THE DESIGN OF A HOSPITAL FOR THE TREATMENT OF DR-TB IN IBHAYI, PORT ELIZABETH

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Definitions

Biophilia - is defined as the inherent human inclination to affiliate with nature

Tuberculosis - an infectious bacterial disease characterized by the growth of nodules (tubercles) in the tissues, especially the lungs.

Abbreviations

TB_ Tuberculosis

DRTB_ Drug resistant tuberculosis

MDR_ Multi-drug resistant

XDR_ Extreme-drug resistant

OPD_ Old patient department

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DECLARATION

This document is submitted in partial fulfillment of the requirements for the degree of Master of Architecture (Professional) Coursework to the School of Architecture, Faculty of Arts, at Nelson Mandela Metropolitan University.

I hereby declare that this treatise is my own unaided work. It is being submitted to the School of Architecture, Nelson Mandela University, Port Elizabeth, for the degree of Master of Architecture and has not been submitted before for any degree or examination at any other University.

Figure 01 - abstract TB collage

ABSTRACT

Tuberculosis, and more specifically drug resistant tuberculosis, is a growing epidemic in South Africa. Yet many of the existing specialised tuberculosis facilities have been designed in a way that do not incorporate biophillic elements necessary to create a healing environment with spaces conducive to the wellness of its users.

This treatise responds to these issues through the design of a hospital that utilises biophillic principles with highly inclusive spaces providing a dignified sense of place for drug-resistant tuberculosis patients where the architecture offers more than a functional space. It induces healing.

Figure 02 : Young child

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*“ This is a fundamental view of the world. It says that when you build a thing you cannot merely build that thing in **isolation**, but must 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

BACKGROUND

The motivation for this treatise comes from a preoccupation with, and concern for, the state of public healthcare in South Africa. According to Head of the National Tuberculosis Control Programme, Dr Lindiwe Mvusi, tuberculosis is not only a critical public health problem but a social issue too. She says this pandemic will not get under control without strengthening our health systems. (Mail & Guardian, 201) Due to the enormity of the pandemic that South Africa and specifically the Eastern Cape is facing the effective treatment of Tuberculosis (TB) and Multi-Drug Resistant Tuberculosis (MDR-TB) requires urgent attention.

Through researching the state of medical facilities in Port Elizabeth and discussions with medical professionals, the conclusion drawn is that more specialised Tuberculosis facilities are required.

According to the WHO (World Health Organisation), South Africa is one of the countries with the highest burdens of TB patients, with an estimated incidence of 454,000 cases in 2015. (Maseko, 2016) Tuberculosis also continues to be the leading cause of death in the country with the numbers growing every year. All of this data reiterates the necessity for well-designed facilities that cater for the specific requirements of patients with MDR-TB.

Through architectural intervention this medical facility aims to use Biophilic design principles. The Biophilia hypothesis is the "idea that humans possess an innate tendency to seek connections with nature and other forms of life". It is a mode of architectural design that seeks to stimulate the physiological needs and neurological functions of individuals and society.

The treatise aims to challenge typical institutional hospital typology. This is done through the investigation of how Biophilic design principles may be applied and where architecture becomes the catalyst for physical and psychological healing. The design aims to challenge the paradigm of isolation which is necessitated by the

disease and at the same show how architecture can break down the psychological barriers of this state to enable recovery.

Hospitals are by nature internalised elements. So how does one create an internal space that caters to the needs of the patients while still linking to the surrounding context in order to counteract the isolation that diseases create?

The exploration of architectural theories and the examination of precedents will facilitate a discerned and appropriate response to the informants and constraints of the disease as well as the context in which it is found.

The site within the Dora Nginza hospital precinct was identified as an appropriate area in which to position this development. The reasons are that: it forms part of and contributes to the larger medical and educational precinct; it is situated within the larger context of Ibhayi where a huge number of the immediate population and that of surrounding areas are seriously affected by MDR-TB and where they have a limited access to specialist facilities for correct treatment.

The architectural design aims to engage socially with the surrounding community by creating a hospital for the specific treatment of MDR-TB. Its design will create spaces that break down the barriers of psychological isolation and the stigmas attached to the disease. It will provide a healing environment for long-stay patients that promotes a sense of well-being. In turn the positive outcome will be that it encourages those infected with the disease to seek treatment. This approach to design not only focuses on the building's users, but on the spaces that influence the human activities within it.

Figure 03 : Isolation graphic

METHODOLOGY

In order that the conclusions drawn are objective and unbiased a research methodology is used to set up a strategic framework of philosophical paradigms that ensure the research procedures that take place are reliable and valid.

For the purpose of better understanding the concepts within the given field, the following methods define the process whereby data is collected and, therefore, sets up the framework for the research to be carried out. This treatise is developed from a particular interest within a particular discourse. Therefore, the main issues are addressed, as well as programme and site requirements that are developed from this point.

This treatise is twofold in that it is a work of pure research, but its application is a work of applied research. The outcome of this study is reached through choosing to position itself within a research paradigm following a clear and rational argument. This conclusion is based on a hypothetical design intervention which will remain in the academic realm of study by adding to the existing body of research.

Applied research on the other hand is the practical questioning and understanding of the subject in order to understand better the phenomenon at hand.

This study is made within a qualitative and quantitative framework in order to gain information through observation and investigation. Within the qualitative methodological approach the investigation utilises both primary and secondary sources. The primary data sources compromise of site analysis observations of the spatial and physical context utilising mapping and site sketches as well as through photographic studies of the site. Conclusions are drawn through interviews and discussions with lecturers and professionals that are related to the field of study. The secondary sources refer to precedent studies as well as literature reviews

which include published and non published materials, photographs, statistics and articles in order to reach accurate conclusions.

All the data gathered is processed for the purpose of understanding the discourse and paradigms that are being addressed, and where one is theoretically positioned to develop a clear strategic framework for this treatise.

AIMS & OBJECTIVES

Aims:

- To design a hospital for the treatment of multi-drug resistant tuberculosis in Port Elizabeth, through the exploration of how Biophilic principles can generate a positive place and space for those suffering with MDR-TB. And how an isolated facility can contribute positively to the public realm where it is situated.

Objectives:

In order to achieve the above stated aims the following objectives are:

- To understand the general area of MDR-TB and the requirements and activities thereof.
- To understand the nature of the spatial typologies associated with medical architecture.
- To identify an appropriate site and respond in a discerned manner to the informants and constraints.
- To understand how one can succesfully apply biophilic principles to the design of a medical facility.
- To create a design response which creates a sense of place as well improving the well-being of its users.

Problem Statement

Drug Resistant Tuberculosis is a national disaster in South Africa and is expected to worsen over the coming years. DRTB requires facilities that specialise in treatment and recovery which have been designed for this specific purpose. This building precinct should look to be a symbol of wellness in the community and a safe, holistic place where patients suffering with DRTB can be treated.

PART 01
RESEARCH

Chapter 01

[COMMUNITY & ALIENATION]

Introduction

The following chapter intends to break down the motives and reality of stigmatisation and alienation within communities of patients suffering from tuberculosis. An understanding of this, needs to be embraced in order to develop a relevant architectural approach to this issue. This could potentially lower the stigma associated with facilities that cater for patients with drug resistant tuberculosis.

Figure 04 : Stigmatisation and Isolation of TB patient

For more than three decades, activists and health workers have been aware that a stigma is a silent killer. As South Africa witnesses about 450 000 tuberculosis cases annually, there is a growing awareness of a new type of stigma, namely TB stigma. (Maseko, 2016)

Through the studies of Andrew Courtwright and Abigail Norris Turner, an understanding can be gathered around the issues and stigma of being a TB sufferer. Stigmas cause negative effects to the wellbeing of a patient suffering with TB. The main stigma regarding tuberculosis is the contraction of the disease itself as it causes a relay effect. It is perceived to increase the TB diagnostic postponement and further enhance treatment nonconformity.

Stigma, which is shaped and promulgated by institutional and community norms and interpersonal attitudes, is a social determinant of health. (Courtwright & Turner, 2010)

Patients with tuberculosis tend to withdraw from society and relationships in order to avoid infecting other individuals. This leads to self-marginalisation within the community. Tuberculosis itself as a disease is extremely self-marginalising.

It is a significant process to identify the associations with TB stigma, in order to reduce the impact it has on health.

Figure 05 : Unmask Stigma

" Stigma, which is shaped and promulgated by institutional and community norms and interpersonal attitudes, is a social determinant of health "

(Courtwright, A. & Norris, A. 2010).

The lack of knowledge of communities towards the means of transmission of the disease and the risk of contracting the disease, leads to stigmas and furthermore isolation.

Tuberculosis is commonly referred to as the "poor man's disease" as the spread of the disease occurs more frequently in lower socio-economic areas. This is, in part, largely due to the following factors; overcrowding, poor ventilation and a lack of education. A patient that is infected with TB will often be shunned out of the community, lose their jobs and livelihood and have little hope of a future. All of this caused by the stigmas that people with the disease face. (Luiz, 2018)

Due to these unfavourable contextual circumstances and settings, patients often lose their ability to maintain an income, as the infected individuals are rejected if they declare their tuberculosis status and they become a risk if they do not disclose their results of the screening. (Courtwright & Turner, 2010) Due to this alienation, people refuse to seek early treatment and suffer much verbal and physical abuse. This problem is made exponentially worse by the fact that these patients then end up starting treatment later and are less likely to then complete their drug course, this creates a negative cycle. (Luiz, 2018)

Figure 06 : Artwork abstract representing community

It is a result of these circumstances that patients become removed from their communities and suffer through the illness with negative stigmatisation. Tuberculosis as a disease necessitates isolation, society enforces the idea of isolation through this stigmatisation and the patient then withdraws which, in turn, isolates them.

In South Africa and particularly the Eastern Cape, there is an essential need for a primary healthcare facility that specialises in treating and monitoring MDR-TB and XDR-TB patients. The proposed building requirements need to counteract the negative aspects of other similar institutions. It needs to incorporate the patient requirements in a way that does not cause isolation but creates an environment that breaks the psychological isolation that is so often caused by the treatment of this disease.

This design needs to take all these aspects into consideration in order to understand the specialised needs of the specific groups using this building, **in order to create spaces that heal and promote recovery and rehabilitation.**

Figure 07 : Abstract image of biophillia

Chapter 02

[B I O P H I L I A]

Introduction

This following chapter will discuss the nature of Biophilia and its application to the built environment, specifically medical architecture.

It will look at theories and principles of regenerative sustainability and Biophilia in order to understand how architecture can generate spaces that create wellness. The principles will provide an understanding of how the building should be designed in order to create a suitable architectural response and strategy.

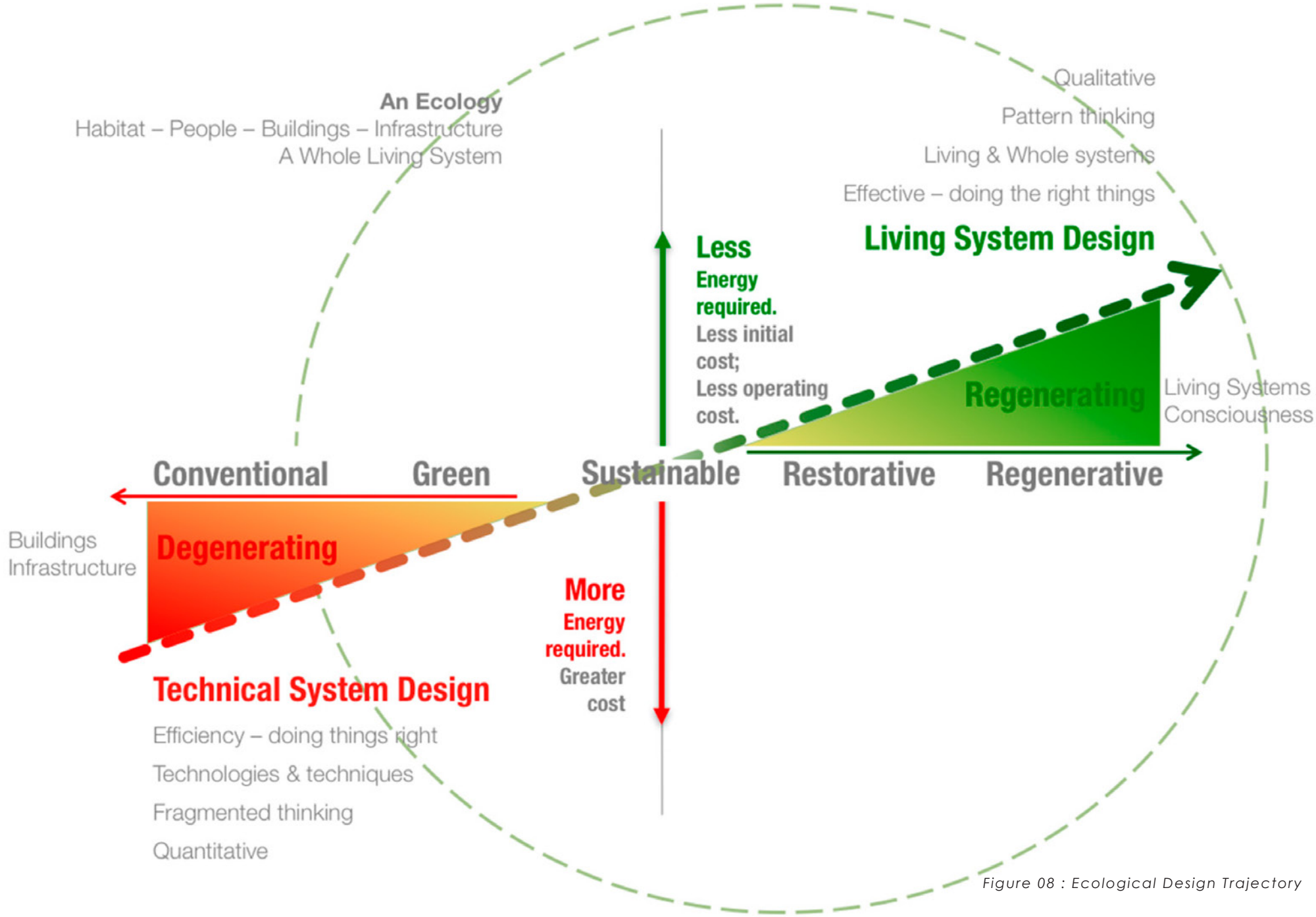


Figure 08 : Ecological Design Trajectory

In order to create an alternate design approach that creates a future place for humans to thrive and not just survive, as in the past where sustainability was not considered, requires a shift in the way we design, create and ultimately perceive the built environment. In so doing it contributes to the wellness and regeneration of the ideologies and psychological influences on individuals and communities. This approach can be termed through multiple names; from 'Biophilia' to 'regenerative sustainability', as used by Chrisna Du Plessis in her book, "Designing for Hope, pathways to regenerative sustainability". This book is used as the lens for understanding sustainability in South Africa and forms part of the ecological framework of this treatise. (Hes & Du Plessis, 2015)

Her book provides a different approach to the sustainable model of development. Her insights are built on an alternative, ecological world-view that takes into consideration humans as a part of larger community life. This ideal is based on the ideology that we do not need to only be consumers, but that we have a positive role in society and can be producers of resources. (Hes & Du Plessis, 2015) In contradiction to this mechanistic world-view, which is the belief that living things are like machines which are composed of multiple parts that lack any intrinsic relationship to one another, is the new ecological view. Technically the ecological view is a combination of multiple views from classical and new sciences. Ecological aspects can be structured around two simple key themes; Wholeness and Change. The main shift from the old mechanistic to the ecological is the emphasis on understanding the whole instead of the parts. The use of the term 'Whole' in this instance has two meanings. Firstly, as 'entire', which is understood as undivided. Secondly, as 'intact' representing unbrokenness and in a functioning healthy state. (Hes & Du Plessis, 2015)

Biophilia or Regenerative Sustainability is more than just about positive experiences with green spaces, it is the connection and feeling of wellness that humans

experience when physical and psychological senses are linked to nature. *(This concept will be discussed further in the document that refers to healing environments)*. How is this connection to nature facilitated? We are linked through the built environment and the incorporation of the natural systems it incorporates. In "Designing for Hope, pathways to regenerative sustainability", the author refers to the concept of regenerative design in creating regenerative landscapes. (Hes & Du Plessis, 2015)

Good biophilic or regenerative design draws from nature in a way that is equally inspirational and restorative without interfering or disturbing the functionality of specific space. How this balance is achieved is done through multiple ways and specific to each case as it differs due to user groups, building types etc. Yet the condition of that healthy space remains a relatively universal human response. (Ryan, et al., 2014)

These concepts are working collectively to improve the built environment and the impact it has on the ecological systems, the experience and the effect on the users. Regenerative sustainability is looking for a new way forward, one that is filled with optimism and hope and this document aims to further refine this ecological paradigm.

The call for sustainability in architecture and ecological building in the healthcare system is a paradoxical situation. *Does it treat sickness or promote the condition of health and wellness?* It is often difficult to see how sustainability can help promote a patient's recovery. In this case healthcare architecture should embrace the ideal of creating a supportive healing environment through design that is physically healthier and psychologically more appropriate. (ARIPIN, 2007)

Our emotional wellbeing plays a large role in how humans ward off disease. By reconnecting individuals with their surroundings that utilises the unique geometry

of nature to improve physical and mental nourishment and rejuvenation. (Salingaros, 2015) This is the essence of biophilia, as it aims to lower the stress induced factors that the human body experiences when exposed to disease and illness and to encourage the natural built up defenses to combat illness and subsequently promote healing. The word 'Biophilia' is often misunderstood by architects and professionals who push for the green aspects of otherwise non-adaptive designs. (Salingaros, 2015) Plants and physical nature in a building are therapeutic yet that is not the essence of this ideology. The architecture itself must be healing. It needs to create spaces that promote wellness and not anxiety. Roger Ulrich in his writings discusses a concept called evidence based supportive design. This theory refers to environmental characteristics that encourage or facilitate coping or restoration with regards to the stress that is accompanied by illness for individuals in hospitals. (Ulrich, 2012)

The advantages of this design approach are discussed as outcomes quoted to the right.

1. Reduced stress/anxiety for patients.
2. Reduced pain
3. Improved sleep quality
4. Lower infection occurrence
5. Improved patient satisfaction
6. Benefits for employees
7. Cost savings

Figure 09 : Render of Gheskio TB hospital by Mass design group

Biophilic patterns

To understand the practical implications of biophilic design one needs to understand the patterns in order to implement them into the design strategy. Using the study of Browning and Clancy in their work on Biophilic patterns, one can begin to expand on the practicalities of biophilia and how to implement them. These patterns are organised into three categories; namely, Nature in the Space, Natural Analogues and lastly Nature of the Space. These categories provide a framework for the understanding of how to incorporate a rich multiplicity of strategies into the built environment. (Browning, et al., 2014)

1. NATURE IN SPACE

Nature in the space addresses the direct engagement with physical nature in a space, such as plant life, water, breezes as well as other natural elements. Spaces are created through meaningful connections with these natural elements.

Visual connection with nature
This is a physical view or connection with elements of nature, such as views of plant life and natural systems. This conveys a sense of time and weather. Its objective is to relieve cognitive fatigue. This can all be done without compromising the risk of internal contamination.
Non-visual connection with nature
This pattern is concerned with the senses other than the visual. These are all non-visual connections which occur through sounds, textures and aromas that stimulate an individual with a connection to those natural elements.

Non-Rhythmic sensory stimuli
This discusses an ephemeral connection with nature. In achieving this one can experience unpredictable stimuli that can help replenish mental fatigue.

Thermal and airflow variability.
These are subtle differences in air flow and temperature all caused by natural ventilation. This can positively bring comfort and the wellbeing of an individual. These conditions mimic those of the natural.

Presence of Water.
This condition can enhance the experience of spaces through the visual and non-visual connection to water. In the case of a hospital for the treatment of tuberculosis it is recommended that water is not used as it often harbours disease.

Dynamic and Diffused Light.
The variance of light and shadows is utilised in order to evoke a feeling of the natural environment. This represents how light naturally changes throughout a daily period. Sunlight provides vitamin D which helps regulate the metabolism and our circadian rhythm, which is important for healing and patient comfort. (Salingaros, 2015)

Connection with Natural Systems
This pattern brings an awareness to the natural processes of a healthy ecosystem. It manifests itself through an awareness of temperature changes as well as seasonal changes. (Browning, et al., 2014)

2. NATURAL ANALOGUES

This pattern addresses the non-living aspects of nature, such as; objects, colours, shapes and patterns that are found in nature, furniture and the built environment.

Biomorphic Forms and Patterns.
This refers to the symbolic references to nature through patterns and textured arrangements that are found in nature. These forms provide a dynamic quality to a space.

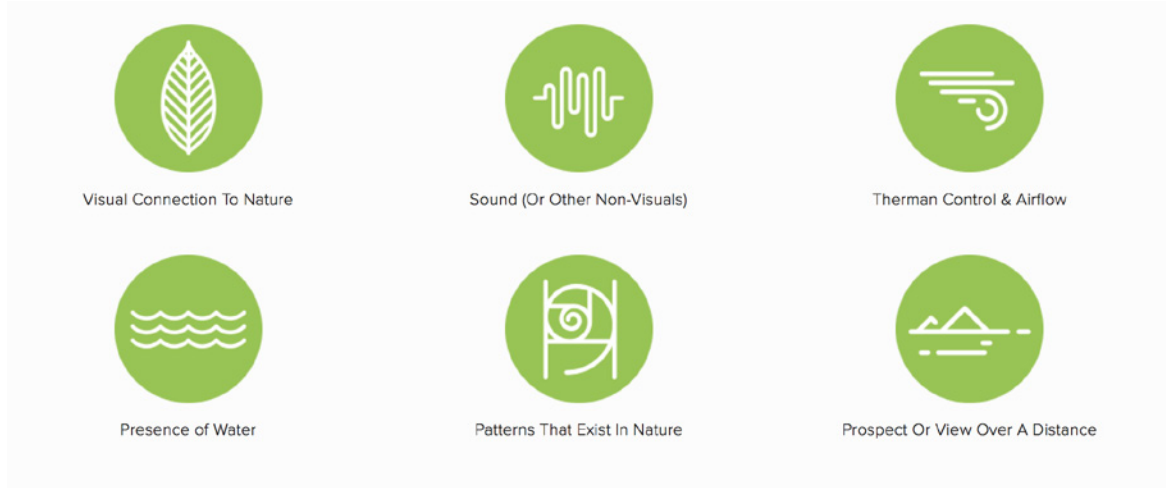


Figure 10 : Biophillic Patterns

Material through Connection with Nature.
Natural materials are known to evoke positive visual and tactile responses. This refers to materials that have been minimally processed and reflect the local ecology and connection to nature thus creating a sense of place in the built environment.

Complexity and Order.
This refers to the spatial hierarchy that is found in nature. Nature consists of repetitive geometric structures at varying scales. These can be found in plants, animals and ourselves, such as a human's nervous system for example. (Salingaros, 2015)

3. NATURE OF A SPACE

The nature of a space is addressed through the understanding of spatial orders and configurations in nature. The strongest experiences of this nature of a space comes though the creation of critically engaged spatial configurations that blend with the Nature in the Space and Natural Analogues.

Figure 11 : Planting in a space

Figure 12 : Happy Children

Prospect
Prospect refers to uninterrupted lines of site over distances. This provides visual connections into spaces and is important in healthcare architecture as to allow individuals to feel visually connected even though certain isolation is necessitated. This also evokes a sense of freedom and connection to spaces.

Refuge
This provides spaces that are withdrawn in certain aspects and provide a sense of relief from environmental conditions or the main areas of activity. These spaces evoke a feeling of safety. Visual connectedness is limited yet still maintained.

Mystery
These spaces entice individuals to travel further into environments with the prospect of something more. This is achieved through partially obstructing certain views or other sensory devices, such as, light or colour.

Peril
Perilous environments or spaces refer to an identifiable risk or danger. These risks are coupled with reliable safeguards for protection. For example, glass balustrades protecting from heights yet still maintains a sense of danger due to height. This evokes a sense of danger and comfort at the same time. (Browning, et al., 2014)

When dealing with nature-health relationships there are three main health responses regarding biophilia; cognitive, physiological and psychological. Each of these helps explain how an individual interacts and experiences their environment. Nature in a space is described as having a diversity of plant and animal life, water bodies and other natural elements within a built environment. Patterns relating to these interactions are; visual connection with nature, non-visual connection with nature, non-rhythmic sensory stimuli, access to thermal and airflow variability, presence of water, dynamic and diffused light and lastly the connection with natural systems. All these patterns act as a guide

in the design process, and help articulate the connections between the built and natural environments and how individuals can benefit from them. (ARIPIN, 2007)

Through the understanding and interrogation of these theories and architectural principles discussed, we see that there is a strong human physical and psychological rationale for an undeniable innate human connection to nature that can be achieved through healing architecture as the catalyst. (Soderland & Newman, 2015)

Design Strategies

These principles look to be implemented through each phase of the design process of a drug resistant tuberculosis hospital, as to be discerning to the issues and challenges and most importantly, to produce an architecture that heals.

Practical strategies that can be incorporated into the design approach are; (list to the right)

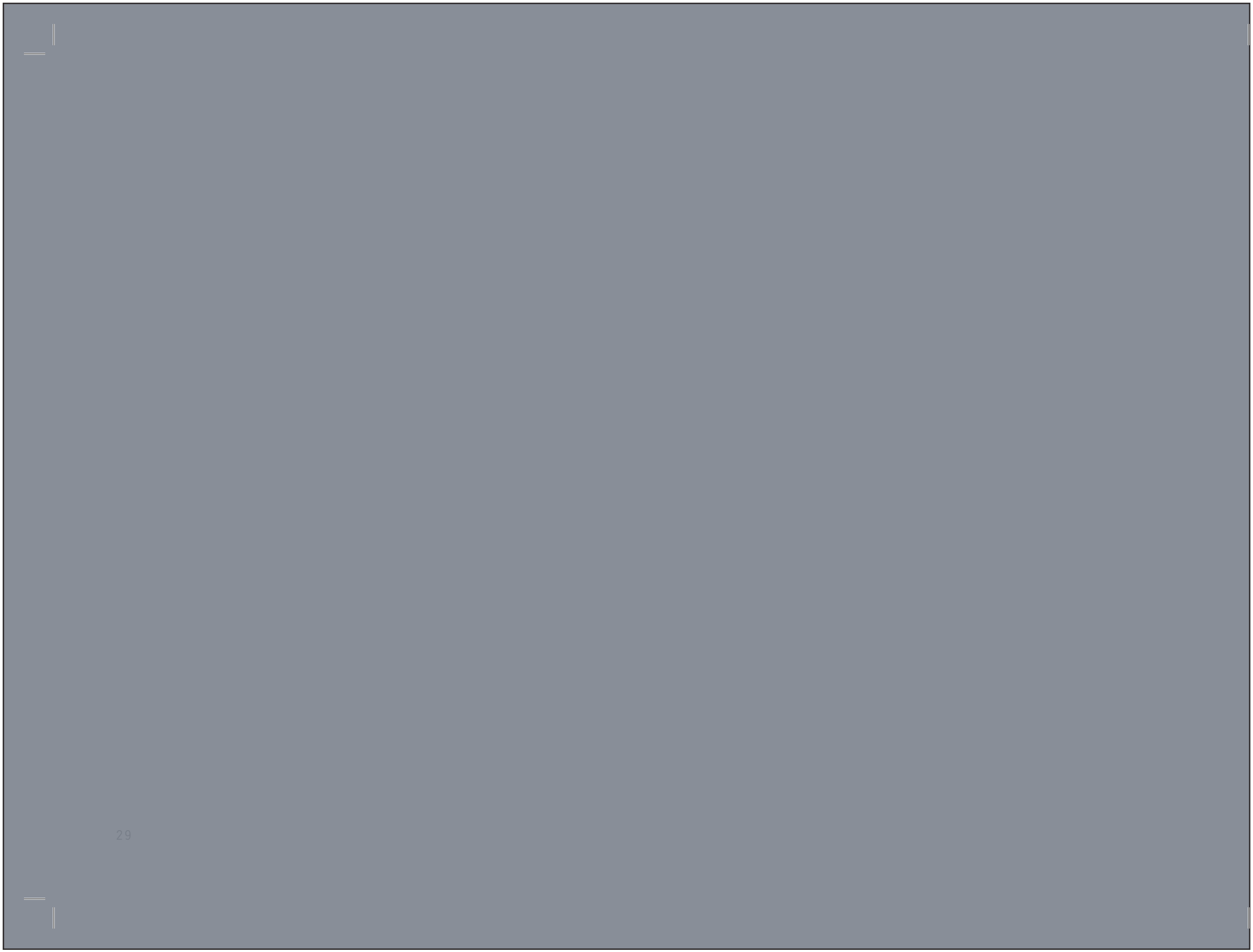
These factors amongst others, need to be incorporated to promote an environment that creates positive space for the users.

- Incorporate planting on the interior of the building.
- Increasing natural environments provides visual and physical links for the inhabitants.
- Maintain visual access to nature.
- Utilise glazing and skylighting in order to achieve maximum daylighting, whcih provides users an experience of the weather and changes of daylight.
- Adjustable environmental devices (louvres).
- Provide courtyard spaces for interaction.
- Utilise multiple natural materials to evoke a sense of connection to the natural realm.

In concluding this chapter, we see how architecture can play a significant role in the psychological and physical wellbeing and recovery of patients. These biophilic and sustainable principles are critically important when discussing tuberculosis. Architecture needs to identify its users as the first priority, and to design in such a way as to abate the effects of isolation and stigmatisation specifically when referring to drug resistant tuberculosis, and to provide a space which lessens patients physical strains as they stay for long periods in these facilities.

Architecture can be used as a tool for healing.

Figure 13 : Tree



Chapter 03

[T Y P O L O G Y]

Introduction

This chapter will survey a brief exploration into the requirements and nature of drug resistant tuberculosis in South Africa. Furthermore, it will expand on the nature of medical facilities through precedents and research in order to understand the spatial and physical requirements thereby informing the design principles and strategies for this treatise.

Understanding the Disease

Mycrobacterium Tuberculosis, in which it is formally known, has been a huge issue throughout much of human history, claiming many lives in the process as it reached epidemic proportions. Tuberculosis is an infectious disease that has established itself in South African society as the foremost cause of mortality. South Africa also has the third highest incidence globally. (WHO, n.d.)

The high default rate of TB patients has led to the lethal emergence of Multi-Drug Resistant Tuberculosis (MDR-TB) and extreme drug resistant tuberculosis (XDR-TB). (Luiz, 2018) These are both forms of tuberculosis that do not react to the Rifampicin and Isoniazid drugs and therefore require longer and more specialised treatment regimes that can last up to nine months or once a patient is 'two smear negative' which means they have recovered from the disease. These forms of TB have grown into epidemic proportions, also largely due to the poverty in the country and high HIV rate which leaves people more susceptible to contracting the disease. (IUSS. 2014)

The primary route of transmission of the disease is through airborne pathogens, such as coughing by a patient. It is also transmitted through bodily fluids of sexual intercourse. This is becoming a huge issue in poverty-stricken areas as individuals are deliberately attempting to get TB in order to receive a government grant. All this adding to the growing epidemic. (Luiz, 2018)

Another issue that is increasing the spread of the disease is a lack of education surrounding tuberculosis. There is a lack of knowledge about contamination of the disease and what the symptoms are. Many people are unaware of the symptoms and means of contracting the disease, which leaves themselves susceptible to the disease, there is also a lack of training in nurses on how to treat patients with MDR-TB or XDR-TB, which leads to patients not being treated correctly or even treated at all. (Luiz, 2018)

Tuberculosis is also commonly known as the "poor man's disease" as it is associated with lower socio-economic areas. This is largely due to the following factors; overcrowding, poor ventilation and a lack of education. All these factors lead to the disease spreading faster. (Luiz, 2018)

A patient that is infected with TB will often be rejected by society, risk losing their jobs and livelihood and have little hope of the future. This adds an extra burden to a family as one financially earning individual now has no way of bringing home income. Amongst patients the suicide rate is also extremely high as many individuals no longer have hope of recovery or in society.

