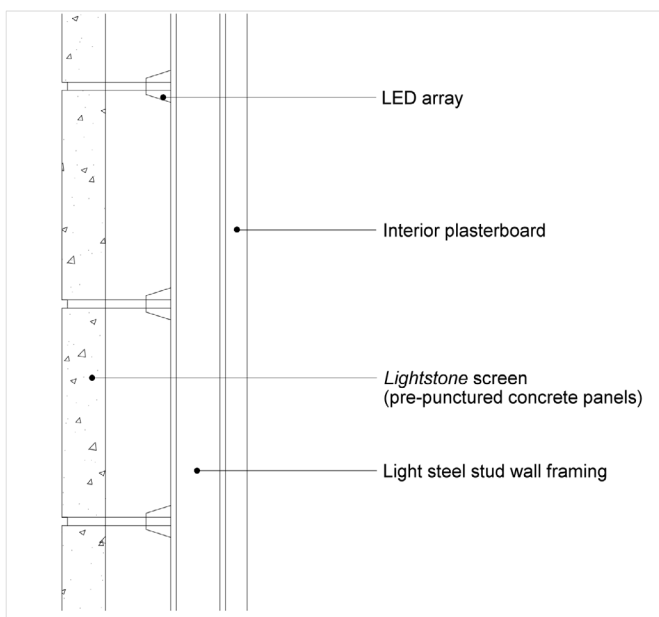
On the other hand, the flexible elements are those that relate to the utilization of technology as well as adaptability regarding usage. These include the primary steel structure, secondary light gauge steel wall framing, the tertiary infill wall panels such as the 'etics' cladding and translucent sheeting as well as roof sheeting; and then also the digital LED screens (whether embedded in translucent concrete or with conventional glass surface).

### 8.1.4 LED EMBEDDED CONCRETE - *LIGHTSTONE*

In light of the design strategy of ‘extending learning material beyond the ‘school’ boundaries’ and ‘procuring physical and virtual learning environments in tandem’ (see Chapter 5), Figure 8.20 illustrates the designated facades (on the southern side of the building) for digital display content. This is done by means of *Lightstone* (*DuPont* manufacturers) cladding, which is a concrete surface with LED’s embedded into it (Fig 8.19). The reason for using this material is twofold: firstly as the concrete surface makes the material vandal-proof (in comparison with conventional glass LED screens), and secondly as the material can be seamlessly integrated with the rest of the building without seeing a ‘screen’. The digital content can be turned off and a normal concrete surface is seen, when it is switched on again it presents the element of surprise of appearing on an unexpected surface (Fig 8.18).



**Figure 8.18:** Example of seamlessly integrated ‘screen’



**Figure 8.19:** Detail section showing LED embedded in concrete



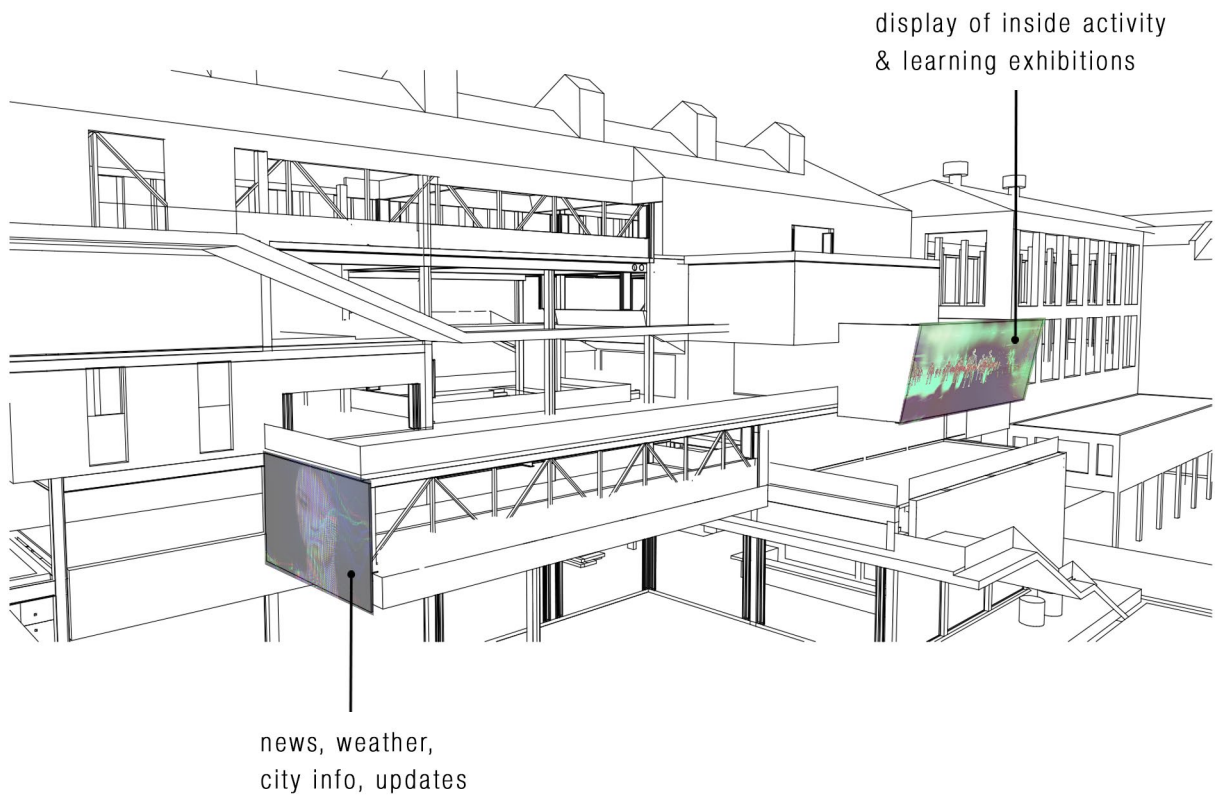


Figure 8.20: Designated digital display screens on facade



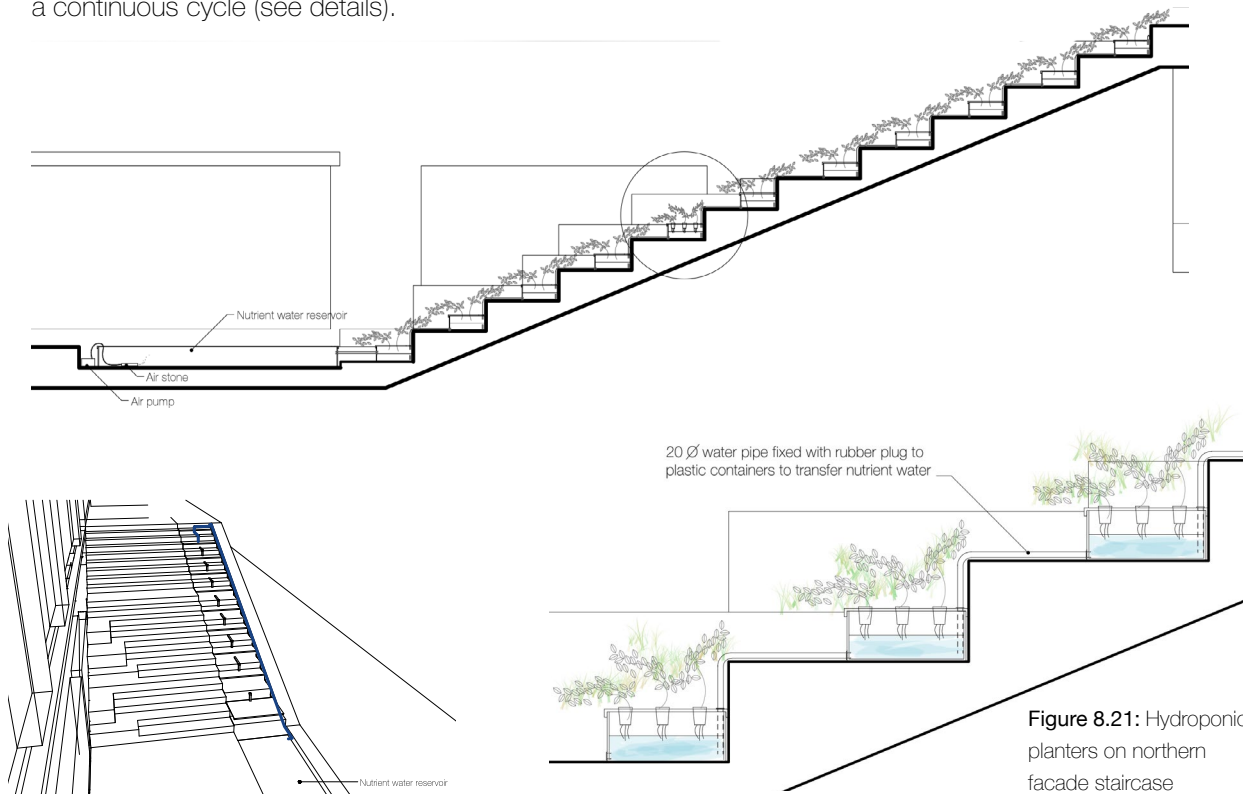
## SECTION 2: ENVIRONMENTAL CONSIDERATIONS

### 8.2.1 HYDROPONIC PLANTING

As discussed in Chapters 5 and 6, in response to Compromiser 3 (loss of relationship with nature), the counter-strategy constitutes integrating natural vegetation as much (and as close to the user) as possible - not just as it is necessary in a learning environment but for any living / working environment. The design approach is to incorporate 'green pockets' throughout the building and on all levels. Taking into consideration the cantilevered levels, these vegetation pockets should be as lightweight as possible; implementing greenery by means of soil planting on the upper levels would mean very excessive loading on the already cantilevered structure. Therefore, in order to keep the vegetation as lightweight as possible, the strategy constitutes hydroponically-grown planters throughout the entire 5-storey building. In some instances the planter can be combined with seating, for direct user-contact.



The hydroponic planters make use of the wick-system, whereby the nutrient water is transferred through a cotton wick by capillary action to the growing medium such as vermiculite, which is also very lightweight, all inside a custom-made plastic container. The planting ranges from indigenous still to creeping plants (by galvanised steel rods) which will define a green 'pocket' without creating a solid barrier. Each water-container has its own aerator pump and in the case of stepped planters the nutrient water flows downward from the top to the bottom, through each planter and then it is pumped up again in a continuous cycle (see details).