In the South African context, tuberculosis has become attached to stigmatisation. Individuals infected with the disease often face serious discrimination because of their condition. Patients lose their jobs, families, livelihoods and are viewed as lesser in society and are treated as outcasts. This stigmatisation has negative effects on the patient's treatments as it often prevents patients from seeking early medical attention. These patients then end up starting treatment later and are less likely to then complete their drug course, this creates a negative cycle. (Luiz, 2018)

In South Africa and particularly the Eastern Cape, there is an essential need for a primary healthcare facility that specialises in treating and monitoring MDR-TB and XDR-TB patients. As early treatment greatly enhances the chance of full recovery.

This hospital for the treatment of MDR-TB patients will have to meet the basic requirements necessitated by the Department of Health. These guidelines will ensure that the dual objective of patient centered care and effective infection prevention and control of the MDR-TB and XDR-TB epidemic are addressed. "According to this framework, for a successful decentralized MDR-TB programme, the following should be provided in in-patient care facilities in order to ensure adequate

infrastructure and infection control measures: well ventilated consulting rooms, well ventilated waiting areas, well ventilated rooms that can accommodate from one to six patients, a distance between beds not less than 1.2m, administration with measures of infection control in place, UVGI lights and extractor fans where possible and respiratory protection tools must be readily available such as surgical masks and N95 respirators" (IUSS. 2014).

In order to implement these criteria architecturally, a thorough knowledge of the disease and requirements of it need to be understood clearly in order to develop a suitable architectural intervention.

Figure 14 : Destructive Architecture abstract illustration

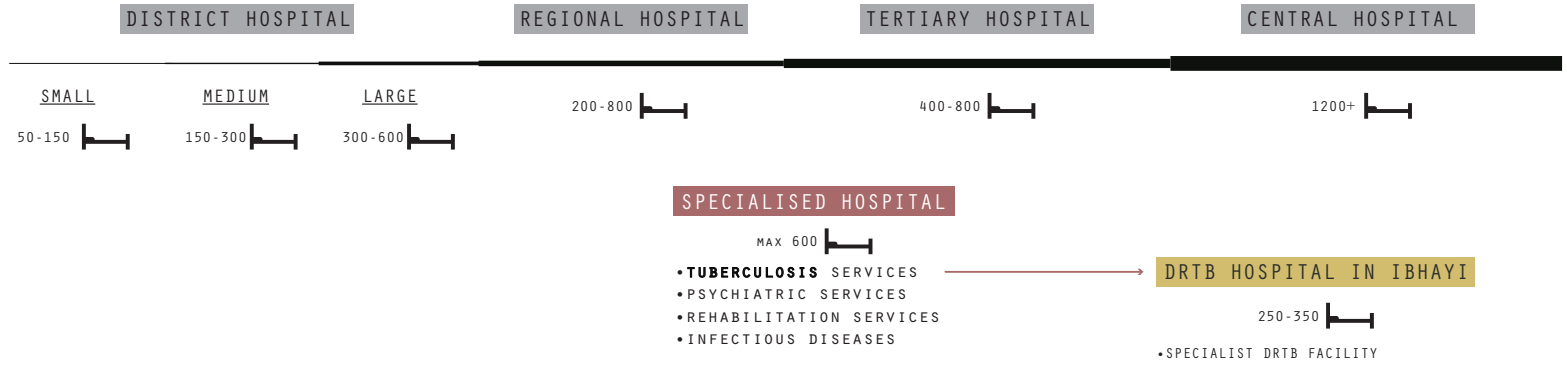


Figure 15 : Hospital Structure

Figure 16 : DR-TB Hospital Structure

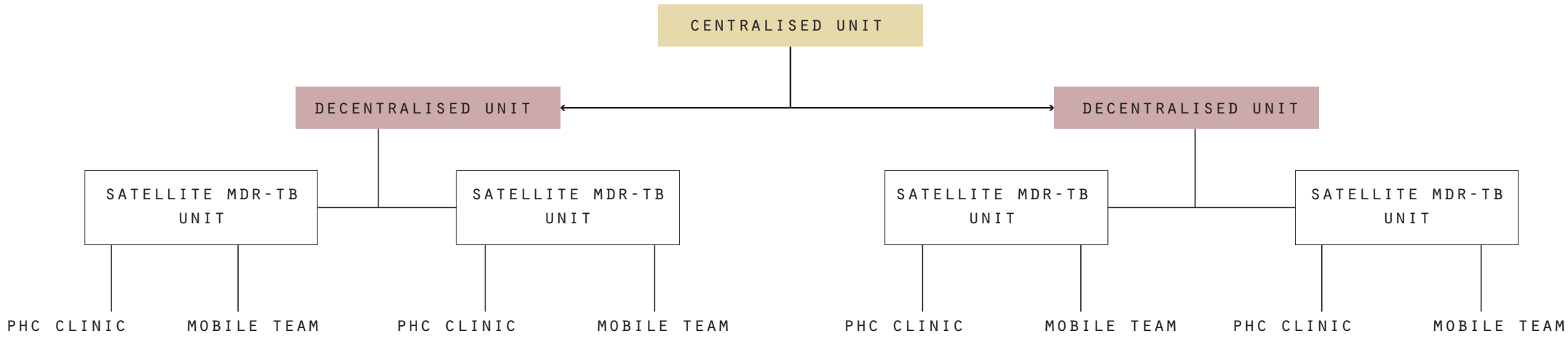


Figure 27 : DRTB facility hierarchy

Hospital Structure

The diagrams to the left firstly illustrate the South African hospital structure and secondly the structural hierarchy of DRTB facilities in South Africa. This design is proposing to be a centralised unit. (Department of Health South Africa, 2013) These are also known as provincial centers as each province is required to have at least one specialised facility. This provides the supervisory role for the other facilities under it as well as technical advice to the decentralised facilities.

According to the Department of Health guidelines for the management of Drug-resistant Tuberculosis policy guidelines. The guidelines states that a following centralised facility needs to do the following: (Department of Health South Africa, 2013)

- Initiating treatment of all DR-TB cases after appropriate assessment;
- Admitting DR-TB cases from the geographic area around the unit;
- Ensuring hospitalisation of all XDR-TB cases until there are two successive negative TB Cultures;
- Assessing all DR-TB patients attending the clinic each month;
- Providing Directly Observed Treatment (DOT) to all DR-TB patients attending the unit each day;
- Recording and reporting to the provincial Department of Health;
- Providing on-going training, support and supervision for all the facilities in the province;
- Providing social support, rehabilitation, educational and skills building programmes for patients;
- Providing education and counselling to all patients admitted in hospital;
- Preparing a discharge plan for all patients and ensuring effective down referrals;
- Monitoring DR-TB patients post discharge until completion of treatment and two years post treatment completion;
- Monitoring rational usage of second-line drugs and ancillary drugs for side effects management;

- Establishing and maintaining functional clinical management teams;
- Compiling monthly, quarterly, six-monthly and annual reports of DR-TB patients started on treatment, their culture conversion and outcomes;
- Providing technical assistance and capacity building to decentralised DR-TB units, and feeder clinics on management of DR-TB; and
- Arranging patients' evaluations at provincial patient review committees."

(Department of Health South Africa, 2013)

The table to the right refers to the minimum staffing requirements of a centralised DR-TB hospital.

The proposed Hospital will be the centralised facility for MDR-TB in Port Elizabeth. It will mainly service the area of Ibhayi while providing support to Jose Pearson Hospital which is a smaller decentralised DRTB facility in Port Elizabeth.

Staff	Recommended Staffing Levels
Doctors	1 doctor for each 40-bed centralised DR-TB unit
Operational nursing manager	1 for each unit
Nurses	15 nurses are adequate for a 40-bed unit.
Pharmacist	1 pharmacist for a unit of 100 to 200 beds.
Social Worker	1 for a 40-bed unit
Dietician	1 for a 40-bed unit
Clinical Psychologist	1 for a 40-bed unit
Occupational Therapist	1 for a 40-bed unit
Audiologist	1 for a 100-bed unit
Physiotherapist	1 for a 40-bed unit
Administration Clerk	1 for a 40-bed unit
Data Capturer	1 for a 40-bed unit
General Assistants	8 for a 40-bed unit
Housekeepers	1 for each unit
Drivers	1 for a 40-bed unit

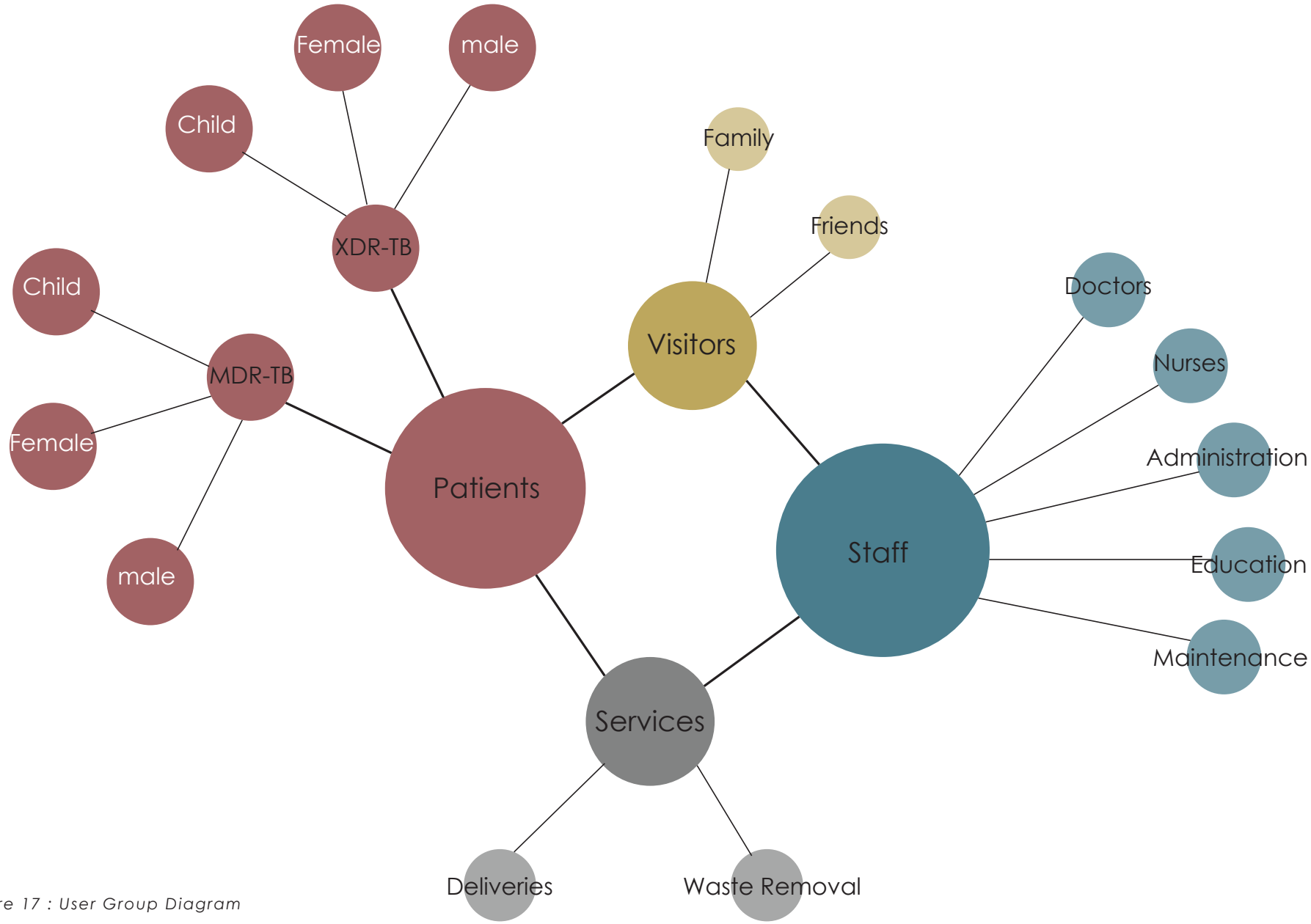


Figure 17 : User Group Diagram

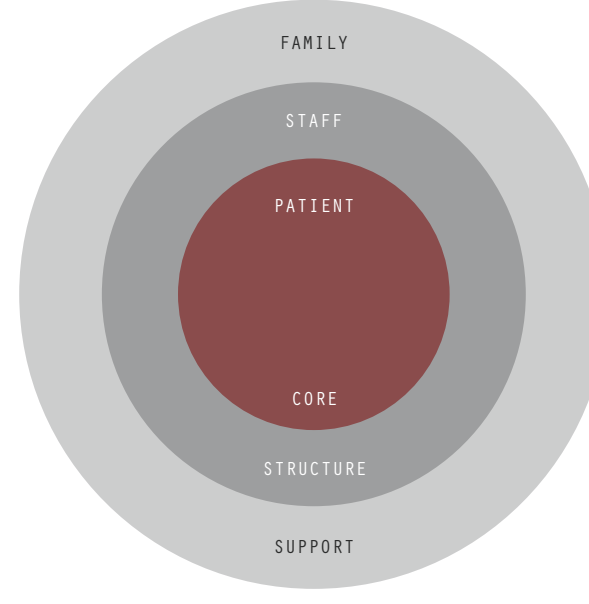
Users

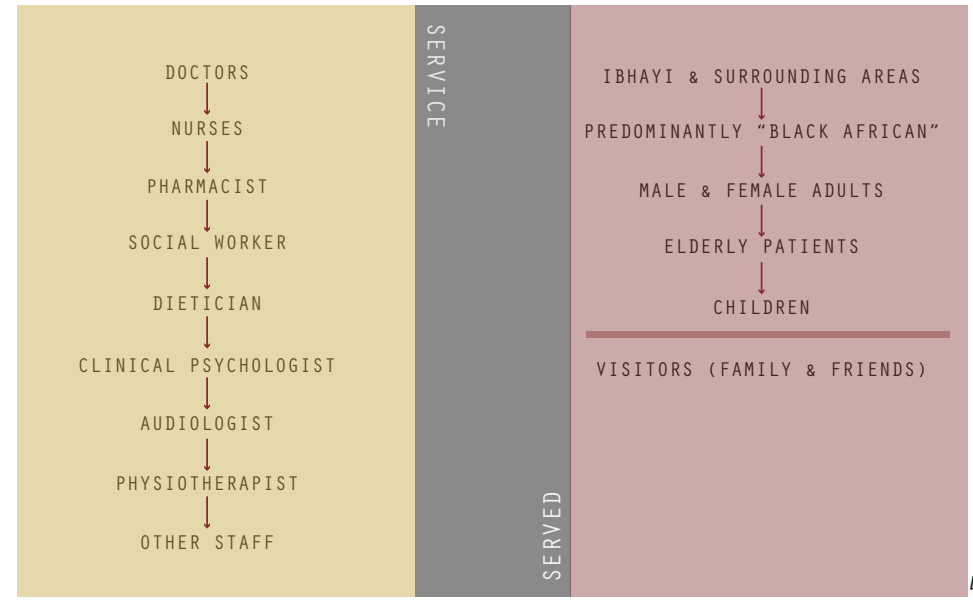
This medical facility is not a general public building. The daily users are people who can be divided into four distinct groups identified as;

- Patients
- Staff
- Visitors
- Services

(diagram on to the left)

Due to the nature of the disease specific spaces need to be set up and thresholds applied in order to avoid cross contamination.





Plan Typologies

Medical facilities consist of a wide variety of types, ranging from large hospital precincts to small community clinics. Four plan typologies are to be discussed, namely; functionalist, campus, oasis and monument.

Functionalist Typology

The design of a large amount of primary healthcare facilities in South Africa utilise a purely functionalist approach. These facilities often come across as sterile and cold. Humans need different environments for healing. Natural lighting is a large factor in this design approach as often seen through the linear spatial form of long ward wings with inaccessible courtyard space in between. The physical well-being of patients is the main goal at the detriment to the psychological wellbeing. Alvar Alto's, Paimio Sanitorium is an example of this spatial arrangement. (Discussed in next section)

Oasis Typology

This describes a building type where architecture creates an interior, protected oasis. This enhances a sense of sanctuary. This approach creates an architectural

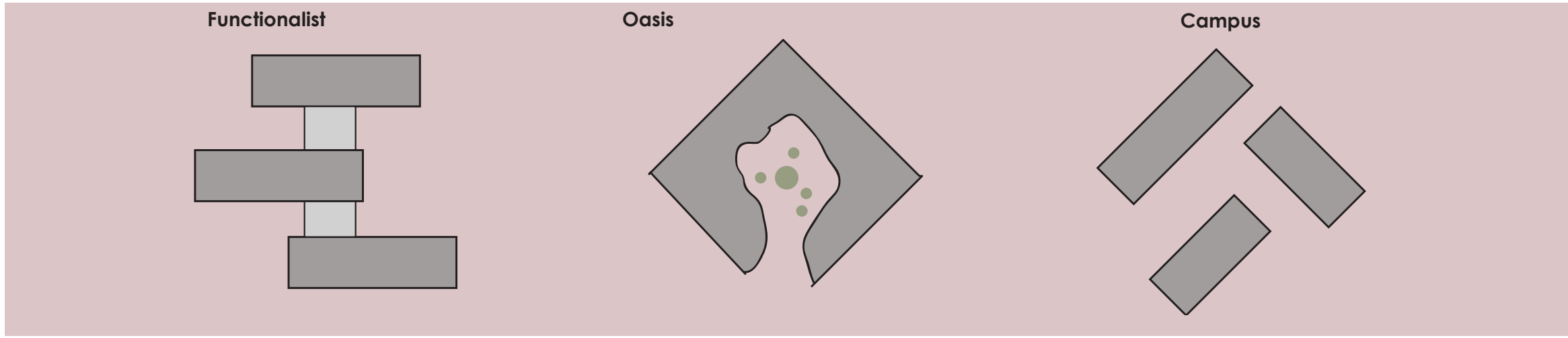


Figure 17 : Plan Typology Illustrations

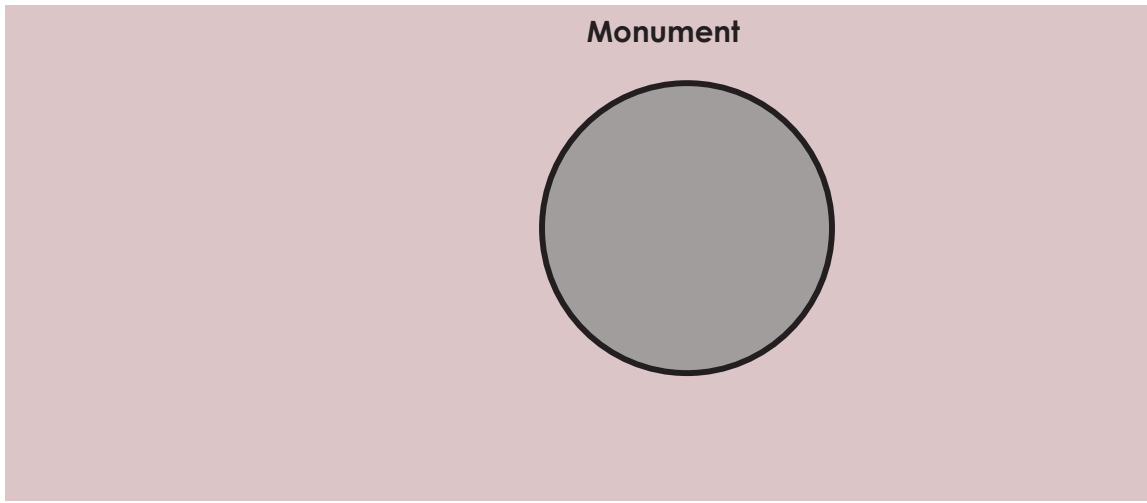
environment where the users feel safe and disconnected from the rest of society, yet provides strong natural connections through courtyard and interstitial spaces that engage the with the physical and psychological.

Campus Typology

This typology is a collection of buildings that together form one building. The separate collection of buildings represents different functionalities with the spaces in between utilised as courtyard spaces. This spatial arrangement allows for more openness and has a more rural segregated nature. Mass Design Group's Butaro Hospital in Rwanda, is an example of this type.

Monument Typology

Refers to an architecture that is very monumental by nature, meaning that it stands alone on a large space and it creates a beacon in the environment in which it is situated. It has a larger scale and evokes a sense of dignity. It often lacks a sense of human scale as it rises above its context. These factors are important when creating a building of this nature as it can become a symbolic reference within the community. It is institutional by nature but can come across as cold and harsh and not appealing to the needs of the users.



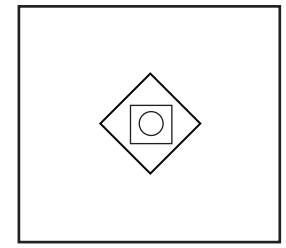
Current tuberculosis hospitals such as Jose Pearson in Port Elizabeth utilise a mixture between campus and functionalist typologies which is typically long rectangular wards connected by walkways. This treatise aims to incorporate elements spatially and physically from all these types. It mainly will be a campus building as it is forming part of a larger hospital precinct yet aims to create an internal oasis for patients while the scale of the building responds to evoke a sense of dignity and importance

Spatial Principle Understanding

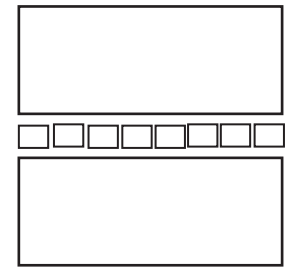
This section seeks to use diagrammatic sketches in order to provide an understanding of various spatial organisers and systems that create positive spaces in architecture. This understanding is achieved through the study of Form, space and order written by Francis D.K. Ching. It will provide an understanding of many systems and serve to enable discernment as to which principles will be best incorporated into the design of a TB hospital.

Spatial Organising Types

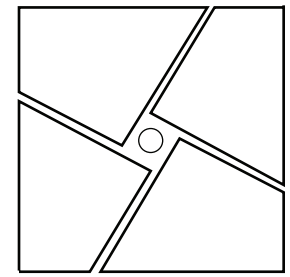
The following types discuss and illustrate the various spatial relationships which lead to a contextual response. (Ching, 2007)



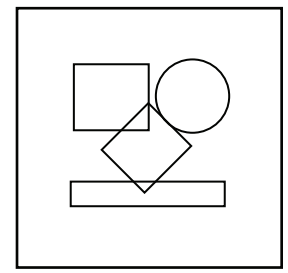
Central Organisation
A central, dominant space about which a number of secondary spaces are grouped.



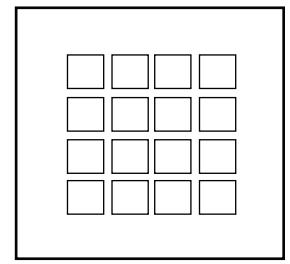
Linear Organisation
A linear sequence of repetitive spaces.



Radial Organisation
A central space from which linear organisations of space extend in a radial manner



Clustered Organisation
Spaces grouped together by proximity or the sharing of a common visual trait or relationship.



Grid Organisation
Spaces organised within the field of a structural grid or other three-dimensional framework.

Entrance

Prior to approaching the interior of a building, one approaches its entrance along a path. This looks at two different entrance types and discusses their approach.

Frontal

A frontal approach leads directly to the entrance of a building along a straight, axial path. The visual approach is clear.

Oblique

This approach enhances the effect of perspective on the front facade and form of a building. (Ching, 2007) The pathway to the entrance can be redirected to delay and prolong the sequence of the approach.

The design of the hospital will utilise an oblique approach servicing multiple pathways providing a sense of intrigue when approaching the facility.

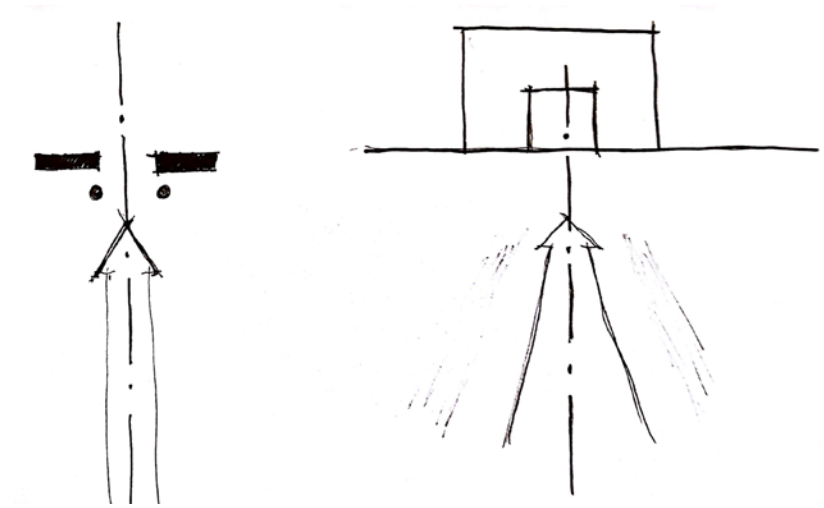


Figure 18 : Entrance Principles

Hierarchy

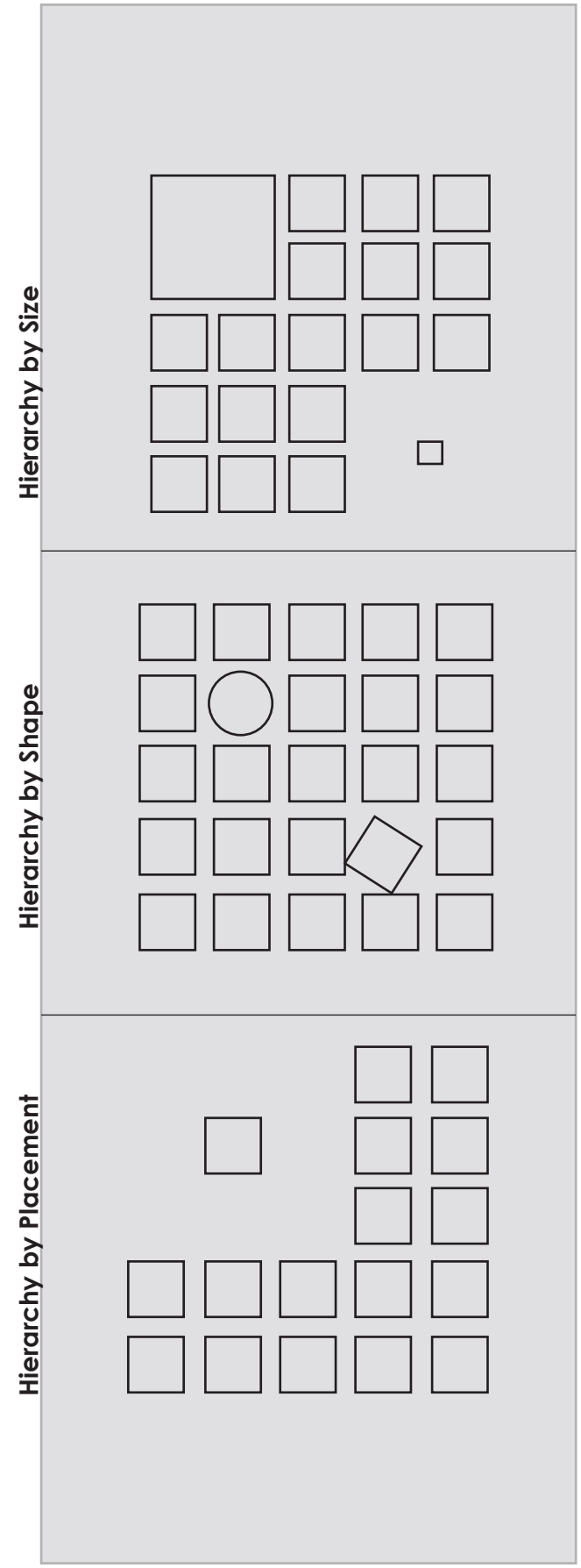
The hierarchy of a space implies that in architectural composition, real differences exist amongst their form and spaces. These translate into varying degrees of importance of these spaces or forms. The value system by which this is determined depends on the needs and desires of the users and the decision of the designer. The manner in which these functional or symbolic differences of the building elements are revealed is critical to the establishment of a hierarchical order for the space. (Ching, 2007)

Hierarchy by Size

A form or a space may dominate a composition due to the larger scale in size from all the other elements in the composition. This dominance is often created by the large size of the element. This gives that element a greater hierarchical order than the rest of the composition.

Hierarchy by Shape

A space can be made visually dominant through clearly differentiating its shape or form from the other elements surrounding it. The discernible contrast of the shape



is important as it creates a hierarchically significant element. (Ching, 2007)

Hierarchy by Placement

These spaces may be carefully placed in order to draw the focus toward itself as being the most important element in the configuration.

The treatise project design utilises multiple elements from these principles yet mainly incorporates, hierarchy by size, as it responds to the existing hospital precinct context and sets itself up as a larger mass which evokes a certain sense of place.

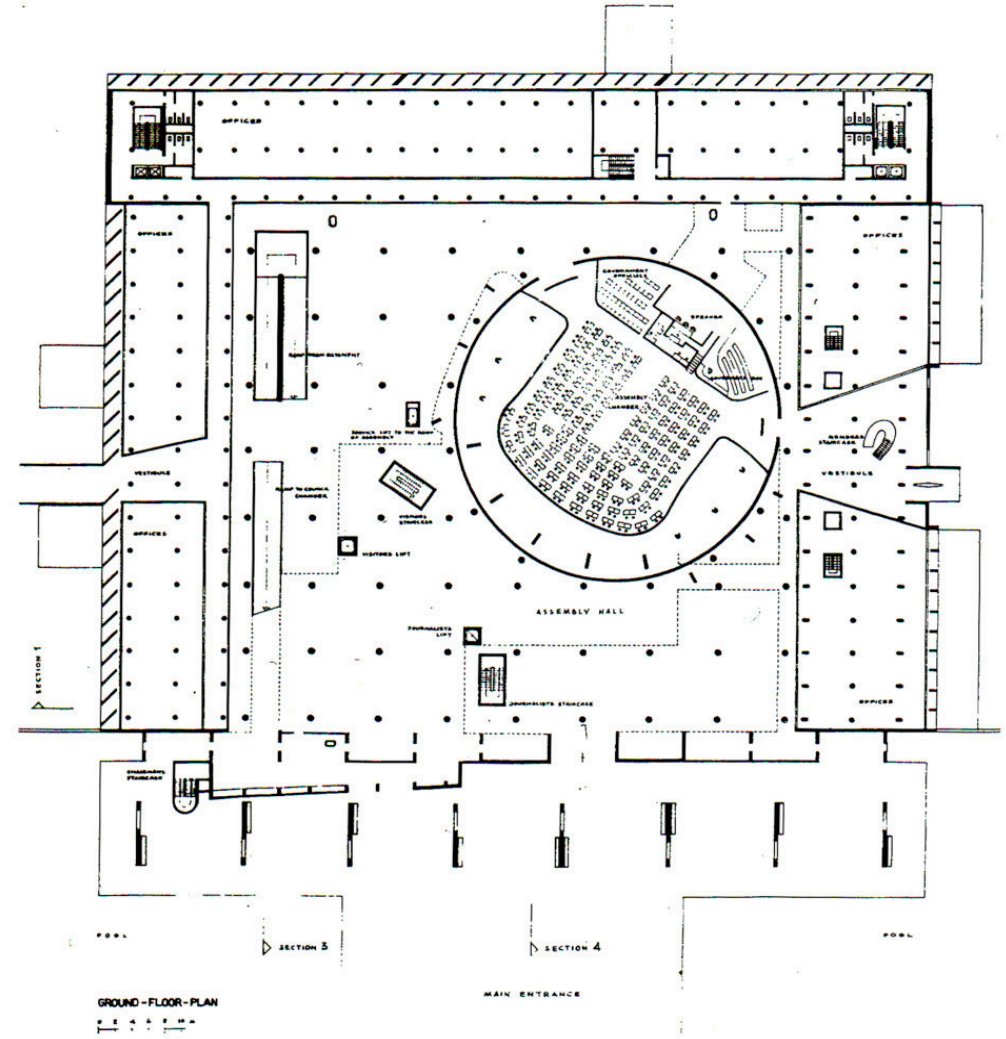


Figure 19 : Legislative Assembly Building, India

Figure 20 : Enclosed Courtyard

Courtyards

A courtyard is a predominant and common architectural feature that has been used throughout history. Courtyards were and continue to be a place of meeting and were used for specific purposes. Briefly explained it is an open space with a built or urban fabric which fulfills certain functions, namely; social, leisure and provides a more user friendly micro-climate. Courtyard spaces provide visual and physical connections to climatic elements and start to introduce nature into spaces. (Almhafdy, et al., 2013)

With regards to hospitals, a courtyard could be used as a suitable place to promote a healing environment. This could be achieved through the introduction of plant life and natural elements into a space, all the while introducing natural air, light and elements into spaces to evoke a sense of wellness.