**Figure 8.21:** Hydroponic planters on northern facade staircase

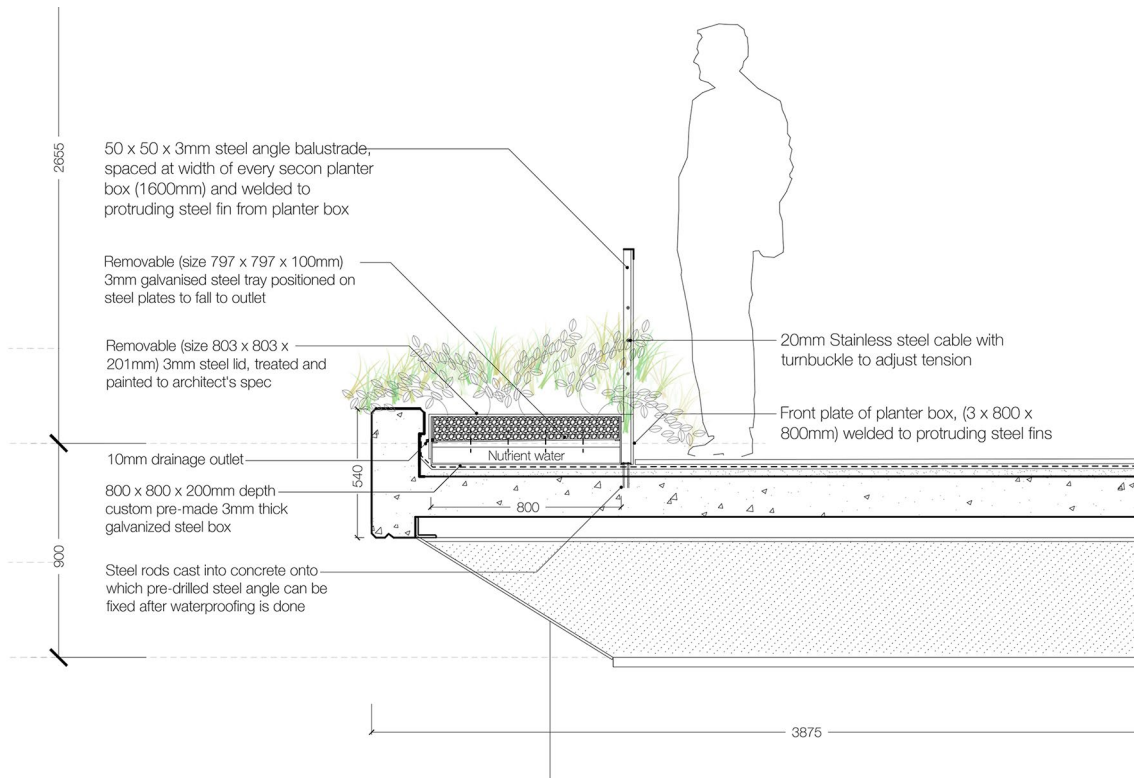


Figure 8.22 PLANTER & HANDRAIL COMBINATION

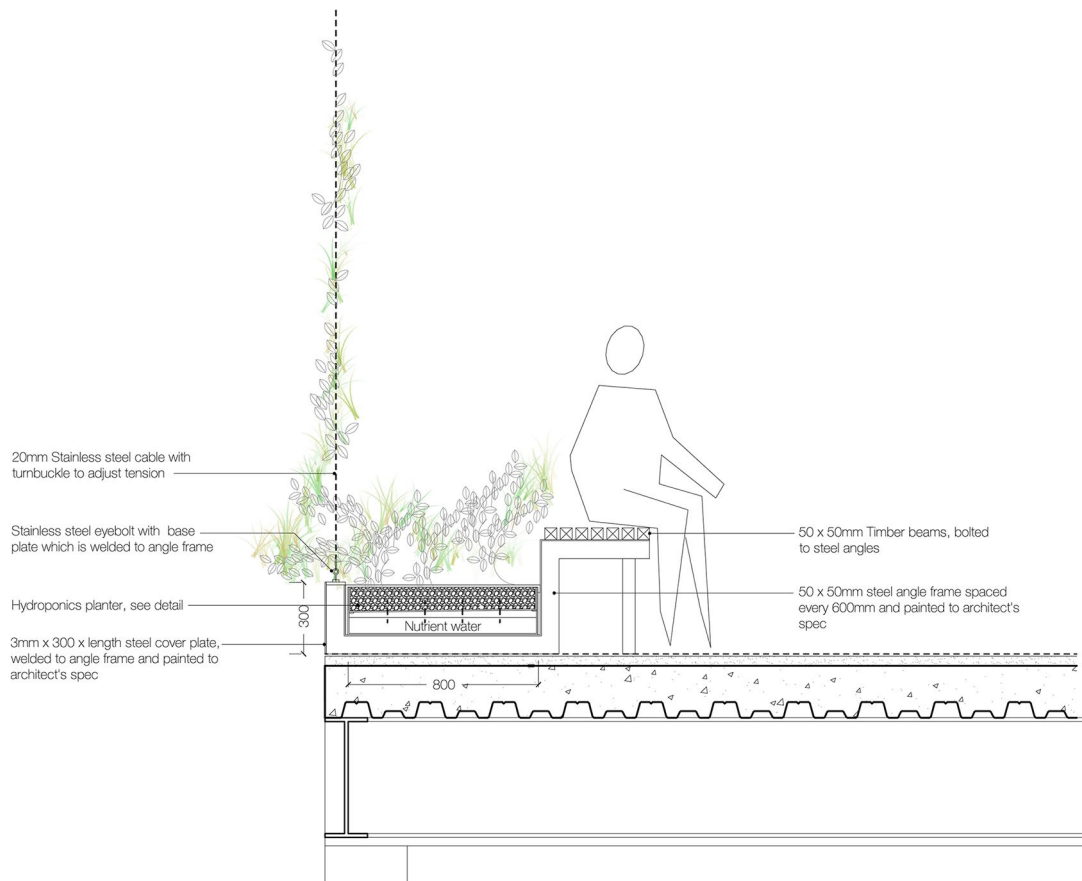


Figure 8.23 PLANTER & SEAT COMBINATION

### 8.2.2 EXPOSED RAIN WATER-HARVESTING SYSTEM

In further response to Compromiser 3, the rain-water-harvesting system stems from a dual design intention of collecting and reusing rainwater but also for the haptic quality of being in close connection with water as a natural element. The harvesting system therefore constitutes an open-channel water channel that cuts through the site, starting in the Wierda building courtyard (as it is on the higher level - slope falls in a diagonal north-west direction across the site) where it surfaces as a water feature, then it flows naturally down the channel (where it submerges at times and emerges again at other times), through a filter and into a water storage basement tank underneath the western footprint (auditorium) building. From here the water is pumped again to the original point of emergence and continues the flow in a closed-loop cycle.



This water is used as grey water for toilet-flushing as well as for irrigation purposes across the site. Figure 8.25 indicates the catchment areas and flow direction as well as the different emerged and submerged lines of the water-channel. The storage-tank size is calculated (see annex A) according to the cubic meters of grey water necessary to serve all the buildings on the site for the duration of the three (almost) completely dry months during winter.

The intention for the open water channel is that people can engage with it and experience it as an urban public recreational element. Therefore the water channel is moulded into the landscape with different ergonomic approaches. It is also important that the surface of the channel has a polished (for cleaning purposes) finish but still a firm grip - similar to the Diana Memorial surface finish where Cornish granite was used for the surface illustrated in Figure 8.24.



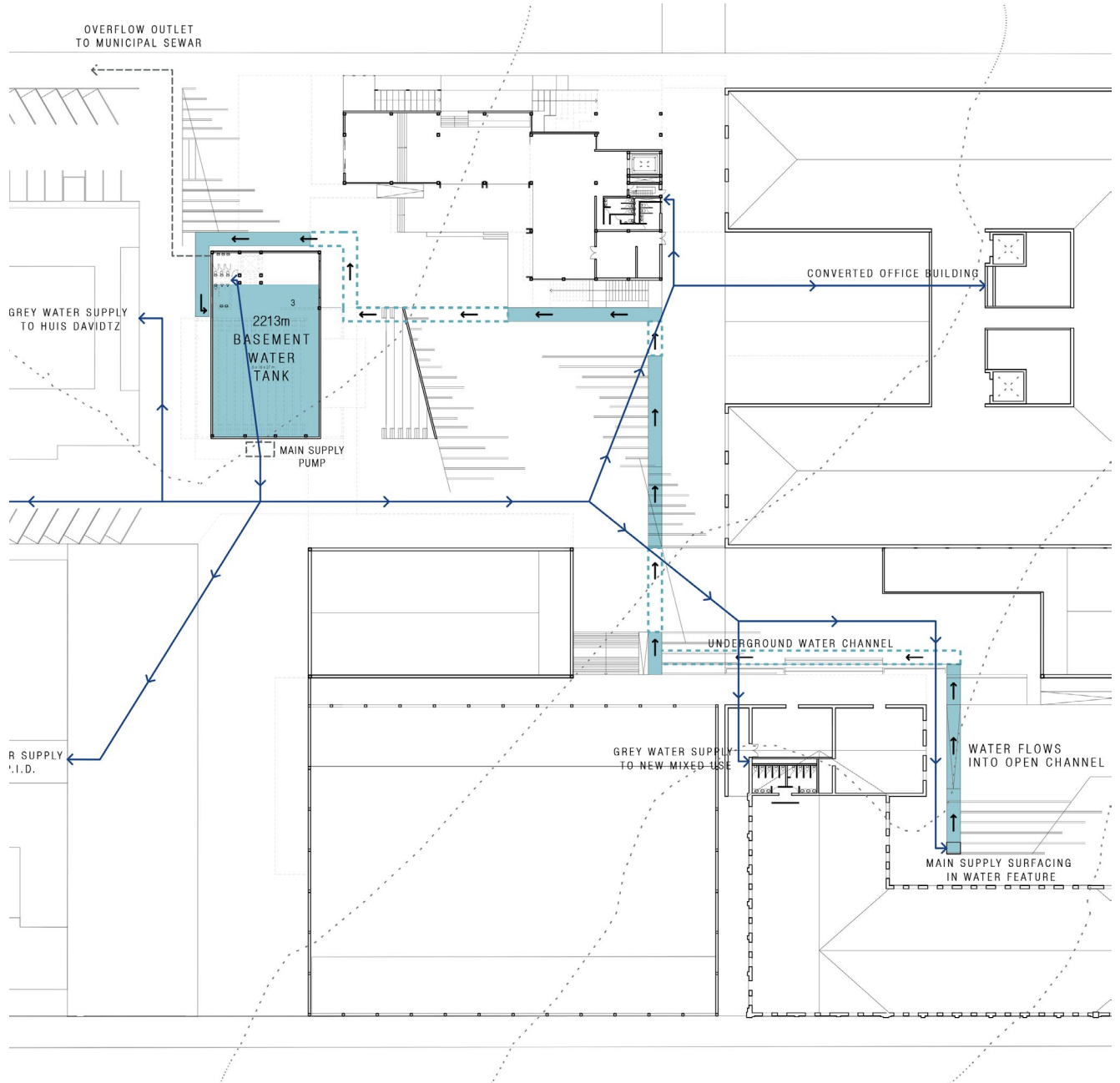
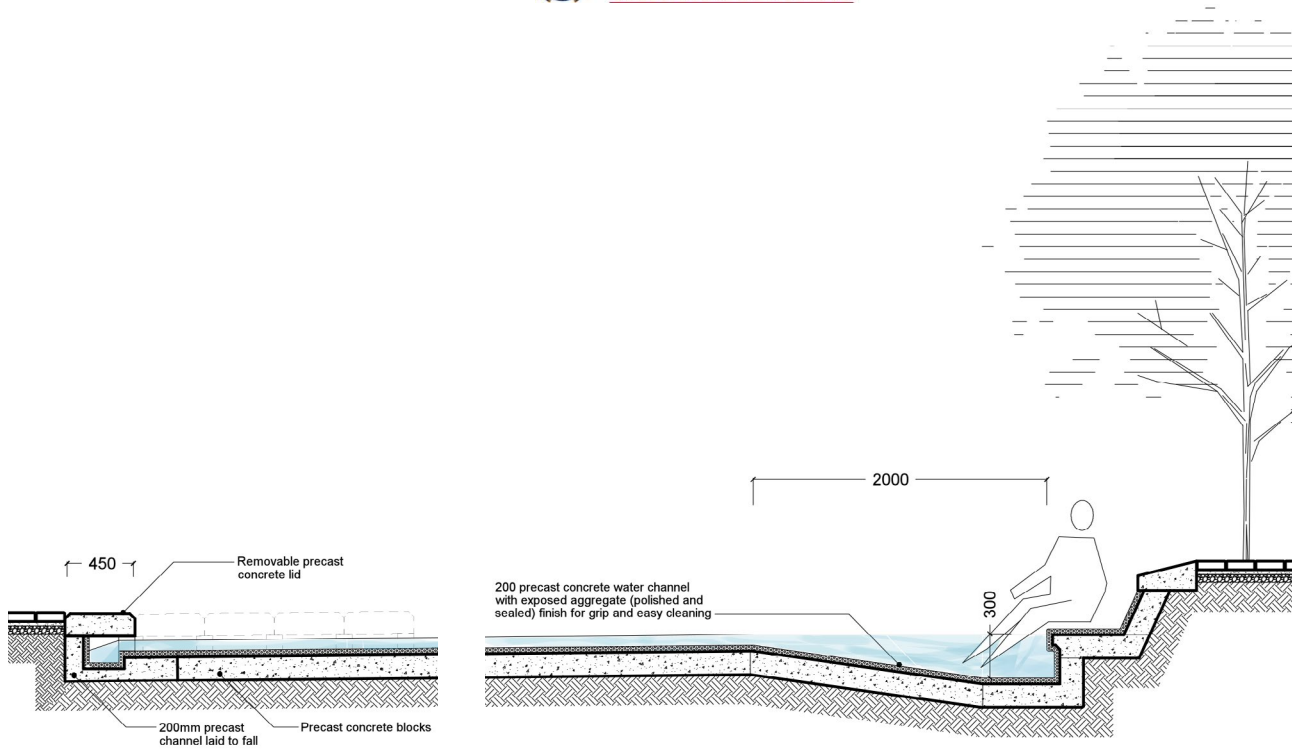


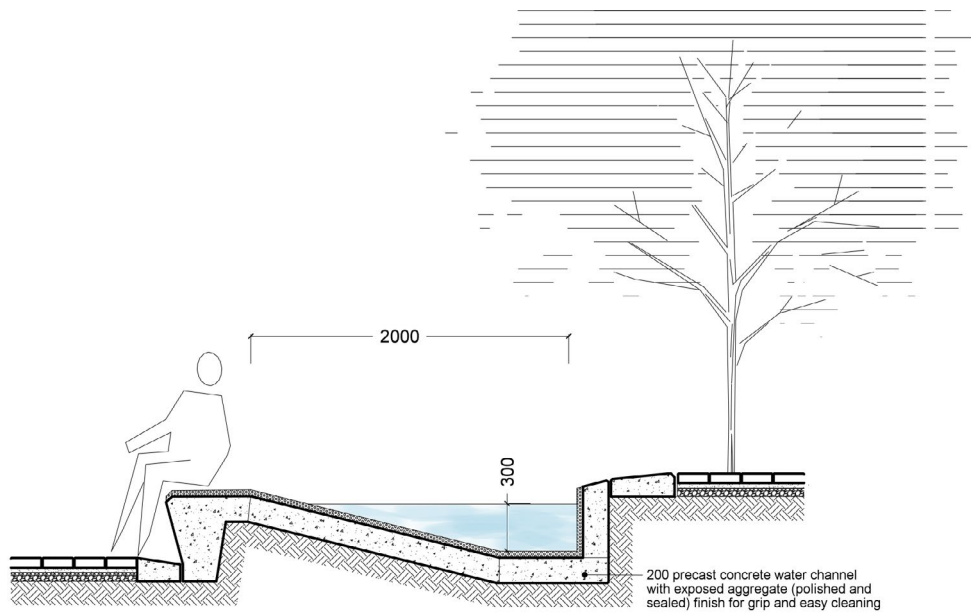
Figure 8.25: Water channel and system layout



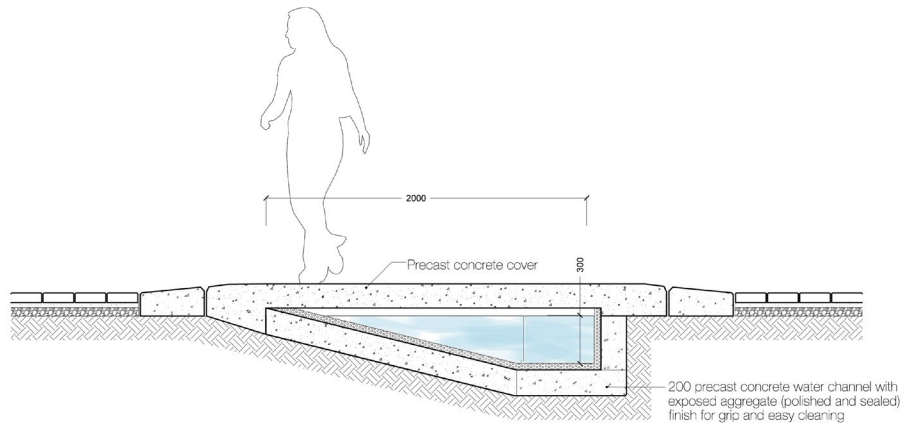


## OPEN WATER CHANNEL

Figure 8.26: Detail sections through open water channel



## OPEN WATER CHANNEL WITH SEAT



SUBMERGED WATER CHANNEL

Figure 8.27: Detail section through water channel with walkway crossing

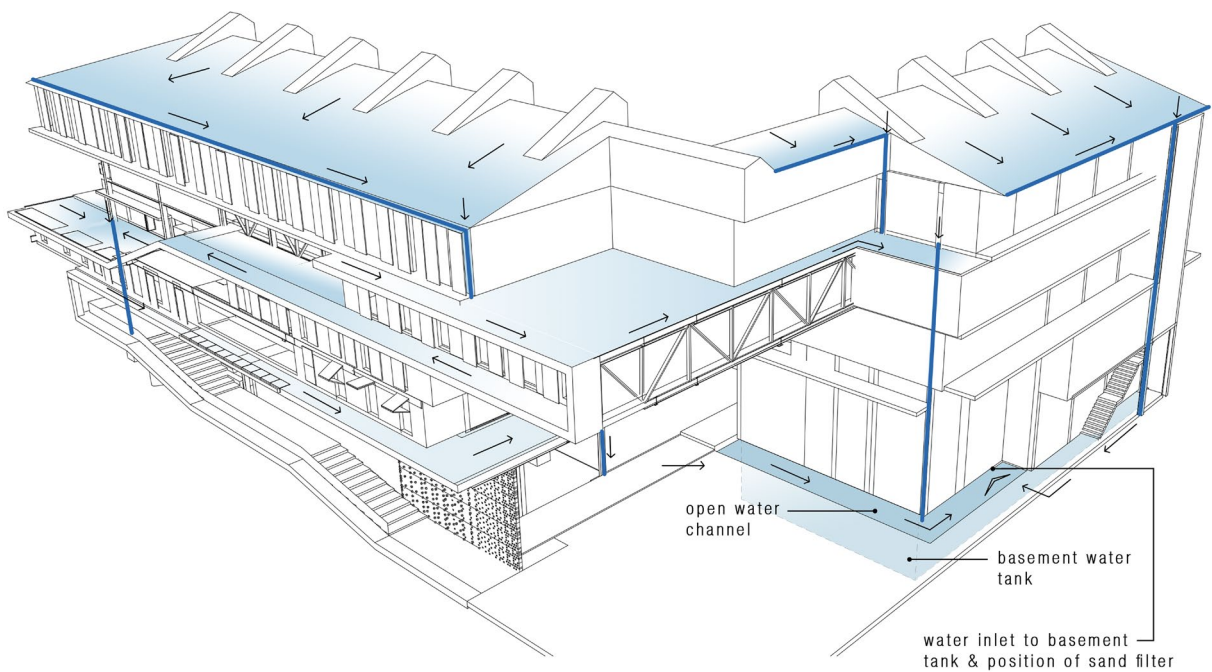


Figure 8.28: Rain-water catchment and directions of flow from building into basement tank

### 8.2.3 PASSIVE GEOTHERMAL HEATING AND COOLING SYSTEM

Although most indoor spaces inside the T.E.L. Centre make use of cross-ventilation, the electronic equipment inside the building gives off excess heat. Therefore the building makes use of a passive geothermal heating and cooling system by means of earth tubes. The earth's temperature remains at a constant all through the year, which means that it is cooler in summer than the outside air, and warmer in winter. Therefore it cools down the air in summer and warms up the air in winter before it enters the building.

As illustrated in Figure 8.29, the air inlets are positioned in the central open space of the block, in between trees, vegetation and next to the water channel so that it is as far away from vehicular outlet gasses in the surrounding streets as possible. From there the air circulates through the earth in submerged PVC piping. These pipes transfer the air into the service-shaft and vertically upwards, branching off for every level. The warm air inside the building is then sucked out at the top of each level by means of extractor fans and transferred through another pipe down the service shaft and out another outlet vent outside of the central space, away from the inlets.

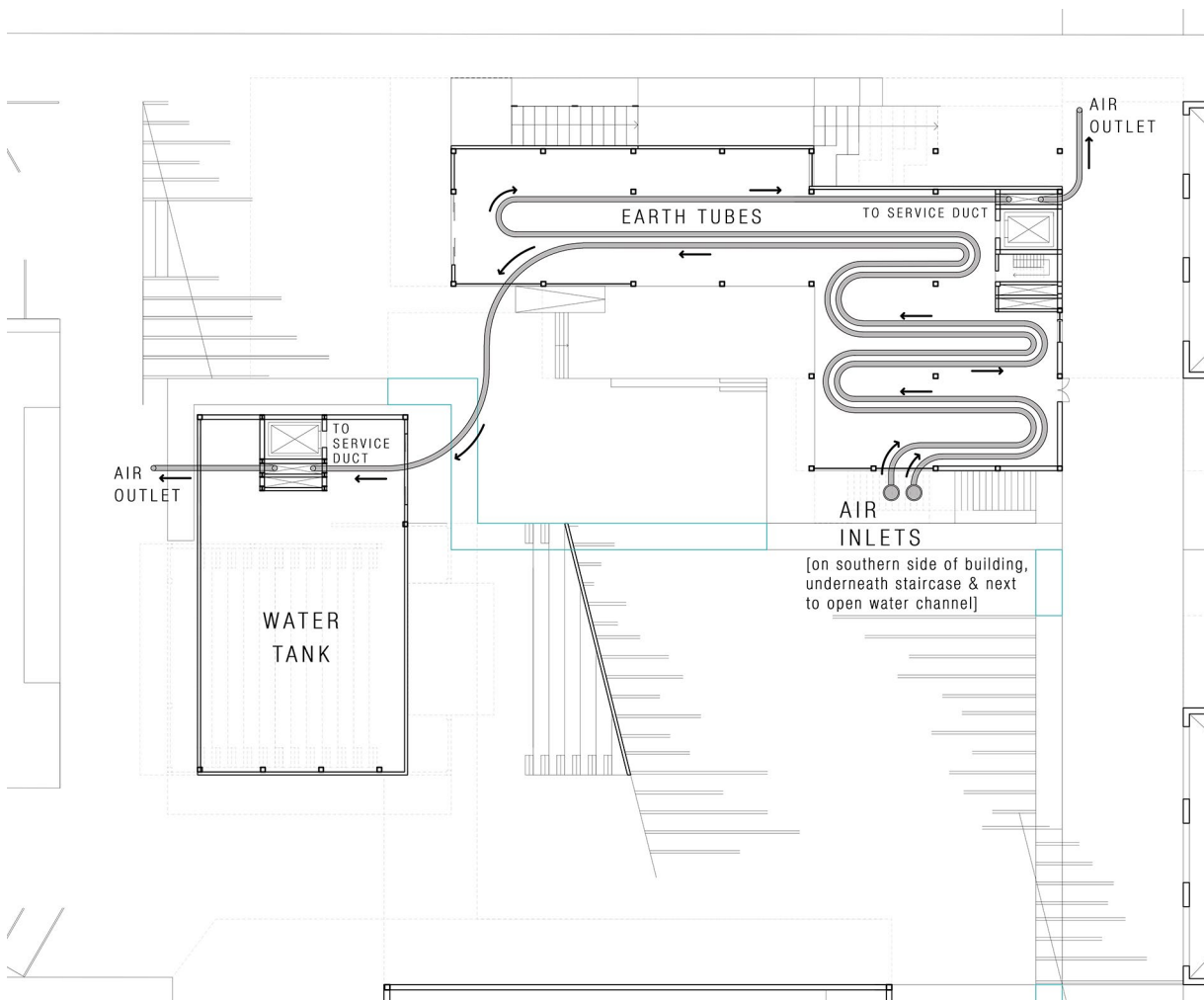


Figure 8.29: Earth tube system layout

## 8.2.4 SOLAR-ASSISTED STACK VENTILATION

In addition to the geothermal air regulation, the thermal comfort of the interior space is further enhanced by means of a solar-assisted stack-ventilation system. In commemoration of the scientific heritage of the buildings on the GPW block, which constitutes a roof-ventilator system (as discussed in Chapter 7) with a rhythmic repetition of protruded ventilators on the roofs (Fig 7.30), the new building's roof expresses the same elements in a new language.

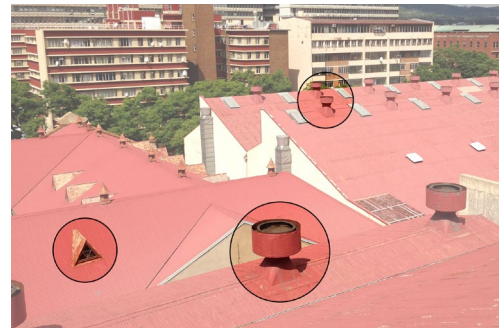


Figure 7.30: Existing roof ventilators in GPW

As illustrated in Figure 8.31 the stack-ventilation system makes use of air-pressure differences to pull the air through the building; warm temperatures have a lower air pressure and a lower air-pressure at the top of the building will passively pull the air upwards. This negative pressure at the top is further enhanced by means of the solar energy that is absorbed through the sky-light by the thermal mass-panel and then slowly released into the cavity between the panel and the glass. Most materials with a high thermal mass capacity are heavy weight like concrete slabs or similar; but because of the lightweight steel roof structure the thermal-mass-panel will rather constitute multiple plastic water canisters in a container which is fixed with angles inbetween the two roof trusses. This will work efficiently as water has a very high heat capacity of 4180 J/kgK (in relation to that of concrete:  $C = 880 \text{ J/kgK}$ ) (Joubert, 2010: 64).