Courtyard Configuration

Courtyards do not necessarily have a fixed plan or layout. Traditionally they were square or rectangular but can also be from circular or curvilinear to organic in shape. The form of the courtyard can be enclosed in numerous ways, typically, however a courtyard is either fully enclosed, semi enclosed or two sided. Each of these types will have different micro-climatic conditions and evoke different responses to the spaces. Wall enclosures refer to all the components that form a courtyard within the building environment. This refers to the opening or closing of apertures and the wall to window ratio. (Almhafdy, et al., 2013)

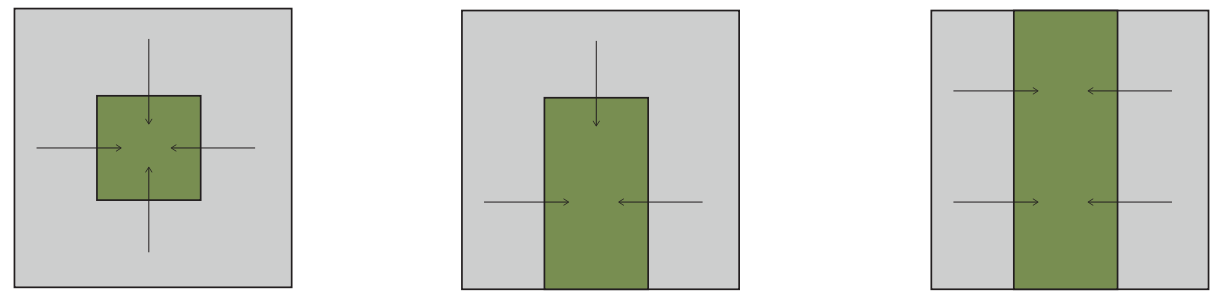


Figure 21 : Courtyard Configuration

These spaces allow for buildings to incorporate better ventilation and thermal control to create a more pleasant interior environment.

Natural elements within these spaces produce environmental benefits. By adding trees, shrubs and plant life to these courtyard environments one greatly improves the thermal comfort as they provide shade and cover to open areas, as well as linking the senses to the environment helping reduce the psychological isolation the patients experience. By providing shade elements to these spaces more activity is encouraged as they offer protection from the elements rather than being mere empty left-over spaces.

Courtyards in the MDR-TB hospital design are of great importance as they provide a connection with nature and have many physical and psychological benefits. They contribute to the overall performance and efficiency of the building through passive design techniques to create an environment that is conducive to healing.

Figure 22 Top : Courtyard example 01
Figure 23 Middle : Courtyard example 02
Figure 24 Bottom : Courtyard example 03

Figure 25 : Dora Nginza Ward Courtyard

PRECEDENTS

Butaro Hospital, Rwanda

Mass Design Group

Butaro Hospital in Rwanda set out to create a more holistic model of architecture. It utilises evidence-based design through its innovative design techniques in order to reduce the spread of airborne diseases. The design focused on the specific user group flows, ventilation requirements and daylighting required in order to achieve the overall planning layout. (archdaily, 2011)

The building and construction of the hospital utilised all local labour and the majority of materials used were also sourced locally and in turn the community surrounding the hospital was built up through their involvement.

Figure 26 : Space in Butaro Hospital

The natural setting of the hospital aids in the recovery process as the patients could engage with the natural outdoor environment. Walkways have all been moved outside to avoid the transferring of diseases. This is extremely valuable when it comes to combating the spread of TB.

Few hardscape areas are used in order to avoid water stagnating as it is generally a source of disease. (archdaily, 2011)

Through the physical nature of this building, many of these factors can be incorporated in the design of an MDR-TB facility; where daylight and airflow is of an utmost priority, there is a space where patients don't feel isolated and restricted to their rooms and natural outdoor areas for patients to recover are provided. This helps break down the psychological barriers that the isolation of the disease creates.

Figure 27 : Butaro hospital floor plan

1. Intensive Care Unit
2. Post Operative Ward
3. Operating Room
4. Check In
5. Neonatal ICU
6. Delivery
7. Pre-Delivery
8. Paediatric Ward
9. Post Delivery Ward
10. Mens Ward
11. Laundry

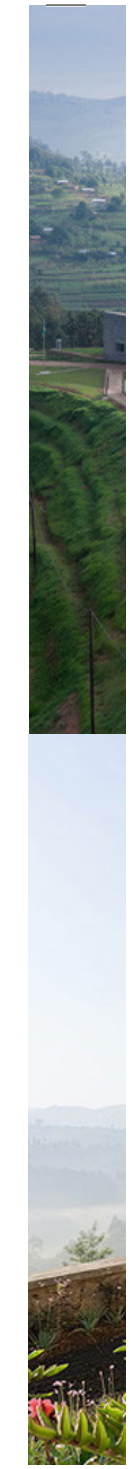


Figure 28 : Aerial view of hospital

Figure 29 : hospitals walkways and natural outdoor environments

Figure 30 :Patient Ward

Figure 31 : Outdoor walkways

Figure 32 : Paimio Sanitorium

Paimio Sanitorium, Finland

Alvar Aalto

One of Alvar Aalto's most well-known buildings is the Paimio Sanitorium, a tuberculosis facility located in Finland. This was built during a time when TB was not treated pharmacologically but only through natural sunlight and fresh air. This was one of the reasons why the building was situated in the forest. It satisfied the passive requirements as well as isolating the patients from society to avoid contamination. The sanitorium consisted of multiple wings with wards all facing South (Northern Hemisphere) for the optimum lighting with shading devices to block out the harsh sun. Each patient was in a two-bed room that had views of the surrounding forest. (Vaija, 2018)

Figure 33 : Paimio Sanitorium Old photo

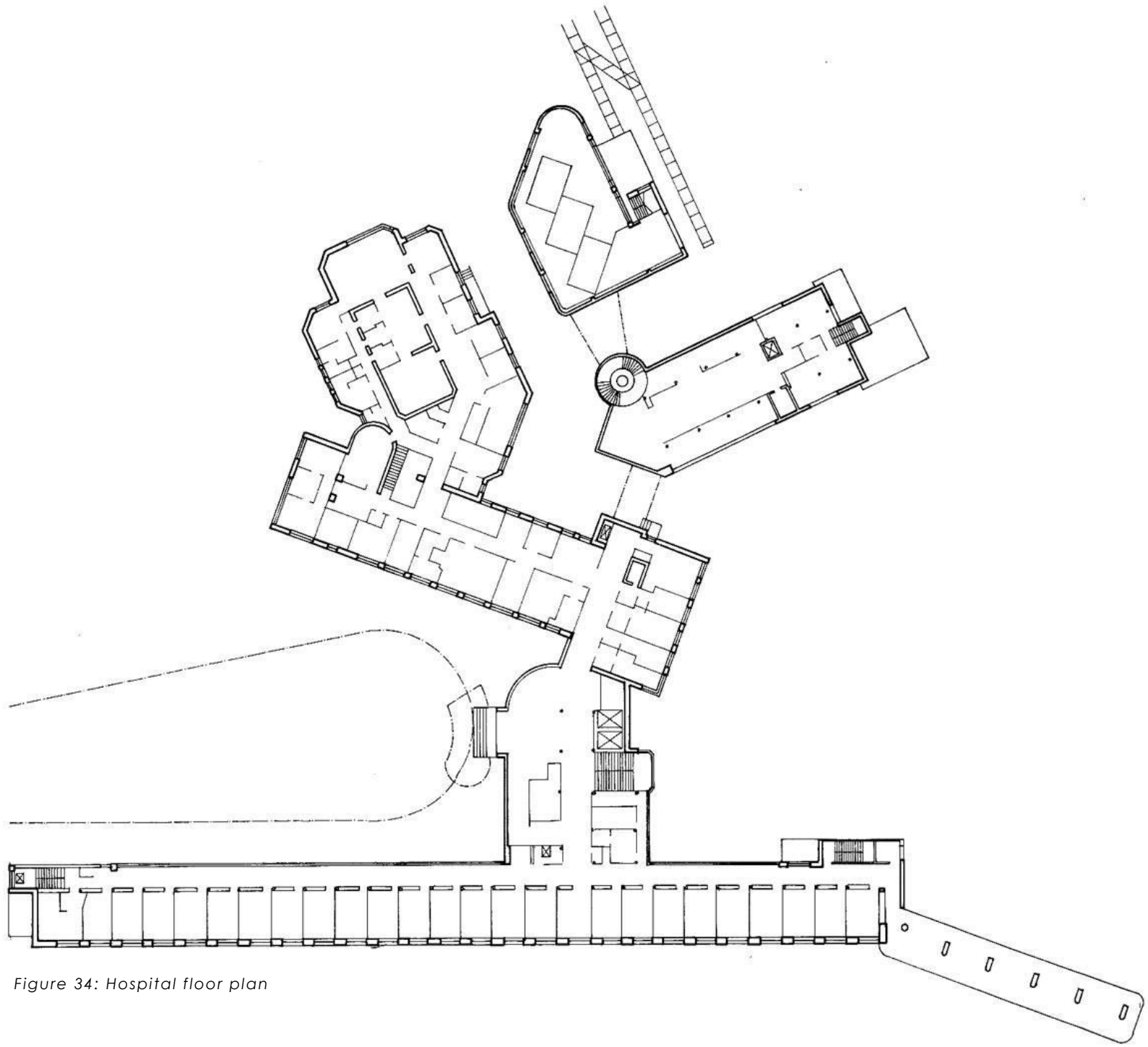


Figure 34: Hospital floor plan

Psychologically the stigma of tuberculosis makes patients feel isolated from their communities, yet through the design of this sanitorium ensures that the patients are not isolated from their natural environment.

In exploring this purely modernist functional building, it comes across as sterile and cold through its appearance and feel. People need different spaces and environments to encourage and generate healing. This building set out to create a healing space for the patients, yet in doing so it has emphasised isolation through materiality and enclosure of being stuck in a room in a forest. This treatise aims to understand the spatial and physical orders of nature in order to design a building that heals while breaking down the psychological aspect of isolation.

Figure 35: Showing large glazed elements and scale

Figure 37: patient sun deck

Figure 36: exterior view of wards

Figure 38: view from the forest

Halden Prison, Norway

Erik Moller + HLM Architects

This precedent has been chosen on the basis that tuberculosis facilities are often likened to prisons due to the reasoning that patients are isolated and secured inside for long periods of time during their treatment period. These facilities are also generally found on the outskirts of society, emphasising the isolation aspect more. This creates an architecture that is not conducive to healing.

Halden Prison will be analysed to understand how to scale back the effects of institutionalization and how isolated environments can be designed in a way that breaks down that same sense of isolation.

Figure 39 : Halden Prison wall art

Figure 40 : Holden Prison site perspective

Rehabilitation is the key difference between this prison and others where rehabilitating individuals is the goal. The design of this prison responds spatially through creating a village sense through organisation of buildings and rooms. This allows prisoners to feel like they are part of society. (Vinnitskaya, 2011)

The interior of the facility is designed in a way to distinguish the spaces “of home”. Buildings are disconnected, encouraging the inmates to walk and connect to the outside world. The aim of this facility is to avoid psychological pressures and internal conflicts.

The majority of these inmates will return to society in the future. The question is, would we want people who are angry or people who have been rehabilitated?

Figure 41 : Halden Prison exterior

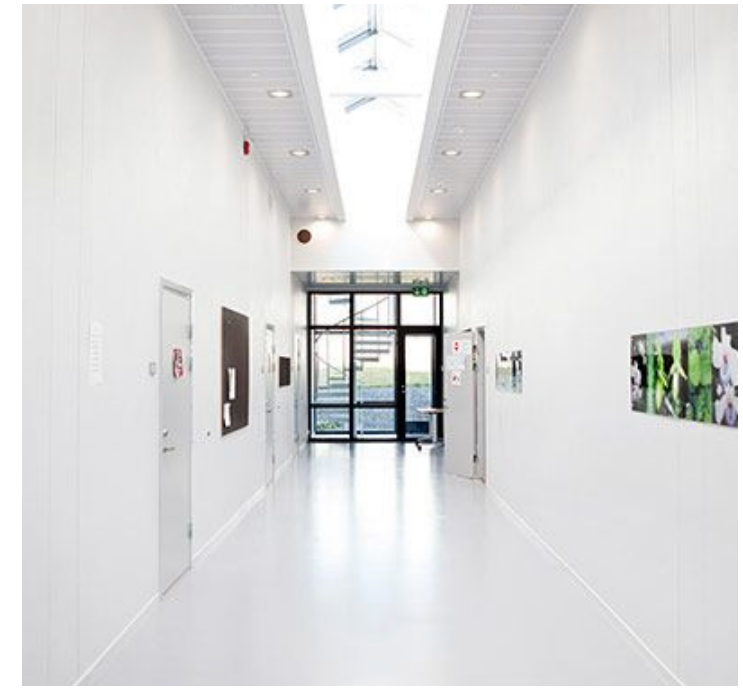


Figure 42 : Prison Skylight passages

The same could be argued in reference to a DR-TB hospital. Its aim is to **heal and rehabilitate**, not discharge patients that are still sick enough to be harmful to society and who will most likely need to return to the facility again.

One can take away the need to incorporate links to the outdoor environment from the hospital design by instead introducing natural light into interior spaces and providing spaces for interaction. This would give the patients a sense of dignity and provide them with an alternative domestic space for their treatment period.

Figure 43 : Halden Prison break room

Figure 44 : Prison courtyard

Gheskio MDR-TB Hospital, Haiti

Mass Design Group

This designs philosophy aligns with that of the treatise as it sets out to see how architectural design can improve the wellbeing of patients suffering from tuberculosis.

This multi-drug resistant tuberculosis facility in Haiti was constructed to provide a specialised facility for those suffering with MDR-TB. There is an extreme need for TB facilities in that country as the disease is also at epidemic proportions. This project has many similarities to the treatise making it appropriate to study how aspects of this smaller intervention can be incorporated into a larger regional facility.

The hospital accommodates 32 patients in individual isolated rooms. The design of the building sets out to maintain a

Figure 45 : Gheskio TB hospital patient

Figure 46 : Gheskio TB hospital plan

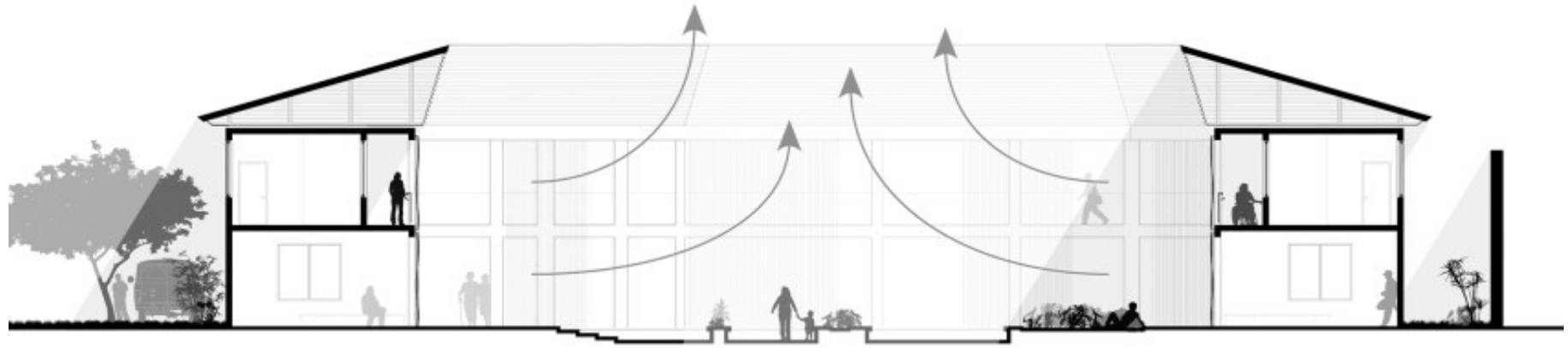


Figure 47 : Gheskio TB hospital section

connection to the outdoor environment at all times as natural ventilation and sun lighting is known to combat the spread of the disease. These passive systems have been incorporated throughout the design in order to create better environments. In order to avoid contamination, staff have access through separate entrances. The interior courtyard provides a space for patients to interact with one another and offers a tranquil environment that aims to create a healing space. (Mass Design Group, 2015)

This project utilised isolated rooms for their patients which provides dignity yet it may not be the most appropriate for this disease. Single rooms emphasise isolation physically and psychologically. This treatise will utilise wards with up to 5 patients, to encourage interaction of individuals and to emphasise a community aspect. By not isolating the patients the risk of suicide and depression is less than for those who are in isolated rooms. On the other hand, the way thresholds have been set up to create separate areas for different users is a necessity in the design of this treatise hospital in order to maintain a connection to the rest of the activities even though they have been isolated to a degree.

Figure 48 : Gheskio TB hospital courtyard

Figure 49 : Gheskio TB hospital ventilated walkways

Precedent Conclusion

Through the study of these precedents, it is seen that a common goal occurs. This is to create an environment where architecture is used to create wellness both physically and psychologically. Spaces have been highly considered in order to rehabilitate instead of isolate. It devotes great attention to the unique needs of the specific users and their requirements while creating a stimulus to promote the healing outcome of patient care.

Contrary to all that has been said towards an ideal design above, we assess the present state of public TB hospitals in South Africa. They are purely functional buildings. They do not take into account the needs and wellbeing of the patients they serve or the outcome of their patient care. They often cause more harm than good when due to poor design, patients, especially those which are long term, are becoming sicker instead of recovering. This reality necessitates that architecture should strive to uphold the principles discussed in this chapter to create a more holistic environment for its users.

Chapter 04

[CONTEXT EXPLORATION]

Introduction

This chapter intends to interrogate the spatial and physical attributes of Port Elizabeth and Ibhayi through the study of natural and man-made structuring systems in order to understand the existing context. The hospital precinct of Dora Nginza will be analysed to understand the nature of the precinct and to formulate and understand the informants and constraints of the site to develop a clear intervention strategy.

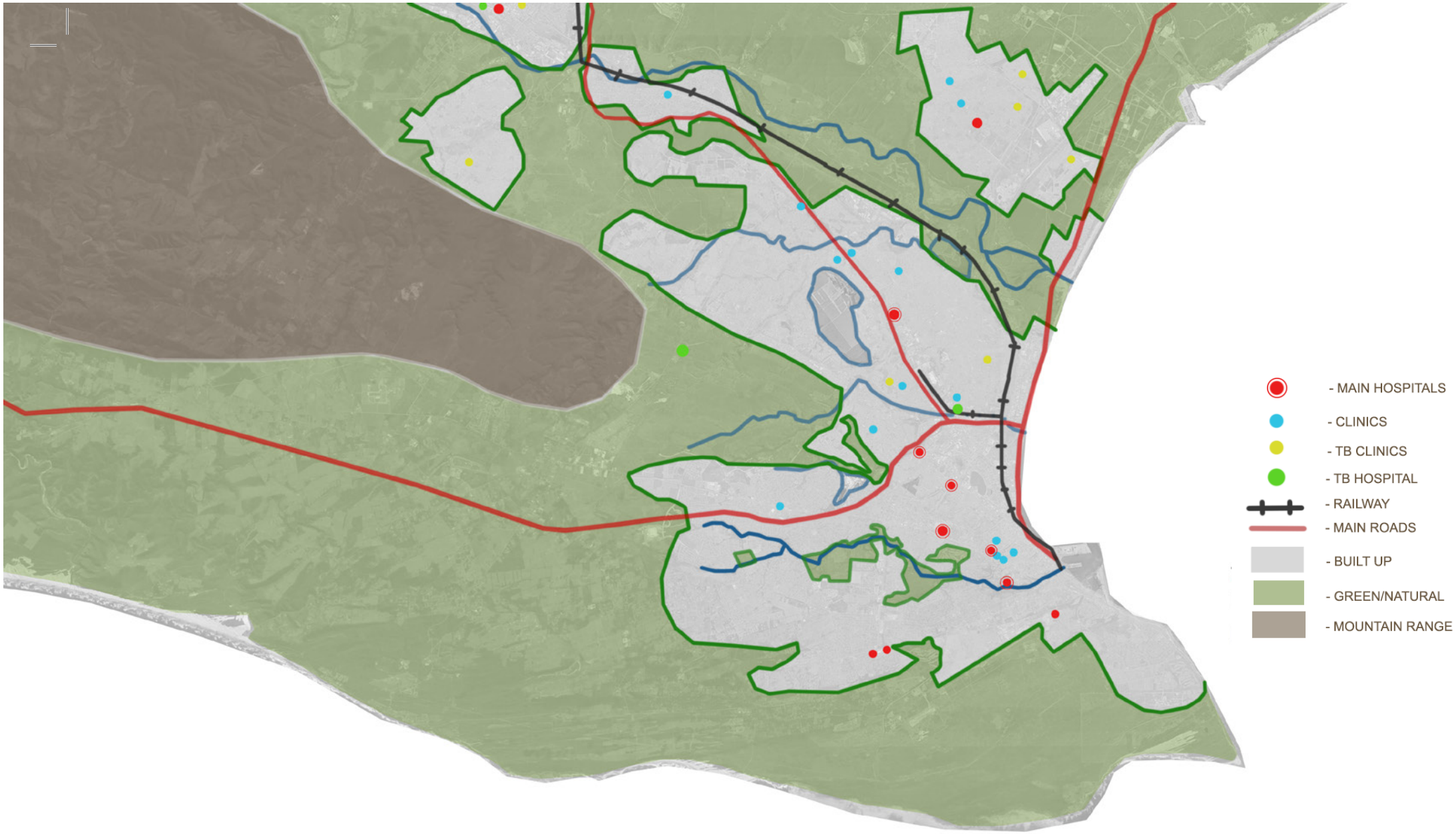


Figure 50 : Metro analysis of Port Elizabeth

Metro Hospital Analysis

The Port Elizabeth area has three tertiary state hospitals. The DR-TB hospitals and clinics in the area are all decentralised facilities, meaning that they are not part of a hospital complex and in some cases are removed completely from the community. There is a large need to have a centralised DR-TB facility that caters directly to the effected community in which it is situated. Public hospitals are a prime location due to accessibility and resources. Infected individuals seek treatment at these facilities first before being sent out to the specialised facilities on the periphery which removes patients completely and isolates them. A hospital precinct provides the opportunity to connect to the existing health care precinct and contribute to the urban community surrounding it. This section seeks to briefly analyse the three public hospital models to find a suitable precinct to which it can contribute.

These three hospitals' location was decided by apartheid ideologies of the time when ethnic groups were divided and relocated to various suburbs across Port Elizabeth. These public healthcare facilities were constructed to cater to the needs of these areas. Post-Apartheid, these hospitals have each taken up different roles and functions in order not to have duplicity of similar resources.

Provincial Hospital

Provincial hospital is located just off Cape Road in a middle-class suburb called Richmond Hill. It is a tertiary teaching hospital and is in very close proximity to two large private hospitals. It is along main transport routes and does not have specialised TB facilities nearby.

Figure 51 : Provincial Hospital

Livingstone Hospital

This hospital is located in Korsten and serves a middle to low class community. This hospital is along a major transport interchange and is adjacent to a green belt. Tuberculosis facilities are in close proximity at Empilweni TB Hospital.

Figure 52 : Livingstone Hospital

Dora Nginza Hospital

Dora Nginza is located in a suburb called Zwide, Ibhayi. This hospital is a general public hospital that specialises in obstetrics. It is situated in a low-income to no-income area. TB is extremely prevalent throughout this area mainly due to poor living conditions often associated with this economic class. This precinct has been identified as a key developmental node as is seen by the new ambulance depot being constructed as well as the new Nelson Mandela University Medical School.

This precinct would benefit from the incorporation of a specialised DR-TB hospital that deals with high levels of TB in the immediate area and its surrounds. The key developments being constructed provide the opportunity to be integrated within the larger urban strategy of the precinct. The hospital is highly accessible and suited to a development this treatise is proposing.

Figure 53 : Dora Nginza Hospital

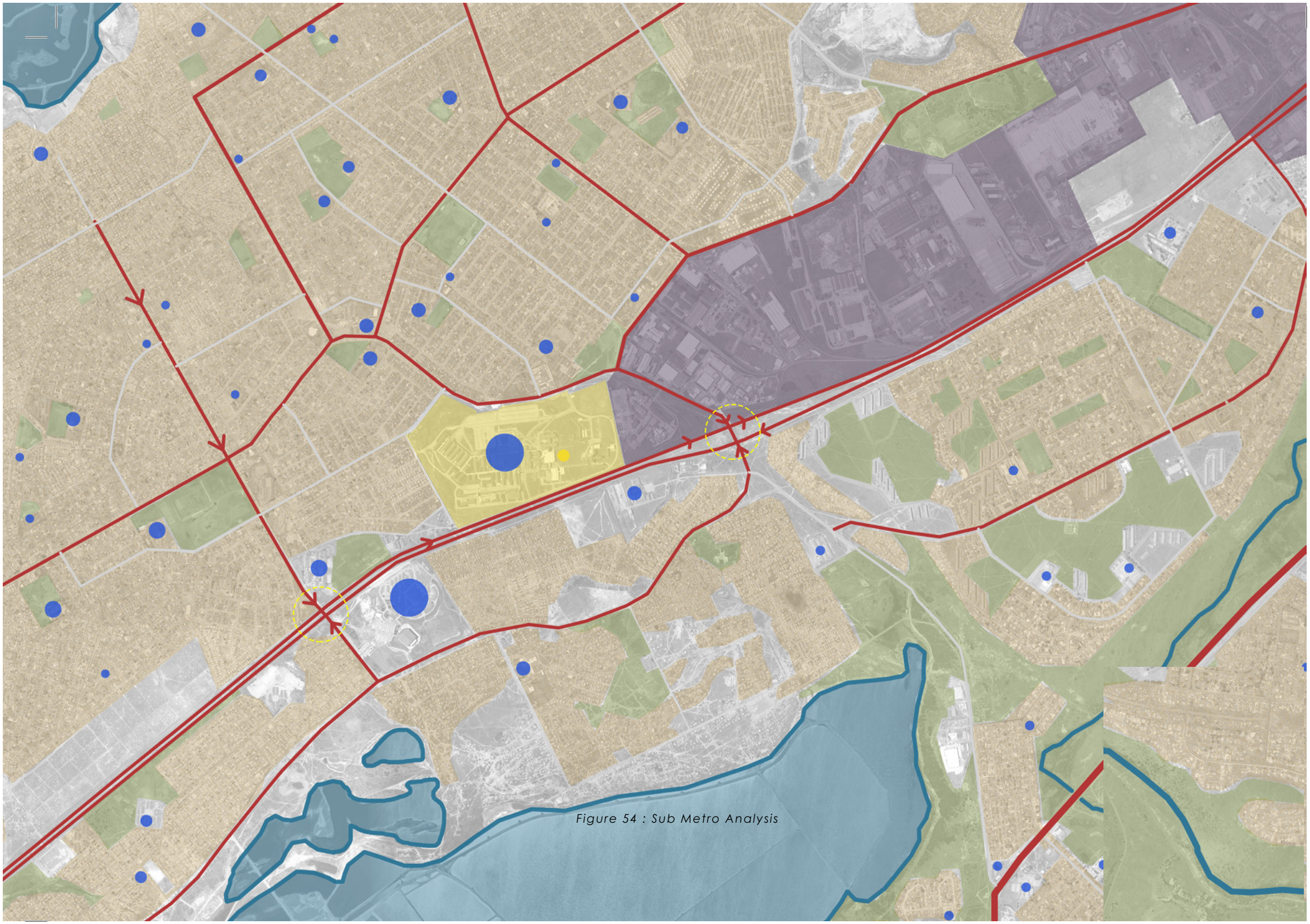


Figure 54 : Sub Metro Analysis

STUDY AREA

The area of Ibhayi is a result of the apartheid ideologies. Through the relocation of race groups, the city was dispersed in the process. Services were constructed to supply the respective communities. Dora Nginza hospital was constructed to serve the larger area of Ibhayi and the surrounding areas.

Ibhayi is in dire need of urban upliftment. Due to the low socio-economic status of the area little development happens. The majority of the area is of a dense built-up residential nature which varies from small houses to informal settlements. There is also a large commercial zone which is where a majority of the population work.

The hospital is located along Uitenhage Road which is a main connector between Port Elizabeth and Uitenhage. It is a main traffic thoroughfare and also the main divider in Ibhayi separating communities.

The precinct creates a hard edge facing the road due to its busy nature and lack of access opening up towards the community side where access is available. The hospital is slightly higher than the community areas thus creating an icon in the community; one that can become positive. Access to Spondo Street is a mixture of vehicular and pedestrian traffic, with large amounts of informal economic activity taking place. Natural barriers are created through the salt pans and the river creating a green belt. There are very few green urban spaces for interaction and recreation as the majority of them are part of schools and institutions

The hospital is very well connected to the main road structure. It is a monument in scale and size to the rest of the institutions in the area thus giving it an importance and presence.

Figure 56 : Hospital Activities

Hospital Activity

- Derelict Buildings
- Dental Clinic & Clinic
- Administration
- Entrance
- Rape Crisis Centre
- Produce Planting
- Patient Wards
- Doctors and Nurse Housing/accommodation
- Mortuary
- Nelson Mandela University Medical Campus
- Ambulance Depot
- Records and Pharmacy

Figure 57 : Dora Nginza Movement

Hospital movement

The precinct utilises a ring-road system to connect the different sections of the hospital. The red lines indicate the main vehicular routes, with the yellow lines indicating the new proposed links to further connect the system.

The Green buildings are the new developments on the site. The majority of the development is occurring along the south side of the precinct.

The buildings are all connected yet seperated by function. The main buildings are all the same scale and have been organised on the basis of orientation, this is represented by a strong axial geometry on the site.