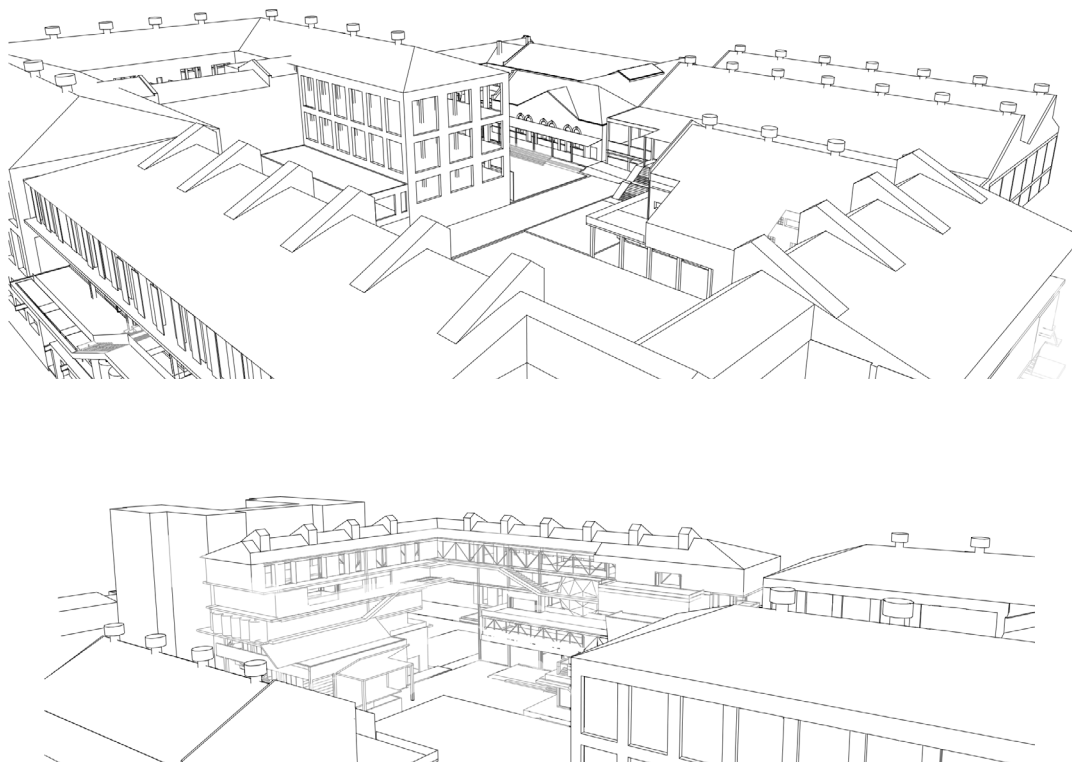


Figure 8.31 A & B: Roof with protruding stacks in relation to existing buildings with stack ventilators on site



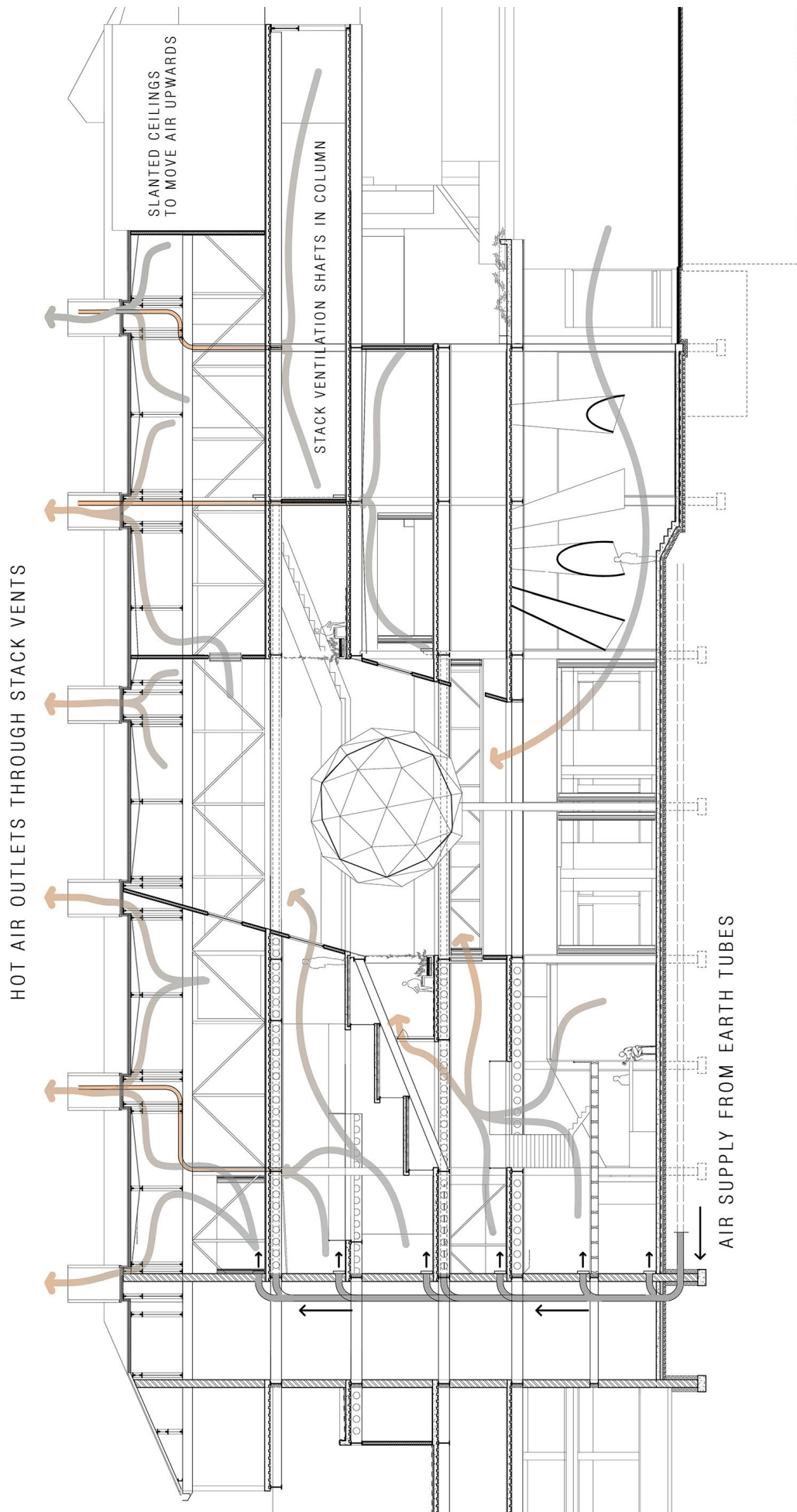


Figure 8.32: Longitudinal section showing airflow through building by means of stack ventilation

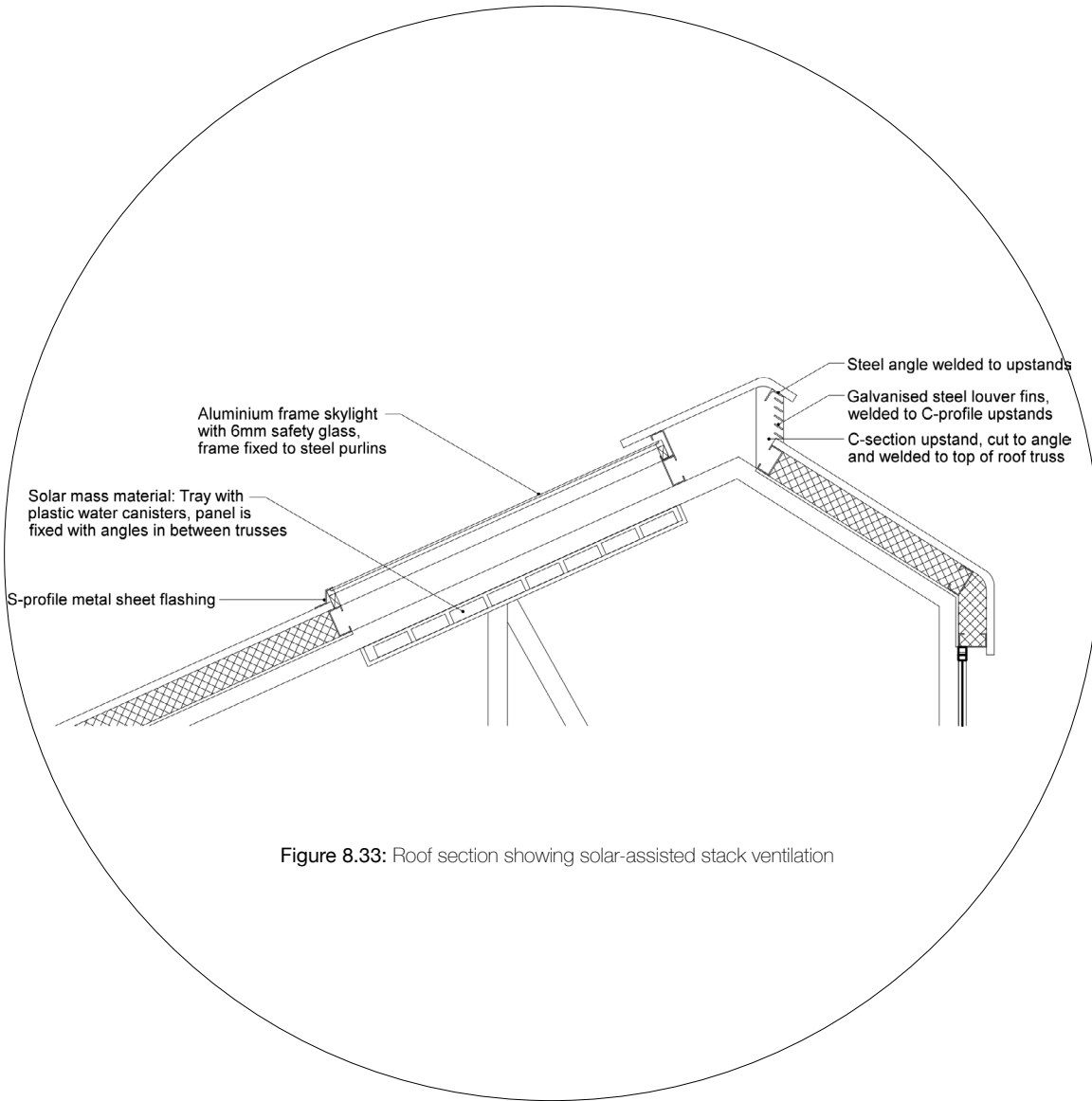
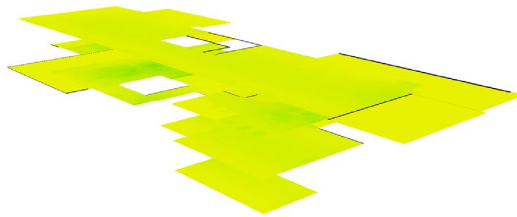
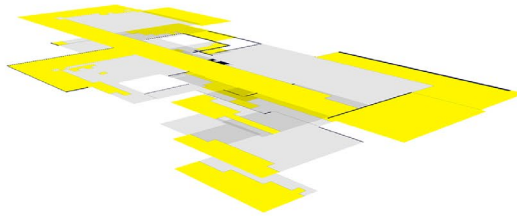
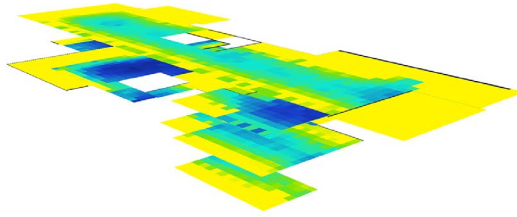
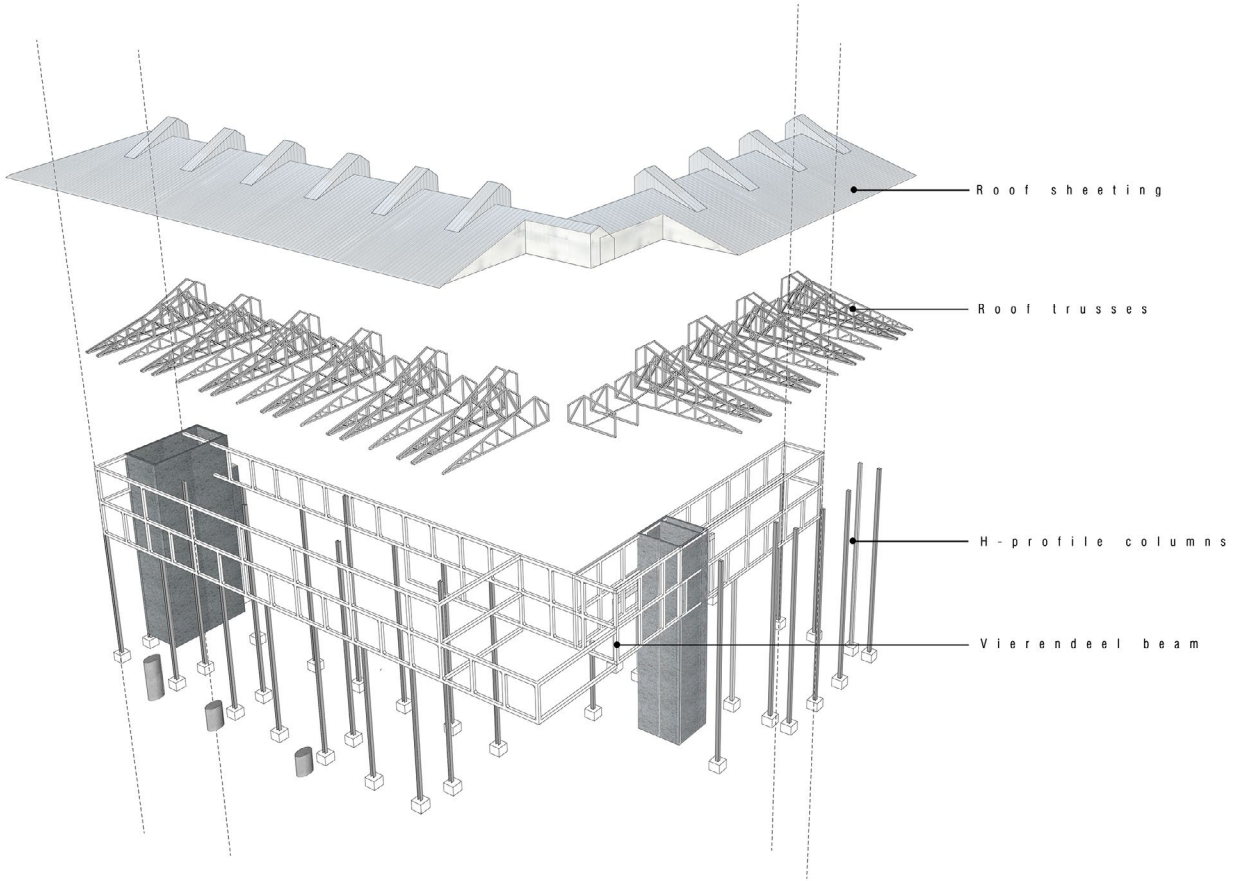


Figure 8.33: Roof section showing solar-assisted stack ventilation

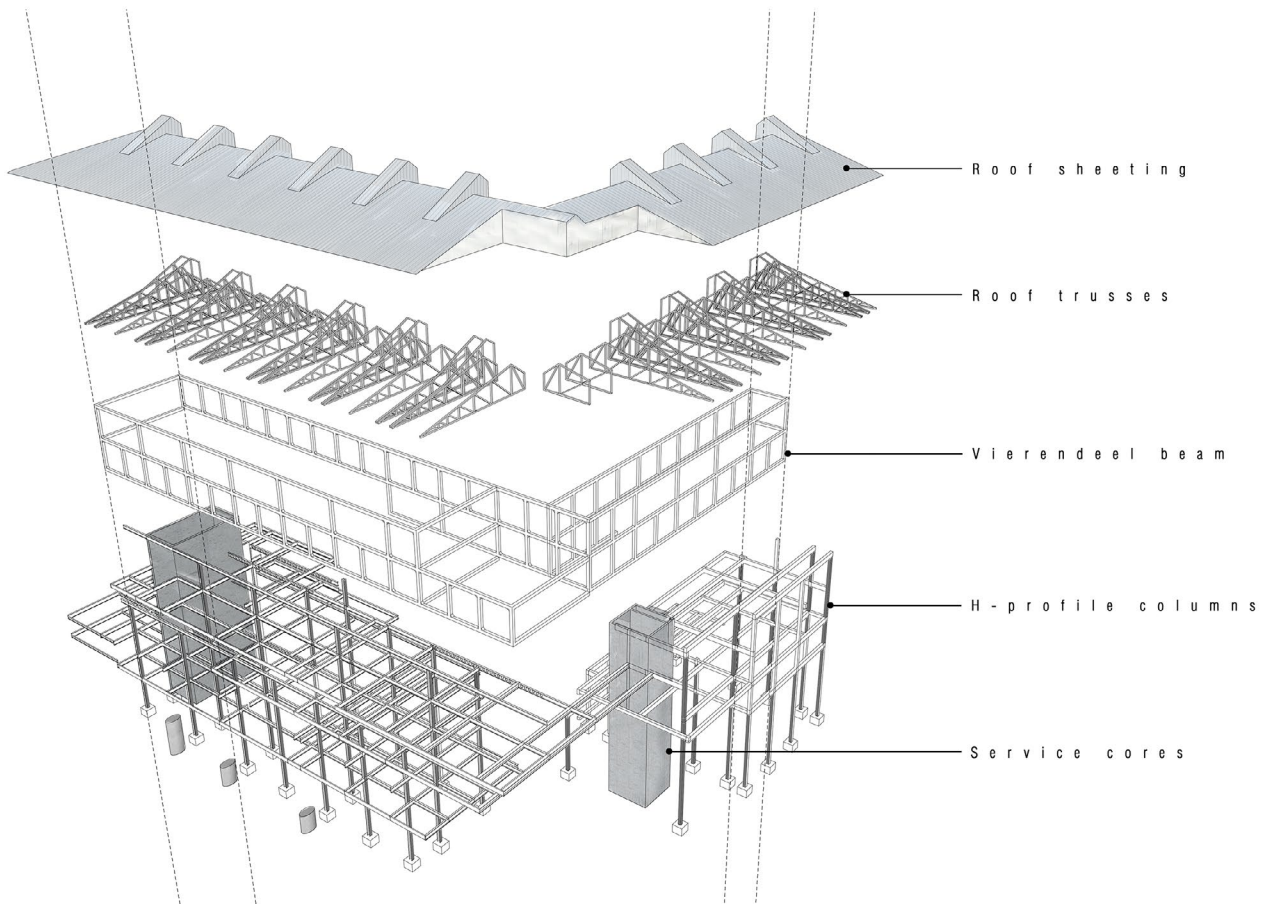


D A Y L I G H T I N G   A N A L Y S I S



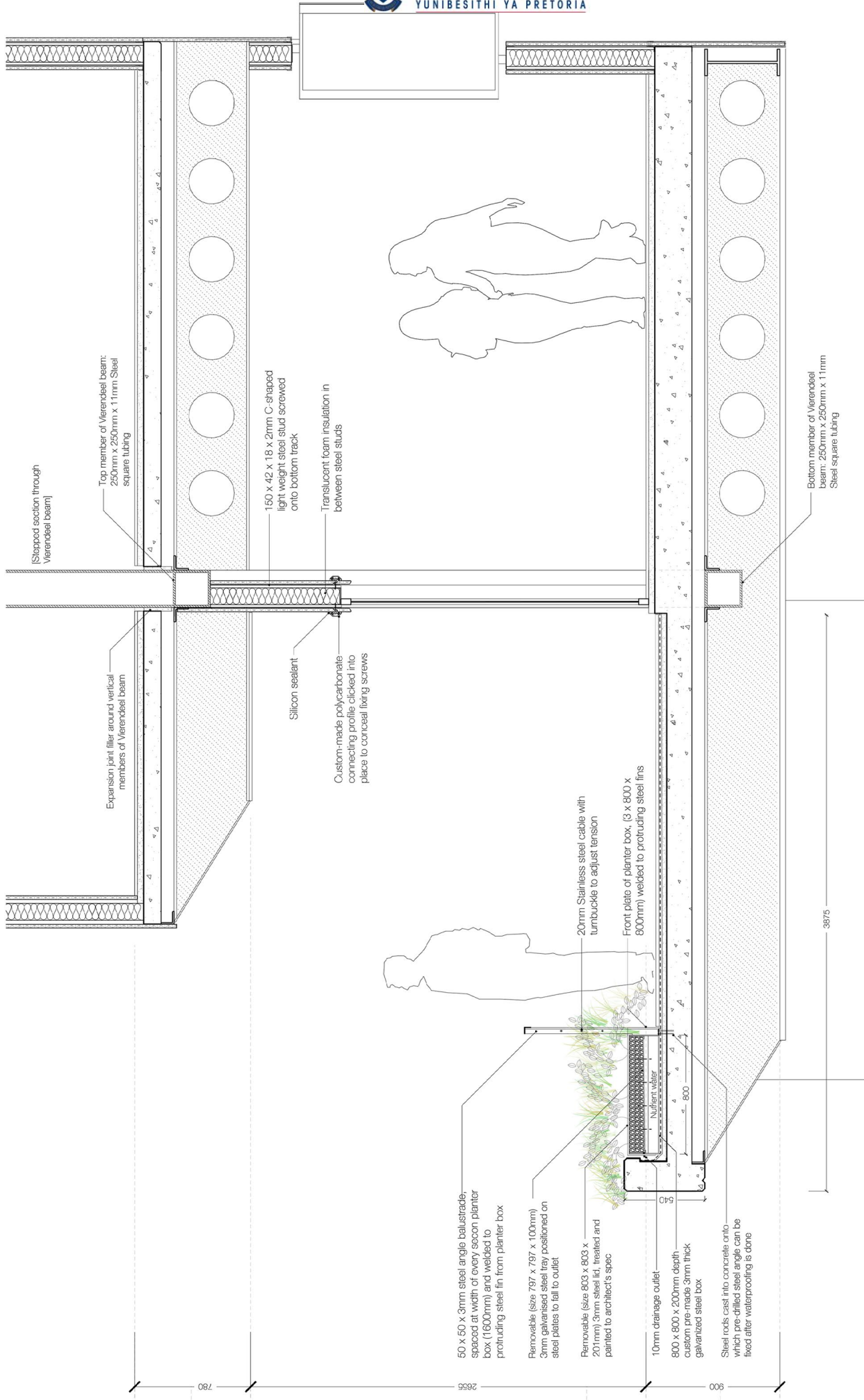


Exploded structure showing corner cantilever



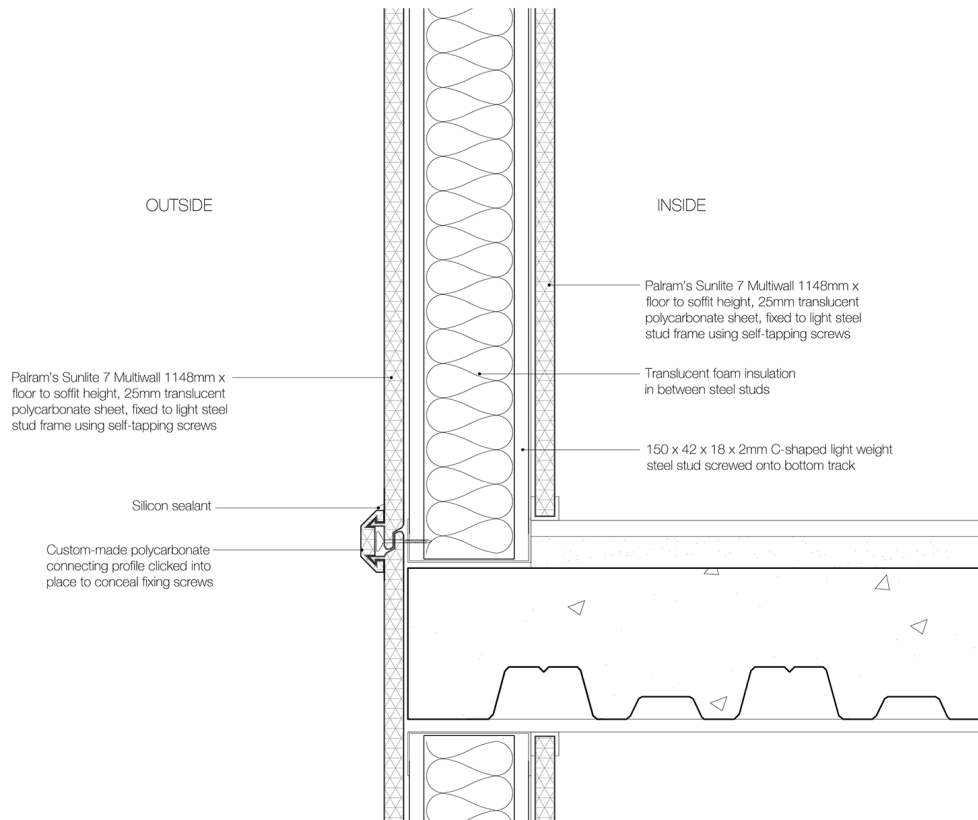
Exploded structure of entire building



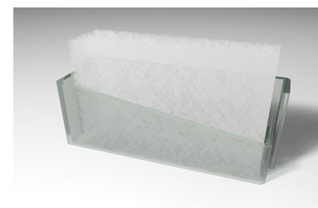
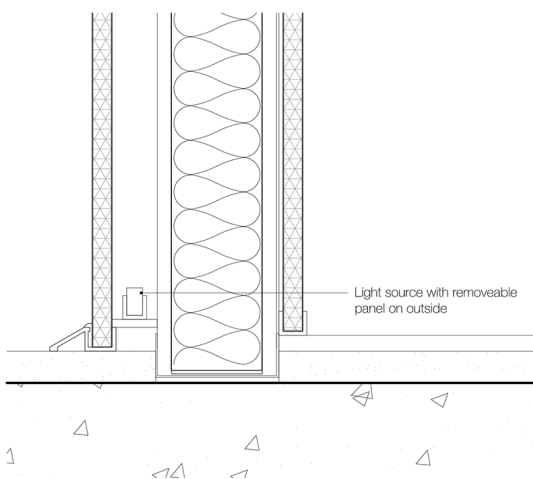