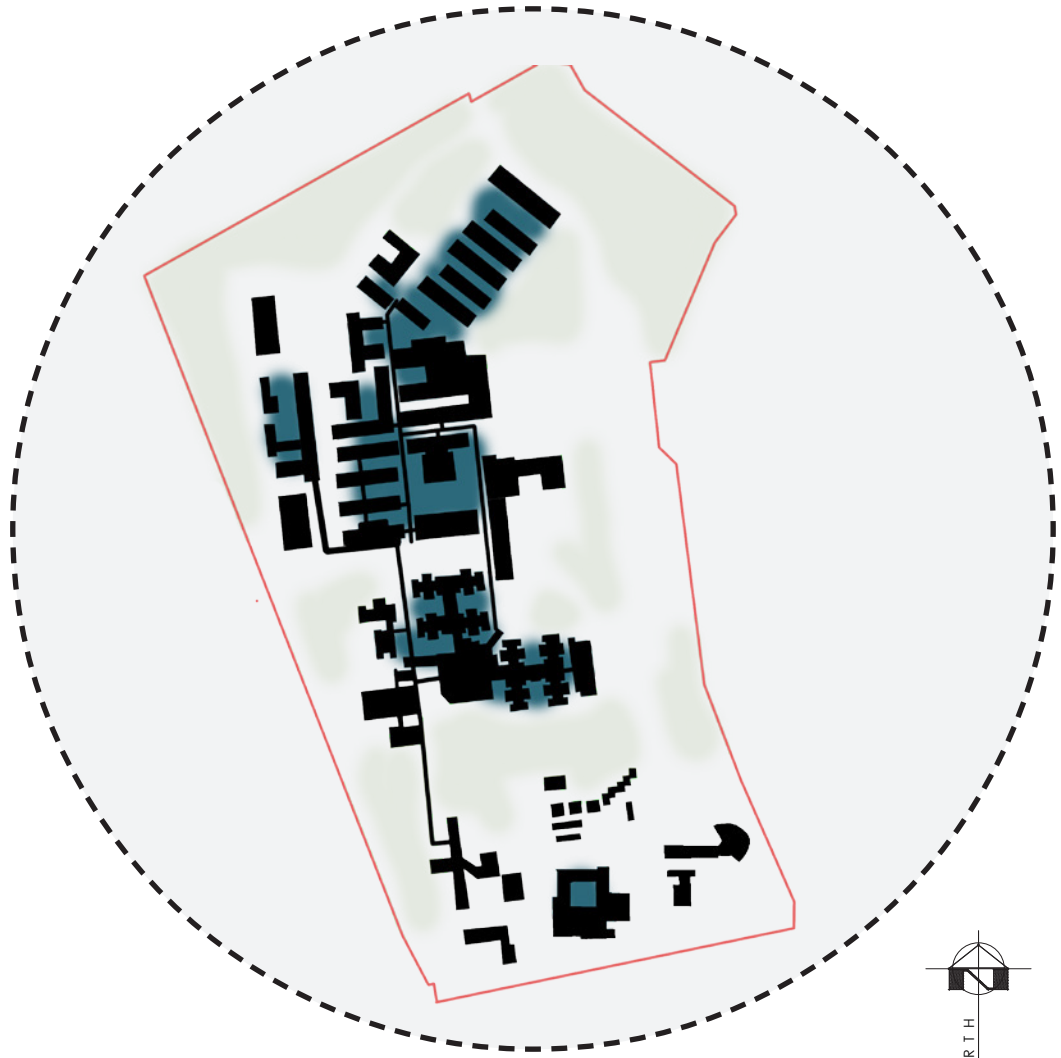


Figure 58 : Dora Nginza Interstitial space

<u>Hospital Interstitial Space and left over Green Space</u>

Due to the hospital buildings being separated from one another and connected by walkways. Lots of interstitial spaces have been created. These spaces however have not been used or catered for in the existing precinct. Around the periphery of the site is an abundance of unused green space that has the potential to be utilised and to benefit the urban precinct.

Between the new development area on the south side of the site and the main administration and wards building is green space which can possible be utilised to link the two sections of the precinct together.

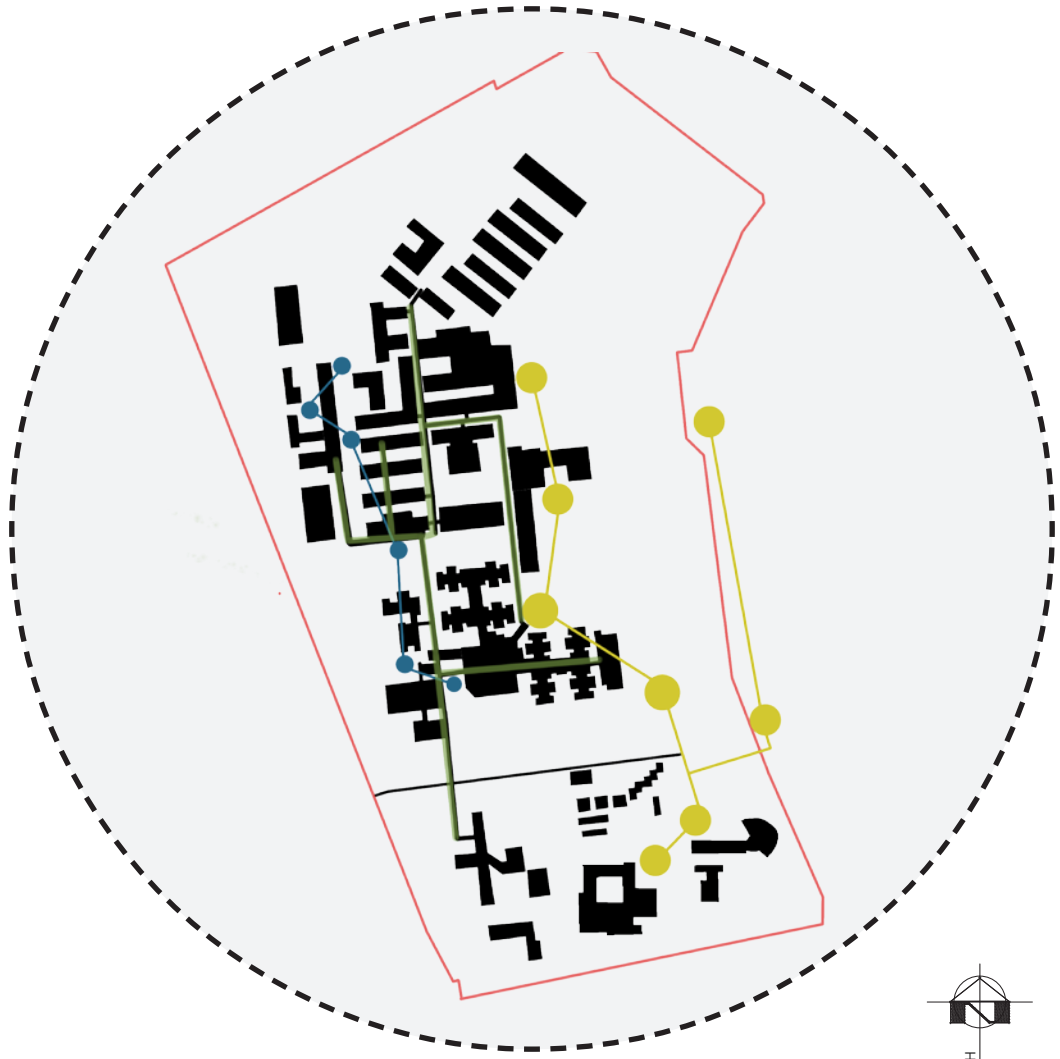


Figure 59 : Dora Nginza Access

Hospital Access

The yellow circles indicate the public access to the hospitals various functions. The blue circles show the private entrances for personal only. This indicates the fronts and the backs of the buildings. There is a fully connected pedestrian link that runs through the length of the hospital which is in green.

Hospital Perspectives

The images to the right show the human movement corridors and the green unused courtyard spaces at the facility. These green spaces have little to no activity and have very hard surfaces and are closed off on three to four sides. In the design of the treatise one needs to be aware of these errors and not create the same spaces, but to create accessible courtyards for the patients to use.

The backs of the buildings have little to no openings and closes itself off to the natural environment . This provides an opportunity through the design of the DR-TB hospital to create edges that still interact with its surroundings through visual connections.

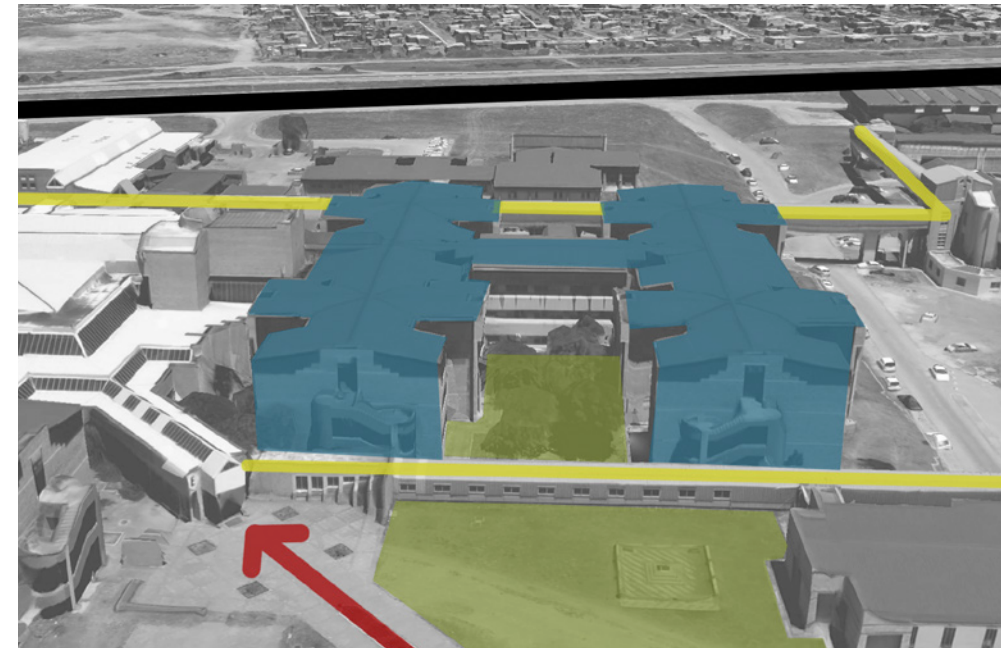


Figure 60 : Dora Nginza Access & Green Space

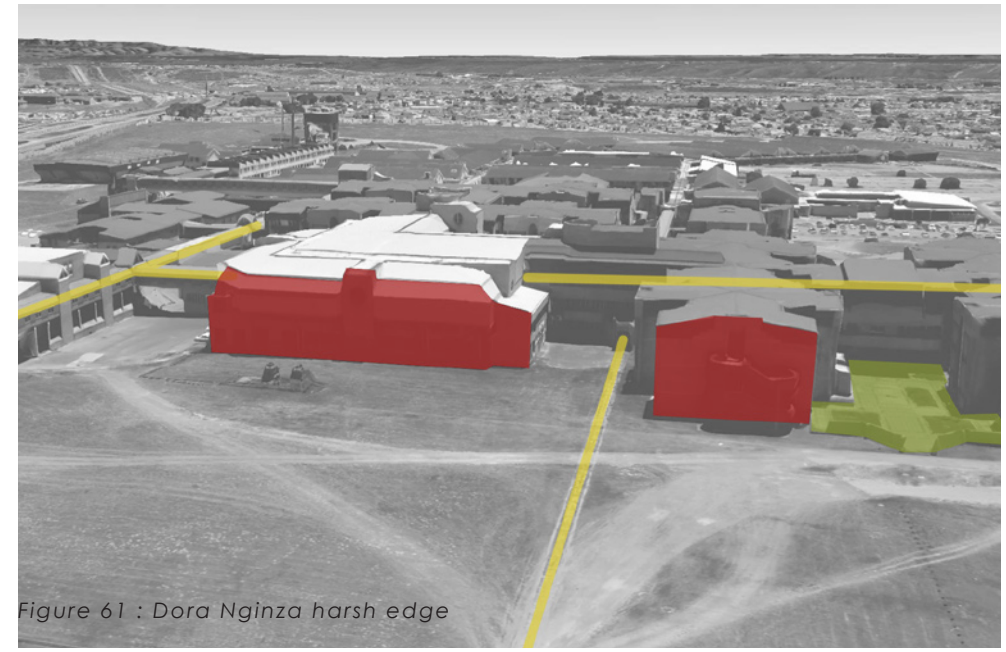


Figure 61 : Dora Nginza harsh edge

Figure 62 : Dora Nginza Overhead Walkway 01

Conclusion of theoretical underpinnings

This research has created a strong emphasis on the negative aspects of public healthcare and the reality and issues pertaining to MDR-TB in South Africa. It deals with how to break away from isolation that is necessitated by the disease and how to create spaces through an architecture that heals instead of causing more harm.

Drug-resistant tuberculosis patients need an alternative place to call home during their treatment period. This would encourage patients to seek treatment if a sense of community and dignity could be given through the architecture created. A new physical and spatial strategy is required in order to facilitate the specialised requirements of this design.

This research has led to the formulation of a conceptual architectural approach that considers the principles discussed in order to create layers and thresholds through the environment it creates. Its aim is to cater for the needs of the patient and provide a healing environment.

PART 02

DESIGN

Chapter 05

[PROGRAMME]

Introduction

This section of the treatise looks to formulate the project brief and indicate the spatial and physical responses required to design a hospital for the treatment of drug resistant tuberculosis.

It aims to achieve a well-rounded understanding of the nature of spaces required for such a facility in order for the design to respond in an informed manner.

Figure 63 : Dora Nginza Clinic

Formulation of the Brief

The design of a hospital for the treatment of DR-TB aims to create a specialised facility where biophillic principles are utilised to create an environment that heals patients.

The Eastern Cape is in dire need of more specialised tuberculosis treatment facilities. Dora Nginza hospital precinct has been identified as a key development node within Ibhayi and the greater Port Elizabeth. Ibhayi is one of the worst affected areas when it comes to tuberculosis in Port Elizabeth yet Dora Nginza hospital does not have the facilities to treat the infected patients. This provides an opportunity to connect to the existing hospital and provide a specialised facility that treats and monitors patients with DR-TB.
Nelson Mandela University is currently constructing a medical campus on the same precinct. This provides an opportunity to link with the educational campus and provide training to students in the specialised requirements of MDR-TB treatment.

This facility is integrated within the larger urban precinct yet remains physically isolated in order to reduce a contamination risk and to give the building hierarchical importance.

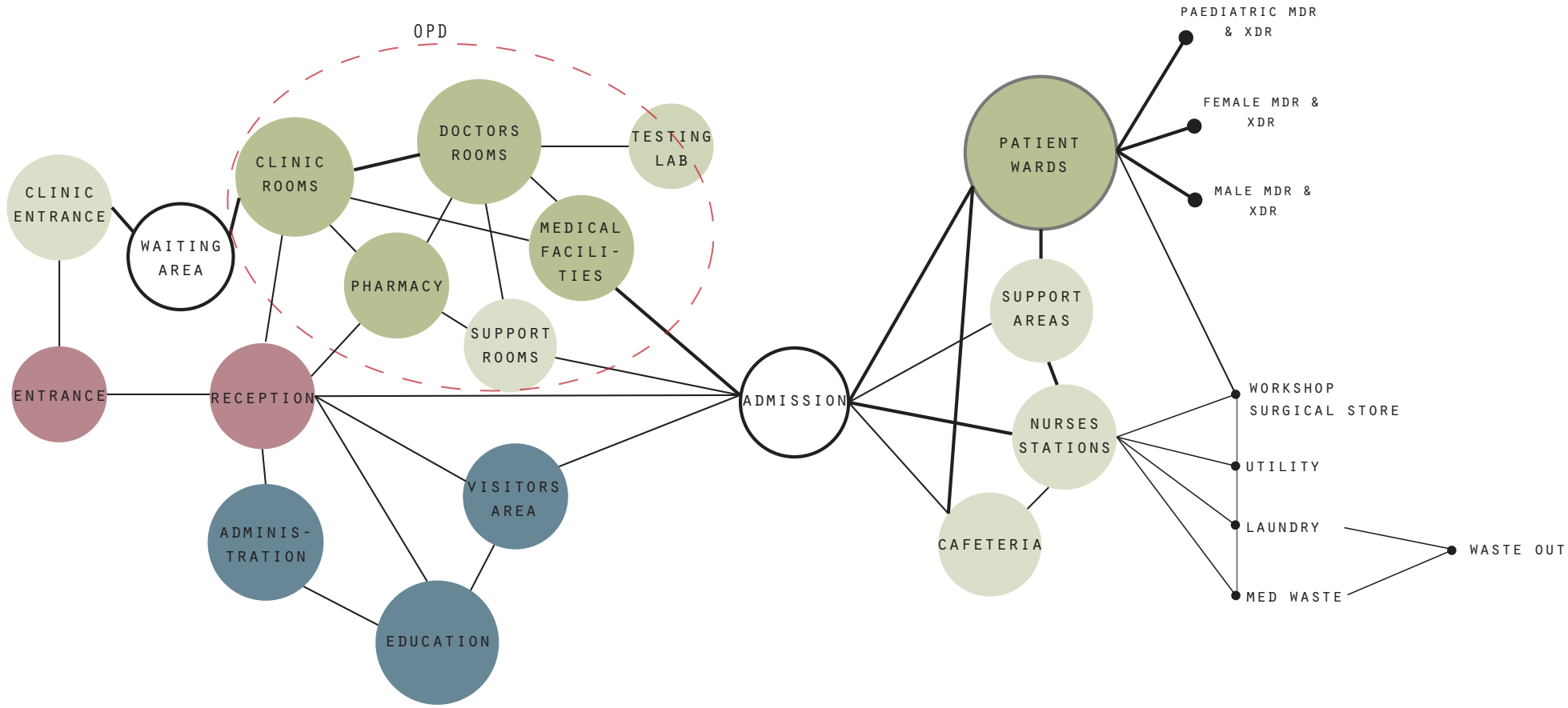


Figure 64 : Building programme web

Programme

This building programme is created around four categories of users; patients, staff, visitors and services. Those are the four core areas of this design and to design around the flows and requirements of the users. This diagram is showing the direct links between spaces and the importance and significance due to thickness and size.

Red: General public/visitors

Green: Patients and staff

(representing health)

No colour : Services

Blue: Admin/education

Accommodation Schedule

General Areas

- Reception area	60m²
- Records room	10m²
- Server room	5m²
- Store	5m²
- Wheelchair store	5m²
- Ablutions	50m²
- Managers office	15m²
- Security room	12m²
- Visitors area	20m²
Total	**182m²**

Administration/Education

- Managers offices	60m²
- Research space	50m²
- Board rooms	45m²
- Ablutions	40m²
- Kitchenette	12m²
- IT office	10m²
- Maintenance store	5m²
- General storage	5m²
- Break room	30m²
Total	**257m²**

Clinic (OPD)

- DOT room	30m²
- Doctors rooms	15m²
- Nurses rooms	10m²
- X-ray room	25m²
- Audiology room	15m²
- Therapy room	20m²
- Counseling room	12m²
- Testing laboratory	60m²
- Store	5m²
- Office	15m²
- Ablutions	60m²
- Store room	8m²
- Sluice room	10m²
- Admissions	25m²
- Pharmacy	40m²
- Store	20m²
- Office	15m²
- Covered waiting area	60m²
Total	**445m²**

Patient Wards

- MDR-TB wards	
- Male	600m²
- Female	540m²
- Paed	360m²
- XDR-TB wards	
- Male	360m²
- Female	360m²
- Paed	240m²
- Isolation Rooms	120m²

- Store rooms	150m^2
- Nurses stations	200m^2
- Leisure areas	250m^2
- Courtyard spaces	400m^2
Total	**3580m^2**

Patient General

- Therapy rooms	60m^2
- Patient cafeteria	150m^2
- Dietitian office	15m^2
- Kitchen	90m^2
- Food store	15m^2
- Cold room	10m^2
- Kitchen office	12m^2
Total	**352m^2**

Nurse Area

- Changing rooms	100m^2
- Ablutions	100m^2
- Store room	20m^2
- Kitchenette	15m^2
- Lounge	30m^2
Total	**265m^2**

Services

- HVAC room	110m^2
- Medical waste room	40m^2
- System room	20m^2
- Incoming store	60m^2
- Workshop	150m^2
- Store rooms	30m^2
- Ablutions	40m^2
- Laundry room	60m^2
Total	**510m^2**

Overall Total	**5591m^2**

MDR-TB Requirements

In order to understand the nature of the spaces to be created and the specific requirements that MDR-TB has, leads to the need for spaces to be designed in order to accommodate their specific needs.

On arrival at the facility, users will enter through two entrances, one is for nurses, visitors and staff and the other is for the clinic patients seeking treatment or testing. Circulation of air is important as are the thresholds created to restrict access where necessary. The clinic has multiple aspects from outdoor covered waiting areas to specific doctors' rooms with sputum booth areas as well as on-site lab testing facilities to increase output of TB results allowing for efficiency in getting individuals admitted if infected.

Once patients have been admitted to the facility they will be placed in one of the ward rooms suitable to their gender and strain of DR-TB. The interaction between the wards and leisure areas as well as outdoor spaces is of great importance as it breaks down the feeling of incarceration.

Through this discussion, multiple spaces have been identified as specifically important. They will be explored to create an informed design.

Clinic (Old patient department)

Doctors Room

The day clinic aspect of this development has its own entrance on two sides. One connects to the hospital for patient transfer and the main entrance is for those seeking treatment or diagnosis of tuberculosis. This section houses doctors rooms, therapy rooms, x-ray rooms, audiology rooms and laboratory testing facilities. The doctors rooms are for consultations and test with the necessary sputum booths that are outside. These rooms require specific ventilation and UV lighting to combat the spread of DR-TB. In these doctors rooms there needs to be an extractor vent above where the patient sits and an air outlet where the doctor sits to extract the contaminated air and replace it with fresh air above the doctor. UV lighting is required as it is another form of defense as it kills the disease.

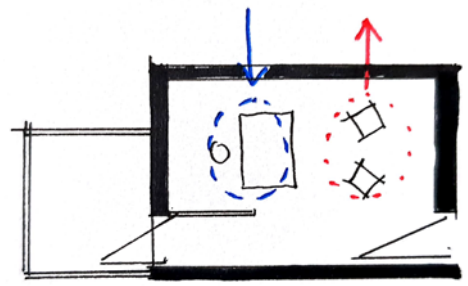


Figure 65 : Doctors room layout

The floors need to be impermeable as to not gather dirt and diseases. This surface is also much easier to clean.

Pharmacy

This space needs to be highly accessible from the clinic and the rest of the hospitals. This space requires locked storage that is temperature controlled for the medicine. Space needs to be considered for dispensing of these drugs to the relevant nurses for distribution. Main storage is however in the main hospital pharmacy at Dora Nginza.

Figure 66 : Pharmacy

Testing Laboratory

This is where the Tuberculosis samples are sent to be tested to see if they have DR-TB and which drugs they would be immune to. This is a highly controlled environment. All surfaces need to be impermeable with the relevant equipment to carry out the testing. Storage facilities and an office need to be provided for the doctors. The doors require seals as well as ventilation that extracts and provides new clean air. The temperature control is separate to the rest of the clinic as very specific temperatures are required. This is a sealed environment.

Figure 67 : Laboratory

Wards

Male & Female wards rooms

A room for tuberculosis requires lots of light and fresh air. The floors need to be impermeable from elements. Patients bed spaces need to be a minimum of 1.2 metres away from each other. The bathrooms need to conform to the regulations of SANS 10400 part S so persons with disabilities will be catered for. Spaces need to be provided for leisure. Each of these areas requires specific ventilation layouts and UV lights to kill spread of the airborne pathogens. All wards that have patients with different strains of DR-TB need to be separated to avoid contamination. However visual connections may still be maintained. The aim is to create a space that feels like a home.

Figure 68 : Hospital room

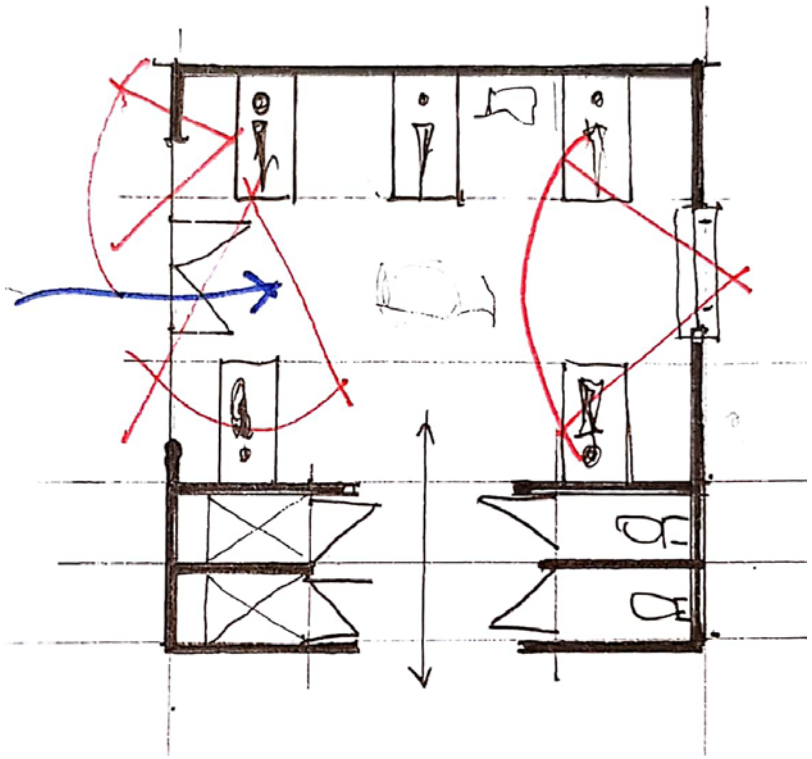


Figure 69 : Ward configuration

Courtyards

Courtyards are an important aspect of hospitals. They provide an interaction with a natural environment. The benefits for a patient with MDR-TB are high due to the fact that sunlight helps kill the disease, an interaction with these spaces allows the patients to feel less isolated. They provide a space to play or interact. The materials are either grass or timber decking with trees and other natural elements. Places to sit and rest are important in these places as well as shading devices. These spaces are important as they provide an alternative space to the wards.

Figure 70 : Planted Courtyard

Mechanical & Medical Waste Services

These services are vital to the operation of the hospital. Hence they must run efficiently to prevent disease contamination and the spread of it. In order for these mechanical systems to be incorporated throughout the hospital, spaces and voids of suitable size need to be provided to accommodate them.

The location of these plant rooms needs to be accessible to the outside for maintenance and removal of waste but away from the typical occupants of the building. At the same time they need to be enclosed and secure with sufficient space to house all the necessary machinery.

The HVAC (heating, ventilating and cooling) systems are of utmost necessity in these specialised hospitals as TB is an airborne disease. The HVAC systems need to provide clean air to spaces while removing contaminated air at the same time in order to maintain a healthy environment. Temperature control is important for patient comfort but it must be sufficiently cool in order for the disease not to multiply. Certain dedicated units may be required in specific spaces. This system needs to then discharge the contaminated air into an appropriate area away from other facilities.

Figure 71 : HVAC Room

Figure 72 : Medical Waste illustration

Medical Waste

Medical waste needs to be handled and removed with care. The different kinds of waste need to be clearly stored in different spaces and containers. The waste is then removed and burnt off site. Non-contaminated waste will be collected and recycled. These spaces need to be accessible from the service yard but separate from other sections in order for the waste to be collected but closed off in order to avoid contamination. Sluice machines will be used throughout the hospital to collect waste which will then be transported to the medical waste room.

Technical Strategies

Hospital designs have technically many regulations regarding materials and spaces. These strict regulations may affect the ability to create biophilic spaces that are required. Through these technical strategies, aspects will be explored in order to gain insight into how they may be used in a medical architecture environment.

Structural System

Concrete framed structures have been identified as the most suitable for the project. They provide an efficient use of materials for a large building and provide flexibility within spaces due to their large spans. Concrete's thermal properties are favoured in this instance. Due to the concrete's high thermal mass it contributes to the patient's need for a comfortable environment temperature. The large voids that concrete flooring allows provide space for all the mechanical hardware such as cabling and HVAC systems to run neatly through the building.

The in-fill structure will utilise clay bricks which are sourced in Port Elizabeth and then plastered and painted, or clad in a steel or timber material.

This structure aims to reduce energy consumption within the envelope and to improve the thermal comfort within the building which improves the overall wellness of the environment.

Materiality

The physical materiality of the building's appearance will tie in with materials that have been used throughout the hospital precinct which are common throughout the area. The materials will look to respond to the environment it is in.

The materials used tie into the biophilic principles discussed earlier; the visual appeal and their feel, evoke a sense of the outdoors. Concrete and timber represent natural materials while painted green walls and planted areas add to the concept. Steel sheeting and cladding

will be utilised to tie in with the existing hospital as well as the low socio-economic area surrounding the hospital which mainly uses steel sheeting. This material emphasises a lack of permanence and lightness. Glass as the main element within the interior of the hospital used as thresholds or barriers serves to maintain visual connection and interaction with the outdoors. This material isolates natural elements while maintaining the visual environmental connection.

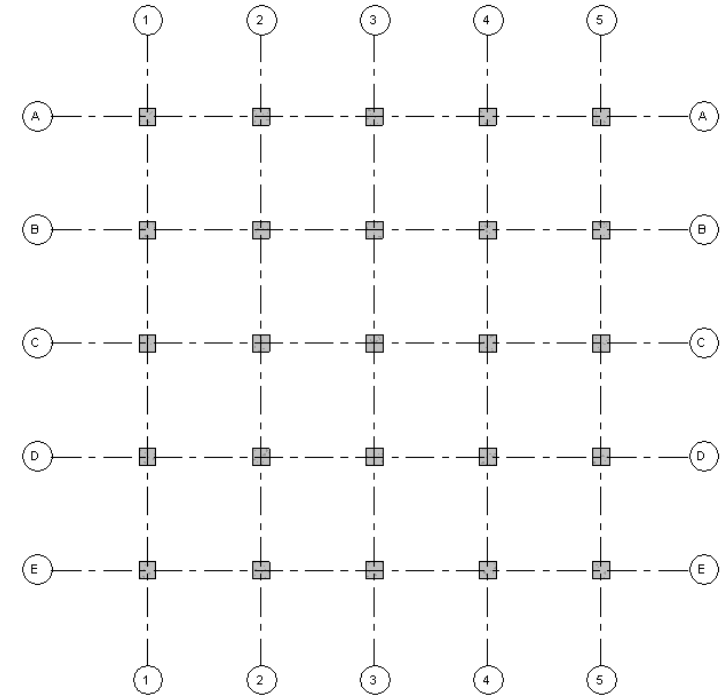
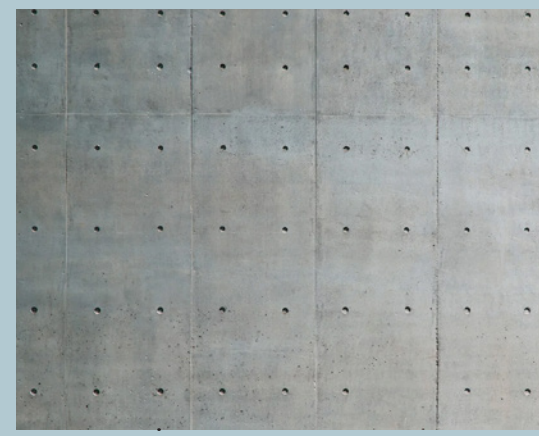


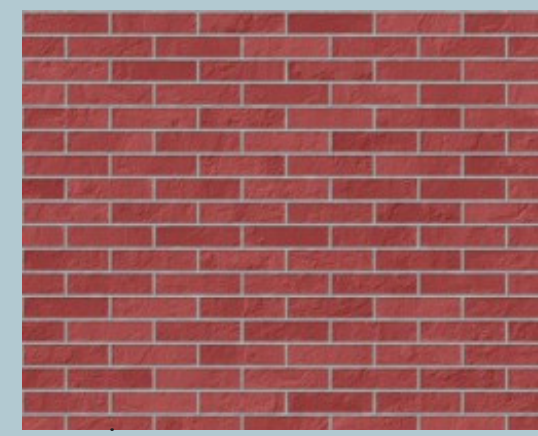
Figure 73 : Column grid

Figure 74 : Concrete



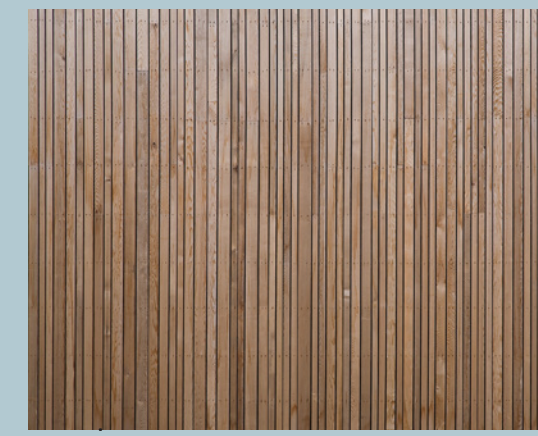
Concrete is the main structural material in the development. Its natural material composition makes it part of the earth and relates it to the landscape. It is being utilised for its thermal properties and its represention of a sense of permanence too.