Section A-A Call-out: Stepped through Vierendeel beam & Planter-handrail combination on northern facade





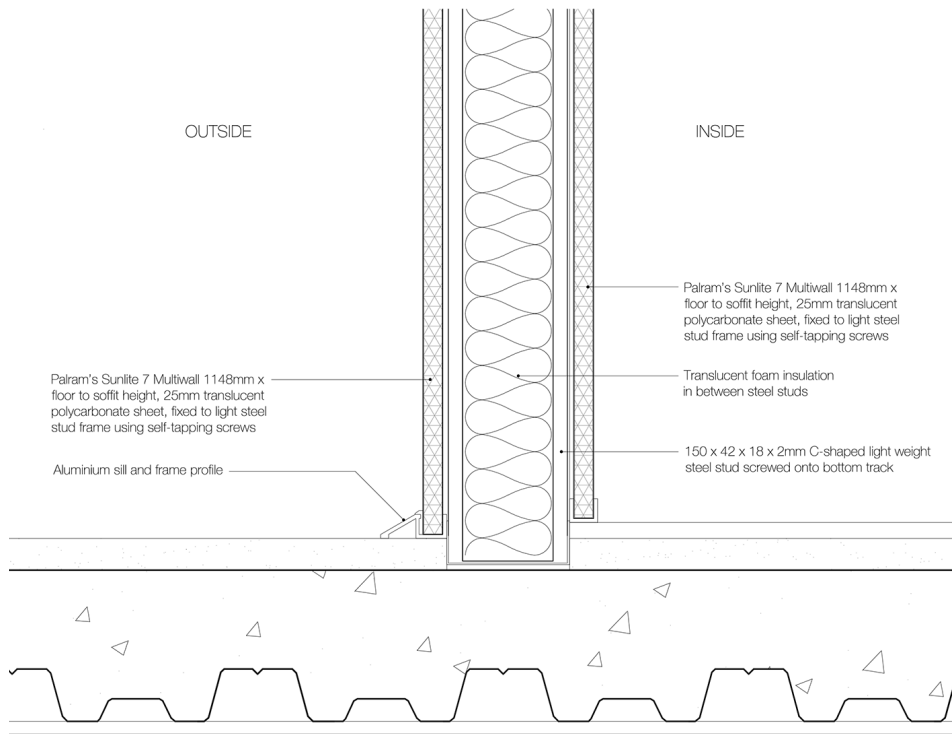
Translucent cladding detail at slab edge



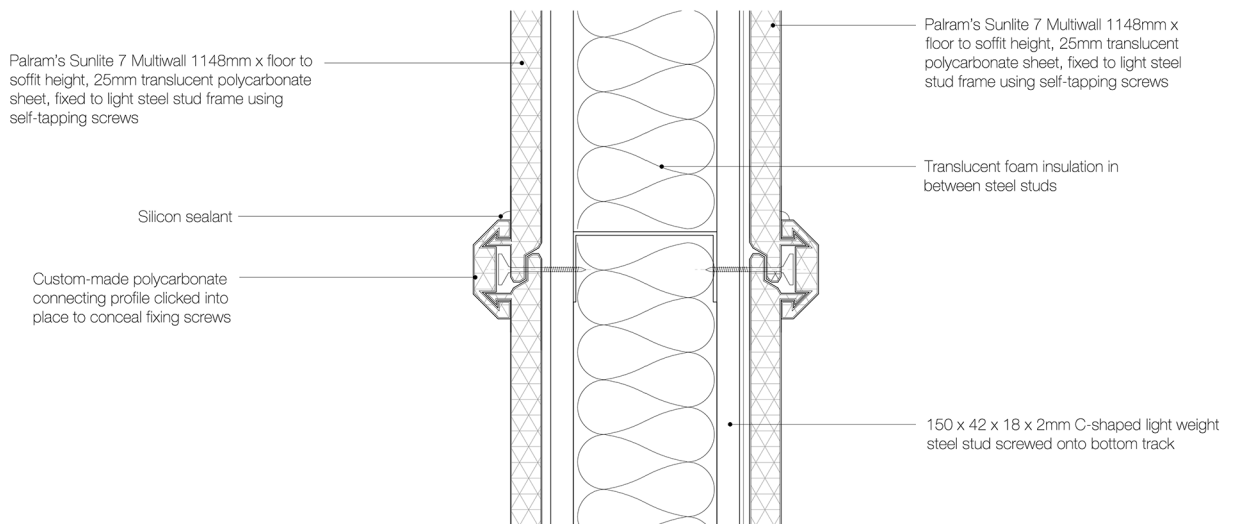
Translucent insulation

- Made from extremely fine glass fibres
- U-value: 1.2 W/m<sup>2</sup>K

Translucent cladding- position of backlighting source



Detail section through translucent cladding



Translucent cladding connection detail





# Chapter 9

## C O N C L U S I O N



TERMINATION



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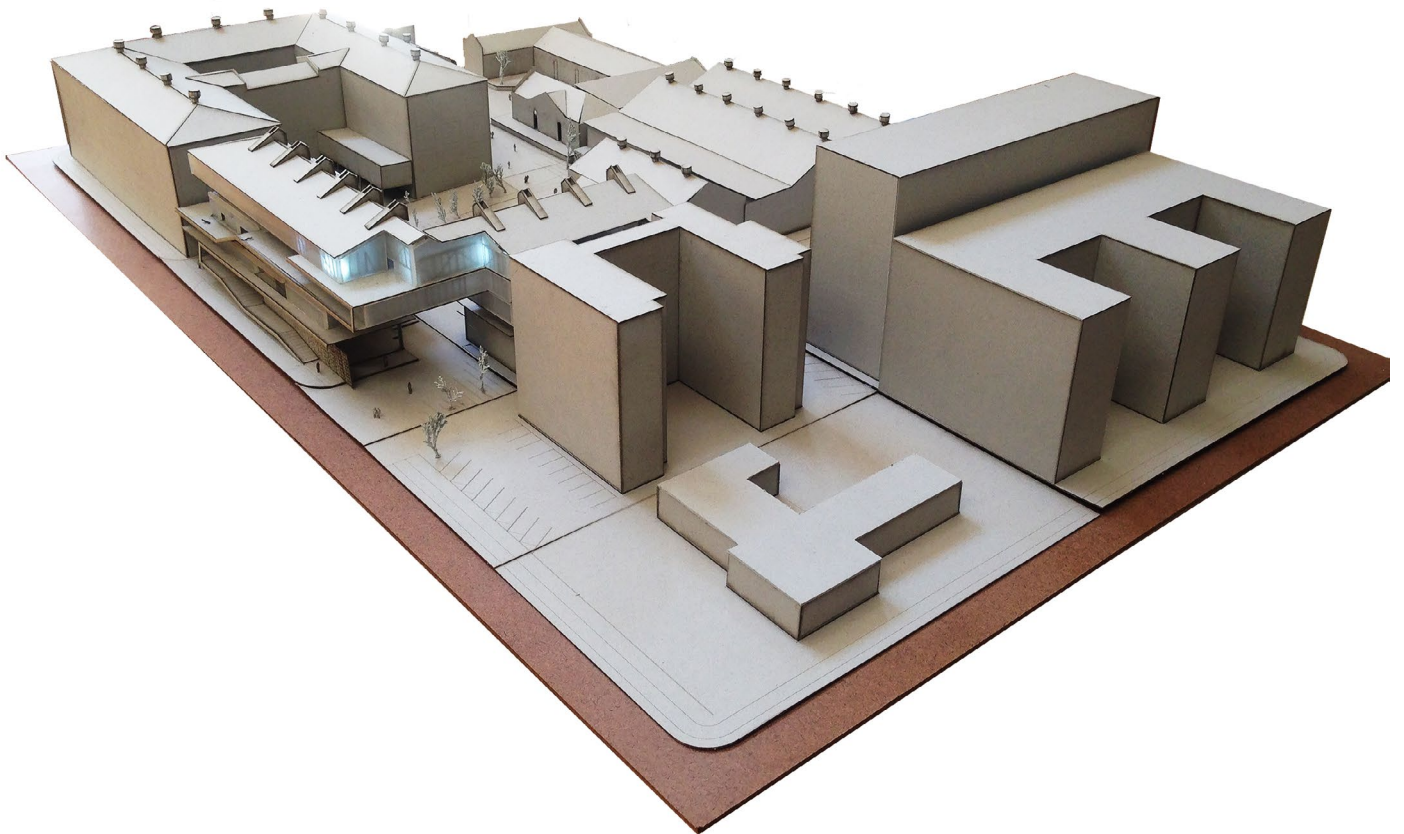
“...when you build a thing you cannot merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at that one place becomes more coherent, and more whole; and the thing which you make takes its place in the web of nature, as you make it.”

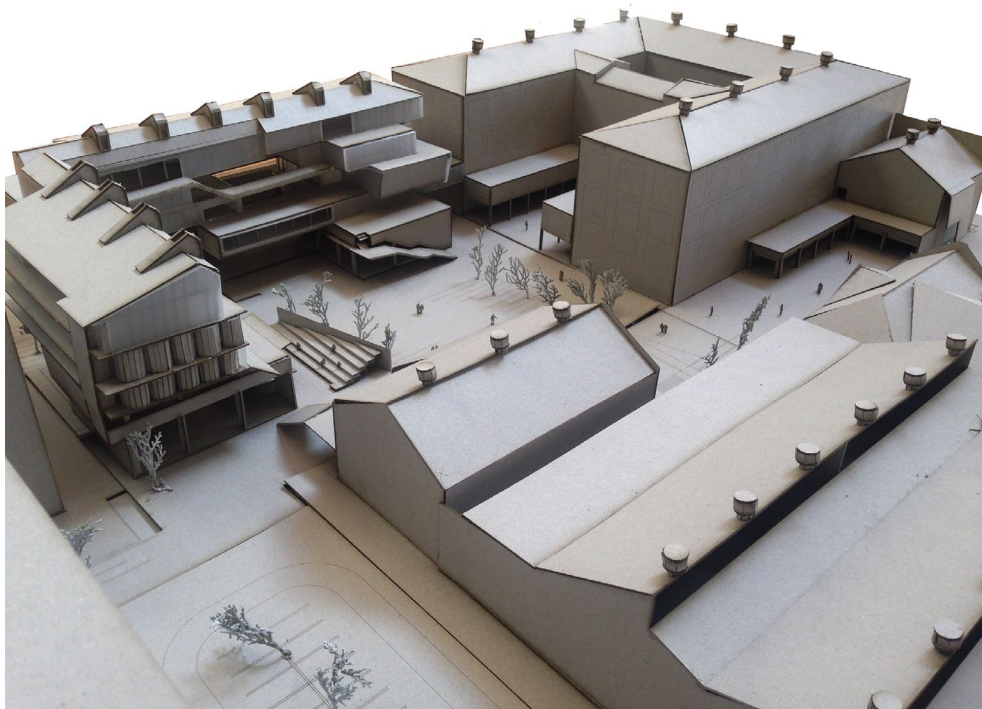
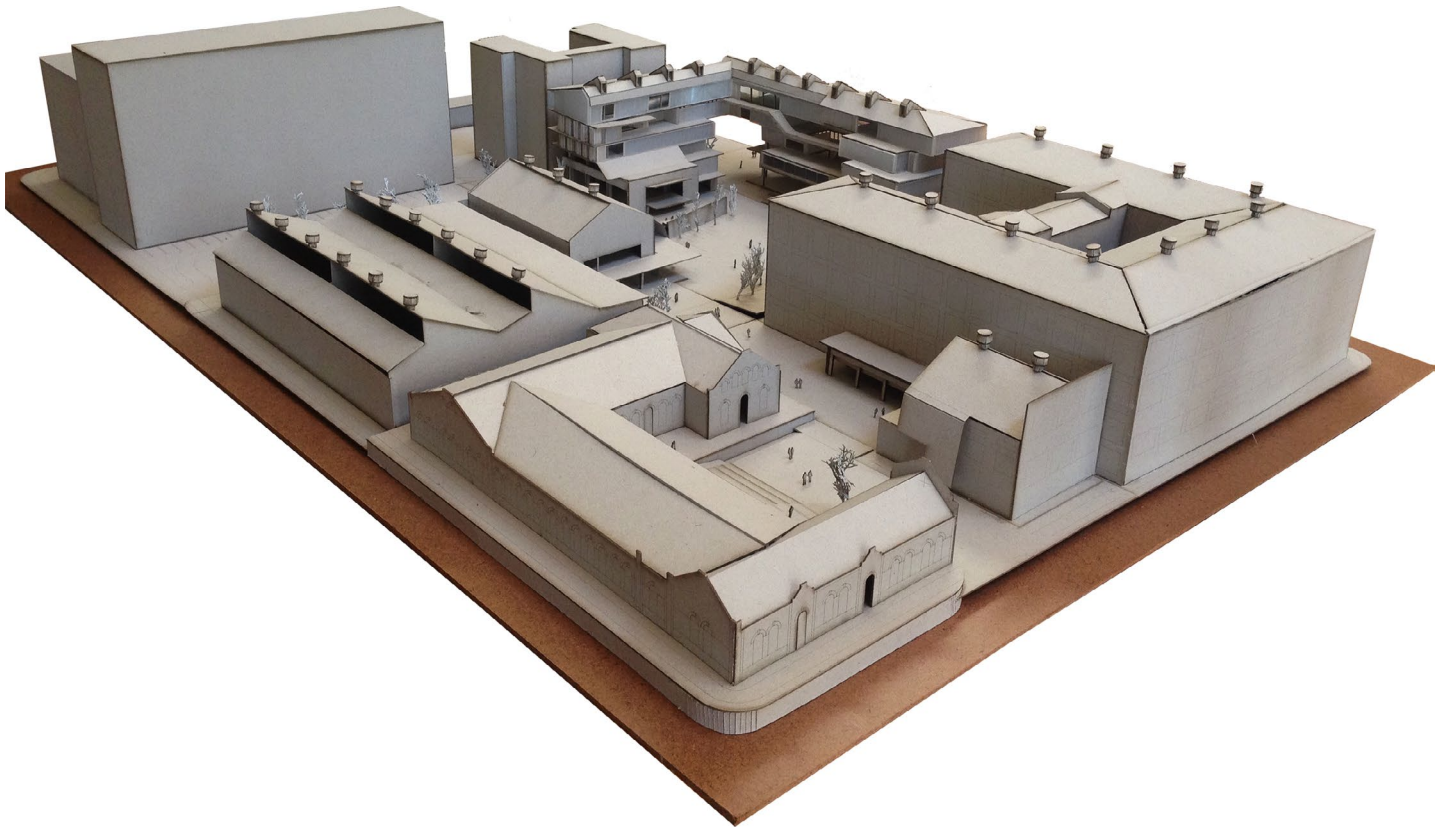
- Christopher Alexander, 1977





F I N A L M O D E L









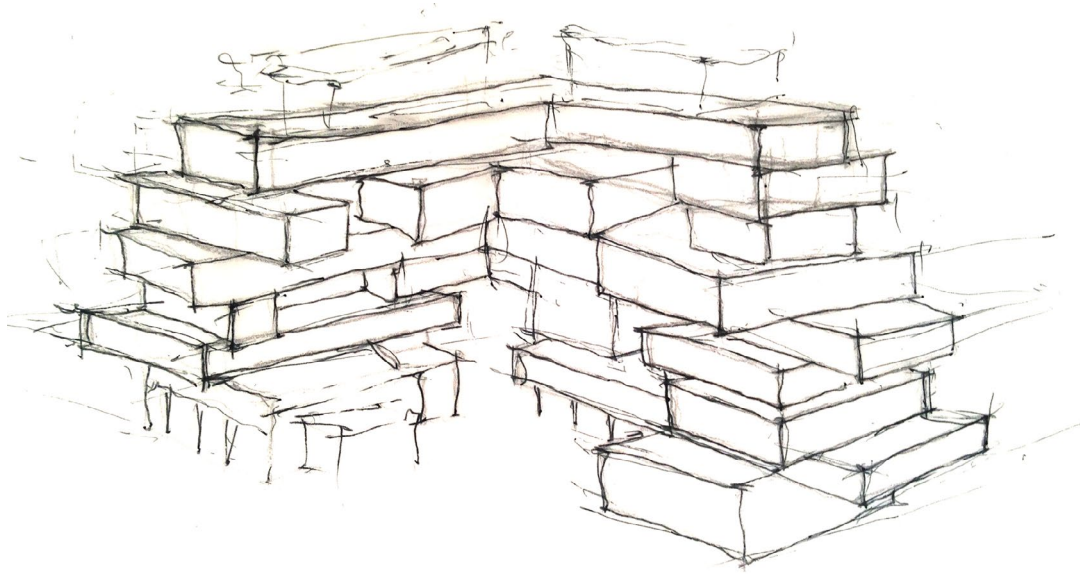
F I N A L R E V I E W





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' G R O W I N G ' B U I L D I N G  
M A S S I N P E R P E T U I T Y



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I hope that this study will encourage the reader to always remain cognisant of changing times, to never accept the patterns of the world around them and always keep on questioning the norm.

## CHAPTER 1

**Figure 1.1:** Three dualisms (Author, 2016)

**Figure 1.2:** Theme of dissertation: Man, Technology and Architecture (Author, 2016)

**Figure 1.3:** Locality map (Author, 2016)

## CHAPTER 2

**Figure 2.1: Four industrial revolutions** Schwab, K. 2016. *The Fourth Industrial Revolution: what it means, how to respond*. [Online] Available at: <<https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>> (Accessed 10 July 2016) (edited by author, 2016)

**Figure 2.2:** Illustrations depicting historical cases of 'technology as compromiser' [Online] Available at: <<https://en.wikipedia.org/wiki/Car#/media/File:1885Benz.jpg>> (<https://maysageorge2.wordpress.com/2011/03/31/28/first-printing-press/>) and <[http://www.dbnl.org/tekst/fokk005reke01\\_01/fokk005reke01\\_01\\_0013.php](http://www.dbnl.org/tekst/fokk005reke01_01/fokk005reke01_01_0013.php)>

**Figure 2.3:** Local (Pretoria Station) and international examples of co-working offices [Online] Available at: <<http://wlovebudapest.com/cafes.and.restaurants.1/coffice.blends.a.co.working.space.a.cafe.and.lots.of.caffeine>> and <<https://www.facebook.com/www.pltfrm.co.za/>>

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## R E F E R E N C E S

Allen, V. 1971. *Kruger's Pretoria*. Cape Town: A. A. Balkema

AspenInstitute, 2009. *In Conversation with Frank Gehry*. [video online] Available at: <<http://www.youtube.com/watch?v=ZHx3Gx9PL88>> [Accessed 11 September 2011]

AUSTRALIA ICOMOS. 1999. *The Australia ICOMOS charter for places of cultural significance. With associated guidelines and code on the ethics of co-existence* ('The Burra Charter'). Burwood: Australia ICOMOS. [Online] Available at: <[http://australia.icomos.org/wp-content/uploads/BURRA\\_CHARTER.pdf](http://australia.icomos.org/wp-content/uploads/BURRA_CHARTER.pdf)> [Accessed 8 February 2012]

Bakker, K., Clarke, N. J. and Fisher, R. C. 2014. *Eclectic ZA Wilhelmsens: a shared Dutch built heritage in South Africa*. Pretoria: Visual Books

Barker, A. 2016. Class lecture. (Personal communication, 15 March 2016)

Barker, A. 2012. *Heterotrophic Syntheses Mediation in the Domestic Architecture of Gabriël (Gawie) Fagan*. Ph.D. University of Pretoria. [Online] Available at: <<http://repository.up.ac.za/handle/2263/28137>> [Accessed 6 July 2016].

Benjamin, W. 1929. *Selected Writings II 1927-1934*. Translated by Livingstone, R. et al., 1999. [Online] Available at: <<http://blindflaneur.com/contact/browse-the-archives/tutelary-spirits/the-return-of-the-flaneur/>>

Bernstein, J., Brown, K. W., Gagné, M., Mistretta, L., Ryan, R. M. and Weinstein, N. 2010. Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology*, 30: pp1597-168 [online] Available at:<[https://selfdeterminationtheory.org/SDT/documents/2010\\_RyanWeinsterEtAl\\_JEVP.pdf](https://selfdeterminationtheory.org/SDT/documents/2010_RyanWeinsterEtAl_JEVP.pdf)> [Accessed 15 July 2016].

Betskey, A. 2015: a. The Architecture of Liminal Spaces. *The Journal of the American Institute of Architects*. [online] Available at: <[http://www.architectmagazine.com/design/urbanism-planning/the-architecture-of-liminal-spaces\\_o](http://www.architectmagazine.com/design/urbanism-planning/the-architecture-of-liminal-spaces_o)> [Accessed 17 July 2016].

Betskey, A. 2015: b. Times Square and the Reality of Public Spaces. *The Journal of the American Institute of Architects*. [online] Available at: <[http://www.architectmagazine.com/design/times-square-and-the-reality-of-public-spaces\\_o](http://www.architectmagazine.com/design/times-square-and-the-reality-of-public-spaces_o)> [Accessed 17 July 2016].

Betts, R. 2011. Jan Gehl: cars and effect. *Vancouverpublicspace.wordpress.com*. Public space blog, [blog] 31 January, Available at: <<https://vancouverpublicspace.wordpress.com/2011/01/31/jan-gehl-cars-and-effect/>> [Accessed 15 July 2016].

Brand, S. 1995. *How Buildings Learn: What Happens After They're Built*. New York: Penguin Books

Brand, S. 2012. 6. *How Buildings Learn - Stewart Brand - 6 of 6 - "Shearing Layers"*. [video online] Available at: <<https://www.youtube.com/watch?v=HTSbtM12IZw>> [Accessed 6 September 2016].

Cameron, R. and Harrison, J. L. The interrelatedness of formal, non-formal and informal learning: Evidence from labour market program participants. *Australian Journal of Adult Learning*. 52(2): pp277-309 [online] Available at:<<http://files.eric.ed.gov/fulltext/EJ1000165.pdf>> [Accessed 21 July 2016].

Canizaro, V. B. 2007. *Architectural Regionalism Collected Writings on Place, Identity, Modernity, and Tradition*. New York: Princeton Architectural Press

- Castle, H., Bullivant, L. and Haque, O. 2007. 4dsocial Interactive Design Environments, *Architectural Design*, 77[4]. West Sussex: John Wiley & Sons Ltd
- Chatti, M. A., Jarke, M. and Specht, M. 2010. The 3P Learning Model. *Educational Technology & Society*, 13(4), pp.74–85 [Online] Available at: <[http://www.ifets.info/journals/13\\_4/8.pdf](http://www.ifets.info/journals/13_4/8.pdf)> [Accessed 21 July 2016]
- Choay, F. 2001. *The Invention of the Historic Monument*. Cambridge: University Press
- Clarke, N., Corten, J., de Villiers, A., Fischer, R.C., Kuipers, M., Lourens, F., Mabin, A., Mbhokodo, I.M., Peres, E., Roos, J. and Swart, J. 2015. *RE-CENTRING TSHWANE Urban heritage strategies for a resilient Capital*. Pretoria: Visual Books
- David, R. 2015. Can robots truly be creative and use their imagination? *The Gaurdian*. [Online] 10 October. Available at: <<https://www.theguardian.com/technology/2015/oct/10/can-robots-be-creative>> Accessed 15 October 2016
- da Costa, M. A. & van Rensburg, R. J. 2008. Space as ritual: rethinking spatial strategies in the African city, *SAJAH* [e-journal] 23(3): P43-55 Available through: UPSpace database [Accessed 9 October 2012]
- Deppe, R. 2016. Site meeting with facilities manager. (Personal communication)
- Derix, C. and Izaki, A. 2014. Architectural Design: *Empathic Space The Computation Of Human-Centric Architecture*. September/October 2014. London: John Wiley & Sons
- de Villiers, A. 2016. Email correspondence. (Personal communication)
- Döveling, K., von Scheve, C. and Koniijn, E. A. 2011. *The Routledge Handbook of Emotions and Mass Media*. Oxfordshire: Routledge
- Evans, A. 2001. *This Virtual Life: Escapism and Simulation in our Media World*. UK: Fusion Press
- Fiske, E. B. and Ladd, H. F. 2004. *Elusive Equity: Education Reform in Post-Apartheid South Africa*. Washington D.C.: Brookings Institution Press
- Franck, K.A. 2016. *Architecture Timed: Designing with Time in Mind*. New Jersey: John Wiley & Sons
- Fraser, K., Keppel, M., White, B., Williams, G., England, R., Morrone, A., Workman, S. B., Crisp, G. T., Hadgraft, R., Dane, J., Sharpe, R., Larkin, H., Nhill, C., Devlin, M., Carr, N., van den Elsen, C. H., Plasmas, T., de la Harpe, B., Mason, T., van Schaik, L., Germany, L., Achterburg, A., Sparrow, J. and Whitmer, S. 2014. *The Future of Learning and Teaching in Next Generation Learning Spaces*. Bangles: Emerald Group
- Fromm, E. 1964. *The Heart of Man*. New York: Harper & Row
- Gehl, J. 2010. *Cities For People*. Washington: Island Press
- Gehl, J. 2011. *LIFE BETWEEN BUILDINGS Using Public Space*. Washington: Island Press
- Hartmann, M. 2004. *Technology and Utopias: The Cyber-flâneur and the Experience of 'Being Online'*. Ph.D. University of Westminster. [Online] Available at: <<http://westminsterresearch.wmin.ac.uk/8517/>> [Accessed 27 March 2016].
- Hertzberger, H. 2008. *Space and Learning: Lessons in Architecture 3 (Lessons for students in architecture)*. Rotterdam: 010 Publishers