Figure 75 : Clay bricks



Clay brick is the in-fill material used as walling throughout the project. This is a natural material found in the Port Elizabeth area. The hospital is of exposed face-brick as this material relates to the existing context yet when plastered it stands alone as something new creating its own identity while still acknowledging the existing structures.

Figure 76 : Timber

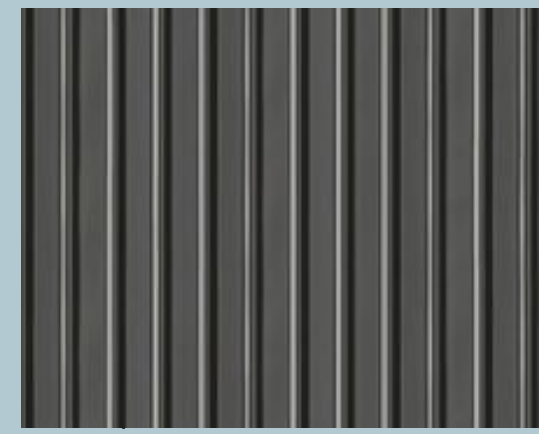


Natural timber will have an ornamental cladding function throughout the building. This material reinforces the connection to earth while maintaining a 'softness' when used. It has beneficial acoustic qualities which reduce excess noise within spaces. The material naturally fades and weathers with time which emphasises its naturalness. It will be used for cladding, louvers and shading devices throughout the building.

Figure 77 : Glass

Glass is used throughout the building for windows, dividers and thresholds. This material allows a visual connection to nature while protecting the individuals from the elements. It provides the opportunity to incorporate light into spaces and maintain views and connections to multiple spaces, thus breaking down the sense of isolation while being isolated.

Figure 78 : Steel cladding



Steel cladding and roofing materials will be used throughout. This material relates to the industrial and residential parts of the surrounding areas where the material is mostly used. This material is long lasting and durable yet has a sense of lightness and non-permanence. It stands alone while still relating to the existing sections and materials of the hospital.

Figure 79 : Green wall

Green walls/natural planting are incorporated in the interior and exterior of the building throughout the courtyards and in meeting spaces. Green walls and roofs provide interaction directly with nature as does natural planting which improves the air quality within spaces too.

Passive Design Aspects

Passive and sustainable design principles are to be used throughout the facility. Natural ventilation and lighting is to be incorporated as much as possible in order to help combat disease, create a comfortable environment and increase the energy efficiency of the building. In order to let in light, skylights, clerestory glazing and light shelves will be utilised to bring in south and north light where required. Adjustable shading devices on the west and north elevations will be used in order to avoid excess solar heat gain. Rainwater is to be collected and stored on site and reused as greywater throughout the building. Hot and cold-water piping is run through the floors of the slabs in the wards to provide heating and cooling when required. Through these passive strategies one looks to reduce the ecological footprint and provide a more sustainable hospital environment for the users.

Light Shelves

Light shelves will be used in order for light to penetrate deeper into a space. The position of the light shelf can effect how much light penetrates and where it penetrates. This will be determined based on the space it is serving.

Clerestory

When bringing light into a space it is not always possible to introduce it through a window so clerestory's and skylights can be utilised to bring in direct or indirect light when required. This also provides design opportunities for architecture to create the necessary environments. South lighting and north lighting will be utilised within spaces and to bring in light on multiple levels.

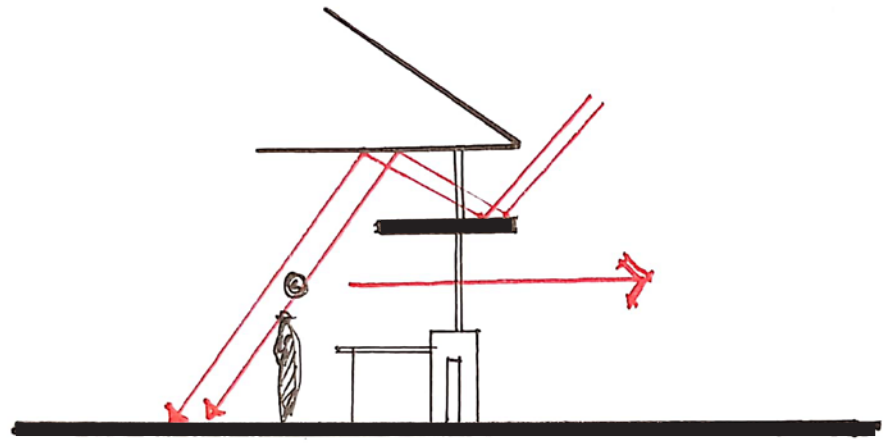


Figure 80 : Light Shelves

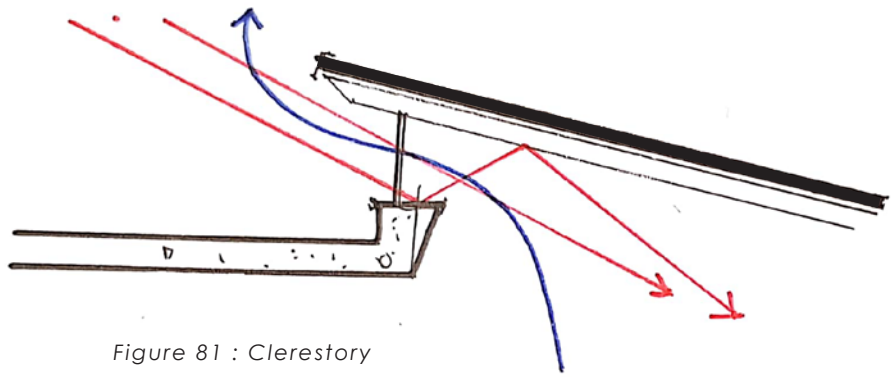


Figure 81 : Clerestory

Conclusion

Through the interrogation of the programme and technical strategy understanding the nature of space and the requirements of DR-TB it is identified that a tuberculosis hospital is different form other medical institutions.

These technical investigations informed an understanding of what is required for a drug resistant tuberculosis hospital and that the spaces required are very specific to the users requirements.

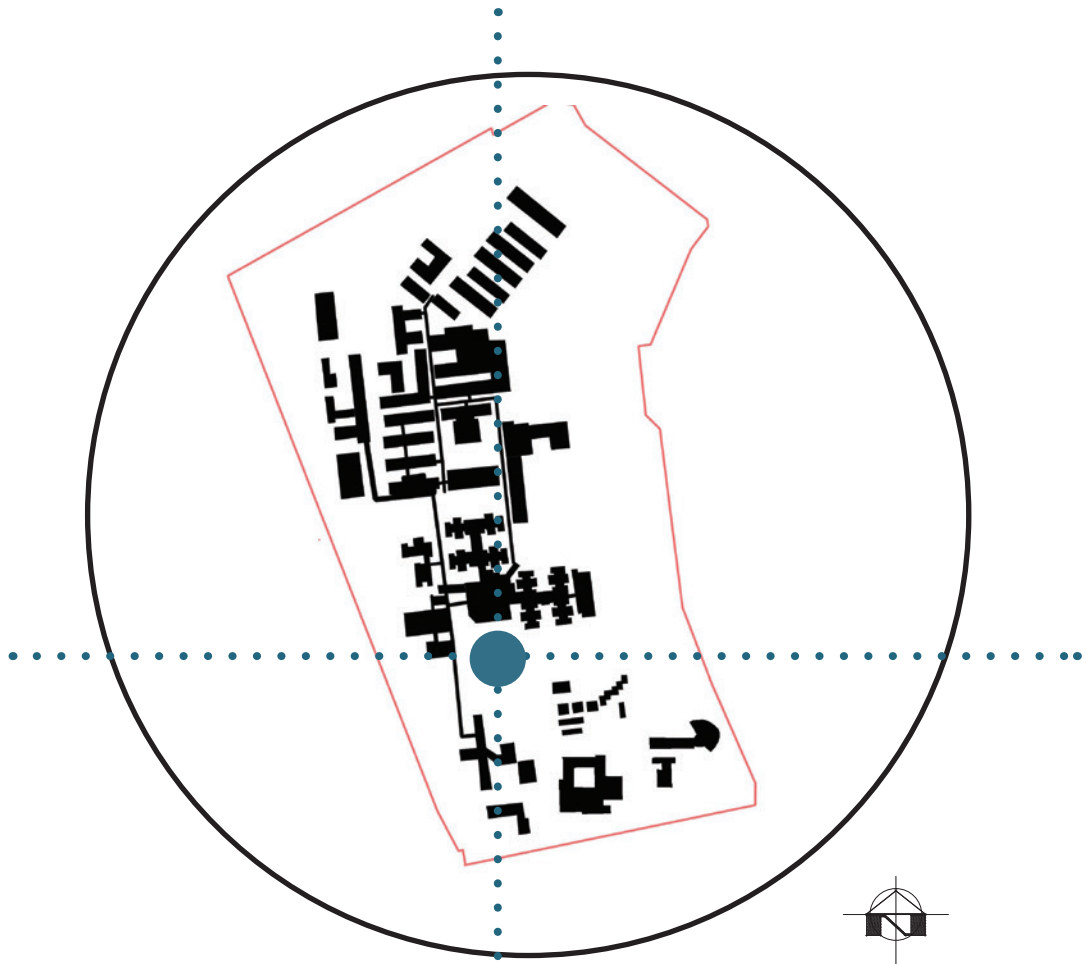


Figure 83 : Site Selection

Figure 82 : Dora Nginza walkway 02

Site Analysis

This chosen site is a response to all the factors that have been discussed throughout the document thus far. This site provides the opportunity for a hospital that treats DR-TB. It forms part of the larger hospital precinct and strengthens the existing facilities. Through this it benefits the community through the treating of tuberculosis which is rife in the area. It aims to provide a link to the new NMU medical school through the practical training of doctors and nurses for the requirements of DR-TB. By responding to the existing scale of the hospital, it provides the opportunity for architecture to create positive environments within the precinct. This project looks to be catalytic within the hospital precinct in order for more awareness to be raised about the benefits of better facilities, thus leading to the rejuvenation of the existing hospital.

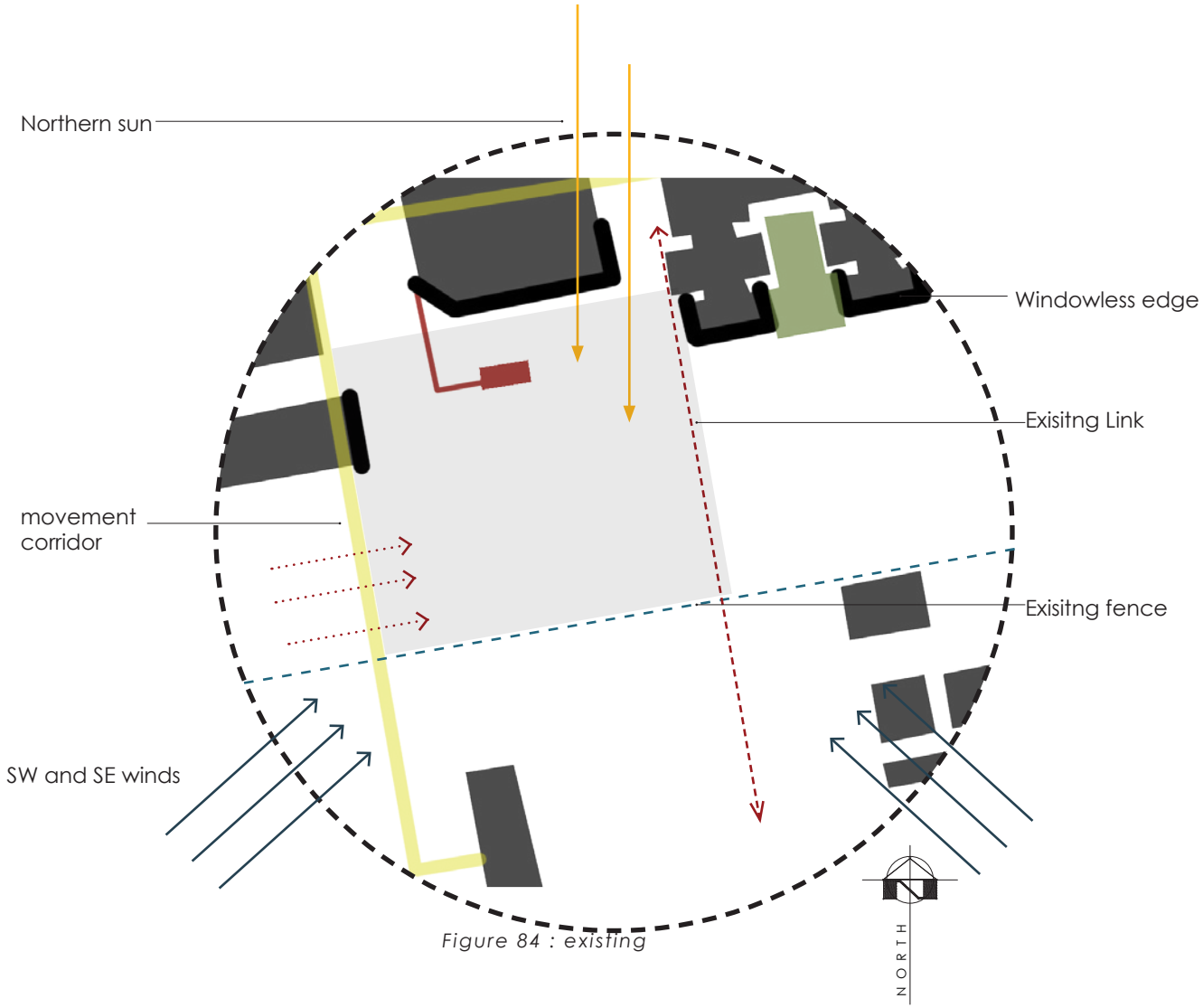


Figure 84 : existing

The chosen site area has multiple existing features and constraints. The site faces the back edge of the administration block and patient wards. There are existing pathways showing pedestrian and vehicular movement across the site. The site is enclosed on two sides, the one side is partially enclosed due to overhead walkway which provides access underneath at human scale. There are existing service tanks on the site as well as a fence separating the doctors accommodation and subsequently the new developments from the rest of the hospital precinct.

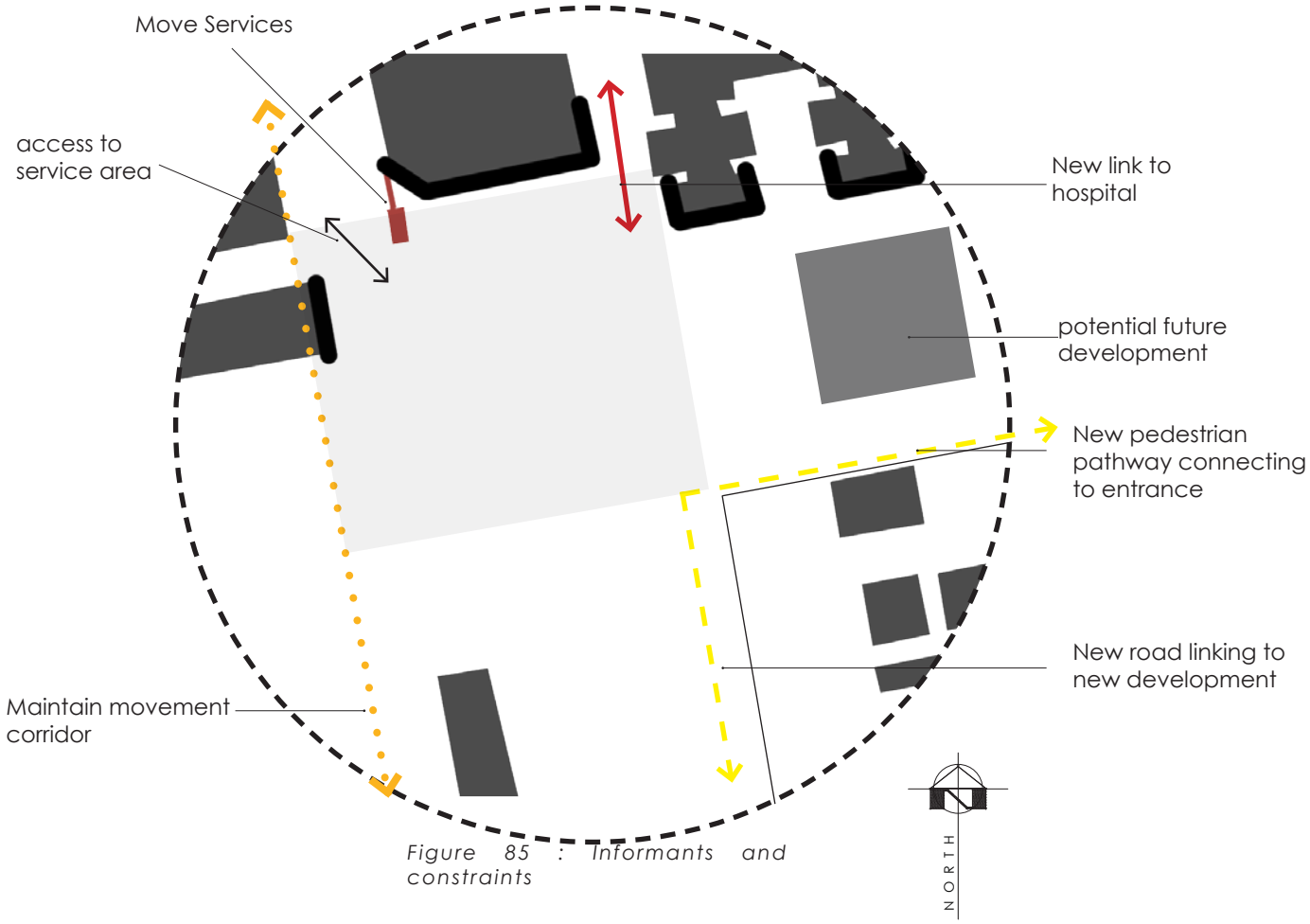


Figure 85 : Informants and constraints

This diagram illustrates the new possibilities and informants on the site. There is a possible link to the existing movement corridor in the hospital to the site which will provide an opportunity for patient transfer. The rear of the site is closed off to the harsh edge of the existing building which provides the opportunity to open up to the existing service yard. A new road which flows underneath the permeable walkway looks to link the existing hospital to the medical school and breaks down the physical fence barrier. A buffer area between the site and possible future development would be suitable for leisure/sports facilities which would be a zone of activity and interaction.

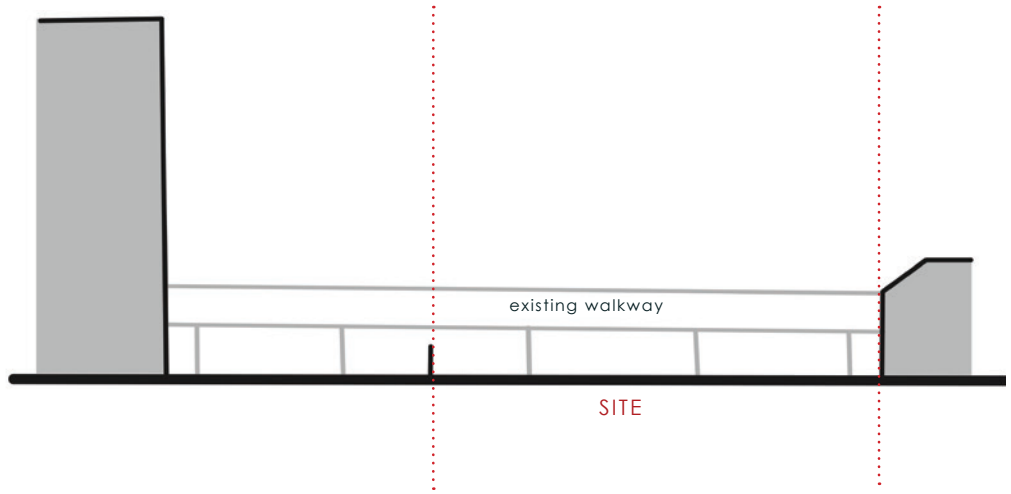


Figure 86 : Site Section

This site section illustrates the scale difference on the site. The main hospital buildings are two storeys high whereas the doctors accommodation is seven storeys high. The site is between these to scales. The design aims to respond to each scale and bridge the gap between the two and create a contextually sensitive fit.

Conclusion

An interrogation of the site through the understanding and development of the constraints and informants which serve to inform the design.

The nature of the hospital needed to be considered in order to come to an understanding of the site. These outcomes further enhance the design criteria and justification for the treatise building.

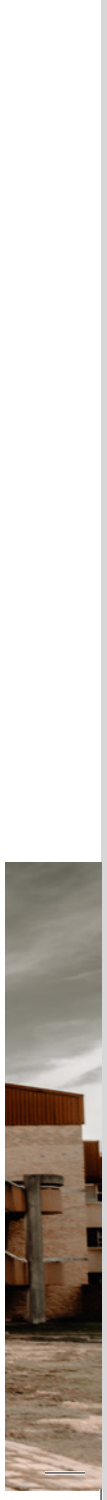


Figure 87 : Dora Nginza Fire Escape

Chapter 06

[DESIGN DEVELOPMENT]

Introduction

This section deals with the concept design drawings that show a response to the sites constraints and informants and outline the design strategy.

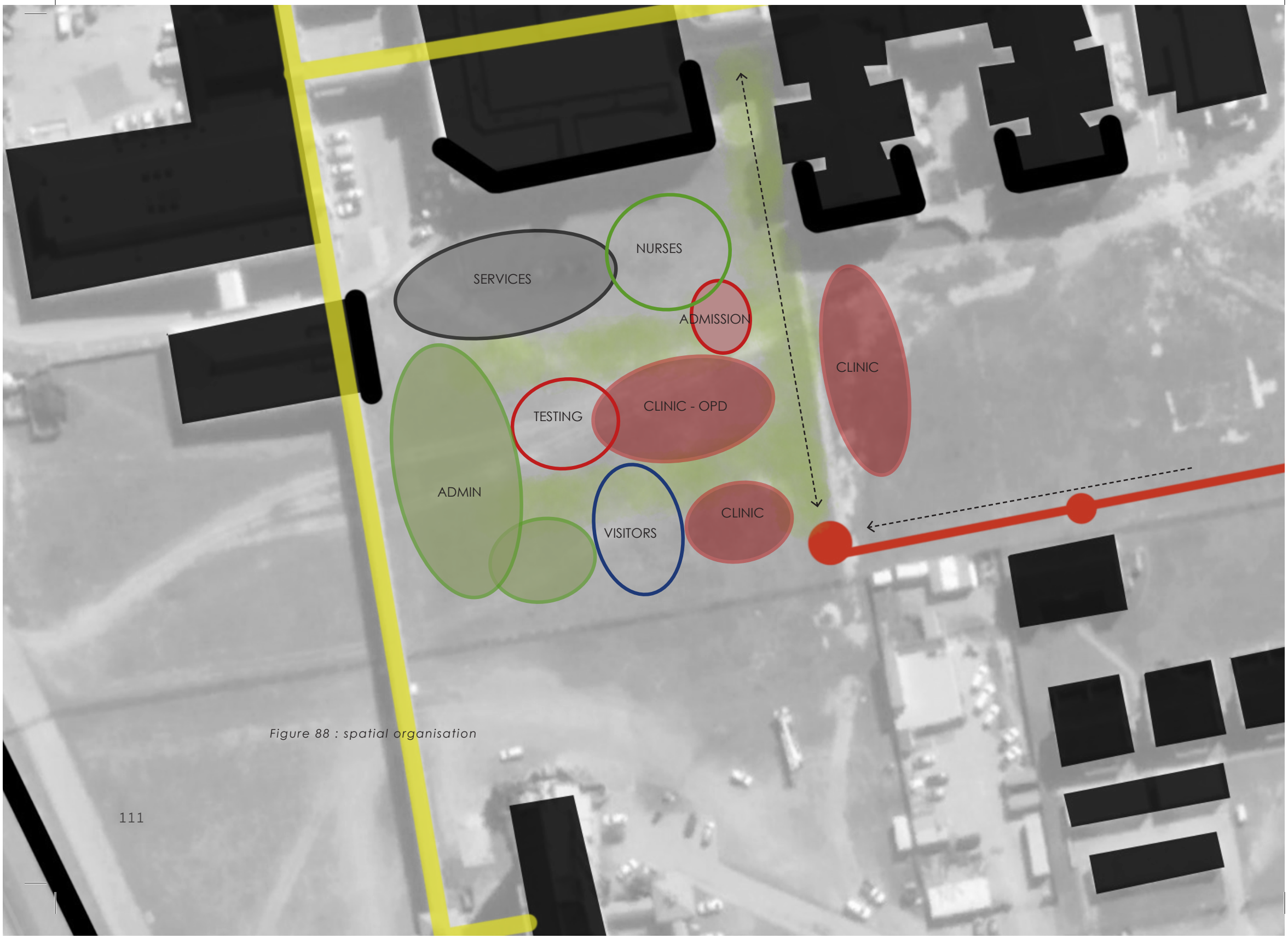


Figure 88 : spatial organisation

Concept Design

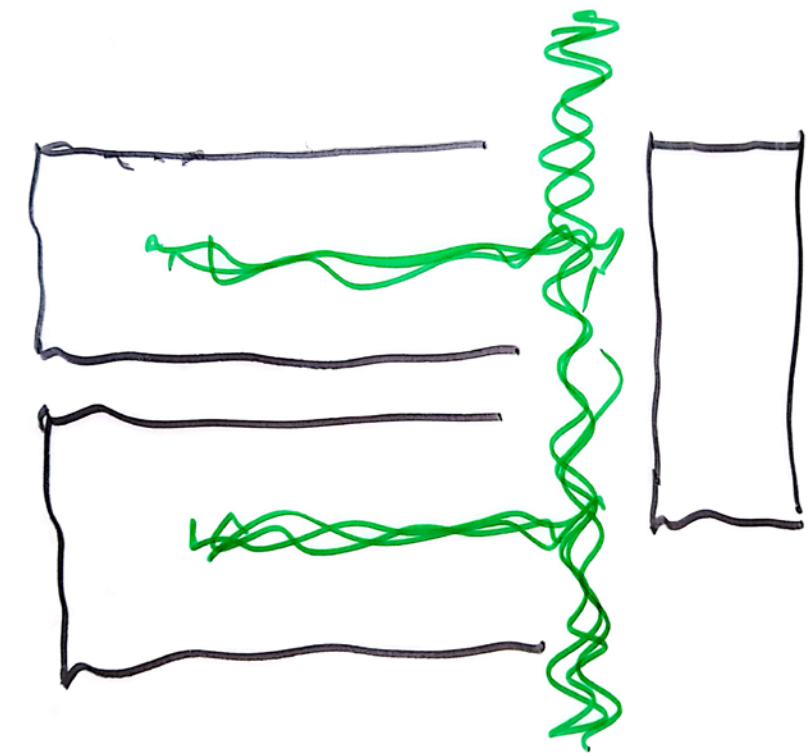
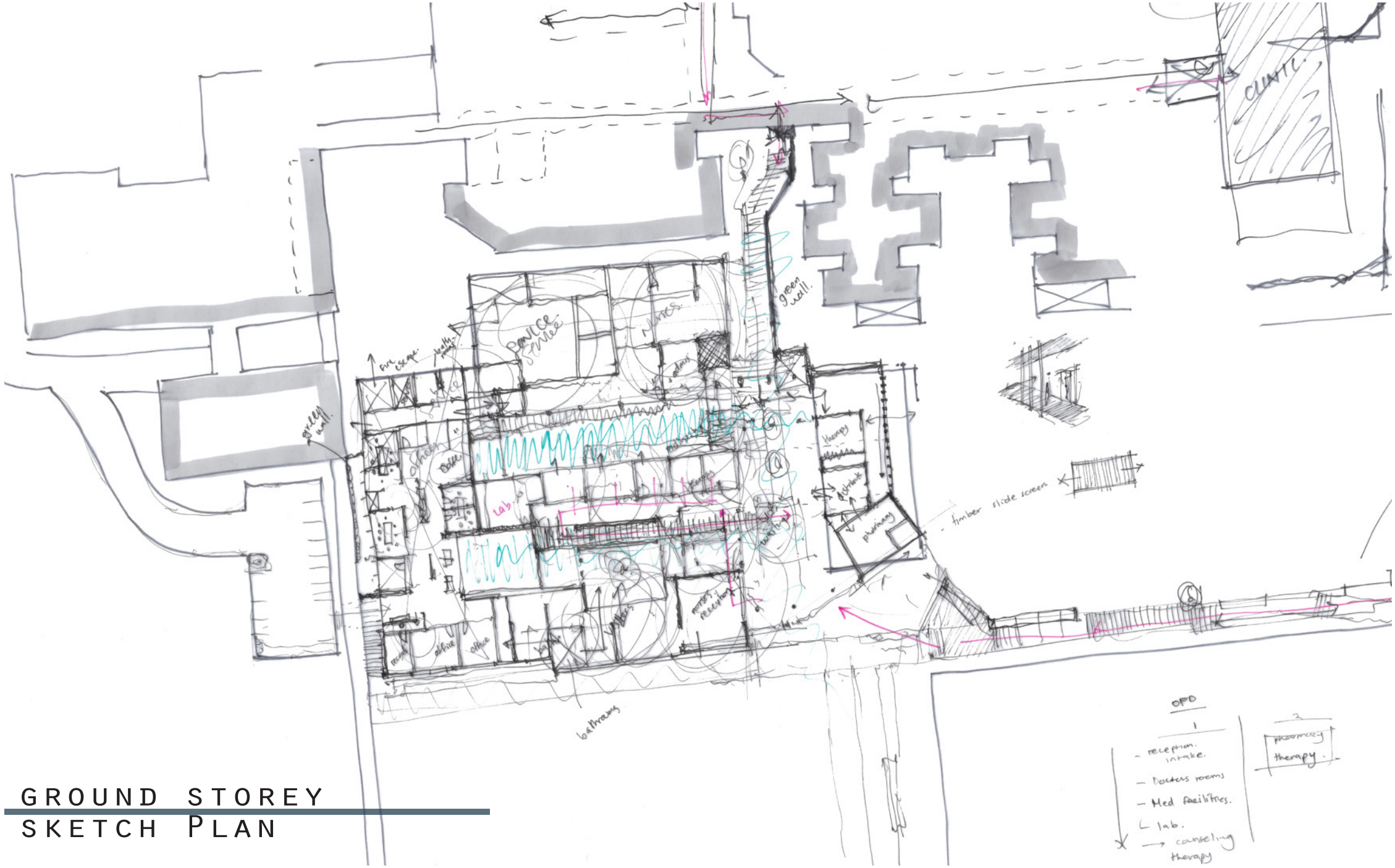


Figure 89 : Coutyard Diagram

The initial planning concept is looking to create a building that is stand alone and isolated in nature yet opens up to create healing spaces on the interior for the long stay patients. It primarily is designed around three large courtyards that vary in privacy and accessibility. These courtyards provide light and air into spaces which help combat the spread of disease while maintaining a link to the natural environment. This design needs to respond to the existing buildings surrounding it and responding to the existing edge conditions. The more public aspects of the building are closer towards the south side where the entrance is, towards the more private which then connects to the existing hospital building. This is a building of one front one side and two backs as it closes itself off towards the hard edges of the existing buildings. The new pedestrian walkway aims to link this facility to the main movement network of the hospital as well as linking to the existing transport systems in area.

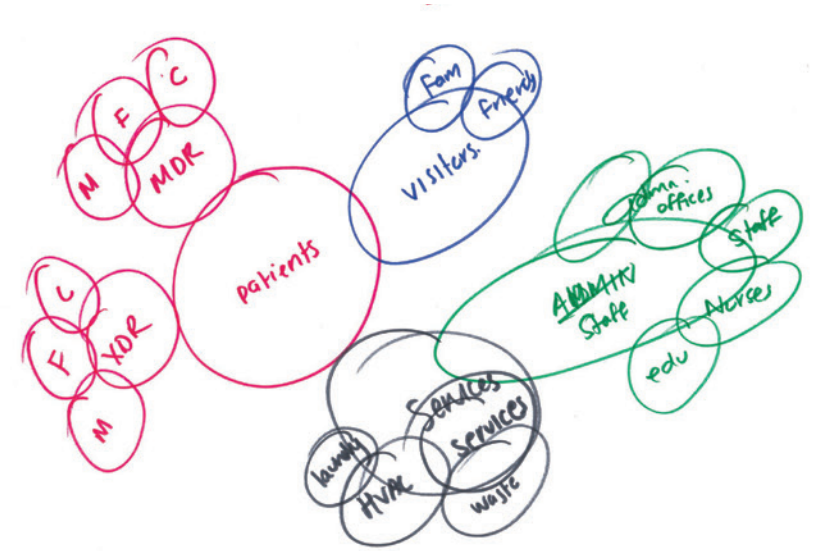


GROUND STOREY
SKETCH PLAN

The spatial layout of the building is creating spaces by layering thresholds. These need to control and dictate were users can and cannot go to avoid contamination. The building has been designed around 4 main user groups:

- Patients
- Staff
- Visitors
- Services

Multiple courtyard and inside outside spaces are to be utilised to create a constant engagement with the natural environment. The management of movement is managed through main axis routes that are set up by the large courtyard spaces, which provides open air spaces for patients as well as spaces for new patients waiting to seek testing. The design maintains and formalises the link to the main ward of the existing hospital for patient transfer and for access for doctors and nurses when neccesary. The spatial layout looks to break down the sense of isolation through the architectural design response. and to form part of the integrated hospital network.



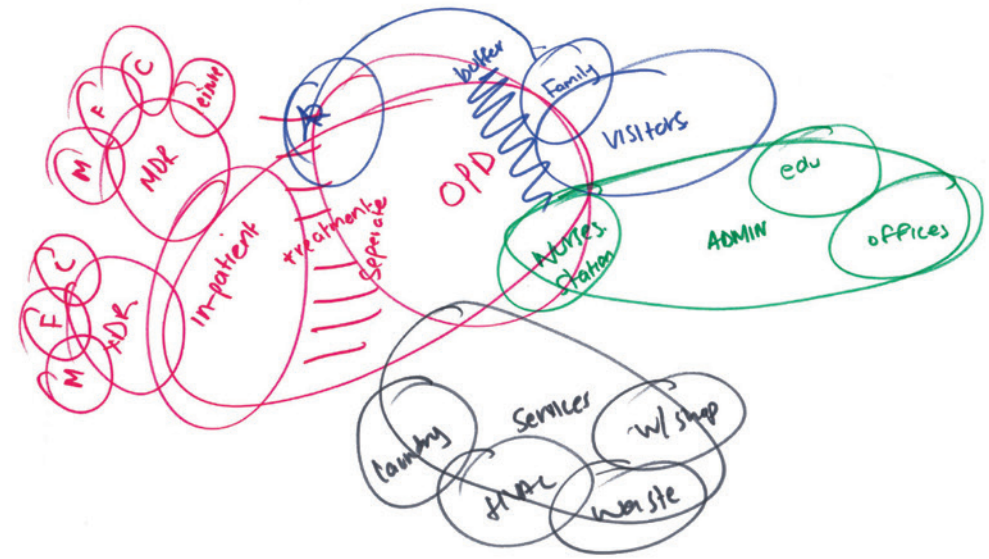


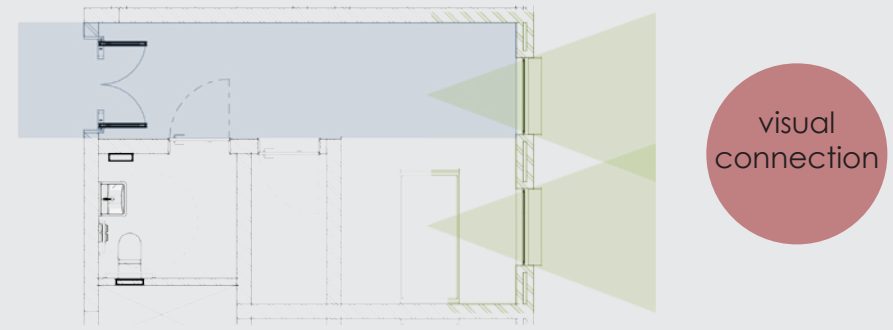
Figure 90 : user group diagrams

GROUND STOREY PLAN

SCALE 1:200

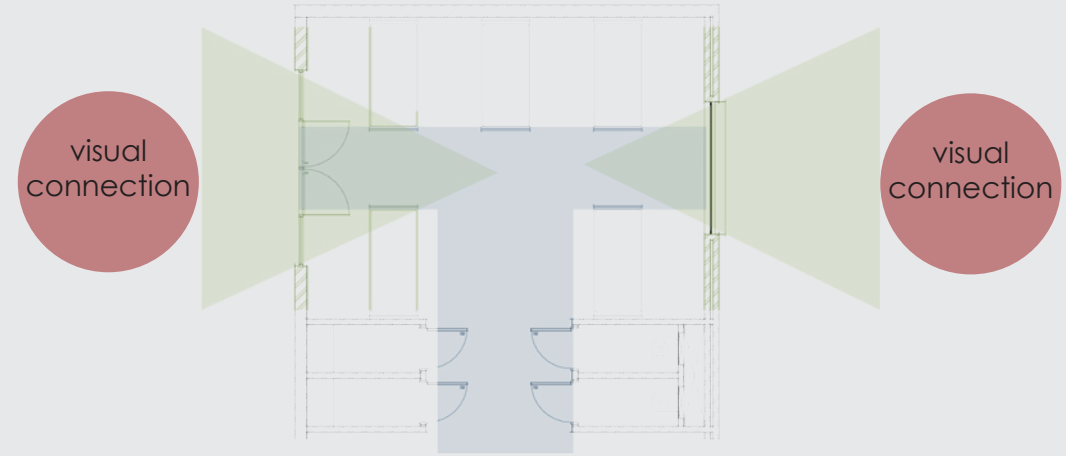
The ground storey plan consists of 3 main courtyards that function as spines that split certain parts of the building due to function. The main spinal courtyard is a public courtyard that acts as outdoor waiting areas for OPD patients to receive treatment as well as receive treatment. All of this is exposed to natural airflow to reduce the risk of disease contamination. If a patient tests positive for MDR-TB or XDR-TB they are then admitted to the wards which are on the first storey and higher. All public and administrative functions take place on the ground storey. The entrance is linked to a pedestrian walkway which links to the main hospital entrance as well as the existing path that pedestrians take from the taxi drop off point as the majority of patients travel by walking. The building is a stand-alone element yet aims to tie into the scale of the existing hospital and form as an extension to the overall hospital precinct.

The diagram on the right illustrates two different ward layouts. Firstly, the isolation ward is for serious cases where patient isolation is required for a certain period of time. Secondly, the 5-bed wards which were decided on due to the reasoning that the disease causes isolation psychologically and removes people from community. Therefore, through being in contact with other individuals encourages a sense of community and builds relationships which can promote healing.



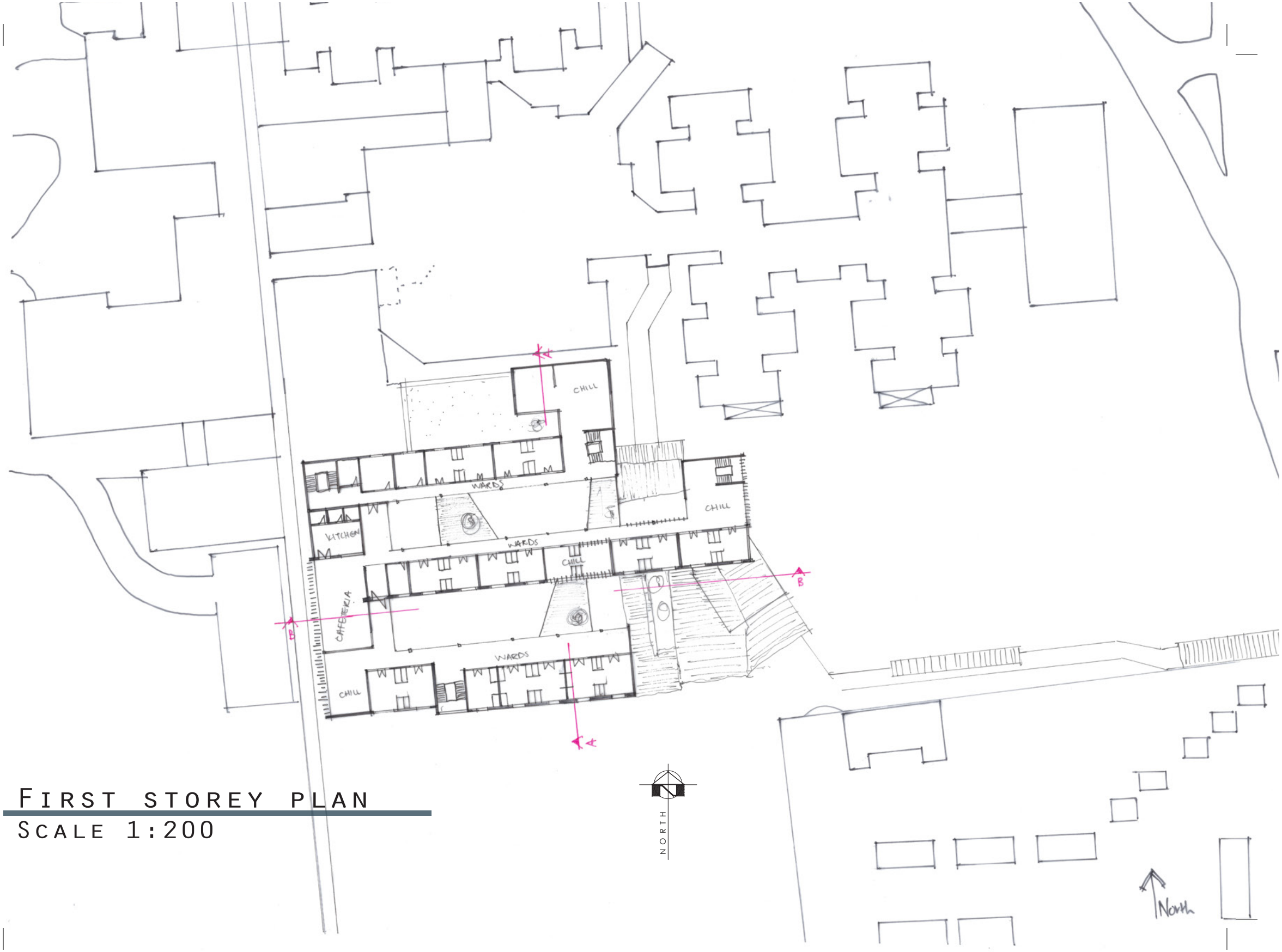
Isolation Ward Layout

Figure 91 : ward layout 01



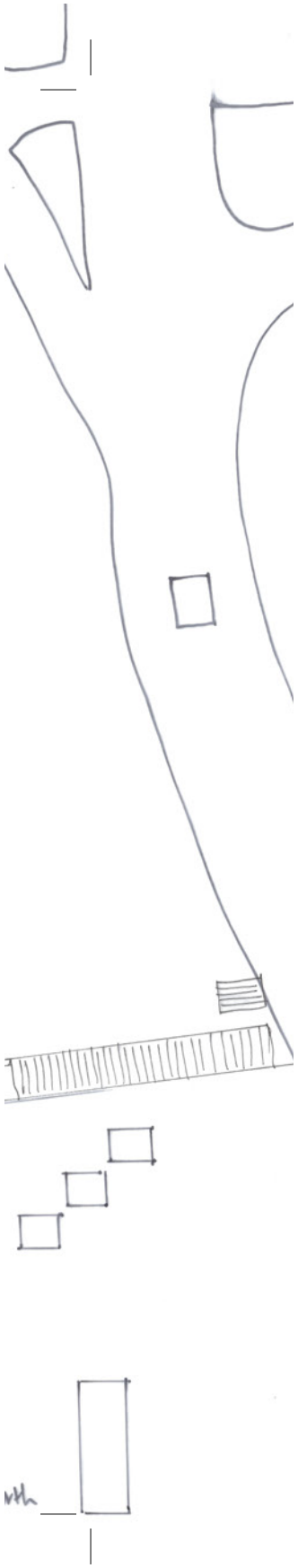
5-Bed Ward Layout

Figure 92 : ward layout 02



First storey plan

Scale 1:200



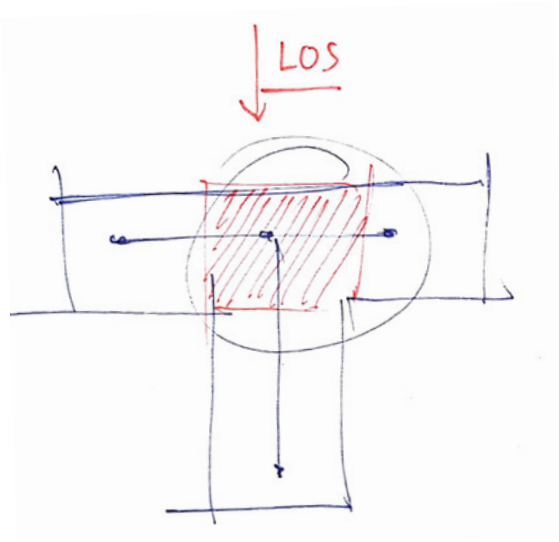
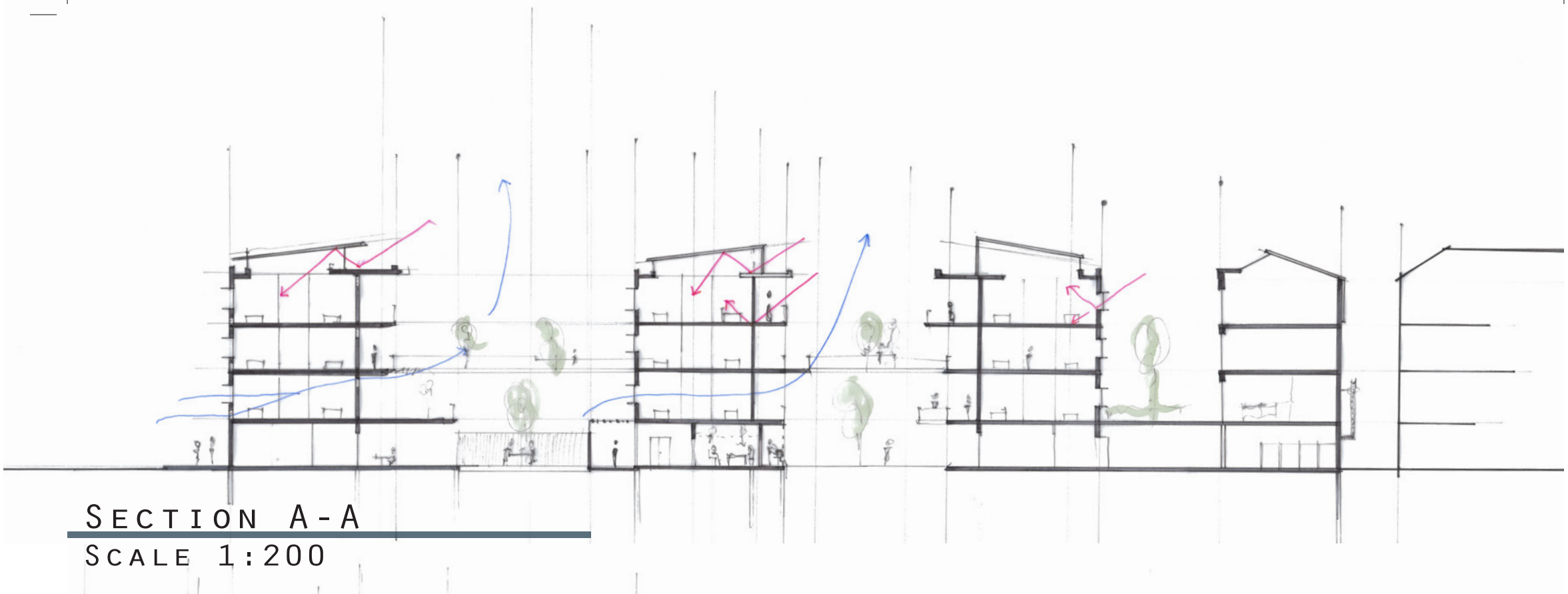


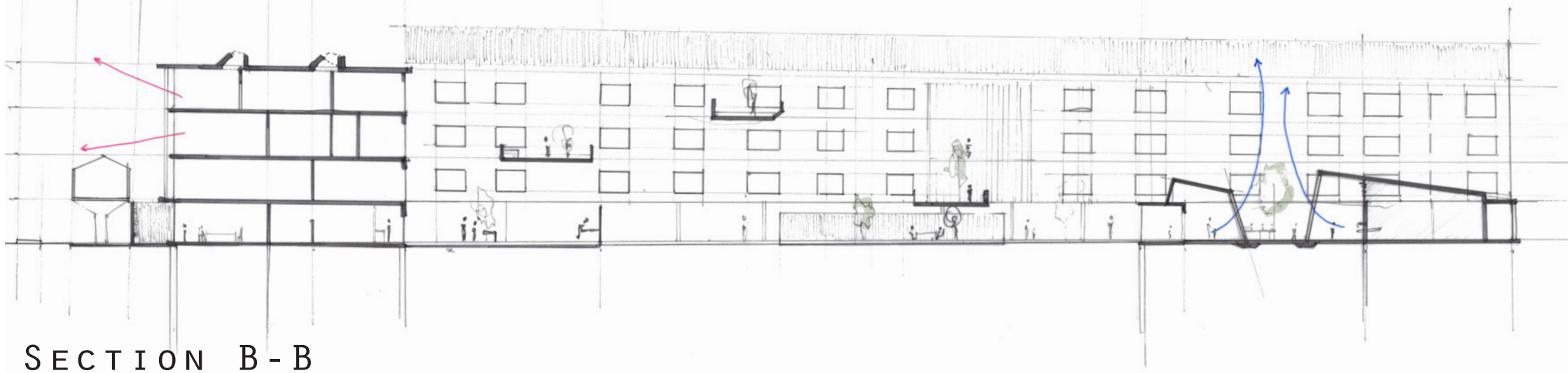
Figure 93 : Line of sight diagram

The First storey plan is focused on the in patients and creating spaces that promote wellness. These spaces are important as patients can spend 6 months to a year in the facility so the indoor environmental quality is of utmost importance. The plan utilises 3 ward wings as patients need to be separated due to biological sex and strand of tuberculosis. Large "relax" zones are important as this provides an alternate area for patients to spend time outside of their ward room. The layout aims to incorporate as much direct and indirect light as possible as sunlight is proven to combat the disease as well as natural air ventilation. This helps combat the spread of disease and can save on mechanical costs where appropriate. A large dining area is provided where patients can receive daily meals at predetermined times. At all times patients have a visual or physical connection to the natural environment which helps breakdown the institutional stigma these buildings can often have. The spatial layout creates separation of people that is necessitated, yet through materials and thresholds aims to create visual links that break down the psychological sense of isolation.



Section A-A

Scale 1:200



Section B-B

Scale 1:200

Physically the building is 3 storeys high which relates to the existing hospital scale. The wards are all separated by open courtyards. The wards have large open walkway passages that connect with the outdoor and vary in size to promote different spaces that interact with the courtyard. These open spaces help open up the building to natural passive elements for better airflow and sunlight penetration. The goal is to create spaces that have institutional attributes yet does not look like an institution. But to be a highly sustainable building that creates spaces that patients want to spend time in. The aim is to create spaces that are constantly in contact with nature as this promotes a sense of healing and wellness. What needs to develop further is finding solutions on facade and materials in how break down that sense of institutionalization and to see how thresholds can be managed better to create spaces that isolate physically, while breaking down the psychological sense of isolation.

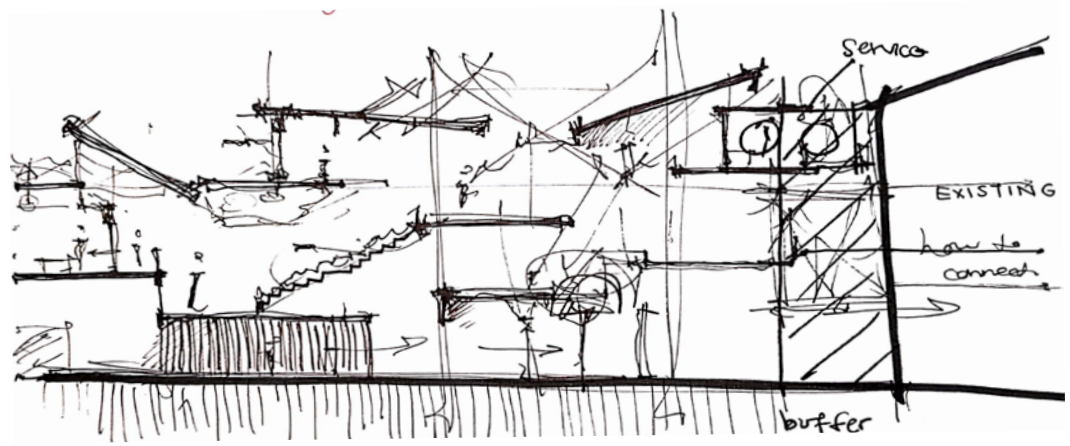


Figure 94 : section concept sketch 01

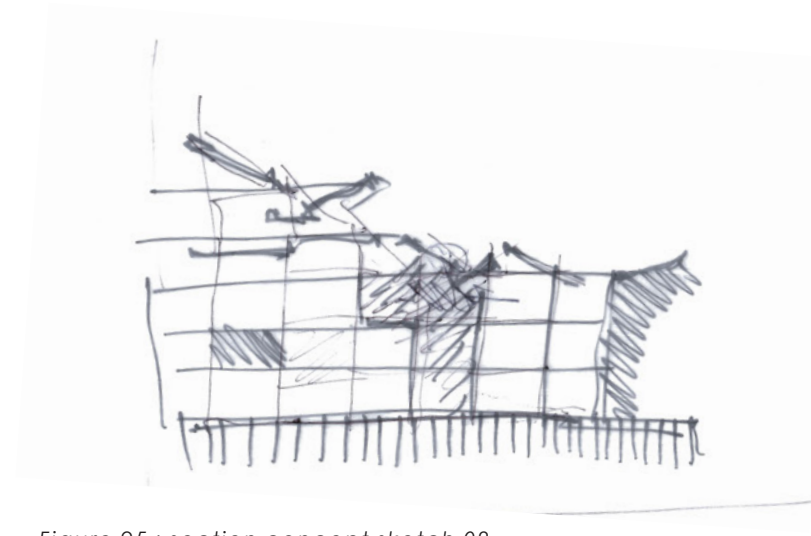


Figure 95 : section concept sketch 02

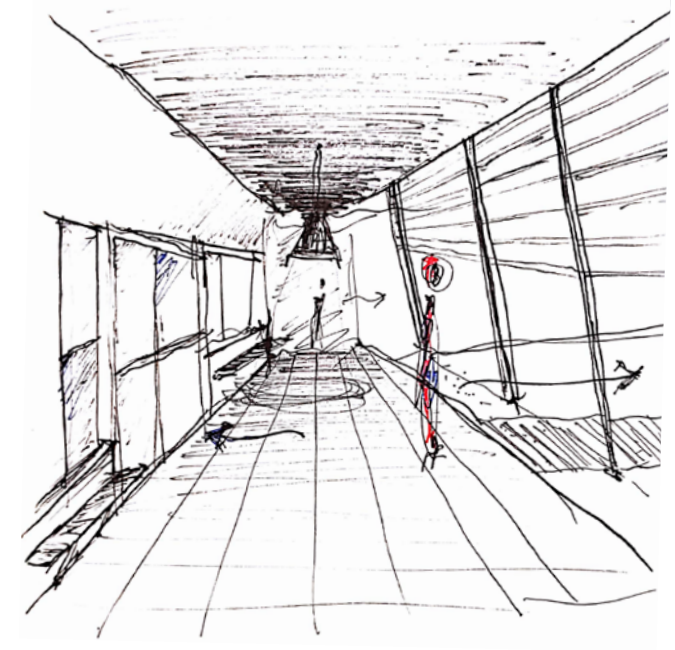


Figure 96 : walkway sketch

Chapter 07

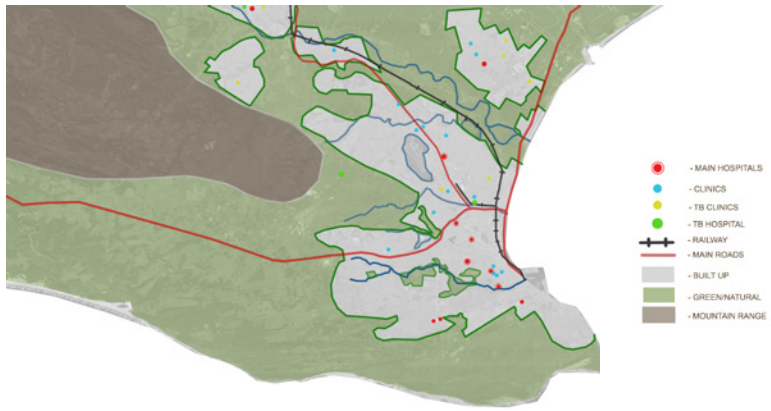
[FINAL DESIGN]

This chapter illustrates the final design presentation of the treatise as well as photographic images of the model as presented at the final examination.

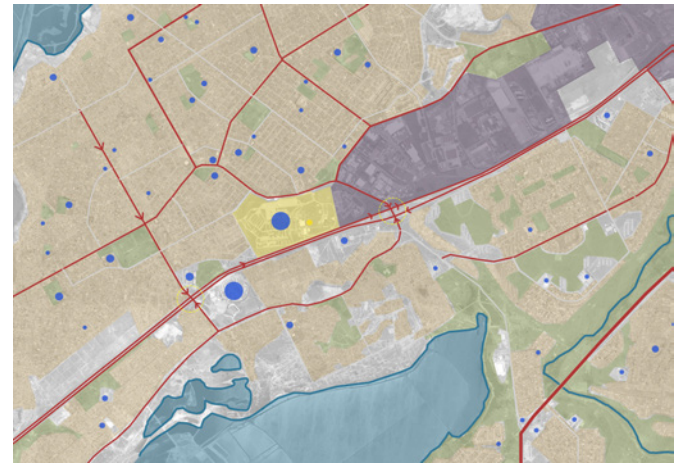
THE DESIGN OF A **HOSPITAL FOR THE TREATMENT OF DR-TB** IN IBHAYI, PORT ELIZABETH

DEVON JOHNSON S213208989

SITE ANALYSIS



The Port Elizabeth area has three tertiary state hospitals. The DR-TB hospitals and clinics in the area are all decentralised facilities, meaning that they are not part of a hospital complex and in some cases are removed completely from the community. There is a large need to have a centralised DR-TB facility that caters directly to the effected community in which it is situated. Public hospitals are a prime location due to accessibility and resources. Infected individuals seek treatment at these facilities first before being sent out to the specialised facilities on the periphery which removes patients completely and isolates them. A hospital precinct provides the opportunity to connect to the existing health care precinct and contribute to the urban community surrounding it.

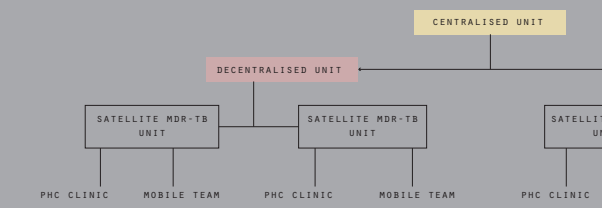


Ibhayi is in dire need of urban upliftment. Due to the low socio-economic status of the area little development happens. The majority of the area is of a dense built-up residential nature which varies from small houses to informal settlements. There is also a large commercial zone which is where a majority of the population work.

The hospital is located along Uitenhage Road which is a main connector between Port Elizabeth and Uitenhage. It is a main traffic thoroughfare and also the main divider in Ibhayi separating communities. The precinct creates a hard edge facing the road due to its busy nature and lack of access opening up towards the community side where access is available. The hospital is slightly higher than the community areas thus creating an icon in the community; one that can become positive. Access to Spondo Street is a mixture of vehicular and pedestrian traffic, with large amounts of informal economic activity taking place.

CATEGORIES OF PUBLIC HOSPITALS

DR-TB HOSPITAL HIERACHY

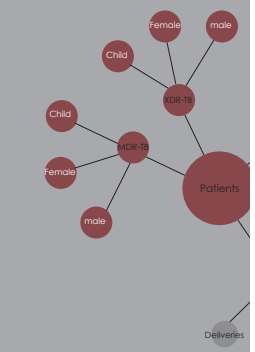


DR-TB HOSPITAL USER GROUPS

This medical facility is not a general public building. The daily users are people who can be divided into four distinct groups identified as;

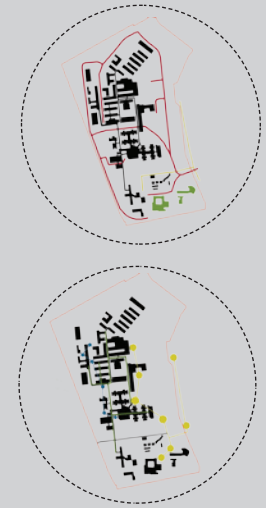
-Patients
-Staff
-Visitors
-Services

Due to the nature of the disease specific spaces need to be set up and thresholds applied in order to avoid cross contamination.



DORA NGINZA HOSPITAL PRECINCT

- Derelict Buildings
- Dental Clinic & Clinic
- Administration
- Entrance
- Rape Crisis Centre
- Produce Planting
- Patient Wards
- Doctors and Nurse Housing/accommodation
- Mortuary
- Nelson Mandela University Medical Campus
- Ambulance Depot
- Records and Pharmacy



PRECINCT ROAD NETWORK

The precinct utilises a ring-road system to connect the different sections of the hospital. The red lines indicate the main vehicular routes, with the yellow lines indicating the new proposed links to further connect the system.

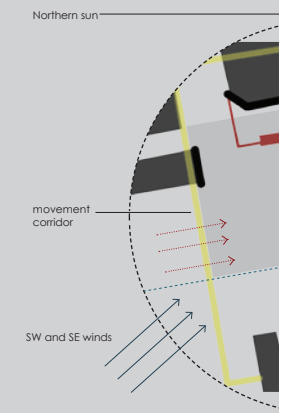
The Green buildings are the new developments on the site. The majority of the development is occurring along the south side of the precinct.