- Hill, E. J., Ferris, M. and Mårtinson, V. 2003. Does it matter where you work? A comparison of how three work venues (traditional office, virtual office, and home office) influence aspects of work and personal/family life. *Journal of Vocational Behaviour*, 63, pp.220-241. [Online] Available at: <<http://www.rc.usf.edu/~jdoria/DOES%20IT%20MATTER%20WHERE%20YOU%20WORK.pdf>> Accessed 13 July 2016
- Houghton, K. 2011. Augmenting public urban spaces: The impact of the digital future on the design of public urban spaces. *Queensland Planner*, pp19-23. [Online] Available at: <<https://www.planning.org.au/documents/item/2196>> [Accessed 28 July 2016].
- Ikeda, S. 2008. Ken-Ichi Sasaki on Urban "Tactility". *The New York Sun*, [Online] 20 July. Available at: <<http://www.nysun.com/blogs/culture-of-congestion/2008/07/ken-ichi-sasaki-on-urban-tactility.html>> [Accessed 11 April 2015]
- Jacobs, J. 1961. *The Death and Life of Great American Cities*. Reprint 1992. New York: Vintage Books
- Johnston, G. M. 2001. *Preaching to a Postmodern World: A Guide to Reaching Twenty-first Century*. Michigan: Baker Books
- Jordaan, G. J. 1989. Pretoria as 'Urbs Quadrata'. *Architecture SA*, May/June, 26-29.
- Jung, C. G. 1963. *Memories, Dreams, Reflections*. Reprint 1989. New York: Vintage Books
- Kahn, P. H., Ruckert, J. H. and Severson, R. L. 2009. The Human Relation with Nature and Technological Nature, *Current Directions in Psychological Science* 18(1): pp37-42 [Online] Available at: <[https://depts.washington.edu/hints/publications/Human\\_Relation\\_Technological\\_Nature.pdf](https://depts.washington.edu/hints/publications/Human_Relation_Technological_Nature.pdf)> Accessed 14 July 2016
- Kellert, S. R. and Wilson, E. D. 1993. *The Biophilia Hypothesis*. Washington: Island Press
- Kim, M. 2015. The Good and the Bad of Escaping to Virtual Reality. *The Atlantic*. [Online] 18 February. Available at: <<http://www.theatlantic.com/health/archive/2015/02/the-good-and-the-bad-of-escaping-to-virtual-reality/385134/>> Accessed 11 July 2016
- Koller, D. 2012. What we're learning from online education. *TedTalks*. [video online] Available at: <[https://www.ted.com/talks/daphne\\_koller\\_what\\_we\\_re\\_learning\\_from\\_online\\_education](https://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education)> [Accessed 16 May 2016].
- Koolhaas, R. 1994. *Delirious New York: A Retroactive Manifesto for Manhattan*. New York: Monacelli Press
- Laskaris, J. 2015. 20 facts about eLearning, *Talentlms*. [Online] Available at: <<http://www.talentlms.com/blog/20-facts-elearning-infographic/>> Accessed 21 July 2016
- Lee, J. 2014. 6 Human Jobs That Computers Will Never Replace. *Future Tech*, [blog] 21 July, Available at: <<http://www.makeuseof.com/tag/6-human-jobs-computers-will-never-replace/>> [Accessed 15 October 2016].
- Lodder, J. 2016. *The Fourth Industrial Revolution and the Education System, how to respond?* [Online] Available at: <<https://www.linkedin.com/pulse/we-brink-rst-cyber-world-war-shelly-palmer>> (Accessed 15 October 2016)
- Lynch, K. 1972. *What time is this place?*. Cambridge: MIT Press
- Malan, J. 2016. Discussion on urban condition of Pretoria CBD. (Personal communication, 13 July 2016)
- Mandela, N. 1995. *Long Walk to Freedom*. New York: Little, Brown and Company
- Mandela, N. 2003. [Online] Available at: <<http://www.un.org/en/globalissues/briefingspapers/efa/quotes.shtml>> (Accessed 27 February)

Malone, T. W. and Lepper, M. R. 1987. Making Learning Fun: A Taxonomy of Intrinsic Motivations of Learning. In: Snow, R. E., and Farr, M. J. 1987. *Aptitude, Learning and Instruction Volume 3: Conative and Affective Process Analysis*. [pdf] London: Lawrence Erlbaum Associates. Available at: <[http://ocw.metu.edu.tr/pluginfile.php/2340/mod\\_resource/content/0/ceit706/week3/MakingLearningFun-ATaxonomyOfIntrinsicMotivationsForLearning.pdf](http://ocw.metu.edu.tr/pluginfile.php/2340/mod_resource/content/0/ceit706/week3/MakingLearningFun-ATaxonomyOfIntrinsicMotivationsForLearning.pdf)> [Accessed 29 July 2016]

Mouton, J. P. 2014. *Drawing the Building & Building the Drawing*. Masters Dissertation. University of Pretoria.

Newton, C. 2016. Can AI x education? We asked Bill Gates: How personalized learning is changing schools. *The Verge*. [Online] Available at: <<http://www.theverge.com/2016/4/25/11492102/bill-gates-interview-education-software-artificial-intelligence>> [Accessed 14 May 2016]

Naude, M. 1991. *Pretoria se eie braak*. Plekke en Geboue van Pretoria, 'n oorsig van hulle argitektoniese en stedelike belang. Volume 2. Edited by le Roux, S and Botes, N. Pretoria, Stadsraad van Pretoria. 106-108

Packer, G. 2006. The MegaCity: Decoding the Chaos of Lagos. *The New Yorker*, [Online] Available at: <<http://www.newyorker.com/magazine/2006/11/13/the-megacity>> [Accessed 10 April 2015]

Panera, P., Castex, J., Depaule, J., Samuels, I. 2004. *URBAN FORMS The Death and Life of the Urban Block*. Oxford: Elsevier

Poplak, R. 2016. TRAINSPOTTER: Adam Habib – the rock, the hard place, and the cruel beauty of an uncaring universe. *Daily Maverick*. [Online] Available at < <http://www.dailymaverick.co.za/article/2016-10-04-trainspotter-adam-habib-the-rock-the-hard-place-and-the-cruel-beauty-of-an-uncaring-universe/#.WUsgph96jg>> (Accessed 7 October 2016)

Prince-Ramus, J. 2006. Behind the design of Seattle's library. *TedTalks*. [video online]. Available at: <[https://www.ted.com/talks/joshua\\_prince\\_ramus\\_on\\_seattle\\_s\\_library?language=en#t-1118140](https://www.ted.com/talks/joshua_prince_ramus_on_seattle_s_library?language=en#t-1118140)> [Accessed 5 September 2016]

Prince-Ramus, J. 2009. Building a theatre that remakes itself. *TedTalks*. [video online]. Available at: <[https://www.ted.com/talks/joshua\\_prince\\_ramus\\_building\\_a\\_theater\\_that\\_remakes\\_itself](https://www.ted.com/talks/joshua_prince_ramus_building_a_theater_that_remakes_itself)> [Accessed 5 September 2016]

Quirck, V. 2012. Rem Koolhaas: A Reluctant Architect. *The New Yorker*, [Online] Archdaily. Available at: <<http://www.archdaily.com/294970/rem-koolhaas-a-reluctant-architect/>> [Accessed 11 April 2015]

Quirck, V. 2013. *BIG, OMA, Büro-OS To Compete for New Media Campus in Berlin*. [Online] Archdaily. Available at: <<http://www.archdaily.com/459281/big-oma-buro-os-to-compete-for-new-media-campus-in-berlin>> [Accessed 11 May 2016]

Rex, H. M. 1974. *Die Lewe en Were van Sytze Wopkes Wierda in Nederland met verwysing na sy betekenis vir die Zuid-Afrikaanse Republiek*. Unpublished PhD thesis, University of Pretoria.

Scott, F. 2008. *On altering architecture*. London: Rutledge

Sennett, R. 1990. *The Conscience of the Eye: The Design and Social Life of Cities*. New York: W.W. Norton & Company Ltd

Slouka, M. 1995. *War of the Worlds: Cyberspace and the high-tech assault on reality*. New York: BasicBooks

Statistics South Africa, 2016. [Online] Available at: <<http://www.statssa.gov.za/>> (Accessed 27 February)

Stenseng, F. 2009. *A Dualistic Approach to Leisure Activity Engagement – On The Dynamics of Passion, Escapism, and Life Satisfaction*. Ph. D. University of Oslo



The Onrushing Wave. 2014. *The Economist*. [Online] Available at: <<http://www.economist.com/news/briefing/21594264-previous-technological-innovation-has-always-delivered-more-long-run-employment-not-less>> (Accessed 15 October 2016)

Swart, J. 2010. *Urban Church*. Masters dissertation. University of Pretoria

Van Biljon, L. 1991. *Noordwestelike kwadrant*. Plekke en Geboue van Pretoria, 'n oorsig van hulle argitektoniese en stedelike belang. Volume 2. Edited by le Roux, S and Botes, N. Pretoria, Stadsraad van Pretoria. 109

van der Rohe, M. 1950. ID Merger Speech. [Online] Available at: <<http://www.miessociety.org/speeches/id-merger-speech/>> (Accessed 5 October 2016)

Visser, R. 1991. *Stedelike henuwing*. Plekke en Geboue van Pretoria, 'n oorsig van hulle argitektoniese en stedelike belang. Volume 2. Edited by le Roux, S and Botes, N. Pretoria, Stadsraad van Pretoria. 110-113

Wenger, E. 1998. *Communities of Practice Learning, Meaning and Identity*. Cambridge: University Press White, G. 2015. Discussion on South African Urbanism. (Personal communication, 4 March 2015)

Wiggin, J. 2009. *Extending the Skin(s) of the Capitol Theatre*. Masters dissertation. University of Pretoria

Wright, F. L. 1953. in Gutmann, M. 2006. Architectural Brilliance [Online] Available at: <<http://pabook2.libraries.psu.edu/palitmap/fallingwater.html>> (Accessed 5 May 2016)



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## WATER TANK CALCULATIONS:

Annual rainfall = 650mm

Total runoff surface area = 17360m<sup>2</sup>

### WATER USAGE:

#### IRRIGATION:

TOTAL IRRIGATION SURFACE AREA = 918m<sup>2</sup>

918m<sup>2</sup> x 5mm irrigation per day = 4,59m<sup>3</sup> water

4,59m<sup>3</sup> x twenty days per month (dry season) = 92m<sup>3</sup> water per month

4,59m<sup>3</sup> x fifteen days per month (wet season) = 69m<sup>3</sup> water per month

#### FLUSHING OF TOILETS (Total water usage per month):

(See Note 1 for occupancy & usage calculations per building)

Auditorium:	3,072m <sup>3</sup>
Restaurant (in new building):	11,440m <sup>3</sup>
Learning spaces:	19,760m <sup>3</sup>
Historic 1896 building (Co-working office & restaurant):	25,272m <sup>3</sup>
Production House:	7,040m <sup>3</sup>
Offices in N-E building:	20,988m <sup>3</sup>

Total water usage for toilets per month on block (designated site are) = 87,572m<sup>3</sup>

TOTAL WATER USAGE PER MONTH (dry season) = 92m<sup>3</sup> + 88m<sup>3</sup> = 180m<sup>3</sup> + 499,1m<sup>3</sup> (western side) = 679,1m<sup>3</sup>

TOTAL WATER USAGE PER MONTH (wet season) = 69m<sup>3</sup> + 88m<sup>3</sup> = 157m<sup>3</sup> + 482,5m<sup>3</sup> (western side) = 639,5m<sup>3</sup>

679,1m<sup>3</sup> x 4 months during dry season = 2716,4m<sup>3</sup>

2716,4m<sup>3</sup> - (29mm rainfall during driest months (May, June, July & Aug) over surface area (17360m<sup>2</sup>) = 503,4m<sup>3</sup>)

Storage tank will therefore need to store 2213m<sup>3</sup> water

### **TOTAL VOLUME OF WATER STORAGE TANK = 2213m<sup>3</sup>**

[Dimensions of tank = 5,2m x 15,7m x 26,8m]

TO FILL UP THE TANK TANK WILL TAKE 127,5mm rainfall over surface area of 17360m<sup>2</sup>.

#### DURING SUMMER:

Dec (80mm x 17360m<sup>2</sup>) + Jan (80mm x 17360m<sup>2</sup>) + Feb (60mm x 17360m<sup>2</sup>)

= 3819,2m<sup>3</sup> rain water collected

3819,2m<sup>3</sup> - (usage of 157m<sup>3</sup> x 3 months during wet season + 720m<sup>3</sup> volume of tank)

= SURPLUS of 300m<sup>3</sup> water during three peak rainfall months



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