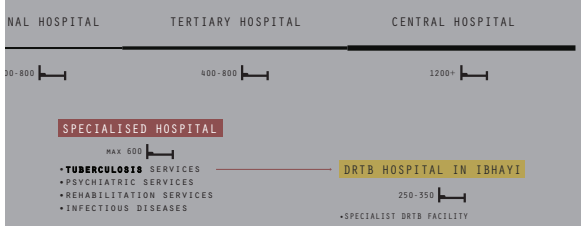
The buildings are all connected yet seperated by function. The main buildings are all the same scale and have been organised on the basis of orientation, this is represented by a strong axial geometry on the site.

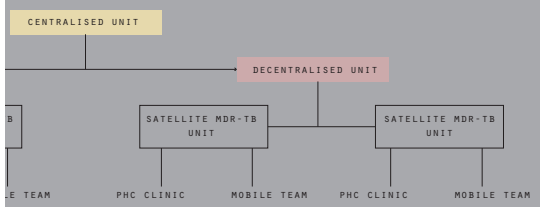
HOSPITAL ACCESS HIERACHY

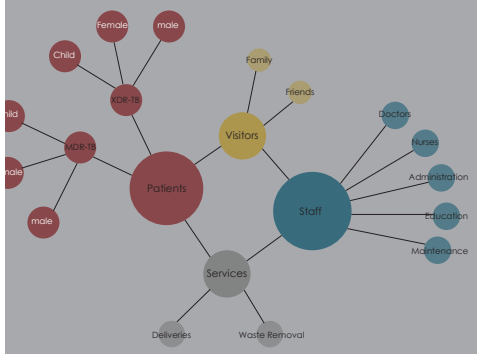
The yellow circles indicate the public access to the hospitals various functions. The blue circles show the private entrances for personal only. This indicates the fronts and the backs of the buildings. There is a fully connected pedestrian link that runs through the length of the hospital which is in green.

SITE ANALYSIS EXISTING

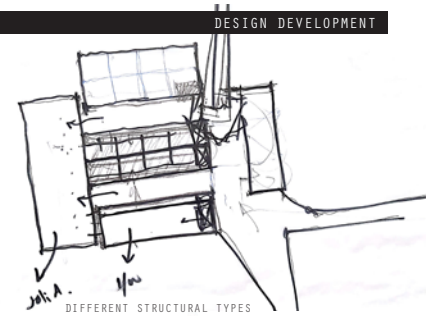




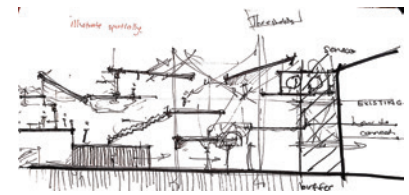




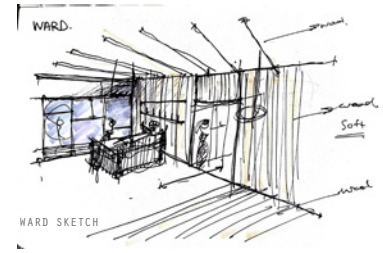
DESIGN DEVELOPMENT



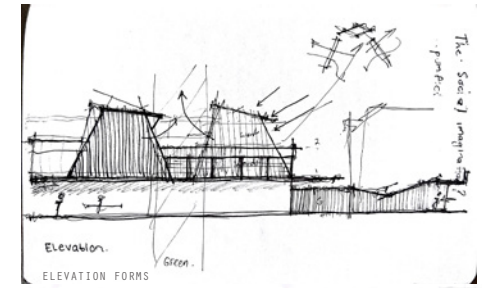
DIFFERENT STRUCTURAL TYPES



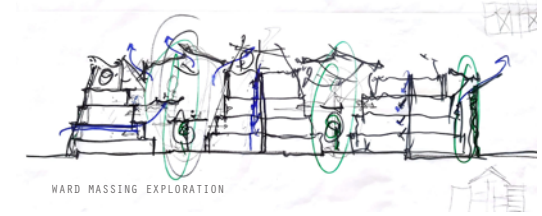
SPATIAL EXPLORATION



WARD SKETCH



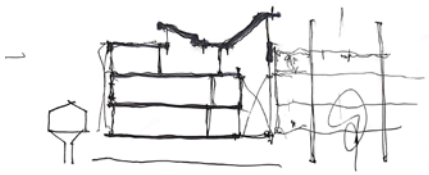
ELEVATION FORMS



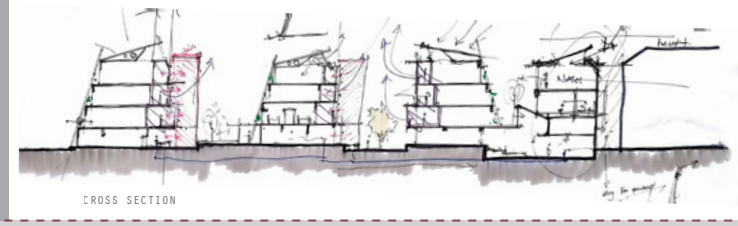
WARD MASSING EXPLORATION

GROUND STOREY PLAN

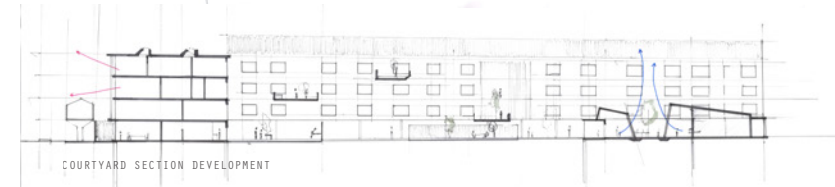
FIRST STOREY PLAN



ROOF PROFILE EXPLORATION

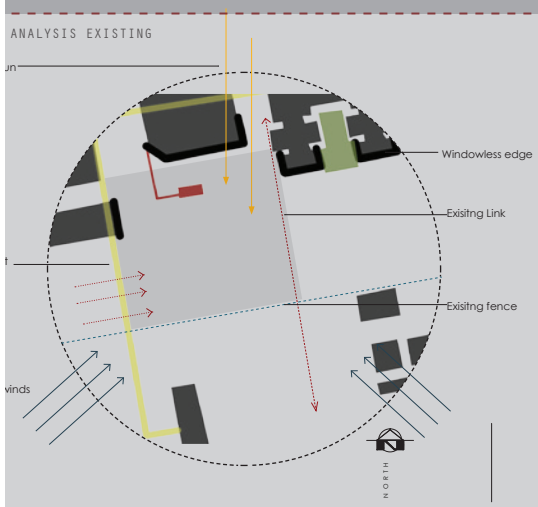


CROSS SECTION



COURTYARD SECTION DEVELOPMENT

ANALYSIS EXISTING



CONSTRAINTS AND INFORMANTS

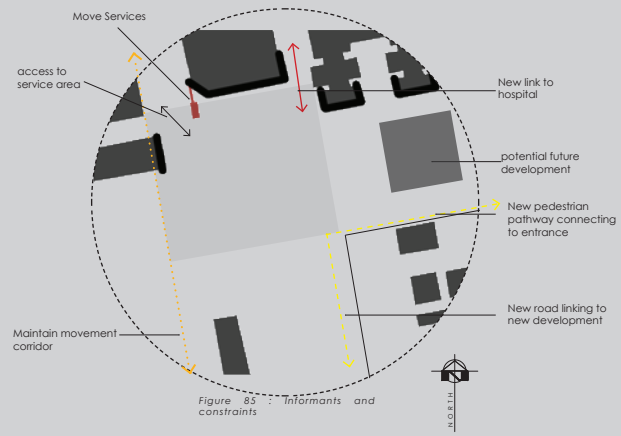


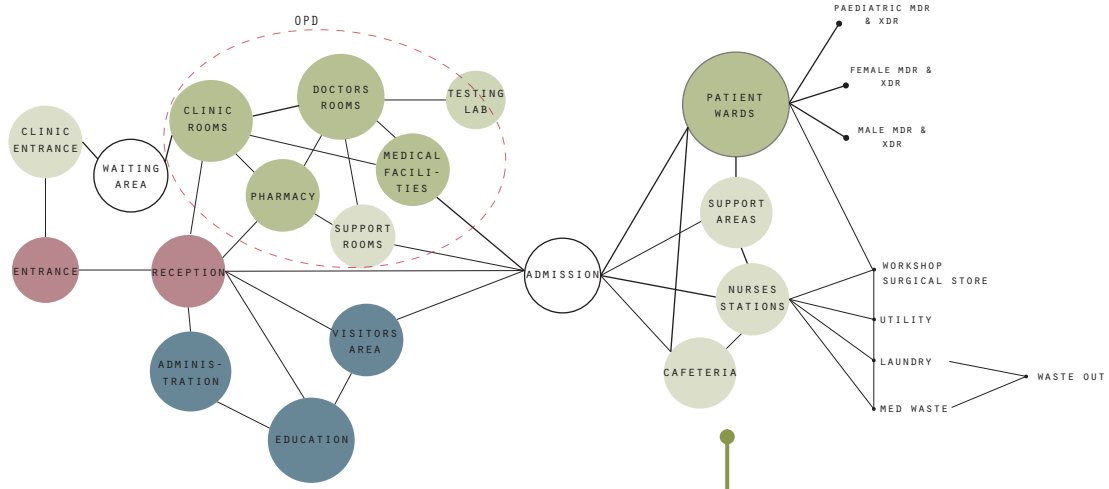
Figure 85 : Informants and constraints

FORMULATION OF THE BRIEF

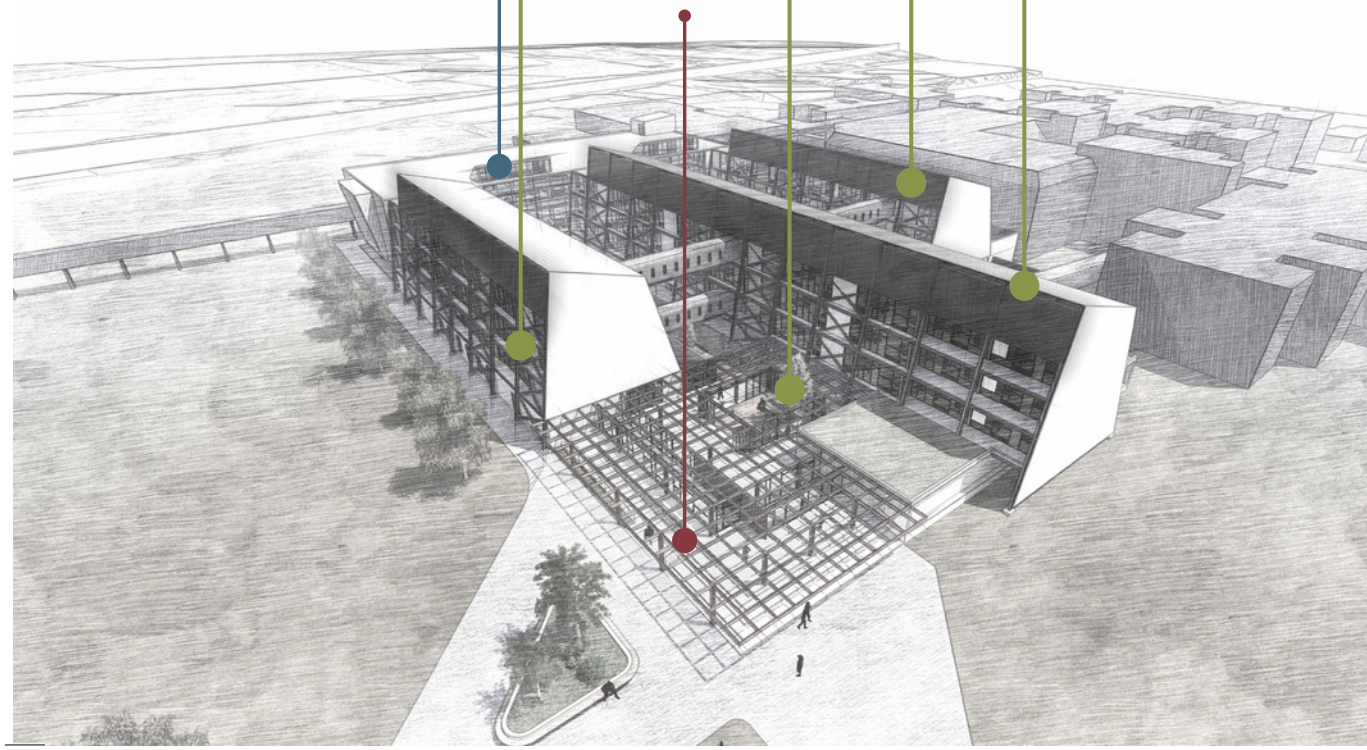
The design of a hospital for the treatment of DR-TB aims to create a specialised facility where biophillic principles are utilised to create an environment that heals patients.

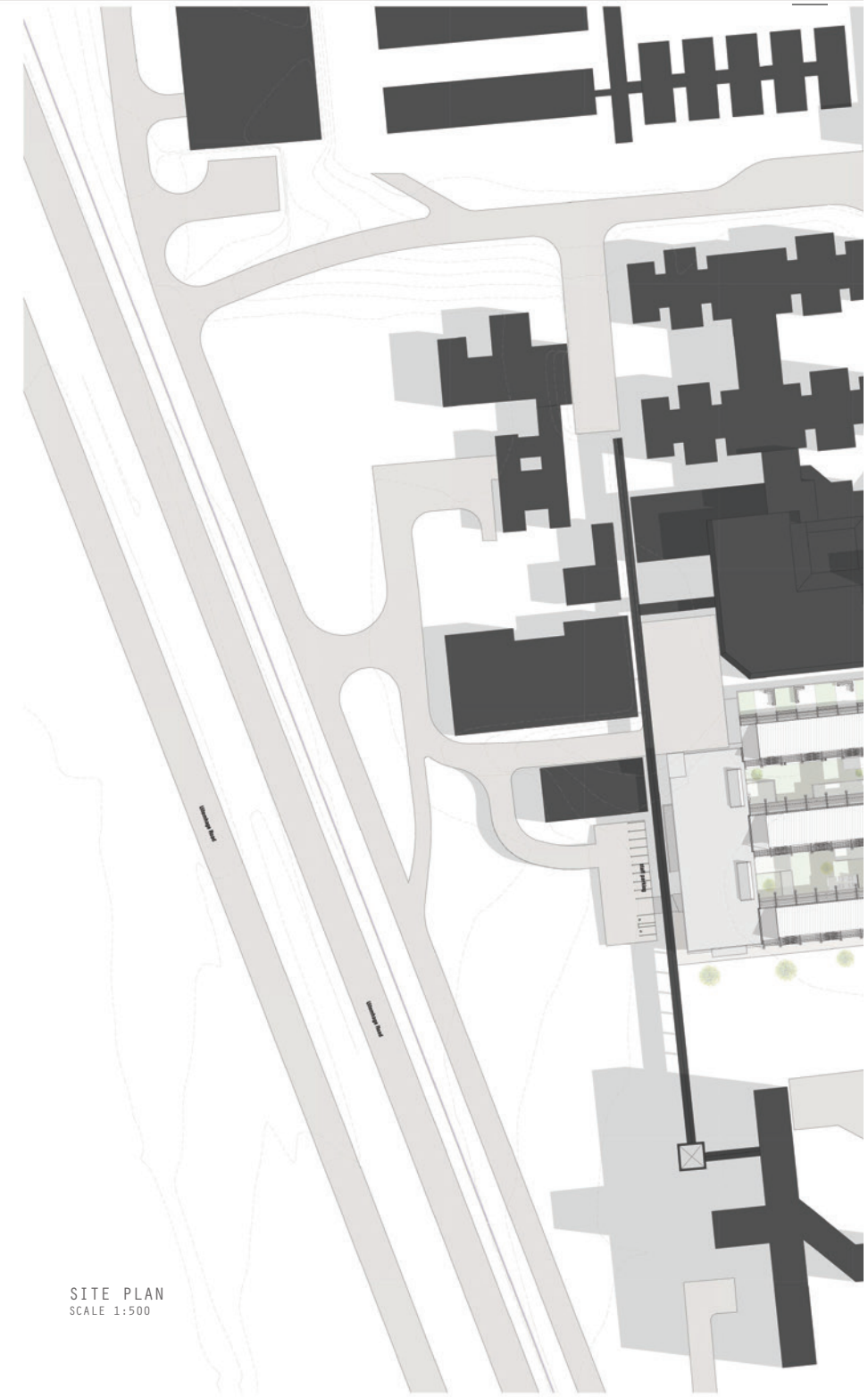
The Eastern Cape is in dire need of more specialised tuberculosis treatment facilities. Dora Nginza hospital precinct has been identified as a key development node within Ibhayi and the greater Port Elizabeth. Ibhayi is one of the worst affected areas when it comes to tuberculosis in Port Elizabeth yet Dora Nginza hospital does not have the facilities to treat the infected patients. This provides an opportunity to connect to the existing hospital and provide a specialised facility that treats and monitors patients with DR-TB.
Nelson Mandela University is currently constructing a medical campus on the same precinct. This provides an opportunity to link with the educational campus and provide training to students in the specialised requirements of MDR-TB treatment.

This facility is integrated within the larger urban precinct yet remains physically isolated in order to reduce a contamination risk and to give the building hierarchical importance.

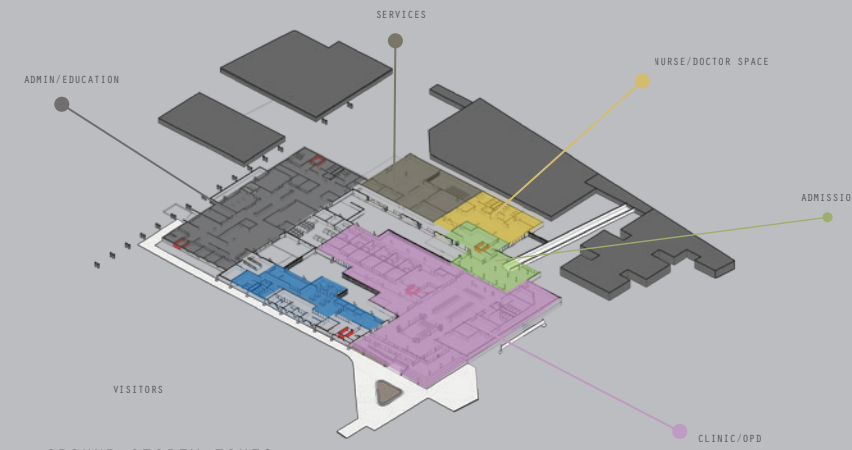


PROGRAMME WEB ZONES

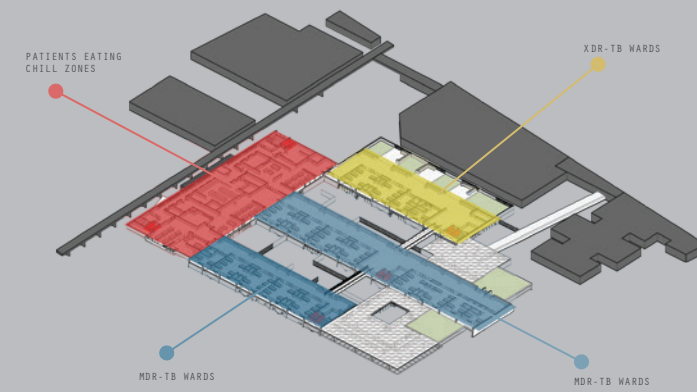




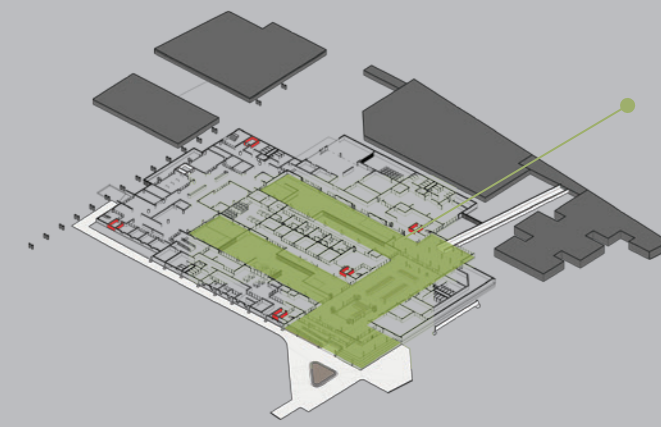
SITE PLAN
SCALE 1:500



GROUND STOREY ZONES



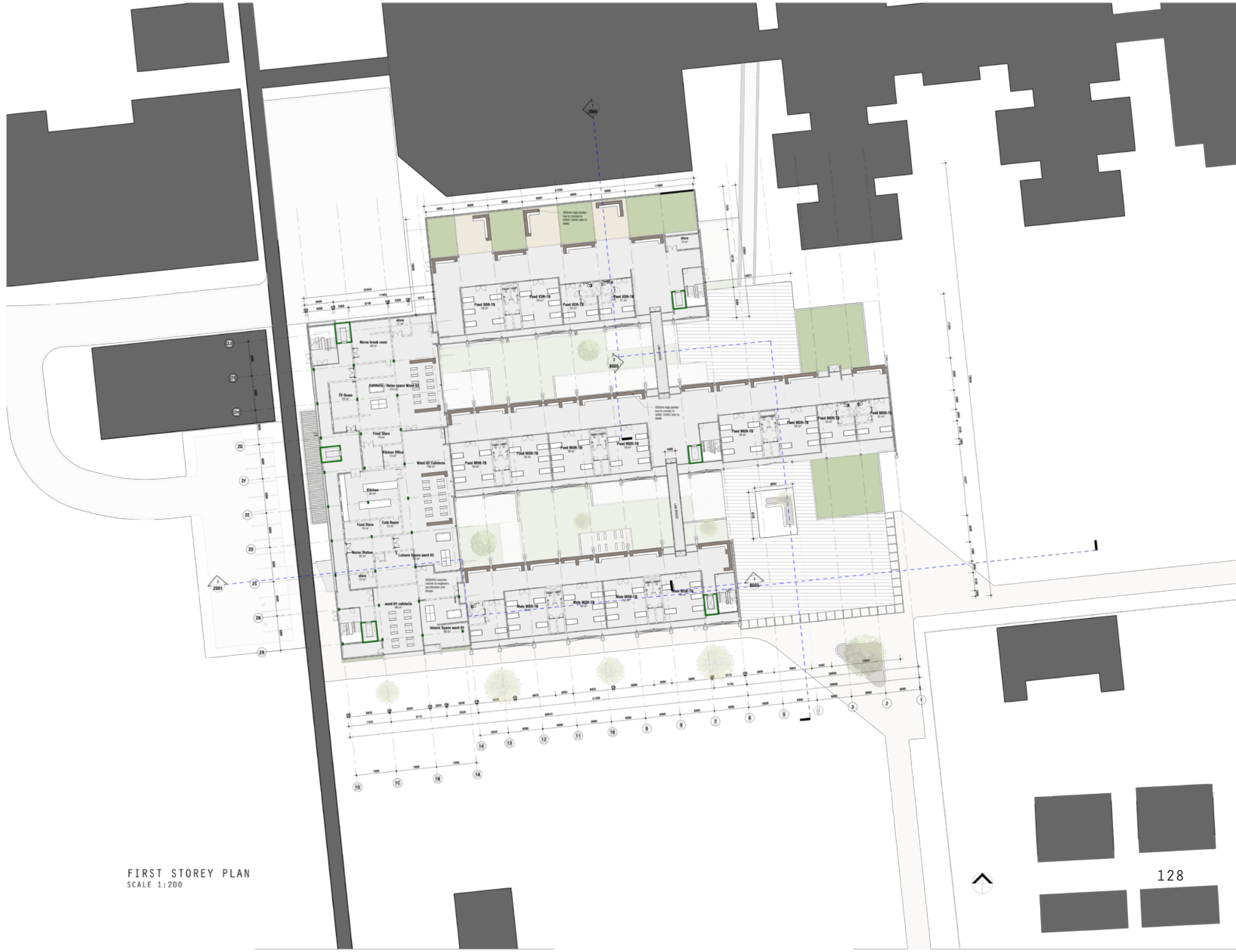
FIRST STOREY ZONES



2 LARGE OPEN COURTYARD SPACES SEPERATING THE VARIOUS WARDS FROM EACH OTHER,AS WELL AS CREATING SPACES FOR MOVEMENT AND INTERACTION WITH OUTDOOR ENVIRONMNETS. AIR FLOW IS PROMOTED THROUGH THE WARDS DUE ITS ORIENTATION. THE ONE COURTYARD IS ENCLOSED YET MAINTAINS ITS CONNECTION TO THE NATURAL THROUGH CLEAR POLYCARBONATE SHEETING TO BREAK DOWN THE FEELING OF ISOLATION

COURTYARD ZONES


SERVICE/DELIVERY YARD
STAFF PARKING
Medical Waste Area
Incoming Store Room
Laundry
workshop
System Room
Nurse/Doctor Chill Space
Admission
Admissions waiting area
Outdoor lunch space
Female
Male
Toilet for persons with disabilities
Training
Office
coffee area
Research space
Laboratory
Cold room shelves
lab office
Audiology
X-Ray
Doctors Room
Therapy Room
Counselling
Processing Area
Female Ablutions
Male Ablutions
Toilet for person with disability
Pharmacist Offices
pharmacy Store
Pharmacy
Waiting Area
Board Room
Server Room
File Room
Reception
Open Plan Offices
Nurse waiting area
visitors area
Circulation
Kitchenette
Storage
Office
Room
Curtain Wall to architects specification and design & to comply with SANS 10400 & 204-04 and SBSL. refer to window schedule
GROUND STOREY PLAN
SCALE 1:200

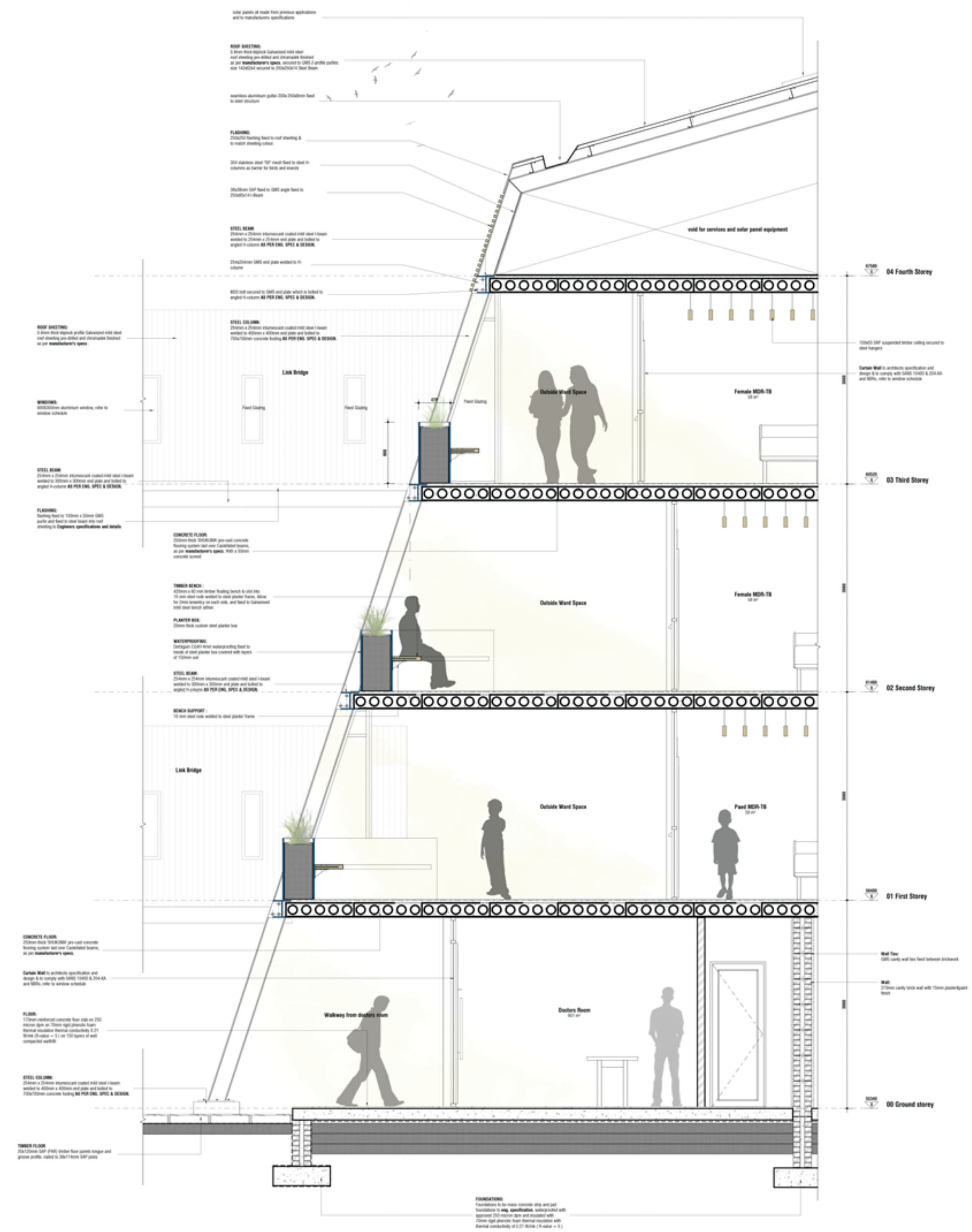


FIRST STOREY PLAN
SCALE 1:200

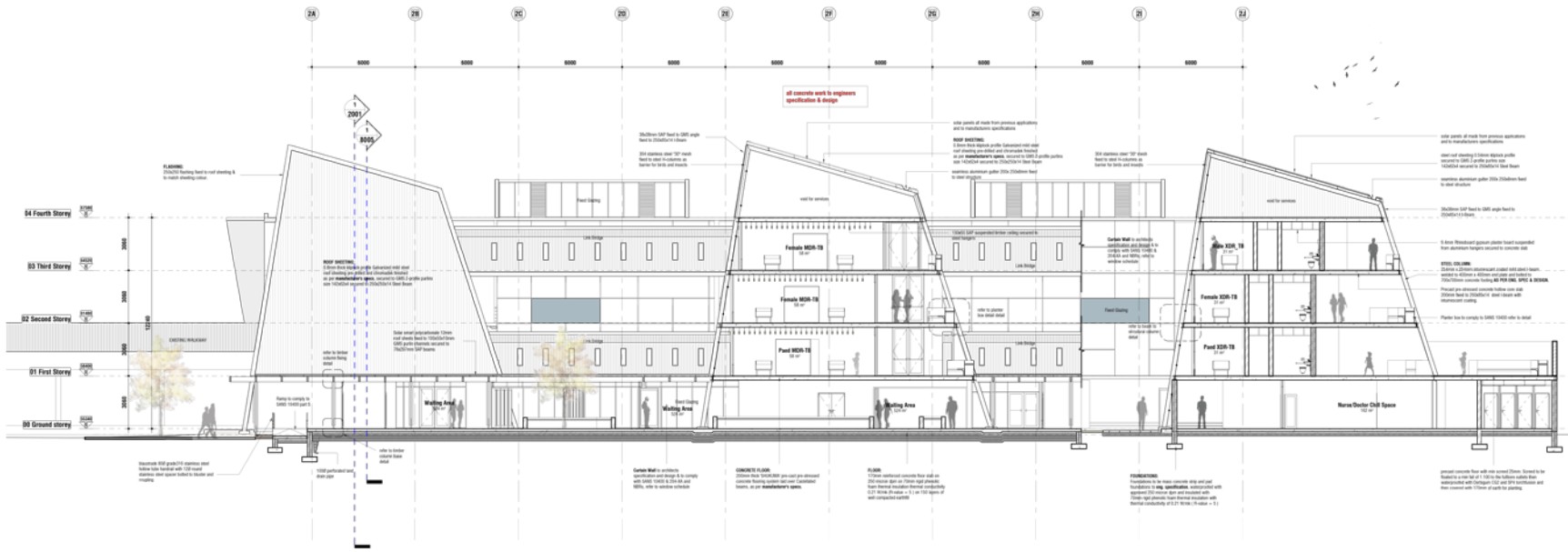
SECOND STOREY PLAN
SCALE 1:200

THIRD STOREY PLAN
SCALE 1:200

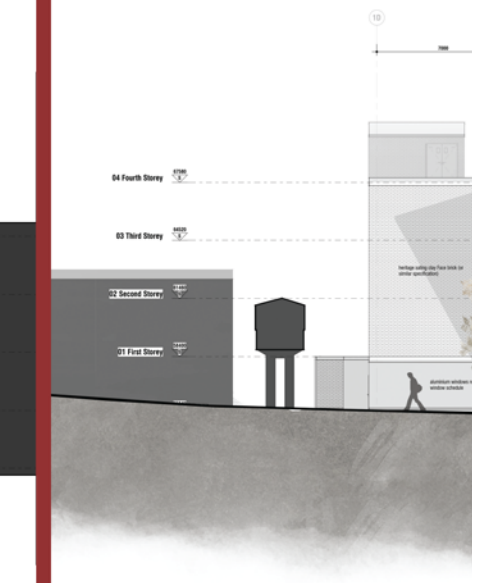
IRD STOREY PLAN
LE 1:200



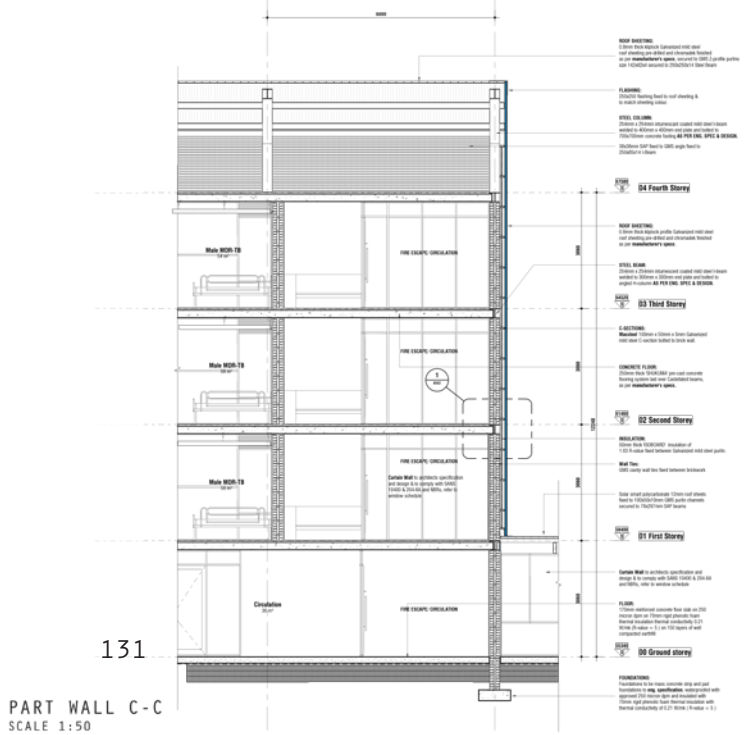
PART WALL SECTION D-D
SCALE 1:25



SECTION A-A
SCALE 1:100

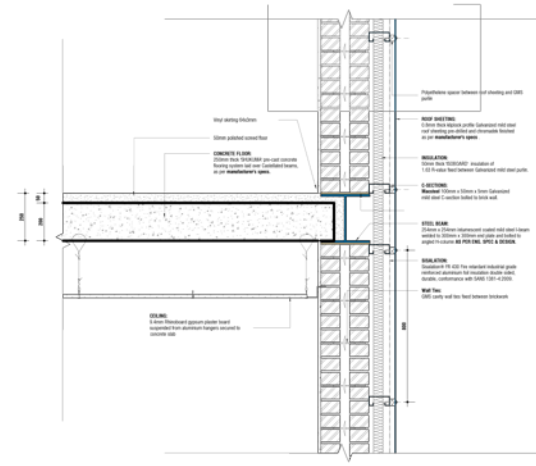


SOUTH ELEVATION
SCALE 1:100



PART WALL C-C
SCALE 1:50

CONSTRUCTION DETAILS



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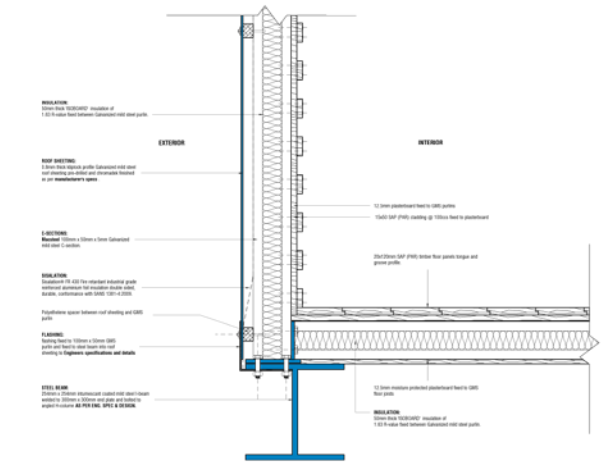

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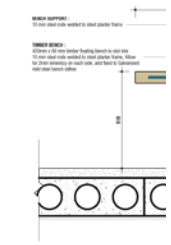

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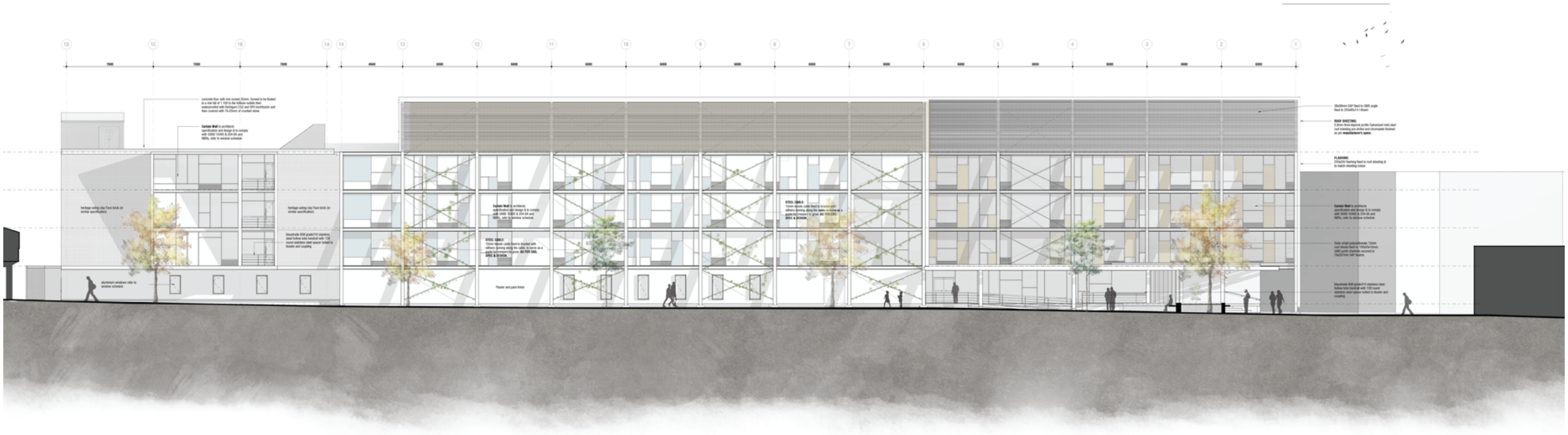
SCALE 1:10



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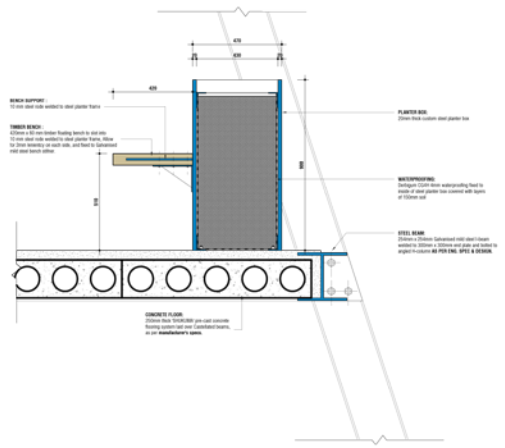

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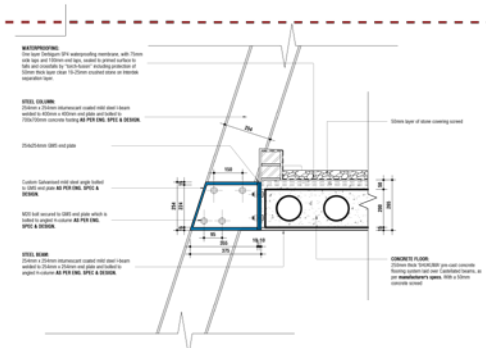

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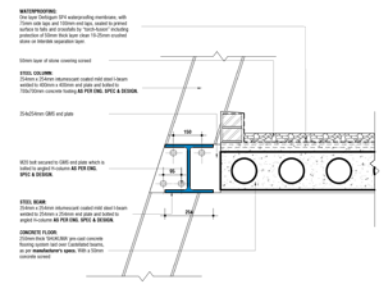

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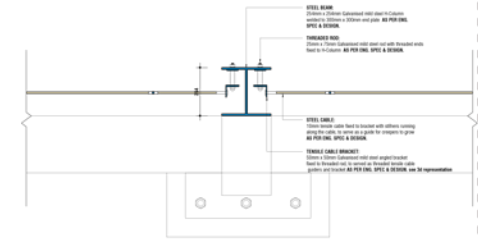

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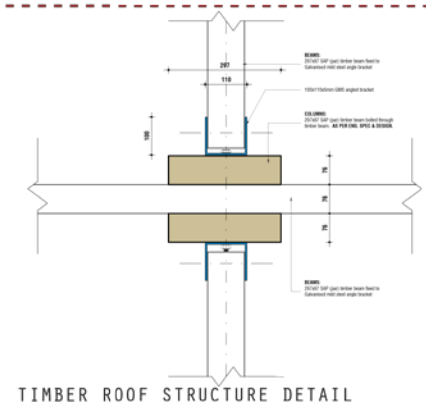

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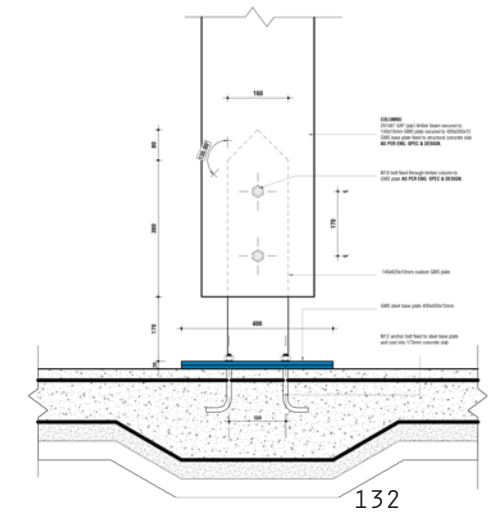

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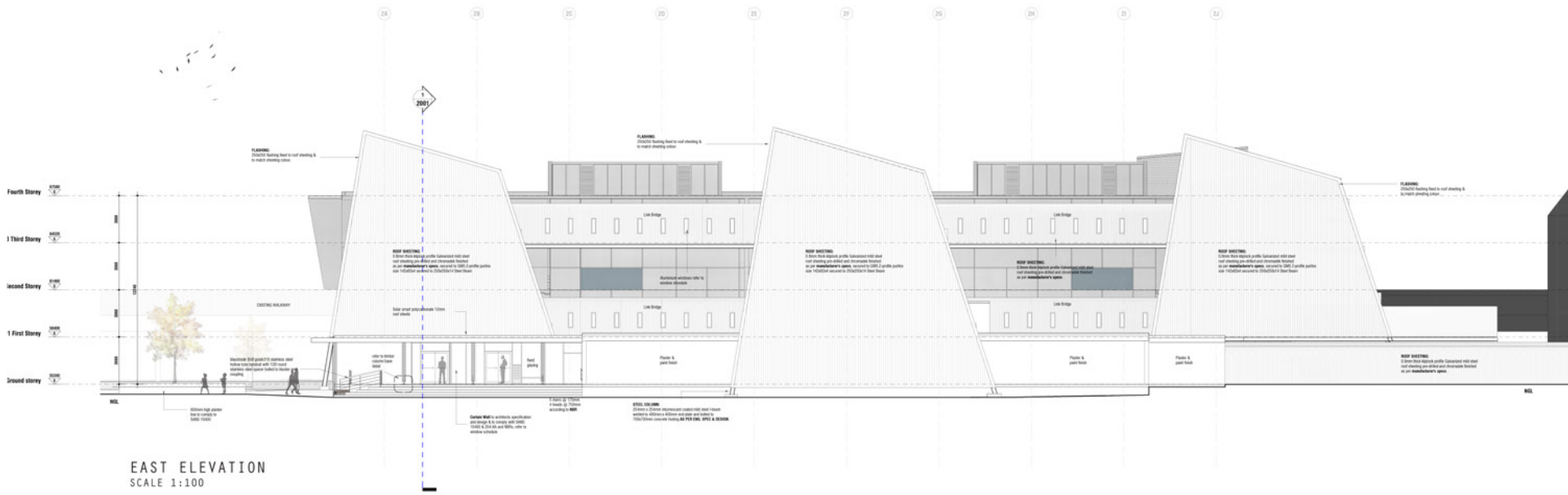

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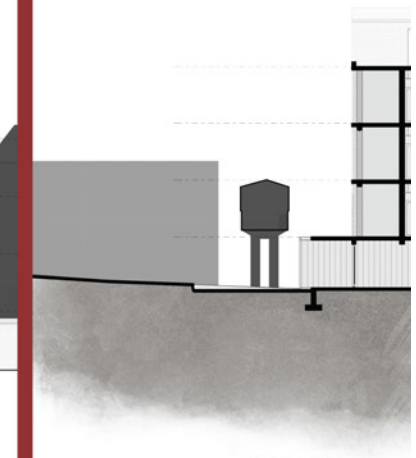

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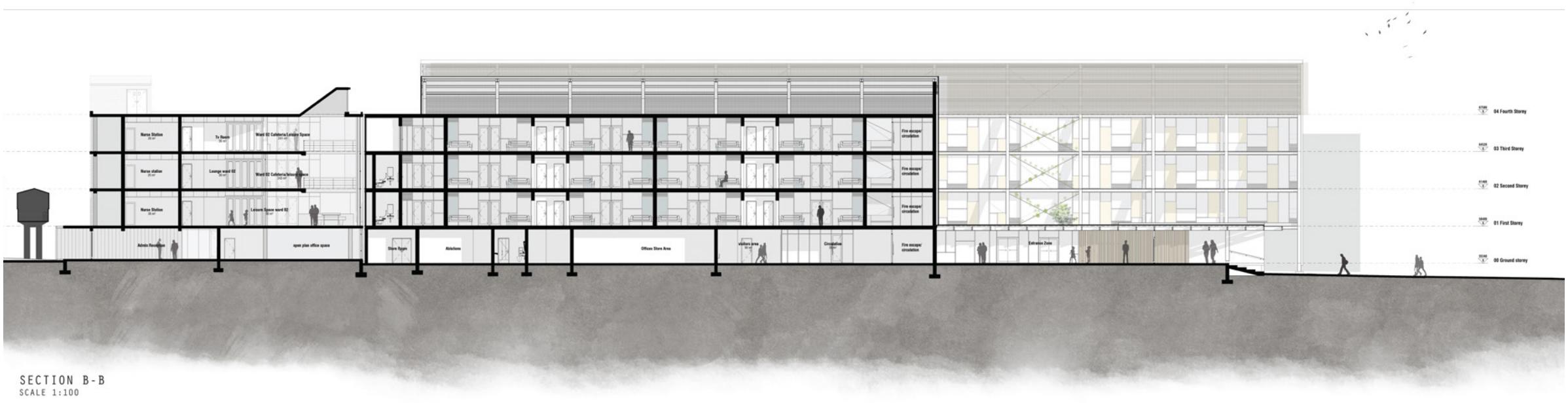

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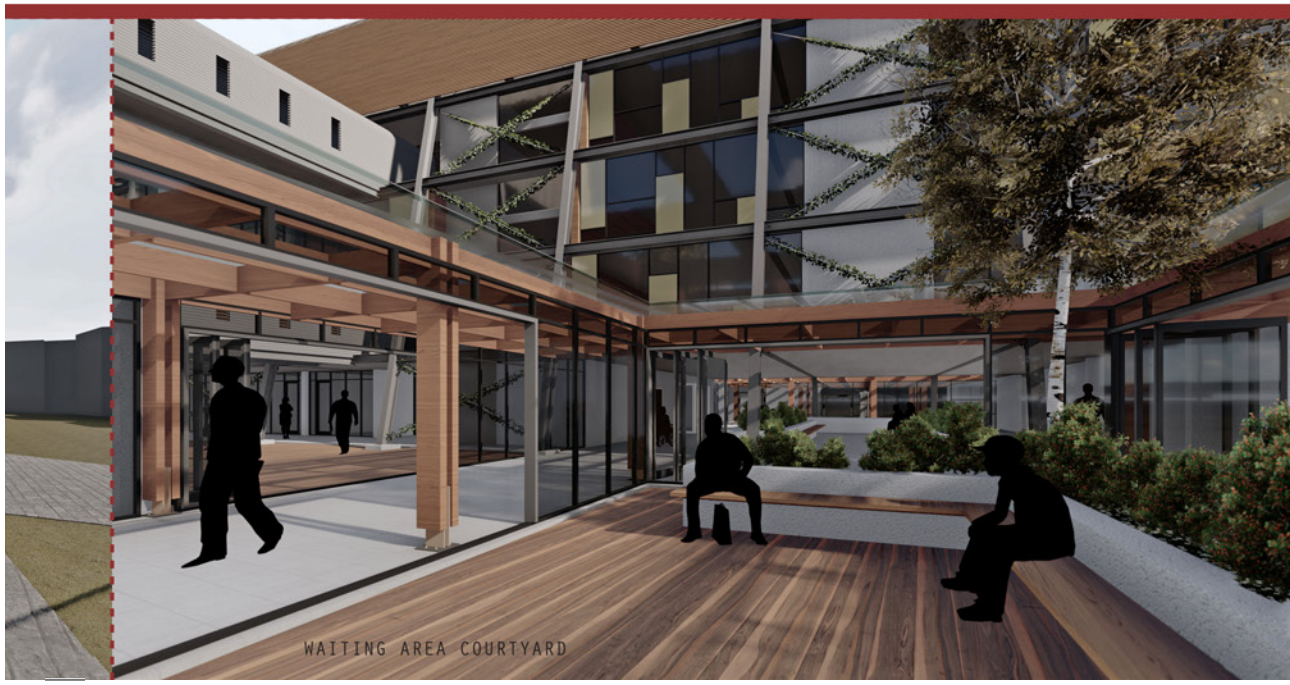

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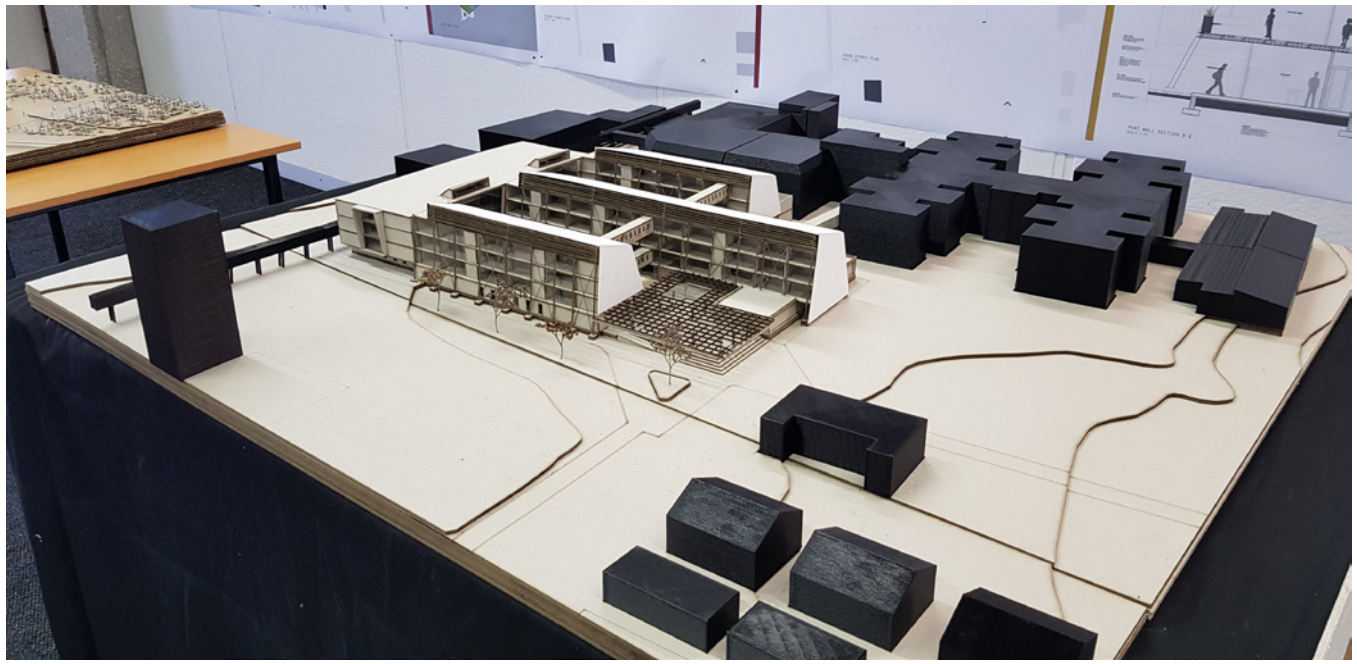

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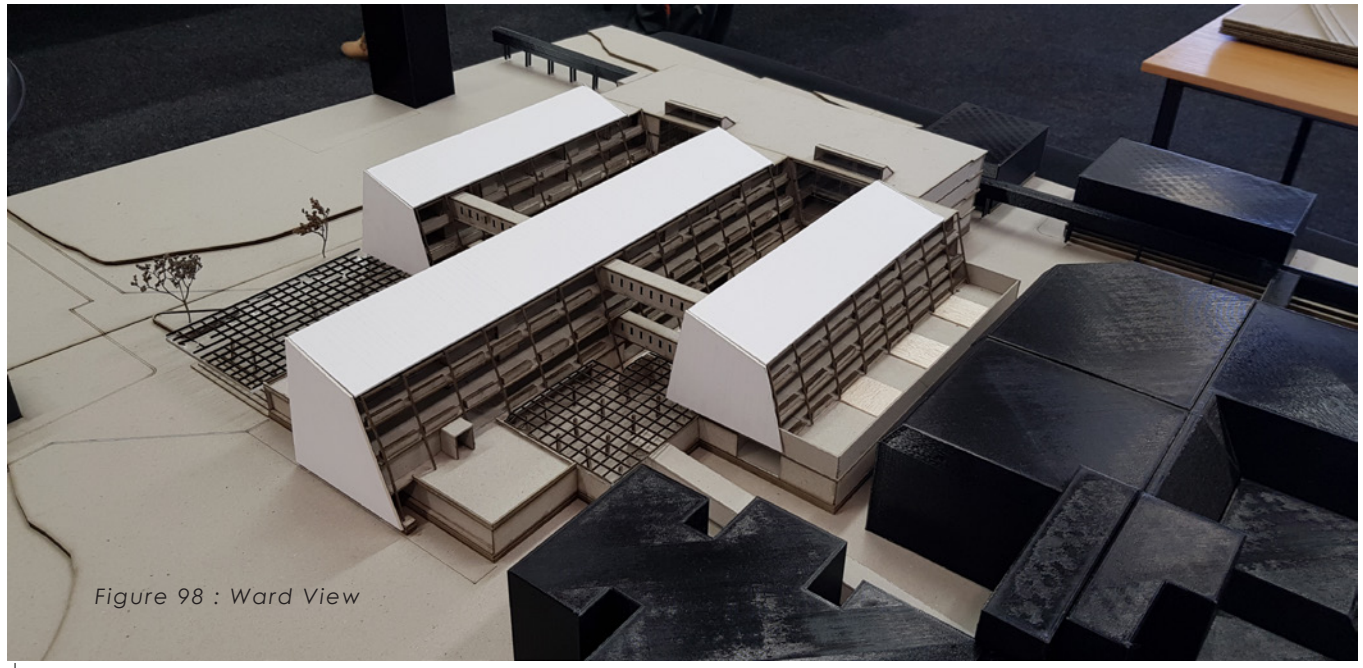

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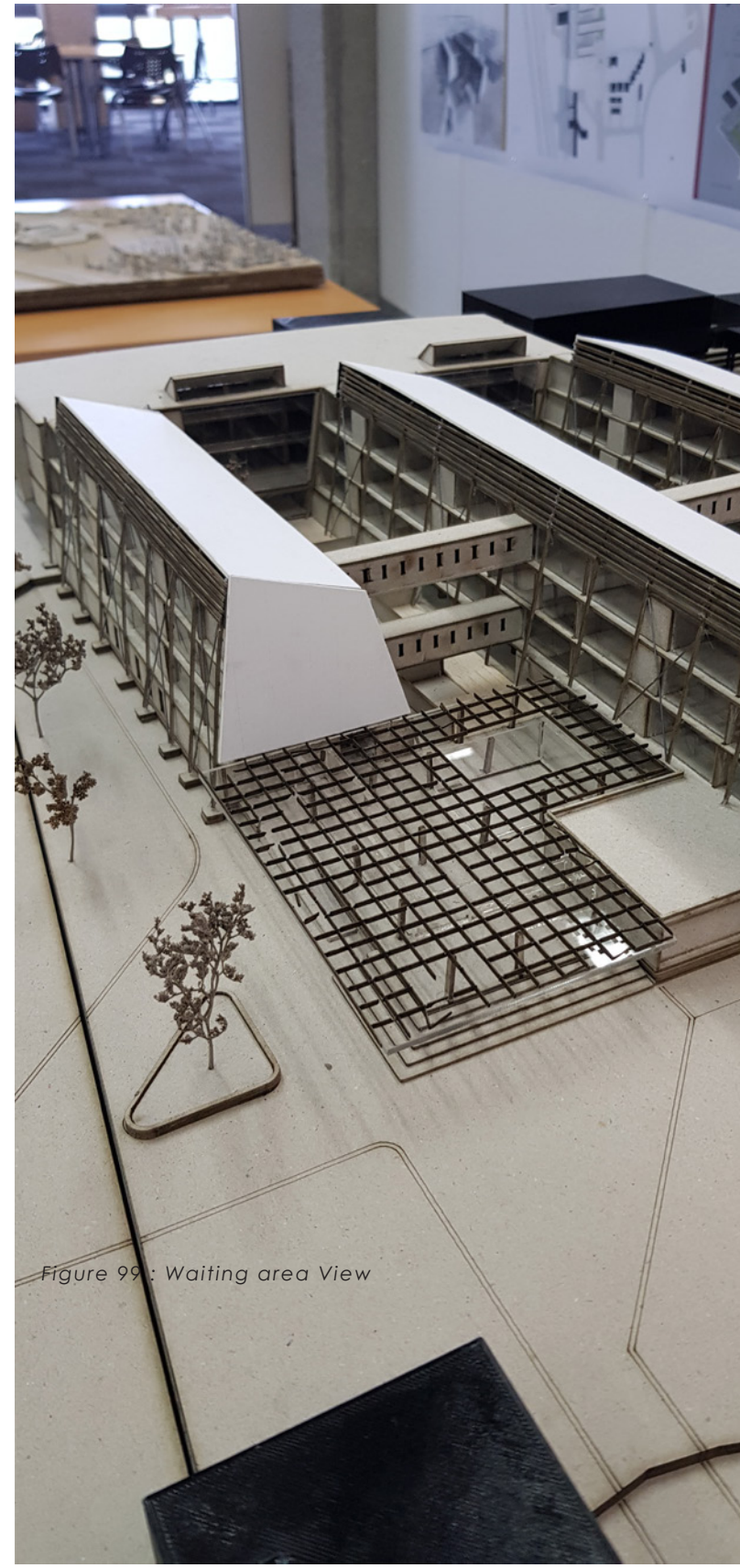

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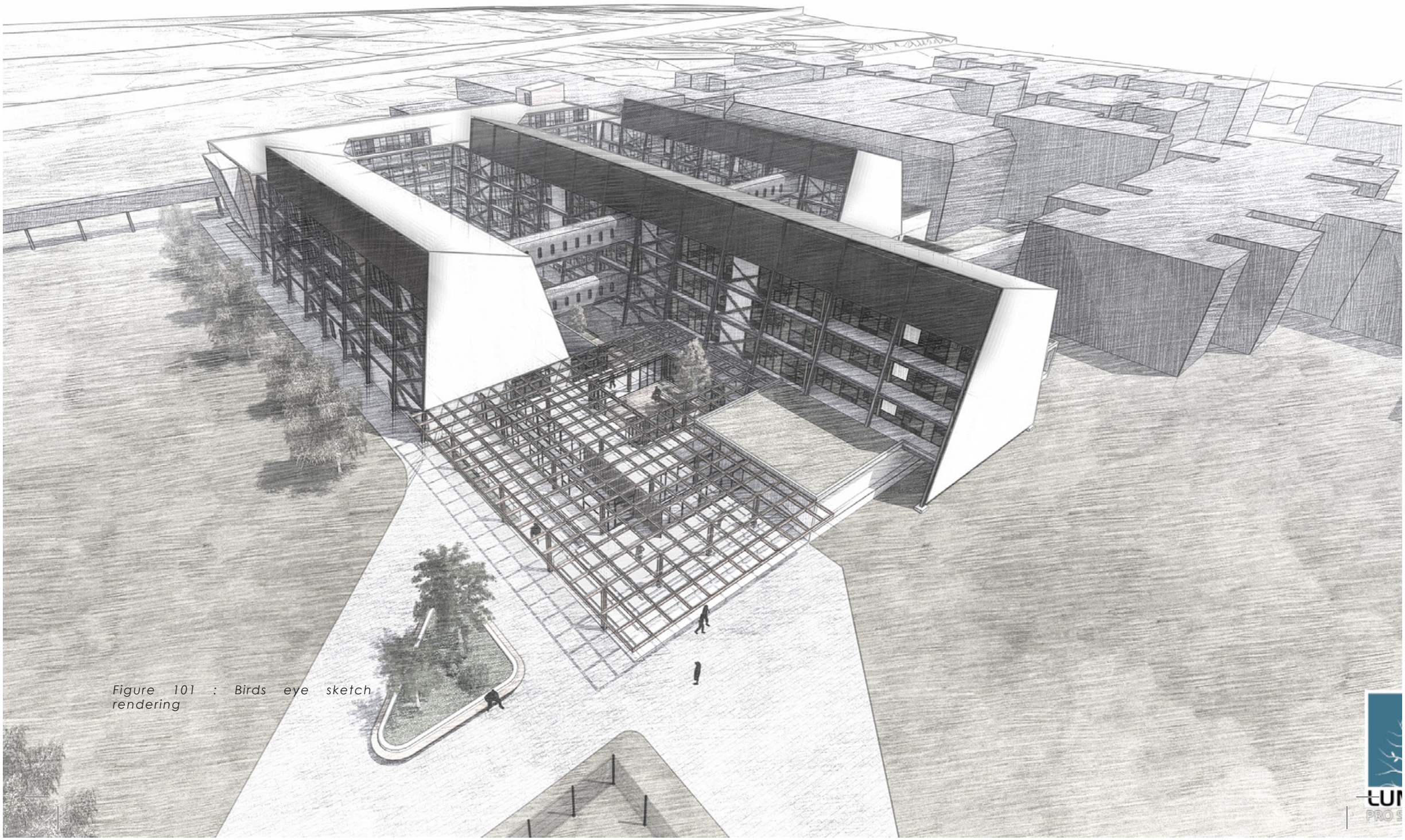

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